Seq 4 Liner Bubble Deficiency Corrective Measure Report

Amos FGD Landfill

John E Amos Plant

Appalachian Power Co.

Putnam County, West Virginia

July 2024

Prepared for: Appalachian Power Co. – John Amos Plant
1530 Winfield Rd
Winfield, West Virginia 25213

Prepared by: American Electric Power Service Corporation
1 Riverside Plaza
Columbus, OH 43215

Document ID: GERS-24-007

Seq 4 Liner Bubble Deficiency Corrective Measure Report

John Amos Plant

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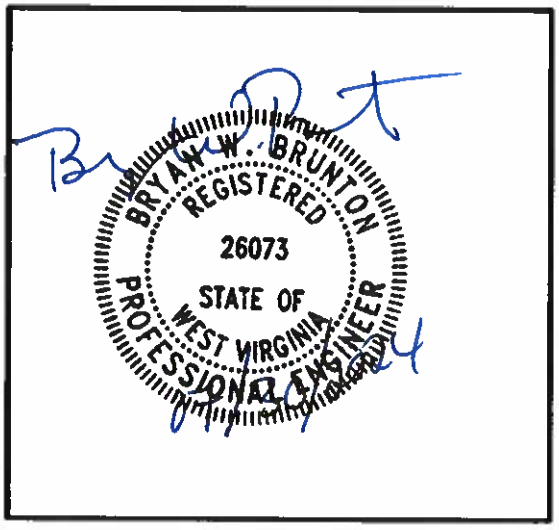
Document Number: GERS-24-007

PREPARED BY _____ DATE July 22, 2024
Brian G. Palmer, P.E.

REVIEWED BY _____ DATE 07-24-2024
Shah Baig, P.E.

APPROVED BY _____ DATE 07/30/2024
Bryan W. Brunton, P.E.
Manager – AEP Geotechnical Engineering



I certify to the best of my knowledge, information and belief the information contained in this report meets the requirements of 40 CFR § 257.84(b).

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1.0 INTRODUCTION

This report was prepared by AEP – Geotechnical Engineering Services (GES) section, in part, to fulfill requirements of 40 CFR 257 and to provide the John Amos Plant a report documenting the corrective measures associated with a deficiency.

This report specifically addresses the corrective action related to the deficiency involving water bubble under the liner in Sequence 4 (Seq. 4) of the FGD Landfill (see Site Map in Appendix A).

Investigation of the cause of the bubble was supported by Arcadis US, Inc who provide additional hydrogeologic investigation and GAI Consultants who reviewed design and construction documentation and prepared detail design for the corrective measures.

The work for the repair was performed by Entact, LLC, over overseen by Dave Fry, AEP Construction – Site Lead Coordinator. Arcadis US provided technical support and GAI Consultants provided Construction Quality Assurance services for the construction phase of corrective measure project.

Brian Palmer, PE, AEP Geotechnical Engineering Services, provided technical support and general oversight for the entire project. Janine White, AEP Project Manager provided management of the construction phase of the corrective measure.

2.0 DESCRIPTION OF LANDFILL

The landfill was re-permitted on September 7, 2017 by the West Virginia Department of Environmental Protection (Permit No. WV0116254) that reduces the number of sequences and footprint. The landfill now consists of nine sequences that will encompass 191.9 acres for a permitted fill capacity of 36.8 million cubic yards.

The landfill permit revision also allows a design change from a 2 ft thick soil cover cap to a Coal Combustion Residuals (CCR) compliant cap. This permit revision also allows a change for the base liner design from an 18 inch thick recompacted clay liner (overlain by a geomembrane and leachate collection system) to a 24 inch thick recompacted clay liner (overlain by a geomembrane and a leachate collection system) that is compliant with the Coal Combustion Residuals regulations.

Currently only Sequences 1 through 4, consisting of approximately 100 acres have been developed and contain CCR material. Sequences 1 through 3 drain to the South Valley leachate /sedimentation basin complex.

Sequence 4 completed construction in 2019 and was placed into service. Sequence 4 along with future sequences (5-9) drain to the North Valley leachate/sedimentation basin complex.

Approximately 16.3 acres within the South Valley had final cover cap installed in 2018 to 2019. An additional 9 acres of the South Valley slopes had final cover installed in 2022.

The landfill utilizes sediment collection ponds and two leachate holding basins at the mouth of each drainage area (North and South Areas). The sediment collection ponds are used to collect watershed runoff that is not leachate or CCR contact water. The leachate holding basins collect and contain leachate and contact water generated from the landfill.

3.0 DESCRIPTION OF DEFICIENCY (257.84(b)(5))

As part of periodic facility inspections, the facility identified an area of Sequence 4 that appeared to have several "bubbles" under the liner system. The bubbles were limited to the eastern portion of Sequence 4.

4.0 INVESTIGATION AND CORRECTIVE MEASURES (257.84(b)(5)

4.1 INVESTIGATION

Several investigative steps were taken after the review of design and construction documents.

1. Initial site reviews suspected that the unlined stormwater pond (Plateau Pond) to the immediate south of the area may be contributing water that was overwhelming the field installed underdrain system as the pond did not hold water after a storm events.
2. GAI consultants prepared plans for the lining of the Plateau Pond with a geosynthetic liner system during the spring of 2020.
3. During the summer of 2020 RB Jergens (RBJ) installed the geosynthetic liner system in the Plateau Pond. After installing a geosynthetic liner system in the stormwater pond the water under the landfill liner was drained and the areas left without protective cover for several weeks to verify that the issue was properly addressed. (Construction Activities report included in Appendix B-1). The single bubble located on the east side of the center of Seq 4 did not return and was considered resolved. The main area of bubbles in the far east end of Sequence 4 subsequently returned and additional investigative activities were initiated.
4. Arcadis was engaged to further evaluate the hydrogeologic conditions in the immediate area of the east area of Sequence 4. Concurrently, GAI Consultants evaluated the construction design, construction records and related data to identified issues/deficiencies in the design or construction that could contribute to the water under the liner.
    a. The Arcadis investigation identified zones within the weathered bedrock (stress relief fracture zone) upper most aquifer that are more permeable and subject to seepage. (Hydrogeologic report included in Appendix B-2)
    b. Review of the field installed underdrain system indicated that it did not fully align with the identified areas of the zones of more seepage that may be attributed to the source of water under the liner.
5. A Risk Based Technical Option (RBTO) review with Amos Plant Staff, AEP Engineering Services, AEP Environmental Services, AEP Construction, and GAI Consultants was conducted to evaluate the best method to address the area of the deficiency. This process determined that reconstruction of the impacted area of Sequence 4 with a formally designed underdrain system was the best method for addressing the deficiency.

4.2 CORRECTIVE MEASURE

After completing the RBTO process GAI Consultants put together engineering plans for the reconstruction of the impacted area of Seq 4 to include over excavation of the area to allow the installation of an 18-in rock blanket underdrain with 5-ft of separation material (4-ft isolation layer and 1-ft liner subgrade per WVDEP requirements) below the clay liner system.

A contract was awarded to ENTACT for the reconstruction of impacted area of Seq. 4 in spring of 2023. Construction initiated with the installation of a temporary separation berm to isolate the area from the rest of Seq 4 for re-construction. ENTACT removed the existing protective cover, leachate collection system and geomembrane liner prior to excavating the recompacted clay soil, the liner subgrade soil and structural fill prior to over-excavating for the rock blanket layer. Over

excavation included removal of the existing field underdrain system installed as part of the original construction. Following all removal and excavation/over-excavation activities the rock blanket and underdrain pipe were installed followed by the installation of 4-ft of isolation layer and 1-ft of liner subgrade material per WVDEP requirements to establish the required 5-ft separation per 40 CFR 257 between the upper most aquifer and the bottom of the liner system. The clay liner, PVC liner, Leachate Collection system, and the protective cover were subsequently reconstructed.

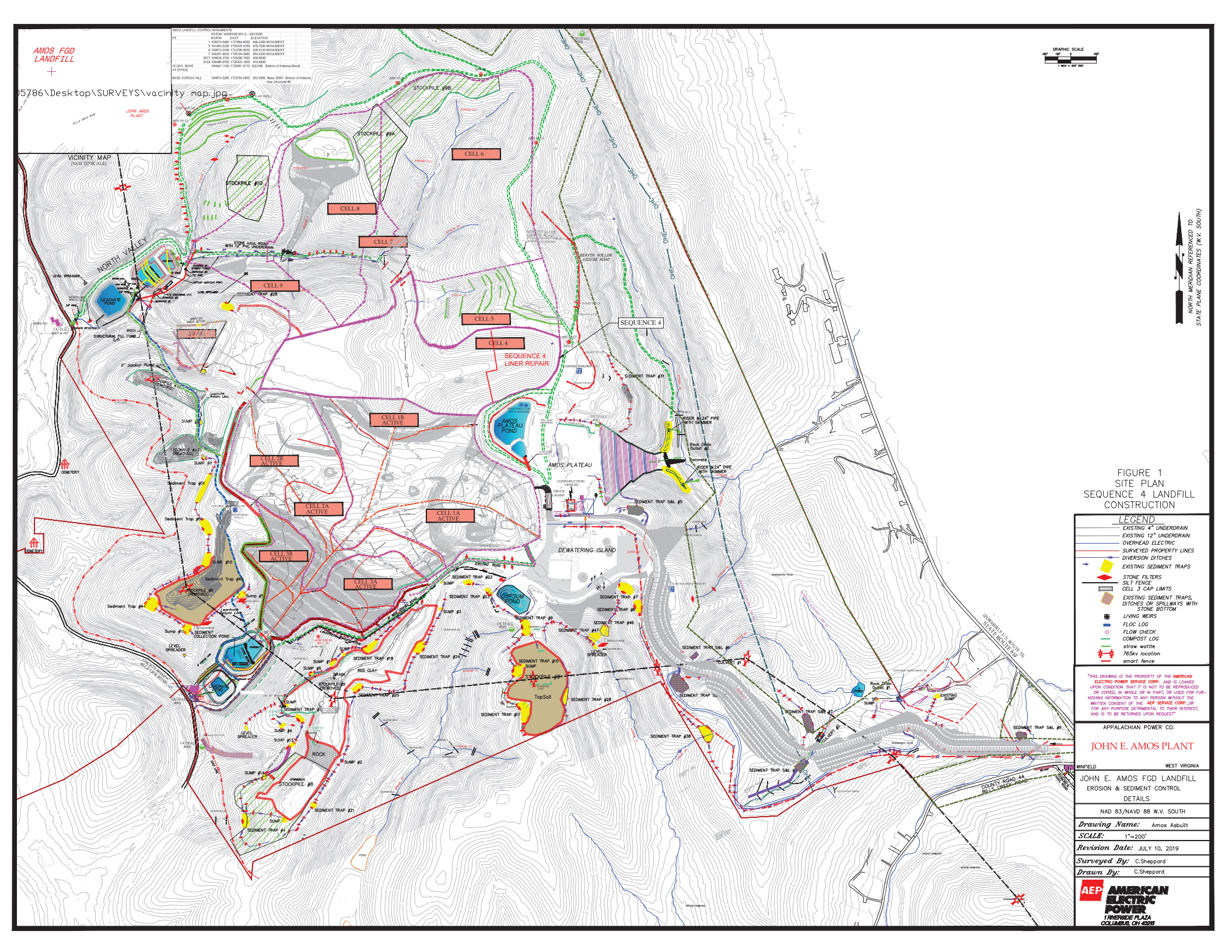
Reconstruction of Sequence 4 bubble area was completed in June 2024 with final certification reports submitted to WVDEP. A final overall certification and all the respective certification reports are included in Appendix B-3

5.0 CONCLUSION

The corrective measures taken to correct the water under the liner in an area of Sequence 4 have been completed and the deficiency resolved in accordance with 40 CFR 257.

Appendix A

Site Map


AMOS FGD LANDFILL
05786\Desktop\SURVEYS\vacinity map.jpg
JOHN AMOS PLANT
VICINITY MAP
(NOT TO SCALE)
AMOS LANDFILL CONTROL MONUMENTS
DATUM: NAD83/88 WV S - GEOID09
PT. NORTH EAST ELEVATION
1 539375.6400 1727964.6500 949.2400 MONUMENT
5 541955.8200 1725470.5700 970.7500 MONUMENT
6 540672.0190 1727790.9030 926.9120 MONUMENT
7 540251.9620 1728194.6480 954.4330 MONUMENT
5077 540620.3700 1725286.7600 939.5930
5104 539480.8700 1728325.1600 916.5930
540947.1150 1725381.9170 929.596 Bottom of Antenna Mount
BASE ACROSS HILL 540874.0200 1722784.0800 933.0900 Base 25001 Bottom of Antenna Near Stockpile #6
GRAPHIC SCALE
1 INCH = 200 FEET
NORTH MERIDIAN REFERENCED TO STATE PLANE COORDINATES (W.V. SOUTH)
NORTH VALLEY
LEACHATE POND
STRUCTURAL FILL POND 2/3
SEDIMENT TRAP #28
STONE HAUL ROAD WITH 12" PVC UNDERDRAIN
STOCKPILE #9B
STOCKPILE #9A
STOCKPILE #10
CELL 6
CELL 8
CELL 7
CELL 9
CELL 5
CELL 4
SEQUENCE 4
SEQUENCE 4 LINER REPAIR
CELL 1B ACTIVE
CELL 2B ACTIVE
CELL 2A ACTIVE
CELL 1A ACTIVE
CELL 3B ACTIVE
CELL 3A ACTIVE
AMOS PLATEAU POND
AMOS PLATEAU
DEWATERING ISLAND
DRY SUMP POND
SEDIMENT COLLECTION POND
CEMETERY
BEAVER HOLLOW ACCESS RD. ROAD
(FORMERLY U.S. ROUTE 35) STATE ROUTE 817
COUNTY ROAD 44 BILLS CREEK ROAD
OHIO
FIGURE 1
SITE PLAN
SEQUENCE 4 LANDFILL
CONSTRUCTION
LEGEND
EXISTING 4" UNDERDRAIN
EXISTING 12" UNDERDRAIN
OVERHEAD ELECTRIC
SURVEYED PROPERTY LINES
DIVERSION DITCHES
EXISTING SEDIMENT TRAPS
STONE FILTERS
SILT FENCE
CELL 3 CAP LIMITS
EXISTING SEDIMENT TRAPS, DITCHES OR SPILLWAYS WITH STONE BOTTOM
LIVING WEIRS
FLOC LOG
FLOW CHECK
COMPOST LOG
straw wattle
765kv location
smart fence
"THIS DRAWING IS THE PROPERTY OF THE AMERICAN ELECTRIC POWER SERVICE CORP. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF THE AEP SERVICE CORP., OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST"
APPALACHIAN POWER CO.
JOHN E. AMOS PLANT
WINFIELD WEST VIRGINIA
JOHN E. AMOS FGD LANDFILL
EROSION & SEDIMENT CONTROL DETAILS
NAD 83/NAVD 88 W.V. SOUTH
Drawing Name: Amos Asbuilt
SCALE: 1"=200'
Revision Date: JULY 10, 2019
Surveyed By: C.Sheppard
Drawn By: C.Sheppard
AEP AMERICAN ELECTRIC POWER
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

Appendix B

Construction Reports

B-1 – 2020 Plateau Pond Construction Activities Report

GAI Consultants, Inc.
Charleston Office
500 Lee Street East
Charleston, West Virginia 25301

T 304.926.8100
F 304.926.8180

September 8, 2022

Project C130109.24.005 and 006

Mr. Brian G. Palmer, P.E.
Principal Engineer
American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215-2372

2020-2021 Construction Activities Report
Plateau Pond Lining and Sequence 4 Bubble Investigation Repairs
John E. Amos Flue Gas Desulfurization Landfill
John E. Amos Plant
Winfield, West Virginia

Dear Mr. Palmer:

GAI Consultants, Inc. (GAI) has prepared this Construction Activities Report to document the lining of the Plateau Pond in 2020 and the repairs to the Sequence 4 liner during the 2020 and 2021 bubble investigations at the John E. Amos Landfill in Putnam County, West Virginia. The Report describes the activities conducted and includes the available quality control and quality assurance materials pertinent to the activities.

The Plateau Pond lining was performed in 2020 and consisted of the installation of a 40-mil linear low density polyethylene (LLDPE) geomembrane with a protective cover in the Plateau Pond. The Sequence 4 bubble investigations consisted of separate repairs made to the 30-mil polyvinyl chloride (PVC) geomembrane at selected bubble locations where draining of the bubbles was conducted.

The Report includes the following documents pertinent to the construction:

- Plateau Pond Lining: Requests for Information (RFIs) – Attachment 1;
- Plateau Pond Lining: Submittals – Attachment 2;
- Plateau Pond Lining: Daily Work Progress Reports – Attachment 3;
- Plateau Pond Lining: Grout Placement and Testing – Attachment 4;
- Plateau Pond Lining: LLDPE Geomembrane: Bill of Lading, Seaming and Non-Destructive Test Log, Trial Seems, Panel Placement, and Repairs – Attachment 5;
- Plateau Pond Lining: Certificate of Subgrade Acceptance – Attachment 6;
- Sequence 4 Bubble Repair and Liner Patching – Memo and Reports – Attachment 7; and
- Design Drawings – Attachment 8.

Plateau Pond Lining RFIs

A summary log and copies of the RFIs are provided in Attachment 1. Five RFIs were received, as listed in Table 1. Refer to Attachment 1 for copies of the RFIs and responses.

Table 1

List of Requests for Information
Plateau Pond Lining Construction

RFI #	Description	Response by
ABPP-1	Relocation of the anchor trench to preserve road width; Handling of seep in pond; Protection of geomembrane on bedrock within pond	GAI
ABPP-2	Proposed alternative to the skimmer arm rope guide system, using poles	GAI
ABPP-3	Elimination of third-party destruct testing on synthetic liner	AEP
ABPP-4	Method utilized to drain the water from below the geomembrane	GAI
ABPP-5	Replacement of structural fill over the revetment mattress land liner with crusher run material and omittance of compaction requirement	GAI

Plateau Pond Lining Submittals

A summary log and copies of the submittals with the GAI reviews are provided in Attachment 2. Three submittals were reviewed, as listed in Table 2.

Table 2

List of Submittals
Plateau Pond Lining Construction

Submittal	Description
PP-SUB-003	Agrutex 8 oz. and 16 oz. non-woven geotextiles; 40-mil. Agrutex MicroSpike LLDPE geomembrane
PP-SUB-004	Hydrotex FP400
PP-SUB-005	MQC for geosynthetics: Agrutex 8 oz. and 16 oz. non-woven geotextiles and Agrutex MicroSpike 40-mil. LLDPE geomembrane

Plateau Pond Lining Daily Work Progress Reports

Copies of the Daily Work Progress Reports are provided in Attachment 3. The reports cover the period from July 15, 2020 through August 18, 2020. The reports include documentation for the Amos Landfill Plateau Lining work performed in Sequence 4.

Plateau Pond Lining Grout Placement and Testing

Field placement and testing reports, as well as laboratory strength testing for the concrete and grout, are provided in Attachment 4.

Plateau Pond Lining LLDPE Geomembrane Bill of Lading, Seaming and Non-Destructive Test Log, Trial Seems, Panel Placement, and Repairs

Documentation of testing and field placement of the LLDPE geomembrane is provided in Attachment 5.

Plateau Pond Lining Certificate of Subgrade Acceptance

A Hallaton certificate accepting the soil subgrade surface conditions is provided in Attachment 6.

Sequence 4 Bubble Repair and Liner Patching - Memo and Reports

Memo, reports, and photos detailing the bubble areas opened and repaired is provided in Attachment 7

Design Drawings

Design drawings for the Plateau Pond Lining construction are provided in Attachment 8.

Sincerely,

GAI Consultants, Inc.

Charles F. Straley

Digitally signed by Charles F. Straley
DN:
E=c.straley@gaiconsultants.com,
CN=Charles F. Straley
Date: 2022.09.21 11:23:44-04'00'

Charles F. Straley, P.E., P.L.S.
Quality Assurance Officer

Digitally signed by John R. Klamut
DN:
E=J.Klamut@gaiconsultants.com,
CN=John R. Klamut
Date: 2022.09.21 22:02:04-04'00'

John R. Klamut, P.E.
Project Manager

CFS:JRK/smp

Attachments: Attachment 1 (Plateau Pond Lining: Requests for Information [RFIs]), Attachment 2 (Plateau Pond Lining: Submittals), Attachment 3 (Plateau Pond Lining: Daily Work Progress Reports), Attachment 4 (Plateau Pond Lining: Grout Placement and Testing), Attachment 5 (Plateau Pond Lining: LLDPE Geomembrane: Bill of Lading, Seaming, and Non-Destructive Test Log, Trial Seams, Panel Placement, and Repairs), Attachment 6 (Plateau Pond Lining: Certificate of Subgrade Acceptance), Attachment 7 (Sequence 4 Bubble Repair and Liner Patching – Memo and Reports), and Attachment 8 (Design Drawings)

ATTACHMENT 1

PLATEAU POND LINING:

REQUESTS FOR INFORMATION (RFIS)

American Electric Power ***REQUEST FOR INFORMATION (RFI)***		RFI Number:	ABPP - 1
Project:	Amos Plateau Pond	Project Number:	AM-LC-2629
Contractor:	R. B. Jergens Contractors, Inc.		
RFI Initiated By:	Jacob Warner	Date:	6-17-2020
RFI Initiator Contact Information:	Jacob.Warner@RBJergens.com		
References: Drawing Number:		Spec. Section:	

Cause of RFI:

Clarification
Construction Preference
Changed Site
Conditions Other _____

Description: (Information Requested, Pertinent Background Information, etc)

GAI Charlie Straley was on site 6/17 for discussions of clarifications of designers' intent and construction preference. We have a few questions for documentation included below:

1. Liner limits as indicated on the drawings reduce the drivable surface after completion. Please clarify that the intent is to offset a distance from the actual top of slope for inside edge of anchor trench. Additional clarification for offsets of guardrail is requested for outside edge of anchor trench.
2. Seeps have been found in the pond limits after stripping of topsoil. Some effort has been made to blind off the seeps with clay materials removed from the pond but one water producing seep near the discharge structure has been identified as a potential future problem. R.B. Jergens is requesting clarification if mitigation is desired prior to synthetic installation.
3. After removal of existing sediment and vegetation, some bedrock surfaces have been exposed. R.B. Jergens requests confirmation that the 8 oz/sy cushion material below the synthetic liner is sufficient in these areas.

Signature:	*Jacob Warner*
Assigned to:	
Contact Information:	

Response: (Clarification, Resulting Actions, etc)

Responses to each item are provided on the accompanying sheets. Participants in the site discussions were Pat Kearns and Ed Sobonya of AEP, Jacob Warner of R. B. Jergens, and Charlie Straley and Kerry Frech (latter by phone) of GAI.

Does RFI Cause Drawing Content to Change?	Yes _____	No

Does RFI Cause Design Configuration to Change?		Yes (Generate ECN) _____		No
References:	Drawing Number:30203SH24, 30320SH25		Spec. Section:	
Signature:	Charles F. Straley			
Date:	June 24, 2020			

RFI-1 Item #1: Liner limits as indicated on the drawings reduce the drivable surface after completion. Please clarify that the intent is to offset a distance from the actual top of slope for inside edge of anchor trench. Additional clarification for offsets of guardrail is requested for outside edge of anchor trench.

RFI-1 Item #1 Response: *The design intent is to have the anchor trench for the geomembrane liner and its underlying cushion geotextile (and, where applicable, the fabric form concrete lining protection), on a level surface, and some height above elevation 924.2 feet (the crest elevation of the modified emergency spillway). During the discussions at the site, to alleviate the encroachment into the existing road, a suggestion was made to remove the aggregate road paving to its subgrade (indicated to be approximately 2 feet depth), install the anchor trench, and then restore the road paving. This suggestion is acceptable, as the roadway surface is approximately elevation 929-930 +/- feet. If desired, excavation into the subgrade (up to 4 feet in total depth) could also be made, if authorized by the Owner, at the roadway.*
DOT recommends a minimum offset of 12 inches for the guardrail from the outside edge of the anchor trench to the nearest side of the guardrail post.

RFI -1 Item #2: Seeps have been found in the pond limits after stripping of topsoil. Some effort has been made to blind off the seeps with clay materials removed from the pond but one water producing seep near the discharge structure has been identified as a potential future problem. R.B. Jergens is requesting clarification if mitigation is desired prior to synthetic installation.

RFI-1 Item #2 Response: *GAI has requested that the location and an elevation be determined for the water producing seep near the discharge structure (riser), in addition to the quantity of water and its probable source area. This additional information is required to develop a reasonable resolution. GAI understands that the barrel pipe for the principal spillway (riser & barrel) has a gravel envelope. If so, and if the seep location is above (elevation) the barrel pipe the seep in question may be able to be directed to either the riser or barrel pipe (as a piping connection) or to the gravel envelope, to reduce the hydrostatic pressures on the geomembrane at the seep location. If the seep is situated at a lower elevation than the barrel pipe, further information as to the probable source of the water is needed, as the Plateau Pond is situated on a ridge, and the subsurface contributing area should not be so large as to preclude measures outside the pond itself.*

RFI-1 Item #3: After removal of existing sediment and vegetation, some bedrock surfaces have been exposed. R.B. Jergens requests confirmation that the 8 oz/sy cushion material below the synthetic liner is sufficient in these areas.

RFI-1 Item #3 Response: *During the site discussions, the bedrock surfaces were described as relatively smooth. To protect the geomembrane in these areas, GAI recommends either replacing the specified 8 oz non-woven geotextile with the 16 oz non-woven geotextile, or doubling the 8 oz non-woven geotextile. For either installation, the geotextile should overlap the perimeter of the bedrock area by at least one foot. GAI believes that overexcavation of the bedrock and replacement with a subbase material is not necessary and not appropriate for the intent of the Plateau Pond lining.*

☒☐☐☐

Note: *During the site discussions, a question was asked about any protective layer on the LLDPE geomembrane above the protective layers of the AASHTO No. 2 stone layer and/or the fabric form concrete lining (grout-filled revetment mattress). The response is no, the geomembrane is exposed above the indicated limits of these protective layers, similar to the geomembrane installations at the Leachate Holding Basins. The design intent of the AASHTO No. 2 stone and the fabric form concrete lining is to protect the geomembrane during mechanical clean-out activities.*

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American Electric Power		RFI Number:	ABPP - 2
REQUEST FOR INFORMATION (RFI)			
Project:	Amos Plateau Pond	Project Number:	AM-LC-2629
Contractor:	R. B. Jergens Contractors, Inc.		
RFI Initiated By:	Jacob Warner	Date:	6-24-2020
RFI Initiator Contact Information:	Jacob.Warner@RBJergens.com		
References: Drawing Number:		Spec. Section:	

Cause of RFI:

Clarification
Construction Preference
Changed Site
Conditions Other ____

Description: (Information Requested, Pertinent Background Information, etc)

R.B. Jergens is requesting clarification to the skimmer arm tie-off posts. After reviewing the drawings, detail appears to direct posts to be installed outside of the liner trench with a rope leading to the skimmer head over 100 feet away. The elevations of the existing surface and the invert of the skimmer barrel appear to require a soil wedge below the skimmer to achieve a horizontal resting position. We propose to install posts in a similar fashion as the previous installation. We propose embedding the posts 5 feet into the berm offset a horizontal distance away from the skimmer barrel as a means of physical direction control in lieu of a long rope.

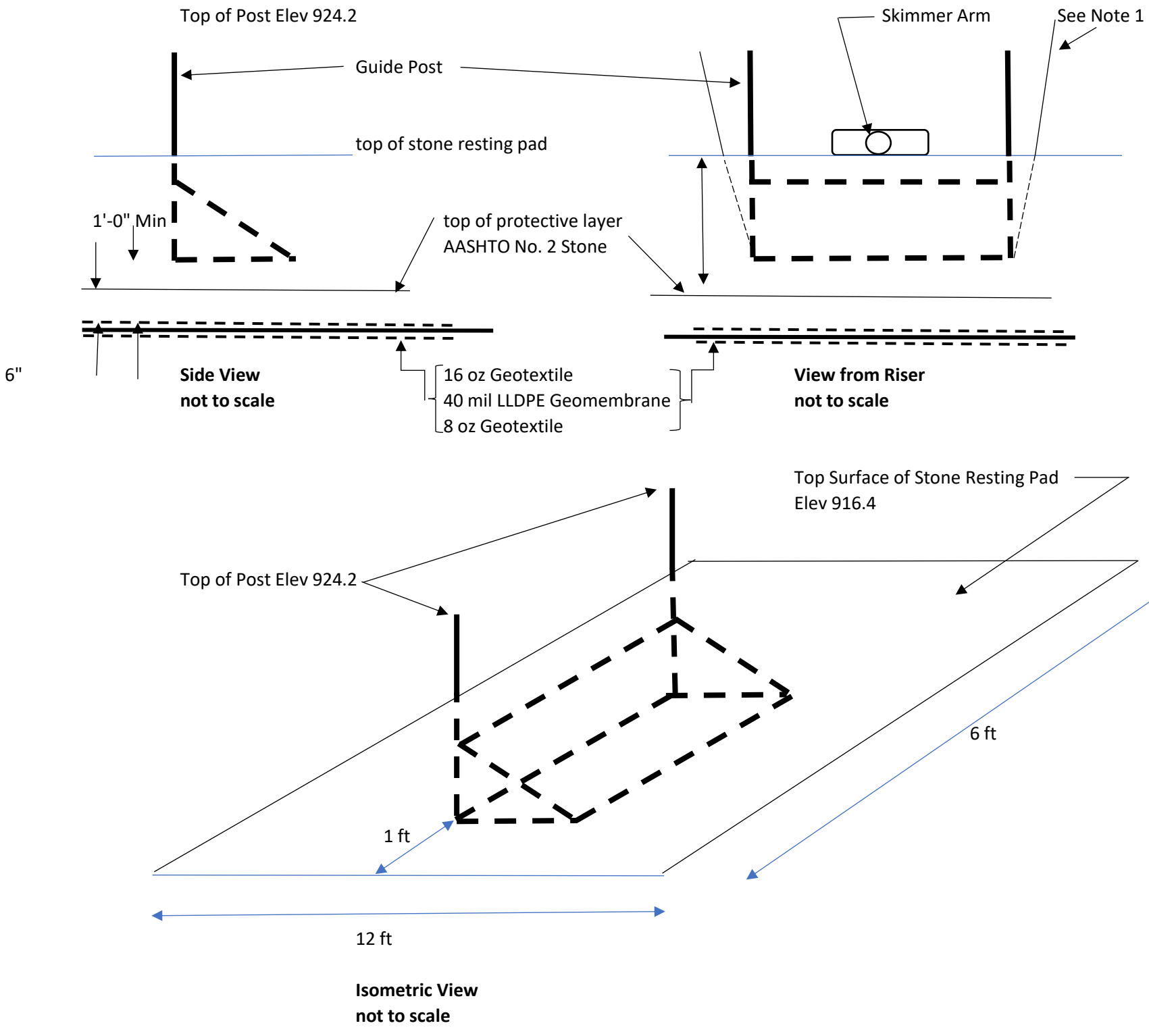
Signature:	Jacob Warner
Assigned to:	
Contact Information:	

Response: (Clarification, Resulting Actions, etc)

GAI agrees in principle to the proposed installation, but additional information is needed: the elevation(s) of the subgrade at the anticipated locations of the posts, and the proposed post material. Also, Detail 7/Sheet 25 calls for the pad to be AASHTO No. 1 stone, not soil. Soil is not recommended for the pad, and wood is not recommended for the posts.
Two installation conditions must be addressed – the geomembrane must be protected from the posts, and the posts must be anchored securely within the stone.
The bottom of the posts must be sufficiently above the geomembrane so as to not cause damage. The proposed five-foot depth for the post may or may not be feasible. GAI recommends a minimum one-foot separation between the bottom of the post and the geomembrane. The subgrade elevation(s) will determine the actual embedment depth of the posts. Note that the posts will need to extend to Elevation 924.2 (crest elevation of emergency spillway) in height.
Given the actual embedment of the posts, measures are needed to anchor the posts securely within the stone pad – examples might be a fabricated "U" or "V" post system, slush grouting around the posts, flat plates mounted on the base of individual posts - see the attached sketches.
Please provide additional information of the subgrade elevation(s) at the post locations, the proposed post material, and reasonable measures to anchor the posts within the stone pad.

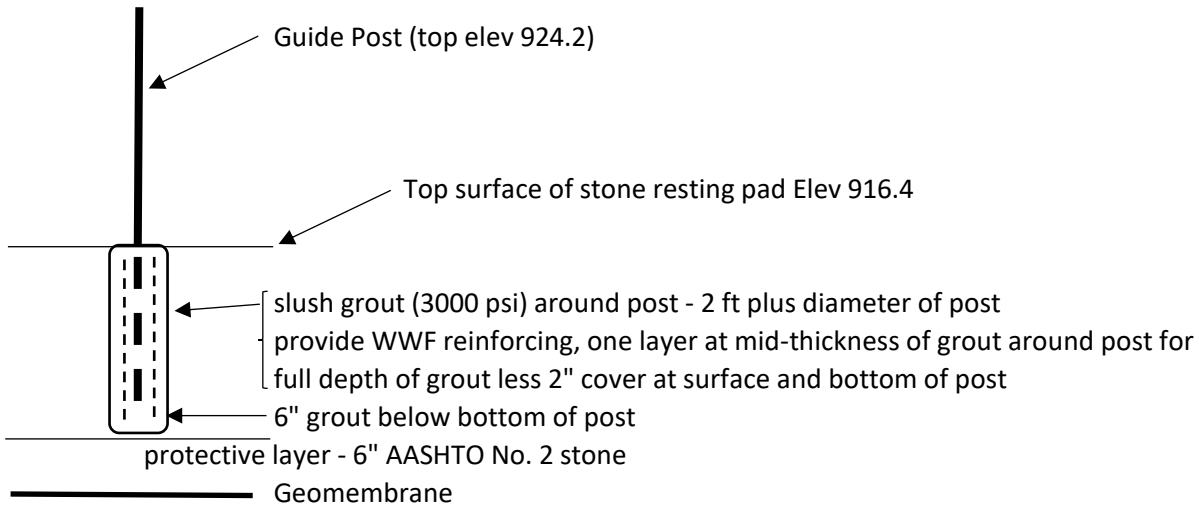
Does RFI Cause Drawing Content to Change?		Yes _____		No
Does RFI Cause Design Configuration to Change?		Yes (Generate ECN) _____		No
References:	Drawing Number:		Spec. Section:	
Signature:	Charles F. Straley	Digitally signed by Charles F. Straley		
Date:	June 26, 2020			

SUGGESTED FABRICATED SKIMMER ARM GUIDE SYSTEM



Note 1: Posts may be angled outward slightly from their base to increase the distance between the posts with elevation - see View from Riser. Not shown in Isometric View.

Note 2: Posts may be steel pipe, 4", Schedule 40, or accepted equal. Joints may be threaded or welded.



Slush Grouted Posts
not to scale

American Electric Power ***REQUEST FOR INFORMATION (RFI)***		RFI Number:	ABPP - 3
Project:	Amos Plateau Pond	Project Number:	AM-LC-2629
Contractor:	R. B. Jergens Contractors, Inc.		
RFI Initiated By:	Jacob Warner	Date:	7-20-2020
RFI Initiator Contact Information:	Jacob.Warner@RBJergens.com		
References: Drawing Number:		Spec. Section:	

Cause of RFI:

Clarification
☒ Construction Preference
☐ Changed Site
☐ Conditions Other _____
☐

Description: (Information Requested, Pertinent Background Information, etc)

R.B. Jergens is requesting an exemption from destructive testing of the synthetic components of the Plateau Pond. This request stems from a limited quantity of seaming lengths in which destructive sampling is applicable and a desire to limit the quantity of repairs due to sampling. Material manufacturer quality testing, installer quality control (trial welds and equipment certifications), and third-party field quality assurance testing (non-destructive air lancing) will be performed per protocol and assure all quality assurance and conformance requirements are met.

Signature:	Jacob Warner
Assigned to:	
Contact Information:	

Response: (Clarification, Resulting Actions, etc)

In consultation and agreement with Charlie Straley from GAI, AEP provides an exemption from the destructive testing based on passing field trial seams and completion of all non-destructive testing of all seams. This will eliminate extra opportunities for defects in a small area. This exemption is limited to the 2020 lining of Amos Plateau Pond.,

Does RFI Cause Drawing Content to Change?		Yes _____		No X
Does RFI Cause Design Configuration to Change?		Yes (Generate ECN) _____		No
References:	Drawing Number:		Spec. Section:	
Signature:				
Date:	07/29/2020			

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American Electric Power		RFI Number:	ABPP - 4
REQUEST FOR INFORMATION (RFI)			
Project:	Amos Plateau Pond	Project Number:	AM-LC-2629
Contractor:	R. B. Jergens Contractors, Inc.		
RFI Initiated By:	Jacob Warner	Date:	7-24-2020
RFI Initiator Contact Information:	Jacob.Warner@RBJergens.com		
References: Drawing Number:		Spec. Section:	

Cause of RFI:

Clarification
☒ Construction Preference
☐ Changed Site
☐ Conditions Other ____
☐

Description: (Information Requested, Pertinent Background Information, etc)

After the successful completion of the synthetic components and during the installation of grout revetment matting, water infiltrated below the liner system and hydraulically lifted the synthetic liner components. After team communications on site, it was determined to lance 2 locations in the floor of the forebay to remove the trapped water. R.B. Jergens suggests repairing the cut liner components and cover with revetment matting as per design.

Signature:	Jacob Warner
Assigned to:	
Contact Information:	

Response: (Clarification, Resulting Actions, etc)

GAI concurs with the suggested approach for this issue.

Does RFI Cause Drawing Content to Change?		Yes _____	No
Does RFI Cause Design Configuration to Change?		Yes (Generate ECN) _____	No
References:	Drawing Number:	Spec. Section:	
Signature:	Charles Straley, P.E., P.S. Charles F. Straley		
Date:	July 28, 2020		

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American Electric Power			
REQUEST FOR INFORMATION (RFI)		RFI Number:	ABPP - 5
Project:	Amos Plateau Pond	Project Number:	AM-LC-2629
Contractor:	R. B. Jergens Contractors, Inc.		
RFI Initiated By:	Jacob Warner	Date:	7-28-2020
RFI Initiator Contact Information:	Jacob.Warner@RBJergens.com		
References: Drawing Number:	30203SH25	Spec. Section:	

Cause of RFI:

Clarification
- ☒ Construction Preference
- ☐ Changed Site
- ☐ Conditions Other ____
- ☐

Description: (Information Requested, Pertinent Background Information, etc)

Detail 3 and 11 showing the roadway system indicates 10 inches of structural fill placed over concrete revetment mattress and liner. R.B. Jergens requests that the structural fill be clarified to be aggregate structural fill (Dense Grade Aggregate "Crusher Run") and placed at an initial thickness of 16 inches. We also request clarification that travel over concrete revetment matting with equipment is allowable for placement of materials and access after installation is complete.

Signature:	*Jacob Warner*
Assigned to:	
Contact Information:	

Response: (Clarification, Resulting Actions, etc)

See below for response.

Does RFI Cause Drawing Content to Change?	Yes ____		No
Does RFI Cause Design Configuration to Change?	Yes (Generate ECN) ____		No
References: Drawing Number:		Spec. Section:	
Signature:	Charles Straley, P.E., P.S. Charles F. Straley		
Date:	July 29, 2020		

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GAI's response is as follows:

- Crusher run material can be substituted for the structural fill.
- The 8 oz non-woven geotextile shown between the structural fill and the crusher run shall now be placed over the 16 oz geotextile in the main pond access road area, and over the revetment mattress and 8 oz geotextile in the forebay access road area to provide additional protection to the geomembrane and the revetment mattress.
- The crusher run is to be placed in one 16-inch layer.
- For the placement of the crusher run material, the revetment mattress may be traveled on with low ground pressure equipment after 5 days of the placement of the grout/concrete.

ATTACHMENT 2

PLATEAU POND LINING:

SUBMITTALS

R. B. JERGENS CONTRACTORS, INC. VANDALIA, OHIO

11418 N. Dixie Drive P.O. Box 309
Vandalia, OH 45377

Phone: (937) 669-9799
Fax: (937) 669-0301

LETTER OF TRANSMITTAL

DATE: 03-Jun-20	JOB NO.: 18-003
ATTENTION Pat Kearns	
Submittal No. AMLF-PP-SUB-003	
Amos Beaver Plateau Pond Synthetic Materials	

TO **American Electric Power**
1 Riverside Plaza
Columbus, OH 43215

WE ARE SENDING YOU [X] Attached [ ] Under separate cover via _____ the following items

[ ] Shop drawings [ ] Prints [ ] Plans [ ] Samples [X] Specifications
[ ] Copy of letter [ ] Change Order [ ] Test Results

COPIES	DATE	NO.	DESCRIPTION
1 electronic	3-Jun	1	Amos Beaver Plateau Pond Synthetic Materials

THESE ARE TRANSMITTED as checked below:

[X] For Approval
[ ] For your use
[ ] As requested
[ ] For review

[X] Approved as submitted
[ ] Approved as noted
[ ] Returned for corrections
[ ] GAI Consultants, Inc. CFS 6/4/2020

[ ] Resubmit_____copies for approval
[ ] Submit_____copies for distribution
[ ] Return _____ corrected prints

[ ]

REMARKS:
For use in the Plateau Pond.

GAI Review, 6/4/2020 klf
geotextile, 16 oz non-woven - ACCEPTED
geotextile, 8 oz non-woven - ACCEPTED
geomembrane, 40 mil LLDPE - ACCEPTED

Kevin Harshberger, RBJ
Mike Davis, RBJ
Ash Hutsonpillar, RBJ

SIGNED: *Jacob Warner* (signed)

Jacob Warner

AGRUTEX 16 oz Nonwoven Geotextile

Polypropylene Geotextile

Environmental Applications

16 oz non-woven geotextile ACCEPTED GAI 6/4/2020 (klf)

Agrutex is a polypropylene, staple fiber, needle punch. The fibers are needled together to form a stable network that retains dimensional stability relative to each other. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils.

Agrutex conforms to the property values listed below.[1] Agru America's Laboratories are accredited by the Geosynthetic Accreditation Institute's Laboratory Accreditation Program (GAI-LAP).

PROPERTY	TEST METHOD	FREQUENCY	MINIMUM AVERAGE ROLL VALUE					
Physical								
Mass/Unit Area, oz/sy (g/m^2)	ASTM D-5261	100,000 SF	4 (136)	6 (203)	8 (271)	10 (339)	12 (407)	16 (544)
Thickness[2], mils (mm)	ASTM D-5199	100,000 SF	45 (1.1)	65 (1.7)	72 (1.8)	95 (2.4)	106 (2.7)	125 (3.2)
Mechanical								
Grab Tensile, lbs (N)	ASTM D-4632	100,000 SF	120 (534)	170 (757)	220 (979)	270 (1200)	320 (1424)	390 (1736)
Elongation, %	ASTM D-4632	100,000 SF	50	50	50	50	50	50
CBR Puncture, lbs (kN)	ASTM D-6241	500,000 SF	335 (1.5)	435 (1.9)	600 (2.7)	725 (3.2)	925 (4.1)	1125 (5.0)
Pin Puncture, lbs (N)	ASTM D-4833	100,000 SF	65 (289)	90 (423)	120 (530)	165 (730)	180 (801)	240 (1055)
Mullen Burst, psi (MPa)	ASTM D-3786	500,000 SF	230 (1.6)	330 (2.3)	380 (2.6)	480 (3.3)	600 (4.1)	740 (5.1)
Trapezoidal Tear, lbs (N)	ASTM D-4533	100,000 SF	50 (223)	65 (289)	95 (423)	105 (467)	125 (556)	150 (668)
Endurance								
UV Resistance % Strength Retained after 500 hrs	ASTM D-4355	Formulation	70	70	70	70	70	70
Hydraulic								
Apparent Opening Size, US Sieve (mm)[2,3]	ASTM D-4751	500,000 SF	70 (0.212)	70 (0.212)	80 (0.180)	100 (0.150)	100 (0.150)	100 (0.150)
Permittivity[2], sec^{-1}	ASTM D-4491	500,000 SF	1.8	1.5	1.3	1.1	1.0	0.7
Permeability[2] cm/sec	ASTM D-4491	500,000 SF	0.21	0.25	0.30	0.29	0.29	0.26
Water Flow Rate[2], g/min/sf (l/min/m^2)	ASTM D-4491	500,000 SF	135 (5500)	110 (4479)	95 (3895)	80 (3280)	60 (2445)	50 (2050)
Roll Dimensions	Width, ft (m)		15 (4.6)	15 (4.6)				
	Length, ft (m)		360 (110)	300 (91.5)				
	Area, sf (m^2)		5,400 (502)	4,500 (418)				

NOTES:

1. Effective January 2014 and subject to change without notice.
2. Values established at the time of manufacturing. Handling, storage, and shipping may change these properties.
3. Apparent Opening Size, (AOS), reported as maximum average roll value.

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Rev: 5/27/2014

Executive Offices: 500 Garrison Road, Georgetown, SC 29440 (843) 546-0600, (800) 321-1379
Manufacturing: 181 Hwy 521 Andrews, SC (843) 221-4121, (800) 321-1379
email: salesmkg@agruamerica.com website: www.agruamerica.com

8 oz non-woven geotextile ACCEPTED GAI 6/4/2020 (klf)

agru
The Plastics Experts.

AGRUTex® 081

NONWOVEN GEOTEXTILE

At AGRU, our core competency is servicing the waste containment industry, and that is why our nonwoven geotextile product line is centric to this industries applications. Our geotextiles are superior in performance for the following applications: geomembrane liner protection, subsurface drainage systems, leachate collection systems, and gas/ collection venting systems.

Our capabilities are not limited to our standard product line, and we specialize in made to order products with customized properties designed to meet project specific requirements. Please contact us for solutions available from AGRU.

AGRUTex 081 is a polypropylene, staple fiber, needle punched nonwoven geotextile. The fibers are needled to form a stable network that retains dimensional stability relative to each other. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils.

ARGUTex 081 standard products conform to the property values listed below.[1] AGRU America's Laboratories are accredited by the Geosynthetic Accreditation Institute's Laboratory Accreditation Program (GAI-LAP).

			Minimum Average Roll Values	
Property	**Test Method**	**Frequency**	**Imperial**	**Metric**
Physical				
Mass/Unit Area	ASTM D-5261	100,000 SF	8 oz/yd²	271 g/m²
Mechanical				
Tensile Strength (Grab)	ASTM D-4632	100,000 SF	220 lbs	979 N
Elongation	ASTM D-4632	100,000 SF	50%	50%
CBR Puncture	ASTM D-6241	500,000 SF	600 lbs	2.7 kN
Trapezoidal Tear	ASTM D-4533	100,000 SF	95 lbs	423 N
Endurance				
UV Resistance % Retained at 500 hrs	ASTM D-4355	Per Formulation	70%	70%
Hydraulic[2]				
Apparent Opening Size[3] (AOS)	ASTM D-4751	500,000 SF	80 US Std. Sieve	0.180 mm
Permittivity, sec⁻¹	ASTM D-4491	500,000 SF	1.3	1.3
Permeability	ASTM D-4491	500,000 SF	0.30 cm/sec	0.30 cm/sec
Water Flow Rate	ASTM D-4491	500,000 SF	95 g/min/ft²	3895 l/min/m²
Roll Sizes			15ft x 600ft	4.6m x 183m

ok

AOS required value is 0.18 mm.

Notes:

1. Effective February 2018 and subject to change without notice.
2. Values established at the time of manufacturing. Handling, storage, and shipping may change these properties.
3. Apparent Opening Size, (AOS), reported as maximum average roll value.

Puncture (Pin) ASTM D4833 - required value is 80 lbs - met as given by submittal page 2 table - ok

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AGRU America, Inc.
500 Garrison Road
Georgetown, SC 29440 USA
(800) 373-2478 | Fax: (843) 546-0516
agru.life/agrutex

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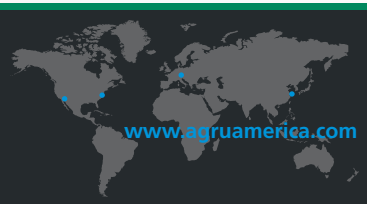

40 mil LLDPE textured geomembrane
ACCEPTED
GAI 6/4/2020 (klf)

The Plastics Experts.

MicroSpike® Liner

LINEAR LOW DENSITY POLYETHYLENE

AGRU America's structured geomembranes are manufactured on state-of-the-art manufacturing equipment using the flat die calender manufacturing process, a method that produces a more consistent core thickness than other processes, such as the blown film extrusion process. AGRU uses only the highest-grade HDPE and LLDPE resins manufactured in North America.

PRODUCT DATA

Property	Test Method	Frequency	Minimum Average Values			
Thickness (nominal), mil (mm)	ASTM D5994	Per Roll	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (min avg), mil (mm)			38 (0.95)	57 (1.43)	76 (1.9)	95 (2.38)
Thickness (min 8 of 10), mil (mm)			36 (0.90)	54 (1.35)	72 (1.8)	90 (2.25)
Thickness (lowest individual), mil (mm)			34 (0.85)	51 (1.28)	68 (1.7)	85 (2.13)
Asperity Height mils, (mm)	ASTM D7466	2nd Roll	20 (0.51)	20 (0.51)	18 (0.46)	18 (0.46)
Density, g/cc, maximum	ASTM D792, Method B	200,000 lb	0.939	0.939	0.939	0.939
Tensile Properties (both directions)	ASTM D6693, Type IV					
Strength @ Break, lb/in width (N/mm)	2 in/minute	20,000 lb	112 (19.6)	168 (29.4)	224 (39.2)	280 (49)
Elongation @ Break, % (GL=2.0in)			400	400	400	400
Tear Resistance, lb,s. (N)	ASTM D1004	45,000 lb	25 (111)	36 (160)	50 (222)	60 (267)
Puncture Resistance, lbs. (N)	ASTM D4833	45,000 lb	50 (222)	70 (310)	90 (400)	115 (512)
Carbon Black Content, % (range)	ASTM D4218	20,000 lb	2-3	2-3	2-3	2-3
Carbon Black Dispersion (Category)	ASTM D5596	45,000 lb	Only near spherical agglomerates: 10 views Cat.1 or 2			
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	200,000 lb	≥140	≥140	≥140	≥140

AGRU America's geomembranes are certified to pass Low Temp. Brittleness via ASTM D746 (-80°C), Dimensional Stability via ASTM D1204 (±2% @ 100°C). Oven Aging and UV Resistance are tested per GRI GM 17. These product specifications meet or exceed GRI's GM17.

SUPPLY INFORMATION (STANDARD ROLL DIMENSIONS)

THICKNESS mil	THICKNESS mm	WIDTH ft	WIDTH m		LENGTH ft	LENGTH m	AREA (APPROX.) ft²	AREA (APPROX.) m²
40	1.0	23	7	Double-Sided	750	229	17,250	1,603
				Single-Sided	800	244	18,400	1,709
60	1.5	23	7	Double-Sided	540	165	12,420	1,154
				Single-Sided	560	171	12,880	1,197
80	2.0	23	7	Double-Sided	410	125	9,430	876
				Single-Sided	425	130	9,775	908
100	2.5	23	7	Double-Sided	335	102	7,705	716
				Single-Sided	340	104	7,820	726

Note:

Average roll weight is 3,900 lbs (1,770 kg). All rolls are supplied with two slings. Rolls are wound on a 6" core. Special length available upon request. Roll length and width have a tolerance of ±1%. The weight values may change due to project specifications (i.e. average or absolute minimum thickness) or shipping requirements (i.e. international contanerized shipments).

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AGRU America, Inc.
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Georgetown, SC 29440 USA

(800) 373-2478 | Fax: (843) 546-0516
salesmkg@agruamerica.com
Revision Date: March 21, 2018

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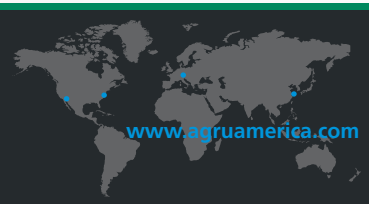


R. B. JERGENS
CONTRACTORS, INC. VANDALIA, OHIO

11418 N. Dixie Drive P.O. Box 309
Vandalia, OH 45377

Phone: (937) 669-9799
Fax: (937) 669-0301

LETTER OF TRANSMITTAL

DATE: 15-Jun-20	JOB NO.: 18-003
ATTENTION Pat Kearns	
Submittal No. AMLF-PP-SUB-004	
Amos Beaver Plateau Pond Filterpoint Material	

TO **American Electric Power**
1 Riverside Plaza
Columbus, OH 43215

WE ARE SENDING YOU [X] Attached [ ] Under separate cover via _____ the following items

[ ] Shop drawings [ ] Prints [ ] Plans [ ] Samples [X] Specifications
[ ] Copy of letter [ ] Change Order [ ] Test Results

COPIES	DATE	NO.	DESCRIPTION
1 electronic	15-Jun	1	Amos Beaver Plateau Pond Filterpoint Material

THESE ARE TRANSMITTED as checked below:

[X] For Approval [X] Approved as submitted [ ] Resubmit_____copies for approval
[ ] For your use [ ] Approved as noted [ ] Submit_____copies for distribution
[ ] As requested [ ] Returned for corrections [ ] Return _____ corrected prints
[ ] For review [ ] Accepted as Submitted GAI KLF/CFS 6/16/2020

[ ]

REMARKS:
For use in the Plateau Pond forebay area.

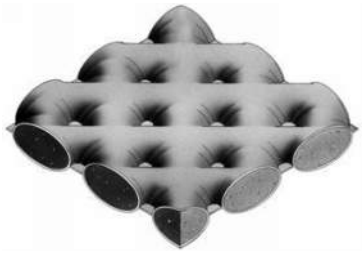
GAI Review, 6/15/2020 klf - FP400 fabric formed filterpoint concrete lining - ACCEPTED

Kevin Harshberger, RBJ
Mike Davis, RBJ
Ash Hutsonpillar, RBJ

SIGNED: *Jacob Warner* (signed)

Jacob Warner

5550 Triangle Parkway
Suite 220
Peachtree Corners, GA 30092



FP400 fabric formed filterpoint concrete lining - ACCEPTED
GAI 6/15/2020 (klf)

HYDROTEX™ FILTER POINT FP400
FABRIC FORMED CONCRETE

Hydrotex™ Filter Point linings with filtration point (drains) provide an erosion resistant, permeable concrete lining having a cobbled surface and a relatively high coefficient of hydraulic friction in order to reduce water velocity and wave runup. The spacing of the filter points determines the linings thickness and weight, while the specially designed filter points relieve hydrostatic pressure and reduce applied stress to the fabric form during pumping. Filter points are formed by interweaving the double-layer fabric to form water permeable drains and attachment points for the control of the concrete lining thickness.

The fabric forms for casting the concrete lining(s) are HYDROTEX® Filter Point (FP400) fabric forms manufactured by Synthetex, LLC; 5550 Triangle Parkway, Suite 220 Peachtree Corners, Georgia 30092, Tel: 800.253.0561 or 770.399.5051, E-Mail: info@synthetex.com. Hydrotex Filter Point (FP400) type has a finished average thickness of 4 inches, a nominal mass per unit area of 45 lb/ft^2, and a deeply cobbled surface appearance with cross shaped filter points on approximately 8-inch, spacing when measured along the diagonal. The shear resistance of the concrete lining is a minimum of 20 lb/ft^2, as demonstrated by full scale flume testing. The full scale flume test report is available upon request. The interweaving of the fabric layers form an area of double density, high strength, single-layer fabric with an area of 2 in^2 and a perimeter of 6.5 inches. All filter points are cross shaped and have twill weave centers designed to function as drains to aid in relieving hydrostatic uplift pressure.

The fabric forms are composed of nylon or polyester yarns formed into a woven fabric. Forms are woven with a minimum of 50% textured yarns (by weight). Partially-oriented (POY), draw-textured, and/or staple yarns are not used in the manufacture of the fabric. Each layer of fabric conforms to the physical, mechanical and hydraulic requirements Mean Average Roll Values listed in Table 1.0. The fabric forms are free of defects or flaws which significantly affect their physical, mechanical, or hydraulic properties.

Mill widths of fabric are a minimum of 84 inches. Each selvage edge of the top and bottom layers of fabric is reinforced for a width of not less than 1.35 inches by adding a minimum of 6 warp yarns to each selvage construction. Mill width rolls are cut to the length required, and the double-layer fabric separately joined, bottom layer to bottom layer and top layer to top layer, by means of sewing thread, to form multiple mill width panels with sewn seams on not less than 80-inch centers.

Fabric form panels are factory-sewn, by joining together the layers of fabric, top layer to top layer and bottom layer to bottom layer, into predetermined custom sized panels. Sewn seams are downward facing as shown on the Contract Drawings. All sewn seams and zipper attachments are made using a double line of U.S. Federal Standard Type 401 stitch. All seams sewn are not less than 100 lbf/inch when tested in accordance with ASTM D 4884. Both lines of stitches are sewn simultaneously and be parallel to each other, spaced between 0.25 inches to 0.75 inches apart. Each row of stitching shall consist of 4 to 7 stitches per inch. Thread used for seaming is polyester. Edges of the panels can be attached in the field by means of sewing or pre-attached zippers.

Synthetex can provide certificates of compliance for the fabric forms as well as specifications, literature, shop drawings for the layout of the concrete lining panels, and recommendations that are specifically related to the project.

FP400 fabric formed filterpoint concrete lining - ACCEPTED
GAI 6/15/2020 (klf)

Table 1.0 PROPERTY REQUIREMENTS – HYDROTEX FABRIC [1, 2]			
	Test Method	**Units**	**MARV**
Physical Properties			
Mass Per Unit Area (double-layer)	ASTM D 5261	oz/yd^2	13
Thickness (single-layer)	ASTM D 5199	mils	15
Mill Width (Woven)		inch	84
Mechanical Properties			
Wide-Width Strip Tensile Strength - MD | TD	ASTM D 4595	lbs/inch	300 **|** 350
Elongation at Break - MD **|** TD - Max.		%	15 **|** 15
Trapezoidal Tear Strength - MD | TD	ASTM D 4533	lbs	150 **|** 175
CBR Puncture Strength	ASTM D 6241	lbs	1250
Mullen Burst Strength	ASTM D 3786 (Mod.)	psi	500
	Test Method	**Units**	**MARV Range**
Hydraulic Properties			
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Standard Sieve	30 - 40
Flow Rate	ASTM D 4491	gal/min/ft^2	30 - 55

Notes:

1. Conformance of fabric to specification property requirements are based on ASTM D 4759. Material testing reports are available and prepared by a certified geotextile laboratory attesting to the fabric form material's compliance with this Specification. Material laboratory testing shall have been performed within ninety (90) days of the submittal date.

2. All numerical values represent minimum average roll values (i.e., average of test results from any sample roll in a lot shall meet or exceed the minimum values). Lots are sampled according to ASTM D 4354.

Many times, the forms are fabricated with baffles. The baffles are flow-directing vertical geotextile walls constructed between fabric form layers. Baffles are an integral part of the fabric form design. Baffles are designed to support the panel section, determine the concrete area of the section and direct the flow of fine aggregate concrete for maximum efficiency. Baffles are installed at predetermined mill width intervals to regulate the distance of lateral flow of fine aggregate concrete. The baffles are designed to maintain a full concrete lining thickness along the full length of the baffle. The grab tensile strength of the baffle is not less than 180 lbf/inch when tested in accordance with ASTM D 4632.

Certification (Open Channel Flow)

The Hydrotex Fabric formed concrete lining has been tested in full-scale hydraulic flume. Performance characteristics that are derived from tests under controlled flow conditions are available. Test guidelines conform to testing protocol as documented in "Hydraulic Stability of Fabric Formed Concrete Lining and Mat Systems During Overtopping Flow."

FP400 fabric formed filterpoint concrete lining - ACCEPTED
GAI 6/15/2020 (klf)

The average thickness, mass per unit area and hydraulic resistance of each concrete lining shall withstand the hydraulic loadings for the design discharges along the structure(s). The stability analysis for each concrete lining are accomplished using a factor-of-safety methodology. A minimum factor of safety of 1.3 is required, or higher as determined by local conditions or critical structures. Synthetex can provide the calculations if needed to confirm conformance to the project conditions and requirements.

Geotextile Filter Fabric

A geotextile filter fabric, as specified elsewhere, is placed on the graded surface approved by the Engineer.

Fine Aggregate Concrete

The Contractor shall provide a suitable fine aggregate concrete for proper filling of the fabric forms. Typical concrete mix proportions and sample mix designs can be provided by Synthetex, as well as installation means and methods.

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Hydrotex products are manufactured and sold by:

5550 Triangle Parkway, Suite 220
Peachtree Corners, GA 30092
Tel: 1.800.253.0561 or 770.399.5051
Fax: 770.394.5999
www.synthetex.com • e-mail: info@synthetex.com

R. B. JERGENS CONTRACTORS, INC. VANDALIA, OHIO

11418 N. Dixie Drive P.O. Box 309
Vandalia, OH 45377

Phone: (937) 669-9799
Fax: (937) 669-0301

LETTER OF TRANSMITTAL

DATE: 16-Jun-20	JOB NO.: 18-003
ATTENTION Pat Kearns	
Submittal No. AMLF-PP-SUB-005	
Amos Beaver Plateau Pond Agru Synthetics MQC Data	

TO **American Electric Power**
1 Riverside Plaza
Columbus, OH 43215

WE ARE SENDING YOU [X] Attached [ ] Under separate cover via _____ the following items

[ ] Shop drawings [ ] Prints [ ] Plans [ ] Samples [ ] Specifications
[ ] Copy of letter [ ] Change Order [X] Test Results

COPIES	DATE	NO.	DESCRIPTION
1 electronic	16-Jun	1	Amos Beaver Plateau Pond Agru Synthetics MQC Data

THESE ARE TRANSMITTED as checked below:

[X] For Approval [ ] Approved as submitted [ ] Resubmit_____copies for approval
[ ] For your use [X] Approved as noted [ ] Submit_____copies for distribution
[ ] As requested [ ] Returned for corrections [ ] Return _____ corrected prints
[ ] For review [ ] GAI Consultants, Inc. KLF/CFS

[ ]

REMARKS:
For use in the Plateau Pond

Note: Testing provided for Agru Oven and QUV Exposure for HP-OIT Testing is not for any of the project rolls. It also occurred well before the resin certification.

Review of 8 oz and 16 oz non-woven geotextiles & 40 mil LLDPE Microspike geomembrane.
Accepted with Comments
GAI (klf) 6/17/2020

Kevin Harshberger, RBJ
Mike Davis, RBJ
Ash Hutsonpillar, RBJ

SIGNED: *Jacob Warner* (signed)

Jacob Warner

Geotextile Quality Certification

this table is for the 8 oz non-woven geotextile

OA # / PROJECT: 7821

Customer: AEP JOHN AMOS

Destination: W INFIELD W V

Item Code/Description AGRUTEX 081

DATE: 6/2/2020

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D475	D4355	
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs	Roll Length
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units: Lbs	SIEVE	* % ret.	FT
ATNL10047080041	9.19	327.00	372.00	98	99	135.00	160.00	115.00	.36	1.53	914	80	70	600
ATNL10047080042	9.19	327.00	372.00	98	99	135.00	160.00	115.00	.36	1.53	914	80	70	600
ATNL10047080043	9.19	327.00	372.00	98	99	135.00	160.00	115.00	.36	1.53	914	80	70	600
ATNL10047080044	9.19	327.00	372.00	98	99	135.00	160.00	115.00	.36	1.53	914	80	70	600
ATNL10047080046	9.19	327.00	372.00	98	99	135.00	160.00	115.00	.36	1.53	914	80	70	600
ATNL10047080047	9.19	327.00	372.00	98	99	135.00	160.00	115.00	.36	1.53	914	80	70	600
ATNL10047080048	9.19	327.00	372.00	98	99	135.00	160.00	115.00	.36	1.53	914	80	70	600
ATNL10047080060	9.01	335.00	363.00	100	99	131.00	169.00	113.00	.34	1.51	841	80	70	600
ATNL10047080061	9.01	335.00	363.00	100	99	131.00	169.00	113.00	.34	1.51	841	80	70	600
ATNL10047080062	9.01	335.00	363.00	100	99	131.00	169.00	113.00	.34	1.51	841	80	70	600
ATNL10047080063	9.01	335.00	363.00	100	99	131.00	169.00	113.00	.34	1.51	841	80	70	600
ATNL10047080064	9.01	335.00	363.00	100	99	131.00	169.00	113.00	.34	1.51	841	80	70	600
ATNL10047080072	8.56	308.00	349.00	98	99	156.00	129.00	139.00	.40	1.87	841	80	70	600
ATNL10047080073	8.70	305.00	326.00	98	101	133.00	169.00	106.00	.31	1.42	841	80	70	600
ATNL10047080074	8.70	305.00	326.00	98	101	133.00	169.00	106.00	.31	1.42	841	80	70	600
ATNL10047080075	8.70	305.00	326.00	98	101	133.00	169.00	106.00	.31	1.42	841	80	70	600
ATNL10047080076	8.70	305.00	326.00	98	101	133.00	169.00	106.00	.31	1.42	841	80	70	600
ATNL10047080077	8.70	305.00	326.00	98	101	133.00	169.00	106.00	.31	1.42	841	80	70	600
ATNL10047080092	9.69	302.00	366.00	100	99	154.00	173.00	98.00	.30	1.32	841	80	70	600
min	8.56	302.00	326.00	98.00	99.00	131.00	129.00	98.00	.30	1.32	841.00	80.00	70.00	19rolls
	8	200	200			80	80			0.25	320	80	70	Spec Values CE-1-013A

Mark Lockliear

Mark Lockliear, La

Date: 6/2/2020

Mark Lockliear

at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

8 oz non-woven geotextile
Review GAI (klf) 6/17/2020
Accepted

Geotextile Quality Certification

this table is for the 16 oz non-woven geotextile

OA # / PROJECT: 7821

Customer: AEP JOHN AMOS

Destination: W INFIELD W V

Item Code/Description AGRUTEX 161

DATE: 6/2/2020

agru america quality control dept.

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D475	D4355	
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs	Roll Length
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units: Lbs	SIEVE	* % ret.	FT
ATNL10039970133	17.36	540.00	712.00	86	71	206.00	291.00	57.00	.31	.76	1693	100	70	120
ATNL10051520002	16.78	528.00	743.00	111	112	209.00	295.00	70.00	.37	.94	1519	100	70	300
ATNL10051520003	16.78	528.00	743.00	111	112	209.00	295.00	70.00	.37	.94	1519	100	70	300
ATNL10051520005	16.78	528.00	743.00	111	112	209.00	295.00	70.00	.37	.94	1519	100	70	300
ATNL10051520006	16.78	528.00	743.00	111	112	209.00	295.00	70.00	.37	.94	1519	100	70	300
ATNL10051520008	16.78	528.00	743.00	111	112	209.00	295.00	70.00	.37	.94	1519	100	70	300
ATNL10051520009	16.78	528.00	743.00	111	112	209.00	295.00	70.00	.37	.94	1519	100	70	300
ATNL10051520011	16.78	528.00	743.00	111	112	209.00	295.00	70.00	.37	.94	1519	100	70	300
ATNL10051520012	17.36	540.00	729.00	115	120	188.00	253.00	63.00	.36	.85	1519	100	70	300
ATNL10051520013	17.36	540.00	729.00	115	120	188.00	253.00	63.00	.36	.85	1519	100	70	300
ATNL10051520014	17.36	540.00	729.00	115	120	188.00	253.00	63.00	.36	.85	1519	100	70	300
ATNL10051520045	17.12	528.00	753.00	115	110	186.00	290.00	64.00	.35	.86	1519	100	70	300
ATNL10051770001	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770002	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770003	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770004	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770005	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770006	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770007	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770008	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770009	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770010	16.79	409.00	546.00	125	120	168.00	255.00	76.00	.40	1.03	1264	100	70	300
ATNL10051770011	17.04	470.00	712.00	123	122	186.00	311.00	54.00	.32	.73	1264	100	70	300
ATNL10051770012	17.04	470.00	712.00	123	122	186.00	311.00	54.00	.32	.73	1264	100	70	300
ATNL10051770013	17.04	470.00	712.00	123	122	186.00	311.00	54.00	.32	.73	1264	100	70	184
ATNL10055730057	16.84	542.00	751.00	112	102	195.00	275.00	58.00	.33	.78	1668	100	70	300
ATNL10055730058	16.84	542.00	751.00	112	102	195.00	275.00	58.00	.33	.78	1668	100	70	300
ATNL10054700080	17.51	521.00	777.00	119	110	169.00	324.00	58.00	.37	.78	1603	100	70	300
min	16.78	409.00	546.00	86.00	71.00	168.00	253.00	54.00	.31	.73	1264.00	100.00	70.00	28ROLLS
	16	370	370			145	145			---	900	---	70	Spec Values CE-1-013A

Mark Lockliear

Mark Lockliear, L

Date: 6/2/2020

16 oz non-woven geotextile
Review GAI (klf) 6/17/2020
Accepted

Mark Lockliear

at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

AEP John Amos - Plateau Pond Liner
Hallaton C/O RB Jergens
143-325 Bills Creek Road
Winfield, WV 25213

SO#: 00007821

FG-LDMSDS040BBBEG	9 rolls @ 750	155,250 ft.²		6449

Roll #	Width	English Length	Area	Item	Count	Weight	Resin Lot #	MQC
	ft.	ft.	ft.²			lbs.		
GTC0051960037	23	750	17,250	**FG-LDMSDS040BBBEG**	1	**3880**	**DKN811200**	6449
GTC0053230004	23	750	17,250	**FG-LDMSDS040BBBEG**	2	**3700**	**DKN811180**	6449
GTF0046500021	23	750	17,250	**FG-LDMSDS040BBBEG**	3	**3678**	**DKM810600**	6449
GTF0046500022	23	750	17,250	**FG-LDMSDS040BBBEG**	4	**3672**	**DKM810600**	6449
GTF0046500023	23	750	17,250	**FG-LDMSDS040BBBEG**	5	**3650**	**DKM810600**	6449
GTF0046500024	23	750	17,250	**FG-LDMSDS040BBBEG**	6	**3640**	**DKM810600**	6449
GTF0046500025	23	750	17,250	**FG-LDMSDS040BBBEG**	7	**3684**	**DKM810600**	6449
GTF0046500026	23	750	17,250	**FG-LDMSDS040BBBEG**	8	**3650**	**DKM810620**	6449
GTF0046500027	23	750	17,250	**FG-LDMSDS040BBBEG**	9	**3690**	**DKM810620**	6449

155,250
total for order

agru america quality control dept

Maria Coffey-Manager
Quality Control Department

AEP John Amos - Plateau Pond Liner
Hallaton C/O RB Jergens
143-325 Bills Creek Road
Winfield, WV 25213

SO#: **00007821** MQC#: **6449**
Liner Type: **40LL microspike**
Item: **FG-LDMSDS040BBBEG**
Current # of Rolls: **9**
Roll Count: **1-9** **(all)**
Report Date: **6/3/2020** **ENGLISH**

Count	Roll #	(English)			Thickness (English)			Asperity (Top)	Asperity (Bottom)	Weight	Lot #	OIT (Standard)	Specific Gravity	Melt Flow Index	Carbon Black Content	Carbon Black Disp.	Tensile Str. @Break (MD)		Tensile Str. @Break (TD)		Elong. @Break (MD)	Elong. @Break (TD)	Tear Resistance (MD)	Tear Resistance (TD)	Puncture Resistance	Production Date
					ASTM D5994 (Modified)			ASTM D7466				ASTM D3895	ASTM D792	ASTM D1238	ASTM D4218	ASTM D5596	ASTM D6693						ASTM D1004		ASTM D4833	
		Width	Length	Area	Min.	Max.	Ave.																			
		ft.	ft.	ft.²	mils	mils	mils	mils	mils	lbs.		min	g/cc	g/10 min.	%	(# in Cat. 1)	ppi	psi	ppi	psi	%	%	lbs.	lbs.	lbs.	
	Minimum Results (ea. Col.)				37	42	40	27	28	3640		163	0.930	0.32	2.3	10	141	3307	125	3093	412	555	34	33	88	
1	GTC0051960037	23	750	17,250	37	42	40	29	32	3880	DKN811200	163	0.932	0.32	2.3	10	144	3564	135	3337	473	567	39	39	93	3/30/2020
2	GTC0053230004	23	750	17,250	39	43	41	32	32	3700	DKN811180	165	0.934	0.38	2.3	10	148	3666	149	3666	418	591	34	33	92	4/4/2020
3	GTF0046500021	23	750	17,250	39	43	42	28	30	3678	DKM810600	186	0.930	0.37	2.4	10	141	3307	125	3093	412	555	37	35	88	12/11/2019
4	GTF0046500022	23	750	17,250	40	44	42	28	31	3672	DKM810600	186	0.930	0.37	2.5	10	141	3307	125	3093	412	555	37	35	88	12/11/2019
5	GTF0046500023	23	750	17,250	40	43	42	29	30	3650	DKM810600	186	0.930	0.37	2.5	10	141	3307	125	3093	412	555	37	35	88	12/11/2019
6	GTF0046500024	23	750	17,250	39	43	41	27	28	3640	DKM810600	186	0.930	0.37	2.7	10	148	3667	139	3396	479	587	37	35	88	12/11/2019
7	GTF0046500025	23	750	17,250	38	42	41	31	31	3684	DKM810600	186	0.930	0.37	2.7	10	148	3667	139	3396	479	587	37	35	88	12/11/2019
8	GTF0046500026	23	750	17,250	39	44	41	29	32	3650	DKM810620	195	0.935	0.36	2.5	10	148	3667	139	3396	479	587	37	35	88	12/11/2019
9	GTF0046500027	23	750	17,250	39	43	41	29	31	3690	DKM810620	195	0.935	0.36	2.5	10	148	3667	139	3396	479	587	37	35	88	12/12/2019
Specified values per Spec					36			16				100	0.939	< 1.0	2-3	Cat 1,2	60		60		250	250	22	22	44	

40 mil LLDPE Microspike
Review GAI (klf) 6/17/2020
Accepted

CoA Date: 12/28/2019

Certificate of Analysis

Shipped To: AGRU AMERICA INC:MULLINS
171 Highway 905
CONWAY SC 29526-6801
USA

Recipient: PALMER
Fax:

Delivery #: 80107417
PO #: 16851
Weight: 188700.000 LB
Ship Date: 12/28/2019
Package: BULK
Mode: Hopper Car
Car #: CHVX890156
Seal No: 191058

Product:
MARLEX 7104 POLYETHYLENE in Bulk

Lot Number: DKN811200

Property	Test Method	Value		Unit
Melt Index	ASTM D1238	0.32	< 1.0	g/10min
Density	D1505	0.919	< 0.926	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

T. KEVIN AYRES
QUALITY ASSURANCE SUPERINTENDENT

For CoA questions contact Shannon Blacknall at +1-832-813-4807

LLDPE resin
Review GAI (klf) 6/17/2020
Accepted

CoA Date: 12/28/2019

Certificate of Analysis

Shipped To: AGRU AMERICA INC:MULLINS
171 Highway 905
CONWAY SC 29526-6801
USA

Recipient: PALMER
Fax:

Delivery #: 80107416
PO #: 16851
Weight: 186650.000 LB
Ship Date: 12/28/2019
Package: BULK
Mode: Hopper Car
Car #: CHVX898161
Seal No: 190955

Product:
MARLEX 7104 POLYETHYLENE in Bulk

Lot Number: DKN811180

Property	Test Method	Value		Unit
Melt Index	ASTM D1238	0.35	< 1.0	g/10min
Density	D1505	0.920	< 0.926	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

T. KEVIN AYRES
QUALITY ASSURANCE SUPERINTENDENT

For CoA questions contact Shannon Blacknall at +1-832-813-4807

LLDPE resin
Review GAI (klf) 6/17/2020
Accepted

CoA Date: 11/17/2019

Certificate of Analysis

Shipped To: AGRU AMERICA INC:MULLINS
171 Highway 905
CONWAY SC 29526-6801
USA

Recipient: PALMER
Fax:

Delivery #: 80082433
PO #: 16755
Weight: 188750.000 LB
Ship Date: 11/17/2019
Package: BULK
Mode: Hopper Car
Car #: CPCX805127
Seal No: 125700

Product:
MARLEX 7104 POLYETHYLENE in Bulk

Lot Number: DKM810600

Property	Test Method	Value		Unit
Melt Index	ASTM D1238	0.37	< 1.0	g/10min
Density	D1505	0.918	< 0.926	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

T. KEVIN AYRES
QUALITY ASSURANCE SUPERINTENDENT

For CoA questions contact Shannon Blacknall at +1-832-813-4807

LLDPE resin
Review GAI (klf) 6/17/2020
Accepted

CoA Date: 11/17/2019

Certificate of Analysis

Shipped To: AGRU AMERICA INC:MULLINS
171 Highway 905
CONWAY SC 29526-6801
USA

Recipient: PALMER
Fax:

Delivery #: 80082432
PO #: 16755
Weight: 188950.000 LB
Ship Date: 11/17/2019
Package: BULK
Mode: Hopper Car
Car #: CPCX814288
Seal No: 125704

Product:
MARLEX 7104 POLYETHYLENE in Bulk

Lot Number: DKM810620

Property	Test Method	Value		Unit
Melt Index	ASTM D1238	0.36	< 1.0	g/10min
Density	D1505	0.918	< 0.926	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem). **However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.**

T. KEVIN AYRES
QUALITY ASSURANCE SUPERINTENDENT

For CoA questions contact Shannon Blacknall at +1-832-813-4807

LLDPE resin
Review GAI (klf) 6/17/2020
Accepted

Vergil H. Rhodes, PE, CPlasT - Tech Svc & App Dev Engineer, Geomembranes
Highways 60 & 123, Bartlesville Research and Technology Center, Room 103 PTC
Bartlesville, OK 74003
■ 918-977-4229 ■ rhodevh@cpchem.com ■ Fax: 918-977-7599 ■ www.cpchem.com

September 9, 2019
Filename: Agru Oven and QUV Exposure for HP-OIT Testing_2019_090919.pdf

Nathan Ivy - Corporate Quality Control/Technical Manager
Agru America, Inc.
800 Rockmead #122
Kingwood, TX 77339
281-358-4741

this testing is not for the project geomembranes - this testing occurred well before the resin testing (Nov-Dec 2019),much less the geomembrane sheet testing (Dec 2019 & Jan 2020)

Dear Mr. Ivy:

Please recall your request for testing of oven-exposed and UV-exposed geomembrane samples produced primarily from Marlex® 7104 LLDPE and Marlex® K307 MDPE. Agru blended other components with each of these polyethylenes to produce the geomembrane samples for testing. Textured geomembrane samples have been received from Agru, and test specimens were taken from the smooth border of the samples. Test results are reported below. The samples were tested for HP-OIT in their as-received condition and were also tested after oven and UV exposures of 90 days and 1600 hours of irradiance, respectively, in accordance with GRI-GM13 and GRI-GM17 requirements.

The following geomembrane sheet samples were received from Agru in April 2019 and were reported to be primarily composed of each of the Chevron Phillips Chemical Company grades in the description below:

not the project rolls

- K307 Lot # HJM810770, Agru Roll # GTF0029510004, black sheet, textured, nominal 0.060" thick.
- 7104 Lot # CJE811700, Agru Roll # GTA0031290012, black sheet, textured, nominal 0.050" thick.

The exposure and testing conditions along with the corresponding test results are tabulated on the next page. GM-13 and GM-17 require a minimum % HP-OIT retention after a 90-day oven exposure and after a 1600-hour UV irradiance exposure. These test results indicate the GM-13 and GM-17 minimum % HP-OIT retentions were exceeded by the Agru-supplied K307 and 7104 sheet samples, respectively.

If you have any questions, please feel free to contact me (contact information given above).

Sincerely,

Vergil Rhodes
Polyethylene Technical Service and Applications Development, Geomembrane

NOTICES
Technical Information - By using any Technical Information contained herein, Recipient agrees that said Technical Information is given by CPChem for convenience only, without any warranty or guarantee of any kind, and is accepted and used at your sole risk. Recipients are encouraged to verify independently any such information to their reasonable satisfaction. As used in this paragraph, "Technical Information" includes any technical advice, recommendations, testing, or analysis, including, without limitation, information as it may relate to the selection of a product for a specific use and application.

The following oven aging and UV exposure test methods were conducted in accordance with the GRI-GM13 (HDPE) and GRI-GM17 (LLDPE) requirements:

Test Name	**Exposure Conditions**	**Test Method**
Oven Aging	90 days in an oven at 85 °C	ASTM D5721
UV Exposure	1600 UV irradiance hours. Cycle: 20 hours UVA-340 at 75 °C followed by 4 hours dark with condensation at 60 °C. Irradiance was 0.78 W/m^2 at wavelength 340 nm. Note: This implies a total UV chamber residence time of 1920 hours, e.g., 1600 hours of irradiance and 320 hours of dark/condensation.	ASTM D7238
HP-OIT	150 °C in an oxygen atmosphere at 500 psi	ASTM D5885

Oven Aging Results:

Sample	Initial HP-OIT (min)	HP-OIT after 90 days of oven aging. (min)	**% HP-OIT** Retained after 90 days of oven aging.	GRI-GM13 and GRI-GM17 minimum % HP-OIT requirements after 90 days of oven aging.
K307 Lot # HJM810770, Agru Roll # GTF0029510004, black sheet, textured, nominal 0.060" thick	1303	1130	**86.7%**	GRI-GM13: % HP-OIT: 80% minimum
7104 Lot #CFJ810540, Agru Roll #G15B434055, black sheet, smooth, nominal 0.040" thick	904	838	**92.6%**	GRI-GM17: % HP-OIT: 60% minimum

results meet specs, but not for the project rolls

Continued on Page 3 - - -

NOTICES
Technical Information - By using any Technical Information contained herein, Recipient agrees that said Technical Information is given by CPChem for convenience only, without any warranty or guarantee of any kind, and is accepted and used at your sole risk. Recipients are encouraged to verify independently any such information to their reasonable satisfaction. As used in this paragraph, "Technical Information" includes any technical advice, recommendations, testing, or analysis, including, without limitation, information as it may relate to the selection of a product for a specific use and application.

UV Aging Results:

Sample	Initial HP-OIT (min)	HP-OIT after 1600 hrs of UV exposure. (min)	**% HP-OIT** Retained after 1600 hrs of UV exposure.	GRI-GM13 and GRI-GM17 minimum % HP-OIT requirements after 1600 hours of UV exposure.
K307 Lot # HJM810770, Agru Roll # GTF0029510004, black sheet, textured, nominal 0.060" thick	1310	1025	**78.2%**	GRI-GM13: % HP-OIT: 50% minimum
7104 Lot #CFJ810540, Agru Roll #G15B434055, black sheet, smooth, nominal 0.040" thick	919	650	**70.7%**	GRI-GM17: % HP-OIT: 35% minimum

results meet specs, but not for the project rolls

Notes:

- 1600 hours of UV exposure in accordance with ASTM D7238 implies a total UV chamber residence time of 1920 hours, e.g., 1600 hours of irradiance and 320 hours of darkness with condensation.
- Sheet samples were aged with the shiny side of the sheet facing the UV bulbs.

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GEOMEMBRANE TEST RESULTS

TRI Client: Agru America

Material: 40 mil. Microspike LLDPE Geomembrane
Roll Number: 303112-13
TRI Log #: E2375-24-04

Resin: Chevron Marlex 7104 LLDPE
Resin Lot #: CCN811900

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
2% Secant Modulus (ASTM D 5323)												
MD 2% Secant Modulus (psi)	34530	33311	37457	36861	40240						**36480**	2696
MD 2% Secant Modulus (lb/in)	1744	1782	1794	1773	1887						**1796**	54
TD 2% Secant Modulus (psi)	44698	44751	47500	37885	49374						**44842**	4360
TD 2% Secant Modulus (lb/in)	2007	2099	2109	1769	2355						**2068**	211

MD Machine Direction TD Transverse Direction

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

results not for the project rolls

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9063 Bee Caves Road / Austin, TX 78733 / 512 263 2101 / fax: 512 263 2558

GEOMEMBRANE TEST RESULTS

TRI Client: Agru America
Project:GRI GM17 compliance 2010

Material: AGRU 40 mil Microspike LLDPE Geomembrane
Roll #: 319110.10 (Chevron 7104 LLDPE resin lot CAA810800)
TRI Log #: E2341-52-07

PARAMETER	TEST REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	MEAN	STD. DEV.	PROJ. SPEC.
Multi-axial Tensile (ASTM D 5617)													
Test Method A: Centerpoint Deflection Versus Pressure													
Thickness (mils)	43	43	40								**42**	2	
Maximum Stress (psi)	1765	1558	1643								**1655**	104	
% Elongation @ Rupture (%)	76.9	76.3	81.6								**78.3**	2.9	30 min
Failure Description	H-CAT N-EF	MDT N-EF	MDT N-EF										

MDT A tear in the machine direction.
TDT A tear in the transverse direction.
H Circular or elliptical hole in the specimen.
H-CAT Circular or elliptical hole in an area where the material has significantly necked down or thinned. The large thinned area resembles a pupil of a cat eye.
N-EF No edge failure

MD Machine Direction TD Transverse Direction NA Not Available

The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

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ATTACHMENT 3

PLATEAU POND LINING:

DAILY WORK PROGRESS REPORTS

GAI Consultants, Inc.
500 Lee Street East, Suite 700
Charleston, WV 25301
(304) 926-8100
(304) 926-8180 (FAX)

QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/15/2020	C130109.10	2020-001

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

60LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 7:00 a.m. DEPART 8:00 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	Hallaton Environmental Linings

WEATHER

AM: 78°F, Sunny PM: 92°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	2	9		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens finished constructing the anchor trench, leaving an area for buggy access to the pond.
- Jergens finished shaping and rolling the subgrade.

- Hallaton deployed the cushion layer geotextile on the prepared subgrade. The seams were heat fused together. All that remains for the cushion layer to be complete is detail work.

CQA REPRESENTATIVE:

Joe Rose.

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Jergens working on Spillway Grade Elevation. 20200715

Plateau Pond: Hallaton deploying 16 oz/sy Geotextile on the Forebay Berm. 20200715

Plateau Pond: Cushion Layer Geotextile deployed on the Pond Subgrade.

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DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/16/2020	C130109.10	2020-002

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:00 a.m. DEPART 7:30 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	Hallaton Environmental Linings

WEATHER

AM: 75°F, Cloudy PM: 92°F, Partly cloudy

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	1	10		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Hallaton finished detailing the cushion layer geotextile.
- Hallaton deployed 7 rolls of LLDPE geomembrane, covering the forebay and majority of the main pond area.
- Hallaton seamed the panels together.

CQA REPRESENTATIVE:

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Hallaton deploying the Liner
20200716

Plateau Pond: View of Liner Progress Mid-Day
20200716

Plateau Pond: Liner deployed on 7/16.
Picture taken the morning of 7/17.

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DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/17/2020	C130109.10	2020-003

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:00 a.m. DEPART 8:30 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	Hallaton Environmental Linings

WEATHER

AM: 75°F, rain showers PM: 94°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	1	10		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Hallaton finished deploying the liner
- Hallaton performed air testing and repairs on the liner.
- Hallaton constructed the culvert pipe penetration seal in the forebay area.

- Jergens pumped water out of the forebay and main pond area.

- Due to the rain showers some water did come in contact with the subgrade near the riser pipe area. The water was pumped out, and the area allowed to dry as best as possible throughout the day. This was an area that has a seep and it was decided by all parties that the seep would not allow the area to fully dry, thus the area was lined.

CQA REPRESENTATIVE:

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Hallaton Air Testing a Seam. 20200717

Plateau Pond: Liner deployed at the end of the Day. 20200716

Plateau Pond: Culvert Pipe Penetration Seal. 20190717

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DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/18/2020	C130109.10	2020-004

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 7:00 a.m. DEPART 7:30 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	Hallaton Environmental Linings

WEATHER

AM: 75°F, Sunny PM: 94°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	2	1	13		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens deployed 3 panels of the revetment mattress in the forebay area
- Hallaton finished detail work, air testing seams, and repairs on the liner.
- Hallaton deployed all the protective layer geotextile on the project.
- Hallaton removed the valve in the bowl area of Sequence 4, placed a patch and air tested the patch.

CQA REPRESENTATIVE:

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Revetment Mattress deployed.
20200718

Plateau Pond: Vacuum Box Testing a Repair.
20200718

Sequence 4: Valve Removed and Repair Completed.
20200718

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DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/20/2020	C130109.10	2020-005

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 7:00 a.m. DEPART 4:15 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	Hallaton Environmental Linings

WEATHER

AM: 75°F, Sunny PM: 95°F, Thunderstorms

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	2	6		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- AEP made the decision to extend the protective layer of 16 oz/sy geotextile up to the anchor trench. This will cover all of the previously exposed LLDPE geomembrane. The protective stone layer will also extend to the top of the slope to provide an extra layer of protection.
- Jergens worked on backfilling and compacting the anchor trench.
- Jergens deployed the protective layer of geotextile in the main pond area.
- Jergens performed housekeeping on the jobsite.

At approx. 4:00 pm work was stopped for the day due to lightning and approaching storms.

CQA REPRESENTATIVE:

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Protective Layer of Geotextile extended to the Anchor Trench. 20200720

Plateau Pond: Anchor Trench Backfilled and Compacted in 12" lifts. 20200720

Plateau Pond: Protective Geotextile progress for the day. 20200720

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/21/2020	C130109.10	2020-006

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 7:00 a.m. DEPART 5:15 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 74°F, Sunny PM: 93°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	2	4		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens continued backfilling and compacting the anchor trench.
- Jergens deployed the revetment mattress fabric in the forebay area. The mattress will be trimmed to fit according to the design drawings.
- Jergens continued placing the 16 oz/sy protective geotextile.

CQA REPRESENTATIVE:

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Revetment Mattress deployed in the forebay area. 20200721

Plateau Pond: Protective Geotextile progress in the Main Pond Area. 20200721

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/22/2020	C130109.10	2020-007

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 4:45 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 70°F, Mostly Cloudy PM: 91°F, Mostly Cloudy

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	2	6		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens finished placing the protective layer of geotextile.
- Jergens began filling the revetment mattress with grout.

CQA REPRESENTATIVE:

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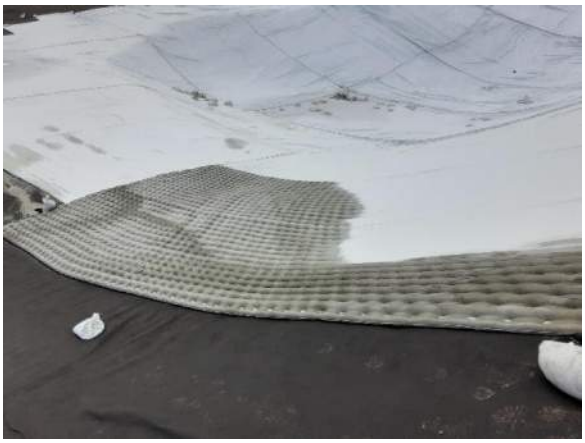
DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Protective Layer of Geotextile Finished. 20200722



Plateau Pond: Filling the Revetment Mattress in the Forebay Area. 20200722

Plateau Pond: End of Day Revetment Mattress Progress in the Forebay Area. 20200722

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/23/2020	C130109.10	2020-008

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 1:00 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 70°F, Mostly Cloudy PM: 91°F, Showers

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	2	6		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

Due to the previous night rain showers no work was completed on the revetment mattress. Water was pumped from the forebay into the main pond area. A significant amount of water was found to be under the geomembrane. The exact source of this water is unknown at this time.

CQA REPRESENTATIVE:

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Water under the Geomembrane 20200723

Plateau Pond: Trying to Depict the Depth of Water Under the Geomembrane. 20200723

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/24/2020	C130109.10	2020-009

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 5:25 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 71°F, Mostly Cloudy PM: 87°F, Cloudy

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	2	6		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens cut two holes in the LLDPE geomembrane to drain the water trapped beneath. Hallaton was notified and will be on site as soon as a crew is available to patch the holes.
- Jergens finished pouring the grout in the revetment mattress.
- Jergens continued backfilling the anchor trench in areas where the revetment mattress was placed and cured enough to allow.

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Drainage Hole in LLDPE. 20200724

Plateau Pond: Revetment Mattress and Anchor Trench. 20200724

Plateau Pond: Revetment Mattress pouring Complete. 20200724

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/27/2020	C130109.10	2020-010

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 5:10 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 70°F, Mostly Cloudy PM: 88°F, Cloudy

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	3	6		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens placed the geotextile for the structural fill layer for construction of the access road on the main pond area.
- Jergens placed stone on the backfilled anchor trench to widen the main access road.
- Jergens performed clean up in the North Valley Pond area.

CQA REPRESENTATIVE:

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Placing Stone on Backfilled Anchor Trench to Widen the Road. 20200727

Plateau Pond: Placing Stone on Backfilled Anchor Trench to Widen the Road. 20200727

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/28/2020	C130109.10	2020-011

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 1:00 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 72°F, Mostly Cloudy PM: 86°F, Partly cloudy, Lt. rain

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	3	6		

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens finished placing stone on the anchor trench to widen the road. A top layer or driving layer will be added at a later date.
- Jergens pumped water from the forebay into the main pond area to prepare the drainage holes for repair.

Jergens stopped work at approximately 12:00 p.m. awaiting approval for an RFI regarding the use of crusher run as structural fill material.

CQA REPRESENTATIVE:

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Stone placed on the Anchor Trench to Widen the Road. 20200728

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/29/2020	C130109.10	2020-012

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 4:25 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 70°F, Sunny PM: 91°F, Mostly Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	1	3	6		

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens placed an extra layer of 8 oz/sy geotextile on the main pond area access road.
- Jergens placed 16 inches of crusher run for the pond access road.
- Jergens placed the 6-inch-thick No. 2 stone layer along slope of the pond above the pond access road.
- Jergens continued to pump water in preparation of the repairs in the forebay area.

CQA REPRESENTATIVE:

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Additional 8 oz/sy Geotextile placed along the Access Road. 20200729

Plateau Pond: Close-up of the Crusher Run used for the Pond Access Road. 20200729

Plateau Pond: Placing No.2 Stone on the Slope of the Pond, and Crusher Run on the Access Road. 20200729

July 29, 2020

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DAILY PROGRESS REPORT

Plateau Pond: Daily Progress on the Access Road and No. 2 Stone Pplacement. 20200729

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DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/30/2020	C130109.10	2020-013

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 4:25 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	Hallaton Environmental Linings

WEATHER

AM: 70°F, Sunny PM: 75°F, Thunderstorms

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	2	3	8		

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Hallaton extrusion welded the patches in the forebay area. After the repairs were made the were vacuum box tested.
- Hallaton cut the "bubble" areas open in the bowl area of Sequence 4, drained the water, leistered patches to cut areas, and air tested the patches.
- Hallaton placed the steel bands around the two inlet pipes in the forebay area. A picture of this will be in the next work day's report.
- Jergens placed geotextile and quickcrete over the repairs made in the forebay floor.
- Jergens placed the 14 inches of AASHTO No.1 stone on the pond access road

CQA REPRESENTATIVE:

Joe Rose.

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GAI Consultants, Inc.
500 Lee Street East, Suite 700
Charleston, WV 25301
(304) 926-8100
(304) 926-8180 (FAX)

DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Placing No.1 Stone on the Pond Access Road in the Forebay Area. 20200730

Plateau Pond: Repair made on one of the Drainage Holes in the Forebay Area. 20200730

Sequence 4 Bowl Area: One of the "Bubbles" Cut and Draining. 20200730

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DAILY PROGRESS REPORT

Sequence 4 Bowl Area: Liner Patched.
20200730

Sequence 4 Bowl Area: Patch being Air lLnced
20200730

Plateau Pond: Pumping Water into the Forebay.
20200730

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
08/03/2020	C130109.10	2020-014

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:55 a.m. DEPART 5:05 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	Hallaton Environmental Linings

WEATHER

AM: 70°F, Sunny PM: 84°F, Cloudy

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
		3	2		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens Hauled No.2 Stone to make a temporary access road along the bench around the main pond area. This will be used to access areas above and below the bench in order to place the 6-inch thick protective layer.
- Jergens Hauled the No.1 stone to begin rebuilding of the berm between the main pond and the forebay.

- Two of the Three bubble areas on Sequence 4 have accrued a substantial amount of water. The Third area has a small amount that could be contributed to the remnants between the subgrade and liner after the repair.

CQA REPRESENTATIVE:

Joe Rose.

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DAILY PROGRESS REPORT

PHOTOS

Sequence 4 Bowl Area: One of the Bubble Areas that Accrued Water. 20200803

Plateau Pond: Temporary Access Road along the Bench of the Main Pond Area. 20200803

Plateau Pond: Bands placed on the inlet pipes. 20200803

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
08/04/2020	C130109.10	2020-015

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 5:05 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 66°F, Sunny PM: 84°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
		3	2		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens continued placing the No.2 stone along the bench in the main pond area.
- Jergens continued placing the No.1 stone to rebuild the berm between the forebay and main pond area.
- Jergens pumped water out of the main pond area in preparation of placing the protective layer of No.2 stone.

CQA REPRESENTATIVE:

Joe Rose.

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: No.1 Stone placed on Berm between Forebay and Main Pond Area. 20200804

Plateau Pond: Main Pond Area Pumped in Preparation of Protective Stone Layer. 20200804

Plateau Pond: No.2 Stone being placed on Bench as Temporary Access Road. 20200804

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
08/05/2020	C130109.10	2020-016

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 5:00 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 66°F, Sunny PM: 86°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
		3	2		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens continued placing the No.2 stone in the main pond area.
- Jergens spread the stone from the temporary access road in the main pond area to the slopes above and below the bench.
- C. Straley of GAI on site in afternoon.

CQA REPRESENTATIVE:

Joe Rose.

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: No. 2 Stone Spread on the Slopes of the Main Pond Area. 20200805

Plateau Pond: Temporary Access Road to reach Main Pond Area. 20200805

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
08/06/2020	C130109.10	2020-017

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 4:30 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 66°F, Sunny PM: 86°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
		3	2		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens continued placing the No.2 stone in the main pond area.
- Jergens spread the No.2 stone along the bottom of the main pond area.

CQA REPRESENTATIVE:

Joe Rose.

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: No. 2 Stone Spread on the Floor of the Main Pond Area. 20200806

Plateau Pond: No. 2 Stone Spread along the Slope and Main Pond Area Floor. 20200806

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
08/10/2020	C130109.10	2020-018

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 4:45 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 66°F, Sunny PM: 90°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
		3	2	1	Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens continued placing and spreading the No.2 stone in the main pond area and along the inside slope.
- Jergens placed and spread No. 1 stone along the forebay berm.

CQA REPRESENTATIVE:

Jason Gandee.

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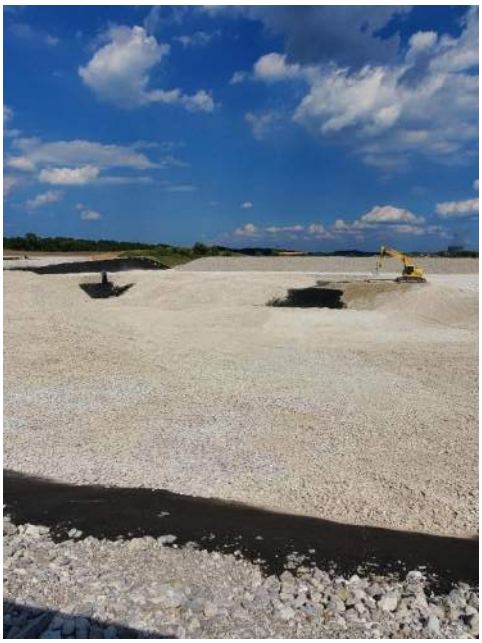
DAILY PROGRESS REPORT

PHOTOS



Plateau Pond: No. 2 Stone spread on the Side Slopes of the Main Pond Area. 20200810

Plateau Pond: No. 1 Stone Spread along Forebay Berm. 20200810

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(304) 926-8180 (FAX)

QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
08/11/2020	C130109.10	2020-019

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 5:00 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 66°F, Sunny PM: 83°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
		3	3	1	Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens continued placing and spreading the No.2 stone in the main pond area and along the inside slope.
- Jergens placed and spread No. 1 stone along the forebay berm.

CQA REPRESENTATIVE:

Jason Gandee.

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: No. 2 Stone Spread on the Side Slopes of the Main Pond Area. 20200811

Plateau Pond: No. 1 Stone Spread along Forebay Berm. 20200811

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QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
08/12/2020	C130109.10	2020-020

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 5:00 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 66°F, Sunny PM: 85°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
		3	3	1	Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens continued placing and spreading the No.2 stone in the main pond area and along the inside slope.
- Jergens placed and spread riprap along the forebay berm.
- Jergens constructed the skimmer pad and installed the skimmer to the riser pipe.

CQA REPRESENTATIVE:

Jason Gandee.

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DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: No. 2 Stone Spread on the Side Slopes of the Main Pond Area and Skimmer Pad. Skimmer Installed. 20200812

Plateau Pond: Riprap Spread along Forebay Berm. 20200812

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Charleston, WV 25301
(304) 926-8100
(304) 926-8180 (FAX)

QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
08/13/2020	C130109.10	2020-021

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 5:00 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	

WEATHER

AM: 66°F, Sunny PM: 85°F, Sunny

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
		3	3	1	Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens continued placing and spreading the No.2 stone in the main pond area and along the inside slope.
- Jergens placed No. 1 stone and riprap along the berm between the forebay and the main pond.
- Jergens completed the stone placement for the pond.

CQA REPRESENTATIVE:

Jason Gandee.

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(304) 926-8180 (FAX)

DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: No. 1 Stone and Riprap Spread along the Forebay Berm. 20200813

Plateau Pond: No. 2 Stone Placed and Spread in the Bottom of the Pond and the Inside Side Slopes. 20200813

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ATTACHMENT 4

PLATEAU POND LINING:

GROUT PLACEMENT AND TESTING

GROUT COMPRESSIVE STRENGTH TEST REPORT

Report Number: N2181067.0041
Service Date: 07/29/20
Report Date: 08/19/20 Revision 1 - 28-day results
Task:

Terracon
912 Morris St
Charleston, WV 25301-1425
304-344-0821

Client

GAI Consultants, Inc.
Attn: Charles Straley
300 Summers St Ste 1100
Charleston, WV 25301-1631

Project

C130109.10 John Amos
912 Morris Street
Charleston, WV 25301

Project Number: N2181067

Material Information

Specified Strength:

Mix ID:
Supplier:
Batch Time: **Plant:**
Truck No.: **Ticket No.:**

Sample Information

Sample Date: 07/22/20 **Sample Time:**
Sampled By: Client
Weather Conditions:
Accumulative Yards: **Batch Size:**
Sample Size:
Sample Location:
Placement Location:
Form Material: Plastic Mold **No. Units:**
Samples Plumb: Yes
Temperature Range:

Field Test Data

Test	Result	Specification
Slump (in):		
Grout Temp. (F):		
Ambient Temp. (F):		

Laboratory Test Data

Set No.	Specimen ID	Date Received	Date Tested	Age (days)	Area (sq in)	Maximum Load (lbs)	Compressive Strength (psi)	Tested By
1	A		07/29/20	7	3.98	5,850	1,470	
1	B		07/29/20	7	3.98	6,680	1,680	
						Average (7 days)	**1,570**	
1	C		08/19/20	28	3.92	8,900	2,270	
1	D		08/19/20	28	3.96	9,260	2,340	
						Average (28 days)	**2,300**	
1	E			Hold				
1	F			Hold				
1	G			Hold				
1	H			Hold				
1	I			Hold				
1	J			Hold				
1	K			Hold				
1	L			Hold				

Initial Cure: Cure Box **Final Cure:** Moist Room

Comments:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

GROUT COMPRESSIVE STRENGTH TEST REPORT

Report Number: N2181067.0041
Service Date: 07/29/20
Report Date: 08/19/20 Revision 1 - 28-day results
Task:

Terracon
912 Morris St
Charleston, WV 25301-1425
304-344-0821

Client

GAI Consultants, Inc.
Attn: Charles Straley
300 Summers St Ste 1100
Charleston, WV 25301-1631

Project

C130109.10 John Amos
912 Morris Street
Charleston, WV 25301

Project Number: N2181067

Samples Made By: Terracon
Services:

Reported To:
Contractor:
Report Distribution:
(1) GAI Consultants, Inc., Charles Straley

Reviewed By: Reedy, Jamie D

Jamie Reedy
Laboratory & CMET Project Manager

Test Methods: ASTM C109

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

GROUT COMPRESSIVE STRENGTH TEST REPORT

Report Number: N2181067.0042
Service Date: 07/29/20
Report Date: 09/21/20 Revision 2 - 56-day results
Task:

Terracon
912 Morris St
Charleston, WV 25301-1425
304-344-0821

Client

GAI Consultants, Inc.
Attn: Charles Straley
300 Summers St Ste 1100
Charleston, WV 25301-1631

Project

C130109.10 John Amos
912 Morris Street
Charleston, WV 25301

Project Number: N2181067

Material Information

Specified Strength:

Mix ID:
Supplier:
Batch Time: **Plant:**
Truck No.: **Ticket No.:**

Sample Information

Sample Date: 07/24/20 **Sample Time:**
Sampled By: Client
Weather Conditions:
Accumulative Yards: **Batch Size:**
Sample Size:
Sample Location:
Placement Location:
Form Material: Plastic Mold **No. Units:**
Samples Plumb: Yes
Temperature Range:

Field Test Data

Test	Result	Specification
Slump (in):		
Grout Temp. (F):		
Ambient Temp. (F):		

Laboratory Test Data

Set No.	Specimen ID	Date Received	Date Tested	Age (days)	Area (sq in)	Maximum Load (lbs)	Compressive Strength (psi)	Tested By
1	A		07/31/20	7	3.82	5,200	1,360	
1	B		07/31/20	7	4.32	5,200	1,200	
						Average (7 days)	**1,280**	
1	C		08/21/20	28	3.92	9,720	2,480	
1	D		08/21/20	28	3.90	9,540	2,450	
						Average (28 days)	**2,460**	
1	K		09/18/20	56	4.04	12,830	3,180	
1	L		09/18/20	56	3.72	11,950	3,210	
						Average (56 days)	**3,190**	
1	E			Hold				
1	F			Hold				
1	G			Hold				
1	H			Hold				
1	I			Hold				
1	J			Hold				
1	M			Hold				
1	N			Hold				
1	O			Hold				

Initial Cure: Cure Box **Final Cure:** Moist Room

Comments:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

GROUT COMPRESSIVE STRENGTH TEST REPORT

Report Number: N2181067.0042
Service Date: 07/29/20
Report Date: 09/21/20 Revision 2 - 56-day results
Task:

912 Morris St
Charleston, WV 25301-1425
304-344-0821

Client

GAI Consultants, Inc.
Attn: Charles Straley
300 Summers St Ste 1100
Charleston, WV 25301-1631

Project

C130109.10 John Amos
912 Morris Street
Charleston, WV 25301

Project Number: N2181067

Samples Made By: Terracon
Services:

Reported To:
Contractor:
Report Distribution:
(1) GAI Consultants, Inc., Charles Straley

Reviewed By: Reedy, Jamie D

Jamie Reedy
Laboratory & CMET Project Manager

Test Methods: ASTM C109

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

Summary of Concrete/Grout Testing
Amos Landfill - Sequence 4

	Purpose	sample ID	Slump	Air	Test Date	Sample Type	Test Criteria (psi)	Strength Results (psi @ days indicated)					
							28-day	3-day	7-day	14-day	21-day	28-day	56-day
7/22/2020	Fabriform Grout	A			7/29/2020	cubes	3000		1470				
		B			7/29/2020	cubes			1680				
		C			8/19/2020	cubes						2270	
		D			8/19/2020	cubes						2340	
7/24/2020	Fabriform Grout	A			7/31/2020	cubes	3000		1360				
		B			7/31/2020	cubes			1200				
		C			8/21/2020	cubes						2480	
		D			8/21/2020	cubes						2450	
		K			9/18/2020								3180
		L			9/18/2020	cubes							3210

* - AEP Notified

ATTACHMENT 5

PLATEAU POND LINING:

LLDPE GEOMEMBRANE: BILL OF LADING, SEAMING, AND NON-DESTRUCTIVE TEST LOG,

TRIAL SEAMS, PANEL PLACEMENT, AND REPAIRS

STRAIGHT BILL OF LADING - SHORT FORM - ORIGINAL - NOT NEGOTIABLE

NAME OF CARRIER	CARRIER'S TRUCK NO	FREIGHT QTE NO.	DATE	B/L NO.
ARDTRU	6920		6/23/2020	20674
SALES ORDER	**PURCHASE ORDER**	**C.O.D. FEE**		
SO00007821	P10594	Prepaid __ Collect $ __	Freight charges are PREPAID unless marked collect	

RECEIVED, subject to the classifications and lawfully filed tariffs in effect on the date of this Bill of Lading,
the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown) marked, consigned, and destined as indicated below which said carrier (the w
carrier being understood throughout this contract as meaning any person or corporation in possession of the property under contract) agrees to carry to its usual place of delivery at said destination, if on its ro
otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party
any time interested in all or any said property, that every service to be performed hereunder, shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform
Freight Classifications in effect on the date hereof, if this is a ra or a rail-watershipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.
**Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and t
said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.**

FROM:

SHIPPER

Georgetown
Agru America, Inc
500 Garrison Rd
Georgetown, SC 29440 United States
843-546-0600

TO:

CONSIGNEE

AEP John Amos - Plateau Pond Liner
Hallaton C/O RB Jergens
58 Bills Creek Road
Winfield, WV 25213 United States

Contact: Ash Hutsonpillar 937-405-9858

SPECIAL INSTRUCTIONS	CONTAINER NO.	SEAL NO.

NO. PCS	ITEM	LOT NUMBER	QUANTITY	WEIGHT	CLASS OR RATE
1	FG-LDMSDS040BBBEG	GTC0051960037 PH QR	17250 SF	3,880 LB	
1	FG-LDMSDS040BBBEG	GTC0053230004 PH QR	17250 SF	3,700 LB	
1	FG-LDMSDS040BBBEG	GTF0046500021 PH QR	17250 SF	3,678 LB	
1	FG-LDMSDS040BBBEG	GTF0046500022 PH QR	17250 SF	3,672 LB	
1	FG-LDMSDS040BBBEG	GTF0046500023 PH QR	17250 SF	3,650 LB	
1	FG-LDMSDS040BBBEG	GTF0046500024 PH QR	17250 SF	3,640 LB	
1	FG-LDMSDS040BBBEG	GTF0046500025 PH QR	17250 SF	3,684 LB	
1	FG-LDMSDS040BBBEG	GTF0046500026 PH QR	17250 SF	3,650 LB	
1	FG-LDMSDS040BBBEG	GTF0046500027 PH QR	17250 SF	3,690 LB	
5	FW-WR-LLDPE-BK-5MM	GTWR10038130001 PH QR	5 SP	110 LB	
14				33,354 LB	

REMIT C.O.D. TO:	C.O.D. AMT $	Subject to Section 7 of conditions, if this shipment is to be deliver to the consignee without recourse on the consignor, the consign shall sign the following stetement: The carrier shall not make delivery of this shipment without peyment of freight end all othe lawful charges.
Agru America, Inc. 500 Garrison Road Georgetown, SC 29440 US 843-546-0600		Signature of Consignor

If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it's a "carrier's or shipper's weight." Shipper's imprint in lieu of stamp; not a part of bill of lading approved by the Interstate Commerce Commission.	Note: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property The agreed or declared velue of the property is hereby specifically stated by the shipper to be not exceeding $ per

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation."

Shipper, Per **Carrier, Per**

Permanent post office address of shipper

MARK WITH "X" TO DESIGNATE HAZARDOUS MATERIAL AS DEFINED IN TITLE 49 OF FEDERAL REGULATIONS

When transporting hazardous materials, include the technical or chemical name for n.o.a. (not otherwise specified) or generic description of material with appropriate UN or NA numbers as defined in US DOT Emergency Response Communication Standard (HM-126C). Provide emergency response phone number in case of incident or accident.

GAI Consultants, Inc.

Seaming and Non Destructive Test Log

Project Name: Amos LF - Plateau Pond
Start Date: 15-Jul-20
Project Location: Putnam County, WV

Material: LLDPE
Thickness: 40 mil

Weld Date	Seam # (P#/P#)	Weld Time	Tech ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (feet)	Air Pressure Test or V-Box (1)					
										PSI		Time		Tech	Date (2)
										Start	Finish	Start	Finish		
7/16/20	P-6/7	8:35	JL	M50	860	750	BOSS	EOS	84	30	28	1:31	1:36	CL	7/17/20
7/16/20	P-6/18	12:01	JL	M50	860	750	EOS	BOSS	13	30	30	7:07	7:12	CL	7/17/20
7/16/20	P-18/CAP	11:45	JL	M50	860	750	BOSS	10'>BOSS	10	30	28	9:28	9:33	CL	7/17/20
7/16/20	P-18/CAP	11:46	JL	M50	860	750	10'>BOSS	EOS	36	30	30	9:24	9:29	CL	7/17/20
7/16/20	P-16/CAP	11:51	JL	M50	860	750	BOSS	11'>BOSS	11	30	28	9:31	9:36	CL	7/17/20
7/16/20	P-16/CAP	11:53	JL	M50	860	750	11'>BOSS	EOS	39	30	29	7:11	7:16	CL	7/17/20
7/16/20	P-6/16	12:00	JL	M50	860	750	EOS	BOSS	10	30	29	6:56	7:01	CL	7/17/20
7/16/20	P-5/6	8:17	DS	M46	860	700	BOSS	EOS	92	30	28	7:00	7:05	CL	7/17/20
7/16/20	P-5/16	11:30	JL	M50	860	750	EOS	BOSS	23	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-17/18	10:36	EM	M48	800	700	BOSS	EOS	92	30	29	9:34	9:39	CL	7/17/20
7/16/20	P-16/17	1:25	JL	M50	860	750	BOSS	EOS	23	30	28	9:19	9:24	CL	7/17/20
7/16/20	P-14/15	10:03	DS	M46	860	700	BOSS	EOS	23	30	30	8:58	9:03	CL	7/17/20
7/16/20	P-15/17	10:31	DS	M46	860	700	BOSS	48'>BOSS	48	30	29	9:45	9:50	CL	7/17/20
7/16/20	P-15/17	10:36	DS	M46	860	700	48'>BOSS	EOS	81	30	29	9:07	9:12	CL	7/17/20
7/16/20	P-14/16	10:37	DS	M46	860	700	BOSS	12'>BOSS	12	30	29	9:16	9:21	CL	7/17/20
7/16/20	P-14/16	10:38	DS	M46	860	700	12'>BOSS	EOS	59	30	29	8:44	8:49	CL	7/17/20
7/16/20	P-13/15	10:14	JL	M50	860	750	EOS	BOSS	75	30	30	8:54	8:59	CL	7/17/20
7/16/20	P-13/14	9:58	JL	M50	860	750	EOS	BOSS	91	30	30	8:49	8:54	CL	7/17/20
7/16/20	P-4/5	8:08	JL	M50	860	750	BOSS	EOS	103	30	29	8:40	8:45	CL	7/17/20
7/16/20	P-4/14	11:32	JL	M50	860	750	BOSS	EOS	25	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-3/14	11:34	JL	M50	860	750	BOSS	BOSS	5	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-3/13	11:36	JL	M50	860	750	BOSS	EOS	21	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-2/13	11:37	JL	M50	860	750	BOSS	EOS	12	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-2/12	11:39	JL	M50	860	750	BOSS	EOS	11	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-1/12	11:44	JL	M50	860	750	BOSS	EOS	24	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-3/4	8:05	EM	M48	800	700	BOSS	EOS	115	30	28	9:52	9:57	CL	7/17/20
7/16/20	P-2/3	8:00	DS	M46	860	700	BOSS	EOS	127	30	30	9:55	10:00	CL	7/17/20
7/16/20	P-12/13	9:34	EM	M48	800	700	BOSS	EOS	188	30	29	10:08	10:13	CL	7/17/20
7/16/20	P-1/2	3:48	JL	M50	860	750	BOSS	EOS	129	30	28	10:28	10:33	CL	7/17/20
7/16/20	P-12/23	1:26	DS	M46	860	700	BOSS	EOS	192	30	28	10:11	10:16	CL	7/17/20
7/16/20	P-1/30	4:41	JL	M50	860	750	EOS	55'<EOS	55	30	28	10:39	10:44	CL	7/17/20
7/16/20	P-1/30	4:58	JL	M50	860	750	55'<EOS	66'<EOS	66	30	29	3:03	3:08	CL	7/17/20
7/16/20	P-1/30	5:02	JL	M50	860	750	66'<EOS	BOSS	134	30	29	3:14	3:19	CL	7/17/20

GAI Consultants, Inc.

Seaming and Non Destructive Test Log

Project Name: Amos LF - Plateau Pond
Start Date: 15-Jul-20
Project Location: Putnam County, WV

Material: LLDPE
Thickness: 40 mil

Weld Date	Seam # (P#/P#)	Weld Time	Tech ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (feet)	Air Pressure Test or V-Box (1)					
										PSI		Time		Tech	Date (2)
										Start	Finish	Start	Finish		
7/16/20	P-23/43	6:30	EM	M48	800	700	BOSS	EOS	24	30	28	10:16	10:21	CL	7/17/20
7/16/20	P-24/45	6:35	EM	M48	800	700	BOSS	EOS	24	30	28	10:16	10:21	CL	7/17/20
7/16/20	P-25/46	6:42	EM	M48	800	700	BOSS	EOS	24	30	28	10:16	10:21	CL	7/17/20
7/16/20	P-26/47	6:47	EM	M48	800	700	BOSS	EOS	24	30	28	10:16	10:21	CL	7/17/20
7/16/20	P-32/43	5:16	JL	M50	860	750	BOSS	EOS	91	30	30	10:51	10:56	CL	7/17/20
7/16/20	P-32/44	5:11	JL	M50	860	750	BOSS	EOS	57	30	28	1:19	1:24	CL	7/17/20
7/16/20	P-43/44	5:09	JL	M50	860	750	BOSS	EOS	23	30	30	12:28	12:33	CL	7/17/20
7/16/20	P-23/24	1:12	EM	M48	800	700	BOSS	EOS	187	30	30	11:10	11:15	CL	7/17/20
7/16/20	P-43/45	5:26	DS	M46	860	700	BOSS	EOS	90	30	29	11:07	11:12	CL	7/17/20
7/16/20	P-44/45	5:22	DS	M46	860	700	BOSS	13'>BOSS	13	30	28	11:14	11:19	CL	7/17/20
7/16/20	P-44/45	5:23	DS	M46	860	700	13'>BOSS	50'>BOSS	50	30	29	12:23	12:28	CL	7/17/20
7/16/20	P-44/45	5:25	DS	M46	860	700	50'>BOSS	EOS	57	30	29	12:11	12:16	CL	7/17/20
7/16/20	P-24/25	1:23	JL	M50	860	750	BOSS	EOS	175	30	28	11:21	11:26	CL	7/17/20
7/16/20	P-45/46	5:30	JL	M50	860	750	BOSS	EOS	133	30	29	11:23	11:28	CL	7/17/20
7/16/20	P-25/26	1:35	EM	M48	800	700	BOSS	EOS	165	30	28	11:28	11:33	CL	7/17/20
7/16/20	P-46/47	5:44	DS	M46	860	700	BOSS	39'>BOSS	39	30	29	12:07	12:12	CL	7/17/20
7/16/20	P-46/47	5:53	DS	M46	860	700	39'>BOSS	EOS	125	30	28	11:32	11:37	CL	7/17/20
7/16/20	P-26/27	1:49	DS	M46	860	700	BOSS	EOS	156	30	28	11:35	11:40	CL	7/17/20
7/16/20	P-47/48	5:48	EM	M48	800	700	BOSS	EOS	118	30	30	11:43	11:48	CL	7/17/20
7/16/20	P-27/48	7:10	EM	M48	800	700	BOSS	EOS	24	30	28	11:40	11:45	CL	7/17/20
7/16/20	P-28/48	7:11	EM	M48	800	700	BOSS	EOS	5	30	28	11:40	11:45	CL	7/17/20
7/16/20	P-28/49	7:15	EM	M48	800	700	BOSS	EOS	24	30	28	11:40	11:45	CL	7/17/20
7/16/20	P-48/49	5:54	JL	M50	860	750	BOSS	EOS	109	30	30	11:53	11:58	CL	7/17/20
7/16/20	P-28/29	2:15	EM	M48	800	700	BOSS	EOS	140	30	29	11:57	12:02	CL	7/17/20
7/16/20	P-49/50	6:50	DS	M46	860	700	BOSS	EOS	98	30	30	12:01	12:06	CL	7/17/20
7/16/20	P-7/18	12:02	JL	M50	860	750	BOSS	EOS	17	30	29	1:28	1:33	CL	7/17/20
7/16/20	P-7/19	12:04	JL	M50	860	750	BOSS	EOS	5	30	29	1:28	1:33	CL	7/17/20
7/16/20	P-8/19	12:05	JL	M50	860	750	BOSS	EOS	25	30	29	1:54	1:59	CL	7/17/20
7/16/20	P-18/19	10:45	JL	M50	860	750	BOSS	EOS	121	30	29	1:35	1:40	CL	7/17/20
7/16/20	P-7/8	8:38	EM	M48	800	700	BOSS	EOS	75	30	30	1:55	2:00	CL	7/17/20
7/16/20	P-19/20	11:00	EM	M48	800	700	BOSS	EOS	93	30	29	2:02	2:07	CL	7/17/20
7/16/20	P-8/9	8:49	DS	M46	860	700	BOSS	EOS	66	30	28	2:00	2:05	CL	7/17/20
7/16/20	P-9/20	12:07	JL	M50	860	750	BOSS	EOS	15	30	29	2:06	2:11	CL	7/17/20

GAI Consultants, Inc.

Seaming and Non Destructive Test Log

Project Name: Amos LF - Plateau Pond
Start Date: 15-Jul-20
Project Location: Putnam County, WV

Material: LLDPE
Thickness: 40 mil

Weld Date	Seam # (P#/P#)	Weld Time	Tech ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (feet)	Air Pressure Test or V-Box (1)					
										PSI		Time		Tech	Date (2)
										Start	Finish	Start	Finish		
7/16/20	P-9/10	8:51	EM	M48	800	700	BOSS	EOS	55	30	28	2:34	2:39	CL	7/17/20
7/16/20	P-20/21	11:06	DS	M46	860	700	BOSS	EOS	79	30	30	2:32	2:37	CL	7/17/20
7/16/20	P-10/21	12:10	JL	M50	860	750	BOSS	EOS	23	30	28	2:30	2:35	CL	7/17/20
7/16/20	P-21/22	11:17	DS	M46	860	700	BOSS	EOS	27	30	30	2:43	2:48	CL	7/17/20
7/16/20	P-11/22	12:54	JL	M50	860	750	BOSS	EOS	20	30	28	2:46	2:51	CL	7/17/20
7/16/20	P-10/11	9:04	EM	M48	800	700	BOSS	EOS	23	30	30	2:51	2:56	CL	7/17/20
7/16/20	P-30/32	5:20	EM	M48	800	700	BOSS	EOS	27	30	29	10:42	10:47	CL	7/17/20
7/16/20	P-30/31	3:25	DS	M46	860	700	BOSS	EOS	112	30	29	3:21	3:26	CL	7/17/20
7/16/20	P-32/33	3:55	EM	M48	800	700	BOSS	EOS	131	30	28	3:25	3:30	CL	7/17/20
7/16/20	P-31/40	5:04	EM	M48	800	700	BOSS	EOS	26	30	29	3:27	3:32	CL	7/17/20
7/16/20	P-33/34	4:42	EM	M48	800	700	BOSS	EOS	28	30	30	3:30	3:35	CL	7/17/20
7/16/20	P-34/35	4:01	JL	M50	860	750	BOSS	EOS	71	30	28	3:39	3:44	CL	7/17/20
7/16/20	P-33/35	4:38	EM	M48	800	700	BOSS	EOS	28	30	29	3:37	3:42	CL	7/17/20
7/16/20	P-35/36	4:10	DS	M46	860	700	BOSS	EOS	51	30	28	3:42	3:47	CL	7/17/20
7/16/20	P-33/36	4:35	EM	M48	800	700	BOSS	EOS	17	30	29	3:45	3:50	CL	7/17/20
7/16/20	P-36/37	4:11	JL	M50	860	750	BOSS	EOS	27	30	30	3:54	3:59	CL	7/17/20
7/16/20	P-33/37	4:30	EM	M48	800	700	BOSS	EOS	28	30	29	3:50	3:55	CL	7/17/20
7/16/20	P-34/38	4:26	JL	M50	860	750	BOSS	EOS	44	30	28	4:04	4:09	CL	7/17/20
7/16/20	P-34/40	4:32	JL	M50	860	750	BOSS	EOS	49	30	29	3:31	3:36	CL	7/17/20
7/16/20	P-38/39	4:33	DS	M46	860	700	BOSS	EOS	42	30	29	4:07	4:12	CL	7/17/20
7/16/20	P-38/40	4:23	EM	M48	800	700	BOSS	EOS	23	30	29	4:06	4:11	CL	7/17/20
7/16/20	P-39/40	4:38	DS	M46	860	700	BOSS	EOS	28	30	28	4:13	4:18	CL	7/17/20
7/16/20	P-39/41	4:49	DS	M46	860	700	BOSS	EOS	48	30	30	4:18	4:23	CL	7/17/20
7/16/20	P-41/42	5:02	DS	M46	860	700	BOSS	EOS	18	30	30	4:23	4:28	CL	7/17/20
7/16/20	P-31/39	5:10	EM	M48	800	700	BOSS	EOS	28	30	29	4:15	4:20	CL	7/17/20
7/16/20	P-31/41	5:13	EM	M48	800	700	BOSS	EOS	27	30	28	4:21	4:26	CL	7/17/20
7/16/20	P-31/42	5:16	EM	M48	800	700	BOSS	EOS	15	30	29	4:25	4:30	CL	7/17/20
7/16/20	P-29/49	5:10	EM	M48	800	700	BOSS	EOS	6	30	28	11:40	11:45	CL	7/17/20
7/17/20	P-29/CAP	7:13	JL	M46	860	700	BOSS	EOS	18	30	29	7:35	7:40	CL	7/17/20
7/17/20	P-50/CAP	7:16	JL	M46	860	700	BOSS	EOS	18	30	29	7:37	7:42	CL	7/17/20

GAI Consultants, Inc.

Seaming and Non Destructive Test Log

Project Name: Amos LF - Plateau Pond
Start Date: 15-Jul-20
Project Location: Putnam County, WV

Material: LLDPE
Thickness: 40 mil

Weld Date	Seam # (P#/P#)	Weld Time	Tech ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (feet)	Air Pressure Test or V-Box (1)					
										PSI		Time		Tech	Date (2)
										Start	Finish	Start	Finish		
7/17/20	P-29/58	5:35	JL	M46	860	700	BOSS	EOS	135	30	29	7:02	7:07	CL	7/17/20
7/17/20	P-50/58	7:02	DS	M48	860	750	BOSS	EOS	6	30	28	7:38	7:43	CL	7/17/20
7/17/20	P-51/58	7:04	DS	M48	860	750	BOSS	EOS	18	30	29	7:47	7:52	CL	7/17/20
7/17/20	P-51/59	7:07	DS	M48	860	750	BOSS	EOS	6	30	29	7:47	7:52	CL	7/17/20
7/17/20	P-52/59	7:07	DS	M48	860	750	BOSS	EOS	18	30	29	7:47	7:52	CL	7/17/20
7/17/20	P-50/51	5:17	DS	M48	860	750	BOSS	EOS	90	30	28	7:04	7:09	CL	7/17/20
7/17/20	P-58/59	5:48	JL	M46	860	700	BOSS	EOS	125	30	28	7:07	7:12	CL	7/17/20
7/17/20	P-51/52	5:28	DS	M48	860	750	BOSS	EOS	78	30	30	7:11	7:16	CL	7/17/20
7/17/20	P-59/61	6:30	JL	M46	860	700	BOSS	62'>BOSS	62	30	28	10:24	10:29	CL	7/17/20
7/17/20	P-59/61	6:37	JL	M46	860	700	62'>BOSS	72'>BOSS	72	30	29	7:25	7:30	CL	7/17/20
7/17/20	P-59/61	6:40	JL	M46	860	700	72'>BOSS	EOS	80	30	29	7:24	7:29	CL	7/17/20
7/17/20	P-52/53	5:40	DS	M48	860	750	BOSS	EOS	71	30	28	7:28	7:33	CL	7/17/20
7/17/20	P-53/61	7:08	DS	M48	860	750	BOSS	EOS	20	30	28	7:44	7:49	CL	7/17/20
7/17/20	P-54/61	7:10	DS	M48	860	750	BOSS	EOS	9	30	28	7:44	7:49	CL	7/18/20
7/17/20	P-60/62	6:55	JL	M46	860	700	BOSS	EOS	25	30	29	11:46	11:51	CL	7/18/20
7/17/20	P-60/65	6:58	JL	M46	860	700	BOSS	EOS	6	30	29	11:40	11:45	CL	7/18/20
7/17/20	P-61/65	6:59	JL	M46	860	700	BOSS	EOS	24	30	29	10:56	11:01	CL	7/18/20
7/17/20	P-61/64	7:00	JL	M46	860	700	BOSS	EOS	30	30	29	10:27	10:32	CL	7/18/20
7/17/20	P-53/54	5:49	DS	M48	860	750	BOSS	EOS	68	30	28	10:20	10:25	CL	7/18/20
7/17/20	P-54/64	7:11	DS	M48	860	750	BOSS	EOS	13	30	28	7:44	7:49	CL	7/18/20
7/17/20	P-55/64	7:15	DS	M48	860	750	BOSS	EOS	48	30	28	7:44	7:49	CL	7/18/20
7/17/20	P-54/55	6:21	DS	M48	860	750	BOSS	EOS	23	30	29	10:29	10:34	CL	7/18/20
7/17/20	P-55/56	6:02	DS	M48	860	750	BOSS	EOS	40	30	29	10:52	10:57	CL	7/18/20
7/17/20	P-54/56	6:23	DS	M48	860	750	BOSS	11'>BOSS	11	30	29	10:36	10:41	CL	7/18/20
7/17/20	P-54/56	6:25	DS	M48	860	750	11'>BOSS	EOS	23	30	29	10:38	10:43	CL	7/18/20
7/17/20	P-56/57	6:00	DS	M48	860	750	BOSS	EOS	18	30	28	10:42	10:47	CL	7/18/20
7/17/20	P-54/57	6:27	DS	M48	860	750	BOSS	EOS	17	30	30	10:45	10:50	CL	7/18/20
7/17/20	P-64/66	7:26	DS	M48	860	750	BOSS	EOS	17	30	28	11:02	11:07	CL	7/18/20
7/17/20	P-64/65	6:44	JL	M46	860	700	BOSS	EOS	21	30	28	10:55	11:00	CL	7/18/20
7/17/20	P-63/65	6:41	JL	M46	860	700	BOSS	EOS	23	30	28	11:31	11:36	CL	7/18/20
7/17/20	P-62/63	6:50	JL	M46	860	700	BOSS	EOS	36	30	29	11:34	11:39	CL	7/18/20
7/17/20	P-60/61	6:20	JL	M46	860	700	BOSS	EOS	23	30	29	11:38	11:43	CL	7/18/20
7/17/20	P-59/60	6:28	JL	M46	860	700	BOSS	EOS	35	30	28	11:40	11:45	CL	7/18/20

HALLATON
ENVIRONMENTAL LININGS

Seaming and Non Destructive Test Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Start Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
Thickness : 40 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test or V-Box					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
7/16/20	P-6/7	8:35	JL	M50	860	750	BOSS	EOS	84	30	28	1:31	1:36	CL	7/17/20
7/16/20	P-6/18	12:01	JL	M50	860	750	EOS	BOSS	13	30	30	7:07	7:12	CL	7/17/20
7/16/20	P-18/CAP	11:45	JL	M50	860	750	BOSS	10'>BOSS	10	30	28	9:28	9:33	CL	7/17/20
7/16/20	P-18/CAP	11:46	JL	M50	860	750	10'>BOSS	EOS	36	30	30	9:24	9:29	CL	7/17/20
7/16/20	P-16/CAP	11:51	JL	M50	860	750	BOSS	11'>BOSS	11	30	28	9:31	9:36	CL	7/17/20
7/16/20	P-16/CAP	11:53	JL	M50	860	750	11'>BOSS	EOS	39	30	29	7:11	7:16	CL	7/17/20
7/16/20	P-6/16	12:00	JL	M50	860	750	EOS	BOSS	10	30	29	6:56	7:01	CL	7/17/20
7/16/20	P-5/6	8:17	DS	M46	860	700	BOSS	EOS	92	30	28	7:00	7:05	CL	7/17/20
7/16/20	P-5/16	11:30	JL	M50	860	750	EOS	BOSS	23	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-17/18	10:36	EM	M48	800	700	BOSS	EOS	92	30	29	9:34	9:39	CL	7/17/20
7/16/20	P-16/17	1:25	JL	M50	860	750	BOSS	EOS	23	30	28	9:19	9:24	CL	7/17/20
7/16/20	P-14/15	10:03	DS	M46	860	700	BOSS	EOS	23	30	30	8:58	9:03	CL	7/17/20
7/16/20	P-15/17	10:31	DS	M46	860	700	BOSS	48'>BOSS	48	30	29	9:45	9:50	CL	7/17/20
7/16/20	P-15/17	10:36	DS	M46	860	700	48'>BOSS	EOS	81	30	29	9:07	9:12	CL	7/17/20
7/16/20	P-14/16	10:37	DS	M46	860	700	BOSS	12'>BOSS	12	30	29	9:16	9:21	CL	7/17/20
7/16/20	P-14/16	10:38	DS	M46	860	700	12'>BOSS	EOS	59	30	29	8:44	8:49	CL	7/17/20
7/16/20	P-13/15	10:14	JL	M50	860	750	EOS	BOSS	75	30	30	8:54	8:59	CL	7/17/20
7/16/20	P-13/14	9:58	JL	M50	860	750	EOS	BOSS	91	30	30	8:49	8:54	CL	7/17/20
7/16/20	P-4/5	8:08	JL	M50	860	750	BOSS	EOS	103	30	29	8:40	8:45	CL	7/17/20
7/16/20	P-4/14	11:32	JL	M50	860	750	BOSS	EOS	25	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-3/14	11:34	JL	M50	860	750	BOSS	BOSS	5	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-3/13	11:36	JL	M50	860	750	BOSS	EOS	21	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-2/13	11:37	JL	M50	860	750	BOSS	EOS	12	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-2/12	11:39	JL	M50	860	750	BOSS	EOS	11	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-1/12	11:44	JL	M50	860	750	BOSS	EOS	24	30	28	7:04	7:09	CL	7/17/20
7/16/20	P-3/4	8:05	EM	M48	800	700	BOSS	EOS	115	30	28	9:52	9:57	CL	7/17/20
7/16/20	P-2/3	8:00	DS	M46	860	700	BOSS	EOS	127	30	30	9:55	10:00	CL	7/17/20
7/16/20	P-12/13	9:34	EM	M48	800	700	BOSS	EOS	188	30	29	10:08	10:13	CL	7/17/20
7/16/20	P-1/2	3:48	JL	M50	860	750	BOSS	EOS	129	30	28	10:28	10:33	CL	7/17/20
7/16/20	P-12/23	1:26	DS	M46	860	700	BOSS	EOS	192	30	28	10:11	10:16	CL	7/17/20

HALLATON
ENVIRONMENTAL LININGS

Seaming and Non Destructive Test Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Start Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
Thickness : 40 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test or V-Box					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
7/16/20	P-1/30	4:41	JL	M50	860	750	EOS	55'<EOS	55	30	28	10:39	10:44	CL	7/17/20
7/16/20	P-1/30	4:58	JL	M50	860	750	55'<EOS	66'<EOS	66	30	29	3:03	3:08	CL	7/17/20
7/16/20	P-1/30	5:02	JL	M50	860	750	66'<EOS	BOSS	134	30	29	3:14	3:19	CL	7/17/20
7/16/20	P-23/43	6:30	EM	M48	800	700	BOSS	EOS	24	30	28	10:16	10:21	CL	7/17/20
7/16/20	P-24/45	6:35	EM	M48	800	700	BOSS	EOS	24	30	28	10:16	10:21	CL	7/17/20
7/16/20	P-25/46	6:42	EM	M48	800	700	BOSS	EOS	24	30	28	10:16	10:21	CL	7/17/20
7/16/20	P-26/47	6:47	EM	M48	800	700	BOSS	EOS	24	30	28	10:16	10:21	CL	7/17/20
7/16/20	P-32/43	5:16	JL	M50	860	750	BOSS	EOS	91	30	30	10:51	10:56	CL	7/17/20
7/16/20	P-32/44	5:11	JL	M50	860	750	BOSS	EOS	57	30	28	1:19	1:24	CL	7/17/20
7/16/20	P-43/44	5:09	JL	M50	860	750	BOSS	EOS	23	30	30	12:28	12:33	CL	7/17/20
7/16/20	P-23/24	1:12	EM	M48	800	700	BOSS	EOS	187	30	30	11:10	11:15	CL	7/17/20
7/16/20	P-43/45	5:26	DS	M46	860	700	BOSS	EOS	90	30	29	11:07	11:12	CL	7/17/20
7/16/20	P-44/45	5:22	DS	M46	860	700	BOSS	13'>BOSS	13	30	28	11:14	11:19	CL	7/17/20
7/16/20	P-44/45	5:23	DS	M46	860	700	13'>BOSS	50'>BOSS	50	30	29	12:23	12:28	CL	7/17/20
7/16/20	P-44/45	5:25	DS	M46	860	700	50'>BOSS	EOS	57	30	29	12:11	12:16	CL	7/17/20
7/16/20	P-24/25	1:23	JL	M50	860	750	BOSS	EOS	175	30	28	11:21	11:26	CL	7/17/20
7/16/20	P-45/46	5:30	JL	M50	860	750	BOSS	EOS	133	30	29	11:23	11:28	CL	7/17/20
7/16/20	P-25/26	1:35	EM	M48	800	700	BOSS	EOS	165	30	28	11:28	11:33	CL	7/17/20
7/16/20	P-46/47	5:44	DS	M46	860	700	BOSS	39'>BOSS	39	30	29	12:07	12:12	CL	7/17/20
7/16/20	P-46/47	5:53	DS	M46	860	700	39'>BOSS	EOS	125	30	28	11:32	11:37	CL	7/17/20
7/16/20	P-26/27	1:49	DS	M46	860	700	BOSS	EOS	156	30	28	11:35	11:40	CL	7/17/20
7/16/20	P-47/48	5:48	EM	M48	800	700	BOSS	EOS	118	30	30	11:43	11:48	CL	7/17/20
7/16/20	P-27/48	7:10	EM	M48	800	700	BOSS	EOS	24	30	28	11:40	11:45	CL	7/17/20
7/16/20	P-28/48	7:11	EM	M48	800	700	BOSS	EOS	5	30	28	11:40	11:45	CL	7/17/20
7/16/20	P-28/49	7:15	EM	M48	800	700	BOSS	EOS	24	30	28	11:40	11:45	CL	7/17/20
7/16/20	P-48/49	5:54	JL	M50	860	750	BOSS	EOS	109	30	30	11:53	11:58	CL	7/17/20
7/16/20	P-28/29	2:15	EM	M48	800	700	BOSS	EOS	140	30	29	11:57	12:02	CL	7/17/20
7/16/20	P-49/50	6:50	DS	M46	860	700	BOSS	EOS	98	30	30	12:01	12:06	CL	7/17/20
7/16/20	P-7/18	12:02	JL	M50	860	750	BOSS	EOS	17	30	29	1:28	1:33	CL	7/17/20
7/16/20	P-7/19	12:04	JL	M50	860	750	BOSS	EOS	5	30	29	1:28	1:33	CL	7/17/20

HALLATON
ENVIRONMENTAL LININGS

Seaming and Non Destructive Test Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Start Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
Thickness : 40 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test or V-Box					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
7/16/20	P-8/19	12:05	JL	M50	860	750	BOSS	EOS	25	30	29	1:54	1:59	CL	7/17/20
7/16/20	P-18/19	10:45	JL	M50	860	750	BOSS	EOS	121	30	29	1:35	1:40	CL	7/17/20
7/16/20	P-7/8	8:38	EM	M48	800	700	BOSS	EOS	75	30	30	1:55	2:00	CL	7/17/20
7/16/20	P-19/20	11:00	EM	M48	800	700	BOSS	EOS	93	30	29	2:02	2:07	CL	7/17/20
7/16/20	P-8/9	8:49	DS	M46	860	700	BOSS	EOS	66	30	28	2:00	2:05	CL	7/17/20
7/16/20	P-9/20	12:07	JL	M50	860	750	BOSS	EOS	15	30	29	2:06	2:11	CL	7/17/20
7/16/20	P-9/10	8:51	EM	M48	800	700	BOSS	EOS	55	30	28	2:34	2:39	CL	7/17/20
7/16/20	P-20/21	11:06	DS	M46	860	700	BOSS	EOS	79	30	30	2:32	2:37	CL	7/17/20
7/16/20	P-10/21	12:10	JL	M50	860	750	BOSS	EOS	23	30	28	2:30	2:35	CL	7/17/20
7/16/20	P-21/22	11:17	DS	M46	860	700	BOSS	EOS	27	30	30	2:43	2:48	CL	7/17/20
7/16/20	P-11/22	12:54	JL	M50	860	750	BOSS	EOS	20	30	28	2:46	2:51	CL	7/17/20
7/16/20	P-10/11	9:04	EM	M48	800	700	BOSS	EOS	23	30	30	2:51	2:56	CL	7/17/20
7/16/20	P-30/32	5:20	EM	M48	800	700	BOSS	EOS	27	30	29	10:42	10:47	CL	7/17/20
7/16/20	P-30/31	3:25	DS	M46	860	700	BOSS	EOS	112	30	29	3:21	3:26	CL	7/17/20
7/16/20	P-32/33	3:55	EM	M48	800	700	BOSS	EOS	131	30	28	3:25	3:30	CL	7/17/20

HALLATON
ENVIRONMENTAL LININGS

Seaming and Non Destructive Test Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Start Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
Thickness : 40 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test or V-Box					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
7/16/20	P-31/40	5:04	EM	M48	800	700	BOSS	EOS	26	30	29	3:27	3:32	CL	7/17/20
7/16/20	P-33/34	4:42	EM	M48	800	700	BOSS	EOS	28	30	30	3:30	3:35	CL	7/17/20
7/16/20	P-34/35	4:01	JL	M50	860	750	BOSS	EOS	71	30	28	3:39	3:44	CL	7/17/20
7/16/20	P-33/35	4:38	EM	M48	800	700	BOSS	EOS	28	30	29	3:37	3:42	CL	7/17/20
7/16/20	P-35/36	4:10	DS	M46	860	700	BOSS	EOS	51	30	28	3:42	3:47	CL	7/17/20
7/16/20	P-33/36	4:35	EM	M48	800	700	BOSS	EOS	17	30	29	3:45	3:50	CL	7/17/20
7/16/20	P-36/37	4:11	JL	M50	860	750	BOSS	EOS	27	30	30	3:54	3:59	CL	7/17/20
7/16/20	P-33/37	4:30	EM	M48	800	700	BOSS	EOS	28	30	29	3:50	3:55	CL	7/17/20
7/16/20	P-34/38	4:26	JL	M50	860	750	BOSS	EOS	44	30	28	4:04	4:09	CL	7/17/20
7/16/20	P-34/40	4:32	JL	M50	860	750	BOSS	EOS	49	30	29	3:31	3:36	CL	7/17/20
7/16/20	P-38/39	4:33	DS	M46	860	700	BOSS	EOS	42	30	29	4:07	4:12	CL	7/17/20
7/16/20	P-38/40	4:23	EM	M48	800	700	BOSS	EOS	23	30	29	4:06	4:11	CL	7/17/20
7/16/20	P-39/40	4:38	DS	M46	860	700	BOSS	EOS	28	30	28	4:13	4:18	CL	7/17/20
7/16/20	P-39/41	4:49	DS	M46	860	700	BOSS	EOS	48	30	30	4:18	4:23	CL	7/17/20
7/16/20	P-41/42	5:02	DS	M46	860	700	BOSS	EOS	18	30	30	4:23	4:28	CL	7/17/20
7/16/20	P-31/39	5:10	EM	M48	800	700	BOSS	EOS	28	30	29	4:15	4:20	CL	7/17/20
7/16/20	P-31/41	5:13	EM	M48	800	700	BOSS	EOS	27	30	28	4:21	4:26	CL	7/17/20
7/16/20	P-31/42	5:16	EM	M48	800	700	BOSS	EOS	15	30	29	4:25	4:30	CL	7/17/20
7/16/20	P-29/49	5:10	EM	M48	800	700	BOSS	EOS	6	30	28	11:40	11:45	CL	7/17/20
7/17/20	P-29/CAP	7:13	JL	M46	860	700	BOSS	EOS	18	30	29	7:35	7:40	CL	7/17/20
7/17/20	P-50/CAP	7:16	JL	M46	860	700	BOSS	EOS	18	30	29	7:37	7:42	CL	7/17/20
7/17/20	P-29/58	5:35	JL	M46	860	700	BOSS	EOS	135	30	29	7:02	7:07	CL	7/17/20
7/17/20	P-50/58	7:02	DS	M48	860	750	BOSS	EOS	6	30	28	7:38	7:43	CL	7/17/20
7/17/20	P-51/58	7:04	DS	M48	860	750	BOSS	EOS	18	30	29	7:47	7:52	CL	7/17/20
7/17/20	P-51/59	7:07	DS	M48	860	750	BOSS	EOS	6	30	29	7:47	7:52	CL	7/17/20
7/17/20	P-52/59	7:07	DS	M48	860	750	BOSS	EOS	18	30	29	7:47	7:52	CL	7/17/20
7/17/20	P-50/51	5:17	DS	M48	860	750	BOSS	EOS	90	30	28	7:04	7:09	CL	7/17/20
7/17/20	P-58/59	5:48	JL	M46	860	700	BOSS	EOS	125	30	28	7:07	7:12	CL	7/17/20
7/17/20	P-51/52	5:28	DS	M48	860	750	BOSS	EOS	78	30	30	7:11	7:16	CL	7/17/20
7/17/20	P-59/61	6:30	JL	M46	860	700	BOSS	62'>BOSS	62	30	28	10:24	10:29	CL	7/17/20

HALLATON
ENVIRONMENTAL LININGS

Seaming and Non Destructive Test Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Start Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
Thickness : 40 mil

WELD DATE	SEAM # (P#/P#)	WELD TIME	TECH ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (Feet)	Air Pressure Test or V-Box					
										PSI		Time		Tech	Date
										Start	Finish	Start	Finish		
7/17/20	P-59/61	6:37	JL	M46	860	700	62'>BOSS	72'>BOSS	72	30	29	7:25	7:30	CL	7/17/20
7/17/20	P-59/61	6:40	JL	M46	860	700	72'>BOSS	EOS	80	30	29	7:24	7:29	CL	7/17/20
7/17/20	P-52/53	5:40	DS	M48	860	750	BOSS	EOS	71	30	28	7:28	7:33	CL	7/17/20
7/17/20	P-53/61	7:08	DS	M48	860	750	BOSS	EOS	20	30	28	7:44	7:49	CL	7/17/20
7/17/20	P-54/61	7:10	DS	M48	860	750	BOSS	EOS	9	30	28	7:44	7:49	CL	7/18/20
7/17/20	P-60/62	6:55	JL	M46	860	700	BOSS	EOS	25	30	29	11:46	11:51	CL	7/18/20
7/17/20	P-60/65	6:58	JL	M46	860	700	BOSS	EOS	6	30	29	11:40	11:45	CL	7/18/20
7/17/20	P-61/65	6:59	JL	M46	860	700	BOSS	EOS	24	30	29	10:56	11:01	CL	7/18/20
7/17/20	P-61/64	7:00	JL	M46	860	700	BOSS	EOS	30	30	29	10:27	10:32	CL	7/18/20
7/17/20	P-53/54	5:49	DS	M48	860	750	BOSS	EOS	68	30	28	10:20	10:25	CL	7/18/20
7/17/20	P-54/64	7:11	DS	M48	860	750	BOSS	EOS	13	30	28	7:44	7:49	CL	7/18/20
7/17/20	P-55/64	7:15	DS	M48	860	750	BOSS	EOS	48	30	28	7:44	7:49	CL	7/18/20
7/17/20	P-54/55	6:21	DS	M48	860	750	BOSS	EOS	23	30	29	10:29	10:34	CL	7/18/20
7/17/20	P-55/56	6:02	DS	M48	860	750	BOSS	EOS	40	30	29	10:52	10:57	CL	7/18/20
7/17/20	P-54/56	6:23	DS	M48	860	750	BOSS	11'>BOSS	11	30	29	10:36	10:41	CL	7/18/20
7/17/20	P-54/56	6:25	DS	M48	860	750	11'>BOSS	EOS	23	30	29	10:38	10:43	CL	7/18/20
7/17/20	P-56/57	6:00	DS	M48	860	750	BOSS	EOS	18	30	28	10:42	10:47	CL	7/18/20
7/17/20	P-54/57	6:27	DS	M48	860	750	BOSS	EOS	17	30	30	10:45	10:50	CL	7/18/20
7/17/20	P-64/66	7:26	DS	M48	860	750	BOSS	EOS	17	30	28	11:02	11:07	CL	7/18/20
7/17/20	P-64/65	6:44	JL	M46	860	700	BOSS	EOS	21	30	28	10:55	11:00	CL	7/18/20
7/17/20	P-63/65	6:41	JL	M46	860	700	BOSS	EOS	23	30	28	11:31	11:36	CL	7/18/20
7/17/20	P-62/63	6:50	JL	M46	860	700	BOSS	EOS	36	30	29	11:34	11:39	CL	7/18/20
7/17/20	P-60/61	6:20	JL	M46	860	700	BOSS	EOS	23	30	29	11:38	11:43	CL	7/18/20
7/17/20	P-59/60	6:28	JL	M46	860	700	BOSS	EOS	35	30	28	11:40	11:45	CL	7/18/20

HALLATON
ENVIRONMENTAL LININGS

Geomembrane Field Trial Seam Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Start Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE

40 mil Thickness

Project Seam Requirements

	Fusion:	Extrusion:
Peel:	50	44
Shear:	60	60
Tensiometer #:	T16	

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail	Tech ID	Remarks
								Peel (ppi) IN/OUT					Shear (ppi)							
				Machine	Operator	Temp/ Speed ºF/fpm (or %max)	Barrel/ Preheat ºF/ºF	1	2	3	4	5	1	2	3	4	5			
1	7/16/20	7:20	72	M50	JL	860/750		74	75	75			73	77				P	AA	SM/SM
								68	70	70										
2	7/16/20	7:23	72	M46	DS	800/800		67	62	63			77	73				P	AA	SM/SM
								63	68	62										
3	7/16/20	7:23	72	M48	EM	800/700		69	76	67			73	83				P	AA	SM/SM
								74	75	71										
4	7/16/20	8:24	72	M50	JL	800/600		73	68	65			72	79				P	AA	TX/TX
								67	71	66										
5	7/16/20	8:22	72	M48	EM	800/650		72	66	68			69	69				P	AA	TX/TX
								65	67	67										
6	7/16/20	7:27	72	M46	DS	860/600		60	67	61			67	68				P	AA	TX/TX
								62	68	66										
7	7/16/20	12:40	89	M50	JL	860/750		63	58	65			65	65				P	AA	SM/SM
								64	62	64										
8	7/16/20	12:48	89	M48	EM	800/700		58	62	60			62	65				P	AA	SM/SM
								56	57	62										
9	7/16/20	1:06	89	M46	DS	860/700		56	55	58			64	67				P	AA	SM/SM
								57	59	57										
10	7/16/20	12:44	89	M50	JL	860/650		64	54	59			63	65				P	AA	TX/TX
								60	61	61										
11	7/16/20	12:50	89	M48	EM	800/650		54	56	59			64	71				P	AA	TX/TX
								56	62	60										

HALLATON
ENVIRONMENTAL LININGS

Geomembrane Field Trial Seam Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Start Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE

40 mil Thickness

Project Seam Requirements

	Fusion:	Extrusion:
Peel:	50	44
Shear:	60	60
Tensiometer #:	T16	

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail	Tech ID	Remarks
				Machine	Operator	Temp/ Speed ºF/fpm (or %max)	Barrel/ Preheat ºF/ºF	Peel (ppi) IN/OUT					Shear (ppi)							
								1	2	3	4	5	1	2	3	4	5			
12	7/16/20	12:50	89	M46	DS	860/600		61	51	59			67	71				P	AA	TX/TX
								52	62	58										
13	7/17/20	8:45	75	X5	JL		300/500	70	64	66			70	71				P	AA	TX/TX
14	7/17/20	1:45	75	X5	JL		300/500	63	66	59			68	72				P	AA	TX/TX
15	7/17/20	1:51	75	X27	EM		350/500	61	59	63			72	71				P	AA	TX/TX
16	7/17/20	5:00	89	M48	DS	860/800		62	61	58			77	69				P	AA	SM/SM
								61	63	59										
17	7/17/20	5:10	89	M48	DS	860/700		59	62	58			80	75				P	AA	TX/TX
								60	68	62										
18	7/17/20	5:23	89	M48	JL	860/750		60	59	63			66	68				P	AA	SM/SM
								59	60	61										
19	7/17/20	5:20	89	M46	JL	860/700		59	69	63			69	71				P	AA	TX/TX
								60	62	59										
20	7/17/20	6:25	89	X27	EM		300/550	68	69	71			73	72				P	AA	TX/TX
21	7/17/20	6:29	89	X5	JL		350/300	59	61	61			69	71				P	AA	TX/TX
22	7/18/20	7:42	73	X27	OO		300/500	65	61	63			66	77				P	AA	TX/TX
23	7/18/20	1:30	91	X27	OO		300/500	64	65	65			70	74				P	AA	TX/TX

HALLATON
ENVIRONMENTAL LININGS

Panel Placement Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Project Start Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
40 mil

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
7/16/20	P1	7:22	SLOPE	0024	23	133	3059
7/16/20	P2	7:29	SLOPE	0024	23	128	2944
7/16/20	P3	7:37	SLOPE	0024	23	122	2806
7/16/20	P4	7:43	SLOPE	0024	23	110	2530
7/16/20	P5	7:50	SLOPE	0024	23	97	2231
7/16/20	P6	8:03	SLOPE	0024	23	88	2024
7/16/20	P7	8:25	SLOPE	0024	23	80	1840
7/16/20	P8	8:35	SLOPE	0024	23	70	1610
7/16/20	P9	8:40	SLOPE	0024	23	60	1380
7/16/20	P10	8:48	SLOPE	0024	23	48	1104
7/16/20	P11	9:00	SLOPE	0024	23	30	690
7/16/20	P12	9:20	SLOPE	0023	23	190	4370
7/16/20	P13	9:35	SLOPE	0023	23	175	4025
7/16/20	P14	9:46	SLOPE	0023	23	80	1840
7/16/20	P15	9:56	SLOPE	0004	23	75	1725
7/16/20	P16	12:20	SLOPE	0004	23	54	1242
7/16/20	P17	10:18	SLOPE	0004	23	91	2093
7/16/20	P18	10:30	SLOPE	0004	23	131	3013
7/16/20	P19	10:40	SLOPE	0004	23	116	2668
7/16/20	P20	10:51	SLOPE	0004	23	85	1955
7/16/20	P21	11:00	SLOPE	0004	23	52	1196
7/16/20	P22	11:11	SLOPE	0004	23	20	460
7/16/20	P23	12:56	SLOPE	0021	23	193	4439
7/16/20	P24	1:83	SLOPE	0021	23	183	4209
7/16/20	P25	1:16	SLOPE	0021	23	171	3933
7/16/20	P26	1:29	SLOPE	0021	23	160	3680
7/16/20	P27	1:47	SLOPE	0027	23	152	3496
7/16/20	P28	2:02	SLOPE	0027	23	145	3335
7/16/20	P29	2:15	SLOPE	0027	23	137	3151
7/16/20	P30	3:10	SLOPE	0027	23	124	2852
7/16/20	P31	3:18	SLOPE	0027	23	106	2438
7/16/20	P32	3:46	SLOPE	0026	23	142	3266

HALLATON
ENVIRONMENTAL LININGS

Panel Placement Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Project Start Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
40 mil

Date Deployed	Panel No.	Time Deployed	Panel Location	Roll No.	Width (FT)	Length (FT)	Area (SQ FT)
7/16/20	P33	3:51	SLOPE	0026	23	126	2898
7/16/20	P34	3:57	SLOPE	0026	23	79	1817
7/16/20	P35	4:02	SLOPE	0026	23	60	1380
7/16/20	P36	4:06	SLOPE	0026	23	41	943
7/16/20	P37	4:10	SLOPE	0026	23	16	368
7/16/20	P38	4:16	SLOPE	0027	23	43	989
7/16/20	P39	4:20	SLOPE	0026	23	61	1403
7/16/20	P40	4:23	SLOPE	0026	23	34	782
7/16/20	P41	4:40	SLOPE	0026	23	37	851
7/16/20	P42	4:45	SLOPE	0026	9	18	162
7/16/20	P43	4:54	SLOPE	0026	23	90	2070
7/16/20	P44	5:06	SLOPE	0022	23	56	1288
7/16/20	P45	5:12	SLOPE	0022	23	137	3151
7/16/20	P46	5:25	SLOPE	0022	23	129	2967
7/16/20	P47	5:36	SLOPE	0022	23	122	2806
7/16/20	P48	5:44	SLOPE	0022	23	112	2576
7/16/20	P49	5:50	SLOPE	0022	23	105	2415
7/16/20	P50	6:10	SLOPE	0025	23	94	2162
7/16/20	P51	4:53	SLOPE	0025	23	85	1955
7/16/20	P52	4:56	SLOPE	0025	23	75	1725
7/16/20	P53	4:59	SLOPE	0025	23	71	1633
7/16/20	P54	5:28	SLOPE	0025	23	63	1449
7/16/20	P55	5:10	SLOPE	0022	23	48	1104
7/16/20	P56	5:14	SLOPE	0025	23	30	690
7/16/20	P57	5:19	SLOPE	0025	15	18	270
7/16/20	P58	5:30	SLOPE	0025	23	129	2967
7/16/20	P59	5:42	SLOPE	0025	23	122	2806
7/16/20	P60	6:10	SLOPE	0037	23	34	782
7/16/20	P61	6:15	SLOPE	0037	23	67	1541
7/16/20	P62	9:19	SLOPE	0025	23	23	529
7/16/20	P63	6:25	SLOPE	0037	23	35	805
7/16/20	P64	6:37	SLOPE	0037	23	65	1495
7/16/20	P65	6:42	SLOPE	0037	23	11	253
7/16/20	P66	7:15	SLOPE	0025	13	17	221

HALLATON
ENVIRONMENTAL LININGS

Repair Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
Thickness: 40 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test	
		Seam #						P / F	Date
1	AT	P-6/16/18/CAP	7/17/20	9:42	2x3	X5	JL	PASS	7/17/20
2	AT	P-6/7/18	7/17/20	10:34	2x2	X5	JL	PASS	7/17/20
3	BO	P-16/18/CAP	7/17/20	10:28	2x2	X5	JL	PASS	7/17/20
4	AT	P-16/17/18/CAP	7/17/20	3:15	2x4	X5	JL	PASS	7/17/20
5	BO	P-14/16 12'>BOSS	7/17/20	10:07	2x3	X5	JL	PASS	7/17/20
6	AT	P-14/15/16/17	7/17/20	10:00	2x4	X5	JL	PASS	7/17/20
7	AT	P-13/14/15	7/17/20	10:46	2x2	X5	JL	PASS	7/18/20
8	AT	P-5/6/16	7/17/20	9:15	2x4	X5	JL	PASS	7/18/20
9	AT	P-4/5/14/16	7/17/20	10:41	2x2	X5	JL	PASS	7/18/20
10	AT	P-3/4/14	7/17/20	11:07	2x2	X5	JL	PASS	7/18/20
11	AT	P-3/13/14	7/17/20	11:10	2x2	X5	JL	PASS	7/18/20
12	MD	P-13 4'>P-3	7/17/20	11:22	2x2	X5	JL	PASS	7/18/20
13	AT	P-2/3/13	7/17/20	11:20	2x2	X5	JL	PASS	7/18/20
14	AT	P-2/12/13	7/17/20	11:30	2x2	X5	JL	PASS	7/18/20
15	AT	P-1/2/12	7/17/20	12:04	2x2	X5	JL	PASS	7/18/20
16	CAP	P-1/12/23/30/32/43	7/17/20	11:58	3x14	X5	JL	PASS	7/18/20
17	AT	P-23/24/43/45	7/17/20	12:12	2x3	X5	JL	PASS	7/18/20
18	AT	P-24/25/45/46	7/17/20	12:23	2x5	X5	JL	PASS	7/18/20
19	AT	P-25/26/46	7/17/20	1:25	2x2	X5	JL	PASS	7/18/20
20	AT	P-26/46/47	7/17/20	1:32	2x2	X5	JL	PASS	7/18/20
21	AT	P-26/27/47	7/17/20	1:41	2x2	X5	JL	PASS	7/18/20
22	AT	P-27/47/48	7/17/20	1:47	2x2	X5	JL	PASS	7/18/20
23	AT	P-27/28/48	7/17/20	1:55	2x2	X5	JL	PASS	7/18/20
24	AT	P-28/48/49	7/17/20	2:00	2x2	X5	JL	PASS	7/18/20
25	AT	P-28/29/49	7/17/20	2:03	2x3	X5	JL	PASS	7/18/20
26	AT	P-7/18/19	7/17/20	3:04	2x2	X5	JL	PASS	7/18/20
27	AT	P-7/8/19	7/17/20	3:08	2x2	X5	JL	PASS	7/18/20
28	AT	P-8/9/19/20	7/17/20	3:21	2x2	X5	JL	PASS	7/18/20
29	CAP	9/10/20/21	7/17/20	3:54	2x21	X5	JL	PASS	7/18/20
30	AT	P-30/31/32/33	7/17/20	4:26	2x2	X5	JL	PASS	7/18/20
31	AT	P-31/33/34/40	7/17/20	4:32	2x3	X5	JL	PASS	7/18/20
32	AT	P-33/34/35	7/17/20	4:42	2x8	X5	JL	PASS	7/18/20

HALLATON
ENVIRONMENTAL LININGS

Repair Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
Thickness: 40 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test	
		Seam #						P / F	Date
33	AT	P-33/35/36	7/17/20	4:50	2x2	X5	JL	PASS	7/18/20
34	BO	P-44/45 13'>BOSS	7/17/20	5:04	2x2	X5	JL	PASS	7/18/20
35	BO	P-44/45/TOP TRENCH	7/17/20	5:10	2x2	X5	JL	PASS	7/18/20
36	AT	P-10/21 10'>BOOT	7/17/20	5:00	2x2	X27	EM	PASS	7/18/20
37	BT	P-10/11/21/22	7/17/20	5:35	16x16	X27	EM	PASS	7/18/20
38	BO	P-11/22/TOP TRENCH	7/17/20	5:50	2x4	X27	EM	PASS	7/18/20
39	BO	P-21/22 2'>TRENCH	7/17/20	5:55	2x2	X27	EM	PASS	7/18/20
40	BO	P-18/19 3'>TRENCH	7/17/20	5:59	2x2	X27	EM	PASS	7/18/20
41	BO	P-17/18 2'>TOP TRENCH	7/17/20	6:16	2x2	X27	EM	PASS	7/18/20
42	BO	P-15/17 1'>TOP TRENCH	7/17/20	6:23	2x2	X27	EM	PASS	7/18/20
43	BO	P-15/17 48'>BOSS	7/17/20	6:30	2x3	X27	EM	PASS	7/18/20
44	BO	P-8/9 2'>TOP TRENCH	7/17/20	6:46	2x2	X27	EM	PASS	7/18/20
45	BO	P-2/3 2'>TRENCH	7/17/20	7:09	2x2	X27	EM	PASS	7/18/20
46	BO	P-1/2 2'>TRENCH	7/17/20	7:15	2x2	X27	EM	PASS	7/18/20
47	BO	P-1/30 2'>TRENCH	7/17/20	7:50	2x2	X27	EM	PASS	7/18/20
48	BO	P-30/31 2'>TRENCH	7/17/20	7:47	2x2	X27	EM	PASS	7/18/20
49	BO	P-31/42 2'>TOP TRENCH	7/17/20	8:08	2x2	X27	EM	PASS	7/18/20
50	AT	P-29/49/50/CAP	7/17/20	8:13	2x2	X5	JL	PASS	7/18/20
51	AT	P-29/50/58/CAP	7/17/20	8:09	2x2	X5	JL	PASS	7/18/20
52	AT	P-50/51/58	7/17/20	8:04	2x2	X5	JL	PASS	7/18/20
53	AT	P-51/58/59	7/17/20	7:57	2x2	X5	JL	PASS	7/18/20
54	AT	P-51/52/59	7/17/20	8:00	2x2	X5	JL	PASS	7/18/20
55	AT	P-52/59/61	7/17/20	8:18	2x2	X5	JL	PASS	7/18/20
56	BO	P-1/30 55'<EOS	7/17/20	4:14	2x2	X5	JL	PASS	7/18/20
57	BO	P-1/30 66'<EOS	7/17/20	4:18	2x2	X5	JL	PASS	7/18/20
58	AT	P-31/39/40	7/18/20	7:57	2x2	X27	OO	PASS	7/18/20
59	AT	P-34/38/40	7/18/20	8:07	2x2	X27	OO	PASS	7/18/20
60	AT	P-38/39/50	7/18/20	5:03	2x2	X27	OO	PASS	7/18/20
61	AT	P-31/39/41	7/18/20	7:50	2x2	X27	OO	PASS	7/18/20
62	AT	P-31/41/42	7/18/20	8:12	2x2	X27	OO	PASS	7/18/20
63	BO	P-39/41 2'>TOP TRENCH	7/18/20	8:36	2x2	X27	OO	PASS	7/18/20
64	BO	P-38/39 2'>TOP TRENCH	7/18/20	8:37	2x2	X27	OO	PASS	7/18/20

HALLATON
ENVIRONMENTAL LININGS

Repair Log

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Date: 7/16/20
Project Location: Winfield, WV

Material: LLPDE
Thickness: 40 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test	
		Seam #						P / F	Date
65	BO	P-34/38/TOP TRENCH	7/18/20	8:44	2x5	X27	OO	PASS	7/18/20
66	CAP	P-33/36/37	7/18/20	9:24	2x16	X27	OO	PASS	7/18/20
67	BO	P-36/37/TOP TRENCH	7/18/20	9:04	2x2	X27	OO	PASS	7/18/20
68	BO	P-32/44 2'>TOP TRENCH	7/18/20	9:12	2x2	X27	OO	PASS	7/18/20
69	AT	P-32/43/44	7/18/20	9:29	2x2	X27	OO	PASS	7/18/20
70	AT	P-43/44/45	7/18/20	9:36	2x2	X27	OO	PASS	7/18/20
71	BO	P-44/45 50'>BOSS	7/18/20	9:30	2x2	X27	OO	PASS	7/18/20
72	BO	P-46/47 39'>BOSS	7/18/20	9:48	2x2	X27	OO	PASS	7/18/20
73	BO	P-45/46 3'>BOSS	7/17/20	2:50	2X2	X5	JL	PASS	7/18/20
74	BO	P-46/47 2'>TOP TRENCH	7/17/20	2:42	2x5	X5	JL	PASS	7/18/20
75	BO	P-49/50 2'>TOP TRENCH	7/17/20	2:30	2x2	X5	JL	PASS	7/18/20
76	BO	P-51/52 7'<TOP TRENCH	7/18/20	1:00	2x2	X27	OO	PASS	7/18/20
77	BO	P-72/73 1'>TOP TRENCH	7/18/20	10:10	2x5	X27	OO	PASS	7/18/20
78	AT	P-52/63/61	7/18/20	10:58	2x3	X27	OO	PASS	7/18/20
79	BO	P-59/61 72'>BOSS	7/18/20	11:01	2x2	X27	OO	PASS	7/18/20
80	BT	P-59/61 62'>BOSS	7/18/20	12:10	8x8	X27	OO	PASS	7/18/20
81	AT	P-59/60/61	7/18/20	1:38	2x2	X27	OO	PASS	7/18/20
82	AT	P-60/62/63/65	7/18/20	1:46	2x3	X27	OO	PASS	7/18/20
83	AT	P-60/61/63	7/18/20	1:42	2x2	X27	OO	PASS	7/18/20
84	AT	P-61/64/65	7/18/20	1:35	2x2	X27	OO	PASS	7/18/20
85	AT	P-63/64/65	7/18/20	1:51	2x2	X27	OO	PASS	7/18/20
86	AT	P-53/54/61	7/18/20	11:10	2x2	X27	OO	PASS	7/18/20
87	AT	P-54/61/64	7/18/20	11:14	2x2	X27	OO	PASS	7/18/20
88	AT	P-54/55/64	7/18/20	12:18	2x2	X27	OO	PASS	7/18/20
89	AT	P-54/55/56	7/18/20	12:23	2x2	X27	OO	PASS	7/18/20
90	AT	P-54/56 11'>BOSS	7/18/20	1:56	2x2	X27	OO	PASS	7/18/20
91	BO	P-54/56/57	7/18/20	2:00	2x2	X27	OO	PASS	7/18/20
92	BO	P-55/56 9'>TOP TRENCH	7/18/20	2:04	2x2	X27	OO	PASS	7/18/20
93	CAP	P-55/66/TOP TRENCH	7/18/20	2:24	2x18	X27	OO	PASS	7/18/20
94	BO	P-58/59 9'>TOP TRENCH	7/18/20	2:50	2x9	X27	OO	PASS	7/18/20
95	BO	P-27/28 1'>TOP TRENCH	7/18/20	2:54	2x2	X27	OO	PASS	7/18/20
96	BO	P-12/13 1'>TOP TRENCH	7/18/20	3:20	2x6	X27	OO	PASS	7/18/20

ATTACHMENT 6

PLATEAU POND LINING:

CERTIFICATE OF SUBGRADE ACCEPTANCE

HALLATON
ENVIRONMENTAL LININGS
1206 SPARKS ROAD - SPARKS, MD 21152
(410) 583-7700 - Fax (410) 583-7720

Certificate of Subgrade Acceptance

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Project Start Date: 7/16/20
Project Location: Winfield, WV

I, the undersigned, duly authorized representative of the installer, do hereby accept the soil subgrade surface conditions. I do not accept any responsibility for the conditions or character of the subsurface soil, or any effect the subsurface soil might have on the liner system.

Area to be Accepted:

Date Installed: 7/16/2020
Panels Installed: P-1 to P-50
Description of Area: Liner installed- 112632 SQ FT

Hallaton Signature — Title

Antonio Arvizu

QA/QC Signature — Title

GC/Other — Title

Area to be Accepted:

HALLATON
ENVIRONMENTAL LININGS
1206 SPARKS ROAD - SPARKS, MD 21152
(410) 583-7700 - Fax (410) 583-7720

Certificate of Subgrade Acceptance

Project No.: 2077-1382
Project Name: AEP Amos Plateau Power Plant Pond
Project Start Date: 7/16/20
Project Location: Winfield, WV

I, the undersigned, duly authorized representative of the installer, do hereby accept the soil subgrade surface conditions. I do not accept any responsibility for the conditions or character of the subsurface soil, or any effect the subsurface soil might have on the liner system.

Date Installed: 7/17/2020
Panels Installed: P-51 to P-66
Description of Area: Liner installed- 20225 SQ FT

Hallaton Signature	Title
Antonio Arvizu	
QA/QC Signature	Title
GC/Other	Title

ATTACHMENT 7

SEQUENCE 4 BUBBLE REPAIR AND LINER PATCHING – MEMO AND REPORTS

GAI Consultants, Inc.
500 Lee Street East, Suite 700
Charleston, WV 25301
(304) 926-8100
(304) 926-8180 (FAX)

QAQC.1

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
07/30/2020	C130109.10	2020-013

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:45 a.m. DEPART 4:25 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	Hallaton Environmental Linings

WEATHER

AM: 70°F, Sunny PM: 75°F, Thunderstorms

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
	2	3	8		

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Hallaton extrusion welded the patches in the forebay area. After the repairs were made the were vacuum box tested.
- Hallaton cut the "bubble" areas open in the bowl area of Sequence 4, drained the water, leistered patches to cut areas, and air tested the patches.
- Hallaton placed the steel bands around the two inlet pipes in the forebay area. A picture of this will be in the next work day's report.
- Jergens placed geotextile and quickcrete over the repairs made in the forebay floor.
- Jergens placed the 14 inches of AASHTO No.1 stone on the pond access road

CQA REPRESENTATIVE:

Joe Rose.

gai consultants
transforming ideas into reality

GAI Consultants, Inc.
500 Lee Street East, Suite 700
Charleston, WV 25301
(304) 926-8100
(304) 926-8180 (FAX)

DAILY PROGRESS REPORT

PHOTOS

Plateau Pond: Placing No.1 Stone on the Pond Access Road in the Forebay Area. 20200730

Plateau Pond: Repair made on one of the Drainage Holes in the Forebay Area. 20200730

Sequence 4 Bowl Area: One of the "Bubbles" Cut and Draining. 20200730

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(304) 926-8180 (FAX)

DAILY PROGRESS REPORT

Sequence 4 Bowl Area: Liner Patched.
20200730

Sequence 4 Bowl Area: Patch being Air lLnced
20200730

Plateau Pond: Pumping Water into the Forebay.
20200730

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Charleston, WV 25301
(304) 926-8100
(304) 926-8180 (FAX)

DAILY PROGRESS REPORT

DATE:	PROJECT NO.:	REPORT NO.:
08/03/2020	C130109.10	2020-014

PROJECT:
AEP Amos LF Beaver Plateau Pond Lining

LOCATION:	CQA TIME ON-SITE:
AEP Amos FGD Landfill	ARRIVE: 6:55 a.m. DEPART 5:05 p.m.
CONTRACTOR(S):	SUBCONTRACTOR(S)
RBJ	Hallaton Environmental Linings

WEATHER

AM: 70°F, Sunny PM: 84°F, Cloudy

MANPOWER

PRIME	SUPER'S	FOREMAN	OPERATORS	LABORERS	OTHER:
		3	2		Ed Sobonya

OTHER CONTRACTORS:

THE FOLLOWING WAS NOTED:

- Jergens Hauled No.2 Stone to make a temporary access road along the bench around the main pond area. This will be used to access areas above and below the bench in order to place the 6-inch thick protective layer.
- Jergens Hauled the No.1 stone to begin rebuilding of the berm between the main pond and the forebay.

- Two of the Three bubble areas on Sequence 4 have accrued a substantial amount of water. The Third area has a small amount that could be contributed to the remnants between the subgrade and liner after the repair.

CQA REPRESENTATIVE:

Joe Rose.

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Charleston, WV 25301
(304) 926-8100
(304) 926-8180 (FAX)

DAILY PROGRESS REPORT

PHOTOS

Sequence 4 Bowl Area: One of the Bubble Areas that Accrued Water. 20200803

Plateau Pond: Temporary Access Road along the Bench of the Main Pond Area. 20200803

Plateau Pond: Bands placed on the inlet pipes. 20200803

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Bubble Repair and Liner Patching Memo

Hallatan had two areas opened through the GDN and PCV Liner for water sampling. The patching consisted of cutting on site PCV Material 6-inches greater than the sampled area openings. Cleaned the cut areas of the Existing PCV, then glued the patches in place. The GDN cut Areas were put back together using Zip-Ties.

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Bubble Repair and Liner Patching Memo

PHOTOS

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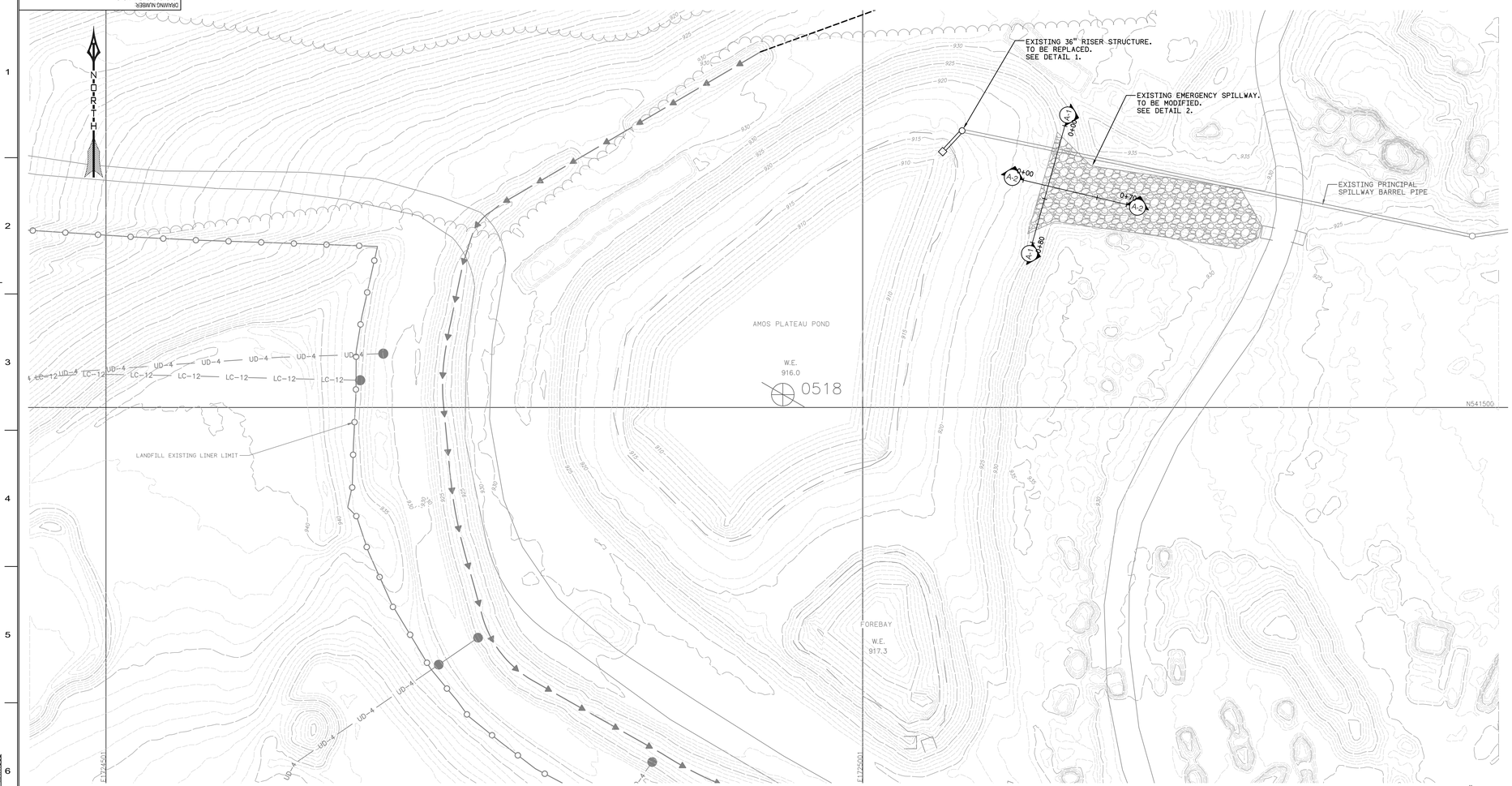
(304) 926-8100
(304) 926-8180 (FAX)

Bubble Repair and Liner Patching Memo

ATTACHMENT 8

DESIGN DRAWINGS



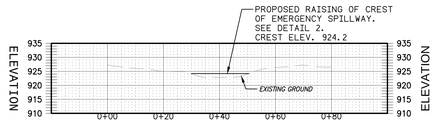
PLAN VIEW

SCALE: 1" = 30'

30 0 30 60

LEGEND

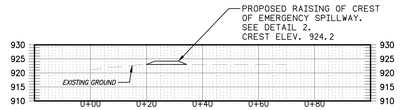
- 910 — EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING ROCK LINING



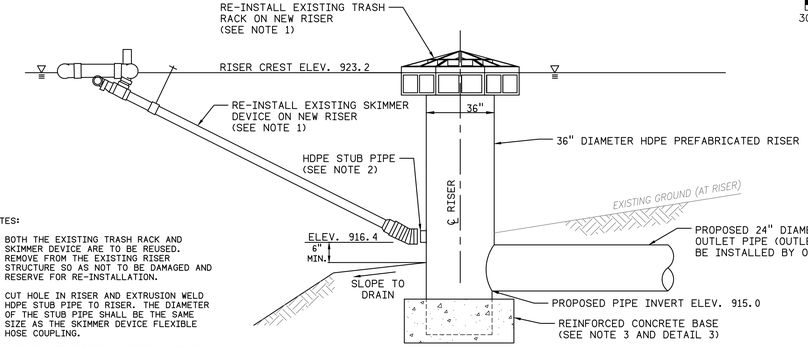
SECTION A-1

SCALE: 1" = 20'

20 0 20 40



SECTION A-2

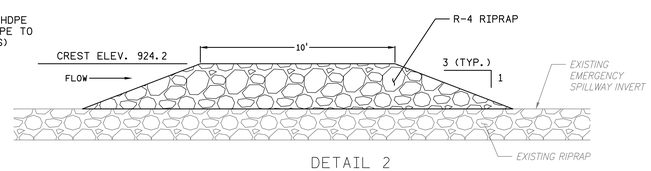


NOTES:

1. BOTH THE EXISTING TRASH RACK AND SKIMMER DEVICE ARE TO BE REUSED. REMOVE FROM THE EXISTING RISER STRUCTURE SO AS NOT TO BE DAMAGED AND RESERVE FOR RE-INSTALLATION.
2. CUT HOLE IN RISER AND EXTRUSION WELD HDPE STUB PIPE TO RISER. THE DIAMETER OF THE STUB PIPE SHALL BE THE SAME SIZE AS THE SKIMMER DEVICE FLEXIBLE HOSE COUPLING.
3. THE NEW REINFORCED CONCRETE BASE IS TO BE 5.5-FEET BY 5.5-FEET AND 2-FEET THICK.IT IS TO BE ATTACHED TO THE RISER AS SHOWN, OR ATTACHED BY OTHER METHODS APPROVED BY THE OWNER'S ENGINEER. EXISTING PAD TO BE REMOVED AND DISPOSED.

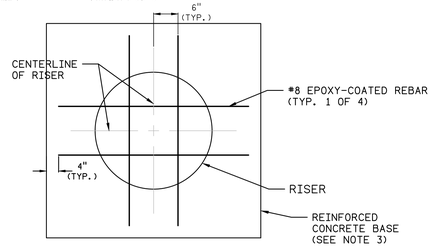
DETAIL 1
PROPOSED REPLACEMENT RISER STRUCTURE

NOT TO SCALE

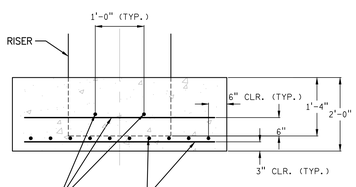


DETAIL 2
PROPOSED MODIFICATION TO EXISTING EMERGENCY SPILLWAY

NOT TO SCALE



PLAN VIEW



RISER TO CONCRETE BASE: MINIMUM 2 #8 EPOXY-COATED RE-BARS PLACED IN EACH DIRECTION AT RIGHT ANGLES AND PROJECTING THROUGH SIDES OF RISER. RE-BARS TO PROJECT A MINIMUM OF 8" BEYOND THE OUTSIDE OF THE RISER.

CONCRETE BASE REINFORCING: #4 EPOXY-COATED BARS @ 6" C/C SPACING BOTH WAYS

DETAIL 3
REINFORCED CONCRETE BASE

NOT TO SCALE

DRAWING REFERENCES:

- TOPOGRAPHY OBTAINED VIA E-MAIL FROM AEP DRAWING 'AMOS PLATEAU POND AS-BUILT' DATED JUNE 11, 2019.

DATE	NO.	DESCRIPTION	APPD.
02/19/20	0	ISSUED FOR CONSTRUCTION	MRL

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APPALACHIAN POWER CO.

JOHN E. AMOS PLANT

WINFIELD WEST VIRGINIA

AMOS PLATEAU POND PROPOSED SPILLWAY MODIFICATIONS

UNIT:	DRAWING NUMBER:	REV:
13	30203SH23	0

SCALE:

DR: DOYLE

CH: FRECH

SUP:

ENG: FRECH

DATE: 7-30-2019

APPROVED BY

gai consultants

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AEP AMERICAN ELECTRIC POWER

AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

CAD FILE PATH: Z:\ENERGY\2013\G13010910 - AEP SEQ 4 2018-2020 AMOS\CAD\PRODUCTION DWGS\30203SH23.DWG, PLOTTED: 02/19/2020 BY: ED MAYHOOD

PLOT DATE: 19-FEB-2020
PLOT TIME: 1:58PM
BY: ED MAYHOOD

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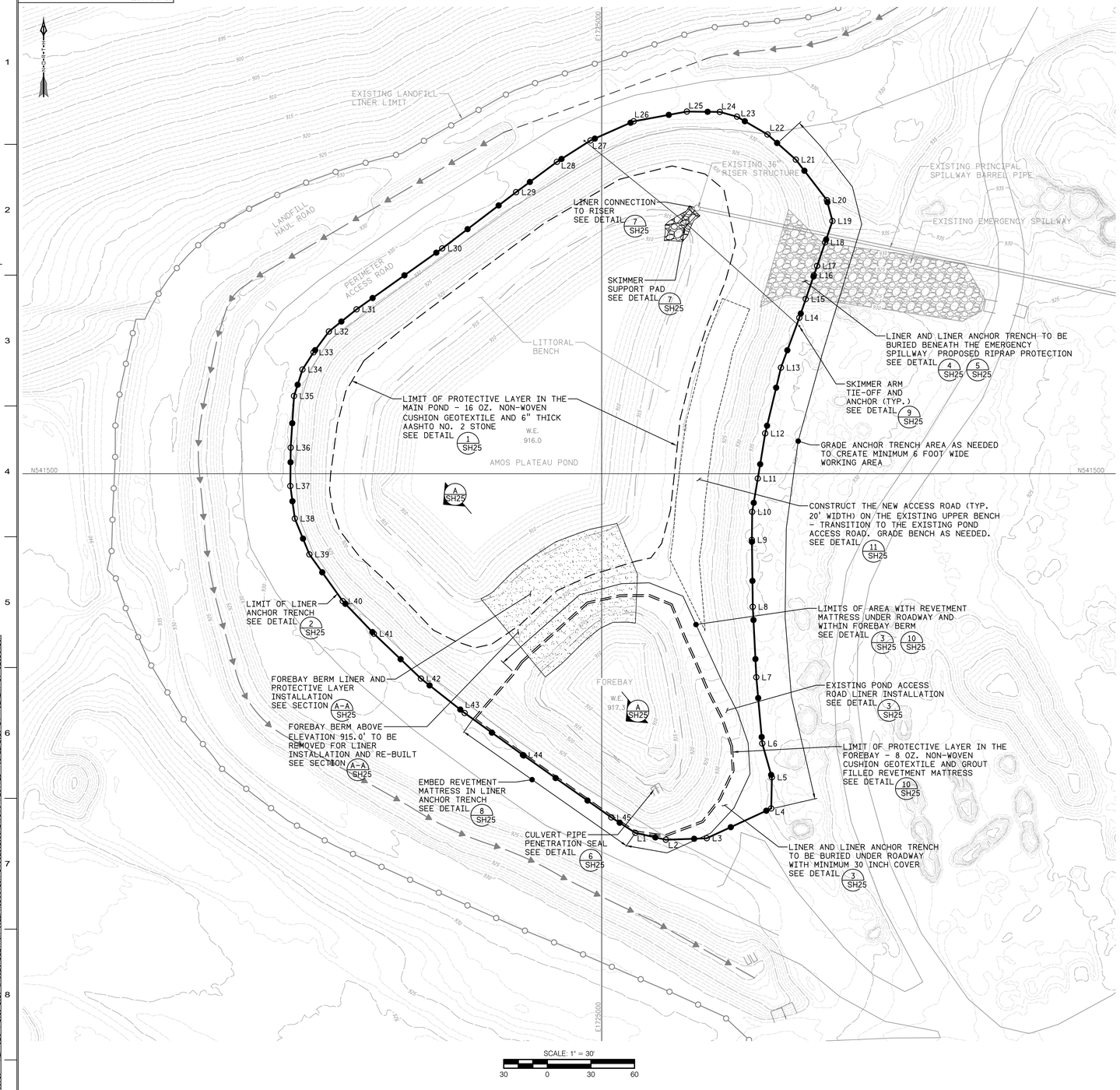

SCALE: 1" = 30'

LEGEND

- EXISTING INDEX CONTOUR (800)
- EXISTING INTERMEDIATE CONTOUR
- WATER'S EDGE
- EXISTING EDGE OF LANDFILL LINER
- PROPOSED EDGE OF POND LINER SYSTEM WITH CONSTRUCTION POINT (L20)
- PROPOSED LIMIT OF GROUT-FILLED REVETMENT MATTRESS (FILTERPOINT)
- PROPOSED LIMIT OF AASHTO NO. 2 STONE PROTECTIVE LAYER
- PROPOSED LIMIT OF NEW ACCESS ROAD BENCH

POINT TABLE			
POINT	NORTHING	EASTING	ELEVATION
L1	541252.93	1725023.21	927.50'
L2	541248.15	1725044.20	927.76'
L3	541249.21	1725072.32	928.33'
L4	541269.73	1725116.66	935.69'
L5	541291.11	1725117.11	934.71'
L6	541314.41	1725110.52	933.51'
L7	541359.97	1725106.45	933.54'
L8	541408.47	1725104.00	935.00'
L9	541454.49	1725103.39	935.00'
L10	541473.76	1725103.60	935.04'
L11	541496.70	1725107.45	936.00'
L12	541527.75	1725112.56	935.42'
L13	541573.02	1725123.37	936.00'
L14	541607.34	1725136.04	934.73'
L15	541620.16	1725140.44	930.00'
L16	541636.60	1725146.07	922.70'
L17	541642.94	1725148.25	922.70'
L18	541659.17	1725153.81	930.06'
L19	541673.89	1725158.86	936.19'
L20	541688.30	1725154.97	935.78'
L21	541716.17	1725133.62	931.04'
L22	541733.43	1725114.14	928.60'
L23	541745.71	1725093.12	928.84'
L24	541748.96	1725081.27	929.50'
L25	541749.22	1725058.66	929.50'
L26	541742.50	1725022.07	929.49'
L27	541729.29	1724992.28	929.50'
L28	541714.60	1724969.22	929.50'
L29	541693.76	1724941.10	928.68'
L30	541655.05	1724890.26	927.50'
L31	541613.09	1724831.33	927.50'
L32	541597.88	1724812.26	927.50'
L33	541583.55	1724801.70	927.50'
L34	541571.69	1724794.08	927.99'
L35	541553.49	1724788.27	927.68'
L36	541517.97	1724785.96	927.50'
L37	541491.56	1724785.70	927.06'
L38	541469.16	1724788.82	926.63'
L39	541444.49	1724798.87	926.63'
L40	541412.37	1724821.83	927.45'
L41	541389.92	1724843.28	927.50'
L42	541359.07	1724875.60	927.50'
L43	541335.38	1724905.72	927.50'
L44	541306.52	1724945.75	927.20'
L45	541263.58	1725006.66	927.43'

• ELEVATION IS THE GEOMEMBRANE ELEVATION AT THE TOP OF THE ANCHOR TRENCH - SEE DETAIL 2 ON SH25 FOR THE LOCATION OF THE CONSTRUCTION POINT.

SUGGESTED CONSTRUCTION SEQUENCE:

1. CLEAN OUT THE POND TO REMOVE ACCUMULATED SEDIMENTS, UNSUITABLE MATERIALS, ETC.
2. STRIP VEGETATION FROM THE BOTTOM AND THE INTERIOR SLOPES OF THE POND, STOCKPILE AT A LOCATION DESIGNATED BY THE OWNER.
3. GRADE IN THE NEW ACCESS ROAD BENCH - TOP OF ROADWAY FINISH ELEVATION 923±, 2% CROSS SLOPE TO DRAIN TO POND.
4. REMOVE THE RIPRAP FROM THE FOREBAY, STOCKPILE AT A LOCATION DESIGNATED BY THE OWNER.
5. REMOVE THE FOREBAY BERM ABOVE ELEVATION 915.0', STOCKPILE AT A LOCATION DESIGNATED BY THE OWNER. IF AGGREGATE, THE MATERIAL WILL BE USED TO RE-BUILD THE FOREBAY BERM.
6. INSPECT THE SUBGRADE FOR LARGE (GREATER THAN 6" IN ANY DIMENSION) OR SHARP ROCKS, PROTRUSIONS AND INDENTATIONS GREATER THAN 1", UNSUITABLE MATERIALS, EXPOSED BEDROCK, AND SOFT FOUNDATION CONDITIONS. REMOVE AND/OR OVEREXCAVATE AND REPLACE WITH STRUCTURAL FILL AS NEEDED.
7. INSTALL THE BOTTOM CUSHION GEOTEXTILE FOR THE ENTIRE AREA TO BE LINED WITH THE GEOMEMBRANE. CONSTRUCT THE ANCHOR TRENCH ALONG THE PERIMETER OF THE PROPOSED POND LINING.
8. INSTALL THE GEOMEMBRANE AND COMPLETE THE INSTALLATION IN THE ANCHOR TRENCH. INSTALL PIPE BOOTS ON THE INLET CULVERTS. EXTRUSION WELD THE GEOMEMBRANE TO THE NEW RISER.
9. INSTALL THE INDICATED WEIGHT UPPER CUSHION GEOTEXTILE FOR THE ENTIRE AREA TO RECEIVE THE PROTECTION LAYER (GROUT-FILLED REVETMENT MATTRESS WITH 8 OZ NON-WOVEN GEOTEXTILE OR 6" THICK LAYER OF AASHTO NO. 2 WITH 16 OZ NON-WOVEN GEOTEXTILE).
10. INSTALL THE PROTECTIVE LAYER FOR THE GEOMEMBRANE. TERMINATE THE AASHTO NO. 2 STONE LAYER IN THE MAIN POND ON THE EXISTING LITTORAL BENCH. TERMINATE THE GROUT FILLED MATTRESS WITHIN THE FOREBAY IN THE GEOMEMBRANE ANCHOR TRENCH, AS RUNOUT BENEATH THE POND ACCESS ROAD, OR AS RUNOUT WITHIN THE FOREBAY BERM - AS INDICATED ON DRAWINGS 13-30203SH24 AND 13-30203SH25.
11. REBUILD THE FOREBAY BERM ABOVE ELEVATION 915.0'. RECONSTRUCT THE LITTORAL BENCH ON THE DOWNSTREAM SLOPE OF THE FOREBAY BERM. CONSTRUCT THE ACCESS ROAD BENCH ON THE EXISTING UPPER BENCH ON THE MAIN POND'S EAST SIDE, AND TIE INTO THE EXISTING POND ACCESS ROAD. USE ORIGINAL MATERIAL IF AGGREGATE, ELSE USE CLASS 1 AGGREGATE. PLACE THE RIPRAP ON THE FOREBAY INTERIOR SLOPES.
12. INSTALL THE SKIMMER SUPPORT PAD WITH SKIMMER ARM, TIE-OFFS, AND ANCHORS (2). ROPE TIE-OFFS ARE TO ALLOW SUFFICIENT SLACK TO ALLOW FREE VERTICAL MOVEMENT OF THE SKIMMER ARM FROM ELEVATION 916 FEET TO 925 FEET. SUPPORT PAD TOP SURFACE TO ACCOMMODATE SIDE TO SIDE RANGE OF THE SKIMMER ORIFICE.

DRAWING REFERENCES:

- TOPOGRAPHY OBTAINED VIA E-MAIL FROM AEP DRAWING 'AMOS PLATEAU POND AS-BUILT' DATED JUNE 11, 2019.

DATE	NO.	DESCRIPTION	APPD.

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APPALACHIAN POWER CO.

JOHN E. AMOS PLANT

WINFIELD WEST VIRGINIA

AMOS PLATEAU POND

CONSTRUCTION POINTS PLAN AND TABLE

UNIT:	DRAWING NUMBER:	REV:
13	30203SH24	0

SCALE:

DR:	APPROVED BY:
CH:	
SUP:	
ENG:	
DATE:	

gai consultants

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AEP AMERICAN ELECTRIC POWER — AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215

PLOT DATE: 22-May-2020
PLOT TIME: 10:49:00
By: Jeremy Slocum

CROSS REFS:

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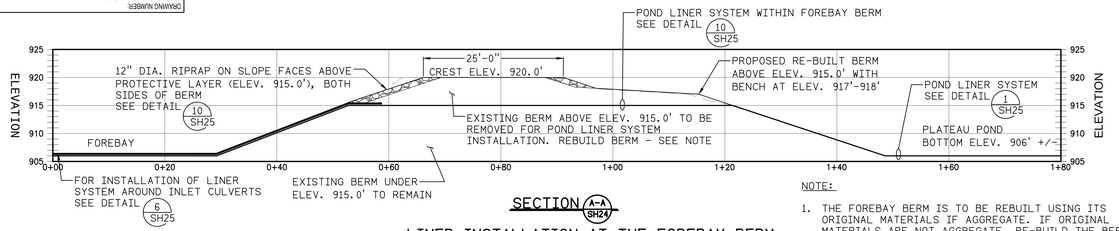


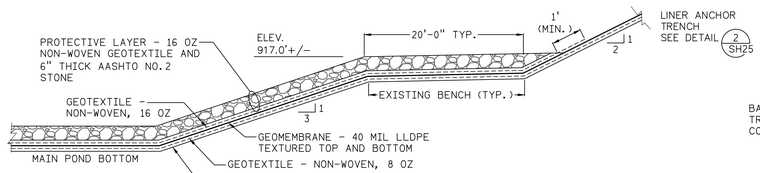
SECTION A-A SH24

LINER INSTALLATION AT THE FOREBAY BERM

SCALE: 1" = 10'

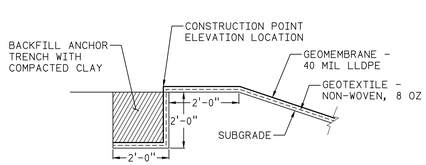
NOTE:

1. THE FOREBAY BERM IS TO BE REBUILT USING ITS ORIGINAL MATERIALS IF AGGREGATE. IF ORIGINAL MATERIALS ARE NOT AGGREGATE, RE-BUILD THE BERM WITH AASHTO NO.1 STONE. PROPOSED RE-BUILT BERM SLOPES ARE MINIMUM 3H:1V IN THE FOREBAY AND IN THE MAIN POND.



NOTES:

1. PROVIDE PIPE PENETRATION BOOTS FOR THE INLET CULVERTS, AND EXTRUSION WELD THE GEOMEMBRANE TO THE NEW RISER PER PE INDUSTRY STANDARDS.
2. INSTALL THE AASHTO NO.2 STONE WITH 16 OZ NON-WOVEN GEOTEXTILE PROTECTIVE LAYER ON THE MAIN POND BOTTOM AND EXTEND UP THE SIDES OF THE MAIN POND UP TO AND ONTO THE EXISTING BENCH AT ELEVATION 917'+/- AS SHOWN ON DRAWING 13-30203SH24.
3. INSTALL THE GROUT FILLED REVETMENT MATTRESS PROTECTIVE LAYER IN THE FOREBAY, EXTENDING UP THE POND SIDES TO THE ANCHOR TRENCH AND AS RUNOUT UNDERNEATH THE ROADWAYS, AS SHOWN ON DRAWINGS 13-30203SH24 AND SH25.
4. GROUT-FILLED REVETMENT MATTRESS LINER SHALL BE FP400 AS MANUFACTURED BY SYNTHETEX, OR ACCEPTED EQUAL. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
5. NO TRAFFIC IS ALLOWED ON THE INSTALLED GEOTEXTILES, GEOMEMBRANES, OR THE STONE PROTECTIVE LAYER.



DETAIL 2 SH24, SH25

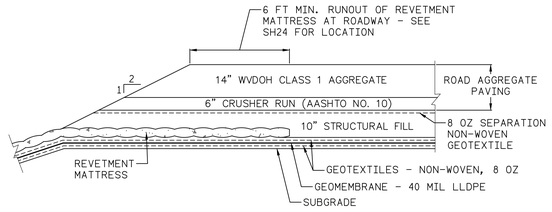
LINER ANCHOR TRENCH

N.T.S.

DETAIL 1 SH24, SH25

MAIN POND LINER SYSTEM

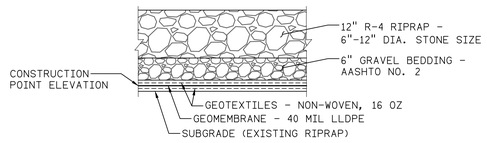
N.T.S.



DETAIL 3 SH24

POND LINER SYSTEM UNDER POND ACCESS ROAD IN FOREBAY

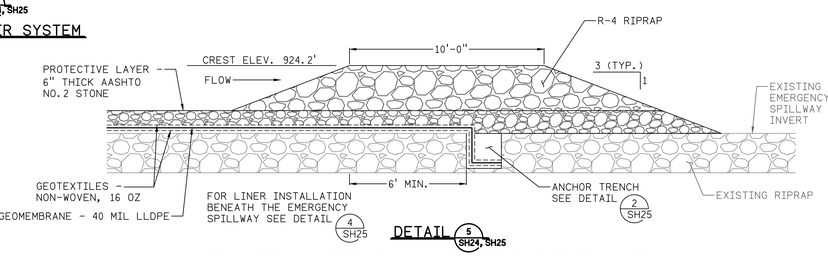
N.T.S.



DETAIL 4 SH24

POND LINER SYSTEM UNDER EMERGENCY SPILLWAY IN MAIN POND

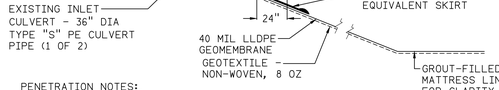
N.T.S.



DETAIL 5 SH24, SH25

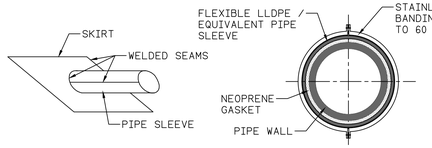
PROPOSED MODIFICATION TO EXISTING EMERGENCY SPILLWAY

N.T.S.



PENETRATION NOTES:

1. USE TWO STAINLESS STEEL BANDS PER PIPE PENETRATION SEAL. INSTALL BANDS AT RIDGES OF CULVERT PIPE CORRUGATIONS.
2. SKIRT IS TO EXTEND 36 INCHES BEYOND PIPE IN ALL DIRECTIONS.



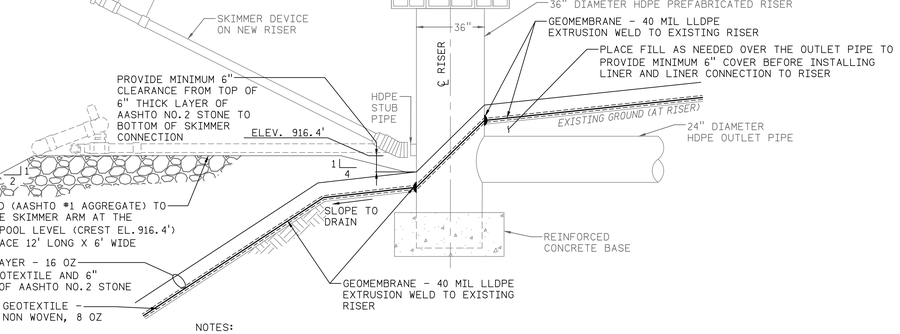
NOTES:

1. PIPE PENETRATION SEAL MATERIALS TO BE CONSISTENT WITH LINER AND PIPE
2. DETAIL IS APPLICABLE TO THE EXISTING DUAL INLET CULVERT PIPES TO THE AMOS PLATEAU POND.
3. INSTALL CULVERT PIPE EXTENSIONS OF SUFFICIENT LENGTH TO FACILITATE INSTALLATION OF THE PIPE PENETRATION SEAL. USE MANUFACTURED JOINTS WITH WATERPROOF GASKETS.

DETAIL 6 SH24, SH25

CULVERT PIPE PENETRATION SEAL

N.T.S.



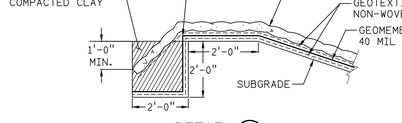
NOTES:

1. GRADE / PLACE FILL AROUND RISER AS NEEDED TO FACILITATE INSTALLATION OF THE LINER AND PROTECTIVE LAYER (16 OZ NON-WOVEN GEOTEXTILE AND AASHTO NO.2 STONE).
2. EXTRUSION WELD THE LLDPE GEOMEMBRANE TO THE INSTALLED HDPE RISER IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

DETAIL 7 SH24

LINER CONNECTION TO RISER

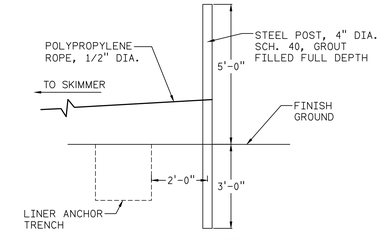
N.T.S.



DETAIL 8 SH24, SH25

LINER ANCHOR TRENCH WITH REVETMENT MATTRESS

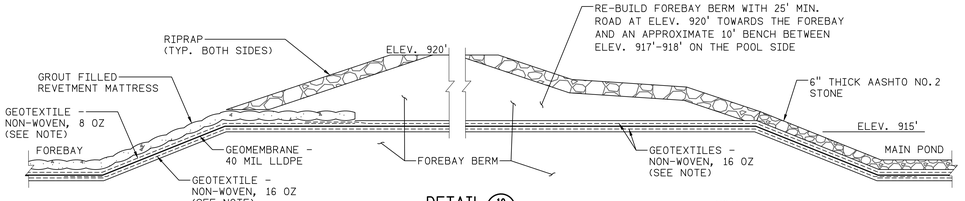
N.T.S.



DETAIL 9 SH24

SKIMMER ARM TIE-OFF AND ANCHOR

N.T.S.



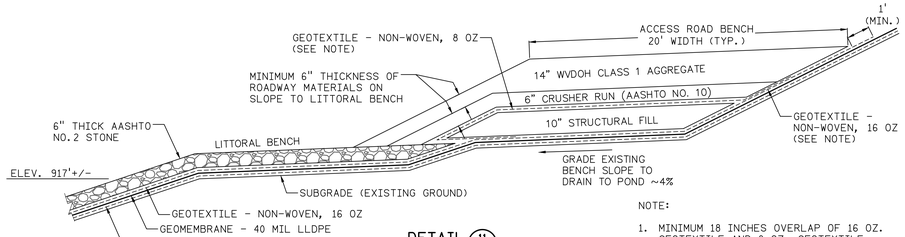
DETAIL 10 SH24, SH25

POND LINER SYSTEM WITHIN FOREBAY BERM

N.T.S.

NOTE:

1. MINIMUM 18 INCHES OVERLAP OF 16 OZ. GEOTEXTILE AND 8 OZ. GEOTEXTILE.



DETAIL 11 SH24

POND LINER SYSTEM UNDER NEW ACCESS ROAD BENCH - MAIN POND

N.T.S.

NOTE:

1. MINIMUM 18 INCHES OVERLAP OF 16 OZ. GEOTEXTILE AND 8 OZ. GEOTEXTILE.

DATE	NO.	DESCRIPTION	APPD.

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APPALACHIAN POWER CO.

JOHN E. AMOS PLANT

WINFIELD WEST VIRGINIA

AMOS PLATEAU POND

LINER CONSTRUCTION DETAILS

UNIT:	DRAWING NUMBER:	REV:
13	30203SH25	0

SCALE:
DR:
CH:
SUP:
ENG:
DATE:
APPROVED BY:

gai consultants

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AEP AMERICAN ELECTRIC POWER
AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

PLOT DATE: 23-Sep-2020
PLOTTED BY: Jeremy Dawson
PLOT SCALE: 1:1

CROSS REFS:

CAD FILE PATH: Z:\AENERGY\2013\AC13009.10 - AEP SEQ 4 2018-2020 QA\QC\CAD_TASK 002\PRODUCTION DWGS\30203SH25.DWG PLOTTED: 05/22/2020 BY: JEREMY D. SLOCOMICK

B-2 – 2022 Sequence 4 Hydrogeologic Investigation Report

FGD Landfill-Sequence 4 Hydrogeologic Investigation Report

Amos Plant
Winfield Road
Putnam County
Winfield, West Virginia

March 25, 2022

FGD Landfill-Sequence 4 Hydrogeologic Investigation Report

Amos Plant
Winfield Road
Putnam County
Winfield, West Virginia

March 25, 2022

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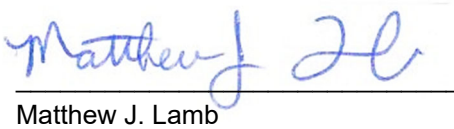
Principal Geologist



Matthew J. Lamb
Project Manager

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Principal Engineer

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Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
AEP	American Electric Power
amsl	above mean sea level
ASTM	ASTM International
bgs	below ground surface
CCR	Coal Combustion Residual
CSM	conceptual site model
DO	dissolved oxygen
EM	electromagnetic
FGD	flue gas desulfurization
ft	foot/feet
ft^2	square foot/feet
gpm	gallon per minute
mL/min	milliliters per minute
MMA	Marshall Miller & Associates
ORP	oxidation-reduction potential
PVC	polyvinyl chloride
RQD	rock quality designation
SRF	stress relief fracturing
USGS	U.S. Geological Survey
WVDEP	West Virginia Department of Environmental Protection

1 Introduction

American Electric Power (AEP) is constructing additional cells within the north valley of the flue gas desulfurization (FGD) landfill at the John E. Amos Plant in Winfield, West Virginia (the Site; **Figure 1-1**). Construction of Sequence 4 included groundwater underdrains, subbase, a compacted clay liner, a geomembrane liner, and a protective cover. After construction, water began to accumulate beneath the geomembrane in the eastern portion (eastern valley) of Sequence 4 and formed several bubbles beneath the liner that were exposed to the surface during erosion of the bottom ash protective cover material (**Figure 1-2**). The Plateau Stormwater Retention Pond (the pond), which is south of the eastern valley, was initially identified as a potential source for excessive recharge to groundwater, as it was unlined. AEP lined the pond in June 2020; however, after the pond lining the liner bubbles were drained in August 2020 and then re-formed in September 2020. AEP subsequently requested that Arcadis U.S., Inc. (Arcadis) prepare a hydrogeologic summary and data gap recommendations to further evaluate the source of the excessive water forming the liner bubbles.

1.1 Preliminary Hydrogeologic Summary and Data Gap Recommendations

The preliminary hydrogeologic summary and data gap recommendations for the Sequence 4 area using existing information were submitted in April 2021 and are summarized below.

The ridges and valleys at the Site consist of alternating beds of sandstone, siltstone, claystone, and shale of the Monongahela and Conemaugh Formations, with occasional thin limestone and coal beds. These alternating beds are nearly horizontal, dipping to the north-northwest at 20 feet (ft) per mile. Sedimentary bed thickness varies laterally, making stratigraphic correlation difficult (GAI 2006). Bedrock at the Site has been fractured through a process called stress relief fracturing (SRF), which is characteristic of Appalachian valleys (U.S. Geological Survey [USGS] 1981, 2001) and results in a network of nearly horizontal to nearly vertical fractures both along ridges, slopes, and underlying valley floors. Based on the past data and understanding of the geologic conditions, groundwater flow within the SRF system constitutes the uppermost aquifer. In general, groundwater from the ridges provided by recharge follows topography and flows vertically downwards to the valley floor. However, local groundwater flow may be further influenced by differences in the bedrock stratigraphic characteristics such as bed thickness, bed induration, and degree of fracturing along bedding planes based on variation of these characteristics.

Water has accumulated beneath the liner predominately on the eastern end of Sequence 4 and in areas to the northeast and southeast. The water accumulation can be potentially attributed to several factors. One factor could be localized preferential horizontal groundwater flow near Sequence 4, where groundwater within the SRF system encounters a less permeable zone at a depth that may deflect flow more laterally along bedding planes than vertically. These preferential horizontal flow paths are expressed as seeps along slopes. As-built drawings of Sequence 4 indicated several areas within the eastern portion that required installation of gravel blankets and underdrains to divert and mitigate flow along observed seepage faces.

To better understand the potential for preferential groundwater flow paths and/or local vertical flow impedance (aquitards) near Sequence 4, Arcadis reviewed the 0517 boring log. This boring was installed in May 2005 via wire-line rock coring techniques and is the only boring that provides detailed lithologic data in the immediate vicinity of the eastern portion of Sequence 4. Boring 0517 was subsequently converted to a piezometer and monitoring well MW-8 was installed adjacent to boring 0517 via air rotary techniques (**Figure 1-2**).

At boring 0517, bedrock was encountered approximately 10 ft below the soil overburden consisting of silty to sandy clay. The remaining 140 ft of the borehole is characterized by alternating shale, claystone, siltstone, and sandstone. Individual rock beds are often thinner (i.e., less than 5 ft thick), and multiple depth intervals are described as interbedded shale and sandstone. There are some relatively massive sandstone beds located at elevations of 909 to 918 ft above mean sea level (amsl), 889 to 898 ft amsl, and 814 to 834 ft amsl. In the context of the SRF system, these sandstone beds are more resistant to fracturing than the shale, claystone, and siltstone. Low to moderate angled stained fractures were observed throughout the upper portion of the borehole from the bedrock surface to 864 ft amsl with most of these fractures occurring in non-sandstone beds. This suggests that vertical groundwater flow through the SRF system is more likely to occur, supported by vertical fracturing within this portion of the borehole. Below 864 ft amsl (i.e., the bottom 68 ft of the borehole), the bedrock notably becomes more competent with fewer observed fractures, suggesting reduced permeability.

Based on the data review, bedrock groundwater flow surrounding the eastern valley of Sequence 4 flows from the ridges, along the slopes and towards topographic lows and likely has potential transitions of variable vertical to horizontal components of flow at an approximate elevation of 864 ft amsl. In addition, local competent beds higher in elevation along the slope (e.g., sandstone and shale bedding contacts from 889 to 898 ft amsl) may also contribute to horizontal groundwater seepage. This higher elevation of groundwater seepage correlates with the elevation of the main 4-inch groundwater underdrain installed on the bench along the Sequence 4 northern slope and associated laterals that run along erosion rills observed during the installation.

During a site visit conducted by AEP and Arcadis personnel on April 13, 2021, groundwater seeps (**Seep 1 on Fig. 1-1**) were observed approximately 350 feet northeast of the eastern edge of Sequence 4 on the downslope side of the ridge. The observed groundwater seeps were associated with a several feet thick sandstone outcrop that was surveyed at an approximate elevation of 889 ft amsl. This seep elevation correlates to the base of a sandstone unit observed at a near equivalent elevation at boring 0517, and also correlates to the a range of elevations of the gravel blankets and the 4-inch bench groundwater underdrain within the eastern valley of Sequence 4. The presence and variable flow of the groundwater seeps along the ridge are likely seasonal and intermittent to non-existent during drier periods of the year.

Similar mid-slope groundwater seepage faces were also observed to the north within Sequence 6 and downgradient from MW-9 (**Seep 2 on Figure 1-1**). This observed groundwater seepage face, which occurs in several areas along the slope, was surveyed at approximately 900 ft amsl and is comparable to the elevation observations in Sequence 4 and to the northeast of Sequence 4 at Seep 1, suggesting bedrock stratigraphy driven horizontal groundwater flow components.

The Arcadis Initial Hydrogeology Summary and Recommendations for Data Gap Investigation memo, dated April 30, 2021, also included recommendations for collecting data to update the groundwater flow conceptual site model (CSM) and provide empirical data for understanding the volumetric groundwater flux entering Sequence 4. The following specific objectives were outlined:

1. Collect additional data for comprehensive bedrock stratigraphic and fracture understanding along the northern, southern, and eastern ridges surround the Sequence 4 eastern portion.
2. Define the quantifiable horizontal and vertical groundwater flow conditions along the ridge surrounding Sequence 4 (e.g., volumetric flux).
3. Record comprehensive groundwater elevation data to evaluate horizontal and vertical groundwater flow directions and magnitudes (hydraulic gradients) at Sequence 4 eastern portion and to the east within the downgradient valley.

4. Provide implications, if necessary, based on the results for the Coal Combustion Residual (CCR) Location Restrictions for separation from the uppermost aquifer and whether additional measures are required to meet that criterion.

This report is organized to describe the work completed during implementation of the data gap recommendations and evaluation to meet the objectives identified above.

1.2 Data Gap Investigation

The data gap investigation was completed from June to September 2021 and included collecting the data summarized below:

- Six bedrock borings (2101 to 2106) were installed to provide a more comprehensive stratigraphic and fracture understanding along the northern, southern, and eastern ridges surrounding the Sequence 4 eastern valley (2101 to 2104); and additionally at Sequence 6 (2105) and the western downgradient valley center (2106).
- Borehole geophysics (temperature, fluid resistivity, natural gamma, density, neutron, lateral resistivity, spontaneous potential, caliper, single point resistance, acoustic televiewer, and electromagnetic flow meter) were documented at five of the six borings (2101 to 2105).
- Nine monitoring wells were installed and developed as clusters at targeted fracture zones within Sequence 4 across 4 potential water bearing zones: (1)super shallow [ss], (2) shallow [s], (3) intermediate [i], and (4) deep [d] at locations (MW-2101ss, s, i, d, MW-2102s,i,d and MW-2103 s,i.
- Four monitoring wells were installed and developed at targeted fracture zones within Sequence 6 at MW-2105 ss, s, i, and d.
- One monitoring well was installed and developed within the downgradient valley SRF in Sequence 9 at MW-2106.
- Hydraulic testing was conducted that included slug testing and single-well pumping tests.
- Groundwater elevation data were collected to evaluate recharge response and groundwater flow directions and magnitudes (hydraulic gradients).
- Groundwater, liner bubbles, chimney drains, Plateau Pond, and groundwater underdrains were sampled for geochemistry to characterize the water types.

1.3 Sequence 4 North Valley Construction

In 2019, tree removal and excavation were completed over the surface during landfill construction activities. This included removal of more than 10 ft of clay soil overburden in the Sequence 4 area. Drawings and reports of the Sequence 4 liner system construction provided by GAI indicates the following for Sequence 4:

- Groundwater interceptor underdrain system (approximately 3 ft below the subbase);
- Twelve inches of compacted or in-place clayey-silt sub-base;
- Twenty-four inches of compacted clay liner (north valley);
- Thirty-mil polyvinyl chloride (PVC) geomembrane;
- Geo-composite drainage net (GDN)

- Eighteen inches of protective cover (typically bottom ash, potentially West Virginia Department of Transportation mortar sand or gypsum).

During construction, GAI Consultants (GAI) communicated several areas within the eastern valley that required installation of gravel blankets along with the groundwater underdrains to divert and mitigate flow along observed seepage faces. These areas, along with the underdrains, are shown on **Figure 1-2**. The underdrains consist of 4-inch, 6-inch, and 12-inch diameter perforated pipe with several lateral runs and connections that are wrapped in geotextile fabric, and the gravel trenches are approximately 3 ft by 3 ft and composed of non-calcareous American Association of State Highway and Transportation Officials (AASHTO) No. 57 stone. The geomembrane liner is currently covered with bottom ash, sand, or gypsum as protective cover before waste placement.

2 Methods

The activities described below were completed in accordance with the AEP-approved work plan prepared by Arcadis following the initial hydrogeologic review and data gap summary. The work plan was prepared using West Virginia Department of Environmental Protection Title 47 Series 60 Monitoring Well Design Standards, dated June 21, 2011 and ASTM International (ASTM) standards, where referenced, as guidance.

2.1 Boring Installation

AEP staff staked and surveyed the six boring locations (2101 through 2106) to facilitate drilling pad construction by RB Jergens. The AEP staff also provided locating clearance for private plant utilities in the vicinity of the boring locations and offset borings for multiple monitoring wells in clusters, where applicable. Arcadis subcontracted Underground Detective to perform utility location services using ground-penetrating radar and electromagnetic (EM) survey over an area of approximately 25 feet by 25 feet at each location. The boring locations were also soft cleared using air excavation (air knife) to a diameter of at least 10 percent larger than the largest diameter drilling tooling to be used. Underground Detective completed air excavation to a minimum depth of 6 feet below ground surface (bgs) or the soil-rock interface, whichever was shallower. In most cases, the bedrock surface was very shallow (less than 6 inches to 6.5 ft of overburden), and minimal air excavation was necessary.

Overburden was minimal at the borings, except for location MW-2106 in the center portion of the valley in Sequence 9. If overburden was present, an 8-inch diameter steel surface casing was installed approximately 2 feet into the competent bedrock. Wireline rock coring with a core size of 2 inches diameter (NQ2) over 10-foot lengths was used to continuously sample the bedrock. An Arcadis geologist logged the rock cores and any other pertinent information via field logs that included the soil and bedrock classification in accordance with the Work Plan. The rock cores are stored in a storage building at the landfill near the offices.

Borings were advanced to a minimum elevation of approximately 865 ft amsl (66 to 127 ft below surface) and/or were terminated when at least one significant fracture zone was encountered in deeper competent bedrock defined by a rock quality designation (RQD) greater than 90 percent for approximately 15 feet. The rock coring at MW-2106 was advanced until the water-bearing SRF underlying the valley was encountered. The location of each boring is depicted on **Figure 1-1.** The rock core logs for the borings listed above are included in **Appendix A-1.**

2.2 Borehole Geophysics

Arcadis contracted Marshall Miller & Associates (MMA) to complete borehole geophysical logging on five of the six initially installed borings (2101 through 2105). The geophysical logging was completed by lowering various

probes down the open borehole using a winch system. Nine parameters were measured by the following six instruments:

1. Acoustic televiewer;
2. Density;
3. Temperature, lateral resistivity, fluid conductivity, natural gamma count (four sensors on one probe);
4. Neutron porosity;
5. Three-arm caliper;
6. EM flow meter.

After the initial logging, MMA and Arcadis field and technical staff analyzed the data in real time to identify significant fracture intervals, depths, and thicknesses. Up to six fracture intervals were selected for additional testing using an EM flow meter. The EM flow meter provided a flow rate and vertical flow direction within the borehole for the selected intervals under ambient and pumping conditions to evaluate the relative transmissivity of each identified fracture zone following the methods described below:

1. The static borehole water level was measured manually using an electronic water level meter.
2. A submersible pump was placed in the open borehole approximately 5 to 7 feet below the static water level.
3. The borehole was pumped at the minimum flow rate necessary to induce near steady-state drawdown of 2 to 4 feet.
4. Once near steady-state conditions were met, the EM flow meter data were recorded.
5. The pumping rate and water level were measured and recorded continuously throughout the EM flow meter testing.

The geophysical logging information and interpretation were used, along with the core log, to design the monitoring well screen intervals. The data reports for the geophysical logging are provided in **Appendix B.**

2.3 Well Installation

A total of 14 monitoring wells were installed at all borehole locations except for location 2104. The boring location 2104, on the north side of the Sequence 4 eastern valley, was not completed with monitoring wells as additional construction is planned in the Sequence 5 area. The monitoring well locations are shown on **Figure 1-1,** and well construction details are summarized in **Table 2-1**. Well completion construction diagrams are provided on the well construction logs in **Appendix A-2**. The West Virginia Department of Environment Protection (WVDEP) monitoring well construction approvals are also provided in **Appendix A-3**.

The initial six borings were reamed using air rotary methods with an 8-inch air hammer bit to the completion depths for deeper wells installed as a nested pair. Offset boreholes were advanced using a 6-inch diameter air rotary to install shallow offset monitoring wells MW-2101ss, MW-2101s, and MW-2102s; and MW-2106, which was not installed within a cluster. The five nested monitoring wells include:

- MW-2101i and 2101d;
- MW-2102i and 2102d;
- MW-2103s and 2103i;
- MW-2105ss and 2105s;
- MW-2105i and 2105d.

The monitoring wells were constructed using 10 to 20-feet long machine-slotted (20-slot well screen) 2-inch diameter Schedule 40 PVC well screens. A minimum of 2 feet of filter pack sand was placed below the bottom of the well screens and above backfill material. All monitoring well screens were installed using a primary filter pack

consisting of a Global No. 5 brand or equivalent sand. The primary filter pack was placed in the annular space between the borehole and the screened interval, extending from 1 to 4 feet below the bottom of the screen to between 1 foot to 4 feet above the top of the screen. The thicknesses above and below the well screens was determined based on depths, lithology and where the well was nested. A secondary filter pack consisting of Global No. 6 brand sand or equivalent was placed extending from the top of the primary filter pack to 1 foot above the primary filter pack. Stainless steel casing centralizers were used for deeper locations above the filter pack material near the mid depth of the boring.

