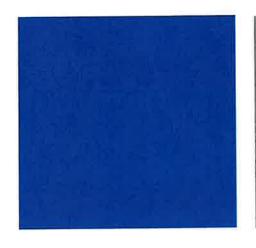
Exhibit 6







ECS MID-ATLANTIC, LLC

Geotechnical Engineering Report

Warrenton Data Center

Lee Highway and Blackwell Road Warrenton, Virginia 20186

ECS Project No. 01:31153

Revised August 15, 2022





Geotechnical • Construction Materials • Environmental • Facilities

Revised August 15, 2022

Ms. Patricia Krinke Bohler Engineering 28 Blackwell Park Lane, Suite 201 Warrenton, Virginia 20186

ECS Project No. 01:31153

Reference:

Geotechnical Engineering Report

Warrenton Data Center

Lee Highway and Blackwell Road Warrenton, Virginia 20186

Dear Ms. Krinke:

ECS Mid-Atlantic, LLC (ECS) has completed the subsurface exploration and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 01:63686-GP1, dated May 4, 2021. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration conducted and our design and construction recommendations.

It has been our pleasure to be of service to Bohler Engineering during the design phase of this project. We would welcome 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

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- Zone of Influence Diagram

EXECUTIVE SUMMARY

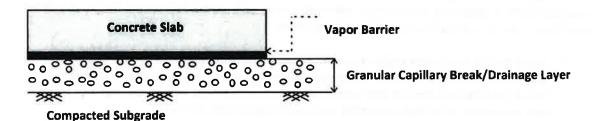
This Executive Summary is intended as a brief overview of the primary geotechnical conditions that are expected to affect design and construction. Information gleaned from this Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

- Based on the subsurface exploration completed we anticipate the site will be suitable for the
 proposed development. We do not anticipate conditions on the project site to adversely affect
 future development beyond the typical difficulties encountered in this geographic region (i.e.,
 rock excavation, potentially expansive soils, and moisture sensitive soils).
- For shallow foundation design we recommend the following design parameters:

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure (Stratum I Soil/Structural Fill)	3,000 psf	3,000 psf
Net Allowable Bearing Pressure (Stratum II- Weathered Rock Areas)	8,000 psf	8,000 psf
Minimum Width	24 inches	24 inches
Minimum Footing Embedment Depth (below slab or finished grade)	24 inches	24 inches

Deep foundation systems such as Drilled Shaft foundations or Auger Cast-In-Place (ACIP) Pile foundations can be utilized for heavily loaded structures. Deep foundations may be designed for an allowable bearing pressure on the order of 50 tons to 100 tons, if extended at least 3 drilled shaft diameters into the relatively unweathered rock. Actual designs will be provided in the final geotechnical report.

 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: 6 inches minimum.
- 2. Drainage Layer Material: 6 Inches of VDOT #57 stone, VDOT 21-A/21-B

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. Floor slabs placed in areas where expansive soils (CH/MH) are encountered should be underlain by at least 2 feet of compacted suitable fill.

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 150 pci (lbs./cu. inch).

Based on report, the anticipated geotechnical issues be considered during design included issues related to shallow bedrock, perched groundwater, potentially expansive and moisture sensitive soils, and deep foundations (drilled shafts) for the buildings.

• 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 Structural Areas	LL < 40, PI<15				
Pavement Areas	LL < 45, PI<20				
Max. Particle Size	4 inches				
Fines Content (% passing #200 sieve)	Max. 25 %				
Max. organic content	5% by dry weight				

• Compaction Methodologies:

STRUCTURAL FILL COMPACTION REQUIREMENTS					
Subject Requirement					
Compaction Standard	Standard Proctor, ASTM D698/ Virginia Test Method (VTM-1)				
	95% of Max. Dry Density for fill less than 10 feet				
Required Compaction	98% of Max. Dry Density for fill greater than 10 feet				
Moisture Content	-2 to +3 % points of the soil's optimum value				
Loose Thickness	8 inches prior to compaction				

 Building and site retaining walls and foundations (soil bearing, lateral earth pressures, subgrade modulus, coefficients of friction, etc.)

Site Soil Design Parameters

Material	Unit Weight (pcf)	Angle of Internal Friction (phi)	At-Rest Pressure (psf per vertical foot of wall)	Active Pressure (psf per vertical foot of wall)	Passive Pressure (psf per vertical foot of wall)
СН	115	12	90	75	175
ML	120	25	70	50	300
SM	125	30	65	45	375
Weathered Rock	135	45	40	25	400

Material	Compacted or In-Situ Soil Moist Unit Weight (δ)	Angle of Internal Friction (ø)	Cohesion (C)	Coefficient of Earth Pressure at Rest (K _o)	Coefficient of Active Earth Pressure (Ka)	Coefficient of Passive Earth Pressure (K _p)
СН	115	12	0	0.79	0.66	1.52
ML	120	25	0	0.58	0.41	2.46
SM	125	30	0	0.50	0.33	3.0
Weathered Rock	135	45	0	0.29	0.17	5.82

For sliding coefficient:

Sliding Friction Coefficient [Concrete on Soil] (µ)	0.30
Skin Friction [Concrete cast against Soil] (F _s) ¹	250 psf

- Potentially expansive soils (CH/MH) are common in the local geology characterized at this site. Expansive soils should not be reused as engineered fill in the building pad, nor as fill for roadway, curb, gutter, and sidewalk subgrade, within utility trenches, or within embankment slopes. Expansive soils (CH/MH) should be undercut to 4 feet below finished exterior grade or to 2 feet below the bottom of footing, whichever is deeper, and backfilled with controlled, compacted fill where encountered. In proposed pavement areas, we recommend undercutting and replacement of the expansive soils (CH/MH) to provide at least 2 feet of non-expansive soil fill below the pavement subgrade.
- Based on the soil conditions encountered (shallow rock and low permeability soils), stormwater management facilities that require infiltration are not feasible for this site.
- Considering the shallow weathered rock surface encountered at this site and our experience with other projects in the area, we recommend that the design for the building be based on a seismic site classification of Site Class C.
- Preliminary pavement section designs based on laboratory data and assumed design parameters are included within the report. We recommend pavement designs be developed in accordance with applicable VDOT requirements. Finalized designs should be based on anticipated traffic loading conditions and actual soil subgrade conditions. For design purposes, we recommend using a design California Bearing Ratio (CBR) value of 4 for the on-site clayey, silty, and sandy soil materials. Additionally, we recommend a Resiliency Factor (RF) of 1.5 be utilized for design of the proposed pavements.
- Groundwater on this site can be characterized as being broadly perched above less permeable materials and shallow rock. The depth at which perched water is present on the site varies with surface elevation. In low-lying areas, the presence of perched water is more pronounced. In higher areas and on ridge lines, perched water may be present, including above design cut elevations, but is less concentrated. Soils at contact with perched water levels were very moist to wet. In most cases, moisture then decreased with depth. The permanent groundwater able is significantly below the anticipated extents of excavation for this project.

1.0 INTRODUCTION

The purpose of this study was to provide geotechnical information for the design and construction of an industrial site which includes one data center building, a guard house facility, a stormwater management pond, a substation area, associated pavement infrastructure, and mass grading for the overall site. The recommendations developed for this report are based on project information supplied by Bohler Engineering.

Our services were provided in accordance with our Proposal No. No. 01:63686-GP1, dated May 4, 2021. This report contains the procedures and results of our subsurface exploration program, 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.
- A review of surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Copies of our soil test boring logs.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills.
- Recommended foundation types.
- General recommendations for pavement design including a recommended design CBR value.
- Evaluation and recommendations relative to groundwater control.
- Recommendations for design and construction of drainage structures and stormwater management facilities.
- An evaluation of potential soil and rock excavation issues.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION & CURRENT SITE CONDITIONS

The proposed project site is located to the northeast of the intersection of Lee Highway and Blackwell Road in Warrenton, Fauquier County, Virginia. The subject property spans a single parcel (GPIN: 6984-69-2419) which, at the time of this exploration, is primarily occupied by active farmland with some wooded areas in the northwest and southeast portions, and site elevations range from approximate EL. 510± feet along the north edge of the site to approximate EL. 465± feet in the northeast corner. The southwest corner of the site is bordered by an existing car dealership. An aerial view of the site is pictured below.

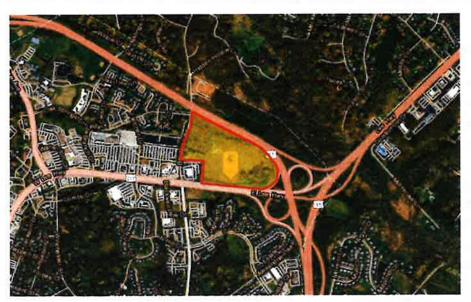


Figure 2.1.1 Site Location

2.2 PROPOSED CONSTRUCTION

It is our understanding that the development will include the construction of one 214,388 sq. ft., 1-story data center building (FFE = EL. 486.0 feet), a guard house facility, a stormwater management pond, a 6-acre substation area, a retaining wall with a maximum exposed height of 6 feet, and associated pavement infrastructure. Based on current proposed grading information, it is our understanding that soils fill on the order of 21± feet and cuts on the order of 40± feet will be required in order to establish final site grades.

The description of the proposed project is based on the information provided to us by your office or other design team members at this time. If any of the information is inaccurate, either due to misunderstanding or due to design changes that may occur later, we recommend that we be contacted to provide additional or alternate recommendations that may be required.

2.2.1 Structural Information/Loads

A maximum structural column loading of 450 kips has been provided by the structural engineer at this time and it is our understanding that shallow foundations are considered feasible in design for support of the main building. If additional/revised maximum structural loading becomes available, ECS should be informed so that we may confirm or re-evaluate our recommendations.

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 overall scope of work included drilling a total of 20 soil borings. Thirteen borings were performed in the vicinity of the data center building and guard house structural footprints, two borings were performed within the proposed stormwater pond, and five borings were performed within proposed pavement areas.

A track-mounted drill rig was utilized to drill the soil test borings. Borings were advanced to depths on the order of up to 80± feet below the existing ground surface. The subsurface exploration was completed under the general supervision of an ECS geotechnical engineer.

Boring locations were identified in the field by ECS personnel using GPS techniques prior to mobilization of our drilling equipment. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. Ground surface elevations noted on our boring logs were interpolated from the provided existing contour mapping.

Standard penetration tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D 1586. Representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistances obtained provide a general indication of soil shear strength and compressibility.

Rock sampling was performed at Borings B-3 and B-10 in accordance with ASTM D-2113 using a diamond-studded bit fastened to the end of a hollow double-tube core barrel. The core barrel was drilled into the rock up to five feet at a time, and the samples were removed for measurement of sample recovery. The recovery is determined as the ratio of sample length recovered to the distance drilled.

The core samples were stored in boxes and returned to our laboratory for identification and determination of the Rock Quality Designation (RQD). The RQD is determined as the ratio of intact rock in NX or NQ core sections 4 inches or longer to the distance drilled. Percentages of recovery and RQD are given on the boring logs included in the Appendix of this report and summarized within the table below.

Boring No.	o. Depth of Core Run (feet) REC (%)		RQD (%)
D 2	39.0-44.0	32	13
B-3	44.0-49.0	53	7
D 10	23.5-28.5	87	17
B-10	28.5-33.5	100	22

3.1 SUBSURFACE CHARACTERIZATION

The project site is located within the Central Blue Ridge Anticlinorium. Based on the USGS Geological Map of Virginia (1993), the site is mapped within the Catoctin Formation – Metabasalt soils. This formation typically consists of grayish green to dark yellowish green, fine-grained, schistose chlorite and actinolite

bearing metabasalt. The materials will initially weather into Silty and Clayey SAND and then into SILT and CLAY with extensive weathering.

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.

Table 3.1.1 - Subsurface Soil Summary

Approximate Depth (ft)	Stratum	Description	Ranges of SPT ⁽¹⁾ N-values (bpf)
0-0.5 (Surface cover)	n/a	Topsoil, Roots, and Organics	N/A
0.3-32.0	1	- Very Loose to Very Dense SAND (SM) and SILT (ML) with varying amounts of parent rock fragments - Firm to Very Stiff CLAY (CL, CH, MH)	4 to 50/4
3.0-80.0	И	- Very Dense Weathered Rock with varying amounts of parent rock fragments	60 to 50/0

Notes: (1) Standard Penetration Test

3.2 GROUNDWATER OBSERVATIONS

Groundwater was encountered in 4 of the 20 borings (B-1, B-2, B-3, and B-5) drilled as part of this geotechnical study ranging from depths of 23± to 53± feet below the existing ground surface. Perched water occurs as precipitation that enters the site, either directly or from overland flow from adjacent properties, begins to percolate through the near surface soils. Once the water percolation reaches the bedrock, which is virtually impermeable, it begins to flow at the intersection of the rock and the soil. This groundwater flow continues down gradient with the water table occasionally surfacing to form as springs and intermittent streams. Only in the lowest lying areas and adjacent to existing creeks is a shallow groundwater table in a continuous condition. Otherwise, it is related to precipitation, although springs may exist in the lower lying areas for extended periods of time without recharge from rainfall. Therefore, the groundwater conditions at this site are expected to be significantly influenced by surface water runoff and precipitation.

Because of the perched nature of the groundwater at this site, long term groundwater conditions can be deceptive. Although the true groundwater table can exist several hundred feet below the existing ground surface, groundwater located in streams and creeks, because of perched overland flow, creates the presence of an effective near surface groundwater table. Because the water is perched and flows at the interface between the soil and bedrock, water exiting fracture channels and cracks is common. Therefore, although all building excavations may appear dry at the time of completion, it is very common for fracture patterns in the rock, because of natural conditions or blasting to become natural pathways for ground water flow.

The highest groundwater observations are normally encountered in the late winter and early spring. Variations in the location of the long-term water table may occur because of changes in precipitation, evapo-transpiration, surface water runoff, and other factors not immediately apparent at the time of this

exploration. The site may also be subject to severe desiccation during extended dry periods. Therefore, earthwork operations, especially in the winter and spring months are more likely to encounter difficulties with perched conditions than those operations undertaken in the summer or fall.

3.3 LABORATORY TESTING

Representative soil samples were selected tested in our laboratory to check field classification and to evaluate pertinent engineering properties. The laboratory testing program included visual classifications (ASTM D4318), moisture content tests (ASTM D2216), Atterberg Limits tests (ASTM D4318), washed sieve grain size analyses (ASTM D412), thermal resistivity testing (ASTM D5334), and California Bearing Ratio testing.

Each soil sample was visually classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. A brief explanation of the Unified Soil Classification System is included in Appendix B of this report. The various soil types were grouped into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual, rather than distinct.

4.0 DESIGN RECOMMENDATIONS

The design recommendations outlined in this report are based on the 20 soil test borings performed within the proposed development limits. The following sections provide recommendations for foundation design, soil supported floor slabs, seismic design parameters, pavements, and stormwater management facilities.

4.1 BUILDING FOUNDATIONS

4.1.1 Shallow Foundations (Option)

Provided subgrades and structural fills are prepared as recommended in this report, the buildings, structures, and lightly-loaded substation features may be supported by shallow foundations including column footings and continuous wall footings. We recommend the foundation design use the following parameters:

Table 4.1.1.1 Shallow Foundation Design

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure (Stratum I Soil/Structural Fill) (1)	3,000 psf	3,000 psf
Net Allowable Bearing Pressure (Stratum II) ¹	8,000 psf	8,000 psf
Minimum Width	24 inches	24 inches
Minimum Footing Embedment Depth (below slab or finished grade) (2)	24 inches	24 inches
Estimated Total Settlement (3)	Less than 1 inch	Less than 1 inch
Estimated Differential Settlement (4)	Less than 0.5 inches between columns	Less than 0.5 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.
- (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 should be re-evaluated once the foundation plans are more complete.

Potential Undercuts: Most of the natural soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structures. 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 lean concrete ($f'_c \ge 1,000$ psi at 28 days) up to the original design bottom of footing elevation; the original footing shall be constructed on top of the hardened lean concrete. Additional undercutting of foundations may be required if highly plastic soils or undocumented fill soils are present below the foundation. Please see the <u>High Plasticity Soils</u> section of this report.

For building and site retaining walls and foundations (soil bearing, lateral earth pressures, subgrade modulus, coefficients of friction, etc.).

Site Soil Design Parameters

Material	Unit Weight (pcf)	Angle of Internal Friction (phi)	At-Rest Pressure (psf per vertical foot of wall)	Active Pressure (psf per vertical foot of wall)	Passive Pressure (psf per vertical foot of wall)
СН	115	12	90	75	175
ML	120	25	70	50	300
SM	125	30	65	45	375
Weathered Rock	135	45	40	25	400

Material	Compacted or In-Situ Soll Moist Unit Weight (δ)	Angle of Internal Friction (ø)	Cohesion (C)	Coefficient of Earth Pressure at Rest (K _o)	Coefficient of Active Earth Pressure (Ka)	Coefficient of Passive Earth Pressure (K _p)
СН	115	12	0	0.79	0.66	1.52
ML	120	25	0	0.58	0.41	2.46
SM	125	30	0	0.50	0.33	3.0
Weathered Rock	135	45	0	0.29	0.17	5.82

• For sliding coefficient:

Sliding Friction Coefficient [Concrete on Soil] (µ)	0.30
Skin Friction [Concrete cast against Soil] (F _s) ¹	250 psf

4.1.2 Drilled Shafts (Option)

In the event maximum structural loads for the building are considered to be excessive for shallow foundation system design, the building as well as typical more heavily-loaded substation structures (e.g. transmission line towers, etc.) can be designed to bear on drilled shaft foundations. For preliminary design purposes only, we estimated that drilled shafts may be designed to bear in rock sockets having a depth of at least 1 shaft diameter with a design capacity of 60 ksf. An average rock unconfined strength of 4,000 psi may be utilized for preliminary design purposes. Rock suitable for end bearing can generally be identified in the field during drilling by observing drill cuttings which appear generally dry and to consist of rock fragments, a pronounced grinding of the auger teeth and visible dust noted during drilling. Based on the rock depths encountered, we estimate the shaft lengths will vary across the site between 15 feet to over 40 feet in some areas. Additional borings and rock coring data will be required to determine final tip elevations for each drilled shaft location. Project planning and estimates should account for potential variability of drilled shaft length throughout the project.

The actual structural designs of the drilled shaft foundation system (including final pler locations, pier lengths, pier dimensions, and spacing) shall be designed and submitted, separately, for review approval and appropriate permit to Prince William County Building Division prior to construction.

We recommend all drilled shaft excavations be observed and approved by the GER prior to concrete placement. We recommend a pre-production meeting be held prior to drilling operations to review the shaft termination criteria with the GER and drilling contractor. Termination criteria shall be determined by the GER based on the final structural design and type of rig.

4.1.3 Auger Cast-In-Place (ACIP) Pile Foundations (Option)

Auger Cast-In-Place (ACIP) piles are installed by drilling a hollow stem auger with a closed tip. Upon reaching the bearing stratum, the plug is removed, and a sand-cement grout is placed under pressure through the hollow stem as the augers are withdrawn (tremie placement). The upper portion of the pile is terminated approximately 6 inches above the bottom of the proposed pile cap. ACIP foundations may be preliminarily designed for an allowable bearing pressure on the order of 50 tons to 100 tons. We estimate the shaft lengths will vary across the site between 25 feet to over 60 feet in some areas. Additional borings and rock coring data will be required to determine final tip elevations for each ACIP location. Project planning and estimates should account for potential variability of drilled shaft length throughout the project.

Auger cast-in-place piles greater than 18 inches in diameter will require special equipment to be installed and generally cannot be drilled more than 60 feet in the ground. Please note top of pile elevations were used in calculations and were estimated to be two feet below the finished floor elevations.

The actual structural designs of the ACIP foundation system (including final pier locations, pier lengths, pler dimensions, and spacing) shall be designed and submitted, separately, for review approval and appropriate permit to Prince William County Building Division prior to construction.

We recommend a series of three widely spaced auger probe/test piles be installed under the observation of the geotechnical engineer. Based on these observations, at least one pile should be selected for load testing, by the geotechnical engineer. The purpose of the test piles is to confirm our assumption of pile capacity (which is related to our design safety factor) and to allow observation of the subsurface conditions encountered by the augers.

The single test pile should be load tested in axial compression. The primary objective of the load test program is to observe the load-settlement response of an individual pile in order to verify that the contractor's construction procedures and installation equipment can produce an acceptable pile foundation. The geotechnical engineer should be retained to select the location of the test, observe and document the installation of the test pile and reaction piles, perform the load test and interpret the results, and develop recommendations concerning installation procedure and design tip elevations of production piles. Significant differences from accepted procedures or expected results should be brought to the attention of the Structural Consultant.

The axial compressive pile load test should be performed in general accordance with procedures outlined in ASTM D1143, Paragraphs 5.1 and 5.3. The test pile should eventually be loaded to plunging failure, which can be described as a total pile butt displacement on the order of 15% of the pile diameter, or about

2 inches. Accurate systems referenced to a stationary reference beam supported well away from the zone of influence of the test pile and reaction piles (if applicable). We recommend the load test be performed no sooner than five days after the installation of the test pile, unless the contractor can establish sufficient grout strength only after three days.

Auger cast piles may also be utilized to anchor the reaction frame system for the pile load test. However, these anchor piles may be pulled upward during loading. Upward movement of the piles beyond that of elastic elongation would reduce the downward axial capacity of these piles. Therefore, these anchor piles should not be used as production piles.

4.2 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:

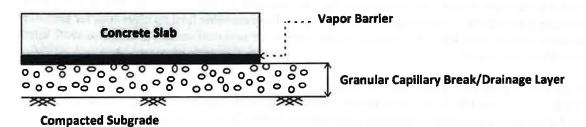


Figure 4.2.1

- 1. Drainage Layer Thickness: 6 inches minimum.
- 2. Drainage Layer Material: 6 inches of VDOT #57 stone, VDOT 21-A/21-B

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. Floor slabs placed in areas where expansive soils (CH/MH) are encountered should be underlain by at least 2 feet of compacted suitable fill.

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 150 pci (lbs./cu. inch).

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.

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.

4.3 BELOW GRADE WALLS

Any below grade walls that will be backfilled with soil or aggregate should be designed to withstand lateral earth pressures and surcharge loads. For below grade walls that are properly drained, the walls may be designed for an equivalent fluid pressure of 60 pounds per square foot (psf) per foot of wall height. The 60 psf horizontal pressure reflects the moderate strength low plasticity silty and clayey soils present with the wall influence zones. A Lateral Earth Pressure Diagram illustrating our general recommendations regarding the application of lateral earth pressure are included in the Appendix D of this report and in Figure 4.3.1.

The following Figure depicts the suggested lateral earth pressure condition for a "drained condition" with restrained wall top:

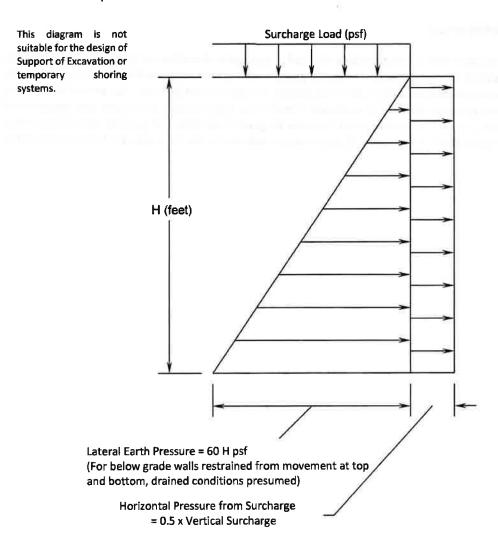


Figure 4.3.1

Any surcharge loads imposed within a 45 degree slope of the base of the wall should be considered in the below grade wall design. The influence of these surcharge loads on the below grade walls should be based on an at-rest pressure coefficient, k_0 , of 0.5 in the case of restrained walls.

Backfill materials should consist of inorganic materials, free of debris and be free draining. The fill placed adjacent to the below grade walls should not be over-compacted. Heavy earthwork equipment should maintain a minimum horizontal distance away from the below grade walls of 1 foot per foot of vertical wall height. Lighter compaction equipment should be used close to the below grade walls and the thickness of the lifts should be no more than 6 inches where light weight compaction equipment is used.

To reduce excessive pressures against the below grade walls, and to reduce the settlement of the wall backfill, it is recommended that the wall backfill be compacted to between 92% and 95% of the maximum dry density determined in accordance with ASTM D 698 or VTM-1. Where the fill will be supporting pavement or other structures, the fill should be compacted to near 95% of this specification. Backfill materials which are placed behind below-grade walls should be free of organic materials and debris, free-draining, non-frost susceptible, and should not include any high plasticity Elastic SILT (MH) or Fat CLAY (CH) materials.

Depending upon the excavation methods employed at the time of installation, it may be advantageous to discontinue use of soil as structural backfill and substitute using open graded stone such as VDOT No. 57 stone. The use of No. 57 stone should help with any problems that should be encountered when attempting to backfill and compact soils. The top 2 feet of backfill should be suitable soils placed and compacted in accordance with the section titled Fill Placement. We recommend filter fabric be placed between the VDOT No. 57 stone and the compacted soil to reduce the risk of the soil fines migrating into the voids in the VDOT No. 57 stone. The GER should be contacted prior to employing the use of open graded stone to backfill around these structures.

Suitable manmade drainage materials may be used in lieu of the free draining granular backfill, adjacent to the below grade walls. These materials should be covered with a filter fabric having an Apparent Opening Size (AOS) consistent with the size of the soils to be retained. The material should be placed in accordance with the manufacturer's recommendations and connected to either the perimeter drainage system or the underslab granular mat, which in turn should be properly drained. The ground surface adjacent to the below grade walls should be kept properly graded to prevent ponding of water adjacent to below grade walls.

4.4 SEISMIC DESIGN CONSIDERATIONS

The International Building Code (IBC) 2012 and Chapter 20 of ASCE 7 require site classification for seismic design based on the upper 100 feet of a soil profile. Three methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the undrained shear strength (s_u) method; and the Standard Penetration Test Resistance (N-value) method. Where site specific data are not available to a depth of 100 feet, appropriate soil properties are permitted to be estimated by the registered design professional preparing the soils report based on known geologic conditions. The seismic site class definitions for the weighted average of either the SPT N-values or the shear wave velocities in the upper 100 feet of the soil profile are presented in Chapter 20 of ASCE 7 and in the table below.

Table 4.4.1: Seismic Site Classification

Site Class	Soil Profile Name	Shear Wave Velocity, Vs, (ft./s)	N value (bpf)
A	Hard Rock	Vs > 5,000 fps	N/A
В	Rock	2,500 < Vs ≤ 5,000 fps	N/A
С	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	>50
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	15 to 60
E	Soft Soil Profile	Vs < 600 fps	<15

In the absence of actual shear wave (V_s) data, we utilized the Standard Penetration Test (SPT) N-values recorded from the borings. Considering the shallow rock surface encountered at this site and our experience with other projects in the area, we recommend that the design for the building be based on a seismic site classification of **Site Class C**.

Considering that the foundation will bear in or close to bedrock, a Site Class B may be possible; however, site specific seismic testing to determine the shear wave velocity of the rock would be required to evaluate this site classification. If it is determined by the structural engineer that an increase in the site class for the project site will result in significant economic savings in the final design, we would be pleased to provide additional site-specific seismic testing services.

4.5 PAVEMENTS

The pavement design recommendations shall conform to the latest VDOT Road and Bridge Standards and Specifications. For the design and construction of exterior pavements, we recommend that all the procedures outlined in the <u>Subgrade Preparation and Earthwork Operations</u> and <u>Fill Placement and Compaction</u> sections be followed through the establishment of roadway section subgrade elevations.

We recommend that topsoil, existing fill material, construction debris, and any other soft or unsuitable materials be removed from the pavement area. The stripped surface should be proofrolled and carefully observed at the time of construction in order to aid in identifying the localized soft or unsuitable materials which should be removed. If high plasticity soils are exposed during the final grading of the paved areas, we recommend that these areas be over-excavated of the high plasticity soil to a depth of 2 feet and replaced with engineered fill.

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should reduce the possibility of the subgrade materials becoming saturated over a long period of time. We would be pleased to be of further assistance to you in the design of the project pavements by providing additional recommendations during construction of the project.

It is common practice to install only the base aggregate and the base course asphalt during initial construction, and then the final topping surface asphalt much later in the construction process. Often, depending upon the sequence and timing of construction, the final pavement surface may not be placed until several months to even years after the initial base asphalt is placed. Studies have shown that the most critical load conditions for most development occur during the construction phase. In particular, the pavement system is subjected to loading that includes construction equipment, low-boys, concrete trucks, pre-fabricated joist and dry wall deliveries, and other heavy, high concentrated truck loading which does not occur once the development is finished. Not only does this represent the highest traffic loading condition, but it occurs at a time when the pavement section is not at its full strength, simply because the surface asphalt has not been placed.

Although it is usually not economically feasible to increase the pavement section to satisfy this potential design issue, it should be recognized that prudent steps can be taken to help reduce failures of the pavement system during the construction. For example, we recommend using intermediate type asphalt for the base layer of asphalt to reduce the amount of surface water infiltration into the pavement subbase.

Furthermore, any areas that are low and will have a tendency to pond water should be drained to the extent feasible. This should normally be undertaken in areas that are relatively low and wet, or in areas where there is known to be a concentration of construction traffic. These concentrations should be considered to be the initial entryways to the site, the travelways and any other high-construction traffic areas.

Depending upon the time in which the temporary construction is used as a service road, some failures should be expected. If the construction pavement system fails, it will be necessary to remove this failed section and replace it with the initial design section or an equivalent repaired section.

If pavements will be constructed early during site development to accommodate construction traffic, consideration must be given to the construction of heavier pavement sections, capable of accommodating the much heavier loads normally associated with these activities. The design of actual pavement sections is beyond the scope of this report. We recommend final pavement designs be developed in accordance with applicable VDOT and Prince William County requirements, as appropriate. Such a design should be developed considering anticipated traffic loading conditions, soil subgrade conditions, and CBR value.

Rutting of pavement and ultimately pavement failure are typically experienced due to front loading garbage trucks imposing concentrated wheel loads on pavements. Therefore, we recommend that the pavement in any trash pick-up areas consist of a reinforced concrete pavement underlain by VDOT 21A subbase. Design of concrete pavements is beyond the scope of this report. We recommend concrete pavement designs be developed in accordance with applicable VDOT and Prince William County requirements. Such a design should be based on anticipated traffic loading conditions and soil subgrade conditions.

