ADDENDUM ONE
AVONDALE YOUTH AND FAMILY DEVELOPMENT CENTER
SITE IMPROVEMENTS
CONTRACT NO. Y-15-008-203
CITY OF CHATTANOOGA, TENNESSEE

The following changes shall be made to the Contract Documents, Specifications, and Drawings:

I. Pre-Bid Agenda and Attendee List

A. The agenda from the Pre-Bid meeting and sign-in sheet are both included in this Addendum.

II. Geotechnical Report and Soil Management Plan

A. Both documents are attached for reference.

III. Additional Specification

A. Section 0843 is added to the Project Manual for use if a partial retainage release is requested for projects with an escrow account.

IV. Q & A

Q: Are there Prevailing Wages for this project? If so, will you send me a copy of the listing?

A: This project is 100% locally-funded, and thus prevailing wage rates are not enforced.

October 25, 2019

/s/ Justin C. Holland, Administrator
City of Chattanooga
Department of Public Works

AVONDALE YOUTH AND FAMILY DEVELOPMENT SITE IMPROVEMENTS
CONTRACT NUMBER Y-15-008-203
PRE-BID MEETING AGENDA
Thursday October 17, 2019

1. Receipt of Bids – Thursday, November 7 at 2:00 PM @ Chattanooga City Hall, Purchasing Department, Suite G13. 101 E. 11th St.

2. Last day for questions- Friday November 1 at 4:30 p.m.

3. Bidding Requirements- Comply with the requirements described in 00200 Instruction to Bidders

4. Contract and bid forms included in the project manual. Contractor must supply originals of Sections 201-486, and Section 201 must be placed on the outside of the bid envelope.

5. Contract Time- **180 calendar days**

6. Nothing said in this meeting changes any of the Contract Documents. All questions to be submitted in writing; all official responses to be made in writing.

7. Questions shall be submitted in writing using the "Request for Bidder Information" form in the Contract Documents Section 00009-1, and shall be submitted to the City of Chattanooga Purchasing Department.

8. Project consists of:

   The scope of work shall consist of the following operations, including but not limited to: installation and maintenance of appropriate erosion controls in accordance with approved SWPPP, erosion control plans, and as directed by the Engineer; limited demolition of selected portions of the site to permit construction of grading, storm drainage, retaining walls, parking lots, sidewalks and ramps, site lighting, new freestanding center sign, turf athletic field, utility construction for lighting and for a future concessions and restroom facility, site amenities, new fencing and gates in selected locations, new green infrastructure, and completing all final connections for site storm drainage, utilities, and surface transportation. Site irrigation and landscaping also included. All activities to be coordinated with YFD staff and other contractors on site to maintain access to the site and the new YFD Center, and to avoid interference with Center operations or ongoing construction activities. Proper handling and disposal of Special Waste as required. Coordination of construction activities with CDOT and TDOT as necessary for maintaining public safety, transportation connectivity, and minimizing inconvenience to the traveling public. Installing and maintaining construction security fencing to control access to the active construction zones and protection of the traveling public. Constructing and maintaining temporary road and/or sidewalk connections within the site in order to accommodate the Owner's use of the YFD Center, with special attention to providing safe through-site access from Wilson St. to Dodson Ave. for Center participant traffic; these temporary connections may require the Contractor to construct ADA-compliant ramps or other facilities, the cost of which shall be included in the cost of other items.

SIGN-IN SHEET

PROJECT: Y-15-008-203 AVONDALE YFD SITE IMPROVEMENTS

	NAME	COMPANY	PHONE	EMAIL
1	ANDREW HUTSELL	CITY OF CHATT.	423-643-6045	AHUTSELL@CHATTANOOGA.GOV
2	SHELTON WALKER	IST, LLC	270-889-4780	swalker@istcompany.com
3	Aaron Pack	J&J Contractors, Inc.	423-265-3233	aaron@jjcontractors.com
4	MICHAEL McBRAYER	THOMAS BROTHERS	423-508-4888	MIKE@TBCCINC.NET
5	BONNIE MUMPOWER DODSON	COC	643 6037	BMUMPOWER@CHATTANOOGA.GOV
6	DEBBIE TALLEY	COC	643 7230	DTALLEY@CHATTANOOGA.GOV
7	DENNIS MALONE	COC	643 6188	DMALONE@CHATTANOOGA.GOV
8	CEDRIC ALFORD	PARIS CONSTRUCTION	615.482.5900	cf4l4d@gmail.com
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Report of Geotechnical Exploration
Avondale Youth and Family Center
Chattanooga, Tennessee
S&ME Project No. 4181-17-006

Prepared for:

City of Chattanooga – Department of Public Works
1250 Market Street
Chattanooga, Tennessee 37402-2713

Prepared by:

S&ME, Inc.
4291 Highway 58
Chattanooga, Tennessee 37416

February 17, 2017

S&ME

February 17, 2017

City of Chattanooga – Department of Public Works
Division of Engineering Services
1250 Market Street
Chattanooga, Tennessee 37402-2713

Attention: Mr. Dennis Malone

Reference: Report of Geotechnical Exploration
Avondale Youth and Family Center
Chattanooga, Tennessee
S&ME Project No. 4181-17-006

Dear Mr. Malone:

This report presents the results of the geotechnical exploration for the Avondale Youth and Familty Center site in Chattanooga, Tennessee. Our work was performed in general accordance with S&ME Proposal No. 41-1600555R1 dated September 23, 2016.

This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations. S&ME appreciates this opportunity to be of service to you. Please call if you have questions concerning this report or any of our services.

Sincerely,

S&ME, Inc.

DAVID MICHAEL GRASS
No. 114526
4/12/17

David Grass, PE
Project Engineer

James P. McGirl, PE
Principal Engineer

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Appendices

Executive Summary

This summary is presented for the convenience of the reader. The full report text should be studied and understood before preparing an estimation of quantities or preparing designs based on this report, as it contains important information and recommendations that are not included in this brief summary.

1. The geotechnical exploration included drilling and sampling of ten soil test borings. The samples collected during our exploration were returned to our Chattanooga laboratory where they were further evaluated by a professional engineer.
2. Infiltration testing was performed at five locations on the west portion of the site.
3. Natural moisture content and Atterberg limits laboratory tests were performed on selected samples to aid our soil classification and to evaluate the on-site soil's volume change potential.
4. Subsurface conditions generally consisted of either fill or alluvial soils overlying residual soils, or residual soils from the ground surface to auger refusal. The fill soils were typically composed of very soft black and gray clay with trace amounts of foundry sand and brick fragments to depths of approximately 3 ½ to 5 ½ feet below the existing ground surface. Alluvial soils were typically composed of soft to very stiff clays to depths of about 3 to 5 ½ feet. Residual soils were typically composed of soft to hard fat clays with varying amounts of chert and limestone fragments.
5. Auger refusal was encountered in each of the test borings at depths ranging from about 3 ½ to 19 ½ feet below the existing ground surface.
6. Groundwater was not encountered in the test borings at the time of drilling. We do not expect groundwater control will be necessary during construction.
7. The site is adaptable for the proposed construction provided that necessary steps are taken during construction. This includes proper site preparation and construction testing as outlined in this report.
8. Very soft to soft residual and fill soils were encountered near the existing ground surface in several borings. These soils will require undercutting during earthwork or foundation construction. The extent of undercutting will depend on final site grades, foundation bearing elevations, and the time of year of construction. Undercutting will be less if earthwork and foundation construction is performed during the dryer months of the year.
9. The proposed structure may be supported on foundations bearing in stiff or better consistency undisturbed alluvial or residual soils or newly placed and compacted fill. The bearing conditions at each of the foundation excavations should be observed by the geotechnical engineer or his representative. The purpose of these observations is to evaluate whether the bearing conditions are suitable for the design bearing pressure or if remedial measures will be required.
10. Difficult excavation techniques may be required during foundation and utility construction.

1.0 Introduction

S&ME, Inc. has completed the geotechnical exploration at the Avondale Youth and Family Center site in Chattanooga, Tennessee. Our work was performed in general accordance with S&ME Proposal Number 41-1600555R1 dated September 23, 2016. Our services were authorized by Mr. Dennis Malone, PE of the City of Chattanooga on September 27, 2016 by City of Chattanooga Contract No. Y-15-008-301.

The purpose of our work was to explore the subsurface soil conditions and groundwater level, and to provide feasible foundation and site preparation recommendations. This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations relative to the above considerations.

The scope of our geotechnical services did not include an environmental assessment for evaluating the presence or absence of wetlands, or hazardous or toxic materials.

A Site Location Plan and Test Location Plan are included in Appendix I. A discussion of the field investigative procedures, a legend of soil classification and symbols, and the Test Boring Records are included in Appendix II. Appendix III contains a discussion of the laboratory testing procedures and the laboratory test results. Appendix IV contains a copy of the ACI 302.1R-04 Guide for Concrete Floor and Slab Construction and a document titled “Important Information About Your Geotechnical Engineering Report”.

2.0 Site and Project Description

Our understanding of the project is based on our discussions with Mr. Eric Booker and Mr. Andrew Hutsell of the City of Chattanooga. We were also provided schematic diagrams of building options and a site topographic survey by Mr. Chris Dufresne of H+K Architects.

2.1 Site Description

The 7-acre site is located 1305 Dodson Avenue in Chattanooga, Tennessee. A Site Location Plan, Figure 1, showing the general project site location is provided in Appendix I. The site is currently occupied by a recreation center located on the east side of the site and a small concessions building located near the center of the site. The remainder of the site is occupied by two softball fields, a baseball field, two tennis courts and associated asphalt paved driveways and parking lots. The site is relatively flat. The surrounding area is predominately residential developments.

2.2 Project Description

The project will include the construction of a new recreation center. We understand that the proposed building location is the northeast corner of the site. Building specifics relative to size has not been developed. However, we expect the building will be a single story structure that includes a gymnasium. The gymnasium will have a steel frame, while we expect the remainder of the building will have exterior load bearing masonry walls. Structural loading information has not been provided. Based on our experience with similar structures, we estimate maximum column and wall loads of 150 kips and 4 kips per linear foot, respectively. Once loads have been developed by the structural engineer, S&ME, Inc. should be retained to review the design loads and our recommendations. At that time, it may be necessary to modify or amend the recommendations of this report.

Proposed grading information has not been developed. However based on existing grades, we expect minimal grade adjustments (less than 3 feet) will be required to bring the proposed building pad to final grade.

3.0 Regional Geology

Chattanooga, Tennessee is located in the Valley and Ridge Physiographic Province. Elongated ridges that trend in a northeast-southwest direction characterize this province. The ridges are typically formed on highly resistant sandstones and shales, while the valleys and rolling hills are formed on less resistant limestone, dolomite, and shales.

Based on our review of the Geologic Map of Tennessee, dated 1963, bedrock of the lower member of the Chickamauga Group underlies the site. The lower member of the Chickamauga is composed of light gray to gray, fine to coarse grained limestone. An interval of bentonite clay is typically encountered at the soil/rock interface. Residual soils derived from this geology are typically composed of silts and clays with overburden thicknesses less than 15 feet.

Limestone, such as the strata underlying this site, is of great geologic age and has been subject to solution weathering over geologic time. Rainwater falling onto the surface and percolating downward through the soil and into cracks and fissures gradually dissolves the rock, producing insoluble impurities such as chert and clay. Since limestone varies greatly in its resistance to weathering, the soil/bedrock contact may be extremely irregular. More soluble bedrock develops a thicker soil cover and a more irregular bedrock surface with pinnacles and slots, and less soluble bedrock usually develops a thinner soil cover and a less irregular soil-bedrock surface.

These large variations in bedrock depth are greatly enhanced by the presence of fractures, bedding planes, and faults, which provide an increased opportunity for a greater influx of percolating water. The weaknesses may form clay-filled cavities or enlarge into caves and may be connected by a network of passageways. If a cave forms close to the bedrock surface, its roof may collapse and the overlying soils may erode into the cave. Once the weight of the overlying soil exceeds the soil's arching strength, the soil collapses and an open hole or depression may appear at the ground surface. Such a feature is termed a sinkhole.

There is always some risk associated with developing any site underlain by carbonate bedrock. However, the test borings drilled at this site did not encounter open voids or other signs of incipient sinkhole conditions. We have reviewed the USGS quadrangle map for this area. The map does not show a pattern of closed depressions that would indicate past sinkhole activity in near proximity to the site. We also observed successful development in the surrounding area. Therefore, we believe the risk of sinkhole development for this project is no greater than for surrounding successfully developed sites.

4.0 Subsurface Conditions

4.1 Field Exploration Procedures

The procedures used by S&ME, Inc. for field sampling and testing are in general accordance with ASTM procedures and established engineering practice in the State of Tennessee. Appendix II contains brief descriptions of the procedures used in this exploration.

S&ME, Inc. drilled ten soil test borings to obtain subsurface information at the project site. Members of our engineering staff established the actual boring locations in the field by measuring distances and estimating right angles relative to on-site landmarks. Boring elevations were obtained by superimposing boring locations onto the provided topographic site plan and interpolating between contours. Therefore, both the boring locations shown on Figure 2 – Test Location Plan in Appendix I, and the elevations shown on the Test Boring Records in Appendix II, should be considered approximate.

After each boring was completed, we observed the boreholes for the presence of groundwater. The borings were then backfilled with auger cuttings before leaving the site.

Our field representative packaged the soil samples in sealed containers, labeled them for identification, and returned them to the Chattanooga office where a geotechnical engineer further examined them. We visually classified the soils according to the Unified Soil Classification System (ASTM D 2488). The resulting soil descriptions are shown on the Test Boring Records in Appendix II. Samples were then selected for laboratory testing.

4.2 Soil Stratification

The results of our field testing program are summarized in the following paragraphs, and are shown on the Test Boring Records in Appendix II. These records present our interpretation of the subsurface conditions at specific boring locations at the time of our exploration. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied.

SURFACE MATERIALS

Surface material consisting of topsoil was encountered from the ground surface to depths ranging from about 2 to 3 inches in borings B-1, B-3, B-4, B-5, B-6, and B-7. About 2 inches of topsoil was also observed at each infiltration test location. Asphalt and crushed stone was observed to depths ranging from about 9 to 14 inches in borings B-8, B-9, and B-10. Surface material was not countered in boring B-2. This boring was performed in the infield area of a softball field.

FILL

Below the ground cover or from the ground surface, fill was encountered in borings B-9 and B-10 to depths ranging from about 3 ½ to 5 ½ feet. Fill is material that has been transported to its present location by man. The fill was generally composed of gray, black, or dark brown fat clay with small amounts of foundry derived waste and brick fragments. Fill was also observed at infiltration testing locations to depths of about 12 inches. Fill at infiltration test locations consisted of red-brown clays with varying amounts of chert and brick fragments. Standard Penetration Test (SPT) N values in the fill ranged from 1 to 2 blows per foot, indicating a very soft soil consistency. Penetration resistances indicate the fill soils were likely not compacted during placement.

The fill was not penetrated in boring B-9 above the auger refusal depth of about 3 ½ feet. This boring was offset 5 feet east and re-drilled. Auger refusal was encountered at a depth of about 3 feet in this offset boring. In our opinion, the refusal material encountered in boring B-9 and the associated offset boring does not reflect bedrock.

ALLUVIUM

Alluvial soils were encountered in borings B-2, B-3, B-4, and B-7 below the surface materials to depths ranging from about 3 to 5 ½ feet. Alluvial soil is soil that has been transported to its present location by flowing water. The alluvial soils encountered at the site were typically composed of either brown and gray silty clay or red-brown and yellow-brown fat clay. SPT N values in the alluvium ranged from 4 to 22 blows per foot, indicating a soft to very stiff soil consistency.

RESIDUUM

Residual soils were encountered in each of the test borings, except B-9 to auger refusal depths. Residual soil forms from the in-place weathering of the underlying bedrock. The residual soils encountered at the site were typically composed of yellow-brown and gray or red-brown and yellow-brown fat clay with varying amounts of chert and limestone fragments. SPT N values in the residuum ranged from 4 to over 50 blows per foot, indicating a soft to hard soil consistency. Residual soils typically had consistencies in the firm to very stiff range.

AUGER REFUSAL

Auger refusal was encountered in each of the test borings at depths ranging from about 3 ½ to 19 ½ feet below the existing ground surface.

4.3 Water Levels

The boreholes were observed for the presence of groundwater at the termination of boring. Groundwater was not observed in the borings. We backfilled the boreholes shortly after completion due to safety concerns, and therefore delayed groundwater level measurements were not obtained. It should be noted that groundwater levels can fluctuate with seasonal, climatic, and environmental changes. Further, groundwater may be encountered within the reach of our test borings at some future time.

5.0 Infiltration Testing

5.1 Field Procedures

Infiltration tests were performed at five locations as shown on Figure 2 – Test Location Plan. Infiltration tests were located in the field by measuring distances and estimating right angles relative to on-site landmarks. Infiltration testing was performed in accordance with the Chattanooga Rainwater Management Guide, Revision 1, dated November 21, 2012. A 6 to 8 inch diameter hole was excavated to a depth of about 1 to 1 ½ feet at each location using a hand auger and post hole digger. The sides and bottoms of the excavated holes were scarified with a sharp instrument and then filled with a minimum depth of 6 inches of water. The holes were allowed to presoak for 2 hours. The infiltration testing started immediately following the 2 hour presoak period.

After the presoak period, a member of our professional staff filled each of the infiltration tests holes with water to a minimum depth of 6 inches above the bottom of each hole. A nail was placed in the side of each hole and was used as fixed reference point for the depth to water. The drop in water level below this depth was measured after 30 minutes in each hole. Water was then added to each hole to raise the water level to the starting depth. This procedure was repeated every 30 minutes for 4 hours.

5.2 Test Results

The infiltration test results are summarized in the below table.

Location	Infiltration Rate (inches / hour)
I-1	2
I-2	1 ½
I-3	2 ½
I-4	2
I-5	½

6.0 Laboratory Testing

Laboratory tests were performed on representative split-spoon samples obtained during the field exploration phase of this project. We conducted moisture content and Atterberg limits tests on selected samples to aid our soil classification and to evaluate the relative volume change potential of on-site soils. The resulting soil descriptions are shown on the Test Boring Records in Appendix II. The laboratory test results and a brief description of the laboratory test procedures are presented in Appendix III.

7.0 Assessment

On the basis of this geotechnical exploration, we conclude that this site is adaptable, for the proposed construction. In order to develop and adapt this site, a few items should be addressed during the planning, design, and construction phases of the project.