A 3 feet thick bentonite pellet seal was placed in the annulus immediately above the secondary filter pack or to the base of the shallower well primary filter pack base at nested locations. The bentonite pellet seal was allowed to hydrate for at least 2 hours before placing a high-solids bentonite grout in the remaining annulus with a tremie pipe. The high-solids bentonite grout consisted of bentonite grout and water mixture with a minimum of 20 percent solids, mixed and placed in accordance with the manufacturer's written instructions (i.e., 66.75 lbs of grout to 40 gallons of water for Halliburton quick grout). A lockable steel protective casing was installed over the PVC risers in accordance with ASTM D5787. The protective casing was centered in a concrete pad that meets applicable AEP and WVDEP requirements of a minimum 4-inch-thick apron extending 3 feet or more from the outer edge of the borehole.

The RB Jergens on-site survey team surveyed all new monitoring wells and boreholes. The ground surface or top of concrete pad, the top of protective casing and the top of PVC well casing were surveyed for elevation. AEP also surveyed the final locations of the boreholes/monitoring wells on July 26, 2021, and the survey data are provided in **Table 2-1**.

2.4 Well Development

Each newly installed monitoring well was developed. Most of the monitoring wells were low-yielding, and several methods were used to develop the wells and remove sediment. Wells were primarily developed using surge and purge methods and subsequently jetting and flushing with potable water as a best attempt to clear out sediment and achieve a greater level of groundwater zone communication. Well development was continued until the following criteria were met:

- A minimum of 10 casing volumes was purged from the well during the final pumping cycle.
- If the well water-level was drawn down during pumping to the screen before removing 10 well volumes, well development continued later when sufficient water recharge had occurred
- Field water quality parameters (temperature, pH, conductivity, oxidation-reduction potential [ORP], and turbidity) were measured and recorded at 5-minute intervals during the purging process.
- Depth to water and total volume of water purged were measured and recorded at 5-minute intervals.
- Development continued until the minimum purge volume was achieved and field water quality parameters met the following criteria over three successive measurements:
  - Temperature stabilizes within ±0.5 degrees Celsius.
  - pH stabilizes within ±0.2 units.
  - Conductivity stabilizes within ±3 percent.
  - Turbidity is less than 10 nephelometric turbidity units.
- If the turbidity requirement could not be achieved during development and a minimum volume was removed, the efforts suggested that the natural formation was high in suspended solids.

Well development was tracked and summarized in **Table 2-2,** and the well development logs are provided as **Appendix C.**

2.5 Groundwater, Surface Water, and Liner Bubble Sampling

Collection of aqueous geochemistry data was recommended to provide additional lines of evidence of the source of water contributing to the liner bubbles. Two liner bubbles were sampled, along with eight groundwater monitoring wells, the Plateau Pond, the north valley groundwater underdrain, and two Sequence 4 eastern valley chimney drains, to provide a chemistry comparison for current conditions and comparison to January 2020 conditions with past sampling results. Analytes for the samples included:

- Dissolved potassium, sodium, magnesium, calcium, sulfate, chloride, barium, lithium, and fluoride;
- Carbonate/bicarbonate alkalinity;
- Total suspended and dissolved solids;
- Field parameters: pH, ORP, specific conductivity, dissolved oxygen (DO), temperature.

Monitoring wells within the Sequence 4 eastern valley (except for the deep [d] wells) and downgradient MW-2106 were sampled via low-flow or volumetric methods to provide a representative data set for groundwater. During sampling, two of the intermediate zone monitoring wells (MW-2101i and MW-2102i) exhibited limited recharge, and samples could not be collected. However, the remaining eight monitoring wells were sampled including MW-8, MW-2101ss, MW-2101s, MW-2102s, MW-2103s, MW-2103i, MW-2106, and MW-1802.

Additional grab samples were collected from the Plateau Pond using a dedicated sampling cup and at the north valley underdrain end of pipe that represents chemistry from a nearby surface water body and combined groundwater, respectively. Samples from the liner bubbles were collected via a peristaltic pump from the northeast and southeastern sides of the Sequence 4 eastern valley by cutting the liner and inserting a 1-inch PVC pipe. Standing water in two of the chimney drains (west and east) had to be decanted with dedicated sample cups due to excess sediment and represents the liner local runoff chemistry. Geochemistry sample locations are shown on **Figure 2-1**.

Samples were packaged in coolers on ice and transported to the AEP Dolan Lab in Groveport, Ohio for analysis. Laboratory and field parameter results were compiled and provided within comprehensive monitoring well summary table in **Appendix D** (Table D-1) and focused summary table provided as **Table 2-3**. Laboratory reports from 2020 and 2021 geochemistry sampling are included in **Appendix E**.

2.6 Water Level Monitoring

Groundwater levels were measured manually using a water level meter and continuously using data-logging pressure transducers from newly installed monitoring wells and select pre-existing wells. The recorded manual groundwater levels and associated groundwater elevations from the survey point are provided in **Table 2-4**. Data-logging pressure transducers were installed on August 9, 2021 in the newly installed wells with 10 new pressure transducers and redeploying four existing pressure transducers from MW-1, MW-2, MW-5, and MW-10 to new locations. Locations for the revised continuous groundwater level monitoring network include 17 locations:

- 3 Pre-existing monitoring wells: MW-4, MW-8, and MW-9;

- 14 Newly installed monitoring wells: MW-2101ss, MW-2101s, MW-2101i, MW-2101d, MW-2102s, MW-2102i, MW-2102d, MW-2103s, MW-2103i, MW-2105ss, MW-2105s, MW-2105i, MW-2105d, and MW-2106;
- Barometric pressure logging at MW-2101ss (used for compensation of the non-vented pressure transducers).

During installation, the pressure transducers were set to record at 5-minute intervals. The pressure transducers were programmed during hydraulic testing (discussed below) and reset to a longer recording interval of 15 minutes after testing. Final download of the pressure transducers was completed on September 2 and 3, 2021, which provided approximately 25 days of continuous groundwater levels after hydraulic testing for this report. After the final download, the pressure transducers were kept in place monitoring at 15-minute intervals.

Downloaded data were processed to compensate for barometric pressure and calibrated to groundwater elevation using manual depth to water measurements from the surveyed top of casing. Hydrographs for each monitoring well were produced and are provided in **Appendix F.** Additional evaluation of the groundwater level data is discussed below in Section 3.3.

2.7 Hydraulic Testing

Single-well hydraulic testing, consisting of slug testing and low stress single-well steady-state drawdown tests, were completed at the monitoring wells in the Sequence 4 area and MW-2105 cluster. As mentioned above, test responses were monitored using the installed pressure transducers programmed to 1-second intervals, and the test was also monitored with manual depth-to-water measurements. Slug testing was completed via bail down methods by completely submerging a bailer (1.6 inches in diameter by 3 feet in length) below the water table. The water level in the well was allowed to recover to static conditions, then the bailer was quickly pulled from the water column to initiate the test. The test was complete after the water level had returned to static conditions. The depth to water was measured manually throughout the test as a backup to the pressure transducer. Slug testing was completed at ten locations (MW-2101ss, MW-2101s, MW-2101i, MW-2102s, MW-2102i, MW-2102d, MW-2103s, MW-2103i, MW-2105ss, MW-2105s). Tests were not analyzed at two locations (MW-2101d and MW-2105i) due to the slow recovery rates of more than 24 hours, which is indicative of low permeability. The results of the analysis are discussed in Section 3.4.

Single-well pumping tests using low-stress single-well steady-state drawdown methodology were completed after the slug testing at locations MW-8, MW-2101ss, and MW-2101s. These wells were selected because the well responses were expected to exhibit the highest yields based on the previous development and slug testing results. The tests were completed by inducing a drawdown using a submersible pump. Flow rates were recorded manually using a graduated cylinder, and drawdown was monitored by a pressure transducer and manual gauging. The steady-state drawdown tests were performed at the lowest stress (i.e., lowest flow rates) feasible with the objective of recording an appreciable drawdown of greater than 0.1 feet.

The results of the analysis for both the slug testing and low stress single well steady state drawdown tests are discussed in Section 3.4.

3 Results and Discussion

A summary of the results from the various field and laboratory sampling is presented in this section, along with a discussion of how the results have been used to update the hydrogeologic CSM.

3.1 Aerial Imagery and Topographic Maps

As part of the initial hydrogeologic review, aerial imagery and topographic maps were reviewed to understand pre-construction drainage channels for the Site surface runoff before construction and grading (**Appendix G**). Before landfill construction, small and large natural drainage channels were formed along the ridge slopes and valleys as erosional features. These erosional features likely occur in areas of rock weakness and/or increased fracturing. During landfill construction, drainage channels have been constructed to manage runoff that contacts CCR materials. The pre-construction topographic contours were used to identify natural drainage channels that underlie Sequence 4 with several erosional channels along the northern, eastern, and southern ridges of the Sequence 4 eastern valley portion. The presence of these channels indicates areas of weaker rock over which surface flow was directed and potential areas of groundwater seepage before landfill construction. Some of these features are located in the general vicinity of the Sequence 4 liner bubbles on the northeast and southeast sides of the eastern valley and suggest that channelized water flow along these pre-construction drainage features may be preferential flow paths. Historical aerial imagery available from Google Earth (earth.google.com/web) was also reviewed and confirms the observations of the topographic maps. This includes a former retention pond that was located in the southeast corner of Sequence 4 and appeared to be in use from at least 2007 to sometime between 2012 and 2015. The use of this retention pond apparently stopped after the Plateau Pond was fully operational. The outline of this former surface drainage feature is apparent on the pre-construction topographic contours included on the site maps.

3.2 Bedrock Geology, Hydrogeology, and Borehole Geophysical Logging

The bedrock geology was summarized as part of the preliminary hydrogeologic evaluation presented in Section 1 of this report. The data gap investigation provided additional data to refine the stratigraphy locally in the Sequence 4, 5, and 6 areas, which included borehole geophysical logging and detailed core logging.

Vertical geophysical logging, including temperature, fluid conductivity, natural gamma count, density, neutron porosity, lateral resistivity, three-arm caliper, acoustical televiewer, and EM flow meter logging, was completed at five boreholes: 2101, 2102, 2103, 2104, and 2105 (**Appendix B**). In general, the geophysical logging results were consistent with a sedimentary package of alternating shale and sandstone. In addition, the detailed logging provided discreet water bearing fracture intervals related to bedding transitions of relatively unfractured sandstones to highly fractured shale or claystone. To illustrate the results of the hydrostratigraphic mapping of the water-bearing fracture intervals, a fence diagram was completed with the transect shown on **Figure 3-1**. The fence diagram was split into two figures, with the smaller-scale diagram including location 2105 to the north within Sequence 6 (**Figure 3-2**) and larger-scale figure focusing on 2101 through 2104 completed in the Sequence 4 eastern valley of interest (**Figure 3-3**). On the fence diagram are the acoustical televiewer logs, which show the highly fractured intervals (darker areas) that were targeted for testing and groundwater monitoring well installation. Note that the fracture intervals correlate well with elevation, which is reflective of the minimal dip of the bedrock beds, and the fracture intervals are separated by thick sequences of relatively unfractured bedrock. The fracture intervals also generally correlate to the north, as it is expected that over further distances, in bedding thicknesses and transitions to differing units may vary. Additional instruments provided similar identification for these fracture intervals, most notably seen in the caliper, neutron porosity, and density logs.

The fracture zones that represent weaker areas of rock that most readily provide groundwater flow are shown as discreet horizontal features. Per the CSM, shallower bedrock units described that have fractures in response to a decline in stress as a result of erosion forms the characteristic SRF of Appalachian valleys (USGS 1981). The

SRF is defined as the uppermost aquifer per the CCR rule and defines groundwater flow within these fracture systems (secondary porosity), while groundwater within primary porosity components (i.e., pore spaces) is less significant (Arcadis 2020). Bedrock groundwater flow follows surface topography and is directionally downslope from the ridge towards the valley floors. This flow occurs independent of lithologic unit within the SRF system (USGS 1981).

The SRF system at the Site is thinner along ridges and thicker in the valleys. The groundwater zones at depth along the ridges that occur deeper than the uppermost SRF are stratigraphically driven and not related to the SRF that occurs more local to the slopes and valleys. Therefore, the hydrostratigraphy defined for the Site as presented below with specifics related to Sequence 4 includes the SRF as the shallowest groundwater zone on the ridge (i.e., Super Shallow Zone); the deeper zones (Shallow, Intermediate, and Deep Zones) are discreet units that contribute lateral flow to the SRF. The detailed logging and data collection resulted in the recognition of the following four hydrostratigraphic zones along the ridge of the Sequence 4 eastern valley:

- Super Shallow Zone – uppermost groundwater zone (SRF):
  - Base elevation; approximately 902 to 904 ft amsl
  - Thickness; approximately 28 to 32 ft
- Shallow Zone:
  - Base elevation; approximately 878 to 881 ft amsl
  - Thickness; approximately 6 to 7 ft
- Intermediate Zone:
  - Base elevation; approximately 854 to 858 ft amsl
  - Thickness; approximately 14 to 22 ft (fractures not present along entire thickness)
- Deep Zone:
  - Base elevation; approximately 830 to 832 ft amsl
  - Thickness; approximately 3 to 5 ft

3.3 Water Levels

Groundwater levels collected using data-logging pressure transducers installed on August 9, 2021 and calibrated to manual depth-to-water measurements were analyzed to evaluate transient water level behavior during both static and non-static (e.g., during storm event) conditions. Identifying temporal water level patterns both laterally and vertically increases the understanding of groundwater flow. This detailed examination of water levels is focused on the Sequence 4 eastern valley. A composite hydrograph showing Sequence 4 wells, along with daily precipitation totals from August 9 to September 2, 2021, is provided on **Figure 3-4**. Manual groundwater elevation measurements used to calibrate the pressure transducer data are provided in **Table 2-4**. Individual hydrographs for each well (including those outside of the Sequence 4 eastern valley) are included in **Appendix F**.

Groundwater elevations in the Super Shallow Zone were monitored at MW-2101ss and MW-8 (collocated with the 2103 well cluster). Notably, groundwater was not encountered in this zone at the 2102 well cluster during drilling, potentially a result of gravel blankets installed nearby where groundwater seeps were encountered during Sequence 4 construction. Groundwater elevations in the Super Shallow Zone were approximately greater than 913 ft amsl and less than 925 ft amsl. The groundwater elevation at MW-8 was several feet higher than that of MW-2101ss during the monitoring period. Significant precipitation events were observed from August 16 to 18, 2021 (3.15 inches over 3 days) and again from August 29 to September 1, 2021 (1.67 inches over 4 days). During

each of these events, the observed super shallow groundwater elevations increased from approximately 0.5 to 6 ft depending on the amount of precipitation (**Figure 3-4**). The MW-8 water level change during precipitation events was greater than the response observed at MW-2101ss, likely due to local differences in fracture hydraulic conductivity. Super Shallow Zone groundwater elevations responded quickly to precipitation events (i.e., within hours), which indicates that groundwater recharge occurs following precipitation events.

Groundwater elevations in the Shallow Zone were monitored at MW-2101s, MW-2102s, and MW-2103s. At MW-2101s and MW-2102s, both located nearest to the Plateau Pond along the southern half of the Sequence 4 eastern valley, groundwater elevations exhibited a similar and a small range between approximately 895 and 898 ft amsl. There was an apparent water level increase of approximately 1 ft at MW-2101s during the storm event from August 16 to 18, 2021. This response was delayed relative to the initial onset of precipitation by at least 1 to 2 days,and may indicate that vertical fracturing is sufficient in at least some portions between the Super Shallow and Shallow Zones to allow for vertical groundwater flow and recharge. There was no apparent water level increase during this same period at MW-2102. At MW-2103s, along the northern half of the Sequence 4 eastern valley, the groundwater elevation was lower (observed between approximately 880 to 885 ft amsl; **Figure 3-4**). However, it should be noted that the groundwater elevation at MW-2103s did not appear to reach a static equilibrium during the period of observation (i.e., it continually and gradually increased) which suggests a lower hydraulic conductivity in this portion of the Shallow Zone relative to MW-2101s and MW-2102s.

Groundwater elevations in the Intermediate Zone were monitored at MW-2101i, MW-2102i, and MW-2103i. The water level at MW-2101i was markedly higher than the other two wells, ranging from approximately 875 to 880 ft amsl. This could potentially be attributed to increased hydraulic connection between the Shallow and Intermediate Zones at the 2101 well cluster, resulting in higher hydraulic heads at MW-2101i. Conversely, the water levels at MW-2102i and MW-2103i were more than 20 ft lower, ranging from 885 to 888 ft amsl. Despite localized differences within the Intermediate Zone, water levels at each well were notably consistent and did not appear to be affected by precipitation. Similarly, groundwater elevations in the Deep Zone were monitored at MW-2101d and MW-2102d. There was little variation in the water level, which ranged from 830 to 835 ft amsl (**Figure 3-4**).

One key finding from water level monitoring is that groundwater in each water-bearing fracture zone, especially in topographically high areas (i.e., ridges), appears to be isolated with vertical flow likely inhibited and horizontal flow as the dominant flow component. The zones are likely leaky with predominate vertical flow along the SRF system and limited vertical flow through vertical fractures within the upland areas. The upland downward vertical fracture flow is facilitated by strong downward vertical hydraulic gradients. The downward vertical hydraulic gradients were calculated from the groundwater elevation change between two vertically adjacent wells (e.g., MW-2101ss and MW-2101s) divided by the vertical distance between their well screens. The average vertical hydraulic gradients at 2101- and 2102-cluster wells from August 9 to September 2, 2021 were approximately 0.7 to 1.9 ft/ft. This gradient range was similar across the Super Shallow, Shallow, Intermediate, and Deep Zones. Vertical gradients at 2103-cluster wells were not calculated due to the MW-2103s water level not reaching a static condition during the same timeframe. While groundwater flow in each of these zones is predominately horizontal towards the SRF system, the strong vertical gradients present in the upland areas are representative of generally isolated and distinct hydraulic units. Vertical groundwater flow is quantified further in Section 3.6.

3.4 Hydraulic Testing

The primary objective of hydraulic testing was to estimate hydraulic conductivity for each water-bearing fracture interval (groundwater zones). Hydraulic conductivity values were subsequently used to calculate lateral (i.e., horizontal) groundwater flux into the Sequence 4 eastern valley (discussed in Section 3.6). Reported hydraulic conductivity estimates are provided in **Table 3-1**.

Slug tests that exhibited appreciable recovery within 24 hours were analyzed with applicable solutions using AQTESOLV® for Windows® Version 4.50 (Duffield 2007). Individual solution reports are provided in **Appendix H**. While two wells (MW-2101d, MW-2105i) was not analyzed due to very low permeability, the other ten wells were representative of Super Shallow, Shallow, Intermediate, and Deep Zone conditions. The highest hydraulic conductivity values based on slug testing were observed at the 2101 well cluster. Estimated hydraulic conductivity values were 23 ft/day at MW-2101ss, 8.2 ft/day at MW-2101s, and 0.6 ft/day at MW-2101i. Nearby at the MW-2102s, the estimated hydraulic conductivity value was similar at 0.8 ft/day (**Table 3-1**). Slug test results at all other locations were at least an order of magnitude lower, ranging from 1.6×10^{-2} ft/day (MW-2103s) to 3.1×10^{-3} ft/day (MW-2102d). This suggests that the most transmissive zones around the Sequence 4 eastern valley were estimated at MW-2101ss, MW-2101s, MW-2101i, and MW-2102s.

At the wells with the highest estimated hydraulic conductivity estimates during slug testing (MW-2101ss and MW-2101s), low-stress single-well steady-state drawdown tests were completed. These tests were intended to provide additional estimates of hydraulic conductivity to complement the slug testing results, as the slug test recovery occurred very rapidly at less than 60 seconds. Additionally, a single well-test was completed at MW-8, which is partially screened across the Super Shallow Zone above MW-2103s. The resulting hydraulic conductivity estimates were 0.3 ft/day at MW-2101ss, 5.7 ft/day at MW-2101s, and 0.5 ft/day at MW-8 (**Table 3-1**). The corresponding steady-state flow rates during these tests were approximately 750 milliliters per minute (mL/min) at MW-2101ss (with 8.7 ft of drawdown), 3,785 mL/min (or 1 gallon per minute [gpm]) at MW-2101s (with 2.2 ft of drawdown), and 800 mL/min at MW-8 (with 8.9 ft of drawdown).

While the Super Shallow, Shallow, and Intermediate Zones exhibited hydraulic conductivity variation of three to four orders of magnitude, the values decreased with depth. The Super Shallow Zone exhibited the highest average hydraulic conductivity of 5.9 ft/day, while the Intermediate Zone exhibited the lowest average hydraulic conductivity of 0.2 ft/day (**Table 3-1**). The higher hydraulic conductivity within the Super Shallow Zone comprising the ridge SRF system agrees with the CSM and, as expected, the hydraulic conductivity decreases with depth as fractures opening decrease with depth due to increased lithostatic stress.

3.5 Geochemistry

The geochemistry data (dissolved constituents) presented in **Table 2-3** were plotted to compare the concentrations. Concentration data were plotted on two scatter plots with dissolved lithium and barium on the y-axis versus sulfate on the x axis (**Figure 3-5**). The plot includes:

- Sequence 4 area and downgradient newly installed and select existing groundwater wells (MW-8 and MW-1802) sampled in September 2021;
- Past groundwater sampling results for MW-8 in June 2017 and November 2019;
- Liner bubble samples collected in January 2020 before lining of the Plateau Pond;
- Liner bubble samples collected in September 2021 from the northeast and southeast areas of Sequence 4 eastern valley;
- Plateau Pond and groundwater underdrain samples from January 2020 and September 2021;
- Chimney drain samples from September 2021 within the western and eastern portions of the Sequence 4 eastern valley.

Included on the plots are general groupings of sample concentrations. Water quality samples that best correlate with the liner bubble chemistry include MW-8 (ss) for both past and current samples and MW-2101ss, suggesting

that groundwater from this area is likely a dominant contributor to the liner bubbles. Other Sequence 4 eastern valley groundwater chemistry varies, with MW-2102s exhibiting lower sulfate and higher barium concentrations and MW-2103s/i having higher sulfate concentrations. These sample concentrations suggest that these areas are likely minor contributors to the liner bubbles. Downgradient groundwater has more unique chemistry demonstrated by lower barium and sulfate concentrations at MW-1802 and higher lithium concentrations at MW-2106. The Plateau Pond correlates with the liner bubble chemistry; however, the results from pond samples collected before lining differ from those of current samples, which suggests variable chemistry from the pond (storm water) source. The groundwater underdrain concentrations for the January 2020 and September 2021 samples correlate with one another and are lower in lithium concentrations, but the barium concentrations are comparable. The groundwater underdrain represents multiple groundwater sources and is expected to exhibit more unique chemistry. Runoff represented by the chimney drain samples exhibits high concentrations of lithium, barium and sulfate and differs from all other samples.

The geochemistry results were also evaluated with the major ion chemistry by percentage with a trilinear diagram or Piper plot (**Figure 3-6**). As with the concentration plots, recent samples from September 2021 were included; however, past samples, such as bubble samples from January 2020, were not included on this diagram as not all constituents were analyzed that are necessary for a Piper plot. As shown on the cation and anion lower left and right plots, the super shallow and shallow monitoring wells, except for MW-2103s, and liner bubble samples are similar as they are all calcium- and bicarbonate-driven, which supports the conclusion the dominant source is groundwater seepage. The monitoring wells screened in the Shallow (MW-2103s) and Intermediate Zones (MW-2103i) clustered with MW-8 (ss) are sodium- and sulfate-driven, suggesting a different type of groundwater. This observation is consistent with the concentration plot evaluation and suggests that this area of groundwater may be a minor contributing source to the groundwater seepage forming the liner bubbles. The Plateau Pond samples generally correlate with the liner bubble samples; however, it is considered coincident given the different source of water (storm water) and the lack of correlation observed for barium and lithium noted above. The downgradient monitoring well samples (MW-1802 and MW-2106) are sodium- and bicarbonate-type, representing a different type of groundwater deeper in the SRF system downgradient. The groundwater underdrain plots similar to the liner bubbles and the monitoring wells suggested to provide dominant groundwater seepage to the Sequence 4 easter valley. Similar to the concentration plot, general groupings were made for the central diamond plot, which is a combined plot for the two lower plots. As shown, unique chemistry types are apparent with the chimney drains driven by calcium/magnesium and sulfate, MW-2103s/i plotting with higher sodium, and downgradient groundwater MW-1802/MW-2106 plotting with high sodium and bicarbonate.

The geochemistry plots suggest that groundwater is the dominant recharge component to the liner bubbles especially within dominant areas and groundwater zone seepage faces represented by MW-8 (ss), MW-2101ss/s and MW-2102s. A minor groundwater recharge component is represented by groundwater zone seepage at MW-2103s/i. Note that monitoring wells were not installed at the northern boring location 2104; however, groundwater zones similar to the other areas surrounding Sequence 4 eastern valley were identified and are assumed to be contributing groundwater seepage to the valley.

3.6 Water Balance

A water balance analysis at the Site was completed to understand the volume relationships for water migration (i.e., volumetric discharge) that includes groundwater seepage within the Sequence 4 eastern valley under average (i.e., static or seasonally dry) conditions and storm conditions during the observation period from August 9 to September 2, 2021. The objective of the volumetric discharge estimate is a water volume comparison to provide an understanding of general excess water volume likely contributing to the liner bubble formation. The plan view of the Sequence 4 area with estimated recharge area, groundwater seepage zones, and groundwater

underdrains is shown on **Figure 3-7**. The conceptual basis of the water balance with individual components for the quantitative estimates are shown on a three-dimensional view of the Sequence 4 area looking east on **Figure 3-8**.

The water volume estimate used several data sources associated with the recently installed borings and monitoring well clusters including results presented above for the borehole geophysical logging, groundwater elevations, geochemistry, and hydraulic testing. Additional data sources available included groundwater underdrain flow rates and local precipitation measurements at the Amos Plant. The duration, assumptions, calculation formulas, and additional details for the various datasets are provided in **Table 3-2**.

The water balance analysis is based on the fundamental assumption that recharge to the groundwater system is equal to the discharge from the groundwater flow system. Conceptually, the excess flow beyond what the horizontal and vertical groundwater flux components were able to store and transmit would result in groundwater seepage and intermittent surface water occurrence. However, groundwater seepage can still occur in zones with preferential flow paths (such as horizontal bedding plane bedrock fractures). In general, the primary source of recharge in most groundwater systems is infiltration of precipitation to groundwater. The primary sources of discharge can vary, but include runoff from precipitation, evaporation, and transportation (i.e., evapotranspiration); horizontal groundwater flow towards hydrologic boundaries (e.g., seepage faces, springs, streams, rivers); and vertical groundwater flow towards deeper hydrogeologic units. These parameters have been estimated with calculations or assumed based on field observations, analytical methods, and/or direct measurement to quantify the water balance and identify potential water surpluses or deficits in the Sequence 4 eastern valley.

From the two fundamental functions of storage and discharge:

Net Recharge = Net Discharge

where,

Net Recharge = Groundwater Recharge from Precipitation

(Note that groundwater recharge is precipitation infiltrated into the ground less runoff and evapotranspiration. Evapotranspiration was assumed to be negligible with the overburden and vegetation removed.)

and,

Net Discharge = Lateral Groundwater Flux (Volumetric Discharge) + Vertical Groundwater Flux (Deep Losses)

(Note that groundwater recharge, lateral groundwater flux, and vertical flux were calculated as detailed below)

Net Recharge: The groundwater recharge within the Sequence 4 eastern valley was calculated from the following components:

- Recharge surface area (6.9 acres, or 301,593 square feet [ft^2]) shown on **Figure 3-7**;
- Average conditions for a 25-day period from August 9, 2021 to September 2, 2021 to correlate to the groundwater level collection and using data from the calibrated numerical flow model (Arcadis 2019):
  - Groundwater recharge of 14 inches per year or approximately 0.96 inches over a 25-day period;
- Storm conditions observed during a rainfall event occurring from August 16 to August 18, 2021:
  - Precipitation from Amos plant float gauge totaling 3.15 inches over the 3 days;
  - Recharge to groundwater with an average 2-feet increase in Super Shallow Zone groundwater levels;
  - Infiltration pore volume (specific yield) to the Super Shallow Zone (approximately 5 percent average porosity estimated from the Super Shallow Zone [SRF] neutron porosity borehole geophysical logging results – **Appendix B**)

= Average Conditions (over a 25-day period) = 180,280 gallons

= Storm Conditions (over the 3-day storm period) = 136,210 gallons

Note that runoff and evapotranspiration are estimated to be approximately 67 percent from the calibrated numerical flow model with a total annual average precipitation of 42.2 inches. Larger precipitation events over a relatively shorter period of time were estimated to increase the runoff to 77 percent. Evapotranspiration for the area was assumed to be zero due to removal of most vegetation and short duration of the study.

Net Discharge: The groundwater volumetric discharge within the Sequence 4 eastern valley was calculated from the following variables:

- Lateral groundwater flux calculation based on Darcy's Law:
  - Linear distance along the Sequence 4 eastern valley ridge trace (south, east, and north sides);
  - Average values used for the individual zone hydraulic conductivity (**Table 3-2**);
  - Super Shallow Zone and Intermediate Zone thickness estimated from the water column height at each corresponding well or as a saturated thickness if the water column height was less than the fractured zone thickness;
  - Shallow Zone estimated by the zone thickness;
  - The area at boring 2102 was not saturated within the Super Shallow Zone, which is likely due to installation of a gravel blanket in the eastern valley of Sequence 4 that locally intercepts the SS zone in the area and therefore was not included in the lateral flux calculation for that zone;
  - Horizontal hydraulic gradient:
    - Average condition ranges from 0.036 to 0.050 from calibrated numerical flow model Sequence 4 upland area (Arcadis 2019; Figure 3-12 – Model Layer 1 simulated groundwater contours);
    - Storm condition average estimate of 0.109, 0.052, and 0.018 for the Super Shallow Zone, Shallow Zone, and Intermediate Zone, respectively, based on groundwater levels and base of the zone projected at the Sequence 4 eastern valley wall (**Figure 3-8**);
  - Groundwater levels for the 25-day period from August 9, 2021 to September 2, 2021 (**Figure 3-4**);

  = Average Conditions (25 day period) =

  Lateral Flux (using 0.036 to 0.05 horizontal hydraulic gradient) =

  202,518 to 281,275 gallons

  = Storm Conditions (3 day period) =

  Lateral Flux (estimated using average individual zone horizontal hydraulic gradients) =

  281,275 gallons

- Vertical groundwater flux calculation based on Darcy's Law for deeper groundwater losses from the intermediate zone to the deep zone:
  - Recharge surface area (6.9 acres, or 301,593 square feet [ft^2]) shown on **Figure 3-8**;
  - Calibrated numerical groundwater flow model vertical hydraulic conductivity for Sequence 4 area; and
  - Groundwater levels for the 25-day period from August 9, 2021 to September 2, 2021 (**Figure 3-4**).

= Average Conditions (25 day period) =

4,371 gallons

= Storm Conditions (3 day period) =

525 gallons

General Net Balance for Average Conditions:

= Direct Recharge – (Lateral Flux + Vertical Flux)

= 180,280 gal – (202,518 gal + 4,371 gal) to 180,280 gal – (281,275 gal + 4,371 gal)

= -26,609 gallons to -105,366 gallons

General Net Balance for Storm Conditions:

= Direct Recharge – (Lateral Flux + Vertical Flux)

= 136,210 gal – (67,852 gal + 525 gal)

= 67,834 gallons

Under average conditions, the general water balance analysis suggests approximately 20,000 to 100,000 gallons more water discharging into the Sequence 4 eastern valley than being recharged over this time period of 25 days. This excess water in the imbalance is likely due to uncertainty and sensitive parameters such as direct recharge estimates and the horizontal hydraulic gradient estimates. However, the storm condition volume increases to an excess of recharge of nearly 70,000 gallons for a large storm over 3 days, which demonstrates the Sequence 4 area may receive short-term surpluses in recharge, contributing to increased flow and storage within the system.

The geochemistry evaluation suggested that the dominant type of water entering the Sequence 4 area is groundwater seepage coming from the Super Shallow and Shallow Zones, except for the Super Shallow Zone that is not saturated at boring 2102 (likely drained by the gravel blanket) and Shallow Zone at MW-2103s. The short-term surplus in water during storm events, which contribute to increased flow in these seepage areas and likely accumulates and builds excess pressure under the subgrade and liner, forming the liner bubbles. The groundwater system after the short-term events will eventually attenuate back to average conditions; however, the liner bubble water may not fully recede (drain) unless construction changes alleviate the excess flow and pressure. This has been observed when the liner bubbles were drained in June 2020 and re-accumulated over 2 to 3 months.

The groundwater underdrain system flow rates were measured from the underdrain outfall into the north valley mouth sedimentation pond periodically during the 25-day period by AEP staff with a bucket or by visual estimates when the flow rate was too high to measure with a bucket. The higher flow rates have less certainty due to the inability to use a direct measurement method. The underdrain flow rates as shown on **Figure 3-9** range from less than 10 gpm under average conditions to more than 100 gpm during storm conditions. The flow rates represent single instantaneous measurements beyond the eastern valley study area for all of the Sequence 4 area and some of the Sequence 5 area. Uncertainty in the variation of flow during the 25-day period and allocation of flow specific to the eastern valley limits the comparison of flow with the short-term excess recharge estimated above. However, the general water balance suggests there can be an excess of 70,000 gallons over short-term storm events, which confirms that excess groundwater discharge is the likely cause of the induced stress to the currently designed groundwater underdrain system by the formation of the liner bubbles.

Another limitation to the water balance analysis described above beyond some uncertainty with the calculation parameters is the short duration of data collection. A longer-term data set is available at MW-8 (ss), and the

resulting hydrograph is shown as **Figure 3-10**. The long-term hydrograph is also plotted along with precipitation from May 2018 to September 2021. As shown, the variation in groundwater elevation is apparent, with the highest consistent groundwater elevations occurring during late 2019 through mid-2020 and a general rise in groundwater elevation using the polynomial fit within the Super Shallow Zone of approximately 5 feet to a groundwater elevation of near 924 feet amsl. During early 2020, peak responses to storm events reached an order of 10 feet. Recall above that the storm event calculation resulted in nearly triple the amount of available groundwater compared to average conditions with an average rise in groundwater levels of approximately 2 feet within the Super Shallow Zone. At MW-8, the groundwater level increased from an approximate groundwater elevation of 917.5 feet amsl to 924 feet amsl, resulting in approximately 6.5 feet of rise in water level. Based on these observations from the MW-8 long-term hydrograph, there have been other larger and longer duration precipitation events that have occurred outside of this short-term study and have likely resulted in recharge exceeding discharge as high or higher than the 3-day storm event presented above.

4 Revised Hydrogeologic Conceptual Site Model and Liner Bubble Implications

The data gap investigation provided essential data that were used to meet the project objectives for the Sequence 4 eastern valley area. The data detailed the bedrock stratigraphy and identified bedding plane bedrock fracture zones. The following key observations are considered significant revisions to update the original hydrogeologic CSM:

1. Bedrock type was verified with alternating sedimentary sequences of relatively flat lying sandstones and shale units.
2. Additional stratigraphic driven fracture zones (hydrostratigraphic zones) were identified at depth below and within shale units separated by competent sandstone units.
3. The original defined and characteristic SRF system is the dominant system for groundwater flow and defined by the Super Shallow Zone on the ridges (upland areas).
4. The hydrostratigraphic zones occurring below the Super Shallow Zone (SRF) represent weak areas of rock that most readily provide preferential horizontal groundwater flow as discreet horizontal features (shallow and intermediate zones) towards the valley walls and SRF system.
5. The preferential horizontal groundwater flow is stratigraphic driven and likely produces seeps along the slopes of the valley walls with the flow rates of those seeps directly related by the available recharge.
6. Limited and deeper groundwater was identified as the Deep Zone to assist in identifying the vertical flow components outside the ridge to valley SRF groundwater flow system.
7. Upland groundwater levels surrounding Sequence 4 and other areas surrounding the FGD Landfill, are defined by discreet hydrostratigraphic zones with the shallowest zone representing the SRF. Groundwater is isolated within the zones and upland vertical flow is limited with strong vertical hydraulic gradients ranging from 0.7 to 1.9 ft/ft between the Super Shallow, Shallow, Intermediate, and Deep Zones.
8. Horizontal hydraulic conductivity estimates in all hydrostratigraphic zones were generally low (10^{-2} to 10^{-3} ft/day). However, some zones were identified that exhibited higher estimated hydraulic conductivity values, particularly at Super Shallow Zone wells MW-2101ss (0.3 to 23 ft/day) and MW-8 (0.5 ft/day), Shallow Zone wells MW-2101s (5.7 to 8.2 ft/day) and MW-2102s (0.8 ft/day), and Intermediate Zone well MW-2101i (0.6 ft/day). Groundwater flow rates are likely higher at the zones with highest hydraulic conductivity estimates. Average hydraulic conductivity estimates decrease with depth. The highest average hydraulic conductivity was in the Super Shallow Zone or SRF (5.9 ft/day).

9. Geochemistry analysis of groundwater and liner bubbles suggests groundwater as the source of water to the liner bubbles with dominant flow contribution from the Super Shallow and Shallow Zones and minor contribution from the Intermediate Zone.
10. Water balance calculations suggest that recharge exceeds discharge during storm events and contributes to the Sequence 4 eastern valley as seepage faces predominantly within the Super Shallow and Shallow Zones.
11. The quantitative estimate for excessive recharge was approximately 70,000 gallons during short-term large storm events on the order of 3 inches of total rainfall.
12. The excess discharge after storm events or seasonal fluctuations is a likely contributor to excess pressure head resulting in formation of the liner bubbles.
13. Modifications of the groundwater underdrain system and or other measures are required to reduce the excess groundwater occurrence for the Sequence 4 area.

5 Future Activities and Recommendations

The hydrogeologic evaluation presented above has provided the data to support corrective measures to mitigate excessive groundwater recharge to the Sequence 4 eastern valley. While the information provided by the data gap investigation resulted in significant updates to the CSM and provided the necessary data, there are limitations to the data evaluation based on parameter uncertainty and the short duration of the study. Further data collection is recommended to validate and refine the water balance as needed. Pressure transducers that are in place have been and are currently recording groundwater levels and, along with the Amos Plant precipitation data collection, can be used to further observe the Super Shallow, Shallow, Intermediate and/or Deep Zone seasonal fluctuations.

In addition, the understanding of flow rates from the groundwater underdrains and discharge piping was limited given the flow rate is quantified by using a bucket at lower flow rates (<40 gpm) or by visual estimate at higher flow rates greater than 40 gpm. Flow meter planning, specifications, and installation scoping was provided to potentially install an in pipe meter during this study at the discharge of the north valley groundwater underdrain. AEP elected to defer installation of the meter at this time, however it could be further considered for future installation. Photos of the end of the 1-foot diameter pipe discharge point at the sedimentation pond and product details and specifications for ADS Triton+ sensors are included in **Appendix I**. Confirmation that the existing underdrain laterals and header piping system in the eastern valley have the capacity to convey the existing and anticipated seeps without flow restrictions that would otherwise result in upward pressure along and at the base of the slope is recommended. The upper pressure from flow that it is not intercepted and without an overlying material to provide a confining stress will likely cause similar liner bubble issues by upward migration of water through the sub-base and compacted clay liner. A better understanding of underdrain flow rates during average and storm conditions could be improved with additional underdrain flow rate data. Additionally, increased underdrain flow rates are expected after underdrain corrective actions are implemented and a more robust underdrain flow rate data set will provide a baseline for comparison to flow rates after the Sequence 4 mitigation.

The resulting corrective actions will need to include a physical separation distance of 5 feet for the uppermost aquifer (SRF system) from top of the groundwater underdrain or associated gravel blanket to the base of the compacted clay liner to meet the CCR rule location restrictions. Some potential corrective measures that may be considered separately, or in combination, to mitigate the excessive flows causing the liner bubbles may include:

- The addition of supplemental underdrains in the Sequence 4 area to intercept the groundwater seepage likely preferential flow within the pre-construction drainage areas, and route to the underdrain system with the addition of access points to allow the underdrain to be monitored for free drainage conditions;

- The addition of a continuous drainage layer over portions of the Sequence 4 eastern valley to intercept the groundwater seepage and route the flow to the underdrain system with the addition of access points to allow the underdrain to be monitored for free drainage conditions;
- Increase the thickness of the sub-base and/or overlying liner system to establish the required separation thickness of 5-feet; or
- Re-assess the capacity needed of the 12 inch main underdrain discharge to manage the water within Sequence 4 and Sequence 5. Adjust discharge line size or add additional discharge pipes to sufficiently convey water stored in the underdrain and rock blanket, if necessary.
- Increase the thickness of the protective cover and maintenance of the cover to maintain a uniform normal load on the liner system to minimize the potential for upward migration of seeps to the underside of the geomembrane layer.
- A reduction of infiltration in upland recharge areas adjacent to the Sequence 4 area by increasing of vegetative cover, re-grading and re-directing storm water runoff, and considering placement of less pervious materials at the surface.

It is our understanding AEP intends to implement corrective measures in 2022 by removing and re-installing the eastern portion of Sequence 4 with additional rock blankets and re-positioned or additional underdrains. After the appropriate changes are implemented to meet the criteria and mitigate the excess flow causing the liner bubbles, the CCR location restriction report will be updated to reflect these changes and revisions to the hydrogeologic conceptual site model as appropriate.

The investigation activities in Sequence 4 have provided additional knowledge of hydrogeologic conditions that can be used to improve construction practices and ensure permit/regulation adherence. The hydrogeologic data that is currently being collected by instrumentation along with additional recommendations below can assist in the planning and design and construction effort of future sequences:

- Continued groundwater level collection using the installed pressure transducers and assessment is recommended to maintain a groundwater elevation database for use for verification of conditions related to season changes or site conditions changes (borrow, etc.) and proximal groundwater elevations at Sequence 6 (i.e., MW-9 and MW-2105 well cluster) for use in future construction design. Arcadis is prepared to maintain the database to include connection to the data and charts via online portal.
- Hydrogeologic reconnaissance and mapping prior to and during construction activities to identify areas of groundwater seepage along preferential pathways to assist in groundwater interceptor drain placement.
- Groundwater underdrain construction inspection and documentation prior to sub-base and liner emplacement is also recommended to verify and document as built conditions.

6 References

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Version Control

Revision No.	Date Issued	Revision Location	Description
0	10/8/2021		Draft Report
1	3/25/2022	All	Revised previous PZ references to “MW” in text, tables, figures, and appendices. Minor text revisions to improve grammar and clarity.
		Intro, Page 1, Fig 3-10	Revised dates of Sequence 4 liner bubble draining to August 2020 and re-appeared in September 2020
		Section 2.3, Page 5, App. A	Added sentence in text and referencing WVDEP well construction approval logs added in App. A-3.
		Section 3.1, Page 9, App G	Added discussion and aerial imagery related to former retention pond in SE corner of Sequence 4
		Section 5, Page 20	Added recommendation continued water level monitoring/transducers, construction inspection and documentation of as built corrective measures
		Tab 2-3	Renumbered to Table 2-4
		Tab 3-2	Renumbered to Table 2-3
		Tab 3-3	Renumbered to Table 3-2
		App B	Added Acoustic Televiewer Interpretation tables

Tables

Table 2-1
2021 Well Construction Details
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

ARCADIS

Boring or Monitoring Well ID	Surveyed Ground Surface Elevation (ft amsl) [c]	Stick-up Height (ft)	Surveyed Top of Casing Elevation (ft amsl) [c]	Northing [a]	Easting [a]	Boring Diameter [b] (inches)	Casing Diameter (inches)	Top of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft bgs)	Bottom of Screen (ft amsl)	Screen Length (ft)	Slot Size (slot)	Total Well Depth (ft bgs) [d]	Bottom of Borehole (ft bgs)	Bottom of Borehole (ft amsl)	Bottom of Grout Seal (ft bgs)	Bottom of Grout Seal (ft amsl)	Grout Seal Thickness (ft)	Bentonite Pellet Seal Thickness (ft)	Top of Secondary Sandpack (choker sand) (ft bgs)	Top of Secondary Sandpack (choker sand) (ft amsl)	Secondary Sandpack Thickness (choker sand) (ft)	Top of Primary Sandpack (ft bgs)	Top of Primary Sandpack (ft amsl)	Bottom of Sandpack (ft bgs)	Primary Sandpack Thickness (ft)
NQ Wireline Coring																												
MW-2101d	932.04	--	--	541732.909	1724951.574	3	--	--	--	--	--	--	--	--	144.5	788	--	--	--	--	--	--	--	--	--	--	--
MW-2102d	932.97	--	--	541942.346	1725328.869	3	--	--	--	--	--	--	--	--	134.6	798	--	--	--	--	--	--	--	--	--	--	--
MW-2103d	935.46	--	--	542191.177	1725406.308	3	--	--	--	--	--	--	--	--	134.6	801	--	--	--	--	--	--	--	--	--	--	--
MW-2104	931.21	--	--	542356.375	1725041.563	3	--	--	--	--	--	--	--	--	134.6	--	--	--	--	--	--	--	--	--	--	--	--
MW-2105d	991.72	--	--	543825.103	1725192.735	3	--	--	--	--	--	--	--	--	194.5	797	--	--	--	--	--	--	--	--	--	--	--
MW-2106	722.64	--	--	542837.390	1722861.693	3	--	--	--	--	--	--	--	--	104.6	618	--	--	--	--	--	--	--	--	--	--	--
TOTALS															**847**												
Air Rotary Drilling and Well Construction																											
MW-2101ss	931.95	2.80	934.75	541737.317	1724959.605	6	2	19.61	912.34	29.61	902.34	10	20	29.61	30.00	901.95	11.00	920.95	11.00	3	14.00	917.95	1	15.00	916.95	30.00	15
MW-2101s	931.95	2.86	934.80	541735.055	1724955.370	6	2	42.92	889.03	57.92	874.03	15	20	57.92	58.00	873.95	34.00	897.95	34.00	3	37.00	894.95	1	38.00	893.95	58.00	20
MW-2101i & MW-2101d (nested; top of protector)	931.97		935.60	541732.909	1724951.574	8	--		--	--	--	--	--	--	104.00	827.97	--	--	--	--	--	--	--	--	--	--	--
MW-2101i	931.97	2.73	934.70	541732.925	1724951.709	--	2	61.03	870.94	76.03	855.94	15	20	76.03	--	--	54.00	877.97	54.00	3	57.00	874.97	1	58.00	873.97	77.00	19
MW-2101d	931.97	2.71	934.68	541732.940	1724951.431	--	2	93.09	838.88	103.09	828.88	10	20	103.09	--	--	--	--	--	10	87.00	844.97	1	88.00	843.97	104.00	16
MW-2102s	933.09	2.97	936.06	541946.401	1725330.822	6	2	43.76	889.33	58.76	874.33	15	20	58.76	59.00	874.09	35.00	898.09	35.00	3	38.00	895.09	1	39.00	894.09	59.00	20
MW-2102i & MW-2102d (nested; top of protector)	933.08		936.73	541942.346	1725328.869	8	--		--	--	--	--	--	--	108.00	825.08	--	--	--	--	--	--	--	--	--	--	--
MW-2102i	933.08	2.90	935.98	541942.229	1725328.854	--	2	63.71	869.37	78.71	854.37	15	20	78.71	--	--	56.00	877.08	56.00	3	59.00	874.08	1	60.00	873.08	81.00	21
MW-2102d	933.08	2.89	935.97	541942.502	1725328.918	--	2	98.86	834.22	108.86	824.22	10	20	108.86	--	--	--	--	--	10	91.00	842.08	1	92.00	841.08	108.00	16
MW-2103s & MW-2103i (nested; top of protector)	935.58		938.55	542191.177	1725406.308	8	--		--	--	--	--	--	--	84.00	851.58	--	--	--	--	--	--	--	--	--	--	--
MW-2103s	935.58	2.47	938.04	542191.081	1725406.396	--	2	48.99	886.59	58.99	876.59	10	20	58.99	--	--	40.00	895.58	40.00	3	43.00	892.58	1	44.00	891.58	59.00	15
MW-2103i	935.58	2.45	938.02	542191.227	1725406.229	--	2	67.65	867.93	82.65	852.93	15	20	82.65	--	--	--	--	--	5	64.00	871.58	1	65.00	870.58	84.00	19
MW-2105ss & MW-2105s (nested; top of protector)	991.81		995.10	543830.171	1725193.696	8	--		--	--	--	--	--	--	110.00	881.81	--	--	--	--	--	--	--	--	--	--	--
MW-2105ss	991.81	2.78	994.59	543830.308	1725193.601	--	2	61.92	929.89	76.92	914.89	15	20	76.92	--	--	53.00	938.81	53.00	3	56.00	935.81	1	57.00	934.81	80.00	23
MW-2105s	991.81	2.69	994.49	543830.133	1725193.619	--	2	98.90	892.91	108.90	882.91	10	20	108.90	--	--	--	--	--	13	93.00	898.81	1	94.00	897.81	110.00	16
MW-2105i & MW-2105d (nested; top of protector)	991.91		995.23	543825.103	1725192.735	8	--		--	--	--	--	--	--	184.00	807.91	--	--	--	--	--	--	--	--	--	--	--
MW-2105i	991.91	2.69	994.60	543824.997	1725192.683	--	2	121.15	870.76	141.15	850.76	20	20	141.15	--	--	112.00	879.91	112.00	3	115.00	876.91	1	116.00	875.91	142.00	26
MW-2105d	991.91	2.89	994.80	543825.180	1725192.750	--	2	168.28	823.63	183.28	808.63	15	20	183.28	--	--	--	--	--	20	162.00	829.91	1	163.00	828.91	184.00	21
MW-2106	722.66	2.94	725.60	542837.390	1722861.693	6	2	37.66	685.00	57.66	665.00	20	20	57.66	59.00	663.66	29.00	693.66	29.00	3	32.00	690.66	1	33.00	689.66	59.00	26
TOTALS												**185**		**1193**	**766**				**413**	**82**			**13**				**258**

NOTES:
[a] 1983 West Virginia South State Planar Coordinates. Surveyed on 7/26/2021.
[b] Air rotary borehole bit diameter assumed to be slightly less than 6 inches or 8 inches to drive within the 6-inch to 8-inch surface casing.
[c] Vertical datum is based on NAVD88. Surveyed on 7/26/2021.
[d] Total well depth based on field measurement with weighted tag line.
ft = feet
bgs = below ground surface
amsl = above mean sea level
NA = not applicable
NAVD88 = North American Vertical Datum of 1988

Table 2-2
2021 Well Development Summary
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Monitoring Well ID	Date	Depth to Bottom (ft btoc)	Depth to Water (ft-btoc)	Well Volume (gallons) *use Calculator Tab	3x Well Volume (gallons)	10x Well Volume (gallons)	Minimum Volume if Purged Dry (gallons)	Minimum Volume if not Purged Dry (gallons)	Volume Removed (as of 9/3/2021)	Volume Remaining (as of 9/3/2021)	Method	Water Volume Removed (gallons)	Purged Dry? (Y/N)	Turbidity (NTU)	Clarity/ Appearance	Well Flush Date	Volume Jetted (Gallons)	Estimated Volume Return to Surface	Volume Recovered/ Pumped (Gallons)	Net Volume Removed after Jetting (gallons)	Turbidity/ Clarity	Well Stable (Y/N)	Well Dry (Y/N)	Comments
MW-2101ss	7/20/2021	32.41	19.95	7.1	21	71	21	71	244	NA	Bladder Pump	62.6	N	336	Mod. Turbidity									Pumped at 1.8 L/min, approx 0.5 ft drawdown
	7/21/2021	32.41	20.08								Bladder Pump	181.65	N	2.5	Clear									
											Subtotal volume removed during purging:	**244.25**						**Subtotal volume removed during jetting:**		**0**				
MW-2101s	7/20/2021	60.70	38.6	11.8	35	118	35	118	228	NA	Bladder Pump	100.76	N	589	Mod. Turbidity									Compressor ran out of gas, surge well using pump, turbidity decreasing.
	7/21/2021	60.70	38.05								Bladder Pump	127.34	N	0.6	Clear									Pumped at 2 L/min, approx 0.6 ft drawdown, good yield.
											Subtotal volume removed during purging:	**228.1**						**Subtotal volume removed during jetting:**		**0**				
MW-2101i	7/20/2021	78.76	56.64	18.3	55	183	55	183	44	10.5	Bladder Pump	3.04	Y	>1000	V. Turbid									
	7/21/2021	78.76	57.05								Submersible	15.38	Y	>1000	V. Turbid									pumped at 1 L/min, removwd 15 gallons each time, well fully recovers in 24-hr. turb > 1000.
	7/26/2021	78.76	58.06													7/26/2021	60	47.4	22.19	9.59	>1000	N	Y	60 gal - [78.76 ft x 0.16 gal/ft = 12.6 gal] = 47.4 gal returned to surface, 12.6 gal remaining in casing.
	7/29/2021										Bladder Pump	10				7/29/2021	12.6	0	19	6.4	>1000	N	Y	Filled casing with water, redeveloped, turbidity decreasing but increases as screen dewatered, 1200 ml/min. Developed by AEP, no well development log generated.
											Subtotal volume removed during purging:	**28.42**						**Subtotal volume removed during jetting:**		**15.99**				
MW-2101d	7/20/2021	105.8	105.47	1.0	3	10	3	10	48	NA	--	--	--	--	--									No development activities performed due to low well volume (0.33 ft water column). No well development log generated.
	7/26/2021	105.8	105.42													7/26/2021	60	55	33.55	28.55	>1000	N	Y	
	7/29/2021										Bladder Pump	10	Y	>1000	V. Turbid	7/29/2021	16.9	0	22	5.1	>1000	N	Y	Filled casing with water, redeveloped, turbidity decreasing but increases as screen dewatered, 1200 ml/min. Developed by AEP, no well development log generated.
	9/1/2021	105.8	100.37								Inertia Pump	4	Y	>1000	V. Turbid									
											Subtotal volume removed during purging:	**14**						**Subtotal volume removed during jetting:**		**33.65**				
MW-2102s	7/22/2021	61.73	41.2	11.5	34	115	34	115	57	NA	Bladder Pump	3.83	Y	>1000	V. Turbid									
	7/28/2021	61.73	41.28													7/28/2021	10	0	14.6	4.6	>1000	N	Y	Pumping rate 2400 ml/min, Filled casing, redeveloped, turbidity decreasing.
	7/28/2021	61.73	46.94													7/28/2021	10	0	22.8	12.8	>1000	N	Y	Pumping rate 2400 ml/min. Filled casing, redeveloped, turbidity decreasing, until well screen dewatered, then turbidity increases
	8/4/2021	61.73	41.12								Submersible	22.19	Y	875	Mod. Turbidity									
	8/31/2021	61.7	41.24								Inertia Pump	14	Y	>1000	V. Turbid									
											Subtotal volume removed during purging:	**40.02**						**Subtotal volume removed during jetting:**		**17.4**				
MW-2102i	7/19/2021	81.61	47.23	21.8	65	218	65	218	39	27	Bladder Pump	9.12	Y	>1000	V. Turbid									
	7/20/2021	81.61	73.14	9.3	28	93	28	93	39	NA	Bladder Pump	1.38	Y	>1000	V. Turbid									Re-calculated well volume based on more representative static water level
	7/22/2021	81.61	74.64								Bladder Pump	3.5	Y	>1000	V. Turbid									
	7/28/2021	81.61	74.81													7/28/2021	13	0	13.5	0.5	>1000	N	Y	Filled casing with water, redeveloped, turbidity decreasing
																7/28/2021	13	0	14	1	>1000	N	Y	Turbidity increases as screen dewatered.
																7/28/2021	10	0	11.8	1.8	>1000	N	Y	Turbidity increases as screen dewatered.
																7/28/2021	13	0	14.3	1.3	>1000	N	Y	Decreased pumping rate to 1200 ml/min. Turbidity deceasing visually, until well screen dewatered, turbidity increases to >1000.
	8/4/2021	81.61	78.38	insufficient volume to purge																				
	8/31/2021	80.7	78.99								Inertia Pump	0.75	Y	>1000	V. Turbid									
	9/2/2021	78.78	55.09								Inertia Pump	19.2	Y	>1000	V. Turbid									
											Subtotal volume removed during purging:	**33.95**						**Subtotal volume removed during jetting:**		**4.6**				
MW-2102d	7/19/2021	111.35	58.02	21.2	64	212	64	212	35	29	Bladder Pump	17.26	Y	363	Mod. Turbidity									
	7/20/2021	111.35	103.58	6.6	20	66	20	66	35	NA	Bladder Pump	3	Y	>1000	V. Turbid									Re-calculated well volume based on more representative static water level
	7/28/2021	111.35	102.54													7/28/2021	18	0	21.13	3.13	>1000	N	Y	Filled casing with water, redeveloped, turbidity decreasing visually, still >1000.
																7/28/2021	18	0	24.57	6.57	>1000	N	Y	Turbidity increases as screen dewatered.
	8/6/2021	111.35	105.94								Submersible	0.25	Y	>1000	V. Turbid									Insufficient water in well casing, to discharge to surface (tubing 0.25 gal / 10 ft)
	8/31/2021	110.7	103.9								Inertia Pump	4.5	Y	>1000	V. Turbid									
											Subtotal volume removed during purging:	**25.01**						**Subtotal volume removed during jetting:**		**9.7**				
MW-2103s	7/22/2021	61.46	dry	0.0	0	0	0	0	17	NA	--	--	--	--	--									No development activities performed due to dry well. No well development log generated.
	7/28/2021	61.46	45.92													7/28/2021	10	0	11.41	1.41	248	N	Y	Filled casing with water, redeveloped, turbidity decreasing
																7/28/2021	10	0	14.4	4.4	380	N	Y	Filled casing with water, redevloped, turbidity decreasing. (1600 ml/min x 34 min 14.4 gal) Total vol calculator in Fulcom incorrect.
	8/5/2021	61.46	53.03								Submersible	6.34	Y	306	Mod. Turbidity									
	8/31/2021	60.85	54								Inertia Pump	4.5	Y	>1000	V. Turbid									
											Subtotal volume removed during purging:	**10.84**						**Subtotal volume removed during jetting:**		**5.81**				
MW-2103i	7/22/2021	85.1	61.85	18.5	55	185	55	185	53	2	Bladder Pump	22.29	Y	>1000	V. Turbid									
	7/28/2021	85	46.38													7/28/2021	15	0	21.4	6.4	325	N	Y	Filled casing with water, redevloped, turbidity decreasing. Turbidity >1000 as screen dewatered.
																7/28/2021	15	0	28.7	13.7	421	N	Y	Turbidity increases to >1000 as screen dewatered.
	8/5/2021	85.1	77.17								Submersible	6.34	Y	722	Mod. Turbidity									
	8/6/2021	85.1	82.75								Submersible	4	Y	638	Mod. Turbidity									
	8/31/2021	85.4	82.25								Inertia Pump	0.5	Y	--	--									
											Subtotal volume removed during purging:	**33.13**						**Subtotal volume removed during jetting:**		**20.1**				
MW-2105ss	7/22/2021	79.7	79.57	2.4	7	24	7	24	8	NA	--	--	--	--	--									No development activities performed due to low well volume (0.13 ft water column). No well development log generated.
	7/28/2021	79.9	20.12													7/28/2021	13	0	15.8	2.8	650	N	Y	Filled casing with water, redeveloped, turbidity decreasing
	8/31/2021	79.7	71.31								Inertia Pump	5	Y	>1000	V. Turbid									
	9/3/2021	79.7	79.5								Inertia Pump	0.03	Y	>1000	V. Turbid									
											Subtotal volume removed during purging:	**5.03**						**Subtotal volume removed during jetting:**		**2.8**				
MW-2105s	7/20/2021	111.58	109.31	2.9	9	29	9	29	14	NA	Submersible	1.66	Y	>1000	V. Turbid									
	7/28/2021	111.58	44.72													7/28/2021	18	0	26.21	8.21	840	N	Y	Filled casing with water, redevloped, turbidity decreasing.
	8/5/2021	111.58	105.57								Submersible	2.5	Y	>1000	V. Turbid									
	8/30/2021	113	108.21								Inertia Pump	1.75	Y	>1000	V. Turbid									
											Subtotal volume removed during purging:	**5.91**						**Subtotal volume removed during jetting:**		**8.21**				
MW-2105i	7/20/2021	143.84	141.33	2.9	9	29	9	29	28	NA	Submersible	0.66	Y	>1000	V. Turbid									
	7/27/2021	143.84	137.84													7/27/2021	25	0	30.8	5.8	>1000	N	Y	
	7/27/2021	143.84	138.84													7/27/2021	25	0	32.55	7.55	>1000	N	Y	Filled casing with water, redevloped.Turbidity clearing
	7/28/2021	143.84	113.81													7/28/2021	25	0	30.85	5.85	>1000	N	Y	Filled casing with water, redevloped, turbidity decreasing.
	8/30/2021	144.5	129.38								Inertia Pump	8	Y	>1000	V. Turbid									
						0.32																		
											Subtotal volume removed during purging:	**8.66**						**Subtotal volume removed during jetting:**		**19.2**				
MW-2105d	7/20/2021	186.17	179.11	6.9	21	69	21	69	24	NA	Submersible	5.78	Y	>1000	V. Turbid									
	7/27/2021	186.17	10.35													7/27/2021	30	0	30.46	0.46	>1000	N	Y	Fillled casing with water, then redeveloped surged well,
	7/27/2021	186.17	10.35													7/27/2021	35	0	46.73	11.73	>1000	N	Y	Fillled casing with water, then redeveloped surged well,
	7/28/2021	186.17	82.18													7/28/2021	30	0	36.35	6.35	>1000	N	Y	Filled casing with water, surged well, then redeveloped
	8/30/2021	188	180.55								Inertia Pump	0.1	Y	>1000	V. Turbid									
											Subtotal volume removed during purging:	**5.88**						**Subtotal volume removed during jetting:**		**18.54**				
MW-2106	7/21/2021	57.6	16.86	17.2	52	172	52	172	44	7	Bladder Pump	10.96	Y	>1000	V. Turbid									
	7/27/2021	60.6	10.55													7/27/2021	120	110.3	13.29	3.59	>1000	N	Y	removed 3-ft of sediment in bottom of well casing. 60.60 TD x 0.16 gal/ft = 9.7 gal in casing - 120 gal flushed = 110.3 returned to surface
	7/29/2021	60.7	53.1													7/29/2021	10	0	15	5	500	N	Y	filled casing with 10 gallons, redeveloped, turbidity decreasing. Developed by AEP, no well development log generated.
																7/29/2021	10	0	15	5	300	N	Y	filled casing with 10 gallons, redeveloped, turbidity decreasing. Developed by AEP, no well development log generated.
																7/29/2021	10	0	15	5	100	N	Y	filled casing with 10 gallons, redeveloped, turbidity decreasing, but increases as screen dewatered. Developed by AEP, no well development log generated.
	8/5/2021	60.6	37.84								Submersible	13.48	Y	486	Mod. Turbidity									
	8/6/2021	60.7	54.66								Submersible	1.25	Y	>1000	V. Turbid									
											Subtotal volume removed during purging:	**25.69**						**Subtotal volume removed during jetting:**		**18.59**				

NOTES:

Minimum purge volume is whichever is greater; 2x the volume of water introduced during drilling or 3x/10x the calculated well volume

If the well can be purged dry, 3x the well volume is the minimum target volume (unless 2x the volume of water introduced is greater)

If the well cannot be purged dry, 10x the well volume is the required minimum volume under west virginia law (unless 2x the volume of water introduced is greater)

ft = feet

bgs = below ground surface

amsl = above mean sea level

-- = not applicable

Table 2-3
Summary of Geochemistry Analytical Data
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent Unit of Measurement			Alkalinity, as CaCO3 mg/L	pH standard units	Specific Conductance µmho/cm	Calcium, Ca (dissolved) mg/L	Barium, Ba (dissolved) µg/L	Potassium, K (dissolved) mg/L	Magnesium, Mg (dissolved) mg/L	Lithium, Li (dissolved) mg/L	Sodium, Na (dissolved) mg/L	Barium, Ba (total) µg/L	Lithium, Li (total) mg/L	Fluoride, F mg/L	Total Dissolved Solids mg/L	Total Suspended Solids mg/L	Sulfate, SO4 mg/L
Sample ID	Date	Lab Sample ID															
MW-8	8/31/2021	215633-011	358	6.9	853	--	--	--	--	--	--	--	--	0.2	530	22.5	73.7
	8/31/2021	215633-011-01	--	--	--	98.3	129	2.5	25.1	0.00729	51.9	--	--	--	--	--	--
MW-1802	8/30/2021	215633-007	416	8.83	809	--	--	--	--	--	--	--	--	4.79	500	4.3 P1	18.6
	8/30/2021	215633-007-01	--	--	--	1	13.8	0.8 J1	0.16	0.00737	197	--	--	--	--	--	--
MW-2101ss	9/1/2021	215633-006	207	6.7	672	--	--	--	--	--	--	--	--	0.15	420	7	73.6
	9/1/2021	215633-006-01	--	--	--	90.1	85.1	2.8	18	0.00835	19.1	--	--	--	--	--	--
MW-2101s	9/1/2021	215633-004	240	6.99	714	--	--	--	--	--	--	--	--	0.2	490	<0.2 U1	108
	9/1/2021	215633-004-01	--	--	--	102	110	5.1	28.5	0.0113	20.3	--	--	--	--	--	--
MW-2102s	9/1/2021	215633-012	304	6.84	737	--	--	--	--	--	--	--	--	0.13 J1	430	1.6	32.9
	9/1/2021	215633-012-01	--	--	--	70.1	399	3.3	22.2	0.0113	52.7	--	--	--	--	--	--
MW-2103s	9/2/2021	215633-008	217	7.77	1500	--	--	--	--	--	--	--	--	0.86	980	14.8	372
	9/2/2021	215633-008-01	--	--	--	27.3	136	2.7	6.31	0.01	260	--	--	--	--	--	--
MW-2103i	9/2/2021	215633-013	236	7.9	1440	--	--	--	--	--	--	--	--	1.04	970	2650	382
	9/2/2021	215633-013-01	--	--	--	17.2	131	3	3.8	0.0111	272	--	--	--	--	--	--
MW-2106	8/31/2021	NA	--	--	1140	--	--	--	--	--	--	--	--	--	--	--	--
	9/2/2021	215633-003	581	8.96	--	--	--	--	--	--	--	--	--	7.1	950	153	64.3
	9/2/2021	215633-003-01	--	--	--	3	68.7	2.5	1.09	0.0168	280	--	--	--	--	--	--
Plateau Pond	1/23/2020	200246-005	--	--	--	--	--	--	--	--	--	47	0.00361	0.32	366	--	153
	9/3/2021	215633-010	89	7.17 H1	272	--	--	--	--	--	--	--	--	1.01	160	<0.2 U1	30.2
	9/3/2021	215633-010-01	--	--	--	30.5	77.7	5.6	9.71	5.6	0.00518	--	--	--	--	--	--
Liner Bubble 1	1/23/2020	200246-001	--	--	--	--	--	--	--	--	--	126	0.00836	0.25	782	144	112
Liner Bubble 2	1/23/2020	200246-003	--	--	--	--	--	--	--	--	--	124	0.00847	0.25	748	155	116
Liner Bubble NE	9/2/2021	215633-005	418	6.86 H1	910	--	--	--	--	--	--	--	--	0.25	570	13.9	65.9
	9/2/2021	215633-005-01	--	--	--	126	92.1	1.8	32.7	28.6	0.00363	--	--	--	--	--	--
Liner Bubble SE	9/2/2021	215633-002	295	6.82 H1	683	--	--	--	--	--	--	--	--	0.6	430	8.7	84
	9/2/2021	215633-002-01	--	--	--	97.4	83.9	2.4	20.1	23.1	0.00513	--	--	--	--	--	--
North Valley Underdrain	1/23/2020	200246-010	--	--	--	--	--	--	--	--	--	47.4	0.00126	0.13	268	--	56.1
	9/2/2021	215633-001	162	6.4 H1	368	--	--	--	--	--	--	--	--	0.15	230	10.1	29.4
	9/2/2021	215633-001-01	--	--	--	48.2	58.7	2.6	13	9.4	0.0012	--	--	--	--	--	--
East Chimney	9/2/2021	215633-014	210	7.58 H1	3330	--	--	--	--	--	--	--	--	10.5	11800	103000 S2	2180
	9/2/2021	215633-014-01	--	--	--	554	43.7	13.2	196	0.0929	22.5	--	--	--	--	--	--
West Chimney	9/2/2021	215633-009	59	8.15 H1	434	--	--	--	--	--	--	--	--	13.6	4100	39.9	2660
	9/2/2021	215633-009-01	--	--	--	543	22.8	11.5	303	24.1	0.0535	--	--	--	--	--	--

NOTES:
mg/L = milligrams per liter
µg/L = micrograms per liter
µmho/cm = micromhos per centimeter
-- = not analyzed
< = not detected above Reporting Limit
NA = not available
H1 = Sample was received past holding time.
J1 = Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
S2 = Residue weight is above the method criteria but was already analyzed with the highest dilution factor.
U1 = Not detected at or above method detection limit (MDL).

Table 2-4
Water Level Data
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Boring or Monitoring Well ID	Surveyed Top of Casing Elevation (ft amsl) [a]	8/9/2021		8/10/2021		8/12/2021		8/13/2021		9/2/2021		9/3/2021	
		DTW (ft btoc)	GW Elev (ft amsl)	DTW (ft btoc)	GW Elev (ft amsl)	DTW (ft btoc)	GW Elev (ft amsl)	DTW (ft btoc) [b]	GW Elev (ft amsl) [b]	DTW (ft btoc)	GW Elev (ft amsl)	DTW (ft btoc)	GW Elev (ft amsl)
MW-2101ss	934.75	20.61	914.14	20.63	914.12	--	--	20.66	914.09	19.90	914.85	--	--
MW-2101s	934.80	38.59	896.21	38.64	896.16	--	--	--	--	38.83	895.97	--	--
MW-2101i & MW-2101d (nested; top of protector)	935.60	--	--	--	--	--	--	--	--	--	--	--	--
MW-2101i	934.70	59.93	874.77	56.96	877.74	--	--	56.16	878.54	69.68	865.02	--	--
MW-2101d	934.68	104.06	830.62	104.03	830.65	--	--	104.01	830.67	104.62	830.06	--	--
MW-2102s	936.06	41.27	894.79	41.26	894.80	--	--	41.29	894.77	41.39	894.67	--	--
MW-2102i & MW-2102d (nested; top of protector)	936.73	--	--	--	--	--	--	--	--	--	--	--	--
MW-2102i	935.98	78.94	857.04	78.92	857.06	--	--	79.13	856.85	80.23	855.75	--	--
MW-2102d	935.97	105.68	830.29	105.59	830.38	--	--	105.87	830.10	107.96	828.01	--	--
MW-2103s & MW-2103i (nested; top of protector)	938.55	--	--	--	--	--	--	--	--	--	--	--	--
MW-2103s	938.04	57.15	880.89	56.98	881.06	--	--	56.86	881.18	--	--	58.90	879.14
MW-2103i	938.02	82.52	855.50	82.45	855.57	--	--	82.72	855.30	83.82	854.20	--	--
MW-2105ss & MW-2105s (nested; top of protector)	995.10	--	--	--	--	--	--	--	--	--	--	--	--
MW-2105ss	994.59	75.08	919.51	74.86	919.73	--	--	74.84	919.75	--	--	77.29	917.30
MW-2105s	994.49	107.68	886.81	107.57	886.92	--	--	107.93	886.56	--	--	110.10	884.39
MW-2105i & MW-2105d (nested; top of protector)	995.23	--	--	--	--	--	--	--	--	--	--	--	--
MW-2105i	994.60	135.96	858.64	135.52	859.08	135.23	859.37	--	--	--	--	136.91	857.69
MW-2105d	994.80	180.33	814.47	180.27	814.53	--	--	180.55	814.25	--	--	180.84	813.96
MW-2106	725.60	48.35	677.25	--	--	51.45	674.15	--	--	--	--	47.65	677.95

NOTES:
[a] Vertical datum is based on NAVD88. Surveyed on 7/26/2021.
[b] Shading indicates water level is not represntative of static conditions. Data was collected while well was recovering from well development activities.
amsl = above mean sea level
btoc = below top of casing
DTW = depth to water
Elev = elevation
ft = feet
GW = groundwater

Table 3-1
Summary of Hydraulic Testing Results
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Well ID	Screen Interval (ft bgs)	Effective Thickness (ft) [1]	Hydraulic Test Type	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)	Test Analytical Solution
Super Shallow Zone - unconfined						
MW-2101ss	19-29	7.75	Baildown Slug	23	8.0E-03	Bouwer and Rice
MW-2101ss	19-29	7.75	Pumping Test	0.3	1.1E-04	Robbins
MW-2105ss	61-76	4.84	Baildown Slug	1.1E-02	4.0E-06	Bouwer and Rice
MW-8	30-50	5.00	Pumping Test	0.5	1.8E-04	Robbins
			Average:	**5.9**	**2.1E-03**	
Shallow Zone - unconfined						
MW-2101s	42-57	7.50	Baildown Slug	8.2	2.9E-03	Bouwer and Rice
MW-2101s	42-57	7.50	Pumping Test	5.7	2.0E-03	Theis
MW-2102s	43-58	14.75	Baildown Slug	0.8	2.7E-04	Hyder et al.
MW-2103s	48-58	4.48	Baildown Slug	1.6E-02	5.8E-06	Bouwer and Rice
MW-2105s	98-108	4.01	Baildown Slug	9.6E-03	3.4E-06	Bouwer and Rice
			Average:	**3.0**	**1.0E-03**	
Intermediate Zone - confined						
MW-2101i	60-75	3.50	Baildown Slug	0.6	2.2E-04	Hyder et al.
MW-2102i	62-77	2.69	Baildown Slug	3.4E-03	1.2E-06	Bouwer and Rice
MW-2103i	67-82	2.65	Baildown Slug	4.8E-03	1.7E-06	Bouwer and Rice
			Average:	**0.2**	**7.4E-05**	
Deep Zone - confined						
MW-2102d	96-106		Baildown Slug	3.1E-03	1.1E-06	Bouwer and Rice

NOTES:

[1] Radial flow assumed with saturated thickness equal to water column height

bgs = below ground surface

cm/sec = centimeters per second

ft = feet

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Table 3-2
Sequence 4 Water Balance Summary
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

ARCADIS

SEQUENCE 4 RECHARGE COMPONENTS														
Reference	Reference Date	Start Date	End Date	Total Period (days or years)	Measured or Calculated	Rate (in/year)	Total (inches)	Average Percent	Recharge Area (square feet)	Volume[1] (cubic feet)	Volume[1] (gallons)	Volumetric Flow (gpd)	Volumetric Flow (gpm)	Notes
Total Precipitation (P)														
Annual Average, 2005-2006	September 2021	1/1/2005	12/31/2006	2 years	Measured	41.3	--	--	301,593	1,037,731	7,762,769	21,268	14.8	2005 to 2006 average measured precipitation at Yeager Airport, Charleston, WV
Sequence 4, 3 Week Data Collection	September 2021	8/9/2021	9/2/2021	25 days	Measured	--	5.43	--	301,593	136,471	1,020,873	40,835	28.4	Measured with onsite float gauge
Sequence 4, 3 Day Storm Event	September 2021	8/16/2021	8/18/2021	3 days	Measured	--	3.15	--	301,593	79,168	592,219	197,406	137.1	Measured with onsite float gauge
Direct Recharge (Rd)														
Numerical Groundwater Flow Model	May 2019	2005	2006	1 year	Calculated	14	--	--	301,593	351,859	2,632,085	7,211	5.0	Based on numerical groundwater flow model calibration; 34% of total precipitation recharges groundwater
Sequence 4, 3 Week Data Collection	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	1.50	--	301,593	37,692	281,953	11,278	7.8	Recharge at 34% if rain <0.75 inches per day[3]. Recharge at 23% if rain >0.75 inches per day[4].
Sequence 4, 3 Day Storm Event	September 2021	8/16/2021	8/18/2021	3 days	Calculated	--	0.72	--	301,593	18,096	135,364	45,121	31.3	Water Table Fluctuations Method[A]
SEQUENCE 4 DISCHARGE COMPONENTS														
Runoff (RO)														
Annual Average, 2005-2006	September 2021	1/1/2005	12/31/2006	2 years	Calculated	--	--	66%	--	685,873	5,130,685	--	--	Total precipitation minus direct recharge
Sequence 4, 3 Week Data Collection	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	72%	--	98,779	738,920	--	--	Total precipitation minus direct recharge
Sequence 4, 3 Day Storm Event	September 2021	8/16/2021	8/18/2021	3 days	Calculated	--	--	77%	--	61,073	456,855	--	--	Total precipitation minus direct recharge
Lateral Flux (LF) - Average Flow - hydraulic gradient = 0.036 ft/ft														
Super Shallow	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	--	--	--	--	1,960	1.4	Horizontal Darcy's equation[B]; cross sectional area (A) based on unit saturated thickness and lengths
Shallow	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	--	--	--	--	5,902	4.1	Horizontal Darcy's equation[B]; cross sectional area (A) based on stratigraphic unit thickness and lengths
Intermediate	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	--	--	--	--	239	0.2	Horizontal Darcy's equation[B]; cross sectional area (A) based on unit saturated thickness and lengths
Lateral Flux (LF) - Average Flow - hydraulic gradient = 0.05 ft/ft														
Super Shallow	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	--	--	--	--	2,722	1.9	Horizontal Darcy's equation[B]; cross sectional area (A) based on unit saturated thickness and lengths
Shallow	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	--	--	--	--	8,197	5.7	Horizontal Darcy's equation[B]; cross sectional area (A) based on stratigraphic unit thickness and lengths
Intermediate	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	--	--	--	--	332	0.2	Horizontal Darcy's equation[B]; cross sectional area (A) based on unit saturated thickness and lengths
Lateral Flux (LF) - Storm Flow - specific hydraulic gradient per zone														
Super Shallow	September 2021	8/16/2021	8/18/2021	3 days	Calculated	--	--	--	--	--	--	7,243	5.0	Horizontal Darcy's equationB; cross sectional area (A) based on unit saturated thickness and lengths
Shallow	September 2021	8/16/2021	8/18/2021	3 days	Calculated	--	--	--	--	--	--	15,005	10.4	Horizontal Darcy's equation[B]; cross sectional area (A) based on stratigraphic unit thickness and lengths
Intermediate	September 2021	8/16/2021	8/18/2021	3 days	Calculated	--	--	--	--	--	--	369	0.3	Horizontal Darcy's equation[B]; cross sectional area (A) based on unit saturated thickness and lengths
Vertical Flux (VF)														
Super Shallow to Shallow[5]	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	--	--	--	--	197	0.1	Vertical Darcy's equation[C]; based on average water levels
Shallow to Intermediate[5]	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	--	--	--	--	452	0.3	Vertical Darcy's equation[C]; based on average water levels
Intermediate to Deep	September 2021	8/9/2021	9/2/2021	25 days	Calculated	--	--	--	--	--	--	205	0.1	Vertical Darcy's equation[C]; based on average water levels

WATER BALANCE CALCULATION					
		Recharge	Discharge		Net (Rd-[LF+VF])
Reference	Total Period (days or years)	Direct Recharge (Rd) (gallons)	Lateral Flux (LF) (gallons)	Vertical Flux (VF) (gallons)	Volume[6] (gallons)
Average					
3 Week Study Period, hydraulic gradient = 0.036 ft/ft	25 days	180,280	202,518	5,126	-27,365
3 Week Study Period, hydraulic gradient = 0.05 ft/ft	25 days	180,280	281,275	5,126	-106,122
Storm					
FGD Landfill - Sequence 4 - Storm Event	3 days	135,364	67,852	615	66,897

NOTES:
[1] Volume for Recharge components calculated across 301,593 square feet.
[2] Corresponds to calibration period for numerical groundwater flow model.
[3] Recharge estimate corresponds to calibrated numerical groundwater flow model.
[4] Recharge estimate corresponds to storm event recharge calculations[A].
[5] Vertical flux between the super shallow, shallow, and intermediate zones are accounted for in the lateral flux calculations. Only vertical flux from the intermediate to deep zone is considered for discharge.
[6] Positive net volume indicates higher calculated precipitation recharge than lateral flux into Sequence 4.

REFERENCE FOR WATER TABLE FLUCTUATION AND APPLIED DARCY EQUATIONS:
Applied Hydrogeology of Fractured Rocks, 2nd Ed., Singhal and Gupta

FORMULAS:

A. Water Table Fluctuations Method

$$R_p = S_y h$$

S_y = specific yield (approximately effective porosity)
S_y = 0.03

h = weighted average rise in water table during precipitation event
h = 2 ft

B. Horizontal Darcy's equation

$$Q = K \frac{dh}{dx} A$$

K = horizontal hydraulic conductivity (from hydraulic testing)
K_{ss} = 0.3 to 0.5 ft/day (independent value used for each transect)
K_s = 1.6 x 10^{-2} to 7 ft/day (independent value used for each transect)
K_i = 3.4 x 10^{-3} to 0.6 ft/day (independent value used for each transect)

dh/dx = horizontal hydraulic gradient
$dh/dx_{ss,s,i}$ (average) = 0.036 to 0.05 ft/ft (from numerical groundwater flow model)
dh/dx_{ss} (storm) = 0.08 to 0.14 ft/ft (from maximum water level, 8/16 to 8/18)
dh/dx_s (storm) = 0.01 to 0.09 ft/ft (from maximum water level, 8/16 to 8/18)
dh/dx_i (storm) = 0.003 to 0.06 ft/ft (from maximum water level, 8/16 to 8/18)

A = cross sectional area of discharge face
A = zone length (L) x zone thickness (b)
L = 1600 ft (total approximate lateral distance of 4 transects around Sequence 4 valley)
b_{ss} (average) = 10.1 to 15.8 ft (based on water column height)
b_{ss} (storm) = 12.0 to 20.5 ft (based on water column height)
b_s (average/storm) = 5.5 to 7.0 ft (based on zone thickness)
b_i (average/storm) = 2.7 to 3.5 ft (based on water column height)

C. Vertical Darcy's equation

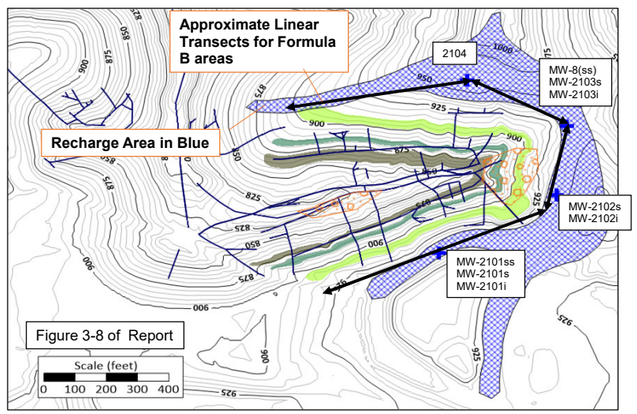
$$Q_v = \frac{k' \, dh A}{b'}$$

k' = vertical hydraulic conductivity (from 2019 numerical groundwater flow model)
k' = 5 x 10^{-5} ft/day

A = plan area of recharge area
A = 301,593 ft^2

dh = water level change between zones (based on average water levels, 8/9 to 9/3)
dh_{ss-s} = 28.52 ft
dh_{s-i} = 27.06 ft
dh_{i-d} = 36.81 ft

b' = vertical distance between zones (i.e., aquitard thickness)
b'_{ss-s} = 16.33 ft (based on geophysical logs)
b'_{s-i} = 6.75 ft (based on geophysical logs)
b'_{i-d} = 23.75 ft (based on geophysical logs)



Figures

WV Oil & Gas Well No. 079-00744
0521
MW-9
MW-10
SEEP2
MW-2105s
MW-2105ss
MW-2105d
MW-2105i
0522
0519
WV Oil & Gas Well No. 079-00703
Sedimentation Pond
North Valley
MW-1802
WV Oil & Gas Well No. 079-01531
MW-2106
SEEP1
0523
0524
Structural Fill Pond
Lick Run
2104
MW-8
MW-2103s
0512/0513
MW-2103i
MW-4
0525
MW-3RA
0517
MW-2102s
Leachate Pond (not in use)
0520
MW-5
0508
MW-3R
MW-2102i
0509
MW-3
MW-2102d
0511
WV Oil & Gas Well No. 079-00611
MW-2101d
Plateau Pond
WV Oil & Gas Well No. 079-01528
0505
MW-2101ss
South Valley
MW-2101s
0510
0504
MW-2101i
WV Oil & Gas Well No. 079-00722
0503
MW-6
0502
0501
0514
Sedimentation Pond
MW-7R
Gypsum Pond
Ash Pond System
Little Hurricane Creek
MW-1801
MW-7
MW-1
WV Oil & Gas Well No. 079-00733
WV Oil & Gas Well No. 079-00660
MW-2
0515
Leachate Pond
0507
0506
WV Oil & Gas Well No. 079-00018
Kanawha River
(stage elevation: ~565-583 ft amsl)

Legend

- Sequence Boundary
- CCR Unit Boundary
- Pond Boundary
- Approximate North-South Valley Divide
- Monitoring Well (gray if abandoned)
- Piezometer (gray if abandoned)
- Oil & Gas Well (gray if abandoned)
- Bedrock Investigation Boring
- Seep
- Rivers and Streams
- Streamflow Direction

0 850 1,700
SCALE IN FEET

NOTES:
1. 2021 AERIAL IMAGERY OBTAINED FROM WEST VIRGINIA GEOGRAPHIC INFORMATION SYSTEM TECHNICAL CENTER, COURTESY OF PUTNAM COUNTY, WEST VIRGINIA.
2. WELL COORDINATES SOURCE: GAI CONSULTANTS, MARCH 2006. CLASS F INDUSTRIAL LANDFILL FACILITY APPLICATION, JOHN E. AMOS LANDFILL.
3. WEST VIRGINIA 1983 STATE PLANAR COORDINATES.
4. MW-3 WAS ABANDONED AND REPLACED BY MW-3R; MW-3R WAS ABANDONED AND REPLACED BY MW-3RA.
5. MONITORING WELL MW-3R AND MW-3RA LOCATIONS ARE APPROXIMATE.
6. EXTENT OF CONSTRUCTION BASED ON AEP DRAWING "BLAST RADIUS FOR CELL 4.DWG".
7. TOPOGRAPHIC CONTOURS BASED ON AEP DRAWING "LAYERS FOR GIS 090718.DWG".
8. CCR = COAL COMBUSTION RESIDUAL

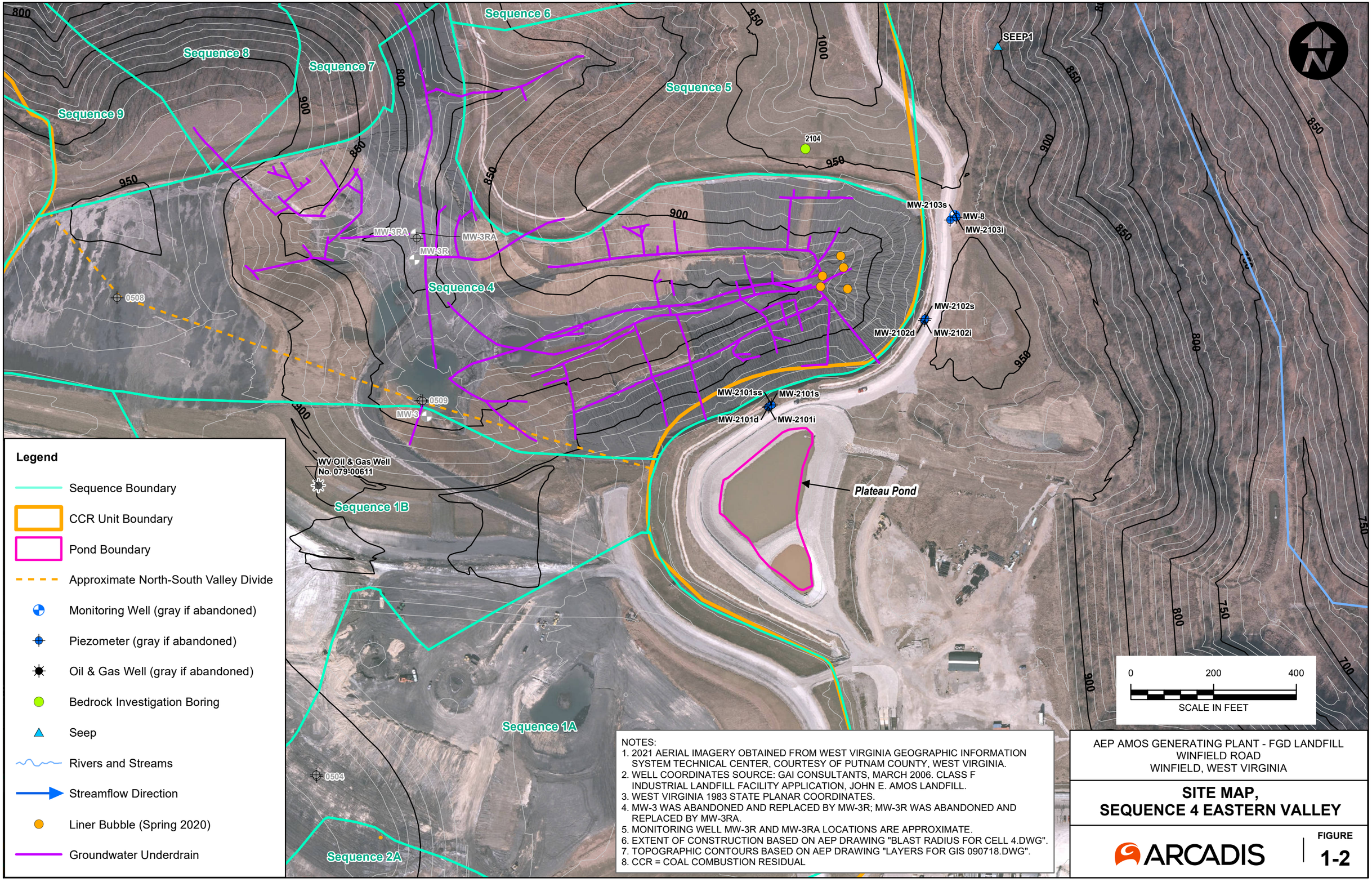
AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

SITE MAP

ARCADIS

FIGURE
1-1

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: AKENS
OH015976.0009.00001 (Mountaineer Ash Pond)
T:_ENV\AEP\Amos\mxd\Landfill Report\2021\F1_1_SiteMap.mxd 3/23/2022 11:30:25 AM



Legend

- Sequence Boundary
- CCR Unit Boundary
- Pond Boundary
- Approximate North-South Valley Divide
- Monitoring Well (gray if abandoned)
- Piezometer (gray if abandoned)
- Oil & Gas Well (gray if abandoned)
- Bedrock Investigation Boring
- Seep
- Rivers and Streams
- Streamflow Direction
- Liner Bubble (Spring 2020)
- Groundwater Underdrain

NOTES:
1. 2021 AERIAL IMAGERY OBTAINED FROM WEST VIRGINIA GEOGRAPHIC INFORMATION SYSTEM TECHNICAL CENTER, COURTESY OF PUTNAM COUNTY, WEST VIRGINIA.
2. WELL COORDINATES SOURCE: GAI CONSULTANTS, MARCH 2006. CLASS F INDUSTRIAL LANDFILL FACILITY APPLICATION, JOHN E. AMOS LANDFILL.
3. WEST VIRGINIA 1983 STATE PLANAR COORDINATES.
4. MW-3 WAS ABANDONED AND REPLACED BY MW-3R; MW-3R WAS ABANDONED AND REPLACED BY MW-3RA.
5. MONITORING WELL MW-3R AND MW-3RA LOCATIONS ARE APPROXIMATE.
6. EXTENT OF CONSTRUCTION BASED ON AEP DRAWING "BLAST RADIUS FOR CELL 4.DWG".
7. TOPOGRAPHIC CONTOURS BASED ON AEP DRAWING "LAYERS FOR GIS 090718.DWG".
8. CCR = COAL COMBUSTION RESIDUAL

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

SITE MAP, SEQUENCE 4 EASTERN VALLEY

ARCADIS

FIGURE
1-2

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: AKENS
OH015976.0009.00001 (Mountaineer Ash Pond)
T:_ENV\AEP\Amos\mxd\Landfill Report\2021\F1_2_SiteMapSequence4EasternValley.mxd 3/23/2022 11:39:03 AM

NOTES:
1. 2021 AERIAL IMAGERY OBTAINED FROM WEST VIRGINIA GEOGRAPHIC INFORMATION SYSTEM TECHNICAL CENTER, COURTESY OF PUTNAM COUNTY, WEST VIRGINIA.
2. 2021 WELL COORDINATES SOURCE: AEP WELL SURVEY DATED 7/26/2021.
3. ALL OTHER WELL COORDINATES SOURCE: GAI CONSULTANTS, MARCH 2006. CLASS F INDUSTRIAL LANDFILL FACILITY APPLICATION, JOHN E. AMOS LANDFILL.
4. WEST VIRGINIA 1983 STATE PLANAR COORDINATES.
5. MW-3 WAS ABANDONED AND REPLACED BY MW-3R; MW-3R WAS ABANDONED AND REPLACED BY MW-3RA.
6. MONITORING WELL MW-3R AND MW-3RA LOCATIONS ARE APPROXIMATE.
7. EXTENT OF CONSTRUCTION BASED ON AEP DRAWING "BLAST RADIUS FOR CELL 4.DWG".
8. TOPOGRAPHIC CONTOURS BASED ON AEP DRAWING "LAYERS FOR GIS 090718.DWG".
9. LABELS HIGHLIGHTED IN YELLOW REPRESENT GEOCHEMISTRY SAMPLE LOCATIONS.
10. CCR = COAL COMBUSTION RESIDUAL

Legend

- Sequence Boundary
- CCR Unit Boundary
- Pond Boundary
- Approximate North-South Valley Divide
- Geochemistry Sample Location
- Monitoring Well (gray if abandoned)
- Piezometer (gray if abandoned)
- Oil & Gas Well (gray if abandoned)
- Bedrock Investigation Boring
- Seep
- Rivers and Streams
- Streamflow Direction
- Liner Bubble (Spring 2020)
- Groundwater Underdrain

MW-10
WV Oil & Gas Well No. 079-00744
0521
MW-9
SEEP2
0522
MW-2105ss
MW-2105s
MW-2105i
MW-2105d
0519
Sequence 6
Sequence 8
North Valley
Groundwater Underdrain
Sedimentation Pond
MW-1802
Sequence 9
MW-2106
Sequence 7
0523
0524
Lick Run
Leachate Pond (not in use)
Structural Fill Pond
SEEP1
Sequence 5
0525
0520
MW-5
2104
MW-8
MW-2103s
MW-2103i
MW-3RA
0512/0513
MW-3R
Northeast Liner Bubble
0517
East Chimney
Sequence 4
MW-2102s
MW-2102i
MW-2102d
0508
Southeast Liner Bubble
West Chimney
MW-2101ss
0509
MW-2101s
0511
MW-2101i
MW-3
MW-2101d
WV Oil & Gas Well No. 079-00611
Plateau Pond
Sequence 1B
Sequence 2B
0505
South Valley
MW-6
0510
Sequence 2A
0503
Sequence 3

0 360 720
SCALE IN FEET

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

GEOCHEMISTRY SAMPLE LOCATION MAP

ARCADIS

FIGURE 2-1

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: AKENS
OH015976.0009.00001 (Mountaineer Ash Pond)
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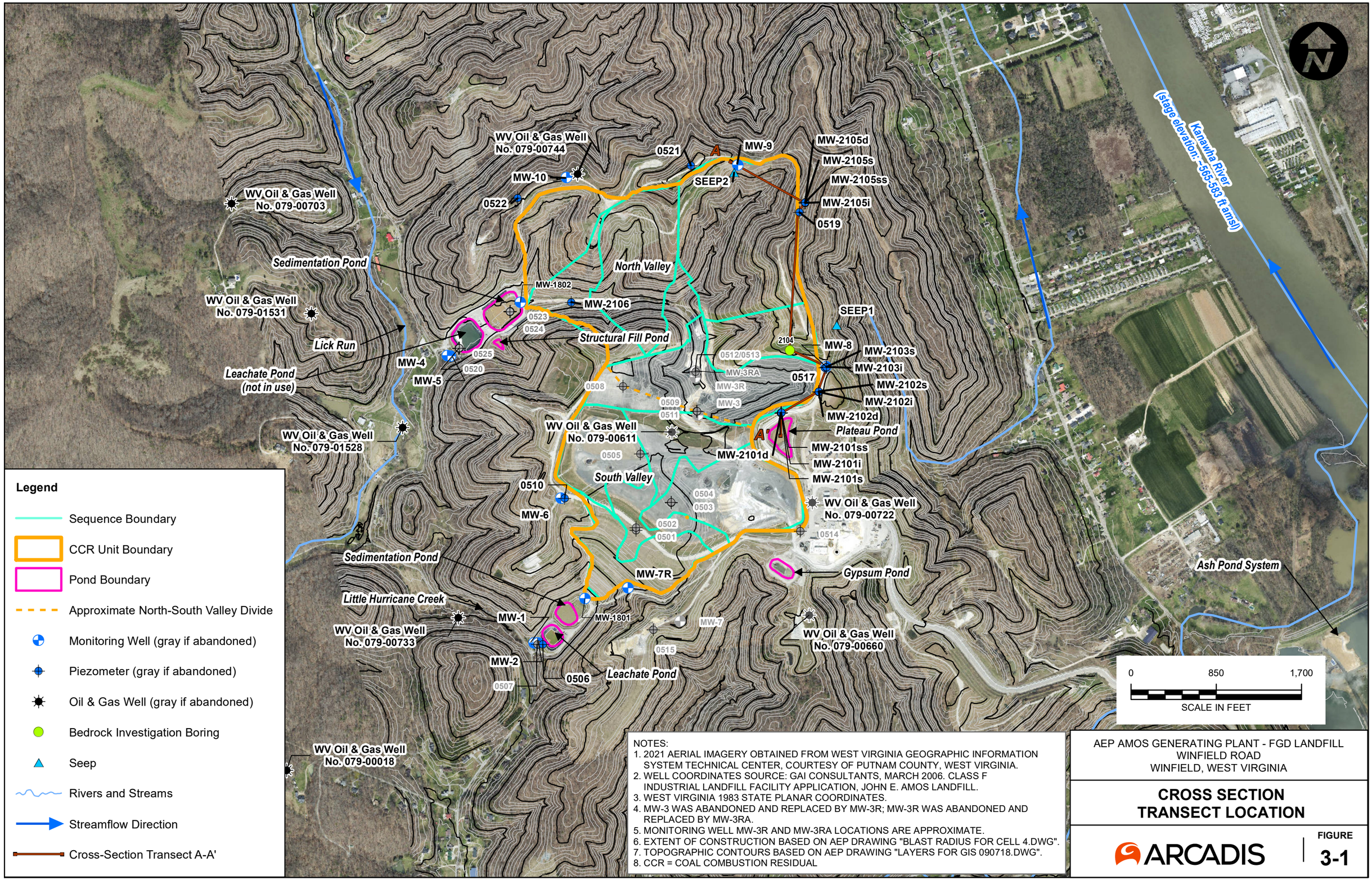

Legend

- Sequence Boundary
- CCR Unit Boundary
- Pond Boundary
- Approximate North-South Valley Divide
- Monitoring Well (gray if abandoned)
- Piezometer (gray if abandoned)
- Oil & Gas Well (gray if abandoned)
- Bedrock Investigation Boring
- Seep
- Rivers and Streams
- Streamflow Direction
- Cross-Section Transect A-A'

NOTES:
1. 2021 AERIAL IMAGERY OBTAINED FROM WEST VIRGINIA GEOGRAPHIC INFORMATION SYSTEM TECHNICAL CENTER, COURTESY OF PUTNAM COUNTY, WEST VIRGINIA.
2. WELL COORDINATES SOURCE: GAI CONSULTANTS, MARCH 2006. CLASS F INDUSTRIAL LANDFILL FACILITY APPLICATION, JOHN E. AMOS LANDFILL.
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4. MW-3 WAS ABANDONED AND REPLACED BY MW-3R; MW-3R WAS ABANDONED AND REPLACED BY MW-3RA.
5. MONITORING WELL MW-3R AND MW-3RA LOCATIONS ARE APPROXIMATE.
6. EXTENT OF CONSTRUCTION BASED ON AEP DRAWING "BLAST RADIUS FOR CELL 4.DWG".
7. TOPOGRAPHIC CONTOURS BASED ON AEP DRAWING "LAYERS FOR GIS 090718.DWG".
8. CCR = COAL COMBUSTION RESIDUAL

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

CROSS SECTION TRANSECT LOCATION

ARCADIS

FIGURE 3-1

City: CITRIX Div/Group: IM/DV Created By: K.Ives Last Saved By: AKENS
OH015976.0009.00001 (Mountaineer Ash Pond)
T:_ENV\AEP\Amos\mxd\Landfill Report\2021\F3_1_CrossSectionTransectLocation.mxd 3/24/2022 4:38:48 PM

A
NORTH

A'
SOUTH

MW-2105s G.E.=991.81
MW-2105ss G.E.=991.81
MW-2105i G.E.=991.91
MW-2105d G.E.=991.91
0519 G.E.=991.07
1368'
MW-9
G.E.=933.39
2104
G.E.=931.21
MW-2103s
G.E.=935.58
MW-2103i
G.E.=935.58
MW-8
G.E.=935.14
0517
G.E.=935.14
SEQUENCE 4 EASTERN VALLEY
MW-2102s
G.E.=933.09
MW-2102i
G.E.=933.08
MW-2102d
G.E.=933.08
APPROXIMATE LOCATION
OF PLATEAU POND
MW-2101s
G.E.=931.95
MW-2101ss
G.E.=931.95
MW-2101i
G.E.=931.97
MW-2101d
G.E.=931.97
BASE OF SUPER
SHALLOW ZONE
SHALLOW ZONE
INTERMEDIATE ZONE
DEEP ZONE

ELEVATION (ft amsl)

990
980
970
960
950
940
930
920
910
900
890
880
870
860
850
840
830
820
810
800

LEGEND

MW-2101SS WELL IDENTIFICATION
G.E.=931.95 GROUND SURFACE ELEVATION
WELL
WELL SCREEN
BORING
ft FEET
amsl ABOVE MEAN SEA LEVEL

ACCOUSTIC TELEVIEWER LOG
PRIMARILY SANDSTONE, FEW FRACTURES, RELATIVELY LOW POROSITY
PRIMARILY SHALE, FRACTURED, RELATIVELY HIGH POROSITY

25'
20'
15'
10'
5'
0
100'
200'
VERTICAL SCALE: 1" = 25'
HORIZONTAL SCALE: 1" = 200'

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

CROSS SECTION A-A', NORTH VALLEY EASTERN RIDGE

ARCADIS

FIGURE
3-2

C:\Users\bsmith\OneDrive - ARCADIS\BIM360 - OneDrive Sync Location\AUS-AEP-AMOS GENERATING PLANT-WINFIELD West Virginia\2022\01-In Progress\01-DWG\AEP-CS A-A.dwg LAYOUT: FENCE SAVED: 3/24/2022 12:54 PM ACADVER: 23.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 3/25/2022 7:39 AM BY: SMITH, BOB
XREFS: IMAGES: PROJECTNAME: ----

NORTH
TOWARDS
A

A'
SOUTH

APPROXIMATE LOCATION
OF PLATEAU POND

SEQUENCE 4 EASTERN VALLEY

2104
G.E.=931.21

MW-8
G.E.=935.14

MW-2103s
G.E.=935.58

MW-2103i
G.E.=935.58

0517
G.E.=935.14

MW-2102s
G.E.=933.09

MW-2102i
G.E.=933.08

MW-2102d
G.E.=933.08

MW-2101s
G.E.=931.95

MW-2101ss
G.E.=931.95

MW-2101i
G.E.=931.97

MW-2101d
G.E.=931.97

BASE OF SUPER SHALLOW ZONE

SHALLOW ZONE

INTERMEDIATE ZONE

DEEP ZONE

ELEVATION (ft amsl)

950
940
930
920
910
900
890
880
870
860
850
840
830
820
810
800

LEGEND

MW-2101SS
G.E.=931.95
WELL IDENTIFICATION
GROUND SURFACE ELEVATION

WELL

WELL SCREEN

BORING

ft FEET

amsl ABOVE MEAN SEA LEVEL

ACCOUSTIC TELEVIEWER LOG

PRIMARILY SANDSTONE, FEW FRACTURES,
RELATIVELY LOW POROSITY

PRIMARILY SHALE, FRACTURED,
RELATIVELY HIGH POROSITY

20'
15'
10'
5'
0
80'
160'

VERTICAL SCALE: 1" = 20'
HORIZONTAL SCALE: 1" = 160'

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

CROSS SECTION A-A';
SEQUENCE 4 EASTERN VALLEY

ARCADIS

FIGURE
3-3

C:\Users\bsmith\OneDrive - ARCADIS\BIM360 - OneDrive Sync Location\AUS-AEP-AMOS GENERATING PLANT-WINFIELD West Virginia\2022\01-In Progress\01-DWG\AEP-CS A-A.dwg LAYOUT: 2101-2104 11X17 SAVED: 3/24/2022 12:54 PM ACADVER: 23.1S (LMS TECH) PAGESETUP: ---
PLOTSTYLETABLE: ACAD.CTB PLOTTED: 3/25/2022 7:40 AM BY: SMITH, BOB
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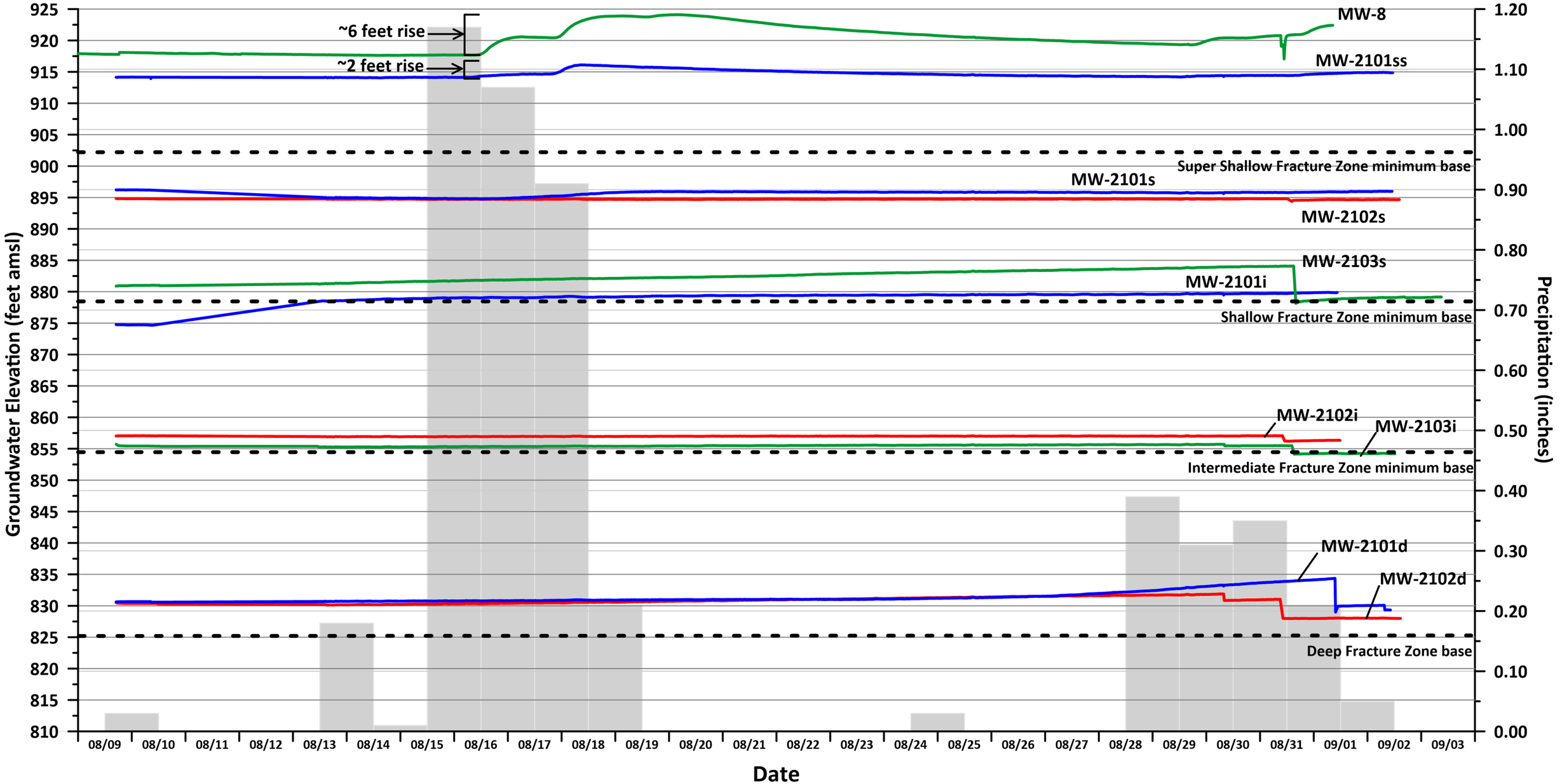


Legend

- 2101-Area (MW-2101ss, s, i, d)
- 2102-Area (MW-2102s, i, d)
- 2103-Area (MW-8, MW-2103s, i)
- Precipitation

amsl = above mean sea level

Note: monitoring well development activties occured after 08/29 causing abnormal water levels in some wells

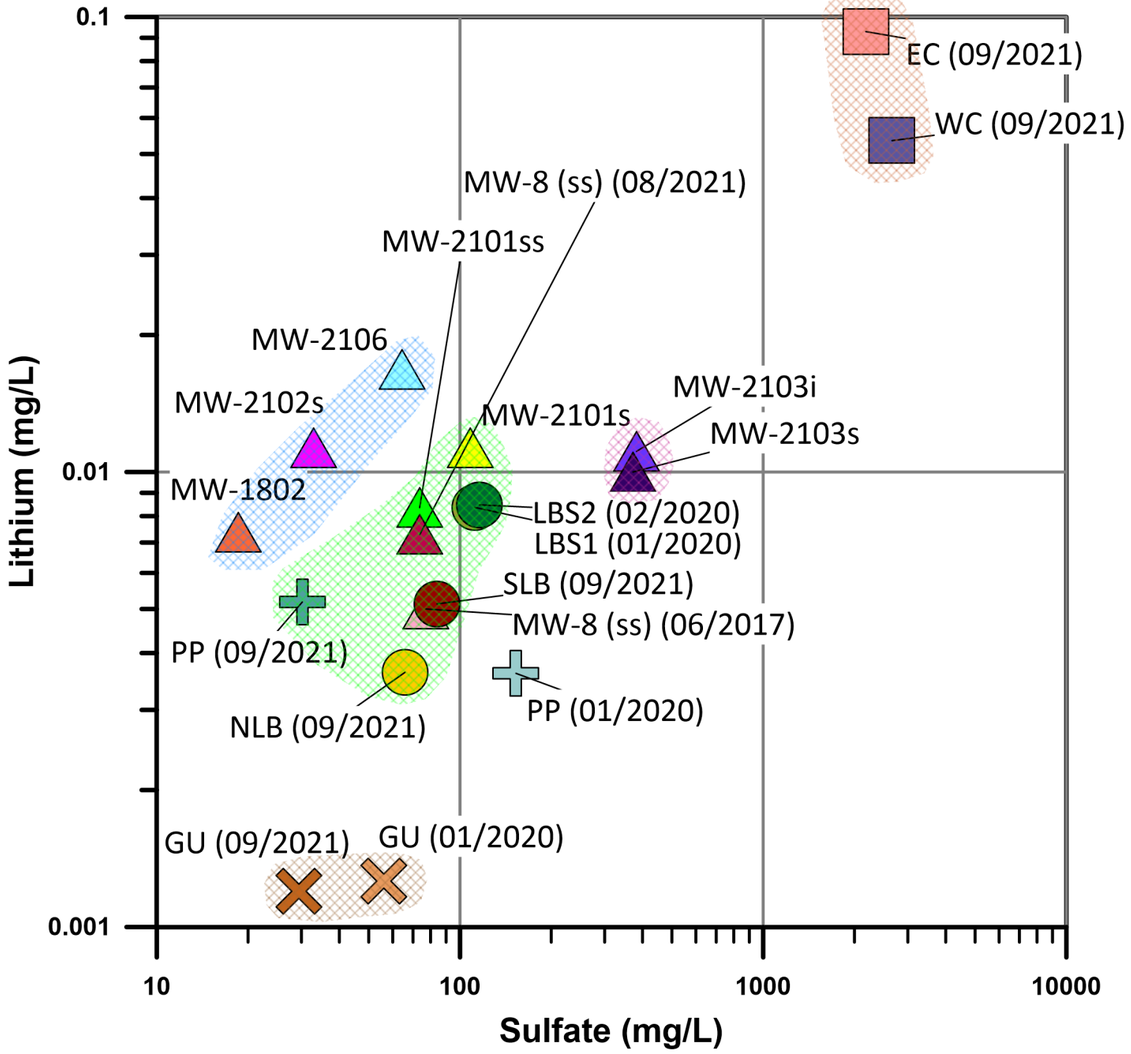
AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

Composite Hydrograph, August 9 to September 2, 2021

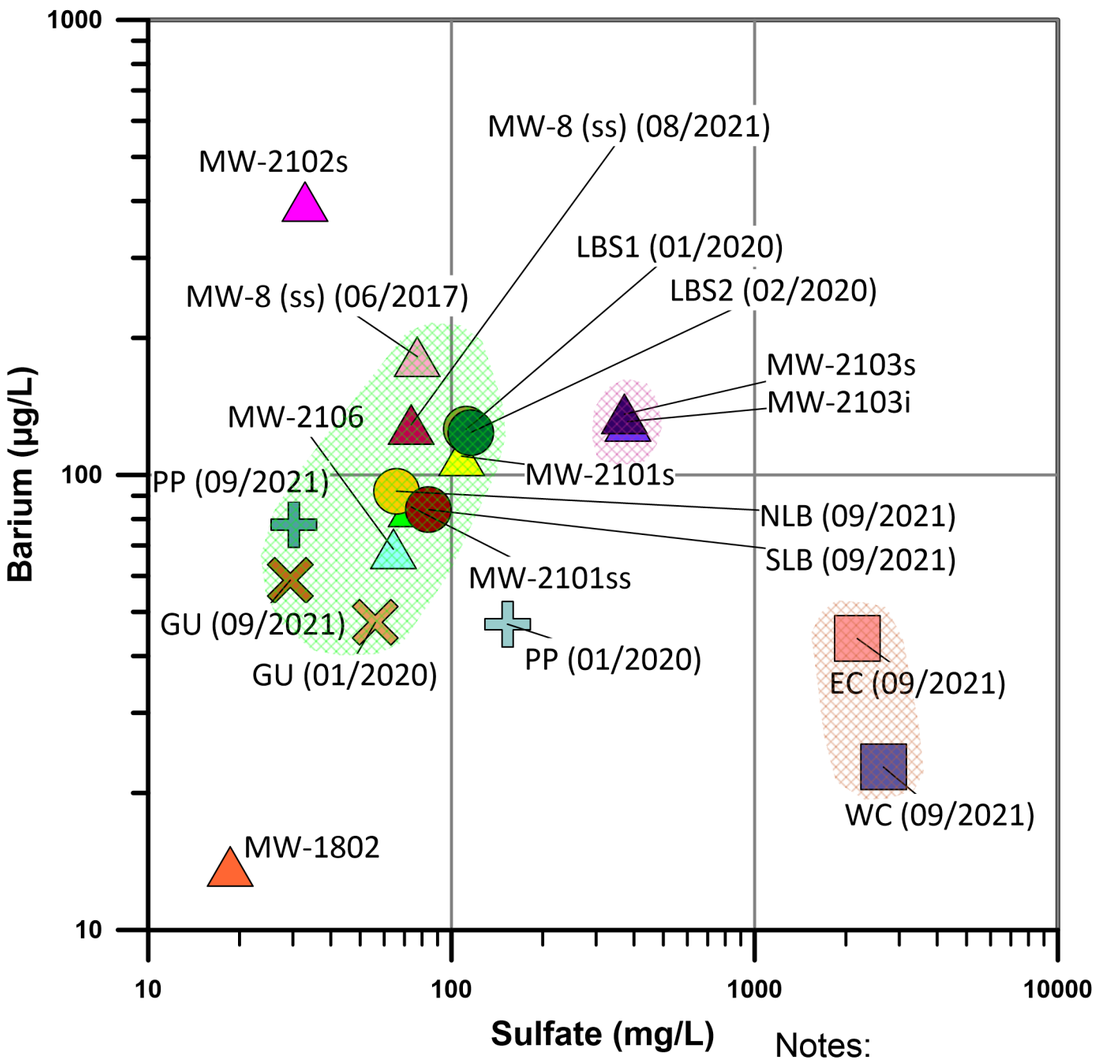
ARCADIS

FIGURE
3-4

Lithium vs. Sulfate



Barium vs. Sulfate



- MW-1802
- MW-2101ss
- MW-2101s
- MW-2102s
- MW-2103i
- MW-2103s
- MW-2106
- MW-8 (ss) (08/2021)
- MW-8 (ss) (06/2017)
- MW-8 (ss) (11/2019)
- Plateau Pond (PP) (09/2021)
- Plateau Pond (PP) (01/2020)
- Groundwater Underdrain (GU) (09/2021)
- Groundwater Underdrain (GU) (01/2020)
- Northeast Liner Bubble (NLB) (09/2021)
- Southeast Liner Bubble (SLB) (09/2021)
- Liner Bubble Sample 1 (LBS1) (01/2020)
- Liner Bubble Sample 2 (LBS2) (01/2020)
- East Chimney (EC) (09/2021)
- West Chimney (WC) (09/2021)

- Runoff - Sequence 4 eastern valley surface water
- Downgradient Groundwater and MW-2102S - deeper groundwater geochemistry in north valley and unique lower sulfate for MW-2102S
- Dominant Groundwater Seepage Signature - Sequence 4 eastern valley similiar to liner bubble type (Note: Plateau Pond barium sample [storm water] similiar)
- Minor Groundwater Seepage Signature - Sequence 4 eastern valley unique signature
- Unique lower lithium groundwater underdrain signature

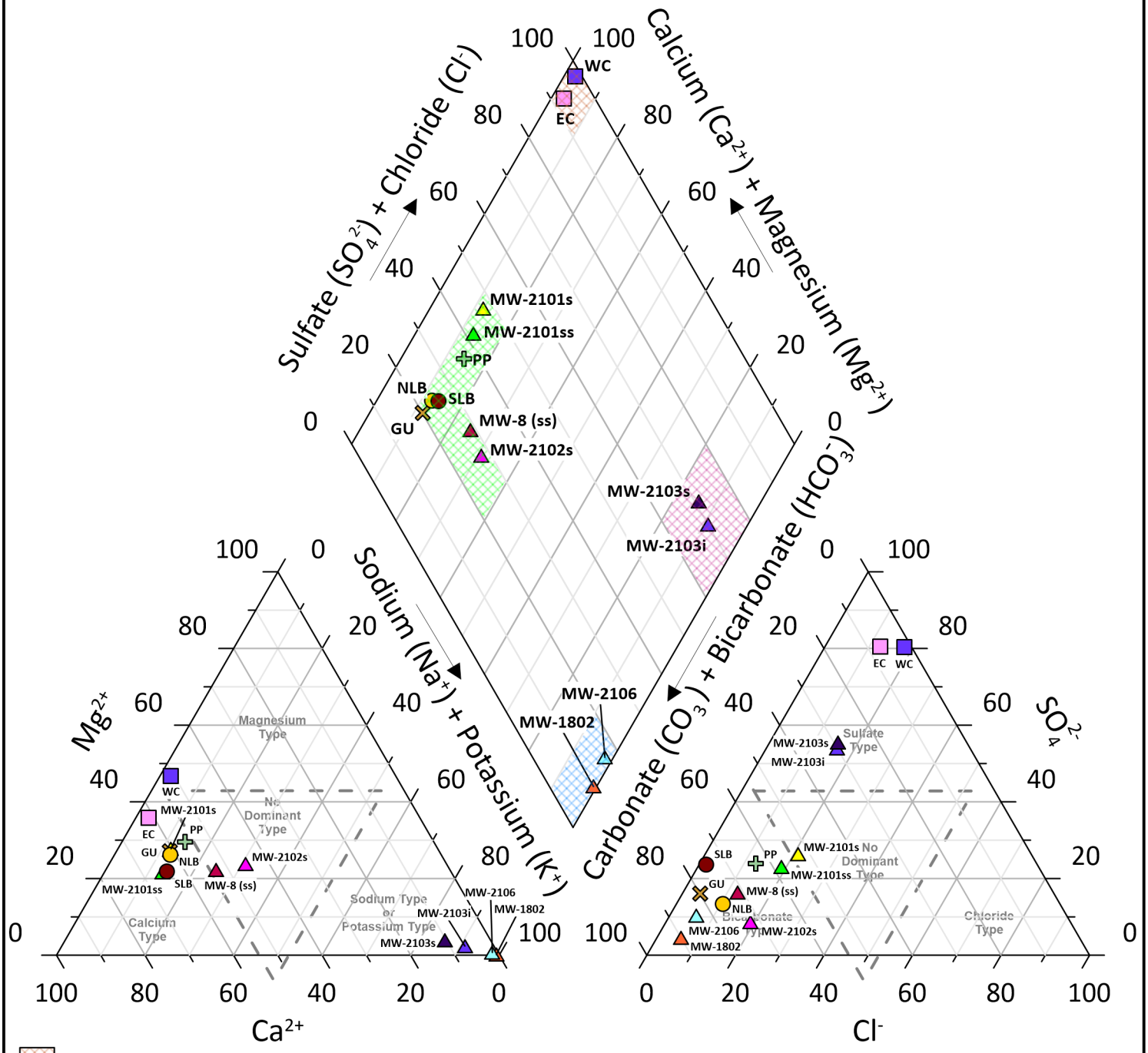
Notes:
mg/L - milligrams per liter
µg/L - micrograms per liter

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINA

LITHIUM AND BARIUM VS SULFATE GROUNDWATER CONCENTRATION PLOT

ARCADIS

FIGURE 3-5



Runoff - Sequence 4 eastern valley surface water

Downgradient Groundwater - deeper ground geochemistry type in north valley

Dominant Groundwater Seepage - Sequence 4 eastern valley dominant type (similiar to liner bubble type)
Note: Plateau Pond sample (storm water) similiar

Minor Groundwater Seepage - Sequence 4 eastern valley minor type (unique signature)

- MW-1802
- MW-2101SS
- MW-2101S
- MW-2102S
- MW-2103I
- MW-2103S
- MW-2106
- MW-8 (ss)
- Plateau Pond (PP)
- Groundwater Underdrain (GU)
- Northeast Liner Bubble (NLB)
- Southeast Liner Bubble (SLB)
- East Chimney (EC)
- West Chimney (WC)

Anions
Cl^- chlorine
SO_4^{2-} sulfate
CO_3^{2-} carbonate
HCO_3^- bicarbonate

Cations
Na^+ sodium
K^+ potassium
Ca^{2+} calcium
Mg^{2+} magnesium

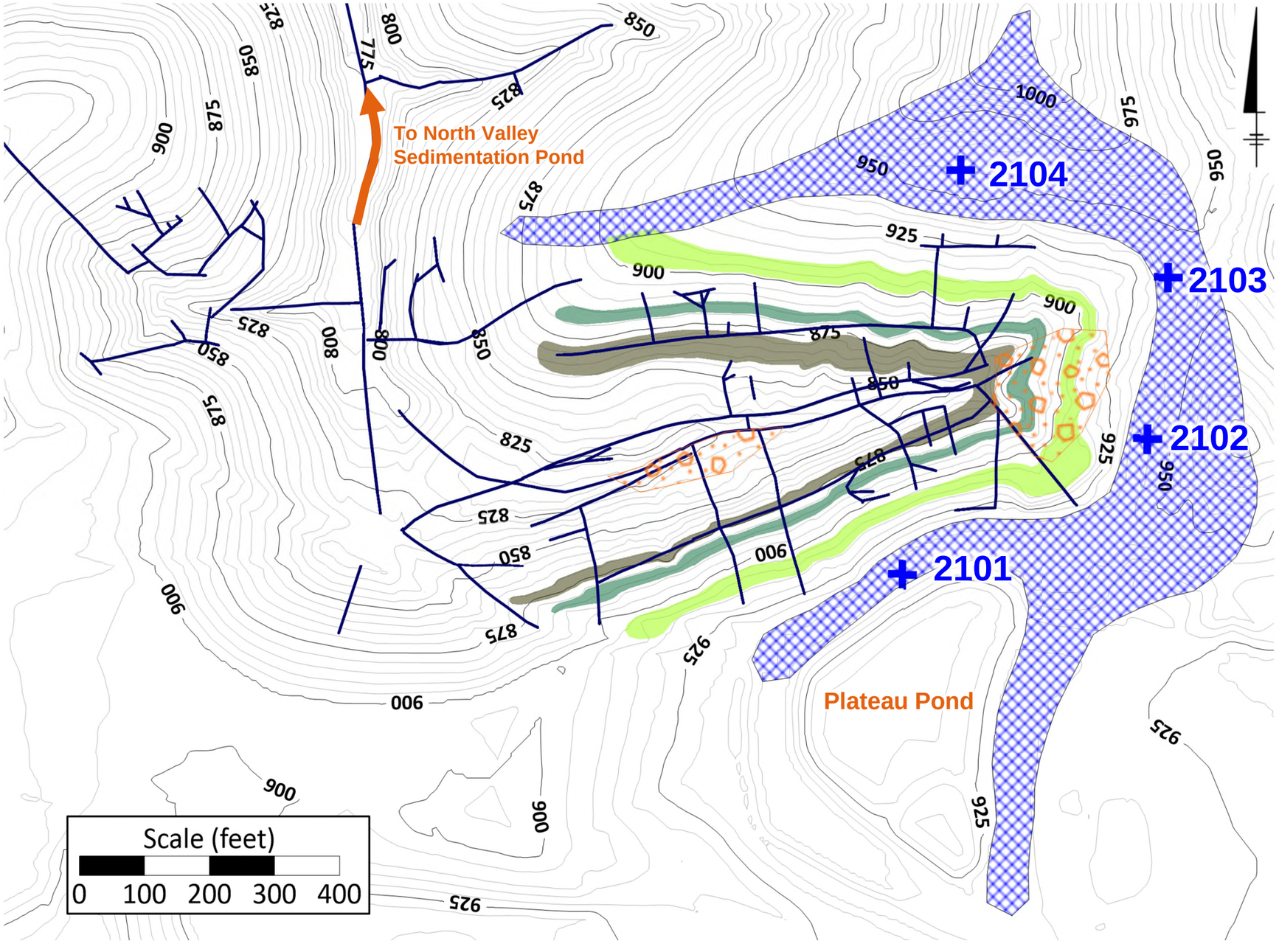
Remarks
ss - Super Shallow Zone
s - Shallow Zone
i - Intermediate Zone
MW-1802 and MW-2106 are downgradient north valley wells

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINA

Trilinear "Piper" Diagram

ARCADIS

FIGURE 3-6



Note: The pre-construction ground surface is shown to illustrate accurate position of groundwater underdrains and stratigraphic units.

Legend

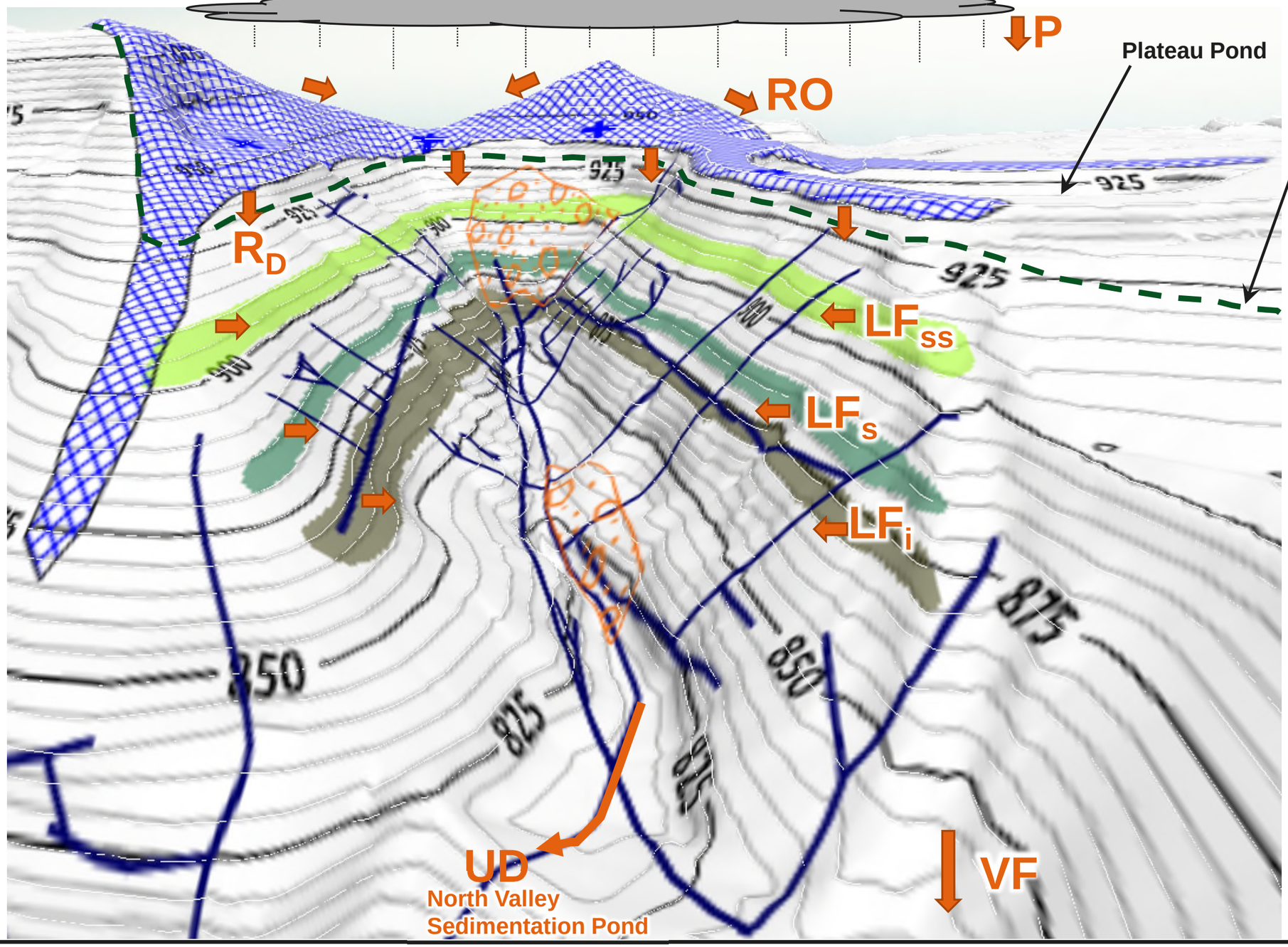
- Gravel blanket
- Recharge Area (301,593 ft^2)
- Super Shallow Zone
- Shallow Zone
- Intermediate Zone
- Groundwater Underdrain
- Boring Location

AEP AMOS GENERATING PLANT – FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

SEQUENCE 4 HYDROSTRATIGRAPHIC ZONES AND GROUNDWATER UNDERDRAIN LOCATIONS

ARCADIS

FIGURE
3-7



Current Graded Approximate Surface Elevation (Jan 2021)

Note: The pre-construction ground surface is shown to illustrate accurate position of groundwater underdrains and stratigraphic units. The approximate January 2021 ground surface is shown as a dashed black line.

Legend

- Gravel blanket
- Recharge Area (301,593 ft^2)
- Super Shallow Zone
- Shallow Zone
- Intermediate Zone
- Groundwater Underdrain

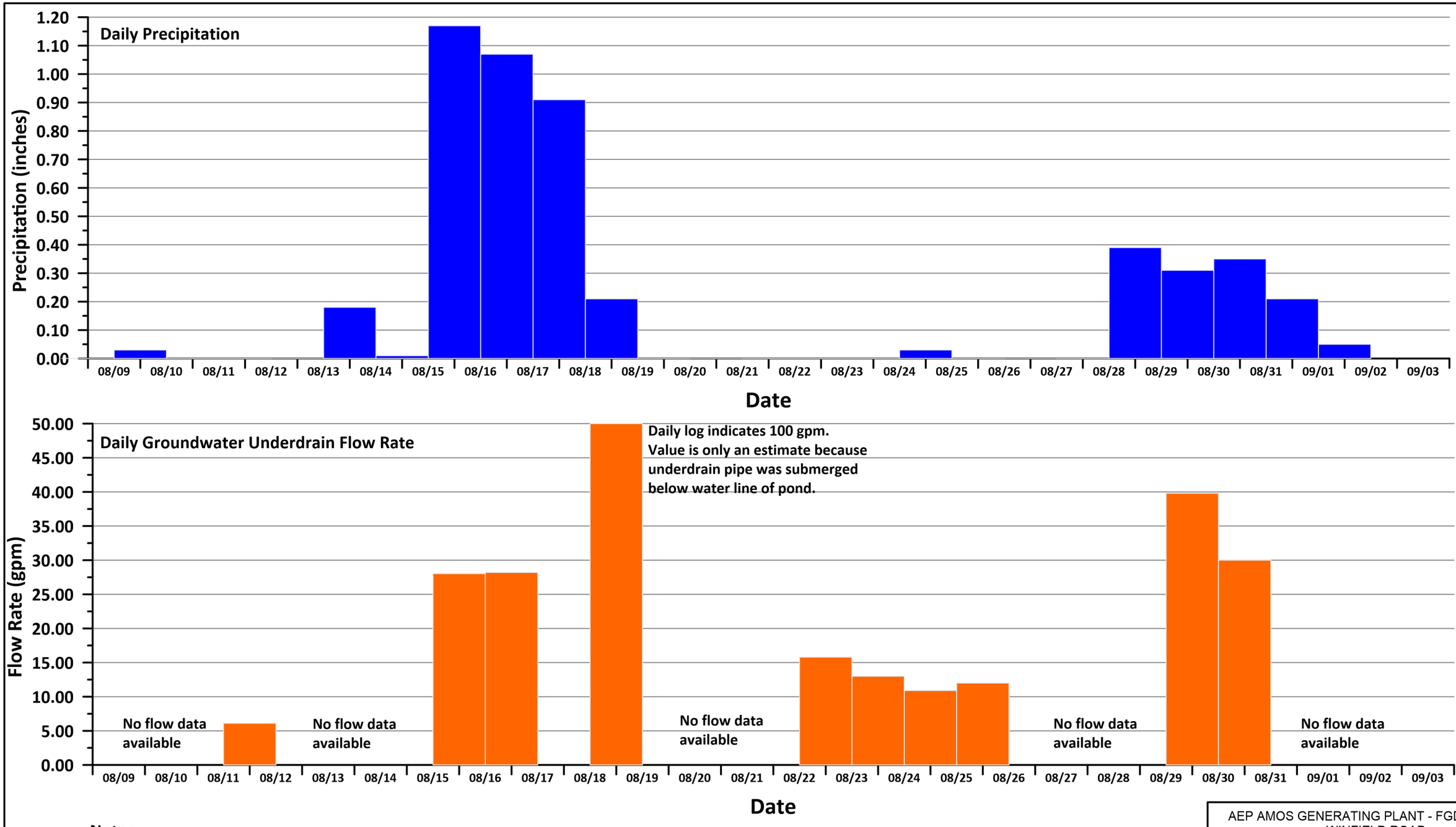
P – Precipitation
RO – Runoff
R_D – Direct Recharge
LF_{SS} – Lateral flow, Super Shallow
LF_S – Lateral flow, Shallow
LFi – Lateral flow, Intermediate
VF – Vertical Flux
UD – Underdrain Flow

AEP AMOS GENERATING PLANT – FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

WATER BALANCE AND GROUNDWATER FLOW CONCEPTUAL SITE MODEL

ARCADIS

FIGURE
3-8



Notes

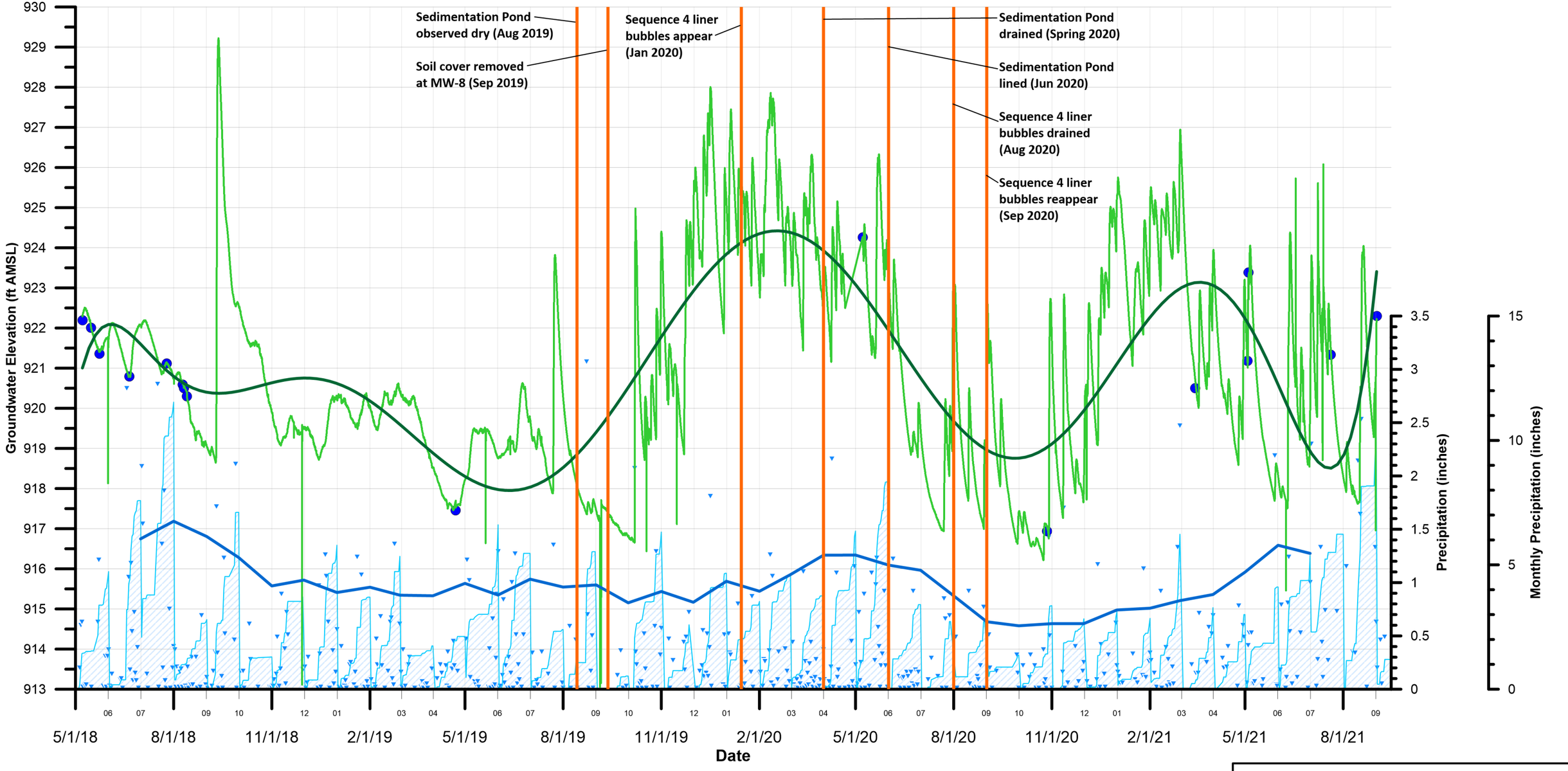
1. gpm = gallons per minute
2. Precipitation measured onsite with a float gauge.
3. North Valley groundwater underdrain flow rates measured via 5-gallon bucket and stopwatch during daily inspections. Not all data available at time of report.

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

North Valley Groundwater Underdrain Flow Rates and Precipitation

ARCADIS

FIGURE
3-9



-All elevations are in feet NAVD 1988.
-Water elevations are calibrated to manual measurements from surveyed measuring points.
-Well Screen: 40-60 feet bgs.
-Ft = feet

-Precipitation data collected from NOAA CHARLESTON 3.9 WSW, WV US
-Barometric efficiency has been applied. BE = 0.2.
-AMSL = above mean sea level

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

MW-8 Comprehensive Hydrograph
May 2018 to September 2021

ARCADIS

FIGURE
3-10

Appendix A

Boring and Monitoring Well Construction Logs

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,737.317 E 1,724,959.605**

GROUND ELEVATION **932.04 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 20.61	▽	▽
TIME			
DATE	8/9/2021		

BORING NO. **2101 SS** DATE **9/2/21** SHEET **1** OF **2**

BORING START **6/15/21** BORING FINISH **6/16/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.8'** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **19'** BOTTOM **29'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
										(0-4.1 ft) SANDSTONE; moderately fractured; brownish gray		0-11': Grout seal *Lithology from 2101 I/D borehole. 2101 SS installed in offset 6" borehole.
1	RC	4.1	9.5		5.3	96	5			(4.1-4.8 ft) SANDSTONE, fine grained to medium grained; brownish gray; moderately weathered; moderately fractured; medium-bedded; weak field strength. (4.8-9.7 ft) SANDSTONE, fine grained; brownish gray; moderately weathered; moderately fractured; medium-bedded; micaceous; moderate field strength.		
2	RC	9.5	19.5		8.5	80	10			(9.7-12.1 ft) SANDY SHALE, medium grained to coarse grained; reddish brown; highly weathered; very intensely fractured (few intact core segments); laminated; very weak field strength. (12.1-19.8 ft) SANDSTONE, medium grained; yellowish brown; slightly weathered; slightly fractured; thick-bedded; moderate field strength.		11-14': Bentonite seal 14-15': Secondary Sand Pack (choker sand) 15-30': Primary Sand Pack
3	RC	19.5	24.5		3.9	67	15					19'-29': Slotted PVC (20-slot) Screen

TYPE OF CASING USED

NA	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

Continued Next Page

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

AEP - AEP.GDT - 9/2/21 10:40 - C:\USERS\SOLUND\ARCADIS\AEP TEAM SITE - FGD LANDFILL\2021 INVESTIGATION\BORING LOGS-GINT\AEP BORING LOGS (1).GPJ

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2101 SS** DATE **9/2/21** SHEET **2** OF **2**

PROJECT **Amos - FGD Landfill** BORING START **6/15/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	SAMPLE DEPTH IN FEET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
3	RC	19.5	24.5		3.9	67				(19.8-24.8 ft) MUDSTONE, fine grained; reddish brown; moderately weathered; moderately fractured; medium-bedded; weak to moderate field strength. NOTE: Occasionally interbedded with shale.		
4	RC	24.5	30.0		5.2	71	25			(24.8-30.0 ft) SANDSTONE, medium grained; gray; slightly weathered; slightly fractured; medium-bedded; micaceous banding; weak to moderate field strength. (28.2-28.5 ft) NOTE: Vertical fracture		
							30					
							35					
							40					
							45					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,735.055 E 1,724,955.37**

GROUND ELEVATION **932.04 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 38.59	▽	▼
TIME			
DATE	8/9/2021		

BORING NO. **2101 S** DATE **9/2/21** SHEET **1** OF **3**

BORING START **6/15/21** BORING FINISH **6/16/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.86'** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **42'** BOTTOM **57'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
1	RC	4.1	9.5		5.3	96	5			(0-4.1 ft) SANDSTONE; moderately fractured; brownish gray (4.1-4.8 ft) SANDSTONE, fine grained to medium grained; brownish gray; moderately weathered; moderately fractured; medium-bedded; weak field strength. (4.8-9.7 ft) SANDSTONE, fine grained; brownish gray; moderately weathered; moderately fractured; medium-bedded; micaceous; moderate field strength.		0-34': Grout seal *Lithology from 2101 I/D borehole. 2101 S installed in offset 6" borehole.
2	RC	9.5	19.5		8.5	80	10			(9.7-12.1 ft) SANDY SHALE, medium grained to coarse grained; reddish brown; highly weathered; very intensely fractured (few intact core segments); laminated; very weak field strength. (12.1-19.8 ft) SANDSTONE, medium grained; yellowish brown; slightly weathered; slightly fractured; thick-bedded; moderate field strength.		
3	RC	19.5	24.5		3.9	67	15					

TYPE OF CASING USED

NA	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

Continued Next Page

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2101 S** DATE **9/2/21** SHEET **2** OF **3**

PROJECT **Amos - FGD Landfill** BORING START **6/15/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
3	RC	19.5	24.5		3.9	67				(19.8-24.8 ft) MUDSTONE, fine grained; reddish brown; moderately weathered; moderately fractured; medium-bedded; weak to moderate field strength. NOTE: Occasionally interbedded with shale.		
4	RC	24.5	34.5		9.4	71	25			(24.8-42.5 ft) SANDSTONE, fine grained to medium grained; gray; slightly weathered; slightly fractured; medium-bedded; micaceous banding; weak to moderate field strength.		
										(28.2-28.5 ft) NOTE: Vertical fracture		
							30					
												34-37': Bentonite seal
5	RC	34.5	44.5		9.8	69	35					37-38': Secondary Sand Pack (choker sand)
												38-58': Primary Sand Pack
										(39.2-42.5 ft) NOTE: Medium grained		
							40					42-57': Slotted PVC (20-slot) Screen
										(42.5-50.4 ft) SHALE, medium grained; gray with red mottling; highly weathered; moderately fractured; medium-bedded. NOTE: Interbedded with medium-grained sandstone.		
6	RC	44.5	49.5		4.1	0	45					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2101 S** DATE **9/2/21** SHEET **3** OF **3**

PROJECT **Amos - FGD Landfill** BORING START **6/15/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
6	RC	44.5	49.5		4.1	0						
7	RC	49.5	56.5		6.9	94	50			(50.4-58.0 ft) SANDSTONE, fine grained to medium grained; gray; slightly weathered; slightly fractured; medium-bedded; micaceous; moderate to strong field strength.		
8	RC	56.5	58.0		1.5	98	55					
							60					
							65					
							70					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,732.909 E 1,724,951.574**

GROUND ELEVATION **932.04 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 56.95	▽ 104.06 (D)	▼
TIME			
DATE	8/9/2021	8/9/2021	

BORING NO. **2101 I & D** DATE **9/2/21** SHEET **1** OF **6**

BORING START **6/15/21** BORING FINISH **6/16/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.73' (I) 2.71' (D)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **60'/92'** BOTTOM **75'/102'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
1	GB	0.0	4.1							(0-4.1 ft) SANDSTONE; moderately fractured; brownish gray		0-54': Grout seal NOTE: 8" Borehole Diameter
2	RC	4.1	9.5		5.3	96	5			(4.1-4.8 ft) SANDSTONE, fine grained to medium grained; brownish gray; moderately weathered; moderately fractured; medium-bedded; weak field strength. (4.8-9.7 ft) SANDSTONE, fine grained; brownish gray; moderately weathered; moderately fractured; medium-bedded; micaceous; moderate field strength.		
3	RC	9.5	19.5		8.5	80	10			(9.7-12.1 ft) SANDY SHALE, medium grained to coarse grained; reddish brown; highly weathered; very intensely fractured (few intact core segments); laminated; very weak field strength.		
							15			(12.1-19.8 ft) SANDSTONE, medium grained; yellowish brown; slightly weathered; slightly fractured; thick-bedded; moderate field strength.		
4	RC	19.5	24.5		3.9	67						

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

Continued Next Page

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

AEP - AEP.GDT - 9/2/21 10:40 - C:\USERS\SOLUND\ARCADIS\AEP TEAM SITE - FGD LANDFILL\2021 INVESTIGATION\BORING LOGS-GINT\AEP BORING LOGS (1).GPJ

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2101 I & D** DATE **9/2/21** SHEET **2** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/15/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
4	RC	19.5	24.5		3.9	67				(19.8-24.8 ft) MUDSTONE, fine grained; reddish brown; moderately weathered; moderately fractured; medium-bedded; weak to moderate field strength. NOTE: Occasionally interbedded with shale.		
5	RC	24.5	34.5		9.4	71	25			(24.8-42.5 ft) SANDSTONE, fine grained to medium grained; gray; slightly weathered; slightly fractured; medium-bedded; micaceous banding; weak to moderate field strength.		
										(28.2-28.5 ft) NOTE: Vertical fracture		
							30					
6	RC	34.5	44.5		9.8	69	35					
										(39.2-42.5 ft) NOTE: Medium grained		
							40					
										(42.5-50.4 ft) SHALE, medium grained; gray with red mottling; highly weathered; moderately fractured; medium-bedded. NOTE: Interbedded with medium-grained sandstone.		
7	RC	44.5	49.5		4.1	0	45					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2101 I & D** DATE **9/2/21** SHEET **3** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/15/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
7	RC	44.5	49.5		4.1	0						
8	RC	49.5	56.5		6.9	94	50			(50.4-59.2 ft) SANDSTONE, fine grained to medium grained; gray; slightly weathered; slightly fractured; medium-bedded; micaceous; moderate to strong field strength.		54-57': Bentonite seal
9	RC	56.5	64.5		8	98	55					57-58': Secondary Sand Pack (choker sand) 58-77': Primary Sand Pack
							60			(59.2-62.5 ft) MUDSTONE, fine grained; reddish brown; slightly weathered; moderately fractured; thick-bedded; moderate to strong field strength. NOTE: Occasional shale layers (<0.5' thick).		60-75': Slotted PVC (20-slot) Screen
10	RC	64.5	74.5		10	68	65			(62.5-85.8 ft) SANDSTONE, fine grained to medium grained; gray; slightly weathered; slightly fractured; medium-bedded; micaceous; very weak to moderate field strength. NOTE: Interbedded with gray shale with occasional iron staining. (65-67 ft) NOTE: Shale layer.		
							70			(71-72.5 ft) NOTE: Very soft and fissile; highly decomposed.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2101 I & D** DATE **9/2/21** SHEET **4** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/15/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
10	RC	64.5	74.5		10	68				(72.3-73.2 ft) NOTE: Shale layer.		
11	RC	74.5	84.5		10	67	75			(76.8-77 ft) NOTE: Interbedded shale layers; moderately weathered; moderately fractured; thin-bedded.		77-87': Bentonite seal
							80			(82.8-83.5 ft) NOTE: Interbedded shale layers; moderately weathered; moderately fractured; thin-bedded.		
12	RC	84.5	94.5		10	86	85			(84.5-85.8 ft) NOTE: Interbedded shale layers; moderately weathered; moderately fractured; thin-bedded.		
										(85.8-103 ft) SHALE, fine grained; gray; slightly weathered; slightly fractured; medium-bedded; weak to strong field strength. NOTE: Occasionally reddish brown due to oxidation.		87-88': Secondary Sand Pack (choker sand) 88-104': Primary Sand Pack
							90					92-102': Slotted PVC (20-slot) Screen
13	RC	94.5	104.5		10	44	95			(96.5-100.8 ft) NOTE: Highly fractured.		

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AEP - AEP.GDT - 9/2/21 10:40 - C:\USERS\SOLUND\ARCADIS\AEP TEAM SITE - FGD LANDFILL\2021 INVESTIGATION\BORING LOGS-GINT\AEP BORING LOGS (1).GPJ

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2101 I & D** DATE **9/2/21** SHEET **5** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/15/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
13	RC	94.5	104.5		10	44	100			(97.3-97.6 ft) NOTE: Very weathered, highly decomposed, intensely disintegrated, reddish brown		
14	RC	104.5	114.5		10	100	105			(103-128.7 ft) SANDSTONE, fine grained to medium grained; gray; slightly weathered; slightly fractured; medium-bedded; micaceous.		104'-144.5': Bentonite backfill
15	RC	114.5	124.5		10	100	110					
							115					
							120					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2101 I & D** DATE **9/2/21** SHEET **6** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/15/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
16	RC	124.5	134.5		10	78	125					
										(128.7-132.3 ft) SHALE, fine grained; gray; slightly weathered; slightly fractured; weak to moderate field strength. NOTE: more heavily weathered and fractured in upper 2.4'.		
							130					
										(132.3-136.3 ft) SANDSTONE, fine grained to medium grained; gray; fresh to slightly weathered; unfractured; moderate to strong field strength.		
17	RC	134.5	144.5		10	67	135					
										(136.3-138.4 ft) SANDSTONE, fine grained to medium grained; gray; fresh to slightly weathered; unfractured; thin-bedded; moderate to strong field strength.		
										(138.4-142.8 ft) SHALE, fine grained; reddish brown; slightly to moderately weathered; slightly fractured; moderately fractured; thin-bedded; weak to very weak field strength. NOTE: gray in upper 0.3'; chert nodules present.		
							140					
										(142.8-144.5 ft) SANDSTONE, fine grained to medium grained; gray; fresh to slightly weathered; unfractured; thin-bedded; moderate to strong field strength.		
							145					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,946.401 E 1,725,330.822**

GROUND ELEVATION **932.97 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 41.27	▽	▽
TIME			
DATE	8/9/2021		

BORING NO. **2102 S** DATE **9/2/21** SHEET **1** OF **3**

BORING START **6/16/21** BORING FINISH **6/16/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.97'** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **43'** BOTTOM **58'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
1	GB	0.0	4.0						GC	(0.0-1.5 ft) GRAVEL; some clay, silt, and sand; moist		0-35': Grout seal
										(1.5-2.5 ft) SANDSTONE, fine grained to medium grained; yellowish brown; highly weathered; medium-bedded; very weak to weak field strength.		*Lithology from 2102 I/D borehole. 2102 S was installed in offset 6" borehole.
2	RC	4.0	14.6		7.7	17	5			(2.5-7.2 ft) SHALE, fine grained; reddish brown; moderately weathered; intensely fractured; thin-bedded; weak field strength.		
										(7.2-18.6 ft) SANDSTONE, fine grained; grayish brown; slightly weathered; intensely fractured; thin-bedded; weak to strong field strength (strengthens downward).		
							10			(8.5-8.8 ft) NOTE: Vertical fractures with iron staining.		
3	RC	14.6	24.6		9.3	35	15			(15-17.9 ft) NOTE: Vertical fractures with iron staining.		
										(18.6-24.2 ft) SHALE, fine grained; gray; moderately weathered; intensely fractured; thin-bedded to medium-bedded; very weak to		

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TYPE OF CASING USED

NA	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2102 S** DATE **9/2/21** SHEET **2** OF **3**

PROJECT **Amos - FGD Landfill** BORING START **6/16/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
3	RC	14.6	24.6		9.3	35				moderate field strength. NOTE: Occasional sandstone seams.		
4	RC	24.6	34.6		8.5	48	25			(24.2-28.7 ft) SHALE, fine grained; reddish brown; highly weathered; intensely fractured.		
							30			(28.7-36.1 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; medium-bedded; moderate to strong field strength. NOTE: Interbedded with thin shale layers. (30.1-30.3 ft) NOTE: Vertical fracture.		
5	RC	34.6	44.6		10	9	35			(36.1-39.4 ft) SANDSTONE, fine grained to medium grained; brown to yellowish brown; fresh; slightly fractured; medium-bedded; strong field strength. NOTE: Occasional limestone or chert nodule.		35-38': Bentonite seal 38-39': Secondary Sand Pack (choker sand)
							40			(39.4-43 ft) SANDSTONE, fine grained to medium grained; gray; fresh; slightly fractured; medium-bedded; strong field strength.		39-59': Primary Sand Pack
										(43-46.3 ft) SHALE, fine grained; gray; fresh; moderately fractured; thin-bedded; moderate to strong field strength.		43'-58': Slotted PVC (20-slot) Screen
6	RC	44.6	54.6		8.6	58	45					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2102 S** DATE **9/2/21** SHEET **3** OF **3**

PROJECT **Amos - FGD Landfill** BORING START **6/16/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
6	RC	44.6	54.6		8.6	58	50			(46.3-53.4 ft) SHALE, fine grained; gray to reddish brown; moderately weathered. (49.3-53.4 ft) NOTE: Moderate to highly decomposed, soil-like consistency, reddish brown. (49.9-50.8 ft) NOTE: Sandstone layer. (51.6-52.3 ft) NOTE: Sandstone layer.		
7	RC	54.6	58.0		3.4	73	55			(53.4-59.0 ft) SANDSTONE, fine grained to medium grained; gray; fresh; slightly fractured; medium-bedded; strong field strength. NOTE: Occasional layers of strong shale (<0.5').		
							60					
							65					
							70					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,942.346 E 1,725,328.869**

GROUND ELEVATION **932.97 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 78.94 (I)	▽105.68 (D)	▼
TIME			
DATE	8/9/2021	8/9/2021	

BORING NO. **2102 I & D** DATE **9/2/21** SHEET **1** OF **6**

BORING START **6/16/21** BORING FINISH **6/16/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.90' (I), 2.89' (D)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **62'/96'** BOTTOM **77'/106'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	SAMPLE DEPTH IN FEET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
1	GB	0.0	4.0						GC	(0.0-1.5 ft) GRAVEL; some clay, silt, and sand; moist		0-56': Grout seal
										(1.5-2.5 ft) SANDSTONE, fine grained to medium grained; yellowish brown; highly weathered; medium-bedded; very weak to weak field strength.		NOTE: 8" Borehole Diameter
2	RC	4.0	14.6		7.7	17	5			(2.5-7.2 ft) SHALE, fine grained; reddish brown; moderately weathered; intensely fractured; thin-bedded; weak field strength.		
							10			(7.2-18.6 ft) SANDSTONE, fine grained; grayish brown; slightly weathered; intensely fractured; thin-bedded; weak to strong field strength (strengthens downward). (8.5-8.8 ft) NOTE: Vertical fractures with iron staining.		
3	RC	14.6	24.6		9.3	35	15			(15-17.9 ft) NOTE: Vertical fractures with iron staining.		
										(18.6-24.2 ft) SHALE, fine grained; gray; moderately weathered; intensely fractured; thin-bedded to medium-bedded; very weak to		

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

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PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2102 I & D** DATE **9/2/21** SHEET **2** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/16/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
3	RC	14.6	24.6		9.3	35				moderate field strength. NOTE: Occasional sandstone seams.		
4	RC	24.6	34.6		8.5	48	25			(24.2-28.7 ft) SHALE, fine grained; reddish brown; highly weathered; intensely fractured.		
							30			(28.7-36.1 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; medium-bedded; moderate to strong field strength. NOTE: Interbedded with thin shale layers. (30.1-30.3 ft) NOTE: Vertical fracture.		
5	RC	34.6	44.6		10	9	35			(36.1-39.4 ft) SANDSTONE, fine grained to medium grained; brown to yellowish brown; fresh; slightly fractured; medium-bedded; strong field strength. NOTE: Occasional limestone or chert nodule.		
							40			(39.4-43 ft) SANDSTONE, fine grained to medium grained; gray; fresh; slightly fractured; medium-bedded; strong field strength.		
6	RC	44.6	54.6		8.6	58	45			(43-46.3 ft) SHALE, fine grained; gray; fresh; moderately fractured; thin-bedded; moderate to strong field strength.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2102 I & D** DATE **9/2/21** SHEET **3** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/16/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	SAMPLE DEPTH IN FEET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
6	RC	44.6	54.6		8.6	58				(46.3-53.4 ft) SHALE, fine grained; gray to reddish brown; moderately weathered.		
							50			(49.3-53.4 ft) NOTE: Moderate to highly decomposed, soil-like consistency, reddish brown. (49.9-50.8 ft) NOTE: Sandstone layer. (51.6-52.3 ft) NOTE: Sandstone layer.		
7	RC	54.6	64.6		10	73	55			(53.4-63.4 ft) SANDSTONE, fine grained to medium grained; gray; fresh; slightly fractured; medium-bedded; strong field strength. NOTE: Occasional layers of strong shale (<0.5').		56-59': Bentonite seal
										(57.9-58.5 ft) NOTE: Moderate fracture .		
							60					59-60': Secondary Sand Pack (choker sand) 60-81': Primary Sand Pack 62-77': Slotted PVC (20-slot) Screen
8	RC	64.6	74.6		10	85	65			(63.4-64.8 ft) SHALE, fine grained; reddish brown ; slightly weathered; moderately fractured; medium-bedded; weak to strong field strength. NOTE: Possible slickensides, smooth, shiny, conchoidal fracture. (64.8-76.8 ft) SHALE, fine grained; gray; slightly weathered; slightly fractured; medium-bedded; Moderate to strong field strength. NOTE: Occasional layers of soft, weathered shale (<0.1') at 68.9', 69.3', and 69.6'. (66.5 ft) NOTE: Becomes included with limestone or chert from 64.8 to 66.5'.		
							70			(71 ft) NOTE: Becomes strong to very strong, slightly weathered to fresh.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2102 I & D** DATE **9/2/21** SHEET **4** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/16/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	SAMPLE DEPTH IN FEET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
8	RC	64.6	74.6		10	85						
9	RC	74.6	84.6		10	94	75			(75.6-76 ft) NOTE: Moderately to highly weathered, weak, reddish brown layer with natural horizontal fractures; sand content increasing. (76.8-80.9 ft) SANDSTONE, fine grained; gray; fresh; unfractured; thick-bedded; strong field strength.		
							80			(80.9-91 ft) SHALE, fine grained; gray; slightly weathered; slightly fractured; medium-bedded; moderate field strength.		81-91': Bentonite seal
10	RC	84.6	94.6		10	88	85					
							90			(89-90.7 ft) NOTE: Reddish brown, moderately to intensely fractured.		
										(91-91.5 ft) SANDSTONE; gray; fresh; competent. (91.5-98.2 ft) SHALE, fine grained; gray to reddish brown; slightly weathered; slightly fractured; medium-bedded; moderate field strength.		91-92': Secondary Sand Pack (choker sand) 92-108': Primary Sand Pack
11	RC	94.6	104.6		9.7	76	95					96-106': Slotted PVC (20-slot) Screen

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2102 I & D** DATE **9/2/21** SHEET **5** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/16/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
11	RC	94.6	104.6		9.7	76	100			(98.2-102 ft) SHALE, fine grained; moderately fractured to intensely fractured.		
										(102-117.4 ft) SHALE, fine grained; gray to reddish brown; slightly weathered; slightly fractured; medium-bedded; moderate field strength. NOTE: Interbedded with gray sandstone (see notes).		
12	RC	104.6	114.6		10	100	105			(104.6-106.8 ft) NOTE: Gray sandstone, fresh, competent, unfractured, very strong field strength.		
										(108.4-109.3 ft) NOTE: Gray sandstone, fresh, competent, unfractured, very strong field strength.		108'-134.6': Bentonite backfill
							110					
										(113.1-114.6 ft) NOTE: Gray sandstone, fresh, competent, unfractured, very strong field strength.		
13	RC	114.6	124.6		10	100	115					
										(117.4-129 ft) SANDSTONE, fine grained to medium grained; fresh; unfractured; medium-bedded; micaceous; very strong field strength.		
							120					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2102 I & D** DATE **9/2/21** SHEET **6** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/16/21** BORING FINISH **6/16/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
13	RC	114.6	124.6		10	100						
14	RC	124.6	134.6		10	100	125					
										(129-134.6 ft) SHALE, fine grained to medium grained; gray; fresh; slightly fractured; medium-bedded; some observable sandstone; strong to very strong field strength.		
							130					
							135					
							140					
							145					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 542,191.177 E 1,725,406.308**

GROUND ELEVATION **935.46 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 57.15 (S)	▽ 82.52 (I)	▼
TIME			
DATE	8/9/2021	8/9/2021	

BORING NO. **2103 S & I** DATE **9/2/21** SHEET **1** OF **6**

BORING START **6/17/21** BORING FINISH **6/17/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.47' (S), 2.45' (I)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **45'/67'** BOTTOM **58'/82'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
										(0.0-0.5 ft) GRAVEL, fine to coarse; and sand, fine to coarse; brown.		0-40': Grout seal
										(0.5-15.2 ft) SANDSTONE, fine grained to medium grained; olive gray; slightly weathered; slightly fractured; medium-bedded; moderate field strength.		NOTE: 8" Borehole Diameter
1	RC	4.6	14.6		10	77	5					
							10					
2	RC	14.6	24.6		9.9	80	15					
										(15.2-18.6 ft) SHALE, fine grained; reddish brown; moderately weathered; intensely fractured; thin-bedded; weak to moderate field strength.		
										(18.6-26.8 ft) SANDSTONE, fine grained to medium grained; olive gray; slightly weathered; slightly fractured; medium-bedded; moderate field		

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

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PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2103 S & I** DATE **9/2/21** SHEET **2** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/17/21** BORING FINISH **6/17/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
2	RC	14.6	24.6		9.9	80				strength.		
3	RC	24.6	34.6		8.9	90	25			(26.8-31 ft) SHALE, fine grained; reddish brown; highly weathered; thin-bedded; weak to moderate field strength.		
							30			(31-37.2 ft) SHALE, fine grained; gray; slightly weathered; slightly fractured; medium-bedded; banded; some observable sand; strong field strength.		
4	RC	34.6	44.6		10	100	35			(37.2-40 ft) SANDSTONE, fine grained to medium grained; gray; fresh; slightly fractured; medium-bedded; micaceous; banded; strong field strength.		
							40			(40-42.6 ft) SHALE, fine grained to medium grained; gray; slightly weathered; moderately fractured; medium-bedded; sandy; weak to strong field strength.		40-43': Bentonite seal
										(42.6-56.2 ft) SHALE, fine grained; reddish brown to gray; moderately weathered; intensely fractured; thin-bedded. NOTE: weak to moderate field strength.		43-44': Secondary Sand Pack (choker sand) 44-59': Primary Sand Pack
5	RC	44.6	54.6		9.5	82	45					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2103 S & I** DATE **9/2/21** SHEET **3** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/17/21** BORING FINISH **6/17/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	SAMPLE DEPTH IN FEET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
5	RC	44.6	54.6		9.5	82	50					48-58': Slotted PVC (20-slot) Screen
6	RC	54.6	64.6		10	81	55			(56.2-66.1 ft) SHALE, fine grained to medium grained; gray; slightly weathered; slightly fractured; medium-bedded; moderate to strong field strength. NOTE: Occasional sandstone layer (<0.5'). (58.7-58.8 ft) NOTE: Thin fracture (<0.1') of weathered shale, washed out in core.		59-64': Bentonite seal
7	RC	64.6	74.6		10	67	60					64-65': Secondary Sand Pack (choker sand) 65-84': Primary Sand Pack
							65			(66.1-69.6 ft) MUDSTONE, fine grained; reddish brown; moderately weathered; moderately fractured; medium-bedded; some shale; weak to moderate field strength. (66.3 ft) NOTE: Highly weathered from 66.1' to 66.3'.		67-82': Slotted PVC (20-slot) Screen
							70			(69.6-80.2 ft) SHALE, fine grained to medium grained; gray; slightly weathered; slightly fractured; medium-bedded; sandy; micaceous; nodules present (chert or lime); strong field strength. NOTE: Becomes less sandy with depth.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2103 S & I** DATE **9/2/21** SHEET **4** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/17/21** BORING FINISH **6/17/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	SAMPLE DEPTH IN FEET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
7	RC	64.6	74.6		10	67						
8	RC	74.6	84.6		10	72	75			(73.8-75 ft) NOTE: Reddish brown zone of weak shale, moderately weathered, thin bedded; very friable below 74.1'. (75.9-76 ft) NOTE: Reddish brown zone of weak shale, moderately weathered, thin bedded. (78.9-80.2 ft) NOTE: Reddish brown zone of weak shale, moderately weathered, thin bedded.		
							80			(80.2-103.2 ft) SHALE, fine grained; gray; fresh; slightly fractured; medium-bedded; nodules (lime or chert); strong field strength. (83.2-86.6 ft) NOTE: Gray micaceous sandstone, fine to medium grained, fresh, strong field strength.		84'-134.6': Bentonite backfill
9	RC	84.6	94.6		9.8	76	85			(86.6-87.2 ft) NOTE: Gray to reddish brown shale, intensely fractured, moderately weathered. (88.5-90.4 ft) NOTE: Gray to reddish brown shale, intensely fractured, moderately weathered.		
							90					
10	RC	94.6	104.6		9.8	72	95					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2103 S & I** DATE **9/2/21** SHEET **5** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/17/21** BORING FINISH **6/17/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
10	RC	94.6	104.6		9.8	72	100			(97.4-101.8 ft) NOTE: reddish brown shale, intensely fractured, slight to moderately weathered, thin to medium bedded.		
11	RC	104.6	114.6		10	97	105			(103.2-120.4 ft) SANDSTONE, fine grained to medium grained; gray; fresh; unfractured; medium-bedded; strong to very strong field strength. (105.6-106.7 ft) NOTE: Gray shale.		
12	RC	114.6	124.6		10	100	110 115 120			(115-118 ft) NOTE: Angled sandstone. (120.4-134.6 ft) SHALE, fine grained; gray; fresh; unfractured; medium-bedded; strong to very strong field strength.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2103 S & I** DATE **9/2/21** SHEET **6** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/17/21** BORING FINISH **6/17/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
12	RC	114.6	124.6		10	100						
13	RC	124.6	134.6		10	100	125					
							130			(130.8-132.6 ft) NOTE: Gray sandstone.		
							135					
							140					
							145					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 542,356.375 E 1,725,041.563**

GROUND ELEVATION **931.21 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽	▽	▼
TIME			
DATE			

BORING NO. **2104** DATE **9/2/21** SHEET **1** OF **6**

BORING START **6/22/21** BORING FINISH **6/22/21**

PIEZOMETER TYPE **NA** WELL TYPE **NA**

HGT. RISER ABOVE GROUND **NA** DIA **NA**

DEPTH TO TOP OF WELL SCREEN **NA** BOTTOM **NA**

WELL DEVELOPMENT **NA** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
												No well installed
1	RC	3.0	9.6		4.6	28	5			(3-10.1 ft) SANDSTONE, fine grained; tan and black (banded); moderately weathered; moderately fractured; thin-bedded; moderate field strength.		
2	RC	9.6	14.6		4.7	45	10			(10.1-12.6 ft) MUDSTONE, fine grained; red; fresh; moderately fractured; thin-bedded; moderate field strength. (11.6-12.6 ft) NOTE: Becomes weak, slight to fresh decomposition, moderately fractured; thick-bedded. (12.6-18.1 ft) MUDSTONE, fine grained; tan to gray; slightly weathered; slightly fractured; thick-bedded; moderate field strength.		
3	RC	14.6	24.6		9.1	49	15			(18.1-19.2 ft) SHALE, fine grained; Gray-green; moderately weathered; unfractured; laminated; weak field strength.		

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

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PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Alan Gillespie**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2104** DATE **9/2/21** SHEET **2** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/22/21** BORING FINISH **6/22/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
3	RC	14.6	24.6		9.1	49				(19.2-27.4 ft) MUDSTONE, fine grained; red to gray; fresh; moderately fractured; massive; weak field strength.		
4	RC	24.6	34.6		8.1	79	25			(27.4-28.5 ft) MUDSTONE, fine grained; gray; moderately weathered; moderately fractured; laminated; weak field strength.		
										(28.5-39.7 ft) SANDSTONE, fine grained; gray to green; slightly weathered; slightly fractured; massive; strong field strength.		
5	RC	34.6	44.6		9.2	56	30					
							35			(35.8-36.4 ft) NOTE: Sandstone becomes medium grained.		
							40			(39.7-44.2 ft) SANDSTONE, medium grained; gray; slightly weathered; massive; strong field strength.		
6	RC	44.6	54.6		8.4	72	45			(44.2-45.6 ft) MUDSTONE, fine grained; gray; moderately weathered; moderately fractured; thin-bedded; moderate field strength.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2104** DATE **9/2/21** SHEET **3** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/22/21** BORING FINISH **6/22/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
6	RC	44.6	54.6		8.4	72				(45.6-49.1 ft) MUDSTONE, fine grained; red; moderately weathered; moderately fractured; thick-bedded; shaley; moderate field strength.		
							50			(49.1-50.8 ft) SANDSTONE, fine grained; gray; fresh; slightly fractured; massive.		
										(50.8-52.3 ft) SANDSTONE, fine grained; gray; moderately weathered; moderately fractured; thin-bedded; shaley.		
										(52.3-59.2 ft) SANDSTONE, fine grained; gray; fresh; slightly fractured; massive; strong field strength.		
7	RC	54.6	64.6		9.6	74	55					
							60			(59.2-61.1 ft) MUDSTONE, fine grained; red; moderately weathered; moderately fractured); thin-bedded; shaley.		
										(61.1-65.7 ft) SANDSTONE, fine grained; gray to red, mottled; slightly weathered; slightly fractured; thin-bedded; shaley.		
8	RC	64.6	74.6		9.9	65	65					
										(65.7-67.2 ft) SANDSTONE, fine grained; gray to red, banded; moderately weathered; moderately fractured; medium-bedded . NOTE: Interbedded with shale.		
										(67.2-73.2 ft) SANDSTONE, fine grained; gray; slightly weathered; moderately fractured; strong field strength. NOTE: Interbedded with shale.		
							70					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2104** DATE **9/2/21** SHEET **4** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/22/21** BORING FINISH **6/22/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
8	RC	64.6	74.6		9.9	65						
9	RC	74.6	84.6		9.8	80	75			(73.2-80.1 ft) SANDSTONE, fine grained; gray; fresh; slightly fractured; thin-bedded; strong field strength.		
10	RC	84.6	94.6		9.5	72	80			(80.1-81.6 ft) SANDSTONE, fine grained; gray with red banding; moderately weathered; moderately fractured; thin-bedded; shaley; moderate field strength.		
										(81.6-84.1 ft) SANDSTONE, fine grained; gray; fresh; slightly fractured; thin-bedded; strong field strength.		
							85			(84.1-86.4 ft) SILTSTONE, fine grained; red with gray banding; moderately weathered; moderately fractured; thin-bedded; moderate field strength.		
										(85.4-86.1 ft) NOTE: Thin layer of sandstone.		
										(86.4-86.9 ft) MUDSTONE, fine grained; gray; moderately weathered; moderately fractured; thin-bedded; sandy; moderate to weak field strength.		
										(86.9-89.4 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		
							90			(89.4-98.5 ft) MUDSTONE, fine grained; mottled; moderately weathered; moderately fractured; medium-bedded; moderate to weak field strength.		
11	RC	94.6	104.6		9.5	75	95					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2104** DATE **9/2/21** SHEET **5** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/22/21** BORING FINISH **6/22/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
11	RC	94.6	104.6		9.5	75						
										(98.5-124.6 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		
							100					
12	RC	104.6	114.6		10	85	105					
							110					
13	RC	114.6	124.6		10	90	115			(114.3 ft) NOTE: Sandstone becomes medium-grained and medium-bedded.		
							120					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2104** DATE **9/2/21** SHEET **6** OF **6**

PROJECT **Amos - FGD Landfill** BORING START **6/22/21** BORING FINISH **6/22/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
13	RC	114.6	124.6		10	90				(123.6 ft) NOTE: Sandstone is shaley, fine-grained, gray/light gray (mottled), no fractures.		
14	RC	124.6	134.6		10	77	125			(124.6-126.1 ft) SANDSTONE, medium grained; slightly weathered; unfractured; thin-bedded; strong field strength.		
										(126.1-133.7 ft) SHALE, fine grained; moderately weathered; moderately fractured; thin-bedded; weak field strength.		
							130					
										(133.7-134.6 ft) SANDSTONE, fine grained; gray; slightly weathered; unfractured; thin-bedded; strong field strength.		
							135					
							140					
							145					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 543,830.171 E 1,725,193.696**

GROUND ELEVATION **991.72 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽75.08 (SS)	▽107.68 (S)	▼
TIME			
DATE	8/9/2021	8/9/2021	

BORING NO. **2105 SS & S** DATE **9/2/21** SHEET **1** OF **5**

BORING START **6/23/21** BORING FINISH **6/23/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.78' (SS), 2.69' (S)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **61'/98'** BOTTOM **76'/108'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
							5					0-53': Grout seal *Lithology from 2105 I/D borehole. 2105 S & SS installed in 8" borehole.
1	RC	6.4	14.5		4.1	59	10			(6.4-16.6 ft) MUDSTONE, fine grained; tan; highly weathered; slightly fractured; medium-bedded. NOTE: Interbedded shale lenses, red, weak to moderate field strength.		
2	RC	14.5	24.5		6.8	51	15			(16.6-18.1 ft) SANDSTONE, fine grained; gray; slightly weathered; moderately fractured; thin-bedded; strong field strength. (18.1-20 ft) MUDSTONE, fine grained; tan/red/black mottled; highly weathered; moderately fractured; medium-bedded; weak field strength.		

TYPE OF CASING USED

NA	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

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PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Alan Gillespie**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 SS & S** DATE **9/2/21** SHEET **2** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
2	RC	14.5	24.5		6.8	51				(20-26.1 ft) SHALE, fine grained; red with tan/gray mottling; slightly weathered; slightly fractured. NOTE: Sandstone nodules throughout.		
3	RC	24.5	34.5		5	66	25			(26-26.1 ft) NOTE: Highly weathered. (26.1-34.5 ft) SHALE, fine grained; gray-green with light gray nodules; moderately weathered; intensely fractured; medium-bedded. NOTE: Light gray sandstone nodules throughout (typically 1-2 cm, occasionally 10-12cm). (29.9 ft) NOTE: Rust in fracture.		
4	RC	34.5	44.5		9.9	56	30 35			(34.5-37.8 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded. NOTE: Reddish coloring along bedding planes. (37.8-41.8 ft) SANDSTONE, fine grained; gray with red banding; moderately weathered; moderately fractured; medium-bedded; moderate field strength. NOTE: Interbedded with shale.		
5	RC	44.5	54.5		10	65	40 45			(41.8-49.3 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 SS & S** DATE **9/2/21** SHEET **3** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
5	RC	44.5	54.5		10	65						
							50			(49.3-64 ft) MUDSTONE, fine grained; red with gray/tan mottling; moderately weathered; moderately fractured; medium-bedded; moderate field strength.		53-56': Bentonite seal
6	RC	54.5	64.5		7.1	56	55					56-57': Secondary Sand Pack (choker sand)
												57-80': Primary Sand Pack
							60			(58.6 ft) NOTE: Becomes more weathered and fractured: moderate to weak field strength, moderate to highly weathered, moderately fractured, medium-bedded.		61-76': Slotted PVC (20-slot) Screen
7	RC	64.5	74.5		7.4	58	65			(64-73.4 ft) MUDSTONE, fine grained; dark red; highly weathered; moderately fractured; thick-bedded; moderate field strength.		
							70					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 SS & S** DATE **9/2/21** SHEET **4** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	SAMPLE DEPTH IN FEET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
7	RC	64.5	74.5		7.4	58						
8	RC	74.5	84.5		9.4	87	75			(73.4-74.5 ft) SANDSTONE, fine grained; gray with red mottling; moderately weathered; slightly fractured; thin-bedded. NOTE: Interbedded with mudstone. (74.5-75.1 ft) SHALE, fine grained; red; moderately weathered; moderately fractured; thin-bedded; moderate to weak field strength. (75.1-82 ft) SANDSTONE, fine grained; gray; moderately weathered; intensely fractured; thin-bedded; strong field strength. NOTE: Moderate to high disintegration at contact (82.0'). (78.8-80.8 ft) NOTE: Calcite deposition and iron staining at fracture.		
							80			(80.8-81 ft) NOTE: Weathered shale. (82-83.2 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded; moderate to strong field strength. NOTE: Interbedded with red shale.		80-93': Bentonite seal
9	RC	84.5	94.5		9.9	67	85			(83.2-86.3 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength. (86.3-92.7 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded. NOTE: Interbedded with gray-green shale. (87.5 ft) NOTE: Becomes red shale interbedded with gray sandstone; moderate to weak field strength, thinly bedded, moderate weathering, slightly fractured.		
							90			(90.1 ft) NOTE: Shale becomes more sandy and transitions to sandstone. (92.7-94.7 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		93-94': Secondary Sand Pack (choker sand)
10	RC	94.5	104.5		9.3	44	95			(94.7-100 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded. NOTE: Interbedded with shale. (94.9-95.5 ft) NOTE: Heavy calcite deposits.		94-110': Primary Sand Pack

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 SS & S** DATE **9/2/21** SHEET **5** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	SAMPLE DEPTH IN FEET TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
10	RC	94.5	104.5		9.3	44	100			(100-107.2 ft) MUDSTONE, fine grained; red with gray mottling; highly weathered; medium-bedded; moderate field strength. NOTE: Calcite nodules (2-3cm) at upper contact (100-101').		98-108': Slotted PVC (20-slot) Screen
11	RC	104.5	110.0		5.5	87	105			(106.4-107.2 ft) NOTE: Becomes shale-dominated, with interbedded mudstone; gray with red mottling, thinly bedded, moderately weathered, moderately fractured. NOTE: fractures and calcite deposits at 106.7' to 107.2'.		
							110			(107.2-120.4 ft) SANDSTONE, fine grained to medium grained; gray to light gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		
							115					
							120					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 543,825.103 E 1,725,192.735**

GROUND ELEVATION **991.72 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽135.96 (I)	▽180.33 (D)	▼
TIME			
DATE	8/9/2021	8/9/2021	

BORING NO. **2105 I & D** DATE **9/2/21** SHEET **1** OF **8**

BORING START **6/23/21** BORING FINISH **6/23/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.69' (I), 2.89' (D)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **120'/167'** BOTTOM **140'/182'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
							5					0-112': Grout seal NOTE: 8" Borehole Diameter
1	RC	6.4	14.5		4.1	59	10			(6.4-16.6 ft) MUDSTONE, fine grained; tan; highly weathered; slightly fractured; medium-bedded. NOTE: Interbedded shale lenses, red, weak to moderate field strength.		
2	RC	14.5	24.5		6.8	51	15			(16.6-18.1 ft) SANDSTONE, fine grained; gray; slightly weathered; moderately fractured; thin-bedded; strong field strength. (18.1-20 ft) MUDSTONE, fine grained; tan/red/black mottled; highly weathered; moderately fractured; medium-bedded; weak field strength.		

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

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PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Alan Gillespie**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 I & D** DATE **9/2/21** SHEET **2** OF **8**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
2	RC	14.5	24.5		6.8	51				(20-26.1 ft) SHALE, fine grained; red with tan/gray mottling; slightly weathered; slightly fractured. NOTE: Sandstone nodules throughout.		
3	RC	24.5	34.5		5	66	25			(26-26.1 ft) NOTE: Highly weathered. (26.1-34.5 ft) SHALE, fine grained; gray-green with light gray nodules; moderately weathered; intensely fractured; medium-bedded. NOTE: Light gray sandstone nodules throughout (typically 1-2 cm, occasionally 10-12cm). (29.9 ft) NOTE: Rust in fracture.		
4	RC	34.5	44.5		9.9	56	30 35			(34.5-37.8 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded. NOTE: Reddish coloring along bedding planes. (37.8-41.8 ft) SANDSTONE, fine grained; gray with red banding; moderately weathered; moderately fractured; medium-bedded; moderate field strength. NOTE: Interbedded with shale.		
5	RC	44.5	54.5		10	65	40 45			(41.8-49.3 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 I & D** DATE **9/2/21** SHEET **3** OF **8**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
5	RC	44.5	54.5		10	65						
							50			(49.3-64 ft) MUDSTONE, fine grained; red with gray/tan mottling; moderately weathered; moderately fractured; medium-bedded; moderate field strength.		
6	RC	54.5	64.5		7.1	56	55					
							60			(58.6 ft) NOTE: Becomes more weathered and fractured: moderate to weak field strength, moderate to highly weathered, moderately fractured, medium-bedded.		
7	RC	64.5	74.5		7.4	58	65			(64-73.4 ft) MUDSTONE, fine grained; dark red; highly weathered; moderately fractured; thick-bedded; moderate field strength.		
							70					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 I & D** DATE **9/2/21** SHEET **4** OF **8**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
7	RC	64.5	74.5		7.4	58						
										(73.4-74.5 ft) SANDSTONE, fine grained; gray with red mottling; moderately weathered; slightly fractured; thin-bedded. NOTE: Interbedded with mudstone.		
8	RC	74.5	84.5		9.4	87	75			(74.5-75.1 ft) SHALE, fine grained; red; moderately weathered; moderately fractured; thin-bedded; moderate to weak field strength.		
										(75.1-82 ft) SANDSTONE, fine grained; gray; moderately weathered; intensely fractured; thin-bedded; strong field strength. NOTE: Moderate to high disintegration at contact (82.0').		
										(78.8-80.8 ft) NOTE: Calcite deposition and iron staining at fracture.		
							80			(80.8-81 ft) NOTE: Weathered shale.		
										(82-83.2 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded; moderate to strong field strength. NOTE: Interbedded with red shale.		
9	RC	84.5	94.5		9.9	67				(83.2-86.3 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		
							85					
										(86.3-92.7 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded. NOTE: Interbedded with gray-green shale.		
										(87.5 ft) NOTE: Becomes red shale interbedded with gray sandstone; moderate to weak field strength, thinly bedded, moderate weathering, slightly fractured.		
							90			(90.1 ft) NOTE: Shale becomes more sandy and transitions to sandstone.		
										(92.7-94.7 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		
10	RC	94.5	104.5		9.3	44	95			(94.7-100 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded. NOTE: Interbedded with shale.		
										(94.9-95.5 ft) NOTE: Heavy calcite deposits.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 I & D** DATE **9/2/21** SHEET **5** OF **8**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
10	RC	94.5	104.5		9.3	44	100			(100-107.2 ft) MUDSTONE, fine grained; red with gray mottling; highly weathered; medium-bedded; moderate field strength. NOTE: Calcite nodules (2-3cm) at upper contact (100-101').		
11	RC	104.5	114.5		10	87	105			(106.4-107.2 ft) NOTE: Becomes shale-dominated, with interbedded mudstone; gray with red mottling, thinly bedded, moderately weathered, moderately fractured. NOTE: fractures and calcite deposits at 106.7' to 107.2'.		
										(107.2-120.4 ft) SANDSTONE, fine grained to medium grained (0.25-0.5 mm); gray to light gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		
12	RC	114.5	124.5		10	57	110					112-115': Bentonite seal
							115					115-116': Secondary Sand Pack (choker sand) 116-142': Primary Sand Pack
							120			(119.2 ft) NOTE: Calcite nodule (5 cm) and fractures.		120-140': Slotted PVC (20-slot) Screen
										(120.4-127.4 ft) SHALE, fine grained; gray with red/tan mottling; moderately weathered; moderately fractured; thin-bedded; moderate field strength.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 I & D** DATE **9/2/21** SHEET **6** OF **8**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
13	RC	124.5	134.5		9.6	81	125			(127.4-136.3 ft) SANDSTONE, fine grained; light gray; moderately weathered; slightly fractured; thin-bedded; strong field strength. NOTE: Calcite deposits throughout with calcium deposits near contacts (127.4-127.8' and 130.0-131.1').		
							130			(132-132.3 ft) NOTE: Thin shale layer, red, highly weathered, moderately fractured.		
14	RC	134.5	144.5		9.5	85	135			(136.3-144.8 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded; strong field strength. NOTE: Calcite veins and nodules throughout.		
							140			(143.8-144.8 ft) NOTE: Interbedded with shale.		142-162': Bentonite seal
15	RC	144.5	154.5		10	91	145			(144.8-149.9 ft) SANDSTONE, fine grained; gray to light gray; moderately weathered; thin-bedded; strong to very strong field strength.		
										(147.2-147.5 ft) NOTE: Calcite veins.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 I & D** DATE **9/2/21** SHEET **7** OF **8**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
15	RC	144.5	154.5		10	91				(149.9-151 ft) SHALE, fine grained; red with gray mottling; moderately weathered; slightly fractured; thin-bedded; moderate to strong field strength. NOTE: Calcite veins at top and base contacts. (151-154.5 ft) SANDSTONE, fine grained; gray to light gray; moderately weathered; thin-bedded; strong field strength. (153.9-154.5 ft) NOTE: Interbedded with shale.		
16	RC	154.5	164.5		10		155			(154.5-163.2 ft) SANDSTONE, fine grained; gray; slightly weathered; unfractured; thin-bedded; strong field strength. (156.1-163.2 ft) NOTE: Interbedded with red shale.		
							160					162-163': Secondary Sand Pack (choker sand) 163-184': Primary Sand Pack
										(163.2-166.2 ft) SANDSTONE, fine grained; gray to light gray; slightly weathered; slightly fractured; thin-bedded; strong field strength. NOTE: Fractures and calcite veins at base contact.		
17	RC	164.5	174.5		10	79	165			(166.2-170 ft) NOTE: Interbedded with shale, moderately weathered and fractured.		167-182': Slotted PVC (20-slot) Screen
							170			(170-180 ft) SHALE, fine grained; red to dark red; moderately weathered; moderately fractured; thin-bedded; moderate field strength.		
18	RC	174.5	184.5		9.8	91	175					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2105 I & D** DATE **9/2/21** SHEET **8** OF **8**

PROJECT **Amos - FGD Landfill** BORING START **6/23/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
18	RC	174.5	184.5		9.8	91				(177.6-178.8 ft) NOTE: Interbedded with sandstone, red/gray/tan mottled, highly weathered, weak. (178.8-180 ft) NOTE: Shale becomes gray-green.		
							180			(180-184.5 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		
19	RC	184.5	194.5		10	97						184'-194.5': Bentonite backfill
							185			(184.5-185 ft) SHALE, fine grained; gray-green; moderately weathered; slightly fractured; thin-bedded; sandy; moderate to strong field strength. (185-194.5 ft) SANDSTONE, medium grained; dark gray; fresh; unfractured; thin-bedded; strong field strength.		
							190					
							195					
							200					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 542,837.390 E 1,722,861.693**

GROUND ELEVATION **722.64 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 48.35	▽	▼
TIME			
DATE	8/9/2021		

BORING NO. **2106** DATE **9/2/21** SHEET **1** OF **5**

BORING START **6/22/21** BORING FINISH **6/23/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.94'** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **37'** BOTTOM **57'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
0	RC	3.0	9.6		4.3	37	5			(3-3.5 ft) MUDSTONE, fine grained; red-gray mottled; highly weathered; intensely fractured; medium-bedded; weak field strength. (3.5-4.1 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength. (4.1-6.3 ft) SANDSTONE, fine grained; moderately weathered; intensely fractured; medium-bedded; moderate field strength. NOTE: Interbedded with mudstone. (6.3-10.1 ft) SANDSTONE, fine grained; slightly weathered; slightly fractured; thin-bedded; strong field strength.		0-29': Grout seal NOTE: 6" Borehole Diameter
1	RC	9.6	14.6		4.3	42	10			(10.1-16.8 ft) MUDSTONE, fine grained; red to reddish gray (mottled); highly weathered; moderately fractured; moderate to weak field strength.		
2	RC	14.6	24.6		10	63	15			(16.8-27.2 ft) SANDSTONE, fine grained; gray; moderately weathered; slightly fractured; thin-bedded; strong field strength.		

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

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PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Alan Gillespie**

AEP - AEP.GDT - 9/2/21 10:40 - C:\USERS\SOLUND\ARCADIS\AEP TEAM SITE - FGD LANDFILL\2021 INVESTIGATION\BORING LOGS-GINT\AEP BORING LOGS (1).GPJ

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2106** DATE **9/2/21** SHEET **2** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **6/22/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
2	RC	14.6	24.6		10	63				(20.3-20.6 ft) NOTE: Shale lens. (21.5-21.6 ft) NOTE: Shale lens.		
3	RC	24.6	34.6		10	41	25					
										(27.2-33.7 ft) SHALE, fine grained; gray with red banding; moderately weathered; slightly fractured; medium-bedded; moderate to weak field strength. NOTE: Interbedded with mudstone.		29-32': Bentonite seal
							30					32-33': Secondary Sand Pack (choker sand)
												33-59': Primary Sand Pack
										(33.7-56.5 ft) MUDSTONE, fine grained; red/tan/gray mottled; highly weathered; moderately fractured; medium-bedded; weak field strength.		
4	RC	34.6	44.6		4.2	43	35					37'-57': Slotted PVC (20-slot) Screen
							40					
5	RC	44.6	54.6		4.4	36	45			(44.6 ft) NOTE: Becomes less weathered, moderate field strength.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2106** DATE **9/2/21** SHEET **3** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **6/22/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
5	RC	44.6	54.6		4.4	36	50			(52.4 ft) NOTE: Becomes less weathered, less fractured, tan coloring dominates.		
6	RC	54.6	64.6		9.6	76	55			(56.5-67.9 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded. NOTE: Interbedded with red sandy shale.		59'-104.6': Bentonite backfill
7	RC	64.6	74.6		9	39	60					
							65					
							70			(67.9-89.6 ft) SHALE, fine grained; red with gray mottling; highly weathered; moderately fractured; weak field strength.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2106** DATE **9/2/21** SHEET **4** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **6/22/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
7	RC	64.6	74.6		9	39						
8	RC	74.6	84.6		8.7	51	75			(79.1 ft) NOTE: Becomes less weathered, moderate field strength.		
9	RC	84.6	94.6		9.7	64	80					
							85					
							90			(89.6-94.3 ft) SANDSTONE, fine grained; gray; slightly weathered; unfractured; thin-bedded; strong field strength. (92.7-92.8 ft) NOTE: Highly weathered. (93.7-93.8 ft) NOTE: Highly weathered.		
10	RC	94.6	104.6		9.7	69	95			(94.3-99.8 ft) SHALE, fine grained; red; moderately weathered; slightly fractured; moderate field strength. NOTE: Interbedded with gray sandstone.		

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power** BORING NO. **2106** DATE **9/2/21** SHEET **5** OF **5**

PROJECT **Amos - FGD Landfill** BORING START **6/22/21** BORING FINISH **6/23/21**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
10	RC	94.6	104.6		9.7	69	100			(99.8-104 ft) SANDSTONE, fine grained; gray; slightly weathered; slightly fractured; thin-bedded; strong field strength.		
							105			(104-104.6 ft) SHALE, fine grained; red; moderately weathered; moderately fractured; medium-bedded; moderate to weak field strength. NOTE: Highly weathered at 104.4-104.6'.		
							110					
							115					
							120					

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,732.909 E 1,724,951.574**

GROUND ELEVATION **932.04 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 56.95	▽	▽
TIME			
DATE	8/9/2021		

BORING NO. **2101 I & D** DATE **10/8/21** SHEET **1** OF **1**

BORING START **6/15/21** BORING FINISH **6/16/21**

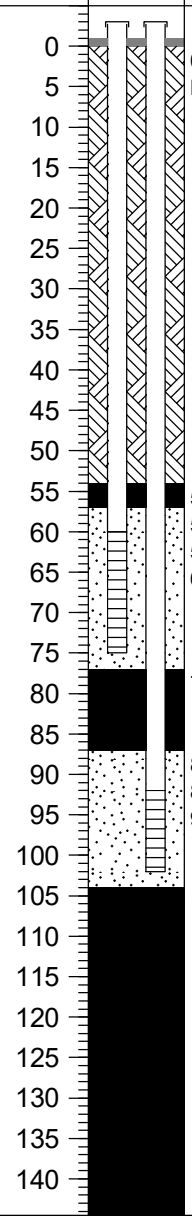
PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.73' (I) 2.71' (D)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **60'/92'** BOTTOM **75'/102'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**



TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

AEP WELL CONSTRUCTION - AEP.GDT - 10/8/21 15:32 - C:\USERS\LWOODS\ONEDRIVE - ARCADIS\FULCRUM-GINT PROJECTS\AEP\AEP BORING LOGS (1).GPJ

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,735.055 E 1,724,955.37**

GROUND ELEVATION **932.04 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 38.59	▽	▽
TIME			
DATE	8/9/2021		

BORING NO. **2101 S** DATE **10/8/21** SHEET **1** OF **1**

BORING START **6/15/21** BORING FINISH **6/16/21**

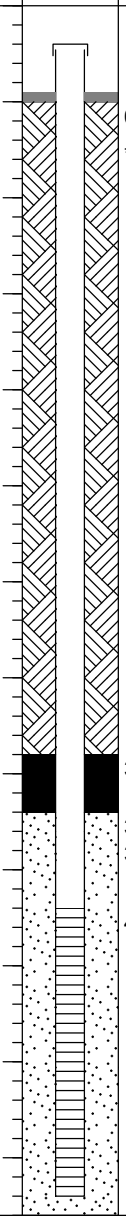
PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.86'** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **42'** BOTTOM **57'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**



DESCRIPTION

0-34': Grout seal

*Lithology from 2101 I/D borehole. 2101 S installed in offset 6" borehole.

34-37': Bentonite seal

37-38': Secondary Sand Pack (choker sand)

38-58': Primary Sand Pack

42-57': Slotted PVC (20-slot) Screen

TYPE OF CASING USED

NA	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,737.317 E 1,724,959.605**

GROUND ELEVATION **932.04 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 20.61	▽	▽
TIME			
DATE	8/9/2021		

BORING NO. **2101 SS** DATE **10/8/21** SHEET **1** OF **1**

BORING START **6/15/21** BORING FINISH **6/16/21**

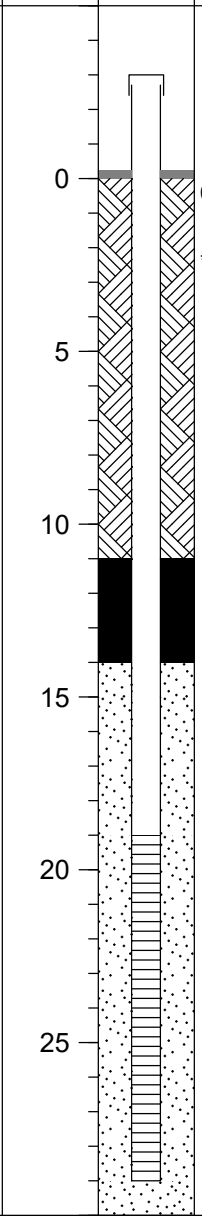
PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.8'** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **19'** BOTTOM **29'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**



TYPE OF CASING USED

NA	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,942.346 E 1,725,328.869**

GROUND ELEVATION **932.97 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 78.94	▽	▼
TIME			
DATE	8/9/2021		

BORING NO. **2102 I & D** DATE **10/8/21** SHEET **1** OF **1**

BORING START **6/16/21** BORING FINISH **6/16/21**

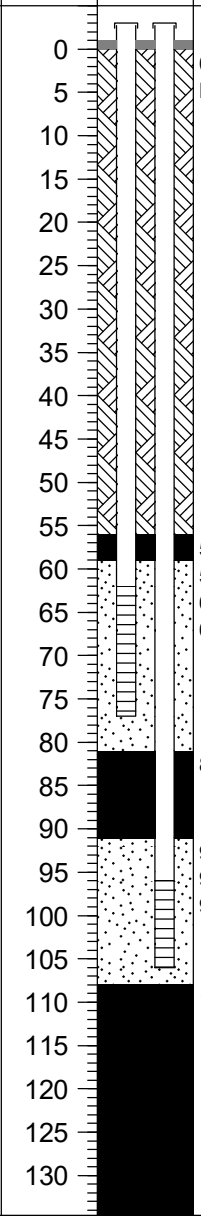
PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.90' (I), 2.89' (D)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **62'/96'** BOTTOM **77'/106'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**



TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 541,946.401 E 1,725,330.822**

GROUND ELEVATION **932.97 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 41.27	▽	▼
TIME			
DATE	8/9/2021		

BORING NO. **2102 S** DATE **10/8/21** SHEET **1** OF **1**

BORING START **6/16/21** BORING FINISH **6/16/21**

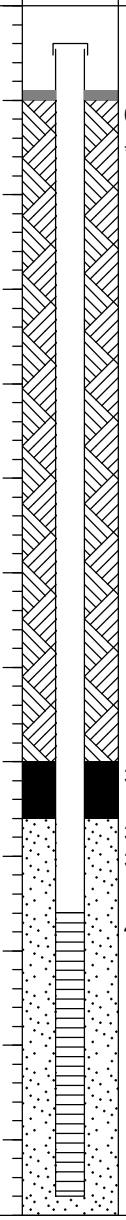
PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.97'** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **43'** BOTTOM **58'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**



TYPE OF CASING USED

NA	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 542,191.177 E 1,725,406.308**

GROUND ELEVATION **935.46 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 57.15	▽	▽
TIME			
DATE	8/9/2021		

BORING NO. **2103 S & I** DATE **10/8/21** SHEET **1** OF **1**

BORING START **6/17/21** BORING FINISH **6/17/21**

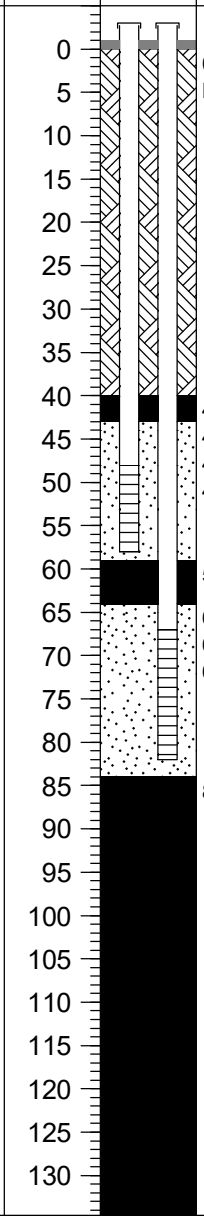
PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.47' (S), 2.45' (I)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **45'/67'** BOTTOM **58'/82'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**



TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Mike Lutz**

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AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 543,825.103 E 1,725,192.735**

GROUND ELEVATION **991.72 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 135.96	▽	▼
TIME			
DATE	8/9/2021		

BORING NO. **2105 I & D** DATE **10/8/21** SHEET **1** OF **1**

BORING START **6/23/21** BORING FINISH **6/23/21**

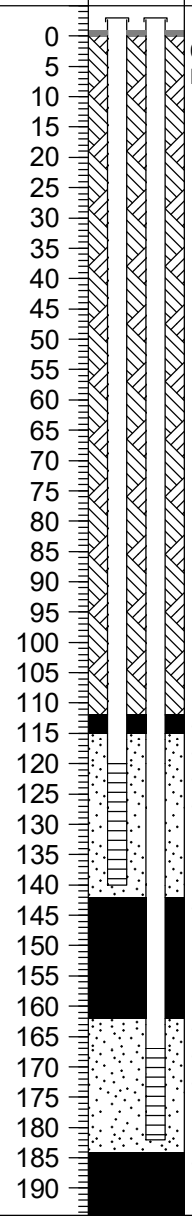
PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.69' (I), 2.89' (D)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **120'/167'** BOTTOM **140'/182'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**



TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Alan Gillespie**

AEP WELL CONSTRUCTION - AEP.GDT - 10/8/21 15:32 - C:\USERS\LWOODS\ONEDRIVE - ARCADIS\FULCRUM-GINT PROJECTS\AEP\AEP BORING LOGS (1).GPJ

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 543,830.171 E 1,725,193.696**

GROUND ELEVATION **991.72 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 75.08	▽	▼
TIME			
DATE	8/9/2021		

BORING NO. **2105 SS & S** DATE **10/8/21** SHEET **1** OF **1**

BORING START **6/23/21** BORING FINISH **6/23/21**

PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.78' (SS), 2.69' (S)** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **61'/98'** BOTTOM **76'/108'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**

DEPTH IN FEET	WELL	DESCRIPTION
0		0-53': Grout seal *Lithology from 2105 I/D borehole. 2105 S & SS installed in 8" borehole.
55		53-56': Bentonite seal 56-57': Secondary Sand Pack (choker sand) 57-80': Primary Sand Pack 61-76': Slotted PVC (20-slot) Screen
80		80-93': Bentonite seal
95		93-94': Secondary Sand Pack (choker sand) 94-110': Primary Sand Pack 98-108': Slotted PVC (20-slot) Screen

TYPE OF CASING USED

NA	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Alan Gillespie**

AEP WELL CONSTRUCTION - AEP.GDT - 10/8/21 15:32 - C:\USERS\LWOODS\ONEDRIVE - ARCADIS\FULCRUM-GINT PROJECTS\AEP\AEP BORING LOGS (1).GPJ

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER **30080156**

COMPANY **American Electric Power**

PROJECT **Amos - FGD Landfill**

COORDINATES **N 542,837.390 E 1,722,861.693**

GROUND ELEVATION **722.64 ft** SYSTEM **NAD83/NAVD88**

Water Level, ft	▽ 48.35	▽	▽
TIME			
DATE	8/9/2021		

BORING NO. **2106** DATE **10/8/21** SHEET **1** OF **1**

BORING START **6/22/21** BORING FINISH **6/23/21**

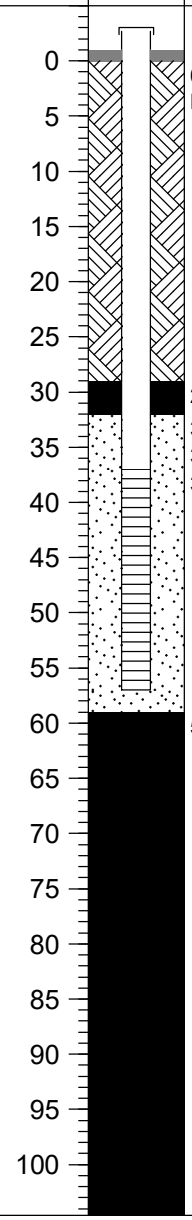
PIEZOMETER TYPE **NA** WELL TYPE **OW**

HGT. RISER ABOVE GROUND **2.94'** DIA **2"**

DEPTH TO TOP OF WELL SCREEN **37'** BOTTOM **57'**

WELL DEVELOPMENT **Purge/Jet** BACKFILL **Bentonite Grout**

FIELD PARTY **Zack Racer (AEP)** RIG **Wireline Coring**



TYPE OF CASING USED

X	NQ-2 ROCK CORE	
NA	6" x 3.25 HSA	
NA	9" x 6.25 HSA	
NA	HW CASING ADVANCER	4"
NA	NW CASING	3"
NA	SW CASING	6"
NA	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER **Alan Gillespie**

AEP WELL CONSTRUCTION - AEP.GDT - 10/8/21 15:32 - C:\USERS\LWOODS\ONEDRIVE - ARCADIS\FULCRUM-GINT PROJECTS\AEP\AEP BORING LOGS (1).GPJ

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0004-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0004-21
Grid Location:
a. Latitude: 38 29 5 .0
b. Longitude: 81 51 3 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2101SS

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/13/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	6 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	14 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 200 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	14 ft.
15.Depth to Top of Screen:	19.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 9.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	29 ft.
19.Bottom of Filter Pack:	30 ft.
20.Bottom of Borehole:	30 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0003-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0003-21
Grid Location:
a. Latitude: 38 29 5 .0
b. Longitude: 81 51 3 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2101S

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/07/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	6 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	25 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 150 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	37 ft.
15.Depth to Top of Screen:	42.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 14.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	57 ft.
19.Bottom of Filter Pack:	58 ft.
20.Bottom of Borehole:	58 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0002-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0002-21
Grid Location:
a. Latitude: 38 29 5 .0
b. Longitude: 81 51 3 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2101I

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/07/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	51 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 150 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	57 ft.
15.Depth to Top of Screen:	60.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 14.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	75 ft.
19.Bottom of Filter Pack:	77 ft.
20.Bottom of Borehole:	104 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0001-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0001-21
Grid Location:
a. Latitude: 38 29 5 .0
b. Longitude: 81 51 3 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2101D

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/07/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	77 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 250 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	87 ft.
15.Depth to Top of Screen:	92.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 9.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	102 ft.
19.Bottom of Filter Pack:	104 ft.
20.Bottom of Borehole:	104 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	

24.WV Contractor License No.

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0007-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0007-21
Grid Location:
a. Latitude: 38 29 7 .0
b. Longitude: 81 50 58 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2102S

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/06/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	6 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	26 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 150 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	37 ft.
15.Depth to Top of Screen:	43.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 14.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	58 ft.
19.Bottom of Filter Pack:	59 ft.
20.Bottom of Borehole:	59 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0006-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0006-21
Grid Location:
a. Latitude: 38 29 7 .0
b. Longitude: 81 50 58 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2102I

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/02/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	52 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 150 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	58.5 ft.
15.Depth to Top of Screen:	62.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 14.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	77 ft.
19.Bottom of Filter Pack:	81 ft.
20.Bottom of Borehole:	134.6 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0005-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0005-21
Grid Location:
a. Latitude: 38 29 7 .0
b. Longitude: 81 50 58 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2102D

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/02/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	81 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 250 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	90.5 ft.
15.Depth to Top of Screen:	96.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 9.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	106 ft.
19.Bottom of Filter Pack:	108 ft.
20.Bottom of Borehole:	134.6 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0009-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0009-21
Grid Location:
a. Latitude: 38 29 9 .0
b. Longitude: 81 50 57 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2103S

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/12/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	35 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 150 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	43 ft.
15.Depth to Top of Screen:	48 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 9.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	57.6 ft.
19.Bottom of Filter Pack:	59 ft.
20.Bottom of Borehole:	84 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0008-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0008-21
Grid Location:
a. Latitude: 38 29 9 .0
b. Longitude: 81 50 57 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2103I

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/12/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	59 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 100 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	64 ft.
15.Depth to Top of Screen:	67 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 14.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	81.6 ft.
19.Bottom of Filter Pack:	84 ft.
20.Bottom of Borehole:	84 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0013-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0013-21
Grid Location:
a. Latitude: 38 29 25 .0
b. Longitude: 81 51 0 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2105SS

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/15/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	47 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 250 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	56 ft.
15.Depth to Top of Screen:	61.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 14.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	76 ft.
19.Bottom of Filter Pack:	80 ft.
20.Bottom of Borehole:	110 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0012-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0012-21
Grid Location:
a. Latitude: 38 29 25 .0
b. Longitude: 81 51 0 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2105S

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/15/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	80 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 600 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	93 ft.
15.Depth to Top of Screen:	98.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 9.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	108 ft.
19.Bottom of Filter Pack:	110 ft.
20.Bottom of Borehole:	110 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0011-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0011-21
Grid Location:
a. Latitude: 38 29 25 .0
b. Longitude: 81 51 0 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2105I

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/14/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	108 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 150 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	115 ft.
15.Depth to Top of Screen:	120.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 19.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	140 ft.
19.Bottom of Filter Pack:	142 ft.
20.Bottom of Borehole:	184 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0010-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0010-21
Grid Location:
a. Latitude: 38 29 25 .0
b. Longitude: 81 51 0 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2105D

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
07/14/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	8 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	142 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 500 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	162 ft.
15.Depth to Top of Screen:	167.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 14.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	182 ft.
19.Bottom of Filter Pack:	184 ft.
20.Bottom of Borehole:	184 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

State of West Virginia
Department of Environmental Protection

Monitoring Well Construction

Well Number: WV00528-0014-21
Approved

Site Name/Physical Address:
Site: John E. Amos Plant
Line 1: 1530 Winfield Rd.
Line 2:
City: Winfield
State: WV
Zip: 25213-
County: Putnam

Well Registration No. WV00528-0014-21
Grid Location:
a. Latitude: 38 29 15 .0
b. Longitude: 81 51 30 .0
c. Method Used: GPS Differentially Collected

Company/Project Well No.:
MW-2106

Purpose of Monitoring Well:
Assessment

Well Owner (Name, Firm, Address):
Owner: American Electric Power
Line 1: 1 Riverside Plaza
Line 2:
City: Columbus
State: OH
Zip: 43215-
Phone: 614-836-4201

Installed By (Name, Firm, Address):
Installer: AEP Dolan Lab
Line 1: 4001 Bixby Rd.
Line 2:
City: Groveport
State: OH
Zip: 43125-
Phone: 614-836-4201

Date Well Installed:
06/29/2021

Driller's WV Cert No.
WV00528

Section B: (all number fields must be in decimal format)

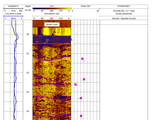
1.Cap and Lock:	YES
2.Protective Cover:	Protective Cover Pipe
3.Monitoring Well Reference Point:	0 ft.
4.Borehole Diameter:	6 inches.
5.Ground Surface Seal: a.Material: bentonite-cement grout b.Installation Procedure: gravity	
6.Surface Seal Bottom/Annular Space Top:	2 ft.
7.Well Riser: a.OD Well Riser: 2 inches. b.ID Well Riser: 1.98 inches. c.Material: PVC d.Installation Procedure: hand set	
8.Annular Space Seal: a.Material: high solids grout - b.Installation Procedure: tremie pipe-pumped	
9.Well Development Procedure: airlift -	
10.Drilling Method Used: air rotary -	
11.Annular Space Seal Bottom/Filter Seal Top:	23 ft.
12.Drilling Fluid Used: Yes Source: Water	
13.Filter Pack Seal: a.Material: bentonite pellet b.Installation Procedure: Gravity Fed c.Volume Added: 150 pounds	
14.Bottom of Bentonite Seal/Filter Pack Top:	32 ft.
15.Depth to Top of Screen:	37.4 ft.
16.Screen: a.Material: PVC b.Installation Procedure: hand set c.Slot Size: 0.02 inches. d.Screen Length: 19.6 ft.	
17.Filter Pack: a.Material: fine sand b.Installation Procedure: gravity	
18.Well Depth:	57 ft.
19.Bottom of Filter Pack:	59 ft.
20.Bottom of Borehole:	104.6 ft.
21.Backfill Material (below filter pack): N/A	
22.Decontamination Procedures: Liquid-Nox w/high pressure water pump	
23.Special Circumstances and Exceptions: No Variance Number:	
24.WV Contractor License No.	