A design CBR value of 4 is recommended based on laboratory testing performed on samples obtained from Borings B-14 and B-15 during our subsurface exploration. Additionally, we recommend that a Resiliency Factor (RF) of 1.5 be utilized for design purposes of the pavements. If the results of the CBR tests taken during construction differ from that mentioned above, the pavement design should be modified as necessary.

New Asphalt Pavement Section: We have assumed that asphalt (light-duty and heavy-duty) and concrete (heavy-duty) pavement section designs for the parking lot and access roadway pavement areas will be based upon 20-year and 30-year design lives with assumed ESALs of 19,300/610,000 for light/heavy-duty Flexible Pavements and 1,400,000 for Rigid Pavement. If these assumptions are found to be inaccurate for the finalized project average daily traffic values, ECS shall be informed in order to revise pavement section design accordingly.

We have also assumed other design parameters in table below.

Table 4.5.1 Pavement Design Parameters

Reliability	90%
Overall Standard Deviation	0.49
Effective Subgrade Resilient Modulus	6,000 psi
Initial Serviceability	4.2
Terminal Serviceability	2.8

The following sections are expected to provide adequate support for standard-duty pavement and heavy-duty pavements for the newly constructed pavement areas that will be part of the development of the project site.

Table 4.5.2 Design Pavement Sections

mit of the bearing the fi	Pavement Thickness (inches)		
Pavement Material	Standard-Duty - Asphalt	Heavy-Duty - Asphalt	Heavy-Duty - Concrete
Surface Course	1.5	1.5	
Intermediate Course		2.0	-
Base Course	3.0	3.0	
Portland Cement Concrete	***		8.0
Aggregate Base Material	6.0	8.0	8.0
Total Pavement Section Thickness	10.5	14.5	16.0

It should be recognized that construction loading conditions may be more severe than in-service conditions and the Geotechnical Engineer should be advised of any traffic loading conditions that become available in order to confirm and/or modify the pavement section recommendations.

New Concrete Pavement Section: The heavy-duty concrete pavement section should consist of a minimum of 8 inches of air-entrained Portland cement concrete having a minimum 28-day compressive strength of 4,000 pounds per square inch (psi). The concrete pavement shall be underlain by a minimum of 8 inches of compacted dense-graded aggregate base course stone (VDOT 21-A). The rigid concrete pavement section should be provided with construction joints at appropriate intervals per typical concrete pavement construction requirements.

Exterior Concrete Slabs on Grade (Sidewalks, Curbs, Gutters, and Dumpster Pads): The exterior concrete slabs recommendations should conform to the latest VDOT Road and Bridge Standards and Specifications. For the construction of exterior concrete, we recommend that topsoil and any other soft or unsuitable materials be removed from the paved area. The stripped surface should be proofrolled and carefully

observed at the time of construction in order to aid in identifying the localized soft or unsuitable materials which should be removed.

We recommend that exterior concrete slabs such as sidewalks, curbs and gutter be underlain by a minimum of 4 inches of granular material having a maximum aggregate size of 1.5 inches and no more than 2% passing the #200 sieve. This granular layer will reduce the potential for frost heaving of the exterior slabs. Exterior concrete exposed to the weather should be air-entrained.

4.6 SITE RETAINING WALL

One retaining wall with a maximum exposed wall height of 6 feet is proposed along the northeast edge of the site. While design details for the wall are not available at this time, general recommendations have been provided below.

Since retaining walls are free to rotate at the top, they effectively mobilize more of the shear strength of the retained soil than conventional basement or loading dock walls. For the design of permanent site retaining walls with level backfill, we recommend an equivalent fluid pressure of 45 psf per vertical foot of wall. At the areas of the walls such as corners where rotation will be limited, we recommend an equivalent fluid pressure of 60 psf per vertical foot of wall since rotation is restricted in these areas. This lateral earth pressure assumes that low-plasticity materials with a LL equal to or less than 40 and a PI less than 15, unless the material can be shown to have a very low expansion potential, are used for the wall backfill and that drainage of the backfill is provided as discussed below. A Lateral Earth Pressure Diagram has been included in the Appendix to further detail the anticipated earth pressure distribution behind the wall. The design should also account for any surcharge loads that are within a 45° slope from the base of the wall, and any slope of the backfill. The retaining wall should be designed so that the resultant of the overturning forces remains in the central one-third of the footing.

The foundations for proposed retaining wall should be designed for a maximum allowable soil bearing pressure of 3,000 psf, provided that the footings are founded within firm natural soils or engineered fill placed over firm natural soils. Special care should be taken to confirm soft existing soils are removed prior to the placement of structural fill on the established foundation subgrades.

Sliding resistance of the retaining wall can be achieved either through the use of a shear key (for concrete retaining walls only) or through the frictional forces developed at the base of the retaining wall. A shear key, if installed, can be designed for a passive pressure of 300 psf per foot of depth. This assumes that the soils at the base of the retaining wall are approved, firm natural soils or compacted structural fill. A frictional resistance coefficient of 0.3 can be utilized for sliding resistance design for the retaining wall. The structural design of proposed retaining walls should be approved prior to site implementation.

The recommendations presented herein assume that the backfill behind the retaining wall is properly drained. Suitable man-made drainage materials may be used in lieu of the free draining granular backfill, adjacent to the wall. These materials should be covered with a filter fabric having an Apparent Opening Size (AOS) consistent with the size of the soils to be retained and should be placed in accordance with the manufacturer's requirements. Drainage of the backfill may be accomplished through the use of 4-inch diameter weep holes at 8 feet spacing, through the wall, immediately above proposed grade at the front of the wall. Alternatively, a longitudinal drain line could be used behind the retaining wall. The drain should consist of a 6-inch perforated pipe surrounded by a minimum of 6 inches of VDOT No. 57 stone.

The No. 57 stone should be completely wrapped in a filtration geotextile such as Mirafi 140N. The geotextile used should be reviewed and approved by the geotechnical engineer. The ground surface adjacent to the retaining wall should be kept properly graded to prevent ponding of water adjacent to the wall or drainage of water over the front of the wall.

The land above the recommended geogrid reinforcement layers must be designated as a "soil reinforcement zone easement" and any future landscaping or planting should be coordinated such that it does not disturb the soil reinforcement system and/or will not affect the retaining wall stability. The geogrid layers will be installed in conjunction with the wall construction and thus will precede the excavations for plant material and landscaping. Trees and other plant material that might impact the geogrid reinforcing shall be kept outside the soil reinforcement zone easement.

The construction sequence will be important in areas where construction of the wall will either be in conflict or be too close to any existing storm pipes and structures. We recommend that in such cases, the storm pipes and the structures be installed first or simultaneously with the construction of the wall, since excavation for the storm pipes and structures after construction of the wall may jeopardize the stability of the wall. The wall designer should consider the presence of the storm structures in his or her design and should include standard or specific details for placement of wall backfill around these structures in design. In cases where storm sewer pipes penetrate and/or are located underneath the proposed wall, we recommend the provision of an encasement/liner or a grade beam in order to allow the pipes to be removed for maintenance without affecting the wall stability. If the storm line extends through the face of the wall, then block units should be saw cut within 1/2-inch of the pipe. Details for the pipe outlet and casing as well as wall sections with the pipe in the reinforcing zone should be included in the retaining wall design.

4.7 STORM WATER MANAGEMENT PONDS

One storm water management pond is currently proposed for the site. At the time of this report, specific details regarding water surface elevations and locations and elevations of pond structures were not available. As such, it is the intent of this section to provide general recommendations for design and construction of the pond. Once detailed pond designs and grading is available, ECS should be contacted to provide updated recommendations and, if necessary, global stability analyses for the pond.

4.7.1 Earthwork Operations

Subgrade preparation operations should consist of stripping all vegetation, rootmat, and topsoil and any other soft or unsuitable material from the dam embankment. Where possible, stripping limits for the proposed grading of the dam should be extended at least 10 feet beyond the toe.

After stripping to the desired grade and prior to new fill placement, the exposed soils should be carefully examined to identify any localized loose, yielding or otherwise unsuitable materials by an experienced geotechnical engineer or his authorized representative. After examining the exposed soils, loose and yielding areas can be identified by proofrolling with an approved piece of equipment, such as a loaded dump truck having an axle weight of at least 10 tons. Any soft or unsuitable materials encountered during this proofrolling should be removed and replaced with an approved backfill.

4.7.2 Embankment Fill Placement

The on-site materials may be reused as engineered fill if they do not contain organics or foreign debris, are not highly plastic, are not environmentally impacted, and conform to the criteria outlined below for acceptable soil types for construction. Based on observations made during the subsurface exploration program and following visual observation of the recovered soil samples, some of the natural soils may be suitable for reuse as engineered fill materials; however additional laboratory testing will be required for confirmation of soils to be used as engineered fill. Under no circumstances should CH soils be used as fill material in proposed structural areas.

The preparation of fill subgrades should be observed on a full-time basis. These observations should be performed by the Geotechnical Engineer of Record, or their representative, to ensure all unsuitable materials have been removed, and the subgrade is suitable for support of the proposed construction and/or fills. In some areas, excessively soft and/or wet soils may be encountered for fill subgrades, especially in the winter or early spring months. All soft areas should be excavated and removed.

Upon achieving competent subgrade materials, the excavated area should be filled, where appropriate, to planned grades with an approved controlled, compacted fill. All fill and backfill placed within the embankments and around the structures should be placed in lifts not exceeding 8-inches in loose thickness and moisture conditioned to within 2 percentage points on the wet side of the optimum moisture content. We recommend that the lifts be compacted to at least 95 % of their maximum dry density, as determined by ASTM D-698, Standard Proctor, for the full depth of the fill. Acceptable soil types for construction of the embankment on the upstream and downstream side (excluding the clay liner) include soils having a USCS designation of ML and CL; and SM and SC having a minimum of 25% passing No. 200 sieve. The on-site SM and SC soils tested do generally meet these requirements and should be suitable for use as fill.

The timing for placement of backfill for the embankment should be planned to minimize the risk of piping of soil based on laboratory tests performed on the material proposed for use prior to construction (additional observations and analyses may be required for the clay liner placement).

It is recommended that new fill soils be <u>benched</u> into the existing soils to verify adequate soil bonding of these materials. If the top of an exposed layer is too smooth, it should be rerolled with a sheepsfoot roller, or scarified prior to the placement of the next lift of fill. Although it is desirable to seal off fill surfaces on a daily basis using a steel drum or rubber tired roller, these surfaces should be scarified the following day prior to fill activities to minimize the creation of planes of seepage within the embankment structure.

Fill materials should not be placed on frozen soils or frost-heaved soils and/or soils which have been recently subjected to precipitation. All frozen soils should be removed prior to continuation of fill operations. Borrow fill materials, if required, should not contain frozen materials at the time of placement. All frost-heaved soils should be removed prior to placement of controlled, compacted fill, granular subbase materials, foundation or slab concrete, and asphalt pavement materials. Soil bridging lifts within the proposed embankment should not be used since excessive settlement of the structure can occur. Also, trees should not be planted on the existing dam embankment.

4.7.3 Facility Outlets

The principal outlet pipes penetrating the embankment dams should be provided with seepage control measures consisting of a concrete cradle and downstream collection drain. Primary outlet conduits, which penetrate the facility embankments, should be constructed on a concrete cradle along the upstream two-thirds of the conduit length. The downstream one-third of the principal spillway pipe should be surrounded with a 12-inch thick layer of open graded coarse aggregate (VDOT No. 78) wrapped with a suitable nonwoven geotextile with an Apparent Opening Size (AOS) of 70. (The coarse aggregate should conform to the current VDOT Road and Bridge Specifications Section 203 and the geotextile with Section 245.) The gravel layer below and around the conduit at the downstream end will serve to collect any seepage along the conduit. This drainage blanket should be daylighted at the slope face or tied into the stormwater discharge structure.

4.7.4 Foundations for Drainage Control Structures

Based on the results of our subsurface exploration and our engineering analysis, we recommend that any proposed stormwater discharge control structures be supported on spread footing foundations bearing either on suitable firm natural soils or on new engineered fill constructed over suitable natural soils. Assuming subgrades are prepared according to the recommendations above, the foundations may be designed for a net allowable soil bearing pressure of 2,000 pounds per square foot (psf).

If unsuitable soil types or bearing conditions are found to exist at the foundation level, then the base of the excavation should be lowered to suitable materials. As an alternative, the original bottom-of-footing level can be restored by the placement of "lean" (1,000 psi) concrete after removal of the unsuitable soils.

Fill materials should be placed in accordance with the <u>Compaction</u> section of this report. The soil will be moisture and disturbance sensitive; therefore, excavation for the outlet structures should proceed in an expeditious manner in order to reduce exposure of the bedding soils. The foundation excavation should be observed and the bearing pressure of the footing subgrade tested by an authorized representative of the GER.

Granular bedding should not be used to support foundations or pipes penetrating the facility embankments. Granular soils should only be used where specifically designed for drainage. Conduits penetrating the embankments should be supported by properly placed soil or natural soils trimmed to fit the pipe diameter, or concrete fill, such as lean concrete or "flowable" fill, to control seepage along such conduits which could otherwise result in a soil piping failure. The upstream two thirds of the primary discharge pipe should be placed over a concrete cradle as described in the previous section.

4.7.5 Pond Liner (Wet Ponds Only)

In order to maintain the permanent pool elevations, we recommend the use of a clay or synthetic liner to minimize the potential for seepage through the silty and clayey sand materials and weathered rock.

The liner should be present along the entire pond bottom, including embankment slopes up to the 10-yr storm elevation on the impounded side only. The liner should consist of an 18-inch thick layer of material meeting the specification of the most recent edition of the BMP Clearinghouse (Table 14.4). The liner should consist of soil with a minimum of 30% clay particles, by weight. The material should also have a

minimum Plasticity Index of 15 and a minimum Liquid Limit of 30. We recommend the liner have a maximum permeability of 1×10^{-7} ft/sec and should be compacted to 90% to 95% of the maximum dry density as determined by the Standard Proctor Method (ASTM D698). Generally, a soil material classified as Lean CLAY (CL) and having less than 10% retained on the #4 sieve should meet this requirement. Fat CLAY (CH) is not recommended for use as a liner due to concerns over shrinkage cracks. We also recommend the soils for the liner be installed at 2 to 3 percentage points wet of the optimum moisture content. Clay liner materials should be kept moist during and after installation to reduce the potential for desiccation and cracking. It is recommended that new clay liner soils be benched into the existing soils to verify adequate soil bonding of these materials.

4.8 SOIL THERMAL RESISTIVITY

Soil thermal resistivity testing was performed on remolded samples obtained from depths ranging from 1± feet to 6± feet below site grades. The samples were compacted to approximately 95% of the maximum dry density as determined by the Standard Proctor Method (ASTM D698). Tests were performed in general accordance with ASTM D5334. Tests were performed at various moisture contents to develop a dry-out curve. Based on the test results, we recommend the following maximum resistivity values at each location be used for design:

Sample No.	Recommended Max. Rho (°C*cm/W)
B-2	220
B-7	190
B-11	205

Based on the test results, we recommend a **single maximum resistivity value of 220** be used for design of general site duct banks. Laboratory test results for each sample are included in the Appendix of this report.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, existing fill, and any soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits, and 5 feet beyond the toe of structural fills. Deeper topsoil or organic laden soils may be present in wet, low-lying, and poorly drained areas. Root balls may extend as deep as about 2 feet and will require additional localized stripping depth to completely remove the organics. 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.

5.1.2 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.

5.1.3 Site Temporary Dewatering

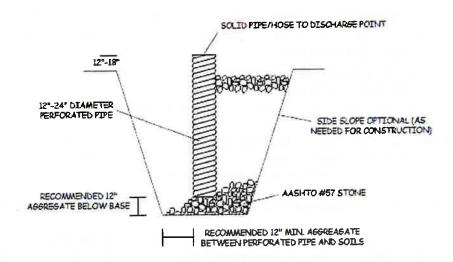
Groundwater on this site can be characterized as being broadly perched above less permeable materials and shallow rock. The depth at which perched water is present on the site varies with surface elevation. In low-lying areas the presence of perched water is more pronounced. In higher areas and on ridge lines, perched water may be present, including above design cut elevations, but is less concentrated. Soils at contact with perched water levels were very moist to wet. In most cases, moisture then decreased with depth.

The contractor shall make their own assessment of temporary dewatering needs based upon the limited subsurface groundwater information presented in this report. Soil sampling is not continuous, and thus soil and groundwater conditions may vary between sampling intervals (typically 5 feet). If the contractor believes additional subsurface information is needed to assess dewatering needs, they should obtain such information at their own expense. ECS makes no warranties or guarantees regarding the adequacy of the provided information to determine dewatering requirements; such recommendations are beyond our scope of services.

Dewatering systems are a critical component of many construction projects. Dewatering systems must be selected, designed, and maintained by a qualified and experienced (specialty or other) contractor familiar with the succinct geotechnical and other aspects of the project. The failure to properly design and maintain a dewatering system for a given project can result in delayed construction, unnecessary foundation subgrade undercuts, detrimental phenomena such as 'running sand' conditions, internal erosion (i.e., 'piping'), the migration of 'fines' down-gradient towards the dewatering system, localized settlement of nearby infrastructure, foundations, slabs-on-grade and pavements, etc. Water discharged from any site dewatering system shall be discharged in accordance with all local, state and federal requirements.

Strategies for Addressing Perched Groundwater:

The typical primary strategy for addressing perched groundwater seeping into excavations is pumping from trench (or French) and sump pits with sump pumps. A typical sump pump drain (found in a sump pit or along a French drain) is depicted below. The inlet of the sump pump is placed at the bottom of the corrugated pipe and the discharge end of the sump is directed to an appropriate stormwater drain.



Sump Pit/Pump Diagram

Details of a typical French drainage installation are included in Appendix D. A typical French drain consists of an 18 to 24-inch wide by 18 to 24-inch deep bed of AASHTO #57 (or similar open graded aggregate) aggregate wrapped in a medium duty, non-woven geotextile and (sometimes) containing a 6-inch diameter, Schedule 40 PVC perforated or slotted pipe. Actual dimensions should be as determined necessary by ECS during construction. After the installation has been completed, the geotextile should be wrapped over the top of the aggregate and pipe followed by placement of backfill. The top of the drain should be positioned at least 18 inches below the design subgrade elevations. Drains should not be routed within the expanded building limits.

Pumping wells or a vacuum system could also be used to address perched groundwater. These techniques often are only effective during the initial depletion of the perched water quantity and may quickly be ineffective at addressing accumulation of water from rain, snow, etc.

5.2 EARTHWORK OPERATIONS

5.2.1 High Plasticity Solls

Within the proposed project limits, potentially expansive soils (CH/MH) were encountered during this exploration; these types of soils are common in this area, and, based on the regional geology as well as results from past ECS subsurface explorations performed on nearby sites, these and other high plasticity soils are believed to present at the site at locations which may not have been evaluated during this subsurface exploration. Care should be taken to limit moisture variations in order to reduce potential volume changes. If the field work is conducted during the winter or early spring months, it is expected that even the low-plasticity clay/silt soils at the surface may need to be removed or dried prior to fill placement. If expansive clays and clay-silt mixtures are encountered, they should not be used as fill for roadway, curb, gutter, and sidewalk subgrade, within utility trenches, or within embankment slopes. For suitability of natural soils to be used in structural areas (i.e. foundations and floor slabs), soils meeting all four of the following provisions shall be considered expansive per IBC 2012, except that tests to show compliance with items 1, 2, and 3 shall not be required if the test prescribed in Item 4 is conducted:

- Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM D 4318.
- 2. More than 10 percent of the soil particles pass a No. 200 sieve (0.75 μ m), determined in accordance with ASTM D 422.
- 3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422.
- 4. Expansion Index greater than 20, determined in accordance with ASTM D4829.

If the Plasticity Index (PI) of the soil is 20 or less and the Liquid Limit (LL) is 45 or less, the Plasticity Index Corrected (PI cor) or the Expansion Index Corrected (E1 cor) may be substituted in the definition of Expansive Soil. Where PI cor and E1 cor are determined as follows:

Pl cor = Pl x (% Passing No.40 sieve)/100 and El cor = El x (% Passing No. 4 Sieve)/100

These soils should not be reused as engineered fill. When these soils are encountered in cut areas, they should be undercut to 4 feet below finished exterior grade or to 2 feet below the bottom of footing, whichever is deeper, and backfilled with controlled, compacted fill. If the bottom of the plastic soils extends to depths less than 4 feet below the finished exterior grade, the undercutting and replacement may be limited to the depth of the high plasticity soils.

Alternatively, the footings can be "stepped down" to bear either at 4 feet below exterior grade or at 2 feet below normal footing subgrade, whichever is deeper, bearing on the plastic soils. If the plastic soils are found to be less than 4 feet in thickness, the footing needs bear only below the plastic soils and the frost line.

Floor slabs placed in areas where highly plastic soils are encountered should be underlain by at least 2 feet of compacted suitable fill. In proposed pavement areas, we recommend undercutting and replacement of the expansive soils in order to provide at least 2 feet of non-expansive soil fill below the pavement subgrade.

5.2.2 Existing Man-Placed Fill

Existing man-placed fill was not encountered below the existing ground surface within any of the borings evaluated for this exploration. However, it should be noted that the general site is bordered by some developed areas and fill may be present in areas of the site not explored during our current study or adjacent to utilities or structures at the site. Existing fill material should be considered undocumented fill and will have to be removed and reworked or replaced within structural areas. Any encountered trash or unsuitable fill materials should be completely removed within structural areas and should not be used in structural fill areas.

If areas of existing fill are encountered at a subsequent time during site development, it may be feasible to remove and re-compact the existing fill materials; however, further laboratory testing should be performed at that time to confirm if the fill materials satisfy the requirements for an engineered fill. Some moisture conditioning of the soils may be necessary prior to placement in order to achieve proper compaction. Additionally, the amount of debris present in existing fill materials can frequently be difficult to evaluate with soil borings. Therefore, test pits may be warranted to confirm the fill does not contain unacceptable debris prior to reuse in engineered fill. Some screening may be required to remove any debris prior to placement of these soils, so the planning of earthwork operations should recognize and account for these efforts and increased costs.

5.2.3 Weathered Rock and Rock Excavation Operations

Weathered rock was encountered as shallow as 3.0± feet below the existing ground surface. Rock excavation will be required for mass grading and installation of any deep utilities. Typically, for excavations in relatively unweathered rock material, ripping is practical for excavations extending down to about 2 feet below the depth of auger refusal. However, blasting or hoe-ramming for removal of weathered rock or intact rock will likely be required below auger refusal depths.

For the construction planning and final pay quantities, we recommend that the following definition be utilized in the project specification to define rock:

"For footings, trenches and pits, rock shall be defined as those materials that cannot be excavated with a Caterpillar Model No. 320L track-type hydraulic excavator, equipped with a 42-inch wide short-tip radius rock bucket, rated at not less than 120 hp flywheel power with a maximum drawbar pull force of not less than 39,700 lbs. Boulders or masses of rock exceeding one-half cubic yard in volume shall also be considered rock excavation. This classification does not include materials such as loose rock, concrete, or other materials that can be removed by means other than drilling and blasting, hoe-ramming, or rock trenching, but which for reasons of economy in excavating, the contractor chooses to remove by drilling and blasting, hoe-ramming, or rock trenching techniques."

Refusal materials (intact rock) normally require blasting in deep 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 requirements of the county.

5.2.4 Structural Fill

Product Submittals: Prior to placement of structural fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Satisfactory Structural Fill Materials: Fill material underneath the proposed structures and pavements should consist of an approved material (CL, ML, SC, SM or more granular), free of debris, organics, and cobbles greater than 4 inches. The structural fill in the "active zone" under the building pad should have Liquid Limit (LL) no greater than 40 and Plasticity Index (PI) less than 15, and shall be non-expansive in addition to meeting all the other requirements for a suitable structural fill material. The "active zone" is defined by PWC as a buffer of at least four feet below the final exterior grades or two feet below the bottom of the foundation, whichever is greater. Fill below the "active zone" for structures, and below subgrade for slopes and pavement (curb and gutter, sidewalk, etc.) should have LL and PI no greater than 45 and 20, respectively, unless it can be shown to have very low expansion potential. If no structural fill is required, the upper two feet of existing soil shall meet these criteria. Under no circumstances should high plasticity (CH, MH) soil be used as fill material in proposed structural areas.

The low plasticity natural soils at this site are expected to be suitable for use as controlled fill; however, they may require moisture content adjustments, via discing or other drying techniques or spraying of water to the soil prior to their use as controlled fill material. Additionally, any debris or other unsuitable materials must be removed, as necessary, from the on-site materials prior to their reuse as engineered fill. The planning of earthwork operations should recognize and account for these efforts and increased costs. Suitable structural fill soils should have the index properties shown in the tables below.

STRUCTURAL FILL INDEX PROPERTIES	
Subject	Property
Building and Structural Areas	LL < 40, PI<15
Pavement Areas	LL < 45, PI<20
Max. Particle Size	4 inches
Fines Content (% passing #200 sieve)	Max. 25 %
Max. organic content	5% by dry weight

STRUCTURAL FILL COMPACTION REQUIREMENTS		
Subject Requirement		
Compaction Standard	Standard Proctor, ASTM D698/ Virginia Test Method (VTM-1)	
Required Compaction	95% of Max. Dry Density for fill less than 10 feet	
	98% of Max. Dry Density for fill greater than 10 feet	
Moisture Content	-2 to +3 % points of the soil's optimum value	
Loose Thickness	8 inches prior to compaction	

Flowable Fill/Lean Concrete Fill Recommendations: Low strength flowable fill/lean concrete materials are also considered suitable for use as fill to restore site grades to final slab-on-grade elevations for conduit installation. Prior to the placement of these materials, subgrades shall be observed and approved in accordance with the requirements presented in this report. Fill areas shall be limited to locations where compaction of approved structural fill soils will not result in adequate parameters/values, and fill depths shall be limited to depths to which consolidation will not be permissible. The flowable fill shall be approved by the design team to ensure placement, curing, and resistivity values are achieved. Other approved structural fill materials shall not be layered between multiple lifts of flowable fill.

On-Site Borrow Suitability: Significant natural deposits of soils classified in our boring logs as Silty SAND/Sandy SILT (SM/ML) have been identified as being present on the site. These occur mostly at relatively shallow depth below the surface where residual soils are mostly weathered.

Non-Durable Rock: Nondurable rock materials removed in ripping excavations may be used as fill if suitably broken down by mechanical compaction effort. Durability is the term used to describe the ability of a rock or rock-like material to withstand long term chemical or mechanical weathering without size degradation. Any weathered rock excavated from the site and used as engineered fill should have a well-graded grain size distribution with rock and soil particles ranging from clay or silt size particles to a maximum size of 4 inches in diameter. Particles larger than this should be broken by mechanical compaction equipment to achieve the desired grain size distribution, and the samples should have a minimum of 20% passing the #200 sieve and 50% passing the #40 sieve. Variations from these recommendations should be approved by the GER, at the time the samples are prepared.

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.

Fill Equilibrium Monitoring: Up to approximately 21± feet of new fill will be required to reach planned grades in some areas. With this extensive fill and predominately fine-grained soils anticipated for its construction, settlement monitoring prior to commencing foundation construction is recommended in order to confirm the fill has reached equilibrium. Likewise, it would be prudent to place the extensive new fill for the building as early as possible in the site development phase so that any residual, fill-induced settlement can occur without major impacts to the building construction schedule.

We believe that the majority of the fill-induced settlement will occur within the fill itself, rather than over a deep soft soil layer. Therefore, a monitoring program utilizing near-surface settlement plates or

monuments should be implemented near or immediately upon the conclusion of the fill placement. The frequency of monitoring should be on a weekly basis, but this should be adjusted as necessary by the GER based upon settlement rates. The GER will also determine the duration of the settlement monitoring based on settlement rates and trends. Typically, the fill-induced settlement rates are highest during the fill placement and begin to taper off shortly after ceasing any fill placement. Fill-induced settlements will practically stop within two or so months after the completion of any fill placement. Construction can begin when subsequent readings indicate settlement of the fill under its own weight has virtually ceased.

5.2.5 Temporary and Permanent Slopes

Because of the erodibility of the natural soil at the site, special care should be taken to prevent erosion. We recommend that temporary slopes established during construction be constructed no steeper than 1H:1V and maintained for no more than 30 days.

Landscape berms can be constructed as steep as 2H:1V; however, it should be noted that the site soil is highly erodible and that adequate measures must be taken to prevent erosion of slopes steeper than 3H:1V. All slopes must be protected from erosion by a ground cover of adequate vegetation and erosion control measures. All excavations should be performed in accordance with the current OSHA and VOSHA regulations.

5.3 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**.

5.4 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 (often VDOT #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.

