

540.381.6011 office - 540.381.2773 fax www.foresightdesignservices.com

PROJECT:	Auburn Park Full Build-Out
	Montgomery County, VA Parks and Recreation
GNI Job No.:	2893.00
DATE:	Tuesday, April 2, 2024

The following additions, deletions and/or modifications are to be incorporated into the Contract Documents and acknowledgement of receipt of this addendum shall be so noted on the Proposal Form submitted.

#### **BID DOCUMENTS**

#### **TECHNICAL SPECIFICATIONS**

#### **DRAWINGS**

#### **CLARIFICATIONS**

 Please find attached the Geotechnical Engineering Report conducted by ECS Mid-Atlantic, LLC dated March 21, 2021 which corresponds to the boring locations shown on C1-02, C1-03 and C1-04 of the drawings.

#### **ATTACHMENTS**

1. Geotechical Engineering Report by ECS Mid-Atlantic, LLC dated March 21, 2021.

#### END ADDENDUM NO. 7



# **ECS Mid-Atlantic, LLC**

Geotechnical Engineering Report

Auburn Park

3595 Riner Road Riner, Virginia

ECS Project No. 12:19208

March 12, 2021



"Setting the Standard for Service"



March 12, 2021

Mr. Trevor Kimzey, PE Gay and Neel, Inc. 1260 Radford Street Christiansburg, Virginia 24073

ECS Project No. 12:19208

Reference: Geotechnical Engineering Report Auburn Park 3595 Riner Road Riner, Virginia

Dear Mr. Kimzey:

ECS Mid-Atlantic, LLC (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

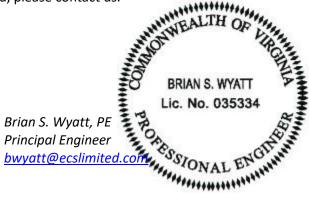
It has been our pleasure to be of service to Gay and Neel, Inc. during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify subsurface conditions assumed for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted, **ECS Mid-Atlantic, LLC** 

Čhris O'Hara, EIT Staff Engineer cohara@ecslimited.com

andon Quinn

Brandon M. Quinn, PE Branch Manager <u>bquinn@ecslimited.com</u>



#### **TABLE OF CONTENTS**

EXECUTIVE SUMMARY	.1
1.0 INTRODUCTION	.2
2.0 PROJECT INFORMATION	.2
2.1 Project Location/Current Site Use/Past Site Use	2
2.2 Proposed Construction	3
3.0 FIELD EXPLORATION AND LABORATORY TESTING	.4
3.1 Site Geology	4
3.2 Subsurface Characterization	
3.3 Groundwater Observations	5
3.4 Laboratory Testing	5
4.0 DESIGN RECOMMENDATIONS	.5
4.1 Karst Risk Commentary	5
4.2 Foundations	6
4.3 Slabs on Grade	7
5.0 Subgrade Preparation	.8
5.1 Stripping and Grubbing	8
5.2 Proofrolling	8
5.3 Earthwork Operations	9
5.3.1 Weathered Rock and Rock	
5.3.2 Structural Fill	9
5.4 Foundation and Slab Observations1	
5.5 Utility Installations1	
6.0 CLOSING1	.1

#### APPENDICES

#### Appendix A – Drawings & Reports

- Site Location Diagram
- Boring Location Diagram

#### **Appendix B – Field Operations**

- Reference Notes for Boring Logs
- Subsurface Exploration Procedure: Standard Penetration Testing (SPT)
- Boring Logs B-1 through B-27, SMW-1 through SWM-6

#### **Appendix C – Laboratory Testing**

- Laboratory Test Results Summary
- Plasticity Chart
- Moisture-Density Relationship Curves

#### **EXECUTIVE SUMMARY**

This Executive Summary is intended as a very brief overview of the primary geotechnical conditions that are expected to affect design and construction. Information gleaned from the Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

Based on the results of our SPT soil borings and assumed structural loads, the proposed lightly loaded structures may be supported on conventional shallow foundations consisting of column or strip footings bearing on natural soils or approved structural fill with an allowable net bearing capacity of 2,000 psf.

Based on the provided preliminary grading plan and the results of our borings, we anticipate shallow rock will be encountered in some cut areas of the site.

#### **1.0 INTRODUCTION**

The purpose of this study was to provide geotechnical information for the design of the proposed park development. The project will include the construction of athletic fields, lightly loaded picnic shelters, playground areas, stormwater management, and parking areas. The recommendations developed for this report are based on project information supplied by you.

Our services were provided in accordance with our Proposal No. 14511-P, dated February 5, 2021, as authorized by Gay and Neel, Inc. on February 5, 2021, which includes our Terms and Conditions of Service.

This report contains the procedures and results of our subsurface exploration and laboratory testing programs, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items:

- A brief review and description of our field and laboratory test procedures and the results of testing conducted
- A review of surface topographical features and site conditions
- A review of area and site geologic conditions
- A review of subsurface soil/rock stratigraphy with pertinent physical properties
- Final soil exploration boring logs
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills and identification of potentially unsuitable soils and/or soils exhibiting excessive moisture at the time of sampling
- Recommended foundation type
- An evaluation of soil and rock excavation issues

#### 2.0 PROJECT INFORMATION

#### 2.1 PROJECT LOCATION/CURRENT SITE USE/PAST SITE USE

The site is located at 3595 Riner Road in the Riner area of Montgomery County, Virginia. At the time of our visit, the ground surface was generally covered with grass. The overall site is located to the southwest and south of the existing Riner Volunteer Fire Department.



Figure 2.1 Site Location

The topography of the site is generally characterized by gently undulating hills. Grades vary from approximately 2120 feet near the middle of the southwest border of the site, to approximately 2061 feet at the southernmost corner of the site.

#### 2.2 PROPOSED CONSTRUCTION

ECS was provided project documents prepared by Gay and Neel, Inc., which included a conceptual master plan dated January 12, 2021, and the preliminary grading plan dated February 2, 2021. Based on our review of the provided documents, we understand the project will include the construction of a park located to the south and west of the Riner Volunteer Fire Department. We understand the park will consist of multiple athletic fields, lightly-loaded picnic shelters, and playground areas.

Structural loading conditions for the picnic shelters have not been provided, however, we anticipate maximum column and wall loads of approximately 25 kips per column and 3 kips per linear foot, respectively.

Based on the existing and proposed grades, it appears maximum cuts and fills will be on the order of approximately 20 feet and 15 feet, respectively, to reach design grades.

Stormwater management, consisting of two ponds and an underground stormwater detention system are included in the design. Design grades have not been provided at this time, however, we understand the proposed ponds will utilize existing grades. We understand the proposed stormwater facility closest to Riner Road will be utilized as a sediment basin during the mass grading phase and later converted to an underground system.

#### **3.0 FIELD EXPLORATION AND LABORATORY TESTING**

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedures. Our scope of work included drilling 33 borings, as well as four offset borings. Our borings were located with a Trimble GPS unit while referencing available satellite imagery Their approximate locations are shown on the Boring Location Diagram in Appendix A.

#### **3.1 SITE GEOLOGY**

Based on our review of the Interstate 81 Corridor Digital Geologic Compilation: Riner Quadrangle, Virginia (2013), the site is located within the Valley and Ridge Geologic Province of Virginia. Specifically, the mapping indicates the site is underlain by the Rome Formation. Bedrock in this formation primarily consists of phyllitic mudstone, quartzose argillite, metasiltstone, and dolomite, with limestone interbeds.

The carbonate rock types encountered in this geology are subject to development of karst features such as sinkholes. Carbonate materials solution in water over long periods of time, resulting in loss of rock material. The solution process typically occurs along planes of more soluble material and causes the formation of interconnected seams and cavities within carbonate formations.

The boundary between soil and rock is not sharply defined. A transitional zone termed "highly weathered rock" (HWR) is normally found overlying the parent bedrock. Highly weathered rock is defined, for engineering purposes, as residual material with Standard Penetration resistance greater than 100 blows per foot (bpf). Because weathering is facilitated by fractures, joints, and the presence of less resistant rock types, the profile of the HWR and bedrock is typically irregular and erratic, even over short horizontal distances. Also, it is not unusual to find lenses and natural boulders of hard rock "floating" in zones of HWR within the soil mantle, well above the general bedrock level.

#### **3.2 SUBSURFACE CHARACTERIZATION**

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil and rock strata. Please refer to the boring logs in Appendix B.

Approximate Depth (ft)	Stratum	Description	Ranges of SPT <sup>(1)</sup> N-values (bpf)
0-1 (Surface cover)	n/a	Topsoil (approximately 5 to 12 inches)	N/A
0.4-20	Ι	Residuum, soft to very hard, LEAN CLAY (CL), FAT CLAY (CH), SILT (ML), ELASTIC SILT (MH), CLAYEY SAND (SC), containing varying concentrations of sand, and SILTY SAND (SM)	3 to 65
0.5-22	II	Highly Weathered Rock Sampled as SILTY SAND WITH GRAVEL and GRAVEL WITH SAND (HWR), moist	100+
5.5-22+	II	Hard rock, presumed to be mudstone, argillite, siltstone, dolomite, or limestone	N/A

Notes:

(1) Standard Penetration Testing

#### **3.3 GROUNDWATER OBSERVATIONS**

Water levels were measured in our borings were measured at the time of drilling and are reported in our borings logs in Appendix B. Perched groundwater was encountered in Boring B-18 at a depth of approximately 6 feet. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

#### **3.4 LABORATORY TESTING**

The laboratory testing consisted of selected tests performed on samples obtained during our field exploration operations. Classification and index property tests were performed on representative soil samples. The laboratory testing program included natural moisture content tests (ASTM D2216), percent passing the No. 200 sieve tests (ASTM D1140), and Atterberg Limits tests (ASTM D4318). Standard Proctor tests (VTM-1) were performed on bulk soil samples. The results of all laboratory testing conducted are included in the Appendix of this report.

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols, and ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS)). After classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

#### **4.0 DESIGN RECOMMENDATIONS**

#### 4.1 KARST RISK COMMENTARY

Based on our site reconnaissance karst features were not observed in close vicinity of the proposed development. However, the site is mapped to be underlain by geologic parent rock which is known to be

carbonate in nature. Based on our experience in the geology, the site will likely be most vulnerable to sinkhole development during the mass grading phase of construction. During grading operations, drainage control is typically poor and the critical rock/soil interface is exposed to flooding from precipitation. It is a common occurrence for small sinkholes to develop during this phase of construction.

The subsurface conditions encountered in the soil test borings consist of residual soils of varying strength and moisture, as well as an erratic karst bedrock surface. In addition, the soil strength profile encountered in some of the borings decreased gradually with depth. These conditions are indicative of residual soils underlain by karst bedrock, which is subject to sinkhole development. Although we define the risk of future sinkhole development on this site as low to moderate, the owner should accept some risk related to the impact of karst features on foundation and overall site performance.

#### 4.2 FOUNDATIONS

Provided subgrades and Structural Fills are prepared as recommended in this report, the proposed lightly loaded shelter structures can be supported by shallow foundations including column footings and continuous wall footings. We recommend the foundation design use the following parameters:

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure <sup>(1)</sup>	2,000 psf	2,000 psf
Acceptable Bearing Soil Material	Firm Residual Soils (Stratum I)	Firm Residual Soils (Stratum I)
Minimum Width	24 inches	16 inches
Minimum Footing Embedment Depth (below slab or finished grade) <sup>(2)</sup>	30 inches	30 inches
Estimated Total Settlement <sup>(3)</sup>	Less than 1- inch	Less than 1- inch
Estimated Differential Settlement <sup>(4)</sup>	Less than ¾ inches between columns	Less than ¾ inches

Notes:

(1) Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.

(2) For frost penetration requirements and expansive soil concerns.

(3) Based on assumed structural loads. If final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.

(4) Based on maximum column/wall loads and variability in borings. Differential settlement can be re-evaluated once the foundation plans are more complete.

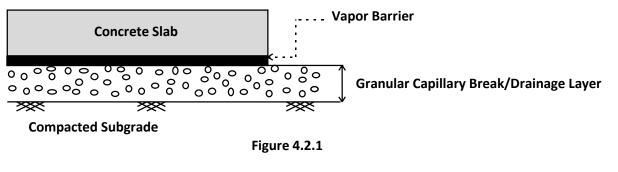
**Shallow Rock:** The borings suggest that hard rock may be encountered at or above design bearing elevations in some areas of the site. This rock is also likely to be seamy, with abrupt transitions between soil-supported and rock-supported footings. In such instances, it is recommended to perform isolated undercuts below the footings to reduce the potential for excessive differential settlement across relatively short horizontal distances. Where footings transition from soil-support to rock-support and the length of the rock seam is greater than 4 feet, we recommend that soil on either side of the rock seam, for a distance of 4 feet along the trench, be removed and replaced with compacted stone. In instances where the rock

pinnacle extends for a distance of less than 4 feet along the trench, the rock pinnacle should be removed to a depth of 12 inches below the design bearing level and replaced with compacted stone.

**Potential Undercuts:** Most of the soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structure. If soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. Any undercut should be backfilled with cementitious flowable fill ( $f'_c \ge 200$  psi at 28 days) or compacted VDOT No. 21-A Stone up to the original design bottom of footing elevation; the original footing shall be constructed at the desired footing elevations. Due to karst potential on the site, we do not recommend the use of VDOT No. 57 Stone for undercut backfilling.

#### 4.3 SLABS ON GRADE

Provided subgrades and structural fills are prepared as discussed herein, the proposed floor slabs can be constructed as Ground Supported Slabs (or Slab-On-Grade). The following graphic depicts our soil-supported slab recommendations:



- 1. Drainage Layer Thickness: 4 inches
- 2. Drainage Layer Material: GRAVEL (GP, GW), SAND (SP, SW)

Soft or yielding soils may be encountered in some areas. Those soils should be removed and replaced with compacted Structural Fill in accordance with the recommendations included in this report.

**Subgrade Modulus:** Provided the Structural Fill and Granular Drainage Layer are constructed in accordance with our recommendations, the slab may be designed assuming a modulus of subgrade reaction,  $k_1$  of 75 pci (lbs./cu. inch). The modulus of subgrade reaction value is based on a 1 foot by 1 foot plate load test basis.

**Porous Slab Base:** We recommend the slab-on-grade be underlain by a minimum of 4 inches of clean, angular gravel (crushed stone) having a maximum aggregate size of 1.5 inches. VDOT No. 57 Stone is considered suitable for this purpose. This porous fill layer will facilitate the fine grading of the building pad, provide more uniform bearing conditions, and help prevent the rise of water to the bottom of the slab (capillary action).

**Vapor Barrier:** Before the placement of concrete, a vapor barrier may be placed on top of the granular drainage layer to provide additional protection against moisture penetration through the floor slab. When

a vapor barrier is used, special attention should be given to surface curing of the slab to reduce the potential for uneven drying, curling and/or cracking of the slab. Depending on proposed flooring material types, the structural engineer and/or the architect may choose to eliminate the vapor barrier.

**Rock Above Design Bearing Elevation:** We recommend that sufficient rock be removed to allow placement of the entire drainage layer. This will serve to cushion the slab and reduce the potential for point loads and subsequent cracking of the concrete. In such cases, additional overexcavation of rock should be considered to allow installation of underslab utilities.

**Slab Isolation:** Soil-supported slabs should be isolated from the foundations and foundation-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab such as in a drop down footing/monolithic slab configuration, the slab should be designed with suitable reinforcement and load transfer devices to preclude overstressing of the slab.

#### **5.0 SUBGRADE PREPARATION**

#### **5.1 STRIPPING AND GRUBBING**

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, existing fill, and any soft or unsuitable materials from the 5-foot expanded building and 2-foot expanded pavement limits, and 5 feet beyond the toe of Structural Fills. Borings performed in "undisturbed" areas of the site contained an observed 5 to 12 inches of topsoil. Deeper topsoil or organic laden soils may be present in wet, low-lying, and poorly drained areas. In wooded areas, the root balls may extend as deep as about 2 feet and will require additional localized stripping depth to completely remove the organics. It is noted that the site has been subject to previous agricultural activity. Often, this results in a subsoil layer which is not organic, but is notably different from the underlying residual soils. It is not uncommon for this layer to be several feet thick, particularly in low-lying areas. This layer, where present, should not be stripped as topsoil unless specifically recommended by the geotechnical engineer in the field. ECS should be retained to verify that topsoil and unsuitable surficial materials have been removed prior to the placement of structural fill or construction of structures.

#### **5.2 PROOFROLLING**

Prior to fill placement or other construction on subgrades, the subgrades should be evaluated by an ECS field technician. The exposed subgrade should be thoroughly proofrolled with construction equipment having a minimum axle load of 10 tons [e.g. fully loaded tandem-axle dump truck]. Proofrolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of an ECS technician. This procedure is intended to assist in identifying any localized yielding materials.

Where proofrolling identifies areas that are unstable or "pumping" subgrade those areas should be repaired prior to the placement of any subsequent Structural Fill or other construction materials. Methods of stabilization include undercutting, moisture conditioning, or chemical stabilization. The situation should be discussed with ECS to determine the appropriate procedure. Test pits may be excavated to explore the shallow subsurface materials to help in determining the cause of the observed unstable materials, and to assist in the evaluation of appropriate remedial actions to stabilize the subgrade.