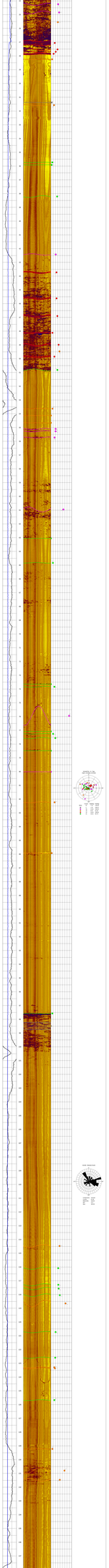
Appendix B

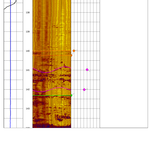
Borehole Geophysical Logs

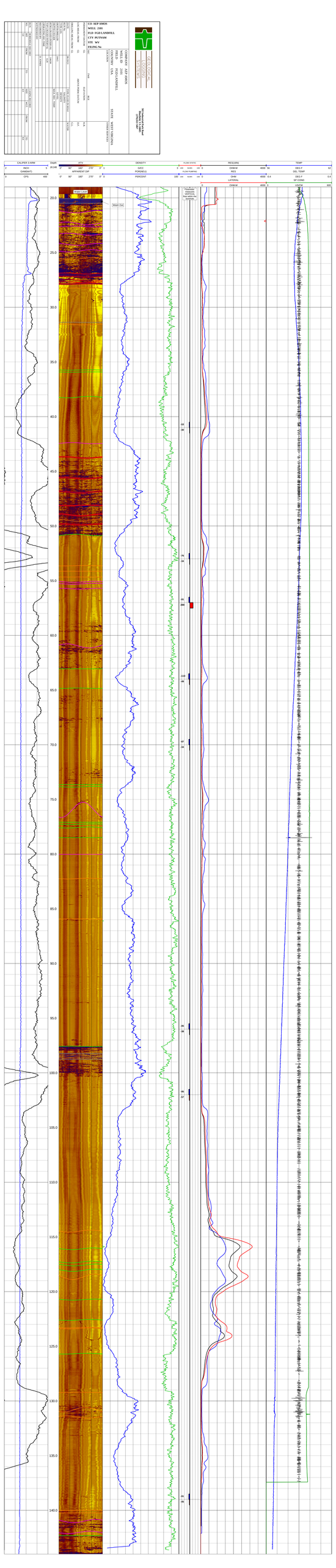
ARCADIS

2101






Gamma Ray (API)
Caliper (in)
Resistivity (ohm.m)
Density (g/cm3)
Neutron Porosity (dec)
Delta Rho (g/cm3)
PE (b/e)

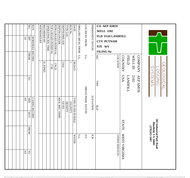

CO AEP AMOS
WELL 2101
FLD FGD LANDFILL
CTY PUTNAM
STE WV
FILING No
WELL LOGGED BY
STATE WEST VIRGINIA
COUNTY PUTNAM
FIELD FGD LANDFILL
WELL ID 2101
LOCATION
SECTION
RANGE
TOWNSHIP
PERMANENT DATUM
ELEV.: K.B.
D.F.
G.L.
DATE
RUN No.
DEPTH-DRILLER
DEPTH-LOGGER
BTM. LOG INTERVAL
TOP LOG INTERVAL
CASING-DRILLER
CASING-LOGGER
BIT SIZE
TYPE FLUID IN HOLE
DENS.
VISC.
PH
FLUID LOSS
SOURCE OF SAMPLE
RM @ MEAS. TEMP.
RMF @ MEAS. TEMP.
RMC @ MEAS. TEMP.
SOURCE OF RMF
SOURCE OF RMC
RM @ BHT
TIME CIRC. STOPPED
TIME LOGGER ON BOTTOM
MAX. REC. TEMP.
EQUIP. No.
LOCATION
RECORDED BY
WITNESSED BY
Schlumberger
Schlumberger
CALIPER 3-ARM
INCH
GAMMA/TI
GAPI
Depth
ft
ACX
APPARENT DIP
DENSITY
GCC
FORMEUS
PERCENT
FLOW RATE
RESISTIVITY
OHM-M
RES
OHM
LATERAL
TEMP
DEG F
DEL TEMP
DEG F
SP COND
Water Level
Water Out
Fracture
Fracture
VERTICAL
Fracture
Fracture

		Acoustic Televiewer Interpretation						
2101			**AEP AMOS**					
Depth Feet	**Dip Direction Degrees**	**DIP Angle Degrees**	**APERTURE inch/10**	**Feature Category**	**Feature Category Legend**			
20.28	3.17	0.46	50.08	0	**Color**	**Label**	**Description**	
21.27	139.77	35.49	0	2	Black	0	Broken Zone / Undifferentiated	
22.34	241.52	40.83	0	2	Red	1	Major Open Joint/Fracture	
22.61	293.7	14.7	0	2	Magenta	2	Minor Open Joint/Fracture	
23.32	255.57	30.95	0	2	Orange	3	Partially Open Joint/Fracture	
24.24	155.15	31.49	0	2	Gray	4	Filled Fracture/ Joint	
24.84	84.77	35.67	0	2	Green	5	Bedding/Banding/Foliation	
25.55	96.8	30.19	0	3	Teal	6	Induced Fracture	
27.06	231.88	16.83	34.31	1	Dk Green	7	Top of Coal	
27.53	258.73	28.96	0	1	Dk Blue	8	Bottom of Coal	
27.7	207.48	21.08	0	1	Purple	9	Cleat	
27.85	63.63	11.62	11.58	1				
28.24	9.74	5.23	0	3				
31.38	291.62	3.49	0	0				
31.58	212.91	13.66	0	3				
35.73	89.35	5.85	0	5				
35.92	92.5	3.24	0	5				
38.21	72.25	26.84	0	5				
42.43	288.14	20.98	0	2				
43.73	226.19	24.34	7.32	1				
45.62	217.64	24.52	9.45	1				
46.9	179.13	28.07	10.82	1				
48.12	90.06	6.61	7.04	1				
48.99	182.78	33.46	6.3	1				
49.47	164.67	37.35	0	3				
49.85	194.31	15.07	9.57	1				
50.81	315.45	28.4	0	5				
53.63	38.58	6.93	0	3				
54.13	328.01	0.16	0	3				
54.66	336.79	0.17	0	3				
55.1	124.03	20.5	0	2				
55.27	113.92	20.32	0	2				
55.73	169.07	15.83	0	2				
60.96	247.01	54.23	0	2				
63.05	325.61	0.14	0	5				
64.83	344.89	8.7	0	5				
73.65	334.26	0.1	0	5				
73.84	109.13	15.12	0	5				
75.95	19.1	79.44	0	2				
77.08	322.7	0.09	0	5				
77.26	106.94	9.35	0	5				
77.57	71.43	19.1	0	5				

		Acoustic Televiewer Interpretation						
2101			**AEP AMOS**					
Depth Feet	**Dip Direction Degrees**	**DIP Angle Degrees**	**APERTURE inch/10**	**Feature Category**	**Feature Category Legend**			
78.49	324.19	0.09	0	5				
80.02	330.64	0.07	0	2				
82.23	66.09	15.82	0	3				
85.93	345.58	3.53	0	3				
97.58	279.46	6.06	0	5				
98.48	333.39	0.09	64.25	0				
114.47	84.23	37.58	0	3				
116.09	106	31.58	0	5				
117.29	100.66	32.23	0	5				
117.57	127.29	33.45	0	5				
118.05	117.2	38.62	0	5				
118.65	114.1	63.24	0	3				
120.73	117.99	20.24	0	5				
122.59	77.62	18.59	0	5				
123.29	70.63	14.75	0	3				
123.37	77.6	17.18	0	3				
125.68	49.5	14.8	0	5				
129.22	10.07	6.31	0	3				
130.8	38.18	59.13	0	3				
131.46	238.51	38.63	0	3				
140	76.38	8.87	0	3				
140.24	41.38	0.15	0	3				
140.98	122.01	50.26	0	2				
142.01	76.91	41.41	0	2				
142.31	57.92	0.14	0	5				

ARCADIS

2102



Geometric Dip
0 GTA 90
0 GTA 90
Azimuth
0 GTA 360
0 GTA 360

Depth
Feet
Meters

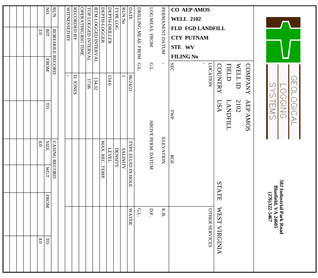
GTA
-90 -45 0 45 90
-45 0 45

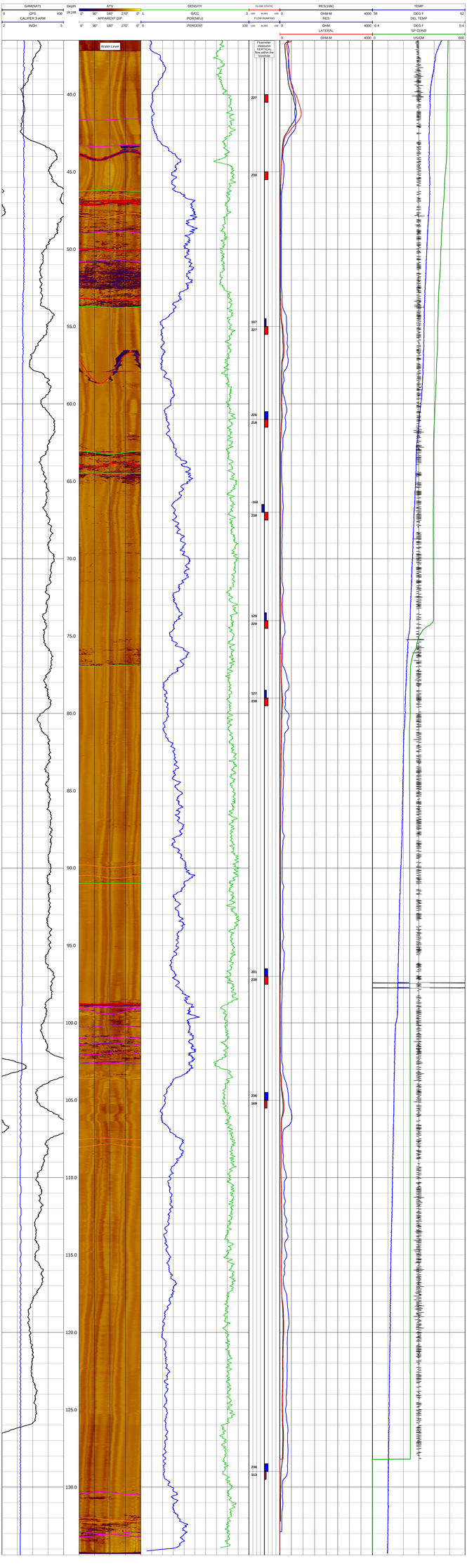
True Dip
90

STRATIGRAPHY
Schlumberger
Schlumberger Private
Schlumberger Private

Schlumberger Private

Schlumberger Private


CO AEP-AMOS
WELL 2102
FLD FGD LANDFILL
CTY PUTNAM
STE WV
FILING No
COMPANY AEP-AMOS
WELL ID 2102
FIELD FGD LANDFILL
COUNTY PUTNAM
STATE WEST VIRGINA
COORDINATES
LOCATION
API
PERMANENT DATUM
ELEV.
LOG MEAS. FROM
DRILL MEAS. FROM
ELEV.: K.B.
D.F.
G.L.
DATE
RUN NO.
DEPTH-DRILLER
DEPTH-LOGGER
BTM. LOG INTERVAL
TOP LOG INTERVAL
CASING-DRILLER
CASING-LOGGER
BIT SIZE
TYPE FLUID IN HOLE
DENS.
VISC.
PH
FLUID LOSS
SOURCE OF SAMPLE
RM @ MEAS. TEMP.
RMF @ MEAS. TEMP.
RMC @ MEAS. TEMP.
SOURCE RMF
SOURCE RMC
RM @ BHT
TIME CIRC. ORDERED
TIME LOGGER ON BOTTOM
MAX. REC. TEMP.
EQUIP. LOCATION
RECORDED BY
WITNESSED BY
GEOLOGICAL SYSTEMS LOGGING
GEOLOGICAL SYSTEMS LOGGING
GSL Instrument Van 6 and Instrument Van 8
(304)522-3867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ATV
DENSITY
FLOW STATIC
RES(16IN)
TEMP
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CPS
400
18.24ft
0° 90° 180° 270° 0°
APPARENT DIP
1
G/CC
3
100
SLWN
100
0
OHM-M
4000
56
DEG F
62
CALIPER 3-ARM
2
INCH
5
0° 90° 180° 270° 0°
0
PERCENT
100
100
SLWN
100
FLOW PUMPING
0
OHM
4000
-0.4
DEL TEMP
0.4
LATERAL
0
OHM-M
4000
0
SP COND
US/CM
600
Water Level
Flowmeter
Direction
VERTICAL
flow within the borehole
227
230
107
227
226
218
168
238
129
220
127
238
201
236
236
309
238
113
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
105.0
110.0
115.0
120.0
125.0
130.0

		Acoustic Televiewer Interpretation					
2102			**AEP AMOS**				
Depth Feet	**Dip Direction Degrees**	**DIP Angle Degrees**	**APERTURE inch/10**	**Feature Category**	**Feature Category Legend**		
41.63	119.18	22.46	0	2	**Color**	**Label**	**Description**
43.32	113.85	18.21	0	2	Black	0	Broken Zone / Undifferentiated
43.94	110.98	64.01	8.95	1	Red	1	Major Open Joint/Fracture
46.22	319.11	12.36	0	5	Magenta	2	Minor Open Joint/Fracture
46.57	17.41	43.55	0	3	Orange	3	Partially Open Joint/Fracture
46.88	53.95	6.23	9.85	1	Gray	4	Filled Fracture/ Joint
47.05	59.42	36.88	9.36	1	Green	5	Bedding/Banding/Foliation
47.87	122.3	50.23	0	3	Teal	6	Induced Fracture
48.89	38.73	25.17	0	2	Dk Green	7	Top of Coal
50.04	263.31	28.37	7.55	1	Dk Blue	8	Bottom of Coal
50.75	9.61	27.82	0	2	Purple	9	Cleat
53.26	193.45	26.31	3.81	1			
53.75	230.11	16.86	0	5			
57.67	122.69	81.64	0	1			
63.14	179.8	37.84	0	5			
63.94	61.98	50.35	6.52	1			
64.48	285.79	1.15	0	5			
76.93	82.97	6.1	0	5			
89.87	198.57	33.93	0	3			
90.56	222.15	36.19	0	3			
90.99	279.97	1.08	0	5			
98.85	338.84	4.12	16.03	1			
99	317.94	20.14	0	2			
99.25	175.37	55.05	0	2			
100.23	22.39	26.07	0	2			
100.94	283.03	18.66	0	2			
101.35	351.1	25.14	0	2			
101.98	73.04	33.51	0	2			
102.61	327.18	11.51	0	2			
107.5	315	26.68	0	3			
107.94	350	41.34	0	3			
130.4	308.44	37.44	0	2			
132.07	237.82	35.43	0	3			
132.26	79	19.79	0	3			
132.97	165.54	35.44	0	2			
133.15	23.03	29.95	0	2			

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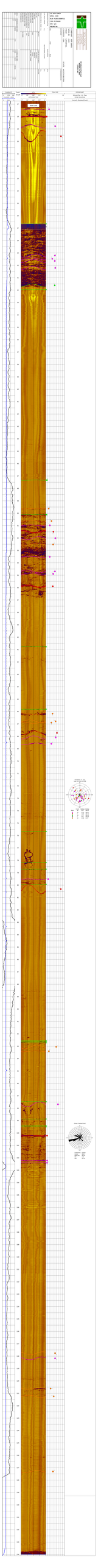
2103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FIELD: ZOR
OUR JOB NUMBER:
DATE: 08-Jul-22
API: 50-279-21...
SURFACE LOCATION
TOWNSHIP: 1 S
RANGE: 1 E
SECTION: 1
FSL: 1 FSL
FEL: 1 FEL
BOTTOM HOLE LOCATION
TOWNSHIP: 1 S
RANGE: 1 E
SECTION: 1
FSL: 1 FSL
FEL: 1 FEL
ELEVATIONS
KB: 0 ft
GL: 0 ft
DF: 0 ft
MSL: 0 ft
CASING
SURFACE: 0 ft MD
INTERMEDIATE: 0 ft MD
PRODUCTION: 0 ft MD
TUBING
SIZE: 0 in
DEPTH: 0 ft MD
PERFORATIONS
TOP: 0 ft MD
BOTTOM: 0 ft MD
SHOTS/FT: 0
PHASE: 0°
GUN SIZE: 0 in
CHARGE: 0 g
PERFORATED BY: 0
DATE: 0
PRESSURE: 0 psi
TEMPERATURE: 0 °F
FLUID LEVEL: 0 ft
FLUID TYPE: 0
GAS RATE: 0 mcf/d
OIL RATE: 0 bbl/d
WATER RATE: 0 bbl/d
GAS GRAVITY: 0
OIL GRAVITY: 0 °API
WATER SALINITY: 0 ppm
H2S: 0 ppm
CO2: 0 %
N2: 0 %
CH4: 0 %
C2H6: 0 %
C3H8: 0 %
C4H10: 0 %
C5H12: 0 %
C6H14: 0 %
C7H16: 0 %
C8H18: 0 %
C9H20: 0 %
C10H22: 0 %
C11H24: 0 %
C12H26: 0 %
C13H28: 0 %
C14H30: 0 %

CO AEP-AM35
WELL 2103
FLD FGD LANDFILL
CTY PUTNAM
STE WV
FILING No

Schlumberger
Wireline & Testing
Mountaineer Division
Dunbar, WV 25064

| | | |

Acoustic Televiewer Interpretation

2103 AEP AMOS

Depth Feet	Dip Direction Degrees	DIP Angle Degrees	APERTURE inch/10	Feature Category
17.42	342.38	15.86	0	2
18	308.08	4.29	6.6	1
18.78	322.35	45.91	0	2
19.59	136.6	73.47	0	1
26.65	243.25	0.44	0	5
26.88	242.58	0.45	52.91	0
29.21	35.35	44.49	0	2
29.48	337	31.48	0	2
29.65	2.24	43.76	0	2
30.21	351.62	46.04	0	2
31.62	341.97	43.22	0	5
31.96	246.87	0.45	0	5
47.33	27.49	5.2	0	5
49.62	34.38	14.17	0	3
50.11	141.54	3.53	0	5
50.63	321.86	27.68	0	3
50.98	323.55	19.86	0	2
51.49	192.81	36.74	5.7	1
52.02	81.88	46.22	0	2
52.52	43.75	35.74	0	3
53.52	305.55	19.44	0	2
54.69	262.21	44.33	0	2
54.9	319.97	35.83	0	2
55.89	275.22	33.98	6.7	1
60.77	254.82	0.59	0	5
65.81	251.83	0.56	0	5
66.17	190.34	32.7	0	3
66.79	305.96	47.66	0	3
66.89	182.11	26.82	0	3
67.73	8.66	54.28	0	1
68.09	1.65	48.06	0	2
68.6	36.5	26.97	0	2
75.67	250.66	0.57	0	5
78.18	250.68	0.58	0	5
78.71	248.95	0.59	0	5
79.53	291.69	11.91	0	2
79.94	249.27	0.62	0	5
80.32	291.92	72.93	0	1
92.56	252.66	0.58	0	5
92.64	252.22	0.58	0	5
92.73	252.42	0.58	0	5
93.05	52.94	50.5	0	3

Feature Category Legend

Color	Label	Description
Black	0	Broken Zone / Undifferentiated
Red	1	Major Open Joint/Fracture
Magenta	2	Minor Open Joint/Fracture
Orange	3	Partially Open Joint/Fracture
Gray	4	Filled Fracture/ Joint
Green	5	Bedding/Banding/Foliation
Teal	6	Induced Fracture
Dk Green	7	Top of Coal
Dk Blue	8	Bottom of Coal
Purple	9	Cleat

		Acoustic Televiewer Interpretation						
2103			**AEP AMOS**					
Depth Feet	**Dip Direction Degrees**	**DIP Angle Degrees**	**APERTURE inch/10**	**Feature Category**	**Feature Category Legend**			
93.4	27.15	14.77	0	3				
97.47	254.98	0.58	0	5				
97.69	85.57	59.12	0	2				
98.87	255.36	0.57	0	5				
99.42	255.02	0.55	0	5				
99.5	254.47	0.58	0	5				
100.22	295.8	6.24	8.93	1				
102.23	135.17	6.46	0	2				
102.4	178.75	5.92	0	2				
117.76	137.31	45.08	0	3				
118.18	124.53	45.11	0	2				
120.61	91.97	23.16	0	3				
121.24	291.3	38.45	0	3				
127.31	50.6	34.62	0	3				

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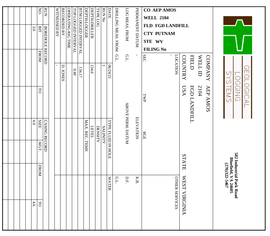
2104

WELL DATA SHEET
TOOLS: LDM
CASE DIGITAL LOGGING
CASE 1 OF 1
RUN NO. 001
DIGITAL
DIGITAL DATA
TOOL TYPE
TOOL NO.
RUN NO.
DATE
TIME
DEPTH
DEPTH
DEPTH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WELL 2184
FLD FOLLANSBEE
CTY PUTNAM
STT WV
FILING No
COMPANY AEP AMOS
WELL ID 2184
LOCATION
PERM DATUM
LOG MEAS FROM
DRLG MEAS FROM
ELEVATION
PERMANENT DATUM
ELEV.K.B.
D.F.
G.L.
DATE
RUN NO.
DEPTH-DRILLER
DEPTH-LOGGER
BTM LOG INTERVAL
TOP LOG INTERVAL
CASING-DRILLER
CASING-LOGGER
BIT SIZE
TYPE FLUID IN HOLE
DENS
VISC
PH
FLUID LOSS
SOURCE OF SAMPLE
RM @ MEAS TEMP
RMF @ MEAS TEMP
RMC @ MEAS TEMP
SOURCE RMF RMC
RM @ BHT
TIME CIRC STOPPED
TIME LOGGER ON BTM
MAX REC TEMP
EQUIP LOCATION
RECORDED BY
WITNESSED BY
Run 1
Run 2
Run 3
Run 4
Run 5
Run 6
Run 7
Run 8
Run 9
Run 10
Run 11
Run 12
Run 13
Run 14
Run 15
Run 16
Run 17
Run 18
Run 19
Run 20
Run

		Acoustic Televiewer Interpretation						
2104			**AEP AMOS**					
Depth Feet	**Dip Direction Degrees**	**DIP Angle Degrees**	**APERTURE inch/10**	**Feature Category**	**Feature Category Legend**			
20.33	244.06	33.12	12.22	1	**Color**	**Label**	**Description**	
20.63	179.55	41.01	0	3	Black	0	Broken Zone / Undifferentiated	
21.57	6.63	25.25	0	2	Red	1	Major Open Joint/Fracture	
21.86	323.74	45.05	0	2	Magenta	2	Minor Open Joint/Fracture	
22.03	9.54	38.59	0	3	Orange	3	Partially Open Joint/Fracture	
22.21	351.61	35.93	0	3	Gray	4	Filled Fracture/ Joint	
22.41	209.3	12.52	0	3	Green	5	Bedding/Banding/Foliation	
22.79	16.52	38.71	0	2	Teal	6	Induced Fracture	
23.33	202.22	19.83	20.85	1	Dk Green	7	Top of Coal	
24.21	217.27	37.16	0	2	Dk Blue	8	Bottom of Coal	
24.72	270.32	39.53	0	2	Purple	9	Cleat	
25.29	211.21	27.69	0	3				
27.25	179.16	11.83	0	3				
28.25	309.53	36.72	0	2				
28.75	357.4	13.07	0	5				
32.37	243.02	7.44	5.62	1				
33.03	265.68	11.84	0	2				
35.87	172.98	26.54	0	5				
36.48	157.85	16.68	0	5				
39.31	195.56	15.51	0	5				
43.59	99.18	19.63	0	5				
44.08	57.63	25.67	9.41	1				
44.5	103.43	40.84	0	3				
45.14	96.09	28.67	5.84	1				
45.61	95.78	0.62	0	5				
45.95	205.63	55.88	0	3				
46.03	28.8	26.14	0	2				
47.1	95.7	0.65	27.4	0				
47.44	124.4	38.65	11.53	1				
48.37	13.41	43.9	0	2				
49.12	334.4	51.73	0	3				
55.04	178.56	16.79	0	5				
55.47	294.26	6.62	0	5				
56.6	201.3	9.9	0	5				
58.67	341.78	24.27	0	5				
59.44	11.2	14.91	0	5				
65.43	248.96	81.27	0	4				
73.3	13.76	7.03	0	5				
86.9	295.46	14.83	0	5				
87.78	265.09	25.25	0	5				
90.62	284.96	25.22	0	3				
90.89	122.77	0.23	0	5				

		Acoustic Televiewer Interpretation						
2104			**AEP AMOS**					
Depth Feet	**Dip Direction Degrees**	**DIP Angle Degrees**	**APERTURE inch/10**	**Feature Category**	**Feature Category Legend**			
92.8	121.37	0.22	0	5				
94.73	114.66	0.23	0	5				
95.05	114.73	0.2	74.17	0				
96.62	53.4	26.62	0	5				
97.04	72.28	28.97	0	3				
97.41	15.09	30.39	0	2				
97.91	38.97	30.43	0	2				
98.14	91.8	34.66	0	5				
98.38	110.79	31.15	0	5				
109.84	16.38	17.3	7.67	1				
129.94	280.1	4.65	0	5				

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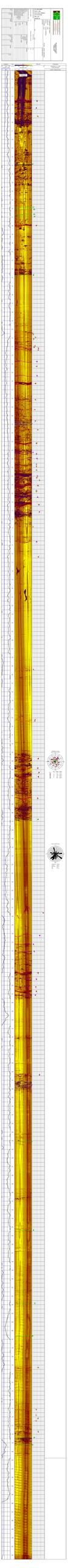
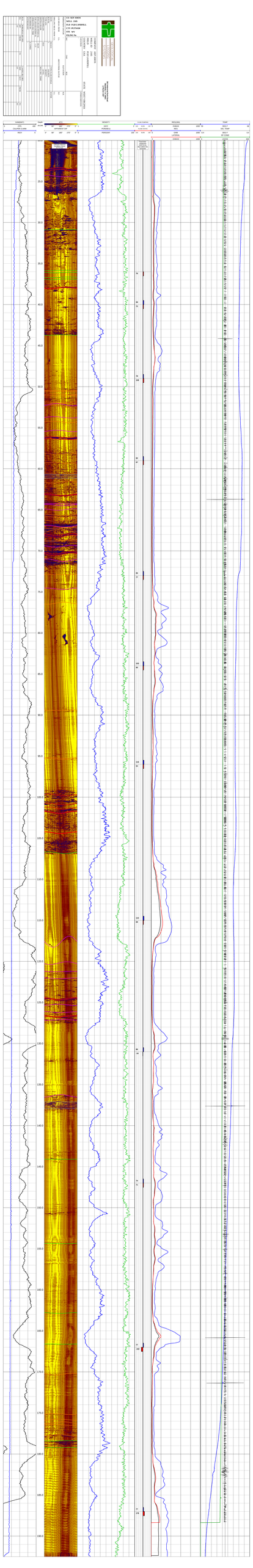
2105

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WELL DEF
FCS FIELDNAME1
CTY PUTNAM
ST NY
FILING No.
Schlumberger
Platform Express
Three Detector Lithology
Compensated Neutron
Array Induction
Gamma Ray
Caliper
Bit Size
Mud Type
Mud Density
Mud Resistivity
Rmf
Rmc
Rm @ BHT
Source Rmf Rmc
Rm @ MRT
Time Since Circ
Max Rec Temp
Equip. Location
Recorded By
Witnessed By
Run No.
Service Order
Permanent Datum
Elevation
Log Measured From
Drilling Measured From
Elev.
K.B.
D.F.
G.L.
Date
Time
Depth-Driller
Depth-Logger
Bottom Logged Interval
Top Log Interval
Casing Driller
Casing Logger
Bit Size
Type Fluid in Hole
Density
Viscosity
PH
Fluid Loss
Source of Sample
Rm @ Meas Temp
Rmf @ Meas Temp
Rmc @ Meas Temp
Source Rmf Rmc
Rm @ BHT
Time Since Circulation
Max Rec Temp
Equipment

		Acoustic Televiewer Interpretation						
2105			**AEP AMOS**					
Depth Feet	**Dip Direction Degrees**	**DIP Angle Degrees**	**APERTURE inch/10**	**Feature Category**	**Feature Category Legend**			
23.55	339.17	37.34	22.42	1	**Color**	**Label**	**Description**	
24.35	216.59	31.8	0	2	Black	0	Broken Zone / Undifferentiated	
25.32	129.56	41.38	0	3	Red	1	Major Open Joint/Fracture	
30.87	55.87	5.78	0	5	Magenta	2	Minor Open Joint/Fracture	
35.85	77.68	8.94	0	5	Orange	3	Partially Open Joint/Fracture	
36.1	103.97	15.83	0	5	Gray	4	Filled Fracture/ Joint	
36.67	85.94	16.48	0	5	Green	5	Bedding/Banding/Foliation	
36.92	72.34	19.24	0	5	Teal	6	Induced Fracture	
37.97	61.59	31.72	9.97	1	Dk Green	7	Top of Coal	
43.72	15.94	12.63	0	5	Dk Blue	8	Bottom of Coal	
50.46	191.16	5.27	0	3	Purple	9	Cleat	
50.58	193.21	11.56	0	3				
50.94	299.96	27.12	0	3				
51.11	190.76	14.14	0	3				
51.92	181.24	22.16	0	3				
52.09	346.84	16.37	0	3				
52.2	311.27	47.18	0	2				
52.39	277.82	46.78	0	3				
53.73	286.14	36.5	0	2				
54.29	281.49	35.29	0	3				
55.38	316.82	37.88	0	2				
56.27	265.08	27.14	26.29	1				
58.14	124.42	24.52	0	3				
59.29	261.2	21.76	0	3				
60.61	206.51	25.16	0	3				
60.92	284.9	0.98	58.11	0				
61.64	86.2	41.18	0	3				
63.19	203.25	33.81	11.4	1				
64.26	260.93	9.02	0	2				
64.42	207.54	33.24	0	2				
64.96	149.6	36.56	0	2				
65.63	196.99	32.41	0	3				
65.87	172.96	32.65	0	3				
66.31	129.14	32.76	0	3				
67	217.27	39.71	0	2				
67.2	69.8	34.68	0	3				
67.51	345	53.96	0	3				
68.1	124.62	43.09	20.03	1				
68.68	85.52	31.09	0	3				
68.8	82.19	31.42	0	3				
69.43	123.57	40.97	0	2				
70.32	112.14	49.62	13.77	1				

		Acoustic Televiewer Interpretation						
2105			**AEP AMOS**					
Depth Feet	**Dip Direction Degrees**	**DIP Angle Degrees**	**APERTURE inch/10**	**Feature Category**	**Feature Category Legend**			
71.14	205.76	52.64	0	2				
72.87	234.08	9.03	0	3				
74.6	200.16	34.05	0	2				
76.37	32.97	46.29	0	3				
89.4	126.55	10.31	0	3				
95.22	229.51	23.17	0	3				
95.37	230.2	21.77	0	3				
99.73	229.99	46.03	0	1				
100.83	216.31	42.24	0	1				
101.34	214.93	50.41	0	1				
101.83	165.09	46.67	6.04	1				
104.32	178.64	41.55	3.83	1				
106.77	228.94	43.79	0	5				
117.6	93.31	79.92	0	2				
120.22	64.16	55.27	0	2				
121.24	147.82	11.7	0	2				
122.05	173.56	17.25	0	2				
124.56	163.16	44.17	10.69	1				
125.29	340.71	32.58	0	2				
126.18	181.25	28.07	0	2				
126.69	149.13	31.63	8.77	1				
127.13	30.89	25.31	0	2				
136.38	0.74	53.58	0	2				
137.52	326.02	0.78	102.05	0				
144.09	324.27	0.76	0	5				
154.36	229.13	11.86	0	5				
162.82	164.58	20.77	0	5				
166.61	226.57	5.88	0	5				
170.27	117.99	44.41	0	3				
175.13	288.76	32.36	0	3				
175.82	347.4	30.25	0	3				
176.19	19.49	43.45	0	3				
176.46	291.43	31.28	0	3				
177.72	340.75	46.01	0	3				
178.39	83.8	16.83	0	5				
179.22	176.63	5.29	0	5				

Appendix C

Well Development Logs

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2101ss		Date	07/20/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	12:25	Time End	16:15

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	31.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.28
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	32.41	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	19.95	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	12.46	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	2.02	Color	NA
Total Well Volumes Purged	30.99	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
12:30	20.68	800	0	0.00	NR	>1000	NR	NR	NR	NR	V turbid
12:45	20.02	1200	15	4.76	NR	>1000	NR	NR	NR	NR	NR
13:03	19.91	1200	33	10.47	NR	NR	NR	NR	NR	NR	NR
13:30	20.08	1200	60	19.03	0.825	864	22.36	7.72	NR	6.97	NR
13:45	20.25	1000	75	22.99	-0.21	603	21.38	7.7	NR	9.58	NR
14:15	20.95	1000	105	30.92	0.773	>1000	23.02	7.35	NR	6.66	surged well using pump
14:30	20.25	1000	120	34.88	0.724	561	22.63	7.24	NR	4.78	NR
14:45	20.31	1000	135	38.84	0.768	232	22.13	7.76	NR	7.77	NR
15:00	20.28	1000	150	42.80	0.705	40.1	20.27	767	NR	7.62	NR
15:15	20.34	1000	165	46.76	0.708	27.3	20.44	7.61	NR	6.46	NR
15:30	20.32	1000	180	50.72	0.713	38.5	20.57	7.63	NR	7.86	NR
15:45	19.39	1000	195	54.68	0.78	47.8	21.29	7.63	NR	6.4	NR
16:00	20.45	1000	210	58.64	0.762	801	20.52	7.68	NR	7.58	surged well using pump.
16:15	20.66	1000	225	62.60	0.786	336	21.19	7.71	NR	5.83	compress out of gas, allow wells

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

: -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2101ss	Date	07/21/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	07:45
Time End	13:00		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.59
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	32.41	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	20.08	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	12.33	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	2	Color	NA
Total Well Volumes Purged	90.83	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
07:50	20.24	1750	0	0.00	0.777	874	20.24	7.55	NR	858	NR
08:10	20.58	1750	20	9.25	0.781	150	18.65	7.94	NR	9.9	NR
08:30	20.38	1750	40	18.50	0.767	169	18.71	7.93	NR	7.3	NR
08:50	20.54	1750	60	27.75	0.776	164	19.23	7.86	NR	10.53	NR
09:15	20.39	2250	85	42.61	0.779	246	20.25	7.83	NR	7.92	NR
09:40	20.48	2250	110	57.47	0.704	968	20.16	7.82	NR	2.94	surged well using pump
10:00	20.44	2250	130	69.36	0.768	38.4	21.96	7.95	NR	7.09	NR
10:20	21.13	2250	150	81.25	0.786	320	21.12	7.96	NR	7.37	NR
10:40	20.58	2250	170	93.14	0.766	134	21.1	7.98	NR	7.67	NR
11:00	20.33	2250	190	105.03	0.716	99.5	20.51	0.02	NR	8.29	NR
11:20	21.14	2250	210	116.92	0.786	54.1	21.12	7.84	NR	5.22	NR
11:40	20.55	2500	230	130.13	0.783	114	21.41	7.52	NR	6.87	NR
12:00	20.59	2500	250	142.02	0.729	185	22.18	7.65	NR	5.42	NR
12:20	20.56	2500	270	155.23	0.732	75.8	21.36	8.05	NR	8.39	NR
12:40	20.62	2500	290	168.44	0.729	39.9	21.95	8.19	NR	7.29	NR
13:00	20.78	2500	310	181.65	0.735	2.5	20.78	8.1	NR	7.83	stopped development

Development Personnel:

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Notes:

	Well Diameter (in) = Unit Volume (gallon per ft of water column)				
Well Volume Calcs	1 = 0.04 1.25 = 0.06	1.5 = 0.09 2 = 0.16	2.5 = 0.26 3 = 0.37	3.5 = 0.50 4 = 0.65	6 = 1.47

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2101s	Date	07/20/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	09:59
Time End	16:15		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.34
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	60.7	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	38.6	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	22.1	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.59	Color	Dark brown
Total Well Volumes Purged	28.07	Odor	None
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
11:17	38.78	800	0	0.00	NR	NR	NR	NR	NR	NR	NR
11:28	39.59	800	11	2.32	NR	>1000	NR	NR	NR	NR	NR
11:40	38.72	1600	23	7.39	NR	>1000	22.48	7.7	147	4.48	NR
12:00	NR	1600	43	15.84	0.819	>1000	22.98	6.29	NR	3.2	NR
12:15	NR	1600	58	22.18	0.912	>1000	22.87	6	NR	3.98	NR
12:45	38.92	1000	88	30.11	0.865	784	22.6	7.31	NR	3.16	NR
13:05	39.15	1600	108	43.31	0.865	642	22.6	7.45	NR	5.03	NR
13:30	38.85	1200	133	51.24	0.801	450	21.43	7.72	NR	7.28	NR
13:45	39.02	1200	148	56.00	0.786	515	21.9	7.66	NR	7.96	Surged well using pump
14:15	38.91	1100	178	64.72	0.726	>1000	21.96	7.66	NR	4.6	NR
14:30	39.16	1000	193	72.64	0.894	>1000	22.39	7.86	NR	5.4	NR
14:45	39.82	1100	208	77.00	0.83	409	23.03	7.76	NR	7.91	NR
15:00	39.88	1000	223	80.96	0.717	216	22.05	7.63	NR	8.99	NR
15:15	39.23	1000	238	84.92	0.806	117	21.09	7.64	NR	6.59	NR
15:30	39.46	1000	253	88.88	0.866	147	21.76	7.62	NR	0.03	NR
15:45	39.52	1000	268	92.84	0.795	74.0	21.18	7.62	NR	5.31	Surge well with pump
16:00	39.59	1000	283	96.80	0.858	>1000	21.68	7.72	NR	3.9	NR
16:15	NR	1000	298	100.76	0.858	589	21.68	NR	NR	3.9	Compressor out of gas, allow to

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Development Personnel:	Alan Gillespie
Notes:	700 ml/min

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2101s	Date	07/21/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	07:45
Time End	11:25		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.59
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	60.7	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	38.05	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	22.65	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.68	Color	NA
Total Well Volumes Purged	34.60	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
07:50	38.38	2400	0	0.00	0.795	>1000	20.21	7.33	NR	7.44	NR
08:10	38.5	2400	20	12.68	0.8	305	20.21	7.93	NR	9.08	NR
08:30	39.3	2000	40	21.14	0.796	88.2	18.72	7.92	NR	10	NR
08:50	38.68	2000	60	31.71	0.691	102	10.02	7.93	NR	10.8	NR
09:15	39.37	2000	85	44.92	0.865	145	20.11	7.89	NR	6.28	NR
09:40	39.22	2400	110	60.77	0.751	69.1	20.67	7.96	NR	7.85	NR
10:00	38.7	2400	130	73.45	0.865	71.3	21.23	7.92	NR	3.85	NR
10:20	38.77	2400	150	86.13	0.907	76.8	21.24	7.96	NR	6.18	NR
10:40	38.79	2400	170	98.81	0.813	53.46	21.02	7.98	NR	6.02	NR
11:00	38.85	2400	190	111.49	0.876	24.5	21.59	8.11	NR	4.6	NR
11:25	38.99	2400	215	127.34	0.798	0.6	20.98	7.99	NR	2.74	Terminate development

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2101i		Date	07/20/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	11:10	Time End	11:38

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.13
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	78.76	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	56.64	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	22.12	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.59	Color	NA
Total Well Volumes Purged	0.85	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
11:15	74.38	500	0	0.00	NR	>1000	NR	NR	NR	NR	NR
11:26	74.48	500	11	1.45	NR	>1000	NR	NR	NR	NR	4 gal removed
11:38	74.48	500	23	3.04	NR	>1000	22.48	7.79	120	23.5	NR

Development Personnel:

Notes: 700 ml/ min

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2101i		Date	07/21/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	10:28	Time End	12:28

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	77.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.13
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	78.76	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	57.03	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	21.73	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.53	Color	NA
Total Well Volumes Purged	4.36	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
10:30	73.93	500	0	0.00	0.737	484	24.78	7.77	NR	6.84	NR
11:50	75	500	80	10.57	0.769	>1000	22.14	8.26	NR	9.26	WL at top of pump or below
12:00	NR	500	90	11.89	10.63	>1000	21.43	7.81	NR	10.63	NR
12:20	75	500	110	14.53	0.793	>1000	21.78	8.17	NR	9.19	NR
12:28	75	400	118	15.38	-4	NR	NR	NR	NR	NR	well dry, removed 15.3

Development Personnel:

Notes: removed 15.3 gallons, pumped well dry, turb>1000

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2101i	Date	07/26/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	13:40
Time End	15:24		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	77.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	78.76	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	17.4	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	61.36	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	9.97	Color	NA
Total Well Volumes Purged	2.23	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
14:00	58.06	1000	0	0.00	NR	NR	NR	NR	NR	NR	NR
14:24	58.42	1000	24	6.34	0.354	>1000	28.49	8.6	145	9.61	NR
14:32	58	1000	32	8.45	NR	NR	NR	NR	NR	NR	Controller malfunction, not
14:41	59.99	1000	41	10.83	0.357	>1000	28.81	8.05	172	8.36	Pump restarted, 8 gal removed
15:07	70.62	1000	67	17.70	0.355	>1000	25.07	8.05	179	6.2	NR
15:19	74	1000	79	20.87	0.56	>1000	24.07	7077	249	4.98	Top of pump
15:24	77.5	1000	84	22.19	NR	>1000	NR	NR	NR	NR	Pumped well Dry

Development Personnel:

Notes: 8 gal removed, pump restarted at 1000 ml/ min

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2101d	Date	07/26/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	13:41
Time End	15:27		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	104.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	105.8	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	105.42	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	0.38	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.06	Color	NA
Total Well Volumes Purged	559.17	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
13:20	44.3	1000	0	0.00	NR	NR	NR	NR	NR	NR	NR
14:23	62.82	1000	63	16.64	NR	>1000	29.17	8.6	120	8.57	NR
14:45	104	1000	85	22.45	0.353	>1000	30.4	7.98	182	7.56	Top of pump
15:21	NR	1000	121	31.96	NR	NR	NR	NR	NR	NR	NR
15:27	NR	1000	127	33.55	NR	NR	NR	NR	NR	NR	Well pumped dry, removed 21

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2101D		Date	09/01/2021	
Project	AEP Amos Landfill		Project No.	300890156	
Site Location	Winfield, WV	Top of Screen (ft bmp)	92	Bottom of Screen (ft bmp)	102
Weather	70F Rain	Time Begin	11:03	Time End	11:08

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	Close to bottom
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.35
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	105.78	Post-Dev Well Depth (ft bmp)	105.8
Pre-Dev DTW (ft bmp)	100.37	Post-Dev DTW (ft bmp)	104.5
Pre-Dev Water Column (ft)	5.41	Post-Dev Water Column (ft)	1.3
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.88	Color	Lt. Brown
Total Well Volumes Purged	1.99	Odor	None
		Appearance	Turbid

Time	Measured DTW (ft bmp)	Pumping Rate (gpm)	Elapsed Time (min)	Gallons Removed	Conductivity (umhos/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
11:03	NR	0.35	0	0.00	690	>1000	17.4	7.74	-66.2	3.35	NR
11:08	NR	0.35	5	1.75	665	>1000	16.5	7.95	-0.4	3.22	NR

Development Personnel: J. Fino

Notes: Total volume purged 4 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102s	Date	07/22/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	12:00
Time End	12:44		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	40.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.13
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	61.73	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	41.2	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	20.53	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC		
Initial Well Volume (gallons)	3.34		
Total Well Volumes Purged	1.15		

Field Parameters

Color	Red-orange
Odor	None
Appearance	Silty, thick

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
12:15	51.4	500	0	0.00	0.702	>1000	24.13	8.83	36	14.61	NR
12:34	57	500	19	2.51	0.725	>1000	23.34	8.41	71	7.86	WL below top of pump
12:44	61	500	29	3.83	NR	>1000	23.26	8.1	104	5.84	Well pumped dry, est 4

Development Personnel: Alan Gillespie

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102s		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	16:05	Time End	16:28

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	NR
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	61.73	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	41.28	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	20.45	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.32	Color	NA
Total Well Volumes Purged	0.00	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
16:26	58	2400	0	0.00	0.809	>1000	23.75	8.12	224	9.12	Pumped dry, 4 gallons removed

Development Personnel:

Notes: Flushed 10 gallons in well casing and redeveloped. Total volume removed: 14.6 gallons.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102s		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	16:29	Time End	17:05

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.66
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	61.73	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	0	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	61.73	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	10.03	Color	NA
Total Well Volumes Purged	0.59	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
16:42	46.94	2500	0	0.00	0.467	>1000	27.19	8.08	255	6.68	NR
16:51	52.05	2500	9	5.94	118	>1000	25.92	7.78	252	6.7	Turbidity increase as screen exposed with WL drawdown

Development Personnel:

Notes: Flushed 10 gallons in well casing and redeveloped. Total volume removed: 22.8 gallons.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102s	Date	08/04/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	14:10
Time End	15:45		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	60
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	61.73	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	41.12	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	20.61	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.35	Color	NA
Total Well Volumes Purged	6.62	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
14:20	46.6	1000	0	0.00	NR	NR	NR	NR	NR	NR	NR
14:31	47.58	1000	11	2.91	0.879	398	23.56	8.88	220	15.93	NR
14:43	48.38	1000	23	6.08	0.816	286	22.81	8.6	218	9.02	NR
15:04	50.78	1000	44	11.63	0.848	541	21.9	8.5	203	5.21	NR
15:13	51.75	1000	53	14.01	0.889	846	21.14	8.1	130	5.74	NR
15:33	53.98	1000	73	19.29	0.845	705	21.15	8.18	155	5.78	Turbidity increase as
15:41	56.43	1000	81	21.40	0.833	875	20.99	8.23	169	6.73	NR
15:44	NR	1000	84	22.19	NR	NR	NR	NR	NR	NR	NR

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2102S			Date	08/31/2021
Project	AEP Amos Landfill			Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	43	Bottom of Screen (ft bmp)	58
Weather	85F Overcast	Time Begin	13:56	Time End	14:20

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	Various depths
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.62
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	61.7	Post-Dev Well Depth (ft bmp)	61.7
Pre-Dev DTW (ft bmp)	41.24	Post-Dev DTW (ft bmp)	60
Pre-Dev Water Column (ft)	20.46	Post-Dev Water Column (ft)	1.7
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.32	Color	Lt. Brown
Total Well Volumes Purged	3.92	Odor	None
		Appearance	Turbid

Time	Measured DTW (ft bmp)	Pumping Rate (gpm)	Elapsed Time (min)	Gallons Removed	Conductivity (umhos/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
13:57	NR	0.2	0	0.00	839	>1000	19.6	7.56	159.1	3.62	NR
14:02	NR	0.2	5	1.00	836	>1000	17.3	752	137	2.85	NR
14:07	NR	1	10	6.00	814	>1000	15.9	7.45	116.4	1.23	NR
14:11	NR	1	14	10.00	831	>1000	16.9	7.63	101.5	3.93	Tubing lowered after readings collected
14:13	NR	0	16	10.00	NR	NR	NR	NR	NR	NR	Restarted pumping
14:18	NR	0.6	21	13.00	824	>1000	17.4	7.63	102.6	5.27	NR

Development Personnel: J. Fino

Notes: Would not pull from 60ft-btoc. Total volume purged 14gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs

1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102i	Date	07/19/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	14:05
Time End	14:45		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	81.61	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	47.23	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	34.38	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	5.59	Color	NA
Total Well Volumes Purged	1.63	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
14:10	50.98	750	0	0.00	NR	>1000	NR	NR	NR	NR	NR
14:12	60.03	1000	2	0.53	NR	NR	NR	NR	NR	NR	NR
14:22	65.6	1000	12	3.04	NR	>1000	NR	NR	NR	NR	NR
14:40	70	1000	30	7.80	NR	>1000	NR	NR	NR	NR	NR
14:45	74.6	1000	35	9.12	NR	>1000	NR	NR	NR	NR	NR

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102i	Date	07/20/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	07:20
Time End	07:25		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.27
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	81.61	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	73.14	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	8.47	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.38	Color	NA
Total Well Volumes Purged	0.38	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
07:23	81	1000	0	0.00	NR	>1000	NR	NR	NR	NR	Removed 1 gall on pumped well
07:25	NR	1000	2	0.53	NR	NR	NR	NR	NR	NR	Removed 1 gallon, well dry

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102i	Date	07/22/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	12:52
Time End	13:19		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	81
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.13
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	81.61	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	74.64	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	6.97	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.13	Color	NA
Total Well Volumes Purged	2.34	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
12:59	NR	500	0	0.00	0.924	>1000	24.26	8.07	109	6.47	WL below top of pump
13:18	NR	500	19	2.51	1.06	>1000	24.62	8.06	108	5.85	NR
13:19	NR	500	20	2.64	NR	NR	NR	NR	NR	NR	Well pumped dry, 3.5 gallon

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102i		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	13:05	Time End	13:37

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	81.61	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	74.81	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	6.8	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.1	Color	NA
Total Well Volumes Purged	1.15	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
13:34	54.28	1600	0	0.00	0.322	>1000	26.98	8.22	266	6.14	NR
13:37	NR	1600	3	1.27	NR	NR	NR	NR	NR	NR	NR

Development Personnel:

Notes: Flushed 13 gallons in well casing and redeveloped. Total volume removed: 13.5 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs

1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102i		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	13:58	Time End	14:10

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	NR
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	81.61	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	74.8	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	6.81	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.11	Color	NA
Total Well Volumes Purged	0.00	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
14:10	81	1600	0	0.00	NR	>1000	NR	NR	NR	NR	NR

Development Personnel:

Notes: Flushed 13 gallons in well casing and redeveloped. Total volume removed: 14 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102i		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	14:12	Time End	14:40

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	81.61	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	0	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	81.61	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	13.26	Color	NA
Total Well Volumes Purged	0.29	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
14:30	44.85	1600	0	0.00	0.48	>1000	26.87	8.24	224	13.31	NR
14:39	81	1600	9	3.80	NR	>1000	NR	NR	NR	NR	Pumped dry

Development Personnel:

Notes: Flushed 10 gallons in well casing and redeveloped. Total volume removed: 11.8 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs

1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102i	Date	07/28/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
		Bottom of Screen (ft bmp)	
Weather		Time Begin	14:40
		Time End	15:25

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.32
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	81.61	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	0	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	81.61	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	13.26	Color	NA
Total Well Volumes Purged	0.65	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
15:01	78	1200	0	0.00	0.568	>1000	27.38	8.25	211	6.88	NR
15:28	81	1200	27	8.56	0.364	>1000	24.73	8.14	267	9.01	Pumped well dry, clearing, light grey color , removed 12 additional gallons

Development Personnel:

Notes: Flushed 13 gallons in well casing and redeveloped. Total volume removed: 14.3 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102i		Date	08/04/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	16:20	Time End	na

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	80
MP Elevation (ft)	NA	Pumping Rate (gpm)	0
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	81.61	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	78.38	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	3.23	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.52	Color	NA
Total Well Volumes Purged		Odor	NA
		Appearance	NA

Development Personnel:

Notes: Insufficient water in well to pump to surface., no water discharged.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2102I		Date	08/31/2021	
Project	AEP Amos Landfill		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)	62	Bottom of Screen (ft bmp)	77
Weather	75F Rainy	Time Begin	11:13	Time End	11:46

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	80.7	Post-Dev Well Depth (ft bmp)	80.7
Pre-Dev DTW (ft bmp)	78.99	Post-Dev DTW (ft bmp)	79.8
Pre-Dev Water Column (ft)	1.71	Post-Dev Water Column (ft)	0.9
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.28	Color	Brown
Total Well Volumes Purged		Odor	Nonw
		Appearance	Turbid

Development Personnel:	J. Fino
Notes:	Could not pump water out of tubing. About 0.75 gallons of water in tubing.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2102I		Date	09/02/2021	
Project	AEP Amos Landfill		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)	60	Bottom of Screen (ft bmp)	75
Weather	70F Rain	Time Begin	09:34	Time End	10:06

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	Various depths
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.6
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	78.78	Post-Dev Well Depth (ft bmp)	78.8
Pre-Dev DTW (ft bmp)	55.09	Post-Dev DTW (ft bmp)	77.35
Pre-Dev Water Column (ft)	23.69	Post-Dev Water Column (ft)	1.45
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.85	Color	Lt. Brown
Total Well Volumes Purged	4.99	Odor	None
		Appearance	Turbid

Time	Measured DTW (ft bmp)	Pumping Rate (gpm)	Elapsed Time (min)	Gallons Removed	Conductivity (umhos/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
09:34	NR	0.4	0	0.00	878	221	20.6	7.67	111.7	4.69	NR
09:39	NR	0.4	5	2.00	1000	893	15.7	7.77	65.2	0.75	NR
09:44	NR	0.6	10	5.00	951	866	15.5	7.7	45.2	1.8	NR
09:49	NR	0.6	15	8.00	991	>1000	15.3	7.72	34.4	1.73	NR
09:50	NR	0.5	16	8.50	NR	NR	NR	NR	NR	NR	Move tubing lower
09:52	NR	0	18	8.50	NR	NR	NR	NR	NR	NR	Restart pump
09:57	NR	0.7	23	12.00	976	>1000	14.9	7.77	23.5	2.55	NR
10:02	NR	0.8	28	16.00	1085	>1000	14.9	7.78	22.3	1.59	NR
10:06	NR	0.8	32	19.20	NR	NR	NR	NR	NR	NR	Went dry

Development Personnel: J. Fino

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

D-2021-07-19

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102D	Date	07/19/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	14:00
Time End	15:20		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	111.35	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	58.02	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	53.33	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	8.67	Color	NA
Total Well Volumes Purged	1.99	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
14:06	59.25	750	0	0.00	NR	>1000	NR	NR	NR	NR	NR
14:18	77.75	750	12	2.38	NR	>1000	NR	NR	NR	NR	NR
14:20	NR	750	14	2.78	NR	>1000	NR	NR	NR	NR	NR
14:25	88.98	1000	19	4.10	NR	>1000	NR	NR	NR	NR	NR
14:41	101	1000	35	8.33	0.949	150	25.65	6.75	NR	5.01	NR
14:55	102	1200	49	12.77	0.946	261	25.35	7.14	NR	NR	NR
15:12	103.36	1000	66	17.26	1.39	363	23.41	7.99	NR	8.98	NR

Development Personnel:

Notes: Pumped dry allow to recover

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs

1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47	
1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65		

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102d		Date	07/20/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	07:20	Time End	723

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	110.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	111.35	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	103.58	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	7.77	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.26	Color	NA
Total Well Volumes Purged	0.63	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
07:20	NR	1000	0	0.00	NR	NR	NR	NR	NR	NR	Surged well well dry will not
07:23	NR	1000	3	0.79	NR	>1000	NR	NR	NR	NR	NR

Development Personnel:

Notes: Removed approx 3 gallons , pumped well dry

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102d		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	14:11	Time End	16:46

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.18
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	111.35	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	0	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	111.35	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	18.09	Color	NA
Total Well Volumes Purged	1.36	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
14:33	29.95	1200	0	0.00	0.549	>1000	27.56	8.11	238	8.58	NR
14:58	55.3	1200	25	7.93	0.487	>1000	26.7	8.23	242	8.06	NR
15:30	90.58	800	57	14.69	0.492	>1000	24.24	7.94	283	5.91	NR
15:57	99.83	800	84	20.40	0.448	>1000	24.36	7.94	285	5.59	NR
16:35	104.4	300	122	23.41	0.626	>1000	25.12	8.12	221	8.07	sing
16:46	111	400	133	24.57	NR	>1000	NR	NR	NR	NR	Pumped dry, still yield .350 -

Development Personnel:

Notes: Added induced18 Gallons, redeveloped . Turbidity increases as well screen exposed

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102d	Date	07/28/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	13:58
Time End	15:00		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	111.61	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	102.54	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	9.07	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.47	Color	NA
Total Well Volumes Purged	14.37	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
14:10	111	1600	0	0.00	NR	>1000	NR	NR	NR	NR	Pumped well dry
15:00	NR	1600	50	21.13	NR	NR	NR	NR	NR	NR	NR

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2102d		Date	08/06/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	10:36	Time End	10:46

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	NR
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	111.35	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	105.94	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	5.41	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	/PVC	**Field Parameters**	
Initial Well Volume (gallons)	NA	Color	NA
Total Well Volumes Purged		Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
10:46	111	0	0	0.00	NR	NR	NR	NR	NR	NR	No water discharge to

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2102D		Date	08/31/2021	
Project	AEP Amos Landfill		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)	96	Bottom of Screen (ft bmp)	106
Weather	75F Rainy	Time Begin	10:42	Time End	10:48

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	Various depths
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.5
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	110.7	Post-Dev Well Depth (ft bmp)	111
Pre-Dev DTW (ft bmp)	103.9	Post-Dev DTW (ft bmp)	108.5
Pre-Dev Water Column (ft)	6.8	Post-Dev Water Column (ft)	2.5
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.1	Color	Brown
Total Well Volumes Purged	2.27	Odor	None
		Appearance	Turbid

Time	Measured DTW (ft bmp)	Pumping Rate (gpm)	Elapsed Time (min)	Gallons Removed	Conductivity (umhos/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
10:42	NR	0.5	0	0.00	908	>1000	16.9	8.58	137.5	2.67	NR
10:47	NR	0.5	5	2.50	1025	>1000	15	8.62	103.1	1.06	NR

Development Personnel:	J. Fino
Notes:	Would not pull from 108.5ft-btoc. Total gallons purged 4.5

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2103s		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	11:42	Time End	12:31

Development Data

Measuring Point	NA	Pump Intake Setting (ft bmp)	61
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	61.46	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	0	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	61.46	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	9.99	Color	NA
Total Well Volumes Purged	1.14	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
12:04	45.92	1600	0	0.00	0.38	248	25.75	7.8	448	8.73	NR
12:31	NR	1600	27	11.41	NR	NR	NR	NR	NR	NR	NR

Development Personnel:

Notes: Induced 10 gallons, redeveloped

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2103s		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	12:31	Time End	13:05

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	61.46	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	0	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	61.46	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	9.99	Color	NA
Total Well Volumes Purged	0.55	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
12:52	57	1600	0	0.00	0.38	380	25.75	7.8	448	8.73	Top of pump
13:05	NR	1600	13	5.49	NR	NR	NR	NR	NR	NR	NR

Development Personnel:

Notes: Flushed 10 gallons in well casing and redeveloped. Total volume removed: 14.4 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2103s		Date	08/05/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	08:13	Time End	8:41

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	61.46	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	53.03	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	8.43	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.37	Color	NA
Total Well Volumes Purged	4.63	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
08:17	54.98	900	0	0.00	0.544	182	19.15	9.45	238	15.36	NR
08:38	58.55	1000	21	5.55	0.519	306	19.76	9.37	242	12.75	NR
08:41	60.5	1000	24	6.34	NR	NR	NR	NR	NR	NR	Pumped well dry 6 gallons

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2103S		Date	08/31/2021	
Project	AEP Amos Landfill		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)	48	Bottom of Screen (ft bmp)	58
Weather	80F Rainy	Time Begin	16:23	Time End	16:45

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	Near bottom
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.23
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	60.85	Post-Dev Well Depth (ft bmp)	61.2
Pre-Dev DTW (ft bmp)	54	Post-Dev DTW (ft bmp)	59.45
Pre-Dev Water Column (ft)	6.85	Post-Dev Water Column (ft)	1.75
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.11	Color	Lt. Brown
Total Well Volumes Purged	4.05	Odor	None
		Appearance	Turbid

Time	Measured DTW (ft bmp)	Pumping Rate (gpm)	Elapsed Time (min)	Gallons Removed	Conductivity (umhos/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
16:23	NR	0.2	0	0.00	1667	762	20.2	7.79	157.2	4.83	NR
16:28	NR	0.2	5	1.00	1570	>1000	17	7.96	131	5.62	NR
16:33	NR	0.2	10	2.00	1418	>1000	16.4	8.01	115.1	4.75	NR
16:38	NR	0.25	15	3.25	1452	>1000	16.1	8.03	108.1	4.54	NR
16:43	NR	0.25	20	4.50	1458	>1000	17.2	8	103.2	4.4	NR

Development Personnel: J. Fino

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2103i	Date	07/22/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
		Bottom of Screen (ft bmp)	
Weather	Cool AM, 60 F	Time Begin	08:15
		Time End	9:36

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	84
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.25
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	85.1	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	61.85	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	23.25	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.78	Color	Red-orange color
Total Well Volumes Purged	5.90	Odor	None
		Appearance	Silty, v fine sand pack sand in bottom of well

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
08:07	57.4	500	0	0.00	NR	>1000	NR	NR	NR	NR	NR
08:17	68.3	800	10	2.11	NR	>1000	NR	NR	NR	NR	Using pump to surge well
08:24	67.82	800	17	3.59	NR	>1000	NR	NR	NR	NR	NR
08:30	70.4	800	23	4.86	NR	>1000	NR	NR	NR	NR	Using pump to surge block well
08:47	74.23	1000	40	9.35	NR	>1000	NR	NR	NR	NR	NR
08:57	75.42	1000	50	11.99	1.92	>1000	18.6	7.84	88	5.91	Using pump to surge well and
09:12	84	1000	65	15.95	NR	>1000	NR	NR	NR	NR	WL at top of pump
09:36	86.5	1000	89	22.29	1.32	>1000	20.45	8.25	97	9.55	Well dry, allow to recover

Development Personnel:	Alan Gillespie
Notes:	Pumping restarted, sand clogged ck ball in pump.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2103i		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	11:40	Time End	12:31

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	84.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	85	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	0	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	85	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	13.81	Color	NA
Total Well Volumes Purged	0.83	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
12:03	46.38	1600	0	0.00	0.223	325	26.65	8.08	387	7.11	NR
12:30	NR	1600	27	11.41	NR	NR	NR	NR	NR	NR	Dry

Development Personnel:

Notes: Flushed 15 gallons in well casing and redeveloped. Total volume removed: 21.4 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2103i	Date	07/28/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
		Bottom of Screen (ft bmp)	
Weather		Time Begin	12:32
		Time End	13:38

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	85.1	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	0	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	85.1	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	/PVC	**Field Parameters**	
Initial Well Volume (gallons)	NA	Color	NA
Total Well Volumes Purged	0	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
12:54	79.15	1600	0	0.00	0.581	421	24.97	7.86	418	10.42	NR
13:41	NR	1600	47	19.87	0.332	>1000	26.98	8.22	266	6.14	Pumped well dry

Development Personnel:

Notes: Flushed 15 gallons in well casing and redeveloped. Total volume removed: 28.7 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2103i		Date	08/05/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	08:50	Time End	9:25

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	85.1	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	77.17	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	7.93	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.29	Color	NA
Total Well Volumes Purged	4.91	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
09:01	79.26	1000	0	0.00	547	19.35	9.07	213	7.76	NR
09:06	80.9	1000	5	1.32	447	18.29	8.84	182	7.48	NR
09:22	83.35	1000	21	5.55	727	19.78	8.76	185	7.62	NR
09:25	84.5	1000	24	6.34	NR	NR	NR	NR	NR	Pumped well dry

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04 1.25 = 0.06	1.5 = 0.09 2 = 0.16	2.5 = 0.26 3 = 0.37	3.5 = 0.50 4 = 0.65	6 = 1.47

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2103i	Date	08/06/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	09:50
Time End	10:07		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	85.1	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	82.75	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	2.35	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.38	Color	NA
Total Well Volumes Purged	3.47	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
10:01	84.32	1000	0	0.00	0.746	638	27.34	8.76	214	9.83	NR
10:06	NR	1000	5	1.32	NR	NR	NR	NR	NR	NR	Pumped well dry, removed 4

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2103I		Date	08/31/2021	
Project	AEP Amos Landfill		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)	67	Bottom of Screen (ft bmp)	82
Weather	80F Rainy	Time Begin	15:36	Time End	15:48

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	Just off bottom
MP Elevation (ft)	NA	Pumping Rate (gpm)	0
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	85.4	Post-Dev Well Depth (ft bmp)	85.4
Pre-Dev DTW (ft bmp)	82.25	Post-Dev DTW (ft bmp)	83.1
Pre-Dev Water Column (ft)	3.15	Post-Dev Water Column (ft)	2.3
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.51	Color	NA
Total Well Volumes Purged		Odor	NA
		Appearance	NA

Development Personnel:	J. Fino
Notes:	Would not pump out of tubing. 0.5 gallons of water in tubing.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105ss		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	FGD LF	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	10:00	Time End	11:15

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.21
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	79.9	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	20.12	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	59.78	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	9.71	Color	NA
Total Well Volumes Purged	1.26	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
10:20	39.25	800	0	0.00	0.283	777	19.94	8.34	269	10.47	NR
10:51	67.55	800	31	6.55	0.326	650	20.47	8.27	229	9.17	NR
11:18	NR	800	58	12.26	NR	NR	NR	NR	NR	NR	Pumped dry

Development Personnel:

Notes: Flushed 13 gallons in well casing and redeveloped. Total volume removed: 15.8 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2105SS		Date	08/31/2021	
Project	AEP Amos Landfill		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather	75F Rainy	Time Begin	09:02	Time End	09:14

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	Various depths
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.5
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	79.7	Post-Dev Well Depth (ft bmp)	79.7
Pre-Dev DTW (ft bmp)	71.31	Post-Dev DTW (ft bmp)	78.9
Pre-Dev Water Column (ft)	8.39	Post-Dev Water Column (ft)	0.8
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.36	Color	Light brown
Total Well Volumes Purged	3.68	Odor	None
		Appearance	Turbid

Time	Measured DTW (ft bmp)	Pumping Rate (gpm)	Elapsed Time (min)	Gallons Removed	Conductivity (umhos/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
09:03	NR	0.7	0	0.00	1352	>1000	16	8.09	116.5	3.03	NR
09:08	NR	0.7	5	3.50	1325	>1000	14.7	8.05	109.9	2.82	NR
09:13	NR	0.3	10	5.00	1354	>1000	19.8	8.08	102.5	6.29	NR

Development Personnel: J. Fino

Notes: Would not pull water from deeper than 78.9ft-btoc.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs

1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105ss	Date	09/03/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	08:47
Time End	09:07		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	79.7	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	79.5	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	0.2	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.03	Color	NA
Total Well Volumes Purged	1.00	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
08:57	79.7	10	0	0.00	NR	>1000	NR	NR	NR	NR	well pumped dry immediately, only 0.2 ft of water in well
09:07	NR	10	10	0.03	NR	>1000	NR	NR	NR	NR	less than 0.5 L removed, well dry, very trubid.

Development Personnel:

Notes: only 0.2 ft of water in well.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105s	Date	07/20/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	08:47
Time End	09:20		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	111
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.05
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	111.58	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	109.31	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	2.27	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.37	Color	NA
Total Well Volumes Purged	4.49	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
08:47	109.31	700	0	0.00	NR	>1000	NR	NR	NR	NR	NR
08:57	111	300	10	0.79	NR	>1000	NR	NR	NR	NR	NR
09:07	111	200	20	1.32	NR	>1000	NR	NR	NR	NR	NR
09:20	111	100	33	1.66	NR	>1000	NR	NR	NR	NR	well pumped dry, approx 1.5

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105s		Date	07/28/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	09:25	Time End	10:40

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	44
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	111.58	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	44.72	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	66.86	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	10.86	Color	NA
Total Well Volumes Purged	2.41	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
09:38	59.95	1600	0	0.00	0.287	>1000	20.31	8.35	243	10.31	NR
10:19	94.12	1600	41	17.33	0.343	436	20.36	8.49	255	6.92	NR
10:40	110	1600	62	26.21	0.329	840	20.28	8.24	233	9.16	Pumped dry

Development Personnel:

Notes: 18gallons added to well 7/27/21., allowed to settle overnight

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs

1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105s	Date	08/05/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	12:30
Time End	12:42		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.26
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	111.58	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	105.57	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	6.01	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.98	Color	NA
Total Well Volumes Purged	0.27	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
12:41	108.85	1000	0	0.00	NR	>1000	NR	NR	NR	NR	NR
12:42	NR	1000	1	0.26	NR	>1000	NR	NR	NR	NR	Dry, removed 2.5 gallons

Development Personnel:

Notes: Very turbid, turbidity increased as screen exposed last few ft.. total 2.5 gallons removed

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2105S	Date	08/30/2021
Project	AEP Amos Landfill	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
		Bottom of Screen (ft bmp)	
Weather	85F Overcast	Time Begin	17:32
		Time End	17:44

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	Various depths
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.2
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	113	Post-Dev Well Depth (ft bmp)	113.5
Pre-Dev DTW (ft bmp)	108.21	Post-Dev DTW (ft bmp)	111
Pre-Dev Water Column (ft)	4.79	Post-Dev Water Column (ft)	2.5
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.78	Color	Brown
Total Well Volumes Purged	1.28	Odor	None
		Appearance	Turbid

Time	Measured DTW (ft bmp)	Pumping Rate (gpm)	Elapsed Time (min)	Gallons Removed	Conductivity (umhos/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
17:39	NR	0.2	0	0.00	563.6	>1000	15.8	9.42	92.4	2.39	NR
17:44	NR	0.2	5	1.00	582	>1000	21.7	9.06	23.6	5.65	NR

Development Personnel: J. Fino

Notes: 1.75 total gallons purged. Dry at 111ft-btoc.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs

1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105I	Date	07/20/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	07:50
Time End	08:00		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	143.84	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	141.33	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	2.51	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.41	Color	NA
Total Well Volumes Purged	1.32	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
07:55	143	100	0	0.00	NR	>1000	NR	NR	NR	NR	NR
10:11	143	15	136	0.54	NR	>1000	NR	NR	NR	NR	removed 2.5 L, pumped well dry.

Development Personnel:

Notes: removed 2.5 L, pumped dry, allow to recover

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105i	Date	07/27/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
		Bottom of Screen (ft bmp)	
Weather		Time Begin	13:35
		Time End	15:00

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	142.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	143.84	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	5	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	138.84	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	22.56	Color	NA
Total Well Volumes Purged	1.44	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
13:52	93.52	1600	0	0.00	0.462	>1000	27.17	8.47	214	5.82	2.5 gallons removed, controller sticking.
14:15	119.92	1600	23	9.72	0.551	>1000	27.94	8.34	218	6.96	NR
14:32	127.55	1600	40	16.91	0.529	>1000	26.27	8.28	234	6.8	NR
14:51	134.85	1600	59	24.94	0.633	>1000	26.09	8.31	225	6.94	NR
15:09	142	1600	77	32.55	NR	NR	NR	NR	NR	NR	Pumped well dry, removed 50 gallons by bucket count, turbid >1000

Development Personnel:

Notes: 25 gallons pumped in to flush well, initial DTW=133.78

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105i		Date	07/27/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather		Time Begin	15:14	Time End	16:10

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	142.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	143.84	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	6	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	137.84	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	22.4	Color	NA
Total Well Volumes Purged	1.00	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
15:17	25.85	1600	0	0.00	0.565	>1000	28.9	8.42	255	6.61	NR
15:31	65.7	1600	14	5.92	0.396	>1000	29.55	8.37	313	6.94	NR
16:10	125.47	1600	53	22.40	0.443	>1000	27.94	8.42	224	8.32	NR

Development Personnel:

Notes: Flushed 25 gallons in well casing and redeveloped. Total volume removed: 30.8 gallons

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105i	Date	07/28/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
		Bottom of Screen (ft bmp)	
Weather		Time Begin	07:48
		Time End	09:19

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	143.84	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	113.81	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	30.03	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	4.88	Color	NA
Total Well Volumes Purged	6.32	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
08:06	121.88	1600	0	0.00	0.58	>1000	18.91	8.67	113	10.41	NR
08:22	129.12	1600	16	6.76	0.536	>1000	18.24	8.86	135	10.53	NR
08:49	132.38	1600	43	18.17	0.698	>1000	19.42	8.64	246	10.87	NR
09:19	143	1600	73	30.85	NR	NR	NR	NR	NR	NR	Pumped well dry.Turbidity decreasing

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2105I		Date	08/30/2021	
Project	AEP Amos Landfill		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather	80F Rainy	Time Begin	14:50	Time End	16:26

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	Bottom of screen, varying depths
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.5
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	144.5	Post-Dev Well Depth (ft bmp)	145.3
Pre-Dev DTW (ft bmp)	129.38	Post-Dev DTW (ft bmp)	138
Pre-Dev Water Column (ft)	15.12	Post-Dev Water Column (ft)	7.3
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	2.46	Color	Brown
Total Well Volumes Purged	1.02	Odor	None
		Appearance	Turbid

Time	Measured DTW (ft bmp)	Pumping Rate (gpm)	Elapsed Time (min)	Gallons Removed	Conductivity (umhos/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
16:06	NR	0.5	0	0.00	2083	>1000	18.7	7.98	82.2	2.76	NR
16:11	NR	0.5	5	2.50	2178	>1000	16.4	8.26	54.7	2.36	NR

Development Personnel: J. Fino

Notes: Total purged 8 gallons. Would not pull water from 138ft-btoc.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105d	Date	07/20/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	07:50
Time End	08:30		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	185
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.16
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	186.17	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	179.11	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	7.06	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.15	Color	NA
Total Well Volumes Purged	5.03	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
07:53	183	700	0	0.00	NR	NR	1000	NR	NR	NR	air in line, pumping dry.
08:10	185	700	17	3.14	NR	>1000	NR	NR	NR	NR	NR
08:30	185	500	37	5.78	NR	>1000	NR	NR	NR	NR	well dry, approx 5 gallons

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105d	Date	07/27/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	11:13
Time End	12:27		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	185.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.44
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	186.17	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	10.35	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	175.82	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	28.57	Color	NA
Total Well Volumes Purged	1.07	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
11:18	39.95	2500	0	0.00	0.343	>1000	23.52	8.54	213	9.41	NR
11:43	112.03	2500	25	16.51	NR	>1000	NR	NR	NR	NR	NR
12:06	152.3	1200	48	23.80	0.338	>1000	24.19	8.64	201	10.7	NR
12:27	169.35	1200	69	30.46	0.304	>1000	23.99	8.61	254	10.9	Turbid, but clearing up

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105d	Date	07/27/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	11:13
Time End	13:30		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	185.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.36
Land Surface Elevation (ft)	NA	Development Method	NA
Pre-Dev Well Depth (ft bmp)	186.17	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	10.35	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	175.82	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	28.57	Color	NA
Total Well Volumes Purged	1.64	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
11:18	39.95	2500	0	0.00	0.343	>1000	23.52	8.54	213	9.41	NR
11:43	112.03	2500	25	16.51	NR	>1000	NR	NR	NR	NR	NR
12:06	152.3	1200	48	23.80	0.338	>1000	24.19	8.64	201	10.7	NR
12:27	169.35	800	69	28.24	0.304	>1000	23.99	8.61	254	10.9	Turbid, but clearing up
13:03	177.56	800	105	35.85	0.297	>1000	22.93	8.57	273	9.81	NR
13:27	NR	1000	129	46.31	NR	NR	NR	NR	NR	NR	NR
13:28	185	800	130	46.52	NR	NR	NR	NR	NR	NR	Top of pump.
13:29	188	800	131	46.73	0.326	>1000	24.38	8.62	215	6.61	Purged approx 40 gallons by

Development Personnel:

Notes: Pumped in 35 gallons to flush well.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2105d	Date	07/28/2021
Project	AEP Amos	Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	07:47
Time End	09:35		

Development Data

Measuring Point	NA	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.42
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	186.17	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	82.18	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	103.99	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	16.9	Color	NA
Total Well Volumes Purged	2.15	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
08:09	111.59	1600	0	0.00	0.779	>1000	19.64	8.08	103	10.25	NR
08:23	140.08	1600	14	5.92	0.308	>1000	16.9	8.66	326	8.95	NR
08:50	160.44	1600	41	17.33	0.529	>1000	19.28	8.45	246	10.57	NR
09:35	185	1600	86	36.35	0.295	>1000	21.28	8.4	226	0.48	Pumped well dry

Development Personnel:

Notes: Water added to top of casing 7/27/21 evening and allowed to settle overnight 30 gal

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs

1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	MW-2105D		Date	08/30/2021	
Project	AEP Amos Landfill		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather	85F Rainy	Time Begin	14:12	Time End	14:40

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0
Land Surface Elevation (ft)	NA	Development Method	Centrifugal
Pre-Dev Well Depth (ft bmp)	188	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	180.55	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	7.45	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	1.21	Color	NA
Total Well Volumes Purged		Odor	NA
		Appearance	NA

Development Personnel:	J. Fino
Notes:	Could not get water to flow more than 8ft into tubing.

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2106			Date	07/21/2021
Project	AEP Amos			Project No.	30080156
Site Location	Winfield, WV	Top of Screen (ft bmp)	37 bgs	Bottom of Screen (ft bmp)	57 bgs
Weather	Sunny, hot and humid, 87 F	Time Begin	13:30	Time End	14:58

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	56.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.13
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	57.6	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	16.86	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	40.74	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	6.62	Color	Dark red-orange
Total Well Volumes Purged	1.66	Odor	None
		Appearance	Silty

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
13:35	23.28	500	0	0.00	NR	>1000	NR	NR	NR	NR	NR
13:39	28.55	500	4	0.53	NR	>1000	NR	NR	NR	NR	Very turbid and silty, red-orange
13:46	39.43	500	11	1.45	NR	>1000	NR	NR	NR	NR	NR
14:00	40.02	500	25	3.30	NR	>1000	NR	NR	NR	NR	Still very turbid
14:21	45.38	500	46	6.07	NR	>1000	NR	NR	NR	NR	Very turbid, red-brown color.
14:41	51.56	500	66	8.71	NR	>1000	NR	NR	NR	NR	Very turbid
14:58	57	500	83	10.96	NR	>1000	NR	NR	NR	NR	Well pumped dry, very turbid

Development Personnel: Alan Gillespie

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2106		Date	07/27/2021	
Project	AEP Amos		Project No.	30080156	
Site Location	Winfield, WV	Top of Screen (ft bmp)		Bottom of Screen (ft bmp)	
Weather	Fog AM, 90 F	Time Begin	07:52	Time End	09:16

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	59.5
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.15
Land Surface Elevation (ft)	NA	Development Method	Bladder
Pre-Dev Well Depth (ft bmp)	60.6	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	10.55	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	50.05	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	8.13	Color	NA
Total Well Volumes Purged	1.63	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
07:56	13.17	800	0	0.00	NR	>1000	NR	NR	NR	NR	NR
08:17	44.63	800	21	4.44	0.386	>1000	21.34	9.17	28	11.36	Very turbid, surging well using pump
08:32	52	500	36	6.42	0.446	>1000	20.98	9.05	52	10.6	NR
08:36	55.22	500	40	6.95	NR	NR	NR	NR	NR	NR	NR
08:50	56.42	500	54	8.80	NR	NR	NR	NR	NR	NR	Top of pump, nearly dry. 11.5 gallons total removed.
09:00	50.35	500	64	10.12	NR	>1000	NR	NR	NR	NR	Added 7 gallons, surged well using pump, restarted pump at 500 ml/ min
09:14	55.21	500	78	11.97	0.431	>1000	21.82	8.86	103	9.01	NR
09:24	59.5	500	88	13.29	NR	>1000	NR	NR	NR	NR	Well pumped dry, 5 gal removed, allow to recharge 30 min.

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Development Personnel:	
Notes:	Well flushed using 120 gallons of water, removed 3-ft of sediment in bottom of well casing. New TD = 60.6 ft

	Well Diameter (in) = Unit Volume (gallon per ft of water column)				
Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point
nV-millivolts

°F / °C- Degrees Fahrenheit/Celsius
gpm - gallons per minute

mS/cm-Milisiemens per centimeter

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2106	Date	08/05/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	15:34
Time End	16:15		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	0.4
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	60.6	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	37.84	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	22.76	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	3.7	Color	NA
Total Well Volumes Purged	3.64	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
15:41	44.72	1500	0	0.00	1.06	641	27.94	9.95	171	22.32	NR
15:47	47.27	1500	6	2.38	1.05	548	26.24	9.96	171	14.63	NR
16:01	53.05	1500	20	7.93	1.05	486	24.46	9.91	178	9.51	NR
16:15	NR	1500	34	13.48	NR	NR	NR	NR	NR	NR	Well dry, 13.5 gallons

Development Personnel:

Notes:

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

MONITORING WELL DEVELOPMENT LOG

ARCADIS Design & Consultancy for natural and built assets

Site/Project Information

Well ID	2106	Date	08/06/2021
Project	AEP Amos	Project No.	30080156
Site Location	FGD LF	Top of Screen (ft bmp)	
Bottom of Screen (ft bmp)			
Weather		Time Begin	08:13
Time End	08:19		

Development Data

Measuring Point	Top of Casing	Pump Intake Setting (ft bmp)	NR
MP Elevation (ft)	NA	Pumping Rate (gpm)	NR
Land Surface Elevation (ft)	NA	Development Method	Submersible
Pre-Dev Well Depth (ft bmp)	60.7	Post-Dev Well Depth (ft bmp)	NA
Pre-Dev DTW (ft bmp)	54.66	Post-Dev DTW (ft bmp)	NA
Pre-Dev Water Column (ft)	6.04	Post-Dev Water Column (ft)	NA
Casing Diameter (in) / Type	2/PVC	**Field Parameters**	
Initial Well Volume (gallons)	0.98	Color	NA
Total Well Volumes Purged	0.00	Odor	NA
		Appearance	NA

Time	Measured DTW (ft bmp)	Pumping Rate (mL/min)	Elapsed Time (min)	Gallons Removed	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	pH (s.u.)	ORP (mV)	DO (mg/L)	Remarks
08:17	59	1600	0	0.00	NR	>1000	NR	NR	NR	NR	NR

Development Personnel:

Notes: Pumped dry, removed 1.25 gallons , turbidity >1000

Well Diameter (in) = Unit Volume (gallon per ft of water column)

Well Volume Calcs	1 = 0.04	1.5 = 0.09	2.5 = 0.26	3.5 = 0.50	6 = 1.47
	1.25 = 0.06	2 = 0.16	3 = 0.37	4 = 0.65	

t -bmp - feet below measuring point °F / °C- Degrees Fahrenheit/Celsius mS/cm-Milisiemens per centimeter
nV-millivolts gpm - gallons per minute

Appendix D

Geochemistry Data

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent / Unit of Measurement			Appendix IV Parameters Antimony, Sb ug/L	Appendix IV Parameters Arsenic, As ug/L	Appendix IV Parameters Barium, Ba ug/L	Barium, Ba (dissolved) ug/L	Appendix IV Parameters Beryllium, Be ug/L	Appendix IV Parameters Cadmium, Cd ug/L	Appendix IV Parameters Chromium, Cr ug/L	Appendix IV Parameters Cobalt, Co ug/L	Appendix IV Parameters Lead, Pb ug/L	Appendix IV Parameters Lithium, Li mg/L	Lithium, Li (dissolved) mg/L
Sample ID	Date	Lab Sample ID											
Downgradient													
MW-1	8/23/2016	NA	0.04 J	0.27	207	--	0.024	0.02 J	0.3	0.097	0.186	0.017	--
	10/18/2016	164253-002	0.04 J	0.62	206	--	0.050	0.03	0.627	0.306	0.567	0.017	--
	11/9/2016	164526-006	0.04 J	0.44	210	--	0.036	0.03	0.564	0.200	0.450	0.02	--
	12/13/2016	164979-004	0.05 J	1.09	232	--	0.100	0.01 J	2.16	0.613	1.45	0.027	--
	2/9/2017	170512-008	0.03 J	0.37	184	--	0.026	0.02 J	0.401	0.174	0.34	0.015	--
	3/16/2017	170934-005	0.06	0.67	200	--	0.057	0.06	0.993	0.393	1.03	0.012	--
	3/16/2017	170934-005A	--	--	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-005	0.08	0.40	211	--	0.032	0.05	0.555	0.292	0.697	0.026	--
	5/23/2017	171786-005A	0.06	0.20	200	--	0.008 J	0.02 J	0.222	0.01 J	0.023	0.016	--
	6/21/2017	172107-008	0.07	0.43	200	--	0.031	0.06	0.547	0.289	0.753	0.013	--
	6/21/2017	172107-008A	0.04 J	0.18	200	--	0.009 J	0.01 J	0.144	0.009 J	0.01 J	0.011	--
	11/1/2017	NA	--	--	--	--	--	--	--	--	--	--	--
	5/2/2018	181488-001	--	--	--	--	--	--	--	--	--	--	--
	11/29/2018	184013-001	--	--	--	--	--	--	--	--	--	--	--
	12/18/2018	184285-001	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-001	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-001A	--	--	--	--	--	--	--	--	--	--	--
MW-2	8/23/2016	NA	0.03 J	6.57	51.8	--	0.129	0.14	1.3	1.02	1.24	0.009	--
	10/17/2016	164253-001	0.01 J	3.94	25.7	--	0.04	0.005 J	0.592	0.29	0.258	0.01	--
	11/8/2016	164526-004	0.01 J	3.54	23.7	--	0.02 J	< 0.005 U	0.295	0.107	0.077	0.008	--
	12/13/2016	164979-005	0.01 J	4.36	27.1	--	0.009 J	< 0.005 U	0.952	0.075	0.068	0.011	--
	2/8/2017	170512-007	< 0.01 U	4.09	25.5	--	0.032	0.005 J	0.571	0.287	0.279	0.009	--
	3/14/2017	170909-003	0.02 J	3.72	31.9	--	0.071	0.02	1.01	0.573	0.651	0.01	--
	3/14/2017	170909-003A	--	--	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-004	0.03 J	3.59	27.2	--	0.043	0.009 J	0.605	0.341	0.333	0.01	--
	5/23/2017	171786-004A	0.04 J	3.65	22.9	--	< 0.004 U	< 0.005 U	0.075	0.022	0.01 J	0.004	--
	6/21/2017	172107-007	0.03 J	3.80	27.7	--	0.028	0.01 J	0.49	0.234	0.229	0.004	--
	6/21/2017	172107-007A	0.01 J	3.82	24.8	--	0.009 J	< 0.005 U	0.085	0.02 J	0.01 J	0.005	--
	11/1/2017	NA	--	--	--	--	--	--	--	--	--	--	--
	1/8/2018	NA	--	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-002	--	--	--	--	--	--	--	--	--	--	--
	6/19/2018	182058-001	--	--	--	--	--	--	--	--	--	--	--
	9/24/2018	183327-001	--	--	--	--	--	--	--	--	--	--	--
	11/28/2018	184013-002	--	--	--	--	--	--	--	--	--	--	--
	12/17/2018	184285-002	--	--	--	--	--	--	--	--	--	--	--
	1/24/2019	190294-001	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-002	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-002A	--	--	--	--	--	--	--	--	--	--	--
MW-4	8/23/2016	NA	0.01 J	9.61	24.1	--	0.02	0.11	0.9	0.158	0.371	0.008	--
	10/18/2016	164253-003	< 0.01 U	8.81	20.2	--	< 0.004 U	0.006 J	0.064	0.01	0.021	0.002	--
	11/7/2016	164526-002	< 0.01 U	9.07	21.5	--	< 0.004 U	< 0.005 U	1.68	0.029	0.007 J	0.003	--
	12/13/2016	164979-007	< 0.01 U	9.44	22.4	--	< 0.004 U	< 0.005 U	0.169	0.01	0.009 J	0.007	--
	2/8/2017	170512-005	< 0.01 U	8.78	19.2	--	0.006 J	< 0.005 U	0.122	0.043	0.064	0.006	--
	3/14/2017	170909-002	< 0.01 U	10.1	20.4	--	0.005 J	0.005 J	0.523	0.041	0.114	0.006	--
	3/14/2017	170909-002A	--	--	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-002	0.02 J	8.96	21.1	--	< 0.004 U	< 0.005 U	0.104	0.008 J	0.01 J	0.012	--
	5/23/2017	171786-002A	0.03 J	9.40	22.1	--	0.006 J	0.005 J	0.156	0.056	0.084	0.009	--
	6/20/2017	172107-005	0.02 J	9.15	21.8	--	0.004 J	0.005 J	0.157	0.037	0.039	0.005	--
	6/20/2017	172107-005A	< 0.01 U	9.24	21.3	--	< 0.004 U	< 0.005 U	0.076	0.008 J	< 0.004 U	0.002	--
	11/1/2017	NA	--	--	--	--	--	--	--	--	--	--	--
	1/8/2018	NA	--	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-003	--	--	--	--	--	--	--	--	--	--	--
	11/28/2018	184013-003	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-003	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-003A	--	--	--	--	--	--	--	--	--	--	--

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent Unit of Measurement			Appendix IV Parameters Antimony, Sb ug/L	Appendix IV Parameters Arsenic, As ug/L	Appendix IV Parameters Barium, Ba ug/L	Barium, Ba (dissolved) ug/L	Appendix IV Parameters Beryllium, Be ug/L	Appendix IV Parameters Cadmium, Cd ug/L	Appendix IV Parameters Chromium, Cr ug/L	Appendix IV Parameters Cobalt, Co ug/L	Appendix IV Parameters Lead, Pb ug/L	Appendix IV Parameters Lithium, Li mg/L	Lithium, Li (dissolved) mg/L
Sample ID	Date	Lab Sample ID											
MW-5	8/23/2016	NA	0.04 J	0.47	93.3	--	0.02 J	0.07	0.3	0.188	0.263	0.006	--
	10/18/2016	164253-004	0.04 J	0.34	82.5	--	0.02 J	0.02	0.546	0.198	0.25	0.005	--
	11/8/2016	164526-005	0.04 J	0.49	80.1	--	0.05	0.05	0.945	0.446	0.698	< 0.0002 U	--
	12/13/2016	164979-006	0.04 J	0.51	80.9	--	0.033	0.03	0.622	0.339	0.442	0.01	--
	2/8/2017	170512-006	0.02 J	0.30	70.2	--	0.022	0.02 J	0.465	0.217	0.257	0.005	--
	3/16/2017	170934-003	0.09	2.32	121	--	0.183	0.21	4.43	2.92	3.77	0.002	--
	3/16/2017	170934-003A	--	--	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-003	0.06	0.21	77.7	--	0.01 J	0.02	0.248	0.072	0.093	0.011	--
	5/23/2017	171786-003A	0.04 J	0.18	76.5	--	0.006 J	0.01 J	0.193	0.007 J	0.02 J	0.004	--
	6/20/2017	172107-006	0.02 J	0.25	80.6	--	0.01 J	0.03	0.291	0.092	0.097	< 0.0002 U	--
	6/20/2017	172107-006A	0.03 J	0.21	83.8	--	0.008 J	0.02	0.178	0.007 J	0.009 J	0.002	--
	11/1/2017	NA	--	--	--	--	--	--	--	--	--	--	--
	1/8/2018	NA	--	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-004	--	--	--	--	--	--	--	--	--	--	--
	6/19/2018	182058-002	--	--	--	--	--	--	--	--	--	--	--
	11/29/2018	184013-004	--	--	--	--	--	--	--	--	--	--	--
	12/17/2018	184285-003	--	--	--	--	--	--	--	--	--	--	--
	11/5/2019	193590-004	--	--	--	--	--	--	--	--	--	--	--
	11/5/2019	193590-004A	--	--	--	--	--	--	--	--	--	--	--
MW-1801	12/18/2018	184284-001	0.30	13.5	39.3	--	0.113	0.07	3.30	0.876	0.966	< 0.009 U	--
	1/24/2019	190302-001	0.14	11.8	34.6	--	0.08 J	< 0.01 U	2.56	0.436	0.544	0.032	--
	2/21/2019	190626-001	0.14	10.4	28.7	--	0.02 J	< 0.01 U	0.585	0.162	0.272	< 0.009 U	--
MW-1802	12/17/2018	184284-002	0.03 J	6.08	15.5	--	< 0.02 U	< 0.01 U	0.296	0.081	0.1 J	< 0.009 U	--
	1/25/2019	190302-002	0.05 J	6.00	17.1	--	0.03 J	< 0.01 U	0.497	0.219	0.214	0.03 J	--
	2/21/2019	190626-005	0.03 J	6.42	16.1	--	< 0.02 U	< 0.01 U	0.232	0.083	0.08 J	< 0.009 U	--
	8/30/2021	215633-007	--	--	--	--	--	--	--	--	--	--	--
	8/30/2021	215633-007-01	--	--	--	13.8	--	--	--	--	--	--	0.00737
MW-2106	9/2/2021	215633-003	--	--	--	--	--	--	--	--	--	--	--
	9/2/2021	215633-003-01	--	--	--	68.7	--	--	--	--	--	--	0.0168

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent Unit of Measurement			Appendix IV Parameters Antimony, Sb ug/L	Appendix IV Parameters Arsenic, As ug/L	Appendix IV Parameters Barium, Ba ug/L	Barium, Ba (dissolved) ug/L	Appendix IV Parameters Beryllium, Be ug/L	Appendix IV Parameters Cadmium, Cd ug/L	Appendix IV Parameters Chromium, Cr ug/L	Appendix IV Parameters Cobalt, Co ug/L	Appendix IV Parameters Lead, Pb ug/L	Appendix IV Parameters Lithium, Li mg/L	Lithium, Li (dissolved) mg/L
Sample ID	Date	Lab Sample ID											
Upgradient													
MW-6	8/24/2016	NA	0.04 J	6.03	245	--	0.036	0.03	0.5	0.183	0.461	0.015	--
	10/19/2016	164253-007	0.02 J	6.42	235	--	0.033	< 0.005 U	0.413	0.148	0.381	0.015	--
	11/7/2016	164526-001	0.01 J	6.64	250	--	0.009 J	< 0.005 U	0.16	0.023	0.053	0.011	--
	12/12/2016	164979-001	0.01 J	7.36	246	--	0.006 J	0.01 J	0.104	0.02	0.039	0.023	--
	2/7/2017	170512-001	< 0.01 U	5.47	199	--	0.02 J	< 0.005 U	0.207	0.073	0.16	0.013	--
	3/16/2017	170934-004	0.03 J	4.44	224	--	< 0.004 U	0.005 J	0.498	0.028	0.048	0.009	--
	3/16/2017	170934-004A	--	--	--	--	--	--	--	--	--	--	--
	5/22/2017	171786-001	0.04 J	4.58	218	--	0.02 J	0.009 J	0.175	0.063	0.117	0.019	--
	5/22/2017	171786-001A	0.04 J	4.69	227	--	< 0.004 U	< 0.005 U	0.115	0.025	0.022	0.017	--
	6/19/2017	172107-001	0.03 J	4.86	233	--	0.01 J	< 0.005 U	0.274	0.051	0.136	0.011	--
	6/19/2017	172107-001A	0.02 J	4.97	237	--	< 0.004 U	< 0.005 U	0.065	0.02 J	0.02 J	0.012	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-005	--	--	--	--	--	--	--	--	--	--	--
	11/28/2018	184013-005	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-005	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-005A	--	--	--	--	--	--	--	--	--	--	--
MW-7R	8/24/2016	NA	0.11	8.37	60.8	--	0.155	0.04	1	0.368	1.52	0.016	--
	10/18/2016	164253-005	0.07	7.13	51.4	--	0.111	0.01 J	0.76	0.279	0.961	0.012	--
	11/8/2016	164526-003	0.08	5.81	42.2	--	0.026	0.02	2.82	0.084	0.261	0.013	--
	12/14/2016	164979-009	0.09	7.33	44.3	--	0.028	0.01 J	1.73	0.103	0.249	0.014	--
	2/9/2017	170512-009	0.05	4.21	41.7	--	0.01 J	0.01 J	0.217	0.065	0.156	0.012	--
	3/14/2017	170909-004	0.08	7.02	40.2	--	0.01 J	0.01 J	0.234	0.064	0.154	0.01	--
	3/14/2017	170909-004A	--	--	--	--	--	--	--	--	--	--	--
	5/24/2017	171786-010	0.10	7.48	42.0	--	0.01 J	0.01 J	0.242	0.08	0.171	0.016	--
	5/24/2017	171786-010A	0.10	6.38	49.9	--	< 0.004 U	0.008 J	0.16	0.037	0.026	0.013	--
	6/21/2017	172107-011	0.08	6.69	39.1	--	0.006 J	0.006 J	0.154	0.043	0.064	0.01	--
	6/21/2017	172107-011A	0.08	6.36	38.4	--	< 0.004 U	0.007 J	0.157	0.02 J	0.01 J	0.006	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-006	--	--	--	--	--	--	--	--	--	--	--
	11/28/2018	184013-006	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-006	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-006A	--	--	--	--	--	--	--	--	--	--	--
MW-8	8/24/2016	NA	0.04 J	0.41	221	--	0.021	0.04	0.4	0.27	0.393	0.013	--
	10/19/2016	164253-011	0.03 J	0.35	195	--	0.01 J	0.04	0.158	0.14	0.279	0.006	--
	11/9/2016	164526-008	0.02 J	0.25	209	--	0.008 J	< 0.005 U	0.164	0.082	0.028	0.004	--
	12/14/2016	164979-008	0.03 J	0.32	212	--	0.008 J	0.008 J	0.097	0.083	0.062	0.013	--
	2/8/2017	170512-003	0.03 J	0.37	192	--	0.01 J	0.007 J	0.131	0.059	0.109	0.007	--
	3/15/2017	170909-005	0.05 J	1.44	270	--	0.069	0.02 J	2.39	1.02	1.43	0.011	--
	3/15/2017	170909-005A	--	--	--	--	--	--	--	--	--	--	--
	5/24/2017	171786-008	0.07	0.47	201	--	0.02 J	0.009 J	0.354	0.201	0.26	0.016	--
	5/24/2017	171786-008A	0.05	0.32	194	--	0.006 J	< 0.005 U	0.126	0.084	0.047	0.018	--
	6/20/2017	172107-003	0.03 J	0.35	182	--	0.02 J	0.007 J	0.192	0.077	0.142	0.005	--
	6/20/2017	172107-003A	0.04 J	0.28	187	--	0.006 J	< 0.005 U	0.138	0.01 J	0.042	0.007	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-007	--	--	--	--	--	--	--	--	--	--	--
	11/29/2018	184013-007	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-007	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-007A	--	--	--	--	--	--	--	--	--	--	--
	8/31/2021	215633-011	--	--	--	--	--	--	--	--	--	--	--
	8/31/2021	215633-011-01	--	--	--	129	--	--	--	--	--	--	0.00729

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
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Constituent Unit of Measurement			Appendix IV Parameters Antimony, Sb ug/L	Appendix IV Parameters Arsenic, As ug/L	Appendix IV Parameters Barium, Ba ug/L	Barium, Ba (dissolved) ug/L	Appendix IV Parameters Beryllium, Be ug/L	Appendix IV Parameters Cadmium, Cd ug/L	Appendix IV Parameters Chromium, Cr ug/L	Appendix IV Parameters Cobalt, Co ug/L	Appendix IV Parameters Lead, Pb ug/L	Appendix IV Parameters Lithium, Li mg/L	Lithium, Li (dissolved) mg/L
Sample ID	Date	Lab Sample ID											
MW-9	8/24/2016	NA	0.07	1.45	443	--	0.025	0.03	0.8	0.464	0.565	0.017	--
	10/19/2016	164253-010	0.04 J	3.75	441	--	0.025	0.01 J	0.625	0.372	0.478	0.01	--
	11/9/2016	164526-007	0.05 J	1.12	491	--	< 0.004 U	0.02 J	0.207	0.02	0.046	0.008	--
	12/13/2016	164979-002	0.04 J	1.23	497	--	< 0.004 U	0.04	0.54	0.032	0.084	0.019	--
	2/8/2017	170512-002	0.02 J	1.78	388	--	0.004 J	0.03	0.078	0.033	0.058	0.012	--
	3/15/2017	170934-001	0.04 J	4.40	603	--	0.074	0.04	1.43	1.51	1.81	0.009	--
	3/15/2017	170934-001A	--	--	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-006	0.07	0.96	425	--	< 0.004 U	0.02 J	0.117	0.021	0.063	0.021	--
	5/23/2017	171786-006A	0.08	0.88	423	--	< 0.004 U	0.01 J	0.11	0.009 J	0.02	0.012	--
	6/20/2017	172107-002	0.05 J	1.35	441	--	< 0.004 U	0.03	0.094	0.066	0.038	0.014	--
	6/20/2017	172107-002A	0.04 J	1.44	445	--	< 0.004 U	0.02 J	0.12	0.059	0.021	0.011	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-008	--	--	--	--	--	--	--	--	--	--	--
	11/29/2018	184013-008	--	--	--	--	--	--	--	--	--	--	--
	11/7/2019	193602-001	--	--	--	--	--	--	--	--	--	--	--
	11/7/2019	193602-001A	--	--	--	--	--	--	--	--	--	--	--
MW-10	8/24/2016	NA	0.36	24.5	105	--	0.058	0.26	0.5	0.367	1.11	0.01	--
	10/19/2016	164253-009	0.26	19.4	62.4	--	0.02 J	0.01 J	0.373	0.102	0.357	0.008	--
	11/9/2016	164526-009	0.38	21.5	144	--	0.264	0.05	3.96	1.66	3.41	0.007	--
	12/13/2016	164979-003	0.63	17.1	69.8	--	0.029	0.2	1.63	0.212	0.895	0.019	--
	2/8/2017	170512-004	0.38	22.8	92.9	--	0.124	0.04	2.28	0.85	1.89	0.008	--
	3/14/2017	170909-001	0.32	21.2	69.0	--	0.039	0.01 J	0.965	0.28	0.635	0.01	--
	3/14/2017	170909-001A	--	--	--	--	--	--	--	--	--	--	--
	5/24/2017	171786-007	0.23	9.07	55.6	--	0.022	0.02 J	0.5	0.151	0.469	0.011	--
	5/24/2017	171786-007A	0.41	18.9	58.0	--	< 0.004 U	0.006 J	0.173	0.006 J	0.032	0.009	--
	6/20/2017	172107-004	0.30	17.7	61.7	--	0.025	0.01 J	0.577	0.17	0.448	0.004	--
	6/20/2017	172107-004A	0.36	19.6	58.5	--	< 0.004 U	0.006 J	0.173	0.004 J	0.02 J	0.007	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--	--
	5/2/2018	181488-009	--	--	--	--	--	--	--	--	--	--	--
	11/29/2018	184013-009	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-008	--	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-008A	--	--	--	--	--	--	--	--	--	--	--
MW-2101ss	9/1/2021	215633-006	--	--	--	--	--	--	--	--	--	--	--
	9/1/2021	215633-006-01	--	--	--	85.1	--	--	--	--	--	--	0.00835
MW-2101s	9/1/2021	215633-004	--	--	--	--	--	--	--	--	--	--	--
	9/1/2021	215633-004-01	--	--	--	110	--	--	--	--	--	--	0.0113
MW-2102s	9/1/2021	215633-012	--	--	--	--	--	--	--	--	--	--	--
	9/1/2021	215633-012-01	--	--	--	399	--	--	--	--	--	--	0.0113
MW-2103i	9/2/2021	215633-013	--	--	--	--	--	--	--	--	--	--	--
	9/2/2021	215633-013-01	--	--	--	131	--	--	--	--	--	--	0.0111
MW-2103s	9/2/2021	215633-008	--	--	--	--	--	--	--	--	--	--	--
	9/2/2021	215633-008-01	--	--	--	136	--	--	--	--	--	--	0.01

NOTES:

mg/L = milligrams per liter

pCi/L = picocuries per liter

ug/L = micrograms per liter

-- = not analyzed

< = not detected above Reporting Limit

NA = not available

J = estimated result

U = below detection limits

J1 = Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

P1 = The precision between duplicate results was above acceptance limits.

U1 = Not detected at or above method detection limit (MDL).

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent / Unit of Measurement			Appendix IV Parameters Magnesium, Mg mg/L	Magnesium, Mg (dissolved) mg/L	Appendix IV Parameters Manganese, Mn mg/L	Appendix IV Parameters Manganese, Mn (Dissolved) mg/L	Appendix IV Parameters Mercury, Hg ug/L	Appendix IV Parameters Molybdenum, Mo ug/L	Appendix IV Parameters Potassium, K mg/L	Potassium, K (dissolved) mg/L	Appendix IV Parameters Radium-226 pCi/L	Appendix IV Parameters Radium-228 pCi/L
Sample ID	Date	Lab Sample ID										
Downgradient												
MW-1	8/23/2016	NA	--	--	--	--	0.005 U	0.04 J	--	--	--	--
	10/18/2016	164253-002	--	--	--	--	0.002 J	0.08 J	--	--	0.291	0.949
	11/9/2016	164526-006	--	--	--	--	< 0.002 U	0.14	--	--	0.403	0.598
	12/13/2016	164979-004	--	--	--	--	< 0.002 U	0.11	--	--	0.0531	0.617
	2/9/2017	170512-008	--	--	--	--	< 0.002 U	0.21	--	--	0.564	0.272
	3/16/2017	170934-005	9.89	--	--	--	0.003 J	0.1	3.08	--	0.308	0.422
	3/16/2017	170934-005A	--	--	0.001	--	--	--	--	--	--	--
	5/23/2017	171786-005	10.6	--	--	--	< 0.002 U	0.11	3.28	--	2.6	0.643
	5/23/2017	171786-005A	10.1	--	0.0004 J	--	--	0.97	3.2	--	--	--
	6/21/2017	172107-008	9.98	--	--	--	< 0.002 U	0.1	3.16	--	0.259	1.12
	6/21/2017	172107-008A	10.5	--	0.0002 J	--	--	0.4	3.36	--	--	--
	11/1/2017	NA	--	--	--	--	--	--	--	--	--	--
	5/2/2018	181488-001	9.88	--	--	0.0009 J	--	--	3.4	--	--	--
	11/29/2018	184013-001	9.47	--	--	0.038	--	--	3.37	--	--	--
	12/18/2018	184285-001	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-001	9.79	--	--	--	--	--	3.2	--	--	--
	11/6/2019	193590-001A	--	--	--	< 0.0005 U	--	--	--	--	--	--
MW-2	8/23/2016	NA	--	--	--	--	0.005 U	6.04	--	--	--	--
	10/17/2016	164253-001	--	--	--	--	< 0.002 U	3.7	--	--	0.208	-0.181
	11/8/2016	164526-004	--	--	--	--	< 0.002 U	3.84	--	--	0.0645	0.818
	12/13/2016	164979-005	--	--	--	--	< 0.002 U	6.11	--	--	0.288	-0.491
	2/8/2017	170512-007	--	--	--	--	< 0.002 U	5.55	--	--	0.473	0.636
	3/14/2017	170909-003	0.405	--	--	--	0.002 J	3.46	0.99	--	0.323	2.54
	3/14/2017	170909-003A	--	--	0.0081	--	--	--	--	--	--	--
	5/23/2017	171786-004	0.308	--	--	--	< 0.002 U	3.7	0.79	--	0.155	0.641
	5/23/2017	171786-004A	0.224	--	0.007	--	--	4	0.94	--	--	--
	6/21/2017	172107-007	0.315	--	--	--	0.003 J	4.57	0.98	--	0.0888	1.03
	6/21/2017	172107-007A	0.26	--	0.0076	--	--	4.88	0.88	--	--	--
	11/1/2017	NA	--	--	--	--	--	--	--	--	--	--
	1/8/2018	NA	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-002	1.33	--	--	0.0077	--	--	2.17	--	--	--
	6/19/2018	182058-001	--	--	--	--	--	--	--	--	--	--
	9/24/2018	183327-001	--	--	--	--	--	--	--	--	--	--
	11/28/2018	184013-002	0.548	--	--	0.0097	--	--	1.4	--	--	--
	12/17/2018	184285-002	--	--	--	--	--	--	--	--	--	--
	1/24/2019	190294-001	--	--	--	--	--	--	--	--	--	--
	11/6/2019	193590-002	0.292	--	--	--	--	--	1.08	--	--	--
	11/6/2019	193590-002A	--	--	--	0.0075	--	--	--	--	--	--
MW-4	8/23/2016	NA	--	--	--	--	0.005 U	8.82	--	--	--	--
	10/18/2016	164253-003	--	--	--	--	< 0.002 U	8.01	--	--	0.152	-0.446
	11/7/2016	164526-002	--	--	--	--	< 0.002 U	8.14	--	--	0.681	0.879
	12/13/2016	164979-007	--	--	--	--	< 0.002 U	8.94	--	--	0.16	-0.039
	2/8/2017	170512-005	--	--	--	--	< 0.002 U	8.15	--	--	0.199	0.368
	3/14/2017	170909-002	0.108	--	--	--	< 0.002 U	9.7	0.56	--	0.426	1.03
	3/14/2017	170909-002A	--	--	0.0033	--	--	--	--	--	--	--
	5/23/2017	171786-002	0.087	--	--	--	< 0.002 U	8.21	0.41	--	0.517	0.355
	5/23/2017	171786-002A	0.115	--	0.0049	--	--	8.46	0.57	--	--	--
	6/20/2017	172107-005	0.111	--	--	--	< 0.002 U	7.86	0.63	--	0.181	0.724
	6/20/2017	172107-005A	0.102	--	0.003	--	--	7.91	0.55	--	--	--
	11/1/2017	NA	--	--	--	--	--	--	--	--	--	--
	1/8/2018	NA	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-003	0.177	--	--	0.0036	--	--	0.93	--	--	--
	11/28/2018	184013-003	0.114	--	--	0.0053	--	--	0.5 J	--	--	--
	11/6/2019	193590-003	0.117	--	--	--	--	--	0.6 J	--	--	--
	11/6/2019	193590-003A	--	--	--	0.0033	--	--	--	--	--	--

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent			Appendix IV Parameters Magnesium, Mg	Magnesium, Mg (dissolved)	Appendix IV Parameters Manganese, Mn	Appendix IV Parameters Manganese, Mn (Dissolved)	Appendix IV Parameters Mercury, Hg	Appendix IV Parameters Molybdenum, Mo	Appendix IV Parameters Potassium, K	Potassium, K (dissolved)	Appendix IV Parameters Radium-226	Appendix IV Parameters Radium-228
Unit of Measurement			mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	mg/L	mg/L	pCi/L	pCi/L
Sample ID	Date	Lab Sample ID										
MW-5	8/23/2016	NA	--	--	--	--	0.005 U	0.17	--	--	--	--
	10/18/2016	164253-004	--	--	--	--	< 0.002 U	0.16	--	--	0.353	-0.28
	11/8/2016	164526-005	--	--	--	--	< 0.002 U	0.14	--	--	0.407	1.44
	12/13/2016	164979-006	--	--	--	--	< 0.002 U	0.18	--	--	0.187	0.993
	2/8/2017	170512-006	--	--	--	--	< 0.002 U	0.14	--	--	0.0978	0.489
	3/16/2017	170934-003	5.22	--	--	--	0.008	0.4	3.42	--	0.406	0.69
	3/16/2017	170934-003A	--	--	0.0018	--	--	--	--	--	--	--
	5/23/2017	171786-003	4.28	--	--	--	< 0.002 U	0.14	2.56	--	1.17	0.142
	5/23/2017	171786-003A	4.29	--	0.002	--	--	0.49	2.88	--	--	--
	6/20/2017	172107-006	4.53	--	--	--	< 0.002 U	0.09 J	2.75	--	0.474	0.667
	6/20/2017	172107-006A	4.55	--	0.013	--	--	0.28	2.57	--	--	--
	11/1/2017	NA	--	--	--	--	--	--	--	--	--	--
	1/8/2018	NA	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-004	4.61	--	--	0.0055	--	--	3.07	--	--	--
	6/19/2018	182058-002	--	--	--	--	--	--	--	--	--	--
	11/29/2018	184013-004	4.53	--	--	0.0087	--	--	3.44	--	--	--
	12/17/2018	184285-003	--	--	--	--	--	--	--	--	--	--
	11/5/2019	193590-004	5.6	--	--	--	--	--	5.16	--	--	--
	11/5/2019	193590-004A	--	--	--	0.0091	--	--	--	--	--	--
MW-1801	12/18/2018	184284-001	0.521	--	--	0.0042	< 0.002 U	58.4	1.55	--	0.53	0.286
	1/24/2019	190302-001	0.374	--	--	0.0061	< 0.002 U	64.5	1.1	--	0.596	0.387
	2/21/2019	190626-001	0.256	--	--	0.0064	< 0.002 U	66.3	0.97	--	0.175	-0.315
MW-1802	12/17/2018	184284-002	0.154	--	--	0.0049	< 0.002 U	22.7	1	--	0.131	0.314
	1/25/2019	190302-002	0.203	--	--	0.0064	< 0.002 U	23.1	0.79	--	0.404	0.118
	2/21/2019	190626-005	0.149	--	--	0.0028	< 0.002 U	24.9	0.63	--	0.136	0.0379
	8/30/2021	215633-007	--	--	--	--	--	--	--	--	--	--
	8/30/2021	215633-007-01	--	0.16	--	--	--	--	--	0.8 J1	--	--
MW-2106	9/2/2021	215633-003	--	--	--	--	--	--	--	--	--	--
	9/2/2021	215633-003-01	--	1.09	--	--	--	--	--	2.5	--	--

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent Unit of Measurement			Appendix IV Parameters Magnesium, Mg mg/L	Magnesium, Mg (dissolved) mg/L	Appendix IV Parameters Manganese, Mn mg/L	Appendix IV Parameters Manganese, Mn (Dissolved) mg/L	Appendix IV Parameters Mercury, Hg ug/L	Appendix IV Parameters Molybdenum, Mo ug/L	Appendix IV Parameters Potassium, K mg/L	Potassium, K (dissolved) mg/L	Appendix IV Parameters Radium-226 pCi/L	Appendix IV Parameters Radium-228 pCi/L
Sample ID	Date	Lab Sample ID										
Upgradient												
MW-6	8/24/2016	NA	--	--	--	--	0.005 U	0.77	--	--	--	--
	10/19/2016	164253-007	--	--	--	--	< 0.002 U	0.36	--	--	0.428	0.269
	11/7/2016	164526-001	--	--	--	--	< 0.002 U	0.36	--	--	1.01	1.69
	12/12/2016	164979-001	--	--	--	--	< 0.002 U	0.39	--	--	0.894	0.984
	2/7/2017	170512-001	--	--	--	--	< 0.002 U	0.44	--	--	0.313	0.838
	3/16/2017	170934-004	11.5	--	--	--	0.003 J	0.53	2	--	0.494	1.35
	3/16/2017	170934-004A	--	--	0.117	--	--	--	--	--	--	--
	5/22/2017	171786-001	10.8	--	--	--	< 0.002 U	0.5	2.09	--	1.67	0.73
	5/22/2017	171786-001A	10.6	--	0.076	--	--	1.06	2.1	--	--	--
	6/19/2017	172107-001	11.9	--	--	--	< 0.002 U	0.44	2.38	--	0.367	1.25
	6/19/2017	172107-001A	11.8	--	0.077	--	--	0.93	2.36	--	--	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-005	11.1	--	--	0.0738	--	--	2.36	--	--	--
	11/28/2018	184013-005	11.6	--	--	0.0691	--	--	2.23	--	--	--
	11/6/2019	193590-005	11.9	--	--	--	--	--	2.52	--	--	--
	11/6/2019	193590-005A	--	--	--	0.101	--	--	--	--	--	--
MW-7R	8/24/2016	NA	--	--	--	--	0.004 J	25.7	--	--	--	--
	10/18/2016	164253-005	--	--	--	--	0.002 J	23.2	--	--	0.312	0.647
	11/8/2016	164526-003	--	--	--	--	< 0.002 U	17.5	--	--	1.06	0.835
	12/14/2016	164979-009	--	--	--	--	< 0.002 U	24.6	--	--	0.13	0.832
	2/9/2017	170512-009	--	--	--	--	< 0.002 U	11.7	--	--	0.0996	-0.436
	3/14/2017	170909-004	12.1	--	--	--	< 0.002 U	24.6	2.22	--	0.545	2.19
	3/14/2017	170909-004A	--	--	0.0452	--	--	--	--	--	--	--
	5/24/2017	171786-010	11.6	--	--	--	< 0.002 U	25.7	1.96	--	0.0868	0.302
	5/24/2017	171786-010A	15	--	0.0388	--	--	20.8	2.16	--	--	--
	6/21/2017	172107-011	12.8	--	--	--	< 0.002 U	22.9	2.21	--	0.267	1.23
	6/21/2017	172107-011A	13.1	--	0.0448	--	--	22.3	2.27	--	--	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-006	12.3	--	--	0.0262	--	--	2.56	--	--	--
	11/28/2018	184013-006	18.9	--	--	0.0464	--	--	2.09	--	--	--
	11/6/2019	193590-006	9.33	--	--	--	--	--	2.31	--	--	--
	11/6/2019	193590-006A	--	--	--	0.035	--	--	--	--	--	--
MW-8	8/24/2016	NA	--	--	--	--	0.005 U	0.4	--	--	--	--
	10/19/2016	164253-011	--	--	--	--	< 0.002 U	0.07 J	--	--	0.33	0.416
	11/9/2016	164526-008	--	--	--	--	< 0.002 U	0.08 J	--	--	0.452	0.661
	12/14/2016	164979-008	--	--	--	--	< 0.002 U	0.1	--	--	0.272	1.31
	2/8/2017	170512-003	--	--	--	--	< 0.002 U	0.47	--	--	0.506	0.717
	3/15/2017	170909-005	32.5	--	--	--	0.003 J	0.28	2.28	--	0.815	2.59
	3/15/2017	170909-005A	--	--	0.006	--	--	--	--	--	--	--
	5/24/2017	171786-008	34.2	--	--	--	< 0.002 U	0.11	2.39	--	0.364	0.893
	5/24/2017	171786-008A	33.2	--	0.0058	--	--	0.81	2.24	--	--	--
	6/20/2017	172107-003	35	--	--	--	< 0.002 U	0.07 J	2.41	--	0.271	0.794
	6/20/2017	172107-003A	35.1	--	0.0033	--	--	0.09 J	2.27	--	--	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-007	36	--	--	0.003	--	--	2.69	--	--	--
	11/29/2018	184013-007	29.9	--	--	0.0213	--	--	1.49	--	--	--
	11/6/2019	193590-007	30	--	--	--	--	--	2.51	--	--	--
	11/6/2019	193590-007A	--	--	--	0.0114	--	--	--	--	--	--
	8/31/2021	215633-011	--	--	--	--	--	--	--	--	--	--
	8/31/2021	215633-011-01	--	25.1	--	--	--	--	--	2.5	--	--

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent			Appendix IV Parameters Magnesium, Mg	Magnesium, Mg (dissolved)	Appendix IV Parameters Manganese, Mn	Appendix IV Parameters Manganese, Mn (Dissolved)	Appendix IV Parameters Mercury, Hg	Appendix IV Parameters Molybdenum, Mo	Appendix IV Parameters Potassium, K	Potassium, K (dissolved)	Appendix IV Parameters Radium-226	Appendix IV Parameters Radium-228
Unit of Measurement			mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	mg/L	mg/L	pCi/L	pCi/L
Sample ID	Date	Lab Sample ID										
MW-9	8/24/2016	NA	--	--	--	--	0.005 U	0.48	--	--	--	--
	10/19/2016	164253-010	--	--	--	--	< 0.002 U	0.27	--	--	0.865	2.17
	11/9/2016	164526-007	--	--	--	--	< 0.002 U	0.41	--	--	0.804	0.931
	12/13/2016	164979-002	--	--	--	--	< 0.002 U	0.56	--	--	0.39	-0.044
	2/8/2017	170512-002	--	--	--	--	< 0.002 U	0.27	--	--	0.745	0.703
	3/15/2017	170934-001	22.4	--	--	--	0.002 J	0.37	2.61	--	0.705	1.66
	3/15/2017	170934-001A	--	--	0.0335	--	--	--	--	--	--	--
	5/23/2017	171786-006	22.2	--	--	--	< 0.002 U	0.37	2.72	--	1.23	0.943
	5/23/2017	171786-006A	22.8	--	0.0025	--	--	0.38	2.88	--	--	--
	6/20/2017	172107-002	23.4	--	--	--	< 0.002 U	0.33	2.77	--	1.07	0.922
	6/20/2017	172107-002A	22.9	--	0.0716	--	--	0.91	2.67	--	--	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-008	21.3	--	--	0.0006 J	--	--	3.62	--	--	--
	11/29/2018	184013-008	20.9	--	--	0.0357	--	--	2.52	--	--	--
	11/7/2019	193602-001	20.2	--	--	--	--	--	2.74	--	--	--
	11/7/2019	193602-001A	--	--	--	0.001 J	--	--	--	--	--	--
MW-10	8/24/2016	NA	--	--	--	--	0.003 J	3.08	--	--	--	--
	10/19/2016	164253-009	--	--	--	--	< 0.002 U	2.58	--	--	0.0283	-0.597
	11/9/2016	164526-009	--	--	--	--	0.004 J	2.53	--	--	0.168	-0.047
	12/13/2016	164979-003	--	--	--	--	< 0.002 U	2.79	--	--	0.0992	-0.108
	2/8/2017	170512-004	--	--	--	--	0.003 J	2.76	--	--	0.144	0.00243
	3/14/2017	170909-001	0.26	--	--	--	0.003 J	3.38	0.95	--	0.389	1.7
	3/14/2017	170909-001A	--	--	0.0003 J	--	--	--	--	--	--	--
	5/24/2017	171786-007	0.212	--	--	--	< 0.002 U	3.52	0.69	--	0.644	0.416
	5/24/2017	171786-007A	0.143	--	0.0005 J	--	--	4.35	0.68	--	--	--
	6/20/2017	172107-004	0.222	--	--	--	< 0.002 U	2.4	0.81	--	0.0892	0.0484
	6/20/2017	172107-004A	0.157	--	0.0005 J	--	--	2.99	0.73	--	--	--
	11/2/2017	NA	--	--	--	--	--	--	--	--	--	--
	5/2/2018	181488-009	0.567	--	--	0.002	--	--	1.58	--	--	--
	11/29/2018	184013-009	0.194	--	--	0.003	--	--	1.06	--	--	--
	11/6/2019	193590-008	0.218	--	--	--	--	--	1.2	--	--	--
	11/6/2019	193590-008A	--	--	--	< 0.0005 U	--	--	--	--	--	--
MW-2101ss	9/1/2021	215633-006	--	--	--	--	--	--	--	--	--	--
	9/1/2021	215633-006-01	--	18	--	--	--	--	--	2.8	--	--
MW-2101s	9/1/2021	215633-004	--	--	--	--	--	--	--	--	--	--
	9/1/2021	215633-004-01	--	28.5	--	--	--	--	--	5.1	--	--
MW-2102s	9/1/2021	215633-012	--	--	--	--	--	--	--	--	--	--
	9/1/2021	215633-012-01	--	22.2	--	--	--	--	--	3.3	--	--
MW-2103i	9/2/2021	215633-013	--	--	--	--	--	--	--	--	--	--
	9/2/2021	215633-013-01	--	3.8	--	--	--	--	--	3	--	--
MW-2103s	9/2/2021	215633-008	--	--	--	--	--	--	--	--	--	--
	9/2/2021	215633-008-01	--	6.31	--	--	--	--	--	2.7	--	--

NOTES:

mg/L = milligrams per liter

pCi/L = picocuries per liter

ug/L = micrograms per liter

-- = not analyzed

< = not detected above Reporting Limit

NA = not available

J = estimated result

U = below detection limits

J1 = Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

P1 = The precision between duplicate results was above acceptance limits.

U1 = Not detected at or above method detection limit (MDL).

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent Unit of Measurement			Appendix IV Parameters Selenium, Se ug/L	Appendix IV Parameters Silica, SiO2 (Dissolved) mg/L	Appendix IV Parameters Sodium, Na mg/L	Sodium, Na (dissolved) mg/L	Appendix IV Parameters Strontium, Sr mg/L	Appendix IV Parameters Thallium, Tl ug/L	Appendix III Parameters Alkalinity, as CaCO3 mg/L	Appendix III Parameters Boron, B mg/L	Appendix III Parameters Bromide, Br mg/L
Sample ID	Date	Lab Sample ID									
Downgradient											
MW-1	8/23/2016	NA	0.9	--	--	--	--	0.01 J	--	0.044	--
	10/18/2016	164253-002	1.4	--	--	--	--	0.05 J	--	0.06	--
	11/9/2016	164526-006	1.3	--	--	--	--	0.088	--	0.076	--
	12/13/2016	164979-004	1.7	--	--	--	--	0.02 J	--	0.065	--
	2/9/2017	170512-008	1.6	--	--	--	--	0.02 J	--	0.05	--
	3/16/2017	170934-005	1.1	--	31.1	--	0.499	0.02 J	157	0.046	0.248
	3/16/2017	170934-005A	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-005	1.1	--	30.9	--	0.497	0.01 J	156	0.123	0.229
	5/23/2017	171786-005A	1.5	--	30.6	--	0.486	< 0.01 U	--	0.08	--
	6/21/2017	172107-008	1.2	10.3	29.6	--	0.465	0.02 J	140	0.037	0.247
	6/21/2017	172107-008A	1	--	31	--	0.496	0.01 J	--	0.111	--
	11/1/2017	NA	--	--	--	--	--	--	--	0.047	--
	5/2/2018	181488-001	--	--	29.1	--	0.498	--	149	0.134	0.243
	11/29/2018	184013-001	--	--	31.2	--	0.466	--	167	0.143	0.216
	12/18/2018	184285-001	--	--	--	--	--	--	--	0.07 J	--
	11/6/2019	193590-001	--	--	27.5	--	0.445	--	154	0.04 J	0.296
	11/6/2019	193590-001A	--	--	--	--	--	--	--	--	--
MW-2	8/23/2016	NA	0.2 J	--	--	--	--	0.03 J	--	0.201	--
	10/17/2016	164253-001	0.09 J	--	--	--	--	0.067	--	0.198	--
	11/8/2016	164526-004	0.05 J	--	--	--	--	< 0.01 U	--	0.216	--
	12/13/2016	164979-005	0.05 J	--	--	--	--	< 0.01 U	--	0.217	--
	2/8/2017	170512-007	0.1	--	--	--	--	0.02 J	--	0.19	--
	3/14/2017	170909-003	0.2	--	129	--	0.0699	0.02 J	303	0.184	0.16
	3/14/2017	170909-003A	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-004	0.1	--	133	--	0.0642	< 0.01 U	318	0.187	0.086
	5/23/2017	171786-004A	< 0.03 U	--	143	--	0.0643	< 0.01 U	--	0.277	--
	6/21/2017	172107-007	0.08 J	7.92	140	--	0.0691	0.03 J	335	0.189	0.1 J
	6/21/2017	172107-007A	0.03 J	--	148	--	0.0702	0.01 J	--	0.205	--
	11/1/2017	NA	--	--	--	--	--	--	--	0.202	--
	1/8/2018	NA	--	--	--	--	--	--	--	0.251	--
	5/1/2018	181488-002	--	--	141	--	0.115	--	350	0.241	0.066
	6/19/2018	182058-001	--	--	--	--	--	--	--	0.338	--
	9/24/2018	183327-001	--	--	--	--	--	--	--	0.215	--
	11/28/2018	184013-002	--	--	143	--	0.0779	--	342	0.235	0.07 J
	12/17/2018	184285-002	--	--	--	--	--	--	--	0.285	--
	1/24/2019	190294-001	--	--	--	--	--	--	--	0.218	--
	11/6/2019	193590-002	--	--	146	--	0.0717	--	362	0.203	0.1 J
	11/6/2019	193590-002A	--	--	--	--	--	--	--	--	--
MW-4	8/23/2016	NA	0.09 J	--	--	--	--	0.05 U	--	0.173	--
	10/18/2016	164253-003	< 0.03 U	--	--	--	--	0.03 J	--	0.165	--
	11/7/2016	164526-002	< 0.03 U	--	--	--	--	< 0.01 U	--	0.203	--
	12/13/2016	164979-007	< 0.03 U	--	--	--	--	0.02 J	--	0.18	--
	2/8/2017	170512-005	< 0.03 U	--	--	--	--	0.03 J	--	0.17	--
	3/14/2017	170909-002	< 0.03 U	--	144	--	0.0312	< 0.01 U	352	0.173	0.127
	3/14/2017	170909-002A	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-002	< 0.03 U	--	154	--	0.0329	< 0.01 U	348	0.19	0.114
	5/23/2017	171786-002A	< 0.03 U	--	160	--	0.0344	< 0.01 U	--	0.215	--
	6/20/2017	172107-005	0.05 J	8.2	155	--	0.0335	< 0.01 U	355	0.161	0.114
	6/20/2017	172107-005A	< 0.03 U	--	158	--	0.0337	< 0.01 U	--	0.174	--
	11/1/2017	NA	--	--	--	--	--	--	--	0.194	--
	1/8/2018	NA	--	--	--	--	--	--	--	0.145	--
	5/1/2018	181488-003	--	--	155	--	0.0342	--	355	0.199	0.108
	11/28/2018	184013-003	--	--	152	--	0.0294	--	378	0.188	0.09 J
	11/6/2019	193590-003	--	--	156	--	0.0283	--	345	0.173	0.2 J
	11/6/2019	193590-003A	--	--	--	--	--	--	--	--	--

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Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent Unit of Measurement			Appendix IV Parameters Selenium, Se ug/L	Appendix IV Parameters Silica, SiO2 (Dissolved) mg/L	Appendix IV Parameters Sodium, Na mg/L	Sodium, Na (dissolved) mg/L	Appendix IV Parameters Strontium, Sr mg/L	Appendix IV Parameters Thallium, Tl ug/L	Appendix III Parameters Alkalinity, as CaCO3 mg/L	Appendix III Parameters Boron, B mg/L	Appendix III Parameters Bromide, Br mg/L
Sample ID	Date	Lab Sample ID									
MW-5	8/23/2016	NA	0.1	--	--	--	--	0.01 J	--	0.032	--
	10/18/2016	164253-004	0.2	--	--	--	--	0.03 J	--	0.034	--
	11/8/2016	164526-005	0.1	--	--	--	--	0.01 J	--	0.034	--
	12/13/2016	164979-006	0.2	--	--	--	--	0.07	--	0.015	--
	2/8/2017	170512-006	0.1	--	--	--	--	0.02 J	--	0.03	--
	3/16/2017	170934-003	0.9	--	13.9	--	0.156	0.04 J	62.7	0.026	0.095
	3/16/2017	170934-003A	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-003	0.09 J	--	12.9	--	0.15	< 0.01 U	57.7	0.032	0.079
	5/23/2017	171786-003A	0.07 J	--	13.7	--	0.145	< 0.01 U	--	0.049	--
	6/20/2017	172107-006	0.09 J	9.33	12.9	--	0.159	< 0.01 U	53.8	0.017	0.083
	6/20/2017	172107-006A	0.08 J	--	12.8	--	0.16	< 0.01 U	--	0.022	--
	11/1/2017	NA	--	--	--	--	--	--	--	0.046	--
	1/8/2018	NA	--	--	--	--	--	--	--	--	--
	5/1/2018	181488-004	--	--	11.6	--	0.158	--	61	0.123	0.082
	6/19/2018	182058-002	--	--	--	--	--	--	--	0.126	--
	11/29/2018	184013-004	--	--	12.2	--	0.143	--	65.7	< 0.02 U	0.08 J
	12/17/2018	184285-003	--	--	--	--	--	--	--	0.08 J	--
	11/5/2019	193590-004	--	--	14.8	--	0.152	--	80.7	0.03 J	0.2 J
	11/5/2019	193590-004A	--	--	--	--	--	--	--	--	--
MW-1801	12/18/2018	184284-001	0.3	--	192	--	0.0764	< 0.1 U	420	0.273	0.05 J
	1/24/2019	190302-001	0.2 J	--	183	--	0.0827	< 0.1 U	473	0.247	0.05 J
	2/21/2019	190626-001	0.1 J	--	192	--	0.0688	< 0.1 U	456	0.219	0.05 J
MW-1802	12/17/2018	184284-002	0.04 J	--	185	--	0.0436	< 0.1 U	419	0.267	0.08 J
	1/25/2019	190302-002	0.05 J	--	170	--	0.0491	< 0.1 U	414	0.249	0.08 J
	2/21/2019	190626-005	< 0.03 U	--	191	--	0.0431	< 0.1 U	402	0.233	0.08 J
	8/30/2021	215633-007	--	--	--	--	--	--	416	--	--
	8/30/2021	215633-007-01	--	--	--	197	--	--	--	--	--
MW-2106	9/2/2021	215633-003	--	--	--	--	--	--	581	--	--
	9/2/2021	215633-003-01	--	--	--	280	--	--	--	--	--

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent / Unit of Measurement			Appendix IV Parameters Selenium, Se ug/L	Appendix IV Parameters Silica, SiO2 (Dissolved) mg/L	Appendix IV Parameters Sodium, Na mg/L	Sodium, Na (dissolved) mg/L	Appendix IV Parameters Strontium, Sr mg/L	Appendix IV Parameters Thallium, Tl ug/L	Appendix III Parameters Alkalinity, as CaCO3 mg/L	Appendix III Parameters Boron, B mg/L	Appendix III Parameters Bromide, Br mg/L
Sample ID	Date	Lab Sample ID									
Upgradient											
MW-6	8/24/2016	NA	0.09 J	--	--	--	--	0.138	--	0.095	--
	10/19/2016	164253-007	0.09 J	--	--	--	--	0.02 J	--	0.093	--
	11/7/2016	164526-001	< 0.03 U	--	--	--	--	< 0.01 U	--	0.147	--
	12/12/2016	164979-001	0.04 J	--	--	--	--	0.03 J	--	0.109	--
	2/7/2017	170512-001	0.05 J	--	--	--	--	0.01 J	--	0.122	--
	3/16/2017	170934-004	0.03 J	--	90.8	--	1.61	< 0.01 U	304	0.098	0.098
	3/16/2017	170934-004A	--	--	--	--	--	--	--	--	--
	5/22/2017	171786-001	0.04 J	--	88.3	--	1.49	0.01 J	332	0.171	0.082
	5/22/2017	171786-001A	0.05 J	--	88.9	--	1.48	< 0.01 U	--	0.197	--
	6/19/2017	172107-001	0.04 J	13.5	92.5	--	1.6	< 0.01 U	334	0.154	0.085
	6/19/2017	172107-001A	0.03 J	--	93.3	--	1.61	< 0.01 U	--	0.161	--
	11/2/2017	NA	--	--	--	--	--	--	--	0.159	--
	5/1/2018	181488-005	--	--	86.8	--	1.52	--	318	0.163	0.068
	11/28/2018	184013-005	--	--	86.2	--	1.6	--	313	0.156	0.06 J
	11/6/2019	193590-005	--	--	93.7	--	1.7	--	331	0.1	0.1 J
	11/6/2019	193590-005A	--	--	--	--	--	--	--	--	--
MW-7R	8/24/2016	NA	0.4	--	--	--	--	0.061	--	0.106	--
	10/18/2016	164253-005	0.3	--	--	--	--	0.03 J	--	0.083	--
	11/8/2016	164526-003	0.2	--	--	--	--	0.01 J	--	0.102	--
	12/14/2016	164979-009	0.2	--	--	--	--	0.02 J	--	0.084	--
	2/9/2017	170512-009	0.08 J	--	--	--	--	0.02 J	--	0.071	--
	3/14/2017	170909-004	0.1	--	164	--	0.798	0.02 J	316	0.078	0.073
	3/14/2017	170909-004A	--	--	--	--	--	--	--	--	--
	5/24/2017	171786-010	0.2	--	175	--	0.779	0.01 J	330	0.072	0.06 J
	5/24/2017	171786-010A	0.1	--	166	--	0.963	0.01 J	--	0.075	--
	6/21/2017	172107-011	0.1	11.4	183	--	0.837	0.01 J	324	0.092	< 0.02 U
	6/21/2017	172107-011A	0.2	--	183	--	0.853	0.01 J	--	0.104	--
	11/2/2017	NA	--	--	--	--	--	--	--	0.109	--
	5/1/2018	181488-006	--	--	200	--	0.842	--	341	0.145	< 0.02 U
	11/28/2018	184013-006	--	--	134	--	1.14	--	359	0.118	< 0.04 U
	11/6/2019	193590-006	--	--	184	--	0.748	--	350	0.099	0.09 J
	11/6/2019	193590-006A	--	--	--	--	--	--	--	--	--
MW-8	8/24/2016	NA	0.2	--	--	--	--	0.03 J	--	0.021	--
	10/19/2016	164253-011	0.2	--	--	--	--	0.02 J	--	0.037	--
	11/9/2016	164526-008	0.2	--	--	--	--	0.02 J	--	0.029	--
	12/14/2016	164979-008	0.2	--	--	--	--	0.02 J	--	0.017	--
	2/8/2017	170512-003	0.1	--	--	--	--	0.136	--	0.092	--
	3/15/2017	170909-005	0.4	--	26.5	--	0.771	0.02 J	486	0.074	0.174
	3/15/2017	170909-005A	--	--	--	--	--	--	--	--	--
	5/24/2017	171786-008	0.2	--	30.3	--	0.955	0.01 J	506	0.031	0.156
	5/24/2017	171786-008A	0.3	--	27.2	--	0.87	< 0.01 U	--	0.029	--
	6/20/2017	172107-003	0.3	12.6	29.3	--	0.94	0.02 J	507	0.034	0.15
	6/20/2017	172107-003A	0.3	--	29.4	--	0.952	--	--	0.039	--
	11/2/2017	NA	--	--	--	--	--	--	--	0.031	--
	5/1/2018	181488-007	--	--	33.9	--	1.02	--	519	0.065	0.148
	11/29/2018	184013-007	--	--	25.6	--	0.679	--	515	0.05 J	0.1 J
	11/6/2019	193590-007	--	--	37.4	--	0.802	--	490	< 0.02 U	0.262
	11/6/2019	193590-007A	--	--	--	--	--	--	--	--	--
	8/31/2021	215633-011	--	--	--	--	--	--	358	--	--
	8/31/2021	215633-011-01	--	--	--	51.9	--	--	--	--	--

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent / Unit of Measurement			Appendix IV Parameters Selenium, Se ug/L	Appendix IV Parameters Silica, SiO2 (Dissolved) mg/L	Appendix IV Parameters Sodium, Na mg/L	Sodium, Na (dissolved) mg/L	Appendix IV Parameters Strontium, Sr mg/L	Appendix IV Parameters Thallium, Tl ug/L	Appendix III Parameters Alkalinity, as CaCO3 mg/L	Appendix III Parameters Boron, B mg/L	Appendix III Parameters Bromide, Br mg/L
Sample ID	Date	Lab Sample ID									
MW-9	8/24/2016	NA	0.2	--	--	--	--	0.03 J	--	0.064	--
	10/19/2016	164253-010	0.1	--	--	--	--	0.03 J	--	0.042	--
	11/9/2016	164526-007	0.1	--	--	--	--	0.03 J	--	0.076	--
	12/13/2016	164979-002	0.2	--	--	--	--	< 0.01 U	--	0.057	--
	2/8/2017	170512-002	0.1	--	--	--	--	0.02 J	--	0.052	--
	3/15/2017	170934-001	0.5	--	42.3	--	1.67	0.04 J	410	0.093	0.073
	3/15/2017	170934-001A	--	--	--	--	--	--	--	--	--
	5/23/2017	171786-006	0.2	--	41	--	2	0.02 J	399	0.084	0.05 J
	5/23/2017	171786-006A	0.2	--	41.7	--	2.05	0.01 J	--	0.076	--
	6/20/2017	172107-002	0.07 J	14.2	37.1	--	1.87	0.02 J	398	0.079	0.05 J
	6/20/2017	172107-002A	0.09 J	--	36	--	1.83	0.01 J	--	0.084	--
	11/2/2017	NA	--	--	--	--	--	--	--	0.075	--
	5/1/2018	181488-008	--	--	54.7	--	2.1	--	386	0.2	< 0.02 U
	11/29/2018	184013-008	--	--	46.1	--	1.93	--	396	0.09 J	< 0.04 U
	11/7/2019	193602-001	--	--	44.2	--	1.89	--	389	0.04 J	0.09 J
	11/7/2019	193602-001A	--	--	--	--	--	--	--	--	--
MW-10	8/24/2016	NA	0.5	--	--	--	--	0.01 J	--	0.087	--
	10/19/2016	164253-009	0.4	--	--	--	--	0.082	--	0.081	--
	11/9/2016	164526-009	1.1	--	--	--	--	0.057	--	0.118	--
	12/13/2016	164979-003	0.7	--	--	--	--	< 0.01 U	--	0.076	--
	2/8/2017	170512-004	1.9	--	--	--	--	0.071	--	0.113	--
	3/14/2017	170909-001	2.3	--	178	--	0.0465	0.02 J	444	0.125	0.07
	3/14/2017	170909-001A	--	--	--	--	--	--	--	--	--
	5/24/2017	171786-007	0.5	--	177	--	0.0474	0.01 J	419	0.081	0.05 J
	5/24/2017	171786-007A	2.5	--	197	--	0.048	< 0.01 U	--	0.095	--
	6/20/2017	172107-004	1	7.03	189	--	0.0451	0.01 J	448	0.078	0.05 J
	6/20/2017	172107-004A	1.4	--	199	--	0.0446	< 0.01 U	--	0.093	--
	11/2/2017	NA	--	--	--	--	--	--	--	0.095	--
	5/2/2018	181488-009	--	--	209	--	0.0628	--	470	0.157	< 0.02 U
	11/29/2018	184013-009	--	--	197	--	0.0443	--	480	0.174	< 0.04 U
	11/6/2019	193590-008	--	--	188	--	0.0496	--	461	0.076	0.09 J
	11/6/2019	193590-008A	--	--	--	--	--	--	--	--	--
MW-2101ss	9/1/2021	215633-006	--	--	--	--	--	--	207	--	--
	9/1/2021	215633-006-01	--	--	--	19.1	--	--	--	--	--
MW-2101s	9/1/2021	215633-004	--	--	--	--	--	--	240	--	--
	9/1/2021	215633-004-01	--	--	--	20.3	--	--	--	--	--
MW-2102s	9/1/2021	215633-012	--	--	--	--	--	--	304	--	--
	9/1/2021	215633-012-01	--	--	--	52.7	--	--	--	--	--
MW-2103i	9/2/2021	215633-013	--	--	--	--	--	--	236	--	--
	9/2/2021	215633-013-01	--	--	--	272	--	--	--	--	--
MW-2103s	9/2/2021	215633-008	--	--	--	--	--	--	217	--	--
	9/2/2021	215633-008-01	--	--	--	260	--	--	--	--	--

NOTES:

mg/L = milligrams per liter

pCi/L = picocuries per liter

ug/L = micrograms per liter

-- = not analyzed

< = not detected above Reporting Limit

NA = not available

J = estimated result

U = below detection limits

J1 = Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

P1 = The precision between duplicate results was above acceptance limits.

U1 = Not detected at or above method detection limit (MDL).

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent Unit of Measurement			Appendix III Parameters Calcium, Ca mg/L	Calcium, Ca (dissolved) mg/L	Appendix III Parameters Chloride, Cl mg/L	Appendix III Parameters Fluoride, F mg/L	Appendix III Parameters Iron, Fe mg/L	Appendix III Parameters Iron, Fe (Dissolved) mg/L	Appendix III Parameters Total Dissolved Solids mg/L	Appendix III Parameters Sulfate, SO4 mg/L	pH standard units	Total Suspended Solids mg/L
Sample ID	Date	Lab Sample ID										
Downgradient												
MW-1	8/23/2016	NA	31.1	--	3.45	0.09 J	--	--	182	30.6	6.2	--
	10/18/2016	164253-002	29	--	3.31	0.09	--	--	232	30.8	6.51	--
	11/9/2016	164526-006	29.9	--	3.42	0.10	--	--	194	31.3	6.51	--
	12/13/2016	164979-004	29.3	--	3.08	0.07 J	--	--	250	27.7	6.09	--
	2/9/2017	170512-008	26.8	--	3.16	0.09	--	--	234	27.9	6.62	--
	3/16/2017	170934-005	28.4	--	3.32	0.09	--	--	216	29.4	7.5	--
	3/16/2017	170934-005A	--	--	--	--	0.002 J	--	--	--	7.5	--
	5/23/2017	171786-005	30.2	--	3.19	0.09	--	--	215	28.5	6.64	--
	5/23/2017	171786-005A	29.5	--	--	--	0.002	--	--	--	6.64	--
	6/21/2017	172107-008	28.1	--	4.94	0.08	--	--	204	31.9	6.35	--
	6/21/2017	172107-008A	29.8	--	--	--	< 0.0004 U	--	--	--	6.35	--
	11/1/2017	NA	28.7	--	3.08	0.10	--	--	224	30.2	6.4	--
	5/2/2018	181488-001	27.2	--	3.22	0.10	--	0.004 J	194	29.9	6.52	--
	11/29/2018	184013-001	26.4	--	3.07	0.11	--	0.063	191	27.8	6.7	--
	12/18/2018	184285-001	--	--	--	--	--	--	--	--	6.5	--
	11/6/2019	193590-001	30.1	--	3.2	0.1	--	--	193	29.4	--	--
	11/6/2019	193590-001A	--	--	--	--	--	< 0.02 U	--	--	--	--
MW-2	8/23/2016	NA	1.99	--	4	1.34	--	--	362	12	8.7	--
	10/17/2016	164253-001	1.53	--	4.21	1.26	--	--	354	11.8	9.1	--
	11/8/2016	164526-004	1.46	--	4.13	1.30	--	--	378	11.3	8.22	--
	12/13/2016	164979-005	1.65	--	2.99	1.19	--	--	350	7.6	8.49	--
	2/8/2017	170512-007	1.56	--	2.66	1.33	--	--	374	7.4	8.73	--
	3/14/2017	170909-003	1.81	--	3.91	1.20	--	--	354	7.7	8.4	--
	3/14/2017	170909-003A	--	--	--	--	0.01	--	--	--	8.4	--
	5/23/2017	171786-004	1.42	--	4.23	1.17	--	--	354	8.1	8.65	--
	5/23/2017	171786-004A	1.42	--	--	--	0.001 J	--	--	--	8.65	--
	6/21/2017	172107-007	1.56	--	3.47	1.19	--	--	356	7.4	8.5	--
	6/21/2017	172107-007A	1.56	--	--	--	< 0.0004 U	--	--	--	8.5	--
	11/1/2017	NA	1.88	--	2.34	1.46	--	--	394	8.6	8.8	--
	1/8/2018	NA	--	--	--	1.07	--	--	353	--	8.4	--
	5/1/2018	181488-002	3.5	--	3.9	1.45	--	0.008	344	9.4	8.52	--
	6/19/2018	182058-001	1.79	--	--	1.28	--	--	--	--	8.5	--
	9/24/2018	183327-001	--	--	--	--	--	--	--	--	7.04	--
	11/28/2018	184013-002	1.84	--	5.09	1.15	--	0.183	355	8.5	8.49	--
	12/17/2018	184285-002	--	--	--	--	--	--	--	--	8.6	--
	1/24/2019	190294-001	--	--	--	--	--	--	--	--	8.34	--
	11/6/2019	193590-002	1.73	--	3.44	1.66	--	--	379	9.5	--	--
	11/6/2019	193590-002A	--	--	--	--	--	< 0.02 U	--	--	--	--
MW-4	8/23/2016	NA	0.914	--	14.1	1.49	--	--	368	10.7	9.9	--
	10/18/2016	164253-003	0.807	--	13.9	1.33	--	--	386	11.7	9.77	--
	11/7/2016	164526-002	0.842	--	14.6	1.44	--	--	376	11.1	9.51	--
	12/13/2016	164979-007	0.836	--	15.7	1.34	--	--	372	8	8.95	--
	2/8/2017	170512-005	0.807	--	14.9	1.40	--	--	412	8	9.31	--
	3/14/2017	170909-002	0.855	--	14.5	1.46	--	--	381	7.4	8.8	--
	3/14/2017	170909-002A	--	--	--	--	0.002	--	--	--	8.8	--
	5/23/2017	171786-002	0.75	--	15.3	1.38	--	--	390	7.9	9.2	--
	5/23/2017	171786-002A	0.852	--	--	--	0.098	--	--	--	9.2	--
	6/20/2017	172107-005	0.814	--	15.1	1.36	--	--	392	7.6	9.05	--
	6/20/2017	172107-005A	0.831	--	--	--	< 0.0004 U	--	--	--	9.05	--
	11/1/2017	NA	0.766	--	14.2	1.36	--	--	404	9.3	9.4	--
	1/8/2018	NA	--	--	--	1.37	--	--	--	--	--	--
	5/1/2018	181488-003	0.783	--	14.9	1.47	--	0.004 J	380	9	9.18	--
	11/28/2018	184013-003	0.807	--	14.1	1.42	--	0.104	383	8.8	8.84	--
	11/6/2019	193590-003	0.761	--	14.9	1.49	--	--	382	9.4	--	--
	11/6/2019	193590-003A	--	--	--	--	--	< 0.02 U	--	--	--	--

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AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent Unit of Measurement			Appendix III Parameters Calcium, Ca mg/L	Calcium, Ca (dissolved) mg/L	Appendix III Parameters Chloride, Cl mg/L	Appendix III Parameters Fluoride, F mg/L	Appendix III Parameters Iron, Fe mg/L	Appendix III Parameters Iron, Fe (Dissolved) mg/L	Appendix III Parameters Total Dissolved Solids mg/L	Appendix III Parameters Sulfate, SO4 mg/L	pH standard units	Total Suspended Solids mg/L
Sample ID	Date	Lab Sample ID										
MW-5	8/23/2016	NA	18.4	--	3.59	0.14	--	--	124	29.3	6.7	--
	10/18/2016	164253-004	15.6	--	3.61	0.12	--	--	148	29.3	6.39	--
	11/8/2016	164526-005	14.3	--	3.52	0.11	--	--	92	25.5	6.3	--
	12/13/2016	164979-006	14.6	--	3.61	0.07	--	--	100	24.3	6.23	--
	2/8/2017	170512-006	14.1	--	3.54	0.09	--	--	126	24	6.4	--
	3/16/2017	170934-003	15.9	--	3.72	0.09	--	--	158	24.9	7	--
	3/16/2017	170934-003A	--	--	--	--	0.008	--	--	--	7	--
	5/23/2017	171786-003	13.7	--	3.7	0.09	--	--	108	24.2	6.25	--
	5/23/2017	171786-003A	14.1	--	--	--	< 0.0004 U	--	--	--	6.25	--
	6/20/2017	172107-006	14.5	--	3.66	0.08	--	--	102	27.8	6.03	--
	6/20/2017	172107-006A	14.7	--	--	--	< 0.0004 U	--	--	--	6.03	--
	11/1/2017	NA	15.6	--	4.09	0.09	--	--	136	28.4	6.1	--
	1/8/2018	NA	--	--	4.22	--	--	--	--	--	6.7	--
	5/1/2018	181488-004	14.3	--	4.39	0.09	--	0.006	122	26.3	6.23	--
	6/19/2018	182058-002	--	--	4.61	--	--	--	--	--	6.08	--
	11/29/2018	184013-004	14.1	--	4.86	0.13	--	0.01 J	113	24.5	7.39	--
	12/17/2018	184285-003	--	--	4.77	--	--	--	--	--	6.16	--
	11/5/2019	193590-004	18.3	--	5.21	0.1	--	--	131	28.3	--	--
	11/5/2019	193590-004A	--	--	--	--	--	0.222	--	--	--	--
MW-1801	12/18/2018	184284-001	1.76	--	10.4	5.01	--	0.004 J	498	8.1	8.94	--
	1/24/2019	190302-001	1.59	--	10.8	5.19	--	< 0.003 U	490	7.2	8.92	--
	2/21/2019	190626-001	1.38	--	11	5.26	--	< 0.003 U	550	6.8	9.04	--
MW-1802	12/17/2018	184284-002	0.821	--	8.33	4.79	--	0.007 J	482	20.6	9.14	--
	1/25/2019	190302-002	0.924	--	8.87	4.82	--	0.01 J	451	20.3	9.05	--
	2/21/2019	190626-005	0.84	--	8.94	4.87	--	< 0.003 U	532	20.1	9.26	--
	8/30/2021	215633-007	--	--	14.7	4.79	--	--	500	18.6	8.83	4.3 P1
	8/30/2021	215633-007-01	--	1	--	--	--	--	--	--	--	--
MW-2106	9/2/2021	215633-003	--	--	24.3	7.1	--	--	950	64.3	8.96	153
	9/2/2021	215633-003-01	--	3	--	--	--	--	--	--	--	--

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent / Unit of Measurement			Appendix III Parameters Calcium, Ca mg/L	Calcium, Ca (dissolved) mg/L	Appendix III Parameters Chloride, Cl mg/L	Appendix III Parameters Fluoride, F mg/L	Appendix III Parameters Iron, Fe mg/L	Appendix III Parameters Iron, Fe (Dissolved) mg/L	Appendix III Parameters Total Dissolved Solids mg/L	Appendix III Parameters Sulfate, SO4 mg/L	pH standard units	Total Suspended Solids mg/L
Sample ID	Date	Lab Sample ID										
Upgradient												
MW-6	8/24/2016	NA	40.7	--	7.78	0.26	--	--	408	41.3	7.6	--
	10/19/2016	164253-007	39.8	--	7.67	0.23	--	--	438	51.1	7.93	--
	11/7/2016	164526-001	42.7	--	7.76	0.25	--	--	426	51.6	7.67	--
	12/12/2016	164979-001	44.4	--	8.17	0.20	--	--	414	54	7.47	--
	2/7/2017	170512-001	36.7	--	7.2	0.23	--	--	380	31.1	7.47	--
	3/16/2017	170934-004	37.1	--	7.09	0.24	--	--	388	29.1	7.9	--
	3/16/2017	170934-004A	--	--	--	--	1.19	--	--	--	7.9	--
	5/22/2017	171786-001	33.7	--	6.89	0.23	--	--	359	24.7	7.68	--
	5/22/2017	171786-001A	34.5	--	--	--	0.09	--	--	--	7.68	--
	6/19/2017	172107-001	37.2	--	7.01	0.21	--	--	386	33.1	7.42	--
	6/19/2017	172107-001A	37.2	--	--	--	0.131	--	--	--	7.42	--
	11/2/2017	NA	41.3	--	7.77	0.22	--	--	440	51.8	7.5	--
	5/1/2018	181488-005	33.4	--	6.94	0.26	--	0.096	358	24.7	7.37	--
	11/28/2018	184013-005	35.8	--	6.85	0.24	--	0.162	333	22.9	7.56	--
	11/6/2019	193590-005	39.8	--	8	0.24	--	--	390	33.2	--	--
	11/6/2019	193590-005A	--	--	--	--	--	0.06 J	--	--	--	--
MW-7R	8/24/2016	NA	31	--	4.13	0.36	--	--	678	228	7.7	--
	10/18/2016	164253-005	30.9	--	3.86	0.32	--	--	706	229	7.95	--
	11/8/2016	164526-003	33.5	--	3.78	0.31	--	--	618	209	7	--
	12/14/2016	164979-009	32.2	--	3.94	0.26	--	--	606	217	7.59	--
	2/9/2017	170512-009	37.7	--	3.45	0.22	--	--	542	186	7.55	--
	3/14/2017	170909-004	33.6	--	3.79	0.30	--	--	640	215	7.7	--
	3/14/2017	170909-004A	--	--	--	--	0.003	--	--	--	7.7	--
	5/24/2017	171786-010	30.4	--	3.8	0.29	--	--	663	226	7.6	--
	5/24/2017	171786-010A	39	--	--	--	< 0.0004 U	--	--	--	7.6	--
	6/21/2017	172107-011	32.5	--	3.6	0.26	--	--	680	246	7.59	--
	6/21/2017	172107-011A	33	--	--	--	0.001 J	--	--	--	7.59	--
	11/2/2017	NA	31.7	--	3.59	0.28	--	--	636	211	7.6	--
	5/1/2018	181488-006	30.3	--	4.09	0.36	--	0.002 J	688	239	7.73	--
	11/28/2018	184013-006	44.4	--	3.65	0.26	--	0.01 J	627	201	7.42	--
	11/6/2019	193590-006	26.6	--	4.15	0.34	--	--	655	217	--	--
	11/6/2019	193590-006A	--	--	--	--	--	< 0.02 U	--	--	--	--
MW-8	8/24/2016	NA	141	--	13.3	0.16	--	--	578	73.6	7	--
	10/19/2016	164253-011	135	--	12.6	0.15	--	--	538	66.5	7.17	--
	11/9/2016	164526-008	137	--	5.12	0.07	--	--	532	26.1	6.94	--
	12/14/2016	164979-008	136	--	14.2	0.13	--	--	504	59.7	6.82	--
	2/8/2017	170512-003	132	--	12.9	0.15	--	--	540	67.5	6.88	--
	3/15/2017	170909-005	151	--	13.5	0.16	--	--	623	74.5	7.2	--
	3/15/2017	170909-005A	--	--	--	--	0.013	--	--	--	7.2	--
	5/24/2017	171786-008	137	--	13.9	0.14	--	--	596	73.2	6.84	--
	5/24/2017	171786-008A	142	--	--	--	< 0.0004 U	--	--	--	6.84	--
	6/20/2017	172107-003	139	--	12.6	0.13	--	--	574	77.2	6.85	--
	6/20/2017	172107-003A	140	--	--	--	< 0.0004 U	--	--	--	6.85	--
	11/2/2017	NA	125	--	12.1	0.15	--	--	526	63.1	6.8	--
	5/1/2018	181488-007	136	--	13.1	0.17	--	< 0.002 U	592	78.8	6.9	--
	11/29/2018	184013-007	126	--	13.2	0.17	--	0.334	558	58.8	6.82	--
	11/6/2019	193590-007	134	--	21.2	0.16	--	--	613	78.6	--	--
	11/6/2019	193590-007A	--	--	--	--	--	< 0.02 U	--	--	--	--
	8/31/2021	215633-011	--	--	35.9	0.2	--	--	530	73.7	6.9	22.5
	8/31/2021	215633-011-01	--	98.3	--	--	--	--	--	--	--	--

Table D-1
Monitoring Well Geochemistry Data Summary Table - 2016 to 2021
AEP Amos Generating Plant - FGD Landfill
Winfield, West Virginia

Constituent Unit of Measurement			Appendix III Parameters Calcium, Ca mg/L	Calcium, Ca (dissolved) mg/L	Appendix III Parameters Chloride, Cl mg/L	Appendix III Parameters Fluoride, F mg/L	Appendix III Parameters Iron, Fe mg/L	Appendix III Parameters Iron, Fe (Dissolved) mg/L	Appendix III Parameters Total Dissolved Solids mg/L	Appendix III Parameters Sulfate, SO4 mg/L	pH standard units	Total Suspended Solids mg/L
Sample ID	Date	Lab Sample ID										
MW-9	8/24/2016	NA	80.1	--	6.3	0.24	--	--	414	37.3	7.3	--
	10/19/2016	164253-010	103	--	6.09	0.18	--	--	444	36.4	7.45	--
	11/9/2016	164526-007	90.6	--	6.11	0.22	--	--	420	34.5	7.19	--
	12/13/2016	164979-002	94.4	--	6.59	0.18	--	--	390	35.1	7.06	--
	2/8/2017	170512-002	99	--	6.22	0.16	--	--	382	34.9	7.09	--
	3/15/2017	170934-001	99.1	--	6.26	0.22	--	--	402	35.8	7.4	--
	3/15/2017	170934-001A	--	--	--	--	0.015	--	--	--	7.4	--
	5/23/2017	171786-006	86.4	--	6.21	0.18	--	--	438	34.8	7.13	--
	5/23/2017	171786-006A	90.3	--	--	--	< 0.0004 U	--	--	--	7.13	--
	6/20/2017	172107-002	93.8	--	6.17	0.15	--	--	424	38.4	7	--
	6/20/2017	172107-002A	92	--	--	--	0.02	--	--	--	7	--
	11/2/2017	NA	79.1	--	5.97	0.20	--	--	404	33.1	7.1	--
	5/1/2018	181488-008	73.1	--	6.14	0.26	--	0.006	402	30.9	7.17	--
	11/29/2018	184013-008	78.8	--	6.08	0.21	--	0.005 J	412	31.6	7.08	--
	11/7/2019	193602-001	85.8	--	6.11	0.19	--	--	442	38.2	--	--
	11/7/2019	193602-001A	--	--	--	--	--	< 0.02 U	--	--	--	--
MW-10	8/24/2016	NA	1.68	--	5.54	0.89	--	--	512	19.1	9	--
	10/19/2016	164253-009	1.09	--	4.49	0.72	--	--	504	18	9.6	--
	11/9/2016	164526-009	2.31	--	5.46	0.92	--	--	546	16.9	8.86	--
	12/13/2016	164979-003	1.24	--	4.15	0.38	--	--	482	14.1	8.74	--
	2/8/2017	170512-004	1.37	--	4.24	0.57	--	--	504	14.4	9.01	--
	3/14/2017	170909-001	1.18	--	4.6	0.50	--	--	499	13.3	8.7	--
	3/14/2017	170909-001A	--	--	--	--	0.005	--	--	--	8.7	--
	5/24/2017	171786-007	1.16	--	4.19	0.43	--	--	467	14.3	8.85	--
	5/24/2017	171786-007A	1.03	--	--	--	0.001 J	--	--	--	8.85	--
	6/20/2017	172107-004	1.04	--	4.11	0.44	--	--	492	14.9	8.63	--
	6/20/2017	172107-004A	0.99	--	--	--	< 0.0004 U	--	--	--	8.63	--
	11/2/2017	NA	1.12	--	5.08	0.55	--	--	508	17	9.2	--
	5/2/2018	181488-009	1.74	--	5.67	0.69	--	0.007	522	16.7	9.16	--
	11/29/2018	184013-009	1.03	--	5.27	0.59	--	0.028	506	15.3	8.67	--
	11/6/2019	193590-008	1.43	--	5.62	0.52	--	--	490	16.8	--	--
	11/6/2019	193590-008A	--	--	--	--	--	< 0.02 U	--	--	--	--
MW-2101ss	9/1/2021	215633-006	--	--	39.1	0.15	--	--	420	73.6	6.7	7
	9/1/2021	215633-006-01	--	90.1	--	--	--	--	--	--	--	--
MW-2101s	9/1/2021	215633-004	--	--	55.7	0.2	--	--	490	108	6.99	<0.2 U1
	9/1/2021	215633-004-01	--	102	--	--	--	--	--	--	--	--
MW-2102s	9/1/2021	215633-012	--	--	46.6	0.13 J1	--	--	430	32.9	6.84	1.6
	9/1/2021	215633-012-01	--	70.1	--	--	--	--	--	--	--	--
MW-2103i	9/2/2021	215633-013	--	--	73	1.04	--	--	970	382	7.9	2650
	9/2/2021	215633-013-01	--	17.2	--	--	--	--	--	--	--	--
MW-2103s	9/2/2021	215633-008	--	--	66.8	0.86	--	--	980	372	7.77	14.8
	9/2/2021	215633-008-01	--	27.3	--	--	--	--	--	--	--	--

NOTES:

mg/L = milligrams per liter

pCi/L = picocuries per liter

ug/L = micrograms per liter

-- = not analyzed

< = not detected above Reporting Limit

NA = not available

J = estimated result

U = below detection limits

J1 = Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.

P1 = The precision between duplicate results was above acceptance limits.

U1 = Not detected at or above method detection limit (MDL).

Appendix E

Laboratory Reports - January 2020 and August, September 2021

ARCADIS

January 2020

Form REP-703
Rev. 1, 11/2013

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
T: 614-836-4221, Audinet 210-4221
F: 614-836-4168, Audinet 210-4168
http://aepenv/labs

Water Analysis

Location: Amos Plant ***Reissued Report Date: 5/18/2021***

Liner Bubble Sample - 1 Composite

Sample Number: 200246-001 **Date Collected: 01/23/2020 09:44** **Date Received: 1/24/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.2	ug/L	U	1	0.2	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.24	ug/L		1	0.3	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Barium, Ba	126	ug/L		2	0.5	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.4	ug/L	J	1	0.07	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.04	ug/L	U	0.5	0.04	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	7.00	ug/L		2	0.4	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	3.15	ug/L		0.5	0.03	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Lead, Pb	2.79	ug/L		2	0.5	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 1	ug/L	U	20	1	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Selenium, Se	1	ug/L	J	5	0.9	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.4	ug/L	U	5	0.4	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Boron, B	< 0.09	mg/L	U	0.5	0.09	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	140	mg/L		0.3	0.1	DAM	02/03/2020 14:44	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.00836	mg/L		0.002	0.0005	GES	01/28/2020 19:06	EPA 200.8-1994, Rev. 5.4
Magnesium, Mg	38.9	mg/L		0.1	0.02	DAM	02/03/2020 14:44	EPA 200.7-1994, Rev. 4.4
Potassium, K	2.81	mg/L		1	0.2	DAM	02/03/2020 14:44	EPA 200.7-1994, Rev. 4.4
Chloride, Cl	32.1	mg/L		0.04	0.01	CRJ	01/28/2020 14:02	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.25	mg/L		0.06	0.01	CRJ	01/28/2020 14:02	EPA 300.1-1997, Rev. 1.0
Residue, Filterable, TDS	782	mg/L		100	40	SDW	01/29/2020	SM 2540C-2011
Residue, Non-Filterable, TSS	144	mg/L		2	0.5	SDW	01/29/2020	SM 2540D-2011
Sulfate, SO4	112	mg/L		10	2	CRJ	01/28/2020 13:07	EPA 300.1-1997, Rev. 1.0

Liner Bubble Sample - 1 Grab

Sample Number: 200246-002 **Date Collected: 01/23/2020 09:34** **Date Received: 1/24/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Mercury, Hg	0.003	ug/L	J	0.005	0.002	JAB	01/29/2020	EPA 245.7-2005, Rev. 2.0

Liner Bubble Sample - 2 Composite

Sample Number: 200246-003 **Date Collected: 01/23/2020 09:44** **Date Received: 1/24/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	< 0.2	ug/L	U	1	0.2	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Arsenic, As	3.49	ug/L		1	0.3	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Barium, Ba	124	ug/L		2	0.5	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.4	ug/L	J	1	0.07	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.04	ug/L	U	0.5	0.04	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	7.23	ug/L		2	0.4	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	3.21	ug/L		0.5	0.03	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Lead, Pb	2.80	ug/L		2	0.5	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Molybdenum, Mo	< 1	ug/L	U	20	1	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.9	ug/L	J	5	0.9	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.4	ug/L	U	5	0.4	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Boron, B	< 0.09	mg/L	U	0.5	0.09	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	137	mg/L		0.3	0.1	DAM	02/03/2020 14:48	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.00847	mg/L		0.002	0.0005	GES	01/28/2020 19:11	EPA 200.8-1994, Rev. 5.4
Magnesium, Mg	38.0	mg/L		0.1	0.02	DAM	02/03/2020 14:48	EPA 200.7-1994, Rev. 4.4
Potassium, K	2.83	mg/L		1	0.2	DAM	02/03/2020 14:48	EPA 200.7-1994, Rev. 4.4
Chloride, Cl	32.2	mg/L		0.04	0.01	CRJ	01/28/2020 15:41	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.25	mg/L		0.06	0.01	CRJ	01/28/2020 15:41	EPA 300.1-1997, Rev. 1.0
Residue, Filterable, TDS	748	mg/L		100	40	SDW	01/29/2020	SM 2540C-2011
Residue, Non-Filterable, TSS	155	mg/L		3	0.7	SDW	01/29/2020	SM 2540D-2011
Sulfate, SO4	116	mg/L		2	0.3	CRJ	01/28/2020 15:16	EPA 300.1-1997, Rev. 1.0

Liner Bubble Sample - 2 Grab

Sample Number: 200246-004 **Date Collected: 01/23/2020 09:34** **Date Received: 1/24/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Mercury, Hg	0.003	ug/L	J	0.005	0.002	JAB	01/29/2020	EPA 245.7-2005, Rev. 2.0

Beaver Plateau Pond

Sample Number: 200246-005 **Date Collected: 01/23/2020 10:15** **Date Received: 1/24/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.16	ug/L		0.1	0.02	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.72	ug/L		0.1	0.03	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Barium, Ba	47.0	ug/L		0.2	0.05	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.01	ug/L	J	0.1	0.007	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.004	ug/L	U	0.05	0.004	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	3.22	ug/L		0.2	0.04	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.160	ug/L		0.05	0.003	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.1	ug/L	J	0.2	0.05	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Mercury, Hg	< 0.002	ug/L	U	0.005	0.002	JAB	01/29/2020	EPA 245.7-2005, Rev. 2.0
Molybdenum, Mo	3.02	ug/L		2	0.1	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Selenium, Se	2.3	ug/L		0.5	0.09	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.04	ug/L	U	0.5	0.04	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Boron, B	0.02	mg/L	J	0.05	0.009	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	60.5	mg/L		0.3	0.1	DAM	02/03/2020 14:52	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.00361	mg/L		0.0002	0.00005	GES	01/28/2020 19:16	EPA 200.8-1994, Rev. 5.4
Magnesium, Mg	12.6	mg/L		0.1	0.02	DAM	02/03/2020 14:52	EPA 200.7-1994, Rev. 4.4
Potassium, K	3.84	mg/L		1	0.2	DAM	02/03/2020 14:52	EPA 200.7-1994, Rev. 4.4
Chloride, Cl	5.82	mg/L		0.04	0.01	CRJ	01/28/2020 12:42	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.32	mg/L		0.06	0.01	CRJ	01/28/2020 12:42	EPA 300.1-1997, Rev. 1.0
Residue, Filterable, TDS	366	mg/L		100	40	SDW	01/29/2020	SM 2540C-2011
Sulfate, SO4	153	mg/L		2	0.3	CRJ	01/28/2020 14:51	EPA 300.1-1997, Rev. 1.0

Beaver Plateau Pond Duplicate

Sample Number: 200246-006 **Date Collected: 01/23/2020 10:15** **Date Received: 1/24/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Mercury, Hg	< 0.002	ug/L	U	0.005	0.002	JAB	01/29/2020	EPA 245.7-2005, Rev. 2.0

Field Blank

Sample Number: 200246-007 **Date Collected: 01/23/2020 10:15** **Date Received: 1/24/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Mercury, Hg	< 0.002	ug/L	U	0.005	0.002	JAB	01/29/2020	EPA 245.7-2005, Rev. 2.0

Trip Blank

Sample Number: 200246-008 **Date Collected: 01/23/2020 10:15** **Date Received: 1/24/2020**

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Mercury, Hg	< 0.002	ug/L	U	0.005	0.002	JAB	01/29/2020	EPA 245.7-2005, Rev. 2.0

FGD Landfill Leachate LCH-002

Sample Number: 200246-009 **Date Collected:** 01/23/2020 10:42 **Date Received:** 1/24/2020

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	1.19	ug/L		0.5	0.1	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Arsenic, As	1.08	ug/L		0.5	0.2	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Barium, Ba	28.4	ug/L		1	0.2	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	< 0.04	ug/L	U	0.5	0.04	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	0.07	ug/L	J	0.2	0.02	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.4	ug/L	J	1	0.2	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.2	ug/L	J	0.2	0.02	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Lead, Pb	< 0.2	ug/L	U	1	0.2	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Mercury, Hg	< 0.002	ug/L	U	0.005	0.002	JAB	01/29/2020	EPA 245.7-2005, Rev. 2.0
Molybdenum, Mo	46.4	ug/L		10	0.6	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Selenium, Se	117	ug/L		2	0.4	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	0.3	ug/L	J	2	0.2	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Boron, B	4.57	mg/L		0.2	0.04	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	490	mg/L		0.3	0.1	DAM	02/03/2020 14:56	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.0284	mg/L		0.001	0.0002	JDB	01/29/2020 15:47	EPA 200.8-1994, Rev. 5.4
•The LFBD is outside the acceptable limit of 85-115%.								
Magnesium, Mg	66.2	mg/L		0.1	0.02	DAM	02/03/2020 14:56	EPA 200.7-1994, Rev. 4.4
Potassium, K	9.64	mg/L		1	0.2	DAM	02/03/2020 14:56	EPA 200.7-1994, Rev. 4.4
Chloride, Cl	58.9	mg/L		0.1	0.03	CRJ	01/28/2020 16:56	EPA 300.1-1997, Rev. 1.0
Fluoride, F	1.04	mg/L		0.2	0.04	CRJ	01/28/2020 16:56	EPA 300.1-1997, Rev. 1.0
Residue, Filterable, TDS	2780	mg/L		1000	400	SDW	01/29/2020	SM 2540C-2011
Sulfate, SO4	1720	mg/L		10	2	CRJ	01/28/2020 16:31	EPA 300.1-1997, Rev. 1.0

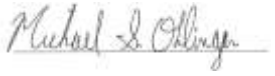
FGD Landfill North Valley Underdrain

Sample Number: 200246-010 **Date Collected:** 01/23/2020 10:32 **Date Received:** 1/24/2020

Parameter	Result	Units	Data Qual	RL	MDL	Analysis By	Analysis Date/Time	Method
Antimony, Sb	0.05	ug/L	J	0.1	0.02	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Arsenic, As	0.36	ug/L		0.1	0.03	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Barium, Ba	47.4	ug/L		0.2	0.05	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Beryllium, Be	0.03	ug/L	J	0.1	0.007	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Cadmium, Cd	< 0.004	ug/L	U	0.05	0.004	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Chromium, Cr	0.516	ug/L		0.2	0.04	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Cobalt, Co	0.285	ug/L		0.05	0.003	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Lead, Pb	0.204	ug/L		0.2	0.05	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Mercury, Hg	< 0.002	ug/L	U	0.005	0.002	JAB	01/29/2020	EPA 245.7-2005, Rev. 2.0
Molybdenum, Mo	0.4	ug/L	J	2	0.1	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Selenium, Se	0.7	ug/L		0.5	0.09	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Thallium, Tl	< 0.04	ug/L	U	0.5	0.04	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Boron, B	0.02	mg/L	J	0.05	0.009	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Calcium, Ca	46.4	mg/L		0.3	0.1	DAM	02/03/2020 15:08	EPA 200.7-1994, Rev. 4.4
Lithium, Li	0.00126	mg/L		0.0002	0.00005	GES	01/28/2020 20:33	EPA 200.8-1994, Rev. 5.4
Magnesium, Mg	12.1	mg/L		0.1	0.02	DAM	02/03/2020 15:08	EPA 200.7-1994, Rev. 4.4
Potassium, K	1.85	mg/L		1	0.2	DAM	02/03/2020 15:08	EPA 200.7-1994, Rev. 4.4
Chloride, Cl	4.00	mg/L		0.04	0.01	CRJ	01/28/2020 19:00	EPA 300.1-1997, Rev. 1.0
Fluoride, F	0.13	mg/L		0.06	0.01	CRJ	01/28/2020 19:00	EPA 300.1-1997, Rev. 1.0
Residue, Filterable, TDS	268	mg/L		100	40	SDW	01/29/2020	SM 2540C-2011
Sulfate, SO4	56.1	mg/L		0.4	0.06	CRJ	01/28/2020 19:00	EPA 300.1-1997, Rev. 1.0

U: Analyte was analyzed and not detected at or above adjusted Method Detection Limit
J: Analyte was positively identified, though the quantitation was below Reporting Limit.

Report reissued 5-18-21 with addition of Mg and K per Ben Kepchar. Original report issued 2/12/2020.



Michael Ohlinger, Chemist

Email msohlinger@aep.com Tel.

Fax 614-836-4168 Audinet 8-210-

THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.

ARCADIS

August, September 2021

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: North Valley Underflow and Dra
Customer Description:
Lab Number: 215633-001
Preparation:
Date Collected: 09/02/2021 08:05
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	4.68	mg/L	2	0.04	0.02		CRJ	09/08/2021 11:33	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.15	mg/L	2	0.06	0.02		CRJ	09/08/2021 11:33	EPA 300.1 -1997, Rev. 1.0
Sulfate	29.4	mg/L	2	0.40	0.06		CRJ	09/08/2021 11:33	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	162	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
Hydrogen Ion (pH) @25°C	6.40	su	1	0.10	0.02	H1			SM 4500-H B-2011
Specific Conductance (@ 25°C)	368	µmho /cm	1	20	5		GES	09/21/2021 09:33	SM 2510B-2011
TDS, Filterable Residue	230	mg/L	1	50	20		SDW	09/08/2021 07:23	SM 2540C-2011
TSS, Non-Filterable Residue	10.1	mg/L	0.10	1.0	0.2		SDW	09/08/2021 07:23	SM 2540D-2011

Customer Sample ID: North Valley Underflow and Dra
Customer Description:
Lab Number: 215633-001-01
Preparation: Dissolved
Date Collected: 09/02/2021 08:05
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	58.7	µg/L	1	0.20	0.05		GES	09/08/2021 14:45	EPA 200.8-1994, Rev. 5.4
Calcium	48.2	mg/L	1	0.3	0.1		SH	09/09/2021 09:18	EPA 200.7-1994, Rev. 4.4
Lithium	0.00120	mg/L	1	0.00020	0.00005		GES	09/08/2021 14:45	EPA 200.8-1994, Rev. 5.4
Magnesium	13.0	mg/L	1	0.10	0.02		SH	09/09/2021 09:18	EPA 200.7-1994, Rev. 4.4
Potassium	2.6	mg/L	1	1.0	0.2		SH	09/09/2021 09:18	EPA 200.7-1994, Rev. 4.4
Sodium	9.4	mg/L	1	0.5	0.2		SH	09/09/2021 09:18	EPA 200.7-1994, Rev. 4.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: SE Bubble
Lab Number: 215633-002
Date Collected: 09/02/2021 07:00

Customer Description:
Preparation:
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	3.52	mg/L	2	0.04	0.02		CRJ	09/08/2021 18:28	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.60	mg/L	2	0.06	0.02		CRJ	09/08/2021 18:28	EPA 300.1 -1997, Rev. 1.0
Sulfate	84.0	mg/L	2	0.40	0.06		CRJ	09/08/2021 18:28	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	295	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
Hydrogen Ion (pH) @25°C	6.82	su	1	0.10	0.02	H1			SM 4500-H B-2011
Specific Conductance (@ 25°C)	683	µmho /cm	1	20	5		GES	09/21/2021 09:33	SM 2510B-2011
TDS, Filterable Residue	430	mg/L	1	50	20		SDW	09/08/2021 07:33	SM 2540C-2011
TSS, Non-Filterable Residue	8.7	mg/L	0.091	0.9	0.2		SDW	09/08/2021 07:33	SM 2540D-2011

Customer Sample ID: SE Bubble
Lab Number: 215633-002-01
Date Collected: 09/02/2021 07:00

Customer Description:
Preparation: Dissolved
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	83.9	µg/L	1	0.20	0.05		GES	09/08/2021 14:50	EPA 200.8-1994, Rev. 5.4
Calcium	97.4	mg/L	1	0.3	0.1		SH	09/09/2021 09:34	EPA 200.7-1994, Rev. 4.4
Lithium	0.00513	mg/L	1	0.00020	0.00005		GES	09/08/2021 14:50	EPA 200.8-1994, Rev. 5.4
Magnesium	20.1	mg/L	1	0.10	0.02		SH	09/09/2021 09:34	EPA 200.7-1994, Rev. 4.4
Potassium	2.4	mg/L	1	1.0	0.2		SH	09/09/2021 09:34	EPA 200.7-1994, Rev. 4.4
Sodium	23.1	mg/L	1	0.5	0.2		SH	09/09/2021 09:34	EPA 200.7-1994, Rev. 4.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: MW-2106 Customer Description:
Lab Number: 215633-003 Preparation:
Date Collected: 09/02/2021 10:40 Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	24.3	mg/L	5	0.10	0.05		CRJ	09/08/2021 19:18	EPA 300.1 -1997, Rev. 1.0
Fluoride	7.10	mg/L	5	0.15	0.05		CRJ	09/08/2021 19:18	EPA 300.1 -1997, Rev. 1.0
Sulfate	64.3	mg/L	5	1.0	0.2		CRJ	09/08/2021 19:18	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	581	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
TDS, Filterable Residue	950	mg/L	2	100	40		SDW	09/08/2021 07:33	SM 2540C-2011
TSS, Non-Filterable Residue	153	mg/L	0.44	4.4	0.9		SDW	09/08/2021 07:40	SM 2540D-2011

Customer Sample ID: MW-2106 Customer Description:
Lab Number: 215633-003-01 Preparation: Dissolved
Date Collected: 09/02/2021 10:40 Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	68.7	µg/L	5	1.0	0.3		GES	09/08/2021 15:06	EPA 200.8-1994, Rev. 5.4
Calcium	3.0	mg/L	1	0.3	0.1		SH	09/09/2021 09:38	EPA 200.7-1994, Rev. 4.4
Lithium	0.0168	mg/L	5	0.0010	0.0003		GES	09/08/2021 15:06	EPA 200.8-1994, Rev. 5.4
Magnesium	1.09	mg/L	1	0.10	0.02		SH	09/09/2021 09:38	EPA 200.7-1994, Rev. 4.4
Potassium	2.5	mg/L	1	1.0	0.2		SH	09/09/2021 09:38	EPA 200.7-1994, Rev. 4.4
Sodium	280	mg/L	1	0.5	0.2		SH	09/09/2021 09:38	EPA 200.7-1994, Rev. 4.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: MW-2101S
Customer Description:
Lab Number: 215633-004
Preparation:
Date Collected: 09/01/2021 17:00
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	55.7	mg/L	5	0.10	0.05		CRJ	09/08/2021 18:53	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.20	mg/L	5	0.15	0.05		CRJ	09/08/2021 18:53	EPA 300.1 -1997, Rev. 1.0
Sulfate	108	mg/L	5	1.0	0.2		CRJ	09/08/2021 18:53	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	240	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
TDS, Filterable Residue	490	mg/L	1	50	20		SDW	09/08/2021 08:03	SM 2540C-2011
TSS, Non-Filterable Residue	<0.2	mg/L	0.10	1.0	0.2	U1	SDW	09/08/2021 08:03	SM 2540D-2011

Customer Sample ID: MW-2101S
Customer Description:
Lab Number: 215633-004-01
Preparation: Dissolved
Date Collected: 09/01/2021 17:00
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	110	µg/L	1	0.20	0.05		GES	09/08/2021 15:11	EPA 200.8-1994, Rev. 5.4
Calcium	102	mg/L	1	0.3	0.1		SH	09/09/2021 09:42	EPA 200.7-1994, Rev. 4.4
Lithium	0.0113	mg/L	1	0.00020	0.00005		GES	09/08/2021 15:11	EPA 200.8-1994, Rev. 5.4
Magnesium	28.5	mg/L	1	0.10	0.02		SH	09/09/2021 09:42	EPA 200.7-1994, Rev. 4.4
Potassium	5.1	mg/L	1	1.0	0.2		SH	09/09/2021 09:42	EPA 200.7-1994, Rev. 4.4
Sodium	20.3	mg/L	1	0.5	0.2		SH	09/09/2021 09:42	EPA 200.7-1994, Rev. 4.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: NE Bubble
Lab Number: 215633-005
Date Collected: 09/02/2021 09:20
Customer Description:
Preparation:
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	33.5	mg/L	5	0.10	0.05		CRJ	09/08/2021 13:40	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.25	mg/L	5	0.15	0.05		CRJ	09/08/2021 13:40	EPA 300.1 -1997, Rev. 1.0
Sulfate	65.9	mg/L	5	1.0	0.2		CRJ	09/08/2021 13:40	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	418	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
Hydrogen Ion (pH) @25°C	6.86	su	1	0.10	0.02	H1			SM 4500-H B-2011
Specific Conductance (@ 25°C)	910	µmho /cm	1	20	5		GES	09/21/2021 09:33	SM 2510B-2011
TDS, Filterable Residue	570	mg/L	1	50	20		SDW	09/08/2021 09:08	SM 2540C-2011
TSS, Non-Filterable Residue	13.9	mg/L	0.10	1.0	0.2		SDW	09/08/2021 09:08	SM 2540D-2011

Customer Sample ID: NE Bubble
Lab Number: 215633-005-01
Date Collected: 09/02/2021 09:20
Customer Description:
Preparation: Dissolved
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	92.1	µg/L	1	0.20	0.05		GES	09/08/2021 15:16	EPA 200.8-1994, Rev. 5.4
Calcium	126	mg/L	1	0.3	0.1		SH	09/09/2021 09:46	EPA 200.7-1994, Rev. 4.4
Lithium	0.00363	mg/L	1	0.00020	0.00005		GES	09/08/2021 15:16	EPA 200.8-1994, Rev. 5.4
Magnesium	32.7	mg/L	1	0.10	0.02		SH	09/09/2021 09:46	EPA 200.7-1994, Rev. 4.4
Potassium	1.8	mg/L	1	1.0	0.2		SH	09/09/2021 09:46	EPA 200.7-1994, Rev. 4.4
Sodium	28.6	mg/L	1	0.5	0.2		SH	09/09/2021 09:46	EPA 200.7-1994, Rev. 4.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: MW-2101 SS
Customer Description:
Lab Number: 215633-006
Preparation:
Date Collected: 09/01/2021 15:15
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	39.1	mg/L	2	0.04	0.02		CRJ	09/08/2021 20:09	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.15	mg/L	2	0.06	0.02		CRJ	09/08/2021 20:09	EPA 300.1 -1997, Rev. 1.0
Sulfate	73.6	mg/L	2	0.40	0.06		CRJ	09/08/2021 20:09	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	207	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
TDS, Filterable Residue	420	mg/L	1	50	20		SDW	09/08/2021 09:08	SM 2540C-2011
TSS, Non-Filterable Residue	7.0	mg/L	0.10	1.0	0.2		SDW	09/08/2021 09:08	SM 2540D-2011

Customer Sample ID: MW-2101 SS
Customer Description:
Lab Number: 215633-006-01
Preparation: Dissolved
Date Collected: 09/01/2021 15:15
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	85.1	µg/L	1	0.20	0.05		GES	09/08/2021 16:18	EPA 200.8-1994, Rev. 5.4
Calcium	90.1	mg/L	1	0.3	0.1		SH	09/09/2021 09:51	EPA 200.7-1994, Rev. 4.4
Lithium	0.00835	mg/L	1	0.00020	0.00005		GES	09/08/2021 16:18	EPA 200.8-1994, Rev. 5.4
Magnesium	18.0	mg/L	1	0.10	0.02		SH	09/09/2021 09:51	EPA 200.7-1994, Rev. 4.4
Potassium	2.8	mg/L	1	1.0	0.2		SH	09/09/2021 09:51	EPA 200.7-1994, Rev. 4.4
Sodium	19.1	mg/L	1	0.5	0.2		SH	09/09/2021 09:51	EPA 200.7-1994, Rev. 4.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: MW-1802
Lab Number: 215633-007
Date Collected: 08/30/2021 16:25
Customer Description:
Preparation:
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	14.7	mg/L	2	0.04	0.02		CRJ	09/08/2021 15:55	EPA 300.1 -1997, Rev. 1.0
Fluoride	4.79	mg/L	2	0.06	0.02		CRJ	09/08/2021 15:55	EPA 300.1 -1997, Rev. 1.0
Sulfate	18.6	mg/L	2	0.40	0.06		CRJ	09/08/2021 15:55	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	416	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
TDS, Filterable Residue	500	mg/L	1	50	20		JAB	09/03/2021 15:50	SM 2540C-2011
TSS, Non-Filterable Residue	4.3	mg/L	0.17	1.7	0.3	P1	JAB	09/03/2021 15:50	SM 2540D-2011

Customer Sample ID: MW-1802
Lab Number: 215633-007-01
Date Collected: 08/30/2021 16:25
Customer Description:
Preparation: Dissolved
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	13.8	µg/L	1	0.20	0.05		GES	09/08/2021 16:23	EPA 200.8-1994, Rev. 5.4
Calcium	1	mg/L	1	0.3	0.1		SH	09/09/2021 09:55	EPA 200.7-1994, Rev. 4.4
Lithium	0.00737	mg/L	1	0.00020	0.00005		GES	09/08/2021 16:23	EPA 200.8-1994, Rev. 5.4
Magnesium	0.16	mg/L	1	0.10	0.02		SH	09/09/2021 09:55	EPA 200.7-1994, Rev. 4.4
Potassium	0.8	mg/L	1	1.0	0.2	J1	SH	09/09/2021 09:55	EPA 200.7-1994, Rev. 4.4
Sodium	197	mg/L	1	0.5	0.2		SH	09/09/2021 09:55	EPA 200.7-1994, Rev. 4.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
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Water Analysis Report

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: MW-2103S
Lab Number: 215633-008
Date Collected: 09/02/2021 16:45

Customer Description:
Preparation:
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	66.8	mg/L	5	0.10	0.05		CRJ	09/08/2021 20:35	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.86	mg/L	5	0.15	0.05		CRJ	09/08/2021 20:35	EPA 300.1 -1997, Rev. 1.0
Sulfate	372	mg/L	50	10	2		CRJ	09/08/2021 14:31	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	217	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
TDS, Filterable Residue	980	mg/L	1	50	20		SDW	09/08/2021 09:18	SM 2540C-2011
TSS, Non-Filterable Residue	14.8	mg/L	0.098	1	0.2		SDW	09/08/2021 09:18	SM 2540D-2011

Customer Sample ID: MW-2103S
Lab Number: 215633-008-01
Date Collected: 09/02/2021 16:45

Customer Description:
Preparation: Dissolved
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	136	µg/L	1	0.20	0.05		GES	09/08/2021 16:28	EPA 200.8-1994, Rev. 5.4
Calcium	27.3	mg/L	1	0.3	0.1		SH	09/09/2021 09:59	EPA 200.7-1994, Rev. 4.4
Lithium	0.0100	mg/L	1	0.00020	0.00005		GES	09/08/2021 16:28	EPA 200.8-1994, Rev. 5.4
Magnesium	6.31	mg/L	1	0.10	0.02		SH	09/09/2021 09:59	EPA 200.7-1994, Rev. 4.4
Potassium	2.7	mg/L	1	1.0	0.2		SH	09/09/2021 09:59	EPA 200.7-1994, Rev. 4.4
Sodium	260	mg/L	1	0.5	0.2		SH	09/09/2021 09:59	EPA 200.7-1994, Rev. 4.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: W Chimney
Lab Number: 215633-009
Date Collected: 09/02/2021 15:00
Customer Description:
Preparation:
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	384	mg/L	50	1.0	0.5		CRJ	09/08/2021 15:05	EPA 300.1 -1997, Rev. 1.0
Fluoride	13.6	mg/L	5	0.15	0.05		CRJ	09/08/2021 21:00	EPA 300.1 -1997, Rev. 1.0
Sulfate	2660	mg/L	50	10	2		CRJ	09/08/2021 15:05	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	59	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
Hydrogen Ion (pH) @25°C	8.15	su	1	0.10	0.02	H1			SM 4500-H B-2011
Specific Conductance (@ 25°C)	434	µmho /cm	1	20	5		GES	09/21/2021 09:33	SM 2510B-2011
TDS, Filterable Residue	4100	mg/L	20	1000	400		SDW	09/09/2021 11:33	SM 2540C-2011
TSS, Non-Filterable Residue	39.9	mg/L	0.10	1.0	0.2		SDW	09/08/2021 09:18	SM 2540D-2011

Customer Sample ID: W Chimney
Lab Number: 215633-009-01
Date Collected: 09/02/2021 15:00
Customer Description:
Preparation: Dissolved
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	22.8	µg/L	1	0.20	0.05		GES	09/08/2021 16:33	EPA 200.8-1994, Rev. 5.4
Calcium	543	mg/L	1	0.3	0.1		SH	09/09/2021 10:03	EPA 200.7-1994, Rev. 4.4
Lithium	0.0535	mg/L	1	0.00020	0.00005		GES	09/08/2021 16:33	EPA 200.8-1994, Rev. 5.4
Magnesium	303	mg/L	1	0.10	0.02		SH	09/09/2021 10:03	EPA 200.7-1994, Rev. 4.4
Potassium	11.5	mg/L	1	1.0	0.2		SH	09/09/2021 10:03	EPA 200.7-1994, Rev. 4.4
Sodium	24.1	mg/L	1	0.5	0.2		SH	09/09/2021 10:03	EPA 200.7-1994, Rev. 4.4

Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
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Phone: 614-836-4221
Audinet: 210-4221

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: N. Sediment Pond
Lab Number: 215633-010
Date Collected: 09/03/2021 08:30

Customer Description:
Preparation:
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	10.3	mg/L	5	0.10	0.05		CRJ	09/09/2021 04:38	EPA 300.1 -1997, Rev. 1.0
Fluoride	1.01	mg/L	5	0.15	0.05		CRJ	09/09/2021 04:38	EPA 300.1 -1997, Rev. 1.0
Sulfate	30.2	mg/L	5	1.0	0.2		CRJ	09/09/2021 04:38	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	89	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
Hydrogen Ion (pH) @25°C	7.17	su	1	0.10	0.02	H1			SM 4500-H B-2011
Specific Conductance (@ 25°C)	272	µmho /cm	1	20	5		GES	09/21/2021 09:33	SM 2510B-2011
TDS, Filterable Residue	160	mg/L	1	50	20		SDW	09/08/2021 09:28	SM 2540C-2011
TSS, Non-Filterable Residue	<0.2	mg/L	0.091	0.9	0.2	U1	SDW	09/08/2021 09:28	SM 2540D-2011

Customer Sample ID: N. Sediment Pond
Lab Number: 215633-010-01
Date Collected: 09/03/2021 08:30

Customer Description:
Preparation: Dissolved
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	77.7	µg/L	1	0.20	0.05		GES	09/08/2021 16:38	EPA 200.8-1994, Rev. 5.4
Calcium	30.5	mg/L	1	0.3	0.1		SH	09/09/2021 10:09	EPA 200.7-1994, Rev. 4.4
Lithium	0.00518	mg/L	1	0.00020	0.00005		GES	09/08/2021 16:38	EPA 200.8-1994, Rev. 5.4
Magnesium	9.71	mg/L	1	0.10	0.02		SH	09/09/2021 10:09	EPA 200.7-1994, Rev. 4.4
Potassium	5.6	mg/L	1	1.0	0.2		SH	09/09/2021 10:09	EPA 200.7-1994, Rev. 4.4
Sodium	5.6	mg/L	1	0.5	0.2		SH	09/09/2021 10:09	EPA 200.7-1994, Rev. 4.4

AMERICAN ELECTRIC POWER

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Water Analysis Report

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: MW-8
Lab Number: 215633-011
Date Collected: 08/31/2021 10:25

Customer Description:
Preparation:
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	35.9	mg/L	5	0.10	0.05		CRJ	09/09/2021 05:03	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.20	mg/L	5	0.15	0.05		CRJ	09/09/2021 05:03	EPA 300.1 -1997, Rev. 1.0
Sulfate	73.7	mg/L	5	1.0	0.2		CRJ	09/09/2021 05:03	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	358	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
TDS, Filterable Residue	530	mg/L	1	50	20		JAB	09/03/2021 16:06	SM 2540C-2011
TSS, Non-Filterable Residue	22.5	mg/L	0.091	0.9	0.2		JAB	09/03/2021 16:06	SM 2540D-2011

Customer Sample ID: MW-8
Lab Number: 215633-011-01
Date Collected: 08/31/2021 10:25

Customer Description:
Preparation: Dissolved
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	129	µg/L	1	0.20	0.05		GES	09/08/2021 16:43	EPA 200.8-1994, Rev. 5.4
Calcium	98.3	mg/L	1	0.3	0.1		SH	09/09/2021 10:33	EPA 200.7-1994, Rev. 4.4
Lithium	0.00729	mg/L	1	0.00020	0.00005		GES	09/08/2021 16:43	EPA 200.8-1994, Rev. 5.4
Magnesium	25.1	mg/L	1	0.10	0.02		SH	09/09/2021 10:33	EPA 200.7-1994, Rev. 4.4
Potassium	2.5	mg/L	1	1.0	0.2		SH	09/09/2021 10:33	EPA 200.7-1994, Rev. 4.4
Sodium	51.9	mg/L	1	0.5	0.2		SH	09/09/2021 10:33	EPA 200.7-1994, Rev. 4.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Water Analysis Report

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: MW-2102S
Customer Description:
Lab Number: 215633-012
Preparation:
Date Collected: 09/01/2021 10:20
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	46.6	mg/L	5	0.10	0.05		CRJ	09/09/2021 01:14	EPA 300.1 -1997, Rev. 1.0
Fluoride	0.13	mg/L	5	0.15	0.05	J1	CRJ	09/09/2021 01:14	EPA 300.1 -1997, Rev. 1.0
Sulfate	32.9	mg/L	5	1.0	0.2		CRJ	09/09/2021 01:14	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	304	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
TDS, Filterable Residue	430	mg/L	1	50	20		SDW	09/08/2021 07:23	SM 2540C-2011
TSS, Non-Filterable Residue	1.6	mg/L	0.091	0.9	0.2		SDW	09/08/2021 07:23	SM 2540D-2011

Customer Sample ID: MW-2102S
Customer Description:
Lab Number: 215633-012-01
Preparation: Dissolved
Date Collected: 09/01/2021 10:20
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	399	µg/L	1	0.20	0.05		GES	09/08/2021 16:48	EPA 200.8-1994, Rev. 5.4
Calcium	70.1	mg/L	1	0.3	0.1		SH	09/09/2021 10:49	EPA 200.7-1994, Rev. 4.4
Lithium	0.0113	mg/L	1	0.00020	0.00005		GES	09/08/2021 16:48	EPA 200.8-1994, Rev. 5.4
Magnesium	22.2	mg/L	1	0.10	0.02		SH	09/09/2021 10:49	EPA 200.7-1994, Rev. 4.4
Potassium	3.3	mg/L	1	1.0	0.2		SH	09/09/2021 10:49	EPA 200.7-1994, Rev. 4.4
Sodium	52.7	mg/L	1	0.5	0.2		SH	09/09/2021 10:49	EPA 200.7-1994, Rev. 4.4

AMERICAN ELECTRIC POWER

Dolan Chemical Laboratory
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Water Analysis Report

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: MW-2103I
Lab Number: 215633-013
Date Collected: 09/02/2021 14:00

Customer Description:
Preparation:
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	73.0	mg/L	5	0.10	0.05		CRJ	09/09/2021 02:31	EPA 300.1 -1997, Rev. 1.0
Fluoride	1.04	mg/L	5	0.15	0.05		CRJ	09/09/2021 02:31	EPA 300.1 -1997, Rev. 1.0
Sulfate	382	mg/L	50	10	2		CRJ	09/09/2021 02:05	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	236	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
TDS, Filterable Residue	970	mg/L	2	100	40		SDW	09/08/2021 09:34	SM 2540C-2011
TSS, Non-Filterable Residue	2650	mg/L	2	20	4		SDW	09/08/2021 09:34	SM 2540D-2011

Customer Sample ID: MW-2103I
Lab Number: 215633-013-01
Date Collected: 09/02/2021 14:00

Customer Description:
Preparation: Dissolved
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	131	µg/L	1	0.20	0.05		GES	09/08/2021 16:53	EPA 200.8-1994, Rev. 5.4
Calcium	17.2	mg/L	1	0.3	0.1		SH	09/09/2021 10:53	EPA 200.7-1994, Rev. 4.4
Lithium	0.0111	mg/L	1	0.00020	0.00005		GES	09/08/2021 16:53	EPA 200.8-1994, Rev. 5.4
Magnesium	3.80	mg/L	1	0.10	0.02		SH	09/09/2021 10:53	EPA 200.7-1994, Rev. 4.4
Potassium	3.0	mg/L	1	1.0	0.2		SH	09/09/2021 10:53	EPA 200.7-1994, Rev. 4.4
Sodium	272	mg/L	1	0.5	0.2		SH	09/09/2021 10:53	EPA 200.7-1994, Rev. 4.4

Water Analysis Report

Dolan Chemical Laboratory
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Audinet: 210-4221

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Customer Sample ID: E Chimney
Lab Number: 215633-014
Date Collected: 09/02/2021 14:30
Customer Description:
Preparation:
Date Received: 09/03/2021 13:40

Ion Chromatography

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Chloride	218	mg/L	50	1.0	0.5		CRJ	09/09/2021 03:22	EPA 300.1 -1997, Rev. 1.0
Fluoride	10.5	mg/L	5	0.15	0.05		CRJ	09/09/2021 03:47	EPA 300.1 -1997, Rev. 1.0
Sulfate	2180	mg/L	50	10	2		CRJ	09/09/2021 03:22	EPA 300.1 -1997, Rev. 1.0

Wet Chemistry

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Alkalinity, as CaCO3	210	mg/L	1	20	5		GES	09/08/2021 12:26	SM 2320B-2011
Hydrogen Ion (pH) @25°C	7.58	su	1	0.10	0.02	H1			SM 4500-H B-2011
Specific Conductance (@ 25°C)	3330	µmho /cm	1	20	5		GES	09/21/2021 09:33	SM 2510B-2011
TDS, Filterable Residue	11800	mg/L	20	1000	400		SDW	09/08/2021 09:45	SM 2540C-2011
TSS, Non-Filterable Residue	103000	mg/L	20	200	40	S2	SDW	09/08/2021 09:45	SM 2540D-2011

Customer Sample ID: E Chimney
Lab Number: 215633-014-01
Date Collected: 09/02/2021 14:30
Customer Description:
Preparation: Dissolved
Date Received: 09/03/2021 13:40

Metals

Parameter	Result	Units	Dilution	RL	MDL	Data Qualifiers	Analyst	Analysis Date	Method
Barium	43.7	µg/L	1	0.20	0.05		GES	09/08/2021 16:59	EPA 200.8-1994, Rev. 5.4
Calcium	554	mg/L	1	0.3	0.1		SH	09/09/2021 10:57	EPA 200.7-1994, Rev. 4.4
Lithium	0.0929	mg/L	1	0.00020	0.00005		GES	09/08/2021 16:59	EPA 200.8-1994, Rev. 5.4
Magnesium	196	mg/L	1	0.10	0.02		SH	09/09/2021 10:57	EPA 200.7-1994, Rev. 4.4
Potassium	13.2	mg/L	1	1.0	0.2		SH	09/09/2021 10:57	EPA 200.7-1994, Rev. 4.4
Sodium	22.5	mg/L	1	0.5	0.2		SH	09/09/2021 10:57	EPA 200.7-1994, Rev. 4.4

215633
Job Comments:

The report was reissued on 9-21 with the addition of past hold pH and conductivity for 001, 002, 005, 009, 010, & 014 per Mike Lutz.

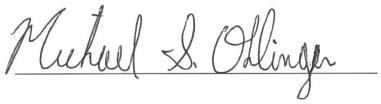
Water Analysis Report

Dolan Chemical Laboratory
4001 Bixby Road
Groveport, OH 43125
Phone: 614-836-4221
Audinet: 210-4221

Job ID: 215633 **Customer: Amos Plant** **Date Reported: 09/21/2021**

Report Verification

This report and the above data have been confirmed by the following analyst.



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Email: msohlinger@aep.com
Phone: 614-836-4184
Audinet: 8-210-4184

THIS TEST REPORT RELATES ONLY TO THE ITEMS TESTED AND SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN APPROVAL OF THE LABORATORY. ALL TEST RESULTS MEET ALL OF THE REQUIREMENTS OF THE ACCREDITING AUTHORITY, UNLESS OTHERWISE NOTED.

Data Qualifer Legend

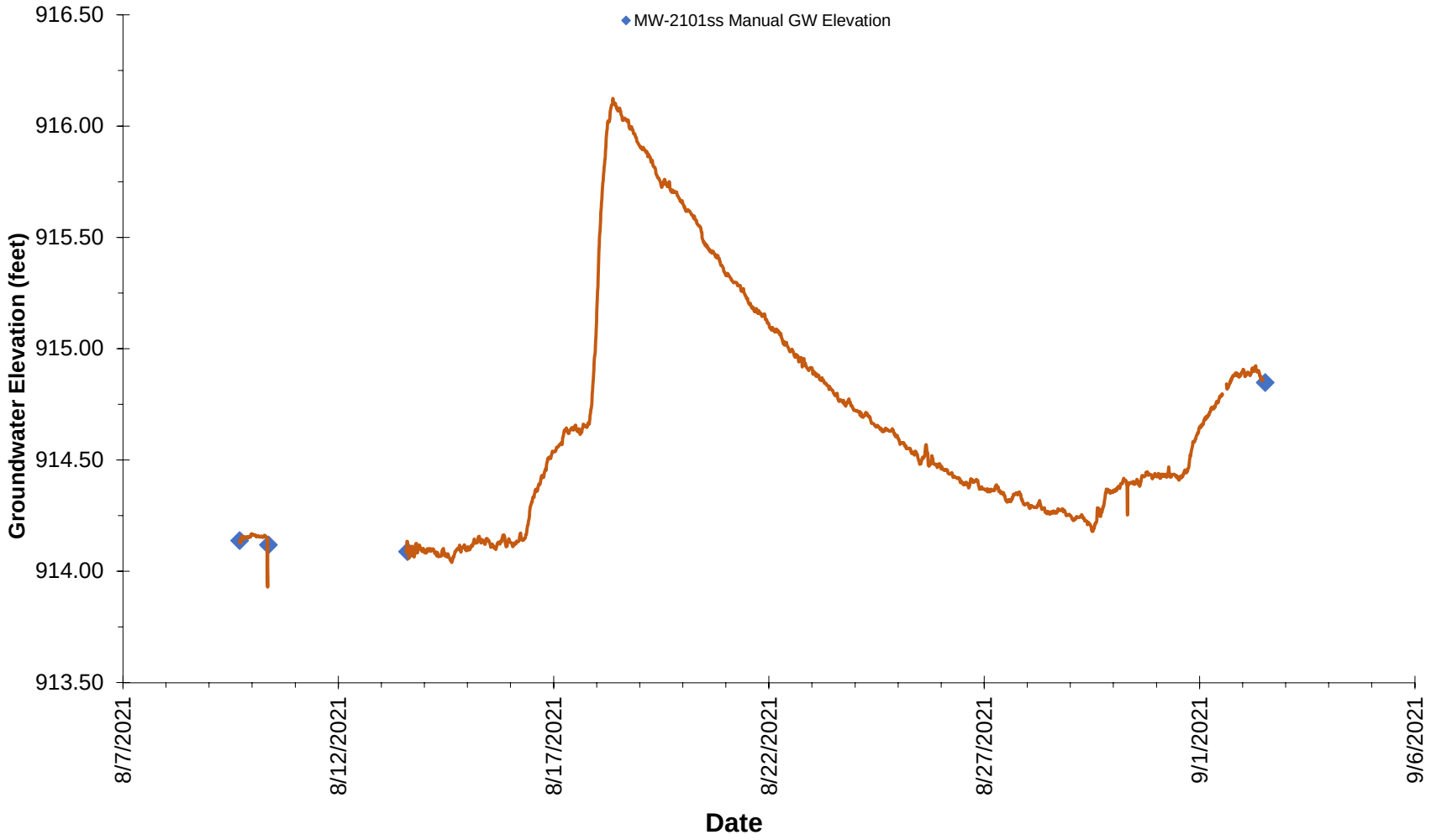
H1 - Sample was received past holding time.
U1 - Not detected at or above method detection limit (MDL).
P1 - The precision between duplicate results was above acceptance limits.
J1 - Concentration estimated. Analyte was detected between the method detection limit and the reporting limit.
S2 - Residue weight is above the method criteria but was already analyzed with the highest dilution factor.

Appendix F

Individual Well Hydrographs

Date Graph Prepared:
Prepared By:
Checked By:

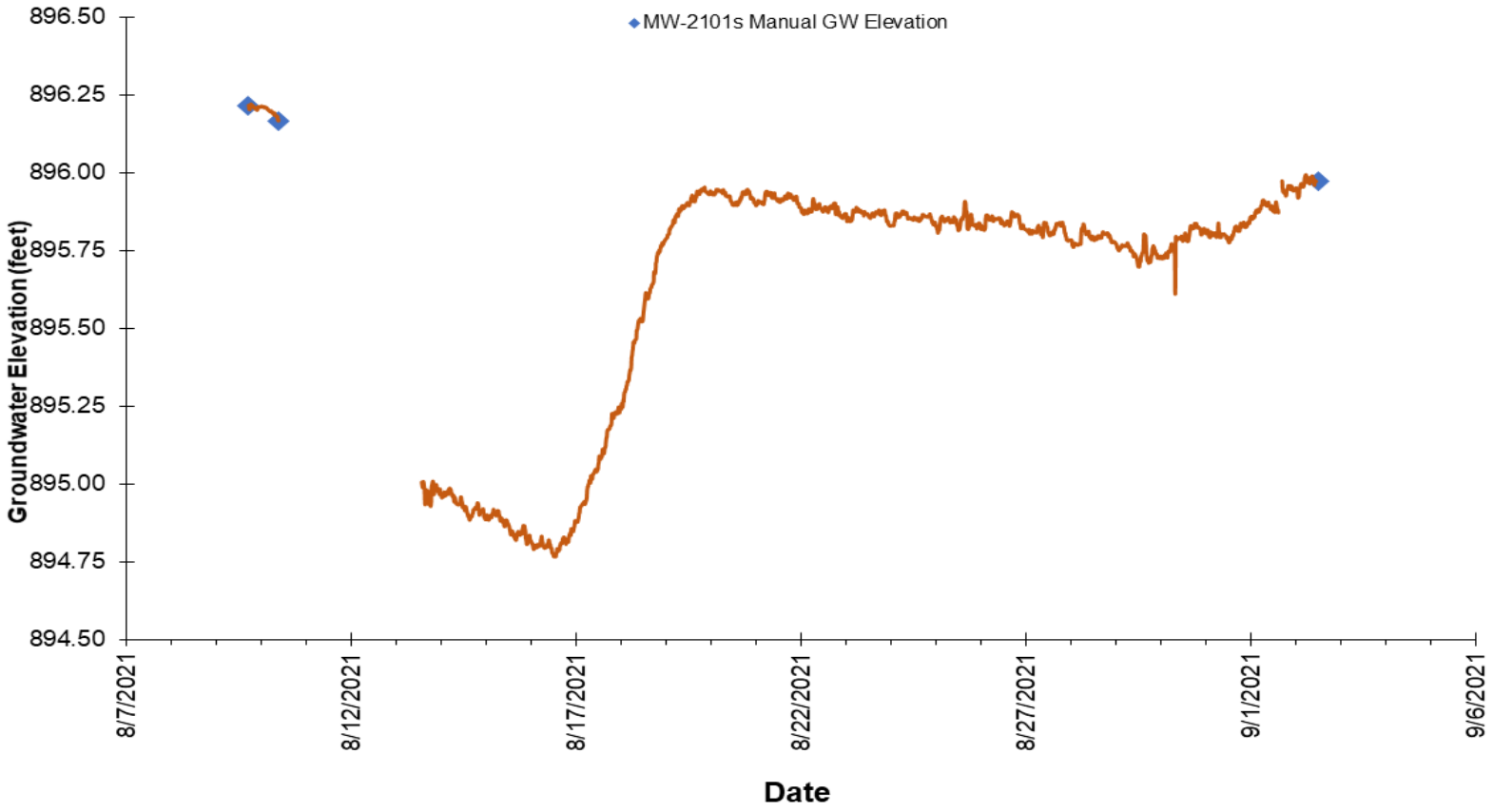
Figure F-1: MW-2101ss Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

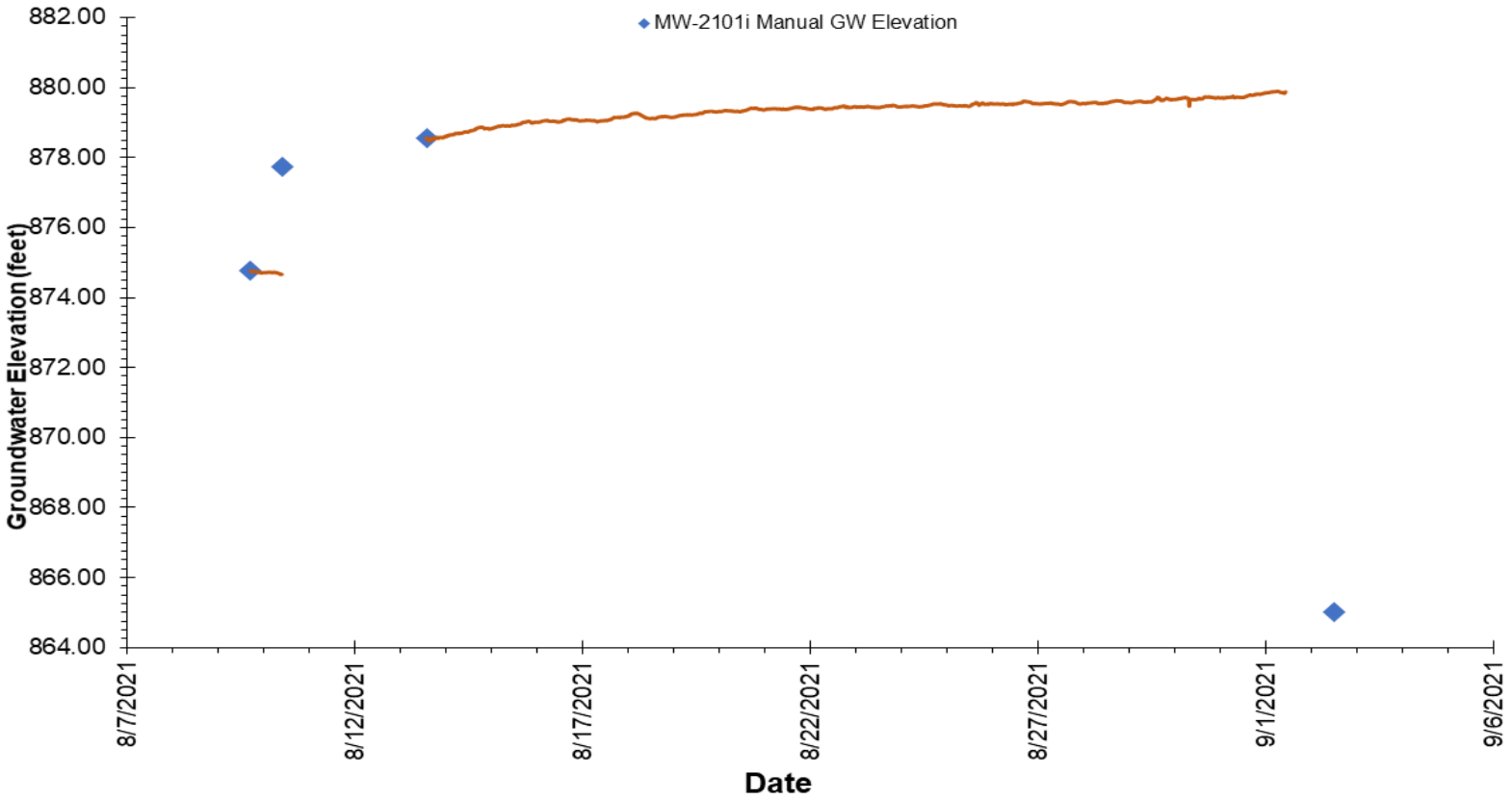
Figure F-2: MW-2101s Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

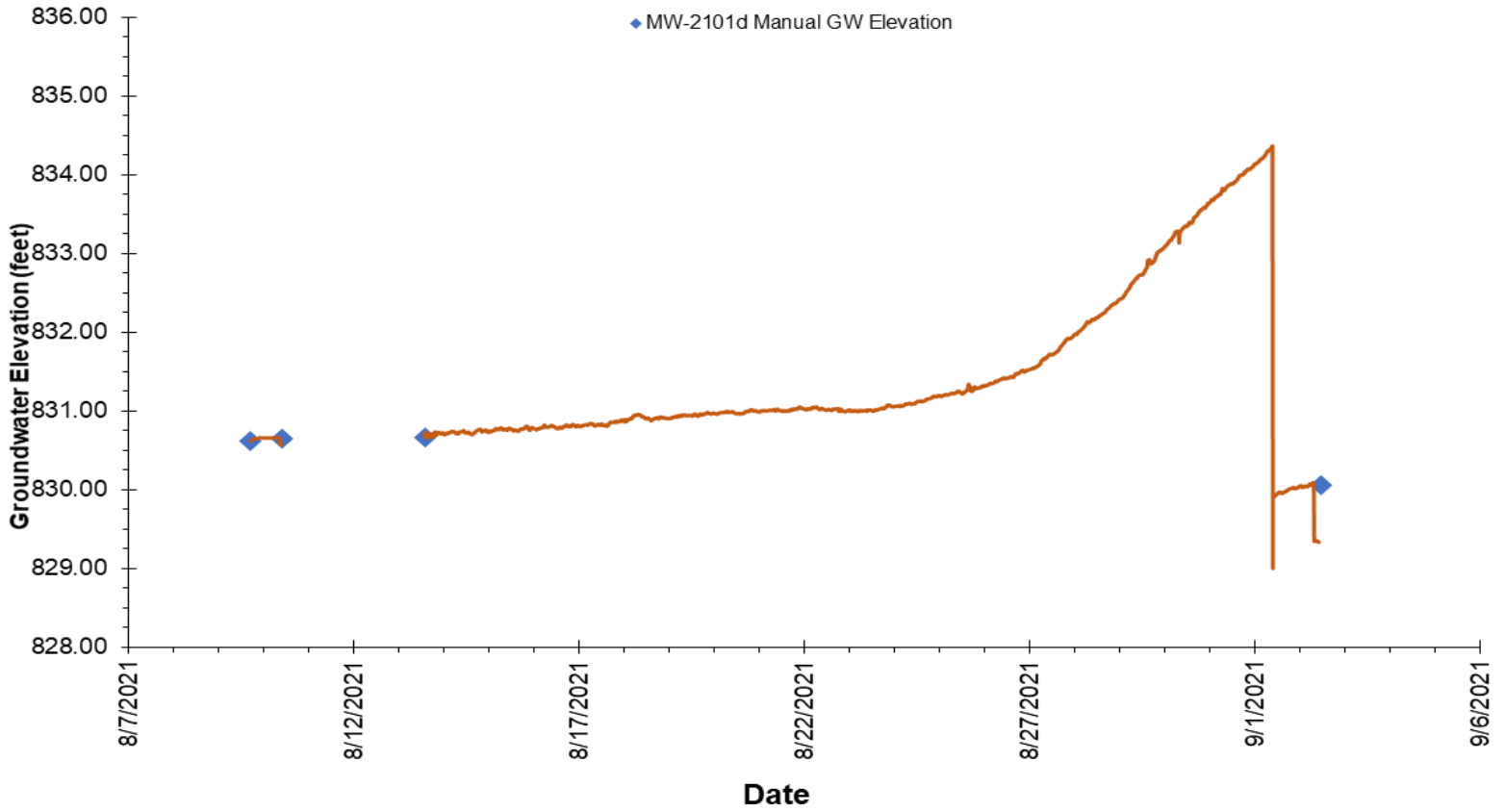
Figure F-3: MW-2101i Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

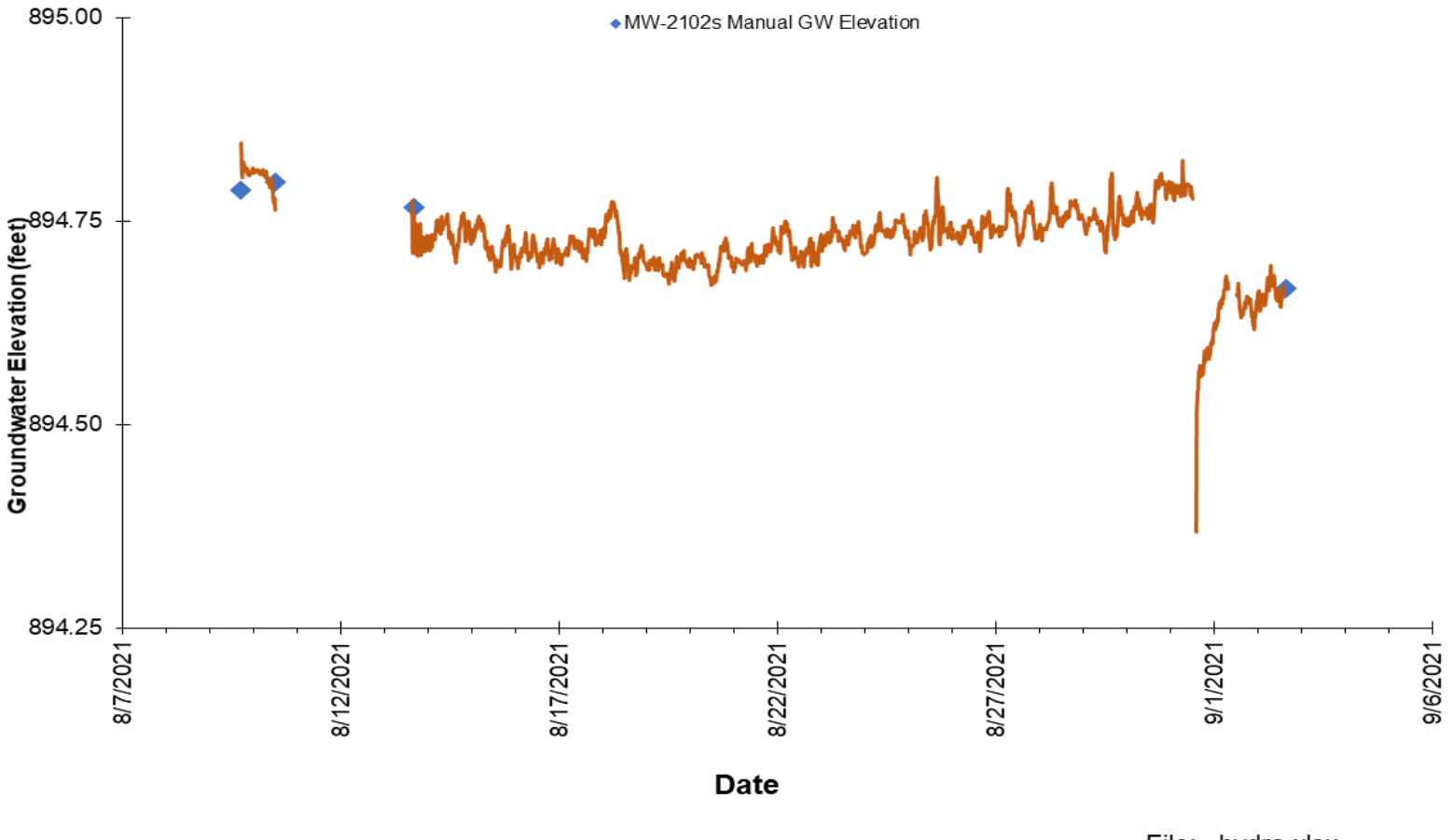
Figure F-4: MW-2101d Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

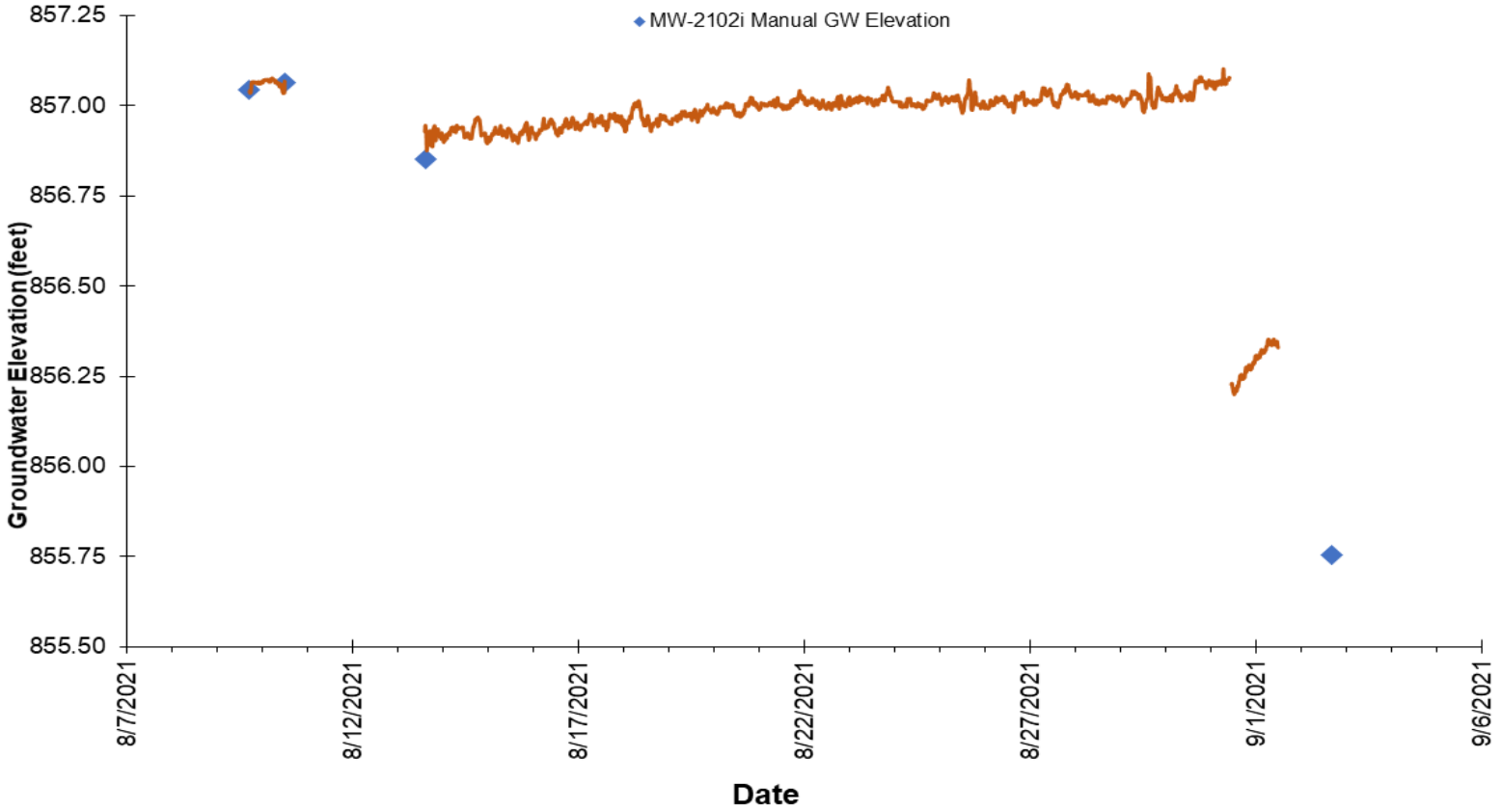
Figure F-5: MW-2102s Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

Figure F-6: MW-2102i Hydrograph

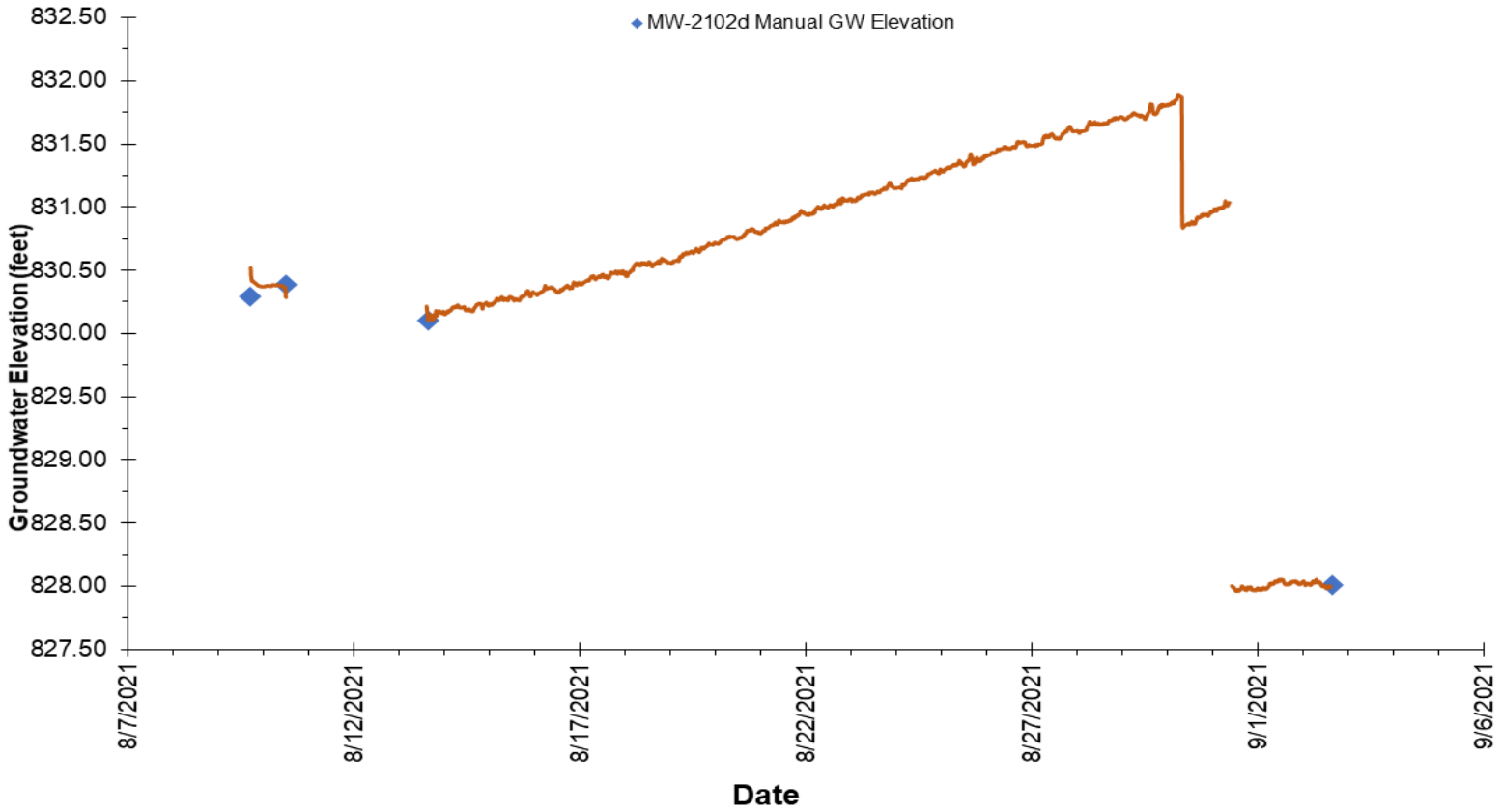


File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

ARCADIS

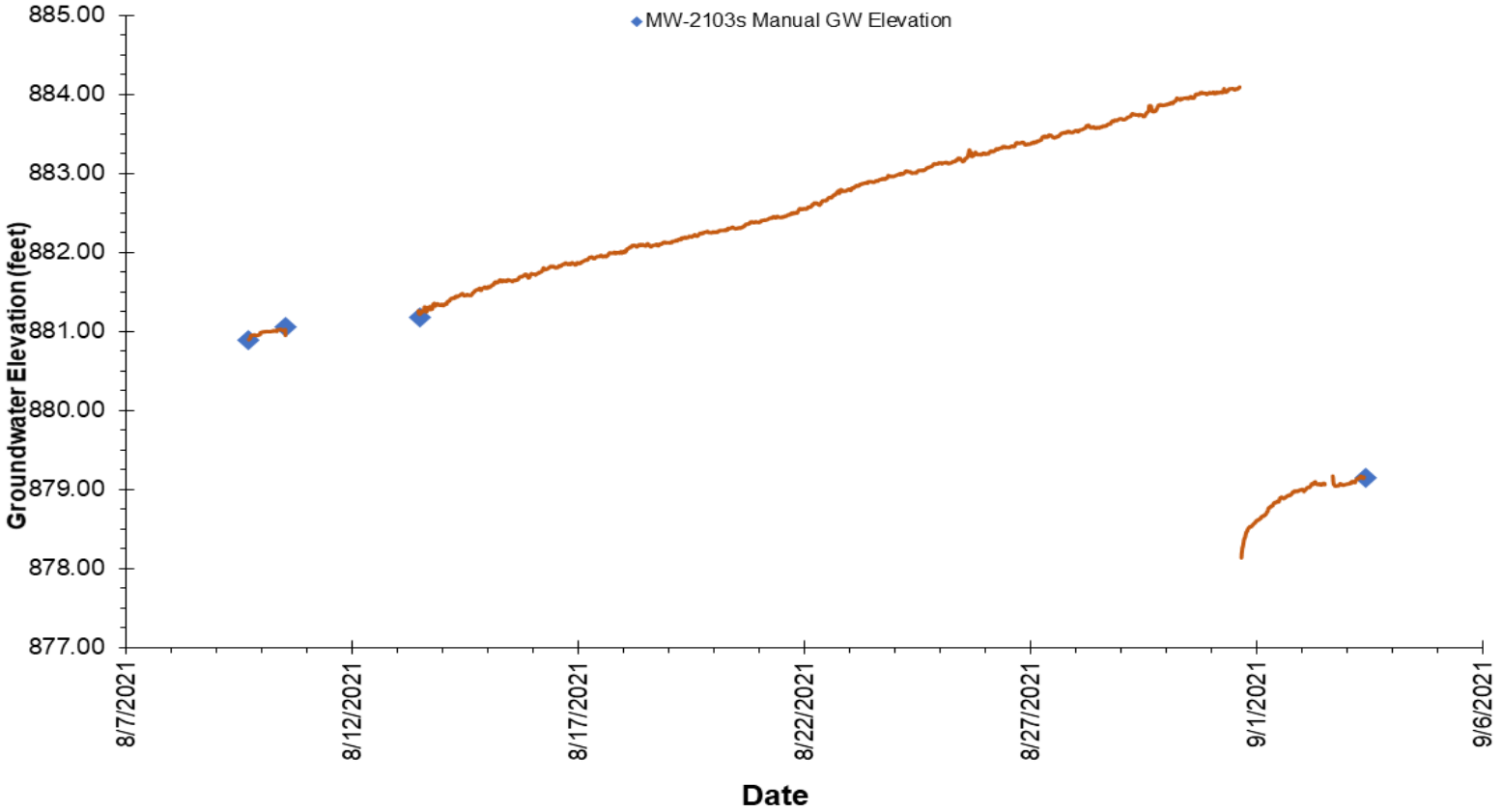
Figure F-7: MW-2102d Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

Figure F-8: MW-2103s Hydrograph

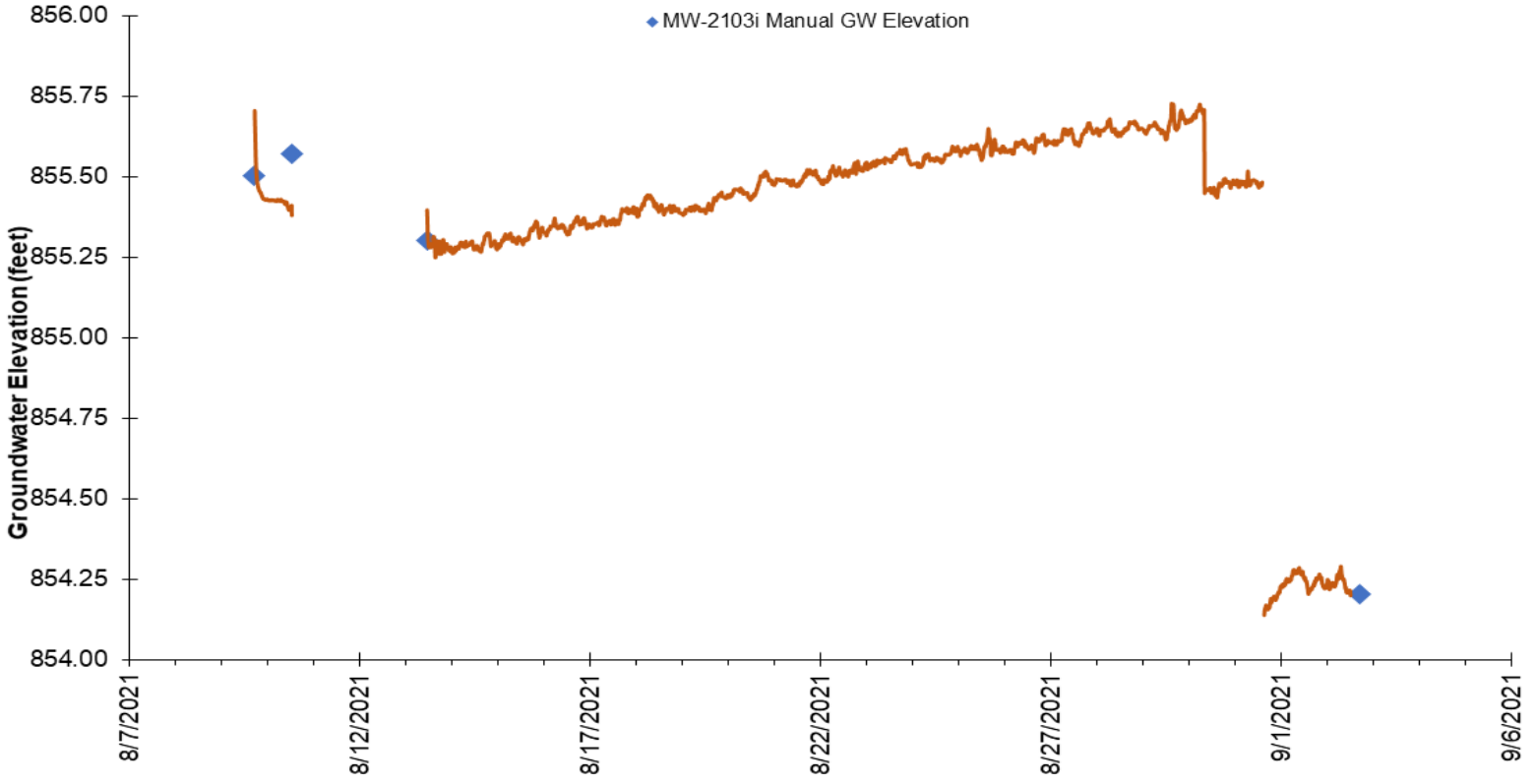


File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

ARCADIS

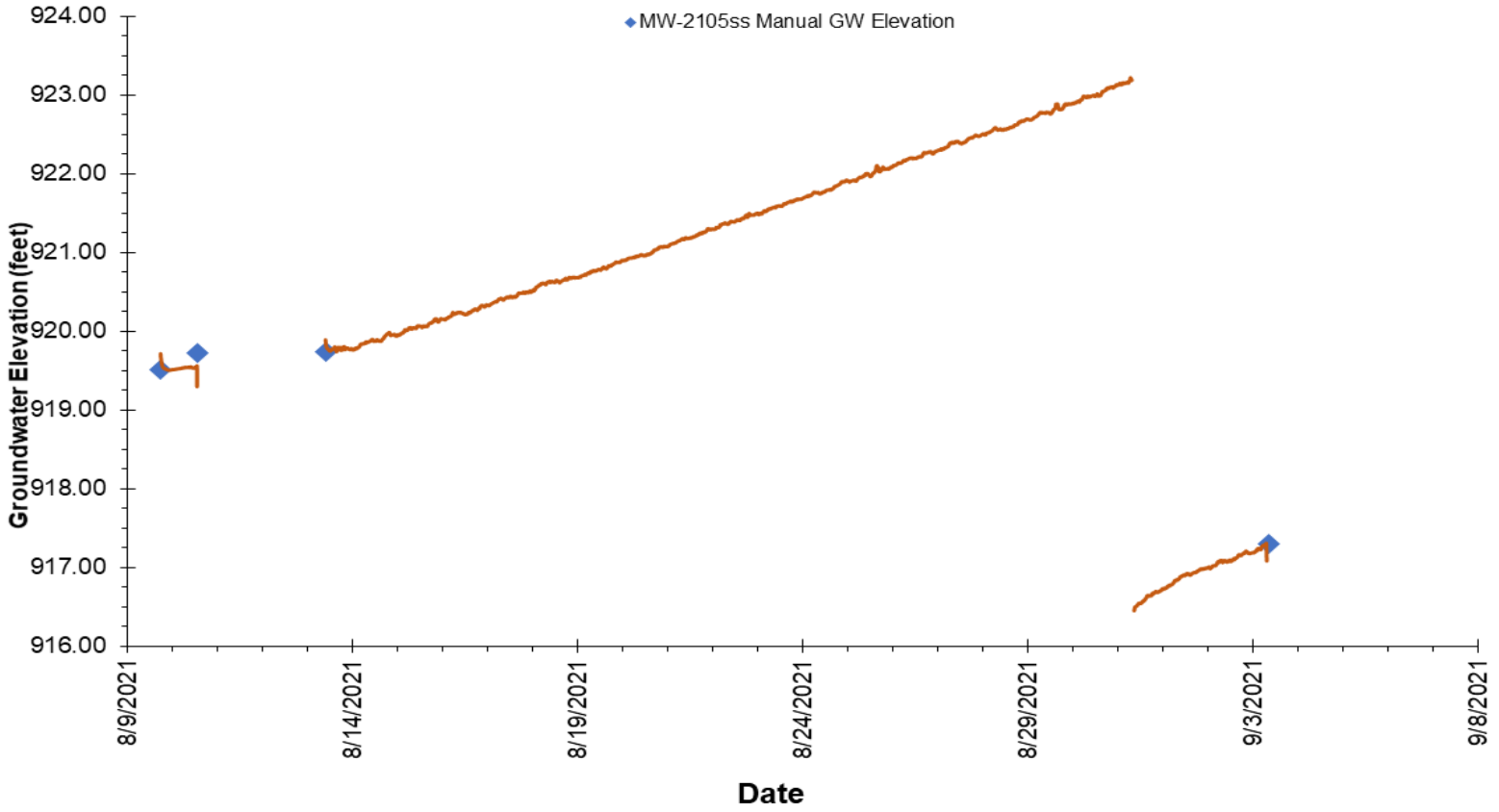
Figure F-9: MW-2103i Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

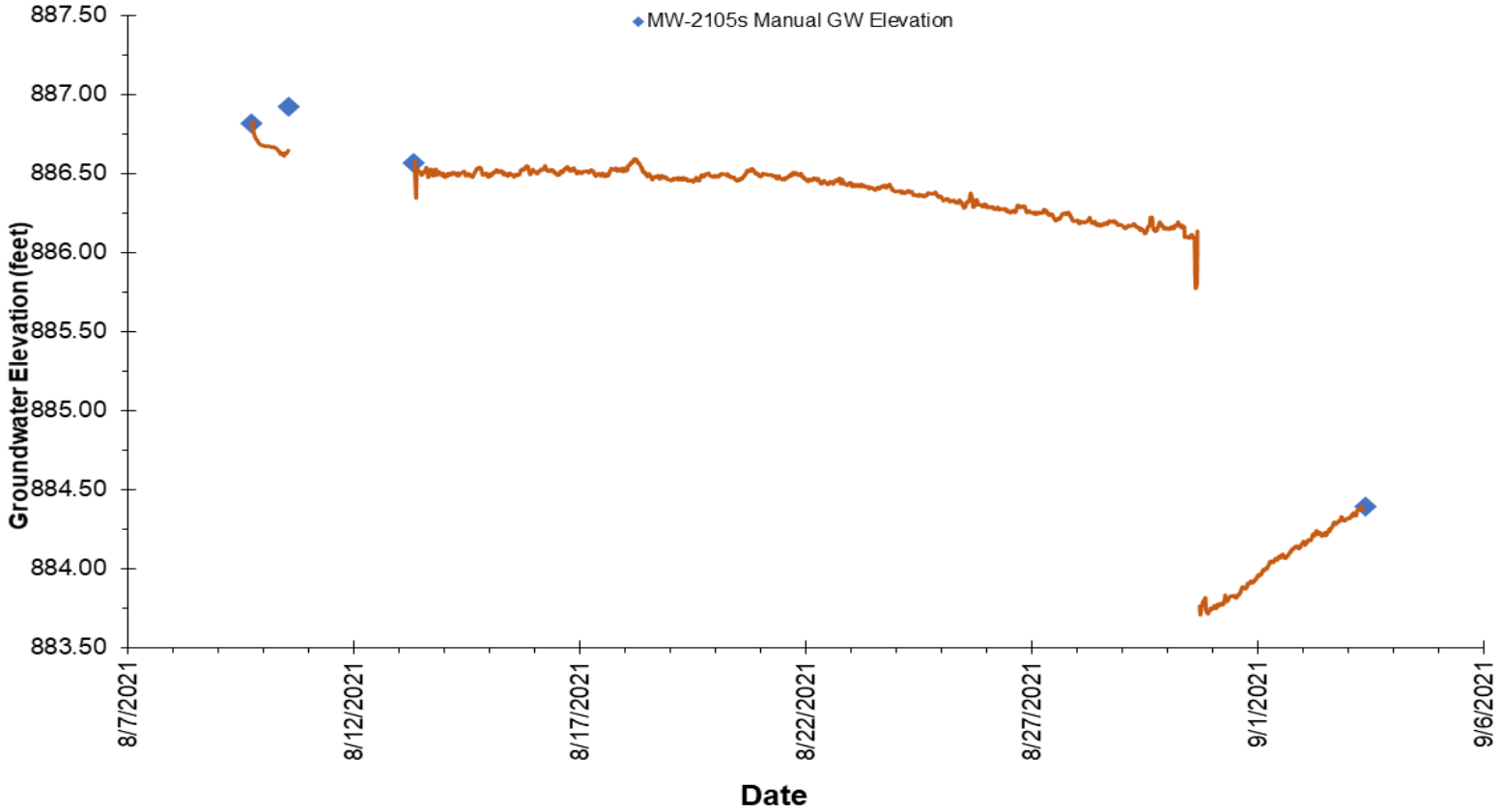
Figure F-10: MW-2105ss Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

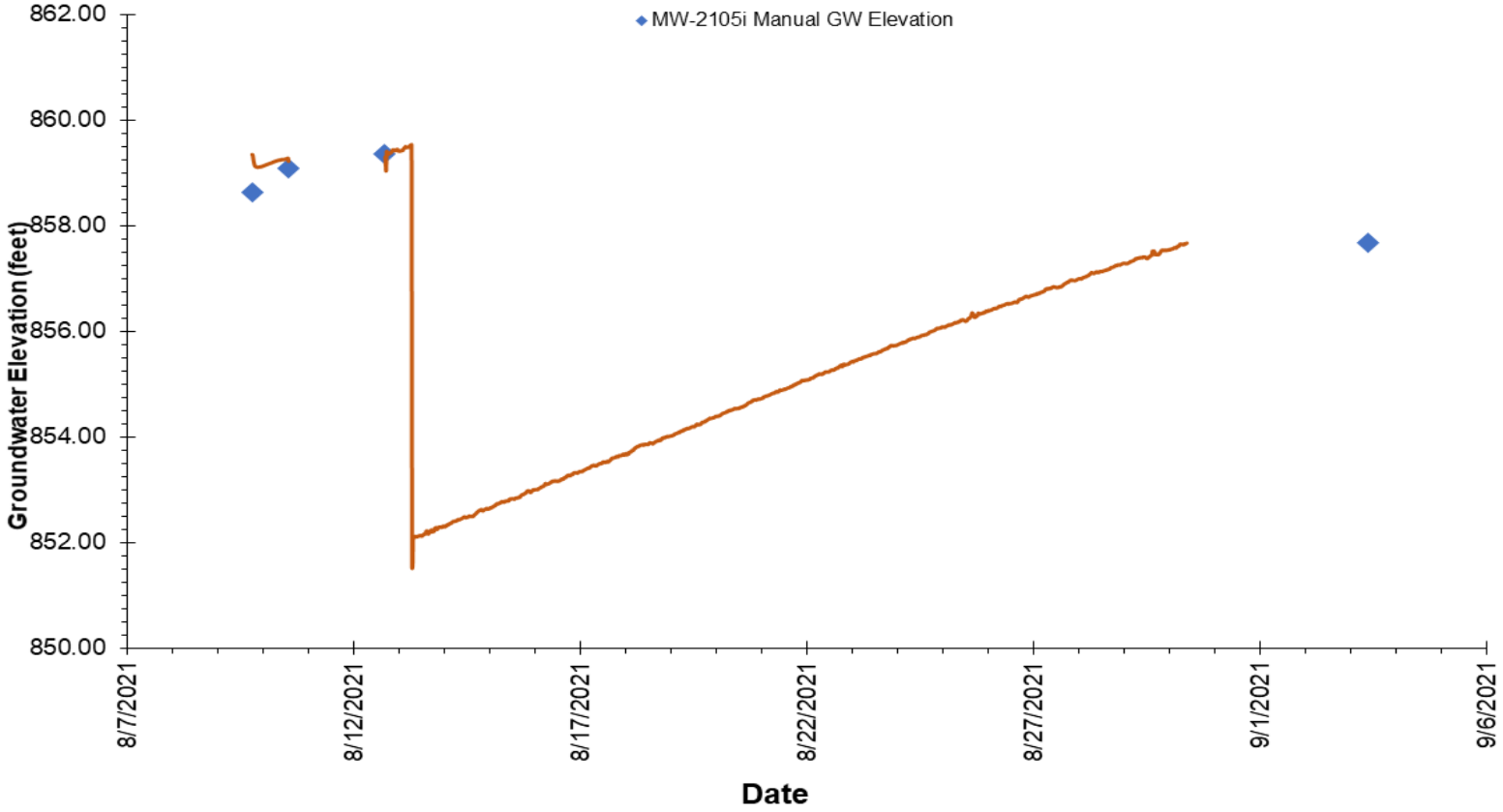
Figure F-11: MW-2105s Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

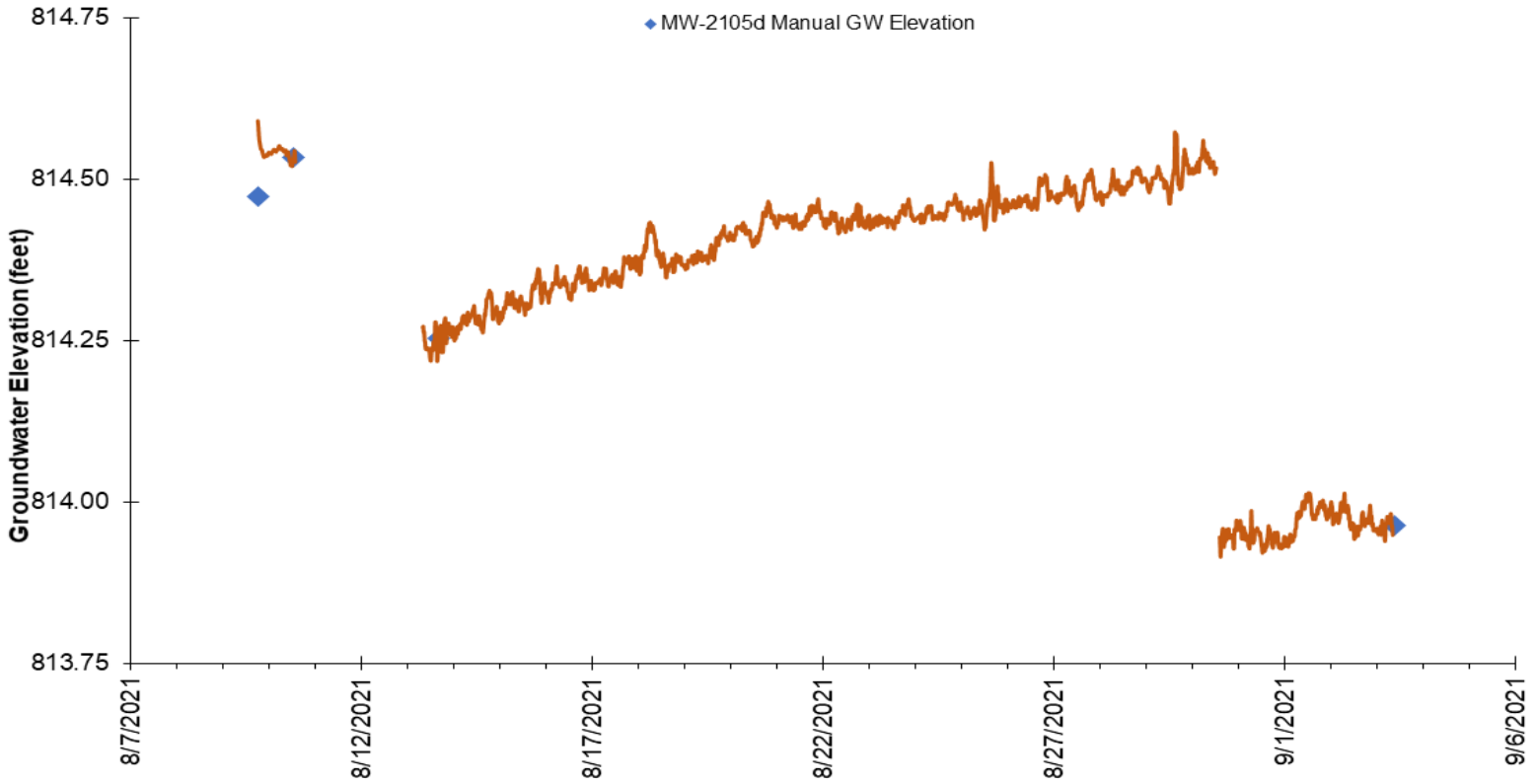
Figure F-12: MW-2105i Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

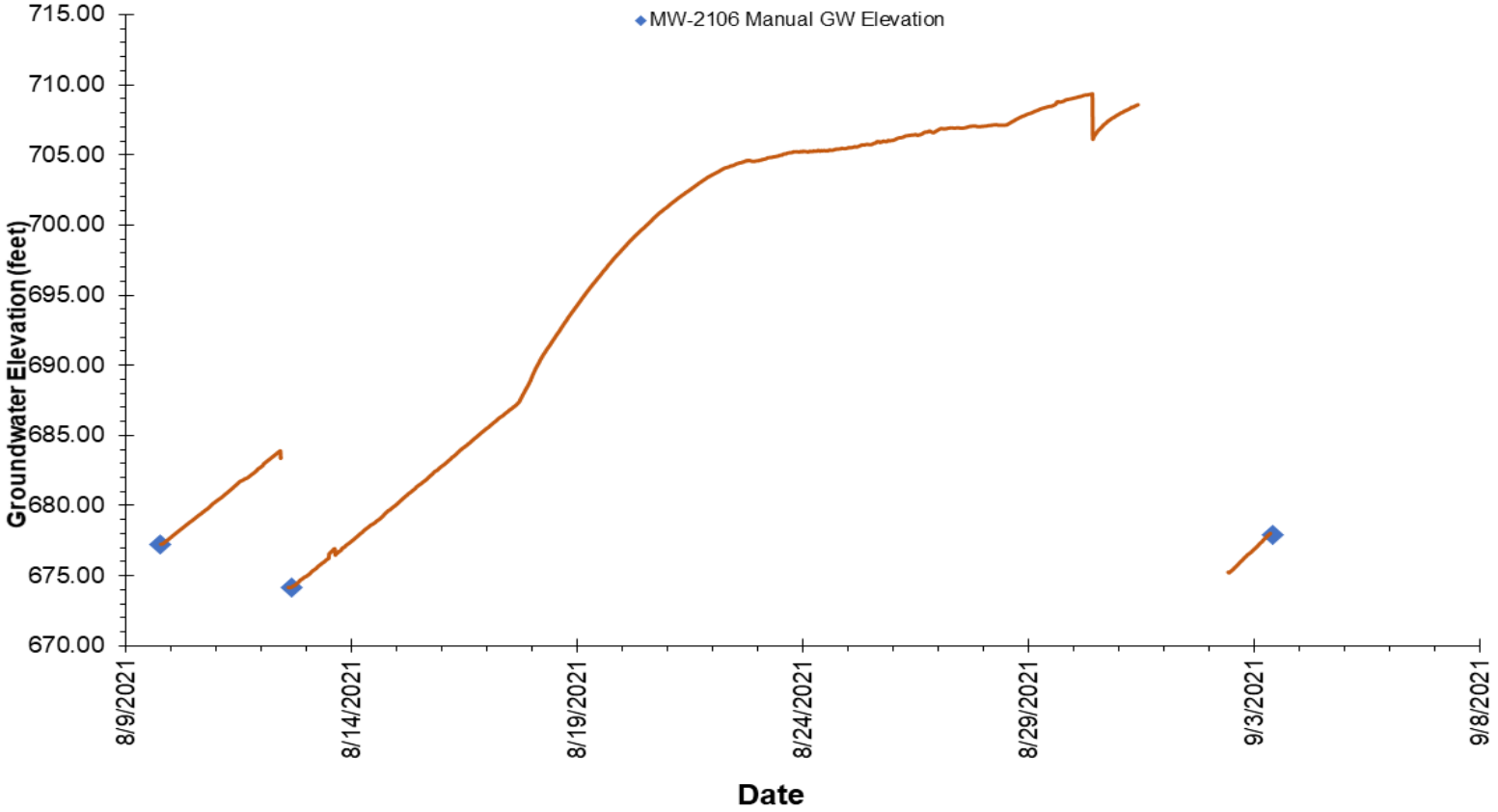
Figure F-13: MW-2105d Hydrograph



File: _hydro.xlsx

Date Graph Prepared:
Prepared By:
Checked By:

Figure F-14: MW-2106 Hydrograph

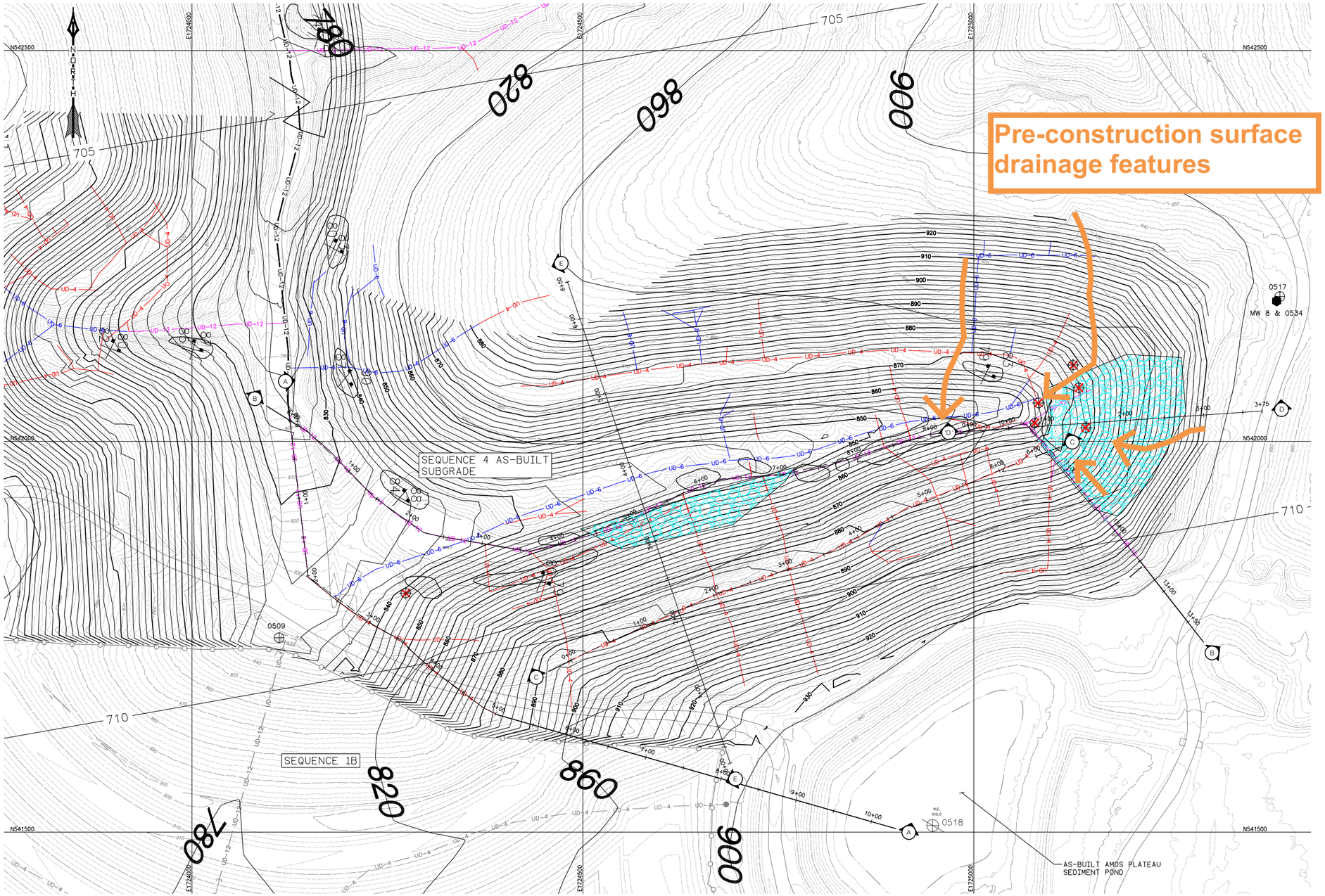


File: _hydro.xlsx

Appendix G

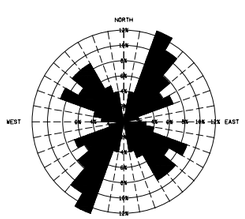
Aerial Imagery and Topographic Maps

App - G-1



DRAWING REFERENCES:

- EXISTING TOPOGRAPHY COMPILED FROM HENDERSON AERIAL SURVEYS INC. DATE OF SURVEY 3-22-2015, 1-FOOT ACCURACY.
- HORIZONTAL DATUM IS THE NORTH AMERICAN DATUM OF 1983 (NAD 83), WEST VIRGINIA SOUTH, AND THE VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
- ROCK BLANKET UNDERDRAINS PROVIDED BY AEP EMAILED BY COTY SHEPPARD 08-2-2019.
- LINER BUBBLE LOCATIONS AND AS-BUILT UNDERDRAINS TAKEN FROM "BUBBLE UNDER LINER" DRAWING RECEIVED FROM AEP 01-16-2020.
- AS-BUILT SUBGRADE, TOP OF CLAY, AND PROTECTIVE COVER SURVEYED BY JERGENS AND EMAILED TO GAI BY BRIAN G PALMER ON 02-17-2020.
- POTENTIOMETRIC CONTOURS OBTAINED FROM DRAWING 13-30500-12-K
- BORINGS OBTAINED FROM DRAWING 13-30500-11-G



ROCK JOINT ORIENTATIONS

LEGEND:

- 900 — POTENTIOMETRIC CONTOURS
- UD-6 — 6" UNDERDRAIN
- UD-12 — 12" UNDERDRAIN
- UD-4 — 4" UNDERDRAIN
- 800 — ORIGINAL EXISTING INDEX CONTOUR
- ORIGINAL EXISTING INTERMEDIATE CONTOUR
- 900 — AS-BUILT SUBGRADE INDEX CONTOUR
- AS-BUILT SUBGRADE INTERMEDIATE CONTOUR
- LOCATION OF LINER BUBBLE
- ROCK BLANKET DRAIN
- 0501 — BORING
- MW1 & 0536 — MONITORING WELL AND BORING NUMBER
- 80 — FRACTURE ORIENTATION AND DIP
- ROCK OUTCROP
- 710 — STRUCTURE CONTOUR ON PROJECTED BASE OF PITTSBURGH COAL

SCALE: 1" = 50'
50 0 50 100

NO. | DATE | DRAWN BY: | CHECKED BY: | APPROVED BY: | REVISION RECORD | DESCRIPTION:

This drawing was produced with computer aided drafting technology and is supported by electronic drawing files. Do not revise this drawing by manual drafting methods.