Prior to construction, several buildings will be demolished. Demolition should include the removal of all concrete slabs and shallow foundations. Basements or subsurface vaults should be excavated and backfilled as described in Section 9.1 of this report. Abandoned utilities should be removed from the construction area and backfilled with structural fill. Active utilities should be re-routed around proposed building pad areas.

Site preparation should include stripping the topsoil from the construction area. Topsoil should be either removed from the site or stockpiled for use in landscape areas. Asphalt and gravel should also be stripped from the construction area. However, the contractor may elect to leave the pavement in place for use as working surface, site access roads, or lay down areas during building construction. The pavement should then be removed prior to driveway and parking lot construction.

Prior to receiving fill and once grade is achieved in cut areas, the subgrade should be thoroughly proofrolled after the completion of demolition and stripping. Proofrolling should be performed using a fully loaded tandem axle dump truck or a similar piece of equipment. Areas deflecting under the weight of the proofroll should be undercut to suitable soil as recommended by the geotechnical engineer. Areas where undercutting is performed should be backfilled as specified in Section 9.3 of this report. We expect soft residual soils encountered in the northeast corner of the site will require undercutting to a depth of about 3 feet if these soils are below final site grades. Further, we expect undercutting of fill soils will be required on the southwest portion of the site. The extent and depth of undercutting required should be determined at the time of construction. Performing earthwork activities during the dryer months of the year will reduce the amount of undercutting required during earthwork.

The proposed structure may be supported on conventional shallow foundations bearing in stiff or better consistency, undisturbed alluvial or residual soils or in newly placed and compacted structural fill. Shallow foundations may be proportioned for maximum allowable bearing pressures of 2,500 pounds per square foot (psf), or less. Depending on final bearing elevations and building locations, we expect that a limited amount of undercutting of soft residual soils will be necessary during foundation construction. Foundation excavations should be observed by the geotechnical engineer or his representative prior to placing concrete. Floor slabs for the new structure may be supported on structural fill or residual soils.

Difficult excavation techniques may be required during foundation construction, and will likely be required during utility construction.

8.0 Design Recommendations

8.1 Limitations of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based on applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

The analyses and recommendations submitted herein are based, in part, on the data obtained from the subsurface exploration. The nature and the extent of variations between the widely-spaced borings will not become evident until the time of construction. If variations appear evident, then we will re-evaluate the recommendations of this report. In the event any changes in the nature, overall design, or location of the building or parking areas are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions verified or modified in writing.

We recommend S&ME be provided the opportunity to review the final design plans and specifications in order that earthwork and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME, Inc.'s observation and monitoring of grading and construction activities.

8.2 Foundations

The subsurface exploration revealed that the subsurface soil conditions at the probable bearing depths are suitable to support the estimated maximum loads using spread footings. Spread footings for the building will bear on either alluvial or residual soils or newly placed and compacted soil fill. Based on our analysis, spread footings bearing on compacted soil fill or residual soil may be designed using an allowable soil bearing pressure of 2,500 psf.

Near surface soft residual soils were encountered in the northeast portion of the proposed building area. Foundations should bear below this material if this material is not undercut and replaced during the earthwork portion of construction. This may require about one third of the building's foundations to be undercut 1 to 2 feet depending on design bearing elevations. The project budget should include a contingency for undercutting foundations.

Although computed footing dimensions may be less, we recommend that continuous footings be a minimum of 18 inches wide and isolated spread footings be a minimum of 36 inches wide to reduce the possibility of a localized punching shear failure. Exterior foundations should be constructed a minimum of 30 inches below subgrade, the seasonal moisture variation depth associated with soil volume change due to fat clay soils. Interior foundations can be constructed at a minimum of 18 inches below subgrade. Constructing the foundations at these depths also provides adequate confinement and protection against frost penetration.

Foundation excavations should be backfilled with concrete the same day they are opened. Footings should be poured "neat" to the excavation so that water cannot collect behind forms before backfilling. If soils exposed in the foundation excavations experience moisture variations prior to concrete placement, the affected bearing materials should be undercut as recommended by our geotechnical engineer. A 2- to 3-inch thick mud-mat of lean concrete may be used to protect the exposed support materials if the excavations cannot be backfilled with concrete the same day they are opened.

The recommendations in this report are contingent on S&ME observing and evaluating the foundation excavations prior to placing concrete. Foundation subgrade observations should be performed by the geotechnical engineer, or his qualified representative, in order to confirm the recommendations provided in this report are consistent with the site conditions encountered. A Dynamic Cone Penetrometer (DCP) should be utilized to provide information that is compared to the data obtained in the geotechnical report. If unacceptable materials are encountered, the material should be excavated to stiff or better soils or remediated as recommended by the geotechnical engineer.

Undercut foundation excavations should be backfilled using either soil fill compacted to at least 95 percent of the standard Proctor (ASTM D 698) maximum dry density or a suitable material recommended by the geotechnical engineer. The foundation subgrade should be relatively level or suitably benched and free of loose soil or rock at the time of our observations.

8.3 Floor Slabs

The floor slab-on-grade should be supported on compacted select fill material. Prior to placement of the aggregate base, the exposed surface should be observed and, if necessary, proofrolled with a loaded, tandem-axle, dump truck, or rubber-tired construction equipment approved by the geotechnical engineer. Proofrolling should be observed by the geotechnical engineer. Areas that pump, rut, or deflect excessively under the loads of the proofroll should be undercut to suitable soils and replaced with compacted structural fill or crushed stone. A stiff subgrade is essential to good floor slab performance.

A four-inch thick (minimum) granular leveling course, preferably graded aggregate base, should be placed between the floor slab and subgrade. The granular layer will promote curing and help distribute concentrated floor slab loads as well as add uniformity and serve as a capillary barrier. The use of a vapor barrier should meet ACI 302 guidelines. We have included these guidelines in Appendix IV. Expansion/contraction and construction joints should be used to isolate the floor slab from load bearing walls and/or isolated columns and should conform to ACI guidelines.

To protect the subgrade from drying or excessive wetting, we recommend protecting the subgrade before concrete is placed. Protection of the subgrade can be achieved by leaving the floor subgrade several inches above grade, and then making the final cut to subgrade shortly before floor construction.

The soil subgrade for the slabs should be crowned and sloped to drain toward the perimeter of the building. Positive site surface drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slab and pavement areas. Surface drainage should be collected and discharged such that the water is not permitted to infiltrate the backfill and floor slab.

8.4 Groundwater

Groundwater was not encountered in the soil test borings during our drilling activities. Therefore, we do not anticipate that groundwater control will be necessary during construction.

8.5 Seismic Site Classification (IBC 2012)

According to the 2012 International Building Code (IBC), the seismic coefficients are determined based on the site class definitions shown on Table 20.3-1 of ASCE 7-10, Minimum Design Loads for Buildings and Other Structures. The soil profile present at the site has been evaluated for a seismic design classification utilizing standard penetration resistance (N-value) information in general accordance with the IBC 2012 and Chapter 20 of ASCE 7-10. Based on the results of our exploration and the geology of the area, we recommend a Site Class of D be used for the design of the proposed buildings. The IBC contains a provision for assessing the use of site specific values, provided a site specific assessment is conducted. S&ME can provide these services, if requested.

8.6 Pavement Design and Construction

When designing pavements, proposed single- and tandem-axle loads are converted to an equivalent number of 18-kip single-axle loads using published conversion factors. The converted loads are known as equivalent single axle loadings (ESAL's). We have not been provided information relative to anticipated traffic loadings. Therefore, we have estimated the following ESAL's:

Standard duty pavement: Total 18 kip ESAL = 25,000
Heavy duty pavement: Total 18 kip ESAL = 75,000

For comparison purposes, an ESAL of 25,000 is typically used to design pavements for a small office building with no truck traffic, and an ESAL of 75,000 is typically used to design pavements for a small strip shopping center delivery lane. If these estimated loadings are not correct, we recommend S&ME be retained to re-evaluate the pavement sections once traffic loading information has been developed for this project. Variations in the traffic loading can significantly impact pavement performance as well as its service life.

Along with traffic loadings, the strength of the soil subgrade is also required when designing pavements. Soil subgrade strength is typically expressed in terms of a California Bearing Ratio (CBR) for flexible pavements. CBR testing of the subgrade soils was beyond the scope of our authorized services. Therefore, based on our experience in the area, and assuming the parking areas are prepared in accordance with our recommendations, we have estimated a CBR value of 3 for flexible pavement design. To achieve this CBR value, we recommend that the top 12 inches of the existing soils be scarified and re-compacted prior to proofrolling as described in Section 9.1 of this report.

FLEXIBLE PAVEMENTS

Our thickness designs for flexible pavements were performed in general accordance with American Association of State Highway and Transportation Officials (AASHTO) procedures. Based on the previously listed CBR and ESAL values, we recommend the following flexible pavement section over a subgrade prepared in accordance with our previously described site preparation recommendations:

Flexible Pavement Type	**Pavement Component**		
	Asphaltic Concrete Surface (inches)	**Asphaltic Concrete Base (inches)**	**Open-Graded Crushed Stone (inches)**
Standard duty, 20 year design life	**1**	**2**	**6**
Heavy duty, 20 year design life	**1**	**2**	**8**

We recommend the asphaltic concrete conform to the current "Standard Specification for Road and Bridge Construction," published January 1, 2015 by the Tennessee Department of Transportation. The surface course mix design should comply with Section 411, Grading D or E, with aggregate gradation per Section 903.11, Grading E. The asphaltic concrete base course should conform to Section 307, Grading B, with aggregate gradation per Section 903.06, Grading B. The crushed stone gradation should comply with Section 903.05B, and should be placed and compacted in accordance with Sections 407 and 303.

Because severe flexible pavement distress is often experienced in the vicinity of trash dumpsters, turn and braking areas, or loading docks, we recommend that the owner consider the construction of concrete pads or drives at such locations to limit pavement distress. Also, using concrete in entrances and exits should be considered. We recommend that dumpster bins be placed on a concrete pad that is long enough to support both the bin and dumpster truck. Otherwise, a punching shear failure of the pavement and subgrade will likely develop in front of the dumpster bins due to the high stresses generated by the dumpster trucks during waste transfer.

GENERAL PAVEMENT RECOMMENDATIONS

Experience has shown that most asphalt pavement failures are caused by localized soft spots in the subgrade or inadequate drainage. Proofrolling, as discussed earlier, should be performed prior to asphalt placement to detect soft spots in the subgrade. The civil design must include proper drainage to reduce softening of the subgrade, frost damage, heaving, soil migration, and pumping failures. The pavement surface and subgrade should have a minimum slope of 2 percent. Water infiltrating the dense graded aggregate base should be directed to drain into catch basins (through weep holes), out-slope areas, or drainage trenches. It may also be advisable to construct a concrete pad around interior catch basins to accommodate the problems associated with the frequent saturation of the pavement system in low areas.

Poor soil subgrade preparation and inadequate or improper soil subgrade drainage can result in pavement failure. We recommend the upper 24 inches of fill beneath pavements be compacted to 100 percent of the standard Proctor maximum dry density. The fill soils should be compacted 1 to 2 percent dry of the optimum moisture content to achieve a higher CBR or subgrade modulus value. A representative of S&ME should test the moisture content and density of each lift before additional lifts are placed.

We recommend the subgrade be proofrolled just before placement of the base course to detect poorly compacted material or soft areas that may have been created during construction. Also, if the prepared base course is rained on or is left in place for an extended period of time prior to asphaltic concrete placement, we recommend additional proofrolling prior to asphaltic concrete placement.

Maintenance is essential to good long-term performance of asphalt pavements. Any distressed areas should be promptly repaired to prevent the failure from spreading due to loading and water infiltration. Cracks and joints should be sealed annually. Additionally, a seal should be applied in the second or third year of service for the asphalt pavements. The seal will retard the asphalt from becoming brittle and seal small cracks that cannot be repaired otherwise.

9.0 Construction Considerations

9.1 Site Preparation

DEMOLITION

We expect a number of existing structures will be demolished prior to construction. This work should include the removal of all existing grade slabs and shallow foundations. Existing basements should be excavated with 4H:1V side slopes where they occur under future building areas. Existing basements and other such areas should be backfilled with properly compacted fill. Abandoned utilities should be removed and replaced with compacted fill. Active utilities should be relocated outside of the construction area. If pipes are not removed from beneath the proposed construction, they may serve as conduits for subsurface erosion that could result in the formation of voids or depressions, with adverse effects on the foundations and floor slabs.

STRIPPING AND UNDERCUTTING

After completion of demolition, asphalt, gravel, and topsoil should be stripped from the construction area and disposed of off-site. The depth of the topsoil encountered in the borings ranged from about2 to 3 inches. Pavement materials were measured to be about 9 to 14 inches thick.

Based on the test boring data, we expect undercutting of very soft existing fill soils may be necessary in the southern parking lot and soft to firm residual soils in the proposed building pad area. The need for undercutting should be determined at the time of construction based on proofrolling as described below.

GENERAL

After completion of stripping in areas to receive fill, and once grade is achieved in cut areas, we recommend proofrolling the exposed surface of the subgrade soils. The purpose of proofrolling is to locate pockets of soft or unstable soils. Proofrolling should be performed using a fully loaded dump truck or other heavy equipment approved by our geotechnical engineer. The proofrolling operation should traffic the site with parallel passes of the vehicle starting at one side of the site and continuing to the other. Each pass should overlap the preceding pass to ensure complete coverage.

An engineer from S&ME should be present to observe the proofrolling operations and to provide recommendations should unstable soils be encountered. In general, unstable materials in the building areas should be undercut until stable materials are exposed. Unstable materials in parking and drive areas should generally be undercut to stable materials or a maximum of 3 feet below planned grade, at which time our geotechnical engineer should evaluate options other than additional undercutting (e.g. bridging). Backfill should consist of compacted soil as described in Section 9.3 of this report. After proofrolling and prior to placing fill on the site, the upper surface soils should be scarified and properly compacted.

Subgrade repair can be expected to be more extensive if grading operations are performed during wet periods of the year. The onsite soils are moisture sensitive and will be softened by rubber-tired construction traffic when wet. Once areas that need remediation have been repaired, the site may be brought to grade with structural fill. Depending on climatic conditions and the speed of contractor activities during the grading phase of this project, proofrolling may be required on multiple occasions.

9.2 Soil Plasticity

Soils with a plasticity index (PI) of less than 30 are generally considered slightly susceptible to volume changes while soils with PIs greater than 50 are generally considered to be highly susceptible to volume changes. Soils with PIs between 30 and 50 are generally considered to be moderately susceptible to volume changes. The soil we tested from this site falls in the moderately susceptible range, with a PI of 44.

Soil volume changes in East Tennessee are generally not as severe as in other areas because lengthy periods of continuously wet or continuously dry weather do not usually occur. However, during periods of dry weather, it is not uncommon for significant drying of soils to occur. If these soils become saturated after foundation or grade slab construction is completed, there is the possibility of structural distress associated with swelling soils. Likewise, should the foundation bearing soils dry substantially after construction, there is the possibility of structural distress associated with soil shrinkage. Therefore, the following construction precautions are recommended for sites where moderately to highly susceptible soils are found:

- Surface water should not be allowed to pond or saturate soils during or after construction;
- High plasticity clays should not be used for backfill materials;
- Floor slab and pavement subgrades should not be allowed to become excessively wet or dry prior to floor slab or pavement construction;
- Exterior building foundations should bear 30 inches below grade, the seasonal moisture variation depth;
- Foundation concrete should be poured the same day the foundation excavation is made;
- Discharge from roof drains should be channeled well away from foundations;
- Foundation soils should be isolated from heat sources to prevent drying of the foundation soils; and,
- Plantings with high water demands should not be planted near foundations.

9.3 Fill Placement

MATERIALS

Fill soils should consist of low to moderately plastic clay or silt with a plasticity index of less than thirty (PI<30) and a standard Proctor maximum dry density greater than 95 pounds per cubic foot. The fill should contain no rock fragments larger than 4 inches in any dimension, and no organic matter.

Soil fill operations should not begin until representative samples of proposed fill soils are collected and tested. The test results will be used to assess whether the proposed fill material meets the previously discussed plasticity and density criteria, and for quality control during grading. Please allow at least 3 to 5 days for testing before the fill operations begin.

COMPACTION

Fill should be placed in thin lifts with a maximum loose thickness of 8 inches, then compacted to 95 percent of the standard Proctor maximum dry density, with a moisture content within 3 percent of the optimum moisture content, depending on the shape of the Proctor curve. Wetting or drying of these soils may be required, depending on the time of year site grading is performed. We recommend the top one foot below grade supported slabs, and the top 2 feet beneath pavements be compacted to 100 percent standard Proctor compaction. The edge of the compacted fill should extend at least 10 feet beyond the outside building edge, and at least 5 feet beyond the outside edge of pavements before sloping. A representative of S&ME should test the density and moisture content of each lift before placing additional lifts.

In confined areas such as utility trenches, portable compaction equipment and thin lifts of 3 to 4 inches may be required to achieve specified degrees of compaction.

We recommend that fill placements be observed by one of S&ME's qualified soils technicians on a full time basis. Frequent fill density and moisture tests should be performed to evaluate that the specified degree of compaction is being achieved. However, the actual testing frequency should be determined by the geotechnical engineer based on the type of soil being placed, the equipment being used, and the time of year the fill is being placed. More frequent testing should be performed in confined areas. Any areas that do not meet the compaction specification should be re-compacted to achieve compliance.

9.4 Drainage and Runoff Concerns

In the Tennessee Valley Region, frequent and sometimes substantial rainfalls occur from November through May. These rainy months can greatly influence the cost and schedule of construction projects, particularly earthwork and work in confined excavations. The moderate plasticity clay soils present at the site will be difficult to work in periods of wet weather. Construction traffic repeatedly crossing exposed wet soil subgrades can damage the subgrades to the point that over-excavation may be required.

The contractor should be prepared to provide adequate methods to control the infiltration of surface water into open excavations. We recommend subgrades be sufficiently sloped to provide rapid drainage. Water that collects in excavations should be removed as soon as possible to prevent softening the subgrade soils.

Maintenance of the exposed subgrade surface will be important to achieve moisture control and to prevent softening of the surface soils due to rainwater infiltration. We recommend keeping the ground surface free from depressions or ruts that would hold water, and sealing the surface using rubber tired equipment to reduce water infiltration.

9.5 Difficult Excavation

Based on the boring data obtained during the exploration, we expect material requiring difficult excavation techniques may be encountered during foundation and utility construction. In confined excavations such as foundations, utility trenches, etc., removal of weathered rock typically requires the use of large backhoes, pneumatic spades, or blasting. The difficulty of excavation will depend on the composition of the rock, the location and orientation of discontinuities and bedding, and the skill of the equipment operator.