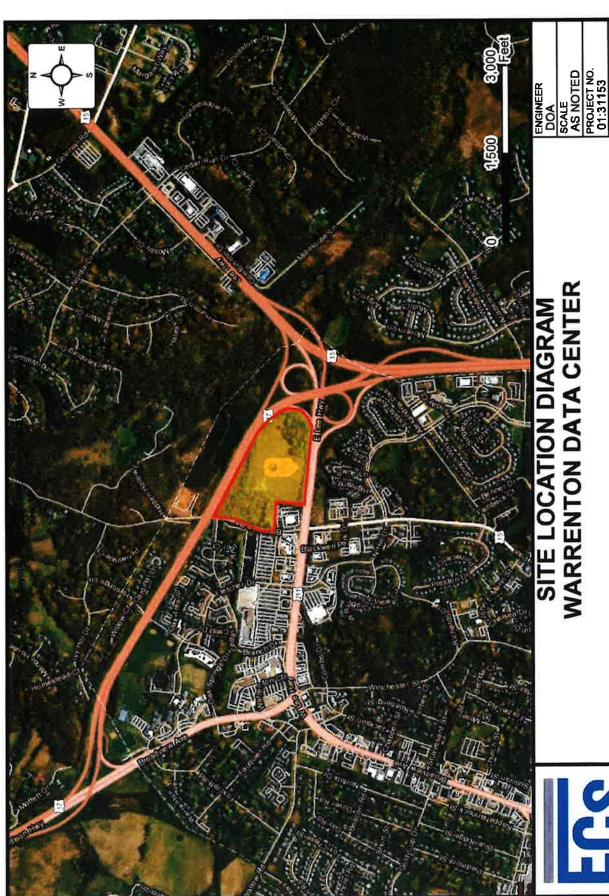
The description of the proposed project is based on information provided to ECS by Bohler. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations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



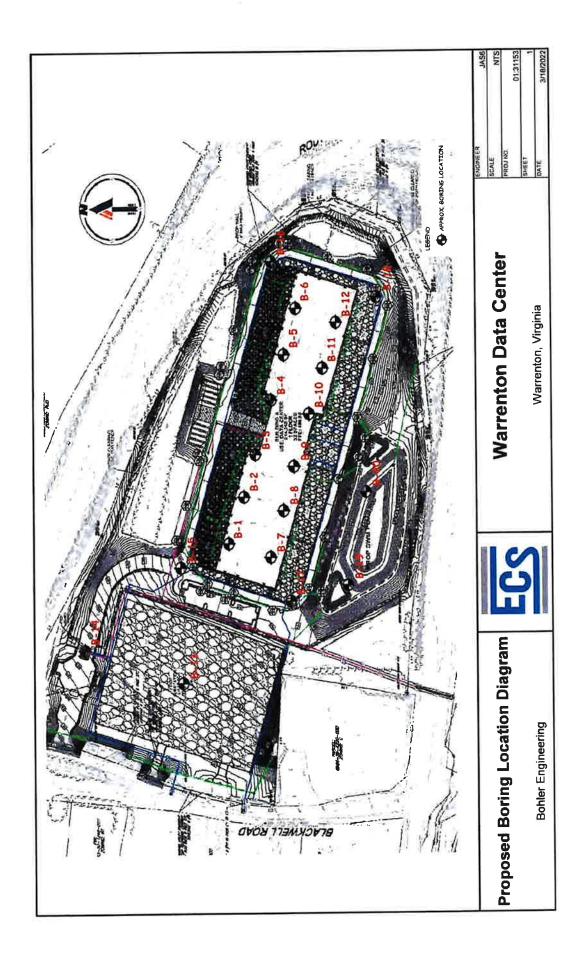
SITE LOCATION DIAGRAM WARRENTON DATA CENTER

LEE HIGHWAY AND BLACKWELL ROAD, WARRENTON, VIRGINIA BOHLER ENGINEERING

DATE 11/10/2021

SHEET 1 OF 1





APPENDIX B – Field Operations

Reference Notes for Boring Logs Subsurface Exploration Procedure Notes Boring Logs B-1 through B-20



REFERENCE NOTES FOR BORING LOGS

MATERIAL	1,2	
	ASPH	IALT
	CONC	CRETE
80000	GRAV	ÆL
	TOPS	SOIL
	VOID	
出出	BRIC	ĸ
8000	AGG	REGATE BASE COURSE
	FILL ³	MAN-PLACED SOILS
256	GW	WELL-GRADED GRAVEL gravel-sand mixtures, little or no fine
	GP	POORLY-GRADED GRAVEL gravel-sand mixtures, little or no fine
HHE	GM	SILTY GRAVEL
744	GC	gravel-sand-sift mixtures CLAYEY GRAVEL
19/92	0147	gravel-sand-clay mixtures
	SW	WELL-GRADED SAND gravelly sand, little or no fines
	SP	POORLY-GRADED SAND gravelly sand, tittle or no fines
	SM	SM SILTY SAND sand-silt mixtures
1111	sc	CLAYEY SAND sand-clay mixtures
	ML	SILT non-plastic to medium plasticity
	MH	ELASTIC SILT high plasticity
	CL	LEAN CLAY low to medium plasticity
1//	СН	FAT CLAY high plasticity
	OL	ORGANIC SILT or CLAY
	ОН	ORGANIC SILT or CLAY high plasticity
	PT	PEAT

	DRILLING SAMPLI	NG SYMBO	LS & ABBREVIATIONS
SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
NS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

		PARTICLE SIZE IDENTIFICATION
DESIGNATIO	N	PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel: (Coarse	% inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to 3/4 inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
1	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fìne	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay	("Fines")	<0.074 mm (smaller than a No. 200 sieve)

COHESI	/E SILTS &	CLAYS		
UNCONFINED COMPRESSIVE STRENGTH, QP	SPT ⁵	CONSISTENCY ⁷ (COHESIVE)		
<0.25	<3	Very Soft		
0.25 - < 0.50	3 - 4	Soft		
0.50 - <1.00	5 - 8	Firm		
1.00 - <2.00	9 - 15	Stiff		
2.00 - <4.00	16 - 30	Very Stiff		
4.00 - 8.00	31 - 50	Hard		
>8.00	>50	Very Hard		

RELATIVE AMOUNT ⁷	COARSE GRAINED (%)8	FINE GRAINED (%)8
Trace	<5	≤5
Dual Symbol (ex: SW-SM)	10	10
With	15 - 25	15 - 25
Adjective (ex: "Silty")	>30	>30

GRAVELS, SANDS	B. NON-COHESIVE SILTS
SPT ⁶	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

	WATER LEVELS
Ā	WL (First Encountered)
Ā	WL (Completion)
Ā	WL (Seasonal High Water)
<u>\$</u>	WL (Stabilized)

highly organic soils

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

²To 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.

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

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

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.

⁶The 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 day 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.

⁷Minor deviation from ASTM D 2488-17 Note 16.

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



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.





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Warren	ton Data	a Cente	r				All American	Geoted	h, Inc.					
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Lee High NORTH		d Black	cwell R		/arrenton, Virginia 20186 STING:	STATION:				ACE EL	EVATION:	BOTTOM OF G	ASING	•
	<u>«</u> ا		_	\perp				Π'	492			Plastic Llmlt Water Content Liquid Limit		
DEPTH (FT)	SAMPLE NUMBER	SAMPLETYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	OF MATERIAL		TAY TO TAY TO	WATER LEVELS ELEVATION (FT)	ELEVATION (FI	BLOWS/6"	S STANDARD PENETRATION BLOWS/F ROCK QUALITY DESIGNATION & RECOVE RQD REC CALIBRATED PENETROMETER TON/S [FINES CONTENT] %		
2					Topsoil Thickness [4"]			m		1				
-	S-1	SS	18	12	(SM) SILTY SAND, brow	wn, moist, l	- 1			=	3-3-4 (7)	8,		
2								Щ	-	4		1		
-	S-2	SS	18	16	(CH) SANDY FAT CLAY, moist, firm	brown and	gray,			-]	4-4-5 (9)	Ø ₉ 15.1		
5-		-			(SM) SILTY SAND, brow	wn, moist, r	nedium	M	- 4	187 -				
-	S-3	SS	18	10	dense					=	5-5-7 (12)	Ø12	3	
2					WEATHERED ROCK, li	ght brown,	moist,			-	32-50/3"			g ²⁰¹³ .
-	5-4	SS	9	0	very dense					182	(50/3")			34.3
10-							7 7 7 8 8 8			-				
15-	S-5	SS	16	13						477-	29-38-50/4" (88/10")		٠	Seamo.
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25 -	-S-7	_ss	-2	2					▼	467	50/2" (50/2"}		ç	8 _{50/2} -
30-	S-8	SS	5.	5	CONTINUED	N NEXT D	AGE			462	50/5" (50/5")		C	& _{50/5} -
-		UC 575	ATIFIC	TION!	INES REPRESENT THE APPROX	CIMATE BOLING	DARY LINES RET	TWFFN	SOIL T	YPES. IN	N-SITU THE T	RANSITION MAY BE O	SRADUAL	
∇	T WL (Fir				INES REPRESENT THE APPROX	- 1	ING STARTED		p 21 2		CAVE IN			
_	WL (Co	_			34.0	BOR	ING		p 21 2	021	HAMME	R TYPE: Auto		
4	WL (Se	asona	High '	Vater)		APLETED:		GGE				_	
	WL (Sta					ATV	IPMENT:				DRILLIN	G METHOD: 3.25 H	SA	
_					GF		CAL BORE	HOL	LO	G				

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Lee Higi	hway ar		kwell F		Varrenton, Virginia 20186						LOSS OF CINC	JEANON	
NORTH	IING:			EA	STING:	STATION:			SURFACE 192	ELEVATION:	BOTTOM OF	Casing	-
	BER	Ä	(N)	Î				21.	E		Plastic Limit Water Content Liquid Limit		
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION (OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BL ROCK QUALITY DESIGNATION & R ROD			
	SAN	SAN									CALIBRATED PENETROMETER TON/SF [DIXES CONTENT] %		1/SF
3					WEATHERED ROCK, lig very dense	ght brown,	moist,		-				
2					, ,		i.		-	50/54			
_	S-9	SS	_5_	5			li i	6		50/5" (50/5")			Ø50/5*
35		l)							457-	1			
-									-	-			
-					,		Ī			1			1 1
	1						15		-	}			
-	S-10	SS	15	15						24-43-50/3" (93/9")	16.5		(956%)
40-									452-	(55/5)			
2							Ē		-	}			
-													
1									-	1			
-	S-11	SS	10	10					20	32-50/4* (50/4")			Ø _{50/4} .
45-									447-	(50/4)			
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60-	1								432-	1			
-	-												
	1		-										
	T	HE STR	ATIFICA	TION L	INES REPRESENT THE APPROX	IMATE BOUNI	DARY LINES BET	WEEN S	OIL TYPES.	IN-SITU THE T	RANSITION MAY BE	GRADUAL	
_	WL (Fir			ed)	23.0	BOR	ING STARTED:	Sep	21 2021	CAVE IN	DEPTH: 47.0		
Y	WL (Co	mplet	ion)		34.0	BOR		Sep	21 2021	наммі	R TYPE: Auto		
Z '	WL (5e	asonal	High \	Water)			IPMENT:		GED BY:				
V	WL (Sta	bilize	d)			ATV				DRILLIN	G METHOD: 3.25 F	ISA	
					GE		CAL BORE	HOLE	LOG				

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PROJECT NAME: Warrenton Data Center	All American Geote			
SITE LOCATION:				LOSS OF CIRCULATION
Lee Highway and Blackwell Road, Warrenton, Virginia 20186		CLIDEACE	ELEVATION:	
NORTHING: EASTING: STATION:		480	LEEVATION.	BOTTOM OF CASING
SAMPLE NUMBER SAMPLE TYPE SAMPLE DIST. (IN) RECOVERY (IN)		WATER LEVELS ELEVATION (FT)	BLOWS/6"	Plastic Limit Water Content Liquid Limit X
Topsoil Thickness [3"]				PINES CONTENTS
S-1 SS 18 12 (SM) SILTY SAND, brown, moist	, loose		2-3-7 (10)	&u 24.7
D35-BG1 60 WEATHERED ROCK, light brown gray, and black, moist, very der	HOST SHE HALL BUT	475	17-24-38	11.7 18× 39 [85.6%]
S-3 SS 17 17			19-34-50/5" (84/11")	Øsam.
S-4 SS 17 17 10-		470	20-37-50/5" (87/11")	Ø _{87/11} -
			17-24-32	
S-5 SS 18 18 18		465	(56)	12.6
			24-50/3"	Ø5013.
20 - S-6 SS 9 9 20 -		460	(50/3")	
S-7 SS 17 15 25-		458	30-41-50/5'	Seini-
- S-8 SS 9 9 30-		456	45-50/3")	⊗ 5003-
CONTINUED ON NEXT	PAGE	LEON TAPE	IN CITUTUE	TRANSITION MAY BE GRADUAL
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOU				
		iep 27 2021	. CAVE II	N DEPTH: 52.0
Wil (Seasonal High Water)	MPLETED:	ogged B		ER TYPE: Auto
▼ WL (Stabilized)				

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PROJECT Warrent							All America							
SITE LO			.61				Mirangilas	425125					oss of circulation) (100×)
Lee High	way a		kwell i		Varrenton, Virginia 20186							LC	355 OF CIRCULATION	Ziaciy
NORTH	ING:			EA	STING:	STATION:	N: SURFACE ELEVATI 480			EVATION:	В	OTTOM OF CASING	>	
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION (OF MATERIAL			WAIER LEVELS	ELEVATION (F1)	BLOWS/6"	⊗ s ROCH	Limit Water Conte STANDARD PENETRATI K QUALITY DESIGNATI REC CALIBRATED PENETRO ES CONTENT! %	ON BLOWS/FT
					WEATHERED ROCK, lig					4			D CONTENT N	
_					gray, and black, moisi	L, VEI y GEIL				2				
_	S-9	55	11	10					1	=	38-50/5" (50/5")			Ø50/5-
35									4	45	(30/2)			
4										4				
	3-10	_55_	_4_	4_				拼拍		4	50/4" (50/4")			QS/2014*
40-									4	40-				
										111				
-										4	50/5"			⊗ _{50/5} .
45	S-11	SS	5_	5_					☑ 4	35	(50/5")			7503
50-	S-12	_ss_	3-	3					4	30-	50/3" (50/3")			⊗ _{sors} .
55-	S-13	SS	4	4					•	25-	50/4" (50/4")			⊗ _{50/4} -
3.5	S-14	SS	3	3	END OF BOR	ING AT 58.8	FT			1.1.1.1.1.1	50/3" (50/3")			⊗ _{50/3} .
60-									4	20-				
		-	-							-1				
					INES REPRESENT THE APPROX	KIMATE BOUN	DARY LINES BE	TWEENS	OIL TY	PES. IN	-SITU THE TI	RANSITION	MAY BE GRAD	UAL
∇ \	VL (Fir	st Enc	ounte	red)	45.0	BOR	RING STARTE): Se	27 20	21	CAVE IN	DEPTH:	52.0	
Y \	VL (Co	mplet	ion)		53.0		RING	Sei	27 20	21	HAMME	R TYPE:	Auto	
Z /	VL (Se	asona	l High	Water)			MPLETED: JIPMENT:		GGED		-			
▼ /	VL (Sta	abilize	d)			ATV					DRILLING	5 METHOI	D: 3.25 HSA	
					GE	OTECHN	ICAL BOR	EHOLE	LOG	9				

CLIENT:	nginee						PROJECT NO 01:31153		В	ORING N	10.:	SHEET: 1 of 2	ECO
PROJEC							DRILLER/CONTRACTOR: All American Geotech, Inc.						
Warrent SITE LO			er				1					LOSS OF CIRCULATION	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
Lee High	hway ar	nd Blac	kwell R	load, W	arrenton, Virginia 20186							101101	
NORTH	IING:			EA	STING:	STATION:			SU 47!		LEVATION:	BOTTOM OF CASING	-
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C			WATER LEVELS	ELEVATION (FT)	"9/SMOJ8	Plastic Limit Water Conter X STANDARD PENETRATI ROCK QUALITY DESIGNATIC RQD REC CALIBRATED PENETRON IFINES CONTENT! %	ON BLOWS/FT	
	S-1	SS	18	12	Topsoil Thickness [6"] (ML) SANDY SILT, light loose to medium dens	brown, me	pist,				3-3-3 (6)	% 25.3	
5-	S-2	SS	18	18						470-	4-5-7 (12)	⊗ ₁₂ 21.5 ²⁸ ×—	44 [71.0%]
	5-3	SS	18	12						1	6-7-9 (16)	Ø _{Te}	
	S-4	SS	4_	4_	WEATHERED ROCK, lig moist, very dense	ght brown	to gray,			405	50/4" (50/4")		⊗ ₅₀₁₄ .
10-										465			
7	S-5	SS	11	11						2	39-50/5" (50/5")	G _A	⊗sos.
15-										460-			
20 -	1	SS	_5_	5						455	50/5" (50/5")		⊗ _{50/5} -
25 -		SS	5	5						450-	50/5" (50/5")		⊗ 50/5*
30	S-8	ss	2	2=					፟፟፟፟፟፟	445-	50/2" (50/2")		⊗ 50/2*
	1				CONTINUED O	N NEXT P	AGE						
	Т	HE STR	ATIFICA	ATION L	INES REPRESENT THE APPROX	KIMATE BOUN	DARY LINES BE	TWEEN	SOI	L TYPES. I	N-SITU THE T	RANSITION MAY BE GRAD	UAL
∇	WL (Fir				29.0		ING STARTE			4 2021		DEPTH: 36.0	
-	WL (Co	_			35.0		RING MPLETED:		Oct O	4 2021	намм	ER TYPE: Auto	
	WL (Se			Water)		EQU ATV	IPMENT:		200.000	GED BY:	DRILLIN	G METHOD: 3.25 HSA	
					GE	OTECHNI	CAL BOR	EHOI	LEL	.OG			

-	Enginee						PROJECT I 01:31153 DRILLER/O		B	BORING 1 1-03	NO.:	SHEET: 2 of 2		EC ₂
	CT NAN		ter				All Americ							
SITE LC	OCATION	V:		Road, V	Varrenton, Virginia 20186							LC	DSS OF CIRCULATION	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
NORTI					STING:	STATION:			SL 47		LEVATION:	E	BOTTOM OF CASING	-
	BER	w	2	Ê					SIS	E	· ·		Limit Water Conter	nt Liquid Limit
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION (OF MATERIA	L		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	_	STANDARD PENETRATIO K QUALITY DESIGNATIO ROD REC	
	SAN	S	SAI	<u>~</u>					>				CALIBRATED PENETRON ES CONTENTI %	NETER TON/SF
	1				WEATHERED ROCK, lig moist, very dense	ght brown	n to gray,			-				
			,		moist, very defise					=	50/3"			⊗ _{sa/s} .
0.5	S-9	33		-3-					_	440-	(50/3")			950/3
35-										4				
	1									1				
	S-10	_ss	2=	2						3	50/2"		•	⊗ _{50/2} -
40-					SCHIST, [REC=32%,RO Weathered, Very Har					435-	(50/2")	1		
	- S-11	RC	60	19	vecunities, very nor	u, Eight (u.u,			1		130	0 32	
	7 11	110	00	13				1-3		-				
,	_				,]		<u> </u>	1	
45-					SCHIST, [REC=53%,RO Weathered, Very Hai					430				
	S-12	RC	60	32]		7 💠	\$53	
	1									1		1		
	1				AUGER REFUS	AL AT 49.	0 FT	<u> [</u>		1		1		
50	1									425-				
3	-									-				
										420-				
55										420				
9										1				
.9										- A				
60]									415				
9	-													
													144V DE 051-	141
∇	WL (Fir				INES REPRESENT THE APPROX		NDARY LINES E			L TYPES. II 3 2021	CAVE IN		36.0	JAL
_	WL (Co			/	35.0		RING		_		1 2000-000			
	WL (Se			Water)		co	MPLETED:			ED BY:	HAMME		Auto	
V	WL (Sta	bilize	d)			AT					DRILLIN	G METHO	D: 3.25 HSA	
					GE	OTECHN	IICAL BOR	REHO	LE L	OG				

LIENT:							PROJECT NO	O.:		ORING N	10.:	SHEET:	-0	
ohler Engi							01:31153	NITO 4		-04		1 of 2	EUS	2
ROJECT N							DRILLER/CO							2
Varrenton TE LOCAT	_		er				An America	Geot	cell, I			lass or single state	ON Sign	2
			well R	oad. W	arrenton, Virginia 20186							LOSS OF CIRCULATION	JN Zieu	9
IORTHING					STING:	STATION:			SU 483		LEVATION:	BOTTOM OF CASIN	iG 📜	D
	Ž,	ш	<u>ŝ</u>	7					ี่	E		Plastic Limit Water Con	tent Liquid Limit ———————————————————————————————————	
DEPTH (FT)	SAMPLE NUME	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	DF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOW5/6"	S STANDARD PENETRA ROCK QUALITY DESMINA: ROD REC CALIBRATED PENETR FINES CONTENT! %	TION & RECOVERY	
	+				Topsoil Thickness [6"]			XX		-				
	-1	SS	18	18	(ML) SILT, brown to lig medium dense to ver	ght browπ,	moist,			1	5-5-16 (21)	Ø ₂₁ 25.2		
-								HIII		3		. \	101	C 40
18 5 - S	88	SS SS	18	18						478-	11-13-19 (32)	22	io)	5.1%
1	-3	SS	18	18						-	5-7 -8 (15)	Ø15 16.9		
-											7-10-10	⊗ 20		
10 S-	-4	SS	18	18						473-	(20)	20		
1										-				
15	-5	SS	18	18			i.			468	11-11-13 (24)	22.6		
20-	i-6	SS	18	18						463-	21-23-31 (54)	8.	\	
1					WEATHERED ROCK, b	rownish gr	ay, moist,						/	
25 - S	5-7	SS	8	8						458-	47-50/2" (50/2")		8,	0/2"
20										-				
1	_	-	44	144	-				5	1	36-50/5"		83.	0/5"
30 - 5	5-8	SS	11	11						453	(50/5")			
-					CONTINUED	N NEXT P	AGE							_
					INES REPRESENT THE APPROX	KIMATE BOUN	DARY LINES BI						DUAL	
✓ WL	_			ed)	Dry		RING STARTE	D:	Sep 2	B 2021	CAVE IN	DEPTH: 17.0		_
▼ WL	_	_		Water			MPLETED:			8 2021	НАММ	ER TYPE: Auto		
	_	_				EQU	JIPMENT:		LOGG	ED BY:	DRILLIN	G METHOD: 3.25 HSA		
▼ WL	(Sta	Dilize	-1		G	OTECHNI		EHO	LE I	OG				

CLIEN		77					PROJECT N	10.:		BORING N	10.:	SHEET: 2 of 2		LO.
	Engine						01:31153 DRILLER/C	ONTDA		B-04		2 OT 2		
	CT NAN		er				All America							
	DCATIO		.EI				All Alliere	iii deoi	2017					1
100			:kwell f	Road, V	Varrenton, Virginia 20186							LOS	S OF CIRCULATION	<u>>1003</u> >
NORT					ASTING:	STATION:			SU 48		LEVATION:	ВО	TTOM OF CASING	
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLETYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	X- ⊗ sπ	Andard Penetration	——△ N BLOWS/FT
🖁	SAMP	SAN	SAMP	REC.					WA	ELE	ā	— R	EC LIBRATED PENETROM	ETER TON/SF
					WEATHERED ROCK, be very dense	rownish g	ray, moist,			-		(FINES	CONTENT) %	
	-S-9-	-55-	-1-	1	AUGER REFUS	AL AT 33.6	FT				50/1"			⊗ _{50/1} -
35					AGGENTIE	ALAI 00.0				448-	(50/1")			
2					(2)									
40										443-				
45										438-				
50										433				
55										428				
1, s	<u>-</u>													
60									a.	423-				
					INES REPRESENT THE APPROX	MATE BOUN	NDARY LINES BE	TWEEN	SOIL	TYPES. IN	I-SITU THE TI	RANSITION N	1AY BE GRADU	AL
_	WL (Fir	_		ed)	Dry	BOI	RING STARTE	D: S	ep 28	3 2021	CAVE IN	DEPTH:	17.0	
_	WL (Co			Water\	Dry	2000	RING MPLETED:	5	ep 28	3 2021	НАММЕ	R TYPE:	Auto	
_	WL (St	_		.ratel/		EQU	UIPMENT:			ED BY:	DRILLING	METHOD:	3.25 HSA	
					GE	OTECHN	ICAL BOR	EHOL	E L	OG				

Moder Engineering SI31153 Society Soci	CLIENT:							PROJECT NO).:	- 1	ORING N	10.:	SHEET:	
Manual M									NITO .	_			1 07 3	EL'C
STRE CONTINUE ROAD Warrenton, Virginia 20185 STATION: SUBFACE ELEVATION: SOTION OF CANADO SUBFACE STATION: SUBFACE ELEVATION: SOTION OF CANADO SUBFACE STATION: SUBFACE ELEVATION: SOTION OF CANADO SUBFACE STATION: SUBFACE STATION: SUBFACE								1						
Continued of the cont	Warrent	on Dat	a Cento	er				All American	Geote	ch, I	nc.			
SATING: SUFFACE ELEVATION:						7/4/24/3							LOSS OF CIRCULATION	N N
Page			id Blaci	kwell R			STATION:			1		LEVATION:	BOTTOM OF CASING	-
S-1 SS 18 10 Independent of the strategies of the strate		α _C		-										ent Liquid Limit
S-1 SS 18 10 Independent of the strategies of the strate	4 (FT)	NUMBE	E TYPE	DIST. (IN	ERY (IN)	DESCRIPTION	DE MATERIAI			I LEVELS	ION (FI	ws/6"	STANDARD PENETRAT	
S-1 SS 18 10 Independent of the strategies of the strate	EPTI	PLE	MP	PLE	8	DESCRIPTION S				Afe	EA	BLO		
S-1 SS 18 10 Independent of the strategies of the strate	۵	NA.	₹	SAM	Æ				1	≥	ੂ ਜ਼		CAUBRATED PENETRO	METER TON/SF
S-1 SS 18 10		- 01		,				K	-2022	_			JAINES CONTENTI %	
S-1 SS 18 18 18 18 18 18 1									mil	\neg				
1005e	1	c 1		10	10	5-7,00-75	dish brown,	moist,	11111		-		⊗,	
S-2 SS 18 18 (ML) SILT, brown and black, moist, medium dense to very dense 477	- 12	2-T	22	10	10	loose			Ш		7	(0)		
S-2 SS 18 18 (ML) SILT, brown and black, moist, medium dense to very dense 477	-								Ш		7			
CONTINUED ON NEXT PAGE Sp. 18 18 Sp. 18		S-2	22	18	12						-		⊗,	
S-3 S5 18 18 18	5-	3-2	33	10	10				444		477 -	(5)		
S-3 SS 18 18 18 10	_							t,	IIIII		1			
S-4 SS 18 18		S-3	SS	18	18	medium dense to ver	y aense		ШШ				Ø12 28.8	
S-4 SS 18 18 18	-	-				_		- 1	11111				\	
S-4 SS 18 18 18	3											500	1	
S-5 SS 18 18	-	S-4	SS	18	18						7		⊗ 10	
S-5 SS 18 18	10-								11111		472-			
S-5 SS 18 18											-			
S-5 SS 18 18									Hill		- 1			
S-5 SS 18 18														
S-5 SS 18 18	্										-	74 77 20		
(ML) SANDY SILT WITH GRAVEL, contains quartz fragments, light brownish gray, moist, very dense (ML) SILT, light brown, moist, medium dense to dense (ML) S	- 4	5-5	SS	18	18						1		\$	2
(ML) SANDY SILT WITH GRAVEL, contains quartz fragments, light brownish gray, moist, very dense (ML) SILT, light brown, moist, medium dense to dense (ML) S	15-					-			HIII		467		3	\
S-6 SS 5 5 5	-													
S-6 SS 5 5 5									4444		- 4			
20 - SS SS S S S S S S S S S S S S S S S											1			/
Moist, very dense Mois	7	-		-	-		ht brownish	gray,			-			⊗ _{50/5} .
(ML) SILT, light brown, moist, medium dense to dense (ML) SILT, light brown, moist, medium dense to dense (ML) SILT, light brown, moist, medium dense to dense (ML) SILT, light brown, moist, medium dense to dense (A57	72	3-0_	-33_		-3-	moist, very dense					4	(50/5")		
S-7 SS 18 18 S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Stabilized) DRILLING METHOD: 3.25 HSA	20-								ШШ		462			
S-7 SS 18 18 S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Stabilized) DRILLING METHOD: 3.25 HSA		1									1		/	
S-7 SS 18 18 S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Stabilized) DRILLING METHOD: 3.25 HSA	1 4								Ш	_	1			
S-7 SS 18 18 S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WL (Stabilized) PORING Sep 28 2021 DRILLING METHOD: 3.25 HSA		1					n, moist, me	edium			1			
S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Seasonal High Water) WL (Seasonal High Water) WU (Stabilized) DRILLING METHOD: 3.25 HSA	1					dense to dense					- 3	9-10-13		
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) WL (Completion) BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 BORING STARTED: Sep 28 2021 WL (Seasonal High Water) COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	2	5-7	SS	18	18								Ø ₂₃	
S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WUL (Stabilized) DRILLING METHOD: 3.25 HSA	25-		_	-	-	-			ШШ		457-			
S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WUL (Stabilized) DRILLING METHOD: 3.25 HSA	5	1									-			
S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WUL (Stabilized) DRILLING METHOD: 3.25 HSA		1							IIIII					
S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WUL (Stabilized) DRILLING METHOD: 3.25 HSA	9	1		1					ШШ					
S-8 SS 18 18 CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WUL (Stabilized) DRILLING METHOD: 3.25 HSA	1 5	1			-	-			Ш		1 5	16-19-22	\	
CONTINUED ON NEXT PAGE THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) BORING COMPLETED: COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	1 5	5-8	SS	18	18				Ш		l3		861	
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) BORING COMPLETED: COMPLETED: EQUIPMENT: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	30-				_						452-			
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) BORING COMPLETED: COMPLETED: EQUIPMENT: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	-	-			-	CONTINUED	N NEXT PA	\GE	ппп					
▼ WL (First Encountered) 53.0 BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 ▼ WL (Completion) 48.0 BORING Sep 28 2021 HAMMER TYPE: Auto ▼ WL (Seasonal High Water) EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA		<u> </u>	HE STR	ATIFIC 4	TION	INES REPRESENT THE APPROX	KIMATE BOUNI	DARY LINES BE	TWEEN	SOIL	TYPES. II	N-SITU THE T	RANSITION MAY BE GRAD	DUAL
▼ WL (Completion) 48.0 BORING COMPLETED: COMPLETED: EQUIPMENT: DRILLING METHOD: 3.25 HSA	7											1		
▼ WL (Seasonal High Water) COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	-	_	_		Cuj					-				
▼ WL (Stabilized) DRILLING METHOD: 3.25 HSA	_	_		_	Water)	COM	IPLETED:						
GEOTECHNICAL BOREHOLE LOG								IPMENT:	1	JUGG	En RA:	DRILLIN	G METHOD: 3.25 HSA	
		· · L (316	, D.1112C	-1		GF		CAL BORE	HOI	E I	OG			