CLIENT
APPALACHIAN POWER CO.
JOHN E. AMOS POWER PLANT
WINFIELD, WEST VIRGINIA

gai consultants

PROJECT
JOHN E. AMOS LANDFILL
SEQUENCE 4

DRAWING TITLE
UNDERDRAIN LAYOUT WITH LINER BUBBLES

ISSUING OFFICE: Pittsburgh | 385 E Waterfront Drive, Homestead, PA 15120

DRAFT

© 2020 GAI Consultants

GAI FILE NUMBER:	C130109-10-005-00-C-E1-001
ALT./CLIENT DRAWING NUMBER:	
GAI DRAWING NUMBER:	E1-001
ISSUE DATE: 02/28/2020	DRAWN BY: EMAYHOOD
SCALE: AS SHOWN	CHECKED BY:
DWG TYPE:	APPROVED BY:
REVISION	SHEET NO.: 1 OF 1

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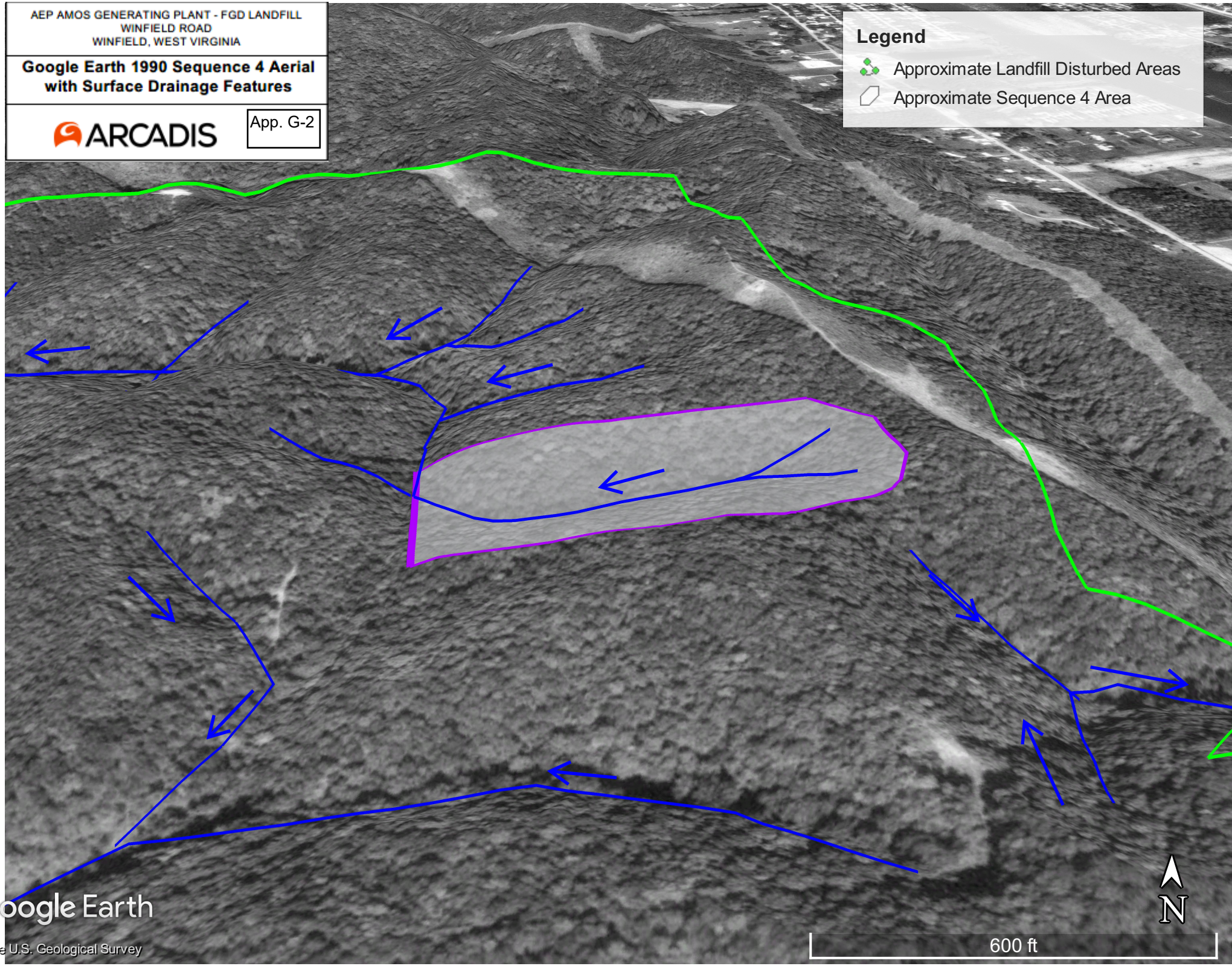
AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

Google Earth 1990 Sequence 4 Aerial with Surface Drainage Features

ARCADIS

App. G-2

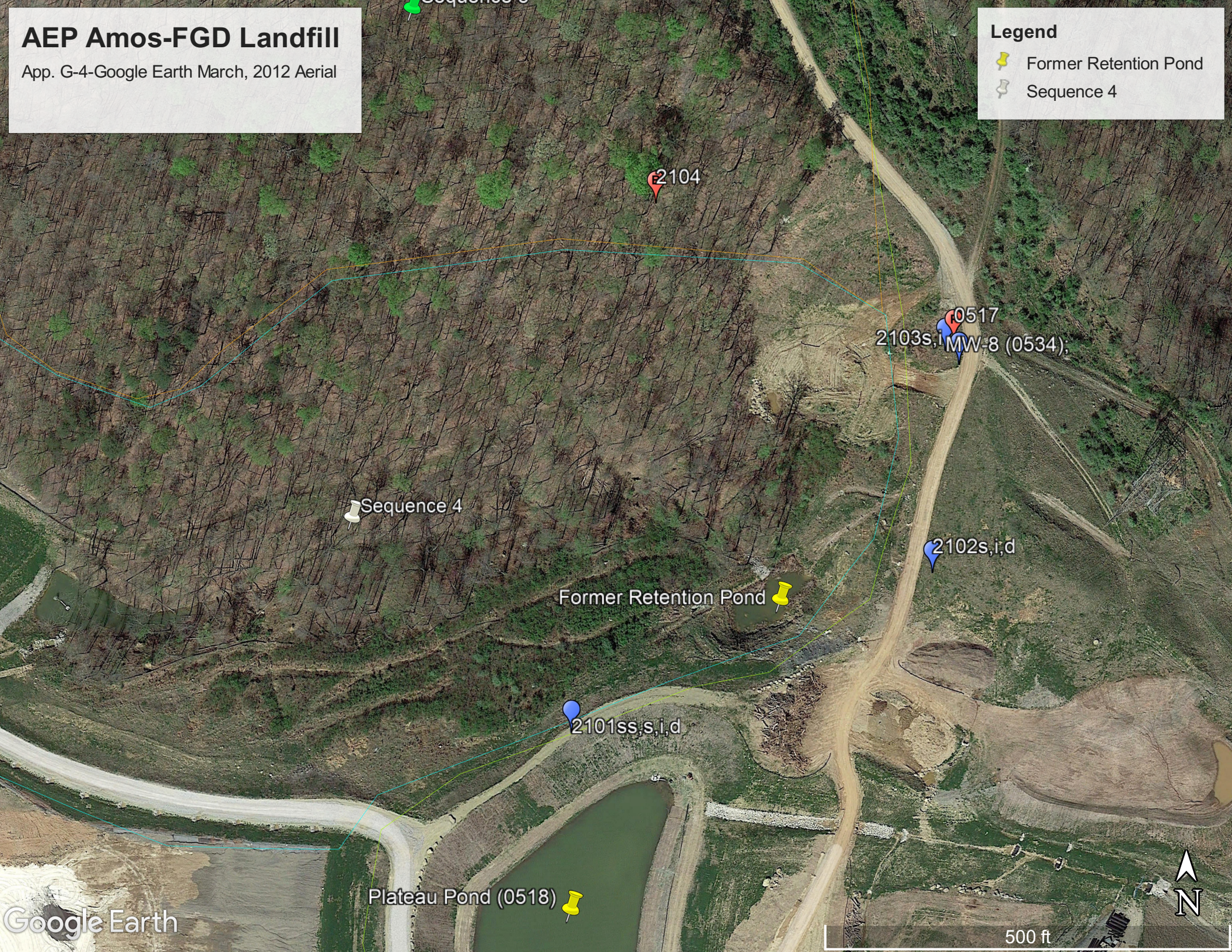


AEP Amos-FGD Landfill

App. G-3-Google Earth May, 2007 Aerial

AEP Amos-FGD Landfill

App. G-4-Google Earth March, 2012 Aerial



AEP Amos-FGD Landfill

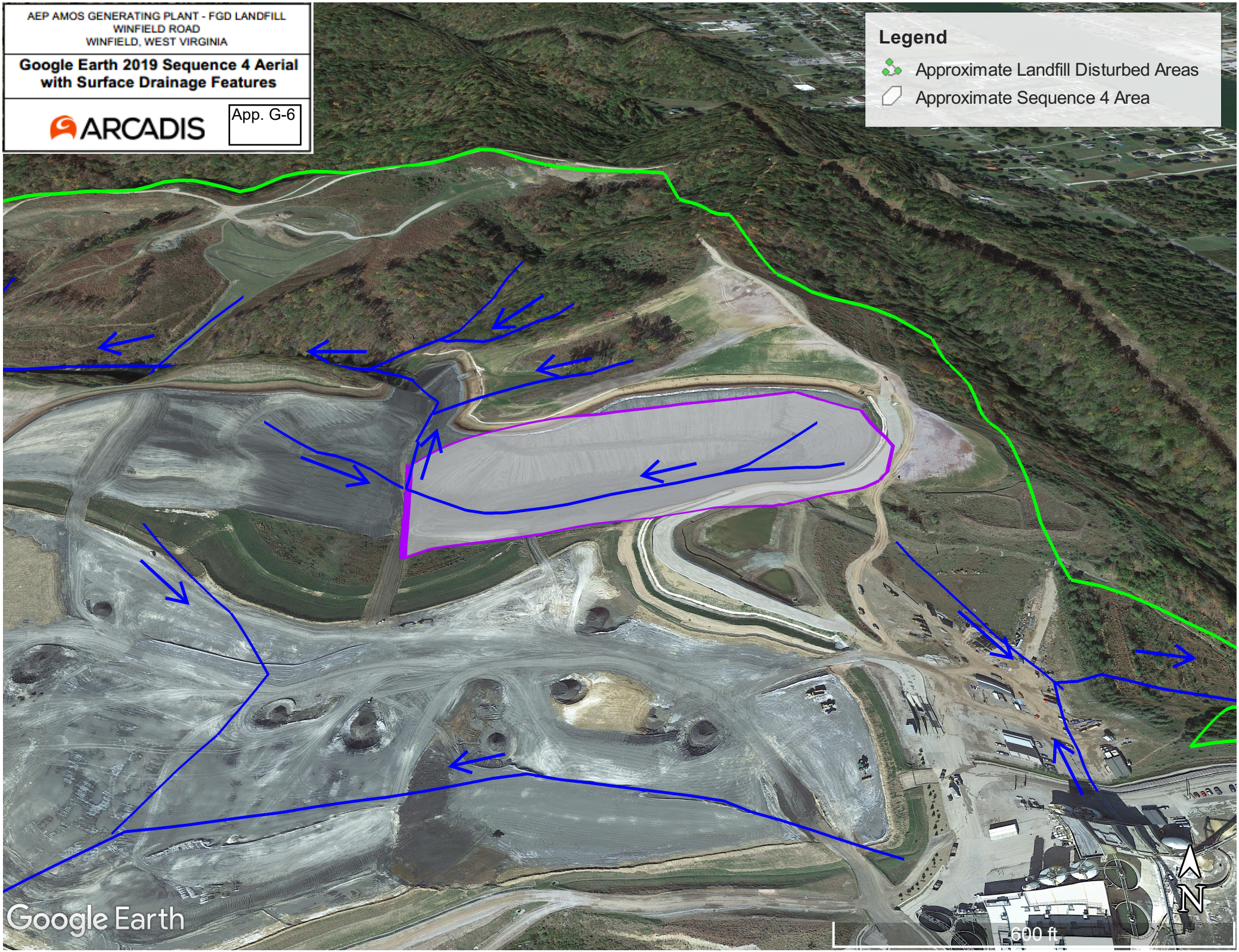
App. G-5-Google Earth September, 2015 Aerial

AEP AMOS GENERATING PLANT - FGD LANDFILL
WINFIELD ROAD
WINFIELD, WEST VIRGINIA

Google Earth 2019 Sequence 4 Aerial with Surface Drainage Features

ARCADIS

App. G-6

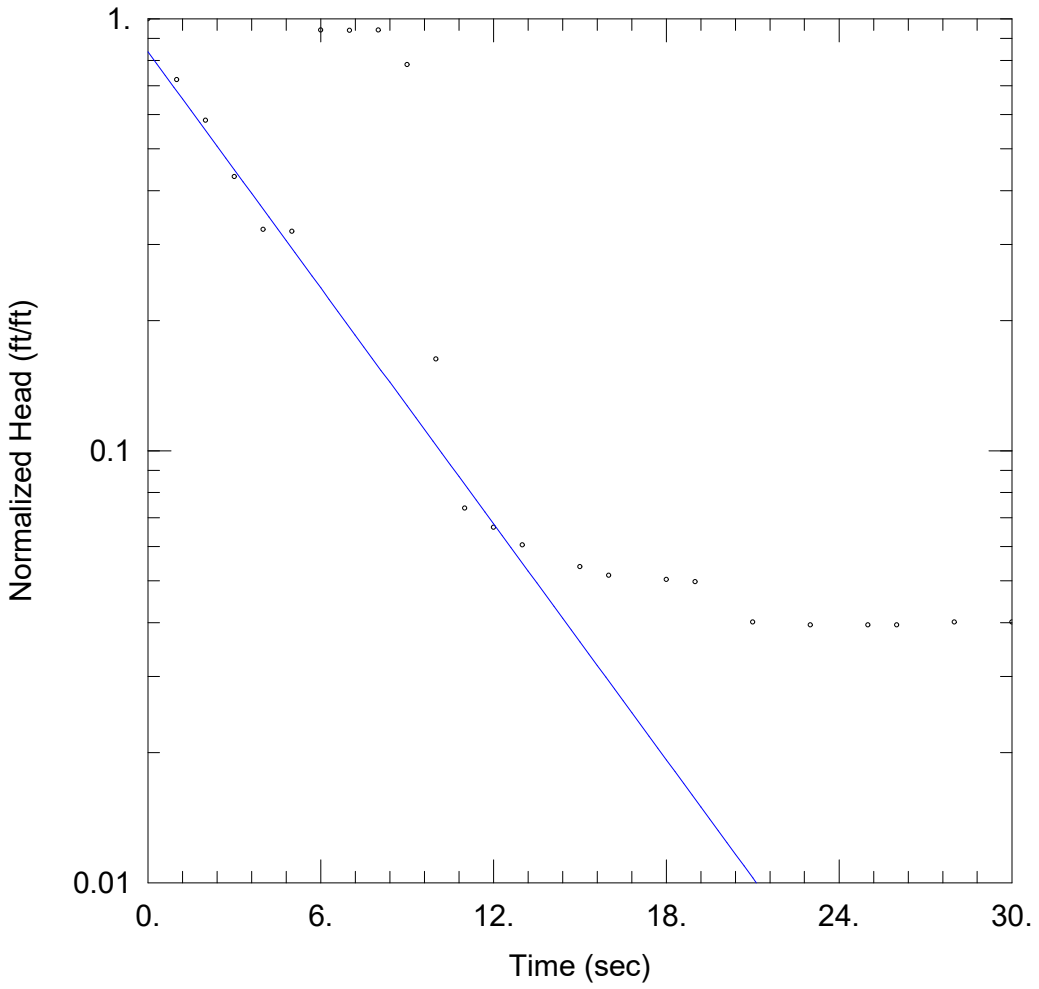


Appendix H

Hydraulic Testing Solution Reports

MW-2101ss Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landfill	Winfield, WV



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 23. ft/day y0 = 1.4 ft

AQUIFER DATA

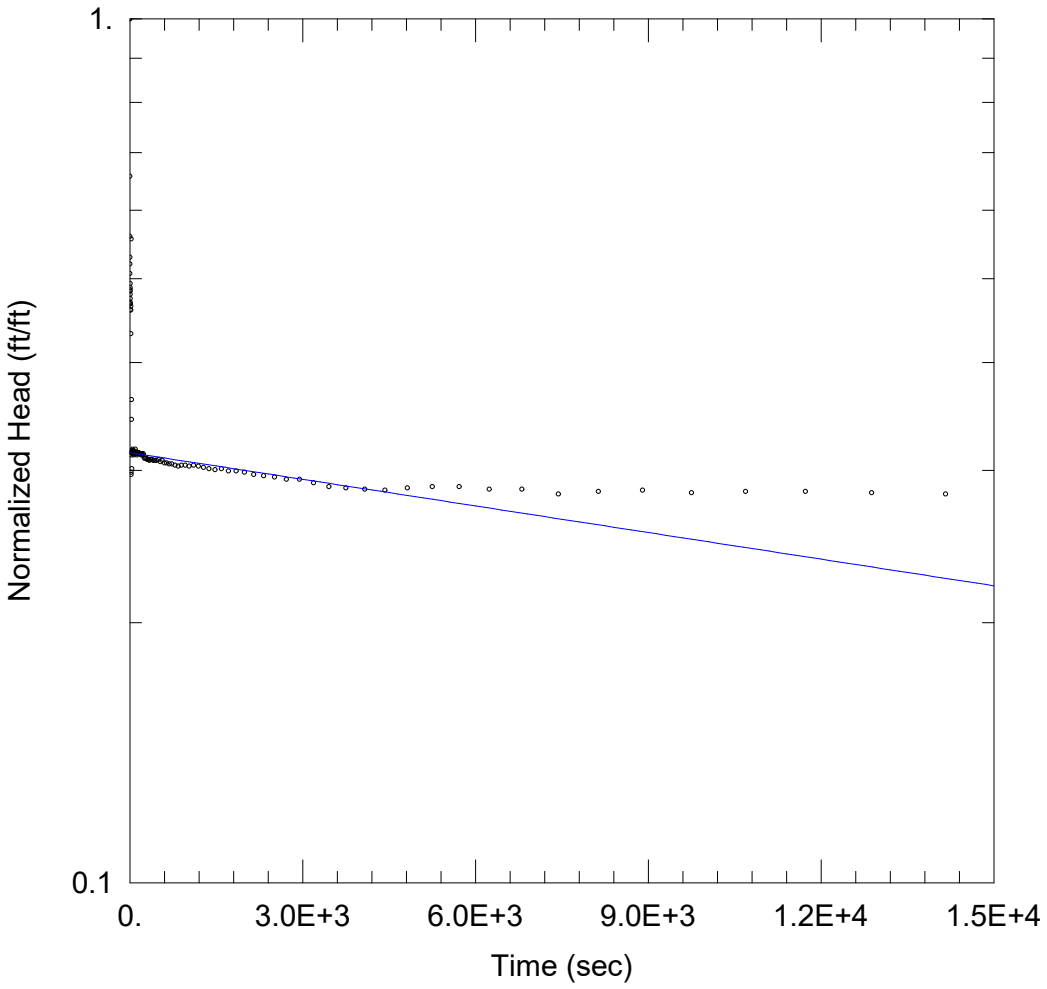
Saturated Thickness: 7.75 Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2101ss)

Initial Displacement: 1.67 ft
Static Water Column Height: 11.78 ft
Total Well Penetration Depth: 11.78 ft
Screen Length: 10. ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft

MW-2105ss Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landfill	Winfield, WV



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.011 ft/day y0 = 0.335 ft

AQUIFER DATA

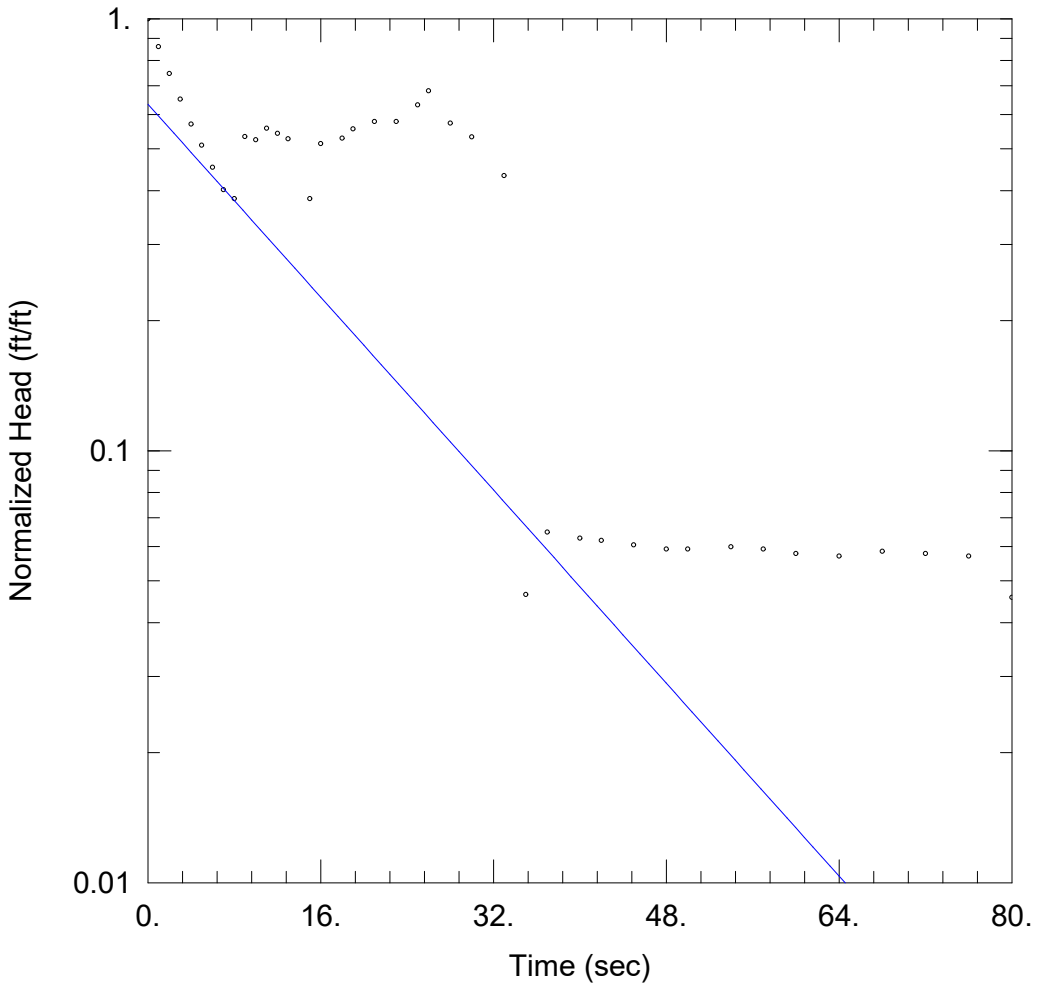
Saturated Thickness: 4.84 Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2105ss)

Initial Displacement: 1.065 ft
Static Water Column Height: 4.84 ft
Total Well Penetration Depth: 4.84 ft
Screen Length: 4.84 ft
Casing Radius: 0.083 ft
Well Radius: 0.33 ft
Gravel Pack Porosity: 0.

MW-2101s Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landfill	Winfield, WV



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

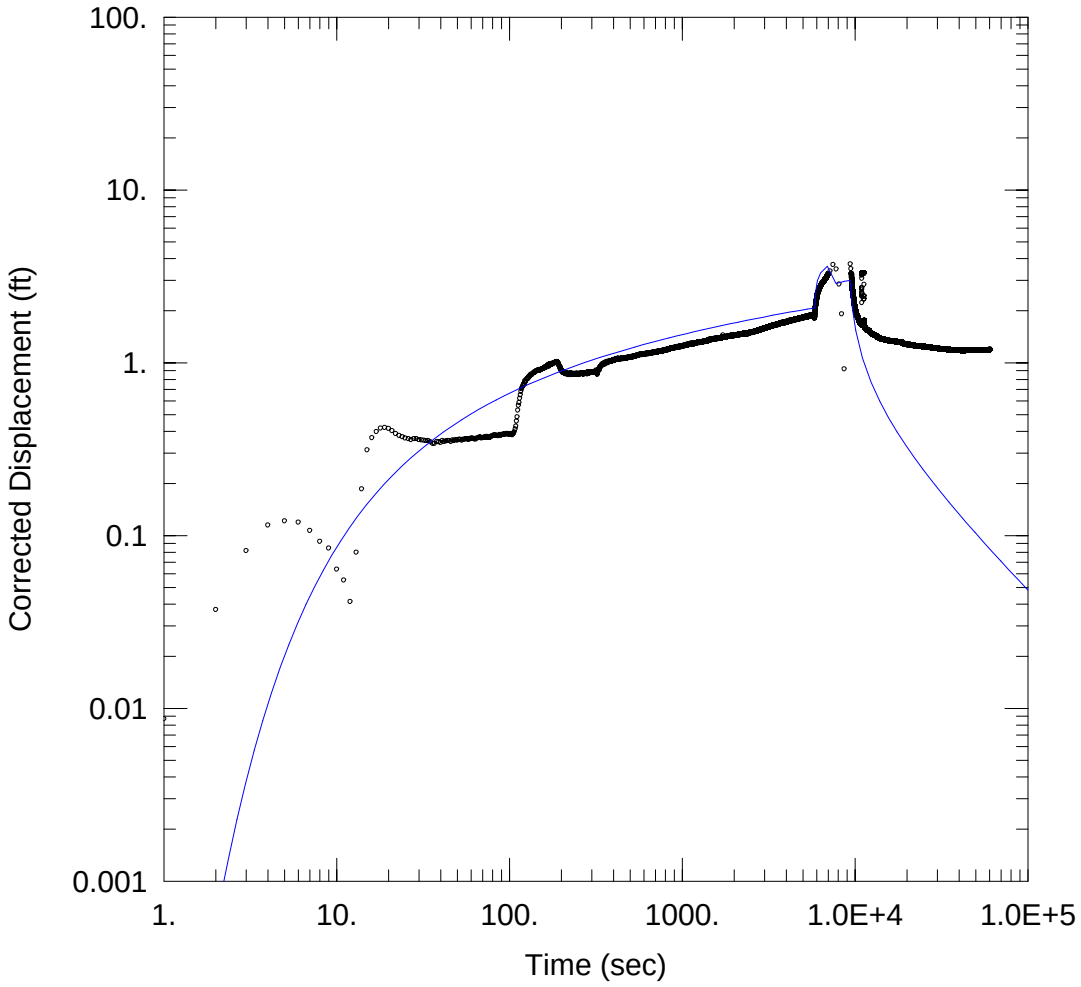
K = 8.2 ft/day y0 = 0.9 ft

AQUIFER DATA

Saturated Thickness: 7.5 ftAnisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2101s)

Initial Displacement: 1.42 ft
Static Water Column Height: 22.14 ft
Total Well Penetration Depth: 22.14 ft
Screen Length: 15. ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft



MW-2101S STEP TEST

PROJECT INFORMATION

Company: Arcadis
Client: AEP
Location: Winfield, WV
Test Well: MW-2101s
Test Date: 8/12/2021

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW-2101s	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
◦ MW-2101s	0	0

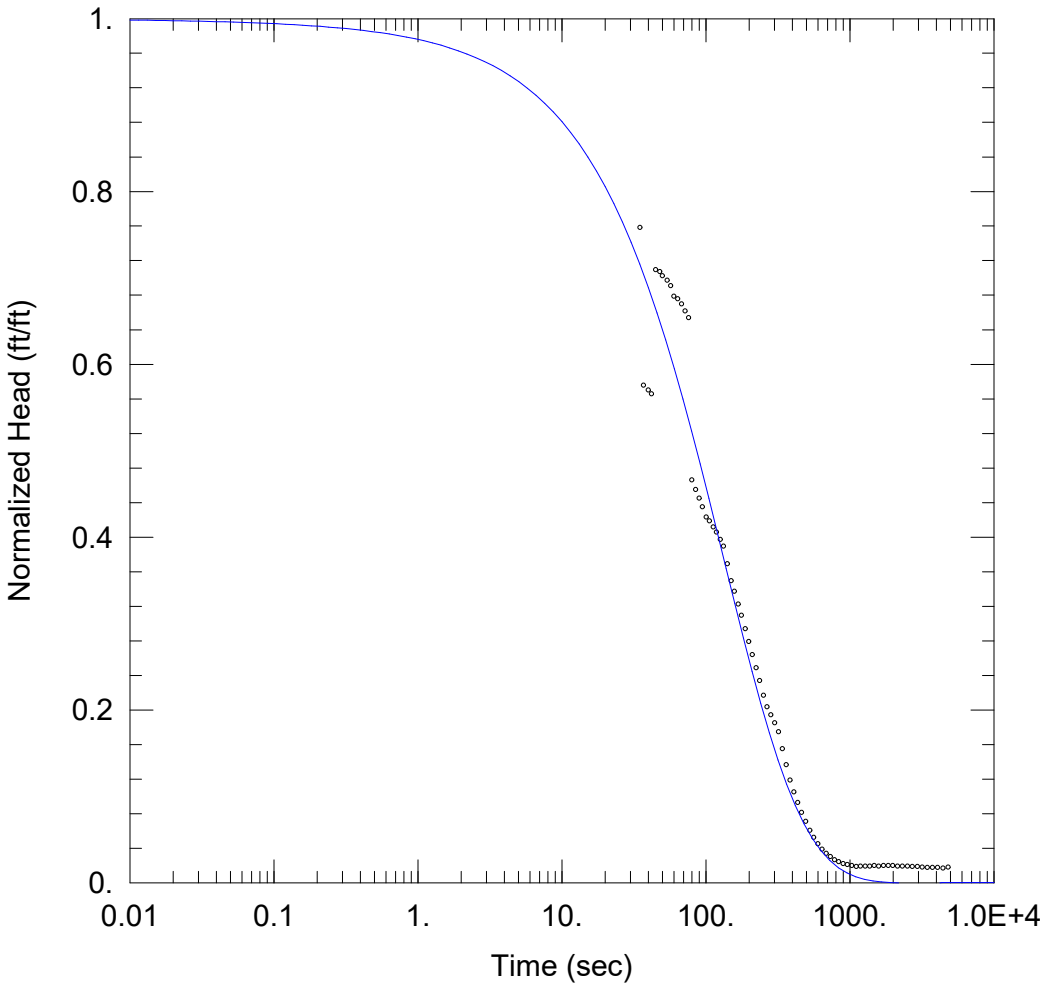
SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 43.1 ft^2/day
S = 0.3015
Kz/Kr = 1.
b = 7.5 ft

MW-2102s Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landfill	Winfield, WV



SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.8 ft/day Ss = 4.9E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

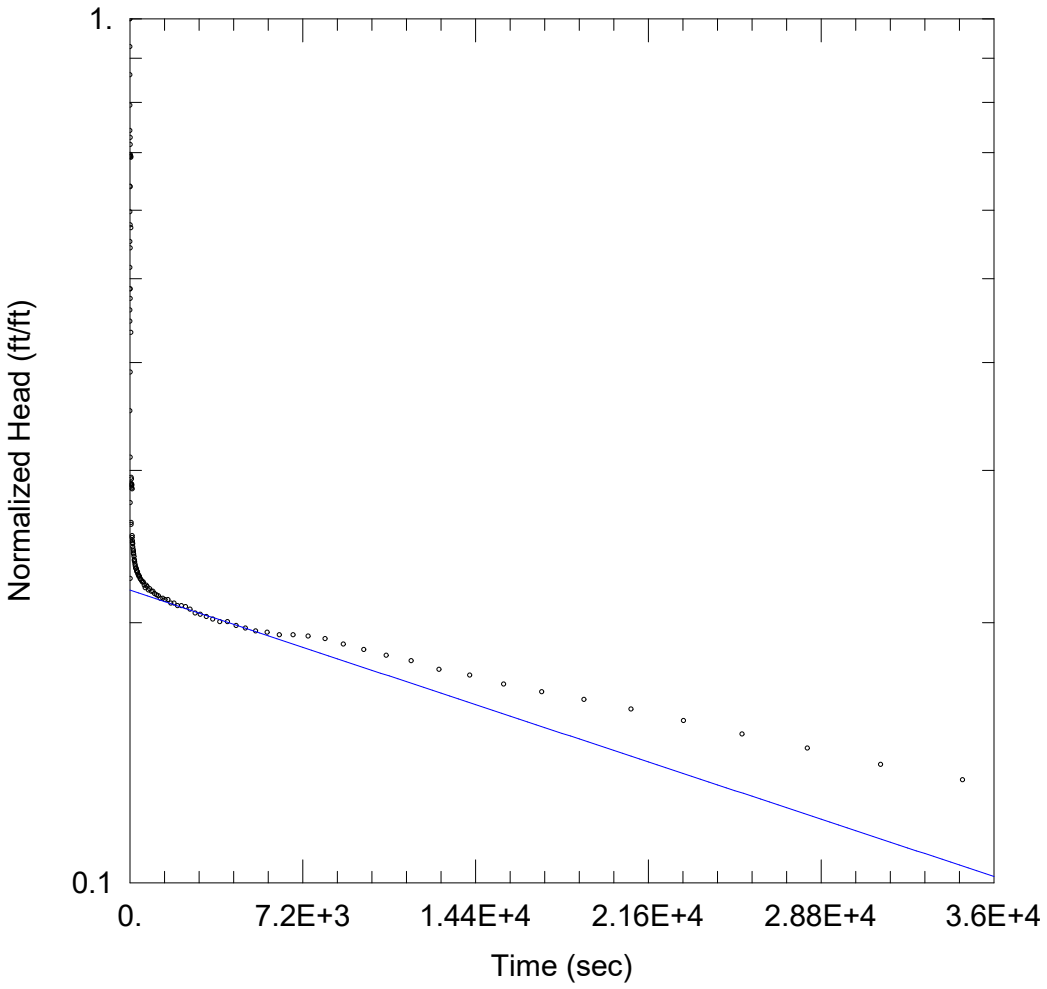
Saturated Thickness: 14.75 ft

WELL DATA (MW-2102s)

Initial Displacement: 1.78 ft
Static Water Column Height: 20.47 ft
Total Well Penetration Depth: 20.47 ft
Screen Length: 15. ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft

MW-2103s Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landfill	Winfield, WV



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.016 ft/day y0 = 0.32 ft

AQUIFER DATA

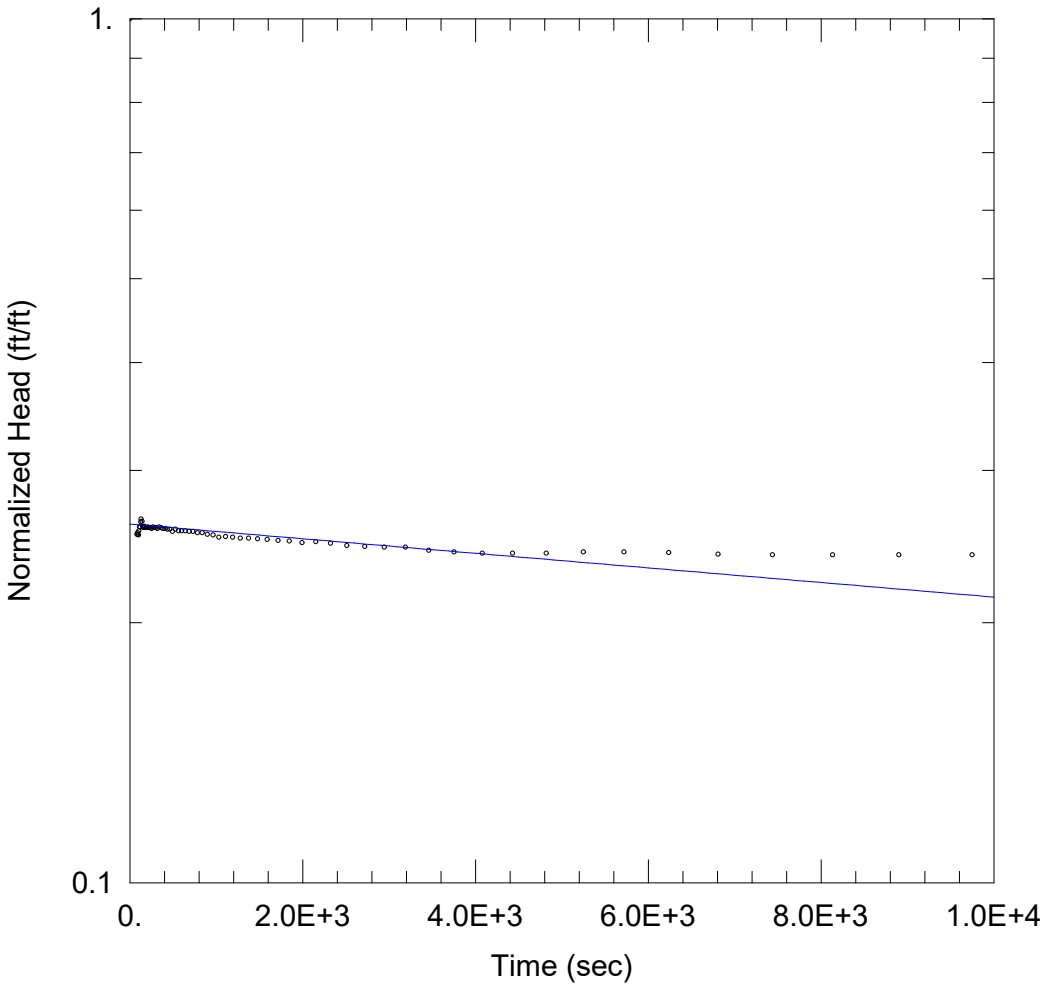
Saturated Thickness: 4.48 Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2103s)

Initial Displacement: 1.467 ft
Static Water Column Height: 4.48 ft
Total Well Penetration Depth: 4.48 ft
Screen Length: 4.48 ft
Casing Radius: 0.083 ft
Well Radius: 0.33 ft
Gravel Pack Porosity: 0.

MW-2105s Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landfill	Winfield, WV



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0096 ft/day y0 = 0.52 ft

AQUIFER DATA

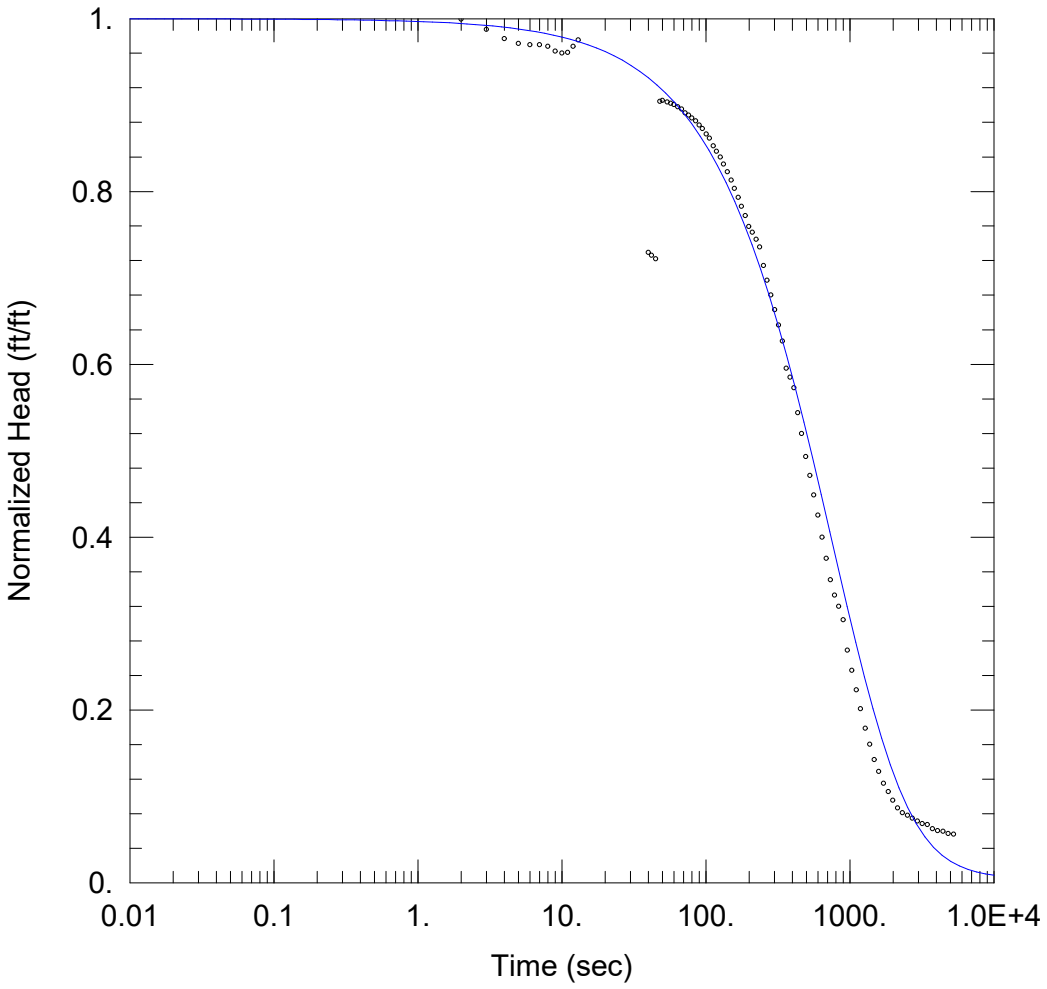
Saturated Thickness: 4.01 Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2105s)

Initial Displacement: 2. ft
Static Water Column Height: 4.01 ft
Total Well Penetration Depth: 4.01 ft
Screen Length: 4.01 ft
Casing Radius: 0.083 ft
Well Radius: 0.33 ft
Gravel Pack Porosity: 0.

MW-2101i Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landfill	Winfield, WV



SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.6 ft/day Ss = 1.0E-6 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

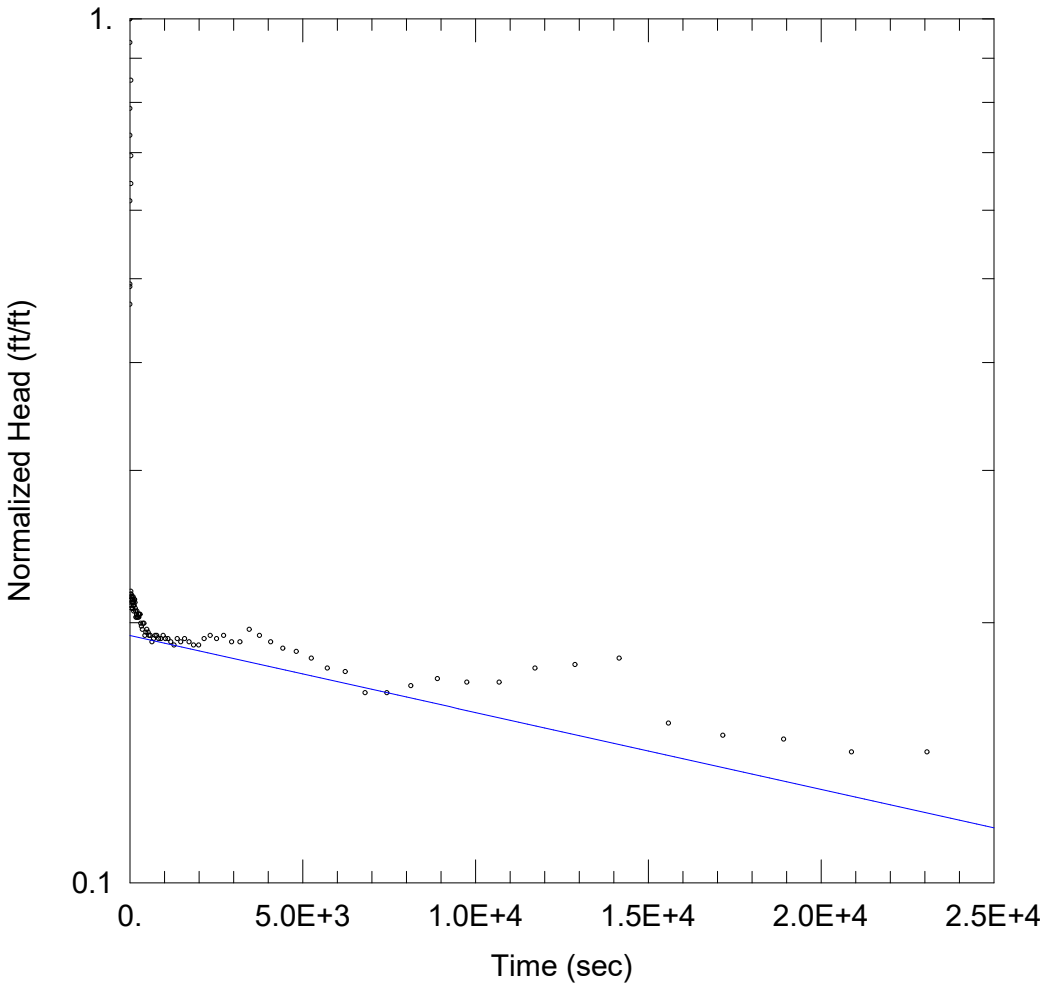
Saturated Thickness: 3.5 ft

WELL DATA (MW-2101i)

Initial Displacement: 1.46 ft
Static Water Column Height: 21.8 ft
Total Well Penetration Depth: 21.8 ft
Screen Length: 15. ft
Casing Radius: 0.083 ft
Well Radius: 0.33 ft

MW-2102i Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landfill	Winfield, WV



SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0034 ft/day y0 = 0.12 ft

AQUIFER DATA

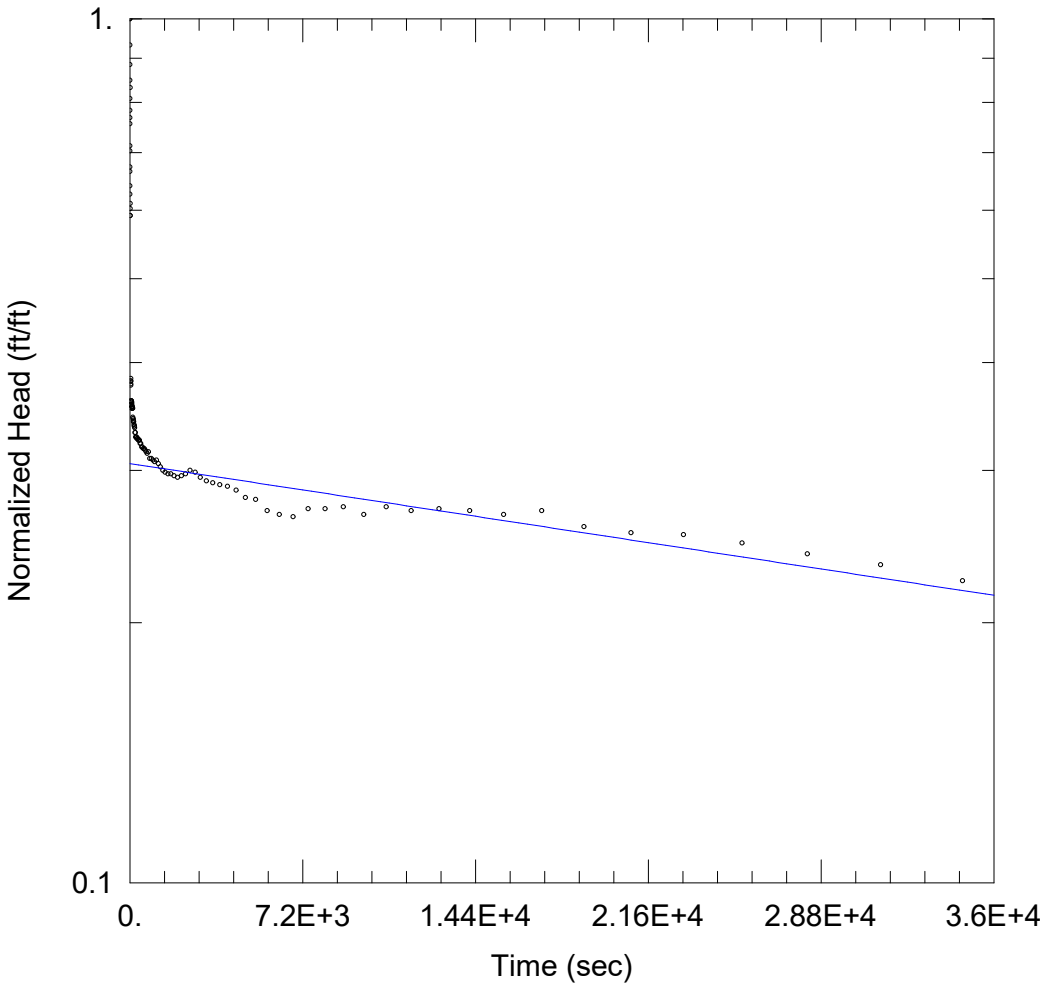
Saturated Thickness: 2.69 Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2102i)

Initial Displacement: 0.621 ft
Static Water Column Height: 2.69 ft
Total Well Penetration Depth: 2.69 ft
Screen Length: 2.69 ft
Casing Radius: 0.083 ft
Well Radius: 0.33 ft
Gravel Pack Porosity: 0.

MW-2103i Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landfill	Winfield, WV



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0048 ft/day y0 = 0.22 ft

AQUIFER DATA

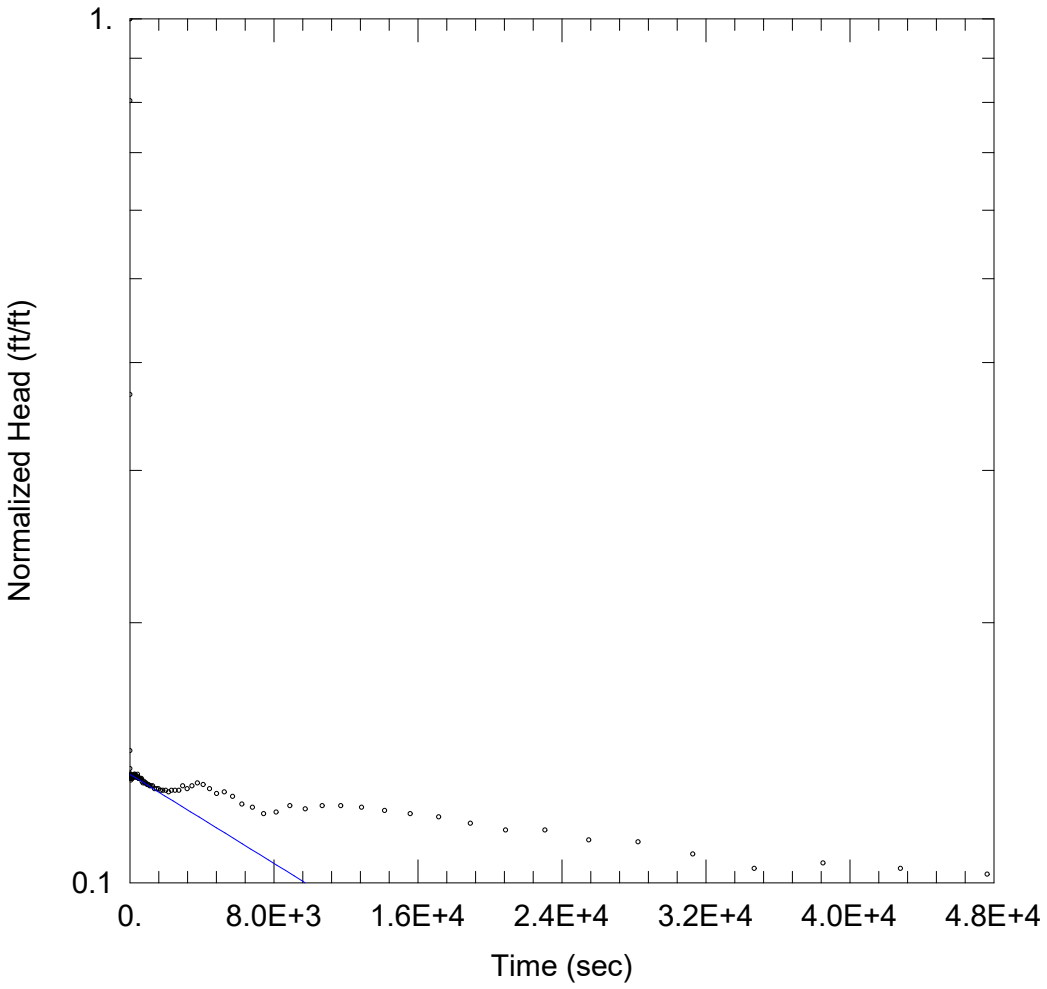
Saturated Thickness: 2.65 Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2103i)

Initial Displacement: 0.72 ft
Static Water Column Height: 2.65 ft
Total Well Penetration Depth: 2.65 ft
Screen Length: 2.65 ft
Casing Radius: 0.083 ft
Well Radius: 0.33 ft
Gravel Pack Porosity: 0.

MW-2102d Slug Test

Prepared By:	Prepared For:
Arcadis	AEP
Project:	**Location:**
FGD Landffill	Winfield, WV



SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0031 ft/day y0 = 0.261 ft

AQUIFER DATA

Saturated Thickness: 6.16 Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2102d)

Initial Displacement: 1.955 ft
Static Water Column Height: 6.16 ft
Total Well Penetration Depth: 6.16 ft
Screen Length: 6.16 ft
Casing Radius: 0.083 ft
Well Radius: 0.33 ft
Gravel Pack Porosity: 0.

Appendix I

Proposed Underdrain Flow Meter Specifications

AEP Amos FGD LF

North Valley Underdrain Outfall at East end of Sedimentation Pond (Photos on 7/26/2021)

- The 1 ft diameter drainage pipe conveys all underdrain water from the north valley (currently includes underdrain flow from sequence 4; future sequences will be added as constructed)
- Water flow rate at end of pipe on 7/26/2021 was approximately 10 gallons per minute.
- Water flow is currently measured twice weekly with a bucket by AEP construction.

Triton+
Peak Combo and Surface Combo Sensors

- Considerations
  - Minimum 1 foot/sec flow in pipe for meter functionality
  - Data collection 5 min intervals
  - Data upload via cellular network
  - Attach to end of pipe

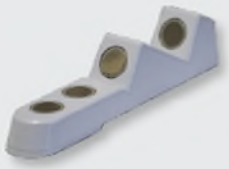
TRITON+
Sensor Specifications

The ADS® ***TRITON+***® features three depths and two velocities with five sensor options. Each sensor provides multiple technologies for continuous running of comparisons.

Peak Combo Sensor

This versatile and economical sensor includes three measurement technologies in a single housing: ADS-patented continuous wave *peak velocity, uplooking ultrasonic depth,* and *pressure depth*.

Dimensions	**Height:** 0.83 in (21 mm), **Width:** 1.23 in (31 mm), **Length:** 6.76 in (172 mm)
Continuous Wave Velocity	**Operating Range:** -30 fps to +30 fps (-9.1 m/s to +9.1 m/s)
	Resolution: 0.01 fps (0.003 m/s)
	Accuracy: +/- 0.04 fps (0.01 m/s) in velocities < 1 fps; +/- 2% of actual velocity in velocities > 1 fps (0.30 m/s) in uniform flow
Uplooking Ultrasonic Depth	Performs with rotation of up to 15 degrees from the center of the invert; up to 30 degrees rotation with Silt Mount Adapter
	Operating Range: 1.0 in (25 mm) to 5 ft (152 cm)
	Resolution: 0.01 in (0.254 mm)
	Accuracy: 0.5% of reading or 0.125 in (3.2 mm), whichever is greater
Pressure Depth	**Operating Range Option:** 0 - 05 PSI up to 11.5 ft (3.5 m) 0 - 15 PSI up to 34.5 ft (10.5 m) 0 - 30 PSI up to 69 ft (21.0 m)
	Resolution: 0.01 in (0.25 mm)
	Accuracy: +/-1.0% of full scale



Surface Combo Sensor

This sensor features four technologies including surface velocity, ultrasonic depth, surcharge continuous wave velocity, and pressure depth.

Dimensions	**Height:** 2.45 in (62 mm), **Width:** 2.03 in (52 mm), **Length:** 10.61 in (269 mm)
Surface Velocity	**Minimum air range:** 3 in (76 mm) from bottom of rear, descended sensor
	Maximum air range: 42 in (107 cm)
	Range: 1.00 to 15 fps (0.30 to 4.57 m/s)
	Resolution: 0.01 fps (0.003 m/s)
	Accuracy: +/-0.25 fps (0.08 m/s) or 5% of actual reading (whichever is greater) in flow velocities between 1.00 and 15 fps (0.30 and 4.57 m/s)
Ultrasonic Depth	**Minimum dead band:** 1.0 in (25.4 mm) from the face of the sensor or 5% of the maximum range, whichever is greater
	Maximum operating air range: 10 ft (3.05 m)
	Resolution: 0.01 in (0.25 mm)
	Accuracy: +/-0.125 in (3.2 mm) with 0.0 in (0 mm) drift, compensating for variations in air temperature
Surcharge Continuous Wave Velocity	*When submerged, this technology provides the same accuracy and range as Continuous Wave Velocity for Peak Combo Sensor*
Surcharge Pressure Depth	*When submerged, this technology provides the same accuracy and range as Pressure Depth for Peak Combo Sensor*

The **Ultrasonic Depth Sensor** version of this sensor specializes in depth measurement. This non-intrusive, zero-drift sensing method results in stable, accurate, and reliable flow depth calculation. Two independent ultrasonic transducers allow for independent cross-checking.

TRITON+®
Flow Meter Specifications

Connectors	U.S. Military specification MIL-C 26482 series 1, for environmental sealing, with gold-plated contacts
Communication	Third-party, FCC/IC/EC- and carrier-approved wireless modem
	Compatible with 4G LTE-M networks worldwide with 2G fallback (where available)
	Automatically detects installed SIM upon boot up to determine correct network
	Modem FCCID: R17ME910C1WW
Monitor Interfaces	Supports simultaneous interfaces with up to two combo sensors
	Supports optional Analog and Digital I/O with ADS XIO: two 4-20 mA inputs and outputs, two switch inputs and two relay outputs
Power	**Internal** - Battery life with a cellular modem: • Over 15 months at a 15-minute sample rate* • Over 6 months at a 5-minute sample rate*
	External - Optional external power available with ADS External Power and Communications Unit (ExPAC) with an ADS- or customer-supplied 9-36 Volt DC power supply
	* Rate based on collecting data once a day and varies according to sensor configuration and operating temperature
Connectivity	**Modbus ASCII:** Wireless; Wired using ADS ExPAC or XBUS
	Modbus RTU: Wireless; Wired using ADS ExPAC or XBUS
	Modbus TCP: Wireless only
Operating and Storage Temperature	-4 degrees to 140 degrees F (-20 degrees to 60 degrees C)
Compatibility	Attachable ADS Sensors
	Qstart™***XML*** with ***TRITON+***® firmware version 6.42 and higher
	PRISM™

Mounting Options	**Mount on the manhole rung** use standard hook (ADS p/n 8000-0021)
	Mount permanently to the manhole wall use monitor mounting bracket/flange (ADS p/n I40-0009)
	Mount to the manhole rim use monitor bracket/flange (ADS p/n I40-0009)
Intrinsic Safety Certifications	**Certified under the ATEX** European Intrinsic Safety standards for Zone 0 rated hazardous areas
	Certified under IECEx (International Electrotechnical Commission) Intrinsic Safety Standards for use in Zone 0 rated hazardous areas (equivalent to Class I, Division 1, Groups C & D)
	CSA Certified to Class 225803 Process Control Equipment, Intrinsically Safe and Non-Incendive Systems – For Zone 0 Hazardous Locations, Ex ia IIB T3 (152°C) in Canada
	CSA Certified to Class 225883 Process Control Equipment, Intrinsically Safe and Non-Incendive Systems – For Class I Zone 0 Hazardous Locations, AEx ia IIB T3 (152°C) in the USA (equivalent to Class I, Division 1, Groups C & D)
Other Certifications/ Compliances	FCC Part 15 and Part 68 compliant
	Carries the EU CE mark
	ROHS (lead-free) compliant
	Canada IC CS-03 compliant

Certificate No: 940056

Learn more about *TRITON+*
www.adsenv.com/triton

Call: 800.633.7246
Email: adssales@idexcorp.com

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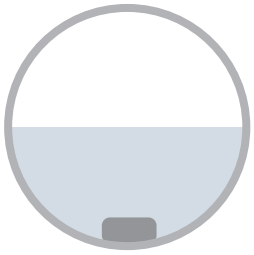
Specifications subject to change without notice.

TRITON+®
Sensor Specifications

The ADS® ***TRITON+***® features three depths and two velocities with five sensor options. Each sensor provides multiple technologies for continuous running of comparisons.

Peak Combo Sensor

This versatile and economical sensor includes three measurement technologies in a single housing: ADS-patented continuous wave *peak velocity, uplooking ultrasonic depth,* and *pressure depth*.



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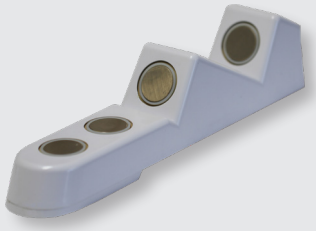
	Resolution: 0.01 in (0.25 mm)
	Accuracy: +/-1.0% of full scale



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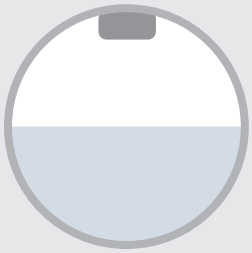
This sensor features four technologies including surface velocity, ultrasonic depth, surcharge continuous wave velocity, and pressure depth.



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Surface Velocity	**Minimum air range:** 3 in (76 mm) from bottom of rear, descended sensor
	Maximum air range: 42 in (107 cm)
	Range: 1.00 to 15 fps (0.30 to 4.57 m/s)
	Resolution: 0.01 fps (0.003 m/s)
	Accuracy: +/-0.25 fps (0.08 m/s) or 5% of actual reading (whichever is greater) in flow velocities between 1.00 and 15 fps (0.30 and 4.57 m/s)
Ultrasonic Depth	**Minimum dead band:** 1.0 in (25.4 mm) from the face of the sensor or 5% of the maximum range, whichever is greater
	Maximum operating air range: 10 ft (3.05 m)
	Resolution: 0.01 in (0.25 mm)
	Accuracy: +/- 0.125 in (3.2 mm) with 0.0 in (0 mm) drift, compensating for variations in air temperature
Surcharge Continuous Wave Velocity	*When submerged, this technology provides the same accuracy and range as Continuous Wave Velocity for Peak Combo Sensor*
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The **Ultrasonic Depth Sensor** version of this sensor specializes in depth measurement. This non-intrusive, zero-drift sensing method results in stable, accurate, and reliable flow depth calculation. Two independent ultrasonic transducers allow for independent cross-checking.

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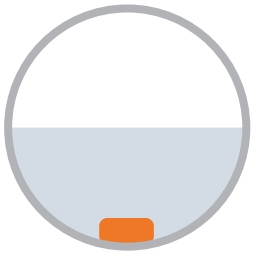
TRITON+® Sensors

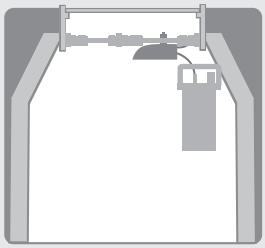
ADS® www.adsenv.com



AV|GATED®

This sensor combines proven depth measurement methods with state-of-the-art gated velocity measurement technology to provide accurate and reliable area-velocity measurements to calculate accurate sewer flow rate.

Dimensions	**Height:** 0.83 in (21 mm), **Width:** 1.50 in (38 mm), **Length:** 7.11 in (181 mm)
Weight	2 lbs (0.91 kg)
Operating Temperature	-4° to 140° F (-20° to 60° C)
Operating Range	**Ultrasonic Depth:** 1 in to 72 in (2.54 cm to 182.88 cm) **Pressure Depth (standard):** 0 in to 277 in at 10 psi (0 cm to 703.58 cm at 10 psi) **Velocity:** -20 fps to +20 fps (-6.10 m/s to +6.10 m/s); minimum depth for velocity = 5 in (12.70 cm)
Accuracy	**Ultrasonic Depth:** ±0.13 in (3.2 mm) or ±0.5% of flow depth; whichever is greater **Pressure Depth:** ±1% of full range **Velocity:** ±0.2 fps (0.06 m/s) or ±4% of average velocity; whichever is greater in uniform flow in velocities between -5 and +20 fps (-1.52 to 6.10 m/s)
Resolution	**Ultrasonic Depth:** 0.01 in (0.03 cm) **Pressure Depth:** 0.01 in (0.03 cm) **Velocity:** 0.01 fps (0.003 m/s)



Long Range Depth Sensor

A narrow, powerful ultrasonic beam allows this depth sensor to perform well over long ranges. Integral Submersion Sensor provides detection of flooding at the point of interest.

Dimensions	**Height:** 4.22 in (107.2 mm), **Width:** 4.40 in (111.8 mm), **Length:** 9.15 in (232.4 mm)
Long Range Ultrasonic Depth	**Minimum Dead Band:** 0.0 in (0.0 mm) from the bottom of sensor housing
	Maximum Operating Air Range: 20 ft (6.1 m)
	Beam Angle: +/- 3°
	Resolution: 0.01 in (0.24 mm)
	Accuracy: +/- 0.25% of sensor range measurement or 0.13 in (3.2 mm) whichever is greater, in a homogeneous temperature air column
	Drift: 0.0 in (0.0 mm)
	Temperature Compensation: Additional compensation for variable temperature air column supported
Submersion	Detects submersion when fully covered with liquid

INCLINOMETER

This sensor utilizes an integrated accelerometer to accurately determine the state of a flood gate's positioning in water control and management systems.

Dimensions	**Height:** 0.87 in (2.20 cm), **Width:** 2.03 in (5.16 cm), **Length:** 3.00 in (7.62 cm)
Housing	Solid molded ABS, high impact and abrasion resistant, fully sealed device
Weight	1.5 lbs (0.68 kg) including 25 ft communication cable and connector
Operating Range	0° to 90°
Accuracy	+/- 0.25 between 0° and 40°
Resolution	0° to 60° = 0.03°
	60° to 90° = 0.3°
Mounting Options	Mount on flat surface of the wastewater side of closed flood gate, or a closed door or hatch for intrusion alarms
	Construction adhesive, stainless steel screws, zip ties, stainless steel clamp

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B-3 – 2024 Sequence 4 Liner Reconstruction Certification

Charleston Office
500 Lee Street, East Street
Suite 700
Charleston, West Virginia 25301

T 304.926.8100
F 304.926.8180

July 15, 2024

Project C130109.27

Ms. Janine White
Project Manager
American Electric Power
One Riverside Plaza
Columbus, Ohio 43215

Sequence 4 Liner System Repair Certification
Sequence 4 Landfill Repair Construction
John E. Amos FGD Landfill
John E. Amos Plant
Winfield, West Virginia

Dear Ms. White:

GAI Consultants, Inc. (GAI) has prepared the compiled certification for the construction of the Sequence 4 Repair liner system at the John E. Amos Flue Gas Desulfurization Landfill (FGD Landfill). The compiled certification presents the signed and sealed Liner System Certification Statement, and the following individual liner system component certification reports (submitted separately).

- Groundwater Control and Subgrade – December 2023 (Attachment 1);
- Compacted Clay Liner - January 2024 (Attachment 2);
- PVC Geomembrane – February 2024 (Attachment 3);
- Leachate Collection System – March 2024 (Attachment 4);
- Protective Cover – Phase 1 – March 2024 (Attachment 5); and
- Protective Cover – Phases 2 and 3 – June 2024 (Attachment 6).

The certification reports for the individual components each contain a narrative describing the construction, the parties and their respective responsibilities, and the applicable design documents; a certification statement signed and sealed by the Quality Assurance Officer/Certifying Engineer; and appendices pertinent to the specific liner construction component, which typically include:

- Record Certification Drawings;
- Typical Construction Photographs;
- Laboratory Conformance and Performance Testing;
- Field Performance Testing; and
- Material Certifications.

The certification reports for the individual components have been submitted to the West Virginia Department of Environmental Protection, as required by regulation 33CSR1-4.5.d.7.

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Closure. This letter report compiles the documentation for certification of the Sequence 4 Liner Repair – Construction. The report contains each of the previously prepared and submitted certification reports for the individual liner system components, and the Liner System Certification Statement.

Sincerely,

GAI Consultants, Inc.

Charles F. Straley, PE

Digitally signed by Charles F. Straley, PE
DN: C=US, E=c.straley@gaiconsultants.com, O="GAI Consultants, Inc.", CN="Charles F. Straley, PE"
Date: 2024.07.22 10:12:55-04'00'

Charles F. Straley, P.E., P.L.S.
Quality Assurance Officer / Certifying Engineer
Director Engineering / Associate

James F. Shields

Digitally signed by James F. Shields
DN: E=j.shields@gaiconsultants.com, CN=James F. Shields
Date: 2024.07.22 10:37:04-04'00'

James F. Shields, P.E.
Engineering Manager

Attachments: GAI Consultants, Inc. Certification (with Drawing C130109-10-003-00-B2-008)
Attachment 1 – Groundwater Control and Subgrade Certification
Attachment 2 – Compacted Clay Liner Certification
Attachment 3 – PVC Geomembrane Certification
Attachment 4 – Leachate Collection System Certification
Attachment 5 - Protective Cover Phase 1 Certification
Attachment 6 – Protective Cover Phases 2 and 3 Certification

cc: Mr. Brian G. Palmer, P.E. – AEP
Ms. Marie C. Gildow – AEP

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GAI Consultants, Inc. Certification

Based on the construction testing and observations performed by American Electric Power (AEP) and GAI Consultants, Inc. (GAI) personnel, I hereby certify that the Liner System installation within Sequence 4 Repair at the Appalachian Power Company's John E. Amos Flue Gas Desulfurization (FGD) Landfill near Winfield, West Virginia (WV), as shown on Drawing C130109-10-003-00-B2-008, has been installed in substantial compliance with the material specifications and construction requirements listed in the WV National Pollutant Discharge Elimination System/Solid Waste Permit (NPDES WV0116254) documents; 40 Code of Federal Regulations Part 257 (the CCR Rule); and the "2023 Site Work Construction Sequence 4 Liner Repair" construction documents. This Liner System Certification encompasses the following components of the liner system:

- Groundwater Control and Subgrade;
- Compacted Clay Liner;
- PVC Geomembrane Liner;
- Leachate Collection System;
- Protective Cover – Phase 1; and
- Protective Cover – Phases 2 and 3.

The Contractor, Entact, provided survey data used to develop the Record Drawings and to verify that the liner system installation met the permit requirements.

This document clarifies "certification" for the installation of the liner system components within Sequence 4 Repair at the Amos FGD Landfill.

The definition of certify as used herein is: Certify means to state or declare a professional opinion of conditions whose true properties cannot be known at the time such certification was made, despite appropriate professional evaluation. A design professional's certification in no way relieves any other party from meeting requirements imposed by contract or other means, including commonly accepted industry practices.

Bearing the above in mind and based on the results of: (1) Certification from the material manufacturers and installation meeting the requirements of the Specifications, the CCR Rule, and the WV Department of Environmental Protection (WVDEP) permit; (2) results of field and laboratory testing; and (3) monitoring of construction efforts during the project; GAI's professional opinion is that the installations of the liner system within Sequence 4 of the Amos FGD Landfill meet the requirements as set forth by the permit documents and the CCR Rule.

Charles F. Straley, PE, PLS
Certifying Engineer and Quality Assurance Officer
PE #11842

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ATTACHMENT 1

GROUNDWATER CONTROL AND SUBGRADE CERTIFICATION

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Sequence 4 Liner Repair

Groundwater Control and Subgrade Certification

American Electric Power
John E. Amos Landfill
John E. Amos Power Plant
Winfield, West Virginia

GAI Project Number: C130109.27
December 2023

Prepared by: GAI Consultants, Inc.
Charleston Office
500 Lee Street East, Suite 700
Charleston, West Virginia 25301

Prepared for: American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215

Sequence 4 Liner Repair

Groundwater Control and Subgrade Certification

American Electric Power
John E. Amos Landfill
John E. Amos Power Plant
Winfield, West Virginia

GAI Project Number: C130109.27

December 2023

Prepared for:
American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215

Prepared by:
GAI Consultants, Inc.
Charleston Office
500 Lee Street East, Suite 700
Charleston, West Virginia 2530

Report Authors:

James F. Shields, PE (West Virginia)
Engineering Manager

Charles F. Straley, PE, PLS (West Virginia)
Quality Assurance Officer / Certifying Engineer
Director Engineering / Associate

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Figure 1 Site Plan

Appendix A As-Built Drawings
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23033A Top of Drainage Sequence 4 Certification Points Top of Drainage Layer
23033A Isolation Layer Sequence 4 Certification Points Isolation Layer
23033A Top Subgrade Sequence 4 Certification Points Top of Subgrade
Surveyed As-Built of the Underdrain Pipes
Appendix B Photographs of Construction Activities
Appendix C Groundwater Control Materials
Appendix C-I PVC Pipe
Appendix C-II Geotextile
Appendix D Compaction Records
Appendix D-I Laboratory Test Results
Appendix D-II Compaction Test Results

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GAI Consultants, Inc. Certification

Based on the construction testing and observations performed by American Electric Power (AEP) and GAI Consultants, Inc. (GAI) personnel, I hereby certify that the groundwater control and subgrade preparation within Sequence 4 Liner Repair at the Appalachian Power Company's John E. Amos Flue Gas Desulfurization (FGD) Landfill near Winfield, West Virginia (WV), as shown on Drawing 30204SH5 and 30204SH6, have been installed in substantial compliance with the material specifications and construction requirements listed in the WV National Pollutant Discharge Elimination System/Solid Waste Permit (NPDES WV0116254) documents, 40CFR257.70, and the 2023 Site Work Construction Sequence 4 Liner Repair construction documents. Exline Surveying Inc. survey personnel provided as-built survey Record Drawings, verifying that the subgrade elevations met the permit requirements, and establish the locations of the groundwater control system.

This document clarifies "certification" for the groundwater control and subgrade preparation construction within Sequence 4 Liner Repair at the Amos FGD Landfill.

The definition of certify as used herein is: Certify means to state or declare a professional opinion of conditions whose true properties cannot be known at the time such certification was made, despite appropriate professional evaluation. A design professional's certification in no way relieves any other party from meeting requirements imposed by contract or other means, including commonly-accepted industry practices.

Bearing the above in mind and based on the results of: (1) Certification from the material manufacturers and installation meeting the requirements of the specifications, the CCR Rule, and the WV Department of Environmental Protection (WVDEP) permit; (2) results of field testing; and (3) monitoring of construction efforts during the project; GAI's professional opinion is that the groundwater control and subgrade preparation construction within Sequence 4 Liner Repair of the Amos FGD Landfill meets the requirements as set forth by the permit documents and the CCR Rule.

Charles F. Straley, PE, PLS
Certifying Engineer and Quality Assurance Officer
PE #11842

1.0 Introduction

1.1 Project Description

This Groundwater Control and Subgrade Construction Certification Report documents the observations performed during the groundwater control drain installation and subgrade preparation for the Sequence 4 Liner Repair at American Electric Power's (AEP's) John E. Amos FGD Landfill (Landfill) in Winfield, West Virginia (WV). The location of Sequence 4 Liner Repair at the Amos Landfill is shown on Figure 1. Appendix A contains the As-Built Drawings for the construction. Appendix B contains typical construction photographs included in the daily reports. Construction of the Sequence 4 Liner Repair site described in this certification report consists of the following:

- Preparation of the foundation and installation of the rock blanket drain.
- Placement and compaction of the isolation soil layer.
- Placement and compaction of the soil structural fill to meet compacted clay liner subgrade elevations.

Construction of the groundwater control and subgrade in Sequence 4 Liner Repair began in September 2023 and was completed in November 2023. The area was constructed in accordance with the approved Quality Assurance/Quality Control (QA/QC) Plan; the Landfill's Solid Waste/National Pollutant Discharge Elimination System (NPDES) permit (Permit No. WV0116254); WV Department of Environmental Protection (WVDEP) Title 33, Series 1, Solid Waste Management rule; the Coal Combustion Residuals (CCR) Rule; and AEP's Civil Engineering Division Technical Specifications for Material Construction. Included in this report are the field information and the applicable Record Drawings in accordance with the WVDEP requirements. The construction QA (CQA) services performed by GAI are discussed in the following sections.

1.2 Companies and Personnel

The key companies and personnel involved with the groundwater control and subgrade construction of Sequence 4 are listed below.

AEP - Owner
Appalachian Power Company - Operator

Janine White, Project Manager
Brian Palmer, P.E., Principal Civil Engineer
David Fry, Lead Construction Coordinator

GAI Consultants Inc. (GAI) – CQA/Soil Testing

Charles Straley, P.E., P.S., Certifying Engineering, QA Officer (QAO) and Director Engineering
John Klamut, P.E., Project Manager
James Shields, P.E., Lead QC Inspector (QCI)

Entact, LLC.(Entact) - Earthwork Contractor

Jonathan Lovenduski, Project Manager
Eric Cline, Superintendent

1.3 Scope of Services

1.3.1 Preconstruction Activities

Preconstruction activities conducted by GAI personnel consisted of the following:

1. Attended a preconstruction meeting;
2. Inspected material to be used for groundwater control;

3. Reviewing manufacturer's/supplier's information that materials met project and permit specifications; and
4. Collected soil samples for laboratory analysis.

1.3.2 Construction Documentation Activities

Construction documentation activities performed by GAI personnel included the following:

1. Observed and documented the installation of the groundwater control drain components;
2. Observed and documented the structural fill soil material;
3. Observed and documented the subgrade surface conditions prior to the placement of the compacted clay liner;
4. Prepared daily field reports and documented construction activities. GAI also attended daily health and safety meetings, weekly project update meetings, and monthly contractor's meetings, as well as other supplemental meetings, when needed; and
5. Provided photo documentation throughout the construction showing typical construction procedures (see Appendix B).

1.3.3 Record Drawings and Certification Report

Documentation and certification activities performed by the QA/QC team included the following:

1. Exline Surveying Inc. provided surveying services for the As-Built Drawings (see Appendix A). As-Built Drawing Bottom of Excavation depicts the bottom of excavation and bottom of drainage layer. As-Built Drawing Top of Drainage depicts the top of the drainage layer and bottom of structural fill. As-Built Drawing Isolation Layer depicts top of the structural fill and bottom of the subgrade layer. As-Built Drawing Top of Subgrade depicts the top of the subgrade layer which is the subbase for the compacted clay layer. As-Built Drawing Surveyed As-Built of the Underdrain Pipes provides the location of the underdrain pipes..
2. GAI personnel performed the construction documentation activities discussed in Sections 1.3.1 and 1.3.2 of this report.
3. Project personnel observed the construction activities and provided the enclosed information documenting that the construction activities were performed consistent with the design and permit requirements.

1.4 Construction Schedule

Site clearing, damaged liner removal, and excavation were performed prior to groundwater control and fill placement. Final groundwater control and subgrade preparation began in the September of 2023 and was completed in November 2023.

1.5 Reference Documents

The plans, specifications, and QA requirements for the construction activities and materials used by GAI personnel for this project are as follows:

1. Solid Waste/NPDES Permit No. WV0116254.
2. AEP Civil Engineering Division, Technical Specifications for Material and Construction (prepared by AEP), and Addenda to the Technical Specifications (prepared by GAI).

3. "Quality Assurance and Quality Control Plan, Sequence 4 Liner Repair" for the Appalachian Power Company John E. Amos Plant's Amos FGD Landfill (revised June 2022, prepared by GAI).
4. Amos FGD Landfill Sequence 4 Liner Repair Construction Drawings (issued for construction March 2023 and revised September 2023, prepared by GAI)

2.0 Foundation Preparation/Groundwater Control

Foundation preparation for the Landfill facility included installation of an aggregate blanket drain, groundwater control pipes, structural fill and subgrade preparation for the compacted clay liner. Activities were monitored daily by the QCI Team and AEP field personnel.

2.1 Groundwater Control

The groundwater controls were installed per the drawings. Additional controls, consisting of pipes and aggregate envelopes, were installed to collect seeps encountered during construction. The groundwater control components are shown on the construction drawings.

QA documentation for the groundwater control drain installation included the following:

1. Reviewed manufacturer's certification of material properties for the perforated pipes (Appendix C-I).
2. Reviewed manufacturer's certification of material properties for the geotextile wrap (Appendix C-II).
3. Observations and surveys to document that the pipe was bedded, placed, and backfilled per specifications (observed by GAI and AEP, surveyed by Entact).

The groundwater control piping network consists of 12-inch-diameter perforated C900 PVC header pipes that are generally oriented along the center of the valley floor, and four-inch-diameter C900 PVC pipe laterals, as needed, connected to the header pipes. The pipes were embedded in an envelope of AASHTO #57 non-calcareous stone, per the construction documents.

The groundwater control pipes and aggregate were wrapped with non-woven geotextile to minimize fine-grained soils from infiltrating and clogging the drainage system. An aggregate blanket drain was placed directly over the drain to provide a stable surface for the overlying structural fill and compacted clay liner.

The aggregate blanket drain consisted of R-3 riprap.

The groundwater controls installed for Sequence 4 Liner Repair connect to the existing underdrain trunk system for the Sequence 4.

2.2 Compacted Clay Liner Subgrade

The subgrade was visually observed and inspected to demonstrate that the subgrade was structurally stable for subsequent placement of the overlying compacted clay liner. Field personnel observed the area after structural fill placement and prior to placement of the compacted clay liner. Where soft or excessively wet foundation material was observed, the subgrade was over-excavated to a firm competent elevation and the surface was cleaned to allow the area to be backfilled with acceptable material.

Structural fill was placed to the grade lines, per the plan, by a series of vertical lifts of 12-inch thickness. The structural fill primarily consisted of a "rock soil", particularly a non-cohesive heterogenous sandstone mixed with sandy/clay materials. This structural fill material was placed in accordance with the Construction Documents and AEP standard technical specifications CE-005 and CE-006. Per these specifications. Nuclear gauge test(s) were used to confirm that the lift compaction conformed to

specifications. The construction was also visually observed and inspected to demonstrate that the subgrade was structurally stable.

Compacted lifts received passing test results. The laboratory test results and summary of compaction tests are included in Appendix D.

Entact and Exline Surveying performed surveys to establish that the as-built excavation, blanket drain, and subgrade (i.e., base of compacted clay liner) elevations was within the specified tolerance to the design subgrade elevations within the Sequence 4 Liner Repair limits. Appendix A contains the As-Built Drawings for the excavation, blanket drain, and subgrade surface.

3.0 Summary

The construction work documented in this report was completed in accordance with the design and specifications presented in the applicable WVDEP Solid Waste/NPDES Permit (No. WV0116254), the CCR Rule, and the construction documents listed in this report. The field activities documented in this report represent the CQA services provided for the groundwater control drain installation and subgrade preparation for construction of Sequence 4 Liner Repair at the Landfill.

FIGURE

AMOS FGD LANDFILL

05786\Desktop\SURVEYS\vacinity map.jpg

JOHN AMOS PLANT

BLUE LICK ROAD

BELLS CREEK ROAD

VICINITY MAP
(NOT TO SCALE)

AMOS LANDFILL CONTROL MONUMENTS
DATUM: NAD83/88 WV S - GEOID03

PT.	NORTH	EAST	ELEVATION	
1	539375.6400	1727964.6500	649.2400	MONUMENT
5	541953.8200	1725476.5700	979.7500	MONUMENT
6	540672.8190	1722790.9030	926.9120	MONUMENT
7	540251.9820	1728194.8480	954.4330	MONUMENT
5077	540828.3700	1725256.7600	939.6500	
5104	539496.9700	1728326.1600	618.8900	
15 2012 BASE AT OFFICE	540947.1150	1725381.9170	929.596	Bottom of Antenna Mount
BASE ACROSS HILL	540874.0200	1722784.0800	933.0950	Base 25001 Bottom of Antenna Near Stockpile #6

GRAPHIC SCALE
200' 100' 0 200'
1 INCH = 200 FEET

NORTH MERIDIAN REFERENCED TO STATE PLANE COORDINATES (W.V. SOUTH)

FIGURE 1
SITE PLAN
SEQUENCE 4 LANDFILL
CONSTRUCTION

LEGEND
- EXISTING 4" UNDERDRAIN
- EXISTING 12" UNDERDRAIN
- OVERHEAD ELECTRIC
- SURVEYED PROPERTY LINES
- DIVERSION DITCHES
- EXISTING SEDIMENT TRAPS
- STONE FILTERS
- SILT FENCE
- CELL 3 CAP LIMITS
- EXISTING SEDIMENT TRAPS, DITCHES OR SPILLWAYS WITH STONE BOTTOM
- LIVING WEIRS
- FLOC LOG
- FLOW CHECK
- COMPOST LOG
- straw wattle
- 765kv location
- smart fence

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APPALACHIAN POWER CO.

JOHN E. AMOS PLANT

WINFIELD WEST VIRGINIA

JOHN E. AMOS FGD LANDFILL
EROSION & SEDIMENT CONTROL
DETAILS

NAD 83/NAVD 88 W.V. SOUTH

Drawing Name:	Amos Asbuilt
SCALE:	1"=200'
Revision Date:	JULY 10, 2019
Surveyed By:	C.Sheppard
Drawn By:	C.Sheppard

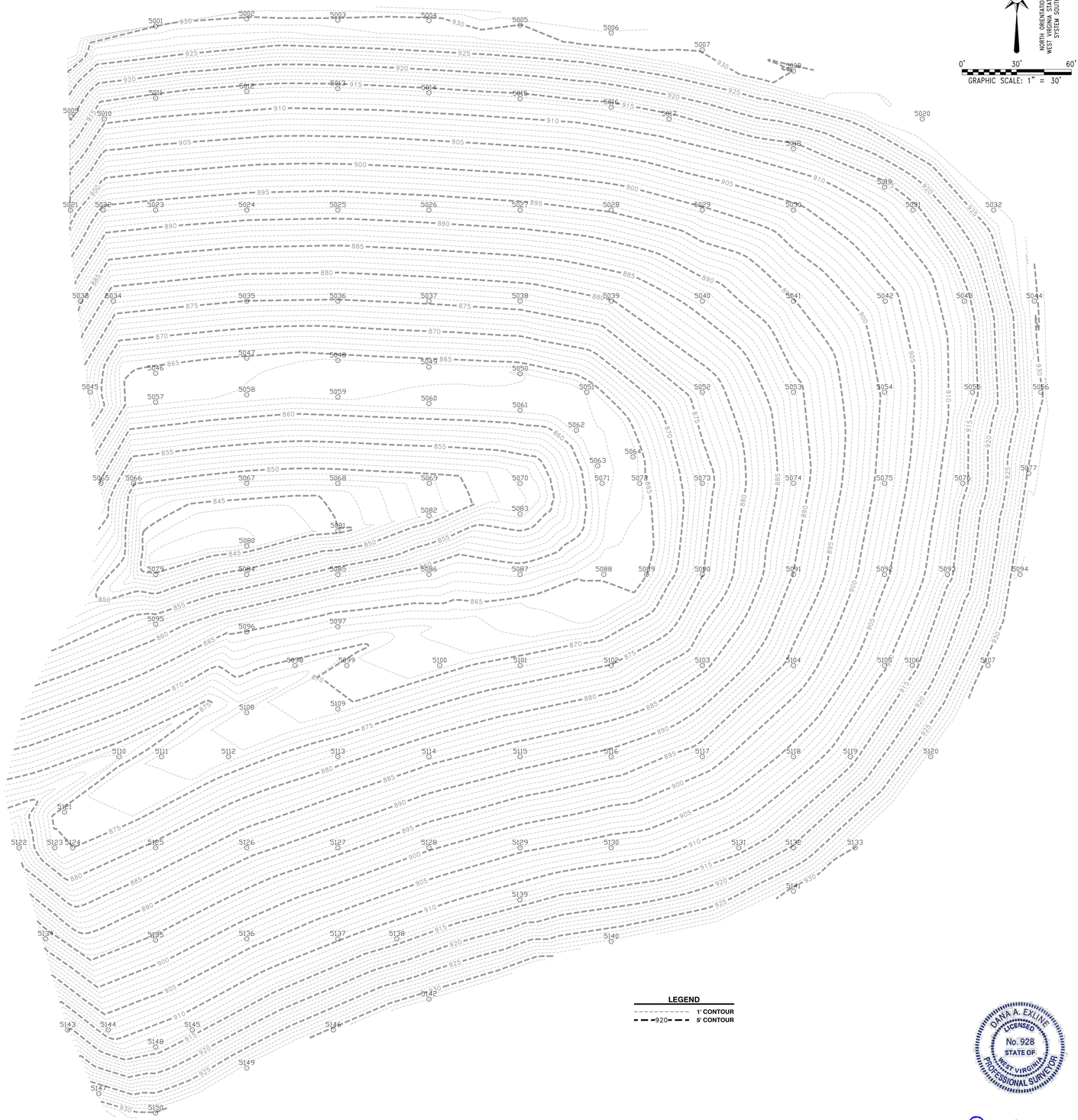
AEP AMERICAN ELECTRIC POWER
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

APPENDIX A
As-Built Drawings

gai consultants
transforming ideas into reality

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	DESIGN ELEV	DEPTH
5001	542300.87	1724850.00	929.99	932.94	2.96
5002	542304.93	1724900.00	929.70	932.20	2.50
5003	542304.20	1724949.95	929.71	932.18	2.48
5004	542304.01	1725000.01	929.38	933.15	3.77
5005	542301.49	1725049.99	929.97	933.61	3.64
5006	542297.23	1725100.03	930.90	933.46	2.56
5007	542287.94	1725149.99	930.07	934.00	3.93
5008	542276.33	1725200.04	929.99	934.00	4.01
5009	542251.57	1724803.50	920.77	920.74	-0.02
5010	542250.00	1724821.80	910.80	910.66	-0.14
5011	542261.52	1724850.00	913.51	913.41	-0.10
5012	542265.20	1724899.96	913.36	913.21	-0.15
5013	542266.68	1724950.01	913.71	913.53	-0.18
5014	542264.41	1725000.01	913.70	913.52	-0.18
5015	542261.08	1725049.98	913.49	913.50	0.01
5016	542256.47	1725099.98	913.66	913.50	-0.16
5017	542250.00	1725131.79	913.51	913.50	-0.01
5018	542233.69	1725199.98	913.57	913.51	-0.05
5019	542212.56	1725250.01	913.57	913.57	0.00
5020	542249.96	1725270.73	928.20	934.00	5.80
5021	542200.03	1724803.21	901.87	903.70	1.83
5022	542200.02	1724821.19	894.15	894.09	-0.07
5023	542200.03	1724849.99	893.19	893.04	-0.14
5024	542200.01	1724900.00	891.88	891.72	-0.15
5025	542200.01	1724949.98	891.58	891.44	-0.14
5026	542200.02	1724999.98	892.33	892.16	-0.17
5027	542200.01	1725050.02	893.41	893.33	-0.08
5028	542199.99	1725100.02	895.33	895.27	-0.06
5029	542199.98	1725149.97	899.44	899.38	-0.06
5030	542199.97	1725199.98	903.84	903.80	-0.04
5031	542200.02	1725265.62	913.49	913.63	0.14
5032	542200.00	1725309.90	927.34	930.10	2.76
5033	542150.03	1724808.79	885.43	886.92	1.49
5034	542150.00	1724826.80	877.35	877.31	-0.04
5035	542149.96	1724900.02	874.92	874.90	-0.02
5036	542150.01	1724950.00	874.68	874.63	-0.04
5037	542150.00	1725000.00	875.49	875.42	-0.07
5038	542149.99	1725050.01	876.59	876.53	-0.05
5039	542149.98	1725100.02	879.76	879.70	-0.06
5040	542150.02	1725150.02	886.63	886.65	0.01
5041	542149.97	1725200.02	894.80	894.83	0.03
5042	542149.99	1725250.35	903.16	903.15	-0.01
5043	542150.02	1725293.80	913.37	913.52	0.15
5044	542150.00	1725332.19	929.46	932.00	2.54
5045	542100.02	1724814.05	872.52	873.81	1.29
5046	542110.38	1724850.01	864.61	864.52	-0.09
5047	542118.72	1724900.01	864.39	864.23	-0.15
5048	542117.46	1724950.03	863.93	863.74	-0.19
5049	542113.81	1725000.01	863.39	863.25	-0.14
5050	542110.18	1725049.98	862.90	862.75	-0.15
5051	542099.99	1725086.56	863.03	862.86	-0.17
5052	542100.04	1725150.02	877.08	877.13	0.05
5053	542099.99	1725199.96	888.67	888.70	0.03
5054	542100.00	1725250.02	900.61	900.50	-0.11
5055	542100.00	1725298.26	913.67	913.51	-0.17
5056	542100.00	1725335.81	929.65	932.00	2.35
5057	542094.56	1724850.00	864.12	864.34	0.22
5058	542098.65	1724899.98	863.81	863.84	0.03
5059	542097.44	1724950.00	863.15	863.33	0.18
5060	542093.77	1725000.00	862.60	862.83	0.24
5061	542090.13	1725050.01	862.36	862.33	-0.03
5062	542079.18	1725080.89	862.47	862.52	0.05
5063	542059.61	1725092.57	862.54	862.74	0.21
5064	542064.57	1725111.94	863.34	863.14	-0.20
5065	542049.99	1724819.98	859.39	859.47	0.08
5066	542049.99	1724837.99	850.10	850.00	-0.10
5067	542050.00	1724899.99	847.68	847.70	0.02
5068	542049.98	1724950.04	847.35	847.17	-0.18
5069	542049.99	1725000.20	848.79	848.96	0.16
5070	542050.01	1725050.02	852.15	852.01	-0.14
5071	542050.00	1725095.01	862.84	863.04	0.20
5072	542050.00	1725115.63	863.76	863.59	-0.16
5073	542049.98	1725149.99	873.09	873.06	-0.03
5074	542049.97	1725200.00	887.51	887.45	-0.06
5075	542049.98	1725250.04	901.59	901.52	-0.07

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	DESIGN ELEV	DEPTH
5076	542050.03	1725292.90	913.67	913.51	-0.15
5077	542055.54	1725328.92	930.29	930.16	-0.13
5078	N/A	N/A	N/A	N/A	N/A
5079	541999.97	1724850.00	845.37	846.39	1.02
5080	542015.63	1724900.01	843.29	843.63	0.34
5081	542023.96	1724949.98	844.32	845.59	1.26
5082	542032.31	1725000.00	848.22	848.86	0.64
5083	542033.27	1725050.05	852.42	852.30	-0.12
5084	542000.01	1724899.99	851.48	851.29	-0.19
5085	542000.01	1724950.04	857.24	857.10	-0.14
5086	541999.99	1725000.00	861.31	864.42	3.11
5087	542000.00	1725049.97	861.74	861.86	0.12
5088	541999.97	1725095.95	864.90	864.83	-0.07
5089	542000.01	1725119.44	864.97	864.87	-0.10
5090	541999.97	1725149.98	874.83	874.91	0.08
5091	542000.01	1725200.00	890.09	890.09	0.00
5092	542000.01	1725250.00	904.27	904.30	0.04
5093	542000.01	1725284.53	913.67	913.50	-0.17
5094	542000.01	1725324.37	930.81	931.37	0.56
5095	541972.62	1724849.98	857.43	859.78	2.35
5096	541968.53	1724900.01	865.07	866.74	1.67
5097	541971.30	1724950.03	867.07	871.01	3.94
5098	541950.00	1724926.51	870.85	875.37	4.52
5099	541950.00	1724954.89	869.48	869.35	-0.13
5100	541950.01	1725005.81	868.47	868.35	-0.12
5101	541949.96	1725049.99	871.80	871.79	-0.02
5102	541949.97	1725099.97	875.17	875.15	-0.02
5103	541950.00	1725149.96	883.88	884.08	0.19
5104	541950.01	1725199.98	896.47	896.46	-0.01
5105	541950.02	1725249.97	909.60	909.56	-0.04
5106	541950.03	1725265.20	913.65	913.51	-0.14
5107	541950.04	1725306.77	930.60	931.03	0.43
5108	541924.18	1724899.98	871.28	871.22	-0.07
5109	541926.17	1724950.02	870.35	870.17	-0.18
5110	541900.00	1724829.89	876.54	878.24	1.70
5111	541899.99	1724853.27	872.78	872.68	-0.10
5112	541900.03	1724889.99	872.24	872.13	-0.10
5113	541899.99	1724950.00	878.43	878.47	0.04
5114	541900.04	1724999.99	883.55	883.55	0.01
5115	541900.01	1725049.98	887.74	887.75	0.01
5116	541899.99	1725100.02	891.49	891.36	-0.13
5117	541900.03	1725149.96	897.37	897.32	-0.05
5118	541900.00	1725200.01	906.58	906.54	-0.03
5119	541900.00	1725231.23	913.37	913.51	0.14
5120	541900.04	1725275.36	929.32	930.96	1.63
5121	541869.59	1724800.00	874.51	874.45	-0.06
5122	541849.99	1724774.97	883.60	884.51	0.91
5123	541850.00	1724794.71	875.29	875.12	-0.17
5124	541850.02	1724804.48	875.02	874.91	-0.12
5125	541850.02	1724849.99	881.09	880.98	-0.11
5126	541850.01	1724900.02	888.31	888.23	-0.08
5127	541849.97	1724950.02	893.75	894.23	0.49
5128	541849.98	1725000.04	899.53	899.45	-0.08
5129	541849.98	1725049.97	904.16	904.06	-0.10
5130	541850.00	1725100.02	907.31	907.30	-0.01
5131	541850.00	1725169.92	913.50	913.50	0.00
5132	541850.01	1725200.00	920.50	920.75	0.25
5133	541850.01	1725233.87	930.01	930.80	0.79
5134	541800.01	1724789.59	897.34	898.50	1.16
5135	541799.27	1724850.00	895.92	896.00	0.08
5136	541799.99	1724899.99	903.23	903.40	0.17
5137	541800.01	1724950.01	909.64	910.04	0.40
5138	541800.02	1724982.37	913.56	913.50	-0.06
5139	541821.50	1725049.87	913.36	913.49	0.14
5140	541798.52	1725099.98	928.41	929.53	1.11
5141	541826.12	1725200.05	930.12	930.19	0.06
5142	541766.92	1725000.02	932.01	931.95	-0.06
5143	541750.02	1724801.73	914.88	915.35	0.47
5144	541750.00	1724824.05	907.92	907.87	-0.05
5145	541750.03	1724870.07	913.58	913.59	0.01
5146	541749.99	1724947.50	930.36	931.73	1.38
5147	541715.09	1724818.76	927.89	927.87	-0.01
5148	541740.65	1724850.00	913.22	913.33	0.11
5149	541729.12	1724900.00	929.95	930.00	0.05
5150	541704.41	1724850.01	930.23	930.76	0.53



DANA A. EXLINE LICENSED No. 928 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

DANA A. EXLINE
PROFESSIONAL SURVEYOR #928
STATE OF WEST VIRGINIA
DATE: 10/09/23

REV.	DESCRIPTION	DATE
0	BOTTOM OF EXCAVATION	9-12-23

EXLINE SURVEYING, INC.
10356 STATE ROUTE 139
JACKSON, OHIO 45640
PHONE: (740) 286-7024 • TELECOPIER (740) 286-0012

CERTIFICATION POINTS
FOR
ENTACT, LLC

SEQUENCE 4
CERTIFICATION POINTS
BOTTOM OF EXCAVATION
JOHN E. AMOS PLANT
WINFIELD, WEST VIRGINIA

DRAWING SCALE: 1" = 30'

TITLE RESEARCH: N/A

CALCULATED BY: P. TAYLOR

DRAWN BY: P. TAYLOR

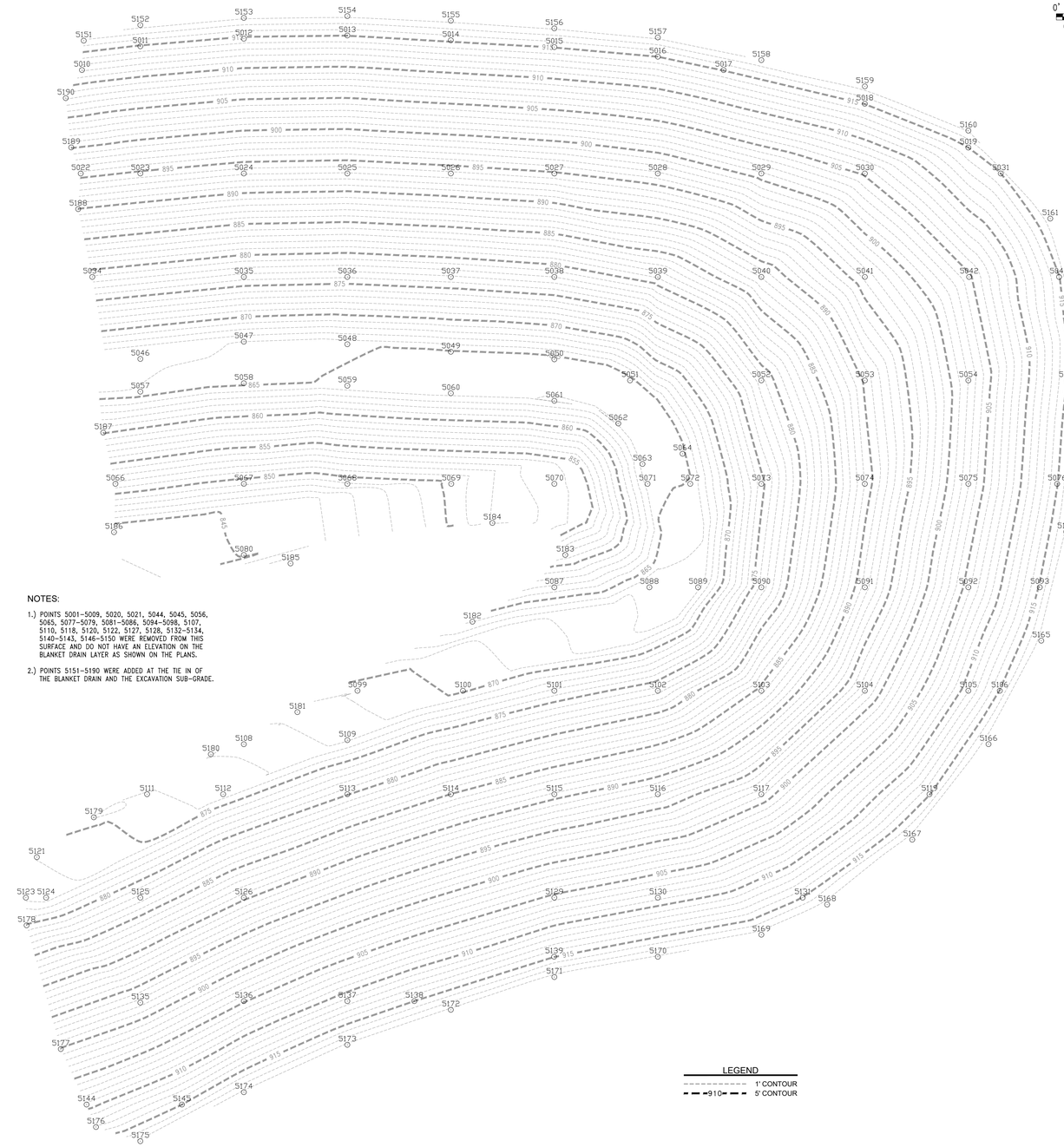
CHECKED BY: D. EXLINE

DRAWING NUMBER: 23033A BOTTOM OF EXCAVATION

SHEET NUMBER: 1 OF 1

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	BOTTOM EXCAVATION ASBUILT	DEPTH BETWEEN LAYERS
5010	542249.99	1724821.77	912.13	910.80	1.33
5011	542261.51	1724850.00	914.85	913.51	1.34
5012	542265.20	1724900.02	914.70	913.36	1.34
5013	542266.71	1724950.03	915.03	913.71	1.33
5014	542264.40	1725000.00	915.24	913.70	1.54
5015	542261.10	1725050.00	915.07	913.49	1.58
5016	542256.50	1725100.02	915.02	913.66	1.36
5017	542250.01	1725131.79	915.09	913.51	1.58
5018	542233.70	1725200.04	915.05	913.57	1.49
5019	542212.56	1725249.98	915.01	913.57	1.44
5022	542200.00	1724821.22	895.71	894.15	1.56
5023	542200.05	1724850.00	894.65	893.19	1.46
5024	542200.00	1724899.98	893.15	891.88	1.27
5025	542200.00	1724950.03	892.87	891.58	1.29
5026	542199.99	1724999.99	893.70	892.33	1.36
5027	542200.04	1725050.04	894.79	893.41	1.38
5028	542200.01	1725100.04	896.76	895.33	1.44
5029	542200.07	1725150.04	900.83	899.44	1.39
5030	542199.97	1725199.99	905.22	903.84	1.38
5031	542200.02	1725265.63	915.00	913.49	1.52
5034	542150.01	1724826.82	878.82	877.35	1.48
5035	542150.04	1724900.02	876.47	874.92	1.55
5036	542149.95	1724950.05	876.08	874.68	1.40
5037	542149.94	1725000.02	876.81	875.49	1.32
5038	542149.96	1725049.97	877.98	876.59	1.39
5039	542150.00	1725100.01	881.13	879.76	1.38
5040	542150.03	1725150.01	888.08	886.63	1.44
5041	542149.95	1725199.97	896.23	894.80	1.43
5042	542150.07	1725250.40	904.70	903.16	1.54
5043	542149.98	1725293.82	914.92	913.37	1.54
5046	542110.42	1724850.02	866.17	864.61	1.56
5047	542118.73	1724900.00	866.00	864.39	1.62
5048	542117.47	1724950.01	865.34	863.93	1.41
5049	542113.84	1725000.00	864.85	863.39	1.47
5050	542110.19	1725050.00	864.42	862.90	1.52
5051	542100.00	1725086.61	864.47	863.03	1.44
5052	542100.04	1725149.97	878.59	877.08	1.51
5053	542100.00	1725200.02	890.28	888.67	1.61
5054	542100.05	1725249.99	902.02	900.61	1.40
5055	542099.99	1725298.26	915.21	913.67	1.54
5057	542094.58	1724850.08	865.78	864.12	1.66
5058	542098.60	1724900.09	865.31	863.81	1.50
5059	542097.47	1724950.02	864.72	863.15	1.58
5060	542093.81	1725000.04	864.30	862.60	1.71
5061	542090.14	1725050.04	863.93	862.36	1.57
5062	542079.23	1725080.86	863.98	862.47	1.51
5063	542059.58	1725092.58	864.44	862.54	1.90
5064	542064.51	1725111.95	864.62	863.34	1.28
5066	542050.02	1724837.96	851.68	850.10	1.59
5067	542049.96	1724900.00	849.13	847.68	1.45
5068	542049.99	1724950.05	848.89	847.35	1.54
5069	542050.02	1725000.23	850.39	848.79	1.60
5070	542050.00	1725050.09	853.48	852.15	1.33
5071	542049.99	1725095.04	864.48	862.84	1.64
5072	542050.03	1725115.66	865.11	863.76	1.36
5073	542050.02	1725150.02	874.53	873.09	1.44
5074	542050.00	1725200.02	889.05	887.51	1.54
5075	542050.01	1725250.05	902.92	901.59	1.33
5076	542050.04	1725292.92	914.92	913.67	1.26
5080	542015.63	1724900.02	845.10	843.29	1.81
5087	542000.00	1725049.96	863.30	861.74	1.56
5088	542000.01	1725095.92	866.50	864.90	1.60
5089	542000.00	1725119.43	866.63	864.97	1.66
5090	542000.03	1725150.07	876.35	874.83	1.52
5091	541999.96	1725200.02	891.48	890.09	1.39
5092	541999.99	1725250.01	905.70	904.27	1.43
5093	541999.93	1725284.57	915.21	913.67	1.54
5099	541949.97	1724954.91	870.91	869.48	1.43
5100	541950.03	1725005.89	869.78	868.47	1.31
5101	541950.02	1725049.97	873.26	871.80	1.45
5102	541950.01	1725099.99	876.56	875.17	1.39

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	BOTTOM EXCAVATION ASBUILT	DEPTH BETWEEN LAYERS
5103	541950.02	1725150.00	885.57	883.88	1.68
5104	541949.95	1725200.00	897.91	896.47	1.44
5105	541950.06	1725250.04	910.95	909.60	1.35
5106	541949.99	1725265.15	915.06	913.65	1.41
5108	541924.17	1724899.97	872.71	871.28	1.43
5109	541926.14	1724950.01	871.85	870.35	1.50
5111	541900.01	1724853.24	874.08	872.78	1.30
5112	541900.04	1724890.04	873.78	872.24	1.55
5113	541899.97	1724950.01	879.90	878.43	1.47
5114	541900.04	1725000.00	885.02	883.55	1.48
5115	541899.97	1725050.02	889.23	887.74	1.48
5116	541900.00	1725100.04	892.75	891.49	1.26
5117	541899.97	1725149.97	898.72	897.37	1.35
5119	541899.96	1725231.18	914.90	913.37	1.53
5121	541869.59	1724800.00	875.96	874.51	1.46
5123	541850.00	1724794.69	876.55	875.29	1.26
5124	541850.00	1724804.47	876.41	875.02	1.39
5125	541849.98	1724850.00	882.39	881.09	1.31
5126	541850.02	1724899.97	889.64	888.31	1.33
5129	541849.97	1725050.01	905.58	904.16	1.42
5130	541849.99	1725099.97	908.69	907.31	1.38
5131	541849.97	1725169.92	915.09	913.50	1.60
5135	541799.31	1724850.01	897.50	895.92	1.58
5136	541800.00	1724900.02	904.82	903.23	1.59
5137	541800.04	1724950.05	911.42	909.64	1.79
5138	541800.00	1724982.33	915.00	913.56	1.44
5139	541821.48	1725049.85	914.95	913.36	1.60
5144	541750.01	1724824.01	909.24	907.92	1.33
5145	541750.01	1724870.07	914.99	913.58	1.41
5151	542264.25	1724822.65	916.84	N/A	N/A
5152	542271.71	1724849.98	918.49	N/A	N/A
5153	542275.17	1724899.98	918.13	N/A	N/A
5154	542276.05	1724949.97	918.22	N/A	N/A
5155	542273.84	1725000.03	918.25	N/A	N/A
5156	542270.15	1725049.98	918.12	N/A	N/A
5157	542265.77	1725099.99	918.22	N/A	N/A
5158	542254.80	1725149.96	917.96	N/A	N/A
5159	542242.07	1725199.99	917.57	N/A	N/A
5160	542220.66	1725250.02	917.06	N/A	N/A
5161	542178.25	1725289.51	916.63	N/A	N/A
5162	542124.02	1725305.18	916.97	N/A	N/A
5163	542075.83	1725302.50	917.07	N/A	N/A
5164	542026.89	1725297.31	917.21	N/A	N/A
5165	541974.16	1725285.22	917.47	N/A	N/A
5166	541924.17	1725259.73	917.89	N/A	N/A
5167	541878.05	1725222.85	917.72	N/A	N/A
5168	541846.72	1725181.79	917.54	N/A	N/A
5169	541832.10	1725150.00	917.58	N/A	N/A
5170	541821.40	1725099.98	918.18	N/A	N/A
5171	541811.64	1725049.99	918.44	N/A	N/A
5172	541795.80	1724999.96	918.27	N/A	N/A
5173	541778.88	1724950.03	918.25	N/A	N/A
5174	541756.01	1724900.05	918.29	N/A	N/A
5175	541732.34	1724850.00	917.29	N/A	N/A
5176	541739.20	1724828.60	913.18	N/A	N/A
5177	541776.82	1724811.62	900.18	N/A	N/A
5178	541836.63	1724795.06	880.17	N/A	N/A
5179	541888.81	1724827.46	873.88	N/A	N/A
5180	541919.35	1724884.04	873.13	N/A	N/A
5181	541939.68	1724925.84	871.25	N/A	N/A
5182	541983.37	1725010.44	865.98	N/A	N/A
5183	542015.67	1725055.27	858.42	N/A	N/A
5184	542031.06	1725020.13	852.11	N/A	N/A
5185	542011.54	1724922.54	847.86	N/A	N/A
5186	542026.66	1724837.29	844.28	N/A	N/A
5187	542074.75	1724832.07	860.12	N/A	N/A
5188	542182.76	1724819.96	889.93	N/A	N/A
5189	542212.61	1724816.61	900.11	N/A	N/A
5190	542236.38	1724814.02	908.15	N/A	N/A



DANA A. EXLINE
PROFESSIONAL SURVEYOR #928
STATE OF WEST VIRGINIA
DATE: 10/09/23

0	TOP OF DRAINAGE	9-27-23	
REV.	DESCRIPTION	DATE	

EXLINE SURVEYING, INC.
10356 STATE ROUTE 139
JACKSON, OHIO 45640
PHONE: (740) 286-7024 • TELECOPIER (740) 286-0012

CERTIFICATION POINTS
FOR
ENTACT, LLC

SEQUENCE 4
CERTIFICATION POINTS
TOP OF DRAINAGE LAYER
JOHN E. AMOS PLANT
WINFIELD, WEST VIRGINIA

DRAWING SCALE:
1" = 30'

TITLE RESEARCH:
N/A

CALCULATED BY:
P. TAYLOR

DRAWN BY:
P. TAYLOR

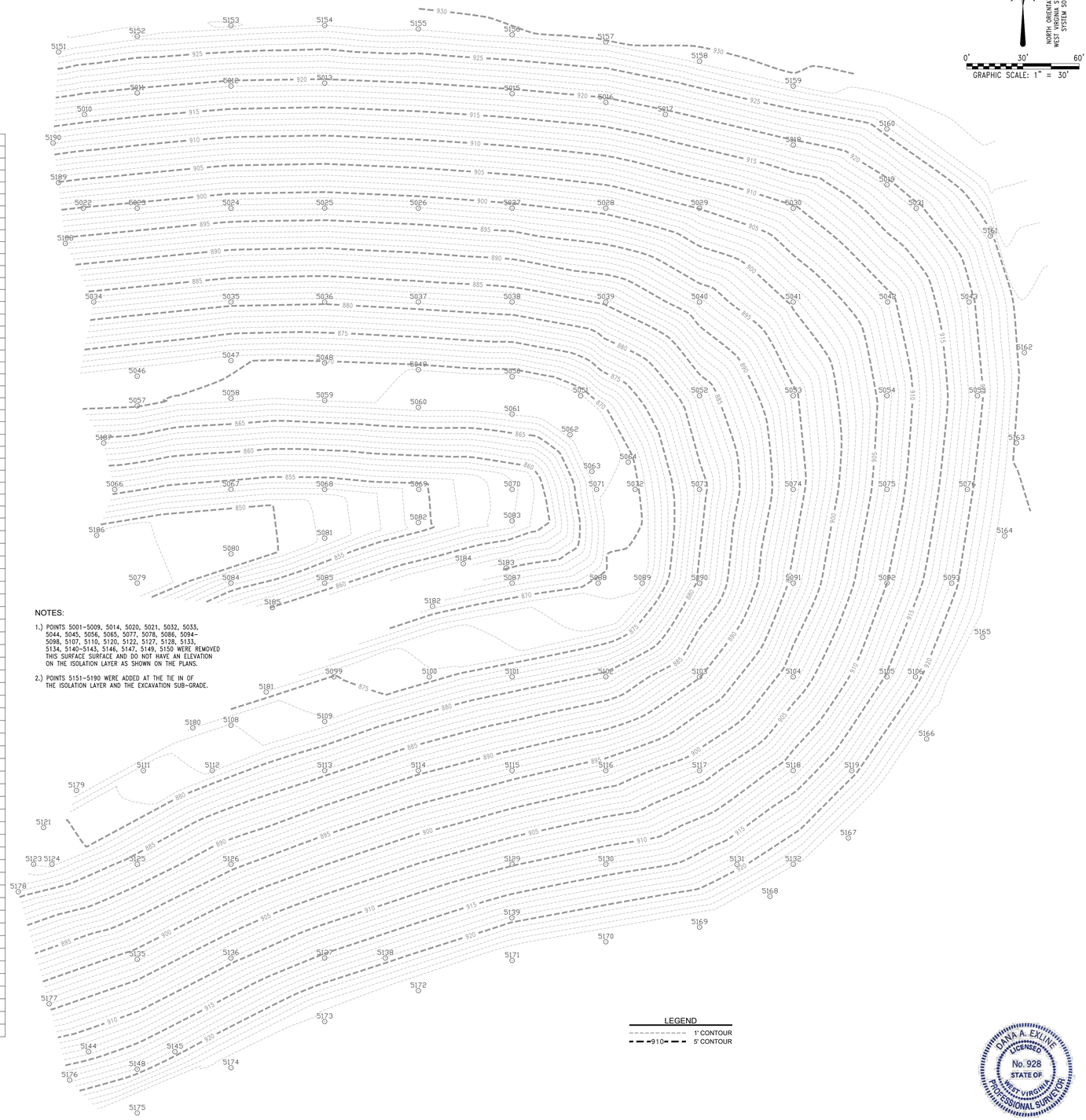
CHECKED BY:
D. EXLINE

DRAWING NUMBER
23033A TOP OF DRAINAGE

SHEET NUMBER
1 OF 1

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	TOP DRAINAGE ASBUILT	DEPTH BETWEEN LAYERS
5010	542250.00	1724821.78	916.38	912.13	4.25
5011	542261.48	1724850.03	919.15	914.85	4.30
5012	542265.09	1724900.01	919.02	914.70	4.32
5013	542266.71	1724950.03	919.30	915.03	4.27
5015	542261.11	1725050.00	919.20	915.07	4.13
5016	542256.46	1725100.01	919.19	915.02	4.17
5017	542250.02	1725131.76	919.23	915.09	4.14
5018	542233.69	1725200.04	919.18	915.05	4.13
5019	542212.53	1725250.01	919.20	915.01	4.20
5022	542200.07	1724821.19	899.86	895.71	4.15
5023	542200.00	1724849.95	898.98	894.65	4.33
5024	542200.04	1724899.94	897.44	893.15	4.29
5025	542199.97	1724950.02	897.12	892.87	4.24
5026	542200.02	1724999.98	897.88	893.70	4.18
5027	542199.98	1725050.03	899.12	894.79	4.33
5028	542199.97	1725099.98	900.98	896.76	4.21
5029	542200.01	1725149.97	905.09	900.83	4.26
5030	542200.01	1725200.04	909.54	905.22	4.32
5031	542200.04	1725265.62	919.29	915.00	4.29
5034	542149.99	1724826.86	883.05	878.82	4.22
5035	542150.03	1724899.97	880.72	876.47	4.25
5036	542149.98	1724950.00	880.37	876.08	4.29
5037	542150.01	1725000.00	881.29	876.81	4.48
5038	542149.96	1725049.99	882.32	877.98	4.33
5039	542150.01	1725099.98	885.46	881.13	4.32
5040	542150.00	1725149.96	892.50	888.08	4.42
5041	542150.03	1725200.05	900.50	896.23	4.27
5042	542150.02	1725250.36	908.94	904.70	4.24
5043	542150.06	1725293.85	919.27	914.92	4.35
5046	542110.44	1724850.02	870.38	866.17	4.21
5047	542118.67	1724899.99	870.14	866.00	4.14
5048	542117.49	1724949.97	869.70	865.34	4.36
5049	542113.80	1724999.98	869.07	864.85	4.22
5050	542110.17	1725049.98	868.67	864.42	4.25
5051	542099.98	1725086.57	868.83	864.47	4.36
5052	542099.97	1725149.99	882.78	878.59	4.18
5053	542099.99	1725200.04	894.37	890.28	4.09
5054	542100.03	1725250.00	906.35	902.02	4.33
5055	542099.99	1725298.26	919.21	915.21	4.00
5057	542094.50	1724850.05	870.15	865.78	4.37
5058	542098.66	1724899.95	869.60	865.31	4.29
5059	542097.40	1724949.99	869.07	864.72	4.34
5060	542093.83	1725000.03	868.61	864.30	4.31
5061	542090.15	1725050.01	868.13	863.93	4.20
5062	542079.15	1725080.91	868.36	863.98	4.38
5063	542059.63	1725092.53	868.67	864.44	4.23
5064	542064.55	1725111.97	869.12	864.62	4.50
5066	542050.01	1724837.90	855.78	851.68	4.10
5067	542050.02	1724900.01	853.40	849.13	4.27
5068	542050.04	1724950.09	852.85	848.89	3.96
5069	542049.99	1725000.20	854.64	850.39	4.25
5070	542050.01	1725050.03	857.64	853.48	4.16
5071	542050.00	1725095.02	868.73	864.48	4.25
5072	542049.96	1725115.68	869.47	865.11	4.36
5073	542050.01	1725150.01	878.85	874.53	4.32
5074	542049.99	1725199.95	893.22	889.05	4.17
5075	542050.01	1725250.00	907.32	902.92	4.40
5076	542049.98	1725292.87	919.24	914.92	4.32
5079	541999.93	1724850.09	848.49	N/A	N/A
5080	542015.61	1724900.07	849.23	845.10	4.13
5081	542023.94	1724949.92	851.19	N/A	N/A
5082	542032.31	1725000.02	854.54	N/A	N/A
5083	542033.19	1725049.98	857.92	N/A	N/A
5084	541999.97	1724899.92	853.65	N/A	N/A
5085	541999.96	1724950.02	858.82	N/A	N/A
5087	541999.97	1725049.96	867.63	863.30	4.33
5088	541999.99	1725095.89	870.64	866.50	4.14
5089	541999.95	1725119.38	870.82	866.63	4.20
5090	542000.01	1725150.01	880.53	876.35	4.17
5091	541999.99	1725199.99	895.80	891.48	4.32
5092	541999.99	1725249.97	909.99	905.70	4.30
5093	542000.00	1725284.51	919.17	915.21	3.96
5099	541949.96	1724954.85	875.11	870.91	4.19
5100	541950.04	1725005.85	874.13	869.78	4.35
5101	541949.99	1725050.04	877.44	873.26	4.19

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	TOP DRAINAGE ASBUILT	DEPTH BETWEEN LAYERS
5102	541949.95	1725100.02	880.88	876.56	4.32
5103	541949.98	1725150.03	889.85	885.57	4.28
5104	541949.98	1725199.98	902.13	897.91	4.22
5105	541949.99	1725250.03	915.32	910.95	4.37
5106	541950.03	1725265.15	919.16	915.06	4.09
5108	541924.12	1724899.94	877.05	872.71	4.34
5109	541926.17	1724949.97	876.10	871.85	4.25
5111	541899.96	1724853.27	878.45	874.08	4.37
5112	541899.98	1724889.98	877.84	873.78	4.06
5113	541900.08	1724950.03	884.09	879.90	4.19
5114	541899.99	1725000.00	889.33	885.02	4.31
5115	541899.94	1725050.00	893.44	889.23	4.21
5116	541899.93	1725099.94	897.16	892.75	4.41
5117	541900.03	1725149.98	903.09	898.72	4.37
5118	541899.95	1725200.06	912.23	N/A	N/A
5119	541900.05	1725231.23	919.16	914.90	4.26
5121	541869.59	1724800.00	880.23	875.96	4.27
5123	541850.00	1724794.69	880.91	876.55	4.36
5124	541850.00	1724804.47	880.69	876.41	4.28
5125	541849.99	1724849.98	886.59	882.39	4.20
5126	541850.01	1724900.02	894.02	889.64	4.38
5129	541849.99	1725049.99	909.73	905.58	4.15
5130	541849.99	1725099.99	913.12	908.69	4.43
5131	541850.02	1725169.93	919.20	915.09	4.10
5132	541849.96	1725199.99	923.72	N/A	N/A
5135	541799.30	1724850.02	901.74	897.50	4.23
5136	541800.04	1724899.99	909.08	904.82	4.27
5137	541800.00	1724949.96	915.77	911.42	4.35
5138	541800.03	1724982.31	919.13	915.00	4.13
5139	541821.45	1725049.91	919.23	914.95	4.28
5144	541750.03	1724824.01	913.55	909.24	4.30
5145	541750.01	1724870.07	919.27	914.99	4.28
5148	541740.76	1724849.97	919.07	N/A	N/A
5151	542283.40	1724808.11	927.93	N/A	N/A
5152	542291.71	1724850.03	928.55	N/A	N/A
5153	542297.41	1724900.02	928.87	N/A	N/A
5154	542297.55	1724950.02	929.00	N/A	N/A
5155	542295.67	1725000.04	929.16	N/A	N/A
5156	542292.62	1725049.99	929.36	N/A	N/A
5157	542288.69	1725100.00	929.39	N/A	N/A
5158	542278.46	1725150.01	929.44	N/A	N/A
5159	542265.11	1725199.98	928.74	N/A	N/A
5160	542242.29	1725249.95	925.75	N/A	N/A
5161	542185.14	1725305.15	924.55	N/A	N/A
5162	542123.08	1725323.29	925.75	N/A	N/A
5163	542074.81	1725319.14	925.25	N/A	N/A
5164	542025.21	1725312.81	924.63	N/A	N/A
5165	541971.20	1725301.04	924.40	N/A	N/A
5166	541916.98	1725271.15	924.43	N/A	N/A
5167	541864.02	1725229.39	924.42	N/A	N/A
5168	541832.88	1725187.50	924.40	N/A	N/A
5169	541816.46	1725149.97	924.33	N/A	N/A
5170	541808.63	1725099.96	924.32	N/A	N/A
5171	541798.71	1725049.98	924.33	N/A	N/A
5172	541782.55	1725000.01	924.39	N/A	N/A
5173	541766.05	1724950.00	924.33	N/A	N/A
5174	541741.41	1724900.00	924.34	N/A	N/A
5175	541717.29	1724849.97	924.43	N/A	N/A
5176	541734.85	1724813.89	917.66	N/A	N/A
5177	541775.55	1724803.00	903.97	N/A	N/A
5178	541836.63	1724795.06	884.05	N/A	N/A
5179	541888.81	1724827.46	876.10	N/A	N/A
5180	541922.82	1724879.60	875.98	N/A	N/A
5181	541941.90	1724918.79	874.10	N/A	N/A
5182	541987.67	1725007.52	868.61	N/A	N/A
5183	542008.04	1725046.77	864.86	N/A	N/A
5184	542010.33	1725024.00	862.48	N/A	N/A
5185	541986.91	1724922.09	860.12	N/A	N/A
5186	542026.66	1724837.29	848.20	N/A	N/A
5187	542074.83	1724832.01	864.05	N/A	N/A
5188	542181.17	1724811.71	893.92	N/A	N/A
5189	542213.68	1724808.03	904.89	N/A	N/A
5190	542234.83	1724805.14	912.11	N/A	N/A



NOTES:

1.) POINTS 5001-5009, 5014, 5020, 5021, 5032, 5033, 5044, 5045, 5056, 5065, 5077, 5078, 5086, 5094-5098, 5107, 5110, 5120, 5122, 5127, 5128, 5133, 5134, 5140-5143, 5146, 5147, 5149, 5150 WERE REMOVED THIS SURFACE SURFACE AND DO NOT HAVE AN ELEVATION ON THE ISOLATION LAYER AS SHOWN ON THE PLANS.

2.) POINTS 5151-5190 WERE ADDED AT THE TIE IN OF THE ISOLATION LAYER AND THE EXCAVATION SUB-GRADE.

DANA A. EXLINE
PROFESSIONAL SURVEYOR #928
STATE OF WEST VIRGINIA
DATE: 10/26/23

REV.	DESCRIPTION	DATE
0	TOP OF ISOLATION LAYER	10-25-23

EXLINE SURVEYING, INC.
10356 STATE ROUTE 139
JACKSON, OHIO 45640
PHONE: (740) 286-7024 • TELECOPIER (740) 286-0012

CERTIFICATION POINTS
FOR
ENTACT, LLC

SEQUENCE 4
CERTIFICATION POINTS
ISOLATION LAYER
JOHN E. AMOS PLANT
WINFIELD, WEST VIRGINIA

DRAWING SCALE: 1" = 30'

TITLE RESEARCH: N/A

CALCULATED BY: P. TAYLOR

DRAWN BY: P. TAYLOR

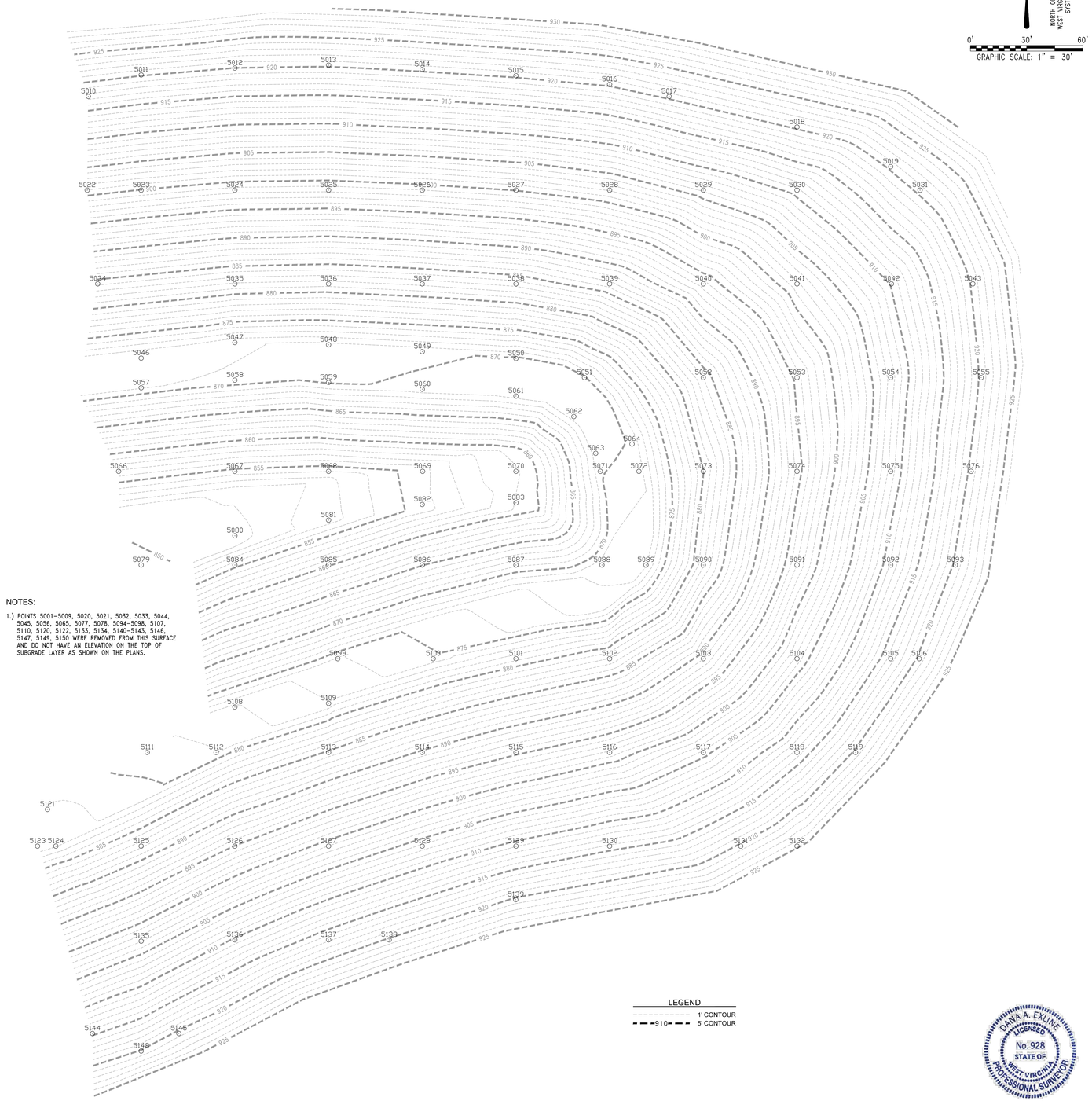
CHECKED BY: D. EXLINE

DRAWING NUMBER: 23033A ISOLATION LAYER

SHEET NUMBER: 1 OF 1

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	TOP ISOLATION ASBUILT	DEPTH BETWEEN LAYERS
5010	542250.04	1724821.80	917.54	916.38	1.16
5011	542261.51	1724850.00	920.14	919.15	0.99
5012	542265.16	1724900.00	919.97	919.02	0.95
5013	542266.76	1724950.05	920.30	919.30	1.00
5014	542264.43	1725000.01	920.36	N/A	N/A
5015	542261.12	1725049.97	920.33	919.20	1.13
5016	542256.49	1725099.98	920.31	919.19	1.12
5017	542249.94	1725131.75	920.42	919.23	1.19
5018	542233.74	1725200.02	920.34	919.18	1.16
5019	542212.50	1725250.00	920.37	919.20	1.17
5022	542199.95	1724821.23	900.94	899.86	1.08
5023	542200.01	1724849.96	899.91	898.98	0.93
5024	542200.00	1724899.97	898.50	897.44	1.06
5025	542200.03	1724950.01	898.29	897.12	1.17
5026	542200.01	1725000.03	898.97	897.88	1.09
5027	542200.03	1725050.01	900.07	899.12	0.95
5028	542200.01	1725099.99	902.09	900.98	1.11
5029	542200.00	1725150.01	906.19	905.09	1.10
5030	542199.96	1725200.02	910.71	909.54	1.16
5031	542200.01	1725265.65	920.50	919.29	1.20
5034	542149.93	1724826.83	884.19	883.05	1.14
5035	542150.02	1724900.06	881.83	880.72	1.11
5036	542150.05	1724949.99	881.47	880.37	1.10
5037	542150.04	1725000.02	882.30	881.29	1.01
5038	542149.99	1725049.99	883.45	882.32	1.14
5039	542149.99	1725099.99	886.60	885.46	1.14
5040	542150.00	1725150.00	893.57	892.50	1.07
5041	542150.02	1725199.97	901.70	900.50	1.21
5042	542150.01	1725250.31	910.15	908.94	1.22
5043	542149.94	1725293.85	920.36	919.27	1.10
5046	542110.38	1724850.04	871.50	870.38	1.12
5047	542118.64	1724899.97	871.27	870.14	1.13
5048	542117.49	1724949.99	870.67	869.70	0.98
5049	542113.87	1724999.97	870.27	869.07	1.20
5050	542110.21	1725049.97	869.70	868.67	1.03
5051	542100.05	1725086.62	869.81	868.83	0.98
5052	542100.01	1725150.01	883.96	882.78	1.18
5053	542099.98	1725199.98	895.50	894.37	1.13
5054	542100.00	1725250.00	907.42	906.35	1.07
5055	542100.03	1725298.25	920.36	919.21	1.15
5057	542094.54	1724850.08	871.05	870.15	0.90
5058	542098.65	1724900.00	870.69	869.60	1.09
5059	542097.40	1724950.05	870.15	869.07	1.08
5060	542093.76	1725000.00	869.62	868.61	1.01
5061	542090.12	1725049.94	869.29	868.13	1.16
5062	542079.15	1725080.86	869.41	868.36	1.05
5063	542059.62	1725092.58	869.51	868.67	0.84
5064	542064.57	1725111.97	870.11	869.12	0.99
5066	542050.01	1724837.99	856.80	855.78	1.02
5067	542050.02	1724899.94	854.58	853.40	1.18
5068	542049.91	1724949.98	854.03	852.85	1.19
5069	542050.06	1725000.23	855.65	854.64	1.01
5070	542050.02	1725050.03	858.79	857.64	1.14
5071	542050.00	1725095.04	869.84	868.73	1.11
5072	542050.02	1725115.66	870.47	869.47	1.00
5073	542050.00	1725149.99	879.93	878.85	1.08

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	TOP ISOLATION ASBUILT	DEPTH BETWEEN LAYERS
5074	542049.97	1725199.97	894.29	893.22	1.07
5075	542049.98	1725249.98	908.44	907.32	1.12
5076	542050.01	1725292.88	920.42	919.24	1.18
5079	542000.05	1724849.99	849.63	848.49	1.15
5080	542015.58	1724899.96	850.58	849.23	1.35
5081	542023.93	1724950.01	852.54	851.19	1.35
5082	542032.25	1724999.95	855.58	854.54	1.04
5083	542033.27	1725049.99	859.07	857.92	1.15
5084	541999.93	1724900.02	854.59	853.65	0.94
5085	541999.98	1724950.03	859.83	858.82	1.01
5086	541999.97	1724999.97	864.94	N/A	N/A
5087	541999.96	1725050.01	868.79	867.63	1.16
5088	541999.98	1725095.91	871.63	870.64	0.99
5089	542000.04	1725119.39	871.82	870.82	1.00
5090	541999.99	1725150.00	881.83	880.53	1.30
5091	541999.99	1725199.97	897.01	895.80	1.21
5092	542000.03	1725249.99	911.15	909.99	1.16
5093	541999.97	1725284.50	920.34	919.17	1.17
5099	541949.98	1724954.87	876.19	875.11	1.09
5100	541950.06	1725005.87	875.35	874.13	1.22
5101	541950.04	1725049.99	878.67	877.44	1.23
5102	541950.02	1725100.00	882.04	880.88	1.16
5103	541949.99	1725149.97	890.92	889.85	1.07
5104	541950.01	1725200.00	903.35	902.13	1.22
5105	541950.03	1725250.02	916.47	915.32	1.15
5106	541950.03	1725265.19	920.36	919.16	1.21
5108	541924.11	1724900.01	878.10	877.05	1.04
5109	541926.19	1724950.00	877.14	876.10	1.04
5111	541899.97	1724853.21	879.49	878.45	1.04
5112	541900.04	1724889.97	879.08	877.84	1.24
5113	541899.97	1724949.98	885.28	884.09	1.19
5114	541899.96	1724999.99	890.37	889.33	1.04
5115	541899.99	1725050.03	894.59	893.44	1.15
5116	541900.02	1725100.03	898.27	897.16	1.11
5117	541899.99	1725150.04	904.25	903.09	1.17
5118	541899.98	1725199.99	913.41	912.23	1.18
5119	541900.01	1725231.21	920.36	919.16	1.21
5121	541869.63	1724800.00	881.33	880.23	1.10
5123	541849.96	1724794.64	881.90	880.91	0.99
5124	541849.98	1724804.51	881.89	880.69	1.20
5125	541849.95	1724850.04	887.75	886.59	1.17
5126	541849.96	1724900.01	895.10	894.02	1.08
5127	541850.04	1724949.99	901.04	N/A	N/A
5128	541850.00	1725000.01	906.31	N/A	N/A
5129	541849.98	1725050.01	910.94	909.73	1.20
5130	541849.96	1725099.97	914.24	913.12	1.12
5131	541849.96	1725169.91	920.41	919.20	1.22
5132	541849.98	1725199.98	924.76	923.72	1.04
5135	541799.29	1724849.97	902.93	901.74	1.19
5136	541799.98	1724899.97	910.34	909.08	1.26
5137	541800.00	1724949.96	916.79	915.77	1.01
5138	541799.98	1724982.33	920.31	919.13	1.18
5139	541821.45	1725049.91	920.37	919.23	1.14
5144	541749.97	1724824.01	914.69	913.55	1.14
5145	541749.99	1724870.04	920.53	919.27	1.26
5148	541740.69	1724850.01	920.14	919.07	1.07



NOTES:

1.) POINTS 5001-5009, 5020, 5021, 5032, 5033, 5044, 5045, 5056, 5065, 5077, 5078, 5094-5098, 5107, 5110, 5120, 5122, 5133, 5134, 5140-5143, 5146, 5147, 5149, 5150 WERE REMOVED FROM THIS SURFACE AND DO NOT HAVE AN ELEVATION ON THE TOP OF SUBGRADE LAYER AS SHOWN ON THE PLANS.

DANA A. EXLINE
PROFESSIONAL SURVEYOR #928
STATE OF WEST VIRGINIA
DATE: 11/2/23

REV.	DESCRIPTION	DATE
0	TOP OF SUBGRADE LAYER	11-1-23

EXLINE SURVEYING, INC.
10356 STATE ROUTE 139
JACKSON, OHIO 45640
PHONE: (740) 286-7024 • TELECOPIER (740) 286-0012

CERTIFICATION POINTS
FOR
ENTACT, LLC

SEQUENCE 4
CERTIFICATION POINTS
TOP OF SUBGRADE LAYER
JOHN E. AMOS PLANT
WINFIELD, WEST VIRGINIA

DRAWING SCALE:
1" = 30'

TITLE RESEARCH:
N/A

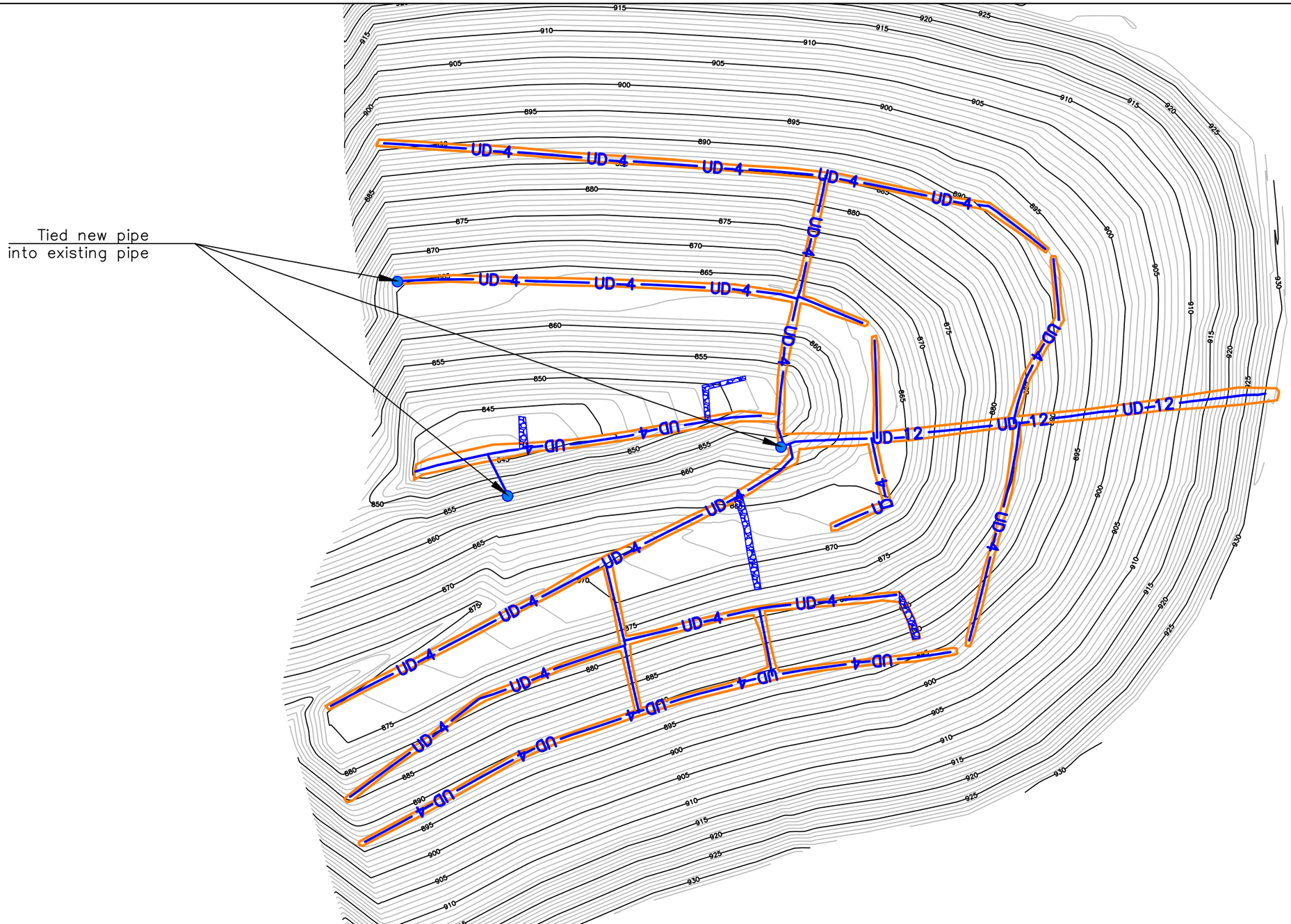
CALCULATED BY:
P. TAYLOR

DRAWN BY:
P. TAYLOR

CHECKED BY:
D. EXLINE

DRAWING NUMBER
23033A
TOP SUBGRADE

SHEET NUMBER
1 OF 1



NOTES:

LEGEND:

- Installed 4 inch Underdrain Pipe
- Installed 12 inch Underdrain Pipe
- Excavated Underdrain Trench
- Gravel Filled 18" Lateral
- 900 — Bottom of Excavation As-Built (Major Contours)
- Bottom of Excavation As-Built (Minor Contours)

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
	11/2/23	JS			As-Built Locations of Underdrainage Pipes

PREPARED FOR:

[AEP-DAVE FRY]
[JOHN AMOS PLANT LANDFILL]

ENTACT

DRAWING NAME: SURVEYED AS-BUILT OF THE UNDERDRAIN PIPES

PROJECT NAME & LOCATION: SEQUENCE 4 BUBBLE LINER REPAIR PROJECT
WINFIELD, WEST VIRGINIA

DRAWN BY	J. STANFIELD	APPROVED BY		REV	DRAFT	SHEET NO.
DATE	11/2/2023	DATE		PROJECT NO.	E9103	1 OF 1

APPENDIX B
Photographs of Construction Activities

Photograph 1. Drainage System Piping

Photograph 2. Drainage System Piping

Photograph 3. Installation of Aggregate Blanket Drainage System

Photograph 4. Installation of Geotextile over Aggregate Blanket Drainage System

Photograph 5. Structural Fill Placement

Photograph 6. Structural Fill Placement

Photograph 7. Structural Fill Placement

Photograph 8. Structural Fill Placement

Photograph 9. Smooth Drum Rolling Subgrade

Photograph 10. Removing Temporary Ramp

Appendix C
Groundwater Control Materials

gai consultants
transforming ideas into reality

Appendix C-I
PVC Pipe

gai consultants
transforming ideas into reality

Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-008**
ENTACT Project Number:	E9103
Submittal Title:	PVC Pipe Materials
Submittal Date:	05/11/2023
Date(s) of Previous Submissions:	N/A
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Robin White, ENTACT
From:	Jarod Stanfield
Reference Specification section and/or	Drawing 30204SH7 & 8 Details #5 , #2

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☒ **Product** ☒ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☐ **Plan**

☐ **Certificate** ☐ **Report** ☐ **Permit** ☐ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile		X	X		No

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COMMENTS:
The pipe will be purchased as solid pipe. Once the distributor receives the pipe from the manufactures it will be sent out to a fabricator and the perforations will be installed as per detail #5 as shown on drawing 30204SH7.

ENTACT, LLC

Contractor's Signature and Date
Jarod Stanfield 05/11/2023

Owner's Representative Review & Comments Section:

This Submittal has been:

☐ **Reviewed** ☒ **Approved** ☐ **Approved as Noted** ☐ **Revised and Resubmit** ☐ **Rejected**

Comments: Schedule 80 PVC pipe from Charlotte is approved for use in the leachate collection system. C900 PVC pipe from JM Eagle is approved for use in the groundwater underdrain.
GAI Consultants CZW 05/15/2023.

Owner's Representative Signature and Date (Stamp if applicable)

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Ground Water Under Drain Pipe

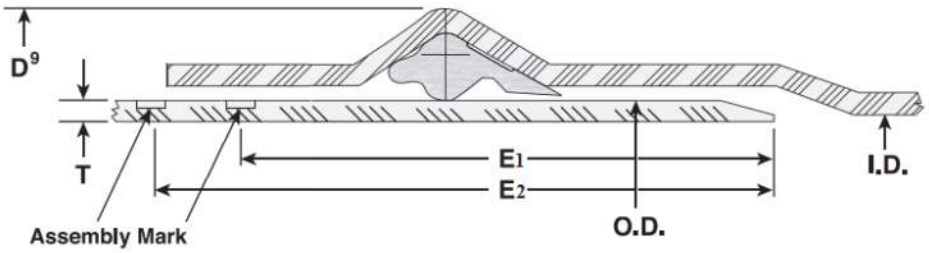
JM Eagle *Building essentials for a better tomorrow™*

BLUE BRUTE™

SUBMITTAL AND DATA SHEET

Pipe Size (IN)	Ave OD (IN)	Nom ID (IN)	D^9 - Approx. Bell Outside Diameter (IN)	Min T (IN)	Ref. E1 ±1/4 (IN)	Ref. E2 ±1/4 (IN)	Approx. Weight (LBS/FT)
PRESSURE CLASS 165 psi (DR25)							
4	4.80	4.39	5.57	0.192	4.50	5.50	1.9
6	6.90	6.31	8.00	0.276	5.25	6.25	3.9
8	9.05	8.28	10.50	0.362	6.25	7.25	6.7
10	11.10	10.16	12.88	0.444	7.25	8.25	10.1
12	13.20	12.08	15.31	0.528	8.25	9.25	14.4
PRESSURE CLASS 235 psi (DR18)*							
4	4.80	4.23	5.87	0.267	4.50	5.50	2.6
6	6.90	6.09	8.43	0.383	5.25	6.25	5.3
8	9.05	7.98	11.06	0.503	6.25	7.25	9.2
10	11.10	9.79	13.57	0.617	7.25	8.25	13.9
12	13.20	11.65	16.13	0.733	8.25	9.25	19.7
PRESSURE CLASS 305 psi (DR14)*							
4	4.80	4.07	6.17	0.343	4.50	5.50	3.2
6	6.90	5.86	8.87	0.493	5.25	6.25	6.7
8	9.05	7.68	11.63	0.646	6.25	7.25	11.6
10	11.10	9.42	14.27	0.793	7.25	8.25	17.6
12	13.20	11.20	16.97	0.943	8.25	9.25	25.1

Consult JM Eagle™ for CSA and other listing availability prior to shipment.
Note: *FM Approvals Pressure Class 150 psi for DR 18 and 200 psi for DR 14.
* Contact your JM eagleTM sales representative for location availability.



I.D. : Inside Dameter
O.D. : Outside Diameter
T. : Wall Thickness
D^9 : Bell Outside Diameter
E : Distance between Assembly Mark to the end of spigot.

Product Standard:	ANSI/AWWA C900
Pipe Compound:	ASTM D1784 Cells Class 12454
Gasket:	ASTM F477
Integral Bell Joint:	ASTM D3139
Certifications:	ANSI/NSF Standard 61
	UL Standard 1285
	Pipe Length: 20 feet laying length
Installation:	AWWA C605
	JM Eagle™ Installation Guide

JM Eagle™ also manufactures this pipe in green for sewer force main applications and purple, specifically for reclaimed water systems. This pipe is made to the same requirements as our standard products. The only difference is that the pigment used is green or purple. These products will not be marked with UL or NSF listing marks. Additionally, the green pipe will be marked "Forced Sewer" and the purple pipe will be marked: "Reclaimed Water... Do Not Drink."

APPENDIX C-II
Geotextile

gai consultants
transforming ideas into reality

Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-014A**
ENTACT Project Number:	E9103
Submittal Title:	Nonwoven Geotextile Manufacturer Quality Control
Submittal Date:	09/13/2023
Date(s) of Previous Submissions:	07/26/2023
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Robin White, ENTACT Jarod Stanfield, ENTACT
From:	Cassidy Siebel
Reference Specification section and/or	CE-013A-3.3 & 4.0

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☒ **Product** ☒ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☒ **Plan**

☒ **Certificate** ☒ **Report** ☐ **Permit** ☒ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile			X		"See below"

ASTM D4833 Puncture Strength per Table 13.1 omitted, however, CBR Puncture strength is tested at the higher frequency and exceeds the MARV

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COMMENTS:
The certification exhibits passing results in accordance with Technical Specification Table 13.1. Shipping, Handling and Storage instructions are included in the Agru Installation Guidelines, Section 1.05.

This submittal includes the additional non-woven geotextile needed due to the revised grading plan.
ENTACT, LLC

Cassidy Siebel

_____

Contractor's Signature and Date
Cassidy Siebel 09/13/2023

Owner's Representative Review & Comments Section:

This Submittal has been:

☐ **Reviewed** ☒ **Approved** ☐ **Approved as Noted** ☐ **Revised and Resubmit** ☐ **Rejected**

Comments: Approved as is - Geotextile properties meets specifications.
GAI Consultants CZW 09/20/2023.

_____

Owner's Representative Signature and Date (Stamp if applicable)

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Geotextile Quality Certification

OA # / PROJECT: SO#18472
AEP JOHN AMOS
W INFIELD W V

Item Code/Description: AGRUTEX 081

DATE: 6/12/2023

agru america
quality control dept.

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D4751	D4355	
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs	LENGTH
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units: Lbs	SIEVE	* % ret.	FT
ATNL10119740001	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740002	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740003	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740004	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740005	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740006	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740007	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740008	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740009	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740010	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740011	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740012	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740013	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740014	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740015	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740016	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740017	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740018	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740019	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740020	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740021	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740022	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740023	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740024	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740025	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740026	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740027	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740028	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740029	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740030	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740031	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740032	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740033	9.13	263.00	307.00	91	95	127.00	170.00	115.00	.37	1.54	793	80	70	600
min	8.40	245.00	302.00	88.00	90.00	127.00	170.00	113.00	.35	1.51	793.00	80.00	70.00	33 ROLLS

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar

Geotextile Quality Certification

OA # / PROJECT: SO 18472

JOHN AMOS

W INFIELD W V

Item Code/Description AGRUTEX 081

DATE: 7/13/2023

agru america quality control dept.

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D4833	D6241	D4751	D4355	
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	PUNCTURE	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs	LENGTH
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Lbs	Units: Lbs	SIEVE	* % ret.	FT
ATNL10120640062	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	378
ATNL10120640064	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	711
ATNL10120640065	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	711
ATNL10120640066	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	600
ATNL10120640067	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	600
min	8.11	269.00	249.00	100.00	106.00	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70.00	5 ROLLS

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

7/13/2023

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

Geotextile Quality Certification

OA # / PROJECT: SO#20103
JOHN AMOS
W INFIELD W V

Item Code/Description: AGRUTEX 081

DATE: 9/5/2023

agru america quality control dept.

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D475	D4355	
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs	LENGTH
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units: Lbs	SIEVE	* % ret.	FT
ATNL10122160003	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160004	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160005	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160006	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160007	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160008	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160009	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160010	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160011	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160012	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160013	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160014	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160015	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160016	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
min	9.04	256.00	316.00	76.00	75.00	120.00	140.00	97.00	.30	1.30	904.00	80.00	70.00	14 ROLLS

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

9/5/2023

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

GEOMEMBRANE AND DRAINAGE INSTALLATION GUIDELINES

Agru America, Inc. is not an installer of Geosynthetics Membranes. These guidelines are based upon our understanding of current quality control and quality assurance standards within the geomembrane industry and are provided in good faith to help prevent any problems caused by errors in installation; they are not meant as a comprehensive authority. These guidelines do not purport to cover all details or variations in the Geosynthetic Membranes and do not claim to provide for every possible contingency met in connection with installation, operation or maintenance of Geosynthetic Membranes. Selection of an experienced installer and determining the suitability and use of the information contained in these guidelines is the sole responsibility of the project owner. We will not be held liable for the installation of Geosynthetic Membranes by others.

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Article I. GENERAL

Section 1.01 SUMMARY

This specification includes furnishing and installing HDPE and LLDPE geomembranes as well as geonets and geocomposite. The HDPE formulated sheet density is 0.940 g/cc or greater. The LLDPE formulated sheet density is ≤0.939 g/cc. Both smooth and textured geomembrane surfaces are included.

Section 1.02 REFERENCES

(a) American Society for Testing and Materials (ASTM), ASTM International, West Conshohocken, PA www.astm.org :

(i) ASTM Standard D6392-12, "Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes"

(ii) ASTM Standard D5641-94 (2011), "Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber"

(iii) ASTM Standard D5820-95 (2011), "Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes"

(iv) ASTM Standard D6365-99 (2011), "Standard Practice for the Nondestructive Testing of Geomembrane Seams using the Spark Test"

(v) ASTM Standard D7240-06 (2011), "Standard Practice for Leak Location using Geomembranes with an Insultating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique."

(vi) ASTM Standard D6747-15 (2015), "Standard Practice for Selection of Techniques for Electrical Leak Location of Leaks in Geomembranes"

(b) Geosynthetic Research Institute (GRI), Folsom, PA www.geosynthetic-institute.org :

(i) GRI GM 9 (2013), "Cold Weather Seaming of Geomembranes"

(ii) GRI GM 13 (2012), "Test Properties, Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes"

(iii) GRI GM 14 (2013), "Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes"

(iv) GRI GM 17 (2012), "Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes"

(v) GRI GM 19, (2013), "Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembrane"

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Section 1.03 SUBMITTALS

(a) Submit the following to the project engineer or property owner, for review and approval, within a reasonable time, to expedite shipment and/or installation of the Geomembrane:

(i) Documentation of Manufacturer's Qualifications

(ii) Manufacturer's Quality Control Program Manual

(iii) Material Properties Sheet

(iv) Material Sample

(v) Documentation of Installer's qualifications;

1) Submit a list of at least ten facilities completed by installer. (For each installation, provide the name of facility, location, date of installation, type and thickness of geomembrane used and surface area of the installed geomembrane.)

2) Submit resumes or qualifications of the installation supervisor, master seamer and Technicians assigned to this project.

3) Installer's Quality Control Program

(vi) Material and Liner Installation Warranties;

1) Submit a copy of all material warranties.
2) Submit a copy of all liner installation warranties.

(b) Shop Drawings

(i) Submit copies of shop drawings for engineer's approval within a reasonable time. Shop drawings shall show the proposed panel layout identifying seams and details. Seams should generally follow the direction of the slope. Butt seams or roll-end seams should not occur on a slope unless approved by the owner's representative. However, if allowed, these seams should be staggered.

(ii) Placement of geomembrane should not occur until owner's representative has received and approved the shop drawings.

(c) Additional Submittals (To be provided during and after installation is complete.)

(i) Manufacturer's warranty

(ii) Geomembrane installation warranty

(iii) Daily written acceptance of sub-grade surface

(iv) Low-temperature seaming procedures if applicable

(v) Prequalification test seam samples

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(vi) Field seam non-destructive test results

(vii) Field seam destructive test results

(viii) Daily field installation reports

(ix) Installation record drawing

Section 1.04 QUALITY CONTROL

(a) Manufacturer's Qualifications: The manufacturer shall have at least five (5) years experience in the manufacturing of the specified or similar geomembrane product and shall have manufactured at least 1,000,000 m^2 (10,000,000 ft^2) of the specified type of geomembrane or a similar product during the last five years.

(b) Installer's Qualifications

(i) The geomembrane installer shall be an approved installer by the manufacturer.

(ii) The geomembrane installer shall have at least three (3) years experience installing the specified or similar geomembrane and shall provide a list outlining at least ten (10) projects totaling 500,000 m^2 (5,000,000 ft^2) of the specified type of geomembrane or similar completed within the past three (3) years.

(iii) A field installation supervisor performs and assumes responsibility throughout the geomembrane installation including geomembrane panel layout, seaming, patching, testing, repairs, and all other outlined responsibilities. The field installation supervisor shall have experience in or supervision in the installation and seaming of at least ten (10) projects totally 500,000 m^2 (5,000,000 ft^2) of geomembrane or the type specified or similar product.

(iv) Seaming shall be performed under the direction of a master seamer (who may also be the field installation supervisor or crew foreman) with seaming experience of a minimum of 300,000 m^2 (3,000,000 ft^2) of the geomembrane type specified or similar product, using the same type of seaming apparatus to be used in the current project. During the seaming, the field installation supervisor and/or master seamer are present.

(v) Qualified technicians employed by the geomembrane installer complete all seaming, patching, testing, and other welding operations.

Section 1.05 DELIVERY, STORAGE AND HANDLING

(a) Manufacturer labels must be on all rolls delivered to the project.

(b) A firmly affixed label attached to the selvage edge, shall clearly state the manufacturer's name, product identification, material thickness, roll number, roll type, roll dimensions and roll weight.

(c) The manufacturer protects the geomembrane from mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

(d) Continuously and uniformly supported, rolls are stored away from high traffic areas on a smooth, level surface. Chocks keep the rolls secure when necessary.

Section 1.06 PROJECT CONDITIONS

Do not install geomembrane in the presence of standing water, while precipitation i s occurring, during excessive winds, or when material temperatures are outside the limits specified in Section 3.02.

Section 1.07 MATERIAL WARRANTY

Material manufacturer shall guarantee material against defects and premature aging from environmental conditions on a pro rata basis for a specified period of time acceptable to owner and manufacturer.

Section 1.08 GEOMEMBRANE INSTALLATION WARRANTY

The geomembrane installer shall guarantee the geomembrane installation against defects in the installation and workmanship for a time period satisfactory to all parties commencing with the date of final acceptance.

Section 1.09 GEOMEMBRANE PRE-CONSTRUCTION MEETING

(a) A pre-construction meeting held at the site prior to installation of the geomembrane will include the geomembrane installer, owner, owner's representative (Engineer and/or CQA Firm), and the earthwork contractor. Topics for this meeting shall include:

(i) Health and Safety

(ii) Lines of authority and communication, resolution of any project document ambiguity.

(iii) Methods for documenting, reporting and distributing documents and reports

(iv) Procedures for packaging and storing archive samples.

(v) Review of time schedule for all installation and testing.

(vi) Review of panel layout and numbering systems for panels and seams including details for marking on geomembrane

(vii) Procedures and responsibilities for preparation and submission of as- built panel and seam drawings

(viii) Temperature and weather limitations, installation procedures for adverse weather conditions, defining acceptable sub grade, geomembrane, or ambient moisture and temperature conditions for working during liner installation

(ix) Sub grade conditions, dewatering responsibilities and sub grade maintenance plan

(x) Deployment techniques including allowable sub grade for the geomembrane

(xi) Plan for controlling expansion/contraction and wrinkling of the geomembrane

(xii) Covering of the geomembrane and cover soil placement

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(xiii) Measurement and payment schedules

(xiv) Responsibilities of each party

(b) A designated person will document the meeting and send a copy of the minutes to each person in attendance.

Article II. PRODUCTS

Section 2.01 SOURCE QUALITY CONTROL

(a) Manufacturing Quality Control

(i) The test methods and frequencies used by the manufacturer for quality control/quality assurance of the above geomembrane prior to delivery, shall be in accordance with the latest revision of the GRI GM 13 for HDPE geomembrane or GRI GM 17 for LLDPE geomembrane, or modified as required for project specific conditions.

(ii) The manufacturer's geomembrane quality control certifications, including results of quality control testing of the products, must be supplied to the owner's representative to verify that the materials supplied for the project are in compliance with all product and or project specifications. The certification, signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, production m anager, or technical services manager, includes lot and roll numbers and corresponding shipping information.

(iii) The manufacturer provides production/manufacturing certification that the geomembrane and welding rod supplied for the project are from the same material type and are compatible.

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Section 2.02 GEOMEMBRANE

(a) The geomembrane shall consist of new, first quality products designed and manufactured specifically for the purpose of this work. The product will satisfactorily complete testing demonstrating its suitability and durability for the purposes intended. The geomembrane rolls shall be seamless, high density polyethylene (HDPE - Formulated Sheet Density ≥ 0.94g/cc) or linear low density polyethylene (LLDPE - Formulated Sheet Density ≤ 0.939 g/cc) containing no plasticizers, fillers or extenders and shall be free of holes, blisters or contaminants, and leak free verified by 100% in line spark or equivalent testing. The geomembrane supplied is a continuous sheet with no factory seams in rolls. The geomembrane will meet the property requirements as shown in GRI GM13 (HDPE) or GRI GM 17 (LLDPE).

(b) Material conformance testing by the owner's representative, if required, will be conducted using in-plant sampling or as specified for the project.

(c) The geomembrane seams shall meet the property requirements as shown in Section 5 or as required by project specifications.

Article III. EXECUTION

Section 3.01 SUB-GRADE PREPARATION

(a) The sub grade shall be prepared in accordance with the project specifications. The geomembrane sub grade shall be uniform and free of sharp or angular objects that may damage the geomembrane prior to installation of the geomembrane.

(b) The geomembrane installer and owner's representative shall inspect the surface before covering with the geomembrane on each day's operations to verify suitability.

(c) The geomembrane installer and owner's representative shall provide daily a written acceptance of the surface before covering with the geomembrane. During installation, the Installer and owner's representative must ensure daily surface maintenance ensuring sub-grade suitability.

(d) Prior to placement of the geomembrane, the installer and owner's representative must repair all sub grade damaged by construction equipment and deemed unsuitable for geomembrane deployment. The installer and owner's representative provides approval for all repairs. All damage and repair protocol including contractor and Installer responsibilities, are outlined in the preconstruction meeting.

Section 3.02 GEOMEMBRANE PLACEMENT

(a) The owner's representative approves all applicable certifications and quality control certificates within the timeframe specified in the contract documents. If the material does not meet project specifications, the contractor removes it from the work area.

(b) The geomembrane installation must follow the limits shown on the project drawings and essentially as shown on approved Panel Placement Drawings. Submit any changes made to Panel Placement Drawings before deployment of liner materials. The Installer must receive approval for the changes prior to deployment of liner materials.

(c) When temperatures are lower than 0°C (32°F), unless approved by the owner's representative, no geomembrane material can be unrolled and/or deployed. The owner's representative may adjust the minimum temperature for material deployment. The installer and owner's representative defines temperature limitations during the preconstruction meeting. Only deploy the quantity of geomembrane that can be anchored and seamed together in one day.

(d) No vehicular traffic shall travel on the geomembrane other than an approved low ground pressure vehicle or equivalent. The owner's representative may suggest that a test pad simulating the methods to be used and showing no damage to the liner will result, be performed prior to implementation of the proposed method.

(e) Use sand bags or equivalent ballast as necessary temporarily holding the geomembrane material in position under the foreseeable and reasonably expected wind conditions. Sand bag material shall be sufficiently close knit to prevent fines from working through the bags and discharging on the geomembrane.

(f) Installer and owner's representative should not place geomembrane if moisture prevents proper sub grade preparation, panel placement, or panel seaming. Defined in the preconstruction meeting, the moisture limitations provide direction for the installer and owner's representative. Damaged and rejected panels (or portions) shall be marked, removed from the work area, and the removal recorded/documented.

(g) The geomembrane should not "bridge over" voids or low areas in the sub grade. The geomembrane shall rest in intimate contact with the sub grade.

(h) Wrinkles caused by panel placement or thermal expansion should be minimized.

(i) Considerations on site geometry: In general, seams shall be oriented parallel to the line of the maximum slope. In corners and odd shaped geometric locations, minimization of the total length of field seams is required. Seams shall not be located at low points in the sub-grade unless geometry requires seaming at such locations and if approved by the owner's representative.

(j) All panels must overlap prior to the seaming process. This overlap affects a weld and allows for proper testing. In no case shall this overlap be less than 75 mm (3")

(k) Sharp stones or other hard objects that could potentially damage the membrane should not be within 1" (25 mm) of the surface to be lined.

(l) Sub-grade should be firm, unyielding and able to support deployment equipment without damage or rutting to the sub-grade.

Section 3.03 SEAMING PROCEDURES

(a) Cold weather installations should follow guidelines as outlined in GRI GM9.

(b) The seaming process shall not occur when liner temperatures are less than 0°C (32°F) unless the installer and/or owner's representative complies with the following conditions.

(i) The seaming of the geomembrane at material temperatures below 0°C (32° F) only transpires when the geomembrane installer can demonstrate the following to the owner's representative using prequalification test seams.

1) Field seams comply with the project specifications.

2) The safety of the crew ensured.

3) Geomembrane material can be fabricated (i.e. pipe boots, penetrations, repairs. etc.) at sub-freezing temperatures.

(ii) The geomembrane installer shall submit to the owner's representative for approval, detailed procedures for seaming at low temperatures, possibly including the following:

1) Preheating of the geomembrane,

2) Using a tent or other device preventing heat loss during seaming and rapid heat loss subsequent to seaming,

3) Completion of a number of test welds to determine appropriate seaming parameters.

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(c) If the geomembrane sheet temperature is above 75° C (170° F) as measured by an infrared thermometer or surface thermocouple, seaming transpires only with the approval by the owner's representative. This approval depends upon the recommendations by the manufacturer and on a field demonstration by the geomembrane installer using prequalification test seams to demonstrate that seams comply with the specification.

(d) Seaming shall primarily be performed using automatic fusion welding equipment and techniques. Use of extrusion welding takes place where fusion welding is not possible such as at pipe penetrations, patches, repairs and short (less than a roll width) runs of seams. Note: Flaps should not be removed as part of the welding process as this may damage the seam.

(e) In the case of fish mouths or excessive wrinkles at the seam overlap section, cut along the ridge of the wrinkles on the back into the panel if necessary. Terminate the cut with a keyhole cut (nominal 10 mm (1/2") diameter hole) minimizing the crack/tear propagation. Then, seam the overlay. Patch the key hole cut with an oval or round patch of the same base geomembrane material extending a minimum of 150 mm (6") beyond the cut in all directions.

(f) When extrusion welding 60 mil (1.5mm) or greater HDPE, it is advisable to bevel the top portion of the seam in a lengthwise direction to maximize intimate contact of material and improve continuity of weld.

(g) Prior to seaming, confirm the area for welding is free of moisture, dirt and any foreign matter that can affect the integrity of the weld on an ongoing basis.

(h) Take precaution and safety of the liner technicians, in extreme heat or cold, which can affect the health of the individuals.

(i) Seaming should run through the anchor trench to terminate at the end of the sheet goods.

Section 3.04 PIPE AND STRUCTURE PENETRATION SEALING SYSTEM

(a) Provide penetration-sealing system as shown in the Project Drawings.

(b) Construct all penetrations from the base geomembrane material, flat stock, prefabricated boots and accessories as shown on the Project Drawings. In the case of Structured Liners such as SuperGripNet™, DrainLiner™ or similar materials offered by Agru America, Inc., use the smooth or textured liner of the same density for such fabrications. Weld the pre-fabricated or field fabricated assembly to the geomembrane as shown on the Project Drawings to prevent leakage. Once complete, test the assembly. If the Installer cannot perform the field non-destructive testing, attachments will be field spark tested by standard holiday leak detectors in accordance with ASTMD 6365. Spark testing should be done in areas where both air pressure testing and vacuum testing is not possible.

(i) Equipment for Spark testing shall be comprised of but not limited to; a hand held holiday spark tester, and conductive wand that generates a high voltage.

(ii) The testing steps performed by the geomembrane installer include:

1) Place an electrically conductive tape or wire beneath the seam prior to welding.

2) Complete a calibration test on a trial seam containing a non-welded segment ensuring the identification of such a defect (non-welded segment) under the planned machine settings and procedures.

3) Upon completion of the weld, enable the spark tester and hold approximately 25mm (1 in) above the weld moving slowly over the entire length of the weld in accordance with ASTM 6365. If no spark occurs, the weld is leak free.

(iii) A spark indicates a hole in the seam. The geomembrane installer locates, repairs, and retests the faulty area.

(iv) When flammable gasses are present, use special care and precautions in the area to be tested.

Section 3.05 FIELD QUALITY CONTROL

The owner's representative must receive information prior to all pre-qualification and production welding and testing, or as agreed upon in the pre-construction meeting.

(a) Prequalification Test Seams

(i) The geomembrane installer tests seams and prepares seams verify seaming parameters (speed, temperature and pressure of welding equipment) are adequate.

(ii) Each welding technician creates seams and tests each in accordance with ASTM D 6392 at the beginning of each seaming period. Welding technicians test the seaming under the same conditions and with the same equipment and operator combination as production seaming. The test seam shall be approximately 3.3 meters (10 feet) long for fusion welding and 1 meter (3 feet) long for extrusion welding with the seam centered lengthwise. At a minimum, each welding technician creates one test seam after seaming 4–6 hours; additional tests may be required with changes in environmental conditions.

(iii) Two 25 mm (1 in) wide specimens shall be die-cut by the geomembrane installer from each end of the test seam. The specimens tested by the geomembrane installer require using a field tension meter testing both tracks for peel strength and shear strength. Each specimen should fail in the parent material and not in the weld, "Film Tear Bond"(FTB). When the seam separation is equal to or greater than 25% of the track width, it is a failed test.

(iv) Tables in Section 6 provide the minimum acceptable seam strength values obtained for all specimens tested. Four specimens out of five must meet the acceptable seam strength values for consideration as passing.

(v) If a test seam fails, the welding technician must immediately conduct an additional test seam. If the additional test seam fails, the welding technician rejects the seaming apparatus. The technician must correct the apparatus deficiencies and produce a successful test seam before using the apparatus for any other/additional production seaming.

(vi) The technician labels a sample from each test seam. The label indicates the date, geomembrane temperature, number of the seaming unit, technician performing the test seam and pass or fail description. The technician then gives the sample to the owner's representative for archiving.

(b) Field Seam Non-destructive Testing

(i) The technician non-destructively tests over the full seam length before the geomembrane installer covers it. Numbered or otherwise designated, each seam's label includes the location, date, test unit, name of tester and outcome of all non-destructive testing. Once recorded, the technician submits the information to the owner's representative.

(ii) Testing should be done as the seaming work progresses, not at the completion of all field seaming, unless agreed to in advance by the owner's representative. All defects found during testing shall be numbered and marked immediately after detection. The technician must repair, retest, and remark all defects indicating the acceptable completion of the repair.

(c) Non-destructive testing shall be performed using vacuum box, air pressure or spark testing equipment.

(d) Experienced technicians familiar with the specified test methods perform all non-destructive tests. The geomembrane installer demonstrates all test methods verifying the validity of said test procedures for the owner's representative.

(e) The geomembrane installer tests all extrusion seams using a vacuum box in accordance with ASTM D 6392 and ASTM D 5641 and the following equipment and procedures:

(i) Equipment for testing extrusion seams is not limited to but should include:

1) Vacuum box assembly consisting of a rigid housing

2) Transparent viewing window

3) Soft rubber gasket attached to the base

4) Port hole or valve assembly and a vacuum gauge

5) Vacuum pump assembly equipped with a pressure controller and pipe connections

6) Rubber pressure/vacuum hose with fittings and connections

7) Plastic bucket

8) Wide paintbrush or mop

9) Soapy solution

(ii) The geomembrane installer must charge the vacuum pump and adjust the tank pressure to approximately 35 kPa (5 psig).

(iii) The geomembrane installer shall create a leak tight seal between the gasket and geomembrane interface by wetting a strip of geomembrane approximately 0.3m (12 in) by 1.2m (48 in) (length and width of box) with a soapy solution, placing the box over the wetted area, and then compressing the box against the geomembrane. The geomembrane installer shall then close the bleed valve, open the vacuum valve, maintain initial pressure of approximately 35 kPa (5 psig) for approximately 3-4 seconds. The Installer must continuously examine the geomembrane through the viewing window for the presence of soap bubbles, indicating a leak. If no bubbles appear after 3-4 seconds, consider the area leak free. Once the area is leak free, depressurize the box and move it over the next adjoining area with an appropriate overlap and the process repeated.

(iv) All areas where soap bubbles appear shall be marked, repaired and then retested.

(v) At seam locations where the Installer is unable to non-destructively test, such as pipe penetrations, the Installer must substitute alternate non-destructive spark testing or equivalent.

(vi) All seams that are vacuum tested shall be marked with the date tested, the name of the technician performing the test and the results of the test.

(f) Double Fusion seams with an enclosed channel shall be air pressure tested by the geomembrane installer in accordance with ASTM D5820 and ASTM D6392 and the following equipment guidelines and procedures.

(i) Equipment for testing double fusion seams shall be comprised of but not limited to: an air pump equipped with a pressure gauge capable of generating and sustaining a pressure of 210 kPa (30 psig), mounted on a cushion to protect the geomembrane; and a manometer equipped with a sharp hollow needle or other approved pressure feed device.

(ii) The geomembrane installer completes all testing activities. Both ends of the seam to be tested are sealed and a needle or other approved pressure feed device inserted into the tunnel created by the double wedge fusion weld. The air pump shall be adjusted to a pressure of 210 kPa (30 psig), and the valve closed. Allow 2 minutes for the injected air to come to equilibrium in the channel, and sustain pressure for 5 minutes.

(g) If pressure loss does not exceed 28 kPa (4 psig) after the five-minute period, the Installer considers the seam leak tight. Release pressure from the opposite end verifying pressure drop on needle to ensure testing of the entire seam. The needle or other approved pressure feed device shall be removed and the feedhole sealed.

(i) If loss of pressure exceeds 28 kPa (4 psig) during the testing period or pressure does not stabilize, the geomembrane installer locates, repairs and retests the faulty area.

(ii) Record all results of the pressure testing on the liner at the seam tested and on a pressure testing record.

(iii) If release of pressure from opposite end of tested seam does NOT deflate seam, the Installer takes measures to determine the cause and remedies to air test 100% of the seam under scrutiny.

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(h) Destructive Field Seam Testing

(i) The Installer analyzes one destructive test sample per 150 linear m (500 linear ft) seam length or the geomembrane installer shall take another predetermined length in accordance with GRI GM 14 from a location specified by the owner's representative. The geomembrane installer receives the sample locations without advance notice of the locations. The geomembrane installer cuts samples as directed by the owner's representative before the complete installation and as seaming progresses.

(ii) All field samples shall be marked with their sample number and seam number including the sample number, date, time, location, and seam number recorded. The geomembrane installer shall repair all holes in the geomembrane resulting from obtaining the seam samples. All patches shall be vacuum box tested or spark tested. If the installation of a permanent patch over the test location the same day of sample collection is not possible, place a temporary patch either tack welded or hot air welded over the opening until affixing a permanent patch.

(iii) Testing requires the destructive samples size at least 300 mm (12") wide, 1m (36") long, with the seam centered lengthwise. The sample shall be cut into three equal sections and distributed as follows: one section given to the owner's representative as an archive sample; one section given to the owner's representative for laboratory testing as specified in paragraph 5 below; and one section retained by the geomembrane installer for field testing as specified in paragraph 4 below.

(iv) For field-testing, the geomembrane installer shall cut 10 identical 25 mm (1") wide replicate specimens from his sample. The geomembrane installer shall test five specimens for seam shear strength and five for peel strength. The geomembrane installer performs peel tests on both the inside and outside weld tracks. To be acceptable, four (4) of five (5) test specimens must pass the stated criteria in section 2.02 with less than 25% separation. If four (4) of five (5) specimens pass, the sample qualifies for testing by the testing laboratory if required.

(v) If the specifications require an independent seam testing, conduct the testing in accordance with ASTM 5820 or ASTM D6392.

(vi) Prepare and submit all reports of the results of examinations and testing to the owner's representative.

(vii) For field seams, if a laboratory test fails, it is an indicator of the possible inadequacy of the entire seamed length corresponding to the test sample. The geomembrane installer should take additional destructive test portions at locations indicated by the Engineer; (typically 3 m (10 ft) on either side of the failed sample) and perform additional laboratory seam tests. Passing tests shall be an indicator of adequate seams. Failing tests shall be an indicator of non-adequate seams. When seams fail the destructive test, the Installer re-seams or repairs seams with a cap-strip. Cap-strip seams shall be non- destructively vacuum box tested until achieving adequacy of the seams. The geomembrane installer must destructively test all Cap strip seams exceeding 50 M in length (150 FT).

(viii) The Installer keeps all samples out of critical areas such as in the bottom of ponds and other locations such as slopes and sumps.

(i) Identification of Defects

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(i) The Installer and owner's representative inspects panels and seams during and after panel deployment to identify all defects, including holes, blisters, un-dispersed raw materials and signs of contamination by foreign matter.

(j) Evaluation of Defects: The Installer must complete a non-destructive test for each suspect location on the liner (both in seam and non-seam areas) using one of the methods described in Section 3.05.B. Each location failing non-destructive testing is marked, numbered, measured and posted on the daily "installation" drawings and subsequently repaired.

(i) If a destructive sample fails the field or laboratory test, the geomembrane installer shall repair the seam between the two nearest passed locations on both sides of the failed destructive sample location.

(ii) All repairs of defective seams, tears or holes use either re-seaming or applying an extrusion welded cap strip process.

(iii) Re-seaming may consist of either:

1) Removing the defective weld area and re-welding the parent material using the original welding equipment; or

2) Re-seam the defective weld area by extrusion welding along the overlap at the outside seam edge left by the fusion welding process.

3) Cap stripping entire faulty seam.

(iv) The Installer repairs blisters, larger holes, and contamination by foreign matter using required patches and/or extrusion weld beads. Each patch shall extend a minimum of 150 mm (6 in) beyond all edges of the defects.

(v) Locate, measure and record all repairs.

(k) Verification of Repairs on Seams: Each repair requires a non-destructive test using either vacuum box or spark testing methods. An indication of a successful repair includes areas passing the non-destructive test. Areas failing the tests require re-seaming and retesting until results show a passing test. Requirements for areas failing the tests include re-seaming and retesting until passing test results. The Installer records the number, date, location, technician and test outcome of each patch.

(l) Daily Field Installation Reports: At the beginning of each day's work, the Installer shall provide the Engineer with daily reports for all work accomplished on the previous workday. Reports shall include the following:

(i) Total amount and location of geomembrane placed

(ii) Total length and location of seams completed, name of technicians doing seaming and welding unit numbers

(iii) Drawings of the previous day's installed geomembrane showing panel numbers, seam numbers and locations of non-destructive and destructive testing

(iv) Results of pre-qualification test seams

(v) Results of non-destructive testing

(vi) Results of vacuum testing of repairs

(m) Prior to covering the liner, report all Destructive test results.

(n) Perform and complete all quality assurance no more than 72 hours after geomembrane deployment.

Section 3.06 LINER ACCEPTANCE

The owner's representative accepts the geomembrane liner when:

(a) The entire installation is completed or an agreed upon subsection of the installation is finished.

(b) The Installer submits all completed QC documentation to the owner.

(c) Verification of the adequacy of all field seams and repairs and associated geomembrane testing is complete.

(d) All submittals are accepted.

Section 3.07 ANCHOR TRENCH

Construct as specified on the project drawings.

Section 3.08 DISPOSAL OF SCRAP MATERIALS

(a) On completion of installation, the geomembrane installer shall dispose of all trash and scrap material in a location approved by the Owner, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner. Finally, remove all scrap material from the surface of the geomembrane.

Article IV. MEASUREMENT AND PAYMENT

The project specifications document/outline the required measurements and payment of services. All parties sign all documents prior to project start up.

Article V. GEOTEXTILES, GEONETS AND GEOCOMPOSITES

Section 5.01 GEOTEXTILES

The general arrangement of Geotextiles includes aligning seams parallel to the prevailing slope and seams finished by either heat seaming with an approved hand held or self-motivated thermal device or by sewing with a stitching approved by the engineer. Whichever stitching method is used, the thread should be compatible with the fabric and have similar chemical resistance to the liner used. Geotextile should be covered by soil or geomembrane within 14 days of deployment to minimize UV exposure.

Section 5.02 GEONET

Geonet may be butt joined or lapped if specified. At five-foot 1.5m (5') intervals along the edge, the Installer applies Nylon/plastic cable ties to the net edge. Complete end splices as follows:

(a) On slopes, the ends will overlap two feet 2' (0.6m) with uphill panels on top and two (2) rows of cable ties applied at 6" spacing or per engineers specification.

(b) In flat areas, the ends will overlap a minimum to six inches 6" (15 cm) and one (1) row of three (3) cable ties applied.

Section 5.03 GEOCOMPOSITES

Geocomposites can overlap with the net portion tied and the Geotextile portion thermally bonded or seamed as required by the project specifications.

Section 5.04 REPAIRS

Repair any holes, tears, or burns through the Geotextile from thermal seaming by patching with the same Geotextile. The patch will be a minimum of twelve inches 12" (30cm) larger – in all directions – than the area repaired and will be spot bonded thermally. Repair all geonet holes and/or tears using a patch of the same geonet. Patches are a minimum of twelve inches 12" (30cm) larger in all directions than the area repaired. Tie the patch in place using a minimum of four (4) nylon cable ties.

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6.1 - TABLES

"This section shall include the current GRI GM13 (HDPE) or GRI GM17 (LLDPE) manufacturer's specification or a revision of GRI GM13 (HDPE) or GRI GM 17 (LLDPE) specific to the unique project requirements and/or standards, as determined by the owner or owners' agent." TO BE INSERTED BY COMPANY PREPARING SUBMITTALS TO GUARANTEE MOST CURRENT GRI SPECIFICATION.

SEAM STRENGTHS - HDPE and LLDPE GRI GM 19

TABLE 1: Seam Strength and related Properties of Thermally Bonded Smooth and Textured High Density Polyethylene (HDPE) Geomembrane (English Units)

Geomembrane Nominal	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams (1)							
shear strength(2), lb/in.	**57**	**80**	**100**	**120**	**160**	**200**	**240**
shear elongation at	50	50	50	50	50	50	50
peel strength (2), lb/in.	**45**	**60**	**76**	**91**	**121**	**151**	**181**
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams							
shear strength(2), lb/in.	**57**	**80**	**100**	**120**	**160**	**200**	**240**
shear elongation at	50	50	50	50	50	50	50
peel strength (2), lb/in.	**39**	**52**	**65**	**78**	**104**	**130**	**156**
peel separation, %	25	25	25	25	25	25	25

Notes for Table 1 – (Used also for hot air and ultrasonic seaming methods.)

(a) Value listed for shear and peel strength are for 4 out of 5 test specimens; the 5th specimen can be low as 80% of the listed values

(b) Elongation measurements should be omitted for field testing

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TABLE 2: Seam Strength and related Properties of Thermally Bonded Smooth and Textured Linear Low Density Polyethylene (LLDPE) Geomembrane (English Units)

Geomembrane Nominal	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams (1)							
shear strength(2), lb/in.	**45**	**60**	**75**	**90**	**120**	**150**	**180**
shear elongation at	50	50	50	50	50	50	50
break(3) , %	**38**	**50**	**63**	**75**	**100**	**125**	**150**
peel strength (2), lb/in.	25	25	25	25	25	25	25
peel separation, %							
Extrusion Fillet Seams (1)							
shear strength(2), lb/in.	**45**	**60**	**75**	**90**	**120**	**150**	**180**
shear elongation at	50	50	50	50	50	50	50
break(3) %	**34**	**44**	**57**	**66**	**88**	**114**	**136**
peel strength (2), lb/in.	25	25	25	25	25	25	25
peel separation, %							

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Field Testing

Material	Minimum PSI	Maximum PSI
30 mil	15	30
40 mil	20	30
60 mil	24	30
80 mil	24	30
100 mil	24	32

40 mil 4 PSI

60 mil 4 PSI

80 mil 4 PSI

100 mil 4 PSI

Note: At all times before heat sealing the end of the seam, the operator should insure that the void or air channel is free of obstruction.

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Appendix D
Compaction Records

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Appendix D-I
Laboratory Test Results

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LABORATORY COMPACTION CHARACTERISTICS OF SOIL REPORT

Report Number: N2181067.0007
Service Date: 04/27/18
Report Date: 04/27/18

912 Morris St
Charleston, WV 25301-1425
304-344-0821

Client

GAI Consultants, Inc.
Attn: Charles Straley
300 Summers St Ste 1100
Charleston, WV 25301-1631

Project

C130109.10 John Amos
912 Morris Street
Charleston, WV 25301

Project Number: N2181067

Material Information

Source of Material:
Proposed Use:

Sample Information

Sample Date:
Sampled By:
Sample Location: Sample #4

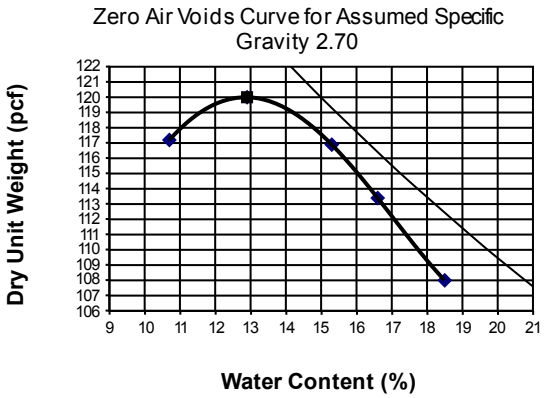
Sample Description: Silt with Sand

Laboratory Test Data

Test Procedure: ASTM D698
Test Method: Method A
Sample Preparation: Dry
Rammer Type: Mechanical
Maximum Dry Unit Weight (pcf): 120.0
Optimum Water Content (%): 12.9

	Result	Specifications
Liquid Limit:		
Plastic Limit:		
Plasticity Index:		
In-Place Moisture (%):		

USCS: ML



Comments:

Services:

Terracon Rep.:
Reported To:
Contractor:

Report Distribution:

(1) GAI Consultants, Inc., Charles Straley

Reviewed By: James L. Smith
Laboratory & CMET Project Manager

Test Methods:

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

LABORATORY COMPACTION CHARACTERISTICS OF SOIL REPORT

Report Number: N2181067.0006
Service Date: 04/27/18
Report Date: 05/03/18

912 Morris St
Charleston, WV 25301-1425
304-344-0821

Client

GAI Consultants, Inc.
Attn: Charles Straley
300 Summers St Ste 1100
Charleston, WV 25301-1631

Project

C130109.10 John Amos
912 Morris Street
Charleston, WV 25301

Project Number: N2181067

Material Information

Source of Material:
Proposed Use:

Sample Information

Sample Date:
Sampled By:
Sample Location: Sample #7

Sample Description: Sandy Silt

Laboratory Test Data

Test Procedure: ASTM D698
Test Method: Method A
Sample Preparation: Wet
Rammer Type: Mechanical

	Result	Specifications
Liquid Limit:		
Plastic Limit:		
Plasticity Index:		
In-Place Moisture (%):		

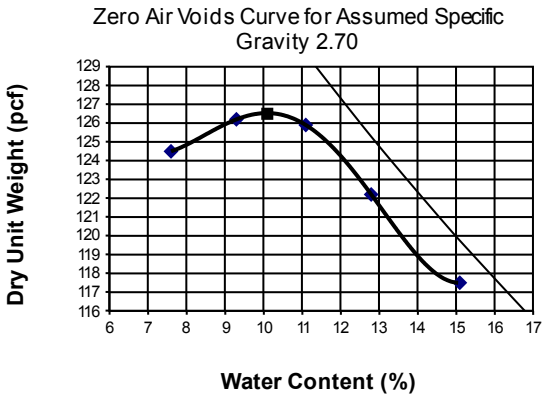
USCS:

Oversized Particles (%): 15.2
Moisture (%): 0.1
Sieve for Oversize Fraction: 4

Assumed Bulk Specific Gravity of Oversized Particles: 2.7

Corrected for Oversized Particles (ASTM D4718)
Maximum Dry Unit Weight (pcf): 126.5
Optimum Water Content (%): 10.1

Uncorrected Values
Maximum Dry Unit Weight (pcf): 121.1
Optimum Water Content (%): 11.8



Comments:

Services:

Terracon Rep.:
Reported To:
Contractor:

Report Distribution:

(1) GAI Consultants, Inc., Charles Straley

Reviewed By: James L. Smith
Laboratory & CMET Project Manager

Test Methods: ASTM D698

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

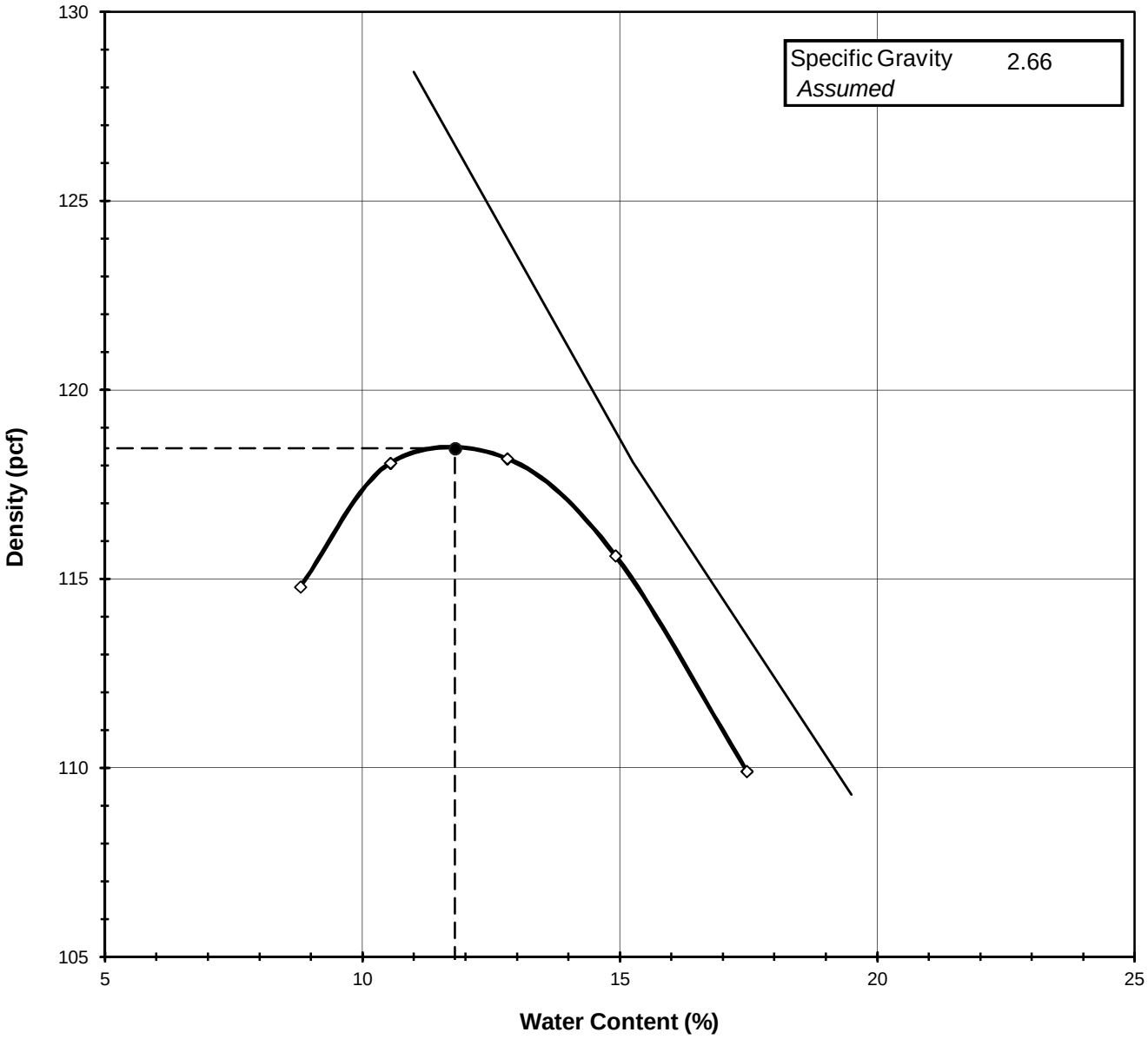
MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	NA
Client Reference:	John E. Amos LF FCS C130109.11	Depth (ft):	NA
Project No.:	2018-381-003	Sample No.:	No. 8
Lab ID:	2018-381-003-001	Test Method	**STANDARD**

Visual Description: Brown Clay with Some Rock

Optimum Water Content **11.8**
Maximum Dry Density **118.5**



Tested By *MF* *Date* *9/17/18* *Checked By* *TMP* *Date* 9/18/18

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	NA
Client Reference:	John E. Amos LF FCS C130109.11	Depth (ft):	NA
Project No.:	2018-381-003	Sample No.:	No. 8
Lab ID:	2018-381-003-001		

Visual Description: Brown Clay with Some Rock

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity:	2.66
Percent Retained on 3/4":	NA
Percent Retained on 3/8":	NA
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	C

Test Type:		**STANDARD**
Rammer Weight (lb):		5.5
Rammer Drop (in):		12
Rammer Type:		MECHANICAL
Machine ID:	G	774
Mold ID:	G	1775
Mold diameter:		6"
Weight of the Mold (g):		5719
Volume of the Mold (cm^3):		2130

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	9982	10174	10270	10254	10126
Weight of Mold (g):	5719	5719	5719	5719	5719
Weight of Wet Sample (g):	4263	4455	4551	4535	4407
Mold Volume (cm^3):	2130	2130	2130	2130	2130

Moisture Content / Density

Tare Number:	875	569	882	580	623
Weight of Tare & Wet Sample (g):	414.26	450.06	452.42	434.07	460.07
Weight of Tare & Dry Sample (g):	389.68	415.05	413.56	388.67	404.04
Weight of Tare (g):	110.22	82.98	110.24	84.26	83.22
Weight of Water (g):	24.58	35.01	38.86	45.40	56.03
Weight of Dry Sample (g):	279.46	332.07	303.32	304.41	320.82

Wet Density (g/cm^3):	2.00	2.09	2.14	2.13	2.07
Wet Density (pcf):	124.9	130.5	133.3	132.9	129.1
Moisture Content (%):	**8.8**	**10.5**	**12.8**	**14.9**	**17.5**
Dry Density (pcf):	**114.8**	**118.1**	**118.2**	**115.6**	**109.9**

Zero Air Voids

Moisture Content (%):	11.0	15.3	19.5
Dry Unit Weight (pcf):	128.4	118.1	109.3

Tested By MF *Date* 9/17/18 *Checked By* TMP *Date* 9/18/18

DCN:CT-S12 DATE:5/1/13 REVISION: 14

S:Excell\Excel Qa\Spreadsheets\Proctor.xls

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APPENDIX D-II
Compaction Test Results

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FIELD DENSITY TESTING RECORD (NUCLEAR METHOD)

PROJECT:	Amos Landfill - Sequence 4 Repair	PROJECT NO.:	C130109.27	TECHNICIAN:	Various	

		STANDARD COUNTS						FIELD DENSITY			PROCTOR DENSITY					COMPACTION			
DATE	GAUGE NO.	MOISTURE	DENSITY	TEST NO.	LIFT / ELEV.	LOCATION	SOIL DESCRIPTION (COLOR & TYPE, LIFT THICKNESS, ETC)	g_{wet} (pcf)	w (%)	g_{dry} (pcf)	Proctor Name	MAX. g_{dry} (pcf)	OPT. w (%)	OPT. w, + (%)	OPT. w, - (%)	FIELD (%)	REQ. (%)	P / F	COMMENTS
10/4/2023				1004-1		North Lower Slope	general fill (lift #1)	133.9	10.5	121.2	Red Sandy	126.5	10.1	3.0	3.0	95.8	95.0	PASS	
10/4/2023				1004-2		East Mid Slope	general fill (lift #1)	137.3	12.9	121.6	Red Sandy	126.5	10.1	3.0	3.0	96.1	95.0	PASS	
10/4/2023				1004-3		East Lower Slope	general fill (lift #1)	138.1	10.3	125.2	Red Sandy	126.5	10.1	3.0	3.0	99.0	95.0	PASS	
10/4/2023				1004-4		South Mid Slope	general fill (lift #1)	135.5	9.2	124.1	Red Sandy	126.5	10.1	3.0	3.0	98.1	95.0	PASS	
10/4/2023				1004-5		South Lower Slope	general fill (lift #1)	138.5	11.1	124.7	Red Sandy	126.5	10.1	3.0	3.0	98.5	95.0	PASS	
10/9/2023				1009-1		North Mid Slope	general fill (lift #2)	132.1	10.3	119.8	RS w/ sand	120.0	12.9	3.0	3.0	99.8	95.0	PASS	
10/9/2023				1009-2		North Lower Slope	general fill (lift #2)	132.1	12.1	117.8	RS w/ sand	120.0	12.9	3.0	3.0	98.2	95.0	PASS	
10/9/2023				1009-3		East Lower Slope	general fill (lift #2)	132.5	12.3	118.0	RS w/ sand	120.0	12.9	3.0	3.0	98.3	95.0	PASS	
10/9/2023				1009-4		South Mid Slope	general fill (lift #2)	135.9	12.8	120.5	Red Sandy	126.5	10.1	3.0	3.0	95.2	95.0	PASS	
10/9/2023				1009-5		South Lower Slope	general fill (lift #2)	132.5	12.7	117.6	RS w/ sand	120.0	12.9	3.0	3.0	98.0	95.0	PASS	
10/17/2023				1017-1		North Mid Slope	general fill (lift #3)	126.2	9.9	114.8	BC w/ rock	118.5	11.8	3.0	3.0	96.9	95.0	PASS	
10/17/2023				1017-2		North Lower Slope	general fill (lift #3)	128.8	11.8	115.2	BC w/ rock	118.5	11.8	3.0	3.0	97.2	95.0	PASS	
10/17/2023				1017-3		East Lower Slope	general fill (lift #3)	130.0	14.1	113.9	BC w/ rock	118.5	11.8	3.0	3.0	96.1	95.0	PASS	
10/17/2023				1017-4		South Mid Slope	general fill (lift #3)	131.2	13.0	116.1	BC w/ rock	118.5	11.8	3.0	3.0	98.0	95.0	PASS	
10/17/2023				1017-5		South Lower Slope	general fill (lift #3)	127.9	11.9	114.3	BC w/ rock	118.5	11.8	3.0	3.0	96.5	95.0	PASS	
10/23/2023				1023-1		East Mid Slope	general fill (lift #4)	130.5	10.4	118.2	BC w/ rock	118.5	11.8	3.0	3.0	99.8	95.0	PASS	
10/24/2023				1024-1		North Upper Slope	general fill (lift #4)	135.0	11.4	121.2	RS w/ sand	120.0	12.9	3.0	3.0	101.0	95.0	PASS	
10/24/2023				1024-2		North Mid Slope	general fill (lift #4)	132.7	10.5	120.1	RS w/ sand	120.0	12.9	3.0	3.0	100.1	95.0	PASS	
10/25/2023				1025-1		Northeast Lower Slope	general fill (lift #4)	131.6	10.5	119.1	BC w/ rock	118.5	11.8	3.0	3.0	100.5	95.0	PASS	
10/26/2023				1026-1		South Mid Slope	subbase	138.4	11.4	124.2	Red Sandy	126.5	10.1	3.0	3.0	98.2	95.0	PASS	
10/27/2023				1027-1		South Lower Slope	subbase	135.1	9.7	123.2	Red Sandy	126.5	10.1	3.0	3.0	97.4	95.0	PASS	
10/27/2023				1027-2		South Upper Slope	subbase	138.6	10.8	125.1	Red Sandy	126.5	10.1	3.0	3.0	98.9	95.0	PASS	
10/28/2023				1028-1		South Lower Slope	subbase	136.6	13.0	120.9	RS w/ sand	120.0	12.9	3.0	3.0	100.7	95.0	PASS	
10/31/2023				1031-1		North Mid Slope	subbase	137.6	8.7	126.6	Red Sandy	126.5	10.1	3.0	3.0	100.1	95.0	PASS	
11/1/2023				1101-1		North Upper Slope	subbase	136.8	10.2	124.1	Red Sandy	126.5	10.1	3.0	3.0	98.1	95.0	PASS	

ATTACHMENT 2
COMPACTED CLAY LINER CERTIFICATION

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Sequence 4 Liner Repair
Compacted Clay Liner Certification

American Electric Power
John E. Amos Landfill
John E. Amos Power Plant
Winfield, West Virginia

GAI Project Number: C130109.27
January2024

Prepared by: GAI Consultants, Inc.
Charleston Office
500 Lee Street East, Suite 700
Charleston, West Virginia 25301

Prepared for: American Electric Power
One Riverside Plaza
Columbus, Ohio 43215

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Quality Assurance Officer
Director Engineering / Associate

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Figure 1 Site Plan

Appendix A Record Drawings
Drawing 23033A Top Liner
Appendix B Photographs of Construction Activities
Appendix C Laboratory Test Data
Appendix D Compaction Records

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GAI Consultants, Inc. Certification

Based on the construction testing and observations performed by American Electric Power (AEP) and GAI Consultants, Inc. (GAI) personnel, I hereby certify that the compacted clay liner construction within Sequence 4 at the Appalachian Power Company's John E. Amos Flue Gas Desulfurization (FGD) Landfill near Winfield, West Virginia (WV), as shown on Drawing 23033A Top Liner, has been installed in substantial compliance with the material specifications and construction requirements listed in the WV National Pollutant Discharge Elimination System/Solid Waste Permit WV0116254) documents; the 2023 Site Work Construction, Sequence 4 Liner Repair construction documents; and the Federal Coal Combustion Residuals (CCR) Rule. Exline Surveying Inc. survey personnel provided as-built survey Record Drawings, verifying that the compacted clay liner met the permit requirements.