#### **5.3 EARTHWORK OPERATIONS**

#### 5.3.1 Weathered Rock and Rock

Based on boring data obtained during the exploration, we anticipate that materials requiring difficult or rock excavation techniques will be encountered during site grading and excavation to planned subgrades. Borings B-06, B-08, and B-21 refused at elevations higher than design elevations. We anticipate these areas will require significant excavation of rock to reach design grades. Borings B-10, B-14, B-16, and B-20 encountered auger refusal at elevations close to design grade. We anticipate these areas may require some amount of difficult excavation to reach design grades. Specific invert elevations have not been provided for the proposed underground stormwater detention, however we anticipate rock will be encountered above design grades in this area as well.

The excavation of weathered rock and rock can have a substantial impact on the cost and schedule of the proposed construction. This discussion considers two general classes of materials for purposes of describing excavatability. Residuum and weathered rock will be used as the terms for the materials to be excavated.

In mass excavations for general site work, overburden soils with standard penetration test N-values of 40 bpf or less can usually be removed with conventional earth excavation equipment. Residual soils or soft weathered (Saprolitic) rock with N-values of 40 to 50 bpf can generally be removed with conventional earth moving equipment after first being loosened with a large single-tooth ripper attached to a large crawler tractor. Harder, less weathered rock will generally require the use of a large single-tooth ripper, dozers, and/or track-mounted backhoes for excavation. However, materials exhibiting N-values of 50 blows or greater for 6 inches of penetration, typically defined as refusal material, will be more difficult to excavate and generally require blasting and other rock excavation techniques. The actual excavatability of the bedrock material will be greatly controlled by in-situ jointing and bedding and may vary from location to location.

In confined excavations, such as utility trenches, excavation of dense residual soils typically requires the use of large track-mounted backhoes. Excavation of harder phases of weathered rock typically requires the use of large track-mounted backhoes, pneumatic spades, or light blasting. Refusal materials (apparent rock) normally require blasting in trench excavations. Blasting in utility trenches should be done carefully to avoid damage to the surrounding materials. When the material to be excavated requires blasting, the contractor should comply with the jurisdictional requirements.

#### 5.3.2 Structural Fill

Prior to placement of Structural Fill, representative bulk samples (about 50 pounds) of on-site and/or offsite borrow should be submitted to ECS for laboratory testing, which will typically include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships (i.e., Proctors) for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications. Alternatively, Proctor data from other accredited laboratories can be submitted if the test results are within the last 90 days.

**Satisfactory Structural Fill Materials:** Materials satisfactory for use as Structural Fill should consist of inorganic soils with the following engineering properties and compaction requirements.

STRUCTURAL FILL INDEX PROPERTIES								
Subject	Property							
Building and Pavement Areas (Borrow Soils)	LL < 50, PI<25							
Building and Pavement Areas (On-site Soils)	LL < 60, PI < 30							
Max. Particle Size	4 inches							
Max. organic content	5% by dry weight							

STRUCTURAL FILL COMPACTION REQUIREMENTS								
Subject	Requirement							
Compaction Standard	Standard Proctor, ASTM D698							
Required Compaction	95% of Max. Dry Density							
Moisture Content	+/-3 % points of the soil's optimum value							
Loose Thickness	8 inches prior to compaction							

**On-Site Borrow Suitability:** Significant natural deposits of soils are present on the site. These occur mostly at relatively shallow depth below the surface where residual soils are most weathered.

**Aggregates/Blast Rock:** The gradation of the material removed by ripping or blasting is typically quite varied. Excavated rock and weathered rock are generally only suitable for use in the deeper parts of embankment fills, or outside the zone of Structural Fill.

When rock or intact weathered rock fragments are placed in non-structural areas, we recommend that the rock fragments be spread out evenly in layers. Many times, the rock needs to be choked off with rock fines, and/or soil, so that voids between the rock fragments are filled. Where the material exhibits large voids between rock fragments, a geotextile may be needed to be placed over the rock prior to placement of additional materials. In general, the larger rock fragments should be placed at the bottom of the fill, but no fragment should exceed 1.5 feet in its maximum dimension. Between 2 feet and 10 feet below the final subgrade elevation, no rock fragment should exceed 8 inches in its maximum dimension. Within 2 feet of the subgrade elevation, no rock fragment should exceed 4 inches in maximum dimension.

In some situations, it can be cost effective to use an onsite rock crusher to produce material that meets the requirements of Structural Fill materials.

**Fill Placement:** Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and all frozen or frost-heaved soils should be removed prior to placement of Structural Fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

#### **5.4 FOUNDATION AND SLAB OBSERVATIONS**

**Protection of Foundation Excavations:** Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation

concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 1 to 3-inch thick "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

**Footing Subgrade Observations:** Most of the soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structure. It is important to have ECS observe the foundation subgrade prior to placing foundation concrete, to confirm the bearing soils are what was anticipated.

**Slab Subgrade Verification:** Prior to placement of a drainage layer, the subgrade should be prepared in accordance with the recommendations found in **Section 5.1.2 Proofrolling**.

#### **5.5 UTILITY INSTALLATIONS**

**Utility Subgrades:** The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrades should be observed and probed for stability by ECS. Any loose or unsuitable materials encountered should be removed and replaced with suitable compacted Structural Fill, or pipe stone bedding material.

**Utility Backfilling:** The granular bedding material (AASHTO #57 stone) should be at least 4 inches thick, but not less than that specified by the civil engineer's project drawings and specifications. We recommend that the bedding materials be placed up to the springline of the pipe. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Structural Fill and Fill Placement.

**Excavation Safety:** All excavations and slopes should be constructed and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing, constructing, and maintaining stable temporary excavations and slopes. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

#### 6.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation, expressed or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS by our client. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our

recommendations and provide additional or alternate recommendations that reflect the proposed construction.

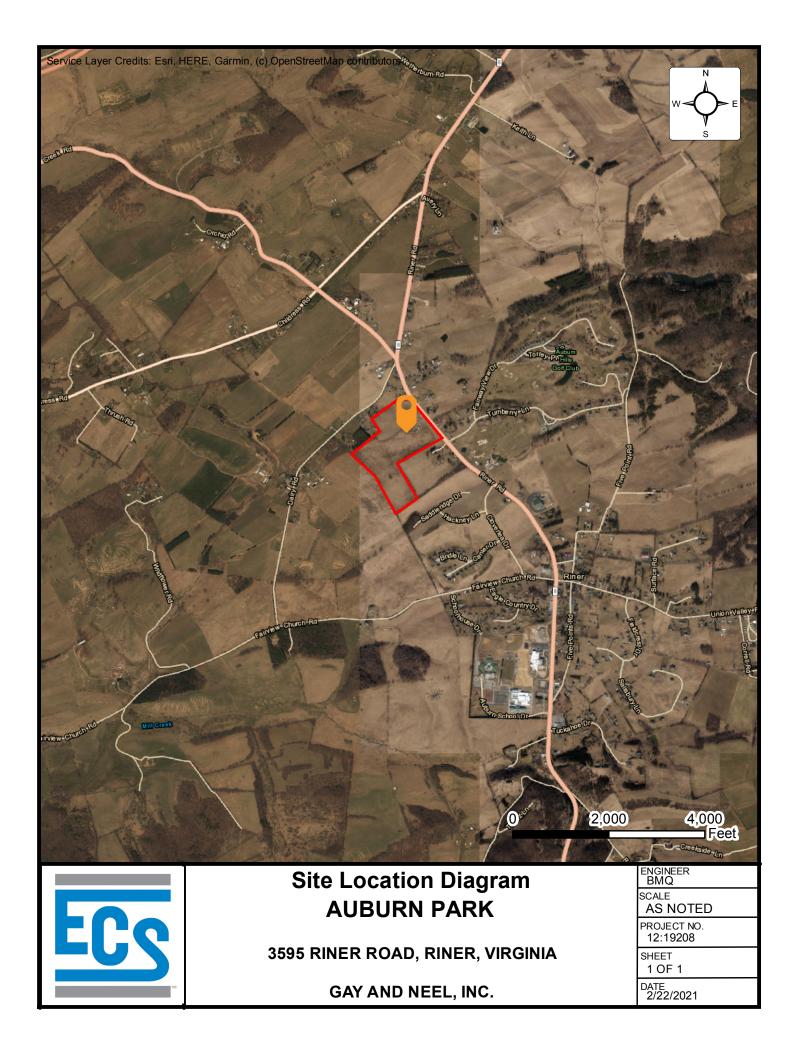
We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

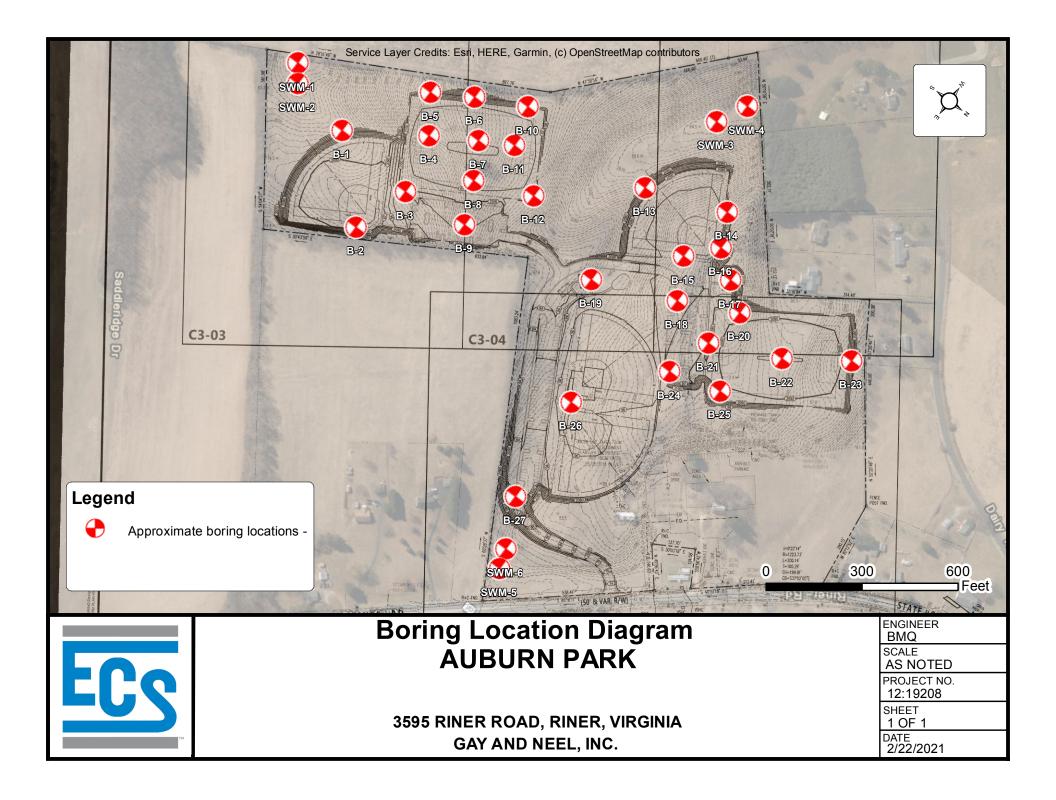
Field observations, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

### APPENDIX A – Diagrams & Reports

Site Location Diagram Boring Location Diagram





### **APPENDIX B – Field Operations**

Reference Notes for Boring Logs Subsurface Exploration Procedure: Standard Penetration Testing (SPT) Boring Logs B-1 through B-27, SWM-1 through SWM-6



# **REFERENCE NOTES FOR BORING LOGS**

MATERIAL	1,2			C	RILLING	SAMPLING S	YMBO	LS & ABBRE	VIATIONS
		HALT	SS	Split Spoor	n Sampler		PM	Pressuremet	er Test
	ASE		ST	Shelby Tub	•	r	RD	Rock Bit Drill	0
	CON	CRETE	WS	Wash Sam	•		RC	Rock Core, N	
			BS	Bulk Samp		0	REC	•	e Recovery %
) , o , i	GRA	VEL	PA	Power Aug	-	nple)	RQD	Rock Quality	Designation %
			HSA	Hollow Ste	m Auger				
	TOP	SOIL			F	PARTICLE SIZ		NTIFICATION	
	VOID		DESIGNA	TION	PARTI	CLE SIZES			
	VOIL	· /	Boulder	S	12 i	inches (300 mr	n) or la	rger	
	BRIC	ĸ	Cobbles	6	3 in	ches to 12 incl	hes (75	mm to 300 m	m)
			Gravel:	Coarse	3∕4 ir	nch to 3 inches	s (19 mi	m to 75 mm)	
	AGG	REGATE BASE COURSE		Fine	4.7	5 mm to 19 mn	n (No. 4	4 sieve to ¾ in	ch)
<u> </u>	GW	WELL-GRADED GRAVEL	Sand:	Coarse	2.00	0 mm to 4.75 n	nm (No	. 10 to No. 4 s	ieve)
	Gw	gravel-sand mixtures, little or no fines		Medium	0.42	25 mm to 2.00	mm (N	o. 40 to No. 1	0 sieve)
0°S	GP	POORLY-GRADED GRAVEL		Fine		74 mm to 0.42	5 mm (l	No. 200 to No	40 sieve)
20		gravel-sand mixtures, little or no fines	Silt & C	lay ("Fines")	<0.	074 mm (small	er than	a No. 200 sie	ve)
13	GM	SILTY GRAVEL	i				i		
'아님		gravel-sand-silt mixtures		COHESIVE	E SILTS &	CLAYS			COARSE
18	GC	CLAYEY GRAVEL	UNCO	NFINED	_			RELATIVE AMOUNT <sup>7</sup>	••••
19 2		gravel-sand-clay mixtures		RESSIVE	SPT⁵	CONSISTENC	1		(70)
• △	SW	WELL-GRADED SAND		GTH, QP <sup>4</sup>	(BPF)	(COHESIVE)		Trace	<5
• •	<b>C</b> D	gravelly sand, little or no fines	1	).25	<3 3 - 4	Very Soft Soft		With	10 - 20
	SP	POORLY-GRADED SAND gravelly sand, little or no fines	1	- <0.50	5-4 5-8	Firm		Adjective	25 - 45
	SM	SILTY SAND	1	- <1.00 - <2.00	9 - 15	Stiff		(ex: "Silty")	25 - 45
	•	sand-silt mixtures	1	- <2.00 - <4.00	16 - 30	Very Stiff			
1/	SC	CLAYEY SAND	1	- 8.00	31 - 50	Hard			
/:/:/.		sand-clay mixtures	1	3.00	>50	Very Hard			
	ML	SILT	1			,			WATER LEVELS
		non-plastic to medium plasticity	GRAVE	LS. SANDS	& NON-C	OHESIVE SIL	TS	WL (F	First Encountered
	MH			SPT <sup>5</sup>		DENSITY		_	
	CL	high plasticity		<5		Very Loose		₩L (0	Completion)
	υL	LEAN CLAT low to medium plasticity	L L	<5 5 - 10		Loose		🔻 WL (§	Seasonal High W
	СН	FAT CLAY		1 - 30	M	edium Dense		<u>↓</u> ((	
		high plasticity	1	1 - 50	111	Dense		🕎 🛛 WL (8	Stabilized)
555	OL	ORGANIC SILT or CLAY		>50		Very Dense		-	
555		non-plastic to low plasticity				,	Į		
$\langle \langle \langle \langle \langle \rangle \rangle \rangle \rangle$	ОН	ORGANIC SILT or CLAY				FILL	AND R	оск	
1111		high plasticity							
76 76	PT	PEAT highly organic soils							
N6 N									

<sup>1</sup>Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

<sup>2</sup>To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

<sup>3</sup>Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

<sup>4</sup>Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

<sup>5</sup>Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler

required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

<sup>6</sup>The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

<sup>7</sup>Minor deviation from ASTM D 2488-17 Note 14.

<sup>8</sup>Percentages are estimated to the nearest 5% per ASTM D 2488-17.

# WL (Seasonal High Water) WL (Stabilized)

ROCK

WATER LEVELS<sup>6</sup>

WL (First Encountered)

Y <sup>7</sup>	RELATIVE AMOUNT <sup>7</sup>	COARSE GRAINED (%) <sup>8</sup>	FINE GRAINED (%) <sup>8</sup>
)	Trace	<5	<5
	With	10 - 20	10 - 25
	Adjective	25 - 45	30 - 45



# SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT) ASTM D 1586 Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

## **SPT Procedure:**

- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 12 inches (in 3 or 4 Increments of 6 inches each)
- Auger is advanced\* and an additional SPT is performed
- One SPT test is typically performed for every two to five feet
- Obtain two-inch diameter soil sample

\*Drilling Methods May Vary— The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.