LIENT:							PROJECT NO.:		BORING I	NO.:	SHEET:	
ohler E							01:31153		B-05		2 of 3	- LCC
ROJEC							DRILLER/CON					
Varrent			er				All American G	eotech,	Inc.			
ITE LO				4							LOSS OF CIF	RCULATION DIBE
ee High NORTH		nd Blac	kwell R		Jarrenton, Virginia 20186 STING:	STATION:		SI 48		LEVATION:	воттом с	of Casing
	BER	ų,	(N)	î				T		3	Plastic Limit Wa	nter Content Liquid Limit
БЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION	of Material		WATER LEVELS	ELEVATION (FT)	BLOW5/6"	ROCK QUALITY RQD REC	PENETRATION BLOWS/FT DESIGNATION & RECOVERY DESIGNATION & RECOVERY DESIGNATION & RECOVERY
					(ML) SILT, light brown dense to dense	, moist, m	edium		-		IPACS CONTEN	
					WEATHERED ROCK, b	rownish gr	ray, moist,					
35	S-9	SS	18	18	very dense				447	21-38-43 (81)	19.9	30 × 45 [87
										46-50/5"		
40-	S-10	SS	11	11					442	(50/5")		⊗ _{sors}
1.01.01	S-11	SS	_5_	_5_						50/5" (50/5")		⊗ _{sor}
45-									437	,,- ,		
The Car	S-12	SS	-3-	-3				•	1	50/3" (50/3")		⊗ _{50/}
50-									432-			
55	S-13	-ss-	-2	-2				▽	427 -	50/2" (50/2")		⊗ _{se} ,
	S-14	-55	2	2-						50/2" (50/2")		⊗ ₅₀ ,
60-									422			
					CONTINUED	N NEXT P	AGE					
					INES REPRESENT THE APPROX	KIMATE BOUN	IDARY LINES BETW	EEN SO	IL TYPES. II	N-SITU THE T	RANSITION MAY BI	E GRADUAL
_	VL (Fir	_		ed)	53.0 48.0		RING STARTED:	Sep 2	8 2021	CAVE IN	DEPTH: 49.0	
_	VL (Co		_	Nater)			RING MPLETED:		8 2021	HAMME	R TYPE: Auto)
	VL (Sta					ATV		200472	GED BY:	DRILLING	METHOD: 3.25	HSA
	_				GE		ICAL BOREH	OLF	OG			

BOOMER TERROR TO THE CONTROL TO THE	CLIENT		ein e					PROJECT NO 01:31153	*	BO B-0	RING N	10,;	SHEET: 3 of 3	-00
All American Gesteck, Inc. Image: Control				_	_				NTRAC	-				- LUC
STATION: STATION: SUSFACE ELEVATION: SUSFAC				er										
SATION: STATION: SUPFACE ELEVATION: SUPFACE				kwall 6	and M	Arrenton Virginia 20186		,					Loss of Circulat	ON)IND?
### DESCRIPTION OF MATERIAL Part			10 101861	KWEII F			STATION:				FACE E	LEVATION:	BOTTOM OF CASI	NG 🕦
### STATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU THE TRANSITION MAY BE GRADUA; Substitute Substitut		E E	ш	î.	9					2	E			ntent Liquid Limit
### STATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU THE TRANSITION MAY BE GRADUA; Substitute Substitut	H(F)	NUM	η. T.	DIST. (ERY (II	DESCRIPTION O	F MATERIAL			, LEVE	I) NOI	ws/6		
### STATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU THE TRANSITION MAY BE GRADUA; Substitute Substitut)EPT	IPLE	IMP!	1PLE	COV	DE30(1)1 11011 5				ATE	EW	BLO		
Sala		SA _N	Ŋ	SAR	R.					≤	ਜ਼		O CALIBRATED PENET	ROMETER TON/SF
\$15	-					WEATHERED ROCK, bi	rownish gra	y, moist,			1-		IFINES CONTENT! %	
## A 17 Sold	-	5.15	- 55	-5	-5						4			⊗ _{50:5} -
Solid Soli		3-13	-33	-							417	(50/5")		
Sold	65 -							f			41/3			
Sold		1						i i			3			
Sold	Ī							H			0			
### STATE ST	-	5 16	-55- -	-1-	-1-						-			Ø _{san} -
Solar Sola	70							H			412-	(30/1)		
Solar Sola	/0-										-			
Solar Sola	-							8						
Solar Sola														
Solution		5-17	_ss_	_3_	3						1			⊗ _{sora} .
S-18 - SS - 1								H			407	(50/3)		
BOO STATE 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 W. (First Encountered) Sa.0 BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 W. (Completion) 48.0 BORING COMPLETED: COMPLETED: COMPLETED: Auto DRILLING METHOD: 3.25 HSA	/5-									1	-01			
BOO STATE 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 W. (First Encountered) Sa.0 BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 W. (Completion) 48.0 BORING COMPLETED: COMPLETED: COMPLETED: Auto DRILLING METHOD: 3.25 HSA	-	1						li di			_			
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85 - 397 - 392 -	1	5-18	SS	-1-	-1-	END OF BORI	NG AT 78.6	FT	FFE	-				⊗ _{30/1} -
397— THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL W.L. (First Encountered) SORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 W.L. (Completion) W.L. (Seasonal High Water) W.L. (Seasonal High Water) Subject to the provided of the provided state						END OF BOTH					402	(30/1)	1	
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WL (Stabilized) ATV 392- 392- CAVE IN DEPTH: 49.0 HAMMER TYPE: Auto DRILLING METHOD: 3.25 HSA	80-	1									1			
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WL (Stabilized) ATV 392- 392- CAVE IN DEPTH: 49.0 HAMMER TYPE: Auto DRILLING METHOD: 3.25 HSA	- 5								- 1					
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WL (Stabilized) ATV 392- 392- CAVE IN DEPTH: 49.0 HAMMER TYPE: Auto DRILLING METHOD: 3.25 HSA		1												
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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (Completion) WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WL (Stabilized) ATV 392- 392- CAVE IN DEPTH: 49.0 HAMMER TYPE: Auto DRILLING METHOD: 3.25 HSA	0.5										307			
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) BORING COMPLETED: COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	85-	1									307			
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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) BORING COMPLETED: COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA		1									302			
WL (First Encountered) 53.0 BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) BORING Sep 28 2021 HAMMER TYPE: Auto COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	90-										392			
WL (First Encountered) 53.0 BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) BORING Sep 28 2021 HAMMER TYPE: Auto COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA		1												
WL (First Encountered) 53.0 BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) BORING Sep 28 2021 HAMMER TYPE: Auto COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA		1									Ī			
WL (First Encountered) 53.0 BORING STARTED: Sep 28 2021 CAVE IN DEPTH: 49.0 WL (Completion) BORING Sep 28 2021 HAMMER TYPE: Auto COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA													DANIGITION NAMED CO.	ADUAL
▼ WL (Completion) 48.0 BORING COMPLETED: Sep 28 2021 HAMMER TYPE: Auto ▼ WL (Seasonal High Water) EQUIPMENT: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA							- Lower							NDUAL
WL (Seasonal High Water) WU (Seasonal High Water) COMPLETED: EQUIPMENT: DRILLING METHOD: 3.25 HSA	_	_		_	ed}			MAN AND AND AND AND AND AND AND AND AND A	Se	p 28 2	2021	CAVE IN	DEPTH: 49.0	
WL (Seasonal riight Water) EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA ■		_							Se	p 28 2	2021	НАММЕ	R TYPE: Auto	
₩ (Stabilized)	_		_		(Vater				LC	GGE	D BY:	DRILLING	G METHOD: 3.25 HSA	
	<u>V</u>	NL (Sta	bilized	1)		0.00		CAL BORE	HO!	: 10		Ditte		

LIENT:		2400000					PROJECT N 01:31153	0.:	- 1	ORING I -D6		SHEET: 1 of 2		0
ROJEC							DRILLER/CO	ONTRA				1012		G
Varrent			er				Ali America							
TE LOC	OITA	۷:										LOSS OF CIRCU	LATION	>10
ee High NORTH		nd Blac	kwell R		Varrenton, Virginia 20186 STING:	STATION:			SU 482		LEVATION:	BOTTOM OF C	ASING	>
	EL	à.	2						1			Plastic Limit Water	Content Liquid	Limit
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION (of Material			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PEI ROCK QUALITY DES RQD REC CALIBRATED PE	NETROMETER TO	WERY
_					Topsoil Thickness [6"]	1						[FINES CONTENT] %		
	S-1	SS	18	12	(ML) SANDY SILT, redo		moist,			1	4-5-5 (10)	⊗ ₁₀ 25.2		
1	S-2	SS	18	10	(ML) SILT, light brown	, moist, loo	se to				3-5-6	⊗ 1,		
5	3-2	33	10	10	mediam dense					477	(11)			
	5-3	SS -	18	18						-	3-4-4 (8)	88	41.6	
10-	5-4	SS	18	18						472-	7-7-7 (14)	Ø.		
-					WEATHERED ROCK, li moist, very dense	ight brown a	and gray,							
15-	S-5	SS	18	18	moist, very dense					467-	22-27-33 (60)	18.3	800	
9-10-51-5-1										1.0		_	/	\
20-	5-6	SS	11	11						462-	33-50/5" (50/5")			8
20										102				
	S-7	SS	16	16						-	27-39-50/4" (89/10")			6
25-										457-				
	S-8	SS	9	9							20-50/3"			8
30-	-									452	(50/3")			
					CONTINUED O	N NEXT PA	GE	774		TUDES		ANCITION AANVES	PADUAL	
-					INES REPRESENT THE APPROX								IKADUAL	
_	_		ounter	ea)	Dry		ING STARTE): 5	ep 28	2021	CAVE IN	DEPTH: 20.0		
▼ V	_	mplet			Dry	BORI	ING IPLETED:	s	ep 28	3 2021	НАММЕ	R TYPE: Auto		
-			High \	water)		2017								
T V	_	abilize				EQU	PMENT:	L	OGG	ED BY:	DRULING	METHOD: 3.25 H	SA.	

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Bohler E	nginee	ring					01:31153			06		2 of 2	LCC
PROJEC							DRILLER/COM	NTRAC	TOR	:			-03
Warrent			er .				All American	Geote	ch, In	IC.			
SITE LO												LOSS OF CIRCULATIO	N (2007)
Lee High	way ar	ıd Alaci	well R	oad. W	arrenton, Virginia 20186							2007 21 21102	
NORTH					STING:	STATION:			SUF 482		EVATION:	BOTTOM OF CASING	
	SER.	ш	<u>S</u>	7					Si	E		Plastic Limk Water Conti	ent Liquid Limit
БЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRAT	
DEP	AMPLE	SAMP	AMPLE	RECO					WATE	ELEV)18	RQD REC CALIBRATED PENETRO	NASTED TOWER
	Ŋ		ςÿ		WEATHERED ROCK, lig	the brown o	and gray		1			FINES CONTENT! %	IMEE IN TORY ST
					moist, very dense	gnt brown a	mu gray,		1	=			
3	5-9	-ss	_1	-1-	AUGER REFUS	AL AT 33.6 F	Ŧ		4	3	50/1" (50/1")		⊗ _{son} .
35-					ACCENTAL CO.	• 11• 3333,55353	93			447	(30/1)		
										1			
-										3			
- -										-			
40-										442			
-										=			
										=			
										437			
45 -										-			
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									П]			
50 -										432-			
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										1			
-										-			
55 -										427 -			
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60-										422-			
00-	-									=			
												TRANSITION ALM DE COA	DUAL
∇	T WL (Fir				INES REPRESENT THE APPROX		ING STARTED			TYPES. IN 2021		DEPTH: 20.0	DUAL
	WL (Co				Dry	BOR	ING	_	_	2021	-	ER TYPE: Auto	
A	WL (Se	asonal	Hìgh '	Water')		IPMENT:			ED BY:		IG METHOD: 3.25 HSA	
X	WL (St	abilized	d)		CE	ATV	CAL BORE	HOI	FI	og	PRILLIN	NETTOD, 2020 HOR	
1					GE	OI COUNT	CWF DOVE						

CLIENT								ROJECT NO	D.:	- 1	BORING I	NO.:	SHEET: 1 of 1		-0-
Bohler		_						1:31153 RILLER/CC	MITDA	_	-07		1011		FLC
PROJE(III America:							
SITE LO			e.					ui Aineneai	i dedi	CC11, 1					2000
			kwell f	Road. V	Varrenton, Virginia 20186									LOSS OF CIRCULATION	y >100.5
NORTH					ASTING:	STATIO	ON:			5U 49:		LEVATION:		BOTTOM OF CASING	-
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION	OF MATER	RIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	RE	tic Limit Water Conte X STANDARD PENETRATION CALLITY DESIGNATION ROD REC	ON BLOWS/FT
	SA	5	SAI	~						>			С	CALIBRATED PENETRON	METER TON/SF
					Topsoil Thickness [6"				ΪЩΪ		-				
	S-1	SS	18	9	(ML) SANDY SILT, red loose	dish bro	own, m	ioist,			-	3-3-4 (7)	⊗,		
	D25	BG1	-60-								1			19 X 3	Z me so
-	D35-	SS	18	12					ШШ		- 5	3-4-5 (9)	2.6	18,4	<u>+2</u> [86,5%
5-	5-2	35	10		(201) 212 21 21 11 1 1 1				ЩЩ		487	(3)	1	10,4	
2	S-3	SS	18	18	(CH) FAT CLAY, light b moist, very stiff	rown ar	nd gray	/,			3	7-7-9 (16)	\ ⊗ ₁₆	28 ×31.6	[86.09
3									III		-	(20)	2.00	(3000)	180000
ি	├	-			(ML) SANDY SILT, bro	wn and	gray, r	noist,				4-7-9			
	S-4	55	18	16	medium dense				Ш		-	(16)	&u _€		
10-											482-				
1 2	1								ЩЩ		1				
22	-				WEATHERED ROCK, I	ight bro	wn to	gray,			12				
1 5	5-5	SS	5	5	moist, very dense						-	50/5"			\$50.5
	1			1							3	(50/5")			1885
15-	1										477				
1 8	1										-				
-	1										-				
	1								444		1				
	5-6	-55	4	4								50/4" (50/4")			⊗ _{50/4} .
00	-										472	(30/4-)			
20-	1				AUGER REFU	SAL AT 2	20.0 FT				4/2				
	1										1				
-	-										-				
,-	7														
	1							1							
0.5	1			l							467				
25-	7										407		1		
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00	1			ľ							462				
30-											-				
	7	HE STR	ATIFICA	ATION L	INES REPRESENT THE APPRO	XIMATE BO	OUNDAR	RY LINES BE	TWEE	I SOIL	TYPES. II	N-SITU THE TE	RANSITIO	N MAY BE GRAD	UAL
-	WL (Fi			red)	Dry			S STARTED): S	ep 29	9 2021	CAVE IN	DEPTH:	13.5	
_	WL (Co	_		Matar	Dry		BORING COMPL		5	iep 29	9 2021	HAMME	R TYPE:	Auto	
-	WL (Se			vvaler)	1		EQUIPN ATV		L	.ogg	ED BY:	DRILLING	METH	DD: 3.25 HSA	
					GE			AL BORE	HOI	LE L	OG				
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PROJEC							DRILLER/CC							
Warrent SITE LOC			er				All Alliertes	Ocot	, .			1055	OF CIRCULATION	>1002>
			kwell R	load, W	/arrenton, Virginia 20186						- U-1	1055	Gr GREDEATION	
NORTH					STING:	STATION:			SU 48		LEVATION:	вот	TOM OF CASING	
	ec.		9						Ŋ	_		Plastic Lii X—	mit Water Conten	st Liquid Limit
F	SAMPLE NUMBER	Ŋ.	SAMPLE DIST. (IN)	RECOVERY (IN)					WATER LEVELS	ELEVATION (FT)	.9/9		NDARD PENETRATIO	ON BLOWS/FT
БЕРТН (FT)	. EN	SAMPLE TYPE	EDIS	VER	DESCRIPTION O	OF MATERIAL			ERL	ATIO	BLOW5/6"	ROCK C	KLALITY DESIGNATIO	N & RECOVERY
DEP	MP	SAM	MPL	EG					WAT	E.E.	18	— R	EC	
	δ, I		S.										LIBRATED PENETRON	TETER TON/SF
					Topsoil Thickness [6"]			m		1				
1	5-1	SS	18	18	(ML) SANDY SILT, red	dish brown	, moist,	ШП		3	3-3-3 (6)	⊗,	29,0	
-	3-1		10	10	loose			ШШ		-	\- 1			
-]	2-3-3			
-	S -2	SS	18	18						482-	(6)	95 ₆		
5-					(ML) SILT, light brown		moist,			702				
1 2	S-3	SS	18	18	loose to medium den	ise					3-4-5 (9)	\$,		
-	5-5		10	10				Ш		1	1-7	1 1		
7				-						-	4-5-6			_
	S-4	55	18	18				Ш		477-	(11)	⊗,,		46.1
10 -										111		1.1		
7												1 1		
-										1				
7				_]	6-7-9			
-	S-5	SS	18	18						472-	(16)	8,16		
15-										412				
1				ŀ										
-	1									-		1 1		
-								Ш			7-8-10			
	5-6	SS	18	18						407	(18)	⊗,8	25.3	
20-	_				1					467 -		1 1		
1														
-	1								1	7		1		
-	_				1			HH		1	8-11-12	1		
-	S-7	SS	18	18				ШШ			(23)	® ₂₃		
25 -	_				1			ШШ		462				
ंड	1									-				
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1	S-8	SS	18	18							9-10-13 (23)	Ø53		
30-	_	-	+	-						457			\	
			-		CONTINUED	N NEXT P	AGE	Him	1					
	Т	HE STR	ATIFIC	ATION L	INES REPRESENT THE APPRO	XIMATE BOUN	IDARY LINES B	TWEE	N SO	IL TYPES. I	N-SITU THE T	RANSITION N	MAY BE GRAD	UAL
∇ \	WL (Fir	st Enc	ounte	red)	Dry	ВО	RING STARTE	D: (Oct 0	2 2021	CAVE IN	DEPTH:	53.0	
	WL (Co		_		Dry		RING MPLETED:		Oct 0	2 2021	намм	ER TYPE:	Auto	
-	WL (Se			Water)	EQI	JIPMENT:		LOG	GED BY:	DRILLIN	G METHOD	; 3.25 HSA	
图 /	WL (Sta	bilize	d)			ATV	ICAL BOR	EHA	151	06				
					G	CUITCHN	ICAL BUK	ENU	LE I	LUG				

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PROJEC							DRILLER/CONTI						
Warren			er				All American Ge	otech,	Inc.				
SITE LO			kwell F	load. V	Varrenton, Virginia 20186						LOS	OF CIRCULATION	<u>>1007</u> >
NORTH		IQ DIOC	, KWEII I		ASTING:	STATION:		SL 48		LEVATION:	во	ITOM OF CASING	-
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	OF MATERIAL		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	X— ⊗ 57/ ROCK C	INDARD PENETRATIC QUALITY DESIGNATION	N BLOWS/FT
۵	SAM	SA	SAM	RE				*	13		0 4	EC Librated Penetrom Content) %	ETER TON/SF
-					(ML) SILT, light brown loose to medium den		moist,				1,515		
-					WEATHERED ROCK, b		ay, moist,	ē.	1 3				
	5-9	SS	18	18	very dense				-	11-24-37 (61)		Ø€1	
35-									452-			/	
3													
1													
	S-10	SS	17	17					-	14-23-50/5" (73/11")			872111°
40-									447 -				
]				
-									-				
	S-11	SS	5	5						50/5" (50/5")			⊗ _{sors} .
45-									442-				
									-				
	S-12	_ss_	_3_	-3-					-	50/3" (50/3")			Ø _{50/3} -
50-									437-	(==,=,			
-													
]								1				
-	S-13	-	4	4						50/4"			Øsou-
-	3-13	33	-	1	1				400	(50/4")			
55-	1								432-				
]												
	1								1				
35	S-14	SS	3-	3	1				-	50/3" (50/3")			Ø _{50/3} -
60-]							1	427 -	1			
,-								É	1 5	1			
					CONTINUED O	N NEXT P	AGE		I Dest	N CITUTUE	DANICITION	AAV DE CDADI	141
\ \tau \	T WL (Fir				INES REPRESENT THE APPROX								DAL
	WL (FIF			eu/	Dry		RING STARTED:	Uct 0	2 2021	LAVE IN	DEPTH:	53.0	
_	WL (Co	_	_	Water			RING MPLETED:	Oct D	2 2021	HAMME	ER TYPE:	Auto	
_	WL (Sta		_			EQU	JIPMENT:	LOGO	SED BY:	DRILLIN	G METHOD	3.25 HSA	
	(366		-1		GE		ICAL BOREH	OLE L	.OG				

CLIENT	:						PROJECT NO.:		BORING N	10.:	SHEET:		<u></u>
Bohler E							01:31153		J-08		3 of 3		6
PROJEC							DRILLER/CONTR						
Warren			r				All American Geo	otecn, i	nc.				
SITE LO			avell B	aad 18	Jarrenton, Virginia 20186						LOSS OF CIRC	CULATION	<u>)1007</u> >
NORTH		IU DIACI	MEILN		STING:	STATION:		SU 48		LEVATION:	воптом оғ	F CASING	-
	8		<u> 2</u>	9				S	E-		Plastic Limit Wat	ler Content Liquid —●———△	
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	OF MATERIAL		WATER LEVELS	ELEVATION (FT)	BLOWS/6"	ROCK QUALITY D RQD REC	PENETRATION BLOWS DESIGNATION & RECO	WERY
	3		25		WEATHERED BOOK by		u maist				CALIBRATED [FINES CONTENT	PENETROMETER TOI	N/SF
-	S-15			-5	WEATHERED ROCK, be very dense	LOMUISU BLA	y, moist,			50/5"			⊗ _{30/5} -
65 -	2-12	_33_	_5_	-3-					422	(50/5")			
70 -	S-16	-55	-2	-2-					417-	50/2" (50/2")			⊗ _{50/2} -
75-	S-17	SS	4	4					412-	50/4" (50/4")			⊗ _{50/4} -
80-	S-18	SS	-5	5	END OF BORI	NG AT 80.0 F	-T		- 407	50/5" (50/5")	ė		⊗ _{50/5} -
85 -									402-				
90 -									397-				
	1			-									
	Т	HE STR	ATIFICA	TION L	INES REPRESENT THE APPROX	IMATE BOUND	ARY LINES BETWE	EN SO	IL TYPES, I	N-SITU THE T	RANSITION MAY BE	GRADUAL	
又	WL (Fir:				Dry		ING STARTED:		2 2021		DEPTH: 53.0		
	WL (Co		_		Dry	BORI	ING IPLETED:	Oct 0	2 2021	НАММІ	ER TYPE: Auto	,	
-	WL (Sea	_		Water))		IPMENT:	LOGG	GED BY:	DRILLIN	G METHOD: 3.25	HSA	
×	AAL (OLE	Juize	-1		GF		CAL BOREHO	OLE I	OG				

CLIENT							PROJEC		- 11	ORING	NO.:	SHEET:		La
PROJEC							01:3115	R/CONTR		I-09		1 of 2		EC.C
Warren			er				100000000000000000000000000000000000000	erican Geo						
SITE LO								111111111111111111111111111111111111111				IOSS	OF CIRCULATION)iea>
		nd Blac	kwell R		Varrenton, Virglnia 20186				la	251.05	TI ELIA TIONE			
NORTH	IING:			EA	STING:	STATION:	i		47		LEVATION:	вот	TOM OF CASING	>
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION (of Materia	L		WATER LEVELS	ELEVATION (FT)	#P/SMO18	X— ⊗ STA ROCK Q	MIL Water Conten	ON BLOWS/FT
DEP	SAMPLI	SAME	SAMPL	RECO					WATE	ELEVA	018	O cas	QD EC IBRATED PENETRON CONTENT! %	ETER TON/SF
					Topsoil Thickness [6"]					-				
-	S-1	SS	18	9	(ML) SANDY SILT, redo loose	dish brow	n, moist,			-	2-2-3 (5)	8,		
-	220	2001	CO		(CL) LEAN CLAY, reddi	sh brown	moist		#	- 2		L	28 ×	49
1 1	D35- 189	BG1 SS	60 18	13	firm	311 0104411,	, 1110130,	V//		-	3-4-5 (9)	\$5.2 ⊗ ₉	34.8	49 (76.4%)
5-	S-2		10		(ML) SANDY SILT, red	dish brow	n, moist,			473-				
3	S-3	SS	18	14	loose					- 2	4-4-4 (B)	(See		
-					(ML) SILT, light brown	, moist, d	ense to			2		/		
	5-4	SS	18	18	very dense					2	13-19-26 (45)		Ø45 30.8	[72.7%]
10-										468-				
2										1				
4			40	47						_	11-15-27			
15-	S-5	SS	18	17						463	(42)		- A52	
										-			/	\
-											FO/4II			/
	3-6	-22	4	_4_						-	50/4" (50/4")			⊗ _{50/4} .
20-										458				
-									i				/	/
	S-7	SS	18	18							14-15-17 (32)	8	S2	
25 -										453-	(42,		/	
													1	\
:-	1				WEATHERED ROCK, li and black, moist, ver		brown,			1				
	S-8	SS	5	_5_	and black, moist, ver	y dense				1	50/5" (50/5")			Ø50/5
30-										448	1			
					CONTINUED O				L				AV DE CESE:	(A)
7 1		HE STR.			INES REPRESENT THE APPROX						CAVE IN		AY BE GRADU	JAL
_		mpleti			Dry		RING STAF			2021	-			
		asonal		Vater)		co	MPLETED			2021	HAMME	K TYPE:	Auto	
-	_	abilized				EQ	UIPMENT:		LOGG	ED BY:	DRILLING	METHOD:	3.25 HSA	
					GE	OTECHN		DREHO	LE L	OG				

CLIENT:							PROJECT NO	D.:		ORING !	NO.:	SHEET: 2 of 2	50	
Bohler E							01:31153 DRILLER/CO	NITDA	_	-09		2012	- EU	6
PROJEC							All America							2
Warren			er				All Americal	n Geot	ecn, I	nt.				
SITE LO	CATION	211										LOSS OF CIRCULAT	ON NO	002
NORTH		id Blac	kwell R		Varrenton, Virginia 20186 STING:	STATION:			SU 478		LEVATION:	BOTTOM OF CASI	NG 🔳	•
	8		î									Plastic Limit Waler Con	ntent Liquid Limit	
DEРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETR ROCK QUALITY DESIGNATION		
⊼	SAME	SAI	SAMI	REC					*	ĒLI		CALIBRATED PENET	ROMETER TON/SF	
					WEATHERED ROCK, lig		own,							
1 3					and black, moist, very	/ uense				1				
-	S-9	SS	14	14						-	17-26-50/2" (76/B")		8	76/8"
35 -					AUGER REFUS	AL AT 34.8 F	т			443				
-										-				
3.00							1							
	S-10	SS	-0-	-0-	_					-	50/0" (50/0")		8	son.
40 -										438				
8										-				
-]									-				
-										1	}			
45 -										433-				
45											1			
1	1									1	}			
A.	1									8				
20-	-									428-	3			
50										420	1	1		
]										1			
										1 1	3			
-	1									-	1			
55 -]									423	4			
1											3			
											1			
										3	1			
60-										418	-			
	-										1			
-											1	TO A MICHTION A LAW DE CO	ADUAL	
					LINES REPRESENT THE APPRO								ADUAL	_
-	WL (Fir	_		red)	Dry		ING STARTE			9 2021		N DEPTH: 27.0		
_	WL (Se	_		Water		CON	APLETED:			9 2021	_	ER TYPE: Auto		
	WL (St	_				ATV	IPMENT:			GED BY:	DRILLIN	NG METHOD: 3.25 HS/	\	
					GI	OTECHNI	CAL BOR	EHO	LE I	.OG				

CLIENT:		5.0 4 1.7127						JECT NO. 1153	:	BORING B-10	NO.:	SHEET: 1 of 2		-00
PROJEC								LER/CON	NTRAC			10/1		- EUG
Warrent			er				100	merican (
SITE LO												LO	SS OF CIRCULATI	ION NO
NORTH		nd Blac	kwell F		Varrenton, Virginia 20186 STING:	STATION	N:		- 1	SURFACE	ELEVATION:	В	OTTOM OF CASII	NG 💌
	3ER	ш	(NE	7					T.				Limit Water Cor	ntent Liquid Limit
DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION (OF MATERIA	AL			WALEN LEVELS	BLOWS/6"	0 0	RQD REC	RATION BLOWS/FT ATION & RECOVERY ROMETER TON/SF
					Topsoil Thickness [6"]			N.		#	-	T	3 LUNIENII R	
1	5-1	SS	18	12	(SM) SILTY SAND, red very loose to loose		wn, moi	st,			1-2-2	⊗.	21.5	
-	S-2	SS	18	18						3	2-2-3	80.	26.0	
5-	3-2	33	10	10	(ML) SANDY SILT WIT					464	- (5) -	1	26.0	
	S-3	SS	18	18	quartz fragments, ligi loose	nt brown	ı, moist,				5-4-5 (9)	8	18.2	- 40
	S-4	SS	5	5_	WEATHERED ROCK, li			1			50/5" (50/5")			⊗ _{sors} .
10					grayish brown, moist	, very de	:1156			459				
	S-5	SS	5_	_5_						3 8	50/5" (50/5")			⊗ ₅₀₅ .
15										454				
4	-S-6-	SS	3-	_3=						3	50/3" (50/3")			⊗ _{sors} .
20 -										449				
1	5-7	SS	0	0	SCHIST, [REC=87%,RC Weathered, Very Ha					-	50/0" (50/0")			⊗ _{sore} .
25-	S-8	RC	60	52	, , , , , , , , , , , , , , , , , , , ,					444		17 🇖		\$87
-					SCHIST, [REC=100%,R Weathered, Very Ha						-	1		<u> </u>
30-	E.0	RC	60	60				***		439	-	1		
					CONTINUED O			IMES DET	WEEN	OII TYPES	IN-SITH THE T	HANSITION	MAY RE GP/	ADUAL
\(\nabla \)			ounter		INES REPRESENT THE APPROX							DEPTH:	19.0	TOURL
	·	mplet		cuj	Dry		ORING S	IARTED:	Oct	05 2021	CAVEIN	ישברות:	13.0	
			High \	Water)		c	OMPLET		_	05 2021 GGED BY:	HAMM	ER TYPE:	Auto	
▼ \	VL (Sta	bilize	d)			165	QUIPMEI	NI;	100	GGED BA:	DRILLIN	G METHO	D: 3.25 HSA	
					GE	OTECH		BORE	HOLE	LOG				