Mass rock removal will require blasting. Since the blasting will take place close to existing buildings, the Tennessee Blasting Regulations should be consulted for guidance. A pre-blast survey of the existing structures should be conducted and the blasts monitored to determine maximum particle velocities.

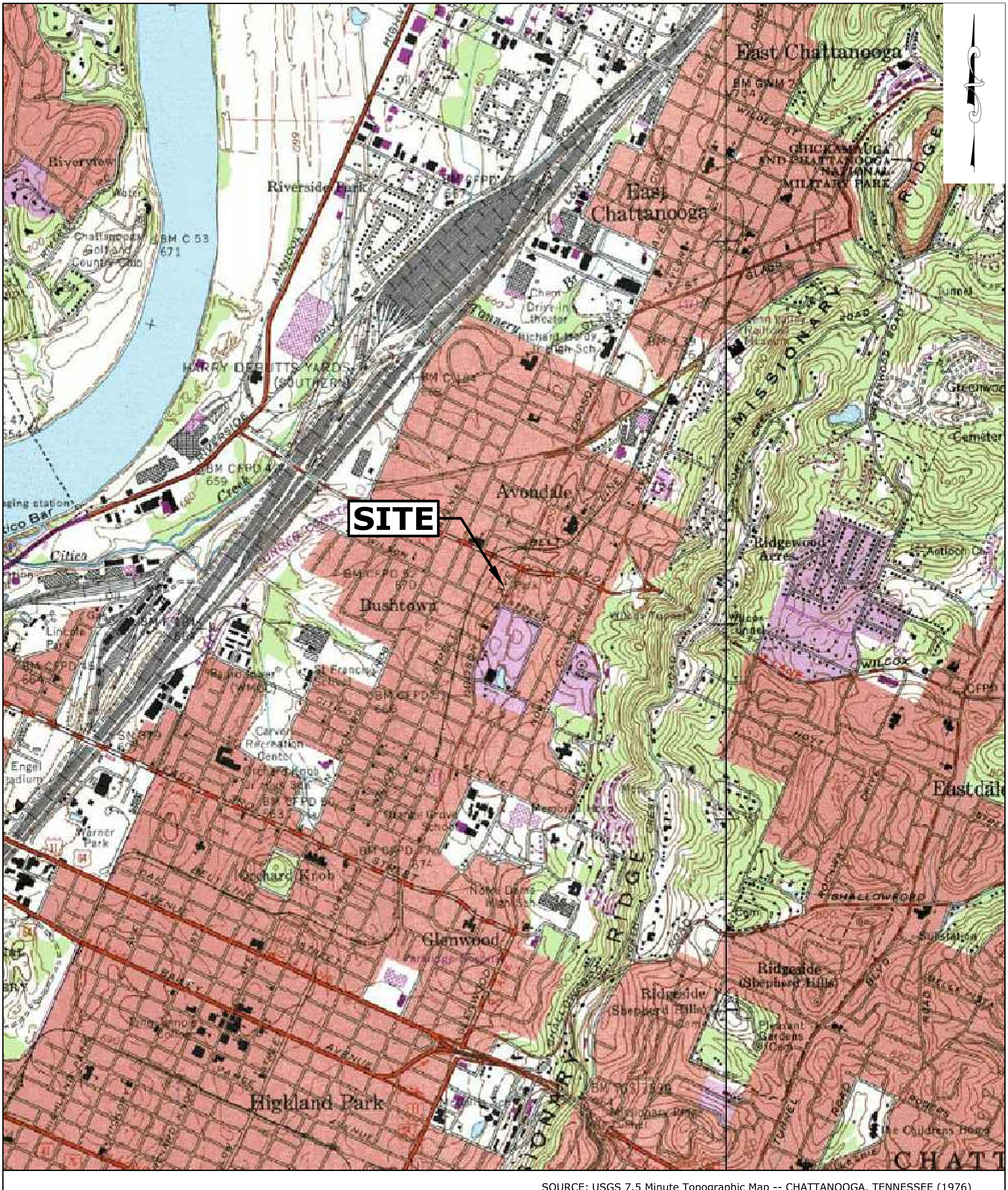
10.0 Follow-Up Services

Our services should not end with the submission of this geotechnical report. S&ME should be kept involved throughout the design and construction process to maintain continuity and to determine if our recommendations are properly interpreted and implemented. To achieve this, we should review project plans and specifications with the designers to see that our recommendations are fully incorporated and have not been misinterpreted. We also should be retained by the owner to monitor and test the site preparation and foundation construction. S&ME's familiarity with the site and foundation recommendations makes us a valuable part of your construction quality assurance team. Our personnel are uniquely qualified to recognize unanticipated ground conditions and can offer responsive remedial recommendations should these unanticipated conditions occur.

Appendix I -

Figure 1 - Site Location Plan

Figure 2 - Test Location Plan



SOURCE: USGS 7.5 Minute Topographic Map -- CHATTANOOGA, TENNESSEE (1976)
DRAWING FOR ILLUSTRATION PURPOSES ONLY

S&ME

SITE LOCATION PLAN

AVONDALE YOUTH AND FAMILY CENTER
CHATTANOOGA, TENNESSEE

JOB NUMBER:	4181-17-006	**APPROXIMATE SCALE:**	1"=2000'
DRAWN BY:	JLN	**CHECKED BY:**	DMG
DATE:	2/16/2017	**FIGURE:**	1

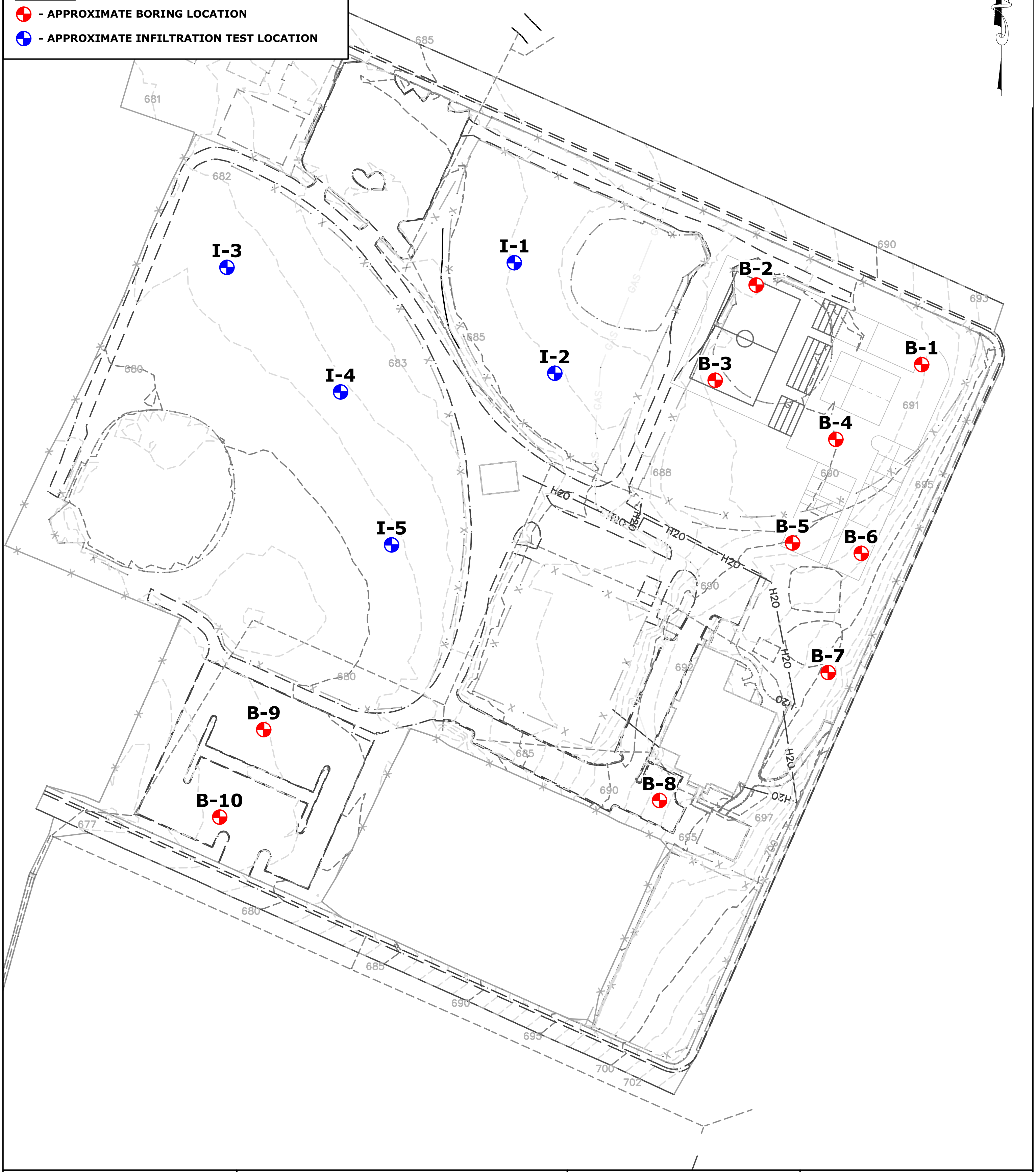
NOTES:

- DRAWING FOR ILLUSTRATIVE PURPOSES ONLY
- BASE IMAGE PROVIDED BY H+K ARCHITECTS

LEGEND:

🔴 - APPROXIMATE BORING LOCATION

🔵 - APPROXIMATE INFILTRATION TEST LOCATION



S&ME

TESTING LOCATION PLAN

AVONDALE YOUTH AND FAMILY CENTER
CHATTANOOGA, TENNESSEE

JOB NUMBER:	4181-17-006	**APPROXIMATE SCALE:**	1"=100'
DRAWN BY:	JLN	**CHECKED BY:**	DMG
DATE:	2/16/2017	**FIGURE:**	2

Appendix II

Field Exploration Procedures

Test Boring Record Legend

Test Boring Records

HOLLOW STEM AUGERING PROCEDURES
WITH STANDARD PENETRATION RESISTANCE TESTING
ASTM D 1586

The borings were advanced using auger drilling techniques. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2.0-inch O.D., split-tube sampler. The sampler was initially seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is the standard penetration resistance. Standard penetration resistance, when properly evaluated, is an index to the soil's strength and density. The criteria used during this exploration are presented on the Test Boring Record Legend.

Representative portions of the soil samples, thus obtained, were placed in sealed containers and transported to the laboratory. The engineer selected samples for laboratory testing. The Test Boring Records in this Appendix provide the soil descriptions and penetration resistances.

Soil drilling and sampling equipment may not be capable of penetrating hard cemented soils, thin rock seams, large boulders, waste materials, weathered rock, or sound continuous rock. Refusal is the term applied to materials that cannot be penetrated with soil drilling equipment or where the standard penetration resistance exceeds 100 blows per foot. Core drilling is needed to determine the character and continuity of the refusal materials.

TEST BORING/PIT RECORD LEGEND

FINE AND COARSE GRAINED SOIL INFORMATION

COARSE GRAINED SOILS (SANDS & GRAVELS)

N	Relative Density
0-4	Very Loose
5-10	Loose
11-20	Firm
21-30	Very Firm
31-50	Dense
Over 50	Very Dense

FINE GRAINED SOILS (SILTS & CLAYS)

N	Consistency	Qu, KSF Estimated
0-1	Very Soft	0-0.5
2-4	Soft	0.5-1
5-8	Firm	1-2
9-15	Stiff	2-4
16-30	Very Stiff	4-8
Over 31	Hard	8+

PARTICLE SIZE

Boulders	Greater than 300 mm (12 in)
Cobbles	75 mm to 300 mm (3 to 12 in)
Gravel	4.74 mm to 75 mm (3/16 to 3 in)
Coarse Sand	2 mm to 4.75 mm
Medium Sand	0.425 mm to 2 mm
Fine Sand	0.075 mm to 0.425 mm
Silts & Clays	Less than 0.075 mm

The **STANDARD PENETRATION TEST** as defined by ASTM D 1586 is a method to obtain a disturbed soil sample for examination and testing and to obtain relative density and consistency information. A standard 1.4-inch I.D./2-inch O.D. split-barrel sampler is driven three 6-inch increments with a 140 lb. hammer falling 30 inches. The hammer can either be of a trip, free-fall design, or actuated by a rope and cathead. The blow counts required to drive the sampler the final two increments are added together and designate the N-value defined in the above tables.

ROCK PROPERTIES

ROCK QUALITY DESIGNATION (RQD)

Percent RQD	Quality
0-25	Very Poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

ROCK HARDNESS

Very Hard:	Rock can be broken by heavy hammer blows
Hard:	Rock cannot be broken by thumb pressure, but can be broken by moderate hammer blows.
Moderately Hard:	Small pieces can be broken off along sharp edges by considerable hard thumb pressure; can be broken with light hammer blows.
Soft:	Rock is coherent but breaks very easily with thumb pressure at sharp edges and crumbles with firm hand pressure.
Very Soft:	Rock disintegrates or easily compresses when touched; can be hard to very hard soil.

$$\text{RQD} = \frac{\text{Sum of 4 in. and longer Rock Pieces Recovered}}{\text{Length of Core Run}} \text{ X100}$$

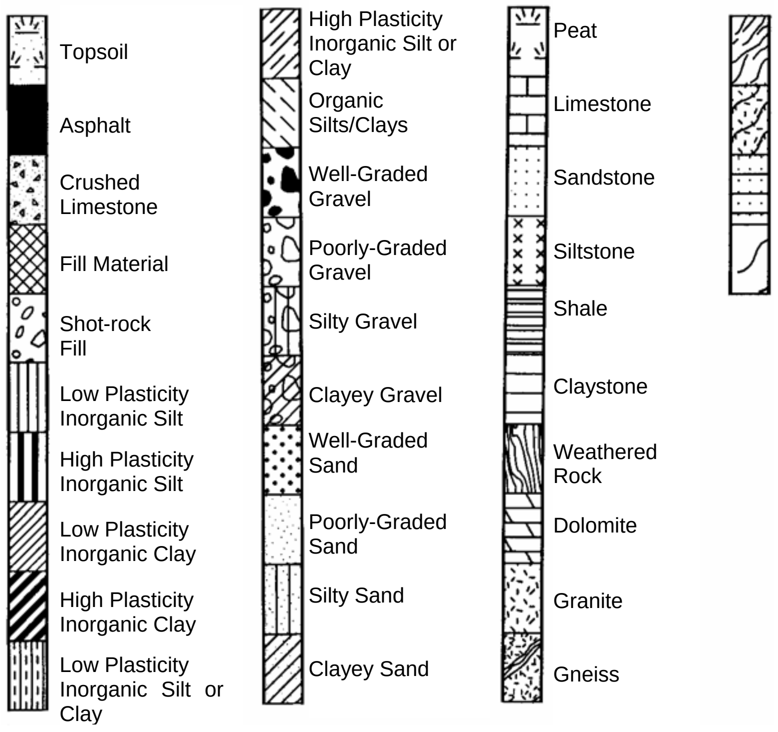
$$\text{Recovery} = \frac{\text{Length of Rock Core Recovered}}{\text{Length of Core Run}} \text{ X100}$$

43 RQD
NQ
63 REC

Core Diameter	Inches
BQ	1-7/16
NQ	1-7/8
HQ	2-1/2

SYMBOLS

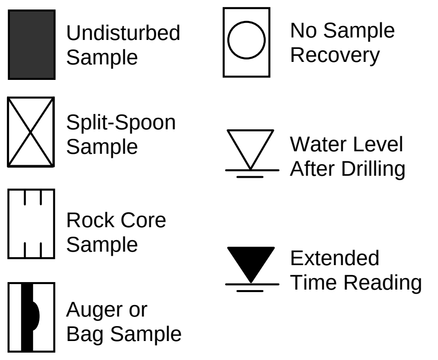
KEY TO MATERIAL TYPES



SOIL PROPERTY SYMBOLS

N:	Standard Penetration, BPF
M:	Moisture Content, %
LL:	Liquid Limit, %
PI:	Plasticity Index, %
Qp:	Pocket Penetrometer Value, TSF
Qu:	Unconfined Compressive Strength Estimated Qu, TSF
γ_D:	Dry Unit Weight, PCF
F:	Fines Content

SAMPLING SYMBOLS



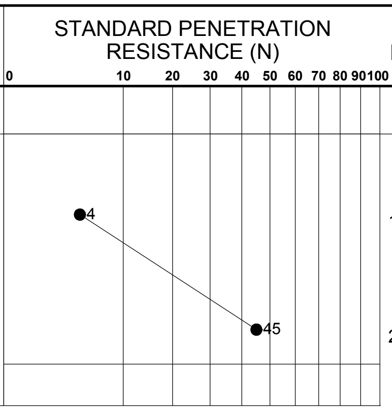
4291 Highway 58
Chattanooga, Tennessee 37416

TEST BORING RECORD

BORING NO.: B-1

PROJECT: Avondale Youth and Family Center
JOB NO: 4181-17-006
SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee
NORTH: 262633
EAST: 2189660
ELEVATION: 691 feet ±
BORING STARTED: 2/2/2017
RIG TYPE: Geoprobe
BORING DIA. (IN): 3.25
DRILLING METHOD: Hollow-Stem Augers
BORING COMPLETED: 2/2/2017
HAMMER: Automatic
GROUNDWATER:
Dry ATD
Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	M	PI	BLOWS/6"
	691.0	0							
	690.8	0.17'	TOPSOIL - 2 inches						
			CLAY (CH) with chert fragments, yellow-brown, moist, soft (RESIDUUM)						1 - 2 - 2 **(4)**
	688.0	3'	CLAY (CH) with limestone fragments, yellow-brown, hard						21 - 20 - 25 **(45)**
		5							
	685.1		*Auger refusal at 5.9 feet, boring terminated*						
		10							
		15							
		20							
		25							



Project Manager: D. Grass, PE

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Chattanooga, Tennessee 37416