CLIENT Gay and		Inc					PROJECT N 12:19208	10.:		BORING I 3-01	NO.:	SHEET: 1 of 1		
PROJEC							DRILLER/C	ONTRA				10.1		EUQ
Auburn	Park						Blue Ridge	Drilling	, Inc.			1		
SITE LO 3595 Ri			er, Virgi	inia 241	149							LC	DSS OF CIRCULATION	<u>&gt;100</u>
NORTH 355534					STING: 913312.0	STATION:				JRFACE E <b>70.0</b>	LEVATION:	E	BOTTOM OF CASING	
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION O	PF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"		X Limit Water Content X STANDARD PENETRATION IX QUALITY DESIGNATION RQD REC CALIBRATED PENETROME ES CONTENT] %	
-					Topsoil Thickness [6"] (CL) Residuum, LEAN (			1777						
-	S-1	SS	18	16	tan- brown, moist, sof		i SAND,			-	2-3-5 (8)	⊗ <sub>8</sub>		
-  5-	S-2	SS	18	18						 2065 —	2-4-4 (8)	⊗ <sub>8</sub>	34.0	
	S-3	SS	18	18							2-2-2 (4)	<b>⊗</b> 4		
-														
10-	S-4	SS	18	18		NG AT 10.0	FT			2060 -	2-3-5 (8)	⊗ <sub>8</sub>		
										-				
15- 										2055 -				
										- - - 2050 -				
25-										2045-				
30-										2040 -				
									601					
∠ v	TI VL (Firs				NES REPRESENT THE APPROXII Dry		DARY LINES BE			. TYPES. IN 2021	CAVE IN		MAY BE GRADUA	L
▼ v	VL (Coi	npleti	on)			BOR				2021	HAMMEI		Auto	
V V	VL (Sea	isonal	High V	Vater)								N ITPE:	Auto	
V V	VL (Sta	bilized	)				JIPMENT: CME-55		DGG RD	ED BY:	DRILLING	6 METHOD	): <b>2 1/4" HSA</b>	
					GEC		CAL BOR	EHOL	ELC	OG				

CLIENT Gay and		Inc.				PROJECT NO.: 12:19208	1	BORING I <b>B-02</b>	NO.:	SHEET: 1 of 1
PROJEC Auburn		ЛЕ:				DRILLER/CONTRA				<b>L</b> C.
SITE LO	CATIO					Bide Kidge Drilling	g, me	•		
3595 Ri North		ad, Rine	er, Virgi		149 Asting: Station:		CI		LEVATION:	
355555					913527.4 STATION.			78.0	LEVATION.	BOTTOM OF CASING
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X
-					Topsoil Thickness [6"]					[FINES CONTENT] %
-	S-1	SS	18	16	(CH) Residuum, FAT CLAY, trace sa brown, moist, stiff	and,			3-5-7 (12)	⊗ <sub>12</sub> 33.6
	S-2	SS	18	18				2073 -	4-6-6 (12)	⊗ <sub>12</sub>
-	S-3	SS	18	17				-	4-5-8 (13)	⊗ <sub>13</sub>
-					(MIL) CILT MUTH CAND rod brown	a maist				
-	S-4	SS	18	14	(ML) SILT WITH SAND, red- browr stiff				4-5-6 (11)	⊗ <sub>11</sub>
10-					END OF DRILLING AT 10.0 F	·T		2068 -		
-										
- - -										
15								2063 -		
20-								 2058 -		
								-		
25-								2053 -		
								-		
-								-		
30-								2048-		
	ті	HE CTP			NES REPRESENT THE APPROXIMATE BOUND			TYPES IN		
∠ v	VL (Firs				Dav			2021	CAVE IN	
	VL (Coi			-	BORI	NG				
V V	VL (Sea	asonal	High V	Vater)	COMF	PLETED:		<b>2021</b>	HAMME	R TYPE: Auto
v v	VL (Sta	bilized	)		EQUIF ATV CI		_OGG Brd	ED BY:	DRILLING	6 METHOD: <b>2 1/4" HSA</b>
					GEOTECHNIC		LEL	OG		

CLIENT Gay and		Inc.				PROJECT N 12:19208		E	BORING N 3-03	10.:	SHEET: 1 of 1	FCo
PROJEC Auburn		ΛE:				DRILLER/CO						<b>-</b> 63
SITE LO		N:				Blue Ridge	Drilling	, inc.	•			<u> </u>
3595 Ri		ad, Rine	er, Virgi								LOSS OF CIRCULATION	
NORTH 355561					ASTING: STATION: 913346.1				JRFACE E 190.0	LEVATION:	BOTTOM OF CASING	
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content X Standard Penetration ROCK QUALITY DESIGNATION & RQD RCC CALIBRATED PENETROMET [FINES CONTENT] %	∆ BLOWS/FT & RECOVERY
	S-1	SS	18	14	Topsoil Thickness [6"] (CL) Residuum, LEAN CLAY, trace brown, moist, firm	sand,				2-2-3 (5)	⊗₅	
	S-2	SS	18	15					2085-	2-3-4 (7)	<sup>⊗</sup> 7 35.6	
	S-3	SS	18	18	(ML) SILT WITH SAND, tan, moist firm	:, soft to				2-1-2 (3)	$\otimes_3$	
	S-4	SS	18	16						2-2-3 (5)	⊗₅	
10-					END OF DRILLING AT 10.0	FT			2080-			
									2075			
30-									2060-			
	 тт	HE STRA	ATIFICA	L TION I I	NES REPRESENT THE APPROXIMATE BOUND	ARY LINES BE	TWEFN	SOII	TYPES. IN	-SITU THF TR	ANSITION MAY BE GRADUAL	
	VL (Firs	st Enco	ounter		Dat	NG STARTED			2021	CAVE IN		
	VL (Cor				BORI		Fe	eb 17	2021	HAMME	R TYPE: Auto	
	VL (Sea		-	Vater)		PLETED: PMENT:	L	CGG	ED BY:			
<u>▼</u> ∨	VL (Sta	bilized	)			CME-55	В	RD			6 METHOD: <b>2 1/4" HSA</b>	

Gay and Neel, Inc.         12:19208         B-04         1 of 1           PROJECT NAME:         DRILLER/CONTRACTOR:            Auburn Park         Blue Ridge Drilling, Inc.		
Auburn Park     Blue Ridge Drilling, Inc.       SITE LOCATION:	LOSS OF CIRCULATION	
3595 Riner Road, Riner, Virginia 24149		
NORTHING: EASTING: STATION: SURFACE ELEVATION:		
3555569.2 10913161.2 2108.0	BOTTOM OF CASING	
DEPTH (FT) SAMPLE NUMBER SAMPLE TYPE SAMPLE DIST. (IN) RECOVERY (IN) RECOVERY (IN) RECOVERY (IN) RECOVERY (IN) RECOVERY (IN) RECOVERY (IN) RECOVERY (IN) RECOVERY (IN) RECOVERY (IN)	Plastic Limit Water Content Liquid Limit X—△ © standard penetration Blows/FT ROCK QUALITY DESIGNATION & RECOVERY RQD REC CAUBRATED PENETROMETER TON/SF [FINES CONTENT] %	
- Topsoil Thickness [6"]		
S-1 SS 18 13 (ML) Residuum, SANDY SILT, moist, stiff (9)	9 18.0	
S-2 SS 18 14	h	
	9	
S-3 SS 18 14 (SM) SILTY FINE SAND, light brown, moist, medium dense	Ø <sub>24</sub>	
S-4     SS     18     15       10	& <sub>21</sub>	
20- 2088 -		
30 - 2078 -		
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITI	ITION MAY BE GRADUAL	
Image: WL (First Encountered)     Dry     BORING STARTED:     Feb 17 2021     CAVE IN DEPTH	DEPTH: <b>4.30</b>	
WL (Completion)     BORING       WL (Seasonal High Water)     Feb 17 2021	PE: Auto	
EQUIPMENT: LOGGED BY:	THOD: <b>2 1/4" HSA</b>	
WL (Stabilized)     ATV CME-55     BRD     DRILLING METT       GEOTECHNICAL BOREHOLE LOG	UU. <b>2 1/4 ПЭА</b>	

CLIENT Gay and		Inc					PROJECT N 12:19208	0.:		BORING I 3-05	NO.:	SHEET: 1 of 1	
PROJEC							DRILLER/C	ONTRA				1011	- 60.6
Auburn							Blue Ridge						
SITE LO 3595 Ri			er, Virg	inia 24:	149							LOSS OF CIRCULATIO	ON <b>100</b> 2
NORTH 355549					STING: 913050.7	STATION:				JRFACE E . <b>12.0</b>	LEVATION:	BOTTOM OF CASIN	G 📕
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION O	F MATERIAL		~~~~~	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Cont X	TION BLOWS/FT
	S-1	SS	18	14	Topsoil Thickness [7"] (ML) Residuum, SAND GRAVEL, tan- brown, r [weathered rock struc	noist, very	' stiff				5-12-17 (29)	Ø29	
	S-2	SS	18	16	samples] (CL) LEAN CLAY, trace s	and brou	12			2107	11-10-11 (21)	<sup>©</sup> 21 20.8	
	S-3	SS	18	15	moist, firm to stiff	sanu, brow	/11,				3-3-3 (6)	<b>∞</b> <sub>6</sub>	
10-	S-4	SS	18	18	END OF DRILLIN	NG AT 10.0	FT			2102 -	4-5-7 (12)	Ø <sub>12</sub>	
										- - - - - - - - - - - - - - - - - - -			
20										2092			
25									2087				
	1												
	 ТI	L HE STR/	L ATIFICA	L TION LI	NES REPRESENT THE APPROXII	MATE BOUNI	DARY LINES BF	TWEEN	SOII	TYPES. IN	-SITU THE TR	L RANSITION MAY BE GRAD	UAL
∠ v	VL (Firs				Dry		ING STARTED			2021	CAVE IN		
	VL (Co	-				BOR		Fe	eb 17	2021	HAMMEI	R TYPE: Auto	
	-		-	Water)			IPLETED: IPMENT:		OGG	ED BY:			
<u>▼</u> V	VL (Sta	bilized	)			ATV (	CME-55	В	RD		DRILLING	5 METHOD: <b>2 1/4" HSA</b>	
					GEC	) [ECHNI	CAL BORE	:HOL	E L(	UG			

CLIENT		•					PROJECT N	10.:		BORING	NO.:	SHEET:	
Gay and PROJEC							12:19208 DRILLER/C	ONTRA		<b>B-06</b>		1 of 1	ECQ
Auburn							Blue Ridge						
SITE LOO			r Virai	inia 241	140							LOSS OF CIRCULATION	) <u>)</u>
3595 Rir NORTH		ia, kine	er, virgi		ASTING:	STATION:			SU	JRFACE E	ELEVATION:		
3555610					912979.0					23.0		BOTTOM OF CASING	
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	9F MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Conter X	DN BLOWS/FT
-					Topsoil Thickness [6"]		/						
	S-1	SS	15	16	(HWR) HIGHLY WEATH					-	13-27-50/3"		∞77/9"
					SAMPLED AS GRAVEL	WITH SAN	D,			-	(77/9")		1119
	<u>S-2</u>	ss		0	purple-gray, moist						50/2"		⊗ <sub>50/2"</sub>
	• -		-							-	(50/2")		- 50/2
5-										2118-			
-					Refusal encounte			ſ					
						NG AT 5.5 P	- 1			_			
-													
-										_			
10-										2113-			
-										_			
-										_			
-													
15-										2108-			
-										-			
_										-			
										-			
-										-			
20-										2103-			
20										2103			
-										-			
										-			
										-			
25 -										2098-			
										_			
-													
										_			
-										_			
30-										2093-			
]													
l	TH	HE STRA	L Atifica	I TION LI	NES REPRESENT THE APPROXI	MATE BOUNE	DARY LINES BE	TWEEN	l I SOIL	I TYPES. II	N-SITU THE TR	I RANSITION MAY BE GRADU	AL
V W					Dry		NG STARTEI			2021	CAVE IN		
▼ w	/L (Cor	npleti	on)			BORI	NG	-	ob 17	2021			
V V	/L (Sea	isonal	High V	Vater)		COM	IPLETED:			2021	HAMME	R TYPE: Auto	
V V	/L (Sta	bilized	)				IPMENT: C <b>ME-55</b>		ogg RD	ED BY:	DRILLING	6 METHOD: <b>2 1/4" HSA</b>	
	, -				GEC					OG	1		

CLIENT: Gay and Neel, Inc.	PROJECT NO.: 12:19208		DRING NO.: D6A	SHEET: 1 of 1
PROJECT NAME:	DRILLER/CON			LUS
Auburn Park	Blue Ridge Dri	lling, Inc.		
SITE LOCATION: 3595 Riner Road, Riner, Virginia 24149				LOSS OF CIRCULATION
NORTHING: EASTING:	STATION:	SUR 2123	RFACE ELEVATION: 3.0	BOTTOM OF CASING
DEPTH (FT) SAMPLE NUMBER SAMPLE TYPE SAMPLE TYPE RECOVERY (IN) RECOVERY (IN)	MATERIAL	WATER LEVELS	ELEVATION (FT) BLOWS/6"	Plastic Limit Water Content Liquid Limit X  Standard PENETRATION BLOWS/FT ROCK QUALITY DESIGNATION & RECOVERY  RQD RCD CALIBRATED PENETROMETER TON/SF
Auger probed to refusa	II, no sampling			[FINES CONTENT] %
5 - Refusal encounter END OF DRILLIN		2	2118 - - - - -	
*performed 4' NE of B-	06		2113 -	
		2		
		2	2103	
25-		2	2098	
30 -		2	2093 -	
THE STRATIFICATION LINES REPRESENT THE APPROXIM	IATE BOUNDARY LINES BETW	EEN SOIL T	I YPES. IN-SITU THE TI	I RANSITION MAY BE GRADUAL
☑ WL (First Encountered)	BORING STARTED:	Feb 17 2		
▼ WL (Completion)	BORING	Feb 17 2	.021 HAMME	R TYPE: Auto
𝕊 WL (Seasonal High Water)	COMPLETED: EQUIPMENT:	LOGGE	BV:	
☑ WL (Stabilized)	ATV CME-55		DRILLING	G METHOD: <b>2 1/4" HSA</b>

CLIENT Gay and		Inc.					PROJEC 12:192	CT NO.:		BORING <b>3-07</b>	NO.:	SHEET: 1 of 1	
PROJEC								R/CONTRA				1011	- EUQ
Auburn	Park						Blue Ri	dge Drilling	, Inc.				
SITE LO 3595 Ri			er, Virgi	inia 241	149							LOSS OF CIRCULATIO	0N <b>)100</b>
NORTH 3555702					STING: 913080.0	STATION	1:			JRFACE E 20.0	LEVATION:	BOTTOM OF CASIN	G D
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION O	F MATERI <i>I</i>	4L		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Cont X	TION BLOWS/FT
-					Topsoil Thickness [6"]					_			
	S-1	SS	18	15	(GC) Residuum, CLAYE SAND, gray and browr					-	13-14-20 (34)	⊗ <b>9</b> 4 19.7	
					(HWR) HIGHLY WEATH	IERED RO	ЭСК				50/6"		⊗ 50/6"
5-	S-2	SS	6	6	SAMPLED AS GRAVEL moist, very dense (SC) CLAYEY SAND WIT	WITH SA	ND, gray,			2115-	30/0		50/6"
-	S-3	SS	18	15	moist, medium dense			, ////		-	15-18-10 (28)	Ø <sub>28</sub>	39.3
-								////		-	2-4-7		
10-	S-4	SS	18	16						2110-	(11)	Ø <sub>11</sub>	
S-5 SS 18 16 15 										2105 - - - - - - - - - - - - - - - - - - -	5-6-7 (13) 22-38-16 (54)	⊗₅4	37.9
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU TI										N-SITU THE TR	RANSITION MAY BE GRAD	UAL	
				ed)	Dry	BC	DRING STAR	TED: F	eb 17	2021	CAVE IN	DEPTH: <b>7.80</b>	
	VL (Cor	-		N/a+- )			DRING DMPLETED:	F	eb 17	2021	HAMME	R TYPE: Auto	
	VL (Sea		-	vater)		EC	QUIPMENT:	L		ED BY:	DRILLING	G METHOD: 2 1/4" HSA	
V V	VL (Sta	uiized	1)		GFC		V CME-55		BRD DRILLING WETHOD. 21/4 HSA				