CLIENT:							PROJECT NO	.:	BORING I	NO.:	SHEET:		
Bohler E	nginee	ring					01:31153	UTD A CT	B-10		2 of 2		6
PROJEC [*]							DRILLER/COI All American						
Warrent			er				All American	Geoteci	i, inc.				
SITE LOC	ATION	l: sd Black	nuell P	A hea	Jarrenton, Virginia 20186						LOSS OF CI	RCULATION)100x)
NORTH		IO DIECI	AACII II		STING:	STATION:			SURFACE E	LEVATION:	воттом	of Casing	-
	Ä	ш	Ê	7				2	E		Plastic Limit W	ater Content Liqu	ıld Limlt ∆
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	OF MATERIAL		MATER LEVELS	ELEVATION (FT)	BLOWS/6"	ROCK QUALITY	PENETRATION BLO DESIGNATION & RE	
٥	SAM	85	SAN	RE				3			— REC CALIBRATE (FINES CONTEN	D PENETADMETER 1	ron/sf
-					SCHIST, [REC=100%,RO Weathered, Very Har	QD=22%], I d, Grayish	Highly Brown		1		22		100
-					AUGER REFUS	AL AT 33 5 F	T		+ 3				!
-					AUGER REFUS	AL A1 33.5 F			40.4				
35 -									434 -				
-													
-									-				
4									1				
1 4									-				
40-									429-				
1 1									1				
-									10-				
							1						
									-				
45									424				
45 -									1				
=									1				
1 3													
=									1 3		1		
									140				
50 -									419				
1 2									-				
-									1	1			
									1 7	1			
=									<u> </u>	1			
55 -									414-	1			
									1	1			
1 2										1			
										1			
1 5							1			1			
-									409-	1			
60 -			ļ.						409	1			
7		1											
-													
	1	HE STR	ATIFICA	TION L	INES REPRESENT THE APPROX	(IMATE BOUNI	DARY LINES BET	TWEEN S	OIL TYPES.			BE GRADUAL	
_	_	st Enc		ed)	Dry		ING STARTED	: Oc	05 2021	CAVE IN	I DEPTH: 19.	0	
_		mplet asonal		Water	Dry	-	APLETED:		05 2021	НАММ	ER TYPE: Au	to	
_	_				<i>'</i>		IIPMENT:	LO	GGED BY:	DRILLIN	IG METHOD: 3.2	5 HSA	
A A	AF (20	abilize	41		GF	OTECHNI	CAL BORE	HOLE	LOG				

LIENT:							PROJECT N	10.:	- 1	ORING N	10.:	SHEET:	La
	Engine						01:31153 DRILLER/C	ONTRA		-11		1 of 1	
	T NAN	∕IE: ta Ce nt	er				All America						
	CATIO											LOSS OF CIRCULATION)inc
			kwell R	load, V	Varrenton, Virginia 20186							FORS OF CIRCULATION	2100
IORTH	IING:			EA	STING:	STATION:			SU 46		LEVATION:	BOTTOM OF CASING	
	BER	ш	(NE)	Ŷ					SI	Æ		Plastic Limit Water Content	Liquid Limit
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION	OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION ROCK QUALITY DESIGNATION ROC ROC ROC ROC REC	
	δ,		\$		- 1701			INCOME.				CALIBRATED PENETROMI FUNES CONTENT) %	ETER TON/SF
	S-1	SS	18	8	Topsoil Thickness [6" (ML) SILT, brownish g	ray, moist,	loose to			=	3-3-4	 ⊗, , <u>24</u> ×—-	45 [81.
-					dense					-	(7)	27×	41
5-	D35- 194 S-2	BG1 SS	60 18	12						463	5-6-9 (15)	21	<u>∆</u> [82
	S-3	SS	18	16						1	7-10-12 (22)	•	
10-	5-4	SS	18	18						458-	11-12-16 (2B)	S28	
15-	S-5	SS	18	18						453-	10-15-19 (34)		
-	S-6_	SS	5	5	WEATHERED ROCK, g	gray, moist,	very			440	50/5" (50/5")		8.
20-										448			
25	S-7	SS	3	3	END OF BOR	ING AT 25.0	FT			443	50/3" (50/3")		&,
30-										438			
					INES REPRESENT THE APPROX		DARY LINES B	ETWEE	I SOIL	L TYPES. IN			AL
Δ /	WL (Fir	st Enc	ounter	ed)	Dry	BOF	RING STARTE	D: 5	iep 29	9 2021	CAVE IN	DEPTH: 12.7	
_	_	mplet	ion) I High \	Mater	Dry		RING MPLETED:	S	Sep 29	9 2021	НАММЕ	R TYPE: Auto	
_		abilize				ATV				ED BY:	DRILLIN	G METHOD: 3.25 HSA	
					GE		ICAL BOR	EHOI	LE L	OG			

CLIENT:							PROJECT NO).:	- 1	ORING N	10.:	SHEET:	LO
Bohler E							01:31153	NITOA	_	12		1 of 1	
PROJEC							DRILLER/CO All American						
Narrent			er				All American	Geote	en, n	II.			Vine)
ITE LOC			kwell R	load, W	/arrenton, Virginia 20186							LOSS OF CIRCULATION	>100>
NORTH					STING:	STATION:			SU1		LEVATION:	BOTTOM OF CASING	-
	BER	μ	(NE)	î					EIS	Ē	ŧ.	Plastic Limit Water Content	Δ
рертн (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF	MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	S STANDARD PENETRATION ROCK QUALITY DESIGNATION RQD REC	E RECOVERY
	δ		55		Tanadi Thiskness [6"]							CALIBRATED PENETROME [FINES CONTENT] %	TER TON/SF
		-	40	40	Topsoil Thickness [6"] (SM) SILTY SAND, redd	ish brown,	moist,			4	3-4-5	⊗ 26.1	
i (=	5-1	SS	18	18	loose						(9)	20.1	
5	S-2	SS	18	18	(ML) SANDY SILT, reddi medium dense					469	6-7-11 (18)	€18.7	
5	S-3	SS	18	18	(ML) SILT, light brown, dense	moist, me	díum				10-13-12 (25)	⊗ ₂₅	
										20104	10-11-15	® ₂₆ 25.1	
10 -	S-4	SS	18	18						464	(26)	25.1	
-													
15 -	S-5	SS	18	18						459-	11-8-11 (19)	8.2	
-					WEATHERED ROCK, lig	ht brown	and gray,						\
20 -	S-6	SS	5	5	moist, very derise					454	50/5" (50/5")		8 50/5
:= :=										(-			
(a)	S-7	SS	5	5_	END OF BORIN	NG AT 23.9	FT				50/5" (50/5")		⊗ _{sors}
25 -					-					449-			
÷													
30 -										444-			
		+											
	7	HE STE	RATIFIC	ATION L	INES REPRESENT THE APPROXI	MATE BOUN	DARY LINES BE	TWEE	N SOI	L TYPES. I	N-SITU THE T	FRANSITION MAY BE GRADU	AL
∇	WL (Fi				Dry		RING STARTE			2 2021		N DEPTH: 14.0	
	WL (Co	_	_		Dry		RING MPLETED:	(Oct O	2 2021	намм	ER TYPE: Auto	
_	WL (Se WL (St			Water	")		JIPMENT:		LOGG	ED BY:	DRILLIN	IG METHOD: 3.25 HSA	
	- (34				GF		CAL BOR	EHO	LEL	OG			

CLIENT								OJECT NO	O.:	- 1	BORING	NO.:	SHEET:	
PROJEC								L: 31153 RILLER/CO	NITD	_	3-13 D.		1 of 1	6
Warren			er					l America:						
SITE LO													LOSS OF CIRCULATION)(00)
NORTH		nd Blad	kwell I		Varrenton, Virginia 20186 ASTING:	STATIO	ON:					LEVATION:	BOTTOM OF CASING	-
	ж ж		2							49			Plastic Limit Water Content Liquid	Limit
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION	of Mater	RIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS ROCK QUALITY DESIGNATION & RECO ROD REC CALIBRATED PENETROMETER TOR	VERY
-				_	Topsoil Thickness [4"]				Y				(FINES CONTENT) %	
-	S-1	SS	18	10	(ML) SILT WITH SAND moist, loose to medic	, reddis		n,			-	3-3-5 (8)	⊗ ₈ adr.e	
1									HIII		-			
5-	Ş-2	SS	18	12							485-	2-3-6 (9)	18.4 ²⁸ × 45	Ā [77.6%]
-	S-3	SS	18	18							-	7-8-11 (19)	& ₁₀	
-	5-4	SS	4	4	(SM) SILTY SAND WIT	H GRAV	/EL, gra	y and	Ш		1	50/4"		850W-
10-					dark brown, moist, m very dense	edium (dense t	o			480-	(50/4")		/
15-	S-5	SS	18	18							475-	12-13-15 (28)	Ø ₂₈	
20-	S-6	SS	18	18							470-	10-12-17 (29)	829	
	-S-7	-ss-	-2-	2	WEATHERED ROCK, d moist, very dense	ark brov	wnish g					50/2"		Ø _{50/2} .
25		00,552	(GIV								465-	(50/2")		
-	S-8	SS	-0	0	AUGER REFUS	AL AT 2	7.0 FT					50/0" (50/0")		⊗ _{sero} .
30											460			
		الد د تت	ATIEICA	TION !	INES REPRESENT THE APPROX	IMATE DO	ים ארוואו ור	I INIES DE	T\A/E=&	ISON	TYDES II		RANSITION MAY BE GRADUAL	
□ v			ounter		Dry			STARTED			2021	CAVE IN		
	VL (Co				Dry		BORING			_				
ZV V	VL (Se	asonal	High \	Water)		C	COMPLE	TED:			2021 ED DV	HAMME	R TYPE: Auto	
▼ v	VL (Sta	bilized	i)			A	EQUIPM ATV			12440	ED BY:	DRILLING	METHOD: 3.25 HSA	
					GEO	OTECH	INICAI	BORE	HOL	E LO	OG			

Bohler Engineering PROJECT NAME: Warrenton Data Center SITE LOCATION: BELER/CONTRACTOR: All American Geotech, Inc. SURFACE ELEVATION: SO Plante Limit Weter Content Liquid Limit SO OCALIBRATION: SO REMONDE PRINTENDERIAN RECOVERY ROC GROUND REMONDERIAN REMONDERIAN RECOVERY ROC GROUND REMONDERIAN REMONDERIAN RECOVERY ROC GROUND REMONDERIAN R	CLIENT:							PROJECT N	0.:		ORING N	10.:	SHEET:		
All American Geolech, Inc.			ring					01:31153	ONITOA				1 of 1	EC	6
STEELOCK Completion Compl								F-7047							2
SOUTH NOTE SOU				er				All America	III GEDE	conj				U PTION	Kanil
SATION: SOURTACE SERVATION: SOURTACE S	Jac High	LATIOI hway ai	v: nd Blac	kwell F	Road, V	Varrenton, Virginia 20186							LOSS OF CIRC	DIATION	7.00.7
DESCRIPTION OF MATERIAL Section DESCRIPTION OF MATERIAL DESCRIPTION OF MATERIAL Section DESCRIPTION OF MATERIAL							STATION:			1		LEVATION:	воттом оғ	CASING	
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. III-SITU THE TRANSITION MAY BE GRADUAL THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. III-SITU THE TRANSITION MAY BE GRADUAL THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. III-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) TWU (Completion) TWU (Completion) Dry BORING STARTED: Sep 30 2021 HAMMER TYPE: Auto DRILLING METHOD: 3.25 HSA	(FT)	UMBER	TYPE	IST. (IN)	(IN)					LEVELS	(FT) NC	.9/5/	X———— STANDARD PI	ENETRATION BLOWS/FT	
S-1 SS 18 18	DEРТН	SAMPLEN	SAMPLE	SAMPLED	RECOVER	DESCRIPTION (OF MATERIAL			WATER	ELEVATION	BLOW	RQD REC CAUBRATED F	PENETROMETER TON/SF	
S-1 SS 18 18 18 18 18 18 1	-								m		1				
186 SS 18 18 SS 18 18		S-1	SS	18	18	, ,	ht brown,	moist,			-		⊗ _a		
S-2 S-3 S-5	2			200	10						3		\$5.5 27 >	49 30 30 5	(85.7% 186.3%
S-3 SS 18 18 18 10 16-12-19	5-	1000	33	18	10		wn, moist,	medium			495			3000	•
S-4 SS 18 18	3	S-3	ss	18	18	dense to dense					-		\$20	31.6	
WEATHERED ROCK, reddish brown and black, moist, very dense So,5" So,5" So,5" So,5" So,7" So,7"	-	S-4	55	18	18]		Sec.	30.4	
S.5 SS 5 S S S S S S S S S S S S S S S S	10-	3,	55	10							490	,- ,-			
S.S. S.S. S.	1							wn and			1				
25 END OF BORING AT 18.7 FT 485 Sol2" 475 Sol2" 470 AR AND AR AND ARREST SEPTION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) WL (First Encountered) WL (Completion) WL (Seasonal High Water) WL (Seasonal High Water) WL (Stabilized) ROUNGET DE Sep 30 2021 HAMMER TYPE: Auto COMPLETED: COMPLETED: Sep 30 2021 PRILLING METHOD: 3.25 HSA	. 3	5.5	55	5	-5	black, moist, very der	nse							1	835015
20 THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Pry BORING STARTED: Sep 30 2021 WL (Completion) Pry WL (Completion) Pry BORING Sep 30 2021 AMMER TYPE: Auto COMPLETED: COMPLETED: COMPLETED: COMPLETED: Pry WL (Stabilized) PRILLING METHOD: 3.25 HSA	- 5	-3-3-	3.3			1					405	(50/5")			
25 475 475 475 475 475 475 475 475 475 47	15-	1									400				
END OF BORING AT 18.7 FT 480 475 475 476 477 THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Pry BORING STARTED: Sep 30 2021 WL (Completion) Pry BORING Sep 30 2021 HAMMER TYPE: Auto COMPLETED: WL (Seasonal High Water) WL (Stabilized) PRILLING METHOD: 3.25 HSA						-					10				
25 30 475 THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Pry BORING STARTED: Sep 30 2021 CAVE IN DEPTH: 11.5 WL (Completion) Dry BORING COMPLETED: Sep 30 2021 HAMMER TYPE: Auto COMPLETED: COMPLETED: Sep 30 2021 WL (Seasonal High Water) WL (Stabilized) DRILLING METHOD: 3.25 HSA	=	S-6	ss	2	2	END OF BOR	ING AT 18.7	FT	76	4	- 2				⊗ _{50/2} -
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Dry BORING STARTED: Sep 30 2021 CAVE IN DEPTH: 11.5 WL (Completion) Pry BORING COMPLETED: Sep 30 2021 WL (Seasonal High Water) WL (Seasonal High Water) WL (Stabilized) DRILLING METHOD: 3.25 HSA	20-					THE PART OF THE PARTY OF THE PA					480				
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Dry BORING STARTED: Sep 30 2021 CAVE IN DEPTH: 11.5 WL (Completion) Pry BORING COMPLETED: Sep 30 2021 WL (Seasonal High Water) WL (Seasonal High Water) WL (Stabilized) DRILLING METHOD: 3.25 HSA											1				
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Dry BORING STARTED: Sep 30 2021 CAVE IN DEPTH: 11.5 WL (Completion) Dry BORING COMPLETED: COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA		-									-				
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Dry BORING STARTED: Sep 30 2021 CAVE IN DEPTH: 11.5 WL (Completion) Pry BORING COMPLETED: COMPLETED: EQUIPMENT: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	25	1									475-				
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Dry BORING STARTED: Sep 30 2021 CAVE IN DEPTH: 11.5 WL (Completion) Pry BORING COMPLETED: COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA											3				
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL WL (First Encountered) Dry BORING STARTED: Sep 30 2021 CAVE IN DEPTH: 11.5 WL (Completion) Pry BORING COMPLETED: COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	3										-				
WL (First Encountered) Dry BORING STARTED: Sep 30 2021 CAVE IN DEPTH: 11.5 WL (Completion) Dry BORING Sep 30 2021 HAMMER TYPE: Auto COMPLETED: QUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA	30										470-				
☑ WL (First Encountered) Dry BORING STARTED: Sep 30 2021 CAVE IN DEPTH: 11.5 ☑ WL (Completion) Dry BORING Sep 30 2021 HAMMER TYPE: Auto ☑ WL (Seasonal High Water) COMPLETED: EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA								ID ADVIABLES :	LTDAYET	N SO:	TOURES !	N CITILTIE	RANCITION MAY BE	GRADUAI	
WL (Seasonal High Water) COMPLETED: EQUIPMENT: WL (Stabilized) COMPLETED: Auto DRILLING METHOD: 3.25 HSA	立											5		Q.MDOAL	
WL (Seasonal High Water) EQUIPMENT: LOGGED BY: DRILLING METHOD: 3.25 HSA VL (Stabilized) DRILLING METHOD: 3.25 HSA	•	WL (C	mplet	ion)		Dry				Spn 2	n 2021	ММАН	ER TYPE: Auto		
▼ WL (Stabilized)	_	_			Water	•)	EQ	UIPMENT:							
CECVIEC MAIL AT MITTER IT III	V	WL (St	abilize	d)					EHO	IF	ne				

CLIENT								ROJECT NO	0.:	- 1	ORING	NO.:	SHEET			
Bohler								1:31153	AITOA		-15		1 of 1		- C(.6
PROJE(or				100	RILLER/CO								
SITE LO			eı					III PAIICIIGAII	GEOL	cen, .	114,					
			kwell l	Road, V	Varrenton, Virginia 20186									LOSS OF CIRCULATIO	N	21003
NORTH					ASTING:	STATION	۱:			SU 497		ELEVATION:		BOTTOM OF CASING	5	-
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION	OF MATERIA	AL			WATER LEVELS	ELEVATION (FT)	BLOW5/6"	⊗ Ra	STANDARD PENETRAL STANDARD PENETRAL CK QUALITY DESIGNATION RQD REC CAUBRATED PENETRO	TON BLOWS/6	-T ERY
					Topsoil Thickness [4"]			B	29		-		JF1	NES CONTENT) %		
-	5-1	SS	18	12	(CL) LEAN CLAY WITH brown, moist, stiff		rayisl	h			-	3-4-6 (10)	Ø10	26 <u>~</u> 25.5	44	[76.5%]
- 2	D35-	BG1	60					V	1//					²¹ ×	45	rna on/1
-	187	SS	18	17				1				4-4-7 (11)	\$6 &	115,777	- 0.75	[81.6%]
5-	5-2				(ML) SANDY SILT WIT brown and gray, mois			- 11			492-	23-24-29				
	S-3	SS	18	18								(53)	10.8	86	\	
2	5-4	SS	15	14	WEATHERED ROCK, g gray, moist, very dens		own	to				15-34-50/3"			/	Ø8479-
10-	-	33	13	14	gray, moist, very den	se .					487	(84/9")				
200											-					
	S-5	SS	=3=	3							3	50/3" (50/3")				Ø _{50/3} .
15-	1										482					
0.00	5-6	-55-	-1-	1	AUGER REFUS	SAL AT 16.	.1 FT		urn		2	50/1" (50/1")				⊗ _{sqn} .
											- 5					
20-											477 -					
9											-					
25-											472-					
30-											467-					
					INES REPRESENT THE APPROX	IMATE BOL	UNDAF	RY LINES BET	WEEN	SOIL	TYPES. I	N-SITU THE T	RANSITION	MAY BE GRAD	UAL	
	_	st Enco		ed)	Dry	BC	ORING	5 STARTED	: S	ep 30	2021	CAVE IN	DEPTH:	10.3		
		mpleti			Dry		ORING	ETED:	5	ер 30	2021	НАММЕ	R TYPE:	Auto		
		asonal abilized		vvater)		-	QUIPN	MENT:	L	OGG	ED BY:	DRILLIN	S METHO	D: 3.25 HSA		
	- ,- •				GE			L BORE	HOL	E L	OG					

CLIENT:							PROJECT N 01:31153	10.:	110	ORING 1 1 6	10.:	1 of 1		-0-
PROJEC			_				DRILLER/C	ONTRA				2011		LUC?
Warren			er				Ali America							
SITE LO												LOS	S OF CIRCULATION	\(\square\)
		nd Blac	kwell 1		Warrenton, Virginia 20186	-			Laur	NEA 05 5	LEVATION.			
NORTH	IING:			E	ASTING:	STATION:			475		LEVATION:	ВС	TTOM OF CASING	
	BER	Ä	(N)	Î					รีรี	E		X-		∆
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION	OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	ROCK F	ANDARD PENETRATICO QUALITY DESIGNATION REC RUBRATED PENETRON CONTENTS **	N & RECOVERY
				-	Topsoil Thickness [6"	1				-		pikes	COMPLATIA	
3				-	(SM) SILTY SAND, bro		loose			1	3-5-5		_	
2	S-1	SS	18	18						3	(10)	⊗,,,	24.5	
5-	5-2	SS	18	18	(ML) SANDY SILT, ligh moist, medium dens		d gray,			470-	5-4-7 (11)	⊗,,		
	S-3	SS	18	18						1	6-6-8 (14)	⊗ 14	35.1	[54.6%]
											5-7-11	⊗ 16		
10-	S-4	SS	18	18	-					465	(18)	are		
-										1	10-13-17			
15-	S-5	SS	18	14	_					460	(30)	8	25.8	
					WEATHERED ROCK, I	ight brown,	moist,			-				
	S-6	SS	4	4	very delise					į	50/4" (50/4")			⊗ _{50/4} -
20-										455				
25-	S-7	SS	5	5.	END OF BOR	RING AT 24.0	FT			450-	50/5" (50/ 5 ")			⊗ _{sors} .
20														
30 -										445-				
												DANGERO	AAV DE COADI	IAI
					LINES REPRESENT THE APPRO	-					processors.			JAL
	WL (Fir WL (Co	_		red)	Dry		ING STARTE		Oct 02		CAVE IN		14.7	
	WL (Se			Water		CON	IPMENT:		Oct 02	2021 ED BY:	Carlotta and	R TYPE:	Auto	
V	WL (Sta	abilize	d)			ATV					DRILLIN	G METHOD): 3.25 HSA	
					GI	EOTECHNI	CAL BOR	REHO	LE LO	OG				

CLIENT: Bohler Eng	gineerin	g					PROJECT NO.: 01:31153	- 1	BORING B-17	NO.:	SHEET: 1 of 1	-0
PROJECT							DRILLER/CONT					-6
Warrento		enter					All American Ge	otech,	Inc.			
ITE LOCA		Blacky	veli R	oad, W	/arrenton, Virginia 2018	6					LOSS OF CIRCULATION	<u>)101</u>
NORTHIN					STING:	STATION:		11	URFACE E	ELEVATION	BOTTOM OF CASING	=
ОЕРТН (FT)	SAMPLE NUMBER	SAINIPLE LYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTI	ON OF MATERIAL		WATER LEVELS	ELEVATION (FT)	.9/5MOTIB	Plastic Limit Water Conter X STANDARD PENETRATIO ROCK QUALITY DESIGNATIO RQD REC CAUBRATED PENETRON FINIS CONTENT! %	ON BLOWS/FT
1 :	S-1 S	s :	18	20	Topsoil Thickness (SM) SILTY SAND, loose		ı, moist,		-	4-4-4 (8)	№ 13.7	
7	S-2 5	s :	18	18				1	407	3-4-4 (8)	⊗ _a	
5	S-3 S	is :	18	18	(ML) SANDY SILT, very loose	brown and gra	y, moist,		487	1-2-2 (4)	⊗ ₁ 36	0
10-	S-4 S	is	5	5	WEATHERED ROC dense	K, dark gray, m	oist, very		482-	50/5" (50/5")		8,
15-	S-5 3	s	3	3	END OF B	ORING AT 13.8	FT		477-	50/3" (50/3")		⊗,
20-									472			
25-									467			
30-									462			
	THE	CTDAT	IEICAT	ION !!	NES REDRESENT THE ADD	BOXINATE BOLIN	DARY LINES BETWEE	EN SO	II TVPES I	N-SITH THE T	RANSITION MAY BE GRADU	JAL
V 14/1	L (First E									CAVE IN		16
	- Villar E			.4)			ING STARTED:	oct 0	2021	CAVE IN	DEFIN. 7.0	
	100						INC			1		
▼ WL			_	Vater)		con	MPLETED:		02 2021 GED BY:	HAMME	R TYPE: Auto	

CLIENT:							PROJECT NO.: BORING NO.: 01:31153 B-18			10.:	SHEET:		
Bohler E												1 of 1	
PROJEC							DRILLER/C						
Warrent			er				All Americ	an Geot	ecn, I	nc.			
SITE LO	CATION	√: 1-21	levell C		Varrenton, Virginia 20185							LOSS OF CIRCU	LATION 2002
NORTH		na biac	KWEII		STING:	STATION:			SU 482		LEVATION:	BOTTOM OF 0	CASING
	3ER	ш	(NI)	7					SIS	Ê		x	r Content Liquid Limit
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION C	DF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	ROCK QUALITY DE	NETRATION & RECOVERY ENETROMETER TON/SF
					Topsoil Thickness [6"]			Alia Ta		-		FINES CONTENT)	<u> </u>
-	S-1	SS	18	18	(SM) SILTY SAND, red loose to medium den		, moist,			-	3-3-4 (7)	8.	
	S-2	SS	18	18						477-	4-5-7 (12)	25,2	
5-	5-3	SS	18	18							7-9-13 (22)	\$22 2 2 4	
-					(ML) SILT, light brown	, moist, de	nse			į	15-15-22		
10-	5-4	SS	18	18						472	(37)	14.7 847	
-	1				WEATHERED ROCK, li	ght brown	to						
-	S-5	SS	5_	5	grayish brown, moist	, very dens	e			-	50/5" (50/5")		Ssors.
15-										467 -			
		SS	4	4	-						50/4"		⊗ _{50/4} .
20 -	3.0	33	-		END OF BOR	NG AT 18.9	FT			462	(50/4")		
										1			
25 -										457-			
4										-			
										3			
30 -	-									452-			
								DET:::5	1	L TYPES	IN CITH THE	FRANCITION MANY DE	GRADIIAI
∇ '			ATIFICA Counte		LINES REPRESENT THE APPRO		IDARY LINES RING START			L TYPES.		DEPTH: 14.5	ONADUAL
-	WL (Co		_		Dry		RING MPLETED:		Oct 0	1 2021	намм	ER TYPE: Auto	
-	WL (St		l High d)	Water)		JIPMENT:		LOGG	GED BY:	DRILLIN	NG METHOD: 3.25 I	HSA
	(50		-,	_	GF	OTECHN		REHO	LE L	OG			

LIENT:		ring					PROJECT N 01:31153	NO.:	- 1	ORING N - 19	0.:	SHEET: 1 of 1		FO
ROJEC	-						DRILLER/C	ONTRA	CTO	₹:				
Varrent			er				All America							
TE LO														
			المسا	lnad 14	Varrenton, Virginia 20186							LOSS OF C	IRCULATION	>in:
NORTH		nu biac	WAKEL U		STING:	STATION:			SU 490		EVATION:	BOTTOM	OF CASING	X
ОЕРТН (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION	OF MATERIAL			WATER LEVELS	ELEVATION (FT)	BLOWS/6"	ROCK QUALIT	Vater Content PENETRATION V DESIGNATION 8	BLOWS/FT
	SAN	23	SAN	22	Topsoil Thickness [4"	1			5	=		CALIBRAY	ED PENETROMET	'ER TON/SF
1 5 10	S-1	SS	18	18	(CL) SANDY LEAN CLA moist, firm		brown,			=	4-4-3 (7)	⊗ 7 21.2		
5-	D35- 190 S-2	BG1 SS	60 18	18	(GM) SILTY GRAVEL V brown and brown, m medium dense			000000 000000		485	3-4-6 (10)	Ø ₁₀	× 33.6	[72.0
3- -	S-3	SS	18	18	medidiii delise			Socooco Socooco			3-3-4 (7)	& ,	³⁸ ×	(45.3 %) ,2
10-	S-4	SS	18	18				Cot octor		480-	9-7-8 (15)	O. S.		
15-		SS	5	5	WEATHERED ROCK, li gray, moist, very den	se				475-	50/5" (50/5") 50/1" (50/1")			8,
25 -										465-				
30	_													
									1.00	TVP55		DANGITION ASS	DE CRADILL	M
∇ \			ATIFICA ountei		INES REPRESENT THE APPRO		NDARY LINES E			_ TYPES. IN	CAVE IN			AL .
		mplet			Dry		RING MPLETED:		Oct 01	2021	НАММЕ	R TYPE: Au	to	
_	_	asona abilize	l High ' d)	Water)		JIPMENT:	L	.066	ED BY:	DRILLING	G METHOD: 3.2	5 HSA	
	-				C		ICAL BOR	EHOI	EL	ne				

CLIENT	:						PROJECT	10.:	- 1	SORING I	VO.:	SHEET:		0-
Bohler I							01:31153	CHITC		-20		1 of 1		6
PROJEC							DRILLER/C							
Warren			er				All Americ	an Geo	tecn,	nc.				
SITE LO												LOSS OF C	IRCULATION)1002)
		d Black	kwell R		Varrenton, Virginia 20186	STATION:			SI	IRFACE F	LEVATION:			
NORTH	IING:			LEA	STING:	STATION:			49		LEVITTON	воттом	OF CASING	
	ER	_	<u> 2</u>	9					ភ			Plastic Limit V	/ater Content Liqu	id Limit
Ē	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)					WATER LEVELS	ELEVATION (FT)	BLOWS/6"		D PENETRATION BLO	
ОЕРТН (FT)		ᆲ	ED	VER	DESCRIPTION O	OF MATERIAL			ER I	MT	NO.	ROCK QUALITY	Y DESIGNATION & RE	COVERY
DEF	₹	ΑŽ	MPI						WAI	🚊	<u>=</u>	REC		
	A	,	Ϋ́	<u> </u>						-		CALIBRAT FINES CONTE	ED PENETROMETER T	an/sf
		_	-	_	Topsoil Thickness [4"]			A TOTAL	4	-		1		
-					(SM) SILTY SAND, brow	wn moist	loose		1	-	4-4-4			
3	S-1	SS	18	10	(SIVI) SIELT SAME, BIO	••••			3		(8)	18.9		
								ШЦ	1	1		1 1		
-					(ML) SILT, reddish bro					-	5-7-7	1 \		
7	S-2	SS	18	18	brown, moist, mediur	m dense to	very			1 3	(14)	Ø1.4	34.5	1
5-		_	-		dense					485		1 1		
-								111111	1	-	7-9-10	1 1		1
1 2	S-3	SS	18	18							(19)	Ø₁9		
		-		_				ЩЩ	<u> </u>					- 1
1				_	(MH) ELASTIC SILT WI			1111		-	14-15-16	1	. 38	63
	S-4	SS	18	18	brown, moist, hard to	very hard		411			(31)	\$31	3 ³⁸ ×−	[76.2%]
10-	-	_	_		1				1	480-				
-]			l)					1	-		1		
	1											1		
	-									-		1		
	1				1			111		-	8-15-26	1		
=	S-5	SS	18	18						-	(41)	 • • • •	ar.	
15-	-		_	-	-					475-			k0	
	1									-		1	\	
	1									-			1	
	-												1	
											17-23-35	1	1	
-	S-6	SS	18	18						1	(58)	1	Se0	
20 -					-					470-				
	1									5-	-	1	/	
	-							Ш		4 4				\
	-				WEATHERED ROCK, 1	ight brown	and gray,	1						
		SS	5	5	moist, very dense						50/5"			\$30/5
ं	2:/_		-3-		1						(50/5")			
25	-									465-	1			
	1		1						Ŧ.	-	-			
	1								4	1 2				
	-									1 2				
	5-8	-55	4	4							50/4"			Ø5014-
12			"	—"	END OF BOR	ING AT 28.9	FT			1	(50/4")			
30	7								1	460-	1			
	1-			-				+-	+	-				
	Т.	HE STR	ATIFIC4	TION I	LINES REPRESENT THE APPROX	KIMATE BOUN	IDARY LINES	BETWE	EN SOI	L TYPES.	N-SITU THE T	RANSITION MAY	BE GRADUAL	
▽	WL (Fir				Dry		RING START			1 2021		I DEPTH: 23		
¥	WL (Co	mpleti	ion)		Dry		RING		Oct 0	1 2021	НАММІ	ER TYPE: Au	to	
A	WL (Se	asonal	High '	Water)	-	MPLETED: JIPMENT:		logo	GED BY:				
V	WL (Sta	bilized	d)			ATV			1000	JED D1.	DRILLIN	G METHOD: 3.7	25 HSA	
_	(011		•		GE	OTECHN		REHC	LE L	.OG				