TEST BORING RECORD

BORING NO.: B-2

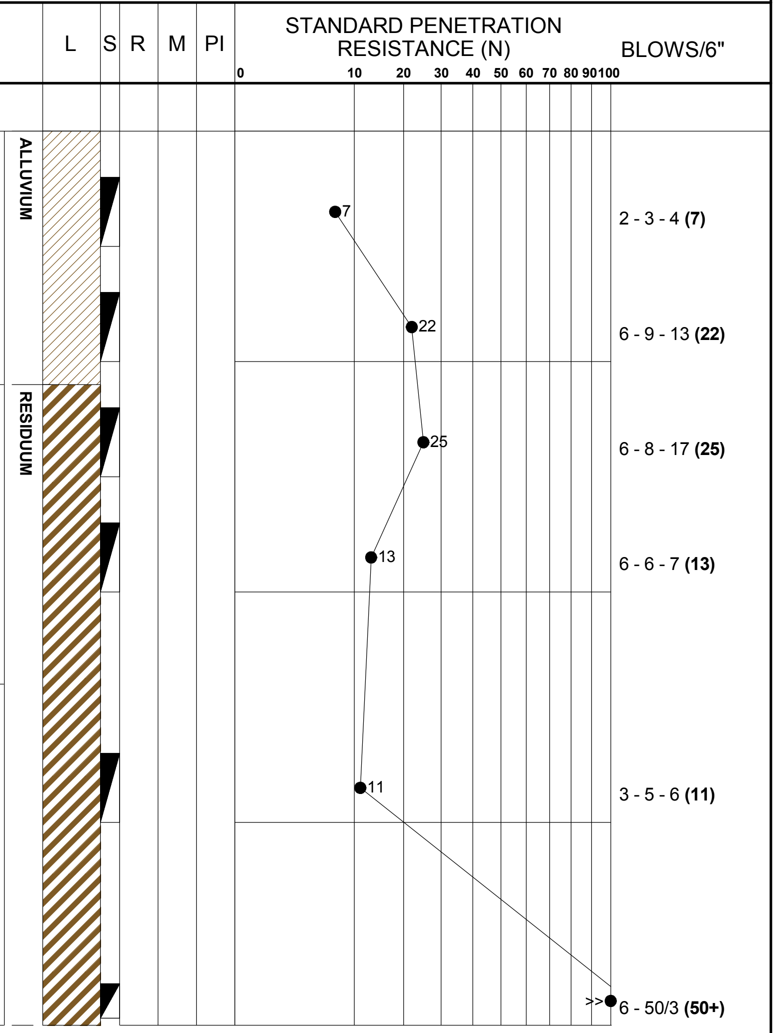
PROJECT: Avondale Youth and Family Center	JOB NO: 4181-17-006	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 262694	EAST: 2189532

ELEVATION: 690 feet ±	BORING STARTED: 2/2/2017	RIG TYPE: Geoprobe	BORING DIA. (IN): 3.25
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 2/2/2017	HAMMER: Automatic	

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION
	690.0	0	SILTY CLAY (CL), brown and gray, firm to very stiff
	684.5	5.5'	CLAY (CH) with chert fragments, brown and yellow-brown, very stiff to stiff
	678.0	12'	CLAY (CH), yellow-brown and gray, stiff to hard
	670.6		*Auger refusal at 19.4 feet, boring terminated*



BLOWS/6"
2 - 3 - 4 **(7)**
6 - 9 - 13 **(22)**
6 - 8 - 17 **(25)**
6 - 6 - 7 **(13)**
3 - 5 - 6 **(11)**
6 - 50/3 **(50+)**

Project Manager: D. Grass, PE

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Chattanooga, Tennessee 37416

TEST BORING RECORD

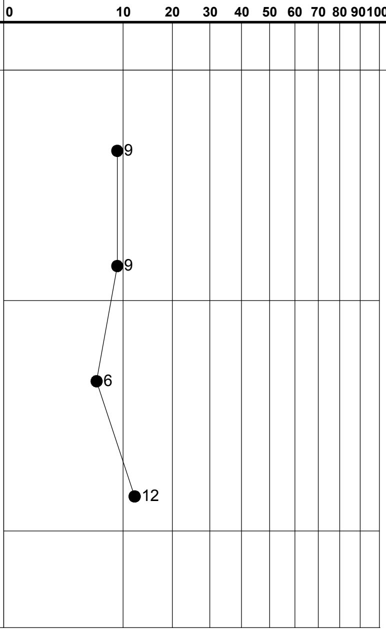
BORING NO.: B-3

PROJECT: Avondale Youth and Family Center
JOB NO: 4181-17-006
SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee
NORTH: 262621
EAST: 2189501
ELEVATION: 690 feet ±
BORING STARTED: 2/2/2017
RIG TYPE: Geoprobe
BORING DIA. (IN): 3.25
DRILLING METHOD: Hollow-Stem Augers
BORING COMPLETED: 2/2/2017
HAMMER: Automatic

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	M	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	690.0	0								
	689.8	0.17'	TOPSOIL - 2 inches	ALLUVIUM						
			SILTY CLAY (CL), gray and brown, stiff						9	2 - 4 - 5 **(9)**
	687.0	3'	CLAY (CH) with chert fragments, yellow-brown and gray, stiff and firm	RESIDUUM					9	4 - 4 - 5 **(9)**
									6	2 - 2 - 4 **(6)**
									12	4 - 5 - 7 **(12)**
	677.9		*Auger refusal at 12.1 feet, boring terminated*							



Project Manager: D. Grass, PE

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4291 Highway 58
Chattanooga, Tennessee 37416

TEST BORING RECORD

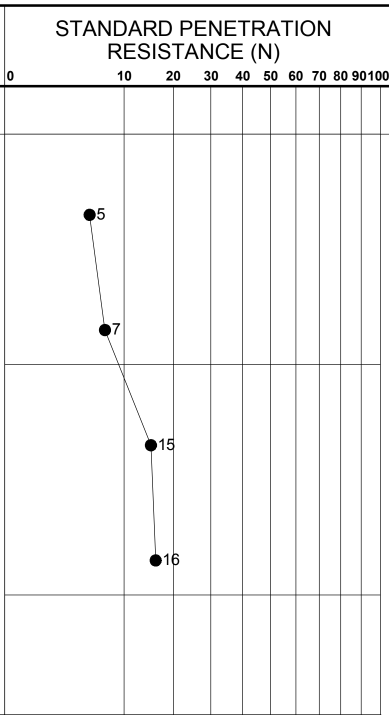
BORING NO.: B-4

PROJECT: Avondale Youth and Family Center
JOB NO: 4181-17-006
SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee
NORTH: 262575
EAST: 2189594
ELEVATION: 690 feet ±
BORING STARTED: 2/2/2017
RIG TYPE: Geoprobe
BORING DIA. (IN): 3.25
DRILLING METHOD: Hollow-Stem Augers
BORING COMPLETED: 2/2/2017
HAMMER: Automatic

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	M	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	690.0	0								
	689.8	0.17'	TOPSOIL - 2 inches							
			CLAY (CH), red-brown and yellow-brown, firm	ALLUVIUM					5	1 - 2 - 3 **(5)**
	687.0	3'	CLAY (CH) with chert fragments, yellow-brown and gray, firm to very stiff	RESIDUUM					7	1 - 2 - 5 **(7)**
									15	5 - 9 - 6 **(15)**
									16	5 - 9 - 7 **(16)**
	677.4		*Auger refusal at 12.6 feet, boring terminated*							



Project Manager: D. Grass, PE

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4291 Highway 58
Chattanooga, Tennessee 37416

TEST BORING RECORD

BORING NO.: B-5

PROJECT: Avondale Youth and Family Center

JOB NO: 4181-17-006

SHEET 1 OF 1

PROJECT LOCATION: Chattanooga, Tennessee

NORTH: 262495

EAST: 2189561

ELEVATION: 690 feet ±

BORING STARTED: 2/2/2017

RIG TYPE: Geoprobe

BORING DIA. (IN): 3.25

DRILLING METHOD: Hollow-Stem Augers

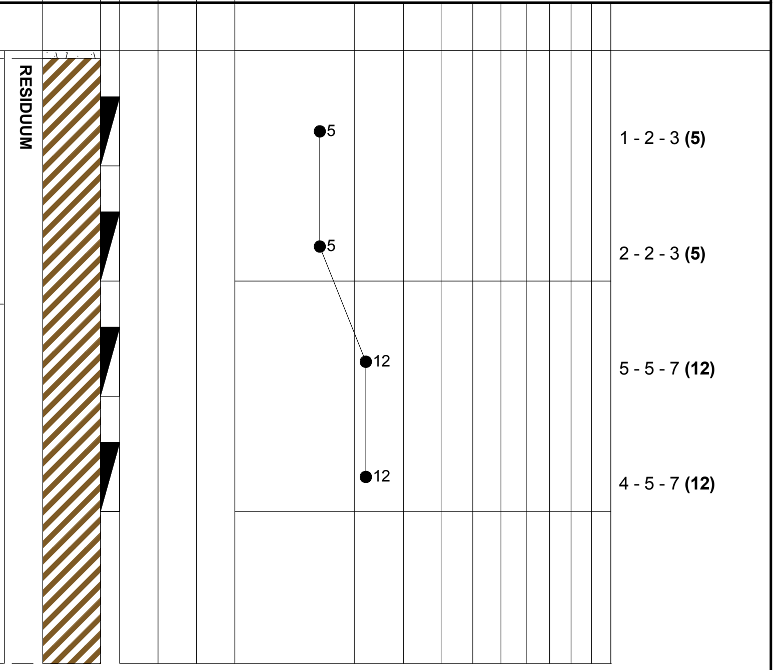
BORING COMPLETED: 2/2/2017

HAMMER: Automatic

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	M	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	690.0	0								
	689.8	0.17'	TOPSOIL - 2 inches							
			CLAY (CH) with trace organics, yellow-brown, firm	RESIDUUM					5	1 - 2 - 3 **(5)**
									5	2 - 2 - 3 **(5)**
	684.5	5.5'	CLAY (CH) with trace chert fragments, yellow-brown and gray, stiff						12	5 - 5 - 7 **(12)**
									12	4 - 5 - 7 **(12)**
	676.7		*Auger refusal at 13.3 feet, boring terminated*							



Depth scale: 0, 5, 10, 15, 20, 25

Project Manager: D. Grass, PE

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4291 Highway 58
Chattanooga, Tennessee 37416

TEST BORING RECORD

BORING NO.: B-6

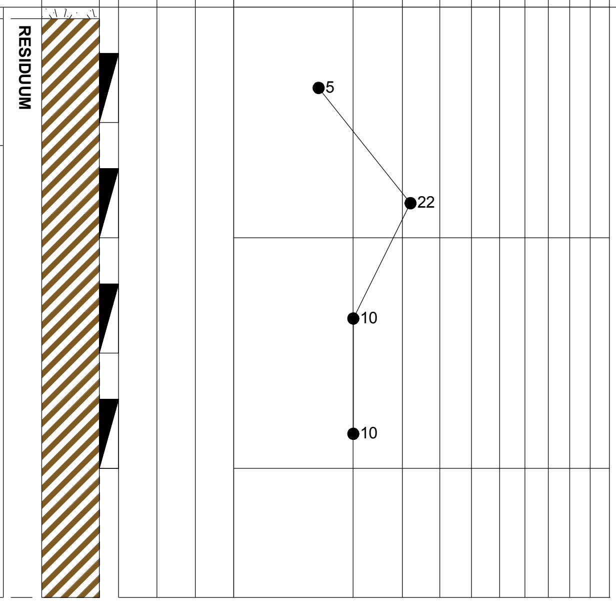
PROJECT: Avondale Youth and Family Center	JOB NO: 4181-17-006	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 262487	EAST: 2189613

ELEVATION: 692 feet ±	BORING STARTED: 2/2/2017	RIG TYPE:Geoprobe	BORING DIA. (IN): 3.25
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 2/2/2017	HAMMER: Automatic	

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	M	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	692.0	0								
	691.8	0.25'	TOPSOIL - 3 inches CLAY (CH) with trace chert, yellow-brown, firm						5	1 - 2 - 3 **(5)**
	689.0	3'	CLAY (CH) with chert fragments, yellow-brown, red-brown, and gray, very stiff to stiff						22	6 - 10 - 12 **(22)**
									10	4 - 4 - 6 **(10)**
									10	3 - 4 - 6 **(10)**
	679.2		*Auger refusal at 12.8 feet, boring terminated*							



Depth scale: 0, 5, 10, 15, 20, 25

Project Manager: D. Grass, PE

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4291 Highway 58
Chattanooga, Tennessee 37416

TEST BORING RECORD

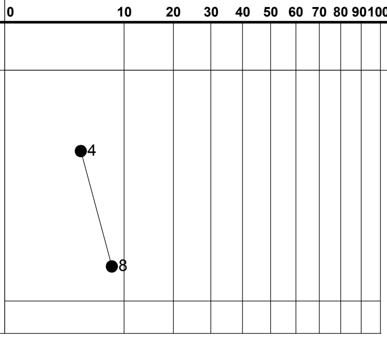
BORING NO.: B-7

PROJECT: Avondale Youth and Family Center
JOB NO: 4181-17-006
SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee
NORTH: 262396
EAST: 2189588
ELEVATION: 695 feet ±
BORING STARTED: 2/2/2017
RIG TYPE: Geoprobe
BORING DIA. (IN): 3.25
DRILLING METHOD: Hollow-Stem Augers
BORING COMPLETED: 2/2/2017
HAMMER: Automatic

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		L	S	R	M	PI	STANDARD PENETRATION RESISTANCE (N)	BLOWS/6"
	695.0	0									
	694.8	0.25'	TOPSOIL - 3 inches								
			CLAY (CH) with trace chert, red-brown and yellow-brown, soft	ALLUVIUM		▮				4	2 - 2 - 2 **(4)**
	692.0	3'	CLAY (CH) with trace chert, yellow-brown and gray, firm	RESIDUUM		▮				8	2 - 3 - 5 **(8)**
		5									
	689.3		*Auger refusal at 5.7 feet, boring terminated*								



DEPTH (FT.): 0, 5, 10, 15, 20, 25

Project Manager: D. Grass, PE

4291 Highway 58
Chattanooga, Tennessee 37416

TEST BORING RECORD

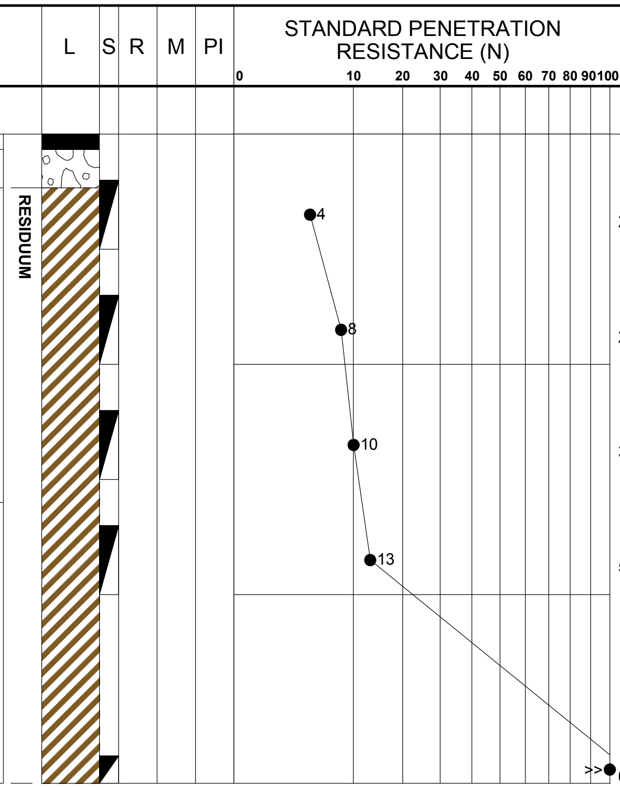
BORING NO.: B-8

PROJECT: Avondale Youth and Family Center
JOB NO: 4181-17-006
SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee
NORTH: 262297
EAST: 2189458
ELEVATION: 692 feet ±
BORING STARTED: 2/2/2017
RIG TYPE: Geoprobe
BORING DIA. (IN): 3.25
DRILLING METHOD: Hollow-Stem Augers
BORING COMPLETED: 2/2/2017
HAMMER: Automatic

GROUNDWATER:
Dry ATD

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)		MATERIAL DESCRIPTION	BLOWS/6"
	692.0	0			
	691.7		0.33'	ASPHALT - 4 inches	
				CRUSHED STONE - 10 inches	
	690.8		1.17'	CLAY (CH), red-brown and yellow-brown, soft to stiff	2 - 2 - 2 **(4)**
					2 - 3 - 5 **(8)**
		5			3 - 4 - 6 **(10)**
	684.0		8'	CLAY (CH), yellow-brown, gray, and black, stiff to hard	5 - 6 - 7 **(13)**
		10			
	677.9				6 - 50/1 **(50+)**
				Auger refusal at 14.1 feet, boring terminated	
		15			
		20			
		25			



Project Manager: D. Grass, PE

4291 Highway 58
Chattanooga, Tennessee 37416

TEST BORING RECORD

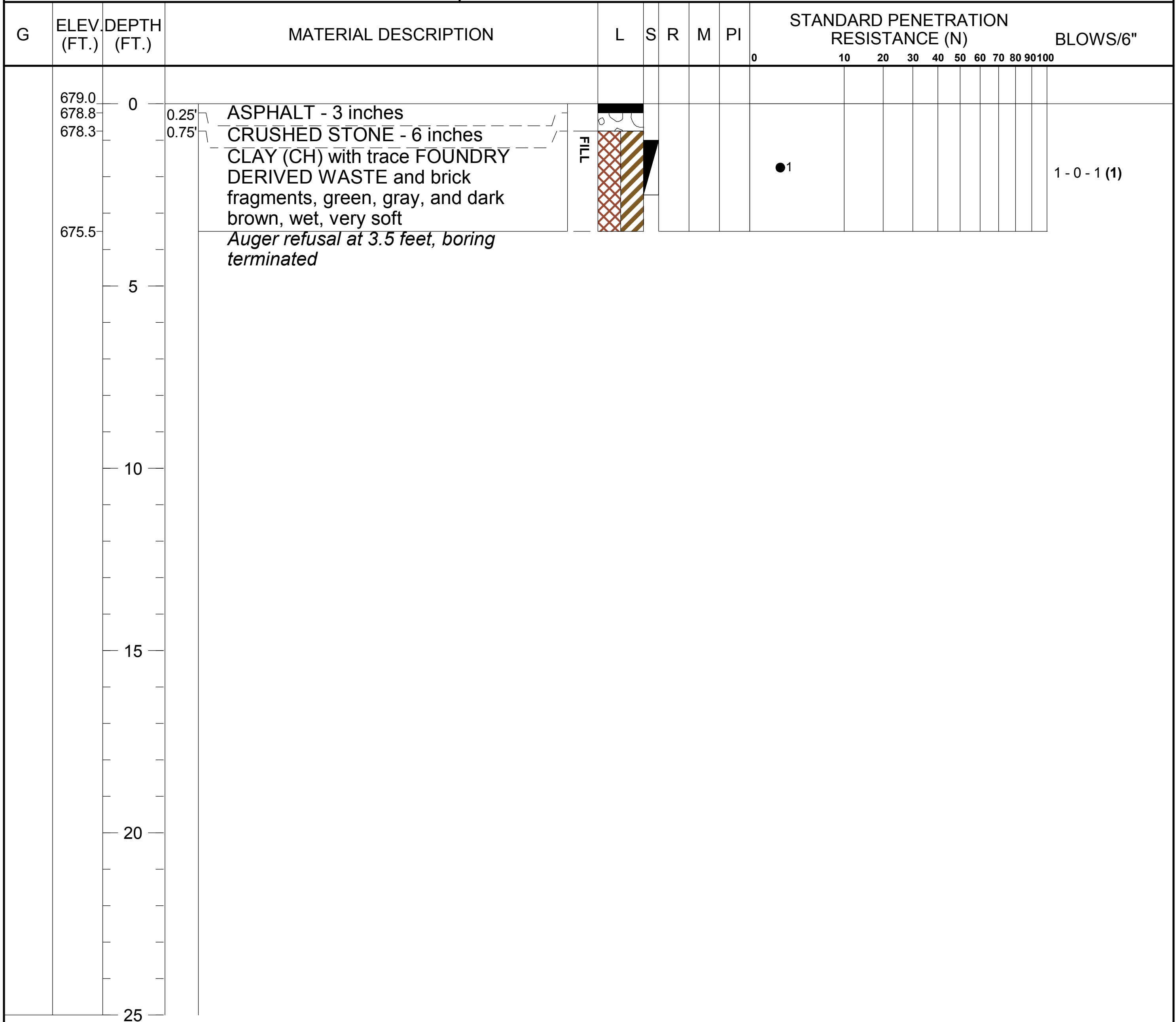
BORING NO.: B-9

PROJECT: Avondale Youth and Family Center	JOB NO: 4181-17-006	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 262352	EAST: 2189153

ELEVATION: 679 feet ±	BORING STARTED: 2/2/2017	RIG TYPE: Geoprobe	BORING DIA. (IN): 3.25
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 2/2/2017	HAMMER: Automatic	

GROUNDWATER:
Dry ATD

Remarks:
Boring offset 5 feet east and re-drilled to auger refusal at 3.1 feet.



ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION
679.0	0	
678.8	0.25'	ASPHALT - 3 inches
678.3	0.75'	CRUSHED STONE - 6 inches
		CLAY (CH) with trace FOUNDRY DERIVED WASTE and brick fragments, green, gray, and dark brown, wet, very soft
675.5		*Auger refusal at 3.5 feet, boring terminated*

BLOWS/6": 1 - 0 - 1 **(1)**

BORING RECORD S&ME - SPLIT LITHOLOGY AVONDALE YOUTH AND FAMILY CENTER.GPJ 2016.GDT 2/17/17

Borehole ID: 9

Project Manager: D. Grass, PE

S&ME
4291 Highway 58
Chattanooga, Tennessee 37416

TEST BORING RECORD

BORING NO.: B-10

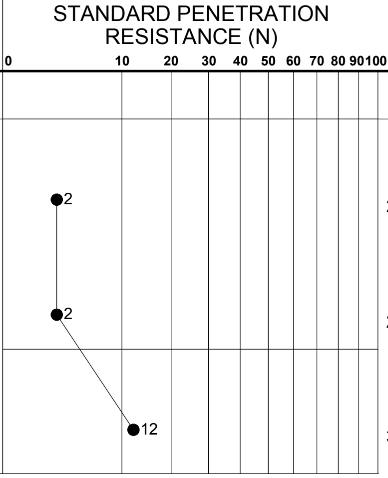
PROJECT: Avondale Youth and Family Center	JOB NO: 4181-17-006	SHEET 1 OF 1
PROJECT LOCATION: Chattanooga, Tennessee	NORTH: 262284	EAST: 2189119

ELEVATION: 679 feet ±	BORING STARTED: 2/2/2017	RIG TYPE: Geoprobe	BORING DIA. (IN): 3.25
DRILLING METHOD: Hollow-Stem Augers	BORING COMPLETED: 2/2/2017	HAMMER: Automatic	

GROUNDWATER:
Dry ATD

Remarks:

ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION		BLOWS/6"
679.0	0			
678.7	0.33'	ASPHALT - 4 inches		
678.2	0.82'	CRUSHED STONE - 6 inches		
		SILTY CLAY (CH) with trace FOUNDRY DERIVED WASTE, gray and black, wet, very soft	FILL	2 - 1 - 1 **(2)**
676.0	3'	SILTY CLAY (CH), gray and yellow-brown, wet, very soft		2 - 1 - 1 **(2)**
673.5	5.5'	SILTY CLAY (CH) with trace rock fragments, yellow-brown and gray, stiff	RESIDUUM	3 - 5 - 7 **(12)**
671.3		*Auger refusal at 7.7 feet, boring terminated*		



Project Manager: D. Grass, PE

Appendix III

Laboratory Test Procedures

Laboratory Test Results

NATURAL MOISTURE
ASTM D 2216, EM 1110-2-1906

The moisture content of soils is an indicator of various physical properties, including strength and compressibility. Selected samples obtained during exploratory drilling were taken from their sealed containers. Each sample was weighed and then placed in an oven heated to 110oC + 5o. The sample remained in the oven until the free moisture had evaporated. The dried sample was removed from the oven, allowed to cool, and re-weighed. The moisture content was computed by dividing the weight of evaporated water by the weight of the dry sample. The results, expressed as a percent, are shown on the attached Laboratory Test Results Summary.

ATTERBERG LIMITS DETERMINATION
ASTM D 4318/AASHTO T89/T90

Representative samples were subjected to Atterberg limits testing to determine the soil's plasticity characteristics. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. The liquid limit (LL) marks the transition from the plastic state to the liquid state. The plastic limit (PL) marks the transition from the plastic state to the solid state.

To determine the liquid limit, a soil specimen is wetted until it is in a viscous fluid state. A portion of this soil is then placed in a brass cup of standardized dimensions, and a groove made through the middle of the soil specimen with a grooving tool of standardized dimensions. The cup is attached to a cam that lifts the cup 10 mm, and then allows the cup to fall and strike a rubber base of standardized hardness. The cam is rotated at about 2 drops per second until the two halves of the soil specimen come in contact at the bottom of the groove along a distance of 13 mm. The number of blows required to make this degree of contact is recorded, and a portion of the specimen is subjected to a moisture content determination. Additional water is added to the remainder of the specimen, and the grooving process and cam action process repeated. This testing sequence is repeated until the soil flows as a heavy viscous fluid. The number of blows vs. moisture content is then plotted on semi-logarithmic graph paper, and the moisture content corresponding to 25 blows is designated the liquid limit.

The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into threads 3 mm in diameter. It is determined by taking a pat of soil remaining from the liquid limit test, and repeatedly rolling, kneading, and air drying the specimen until the soil breaks into threads about 3 mm in diameter and 3 to 10 mm long. The moisture content of these soil threads is then determined, and is designated the plastic limit. The results of these tests are presented on the Laboratory Test Results Summary.

Avondale Youth and Family Center
Chattanooga, Tennessee
S&ME Project No. 4181-17-006

Laboratory Test Results Summary

Boring Number	**Sample Type**	**Sample Depth (ft)**	**Moisture Content (%)**	**ATTERBERG LIMITS**		
				Liquid Limit (%)	**Plastic Limit (%)**	**Plasticity Index (%)**
B-3	SPT	1 – 2.5	18.1			
		3.5 – 5	29.9	69	25	44 (CH)
		6 – 7.5	33.5			
		8.5 - 10	32.8			
B-4	SPT	1 – 2.5	30.2			
		3.5 – 5	30.3			
		6 – 7.5	26.1			
		8.5 - 10	35.1			
B-5	SPT	1 – 2.5	27.4			
		3.5 – 5	33.2			
		6 – 7.5	26.8			
		8.5 - 10	30.4			

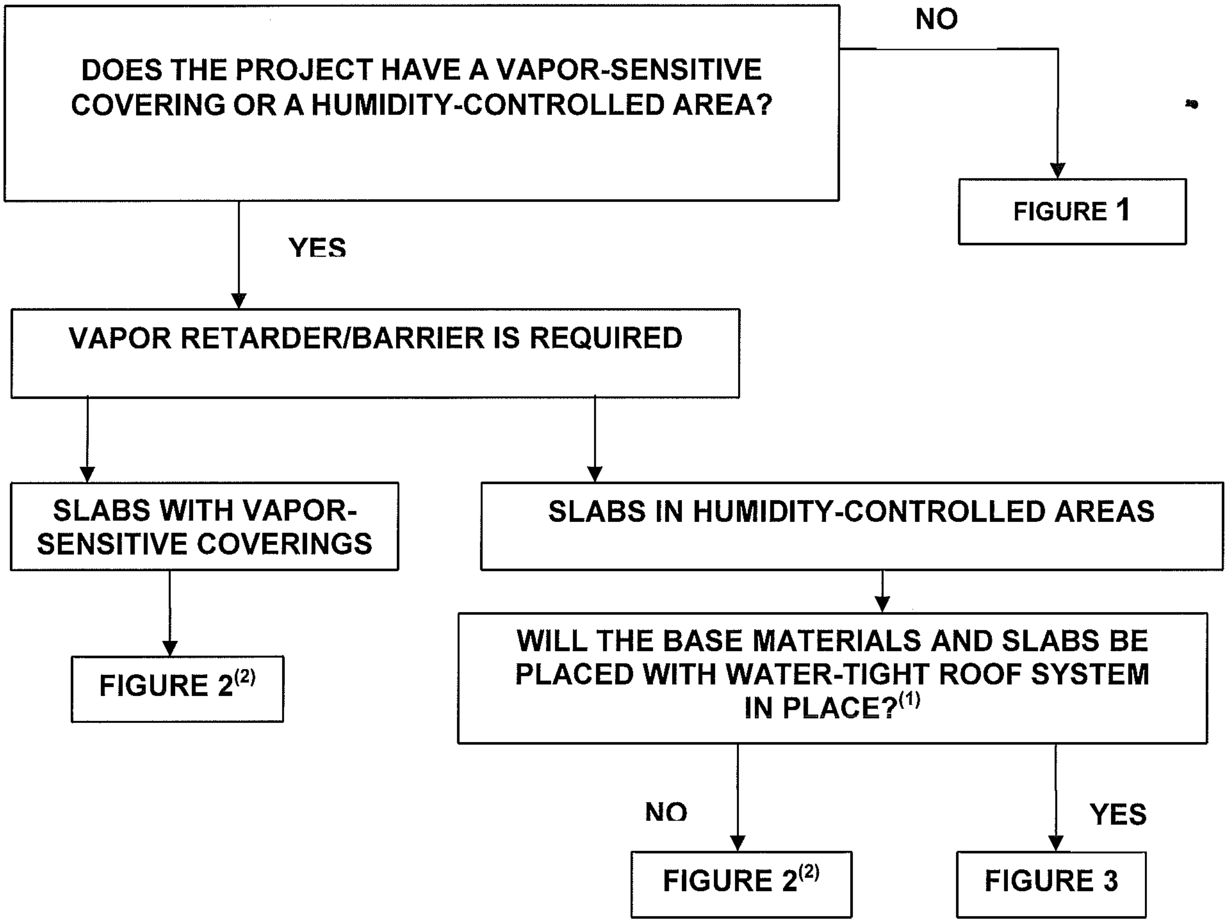
SPT – Standard Penetration Test Sample

Appendix IV

ACI 302.1R-04 Guide For Concrete Floor and Slab Construction

Important Information About Your Geotechnical Engineering Report

ACI 302.1R-04
DECISION FLOW CHART FOR LOCATION OF VAPOR RETARDER/BARRIER



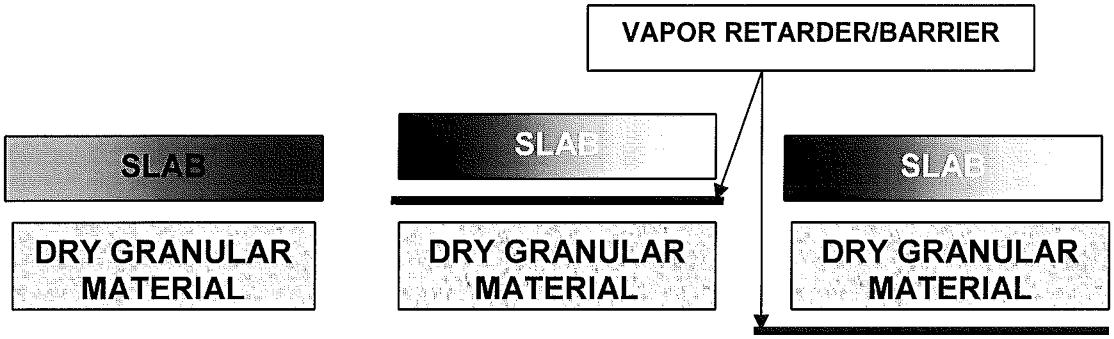


FIGURE 1 FIGURE 2 FIGURE 3

NOTES:

(1) IF GRANULAR MATERIAL IS SUBJECT TO FUTURE MOISTURE INFILTRATION, USE FIGURE 2.

(2) IF FIGURE 2 IS USED, A REDUCED JOINT SPACING, A LOW SHRINKAGE MIX DESIGN, OR OTHER MEASURES TO MINIMIZE SLAB CURL WILL LIKELY BE REQUIRED.

Important Information About Your
Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project. Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.

Portion obtained with permission from "Important Information About Your Geotechnical Engineering Report", ASFE, 2004

Redevelopment and Soil Management Plan
Avondale Recreation Center
1305 Dodson Avenue
Chattanooga, Tennessee
S&ME Project No. 4181-17-006
Phase 03

PREPARED FOR:
City of Chattanooga-Department of Public Works
Division of Engineering Services
1250 Market Street
Chattanooga, Tennessee 37402

PREPARED BY:
S&ME, Inc.
4291 Highway 58
Chattanooga, TN 37416

January 3, 2018

January 3, 2018

City of Chattanooga-Department of Public Works
Division of Engineering Services
1250 Market Street
Chattanooga, Tennessee 37402

Attention: Mr. Andrew Hutsell

Reference: **Redevelopment and Soil Management Plan**
Avondale Recreation Center-1305 Dodson Avenue
Chattanooga, Tennessee
S&ME Project No. 4181-17-006 Phase 03

Dear Mr. Hutsell:

This Soil Management Plan (SMP) provides project-specific management practices established in order to reduce risk associated with typical environmental contaminants associated with foundry sand and other impacted soils identified during prior investigations that may be encountered during project site disturbance. Our services associated with development of this document were conducted at your request. Our services were performed in accordance with our existing agreement with the City of Chattanooga Contract D-14-001-303, dated March 1, 2011 and revise July 22, 2013. The attached SMP is based on the project information currently available. If site redevelopment plans change, updated plans should be provided to TDEC for review. S&ME should be provided the opportunity to review modifications to plans and specifications in order that recommendations are properly interpreted and implemented.

This document has been prepared in accordance with generally accepted practice for specific application to this project site. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made. The recommendations in this report are contingent on S&ME's observation and monitoring of site redevelopment activities. This Plan addresses soil management practices during project site intrusive activities relative to proper environmental management of onsite foundry sand and other impacted soil. S&ME appreciates the opportunity to provide environmental services. Should you have any questions after reviewing this letter, please do not hesitate to contact us.

Sincerely,

S&ME, Inc.

Johanna Heywood

Pat Gribben, PG
Project Geologist

Johanna Heywood, PE, PG
Senior Environmental Engineer

Attachments

Figures:

Tables:

Other:

Environmental Boring Logs

Preliminary Grading Plan, Avondale Youth and Family Development Center, Project No. Y-15-008, dated November 1, 2017, prepared by City of Chattanooga-Department of Public Works

♦ Background

S&ME is familiar with the project based on the findings of our Report of Geotechnical Exploration, dated February 17, 2017; Report of Phase I Environmental Site Assessment (ESA), dated February 27, 2017; and our Report of Limited Phase II ESA, dated October 10, 2017. The subject property, situated at the southwest corner of the intersection between Dodson Avenue and Wilcox Boulevard consists of three, contiguous parcels currently owned by the City of Chattanooga. Currently, the property is improved with the Avondale Recreation Center, which includes an approximately 5,800-square-foot (sf) recreation building, playground, outdoor basketball court, two tennis courts, three baseball/softball fields, an approximately 750-sf concession building, and associated asphalt-paved parking areas. Land use in the vicinity of the subject property generally consists of commercial and residential properties. Figure 1 (Site Vicinity Map), attached, depicts the location of the site on a 1976 USGS topographic map.

Review of available historical resources indicates the subject property was initially developed with residential properties, a Church and a rail line transecting the center of the property in at least 1917. Automotive repair and auto salvage businesses occupied the western portion of the property from at least 1964 to 1974. The Avondale Recreation Center has occupied the property since at least 1950, though they initially occupied the eastern portion of the property, only.

S&ME's Phase I ESA identified *recognized environmental conditions* relative to past onsite operations of auto repair and wrecking and rail lines, onsite presence of shallow foundry sand identified in geotechnical soil borings and offsite historical and regulated operations of Spectra National, two filling/service stations and a dry cleaner.

S&ME's Limited Phase II ESA identified the detectable concentrations of contaminants in soil, groundwater and soil gas at the subject property. Elevated arsenic, lead, and extractable petroleum hydrocarbons (EPH), and low-level polynuclear aromatic hydrocarbons (PAHs) and foundry sand, were present in shallow fill soils in the western portion of the property. Additionally, detectable concentrations of one volatile organic compound (VOC) was identified in groundwater in the northeast corner of the property, and approximately twenty VOCs were detected in soil gas samples collected in the northeaster and northwestern regions of the property. No concentrations of VOCs detected in groundwater or soil gas exceeded their respective comparison criteria. Tables 1-3, attached, present a summary of laboratory analytical data for soil, groundwater and soil gas samples collected for the Limited Phase II ESA.

S&ME understands that the City of Chattanooga plans to construct a new Youth and Family Development Center to replace the existing Avondale Recreation Center. Based on our review of the *Preliminary Grading Plan, Avondale Youth and Family Development Center, Project No. Y-15-008*, dated November 1, 2017, the planned project includes the construction of a new, approximately 16,000 sf Youth and Family Development Center building in the northeast portion of the property, construction of new basketball and tennis courts and a pervious pavement parking area in the southeastern portion of the property, construction of a multipurpose athletic field and pervious pavement parking in the southern portion of the property, and installation of a new, underground storm water and sanitary sewer system across the northern and eastern regions of the property. With the exception of excavation required to install the sewer system, minimal site grading is anticipated to be required within areas of planned disturbance. Portions of the project site are also anticipated to require three to four feet of fill to accommodate proposed site grades. A copy of the Preliminary Grading Plan is attached to this plan.