This document clarifies "certification" for the compacted clay liner construction within Sequence 4 Liner Repair at the Amos FGD Landfill.

The definition of certify as used herein is: Certify means to state or declare a professional opinion of conditions whose true properties cannot be known at the time such certification was made, despite appropriate professional evaluation. A design professional's certification in no way relieves any other party from meeting requirements imposed by contract or other means, including commonly accepted industry practices.

Bearing the above in mind and based on the results of: (1) Certification from the material manufacturers and installation meeting the requirements of the Specifications, the CCR Rule, and the WV Department of Environmental Protection permit; (2) results of field and laboratory testing; and (3) monitoring of construction efforts during the project; GAI's professional opinion is that the compacted clay liner construction within Sequence 4 Liner Repair of the Amos FGD Landfill meets the requirements as set forth by the permit documents and the CCR Rule.

Charles F. Straley, PE, PLS
Certifying Engineer and Quality Assurance Officer
PE #11842

1.0 Introduction

1.1 Project Description

This Compacted Clay Liner Certification Report documents the testing and observations performed during the compacted clay liner installation in Sequence 4 Liner Repair at American Electric Power's (AEP's) John E. Amos FGD Landfill (Landfill) in Winfield, West Virginia (WV). The location of Sequence 4 Liner Repair at the Amos Landfill is shown on Figure 1. Appendix A contains the As-Built Drawings for the compacted clay liner construction. Appendix B contains typical construction photographs included in the daily reports. Construction of the Sequence 4 Liner Repair site described in this certification report consists of the following:

- Construction activities associated with the placement and compaction of the two-foot thick compacted clay liner.

Construction of the groundwater control and subgrade preparation, including placement of structural fill to meet the compacted clay liner subgrade elevations, began in September 2023 and was documented in the Sequence 4 Liner Repair Groundwater Control and Subgrade Certification Report (December 2023).

Construction of the compacted clay liner in Sequence 4 Liner Repair began in November 2023 and was completed in November 2023. The area was constructed in accordance with the approved Quality Assurance/Quality Control (QA/QC) Plan; the Landfill's Solid Waste/National Pollutant Discharge Elimination System (NPDES) permit (Permit No. WV0116254); WV Department of Environmental Protection (WVDEP) Title 33, Series 1, Solid Waste Management Rule; the Coal Combustion Residuals (CCR) Rule; and AEP's Civil Engineering Division Technical Specifications for Material Construction and associated Project Addenda to the Specifications. Included in this report are the field information and the applicable Record Drawings in accordance with the WVDEP requirements. The construction QA (CQA) services performed by GAI are discussed in the following sections.

1.2 Companies and Personnel

The key companies and personnel involved with the compacted clay liner construction of Sequence 4 are listed below.

AEP - Owner
Appalachian Power Company - Operator
Janine White, Project Manager
Brian Palmer, Principal Civil Engineer
David Fry, Lead Construction Coordinator

GAI Consultants Inc. (GAI) – CQA/Soil Testing
Charles Straley, P.E., P.S., Certifying Engineer, QA Officer, and Director Engineering
John Klamut, P.E. Project Manager
Hannah Parsons., Lead QC Inspector (QCI)

Entact, LLC. (Entact) - Earthwork Contractor
Jonathan Lovenduski, Project Manager
Eric Cline, Superintendent

1.3 Scope of Services

1.3.1 Preconstruction Activities

Preconstruction activities conducted by GAI personnel consisted of the following:

1. Review of information for the soils that were used during Sequence 4 Liner Repair compacted clay liner construction; and

2. Collecting additional soil samples and conducting laboratory testing to characterize soils to be used during construction.

1.3.2 Construction Documentation Activities

Construction documentation activities performed by GAI personnel included the following:

1. Observed, documented and tested the placement and compaction of the two-foot thick compacted clay liner;
2. Prepared daily field reports and documented construction activities. GAI also attended daily health and safety meetings, weekly project update meetings, and monthly contractor's meetings, as well as other supplemental meetings when needed; and
3. Provided photo documentation throughout the construction showing typical construction procedures (see Appendix B).

1.3.3 Record Drawings and Certification Report

Documentation and certification activities performed by the QA/QC team included the following:

1. Exline Surveying provided surveying services for the As-Built Drawings presented in Appendix A). As-Built Drawing 23033A Top of Liner depicts the design top surface of the compacted clay liner.
2. GAI personnel performed the construction documentation activities discussed in Sections 1.3.1 and 1.3.2 of this report.
3. Project personnel observed the construction activities and provided the enclosed information documenting that the construction activities were performed consistent with the design and permit requirements.

1.4 Construction Schedule

Site clearing, damaged liner removal, excavation and fill placement for subgrade, and the installation of groundwater controls were performed prior to construction of the compacted clay liner. The compacted clay liner was then constructed upon the finished subgrade. Clay liner construction was completed in November 2023.

1.5 Reference Documents

The plans, specifications, and QA requirements for the construction activities and materials used by GAI personnel for this project are as follows:

1. Solid Waste/NPDES Permit No. WV0116254.
2. AEP Civil Engineering Division, Technical Specifications for Material and Construction (prepared by AEP), and the Addenda to the Technical Specifications (prepared by GAI).
3. "Quality Assurance and Quality Control Plan, Sequence 4 Liner Repair" for the Appalachian Power Company John E. Amos Plant's Amos FGD Landfill (revised June 2022, prepared by GAI).
4. Amos FGD Landfill Sequence 4 Liner Repair Construction Drawings (issued for construction March 2023 and revised September 2023, prepared by GAI)

2.0 Soil Prequalification

Soil pre-qualifications for compacted clay liner construction included the historic soils data in the original (2006) permit application. Clay liner material used in original construction of Sequence 4

compacted clay liner was reused. In addition, supplemental preconstruction soil evaluations were performed on soils to be used for the Sequence 4 compacted clay liner construction.

2.1 Soil Prequalification Requirements

The soil prequalification requirement, as outlined in WVDEP 33CSR1-3.8.b, require that a sample be collected and tested at the following minimum frequencies:

1. Four samples for the first 10 or less acres and one additional sample for each additional 10 acres, for water content testing.
2. Four samples for the first 10 or less acres and one additional sample for each additional 10 acres, for Proctor moisture/density relationship testing.
3. 20 percent of the samples used to develop the Proctor curves must be used to evaluate the soil permeability for each prominent soil type.
4. One sample for each predominant soil type for grain-size distribution testing.
5. One sample for each predominant soil type for Atterberg limit testing.

Testing was performed on the clay materials removed for reuse and additional borrow clay sources which exceeded the above minimum frequencies.

2.2 2023 Sampling

Sampling of clayey soil materials was conducted in 2023 to evaluate reused compacted clay liner material removed from the damaged liner system and potential borrow areas at various locations across the site and to confirm the consistency of the soils to be used in the Sequence 4 Liner Repair liner construction. A total of eight samples were collected for laboratory analyses. The level of sampling was appropriate to verify the consistency of the borrow area soils. The laboratory testing program focused on the soil's physical characteristics (i.e., grain-size distribution, maximum dry density, and optimum moisture content).

Based on the evaluation of the samples collected, the reused clay liner material and three of the borrow area soil types were acceptable: the clayey soil materials were a red lean clay and a brown clay with rock fragments. The samples consist of clayey soil with a Unified Soil Classification System (USCS) classification of CL. Laboratory results are included in Appendix C.

3.0 Compacted Clay Liner

As installed, the compacted clay liner forms a homogenous barrier of recompacted clayey soils in Sequence 4 Liner Repair area. The soil was placed and compacted to provide an in-place hydraulic conductivity of $1X10^{-7}$ cm/sec or less. A minimum thickness of two feet of compacted clay liner (measured perpendicular to the subgrade) was placed and compacted, as verified by survey. The material used to construct the liner consisted of predominantly the red lean clay with some minor amounts of the brown clay with rock (shale) fragments, as discussed in Section 2.2.

3.1 USCS Classification and Standard Proctor Analyses

The soils used for the compacted clay liner were pre-characterized for grain-size distribution (ASTM D 422), Atterberg limits (ASTM D 4318) and maximum dry density/optimum moisture content (ASTM D 698). The soil placed had a USCS designation of CL. A total of 50 quality control Standard Proctors and USCS soil classifications for the soils used for the compacted clay liner were completed for prior landfill development construction. Additional soil Standard Proctor and USCS soil classification tests were performed for the compacted clay liner materials used. The Standard Proctor and USCS classification test results for the Sequence 4 Liner Repair samples are included in Appendix C. The soil samples tested are representative of the soils used to construct the compacted clay liner in Sequence 4 Liner Repair.

3.2 Quality Control/Remolded Permeability Results

The results of the seven permeability analyses completed for remolded samples of the Sequence 4 Liner Repair materials were reviewed. The testing was performed in accordance with ASTM D 5084. The test results are included in Appendix C.

The results ranged from $5.1X10^{-7}$ to $3.4X10^{-9}$ cm/sec for the samples that were moisture conditioned and compacted in general accordance with the minimum compaction criteria listed in Section 3.3. Two of the sampled borrow areas resulted in permeability results greater than the specified $1x10^{-7}$ cm/sec. Where the resulting permeability results were greater than $1x10^{-7}$ cm/sec determined borrow areas which were not acceptable for use and these areas were excluded and not used as the clayey material did not meet the specifications. The remaining test results confirmed that the compaction requirements were appropriate to meet the permeability requirement of $1X10^{-7}$ cm/sec or less.

3.3 Compacted Clay Liner Construction

The clayey soil used for construction of the Sequence 4 Liner Repair compacted clay liner was a lean clay (USCS CL).

In general, the clay was removed from the borrow site with excavators, wetted and transported to the work area using articulated trucks. The soil was spread in maximum eight-inch loose lifts with a dozer. Visual observation of lift placement thickness was the primary means of quality assurance. Water was added, if needed, using a water truck. Rocks greater than two inches in size were removed from the soil when encountered. The lift was compacted using a tow behind sheepsfoot roller to meet the minimum specifications of 95 percent of the maximum dry density and within three-percent of the optimum moisture content.

The soil placement operation was reviewed by the GAI Quality Assurance Inspectors and AEP personnel. Unacceptable material was removed prior to compaction. If an area did not meet compaction specifications based on the described data evaluation methods, then the area represented by the test was reworked by making additional passes with the compactor or modifying the moisture of the soil as needed (by watering to add more moisture or scarifying and allowing the soil to dry to reduce moisture), and recompacting until a passing test was achieved. Retests were taken within the area represented by the original test.

3.4 Compacted Clay Liner Compaction Control

Density tests were performed using a nuclear densometer to compare the in-place density with the minimum compaction requirements. The density tests were performed for each lift of the compacted clay liner. A total of 30 passing tests were performed. The results of the density tests are presented in Appendix D.

3.5 Grade/Thickness Verification

A grid system was developed to measure the elevation at the top and bottom of the compacted clay liner by survey. These values were utilized to confirm that the thickness of the compacted clay liner was equal to or greater than two feet. The grid system and measured thicknesses are shown on Drawings 23033A Top of Liner in Appendix A. GAI also observed that the general nominal thickness of each lift and number of lifts constructed would provide the required minimum two-foot thick compacted clay liner.

4.0 Summary

The construction work documented in this report was completed in accordance with the design and specifications presented in the applicable WVDEP Solid Waste/NPDES Permit (No. WV0116254), the CCR Rule, and the construction documents listed in this report. The field activities documented in this report represent the CQA services provided for the compacted clay liner for construction of Sequence 4 Liner Repair at the Landfill.

FIGURE

AMOS FGD LANDFILL

05786\Desktop\SURVEYS\vacinity map.jpg

JOHN AMOS PLANT

BLUE LICK ROAD

BELLS CREEK ROAD

VICINITY MAP
(NOT TO SCALE)

AMOS LANDFILL CONTROL MONUMENTS
DATUM: NAD83/88 WV S - GEOID03

PT.	NORTH	EAST	ELEVATION	
1	539375.6400	1727964.6500	649.2400	MONUMENT
5	541953.8200	1725476.5700	979.7500	MONUMENT
6	540672.8190	1722790.9030	926.9120	MONUMENT
7	540251.9820	1728194.8480	954.4330	MONUMENT
5077	540828.3700	1725256.7600	939.6500	
5104	539496.9700	1728326.1600	618.8900	
15 2012 BASE AT OFFICE	540947.1150	1725381.9170	929.596	Bottom of Antenna Mount
BASE ACROSS HILL	540874.0200	1722784.0800	933.0950	Base 25001 Bottom of Antenna Near Stockpile #6

GRAPHIC SCALE
200' 100' 0 200'
1 INCH = 200 FEET

NORTH MERIDIAN REFERENCED TO STATE PLANE COORDINATES (W.V. SOUTH)

FIGURE 1
SITE PLAN
SEQUENCE 4 LANDFILL
CONSTRUCTION

LEGEND
- EXISTING 4" UNDERDRAIN
- EXISTING 12" UNDERDRAIN
- OVERHEAD ELECTRIC
- SURVEYED PROPERTY LINES
- DIVERSION DITCHES
- EXISTING SEDIMENT TRAPS
- STONE FILTERS
- SILT FENCE
- CELL 3 CAP LIMITS
- EXISTING SEDIMENT TRAPS, DITCHES OR SPILLWAYS WITH STONE BOTTOM
- LIVING WEIRS
- FLOC LOG
- FLOW CHECK
- COMPOST LOG
- straw wattle
- 765kv location
- smart fence

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APPALACHIAN POWER CO.

JOHN E. AMOS PLANT

WINFIELD WEST VIRGINIA

JOHN E. AMOS FGD LANDFILL
EROSION & SEDIMENT CONTROL
DETAILS

NAD 83/NAVD 88 W.V. SOUTH

Drawing Name:	Amos Asbuilt
SCALE:	1"=200'
Revision Date:	JULY 10, 2019
Surveyed By:	C.Sheppard
Drawn By:	C.Sheppard

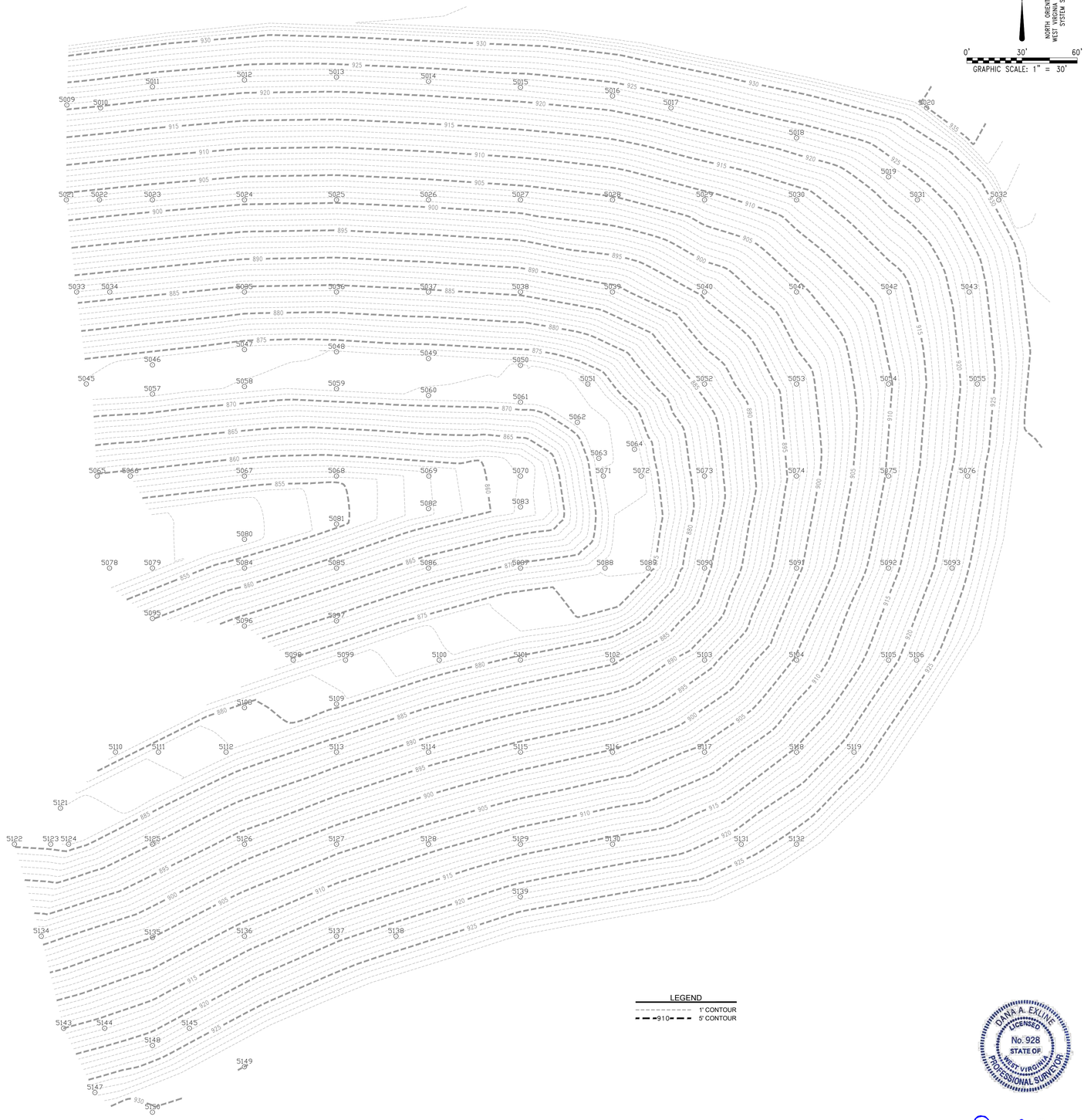
AEP AMERICAN ELECTRIC POWER
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

APPENDIX A
Record Drawings

gai consultants
transforming ideas into reality

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	TOP SUB-GRADE ASBUILT	DEPTH BETWEEN LAYERS
5009	542251.59	1724803.51	920.81	N/A	N/A
5010	542249.94	1724821.80	919.67	917.54	2.13
5011	542261.45	1724850.00	922.41	920.14	2.27
5012	542265.16	1724900.02	922.31	919.97	2.34
5013	542266.67	1724950.02	922.62	920.30	2.32
5014	542264.41	1724999.99	922.59	920.36	2.23
5015	542261.07	1725050.01	922.53	920.33	2.20
5016	542256.49	1725099.99	922.59	920.31	2.28
5017	542249.97	1725131.78	922.58	920.42	2.16
5018	542233.67	1725200.03	922.57	920.34	2.23
5019	542212.55	1725250.07	922.64	920.37	2.27
5020	542249.97	1725270.63	934.52	N/A	N/A
5021	542200.03	1724803.21	903.72	N/A	N/A
5022	542200.00	1724821.20	903.07	900.94	2.13
5023	542199.99	1724849.97	902.16	899.91	2.25
5024	542199.94	1724900.01	900.79	898.50	2.29
5025	542199.97	1724950.02	900.53	898.29	2.24
5026	542199.98	1725000.01	901.29	898.97	2.32
5027	542199.98	1725049.99	902.41	900.07	2.34
5028	542200.02	1725099.95	904.36	902.09	2.28
5029	542199.99	1725149.96	908.50	906.19	2.31
5030	542199.99	1725199.96	912.94	910.71	2.23
5031	542200.01	1725265.64	922.61	920.50	2.11
5032	542199.99	1725309.85	930.48	N/A	N/A
5033	542150.00	1724808.82	886.96	N/A	N/A
5034	542149.98	1724826.80	886.36	884.19	2.17
5035	542149.99	1724900.02	884.00	881.83	2.16
5036	542149.98	1724949.98	883.73	881.47	2.26
5037	542149.97	1725000.00	884.54	882.30	2.24
5038	542149.97	1725050.01	885.62	883.45	2.17
5039	542150.03	1725100.00	888.76	886.60	2.16
5040	542150.00	1725150.00	895.72	893.57	2.15
5041	542149.96	1725199.97	903.83	901.70	2.12
5042	542150.02	1725250.35	912.16	910.15	2.00
5043	542149.98	1725293.80	922.57	920.36	2.21
5045	542100.02	1724814.06	873.94	N/A	N/A
5046	542110.37	1724849.98	873.71	871.50	2.21
5047	542118.70	1724899.99	873.37	871.27	2.10
5048	542117.48	1724949.98	872.85	870.67	2.18
5049	542113.81	1725000.04	872.39	870.27	2.12
5050	542110.21	1725049.95	871.86	869.70	2.16
5051	542099.95	1725086.58	871.90	869.81	2.09
5052	542099.96	1725149.94	886.24	883.96	2.28
5053	542099.98	1725200.00	897.65	895.50	2.15
5054	542100.01	1725250.05	909.47	907.42	2.05
5055	542099.99	1725298.26	922.48	920.36	2.12
5057	542094.58	1724850.01	873.36	871.05	2.31
5058	542098.64	1724900.01	872.89	870.69	2.20
5059	542097.44	1724950.02	872.44	870.15	2.29
5060	542093.76	1725000.00	871.85	869.62	2.23
5061	542090.13	1725049.97	871.37	869.29	2.08
5062	542079.20	1725080.90	871.50	869.41	2.08
5063	542059.60	1725092.61	871.76	869.51	2.25
5064	542064.49	1725111.91	872.26	870.11	2.15
5065	542050.02	1724820.00	859.62	N/A	N/A
5066	542049.99	1724838.01	858.98	856.80	2.18
5067	542049.97	1724900.01	856.75	854.58	2.16
5068	542049.98	1724950.04	856.18	854.03	2.15
5069	542050.04	1725000.24	857.95	855.65	2.31
5070	542050.02	1725050.04	861.11	858.79	2.32
5071	542049.96	1725095.05	872.10	869.84	2.26
5072	542050.01	1725115.69	872.68	870.47	2.21
5073	542049.99	1725149.97	882.03	879.93	2.10
5074	542050.00	1725199.97	896.47	894.29	2.18
5075	542050.02	1725249.99	910.50	908.44	2.06
5076	542049.98	1725292.88	922.57	920.42	2.15

POINT #	AS-BUILT NORTHING	AS-BUILT EASTING	AS-BUILT ELEV	TOP SUB-GRADE ASBUILT	DEPTH BETWEEN LAYERS
5078	541999.97	1724826.61	851.00	N/A	N/A
5079	542000.00	1724850.03	851.80	849.63	2.17
5080	542015.66	1724899.95	852.61	850.58	2.03
5081	542023.96	1724949.99	854.57	852.54	2.03
5082	542032.26	1724999.98	857.82	855.58	2.24
5083	542033.22	1725050.00	861.26	859.07	2.18
5084	541999.98	1724899.98	856.85	854.59	2.26
5085	542000.03	1724950.01	862.00	859.83	2.18
5086	542000.02	1724999.94	867.16	864.94	2.22
5087	542000.02	1725050.02	870.98	868.79	2.19
5088	541999.96	1725095.97	873.86	871.63	2.23
5089	542000.01	1725119.41	873.93	871.82	2.11
5090	541999.94	1725149.98	883.92	881.83	2.08
5091	542000.01	1725199.98	899.13	897.01	2.12
5092	541999.99	1725249.97	913.40	911.15	2.25
5093	541999.98	1725284.46	922.59	920.34	2.25
5095	541972.62	1724849.96	859.86	N/A	N/A
5096	541968.59	1724899.97	866.84	N/A	N/A
5097	541971.39	1724950.00	871.05	N/A	N/A
5098	541950.03	1724926.50	875.43	N/A	N/A
5099	541949.98	1724954.83	878.35	876.19	2.16
5100	541950.01	1725005.81	877.44	875.35	2.09
5101	541950.05	1725050.00	880.81	878.67	2.14
5102	541949.95	1725099.98	884.22	882.04	2.17
5103	541950.00	1725150.06	893.17	890.92	2.25
5104	541950.03	1725199.97	905.45	903.35	2.10
5105	541949.98	1725250.02	918.62	916.47	2.15
5106	541950.00	1725265.18	922.50	920.36	2.14
5108	541924.09	1724900.05	880.24	878.10	2.14
5109	541926.23	1724950.00	879.30	877.14	2.16
5110	541900.08	1724829.90	878.36	N/A	N/A
5111	541900.00	1724853.30	881.80	879.49	2.31
5112	541900.04	1724889.98	881.27	879.08	2.20
5113	541900.02	1724950.00	887.44	885.28	2.16
5114	541900.02	1724999.98	892.61	890.37	2.23
5115	541900.02	1725050.04	896.87	894.59	2.28
5116	541900.06	1725100.03	900.44	898.27	2.17
5117	541900.04	1725149.98	906.31	904.25	2.06
5118	541900.00	1725199.99	915.64	913.41	2.24
5119	541899.97	1725231.19	922.51	920.36	2.15
5121	541869.58	1724799.98	883.41	881.33	2.08
5122	541849.99	1724774.99	884.58	N/A	N/A
5123	541850.06	1724794.67	884.21	881.90	2.31
5124	541850.01	1724804.41	883.88	881.89	1.99
5125	541850.02	1724849.98	889.99	887.75	2.24
5126	541850.04	1724899.97	897.30	895.10	2.21
5127	541850.03	1724949.98	903.30	901.04	2.26
5128	541850.05	1724999.95	908.46	906.31	2.15
5129	541850.00	1725050.00	913.04	910.94	2.10
5130	541850.02	1725100.01	916.33	914.24	2.09
5131	541849.99	1725169.91	922.48	920.41	2.07
5132	541849.97	1725200.01	927.01	924.76	2.25
5134	541799.98	1724789.57	898.50	N/A	N/A
5135	541799.31	1724849.99	905.00	902.93	2.07
5136	541800.03	1724899.99	912.39	910.34	2.04
5137	541800.03	1724950.01	919.04	916.79	2.25
5138	541800.02	1724982.30	922.45	920.31	2.14
5139	541821.45	1725049.90	922.49	920.37	2.12
5143	541749.99	1724801.74	915.01	N/A	N/A
5144	541750.02	1724824.04	916.89	914.69	2.20
5145	541750.04	1724870.07	922.65	920.53	2.11
5147	541715.08	1724818.72	927.50	N/A	N/A
5148	541740.68	1724849.99	922.25	920.14	2.11
5149	541729.14	1724900.02	930.05	N/A	N/A
5150	541704.42	1724849.99	930.80	N/A	N/A



DANA A. EXLINE LICENSED No. 928 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

DANA A. EXLINE
PROFESSIONAL SURVEYOR #928
STATE OF WEST VIRGINIA
DATE: 11/27/23

REV.	DESCRIPTION	DATE
0	TOP OF LINER LAYER	11-20-23

EXLINE SURVEYING, INC.
10356 STATE ROUTE 139
JACKSON, OHIO 45640
PHONE: (740) 286-7024 • TELECOPIER (740) 286-0012

CERTIFICATION POINTS
FOR
ENTACT, LLC

SEQUENCE 4
CERTIFICATION POINTS
TOP OF LINER LAYER
JOHN E. AMOS PLANT
WINFIELD, WEST VIRGINIA

DRAWING SCALE:
1" = 30'

TITLE RESEARCH:
N/A

CALCULATED BY:
P. TAYLOR

DRAWN BY:
P. TAYLOR

CHECKED BY:
D. EXLINE

DRAWING NUMBER
23033A
TOP LINER

SHEET NUMBER
1 OF 1

APPENDIX B
Photographs of Construction Activities

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Photograph 1. Clay Stockpile Excavation

Photograph 2. Clay Stockpile Excavation

Photograph 3. Clay Placement

Photograph 4. Clay Placement

Photograph 5. Clay Compaction

Photograph 6. Clay Placement

Photograph 7. Clay Grading and Compaction

Photograph 8. Clay Placement and Compaction

Appendix C
Laboratory Test Data

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Clay Soil Samples			
Sample ID	Location of Sample	Date of Sample	Meets Specifications
61523-1	Clay Stockpile	6/15/2023	Yes
61523-2	Clay Stockpile	6/15/2023	Yes
61523-3	Clay Stockpile	6/15/2023	Yes
61523-4	Borrow Area North of Clay Stockpile	6/15/2023	No
8/10/23-1	Borrow Area 2-5	8/10/2023	Yes
8/10/23-2	Borrow Area South of Clay Stockpile	8/10/2023	Yes
8/10/23-3	Borrow Area North of Clay Stockpile	8/10/2023	Yes
8/10/23-4	Borrow Area Sequence 5	8/10/2023	No

September 14, 2023

Project No. 2023-370-003

Zach Wilder
GAI Consultants, Inc.
385 East Waterfront Drive
Homestead, PA 15120

Transmittal
Laboratory Test Results
AEP Amos Seq. 4 C130109.27

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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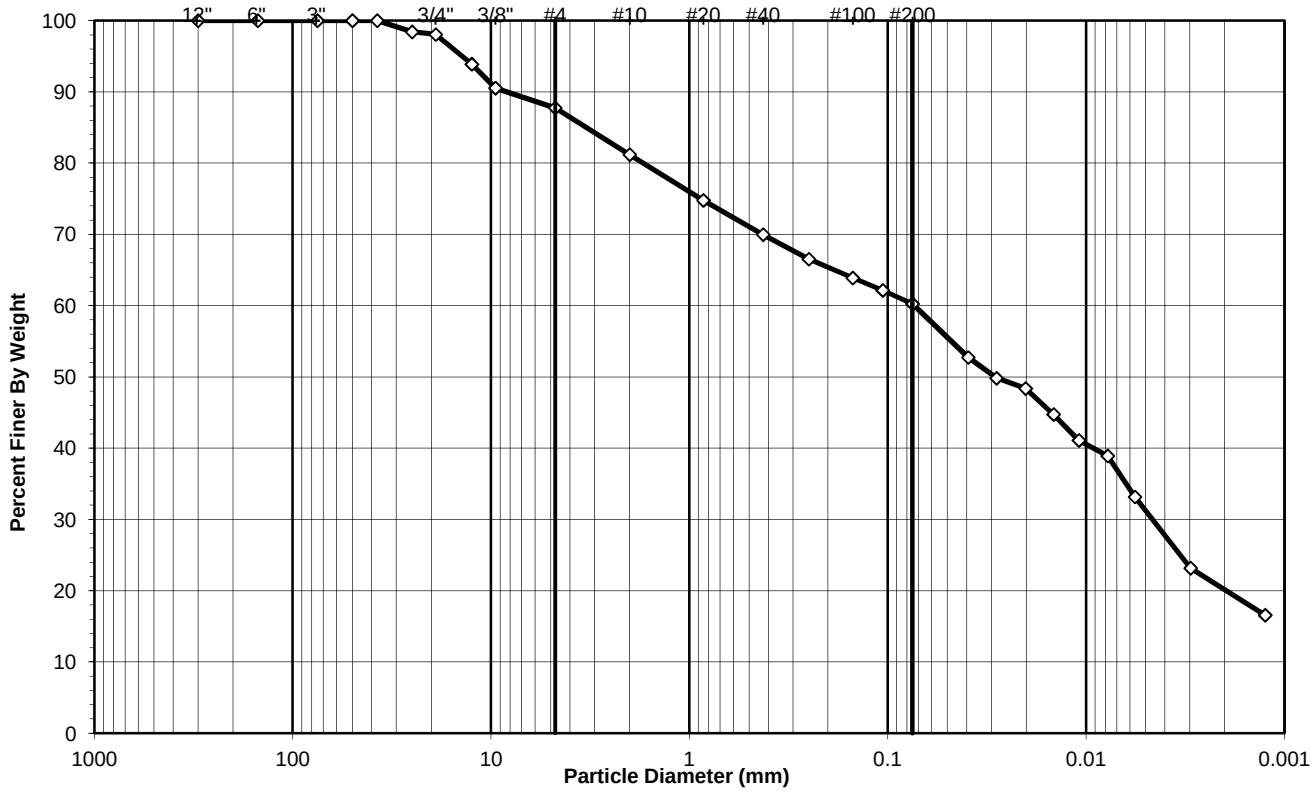
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001	Soil Color:	Red & Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**12.25**
#4 to #200	***Sand***	**27.50**
Finer than #200	***Silt & Clay***	**60.26**

USCS Symbol:
CL, TESTED

USCS Classification:
SANDY LEAN CLAY

Tested By DF Date 7/6/23 Checked By BRB Date 7/10/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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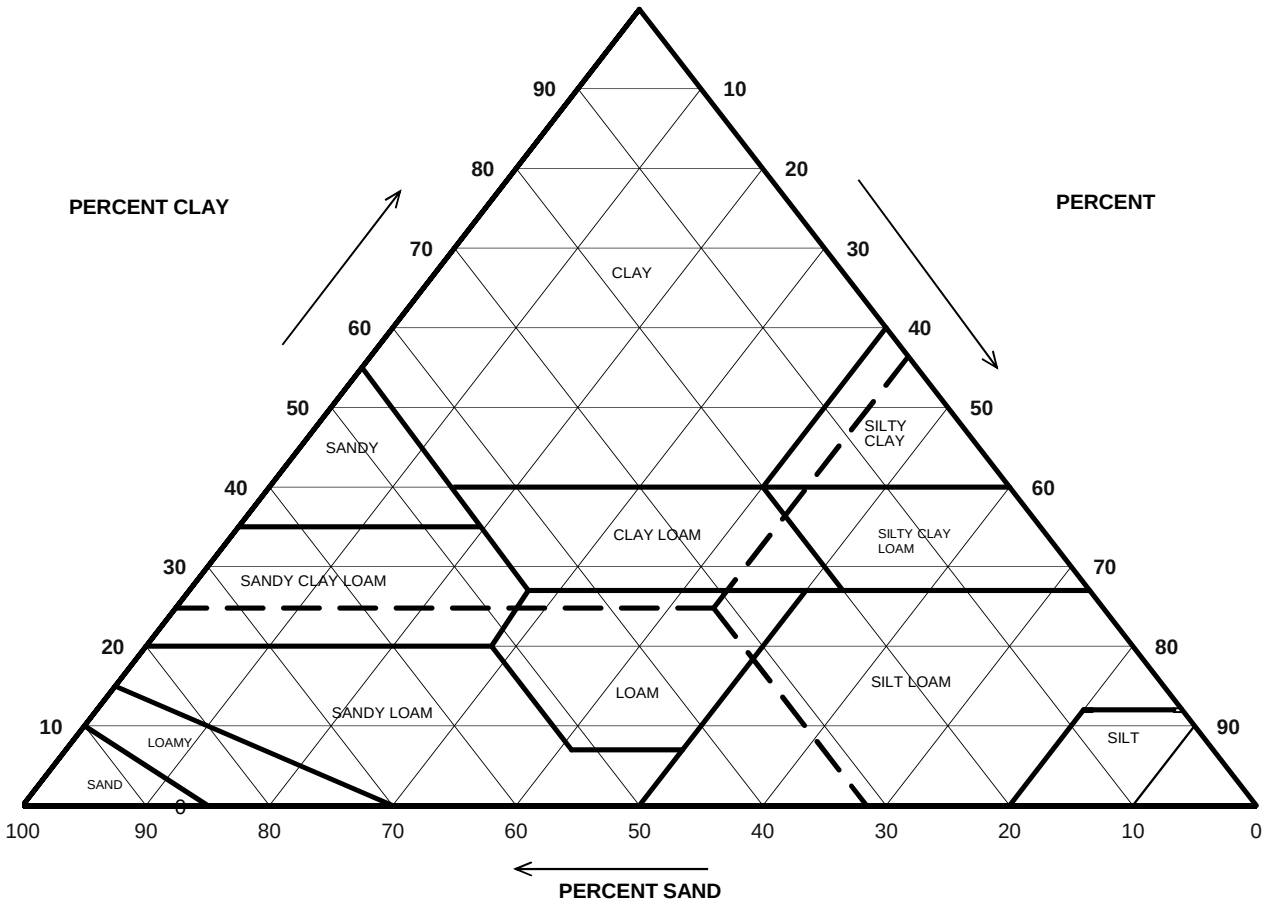
USDA CLASSIFICATION CHART

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001	Soil Color:	Red & Brown



USDA SUMMARY				
Particle Size (mm)	**Percent Finer**		**Actual Percentage**	Corrected % of Minus 2.0 mm material for USDA Classification
		Gravel	**18.81**	
2	**81.19**	**Sand**	**25.65**	**31.59**
0.05	**55.54**	**Silt**	**35.40**	**43.60**
0.002	**20.15**	**Clay**	**20.15**	**24.81**

USDA Classification: LOAM

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001	Soil Color:	Red & Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	3113	Tare No.:	3153
Wt. of Tare & Wet Sample (g):	290.91	Weight of Tare & Wet Sample (g):	446.03
Wt. of Tare & Dry Sample (g):	254.80	Weight of Tare & Dry Sample (g):	419.58
Weight of Tare (g):	8.22	Weight of Tare (g):	8.12
Weight of Water (g):	36.11	Weight of Water (g):	26.45
Weight of Dry Soil (g):	246.58	Weight of Dry Soil (g):	411.46
Moisture Content (%):	**14.6**	**Moisture Content (%):**	**6.4**

Wet Weight of -3/4" Sample (g):	23843.00	Total Dry Weight of Sample (g):	21210.79
Tare No. -3/4" Sub-Specimen (g):	1474	Wet Weight of +3/4" Sample (g):	440.00
Wt. of Tare & Wet -3/4" Sub-Specimen (g):	1160.07	Dry Weight of + 3/4" Sample (g):	413.42
Weight of Tare (g):	144.44	Dry Weight of - 3/4" Sample (g):	20797.36
Sub-Specimen 3/4" Wet Weight (g):	1015.63	Dry Weight -3/4" +3/8" Sample (g):	1594.49
Tare No. (-3/8" Sub-Specimen):	894	Dry Weight of -3/8" Sample (g):	19202.87
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	613.35	J - Factor (% Finer than 3/4"):	98.1%
Weight of Tare (g):	109.67	J - Factor (% Finer than 3/8"):	90.5%
Sub-Specimen -3/8" Wet Weight (g):	503.68		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	357.00		1.58	1.58	98.42	**98**
3/4"	19	83.00		0.37	1.95	98.05	**98**
1/2"	12.5	37.64	(**)	4.25	4.25	95.75	**94**
3/8"	9.5	30.28		3.42	7.67	92.33	**91**
#4	4.75	13.50		3.07	3.07	96.93	**88**
#10	2	31.83		7.24	10.32	89.68	**81**
#20	0.85	31.13	(**)	7.09	17.40	82.60	**75**
#40	0.425	23.32		5.31	22.71	77.29	**70**
#60	0.25	16.70		3.80	26.51	73.49	**67**
#100	0.15	12.85		2.92	29.44	70.56	**64**
#140	0.106	8.40		1.91	31.35	68.65	**62**
#200	0.075	9.20		2.09	33.44	66.56	**60**
Pan	-	292.41		66.56	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	7/6/23	Checked By	BRB	Date	7/10/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001	Soil Color:	Red & Brown

Elapsed Time (min)	Reading rm	Temp. (C^0)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	41.5	25.9	5.24	9.6	0.0393	87.5	52.7
2	39.5	25.9	5.24	9.9	0.0283	82.7	49.8
4	38.5	25.9	5.24	10.1	0.0202	80.3	48.4
8	36.0	25.9	5.24	10.5	0.0146	74.2	44.7
15	33.5	25.9	5.24	11.0	0.0109	68.2	41.1
30	32.0	25.9	5.24	11.3	0.0078	64.6	38.9
60	28.0	26.0	5.20	12.0	0.0057	55.0	33.2
240	21.0	26.3	5.07	13.2	0.0030	38.5	23.2
1440	16.5	26.2	5.11	14.1	0.0013	27.5	16.6

Soil Specimen Data

Tare No.:	1466	Percent Finer than # 200:	60.26
Wt. of Tare & Dry Material (g):	152.52		
Weight of Tare (g):	106.55	Specific Gravity:	2.70 Assumed
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	40.97		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	G- 1819
Cylinder	G- 356
Thermometer	G- 1505
Balance	G- 657
#200 Sieve	G- 1944
Foam Inhibitor Used	No

Tested By TO Date 7/6/23 Checked By BRB Date 7/10/23

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001	Soil Description:	REDDISH BROWN LEAN CLAY

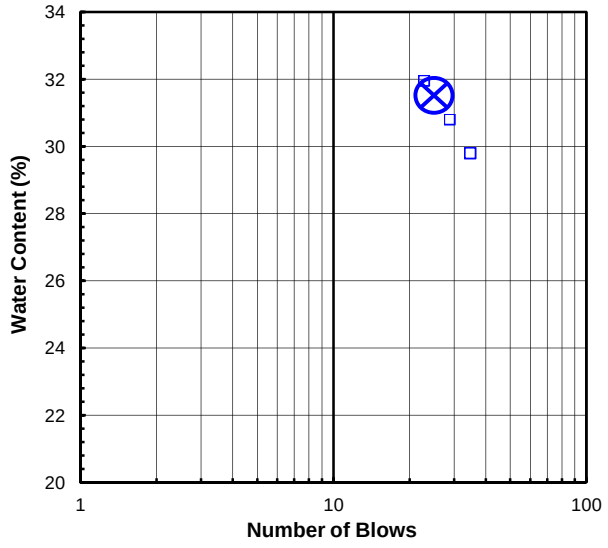
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Air dried)

As Received Moisture Content		Liquid Limit Test			
ASTM D2216-19		1	2	3	M
Tare Number:	2949	217	166	147	U
Wt. of Tare & Wet Sample (g):	191.19	39.05	39.46	40.81	L
Wt. of Tare & Dry Sample (g):	169.20	34.37	34.73	35.80	T
Weight of Tare (g):	8.39	18.65	19.36	20.11	I
Weight of Water (g):	22.0	4.7	4.7	5.0	P
Weight of Dry Sample (g):	160.8	15.7	15.4	15.7	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**13.7**	**29.8**	**30.8**	**31.9**	N
Number of Blows:		**35**	**29**	**23**	T

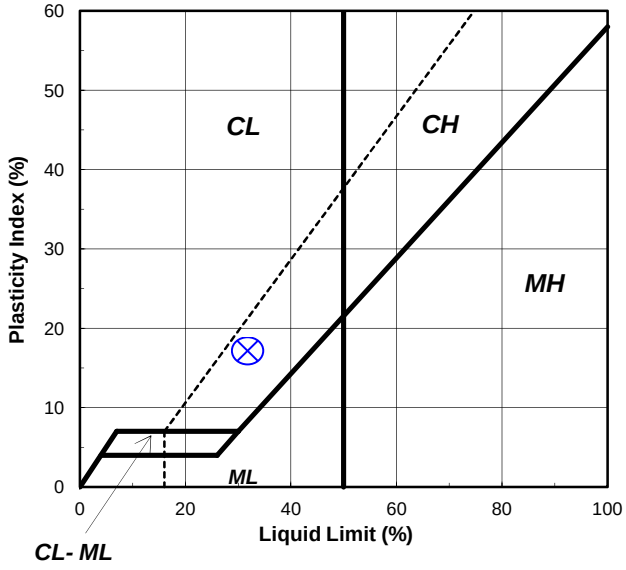
Plastic Limit Test	**1**	**2**	**Range**
Tare Number:	301	630	
Wt. of Tare & Wet Sample (g):	24.95	24.88	
Wt. of Tare & Dry Sample (g):	24.13	24.05	
Weight of Tare (g):	18.70	18.70	
Weight of Water (g):	0.8	0.8	
Weight of Dry Sample (g):	5.4	5.4	
Moisture Content (%):	**15.1**	**15.5**	**-0.4**
Note: The acceptable range of the two Moisture Contents is ±			1.12

Test Results	
Liquid Limit (%):	**32**
Plastic Limit (%):	**15**
Plasticity Index (%):	**17**
USCS Symbol:	**CL**

Flow Curve



Plasticity Chart



Tested By FS *Date* 7/6/23 *Checked By* KC *Date* 7/7/23

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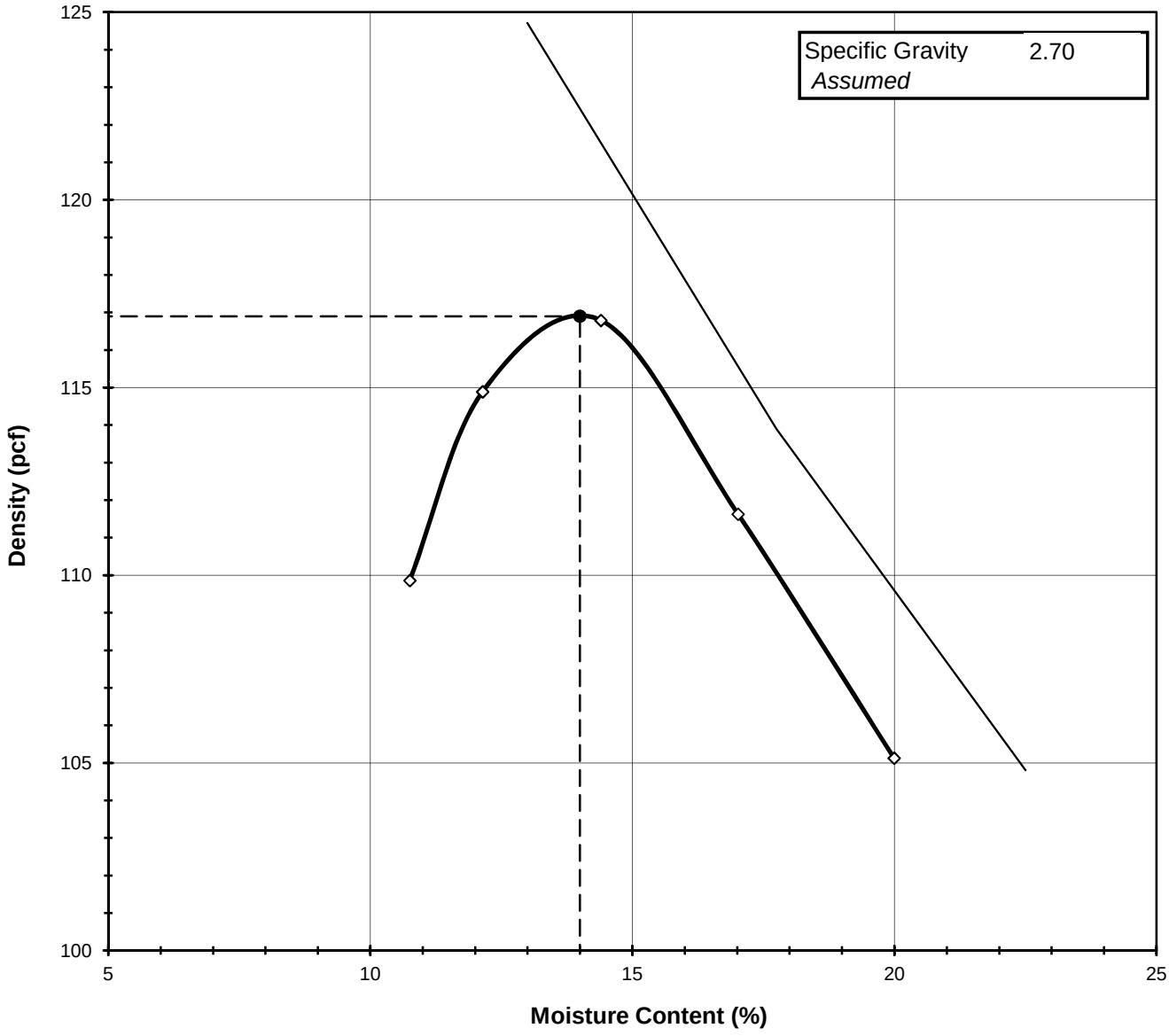
MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001	Test Method	**STANDARD**

Visual Description: Reddish Brown Clay and Rock

Optimum Moisture Content (%): 14.0
Maximum Dry Density (pcf): 116.9



Tested By AB *Date* 7/6/23 *Checked By* KC *Date* 7/7/23

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		

Visual Description: Reddish Brown Clay and Rock

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity:	2.70
Percent Retained on 3/4":	NA
Percent Retained on 3/8":	NA
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	C

Test Type:	**STANDARD**
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	G774
Mold ID:	G3280
Mold diameter:	6"
Weight of the Mold (g):	7110
Volume of the Mold (cm^3):	2133

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	11269	11514	11677	11575	11422
Weight of Mold (g):	7110	7110	7110	7110	7110
Weight of Wet Sample (g):	4159	4404	4567	4465	4312
Mold Volume (cm^3):	2133	2133	2133	2133	2133

Moisture Content / Density

Tare Number:	561	605	609	882	887
Weight of Tare & Wet Sample (g):	485.80	485.82	480.80	509.69	509.73
Weight of Tare & Dry Sample (g):	446.96	442.50	430.44	451.54	443.02
Weight of Tare (g):	85.76	85.74	80.69	109.81	109.37
Weight of Water (g):	38.84	43.32	50.36	58.15	66.71
Weight of Dry Sample (g):	361.20	356.76	349.75	341.73	333.65

Wet Density (g/cm^3):	1.95	2.06	2.14	2.09	2.02
Wet Density (pcf):	121.7	128.8	133.6	130.6	126.1
Moisture Content (%):	**10.8**	**12.1**	**14.4**	**17.0**	**20.0**
Dry Density (pcf):	**109.9**	**114.9**	**116.8**	**111.6**	**105.1**

Zero Air Voids

Moisture Content (%):	13.0	17.8	22.5
Dry Unit Weight (pcf):	124.7	113.9	104.8

Tested By AB *Date* 7/6/23 *Checked By* KC *Date* 7/7/23

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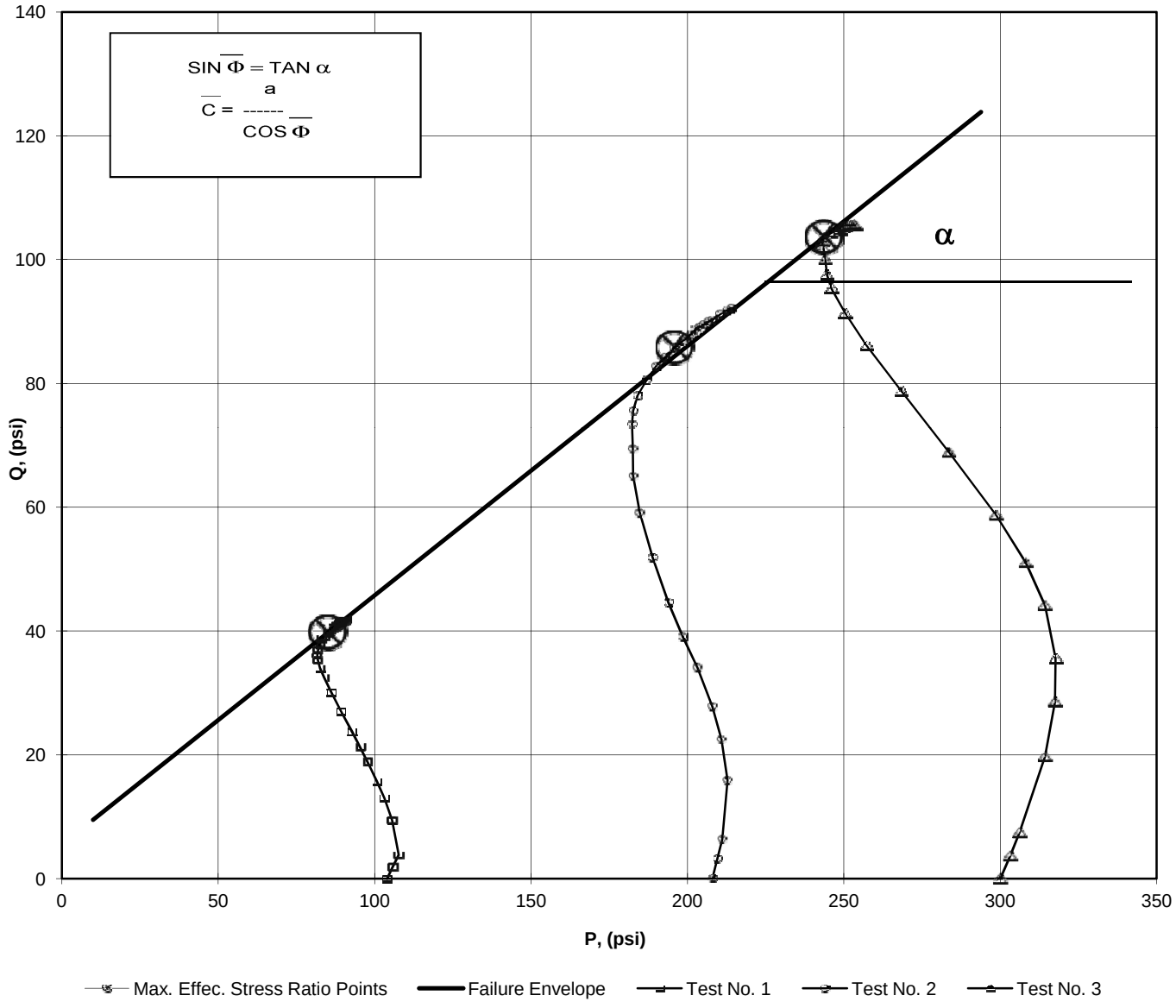
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.00**	$\overline{C}$	=	**0.00**
α	=	**21.9**	$\overline{\Phi}$	=	**23.75**

Tested By: RPE Date: 8/9/23 Approved By: NJM Date: 8/25/23

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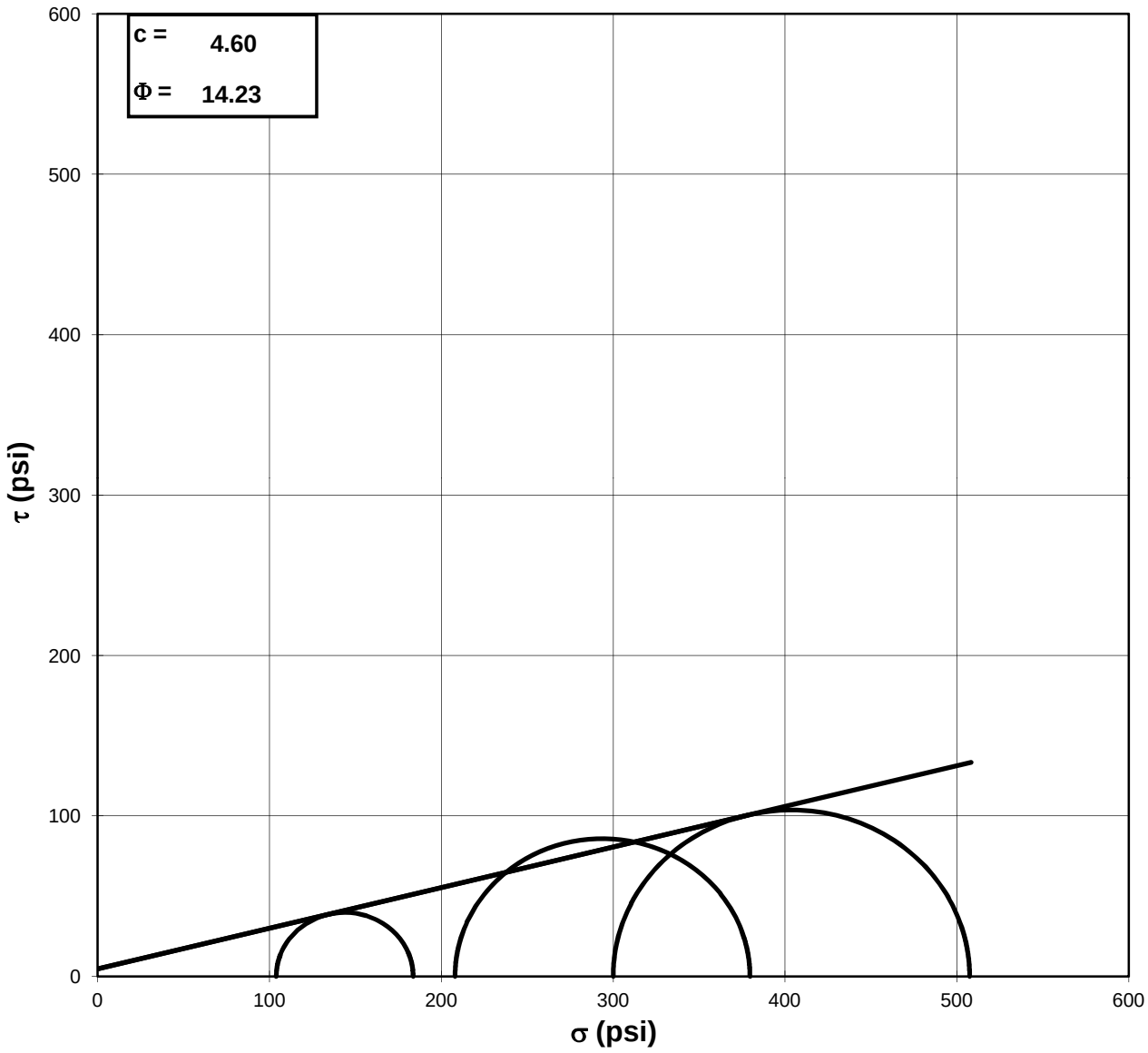
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		
Visual Description:	Reddish-Brown Clay with Rocks (Remolded)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: RPE *Date:* 8/9/23 *Approved By:* NJM *Date:* 8/25/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	146.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	104.0
Pore Pressure Response (%)	99

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	85.20
Q	=	39.80

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	96.0
Final Burette Reading (ml)	30.2
Final Change (ml)	65.8
Initial Dial Reading (mil)	25
Dial Reading After Saturation (mil)	34
Dial Reading After Consolidation (mil)	200

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.6	0.000	42.0
24.1	0.001	42.1
47.0	0.002	42.1
113.9	0.007	49.9
156.6	0.012	55.9
188.4	0.017	61.0
225.5	0.025	67.1
254.6	0.034	71.8
285.4	0.045	77.0
325.3	0.066	83.6
363.6	0.094	89.8
394.4	0.130	94.4
416.5	0.166	97.5
436.1	0.206	99.5
447.5	0.236	100.4
462.0	0.277	101.1
478.3	0.332	101.4
494.0	0.393	101.4
504.5	0.438	101.0
517.7	0.496	100.6
527.0	0.540	100.1
535.9	0.584	99.7
543.8	0.629	99.2
549.3	0.659	98.9
554.9	0.689	98.6
560.5	0.718	98.3
565.7	0.747	97.9
573.1	0.791	97.5
580.2	0.835	97.1
585.6	0.865	96.8
590.4	0.895	96.6

Tested By: RPE Date: 8/9/23 Input Checked By: NJM Date: 8/25/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	104.0	*Stage No.*	1
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	34.16
Length After Consolidation (in)	5.77
Area After Consolidation (in^2)	5.925

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	3.79	0.10	107.69	103.9	1.037	0.03	105.79	1.90
0.04	7.66	0.13	111.53	103.9	1.074	0.02	107.70	3.83
0.12	18.94	7.91	115.03	96.1	1.197	0.42	105.56	9.47
0.21	26.10	13.92	116.17	90.1	1.290	0.54	103.12	13.05
0.30	31.43	18.95	116.48	85.0	1.370	0.61	100.77	15.72
0.43	37.63	25.06	116.57	78.9	1.477	0.67	97.75	18.81
0.58	42.45	29.83	116.62	74.2	1.572	0.71	95.39	21.23
0.78	47.53	34.99	116.54	69.0	1.689	0.74	92.77	23.76
1.14	54.00	41.64	116.36	62.4	1.866	0.78	89.36	27.00
1.63	60.10	47.85	116.25	56.2	2.070	0.80	86.20	30.05
2.25	64.80	52.42	116.38	51.6	2.256	0.82	83.98	32.40
2.88	68.01	55.48	116.54	48.5	2.402	0.82	82.53	34.01
3.58	70.70	57.51	117.20	46.5	2.521	0.82	81.85	35.35
4.09	72.18	58.42	117.76	45.6	2.583	0.82	81.67	36.09
4.80	73.98	59.09	118.89	44.9	2.647	0.81	81.90	36.99
5.76	75.81	59.41	120.41	44.6	2.700	0.79	82.50	37.91
6.81	77.44	59.39	122.05	44.6	2.736	0.77	83.33	38.72
7.59	78.44	59.03	123.41	45.0	2.744	0.76	84.19	39.22
8.60	79.61	58.60	125.01	45.4	2.754	0.74	85.20	39.80
9.36	80.38	58.10	126.27	45.9	2.751	0.73	86.09	40.19
10.13	81.04	57.69	127.35	46.3	2.750	0.72	86.83	40.52
10.91	81.53	57.24	128.30	46.8	2.743	0.71	87.53	40.77
11.43	81.88	56.94	128.93	47.1	2.740	0.70	87.99	40.94
11.94	82.23	56.63	129.60	47.4	2.736	0.70	88.48	41.11
12.45	82.59	56.33	130.26	47.7	2.733	0.69	88.96	41.30
12.95	82.87	55.90	130.96	48.1	2.723	0.68	89.53	41.43
13.72	83.22	55.49	131.73	48.5	2.716	0.67	90.12	41.61
14.49	83.51	55.06	132.45	48.9	2.706	0.67	90.70	41.75
15.00	83.78	54.79	132.99	49.2	2.703	0.66	91.10	41.89
15.51	83.96	54.60	133.36	49.4	2.700	0.66	91.38	41.98

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	250.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	208.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	195.81
Q	=	85.78

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	168.0
Final Burette Reading (ml)	54.8
Final Change (ml)	113.2

Initial Dial Reading (mil)	40
Dial Reading After Saturation (mil)	52
Dial Reading After Consolidation (mil)	224

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.2	0.000	42.2
36.3	0.001	43.7
70.6	0.002	45.3
173.5	0.007	53.0
245.6	0.013	61.6
303.7	0.018	69.8
372.5	0.026	80.9
427.3	0.034	90.6
488.4	0.045	100.7
569.9	0.065	113.0
653.1	0.093	124.4
723.0	0.129	132.4
776.7	0.165	136.9
827.0	0.207	141.1
855.5	0.235	142.9
889.7	0.276	143.9
928.4	0.331	143.6
964.4	0.392	142.8
989.1	0.437	141.4
1019.0	0.495	140.0
1040.2	0.538	138.4
1061.6	0.582	136.9
1080.3	0.629	136.3
1091.5	0.659	135.3
1103.1	0.688	134.4
1115.1	0.718	133.4
1125.3	0.746	132.2
1146.6	0.790	130.7
1165.5	0.834	129.2
1176.4	0.864	128.1
1187.0	0.894	127.9

Tested By: RPE Date: 8/9/23 Input Checked By: NJM Date: 8/25/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	208.0	*Stage No.*	1
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	31.21
Length After Consolidation (in)	5.76
Area After Consolidation (in^2)	5.422

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	6.47	1.66	212.81	206.3	1.031	0.26	209.57	3.23
0.03	12.80	3.28	217.52	204.7	1.063	0.26	211.12	6.40
0.12	31.74	11.04	228.71	197.0	1.161	0.35	212.84	15.87
0.22	44.98	19.58	233.40	188.4	1.239	0.44	210.91	22.49
0.32	55.61	27.80	235.81	180.2	1.309	0.51	208.00	27.80
0.46	68.17	38.89	237.28	169.1	1.403	0.58	203.20	34.08
0.59	78.12	48.57	237.54	159.4	1.490	0.63	198.48	39.06
0.78	89.17	58.66	238.51	149.3	1.597	0.67	193.93	44.58
1.12	103.71	70.99	240.72	137.0	1.757	0.70	188.86	51.86
1.62	118.29	82.39	243.89	125.6	1.942	0.71	184.75	59.14
2.24	130.15	90.41	247.74	117.6	2.107	0.71	182.67	65.08
2.86	138.94	94.93	252.01	113.1	2.229	0.70	182.54	69.47
3.59	146.84	99.10	255.75	108.9	2.348	0.69	182.32	73.42
4.09	151.13	100.89	258.24	107.1	2.411	0.68	182.67	75.56
4.80	156.02	101.93	262.09	106.1	2.471	0.67	184.08	78.01
5.75	161.19	101.55	267.64	106.4	2.514	0.64	187.05	80.60
6.80	165.56	100.78	272.78	107.2	2.544	0.62	190.00	82.78
7.59	168.38	99.39	276.99	108.6	2.550	0.60	192.80	84.19
8.61	171.56	97.97	281.59	110.0	2.559	0.58	195.81	85.78
9.35	173.72	96.38	285.34	111.6	2.556	0.57	198.48	86.86
10.12	175.79	94.91	288.88	113.1	2.554	0.55	200.99	87.89
10.92	177.29	94.27	291.02	113.7	2.559	0.54	202.38	88.65
11.44	178.09	93.35	292.74	114.7	2.553	0.53	203.70	89.04
11.96	178.94	92.38	294.56	115.6	2.548	0.53	205.09	89.47
12.47	179.82	91.39	296.43	116.6	2.542	0.52	206.52	89.91
12.96	180.46	90.21	298.26	117.8	2.532	0.51	208.02	90.23
13.72	182.29	88.69	301.60	119.3	2.528	0.50	210.45	91.14
14.48	183.64	87.25	304.40	120.8	2.521	0.48	212.57	91.82
15.02	184.20	86.08	306.12	121.9	2.511	0.48	214.02	92.10
15.53	184.74	85.95	306.80	122.1	2.514	0.47	214.42	92.37

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	342.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	300.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	243.79
Q	=	103.68

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	120.0
Final Burette Reading (ml)	30.8
Final Change (ml)	89.2

Initial Dial Reading (mil)	58
Dial Reading After Saturation (mil)	68
Dial Reading After Consolidation (mil)	305

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.5	0.000	42.1
44.3	0.001	42.5
87.7	0.001	43.3
228.7	0.005	47.5
329.9	0.009	53.1
411.7	0.014	59.9
510.4	0.021	71.8
590.6	0.029	84.8
680.8	0.039	102.0
801.2	0.059	127.3
920.4	0.088	152.3
1013.6	0.124	170.9
1081.9	0.161	183.0
1138.0	0.202	191.4
1169.8	0.230	195.0
1208.4	0.270	198.0
1244.1	0.326	200.5
1270.9	0.389	201.9
1291.3	0.434	201.9
1315.3	0.493	200.7
1331.6	0.535	197.9
1347.9	0.580	198.2
1362.8	0.628	198.0
1371.6	0.659	197.6
1380.9	0.688	197.1
1389.9	0.718	196.4
1398.3	0.747	195.9
1411.5	0.790	195.1
1425.3	0.835	194.4
1433.0	0.866	193.8
1440.8	0.897	193.4

Tested By: RPE Date: 8/9/23 Input Checked By: NJM Date: 8/25/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	300.0	*Stage No.*	1
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	32.72
Length After Consolidation (in)	5.69
Area After Consolidation (in^2)	5.746

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	7.44	0.55	306.90	299.5	1.025	0.08	303.18	3.72
0.03	15.00	1.31	313.68	298.7	1.050	0.09	306.19	7.50
0.08	39.51	5.47	334.04	294.5	1.134	0.14	314.29	19.76
0.15	57.06	11.07	345.99	288.9	1.197	0.20	317.46	28.53
0.24	71.23	17.90	353.32	282.1	1.252	0.26	317.71	35.61
0.37	88.25	29.79	358.46	270.2	1.327	0.35	314.34	44.13
0.50	102.01	42.81	359.20	257.2	1.397	0.43	308.19	51.00
0.68	117.41	60.04	357.38	240.0	1.489	0.53	298.67	58.71
1.03	137.74	85.29	352.45	214.7	1.642	0.64	283.58	68.87
1.54	157.46	110.32	347.15	189.7	1.830	0.72	268.41	78.73
2.18	172.30	128.94	343.37	171.1	2.007	0.77	257.21	86.15
2.82	182.72	140.96	341.76	159.0	2.149	0.80	250.40	91.36
3.56	190.77	149.36	341.41	150.6	2.266	0.81	246.03	95.38
4.03	195.14	153.01	342.13	147.0	2.328	0.81	244.56	97.57
4.74	200.10	155.98	344.12	144.0	2.389	0.80	244.07	100.05
5.73	203.87	158.47	345.40	141.5	2.440	0.80	243.47	101.93
6.83	205.85	159.91	345.94	140.1	2.469	0.80	243.02	102.93
7.63	207.36	159.89	347.48	140.1	2.480	0.79	243.79	103.68
8.65	208.87	158.71	350.15	141.3	2.478	0.78	245.72	104.43
9.39	209.75	155.91	353.84	144.1	2.456	0.77	248.97	104.88
10.19	210.45	156.19	354.26	143.8	2.463	0.77	249.03	105.23
11.03	210.80	156.05	354.75	144.0	2.464	0.76	249.35	105.40
11.57	210.87	155.58	355.29	144.4	2.460	0.76	249.86	105.44
12.09	211.04	155.10	355.94	144.9	2.456	0.76	250.42	105.52
12.62	211.15	154.44	356.71	145.6	2.451	0.75	251.14	105.57
13.12	211.20	153.90	357.31	146.1	2.446	0.75	251.71	105.60
13.88	211.33	153.10	358.23	146.9	2.439	0.75	252.56	105.66
14.67	211.44	152.39	359.05	147.6	2.432	0.74	253.33	105.72
15.21	211.25	151.83	359.42	148.2	2.426	0.74	253.79	105.62
15.75	211.05	151.40	359.65	148.6	2.420	0.74	254.13	105.52

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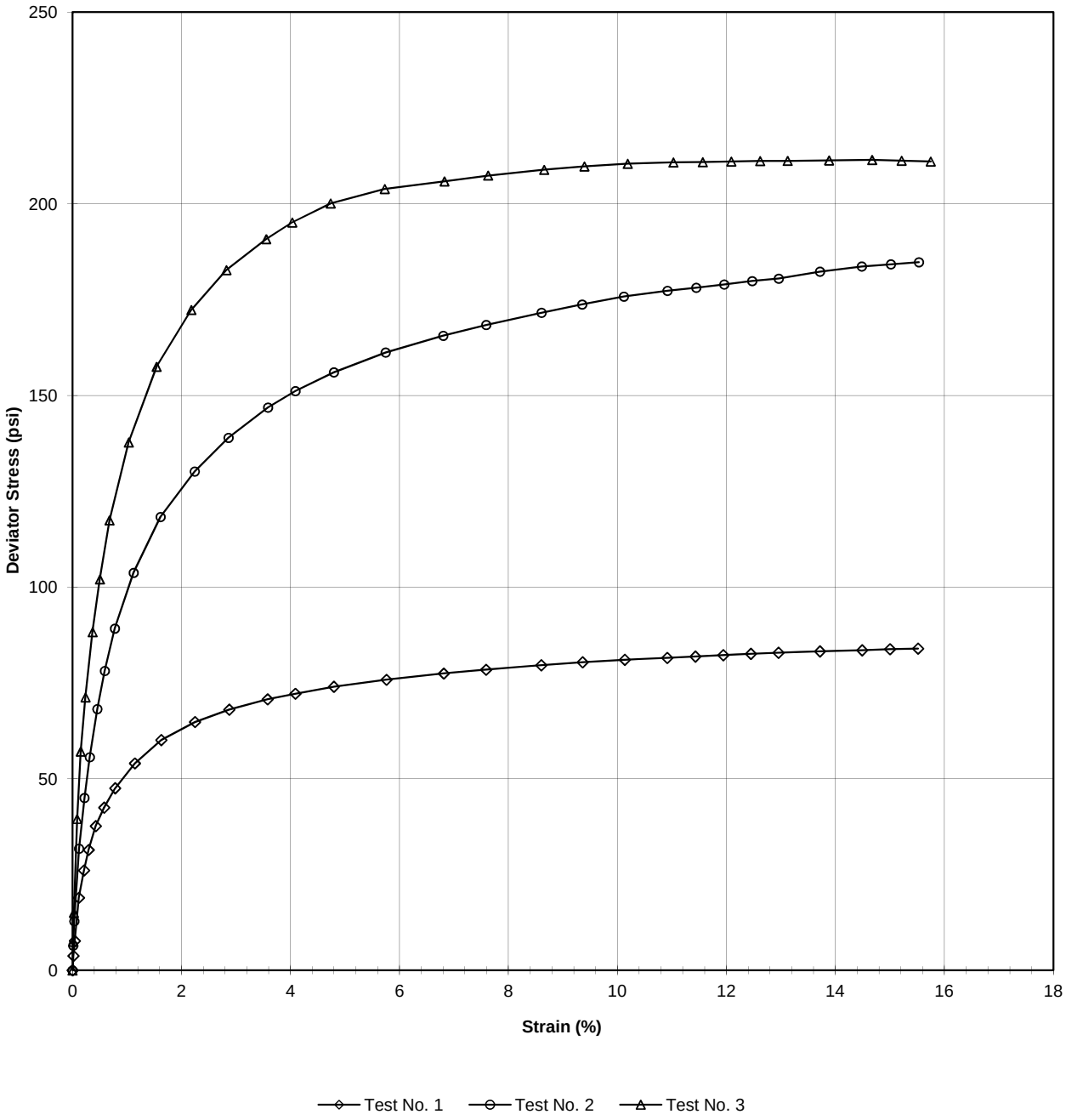
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID:	2023-370-003-001		
Visual Description:	Reddish-Brown Clay with Rocks (Remolded)		



Tested By: RPE Date: 8/9/23 Approved By: NJM Date: 8/25/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.		
Client Reference:	AEP Amos Seq. 4 C130109.27		
Project No.:	2023-370-003		
Lab ID:	2023-370-003-001	Specific Gravity (Assumed)	2.7

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

SAMPLE CONDITION SUMMARY

Boring No.:	AEP Amos	AEP Amos	AEP Amos
Depth (ft):	Seq. 4 Repair	Seq. 4 Repair	Seq. 4 Repair
Sample No.:	61523-1	61523-1	61523-1
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.001	0.0005	0.001
Back Pressure (psi)	42	42	42
Consolidation Time (days)	1	1	1
Moisture Content (%) (INITIAL)	13.9	13.9	13.9
Total Unit Weight (pcf)	126.6	126.6	126.6
Dry Unit Weight (pcf)	111.1	111.1	111.1
Moisture Content (%) (FINAL)	15.2	13.0	12.8
Initial State Void Ratio,e	0.517	0.517	0.517
Void Ratio at Shear, e	0.351	0.235	0.294

Tested By: RPE Date: 8/9/23 Input Checked By: NJM Date: 8/25/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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PERMEABILITY TEST

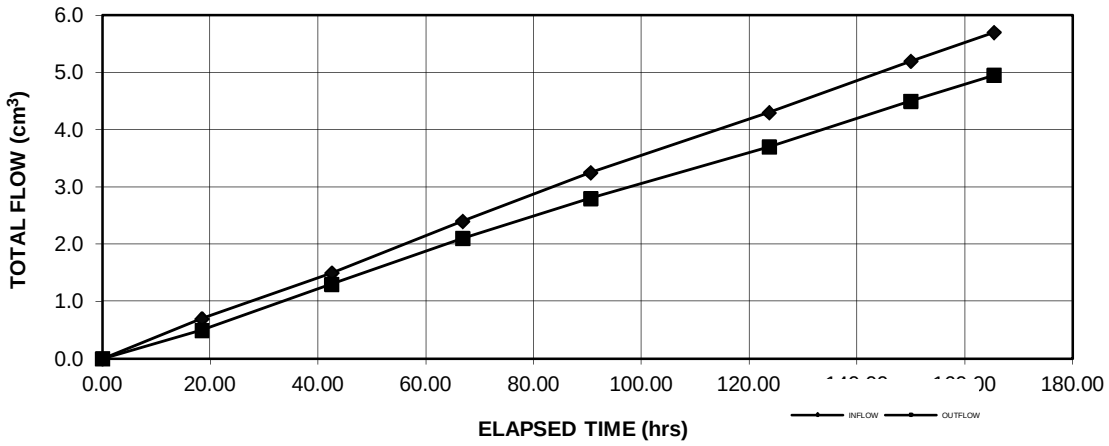
ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID No.:	2023-370-003-001	Avg. Effective Consol. Pressure (psi):	50

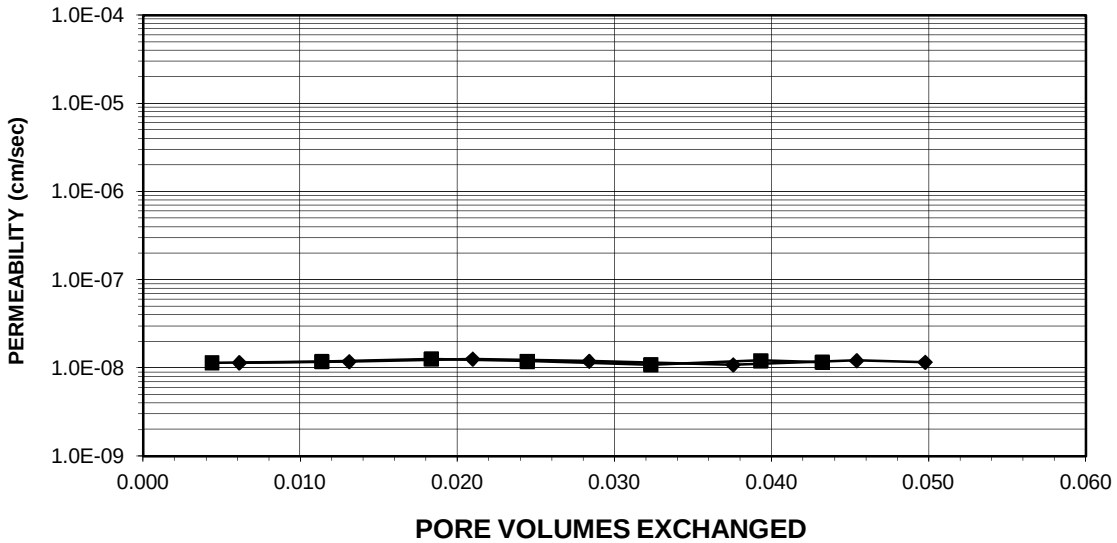
AVERAGE PERMEABILITY = 1.2E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.2E-10 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By:	WT	Date:	7/24/23	Checked By:	JLK	Date:	8/8/23

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PERMEABILITY TEST

ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID No.:	2023-370-003-001	Avg. Effective Consol. Pressure (psi):	50

Specific Gravity:	2.70	Assumed
Sample Condition:		Remolded

Visual Description: Reddish Brown Clay

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	2935	1723
Weight of Tare & Wet Sample (g)	265.31	850.45
Weight of Tare & Dry Sample (g)	233.86	739.36
Weight of Tare (g)	8.18	82.61
Weight of Water (g)	31.45	111.09
Weight of Dry Sample (g)	225.68	656.75
Moisture Content (%)	**13.9**	**16.9**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	1671.01	NA
Weight of Tube (g)	920.30	NA
Weight of Wet Sample (g)	750.71	770.34
Length 1 (in)	3.495	3.430
Length 2 (in)	3.495	3.428
Length 3 (in)	3.495	3.452
Top Diameter (in)	2.870	2.847
Middle Diameter (in)	2.870	2.850
Bottom Diameter (in)	2.870	2.845
Average Length (in)	3.50	3.44
Average Area (in^2)	6.47	6.37
Sample Volume (cm^3)	370.51	358.60
Unit Wet Weight (g/cm^3)	2.03	2.15
Unit Wet Weight (pcf)	126.5	134.1
Unit Dry Weight (pcf)	111.0	114.7
Unit Dry Weight (g/cm^3)	1.78	1.84
Void Ratio, e	0.52	0.47
Porosity, n	0.34	0.32
Pore Volume (cm^3)	126.5	114.6
Total Weight of Sample After Test (g)		767.93

Tested By: WT Date: 7/24/23 Checked By: JLK Date: 8/8/23

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PERMEABILITY TEST

ASTM D 5084-16a Method C

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Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-1
Lab ID No.:	2023-370-003-001	Avg. Effective Consol. Pressure (psi):	50

Pressure Heads (Constant)	
Top Cap (psi)	53.0
Bottom Cap (psi)	55.0
Cell (psi)	104.0
Total Pressure Head (cm)	140.6
Hydraulic Gradient	16.11

Final Sample Dimensions	
Sample Length (cm), L	8.73
Sample Diameter (cm)	7.23
Sample Area (cm^2), A	41.08
Inflow Burette Area (cm^2), a-in	0.962
Outflow Burette Area (cm^2), a-out	0.962
B Parameter (%)	99

AVERAGE PERMEABILITY = 1.2E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.2E-10 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
7/31/23	12	35	0.000	0.0	0.0	161.6	0	22.3	NA
8/1/23	7	1	18.433	0.7	0.5	160.4	0	21.4	1.1E-08
8/2/23	7	7	42.533	1.5	1.3	158.7	0	21.3	1.2E-08
8/3/23	7	22	66.783	2.4	2.1	157.0	0	21.2	1.3E-08
8/4/23	7	8	90.550	3.3	2.8	155.4	0	21.2	1.2E-08
8/5/23	16	16	123.683	4.3	3.7	153.3	0	21.1	1.1E-08
8/6/23	18	33	149.967	5.2	4.5	151.6	0	21.2	1.2E-08
8/7/23	10	0	165.417	5.7	5.0	150.6	1	21.1	1.2E-08

Tested By: WT Date: 7/24/23 Checked By: JLK Date: 8/8/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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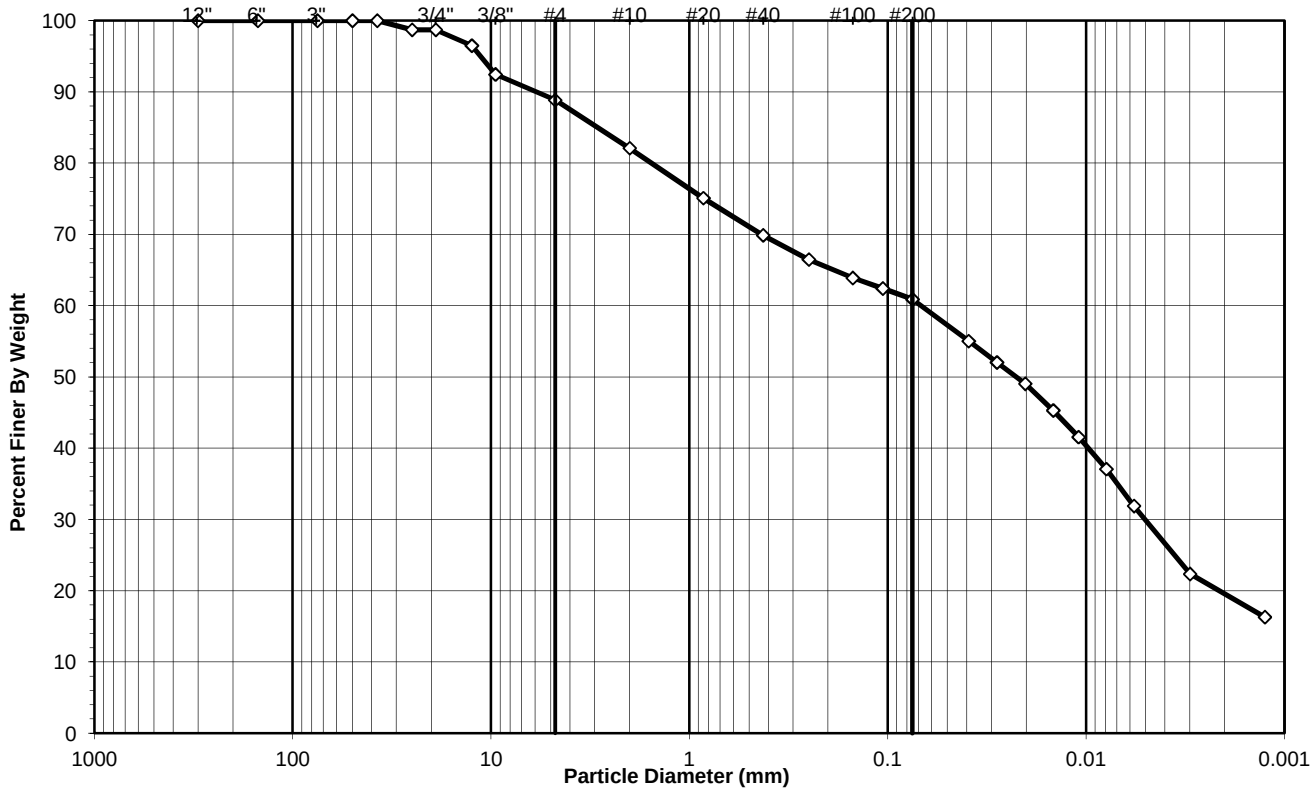
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002	Soil Color:	Red & Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**11.15**
#4 to #200	***Sand***	**27.95**
Finer than #200	***Silt & Clay***	**60.89**

USCS Symbol:
CL, TESTED

USCS Classification:
SANDY LEAN CLAY

Tested By DF Date 7/6/23 Checked By BRB Date 7/10/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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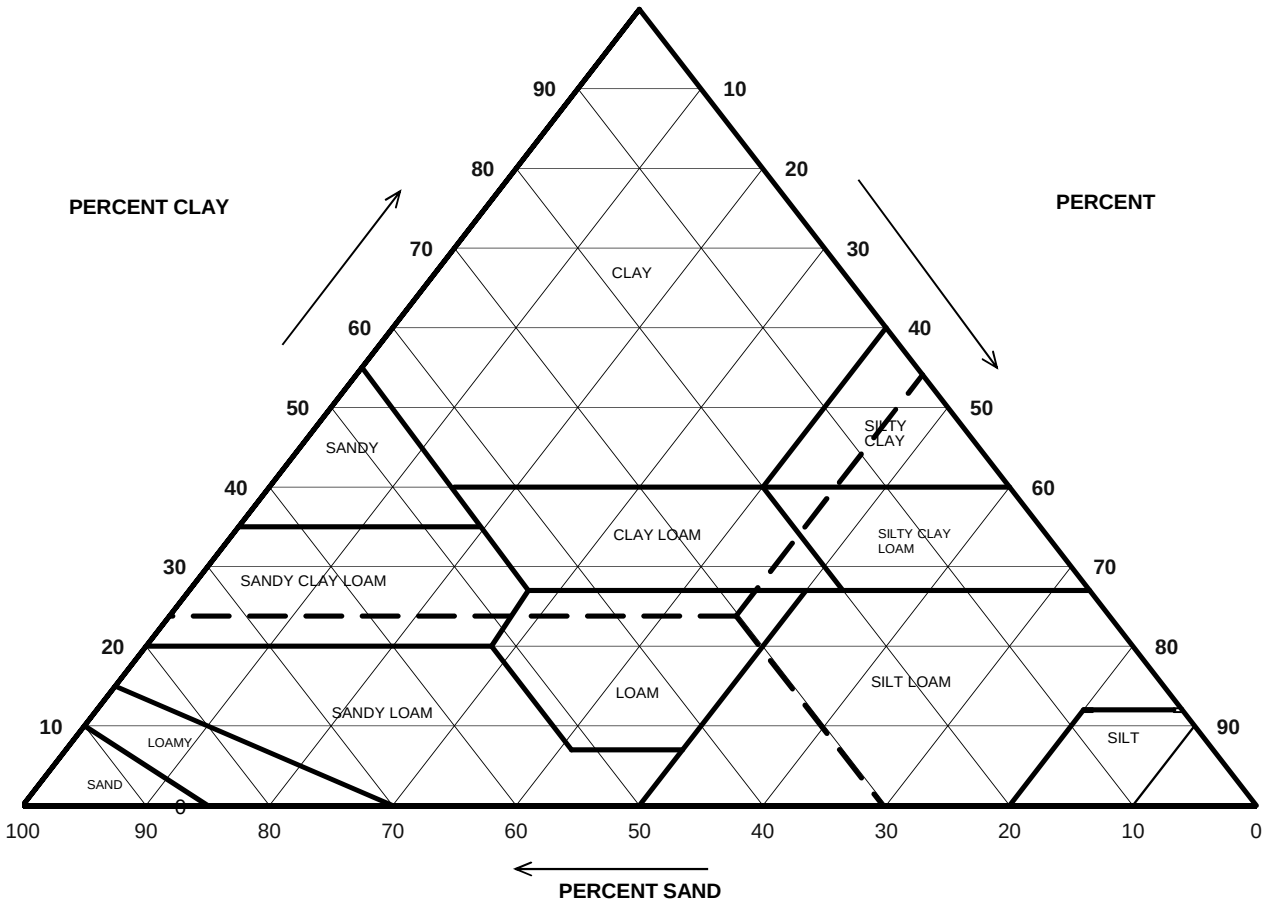
USDA CLASSIFICATION CHART

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002	Soil Color:	Red & Brown



USDA SUMMARY				
Particle Size (mm)	**Percent Finer**		**Actual Percentage**	Corrected % of Minus 2.0 mm material for USDA Classification
		Gravel	**17.90**	
2	**82.10**	**Sand**	**24.85**	**30.27**
0.05	**57.25**	**Silt**	**37.70**	**45.92**
0.002	**19.55**	**Clay**	**19.55**	**23.81**

USDA Classification: LOAM

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002	Soil Color:	Red & Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	4005	Tare No.:	4022
Wt. of Tare & Wet Sample (g):	252.37	Weight of Tare & Wet Sample (g):	334.09
Wt. of Tare & Dry Sample (g):	223.08	Weight of Tare & Dry Sample (g):	312.25
Weight of Tare (g):	8.18	Weight of Tare (g):	8.06
Weight of Water (g):	29.29	Weight of Water (g):	21.84
Weight of Dry Soil (g):	214.90	Weight of Dry Soil (g):	304.19
Moisture Content (%):	**13.6**	**Moisture Content (%):**	**7.2**
Wet Weight of -3/4" Sample (g):	26686.00	Total Dry Weight of Sample (g):	23791.11
Tare No. -3/4" Sub-Specimen (g):	1517	Wet Weight of +3/4" Sample (g):	328.00
Wt. of Tare & Wet -3/4" Sub-Specimen (g):	1202.76	Dry Weight of + 3/4" Sample (g):	306.03
Weight of Tare (g):	142.90	Dry Weight of - 3/4" Sample (g):	23485.08
Sub-Specimen 3/4" Wet Weight (g):	1059.86	Dry Weight -3/4" +3/8" Sample (g):	1490.58
Tare No. (-3/8" Sub-Specimen):	545	Dry Weight of -3/8" Sample (g):	21994.49
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	515.87	J - Factor (% Finer than 3/4"):	98.7%
Weight of Tare (g):	82.54	J - Factor (% Finer than 3/8"):	92.4%
Sub-Specimen -3/8" Wet Weight (g):	433.33		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	328.00		1.29	1.29	98.71	**99**
3/4"	19	0.00		0.00	1.29	98.71	**99**
1/2"	12.5	20.97	(**)	2.25	2.25	97.75	**96**
3/8"	9.5	38.23		4.10	6.35	93.65	**92**
#4	4.75	14.86		3.90	3.90	96.10	**89**
#10	2	27.81		7.29	11.19	88.81	**82**
#20	0.85	28.90	(**)	7.58	18.77	81.23	**75**
#40	0.425	21.55		5.65	24.42	75.58	**70**
#60	0.25	14.00		3.67	28.09	71.91	**66**
#100	0.15	10.70		2.81	30.90	69.10	**64**
#140	0.106	6.06		1.59	32.48	67.52	**62**
#200	0.075	6.29		1.65	34.13	65.87	**61**
Pan	-	251.18		65.87	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	7/6/23	Checked By	BRB	Date	7/10/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002	Soil Color:	Red & Brown

Elapsed Time (min)	Reading rm	Temp. (C^0)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	42.0	25.9	5.24	9.5	0.0391	90.4	55.0
2	40.0	25.9	5.24	9.8	0.0282	85.5	52.0
4	38.0	25.9	5.24	10.2	0.0203	80.5	49.0
8	35.5	25.9	5.24	10.6	0.0146	74.4	45.3
15	33.0	25.9	5.24	11.1	0.0109	68.3	41.6
30	30.0	25.9	5.24	11.6	0.0079	60.9	37.1
60	26.5	26.0	5.20	12.3	0.0057	52.4	31.9
240	20.0	26.3	5.07	13.4	0.0030	36.7	22.4
1440	16.0	26.2	5.11	14.1	0.0013	26.8	16.3

Soil Specimen Data

Tare No.:	692	Percent Finer than # 200:	60.89
Wt. of Tare & Dry Material (g):	136.91		
Weight of Tare (g):	91.69	Specific Gravity:	2.70 Assumed
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	40.22		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	G- 1819
Cylinder	G- 356
Thermometer	G- 1505
Balance	G- 657
#200 Sieve	G- 1944
Foam Inhibitor Used	No

Tested By TO Date 7/6/23 Checked By BRB Date 7/10/23

ATTERBERG LIMITS

ASTM D 4318-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002	Soil Description:	REDDISH BROWN LEAN CLAY

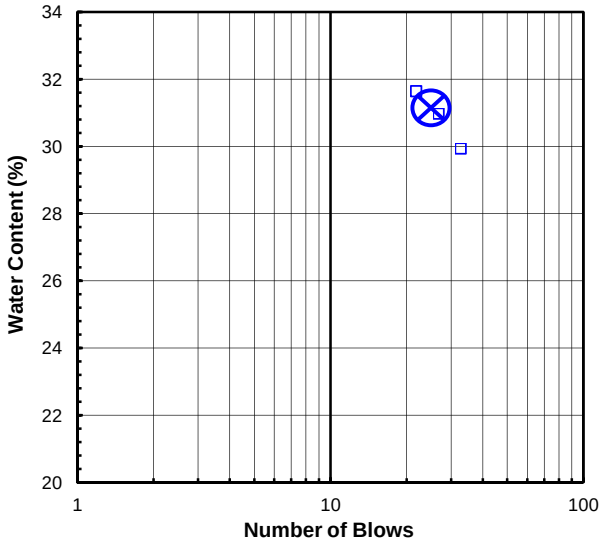
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Air dried)

As Received Moisture Content ASTM D2216-19		**Liquid Limit Test** 1	2	3	M
Tare Number:	3150	1274	613	1431	U
Wt. of Tare & Wet Sample (g):	272.01	43.64	39.83	38.73	L
Wt. of Tare & Dry Sample (g):	241.55	38.95	35.07	33.89	T
Weight of Tare (g):	8.09	23.27	19.69	18.58	I
Weight of Water (g):	30.5	4.7	4.8	4.8	P
Weight of Dry Sample (g):	233.5	15.7	15.4	15.3	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**13.0**	**29.9**	**30.9**	**31.6**	N
Number of Blows:		**33**	**27**	**22**	T

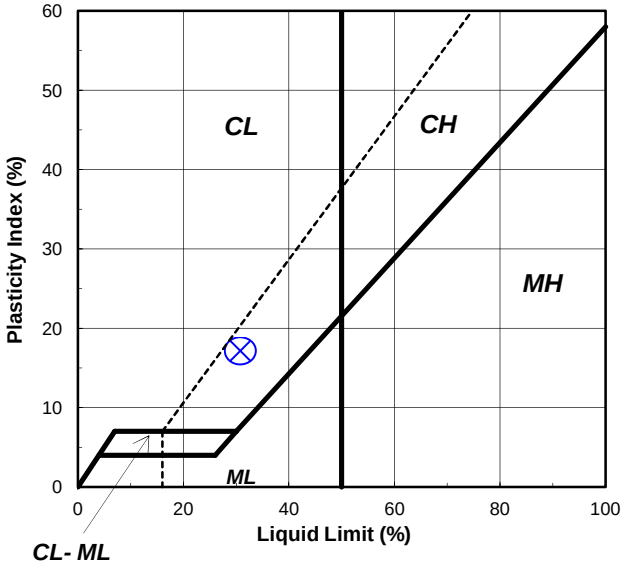
Plastic Limit Test	**1**	**2**	**Range**
Tare Number:	305	609	
Wt. of Tare & Wet Sample (g):	25.45	25.01	
Wt. of Tare & Dry Sample (g):	24.68	24.25	
Weight of Tare (g):	19.05	18.80	
Weight of Water (g):	0.8	0.8	
Weight of Dry Sample (g):	5.6	5.5	
Moisture Content (%):	**13.7**	**13.9**	**-0.3**
Note: The acceptable range of the two Moisture Contents is ±			1.12

Test Results	
Liquid Limit (%):	**31**
Plastic Limit (%):	**14**
Plasticity Index (%):	**17**
USCS Symbol:	**CL**

Flow Curve



Plasticity Chart



Tested By FS *Date* 7/6/23 *Checked By* KC *Date* 7/7/23

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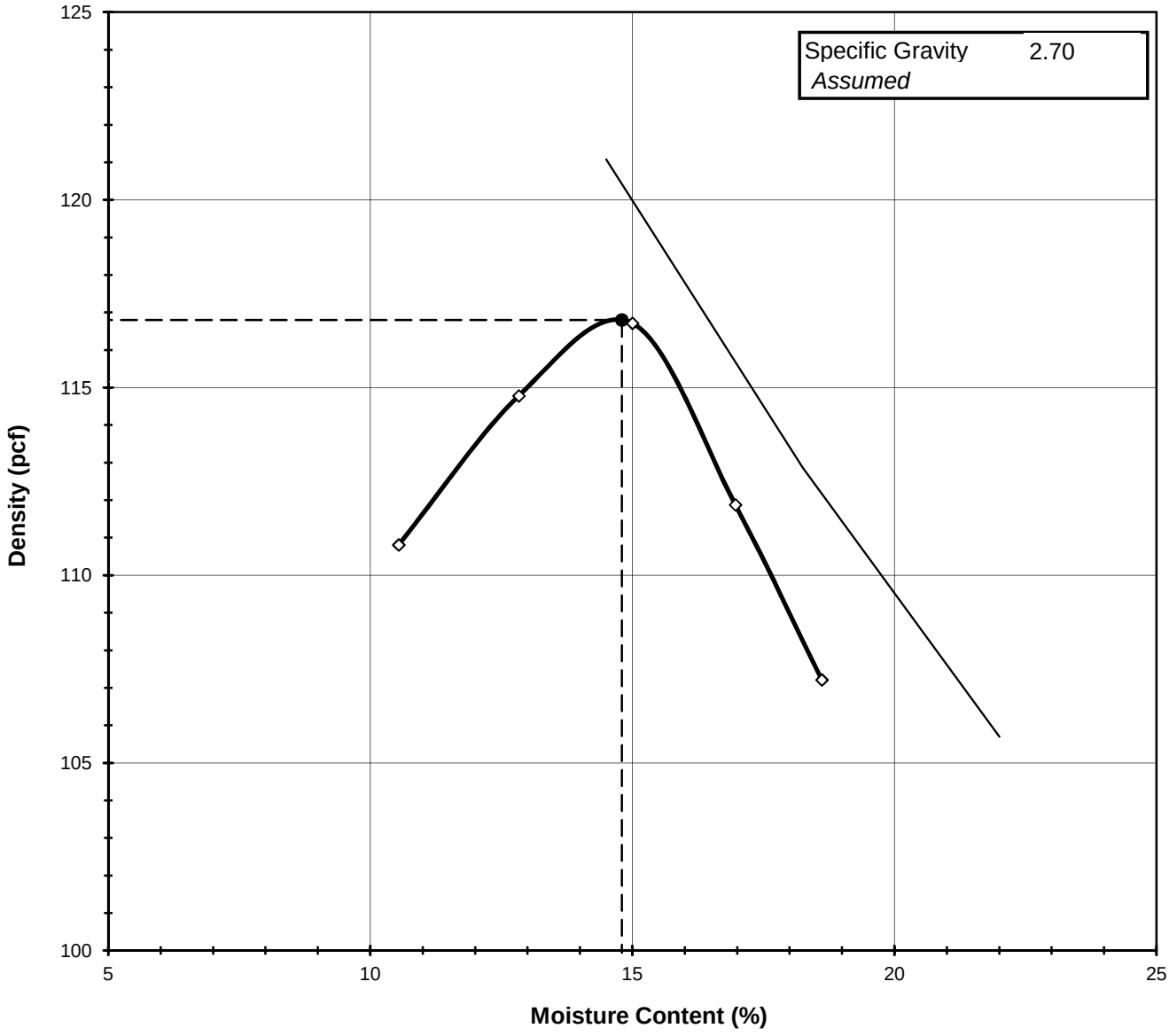
MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002	Test Method	**STANDARD**

Visual Description: Reddish Brown Clay and Rock

Optimum Moisture Content (%): 14.8
Maximum Dry Density (pcf): 116.8



Tested By AB *Date* 7/6/23 *Checked By* KC *Date* 7/7/23

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		

Visual Description: Reddish Brown Clay and Rock

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity:	2.70
Percent Retained on 3/4":	NA
Percent Retained on 3/8":	NA
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	C

Test Type:	**STANDARD**
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	G774
Mold ID:	G3280
Mold diameter:	6"
Weight of the Mold (g):	7110
Volume of the Mold (cm^3):	2133

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	11297	11537	11698	11583	11457
Weight of Mold (g):	7110	7110	7110	7110	7110
Weight of Wet Sample (g):	4187	4427	4588	4473	4347
Mold Volume (cm^3):	2133	2133	2133	2133	2133

Moisture Content / Density

Tare Number:	875	893	907	912	1717
Weight of Tare & Wet Sample (g):	510.69	510.78	510.56	509.92	482.74
Weight of Tare & Dry Sample (g):	472.48	465.22	458.32	451.91	419.94
Weight of Tare (g):	110.00	110.23	110.07	109.99	82.59
Weight of Water (g):	38.21	45.56	52.24	58.01	62.80
Weight of Dry Sample (g):	362.48	354.99	348.25	341.92	337.35

Wet Density (g/cm^3):	1.96	2.08	2.15	2.10	2.04
Wet Density (pcf):	122.5	129.5	134.2	130.9	127.2
Moisture Content (%):	**10.5**	**12.8**	**15.0**	**17.0**	**18.6**
Dry Density (pcf):	**110.8**	**114.8**	**116.7**	**111.9**	**107.2**

Zero Air Voids

Moisture Content (%):	14.5	18.3	22.0
Dry Unit Weight (pcf):	121.1	112.9	105.7

Tested By AB *Date* 7/6/23 *Checked By* KC *Date* 7/7/23

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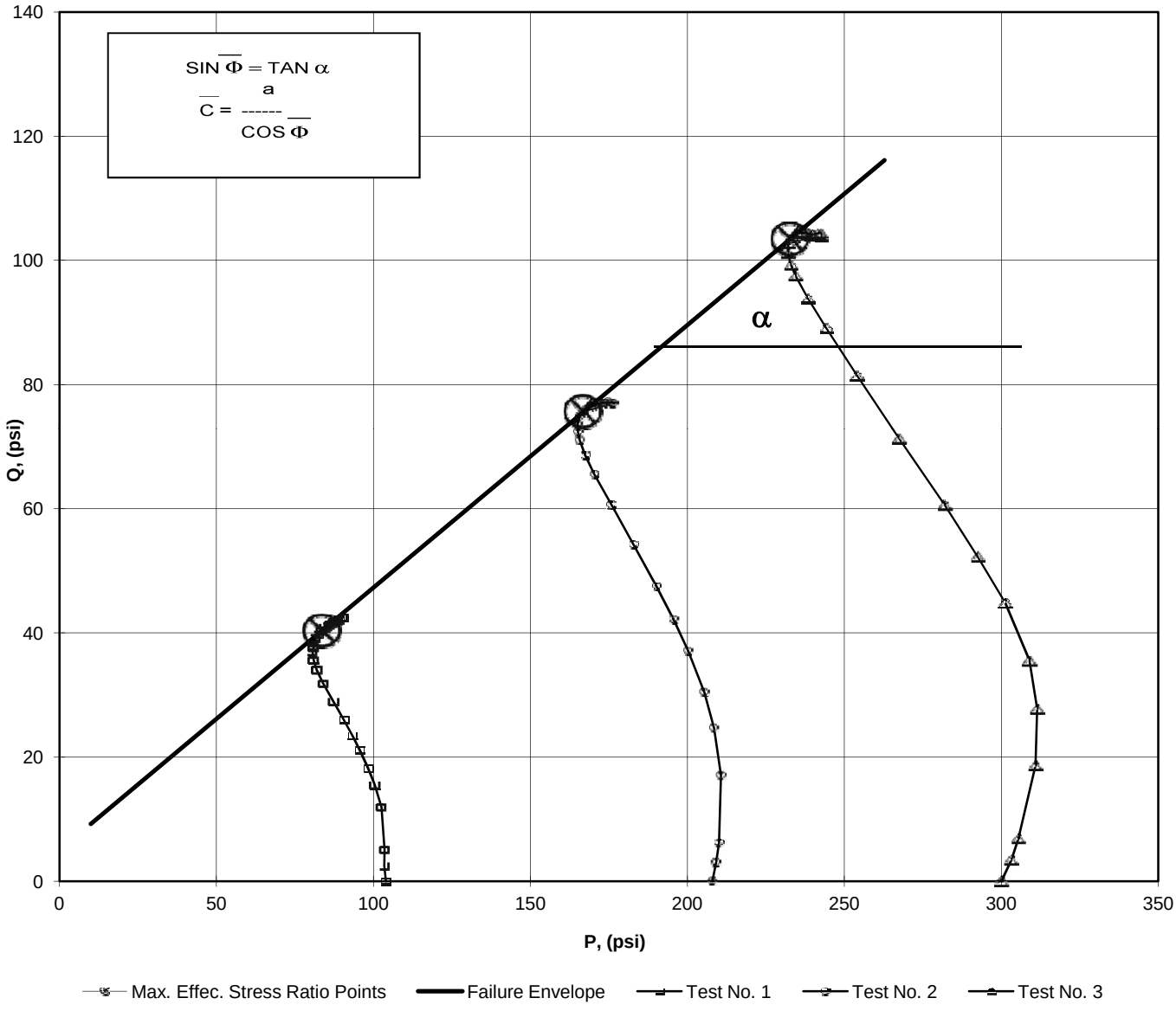
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.00**	$\bar{C}$	=	**0.00**
α	=	**22.9**	$\bar{\Phi}$	=	**25.00**

Tested By: RPE Date: 8/10/23 Approved By: NJM Date: 8/31/23

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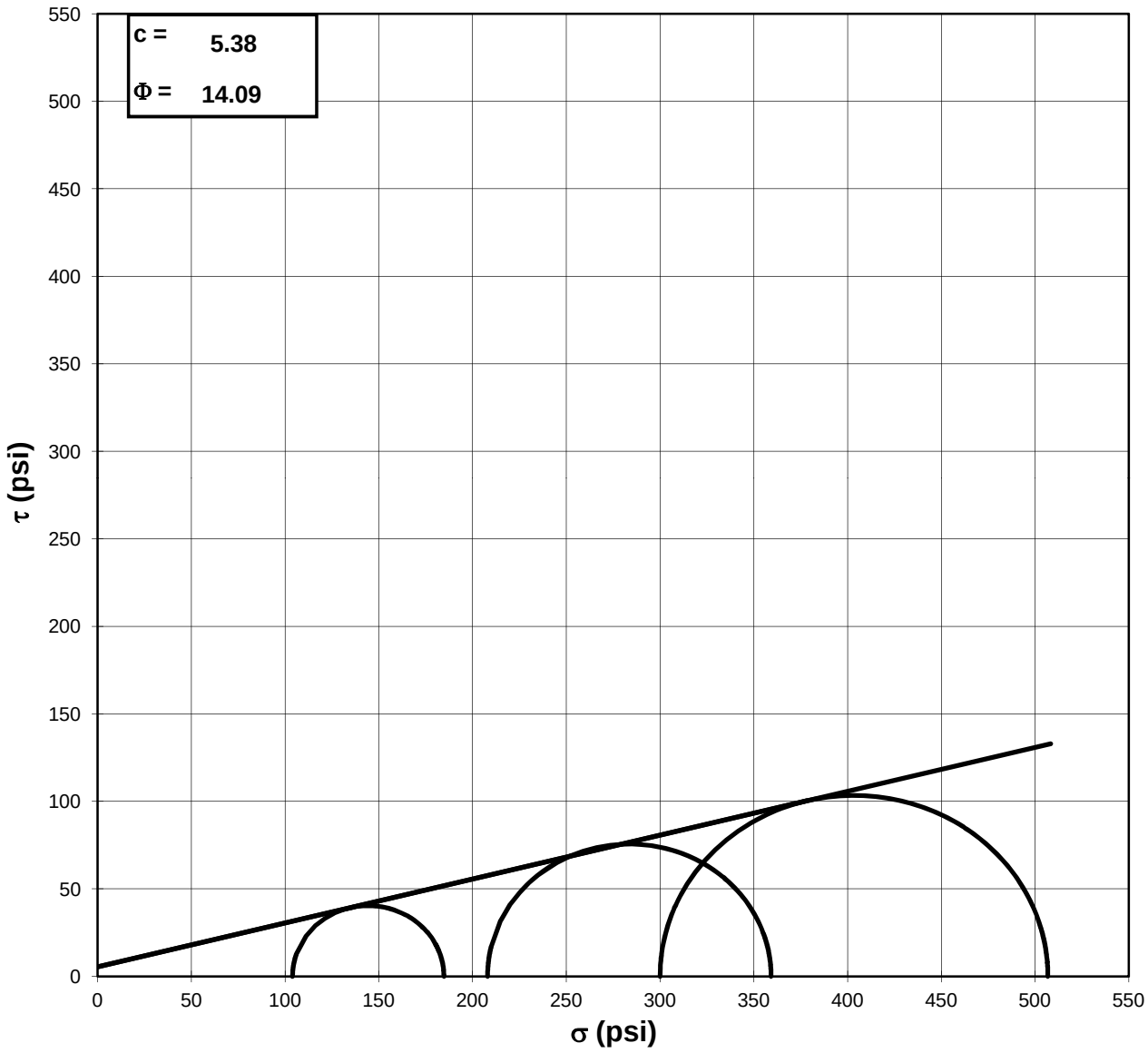
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		
Visual Description:	Reddish-Brown Clay with Rocks (Remolded)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: RPE *Date:* 8/10/23 *Approved By:* NJM *Date:* 8/31/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	146.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	104.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	83.58
Q	=	40.35

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	120.0
Final Burette Reading (ml)	58.4
Final Change (ml)	61.6
Initial Dial Reading (mil)	33
Dial Reading After Saturation (mil)	43
Dial Reading After Consolidation (mil)	234

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.2	0.000	42.0
30.8	0.001	45.0
61.8	0.002	47.5
144.2	0.008	55.4
187.2	0.014	61.0
219.0	0.020	65.8
255.9	0.030	71.5
284.7	0.038	76.2
315.4	0.050	81.3
353.3	0.071	87.8
389.6	0.100	93.7
418.9	0.135	98.1
441.6	0.170	100.6
461.4	0.213	102.4
472.9	0.243	102.7
485.4	0.285	103.4
499.7	0.341	103.6
513.5	0.399	103.2
525.5	0.444	102.8
537.8	0.504	102.2
546.1	0.549	101.6
553.5	0.593	101.2
561.2	0.636	100.6
566.4	0.666	100.3
571.7	0.696	99.9
577.1	0.727	99.6
582.2	0.757	99.3
589.6	0.802	98.9
596.9	0.845	98.3
601.5	0.874	98.1
606.0	0.903	97.7

Tested By: RPE Date: 8/10/23 Input Checked By: NJM Date: 8/31/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	104.0	*Stage No.*	1
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	34.40
Length After Consolidation (in)	5.74
Area After Consolidation (in^2)	5.993

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	4.94	2.97	105.97	101.0	1.049	0.62	103.50	2.47
0.04	10.11	5.48	108.63	98.5	1.103	0.56	103.58	5.06
0.14	23.82	13.36	114.46	90.6	1.263	0.58	102.55	11.91
0.25	30.96	19.02	115.95	85.0	1.364	0.63	100.46	15.48
0.35	36.22	23.78	116.44	80.2	1.451	0.68	98.33	18.11
0.52	42.27	29.51	116.76	74.5	1.567	0.72	95.62	21.14
0.67	46.99	34.21	116.78	69.8	1.673	0.75	93.29	23.50
0.87	51.97	39.35	116.62	64.7	1.804	0.78	90.64	25.98
1.23	58.02	45.77	116.26	58.2	1.996	0.81	87.25	29.01
1.74	63.68	51.75	115.93	52.3	2.219	0.84	84.09	31.84
2.35	68.06	56.09	115.97	47.9	2.421	0.85	81.94	34.03
2.97	71.30	58.64	116.66	45.4	2.572	0.85	81.01	35.65
3.70	73.94	60.37	117.57	43.6	2.695	0.84	80.60	36.97
4.23	75.38	60.72	118.67	43.3	2.742	0.83	80.98	37.69
4.97	76.77	61.44	119.33	42.6	2.804	0.83	80.94	38.39
5.94	78.24	61.59	120.64	42.4	2.845	0.81	81.52	39.12
6.95	79.54	61.21	122.33	42.8	2.859	0.79	82.56	39.77
7.74	80.71	60.77	123.93	43.2	2.867	0.78	83.58	40.35
8.79	81.66	60.23	125.43	43.8	2.866	0.76	84.60	40.83
9.57	82.21	59.62	126.59	44.4	2.853	0.75	85.48	41.11
10.33	82.63	59.15	127.48	44.8	2.843	0.74	86.16	41.32
11.09	83.08	58.61	128.48	45.4	2.830	0.73	86.93	41.54
11.61	83.37	58.32	129.04	45.7	2.825	0.72	87.36	41.68
12.13	83.64	57.94	129.70	46.1	2.816	0.71	87.88	41.82
12.66	83.93	57.57	130.35	46.4	2.808	0.71	88.39	41.96
13.18	84.16	57.26	130.90	46.7	2.801	0.70	88.82	42.08
13.97	84.47	56.87	131.61	47.1	2.792	0.69	89.37	42.24
14.72	84.76	56.34	132.42	47.7	2.779	0.69	90.04	42.38
15.22	84.92	56.09	132.83	47.9	2.773	0.68	90.37	42.46
15.72	85.04	55.70	133.35	48.3	2.761	0.68	90.83	42.52

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	250.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	208.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	166.80
Q	=	75.60

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	144.0
Final Burette Reading (ml)	62.8
Final Change (ml)	81.2

Initial Dial Reading (mil)	33
Dial Reading After Saturation (mil)	41
Dial Reading After Consolidation (mil)	294

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.3	0.000	41.9
38.0	0.001	43.9
74.5	0.001	46.2
201.3	0.006	56.4
290.7	0.010	66.2
358.5	0.015	75.0
437.1	0.022	86.8
497.6	0.030	96.6
561.6	0.042	107.4
643.5	0.061	121.4
722.8	0.091	134.8
785.2	0.127	145.0
828.1	0.162	151.2
864.2	0.205	155.4
884.4	0.235	157.1
907.2	0.276	158.6
932.1	0.331	159.2
951.8	0.392	158.8
966.0	0.439	158.1
982.9	0.499	157.0
994.1	0.543	156.2
1004.4	0.588	155.5
1015.0	0.633	154.6
1022.0	0.663	154.1
1028.4	0.693	153.5
1035.0	0.723	153.0
1043.4	0.753	152.4
1051.0	0.797	151.6
1060.2	0.841	150.9
1066.1	0.871	150.3
1072.6	0.901	149.9

Tested By: RPE Date: 8/10/23 Input Checked By: NJM Date: 8/31/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	208.0	*Stage No.*	1
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	33.24
Length After Consolidation (in)	5.68
Area After Consolidation (in^2)	5.853

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	6.27	1.92	212.35	206.1	1.030	0.32	209.21	3.14
0.02	12.51	4.19	216.32	203.8	1.061	0.35	210.06	6.25
0.10	34.14	14.35	227.79	193.6	1.176	0.43	210.72	17.07
0.17	49.35	24.18	233.18	183.8	1.268	0.51	208.50	24.68
0.26	60.88	33.04	235.85	175.0	1.348	0.56	205.41	30.44
0.40	74.16	44.76	237.41	163.2	1.454	0.62	200.33	37.08
0.54	84.34	54.56	237.78	153.4	1.550	0.67	195.61	42.17
0.74	95.03	65.36	237.66	142.6	1.666	0.71	190.15	47.51
1.08	108.55	79.44	237.11	128.6	1.844	0.75	182.84	54.27
1.60	121.29	92.84	236.46	115.2	2.053	0.79	175.81	60.65
2.23	130.94	103.00	235.94	105.0	2.247	0.81	170.47	65.47
2.86	137.22	109.18	236.04	98.8	2.389	0.82	167.43	68.61
3.61	142.12	113.38	236.74	94.6	2.502	0.82	165.68	71.06
4.14	144.64	115.15	237.50	92.9	2.558	0.82	165.18	72.32
4.85	147.27	116.56	238.71	91.4	2.611	0.82	165.07	73.64
5.83	149.77	117.18	240.59	90.8	2.649	0.81	165.70	74.88
6.90	151.20	116.80	242.40	91.2	2.658	0.80	166.80	75.60
7.72	152.09	116.15	243.94	91.9	2.656	0.79	167.90	76.04
8.79	152.98	114.98	245.99	93.0	2.645	0.77	169.51	76.49
9.57	153.41	114.19	247.22	93.8	2.635	0.77	170.51	76.70
10.34	153.66	113.50	248.16	94.5	2.626	0.76	171.33	76.83
11.14	153.91	112.60	249.30	95.4	2.613	0.75	172.35	76.95
11.67	154.04	112.13	249.92	95.9	2.607	0.75	172.89	77.02
12.20	154.07	111.48	250.59	96.5	2.596	0.75	173.55	77.04
12.73	154.13	110.97	251.15	97.0	2.589	0.74	174.09	77.06
13.25	154.47	110.40	252.07	97.6	2.583	0.74	174.83	77.23
14.02	154.20	109.58	252.62	98.4	2.567	0.73	175.52	77.10
14.80	154.15	108.91	253.24	99.1	2.556	0.73	176.16	77.07
15.34	154.02	108.29	253.73	99.7	2.545	0.72	176.72	77.01
15.87	154.01	107.87	254.13	100.1	2.538	0.72	177.13	77.00

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	342.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	300.0
Pore Pressure Response (%)	99

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	232.77
Q	=	103.41

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	120.0
Final Burette Reading (ml)	32.9
Final Change (ml)	87.1

Initial Dial Reading (mil)	23
Dial Reading After Saturation (mil)	35
Dial Reading After Consolidation (mil)	320

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.4	0.000	42.0
41.3	0.001	42.3
80.8	0.002	43.4
218.4	0.006	49.8
325.2	0.012	58.4
416.4	0.017	68.7
524.9	0.025	85.6
613.0	0.033	101.8
711.8	0.044	120.7
839.2	0.063	145.8
963.6	0.090	169.4
1060.7	0.125	186.8
1124.8	0.163	197.4
1177.5	0.206	205.0
1205.9	0.237	208.3
1237.5	0.278	211.0
1269.9	0.331	212.6
1292.9	0.390	212.6
1310.1	0.438	212.1
1329.5	0.498	211.2
1344.2	0.542	210.2
1355.2	0.584	209.1
1366.1	0.629	208.1
1373.9	0.660	207.5
1380.4	0.691	206.9
1389.1	0.722	206.3
1397.8	0.751	206.3
1412.1	0.794	204.7
1425.0	0.837	203.8
1429.3	0.867	203.4
1434.6	0.897	202.9

Tested By: RPE Date: 8/10/23 Input Checked By: NJM Date: 8/31/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	300.0	*Stage No.*	1
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	32.81
Length After Consolidation (in)	5.64
Area After Consolidation (in^2)	5.813

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	6.86	0.27	306.59	299.7	1.023	0.04	303.16	3.43
0.04	13.66	1.43	312.23	298.6	1.046	0.11	305.40	6.83
0.11	37.29	7.80	329.49	292.2	1.128	0.21	310.85	18.64
0.21	55.60	16.40	339.20	283.6	1.196	0.30	311.40	27.80
0.30	71.19	26.70	344.48	273.3	1.260	0.38	308.89	35.59
0.44	89.68	43.59	346.08	256.4	1.350	0.49	301.25	44.84
0.59	104.61	59.85	344.76	240.2	1.436	0.58	292.46	52.30
0.78	121.26	78.69	342.57	221.3	1.548	0.66	281.94	60.63
1.11	142.54	103.80	338.74	196.2	1.726	0.74	267.47	71.27
1.60	162.89	127.41	335.48	172.6	1.944	0.79	254.04	81.44
2.22	178.19	144.82	333.37	155.2	2.148	0.82	244.28	89.10
2.89	187.69	155.44	332.25	144.6	2.298	0.84	238.40	93.85
3.66	194.95	162.96	331.99	137.0	2.423	0.84	234.51	97.47
4.20	198.53	166.26	332.27	133.7	2.484	0.85	233.00	99.26
4.92	202.20	169.02	333.17	131.0	2.544	0.84	232.07	101.10
5.87	205.43	170.61	334.82	129.4	2.588	0.84	232.10	102.71
6.91	206.83	170.64	336.19	129.4	2.599	0.83	232.77	103.41
7.77	207.67	170.10	337.57	129.9	2.599	0.83	233.74	103.84
8.83	208.33	169.23	339.10	130.8	2.593	0.82	234.94	104.17
9.60	208.84	168.25	340.59	131.8	2.585	0.81	236.17	104.42
10.35	208.80	167.14	341.66	132.9	2.572	0.81	237.26	104.40
11.14	208.63	166.12	342.50	133.9	2.558	0.80	238.19	104.31
11.69	208.51	165.53	342.98	134.5	2.551	0.80	238.72	104.26
12.24	208.19	164.90	343.29	135.1	2.541	0.80	239.20	104.10
12.78	208.23	164.26	343.97	135.7	2.534	0.80	239.85	104.11
13.31	208.27	164.26	344.01	135.7	2.534	0.80	239.87	104.14
14.07	208.56	162.73	345.84	137.3	2.519	0.79	241.56	104.28
14.83	208.60	161.79	346.81	138.2	2.509	0.78	242.51	104.30
15.37	207.91	161.37	346.54	138.6	2.500	0.78	242.59	103.95
15.90	207.36	160.95	346.42	139.1	2.491	0.78	242.73	103.68

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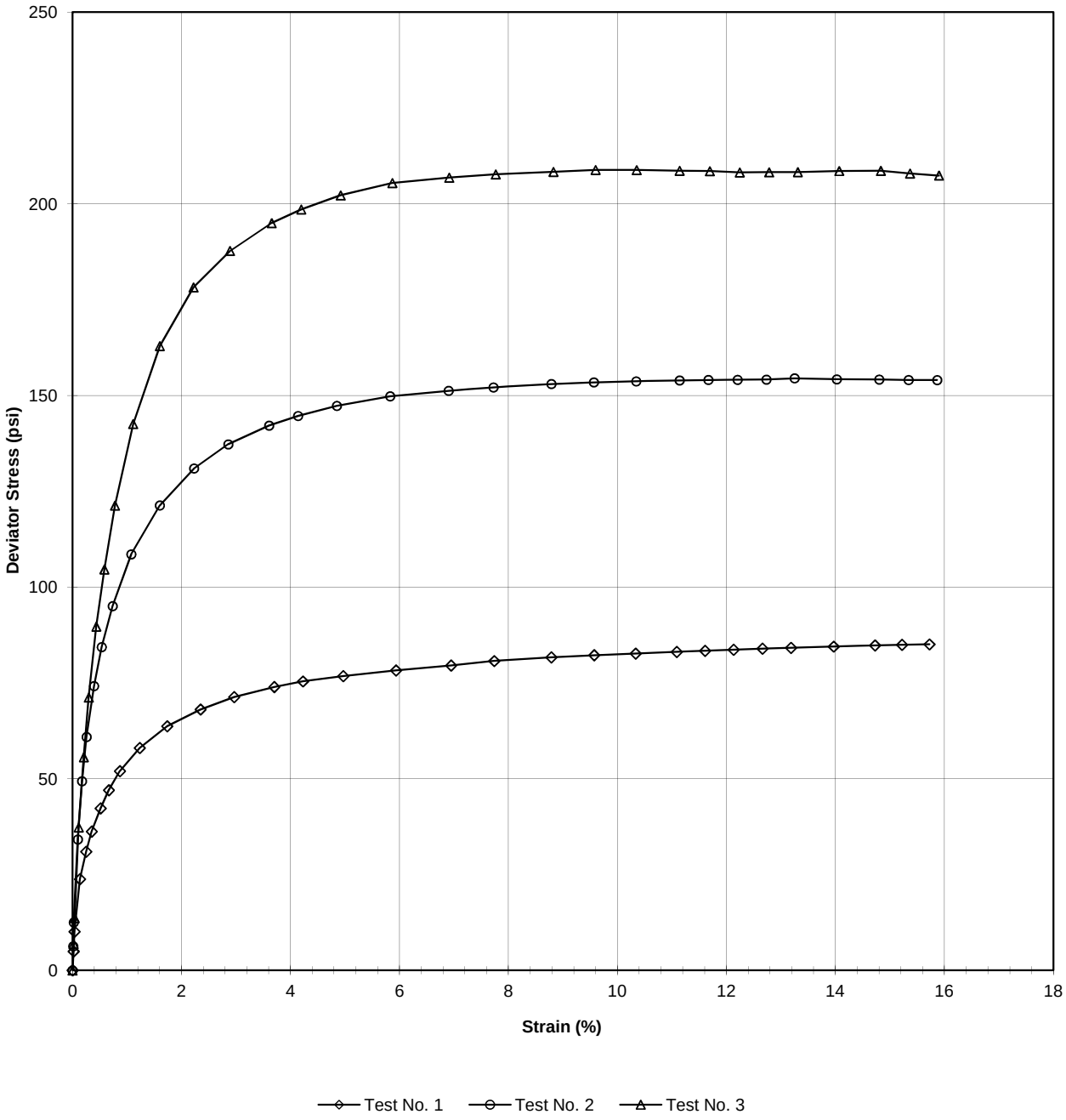
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID:	2023-370-003-002		
Visual Description:	Reddish-Brown Clay with Rocks (Remolded)		



Tested By: RPE Date: 8/10/23 Approved By: NJM Date: 8/31/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.		
Client Reference:	AEP Amos Seq. 4 C130109.27		
Project No.:	2023-370-003		
Lab ID:	2023-370-003-002	Specific Gravity (Assumed)	2.7
Visual Description:	Reddish-Brown Clay with Rocks (Remolded)		

SAMPLE CONDITION SUMMARY

Boring No.:	AEP Amos	AEP Amos	AEP Amos
Depth (ft):	Seq. 4 Repair	Seq. 4 Repair	Seq. 4 Repair
Sample No.:	61523-2	61523-2	61523-2
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.001	0.001	0.001
Back Pressure (psi)	42	42	42
Consolidation Time (days)	1	1	1
Moisture Content (%) (INITIAL)	14.6	14.6	14.6
Total Unit Weight (pcf)	127.2	127.3	127.2
Dry Unit Weight (pcf)	111.0	111.0	111.0
Moisture Content (%) (FINAL)	15.1	13.9	12.9
Initial State Void Ratio,e	0.518	0.518	0.518
Void Ratio at Shear, e	0.362	0.316	0.299

Tested By: RPE Date: 8/10/23 Input Checked By: NJM Date: 8/31/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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PERMEABILITY TEST

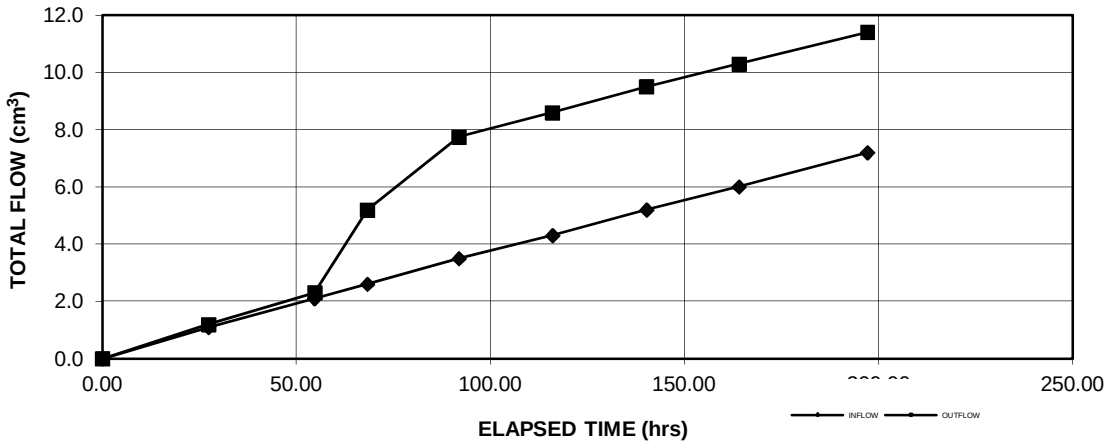
ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID No.:	2023-370-003-002	Avg. Effective Consol. Pressure (psi):	50

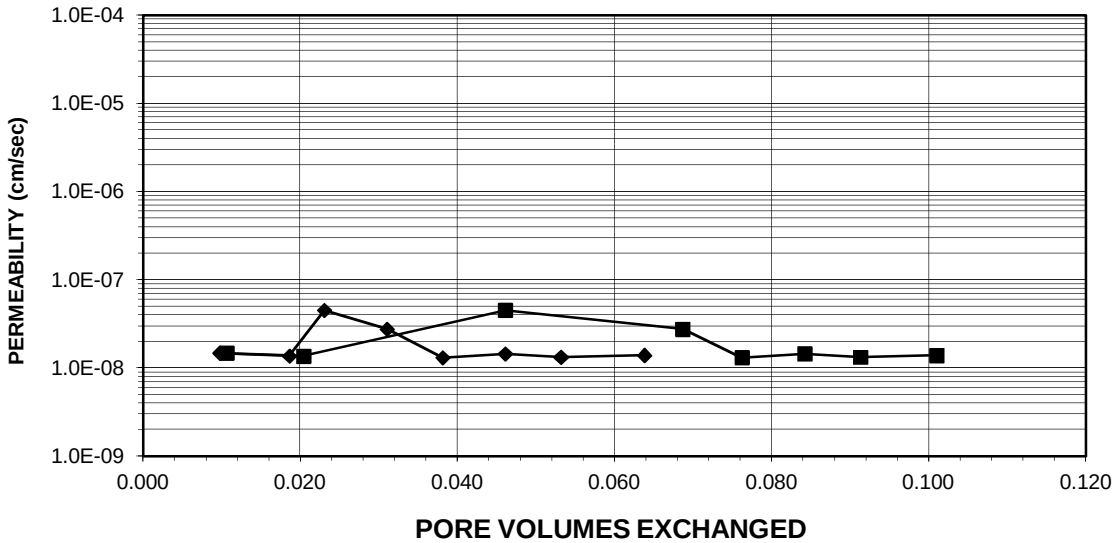
AVERAGE PERMEABILITY = 1.4E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.4E-10 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By:	WT	Date:	7/24/23	Checked By:	JLK	Date:	8/8/23

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PERMEABILITY TEST

ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID No.:	2023-370-003-002	Avg. Effective Consol. Pressure (psi):	50

Specific Gravity:	2.70	Assumed
Sample Condition:		Remolded

Visual Description: Reddish Brown Clay

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	3167	1743
Weight of Tare & Wet Sample (g)	327.98	852.36
Weight of Tare & Dry Sample (g)	287.22	742.04
Weight of Tare (g)	8.16	83.28
Weight of Water (g)	40.76	110.32
Weight of Dry Sample (g)	279.06	658.76
Moisture Content (%)	**14.6**	**16.7**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	1675.16	NA
Weight of Tube (g)	920.30	NA
Weight of Wet Sample (g)	754.86	768.96
Length 1 (in)	3.495	3.439
Length 2 (in)	3.495	3.426
Length 3 (in)	3.495	3.439
Top Diameter (in)	2.870	2.835
Middle Diameter (in)	2.870	2.843
Bottom Diameter (in)	2.870	2.845
Average Length (in)	3.50	3.43
Average Area (in^2)	6.47	6.34
Sample Volume (cm^3)	370.51	356.79
Unit Wet Weight (g/cm^3)	2.04	2.16
Unit Wet Weight (pcf)	127.2	134.5
Unit Dry Weight (pcf)	111.0	115.2
Unit Dry Weight (g/cm^3)	1.78	1.85
Void Ratio, e	0.52	0.46
Porosity, n	0.34	0.32
Pore Volume (cm^3)	126.6	112.8
Total Weight of Sample After Test (g)		769.20

Tested By: WT Date: 7/24/23 Checked By: JLK Date: 8/8/23

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PERMEABILITY TEST

ASTM D 5084-16a Method C

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Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-2
Lab ID No.:	2023-370-003-002	Avg. Effective Consol. Pressure (psi):	50

Pressure Heads (Constant)	
Top Cap (psi)	53.0
Bottom Cap (psi)	55.0
Cell (psi)	104.0
Total Pressure Head (cm)	140.6
Hydraulic Gradient	16.12

Final Sample Dimensions	
Sample Length (cm), L	8.72
Sample Diameter (cm)	7.22
Sample Area (cm^2), A	40.90
Inflow Burette Area (cm^2), a-in	0.962
Outflow Burette Area (cm^2), a-out	0.962
B Parameter (%)	98

AVERAGE PERMEABILITY = 1.4E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.4E-10 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
7/28/23	11	10	0.000	0.0	0.0	161.6	0	22.3	NA
7/29/23	14	29	27.317	1.1	1.2	159.2	0	22.0	1.5E-08
7/30/23	17	48	54.633	2.1	2.3	157.1	0	22.2	1.4E-08
7/31/23	7	27	68.283	2.6	5.2	153.5	0	22.0	4.5E-08
8/1/23	7	2	91.867	3.5	7.8	150.0	0	21.4	2.7E-08
8/2/23	7	8	115.967	4.3	8.6	148.3	0	21.3	1.3E-08
8/3/23	7	23	140.217	5.2	9.5	146.4	0	21.2	1.4E-08
8/4/23	7	10	164.000	6.0	10.3	144.8	0	21.2	1.3E-08
8/5/23	16	17	197.117	7.2	11.4	142.4	1	21.1	1.4E-08

Tested By: WT Date: 7/24/23 Checked By: JLK Date: 8/8/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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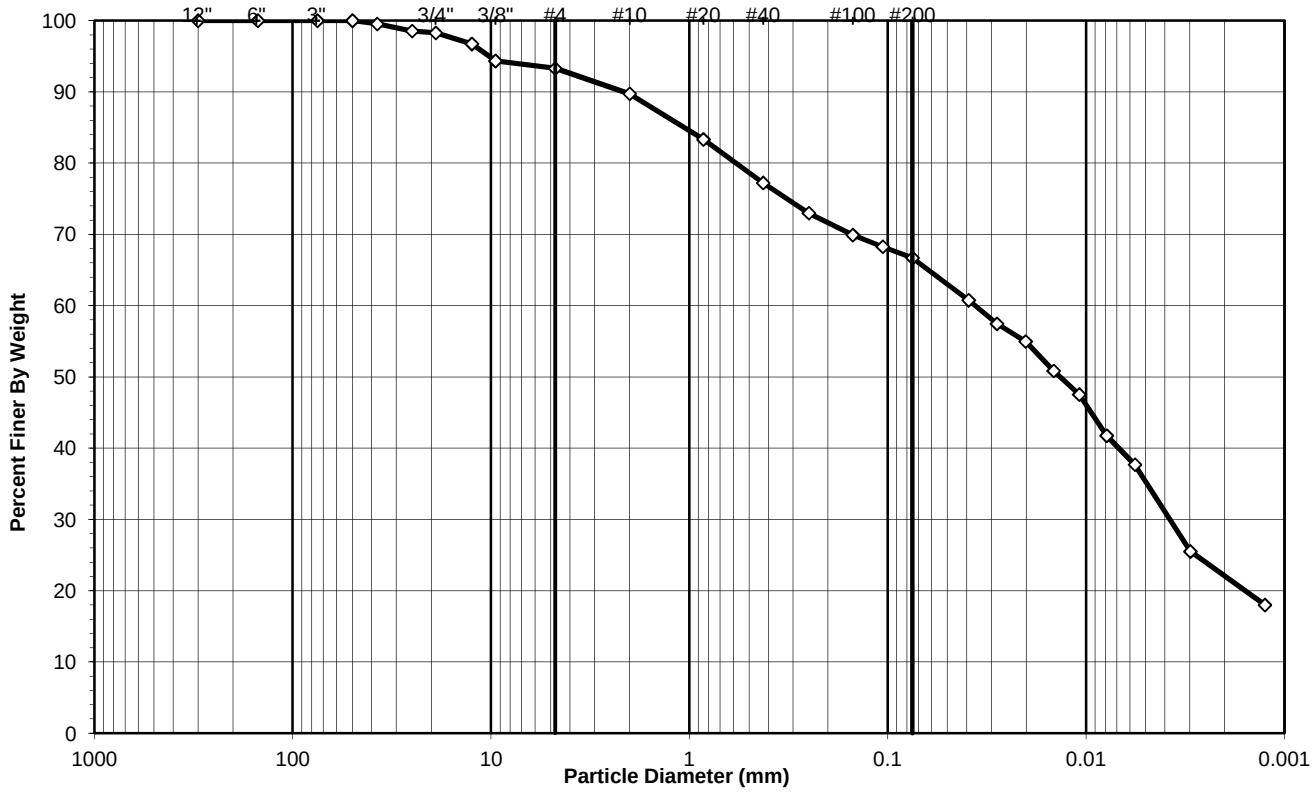
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003	Soil Color:	Red & Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**6.71**
#4 to #200	***Sand***	**26.59**
Finer than #200	***Silt & Clay***	**66.70**

USCS Symbol:
CL, TESTED

USCS Classification:
SANDY LEAN CLAY

Tested By DF Date 7/6/23 Checked By BRB Date 7/10/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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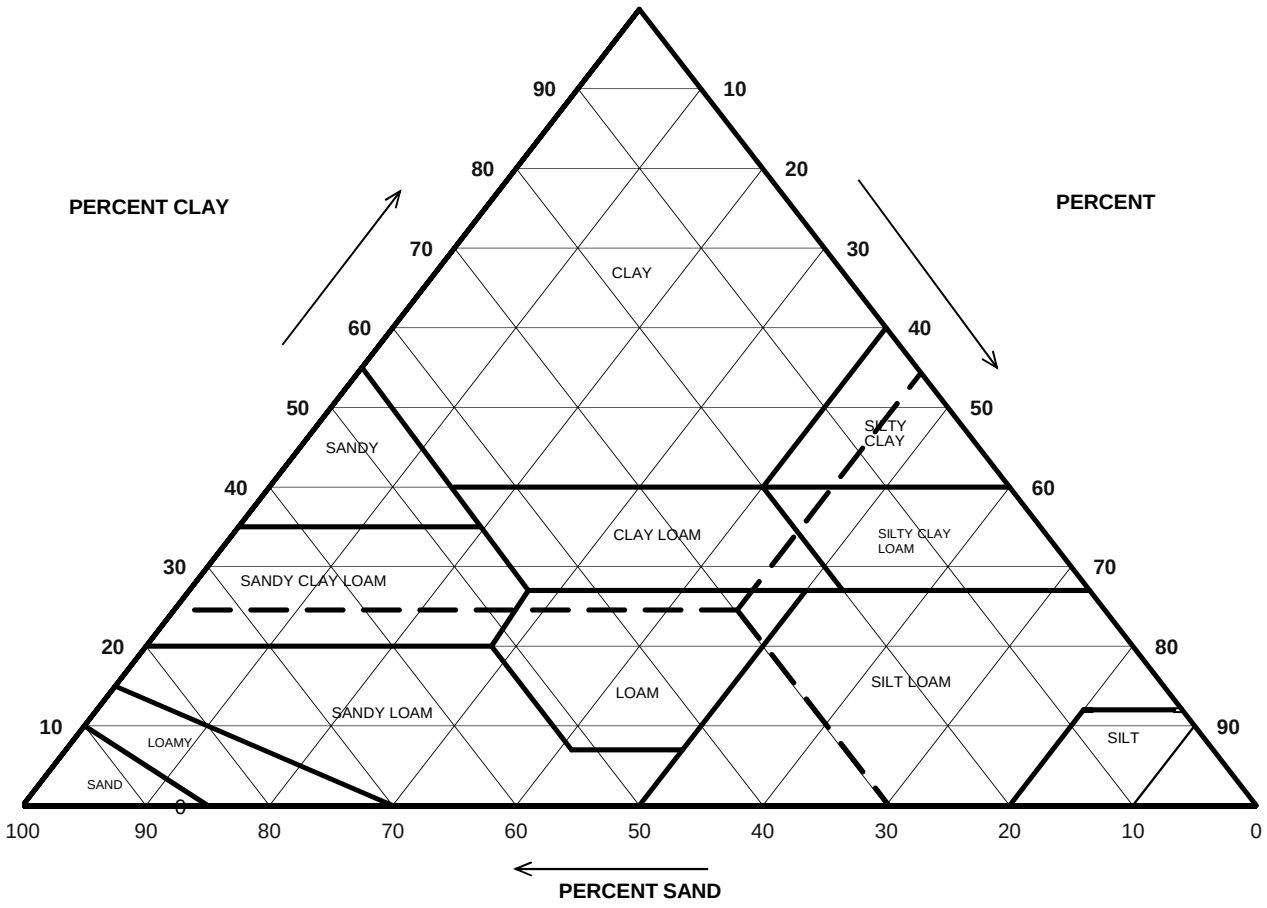
USDA CLASSIFICATION CHART

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003	Soil Color:	Red & Brown



USDA SUMMARY				
Particle Size (mm)	**Percent Finer**		**Actual Percentage**	Corrected % of Minus 2.0 mm material for USDA Classification
		Gravel	**10.26**	
2	**89.74**	**Sand**	**26.73**	**29.78**
0.05	**63.01**	**Silt**	**40.97**	**45.65**
0.002	**22.04**	**Clay**	**22.04**	**24.57**

USDA Classification: LOAM

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003	Soil Color:	Red & Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	2948	Tare No.:	2976
Wt. of Tare & Wet Sample (g):	287.43	Weight of Tare & Wet Sample (g):	257.91
Wt. of Tare & Dry Sample (g):	256.67	Weight of Tare & Dry Sample (g):	243.66
Weight of Tare (g):	8.25	Weight of Tare (g):	8.04
Weight of Water (g):	30.76	Weight of Water (g):	14.25
Weight of Dry Soil (g):	248.42	Weight of Dry Soil (g):	235.62
Moisture Content (%):	**12.4**	**Moisture Content (%):**	**6.0**

Wet Weight of -3/4" Sample (g):	27576.00	Total Dry Weight of Sample (g):	24966.73
Tare No. -3/4" Sub-Specimen (g):	1524	Wet Weight of +3/4" Sample (g):	455.00
Wt. of Tare & Wet -3/4" Sub-Specimen (g):	1217.03	Dry Weight of + 3/4" Sample (g):	429.05
Weight of Tare (g):	145.39	Dry Weight of - 3/4" Sample (g):	24537.68
Sub-Specimen 3/4" Wet Weight (g):	1071.64	Dry Weight -3/4" +3/8" Sample (g):	983.50
Tare No. (-3/8" Sub-Specimen):	615	Dry Weight of -3/8" Sample (g):	23554.18
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	533.79	J - Factor (% Finer than 3/4"):	98.3%
Weight of Tare (g):	83.57	J - Factor (% Finer than 3/8"):	94.3%
Sub-Specimen -3/8" Wet Weight (g):	450.22		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	123.00		0.46	0.46	99.54	**100**
1"	25	264.00		1.00	1.46	98.54	**99**
3/4"	19	68.00		0.26	1.72	98.28	**98**
1/2"	12.5	15.04	(**)	1.58	1.58	98.42	**97**
3/8"	9.5	23.18		2.43	4.01	95.99	**94**
#4	4.75	4.46		1.11	1.11	98.89	**93**
#10	2	15.10		3.77	4.88	95.12	**90**
#20	0.85	27.17	(**)	6.78	11.66	88.34	**83**
#40	0.425	25.95		6.48	18.14	81.86	**77**
#60	0.25	18.00		4.49	22.64	77.36	**73**
#100	0.15	13.07		3.26	25.90	74.10	**70**
#140	0.106	6.96		1.74	27.64	72.36	**68**
#200	0.075	6.67		1.66	29.30	70.70	**67**
Pan	-	283.23		70.70	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	7/6/23	Checked By	BRB	Date	7/10/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003	Soil Color:	Red & Brown

Elapsed Time (min)	Reading rm	Temp. (C^0)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	42.0	25.9	5.24	9.5	0.0391	91.1	60.8
2	40.0	25.9	5.24	9.8	0.0282	86.1	57.5
4	38.5	25.9	5.24	10.1	0.0202	82.4	55.0
8	36.0	25.9	5.24	10.5	0.0146	76.2	50.8
15	34.0	25.9	5.24	10.9	0.0108	71.3	47.5
30	30.5	25.9	5.24	11.5	0.0079	62.6	41.8
60	28.0	26.0	5.20	12.0	0.0057	56.5	37.7
240	20.5	26.3	5.07	13.3	0.0030	38.2	25.5
1440	16.0	26.2	5.11	14.1	0.0013	27.0	18.0

Soil Specimen Data

Tare No.:	889	Percent Finer than # 200:	66.70
Wt. of Tare & Dry Material (g):	143.32		
Weight of Tare (g):	98.42	Specific Gravity:	2.70 Assumed
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	39.90		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	G- 1819
Cylinder	G- 356
Thermometer	G- 1505
Balance	G- 657
#200 Sieve	G- 1944
Foam Inhibitor Used	No

Tested By TO Date 7/6/23 Checked By BRB Date 7/10/23

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003	Soil Description:	REDDISH BROWN LEAN CLAY

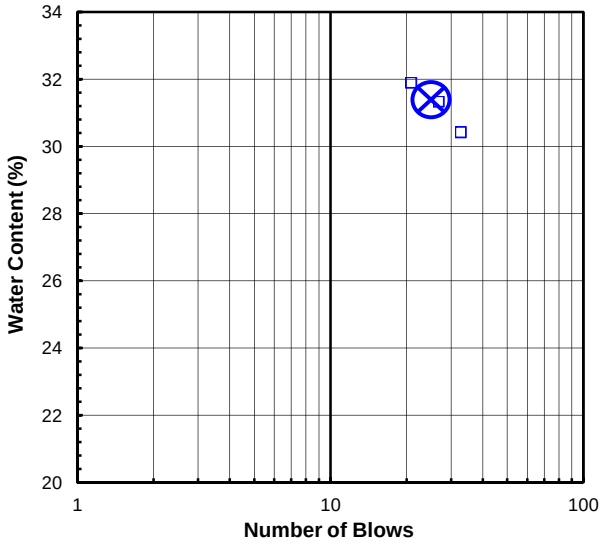
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Air dried)

As Received Moisture Content		Liquid Limit Test			
ASTM D2216-19		1	2	3	M
Tare Number:	3310	1280	237	186	U
Wt. of Tare & Wet Sample (g):	269.64	40.51	39.08	38.65	L
Wt. of Tare & Dry Sample (g):	241.59	35.75	34.24	33.78	T
Weight of Tare (g):	8.12	20.09	18.78	18.50	I
Weight of Water (g):	28.1	4.8	4.8	4.9	P
Weight of Dry Sample (g):	233.5	15.7	15.5	15.3	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**12.0**	**30.4**	**31.3**	**31.9**	N
Number of Blows:		**33**	**27**	**21**	T

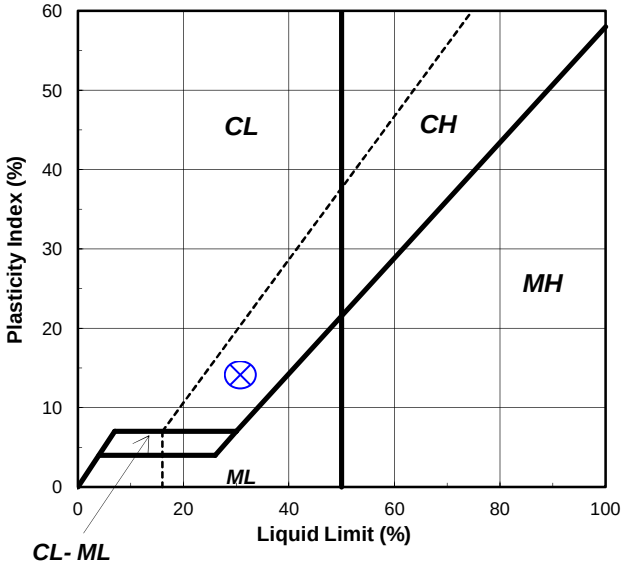
Plastic Limit Test	**1**	**2**	**Range**
Tare Number:	1101	268	
Wt. of Tare & Wet Sample (g):	24.35	24.03	
Wt. of Tare & Dry Sample (g):	23.46	23.13	
Weight of Tare (g):	18.20	17.75	
Weight of Water (g):	0.9	0.9	
Weight of Dry Sample (g):	5.3	5.4	
Moisture Content (%):	**16.9**	**16.7**	**0.2**
Note: The acceptable range of the two Moisture Contents is ±			1.12

Test Results	
Liquid Limit (%):	**31**
Plastic Limit (%):	**17**
Plasticity Index (%):	**14**
USCS Symbol:	**CL**

Flow Curve



Plasticity Chart



Tested By FS *Date* 7/6/23 *Checked By* KC *Date* 7/7/23

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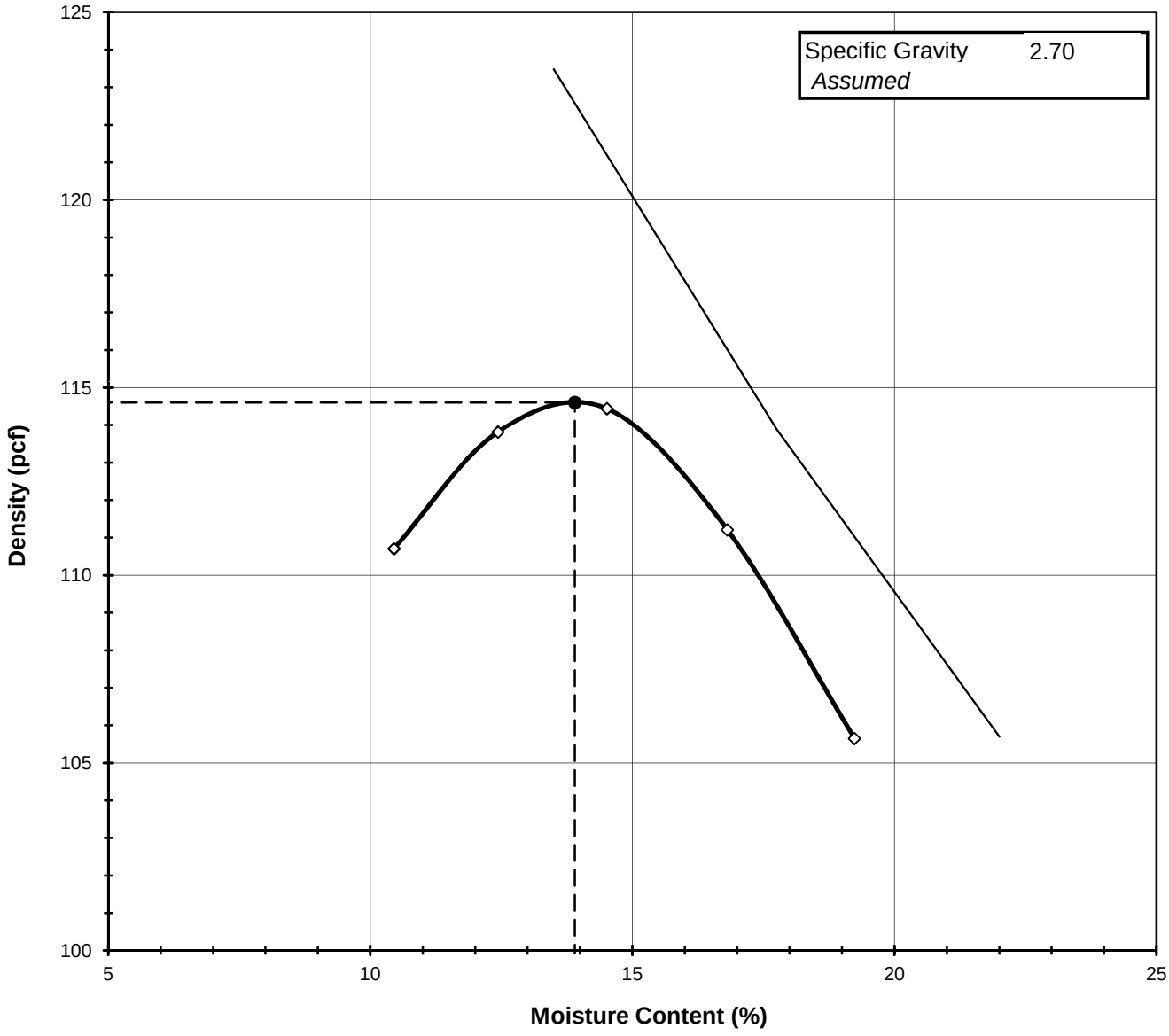
MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003	Test Method	**STANDARD**

Visual Description: Reddish Brown Clay and Rock

Optimum Moisture Content (%): 13.9
Maximum Dry Density (pcf): 114.6



Tested By *MLF* *Date* *7/6/23* *Checked By* *JLK* *Date* 7/10/23

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		

Visual Description: Reddish Brown Clay and Rock

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity:	2.70
Percent Retained on 3/4":	NA
Percent Retained on 3/8":	NA
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	C

Test Type:	**STANDARD**
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	G774
Mold ID:	G1776
Mold diameter:	6"
Weight of the Mold (g):	5578
Volume of the Mold (cm^3):	2127

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	9746	9940	10045	10006	9872
Weight of Mold (g):	5578	5578	5578	5578	5578
Weight of Wet Sample (g):	4168	4362	4467	4428	4294
Mold Volume (cm^3):	2127	2127	2127	2127	2127

Moisture Content / Density

Tare Number:	871	870	587	629	546
Weight of Tare & Wet Sample (g):	451.38	450.24	457.17	459.61	456.79
Weight of Tare & Dry Sample (g):	419.08	412.53	409.58	405.81	396.74
Weight of Tare (g):	109.99	109.25	81.69	85.76	84.54
Weight of Water (g):	32.30	37.71	47.59	53.80	60.05
Weight of Dry Sample (g):	309.09	303.28	327.89	320.05	312.20

Wet Density (g/cm^3):	1.96	2.05	2.10	2.08	2.02
Wet Density (pcf):	122.3	128.0	131.0	129.9	126.0
Moisture Content (%):	**10.5**	**12.4**	**14.5**	**16.8**	**19.2**
Dry Density (pcf):	**110.7**	**113.8**	**114.4**	**111.2**	**105.7**

Zero Air Voids

Moisture Content (%):	13.5	17.8	22.0
Dry Unit Weight (pcf):	123.5	113.9	105.7

Tested By MLF *Date* 7/6/23 *Checked By* JLK *Date* 7/10/23

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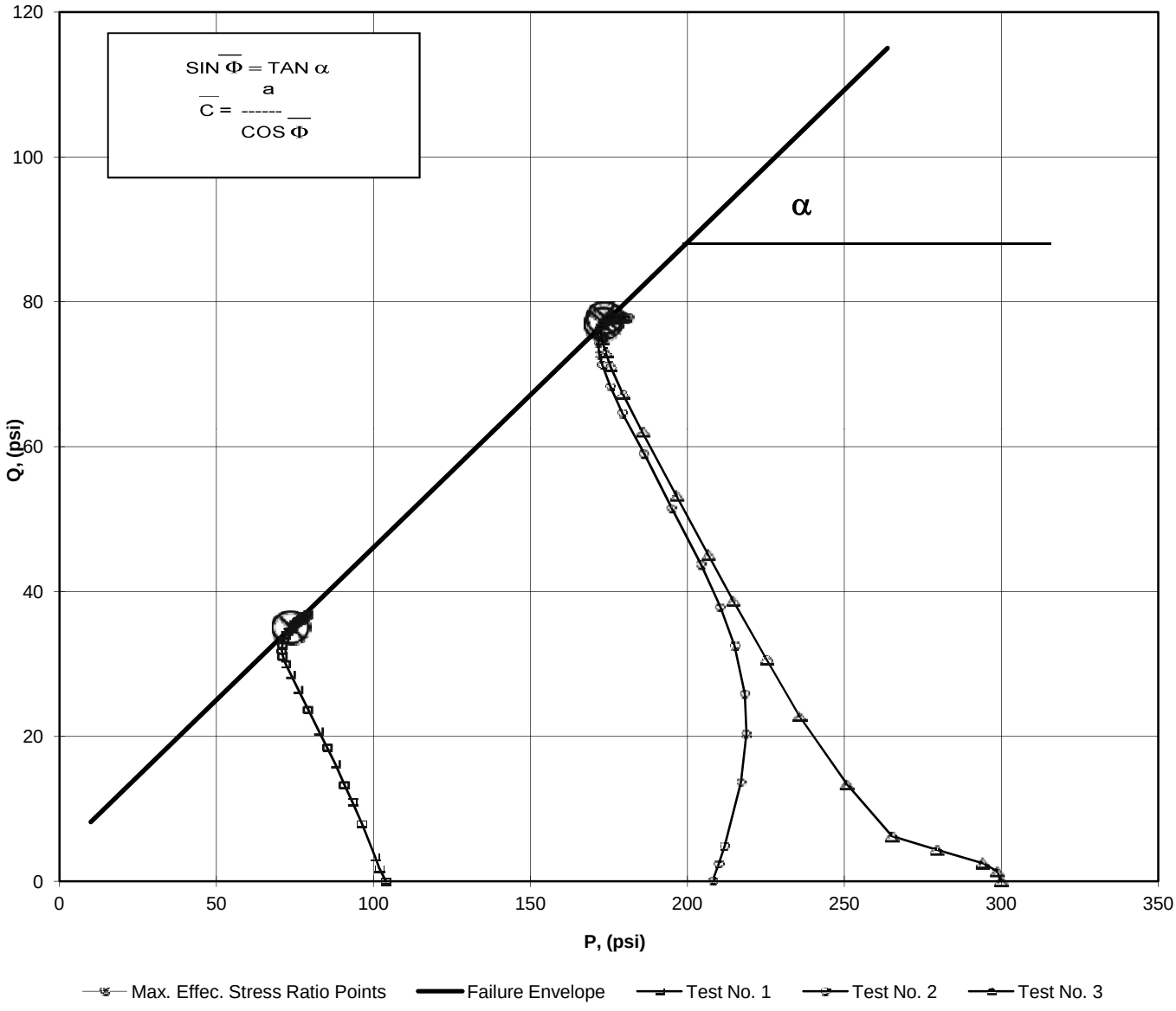
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.00**	$\overline{C}$	=	**0.00**
α	=	**22.8**	$\overline{\Phi}$	=	**24.90**

Tested By: RPE Date: 8/24/23 Approved By: NJM Date: 9/7/23

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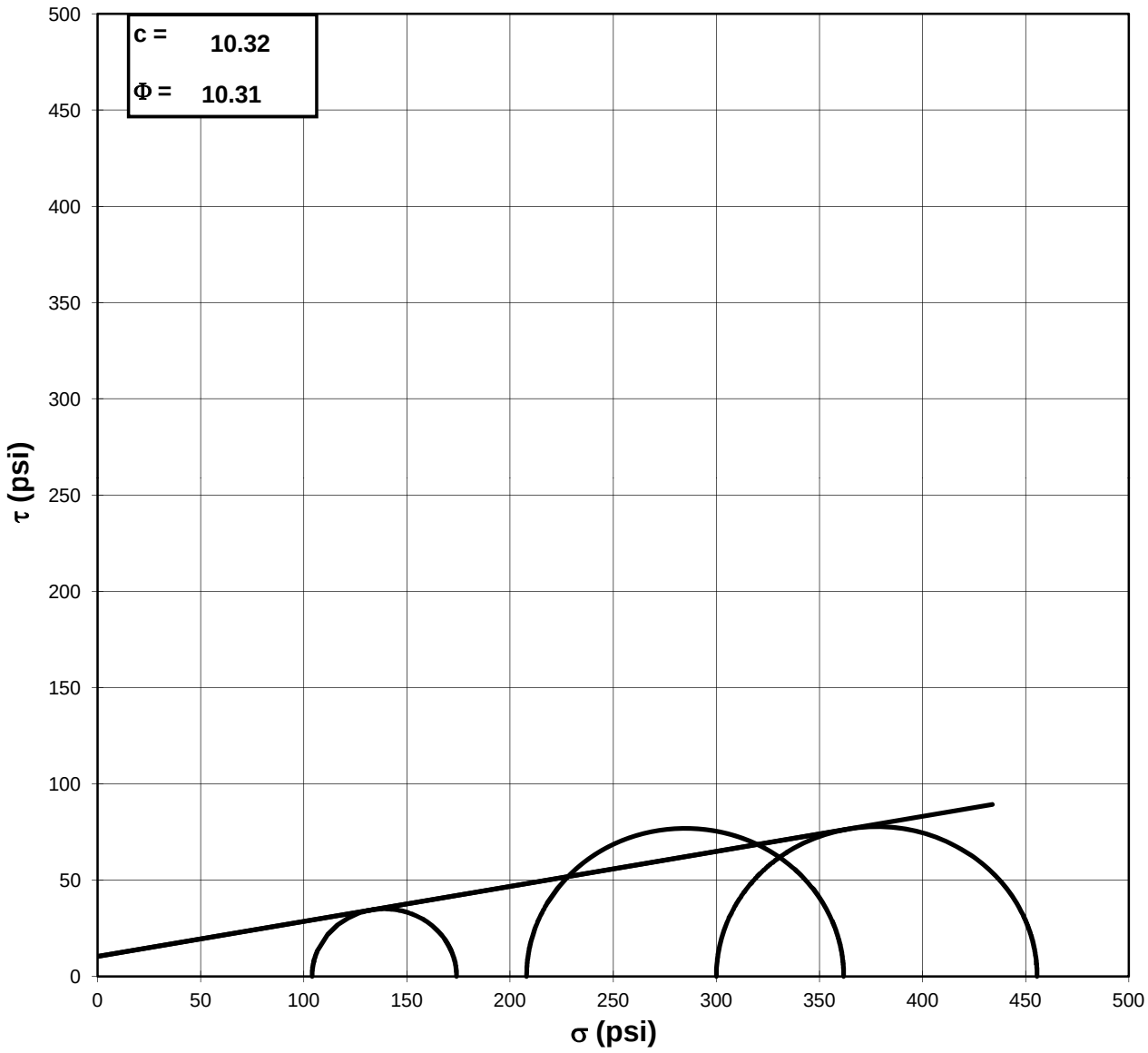
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		
Visual Description:	Reddish-Brown Clay with Rocks (Remolded)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: RPE *Date:* 8/24/23 *Approved By:* NJM *Date:* 9/7/23

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ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	146.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	104.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	73.80
Q	=	35.03

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	96.0
Final Burette Reading (ml)	24.6
Final Change (ml)	71.4

Initial Dial Reading (mil)	7
Dial Reading After Saturation (mil)	15
Dial Reading After Consolidation (mil)	215

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.3	0.000	42.0
22.4	0.001	45.9
41.3	0.002	48.8
94.5	0.007	57.5
130.6	0.012	63.6
159.5	0.018	68.6
193.6	0.027	74.4
220.4	0.035	79.2
248.9	0.046	84.2
285.1	0.067	90.5
319.8	0.098	96.5
347.0	0.133	101.0
366.3	0.169	103.9
383.6	0.211	106.1
394.1	0.240	107.0
406.0	0.281	107.6
420.4	0.337	107.9
434.0	0.399	107.9
443.1	0.443	107.7
454.6	0.502	107.2
461.9	0.546	106.9
470.0	0.592	106.5
477.6	0.637	106.0
482.6	0.667	105.7
487.3	0.696	105.4
492.0	0.727	105.2
496.2	0.756	104.9
503.3	0.801	104.3
510.3	0.845	104.0
515.6	0.876	103.8
520.1	0.905	103.5

Tested By: RPE Date: 8/24/23 Input Checked By: NJM Date: 9/7/23

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ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	104.0	*Stage No.*	1
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	33.84
Length After Consolidation (in)	5.73
Area After Consolidation (in^2)	5.903

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	3.57	3.87	103.71	100.1	1.036	1.10	101.92	1.79
0.04	6.77	6.81	103.95	97.2	1.070	1.03	100.57	3.38
0.12	15.76	15.49	104.28	88.5	1.178	1.00	96.40	7.88
0.21	21.86	21.62	104.24	82.4	1.265	1.01	93.31	10.93
0.32	26.72	26.56	104.17	77.4	1.345	1.01	90.80	13.36
0.47	32.43	32.39	104.04	71.6	1.453	1.02	87.82	16.21
0.62	36.88	37.16	103.73	66.8	1.552	1.03	85.29	18.44
0.81	41.60	42.24	103.36	61.8	1.674	1.04	82.56	20.80
1.17	47.52	48.53	102.99	55.5	1.857	1.04	79.23	23.76
1.70	53.03	54.51	102.53	49.5	2.072	1.05	76.01	26.52
2.32	57.20	58.98	102.22	45.0	2.271	1.05	73.62	28.60
2.95	60.01	61.94	102.07	42.1	2.427	1.05	72.07	30.01
3.68	62.39	64.10	102.28	39.9	2.564	1.05	71.09	31.19
4.18	63.76	65.04	102.72	39.0	2.636	1.04	70.84	31.88
4.90	65.20	65.58	103.62	38.4	2.697	1.03	71.02	32.60
5.89	66.81	65.90	104.91	38.1	2.754	1.01	71.51	33.41
6.96	68.20	65.93	106.26	38.1	2.792	0.99	72.17	34.10
7.73	69.06	65.68	107.38	38.3	2.802	0.97	72.85	34.53
8.76	70.07	65.23	108.84	38.8	2.807	0.95	73.80	35.03
9.53	70.60	64.87	109.74	39.1	2.804	0.94	74.44	35.30
10.32	71.20	64.47	110.73	39.5	2.801	0.92	75.13	35.60
11.11	71.73	63.99	111.74	40.0	2.792	0.91	75.88	35.86
11.64	72.04	63.70	112.34	40.3	2.788	0.90	76.32	36.02
12.15	72.33	63.39	112.94	40.6	2.781	0.89	76.77	36.16
12.67	72.60	63.21	113.39	40.8	2.780	0.89	77.09	36.30
13.19	72.79	62.92	113.86	41.1	2.772	0.88	77.47	36.39
13.97	73.16	62.27	114.89	41.7	2.753	0.87	78.31	36.58
14.74	73.52	62.02	115.50	42.0	2.751	0.86	78.74	36.76
15.27	73.81	61.75	116.06	42.2	2.747	0.85	79.15	36.91
15.79	74.01	61.47	116.54	42.5	2.740	0.85	79.54	37.01

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ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	250.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	208.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	173.19
Q	=	76.88

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	144.0
Final Burette Reading (ml)	54.4
Final Change (ml)	89.6

Initial Dial Reading (mil)	37
Dial Reading After Saturation (mil)	48
Dial Reading After Consolidation (mil)	312

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.4	0.000	41.9
29.0	0.001	42.4
57.2	0.002	43.0
159.0	0.007	46.6
237.3	0.012	51.6
300.8	0.017	57.6
377.9	0.025	67.5
440.4	0.033	77.3
510.0	0.044	89.4
601.7	0.064	106.4
693.8	0.094	122.8
763.7	0.129	135.2
812.4	0.165	142.7
853.6	0.206	148.3
875.7	0.235	150.7
901.3	0.276	152.6
925.0	0.332	153.9
947.4	0.392	154.1
962.2	0.437	153.7
978.6	0.496	153.0
989.3	0.540	152.2
999.8	0.585	151.3
1010.1	0.630	150.6
1017.1	0.661	150.0
1024.5	0.690	149.5
1030.4	0.720	148.9
1036.8	0.750	148.4
1046.1	0.793	147.7
1055.5	0.839	146.9
1061.2	0.869	146.4
1066.7	0.899	145.9

Tested By: RPE Date: 8/24/23 Input Checked By: NJM Date: 9/7/23

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ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	208.0	*Stage No.*	1
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	32.67
Length After Consolidation (in)	5.67
Area After Consolidation (in^2)	5.766

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	4.79	0.41	212.38	207.6	1.023	0.09	209.99	2.39
0.03	9.68	0.99	216.69	207.0	1.047	0.11	211.85	4.84
0.12	27.30	4.59	230.71	203.4	1.134	0.17	217.06	13.65
0.21	40.83	9.62	239.21	198.4	1.206	0.24	218.79	20.41
0.30	51.77	15.60	244.17	192.4	1.269	0.31	218.29	25.88
0.43	65.01	25.45	247.55	182.5	1.356	0.40	215.05	32.50
0.59	75.67	35.35	248.33	172.7	1.438	0.48	210.49	37.84
0.78	87.51	47.43	248.08	160.6	1.545	0.56	204.32	43.76
1.13	102.92	64.37	246.56	143.6	1.717	0.64	195.10	51.46
1.66	118.09	80.76	245.33	127.2	1.928	0.71	186.29	59.05
2.27	129.19	93.19	244.01	114.8	2.125	0.74	179.41	64.60
2.91	136.55	100.74	243.81	107.3	2.273	0.76	175.53	68.28
3.63	142.43	106.26	244.17	101.7	2.400	0.77	172.95	71.22
4.15	145.33	108.67	244.66	99.3	2.463	0.77	172.00	72.66
4.87	148.44	110.63	245.81	97.4	2.524	0.77	171.59	74.22
5.86	150.77	111.86	246.91	96.1	2.568	0.76	171.52	75.38
6.92	152.69	112.05	248.63	95.9	2.591	0.76	172.29	76.34
7.71	153.76	111.69	250.08	96.3	2.596	0.75	173.19	76.88
8.75	154.63	111.01	251.62	97.0	2.594	0.74	174.30	77.31
9.53	154.98	110.22	252.76	97.8	2.585	0.73	175.27	77.49
10.32	155.28	109.33	253.95	98.7	2.574	0.73	176.31	77.64
11.13	155.46	108.55	254.91	99.4	2.563	0.72	177.18	77.73
11.67	155.59	108.00	255.60	100.0	2.556	0.72	177.80	77.80
12.19	155.81	107.50	256.31	100.5	2.550	0.71	178.41	77.90
12.71	155.76	106.92	256.84	101.1	2.541	0.71	178.96	77.88
13.24	155.78	106.44	257.35	101.6	2.534	0.70	179.46	77.89
14.00	155.80	105.73	258.07	102.3	2.523	0.70	180.17	77.90
14.81	155.74	104.91	258.83	103.1	2.511	0.69	180.96	77.87
15.33	155.61	104.37	259.25	103.6	2.502	0.69	181.44	77.81
15.87	155.42	103.91	259.51	104.1	2.493	0.69	181.80	77.71

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Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	342.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	300.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	173.77
Q	=	77.76

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	120.0
Final Burette Reading (ml)	28.4
Final Change (ml)	91.6

Initial Dial Reading (mil)	36
Dial Reading After Saturation (mil)	47
Dial Reading After Consolidation (mil)	315

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
0.5	0.000	42.0
15.7	0.002	44.5
29.2	0.003	50.4
50.6	0.012	67.0
72.6	0.025	83.1
155.2	0.030	104.5
264.0	0.037	129.0
355.2	0.045	147.3
450.0	0.056	166.0
524.7	0.068	180.3
621.9	0.088	198.6
729.3	0.124	218.3
796.0	0.157	229.8
847.3	0.197	237.6
874.6	0.226	241.0
903.1	0.270	244.0
919.7	0.301	245.2
941.6	0.354	246.2
957.4	0.399	246.4
973.1	0.457	246.0
983.6	0.502	245.5
991.9	0.548	244.8
1000.1	0.594	244.1
1006.4	0.624	243.5
1010.8	0.653	243.0
1017.7	0.682	242.5
1023.7	0.711	242.1
1033.5	0.757	241.4
1042.7	0.803	240.7
1051.5	0.833	240.1
1056.9	0.862	239.7

Tested By: RPE Date: 8/24/23 Input Checked By: NJM Date: 9/7/23

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ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	300.0	*Stage No.*	1
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	32.55
Length After Consolidation (in)	5.66
Area After Consolidation (in^2)	5.749

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.03	2.64	2.54	300.10	297.5	1.009	0.98	298.78	1.32
0.05	4.99	8.41	296.58	291.6	1.017	1.72	294.08	2.49
0.21	8.70	24.98	283.72	275.0	1.032	2.93	279.37	4.35
0.45	12.48	41.12	271.37	258.9	1.048	3.36	265.13	6.24
0.53	26.76	62.54	264.22	237.5	1.113	2.38	250.84	13.38
0.66	45.53	87.04	258.50	213.0	1.214	1.95	235.73	22.77
0.79	61.21	105.34	255.87	194.7	1.314	1.76	225.26	30.60
1.00	77.42	124.00	253.42	176.0	1.440	1.63	214.71	38.71
1.20	90.08	138.29	251.80	161.7	1.557	1.57	206.76	45.04
1.56	106.40	156.62	249.78	143.4	1.742	1.50	196.58	53.20
2.19	123.99	176.25	247.74	123.7	2.002	1.45	185.74	61.99
2.78	134.53	187.82	246.72	112.2	2.199	1.42	179.45	67.27
3.48	142.17	195.63	246.54	104.4	2.362	1.40	175.46	71.08
4.00	145.96	199.02	246.94	101.0	2.445	1.39	173.96	72.98
4.77	149.51	202.02	247.49	98.0	2.526	1.38	172.73	74.76
5.31	151.39	203.23	248.16	96.8	2.564	1.37	172.47	75.70
6.25	153.48	204.24	249.24	95.8	2.603	1.36	172.50	76.74
7.05	154.71	204.40	250.31	95.6	2.618	1.35	172.95	77.35
8.07	155.53	204.00	251.53	96.0	2.620	1.34	173.77	77.76
8.86	155.85	203.48	252.38	96.5	2.615	1.33	174.45	77.93
9.68	155.75	202.80	252.95	97.2	2.602	1.33	175.07	77.88
10.49	155.63	202.09	253.54	97.9	2.589	1.33	175.72	77.81
11.01	155.69	201.53	254.17	98.5	2.581	1.32	176.32	77.85
11.54	155.46	201.03	254.43	99.0	2.571	1.32	176.70	77.73
12.05	155.61	200.54	255.07	99.5	2.565	1.32	177.27	77.81
12.56	155.62	200.06	255.56	99.9	2.557	1.31	177.75	77.81
13.36	155.67	199.37	256.30	100.6	2.547	1.31	178.46	77.84
14.18	155.57	198.67	256.90	101.3	2.535	1.30	179.11	77.79
14.71	155.93	198.15	257.78	101.9	2.531	1.30	179.82	77.96
15.23	155.77	197.69	258.08	102.3	2.523	1.30	180.19	77.88

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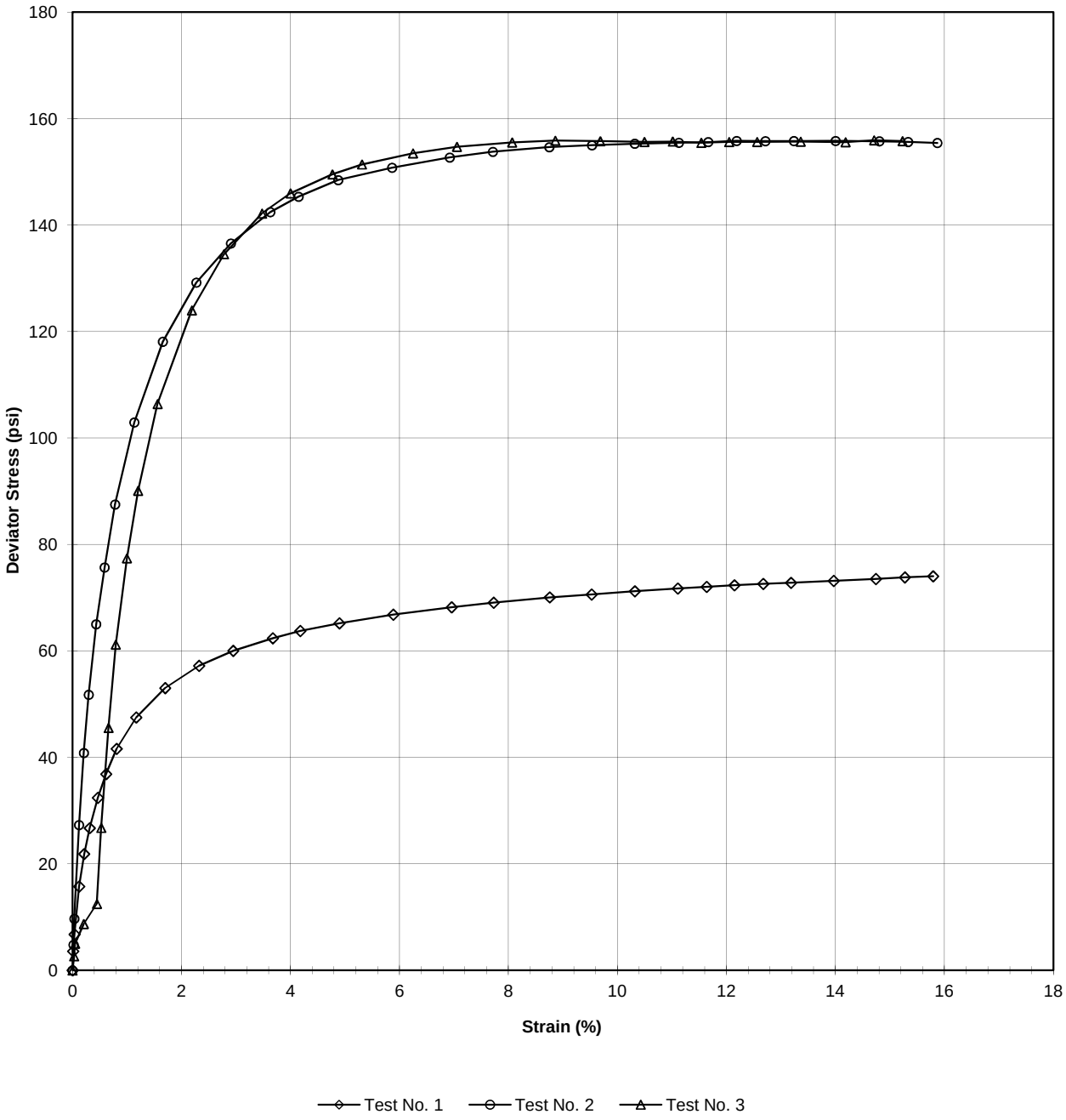
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID:	2023-370-003-003		
Visual Description:	Reddish-Brown Clay with Rocks (Remolded)		



Tested By: RPE Date: 8/24/23 Approved By: NJM Date: 9/7/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.		
Client Reference:	AEP Amos Seq. 4 C130109.27		
Project No.:	2023-370-003		
Lab ID:	2023-370-003-003	Specific Gravity (Assumed)	2.7

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

SAMPLE CONDITION SUMMARY

Boring No.:	AEP Amos	AEP Amos	AEP Amos
Depth (ft):	Seq. 4 Repair	Seq. 4 Repair	Seq. 4 Repair
Sample No.:	61523-3	61523-3	61523-3
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.001	0.001	0.001
Back Pressure (psi)	42	42	42
Consolidation Time (days)	1	1	1
Moisture Content (%) (INITIAL)	14.2	14.2	14.2
Total Unit Weight (pcf)	124.4	124.4	124.4
Dry Unit Weight (pcf)	108.9	108.9	108.9
Moisture Content (%) (FINAL)	15.1	13.7	13.6
Initial State Void Ratio,e	0.547	0.547	0.547
Void Ratio at Shear, e	0.365	0.318	0.313

Tested By: RPE Date: 8/24/23 Input Checked By: NJM Date: 9/7/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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PERMEABILITY TEST

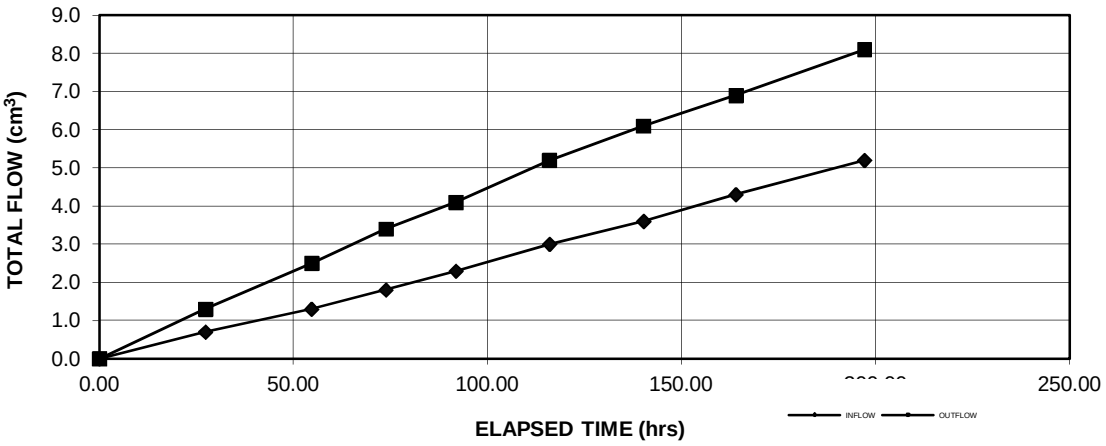
ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID No.:	2023-370-003-003	Avg. Effective Consol. Pressure (psi):	50

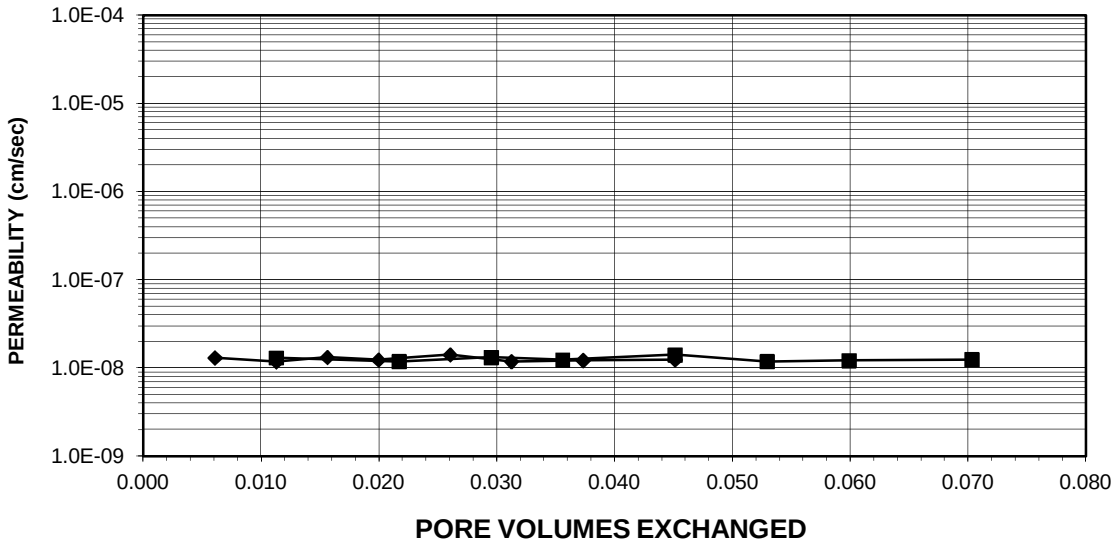
AVERAGE PERMEABILITY = 1.3E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.3E-10 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: WT Date: 7/24/23 Checked By: JLK Date: 8/8/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID No.:	2023-370-003-003	Avg. Effective Consol. Pressure (psi):	50

Specific Gravity:	2.70	Assumed
Sample Condition:		Remolded

Visual Description: Reddish Brown Clay

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	2996	1718
Weight of Tare & Wet Sample (g)	117.46	831.15
Weight of Tare & Dry Sample (g)	104.19	723.63
Weight of Tare (g)	8.13	81.58
Weight of Water (g)	13.27	107.52
Weight of Dry Sample (g)	96.06	642.05
Moisture Content (%)	**13.8**	**16.7**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	1655.60	NA
Weight of Tube (g)	920.30	NA
Weight of Wet Sample (g)	735.30	754.24
Length 1 (in)	3.495	3.438
Length 2 (in)	3.495	3.454
Length 3 (in)	3.495	3.455
Top Diameter (in)	2.870	2.826
Middle Diameter (in)	2.870	2.814
Bottom Diameter (in)	2.870	2.838
Average Length (in)	3.50	3.45
Average Area (in^2)	6.47	6.27
Sample Volume (cm^3)	370.51	354.51
Unit Wet Weight (g/cm^3)	1.98	2.13
Unit Wet Weight (pcf)	123.9	132.8
Unit Dry Weight (pcf)	108.8	113.8
Unit Dry Weight (g/cm^3)	1.74	1.82
Void Ratio, e	0.55	0.48
Porosity, n	0.35	0.33
Pore Volume (cm^3)	131.2	115.2
Total Weight of Sample After Test (g)		749.74

Tested By: WT Date: 7/24/23 Checked By: JLK Date: 8/8/23

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PERMEABILITY TEST

ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-3
Lab ID No.:	2023-370-003-003	Avg. Effective Consol. Pressure (psi):	50

Pressure Heads (Constant)	
Top Cap (psi)	53.0
Bottom Cap (psi)	55.0
Cell (psi)	104.0
Total Pressure Head (cm)	140.6
Hydraulic Gradient	16.05

Final Sample Dimensions	
Sample Length (cm), L	8.76
Sample Diameter (cm)	7.18
Sample Area (cm^2), A	40.47
Inflow Burette Area (cm^2), a-in	0.962
Outflow Burette Area (cm^2), a-out	0.962
B Parameter (%)	96

AVERAGE PERMEABILITY = 1.3E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.3E-10 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
7/28/23	11	10	0.000	0.0	0.0	161.6	0	22.3	NA
7/29/23	14	28	27.300	0.7	1.3	159.5	0	22.0	1.3E-08
7/30/23	17	48	54.633	1.3	2.5	157.7	0	22.2	1.2E-08
7/31/23	12	58	73.800	1.8	3.4	156.2	0	22.3	1.3E-08
8/1/23	7	2	91.867	2.3	4.1	155.0	0	21.4	1.2E-08
8/2/23	7	8	115.967	3.0	5.2	153.1	0	21.3	1.4E-08
8/3/23	7	23	140.217	3.6	6.1	151.6	0	21.2	1.2E-08
8/4/23	7	9	163.983	4.3	6.9	150.0	0	21.2	1.2E-08
8/5/23	16	17	197.117	5.2	8.1	147.9	1	21.1	1.2E-08

Tested By: WT Date: 7/24/23 Checked By: JLK Date: 8/8/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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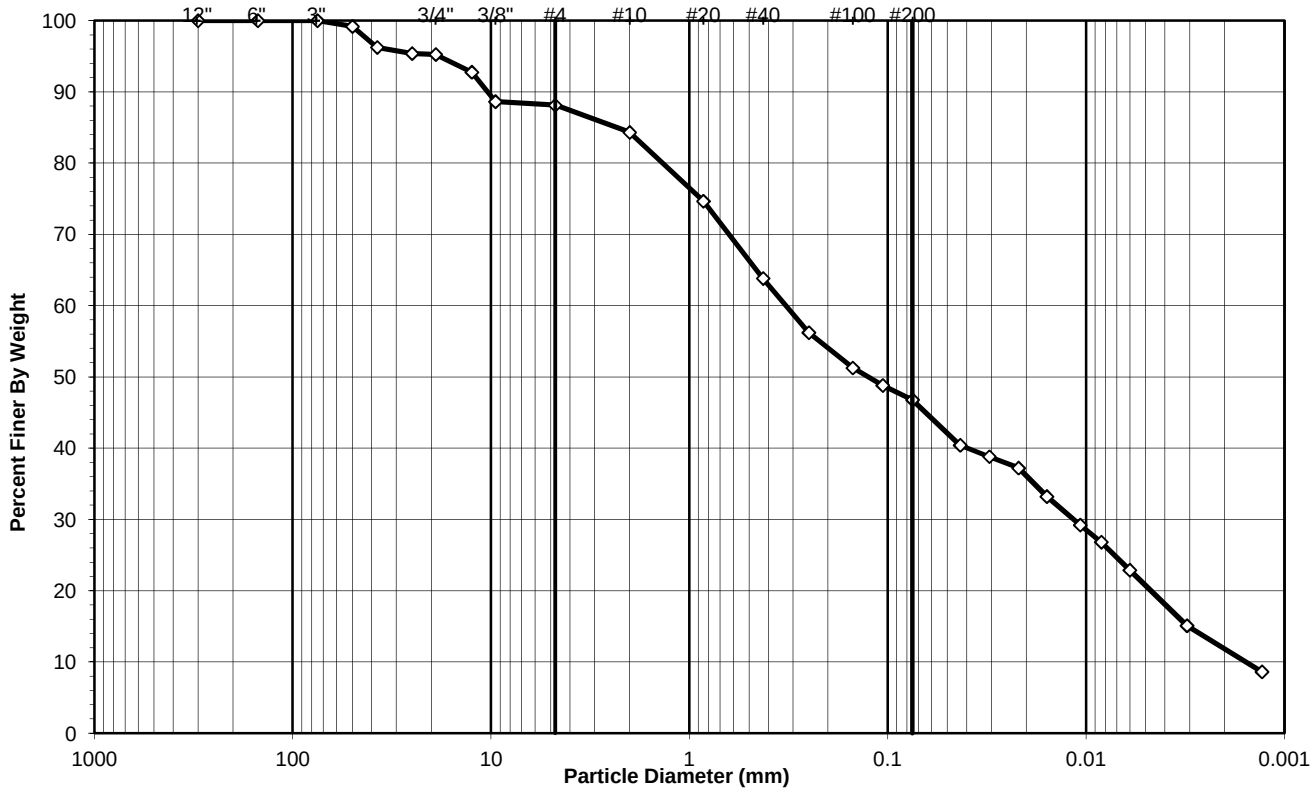
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004	Soil Color:	Red & Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**11.87**
#4 to #200	***Sand***	**41.33**
Finer than #200	***Silt & Clay***	**46.79**

USCS Symbol:
SC, TESTED

D50 = 0.13

USCS Classification:
CLAYEY SAND

Tested By DF Date 7/6/23 Checked By BRB Date 7/10/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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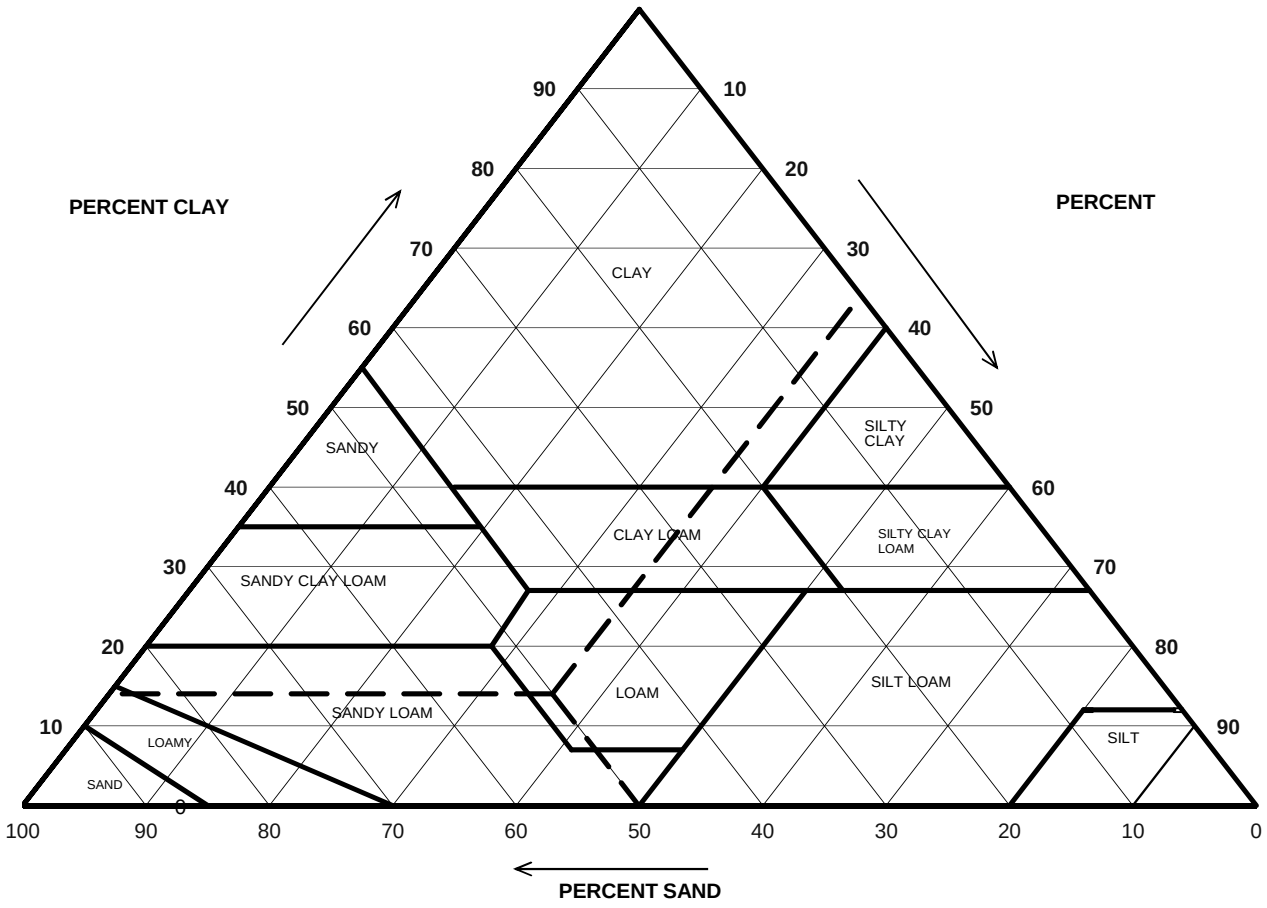
USDA CLASSIFICATION CHART

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004	Soil Color:	Red & Brown



USDA SUMMARY				
Particle Size (mm)	**Percent Finer**		**Actual Percentage**	Corrected % of Minus 2.0 mm material for USDA Classification
		Gravel	**15.68**	
2	**84.32**	**Sand**	**42.20**	**50.05**
0.05	**42.12**	**Silt**	**30.28**	**35.92**
0.002	**11.83**	**Clay**	**11.83**	**14.04**

USDA Classification: LOAM

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004	Soil Color:	Red & Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	3343	Tare No.:	4015
Wt. of Tare & Wet Sample (g):	277.90	Weight of Tare & Wet Sample (g):	360.65
Wt. of Tare & Dry Sample (g):	247.56	Weight of Tare & Dry Sample (g):	325.22
Weight of Tare (g):	8.08	Weight of Tare (g):	8.61
Weight of Water (g):	30.34	Weight of Water (g):	35.43
Weight of Dry Soil (g):	239.48	Weight of Dry Soil (g):	316.61
Moisture Content (%):	**12.7**	**Moisture Content (%):**	**11.2**

Wet Weight of -3/4" Sample (g):	27179.00	Total Dry Weight of Sample (g):	25327.09
Tare No. -3/4" Sub-Specimen (g):	1436	Wet Weight of +3/4" Sample (g):	1339.00
Wt. of Tare & Wet -3/4" Sub-Specimen (g):	1197.58	Dry Weight of + 3/4" Sample (g):	1204.24
Weight of Tare (g):	144.05	Dry Weight of - 3/4" Sample (g):	24122.85
Sub-Specimen 3/4" Wet Weight (g):	1053.53	Dry Weight -3/4" +3/8" Sample (g):	1675.32
Tare No. (-3/8" Sub-Specimen):	914	Dry Weight of -3/8" Sample (g):	22447.52
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	531.04	J - Factor (% Finer than 3/4"):	95.2%
Weight of Tare (g):	109.87	J - Factor (% Finer than 3/8"):	88.6%
Sub-Specimen -3/8" Wet Weight (g):	421.17		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	231.00	(*)	0.82	0.82	99.18	**99**
1 1/2"	37.5	827.00		2.94	3.76	96.24	**96**
1"	25	243.00		0.86	4.62	95.38	**95**
3/4"	19	38.00		0.13	4.75	95.25	**95**
1/2"	12.5	24.37	(**)	2.61	2.61	97.39	**93**
3/8"	9.5	40.57		4.34	6.94	93.06	**89**
#4	4.75	2.13		0.57	0.57	99.43	**88**
#10	2	16.06		4.30	4.87	95.13	**84**
#20	0.85	40.73	(**)	10.90	15.76	84.24	**75**
#40	0.425	45.73		12.23	28.00	72.00	**64**
#60	0.25	32.06		8.58	36.57	63.43	**56**
#100	0.15	20.90		5.59	42.16	57.84	**51**
#140	0.106	10.35		2.77	44.93	55.07	**49**
#200	0.075	8.50		2.27	47.21	52.79	**47**
Pan	-	197.35		52.79	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	7/6/23	Checked By	BRB	Date	7/10/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004	Soil Color:	Red & Brown

Elapsed Time (min)	Reading rm	Temp. (C^0)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	30.5	25.9	5.24	11.5	0.0431	86.4	40.4
2	29.5	25.9	5.24	11.7	0.0307	83.0	38.8
4	28.5	25.9	5.24	11.9	0.0219	79.5	37.2
8	26.0	25.9	5.24	12.3	0.0158	71.0	33.2
18	23.5	25.9	5.24	12.8	0.0107	62.4	29.2
30	22.0	25.9	5.24	13.1	0.0084	57.3	26.8
60	19.5	26.0	5.20	13.5	0.0060	48.9	22.9
240	14.5	26.3	5.07	14.4	0.0031	32.3	15.1
1440	10.5	26.2	5.11	15.1	0.0013	18.4	8.6

Soil Specimen Data

Tare No.:	644	Percent Finer than # 200:	46.79
Wt. of Tare & Dry Material (g):	130.34		
Weight of Tare (g):	96.42	Specific Gravity:	2.70 Assumed
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	28.92		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	G- 1819
Cylinder	G- 356
Thermometer	G- 1505
Balance	G- 657
#200 Sieve	G- 1944
Foam Inhibitor Used	No

Tested By TO Date 7/6/23 Checked By BRB Date 7/10/23

ATTERBERG LIMITS

ASTM D 4318-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004	Soil Description:	REDDISH BROWN LEAN CLAY

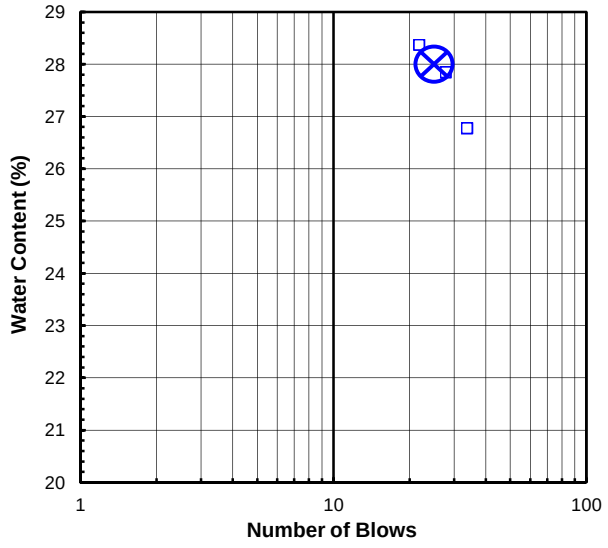
***Note: The* USCS symbol used with this test refers only to the minus No. 40** (Minus #40 sieve material, Air dried)
sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

As Received Moisture Content		Liquid Limit Test			
ASTM D2216-19		1	2	3	M
Tare Number:	3510	357	231	180	U
Wt. of Tare & Wet Sample (g):	257.08	40.63	39.88	39.74	L
Wt. of Tare & Dry Sample (g):	229.47	36.37	35.48	35.30	T
Weight of Tare (g):	8.08	20.45	19.67	19.64	I
Weight of Water (g):	27.6	4.3	4.4	4.4	P
Weight of Dry Sample (g):	221.4	15.9	15.8	15.7	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**12.5**	**26.8**	**27.8**	**28.4**	N
Number of Blows:		**34**	**28**	**22**	T

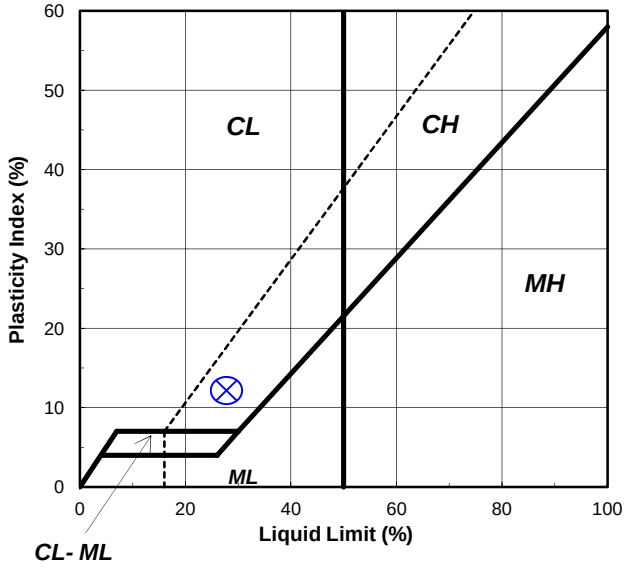
Plastic Limit Test	**1**	**2**	**Range**
Tare Number:	508	603	
Wt. of Tare & Wet Sample (g):	25.41	24.91	
Wt. of Tare & Dry Sample (g):	24.55	24.05	
Weight of Tare (g):	19.31	18.81	
Weight of Water (g):	0.9	0.9	
Weight of Dry Sample (g):	5.2	5.2	
Moisture Content (%):	**16.4**	**16.4**	**0.0**
Note: The acceptable range of the two Moisture Contents is ±			1.12

Test Results	
Liquid Limit (%):	**28**
Plastic Limit (%):	**16**
Plasticity Index (%):	**12**
USCS Symbol:	**CL**

Flow Curve



Plasticity Chart



Tested By FS *Date* 7/6/23 *Checked By* KC *Date* 7/7/23

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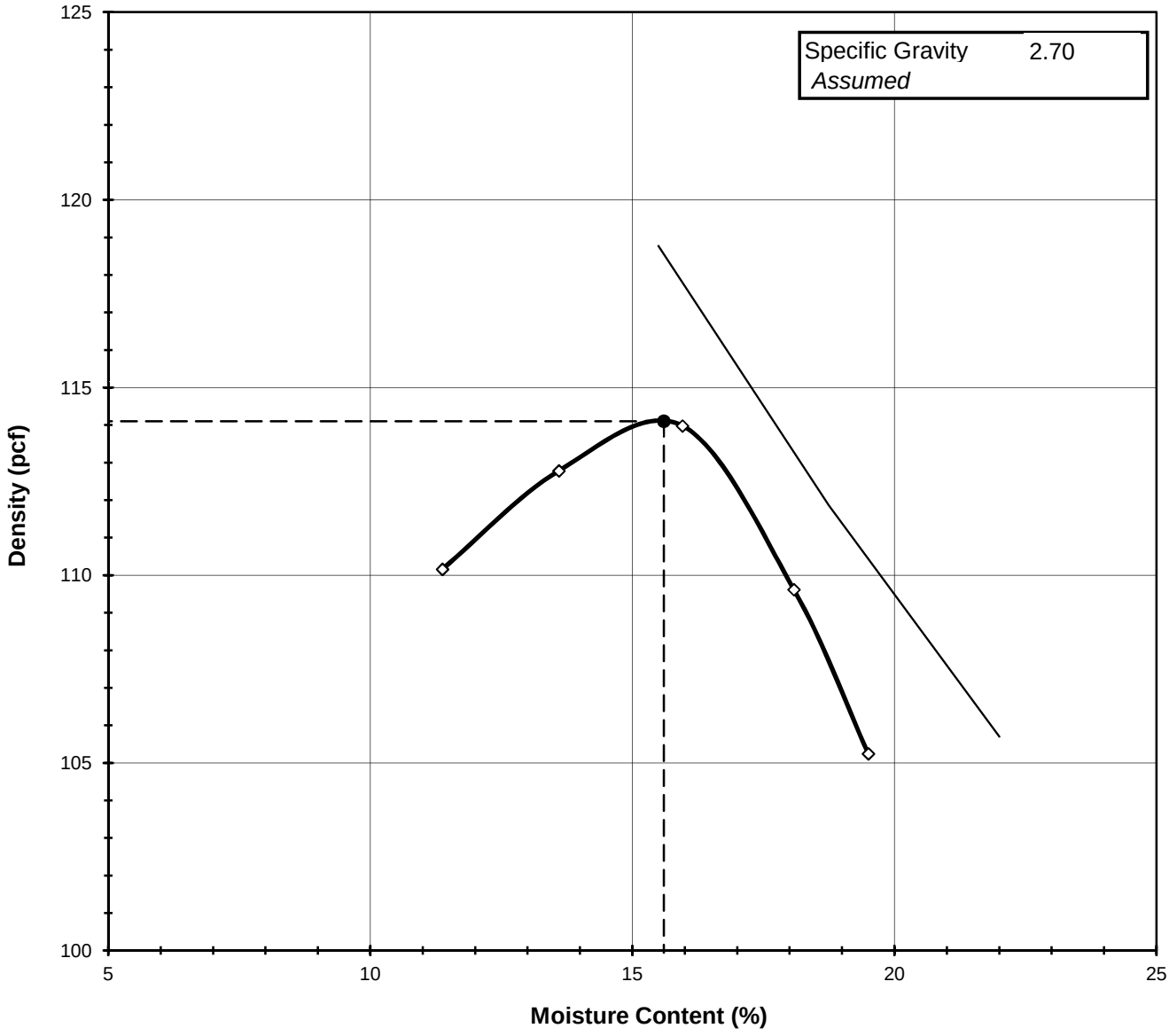
MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004	Test Method	**STANDARD**

Visual Description: Reddish Brown Clay and Rock

Optimum Moisture Content (%): 15.6
Maximum Dry Density (pcf): 114.1



Tested By *MLF* *Date* *7/6/23* *Checked By* *JLK* *Date* 7/10/23

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		

Visual Description: Reddish Brown Clay and Rock

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity:	2.70
Percent Retained on 3/4":	NA
Percent Retained on 3/8":	NA
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	C

Test Type:	**STANDARD**
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	G774
Mold ID:	G1776
Mold diameter:	6"
Weight of the Mold (g):	5578
Volume of the Mold (cm^3):	2127

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	9760	9945	10083	9990	9865
Weight of Mold (g):	5578	5578	5578	5578	5578
Weight of Wet Sample (g):	4182	4367	4505	4412	4287
Mold Volume (cm^3):	2127	2127	2127	2127	2127

Moisture Content / Density

Tare Number:	886	883	594	590	550
Weight of Tare & Wet Sample (g):	456.18	453.68	454.22	450.57	450.66
Weight of Tare & Dry Sample (g):	420.74	412.51	402.77	394.07	390.35
Weight of Tare (g):	109.18	109.75	80.31	81.59	81.10
Weight of Water (g):	35.44	41.17	51.45	56.50	60.31
Weight of Dry Sample (g):	311.56	302.76	322.46	312.48	309.25

Wet Density (g/cm^3):	1.97	2.05	2.12	2.07	2.02
Wet Density (pcf):	122.7	128.1	132.2	129.4	125.8
Moisture Content (%):	**11.4**	**13.6**	**16.0**	**18.1**	**19.5**
Dry Density (pcf):	**110.2**	**112.8**	**114.0**	**109.6**	**105.2**

Zero Air Voids

Moisture Content (%):	15.5	18.8	22.0
Dry Unit Weight (pcf):	118.8	111.9	105.7

Tested By MLF *Date* 7/6/23 *Checked By* JLK *Date* 7/10/23

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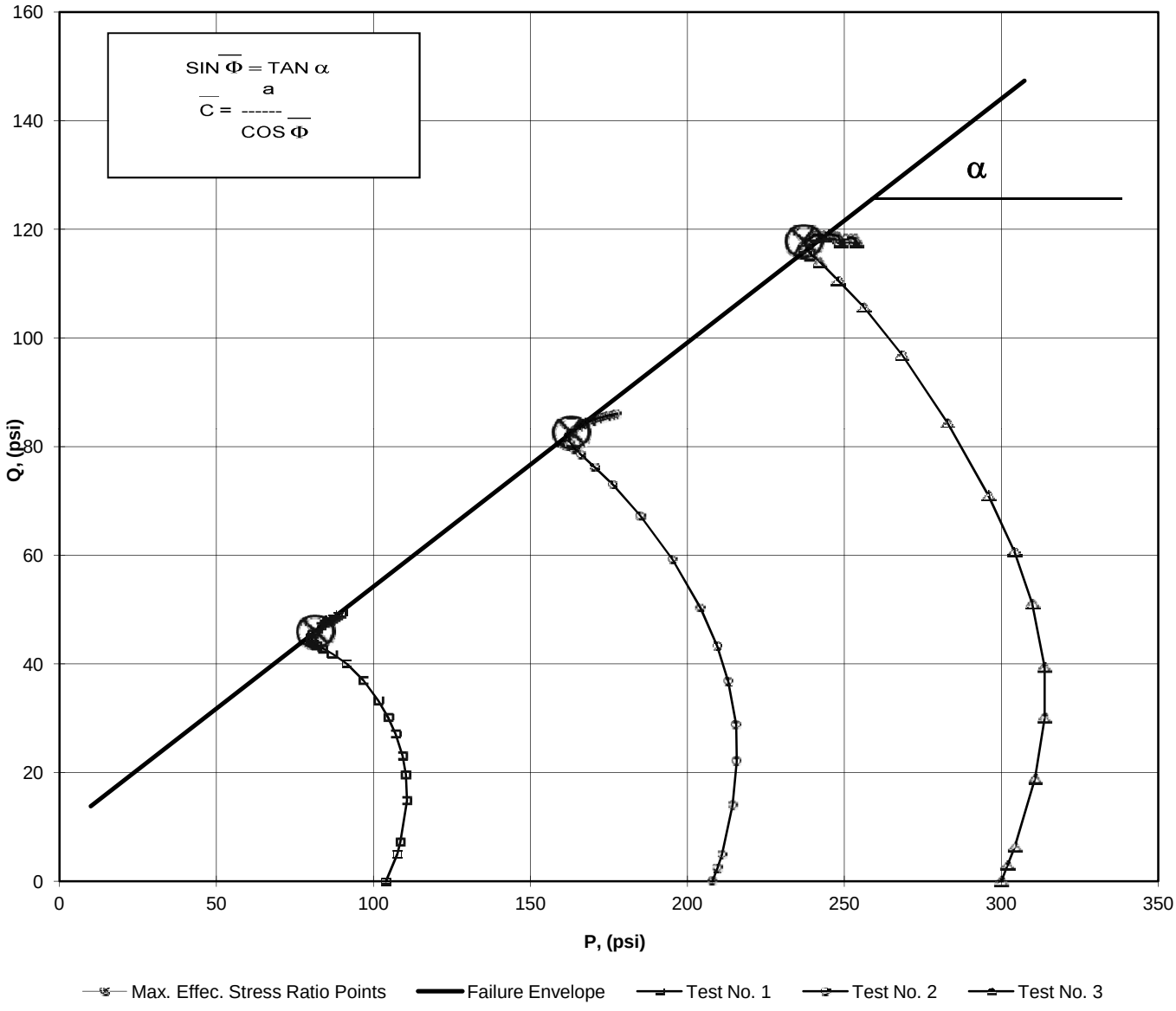
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.00**	$\bar{C}$	=	**0.00**
α	=	**24.2**	$\bar{\Phi}$	=	**26.68**

Tested By: RPE Date: 8/30/23 Approved By: NJM Date: 9/14/23

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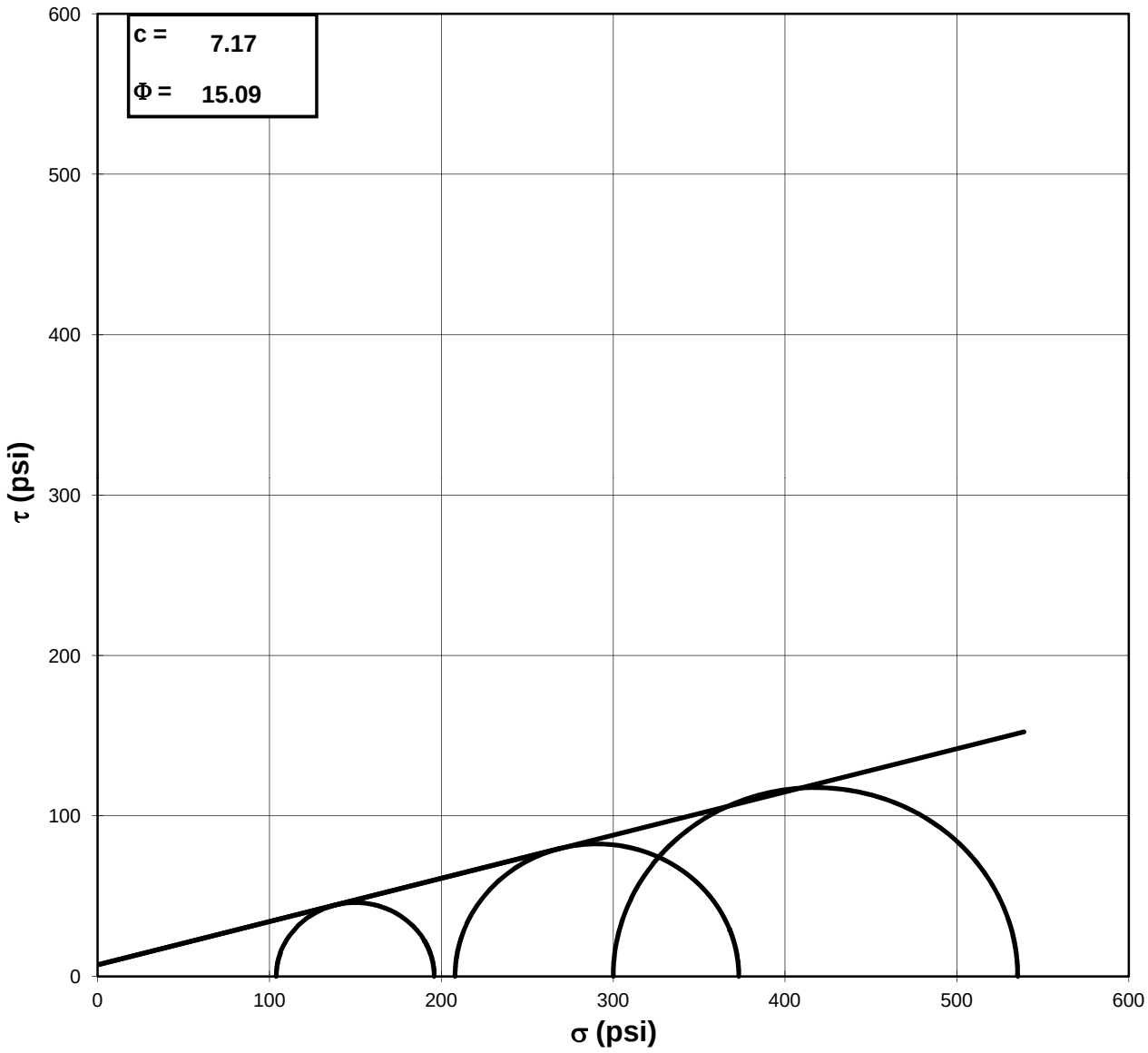
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		
Visual Description:	Reddish-Brown Clay with Rocks (Remolded)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: RPE *Date:* 8/30/23 *Approved By:* NJM *Date:* 9/14/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	146.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	104.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	81.54
Q	=	45.95

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	96.0
Final Burette Reading (ml)	35.4
Final Change (ml)	60.6
Initial Dial Reading (mil)	38
Dial Reading After Saturation (mil)	48
Dial Reading After Consolidation (mil)	220

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
3.1	0.000	42.1
63.0	0.002	43.4
89.6	0.002	44.6
180.9	0.008	50.2
238.3	0.013	55.2
280.3	0.019	59.8
328.4	0.028	66.0
365.8	0.037	71.4
404.4	0.049	77.7
451.0	0.070	86.2
490.7	0.099	94.5
515.9	0.134	100.8
531.1	0.168	104.7
543.0	0.210	107.5
550.7	0.240	108.7
560.4	0.283	109.8
574.1	0.340	110.5
588.6	0.398	110.6
598.7	0.442	110.4
612.6	0.503	110.0
624.3	0.548	109.5
635.1	0.593	109.0
646.1	0.637	108.4
652.7	0.666	108.0
658.3	0.695	107.6
665.3	0.726	107.3
672.4	0.756	106.8
683.6	0.801	106.2
694.0	0.847	105.6
700.3	0.875	105.2
707.0	0.905	104.7

Tested By: RPE Date: 8/30/23 Input Checked By: NJM Date: 9/14/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	104.0	*Stage No.*	1
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	34.46
Length After Consolidation (in)	5.76
Area After Consolidation (in^2)	5.984