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary Plasticity Charts Grain Size Analysis Standard Proctor Test Results California Bearing Ratio Test Results Thermal Resistivity Test Results

					Atte	Atterberg Limits	nits	**Percent	Moisture	Moisture - Density	CBR	CBR (%)	!
Sample Location	Sample	Depth (feet)	√MC (%)	Soil Type	Ⅎ	7	ឨ	Passing No. 200 Sieve	<maximum Density (pcf)</maximum 	<optimum Molsture (%)</optimum 		0.1 in. 0.2 in.	#Organic Content (%)
B-01	S-10	38.5-39.75	16,5	MI	ďΣ	₽	₽	75.6					
B-01	S-2	3.5-5	15.1										
B-02	S-1	1-2.5	24.7										
B-02	S- 2	3.5-5	11.2										
B-02	S-5	13,5-15	12.6										
B-03	2	1-2.5	25.3										
B-03	S-2	3.5-5	21.6	ML	44	28	16	71.0					
B-04	S-1	1-2.5	26.2										
B-04	S-3	6-7.5	16.9										
B-04	S-5-	13.5-15	22.6										
Notes	See test repr values	orts for test r	nethod, ^A	STM D22	16-19, *A	STM D24	88, ••AS	IM D1140-17, #	ASTM D2974-;	Notes: See test reports for test method, "ASTM D2216-19, "ASTM D2488, ""ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values	report fo	r D4718 (corrected
Definitions	s: MC: Moisture Content, Soil Type: US Bearing Ratio, OC: Organic Content	Content, So, OC: Organ	oil Type: U	JSCS (Unif	ied Soil C	lassificati	ion Syste	m), LL: Liquid l	imit, PL: Plasti	Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content	ticity Inde	x, CBR:	California

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> Project: Warrenton Data Center Client:

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151-3232 (703)834-5527



Type						Atte	Atterberg Limits	mits	**Percent	Moisture	Moisture - Density	CBR (%)	(%)	
	Sample Location	Sample Number	Depth (feet)	√MC (%)	Soil	1	김	ā	Passing No. 200 Sieve	<maximum Density (pcf)</maximum 			0.2 in.	#Organic Content (%)
	B-05	S-3	6-7.5	28.8										
	B-05	6-8	33.5-35	19.9	M	45	30	15	87.5					
	B-06	۶-	1-2.5	25.2										
	B-06	83	6-7.5	41.6										
	B-06	8-8	13.5-15	18.3										
	B-07	S-2	3.5-5	18.4										
	B-07	S-3	6-7.5	31.6	팡	09	28	32	86.0					
	B-08	۲ .	1-2.5	29.0										
	B-08	84	8.5-10	46.1										
Notes: See test reports for test method, "ASTM D2216-19, "ASTM D2488, ""ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values	B-08	8-8 9-8	18.5-20	25.3										
	Notes	: See test repo values	rts for test n	nethod, ^A	STM D221	16-19, 'AS	STM D248	38, AST	M D1140-17, #	ASTM D2974-	20e1 < See test	raport for	D4718 o	orrected

Bearing Ratio, OC: Organic Content

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Checked by	Approved by
Htran	Otran

Sample Location Nur					į		3	**Percent	Moisture - Deficity	- Delisity	(11)	, <u>, , , , , , , , , , , , , , , , , , </u>	
	Sample Number	Depth (feet)	₩ C (%)	Soil	=	립	ā	Passing No. 200 Sieve	<maximum Density (pcf)</maximum 	Coptimum 0.1 in. 0.2 in. Molsture (%)	0.1 in. 0		#Organic Content (%)
8-09	S-2	3.5-5	34.8										
B-09	4	8.5-10	30.8	ML	ď	ΔN	ď	72.7					
B-10	P-2	1-2.5	21.5										
B-10	S-2	3.5-5	28.0										
B-10	S-3	6-7.5	18.2										
B-11	S-1	1-2.5	24.7	ML	45	28	17	81.4					İ
B-11	S-3	6-7.5	13.9										
B-12	S-1	1-2.5	26.1										
B-12	S-2	3.5-5	13.7										
B-12	% 4	8.5-10	25.1										
Notes; See tes values	test report es	s for test n	nethod, ^A	STM D22	16-19, 'AS	STM D248	38, ••AST	M D1140-17,#	#ASTM D2974-	Notes: See test reports for test method, ^ASTM D2216-19, ^ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values	report for L	04718 co	rrected
Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content	: Moisture (ring Ratio,	MC: Moisture Content, Soil Type: US Bearing Ratio, OC: Organic Content	oil Type: U	SCS (Unif	ied Soil C	lassificati	on Syster	n), LL: Liquid (.imit, PL: Plasti	c Limit, PI: Plast	iicity Index,	CBR: C	alifornia

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Approved by	Dtran
Checked by	Htran
Tested by	jvong

					Atte	Atterberg Limits	mits	**Percent	Moisture	Moisture - Density	CBR	CBR (%)	
Sample Location	Sample	Depth (feet)	√MC (%)	Soil	1	7	4	Passing No. 200 Sieve	<maximum Density (pcf)</maximum 	<pre><optimum (%)<="" moisture="" pre=""></optimum></pre>		0.1 in. 0.2 in.	#Organic Content (%)
B-13	S-1	1-2.5	30.6										
B-13	S-2	3.5-5	18.4	ML	46	28	18	9'22					
B-14	S-2	3.5-5	30.7	HM	51	30	21	86.3					
B-14	S-3	6-7.5	31.6										
B-14	8 4	8.5-10	30.4										
B-15	۴.	1-2.5	25.5	ರ	44	26	18	2'92					
B-15	8-3	6-7.5	10.8										
B-16	S-1	1-2.5	24.5										
B-16	S-3	6-7.5	35.1	ML	٩	ď	ď	54.6					ī
B-16	8-5	13.5-15	25.8										
Notes	See test report	orts for test n	nethod, ^A	STM D221	6-19, AS	5TM D24	38, **AST	M D1140-17, #	ASTM D2974-2	Notes: See test reports for test method, ^ASTM D2216-19, -ASTM D2488,ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values	report for	D4718 c	отесіва
Definitions	: MC: Moisture Content, Soil Type: US Bearing Ratio, OC: Organic Content	Content, So.	oil Type: U	SCS (Uniffi t	ed Soil C	lassificati	on Syste	m), LL: Liquid L	imit, PL: Plasti	Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plastictly Index, CBR: California Bearing Ratio, OC: Organic Content	licity Inde	x, CBR: (Salifornia

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Approved by	Dtran
Checked by	Htran
Tested by	jvong

					Atter	Atterberg Limits	nits	**Percent	Moisture	Moisture - Density	CBR (%)	(%)	
Sample Location	Sample	Depth (feet)	^MC (%)	Soil	3	4	<u>a</u>	Passing No. 200 Sieve	<maximum Density (pcf)</maximum 	<pre><optimum 0.1="" 0.2="" in,="" in.<="" pre=""></optimum></pre>	0.1 in.	0.2 in.	#Organic Content (%)
B-17	?	1-2.5	13.7										
B-17	S-3	6-7.5	36.0										
B-18	S-2	3.5-5	25.2										
B-18	S-3	6-7.5	22.4										
B-18	84	8.5-10	14.7										
B-19	S-1	1-2.5	21.2										
B-19	S-3	6-7.5	49.2	GM	61	38	23	45.3					
B-20	S-1	1-2.5	18.9										
B-20	S-2	3.5-5	34.5										
B-20	S.4	8.5-10	31.5	HW.	63	38	25	76.2					
Notes	See test repovalues	orts for test i	method, ^A	STM D22	16-19, *A	STM D24	88, **AST	M D1140-17, #	ASTM D2974-	Notes: See test reports for test method, "ASTM D2216-19, "ASTM D2488," "ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values	report for	. D4718 c	orrected
Definitions	: MC: Moisture Content, Soil Type: US Bearing Ratio, OC: Organic Content	Content, So, OC: Organ	toil Type: Unic Conten	JSCS (Unif	fied Soil C	Jassificati	ion Syster	m), LL: Liquid l	imit, PL: Plasti	Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content	ticity Inde	x, CBR: (California
)	The second											

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Approved by	Dtran
Checked by	Htran
	jvong

(faet) (%) Type LL PL PI Passing Sieve Persitication System) Awaximum Sieve Density (pcf) 1-6 11.7 CL 39 18 21 85.6 122.1 1-6 2.2 ML NP NP 85.1 112.3 1-6 2.2 ML 49 28 21 76.4 99.5 1-6 5.2 ML 49 28 21 76.4 99.5 1-6 5.6 CL 49 27 22 85.7 102.3 1-6 5.6 CL 45 27 24 81.6 111.0 1-6 5.6 CL 45 27 22 85.7 101.9 1-6 5.6 CL 45 27 24 81.6 111.0 1-6 3.6 CH 55 24 31 72.0 101.9						Atter	Atterberg Limits	nits	**Percent	Moisture - Density	- Density	CBR	CBR (%)	
	Sample Location	Sample Number	Depth (feet)	vМС (%)	Soil Type	4	립	ā	Passing No. 200 Sieve	<naximum Density (pcf)</naximum 	<optimum Moisture (%)</optimum 	0.1 in.	0.1 in. 0.2 in.	#Organic Content (%)
	B-02	D3S-191	1-6	11.7	당	39	18	21	85.6	122.1	15.2			
	B-04	D3S-188	1-6	2.2	ML	Ā	ď	ď	85.1	112.3	15.8			
	B-07	D3S-193	1-6	2.6	占	37	19	18	86.5	112.2	17.7			
	B-09	D3S-189	1-6	5.2	ML	49	28	21	76.4	98.5	21.6			
	B-11	D3S-194	1-6	2.1	ML	41	27	14	82.5	119.2	13.8			
	B-14	D3S-186	1-6	5.6	苬	49	27	22	85.7	102.3	22.4	2	4.7	
	B-15	D3S-187	1-6	5.6	ರ	45	21	24	81.6	111.0	17.71	5.6	6,6	
Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See values Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: PlastIc Limit, PI: Bearing Ratio, OC: Organic Content	B-19	D3S-190	1-6	33.6	GH	55	24	31	72.0	101.9	24.2			
Notes: See test reports for test method, "ASTM D2216-19, "ASTM D2488, ""ASTM D1140-17, #ASTM D2974-20e1 < See values Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastlc Limit, PI: Bearing Ratio, OC: Organic Content														
Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See values Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastlc Limit, Pl: Bearing Ratio, OC: Organic Content														
Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastlc Limit, PI: Bearing Ratio, OC: Organic Content	Notes:	: See test repo values	rts for test n	nethod, ^A	STM D221	6-19, *AS	TM D248	8, "AST	M D1140-17, #	ASTM D2974-2	0e1 < See test	report for	D4718 c	orrected
	Definitions	: MC: Moisture Bearing Ratio	Content, Sc , OC: Organ	oil Type: U	SCS (Uniffi	ed Soil Cl	assificati	on Syster	n), LL: Liquid L	imit, PL: Plastlo	Limit, PI: Plast	licity Inde	x, CBR: C	alifornia

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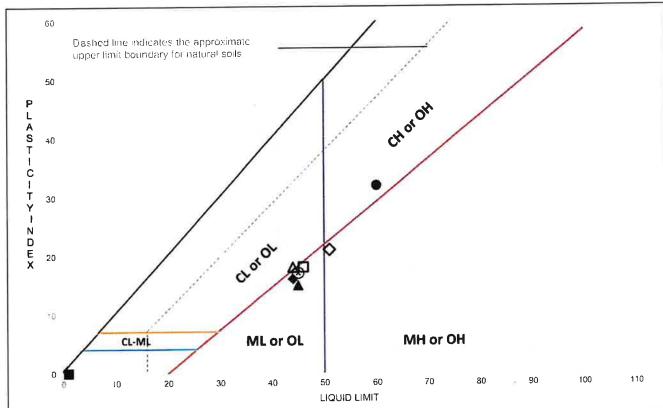
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Approved by	Otran
Checked by	Htran
Tested by	jvong

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

				2011/	COOL	0 (70	1101 10 70 1	0-10 (1110)		//	
	Sample Location	Sample Number	Sample Depth (ft)	п	PL	PI	%<#40	%<#200	AASHTO	uscs	Material Description
	B-01	S-10	38,5-39.75	NP	NP	NP	95.3	75.6	A-4	ML	Silt with Sand Trace Mica Yellow Light Brown
•	B-03	S-2	3.5-5	44	28	16	91.7	71.0	A-7-6	ML	Silt with Sand Trace Mica Yellow Light Brown
lacksquare	B-05	S-9	33.5-35	45	30	15	99.5	87.5	A-7-5	ML	Silt Trace Mica Yellow Light Brown
•	B-07	S-3	6-7.5	60	28	32	93.9	86.0	A-7-6	СН	Fat Clay Light Brown
*	B-09	S-4	8.5-10	NP	NP	NP	95.9	72.7	A-4	ML	Silt with Sand Trace Mica Yellow Light Brown
8	B-11	S-1	1-2.5	45	28	17	95.3	81.4	A-7-6	ML	Silt with Sand Trace Mica Brown
	B-13	S-2	3.5-5	46	28	18	89.9	77.6	A-7-6	ML	Silt with Sand Trace Mica Yellowish Light Brown
\Diamond	B-14	S-2	3.5-5	51	30	21	94.7	86.3	A-7-5	МН	Elastic Silt Trace Mica Light Brown
Δ	B-15	S-1	1-2.5	44	26	18	85.8	76.5	A-7-6	CL	Lean Clay with Sand Light Brown
×	B-16	S-3	6-7.5	NP	NP	NP	85.3	54.6	A-4	ML	Sandy Silt Trace Mica Yellowish Light Brown

Project: Warrenton Data Center

Client:

Project No.: 01:31153 Date Reported:



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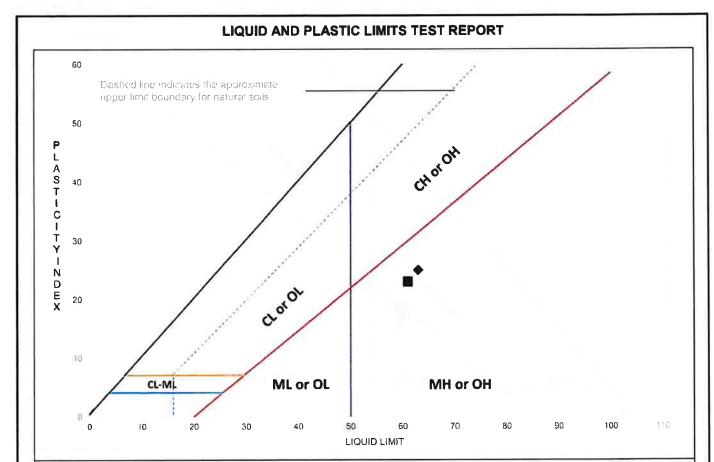
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Tested by	Checked by	Approved by	
yong	Htran	Dtran	
lyoug	TROTT		



				-0114		0 1/10		- 10 (
	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	uscs	Material Description
	B- 19	S-3	6-7.5	61	38	23	53.5	45.3	A-7-5	GM	Silty Gravel with Sand Trace Mica Yellowish Brown
•	B-20	S-4	8.5-10	63	38	25	88.6	76.2	A-7-5	мн	Elastic Silt with Sand Trace Mica Yellowish Light Brown
-							-				
\dashv			-								
7											
						ļ <u>.</u>					

Project: Warrenton Data Center Client: Project No.: 01:31153 Date Reported:



Office / Lab

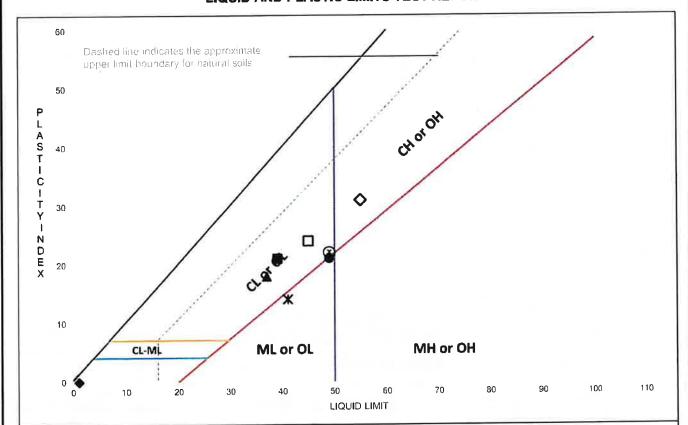
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Tested by	Checked by	Approved by	
jvong	Htran	Dtran	

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	uscs	Material Description
	B-02	D3S-191	1-6	39	18	21	98.8	85.6	A -6	CL	Lean Clay Yellowish Brown
•	B-04	D3S-188	1-6	NP	NP	NP	97.9	85.1	A-4	ML	Silt Trace Mica Yellowish Brown
	B-07	D3S-193	1-6	37	19	18	96.0	86.5	A-6	CL	Lean Clay Trace Mica Brown
•	B-09	D3S-189	1-6	49	28	21	91.1	76.4	A-7-6	ML	Silt with Sand Brwon
*	B-11	D3S-194	1-6	41	27	14	97.9	82.5	A-7-6	ML	Silt with Sand Trace Mica Yellowish Brown
⊗	B-14	D3S-186	1-6	49	27	22	95.3	85.7	A-7-6	CL	Lean Clay with Sand Yellowisht Brown
	B-15	D3S-187	1-6	45	21	24	92.4	81,6	A-7-6	CL	Lean Clay with Sand Yellowish Brown
♦	B-19	D3S-190	1-6	55	24	31	80.6	72.0	A-7-6	СН	Fat Clay with Sand Brown
							4				

Project: Warrenton Dala Center

Client:

Project No.: 01:31153 Date Reported:



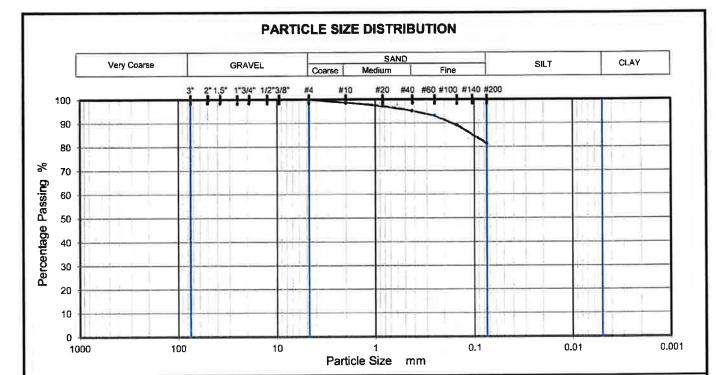
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Chantilly, VA 20151-3232	

Tested by	Checked by	Approved by	
jvong	Htran	Dtran	
11-11-0			



Sle	eving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	98.6		
#20	97.2		
#40	95.3		
#60	93.3		
#100	89.1		
#200	81.4		

Dry Mass of sample, g 40.6	Dry Mass of sample, g	40.6
----------------------------	-----------------------	------

Gravel, 3" to # 4 sieve	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	1.4
Medium Sand, #10 to #40	3.3
Fine Sand, #40 to #200	13.9
Fines <#200	81.4

USCS	ML	Liquid Limit	45	D90	0.167	D50	D	10
AASHTO	A-7-6	Plastic Limit	28	D85	0.104	D30	[C	1
USCS Group Name	Silt with sand	Plasticity Index	17	D60		D15		

Project: Warrenton Data Center

Client:

Sample Description: Silt with Sand Trace Mica Brown

Sample Source: B-11

Project No.: 01:31153 Depth (ft): 1 - 2.5

Sample No.: S-1
Date Reported:



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Address

Office Number / Fax

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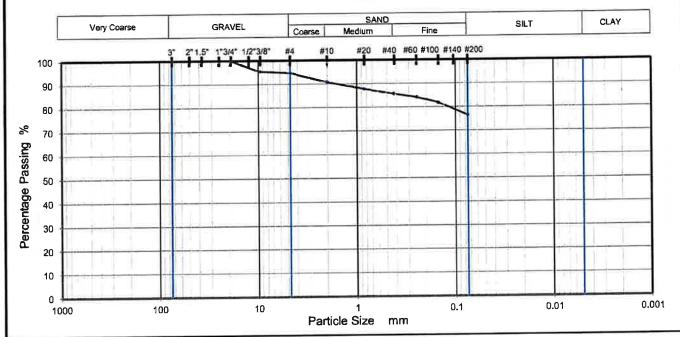
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Co Mid-Adartic ELO - Charling Co

20151-3232

Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	





Sie	ving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
3/4"	100.0		
3/8"	95.4		
#4	94.8		
#10	90.8		
#20	87.8		
#40	85.8		
#60	84.3		
#100	82.0		
#200	76.5		

Dry Mass of sample, g	42.3
Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	5.2
Coarse Sand, #4 to #10 sieve	4.0

Coarse Sand, #4 to #10 sieve	4.0
Medium Sand, #10 to #40	5.0
Fine Sand, #40 to #200	9.3
Fines <#200	76.5

USCS	CL	Liquid Limit	44	D90	1.592	D50	D10
AASHTO	A-7-6	Plastic Limit	26	D85	0.320	D30	Cu
USCS Group Name	Lean clay with sand	Plasticity Index	18	D60		JD15	IICc I

Project: Warrenton Data Center

Client:

Sample Description: Lean Clay with Sand Light Brown

Sample Source: B-15

Project No.: 01:31153 Depth (ft): 1 - 2.5

Sample No.: S-1 Date Reported:



Office / Lab

Address

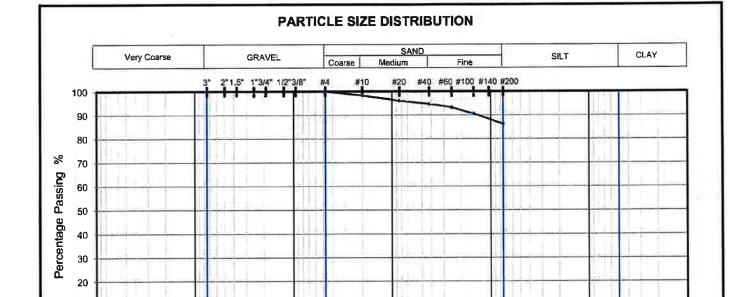
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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



Particle Size mm

dimentatio	Hydrometer Se	SievIng		
% Passin	Particle Size mm	% Passing	Particle Size	
		100.0	3"	
		100.0	#4	
		98.3	#10	
		96.1	#20	
		94.7	#40	
		93.4	#60	
		90.7	#100	
		86.3	#200	

100

10

Dry Mass of sample, g	43.6
-----------------------	------

0.01

0.001

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	1.7
Medium Sand, #10 to #40	3.6
Fine Sand, #40 to #200	8.4
Fines <#200	86.3

USCS	MH	Liquid Limit	51	D90	0.134	D50	D10	
AASHTO	A-7-5	Plastic Limit	30	D85		D30	Cu	
USCS Group Name	Elastic silt	Plasticity Index	21	D60		D15	IIC:	

Project: Warrenton Data Center

Client

Sample Description: Elastic Silt Trace Mica Light Brown

Sample Source: B-14

Project No.: 01:31153 Depth (ft): 3.5 - 5

Sample No.: S-2

0.1

Date Reported:



10

1000

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Address

Office Number / Fax

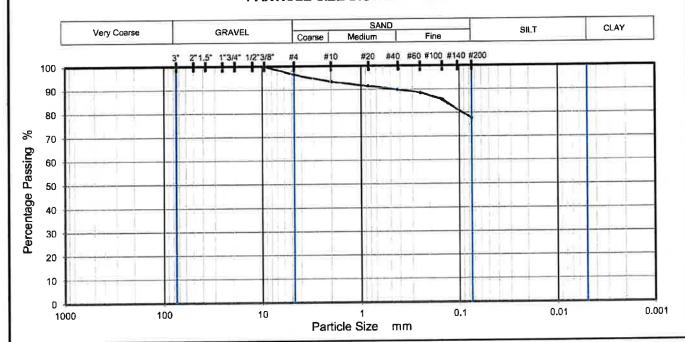
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ng	1,75	dimentation
% Passing	Particle Size mm	% Passing
100.0		
100.0		
96.5		
93.5		
91.4		
89.9		
88,6		
85.7		
77.6		
	100.0 100.0 96.5 93.5 91.4 89.9 88.6 85.7	100.0 100.0 96.5 93.5 91.4 89.9 88.6 85.7

Dry Mass of sample, g	41.7		
Sample Proportions	% dry mass		
Very coarse, >3" sieve	0.0		
Gravel, 3" to # 4 sieve	3.5		

Gravel, 3" to # 4 sieve	3.5
Coarse Sand, #4 to #10 sieve	3.0
Medium Sand, #10 to #40	3.6
Fine Sand, #40 to #200	12.3
Fines <#200	77.6

		76.	40	35	0.445	Mora I	D10	\neg
USCS	ML	Liquid Limit	46	D90	0.445	D50	010	$\overline{}$
AASHTO	A-7-6	Plastic Limit	28	D85	0.141	D30	Cu	
USCS Group Name	Silt with sand	Plasticity Index	18	D60		D15	Cc	

Project: Warrenton Data Center

Client:

Sample Description: Silt with Sand Trace Mica Yellowish Light Brown

Sample Source: B-13

Project No.: 01:31153 Depth (ft): 3.5 - 5 Sample No.: S-2

Date Reported:



Office / Lab

Address

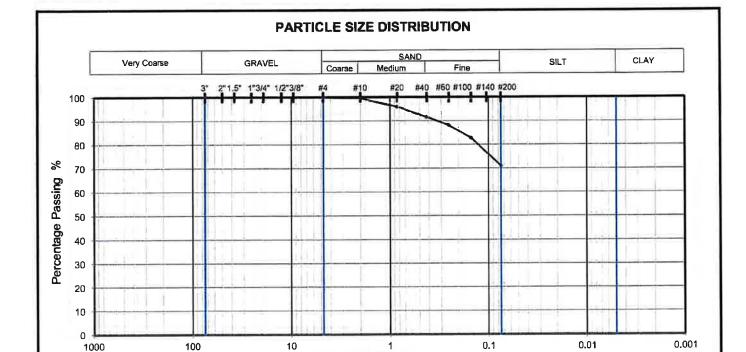
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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



Particle Size mm

Sie	eving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	99.6		
#20	96.1		
#40	91,7		_
#60	88,2		
#100	82.9		
#200	71.0		
		_	

Dry Mass of sample, g 40.9	Dry Mass of sample, g	40.9
----------------------------	-----------------------	------

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.4
Medium Sand, #10 to #40	7.9
Fine Sand, #40 to #200	20.7
Fines <#200	71.0

USCS	ML	Liquid Limit	44	D90	0,328	D 5 0)D:	10	
AASHTO	A-7-6	Plastic Limit	28	D85	0.184	D30) Cı	1	
USCS Group Name	Silt with sand	Plasticity Index	16	D60		D15	Je		

Project: Warrenton Data Center

Client

Sample Description: Silt with Sand Trace Mica Yellow Light Brown

Sample Source: B-03

Project No.: 01:31153 Depth (ft): 3.5 - 5 Sample No.: S-2

Date Reported:



Office / Lab

Address

Office Number / Fax

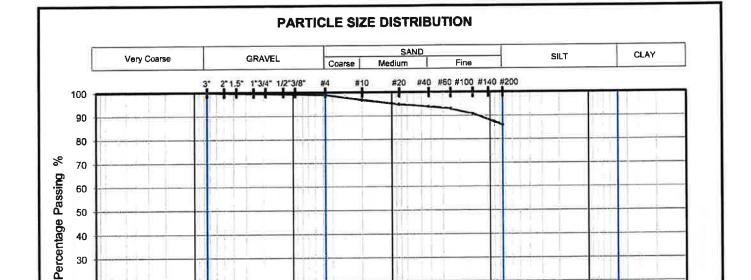
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Tested by	Checked by	Approved by	Remarks
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Particle Size mm

Sle	eving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	99.0		
#10	96.7		
#20	94.9		
#40	93.9		
#60	93.0		
#100	90.9		
#200	86.0		

10

100

Sample Proportions	% dry mass
ery coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	1.0
Coarse Sand, #4 to #10 sieve	2,3
ledium Sand, #10 to #40	2,8
ine Sand, #40 to #200	7.9
Fines <#200	86.0

0.01

0.001

42,5

luscs I	CH	Liquid Limit	60	D90	0.132	D50	D10
AASHTO	A-7-6	Plastic Limit	28	D85		D30	Cu
USCS Group Name	Fat clay	Plasticity Index	32	I D60		D15	l Cc

Project: Warrenton Data Center

Client:

Sample Description: Fat Clay Light Brown

Sample Source: B-07

Project No.: 01:31153 Depth (ft): 6 - 7.5 Sample No.: S-3

0.1

Dry Mass of sample, g

Date Reported:



20 10

1000

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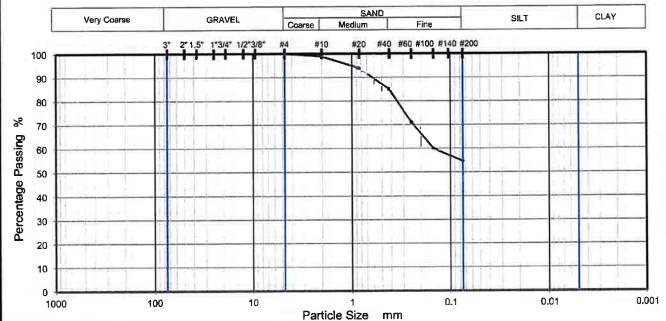
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Tested by	Checked by	Approved by	Remarks
įvong	Htran	Dtran	





Sie	eving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	98.9		
#20	94.1		
#40	85.3		
#60	71,2		
#100	60.1		
#200	54.6		
		-	
		_	

Dry Mass of sample, g	41.9
Dry Mass of sample, g	41.9

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	= 1.1
Medium Sand, #10 to #40	13,6
Fine Sand, #40 to #200	30.7
Fines <#200	54.6

luscs I	ML	Liquid Limit	NP	D90	0.615	D50	D10
AASHTO	A-4	Plastic Limit	NP	D85	0.420	D30	Cu
USCS Group Name	Sandy silt	Plasticity Index	NP	D60	0.148	D15	ICc I

Project: Warrenton Data Center

Sample Description: Sandy Silt Trace Mica Yellowish Light Brown

Sample Source: B-16

Project No.: 01:31153 Depth (ft): 6 - 7.5

Sample No.: S-3 Date Reported:



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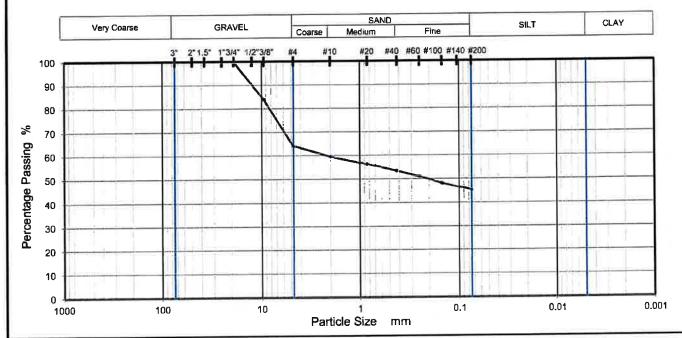
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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	





Sieving		Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3-	100.0		
3/4"	100.0		
3/8"	83.9		
#4	64.1		
#10	59.5		
#20	56.3		
#40	53.5		
#60	51.0		
#100	48.3		
#200	45.3		
		3	

Dry Mass of sample, g	41.9

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	35.9
Coarse Sand, #4 to #10 sieve	4.6
Medium Sand, #10 to #40	6.0
Fine Sand, #40 to #200	8.2
Fines <#200	45.3

USCS	GM	Liquid Limit	61	D90	12.350	D50	0,207	D10	
AASHTO	A-7-5	Plastic Limit	38	D85	9.961	D30		Cu	
USCS Group Name	Silty gravel with sand	Plasticity Index	23	D60	2.197	D15		Cc	

Project: Warrenton Data Center

Client:

Sample Description: Silty Gravel with Sand Trace Mica Yellowish Brown

Sample Source: B-19

Project No.: 01:31153 Depth (ft): 6 - 7.5 Sample No.: S-3

Date Reported:



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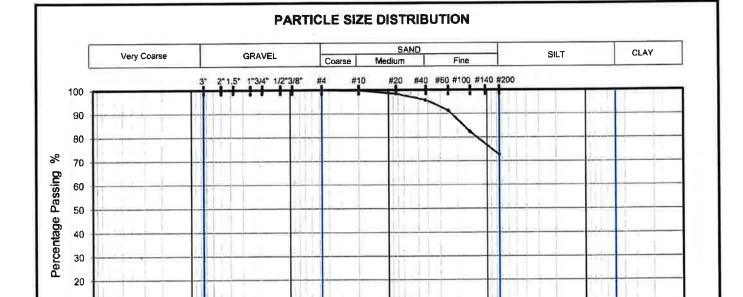
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Tested by	Checked by	Approved by	Remarks
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Particle Size mm

Sie	ving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	99.8		
#20	98.5		
#40	95.9		
#60	91.5		
#100	82.4		
#200	72.7		
		_	
		-	

100

10

Dry Mass of sample, g	41.7

0.01

0.001

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0,2
Medium Sand, #10 to #40	3.9
Fine Sand, #40 to #200	23.2
Fines <#200	72.7

USCS	ML	Liquid Limit	NP	D90	0,230	D50	D10
AASHTO	A-4	Plastic Limit	NP	D85	0.174	D30	Cu
USCS Group Name	Silt with sand	Plasticity Index	NP	D60		D15	Cc

Project: Warrenton Data Center

Client:

Sample Description: Silt with Sand Trace Mica Yellow Light Brown

Sample Source: B-09

Project No.: 01:31153 Depth (ft): 8.5 - 10 Sample No.: S-4

0.1

Date Reported:



10

1000

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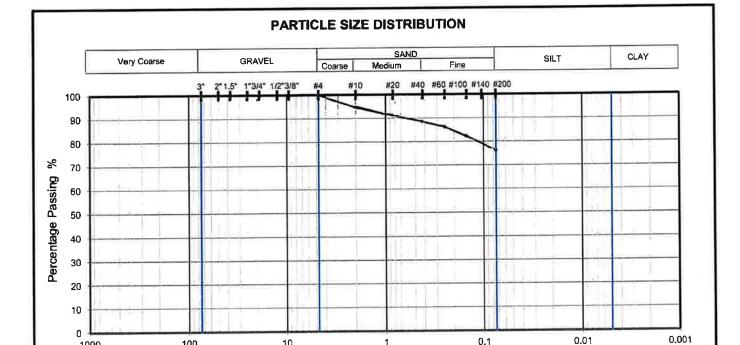
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Tested by	Checked by	Approved by	Remarks
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Particle Size mm

Sie	ving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	94.8		
#20	91.2		
#40	88.6		
#60	86.4		
#100	82.4		
#200	76.2		

10

100

Sample Proportions	% dry mass
/ery coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	5,2
fledium Sand, #10 to #40	6.2
ine Sand, #40 to #200	12.4
ines <#200	76.2

0.01

44.4

	1411	16 invited Limits	63	ipeo l	0.617	1050 I	D10
USCS	MH	Liquid Limit	- 63	Dea		1030	
AASHTO	A-7-5	Plastic Limit	38	D85	0.209	D30	Cu
USCS Group Name	Elastic silt with sand	Plasticity Index	25	D60		D15	l Cc

Project: Warrenton Data Center

Client

Sample Description: Elastic Silt with Sand Trace Mica Yellowish Light Brown

Sample Source: B-20

Project No.: 01:31153 Depth (ft): 8.5 - 10 Sample No.: S-4

Date Reported:

0.1

Dry Mass of sample, g



1000

Office / Lab

Address

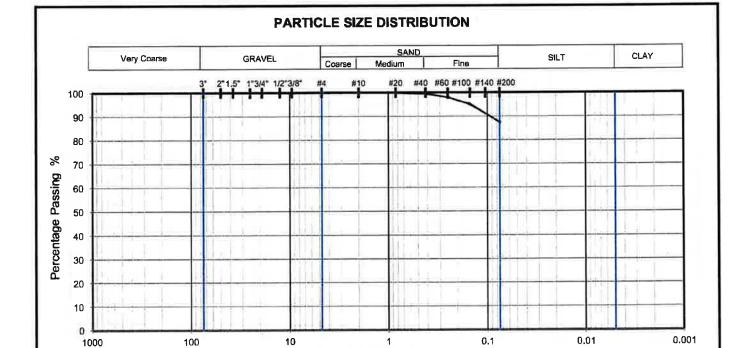
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Particle Size mm

Sie	eving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.5		
#60	98.1		
#100	95.2		
#200	87.5		
		_	
		-	

Dry Mass of sample, g	41.8
	-

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.0
Medium Sand, #10 to #40	0.5
Fine Sand, #40 to #200	12,0
Fines <#200	87.5

USCS	ML	Liquid Limit	45	D90	0.094	D50	D10	
AASHTO	A- 7-5	Plastic Limit	30	D85		D30	Cu	
USCS Group Name	Silt	Plasticity Index	15	D60		D15	Cc	

Project: Warrenton Data Center

Client:

Sample Description: Silt Trace Mica Yellow Light Brown

Sample Source: B-05

Project No.: 01:31153 Depth (ft): 33.5 - 35

Sample No.: S-9

Date Reported:



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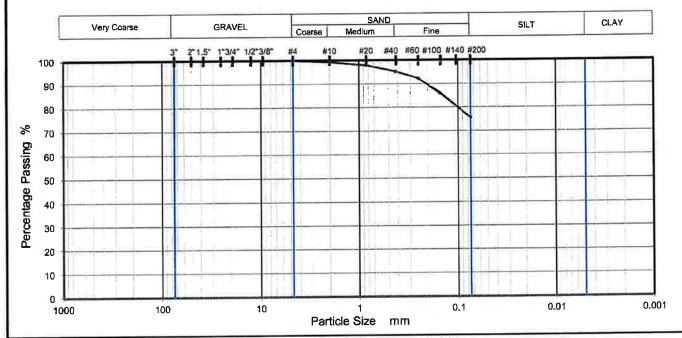
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ving	Hydrometer Se	dimentation
% Passing	Particle Size mm	% Passing
100.0		
100.0		
99.3		
97.9		
95.3		
92.4		
86.1		
75,6		
	% Passing 100.0 100.0 99.3 97.9 95.3 92.4 86.1	% Passing Particle Size mm 100.0 100.0 99.3 97.9 95.3 92.4 86.1

Dry Mass of sample, g	41.5

% dry mass
0.0
0.0
0.7
4.0
19.7
75.6

luscs	ML	Liquid Limit	NP	D90	0.206	D50	D10
AASHTO	A-4	Plastic Limit	NP	D85	0.140	D30	Cu
USCS Group Name	Silt with sand	Plasticity Index	NP	D60		D15	Cc

Project: Warrenton Data Center

Client:

Sample Description: Silt with Sand Trace Mica Yellow Light Brown

Sample Source: B-01

Project No.: 01:31153 Depth (ft): 38.5 - 39.75 Sample No.: S-10

Date Reported:



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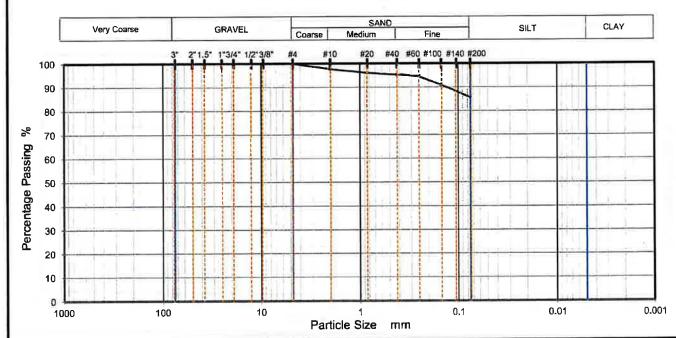
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Tested by	Checked by	Approved by	Remarks
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Sie	ving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	97.6		
#20	96.1		
#40	95.3		
#60	94.5		
#100	91.0		
#200	85.7		
		_	

53.3

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	2.4
Medium Sand, #10 to #40	2.3
Fine Sand, #40 to #200	9.6
Fines <#200	85.7

USCS	CL	Liquid Limit	49	D90	0.132	D50	D10
AASHTO	A-7-6	Plastic Limit	27	D85		D30	Cu
USCS Group Name	Lean clay	Plasticity Index	22	D60		D15	ICc I

Project: Warrenton Data Center

Client:

Sample Description: Lean Clay with Sand Yellowisht Brown

Sample Source: B-14

Project No.: 01:31153 Depth (ft): 1 - 6

Sample No.: D3S-186

Date Reported:



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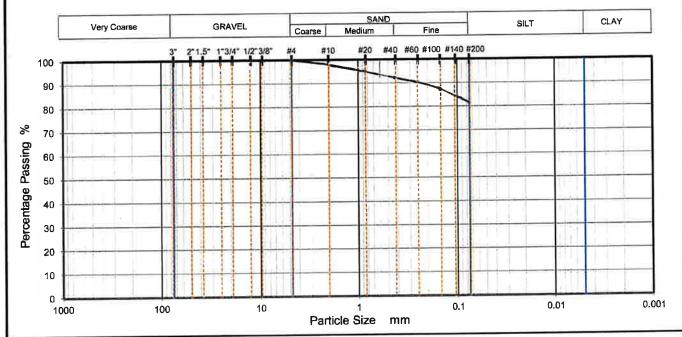
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Tested by	Checked by	Approved by	Remarks
ĵvong	Htran	Dtran	





Sieving		Hydrometer Se	dimentation
ticle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	98.1		
#20	95.1		
#40	92,4		
#60	90.3		
#100	87.6		
#200	81.6		
		_	
		-	

Sample Proportions	% dry mass
/ery coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	1.9
fledium Sand, #10 to #40	5.7
ine Sand, #40 to #200	10.8
Fines <#200	81.6

64.5

uscs	CL	Liquid Limit	45	D90	0.236	D50	D10
AASHTO	A-7-6	Plastic Limit	21	D85	0.111	D30	Cu
USCS Group Name	Lean clay with sand	Plasticity Index	24	D60		D15) Cc

Project: Warrenton Data Center

Client:

Sample Description: Lean Clay with Sand Yellowish Brown

Sample Source: B-15

Project No.: 01:31153 Depth (ft): 1 - 6

Dry Mass of sample, g

Sample No.: D3S-187

Date Reported:



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Address

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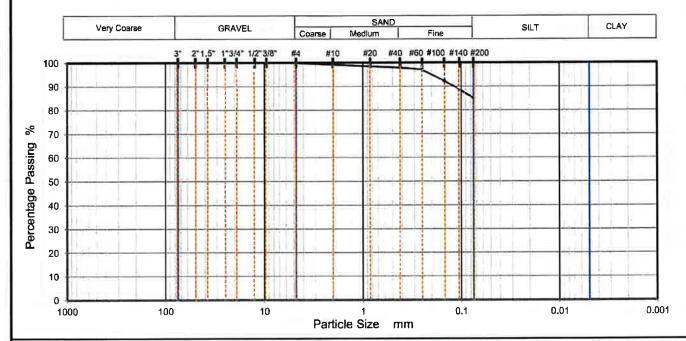
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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	





Sie	Sleving		edimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100,0		
1"	100,0		
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.2		
#20	98.5		
#40	97.9		
#60	97.1		
#100	92.5		
#200	85.1		
		_	

Dry Mass of sample, g	54,9

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.8
Medium Sand, #10 to #40	1.3
Fine Sand, #40 to #200	12.8
Fines <#200	85.1

USCS	ML	Liquid Limit	NP	D90	0.119	D50	D10	
AASHTO	A-4	Plastic Limit	NP	D85		D30	Cu	
USCS Group Name	Silt	Plasticity Index	NP	D60		D15	Cc	

Project: Warrenton Data Center

Client:

Sample Description: Silt Trace Mica Yellowish Brown

Sample Source: B-04

Project No.: 01:31153 Depth (ft): 1 - 6

Sample No.: D3S-188

Date Reported:



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Address

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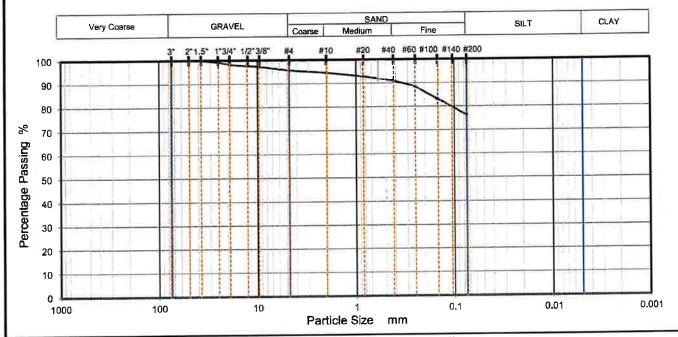
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Tested by	Checked by	Approved by	Remarks
	Htran	Dtran	

PARTICLE SIZE DISTRIBUTION



TEST RESULTS (ASTM D422-63(2007))

Sieving		Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	99.2		
3/4"	98.2		
3/8"	97.3		
#4	95.7		
#10	94.6		
#20	92.9		
#40	91.1		
#60	88.6		
#100	83.4		
#200	76.4		
		-	

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	4.3
Coarse Sand, #4 to #10 sieve	1.1
Nedium Sand, #10 to #40	3.5
ine Sand, #40 to #200	14.7
Fines <#200	76.4

5235.0

luscs I	ML	Liquid Limit	49	D90	0.337	D50	D10
AASHTO	A-7-6	Plastic Limit	28	D85	0.176	D30	Cu
USCS Group Name	Silt with sand	Plasticity Index	21	D60		D15	llCc l

Project: Warrenton Data Center

Client:

Sample Description: Silt with Sand Brwon

Sample Source: B-09

Project No.: 01:31153 Depth (ft): 1 - 6

Dry Mass of sample, g

Sample No.: D3S-189

Date Reported:



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Address

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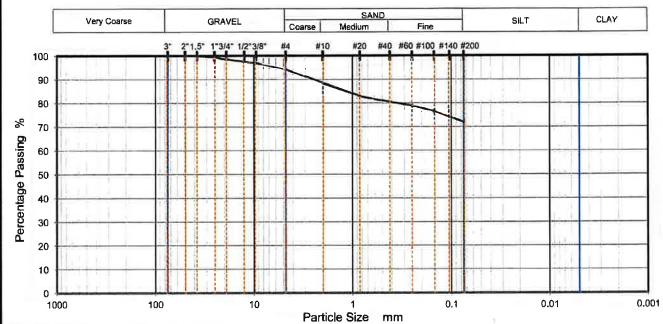
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Suite 100 Chantilly, VA 20151-3232

Tested by	Checked by	Approved by	Remarks
įvong	Htran	Dtran	





Sie	ving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2*	100.0		
1 1/2"	100.0		
1**	99.4		
3/4"	98.5		
3/8"	96.9		
#4	94.4		
#10	88.7		
#20	83.1		
#40	80.6		
#60	79.0		
#100	76.7		
#200	72.0		
		-	

Dry Mass of sample, g	10996.0

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	5.6
Coarse Sand, #4 to #10 sieve	5.7
Medium Sand, #10 to #40	8.1
Fine Sand, #40 to #200	8.6
Fines <#200	72.0

USCS	СН	Liquid Limit	55	D90	2.436	D50		D10	
AASHTO	A-7-6	Plastic Limit	24	D85	1.136	D30		Cu	
USCS Group Name	Fat clay with sand	Plasticity Index	31	D60		D15	<u> </u>	Cc	

Project: Warrenton Data Center

Client:

Sample Description: Fat Clay with Sand Brown

Sample Source: B-19

Project No.: 01:31153 Depth (ft): 1 - 6 Sample No.: D3S-190

Date Reported:



Office / Lab

Address

Office Number / Fax

ECS Mid-Atlantic LLC - Chantilly

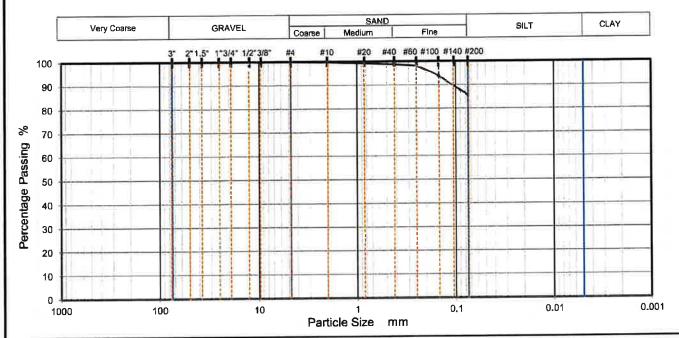
14026 Thunderbolt Place

(703)471-8400

Suite 100 Chantilly, VA 20151-3232

Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	





ring	Hydrometer Se	dimentation
% Passing	Particle Size mm	% Passing
100,0		
100.0		
99.8		
99.3		
98.8		
98.1		
94.0		
85.6		
	% Passing 100.0 100.0 99.8 99.3 98.8 98.1 94.0	% Passing Particle Size mm 100.0 100.0 99.8 99.3 98.8 98.1 94.0

Sample Proportions	% dry mass
/ery coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0,2
Medium Sand, #10 to #40	1.0
ine Sand, #40 to #200	13.2
Fines <#200	85.6

54.9

USCS	CL	Liquid Limit	39	D90	0.108	D50	D10	
AASHTO	A-6	Plastic Limit	18	D85		D30	Cu	
USCS Group Name	Lean clay	Plasticity Index	21	D60		D15	lCc .	

Project: Warrenton Data Center

Client:

Sample Description: Lean Clay Yellowish Brown

Sample Source: B-02

Project No.: 01:31153 Depth (ft): 1 - 6

Dry Mass of sample, g

Sample No.: D3S-191

Date Reported:



Office / Lab

Address

Office Number / Fax

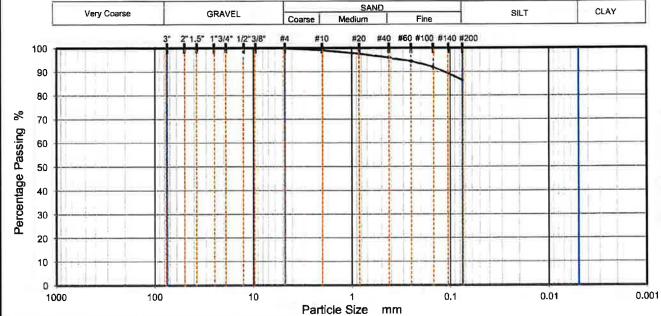
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20151-3232

Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	





Sie	eving	Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100,0		
#4	100.0		
#10	99.1		
#20	97.6		
#40	96.0		
#60	94.6		
#100	92.2		
#200	86.5		

Dry Mass of sample, g	64.0

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	0.0
Coarse Sand, #4 to #10 sieve	0.9
Medium Sand, #10 to #40	3.1
Fine Sand, #40 to #200	9.5
Fines <#200	86.5

USCS	CL	Liquid Limit	37	D90	0.115	D50	D10
AASHTO	A-6	Plastic Limit	19	D85		D30	Cu
USCS Group Name	Lean clay	Plasticity Index	18	D60		D15	ICc

Project: Warrenton Data Center

Client:

Sample Description: Lean Clay Trace Mica Brown

Sample Source: B-07

Project No.: 01:31153 Depth (ft): 1 - 6

Sample No.: D3S-193

Date Reported:



Office / Lab

Address

Office Number / Fax

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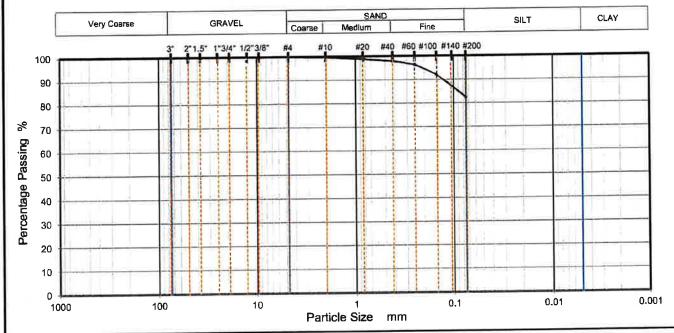
Suite 100 Chantilly, VA

(703)471-8400

20151-3232

Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	





Sieving		Hydrometer Se	dimentation
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
#4	100.0		
#10	99.7		
#20	98.9		
#40	97.9		
#60	96,5		
#100	92.3		
#200	82.5		

ample Proportions	% dry mass
ery coarse, >3" sieve	0.0
ravel, 3" to # 4 sieve	0.0
oarse Sand, #4 to #10 sieve	0.3
edium Sand, #10 to #40	1.8
ine Sand, #40 to #200	15.4
ines <#200	82.5
ines <#200	

51.5

		Mr. Carried Classic	41	Ilpoo I	0.128	iD50	010
USCS	ML_	Liquid Limit	41	D90		1030	
AASHTO	A-7-6	Plastic Limit	27	D85	0.090	D30	Cu
USCS Group Name	Silt with sand	Plasticity Index	14	D60		D15	Cc

Project: Warrenton Data Center

Client:

Sample Description: Silt with Sand Trace Mica Yellowish Brown

Sample Source: B-11

Project No.: 01:31153 Depth (ft): 1 - 6

Dry Mass of sample, g

Sample No.: D3S-194

Date Reported:



Office / Lab

Address

Office Number / Fax

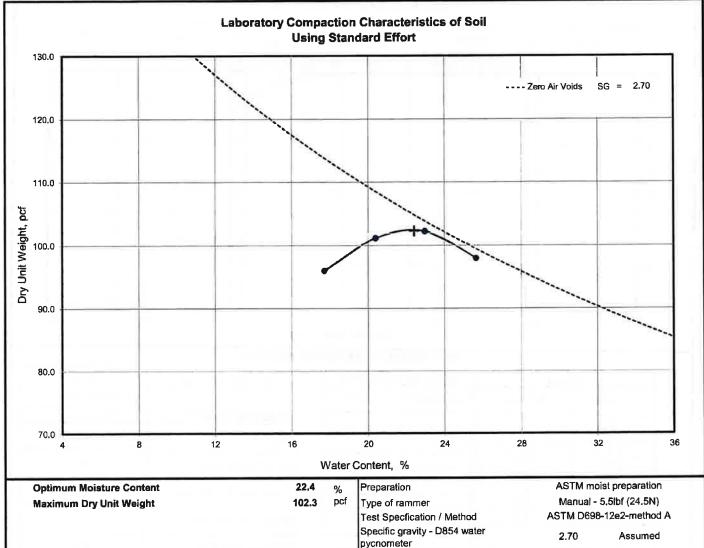
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14026 Thunderbolt Place

(703)471-8400

Suite 100 Chantilly, VA 20151-3232

Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



Cumulative material retained on: 3/4 in. sieve 0.0 % Coarse Aggregate Specific Gravity -3/8 in. sieve 0.0 %

0.0

#4 sieve

Nat. Plasticity **AASHTO** Liquid Limit %< #200 USCS Soil Description Moist. % Index A-7-6 CI. Lean Clay with Sand Yellowisht Brown 5.6 49 22 85.7

Project: Warrenton Data Center

Client: Sample / Source B-14 Test Reference/No.:

Project No.: 01:31153 Depth (ft.): 1 - 6 Sample No.: D3S-186 Date Reported:



Office / Lab

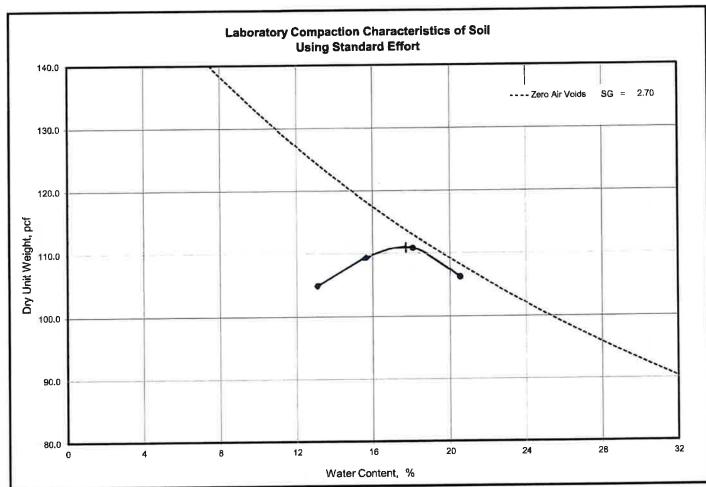
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Office Number / Fax

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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



Optimum Moisture Content		17.7	%	Preparation	ASTM mo	oist preparation
Maximum Dry Unit Weight		111.0	pcf	Type of rammer Test Specfication / Method		5.5lbf (24.5N) 3-12e2-method A
				Specific gravity - D854 water pycnometer	2.70	Assumed
Cumulative material retained on:	3/4 in. sieve 3/8 in. sieve #4 sieve	0.0 0.0 0.0	% % %	Coarse Aggregate Specific Gravity -		

Soil Description		Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Lean Clay with Sand Yellowish Brown	5.6	45	24	81.6	CL	A-7-6

Project: Warrenton Data Center

Client: Sample / Source B-15 Test Reference/No.: Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-187
Date Reported:



Office / Lab

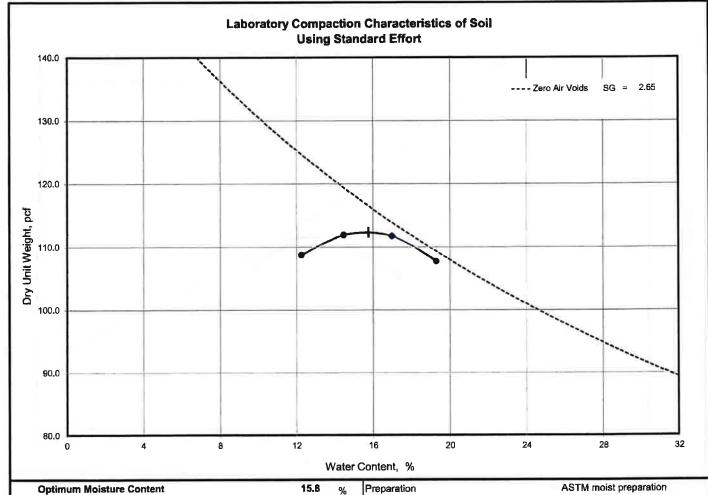
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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



	Maximum Dry Unit Weight		112.3 pcf		Type of rammer Manual - 5.5lbf (24.5N) Test Specification / Method ASTM D698-12e2-method A	e of rammer	• • • • • • • • • • • • • • • • • • • •		
					Specific gravity - D854 water 2.65 Assumed pycnometer	<u> </u>	umed		
	Cumulative material retained on:	3/4 in. sieve	0,0	%	Coarse Aggregate Specific Gravity -	erco Aggregato Specific Gravity -			
		3/8 in. sieve	0.0	%	Coalse Aggregate opecino Gravity	ise Aggregate opecific Gravity			
		#4 sieve	0.0	%					
_	Soil Descripti	ion			Nat. Nat. Liquid Limit Plasticity %< #200 USCS AASHTO	I iduid imit	AASHTO		