S&ME further understands that the City may desire to request written concurrence from TDEC following completion of the project. As such, based on previously identified foundry sand and/or impacted fill soils observed in the western region of the site (geotechnical borings B9 and B10 and environmental soil borings B3, B5, B10, and B12), S&ME recommends adherence to soil handling procedures during site grading and other intrusive construction activities. Figure 2 (Site Map), depicts the configuration of the property on a recent aerial photograph as well as location of prior features of concern, soil boring and temporary well locations, and locations where impacted soils were observed or identified. Soil handling procedures should include documentation of location and placement of impacted soil and nature and extents of cap. This documentation will serve to support request of concurrence from TDEC. TDEC may also require recordation of a Notice of Land Use Restrictions to provide a record of site conditions and location of impacted soil and/or soil commingled with foundry sand.

♦ Soil Management Practices

The presence of foundry sand, metals-impacted, and /or petroleum-impacted soil on a construction site corresponds with potential risks for the ingestion, inhalation and dermal contact exposure pathways. At this time, site development activities present a potential exposure pathway to site workers during construction. Additionally, exposure of the impacted soil presents a potential off-site migration issue if proper storm water best management practices are not implemented. Because of these potential exposure pathways, certain site management practices must be implemented to be protective of potential receptors. Provided that the foundry sand and petroleum impacted soils are placed below a minimum of 24 inches of clean fill or a sufficient impervious layer, then direct exposure to potential future receptors should be significantly reduced.

Within the boundaries of the planned development, it is not anticipated that soils will be excavated for offsite disposal. However, it is contemplated that soils may be relocated in the process of site grading activities to achieve desired grades prior to the placement of fill. Given that impacted soils appear to be limited in extent, i.e. not continuous at shallow locations and not observed at depth, prior to initiating site work, S&ME recommends identifying an area that will be paved as a part of the redevelopment for placement of impacted material. This may allow for isolating impacted soils and which would also be specified in the Notice of Land Use Restrictions, if TDEC concurrence is sought. Alternatively, if only a small amount of material is generated, it may be preferred to dispose of the impacted material as Special Waste. If metals-impacted, petroleum-impacted soil or soil containing foundry sand must be disposed offsite to meet the grading requirements, it will characterized appropriately and for appropriate disposal determination.

In the absence of additional site characterization data, at a minimum, the following soil management practices will be implemented by the property owner/developer. Proper implementation of these management practices should reduce unnecessary exposure to potential constituents of concern associated with foundry sand at the site. The site management practices consist of the following:

- Notification to the materials testing firm and project environmental consultant prior to beginning any construction or demolition work at the site which are intrusive in nature and would potentially disturb or expose the subsurface foundry sand or other impacted soils.
- Site workers who are reasonably expected to be exposed to foundry sand and/or petroleum and metals-impacted soil during construction or demolition activities shall be alerted to the potential constituents of concern associated with the foundry sand at the site and be familiar with these site management practices prior to implementing the work.

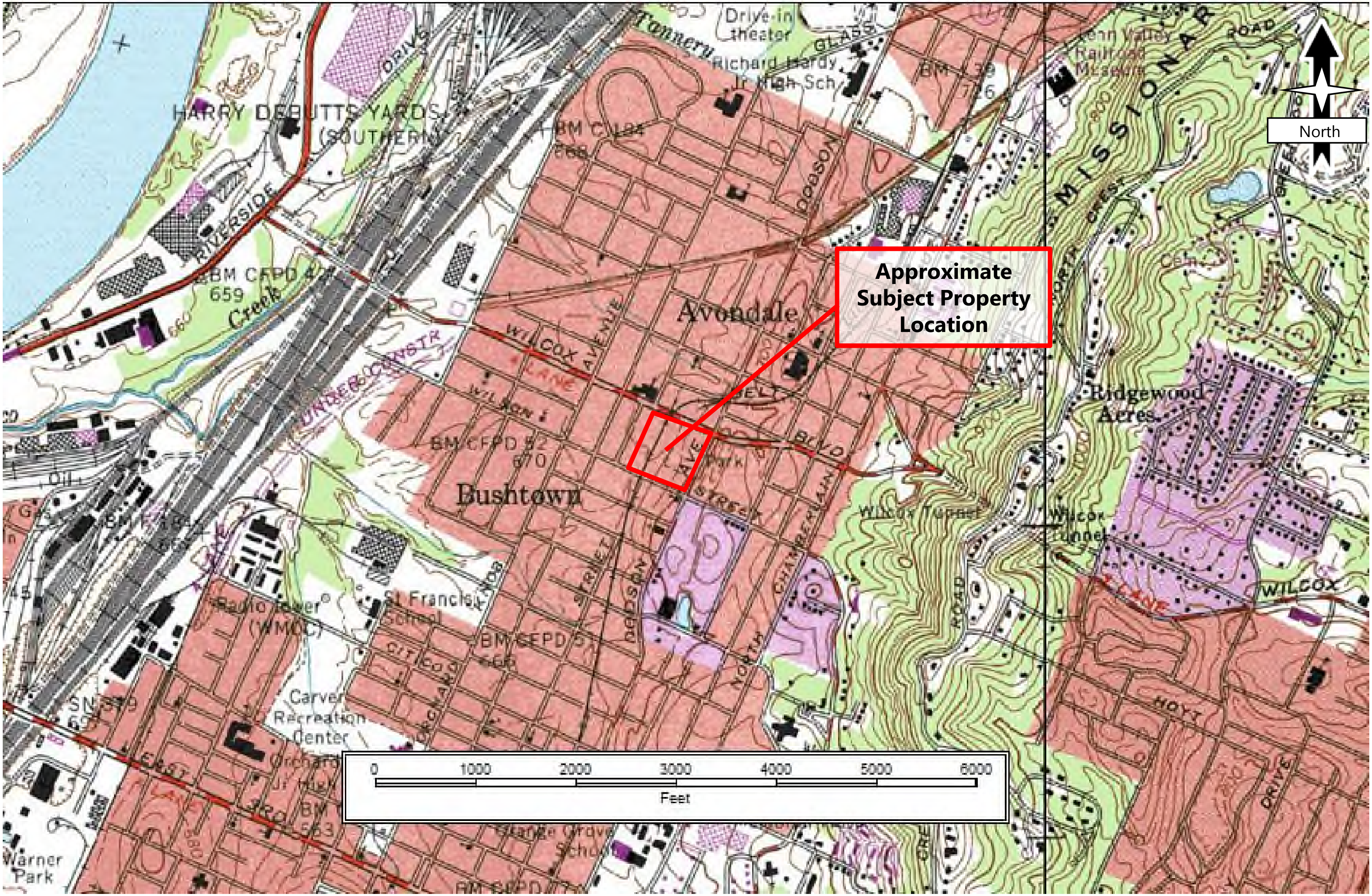
- These workers shall be informed of the risk associated with ingestion or inhalation of the sand particles and shall be instructed to limit physical contact with the impacted soils. If an aspect of the work requires extensive contact with foundry sand and/or petroleum impacted soils, a task-specific safety plan shall be required which would provide additional information on associated risks, personal protective equipment, and decontamination practices. Contractor shall be responsible for ensuring site workers have met any necessary training requirements related to handling foundry sand and/or petroleum impacted soil.
- An Environmental Professional or Environmental Technician qualified to identify impacted materials will be on site during intrusive activities.
- If discolored or stained soils are observed, or unusual odors encountered, the contractor should stop work, notify the superintendent and the Environmental Professional. No soil shall leave the site prior to characterization.
- Proper sediment and erosion controls must be established prior to construction and/or demolition activities to prevent the inadvertent offsite transport of foundry sand and/or petroleum impacted soil from the site. The controls will be established in accordance with the TDEC erosion and sediment control handbook.

  These controls must be periodically inspected and adequately maintained throughout the duration of the construction and/or demolition activities to prevent the offsite transport of foundry sand from the site. Only after the site is adequately stabilized, can the sediment and erosion controls be removed.
- Sufficient dust control practices will be implemented to prevent the air-borne mobilization of foundry sand from the site. This will generally consist of keeping exposed foundry sand damp.

Where the site redevelopment plan will accommodate fill soil, soil and foundry sand at the site may be relocated to any area (other than utility trench backfill) of the site, provided the location of placement also was demonstrated to have had like soils (existing foundry sand or petroleum-impacted soil) and/or will be placed under pavement or 24 inches of clean soil cap.

- Utility trenches excavated in areas where foundry sand is present will be backfilled with clean fill material (i.e. gravel, soil) and not foundry sand. These "clean" utility trenches will prevent future utility workers from contacting foundry sand and/or petroleum impacted soil. The foundry sand and/or impacted soil excavated from these utility trenches may be permitted and disposed offsite as a Special Waste or relocated onsite in areas where foundry sand and/or petroleum impacted soil is/are already present (within the “area of impact”. During construction or demolition activities, exposed foundry sand may be temporarily covered by a minimum 4-inch layer of soil. Once placed, the temporary soil layer must be stabilized within 15 days.
- Final site conditions must provide a sufficient impervious layer (asphalt, concrete, or pavement) or a minimum 24-inch layer of amended top soil, plus sod, or over areas where foundry sand and/or indications of petroleum impact are present. This may require undercutting of landscaped areas to accommodate 24 inches of “cap”. The permanent soil cover must be stabilized within 15 days of being placed. All cover material, permanent soil cover or impervious layer must be permanently maintained to ensure that foundry sand and/or petroleum impacted soil are not exposed.
- An as-built drawing and close-out report shall be submitted following completion of the project to document final conditions to the owner, testing firm and environmental professional to submit to TDEC as requested.

Attachments



Scale: As shown	**SITE VICINITY MAP** **Avondale Recreation Center Property** **1305 Dodson Avenue** Chattanooga, TN- USGS Topographic Map 1976	Figure 1
Contour Interval = 20 feet		
Date: 1/3/2018	**Project No. 4181-17-006 Phase 003**	

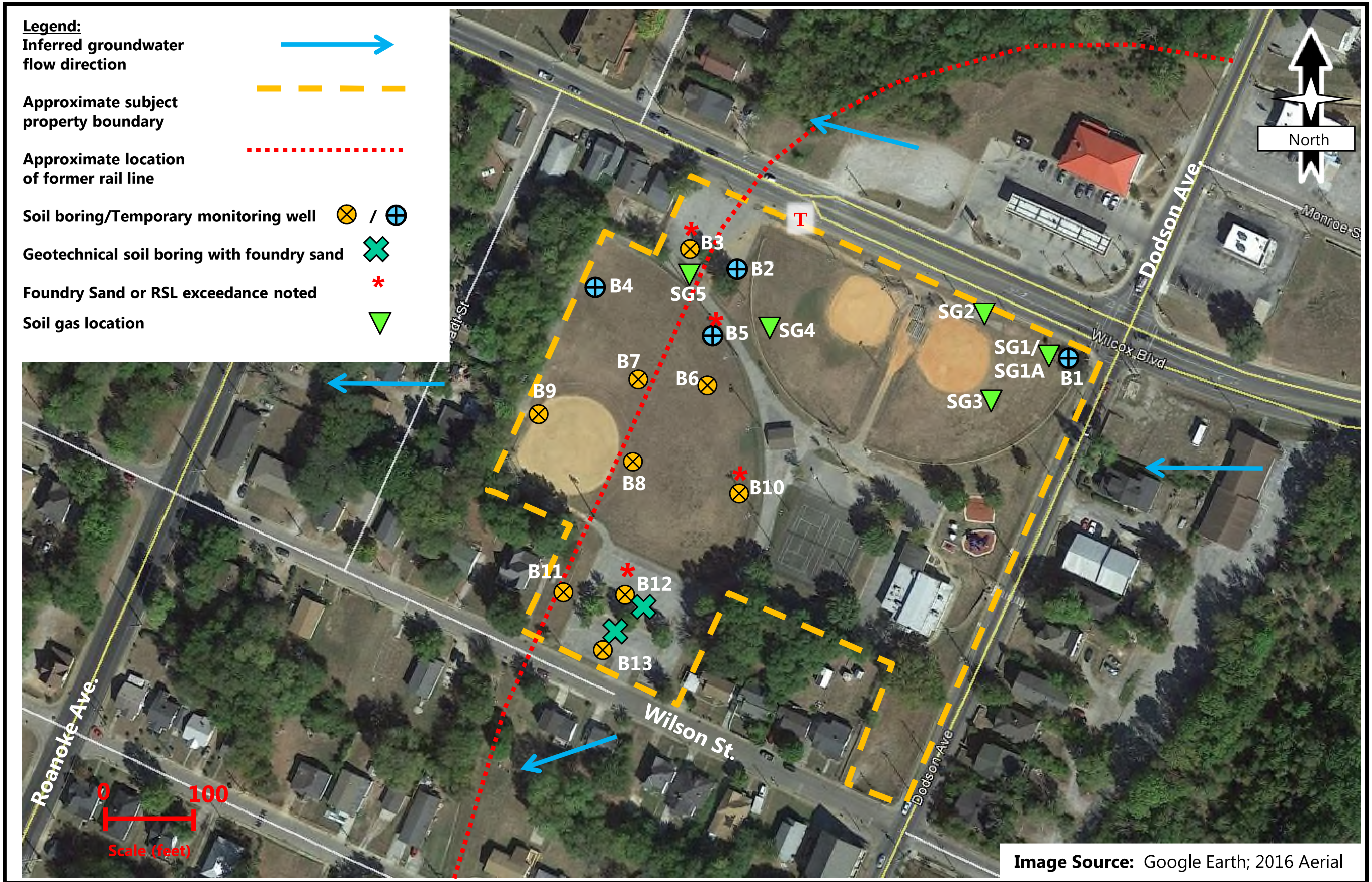


Image Source: Google Earth; 2016 Aerial

Scale: As shown

Prepared by: TPG

Checked by: VJH

Date: 1/3/2018

Site Map

City of Chattanooga-Avondale Recreation Center
1305 Dodson Avenue
Chattanooga, Tennessee

Project No. 4181-17-006 Phase 03

Figure
2

SOIL (concentrations expressed in milligrams per kilogram (mg/kg))									
Boring Number	**B3**	**B4**	**B5**	**B9**	**B10**	**B11**	**B12**	**Comparison Criteria**	
Boring Location	**Northwest region of the site**			**West and southwest region of the site**				**Regional Screening Levels (RSLs)**	
(sample depth)	0.4-5 feet	1.2-3 feet	0.3-2.4 feet	0.4-2.5 feet	0-1.8 feet	1.7-3 feet	0.7-2.5 feet	Residential	Commercial
INORGANICS									
ARSENIC	**5.65**	NA	**9.84**	**3.62**	**4.64**	**3.46**	**2.14**	**0.68**	**3**
BARIUM	140	NA	141	56.6	90.4	89.8	63.6	1,500	22,000
CADMIUM	<0.500	NA	0.519	<0.500	<0.500	<0.500	<0.500	7.1	98
CHROMIUM	12.7	NA	16.1	16.6	21.5	26.7	6.64	12,000	180,000
LEAD	44.9	NA	124	18.5	43.9	16.2	14.8	400	800
SELENIUM	<2.00	NA	<2.00	<2.00	<2.00	<2.00	<2.00	39	580
SILVER	<1.00	NA	<1.00	<1.00	<1.00	<1.00	<1.00	39	580
MERCURY	0.0217	NA	0.0616	0.0617	0.0573	0.0522	0.0489	1.1	4.6
VOLATILE ORGANIC COMPOUNDS (VOCs)									
ACETONE	NA	0.0914	0.0877	NA	NA	NA	NA	6,100	67,000
BENZENE	NA	<0.00100	<0.00100	NA	NA	NA	NA	1.2	5.1
ETHYLBENZENE	NA	<0.00100	<0.00100	NA	NA	NA	NA	5.8	25
2-BUTANONE (MEK)	NA	0.0123	0.0142	NA	NA	NA	NA	2,700	19,000
METHYL TERT-BUTYL ETHER	NA	<0.00100	<0.00100	NA	NA	NA	NA	47	210
NAPHTHALENE	NA	<0.00500	<0.00500	NA	NA	NA	NA	3.8	17
TETRACHLOROETHYLENE	NA	<0.00100	<0.00100	NA	NA	NA	NA	8.1	39
TOLUENE	NA	<0.00500	<0.00500	NA	NA	NA	NA	490	4,700
TRICHLOROETHYLENE	NA	<0.00100	<0.00100	NA	NA	NA	NA	0.41	1.9
VINYL CHLORIDE	NA	<0.00100	<0.00100	NA	NA	NA	NA	0.059	1.7
TOTAL XYLENES	NA	<0.00300	<0.00300	NA	NA	NA	NA	58	250
EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) [1]									
	115	<4.00	**106**	<4.00	15.5	<4.00	92.3	**100 [1]**	
POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)									
ANTHRACENE	<0.0300	<0.00600	0.0699	0.0132	0.0361	<0.00600	<0.00600	1,800	23,000
ACENAPHTHENE	<0.0300	<0.00600	0.0154	<0.00600	0.00844	<0.00600	<0.00600	3,600	4,500
ACENAPHTHYLENE	<0.0300	<0.00600	<0.0120	<0.00600	<0.00600	<0.00600	<0.00600	None established	
BENZO(A)ANTHRACENE	0.0408	<0.00600	0.395	0.0467	0.186	<0.00600	<0.00600	1.1	21
BENZO(A)PYRENE	0.0389	<0.00600	**0.387**	0.0397	**0.173**	<0.00600	<0.00600	**0.11**	2.1
BENZO(B)FLUORANTHENE	0.0570	<0.00600	0.617	0.0526	0.227	<0.00600	<0.00600	1.1	21
BENZO(G,H,I)PERYLENE	0.0336	<0.00600	0.254	0.0291	0.130	<0.00600	<0.00600	None established	
BENZO(K)FLUORANTHENE	<0.0300	<0.00600	0.202	0.0232	0.0892	<0.00600	<0.00600	11	210
CHRYSENE	0.0520	<0.00600	0.391	0.0489	0.189	<0.00600	<0.00600	110	2,100
DIBENZ(A,H)ANTHRACENE	<0.0300	<0.00600	0.0981	0.00787	0.0428	<0.00600	<0.00600	0.11	2.1
FLUORANTHENE	0.0742	<0.00600	0.640	0.131	0.442	<0.00600	<0.00600	240	3,000
FLUORENE	<0.0300	<0.00600	0.0150	<0.00600	0.00881	<0.00600	<0.00600	240	3,000
INDENO(1,2,3-CD)PYRENE	<0.0300	<0.00600	0.253	0.0274	0.128	<0.00600	<0.00600	1.1	21
NAPHTHALENE	0.263	<0.0200	0.292	<0.0200	0.0270	<0.0200	<0.0200	3.8	17
PHENANTHRENE	0.138	<0.00600	0.281	0.0524	0.153	<0.00600	<0.00600	None established	
PYRENE	0.0497	<0.00600	0.467	0.0711	0.258	<0.00600	<0.00600	180	2,300

Notes:

Checked By: DFK

Soil samples collected on April 11, 2017

Gray shading indicated detected compound

Bold text indicates concentration detected or MDL is greater than a comparison criterion-June 2017 EPA RSLs

Analytical methods as presented in text of report, and attached laboratory results.