CLIENT: Gay and		Inc					PROJECT NC 12:19208	).:		BORING I <b>3-08</b>	NO.:	SHEET: 1 of 1		
PROJEC							DRILLER/CO	NTRA				1011		
Auburn							Blue Ridge D							
SITE LOO 3595 Rir			r Virgi	nia 241	140		, ,					LOSS OF CIRC	CULATION	<u>) 100 %</u>
NORTH 3555766	ING:	iu, nine	i, viigi	EA	STING: 913189.5	STATION:				JRFACE E 15.0	LEVATION:	BOTTOM OF	CASING	
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION O	F MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	X	er Content Liquid L 	(FT 'ERY
-					Topsoil Thickness [7"]					-				
-	S-1	SS	8	5	(HWR) HIGHLY WEATH					-	22-50/2" (50/2")			⊗ <sub>50/2"</sub>
					SAMPLED AS GRAVEL moist, very dense	WITH SAINL	D, gray, ⊨ □			-				
	S-2	SS	8	4	moist, very dense						35-50/2"			k
	3-2		0	4						-	(50/2")			& <sub>50/2"</sub>
5-							F			2110-				
-					Refusal encounte									
-										-				
10-										2105-				
_										-				
-														
_										-				
-										-				
15-										2100-				
_										-				
_										_				
_														
20-										2095 -				
										2000 -				
-														
-														
_										_				
25 -										2090 -				
-														
-										-				
-										-				
-														
-										-				
30-										2085-				
												: :	<u> </u>	
	TH	HE STRA	TIFICA	TION LI	NES REPRESENT THE APPROXI	MATE BOUND	ARY LINES BET	WEEN	SOIL	TYPES. IN	I-SITU THE TR	ANSITION MAY BE C	GRADUAL	
V V	/L (Firs	st Enco	untere	ed)	Dry	BORI	NG STARTED:	Fe	eb 19	2021	CAVE IN	DEPTH: <b>2.10</b>		
▼ W	/L (Cor	npletio	on)			BORI		F	eb 19	2021	HAMMEI	R TYPE: Auto		
V V	/L (Sea	sonal	High V	Vater)			PLETED:							
V W	/L (Sta	bilized	)			EQUII ATV C	PMENT: <b>ME-55</b>		oggi RD	ED BY:	DRILLING	6 METHOD: <b>2 1/4</b> "	HSA	
					GEO		CAL BORE			OG	]			

CLIENT Gay and		Inc.				PROJECT 12:19208			BORING B-08A	NO.:	SHEET: 1 of 1	
PROJEC						DRILLER/	CONTRA	сто	R:			LUS
Auburn						Blue Ridg	e Drilling	, Inc.	•			~
SITE LO 3595 Rii			er, Virgi	inia 241	149						LOSS OF CIRCULATION	<u>&gt;100</u> %
NORTH	IING:			EA	ASTING: STATION:				JRFACE E 1 <b>15.0</b>	LEVATION:	BOTTOM OF CASING	
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIA	L		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Li X	—∆ LOWS/FT
DEF	SAMPL	SAM	SAMPL	RECO				WATE	ELEVA	BLC	RQD REC	
					Auger probed to refusal, no sa	mnling					CALIBRATED PENETROMETE	R TON/SF
-					performed.	nping			-			
5-					Refusal encountered at 5.0	foot	_		2110-			
-					END OF DRILLING AT 5.0							
-					* performed 4' from B-08				-			
10-									_ 2105 -			
-									-			
									-			
15-									2100-			
-									-			
-												
20-									2095 -			
-												
-												
25-									2090 -			
-												
30-									2085			
	THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL            \[             WL (First Encountered) <b>Dry</b> BORING STARTED: Feb 19 2021           CAVE IN DEPTH:											
	-	mpleti				RING			9 2021	HAMME		
V V	VL (Sea	asonal	High V	Vater)		MPLETED: UIPMENT:			ED BY:			
v w	VL (Sta	bilized	)		ATV	/ CME-55				DRILLING	6 METHOD: 2 1/4" HSA	
					GEOTECHN	ICAL BOF	REHOL	EL	OG			

CLIENT Gay and		Inc					PROJEC 12:192	CT NO.:		BORING B-09	NO.:	SHEET: 1 of 1	
PROJEC								R/CONTRA				1011	<b>LLG</b>
Auburn								dge Drilling					
SITE LO			or Virai	inia 241	140							LOSS OF CIRCULATION	<u>&gt;100</u> %
3595 Rii North		iu, nine	er, virgi		STING:	STATION:			SU	JRFACE E	ELEVATION:		
355582					913316.9					.09.0		BOTTOM OF CASING	
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	PF MATERIA	L		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Conten X	→ A IN BLOWS/FT N & RECOVERY
_					Topsoil Thickness [7"]								
-	S-1	SS	18	18	(SM) Residuum, SILTY GRAVEL, tan, moist, ve					-	6-19-40 (59)	8.5 ⊗₅9	
					(HWR) HIGHLY WEATH	IERED RO	СК			-	24-50/2"		
5-	S-2	SS	8	6	SAMPLED AS SILTY SAI tan, moist, very dense		GRAVEL,			2104 -	(50/2")		\$50/2"
	6.2		10	10	(ML) SANDY SILT, brow		, very stif	f			18-13-16		
-	S-3	SS	18	18						-	(29)	₩ <sub>29</sub>	
-	S-4	SS	18	18						-	8-14-14	⊗ <sub>28</sub>	
10-	• •					NG AT 10.0	) FT			2099-	(28)	- 20	
										_			
15										2094 -			
-										-			
-										-			
20-										 2089 -			
-													
-										-			
-										-			
25-										2084 -			
-													
-										-			
_										_			
30-										2079-			
					NES REPRESENT THE APPROXI	MATE BOUN	IDARY LINE	S BETWEEN	I SOIL	TYPES. II	N-SITU THE TR	ANSITION MAY BE GRADU	4L
	VL (Firs			ed)	Dry	BO	RING STAF	RTED: F	eb 19	9 2021	CAVE IN	DEPTH: <b>3.80</b>	
	VL (Cor	-	-	N/atas)			RING MPLETED:	F	eb 19	9 2021	HAMME	R TYPE: Auto	
	VL (Sea		-	valer)		EQ	JIPMENT:	L		ED BY:	DRILLING	6 METHOD: <b>2 1/4" HSA</b>	
	VL (Sta	uiized	)		GFC		ATV CME-55 BRD			BRD			

CLIENT Gay and		Inc					PROJECT NO 12:19208	.:		BORING   <b>3-10</b>	NO.:	SHEET: 1 of 1		
PROJEC							DRILLER/CO	NTRA				1011		
Auburn							Blue Ridge D							
SITE LO 3595 Ri			er Virg	inia 24'	149							LOSS OF CI	RCULATION	<u>&gt;100</u> %
NORTH 355576	IING:		,8	EA	ASTING: 1912903.9	STATION:				JRFACE E <b>09.0</b>	LEVATION:	BOTTOM	DF CASING	
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	PF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	ROCK QUALITY	PENETRATION BI	–∆ ows/ft Recovery
	S-1	SS	18	18	Topsoil Thickness [6"] (CL) Residuum, LEAN ( gray- brown, moist, ve		sand,				3-6-10 (16)	<sup>⊗</sup> 16		
-	S-2	SS	18	18						2104	4-7-12 (19)	Ø <sub>t9</sub>		
5	<del>S-3</del>	SS	0	0	No recovery, presume	d to be HW	/ /R			2104 -	50/0" (50/0")			─────────────────────────────────────
-					Refusal encounte			-						
- 10-	•									2099 -				
	•													
										2094 -				
20										2089-				
										- - - 2084 -				
	- - - -									- - 2079 - -				
	 								<u></u>				CRADUAL	
\	VL (Firs				NES REPRESENT THE APPROXI		NG STARTED:			. TYPES. IN <b>2021</b>	CAVE IN		GRADUAL	
V V	VL (Co	mpleti	on)			BORI				2021	HAMMEI			
V V	High \	Water)			PLETED: PMENT:			ED BY:						
⊻ V	VL (Sta	bilized	)		GEO	ATV C		BI	RD		DRILLING	6 METHOD: <b>2 1/4</b>	I" HSA	

CLIENT: Gay and		Inc					PROJECT I 12:19208	NO.:		BORING I <b>3-11</b>	NO.:	SHEET: 1 of 1		
PROJEC							DRILLER/C	CONTRA				1011		EUS
Auburn							Blue Ridge	e Drilling	g, Inc.			1		~
SITE LO( 3595 Rir			er, Virg	inia 241	149							LC	DSS OF CIRCULATION	<u>&gt;100</u> 2
NORTH 3555801					ASTING: 913024.1	STATION:				JRFACE E . <b>10.0</b>	LEVATION:	E	30TTOM OF CASING	
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION O	F MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	ROC ROC	Limit Water Content X	∆ N BLOWS/FT I & RECOVERY
-	S-1	SS	18	15	Topsoil Thickness [6"] (CL) Residuum, LEAN ( brown, moist, stiff	CLAY, trace	e sand,				2-3-6 (9)	⊗ <sub>9</sub>	25.6	
	S-2	SS	18	14						- - - 2105 -	3-5-7 (12)	⊗ <sub>12</sub>		
	S-3	SS	18	15	(CH) FAT CLAY, red bro	wn, moist	, stiff			-	4-6-7 (13)	⊗ <sub>13</sub>		
	S-4	SS	18	18		0.47.40.0				2100-	5-6-6 (12)	⊗ <sub>12</sub>		
					END OF DRILLIN	IG AT 10.0	FI							
15										2095 - - - - -				
20-														
25-														
30-										2080 -				
∠ w					NES REPRESENT THE APPROXII Dry		ING STARTE			. TYPES. IN <b>2021</b>	CAVE IN		MAY BE GRADUA 5.20	AL
▼ W	/L (Cor	npleti	on)			BOR	ING			2021	HAMMEI		Auto	
V V	/L (Sea	sonal	High V	Water)			IPLETED: IPMENT:			ED BY:				
<b>V</b> W	/L (Sta	bilized	)			ATV	CME-55	В	RD		DRILLING	6 METHOD	): 2 1/4" HSA	

CLIENT Gay and		Inc.				PROJECT 12:19208			BORING <b>B-12</b>	NO.:	SHEET: 1 of 1	
PROJEC Auburn		ΛE:				DRILLER/ Blue Ridg						-63
SITE LO	CATIO					Dide Nidg	e Dinini	s, inc	•		LOSS OF CIRCULATION	>100%
3595 Ri NORTH		ad, Rine	er, Virgi		149 ASTING: STATION:			SI		LEVATION:		
355594					913114.2				998.0	LE VANON.	BOTTOM OF CASING	
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Li X STANDARD PENETRATION B ROCK QUALITY DESIGNATION & RQD RQD CAUBRATED PENETROMETEI [FINES CONTENT] %	—∆ Lows/FT RECOVERY
-					Topsoil Thickness [7"]							
-	S-1	SS	18	14	(SM) Residuum, SILTY SAND WIT GRAVEL, tan, moist, medium der dense				-	2-6-21 (27)	<sup>⊗</sup> 27	
	S-2	SS	18	16					2093 -	7-13-16 (29)	<sup>⊗</sup> 29.0	
	S-3	SS	18	16					-	6-13-17 (30)	<b>\$</b> 30	
-												
	S-4	SS	18	14					-	11-18-32 (50)	×50	
10-					END OF DRILLING AT 10.0 F	=T			2088 -			
-												
-												
15-									2083			
									-			
-												
-												
20-									2078-			
-									-			
-												
-												
-												
25-									2073-			
-												
-												
-									-			
30 -									2068 -			
					NES REPRESENT THE APPROXIMATE BOUND	ARY LINES I	BETWEEN	I SOII	TYPES. IN	I-SITU THE TR	ANSITION MAY BE GRADUAL	
	VL (Firs			ed)	Dry BORI	NG STARTI	ED: F	eb 19	9 2021	CAVE IN	DEPTH: <b>4.90</b>	
	VL (Coi	-			BORI		F	eb 19	9 2021	HAMMEI	R TYPE: Auto	
	VL (Sea		-	Vater)		PLETED: PMENT:	L	.OGG	ED BY:			
<u>▼</u> ∨	VL (Sta	bilized	)			ATV CME-55 BRD DRILLING			6 METHOD: <b>2 1/4" HSA</b>			

CLIENT Gay and	l Neel,					PROJECT NO.: 12:19208		BORING   <b>B-13</b>	NO.:	SHEET: 1 of 1
PROJEC Auburn		/IE:				DRILLER/CONTR Blue Ridge Drillin				
SITE LO	CATIO					Bide Ridge Drillin	ig, inc	•		
3595 Ri NORTH		ad, Rine	er, Virgi		149 Asting: Station:				LEVATION:	
355620					912884.3			)72.0	LEVATION.	BOTTOM OF CASING
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X STANDARD PENETRATION BLOWS/FT ROCK QUALITY DESIGNATION & RECOVERY RQD RCD REC CLUBRATED PENETROMETER TON/SF
-					Topsoil Thickness [7"]					[FINES CONTENT] %
-	S-1	SS	18	18	(ML) Residuum, SANDY SILT, gray moist, stiff to very stiff	- brown,			2-6-7 (13)	<sup>(2)</sup> 13 19.5
	S-2	SS	18	18				2067-	4-5-8 (13)	<b>®</b> 13
-									6-8-14	
	S-3	SS	18	18				-	(22)	<sup>⊗</sup> 22
								-	7-11-16	
10-	S-4	SS	18	18	END OF DRILLING AT 10.0 F			2062 -	(27)	⊗ <sub>27</sub>
					END OF DRILLING AT 10.0 F			-		
-								-		
15-								2057 -		
								-		
-								_		
								-		
20-								2052 -		
-										
-										
-										
25-								2047 –		
								-		
-								-		
30-								2042		
	TI VL (Firs				NES REPRESENT THE APPROXIMATE BOUND. Dry BORI					
	VL (Coi			cuj			Feb 19	9 2021	CAVE IN	DEPTH: <b>3.80</b>
	VL (Sea	-		Vater)	BORII COMI	NG PLETED:	Feb 1	9 2021	HAMME	R TYPE: Auto
	VL (Sta		-	1	EQUII ATV C		logo Brd	ED BY:	DRILLING	G METHOD: 2 1/4" HSA
	,				GEOTECHNIC			OG	1	

CLIENT Gay and	l Neel,					PROJECT N 12:19208	E	BORING I <b>3-14</b>	NO.:	SHEET: 1 of 1
PROJEC Auburn		/IE:				DRILLER/CO Blue Ridge I				
SITE LO 3595 Ri	CATIO		er. Virgi	inia 241	149	2.20	 ,,	·		LOSS OF CIRCULATION
NORTH 355645	IING:			EA	STING: STATION: 912791.0			JRFACE E 01.0	LEVATION:	BOTTOM OF CASING
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X STANDARD PENETRATION BLOWS/FT ROCK QUALITY DESIGNATION & RECOVERY RQD RQD RCC CALIBRATED PENETROMETER TON/SF [FINES CONTENT] %
	S-1	SS	18	14	Topsoil Thickness [7"] (SM) Residuum, SILTY SAND, tan medium dense	, moist,			6-15-15 (30)	∞30
5-	S-2	SS	18	16				 2096	6-13-14 (27)	11.0827
-	S-3	SS	8	8	(HWR) HIGHLY WEATHERED ROC SAMPLED AS SILTY SAND WITH (	Γ			35-50/2" (50/2")	⊗ <sub>50/2"</sub>
					tan, very dense, moist Refusal encountered at 7.5 END OF DRILLING AT 7.5 I			2091		
								- - - 2086 - - - - - -		
25								2076 -		
30-								- - 2071 - -		
	т	HE CTD			NES REPRESENT THE APPROXIMATE BOUNI			TYPES IN		
	VL (Firs				Deri	NG STARTED		2 2021	CAVE IN	
	VL (Coi				BOR		 			
V V	VL (Sea	asonal	High V	Vater)	CON	IPLETED:		2021	HAMME	R TYPE: Auto
⊻ v	VL (Sta	bilized	)			IPMENT: C <b>ME-55</b>	ogg RD	ED BY:	DRILLING	6 METHOD: <b>2 1/4" HSA</b>
					GEOTECHNI			OG		

CLIENT Gay and PROJE	d Neel,					PROJECT 12:19208 DRILLER/		1	BORING   B-15	NO.:	SHEET: 1 of 1	25
Auburn		/1∟.				Blue Ridg						
SITE LC 3595 Ri			er. Virgi	inia 241	149	·					LOSS OF CIRCULATION	<u>&gt;100%</u>
NORTH 355643	HING:		., 8	EA	STING: STATION: 912982.7			SU 28		LEVATION:	BOTTOM OF CASING	
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Li X  Standard PENETRATION BLOWS/F ROCK QUALITY DESIGNATION & RECOVE  RQD  RQD  CALIBRATED PENETROMETER TON/S [FINES CONTENT] %	T RY
	S-1	SS	18	16	Topsoil Thickness [6"] (ML) Residuum, SANDY SILT, tar purple, moist, very stiff to hard	and				2-9-10 (19)	<sup>⊗</sup> 19 29,0	
	S-2	SS	18	15					23-	7-10-16 (26)	S <sub>26</sub>	
	S-3	SS	18	16						7-11-15 (26)	\$26	
-	S-4	SS	18	15						12-15-20 (35)	S35	
10-	-				END OF DRILLING AT 10.0	FT			- 18			
	-											
20-									8-			
	-											
25-	-								3			
									-2- -2-			
									TYPEC	ו כודו ו דגור דיי		
	NL (Firs				NES REPRESENT THE APPROXIMATE BOUN	NG STARTE			2 2021	CAVE IN		
	NL (Co					RING						
<b>T</b> 1	NL (Sea	asonal	High V	Vater)	COM	MPLETED: JIPMENT:			2 2021 GED BY:	HAMME	R TYPE: Auto	
<u>ک</u> ۱	NL (Sta	bilized	)			CME-55	В	RD		DRILLING	6 METHOD: 2 1/4" HSA	