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.03	10.01	1.36	112.65	102.6	1.098	0.14	107.64	5.00
0.04	14.45	2.63	115.82	101.4	1.143	0.19	108.59	7.23
0.13	29.67	8.16	125.50	95.8	1.310	0.28	110.67	14.83
0.23	39.21	13.23	129.98	90.8	1.432	0.35	110.37	19.61
0.33	46.17	17.80	132.37	86.2	1.536	0.40	109.28	23.09
0.48	54.10	23.95	134.15	80.0	1.676	0.46	107.10	27.05
0.64	60.23	29.38	134.84	74.6	1.807	0.50	104.73	30.11
0.85	66.50	35.67	134.83	68.3	1.973	0.55	101.58	33.25
1.21	73.94	44.16	133.79	59.8	2.236	0.62	96.81	36.97
1.72	80.08	52.52	131.56	51.5	2.555	0.68	91.52	40.04
2.32	83.70	58.84	128.86	45.2	2.853	0.72	87.01	41.85
2.92	85.65	62.73	126.91	41.3	3.076	0.76	84.09	42.82
3.65	86.93	65.50	125.43	38.5	3.258	0.78	81.96	43.46
4.18	87.69	66.72	124.97	37.3	3.352	0.78	81.12	43.84
4.91	88.56	67.79	124.77	36.2	3.446	0.79	80.49	44.28
5.90	89.79	68.49	125.30	35.5	3.529	0.79	80.40	44.90
6.91	91.08	68.56	126.52	35.4	3.570	0.78	80.98	45.54
7.67	91.90	68.40	127.49	35.6	3.582	0.77	81.54	45.95
8.73	92.96	67.96	129.00	36.0	3.579	0.75	82.52	46.48
9.52	93.93	67.50	130.43	36.5	3.573	0.74	83.47	46.97
10.30	94.72	66.96	131.77	37.0	3.557	0.73	84.41	47.36
11.05	95.57	66.43	133.14	37.6	3.544	0.72	85.36	47.78
11.56	96.01	66.02	133.99	38.0	3.528	0.71	85.98	48.00
12.07	96.27	65.63	134.63	38.4	3.509	0.70	86.50	48.13
12.60	96.72	65.26	135.46	38.7	3.497	0.70	87.10	48.36
13.13	97.16	64.85	136.31	39.2	3.482	0.69	87.73	48.58
13.92	97.89	64.22	137.67	39.8	3.461	0.68	88.73	48.95
14.70	98.49	63.57	138.92	40.4	3.436	0.67	89.68	49.24
15.20	98.80	63.18	139.61	40.8	3.421	0.66	90.21	49.40
15.71	99.16	62.75	140.41	41.3	3.404	0.65	90.83	49.58

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

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Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	250.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	208.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	163.05
Q	=	82.54

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	120.0
Final Burette Reading (ml)	51.0
Final Change (ml)	69.0

Initial Dial Reading (mil)	40
Dial Reading After Saturation (mil)	47
Dial Reading After Consolidation (mil)	310

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.3	0.000	41.9
31.0	0.001	42.8
61.2	0.002	44.0
170.5	0.006	49.7
267.2	0.010	56.4
347.4	0.015	63.3
444.4	0.022	73.8
523.8	0.031	83.9
609.2	0.042	96.1
719.8	0.062	114.0
822.3	0.091	132.4
897.1	0.126	146.8
943.2	0.162	155.9
978.6	0.203	162.5
996.9	0.233	165.4
1018.3	0.274	167.9
1042.1	0.331	169.4
1064.8	0.392	169.5
1082.6	0.437	168.8
1102.9	0.496	167.8
1116.3	0.541	166.9
1131.2	0.585	165.9
1146.8	0.631	164.7
1156.0	0.662	164.0
1166.3	0.691	163.1
1174.0	0.720	162.4
1183.7	0.750	161.7
1196.8	0.794	160.6
1209.5	0.840	159.3
1219.6	0.870	158.5
1227.1	0.900	157.9

Tested By: RPE Date: 8/30/23 Input Checked By: NJM Date: 9/14/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	208.0	*Stage No.*	1
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	34.01
Length After Consolidation (in)	5.67
Area After Consolidation (in^2)	5.997

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	4.95	0.83	212.12	207.2	1.024	0.17	209.65	2.48
0.03	9.99	1.98	216.01	206.0	1.048	0.20	211.01	5.00
0.10	28.18	7.68	228.50	200.3	1.141	0.28	214.41	14.09
0.17	44.26	14.42	237.84	193.6	1.229	0.33	215.71	22.13
0.26	57.57	21.27	244.30	186.7	1.308	0.38	215.52	28.79
0.39	73.60	31.78	249.81	176.2	1.418	0.44	213.02	36.80
0.54	86.67	41.86	252.81	166.1	1.522	0.49	209.47	43.33
0.74	100.63	54.12	254.51	153.9	1.654	0.55	204.20	50.32
1.09	118.51	72.00	254.52	136.0	1.871	0.62	195.26	59.26
1.61	134.70	90.38	252.32	117.6	2.145	0.68	184.97	67.35
2.23	146.06	104.76	249.30	103.2	2.415	0.73	176.27	73.03
2.86	152.58	113.91	246.67	94.1	2.622	0.76	170.38	76.29
3.59	157.12	120.48	244.64	87.5	2.795	0.78	166.08	78.56
4.11	159.20	123.37	243.84	84.6	2.881	0.79	164.24	79.60
4.84	161.39	125.94	243.45	82.1	2.967	0.80	162.75	80.69
5.83	163.44	127.37	244.07	80.6	3.027	0.80	162.35	81.72
6.92	165.08	127.49	245.59	80.5	3.051	0.79	163.05	82.54
7.71	166.42	126.77	247.64	81.2	3.049	0.78	164.43	83.21
8.75	167.62	125.77	249.85	82.2	3.039	0.77	166.04	83.81
9.54	168.21	124.89	251.32	83.1	3.024	0.76	167.22	84.10
10.32	168.97	123.89	253.08	84.1	3.009	0.75	168.59	84.49
11.13	169.77	122.66	255.11	85.3	2.989	0.74	170.22	84.88
11.67	170.10	122.00	256.10	86.0	2.978	0.73	171.05	85.05
12.19	170.60	121.11	257.50	86.9	2.963	0.72	172.20	85.30
12.70	170.72	120.38	258.33	87.6	2.948	0.72	172.98	85.36
13.23	171.08	119.70	259.38	88.3	2.937	0.71	173.84	85.54
14.01	171.43	118.64	260.80	89.4	2.918	0.71	175.08	85.72
14.81	171.64	117.34	262.31	90.7	2.893	0.70	176.49	85.82
15.34	172.00	116.54	263.46	91.5	2.881	0.69	177.46	86.00
15.86	171.98	115.91	264.07	92.1	2.867	0.69	178.08	85.99

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Stage No.	1
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	342.0
Back Pressure (psi)	42.0
Eff. Conf. Pressure (psi)	300.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	237.34
Q	=	117.67

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	120.0
Final Burette Reading (ml)	32.8
Final Change (ml)	87.2

Initial Dial Reading (mil)	37
Dial Reading After Saturation (mil)	45
Dial Reading After Consolidation (mil)	333

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.4	0.000	42.1
35.6	0.001	43.0
74.7	0.002	44.1
221.2	0.007	50.1
352.2	0.011	58.3
462.0	0.016	67.7
599.6	0.024	83.3
712.0	0.032	98.5
833.9	0.043	117.0
995.2	0.062	143.5
1147.7	0.089	170.5
1259.3	0.122	191.4
1326.6	0.158	204.5
1378.0	0.201	213.8
1402.1	0.232	217.8
1428.7	0.274	221.0
1456.8	0.329	222.3
1483.8	0.385	220.7
1499.3	0.431	220.3
1518.3	0.495	218.8
1531.8	0.539	217.3
1547.2	0.582	215.7
1557.4	0.625	214.0
1565.9	0.654	212.9
1570.3	0.686	211.9
1572.0	0.717	210.9
1588.6	0.747	209.8
1605.0	0.792	208.2
1618.1	0.835	206.7
1620.0	0.864	205.7
1612.9	0.893	204.7

Tested By: RPE Date: 8/30/23 Input Checked By: NJM Date: 9/14/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

Effective Confining Pressure (psi)	300.0	*Stage No.*	1
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	32.88
Length After Consolidation (in)	5.65
Area After Consolidation (in^2)	5.824

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	5.88	0.98	304.90	299.0	1.020	0.17	301.96	2.94
0.03	12.57	2.06	310.51	297.9	1.042	0.17	304.23	6.29
0.12	37.70	8.13	329.57	291.9	1.129	0.22	310.72	18.85
0.20	60.11	16.30	343.80	283.7	1.212	0.28	313.75	30.05
0.29	78.85	25.68	353.17	274.3	1.287	0.34	313.74	39.43
0.43	102.27	41.28	360.99	258.7	1.395	0.42	309.85	51.13
0.57	121.31	56.51	364.80	243.5	1.498	0.48	304.14	60.66
0.77	141.85	74.98	366.87	225.0	1.630	0.54	295.95	70.93
1.10	168.75	101.51	367.24	198.5	1.850	0.62	282.87	84.38
1.58	193.70	128.46	365.24	171.5	2.129	0.68	268.39	96.85
2.16	211.30	149.44	361.87	150.6	2.403	0.73	256.22	105.65
2.79	221.19	162.54	358.65	137.5	2.609	0.76	248.05	110.59
3.56	227.95	171.80	356.15	128.2	2.778	0.78	242.17	113.97
4.11	230.61	175.77	354.84	124.2	2.856	0.79	239.54	115.31
4.85	233.18	178.97	354.20	121.0	2.927	0.79	237.61	116.59
5.82	235.35	180.33	355.01	119.7	2.967	0.79	237.34	117.67
6.82	237.16	178.68	358.48	121.3	2.955	0.78	239.90	118.58
7.64	237.53	178.34	359.18	121.7	2.952	0.77	240.42	118.76
8.76	237.64	176.79	360.84	123.2	2.929	0.77	242.03	118.82
9.55	237.68	175.29	362.39	124.7	2.906	0.76	243.55	118.84
10.31	238.04	173.70	364.34	126.3	2.885	0.75	245.32	119.02
11.06	237.60	172.02	365.58	128.0	2.857	0.75	246.78	118.80
11.59	237.49	170.92	366.58	129.1	2.840	0.74	247.83	118.75
12.15	236.65	169.91	366.74	130.1	2.819	0.74	248.42	118.32
12.69	235.44	168.86	366.58	131.1	2.795	0.74	248.86	117.72
13.23	236.46	167.84	368.63	132.2	2.789	0.73	250.39	118.23
14.03	236.71	166.24	370.47	133.8	2.770	0.72	252.12	118.36
14.79	236.53	164.74	371.80	135.3	2.749	0.72	253.53	118.27
15.30	235.37	163.71	371.66	136.3	2.727	0.72	253.98	117.69
15.82	232.91	162.66	370.26	137.3	2.696	0.72	253.80	116.46

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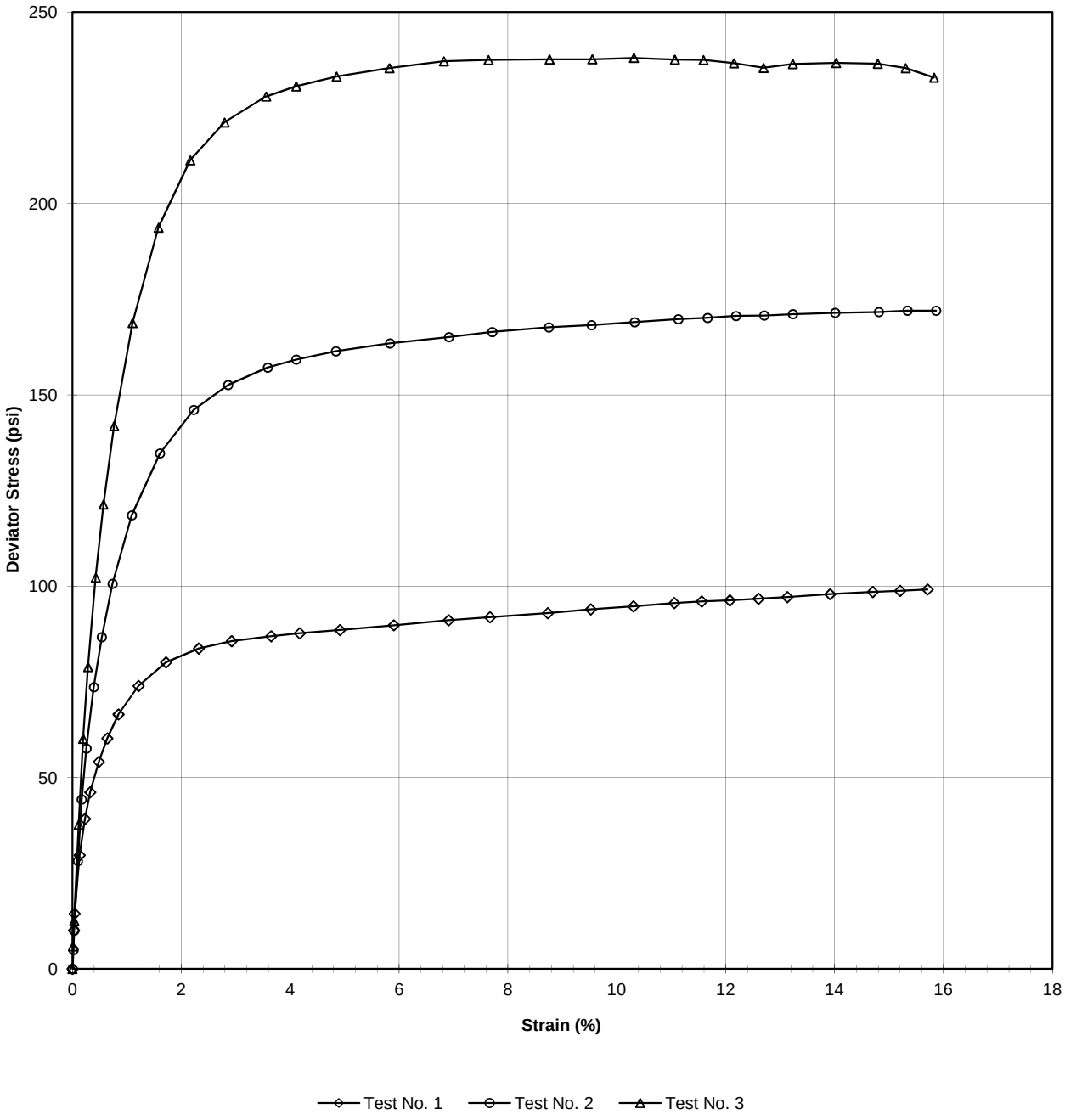
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID:	2023-370-003-004		
Visual Description:	Reddish-Brown Clay with Rocks (Remolded)		



Tested By: RPE Date: 8/30/23 Approved By: NJM Date: 9/14/23

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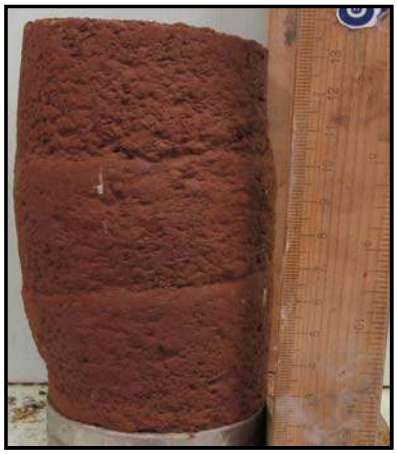
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.		
Client Reference:	AEP Amos Seq. 4 C130109.27		
Project No.:	2023-370-003		
Lab ID:	2023-370-003-004	Specific Gravity (Assumed)	2.7

Visual Description: Reddish-Brown Clay with Rocks (Remolded)

SAMPLE CONDITION SUMMARY

Boring No.:	AEP Amos	AEP Amos	AEP Amos
Depth (ft):	Seq. 4 Repair	Seq. 4 Repair	Seq. 4 Repair
Sample No.:	61523-4	61523-4	61523-4
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.002	0.0011	0.001
Back Pressure (psi)	42	42	42
Consolidation Time (days)	1	1	1
Moisture Content (%) (INITIAL)	15.5	15.5	15.5
Total Unit Weight (pcf)	125.2	125.2	125.2
Dry Unit Weight (pcf)	108.4	108.4	108.4
Moisture Content (%) (FINAL)	16.3	14.9	13.9
Initial State Void Ratio,e	0.554	0.554	0.554
Void Ratio at Shear, e	0.397	0.378	0.333



Tested By: RPE Date: 8/30/23 Input Checked By: NJM Date: 9/14/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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PERMEABILITY TEST

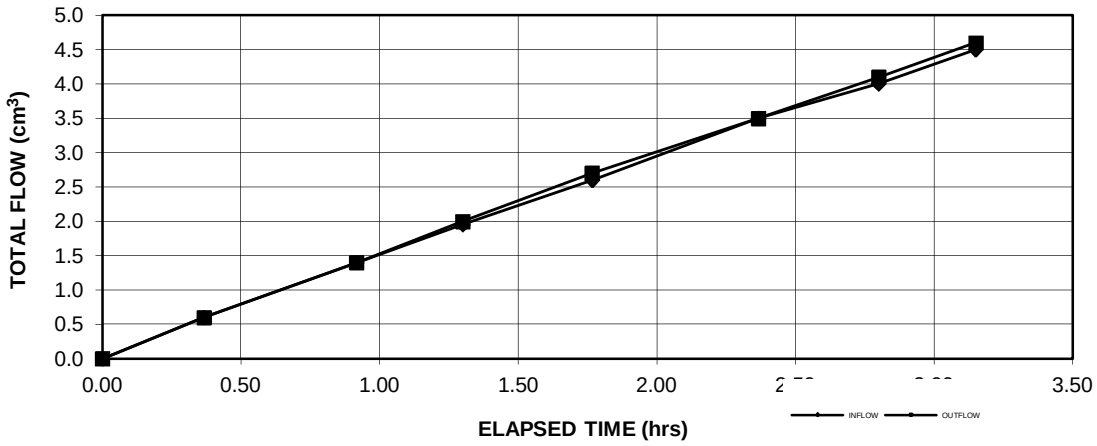
ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID No.:	2023-370-003-004	Avg. Effective Consol. Pressure (psi):	50

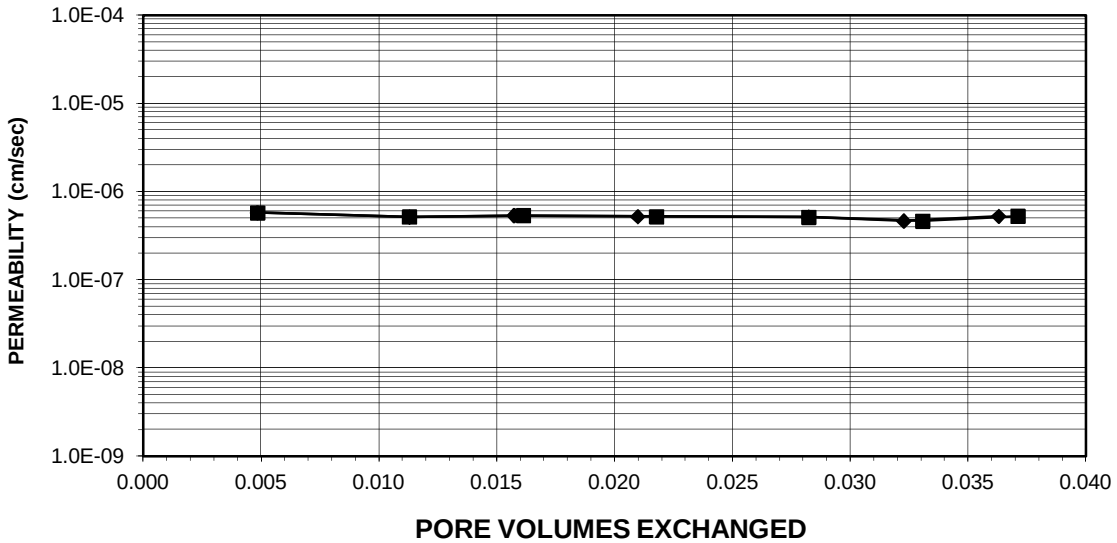
AVERAGE PERMEABILITY = 5.1E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 5.1E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: WT Date: 7/24/23 Checked By: JLK Date: 7/28/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID No.:	2023-370-003-004	Avg. Effective Consol. Pressure (psi):	50

Specific Gravity:	2.70	Assumed
Sample Condition:		Remolded

Visual Description: Reddish Brown Clay

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	4011	1692
Weight of Tare & Wet Sample (g)	122.75	840.80
Weight of Tare & Dry Sample (g)	106.99	723.60
Weight of Tare (g)	8.02	82.10
Weight of Water (g)	15.76	117.20
Weight of Dry Sample (g)	98.97	641.50
Moisture Content (%)	**15.9**	**18.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	1665.81	NA
Weight of Tube (g)	920.30	NA
Weight of Wet Sample (g)	745.51	760.60
Length 1 (in)	3.495	3.458
Length 2 (in)	3.495	3.478
Length 3 (in)	3.495	3.462
Top Diameter (in)	2.870	2.843
Middle Diameter (in)	2.870	2.852
Bottom Diameter (in)	2.870	2.853
Average Length (in)	3.50	3.47
Average Area (in^2)	6.47	6.38
Sample Volume (cm^3)	370.51	362.16
Unit Wet Weight (g/cm^3)	2.01	2.10
Unit Wet Weight (pcf)	125.6	131.1
Unit Dry Weight (pcf)	108.3	110.8
Unit Dry Weight (g/cm^3)	1.74	1.78
Void Ratio, e	0.56	0.52
Porosity, n	0.36	0.34
Pore Volume (cm^3)	132.3	124.0
Total Weight of Sample After Test (g)		759.30

Tested By: WT Date: 7/24/23 Checked By: JLK Date: 7/28/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a Method C

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Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-003	Sample No.:	61523-4
Lab ID No.:	2023-370-003-004	Avg. Effective Consol. Pressure (psi):	50

Pressure Heads (Constant)	
Top Cap (psi)	53.0
Bottom Cap (psi)	55.0
Cell (psi)	104.0
Total Pressure Head (cm)	140.6
Hydraulic Gradient	15.97

Final Sample Dimensions	
Sample Length (cm), L	8.80
Sample Diameter (cm)	7.24
Sample Area (cm^2), A	41.14
Inflow Burette Area (cm^2), a-in	0.962
Outflow Burette Area (cm^2), a-out	0.962
B Parameter (%)	98

AVERAGE PERMEABILITY = 5.1E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 5.1E-09 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
7/27/23	8	23	0.000	0.0	0.0	161.6	0	21.9	NA
7/27/23	8	45	0.367	0.6	0.6	160.4	0	21.9	5.7E-07
7/27/23	9	18	0.917	1.4	1.4	158.7	0	21.9	5.1E-07
7/27/23	9	41	1.300	2.0	2.0	157.5	0	21.9	5.4E-07
7/27/23	10	9	1.767	2.6	2.7	156.1	0	22.0	5.2E-07
7/27/23	10	45	2.367	3.5	3.5	154.4	0	22.1	5.1E-07
7/27/23	11	11	2.800	4.0	4.1	153.2	0	22.1	4.6E-07
7/27/23	11	32	3.150	4.5	4.6	152.2	1	22.1	5.3E-07

Tested By: WT Date: 7/24/23 Checked By: JLK Date: 7/28/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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August 28 2023

Project No. 2023-370-004

Mr. Zach Wilder
GAI Consultants, Inc.
9850 Von Allmen Court
Louisville, KY 40241

Transmittal
Laboratory Test Results
GAI-AEP Amos Seq. 4 C130109.27

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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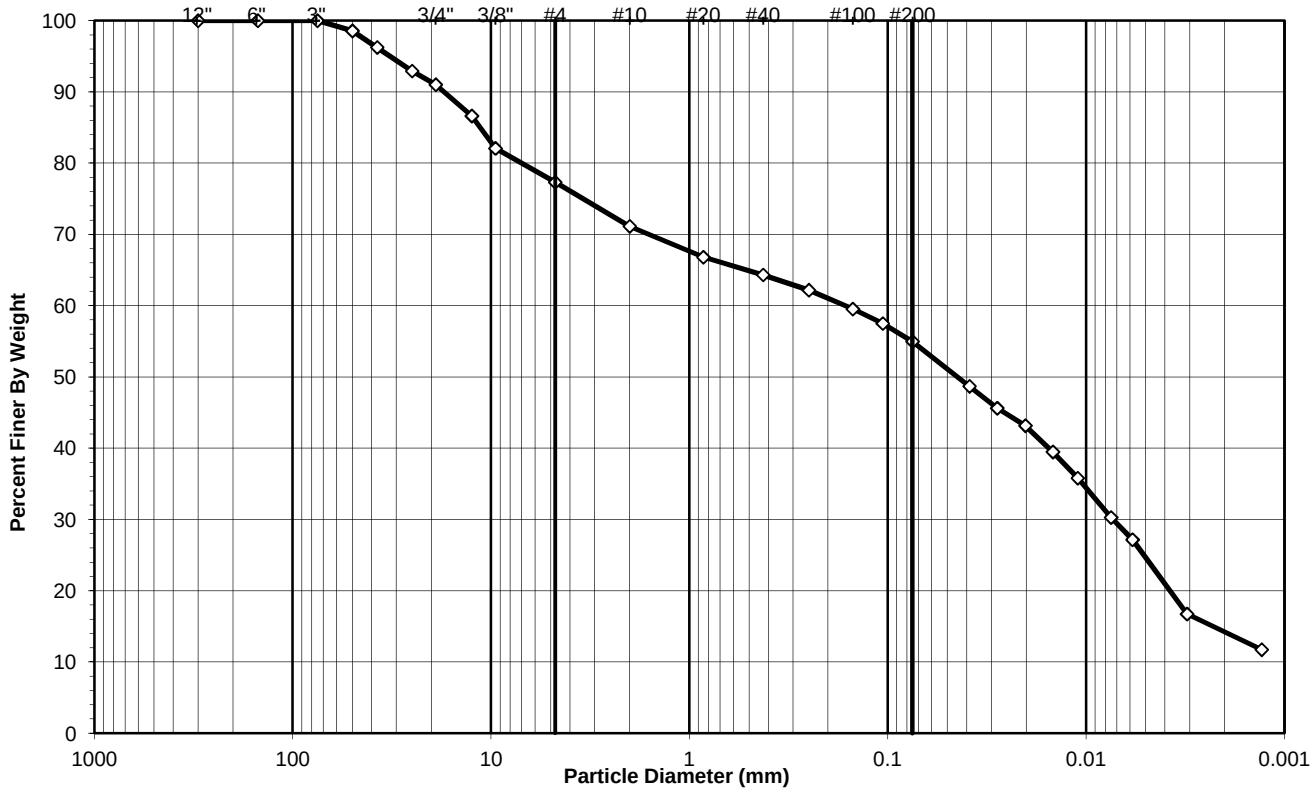
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-1
Lab ID:	2023-370-004-001	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**22.68**
#4 to #200	***Sand***	**22.35**
Finer than #200	***Silt & Clay***	**54.98**

USCS Symbol:
CL, TESTED

USCS Classification:
GRAVELLY LEAN CLAY WITH SAND

Tested By DF Date 8/17/23 Checked By KC Date 8/23/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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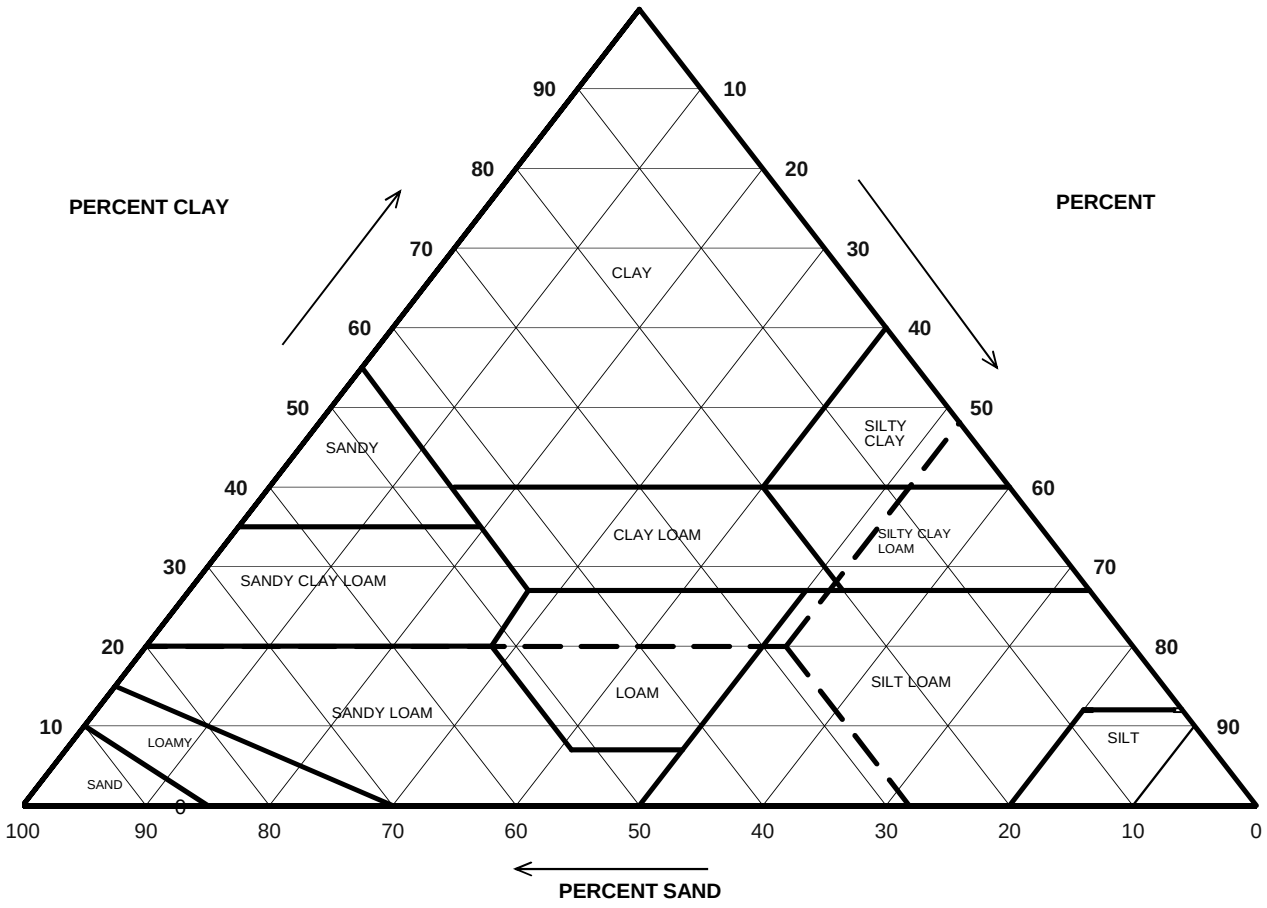
USDA CLASSIFICATION CHART

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-1
Lab ID:	2023-370-004-001	Soil Color:	Brown



USDA SUMMARY				
Particle Size (mm)	**Percent Finer**		**Actual Percentage**	Corrected % of Minus 2.0 mm material for USDA Classification
		Gravel	**28.86**	
2	**71.14**	**Sand**	**20.02**	**28.14**
0.05	**51.12**	**Silt**	**36.91**	**51.89**
0.002	**14.21**	**Clay**	**14.21**	**19.97**

USDA Classification: SILT LOAM

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-1
Lab ID:	2023-370-004-001	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	4038	Tare No.:	3122
Wt. of Tare & Wet Sample (g):	243.39	Weight of Tare & Wet Sample (g):	259.32
Wt. of Tare & Dry Sample (g):	208.34	Weight of Tare & Dry Sample (g):	238.49
Weight of Tare (g):	8.08	Weight of Tare (g):	8.13
Weight of Water (g):	35.05	Weight of Water (g):	20.83
Weight of Dry Soil (g):	200.26	Weight of Dry Soil (g):	230.36
Moisture Content (%):	**17.5**	**Moisture Content (%):**	**9.0**

Wet Weight of -3/4" Sample (g):	18720.00	Total Dry Weight of Sample (g):	17504.39
Tare No. -3/4" Sub-Specimen (g):	2021	Wet Weight of +3/4" Sample (g):	1715.00
Wt. of Tare & Wet -3/4" Sub-Specimen (g):	1279.23	Dry Weight of + 3/4" Sample (g):	1572.78
Weight of Tare (g):	143.81	Dry Weight of - 3/4" Sample (g):	15931.61
Sub-Specimen 3/4" Wet Weight (g):	1135.42	Dry Weight -3/4" +3/8" Sample (g):	1564.48
Tare No. (-3/8" Sub-Specimen):	1694	Dry Weight of -3/8" Sample (g):	14367.13
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	391.88	J - Factor (% Finer than 3/4"):	91.0%
Weight of Tare (g):	83.05	J - Factor (% Finer than 3/8"):	82.1%
Sub-Specimen -3/8" Wet Weight (g):	308.83		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	275.00	(*)	1.44	1.44	98.56	**99**
1 1/2"	37.5	442.00		2.32	3.76	96.24	**96**
1"	25	633.00		3.32	7.07	92.93	**93**
3/4"	19	365.00		1.91	8.99	91.01	**91**
1/2"	12.5	46.61	(**)	4.82	4.82	95.18	**87**
3/8"	9.5	48.28		5.00	9.82	90.18	**82**
#4	4.75	15.22		5.79	5.79	94.21	**77**
#10	2	19.80		7.53	13.32	86.68	**71**
#20	0.85	13.89	(**)	5.28	18.61	81.39	**67**
#40	0.425	7.95		3.02	21.63	78.37	**64**
#60	0.25	6.84		2.60	24.24	75.76	**62**
#100	0.15	8.51		3.24	27.47	72.53	**60**
#140	0.106	6.48		2.47	29.94	70.06	**58**
#200	0.075	8.09		3.08	33.02	66.98	**55**
Pan	-	176.05		66.98	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	8/17/23	Checked By	KC	Date	8/23/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-1
Lab ID:	2023-370-004-001	Soil Color:	Brown

Elapsed Time (min)	Reading rm	Temp. (C^0)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	46.0	23.2	6.33	8.7	0.0387	88.6	48.7
2	43.5	23.2	6.33	9.2	0.0281	83.0	45.6
4	41.5	23.2	6.33	9.6	0.0202	78.5	43.2
8	38.5	23.2	6.33	10.1	0.0147	71.8	39.5
15	35.5	23.2	6.33	10.6	0.0110	65.1	35.8
35	31.0	23.2	6.33	11.4	0.0075	55.1	30.3
60	28.5	23.1	6.36	11.9	0.0058	49.4	27.2
240	20.0	23.1	6.36	13.4	0.0031	30.4	16.7
1440	16.0	22.9	6.44	14.1	0.0013	21.3	11.7

Soil Specimen Data

Tare No.:	703	Percent Finer than # 200:	54.98
Wt. of Tare & Dry Material (g):	143.16		
Weight of Tare (g):	93.86	Specific Gravity:	2.70 Assumed
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	44.30		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	G- 1819
Cylinder	G- 368
Thermometer	G- 1505
Balance	G- 657
#200 Sieve	G- 1944
Foam Inhibitor Used	No

Tested By TO Date 8/21/23 Checked By KC Date 8/23/23

ATTERBERG LIMITS

ASTM D 4318-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-1
Lab ID:	2023-370-004-001	Soil Description:	BROWN LEAN CLAY

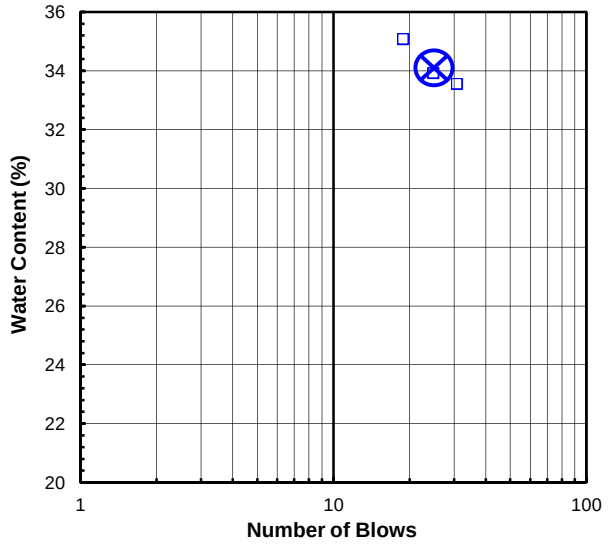
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Air dried)

As Received Moisture Content		Liquid Limit Test			
ASTM D2216-19		1	2	3	M
Tare Number:	2897	293	1280	237	U
Wt. of Tare & Wet Sample (g):	152.94	44.90	40.72	38.93	L
Wt. of Tare & Dry Sample (g):	132.70	39.73	35.50	33.70	T
Weight of Tare (g):	8.17	24.31	20.10	18.78	I
Weight of Water (g):	20.2	5.2	5.2	5.2	P
Weight of Dry Sample (g):	124.5	15.4	15.4	14.9	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**16.3**	**33.5**	**33.9**	**35.1**	N
Number of Blows:		**31**	**25**	**19**	T

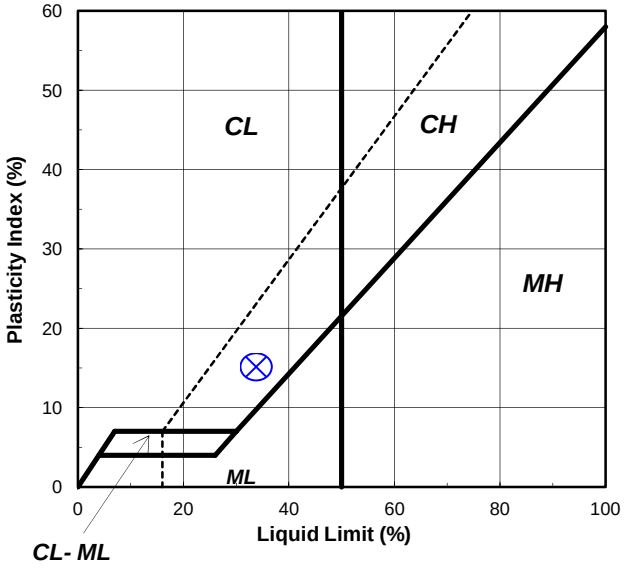
Plastic Limit Test	**1**	**2**	**Range**
Tare Number:	257	630	
Wt. of Tare & Wet Sample (g):	25.63	24.86	
Wt. of Tare & Dry Sample (g):	24.66	23.87	
Weight of Tare (g):	19.51	18.71	
Weight of Water (g):	1.0	1.0	
Weight of Dry Sample (g):	5.2	5.2	
Moisture Content (%):	**18.8**	**19.2**	**-0.4**
Note: The acceptable range of the two Moisture Contents is ±			1.12

Test Results	
Liquid Limit (%):	**34**
Plastic Limit (%):	**19**
Plasticity Index (%):	**15**
USCS Symbol:	**CL**

Flow Curve



Plasticity Chart



Tested By FS *Date* 8/18/23 *Checked By* JLK *Date* 8/21/23

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MOISTURE - DENSITY RELATIONSHIP

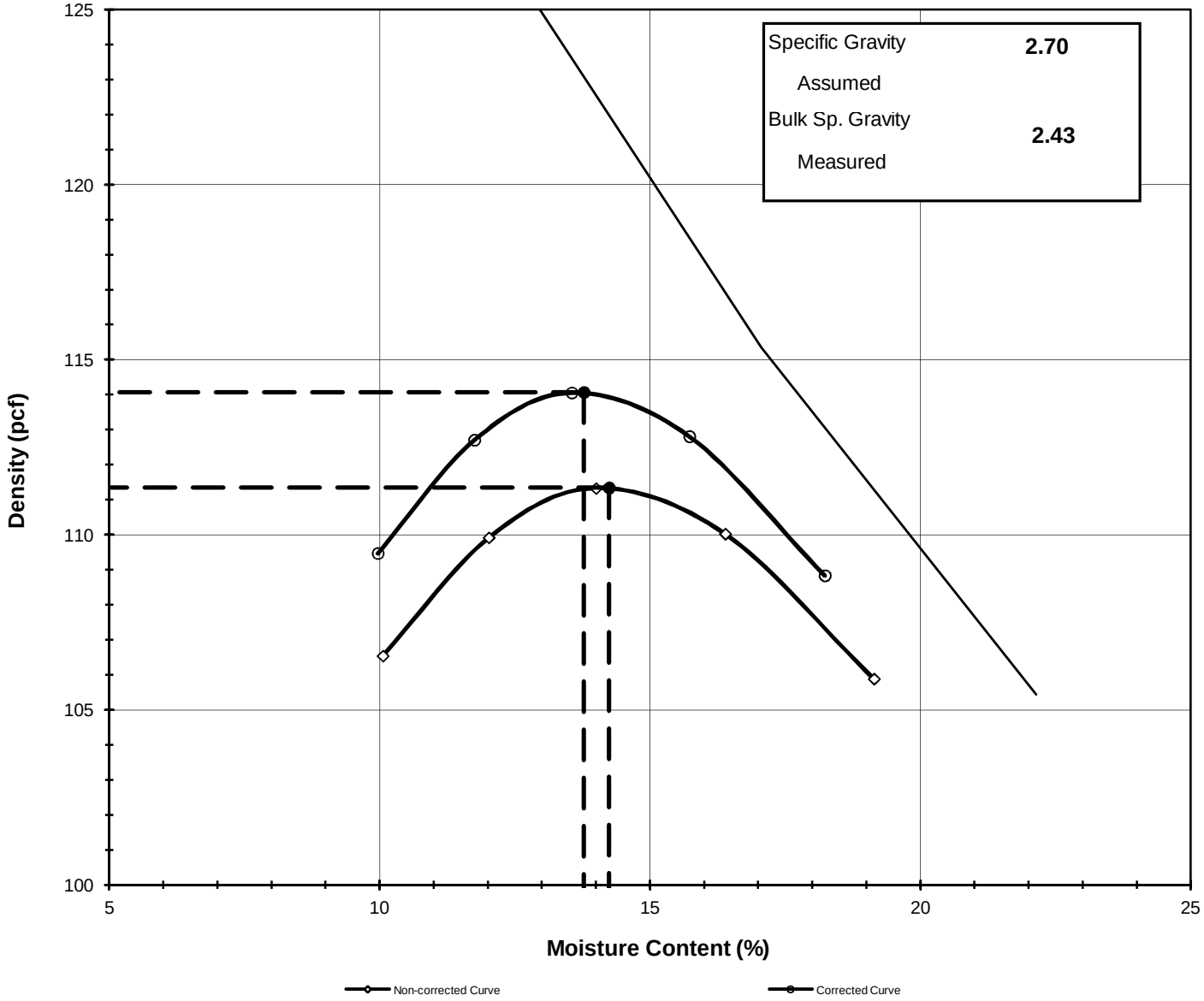
(Corrected for Oversize Particles)

ASTM D 4718-15, D 698-12e2 (SOP-S12,S39)

Client:	GAI Consultants, Inc.	Boring No.:	Aep Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-1
Lab ID:	2023-370-004-001	Test Method	STANDARD

Visual Description: Brown Clay with Rocks

Optimum Moisture Content (%):	**14.2**	**Corrected Moisture Content (%):**	**13.8**
Maximum Dry Density (pcf):	**111.3**	**Corrected Dry Density (pcf):**	**114.1**



Tested By *MLF* *Date* *8/24/23* *Checked By* *KC* *Date* 8/25/23

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MOISTURE - DENSITY RELATIONSHIP

(Corrected for Oversize Particles) *ASTM D 4718-15, D698-12e2 (SOP-S12,S39)*

Client:	GAI Consultants, Inc.	Boring No.:	Aep Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-1
Lab ID:	2023-370-004-001		

Visual Description: Brown Clay with Rocks

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity	2.70

Percent Retained on 3/4" (Dry):	8.99
Percent Retained on 3/8" (Dry):	NA
Percent Retained on #4 (Dry):	NA
Oversize Material:	Not included
Procedure Used:	C

TestType:	**STANDARD**
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	G774
Mold ID:	G1776
Mold diameter (in):	6"
Weight of the Mold (g):	5570
Volume Of the Mold (cm^3):	2127

Mold/Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	9567	9767	9896	9935	9870
Weight of Mold (g):	5570	5570	5570	5570	5570
Weight of Wet Sample (g):	3997	4197	4326	4365	4300
Mold Volume (cm^3):	2127	2127	2127	2127	2127

Moisture Content/Density

Tare Number:	911	891	591	610	581
Weight of Tare & Wet Sample (g):	451.77	451.35	451.23	450.16	451.29
Weight of Tare & Dry Sample (g):	420.50	414.71	406.51	398.41	392.09
Weight of Tare (g):	109.66	109.91	87.07	82.69	82.85
Weight of Water (g):	31.27	36.64	44.72	51.75	59.20
Weight of Dry Sample (g):	310.84	304.80	319.44	315.72	309.24

Wet Density (g/cm^3):	1.88	1.97	2.03	2.05	2.02
Wet Density (pcf):	117.3	123.1	126.9	128.1	126.1
Moisture Content (%):	**10.1**	**12.0**	**14.0**	**16.4**	**19.1**
Dry Density (pcf):	**106.5**	**109.9**	**111.3**	**110.0**	**105.9**

Zero Air Voids

Moisture Content (%):		12.0	17.1	22.1	
Dry Unit Weight (pcf):		127.3	115.4	105.4	

Calculated Oversize Corrected Moisture & Density

Moisture Content (%):	**10.0**	**11.8**	**13.6**	**15.7**	**18.2**
Dry Density (pcf):	**109.5**	**112.7**	**114.1**	**112.8**	**108.8**

Tested By *MLF* *Date* *8/24/23* *Checked By* *KC* *Date* 8/25/23

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Correction of Unit Weight and Water Content for Soils Containing Oversize Particles by Specific Gravity

ASTM D4718/D4718M-15

Client:	GAI Consultants, Inc.	Boring No.:	Aep Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-1
Lab ID:	2023-370-004-001		

Visual Description: Brown Clay with Rocks

Total Dry Weight of Sample (g): 17504.4

FINE PORTION		***COARSE PORTION***	
Total Wet Weight of - 3/4" Portion (g):	18720.0	Total Wet Weight of + 3/4" Portion (g):	1715.0
Total Dry Weight of - 3/4" Portion (g):	15931.6	Total Dry Weight of + 3/4" Portion (g):	1572.8
Percent - 3/4" By Dry Weight (%):	91.01	Percent + 3/4" By Dry Weight (%):	8.99

MOISTURE CONTENT OF -3/4" PORTION		***MOISTURE CONTENT OF +3/4" PORTION***	
Tare Number:	4038	Tare Number:	3122
Weight of Tare & Wet Sample (g):	243.39	Weight of Tare & Wet Sample (g):	259.32
Weight of Tare & Dry Sample (g):	208.34	Weight of Tare & Dry Sample (g):	238.49
Weight of Tare (g):	8.08	Weight of Tare (g):	8.13
Weight of Water (g):	35.05	Weight of Water (g):	20.83
Weight of Dry Sample (g):	200.26	Weight of Dry Sample (g):	230.36
Moisture Content (%):	17.50	**Moisture Content (%):**	9.04

SPECIFIC GRAVITY DETERMINATION

Weight of Basket in Air (g):	1030.5
Weight of Saturated Surface Dry Sample & Basket in Air (g):	2037.5
Weight of Saturated Surface Dry Sample in Air (g):	1007.0
Weight of Basket in Water (g):	895.5
Weight of Saturated Sample & Basket in Water (g):	1507.4
Weight of Saturated Sample in Water (g):	611.9
Tare No.:	1419
Weight of Tare and Dried Sample (g):	1103.6
Weight of Tare (g):	145.0
Weight of Dried Soil (g):	958.6

Bulk Specific Gravity (+3/4"): 2.43

Tested By DF *Date* 8/16/23 *Checked By* JLK *Date* 8/17/23

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October 3, 2023

Project No. 2023-370-005

Zach Wilder
GAI Consultants, Inc.
9850 Von Allmen Court
Louisville, KY 40241

Transmittal
Laboratory Test Results
GAI-AEP Amos Seq. 4 C130109.27

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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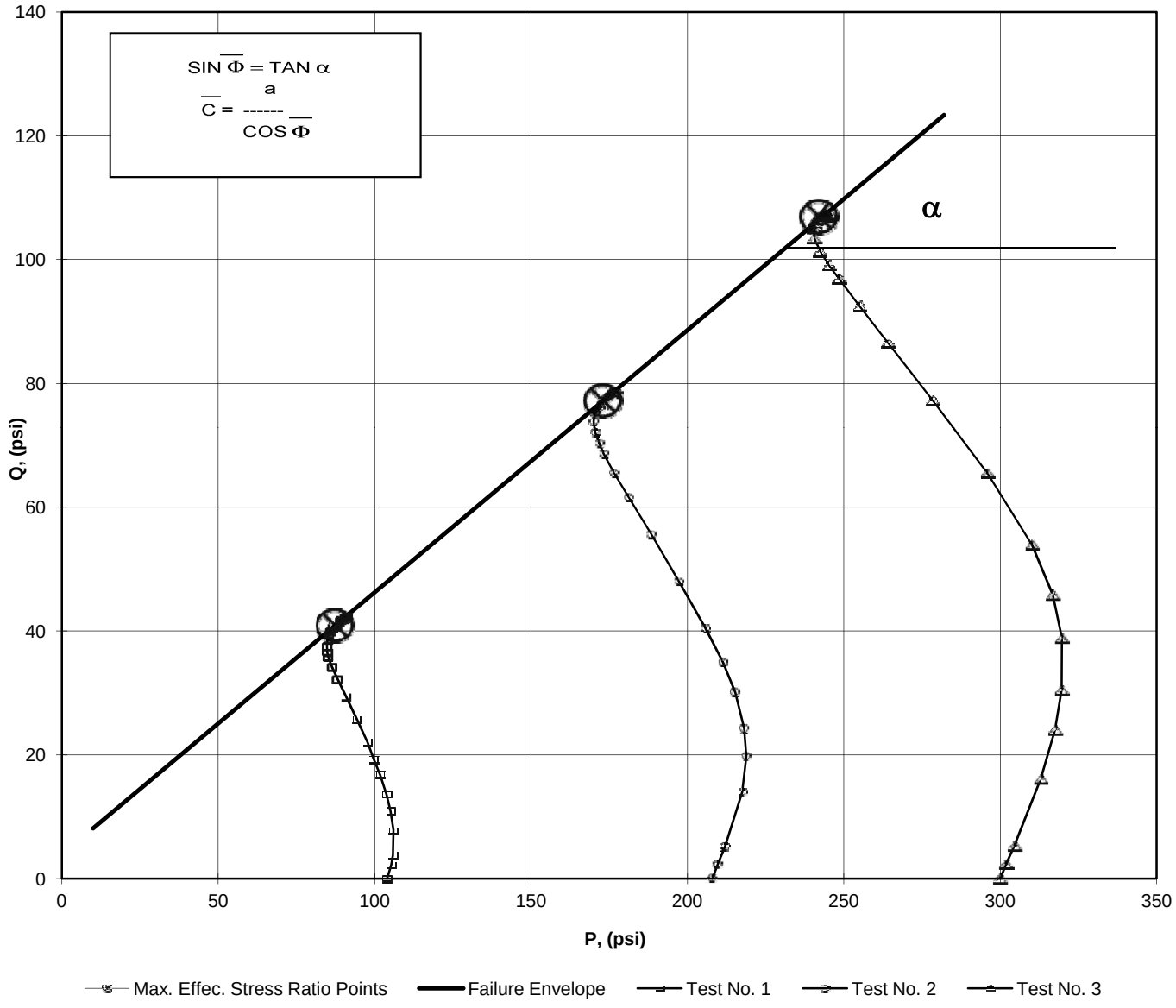
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID:	2023-370-005-001		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.00**	$\overline{C}$	=	**0.00**
α	=	**23.0**	$\overline{\Phi}$	=	**25.07**

Tested By: RPE Date: 9/21/23 Approved By: NJM Date: 10/3/23

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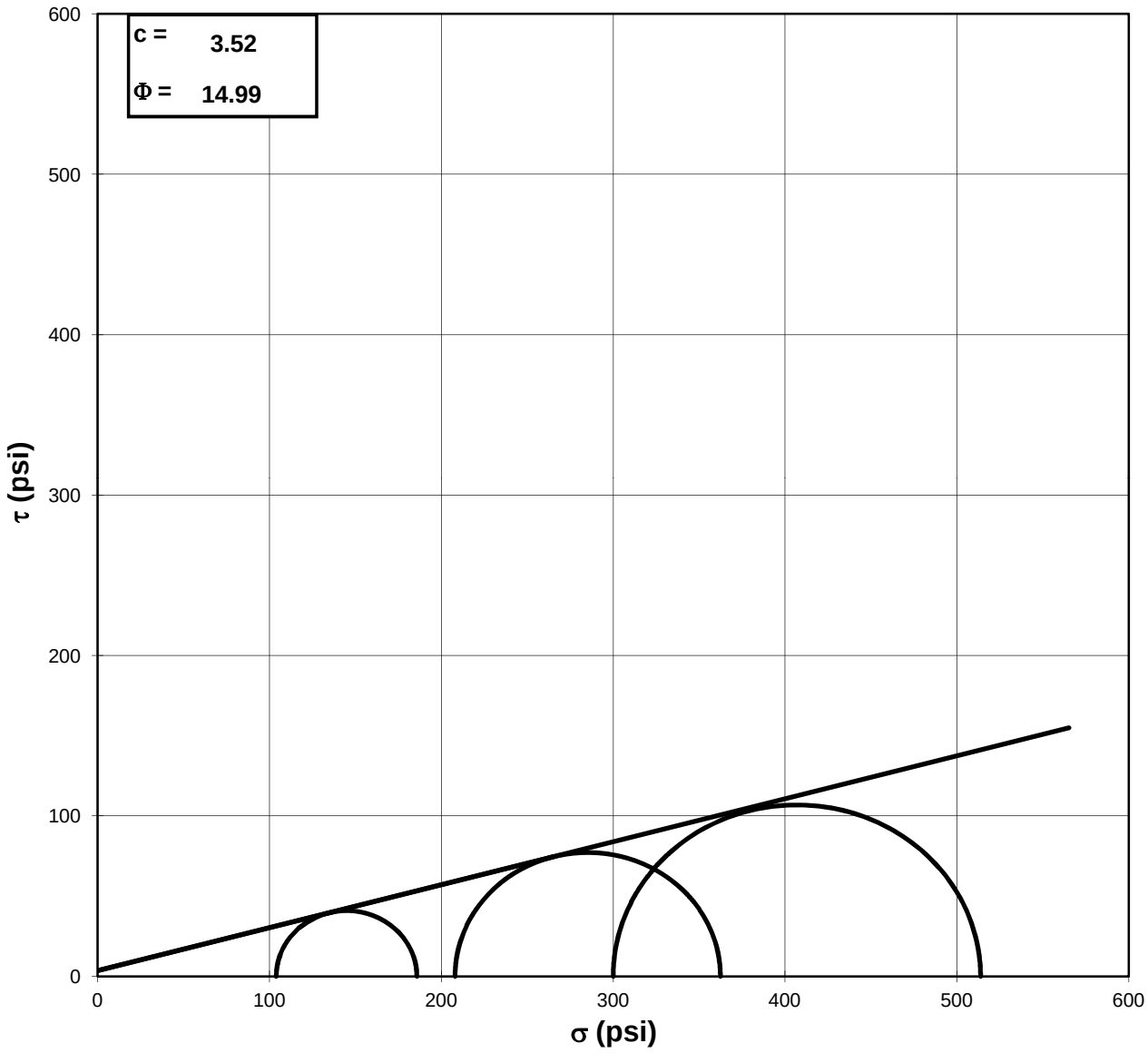
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID:	2023-370-005-001		
Visual Description:	Reddish-Brown Clay with Rocks		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: RPE *Date:* 9/21/23 *Approved By:* NJM *Date:* 10/3/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID:	2023-370-005-001		

Visual Description: Reddish-Brown Clay with Rocks

Stage No.	1
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	136.0
Back Pressure (psi)	32.0
Eff. Conf. Pressure (psi)	104.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	87.36
Q	=	40.89

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	144.0
Final Burette Reading (ml)	69.0
Final Change (ml)	75.0
Initial Dial Reading (mil)	73
Dial Reading After Saturation (mil)	92
Dial Reading After Consolidation (mil)	305

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.2	0.000	32.1
27.2	0.001	32.9
45.8	0.002	33.9
93.1	0.006	37.8
129.8	0.011	41.9
160.6	0.017	45.7
198.1	0.025	50.9
227.5	0.033	55.4
261.3	0.045	60.3
305.5	0.065	67.3
350.3	0.093	74.4
386.8	0.129	80.0
412.7	0.165	83.7
435.2	0.206	86.5
448.2	0.236	87.8
464.0	0.277	88.8
481.8	0.333	89.7
497.4	0.393	90.0
508.2	0.438	90.0
521.0	0.497	89.8
529.9	0.542	89.5
537.9	0.586	89.2
546.0	0.632	88.9
551.6	0.662	88.7
556.8	0.692	88.6
562.3	0.721	88.3
567.2	0.751	88.0
574.9	0.795	87.7
582.0	0.839	87.2
587.0	0.869	87.1
591.6	0.899	86.9

Tested By: RPE Date: 9/21/23 Input Checked By: NJM Date: 10/3/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID:	2023-370-005-001		

Visual Description: Reddish-Brown Clay with Rocks

Effective Confining Pressure (psi)	104.0	*Stage No.*	1
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	33.41
Length After Consolidation (in)	5.71
Area After Consolidation (in^2)	5.852

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	4.45	0.94	107.51	103.1	1.043	0.22	105.29	2.22
0.04	7.62	1.92	109.70	102.1	1.075	0.26	105.89	3.81
0.11	15.68	5.84	113.84	98.2	1.160	0.38	106.00	7.84
0.20	21.92	9.86	116.06	94.1	1.233	0.46	105.10	10.96
0.30	27.16	13.72	117.44	90.3	1.301	0.52	103.86	13.58
0.43	33.50	18.92	118.58	85.1	1.394	0.58	101.83	16.75
0.58	38.45	23.42	119.03	80.6	1.477	0.62	99.80	19.23
0.78	44.10	28.35	119.75	75.7	1.583	0.66	97.70	22.05
1.14	51.41	35.31	120.09	68.7	1.748	0.70	94.39	25.70
1.64	58.68	42.37	120.31	61.6	1.952	0.74	90.97	29.34
2.26	64.40	48.04	120.37	56.0	2.151	0.76	88.16	32.20
2.89	68.29	51.67	120.62	52.3	2.305	0.77	86.48	34.14
3.61	71.48	54.53	120.95	49.5	2.445	0.78	85.21	35.74
4.13	73.24	55.80	121.44	48.2	2.519	0.78	84.82	36.62
4.85	75.24	56.82	122.42	47.2	2.595	0.77	84.80	37.62
5.82	77.34	57.70	123.64	46.3	2.671	0.76	84.97	38.67
6.88	78.96	58.04	124.92	46.0	2.718	0.75	85.44	39.48
7.68	79.98	57.98	126.01	46.0	2.738	0.74	86.01	39.99
8.71	81.08	57.81	127.27	46.2	2.755	0.73	86.73	40.54
9.49	81.77	57.52	128.25	46.5	2.759	0.72	87.36	40.89
10.26	82.30	57.21	129.09	46.8	2.759	0.71	87.94	41.15
11.06	82.80	56.92	129.88	47.1	2.759	0.70	88.48	41.40
11.59	83.15	56.69	130.46	47.3	2.758	0.70	88.88	41.58
12.12	83.44	56.55	130.88	47.4	2.759	0.69	89.16	41.72
12.63	83.77	56.25	131.52	47.7	2.755	0.69	89.63	41.89
13.15	84.01	56.01	131.99	48.0	2.751	0.68	89.99	42.00
13.93	84.39	55.66	132.73	48.3	2.746	0.67	90.53	42.19
14.70	84.66	55.23	133.43	48.8	2.736	0.67	91.10	42.33
15.22	84.87	55.11	133.76	48.9	2.736	0.66	91.33	42.43
15.75	85.01	54.85	134.15	49.1	2.730	0.66	91.65	42.50

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID:	2023-370-005-001		

Visual Description: Reddish-Brown Clay with Rocks

Stage No.	1
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	240.0
Back Pressure (psi)	32.0
Eff. Conf. Pressure (psi)	208.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	173.02
Q	=	77.18

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	144.0
Final Burette Reading (ml)	55.3
Final Change (ml)	88.7
Initial Dial Reading (mil)	30
Dial Reading After Saturation (mil)	42
Dial Reading After Consolidation (mil)	346

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.1	0.000	32.2
28.5	0.001	32.6
61.4	0.002	33.2
163.8	0.007	36.5
231.0	0.011	40.9
284.6	0.017	46.2
352.4	0.025	54.8
410.2	0.034	63.7
475.6	0.044	74.7
566.3	0.064	90.7
658.6	0.092	107.2
734.0	0.128	120.3
785.9	0.163	129.0
830.0	0.205	135.5
854.6	0.235	138.5
882.4	0.276	141.5
913.2	0.332	143.8
939.8	0.391	144.7
958.6	0.436	144.0
979.4	0.496	144.2
993.9	0.539	144.2
1006.9	0.583	143.6
1019.4	0.628	143.2
1027.7	0.658	143.1
1035.4	0.688	142.7
1043.0	0.718	142.4
1050.3	0.748	142.1
1061.2	0.791	141.5
1072.3	0.835	141.1
1078.8	0.865	140.6
1085.6	0.895	140.4

Tested By: RPE Date: 9/21/23 Input Checked By: NJM Date: 10/3/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID:	2023-370-005-001		

Visual Description: Reddish-Brown Clay with Rocks

Effective Confining Pressure (psi)	208.0	*Stage No.*	1
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	32.71
Length After Consolidation (in)	5.63
Area After Consolidation (in^2)	5.815

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	4.72	0.63	212.09	207.4	1.023	0.14	209.73	2.36
0.04	10.36	1.18	217.19	206.8	1.050	0.12	212.00	5.18
0.12	27.95	4.45	231.50	203.5	1.137	0.16	217.53	13.98
0.20	39.46	8.93	238.54	199.1	1.198	0.23	218.80	19.73
0.30	48.61	14.18	242.43	193.8	1.251	0.30	218.13	24.30
0.45	60.14	22.82	245.33	185.2	1.325	0.39	215.25	30.07
0.60	69.94	31.66	246.28	176.3	1.397	0.47	211.31	34.97
0.79	80.95	42.73	246.22	165.3	1.490	0.54	205.75	40.48
1.14	96.09	58.73	245.35	149.3	1.644	0.63	197.31	48.04
1.64	111.22	75.18	244.04	132.8	1.837	0.70	188.43	55.61
2.27	123.18	88.32	242.86	119.7	2.029	0.74	181.27	61.59
2.90	131.05	96.96	242.09	111.0	2.180	0.76	176.56	65.53
3.65	137.36	103.48	241.88	104.5	2.314	0.78	173.20	68.68
4.17	140.65	106.52	242.13	101.5	2.386	0.78	171.81	70.33
4.91	144.12	109.53	242.59	98.5	2.464	0.78	170.53	72.06
5.89	147.62	111.77	243.85	96.2	2.534	0.78	170.04	73.81
6.94	150.22	112.73	245.49	95.3	2.577	0.77	170.38	75.11
7.75	151.90	111.97	247.92	96.0	2.582	0.76	171.97	75.95
8.82	153.40	112.24	249.15	95.8	2.602	0.75	172.46	76.70
9.59	154.36	112.16	250.20	95.8	2.610	0.75	173.02	77.18
10.37	155.04	111.64	251.40	96.4	2.609	0.74	173.88	77.52
11.17	155.57	111.24	252.33	96.8	2.608	0.74	174.55	77.78
11.69	155.90	111.07	252.83	96.9	2.608	0.73	174.88	77.95
12.23	156.11	110.71	253.39	97.3	2.605	0.73	175.34	78.05
12.77	156.30	110.38	253.92	97.6	2.601	0.73	175.77	78.15
13.30	156.44	110.13	254.31	97.9	2.598	0.73	176.09	78.22
14.06	156.67	109.54	255.14	98.5	2.591	0.72	176.80	78.34
14.85	156.87	109.06	255.81	98.9	2.586	0.72	177.37	78.43
15.38	156.83	108.64	256.20	99.4	2.578	0.71	177.78	78.42
15.91	156.83	108.38	256.45	99.6	2.574	0.71	178.04	78.41

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID:	2023-370-005-001		

Visual Description: Reddish-Brown Clay with Rocks

Stage No.	1
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	332.0
Back Pressure (psi)	32.0
Eff. Conf. Pressure (psi)	300.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	241.99
Q	=	106.87

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	144.0
Final Burette Reading (ml)	44.7
Final Change (ml)	99.3

Initial Dial Reading (mil)	31
Dial Reading After Saturation (mil)	48
Dial Reading After Consolidation (mil)	390

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.2	0.000	32.2
28.0	0.001	32.4
62.3	0.002	32.8
185.4	0.007	35.1
277.1	0.012	38.6
351.8	0.017	43.0
448.5	0.025	51.2
529.4	0.032	61.1
623.3	0.043	75.7
759.2	0.062	101.5
900.5	0.089	130.9
1014.1	0.122	154.3
1090.6	0.157	169.3
1152.3	0.200	180.4
1184.5	0.231	185.8
1220.7	0.272	190.9
1258.6	0.325	194.8
1293.2	0.384	196.5
1314.4	0.430	197.1
1336.1	0.490	197.3
1350.5	0.534	197.1
1366.3	0.577	196.9
1381.9	0.622	196.3
1394.9	0.651	196.0
1403.7	0.682	195.6
1411.1	0.713	195.3
1417.3	0.743	195.0
1428.8	0.787	194.5
1439.3	0.830	193.7
1452.8	0.859	193.3
1463.2	0.889	192.9

Tested By: RPE Date: 9/21/23 Input Checked By: NJM Date: 10/3/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID:	2023-370-005-001		

Visual Description: Reddish-Brown Clay with Rocks

Effective Confining Pressure (psi)	300.0	*Stage No.*	1
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	31.96
Length After Consolidation (in)	5.58
Area After Consolidation (in^2)	5.726

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.03	4.68	0.43	304.25	299.6	1.016	0.10	301.91	2.34
0.04	10.67	0.82	309.85	299.2	1.036	0.08	304.52	5.34
0.13	32.12	3.15	328.97	296.9	1.108	0.10	312.91	16.06
0.21	48.08	6.57	341.51	293.4	1.164	0.14	317.47	24.04
0.30	61.04	10.95	350.08	289.0	1.211	0.18	319.57	30.52
0.44	77.77	19.22	358.55	280.8	1.277	0.25	319.67	38.88
0.58	91.71	29.11	362.61	270.9	1.339	0.33	316.75	45.86
0.77	107.80	43.71	364.10	256.3	1.421	0.42	310.19	53.90
1.10	130.91	69.49	361.42	230.5	1.568	0.55	295.97	65.46
1.59	154.55	98.90	355.65	201.1	1.769	0.66	278.38	77.27
2.18	173.02	122.32	350.70	177.7	1.974	0.73	264.19	86.51
2.82	184.89	137.32	347.57	162.7	2.136	0.77	255.13	92.44
3.59	193.80	148.42	345.38	151.6	2.279	0.79	248.48	96.90
4.13	198.10	153.76	344.35	146.2	2.355	0.80	245.29	99.05
4.87	202.60	158.86	343.74	141.1	2.435	0.81	242.44	101.30
5.82	206.79	162.80	343.99	137.2	2.507	0.81	240.59	103.39
6.87	210.11	164.53	345.58	135.5	2.551	0.81	240.52	105.06
7.71	211.65	165.14	346.51	134.9	2.569	0.80	240.69	105.83
8.78	212.63	165.31	347.32	134.7	2.579	0.80	241.00	106.32
9.57	213.09	165.13	347.96	134.9	2.580	0.80	241.41	106.55
10.34	213.73	164.87	348.86	135.1	2.582	0.80	241.99	106.87
11.14	214.26	164.26	350.00	135.7	2.578	0.79	242.87	107.13
11.66	214.99	163.97	351.03	136.0	2.580	0.79	243.53	107.50
12.22	214.98	163.63	351.35	136.4	2.576	0.78	243.86	107.49
12.77	214.78	163.25	351.53	136.7	2.571	0.78	244.14	107.39
13.30	214.40	162.96	351.44	137.0	2.565	0.78	244.24	107.20
14.09	214.17	162.46	351.72	137.5	2.557	0.78	244.63	107.09
14.87	213.80	161.74	352.06	138.3	2.546	0.78	245.16	106.90
15.39	214.49	161.31	353.18	138.7	2.547	0.78	245.93	107.24
15.92	214.66	160.89	353.77	139.1	2.543	0.77	246.44	107.33

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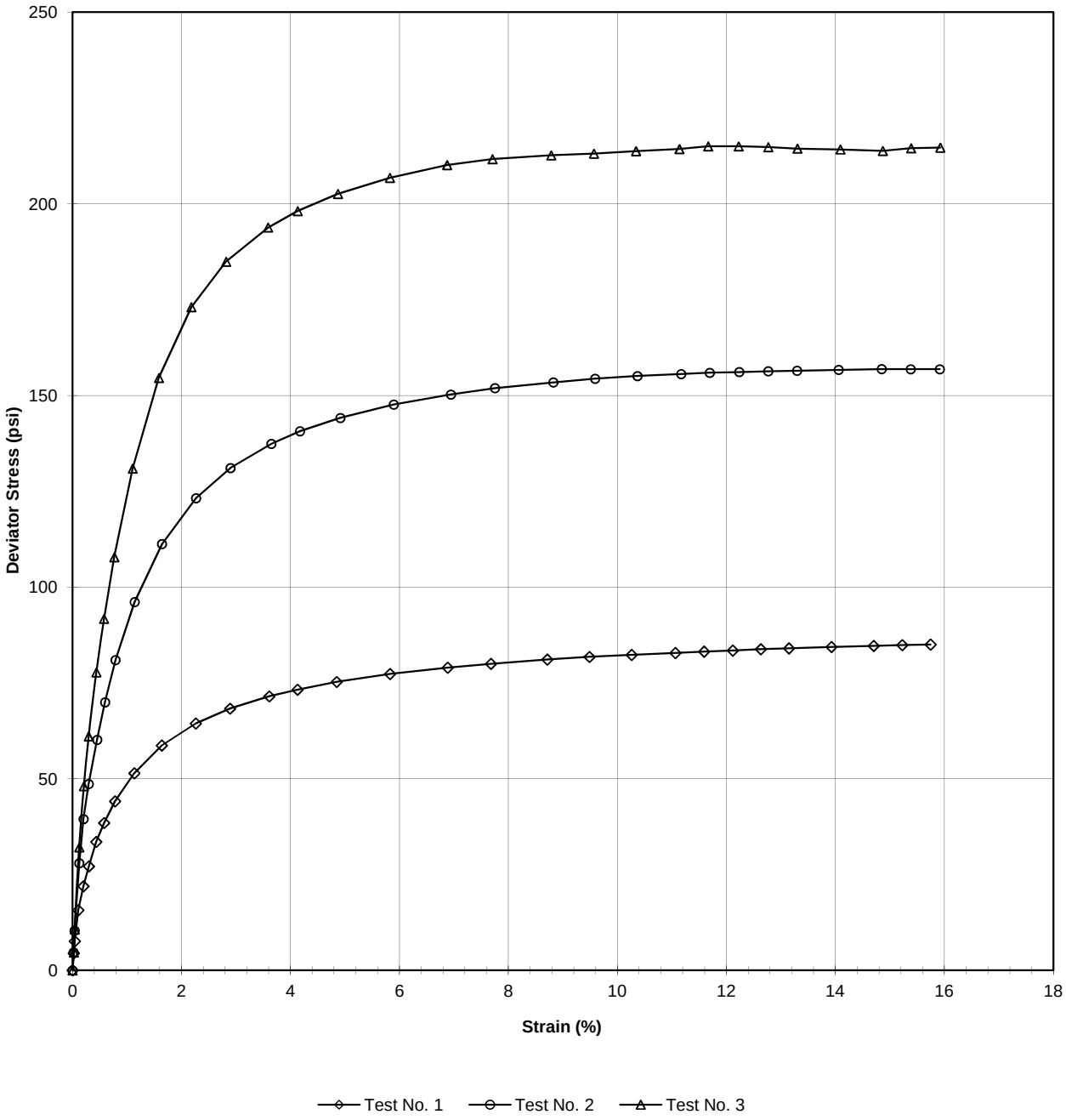
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID:	2023-370-005-001		
Visual Description:	Reddish-Brown Clay with Rocks		



Tested By: RPE Date: 9/21/23 Approved By: NJM Date: 10/3/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.		
Client Reference:	AEP Amos Seq. 4 C130109.27		
Project No.:	2023-370-005		
Lab ID:	2023-370-005-001	Specific Gravity (Assumed)	2.7
Visual Description:	Reddish-Brown Clay with Rocks		

SAMPLE CONDITION SUMMARY

Boring No.:	AEP Amos	AEP Amos	AEP Amos
Depth (ft):	Seq. 4 Repair	Seq. 4 Repair	Seq. 4 Repair
Sample No.:	8/10/23-1	8/10/23-1	8/10/23-1
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.0005	0.00069	0.00075
Back Pressure (psi)	32	32	32
Consolidation Time (days)	1	1	1
Moisture Content (%) (INITIAL)	14.2	14.2	14.2
Total Unit Weight (pcf)	120.7	120.7	120.7
Dry Unit Weight (pcf)	105.7	105.7	105.7
Moisture Content (%) (FINAL)	15.7	13.8	12.9
Initial State Void Ratio,e	0.595	0.595	0.595
Void Ratio at Shear, e	0.390	0.360	0.329

Tested By: RPE Date: 9/21/23 Input Checked By: NJM Date: 10/3/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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PERMEABILITY TEST

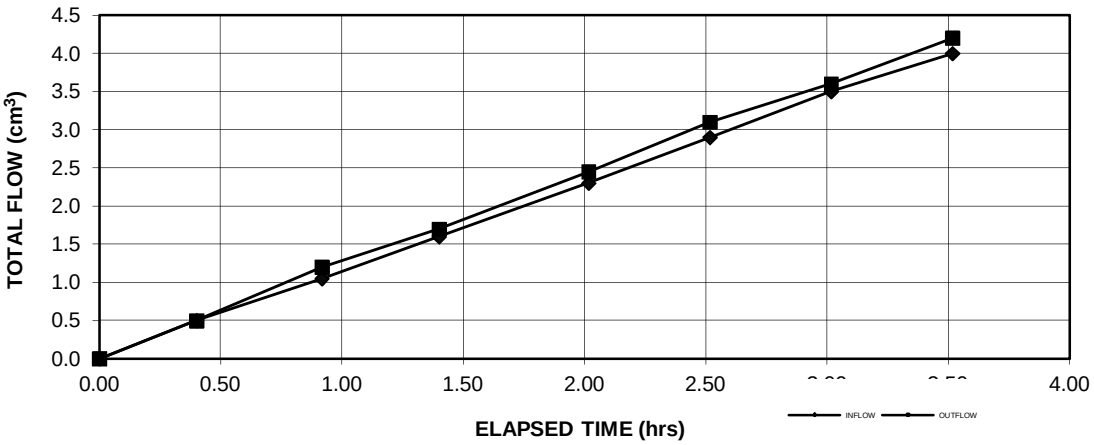
ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID No.:	2023-370-005-001	Avg. Effective Consol. Pressure (psi):	6.25

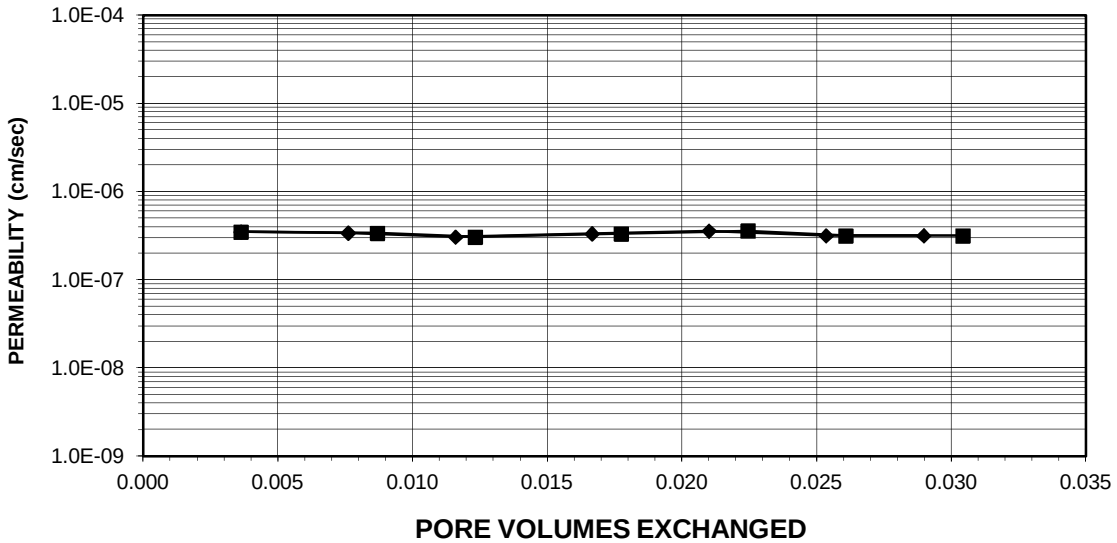
AVERAGE PERMEABILITY = 3.3E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 3.3E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By:	WT	Date:	9/21/23	Checked By:	JLK	Date:	9/28/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID No.:	2023-370-005-001	Avg. Effective Consol. Pressure (psi):	6.25

Specific Gravity:	2.70	Assumed
Sample Condition:		Remolded

Visual Description: Reddish Brown Clay

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	3321	1723
Weight of Tare & Wet Sample (g)	179.34	872.33
Weight of Tare & Dry Sample (g)	158.02	740.68
Weight of Tare (g)	8.23	82.59
Weight of Water (g)	21.32	131.65
Weight of Dry Sample (g)	149.79	658.09
Moisture Content (%)	**14.2**	**20.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	1670.55	NA
Weight of Tube (g)	917.30	NA
Weight of Wet Sample (g)	753.25	791.31
Length 1 (in)	3.490	3.534
Length 2 (in)	3.490	3.556
Length 3 (in)	3.490	3.542
Top Diameter (in)	2.870	2.892
Middle Diameter (in)	2.870	2.901
Bottom Diameter (in)	2.870	2.892
Average Length (in)	3.49	3.54
Average Area (in^2)	6.47	6.58
Sample Volume (cm^3)	369.98	382.28
Unit Wet Weight (g/cm^3)	2.04	2.07
Unit Wet Weight (pcf)	127.1	129.2
Unit Dry Weight (pcf)	111.3	107.7
Unit Dry Weight (g/cm^3)	1.78	1.72
Void Ratio, e	0.51	0.57
Porosity, n	0.34	0.36
Pore Volume (cm^3)	125.8	138.1
Total Weight of Sample After Test (g)		790.21

Tested By: WT Date: 9/21/23 Checked By: JLK Date: 9/28/23

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PERMEABILITY TEST

ASTM D 5084-16a Method C

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Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-005	Sample No.:	8/10/23-1
Lab ID No.:	2023-370-005-001	Avg. Effective Consol. Pressure (psi):	6.25

Pressure Heads (Constant)	
Top Cap (psi)	67.5
Bottom Cap (psi)	70.0
Cell (psi)	75.0
Total Pressure Head (cm)	175.8
Hydraulic Gradient	19.52

Final Sample Dimensions	
Sample Length (cm), L	9.00
Sample Diameter (cm)	7.35
Sample Area (cm^2), A	42.47
Inflow Burette Area (cm^2), a-in	0.936
Outflow Burette Area (cm^2), a-out	0.972
B Parameter (%)	95

AVERAGE PERMEABILITY = 3.3E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 3.3E-09 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
9/25/23	10	25	0.000	0.0	0.0	200.9	0	22.0	NA
9/25/23	10	49	0.400	0.5	0.5	199.8	0	22.2	3.5E-07
9/25/23	11	20	0.917	1.1	1.2	198.5	0	22.2	3.4E-07
9/25/23	11	49	1.400	1.6	1.7	197.4	0	22.3	3.1E-07
9/25/23	12	26	2.017	2.3	2.5	195.9	0	22.3	3.3E-07
9/25/23	12	56	2.517	2.9	3.1	194.6	0	22.2	3.6E-07
9/25/23	13	26	3.017	3.5	3.6	193.4	0	22.4	3.1E-07
9/25/23	13	56	3.517	4.0	4.2	192.3	1	22.4	3.2E-07

Tested By: WT Date: 9/21/23 Checked By: JLK Date: 9/28/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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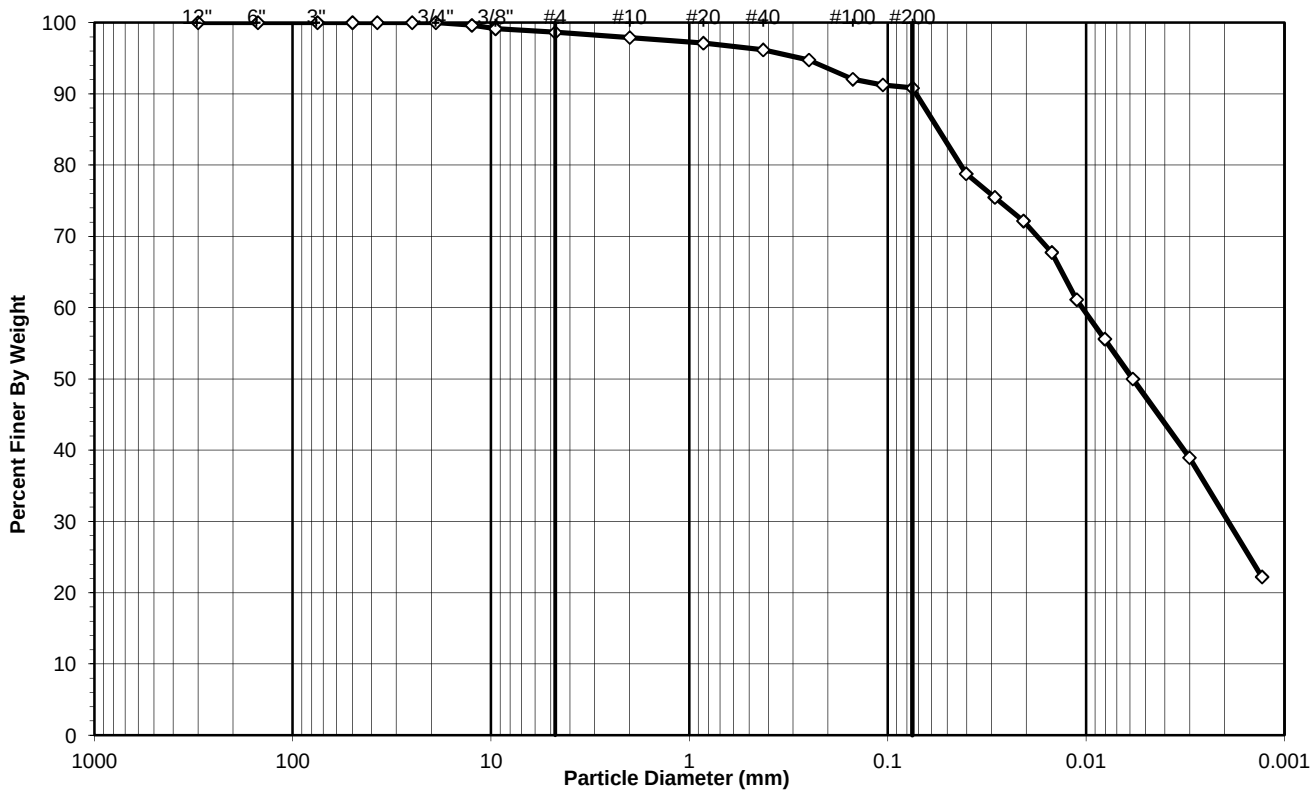
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-2
Lab ID:	2023-370-004-002	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**1.37**
#4 to #200	***Sand***	**7.81**
Finer than #200	***Silt & Clay***	**90.83**

USCS Symbol:
CL, TESTED

USCS Classification:
LEAN CLAY

Tested By DF Date 8/18/23 Checked By KC Date 8/23/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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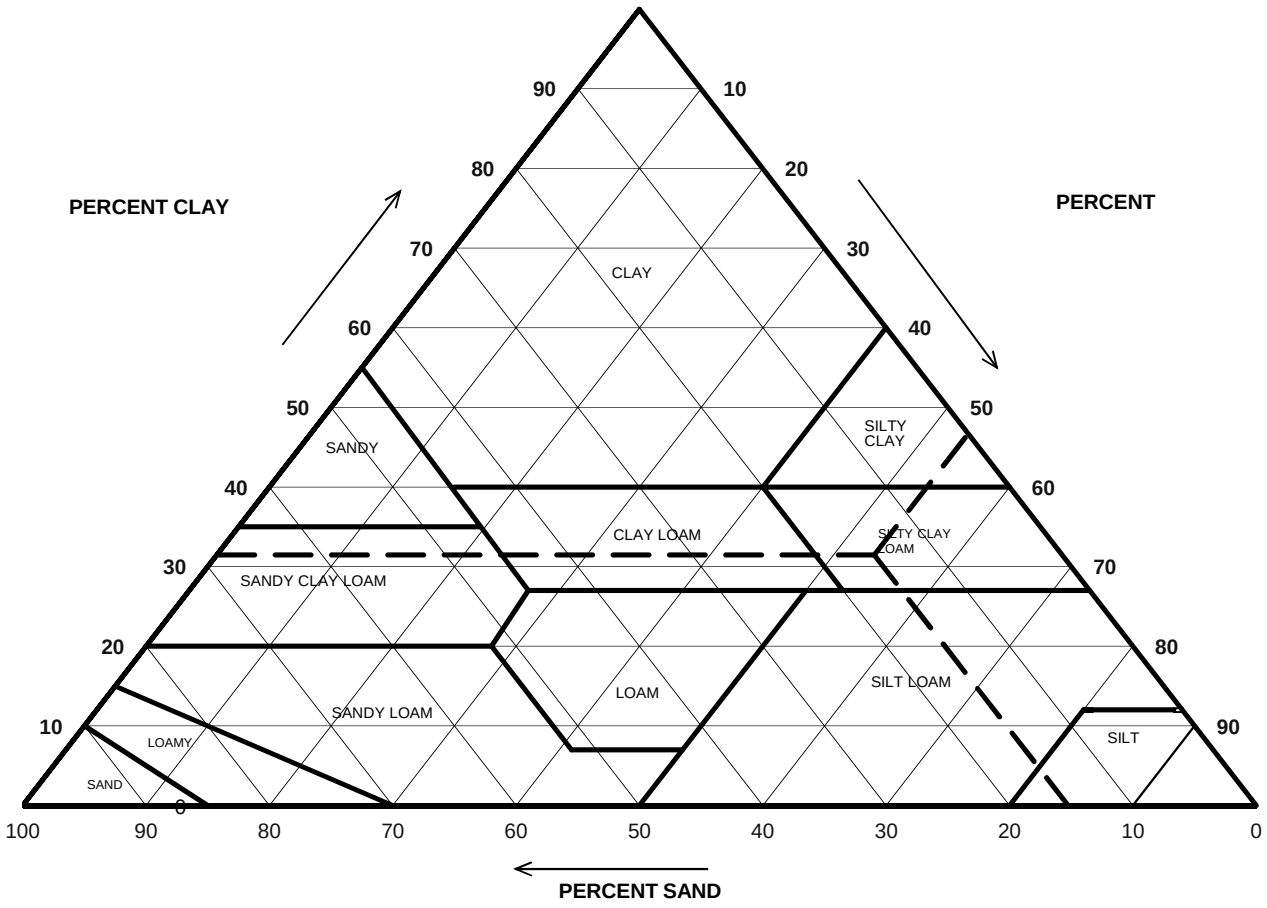
USDA CLASSIFICATION CHART

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-2
Lab ID:	2023-370-004-002	Soil Color:	Brown



USDA SUMMARY				
Particle Size (mm)	**Percent Finer**		**Actual Percentage**	Corrected % of Minus 2.0 mm material for USDA Classification
		Gravel	**2.09**	
2	**97.91**	**Sand**	**14.93**	**15.24**
0.05	**82.99**	**Silt**	**52.18**	**53.29**
0.002	**30.81**	**Clay**	**30.81**	**31.47**

USDA Classification: SILTY CLAY LOAM

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-2
Lab ID:	2023-370-004-002	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1430	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	1029.28	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	928.43	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	144.96	Weight of Tare (g):	NA
Weight of Water (g):	100.85	Weight of Water (g):	NA
Weight of Dry Soil (g):	783.47	Weight of Dry Soil (g):	NA
Moisture Content (%):	**12.9**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	783.47
Tare No. (Sub-Specimen)	1430	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	1029.28	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	144.96	Dry Weight of - 3/4" Sample (g):	783.47
Sub-Specimen Wet Weight (g):	884.32	Dry Weight -3/4" +3/8" Sample (g):	6.70
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	776.77
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	2.97	(**)	0.38	0.38	99.62	**100**
3/8"	9.5	3.73		0.48	0.86	99.14	**99**
#4	4.75	4.00		0.51	1.37	98.63	**99**
#10	2	5.66		0.72	2.09	97.91	**98**
#20	0.85	6.20	(**)	0.79	2.88	97.12	**97**
#40	0.425	7.41		0.95	3.83	96.17	**96**
#60	0.25	11.03		1.41	5.23	94.77	**95**
#100	0.15	21.21		2.71	7.94	92.06	**92**
#140	0.106	6.25		0.80	8.74	91.26	**91**
#200	0.075	3.40		0.43	9.17	90.83	**91**
Pan	-	711.61		90.83	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	8/18/23	Checked By	KC	Date	8/23/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-2
Lab ID:	2023-370-004-002	Soil Color:	Brown

Elapsed Time (min)	Reading rm	Temp. (C^0)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	42.0	23.2	6.33	9.5	0.0403	86.8	78.8
2	40.5	23.2	6.33	9.7	0.0289	83.1	75.5
4	39.0	23.2	6.33	10.0	0.0207	79.5	72.2
8	37.0	23.2	6.33	10.4	0.0149	74.6	67.8
15	34.0	23.2	6.33	10.9	0.0112	67.3	61.1
30	31.5	23.2	6.33	11.4	0.0081	61.2	55.6
60	29.0	23.1	6.36	11.8	0.0058	55.0	50.0
240	24.0	23.1	6.36	12.7	0.0030	42.9	39.0
1440	16.5	22.9	6.44	14.1	0.0013	24.5	22.2

Soil Specimen Data

Tare No.:	672	Percent Finer than # 200:	90.83
Wt. of Tare & Dry Material (g):	140.03		
Weight of Tare (g):	94.37	Specific Gravity:	2.70 Assumed
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	40.66		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	G- 1819
Cylinder	G- 368
Thermometer	G- 1505
Balance	G- 657
#200 Sieve	G- 1944
Foam Inhibitor Used	No

Tested By TO Date 8/21/23 Checked By KC Date 8/23/23

ATTERBERG LIMITS

ASTM D 4318-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-2
Lab ID:	2023-370-004-002	Soil Description:	BROWN LEAN CLAY

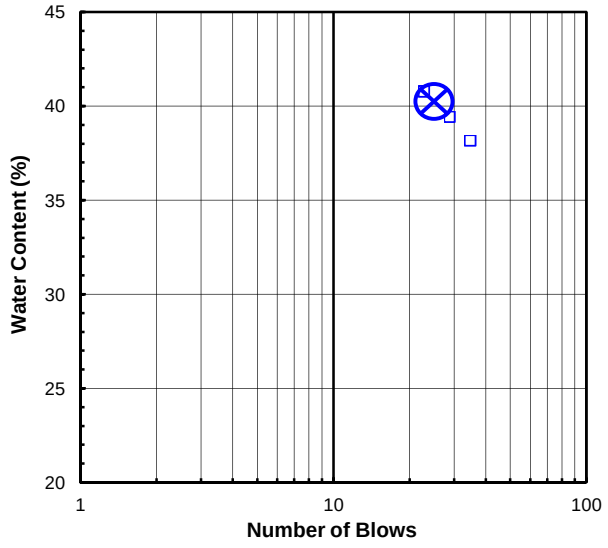
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Air dried)

As Received Moisture Content ASTM D2216-19		**Liquid Limit Test** 1	2	3	M
Tare Number:	3348	293	345	613	U
Wt. of Tare & Wet Sample (g):	245.61	44.59	40.64	39.80	L
Wt. of Tare & Dry Sample (g):	207.45	38.99	34.93	33.98	T
Weight of Tare (g):	8.04	24.30	20.43	19.69	I
Weight of Water (g):	38.2	5.6	5.7	5.8	P
Weight of Dry Sample (g):	199.4	14.7	14.5	14.3	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**19.1**	**38.1**	**39.4**	**40.7**	N
Number of Blows:		**35**	**29**	**23**	T

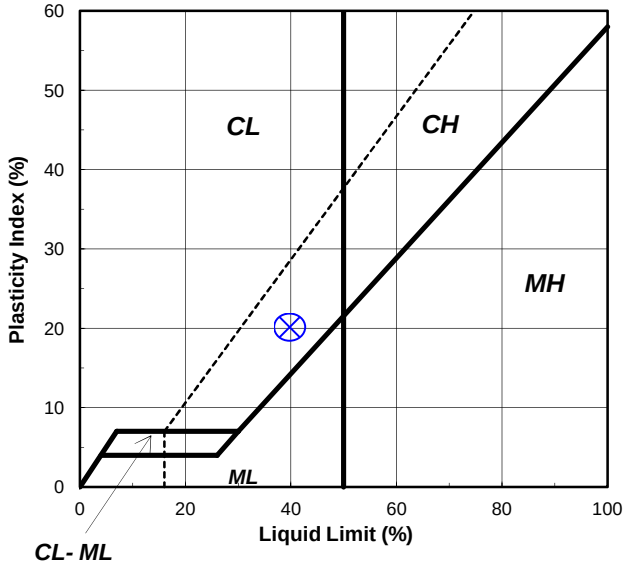
Plastic Limit Test	**1**	**2**	**Range**
Tare Number:	301	319	
Wt. of Tare & Wet Sample (g):	24.84	24.36	
Wt. of Tare & Dry Sample (g):	23.80	23.32	
Weight of Tare (g):	18.70	18.27	
Weight of Water (g):	1.0	1.0	
Weight of Dry Sample (g):	5.1	5.1	
Moisture Content (%):	**20.4**	**20.6**	**-0.2**
Note: The acceptable range of the two Moisture Contents is ±			1.12

Test Results	
Liquid Limit (%):	**40**
Plastic Limit (%):	**20**
Plasticity Index (%):	**20**
USCS Symbol:	**CL**

Flow Curve



Plasticity Chart



Tested By FS *Date* 8/21/23 *Checked By* JLK *Date* 8/22/23

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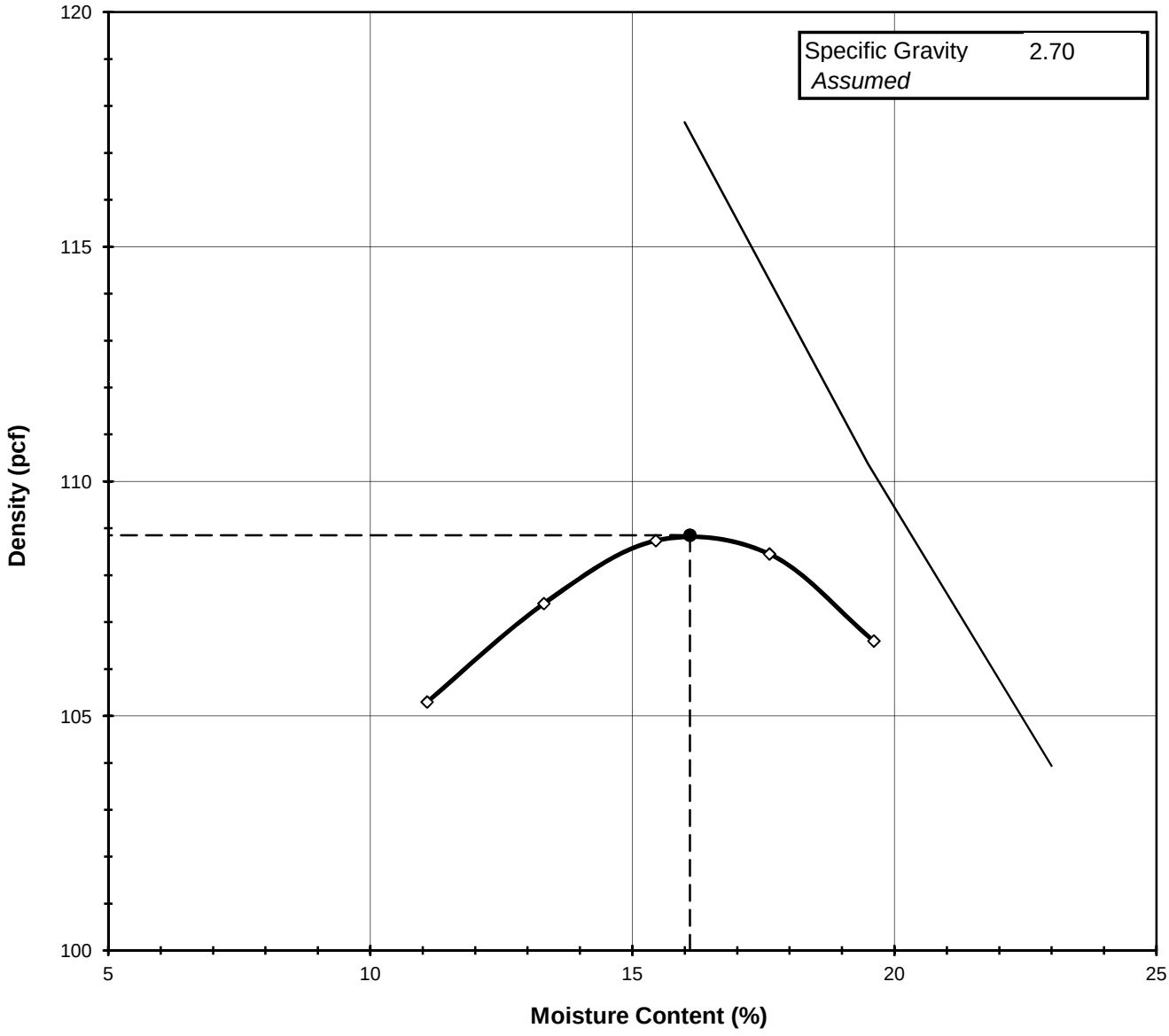
MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	Aep Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-2
Lab ID:	2023-370-004-002	Test Method	**STANDARD**

Visual Description: Brown Clay with Claystone

Optimum Moisture Content (%): 16.1
Maximum Dry Density (pcf): 108.9



Tested By *MLF* *Date* *8/17/23* *Checked By* *KC* *Date* 8/18/23

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	Aep Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-2
Lab ID:	2023-370-004-002		

Visual Description: Brown Clay with Claystone

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity:	2.70
Percent Retained on 3/4":	NA
Percent Retained on 3/8":	NA
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	C

Test Type:	**STANDARD**
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	G774
Mold ID:	G1776
Mold diameter:	6"
Weight of the Mold (g):	5571
Volume of the Mold (cm^3):	2127

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	9558	9719	9850	9919	9917
Weight of Mold (g):	5571	5571	5571	5571	5571
Weight of Wet Sample (g):	3987	4148	4279	4348	4346
Mold Volume (cm^3):	2127	2127	2127	2127	2127

Moisture Content / Density

Tare Number:	916	893	629	599	542
Weight of Tare & Wet Sample (g):	456.49	453.59	459.41	459.97	452.36
Weight of Tare & Dry Sample (g):	421.87	413.25	409.40	403.55	391.59
Weight of Tare (g):	109.45	110.17	85.62	83.25	81.63
Weight of Water (g):	34.62	40.34	50.01	56.42	60.77
Weight of Dry Sample (g):	312.42	303.08	323.78	320.30	309.96

Wet Density (g/cm^3):	1.87	1.95	2.01	2.04	2.04
Wet Density (pcf):	117.0	121.7	125.5	127.6	127.5
Moisture Content (%):	**11.1**	**13.3**	**15.4**	**17.6**	**19.6**
Dry Density (pcf):	**105.3**	**107.4**	**108.7**	**108.5**	**106.6**

Zero Air Voids

Moisture Content (%):	16.0	19.5	23.0
Dry Unit Weight (pcf):	117.7	110.4	103.9

Tested By MLF *Date* 8/17/23 *Checked By* KC *Date* 8/18/23

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October 17, 2023

Project No. 2023-370-006

Zach Wilder
GAI Consultants, Inc.
9850 Von Allmen Court
Louisville, KY 40241

Transmittal
Laboratory Test Results
GAI-AEP Amos Seq. 4 C130109.27

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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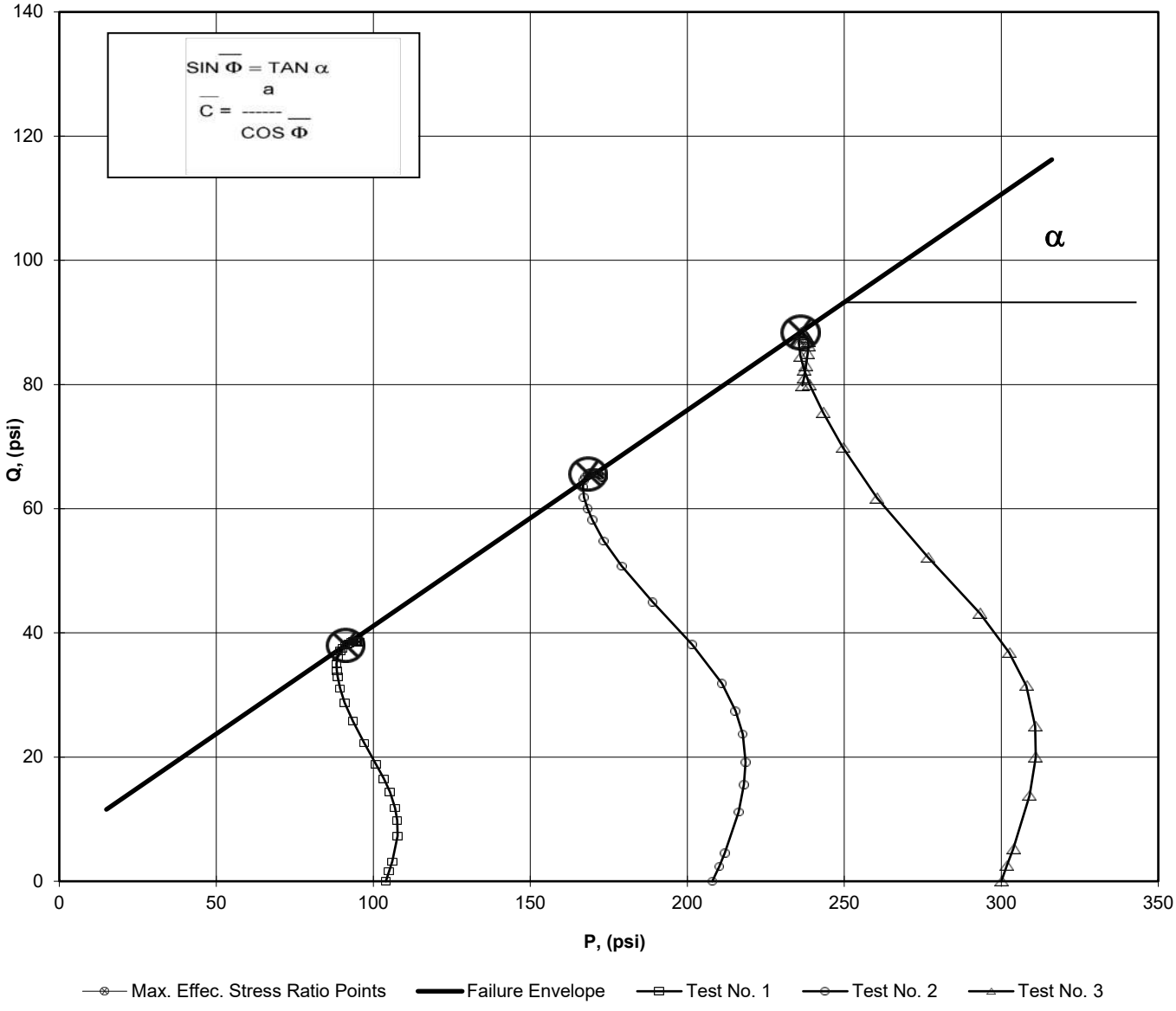
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID:	2023-370-006-001		

Consolidated Undrained Triaxial Test with Pore Pressure



a =	**0.00**	**$\bar{C}$ =**	**0.00**
α =	**19.2**	**$\bar{\Phi}$ =**	**20.34**

Tested By: RPE Date: 9/26/23 Approved By: NJM Date: 10/5/23

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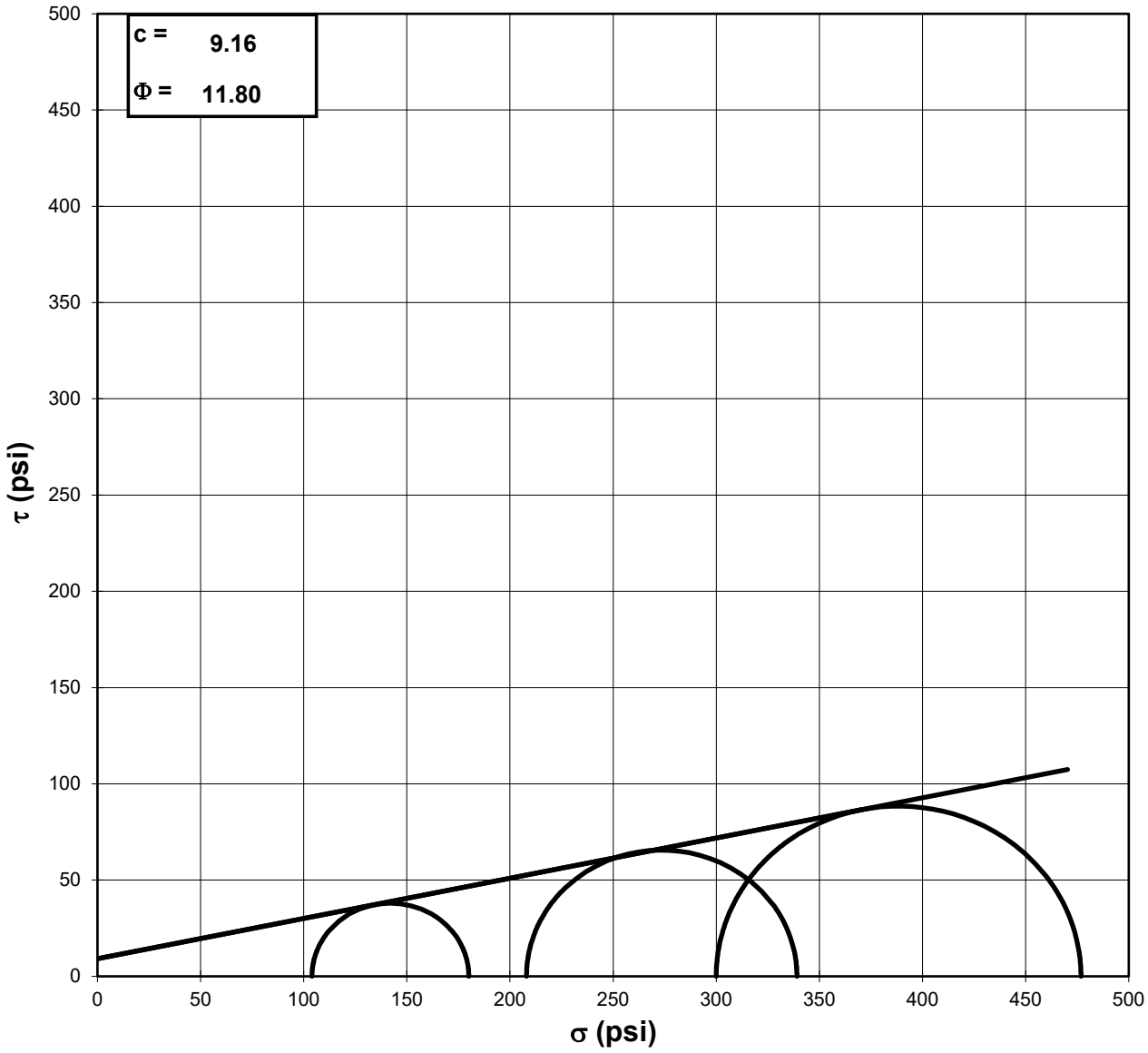
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID:	2023-370-006-001		
Visual Description:	Brown Clay with Claystone (Remolded)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: RPE *Date:* 9/26/23 *Approved By:* NJM *Date:* 10/5/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID:	2023-370-006-001		

Visual Description: Brown Clay with Claystone (Remolded)

Stage No.	1
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	136.0
Back Pressure (psi)	32.0
Eff. Conf. Pressure (psi)	104.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	91.10
Q	=	38.02

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	120.0
Final Burette Reading (ml)	39.5
Final Change (ml)	80.5
Initial Dial Reading (mil)	30
Dial Reading After Saturation (mil)	42
Dial Reading After Consolidation (mil)	288

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.3	0.000	32.1
20.6	0.000	32.6
38.5	0.001	33.2
86.9	0.006	35.6
116.3	0.011	38.2
139.8	0.017	40.9
170.0	0.025	45.1
195.5	0.034	49.1
223.5	0.045	54.0
264.3	0.065	61.1
307.5	0.094	68.3
345.5	0.128	73.9
374.9	0.164	77.6
401.1	0.205	80.4
415.5	0.236	81.6
431.9	0.278	82.8
450.3	0.333	83.5
466.9	0.391	83.6
477.0	0.436	83.4
488.2	0.497	82.9
494.6	0.541	82.5
500.8	0.585	82.0
508.2	0.629	81.5
512.1	0.659	81.2
515.5	0.689	80.8
519.0	0.719	80.5
521.4	0.749	80.1
525.0	0.794	79.6
530.0	0.837	79.1
532.6	0.867	78.7
535.8	0.896	78.3

Tested By: RPE Date: 9/26/23 Input Checked By: NJM Date: 10/5/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID:	2023-370-006-001		

Visual Description: Brown Clay with Claystone (Remolded)

Effective Confining Pressure (psi)	104.0	*Stage No.*	1
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	33.21
Length After Consolidation (in)	5.68
Area After Consolidation (in^2)	5.844

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	3.30	0.63	106.67	103.4	1.032	0.19	105.02	1.65
0.02	6.37	1.17	109.19	102.8	1.062	0.19	106.01	3.18
0.10	14.64	3.57	115.07	100.4	1.146	0.25	107.75	7.32
0.19	19.64	6.16	117.48	97.8	1.201	0.32	107.66	9.82
0.29	23.63	8.88	118.75	95.1	1.248	0.38	106.94	11.81
0.44	28.75	13.07	119.68	90.9	1.316	0.46	105.31	14.38
0.59	33.03	17.10	119.93	86.9	1.380	0.53	103.41	16.52
0.79	37.73	22.00	119.73	82.0	1.460	0.60	100.86	18.87
1.14	44.49	29.10	119.39	74.9	1.594	0.67	97.14	22.25
1.65	51.54	36.28	119.26	67.7	1.761	0.72	93.49	25.77
2.25	57.57	41.92	119.65	62.1	1.927	0.74	90.87	28.79
2.88	62.09	45.57	120.53	58.4	2.063	0.75	89.48	31.05
3.61	65.95	48.35	121.60	55.6	2.185	0.75	88.63	32.98
4.15	67.93	49.60	122.32	54.4	2.249	0.75	88.36	33.96
4.89	70.08	50.77	123.31	53.2	2.317	0.74	88.27	35.04
5.85	72.34	51.53	124.81	52.5	2.379	0.73	88.64	36.17
6.88	74.20	51.55	126.65	52.4	2.415	0.71	89.55	37.10
7.68	75.16	51.36	127.79	52.6	2.428	0.70	90.21	37.58
8.75	76.03	50.91	129.12	53.1	2.432	0.68	91.10	38.02
9.53	76.37	50.48	129.89	53.5	2.427	0.67	91.70	38.18
10.30	76.68	50.02	130.66	54.0	2.420	0.67	92.32	38.34
11.06	77.14	49.50	131.65	54.5	2.415	0.65	93.08	38.57
11.59	77.29	49.17	132.12	54.8	2.410	0.65	93.47	38.64
12.12	77.32	48.81	132.51	55.2	2.401	0.64	93.85	38.66
12.66	77.39	48.45	132.94	55.5	2.393	0.64	94.24	38.69
13.18	77.26	48.11	133.15	55.9	2.382	0.64	94.52	38.63
13.97	77.11	47.62	133.49	56.4	2.368	0.63	94.94	38.55
14.73	77.15	47.06	134.09	56.9	2.355	0.62	95.52	38.57
15.26	77.05	46.69	134.37	57.3	2.344	0.62	95.84	38.53
15.77	77.04	46.31	134.72	57.7	2.336	0.61	96.20	38.52

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

geotechnics
geotechnical & geosynthetic testing

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID:	2023-370-006-001		

Visual Description: Brown Clay with Claystone (Remolded)

Stage No.	1
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	240.0
Back Pressure (psi)	32.0
Eff. Conf. Pressure (psi)	208.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	168.43
Q	=	65.57

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	120.0
Final Burette Reading (ml)	27.3
Final Change (ml)	92.7

Initial Dial Reading (mil)	35
Dial Reading After Saturation (mil)	44
Dial Reading After Consolidation (mil)	368

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.0	0.000	32.0
28.5	0.001	32.2
53.7	0.002	32.6
130.4	0.006	34.8
182.0	0.011	37.5
224.0	0.016	40.6
276.7	0.023	46.0
321.2	0.032	52.0
373.2	0.043	60.8
448.3	0.063	76.6
531.2	0.092	96.0
603.3	0.128	111.6
656.0	0.164	121.4
701.8	0.205	128.4
727.2	0.235	131.7
755.5	0.276	134.7
784.3	0.332	136.8
806.8	0.392	137.5
820.4	0.438	137.6
835.4	0.497	137.1
844.7	0.540	136.7
852.9	0.586	136.1
860.2	0.630	135.5
865.6	0.660	135.0
870.4	0.690	134.6
874.6	0.720	134.3
878.5	0.750	133.7
884.4	0.794	133.1
889.5	0.839	132.3
893.2	0.868	131.9
896.4	0.898	131.6

Tested By: RPE Date: 9/26/23 Input Checked By: NJM Date: 10/5/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID:	2023-370-006-001		

Visual Description: Brown Clay with Claystone (Remolded)

Effective Confining Pressure (psi)	208.0	*Stage No.*	1
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	32.52
Length After Consolidation (in)	5.61
Area After Consolidation (in^2)	5.799

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	4.74	0.19	212.55	207.8	1.023	0.04	210.18	2.37
0.04	9.08	0.64	216.44	207.4	1.044	0.07	211.90	4.54
0.11	22.29	2.83	227.46	205.2	1.109	0.13	216.31	11.14
0.19	31.15	5.51	233.64	202.5	1.154	0.18	218.06	15.58
0.28	38.34	8.61	237.73	199.4	1.192	0.23	218.56	19.17
0.42	47.34	13.97	241.36	194.0	1.244	0.30	217.69	23.67
0.57	54.90	20.03	242.87	188.0	1.292	0.38	215.42	27.45
0.76	63.69	28.80	242.89	179.2	1.355	0.47	211.04	31.84
1.12	76.27	44.61	239.66	163.4	1.467	0.60	201.52	38.13
1.65	89.92	64.00	233.93	144.0	1.624	0.73	188.96	44.96
2.28	101.49	79.60	229.89	128.4	1.790	0.81	179.15	50.74
2.92	109.65	89.43	228.22	118.6	1.925	0.84	173.39	54.82
3.66	116.41	96.43	227.98	111.6	2.043	0.85	169.77	58.21
4.18	119.98	99.74	228.24	108.3	2.108	0.86	168.25	59.99
4.93	123.69	102.75	228.94	105.3	2.175	0.86	167.09	61.84
5.92	127.07	104.76	230.31	103.2	2.231	0.85	166.78	63.54
6.99	129.24	105.55	231.69	102.5	2.261	0.84	167.07	64.62
7.80	130.27	105.62	232.65	102.4	2.272	0.84	167.51	65.14
8.86	131.14	105.14	234.00	102.9	2.275	0.83	168.43	65.57
9.64	131.46	104.68	234.78	103.3	2.272	0.82	169.05	65.73
10.45	131.55	104.07	235.48	103.9	2.266	0.82	169.71	65.77
11.23	131.51	103.48	236.02	104.5	2.258	0.81	170.27	65.75
11.77	131.54	103.03	236.51	105.0	2.253	0.81	170.74	65.77
12.31	131.48	102.64	236.84	105.4	2.248	0.80	171.10	65.74
12.83	131.31	102.25	237.05	105.7	2.242	0.80	171.40	65.65
13.37	131.09	101.72	237.36	106.3	2.233	0.80	171.82	65.54
14.15	130.76	101.09	237.67	106.9	2.223	0.80	172.29	65.38
14.96	130.30	100.29	238.01	107.7	2.210	0.79	172.86	65.15
15.48	130.03	99.89	238.14	108.1	2.203	0.79	173.13	65.02
16.02	129.67	99.59	238.08	108.4	2.196	0.79	173.25	64.83

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID:	2023-370-006-001		

Visual Description: Brown Clay with Claystone (Remolded)

Stage No.	1
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	332.0
Back Pressure (psi)	32.0
Eff. Conf. Pressure (psi)	300.0
Pore Pressure Response (%)	99

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	236.10
Q	=	88.42

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	168.0
Final Burette Reading (ml)	64.9
Final Change (ml)	103.1
Initial Dial Reading (mil)	44
Dial Reading After Saturation (mil)	62
Dial Reading After Consolidation (mil)	425

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.1	0.000	32.1
30.0	0.001	32.7
60.7	0.002	33.4
159.1	0.007	36.8
229.7	0.012	41.0
286.8	0.017	46.2
361.9	0.025	55.5
424.1	0.034	66.3
497.2	0.044	81.9
602.9	0.063	107.5
716.8	0.090	133.2
816.1	0.125	152.3
887.7	0.161	164.2
948.1	0.204	173.1
981.1	0.233	177.1
1016.2	0.275	180.6
1052.0	0.329	183.2
1080.1	0.387	184.2
1095.1	0.434	184.3
1110.2	0.495	183.9
1116.4	0.540	183.3
1121.9	0.582	182.6
1127.2	0.626	181.7
1130.7	0.656	181.1
1132.7	0.688	180.4
1130.7	0.718	179.7
1121.0	0.747	178.7
1105.1	0.791	177.2
1089.2	0.833	175.9
1079.2	0.862	175.2
1064.3	0.893	174.5

Tested By: RPE Date: 9/26/23 Input Checked By: NJM Date: 10/5/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID:	2023-370-006-001		

Visual Description: Brown Clay with Claystone (Remolded)

Effective Confining Pressure (psi)	300.0	*Stage No.*	1
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	31.71
Length After Consolidation (in)	5.56
Area After Consolidation (in^2)	5.704

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	5.07	0.72	304.35	299.3	1.017	0.14	301.82	2.53
0.03	10.44	1.42	309.02	298.6	1.035	0.14	303.80	5.22
0.12	27.67	4.80	322.88	295.2	1.094	0.18	309.04	13.84
0.21	40.00	9.01	330.98	291.0	1.137	0.23	310.99	20.00
0.30	49.93	14.16	335.78	285.8	1.175	0.29	310.81	24.97
0.46	62.97	23.51	339.47	276.5	1.228	0.38	307.98	31.49
0.60	73.71	34.34	339.37	265.7	1.277	0.47	302.51	36.86
0.79	86.29	49.93	336.36	250.1	1.345	0.58	293.21	43.15
1.14	104.30	75.46	328.84	224.5	1.465	0.73	276.69	52.15
1.63	123.43	101.23	322.20	198.8	1.621	0.83	260.48	61.72
2.24	139.68	120.31	319.37	179.7	1.777	0.87	249.53	69.84
2.89	150.96	132.20	318.76	167.8	1.900	0.88	243.28	75.48
3.66	159.95	141.06	318.89	158.9	2.006	0.89	238.91	79.98
4.19	164.60	145.07	319.53	154.9	2.062	0.89	237.23	82.30
4.95	169.17	148.59	320.57	151.4	2.117	0.89	235.99	84.58
5.91	173.35	151.15	322.20	148.8	2.165	0.88	235.52	86.67
6.97	175.98	152.18	323.80	147.8	2.191	0.87	235.81	87.99
7.80	176.84	152.32	324.52	147.7	2.197	0.87	236.10	88.42
8.91	177.13	151.89	325.24	148.1	2.196	0.87	236.67	88.56
9.71	176.54	151.30	325.24	148.7	2.187	0.87	236.97	88.27
10.47	175.92	150.59	325.34	149.4	2.177	0.86	237.37	87.96
11.25	175.20	149.68	325.53	150.3	2.166	0.86	237.93	87.60
11.80	174.67	149.09	325.58	150.9	2.157	0.86	238.24	87.34
12.37	173.85	148.40	325.45	151.6	2.147	0.86	238.52	86.92
12.92	172.45	147.67	324.78	152.3	2.132	0.86	238.56	86.23
13.44	169.94	146.67	323.27	153.3	2.108	0.87	238.30	84.97
14.22	166.04	145.21	320.83	154.8	2.073	0.88	237.81	83.02
14.98	162.19	143.88	318.31	156.1	2.039	0.90	237.21	81.09
15.50	159.72	143.24	316.48	156.8	2.019	0.91	236.62	79.86
16.05	156.47	142.47	314.01	157.5	1.993	0.92	235.77	78.24

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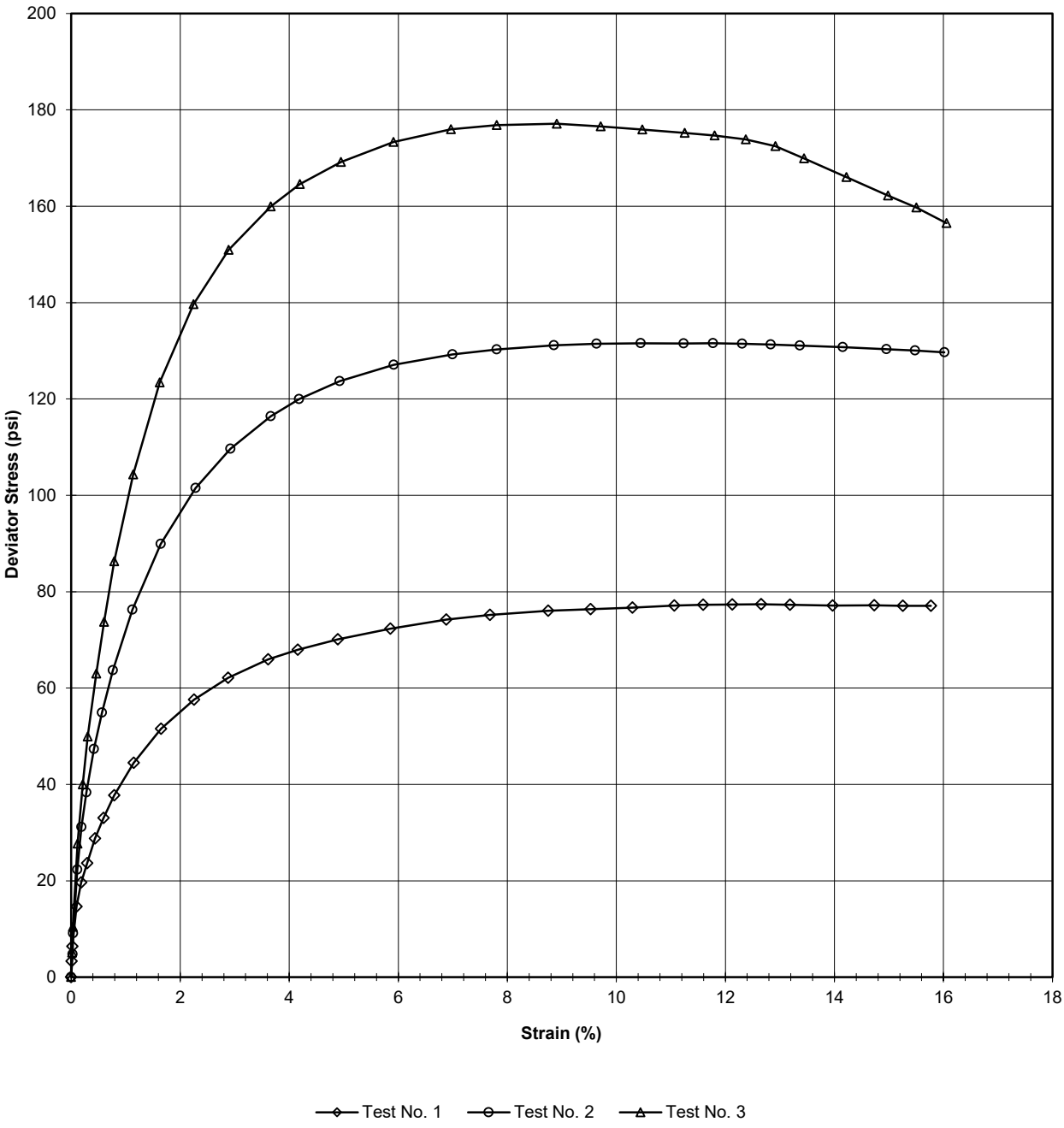
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID:	2023-370-006-001		
Visual Description:	Brown Clay with Claystone (Remolded)		



Tested By: RPE Date: 9/26/23 Approved By: NJM Date: 10/5/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.		
Client Reference:	AEP Amos Seq. 4 C130109.27		
Project No.:	2023-370-006		
Lab ID:	2023-370-006-001	Specific Gravity (Assumed)	2.7

Visual Description: Brown Clay with Claystone (Remolded)

SAMPLE CONDITION SUMMARY

Boring No.:	AEP Amos	AEP Amos	AEP Amos
Depth (ft):	Seq. 4 Repair	Seq. 4 Repair	Seq. 4 Repair
Sample No.:	8/10/23-2	8/10/23-2	8/10/23-2
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.0008	0.0007	0.0005
Back Pressure (psi)	32	32	32
Consolidation Time (days)	1	1	1
Moisture Content (%) (INITIAL)	16.2	16.2	16.2
Total Unit Weight (pcf)	120.3	120.3	120.3
Dry Unit Weight (pcf)	103.5	103.5	103.5
Moisture Content (%) (FINAL)	18.1	16.1	15.0
Initial State Void Ratio,e	0.629	0.629	0.629
Void Ratio at Shear, e	0.411	0.381	0.347

Tested By: RPE Date: 9/26/23 Input Checked By: NJM Date: 10/5/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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PERMEABILITY TEST

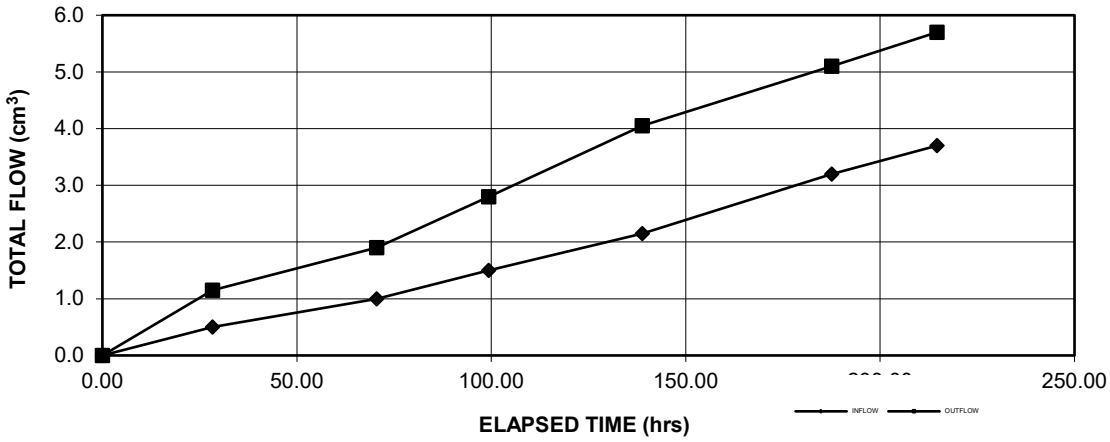
ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID No.:	2023-370-006-001	Avg. Effective Consol. Pressure (psi):	50

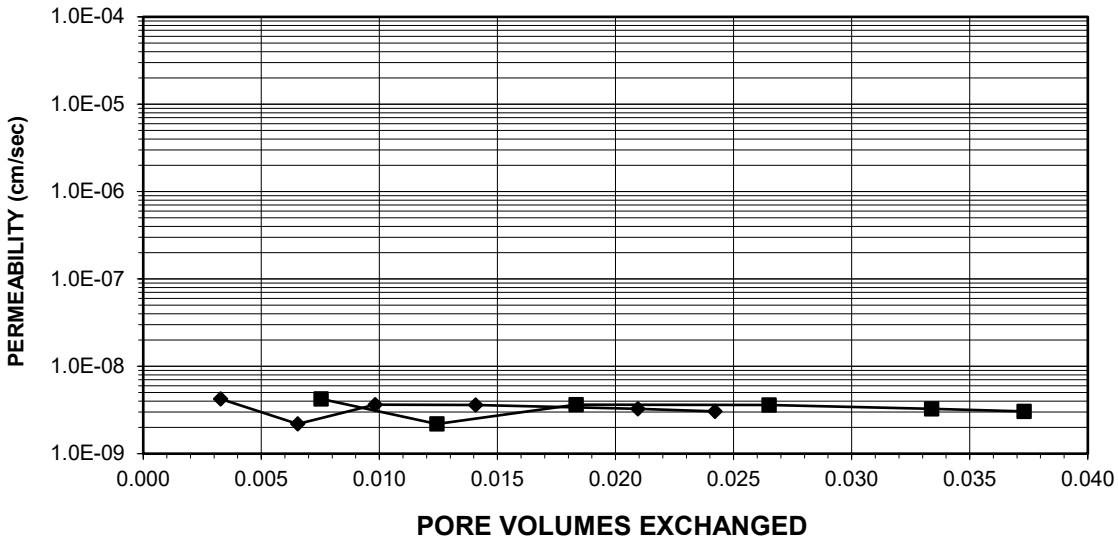
AVERAGE PERMEABILITY = 3.4E-09 cm/sec @ 20°C

AVERAGE PERMEABILITY = 3.4E-11 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: JAB Date: 9/20/23 Checked By: JLK Date: 10/16/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID No.:	2023-370-006-001	Avg. Effective Consol. Pressure (psi):	50

Specific Gravity:	2.70	Assumed
Sample Condition:		Remolded

Visual Description: Brown Clay with Claystone

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	1693	878
Weight of Tare & Wet Sample (g)	206.04	942.82
Weight of Tare & Dry Sample (g)	189.12	803.36
Weight of Tare (g)	82.54	110.10
Weight of Water (g)	16.92	139.46
Weight of Dry Sample (g)	106.58	693.26
Moisture Content (%)	**15.9**	**20.1**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	2127.49	NA
Weight of Tube (g)	1315.30	NA
Weight of Wet Sample (g)	812.19	841.92
Length 1 (in)	3.970	3.915
Length 2 (in)	3.970	3.935
Length 3 (in)	3.970	3.951
Top Diameter (in)	2.877	2.841
Middle Diameter (in)	2.877	2.806
Bottom Diameter (in)	2.877	2.915
Average Length (in)	3.97	3.93
Average Area (in^2)	6.50	6.40
Sample Volume (cm^3)	422.92	412.38
Unit Wet Weight (g/cm^3)	1.92	2.04
Unit Wet Weight (pcf)	119.9	127.4
Unit Dry Weight (pcf)	103.5	106.1
Unit Dry Weight (g/cm^3)	1.66	1.70
Void Ratio, e	0.63	0.59
Porosity, n	0.39	0.37
Pore Volume (cm^3)	163.3	152.8
Total Weight of Sample After Test (g)		832.82

Tested By: JAB Date: 9/20/23 Checked By: JLK Date: 10/16/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a Method C

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Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-006	Sample No.:	8/10/23-2
Lab ID No.:	2023-370-006-001	Avg. Effective Consol. Pressure (psi):	50

Pressure Heads (Constant)	
Top Cap (psi)	42.0
Bottom Cap (psi)	48.0
Cell (psi)	95.0
Total Pressure Head (cm)	421.8
Hydraulic Gradient	42.22

Final Sample Dimensions	
Sample Length (cm), L	9.99
Sample Diameter (cm)	7.25
Sample Area (cm^2), A	41.27
Inflow Burette Area (cm^2), a-in	0.962
Outflow Burette Area (cm^2), a-out	0.962

AVERAGE PERMEABILITY = 3.4E-09 cm/sec @ 20°C

AVERAGE PERMEABILITY = 3.4E-11 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
10/4/2023	12	21	0.000	0.0	0.0	442.8	0	21.4	NA
10/5/2023	16	38	28.283	0.5	1.2	441.1	0	21.7	4.2E-09
10/7/2023	10	52	70.517	1.0	1.9	439.8	0	21.1	2.2E-09
10/8/2023	15	43	99.367	1.5	2.8	438.4	0	20.7	3.6E-09
10/10/2023	7	9	138.800	2.2	4.1	436.4	0	20.8	3.6E-09
10/12/2023	7	52	187.517	3.2	5.1	434.2	0	20.6	3.3E-09
10/13/2023	11	1	214.667	3.7	5.7	433.1	1	21.0	3.0E-09

Tested By: JAB Date: 9/20/23 Checked By: JLK Date: 10/16/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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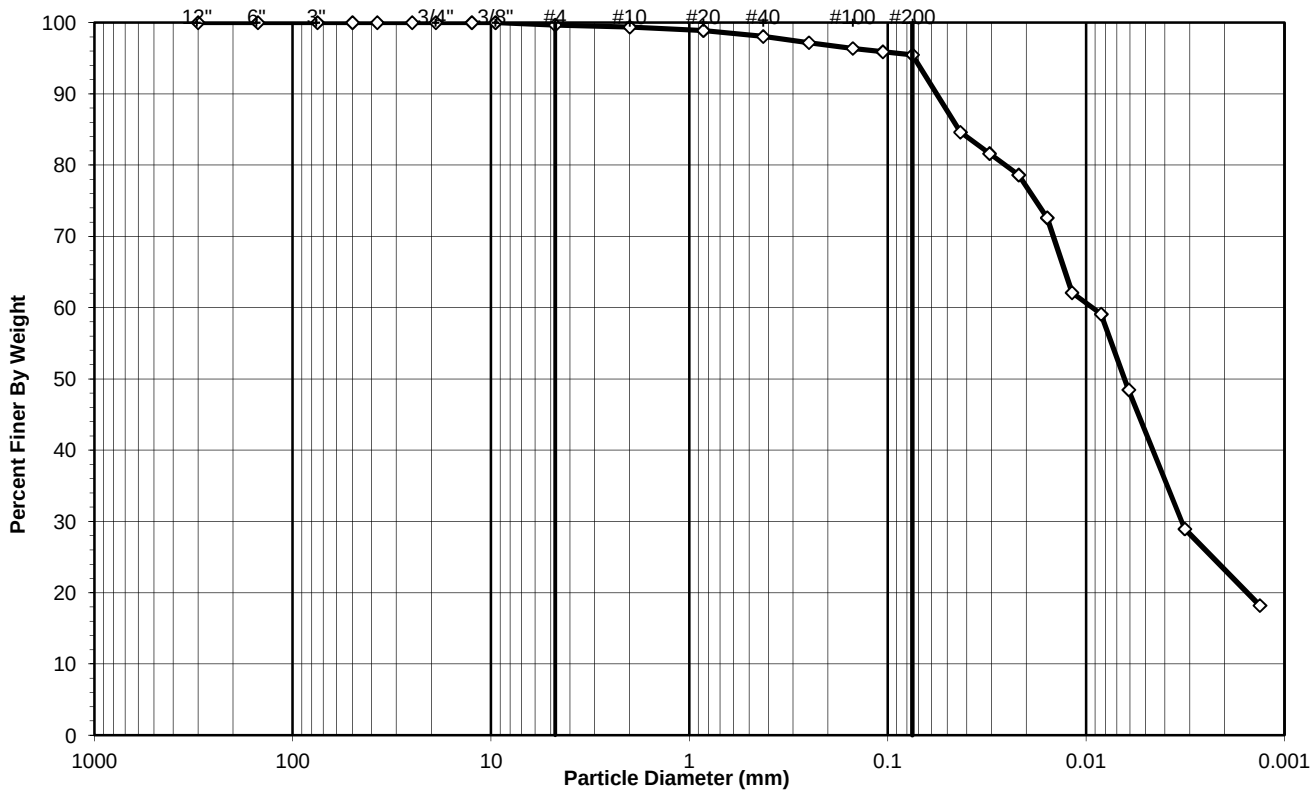
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-3
Lab ID:	2023-370-004-003	Soil Color:	Red

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**0.34**
#4 to #200	***Sand***	**4.19**
Finer than #200	***Silt & Clay***	**95.48**

USCS Symbol:
CL, TESTED

USCS Classification:
LEAN CLAY

Tested By DF Date 8/17/23 Checked By KC Date 8/23/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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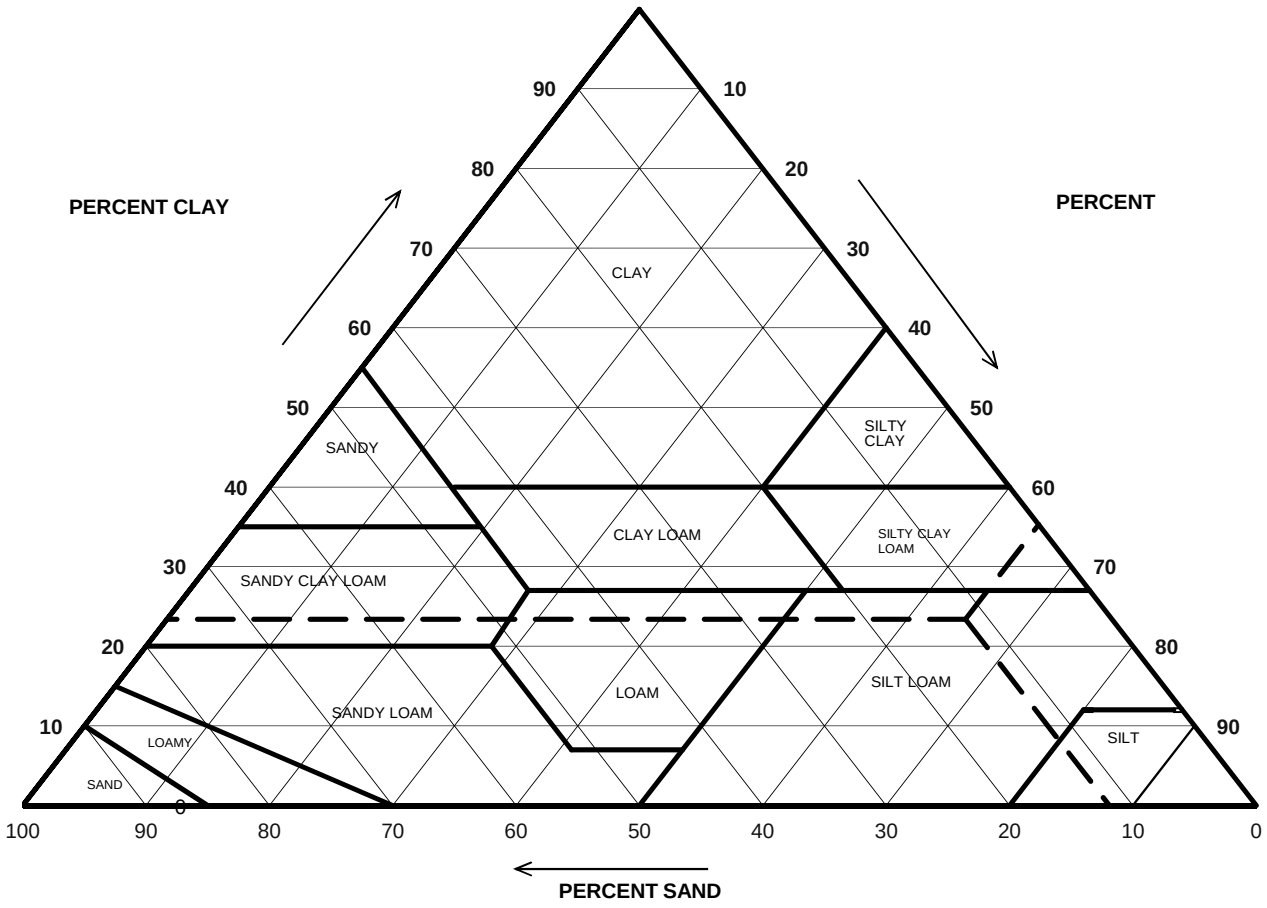
USDA CLASSIFICATION CHART

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-3
Lab ID:	2023-370-004-003	Soil Color:	Red



USDA SUMMARY				
Particle Size (mm)	**Percent Finer**		**Actual Percentage**	Corrected % of Minus 2.0 mm material for USDA Classification
		Gravel	**0.62**	
2	**99.38**	**Sand**	**11.82**	**11.89**
0.05	**87.56**	**Silt**	**64.33**	**64.73**
0.002	**23.23**	**Clay**	**23.23**	**23.37**

USDA Classification: SILT LOAM

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-3
Lab ID:	2023-370-004-003	Soil Color:	Red

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1422	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	1021.20	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	918.55	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	143.81	Weight of Tare (g):	NA
Weight of Water (g):	102.65	Weight of Water (g):	NA
Weight of Dry Soil (g):	774.74	Weight of Dry Soil (g):	NA
Moisture Content (%):	**13.2**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	774.74
Tare No. (Sub-Specimen)	1422	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	1021.20	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	143.81	Dry Weight of - 3/4" Sample (g):	774.74
Sub-Specimen Wet Weight (g):	877.39	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	774.74
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	2.60		0.34	0.34	99.66	**99.7**
#10	2	2.24		0.29	0.62	99.38	**99.4**
#20	0.85	3.82	(**)	0.49	1.12	98.88	**98.9**
#40	0.425	6.40		0.83	1.94	98.06	**98.1**
#60	0.25	6.70		0.86	2.81	97.19	**97.2**
#100	0.15	6.27		0.81	3.62	96.38	**96.4**
#140	0.106	3.66		0.47	4.09	95.91	**95.9**
#200	0.075	3.36		0.43	4.52	95.48	**95.5**
Pan	-	739.69		95.48	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	8/17/23	Checked By	KC	Date	8/23/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-3
Lab ID:	2023-370-004-003	Soil Color:	Red

Elapsed Time (min)	Reading rm	Temp. (C^0)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	34.5	23.2	6.33	10.8	0.0430	88.6	84.6
2	33.5	23.2	6.33	11.0	0.0307	85.5	81.6
4	32.5	23.2	6.33	11.2	0.0219	82.3	78.6
8	30.5	23.2	6.33	11.5	0.0157	76.1	72.6
15	27.0	23.2	6.33	12.2	0.0118	65.0	62.1
30	26.0	23.2	6.33	12.3	0.0084	61.9	59.1
60	22.5	23.1	6.36	13.0	0.0061	50.8	48.5
240	16.0	23.1	6.36	14.1	0.0032	30.3	28.9
1440	12.5	22.9	6.44	14.8	0.0013	19.1	18.2

Soil Specimen Data

Tare No.:	1913	Percent Finer than # 200:	95.48
Wt. of Tare & Dry Material (g):	130.11		
Weight of Tare (g):	93.68	Specific Gravity:	2.70 Assumed
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	31.43		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	G- 1819
Cylinder	G- 368
Thermometer	G- 1505
Balance	G- 657
#200 Sieve	G- 1944
Foam Inhibitor Used	No

Tested By TO Date 8/21/23 Checked By KC Date 8/23/23

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-3
Lab ID:	2023-370-004-003	Soil Description:	RED LEAN CLAY

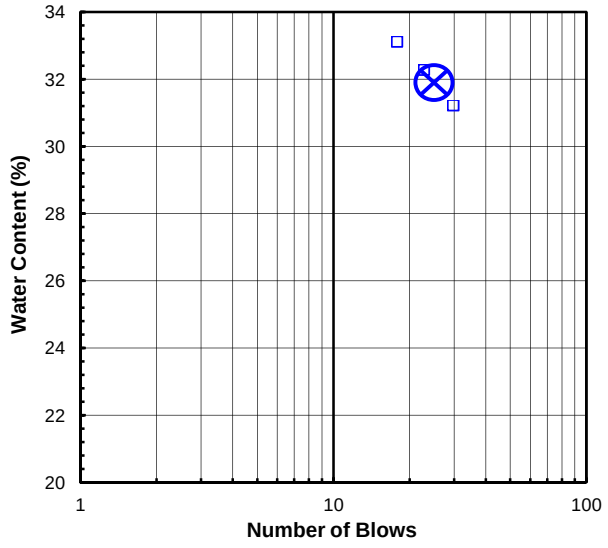
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Air dried)

As Received Moisture Content		Liquid Limit Test			
ASTM D2216-19		1	2	3	M
Tare Number:	3038	518	333	631	U
Wt. of Tare & Wet Sample (g):	290.63	44.11	44.39	42.41	L
Wt. of Tare & Dry Sample (g):	258.37	38.23	38.31	36.55	T
Weight of Tare (g):	8.13	19.38	19.46	18.84	I
Weight of Water (g):	32.3	5.9	6.1	5.9	P
Weight of Dry Sample (g):	250.2	18.9	18.9	17.7	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**12.9**	**31.2**	**32.3**	**33.1**	N
Number of Blows:		**30**	**23**	**18**	T

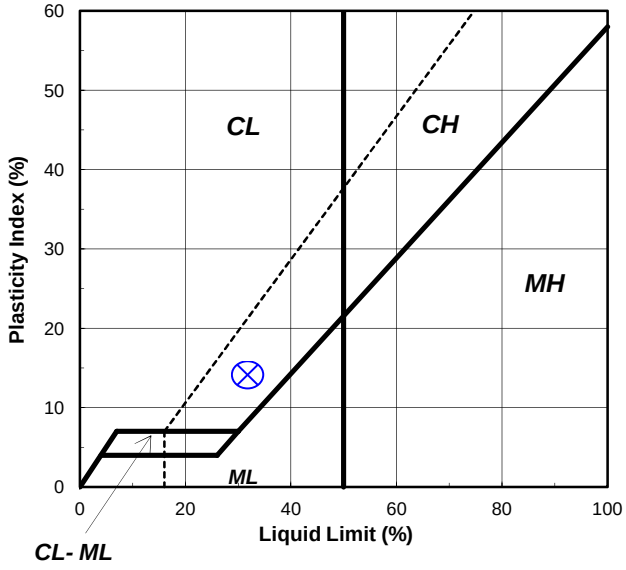
Plastic Limit Test	**1**	**2**	**Range**
Tare Number:	1289	293	
Wt. of Tare & Wet Sample (g):	27.49	25.32	
Wt. of Tare & Dry Sample (g):	26.52	24.27	
Weight of Tare (g):	21.08	18.33	
Weight of Water (g):	1.0	1.1	
Weight of Dry Sample (g):	5.4	5.9	
Moisture Content (%):	**17.8**	**17.7**	**0.2**
Note: The acceptable range of the two Moisture Contents is ±			1.12

Test Results	
Liquid Limit (%):	**32**
Plastic Limit (%):	**18**
Plasticity Index (%):	**14**
USCS Symbol:	**CL**

Flow Curve



Plasticity Chart



Tested By TO *Date* 8/21/23 *Checked By* JLK *Date* 8/22/23

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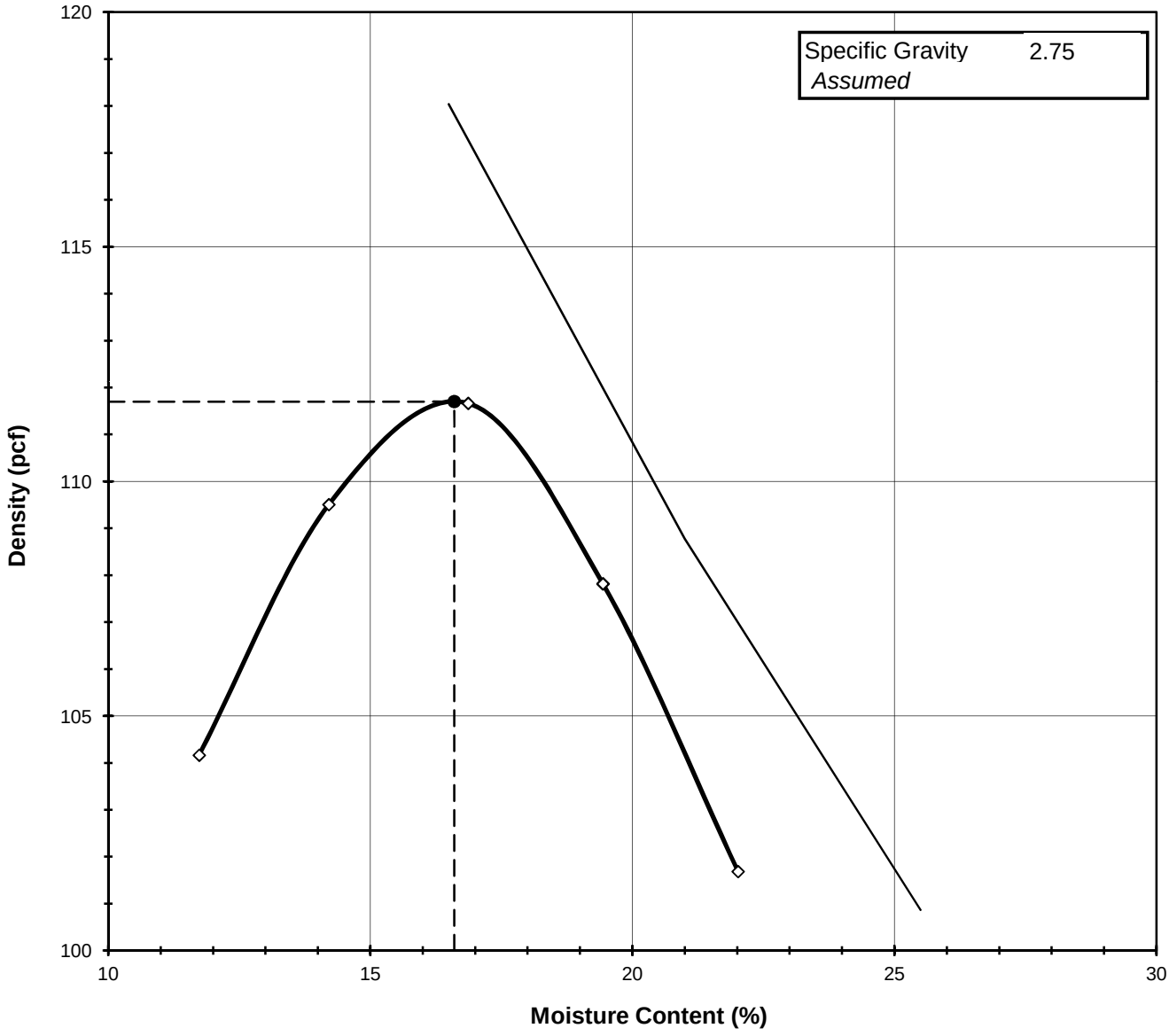
MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-3
Lab ID:	2023-370-004-003	Test Method	**STANDARD**

Visual Description: Red Clay

Optimum Moisture Content (%): 16.6
Maximum Dry Density (pcf): 111.7



Tested By *MLF* *Date* *8/21/23* *Checked By* *JLK* *Date* 8/23/23

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-3
Lab ID:	2023-370-004-003		

Visual Description: Red Clay

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity:	2.75
Percent Retained on 3/4":	NA
Percent Retained on 3/8":	NA
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	B

Test Type:	**STANDARD**
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	G441
Mold ID:	G1924
Mold diameter:	4"
Weight of the Mold (g):	4209
Volume of the Mold (cm^3):	942

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	5966	6097	6179	6153	6082
Weight of Mold (g):	4209	4209	4209	4209	4209
Weight of Wet Sample (g):	1757	1888	1970	1944	1873
Mold Volume (cm^3):	942	942	942	942	942

Moisture Content / Density

Tare Number:	916	886	629	595	599
Weight of Tare & Wet Sample (g):	406.82	406.67	409.33	405.40	409.30
Weight of Tare & Dry Sample (g):	375.59	369.66	362.62	353.50	350.47
Weight of Tare (g):	109.44	109.18	85.67	86.49	83.26
Weight of Water (g):	31.23	37.01	46.71	51.90	58.83
Weight of Dry Sample (g):	266.15	260.48	276.95	267.01	267.21

Wet Density (g/cm^3):	1.87	2.00	2.09	2.06	1.99
Wet Density (pcf):	116.4	125.1	130.5	128.8	124.1
Moisture Content (%):	**11.7**	**14.2**	**16.9**	**19.4**	**22.0**
Dry Density (pcf):	**104.2**	**109.5**	**111.7**	**107.8**	**101.7**

Zero Air Voids

Moisture Content (%):	16.5	21.0	25.5
Dry Unit Weight (pcf):	118.0	108.8	100.9

Tested By MLF *Date* 8/21/23 *Checked By* JLK *Date* 8/23/23

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October 12, 2023

Project No. 2023-370-007

Zach Wilder
GAI Consultants, Inc.
9850 Von Allmen Court
Louisville, KY 40241

Transmittal
Laboratory Test Results
GAI-AEP Amos Seq. 4 C130109.27

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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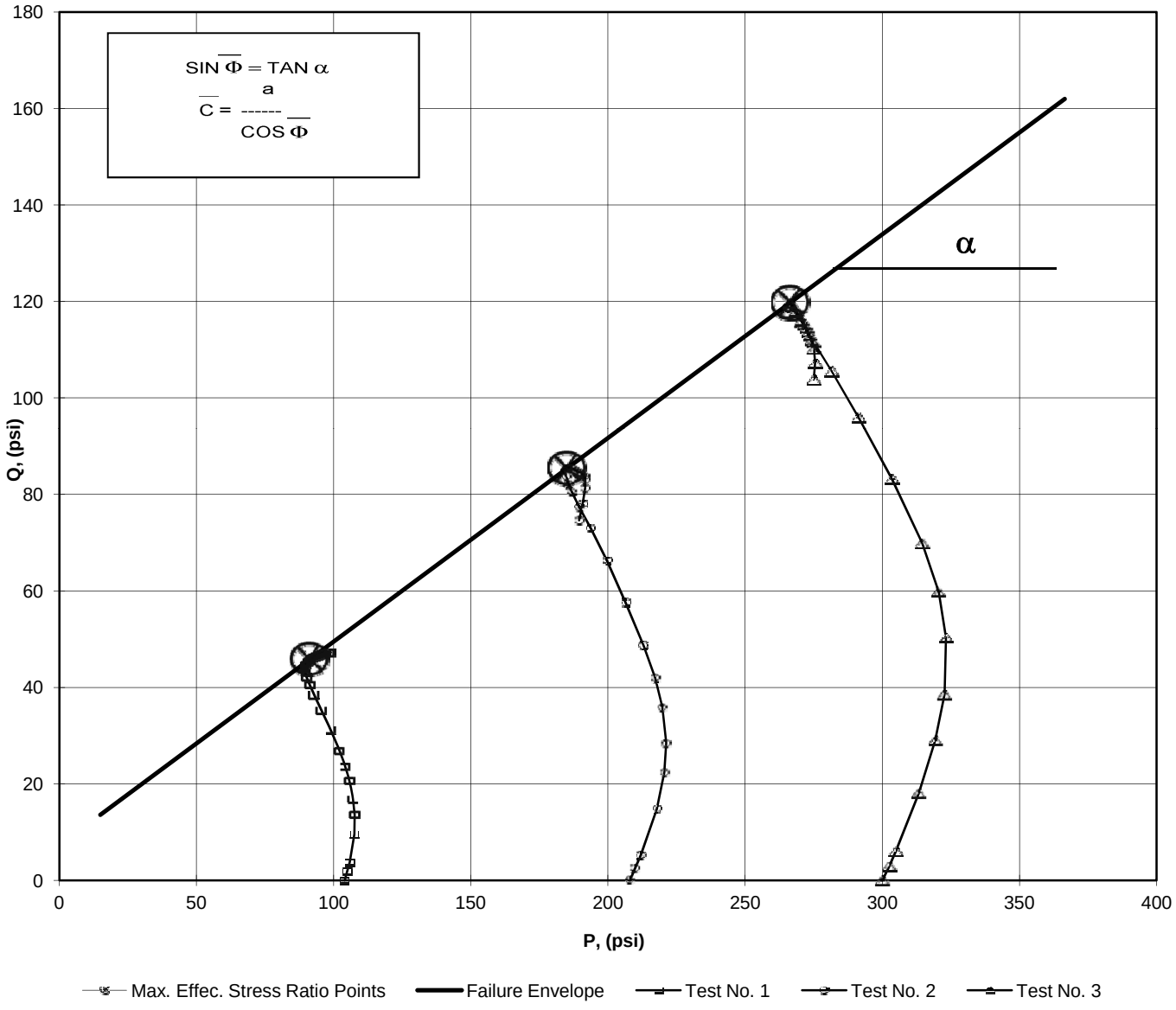
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID:	2023-370-007-001		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.00**	$\overline{C}$	=	**0.00**
α	=	**22.9**	$\overline{\Phi}$	=	**24.98**

Tested By: RPE Date: 10/2/23 Approved By: NJM Date: 10/12/23

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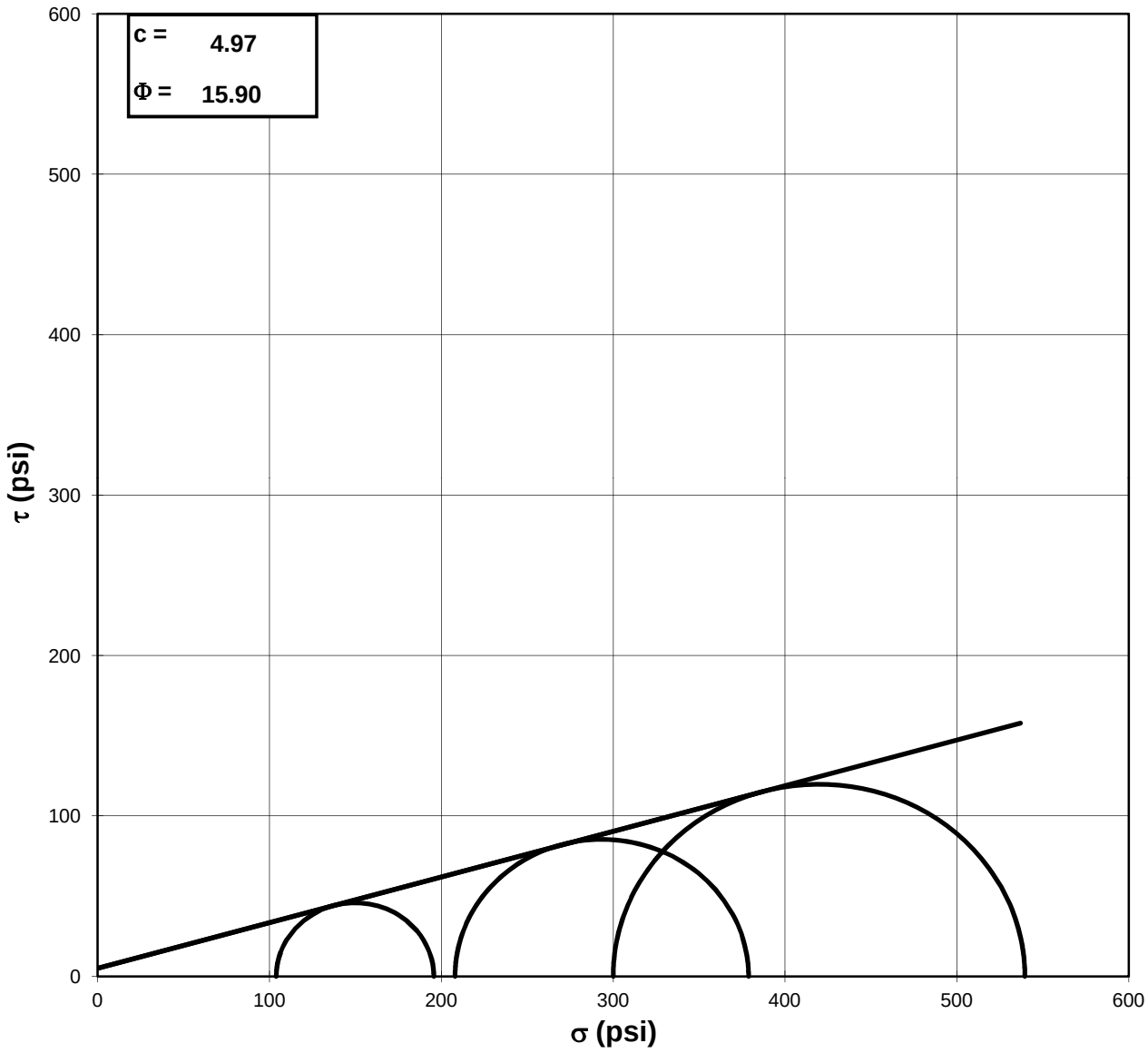
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID:	2023-370-007-001		
Visual Description:	Red Clay (Remolded)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: RPE *Date:* 10/2/23 *Approved By:* NJM *Date:* 10/12/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID:	2023-370-007-001		

Visual Description: Red Clay (Remolded)

Stage No.	1
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	136.0
Back Pressure (psi)	32.0
Eff. Conf. Pressure (psi)	104.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	91.34
Q	=	45.81

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	120.0
Final Burette Reading (ml)	46.05
Final Change (ml)	73.95
Initial Dial Reading (mil)	39
Dial Reading After Saturation (mil)	51
Dial Reading After Consolidation (mil)	265

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.9	0.000	32.1
24.0	0.001	32.9
45.9	0.002	33.9
114.7	0.008	38.0
162.3	0.013	41.9
199.9	0.019	45.7
245.3	0.028	50.8
281.7	0.037	55.4
320.9	0.049	60.8
373.0	0.070	68.2
424.0	0.098	75.7
465.5	0.132	81.7
494.2	0.167	85.5
518.0	0.209	88.2
531.2	0.239	89.4
545.8	0.283	90.5
561.3	0.339	90.9
575.2	0.396	90.8
585.6	0.439	90.5
598.3	0.501	89.8
605.2	0.546	89.2
612.4	0.590	88.5
620.2	0.633	87.9
625.6	0.662	87.4
630.5	0.692	87.0
635.6	0.723	86.5
640.3	0.753	86.1
647.1	0.798	85.5
653.3	0.842	84.8
657.8	0.871	84.3
662.8	0.900	83.9

Tested By: RPE Date: 10/2/23 Input Checked By: NJM Date: 10/12/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID:	2023-370-007-001		

Visual Description: Red Clay (Remolded)

Effective Confining Pressure (psi)	104.0	*Stage No.*	1
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	33.61
Length After Consolidation (in)	5.72
Area After Consolidation (in^2)	5.881

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	3.75	0.94	106.81	103.1	1.036	0.26	104.93	1.87
0.04	7.48	1.90	109.58	102.1	1.073	0.26	105.84	3.74
0.13	19.15	5.98	117.18	98.0	1.195	0.32	107.60	9.58
0.23	27.22	9.93	121.29	94.1	1.289	0.37	107.68	13.61
0.33	33.57	13.69	123.88	90.3	1.372	0.42	107.09	16.78
0.49	41.18	18.84	126.34	85.2	1.484	0.47	105.75	20.59
0.65	47.28	23.45	127.83	80.6	1.587	0.51	104.19	23.64
0.86	53.78	28.76	129.02	75.2	1.715	0.55	102.13	26.89
1.22	62.34	36.18	130.16	67.8	1.919	0.59	98.99	31.17
1.72	70.55	43.67	130.88	60.3	2.169	0.63	95.61	35.27
2.31	77.01	49.65	131.35	54.3	2.417	0.66	92.85	38.50
2.92	81.27	53.46	131.82	50.5	2.608	0.67	91.18	40.64
3.66	84.54	56.21	132.33	47.8	2.769	0.68	90.06	42.27
4.19	86.24	57.40	132.84	46.6	2.851	0.68	89.72	43.12
4.94	87.92	58.46	133.46	45.5	2.931	0.68	89.50	43.96
5.94	89.48	58.95	134.53	45.1	2.986	0.67	89.79	44.74
6.92	90.74	58.79	135.95	45.2	3.007	0.66	90.58	45.37
7.68	91.63	58.48	137.15	45.5	3.013	0.65	91.34	45.81
8.76	92.53	57.80	138.73	46.2	3.003	0.64	92.46	46.27
9.55	92.79	57.17	139.61	46.8	2.982	0.63	93.22	46.39
10.33	93.09	56.53	140.56	47.5	2.961	0.62	94.01	46.54
11.08	93.49	55.85	141.64	48.1	2.942	0.61	94.89	46.75
11.59	93.78	55.43	142.35	48.6	2.931	0.60	95.46	46.89
12.11	93.93	54.99	142.95	49.0	2.917	0.60	95.98	46.97
12.65	94.12	54.53	143.60	49.5	2.903	0.59	96.54	47.06
13.17	94.26	54.10	144.16	49.9	2.889	0.59	97.03	47.13
13.96	94.39	53.45	144.94	50.5	2.867	0.58	97.75	47.20
14.73	94.45	52.77	145.68	51.2	2.844	0.57	98.46	47.23
15.24	94.54	52.32	146.22	51.7	2.829	0.56	98.95	47.27
15.75	94.68	51.91	146.77	52.1	2.818	0.56	99.43	47.34

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID:	2023-370-007-001		

Visual Description: Red Clay (Remolded)

Stage No.	1
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	240.0
Back Pressure (psi)	32.0
Eff. Conf. Pressure (psi)	208.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	184.98
Q	=	85.38

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	144.0
Final Burette Reading (ml)	54.8
Final Change (ml)	89.2

Initial Dial Reading (mil)	38
Dial Reading After Saturation (mil)	52
Dial Reading After Consolidation (mil)	346

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.6	0.000	32.2
30.4	0.001	32.6
62.1	0.002	33.3
173.5	0.007	37.0
261.7	0.011	41.8
332.8	0.017	47.3
419.8	0.025	56.1
491.3	0.033	64.8
570.1	0.044	75.7
676.3	0.064	91.1
782.5	0.093	106.6
867.7	0.129	119.3
925.2	0.165	127.8
971.6	0.207	133.9
995.8	0.237	136.5
1021.8	0.278	138.8
1046.4	0.335	140.4
1065.7	0.395	140.4
1076.3	0.440	139.9
1086.9	0.500	138.6
1093.5	0.544	137.5
1099.8	0.588	136.4
1105.4	0.634	135.3
1111.0	0.664	134.3
1112.5	0.694	133.6
1115.2	0.724	132.4
1113.1	0.753	131.4
1099.7	0.798	129.6
1064.8	0.842	127.3
1024.8	0.872	125.2
964.1	0.903	122.8

Tested By: RPE Date: 10/2/23 Input Checked By: NJM Date: 10/12/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID:	2023-370-007-001		

Visual Description: Red Clay (Remolded)

Effective Confining Pressure (psi)	208.0	*Stage No.*	1
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	32.64
Length After Consolidation (in)	5.63
Area After Consolidation (in^2)	5.794

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	4.97	0.63	212.34	207.4	1.024	0.13	209.86	2.49
0.04	10.43	1.29	217.14	206.7	1.050	0.13	211.92	5.22
0.12	29.63	4.98	232.65	203.0	1.146	0.17	217.84	14.82
0.20	44.80	9.84	242.96	198.2	1.226	0.23	220.56	22.40
0.30	57.00	15.28	249.71	192.7	1.296	0.28	221.22	28.50
0.44	71.85	24.12	255.73	183.9	1.391	0.35	219.81	35.92
0.58	84.03	32.81	259.22	175.2	1.480	0.40	217.21	42.01
0.78	97.34	43.72	261.62	164.3	1.593	0.46	212.95	48.67
1.13	115.13	59.14	263.99	148.9	1.773	0.53	206.42	57.56
1.65	132.54	74.63	265.91	133.4	1.994	0.58	199.64	66.27
2.28	146.06	87.34	266.72	120.7	2.210	0.62	193.69	73.03
2.93	154.73	95.78	266.96	112.2	2.379	0.64	189.59	77.37
3.67	161.27	101.90	267.37	106.1	2.520	0.65	186.73	80.63
4.20	164.38	104.49	267.89	103.5	2.588	0.66	185.70	82.19
4.93	167.39	106.84	268.55	101.2	2.655	0.66	184.86	83.70
5.94	169.59	108.42	269.17	99.6	2.703	0.66	184.37	84.80
7.02	170.77	108.41	270.36	99.6	2.715	0.65	184.98	85.38
7.81	170.99	107.91	271.07	100.1	2.708	0.65	185.58	85.49
8.87	170.69	106.62	272.07	101.4	2.684	0.64	186.73	85.35
9.66	170.24	105.48	272.77	102.5	2.661	0.64	187.64	85.12
10.44	169.74	104.44	273.29	103.6	2.639	0.63	188.43	84.87
11.25	169.07	103.26	273.81	104.7	2.614	0.63	189.27	84.54
11.78	168.90	102.30	274.59	105.7	2.598	0.62	190.15	84.45
12.31	168.12	101.60	274.52	106.4	2.580	0.62	190.46	84.06
12.85	167.49	100.39	275.11	107.6	2.556	0.62	191.36	83.75
13.37	166.18	99.39	274.79	108.6	2.530	0.62	191.70	83.09
14.16	162.69	97.63	273.06	110.4	2.474	0.62	191.72	81.34
14.95	156.06	95.26	268.80	112.7	2.384	0.63	190.77	78.03
15.49	149.24	93.20	264.04	114.8	2.300	0.64	189.42	74.62
16.03	139.48	90.76	256.72	117.2	2.190	0.67	186.98	69.74

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID:	2023-370-007-001		

Visual Description: Red Clay (Remolded)

Stage No.	1
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	332.0
Back Pressure (psi)	32.0
Eff. Conf. Pressure (psi)	300.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	266.43
Q	=	119.76

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.941	Diameter 1:	2.867
Length 2:	5.941	Diameter 2:	2.867
Length 3:	5.941	Diameter 3:	2.867
Avg. Length:	5.941	*Avg. Diam.:*	2.867

VOLUME CHANGE

Initial Burette Reading (ml)	144.0
Final Burette Reading (ml)	44.3
Final Change (ml)	99.7

Initial Dial Reading (mil)	34
Dial Reading After Saturation (mil)	52
Dial Reading After Consolidation (mil)	390

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
1.6	0.000	32.0
35.3	0.001	32.5
70.8	0.002	33.1
208.0	0.005	36.7
333.8	0.010	41.7
443.8	0.015	47.9
578.9	0.023	59.1
688.3	0.030	71.2
806.5	0.041	87.4
962.8	0.061	111.6
1115.8	0.091	136.5
1235.8	0.126	156.0
1314.8	0.161	168.5
1375.4	0.202	177.4
1404.6	0.231	181.2
1433.1	0.272	184.1
1456.0	0.328	185.3
1469.7	0.388	184.7
1475.8	0.433	183.3
1480.1	0.490	181.2
1481.5	0.534	179.4
1483.2	0.580	177.3
1484.0	0.625	175.3
1484.8	0.655	173.9
1484.1	0.685	172.7
1481.8	0.715	171.1
1478.2	0.744	169.7
1468.5	0.789	167.1
1442.7	0.835	163.7
1406.1	0.866	160.8
1336.9	0.896	156.5

Tested By: RPE Date: 10/2/23 Input Checked By: NJM Date: 10/12/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID:	2023-370-007-001		

Visual Description: Red Clay (Remolded)

Effective Confining Pressure (psi)	300.0	*Stage No.*	1
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	5.94
Initial Sample Diameter (in)	2.87
Initial Sample Area (in^2)	6.46
Initial Sample Volume (in^3)	38.35

VOLUME CHANGE

Volume After Consolidation (in^3)	31.92
Length After Consolidation (in)	5.59
Area After Consolidation (in^2)	5.715

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	5.90	0.46	305.43	299.5	1.020	0.08	302.49	2.95
0.03	12.11	1.11	311.00	298.9	1.041	0.09	304.95	6.05
0.09	36.08	4.68	331.40	295.3	1.122	0.13	313.36	18.04
0.18	58.02	9.70	348.32	290.3	1.200	0.17	319.31	29.01
0.26	77.16	15.92	361.24	284.1	1.272	0.21	322.66	38.58
0.40	100.60	27.05	373.55	272.9	1.369	0.28	323.25	50.30
0.54	119.50	39.21	380.30	260.8	1.458	0.34	320.55	59.75
0.74	139.80	55.36	384.43	244.6	1.571	0.41	314.54	69.90
1.09	166.34	79.65	386.69	220.4	1.755	0.49	303.52	83.17
1.62	191.78	104.48	387.30	195.5	1.981	0.56	291.41	95.89
2.26	211.07	123.99	387.08	176.0	2.199	0.61	281.54	105.53
2.89	223.12	136.52	386.59	163.5	2.365	0.63	275.03	111.56
3.61	231.68	145.38	386.30	154.6	2.498	0.65	270.46	115.84
4.14	235.32	149.24	386.08	150.8	2.561	0.65	268.42	117.66
4.87	238.26	152.12	386.14	147.9	2.611	0.66	267.01	119.13
5.88	239.51	153.33	386.19	146.7	2.633	0.66	266.43	119.76
6.95	239.00	152.69	386.31	147.3	2.622	0.66	266.81	119.50
7.75	237.94	151.33	386.61	148.7	2.601	0.66	267.64	118.97
8.78	235.97	149.17	386.79	150.8	2.565	0.65	268.81	117.98
9.57	234.15	147.38	386.77	152.6	2.534	0.65	269.69	117.08
10.39	232.30	145.33	386.97	154.7	2.502	0.64	270.82	116.15
11.20	230.31	143.26	387.06	156.7	2.469	0.64	271.90	115.16
11.73	229.05	141.93	387.12	158.1	2.449	0.64	272.59	114.53
12.27	227.55	140.69	386.86	159.3	2.428	0.64	273.08	113.77
12.80	225.84	139.13	386.71	160.9	2.404	0.64	273.79	112.92
13.32	223.93	137.66	386.27	162.3	2.379	0.63	274.30	111.97
14.13	220.40	135.08	385.32	164.9	2.336	0.63	275.12	110.20
14.95	214.45	131.71	382.75	168.3	2.274	0.63	275.52	107.23
15.50	207.64	128.83	378.80	171.2	2.213	0.64	274.98	103.82
16.05	196.13	124.55	371.58	175.5	2.118	0.65	273.52	98.06

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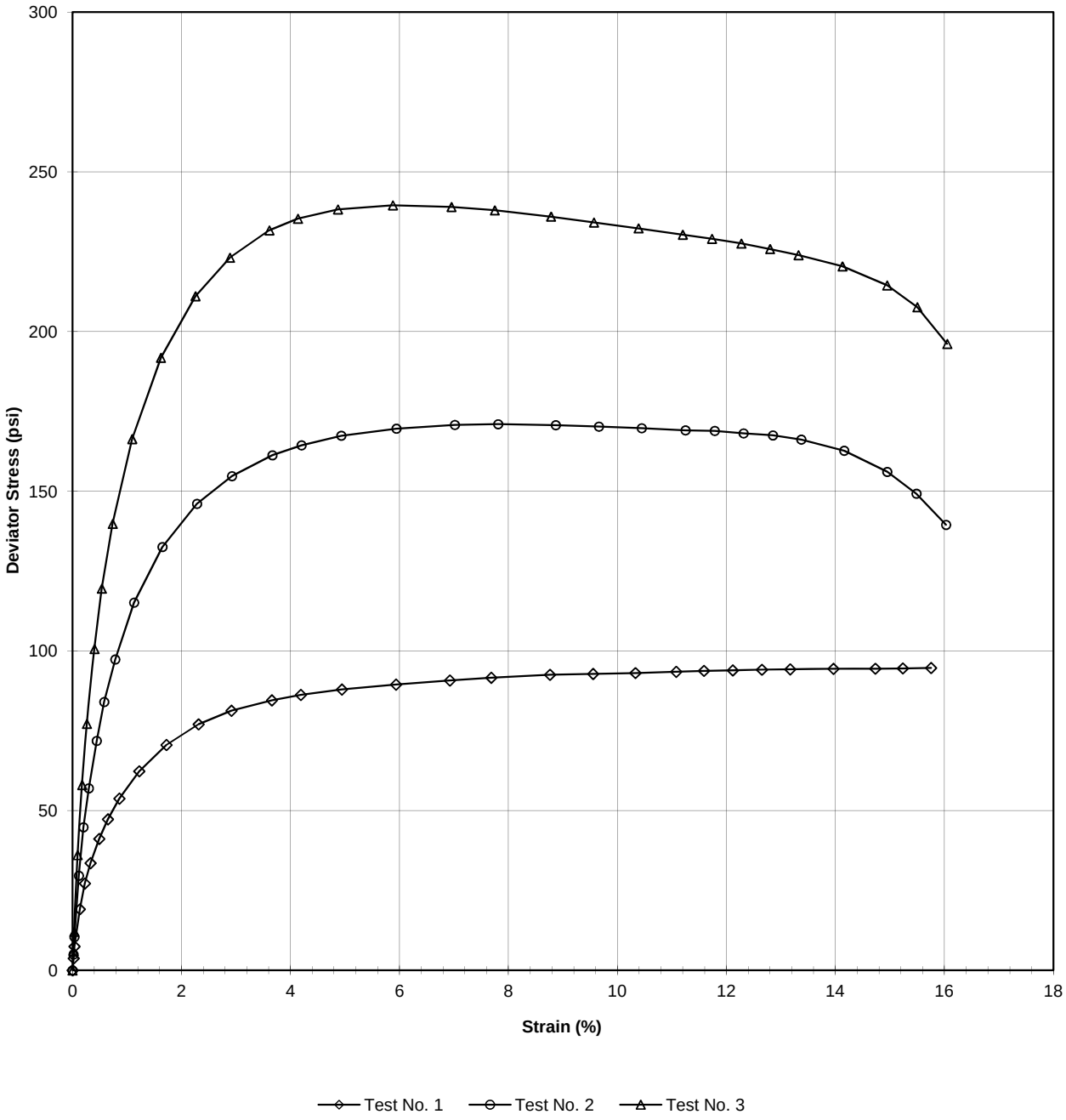
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID:	2023-370-007-001		
Visual Description:	Red Clay (Remolded)		



Tested By: RPE Date: 10/2/23 Approved By: NJM Date: 10/12/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	GAI Consultants, Inc.		
Client Reference:	AEP Amos seq. 4 C130109.27		
Project No.:	2023-370-007		
Lab ID:	2023-370-007-001	Specific Gravity (Assumed)	2.7
Visual Description:	Red Clay (Remolded)		

SAMPLE CONDITION SUMMARY

Boring No.:	AEP Amos	AEP Amos	AEP Amos
Depth (ft):	Seq. 4 Repair	Seq. 4 Repair	Seq. 4 Repair
Sample No.:	8/10/23-3	8/10/23-3	8/10/23-3
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.002	0.002	0.002
Back Pressure (psi)	32	32	32
Consolidation Time (days)	1	1	1
Moisture Content (%) (INITIAL)	16.8	16.8	16.8
Total Unit Weight (pcf)	123.9	123.9	123.9
Dry Unit Weight (pcf)	106.1	106.1	106.1
Moisture Content (%) (FINAL)	16.1	14.6	13.2
Initial State Void Ratio,e	0.589	0.589	0.589
Void Ratio at Shear, e	0.392	0.352	0.322

Tested By: RPE Date: 10/2/23 Input Checked By: NJM Date: 10/12/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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PERMEABILITY TEST

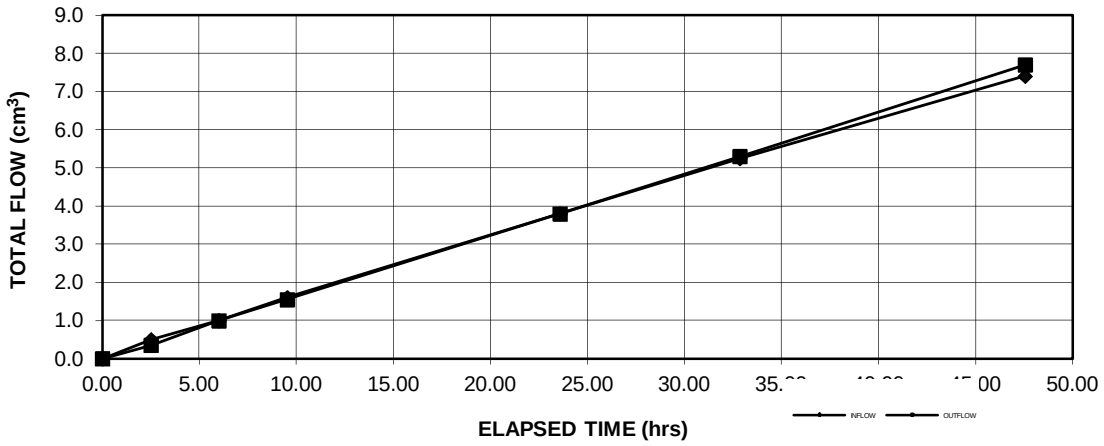
ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID No.:	2023-370-007-001	Avg. Effective Consol. Pressure (psi):	50

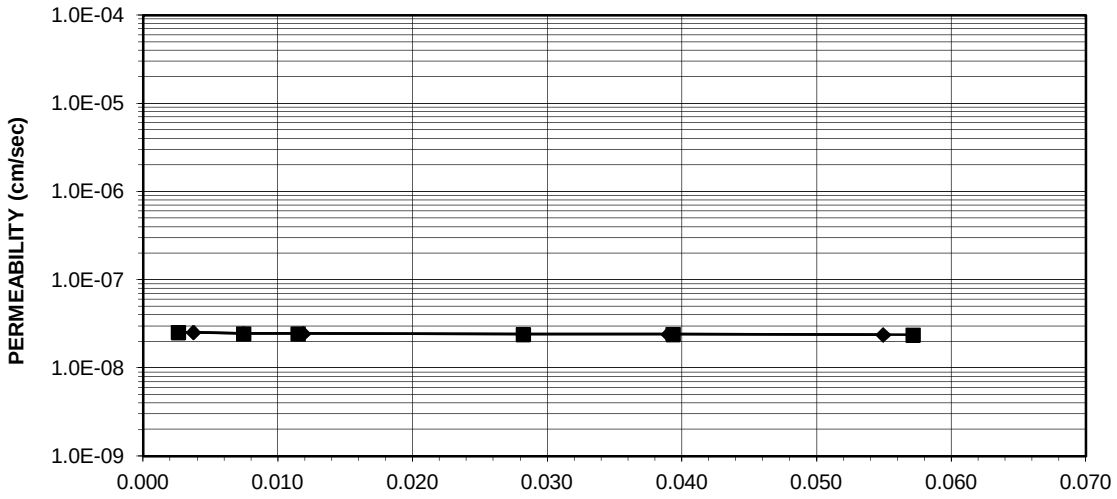
AVERAGE PERMEABILITY = 2.4E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.4E-10 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By:	JAB	Date:	9/20/23	Checked By:	JLK	Date:	10/12/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID No.:	2023-370-007-001	Avg. Effective Consol. Pressure (psi):	50

Specific Gravity:	2.70	Assumed
Sample Condition:		Remolded

Visual Description: Red Clay

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	598	565
Weight of Tare & Wet Sample (g)	253.86	925.81
Weight of Tare & Dry Sample (g)	229.76	795.89
Weight of Tare (g)	84.21	82.18
Weight of Water (g)	24.10	129.92
Weight of Dry Sample (g)	145.55	713.71
Moisture Content (%)	**16.6**	**18.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	2153.30	NA
Weight of Tube (g)	1315.30	NA
Weight of Wet Sample (g)	838.00	849.83
Length 1 (in)	3.970	3.907
Length 2 (in)	3.970	3.912
Length 3 (in)	3.970	3.891
Top Diameter (in)	2.877	2.849
Middle Diameter (in)	2.877	2.804
Bottom Diameter (in)	2.877	2.823
Average Length (in)	3.97	3.90
Average Area (in^2)	6.50	6.27
Sample Volume (cm^3)	422.92	401.02
Unit Wet Weight (g/cm^3)	1.98	2.12
Unit Wet Weight (pcf)	123.7	132.3
Unit Dry Weight (pcf)	106.1	111.9
Unit Dry Weight (g/cm^3)	1.70	1.79
Void Ratio, e	0.59	0.51
Porosity, n	0.37	0.34
Pore Volume (cm^3)	156.6	134.7
Total Weight of Sample After Test (g)		844.45

Tested By: JAB Date: 9/20/23 Checked By: JLK Date: 10/12/23

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PERMEABILITY TEST

ASTM D 5084-16a Method C

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Project:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-007	Sample No.:	8/10/23-3
Lab ID No.:	2023-370-007-001	Avg. Effective Consol. Pressure (psi):	50

Pressure Heads (Constant)	
Top Cap (psi)	42.0
Bottom Cap (psi)	48.0
Cell (psi)	95.0
Total Pressure Head (cm)	421.8
Hydraulic Gradient	42.55

Final Sample Dimensions	
Sample Length (cm), L	9.91
Sample Diameter (cm)	7.18
Sample Area (cm^2), A	40.45
Inflow Burette Area (cm^2), a-in	0.962
Outflow Burette Area (cm^2), a-out	0.962
B Parameter (%)	95

AVERAGE PERMEABILITY = 2.4E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.4E-10 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
10/9/23	7	33	0.000	0.0	0.0	442.8	0	20.7	NA
10/9/23	10	3	2.500	0.5	0.4	441.9	0	21.2	2.5E-08
10/9/23	13	33	6.000	1.0	1.0	440.7	0	21.3	2.4E-08
10/9/23	17	4	9.517	1.6	1.6	439.6	0	21.3	2.4E-08
10/10/23	7	8	23.583	3.8	3.8	435.0	0	20.8	2.4E-08
10/10/23	16	24	32.850	5.3	5.3	431.9	0	21.4	2.4E-08
10/11/23	7	6	47.550	7.4	7.7	427.2	1	21.2	2.4E-08

Tested By: JAB Date: 9/20/23 Checked By: JLK Date: 10/12/23

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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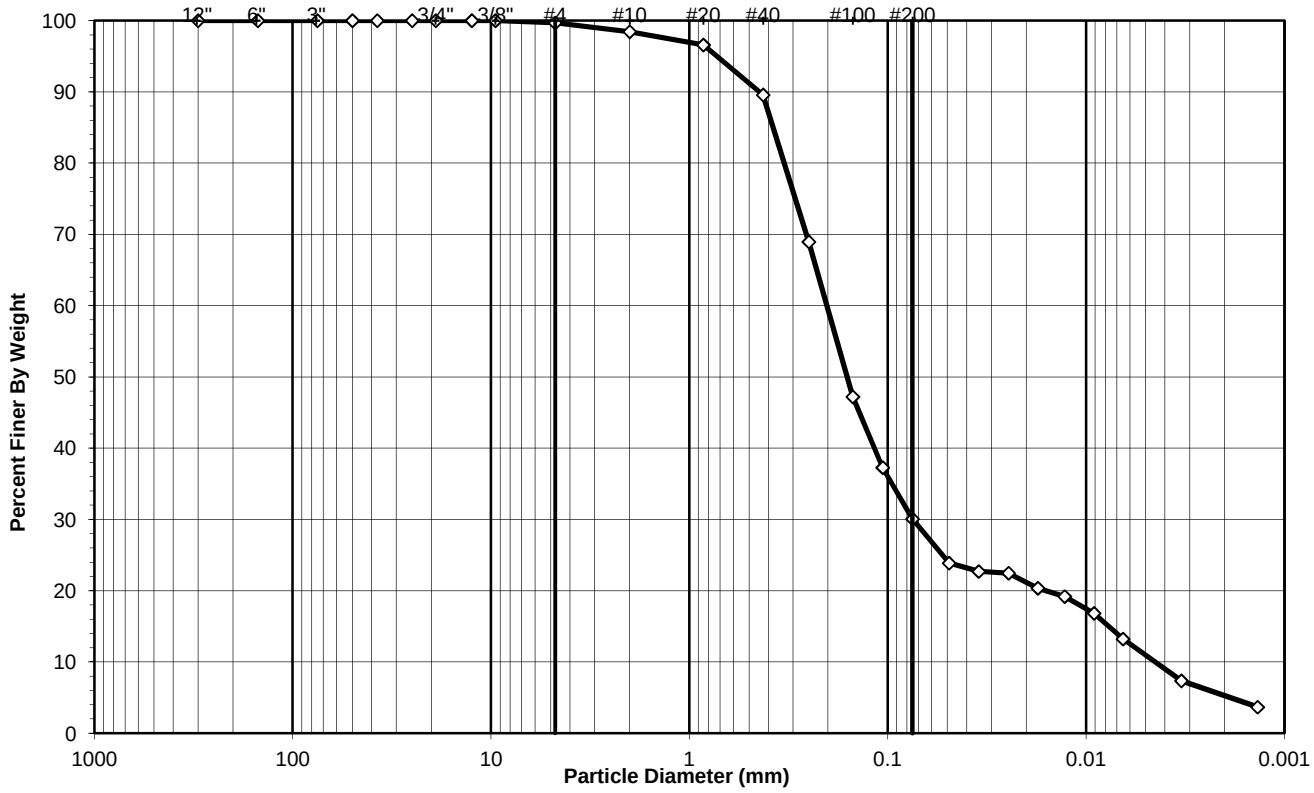
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-4
Lab ID:	2023-370-004-004	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**0.33**
#4 to #200	***Sand***	**69.60**
Finer than #200	***Silt & Clay***	**30.07**

USCS Symbol:
SM, TESTED

D50 = 0.16

USCS Classification:
SILTY SAND
(NON-PLASTIC FINES)

Tested By DF Date 8/18/23 Checked By BRB Date 8/23/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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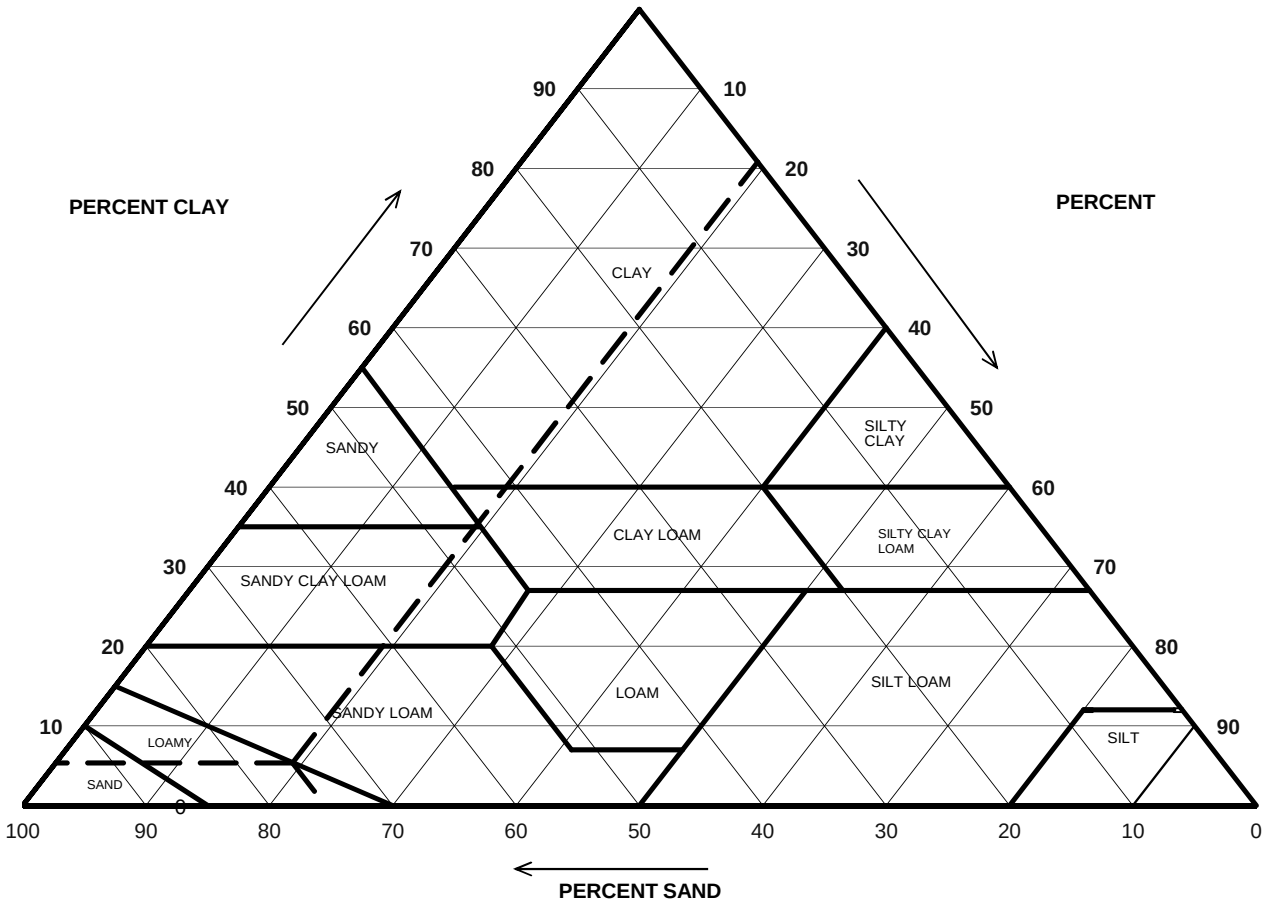
USDA CLASSIFICATION CHART

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-4
Lab ID:	2023-370-004-004	Soil Color:	Brown



USDA SUMMARY				
Particle Size (mm)	**Percent Finer**		**Actual Percentage**	Corrected % of Minus 2.0 mm material for USDA Classification
		Gravel	**1.56**	
2	**98.44**	**Sand**	**74.28**	**75.46**
0.05	**24.15**	**Silt**	**18.90**	**19.20**
0.002	**5.25**	**Clay**	**5.25**	**5.34**

USDA Classification: LOAMY SAND

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-4
Lab ID:	2023-370-004-004	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1502	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	1078.11	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	954.33	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	145.92	Weight of Tare (g):	NA
Weight of Water (g):	123.78	Weight of Water (g):	NA
Weight of Dry Soil (g):	808.41	Weight of Dry Soil (g):	NA
Moisture Content (%):	**15.3**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	808.41
Tare No. (Sub-Specimen)	1502	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	1078.11	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	145.92	Dry Weight of - 3/4" Sample (g):	808.41
Sub-Specimen Wet Weight (g):	932.19	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	808.41
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	2.67		0.33	0.33	99.67	**99.7**
#10	2	9.96		1.23	1.56	98.44	**98.4**
#20	0.85	15.00	(**)	1.86	3.42	96.58	**96.6**
#40	0.425	56.64		7.01	10.42	89.58	**89.6**
#60	0.25	166.66		20.62	31.04	68.96	**69.0**
#100	0.15	175.85		21.75	52.79	47.21	**47.2**
#140	0.106	80.30		9.93	62.73	37.27	**37.3**
#200	0.075	58.25		7.21	69.93	30.07	**30.1**
Pan	-	243.08		30.07	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	8/18/23	Checked By	BRB	Date	8/23/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-4
Lab ID:	2023-370-004-004	Soil Color:	Brown

Elapsed Time (min)	Reading rm	Temp. (C^0)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	16.5	23.2	6.33	14.1	0.0491	79.4	23.9
2	16.0	23.2	6.33	14.1	0.0348	75.5	22.7
4	15.9	23.2	6.33	14.2	0.0246	74.7	22.5
8	15.0	23.2	6.33	14.3	0.0175	67.7	20.4
15	14.5	23.2	6.33	14.4	0.0128	63.8	19.2
30	13.5	23.2	6.33	14.6	0.0091	56.0	16.8
60	12.0	23.1	6.36	14.9	0.0065	44.0	13.2
240	9.5	23.1	6.36	15.3	0.0033	24.5	7.4
1440	8.0	22.9	6.44	15.6	0.0014	12.2	3.7

Soil Specimen Data

Tare No.:	1463	Percent Finer than # 200:	30.07
Wt. of Tare & Dry Material (g):	114.81		
Weight of Tare (g):	97.14	Specific Gravity:	2.70 Assumed
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	12.67		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	G- 1819
Cylinder	G- 356
Thermometer	G- 1505
Balance	G- 657
#200 Sieve	G- 1944
Foam Inhibitor Used	No

Tested By TO Date 8/21/23 Checked By BRB Date 8/23/23

ATTERBERG LIMITS

ASTM D 4318-17

Client:	GAI Consultants, Inc.	Boring No.:	AEP Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-4
Lab ID:	2023-370-004-004	Color:	Brown
			(MInus No. 40 sieve material)

As Received
Water Content

Tare Number	286
Wt. of Tare & Wet Sample (g)	209.26
Wt. of Tare & Dry Sample (g)	182.65
Weight of Tare (g)	8.06
Weight of Water (g)	26.61
Weight of Dry Sample (g)	174.59
Water Content (%)	**15.2**

NON - PLASTIC MATERIAL

Tested By FS *Date* 8/24/23 *Checked By* JLK *Date* 8/25/23

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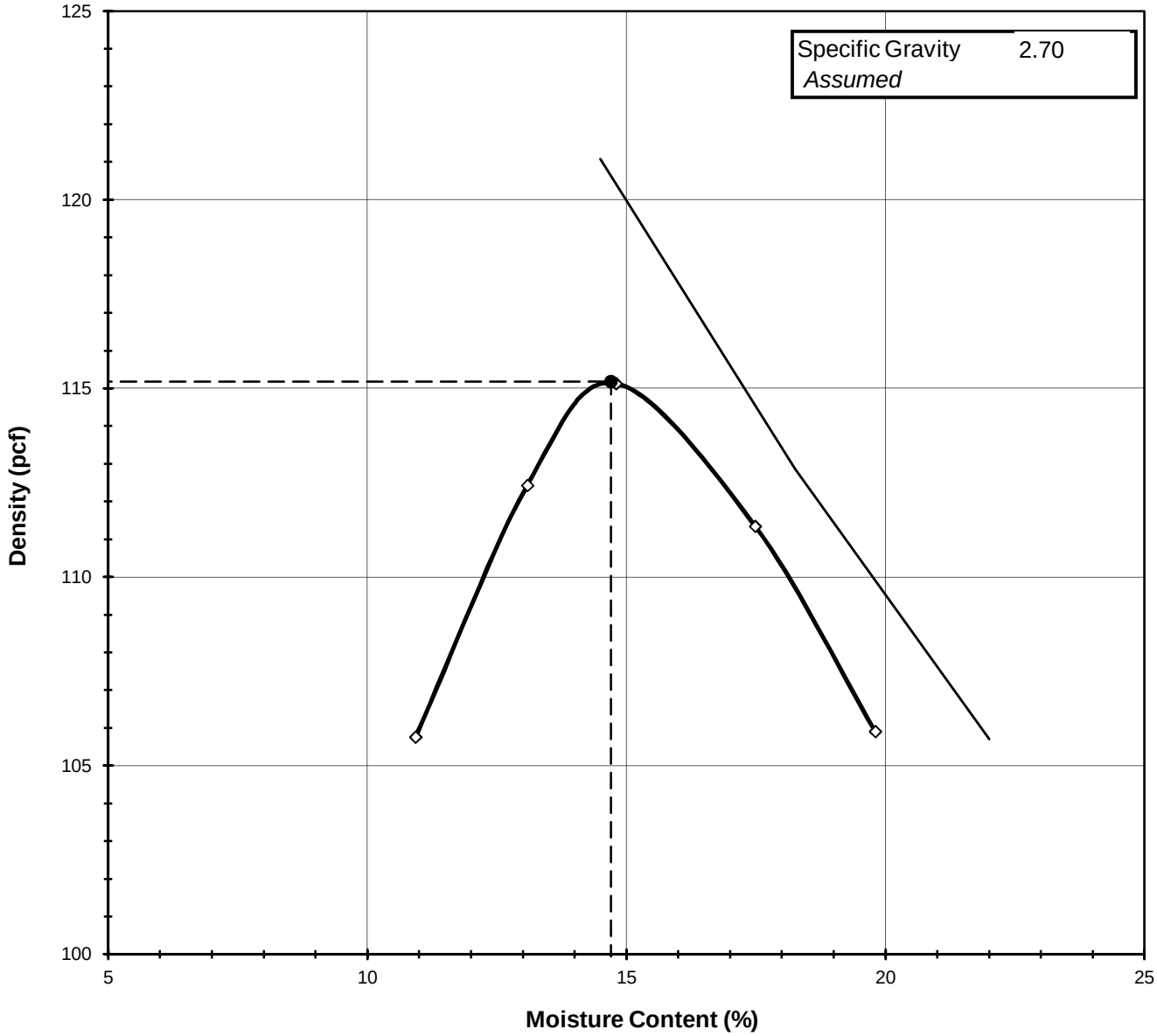
MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	Aep Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-4
Lab ID:	2023-370-004-004	Test Method	**STANDARD**

Visual Description: Brown Clay with Rocks

Optimum Moisture Content (%): 14.7
Maximum Dry Density (pcf): 115.2



Tested By MLF *Date* 8/24/23 *Checked By* KC *Date* 8/25/23

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-12

Client:	GAI Consultants, Inc.	Boring No.:	Aep Amos
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Seq. 4 Repair
Project No.:	2023-370-004	Sample No.:	8/10/23-4
Lab ID:	2023-370-004-004		

Visual Description: Brown Clay with Rocks

Total Weight of the Sample (g):	NA
As Received Water Content (%):	NA
Assumed Specific Gravity:	2.70
Percent Retained on 3/4":	NA
Percent Retained on 3/8":	NA
Percent Retained on #4:	NA
Oversize Material:	Not included
Procedure Used:	C

Test Type:	**STANDARD**
Rammer Weight (lb):	5.5
Rammer Drop (in):	12
Rammer Type:	MECHANICAL
Machine ID:	G774
Mold ID:	G1776
Mold diameter:	6"
Weight of the Mold (g):	5570
Volume of the Mold (cm^3):	2127

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Weight of Mold & Wet Sample (g):	9569	9904	10075	10029	9895
Weight of Mold (g):	5570	5570	5570	5570	5570
Weight of Wet Sample (g):	3999	4334	4505	4459	4325
Mold Volume (cm^3):	2127	2127	2127	2127	2127

Moisture Content / Density

Tare Number:	897	912	582	565	562
Weight of Tare & Wet Sample (g):	457.32	452.89	452.49	455.06	452.53
Weight of Tare & Dry Sample (g):	423.01	413.22	404.92	399.54	391.63
Weight of Tare (g):	109.11	110.14	83.48	82.01	84.10
Weight of Water (g):	34.31	39.67	47.57	55.52	60.90
Weight of Dry Sample (g):	313.90	303.08	321.44	317.53	307.53

Wet Density (g/cm^3):	1.88	2.04	2.12	2.10	2.03
Wet Density (pcf):	117.3	127.1	132.2	130.8	126.9
Moisture Content (%):	**10.9**	**13.1**	**14.8**	**17.5**	**19.8**
Dry Density (pcf):	**105.8**	**112.4**	**115.1**	**111.3**	**105.9**

Zero Air Voids

Moisture Content (%):	14.5	18.3	22.0
Dry Unit Weight (pcf):	121.1	112.9	105.7

Tested By MLF *Date* 8/24/23 *Checked By* KC *Date* 8/25/23

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RJ LEE GROUP
DELIVERING SCIENTIFIC RESOLUTION

LABORATORY REPORT

Geotechnics
544 Braddock Ave.
East Pittsburgh, PA 15112
ATTENTION: Kelly Cummings
Telephone: 412-823-7600

Report Date:	July 19, 2023
Samples Received:	July 7, 2023
RJ Lee Group Job No.:	PA070720230006
Client Project No.:	2023-370-003
Purchase Order No.:	N/A

ANALYSIS: Phase ID and Quantification of Crystalline Phases by X-ray Diffraction (XRD)
METHOD: Rietveld Method

Samples were received at RJ Lee Group in good condition. Each sample was ground to a fine powder and then placed into a back-loaded sample holder for analysis. The specimens were analyzed utilizing a PANalytical Empyrean diffractometer using Cu Kα radiation from 4-75° 2Θ with a step size of 0.008° 2Θ for 240 seconds/step.

The resulting diffraction patterns were then analyzed using X'Pert HighScore Plus search-match software utilizing the ICDD PDF4+ database to identify the phases present. The diffraction patterns, and a corresponding legend illustrating peak matching results are shown in Figures 1-4.

HighScore Plus was also utilized to attempt to quantify the phases present in each sample by Rietveld refinement. Rietveld refinement is a full-pattern fitting method, the goal of which is to use structural data from the PDF4+ database to construct a calculated profile that is as similar as possible to the measured profile of the sample, as obtained by XRD. By refining the model, the differences between the two profiles are minimized and each phase can be quantified. Additionally, a known amount of internal standard (zincite, ZnO) was spiked into each sample and modeled along with the other crystalline phases present. Modelling of a standard in this way and then inputting into the software the actual percentage of standard that was added allows for determination of percentage of amorphous material present.

Phase identification and quantification results are shown in Table 1 below.

Results indicate that the samples are mainly comprised of quartz, mica/illite, chlorite group, calcite and amorphous material. Due to the poorly crystalline nature of clays, the amorphous content may also include some of the clay concentrations (illite, chlorite). Trace amounts of hematite and feldspar were also present.

Table 1. Quantification by Rietveld Method

Phase*	Approximate Composition**	61523-1 001 (Weight %)	61523-2 002 (Weight %)	61523-3 003 (Weight %)	61523-4 004 (Weight %)
Quartz	SiO_2	23	20	21	16
Mica/Illite	$K(Al,Mg,Fe)_2(AlSi_3O_{10})(F,OH)_2$	19	18	20	21
Chlorite Group	$(Mg,Al,Fe,Ni,Mn)_6Al(Al,Si_3)O_{10}(OH)_8$	7	8	9	4
Calcite	$CaCO_3$	7	7	7	9
Feldspar (Albite)	$NaAlSi_3O_8$	< 1	< 1	< 1	< 1
Hematite	Fe_2O_3	1	1	1	1
Amorphous+	-	43	46	43	48

***Amorphous content, crystalline phases present at trace levels and phases that are not currently part of the ICDD PDF 4+ database may remain unidentified.**
****Compositions are approximate and represent an idealized formula for that structure, not including possible elemental substitutions into that crystal structure.**
+Due to the poorly crystalline nature of clay(s), the amorphous content may also include some of the clay phase concentrations (chlorite, illite).

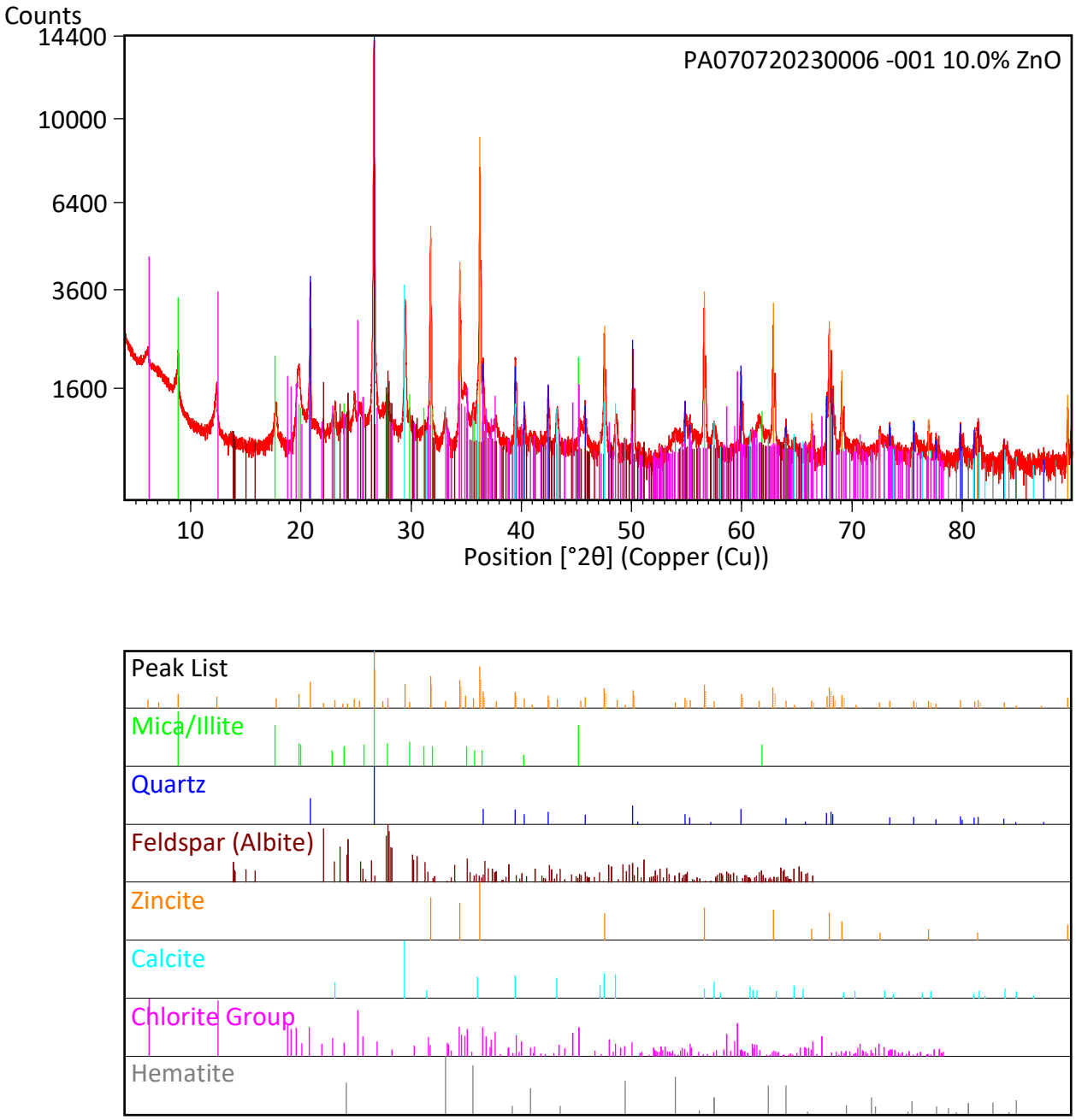

Figure 1 – X-ray diffraction pattern for sample *"61523-1"* (RJ Lee Group Sample *001*), with degrees 2Θ along the x-axis and intensity (counts) along the y-axis (top). Corresponding legend showing the matching patterns (bottom).

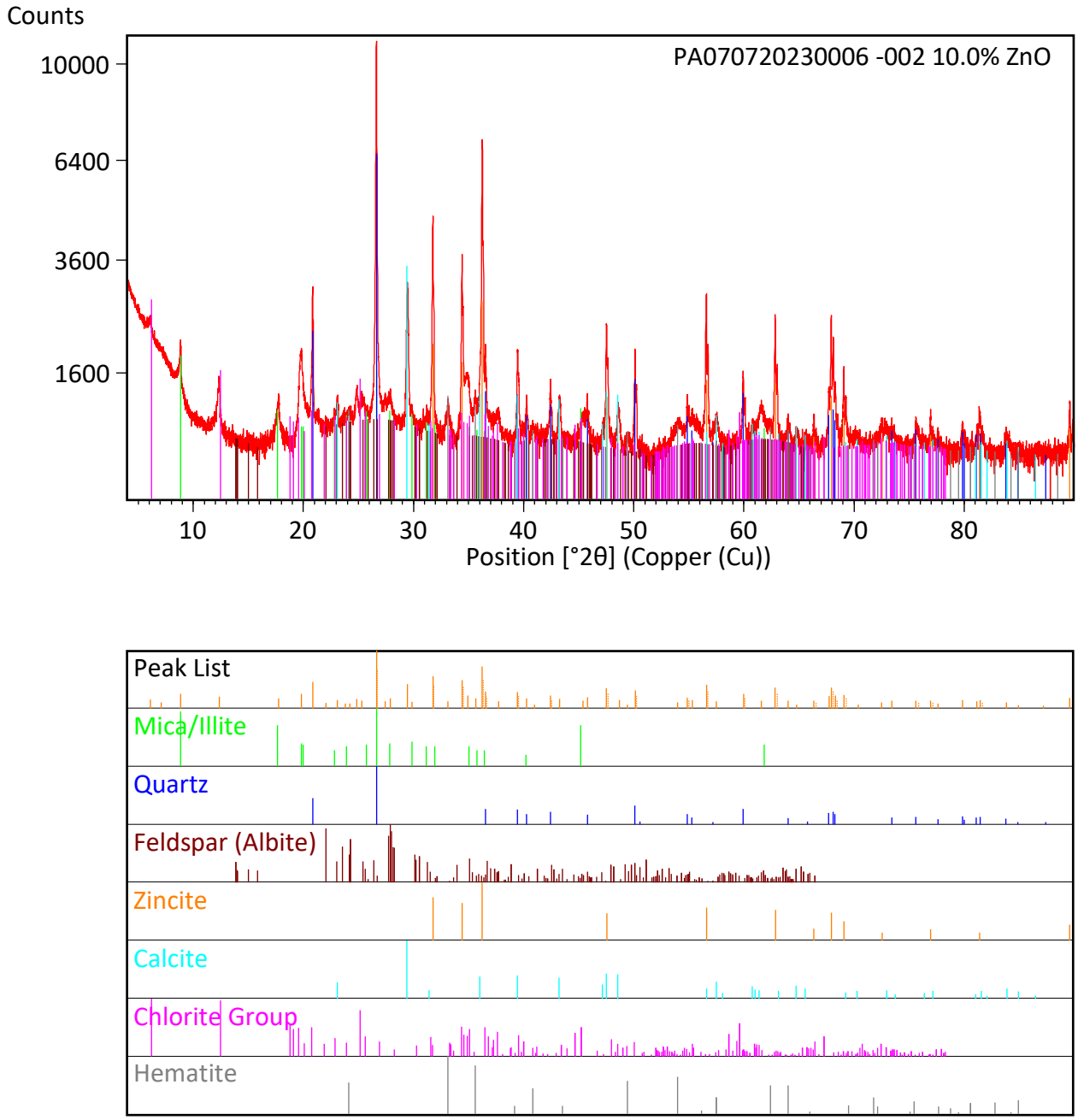

Figure 2 – X-ray diffraction pattern for sample *"61523-2"* (RJ Lee Group Sample *002*), with degrees 2Θ along the x-axis and intensity (counts) along the y-axis (top). Corresponding legend showing the matching patterns (bottom).

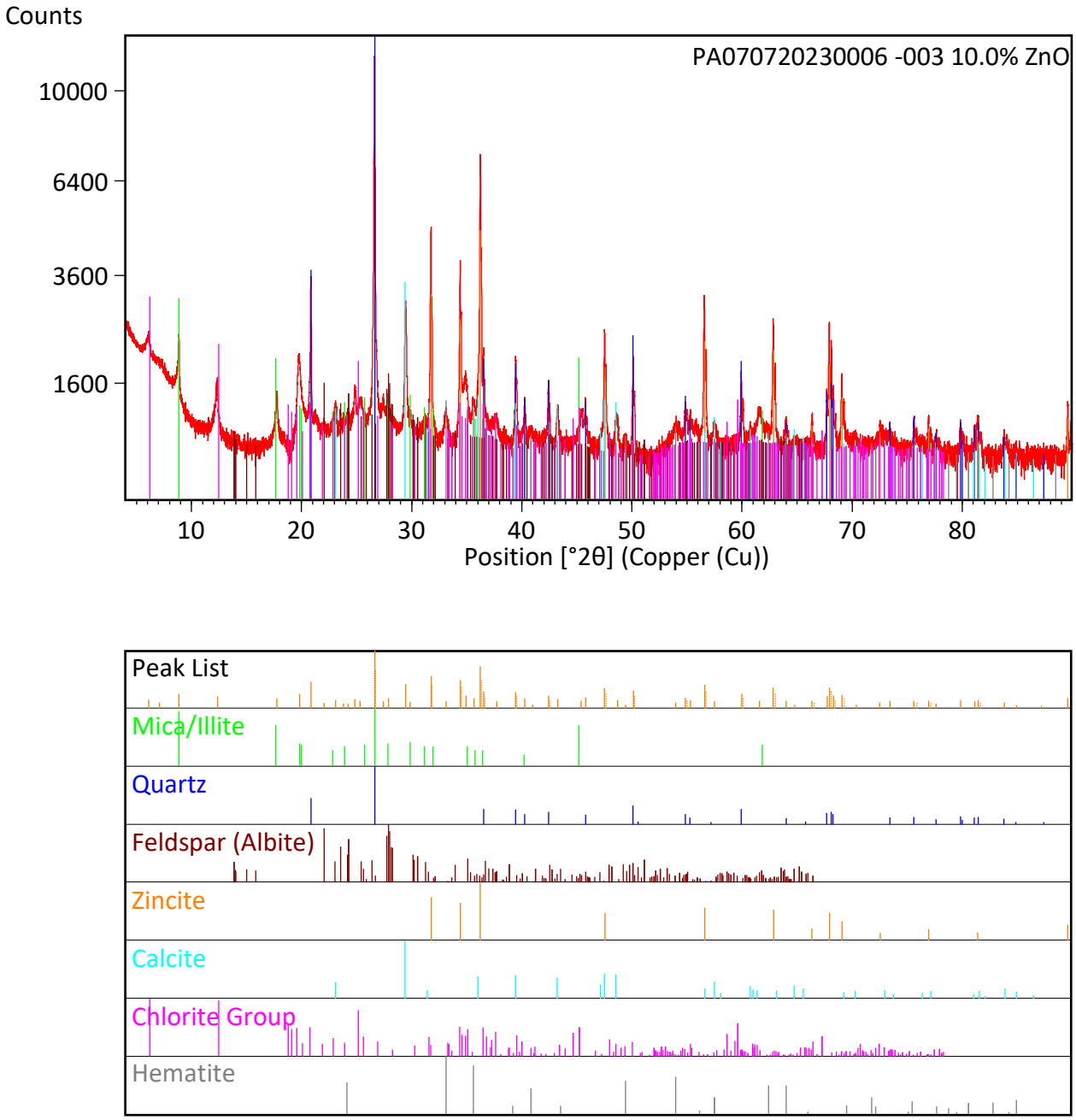

Figure 3 – X-ray diffraction pattern for sample *"61523-3"* (RJ Lee Group Sample *003*, with degrees 2Θ along the x-axis and intensity (counts) along the y-axis (top). Corresponding legend showing the matching patterns (bottom).

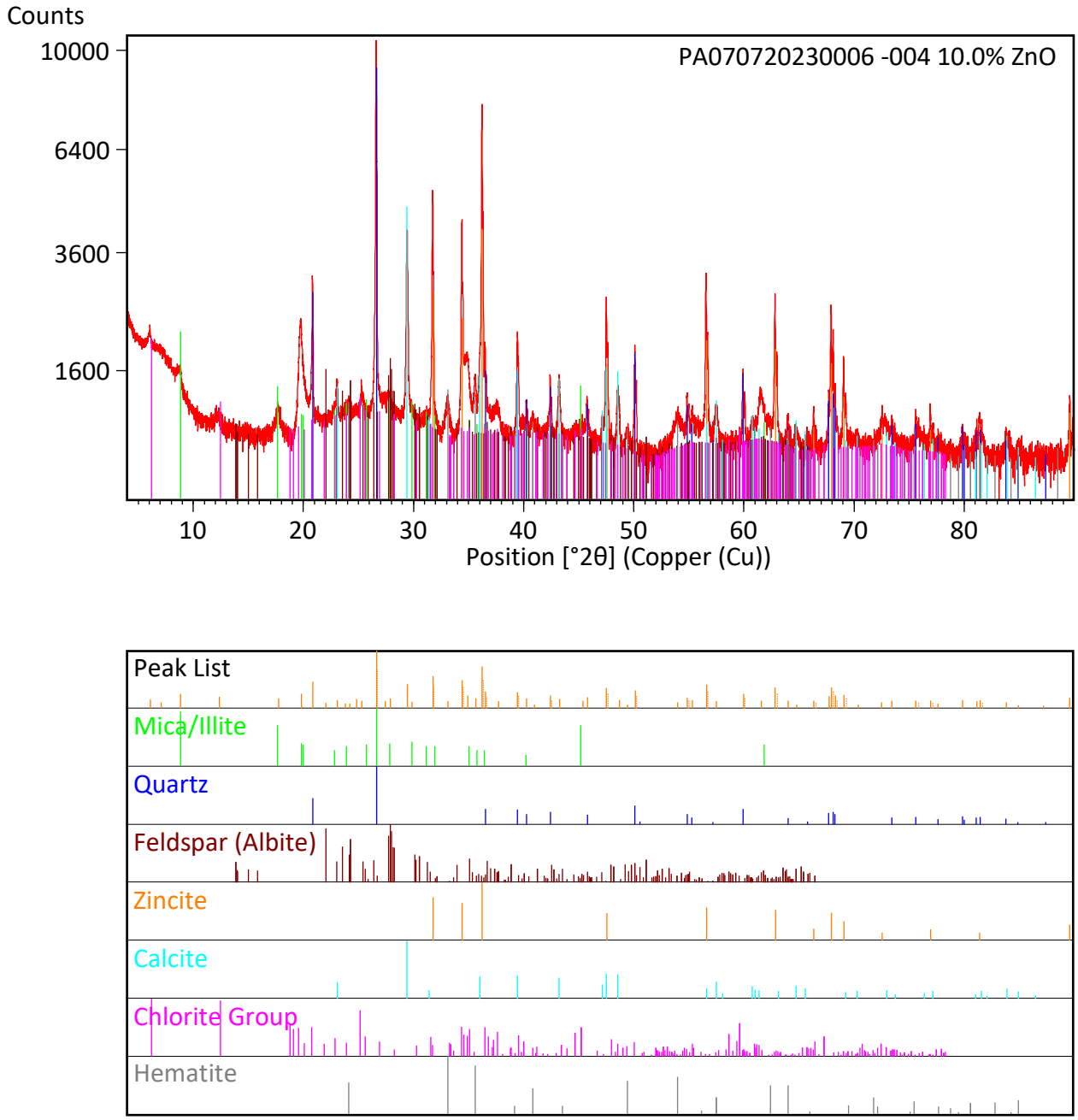

Figure 4 – X-ray diffraction pattern for sample *"61523-4"* (RJ Lee Group Sample *004*), with degrees 2Θ along the x-axis and intensity (counts) along the y-axis (top). Corresponding legend showing the matching patterns (bottom).

These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which the results are used or interpreted. The results contained in this report relate only to the items tested or to the sample(s) as received by the laboratory. Data supplied by the client that can affect the validity of the results has been clearly identified. Measurement of uncertainty data available upon request. Any reproduction of this document must be in full for the report to be valid. Unless notified to return the samples covered by this report, RJ Lee Group will store them for a period of thirty (30) days before discarding.
This laboratory operates in accord with ISO 17025:2017 guidelines and holds a limited scope of accreditation. Please refer to http://www.rjlg.com/about-us/accreditations/ for more information and current status.

Please feel free to contact us should you have any questions regarding this analysis or if we can be of further assistance to you.

Sincerely,

Heather L. Adamson

Heather L. Adamson, Manager XRD/XRF

A2LA ACCREDITED
CERT #3985.01

Agricultural Analytical Services Laboratory
The Pennsylvania State University
111 Ag Analytical Svcs Lab
University Park, PA 16802
(814) 863-0841 aaslab@psu.edu www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
K CUMMINGS GEOTECHNICS 544 BRADDOCK AVE EAST PITTSBURGH PA 15112	TYLER VOLPE GEOTECHNICS 544 BRADDOCK AVE EAST PITTSBURGH PA 15112

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
07/13/2023	S23-40006		Allegheny			370-003-001	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	8.4				
[2]Phosphorus (P)	5	ppm			
[2]Potassium (K)	148	ppm			
[2]Magnesium (Mg)	666	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: NONE

Magnesium (Mg): NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Disturbed Lands	0	120	140	0	*See ST2 for other crop recommendations*

80 lb/A of the N recommendation should be from a slow release source. When available, use manure or other organic material to supply this slow release N.

2	0	0	0	*See ST2 for other crop recommendations*	

3	0	0	0	*See ST2 for other crop recommendations*	

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	*See back for comments* Zinc ppm	Copper ppm	Sulfur ppm
8213	0.0	20.9	1.8	26.5	71.7				0.6	2.0	33.7

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high calcium level in this sample indicates the probable presence of soluble calcium. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable calcium level of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county Extension office.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results Normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. These are not used to make recommendations but rather to identify potential deficiencies of Zn and S or toxicity of Cu. While Zn and S deficiencies are not common in PA, they may occur on soils testing below the normal range. Zn deficiencies are more likely to occur when soil levels are low and soil pH 7.0 or higher, especially on lighter soils. Recent research in Pennsylvania on sulfur fertility suggests that when the Mehlich 3 S level is below 15 ppm, there is an approximately 50% chance that yield will increase by adding S fertilizer. When Mehlich 3 S levels are above 15 ppm, S is usually adequate and there is a very low chance of a yield increase from adding S fertilizer. Both Zn or S deficiencies should be confirmed with plant analysis. Cu toxicity may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	15 - 25

Distribution of Soil Test Results Summaries of soil test results may be used in educational programs. However, individual results will not be released outside of Penn State without permission of the client. Electronic copies of your results are available to you, contact the lab for more information.