Soil Description		Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Silt Trace Mica Yellowish Brown	2.2	NP	NP	85.1	ML	A-4

Project: Warrenton Data Center

Client:

Sample / Source B-04

Test Reference/No.:

Project No.: 01:31153 Depth (ft.): 1 - 6 Sample No.: D3S-188

Date Reported:



Office / Lab

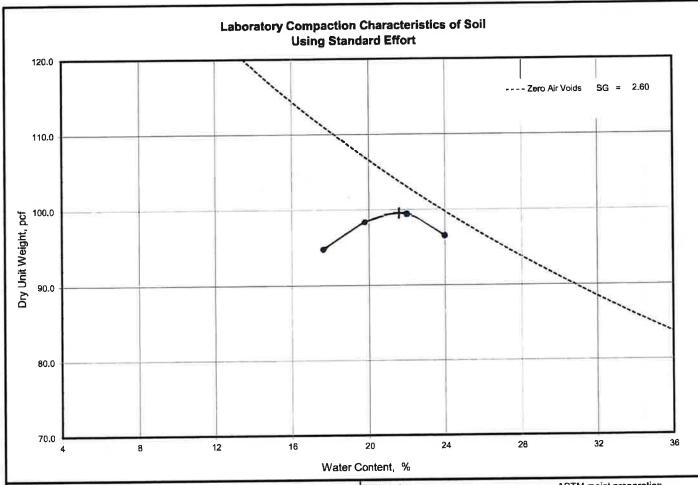
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Tested by	Checked by	Approved by	Remarks
	Htran	Dtran	



Optimum Moisture Content		21.6	%	Preparation	ASTM mo	oist preparation
Maximum Dry Unit Weight		99.5	pcf	Type of rammer Test Specfication / Method		5.5lbf (24.5N) 8-12e2-method A
				Specific gravity - D854 water pycnometer	2.60	Assumed
Cumulative material retained on:	3/4 in. sieve 3/8 in. sieve	1.8 2.7	% %	Coarse Aggregate Specific Gravity -		Assumed

Soit Description		Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Silt with Sand Brown	5.2	19	21	76.4	ML	A-7-6

Project: Warrenton Data Center

Client: Sample / Source B-09 Test Reference/No.: Project No.: 01:31153 Depth (ft.): 1 - 6 Sample No.: D3S-189 Date Reported:



Office / Lab

#4 sieve

4.3

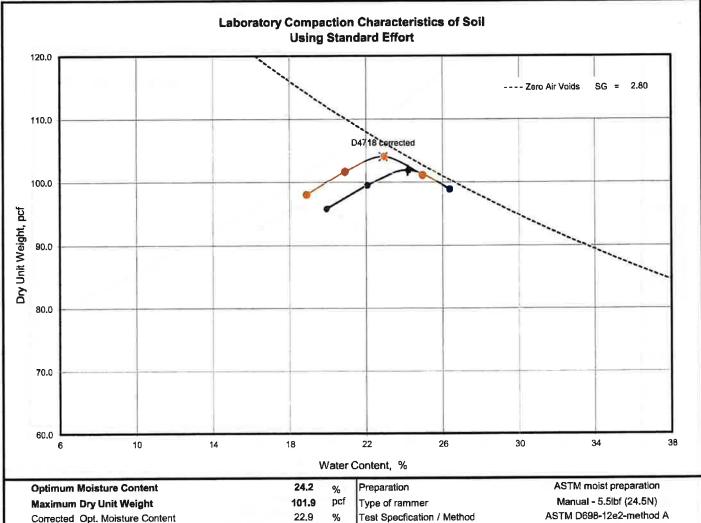
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Tested by	Checked by	Approved by	Remarks
jvang	Htran	Dtran	



Optimum Moisture Content		24,2	%	Preparation	ASTM mo	ist preparation
Maximum Dry Unit Weight		101.9 22.9	pcf %	Type of rammer Test Specfication / Method		5.5lbf (24.5N) -12e2-method A
Corrected Opt. Moisture Content Corrected Max. Dry Density		104.0		Specific gravity - D854 water	2.80	Assumed
	0/4 to	4 E	0/	pycnometer	2.00	, tooding a
Cumulative material retained on:	3/4 in. sieve 3/8 in. sieve	1.5 3.1	% %	Coarse Aggregate Specific Gravity -	2.60	Assumed
	#4 sieve	5.6	%			

alob // fetalica diff # 7 die Fet						
Soil Description		Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Fat Clay with Sand Brown	33.6	55	31	72.0	СН	A-7-6

Project: Warrencon Daca Center

Client: Sample / Source B-19 Project No.: 01:31153 Depth (ft.): 1 - 6 Sample No.: D3S-190 Date Reported:



Test Reference/No.:

Office / Lab

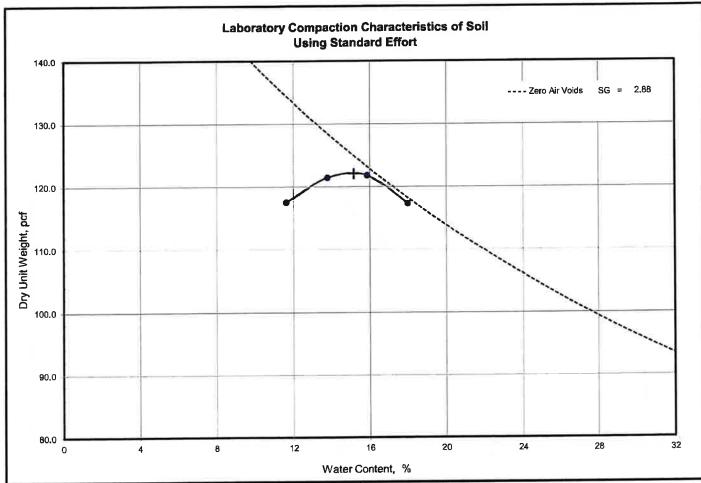
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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



Optimum Moisture Content		15.2	%	Preparation	ASTM mo	sist preparation
Maximum Dry Unit Weight		122.1	pcf	Type of rammer Test Specfication / Method		5.5lbf (24.5N) 3-12e2-method A
				Specific gravity - D854 water pycnometer	2.88	Historical
Cumulative material retained on:	3/4 in. sieve 3/8 in. sieve #4 sieve	0.0 0.0 0.0	% % %	Coarse Aggregate Specific Gravity -		

Soil Description		Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
Lean Clay Yellowish Brown	11.7	39	21	85.6	CL	A-6

Project: Warrenton Data Center

Client: Sample / Source B-02 Test Reference/No.: Project No.: 01:31153 Depth (ft.): 1 - 6 Sample No.: D3S-191 Date Reported:



Office / Lab

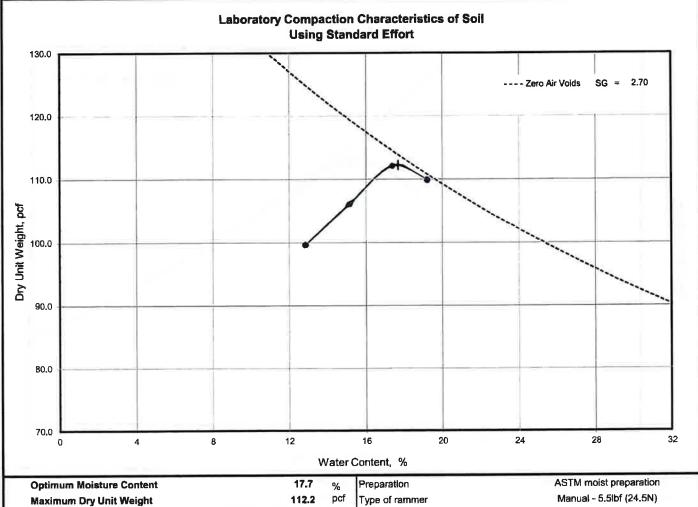
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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



Optimum Moisture Content

Maximum Dry Unit Weight

112.2

Prof Type of rammer

Test Specification / Method

Specific gravity - D854 water
pycnometer

Cumulative material retained on:

3/4 in. sieve 3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

3/8 in. sieve 0.0

4 Preparation

Type of rammer

Test Specification / Method

Specific gravity - D854 water
pycnometer

Coarse Aggregate Specific Gravity -

%

0.0

Plasticity Nat. %< #200 USCS **AASHTO** Soil Description Liquid Limit Moist. % Index CL A-6 37 86.5 18 Lean Clay Trace Mica Brown 2.6

Project: Warrenton Data Center

Client: Sample / Source B-07 Test Reference/No.: Project No.: 01:31153
Depth (ft.): 1 - 6
Sample No.: D3S-193
Date Reported:



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#4 sieve

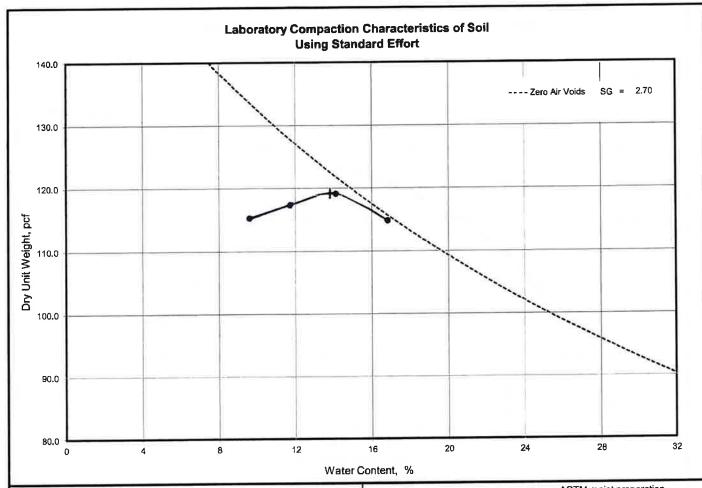
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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



	Optimum Moisture Content		13.8	%	Preparatio	n		ASTM	l moist prep	aration
	Maximum Dry Unit Weight		119.2	pcf	Type of ra	mmer				
	-				Test Spec	fication / Met	hod	ASTM D)698-12e2-i	method A
5					Specific gr pycnometer	ravity - D854 er	water	2.70	His	storical
	Cumulative material retained on:	3/4 in. sieve	0.0	%	Coarse Ad	gregate Spe	cific Gravity	-		
		3/8 in. sieve	0,0	%	000,000	,g, 090.0 opo	o			
		#4 sieve	0.0	%						
	Soil Descript	tion			Nat. Moist. %	Liquid Limit	Plasticity Index	%< #200	USCS	AASHTO
	Silt with Sand Trace Mica	Yellowish Brown			2.1	41	14	82.5	ML	A- 7-6

Project: Warrenton Data Center

Client: Sample / Source B-11 Test Reference/No.: Project No.: 01:31153 Depth (ft.): 1 - 6 Sample No.: D3S-194

Date Reported:



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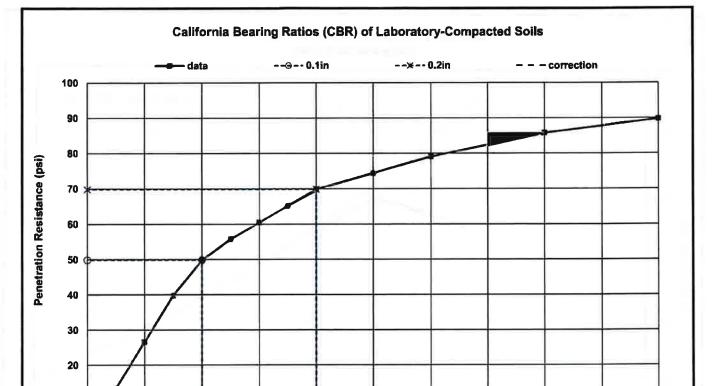
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Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



TEST RESULTS (ASTM D1883-16)

Penetration Depth (in.)

0.2

0.25

0.3

0.35

0.4

	Molded			Soaked		CBF	र (%)				_	
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max, Dens.	Moisture (%)	0.1 in.	0.2 in.	Linearty Correction (in.)	Surci (lb	narge s.)		well (%)
101.8	99.5	22.3	91.1=	89.1	33.8	5.0	4.7	0.00	1	0	2	.22
	М	aterial Description	on		AASHTO	uscs	MAX. Dens. (pcf)	Optimum Moisture (%)	LŁ	PI	% Fines	% Gravel
	Lean Clay w	ith Sand Yello	wish Brown		A-7-6	CL	102.3	22.4	49	22	85.7	0.0

Project: Warrenton Data Center

Client:

0.05

0.1

Sample / Source B-14 Test Reference/No.: 1 Project No,: 01:31153

Depth (ft.): 1 - 6

Sample No.: D3S-186

Date Reported:



10

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0.15

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0.45

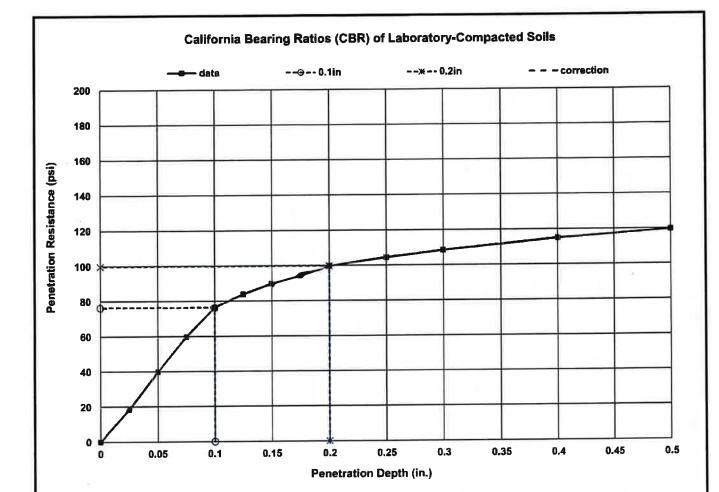
0.5

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20151-3232

(703)834-5527

Tested by	Checked by	Approved by	Remarks
jvong	Htran	Dtran	



TEST RESULTS (ASTM D1883-16)

	Molded			Soaked		СВЕ	₹ (%)	Lincontro	Curat			well
Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	I MOISTINE (%) I	0.1 in.	0.2 in.	Linearty Correction (in.)	Surci (lb	-		(%)
110.5	99.5	17.6	100.2	90.3	27.3	7.6	6.6	0.00	1	0	1	.85
	M	aterial Description	อก		AASHTO	USCS	MAX. Dens. (pcf)	Optimum Moisture (%)	LL	PI	% Fines	% Grave
	Lean Clay v	with Sand Yello	wish Browi	n	A-7-6	CL	111	17.7	45	24	81.6	0.0

Project: Warrenton Data Center

Client: Sample / Source B-15 Test Reference/No.: 1 Project No.: 01:31153 Depth (ft.): 1 - 6 Sample No.: D3S-187

Date Reported:



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Tested by	Checked by	Approved by	Remarks
ivona	Htran	Dtran	

Determination of thermal properties using a thermal needle probe Thermal Conductivity of Soil/Soft Rock ASTM D5334

					Cor	Corrected Conductivity	vity				Average	Average
Test Point	Moisture Content %		1st Reading			2nd Reading			3rd Reading		Conductivity	Resistivity
		K=W/mK	Error Value	fnittal Temp	K=W/mK	Error Value	initial Temp	K=W/mK	Error Value	InNiał Temp	K=W/mK	Rho≕C·cm/W
Dry Point	0.39	0.450	0.0024	21.3	0.467	0.0042	20.8	0.476	0.0042	20.9	0.464	215.471
Moist Point 1	5.60	0.836	0.0017	21.6	0.849	0.0026	21.3	0.845	0.0018	21.1	0.843	118.624
Moist Point 2	10.30	1.238	0.0020	19.4	1.294	0,0016	19,3	1.283	0.0015	19.3	1.272	78.642
Moist Point 3	12.41	1.353	0.0012	19.2	1.382	0.0013	19.1	1,359	0.0011	19.1	1,365	73.286
Moist Point 4	14.36	1,593	0,0029	19.1	1,480	0.0012	19	1,485	0,0012	19	1,519	65,821
Moist Point 5	16.26	1.534	0.0015	18.9	1.516	0.0013	18.9	1.473	0,0010	18.8	1,508	66.332
Moist Point 6												
Moist Point 7												
Moist Point 8												
Moist Point 9												

0.2730 0.2980 0.9161

K Material (Standard)

Calibration Factor K Measured

21 ರ

USCS Symbol

ᇫ 크

39

Depth (ft.): 1 - 6 Sample No.: D3S-191 Date Reported: Project No.: 01:31153

blows per layer.

% compactive effort @

Test Material screened with #4 sleve,

Pre-drill 99

Needle Insertion Methor

Test performed at:

Project: Warrenton Data Center

Sample / Source: B-02

Client

ECS Mid-Atlantic LLC - Chantilly

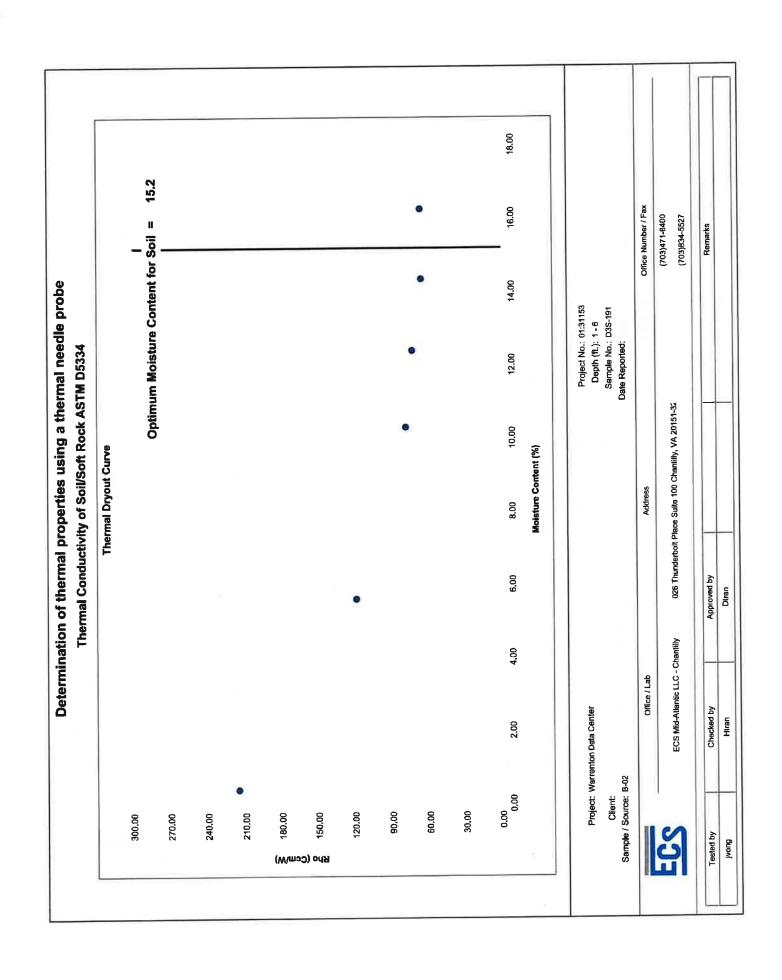
Office / Lab

026 Thunderbolt Place Suite 100 Chantilly, VA 20151-32

Address

Office Number / Fax

Remarks	
Approved by	Diran
Checked by	Htran
Tested by	Jvong



Determination of thermal properties using a thermal needle probe Thermal Conductivity of Soil/Soft Rock ASTM D5334

					Cor	Corrected Conductivity	ivity				Average	Average
Test Point	Moisture Content %		1st Reading			2nd Reading			3rd Reading		Conductivity	Resistivity
		K=W/mK	Error Value	hittal Temp	K=W/mK	Error Value	Initial Temp	K=W/mK	Error Value	Initial Temp	K=W/mK	Rho="C-cm/W
Dry Point	00:00	0.548	0.0045	22	0.531	0:00:0	20.8	0.535	0.0035	20.8	0.538	185,874
Moist Point 1	62'3	1.010	0.0012	20.8	1.058	0.0018	20.4	1.068	0.0019	20.4	1.045	95.668
Moist Point 2	13.78	1,625	0.0013	19.5	1.572	0,0014	19,5	1,580	0,0015	19.5	1.593	62.786
Moist Point 3	15.45	1.692	0.0032	18.8	1.692	0.0016	18.6	1.637	0,0012	18.6	1.674	59.751
Molst Point 4	17.15	1.909	0.0016	18.7	1.852	0.0016	18.7	1.772	0.0010	18.7	1,845	54,214
Moist Point 5	19.24	1.936	0.0013	18.7	1.895	0.0012	18.7	1.867	0.0011	18.7	1.899	52,648
Moist Point 6												
Moist Point 7												
Moist Point 8												
Moist Point 9												

Volume of Mold (cf)	0.0333
Volume of Mold (M^3)	0.00094
Weight of Test Sample (lb)	3.573
Mass of Dry Soil (kg)	1,621

0.2730

K Material (Standard)

K Measured Calibration Factor

LL 37
Pl 18
USCS Symbol CL

Test Malerial screened with #4 sieve.

Needle Insertion Methor Pre-drill

Test performed at: 95

% compactive effort @

blows per layer.

Project No.: 01:31153 Depth (ft.): 1 - 6 Sample No.: D3S-193 Date Reported:

> Client: Sample / Source: B-07

Project: Warrenton Data Center

Office / Lab

ECS Mid-Atlantic LLC - Chantilly 026 Thunderbolt Pic

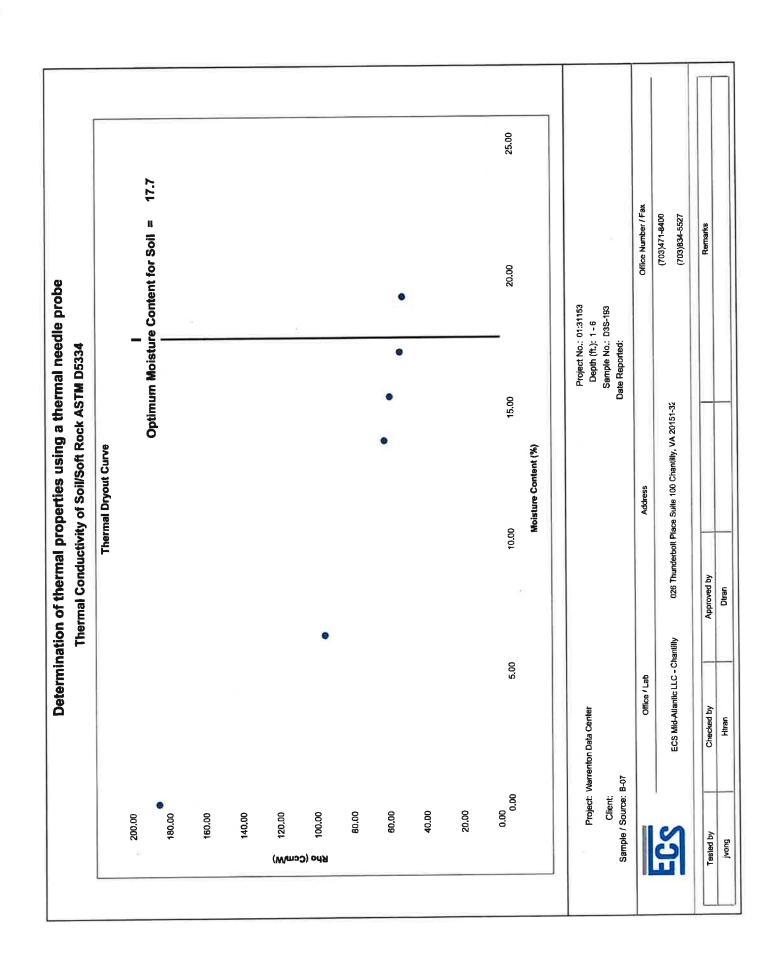
026 Thunderbolt Place Suite 100 Chantilly, VA 20151-32

Address

(703)471-8400 (703)834-5527

Office Number / Fax

Checked by	Approved by	Remarks
Htran	Dtran	



Determination of thermal properties using a thermal needle probe Thermal Conductivity of Soil/Soft Rock ASTM D5334

					Con	Corrected Conductivity	vity				Average	Average
Test Point	Moisture Content %		1st Reading			2nd Reading			3rd Reading		Conductivity	Keelstryity
		K=W/mK	Error Value	Inffial Temp	K=W/mK	Error Value	Initial Temp	K=W/mK	Error Value	Inittal Temp	K=W/mK	Rho≕"C·em/W
Dry Point	0.04	0.494	0.0025	22	0.485	0.0033	22	0.489	0.0050	21.8	0.490	204.274
Moist Point 1	6.58	0.919	0.0026	20.3	0.916	0.0018	20.3	0.895	0.0019	20.5	0.910	109.864
Molst Point 2	09.60	1.332	0.0015	19.6	1.322	0.0015	19.5	1.355	0,0018	19.7	1.337	74.812
Moist Point 3	11.77	1.471	0.0022	18.8	1.481	0.0031	18.9	1.471	0.0022	18.5	1.474	67,835
Moist Point 4	14.23	1.741	0.0018	18,5	1.723	0,0018	18.7	1.731	0.0020	18.6	1.732	57.749
Moist Point 5	16.89	1.837	0.0015	18.8	1.843	0.0015	18.6	1.838	0.0012	18.5	1.839	54.365
Moist Point 6												
Molst Point 7												
Moist Point 8												
Moist Point 9												

K Material (Standard)	0.2730
K Measured	0.2935
Calibration Factor	0.9302

0.0333 0.00094 4.326 1.962 Weight of Test Sample (lb) Mass of Dry Soil (kg) Volume of Mold (M³) Volume of Motd (cf)

14 ₹

USCS Symbol

4

blows per layer.

% compactive effort @

Test Material screened with #4 sleve.

Pre-drill 8

Needle Insertion Methor

Test performed at:

Project No.: 01:31153
Depth (ft.); 1 - 6
Sample No.: D3S-194
Date Reported:

Project: Warrenton Data Center

Sample / Source: B-11 Client:



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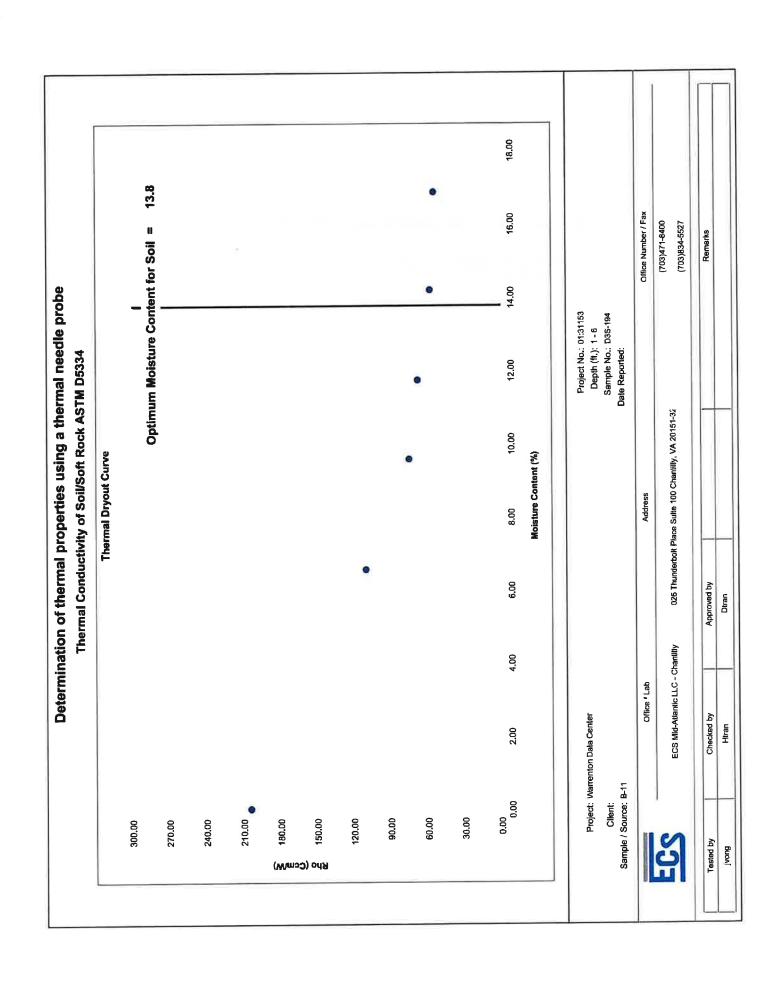
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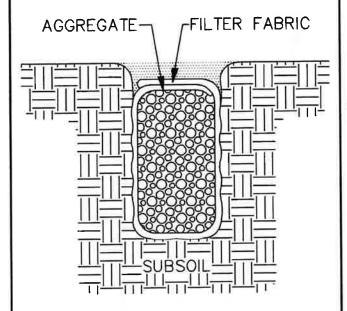
Checked by	Approved by	Кетлагке
Htran	Dtran	



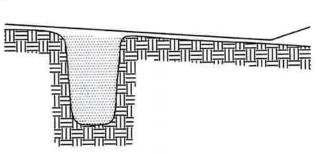
APPENDIX D – Supplemental Report Documents

French Drain Installation Procedure Zone of Influence Diagram

FINAL CONFIGURATION



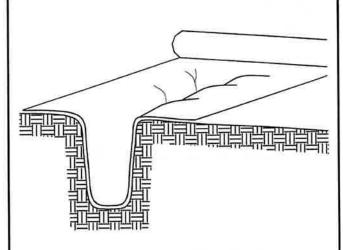
STEP 1



FABRIC IS UNROLLED DIRECTLY OVER TRENCH

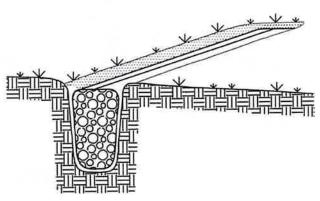
STEP 2

SUBDRAIN USING FILTER FABRIC



THE TRENCH IS FILLED WITH AGGREGATE

STEP 3



THE FABRIC IS LAPPED CLOSED AND COVERED WITH SOIL



9409 Innovation Drive Manassas, Virginia 20110 703-396-6259 Fax 703-396-6298 FRENCH DRAIN © INSTALLATION PROCEDURE

ZONE OF INFLUENCE DIAGRAM

(EXTERIOR WALLS)
NOT TO SCALE