LIENT							PROJECT NO.:		BORING	NO.:	SHEET:		
-	<mark>i Neel,</mark> CT NAN						12:19208 DRILLER/CONT		<b>B-16</b>		1 of 1	——   <b>Ľ</b>	C
uburn		/12.					Blue Ridge Drill						
TE LO	CATIO	N:					0	0,					Σιοι
595 Ri	ner Roa	ad, Rine	er, Virg	inia 241	49						LOSS OF CIR	CULATION	
ORTH					STING:	STATION:		S	JRFACE I	ELEVATION:	BOTTOM O	F CASING	
5650	8.5		r	10	912891.3			2:	108.0				
Æ	SAMPLE NUMBER	γPE	SAMPLE DIST. (IN)	(IN)				'ELS	ELEVATION (FT)	-0	X	ter Content Liquic —●———△	2
DЕРТН (FT)	NN	SAMPLE TYPE	DIS.	RECOVERY (IN)	DESCRIPTION O	F MATERIAI		WATER LEVELS	NOI	BLOWS/6"		PENETRATION BLOW	
DEPT	1PLE	MP	1PLE	0 S				ATEF	LAT	BLO	RQD		
	SAN	/S	SAN	RE				×	ELE			PENETROMETER TO	
											[FINES CONTENT		/// JF
-					Topsoil Thickness [5"]		/ÌÌÌÌ	ТП —	1 _				
-	S-1	SS	18	14	(ML) Residuum, SAND	Y SILT, tan,	moist,		-	6-8-10		<b>9</b>	
-				<u> </u>	very stiff to hard				-	(18)		5.9	
_													
	S-2	SS	18	15						9-14-13 (27)	Ø <sub>27</sub>		
5-									2103-	(27)	21		
_									_				
-	S-3	SS	18	18					-	6-15-16 (31)	Ø31	28.8	
-										(31)		20.0	
_					(CH) FAT CLAY WITH SA	AND, brow	n, moist, 🛛	7	1 -				
_	S-4	SS	18	18	stiff			Δ	-	6-4-9 (13)	Ø <sub>13</sub>		
10 –								Δ	2098-	(10)			
								Λ	-				
_								4					
-					(SM) SILTY SAND WITH	I GRAVEL, 1	tan						
-					brown, moist, dense								
-	S-5	SS	18	16					-	9-18-32 (50)	22.3	250	
15-									2093-			$\mathbf{A}$	
_					(								
					(HWR) HIGHLY WEATH							$\backslash$	
-	S-6	SS	9	7	SAMPLED AS SILTY SAN		IRAVEL,		-	17-50/3"			850
_		55		<i>'</i>	tan- gray, moist, very o	lense			-	(50/3")			<u> </u>
20-									2088-				
-													
					Refusal encounter	rod at 22 0	foot						
_					END OF DRILLIN								
_									-				
25 -									2083 -				
_									-				
_									-				
_									-				
_									-				
- 30 –									2078-				
-									-				
7 1/	TI VL (Firs												
	-			eu)	Dry	BORI	NG STARTED:	Feb 1	7 2021	CAVE IN	DEPTH: Not C	<b>b</b> served	
	VL (Coi	-				BORI		Feb 1	7 2021	HAMME	R TYPE: Auto		
Z V	VL (Sea	asonal	High V	Water)			PLETED: PMENT:		ED BY:				
v v	VL (Sta	bilized	)				ME-55	BRD	יבט טו.	DRILLING	6 METHOD: <b>2 1/4</b>	" HSA	
					GEO		CAL BOREHO		06	1			

LIENT							PROJECT NO.:		BORING	NO.:	SHEET:	
ay and ROJEC							12:19208 DRILLER/CONTF		<b>B-17</b> )R:		1 of 1	EC
uburn		/12.					Blue Ridge Drillin					
TE LO		N:				I	0	0.				<u>&gt;ıor</u>
595 Rir	ner Roa	ad, Rine	er, Virgi	inia 241	.49						LOSS OF CIRCULATION	2101
IORTH						TION:		SU	JRFACE E	ELEVATION:	BOTTOM OF CASING	
556593	8.6			10	912954.5			21	12.0			
Ē	SAMPLE NUMBER	PE	SAMPLE DIST. (IN)	(I N)				ELS	ELEVATION (FT)	Ē	Plastic Limit Water Content X	Δ
DЕРТН (FT)	NUN	SAMPLE TYPE	DISID	RECOVERY (IN)	DESCRIPTION OF MA			WATER LEVELS	NO	BLOWS/6"	STANDARD PENETRATION	-
EPT	PLE	MPI	PLE	202	DESCRIPTION OF MIP			TER	VAT	RLOV	RQD	
	SAM	SA	SAM	RE				1×	ELE	ш		
											CALIBRATED PENETROMET [FINES CONTENT] %	TER TON/SF
-					(SM) Residuum, SILTY SAN							
-	S-1	SS	18	15	GRAVEL, tan- brown, mois	st, medi	um		-	5-13-14	⊗ <sub>27</sub>	
_	2-1	55	10	13	dense to very dense					(27)	27	
_												
-	S-2	SS	18	14					_	8-17-24		
5									2107-	(41)	22.4	
-												
-	S-3	SS	18	15					-	4-7-13 (20)	×,	
-										(20)		
										40.01		
-	S-4	SS	18	14						18-21-33 (54)	27-554	
10 –									2102-	(- )		
_								:				
_								:				
-					(SM) SILTY SAND, brown, i	moist,		:	-			
					medium dense			:	-	470		
_	S-5	SS	18	18				:		4-7-9 (16)	Ø <sub>16</sub>	
15								:	2097 -			
-								:	-			
_								:	_			
_								:				
_								:	-	7-10-16		
~ -	S-6	SS	18	18					2000	(26)	⊗ <sub>26</sub>	
20-					END OF DRILLING A	T 20.0 F	Г		2092 -			
_									-			
_												
-									_			
_									-			
25 -									2087 -			
-												
-												
_												
_												
-									-			
30-									2082			
									1			
	тı	це стр.							TYDEC IN			1
					NES REPRESENT THE APPROXIMATE							L
7 14	-			eu)	Dry		G STARTED:	Feb 22	2 2021	CAVE IN	DEPTH: <b>11.40</b>	
	11 100	mpleti	on)			BORIN		Feh 21	2 2021	HAMMEI	R TYPE: Auto	
								22			Auto	
		asonal	High V	Vater)			LETED:					
Z W	/L (Sea	asonal bilized	-	Vater)			MENT:	logg Brd	ED BY:	DRILLING	6 METHOD: <b>2 1/4" HSA</b>	

Gargend Meet, Inc.         12:13208         1 of 1         Inc 1         Inc 1           Adder Polk         DRILER/CONTRACTOR:         Blue Ride Orilling, Inc.         Inc 1	CLIENT		Inc						OJECT N :: <b>19208</b>	0.:		BORING B-18	NO.:	SHEET: 1 of 1		
Addum mix         Total Relies Redge Defiling, Inc.         Isour Relies Reflected Relies Relies Reflected Relies Refl										ONTRA				1011		EUQ
3939 Biner, Virginia 24149       Loss of Rouch Rine, Virginia 24149       Loss of Rouch Rine, Virginia 24149       Loss of Rouch Rine, Virginia 24149       Virgini 24149       Virgini 24149	Auburn	Park														
3356690       10913106.0       2000       Particular Management (Annumber Statement (Annumber (Ann				er, Virgi	inia <b>24</b> 1	149								L	OSS OF CIRCULATION	2100
End       Model in a second regression and model in a secon							STATION:	:					LEVATION:		BOTTOM OF CASING	
5-1       55       18       16         5       5-2       55       18       15         5       5-3       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5       5       20070       20080         20       5       20080       20080       20080         20       10       10       20070       2070         20       2070       207	DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)		PF MATERIA	۸L		×	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	R0	X STANDARD PENETRATIO CK QUALITY DESIGNATION RQD - REC CALIBRATED PENETROM	∆ N BLOWS/FT I & RECOVERY
S-1         SS         18         16           S-2         SS         18         15           S-3         SS         18         18           10         S-4         SS         18         18           20         S-4         SS         18         18           20         S         S         18         18           20         S         S         18         18           20         S         S         20075         20085           20         S         2075 <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>/</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	-								/							
5       -52       SS       18       15		S-1	SS	18	16									∞₄		
5-3       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         10       5-4       55       18       18         15       5       18       18       END OF DRILLING AT 10.0 FT       2090         20       20       2085       2085       2085       2085         20       2075       2075       2075       2075         30       18       18       18       2075       2075         30       19       19       19       2075       2075         30       19       19       19       2075       2075         30       19       19       19       2075       2070         20       19       19       19       2075       2070         20       19       19       19       10       2075       2070         20       19       19       1		S-2	SS	18	15							2005		₿7		46.8
5-3       SS       18       18         54       SS       18       18         10       54       SS       18       18         15       18       18       18       18         200       2085       2085       2085         201       2080       2080       2080         202       2075       2075       2075         30       18       18       18       18         30       18       18       18       18         30       18       18       18       18         30       18       18       18       18         30						(ML) SANDY SILT tan	wet soft	to fir	m		$\Box$	2095				
10       54       55       18       18       END OF DRILLING AT 10.0 FT       2090       (6)       %         15       1       1       1       1       1       2085       2085         20       20       2085       2085       2085       2085       2085         20       20       2085       2085       2085       2085       2085         20       20       2085       2085       2085       2085       2085         20       20       2005       2075       2075       2075       2075         30       1 <td>-</td> <td>S-3</td> <td>SS</td> <td>18</td> <td>18</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>⊗₄</td> <td></td> <td></td>	-	S-3	SS	18	18									⊗₄		
10       54       55       18       18       END OF DRILLING AT 10.0 FT       2090       (6)       %         15       1       1       1       1       1       2085       2085         20       20       2085       2085       2085       2085       2085         20       20       2085       2085       2085       2085       2085         20       20       2085       2085       2085       2085       2085         20       20       2005       2075       2075       2075       2075         30       1 <td>-</td> <td></td> <td>-</td> <td>2-2-4</td> <td></td> <td></td> <td></td>	-											-	2-2-4			
20- 20- 20- 20- 20- 20- 20- 20-	10-	S-4	SS	18	18							2090-		⊗ <sub>6</sub>		
20 20 20 20 20 20 20 20 20 20	-						NG AT 10.0	0 FT								
20 20 20 20 20 20 20 20 20 20												-				
20 20 20 20 20 20 20 20 20 20	-											-				
20 20 20 20 20 20 20 20 20 20	-															
20 20 20 20 20 20 20 20 20 20	15-											2085-				
25 30 THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) 6.0 BORING STARTED: Feb 22 2021 WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) To WL (Seasonal High Water) The WL (Seasonal High Wate	-											-				
25 30 THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) 6.0 BORING STARTED: Feb 22 2021 WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) To WL (Seasonal High Water) The WL (Seasonal High Wate	-											-				
25 30 30 30 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5	-											-				
25 30 THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) 6.0 BORING STARTED: Feb 22 2021 WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) To WL (Seasonal High Water) The WL (Seasonal High Wate	-															
25 30 30 30 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5	20-											2080-				
30       -												2000				
30       -	-															
30       -	-															
30       -	-															
30       -	-															
Image: Second	25-											2075-				
Image: Second	-															
Image: Second	-															
Image: Second																
Image: Second																
V       WL (First Encountered)       6.0       BORING STARTED:       Feb 22 2021       CAVE IN DEPTH:       4.10         V       WL (Completion)       BORING       Feb 22 2021       HAMMER TYPE:       Auto         V       WL (Seasonal High Water)       COMPLETED:       LOGGED BY:       DRILLING METHOD: 21/4" HSA	30-											2070-				
V       WL (First Encountered)       6.0       BORING STARTED:       Feb 22 2021       CAVE IN DEPTH:       4.10         V       WL (Completion)       BORING       Feb 22 2021       HAMMER TYPE:       Auto         V       WL (Seasonal High Water)       COMPLETED:       LOGGED BY:       DRILLING METHOD: 21/4" HSA																
V     WL (Completion)     BORING     Feb 22 2021     HAMMER TYPE:     Auto       V     WL (Seasonal High Water)     EQUIPMENT:     LOGGED BY:     DRILLING METHOD: 21/4" HSA							MATE BOUN	NDARY	LINES BE	TWEEN	I SOIL	TYPES. IN	I-SITU THE TR	RANSITION	MAY BE GRADUA	AL
Image: Weight of the second		-			ed)	6.0	BO	RING	STARTED	): F	eb 22	2 2021	CAVE IN	DEPTH:	4.10	
EQUIPMENT: LOGGED BY:			-		N )				TED.	F	eb 22	2 2021	HAMME	R TYPE:	Auto	
ATV CME-55 BRD				-	vater)		EQ	UIPM	ENT:	L	.OGG	ED BY:			ר. <b>2 1///יי ⊔כ</b> א	
GEOTECHNICAL BOREHOLE LOG	<u>× v</u>	VL (Sta	bilized	)		~~~						00			J. 2 1/4 ПЭА	

CLIENT Gay and		Inc						ROJECT N 2:19208	0.:		BORING   <b>3-19</b>	NO.:	SHEET: 1 of 1		
PROJEC								RILLER/CO	ONTRA				1011		LCC
Auburn	Park							ue Ridge							
SITE LO 3595 Ri			er, Virgi	inia 241	149								L	OSS OF CIRCULATION	, <u>), , , , , , , , , , , , , , , , , , </u>
NORTH	IING:			EA	STING:	STATION	1:					LEVATION:		BOTTOM OF CASING	
355624	5.9			10	913214.2					20	85.0				
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	F MATERIA	AL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	ROC	CLIMIT Water Conter X	ON BLOWS/FT
-					Topsoil Thickness [7"]				XXX		-				
	S-1	SS	18	13	(CL) Residuum, LEAN ( gray- brown, moist, st		ce sar	nd,			-	3-4-5 (9)	⊗9		
	S-2	SS	18	18				,			-	3-4-5 (9)	⊗9		42.5
5-						· .					2080 -				
	S-3	SS	18	18	(ML) SANDY SILT, brow	/n, moisi	t, son				-	3-2-2 (4)	⊗₄		
											-				
 10-	S-4	SS	18	18							2075-	1-2-2 (4)	$\otimes_4$		
- 10					END OF DRILLIN	IG AT 10.	.0 FT				2075				
-											-				
											-				
-											-				
15-											2070 -				
											-				
_															
-															
											-				
20-											2065 -				
-											-				
-											-				
-											_				
25-											2060 -				
											-				
											-				
											-				
											-				
30-											2055 -				
	Tł	HE STR/	atifica <sup>:</sup>	TION LI	NES REPRESENT THE APPROXI	MATE BOU	INDARY	LINES BE	IWEEN	I SOIL	TYPES. IN	I-SITU THE TR	ANSITION	MAY BE GRADU	AL
∠ v	VL (Firs	st Enco	ounter	ed)	Dry	ВС	DRING	STARTED	: F	eb 19	2021	CAVE IN	DEPTH:	5.10	
▼ v	VL (Cor	npleti	on)				DRING		F	eb 19	2021	HAMMEI	R ΤΥΡΕ·	Auto	
V V	VL (Sea	isonal	High V	Vater)			OMPLE QUIPM				ED BY:				
v 🗴	VL (Sta	bilized	)				V CME			RD		DRILLING	6 METHOD	): <b>2 1/4" HSA</b>	
					GEC	DTECHN			HOL	E LO	OG				