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
07/13/2023	S23-40007		Allegheny			370-003-002	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	8.0				
[2]Phosphorus (P)	7	ppm			
[2]Potassium (K)	152	ppm			
[2]Magnesium (Mg)	786	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: NONE

Magnesium (Mg): NONE

Calcium Carbonate equivalent

Plant Nutrients:

(If manure will be applied, adjust these recommendations accordingly. See back of report.)

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Disturbed Lands	0	120	120	0	*See ST2 for other crop recommendations*

80 lb/A of the N recommendation should be from a slow release source. When available, use manure or other organic material to supply this slow release N.

2	0	0	0	*See ST2 for other crop recommendations*	

3	0	0	0	*See ST2 for other crop recommendations*	

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	*See back for comments* Zinc ppm	Copper ppm	Sulfur ppm
8140	0.0	21.9	1.8	29.9	68.4				0.7	1.9	28.3

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

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5324

Agronomy

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Agricultural Analytical Services Laboratory
The Pennsylvania State University
111 Ag Analytical Svcs Lab
University Park, PA 16802
(814) 863-0841 aaslab@psu.edu www.aasl.psu.edu

SOIL TEST REPORT FOR:	ADDITIONAL COPY TO:
K CUMMINGS GEOTECHNICS 544 BRADDOCK AVE EAST PITTSBURGH PA 15112	TYLER VOLPE GEOTECHNICS 544 BRADDOCK AVE EAST PITTSBURGH PA 15112

DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
07/13/2023	S23-40008		Allegheny			370-003-003	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	8.4				
[2]Phosphorus (P)	7	ppm			
[2]Potassium (K)	141	ppm			
[2]Magnesium (Mg)	770	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: NONE

Magnesium (Mg): NONE

Calcium Carbonate equivalent

Plant Nutrients: ***(If manure will be applied, adjust these recommendations accordingly. See back of report.)***

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Disturbed Lands	0	120	120	0	*See ST2 for other crop recommendations*

80 lb/A of the N recommendation should be from a slow release source. When available, use manure or other organic material to supply this slow release N.

2	0	0	0	*See ST2 for other crop recommendations*	

3	0	0	0	*See ST2 for other crop recommendations*	

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	*See back for comments* Zinc ppm	Copper ppm	Sulfur ppm
8109	0.0	21.8	1.7	29.5	68.9				0.7	1.6	33.1

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high calcium level in this sample indicates the probable presence of soluble calcium. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable calcium level of 15 meq/100 g.

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Agronomy

Recommendation Messages

Enclosures

ST-2 Fertilizer Recommendation Table Guidelines for making recommendations for other crops and for adjusting for a different expected yield.

ST-4 Interpreting Soil Tests for Agronomic Crops Explains the soil test report and provides additional information on the recommendations.

Soil Nutrient Levels Soil nutrient levels are given as parts per million (ppm) elemental P, K , and Mg. As a rule of thumb to convert ppm to lb/A multiply ppm x 2. The elemental results in lb/A can be converted to oxide forms using the following conversions: P x 2.3=P_2O_5, K x 1.2=K_2O, Mg x 1.6=MgO

Below Optimum-Nutrient is deficient. There should be an economic response to adding the recommended nutrient.	**Optimum-**Nutrient is adequate. There will be no yield response to adding more of a nutrient but a recommendation is made to replace what the crop removes and thus maintain the soil test in the optimum range.	**Above Optimum-**The nutrient is more than adequate. Not only will there not be a yield response but the soil nutrient levels are also adequate to accommodate crop removal.

Recommendations N,P, and K recommendations are made for three crop years on this field. New samples should be taken after 3 years. The recommendations for the 2nd and 3rd year assume that the earlier recommendations were followed. These recommendations are based on the results of the soil test and the information provided with the sample. If you think that there is an error on the report, contact the lab at the address on the front of the report. Tables that can be used to adjust or change recommendations for all crops based on the soil test can be found on the web at: www.aasl.psu.edu.

Limestone Recommendations The recommended limestone application should be adequate for 3 years. Limestone recommendations are based on 100% calcium carbonate equivalent limestone and assume "Fine-sized" limestone with 95% passing 20 mesh, 60% passing 60 mesh and 50% passing 100 mesh. Use "ST-2 Liming Materials Conversion Table (enclosed) to adjust for limestone quality. Also see Agronomy Facts #3 "Soil Acidity and Aglime".

Magnesium Only one Mg Recommendation is made for three years. Magnesium is most economically applied by using a limestone containing Mg. Low Mg levels in soils may result in low Mg levels in forage crops especially if a significant amount of N and/or K fertilizer is applied. This can result in potentially fatal grass tetany in animals. Use caution if grazing. Apply the recommended Mg and be sure your feed rations are properly balanced.

Starter Fertilizer Starter fertilizer is important to get a corn crop off to a good start when planting in cold, wet conditions. However, on optimum or higher testing soils, as planting dates get later and soils warm up, the benefit from starter fertilizer goes down. An N only starter is often adequate when soil test levels are above optimum. The correct material, rate, and placement for starter fertilizer are critical to be effective. See Agronomy Facts #51 "Starter Fertilizer".

Nitrogen Nitrogen recommendations on this report are not based on a soil test. They are based on crop requirements for the expected yield of the crop to be grown. The pre-sidedress nitrate soil tests (PSNT) and the Chlorophyll meter test are both available for improving nitrogen recommendations on corn especially when manure is being applied. See: Agronomy Facts 17 "Pre-sidedress Soil Nitrate Test for Corn" and Agronomy Facts 53 "The Early-season Chlorophyll Meter Test for Corn". For optimum efficiency, N should be applied as close to the time of crop need as practical. For corn apply 50-90% of the N when the corn is 10-20" tall. For winter grains apply the N in the spring prior to growth stage 5. For forage grasses split the recommended N for each cutting.

Manure Manure is a very important part of a fertility program. Manure applications may supply all or most of the nutrients recommended and in some cases may apply significantly more than the crop requires. Manure nutrients should be taken into account in developing your fertility program. For details on how to do this see the Penn State Agronomy Guide. Manure analysis kits are available through your county Extension office.

Very High Soil Test Levels Very high soil test levels should be avoided as much as possible. High soil nutrient levels might not only represent an economic loss but they may also indicate potential crop, animal or environmental problems.

Very high pH can results in micronutrient deficiencies and may affect the activity of some pesticides resulting in injury or poor pest control.

Very high phosphorus levels in the soil may lead to crop production problems especially with no manure and may result in potentially harmful P loss to the environment. Best management practices may be necessary to reduce the potential for environmental problems with P.

Zinc, Copper and Sulfur Results Normal ranges for zinc (Zn) copper (Cu), and sulfur (S) in Pennsylvania soils are listed below. These are not used to make recommendations but rather to identify potential deficiencies of Zn and S or toxicity of Cu. While Zn and S deficiencies are not common in PA, they may occur on soils testing below the normal range. Zn deficiencies are more likely to occur when soil levels are low and soil pH 7.0 or higher, especially on lighter soils. Recent research in Pennsylvania on sulfur fertility suggests that when the Mehlich 3 S level is below 15 ppm, there is an approximately 50% chance that yield will increase by adding S fertilizer. When Mehlich 3 S levels are above 15 ppm, S is usually adequate and there is a very low chance of a yield increase from adding S fertilizer. Both Zn or S deficiencies should be confirmed with plant analysis. Cu toxicity may occur at levels testing well above the normal range, but have not been observed in Pennsylvania in agronomic crops even on soils testing 2 to 3 times above the normal range. For additional information, see ST4.

Normal ranges of Zn, Cu and S in Pennsylvania Soils (Mehlich 3)		
Zn (ppm)	Cu (ppm)	S (ppm)
1.1 - 9.4	1.2 - 5.5	15 - 25

Distribution of Soil Test Results Summaries of soil test results may be used in educational programs. However, individual results will not be released outside of Penn State without permission of the client. Electronic copies of your results are available to you, contact the lab for more information.

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DATE	LAB #	SERIAL #	COUNTY	ACRES	ASCS ID	FIELD ID	SOIL
07/13/2023	S23-40009		Allegheny			370-003-004	

SOIL NUTRIENT LEVELS			Below Optimum	Optimum	Above Optimum
[1]Soil pH	8.3				
[2]Phosphorus (P)	1	ppm			
[2]Potassium (K)	151	ppm			
[2]Magnesium (Mg)	315	ppm			

RECOMMENDATIONS: *(See back messages for important information)*

Limestone*: NONE

Magnesium (Mg): NONE

Calcium Carbonate equivalent

Plant Nutrients:

(If manure will be applied, adjust these recommendations accordingly. See back of report.)

Year	Crop	Expected Yield	Nitrogen (lb N/A)	Phosphate (lb P_2O_5/A)	Potash (lb K_2O/A)	
1	Disturbed Lands	0	120	140	0	*See ST2 for other crop recommendations*

80 lb/A of the N recommendation should be from a slow release source. When available, use manure or other organic material to supply this slow release N.

2	0	0	0	*See ST2 for other crop recommendations*	

3	0	0	0	*See ST2 for other crop recommendations*	

ADDITIONAL RESULTS:						Optional Tests:			[2]Trace Elements		
[2]Calcium (ppm)	[3]Acidity (meq/100 g)	[4]CEC (meq/100 g)	% Saturation of the CEC K	Mg	Ca	Organic Matter %	Nitrate-N ppm	Salts mmhos/cm	*See back for comments* Zinc ppm	Copper ppm	Sulfur ppm
12750	0.0	18.0	2.1	14.6	83.3				0.7	1.3	25.8

Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations

The high calcium level in this sample indicates the probable presence of soluble calcium. Therefore the CEC and the percent saturations were calculated using a maximum exchangeable calcium level of 15 meq/100 g.

5326

Agronomy

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Appendix D
Compaction Records

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FIELD DENSITY TESTING RECORD (NUCLEAR METHOD)

PROJECT:	Amos Landfill - Sequence 4 Repair	PROJECT NO.:	C130109.27	TECHNICIAN:	Hannah Parsons	

DATE	TEST NO.	LOCATION	SOIL DESCRIPTION (COLOR & TYPE, LIFT THICKNESS, ETC)	FIELD DENSITY			PROCTOR DENSITY					COMPACTION			COMMENTS
				g_{wet} (pcf)	w (%)	g_{dry} (pcf)	Proctor Name	MAX. g_{dry} (pcf)	OPT. w (%)	OPT. w, + (%)	OPT. w, - (%)	FIELD (%)	REQ. (%)	P / F	
11/2/2023	1102-1	East Mid Slope	Clay liner (lift 1)	135.8	13.7	119.4	RC1	118.6	13.4	3.0	3.0	100.7	95.0	PASS	
11/3/2023	1103-1	Southeast Mid Slope	Clay liner (lift 1)	137.7	12.4	122.5	RC1	118.6	13.4	3.0	3.0	103.3	95.0	PASS	
11/3/2023	1103-2	South Upper Slope	Clay liner (lift 1)	132.7	13.9	116.5	RC1	118.6	13.4	3.0	3.0	98.2	95.0	PASS	
11/4/2023	1104-1	East Mid Slope	Clay liner (lift 1)	137.1	13.5	120.8	RC1	118.6	13.4	3.0	3.0	101.8	95.0	PASS	
11/11/2023	1111-1	North Mid Slope	Clay liner (lift 1)	129.1	10.5	116.8	RC1	118.6	13.4	3.0	3.0	98.5	95.0	PASS	
11/11/2023	1111-2	North Lower Slope	Clay liner (lift 1)	132.4	10.9	119.4	RC1	118.6	13.4	3.0	3.0	100.7	95.0	PASS	
11/4/2023	1104-2	East Mid Slope	Clay liner (lift 2)	131.3	12.5	116.7	RC1	118.6	13.4	3.0	3.0	98.4	95.0	PASS	
11/4/2023	1104-3	South Mid Slope	Clay liner (lift 2)	139.1	13.8	122.2	RC1	118.6	13.4	3.0	3.0	103.1	95.0	PASS	
11/5/2023	1105-1	South Lower Slope	Clay liner (lift 2)	133.8	12.7	118.7	RC1	118.6	13.4	3.0	3.0	100.1	95.0	PASS	
11/5/2023	1105-2	East Lower Slope	Clay liner (lift 2)	135.8	11.3	122.0	RC1	118.6	13.4	3.0	3.0	102.9	95.0	PASS	
11/5/2023	1105-3	East Mid Slope	Clay liner (lift 2)	126.0	10.5	114.0	RC1	118.6	13.4	3.0	3.0	96.1	95.0	PASS	
11/5/2023	1105-4	Southeast Upper Slope	Clay liner (lift 2)	135.3	12.8	119.9	RC1	118.6	13.4	3.0	3.0	101.1	95.0	PASS	
11/6/2023	1106-1	Bottom	Clay liner (lift 2)	138.2	11.9	123.5	RC1	118.6	13.4	3.0	3.0	104.1	95.0	PASS	
11/6/2023	1106-2	Northeast Upper Slope	Clay liner (lift 2)	133.4	11.6	119.5	RC1	118.6	13.4	3.0	3.0	100.8	95.0	PASS	
11/13/2023	1113-1	North Upper Slope	Clay liner (lift 2)	136.8	11.4	122.8	RC1	118.6	13.4	3.0	3.0	103.5	95.0	PASS	
11/14/2023	1114-1	North Mid Slope	Clay liner (lift 2)	127.3	10.6	115.1	RC1	118.6	13.4	3.0	3.0	97.0	95.0	PASS	
11/6/2023	1106-3	South Upper Slope	Clay liner (lift 3)	127.9	11.8	114.4	RC1	118.6	13.4	3.0	3.0	96.5	95.0	PASS	
11/7/2023	1107-1	South Mid slope	Clay liner (lift 3)	136.3	13.4	120.2	RC1	118.6	13.4	3.0	3.0	101.3	95.0	PASS	
11/7/2023	1107-2	Southeast Mid Slope	Clay liner (lift 3)	132.4	10.9	119.4	RC1	118.6	13.4	3.0	3.0	100.7	95.0	PASS	
11/7/2023	1107-3	East Upper Slope	Clay liner (lift 3)	127.1	12.4	113.1	RC1	118.6	13.4	3.0	3.0	95.3	95.0	PASS	
11/7/2023	1107-4	East Mid Slope	Clay liner (lift 3)	136.7	12.6	121.4	RC1	118.6	13.4	3.0	3.0	102.4	95.0	PASS	
11/8/2023	1108-1	Bottom	Clay liner (lift 3)	132.5	11.8	118.5	RC1	118.6	13.4	3.0	3.0	99.9	95.0	PASS	
11/14/2023	1114-2	North Upper Slope	Clay liner (lift 3)	135.7	12.2	120.9	RC1	118.6	13.4	3.0	3.0	102.0	95.0	PASS	
11/14/2023	1114-3	North Mid Slope	Clay liner (lift 3)	135.8	10.9	122.5	RC1	118.6	13.4	3.0	3.0	103.2	95.0	PASS	
11/8/2023	1108-2	South Upper Slope	Clay liner (lift 4)	141.3	13.0	125.0	RC1	118.6	13.4	3.0	3.0	105.4	95.0	PASS	
11/8/2023	1108-3	South Mid Slope	Clay liner (lift 4)	136.7	11.9	122.2	RC1	118.6	13.4	3.0	3.0	103.0	95.0	PASS	
11/9/2023	1109-1	East Mid Slope	Clay liner (lift 4)	137.4	13.5	121.1	RC1	118.6	13.4	3.0	3.0	102.1	95.0	PASS	
11/15/2023	1115-1	North Lower Slope	Clay liner (lift 4)	130.6	12.4	116.2	RC1	118.6	13.4	3.0	3.0	98.0	95.0	PASS	
11/16/2023	1116-1	North Upper Slope	Clay liner (lift 4)	134.6	11.4	120.8	RC1	118.6	13.4	3.0	3.0	101.9	95.0	PASS	
11/17/2023	1117-1	North Upper Slope	Clay liner (lift 4)	141.1	13.5	124.3	RC1	118.6	13.4	3.0	3.0	104.8	95.0	PASS	

ATTACHMENT 3

PVC GEOMEMBRANE CERTIFICATION

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Sequence 4 Liner Repair

PVC Geomembrane Certification

American Electric Power
John E. Amos Landfill
John E. Amos Power Plant
Winfield, West Virginia

GAI Project Number: C130109.27
February 2024

Prepared by: GAI Consultants, Inc.
Charleston Office
500 Lee Street East, Suite 700
Charleston, West Virginia 25301

Prepared for: American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215

Sequence 4 Liner Repair

PVC Geomembrane Certification

American Electric Power
John E. Amos Landfill
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Winfield, West Virginia

GAI Project Number: C130109.27

February 2024

Prepared for:
American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215

Prepared by:
GAI Consultants, Inc.
Charleston Office, Suite 1100
Charleston, West Virginia 25301-1631

Report Authors:

James F. Shields, PE (West Virginia)
Engineering Manager

Charles F. Straley, PE, PLS (West Virginia)
Quality Assurance Officer / Certifying Engineer
Director Engineering / Associate

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Figure 1 Site Plan

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- C - III Sequence 4 PVC Geomembrane Liner Repairs (Drawing C130109-10-003-00-C-E2-002) and Repair Reports
- C - IV Sequence 4 PVC Geomembrane Liner Air Lance Test Reports

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GAI Consultants, Inc. Certification

Based on the construction testing and observations performed by American Electric Power (AEP) and GAI Consultants, Inc. (GAI) personnel, I hereby certify that the PVC Geomembrane within Sequence 4 Liner Repair at the Appalachian Power Company's John E. Amos Flue Gas Desulfurization (FGD) Landfill near Winfield, West Virginia (WV), as shown on Drawing 30204SH5 and 30204SH6, has been installed in substantial compliance with the material specifications and construction requirements listed in the WV National Pollutant Discharge Elimination System/Solid Waste Permit (NPDES WV0116254) documents; 40 Code of Federal Regulations Part 257 (the CCR Rule); and the 2023 Site work Construction Sequence 4 Liner Repair construction documents. . Exline Surveying Inc. survey personnel provided as-built survey Record Drawings verifying that the PVC Geomembrane installation met the permit requirements.

This document clarifies "certification" for the PVC Geomembrane installation within Sequence 4 Liner Repair at the Amos FGD Landfill.

The definition of certify as used herein is: Certify means to state or declare a professional opinion of conditions whose true properties cannot be known at the time such certification was made, despite appropriate professional evaluation. A design professional's certification in no way relieves any other party from meeting requirements imposed by contract or other means, including commonly-accepted industry practices.

Bearing the above in mind and based on the results of: (1) Certification from the material manufacturers and installation meeting the requirements of the Specifications, the CCR Rule, and the WV Department of Environmental Protection (WVDEP) permit; (2) results of field and laboratory testing; and (3) monitoring of construction efforts during the project; GAI's professional opinion is that the PVC Geomembrane installation within Sequence 4 Liner Repair of the Amos FGD Landfill meets the requirements as set forth by the permit documents and the CCR Rule.

Charles F. Straley, PE, PLS
Certifying Engineer and Quality Assurance Officer
PE #11842

1.0 Introduction

1.1 Project Description

This PVC Geomembrane Certification documents the testing and observations performed during the installation of the 30-mil polyvinyl chloride (PVC) geomembrane liner in Sequence 4 Liner Repair at American Electric Power's (AEP's) John E. Amos FGD Landfill (Landfill) in Winfield, West Virginia (WV). The location of Sequence 4 Liner Repair at the Amos Landfill is shown on Figure 1. Appendix A contains typical construction photographs included in the daily reports. Construction of the Sequence 4 Liner Repair described in this certification report consists of the following:

- Construction activities associated with the installation of the 30-mil PVC geomembrane.

1.2 Associated Landfill Construction

Construction of the groundwater control and subgrade preparation, including placement of structural fill to meet the compacted clay liner (CCL) subgrade elevations, began in September 2023 and is documented in the "Sequence 4 Liner Repair Groundwater Control and Subgrade Certification Report", December 2023.

Construction of the CCL in Sequence 4 began in November 2023 and was completed in December 2023 and is documented in the "Sequence 4 Liner Repair Compacted Clay Liner Certification Report", January 2024.

Installation of the PVC geomembrane began in November 2023. Installation was in accordance with the approved Quality Assurance/Quality Control (QA/QC) Plan; the Landfill's Solid Waste/National Pollutant Discharge Elimination System (NPDES) permit (Permit No. WV0116254); WV Department of Environmental Protection (WVDEP) Title 33, Series 1, Solid Waste Management Rule; 40 Code of Federal Regulations Part 257 [the Coal Combustion Residuals (CCR) Rule]; and AEP's Civil Engineering Division Technical Specifications for Material Construction; and associated Project Addenda to the Specifications. Included in this report are the field information and the applicable Record Drawings in accordance with the WVDEP requirements. The construction QA (CQA) services performed by GAI are discussed in the following sections.

1.3 Companies and Personnel

The key companies and personnel involved with the construction of Sequence 4 are listed below.

AEP - Owner
Appalachian Power Company - Operator
Janine White, Project Manager
Brian Palmer, P.E., Principal Civil Engineer
David Fry, Lead Construction Coordinator

GAI Consultants, Inc. (GAI) - CQA/Testing
Charles F. Straley, P.E., P.S., Certifying Engineering, QA Officer (QAO) and Director Engineering
John Klamut, P.E., Project Manager
James Shields, P.E., Lead QC Inspector (QCI)

Entact, LLC. (Entact) - General Contractor
Jonathan Lovenduski, Project Manager
Eric Cline, Superintendent

1.4 Scope of Services

1.4.1 Preconstruction Activities

Preconstruction activities conducted by GAI personnel consisted of the following:

1. Conducting inventory of on-site PVC geomembrane materials.
2. Review of PVC geomembrane manufacturer's submittals for compliance with project and permit specifications; and
3. Collecting compliance samples for laboratory testing and review of results for compliance with project and permit specifications.

1.4.2 Construction Documentation Activities

Construction documentation activities performed by GAI personnel included the following:

1. Documenting and observing the CCL surface prior to the placement of PVC geomembrane,
2. Observing and documenting the installation and field testing of the PVC geomembrane,
3. Preparing daily field reports and documenting construction activities; GAI also attended daily health and safety meetings, weekly project update meetings, and monthly contractor's meetings, as well as other supplemental meetings when needed, and
4. Providing photo documentation throughout construction showing typical construction procedures (see Appendix A).

1.4.3 Record Drawings and Certification Report

Documentation and certification activities performed by the QA/QC team included the following:

1. Exline Surveying Inc. (Exline) provided surveying services for the As-Built Drawings presented in Appendix C. The panel layout is presented on Drawing 23033A Panel As-Built (Appendix C-I). Repairs made to the PVC geomembrane liner are shown on the same Drawing 23033A Panel As-Built (Appendix C-I).
2. GAI personnel performed the construction documentation activities discussed in Sections 1.4.1 and 1.4.2 of this report.
3. Project personnel observed the construction activities and provided the enclosed information documenting that the construction activities were performed consistent with the design and permit requirements.

1.5 Construction Schedule

Site clearing and grubbing, excavation and fill placement for subgrade, the installation of groundwater controls and subgrade, and construction of the CCL were performed prior to installation of the PVC geomembrane. Construction of the PVC geomembrane in Sequence 4 Liner Repair began in November 2023 and was completed in December 2023.

1.6 Reference Documents

The plans, specifications, and QA requirements for the construction activities and materials used by GAI personnel for this project are as follows:

1. Solid Waste/NPDES Permit No. WV0116254.
2. AEP Civil Engineering Division, Technical Specifications for Material and Construction (prepared by AEP), and the Addenda to the Technical Specifications (prepared by GAI).
3. "Quality Assurance and Quality Control Plan, John E. Amos Landfill" for the Appalachian Power Company John E. Amos Plant's Amos FGD Landfill (revised June 2022, prepared by GAI).
4. Amos FGD Landfill Sequence 4 Construction Drawings (issued for construction March 2023 and revised September 2023, prepared by GAI)

2.0 PVC Geomembrane Liner

The 30-mil PVC geomembrane will serve as the primary containment mechanism for FGD material and the leachate generated. The geomembrane was deployed over the Sequence 4 Liner Repair compacted clay liner.

The PVC geomembrane material was manufactured by Plastatech Engineering, Ltd. (Plastatech) of Saginaw, Michigan. The geomembrane material was fabricated into the installation panels by Environmental Protection, Inc. or Traverse City, Michigan. Atlantic Lining Company Inc. (ALCO) was the installer of the geomembrane. QA observation was provided by AEP and GAI representatives. The geomembrane was tested and installed in accordance with the requirements of the Landfill's approved QA/QC plan and the manufacturer's recommended procedures.

The PVC geomembrane panels were delivered to the site beginning in July 2023. The manufacturing QC testing and installer's QA/QC manual were reviewed at the beginning of Sequence 4 Liner Repair construction, and QA conformance testing was performed once production of the liner material started.

2.1 Manufacturing QC

To monitor the quality of the geomembrane produced, Plastatech performed QC testing on selected rolls of geomembrane. Appendix B-I contains QC test data from Plastatech for the geomembrane material used in the construction of Sequence 4 Liner Repair. The test data indicated that the geomembrane meets permit and project specifications.

2.2 Conformance Testing

As part of GAI's QA documentation, five PVC geomembrane samples were collected from the material to be used for the construction of Sequence 4 Liner Repair. The samples were collected at the manufacturing facility by the manufacturer and shipped to Geotechnics, Inc, an independent geotechnical and geosynthetics testing laboratory. Geotechnics' laboratory performed laboratory analyses. Conformance test data for the material is included in Appendix B-II, which confirmed that the PVC geomembrane material was acceptable.

2.3 Geomembrane Installation

The geomembrane material was fabricated into panels by Environmental Protection Inc., in accordance with the proposed panel layout. Prior to geomembrane placement, the surface of the compacted clay liner was inspected by GAI representatives to determine that the clay liner was free of objects that might cause damage to the geomembrane (e.g., sharp gravel, etc.). As each panel section of the PVC geomembrane was placed, it was assigned a field panel number. The field panel numbers were assigned generally according to their order of deployment. The panel layout Drawing 23033A Panel As-Built, located in Appendix C-I, was prepared from field notes and field survey information by Exline. A table that cross-references panel numbers to the PVC manufacturer's roll numbers is included with the panel layout drawing in Appendix C-I.

2.4 Pre-Weld QC

Trial welds were performed for the fusion welds to verify that the PVC geomembrane and fusion welder provided an adequate weld. The test seams were cut into test strips (coupons) and destructive tests were performed in the field to assess whether the seam welds were adequate for the weather conditions, sheet temperature, etc. These tests were performed under the observation of GAI representatives. Adjustments to seaming operations were made, as needed, to demonstrate compliance with the project specifications. Documentation of the trial welds is provided in Appendix C-II.

2.5 Production Seam QC

As part of the QA/QC program, destructive samples were collected and tested at a minimum frequency of one per every 1,000 lineal feet of total seam length per day. The following information was recorded for each destructive sample:

1. Destructive test number;
2. Seam identification and location;
3. Seamer's initials; and
4. Date on which it was seamed.

A total of 10 QA/QC destructive test locations were sampled by GAI representatives for the certified area. The test coupons were tested in the laboratory by Geotechnics. A portion of each destructive sample was archived for future reference. A summary table with the destructive sample locations, seaming information, and average QA laboratory test results is presented in Appendix B-III. Geotechnics' laboratory data sheets for the destructive tests are also located in Appendix B-III. A passing destructive sample is defined as: (1) a sample in which at least four out of the five test coupons pass the project specifications [minimum required values of 18 pounds per inch (ppi) for peel strength and 58.4 ppi for shear strength], and (2) the average for all five test coupons of a sample must be greater than the minimum required value.

Destruct samples were field tested by the installer and submitted for laboratory testing. The field testing generally consisted of 5 coupons tested for peel strength and 5 coupons tested for shear strength. Destruct samples produced passing test results. Three coupon shear strength tests were below the required 58.4 ppi; however, the average of all five coupons for those destruct samples met the required average value.

As all destruct test samples taken met the required values, no additional offset samples were required.

2.6 Non-Destructive Seam Testing

The single-track fusion welded seams were inspected by ALCO and GAI representatives and non-destructively tested for continuity by air lance testing. A representative from GAI was present to observe the air lance testing and record the results. Documentation of the air lance results is in Appendix C-IV.

During air lance testing, a seam was determined to have failed if a hole, gap or flap was exposed by the compressed air. Repairs were made by either heat sealing the area or placing a patch. The repair was then air lanced to ensure an air-tight bond.

2.7 Repairs and Air Lance Testing

QC testing was completed by air lance as described in Section 2.6. Any necessary repairs were completed in accordance with the manufacturer's recommendations. Repair locations are shown on Drawing 23033A Panel As-Built, located in Appendix C-I and the air lance testing results of these repairs are provided in Appendix C-III.

3.0 Summary

The construction work documented in this report was completed in accordance with the design and specifications presented in the applicable WVDEP Solid Waste/NPDES Permit (No. WV0116254), the CCR Rule, and the construction documents listed in this report. The field activities documented in this report represent the CQA services provided for the PVC Geomembrane installation within Sequence 4 at the Landfill.

FIGURE

AMOS FGD LANDFILL

05786\Desktop\SURVEYS\vacinity map.jpg

JOHN AMOS PLANT

BLUE LICK ROAD

BELLS CREEK ROAD

VICINITY MAP
(NOT TO SCALE)

AMOS LANDFILL CONTROL MONUMENTS
DATUM: NAD83/88 WV S - GEOID03

PT.	NORTH	EAST	ELEVATION	
1	539375.6400	1727964.6500	649.2400	MONUMENT
5	541953.8200	1725476.5700	979.7500	MONUMENT
6	540672.8190	1722790.9030	926.9120	MONUMENT
7	540251.9820	1728194.8480	954.4330	MONUMENT
5077	540828.3700	1725256.7600	939.6500	
5104	539496.9700	1728326.1600	618.8900	
15 2012 BASE AT OFFICE	540947.1150	1725381.9170	929.596	Bottom of Antenna Mount
BASE ACROSS HILL	540874.0200	1722784.0800	933.0950	Base 25001 Bottom of Antenna Near Stockpile #6

GRAPHIC SCALE
200' 100' 0 200'
1 INCH = 200 FEET

NORTH MERIDIAN REFERENCED TO STATE PLANE COORDINATES (W.V. SOUTH)

FIGURE 1
SITE PLAN
SEQUENCE 4 LANDFILL
CONSTRUCTION

LEGEND
- EXISTING 4" UNDERDRAIN
- EXISTING 12" UNDERDRAIN
- OVERHEAD ELECTRIC
- SURVEYED PROPERTY LINES
- DIVERSION DITCHES
- EXISTING SEDIMENT TRAPS
- STONE FILTERS
- SILT FENCE
- CELL 3 CAP LIMITS
- EXISTING SEDIMENT TRAPS, DITCHES OR SPILLWAYS WITH STONE BOTTOM
- LIVING WEIRS
- FLOC LOG
- FLOW CHECK
- COMPOST LOG
- straw wattle
- 765kv location
- smart fence

"THIS DRAWING IS THE PROPERTY OF THE AMERICAN ELECTRIC POWER SERVICE CORP. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF THE AEP SERVICE CORP., OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST"

APPALACHIAN POWER CO.

JOHN E. AMOS PLANT

WINFIELD WEST VIRGINIA

JOHN E. AMOS FGD LANDFILL
EROSION & SEDIMENT CONTROL
DETAILS

NAD 83/NAVD 88 W.V. SOUTH

Drawing Name:	Amos Asbuilt
SCALE:	1"=200'
Revision Date:	JULY 10, 2019
Surveyed By:	C.Sheppard
Drawn By:	C.Sheppard

AEP AMERICAN ELECTRIC POWER
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

APPENDIX A
Photographs of Construction Activities

Photograph 1. Initial PVC Deployment on East Slope

Photograph 2. Seaming of PVC Panels

Photograph 3. East slope working South covered with PVC

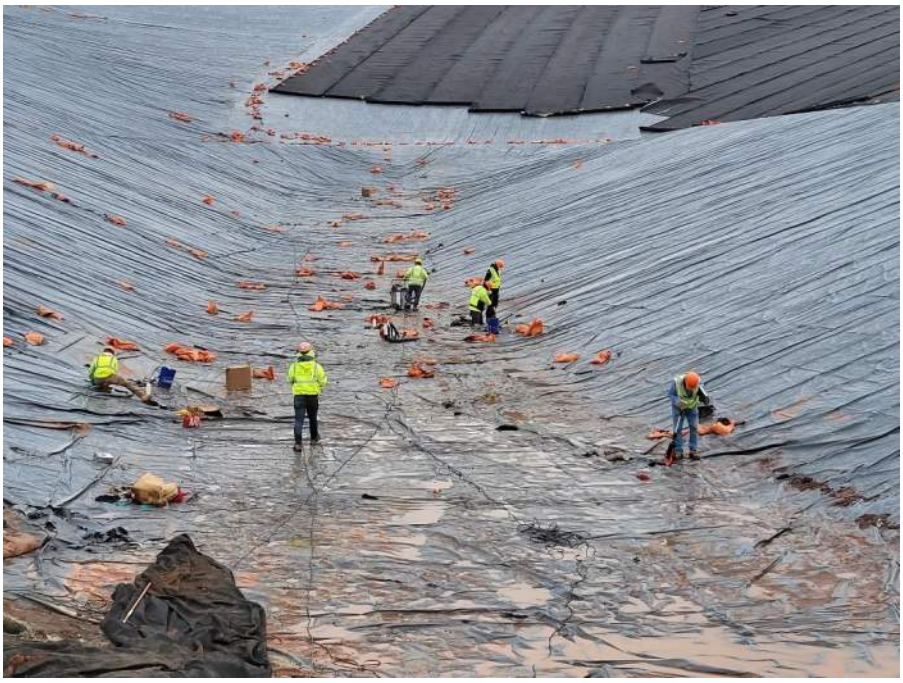
Photograph 4. Preparing to seam

Photograph 5. Placing PVC on the north slope

Photograph 6. Deploying PVC on the North Slope

Photograph 7. Placing panels of PVC

Photograph 8. Preparing to seam last panel of PVC



Photograph 9. Handling a rain event during PVC installation

Photograph 10. Anchor trench backfilling concurrent with GDN placement

Photograph 11. Testing and repairs

Photograph 12. Repairs to bottom area PVC

Appendix B
PVC Geomembrane Laboratory Quality assurance/Quality Control Data

gai consultants
transforming ideas into reality

Appendix B - I
Manufacturing Quality Control Data

gai consultants
transforming ideas into reality

Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-013**
ENTACT Project Number:	E9103
Submittal Title:	PVC Geomembrane Manufacturer and Fabricator QC Certificates
Submittal Date:	07/19/2023
Date(s) of Previous Submissions:	N/A
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Robin White, ENTACT
From:	Jarod Stanfield
Reference Specification section and/or	Tables GM-1, GM-3, GM Subsections 1.02.1.D and H

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☒ **Product** ☒ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☐ **Plan**

☒ **Certificate** ☐ **Report** ☐ **Permit** ☒ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile			X		No

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COMMENTS:
This report is the Manufacturers QC Certification for the Actual Batch run of PVC Liner Material.

ENTACT, LLC

Contractor's Signature and Date
Jarod Stanfield 07/19/2023

Owner's Representative Review & Comments Section:

This Submittal has been:

☐ **Reviewed** ☒ **Approved** ☐ **Approved as Noted** ☐ **Revised and Resubmit** ☐ **Rejected**

Comments: Approved for use as intended. All rolls meet the standards; Roll #16 equals the bare minimum standard for thickness.
GAI Consultants CZW 07/28/2023.

Owner's Representative Signature and Date (Stamp if applicable)

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Verification of Material Properties

Introduction:

Environmental Protection Inc. (EPI) liners are identified by a unique serial number and fabricated by chemical fusion welding. EPI performed peel and shear testing as per ASTM D7408. In addition to seam testing, non-destructive testing was performed on all factory seams, as per EPI's Quality Control Manual for Factory Fabrication of PVC and UltraTech Geomembranes.

Test Procedures:

A minimum of one destructive sample was removed from the liner seam, at every 3000 lineal feet or 1000 lineal feet for smaller multiple liners under 250 lineal feet of seam. Prior to testing, the samples are acclimated to laboratory conditions for a minimum of 40 hours. The samples are tested for peel and shear in accordance with ASTM D7408, D882 and D413 to verify the seam strength meets the required specification.

References:

ASTM Standards:

D413	Standard Test Methods for Rubber Property
D882	Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
D7176	Non-Reinforced Polyvinyl Chloride (PVC) Geomembranes Used In Buried Applications
D7408	Non-Reinforced PVC (Polyvinyl Chloride) Geomembrane Seams

Factory Seam Test Results

In the following table below, the results are reported in pounds per inch width (lb/in), along with type of break. The speed rate for peels is 20in/min. The test results have met or exceeded the minimum requirements for peel and shear as per the ASTM Standards and/or the project specifications.

Serial Number	Shear Avg	Shear LOB	Peel Avg	Peel LOB
6142-1	77.78	SE	27.81	AD
6143-1	73.94	SE	23.70	AD
6144-1	75.01	SE	23.32	AD
6145-1	68.55	SE	22.73	AD
6145-1	67.67	SE	22.15	AD
6146-1	69.89	SE	22.69	AD
6147-1	67.17	SE	22.73	AD
6148-1	65.46	SE	22.79	AD
6148-1	69.32	SE	23.22	AD
6149-1	76.00	SE	26.29	AD
6150-1	77.94	SE	23.48	AD
6150-2	72.32	SE	23.70	AD
6151-1	74.40	SE	24.20	AD
6152-1	71.59	SE	25.41	AD
6153-1	73.30	SE	22.32	AD
6154-1	73.44	SE	22.14	AD
6155-1	73.09	SE	25.31	AD
6156-1	68.88	SE	25.92	AD
6157-1	71.10	SE	25.66	AD
6158-1	73.56	SE	23.74	AD-BRK

Shear Minimum 58.4 lb/in
Peel Minimum 18.0 lb/in

AVG = Average
AD = Peel
SE = Seam Edge
LOB = Locus of Break
AD-BRK = Peel with Break
BRK = Break in Sheet

List of lots and rolls used in fabrication of liner
See attached for Manufacturer's Certification of Analysis

Serial Number	Lot Number	Roll Number
6142-1	10054	104, 85, 84, 87
6143-1	10052	64, 63, 78, 77
6144-1	10052	77, 76,75, 80
6145-1	10052	80, 79, 56, 55
6146-1	10052	55, 50, 49, 42
6147-1	10052	42, 41, 38
6148-1	9969	385, 384
6149-1	10054	86, 91, 90
6150-1	10014	137, 133, 132
6150-2	10014	132, 139, 138
6151-1	10052	14, 13
6152-1	10052	20, 19, 14
	10054	90
6153-1	10052	38, 37, 44, 43
6154-1	10052	43, 6, 5
6155-1	10052	62, 61, 64
6156-1	10052	16, 15
	10054	103, 102
6157-1	10052	15
	10054	105, 104
6158-1	10052	5, 4, 3
	10054	103

Certificate of Analysis

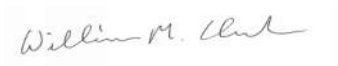
04-13-2023

Product Description	PlastaFlex™ IG 30 mil
Plastatech Product Code	57106
Lot Number	9969
Manufacturing Date	03-28-2023
Lot Quantity	399 Rolls
COA Rolls	360-389

Certified Properties	**Test Method**	**Specification**	**Roll #362**	**Roll #368**	**Roll #376**	**Roll #384**
Thickness	ASTM D5199	30.0 ± 5%	30.7	29.9	30.4	30.2
Tensile Properties	ASTM D882					
Breaking strength MD / CMD		Min. 73 lb./in	91.9/84.8	85.5/78.4	86.4/81.6	93.5/81.7
Elongation at break MD / CMD		Min. 380%	440.1/434.4	417.7/427.2	415.6/426.9	455.1/447.7
100% Modulus MD / CMD		Min. 30 lb./in	39.4/37.8	38.6/35.4	37.4/35.5	41.7/37.4
Tear Resistance MD / CMD	ASTM D1004	Min. 8 lb.	9.3/8.5	9.3/8.6	9.3/8.6	9.2/8.5
Low Temperature Impact	ASTM D1790	At –29°C/-20°F	Pass	Pass	Pass	Pass
Dimensional Stability	ASTM D1204	Max. 3%	1.7	1.0	0.6	1.3
Hydrostatic Resistance	ASTM D751	Min 100 psi	120	115	110	125

Every 8th roll of this production lot was tested and adheres to the physically properties specified above. This product meets or exceeds the Manufacturer's Index Properties in accordance with ASTM-D7176. This product contains no recycled materials.

William M. Clark



Quality Manager, JRB Enterprises

Plastatech Engineering Ltd.
725 Morley Drive
Saginaw, MI 48601

(989) 754-6500
(800) 892-9358
Fax

www.plastatech.com
BClark@plastatech.com

Certificate of Analysis

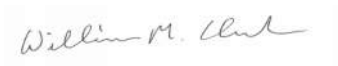
05-23-2023

Product Description	PlastaFlex™ IG 30 mil
Plastatech Product Code	57106
Lot Number	10014
Manufacturing Date	05-18-2023
Lot Quantity	291 Rolls
COA Rolls	129 - 160

Certified Properties	**Test Method**	**Specification**	**Roll #136**	**Roll #144**	**Roll #152**	**Roll #160**
Thickness	ASTM D5199	30.0 ± 5%	29.6	29.6	29.6	29.7
Tensile Properties	ASTM D882					
Breaking strength MD / CMD		Min. 73 lb./in	88.3/84.4	90.3/83.7	88.5/82.1	85.8/83.2
Elongation at break MD / CMD		Min. 380%	429.6/416.3	432.4/418.1	428.7/424.4	413.7/428.9
100% Modulus MD / CMD		Min. 30 lb./in	39.9/39.9	39.0/38.3	38.9/37.0	39.7/37.9
Tear Resistance MD / CMD	ASTM D1004	Min. 8 lb.	9.7/9.0	9.7/8.9	10.0/9.2	9.8/9.2
Low Temperature Impact	ASTM D1790	At –29°C/-20°F	Pass	Pass	Pass	Pass
Dimensional Stability	ASTM D1204	Max. 3%	0.8	0.6	0.5	0.6
Hydrostatic Resistance	ASTM D751	Min 100 psi	120	120	120	120

Every 8th roll of this production lot was tested and adheres to the physically properties specified above. This product meets or exceeds the Manufacturer's Index Properties in accordance with ASTM-D7176. This product contains no recycled materials.

William M. Clark



Quality Manager, JRB Enterprises

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Certificate of Analysis

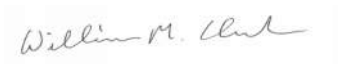
06-27-2023

Product Description	PlastaFlex™ IG 30 mil
Plastatech Product Code	57106
Lot Number	10052
Manufacturing Date	06-27-2023
Lot Quantity	82 Rolls
COA Rolls	1-32

Certified Properties	**Test Method**	**Specification**	**Roll #1**	**Roll #9**	**Roll #16**	**Roll #24**	**Roll #32**
Thickness	ASTM D5199	30.0 ± 5%	29.4	29.5	28.5	29.1	29.4
Tensile Properties	ASTM D882						
Breaking strength MD / CMD		Min. 73 lb./in	92.9/74.6	89.4/79.3	92.1/77.9	89.5/78.6	84.2/79.7
Elongation at break MD / CMD		Min. 380%	437.2/419.6	449.9/443.7	463.7/438.7	461.6/444.4	437.9/438.6
100% Modulus MD / CMD		Min. 30 lb./in	41.7/33.9	35.8/32.4	36.0/33.0	35.0/32.1	34.5/35.5
Tear Resistance MD / CMD	ASTM D1004	Min. 8 lb.	9.5/8.8	9.2/8.8	9.2/8.6	9.4/8.4	9.1/8.8
Low Temperature Impact	ASTM D1790	At –29°C/-20°F	Pass	Pass	Pass	Pass	Pass
Dimensional Stability	ASTM D1204	Max. 3%	0.3	0.6	0.5	0.7	0.3
Hydrostatic Resistance	ASTM D751	Min 100 psi	115.0	115.0	115.0	115.0	115.0

Every 8th roll of this production lot was tested and adheres to the physically properties specified above. This product meets or exceeds the Manufacturer's Index Properties in accordance with ASTM-D7176. This product contains no recycled materials.

William M. Clark



Quality Manager, JRB Enterprises

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Fax

www.plastatech.com
BClark@plastatech.com

Certificate of Analysis

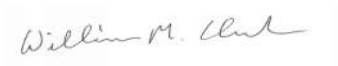
06-27-2023

Product Description	PlastaFlex™ IG 30 mil
Plastatech Product Code	57106
Lot Number	10052
Manufacturing Date	06-27-2023
Lot Quantity	82 Rolls
COA Rolls	33-64

Certified Properties	**Test Method**	**Specification**	**Roll #40**	**Roll #48**	**Roll #56**	**Roll #64**
Thickness	ASTM D5199	30.0 ± 5%	30.0	29.8	29.9	29.7
Tensile Properties	ASTM D882					
Breaking strength MD / CMD		Min. 73 lb./in	85.0/79.3	89.2/82.3	80.7/79.5	77.7/73.3
Elongation at break MD / CMD		Min. 380%	423.4/429.7	434.7/442.6	405.3/417.7	410.7/437.2
100% Modulus MD / CMD		Min. 30 lb./in	36.0/34.3	36.7/34.3	35.5/34.7	32.4/30.6
Tear Resistance MD / CMD	ASTM D1004	Min. 8 lb.	9.1/8.9	9.4/8.8	9.4/8.6	9.1/8.5
Low Temperature Impact	ASTM D1790	At –29°C/-20°F	Pass	Pass	Pass	Pass
Dimensional Stability	ASTM D1204	Max. 3%	0.1	0.2	0.4	0.1
Hydrostatic Resistance	ASTM D751	Min 100 psi	115.0	115.0	120.0	120.0

Every 8th roll of this production lot was tested and adheres to the physically properties specified above. This product meets or exceeds the Manufacturer's Index Properties in accordance with ASTM-D7176. This product contains no recycled materials.

William M. Clark



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Certificate of Analysis

06-27-2023

Product Description	PlastaFlex™ IG 30 mil
Plastatech Product Code	57106
Lot Number	10052
Manufacturing Date	06-27-2023
Lot Quantity	82 Rolls
COA Rolls	65-82

Certified Properties	**Test Method**	**Specification**	**Roll #72**	**Roll #80**
Thickness	ASTM D5199	30.0 ± 5%	30.1	29.6
Tensile Properties	ASTM D882			
Breaking strength MD / CMD		Min. 73 lb./in	87.3/78.7	91.4/77.8
Elongation at break MD / CMD		Min. 380%	439.1/453.4	457.6/459.1
100% Modulus MD / CMD		Min. 30 lb./in	35.4/32.0	37.8/31.8
Tear Resistance MD / CMD	ASTM D1004	Min. 8 lb.	9.1/8.8	9.6/9.1
Low Temperature Impact	ASTM D1790	At –29°C/-20°F	Pass	Pass
Dimensional Stability	ASTM D1204	Max. 3%	0.3	0.3
Hydrostatic Resistance	ASTM D751	Min 100 psi	115.0	120.0

Every 8th roll of this production lot was tested and adheres to the physically properties specified above. This product meets or exceeds the Manufacturer's Index Properties in accordance with ASTM-D7176. This product contains no recycled materials.

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Certificate of Analysis

06-29-2023

Product Description	PlastaFlex™ IG 30 mil
Plastatech Product Code	57106
Lot Number	10054
Manufacturing Date	06-24-2023
Lot Quantity	308 Rolls
COA Rolls	65-96

Certified Properties	**Test Method**	**Specification**	**Roll #72**	**Roll #80**	**Roll #90**	**Roll #96**
Thickness	ASTM D5199	30.0 ± 5%	29.7	29.9	29.9	29.6
Tensile Properties	ASTM D882					
Breaking strength MD / CMD		Min. 73 lb./in	89.3/85.1	89.0/80.3	88.6/87.9	89.4/84.1
Elongation at break MD / CMD		Min. 380%	424.0/431.0	423.0/412.0	414.0/433.0	434.0/441.0
100% Modulus MD / CMD		Min. 30 lb./in	36.5/36.5	35.8/35.6	39.1/38.4	37.7/35.7
Tear Resistance MD / CMD	ASTM D1004	Min. 8 lb.	9.2/8.3	8.6/8.4	8.7/8.1	9.5/9.1
Low Temperature Impact	ASTM D1790	At –29°C/-20°F	Pass	Pass	Pass	Pass
Dimensional Stability	ASTM D1204	Max. 3%	0.6	1.6	0.8	0.6
Hydrostatic Resistance	ASTM D751	Min 100 psi	105	110	115	120

Every 8th roll of this production lot was tested and adheres to the physically properties specified above. This product meets or exceeds the Manufacturer's Index Properties in accordance with ASTM-D7176. This product contains no recycled materials.

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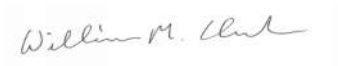

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Certificate of Analysis

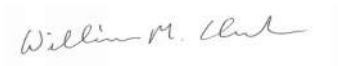
06-29-2023

Product Description	PlastaFlex™ IG 30 mil
Plastatech Product Code	57106
Lot Number	10054
Manufacturing Date	06-24-2023
Lot Quantity	308 Rolls
COA Rolls	97-128

Certified Properties	**Test Method**	**Specification**	**Roll #104**	**Roll #112**	**Roll #120**	**Roll #128**
Thickness	ASTM D5199	30.0 ± 5%	29.7	30.0	30.2	30.0
Tensile Properties	ASTM D882					
Breaking strength MD / CMD		Min. 73 lb./in	85.0/84.2	86.7/76.7	87.1/75.4	83.5/78.0
Elongation at break MD / CMD		Min. 380%	411.0/438.0	426.0/427.0	433.0/425.0	417.0/416.0
100% Modulus MD / CMD		Min. 30 lb./in	39.5/37.8	37.1/33.8	39.0/33.5	36.6/35.0
Tear Resistance MD / CMD	ASTM D1004	Min. 8 lb.	9.6/8.9	9.4/9.1	9.7/9.1	9.6/9.0
Low Temperature Impact	ASTM D1790	At –29°C/-20°F	Pass	Pass	Pass	Pass
Dimensional Stability	ASTM D1204	Max. 3%	0.5	0.8	0.6	0.6
Hydrostatic Resistance	ASTM D751	Min 100 psi	120	120	115	120

Every 8th roll of this production lot was tested and adheres to the physically properties specified above. This product meets or exceeds the Manufacturer's Index Properties in accordance with ASTM-D7176. This product contains no recycled materials.

William M. Clark



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Appendix B - II
Quality Assurance Conformance Test Results

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CONFORMANCE TEST RESULTS

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CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-008
LAB ID NO.: L23-137-008-001
MATERIAL: 30 mil PVC
LOT I.D. 10194
ROLL NO: 106

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	AVE	STD
THICKNESS	D 5199	mils	31	31	31	31	31		
			31	31	31	31	31	**31**	0.00
TEAR	D 1004	MD-lbs	13.2	12.4	13.5	13.4	12.8		
RESISTANCE			13.4	12.5	13.2	13.1	12.9	**13.0**	0.36
		CD-lbs	12.3	11.8	12.2	12.5	12.3		
			12.5	11.9	12.2	11.7	12.0	**12.1**	0.27
TENSILE PROPERTIES	D 882								
STRENGTH AT BREAK		MD-ppi	90.9	88.7	96.6	92.8	89.5	**91.7**	3.15
		CD-ppi	88.2	79.2	89.4	82.8	82.9	**84.5**	4.22
BREAK ELONGATION		MD%	540.4	520.9	609.9	534.2	487.8	**538.6**	44.72
Lo = 2.0"		CD%	602.7	492.8	615.1	510.0	503.8	**544.9**	58.93
100% SECANT	D 882	MD-ppi	47	45	48	50	49	**48**	2
MODULUS		CD-ppi	46	44	46	47	48	**46**	1

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Appendix B - III
Destructive Sample Test Results

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GAI Consultants, Inc.

Geomembrane Seam Destructive Log - Lab

Material: PVC

Project Name: Amos LF - Seq 4 Repair
Start Date: 1-Nov-23
Project Location: Putnam County, WV

30 mil Thickness

Project Seam Requirements

	Fusion:	Extrusion:
Peel:	18	
Shear:	58.4	

Peel Incursion: NA

4 out of 5 Average greater than the strength

Break Code "SIP" = Failure

DS #	Location	Date Removed	Welder ID		Wedge	Extruder	Seam Strength										Peel Incursion (%)					Pass Fail
			Machine	Operator	Temp/ Speed F/fpm	Barrel/ Preheat F/F	Peel (ppi) In/Out					Shear (ppi)										
							1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
DS-1							34.0	37.0	34.0	37.0	31.0	68.0	65.0	65.0	68.0	66.0	<10	<10	<10	<10	<10	Pass
DS-2							27.0	25.0	23.0	31.0	26.0	64.0	66.0	53.0	67.0	66.0	<10	<10	<10	<10	<10	Pass
DS-3							28.0	32.0	30.0	32.0	29.0	62.0	62.0	67.0	71.0	63.0	<10	<10	<10	<10	<10	Pass
DS-4							28.0	24.0	21.0	28.0	31.0	63.0	49.0	107.0	61.0	67.0	<10	<10	<10	<10	<10	Pass
DS-5							30.0	31.0	32.0	33.0	31.0	66.0	67.0	68.0	70.0	68.0	<10	<10	<10	<10	<10	Pass
DS-6							32.0	32.0	33.0	31.0	31.0	61.0	64.0	60.0	64.0	69.0	<10	<10	<10	<10	<10	Pass
DS-7							33.0	31.0	32.0	31.0	32.0	62.0	58.0	65.0	64.0	68.0	<10	<10	<10	<10	<10	Pass
DS-8							32.0	31.0	33.0	33.0	30.0	62.0	58.0	65.0	67.0	59.0	<10	<10	<10	<10	<10	Pass
DS-9							30.0	31.0	35.0	33.0	31.0	60.0	57.0	62.0	63.0	62.0	<10	<10	<10	<10	<10	Pass
DS-10							33.0	29.0	27.0	25.0	30.0	69.0	71.0	71.0	67.0	68.0	<10	<10	<10	<10	<10	Pass

PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-005
LAB ID NO.: L23-137-005-001
MATERIAL: 30 mil PVC
SEAM TYPE: EXTRUSION

SAMPLE I.D.: DS-1

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	34	SE3	<10
2	37	SE3	<10
3	34	SE3	<10
4	37	SE3	<10
5	31	SE3	<10
AVERAGE	**34**		
STD. DEV.	2.14		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	68	SE1
2	65	SE1
3	65	SE1
4	68	SE1
5	66	SE1
AVERAGE	**66**	
STD. DEV.	1.31	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-006
LAB ID NO.: L23-137-006-001
MATERIAL: 30 mil PVC
SEAM TYPE: SF

SAMPLE I.D.: DS-2

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	27	SE3	<10
2	25	SE3	<10
3	23	SE3	<10
4	31	SE3	<10
5	26	SE3	<10
AVERAGE	**26**		
STD. DEV.	2.58		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	64	SE1
2	66	SE1
3	53	SE1
4	67	SE1
5	66	SE1
AVERAGE	**63**	
STD. DEV.	4.98	

CHECKED BY: JLK DATE: 11/20/2023

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-006
LAB ID NO.: L23-137-006-002
MATERIAL: 30 mil PVC
SEAM TYPE: SF

SAMPLE I.D.: DS-3

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	28	SE3	<10
2	32	SE3	<10
3	30	SE3	<10
4	32	SE3	<10
5	29	SE3	<10
AVERAGE	**30**		
STD. DEV.	1.64		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	62	SE1
2	62	SE1
3	67	SE1
4	71	SE1
5	63	SE1
AVERAGE	**65**	
STD. DEV.	3.33	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-006
LAB ID NO.: L23-137-006-003
MATERIAL: 30 mil PVC
SEAM TYPE: SF

SAMPLE I.D.: DS-4

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	28	SE3	<10
2	24	SE3	<10
3	21	SE3	<10
4	28	SE3	<10
5	31	SE3	<10
AVERAGE	**26**		
STD. DEV.	3.40		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	63	SE1
2	49	SE1
3	107	SE1
4	61	SE1
5	67	SE1
AVERAGE	**69**	
STD. DEV.	19.67	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-007
LAB ID NO.: L23-137-007-001
MATERIAL: 30 mil PVC
SEAM TYPE: SF

SAMPLE I.D.: DS-5

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	30	SE3	<10
2	31	SE3	<10
3	32	SE3	<10
4	33	SE3	<10
5	31	SE3	<10
AVERAGE	**31**		
STD. DEV.	0.95		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	66	SE1
2	67	SE1
3	68	SE1
4	70	SE1
5	68	SE1
AVERAGE	**68**	
STD. DEV.	1.14	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-007
LAB ID NO.: L23-137-007-002
MATERIAL: 30 mil PVC
SEAM TYPE: SF

SAMPLE I.D.: DS-6

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	32	SE3	<10
2	32	SE3	<10
3	33	SE3	<10
4	31	SE3	<10
5	31	SE3	<10
AVERAGE	**32**		
STD. DEV.	0.73		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	61	SE1
2	64	SE1
3	60	SE1
4	64	SE1
5	69	SE1
AVERAGE	**64**	
STD. DEV.	3.21	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-009
LAB ID NO.: L23-137-009-001
MATERIAL: 30 mil PVC
SEAM TYPE: SF

SAMPLE I.D.: DS-7

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	33	SE3	<10
2	31	SE3	<10
3	32	SE3	<10
4	31	SE3	<10
5	32	SE3	<10
AVERAGE	**32**		
STD. DEV.	0.72		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	62	SE1
2	58	SE1
3	65	SE1
4	64	SE1
5	68	SE1
AVERAGE	**63**	
STD. DEV.	3.19	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-009
LAB ID NO.: L23-137-009-002
MATERIAL: 30 mil PVC
SEAM TYPE: SF

SAMPLE I.D.: DS-8

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	32	SE3	<10
2	31	SE3	<10
3	33	SE3	<10
4	33	SE3	<10
5	30	SE3	<10
AVERAGE	**32**		
STD. DEV.	1.07		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	62	SE1
2	58	SE1
3	65	SE1
4	67	SE1
5	59	SE1
AVERAGE	**62**	
STD. DEV.	3.33	

CHECKED BY: JLK DATE: 12/5/2023

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-010
LAB ID NO.: L23-137-010-001
MATERIAL: 30 mil PVC
SEAM TYPE: SF

SAMPLE I.D.: DS-9

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	30	SE3	<10
2	31	SE3	<10
3	35	SE3	<10
4	33	SE3	<10
5	31	SE3	<10
AVERAGE	**32**		
STD. DEV.	1.94		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	60	SE1
2	57	SE1
3	62	SE1
4	63	SE1
5	62	SE1
AVERAGE	**61**	
STD. DEV.	2.06	

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PEEL AND SHEAR TEST RESULTS
DESTRUCTIVE SEAM TESTING

ASTM D 6392

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-010
LAB ID NO.: L23-137-010-002
MATERIAL: 30 mil PVC
SEAM TYPE: SF

SAMPLE I.D.: DS-10

PEEL ADHESION

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE	PEEL INCURSION (%)
OUTSIDE TRACK (WELD "A")			
1	33	SE3	<10
2	29	SE3	<10
3	27	SE3	<10
4	25	SE3	<10
5	30	SE3	<10
AVERAGE	**29**		
STD. DEV.	2.70		

BONDED SEAM (SHEAR) STRENGTH

REPLICATE No.	PEAK LOAD (lbs/in)	EPA BREAK CLASSIFICATION CODE
1	69	SE1
2	71	SE1
3	71	SE1
4	67	SE1
5	68	SE1
AVERAGE	**69**	
STD. DEV.	1.56	

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Appendix C
PVC Geomembrane Field Quality Assurance/ Quality Control Data and Drawings

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Appendix C - I
Sequence 4 PVC Geomembrane Liner Panel Layout Drawing

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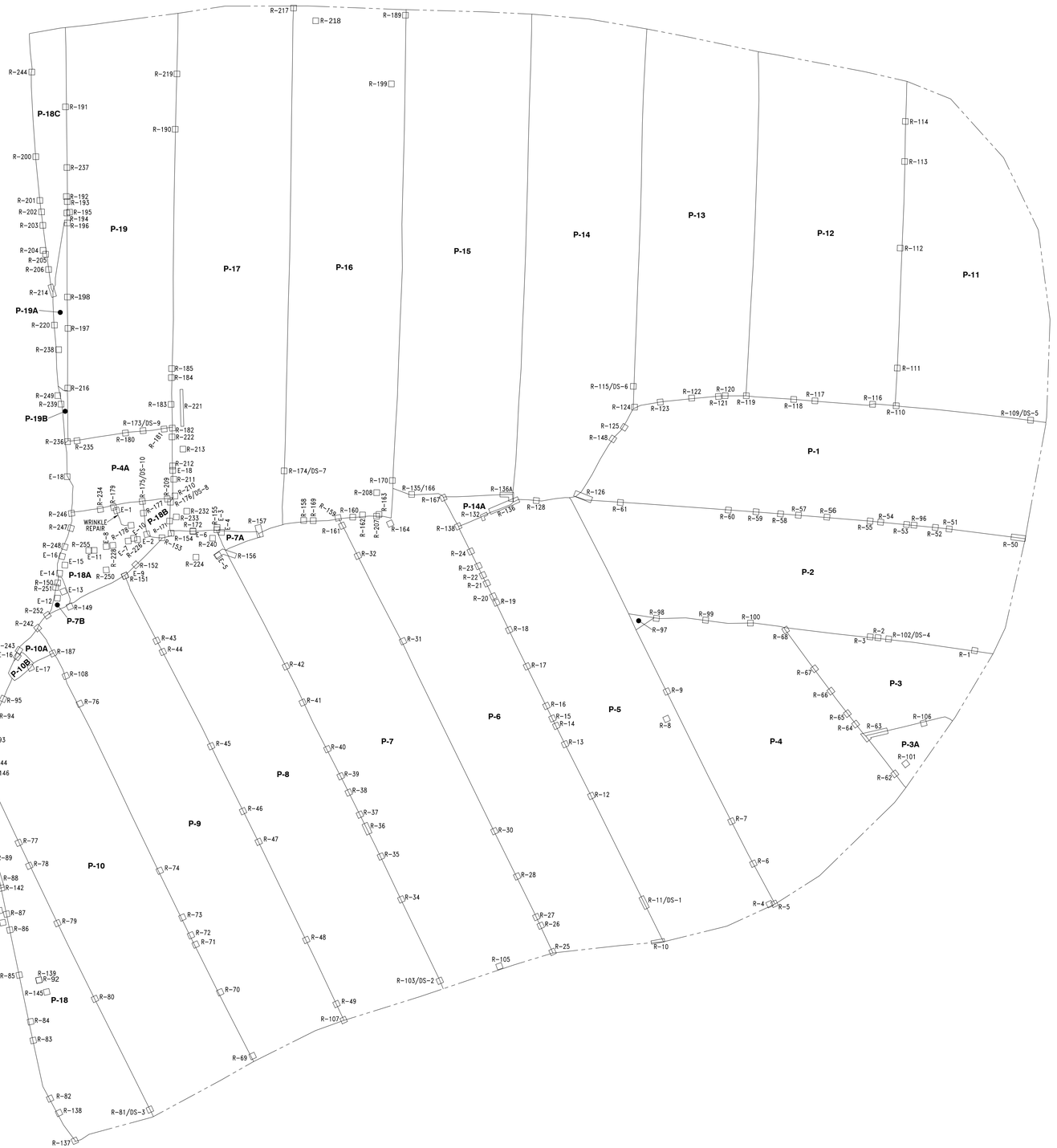
LEGEND

- □ E-1 — REPAIR IDENTIFICATION NOT LABELED IN THE FIELD
- □ R-1 — REPAIR IDENTIFICATION
- P-1 — PANEL IDENTIFICATION
- ——— — ANCHOR TRENCH



NORTH ORIENTATION IS BASED ON THE WEST VIRGINIA STATE PLANE COORDINATE SYSTEM SOUTH ZONE, NAD83.

0' 30' 60'

GRAPHIC SCALE: 1" = 30'

REV.	DESCRIPTION	DATE
0	PANEL ASBUILT	12-11-23

EXLINE SURVEYING, INC.
10356 STATE ROUTE 139
JACKSON, OHIO 45640
PHONE: (740) 286-7024 • TELECOPIER (740) 286-0012

PANEL ASBUILT
FOR
ENTACT, LLC

SEQUENCE 4
PANEL
ASBUILT
JOHN E. AMOS PLANT
WINFIELD, WEST VIRGINIA

DANA A. EXLINE LICENSED No. 928 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

DANA A. EXLINE
PROFESSIONAL SURVEYOR #928
STATE OF WEST VIRGINIA
DATE: 11/21/23

DRAWING SCALE: 1" = 30'

TITLE RESEARCH: N/A

CALCULATED BY: P. TAYLOR

DRAWN BY: P. TAYLOR

CHECKED BY: D. EXLINE

DRAWING NUMBER: 23033A PANEL ASBUILT

SHEET NUMBER: 1 OF 1

Panel Placement Log

Material: PVC

Project Name: Amos LF - Sequence 4
Start Date: 13-May-19
Project Location: Putnam County, WV

30 mil

Date Deployed	Panel No.	Time Deployed	Panel Locations	Roll No.	Width (ft)	Length (ft)	Area (sq ft)
11/13/23	P-1	13:00		w06150-1	62.5	260	16250
11/13/23	P-2	14:15		w06150-2	62	250	15500
11/13/23	P-3	15:35		w06151-3	62	124.5	7719
11/14/23	P-3A	15:30		w06151-1	42	42	1764
11/14/23	P-4	9:50		w06162-1	93	147	13671
11/30/23	P-4A			w06152-1	20	56	1120
11/14/23	P-5	11:00		w06153-1	63	260.5	16411.5
11/14/23	P-6	13:25		w06154-1	55	272	14960
11/14/23	P-7	14:30		w06155-1	62	275	17050
11/30/23	P-7A			w06155-1	12	21	252
11/30/23	P-7B			w06155-1	11	15	165
11/15/23	P-8	8:30		w06156-1	56	277	15512
11/15/23	P-9	10:20		w06157-1	56	267.5	14980
11/15/23	P-10	11:25		w06158-1	62	239	14818
11/17/23	P-11	13:55		w06149-1	87	176	15312
11/20/23	P-12	8:57		w06148-1	81	184	14904
11/20/23	P-13	11:15		w06147-1	61	195.5	11925.5
11/20/23	P-14	13:46		w06146-1	62	239	14818
11/20/23	P-14A			w06146-1	1	1	1
11/20/23	P-15	14:00		w06145-1	68	275	18700
11/29/23	P-16	9:40		w06146-1	61	260	15860
11/29/23	P-17	14:00		w06143-1	62	313	19406
11/16/23	P-18	10:00		w06142-1	32	225	7200
11/30/23	P-18A			w06142-1	54	46	2484
11/30/23	P-18B			w06142-1	12	29	348
11/30/23	P-18C			w06142-1	39	175	6825
11/30/23	P-19			w07009-1	62.5	250	15625
11/30/23	P-19A			w07009-1	5	60	300
11/30/23	P-19B			w07009-1	5	40	200

Appendix C - II
Sequence 4 PVC Geomembrane Trial Weld Test Results

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Geomembrane Field Trial Seam Log

Material: PVC

Project Name: Amos LF - Sequence 3 Cap
Start Date: 13-May-19
Project Location: Putnam County, WV

30 mil Thickness

Project Seam Requirements	Fusion:	Extrusion:
Peel:	18	
Shear:	59	
Tensiometer #:	T-4	

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail
				Machine	Operator	Temp/ Speed F/fpm	Barrel/ Preheat F/F	Peel (ppi) In/Out					Shear (ppi)					
								1	2	3	4	5	1	2	3	4	5	
1	11/13/23	11:00	52	3650	TT	5	800	30	33	34	33		73	72				Pass
								34	32	35	29							
2	11/13/23	11:00	52	4915	JP	4.7	750	33	35	39	35		74	77				Pass
								33	42	35	35							
1	11/14/23	13:00	57	3650	JP	5	800	32	41	32	32		61	64				Pass
								31	29	34	25							
2	11/14/23	15:20	59	solvent	SC	N/A	N/A	23	25	18	20		66	74				Pass
3	11/14/23	15:40	59	solvent	MA	N/A	N/A	25	27	24	27		73	74				Pass
4	11/14/23	16:30	57	4915	JB	4.7	750	31	29	34	33		66	37				Pass
								30	30	38	31							
1	11/15/23	8:00	50	4915	JP	4.8	750	33	27	24	24		73	70				Pass
								29	35	31	31							
2	11/15/23	15:00	68	3650	JP	4.5	700	30	33	36	35		82	70				Pass
								33	32	30	32							
3	11/15/23	12:50	68	solvent	CL	N/A	N/A	18	20	20	18		72	26				Pass
4	11/15/23	12:50	68	solvent	SC	N/A	N/A	26	23	22	23		72	33				Pass
5	11/15/23	12:50	68	solvent	TG	N/A	N/A	27	28	33	31		74	35				Pass
1	11/16/23	8:05	39	4915	JP	N/A	N/A	39	40	38	41		87	34				Pass
								36	41	41	36							
2	11/16/23	10:40	64	solvent	CL	N/A	N/A	19	21	23	22		62	37				Pass
3	11/16/23	10:40	64	solvent	TG	N/A	N/A	25	23	26	24		63	72				Pass

GAI Consultants, Inc.

Geomembrane Field Trial Seam Log

Material: PVC

Project Seam Requirements

Project Name:	Amos LF - Sequence 3 Cap
Start Date:	13-May-19
Project Location:	Putnam County, WV

30 mil Thickness

	Fusion:	Extrusion:
Peel:	18	
Shear:	59	
Tensiometer #:	T-4	

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail
				Machine	Operator	Temp/ Speed F/fpm	Barrel/ Preheat F/F	Peel (ppi) In/Out					Shear (ppi)					
								1	2	3	4	5	1	2	3	4	5	
4	11/16/23	10:40	64	solvent	SC	N/A	N/A	19	21	20	20		61	33				Pass
5	11/16/23	13:00	64	solvent	WTY	N/A	N/A	26	32	27	31		63	34				Pass
6	11/16/23	13:30	69	4915	JP	4.7	750	27	31	33	35		68	34				Pass
								29	32	31	37							
1	11/17/23	7:30	57	solvent	CL	N/A	N/A	24	21	21	27		78	84				Pass
2	11/17/23	7:30	57	solvent	TG	N/A	N/A	34	31	26	29		78	75				Pass
3	11/17/23	7:30	57	solvent	JP	N/A	N/A	29	27	35	32		82	38				Pass
4	11/17/23	7:30	57	solvent	WTY	N/A	N/A	27	24	29	30		74	30				Pass
5	11/17/23	13:00	57	4915	JP	4.5	750	40	45	46	45		73	72				Pass
								48	43	44	44							
1	11/20/23	7:30	35	4915	JP	4.5	750	36	37	41	32		70	73				Pass
								36	32	37	31							
2	11/20/23	13:43	35	solvent	TG	N/A	N/A	18	31	34	40		65	73				Pass
3	11/20/23	14:15	35	solvent	CL	N/A	N/A	22	28	25	20		69	78				Pass
4	11/20/23	16:20	35	solvent	SC	N/A	N/A	38	29	37	37		83	58				Pass
5	11/20/23	13:00	56	4915	JP	4.5	750	38	30	34	39		62	61				Pass
1	11/27/23	10:10	34	solvent	TG	N/A	N/A	48	32	49	40		77	76				Pass

GAI Consultants, Inc.

Geomembrane Field Trial Seam Log

Material: PVC

Project Name: Amos LF - Sequence 3 Cap
Start Date: 13-May-19
Project Location: Putnam County, WV

30 mil Thickness

Project Seam Requirements

	Fusion:	Extrusion:
Peel:	18	
Shear:	59	
Tensiometer #:	T-4	

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail
				Machine	Operator	Temp/ Speed F/fpm	Barrel/ Preheat F/F	Peel (ppi) In/Out					Shear (ppi)					
								1	2	3	4	5	1	2	3	4	5	
2	11/27/23	8:10	34	solvent	TG	N/A	N/A	23	21	23	19		64	74				Pass
3	11/27/23	13:26	34	solvent	WTY	N/A	N/A	32	38	34	36		77	80				Pass
4	11/27/23	7:48	34	solvent	CL	N/A	N/A	37	23	28	30		69	81				Pass
5	11/27/23	8:00	34	solvent	WTY	N/A	N/A	36	33	30	38		76	80				Pass
6	11/27/23	9:00	34	solvent	KS	N/A	N/A	29	27	31	33		79	64				Pass
7	11/27/23	9:20	34	solvent	TG	N/A	N/A	21	19	22	31		70	76				Pass
8	11/27/23	8:30	34	solvent	CL	N/A	N/A	39	31	31	31		77	79				Pass
1	11/29/23	10:12	23	4915	CL	4.5	850	35	41	27	39		74	72				Pass
								25	44	36	41							
2	11/29/23	14:35	45	4915	CL	4.5	800	35	37	37	37		58	84				Pass
								38	36	34	36							
1	11/30/23	13:30	58	4915	CL	4.5	750	35	37	37	37		61	65				Pass
								38	36	34	36							
1	12/4/23	13:30	48	4915	PP	4	850	39	36	44	43		75	74				Pass
								33	37	35	36							
1	11/16/23	10:56		solvent	TG	N/A	N/A	24	29	31	30		69	68	71	67		Pass
1	11/20/23			4915	JP	4.5	750	36	33	31	34		76	71				Pass
								34	31	30	29							
2	11/16/23	10:30		solvent	SC	N/A	N/A	31	31	30	31		69	71				Pass

GAI Consultants, Inc.

Geomembrane Field Trial Seam Log

Material: PVC

Project Name: Amos LF - Sequence 3 Cap
Start Date: 13-May-19
Project Location: Putnam County, WV

30 mil Thickness

Project Seam Requirements

	Fusion:	Extrusion:
Peel:	18	
Shear:	59	
Tensiometer #:	T-4	

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail
				Machine	Operator	Temp/ Speed F/fpm	Barrel/ Preheat F/F	Peel (ppi) In/Out					Shear (ppi)					
								1	2	3	4	5	1	2	3	4	5	
3	11/16/23	10:40		solvent	CL	N/A	N/A	29	27	31	30		72	71				Pass
1	11/27/23			solvent	CL	N/A	N/A	37	30	27	21		71	69				Pass
1	11/18/23			solvent	CL	N/A	N/A	31	28	23	19		71	70				Pass
4	11/16/23			solvent	TG	N/A	N/A	32	31	36	30		69	71				Pass
2	11/18/23	13:00		solvent	JP	N/A	N/A	32	30	29	31		76	70				Pass
1	11/29/23	10:50	23	4915	CL	4.5	850	35	41	27	39		74	72				Pass
								25	44	36	41							
2	11/29/23	14:35	45	4915	CL	4.5	800	35	37	37	37		58	84				Pass
								38	36	34	36							
1	11/30/23	13:30	58	4915	CL	4.5	750	35	31	43	36		61	65				Pass
								31	30	21	36							
3	11/29/23	8:30	26	solvent	KS	N/A	N/A	25	19	18	18		59	59				Pass
4	11/29/23	8:15	26	solvent	CI	N/A	N/A	30	28	30	25		71	62				Pass
5	11/29/23		26	solvent	MT	N/A	N/A	22	21	22	18		59	59				Pass
6	11/29/23	7:30	26	solvent	SC	N/A	N/A	19	21	21	20		61	71				Pass
1	12/2/23	8:00	42	solvent	PO	N/A	N/A	18	18	19	18		59	59				Pass
2	12/2/23	8:10	42	solvent	CL	N/A	N/A	26	23	26	27		59	67				Pass

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Geomembrane Field Trial Seam Log

Material: PVC

Project Seam Requirements

		Fusion:	Extrusion:
Project Name:	Amos LF - Sequence 3 Cap	Peel: 18	Peel:
Start Date:	13-May-19	Shear: 59	Shear:
Project Location:	Putnam County, WV	Tensiometer #: T-4	

30 mil Thickness

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail
				Machine	Operator	Temp/ Speed F/fpm	Barrel/ Preheat F/F	Peel (ppi) In/Out					Shear (ppi)					
								1	2	3	4	5	1	2	3	4	5	
1	12/4/23	7:59	38	solvent	CL	N/A	N/A	19	19	18	19		61	59				Pass
2	12/4/23	8:30	38	solvent	SC	N/A	N/A	18	19	19	18		63	58				Pass
3	12/4/23		42	4915	MB	4.5	800	32	31	32	31		71	70				Pass
								38	33	33	33							
1	12/5/23	9:00		solvent	KS	N/A	N/A	21	19	18	20		69	67				Pass
2	12/5/23	9:00		solvent	CL	N/A	N/A	23	20	19	21		70	71				Pass
3	12/5/23	10:00		solvent	PT	N/A	N/A	23	23	27	25		70	72				Pass
4	12/5/23	9:15		solvent	SH	N/A	N/A	19	21	18	23		69	71				Pass
1	12/6/23	9:06		solvent	CL	N/A	N/A	22	26	25	20		68	71				Pass
2	12/6/23	8:36		solvent	SH	N/A	N/A	18	23	21	23		69	76				Pass
3	12/6/23	9:42		solvent	PT	N/A	N/A	21	26	18	22		70	59				Pass
4	12/6/23	10:05		solvent	KS	N/A	N/A	22	25	23	20		71	71				Pass
1	12/7/23	9:00		solvent	CL	N/A	N/A	18	21	19	22		70	72				Pass
2	12/7/23	8:50		solvent	KS	N/A	N/A	21	23	18	27		69	73				Pass
3	12/7/23	9:10		solvent	SH	N/A	N/A	22	26	31	30		69	74				Pass

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Geomembrane Field Trial Seam Log

Material: PVC

Project Name: Amos LF - Sequence 3 Cap
Start Date: 13-May-19
Project Location: Putnam County, WV

30 mil Thickness

Project Seam Requirements

	Fusion:	Extrusion:
Peel:	18	
Shear:	59	
Tensiometer #:	T-4	

Sample #	Date	Time	Ambient Temp.	Welder ID		Wedge	Extruder	Seam Strength										Pass Fail
				Machine	Operator	Temp/ Speed F/fpm	Barrel/ Preheat F/F	Peel (ppi) In/Out					Shear (ppi)					
								1	2	3	4	5	1	2	3	4	5	
4	12/7/23	10:11		solvent	PT	N/A	N/A	21	26	23	28		70	74				Pass
1	12/8/23	9:40		solvent	KS	N/A	N/A	28	26	31	33		71	69				Pass
2	12/8/23	9:40		solvent	SH	N/A	N/A	23	27	31	33		70	73				Pass
3	12/8/23	9:45		solvent	CL	N/A	N/A	28	31	29	33		72	74				Pass
4	12/8/23	9:35		solvent	PT	N/A	N/A	18	23	31	29		72	70				Pass
1	12/9/23	10:00		solvent	SH	N/A	N/A	19	24	28	31		73	73				Pass
2	12/9/23	10:30		solvent	KS	N/A	N/A	22	29	33	20		69	71				Pass
3	12/9/23	10:12		solvent	PT	N/A	N/A	20	18	26	28		69	69				Pass
4	12/9/23	10:05		solvent	CL	N/A	N/A	23	22	27	29		70	73				Pass
1	12/11/23	8:30		solvent	CL	N/A	N/A	22	26	25	28		69	72				Pass
2	12/11/23	8:33		solvent	SH	N/A	N/A	27	29	34	36		74	70				Pass
3	12/11/23	8:10		solvent	PT	N/A	N/A	32	36	29	31		69	76				Pass
4	12/11/23	8:15		solvent	KS	N/A	N/A	23	28	19	23		70	73				Pass

Appendix C - III

Sequence 4 PVC Geomembrane Liner Repairs Drawing and Repair Reports

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Repair Log

Project Name: Amos LF - Sequence 4
Start Date
Project Location: Putnam County, WV

Material: PVC
Thickness: 30 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test[1]	
		Seam #						P/F	Date
R-1	BO	P-2/3	11/14/23		2'x2'		SC	P	11/14/23
R-2	BO	P-2/3	11/15/23		1'x1'		SC	P	11/15/23
R-3	BO	P-2/3	11/15/23		1'x1'		SC	P	11/15/23
R-4	O	P-5	11/15/23		2'x1'		TG	P	11/15/23
R-5	O	P-4/5	11/15/23		3'x3'		TG	P	11/15/23
R-6	O	P-4/5	11/15/23		1'x1'		TG	P	11/15/23
R-7	O	P-4/5	11/15/23		1'x1'		TG	P	11/15/23
R-8	O	P-5	11/16/23		1'x1'		TG	P	11/15/23
R-9	BO	P-4/5	11/16/23		6'x2'		TG	P	11/16/23
R-10	O	P-5/6	11/15/23		5'x3'		SC	P	11/15/23
R-11	DS#1	P-5/6	11/15/23		6'x2'		SC	P	11/15/23
R-12	BO	P-5/6	11/15/23		1'x1'		SC	P	11/15/23
R-13	BO	P-5/6	11/15/23		1'x1'		SC	P	11/15/23
R-14	BO	P-5/6	11/16/23		1'x1'		SC	P	11/16/23
R-15	BO	P-5/6	11/16/23		1'x1'		SC	P	11/16/23
R-16	BO	P-5/6	11/16/23		4'x1'		SC	P	11/16/23
R-17	BO	P-5/6	11/16/23		5'x1'		SC	P	11/16/23
R-18	BO	P-5/6	11/16/23		7'x2'		SC	P	11/16/23
R-19	BO	P-5/6	11/16/23		1'x1'		SC	P	11/16/23
R-20	BO	P-5/6	11/16/23		1'x1'		SC	P	11/16/23
R-21	BO	P-5/6	11/15/23		1'x1'		CL	P	11/15/23
R-22	O	P-5/6	11/15/23		3'x1'		CL	P	11/15/23
R-23	BO	P-5/6	11/15/23		1'x1'		CL	P	11/15/23
R-24	O	P-5/6	11/15/23		2'x1'		CL	P	11/15/23
R-25	O	P-6/7	11/15/23		1'x3'		CL	P	11/15/23
R-26	BO	P-6/7	11/15/23		1'x1'		CL	P	11/15/23
R-27	BO	P-6/7	11/15/23		1'x1'		CL	P	11/15/23
R-28	O	P-6/7	11/15/23		seam		CL	P	11/15/23
R-29	O	P-6/7	11/15/23		seam		CL	P	11/15/23
R-30	O	P-6/7	11/15/23		seam		CL	P	11/15/23
R-31	O	P-6/7	11/15/23		1'x1'		CL	P	11/15/23
R-32	BO	P-6/7	11/15/23		1'x1'		CL	P	11/15/23
R-33	BO	P-6/7	11/18/23		12'x1'		JP	P	11/18/23
R-34	BO	P-7/8	11/18/23		3'x1'		JP	P	11/18/23
R-35	BO&O	P-7/8	11/18/23		6'x1'		JP	P	11/18/23
R-36	BO	P-7/8	11/18/23		1'x1'		JP	P	11/18/23
R-37	O	P-7/8	11/18/23		2'x1'		JP	P	11/18/23
R-38	O	P-7/8	11/18/23		2'x1'		JP	P	11/18/23
R-39	BO	P-7/8	11/17/23		1'x1'		JP	P	11/17/23
R-40	BO	P-7/8	11/17/23		2'x1'		JP	P	11/17/23
R-41	BO	P-7/8	11/17/23		12'x1'		CL	P	11/17/23
R-42	O	P-7/8	11/20/23		seam		CL	P	11/20/23

GAI Consultants, Inc.

Repair Log

Project Name: Amos LF - Sequence 4
Start Date
Project Location: Putnam County, WV

Material: PVC
Thickness: 30 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test[1]	
		Seam #						P/F	Date
R-43	WR	P-8/9	11/20/23		3'x1'		CL	P	11/20/23
R-44	BO	P-8/9	11/20/23		2'x1'		CL	P	11/20/23
R-45	BO	P-8/9	11/20/23		2'x1'		CL	P	11/20/23
R-46	BO	P-8/9	11/20/23		2'x1'		CL	P	11/20/23
R-47	BO	P-8/9	11/20/23		2'x1'		CL	P	11/20/23
R-48	O	P-8/9	11/16/23		1'x1'		CL	P	11/16/23
R-49	BO	P-8/9	11/16/23		1'x1'		CL	P	11/16/23
R-50	O	P-1/2	11/16/23		12'x2'		CL	P	11/16/23
R-51	BO	P-1/2	11/16/23		6'x2'		CL	P	11/16/23
R-52	BO	P-1/2	11/16/23		2'x1'		CL	P	11/16/23
R-53	BO	P-1/2	11/16/23		2'x1'		CL	P	11/16/23
R-54	BO	P-1/2	11/16/23		1'x1'		CL	P	11/16/23
R-55	BO	P-1/2	11/16/23		2'x1'		CL	P	11/16/23
R-56	BO	P-1/2	11/16/23		3'x1'		CL	P	11/16/23
R-57	O	P-1/2	11/16/23		2'x1'		CL	P	11/16/23
R-58	BO	P-1/2	11/16/23		2'x1'		CL	P	11/16/23
R-59	BO	P-1/2	11/16/23		2'x1'		CL	P	11/16/23
R-60	BO	P-1/2	11/16/23		11'x1'		WTY	P	11/16/23
R-61	BO	P-1/2	11/16/23		2'x1'		WTY	P	11/16/23
R-62	O	P-3A/4	11/16/23		7'x2'		SC	P	11/16/23
R-63	BO	P-3A/3/4	11/17/23		6'x2'		JP	P	11/17/23
R-64	BO	P-3/4	11/17/23		1'x1'		JP	P	11/17/23
R-65	BO	P-3/4	11/17/23		2'x1'		JP	P	11/17/23
R-66	BO	P-3/4	11/17/23		2'x7'		CL	P	11/17/23
R-67	WR	P-3/4	11/17/23		2'x1'		TG	P	11/17/23
R-68	T	P-2/3/4	11/17/23		7'x2'		TG	P	11/17/23
R-69	BO	P-9/10	11/20/23		7'x2'		CL	P	11/20/23
R-70	O	P-9/10	11/20/23		1'x1'		KS	P	11/20/23
R-71	O&WR	P-9/10	11/20/23		2'x1'		KS	P	11/20/23
R-72	BO	P-9/10	11/20/23		1'x1'		KS	P	11/20/23
R-73	BO&O	P-9/10	11/20/23		8;x2;		KS	P	11/20/23
R-74	O	P-9/10	11/20/23		3'x1'		KS	P	11/20/23
R-75	O	P-9/10	11/27/23		3'X1'		CL	P	11/27/23
R-76	BO&O	P-1/2	11/20/23		3'X1'		CL	P	11/20/23
R-77	O	P-10/18	11/20/23		12'x1'		TG	P	11/20/23
R-78	WR	P-10/18	11/20/23		4'X1'		TG	P	11/20/23
R-79	WR	P-10/18	11/20/23		2'X1'		TG	P	11/20/23
R-80	O	P-10/18	11/20/23		3'X1'		TG	P	11/20/23
R-81	O	P-10/18	11/18/23		3'X5'		CL	P	11/18/23
R-82	O	P-18/WTI	11/28/23		3'X1'		KS	P	11/28/23
R-83	O	P-18/WTI	11/28/23		2'X1'		SC	P	11/28/23
R-84	O	P-18/WTI	11/28/23		1'X1'		CL	P	11/28/23

GAI Consultants, Inc.

Repair Log

Project Name: Amos LF - Sequence 4
Start Date
Project Location: Putnam County, WV

Material: PVC
Thickness: 30 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test[1]	
		Seam #						P/F	Date
R-85	O	P-18/WTI	11/28/23		1'X1'		CL	P	11/28/23
R-86	O	P-18/WTI	11/27/23		1'X1'		CL	P	11/27/23
R-87	O	P-18/WTI	11/27/23		3'x1'		CL	P	11/27/23
R-88	O	P-18/WTI	11/27/23		11'x1'		CL	P	11/27/23
R-89	O	P-18/WTI	11/20/23		2'x1'		CL	P	11/20/23
R-90	O	P-18/WTI	11/28/23		8'x5'		SC	P	11/28/23
R-91	O	P-18/WTI	11/29/23		2'x1'		KS	P	11/29/23
R-92	T	P-18/WTI	11/28/23		6'x6'		CL	P	11/28/23
R-93	O	P-10/WTI	12/4/23		2'x1'		SC	P	12/4/23
R-94	BO	P-10/WTI	11/28/23		4'x2'		KS	P	11/28/23
R-95	O	P-10/WTI	12/4/23		3'x2'		SC	P	12/4/23
R-96	O	P-1/2	11/16/23		1'x1'		CL	P	11/16/23
R-97	O	P-2/4	11/16/23		12'12		TG	P	11/16/23
R-98	BO	P-2/4	11/17/23		4'x2'		TG	P	11/17/23
R-99	BO	P-2/4	11/17/23		4'x1'		CL	P	11/17/23
R-100	O	P-2/4	11/17/23		4'x2'		JP	P	11/17/23
R-101	O	P-3A	11/17/23		1'x1'		CL	P	11/17/23
R-102	DS#4	P-2/3	11/18/23		6'x2'		TG	P	11/18/23
R-103	DS#2	P-7/8	11/18/23		6'x2'		JP	P	11/18/23
R-104	DS#3	P-10/18	11/18/23		6'x2'		CL	P	11/18/23
R-105	O	P-7	11/17/24		1'x1'		TG	P	11/17/24
R-106	O	P-3A/3	11/18/23		1'x1'		TG	P	11/18/23
R-107	O	P-8/9	11/20/23		2'x1'		CL	P	11/20/23
R-108	O	P-9/10	11/20/23		1'x1'		CL	P	11/20/23
R-109	DS#5	P-1/11	11/29/23		6'x2'		KS	P	11/29/23
R-110	T	P-1/11	11/28/23		5'x2'		KS	P	11/28/23
R-111	BO	P-11/12	11/28/23		2'x1'		KS	P	11/28/23
R-112	WR	P-11/12	11/28/23		6'x2'		KS	P	11/28/23
R-113	O	P-11/12	11/28/23		3'x1'		KS	P	11/28/23
R-114	O	P-11/12	11/28/23		3'x1'		KS	P	11/28/23
R-115	DS#6	P-13/14	11/28/23		6'x2'		SC	P	11/28/23
R-116	O	P-1/12	11/28/23		3'x1'		SC	P	11/28/23
R-117	O	P-1/12	11/29/23		2'x1'		KS	P	11/29/23
R-118	O	P-1/12	11/29/23		2'x1'		KS	P	11/29/23
R-119	T	P-1/12	11/29/23		5'x1'		KS	P	11/29/23
R-120	O	P-1/13	11/29/23		3'x2'		KS	P	11/29/23
R-121	O	P-1/13	11/29/23		2'x1'		KS	P	11/29/23
R-122	O	P-1/13	11/29/23		2'x1'		SC	P	11/29/23
R-123	O	P-1/13	11/29/23		2'x1'		SC	P	11/29/23
R-124	T	P-1/13	11/29/23		5'x1'		SC	P	11/29/23
R-125	WR	P-1/14	11/29/23		5'x1'		SC	P	11/29/23
R-126	T&WR	P-1/2	11/29/23		3'x2'		SC	P	11/29/23

GAI Consultants, Inc.

Repair Log

Project Name: Amos LF - Sequence 4
Start Date
Project Location: Putnam County, WV

Material: PVC
Thickness: 30 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test[1]	
		Seam #						P/F	Date
R-127	WR	P-2/5/14	11/29/23		1'x1'		SC	P	11/29/23
R-128	O	P-5/14	11/29/23		7'x2'		MT	P	11/29/23
R-129	WR	P-5/14/15	11/29/23		8'x1'		MT	P	11/29/23
R-130	BO	P-5/15	11/29/23		1'x1'		MT	P	11/29/23
R-131	BO	P-5/15	11/29/23		1'x1'		MT	P	11/29/23
R-132	BO	P-5/14A	12/4/23		3'x1'		SH	P	12/4/23
R-133	T	P-5/6/14A	12/4/23		3'x1'		SH	P	12/4/23
R-134	T	P-14A/6/15	12/4/23		2'x2'		CL	P	12/4/23
R-135	O	P-6/15	12/4/23		2'x1'		SH	P	12/4/23
R-136	T	P-5/14A	11/29/23		5'x2'		MT	P	11/29/23
R-136A	O	P-16/14A	12/4/23		7'x2'		SC	P	12/4/23
R-137	O	P-18/WTI	11/28/23		1'x1'		KS	P	11/28/23
R-138	O	P-18/WTI	11/28/23		1'x1'		KS	P	11/28/23
R-139	O	P-18	11/28/23		1'x1'		SC	P	11/28/23
R-140	O	WTI	11/25/23		1'x1'		CL	P	11/28/23
R-141	o	WTI	11/25/23		1'x1'		CL	P	11/28/23
R-142	O	P-8/WTI	11/27/23		1'x1'		CL	P	11/27/23
R-143	O	WTI	11/28/23		2'x1'		SC	P	11/28/23
R-144	WR	P-10/18	11/28/23		7'x3'		KS	P	11/28/23
R-145	O	P-18	11/30/23		1'x1'		KS	P	11/30/23
R-146	O	P-10/18	11/28/23		2'x1'		CL	P	11/28/23
R-147	O	P-10/18/WTI	11/30/23		1'x1'		KS	P	11/30/23
R-148	O	P-1/14	11/29/23		1'x1'		SC	P	11/29/23
R-149	T	P-9	11/29/23		2'x1'		CL	P	11/29/23
R-150	T	P-7B/WTE	11/29/23		1'x1'		CL	P	11/29/23
R-151	T	P-8/9	11/29/23		1'x1'		SC	P	11/29/23
R-152	BO	P-8/18A	11/30/23		1'x1'		SC	P	11/30/23
R-153	O	P-8/18A	12/2/23		1'x1'		PT	P	12/2/23
R-154	O	P-8/17	12/2/23		3'x1'		PT	P	12/2/23
R-155	O	P7A/17	12/2/23		2'x2'		PT	P	12/2/23
R-156	T	P-7/8	12/2/23		9'x3		CL	P	12/2/23
R-157	O	P-7A/17	12/2/23		3'x1'		CL	P	12/2/23
R-158	O	P-7/16	12/2/23		2'x1'		CL	P	12/2/23
R-159	T	P-7/16	12/2/23		2'x2'		PT	P	12/2/23
R-160	O	P-6/16	12/4/23		3'x1'		PT	P	12/4/23
R-161	O	P-6/7	12/4/23		2'x2'		PT	P	12/4/23
R-162	O	P-6/16	12/4/23		2'x2'		CL	P	12/4/23
R-163	BO	P-6/16	12/4/23		2'x2'		CL	P	12/4/23
R-164	O	P-6	12/4/23		2'x2'		CL	P	12/4/23
R-165	O	P-6/15/16	12/4/23		1'x1'		CL	P	12/4/23
R-166	BO	P-6/15	12/4/23		2'x2'		CL	P	12/4/23
R-167	T	P-16/14A	12/4/23		3'x2'		CL	P	12/4/23

GAI Consultants, Inc.

Repair Log

Project Name: Amos LF - Sequence 4 Material: PVC

Start Date

Project Location: Putnam County, WV Thickness: 30 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test[1]	
		Seam #						P/F	Date
R-168	T	P-5/6/14A	12/4/23		3'x2'		SH	P	12/4/23
R-169	BO	P-7/16	12/2/23		2'x1'		PO	P	12/2/23
R-170	BO	P-15/16	12/4/23		2'x1'		CL	P	12/4/23
R-171	BO	P-17/18B	12/4/23		1'x1'		PT	P	12/4/23
R-172	BO	P-8/17	11/30/23		1'x1'		SC	P	11/30/23
R-173	DS-#9	P-4A/19	12/4/23		6'x2'		CL	P	12/4/23
R-174	DS-#7	P-16/17	12/4/23		8'x2'		PT	P	12/4/23
R-175	DS-#10	P-4A/18B	12/4/23		4'x2'		SC	P	12/4/23
R-176	DS-#8	P-17/18B	12/4/23		5'x2'		SC	P	12/4/23
R-177	O	P-18A/18B	12/2/23		3'x3'		PO	P	12/2/23
R-178	O	P-18A	12/4/23		3'x3'		PO	P	12/4/23
R-179	O	P-4A/18A	12/4/23		3'x2'		SC	P	12/4/23
R-180	BO	P-4A/19	12/4/23		3'x2'		PT	P	12/4/23
R-181	O	P-4A/19	12/4/23		1'x1'		PT	P	12/4/23
R-182	T	P-17/19	12/4/23		2'x2'		SH	P	12/4/23
R-183	O	P-17/19	12/4/23		1'X1'		SH	P	12/4/23
R-184	BO	P-17/19	12/4/23		1'X1'		SH	P	12/4/23
R-185	O	P-17/19	12/4/23		1'X1'		SH	P	12/4/23
R-186	O	P-10	12/6/23		1'X1'		KS	P	12/6/23
R-187	T	P-10A/9	12/6/23		8'X4'		KS	P	12/6/23
R-188	O	P-10B/WTI	12/6/23		2'X2'		KS	P	12/6/23
R-189	BO	P-15/16	12/7/23		5'X1'		SH	P	12/7/23
R-190	BO	P-17/19	12/6/23		1'X1'		CL	P	12/6/23
R-191	BO	P-18C/19	12/5/23		3'X1'		CL	P	12/5/23
R-192	BO	P-18C/19	12/5/23		2'X1'		SH	P	12/5/23
R-193	BO	P-18C/19	12/5/23		1'X1'		SH	P	12/5/23
R-194	BO	P-18C/19	12/5/23		1'X1'		SH	P	12/5/23
R-195	BO	P-19	12/5/23		1'X1'		SH	P	12/5/23
R-196	BO	P-18C/19	12/6/23		3'X2'		SH	P	12/6/23
R-197	O	P-19A/19	12/6/23		2'X2'		SH	P	12/6/23
R-198	BO	P-19A/19	12/6/23		5'X2'		SH	P	12/6/23
R-199	O	P-16	12/7/23		1'X1'		SH	P	12/7/23
R-200	O	P-18C/WTI	12/5/23		1'x1'		CL	P	12/5/23
R-201	O	P-18C/WTI	12/6/23		1'x1'		CL	P	12/6/23
R-202	O	P-18C/WTI	12/6/23		1'x1'		CL	P	12/6/23
R-203	O	P-18C/WTI	12/6/23		1'x1'		CL	P	12/6/23
R-204	O	P-18C/WTI	12/6/23		2'x1'		CL	P	12/6/23
R-205	O	P-18C/WTI	12/6/23		2'x1'		CL	P	12/6/23
R-206	O	P-18C/WTI	12/6/23		1'x1'		CL	P	12/6/23
R-207	O	P-6/16	12/7/23		1'x1'		KS	P	12/7/23
R-208	O	P-16	12/7/23		1'x1'		KS	P	12/7/23
R-209	O	P-4A/18B	12/6/23		1'x1'		CL	P	12/6/23

GAI Consultants, Inc.

Repair Log

Project Name: Amos LF - Sequence 4
Start Date
Project Location: Putnam County, WV

Material: PVC
Thickness: 30 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test[1]	
		Seam #						P/F	Date
R-210	O	P-4A/17	12/6/23		2'x1'		CL	P	12/6/23
R-211	BO	P-4A/17	12/6/23		1'X1'		CL	P	12/6/23
R-212	O	P-4A/17	12/6/23		1'X1'		CL	P	12/6/23
R-213	O	P-17	12/6/23		1'X1'		CL	P	12/6/23
R-214	T	P-18C/WTI	12/7/23		5'X2'		CL	P	12/7/23
R-215	O	P-19/19A/WTI	12/7/23		1'X1'		CL	P	12/7/23
R-216	T	P-19A/19	12/7/23		4'X2'		CL	P	12/7/23
R-217	O	P-16/17	12/7/23		1'X1'		SK	P	12/7/23
R-218	O	P-16	12/7/23		1'X1'		KS	P	12/7/23
R-219	O	P-19A/19	12/7/23		2'X2'		CL	P	12/7/23
R-220	O	P-19A/WTI	12/7/23		1'X1'		CL	P	12/7/23
R-221	O	P-17	12/4/23		25'X1'		CL	P	12/4/23
R-222	O	P-4A/17	12/7/23		1'X1'		KS	P	12/7/23
R-223	T	P-7/8/17	12/8/23		3'X2'		SH	P	12/8/23
R-224	O	P-8	12/8/23		2'X2'		SH	P	12/8/23
R-225	O	P-18A/18B	12/8/23		1'X1'		SH	P	12/8/23
R-226	O	P-18A	12/8/23		2'X1		SH	P	12/8/23
R-227	O	P-18A	12/8/23		1'X1'		SH	P	12/8/23
R-228	O	P-18A	12/8/23		1'X1'		CL	P	12/8/23
R-229	O	P-18A	12/8/23		1'X1'		CL	P	12/8/23
R-230	O	P-18A	12/8/23		1'X1'		CL	P	12/8/23
R-231	O	P-18A	12/8/23		1'X1'		CL	P	12/8/23
R-232	O	P-17	12/8/23		2'X2'		SH	P	12/8/23
R-233	O	P-17	12/8/23		1'X1'		PT	P	12/8/23
R-234	O	P-4A/18A	12/8/23		1'X1'		SH	P	12/8/23
R-235	O	P-4A/19	12/8/23		1'X1'		SH	P	12/8/23
R-236	T	P-4A/19B	12/8/23		3'X2'		SH	P	12/8/23
R-237	O	P-18C/19	12/8/23		1'X1'		SH	P	12/8/23
R-238	O	P-19A/WTI	12/8/23		3'X2'		SH	P	12/8/23
R-239	O	P-19B/WTI	12/8/23		3'X2'		SH	P	12/8/23
R-240	O	P-8	12/8/23		1'X1'		PT	P	12/8/23
R-241	O	P-18A/7B	12/8/23		2'X1'		PT	P	12/8/23
R-242	T	P-10A/WTI	12/8/23		2'X1'		KS	P	12/8/23
R-243	T	P-10A/WTI	12/8/23		4'X2'		KS	P	12/8/23
R-244	GC	P-18C/WTI	12/8/23		2'X2'		CL	P	12/8/23
R-245	O	P-7B/18A/WTI	12/8/23		1'X1'		SH	P	12/8/23
R-246	O	P-18A/WTI	12/8/23		1'X1'		SH	P	12/8/23
R-247	O	P-18A/WTI	12/8/23		2'x1'		SH	P	12/8/23
R-248	O	P-18A/WTI	12/8/23		1'X1'		CL	P	12/8/23
R-249	O	P-19B/WTI	12/9/23		1'X1'		CL	P	12/9/23
R-250	O	P-18A	12/9/23		1'X1'		CL	P	12/9/23
R-251	O	P-7B/WTI	12/9/23		1'X1'		CL	P	12/9/23

GAI Consultants, Inc.

Repair Log

Project Name: Amos LF - Sequence 4
Start Date
Project Location: Putnam County, WV

Material: PVC
Thickness: 30 mil

Repair #	Defect Code	Defect Location	Repair Date	Repair Time	Approx Size	Machine ID	Repair Tech	Vacuum Test[1]	
		Seam #						P/F	Date
R-252	T	P-7B/9	12/9/23		1'X1'		PT	P	12/9/23
R-253	O	P-7B/WTI	12/9/23		1'X1'		SH	P	12/9/23
R-254	O	P-7B	12/9/23		2'X2'		PT	P	12/9/23
R-255	O	P-18A	12/9/23		1'X1'		PT	P	12/9/23
R-256	O	P-17	12/9/23		1'X1'		KS	P	12/9/23

Appendix C - IV
Sequence 4 PVC Geomembrane Liner Air Lance Test Reports

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Seaming and Non Destructive Test Log

Project Name: Amos LF - Sequence 4
Start Date: 13-May-19
Project Location: Putnam County, WV

Material: PVC
Thickness: 30 mil

Weld Date	Seam # (P#/P#)	Weld Time	Tech ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (feet)	Air Pressure Test or V-Box [1]					
										PSI		Time		Tech	Date [2]
										Start	Finish	Start	Finish		
11/13/2023	P-1/2	1430	JP	4915	750	470			250					NL	11/17/2023
11/13/2023	P-2/3	1523	TT	3650	800	500			138					NL	11/17/2023
11/14/2023	P-4/5	1300	JP	3650	800	500			174					NL	11/18/2023
11/14/2023	P-2/5	1415	JP	3650	800	500			69					NL	11/18/2023
11/14/2023	P-5/6	1440	JP	4915	800	500			258					NL	11/20/2023
11/14/2023	P-6/7	1700	JP	4915	800	500			272					NL	11/20/2023
11/15/2023	P-7/8	1430	JP	4915	750	4.7			277					GR	11/20/2023
11/15/2023	P-8/9	1028	JP	4915	750	4.7			277					GR	11/20/2023
11/15/2023	P-9/10	1300	JP	4915	750	4.7			253					GR	11/30/2023
11/15/2023	P-10/18	1120	JP	4915	570	4.7			223					GR	11/30/2023
11/16/2023	P-3/3A	1525	JP	4915	750	4.7			52					NL	11/17/2023
11/16/2023	P-3A/4	1640	JP	4915	750	4.7			42					NL	11/18/2023
11/16/2023	P-3/4	1620	JP	4915	750	4.7			74					NL	11/18/2023
11/16/2023	P2/4	1500	JP	4915	750	4.7			68					NL	11/18/2023
11/16/2023	P-18/WTE	1510	JP	4915	750	4.7			224					PP	12/11/2023
11/16/2023	P-10/WTE	1525	JP	4915	750	4.7			50					PP	12/11/2023
11/20/2023	P-11/12	900	JP	4915	750	4.5			178					MB	12/4/2023
11/20/2023	P-12/13	1250	JP	4915	750	4.5			190					MB	12/4/2023
11/20/2023	P-13/14	1417	JP	4915	750	4.5			201					PP	12/4/2023
11/20/2023	P-14/15	1530	JP	4915	750	4.5			277					PP	12/5/2023
11/20/2023	P-1/11	1140	JP	4915	750	4.5			80					MB	12/4/2023
11/20/2023	P-1/12	1150	JP	4915	750	4.5			81					MB	12/4/2023
11/20/2023	P-1/13	1625	JP	4915	750	4.5			63					MB	12/4/2023
11/20/2023	P-1/14	1615	JP	4915	750	4.5			58					PP	12/6/2023
11/20/2023	P-5/14	1640	JP	4915	750	4.5			29					PP	12/6/2023
11/29/2023	P-15/16	1125	CL	4915	850	4.5			285					GR	11/20/2023
11/20/2023	P-14A/15	1650	JP	4915	750	4.5			34					PP	12/6/2023
11/20/2023	P-6/14A	1702	JP	4915	750	4.5			17					PP	12/6/2023
11/20/2023	P-14A/14B	1703	JP	4915	750	4.5			4					PP	12/6/2023
11/20/2023	P-5/14A	1707	JP	4915	750	4.5			2					PP	12/6/2023
11/20/2023	P-6/15	1700	JP	4915	750	4.5			28					PP	12/6/2023
11/30/2023	P-7A/17	1425	CL	4915	750	4.5			23					PP	12/11/2023

GAI Consultants, Inc.

Seaming and Non Destructive Test Log

Project Name: Amos LF - Sequence 4
Start Date: 13-May-19
Project Location: Putnam County, WV

Material: PVC

Thickness: 30 mil

Weld Date	Seam # (P#/P#)	Weld Time	Tech ID	Machine ID	Machine Temp	Machine Speed or Preheat	Start Point	End Point	Seam Length (feet)	Air Pressure Test or V-Box [1]					
										PSI		Time		Tech	Date [2]
										Start	Finish	Start	Finish		
11/30/2023	P-7/7A	1430	CL	4915	750	4.5			21					PP	12/7/2023
11/30/2023	P-7A/8	1415	CL	4915	750	4.5			10					PP	12/11/2023
11/30/2023	P-7/17	1423	CL	4915	750	4.5			13					PP	12/7/2023
11/30/2023	P-7/16	1438	CL	4915	750	4.5			29					PP	12/7/2023
11/30/2023	P-6/16	1440	CL	4915	750	4.5			27					PP	12/6/2023
11/30/2023	P-7B/9	1527	CL	4915	750	4.5			11					PP	12/11/2023
11/30/2023	P-7B/WTE	1530	CL	4915	750	4.5			20					PP	12/11/2023
11/30/2023	P-8A/WTE	1545	CL	4915	750	4.5			39					PP	12/11/2023
11/30/2023	P-7B/8A	1555	CL	4915	750	4.5			16					PP	12/11/2023
11/30/2023	P-8/17	1420	CL	4915	750	4.5			24					PP	12/11/2023
11/30/2023	P-8/18A	1535	CL	4915	750	4.5			27					PP	12/11/2023
11/30/2023	P-17/19	2200	CL	4915	750	4.5			259					PP	12/7/2023
11/30/2023	P-18B/17	2250	CL	4915	750	4.5			19					PP	12/11/2023
11/30/2023	P-18A/18B	2256	CL	4915	750	4.5			23					PP	12/11/2023
11/30/2023	P-4A/17	2312	CL	4915	750	4.5			61					PP	12/11/2023
11/30/2023	P-4A/18B	2320	CL	4915	750	4.5			15					PP	12/11/2023
11/30/2023	P-4A/18A	2330	CL	4915	750	4.5			39					PP	12/11/2023
11/30/2023	P-4A/19	2340	CL	4915	750	4.5			59					PP	12/7/2023

ATTACHMENT 4
LEACHATE COLLECTION SYSTEM CERTIFICATION

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Sequence 4 Liner Repair
Leachate Collection System

American Electric Power
John E. Amos Landfill
John E. Amos Power Plant
Winfield, West Virginia

GAI Project Number: C130109.27
March 2024

Prepared by: GAI Consultants, Inc.
Charleston Office
500 Lee Street East, Suite 700
Charleston, West Virginia 25301

Prepared for: American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215

Sequence 4 Liner Repair
Leachate Collection System
American Electric Power
John E. Amos Landfill
John E. Amos Power Plant
Winfield, West Virginia

GAI Project Number: C130109.27

February 2024

Prepared for:
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Charleston, West Virginia 25301

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James F. Shields, PE (West Virginia)
Engineering Manager

Charles F. Straley, PE, PLS (West Virginia)
Quality Assurance Officer / Certifying Engineer
Director Engineering / Associate

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Figure 1 Site Plan

Appendix A Photographs of Construction Activities
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- B – I Manufacturing Quality Control Data
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Appendix D Record Drawings

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GAI Consultants, Inc. Certification

Based on the construction testing and observations performed by American Electric Power (AEP) and GAI Consultants, Inc. (GAI) personnel, I hereby certify that Leachate Collection System installation within Sequence 4 Liner Repair at the Appalachian Power Company's John E. Amos Flue Gas Desulfurization (FGD) Landfill near Winfield, West Virginia (WV), as shown on Drawing 30204SH5 and 30204SH6, has been installed in substantial compliance with the material specifications and construction requirements listed in the WV National Pollutant Discharge Elimination System/Solid Waste Permit (NPDES WV0116254) documents; the Federal Coal Combustion Residuals (CCR) Rule; and the "2023 Site Work Construction Sequence 4 Liner Repair" construction documents. Exline Surveying Inc. survey personnel provided survey data used to develop the Record Drawings and verify that the leachate collection system met the permit requirements.

This document clarifies "certification" for the installations of the leachate collection system within Sequence 4 Liner Repair at the Amos FGD Landfill.

The definition of certify as used herein is: Certify means to state or declare a professional opinion of conditions whose true properties cannot be known at the time such certification was made, despite appropriate professional evaluation. A design professional's certification in no way relieves any other party from meeting requirements imposed by contract or other means, including commonly-accepted industry practices.

Bearing the above in mind and based on the results of: (1) Certification from the material manufacturers and installation meeting the requirements of the Specifications, the CCR Rule, and the WV Department of Environmental Protection (WVDEP) permit; (2) results of field and laboratory testing; and (3) monitoring of construction efforts during the project; GAI's professional opinion is that the installations of the leachate collection system within Sequence 4 Liner Repair of the Amos FGD Landfill meet the requirements as set forth by the permit documents and the CCR Rule.

Charles F. Straley, PE, PLS
Certifying Engineer and Quality Assurance Officer
PE #11842

1.0 Introduction

1.1 Project Description

This "Leachate Collection System Certification" documents the testing and observations performed for the leachate collection system installations in Sequence 4 Liner Repair at American Electric Power's (AEP's) John E. Amos FGD Landfill (Landfill) in Winfield, West Virginia (WV). The location of Sequence 4 Liner Repair at the Amos Landfill is shown on Figure 1. Appendix A contains typical construction photographs included in the daily reports. Construction of the Sequence 4 Liner Repair site described in this certification report consists of the following:

1. Construction activities associated with the installations of the leachate collection system.

Construction of the groundwater control and subgrade preparation, including placement of structural fill to meet the compacted clay liner subgrade elevations, began in September 2023 and was documented in the "Sequence 4 Liner Repair Groundwater Control and Subgrade Certification" (December 2023).

Construction of the compacted clay liner (CCL) in Sequence 4 Liner Repair began in November 2023 and was completed in December 2023. The CCL construction is documented in the "Sequence 4 Liner Repair Compacted Clay Liner Certification" (January 2024).

Installation of the 30 mil polyvinyl chloride (PVC) geomembrane liner began in November 2023 and was completed in December 2023. The geomembrane installation is documented in the "Sequence 4 Liner Repair PVC Geomembrane Liner Certification Report" (February 2024).

Installation of the leachate collection system was performed in accordance with the approved Quality Assurance/Quality Control (QA/QC) Plan; the Landfill's Solid Waste/National Pollutant Discharge Elimination System (NPDES) permit (Permit No. WV0116254); the West Virginia Department of Environmental Protection (WVDEP) Title 33, Series 1, Solid Waste Management Rule; the Coal Combustion Residuals (CCR) Rule; and AEP's Civil Engineering Division Technical Specifications for Material Construction and associated Project Addenda to the Specifications. Included in this report are the field information and the applicable Record Drawings in accordance with the WVDEP requirements. The construction QA (CQA) services performed by GAI are discussed in the following sections.

1.2 Companies and Personnel

The key companies and personnel involved with the leachate collection system installations of Sequence 4 are listed below.

AEP - Owner
Appalachian Power Company - Operator
Janine White, Project Manager
Brian Palmer, P.E., Principal Civil Engineer
David Fry, Lead Construction Coordinator

GAI Consultants Inc. (GAI) – CQA/Soil Testing
Charles Straley, P.E., P.S., Certifying Engineering, QA Officer (QAO) and Director Engineering
John Klamut, P.E., Project Manager
James Shields, P.E., Lead QC Inspector (QCI)

Entact, LLC. (Entact) - General Contractor
Jonathan Lovenduski, Project Manager
Eric Cline, Superintendent

1.3 Scope of Services

1.3.1 Preconstruction Activities

Preconstruction activities conducted by GAI personnel consisted of the following:

1. Conduct inventory of on-site geocomposite drainage net and other leachate collection system materials;
2. Review of manufacturer's submittals of the geocomposite drainage net and other leachate collection system materials for compliance with project and permit specifications; and
3. Collect conformance samples of the geocomposite drainage net for laboratory testing and review of results for compliance with project and permit specifications.

1.3.2 Construction Documentation Activities

Construction documentation activities performed by GAI personnel included the following:

1. Documenting and observing the PVC geomembrane conditions prior to the installations of the leachate collection system;
2. Observing and documenting the installation and field testing of the leachate collection system;
3. Prepared daily field reports and documented construction activities. GAI also attended daily health and safety meetings, weekly project update meetings, and monthly contractor's meetings, as well as other supplemental meetings when needed; and
4. Provided photo documentation throughout the construction showing typical construction procedures (see Appendix A).

1.3.3 Record Drawings and Certification Report

Documentation and certification activities performed by the QA/QC team included the following:

1. Entact provided surveying services for the Record Drawings presented in Appendix D. Drawing "Leachate Collection Pipe As-built Survey" shows the installation of the leachate collection system piping and GDN collection system placement.
2. GAI personnel performed the construction documentation activities discussed in Sections 1.3.1 and 1.3.2 of this report.
3. Project personnel observed the construction activities and provided the enclosed information documenting that the construction activities were performed consistent with the design and permit requirements.

1.4 Construction Schedule

Site clearing and grubbing, excavation and fill placement for subgrade, and the installation of groundwater controls were performed prior to construction of the compacted clay liner. The compacted clay liner was then constructed upon the finished subgrade. Installation of the geomembrane liner was performed on the compacted clay liner. Installation of the leachate collection system started in December 2023 and was completed in January 2024.

1.5 Reference Documents

The plans, specifications, and QA requirements for the construction activities and materials used by GAI personnel for this project are as follows:

1. Solid Waste/NPDES Permit No. WV0116254.
2. AEP Civil Engineering Division, Technical Specifications for Material and Construction (prepared by AEP), and the Addenda to the Technical Specifications (prepared by GAI).
3. "Quality Assurance and Quality Control Plan, John E. Amos Landfill" for the Appalachian Power Company John E. Amos Plant's Amos FGD Landfill (revised June 2022, prepared by GAI).
4. Amos FGD Landfill Sequence 4 Liner Repair Construction Drawings (issued for construction March 2023 and revised September 2023, prepared by GAI)

2.0 Leachate Collection System

The leachate collection system (LCS) consists of: a 270-mil thick double-sided geocomposite drainage net (i.e., HDPE geonet surrounded by non-woven geotextiles); 12-inch and 4-inch diameter perforated polyvinyl chloride (PVC) pipe placed in the floor of the Sequence 4 Liner Repair area.

The LCS consists of a geocomposite drainage net (GDN) on the valley floor and side slopes, and PVC piping in specific locations in Sequence 4 Liner Repair area. The GDN was installed in accordance with the manufacturer's recommendations. A 12-inch diameter perforated leachate collection pipe was connected in the floor of the Sequence 4 Liner Repair area and installed on the eastern slope. In addition, 4-inch perforated collection lateral pipes were installed along the slopes of the Sequence 4 Liner Repair area. For the installation of the leachate collection pipes, a 6-ounce non-woven geotextile was placed over the GDN, a two-inch (minimum) bedding layer of coarse aggregate was placed on the geotextile, and the collection pipe was placed on top of the aggregate. Aggregate was placed over top of the pipes (minimum 12 inches thickness for the 4-inch diameter pipes, minimum 15-inches thickness for the 12-inch diameter pipes), and the aggregate was then wrapped with the 6-ounce non-woven geotextile to protect the gravel from the intrusion of fines.

The locations of the leachate collection pipes were surveyed, and the as-built locations of the LCS pipes are shown on Drawing Leachate Collection Pipe Record Drawing in Appendix E.

2.1 Manufacturing Quality Control - GDN

The Manufacturer's Quality Control (MQC) certifications were submitted (Appendix B-1) for review. To monitor the quality of the GDN to be used, AGRU (GDN manufacturer) performed the quality control testing on selected rolls of the GDN. Appendix B-I contains the quality control test data from the manufacturer for the GDN material used in the construction of Sequence 4 Liner Repair. The MQC test data indicated that the GDN meets permit and project specifications.

2.2 Manufacturing Quality Control – PVC Piping

The results of the manufacturing quality control testing by Charlotte Pipe and Foundry Company, manufacturer of the Charlotte Pipe PVC Schedule 80 pipe and JM Eagle, manufacturer of the Blue Brute, Class 305 psi (DR 14) pipe used in the LCS, is provided in Appendix C-I.

2.3 Supplier's Certification – Aggregate Drainage Material

The quality control testing documentation for the non-calcareous AASHTO No. 8 aggregate drainage material used in the LCS is provided in Appendix C-II.

2.4 Manufacturing Quality Control – Geotextile Wrap

The results of the manufacturing quality control testing by AGRU on the AGRUTEX 081 non-woven geotextile used in the LCS is provided in Appendix C-III.

2.5 Conformance Testing

As part of GAI's quality assurance documentation, conformance testing was performed on the GDN by Geotechnics, Inc., an independent geotechnical and geosynthetic testing laboratory. Several GDN samples were collected from the material that was used during the construction of Sequence 4 Liner Repair. The samples were collected at the manufacturing facility and submitted to their laboratory for analyses. Conformance test data for the material is included in Appendix B-II, which demonstrated that the GDN material was acceptable.

3.0 Summary

The construction work documented in this report was completed in accordance with the design and specifications presented in the applicable WVDEP Solid Waste/NPDES Permit (No. WV0116254), the CCR Rule, and the construction documents listed in this report. The field activities documented in this report represent the CQA services provided for the installations of the leachate collection system in Sequence 4 Liner Repair at the Amos Landfill

FIGURE

AMOS FGD LANDFILL

05786\Desktop\SURVEYS\vacinity map.jpg

JOHN AMOS PLANT

BLUE LICK ROAD

BELLS CREEK ROAD

VICINITY MAP
(NOT TO SCALE)

AMOS LANDFILL CONTROL MONUMENTS
DATUM: NAD83/88 WV S - GEOID03

PT.	NORTH	EAST	ELEVATION	
1	539375.6400	1727964.6500	649.2400	MONUMENT
5	541953.8200	1725476.5700	979.7500	MONUMENT
6	540672.8190	1722790.9030	926.9120	MONUMENT
7	540251.9820	1728194.8480	954.4330	MONUMENT
5077	540828.3700	1725256.7600	939.6500	
5104	539496.9700	1728326.1600	618.8900	
15 2012 BASE AT OFFICE	540947.1150	1725381.9170	929.596	Bottom of Antenna Mount
BASE ACROSS HILL	540874.0200	1722784.0800	933.0950	Base 25001 Bottom of Antenna Near Stockpile #6

GRAPHIC SCALE
200' 100' 0 200'
1 INCH = 200 FEET

NORTH MERIDIAN REFERENCED TO STATE PLANE COORDINATES (W.V. SOUTH)

FIGURE 1
SITE PLAN
SEQUENCE 4 LANDFILL
CONSTRUCTION

LEGEND
- EXISTING 4" UNDERDRAIN
- EXISTING 12" UNDERDRAIN
- OVERHEAD ELECTRIC
- SURVEYED PROPERTY LINES
- DIVERSION DITCHES
- EXISTING SEDIMENT TRAPS
- STONE FILTERS
- SILT FENCE
- CELL 3 CAP LIMITS
- EXISTING SEDIMENT TRAPS, DITCHES OR SPILLWAYS WITH STONE BOTTOM
- LIVING WEIRS
- FLOC LOG
- FLOW CHECK
- COMPOST LOG
- straw wattle
- 765kv location
- smart fence

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APPALACHIAN POWER CO.

JOHN E. AMOS PLANT

WINFIELD WEST VIRGINIA

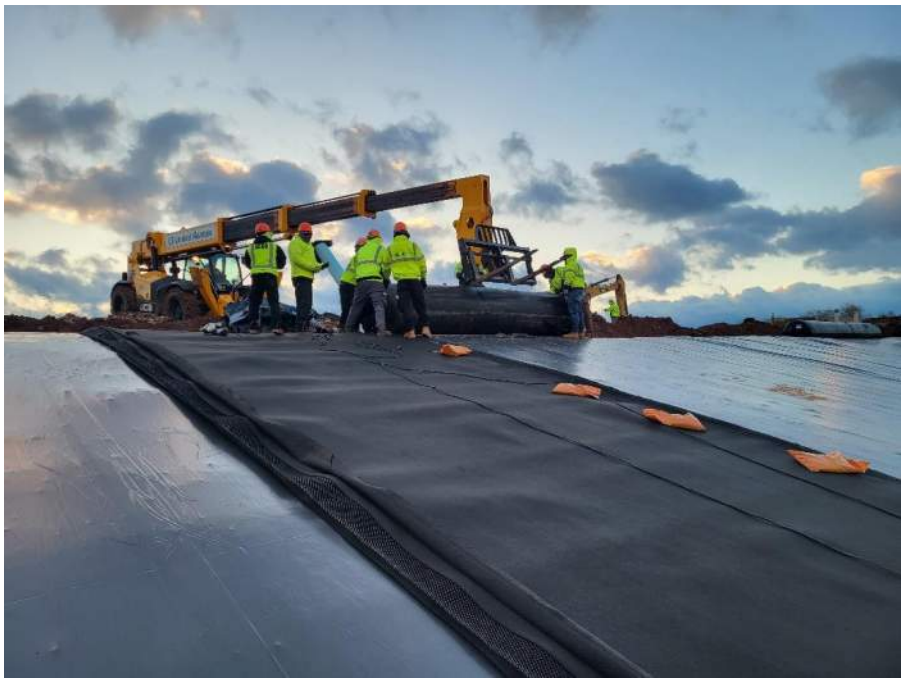
JOHN E. AMOS FGD LANDFILL
EROSION & SEDIMENT CONTROL
DETAILS

NAD 83/NAVD 88 W.V. SOUTH

Drawing Name:	Amos Asbuilt
SCALE:	1"=200'
Revision Date:	JULY 10, 2019
Surveyed By:	C.Sheppard
Drawn By:	C.Sheppard

AEP AMERICAN ELECTRIC POWER
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

APPENDIX A
Photographs



Photograph 1. Placing the Geocomposite Drainage Net.

Photograph 2. Zip-tying Geocomposite Drainage Net.

Photograph 3. Tying of the Geocomposite Drainage Net.

Photograph 4. Placing the Geocomposite Drainage Net

Photograph 5. Placing the Geocomposite Drainage Net.

Photograph 6. Tie-in of Geocomposite Drainage Net to Existing Geocomposite Drainage Net.

Photograph 7. Installation of the Leachate Collection Pipes

APPENDIX B

Geocomposite Drainage Net Quality Control/Quality Assurance Data

Appendix B - I
Manufacturer's Quality Control Data

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Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-019**
ENTACT Project Number:	E9103
Submittal Title:	Geocomposite Drainage Net Manufacturer QC
Submittal Date:	09/22/23
Date(s) of Previous Submissions:	N/A
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Robin White, ENTACT Cassidy Siebel, ENTACT
From:	Jarod Stanfield
Reference Specification section and/or	GDN 1.01.5C.1, 1.02.1C & D, 1.02.2D

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☒ **Product** ☐ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☐ **Plan**

☒ **Certificate** ☒ **Report** ☐ **Permit** ☒ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile			X		N/A

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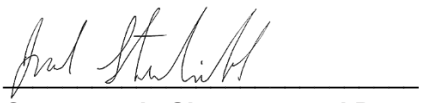
COMMENTS:
N/A

ENTACT, LLC



Contractor's Signature and Date
Jarod Stanfield 09/22/2023

Owner's Representative Review & Comments Section:

This Submittal has been:

☐ **Reviewed** ☒ **Approved** ☐ **Approved as Noted** ☐ **Revised and Resubmit** ☐ **Rejected**

Comments: Results meet specifications

_____

Owner's Representative Signature and Date (Stamp if applicable)

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Composite Quality Certification

Customer: Atlantic Lining Co., Inc
Project: AEP John Amos Power Plant Liner Repair
Destination: WINFIELD, WV
Report Date: 20-Sep-2023 3:37 PM

S.O.# SO00018472
Item Number: FC-COMPP-06-275-06
Product Type: Geocomposite 06-275-06 PP Textile
Roll Count: 114 (From 1 To 114)

0.940 (min ave)
279 (min ave)
3.0x10^-3 (min ave)
1.5x10^-4 (min ave)
2.0-3.0

#	Roll Number	Production Date	Width (ft)	Length (ft)	Area (sf)	Weight (lb)	Top Roll #	Bottom Roll #	Resin Lot #	ASTM D792 Density	ASTM D7179 Net Tensile	ASTM D7005 Peel - Top	ASTM D7005 Peel - Bot.	ASTM D5199 Thickness	ASTM D4716 Transmissivity, NET	ASTM D4716 Transmissivity (0.1)	ASTM D4716 Transmissivity (0.3)	ASTM D4716 Transmissivity (0.5)	ASTM D4218 Carbon
										g/cc	ppi	ppi	ppi	mil	m2/s	m2/s	m2/s	m2/s	%
1	GTE0123150002	08/23/23	14.5	180	2610	1175	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
2	GTE0123150003	08/23/23	14.5	180	2610	1120	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
3	GTE0123150005	08/23/23	14.5	180	2610	1045	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
4	GTE0123150006	08/23/23	14.5	180	2610	1055	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
5	GTE0123150007	08/23/23	14.5	180	2610	1050	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
6	GTE0123150008	08/23/23	14.5	180	2610	1055	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
7	GTE0123150009	08/23/23	14.5	180	2610	1050	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
8	GTE0123150010	08/23/23	14.5	180	2610	1055	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
9	GTE0123150011	08/23/23	14.5	180	2610	1070	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
10	GTE0123150012	08/23/23	14.5	180	2610	1065	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
11	GTE0123150013	08/23/23	14.5	180	2610	1055	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
12	GTE0123150014	08/23/23	14.5	180	2610	1065	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
13	GTE0123150015	08/23/23	14.5	180	2610	1055	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
14	GTE0123150016	08/23/23	14.5	180	2610	1065	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
15	GTE0123150017	08/23/23	14.5	180	2610	1065	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
16	GTE0123150018	08/23/23	14.5	180	2610	1040	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
17	GTE0123150019	08/23/23	14.5	180	2610	1030	ATNL10119010042	ATNL10119010017	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
18	GTE0123150020	08/23/23	14.5	180	2610	1045	ATNL10119010042	ATNL10119010017	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
19	GTE0123150021	08/23/23	14.5	180	2610	1065	ATNL10119010042	ATNL10119010017	DQB610850	0.965	104	5.0	4.9	329	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
20	GTE0123150022	08/23/23	14.5	180	2610	1060	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
21	GTE0123150023	08/23/23	14.5	180	2610	1065	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
22	GTE0123150024	08/23/23	14.5	180	2610	1060	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
23	GTE0123150025	08/23/23	14.5	180	2610	1060	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
24	GTE0123150026	08/23/23	14.5	180	2610	1060	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
25	GTE0123150027	08/23/23	14.5	180	2610	1060	ATNL10119010029	ATNL10122380043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
26	GTE0123150028	08/23/23	14.5	180	2610	1055	ATNL10119010029	ATNL10122380043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
27	GTE0123150029	08/23/23	14.5	180	2610	1065	ATNL10119010029	ATNL10122380043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
28	GTE0123150031	08/23/23	14.5	180	2610	1060	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
29	GTE0123150032	08/23/23	14.5	180	2610	1060	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
30	GTE0123150033	08/23/23	14.5	180	2610	1065	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
31	GTE0123150035	08/23/23	14.5	180	2610	1060	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
32	GTE0123150036	08/23/23	14.5	180	2610	1065	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
33	GTE0123150037	08/23/23	14.5	180	2610	1055	ATNL10119010010	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
34	GTE0123150038	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
35	GTE0123150039	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4

36	GTE0123150040	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010016	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
37	GTE0123150041	08/23/23	14.5	180	2610	1040	ATNL10119010010	ATNL10119010016	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
38	GTE0123150042	08/23/23	14.5	180	2610	1040	ATNL10119010010	ATNL10119010016	DQB610850	0.965	99	3.0	3.0	333	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
39	GTE0123150043	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
40	GTE0123150044	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
41	GTE0123150045	08/23/23	14.5	180	2610	1055	ATNL10122380004	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
42	GTE0123150046	08/23/23	14.5	180	2610	1040	ATNL10122380004	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
43	GTE0123150047	08/23/23	14.5	180	2610	1055	ATNL10122380004	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
44	GTE0123150048	08/23/23	14.5	180	2610	1050	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
45	GTE0123150049	08/23/23	14.5	180	2610	1055	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
46	GTE0123150050	08/23/23	14.5	180	2610	1055	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
47	GTE0123150051	08/23/23	14.5	180	2610	1050	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
48	GTE0123150052	08/23/23	14.5	180	2610	1045	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
49	GTE0123150053	08/23/23	14.5	180	2610	1040	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
50	GTE0123150054	08/23/23	14.5	180	2610	1040	ATNL10119010044	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
51	GTE0123150055	08/23/23	14.5	180	2610	1040	ATNL10119010044	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
52	GTE0123150056	08/23/23	14.5	180	2610	1050	ATNL10119010044	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
53	GTE0123150057	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
54	GTE0123150058	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
55	GTE0123150059	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
56	GTE0123150060	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
57	GTE0123150061	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.4
58	GTE0123150062	08/23/23	14.5	180	2610	1050	ATNL10119010044	ATNL10122380025	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
59	GTE0123150063	08/23/23	14.5	180	2610	1070	ATNL10122380001	ATNL10122380025	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
60	GTE0123150064	08/23/23	14.5	180	2610	1060	ATNL10122380001	ATNL10122380025	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
61	GTE0123150065	08/23/23	14.5	180	2610	1055	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
62	GTE0123150066	08/23/23	14.5	180	2610	1045	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
63	GTE0123150067	08/23/23	14.5	180	2610	1045	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
64	GTE0123150068	08/23/23	14.5	180	2610	1040	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
65	GTE0123150069	08/23/23	14.5	180	2610	1050	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
66	GTE0123150070	08/24/23	14.5	180	2610	1045	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
67	GTE0123150071	08/24/23	14.5	180	2610	1050	ATNL10119010041	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
68	GTE0123150072	08/24/23	14.5	180	2610	1040	ATNL10119010041	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
69	GTE0123150073	08/24/23	14.5	180	2610	1065	ATNL10119010041	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
70	GTE0123150074	08/24/23	14.5	180	2610	1075	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
71	GTE0123150075	08/24/23	14.5	180	2610	1050	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
72	GTE0123150076	08/24/23	14.5	180	2610	1045	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
73	GTE0123150077	08/24/23	14.5	180	2610	1045	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
74	GTE0123150078	08/24/23	14.5	180	2610	1035	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
75	GTE0123150079	08/24/23	14.5	180	2610	1055	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
76	GTE0123150080	08/24/23	14.5	180	2610	1045	ATNL10122380005	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	1.0E-2	6.8E-4	4.0E-04	2.4E-4	2.3
77	GTE0123150083	08/24/23	14.5	180	2610	1050	ATNL10122380005	ATNL10122380020	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
78	GTE0123150084	08/24/23	14.5	180	2610	1055	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
79	GTE0123150085	08/24/23	14.5	180	2610	1050	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
80	GTE0123150086	08/24/23	14.5	180	2610	1045	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
81	GTE0123150087	08/24/23	14.5	180	2610	1045	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
82	GTE0123150088	08/24/23	14.5	180	2610	1040	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
83	GTE0123150089	08/24/23	14.5	180	2610	1040	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
84	GTE0123150090	08/24/23	14.5	180	2610	1035	ATNL10119010048	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
85	GTE0123150091	08/24/23	14.5	180	2610	1035	ATNL10119010048	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
86	GTE0123150092	08/24/23	14.5	180	2610	1045	ATNL10119010048	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
87	GTE0123150093	08/24/23	14.5	180	2610	1045	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
88	GTE0123150094	08/24/23	14.5	180	2610	1060	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
89	GTE0123150095	08/24/23	14.5	180	2610	1055	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
90	GTE0123150096	08/24/23	14.5	180	2610	1065	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6

91	GTE0123150097	08/24/23	14.5	180	2610	1055	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
92	GTE0123150098	08/24/23	14.5	180	2610	1070	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
93	GTE0123150099	08/24/23	14.5	180	2610	1060	ATNL10122380028	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
94	GTE0123150100	08/24/23	14.5	180	2610	1050	ATNL10122380028	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
95	GTE0123150101	08/24/23	14.5	180	2610	1040	ATNL10122380028	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.6
96	GTE0123150102	08/24/23	14.5	180	2610	1030	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
97	GTE0123150103	08/24/23	14.5	180	2610	1040	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
98	GTE0123150104	08/24/23	14.5	180	2610	1040	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
99	GTE0123150105	08/24/23	14.5	180	2610	1050	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
100	GTE0123150106	08/24/23	14.5	180	2610	1015	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
101	GTE0123150109	08/24/23	14.5	180	2610	1035	ATNL10122380026	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
102	GTE0123150110	08/24/23	14.5	180	2610	1045	ATNL10122380026	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
103	GTE0123150111	08/24/23	14.5	180	2610	1035	ATNL10122380026	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
104	GTE0123150112	08/24/23	14.5	180	2610	1040	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
105	GTE0123150113	08/24/23	14.5	180	2610	1025	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
106	GTE0123150114	08/24/23	14.5	180	2610	1035	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
107	GTE0123150115	08/24/23	14.5	180	2610	1025	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
108	GTE0123150116	08/24/23	14.5	180	2610	1020	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
109	GTE0123150117	08/24/23	14.5	180	2610	1020	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
110	GTE0123150118	08/24/23	14.5	180	2610	1025	ATNL10122380022	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
111	GTE0123150119	08/24/23	14.5	180	2610	1030	ATNL10122380022	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
112	GTE0123150120	08/24/23	14.5	180	2610	1030	ATNL10122380022	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
113	GTE0123150121	08/24/23	14.5	180	2610	1025	ATNL10122380022	ATNL10122380039	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3
114	GTE0123150122	08/24/23	14.5	180	2610	1025	ATNL10122380022	ATNL10122380039	DQB610850	0.961	90	2.9	3.4	337	6.8E-3	7.7E-4	3.0E-04	2.4E-04	2.3

Tom Nichols

Tom Nichols, Corporate Quality Director

For Questions, Please Contact:

Corporate Quality Director
Tom Nichols
843-546-0600
Ext 1063

CoA Date: 02/23/2023

Certificate of Analysis

Shipped To: AGRU AMERICA INC:MULLINS
171 Highway 905
CONWAY SC 29526-6801
USA

Recipient: PALMER
Fax:

Delivery #: 80854512
PO #: 20141
Weight: 204950.000 LB
Ship Date: 02/23/2023
Package: BULK
Mode: Hopper Car
Car #: HLTX007523
Seal No: 320954

Product:
MARLEX HHM 5502BN POLYETHYLENE in Bulk

Lot Number: DQB610850

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.38	g/10min
Pellet Count	ST-905	50	pelet/gram
Production date		20230221	
Density	D1505	0.9536	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

JIAHUI LI
QUALITY ASSURANCE SUPERINTENDENT

For CoA questions contact Leslie Dziamara at +1-832-813-4806

Geotextile Quality Certification

agru america quality control dept.

0.21 inch sieve is a 70 sieve

OA # / PROJECT:

Item Code/Description

DATE: 5/30/2023

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D475	D4355
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permittivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units: Lbs	SIEVE	* % ret.
ATNL10119010010	7.02	204.00	209.00	102	102	115.00	132.00	149.00	.44	1.99	625	70	70
ATNL10119010016	8.02	224.00	250.00	105	110	118.00	134.00	149.00	.49	1.97	674	70	70
ATNL10119010017	7.01	235.00	254.00	103	112	108.00	138.00	147.00	.45	1.97	617	70	70
ATNL10119010018	7.01	235.00	254.00	103	112	108.00	138.00	147.00	.45	1.97	617	70	70
ATNL10119010028	7.30	216.00	259.00	103	110	97.00	133.00	156.00	.50	2.09	653	70	70
ATNL10119010029	7.19	220.00	245.00	94	111	108.00	113.00	153.00	.47	2.04	607	70	70
ATNL10119010041	6.71	188.00	230.00	91	107	111.00	146.00	160.00	.46	2.15	662	70	70
ATNL10119010042	6.71	188.00	230.00	91	107	111.00	146.00	160.00	.46	2.15	662	70	70
ATNL10119010044	6.67	213.00	248.00	96	109	124.00	137.00	155.00	.45	2.08	533	70	70
ATNL10119010045	6.67	213.00	248.00	96	109	124.00	137.00	155.00	.45	2.08	533	70	70
ATNL10119010048	7.64	265.00	220.00	105	100	128.00	174.00	142.00	.43	1.91	588	70	70
ATNL10119010050	7.46	212.00	271.00	102	119	132.00	181.00	139.00	.43	1.86	617	70	70
ATNL10119010052	7.46	212.00	271.00	102	119	132.00	181.00	139.00	.43	1.86	617	70	70

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

5/30/2023

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

Geotextile Quality Certification

0.21 inch sieve is a 70 sieve

OA # / PROJECT:

Item Code/Description: TEX 06M

DATE: 8/9/2023

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D475	D4355
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permittivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units Lbs	SIEVE	* % ret.
ATNL10122380001	7.74	199.00	252.00	96	77	111.00	189.00	153.00	.43	2.05	643	70	70
ATNL10122380002	7.74	199.00	252.00	96	77	111.00	189.00	153.00	.43	2.05	643	70	70
ATNL10122380003	7.74	199.00	252.00	96	77	111.00	189.00	153.00	.43	2.05	643	70	70
ATNL10122380004	7.47	182.00	251.00	87	75	111.00	172.00	147.00	.41	1.98	656	70	70
ATNL10122380005	7.47	182.00	251.00	87	75	111.00	172.00	147.00	.41	1.98	656	70	70
ATNL10122380019	7.29	207.00	247.00	82	77	118.00	139.00	148.00	.35	1.98	604	70	70
ATNL10122380020	7.23	191.00	240.00	79	77	114.00	154.00	143.00	.37	1.91	649	70	70
ATNL10122380021	7.23	191.00	240.00	79	77	114.00	154.00	143.00	.37	1.91	649	70	70
ATNL10122380022	7.23	191.00	240.00	79	77	114.00	154.00	143.00	.37	1.91	649	70	70
ATNL10122380024	7.33	251.00	185.00	77	79	100.00	149.00	134.00	.33	1.79	636	70	70
ATNL10122380025	7.33	251.00	185.00	77	79	100.00	149.00	134.00	.33	1.79	636	70	70
ATNL10122380026	7.34	186.00	230.00	79	70	108.00	143.00	118.00	.30	1.59	551	70	70
ATNL10122380028	7.34	186.00	230.00	79	70	108.00	143.00	118.00	.30	1.59	551	70	70
ATNL10122380039	6.33	187.00	237.00	83	80	109.00	141.00	144.00	.39	1.93	690	70	70
ATNL10122380043	6.87	190.00	220.00	85	88	112.00	148.00	134.00	.37	1.79	577	70	70

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

7/28/2023

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-019A**
ENTACT Project Number:	E9103
Submittal Title:	Geocomposite Drainage Net Manufacturer QC
Submittal Date:	10/17/23
Date(s) of Previous Submissions:	09/22/23
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Robin White, ENTACT Jarod Stanfield, ENTACT
From:	Cassidy Siebel
Reference Specification section and/or	GDN 1.01.5C.1, 1.02.1C & D, 1.02.2D

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☒ **Product** ☐ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☐ **Plan**

☒ **Certificate** ☒ **Report** ☐ **Permit** ☒ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile			X		N/A

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COMMENTS:
Roll #GTE0123150029 was damaged at the manufacturer facility prior to shipping and was replaced with roll #GTE0123150123. This substituted roll meets the specifications.

ENTACT, LLC

Cassidy Siebel

_____

Contractor's Signature and Date
Cassidy Siebel 10/17/2023

Owner's Representative Review & Comments Section:

Approved as is - geotextile properties meet specifications
GAI Consultants JFS 11/1/2023

This Submittal has been:

☐ **Reviewed** ☒ **Approved** ☐ **Approved as Noted** ☐ **Revised and Resubmit** ☐ **Rejected**

Comments:

_____

Owner's Representative Signature and Date (Stamp if applicable)

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Composite Quality Certification

Customer: Atlantic Lining Co., Inc
Project: AEP John Amos Power Plant Liner Repair
Destination: WINFIELD, WV
Report Date: 12-Oct-2023 2:05 PM

S.O.# SO00018472
Item Number: FC-COMPP-06-275-06
Product Type: Geocomposite 06-275-06 PP Textile
Roll Count: 114 (From 1 To 114)

										ASTM D792	ASTM D7179	ASTM D7005		ASTM D5199	ASTM D4716	ASTM D4218
										Density	Net Tensile	Peel - Top	Peel - Bot.	Thickness	Transmissivity	Carbon
#	Roll Number	Production Date	Width (ft)	Length (ft)	Area (sf)	Weight (lb)	Top Roll #	Bottom Roll #	Resin Lot #	g/cc	ppi	ppi	ppi	mil	m2/s	%
1	GTE0123150002	08/23/23	14.5	180	2610	1175	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
2	GTE0123150003	08/23/23	14.5	180	2610	1120	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
3	GTE0123150005	08/23/23	14.5	180	2610	1045	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
4	GTE0123150006	08/23/23	14.5	180	2610	1055	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
5	GTE0123150007	08/23/23	14.5	180	2610	1050	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
6	GTE0123150008	08/23/23	14.5	180	2610	1055	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
7	GTE0123150009	08/23/23	14.5	180	2610	1050	ATNL10119010045	ATNL10119010018	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
8	GTE0123150010	08/23/23	14.5	180	2610	1055	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
9	GTE0123150011	08/23/23	14.5	180	2610	1070	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
10	GTE0123150012	08/23/23	14.5	180	2610	1065	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
11	GTE0123150013	08/23/23	14.5	180	2610	1055	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
12	GTE0123150014	08/23/23	14.5	180	2610	1065	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
13	GTE0123150015	08/23/23	14.5	180	2610	1055	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
14	GTE0123150016	08/23/23	14.5	180	2610	1065	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
15	GTE0123150017	08/23/23	14.5	180	2610	1065	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
16	GTE0123150018	08/23/23	14.5	180	2610	1040	ATNL10119010028	ATNL10119010052	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
17	GTE0123150019	08/23/23	14.5	180	2610	1030	ATNL10119010042	ATNL10119010017	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
18	GTE0123150020	08/23/23	14.5	180	2610	1045	ATNL10119010042	ATNL10119010017	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
19	GTE0123150021	08/23/23	14.5	180	2610	1065	ATNL10119010042	ATNL10119010017	DQB610850	0.965	104	5.0	4.9	329	4.0E-4	2.4
20	GTE0123150022	08/23/23	14.5	180	2610	1060	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
21	GTE0123150023	08/23/23	14.5	180	2610	1065	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
22	GTE0123150024	08/23/23	14.5	180	2610	1060	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
23	GTE0123150025	08/23/23	14.5	180	2610	1060	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
24	GTE0123150026	08/23/23	14.5	180	2610	1060	ATNL10119010042	ATNL10119010017	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
25	GTE0123150027	08/23/23	14.5	180	2610	1060	ATNL10119010029	ATNL10122380043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
26	GTE0123150028	08/23/23	14.5	180	2610	1055	ATNL10119010029	ATNL10122380043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
27	GTE0123150031	08/23/23	14.5	180	2610	1060	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
28	GTE0123150032	08/23/23	14.5	180	2610	1060	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
29	GTE0123150033	08/23/23	14.5	180	2610	1065	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
30	GTE0123150035	08/23/23	14.5	180	2610	1060	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
31	GTE0123150036	08/23/23	14.5	180	2610	1065	ATNL10119010029	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
32	GTE0123150037	08/23/23	14.5	180	2610	1055	ATNL10119010010	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
33	GTE0123150038	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4

#	Roll Number	Production Date	Width (ft)	Length (ft)	Area (sf)	Weight (lb)	Top Roll #	Bottom Roll #	Resin Lot #	ASTM D792	ASTM D7179	ASTM D7005		ASTM D5199	ASTM D4716	ASTM D4218
										Density	Net Tensile	Peel - Top	Peel - Bot.	Thickness	Transmissivity	Carbon
										g/cc	ppi	ppi	ppi	mil	m2/s	%
34	GTE0123150039	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010043	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
35	GTE0123150040	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010016	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
36	GTE0123150041	08/23/23	14.5	180	2610	1040	ATNL10119010010	ATNL10119010016	DQB610850	0.965	99	3.0	3.0	333	4.0E-4	2.4
37	GTE0123150042	08/23/23	14.5	180	2610	1040	ATNL10119010010	ATNL10119010016	DQB610850	0.965	99	3.0	3.0	333	3.6E-3	2.4
38	GTE0123150043	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
39	GTE0123150044	08/23/23	14.5	180	2610	1045	ATNL10119010010	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
40	GTE0123150045	08/23/23	14.5	180	2610	1055	ATNL10122380004	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
41	GTE0123150046	08/23/23	14.5	180	2610	1040	ATNL10122380004	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
42	GTE0123150047	08/23/23	14.5	180	2610	1055	ATNL10122380004	ATNL10119010016	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
43	GTE0123150048	08/23/23	14.5	180	2610	1050	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
44	GTE0123150049	08/23/23	14.5	180	2610	1055	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
45	GTE0123150050	08/23/23	14.5	180	2610	1055	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
46	GTE0123150051	08/23/23	14.5	180	2610	1050	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
47	GTE0123150052	08/23/23	14.5	180	2610	1045	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
48	GTE0123150053	08/23/23	14.5	180	2610	1040	ATNL10122380004	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
49	GTE0123150054	08/23/23	14.5	180	2610	1040	ATNL10119010044	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
50	GTE0123150055	08/23/23	14.5	180	2610	1040	ATNL10119010044	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
51	GTE0123150056	08/23/23	14.5	180	2610	1050	ATNL10119010044	ATNL10122380021	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
52	GTE0123150057	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
53	GTE0123150058	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
54	GTE0123150059	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
55	GTE0123150060	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
56	GTE0123150061	08/23/23	14.5	180	2610	1045	ATNL10119010044	ATNL10122380025	DQB610850	0.965	113	7.3	7.0	318	4.0E-4	2.4
57	GTE0123150062	08/23/23	14.5	180	2610	1050	ATNL10119010044	ATNL10122380025	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
58	GTE0123150063	08/23/23	14.5	180	2610	1070	ATNL10122380001	ATNL10122380025	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
59	GTE0123150064	08/23/23	14.5	180	2610	1060	ATNL10122380001	ATNL10122380025	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
60	GTE0123150065	08/23/23	14.5	180	2610	1055	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
61	GTE0123150066	08/23/23	14.5	180	2610	1045	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
62	GTE0123150067	08/23/23	14.5	180	2610	1045	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
63	GTE0123150068	08/23/23	14.5	180	2610	1040	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
64	GTE0123150069	08/23/23	14.5	180	2610	1050	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
65	GTE0123150070	08/24/23	14.5	180	2610	1045	ATNL10122380001	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
66	GTE0123150071	08/24/23	14.5	180	2610	1050	ATNL10119010041	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
67	GTE0123150072	08/24/23	14.5	180	2610	1040	ATNL10119010041	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
68	GTE0123150073	08/24/23	14.5	180	2610	1065	ATNL10119010041	ATNL10122380019	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
69	GTE0123150074	08/24/23	14.5	180	2610	1075	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
70	GTE0123150075	08/24/23	14.5	180	2610	1050	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
71	GTE0123150076	08/24/23	14.5	180	2610	1045	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
72	GTE0123150077	08/24/23	14.5	180	2610	1045	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
73	GTE0123150078	08/24/23	14.5	180	2610	1035	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
74	GTE0123150079	08/24/23	14.5	180	2610	1055	ATNL10119010041	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
75	GTE0123150080	08/24/23	14.5	180	2610	1045	ATNL10122380005	ATNL10122380020	DQB610850	0.964	112	9.3	8.9	322	4.0E-4	2.3
76	GTE0123150083	08/24/23	14.5	180	2610	1050	ATNL10122380005	ATNL10122380020	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6

#	Roll Number	Production Date	Width (ft)	Length (ft)	Area (sf)	Weight (lb)	Top Roll #	Bottom Roll #	Resin Lot #	ASTM D792	ASTM D7179	ASTM D7005		ASTM D5199	ASTM D4716	ASTM D4218
										Density	Net Tensile	Peel - Top	Peel - Bot.	Thickness	Transmissivity	Carbon
										g/cc	ppi	ppi	ppi	mil	m2/s	%
77	GTE0123150084	08/24/23	14.5	180	2610	1055	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
78	GTE0123150085	08/24/23	14.5	180	2610	1050	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
79	GTE0123150086	08/24/23	14.5	180	2610	1045	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
80	GTE0123150087	08/24/23	14.5	180	2610	1045	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
81	GTE0123150088	08/24/23	14.5	180	2610	1040	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
82	GTE0123150089	08/24/23	14.5	180	2610	1040	ATNL10122380005	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
83	GTE0123150090	08/24/23	14.5	180	2610	1035	ATNL10119010048	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
84	GTE0123150091	08/24/23	14.5	180	2610	1035	ATNL10119010048	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
85	GTE0123150092	08/24/23	14.5	180	2610	1045	ATNL10119010048	ATNL10122380024	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
86	GTE0123150093	08/24/23	14.5	180	2610	1045	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
87	GTE0123150094	08/24/23	14.5	180	2610	1060	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
88	GTE0123150095	08/24/23	14.5	180	2610	1055	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
89	GTE0123150096	08/24/23	14.5	180	2610	1065	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
90	GTE0123150097	08/24/23	14.5	180	2610	1055	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
91	GTE0123150098	08/24/23	14.5	180	2610	1070	ATNL10119010048	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
92	GTE0123150099	08/24/23	14.5	180	2610	1060	ATNL10122380028	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
93	GTE0123150100	08/24/23	14.5	180	2610	1050	ATNL10122380028	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
94	GTE0123150101	08/24/23	14.5	180	2610	1040	ATNL10122380028	ATNL10122380003	DQB610850	0.964	94	2.4	2.3	318	3.0E-4	2.6
95	GTE0123150102	08/24/23	14.5	180	2610	1030	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
96	GTE0123150103	08/24/23	14.5	180	2610	1040	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
97	GTE0123150104	08/24/23	14.5	180	2610	1040	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
98	GTE0123150105	08/24/23	14.5	180	2610	1050	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
99	GTE0123150106	08/24/23	14.5	180	2610	1015	ATNL10122380028	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
100	GTE0123150109	08/24/23	14.5	180	2610	1035	ATNL10122380026	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
101	GTE0123150110	08/24/23	14.5	180	2610	1045	ATNL10122380026	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
102	GTE0123150111	08/24/23	14.5	180	2610	1035	ATNL10122380026	ATNL10122380002	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
103	GTE0123150112	08/24/23	14.5	180	2610	1040	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
104	GTE0123150113	08/24/23	14.5	180	2610	1025	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
105	GTE0123150114	08/24/23	14.5	180	2610	1035	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
106	GTE0123150115	08/24/23	14.5	180	2610	1025	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
107	GTE0123150116	08/24/23	14.5	180	2610	1020	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
108	GTE0123150117	08/24/23	14.5	180	2610	1020	ATNL10122380026	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
109	GTE0123150118	08/24/23	14.5	180	2610	1025	ATNL10122380022	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
110	GTE0123150119	08/24/23	14.5	180	2610	1030	ATNL10122380022	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
111	GTE0123150120	08/24/23	14.5	180	2610	1030	ATNL10122380022	ATNL10119010050	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
112	GTE0123150121	08/24/23	14.5	180	2610	1025	ATNL10122380022	ATNL10122380039	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
113	GTE0123150122	08/24/23	14.5	180	2610	1025	ATNL10122380022	ATNL10122380039	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3
114	GTE0123150123	08/24/23	14.5	180	2610	1020	ATNL10122380022	ATNL10122380039	DQB610850	0.961	90	2.9	3.4	337	3.0E-4	2.3

Tom Nichols

For Questions, Please Contact: Corporate Quality Director

Tom Nichols, Corporate Quality Director

Tom Nichols
843-546-0600
Ext 1063

CoA Date: 02/23/2023

Certificate of Analysis

Shipped To: AGRU AMERICA INC:MULLINS
171 Highway 905
CONWAY SC 29526-6801
USA

Recipient: PALMER
Fax:

Delivery #: 80854512
PO #: 20141
Weight: 204950.000 LB
Ship Date: 02/23/2023
Package: BULK
Mode: Hopper Car
Car #: HLTX007523
Seal No: 320954

Product:
MARLEX HHM 5502BN POLYETHYLENE in Bulk

Lot Number: DQB610850

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.38	g/10min
Pellet Count	ST-905	50	pelet/gram
Production date		20230221	
Density	D1505	0.9536	g/cm3

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP (CPChem).
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

JIAHUI LI
QUALITY ASSURANCE SUPERINTENDENT

For CoA questions contact Leslie Dziamara at +1-832-813-4806

Geotextile Quality Certification

OA # / PROJECT:

Item Code/Description

DATE: 5/30/2023

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D475	D4355
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units: Lbs	SIEVE	* % ret.
ATNL10119010010	7.02	204.00	209.00	102	102	115.00	132.00	149.00	.44	1.99	625	70	70
ATNL10119010016	8.02	224.00	250.00	105	110	118.00	134.00	149.00	.49	1.97	674	70	70
ATNL10119010017	7.01	235.00	254.00	103	112	108.00	138.00	147.00	.45	1.97	617	70	70
ATNL10119010018	7.01	235.00	254.00	103	112	108.00	138.00	147.00	.45	1.97	617	70	70
ATNL10119010028	7.30	216.00	259.00	103	110	97.00	133.00	156.00	.50	2.09	653	70	70
ATNL10119010029	7.19	220.00	245.00	94	111	108.00	113.00	153.00	.47	2.04	607	70	70
ATNL10119010041	6.71	188.00	230.00	91	107	111.00	146.00	160.00	.46	2.15	662	70	70
ATNL10119010042	6.71	188.00	230.00	91	107	111.00	146.00	160.00	.46	2.15	662	70	70
ATNL10119010044	6.67	213.00	248.00	96	109	124.00	137.00	155.00	.45	2.08	533	70	70
ATNL10119010045	6.67	213.00	248.00	96	109	124.00	137.00	155.00	.45	2.08	533	70	70
ATNL10119010048	7.64	265.00	220.00	105	100	128.00	174.00	142.00	.43	1.91	588	70	70
ATNL10119010050	7.46	212.00	271.00	102	119	132.00	181.00	139.00	.43	1.86	617	70	70
ATNL10119010052	7.46	212.00	271.00	102	119	132.00	181.00	139.00	.43	1.86	617	70	70

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

5/30/2023

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

Geotextile Quality Certification

OA # / PROJECT:

Item Code/Description: TEX 06M

DATE: 8/9/2023

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D475	D4355
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units: Lbs	SIEVE	* % ret.
ATNL10122380001	7.74	199.00	252.00	96	77	111.00	189.00	153.00	.43	2.05	643	70	70
ATNL10122380002	7.74	199.00	252.00	96	77	111.00	189.00	153.00	.43	2.05	643	70	70
ATNL10122380003	7.74	199.00	252.00	96	77	111.00	189.00	153.00	.43	2.05	643	70	70
ATNL10122380004	7.47	182.00	251.00	87	75	111.00	172.00	147.00	.41	1.98	656	70	70
ATNL10122380005	7.47	182.00	251.00	87	75	111.00	172.00	147.00	.41	1.98	656	70	70
ATNL10122380019	7.29	207.00	247.00	82	77	118.00	139.00	148.00	.35	1.98	604	70	70
ATNL10122380020	7.23	191.00	240.00	79	77	114.00	154.00	143.00	.37	1.91	649	70	70
ATNL10122380021	7.23	191.00	240.00	79	77	114.00	154.00	143.00	.37	1.91	649	70	70
ATNL10122380022	7.23	191.00	240.00	79	77	114.00	154.00	143.00	.37	1.91	649	70	70
ATNL10122380024	7.33	251.00	185.00	77	79	100.00	149.00	134.00	.33	1.79	636	70	70
ATNL10122380025	7.33	251.00	185.00	77	79	100.00	149.00	134.00	.33	1.79	636	70	70
ATNL10122380026	7.34	186.00	230.00	79	70	108.00	143.00	118.00	.30	1.59	551	70	70
ATNL10122380028	7.34	186.00	230.00	79	70	108.00	143.00	118.00	.30	1.59	551	70	70
ATNL10122380039	6.33	187.00	237.00	83	80	109.00	141.00	144.00	.39	1.93	690	70	70
ATNL10122380043	6.87	190.00	220.00	85	88	112.00	148.00	134.00	.37	1.79	577	70	70

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

7/28/2023

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

Appendix B - II
Quality Assurance Conformance Test Results

gai consultants
transforming ideas into reality

TRANSMISSIVITY TEST RESULTS

ASTM D 4716

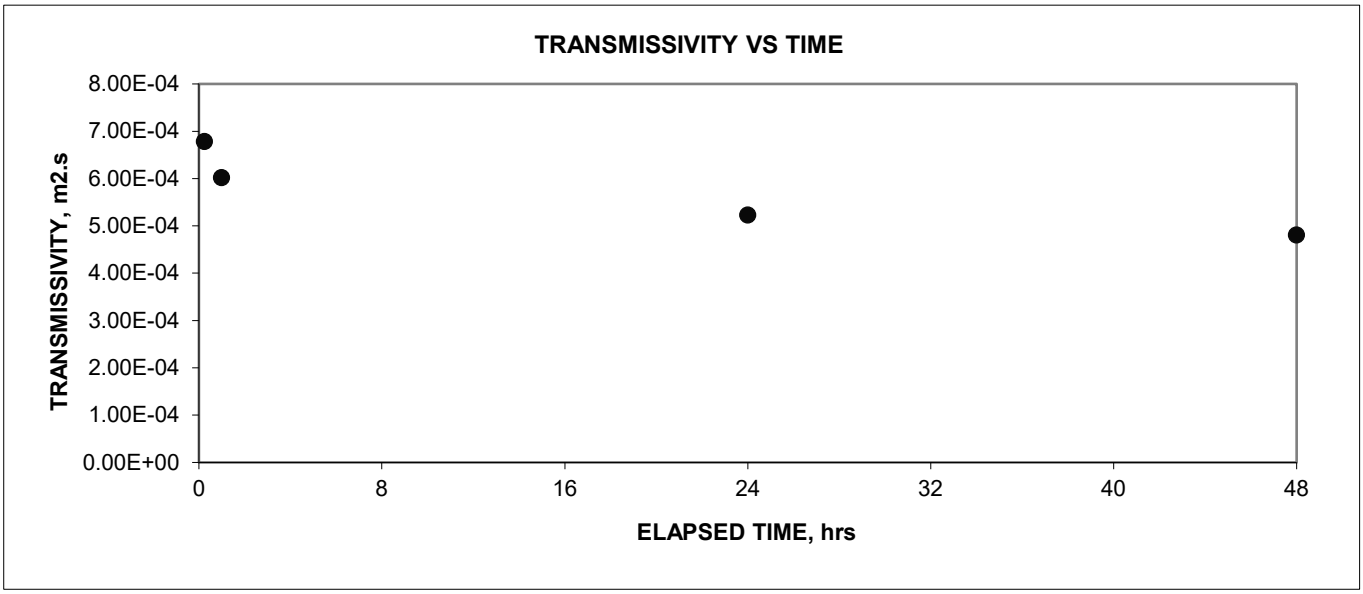
CLIENT: GAI Consultants, Inc.
PROJECT: AMOS Sequence 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB I.D. NO.: L23-137-003-001
SAMPLE NO.: GTE0123150002
REPLICATE NO.: 1 of 1

TEST SECTION: Bottom Ash
Geocomposite
30 mil PVC

25,000 psf NORMAL COMPRESSIVE STRESS

ELAPSED TIME (hrs)	MANOMETERS RES. (in)	MANOMETERS WEIR (in)	HYDR. GRAD.	COLLECTION DATA VOLUME (ml)	COLLECTION DATA TIME (sec.)	WATER TEMP °C	AVERAGE FLOW RATE (l/s-m)	AVERAGE FLOW RATE (gpm/ft)	CALCULATED TRANSMISSIVITY (m2/sec)
0.25	0.44	0.20	0.02	780 780 780	180 180 180	20.8	1.36E-02	0.066	6.78E-04
1	0.44	0.20	0.02	690 690 690	180 180 180	20.7	1.20E-02	0.058	6.02E-04
24	0.44	0.20	0.02	600 600 600	180 180 180	20.7	1.05E-02	0.051	5.23E-04
48	0.44	0.20	0.02	550 550 550	180 180 180	20.6	9.62E-03	0.046	4.81E-04



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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-001
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO: GTE0123150002

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	AVE	STD
Geonet									
THICKNESS	D 5199	mils	329	336	333	348	325		
			322	342	336	343	350	**336**	8.9353
Geocomposite									
PLY ADHESION	D 7005								
	SIDE "A"	MD-lb/in	1.2	7.2	2.7	2.2	5.0	**3.65**	2.172
	SIDE"B"	MD-lb/in	3.6	5.3	2.4	3.1	4.9	**3.86**	1.107

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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-002
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150002
SAMPLE NO: ATNL10119010045
Top textile component

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	6	7	8	9	10	AVG	STD
MASS/UNIT AREA	D 5261	oz/sy	6.80	6.7	7.22	7.59	7.34	7.20	7.34	7.60	6.67	6.80	**7.12**	**0.342**
GRAB STRENGTH	D 4632	MD-lbs	238.5	206.1	201.4	222.5	220.4	203.9	160.7	170.7	165.5	204.4	**199.4**	**24.63**
		CD-lbs	192.7	226.0	243.9	253.4	268.7	249.9	212.2	197.2	219.2	197.7	**226.1**	**25.38**
GRAB ELONGATION	D 4632	MD-%	90.0	83.3	86.7	86.7	86.7	76.7	73.3	80.0	70.0	66.7	**80.0**	**7.60**
		CD-%	106.7	96.7	96.7	90.0	96.7	90.0	100.0	113.3	100.0	110.0	**100.0**	**7.45**
TRAPEZOIDAL TEAR	D 4533	MD-lbs	97.8	85.9	69.0	92.8	112.5	93.0	99.4	99.3	104.1	82.3	**93.6**	**11.59**
		CD-lbs	105.5	93.6	112.9	80.4	139.5	113.3	148.6	139.0	119.7	125.8	**117.8**	**20.29**
PUNCTURE	D 4833	lbs	107.0	113.4	132.0	108.5	118.3	104.6	130.6	119.3	105.9	108.6		
		lbs	102.2	96.1	134.2	105.4	143.6						**115.3**	**13.42**
MULLEN BURST	D 3786	psi	390	300	380	350	360	340	470	300	370	310	**357**	**48.6**
PERMITTIVITY	D 4491	sec-1	1.92	2.17	2.06	2.31							**2.12**	
A.O.S.	D 4751	mm	0.188	0.202	0.149	0.148	0.149						**0.167**	
								AVERAGE AOS, US STD.SIEVE SIZE =					**#80**	

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PERMITTIVITY TEST RESULTS

ASTM D 4491
CONSTANT HEAD TEST

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-002
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150002
SAMPLE NO: ATNL10119010045
Top textile component

SPECIMEN NO.	1	2	3	4	
SPEC.THICKNESS, mils	76.5	82	76.5	75	
CONSTANT HEAD, in	2.0	2.0	2.0	2.0	
COLLECTION DIVISIONS	5	5	5	5	
READING NO.	COLLECTION TIME, sec				
1	11.56	10.22	10.76	9.58	
2	11.59	10.26	10.82	9.69	
3	11.66	10.27	10.79	9.62	
4	11.60	10.26	10.85	9.67	
5	11.62	10.30	10.81	9.60	SAMPLE
AVERAGE, sec	**11.61**	**10.26**	**10.81**	**9.63**	**AVERAGE**
PERMITTIVITY @ 20 C,sec-1	1.92	2.17	2.06	2.31	**2.12 sec-1**
PERMEABILITY @ 20 C, cm/sec	0.37	0.45	0.40	0.44	**0.417 cm/sec**
FLOW RATE @ 2" CONSTANT HEAD gpm/s.f.	143.8	162.6	154.4	173.2	**158.5 gpm/s.f.**

TEST PARAMETERS

QUANTITY COLLECTED PER DIV., cc	457
SPECIMEN DIA., cm	5.08
AREA, cm2	20.27
TEMP, C°	20
CORRECTION FACTOR, Rt	1.00
OXYGEN CONTENT, ppm	< 6

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APPARENT OPENING SIZE
ASTM D 4751

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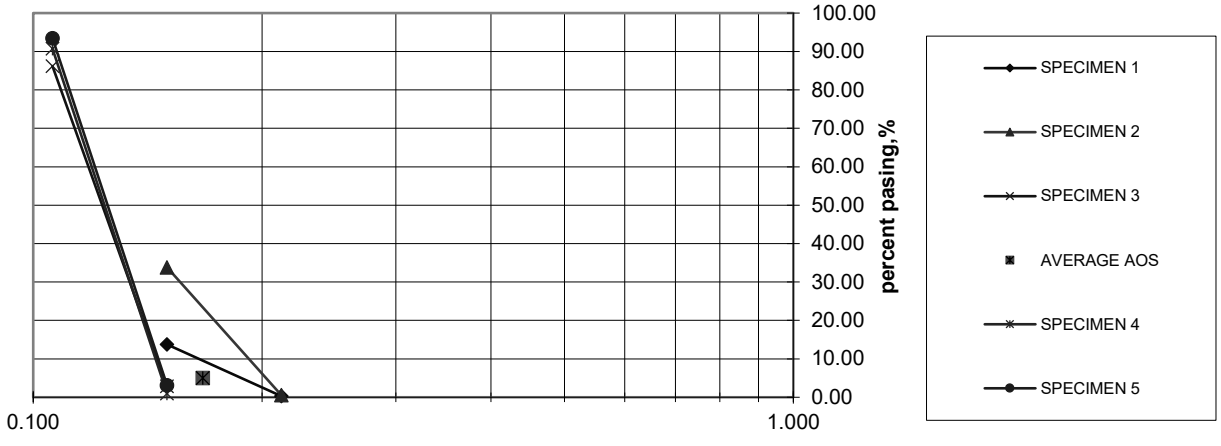
CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-002
ROLL NO.: GTE0123150002
SAMPLE NO: ATNL10119010045
Top textile component

US STD. SIEVE SIZE	SIEVE OPENING (mm)	WT. FRAME & GEOTEXTILE & BEADS (gm)	WT. FRAME & GEOTEXTILE (gm)	WT. BEADS (gm)	WT. PAN & BEADS (gm)	WT. PAN (gm)	WT. BEADS PASSING (gm)	PERCENT PASSING (%)	AOS @ 5% PASSING (mm)
SPECIMEN 1									
#100	0.150	1528.21	1478.21	50.00	304.44	297.57	6.87	13.74	
#70	0.212	1528.21	1478.21	50.00	297.72	297.57	0.15	0.30	
									0.188
SPECIMEN 2									
#100	0.150	542.79	492.79	50.00	425.07	408.17	16.90	33.80	
#70	0.212	542.82	492.82	50.00	408.45	408.17	0.28	0.56	
									0.202
SPECIMEN 3									
#140	0.106	543.20	493.20	50.00	451.09	407.99	43.10	86.20	
#100	0.150	543.18	493.18	50.00	409.41	407.99	1.42	2.84	
									0.149
SPECIMEN 4									
#140	0.106	541.42	491.42	50.00	453.89	408.51	45.38	90.76	
#100	0.150	541.41	491.41	50.00	409.00	408.51	0.49	0.98	
									0.148
SPECIMEN 5									
#140	0.106	542.68	492.68	50.00	456.60	409.86	46.74	93.48	
#100	0.150	542.67	492.67	50.00	411.41	409.86	1.55	3.10	
									0.149

AVERAGE AOS @ 5% PASSING, mm 0.167
AVERAGE AOS, US STD. SIEVE SIZE **#80**



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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-003
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150002
SAMPLE NO: ATNL10119010018
Bottom textile component

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	6	7	8	9	10	AVG	STD
MASS/UNIT AREA	D 5261	oz/sy	6.36	6.5	6.89	7.04	8.44	7.90	8.59	7.66	7.92	7.70	**7.50**	**0.738**
GRAB STRENGTH	D 4632	MD-lbs	193.4	194.4	231.2	197.1	212.4	258.4	188.4	204.0	224.8	215.1	**211.9**	**20.48**
		CD-lbs	268.6	284.7	247.4	327.9	326.6	278.0	248.7	233.3	182.3	193.1	**259.1**	**46.43**
GRAB ELONGATION	D 4632	MD-%	80.0	86.7	96.7	90.0	90.0	96.7	86.7	80.0	80.0	76.7	**86.3**	**6.74**
		CD-%	93.3	83.3	83.3	90.0	100.0	86.7	93.3	103.3	116.7	100.0	**95.0**	**9.80**
TRAPEZOIDAL TEAR	D 4533	MD-lbs	101.3	113.7	107.7	82.4	110.3	110.1	93.7	103.7	93.7	121.5	**103.8**	**10.85**
		CD-lbs	98.6	128.1	159.0	147.8	188.2	132.4	144.8	129.0	137.4	118.0	**138.3**	**22.95**
PUNCTURE	D 4833	lbs	138.4	142.2	145.5	113.4	118.3	122.4	95.3	95.2	111.9	127.3		
		lbs	111.2	103.8	99.7	124.1	130.2						**118.6**	**15.75**
MULLEN BURST	D 3786	psi	370	420	410	380	390	430	390	390	420	450	**405**	**23.8**
PERMITTIVITY	D 4491	sec-1	2.08	2.06	1.79	1.77							**1.92**	
A.O.S.	D 4751	mm	0.149	0.148	0.147	0.148	0.147						**0.148**	
								AVERAGE AOS, US STD.SIEVE SIZE =					**#100**	

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PERMITTIVITY TEST RESULTS

ASTM D 4491
CONSTANT HEAD TEST

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-003
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150002
SAMPLE NO: ATNL10119010018
Bottom textile component

SPECIMEN NO.	1	2	3	4	
SPEC.THICKNESS, mils	85	84	87	91.5	
CONSTANT HEAD, in	2.0	2.0	2.0	2.0	
COLLECTION DIVISIONS	5	5	5	5	
READING NO.	COLLECTION TIME, sec				
1	10.66	10.84	12.50	12.56	
2	10.75	10.75	12.47	12.61	
3	10.72	10.78	12.43	12.59	
4	10.69	10.82	12.52	12.64	
5	10.74	10.81	12.49	12.63	SAMPLE
AVERAGE, sec	**10.71**	**10.80**	**12.48**	**12.61**	**AVERAGE**
PERMITTIVITY @ 20 C,sec-1	2.08	2.06	1.79	1.77	**1.92 sec-1**
PERMEABILITY @ 20 C, cm/sec	0.45	0.44	0.39	0.41	**0.424 cm/sec**
FLOW RATE @ 2" CONSTANT HEAD gpm/s.f.	155.8	154.5	133.7	132.4	**144.1 gpm/s.f.**

TEST PARAMETERS

QUANTITY COLLECTED PER DIV., cc	457
SPECIMEN DIA., cm	5.08
AREA, cm2	20.27
TEMP, C°	20
CORRECTION FACTOR, Rt	1.00
OXYGEN CONTENT, ppm	< 6

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APPARENT OPENING SIZE
ASTM D 4751

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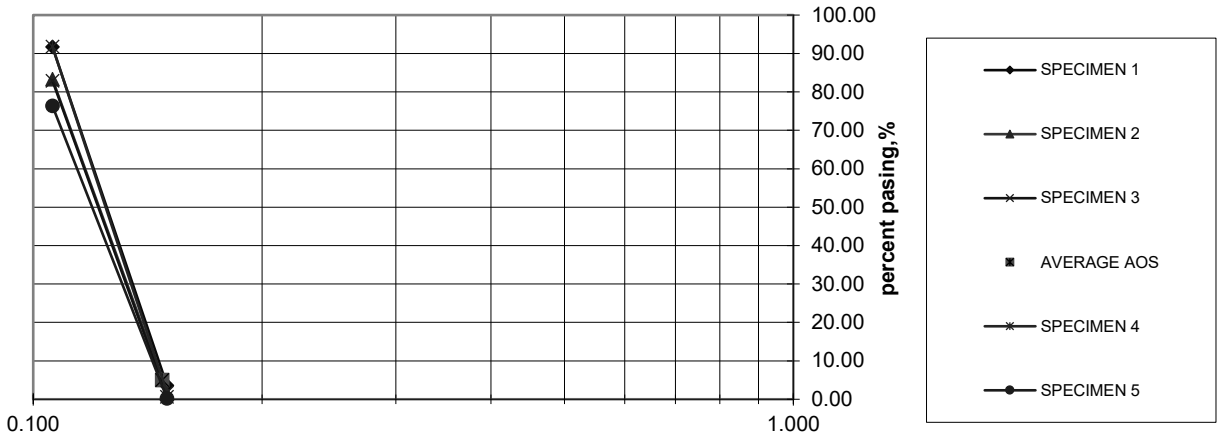
CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-003
ROLL NO.: GTE0123150002
SAMPLE NO: ATNL10119010018
Bottom textile component

US STD. SIEVE SIZE	SIEVE OPENING (mm)	WT. FRAME & GEOTEXTILE & BEADS (gm)	WT. FRAME & GEOTEXTILE (gm)	WT. BEADS (gm)	WT. PAN & BEADS (gm)	WT. PAN (gm)	WT. BEADS PASSING (gm)	PERCENT PASSING (%)	AOS @ 5% PASSING (mm)
SPECIMEN 1									
#140	0.106	1529.42	1479.42	50.00	343.35	297.50	45.85	91.70	
#100	0.150	1529.40	1479.40	50.00	299.30	297.50	1.80	3.60	
									0.149
SPECIMEN 2									
#140	0.106	544.26	494.26	50.00	449.81	408.17	41.64	83.28	
#100	0.150	544.23	494.23	50.00	408.90	408.17	0.73	1.46	
									0.148
SPECIMEN 3									
#140	0.106	544.38	494.38	50.00	449.46	408.00	41.46	82.92	
#100	0.150	544.33	494.33	50.00	408.32	408.00	0.32	0.64	
									0.147
SPECIMEN 4									
#140	0.106	542.21	492.21	50.00	454.42	408.52	45.90	91.80	
#100	0.150	542.17	492.17	50.00	409.37	408.52	0.85	1.70	
									0.148
SPECIMEN 5									
#140	0.106	544.70	494.70	50.00	448.03	409.85	38.18	76.36	
#100	0.150	544.69	494.69	50.00	409.96	409.85	0.11	0.22	
									0.147

AVERAGE AOS @ 5% PASSING, mm 0.148
AVERAGE AOS, US STD. SIEVE SIZE **#100**



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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-004
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO: GTE0123150035

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	AVE	STD
Geonet									
THICKNESS	D 5199	mils	339 353	349 324	340 322	344 332	345 327	**338**	10.2103
Geocomposite									
PLY ADHESION	D 7005								
	SIDE "A"	MD-lb/in	4.1	6.3	4.4	6.4	5.3	**5.29**	0.949
	SIDE"B"	MD-lb/in	4.1	7.2	4.0	7.3	4.9	**5.49**	1.471

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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-005
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150035
SAMPLE NO: ATNL10119010029
Top textile component

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	6	7	8	9	10	AVG	STD
MASS/UNIT AREA	D 5261	oz/sy	6.19	6.1	6.12	5.84	5.93	5.84	6.10	6.23	6.62	7.13	**6.21**	**0.373**
GRAB STRENGTH	D 4632	MD-lbs	187.2	181.3	155.3	146.7	164.2	184.0	227.0	178.6	173.9	272.8	**187.1**	**35.21**
		CD-lbs	242.3	211.5	219.3	235.9	224.9	178.8	194.0	191.6	223.0	214.8	**213.6**	**19.12**
GRAB ELONGATION	D 4632	MD-%	76.7	96.7	83.3	70.0	80.0	90.0	83.3	86.7	70.0	76.7	**81.3**	**8.06**
		CD-%	96.7	83.3	90.0	83.3	86.7	83.3	83.3	96.7	80.0	80.0	**86.3**	**5.86**
TRAPEZOIDAL TEAR	D 4533	MD-lbs	115.8	101.8	88.7	67.1	73.7	84.0	74.2	79.6	77.5	85.7	**84.8**	**13.77**
		CD-lbs	118.3	94.2	96.2	121.9	111.3	98.9	95.7	103.1	95.8	127.5	**106.3**	**11.82**
PUNCTURE	D 4833	lbs	109.2	139.9	131.3	108.8	133.8	140.9	144.7	118.8	110.3	117.2		
		lbs	142.0	130.3	143.4	135.9	87.4						**126.3**	**16.27**
MULLEN BURST	D 3786	psi	370	310	320	400	400	330	270	280	350	360	**339**	**43.0**
PERMITTIVITY	D 4491	sec-1	2.11	2.37	2.10	2.13							**2.18**	
A.O.S.	D 4751	mm	0.193	0.179	0.189	0.158	0.148						**0.174**	
								AVERAGE AOS, US STD.SIEVE SIZE =					**#80**	

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PERMITTIVITY TEST RESULTS

ASTM D 4491
CONSTANT HEAD TEST

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-005
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150035
SAMPLE NO: ATNL10119010029
Top textile component

SPECIMEN NO.	1	2	3	4	
SPEC.THICKNESS, mils	75.5	67.5	67.5	67	
CONSTANT HEAD, in	2.0	2.0	2.0	2.0	
COLLECTION DIVISIONS	5	5	5	5	
READING NO.	COLLECTION TIME, sec				
1	10.60	9.34	10.65	10.46	
2	10.57	9.35	10.57	10.49	
3	10.59	9.39	10.61	10.41	
4	10.63	9.42	10.59	10.44	
5	10.54	9.44	10.63	10.49	**SAMPLE**
AVERAGE, sec	**10.59**	**9.39**	**10.61**	**10.46**	**AVERAGE**
PERMITTIVITY @ 20 C,sec-1	2.11	2.37	2.10	2.13	**2.18 sec-1**
PERMEABILITY @ 20 C, cm/sec	0.40	0.41	0.36	0.36	**0.383 cm/sec**
FLOW RATE @ 2" CONSTANT HEAD gpm/s.f.	157.6	177.7	157.3	159.6	**163.0 gpm/s.f.**

TEST PARAMETERS

QUANTITY COLLECTED PER DIV., cc	457
SPECIMEN DIA., cm	5.08
AREA, cm2	20.27
TEMP, C°	20
CORRECTION FACTOR, Rt	1.00
OXYGEN CONTENT, ppm	< 6

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APPARENT OPENING SIZE
ASTM D 4751

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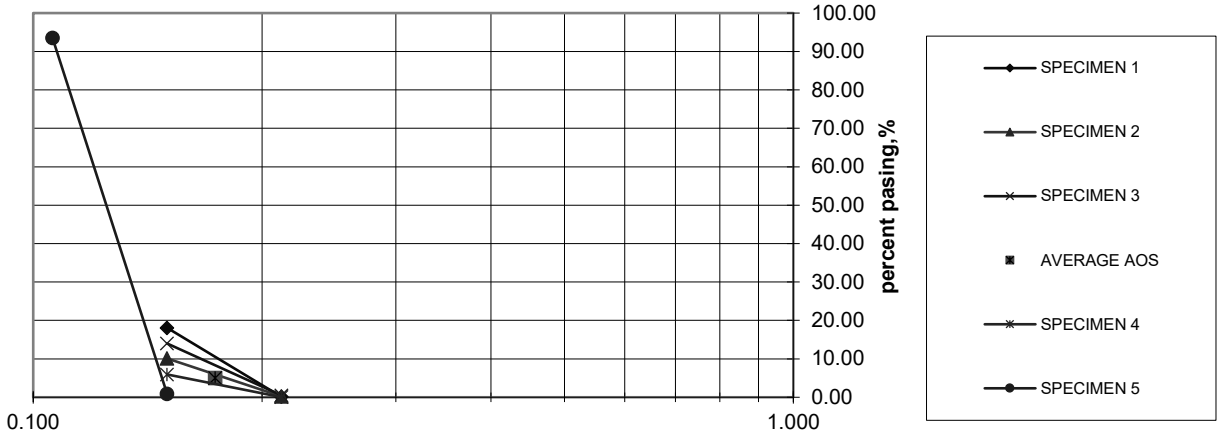
CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-005
ROLL NO.: GTE0123150035
SAMPLE NO: ATNL10119010029
Top textile component

US STD. SIEVE SIZE	SIEVE OPENING (mm)	WT. FRAME & GEOTEXTILE & BEADS (gm)	WT. FRAME & GEOTEXTILE (gm)	WT. BEADS (gm)	WT. PAN & BEADS (gm)	WT. PAN (gm)	WT. BEADS PASSING (gm)	PERCENT PASSING (%)	AOS @ 5% PASSING (mm)
SPECIMEN 1									
#100	0.150	1528.27	1478.27	50.00	306.54	297.50	9.04	18.08	
#70	0.212	1528.31	1478.31	50.00	297.57	297.50	0.07	0.14	
									0.193
SPECIMEN 2									
#100	0.150	542.64	492.64	50.00	413.23	408.18	5.05	10.10	
#70	0.212	542.66	492.66	50.00	408.30	408.18	0.12	0.24	
									0.179
SPECIMEN 3									
#100	0.150	542.54	492.54	50.00	414.98	407.98	7.00	14.00	
#70	0.212	542.54	492.54	50.00	408.24	407.98	0.26	0.52	
									0.189
SPECIMEN 4									
#100	0.150	540.74	490.74	50.00	411.49	408.52	2.97	5.94	
#70	0.212	540.75	490.75	50.00	408.54	408.52	0.02	0.04	
									0.158
SPECIMEN 5									
#140	0.106	542.95	492.95	50.00	456.64	409.86	46.78	93.56	
#100	0.150	542.95	492.95	50.00	410.32	409.86	0.46	0.92	
									0.148

AVERAGE AOS @ 5% PASSING, mm: 0.174
AVERAGE AOS, US STD. SIEVE SIZE: **#80**



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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-006
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150035
SAMPLE NO: ATNL10119010043
Bottom textile component

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	6	7	8	9	10	AVG	STD
MASS/UNIT AREA	D 5261	oz/sy	7.43	7.3	6.67	5.92	6.83	7.23	7.43	6.17	6.27	6.60	**6.78**	**0.522**
GRAB STRENGTH	D 4632	MD-lbs	174.1	185.3	169.2	192.5	201.6	216.1	214.9	192.7	168.5	249.0	**196.4**	**23.86**
		CD-lbs	208.9	226.8	223.3	278.3	276.0	258.6	186.7	241.0	245.8	224.1	**237.0**	**27.50**
GRAB ELONGATION	D 4632	MD-%	73.3	80.0	83.3	80.0	100.0	83.3	83.3	83.3	66.7	80.0	**81.3**	**8.06**
		CD-%	90.0	86.7	86.7	83.3	80.0	83.3	83.3	83.3	80.0	86.7	**84.3**	**3.00**
TRAPEZOIDAL TEAR	D 4533	MD-lbs	84.5	93.1	89.3	88.9	95.3	82.1	82.5	101.7	94.3	104.6	**91.6**	**7.28**
		CD-lbs	100.3	94.5	120.2	119.8	118.8	123.0	113.8	120.7	128.0	99.3	**113.8**	**10.96**
PUNCTURE	D 4833	lbs	133.0	86.3	110.5	110.3	151.9	142.1	129.5	138.4	67.9	111.7		
		lbs	118.1	122.4	117.3	105.3	147.6						**119.5**	**21.91**
MULLEN BURST	D 3786	psi	300	440	310	420	380	360	460	290	320	300	**358**	**60.5**
PERMITTIVITY	D 4491	sec-1	2.02	2.49	1.96	2.16							**2.16**	
A.O.S.	D 4751	mm	0.191	0.180	0.166	0.208	0.149						**0.179**	
								AVERAGE AOS, US STD.SIEVE SIZE =					**#80**	

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PERMITTIVITY TEST RESULTS

ASTM D 4491
CONSTANT HEAD TEST

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-006
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150035
SAMPLE NO: ATNL10119010043
Bottom textile component

SPECIMEN NO.	1	2	3	4	
SPEC.THICKNESS, mils	75.5	69.5	76	66.5	
CONSTANT HEAD, in	2.0	2.0	2.0	2.0	
COLLECTION DIVISIONS	5	5	5	5	
READING NO.	COLLECTION TIME, sec				
1	10.97	8.90	11.40	10.25	
2	11.04	8.96	11.33	10.36	
3	10.99	8.93	11.37	10.28	
4	11.03	8.90	11.42	10.33	
5	11.06	8.99	11.38	10.30	SAMPLE
AVERAGE, sec	**11.02**	**8.94**	**11.38**	**10.30**	**AVERAGE**
PERMITTIVITY @ 20 C,sec-1	2.02	2.49	1.96	2.16	**2.16 sec-1**
PERMEABILITY @ 20 C, cm/sec	0.39	0.44	0.38	0.37	**0.393 cm/sec**
FLOW RATE @ 2" CONSTANT HEAD gpm/s.f.	151.4	186.7	146.6	161.9	**161.7 gpm/s.f.**

TEST PARAMETERS

QUANTITY COLLECTED PER DIV., cc	457
SPECIMEN DIA., cm	5.08
AREA, cm2	20.27
TEMP, C°	20
CORRECTION FACTOR, Rt	1.00
OXYGEN CONTENT, ppm	< 6

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APPARENT OPENING SIZE
ASTM D 4751

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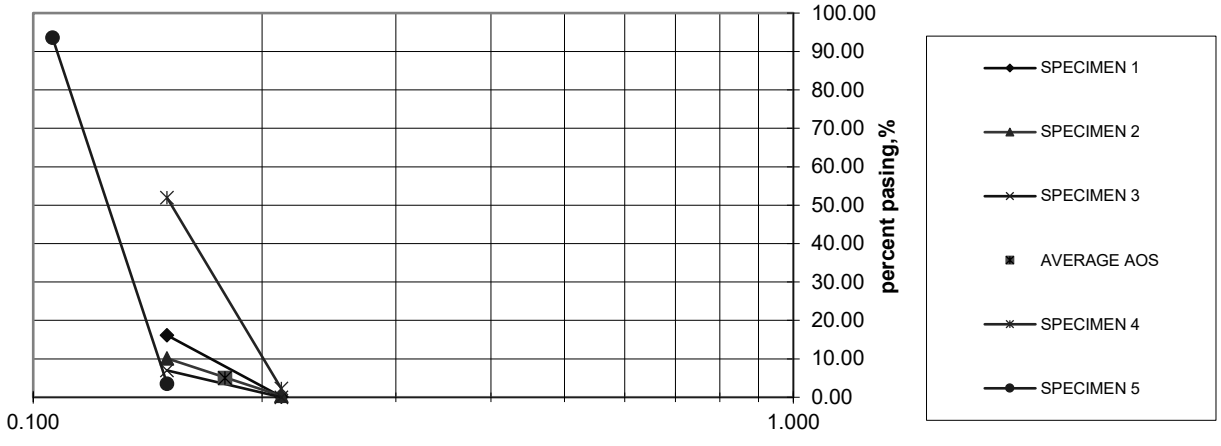
CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-006
ROLL NO.: GTE0123150035
SAMPLE NO: ATNL10119010043
Bottom textile component

US STD. SIEVE SIZE	SIEVE OPENING (mm)	WT. FRAME & GEOTEXTILE & BEADS (gm)	WT. FRAME & GEOTEXTILE (gm)	WT. BEADS (gm)	WT. PAN & BEADS (gm)	WT. PAN (gm)	WT. BEADS PASSING (gm)	PERCENT PASSING (%)	AOS @ 5% PASSING (mm)
SPECIMEN 1									
#100	0.150	1528.03	1478.03	50.00	305.55	297.48	8.07	16.14	
#70	0.212	1528.03	1478.03	50.00	297.56	297.48	0.08	0.16	
									0.191
SPECIMEN 2									
#100	0.150	542.71	492.71	50.00	413.24	408.18	5.06	10.12	
#70	0.212	542.72	492.72	50.00	408.36	408.18	0.18	0.36	
									0.180
SPECIMEN 3									
#100	0.150	542.88	492.88	50.00	411.47	407.98	3.49	6.98	
#70	0.212	542.88	492.88	50.00	407.99	407.98	0.01	0.02	
									0.166
SPECIMEN 4									
#100	0.150	541.44	491.44	50.00	434.48	408.52	25.96	51.92	
#70	0.212	541.41	491.41	50.00	409.65	408.52	1.13	2.26	
									0.208
SPECIMEN 5									
#140	0.106	543.14	493.14	50.00	456.67	409.85	46.82	93.64	
#100	0.150	543.23	493.23	50.00	411.62	409.85	1.77	3.54	
									0.149

AVERAGE AOS @ 5% PASSING, mm: 0.179
AVERAGE AOS, US STD. SIEVE SIZE: **#80**



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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-007
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO: GTE0123150065

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	AVE	STD
Geonet									
THICKNESS	D 5199	mils	343 341	338 341	353 339	347 330	339 335	**341**	5.9699
Geocomposite									
PLY ADHESION	D 7005								
	SIDE "A"	MD-lb/in	1.9	1.9	0.7	0.8	0.7	**1.23**	0.555
	SIDE"B"	MD-lb/in	3.5	1.9	1.6	0.6	0.5	**1.64**	1.099

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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-008
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150065
SAMPLE NO: ATNL10122380001
Top textile component

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	6	7	8	9	10	AVG	STD
MASS/UNIT AREA	D 5261	oz/sy	7.33	6.7	6.52	6.44	6.76	7.10	7.44	7.73	6.86	6.64	**6.96**	**0.406**
GRAB STRENGTH	D 4632	MD-lbs	255.9	183.0	195.3	178.2	171.4	184.6	159.1	227.0	199.9	246.2	**200.1**	**30.83**
		CD-lbs	182.6	264.3	278.2	277.5	275.9	256.6	248.7	231.7	211.4	243.7	**247.1**	**29.65**
GRAB ELONGATION	D 4632	MD-%	100.0	86.7	90.0	93.3	96.7	106.7	90.0	93.3	86.7	80.0	**92.3**	**7.16**
		CD-%	93.3	93.3	83.3	90.0	83.3	83.3	90.0	86.7	80.0	90.0	**87.3**	**4.42**
TRAPEZOIDAL TEAR	D 4533	MD-lbs	88.1	85.8	71.9	101.9	82.1	78.2	81.9	97.7	100.5	92.4	**88.1**	**9.46**
		CD-lbs	100.9	140.6	146.6	146.9	129.7	143.2	154.0	153.7	128.6	131.8	**137.6**	**15.03**
PUNCTURE	D 4833	lbs	148.5	135.3	118.4	112.1	137.7	116.2	144.1	117.4	139.2	126.2		
		lbs	127.2	107.1	166.4	106.6	133.3						**129.0**	**16.19**
MULLEN BURST	D 3786	psi	400	430	320	270	440	320	310	340	330	350	**351**	**52.2**
PERMITTIVITY	D 4491	sec-1	2.21	2.22	1.55	1.76							**1.93**	
A.O.S.	D 4751	mm	0.147	0.148	0.148	0.148	0.148						**0.148**	
								AVERAGE AOS, US STD.SIEVE SIZE =					**#100**	

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PERMITTIVITY TEST RESULTS

ASTM D 4491
CONSTANT HEAD TEST

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-008
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150065
SAMPLE NO: ATNL10122380001
Top textile component

SPECIMEN NO.	1	2	3	4	
SPEC.THICKNESS, mils	72	83	85.5	92.5	
CONSTANT HEAD, in	2.0	2.0	2.0	2.0	
COLLECTION DIVISIONS	5	5	5	5	
READING NO.	COLLECTION TIME, sec				
1	10.04	10.06	14.45	12.65	
2	10.06	10.03	14.47	12.70	
3	10.10	10.09	14.37	12.67	
4	10.13	10.03	14.40	12.67	
5	10.09	10.11	14.38	12.72	SAMPLE
AVERAGE, sec	**10.08**	**10.06**	**14.41**	**12.68**	**AVERAGE**
PERMITTIVITY @ 20 C,sec-1	2.21	2.22	1.55	1.76	**1.93 sec-1**
PERMEABILITY @ 20 C, cm/sec	0.40	0.47	0.34	0.41	**0.405 cm/sec**
FLOW RATE @ 2" CONSTANT HEAD gpm/s.f.	165.5	165.8	115.8	131.6	**144.7 gpm/s.f.**

TEST PARAMETERS

QUANTITY COLLECTED PER DIV., cc	457
SPECIMEN DIA., cm	5.08
AREA, cm2	20.27
TEMP, C°	20
CORRECTION FACTOR, Rt	1.00
OXYGEN CONTENT, ppm	< 6

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APPARENT OPENING SIZE
ASTM D 4751

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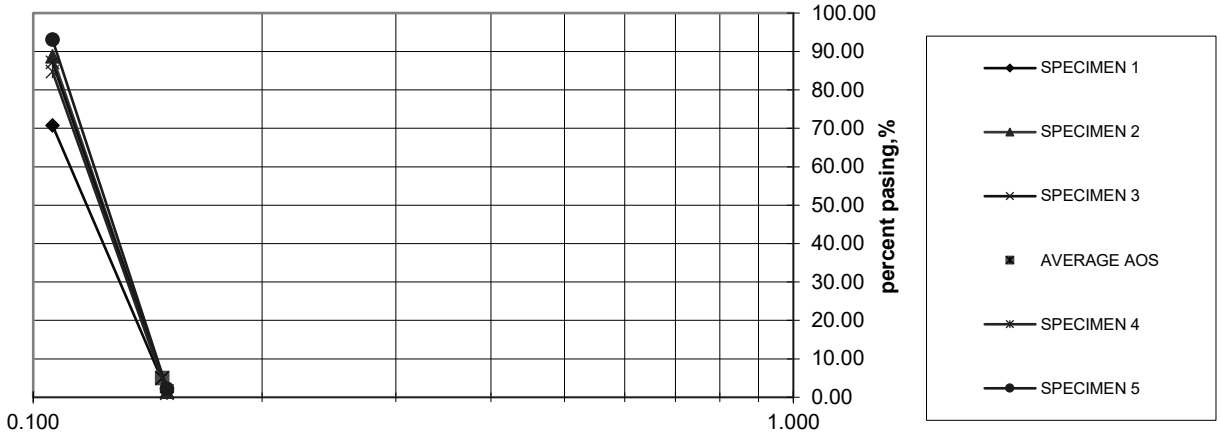
CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-008
ROLL NO.: GTE0123150065
SAMPLE NO: ATNL10122380001
Top textile component

US STD. SIEVE SIZE	SIEVE OPENING (mm)	WT. FRAME & GEOTEXTILE & BEADS (gm)	WT. FRAME & GEOTEXTILE (gm)	WT. BEADS (gm)	WT. PAN & BEADS (gm)	WT. PAN (gm)	WT. BEADS PASSING (gm)	PERCENT PASSING (%)	AOS @ 5% PASSING (mm)
SPECIMEN 1									
#140	0.106	1529.84	1479.84	50.00	332.81	297.41	35.40	70.80	
#100	0.150	1529.81	1479.81	50.00	298.10	297.41	0.69	1.38	
									0.147
SPECIMEN 2									
#140	0.106	544.17	494.17	50.00	452.51	408.13	44.38	88.76	
#100	0.150	544.15	494.15	50.00	408.86	408.13	0.73	1.46	
									0.148
SPECIMEN 3									
#140	0.106	543.90	493.90	50.00	451.58	408.00	43.58	87.16	
#100	0.150	543.87	493.87	50.00	408.83	408.00	0.83	1.66	
									0.148
SPECIMEN 4									
#140	0.106	542.67	492.67	50.00	450.87	408.48	42.39	84.78	
#100	0.150	542.66	492.66	50.00	409.03	408.48	0.55	1.10	
									0.148
SPECIMEN 5									
#140	0.106	544.22	494.22	50.00	456.42	409.87	46.55	93.10	
#100	0.150	544.18	494.18	50.00	410.96	409.87	1.09	2.18	
									0.148

AVERAGE AOS @ 5% PASSING, mm 0.148
AVERAGE AOS, US STD. SIEVE SIZE **#100**



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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-009
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150065
SAMPLE NO: ATNL10122380019
Bottom textile component

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	6	7	8	9	10	AVG	STD
MASS/UNIT AREA	D 5261	oz/sy	7.20	7.6	7.79	8.36	7.79	7.83	8.26	7.47	7.93	8.57	**7.88**	**0.397**
GRAB STRENGTH	D 4632	MD-lbs	215.3	244.5	223.5	211.7	185.8	205.3	181.5	181.7	196.8	195.0	**204.1**	**19.17**
		CD-lbs	245.8	273.6	307.3	295.5	333.8	307.0	281.9	301.9	284.8	263.8	**289.5**	**23.83**
GRAB ELONGATION	D 4632	MD-%	90.0	93.3	90.0	93.3	100.0	93.3	93.3	86.7	86.7	76.7	**90.3**	**5.86**
		CD-%	93.3	80.0	86.7	86.7	83.3	76.7	86.7	76.7	83.3	90.0	**84.3**	**5.17**
TRAPEZOIDAL TEAR	D 4533	MD-lbs	95.1	91.4	97.3	110.6	105.2	96.8	89.7	120.8	89.9	84.5	**98.1**	**10.49**
		CD-lbs	143.4	136.3	156.8	152.8	146.9	146.6	143.9	148.2	137.4	193.9	**150.6**	**15.59**
PUNCTURE	D 4833	lbs	161.7	153.5	139.3	135.7	120.5	121.0	160.1	100.3	111.2	105.4		
		lbs	135.0	103.0	124.5	117.1	92.0						**125.4**	**21.08**
MULLEN BURST	D 3786	psi	370	380	460	360	350	370	300	330	500	390	**381**	**55.9**
PERMITTIVITY	D 4491	sec-1	2.05	1.83	2.21	1.99							**2.02**	
A.O.S.	D 4751	mm	0.149	0.149	0.161	0.149	0.180						**0.158**	
								AVERAGE AOS, US STD.SIEVE SIZE =					**#80**	

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PERMITTIVITY TEST RESULTS

ASTM D 4491
CONSTANT HEAD TEST

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-009
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150065
SAMPLE NO: ATNL10122380019
Bottom textile component

SPECIMEN NO.	1	2	3	4	
SPEC.THICKNESS, mils	82	78	76	72.5	
CONSTANT HEAD, in	2.0	2.0	2.0	2.0	
COLLECTION DIVISIONS	5	5	5	5	
READING NO.	COLLECTION TIME, sec				
1	10.90	12.10	10.06	11.16	
2	10.83	12.14	10.05	11.19	
3	10.88	12.16	10.15	11.23	
4	10.91	12.19	10.11	11.25	
5	10.86	12.16	10.09	11.20	SAMPLE
AVERAGE, sec	**10.88**	**12.15**	**10.09**	**11.21**	**AVERAGE**
PERMITTIVITY @ 20 C,sec-1	2.05	1.83	2.21	1.99	**2.02 sec-1**
PERMEABILITY @ 20 C, cm/sec	0.43	0.36	0.43	0.37	**0.396 cm/sec**
FLOW RATE @ 2" CONSTANT HEAD gpm/s.f.	153.4	137.3	165.3	148.9	**151.2 gpm/s.f.**

TEST PARAMETERS

QUANTITY COLLECTED PER DIV., cc	457
SPECIMEN DIA., cm	5.08
AREA, cm2	20.27
TEMP, C°	20
CORRECTION FACTOR, Rt	1.00
OXYGEN CONTENT, ppm	< 6

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APPARENT OPENING SIZE
ASTM D 4751

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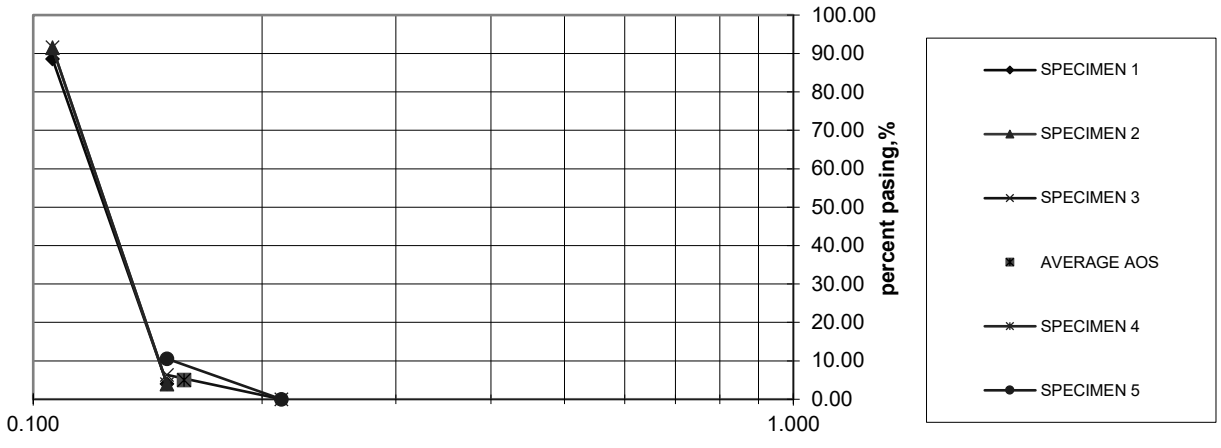
CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-009
ROLL NO.: GTE0123150065
SAMPLE NO: ATNL10122380019
Bottom textile component

US STD. SIEVE SIZE	SIEVE OPENING (mm)	WT. FRAME & GEOTEXTILE & BEADS (gm)	WT. FRAME & GEOTEXTILE (gm)	WT. BEADS (gm)	WT. PAN & BEADS (gm)	WT. PAN (gm)	WT. BEADS PASSING (gm)	PERCENT PASSING (%)	AOS @ 5% PASSING (mm)
SPECIMEN 1									
#140	0.106	1529.33	1479.33	50.00	341.75	297.45	44.30	88.60	
#100	0.150	1529.33	1479.33	50.00	299.45	297.45	2.00	4.00	
									0.149
SPECIMEN 2									
#140	0.106	543.71	493.71	50.00	453.85	408.10	45.75	91.50	
#100	0.150	543.70	493.70	50.00	410.06	408.10	1.96	3.92	
									0.149
SPECIMEN 3									
#100	0.150	543.42	493.42	50.00	411.15	407.98	3.17	6.34	
#70	0.212	543.43	493.43	50.00	407.99	407.98	0.01	0.02	
									0.161
SPECIMEN 4									
#140	0.106	591.62	541.62	50.00	454.30	408.50	45.80	91.60	
#100	0.150	541.62	491.62	50.00	410.49	408.50	1.99	3.98	
									0.149
SPECIMEN 5									
#100	0.150	542.96	492.96	50.00	415.12	409.85	5.27	10.54	
#70	0.212	542.96	492.96	50.00	409.86	409.85	0.01	0.02	
									0.180

AVERAGE AOS @ 5% PASSING, mm 0.158
AVERAGE AOS, US STD. SIEVE SIZE **#80**



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TRANSMISSIVITY TEST RESULTS

ASTM D 4716

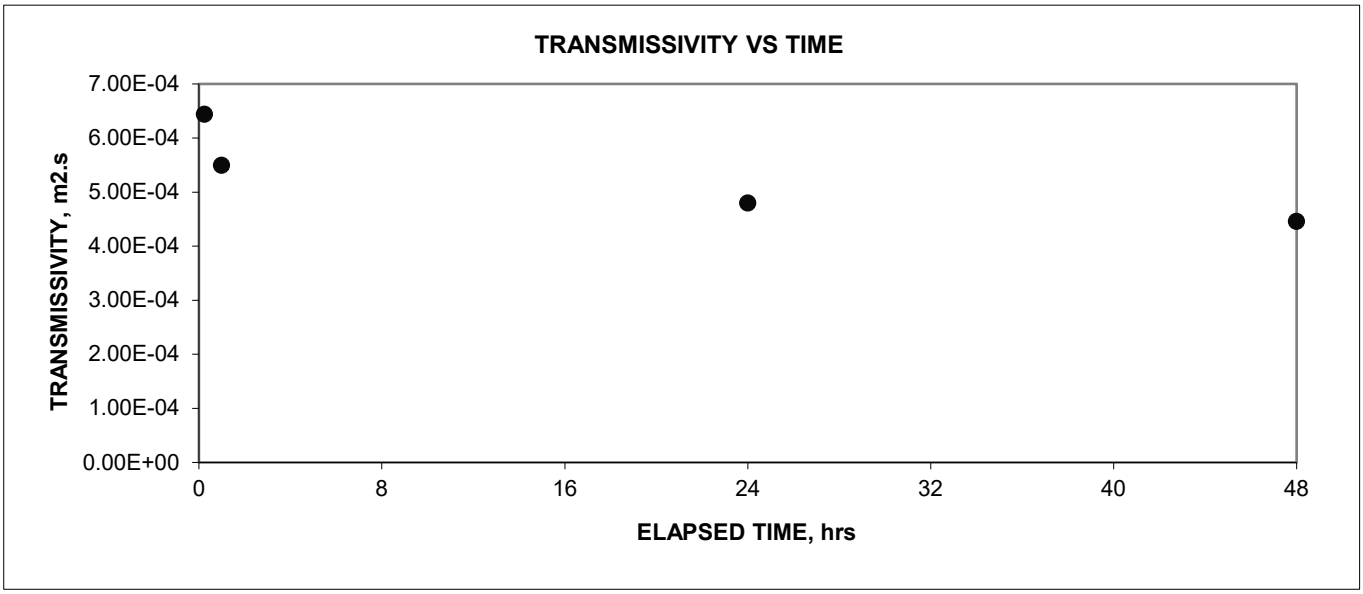
CLIENT: GAI Consultants, Inc.
PROJECT: AMOS Sequence 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB I.D. NO.: L23-137-003-010
SAMPLE NO.: GTE0123150097
REPLICATE NO.: 1 of 1

TEST SECTION: Bottom Ash
Geocomposite
30 mil PVC

25,000 psf NORMAL COMPRESSIVE STRESS

ELAPSED TIME (hrs)	MANOMETERS RES. (in)	MANOMETERS WEIR (in)	HYDR. GRAD.	COLLECTION DATA VOLUME (ml)	COLLECTION DATA TIME (sec.)	WATER TEMP °C	AVERAGE FLOW RATE (l/s-m)	AVERAGE FLOW RATE (gpm/ft)	CALCULATED TRANSMISSIVITY (m2/sec)
0.25	0.79	0.55	0.02	740 740 740	180 180 180	20.8	1.29E-02	0.062	6.44E-04
1	0.79	0.55	0.02	630 630 630	180 180 180	20.7	1.10E-02	0.053	5.49E-04
24	0.79	0.55	0.02	550 550 550	180 180 180	20.7	9.59E-03	0.046	4.80E-04
48	0.79	0.55	0.02	510 510 510	180 180 180	20.6	8.92E-03	0.043	4.46E-04



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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS Sequence 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-010
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO: GTE0123150065

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	AVE	STD
Geonet									
THICKNESS	D 5199	mils	334	341	340	339	329		
			330	342	341	323	321	**334**	7.4431
Geocomposite									
PLY ADHESION	D 7005								
	SIDE "A"	MD-lb/in	4.1	5.7	1.8	0.5	1.1	**2.64**	1.931
	SIDE"B"	MD-lb/in	1.8	3.4	2.1	0.6	0.9	**1.75**	1.010

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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-011
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150097
SAMPLE NO: ATNL10119010048
Top textile component

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	6	7	8	9	10	AVG	STD
MASS/UNIT AREA	D 5261	oz/sy	6.94	7.2	6.24	6.26	6.19	6.76	6.53	7.09	7.30	7.07	**6.76**	**0.406**
GRAB STRENGTH	D 4632	MD-lbs	230.6	181.5	209.6	148.8	174.6	170.6	198.6	188.3	227.4	226.9	**195.7**	**26.32**
		CD-lbs	253.3	272.5	228.7	224.8	257.4	235.3	230.4	214.3	258.7	218.3	**239.4**	**18.67**
GRAB ELONGATION	D 4632	MD-%	120.0	83.3	83.3	96.7	90.0	80.0	80.0	73.3	76.7	73.3	**85.7**	**13.34**
		CD-%	96.7	83.3	70.0	83.3	83.3	80.0	80.0	80.0	83.3	90.0	**83.0**	**6.57**
TRAPEZOIDAL TEAR	D 4533	MD-lbs	94.0	76.3	84.1	79.8	87.2	78.9	67.2	94.7	72.9	102.8	**83.8**	**10.42**
		CD-lbs	115.6	126.6	105.6	124.1	112.4	113.5	138.2	116.2	91.2	126.2	**117.0**	**12.28**
PUNCTURE	D 4833	lbs	180.7	119.8	180.2	118.3	142.8	144.1	147.9	127.7	92.0	115.5		
		lbs	100.8	129.6	129.2	123.3	128.9						**132.1**	**23.82**
MULLEN BURST	D 3786	psi	320	370	420	340	370	310	310	350	360	400	**355**	**35.0**
PERMITTIVITY	D 4491	sec-1	2.25	2.02	2.22	1.92							**2.10**	
A.O.S.	D 4751	mm	0.150	0.114	0.148	0.147	0.148						**0.142**	
								AVERAGE AOS, US STD.SIEVE SIZE =					**#100**	

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PERMITTIVITY TEST RESULTS

ASTM D 4491
CONSTANT HEAD TEST

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-011
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150097
SAMPLE NO: ATNL10119010048
Top textile component

SPECIMEN NO.	1	2	3	4	
SPEC.THICKNESS, mils	75	73	69.5	75	
CONSTANT HEAD, in	2.0	2.0	2.0	2.0	
COLLECTION DIVISIONS	5	5	5	5	
READING NO.	**COLLECTION TIME, sec**				
1	9.90	11.00	10.00	11.63	
2	9.88	11.06	10.11	11.66	
3	9.93	11.11	10.07	11.57	
4	9.98	11.09	10.03	11.60	
5	9.95	11.02	10.11	11.63	**SAMPLE**
AVERAGE, sec	**9.93**	**11.06**	**10.06**	**11.62**	**AVERAGE**
PERMITTIVITY @ 20 C,sec-1	2.25	2.02	2.22	1.92	**2.10 sec-1**
PERMEABILITY @ 20 C, cm/sec	0.43	0.37	0.39	0.37	**0.390 cm/sec**
FLOW RATE @ 2" CONSTANT HEAD gpm/s.f.	168.1	150.9	165.8	143.6	**157.1 gpm/s.f.**

TEST PARAMETERS

QUANTITY COLLECTED PER DIV., cc	457
SPECIMEN DIA., cm	5.08
AREA, cm2	20.27
TEMP, C°	20
CORRECTION FACTOR, Rt	1.00
OXYGEN CONTENT, ppm	< 6

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APPARENT OPENING SIZE
ASTM D 4751

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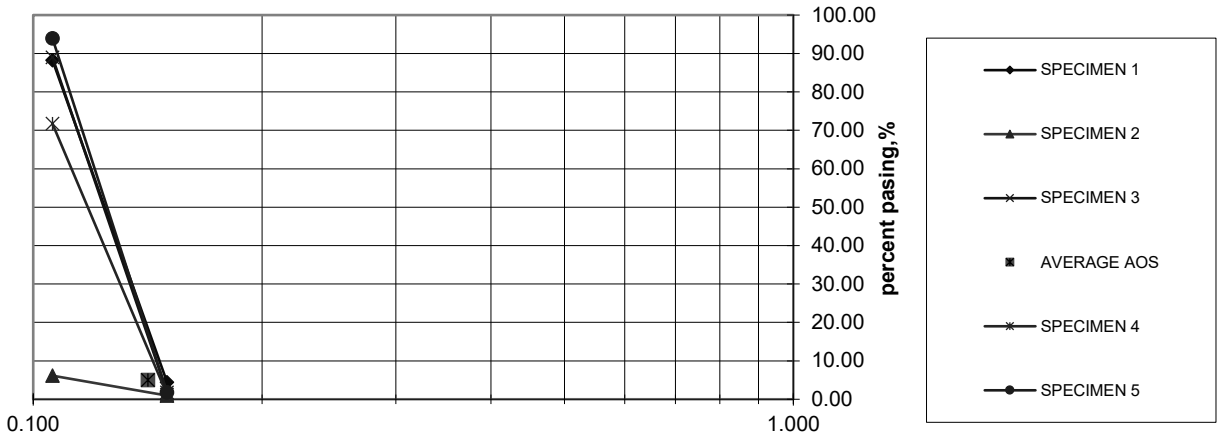
CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-011
ROLL NO.: GTE0123150097
SAMPLE NO: ATNL10119010048
Top textile component

US STD. SIEVE SIZE	SIEVE OPENING (mm)	WT. FRAME & GEOTEXTILE & BEADS (gm)	WT. FRAME & GEOTEXTILE (gm)	WT. BEADS (gm)	WT. PAN & BEADS (gm)	WT. PAN (gm)	WT. BEADS PASSING (gm)	PERCENT PASSING (%)	AOS @ 5% PASSING (mm)
SPECIMEN 1									
#140	0.106	1528.91	1478.91	50.00	341.57	297.43	44.14	88.28	
#100	0.150	1528.91	1478.91	50.00	299.65	297.43	2.22	4.44	
									0.150
SPECIMEN 2									
#140	0.106	543.97	493.97	50.00	411.23	408.16	3.07	6.14	
#100	0.150	543.94	493.94	50.00	408.64	408.16	0.48	0.96	
									0.114
SPECIMEN 3									
#140	0.106	543.65	493.65	50.00	452.47	407.96	44.51	89.02	
#100	0.150	543.63	493.63	50.00	408.88	407.96	0.92	1.84	
									0.148
SPECIMEN 4									
#140	0.106	542.20	492.20	50.00	444.38	408.52	35.86	71.72	
#100	0.150	542.18	492.18	50.00	409.13	408.52	0.61	1.22	
									0.147
SPECIMEN 5									
#140	0.106	543.35	493.35	50.00	456.83	409.86	46.97	93.94	
#100	0.150	543.35	493.35	50.00	410.76	409.86	0.90	1.80	
									0.148

AVERAGE AOS @ 5% PASSING, mm 0.142
AVERAGE AOS, US STD. SIEVE SIZE **#100**



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CONFORMANCE TEST RESULTS

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-012
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150097
SAMPLE NO: ATNL10122380003
Bottom textile component

TEST	ASTM METHOD	UNITS	SPECIMEN NO. 1	2	3	4	5	6	7	8	9	10	AVG	STD
MASS/UNIT AREA	D 5261	oz/sy	6.26	7.1	6.14	5.54	6.06	6.22	6.49	6.53	6.22	6.89	**6.35**	**0.421**
GRAB STRENGTH	D 4632	MD-lbs	199.8	183.3	214.7	145.5	174.6	183.3	203.3	214.4	217.3	229.6	**196.6**	**23.80**
		CD-lbs	210.7	232.1	243.9	216.4	213.6	199.5	194.0	235.1	177.2	216.4	**213.9**	**19.11**
GRAB ELONGATION	D 4632	MD-%	70.0	80.0	76.7	80.0	83.3	93.3	73.3	80.0	80.0	76.7	**79.3**	**5.93**
		CD-%	100.0	86.7	100.0	80.0	76.7	80.0	76.7	83.3	86.7	86.7	**85.7**	**8.03**
TRAPEZOIDAL TEAR	D 4533	MD-lbs	79.3	88.0	85.4	78.6	89.9	87.8	57.4	92.7	79.1	102.1	**84.0**	**11.20**
		CD-lbs	111.3	111.7	106.3	115.4	128.4	132.4	96.7	106.1	104.2	108.2	**112.1**	**10.36**
PUNCTURE	D 4833	lbs	138.6	119.7	114.5	133.9	122.3	137.5	145.3	157.2	108.8	90.2		
		lbs	106.3	118.0	124.6	97.9	128.6						**122.9**	**17.45**
MULLEN BURST	D 3786	psi	430	300	360	370	380	300	310	270	370	390	**348**	**47.7**
PERMITTIVITY	D 4491	sec-1	2.04	2.46	2.49	1.90							**2.22**	
A.O.S.	D 4751	mm	0.200	0.157	0.148	0.148	0.150						**0.160**	
								AVERAGE AOS, US STD.SIEVE SIZE =					**#80**	

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PERMITTIVITY TEST RESULTS

ASTM D 4491
CONSTANT HEAD TEST

CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-012
MATERIAL: Agru 6-275-6 Geocomposite
ROLL NO.: GTE0123150097
SAMPLE NO: ATNL10122380003
Bottom textile component

SPECIMEN NO.	1	2	3	4	
SPEC.THICKNESS, mils	67.5	68	65.5	79.5	
CONSTANT HEAD, in	2.0	2.0	2.0	2.0	
COLLECTION DIVISIONS	5	5	5	5	
READING NO.	COLLECTION TIME, sec				
1	10.93	9.03	8.94	11.66	
2	10.99	9.11	8.96	11.73	
3	10.88	9.03	8.99	11.77	
4	10.90	9.10	8.91	11.69	
5	10.94	9.07	8.96	11.71	**SAMPLE**
AVERAGE, sec	**10.93**	**9.07**	**8.95**	**11.71**	**AVERAGE**
PERMITTIVITY @ 20 C,sec-1	2.04	2.46	2.49	1.90	**2.22 sec-1**
PERMEABILITY @ 20 C, cm/sec	0.35	0.42	0.41	0.38	**0.393 cm/sec**
FLOW RATE @ 2" CONSTANT HEAD gpm/s.f.	152.7	184.0	186.4	142.5	**166.4 gpm/s.f.**

TEST PARAMETERS

QUANTITY COLLECTED PER DIV., cc	457
SPECIMEN DIA., cm	5.08
AREA, cm2	20.27
TEMP, C°	20
CORRECTION FACTOR, Rt	1.00
OXYGEN CONTENT, ppm	< 6

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APPARENT OPENING SIZE
ASTM D 4751

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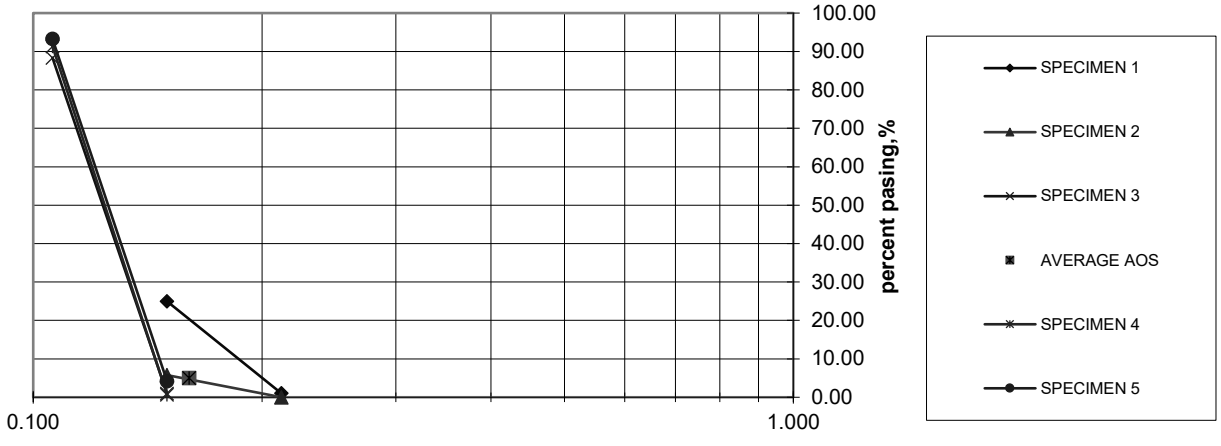
CLIENT: GAI Consultants, Inc.
CLIENT PROJECT: AMOS 4 Repair
MATERIAL: Agru 6-275-6 Geocomposite

PROJECT NO.: L23-137-003
LAB ID NO.: L23-137-003-012
ROLL NO.: GTE0123150097
SAMPLE NO: ATNL10122380003
Bottom textile component

US STD. SIEVE SIZE	SIEVE OPENING (mm)	WT. FRAME & GEOTEXTILE & BEADS (gm)	WT. FRAME & GEOTEXTILE (gm)	WT. BEADS (gm)	WT. PAN & BEADS (gm)	WT. PAN (gm)	WT. BEADS PASSING (gm)	PERCENT PASSING (%)	AOS @ 5% PASSING (mm)
SPECIMEN 1									
#100	0.150	1528.91	1478.91	50.00	309.92	297.44	12.48	24.96	
#70	0.212	1528.91	1478.91	50.00	297.96	297.44	0.52	1.04	
									0.200
SPECIMEN 2									
#100	0.150	543.47	493.47	50.00	411.04	408.16	2.88	5.76	
#70	0.212	543.52	493.52	50.00	408.17	408.16	0.01	0.02	
									0.157
SPECIMEN 3									
#140	0.106	543.80	493.80	50.00	452.17	407.98	44.19	88.38	
#100	0.150	543.76	493.76	50.00	408.47	407.98	0.49	0.98	
									0.148
SPECIMEN 4									
#140	0.106	541.98	491.98	50.00	454.18	408.51	45.67	91.34	
#100	0.150	541.94	491.94	50.00	408.85	408.51	0.34	0.68	
									0.148
SPECIMEN 5									
#140	0.106	543.18	493.18	50.00	456.50	409.85	46.65	93.30	
#100	0.150	543.14	493.14	50.00	411.93	409.85	2.08	4.16	
									0.150

AVERAGE AOS @ 5% PASSING, mm 0.160
AVERAGE AOS, US STD. SIEVE SIZE **#80**



CHECKED BY: JLK DATE: 10/20/2023

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Appendix C
Quality Control Data for Leachate Collection System Materials

gai consultants
transforming ideas into reality

Appendix C - I
PVC Pipe

gai consultants
transforming ideas into reality

Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-008**
ENTACT Project Number:	E9103
Submittal Title:	PVC Pipe Materials
Submittal Date:	05/11/2023
Date(s) of Previous Submissions:	N/A
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Robin White, ENTACT
From:	Jarod Stanfield
Reference Specification section and/or	Drawing 30204SH7 & 8 Details #5 , #2

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☒ **Product** ☒ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☐ **Plan**

☐ **Certificate** ☐ **Report** ☐ **Permit** ☐ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile		X	X		No

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COMMENTS:
The pipe will be purchased as solid pipe. Once the distributor receives the pipe from the manufactures it will be sent out to a fabricator and the perforations will be installed as per detail #5 as shown on drawing 30204SH7.