< = Below Method Detection Limit, not detected at Estimated Quantitation Limit (EQL).
See analytical reports.

NA - Not Analyzed

[1] The TDEC DSW threshhold for disposal as Special Waste is **100 mg/kg**.

Table 1
Summary of Detected Compounds and Results of Soil Analysis (mg/kg)
Limited Phase II ESA
City of Chattanooga-Avondale Recreation Center
Chattanooga, Tennessee
Project No. 4181-17-006 Phase 02

GROUNDWATER (Concentrations in milligrams per Liter (mg/L))

Temporary Well ID	**B1**	**B2**	**B4**	**B5**	**COMPARISON CRITERIA**
Temporary Well Location	**Northeast corner of the site**	**Northern site boundary**	**Northwestern region of the site**		**Regional Screening Levels Tap Water or (MCL)**
VOLATILE ORGANIC COMPOUNDS					
BENZENE	**<0.00100**	**<0.00100**	**<0.00100**	**<0.00100**	**0.00046** (0.005)
DI-ISOPROPYL ETHER	0.00518	<0.00100	<0.00100	<0.00100	0.15
ETHYLBENZENE	<0.00100	<0.00100	<0.00100	<0.00100	0.0015 (0.7)
METHYL TERT-BUTYL ETHER	<0.00100	<0.00100	<0.00100	<0.00100	0.014
NAPHTHALENE	**<0.00500**	**<0.00500**	**<0.00500**	**<0.00500**	**0.00017**
TETRACHLOROETHYLENE	<0.00100	<0.00100	<0.00100	<0.00100	0.0041 (0.005)
TOLUENE	<0.00100	<0.00100	<0.00100	<0.00100	0.11 (1)
TRICHLOROETHYLENE	**<0.00100**	**<0.00100**	**<0.00100**	**<0.00100**	**0.00028** (0.005)
VINYL CHLORIDE	**<0.00100**	**<0.00100**	**<0.00100**	**<0.00100**	**0.000019** (0.002)
XYLENES, TOTAL	<0.00300	<0.00300	<0.00300	<0.00300	0.019 (10)
POLYNUCLEAR AROMATIC HYDROCARBONS					
ANTHRACENE	NA	<0.0000500	<0.0000500	<0.0000500	0.18
ACENAPHTHENE	NA	<0.0000500	<0.0000500	<0.0000500	0.053
ACENAPHTHYLENE	NA	<0.0000500	<0.0000500	<0.0000500	None established
BENZO(A)ANTHRACENE	NA	**<0.0000500**	**<0.0000500**	**<0.0000500**	**0.00003**
BENZO(A)PYRENE	NA	**<0.0000500**	**<0.0000500**	**<0.0000500**	**0.000025** (0.0002)
BENZO(B)FLUORANTHENE	NA	<0.0000500	<0.0000500	<0.0000500	0.00025
BENZO(G,H,I)PERYLENE	NA	<0.0000500	<0.0000500	<0.0000500	None established
BENZO(K)FLUORANTHENE	NA	<0.0000500	<0.0000500	<0.0000500	0.0025
CHRYSENE	NA	<0.0000500	<0.0000500	<0.0000500	0.025
DIBENZ(A,H)ANTHRACENE	NA	**<0.0000500**	**<0.0000500**	**<0.0000500**	**0.000025**
FLUORANTHENE	NA	<0.0000500	<0.0000500	<0.0000500	0.08
FLUORENE	NA	<0.0000500	<0.0000500	<0.0000500	0.029
INDENO(1,2,3-CD)PYRENE	NA	<0.0000500	<0.0000500	<0.0000500	**0.00025**
NAPHTHALENE	NA	**<0.000250**	**<0.000250**	**<0.000250**	**0.00017**
PHENANTHRENE	NA	<0.0000500	<0.0000500	<0.0000500	None established
PYRENE	NA	<0.0000500	<0.0000500	<0.0000500	0.012

Notes:

Checked By: DFK

Groundwater samples collected on April 12, 2017

Gray shading indicated detected compound

Bold text indicates concentration detected or RDL/ MDL greater than a comparison criterion-June 2017 EPA RSLs/MCL

Analytical methods as presented in text of report, and attached laboratory results.

< = Below Method Detection Limit, not detected at Estimated Quantitation Limit (EQL).
See analytical reports.

N/A- Not Analyzed

Table 2
Summary of Detected Compounds and Results of Groundwater Analysis (mg/L)
Limited Phase II ESA
City of Chattanooga-Avondale Recreation Center
Chattanooga, Tennessee
Project No. 4181-17-006 Phase 02

Soil Gas Concentrations (micrograms per cubic meter (ug/m^3))

GENERAL AREA OF ASSESSMENT	**Northeastern region of the site**			**Northwestern region of the site**		**Adjusted EPA Regional Screening Levels (Risk = 1 x 10^{-6} and THQ= 0.1) Attenuation Factor (0.03)**	
SAMPLE ID	**SG-1A**	**SG-2**	**SG-3**	**SG-4**	**SG-5**	**Residential**	**Industrial**
SAMPLE DEPTH (feet)	**3 feet**	**3 feet**	**3 feet**	**3 feet**	**3 feet**		
VOLATILE ORGANIC COMPOUNDS IN AIR by TO-15							
ACETONE	1380	6.42	42.2	29.9	11.1	106,666.7	466,666.7
ALLYL CHLORIDE	<0.626	<0.626	<0.626	<0.626	<0.626	3.3	14.7
BENZENE	0.686	1.17	0.846	3.65	3.40	12	53.3
BENZYL CHLORIDE	<1.04	<1.04	<1.04	<1.04	<1.04	1.9	8.3
BROMODICHLOROMETHANE	<1.34	<1.34	<1.34	<1.34	<1.34	2.5	11
BROMOFORM	<6.21	<6.21	<6.21	<6.21	<6.21	86.7	366.7
BROMOMETHANE	<0.776	<0.776	<0.776	<0.776	<0.776	17.3	73.3
1,3-BUTADIENE	**<4.43**	**<4.43**	**<4.43**	**<4.43**	**<4.43**	**3.1**	13.7
CARBON DISULFIDE	<0.622	2.95	1.12	3.94	6.57	2,433.3	10,333.3
CARBON TETRACHLORIDE	<1.26	<1.26	<1.26	<1.26	<1.26	15.7	66.7
CHLOROBENZENE	<0.924	<0.924	<0.924	<0.924	<0.924	173.3	733.3
CHLOROETHANE	1.17	<0.528	<0.528	<0.528	<0.528	33,333.3	146,666.7
CHLOROFORM	<0.973	1.66	<0.973	<0.973	1.31	4	17.7
CHLOROMETHANE	0.515	<0.413	<0.413	0.420	<0.413	313.3	1,300
2-CHLOROTOLUENE	<1.03	<1.03	<1.03	<1.03	<1.03	NONE ESTABLISHED	
CYCLOHEXANE	0.732	<0.689	0.706	4.74	3.73	21,000	86,666.7
DIBROMOCHLOROMETHANE	<1.70	<1.70	<1.70	<1.70	<1.70	NONE ESTABLISHED	
1,2-DIBROMOETHANE	**<1.54**	**<1.54**	**<1.54**	**<1.54**	**<1.54**	**0.2**	**0.7**
1,2-DICHLOROBENZENE	<1.20	<1.20	<1.20	<1.20	<1.20	700	2,933.3
1,3-DICHLOROBENZENE	<1.20	<1.20	<1.20	<1.20	<1.20	NONE ESTABLISHED	
1,4-DICHLOROBENZENE	<1.20	<1.20	<1.20	<1.20	<1.20	8.7	36.7
1,2-DICHLOROETHANE	<0.810	<0.810	<0.810	<0.810	<0.810	3.7	15.7
1,1-DICHLOROETHANE	<0.802	<0.802	<0.802	<0.802	<0.802	60	256.7
1,1-DICHLOROETHENE	<0.793	<0.793	<0.793	<0.793	<0.793	700	2,933.3
CIS-1,2-DICHLOROETHENE	<0.793	<0.793	<0.793	<0.793	<0.793	NONE ESTABLISHED	
TRANS-1,2-DICHLOROETHENE	<0.793	<0.793	<0.793	<0.793	<0.793	NONE ESTABLISHED	
1,2-DICHLOROPROPANE	<0.924	<0.924	<0.924	<0.924	<0.924	2.5	11
CIS-1,3-DICHLOROPROPENE	<0.908	<0.908	<0.908	<0.908	<0.908	23.3	103.3
TRANS-1,3-DICHLOROPROPENE	<0.908	<0.908	<0.908	<0.908	<0.908	23.3	103.3
1,4-DIOXANE	<0.721	<0.721	<0.721	<0.721	<0.721	18.7	83.3
ETHANOL	104	6.85	3.68	154	17.4	NONE ESTABLISHED	
ETHYLBENZENE	<0.867	<0.867	<0.867	1.69	0.906	36.7	163.3
4-ETHYLTOLUENE	<0.982	<0.982	<0.982	<0.982	<0.982	NONE ESTABLISHED	
TRICHLOROFLUOROMETHANE	1.23	<1.12	1.40	1.40	1.37	NONE ESTABLISHED	
DICHLORODIFLUOROMETHANE	1.48	1.31	1.62	1.79	1.05	333.3	1,466.7
1,1,2-TRICHLOROTRIFLUOROETHANE	<1.53	<1.53	<1.53	<1.53	<1.53	17,333.3	73,333.3
1,2-DICHLOROTETRAFLUOROETHANE	<1.40	<1.40	<1.40	<1.40	<1.40	NONE ESTABLISHED	
HEPTANE	<0.818	<0.818	<0.818	4.00	1.53	1,400	6,000
HEXACHLORO-1,3-BUTADIENE	**<6.73**	**<6.73**	**<6.73**	**<6.73**	**<6.73**	**4.3**	18.7
N-HEXANE	<0.705	0.728	0.901	9.10	2.05	2,433.3	10,333.3
ISOPROPYLBENZENE	<0.983	<0.983	<0.983	<0.983	<0.983	1,400	6,000
METHYLENE CHLORIDE	0.789	<0.694	<0.694	0.754	<0.694	2,100	8,666.7
METHYL BUTYL KETONE	<5.11	<5.11	<5.11	<5.11	<5.11	103.3	433.3
2-BUTANONE (MEK)	<3.69	<3.69	4.01	5.68	<3.69	17,333.3	73,333.3
4-METHYL-2-PENTANONE (MIBK)	<5.12	<5.12	<5.12	<5.12	<5.12	10,333.3	43,333.3
METHYL METHACRYLATE	<0.819	<0.819	<0.819	<0.819	<0.819	2,433.3	10,333.3
METHYL TERT-BUTYL ETHER	<0.721	<0.721	<0.721	<0.721	<0.721	366.7	1,566.7
NAPHTHALENE	**<3.30**	**<3.30**	**<3.30**	**<3.30**	**<3.30**	**2.8**	12
2-PROPANOL	1440	3.32	<3.07	4.28	<3.07	10,000,000*	
PROPENE	<0.689	<0.689	<0.689	18.9	4.06	10,333.3	43,333.3
STYRENE	<0.851	<0.851	<0.851	<0.851	<0.851	3,333.3	14,666.7
1,1,2,2-TETRACHLOROETHANE	<1.37	<1.37	<1.37	<1.37	<1.37	1.6	7
TETRACHLOROETHYLENE	<1.36	<1.36	<1.36	<1.36	<1.36	140	600
TETRAHYDROFURAN	<0.590	<0.590	<0.590	<0.590	<0.590	7,000	29,333.3
TOLUENE	7.76	4.83	2.98	11.6	9.01	17,333.3	73,333.3
1,2,4-TRICHLOROBENZENE	<4.66	<4.66	<4.66	<4.66	<4.66	7	29.3
1,1,1-TRICHLOROETHANE	<1.09	<1.09	<1.09	<1.09	<1.09	17,333.3	73,333.3
1,1,2-TRICHLOROETHANE	**<1.09**	**<1.09**	**<1.09**	**<1.09**	**<1.09**	**0.7**	2.9
TRICHLOROETHENE	<1.07	<1.07	<1.07	<1.07	<1.07	7	29.3
1,2,4-TRIMETHYLBENZENE	<0.982	<0.982	<0.982	<0.982	1.24	210	866.7
1,3,5-TRIMETHYLBENZENE	<0.982	<0.982	<0.982	<0.982	<0.982	210	866.7
2,2,4-TRIMETHYLPENTANE	<0.934	<0.934	<0.934	1.26	<0.934	NONE ESTABLISHED	
VINYL CHLORIDE	<0.511	<0.511	<0.511	<0.511	<0.511	5.7	93.3
VINYL BROMIDE	<0.875	<0.875	<0.875	<0.875	<0.875	2.9	12.7
VINYL ACETATE	<0.704	<0.704	<0.704	<0.704	<0.704	700	2,933.3
M&P-XYLENE	1.87	<1.73	<1.73	3.86	4.02	NONE ESTABLISHED	
O-XYLENE	1.02	1.00	<0.867	2.15	2.51	333.3	1,466.7
TOTAL XYLENES	2.89	1.00	<0.867	6.01	6.53	333.3	1,466.7

Notes:
Checked by: DFK
Soil gas samples collected on April 10. 2017
Gray shaded cells indicate a concentration identified above the laboratory detection limit
Bold text indicates concentration detected or detection limit exceeding the corresponding comparison criteria
NA-Not Analyzed
Comparison Criteria: Adjusted values obtained from the June 2017 EPA RSLs
Analytical methods as presented in text of report, and attached laboratory results.
< = Below Method Detection Limit, not detected at Estimated Quantitation Limit (EQL).
See analytical reports.
*** TDEC-DUST limits established to evaluate sample train integrity using tracer compound-70% Isopropanol**

Table 3
Summary of Soil Gas Analytical Results (ug/m^3)
Limited Phase II ESA
City of Chattanooga-Avondale Recreation Center
Chattanooga, Tennessee
Project No. 4181-17-006 Phase 02

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B1

SHEET 1 of 1

Logged by: P. Gribben, PG

Remarks:

Elevation: Not surveyed

Start Time/Date: 4/11/2017 8:55 AM

Finish Time/Date: 4/11/2017 9:15 AM

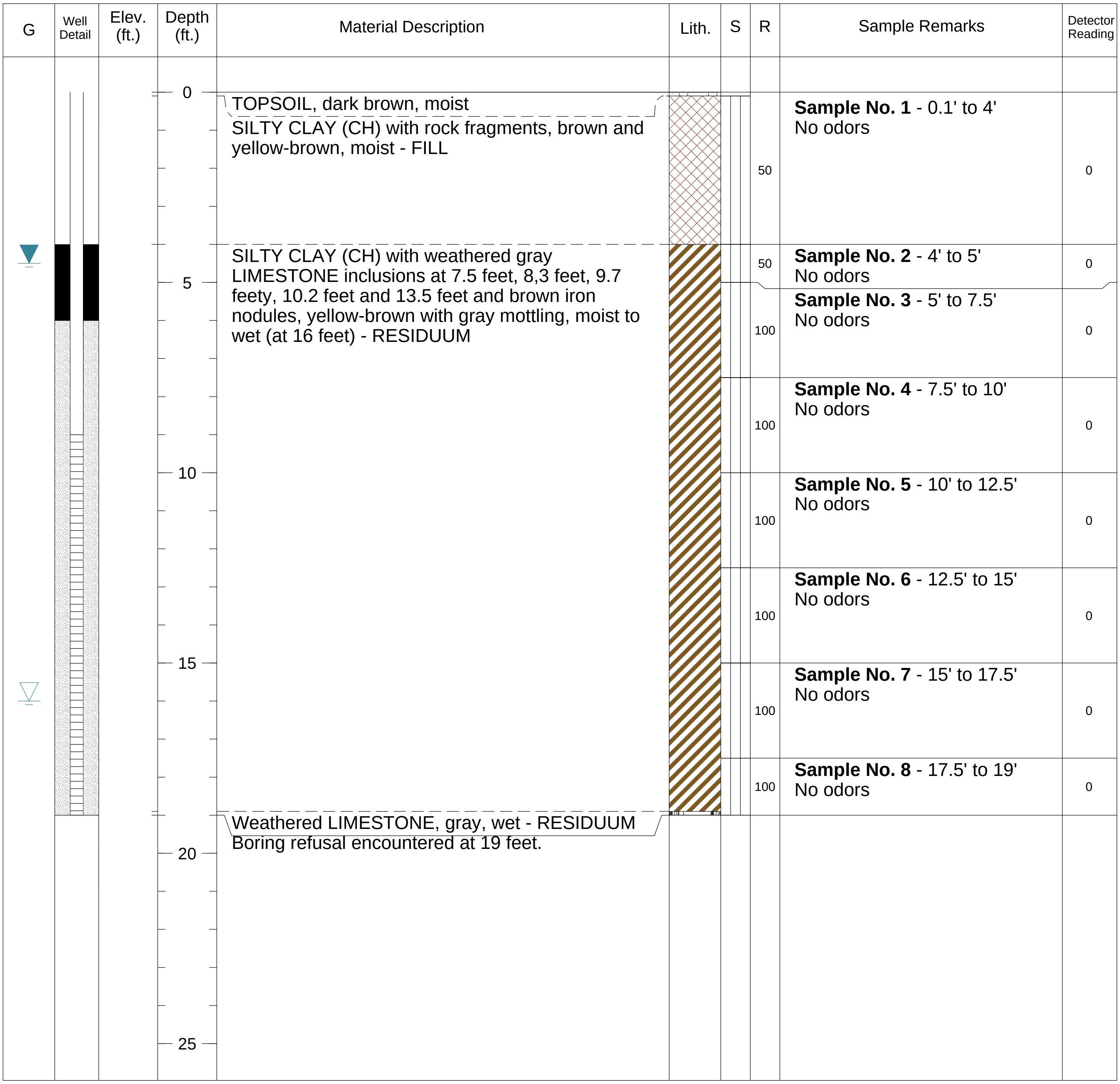
Detector: PID

Rig Type: Geo-Probe

Drilling Method: Direct Push

GROUNDWATER

Date	Water Level
▽ ATD	16 ft
▼ 4/11/17	4.5 ft



Depth (ft.)	Material Description	R	Sample Remarks	Detector Reading
0	TOPSOIL, dark brown, moist			
	SILTY CLAY (CH) with rock fragments, brown and yellow-brown, moist - FILL	50	**Sample No. 1** - 0.1' to 4' No odors	0
4	SILTY CLAY (CH) with weathered gray LIMESTONE inclusions at 7.5 feet, 8,3 feet, 9.7 feety, 10.2 feet and 13.5 feet and brown iron nodules, yellow-brown with gray mottling, moist to wet (at 16 feet) - RESIDUUM	50	**Sample No. 2** - 4' to 5' No odors	0
5		100	**Sample No. 3** - 5' to 7.5' No odors	0
7.5		100	**Sample No. 4** - 7.5' to 10' No odors	0
10		100	**Sample No. 5** - 10' to 12.5' No odors	0
12.5		100	**Sample No. 6** - 12.5' to 15' No odors	0
15		100	**Sample No. 7** - 15' to 17.5' No odors	0
17.5		100	**Sample No. 8** - 17.5' to 19' No odors	0
19	Weathered LIMESTONE, gray, wet - RESIDUUM Boring refusal encountered at 19 feet.			