LIENT							PROJECT NO.:		BORING	NO.:	SHEET:	
-	Neel, T NAN						12:19208 DRILLER/CONTRA		B-20		1 of 1	-EC(
uburn		/IL.					Blue Ridge Drilling					
		N:						5,				
		id, Rine	er, Virgi	inia 24	149						LOSS OF CIRCULAT	
ORTH		-				ATION:		SL	JRFACE E	LEVATION:		
556677	7.5			10	913018.0			21	10.0		BOTTOM OF CASI	NG
	SAMPLE NUMBER	Ĕ	(II)	î				LS	(1-		Plastic Limit Water Cor X	ntent Liquid Limit ────∆
DЕРТН (FT)	ΜU	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)				WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETR	ATION BLOWS/FT
PTH	N E	IPLE	Ц Ц	NCEF	DESCRIPTION OF M	1ATERIAL		ERL	ATIC	Ň	ROCK QUALITY DESIGNA	ATION & RECOVERY
DEI	MPI	SAM	MPI	EC C				VATI	E </td <td>BLG</td> <td>RQD REC</td> <td></td>	BLG	RQD REC	
	SA	0,	SA	~				>	Ξ		CALIBRATED PENETI	ROMETER TON/SF
											[FINES CONTENT] %	
-					Topsoil Thickness [6"]							
-	S-1	SS	18	15	(CL) LEAN CLAY WITH SAM			ł	-	9-18-19	∞	
_	2-1	55	10	15	trace gravel, moist, dense	to mediu	im dense			(37)	O37	
-									-			
_			10	10						4-2-21		
	S-2	SS	18	12			///	1	0405	(23)	× 15.5	
5								1	2105-			
-	<u> </u>			14	(HWR) HIGHLY WEATHER			1	-	8-50/5"		
	S-3	SS	11	11	SAMPLED AS GRAVEL WI	TH SAND,	gray,	1		(50/5")		×50.
-					moist, very dense			1	-			
-					(SM) SILTY SAND, tan, mo	oist,			1 1			
-	S-4	SS	18	15	very dense to medium d				-	13-30-35	Q Q	65
10-	<u> </u>		10						2100-	(65)		60
-												
_												
-									-			
_												
+									-	3-13-12		
	S-5	SS	18	14						(25)	Ø <sub>25</sub>	
15					-				2095 -			
_									_			
									-			
-					(HWR) HIGHLY WEATHER	ED ROCK		-	-			$\mathbf{i}$
_				_	SAMPLED AS SILTY SAND,	, trace gra	avel,	-		50/5"		
_	S-6	SS	_5	5	purple, moist, very dense	9		-		(50/5")		850
20 -									2090 -	()		
					Refusal encountered	d at 21.0 f	eet.		1 1			
-					END OF DRILLING				-			
									_			
-									-			
25 -									2085-			
4									-			
-									-			
-									-			
-									-			
30 -									2080 -			
									2000 -			
					NES REPRESENT THE APPROXIMAT	TE BOUNDA	RY LINES BETWEEN	I SOIL	TYPES. IN	N-SITU THE TR	ANSITION MAY BE GRAD	DUAL
ZW	/L (Firs	st Enco	ounter	ed)	Dry	BORIN	g started: <b>F</b>	eb 17	2021	CAVE IN	DEPTH: <b>7.40</b>	
Z W	/L (Cor	npleti	on)			BORIN	F	eb 17	2021	HAMMEI	R TYPE: Auto	
	/L (Sea	sonal	High V	Water)		COMP	LETED:					
	// /Ch-	اء دا : ا	١			EQUIPI ATV CN			ED BY:	DRILLING	6 METHOD: <b>2 1/4" HS</b> A	4
ΣW	/  /\T2	000700	1					RD				

CLIENT Gay and		Inc.				PROJECT NO 12:19208	D.:		BORING <b>3-21</b>	NO.:	SHEET:
PROJEC	CT NAN					DRILLER/CC					LUS
Auburn		N:				Blue Ridge D	orilling,	, Inc.			
3595 Ri	ner Roa		er, Virg								LOSS OF CIRCULATION
NORTH 355665					ASTING: STATION: 913153.0				JRFACE E .05.0	LEVATION:	BOTTOM OF CASING
	3ER	ш	(N	Î				S	Ē		Plastic Limit Water Content Liquid Limit X
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	S STANDARD PENETRATION BLOWS/FT ROCK QUALITY DESIGNATION & RECOVERY RQD RQD CALIBRATED PENETROMETER TON/SF
-					Topsoil Thickness [6"]				-		[FINES CONTENT] %
-	S-1	SS	18	16	(ML) Residuum, SILT, trace sand, gray, moist, stiff	tan-			-	2-5-8 (13)	<sup>⊗</sup> 13 31 <sup>•</sup> .2
	S-2	SS	18	16	(SM) SILTY SAND WITH GRAVEL, moist, medium dense to dense	gray,			2100-	4-7-13 (20)	\$20
	S-3	SS	18	17						14-20-15 (35)	Ø35
-									-		
 10	S-4	SS	18	16					2095 -	17-18-22 (40)	⊗ <sub>40</sub>
					Refusal encountered at 11.5	i feet.					
					END OF DRILLING AT 11.5				-		
 15									2090 - - -		
									-		
20-									2085-		
									-		
									-		
25-									2080 -		
									-		
									2075-		
									-		
	LTI	HE STRA	ATIFICA	L TION LI	L NES REPRESENT THE APPROXIMATE BOUNE	ARY LINES BET	WEEN	SOIL	TYPES. IN	I-SITU THE TR	ANSITION MAY BE GRADUAL
V V	VL (Firs				Data	NG STARTED:			2021	CAVE IN	
▼ v	VL (Coi	mpleti	on)		BORI		E0	h ??	2021	HAMMEI	R TYPE: Auto
V V	VL (Sea	asonal	High V	Vater)		PLETED: PMENT:			ED BY:		
v 🗵	VL (Sta	bilized	)		ATV (	ME-55	BF	RD		DRILLING	6 METHOD: 2 1/4" HSA
					GEOTECHNI	CAL BORE	HOLI	EĹ	0G 🗌		

CLIENT Gay and		Inc.					PROJEC <sup>-</sup> <b>12:1920</b>			BORING <b>B-22</b>	NO.:	SHEET: 1 of 1		
PROJEC								/CONTRA				11011		-UQ
Auburn								ge Drilling				1		
SITE LO												LOS	SS OF CIRCULATION	) 1007)
3595 Ri		ad, Rin	er, Virg			CTATION								
NORTH 355686					ASTING: 1913052.7	STATION	:			JRFACE I <b>)96.0</b>	ELEVATION:	BC	TTOM OF CASING	
333000	9.5			10	515052.7				20	190.0				
	3ER	ш	Î	Î					S	F		Plastic L X-	imit Water Content Liqu	iid Limit ∆
DЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)					WATER LEVELS	ELEVATION (FT)	\$/6"	⊗ s1	ANDARD PENETRATION BLO	WS/FT
PTH	N U	IPLE	LE D	OVEF	DESCRIPTION O	F MATERIA	AL.		ERL	ATIO	BLOWS/6"		QUALITY DESIGNATION & REG	COVERY
DE	MPI	SAN	MPI	SECC					NAT	ILEV.	BL		RQD REC	
	S		S										ALIBRATED PENETROMETER T	ON/SF
					Topsoil Thickness [6"]							[FINES	CONTENT] %	
-					(CH) FAT CLAY, trace sa	nd. tan-	grav.	_{\\\\	1		2-3-4			[99.0 58%]
	S-1	SS	18	16	moist, firm to stiff	.,	0 . 11		1		(7)	Ø7	<sup>30</sup> × 37.0	58%]
	-								1	_				
-					-				1	-	3-5-7			
	S-2	SS	18	14							(12)	⊗ <sub>12</sub>		
5-					-				1	2091-				
					(CH) FAT CLAY, brown,	moist, st	tiff to firm				3-5-4			
_	S-3	SS	18	16						_	(9)	₿9		
_	-				-									
-					-					-	4-3-4			
-	S-4	SS	18	15						-	(7)	⊗7		
10-					END OF DRILLIN	IG AT 10.	.0 FT			2086 -				
	-													
_														
-										-				
										-				
15-										2081-				
-	1													
	-													
_														
-										-				
	-													
20-										2076 -				
	1									-				
_										-				
۔ مر	1									2074 -				
25 -	1									2071 -				
-	1									-				
_	1									-				
_	-									-				
	1									-				
30-										2066-				
- 50	1													
	Т	HE STR	ATIFICA	TION LI	NES REPRESENT THE APPROXII	MATE BOU	NDARY LINES	BETWEEN	I SOII	TYPES. II	N-SITU THE TR	RANSITION N	1AY BE GRADUAL	
$\nabla$ V	VL (Fir	st Enco	ounter	ed)	Dry	во	RING START	TED: F	eb 22	2 2021	CAVE IN	DEPTH:	4.60	
V V	VL (Co	mpleti	on)				RING							
	-	-	-	Mate:			MPLETED:	F	eb 22	2 2021	HAMME	R TYPE:	Auto	
	-		-	Water)			UIPMENT:	L	OGG	ED BY:				
V V	VL (Sta	bilizec	4)				V CME-55		RD		DRILLING	METHOD:	2 1/4" HSA	
					GEC		ICAL BO	REHOL	E L	OG				

CLIENT Gay and		Inc					PROJECT N 12:19208	IO.:		BORING I <b>3-23</b>	NO.:	SHEET: 1 of 1	
PROJE							DRILLER/C	ONTRA				1011	- <b>EU</b> Q
Auburn							Blue Ridge						
SITE LO 3595 Ri			er, Virgi	inia 241	149							LOSS OF CIRCULAT	
NORTH 355704	IING:			EA	STING: 912927.3	STATION:				JRFACE E 175.0	LEVATION:	BOTTOM OF CASI	NG
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION O	DF MATERIAL		N	WATER LEVELS	ELEVATION (FT)	BLOW5/6"	Plastic Limit Water Co X	ATION BLOWS/FT
-	S-1	SS	18	16	Topsoil Thickness [7"] (ML) Residuum, SAND	Y SILT, bro	wn,				6-9-12	<sup>⊗</sup> 2117 <b>.</b> 6	
		55	10	10	moist, very stiff					-	(21)	<sup>921</sup> 17.6	
5-	S-2	SS	18	15						 2070 -	5-7-13 (20)	⊗ <sub>20</sub>	
-	S-3	SS	18	16						-	2-11-7 (18)	⊗ <sub>18</sub>	
										-	8-8-9		
10-	S-4	SS	18	15		NG AT 10.0	FT			2065 -	(17)	⊗ <sub>17</sub>	
15-	- - - -									2060 -			
	-									- - - - 2055 -			
	-									-			
25-	•									- - 2050 - - -			
30-	-									2045 -			
V V	Tł VL (Firs				NES REPRESENT THE APPROXII Dry		DARY LINES BE			. TYPES. IN 2 2021	CAVE IN		DUAL
V V	VL (Coi	mpleti	on)			BOR	ING			2021	HAMME		
V V	VL (Sea	sonal	High V	Vater)			IPLETED: IPMENT:			ED BY:			
V V	VL (Sta	bilized	)			ATV	CME-55	В	RD		DRILLING	5 METHOD: <b>2 1/4" HS</b> A	4

CLIENT Gay and		Inc					PROJECT 12:19208			BORING B-24	NO.:	SHEET: 1 of 1	
PROJEC							DRILLER/					1011	<b>LCC</b>
Auburn							Blue Ridg						
SITE LO 3595 Ri			er, Virgi	inia 241	149							LOSS OF CIRCULATION	<u>&gt;100</u> %
NORTH 355661	IING:			EA	STING: 913296.2	STATION:				JRFACE E . <b>00.0</b>	LEVATION:	BOTTOM OF CASING	
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION O	PF MATERIAL		×///×////	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Conter X	∆ DN BLOWS/FT N & RECOVERY
	S-1	SS	18	16	Topsoil Thickness [6"] (SM) Residuum, SILTY GRAVEL, gray- brown,						4-5-13 (18)	<b>⊗</b> 18	
					dense to dense	moist, me					5-13-26		
5-	S-2	SS	18	17						2095	(39)	<b>\$</b> 39	
-	S-3	SS	18	16						-	25-23-25 (48)	₽ <sub>48</sub>	
	S-4	SS	18	16							20-22-28 (50)	×50	
10-					END OF DRILLIN	NG AT 10.0	FT	!		2090 -			
										-			
15- 										2085 -			
20										2080 -			
										-			
25-										2075-			
30-										2070 -			
	Tł	HE STRA	L ATIFICA	L TION LI	NES REPRESENT THE APPROXII	MATE BOUNI	DARY LINES	BETWEEN	I I SOIL	TYPES. IN	I-SITU THE TR	ANSITION MAY BE GRADU	AL
V V	VL (Firs				Dry		ING START			2 2021	CAVE IN		
	VL (Cor	-				BOR	ING 1PLETED:	F	eb 22	2 2021	HAMME	R TYPE: Auto	
	VL (Sea		-	Vater)		EQU	IPMENT:			ED BY:	DRILLING	6 Method: <b>2 1/4" HSA</b>	
	VL (Sta	pilized	)		GEC	ATV O	CME-55		RD	OG		5 WEITIOD. 2 1/4 NJA	

CLIENT Gay and		Inc					PROJE 12:19	ECT NO.	:		BORING   <b>3-25</b>	NO.:	SHEET: <b>1 of 1</b>		
PROJEC								ER/CON	ITRA				1011		<b>LCC</b>
Auburn	Park							Ridge Dr							
SITE LO													LOS	S OF CIRCULATION	<u>رد ممار</u>
3595 Ri		ad, Rino	er, Virg			STATION	L.					LEVATION:			
355677					ASTING: 913250.1	STATION	1:				.01.0	LEVATION:	BC	TTOM OF CASING	
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	DF MATERIA	ΑL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	X- © 51 ROCK F C	ANDARD PENETRATIO QUALITY DESIGNATIO RQD REC ALIBRATED PENETRON	ON BLOWS/FT
					Topsoil Thickness [6"]								[FINES	CONTENT] %	
	S-1	SS	18	16	(MH) Residuum, ELAS brown, moist, firm	TIC SILT,	trace sar	nd,				2-3-3 (6)	⊗ <sub>6</sub>		
5-	S-2	SS	18	14							2096 -	2-3-4 (7)	⊗7		40.5× [86.3%
	S-3	SS	18	14	(ML) SANDY SILT, tan a stiff to very stiff	and purp	ole, moist	t,			-	2-4-5 (9)	₿9		
- - - 10-	S-4	SS	18	16							- - 2091 -	4-6-11 (17)	Ø <sub>17</sub>		
												8-9-8			
15	S-5	SS	18	16		NG AT 15.	.0 FT				2086 -	(17)	⊗ <sub>17</sub>		
20											2081				
											2076 -				
30-											2071 -				
										<u></u>					A1
∠ v	Tł VL (Firs				NES REPRESENT THE APPROXI		INDARY LIN DRING STA				. TYPES. IN 2 <b>2021</b>	CAVE IN		IAY BE GRADU <b>7.90</b>	AL
		-		Matar			DRING DMPLETEE	D:	Fe	b 22	2021	HAMME	R TYPE:	Auto	
	VL (Sea VL (Sta			water)		EC	UIPMEN				ED BY:	DRILLING	METHOD:	2 1/4" HSA	
	v L (Jld	שוועפנ	'/		GFC		V CME-55	OREH	BF IOL		DG			-	

CLIENT Gay and		Inc					PROJE 12:192	CT NO.:		BORING B-26	NO.:	SHEET: 1 of 1	
PROJEC								R/CONTF				1011	
Auburn													
	TE LOCATION: 595 Riner Road, Riner, Virginia 24149 ORTHING: EASTING: STATION: SURFACE ELEVATION: BOTTOM OF CASING 556425.6 10913558.7 2081.0		ON <b>500</b>										
						STATION:					ELEVATION:	BOTTOM OF CASIN	IG
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)		PF MATERIAL	L	8777577	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	X STANDARD PENETR. ROCK QUALITY DESIGNA RQD RCC CALIBRATED PENETR	ATION BLOWS/FT TION & RECOVERY
	S-1	SS	18	14	(ML) Residuum, SILT V	VITH SAN	D, brow	٦,				∞9	
	S-2	SS	18	18								Ø <sub>15</sub>	
 	S-3	SS	18	18						2070-		₿6	
											2-3-3		
10-	S-4	SS	18	18		NG AT 10.0	) FT			2071 -	(6)	∞ <sub>6</sub>	
15-										2066 -			
20-										2061			
	ELCONTON:         DOING DELLAG         DOING DELLAG         DOING DELLAGE         DOING DELLAGE<												
30-	S More Read, Rise, Virpinia 24109         Due of OPELLING         STATION:         DUE ACC ELEVATION:         EXET More of Loads         EXET												
	Numer Reade, Burey, Vargenz 244.9         SURFACE FIEVATION:         SURFACE FIEVATION:         NUMEr CFIEVATION:           tzs.6         1993558.7         STATION:         SURFACE FIEVATION:         NUMEr CFIEVATION:         NUMEr CFIEVATION: </td												
∠ v	5         1         55         18         14         1         10         236         10         246         10         26.9												
		1000         1000 <td< td=""><td></td></td<>											
			-	Vater)					LOGG	ED BY:			
<u>▼</u> ∨	VL (Sta	bilized	)		GFC	ATV	CME-55		BRD			∍ METHOD: <b>2 1/4" HSA</b>	<u> </u>