ENTACT, LLC

Contractor's Signature and Date
Jarod Stanfield 05/11/2023

Owner's Representative Review & Comments Section:

This Submittal has been:

☐ **Reviewed** ☒ **Approved** ☐ **Approved as Noted** ☐ **Revised and Resubmit** ☐ **Rejected**

Comments: Schedule 80 PVC pipe from Charlotte is approved for use in the leachate collection system. C900 PVC pipe from JM Eagle is approved for use in the groundwater underdrain.
GAI Consultants CZW 05/15/2023.

Owner's Representative Signature and Date (Stamp if applicable)

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CHARLOTTE PIPE AND FOUNDRY COMPANY®

SUBMITTAL FOR CHARLOTTE PIPE®
PVC SCHEDULE 80 PRESSURE PIPE AND FITTING SYSTEM

Date: _____

Job Name: _____ Location: _____

Engineer: _____ Contractor: _____

Scope:

This specification covers PVC Schedule 80 pipe and fittings for pressure applications. This system is intended for pressure applications where the operating temperature will not exceed 140° F.

Specification:

Pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 12454 as identified in ASTM D 1784.

PVC Schedule 80 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785. Injection molded PVC Schedule 80 fittings shall conform to ASTM D 2467. PVC Schedule 80 threaded fittings shall conform to ASTM D 2464. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. All pipe and fittings shall be manufactured in the United States. Pipe and fittings shall conform to NSF International Standard 61 and the health effects portion of NSF Standard 14.

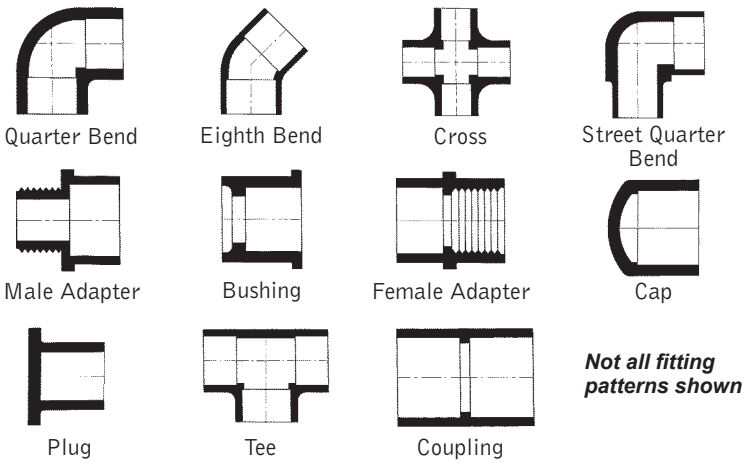
Installation:

Installation shall comply with the latest installation instructions published by Charlotte Pipe and Foundry and shall conform to all applicable plumbing, fire, and building code requirements. Buried pipe shall be installed in accordance with ASTM F 1668 and ASTM D 2774. Solvent cement joints shall be made in a two-step process with a primer meeting ASTM F 656 and a medium- or heavy-bodied solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire-stopping materials, thread sealant, plasticized-vinyl products or other aggressive chemical agents not compatible with PVC compounds. The system shall be hydrostatically tested after installation. **WARNING!** Never test with or transport/store compressed air or gas in PVC pipe or fittings. Doing so can result in explosive failures and cause severe injury or death.

Referenced Standards:

ASTM D 1784: Rigid Vinyl Compounds
ASTM D 1785: PVC Plastic Pipe, Schedule 80
ASTM D 2464 or D 2467: PVC Threaded Fittings, Schedule 80
ASTM D 2467: PVC Socket Fittings, Schedule 80
ASTM D 2564: Solvent Cements for PVC Pipe and Fittings
ASTM D 2774: Underground Installation of Thermoplastic Pressure Piping
ASTM F 1668: Procedures for Buried Plastic Pipe
NSF Standard 14: Plastic Piping Components & Related Materials
NSF Standard 61: Drinking Water System Components–Health Effects

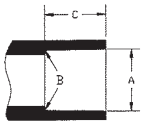
MADE IN U.S.A.



Not all fitting patterns shown

Van Stone Flange

Schedule 80
Tapered Socket Dimensions



PVC SCHEDULE 80 - ASTM D 2467

Nominal Size	Schedule 80 and Schedule 40 Socket Diameter Entrance A	Bottom B	Tolerance	Schedule 80 Socket Length C (Minimum)	Schedule 40 Socket Length C (Minimum)
½	0.848	0.836	±0.004	0.875	0.688
¾	1.058	1.046	±0.004	1.000	0.719
1	1.325	1.310	±0.005	1.125	0.875
1¼	1.670	1.655	±0.005	1.250	0.938
1½	1.912	1.894	±0.006	1.375	1.094
2	2.387	2.369	±0.006	1.500	1.156
2½	2.889	2.868	±0.007	1.750	1.750
3	3.516	3.492	±0.008	1.875	1.875
4	4.518	4.491	±0.009	2.250	2.000
6	6.647	6.614	±0.011	3.000	3.000
8	8.655	8.610	±0.015	4.000	4.000
10	10.780	10.735	±0.015	5.000	5.000
12	12.780	12.735	±0.015	6.000	6.000

PIPE REFERENCE GUIDE

Product	Sizes Available																
	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4	5	6	8	10	12	14	16
PVC Schedule 80	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Charlotte Pipe and Foundry Company • P.O. Box 35430 Charlotte, NC 28235 • (800) 438-6091 • www.charlottepipe.com

Charlotte Pipe and Charlotte Pipe and Foundry Company are registered trademarks of Charlotte Pipe and Foundry Company.

Ground Water Under Drain Pipe

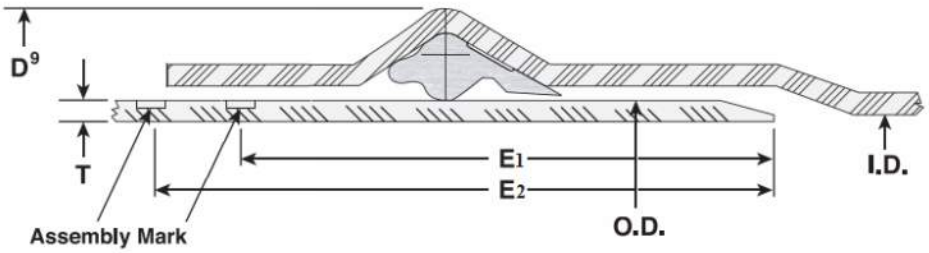
JM Eagle *Building essentials for a better tomorrow™*

BLUE BRUTE™

SUBMITTAL AND DATA SHEET

Pipe Size (IN)	Ave OD (IN)	Nom ID (IN)	D^9 - Approx. Bell Outside Diameter (IN)	Min T (IN)	Ref. E1 ±1/4 (IN)	Ref. E2 ±1/4 (IN)	Approx. Weight (LBS/FT)
PRESSURE CLASS 165 psi (DR25)							
4	4.80	4.39	5.57	0.192	4.50	5.50	1.9
6	6.90	6.31	8.00	0.276	5.25	6.25	3.9
8	9.05	8.28	10.50	0.362	6.25	7.25	6.7
10	11.10	10.16	12.88	0.444	7.25	8.25	10.1
12	13.20	12.08	15.31	0.528	8.25	9.25	14.4
PRESSURE CLASS 235 psi (DR18)*							
4	4.80	4.23	5.87	0.267	4.50	5.50	2.6
6	6.90	6.09	8.43	0.383	5.25	6.25	5.3
8	9.05	7.98	11.06	0.503	6.25	7.25	9.2
10	11.10	9.79	13.57	0.617	7.25	8.25	13.9
12	13.20	11.65	16.13	0.733	8.25	9.25	19.7
PRESSURE CLASS 305 psi (DR14)*							
4	4.80	4.07	6.17	0.343	4.50	5.50	3.2
6	6.90	5.86	8.87	0.493	5.25	6.25	6.7
8	9.05	7.68	11.63	0.646	6.25	7.25	11.6
10	11.10	9.42	14.27	0.793	7.25	8.25	17.6
12	13.20	11.20	16.97	0.943	8.25	9.25	25.1

Consult JM Eagle™ for CSA and other listing availability prior to shipment.
Note: *FM Approvals Pressure Class 150 psi for DR 18 and 200 psi for DR 14.
* Contact your JM eagleTM sales representative for location availability.



I.D. : Inside Dameter
O.D. : Outside Diameter
T. : Wall Thickness
D^9 : Bell Outside Diameter
E : Distance between Assembly Mark to the end of spigot.

Product Standard:	ANSI/AWWA C900
Pipe Compound:	ASTM D1784 Cells Class 12454
Gasket:	ASTM F477
Integral Bell Joint:	ASTM D3139
Certifications:	ANSI/NSF Standard 61
	UL Standard 1285
	Pipe Length: 20 feet laying length
Installation:	AWWA C605
	JM Eagle™ Installation Guide

JM Eagle™ also manufactures this pipe in green for sewer force main applications and purple, specifically for reclaimed water systems. This pipe is made to the same requirements as our standard products. The only difference is that the pigment used is green or purple. These products will not be marked with UL or NSF listing marks. Additionally, the green pipe will be marked "Forced Sewer" and the purple pipe will be marked: "Reclaimed Water... Do Not Drink."

Appendix C - II
Granular Drainage Aggregate

gai consultants
transforming ideas into reality

Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-027**
ENTACT Project Number:	E9103
Submittal Title:	Non-Calcareous ASSHTO No.8 Aggregate QA/QC
Submittal Date:	12/4/23
Date(s) of Previous Submissions:	N/A
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Robin White, ENTACT Eric Cline, ENTACT
From:	Jarod Stanfield
Reference Specification section and/or	QA/QC Plan 6.7 & CE-006

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☐ **Product** ☒ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☐ **Plan**

☒ **Certificate** ☒ **Report** ☐ **Permit** ☐ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile	X		X		N/A

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COMMENTS:
This submittal includes the QA/QC data for the Non-Calcareous ASSHTO No.8 Aggregate to be used on ste provided by Shamblin Stone.

ENTACT, LLC

Contractor's Signature and Date
Jarod Stanfield 12/4/2023

Owner's Representative Review & Comments Section:

The provided gradation meets the requirements of the specification. However, the non-calcareous requirement is not met by the submitted documentation. Additional documentation on the aggregate to be used for the project will be required to show that the aggregate meets the non-calcareous requirements.

GAI Consultants JFS 12/7/2023

This Submittal has been:

☐ **Reviewed** ☐ **Approved** ☐ **Approved as Noted** ☒ **Revised and Resubmit** ☐ **Rejected**

Comments:

Owner's Representative Signature and Date (Stamp if applicable)

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Shelly MATERIALS
A CRH COMPANY

Plant 162_01381-Portland Aggregates

Product 108-OH 8 **Name/Title** Todd Hines / QC Technician

Period: 08/29/2021 - 08/29/2022 **Report Date** 08/29/2022

Procedure	Sieve/Test	Result	Unit	OH 8
	1/2" (12.5mm)	100	%	100-100
	3/8" (9.5mm)	96	%	85-100
	1/4" (6.3mm)	56	%	
	#4 (4.75mm)	22	%	10-30
	#8 (2.36mm)	1	%	0-10
	#16 (1.18mm)	1	%	0-5
	Wash Loss (#200/75um)	0.6	%	
	Coal	0.00		
	Absorption	1.7	%	
	SPGR (Dry,Gsb)	2.531		2.476-2.576
	SPGR (SSD)	2.572		
	SPGR (Apparent,Gsa)	2.640		

Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-027B**
ENTACT Project Number:	E9103
Submittal Title:	Non-Calcareous AASHTO No.8 Aggregate QA/QC
Submittal Date:	12/21/23
Date(s) of Previous Submissions:	12/4/23 S027 12/12/23 S027A
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Jarod Stanfield, ENTACT Eric Cline, ENTACT
From:	Robin White
Reference Specification section and/or	QA/QC Plan 6.7 & CE-006

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☐ **Product** ☒ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☐ **Plan**

☐ **Certificate** ☒ **Report** ☐ **Permit** ☐ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile	X		X		N/A

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COMMENTS:
Based on discussions surrounding the documentation of the non-calcareous characteristic of the Shamblin Stone AASHTO #8, the additional documentation is attached.

ENTACT, LLC

Robin White

_____

Contractor's Signature and Date
Robin White 12/21/23

Owner's Representative Review & Comments Section:

This Submittal has been:

☐ **Reviewed** ☐ **Approved** ☐ **Approved as Noted** ☐ **Revised and Resubmit** ☐ **Rejected**

Comments:

_____

Owner's Representative Signature and Date (Stamp if applicable)

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BOWSER-MORNER, INC.

Delivery Address: 4518 Taylorsville Road Dayton, Ohio 45424 Mailing Address: P.O. Box 51 Dayton, Ohio 45401

AASHTO/ISO 17025 Accredited

LABORATORY REPORT

Report To: Shelly Materials
Attn: Marty Vann
PO Box 266
Thornville, OH 43076

Report Date: 04/27/12
Job No.: 157986
Report No.: 108354
No. of Pages: 1

Report On: Laboratory Determination of Insoluble Residue
Procedure: Insoluble Residue in Carbonate Aggregates (ASTM D 3042)

Sample ID: No. 8 Gravel
Source: Reedsville Plant
Date Received: 04/23/12

Test Parameter	Result	ODOT 703.02 Spec.
Plus No. 200 Insoluble Residue, %:	**92.2**	---
Total Insoluble Residue (Siliceous Material), %:	**92.6**	25% Min.
Total Acid Solubility, %:	**7.4**	---

Should you have any questions, or if we may be of further service, please contact me at 937-236-8805, extension 322.

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Assistant Manager
Construction Materials and
Geotechnical Laboratories

KAF/ksp
108354
1-File
1-mvann@shellyco.com

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Appendix C - III
Geotextile

gai consultants
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Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-014A**
ENTACT Project Number:	E9103
Submittal Title:	Nonwoven Geotextile Manufacturer Quality Control
Submittal Date:	09/13/2023
Date(s) of Previous Submissions:	07/26/2023
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Robin White, ENTACT Jarod Stanfield, ENTACT
From:	Cassidy Siebel
Reference Specification section and/or	CE-013A-3.3 & 4.0

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☒ **Product** ☒ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☒ **Plan**

☒ **Certificate** ☒ **Report** ☐ **Permit** ☒ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile			X		"See below"

ASTM D4833 Puncture Strength per Table 13.1 omitted, however, CBR Puncture strength is tested at the higher frequency and exceeds the MARV

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COMMENTS:
The certification exhibits passing results in accordance with Technical Specification Table 13.1. Shipping, Handling and Storage instructions are included in the Agru Installation Guidelines, Section 1.05.

This submittal includes the additional non-woven geotextile needed due to the revised grading plan.
ENTACT, LLC

Cassidy Siebel

_____

Contractor's Signature and Date
Cassidy Siebel 09/13/2023

Owner's Representative Review & Comments Section:

This Submittal has been:

☐ **Reviewed** ☒ **Approved** ☐ **Approved as Noted** ☐ **Revised and Resubmit** ☐ **Rejected**

Comments: Approved as is - Geotextile properties meets specifications.
GAI Consultants CZW 09/20/2023.

_____

Owner's Representative Signature and Date (Stamp if applicable)

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Geotextile Quality Certification

OA # / PROJECT: SO#18472
AEP JOHN AMOS
W INFIELD W V

Item Code/Description: AGRUTEX 081

DATE: 6/12/2023

agru america
quality control dept.

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D4751	D4355	
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs	LENGTH
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units: Lbs	SIEVE	* % ret.	FT
ATNL10119740001	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740002	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740003	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740004	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740005	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740006	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740007	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740008	8.40	245.00	319.00	97	101	127.00	184.00	127.00	.38	1.71	793	80	70	600
ATNL10119740009	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740010	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740011	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740012	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740013	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740014	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
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ATNL10119740016	8.98	251.00	302.00	94	97	137.00	178.00	119.00	.36	1.60	793	80	70	600
ATNL10119740017	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740018	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740019	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740020	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740021	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
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ATNL10119740023	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740024	9.72	250.00	329.00	88	90	159.00	199.00	115.00	.38	1.54	793	80	70	600
ATNL10119740025	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740026	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
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ATNL10119740028	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740029	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740030	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740031	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740032	9.45	268.00	341.00	99	94	161.00	220.00	113.00	.35	1.51	793	80	70	600
ATNL10119740033	9.13	263.00	307.00	91	95	127.00	170.00	115.00	.37	1.54	793	80	70	600
min	8.40	245.00	302.00	88.00	90.00	127.00	170.00	113.00	.35	1.51	793.00	80.00	70.00	33 ROLLS

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar

Geotextile Quality Certification

OA # / PROJECT: SO 18472

JOHN AMOS

W INFIELD W V

Item Code/Description AGRUTEX 081

DATE: 7/13/2023

agru america quality control dept.

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D4833	D6241	D4751	D4355	
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	PUNCTURE	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs	LENGTH
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Lbs	Units: Lbs	SIEVE	* % ret.	FT
ATNL10120640062	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	378
ATNL10120640064	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	711
ATNL10120640065	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	711
ATNL10120640066	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	600
ATNL10120640067	8.11	269.00	249.00	100	106	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70	600
min	8.11	269.00	249.00	100.00	106.00	129.00	142.00	131.00	.49	1.76	132.00	875.00	80.00	70.00	5 ROLLS

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

7/13/2023

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

Geotextile Quality Certification

OA # / PROJECT: SO#20103
JOHN AMOS
W INFIELD W V

Item Code/Description: AGRUTEX 081

DATE: 9/5/2023

agru america quality control dept.

ASTM	D5261	D4632				D4533		D4491	D4491	D4491	D6241	D475	D4355	
Method	Average Weight	Average Grab Tensile(MD)	Average Grab Tensile(CD)	Average Elongation (MD)	Average Elongation (CD)	Average Trap Tear (MD)	Average TRAP Tear (CD)	Water Flow Rate	Permeability	Permttivity	Average CBR Puncture	Apparent Opening Size	UV Resist % Retained @ 500 hrs	LENGTH
Units	oz / yd^2	Lbs	Lbs	%	%	Lbs	Lbs	gpm / ft^2	cm/sec	sec -1	Units: Lbs	SIEVE	* % ret.	FT
ATNL10122160003	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160004	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160005	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160006	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160007	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160008	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160009	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160010	9.04	265.00	351.00	78	75	121.00	176.00	97.00	.30	1.30	904	80	70	600
ATNL10122160011	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160012	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160013	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160014	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160015	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
ATNL10122160016	9.44	256.00	316.00	76	76	120.00	140.00	124.00	.41	1.66	904	80	70	600
min	9.04	256.00	316.00	76.00	75.00	120.00	140.00	97.00	.30	1.30	904.00	80.00	70.00	14 ROLLS

Mark Lockliear

Mark Lockliear, Lab Manager, Agru Andrews

9/5/2023

For Questions, Please Contact:

* UV test results are based on test performed at TRI Environmental Laboratory on similar weight products with the same raw material components per ASTM D-4355

GEOMEMBRANE AND DRAINAGE INSTALLATION GUIDELINES

Agru America, Inc. is not an installer of Geosynthetics Membranes. These guidelines are based upon our understanding of current quality control and quality assurance standards within the geomembrane industry and are provided in good faith to help prevent any problems caused by errors in installation; they are not meant as a comprehensive authority. These guidelines do not purport to cover all details or variations in the Geosynthetic Membranes and do not claim to provide for every possible contingency met in connection with installation, operation or maintenance of Geosynthetic Membranes. Selection of an experienced installer and determining the suitability and use of the information contained in these guidelines is the sole responsibility of the project owner. We will not be held liable for the installation of Geosynthetic Membranes by others.

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Article I. GENERAL

Section 1.01 SUMMARY

This specification includes furnishing and installing HDPE and LLDPE geomembranes as well as geonets and geocomposite. The HDPE formulated sheet density is 0.940 g/cc or greater. The LLDPE formulated sheet density is ≤0.939 g/cc. Both smooth and textured geomembrane surfaces are included.

Section 1.02 REFERENCES

(a) American Society for Testing and Materials (ASTM), ASTM International, West Conshohocken, PA www.astm.org :

(i) ASTM Standard D6392-12, "Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes"

(ii) ASTM Standard D5641-94 (2011), "Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber"

(iii) ASTM Standard D5820-95 (2011), "Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes"

(iv) ASTM Standard D6365-99 (2011), "Standard Practice for the Nondestructive Testing of Geomembrane Seams using the Spark Test"

(v) ASTM Standard D7240-06 (2011), "Standard Practice for Leak Location using Geomembranes with an Insultating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique."

(vi) ASTM Standard D6747-15 (2015), "Standard Practice for Selection of Techniques for Electrical Leak Location of Leaks in Geomembranes"

(b) Geosynthetic Research Institute (GRI), Folsom, PA www.geosynthetic-institute.org :

(i) GRI GM 9 (2013), "Cold Weather Seaming of Geomembranes"

(ii) GRI GM 13 (2012), "Test Properties, Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes"

(iii) GRI GM 14 (2013), "Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes"

(iv) GRI GM 17 (2012), "Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes"

(v) GRI GM 19, (2013), "Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembrane"

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Section 1.03 SUBMITTALS

(a) Submit the following to the project engineer or property owner, for review and approval, within a reasonable time, to expedite shipment and/or installation of the Geomembrane:

(i) Documentation of Manufacturer's Qualifications

(ii) Manufacturer's Quality Control Program Manual

(iii) Material Properties Sheet

(iv) Material Sample

(v) Documentation of Installer's qualifications;

1) Submit a list of at least ten facilities completed by installer. (For each installation, provide the name of facility, location, date of installation, type and thickness of geomembrane used and surface area of the installed geomembrane.)

2) Submit resumes or qualifications of the installation supervisor, master seamer and Technicians assigned to this project.

3) Installer's Quality Control Program

(vi) Material and Liner Installation Warranties;

1) Submit a copy of all material warranties.
2) Submit a copy of all liner installation warranties.

(b) Shop Drawings

(i) Submit copies of shop drawings for engineer's approval within a reasonable time. Shop drawings shall show the proposed panel layout identifying seams and details. Seams should generally follow the direction of the slope. Butt seams or roll-end seams should not occur on a slope unless approved by the owner's representative. However, if allowed, these seams should be staggered.

(ii) Placement of geomembrane should not occur until owner's representative has received and approved the shop drawings.

(c) Additional Submittals (To be provided during and after installation is complete.)

(i) Manufacturer's warranty

(ii) Geomembrane installation warranty

(iii) Daily written acceptance of sub-grade surface

(iv) Low-temperature seaming procedures if applicable

(v) Prequalification test seam samples

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(vi) Field seam non-destructive test results

(vii) Field seam destructive test results

(viii) Daily field installation reports

(ix) Installation record drawing

Section 1.04 QUALITY CONTROL

(a) Manufacturer's Qualifications: The manufacturer shall have at least five (5) years experience in the manufacturing of the specified or similar geomembrane product and shall have manufactured at least 1,000,000 m^2 (10,000,000 ft^2) of the specified type of geomembrane or a similar product during the last five years.

(b) Installer's Qualifications

(i) The geomembrane installer shall be an approved installer by the manufacturer.

(ii) The geomembrane installer shall have at least three (3) years experience installing the specified or similar geomembrane and shall provide a list outlining at least ten (10) projects totaling 500,000 m^2 (5,000,000 ft^2) of the specified type of geomembrane or similar completed within the past three (3) years.

(iii) A field installation supervisor performs and assumes responsibility throughout the geomembrane installation including geomembrane panel layout, seaming, patching, testing, repairs, and all other outlined responsibilities. The field installation supervisor shall have experience in or supervision in the installation and seaming of at least ten (10) projects totally 500,000 m^2 (5,000,000 ft^2) of geomembrane or the type specified or similar product.

(iv) Seaming shall be performed under the direction of a master seamer (who may also be the field installation supervisor or crew foreman) with seaming experience of a minimum of 300,000 m^2 (3,000,000 ft^2) of the geomembrane type specified or similar product, using the same type of seaming apparatus to be used in the current project. During the seaming, the field installation supervisor and/or master seamer are present.

(v) Qualified technicians employed by the geomembrane installer complete all seaming, patching, testing, and other welding operations.

Section 1.05 DELIVERY, STORAGE AND HANDLING

(a) Manufacturer labels must be on all rolls delivered to the project.

(b) A firmly affixed label attached to the selvage edge, shall clearly state the manufacturer's name, product identification, material thickness, roll number, roll type, roll dimensions and roll weight.

(c) The manufacturer protects the geomembrane from mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

(d) Continuously and uniformly supported, rolls are stored away from high traffic areas on a smooth, level surface. Chocks keep the rolls secure when necessary.

Section 1.06 PROJECT CONDITIONS

Do not install geomembrane in the presence of standing water, while precipitation i s occurring, during excessive winds, or when material temperatures are outside the limits specified in Section 3.02.

Section 1.07 MATERIAL WARRANTY

Material manufacturer shall guarantee material against defects and premature aging from environmental conditions on a pro rata basis for a specified period of time acceptable to owner and manufacturer.

Section 1.08 GEOMEMBRANE INSTALLATION WARRANTY

The geomembrane installer shall guarantee the geomembrane installation against defects in the installation and workmanship for a time period satisfactory to all parties commencing with the date of final acceptance.

Section 1.09 GEOMEMBRANE PRE-CONSTRUCTION MEETING

(a) A pre-construction meeting held at the site prior to installation of the geomembrane will include the geomembrane installer, owner, owner's representative (Engineer and/or CQA Firm), and the earthwork contractor. Topics for this meeting shall include:

(i) Health and Safety

(ii) Lines of authority and communication, resolution of any project document ambiguity.

(iii) Methods for documenting, reporting and distributing documents and reports

(iv) Procedures for packaging and storing archive samples.

(v) Review of time schedule for all installation and testing.

(vi) Review of panel layout and numbering systems for panels and seams including details for marking on geomembrane

(vii) Procedures and responsibilities for preparation and submission of as- built panel and seam drawings

(viii) Temperature and weather limitations, installation procedures for adverse weather conditions, defining acceptable sub grade, geomembrane, or ambient moisture and temperature conditions for working during liner installation

(ix) Sub grade conditions, dewatering responsibilities and sub grade maintenance plan

(x) Deployment techniques including allowable sub grade for the geomembrane

(xi) Plan for controlling expansion/contraction and wrinkling of the geomembrane

(xii) Covering of the geomembrane and cover soil placement

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(xiii) Measurement and payment schedules

(xiv) Responsibilities of each party

(b) A designated person will document the meeting and send a copy of the minutes to each person in attendance.

Article II. PRODUCTS

Section 2.01 SOURCE QUALITY CONTROL

(a) Manufacturing Quality Control

(i) The test methods and frequencies used by the manufacturer for quality control/quality assurance of the above geomembrane prior to delivery, shall be in accordance with the latest revision of the GRI GM 13 for HDPE geomembrane or GRI GM 17 for LLDPE geomembrane, or modified as required for project specific conditions.

(ii) The manufacturer's geomembrane quality control certifications, including results of quality control testing of the products, must be supplied to the owner's representative to verify that the materials supplied for the project are in compliance with all product and or project specifications. The certification, signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, production m anager, or technical services manager, includes lot and roll numbers and corresponding shipping information.

(iii) The manufacturer provides production/manufacturing certification that the geomembrane and welding rod supplied for the project are from the same material type and are compatible.

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Section 2.02 GEOMEMBRANE

(a) The geomembrane shall consist of new, first quality products designed and manufactured specifically for the purpose of this work. The product will satisfactorily complete testing demonstrating its suitability and durability for the purposes intended. The geomembrane rolls shall be seamless, high density polyethylene (HDPE - Formulated Sheet Density ≥ 0.94g/cc) or linear low density polyethylene (LLDPE - Formulated Sheet Density ≤ 0.939 g/cc) containing no plasticizers, fillers or extenders and shall be free of holes, blisters or contaminants, and leak free verified by 100% in line spark or equivalent testing. The geomembrane supplied is a continuous sheet with no factory seams in rolls. The geomembrane will meet the property requirements as shown in GRI GM13 (HDPE) or GRI GM 17 (LLDPE).

(b) Material conformance testing by the owner's representative, if required, will be conducted using in-plant sampling or as specified for the project.

(c) The geomembrane seams shall meet the property requirements as shown in Section 5 or as required by project specifications.

Article III. EXECUTION

Section 3.01 SUB-GRADE PREPARATION

(a) The sub grade shall be prepared in accordance with the project specifications. The geomembrane sub grade shall be uniform and free of sharp or angular objects that may damage the geomembrane prior to installation of the geomembrane.

(b) The geomembrane installer and owner's representative shall inspect the surface before covering with the geomembrane on each day's operations to verify suitability.

(c) The geomembrane installer and owner's representative shall provide daily a written acceptance of the surface before covering with the geomembrane. During installation, the Installer and owner's representative must ensure daily surface maintenance ensuring sub-grade suitability.

(d) Prior to placement of the geomembrane, the installer and owner's representative must repair all sub grade damaged by construction equipment and deemed unsuitable for geomembrane deployment. The installer and owner's representative provides approval for all repairs. All damage and repair protocol including contractor and Installer responsibilities, are outlined in the preconstruction meeting.

Section 3.02 GEOMEMBRANE PLACEMENT

(a) The owner's representative approves all applicable certifications and quality control certificates within the timeframe specified in the contract documents. If the material does not meet project specifications, the contractor removes it from the work area.

(b) The geomembrane installation must follow the limits shown on the project drawings and essentially as shown on approved Panel Placement Drawings. Submit any changes made to Panel Placement Drawings before deployment of liner materials. The Installer must receive approval for the changes prior to deployment of liner materials.

(c) When temperatures are lower than 0°C (32°F), unless approved by the owner's representative, no geomembrane material can be unrolled and/or deployed. The owner's representative may adjust the minimum temperature for material deployment. The installer and owner's representative defines temperature limitations during the preconstruction meeting. Only deploy the quantity of geomembrane that can be anchored and seamed together in one day.

(d) No vehicular traffic shall travel on the geomembrane other than an approved low ground pressure vehicle or equivalent. The owner's representative may suggest that a test pad simulating the methods to be used and showing no damage to the liner will result, be performed prior to implementation of the proposed method.

(e) Use sand bags or equivalent ballast as necessary temporarily holding the geomembrane material in position under the foreseeable and reasonably expected wind conditions. Sand bag material shall be sufficiently close knit to prevent fines from working through the bags and discharging on the geomembrane.

(f) Installer and owner's representative should not place geomembrane if moisture prevents proper sub grade preparation, panel placement, or panel seaming. Defined in the preconstruction meeting, the moisture limitations provide direction for the installer and owner's representative. Damaged and rejected panels (or portions) shall be marked, removed from the work area, and the removal recorded/documented.

(g) The geomembrane should not "bridge over" voids or low areas in the sub grade. The geomembrane shall rest in intimate contact with the sub grade.

(h) Wrinkles caused by panel placement or thermal expansion should be minimized.

(i) Considerations on site geometry: In general, seams shall be oriented parallel to the line of the maximum slope. In corners and odd shaped geometric locations, minimization of the total length of field seams is required. Seams shall not be located at low points in the sub-grade unless geometry requires seaming at such locations and if approved by the owner's representative.

(j) All panels must overlap prior to the seaming process. This overlap affects a weld and allows for proper testing. In no case shall this overlap be less than 75 mm (3")

(k) Sharp stones or other hard objects that could potentially damage the membrane should not be within 1" (25 mm) of the surface to be lined.

(l) Sub-grade should be firm, unyielding and able to support deployment equipment without damage or rutting to the sub-grade.

Section 3.03 SEAMING PROCEDURES

(a) Cold weather installations should follow guidelines as outlined in GRI GM9.

(b) The seaming process shall not occur when liner temperatures are less than 0°C (32°F) unless the installer and/or owner's representative complies with the following conditions.

(i) The seaming of the geomembrane at material temperatures below 0°C (32° F) only transpires when the geomembrane installer can demonstrate the following to the owner's representative using prequalification test seams.

1) Field seams comply with the project specifications.

2) The safety of the crew ensured.

3) Geomembrane material can be fabricated (i.e. pipe boots, penetrations, repairs. etc.) at sub-freezing temperatures.

(ii) The geomembrane installer shall submit to the owner's representative for approval, detailed procedures for seaming at low temperatures, possibly including the following:

1) Preheating of the geomembrane,

2) Using a tent or other device preventing heat loss during seaming and rapid heat loss subsequent to seaming,

3) Completion of a number of test welds to determine appropriate seaming parameters.

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(c) If the geomembrane sheet temperature is above 75° C (170° F) as measured by an infrared thermometer or surface thermocouple, seaming transpires only with the approval by the owner's representative. This approval depends upon the recommendations by the manufacturer and on a field demonstration by the geomembrane installer using prequalification test seams to demonstrate that seams comply with the specification.

(d) Seaming shall primarily be performed using automatic fusion welding equipment and techniques. Use of extrusion welding takes place where fusion welding is not possible such as at pipe penetrations, patches, repairs and short (less than a roll width) runs of seams. Note: Flaps should not be removed as part of the welding process as this may damage the seam.

(e) In the case of fish mouths or excessive wrinkles at the seam overlap section, cut along the ridge of the wrinkles on the back into the panel if necessary. Terminate the cut with a keyhole cut (nominal 10 mm (1/2") diameter hole) minimizing the crack/tear propagation. Then, seam the overlay. Patch the key hole cut with an oval or round patch of the same base geomembrane material extending a minimum of 150 mm (6") beyond the cut in all directions.

(f) When extrusion welding 60 mil (1.5mm) or greater HDPE, it is advisable to bevel the top portion of the seam in a lengthwise direction to maximize intimate contact of material and improve continuity of weld.

(g) Prior to seaming, confirm the area for welding is free of moisture, dirt and any foreign matter that can affect the integrity of the weld on an ongoing basis.

(h) Take precaution and safety of the liner technicians, in extreme heat or cold, which can affect the health of the individuals.

(i) Seaming should run through the anchor trench to terminate at the end of the sheet goods.

Section 3.04 PIPE AND STRUCTURE PENETRATION SEALING SYSTEM

(a) Provide penetration-sealing system as shown in the Project Drawings.

(b) Construct all penetrations from the base geomembrane material, flat stock, prefabricated boots and accessories as shown on the Project Drawings. In the case of Structured Liners such as SuperGripNet™, DrainLiner™ or similar materials offered by Agru America, Inc., use the smooth or textured liner of the same density for such fabrications. Weld the pre-fabricated or field fabricated assembly to the geomembrane as shown on the Project Drawings to prevent leakage. Once complete, test the assembly. If the Installer cannot perform the field non-destructive testing, attachments will be field spark tested by standard holiday leak detectors in accordance with ASTMD 6365. Spark testing should be done in areas where both air pressure testing and vacuum testing is not possible.

(i) Equipment for Spark testing shall be comprised of but not limited to; a hand held holiday spark tester, and conductive wand that generates a high voltage.

(ii) The testing steps performed by the geomembrane installer include:

1) Place an electrically conductive tape or wire beneath the seam prior to welding.

2) Complete a calibration test on a trial seam containing a non-welded segment ensuring the identification of such a defect (non-welded segment) under the planned machine settings and procedures.

3) Upon completion of the weld, enable the spark tester and hold approximately 25mm (1 in) above the weld moving slowly over the entire length of the weld in accordance with ASTM 6365. If no spark occurs, the weld is leak free.

(iii) A spark indicates a hole in the seam. The geomembrane installer locates, repairs, and retests the faulty area.

(iv) When flammable gasses are present, use special care and precautions in the area to be tested.

Section 3.05 FIELD QUALITY CONTROL

The owner's representative must receive information prior to all pre-qualification and production welding and testing, or as agreed upon in the pre-construction meeting.

(a) Prequalification Test Seams

(i) The geomembrane installer tests seams and prepares seams verify seaming parameters (speed, temperature and pressure of welding equipment) are adequate.

(ii) Each welding technician creates seams and tests each in accordance with ASTM D 6392 at the beginning of each seaming period. Welding technicians test the seaming under the same conditions and with the same equipment and operator combination as production seaming. The test seam shall be approximately 3.3 meters (10 feet) long for fusion welding and 1 meter (3 feet) long for extrusion welding with the seam centered lengthwise. At a minimum, each welding technician creates one test seam after seaming 4–6 hours; additional tests may be required with changes in environmental conditions.

(iii) Two 25 mm (1 in) wide specimens shall be die-cut by the geomembrane installer from each end of the test seam. The specimens tested by the geomembrane installer require using a field tension meter testing both tracks for peel strength and shear strength. Each specimen should fail in the parent material and not in the weld, "Film Tear Bond"(FTB). When the seam separation is equal to or greater than 25% of the track width, it is a failed test.

(iv) Tables in Section 6 provide the minimum acceptable seam strength values obtained for all specimens tested. Four specimens out of five must meet the acceptable seam strength values for consideration as passing.

(v) If a test seam fails, the welding technician must immediately conduct an additional test seam. If the additional test seam fails, the welding technician rejects the seaming apparatus. The technician must correct the apparatus deficiencies and produce a successful test seam before using the apparatus for any other/additional production seaming.

(vi) The technician labels a sample from each test seam. The label indicates the date, geomembrane temperature, number of the seaming unit, technician performing the test seam and pass or fail description. The technician then gives the sample to the owner's representative for archiving.

(b) Field Seam Non-destructive Testing

(i) The technician non-destructively tests over the full seam length before the geomembrane installer covers it. Numbered or otherwise designated, each seam's label includes the location, date, test unit, name of tester and outcome of all non-destructive testing. Once recorded, the technician submits the information to the owner's representative.

(ii) Testing should be done as the seaming work progresses, not at the completion of all field seaming, unless agreed to in advance by the owner's representative. All defects found during testing shall be numbered and marked immediately after detection. The technician must repair, retest, and remark all defects indicating the acceptable completion of the repair.

(c) Non-destructive testing shall be performed using vacuum box, air pressure or spark testing equipment.

(d) Experienced technicians familiar with the specified test methods perform all non-destructive tests. The geomembrane installer demonstrates all test methods verifying the validity of said test procedures for the owner's representative.

(e) The geomembrane installer tests all extrusion seams using a vacuum box in accordance with ASTM D 6392 and ASTM D 5641 and the following equipment and procedures:

(i) Equipment for testing extrusion seams is not limited to but should include:

1) Vacuum box assembly consisting of a rigid housing

2) Transparent viewing window

3) Soft rubber gasket attached to the base

4) Port hole or valve assembly and a vacuum gauge

5) Vacuum pump assembly equipped with a pressure controller and pipe connections

6) Rubber pressure/vacuum hose with fittings and connections

7) Plastic bucket

8) Wide paintbrush or mop

9) Soapy solution

(ii) The geomembrane installer must charge the vacuum pump and adjust the tank pressure to approximately 35 kPa (5 psig).

(iii) The geomembrane installer shall create a leak tight seal between the gasket and geomembrane interface by wetting a strip of geomembrane approximately 0.3m (12 in) by 1.2m (48 in) (length and width of box) with a soapy solution, placing the box over the wetted area, and then compressing the box against the geomembrane. The geomembrane installer shall then close the bleed valve, open the vacuum valve, maintain initial pressure of approximately 35 kPa (5 psig) for approximately 3-4 seconds. The Installer must continuously examine the geomembrane through the viewing window for the presence of soap bubbles, indicating a leak. If no bubbles appear after 3-4 seconds, consider the area leak free. Once the area is leak free, depressurize the box and move it over the next adjoining area with an appropriate overlap and the process repeated.

(iv) All areas where soap bubbles appear shall be marked, repaired and then retested.

(v) At seam locations where the Installer is unable to non-destructively test, such as pipe penetrations, the Installer must substitute alternate non-destructive spark testing or equivalent.

(vi) All seams that are vacuum tested shall be marked with the date tested, the name of the technician performing the test and the results of the test.

(f) Double Fusion seams with an enclosed channel shall be air pressure tested by the geomembrane installer in accordance with ASTM D5820 and ASTM D6392 and the following equipment guidelines and procedures.

(i) Equipment for testing double fusion seams shall be comprised of but not limited to: an air pump equipped with a pressure gauge capable of generating and sustaining a pressure of 210 kPa (30 psig), mounted on a cushion to protect the geomembrane; and a manometer equipped with a sharp hollow needle or other approved pressure feed device.

(ii) The geomembrane installer completes all testing activities. Both ends of the seam to be tested are sealed and a needle or other approved pressure feed device inserted into the tunnel created by the double wedge fusion weld. The air pump shall be adjusted to a pressure of 210 kPa (30 psig), and the valve closed. Allow 2 minutes for the injected air to come to equilibrium in the channel, and sustain pressure for 5 minutes.

(g) If pressure loss does not exceed 28 kPa (4 psig) after the five-minute period, the Installer considers the seam leak tight. Release pressure from the opposite end verifying pressure drop on needle to ensure testing of the entire seam. The needle or other approved pressure feed device shall be removed and the feedhole sealed.

(i) If loss of pressure exceeds 28 kPa (4 psig) during the testing period or pressure does not stabilize, the geomembrane installer locates, repairs and retests the faulty area.

(ii) Record all results of the pressure testing on the liner at the seam tested and on a pressure testing record.

(iii) If release of pressure from opposite end of tested seam does NOT deflate seam, the Installer takes measures to determine the cause and remedies to air test 100% of the seam under scrutiny.

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(h) Destructive Field Seam Testing

(i) The Installer analyzes one destructive test sample per 150 linear m (500 linear ft) seam length or the geomembrane installer shall take another predetermined length in accordance with GRI GM 14 from a location specified by the owner's representative. The geomembrane installer receives the sample locations without advance notice of the locations. The geomembrane installer cuts samples as directed by the owner's representative before the complete installation and as seaming progresses.

(ii) All field samples shall be marked with their sample number and seam number including the sample number, date, time, location, and seam number recorded. The geomembrane installer shall repair all holes in the geomembrane resulting from obtaining the seam samples. All patches shall be vacuum box tested or spark tested. If the installation of a permanent patch over the test location the same day of sample collection is not possible, place a temporary patch either tack welded or hot air welded over the opening until affixing a permanent patch.

(iii) Testing requires the destructive samples size at least 300 mm (12") wide, 1m (36") long, with the seam centered lengthwise. The sample shall be cut into three equal sections and distributed as follows: one section given to the owner's representative as an archive sample; one section given to the owner's representative for laboratory testing as specified in paragraph 5 below; and one section retained by the geomembrane installer for field testing as specified in paragraph 4 below.

(iv) For field-testing, the geomembrane installer shall cut 10 identical 25 mm (1") wide replicate specimens from his sample. The geomembrane installer shall test five specimens for seam shear strength and five for peel strength. The geomembrane installer performs peel tests on both the inside and outside weld tracks. To be acceptable, four (4) of five (5) test specimens must pass the stated criteria in section 2.02 with less than 25% separation. If four (4) of five (5) specimens pass, the sample qualifies for testing by the testing laboratory if required.

(v) If the specifications require an independent seam testing, conduct the testing in accordance with ASTM 5820 or ASTM D6392.

(vi) Prepare and submit all reports of the results of examinations and testing to the owner's representative.

(vii) For field seams, if a laboratory test fails, it is an indicator of the possible inadequacy of the entire seamed length corresponding to the test sample. The geomembrane installer should take additional destructive test portions at locations indicated by the Engineer; (typically 3 m (10 ft) on either side of the failed sample) and perform additional laboratory seam tests. Passing tests shall be an indicator of adequate seams. Failing tests shall be an indicator of non-adequate seams. When seams fail the destructive test, the Installer re-seams or repairs seams with a cap-strip. Cap-strip seams shall be non- destructively vacuum box tested until achieving adequacy of the seams. The geomembrane installer must destructively test all Cap strip seams exceeding 50 M in length (150 FT).

(viii) The Installer keeps all samples out of critical areas such as in the bottom of ponds and other locations such as slopes and sumps.

(i) Identification of Defects

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(i) The Installer and owner's representative inspects panels and seams during and after panel deployment to identify all defects, including holes, blisters, un-dispersed raw materials and signs of contamination by foreign matter.

(j) Evaluation of Defects: The Installer must complete a non-destructive test for each suspect location on the liner (both in seam and non-seam areas) using one of the methods described in Section 3.05.B. Each location failing non-destructive testing is marked, numbered, measured and posted on the daily "installation" drawings and subsequently repaired.

(i) If a destructive sample fails the field or laboratory test, the geomembrane installer shall repair the seam between the two nearest passed locations on both sides of the failed destructive sample location.

(ii) All repairs of defective seams, tears or holes use either re-seaming or applying an extrusion welded cap strip process.

(iii) Re-seaming may consist of either:

1) Removing the defective weld area and re-welding the parent material using the original welding equipment; or

2) Re-seam the defective weld area by extrusion welding along the overlap at the outside seam edge left by the fusion welding process.

3) Cap stripping entire faulty seam.

(iv) The Installer repairs blisters, larger holes, and contamination by foreign matter using required patches and/or extrusion weld beads. Each patch shall extend a minimum of 150 mm (6 in) beyond all edges of the defects.

(v) Locate, measure and record all repairs.

(k) Verification of Repairs on Seams: Each repair requires a non-destructive test using either vacuum box or spark testing methods. An indication of a successful repair includes areas passing the non-destructive test. Areas failing the tests require re-seaming and retesting until results show a passing test. Requirements for areas failing the tests include re-seaming and retesting until passing test results. The Installer records the number, date, location, technician and test outcome of each patch.

(l) Daily Field Installation Reports: At the beginning of each day's work, the Installer shall provide the Engineer with daily reports for all work accomplished on the previous workday. Reports shall include the following:

(i) Total amount and location of geomembrane placed

(ii) Total length and location of seams completed, name of technicians doing seaming and welding unit numbers

(iii) Drawings of the previous day's installed geomembrane showing panel numbers, seam numbers and locations of non-destructive and destructive testing

(iv) Results of pre-qualification test seams

(v) Results of non-destructive testing

(vi) Results of vacuum testing of repairs

(m) Prior to covering the liner, report all Destructive test results.

(n) Perform and complete all quality assurance no more than 72 hours after geomembrane deployment.

Section 3.06 LINER ACCEPTANCE

The owner's representative accepts the geomembrane liner when:

(a) The entire installation is completed or an agreed upon subsection of the installation is finished.

(b) The Installer submits all completed QC documentation to the owner.

(c) Verification of the adequacy of all field seams and repairs and associated geomembrane testing is complete.

(d) All submittals are accepted.

Section 3.07 ANCHOR TRENCH

Construct as specified on the project drawings.

Section 3.08 DISPOSAL OF SCRAP MATERIALS

(a) On completion of installation, the geomembrane installer shall dispose of all trash and scrap material in a location approved by the Owner, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner. Finally, remove all scrap material from the surface of the geomembrane.

Article IV. MEASUREMENT AND PAYMENT

The project specifications document/outline the required measurements and payment of services. All parties sign all documents prior to project start up.

Article V. GEOTEXTILES, GEONETS AND GEOCOMPOSITES

Section 5.01 GEOTEXTILES

The general arrangement of Geotextiles includes aligning seams parallel to the prevailing slope and seams finished by either heat seaming with an approved hand held or self-motivated thermal device or by sewing with a stitching approved by the engineer. Whichever stitching method is used, the thread should be compatible with the fabric and have similar chemical resistance to the liner used. Geotextile should be covered by soil or geomembrane within 14 days of deployment to minimize UV exposure.

Section 5.02 GEONET

Geonet may be butt joined or lapped if specified. At five-foot 1.5m (5') intervals along the edge, the Installer applies Nylon/plastic cable ties to the net edge. Complete end splices as follows:

(a) On slopes, the ends will overlap two feet 2' (0.6m) with uphill panels on top and two (2) rows of cable ties applied at 6" spacing or per engineers specification.

(b) In flat areas, the ends will overlap a minimum to six inches 6" (15 cm) and one (1) row of three (3) cable ties applied.

Section 5.03 GEOCOMPOSITES

Geocomposites can overlap with the net portion tied and the Geotextile portion thermally bonded or seamed as required by the project specifications.

Section 5.04 REPAIRS

Repair any holes, tears, or burns through the Geotextile from thermal seaming by patching with the same Geotextile. The patch will be a minimum of twelve inches 12" (30cm) larger – in all directions – than the area repaired and will be spot bonded thermally. Repair all geonet holes and/or tears using a patch of the same geonet. Patches are a minimum of twelve inches 12" (30cm) larger in all directions than the area repaired. Tie the patch in place using a minimum of four (4) nylon cable ties.

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6.1 - TABLES

"This section shall include the current GRI GM13 (HDPE) or GRI GM17 (LLDPE) manufacturer's specification or a revision of GRI GM13 (HDPE) or GRI GM 17 (LLDPE) specific to the unique project requirements and/or standards, as determined by the owner or owners' agent." TO BE INSERTED BY COMPANY PREPARING SUBMITTALS TO GUARANTEE MOST CURRENT GRI SPECIFICATION.

SEAM STRENGTHS - HDPE and LLDPE GRI GM 19

TABLE 1: Seam Strength and related Properties of Thermally Bonded Smooth and Textured High Density Polyethylene (HDPE) Geomembrane (English Units)

Geomembrane Nominal	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams (1)							
shear strength(2), lb/in.	**57**	**80**	**100**	**120**	**160**	**200**	**240**
shear elongation at	50	50	50	50	50	50	50
peel strength (2), lb/in.	**45**	**60**	**76**	**91**	**121**	**151**	**181**
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams							
shear strength(2), lb/in.	**57**	**80**	**100**	**120**	**160**	**200**	**240**
shear elongation at	50	50	50	50	50	50	50
peel strength (2), lb/in.	**39**	**52**	**65**	**78**	**104**	**130**	**156**
peel separation, %	25	25	25	25	25	25	25

Notes for Table 1 – (Used also for hot air and ultrasonic seaming methods.)

(a) Value listed for shear and peel strength are for 4 out of 5 test specimens; the 5th specimen can be low as 80% of the listed values

(b) Elongation measurements should be omitted for field testing

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TABLE 2: Seam Strength and related Properties of Thermally Bonded Smooth and Textured Linear Low Density Polyethylene (LLDPE) Geomembrane (English Units)

Geomembrane Nominal	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams (1)							
shear strength(2), lb/in.	**45**	**60**	**75**	**90**	**120**	**150**	**180**
shear elongation at	50	50	50	50	50	50	50
break(3) , %	**38**	**50**	**63**	**75**	**100**	**125**	**150**
peel strength (2), lb/in.	25	25	25	25	25	25	25
peel separation, %							
Extrusion Fillet Seams (1)							
shear strength(2), lb/in.	**45**	**60**	**75**	**90**	**120**	**150**	**180**
shear elongation at	50	50	50	50	50	50	50
break(3) %	**34**	**44**	**57**	**66**	**88**	**114**	**136**
peel strength (2), lb/in.	25	25	25	25	25	25	25
peel separation, %							

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Field Testing

Material	Minimum PSI	Maximum PSI
30 mil	15	30
40 mil	20	30
60 mil	24	30
80 mil	24	30
100 mil	24	32

40 mil 4 PSI

60 mil 4 PSI

80 mil 4 PSI

100 mil 4 PSI

Note: At all times before heat sealing the end of the seam, the operator should insure that the void or air channel is free of obstruction.

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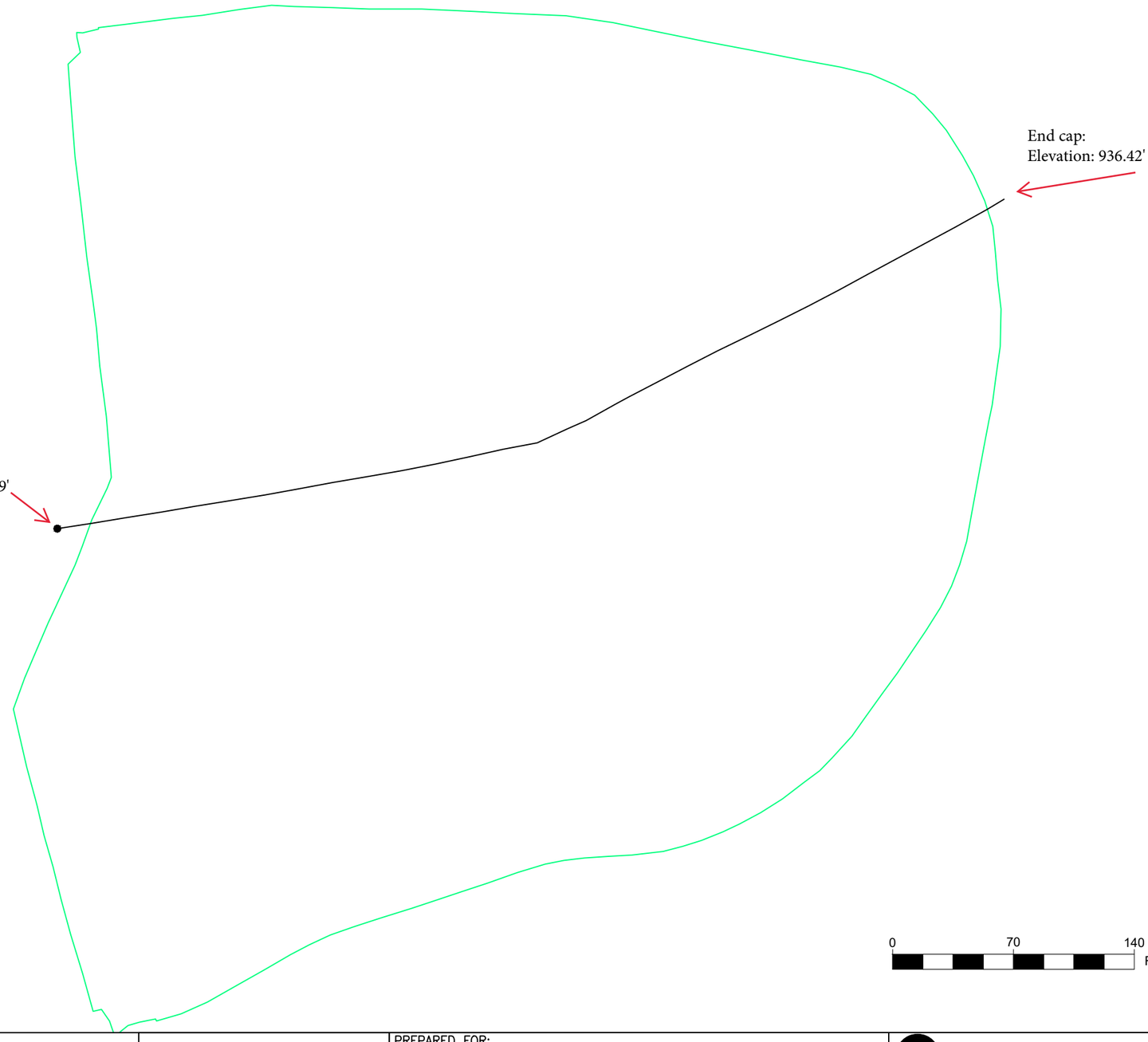
Appendix D
Record Drawings



N

LEGEND:

- Edge of Geocomposite Drainage Net
- Leachate Collection Pipe
- Tie–In to Existing Leachate Collection Pipe

0 70 140 Feet

NOTES:

12"Leachate Collection Pipe Measured Quantities	
Quantity from Baseline Schedule	560 LF
Quantity from As–Built Survey	597 LF
Difference from Baseline Quantity	37 LF

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION
0	01/12/24	JS			Leachate Collection Pipe As–Built Survey

PREPARED FOR:

[AEP–DAVE FRY]
[JOHN AMOS PLANT LANDFILL]

ENTACT

DRAWING NAME: LEACHATE COLLECTION PIPE AS–BUILT SURVEY

PROJECT NAME & LOCATION: SEQUENCE 4 BUBBLE LINER REPAIR PROJECT
WINFIELD, WEST VIRGINIA

DRAWN BY	J. STANFIELD	APPROVED BY		REV	0	SHEET NO.
DATE	01/12/2024	DATE		PROJECT NO.	E9103	1 OF 2

ATTACHMENT 5

PROTECTIVE COVER CERTIFICATION – PHASE 1

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Sequence 4 Liner Repair
Protective Cover Certification – Phase 1

American Electric Power
John E. Amos Landfill
John E. Amos Power Plant
Winfield, West Virginia

GAI Project Number: C130109.27

March 2024

Prepared by: GAI Consultants, Inc.
Charleston Office
500 Lee Street, East, Suite 1100
Charleston, West Virginia 25301

Prepared for: American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215

Sequence 4 Liner Repair
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1 Riverside Plaza
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Engineering Manager

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Quality Assurance Officer / Certifying Engineer
Director Engineering / Associate

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Appendix B Protective Cover Quality Control Data
- B–I Bottom Ash Laboratory Test Results
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Appendix C Record Drawings & Certification Points
- Drawing 23033A Protective Cover

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GAI Consultants, Inc. Certification

Based on the construction testing and observations performed by American Electric Power (AEP) and GAI Consultants, Inc. (GAI) personnel, I hereby certify that Protective Cover – Phase 1 installation within a portion of the Sequence 4 Liner Repair identified on Drawing 23033A Protective Cover at the Appalachian Power Company's John E. Amos Flue Gas Desulfurization (FGD) Landfill near Winfield, West Virginia (WV), as shown on Drawing 30204SH5 and 30204SH6, has been installed in substantial compliance with the material specifications and construction requirements listed in the WV National Pollutant Discharge Elimination System/Solid Waste Permit (NPDES WV0116254) documents the Federal Coal Combustion Residuals (CCR) Rule; and the "2023 Site Work Construction Sequence 4 Liner Repair" construction documents. Exline Surveying Inc. survey personnel provided survey data used to develop the Record Drawings and verify that the protective cover installations met the permit requirements.

This document clarifies "certification" for the installations of the protective cover within Sequence 4 Liner Repair at the Amos FGD Landfill.

The definition of certify as used herein is: Certify means to state or declare a professional opinion of conditions whose true properties cannot be known at the time such certification was made, despite appropriate professional evaluation. A design professional's certification in no way relieves any other party from meeting requirements imposed by contract or other means, including commonly-accepted industry practices.

Bearing the above in mind and based on the results of: (1) Certification from the material manufacturers and installation meeting the requirements of the Specifications, the CCR Rule, and the WV Department of Environmental Protection (WVDEP) permit; (2) results of field and laboratory testing; and (3) monitoring of construction efforts during the project; GAI's professional opinion is that the installations of the protective cover within Sequence 4 Liner Repair of the Amos FGD Landfill meet the requirements as set forth by the permit documents and the CCR Rule.

Charles F. Straley, PE, PLS
Certifying Engineer and Quality Assurance Officer
PE #11842

1.0 Introduction

1.1 Project Description

This “Protective Cover Certification - Phase 1” documents the testing and observations performed for the protective cover installations in Sequence 4 Liner Repair at American Electric Power’s (AEP’s) John E. Amos FGD Landfill (Landfill) in Winfield, West Virginia (WV). The protective cover system is being installed directly above the leachate collection system. The installation is occurring in phases, this certification report includes the first phase of the protective cover system. Buttressing material is required before additional protective cover is placed further upslope. The location of Sequence 4 Liner Repair at the Amos Landfill is shown on Figure 1. Appendix A contains typical construction photographs included in the daily reports. Construction of the Sequence 4 Liner Repair site described in this certification report consists of the following:

1. Construction activities associated with the installations of the protective cover.

Construction of the groundwater control and subgrade preparation, including placement of structural fill to meet the compacted clay liner subgrade elevations, began in September 2023 and was documented in the “Sequence 4 Liner Repair Groundwater Control and Subgrade Certification” (December 2023).

Construction of the compacted clay liner (CCL) in Sequence 4 Liner Repair began in November 2023 and was completed in December 2023. The CCL construction is documented in the “Sequence 4 Liner Repair Compacted Clay Liner Certification” (January 2024).

Installation of the 30 mil polyvinyl chloride (PVC) geomembrane liner began in November 2023 and was completed in December 2023. The geomembrane installation is documented in the “Sequence 4 Liner Repair PVC Geomembrane Liner Certification Report” (February 2024).

Installation of the leachate collection system began in November 2023 and was completed in January 2024. The leachate collection system installation is documented in the “Sequence 4 Liner Repair Leachate Collection System Report” (March 2024).

Installation of the protective cover was performed in accordance with the approved Quality Assurance/Quality Control (QA/QC) Plan; the Landfill’s Solid Waste/National Pollutant Discharge Elimination System (NPDES) permit (Permit No. WV0116254); the West Virginia Department of Environmental Protection (WVDEP) Title 33, Series 1, Solid Waste Management Rule; the Coal Combustion Residuals (CCR) Rule; and AEP’s Civil Engineering Division Technical Specifications for Material Construction and associated Project Addenda to the Specifications. Included in this report are the field information and the applicable Record Drawings in accordance with the WVDEP requirements. The construction QA (CQA) services performed by GAI are discussed in the following sections.

The protective cover has been installed in phases due to potential stability issues in placing the material on the slope. A buttressing plan has been designed for the placement of the protective cover on the slopes. The protective cover will be placed in phases to provide buttressing at the toe of the slope. The permit allows for the protective cover to consist of bottom ash and gypsum.

1.2 Companies and Personnel

The key companies and personnel involved with the protective cover installations of Sequence 4 are listed below.

AEP - Owner
Appalachian Power Company - Operator
Janine White, Project Manager
Brian Palmer, P.E., Principal Civil Engineer
David Fry, Lead Construction Coordinator

GAI Consultants Inc. (GAI) – CQA/Soil Testing
Charles Straley, P.E., P.S., Certifying Engineering, QA Officer (QAO) and Director Engineering
John Klamut, P.E., Project Manager
James Shields, P.E., Lead QC Inspector (QCI)

Entact, LLC. (Entact) - General Contractor
Jonathan Lovenduski, Project Manager
Eric Cline, Superintendent

1.3 Scope of Services

1.3.1 Preconstruction Activities

Preconstruction activities conducted by GAI personnel consisted of the following:

1. Conduct inventory of on-site protective cover materials, and
2. Collect conformance samples of the protective cover material for laboratory testing and review of results for compliance with project and permit specifications.

1.3.2 Construction Documentation Activities

Construction documentation activities performed by GAI personnel included the following:

1. Documenting and observing the leachate collection system conditions prior to the installations of the protective cover material;
2. Observing and documenting the installation and field testing of the protective cover;
3. Prepared daily field reports and documented construction activities. GAI also attended daily health and safety meetings, weekly project update meetings, and monthly contractor's meetings, as well as other supplemental meetings when needed; and
4. Provided photo documentation throughout the construction showing typical construction procedures (see Appendix A).

1.3.3 Record Drawings and Certification Report

Documentation and certification activities performed by the QA/QC team included the following:

1. Exline Surveying Inc. provided surveying services for the Record Drawings presented in Appendix C. Drawings "23033A Protective Cover" "which also presents a tabulation of the as-built protective cover placement above the Leachate Collection System to the as-built certification point elevations of the protective cover.
2. GAI personnel performed the construction documentation activities discussed in Sections 1.3.1 and 1.3.2 of this report.
3. Project personnel observed the construction activities and provided the enclosed information documenting that the construction activities were performed consistent with the design and permit requirements.

1.4 Construction Schedule

Site clearing and grubbing, excavation and fill placement for subgrade, and the installation of groundwater controls were performed prior to construction of the compacted clay liner. The compacted clay liner was then constructed upon the finished subgrade. The PVC liner was then constructed upon

the clay liner and the leachate collection system was then constructed upon the PVC liner. Installation of the protective cover started in December 2023 and was completed in January 2024.

1.5 Reference Documents

The plans, specifications, and QA requirements for the construction activities and materials used by GAI personnel for this project are as follows:

1. Solid Waste/NPDES Permit No. WV0116254.
2. AEP Civil Engineering Division, Technical Specifications for Material and Construction (prepared by AEP), and the Addenda to the Technical Specifications (prepared by GAI).
3. "Quality Assurance and Quality Control Plan, John E. Amos Landfill" for the Appalachian Power Company John E. Amos Plant's Amos FGD Landfill (revised June 2022, prepared by GAI).
4. Amos FGD Landfill Sequence 4 Liner Repair Construction Drawings (issued for construction March 2023 and revised September 2023, prepared by GAI).

2.0 Protective Cover

The protective cover placed within Sequence 4 consists of a minimum 18-inch thick layer of bottom ash and/or flue gas desulfurization (FDG) material placed on the GDN. The bottom ash and FGD were provided by John E, Amos Power Plant operations. Laboratory test results for the bottom ash are provided in Appendix B-I. On the slope benches, an 18-inch thick layer of non-calcareous AASHTO No. 8 stone was placed directly on the GDN, and then covered by a minimum 12-inch thick layer of protective cover. The ASHTO No. 8 stone material properties are provided in Appendix B-II.

The protective cover material was placed over the leachate collection system using a low ground pressure dozer. The protective cover was placed from the valley floor up the side slopes to minimize stresses placed on the underlying PVC geomembrane and GDN. The protective cover is also used to buttress the liner systems in select locations. A minimum three-foot-thick haul road was constructed using bottom ash to facilitate delivery of the material to the working area. GAI's QC inspector observed the protective cover material placement.

The top of protective cover elevations at select points were determined by field survey. Drawing 23033A Protective Cover in Appendix C is a plan of Sequence 4 showing the locations of the design protective cover contours. The drawing and a comparison of the design and as-built elevations for the protective cover.

2.1 Bottom Ash

The results of gradation (sieve and wash sieve) and permeability testing on the bottom ash used in the protective cover is provided in Appendix B-I.

2.2 Subgrade Bench Stone

The quality control testing of the AASHTO No. 8 non-calcareous stone placed on the GDN on the subgrade benches is documented in Appendix B-II.

3.0 Summary

The construction work documented in this report was completed in accordance with the design and specifications presented in the applicable WVDEP Solid Waste/NPDES Permit (No. WV0116254), the CCR Rule, and the construction documents listed in this report. The field activities documented in this report represent the CQA services provided for the installations of the protective cover in Sequence 4 at the Amos Landfill.

FIGURE

AMOS FGD LANDFILL

05786\Desktop\SURVEYS\vacinity map.jpg

JOHN AMOS PLANT

BLUE LICK ROAD

BELLS CREEK ROAD

VICINITY MAP
(NOT TO SCALE)

AMOS LANDFILL CONTROL MONUMENTS
DATUM: NAD83/88 WV S - GEOID03

PT.	NORTH	EAST	ELEVATION	
1	539375.6400	1727964.6500	649.2400	MONUMENT
5	541953.8200	1725476.5700	979.7500	MONUMENT
6	540672.8190	1722790.9030	926.9120	MONUMENT
7	540251.9820	1728194.8480	954.4330	MONUMENT
5077	540828.3700	1725256.7600	939.6500	
5104	539496.9700	1728326.1600	618.8900	
15 2012 BASE AT OFFICE	540947.1150	1725381.9170	929.596	Bottom of Antenna Mount
BASE ACROSS HILL	540874.0200	1722784.0800	933.0950	Base 25001 Bottom of Antenna Near Stockpile #6

GRAPHIC SCALE
200' 100' 0 200'
1 INCH = 200 FEET

NORTH MERIDIAN REFERENCED TO STATE PLANE COORDINATES (W.V. SOUTH)

FIGURE 1
SITE PLAN
SEQUENCE 4 LANDFILL
CONSTRUCTION

LEGEND
- EXISTING 4" UNDERDRAIN
- EXISTING 12" UNDERDRAIN
- OVERHEAD ELECTRIC
- SURVEYED PROPERTY LINES
- DIVERSION DITCHES
- EXISTING SEDIMENT TRAPS
- STONE FILTERS
- SILT FENCE
- CELL 3 CAP LIMITS
- EXISTING SEDIMENT TRAPS, DITCHES OR SPILLWAYS WITH STONE BOTTOM
- LIVING WEIRS
- FLOC LOG
- FLOW CHECK
- COMPOST LOG
- straw wattle
- 765kv location
- smart fence

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APPALACHIAN POWER CO.

JOHN E. AMOS PLANT

WINFIELD WEST VIRGINIA

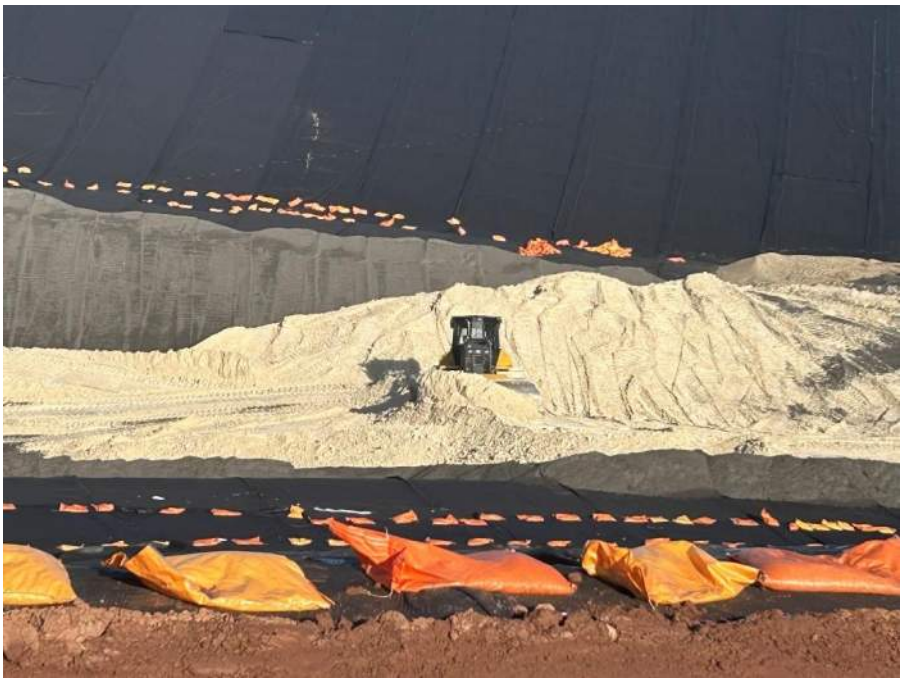
JOHN E. AMOS FGD LANDFILL
EROSION & SEDIMENT CONTROL
DETAILS

NAD 83/NAVD 88 W.V. SOUTH

Drawing Name:	Amos Asbuilt
SCALE:	1"=200'
Revision Date:	JULY 10, 2019
Surveyed By:	C.Sheppard
Drawn By:	C.Sheppard

AEP AMERICAN ELECTRIC POWER
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

APPENDIX A
Photographs



Photograph 1. Installation of Protective Cover

Photograph 2. Gypsum placement as protective cover

Photograph 3, Aggregate placement on bench

Photograph 4. Bottom ash placement on bench

Photograph 5. Tie in of protective cover with existing landfill

APPENDIX B

Appendix B-I
Bottom Ash Laboratory Test Results

gai consultants
transforming ideas into reality

June 8, 2023

Project No. 2023-370-001

Mr. Zach Wilder
GAI Consultants, Inc.
9850 Von Allmen Court
Louisville, KY 40241

Transmittal
Laboratory Test Results
GAI-AEP Amos Seq. 4 C130109.27

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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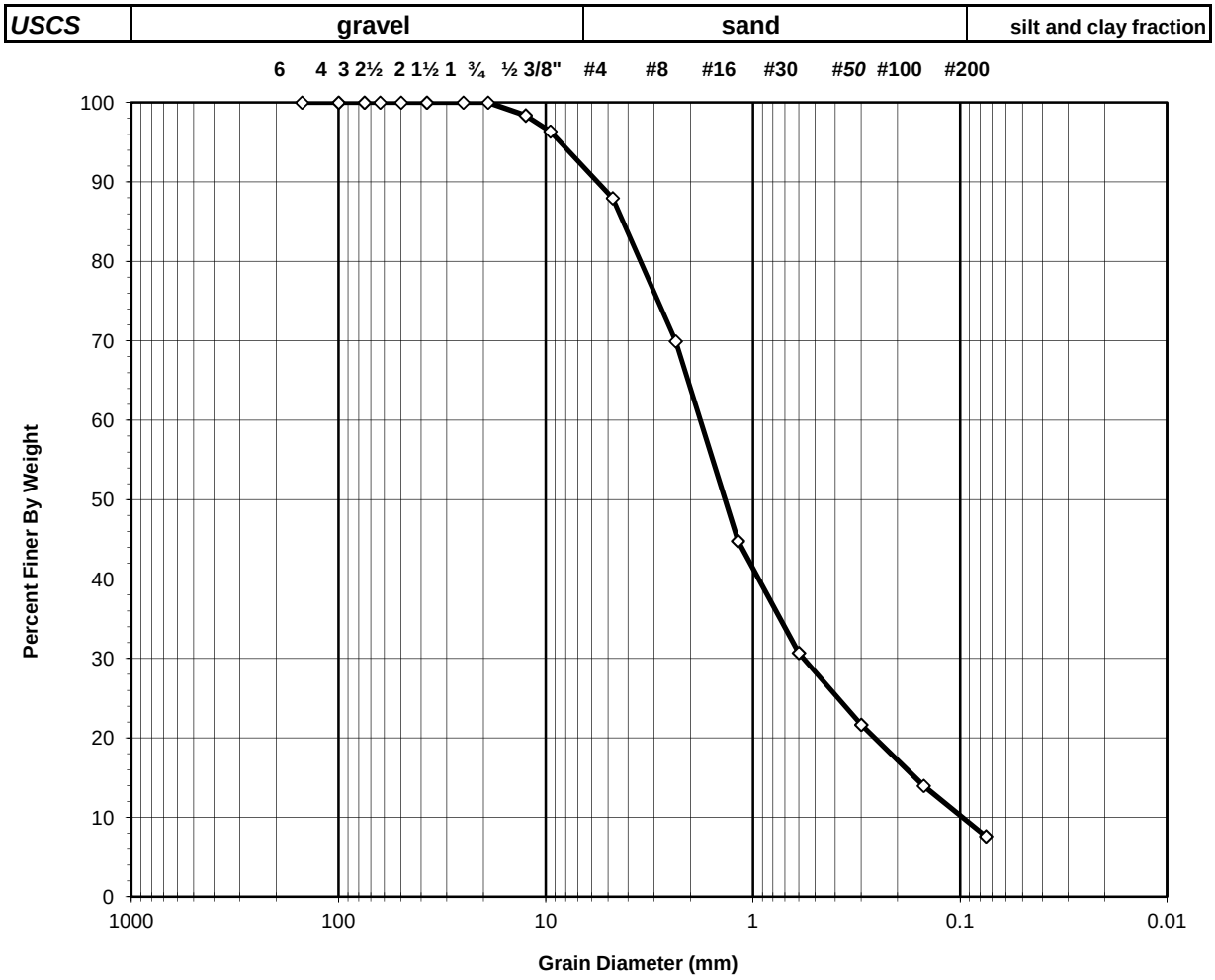
WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-2
Lab ID:	2023-370-001-001	Color:	Dark Gray



USCS Symbol:
sw-sm, ASSUMED

Fineness Modulus:
3.35

D60 = 1.79

D30 = 0.57 **CC = 1.85**

D10 = 0.10 **CU = 18.45**

USCS Classification:
WELL-GRADED SAND WITH SILT

Tested By DF Date 6/6/23 Checked By KC Date 6/6/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-2
Lab ID:	2023-370-001-001	Color:	Dark Gray

Washed using Wetting Agent: No

Tare No.:	1480	Weight of Dry Sample (g):	564.97
Wt. of Tare & Dry Sample (Pre-Wash), (g):	712.95	Weight of + #200 Sample (g):	521.92
Weight of Tare & Dry,Washed Sample (g):	688.72	Weight of - #200 Sample (g):	43.28
Weight of Tare (g):	147.98		
Weight of Dry,Washed Sample (g):	540.74	% Passing #200 Sieve by Washing (%):	4.3
		Total Weight Retained After Sieving (g):	540.97

The % Difference in Weight of the Dry,Washed Sample vs the Total Weight Retained After Sieving (%): 0.0

(% Difference must not be more than 0.3)

Sieve	Sieve Opening (mm)	Weight Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)
6"	150	0.00	0	0	100
4"	100	0.00	0	0	100
3"	75	0.00	0	0	100
2 1/2"	63	0.00	0	0	100
2"	50	0.00	0	0	100
1 1/2"	37.50	0.00	0	0	100
1"	25.00	0.00	0	0	100
3/4"	19.00	0.00	0	0	100
1/2"	12.50	9.20	2	2	98
3/8"	9.50	11.44	2	4	96
#4	4.75	47.44	8	12	88
#8	2.36	101.73	18	30	70
#16	1.18	142.12	25	55	45
#30	0.60	79.60	14	69	31
#50	0.30	51.05	9	78	22
#100	0.15	43.44	8	86	14
#200	0.075	35.90	6.4	92.4	7.6
Pan	-	19.05	3	96	-

Tested By DF Date 6/6/23 Checked By KC Date 6/6/23

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RIGID WALL CONSTANT HEAD PERMEABILITY

ASTM D 2434-68 (2006)

Client	GAI Consultants, Inc.	Boring No.	5/25/23
Client Reference	AEP Amos Seq. 4 C130109.27	Depth (ft)	Stockpile
Project No.	2023-370-001	Sample No.	52523-2
Lab ID	2023-370-001-001	Visual	Black Ash

Unit Weight

Weight of Wet Material (g)	887
Average Length (in)	7.5
Permeameter Diameter (in)	2.94
Sample Volume (cm^3)	834.3
Unit Dry Weight (g/cm^3)	0.96
Unit Dry Weight (pcf)	60.1

Water Content

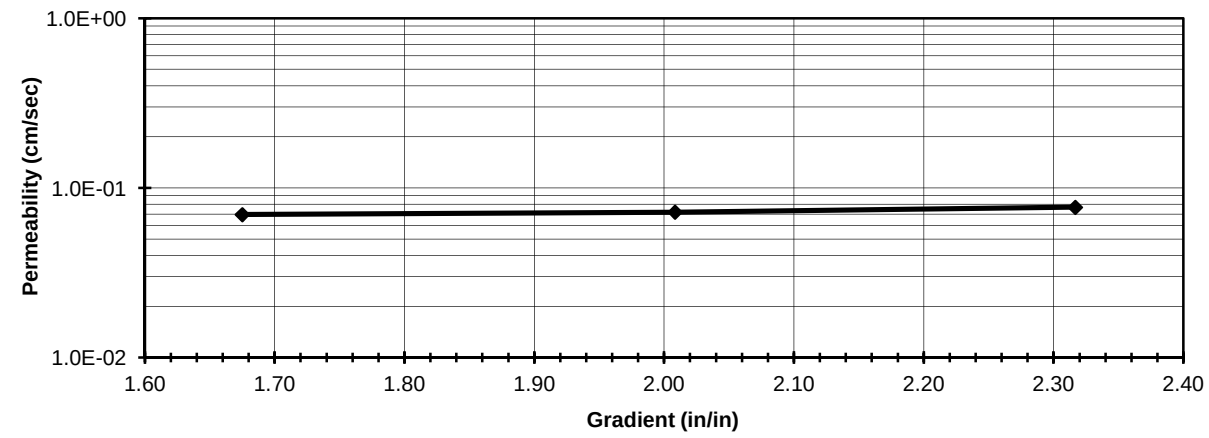
Tare Number	3530
Weight of Tare & Wet Material (g)	126.66
Weight of Tare & Dry Material (g)	115.52
Weight of Tare (g)	8.05
Weight of Water (g)	11.14
Weight of Dry Material (g)	107.47

	Test 1	Test 2	Test 3
Piezometer Spacing (in)	***3***	***3***	***3***
Temperature (^{o} C)	*23.1*	*23.3*	*23.6*
Temp. Correction Factor	*0.9290*	*0.9247*	*0.9183*

Water Content (%) ***10.4*** *(Measured)*

Load (psf) ***0***

Test No.	Replicate No.	Head (in)	Gradient (in/in)	Elapsed Time (sec)	Collected Volume (ml)	Collected Volume (cm^3)	Permeability 20^o C (cm/s)	Average Permeability (cm/s)
1	1	5.03	1.68	30.0	165.0	165.0	7.0E-02	
1	2	5.03	1.68	30.0	165.3	165.3	7.0E-02	**7.0E-02**
1	3	5.03	1.68	30.0	165.2	165.2	7.0E-02	
2	1	6.03	2.01	30.0	205.1	205.1	7.2E-02	
2	2	6.03	2.01	30.0	205.7	205.7	7.2E-02	**7.2E-02**
2	3	6.03	2.01	30.0	205.5	205.5	7.2E-02	
3	1	6.95	2.32	30.0	254.8	254.8	7.7E-02	
3	2	6.95	2.32	30.0	255.2	255.2	7.7E-02	**7.7E-02**
3	3	6.95	2.32	30.0	255.3	255.3	7.7E-02	



Tested By WT Date 6/7/23 Checked By KC Date 6/8/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-3
Lab ID:	2023-370-001-002	Color:	Dark Gray

USCS Symbol:
sw-sm, ASSUMED

Fineness Modulus:
3.05

D60 =	**1.55**				
D30 =	**0.36**	**CC =**	**1.01**
D10 =	**0.08**	**CU =**	**18.52**

USCS Classification:
WELL-GRADED SAND WITH SILT

Tested By	DF	Date	6/6/23	Checked By	KC	Date	6/6/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-3
Lab ID:	2023-370-001-002	Color:	Dark Gray

Washed using Wetting Agent: No

Tare No.:	2035	Weight of Dry Sample (g):	574.49
Wt. of Tare & Dry Sample (Pre-Wash), (g):	721.72	Weight of + #200 Sample (g):	525.86
Weight of Tare & Dry,Washed Sample (g):	684.78	Weight of - #200 Sample (g):	49.24
Weight of Tare (g):	147.23		
Weight of Dry,Washed Sample (g):	537.55	% Passing #200 Sieve by Washing (%):	6.4
		Total Weight Retained After Sieving (g):	538.16

The % Difference in Weight of the Dry,Washed Sample vs the Total Weight Retained After Sieving (%): -0.1

(% Difference must not be more than 0.3)

Sieve	Sieve Opening (mm)	Weight Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)
6"	150	0.00	0	0	100
4"	100	0.00	0	0	100
3"	75	0.00	0	0	100
2 1/2"	63	0.00	0	0	100
2"	50	0.00	0	0	100
1 1/2"	37.50	0.00	0	0	100
1"	25.00	0.00	0	0	100
3/4"	19.00	0.00	0	0	100
1/2"	12.50	4.33	1	1	99
3/8"	9.50	4.87	1	2	98
#4	4.75	51.52	9	11	89
#8	2.36	94.60	16	27	73
#16	1.18	122.93	21	48	52
#30	0.60	85.54	15	63	37
#50	0.30	52.60	9	72	28
#100	0.15	54.01	9	82	18
#200	0.075	55.46	9.7	91.5	8.5
Pan	-	12.30	2	94	-

Tested By DF Date 6/6/23 Checked By KC Date 6/6/23

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RIGID WALL CONSTANT HEAD PERMEABILITY

ASTM D 2434-68 (2006)

Client	GAI Consultants, Inc.	Boring No.	5/25/23
Client Reference	AEP Amos Seq. 4 C130109.27	Depth (ft)	Stockpile
Project No.	2023-370-001	Sample No.	52523-3
Lab ID	2023-370-001-002	Visual	Black Ash

Unit Weight

Weight of Wet Material (g)	918
Average Length (in)	7.5
Permeameter Diameter (in)	2.94
Sample Volume (cm^3)	834.3
Unit Dry Weight (g/cm^3)	1.01
Unit Dry Weight (pcf)	63.2

Water Content

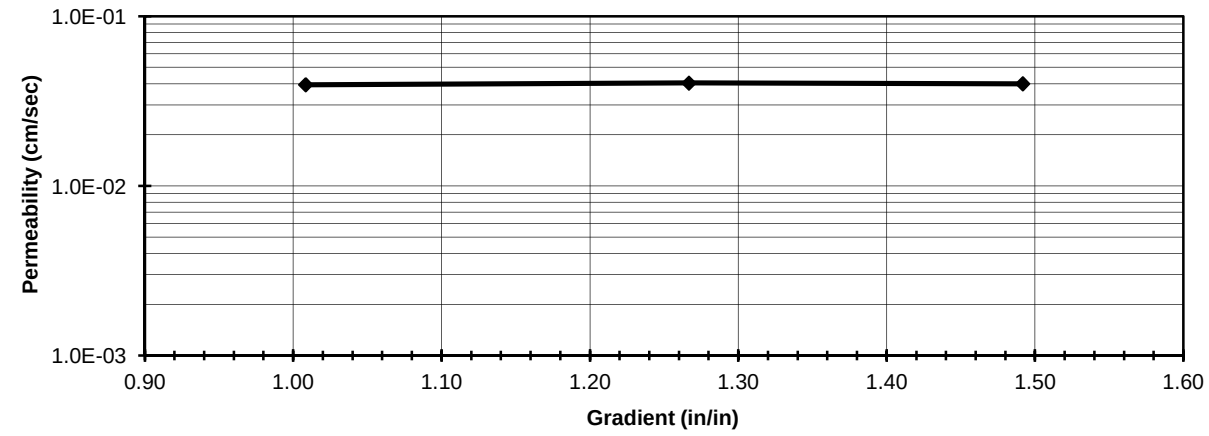
Tare Number	3502
Weight of Tare & Wet Material (g)	187.42
Weight of Tare & Dry Material (g)	173.18
Weight of Tare (g)	8.12
Weight of Water (g)	14.24
Weight of Dry Material (g)	165.06

	Test 1	Test 2	Test 3
Piezometer Spacing (in)	***3***	***3***	***3***
Temperature (^{o} C)	*23.1*	*23.5*	*23.8*
Temp. Correction Factor	*0.9290*	*0.9204*	*0.9140*

Water Content (%) ***8.6*** *(Measured)*

Load (psf) ***0***

Test No.	Replicate No.	Head (in)	Gradient (in/in)	Elapsed Time (sec)	Collected Volume (ml)	Collected Volume (cm^3)	Permeability 20^o C (cm/s)	Average Permeability (cm/s)
1	1	3.03	1.01	30.0	55.9	55.9	3.9E-02	
1	2	3.03	1.01	30.0	56.3	56.3	3.9E-02	**3.9E-02**
1	3	3.03	1.01	30.0	56.7	56.7	4.0E-02	
2	1	3.80	1.27	30.0	73.2	73.2	4.0E-02	
2	2	3.80	1.27	30.0	73.1	73.1	4.0E-02	**4.0E-02**
2	3	3.80	1.27	30.0	73.1	73.1	4.0E-02	
3	1	4.48	1.49	30.0	85.9	85.9	4.0E-02	
3	2	4.48	1.49	30.0	85.6	85.6	4.0E-02	**4.0E-02**
3	3	4.48	1.49	30.0	86.0	86.0	4.0E-02	



Tested By WT Date 6/6/23 Checked By KC Date 6/6/23

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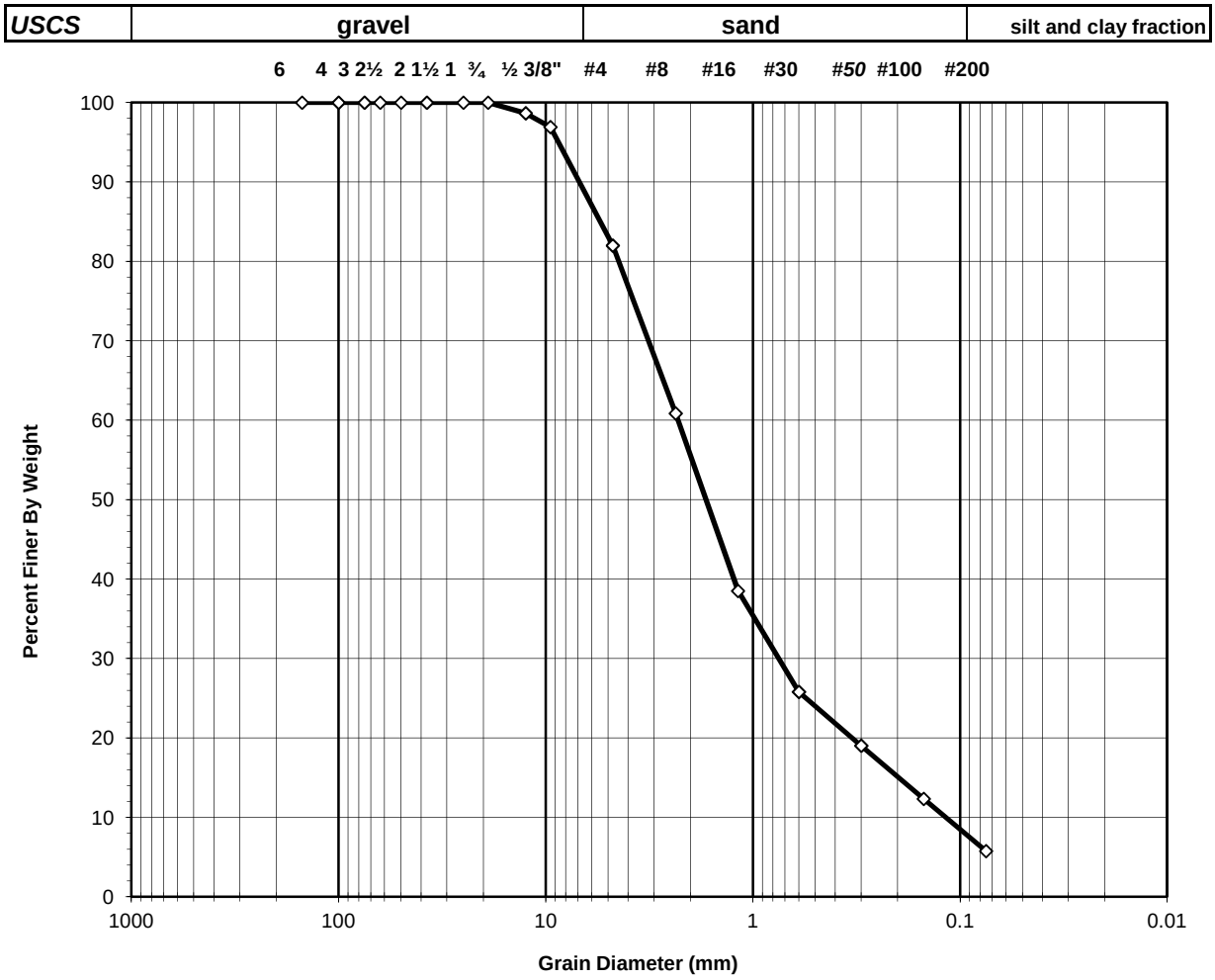
WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-4
Lab ID:	2023-370-001-003	Color:	Dark Gray



USCS Symbol:
sw-sm, ASSUMED

Fineness Modulus:
3.65

D60	**=**	**2.30**			
D30	**=**	**0.75**	**CC**	**=**	**2.09**
D10	**=**	**0.12**	**CU**	**=**	**19.62**

USCS Classification:
WELL-GRADED SAND WITH SILT AND GRAVEL

Tested By	DF	Date	6/6/23	Checked By	KC	Date	6/6/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-4
Lab ID:	2023-370-001-003	Color:	Dark Gray

Washed using Wetting Agent: No

Tare No.:	1466	Weight of Dry Sample (g):	633.38
Wt. of Tare & Dry Sample (Pre-Wash), (g):	774.80	Weight of + #200 Sample (g):	596.84
Weight of Tare & Dry,Washed Sample (g):	744.42	Weight of - #200 Sample (g):	36.19
Weight of Tare (g):	141.42		
Weight of Dry,Washed Sample (g):	603.00	% Passing #200 Sieve by Washing (%):	4.8
		Total Weight Retained After Sieving (g):	602.65

The % Difference in Weight of the Dry,Washed Sample vs the Total Weight Retained After Sieving (%): 0.1

(% Difference must not be more than 0.3)

Sieve	Sieve Opening (mm)	Weight Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)
6"	150	0.00	0	0	100
4"	100	0.00	0	0	100
3"	75	0.00	0	0	100
2 1/2"	63	0.00	0	0	100
2"	50	0.00	0	0	100
1 1/2"	37.50	0.00	0	0	100
1"	25.00	0.00	0	0	100
3/4"	19.00	0.00	0	0	100
1/2"	12.50	8.52	1	1	99
3/8"	9.50	11.00	2	3	97
#4	4.75	94.51	15	18	82
#8	2.36	133.80	21	39	61
#16	1.18	141.57	22	61	39
#30	0.60	80.55	13	74	26
#50	0.30	42.94	7	81	19
#100	0.15	42.25	7	88	12
#200	0.075	41.70	6.6	94.2	5.8
Pan	-	5.81	1	95	-

Tested By DF Date 6/6/23 Checked By KC Date 6/6/23

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RIGID WALL CONSTANT HEAD PERMEABILITY

ASTM D 2434-68 (2006)

Client	GAI Consultants, Inc.	Boring No.	5/25/23
Client Reference	AEP Amos Seq. 4 C130109.27	Depth (ft)	Stockpile
Project No.	2023-370-001	Sample No.	52523-4
Lab ID	2023-370-001-003	Visual	Black Ash

Unit Weight

Weight of Wet Material (g)	1014
Average Length (in)	7.5
Permeameter Diameter (in)	2.94
Sample Volume (cm^3)	834.3
Unit Dry Weight (g/cm^3)	1.15
Unit Dry Weight (pcf)	71.7

Water Content

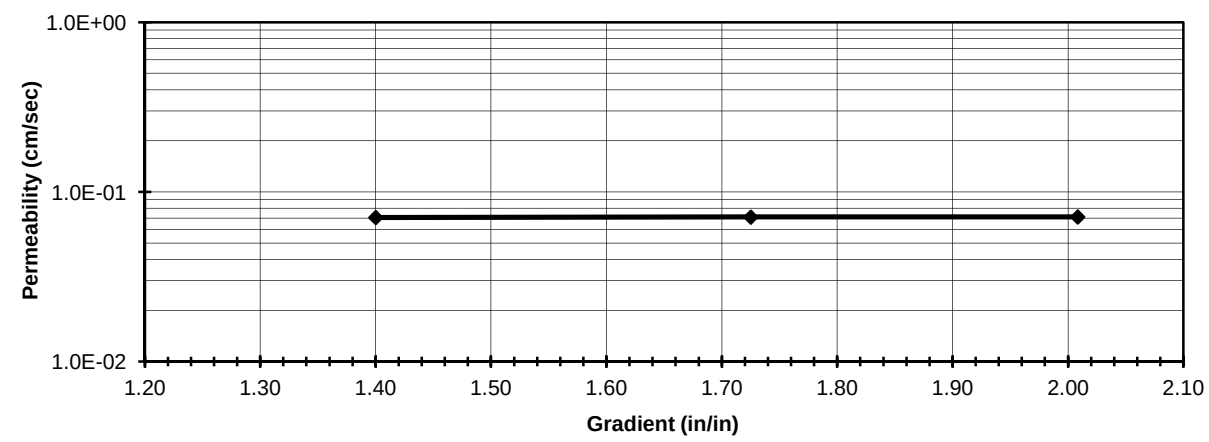
Tare Number	3250
Weight of Tare & Wet Material (g)	144.86
Weight of Tare & Dry Material (g)	137.45
Weight of Tare (g)	8.11
Weight of Water (g)	7.41
Weight of Dry Material (g)	129.34

	Test 1	Test 2	Test 3
Piezometer Spacing (in)	***3***	***3***	***3***
Temperature (^{o} C)	*23.9*	*23.9*	*24.1*
Temp. Correction Factor	*0.9119*	*0.9119*	*0.9077*

Water Content (%) ***5.7*** *(Measured)*

Load (psf) ***0***

Test No.	Replicate No.	Head (in)	Gradient (in/in)	Elapsed Time (sec)	Collected Volume (ml)	Collected Volume (cm^3)	Permeability 20^o C (cm/s)	Average Permeability (cm/s)
1	1	4.20	1.40	30.0	142.2	142.2	7.1E-02	
1	2	4.20	1.40	30.0	142.6	142.6	7.1E-02	**7.1E-02**
1	3	4.20	1.40	30.0	143.0	143.0	7.1E-02	
2	1	5.18	1.73	30.0	176.9	176.9	7.1E-02	
2	2	5.18	1.73	30.0	177.1	177.1	7.1E-02	**7.1E-02**
2	3	5.18	1.73	30.0	176.6	176.6	7.1E-02	
3	1	6.03	2.01	30.0	206.9	206.9	7.1E-02	
3	2	6.03	2.01	30.0	207.3	207.3	7.1E-02	**7.1E-02**
3	3	6.03	2.01	30.0	207.5	207.5	7.1E-02	



Tested By WT Date 6/6/23 Checked By KC Date 6/6/23

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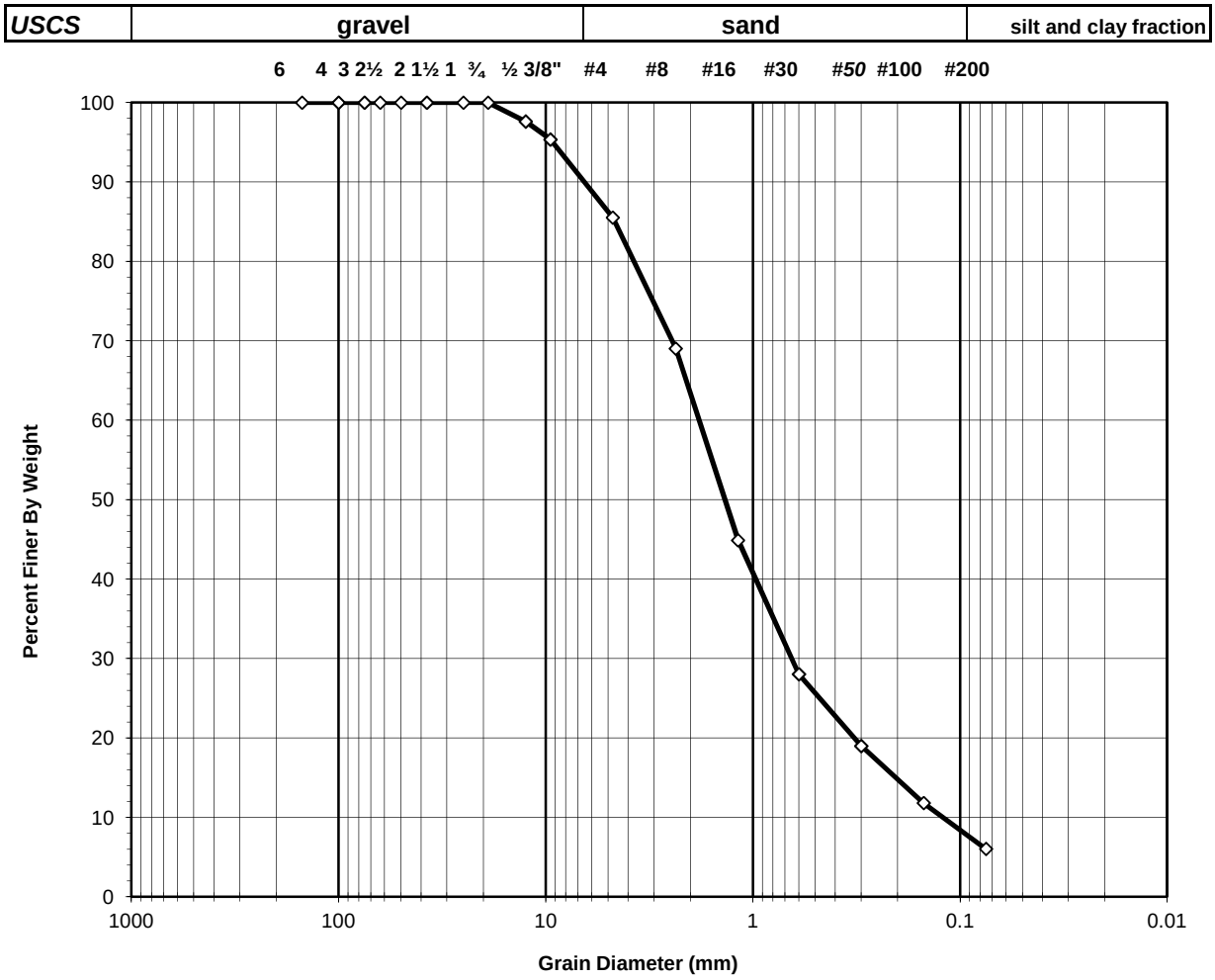
WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-5
Lab ID:	2023-370-001-004	Color:	Dark Gray



USCS Symbol:
sw-sm, ASSUMED

Fineness Modulus:
3.46

D60 =	**1.82**				
D30 =	**0.65**	**CC =**	**1.92**		
D10 =	**0.12**	**CU =**	**15.08**		

USCS Classification:
WELL-GRADED SAND WITH SILT

Tested By	DF	Date	6/6/23	Checked By	KC	Date	6/6/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-5
Lab ID:	2023-370-001-004	Color:	Dark Gray

Washed using Wetting Agent: No

Tare No.:	1456	Weight of Dry Sample (g):	478.40
Wt. of Tare & Dry Sample (Pre-Wash), (g):	608.74	Weight of + #200 Sample (g):	449.54
Weight of Tare & Dry,Washed Sample (g):	587.44	Weight of - #200 Sample (g):	28.67
Weight of Tare (g):	130.34		
Weight of Dry,Washed Sample (g):	457.10	% Passing #200 Sieve by Washing (%):	4.5
		Total Weight Retained After Sieving (g):	456.91

The % Difference in Weight of the Dry,Washed Sample vs the Total Weight Retained After Sieving (%): 0.0

(% Difference must not be more than 0.3)

Sieve	Sieve Opening (mm)	Weight Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)
6"	150	0.00	0	0	100
4"	100	0.00	0	0	100
3"	75	0.00	0	0	100
2 1/2"	63	0.00	0	0	100
2"	50	0.00	0	0	100
1 1/2"	37.50	0.00	0	0	100
1"	25.00	0.00	0	0	100
3/4"	19.00	0.00	0	0	100
1/2"	12.50	11.40	2	2	98
3/8"	9.50	10.86	2	5	95
#4	4.75	47.00	10	14	86
#8	2.36	78.86	16	31	69
#16	1.18	115.47	24	55	45
#30	0.60	80.71	17	72	28
#50	0.30	43.24	9	81	19
#100	0.15	34.38	7	88	12
#200	0.075	27.62	5.8	94.0	6.0
Pan	-	7.37	2	96	-

Tested By DF Date 6/6/23 Checked By KC Date 6/6/23

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RIGID WALL CONSTANT HEAD PERMEABILITY

ASTM D 2434-68 (2006)

Client	GAI Consultants, Inc.	Boring No.	5/25/23
Client Reference	AEP Amos Seq. 4 C130109.27	Depth (ft)	Stockpile
Project No.	2023-370-001	Sample No.	52523-5
Lab ID	2023-370-001-004	Visual	Black Ash

Unit Weight

Weight of Wet Material (g)	806
Average Length (in)	7.5
Permeameter Diameter (in)	2.94
Sample Volume (cm^3)	834.3
Unit Dry Weight (g/cm^3)	0.82
Unit Dry Weight (pcf)	50.9

Water Content

Tare Number	3295
Weight of Tare & Wet Material (g)	174.18
Weight of Tare & Dry Material (g)	148.39
Weight of Tare (g)	8.32
Weight of Water (g)	25.79
Weight of Dry Material (g)	140.07

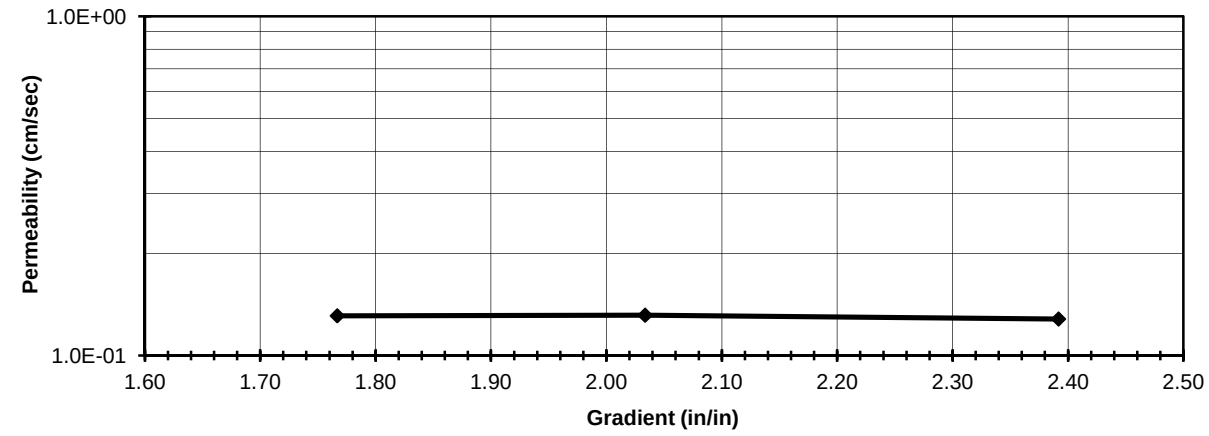
	Test 1	Test 2	Test 3
Piezometer Spacing (in)	***3***	***3***	***3***
Temperature (^{o} C)	*23.2*	*23.5*	*23.8*
Temp. Correction Factor	*0.9268*	*0.9204*	*0.9140*

Water Content (%) ***18.4***

(Measured)

Load (psf) ***0***

Test No.	Replicate No.	Head (in)	Gradient (in/in)	Elapsed Time (sec)	Collected Volume (ml)	Collected Volume (cm^3)	Permeability 20^o C (cm/s)	Average Permeability (cm/s)
1	1	5.30	1.77	30.0	328.4	328.4	1.3E-01	
1	2	5.30	1.77	30.0	327.9	327.9	1.3E-01	**1.3E-01**
1	3	5.30	1.77	30.0	328.2	328.2	1.3E-01	
2	1	6.10	2.03	30.0	381.9	381.9	1.3E-01	
2	2	6.10	2.03	30.0	381.8	381.8	1.3E-01	**1.3E-01**
2	3	6.10	2.03	30.0	382.1	382.1	1.3E-01	
3	1	7.18	2.39	30.0	442.2	442.2	1.3E-01	
3	2	7.18	2.39	30.0	441.0	441.0	1.3E-01	**1.3E-01**
3	3	7.18	2.39	30.0	439.6	439.6	1.3E-01	



Tested By WT Date 6/6/23 Checked By KC Date 6/6/23

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Appendix B-II
Bench Stone Aggregate

gai consultants
transforming ideas into reality

Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-027**
ENTACT Project Number:	E9103
Submittal Title:	Non-Calcareous ASSHTO No.8 Aggregate QA/QC
Submittal Date:	12/4/23
Date(s) of Previous Submissions:	N/A
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Robin White, ENTACT Eric Cline, ENTACT
From:	Jarod Stanfield
Reference Specification section and/or	QA/QC Plan 6.7 & CE-006

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☐ **Product** ☒ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☐ **Plan**

☒ **Certificate** ☒ **Report** ☐ **Permit** ☐ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile	X		X		N/A

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COMMENTS:
This submittal includes the QA/QC data for the Non-Calcareous ASSHTO No.8 Aggregate to be used on ste provided by Shamblin Stone.

ENTACT, LLC

Contractor's Signature and Date
Jarod Stanfield 12/4/2023

Owner's Representative Review & Comments Section:

The provided gradation meets the requirements of the specification. However, the non-calcareous requirement is not met by the submitted documentation. Additional documentation on the aggregate to be used for the project will be required to show that the aggregate meets the non-calcareous requirements.

GAI Consultants JFS 12/7/2023

This Submittal has been:

☐ **Reviewed** ☐ **Approved** ☐ **Approved as Noted** ☒ **Revised and Resubmit** ☐ **Rejected**

Comments:

Owner's Representative Signature and Date (Stamp if applicable)

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Shelly MATERIALS
A CRH COMPANY

Plant 162_01381-Portland Aggregates

Product 108-OH 8 **Name/Title** Todd Hines / QC Technician

Period: 08/29/2021 - 08/29/2022 **Report Date** 08/29/2022

Procedure	Sieve/Test	Result	Unit	OH 8
	1/2" (12.5mm)	100	%	100-100
	3/8" (9.5mm)	96	%	85-100
	1/4" (6.3mm)	56	%	
	#4 (4.75mm)	22	%	10-30
	#8 (2.36mm)	1	%	0-10
	#16 (1.18mm)	1	%	0-5
	Wash Loss (#200/75um)	0.6	%	
	Coal	0.00		
	Absorption	1.7	%	
	SPGR (Dry,Gsb)	2.531		2.476-2.576
	SPGR (SSD)	2.572		
	SPGR (Apparent,Gsa)	2.640		

Letter of Transmittal

John Amos Plant
Sequence 4 Bubble Liner Repair Project
Winfield, WV

ENTACT Submittal(s) Number:	**S-027B**
ENTACT Project Number:	E9103
Submittal Title:	Non-Calcareous AASHTO No.8 Aggregate QA/QC
Submittal Date:	12/21/23
Date(s) of Previous Submissions:	12/4/23 S027 12/12/23 S027A
To: **Cc:**	Janine White, AEP Dave Fry, AEP Brian Palmer, AEP Thad Penuel, ENTACT Jonathan Lovenduski, ENTACT Jarod Stanfield, ENTACT Eric Cline, ENTACT
From:	Robin White
Reference Specification section and/or	QA/QC Plan 6.7 & CE-006

Contractor's Submittal Section:

We are sending:

☐ **Drawings** ☐ **Product** ☒ **Data** ☐ **Sample** ☐ **Schedule** ☐ **Record** ☐ **Plan**

☐ **Certificate** ☒ **Report** ☐ **Permit** ☐ **Other**

# of Copies	As Requested	For Review	For Approval	For Your File	Deviations from Specifications
efile	X		X		N/A

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COMMENTS:
Based on discussions surrounding the documentation of the non-calcareous characteristic of the Shamblin Stone AASHTO #8, the additional documentation is attached.

ENTACT, LLC

Robin White

_____

Contractor's Signature and Date
Robin White 12/21/23

Owner's Representative Review & Comments Section:

This Submittal has been:

☐ **Reviewed** ☐ **Approved** ☐ **Approved as Noted** ☐ **Revised and Resubmit** ☐ **Rejected**

Comments:

_____

Owner's Representative Signature and Date (Stamp if applicable)

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BOWSER-MORNER, INC.

Delivery Address: 4518 Taylorsville Road Dayton, Ohio 45424 Mailing Address: P.O. Box 51 Dayton, Ohio 45401

AASHTO/ISO 17025 Accredited

LABORATORY REPORT

Report To: Shelly Materials
Attn: Marty Vann
PO Box 266
Thornville, OH 43076

Report Date: 04/27/12
Job No.: 157986
Report No.: 108354
No. of Pages: 1

Report On: Laboratory Determination of Insoluble Residue
Procedure: Insoluble Residue in Carbonate Aggregates (ASTM D 3042)

Sample ID: No. 8 Gravel
Source: Reedsville Plant
Date Received: 04/23/12

Test Parameter	Result	ODOT 703.02 Spec.
Plus No. 200 Insoluble Residue, %:	**92.2**	---
Total Insoluble Residue (Siliceous Material), %:	**92.6**	25% Min.
Total Acid Solubility, %:	**7.4**	---

Should you have any questions, or if we may be of further service, please contact me at 937-236-8805, extension 322.

Respectfully submitted,
BOWSER-MORNER, INC.

Karl A. Fletcher, Assistant Manager
Construction Materials and
Geotechnical Laboratories

KAF/ksp
108354
1-File
1-mvann@shellyco.com

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Appendix C
Record Drawings and Certification Points

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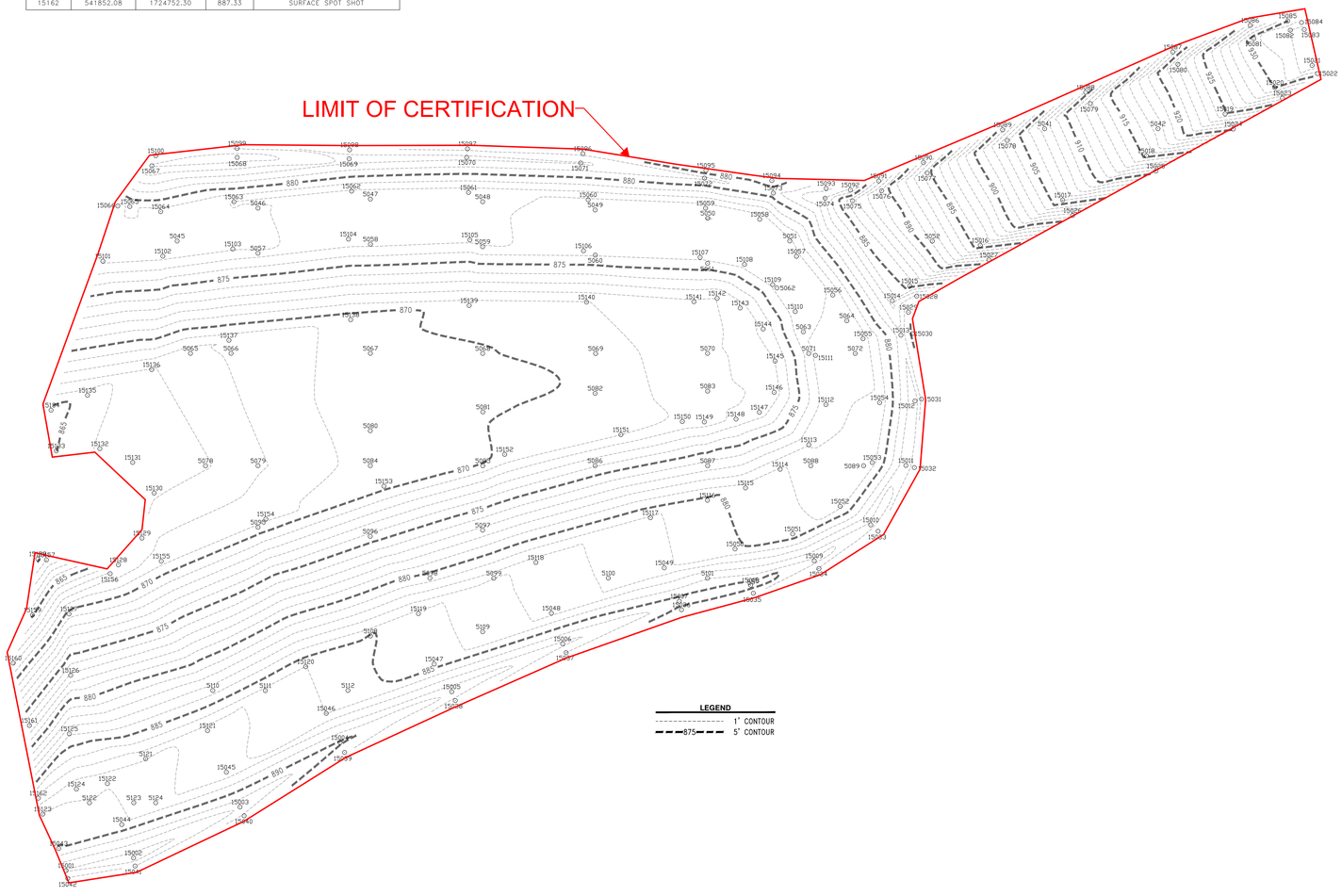
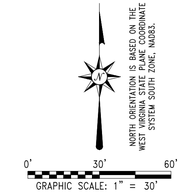
POINT #	ASBUILT NORTHING	ASBUILT EASTING	ASBUILT ELEVATION	DESCRIPTION
5041	542150.00	1725199.96	907.39	PROTECTIVE COVER CERT
5042	542150.03	1725250.39	917.47	PROTECTIVE COVER CERT
5045	542100.03	1724814.04	878.25	PROTECTIVE COVER CERT
5046	542114.68	1724849.99	878.03	PROTECTIVE COVER CERT
5047	542118.68	1724900.01	877.61	PROTECTIVE COVER CERT
5048	542117.50	1724949.97	877.20	PROTECTIVE COVER CERT
5049	542113.85	1725000.00	876.72	PROTECTIVE COVER CERT
5050	542110.17	1725050.03	875.99	PROTECTIVE COVER CERT
5051	542100.07	1725086.58	876.72	PROTECTIVE COVER CERT
5052	542099.99	1725150.00	891.20	PROTECTIVE COVER CERT
5057	542094.60	1724850.00	877.43	PROTECTIVE COVER CERT
5058	542098.60	1724900.02	877.24	PROTECTIVE COVER CERT
5059	542097.50	1724949.95	876.87	PROTECTIVE COVER CERT
5060	542093.76	1725000.04	876.08	PROTECTIVE COVER CERT
5061	542090.11	1725050.00	875.65	PROTECTIVE COVER CERT
5062	542079.17	1725080.87	876.22	PROTECTIVE COVER CERT
5063	542059.62	1725092.63	876.85	PROTECTIVE COVER CERT
5064	542064.56	1725111.93	877.44	PROTECTIVE COVER CERT
5065	542050.00	1724819.98	867.28	PROTECTIVE COVER CERT
5066	542050.03	1724838.03	868.14	PROTECTIVE COVER CERT
5067	542050.02	1724899.99	869.54	PROTECTIVE COVER CERT
5068	542049.99	1724949.98	869.89	PROTECTIVE COVER CERT
5069	542049.95	1725000.21	870.63	PROTECTIVE COVER CERT
5070	542050.01	1725050.00	871.57	PROTECTIVE COVER CERT
5071	542049.98	1725095.02	876.47	PROTECTIVE COVER CERT
5072	542050.01	1725115.69	877.14	PROTECTIVE COVER CERT
5078	542000.00	1724826.64	866.90	PROTECTIVE COVER CERT
5079	542000.00	1724850.00	867.86	PROTECTIVE COVER CERT
5080	542015.59	1724899.96	869.57	PROTECTIVE COVER CERT
5081	542023.97	1724950.05	869.98	PROTECTIVE COVER CERT
5082	542032.24	1724999.99	870.05	PROTECTIVE COVER CERT
5083	542033.23	1725050.02	871.41	PROTECTIVE COVER CERT
5084	542000.03	1724899.97	869.47	PROTECTIVE COVER CERT
5085	542000.00	1724950.01	870.32	PROTECTIVE COVER CERT
5086	542000.03	1724999.97	873.91	PROTECTIVE COVER CERT
5087	542000.02	1725050.03	876.48	PROTECTIVE COVER CERT
5088	541999.97	1725095.92	878.58	PROTECTIVE COVER CERT
5089	542000.02	1725119.41	878.43	PROTECTIVE COVER CERT
5095	541972.64	1724850.00	869.28	PROTECTIVE COVER CERT
5096	541968.58	1724899.95	874.33	PROTECTIVE COVER CERT
5097	541971.34	1724949.95	877.33	PROTECTIVE COVER CERT
5098	541950.01	1724926.50	880.59	PROTECTIVE COVER CERT
5099	541949.97	1724954.89	882.62	PROTECTIVE COVER CERT
5100	541950.00	1725005.85	881.86	PROTECTIVE COVER CERT
5101	541950.00	1725049.98	883.92	PROTECTIVE COVER CERT
5108	541924.21	1724900.02	884.80	PROTECTIVE COVER CERT
5109	541926.15	1724949.97	883.63	PROTECTIVE COVER CERT
5110	541899.98	1724829.88	883.58	PROTECTIVE COVER CERT
5111	541899.95	1724853.27	886.31	PROTECTIVE COVER CERT
5112	541900.00	1724890.03	885.34	PROTECTIVE COVER CERT
5121	541869.55	1724800.02	887.87	PROTECTIVE COVER CERT
5122	541849.98	1724775.01	889.01	PROTECTIVE COVER CERT
5123	541850.00	1724794.72	888.71	PROTECTIVE COVER CERT
5124	541850.02	1724804.50	888.28	PROTECTIVE COVER CERT
15001	541819.84	1724764.63	893.14	SURFACE SPOT SHOT
15002	541825.50	1724794.64	893.69	SURFACE SPOT SHOT
15003	541848.15	1724841.99	891.87	SURFACE SPOT SHOT
15004	541876.81	1724886.51	890.19	SURFACE SPOT SHOT
15005	541899.41	1724936.23	888.84	SURFACE SPOT SHOT
15006	541920.75	1724985.60	887.29	SURFACE SPOT SHOT
15007	541939.71	1725037.42	885.54	SURFACE SPOT SHOT
15008	541946.82	1725069.17	885.49	SURFACE SPOT SHOT
15009	541957.65	1725097.47	884.38	SURFACE SPOT SHOT
15010	541973.66	1725122.62	883.36	SURFACE SPOT SHOT
15011	542000.10	1725138.25	882.79	SURFACE SPOT SHOT
15012	542028.84	1725142.26	882.86	SURFACE SPOT SHOT
15013	542058.13	1725136.04	881.53	SURFACE SPOT SHOT
15014	542073.44	1725132.13	883.43	SURFACE SPOT SHOT
15015	542080.05	1725139.98	885.41	SURFACE SPOT SHOT
15016	542098.10	1725171.32	895.76	SURFACE SPOT SHOT
15017	542118.23	1725207.99	906.12	SURFACE SPOT SHOT
15018	542137.96	1725245.23	915.31	SURFACE SPOT SHOT
15019	542156.62	1725280.24	924.82	SURFACE SPOT SHOT
15020	542168.32	1725302.37	930.05	SURFACE SPOT SHOT
15021	542178.19	1725318.97	932.92	SURFACE SPOT SHOT
15022	542174.53	1725321.28	930.52	SURFACE SPOT SHOT
15023	542163.61	1725305.70	926.31	SURFACE SPOT SHOT
15024	542149.87	1725283.88	920.19	SURFACE SPOT SHOT
15025	542131.15	1725249.49	910.62	SURFACE SPOT SHOT
15026	542111.40	1725212.40	901.38	SURFACE SPOT SHOT
15027	542091.66	1725175.20	891.14	SURFACE SPOT SHOT
15028	542075.50	1725143.04	881.66	SURFACE SPOT SHOT
15029	542068.33	1725139.38	880.26	SURFACE SPOT SHOT
15030	542058.79	1725141.06	879.78	SURFACE SPOT SHOT
15031	542029.68	1725145.18	880.81	SURFACE SPOT SHOT
15032	541999.18	1725142.00	881.44	SURFACE SPOT SHOT
15033	541970.87	1725125.85	882.28	SURFACE SPOT SHOT
15034	541954.24	1725099.54	882.94	SURFACE SPOT SHOT
15035	541943.28	1725070.38	884.25	SURFACE SPOT SHOT
15036	541935.89	1725038.41	884.61	SURFACE SPOT SHOT
15037	541916.82	1724987.08	885.98	SURFACE SPOT SHOT
15038	541895.52	1724937.80	887.69	SURFACE SPOT SHOT
15039	541872.41	1724888.51	889.12	SURFACE SPOT SHOT
15040	541844.21	1724843.85	890.80	SURFACE SPOT SHOT
15041	541821.84	1724795.33	892.03	SURFACE SPOT SHOT
15042	541816.36	1724765.35	891.88	SURFACE SPOT SHOT
15043	541829.68	1724761.35	890.08	SURFACE SPOT SHOT
15044	541840.32	1724789.41	889.22	SURFACE SPOT SHOT

POINT #	ASBUILT NORTHING	ASBUILT EASTING	ASBUILT ELEVATION	DESCRIPTION
15045	541863.65	1724835.95	887.31	SURFACE SPOT SHOT
15046	541889.82	1724880.36	885.99	SURFACE SPOT SHOT
15047	541911.76	1724928.41	884.48	SURFACE SPOT SHOT
15048	541934.38	1724980.56	882.72	SURFACE SPOT SHOT
15049	541954.59	1725030.73	881.15	SURFACE SPOT SHOT
15050	541963.01	1725062.21	880.17	SURFACE SPOT SHOT
15051	541969.67	1725087.86	879.29	SURFACE SPOT SHOT
15052	541981.97	1725108.99	878.72	SURFACE SPOT SHOT
15053	542001.46	1725123.27	878.60	SURFACE SPOT SHOT
15054	542028.08	1725126.57	878.28	SURFACE SPOT SHOT
15055	542056.55	1725119.15	877.48	SURFACE SPOT SHOT
15056	542075.99	1725105.68	877.11	SURFACE SPOT SHOT
15057	542093.22	1725089.57	876.57	SURFACE SPOT SHOT
15058	542109.70	1725073.22	876.11	SURFACE SPOT SHOT
15059	542114.65	1725049.10	876.28	SURFACE SPOT SHOT
15060	542118.39	1724996.89	876.79	SURFACE SPOT SHOT
15061	542121.62	1724943.67	877.33	SURFACE SPOT SHOT
15062	542122.23	1724891.65	877.82	SURFACE SPOT SHOT
15063	542117.47	1724839.31	877.98	SURFACE SPOT SHOT
15064	542113.09	1724806.73	878.60	SURFACE SPOT SHOT
15065	542115.36	1724792.97	879.17	SURFACE SPOT SHOT
15066	542115.63	1724787.62	878.69	SURFACE SPOT SHOT
15067	542133.47	1724802.81	884.13	SURFACE SPOT SHOT
15068	542137.23	1724840.74	884.75	SURFACE SPOT SHOT
15069	542136.62	1724890.58	882.72	SURFACE SPOT SHOT
15070	542137.24	1724942.86	882.35	SURFACE SPOT SHOT
15071	542134.75	1724993.56	882.09	SURFACE SPOT SHOT
15072	542128.01	1725048.61	881.20	SURFACE SPOT SHOT
15073	542121.37	1725079.28	880.63	SURFACE SPOT SHOT
15074	542119.08	1725102.30	883.10	SURFACE SPOT SHOT
15075	542117.92	1725114.49	886.72	SURFACE SPOT SHOT
15076	542122.40	1725127.47	889.18	SURFACE SPOT SHOT
15077	542130.31	1725147.72	894.56	SURFACE SPOT SHOT
15078	542144.82	1725183.28	903.75	SURFACE SPOT SHOT
15079	542161.19	1725220.27	912.81	SURFACE SPOT SHOT
15080	542178.67	1725259.24	922.15	SURFACE SPOT SHOT
15081	542190.12	1725292.96	930.77	SURFACE SPOT SHOT
15082	542193.83	1725309.23	932.03	SURFACE SPOT SHOT
15083	542194.15	1725315.43	932.34	SURFACE SPOT SHOT
15084	542197.27	1725314.24	931.61	SURFACE SPOT SHOT
15085	542197.98	1725308.08	929.97	SURFACE SPOT SHOT
15086	542195.99	1725291.41	926.66	SURFACE SPOT SHOT
15087	542184.16	1725256.97	918.50	SURFACE SPOT SHOT
15088	542166.20	1725218.20	909.31	SURFACE SPOT SHOT
15089	542149.52	1725181.23	900.70	SURFACE SPOT SHOT
15090	542134.95	1725146.06	891.83	SURFACE SPOT SHOT
15091	542126.76	1725126.14	886.43	SURFACE SPOT SHOT
15092	542122.75	1725113.55	883.22	SURFACE SPOT SHOT
15093	542123.43	1725102.77	881.65	SURFACE SPOT SHOT
15094	542126.93	1725078.60	879.40	SURFACE SPOT SHOT
15095	542131.46	1725049.26	879.25	SURFACE SPOT SHOT
15096	542138.90	1724994.55	880.76	SURFACE SPOT SHOT
15097	542141.06	1724943.19	880.72	SURFACE SPOT SHOT
15098	542140.60	1724890.74	881.21	SURFACE SPOT SHOT
15099	542141.24	1724840.73	882.98	SURFACE SPOT SHOT
15100	542137.99	1724804.55	883.36	SURFACE SPOT SHOT
15101	542091.07	1724781.00	878.21	SURFACE SPOT SHOT
15102	542093.30	1724807.67	878.37	SURFACE SPOT SHOT
15103	542096.49	1724838.79	878.13	SURFACE SPOT SHOT
15104	542100.88	1724890.25	877.81	SURFACE SPOT SHOT
15105	542100.54	1724944.23	877.29	SURFACE SPOT SHOT
15106	542095.65	1724994.81	876.50	SURFACE SPOT SHOT
15107	542092.77	1725046.69	876.25	SURFACE SPOT SHOT
15108	542089.63	1725066.43	876.38	SURFACE SPOT SHOT
15109	542080.62	1725079.00	876.20	SURFACE SPOT SHOT
15110	542068.66	1725089.00	876.54	SURFACE SPOT SHOT
15111	542049.10	1725098.01	877.24	SURFACE SPOT SHOT
15112	542027.23	1725102.68	877.71	SURFACE SPOT SHOT
15113	542009.35	1725095.03	877.93	SURFACE SPOT SHOT
15114	541998.43	1725082.29	879.13	SURFACE SPOT SHOT
15115	541990.17	1725066.89	879.41	SURFACE SPOT SHOT
15116	541984.64	1725049.93	880.34	SURFACE SPOT SHOT
15117	541976.88	1725024.57	881.16	SURFACE SPOT SHOT
15118	541956.95	1724973.62	882.57	SURFACE SPOT SHOT
15119	541934.19	1724921.40	884.38	SURFACE SPOT SHOT
15120	541910.59	1724871.21	886.03	SURFACE SPOT SHOT
15121	541882.13	1724827.56	887.56	SURFACE SPOT SHOT
15122	541858.54	1724783.03	888.96	SURFACE SPOT SHOT
15123	541844.97	1724754.27	889.02	SURFACE SPOT SHOT
15124	541856.13	1724769.23	888.82	SURFACE SPOT SHOT
15125	541880.70	1724766.06	883.87	SURFACE SPOT SHOT
15126	541906.76	1724766.71	877.23	SURFACE SPOT SHOT
15127	541934.06	1724765.94	870.52	SURFACE SPOT SHOT
15128	541955.88	1724787.91	867.25	SURFACE SPOT SHOT
15129	541967.78	1724798.38	867.18	SURFACE SPOT SHOT
15130	541987.84	1724803.80	866.85	SURFACE SPOT SHOT
15131	542001.50	1724794.25	866.88	SURFACE SPOT SHOT
15132	542007.58	1724779.65	866.17	SURFACE SPOT SHOT
15133	542006.63	1724760.29	864.99	SURFACE SPOT SHOT
15134	542024.74	1724757.95	864.56	SURFACE SPOT SHOT
15135	542031.35	1724774.16	865.42	SURFACE SPOT SHOT
15136	542042.82	1724802.70	866.92	SURFACE SPOT SHOT
15137	542055.83	1724837.08	868.32	SURFACE SPOT SHOT
15138	542065.02	1724891.25	869.32	SURFACE SPOT SHOT
15139	542071.34	1724943.94	870.44	SURFACE SPOT SHOT
15140	542072.86	1724996.17	870.97	SURFACE SPOT SHOT
15141	542073.00	1725043.95	871.81	SURFACE SPOT SHOT
15142	542074.53	1725054.26	872.03	SURFACE SPOT SHOT

POINT #	ASBUILT NORTHING	ASBUILT EASTING	ASBUILT ELEVATION	DESCRIPTION
15143	542070.24	1725064.51	872.46	SURFACE SPOT SHOT
15144	542060.85	1725074.72	873.19	SURFACE SPOT SHOT
15145	542046.60	1725080.05	873.01	SURFACE SPOT SHOT
15146	542032.69	1725079.64	872.46	SURFACE SPOT SHOT
15147	542023.78	1725073.04	872.38	SURFACE SPOT SHOT
15148	542020.79	1725062.67	872.27	SURFACE SPOT SHOT
15149	542019.51	1725048.58	871.45	SURFACE SPOT SHOT
15150	542019.68	1725038.76	871.18	SURFACE SPOT SHOT
15151	542013.83	1725011.43	870.99	SURFACE SPOT SHOT
15152	542005.06	1724959.75	870.05	SURFACE SPOT SHOT
15153	541990.91	1724906.03	869.62	SURFACE SPOT SHOT
15154	541976.31	1724853.50	868.77	SURFACE SPOT SHOT
15155	541957.53	1724806.99	868.60	SURFACE SPOT SHOT
15156	541951.98	1724784.24	867.20	SURFACE SPOT SHOT
15157	541958.12	1724755.90	861.00	SURFACE SPOT SHOT
15158	541958.53	1724752.07	859.72	SURFACE SPOT SHOT
15159	541933.60	1724749.69	864.85	SURFACE SPOT SHOT
15160	541912.19	1724741.09	867.76	SURFACE SPOT SHOT
15161	541884.42	1724748.33	876.99	SURFACE SPOT SHOT
15162	541852.08	1724752.30	887.33	SURFACE SPOT SHOT





DANA A. EXLINE
PROFESSIONAL SURVEYOR #928
STATE OF WEST VIRGINIA
DATE: 1/11/24

REV.	DESCRIPTION	DATE
0	PROTECTIVE COVER ASBUILT	1-11-24

EXLINE SURVEYING, INC.
10356 STATE ROUTE 139
JACKSON, OHIO 45640
PHONE: (740) 286-7024 • TELECOPIER (740) 286-0012

PROTECTIVE COVER ASBUILT
FOR
ENTACT, LLC

SEQUENCE 4
PROTECTIVE COVER
ASBUILT
JOHN E. AMOS PLANT
WINFIELD, WEST VIRGINIA

DRAWING SCALE:
1" = 30'

TITLE RESEARCH:
N/A

CALCULATED BY:
P. TAYLOR

DRAWN BY:
P. TAYLOR

CHECKED BY:
D. EXLINE

DRAWING NUMBER
23033A
PROTECTIVE COVER

SHEET NUMBER
1 OF 1

ATTACHMENT 6

PROTECTIVE COVER CERTIFICATION – PHASES 2 & 3

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Sequence 4 Liner Repair
Protective Cover Certification – Phases 2 and 3

American Electric Power
John E. Amos Landfill
John E. Amos Power Plant
Winfield, West Virginia

GAI Project Number: C130109.27

June 2024

Prepared by: GAI Consultants, Inc.
Charleston Office
500 Lee Street, East, Suite 1100
Charleston, West Virginia 25301

Prepared for: American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215

Sequence 4 Liner Repair
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1 Riverside Plaza
Columbus, Ohio 43215

Prepared by:
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Charleston Office
500 Lee Street, East, Suite 700
Charleston, West Virginia 25301-1631

Report Authors:

James F. Shields, PE (West Virginia)
Engineering Manager

Charles F. Straley, PE, PLS (West Virginia)
Quality Assurance Officer / Certifying Engineer
Director Engineering / Associate

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  - 1.3.2 Construction Documentation Activities 2
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Figure 1 Site Plan

Appendix A Photographs of Construction Activities
Appendix B Bottom Ash Laboratory Test Results
Appendix C Record Drawings & Certification Points
Drawing 23033A Phase 2 Protective Cover
Drawing 23033A Phase 3 Protective Cover

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GAI Consultants, Inc. Certification

Based on the construction testing and observations performed by American Electric Power (AEP) and GAI Consultants, Inc. (GAI) personnel, I hereby certify that Protective Cover – Phases 2 and 3 installation within a portion of the Sequence 4 Liner Repair identified on Drawing 23033A Phase 2 Protective Cover and Drawing 23033A Phase 3 Protective Cover at the Appalachian Power Company's John E. Amos Flue Gas Desulfurization (FGD) Landfill near Winfield, West Virginia (WV), as shown on Drawing 30204SH5 and 30204SH6, has been installed in substantial compliance with the material specifications and construction requirements listed in the WV National Pollutant Discharge Elimination System/Solid Waste Permit (NPDES WV0116254) documents, the Federal Coal Combustion Residuals (CCR) Rule; and the "2023 Site Work Construction Sequence 4 Liner Repair" construction documents. Exline Surveying Inc. survey personnel provided survey data used to develop the Record Drawings and verify that the protective cover installations met the permit requirements.

This document clarifies "certification" for the installations of the protective cover within Sequence 4 Liner Repair at the Amos FGD Landfill.

The definition of certify as used herein is: Certify means to state or declare a professional opinion of conditions whose true properties cannot be known at the time such certification was made, despite appropriate professional evaluation. A design professional's certification in no way relieves any other party from meeting requirements imposed by contract or other means, including commonly-accepted industry practices.

Bearing the above in mind and based on the results of: (1) Certification from the material manufacturers and installation meeting the requirements of the Specifications, the CCR Rule, and the WV Department of Environmental Protection (WVDEP) permit; (2) results of field and laboratory testing; and (3) monitoring of construction efforts during the project; GAI's professional opinion is that the installations of the protective cover within Sequence 4 Liner Repair of the Amos FGD Landfill meet the requirements as set forth by the permit documents and the CCR Rule.

Charles F. Straley, PE, PLS
Certifying Engineer and Quality Assurance Officer
PE #11842

1.0 Introduction

1.1 Project Description

This “Protective Cover Certification - Phases 2 and 3” documents the testing and observations performed for the protective cover installations in Sequence 4 Liner Repair at American Electric Power’s (AEP’s) John E. Amos FGD Landfill (Landfill) in Winfield, West Virginia (WV). The protective cover system is being installed directly above the leachate collection system. The installation is occurring in phases, this certification report includes the second and third phases of the protective cover system. The location of Sequence 4 Liner Repair at the Amos Landfill is shown on Figure 1. Appendix A contains typical construction photographs included in the daily reports. Construction of the Sequence 4 Liner Repair site described in this certification report consists of the following:

1. Construction activities associated with the installations of the protective cover.

Construction of the groundwater control and subgrade preparation, including placement of structural fill to meet the compacted clay liner subgrade elevations, began in September 2023 and was documented in the “Sequence 4 Liner Repair Groundwater Control and Subgrade Certification” (December 2023).

Construction of the compacted clay liner (CCL) in Sequence 4 Liner Repair began in November 2023 and was completed in December 2023. The CCL construction is documented in the “Sequence 4 Liner Repair Compacted Clay Liner Certification” (January 2024).

Installation of the 30 mil polyvinyl chloride (PVC) geomembrane liner began in November 2023 and was completed in December 2023. The geomembrane installation is documented in the “Sequence 4 Liner Repair PVC Geomembrane Liner Certification Report” (February 2024).

Installation of the leachate collection system began in November 2023 and was completed in January 2024. The leachate collection system installation is documented in the “Sequence 4 Liner Repair Leachate Collection System Report” (March 2024).

Installation of the protective cover for Phase 1 began in December 2023 and completed in January 2024 The Protective Cover – Phase 1 is documented in “Sequence 4 Liner Repair Protective Cover Certification – Phase 1” (March 2024).

Installation of the protective cover for Phases 2 and 3 was performed in accordance with the approved Quality Assurance/Quality Control (QA/QC) Plan; the Landfill’s Solid Waste/National Pollutant Discharge Elimination System (NPDES) permit (Permit No. WV0116254); the West Virginia Department of Environmental Protection (WVDEP) Title 33, Series 1, Solid Waste Management Rule; the Coal Combustion Residuals (CCR) Rule; and AEP’s Civil Engineering Division Technical Specifications for Material Construction and associated Project Addenda to the Specifications. Included in this report are the field information and the applicable Record Drawings in accordance with the WVDEP requirements. The construction QA (CQA) services performed by GAI are discussed in the following sections.

The protective cover has been installed in phases due to potential stability issues in placing the material on the slope. A buttressing plan has been designed for the placement of the protective cover on the slopes. The protective cover was placed in phases to provide buttressing at the toe of the slope. The permit allows for the protective cover to consist of bottom ash and gypsum.

1.2 Companies and Personnel

The key companies and personnel involved with the protective cover installations of Sequence 4 are listed below.

AEP - Owner
Appalachian Power Company - Operator
Janine White, Project Manager
Brian Palmer, P.E., Principal Civil Engineer
David Fry, Lead Construction Coordinator

GAI Consultants Inc. (GAI) – CQA/Soil Testing
Charles Straley, P.E., P.S., Certifying Engineering, QA Officer (QAO) and Director Engineering
John Klamut, P.E., Project Manager
James Shields, P.E., Lead QC Inspector (QCI)

Entact, LLC. (Entact) - General Contractor
Jonathan Lovenduski, Project Manager
Eric Cline, Superintendent

1.3 Scope of Services

1.3.1 Preconstruction Activities

Preconstruction activities conducted by GAI personnel consisted of the following:

1. Conduct inventory of on-site protective cover materials, and
2. Collect conformance samples of the protective cover material for laboratory testing and review of results for compliance with project and permit specifications.

1.3.2 Construction Documentation Activities

Construction documentation activities performed by GAI personnel included the following:

1. Documenting and observing the leachate collection system conditions prior to the installations of the protective cover material;
2. Observing and documenting the installation and field testing of the protective cover;
3. Prepared daily field reports and documented construction activities. GAI also attended daily health and safety meetings, weekly project update meetings, and monthly contractor's meetings, as well as other supplemental meetings when needed; and
4. Provided photo documentation throughout the construction showing typical construction procedures (see Appendix A).

1.3.3 Record Drawings and Certification Report

Documentation and certification activities performed by the QA/QC team included the following:

1. Exline Surveying Inc. provided surveying services for the Record Drawings presented in Appendix C. Drawings "23033A Phase 2 Protective Cover" and "23033A Phase 3 Protective Cover" which also presents a tabulation of the as-built protective cover placement above the Leachate Collection System to the as-built certification point elevations of the protective cover.

2. GAI personnel performed the construction documentation activities discussed in Sections 1.3.1 and 1.3.2 of this report.
3. Project personnel observed the construction activities and provided the enclosed information documenting that the construction activities were performed consistent with the design and permit requirements.

1.4 Construction Schedule

Site clearing and grubbing, excavation and fill placement for subgrade, and the installation of groundwater controls were performed prior to construction of the compacted clay liner. The compacted clay liner was then constructed upon the finished subgrade. The PVC liner was then constructed upon the clay liner and the leachate collection system was then constructed upon the PVC liner. Installation of the Phase 1 protective cover started in December 2023 and was completed in January 2024. Phases 2 and 3 of the projective cover began in March 2024 and completed in May 2024.

1.5 Reference Documents

The plans, specifications, and QA requirements for the construction activities and materials used by GAI personnel for this project are as follows:

1. Solid Waste/NPDES Permit No. WV0116254.
2. AEP Civil Engineering Division, Technical Specifications for Material and Construction (prepared by AEP), and the Addenda to the Technical Specifications (prepared by GAI).
3. “Quality Assurance and Quality Control Plan, John E. Amos Landfill” for the Appalachian Power Company John E. Amos Plant’s Amos FGD Landfill (revised June 2022, prepared by GAI).
4. Amos FGD Landfill Sequence 4 Liner Repair Construction Drawings (issued for construction March 2023 and revised September 2023, prepared by GAI).

2.0 Protective Cover

The protective cover for Phases 2 and 3 placed within Sequence 4 consists of a minimum 18-inch thick layer of bottom ash and/or flue gas desulfurization (FDG) material placed on the GDN. The bottom ash and FGD were provided by John E, Amos Power Plant operations. Laboratory test results for the bottom ash are provided in Appendix B-I.

The protective cover material was placed over the leachate collection system using a low ground pressure dozer. The protective cover was placed from the valley floor up the side slopes to minimize stresses placed on the underlying PVC geomembrane and GDN. The protective cover is also used to buttress the liner systems in select locations. A minimum three-foot-thick haul road was constructed using bottom ash to facilitate delivery of the material to the working area. GAI’s QC inspector observed the protective cover material placement.

The top of protective cover elevations at select points were determined by field survey. Drawings “23033A Phase 2 Protective Cover” and “23033A Phase 3 Protective Cover” in Appendix C are plans of Sequence 4 showing the locations of the design protective cover contours. The drawing and a comparison of the design and as-built elevations for the protective cover.

2.1 Bottom Ash

The results of gradation (sieve and wash sieve) and permeability testing on the bottom ash used in the protective cover is provided in Appendix B-I.

3.0 Summary

The construction work documented in this report was completed in accordance with the design and specifications presented in the applicable WVDEP Solid Waste/NPDES Permit (No. WV0116254), the CCR Rule, and the construction documents listed in this report. The field activities documented in this report represent the CQA services provided for the installations of the protective cover in Sequence 4 at the Amos Landfill.

FIGURE

AMOS FGD LANDFILL

05786\Desktop\SURVEYS\vacinity map.jpg

JOHN AMOS PLANT

BELLS CREEK ROAD

VICINITY MAP
(NOT TO SCALE)

AMOS LANDFILL CONTROL MONUMENTS
DATUM: NAD83/88 WV S - GEOID03

PT.	NORTH	EAST	ELEVATION	
1	539375.6400	1727964.6500	649.2400	MONUMENT
5	541953.8200	1725476.5700	979.7500	MONUMENT
6	540672.8190	1722790.9030	926.9120	MONUMENT
7	540251.9820	1728194.8480	954.4330	MONUMENT
5077	540828.3700	1725256.7600	939.6500	
5104	539496.9700	1728326.1600	618.8900	
15 2012 BASE AT OFFICE	540947.1150	1725381.9170	929.596	Bottom of Antenna Mount
BASE ACROSS HILL	540874.0200	1722784.0800	933.0950	Base 25001 Bottom of Antenna Near Stockpile #6

GRAPHIC SCALE
200' 100' 0 200'
1 INCH = 200' FEET

NORTH MERIDIAN REFERENCED TO STATE PLANE COORDINATES (W.V. SOUTH)

FIGURE 1
SITE PLAN
SEQUENCE 4 LANDFILL
CONSTRUCTION

LEGEND
- EXISTING 4" UNDERDRAIN
- EXISTING 12" UNDERDRAIN
- OVERHEAD ELECTRIC
- SURVEYED PROPERTY LINES
- DIVERSION DITCHES
- EXISTING SEDIMENT TRAPS
- STONE FILTERS
- SILT FENCE
- CELL 3 CAP LIMITS
- EXISTING SEDIMENT TRAPS, DITCHES OR SPILLWAYS WITH STONE BOTTOM
- LIVING WEIRS
- FLOC LOG
- FLOW CHECK
- COMPOST LOG
- straw wattle
- 765kv location
- smart fence

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APPALACHIAN POWER CO.

JOHN E. AMOS PLANT

WINFIELD WEST VIRGINIA

JOHN E. AMOS FGD LANDFILL
EROSION & SEDIMENT CONTROL
DETAILS

NAD 83/NAVD 88 W.V. SOUTH

Drawing Name:	Amos Asbuilt
SCALE:	1"=200'
Revision Date:	JULY 10, 2019
Surveyed By:	C.Sheppard
Drawn By:	C.Sheppard

AEP AMERICAN ELECTRIC POWER
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

APPENDIX A
Photographs

Photograph 1. Installation of Gypsum Protective Cover – Phase 2

Photograph 2. Installation of Gypsum Protective Cover – Phase 2

Photograph 3. Installation of Bottom Ash Protective Cover – Phase 3

Photograph 4. Installation of Bottom Ash Protective Cover – Phase 3

APPENDIX B
Bottom Ash Laboratory Test Results

June 8, 2023

Project No. 2023-370-001

Mr. Zach Wilder
GAI Consultants, Inc.
9850 Von Allmen Court
Louisville, KY 40241

Transmittal
Laboratory Test Results
GAI-AEP Amos Seq. 4 C130109.27

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

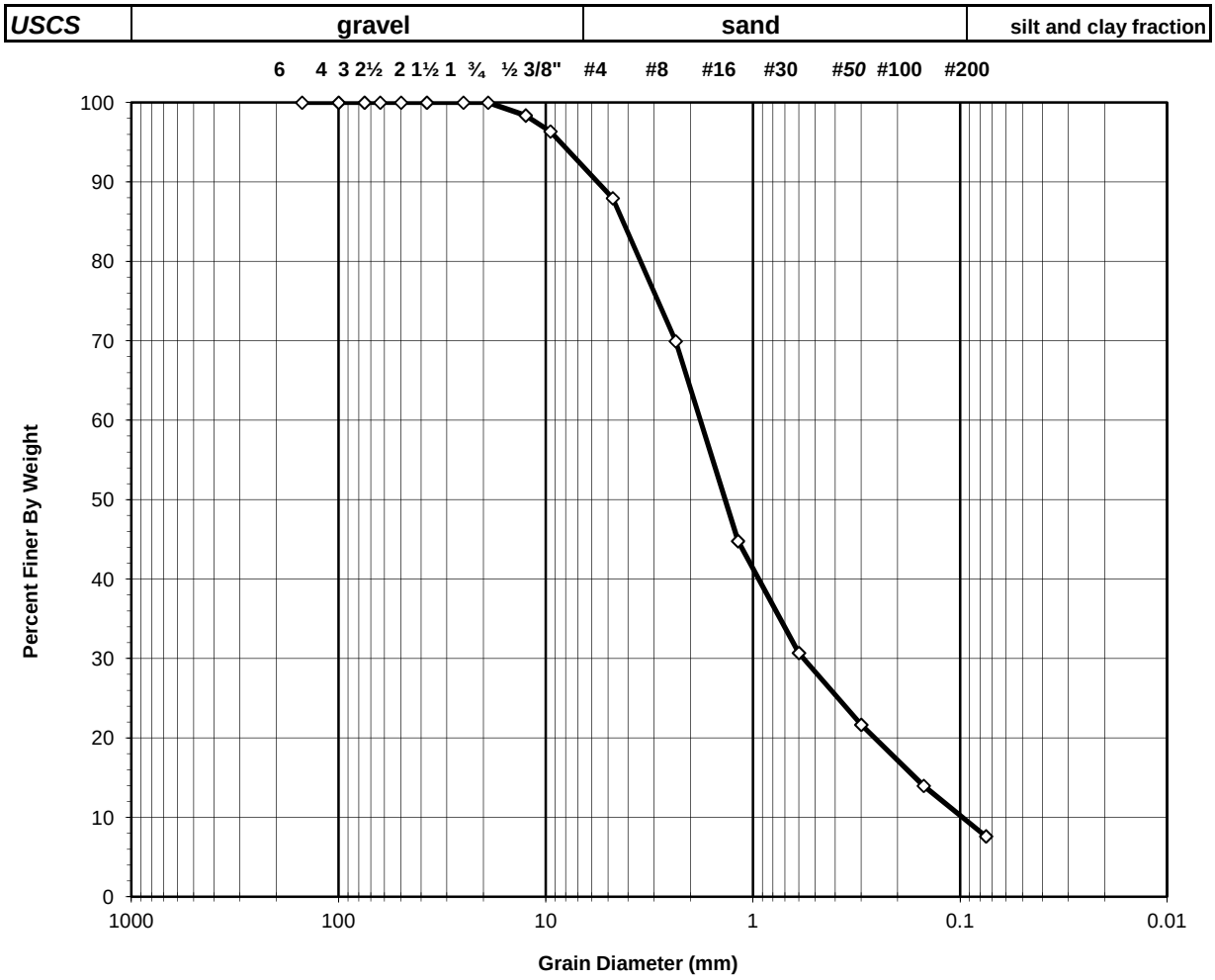
We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

544 Braddock Avenue • East Pittsburgh, PA 15112 • Phone (412) 823-7600 • Fax (412) 823-8999 • www.geotechnics.net

WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-2
Lab ID:	2023-370-001-001	Color:	Dark Gray



USCS Symbol:
sw-sm, ASSUMED

Fineness Modulus:
3.35

D60 =	**1.79**				
D30 =	**0.57**	**CC =**	**1.85**
D10 =	**0.10**	**CU =**	**18.45**

USCS Classification:
WELL-GRADED SAND WITH SILT

Tested By	DF	Date	6/6/23	Checked By	KC	Date	6/6/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-2
Lab ID:	2023-370-001-001	Color:	Dark Gray

Washed using Wetting Agent: No

Tare No.:	1480	Weight of Dry Sample (g):	564.97
Wt. of Tare & Dry Sample (Pre-Wash), (g):	712.95	Weight of + #200 Sample (g):	521.92
Weight of Tare & Dry,Washed Sample (g):	688.72	Weight of - #200 Sample (g):	43.28
Weight of Tare (g):	147.98		
Weight of Dry,Washed Sample (g):	540.74	% Passing #200 Sieve by Washing (%):	4.3
		Total Weight Retained After Sieving (g):	540.97

The % Difference in Weight of the Dry,Washed Sample vs the Total Weight Retained After Sieving (%): 0.0

(% Difference must not be more than 0.3)

Sieve	Sieve Opening (mm)	Weight Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)
6"	150	0.00	0	0	100
4"	100	0.00	0	0	100
3"	75	0.00	0	0	100
2 1/2"	63	0.00	0	0	100
2"	50	0.00	0	0	100
1 1/2"	37.50	0.00	0	0	100
1"	25.00	0.00	0	0	100
3/4"	19.00	0.00	0	0	100
1/2"	12.50	9.20	2	2	98
3/8"	9.50	11.44	2	4	96
#4	4.75	47.44	8	12	88
#8	2.36	101.73	18	30	70
#16	1.18	142.12	25	55	45
#30	0.60	79.60	14	69	31
#50	0.30	51.05	9	78	22
#100	0.15	43.44	8	86	14
#200	0.075	35.90	6.4	92.4	7.6
Pan	-	19.05	3	96	-

Tested By DF Date 6/6/23 Checked By KC Date 6/6/23

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RIGID WALL CONSTANT HEAD PERMEABILITY

ASTM D 2434-68 (2006)

Client	GAI Consultants, Inc.	Boring No.	5/25/23
Client Reference	AEP Amos Seq. 4 C130109.27	Depth (ft)	Stockpile
Project No.	2023-370-001	Sample No.	52523-2
Lab ID	2023-370-001-001	Visual	Black Ash

Unit Weight

Weight of Wet Material (g)	887
Average Length (in)	7.5
Permeameter Diameter (in)	2.94
Sample Volume (cm^3)	834.3
Unit Dry Weight (g/cm^3)	0.96
Unit Dry Weight (pcf)	60.1

Water Content

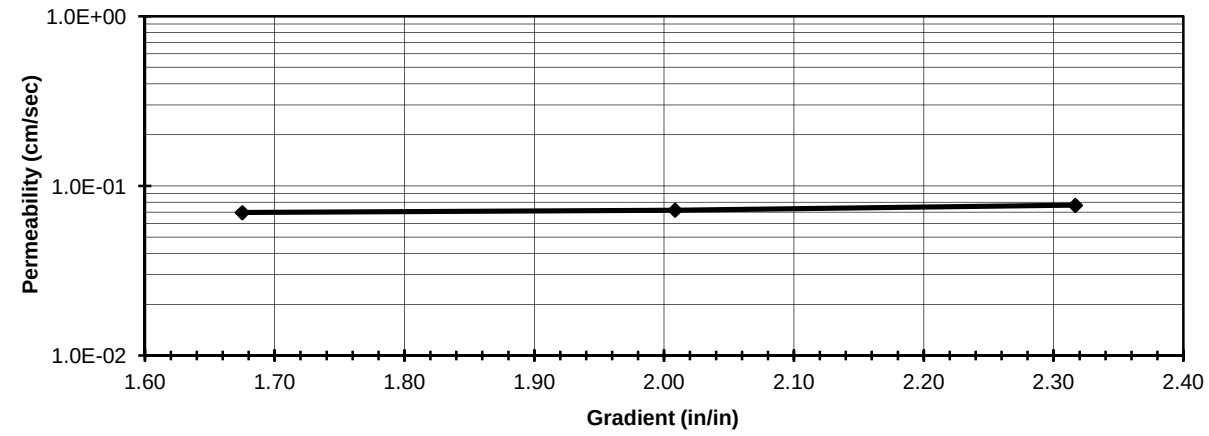
Tare Number	3530
Weight of Tare & Wet Material (g)	126.66
Weight of Tare & Dry Material (g)	115.52
Weight of Tare (g)	8.05
Weight of Water (g)	11.14
Weight of Dry Material (g)	107.47

	Test 1	Test 2	Test 3
Piezometer Spacing (in)	***3***	***3***	***3***
Temperature (^{o} C)	*23.1*	*23.3*	*23.6*
Temp. Correction Factor	*0.9290*	*0.9247*	*0.9183*

Water Content (%) ***10.4*** *(Measured)*

Load (psf) ***0***

Test No.	Replicate No.	Head (in)	Gradient (in/in)	Elapsed Time (sec)	Collected Volume (ml)	Collected Volume (cm^3)	Permeability 20^o C (cm/s)	Average Permeability (cm/s)
1	1	5.03	1.68	30.0	165.0	165.0	7.0E-02	
1	2	5.03	1.68	30.0	165.3	165.3	7.0E-02	**7.0E-02**
1	3	5.03	1.68	30.0	165.2	165.2	7.0E-02	
2	1	6.03	2.01	30.0	205.1	205.1	7.2E-02	
2	2	6.03	2.01	30.0	205.7	205.7	7.2E-02	**7.2E-02**
2	3	6.03	2.01	30.0	205.5	205.5	7.2E-02	
3	1	6.95	2.32	30.0	254.8	254.8	7.7E-02	
3	2	6.95	2.32	30.0	255.2	255.2	7.7E-02	**7.7E-02**
3	3	6.95	2.32	30.0	255.3	255.3	7.7E-02	



Tested By WT Date 6/7/23 Checked By KC Date 6/8/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-3
Lab ID:	2023-370-001-002	Color:	Dark Gray

USCS Symbol:
sw-sm, ASSUMED

Fineness Modulus:
3.05

D60 =	**1.55**				
D30 =	**0.36**	**CC =**	**1.01**
D10 =	**0.08**	**CU =**	**18.52**

USCS Classification:
WELL-GRADED SAND WITH SILT

Tested By	DF	Date	6/6/23	Checked By	KC	Date	6/6/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-3
Lab ID:	2023-370-001-002	Color:	Dark Gray

Washed using Wetting Agent: No

Tare No.:	2035	Weight of Dry Sample (g):	574.49
Wt. of Tare & Dry Sample (Pre-Wash), (g):	721.72	Weight of + #200 Sample (g):	525.86
Weight of Tare & Dry,Washed Sample (g):	684.78	Weight of - #200 Sample (g):	49.24
Weight of Tare (g):	147.23		
Weight of Dry,Washed Sample (g):	537.55	% Passing #200 Sieve by Washing (%):	6.4
		Total Weight Retained After Sieving (g):	538.16

The % Difference in Weight of the Dry,Washed Sample vs the Total Weight Retained After Sieving (%): -0.1

(% Difference must not be more than 0.3)

Sieve	Sieve Opening (mm)	Weight Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)
6"	150	0.00	0	0	100
4"	100	0.00	0	0	100
3"	75	0.00	0	0	100
2 1/2"	63	0.00	0	0	100
2"	50	0.00	0	0	100
1 1/2"	37.50	0.00	0	0	100
1"	25.00	0.00	0	0	100
3/4"	19.00	0.00	0	0	100
1/2"	12.50	4.33	1	1	99
3/8"	9.50	4.87	1	2	98
#4	4.75	51.52	9	11	89
#8	2.36	94.60	16	27	73
#16	1.18	122.93	21	48	52
#30	0.60	85.54	15	63	37
#50	0.30	52.60	9	72	28
#100	0.15	54.01	9	82	18
#200	0.075	55.46	9.7	91.5	8.5
Pan	-	12.30	2	94	-

Tested By DF Date 6/6/23 Checked By KC Date 6/6/23

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RIGID WALL CONSTANT HEAD PERMEABILITY

ASTM D 2434-68 (2006)

Client	GAI Consultants, Inc.	Boring No.	5/25/23
Client Reference	AEP Amos Seq. 4 C130109.27	Depth (ft)	Stockpile
Project No.	2023-370-001	Sample No.	52523-3
Lab ID	2023-370-001-002	Visual	Black Ash

Unit Weight

Weight of Wet Material (g)	918
Average Length (in)	7.5
Permeameter Diameter (in)	2.94
Sample Volume (cm^3)	834.3
Unit Dry Weight (g/cm^3)	1.01
Unit Dry Weight (pcf)	63.2

Water Content

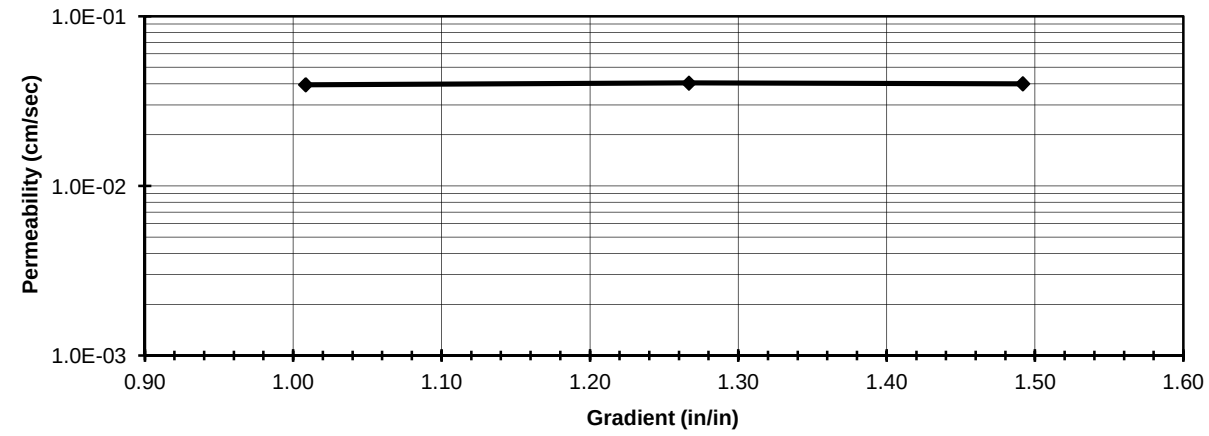
Tare Number	3502
Weight of Tare & Wet Material (g)	187.42
Weight of Tare & Dry Material (g)	173.18
Weight of Tare (g)	8.12
Weight of Water (g)	14.24
Weight of Dry Material (g)	165.06

	Test 1	Test 2	Test 3
Piezometer Spacing (in)	***3***	***3***	***3***
Temperature (^{o} C)	*23.1*	*23.5*	*23.8*
Temp. Correction Factor	*0.9290*	*0.9204*	*0.9140*

Water Content (%) ***8.6*** *(Measured)*

Load (psf) ***0***

Test No.	Replicate No.	Head (in)	Gradient (in/in)	Elapsed Time (sec)	Collected Volume (ml)	Collected Volume (cm^3)	Permeability 20^o C (cm/s)	Average Permeability (cm/s)
1	1	3.03	1.01	30.0	55.9	55.9	3.9E-02	
1	2	3.03	1.01	30.0	56.3	56.3	3.9E-02	**3.9E-02**
1	3	3.03	1.01	30.0	56.7	56.7	4.0E-02	
2	1	3.80	1.27	30.0	73.2	73.2	4.0E-02	
2	2	3.80	1.27	30.0	73.1	73.1	4.0E-02	**4.0E-02**
2	3	3.80	1.27	30.0	73.1	73.1	4.0E-02	
3	1	4.48	1.49	30.0	85.9	85.9	4.0E-02	
3	2	4.48	1.49	30.0	85.6	85.6	4.0E-02	**4.0E-02**
3	3	4.48	1.49	30.0	86.0	86.0	4.0E-02	



Tested By WT Date 6/6/23 Checked By KC Date 6/6/23

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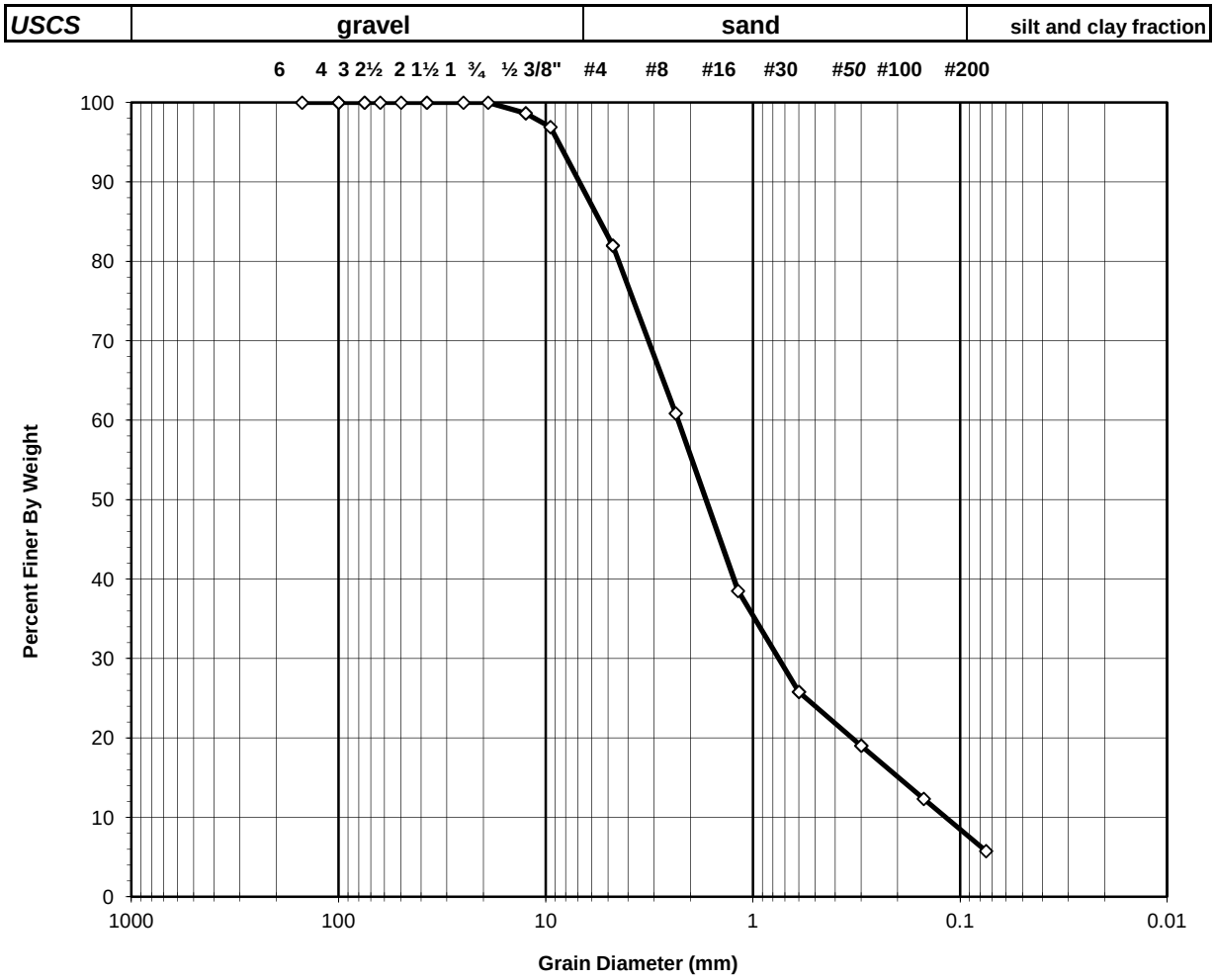
WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-4
Lab ID:	2023-370-001-003	Color:	Dark Gray



USCS Symbol:
sw-sm, ASSUMED

Fineness Modulus:
3.65

D60	**=**	**2.30**			
D30	**=**	**0.75**	**CC**	**=**	**2.09**
D10	**=**	**0.12**	**CU**	**=**	**19.62**

USCS Classification:
WELL-GRADED SAND WITH SILT AND GRAVEL

Tested By	DF	Date	6/6/23	Checked By	KC	Date	6/6/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-4
Lab ID:	2023-370-001-003	Color:	Dark Gray

Washed using Wetting Agent: No

Tare No.:	1466	Weight of Dry Sample (g):	633.38
Wt. of Tare & Dry Sample (Pre-Wash), (g):	774.80	Weight of + #200 Sample (g):	596.84
Weight of Tare & Dry,Washed Sample (g):	744.42	Weight of - #200 Sample (g):	36.19
Weight of Tare (g):	141.42		
Weight of Dry,Washed Sample (g):	603.00	% Passing #200 Sieve by Washing (%):	4.8
		Total Weight Retained After Sieving (g):	602.65

The % Difference in Weight of the Dry,Washed Sample vs the Total Weight Retained After Sieving (%): 0.1

(% Difference must not be more than 0.3)

Sieve	Sieve Opening (mm)	Weight Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)
6"	150	0.00	0	0	100
4"	100	0.00	0	0	100
3"	75	0.00	0	0	100
2 1/2"	63	0.00	0	0	100
2"	50	0.00	0	0	100
1 1/2"	37.50	0.00	0	0	100
1"	25.00	0.00	0	0	100
3/4"	19.00	0.00	0	0	100
1/2"	12.50	8.52	1	1	99
3/8"	9.50	11.00	2	3	97
#4	4.75	94.51	15	18	82
#8	2.36	133.80	21	39	61
#16	1.18	141.57	22	61	39
#30	0.60	80.55	13	74	26
#50	0.30	42.94	7	81	19
#100	0.15	42.25	7	88	12
#200	0.075	41.70	6.6	94.2	5.8
Pan	-	5.81	1	95	-

Tested By DF Date 6/6/23 Checked By KC Date 6/6/23

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RIGID WALL CONSTANT HEAD PERMEABILITY

ASTM D 2434-68 (2006)

Client	GAI Consultants, Inc.	Boring No.	5/25/23
Client Reference	AEP Amos Seq. 4 C130109.27	Depth (ft)	Stockpile
Project No.	2023-370-001	Sample No.	52523-4
Lab ID	2023-370-001-003	Visual	Black Ash

Unit Weight

Weight of Wet Material (g)	1014
Average Length (in)	7.5
Permeameter Diameter (in)	2.94
Sample Volume (cm^3)	834.3
Unit Dry Weight (g/cm^3)	1.15
Unit Dry Weight (pcf)	71.7

Water Content

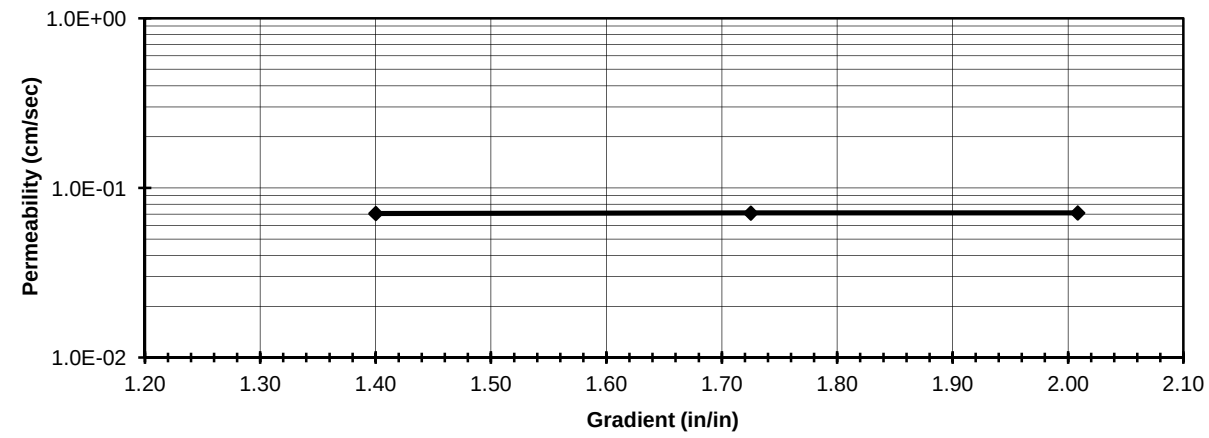
Tare Number	3250
Weight of Tare & Wet Material (g)	144.86
Weight of Tare & Dry Material (g)	137.45
Weight of Tare (g)	8.11
Weight of Water (g)	7.41
Weight of Dry Material (g)	129.34

	Test 1	Test 2	Test 3
Piezometer Spacing (in)	***3***	***3***	***3***
Temperature (^{o} C)	*23.9*	*23.9*	*24.1*
Temp. Correction Factor	*0.9119*	*0.9119*	*0.9077*

Water Content (%) ***5.7*** *(Measured)*

Load (psf) ***0***

Test No.	Replicate No.	Head (in)	Gradient (in/in)	Elapsed Time (sec)	Collected Volume (ml)	Collected Volume (cm^3)	Permeability 20^o C (cm/s)	Average Permeability (cm/s)
1	1	4.20	1.40	30.0	142.2	142.2	7.1E-02	
1	2	4.20	1.40	30.0	142.6	142.6	7.1E-02	**7.1E-02**
1	3	4.20	1.40	30.0	143.0	143.0	7.1E-02	
2	1	5.18	1.73	30.0	176.9	176.9	7.1E-02	
2	2	5.18	1.73	30.0	177.1	177.1	7.1E-02	**7.1E-02**
2	3	5.18	1.73	30.0	176.6	176.6	7.1E-02	
3	1	6.03	2.01	30.0	206.9	206.9	7.1E-02	
3	2	6.03	2.01	30.0	207.3	207.3	7.1E-02	**7.1E-02**
3	3	6.03	2.01	30.0	207.5	207.5	7.1E-02	



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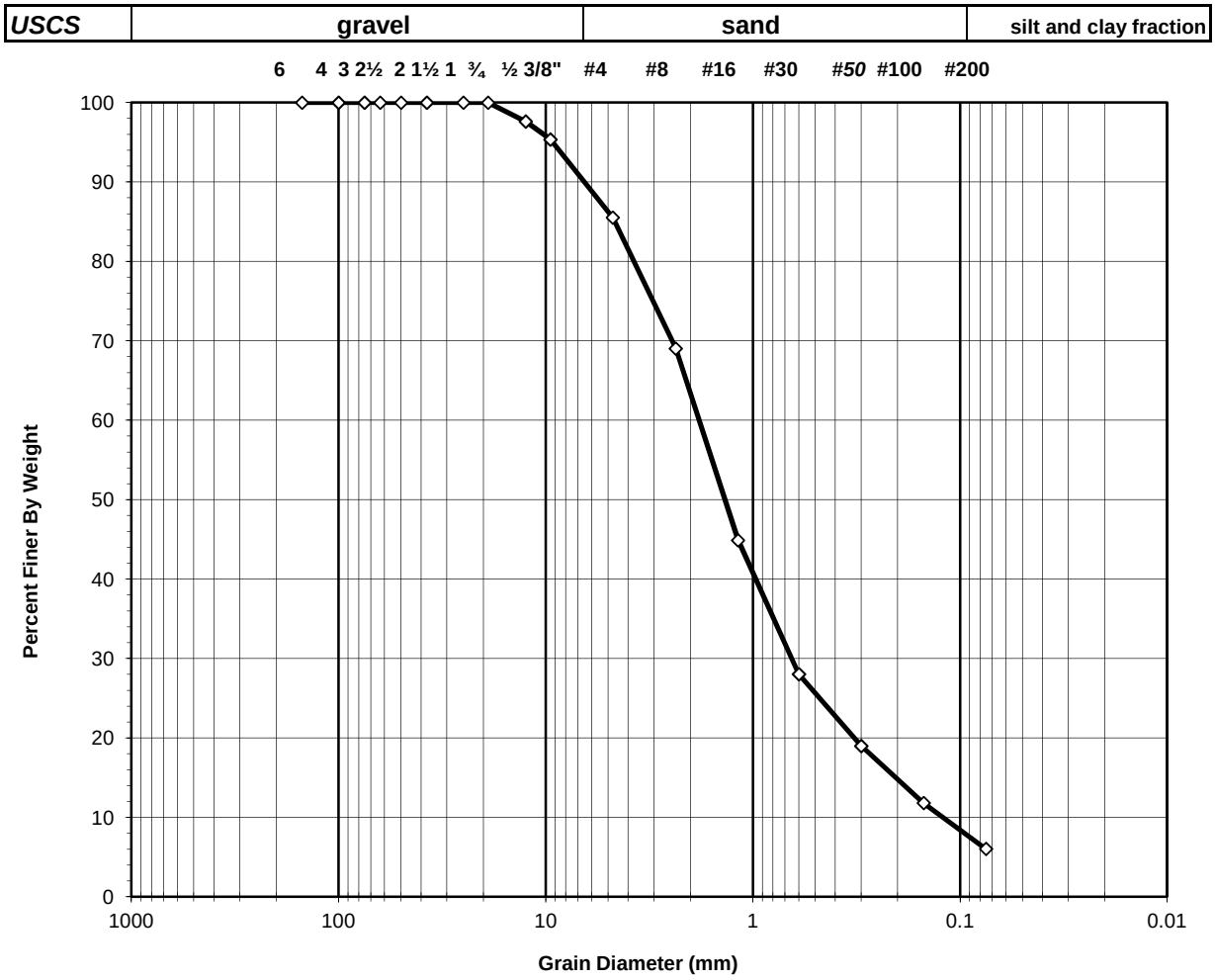
WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-5
Lab ID:	2023-370-001-004	Color:	Dark Gray



USCS Symbol:
sw-sm, ASSUMED

Fineness Modulus:
3.46

D60 = 1.82

D30 = 0.65 **CC = 1.92**

D10 = 0.12 **CU = 15.08**

USCS Classification:
WELL-GRADED SAND WITH SILT

Tested By DF Date 6/6/23 Checked By KC Date 6/6/23

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WASH SIEVE ANALYSIS OF AGGREGATES

ASTM C117-17 / C136-19

Client:	GAI Consultants, Inc.	Boring No.:	5/25/23
Client Reference:	AEP Amos Seq. 4 C130109.27	Depth (ft):	Stockpile
Project No.:	2023-370-001	Sample No.:	52523-5
Lab ID:	2023-370-001-004	Color:	Dark Gray

Washed using Wetting Agent: No

Tare No.:	1456	Weight of Dry Sample (g):	478.40
Wt. of Tare & Dry Sample (Pre-Wash), (g):	608.74	Weight of + #200 Sample (g):	449.54
Weight of Tare & Dry,Washed Sample (g):	587.44	Weight of - #200 Sample (g):	28.67
Weight of Tare (g):	130.34		
Weight of Dry,Washed Sample (g):	457.10	% Passing #200 Sieve by Washing (%):	4.5
		Total Weight Retained After Sieving (g):	456.91

The % Difference in Weight of the Dry,Washed Sample vs the Total Weight Retained After Sieving (%): 0.0

(% Difference must not be more than 0.3)

Sieve	Sieve Opening (mm)	Weight Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)
6"	150	0.00	0	0	100
4"	100	0.00	0	0	100
3"	75	0.00	0	0	100
2 1/2"	63	0.00	0	0	100
2"	50	0.00	0	0	100
1 1/2"	37.50	0.00	0	0	100
1"	25.00	0.00	0	0	100
3/4"	19.00	0.00	0	0	100
1/2"	12.50	11.40	2	2	98
3/8"	9.50	10.86	2	5	95
#4	4.75	47.00	10	14	86
#8	2.36	78.86	16	31	69
#16	1.18	115.47	24	55	45
#30	0.60	80.71	17	72	28
#50	0.30	43.24	9	81	19
#100	0.15	34.38	7	88	12
#200	0.075	27.62	5.8	94.0	6.0
Pan	-	7.37	2	96	-

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RIGID WALL CONSTANT HEAD PERMEABILITY

ASTM D 2434-68 (2006)

Client	GAI Consultants, Inc.	Boring No.	5/25/23
Client Reference	AEP Amos Seq. 4 C130109.27	Depth (ft)	Stockpile
Project No.	2023-370-001	Sample No.	52523-5
Lab ID	2023-370-001-004	Visual	Black Ash

Unit Weight

Weight of Wet Material (g)	806
Average Length (in)	7.5
Permeameter Diameter (in)	2.94
Sample Volume (cm^3)	834.3
Unit Dry Weight (g/cm^3)	0.82
Unit Dry Weight (pcf)	50.9

Water Content

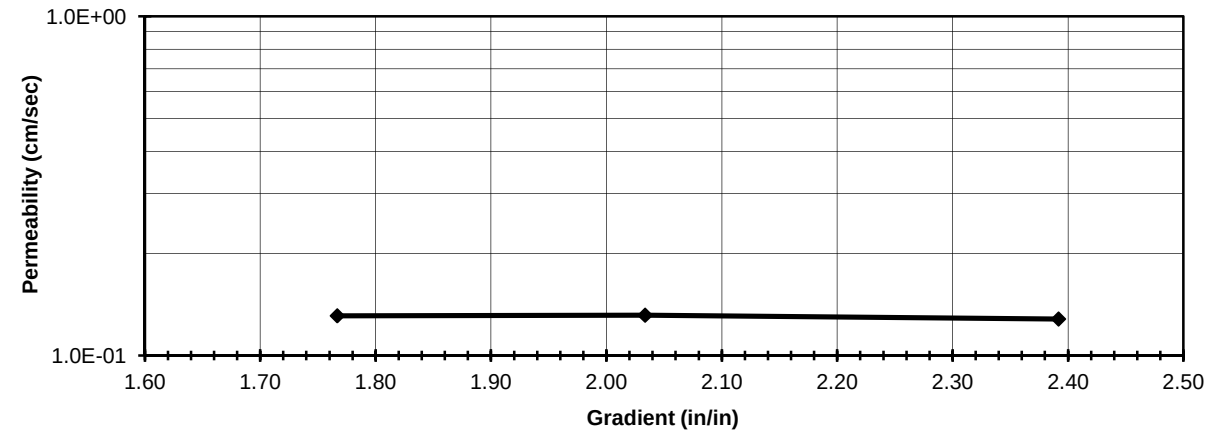
Tare Number	3295
Weight of Tare & Wet Material (g)	174.18
Weight of Tare & Dry Material (g)	148.39
Weight of Tare (g)	8.32
Weight of Water (g)	25.79
Weight of Dry Material (g)	140.07

	Test 1	Test 2	Test 3
Piezometer Spacing (in)	***3***	***3***	***3***
Temperature (^{o} C)	*23.2*	*23.5*	*23.8*
Temp. Correction Factor	*0.9268*	*0.9204*	*0.9140*

Water Content (%) ***18.4*** *(Measured)*

Load (psf) ***0***

Test No.	Replicate No.	Head (in)	Gradient (in/in)	Elapsed Time (sec)	Collected Volume (ml)	Collected Volume (cm^3)	Permeability 20^o C (cm/s)	Average Permeability (cm/s)
1	1	5.30	1.77	30.0	328.4	328.4	1.3E-01	
1	2	5.30	1.77	30.0	327.9	327.9	1.3E-01	**1.3E-01**
1	3	5.30	1.77	30.0	328.2	328.2	1.3E-01	
2	1	6.10	2.03	30.0	381.9	381.9	1.3E-01	
2	2	6.10	2.03	30.0	381.8	381.8	1.3E-01	**1.3E-01**
2	3	6.10	2.03	30.0	382.1	382.1	1.3E-01	
3	1	7.18	2.39	30.0	442.2	442.2	1.3E-01	
3	2	7.18	2.39	30.0	441.0	441.0	1.3E-01	**1.3E-01**
3	3	7.18	2.39	30.0	439.6	439.6	1.3E-01	



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Appendix C
Record Drawings and Certification Points

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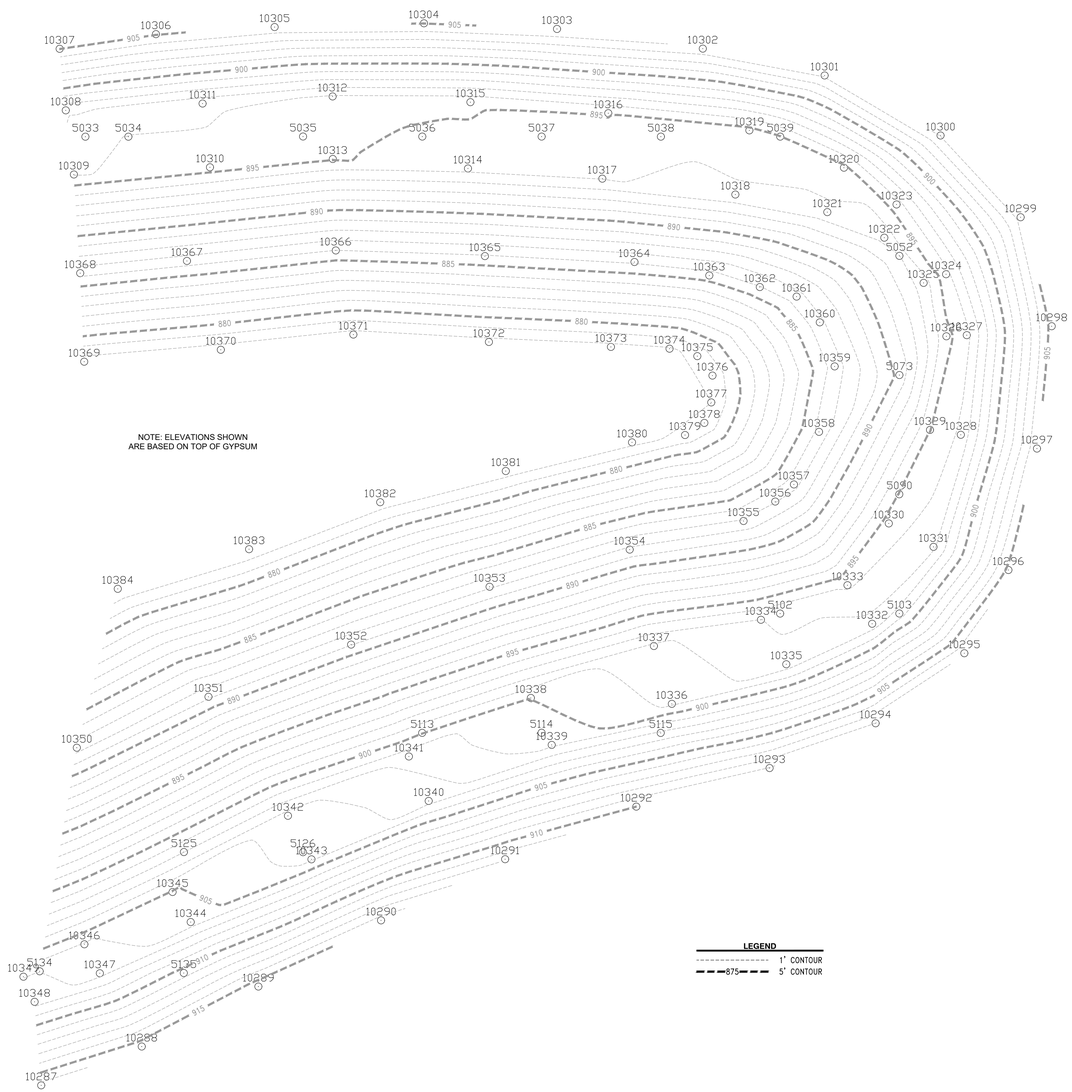
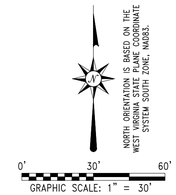
transforming ideas into reality

POINT #	ASBUILT NORTHING	ASBUILT EASTING	ASBUILT ELEVATION	DESCRIPTION
5033	542149.98	1724808.75	896.15	PHASE 2 PROTECTIVE COVER CERT
5034	542149.97	1724826.78	895.98	PHASE 2 PROTECTIVE COVER CERT
5035	542150.05	1724900.00	895.02	PHASE 2 PROTECTIVE COVER CERT
5036	542150.02	1724949.99	894.76	PHASE 2 PROTECTIVE COVER CERT
5037	542150.01	1725000.01	894.24	PHASE 2 PROTECTIVE COVER CERT
5038	542149.99	1725050.01	894.14	PHASE 2 PROTECTIVE COVER CERT
5039	542150.00	1725100.03	894.95	PHASE 2 PROTECTIVE COVER CERT
5052	542099.99	1725150.03	892.95	PHASE 2 PROTECTIVE COVER CERT
5073	542050.02	1725150.02	890.32	PHASE 2 PROTECTIVE COVER CERT
5090	542000.01	1725149.98	895.08	PHASE 2 PROTECTIVE COVER CERT
5102	541949.99	1725100.02	896.73	PHASE 2 PROTECTIVE COVER CERT
5103	541950.02	1725149.98	898.46	PHASE 2 PROTECTIVE COVER CERT
5113	541899.97	1724949.94	899.94	PHASE 2 PROTECTIVE COVER CERT
5114	541900.02	1724999.98	900.28	PHASE 2 PROTECTIVE COVER CERT
5115	541899.96	1725049.94	902.18	PHASE 2 PROTECTIVE COVER CERT
5125	541850.01	1724850.05	901.98	PHASE 2 PROTECTIVE COVER CERT
5126	541849.96	1724899.98	903.64	PHASE 2 PROTECTIVE COVER CERT
5134	541800.00	1724789.58	906.98	PHASE 2 PROTECTIVE COVER CERT
5135	541799.28	1724849.99	910.55	PHASE 2 PROTECTIVE COVER CERT
10287	541752.18	1724790.23	916.32	SURFACE SPOT SHOT
10288	541768.45	1724832.37	915.62	SURFACE SPOT SHOT
10289	541793.59	1724881.28	915.74	SURFACE SPOT SHOT
10290	541821.34	1724932.68	914.51	SURFACE SPOT SHOT
10291	541846.99	1724984.73	911.87	SURFACE SPOT SHOT
10292	541869.05	1725039.71	910.00	SURFACE SPOT SHOT
10293	541885.23	1725095.60	909.05	SURFACE SPOT SHOT
10294	541903.99	1725140.03	908.01	SURFACE SPOT SHOT
10295	541933.38	1725177.25	906.81	SURFACE SPOT SHOT
10296	541968.28	1725195.71	905.28	SURFACE SPOT SHOT
10297	542019.20	1725207.69	904.76	SURFACE SPOT SHOT
10298	542070.49	1725213.86	905.37	SURFACE SPOT SHOT
10299	542116.20	1725200.84	904.40	SURFACE SPOT SHOT
10300	542150.48	1725167.27	904.07	SURFACE SPOT SHOT
10301	542175.65	1725118.65	903.17	SURFACE SPOT SHOT
10302	542186.91	1725067.60	903.69	SURFACE SPOT SHOT
10303	542195.16	1725006.48	904.96	SURFACE SPOT SHOT
10304	542197.53	1724950.71	905.03	SURFACE SPOT SHOT
10305	542195.94	1724888.06	904.73	SURFACE SPOT SHOT
10306	542192.97	1724838.33	905.09	SURFACE SPOT SHOT
10307	542186.82	1724797.94	905.02	SURFACE SPOT SHOT
10308	542161.02	1724800.51	897.21	SURFACE SPOT SHOT
10309	542134.13	1724803.92	896.08	SURFACE SPOT SHOT
10310	542137.15	1724860.97	895.50	SURFACE SPOT SHOT
10311	542163.88	1724857.87	896.30	SURFACE SPOT SHOT
10312	542166.85	1724912.38	895.88	SURFACE SPOT SHOT
10313	542140.63	1724912.46	895.11	SURFACE SPOT SHOT
10314	542136.65	1724969.14	894.35	SURFACE SPOT SHOT
10315	542164.46	1724970.18	895.23	SURFACE SPOT SHOT
10316	542159.83	1725027.96	895.07	SURFACE SPOT SHOT
10317	542132.38	1725025.46	894.04	SURFACE SPOT SHOT
10318	542125.72	1725081.25	893.82	SURFACE SPOT SHOT
10319	542152.63	1725087.11	894.63	SURFACE SPOT SHOT
10320	542136.97	1725126.76	894.68	SURFACE SPOT SHOT
10321	542118.35	1725119.78	893.76	SURFACE SPOT SHOT
10322	542107.62	1725143.69	893.37	SURFACE SPOT SHOT
10323	542121.55	1725148.82	895.49	SURFACE SPOT SHOT
10324	542092.29	1725169.58	895.66	SURFACE SPOT SHOT
10325	542088.68	1725160.17	893.55	SURFACE SPOT SHOT
10326	542066.27	1725169.71	894.73	SURFACE SPOT SHOT

POINT #	ASBUILT NORTHING	ASBUILT EASTING	ASBUILT ELEVATION	DESCRIPTION
10327	542066.74	1725178.27	895.62	SURFACE SPOT SHOT
10328	542024.98	1725175.78	896.20	SURFACE SPOT SHOT
10329	542027.03	1725162.84	894.97	SURFACE SPOT SHOT
10330	541987.79	1725145.56	895.54	SURFACE SPOT SHOT
10331	541977.97	1725164.32	896.76	SURFACE SPOT SHOT
10332	541945.71	1725138.60	897.34	SURFACE SPOT SHOT
10333	541961.91	1725128.23	895.87	SURFACE SPOT SHOT
10334	541947.40	1725091.97	897.02	SURFACE SPOT SHOT
10335	541928.75	1725102.58	897.39	SURFACE SPOT SHOT
10336	541912.15	1725054.61	898.82	SURFACE SPOT SHOT
10337	541936.39	1725047.10	898.24	SURFACE SPOT SHOT
10338	541914.62	1724995.50	899.97	SURFACE SPOT SHOT
10339	541894.92	1725004.23	900.79	SURFACE SPOT SHOT
10340	541871.43	1724952.67	902.60	SURFACE SPOT SHOT
10341	541890.07	1724944.38	901.66	SURFACE SPOT SHOT
10342	541865.19	1724893.66	903.48	SURFACE SPOT SHOT
10343	541846.96	1724903.51	903.84	SURFACE SPOT SHOT
10344	541820.64	1724852.90	905.45	SURFACE SPOT SHOT
10345	541833.25	1724845.29	905.11	SURFACE SPOT SHOT
10346	541811.32	1724808.32	906.12	SURFACE SPOT SHOT
10347	541799.17	1724814.80	906.62	SURFACE SPOT SHOT
10348	541787.19	1724787.45	907.54	SURFACE SPOT SHOT
10349	541797.71	1724782.77	906.97	SURFACE SPOT SHOT
10350	541893.75	1724805.16	887.54	SURFACE SPOT SHOT
10351	541915.10	1724860.36	888.82	SURFACE SPOT SHOT
10352	541936.99	1724920.15	888.95	SURFACE SPOT SHOT
10353	541961.25	1724978.20	887.84	SURFACE SPOT SHOT
10354	541976.82	1725036.95	888.26	SURFACE SPOT SHOT
10355	541988.83	1725084.66	887.12	SURFACE SPOT SHOT
10356	541996.97	1725097.98	886.93	SURFACE SPOT SHOT
10357	542004.15	1725105.79	886.60	SURFACE SPOT SHOT
10358	542026.21	1725116.32	886.28	SURFACE SPOT SHOT
10359	542053.65	1725122.87	886.48	SURFACE SPOT SHOT
10360	542072.13	1725116.63	886.72	SURFACE SPOT SHOT
10361	542082.92	1725106.91	886.59	SURFACE SPOT SHOT
10362	542086.93	1725091.49	885.94	SURFACE SPOT SHOT
10363	542091.77	1725070.32	885.56	SURFACE SPOT SHOT
10364	542097.43	1725038.95	886.14	SURFACE SPOT SHOT
10365	542099.90	1724976.24	885.90	SURFACE SPOT SHOT
10366	542102.28	1724913.73	885.98	SURFACE SPOT SHOT
10367	542097.88	1724851.32	886.48	SURFACE SPOT SHOT
10368	542092.74	1724806.57	886.34	SURFACE SPOT SHOT
10369	542055.63	1724808.26	877.44	SURFACE SPOT SHOT
10370	542060.62	1724865.53	877.47	SURFACE SPOT SHOT
10371	542067.01	1724921.11	877.60	SURFACE SPOT SHOT
10372	542063.90	1724977.91	877.62	SURFACE SPOT SHOT
10373	542061.82	1725029.07	877.65	SURFACE SPOT SHOT
10374	542061.07	1725053.64	877.86	SURFACE SPOT SHOT
10375	542057.94	1725065.28	878.22	SURFACE SPOT SHOT
10376	542049.79	1725071.63	878.23	SURFACE SPOT SHOT
10377	542038.55	1725071.13	877.99	SURFACE SPOT SHOT
10378	542029.95	1725068.23	878.08	SURFACE SPOT SHOT
10379	542024.88	1725060.15	878.23	SURFACE SPOT SHOT
10380	542021.79	1725037.92	877.66	SURFACE SPOT SHOT
10381	542009.77	1724984.99	877.41	SURFACE SPOT SHOT
10382	541996.71	1724932.34	877.34	SURFACE SPOT SHOT
10383	541976.99	1724877.38	877.06	SURFACE SPOT SHOT
10384	541960.38	1724822.33	877.04	SURFACE SPOT SHOT





DANA A. EXLINE
PROFESSIONAL SURVEYOR #928
STATE OF WEST VIRGINIA
DATE: 4/24/24

REV.	DESCRIPTION	DATE
0	PHASE 2 PROTECTIVE COVER ASBUILT	4-24-24

EXLINE SURVEYING, INC.
10356 STATE ROUTE 139
JACKSON, OHIO 45640
PHONE: (740) 286-7024 • TELECOPIER (740) 286-0012

PHASE 2 PROTECTIVE COVER ASBUILT
FOR
ENTACT, LLC

SEQUENCE 4
PHASE 2 PROTECTIVE COVER
ASBUILT
JOHN E. AMOS PLANT
WINFIELD, WEST VIRGINIA

DRAWING SCALE:
1" = 30'

TITLE RESEARCH:
N/A

CALCULATED BY:
P. TAYLOR

DRAWN BY:
P. TAYLOR

CHECKED BY:
D. EXLINE

DRAWING NUMBER
23033A PHASE 2
PROTECTIVE COVER

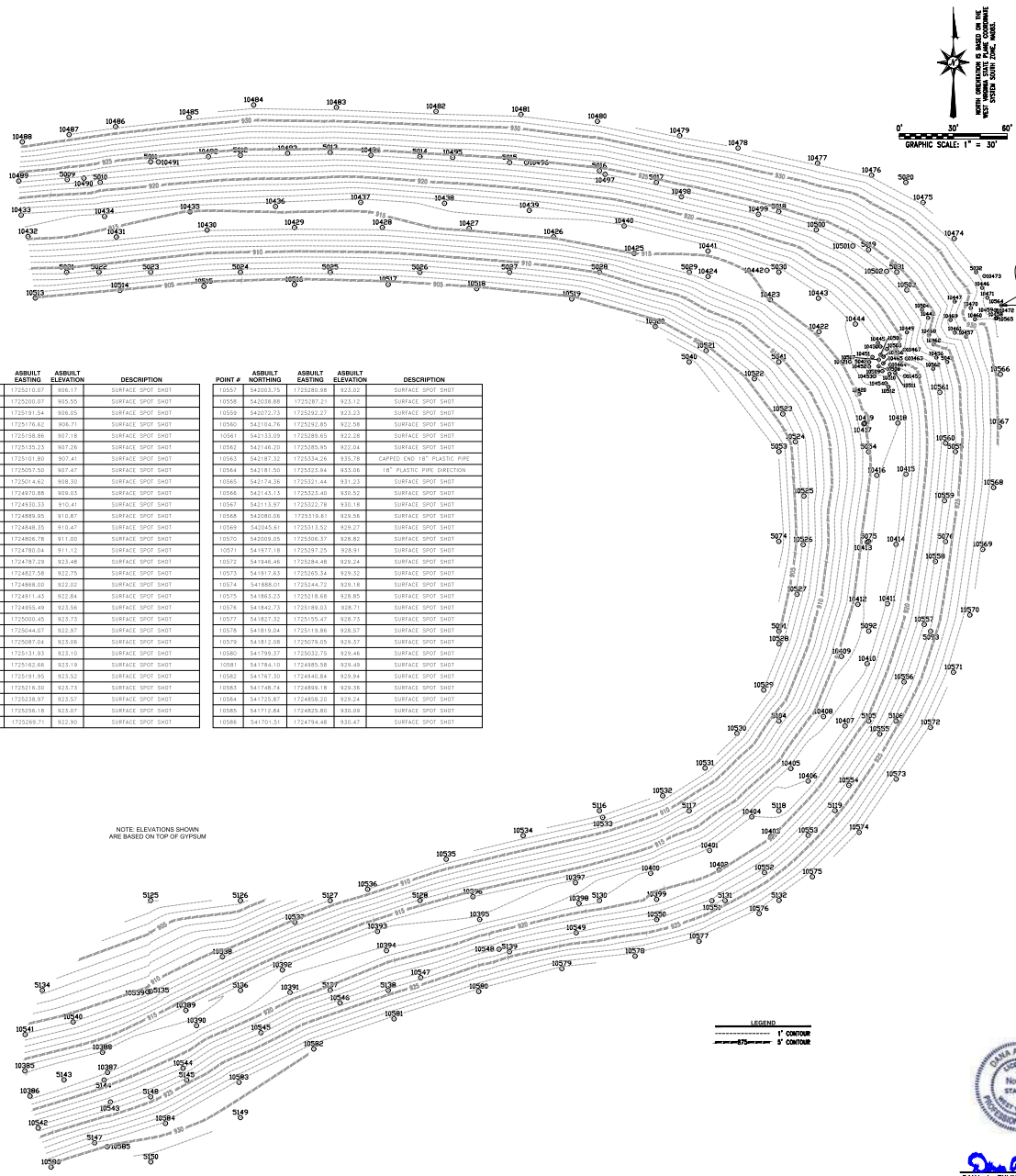
SHEET NUMBER
1 OF 1

POINT #	ASBUILT NORTHING	ASBUILT EASTING	ASBUILT ELEVATION	DESCRIPTION
5009	542251.61	1724853.48	922.10	PHASE 3 PROTECTIVE COVER ASB
5010	542250.07	1724821.86	921.36	PHASE 3 PROTECTIVE COVER ASB
5011	542261.44	1724849.96	924.12	PHASE 3 PROTECTIVE COVER ASB
5012	542265.14	1724900.01	924.02	PHASE 3 PROTECTIVE COVER ASB
5013	542266.70	1724949.96	924.52	PHASE 3 PROTECTIVE COVER ASB
5014	542264.41	1725000.00	924.38	PHASE 3 PROTECTIVE COVER ASB
5015	542261.04	1725049.98	924.26	PHASE 3 PROTECTIVE COVER ASB
5016	542256.51	1725100.04	924.49	PHASE 3 PROTECTIVE COVER ASB
5017	542250.80	1725151.74	924.58	PHASE 3 PROTECTIVE COVER ASB
5018	542233.76	1725199.92	924.34	PHASE 3 PROTECTIVE COVER ASB
5019	542212.56	1725249.96	924.41	PHASE 3 PROTECTIVE COVER ASB
5020	542250.00	1725270.71	934.54	PHASE 3 PROTECTIVE COVER ASB
5021	542199.94	1724803.17	909.23	PHASE 3 PROTECTIVE COVER ASB
5022	542200.05	1724821.17	908.67	PHASE 3 PROTECTIVE COVER ASB
5023	542200.02	1724850.02	907.64	PHASE 3 PROTECTIVE COVER ASB
5024	542199.98	1724899.98	906.42	PHASE 3 PROTECTIVE COVER ASB
5025	542199.96	1724950.00	906.28	PHASE 3 PROTECTIVE COVER ASB
5026	542199.97	1724999.97	906.84	PHASE 3 PROTECTIVE COVER ASB
5027	542199.98	1725049.96	908.08	PHASE 3 PROTECTIVE COVER ASB
5028	542200.04	1725100.05	910.12	PHASE 3 PROTECTIVE COVER ASB
5029	542200.00	1725150.07	914.26	PHASE 3 PROTECTIVE COVER ASB
5030	542200.04	1725199.98	915.42	PHASE 3 PROTECTIVE COVER ASB
5031	542200.07	1725265.71	924.36	PHASE 3 PROTECTIVE COVER ASB
5032	542199.98	1725309.88	931.67	PHASE 3 PROTECTIVE COVER ASB
5040	542149.98	1725150.01	901.47	PHASE 3 PROTECTIVE COVER ASB
5041	542150.01	1725199.98	909.43	PHASE 3 PROTECTIVE COVER ASB
5042	542149.94	1725250.29	917.30	PHASE 3 PROTECTIVE COVER ASB
5043	542149.89	1725293.76	924.20	PHASE 3 PROTECTIVE COVER ASB
5053	542100.09	1725200.03	903.07	PHASE 3 PROTECTIVE COVER ASB
5054	542099.99	1725249.96	914.74	PHASE 3 PROTECTIVE COVER ASB
5055	542100.00	1725298.29	924.16	PHASE 3 PROTECTIVE COVER ASB
5074	542050.04	1725199.94	902.25	PHASE 3 PROTECTIVE COVER ASB
5075	542050.02	1725250.02	915.87	PHASE 3 PROTECTIVE COVER ASB
5076	542049.94	1725292.85	924.17	PHASE 3 PROTECTIVE COVER ASB
5091	542000.00	1725199.99	904.86	PHASE 3 PROTECTIVE COVER ASB
5092	542000.08	1725250.04	916.23	PHASE 3 PROTECTIVE COVER ASB
5093	541999.96	1725284.51	924.16	PHASE 3 PROTECTIVE COVER ASB
5104	541949.98	1725200.01	911.37	PHASE 3 PROTECTIVE COVER ASB
5105	541949.99	1725250.05	920.53	PHASE 3 PROTECTIVE COVER ASB
5106	541950.00	1725265.21	924.39	PHASE 3 PROTECTIVE COVER ASB
5116	541900.03	1725099.98	905.98	PHASE 3 PROTECTIVE COVER ASB
5117	541899.98	1725149.98	912.13	PHASE 3 PROTECTIVE COVER ASB
5118	541899.97	1725199.99	918.74	PHASE 3 PROTECTIVE COVER ASB
5119	541900.04	1725231.25	924.32	PHASE 3 PROTECTIVE COVER ASB
5125	541850.04	1724849.97	901.86	PHASE 3 PROTECTIVE COVER ASB
5126	541849.98	1724899.96	903.54	PHASE 3 PROTECTIVE COVER ASB
5127	541849.97	1724949.96	909.08	PHASE 3 PROTECTIVE COVER ASB
5128	541850.03	1725000.03	914.16	PHASE 3 PROTECTIVE COVER ASB
5130	541850.00	1725100.02	919.05	PHASE 3 PROTECTIVE COVER ASB
5131	541849.99	1725169.96	924.53	PHASE 3 PROTECTIVE COVER ASB
5132	541850.09	1725200.06	928.70	PHASE 3 PROTECTIVE COVER ASB
5134	541799.97	1724789.60	906.64	PHASE 3 PROTECTIVE COVER ASB
5135	541799.32	1724849.96	910.89	PHASE 3 PROTECTIVE COVER ASB
5136	541799.95	1724900.01	917.10	PHASE 3 PROTECTIVE COVER ASB
5137	541800.07	1724950.00	920.69	PHASE 3 PROTECTIVE COVER ASB
5138	541799.97	1724982.33	924.23	PHASE 3 PROTECTIVE COVER ASB
5139	541821.52	1725049.89	924.08	PHASE 3 PROTECTIVE COVER ASB
5143	541750.07	1724801.69	917.85	PHASE 3 PROTECTIVE COVER ASB
5144	541750.01	1724824.05	918.75	PHASE 3 PROTECTIVE COVER ASB
5145	541749.99	1724870.07	924.40	PHASE 3 PROTECTIVE COVER ASB
5147	541715.06	1724818.75	929.08	PHASE 3 PROTECTIVE COVER ASB
5148	541740.68	1724849.97	924.21	PHASE 3 PROTECTIVE COVER ASB
5149	541729.11	1724899.97	930.73	PHASE 3 PROTECTIVE COVER ASB
5150	541704.41	1724852.05	931.58	PHASE 3 PROTECTIVE COVER ASB
10385	541755.13	1724779.88	916.90	SURFACE SPOT SHOT
10386	541741.07	1724782.74	917.49	SURFACE SPOT SHOT
10387	541754.22	1724825.97	917.96	SURFACE SPOT SHOT
10388	541765.48	1724823.09	917.14	SURFACE SPOT SHOT
10389	541788.79	1724869.61	916.78	SURFACE SPOT SHOT
10390	541780.30	1724875.57	917.17	SURFACE SPOT SHOT
10391	541798.79	1724927.61	918.68	SURFACE SPOT SHOT
10392	541811.37	1724923.34	917.70	SURFACE SPOT SHOT
10393	541832.87	1724976.54	917.21	SURFACE SPOT SHOT
10394	541822.07	1724981.26	918.20	SURFACE SPOT SHOT
10395	541859.45	1725033.29	917.20	SURFACE SPOT SHOT
10396	541852.13	1725029.50	915.97	SURFACE SPOT SHOT
10397	541859.93	1725086.64	917.42	SURFACE SPOT SHOT
10398	541848.36	1725088.63	918.56	SURFACE SPOT SHOT
10399	541850.62	1725131.88	920.27	SURFACE SPOT SHOT
10400	541865.16	1725128.50	919.35	SURFACE SPOT SHOT
10401	541877.88	1725161.38	919.37	SURFACE SPOT SHOT
10402	541867.17	1725166.67	919.87	SURFACE SPOT SHOT
10403	541885.67	1725193.54	919.79	SURFACE SPOT SHOT
10404	541896.65	1725184.88	919.02	SURFACE SPOT SHOT
10405	541923.52	1725208.65	917.36	SURFACE SPOT SHOT
10406	541916.55	1725216.27	918.05	SURFACE SPOT SHOT
10407	541947.22	1725236.84	917.77	SURFACE SPOT SHOT
10408	541952.48	1725224.86	916.68	SURFACE SPOT SHOT
10409	541985.99	1725234.86	915.62	SURFACE SPOT SHOT
10410	541981.92	1725249.14	916.83	SURFACE SPOT SHOT
10411	542015.34	1725260.48	917.17	SURFACE SPOT SHOT
10412	542014.98	1725244.00	915.75	SURFACE SPOT SHOT
10413	542049.99	1725249.22	915.91	SURFACE SPOT SHOT
10414	542048.41	1725265.25	916.91	SURFACE SPOT SHOT
10415	542087.47	1725270.79	917.11	SURFACE SPOT SHOT
10416	542086.82	1725254.54	915.88	SURFACE SPOT SHOT
10417	542115.50	1725247.33	914.69	SURFACE SPOT SHOT
10418	542115.98	1725266.29	915.95	SURFACE SPOT SHOT
10419	542115.91	1725247.83	914.81	SURFACE SPOT SHOT
10420	542132.20	1725244.74	915.21	SURFACE SPOT SHOT
10421	542150.09	1725239.57	915.92	SURFACE SPOT SHOT
10422	542166.83	1725222.33	915.48	SURFACE SPOT SHOT
10423	542184.66	1725195.23	915.01	SURFACE SPOT SHOT

POINT #	ASBUILT NORTHING	ASBUILT EASTING	ASBUILT ELEVATION	DESCRIPTION
10424	542197.62	1725160.24	914.67	SURFACE SPOT SHOT
10425	542210.42	1725119.39	915.00	SURFACE SPOT SHOT
10426	542219.69	1725074.47	915.25	SURFACE SPOT SHOT
10427	542224.35	1725027.44	915.37	SURFACE SPOT SHOT
10428	542224.95	1724979.00	914.41	SURFACE SPOT SHOT
10429	542224.89	1724930.09	914.31	SURFACE SPOT SHOT
10430	542223.44	1724881.44	914.06	SURFACE SPOT SHOT
10431	542219.63	1724830.82	914.52	SURFACE SPOT SHOT
10432	542219.85	1724781.63	915.41	SURFACE SPOT SHOT
10433	542231.83	1724777.80	916.73	SURFACE SPOT SHOT
10434	542231.07	1724824.28	915.62	SURFACE SPOT SHOT
10435	542233.65	1724871.91	914.93	SURFACE SPOT SHOT
10436	542236.61	1724919.55	915.27	SURFACE SPOT SHOT
10437	542238.90	1724966.96	915.37	SURFACE SPOT SHOT
10438	542238.36	1725013.70	916.33	SURFACE SPOT SHOT
10439	542234.40	1725060.91	916.52	SURFACE SPOT SHOT
10440	542225.78	1725113.81	915.81	SURFACE SPOT SHOT
10441	542211.78	1725160.49	915.08	SURFACE SPOT SHOT
10442	542201.00	1725193.36	915.15	SURFACE SPOT SHOT
10443	542185.45	1725221.99	915.56	SURFACE SPOT SHOT
10444	542171.09	1725242.59	916.20	SURFACE SPOT SHOT
10445	542160.65	1725255.15	916.97	SURFACE SPOT SHOT
10446	542191.31	1725313.28	931.66	SURFACE SPOT SHOT
10447	542185.69	1725297.95	928.09	SURFACE SPOT SHOT
10448	542174.56	1725283.13	924.09	SURFACE SPOT SHOT
10449	542166.47	1725271.32	920.90	SURFACE SPOT SHOT
10450	542158.57	1725256.54	917.21	SURFACE SPOT SHOT
10451	542152.78	1725232.10	917.28	SURFACE SPOT SHOT
10452	542147.48	1725250.24	917.06	SURFACE SPOT SHOT
10453	542142.03	1725233.18	916.69	SURFACE SPOT SHOT
10454	542138.07	1725259.55	915.99	SURFACE SPOT SHOT
10455	542142.14	1725270.19	918.20	SURFACE SPOT SHOT
10456	542152.45	1725287.71	923.06	SURFACE SPOT SHOT
10457	542164.15	1725304.35	927.83	SURFACE SPOT SHOT
10458	542174.50	1725320.81	931.24	SURFACE SPOT SHOT
10459	542178.74	1725320.67	932.66	SURFACE SPOT SHOT
10460	542173.76	1725309.21	931.11	SURFACE SPOT SHOT
10461	542166.35	1725297.97	928.16	SURFACE SPOT SHOT
10462	542159.82	1725286.30	925.02	SURFACE SPOT SHOT
10463	542151.91	1725271.18	920.76	SURFACE SPOT SHOT
10464	542148.37	1725261.99	918.85	SURFACE SPOT SHOT
10465	542149.21	1725258.13	918.49	SURFACE SPOT SHOT
10466	542152.89	1725258.30	918.45	SURFACE SPOT SHOT
10467	542156.82	1725270.05	921.05	SURFACE SPOT SHOT
10468	542164.99	1725283.58	925.08	SURFACE SPOT SHOT
10469	542173.42	1725295.62	928.49	SURFACE SPOT SHOT
10470	542180.05	1725306.93	931.01	SURFACE SPOT SHOT
10471	542185.81	1725316.14	932.34	SURFACE SPOT SHOT
10472	542178.64	1725321.75	932.69	SURFACE SPOT SHOT
10473	542197.84	1725314.47	932.65	SURFACE SPOT SHOT
10474	542218.73	1725297.64	932.39	SURFACE SPOT SHOT
10475	542238.81	1725280.31	933.27	SURFACE SPOT SHOT
10476	542254.00	1725251.63	933.27	SURFACE SPOT SHOT
10477	542260.70	1725221.53	933.31	SURFACE SPOT SHOT
10478	542276.68	1725177.26	932.93	SURFACE SPOT SHOT
10479	542276.04	1725144.69	933.28	SURFACE SPOT SHOT
10480	542284.02	1725098.85	932.75	SURFACE SPOT SHOT
10481	542287.86	1725066.27	932.30	SURFACE SPOT SHOT
10482	542289.55	1725008.95	932.47	SURFACE SPOT SHOT
10483	542291.80	1724953.45	932.47	SURFACE SPOT SHOT
10484	542293.15	1724907.34	932.63	SURFACE SPOT SHOT
10485	542286.33	1724871.36	931.48	SURFACE SPOT SHOT
10486	542281.08	1724830.41	931.27	SURFACE SPOT SHOT
10487	542276.62	1724804.53	930.98	SURFACE SPOT SHOT
10488	542272.55	1724778.47	930.93	SURFACE SPOT SHOT
10489	542250.77	1724776.51	923.22	SURFACE SPOT SHOT
10490	542252.38	1724812.79	922.72	SURFACE SPOT SHOT
10491	542261.41	1724854.31	924.01	SURFACE SPOT SHOT
10492	542264.52	1724882.19	924.24	SURFACE SPOT SHOT
10493	542266.20	1724926.28	924.31	SURFACE SPOT SHOT
10494	542265.15	1724972.67	924.06	SURFACE SPOT SHOT
10495	542263.91	1725018.24	924.53	SURFACE SPOT SHOT
10496	542261.08	1725059.56	924.59	SURFACE SPOT SHOT
10497	542254.04	1725103.16	923.99	SURFACE SPOT SHOT
10498	542241.99	1725145.70	922.91	SURFACE SPOT SHOT
10499	542232.26	1725188.56	923.00	SURFACE SPOT SHOT
10500	542223.63	1725220.81	923.59	SURFACE SPOT SHOT
10501	542214.57	1725241.17	923.57	SURFACE SPOT SHOT
10502	542200.45	1725260.03	923.48	SURFACE SPOT SHOT
10503	542190.05	1725271.27	923.78	SURFACE SPOT SHOT
10504	542179.11	1725279.74	923.85	SURFACE SPOT SHOT
10505	542157.16	1725260.20	918.34	SURFACE SPOT SHOT
10506	542153.83	1725256.63	917.92	SURFACE SPOT SHOT
10507	542151.27	1725255.69	918.04	SURFACE SPOT SHOT
10508	542147.60	1725255.58	917.89	SURFACE SPOT SHOT
10509	542144.88	1725257.64	917.63	SURFACE SPOT SHOT
10510	542143.46	1725261.66	917.51	SURFACE SPOT SHOT
10511	542145.86	1725264.76	918.01	SURFACE SPOT SHOT
10512	542136.12	1725261.04	915.95	SURFACE SPOT SHOT
10513	542185.60	1724785.73	904.89	SURFACE SPOT SHOT
10514	542189.88	1724832.85	904.90	SURFACE SPOT SHOT
10515	542192.08	1724879.66	904.18	SURFACE SPOT SHOT
10516	542193.31	1724930.06	904.01	SURFACE SPOT SHOT
10517	542193.15	1724982.30	904.42	SURFACE SPOT SHOT
10518	542190.80	1725031.60	904.66	SURFACE SPOT SHOT
10519	542185.09	1725084.59	904.53	SURFACE SPOT SHOT
10520	542169.78	1725131.12	903.84	SURFACE SPOT SHOT
10521	542156.31	1725159.46	904.39	SURFACE SPOT SHOT
10522	542140.66	1725186.33	905.64	SURFACE SPOT SHOT
10523	542121.03	1725202.16	905.84	SURFACE SPOT SHOT
10524	542100.55	1725209.15	905.70	SURFACE SPOT SHOT
10525	542075.27	1725213.91	906.38	SURFACE SPOT SHOT
10526	542048.24	1725213.50	906.12	SURFACE SPOT SHOT

POINT #	ASBUILT NORTHING	ASBUILT EASTING	ASBUILT ELEVATION	DESCRIPTION
10527	542020.57	1725210.07	906.17	SURFACE SPOT SHOT
10528	541992.98	1725200.07	905.55	SURFACE SPOT SHOT
10529	541967.28	1725191.54	906.05	SURFACE SPOT SHOT
10530	541945.08	1725176.62	906.71	SURFACE SPOT SHOT
10531	541923.81	1725158.86	907.18	SURFACE SPOT SHOT
10532	541908.55	1725135.23	907.26	SURFACE SPOT SHOT
10533	541896.32	1725101.80	907.41	SURFACE SPOT SHOT
10534	541886.12	1725097.50	907.47	SURFACE SPOT SHOT
10535	541873.01	1725014.62	908.30	SURFACE SPOT SHOT
10536	541856.29	1724970.88	909.03	SURFACE SPOT SHOT
10537	541837.90	1724930.33	910.41	SURFACE SPOT SHOT
10538	541818.69	1724889.95	910.87	SURFACE SPOT SHOT
10539	541799.15	1724848.35	910.47	SURFACE SPOT SHOT
10540	541782.35	1724806.78	911.80	SURFACE SPOT SHOT
10541	541775.34	1724780.04	911.12	SURFACE SPOT SHOT
10542	541723.26	1724787.29	923.48	SURFACE SPOT SHOT
10543	541737.75	1724827.58	922.75	SURFACE SPOT SHOT
10544	541756.55	1724868.00	922.02	SURFACE SPOT SHOT
10545	541776.36	1724911.43	922.84	SURFACE SPOT SHOT
10546	541792.97	1724955.49	923.56	SURFACE SPOT SHOT
10547	541807.04	1725000.45	923.75	SURFACE SPOT SHOT
10548	541822.89	1725044.07	922.97	SURFACE SPOT SHOT
10549	541852.04	1725087.04	923.06	SURFACE SPOT SHOT
10550	541839.43	1725131.93	923.10	SURFACE SPOT SHOT
10551	541849.89	1725162.66	923.19	SURFACE SPOT SHOT
10552	541865.59	1725191.95	923.52	SURFACE SPOT SHOT
10555	541886.32	1725216.50	923.73	SURFACE SPOT SHOT
10554	541914.18	1725238.97	923.57	SURFACE SPOT SHOT
10555	541942.73	1725256.18	923.07	SURFACE SPOT SHOT
10556	541971.76	1725269.71	922.90	SURFACE SPOT SHOT

POINT #	ASBUILT NORTHING	ASBUILT EASTING	ASBUILT ELEVATION	DESCRIPTION
10557	542003.75	1725280.98	923.02	SURFACE SPOT SHOT
10558	542038.88	1725287.21	923.12	SURFACE SPOT SHOT
10559	542072.72	1725292.27	923.23	SURFACE SPOT SHOT
10560	542104.78	1725292.85	922.98	SURFACE SPOT SHOT
10561	542133.09	1725289.65	922.28	SURFACE SPOT SHOT
10562	542146.20	1725285.95	922.04	SURFACE SPOT SHOT
10563	542187.32	1725334.26	935.78	CAPPED END 18" PLASTIC PIPE
10564	542181.50	1725323.94	933.06	18" PLASTIC PIPE DIRECTION
10565	542174.36	1725321.44	931.23	SURFACE SPOT SHOT
10566	542145.13	1725323.40	930.52	SURFACE SPOT SHOT
10567	542113.97	1725322.78	930.18	SURFACE SPOT SHOT
10568	542080.06	1725319.61	929.56	SURFACE SPOT SHOT
10569	542045.61	1725313.52	929.27	SURFACE SPOT SHOT
10570	542009.05	1725306.37	928.82	SURFACE SPOT SHOT
10571	541977.18	1725297.25	928.51	SURFACE SPOT SHOT
10572	541946.46	1725284.48	929.24	SURFACE SPOT SHOT
10573	541917.63	1725265.34	929.32	SURFACE SPOT SHOT
10574	541888.01	1725244.72	929.18	SURFACE SPOT SHOT
10575	541865.23	1725218.68	928.85	SURFACE SPOT SHOT
10576	541842.73	1725189.03	928.71	SURFACE SPOT SHOT
10577	541827.32	1725155.47	928.73	SURFACE SPOT SHOT
10578	541819.04	1725119.86	928.57	SURFACE SPOT SHOT
10579	541812.08	1725079.05	929.37	SURFACE SPOT SHOT
10580	541799.37	1725032.75	929.46	SURFACE SPOT SHOT
10581	541786.10	1724985.58	929.49	SURFACE SPOT SHOT
10582	541767.30	1724940.84	929.94	SURFACE SPOT SHOT
10583	541748.74	1724899.18	929.36	SURFACE SPOT SHOT
10584	541725.87	1724858.20	929.24	SURFACE SPOT SHOT
10585	541712.84	1724825.80	930.09	SURFACE SPOT SHOT
10586	541701.51	1724794.48	930.47	SURFACE SPOT SHOT



EXLINE SURVEYING, INC.
10356 STATE ROUTE 139
JACKSON, OHIO 45640
PHONE: (740) 286-7024 • TELECOPIER (740) 286-0012

REV.	DESCRIPTION	DATE
0	PHASE 3 PROTECTIVE COVER ASBUILT	5-7-24

PHASE 3 PROTECTIVE COVER ASBUILT
FOR
ENTACT, LLC

SEQUENCE 4
PHASE 3 PROTECTIVE COVER
ASBUILT
JOHN E. AMOS PLANT
WINFIELD, WEST VIRGINIA

DRAWING SCALE:
1" = 30'

TITLE RESEARCH:
N/A

CALCULATED BY:
P. TAYLOR

DRAWN BY:
P. TAYLOR

CHECKED BY:
D. EXLINE

DRAWING NUMBER
23033A PHASE 3 PROTECTIVE COVER

SHEET NUMBER
1 OF 1

DANA A. EXLINE
No. 928
STATE OF WEST VIRGINIA
PROFESSIONAL SURVEYOR

DANA A. EXLINE
PROFESSIONAL SURVEYOR #928
STATE OF WEST VIRGINIA
DATE: 5/9/24