CLIENT Gay and		Inc					PROJECT 12:19208	NO.:		BORING I B-27	NO.:	SHEET: 1 of 1		
PROJEC							DRILLER/	CONTRA				1011		<b>LCC</b>
Auburn	Park													
			er, Virgi	inia 241	149							LC	DSS OF CIRCULATION	<u>&gt;100</u> %
	Sign Rue - Vurging 24.49         Station:         SURPACE FLEVATION:         Particular Wate Caree Local units Surpace FLEVATION:           5         18         18         18         Topsoil Thickness [6"]         2067         24-5 (10)         36-4 (10)         24-5 (10)         24-5 (													
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)		F MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	ROC ROC	X STANDARD PENETRATIO STANDARD PENETRATIO IX QUALITY DESIGNATIO RQD REC CALIBRATED PENETROM	DN BLOWS/FT N & RECOVERY
	U         1091889.0         2072.0         Production													
	S-2	SS	18	18						2067 -		⊗ <sub>10</sub>		
3393 Biner ktack, Rice, Virginal 24169       SLAIDAR:       SUPLACE LEVATION:       PERFORMATION:       PERFORMATION:														
	S-4	SS	18	18		IG AT 10.0	ET			2062 -		⊗ <sub>10</sub>		
	State         State <th< td=""></th<>													
15	SEGUEA         ID013899.0         2072.0         D0100000000000000000000000000000000000													
20-	93 PRIME Receive Verginal 24149         Loss BROAL Mice: Verginal 24149         Use of Booldand on Wergen Sector All Lines (Sector All Lines Sector All Lines (Sector All Lines Sector All Lines Sector All Lines (Sector All Lines Sector All Lines Sector All Lines (Sector All Lines Sector All Lines Sector All Lines Sector All Lines (Sector All Lines Sector All Lines (Sector All Lines Sector													
25-	939 Rise Road, Kinov Yugub 24149       ILLIG CROUNDA       PED         939 Rise Road, Kinov Yugub 24149       ILLIG CROUNDA       PED         556564       10013990.0       SIAIDON       VILLIG CROUNDA       PED         556564       10019       000000000000000000000000000000000000													
30-	Bits Riter Vurplis 24.49         Description 0         Station:         2014 ACL LLVAILOR:         Part of the state of the stat													
	<u>די</u>	TE CTD						FT\A/EEN		TYDEC IN	I_SITI I ТЫС ТВ		MAY RE CRADU	ΔΙ
∑ v														ML
	20 20 20 20 20 20 20 20 20 20													
	Upper         Upper <th< td=""><td></td></th<>													
⊻ v	3939 Bit River, Virging 32439       STATION:       202.0       UNINCE       UNINCE <td></td>													

PEDID IC INAMI:         DIALIT-R/CONTRACTOR:           Aubum Park         Illue Bidge Dolling, Inc.         Illue Bidge Dolling, Illue Bidge Dolling, Illue Bidge Do	CLIENT Gay and		Inc					PROJECT 12:19208			BORING I SWM-1	NO.:	SHEET: 1 of 1		
Autom Pric         Bite Bdge Dolling, Inc.         Image: Control of the set of													1011		<b>LLG</b>
3939 Biner koad, Riner, Virginia 24169     Istal IGG:     Stal IGG:     VILLEX CLOUD:     VILLEX CLOUD	Auburn	Park													
33550 0.8         10913227.8         2061.0         Partial Mark Mark Column (Audit and Mark Column (Audit an															
aborn Fuel Concentrations															
SESSION I         IDENTITY IN CONTRACT         Description of MATERIAL         Sec.0         Part Link Transform															
5       5-2       SS       18       18         5       5-3       SS       18       18         10       5-4       SS       18       16         18       18       18       18       10       10.0 FT         2046       2041       2046       2041       2046         2031       2031       2031       2031       2031         203       2031       2031       2031       2031         2031       2031       2031       2031       2031         201       10       10       10       10       10         201       10       10       10 <td< td=""><td></td><td>S-1</td><td>SS</td><td>18</td><td>16</td><td>(ML) Residuum, SILT V</td><td>VITH SAN</td><td>D, tan,</td><td></td><td></td><td></td><td></td><td>⊗15</td><td></td><td></td></td<>		S-1	SS	18	16	(ML) Residuum, SILT V	VITH SAN	D, tan,					⊗15		
5-2       SS       18       18       stiff	-						moist, ve	ry stiff to							
-53       55       18       18         -54       55       18       16         -54       55       18       16         -54       55       18       16         -54       55       18       16         -54       55       18       16         -54       55       18       16         -54       55       18       16         -57       6       13       97         -57       6       13       93         -57       -57.6       13       93         -57       -57.6       13       93         -57       -57.6       13       93         -57       -57.6       13       93         -57       -57.6       13       93         -57       -57.6       13       93         -57       -57.6       14       14         -57       -57.6       2046       2046         -57       -57.6       2036       2036         -57       -57.6       2036       2031         -57       -57.6       2036       2031         -57       -57.6		S-2	SS	18	18		·				 2056		₿ <sub>17</sub>	23.1	
10       54       SS       18       16       (3)       State         10       1       1       1       10       10       10       10         10       1       1       1       10       10       10       10       10         15       1       1       1       10       10       10       10       10       10         15       1       1       1       10       10       10       10       10       10       10         15       1       1       1       10 </td <td></td> <td>S-3</td> <td>SS</td> <td>18</td> <td>18</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>∞20</td> <td></td> <td></td>		S-3	SS	18	18								∞20		
10       END OF DRILLING AT 10.0 FT       2051         15       2046         15       2046         20       2041         20       2041         20       2041         20       2041         20       2036         20       2036         20       2036         20       2036         20       2031 <td></td> <td></td> <td></td> <td>10</td> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>5-7-6</td> <td></td> <td></td> <td></td>				10	10							5-7-6			
20 20 20 20 20 20 20 20 20 20	10-														
20 20 20 20 20 20 20 20 20 20															
25	15-										2046				
30 30   30 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2041</td><td></td><td></td><td></td><td></td></td<>											2041				
30 30   30 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>															
Image: Stratus in the stratus in t	25-										2036 -				
V       WL (First Encountered)       Dry       BORING STARTED:       Feb 17 2021       CAVE IN DEPTH:       5.40         V       WL (Completion)       BORING       BORING       Feb 17 2021       HAMMER TYPE:       Auto         V       WL (Seasonal High Water)       COMPLETED:       Feb 17 2021       HAMMER TYPE:       Auto         V       WL (Stabilized)       ATV CME-55       BRD       DRILLING METHOD: 2 1/4" HSA											2031 -				
V       WL (First Encountered)       Dry       BORING STARTED:       Feb 17 2021       CAVE IN DEPTH:       5.40         V       WL (Completion)       BORING       BORING       Feb 17 2021       HAMMER TYPE:       Auto         V       WL (Seasonal High Water)       COMPLETED:       Feb 17 2021       HAMMER TYPE:       Auto         V       WL (Stabilized)       ATV CME-55       BRD       DRILLING METHOD: 2 1/4" HSA															
▼     WL (Completion)     BORING COMPLETED:     Feb 17 2021     HAMMER TYPE:     Auto       ▼     WL (Seasonal High Water)     EQUIPMENT:     LOGGED BY:     DRILLING METHOD:     2 1/4" HSA       ▼     WL (Stabilized)     ATV CME-55     BRD     DRILLING METHOD:     2 1/4" HSA															AL
V     WL (Seasonal High Water)     Feb 17 2021     HAMMER TYPE:     Auto       V     WL (Stabilized)     EQUIPMENT:     LOGGED BY:     DRILLING METHOD:     2 1/4" HSA					-uj	Uy									
WL (Stabilized)     ATV CME-55     BRD     DRILLING METHOD: 2 1/4" HSA			-	-	Vater)		CON	MPLETED:					R TYPE:	Auto	
	v w	VL (Sta	bilized	)			ATV	CME-55	В	RD		DRILLING	METHOD:	2 1/4" HSA	

CLIENT Gay and		Inc.				PROJECT NO.: 12:19208		BORING I SWM-2	NO.:	SHEET: 1 of 1
PROJEC Auburn		ΛE:				DRILLER/CONTRA				<b>-</b> <u></u>
		N:				Blue Ridge Drillin	g, inc	•		
		ad, Rine	er, Virgi							
355514									LEVATION:	BOTTOM OF CASING
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X  Standard Penetration BLOWS/FT ROCK QUALITY DESIGNATION & RECOVERY  RQD  RQD  C ALIBRATED PENETROMETER TON/SF [FINES CONTENT] %
	S-1	SS	18	18	Topsoil Thickness [6"] (ML) SANDY SILT, brown, moist, f	irmto stiff			2-2-3 (5)	<i>₩</i> 5
	S-2	SS	18	18				2057 -	3-5-7 (12)	⊗ <sub>12</sub>
	S-3	SS	18	18	(SM) SILTY SAND, brown, moist, dense to loose	medium	•		3-4-7 (11)	<sup>⊗</sup> 11 31 <b>°</b> 5
	S-4	SS	18	18				-2052 -	6-4-5 (9)	⊗,
					END OF DRILLING AT 10.01	-1				
15- 	185.0       10913278.3       2062.0       Perturn void control togale         1       <									
	Inter. Not., The Status Virginia 24.19       SURFACE ELEVATION:       SURFACE ELEVATION:         Inter. Not., TopSoll Thickness [6"]       DESCRIPTION OF MATERIAL       Internet of Calmar       Internet of Calmar         Inter. Not., TopSoll Thickness [6"]       DESCRIPTION OF MATERIAL       Internet of Calmar       Internet of Calmar         Inter. Not., MULLING AT 10.0 FT       Internet of Calmar       Internet of Calmar       Internet of Calmar         Internet of Calmar       Internet of Calmar       Internet of Calmar       Internet of Calmar         Internet of Calmar       Internet of Calmar       Internet of Calmar       Internet of Calmar         Internet of Calmar       Internet of Calmar       Internet of Calmar       Internet of Calmar         Internet of Calmar       Internet of Calmar       Internet of Calmar       Internet of Calmar         Internet of Calmar       Internet of Calmar       Internet of Calmar       Internet of Calmar         Internet of Calmar       Internet of Calmar       Internet of Calmar       Internet of Calmar         Internet of Calmar       Internet of Calmar       Internet of Calmar       Internet of Calmar         Internet of Calmar       Internet of Calmar       Internet of Calmar       Internet of Calmar         Internet of Calmar       Internet of Calmar       Internet of Calmar       Interenet									
25- 	NTHING:         EASTING:         STATION:         SURFACE ELEVATION:         AUTOMOT Case           545.00         10913278.3         DESCRIPTION OF MATERIAL         Image: Case of Case Clubbing of Case Clubing of Case Clubbing of Cas									
	Site Street, Nume, Virging 2449               Extrem Constraints               Support 2449               Extrem Constraints               Support 2449               Sup									
30-	4         -									
		15 075								
	Image: black									
	Image: black									
		-		Vater)			eb 1	7 2021	HAMME	R TYPE: Auto
	-		-	1	EQUI			GED BY:	DRILLING	G METHOD: 2 1/4" HSA
	\5.u		.1					OG	I	

CLIENT Gay and		Inc.				PROJECT NO.: 12:19208		BORING N SWM-3	10.:	SHEET: 1 of 1
PROJEC		/IE:				DRILLER/CONTR				<b>L</b> C.
Auburn SITE LO		N:				Blue Ridge Drillin	ig, Inc			
3595 Ri	ner Roa		er, Virgi							LOSS OF CIRCULATION
NORTH 355625			[		STING: STATION: 912585.3				LEVATION:	BOTTOM OF CASING
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X
	S-1	SS	18	15	Topsoil Thickness [10"] (CL) Residuum, LEAN CLAY WITH brown, moist, soft	SAND,			2-1-3 (4)	∞₄
	5-1         S5         18         15           5-2         S5         18         15           5-3         S5         18         15           5-4         S5         18         15           5-3         S5         18         16           5-4         S5         18         14           10         S4         S5         18         14           10         S4         S5         18         14           10         S4         S5         18         14           10         END OF DRILLING AT 10.0 FT         2054         37.33           15         S         S6         S6         2049         2049           20         S6         S7.35         S6         S6         2034         2034           20         S6         S7.35         S6         S6         2034         2034         2034           20         S7.45 <td< td=""></td<>									
- - -	S1         S5         18         15         CLI Residum, LEAN CLAY WITH SAND, brown, moist, soft         24-33         44         54         55         18         15         43-4         7-7-7-7-7-7-7-7-7-7-7-7-7-7-7-7-7-7-7-									
	SS6253-0         10912553									
	-									
15-	- 3-3       SS       18       16       To very stitt       (7)       3-7-73         - 5-4       SS       18       14       END OF DRILLING AT 10.0 FT       2054       3-7-73         - 5-4       SS       18       14       END OF DRILLING AT 10.0 FT       2054       -       -         - 5-4       SS       18       14       END OF DRILLING AT 10.0 FT       2054       - </td									
20-	5       22       55       18       15         5-3       55       18       14       (ML) SANDY SILT, tan-brown, moist, firm       2059         5-4       55       18       14       (ML) SANDY SILT, tan-brown, moist, firm       2054         5-4       55       18       14       (ML) SANDY SILT, tan-brown, moist, firm       2054         5-4       55       18       14       (ML) SANDY SILT, tan-brown, moist, firm       2054         5-5       18       14       (ML) SANDY SILT, tan-brown, moist, firm       2049         5-6       2049       2049       2049         5-7       2049       2049         5-7       2039       2039         5-7       2039       2039         5-7       2039       2034         5-7       2039       2034         5-7       2039       2034         5-7       2039       2034         5-7       2034       2034         5-7       10       10         5-7       10       10         5-7       10       10         5-7       10       10         5-7       10       10 <t< td=""></t<>									
	-							2039 -		
	5.1         5.5         1.8         1.5         1.6         1.0         Toppoil Thickness [10"]         2059         2.3.3         4.4         2.2.2         4.4         2.2.2         4.4         2.2.2         4.4         2.2.2         4.4         2.2.2         4.4         2.2.2         4.4         2.2.2         4.4         2.2.2         4.4         4.5         1.6         1.0         1.0         Very stiff         2.059         4.3         4									
30-	54       55       18       14									
	 ТІ	HE STRA	L ATIFICA	L	NES REPRESENT THE APPROXIMATE BOUND.	ARY LINES BETWFF	N SOI	L TYPES. IN	-SITU THE TR	ANSITION MAY BE GRADUAL
∑ v					<b>D</b>					
▼ v	VL (Coi	mpleti	on)			NG				
V V	VL (Sea	asonal	High V	Vater)	COMI	PLETED:				KIYPE: Auto
⊻ v	VL (Sta	bilized	)		ATV C	ME-55	BRD		DRILLING	5 METHOD: <b>2 1/4" HSA</b>

	l Neel,					PROJECT NO.: 12:19208	:		NO.:	SHEET: 1 of 1
	DRULLW/CONTRACTOR       DRULLW/CONTRACTOR       DRUE         Bite Ridge Oriling, Ioc.       00001110 (10000)       00000110 (10000)       000000000000000000000000000000000000									
	11 MARL:       3HELLIN/CONTRACTOR         Park       9HELLIN/CONTRACTOR         CATION:       FATION:         See Food, Nice, Wights 24:49       Cold of dict.APCN         NIC:       FATION:         See Food, Nice, Wights 24:49       STATION:         INC:       FATION:         See Food, Nice, Wights 24:49       Descreption of Matterial         Distribution       Distribution         10012488.9       Distribution         1001248.9									
NORTH	y and Reci, Inc.         DIALIZATION         SW0.4         1 of 1         DIALIZATION         1 of 1           DIALIZATION TATUES         DIALIZATION TATUES         Blue Ridge Dolling, Inc.									
DЕРТН (FT)	HELICACINON:									
-	bulow Part   CIONTON:   CIONTON   C									
	LILL LOCATION:     MUST HUNC:     MUST HU									
	Under Norm         Bite Ridge Defining. Inc.         Image: Control									
-	Bubber Part         Bubber Ridge Ontilling, Inc.         Image: Control (Control (Contro) (Contro) (Control (Control (Contro) (Control (Control (Contr									
	Under Ret         Description         Lister Ridge Defining, Inc.         Lister Ridde Ridde Ridde Ridde									
Auburn Pric       United Bdgs Delling, Inc.       United Bdgs Delling,										
	Autom Price         Description         Description <thdescription< th=""> <thdescription< th=""></thdescription<></thdescription<>									
	Lateur Port Incontinue         Late Ridge Defining, Inc.         Image: Control Contro Control Control Control Control Contr									
-	Ubustom Part In LocaTional         Use Neight Defining, Inc.         Image: Part Inc.         <									
15-	L LOCATION - 2007 - 200									
	LE LICICATION - Set Transmer Acade - Set									
	L L L CALINOR - UTUELLING X TILO P. L L L CALINO - L L L CALINO - L L L L CALINO - L L L L L L L L L L L L L L L L L L									
	LICE LOOK INFORME         LICE OF CALLON         LICE OF CALLON         LICE OF CALLON         LICE OF CALLON         Description         Description <thdescription< th="">         Description         <thdescr< td=""></thdescr<></thdescription<>									
20-	abore Park   Unit Configure   Unit Conf									
-								-		
								-		
25-	PRINE IT MANE:         DRIFFICATION         PRINE IT MADE:         DRIFFICATION         PRINCE         PRI									
	PROFICE TENAME:         DMI IF RUCKIN RACE (DRI: Bue Ridge Drilling, Inc.         AMILE INFORMATION:           BISE Biner Rood, Riner, Veginia 2449         AMILE (DRI: Bue Ridge Drilling, Inc.         AMILE (DRI: Bue Ridge Drilling,									
-	Lakeum Pert LocATION:         Set 004         Hele Nidge Driffing, Inc.         Contraction of the set									
								-		
30-								2033		
	т	LE CTD							_S T    דווב דים	
\ □ □ v					<b>D</b> .					
V V	VL (Coi	mpleti	on)		BORIN	NG F	eb 23	2 2021		
	SERVICE:         EASTING:         STATION:         SUPFACE ELEVATION:         BUTTOM OF ORIGINATION (CONFIGURATION CONFIGURATION CONFIGURAT									
V V	VL (Sta	bilized	)		ATV CI	ME-55 B	RD			) MIETHOU: <b>2 1/4" HSA</b>

CLIENT Gay and	l Neel,					PROJECT NC 12:19208		5	BORING I SWM-5	NO.:	SHEET: 1 of 1		ECo
PROJEC Auburn		1E:				DRILLER/CO Blue Ridge D							
SITE LO	CATIO							,,			LOSS	OF CIRCULATION	<u> </u>
		ıd, Rine	er, Virgi					SI	IRFACE F	I EVATION:			
											BO	FTOM OF CASING	
	R		Î										
Ê	JMBE	ТҮРЕ	ST. (II	λ (IN)				SVELS	Z (FT	/6"		-	
PTH	LE NI	<b>1</b> PLE	LE DI	DVER	DESCRIPTION OF MATERIAL			ER LE	ATIO	OWS			& RECOVERY
B	51         55         18         15         (SM) Residuum, SILTY SAND, Purple, moist, dense         422.14         422.14         42.14           52         55         0         0         No recovery, presumed to be HWR         2065         500°           6         Refusal encountered at 5.0 feet. END OF DRILLING AT 5.0 FT         2065         2065         500°         500°           2065         2065         2065         2065         2065         2065         2065           1         1         1         1         2065         2065         2065           2065         2065         2065         2065         2065         2065         2065           2         1         1         1         2065         2065         2065           2         2         2         2         2         2         2         2           2         2         2         2         2         2         2         2         2         2         2           2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2												
	0,					8	///////////////////////////////////////						ETER TON/SF
-						nle				4 22 14			
	5-1         55         18         15           5-2         55         0         0         No recovery, presumed to be HWR         300°           5         5-2         55         0         0         No recovery, presumed to be HWR         2065           5         7         1         1         1         1         1         1           10         1												
-	6.2		0	0	No recovery presumed to be HV	/R				E0/0"			
-	3-2	22	0	0	No recovery, presumed to be riv	VIX							∞50/0"
5-					Refusal encountered at 5.0	eet.	-		2065				
									-				
-													
-													
10_									2060				
-									2000				
-													
									-				
	Gesch L         Jeps4108.2         Joro 0         Part of the second se												
15-	2         30         0         0         DESCRIPTION OF MATERIAL         93         0 <td></td>												
	5-1         SS         18         15           5-2         SS         0         0         No recovery, presumed to be HWR         432.14           5-2         SS         0         0         No recovery, presumed to be HWR         500°           8         No recovery, presumed to be HWR         2066         500°         500°           8         NO recovery, presumed to be HWR         2066         500°         500°           2060         2060         10         2060         10         10           1         1         1         1         2066         100°         2060         100°           2060         2056         2060         2060         10         2060         10 <td< td=""><td></td></td<>												
									-				
									-				
20-									2050 -				
									-				
-													
25									2045				
	i Riere-Road, Rimer, Virgenia 2449         Unit of Metalowicki Status         Setter Status         Seter Status         Setter Status         SeterS												
	NTHING:         STATING:         STATION:         SURFACE FLEVENTON:         INTERNACE FLEVENTON:         INTERNACE           98.06         99.00         90.00 <td></td>												
	Bit Mark All ALL         Description of MATERIAL         Description of MATERIAL <thdescription material<="" of="" th=""> <thdescription material<="" of="" td=""><td></td></thdescription></thdescription>												
	NORTHING:         EASTING:         STATION:         SURFACE ELEVATION:         DETONO COME           USESSEND:         1994108.2         Description or Mattriau         USERACE         USERACE         Description or Mattriau         USERACE         Description or Mattriau         USERACE         USERACE         Description or Mattriau         Description or Matriau         De												
30-	0000         0												
	L Tł	HE STRA	atifica <sup>:</sup>	i Tion Li	L NES REPRESENT THE APPROXIMATE BOUND	ARY LINES BET	WEEN	SOIL	. TYPES. IN	-SITU THE TR	ANSITION M	AY BE GRADUA	AL.
V V	VL (Firs	st Enco	unter	ed)	Dry BORI	NG STARTED:	Fe	eb 19	2021	CAVE IN	DEPTH:	2.10	
▼ v	VL (Cor	npleti	on)		BORI	NG			2024			A	
V V	VL (Sea	isonal	High V	Vater)	СОМ	PLETED:					K TYPE:	Auto	
V Y	VL (Sta	bilized	)						ED BY:	DRILLING	METHOD:	2 1/4" HSA	
									OG				

CLIENT Gay and	l Neel,					PROJECT N 12:19208		s	BORING I SWM-5A	NO.:	SHEET: 1 of 1	FCo
PROJEC Auburn		ИE:				DRILLER/CO						-65
SITE LO		N:				Blue Ridge I	Drining,	inc.				
		ad, Rine	er, Virgi								LOSS OF CIRCULATION	>100/>
NORTH	IING:			EA	STING: STATION:					LEVATION:	BOTTOM OF CASING	
(L:	MBER	ΥΡΕ	T. (IN)	(IN)				/ELS	(FT)	- -	X	Δ
DEPTH (F	AMPLE NU	SAMPLE T	AMPLE DIS	RECOVERY	DESCRIPTION OF MATERIAL			water lev	ELEVATION	BLOWS/		
	S		S								CALIBRATED PENETRON [FINES CONTENT] %	IETER TON/SF
					Auger probed to refusal, no sam performed.	pling						
-									-			
									-			
5-					Refusal encountered at 5.0	feet.	-		2065			
-									-			
					*Performed 4 feet SW of SWM-	5			-			
-									-			
10-	5     Auger probed to refusal, no sampling performed.     2065       6     Refusal encountered at 5.0 feet.     2065       END OF DRILLING AT 5.0 FT     1       *Performed 4 feet SW of SWM-5     1											
	S       Auger probed to refusal, no sampling performed.       2065         S       Refusal encountered at 5.0 feet. END OF DRILLING AT 6.0 FT       2065         10       *Performed 4 feet SW of SWM-5       2065         15       *Performed 4 feet SW of SWM-5       2065         20       2055       2055         20       2055       2055         20       2045       2045         20       2045       2045         20       2045       2045         20       Encountered by Dry BONNAST ENCOUNDARY LINES BETWEEN SOL TYPES IN STU THE TRANSITION MAY BE GRADUAL         Z       WL (Scand High Water)       Provember 100         WU (Stabulard)       Dry BONNAST ENCOUNDARY LINES BETWEEN SOL TYPES IN STU THE TRANSITION MAY BE GRADUAL         Z       WL (Stabulard)       PRUMASTER DOWNAST END											
-	Image: Statistic carbon of price and state of the statistic carbon of t											
45	Image: Description of the served s											
	VL (Completion)       Dry       BORING STARTED:       Feb 19 2021       CAVE IN DEPTH:         BORING       Feb 19 2021       CAVE IN DEPTH:											
	Image: static											
-									-			
20-									2050 -			
-												
-									-			
	No.         No.         No.         No.         DESCRIPTION OF MATERIAL         No.											
25-									2045			
_												
	Line         Line <thline< th="">         Line         Line         <thl< td=""></thl<></thline<>											
30-									2040-			
												A 1
V V					<b>D</b> .							AL
	-											
V V	VL (Sea	asonal	High V	Vater)	CON	1PLETED:					RITPE: Auto	
V V	VL (Sta	bilized	)		ATV	CME-55				DRILLING	6 METHOD: 2 1/4" HSA	
1					GEOTECHNI	CAL BORE	HOLE	LC	DG			

CLIENT Gay and	l Neel,					PROJECT N 12:19208		5	BORING SWM-6	NO.:	SHEET: 1 of 1	FCo
PROJEC Auburn		ΛE:				DRILLER/C Blue Ridge						-05
SITE LO		N:				Blue Kluge		, me.	<u>•</u>			
3595 Ri		ad, Rine	er, Virg								LOSS OF CIRCULATION	
NORTH 355654					ASTING: STATION: 914047.6				JRFACE E 173.0	LEVATION:	BOTTOM OF CASING	
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Conte X STANDARD PENETRATI ROCK QUALITY DESIGNATIC RQD RQD CALIBRATED PENETRON [FINES CONTENT] %	ON BLOWS/FT ON & RECOVERY
	S-1	SS	18	13	Topsoil Thickness [6"] (ML) Residuum, SILT WITH SANE moist, soft to stiff	), brown,				3-2-2 (4)	∞4	
	S-2	SS	18	15					2068 -	4-4-9 (13)	Ør3	
	<del>- S-3</del>	<del>-SS</del> -	-1	1	No recovery, presumed to be H	VR				50/1" (50/1")		─────────────────────────────────────
-					Refusal encountered at 7.5 END OF DRILLING AT 7.5		7					
10									2063			
									2058 - - - - - - - -			
20-									2053 -			
25-									2048 -			
30-									2043			
	Tł	HE STRA	ATIFICA	TION LI	NES REPRESENT THE APPROXIMATE BOUNI	DARY LINES BE	TWEEN	SOIL	TYPES. IN	I-SITU THE TR	RANSITION MAY BE GRADU	JAL
∑ v	VL (Firs	st Enco	unter	ed)	Dry BOR	ING STARTEI	D: F	eb 22	2 2021	CAVE IN	DEPTH: <b>4.50</b>	
V V	VL (Coi	mpleti	on)		BOR	ING	E.	ah 77	2 2021	HAMME	R TYPE: Auto	
V V	VL (Sea	asonal	High V	Water)		IPLETED:			ED BY:		NITE. AULO	
V V	VL (Sta	bilized	)			IPMENT: C <b>ME-55</b>		DGG RD	ED BI:	DRILLING	G METHOD: <b>2 1/4" HSA</b>	
					GEOTECHNI	CAL BOR	EHOL	EL	ŌG			

CLIENT: Gay and		Inc.					PROJECT NO 12:19208	O.:		BORING N SWM-6A	10.:	SHEET: 1 of 1		
PROJEC							DRILLER/CO	ONTRA				-		LUC
Auburn							Blue Ridge I	Drilling	, Inc.			1		
SITE LO( 3595 Rir			er, Virgi	inia <b>24</b> 1	149							LOSS O	F CIRCULATION	<u>&gt;100</u> %
NORTH	ING:			EA	STING:	STATION:			SU	JRFACE E	_EVATION:	BOTTC	OM OF CASING	
FT)	MBER	-YPE	5T. (IN)	(IN)					VELS	4 (FT)	,6"	X	••••	∆
DEPTH (	AMPLE NU	SAMPLE 1	SAMPLE DIS	RECOVERN	DESCRIPTION C	OF MATERIAL			WATER LE	ELEVATION	BLOWS	ROCK QUA RQD REC	LITY DESIGNATIO	N & RECOVERY
	High or the structure of t		ETER TON/SF											
	S-4	SS	18	15	(SM) Residuum, SILTY medium dense END OF DRILLIN	SAND, bro <b>NG AT 10.0 F</b>	wn, moist			-10 -10 -15 - -20 - - -25		<sup>⊗</sup> 19 20.	2	
										_				
						MATE BOUND	ARY LINES BET	WEEN	SOIL	TYPES. IN	-SITU THE TR	ANSITION MAY	BE GRADU	AL
	20 20 20 20 20 20 20 20 20 20		b											
	-	-	-	Vater)				Fe	eb 22	2021	HAMME	R TYPE: Au	uto	
				, ater j		EQUI	PMENT:			ED BY:	DRILLING	METHOD: 2	1/4" HSA	
	- (010		,		GEC					DG				

## **APPENDIX C – Laboratory Testing**

Laboratory Test Results Summary Plasticity Chart Moisture-Density Relationship Curves

					Atte	erberg Li	mits	**Percent	Moisture	- Density	CBF	R (%)	#Organi
Sample Locatior	Number	Depth (feet)	^МС (%)	Soil Type	LL	PL	PI	Passing No. 200 Sieve	Maximum Density (pcf)	Optimum Moisture (%)	0.1 in.	0.2 in.	Content (%)
B-01	S-2	3.5-5	34.0										
B-02	S-1	1-2.5	33.6										
B-03	S-2	3.5-5	35.6										
B-04	S-1	1-2.5	18.0										
B-05	S-2	3.5-5	20.8										
B-07	S-1	1-2.5	19.7										
B-07	S-3	6-7.5	39.3										
B-07	S-5	13.5-15	37.9										
B-09	S-1	1-2.5	8.5										
B-11	S-1	1-2.5	25.6										
otes: efinitions:		e Content, S	oil Type: U	SCS (Unif					#ASTM D2974-2 Limit, PL: Plasti		sticity Ind	ex, CBR:	California
Project: Client:	Auburn I Gay and Ne					Proj Date Re	ect No.: eported:		12:	19208			
	Office /	Lab				A	Address		Ot	fice Number	/ Fax		
ECS	ECS Mid-Atlantic I	LC - Roa	noke			Su	Enon Di ite 101			(540)362-20			
						Roanoł	ke, VA :	24019		(540)362-12	:02		
	Tested by			Checke	ed by			Approved	by	Date	Received		]
	JGeil			jgint			-	jginter			1/2021		f

			^MC (%)	Soil Type	Atte	erberg Li	mits	**Percent	Moisture	CBR (%)		#Organic	
Sample Location	Sample Number	Depth (feet)			LL	PL	PI	Passing No. 200 Sieve	Maximum Density (pcf)	Optimum Moisture (%)	0.1 in.	0.2 in.	Content (%)
B-12	S-2	3.5-5	19.0										
B-13	S-1	1-2.5	19.5										
B-14	S-2	3.5-5	11.0										
B-15	S-1	1-2.5	29.0										
B-16	S-1	1-2.5	26.9										
B-16	S-3	6-7.5	28.8										
B-16	S-5	13.5-15	22.3										
B-17	S-2	3.5-5	22.1										
B-17	S-4	8.5-10	27.6										
B-18	S-2	3.5-5	46.8										
lotes: Definitions:		e Content, S	oil Type: U	SCS (Unif				TM D1140-17, 7 em), LL: Liquid I			sticity Ind	ex, CBR:	California
Project: Client:	Auburn Park Gay and Neel, Inc.					Project No.: 12:19208 Date Reported:							
	Office /			A	Address		Office Number / Fax						
ECS Mid-Atlantic LLC - Roanoke			noke			7670 Enon Drive Suite 101			(540)362-2000				
						Roanoł	ke, VA 2	24019		(540)362-12	202		
Γ	Tested by			Checke	ed by			Approved by		Date	Date Received		
JGeil				igint	jginter			jginter 3/1			1/0004		

Sample Location				Soil Type	Atte	erberg Li	mits	**Percent	Moisture - Density		CBR (%)		#Organic
	Sample Number	Depth (feet)			LL	PL	PI	Passing No. 200 Sieve	Maximum Density (pcf)	Optimum Moisture (%)	0.1 in.	0.2 in.	Content (%)
B-19	S-2	3.5-5	42.5										
B-20	S-2	3.5-5	15.5										
B-21	S-1	1-2.5	31.2										
B-22	S-1	1-2.5	37.0	СН	58	30	28	99					
B-23	S-1	1-2.5	17.6										
B-25	S-2	3.5-5	40.5	MH	73	44	29	86.3					
B-27	S-1	1-2.5	20.7										
SWM-1	S-2	3.5-5	23.1										
SWM-2	S-3	6-7.5	31.5										
SWM-4	S-2	3.5-5	24.0										
Notes: Definitions:		e Content, S	oil Type: U	SCS (Unif				TM D1140-17, a em), LL: Liquid			sticity Ind	ex, CBR:	California
Project: Client:	Auburn Park Gay and Neel, Inc.						Project No.: 12:19208 e Reported:						
	Office /			A	Address		Office Number / Fax						
ECS Mid-Atlantic LLC - Roanoke						Su	Enon Dr ite 101		(540)362-2000				
						Roanoł	ke, VA	24019		(540)362-12	202		
	Tested by			Checke	ed by			Approved	by	Date	Received		
JGeil				jgint	-				iginter 3				

					Atte	erberg Li	<sup>mits</sup> **Percent		Moisture - Density		CBR (%)		#Organic	
Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	LL	PL	PI	Passing No. 200 Sieve	Maximum Density (pcf)		0.1 in. 0.2 in.	Content (%)		
SWM-5	S-1	1-2.5	10.8											
SWM-6A	S-4	8.5-10	20.2											
B-07 (BULK)	D3S-56	1-10		SC	28	19	9	31.9	125.9	10.5				
B-16 (BULK)	D3S-57	1-10		ML	35	25	10	92.6	104.7	19.1				
B-20 (BULK)	D3S-58	1-10		CL	31	21	10	71.4	114.3	15.9				
lotes: Definitions:		Content, S	oil Type: L	ISCS (Unif					#ASTM D2974-2 Limit, PL: Plasti		sticity Ind	ex, CBR:	California	
Project: Client:						Project No.: 12:19208 Date Reported:								
	Office / Lab						Address			Office Number / Fax				
ECS Mid-Atlantic LLC - Roanoke				7670 Enon Drive Suite 101					(540)362-2000					
						Roanoł		24019		(540)362-12	202			
	Tested by			Checke	ed by			Approved	by	Date	Received			
	JGeil													