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B2

SHEET 1 of 1

Logged by: P. Gribben, PG

Remarks:

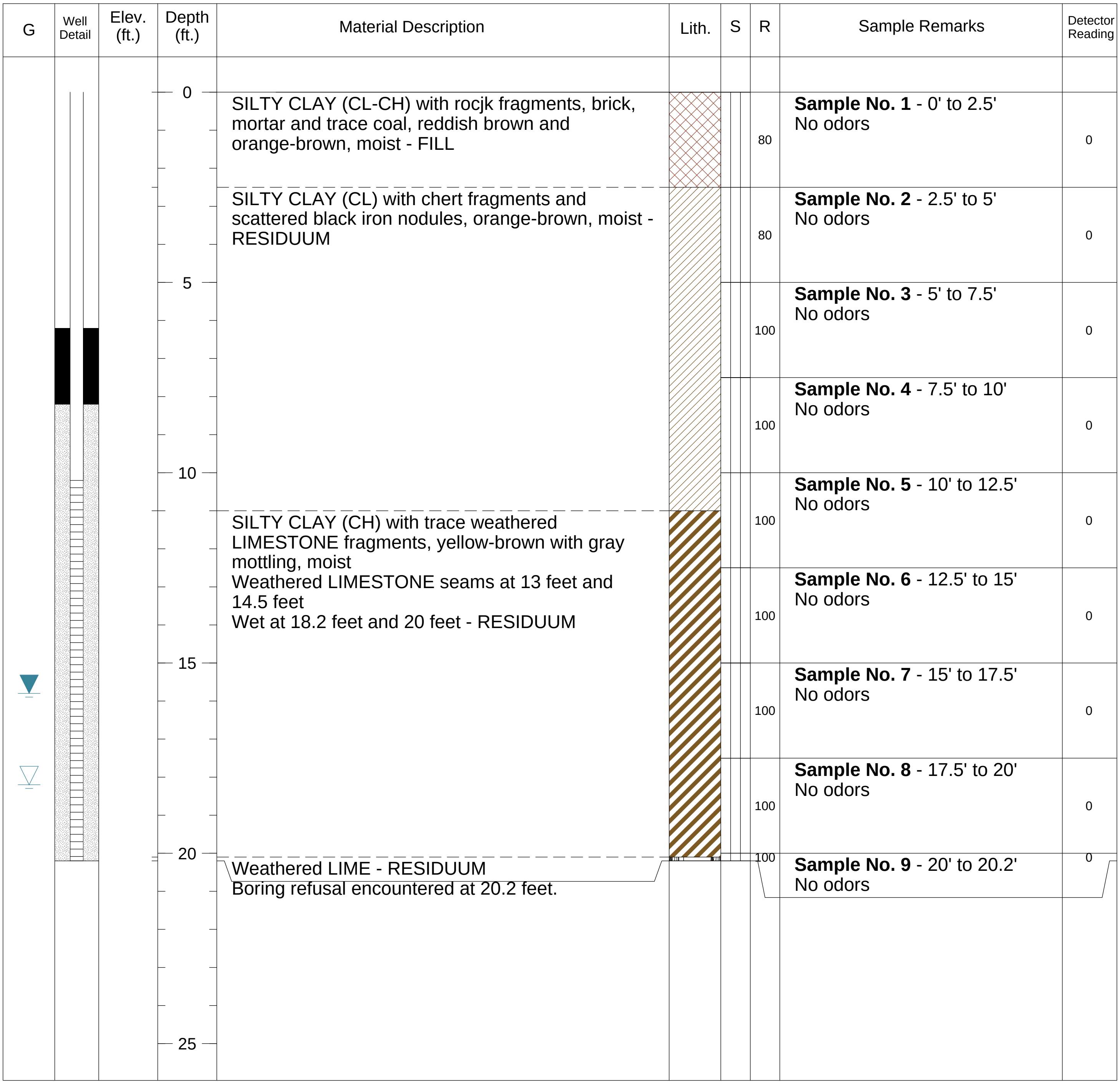
Elevation: Not surveyed

Start Time/Date: 4/11/2017 9:40 AM
Finish Time/Date: 4/11/2017 10:12 AM

Detector: PID
Rig Type: Geo-Probe
Drilling Method: Direct Push

GROUNDWATER

Date	Water Level
∇ ATD	18.2 ft
▼ 4/11/17	15.8 ft



Material Description	R	Sample Remarks	Detector Reading
SILTY CLAY (CL-CH) with rocjk fragments, brick, mortar and trace coal, reddish brown and orange-brown, moist - FILL	80	**Sample No. 1** - 0' to 2.5' No odors	0
SILTY CLAY (CL) with chert fragments and scattered black iron nodules, orange-brown, moist - RESIDUUM	80	**Sample No. 2** - 2.5' to 5' No odors	0
	100	**Sample No. 3** - 5' to 7.5' No odors	0
	100	**Sample No. 4** - 7.5' to 10' No odors	0
SILTY CLAY (CH) with trace weathered LIMESTONE fragments, yellow-brown with gray mottling, moist Weathered LIMESTONE seams at 13 feet and 14.5 feet Wet at 18.2 feet and 20 feet - RESIDUUM	100	**Sample No. 5** - 10' to 12.5' No odors	0
	100	**Sample No. 6** - 12.5' to 15' No odors	0
	100	**Sample No. 7** - 15' to 17.5' No odors	0
	100	**Sample No. 8** - 17.5' to 20' No odors	0
Weathered LIME - RESIDUUM Boring refusal encountered at 20.2 feet.	100	**Sample No. 9** - 20' to 20.2' No odors	0

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B3

SHEET 1 of 1

Logged by: P. Gribben, PG	Elevation: Not surveyed	GROUNDWATER
Remarks:	Start Time/Date: 4/11/2017 10:25 AM Finish Time/Date: 4/11/2017 10:40 AM	Date: ATD Water Level: Not encountered
	Detector: PID Rig Type: Geo-Probe Drilling Method: Direct Push	

G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
	Well not installed		0	ASPHALT- 4 inches	■				
				FOUNDRY SAND with brown CLAY and blue-gray SLAG, black coarse-grained, moist - FILL	▩		20	**Sample No. 1** - 0.4' to 5' Sulfur odor in blue-gray slag	0
			5	GRAVELLY CLAY (CL), reddish brown with chert and LIMESTONE fragments throughout, moist - ALLUVIUM	▨		100	**Sample No. 2** - 5' to 7.5' No odors	0
					▨		100	**Sample No. 3** - 7.5' to 10' No odors	0
				SILTY CLAY (CL-CH) with weathered gray LIMESTONE fragments, yellow-brown with gray mottling, moist - RESIDUUM	▧				
			10		▧		100	**Sample No. 4** - 10' to 12.5' No odors	0
					▧		100	**Sample No. 5** - 12.5' to 15' No odors	0
			15	Boring terminated at 15 feet.					
			20						

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B4

SHEET 1 of 1

Logged by: P. Gribben, PG

Remarks:

Elevation: Not surveyed

Start Time/Date: 4/11/2017 10:57 AM

Finish Time/Date: 4/11/2017 11:25 AM

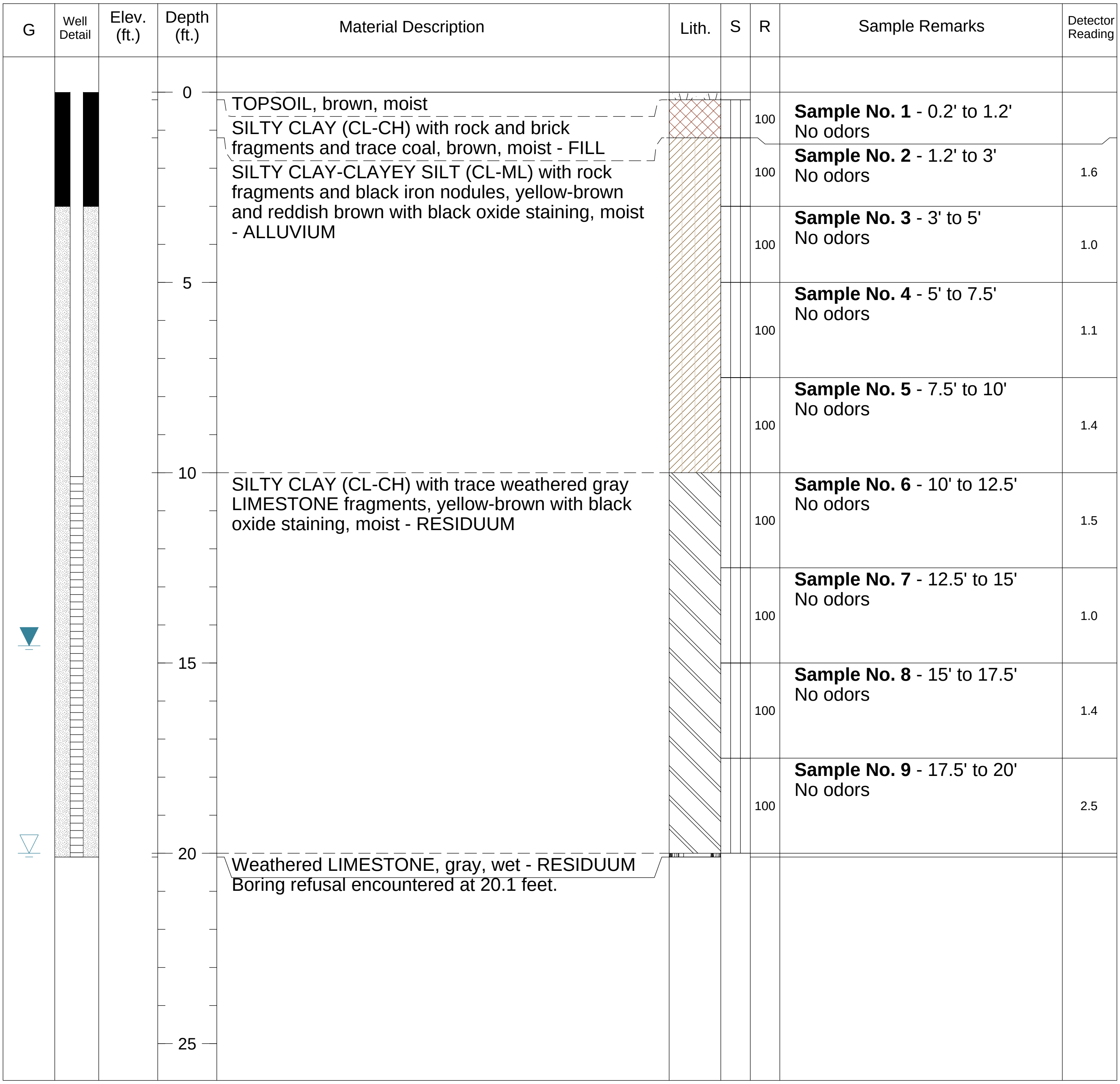
Detector: PID

Rig Type: Geo-Probe

Drilling Method: Direct Push

GROUNDWATER

Date	Water Level
▽ ATD	20 ft
▼ 4/11/17	14.55 ft



G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
			0	TOPSOIL, brown, moist SILTY CLAY (CL-CH) with rock and brick fragments and trace coal, brown, moist - FILL			100	**Sample No. 1** - 0.2' to 1.2' No odors	
				SILTY CLAY-CLAYEY SILT (CL-ML) with rock fragments and black iron nodules, yellow-brown and reddish brown with black oxide staining, moist - ALLUVIUM			100	**Sample No. 2** - 1.2' to 3' No odors	1.6
							100	**Sample No. 3** - 3' to 5' No odors	1.0
			5				100	**Sample No. 4** - 5' to 7.5' No odors	1.1
							100	**Sample No. 5** - 7.5' to 10' No odors	1.4
			10	SILTY CLAY (CL-CH) with trace weathered gray LIMESTONE fragments, yellow-brown with black oxide staining, moist - RESIDUUM			100	**Sample No. 6** - 10' to 12.5' No odors	1.5
▼							100	**Sample No. 7** - 12.5' to 15' No odors	1.0
			15				100	**Sample No. 8** - 15' to 17.5' No odors	1.4
▽							100	**Sample No. 9** - 17.5' to 20' No odors	2.5
			20	Weathered LIMESTONE, gray, wet - RESIDUUM Boring refusal encountered at 20.1 feet.					
			25						

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B5

SHEET 1 of 1

Logged by: P. Gribben, PG

Remarks:

Elevation: Not surveyed

Start Time/Date: 4/11/2017 11:50 AM

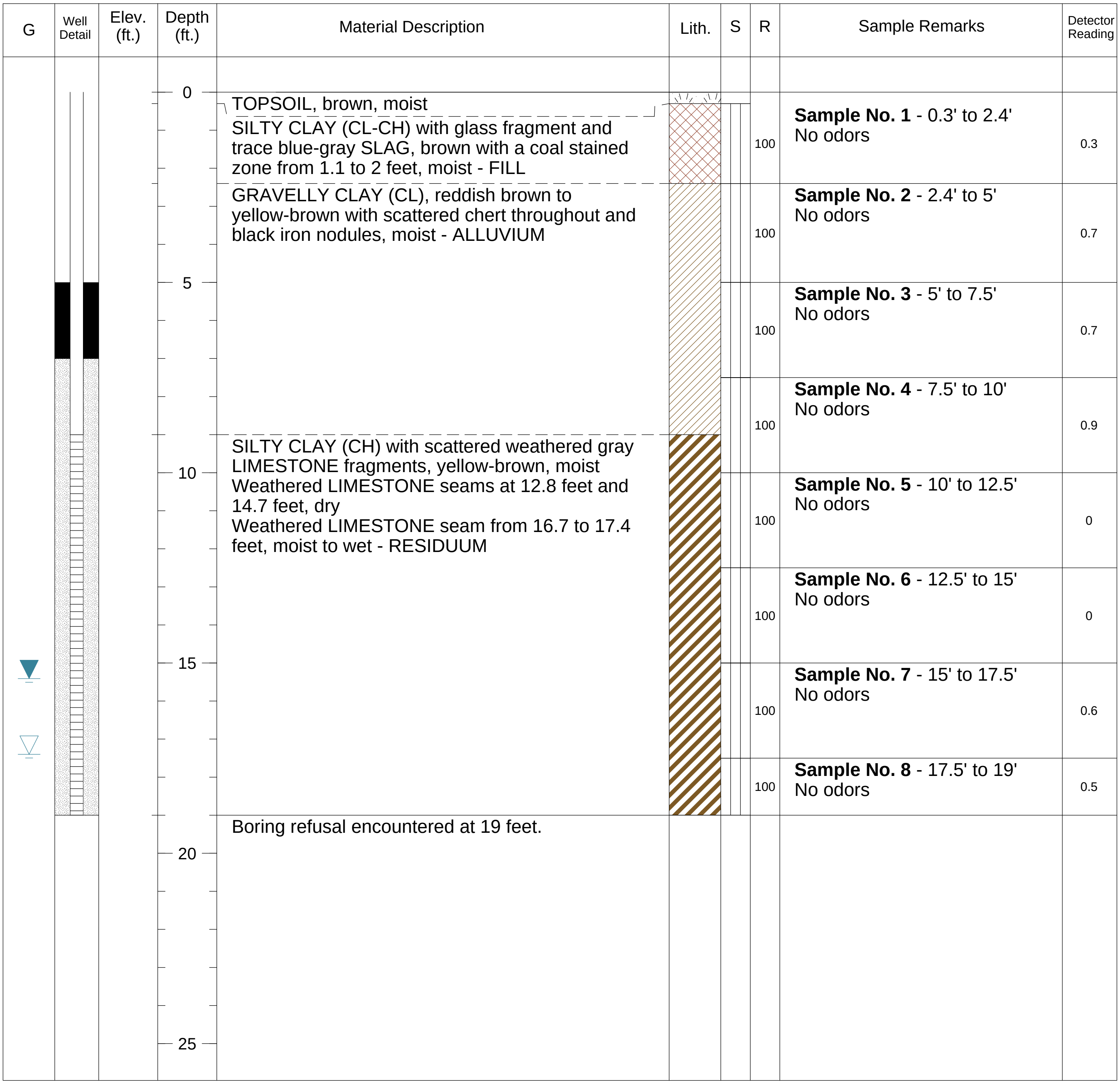
Finish Time/Date: 4/11/2017 12:05 PM

Detector: PID

Rig Type: Geo-Probe

Drilling Method: Direct Push

GROUNDWATER	
Date	Water Level
▽ ATD	17.4 ft
▼ 4/11/17	15.41 ft



Depth (ft.)	Material Description	R	Sample Remarks	Detector Reading
0	TOPSOIL, brown, moist SILTY CLAY (CL-CH) with glass fragment and trace blue-gray SLAG, brown with a coal stained zone from 1.1 to 2 feet, moist - FILL	100	**Sample No. 1** - 0.3' to 2.4' No odors	0.3
	GRAVELLY CLAY (CL), reddish brown to yellow-brown with scattered chert throughout and black iron nodules, moist - ALLUVIUM	100	**Sample No. 2** - 2.4' to 5' No odors	0.7
5		100	**Sample No. 3** - 5' to 7.5' No odors	0.7
		100	**Sample No. 4** - 7.5' to 10' No odors	0.9
10	SILTY CLAY (CH) with scattered weathered gray LIMESTONE fragments, yellow-brown, moist Weathered LIMESTONE seams at 12.8 feet and 14.7 feet, dry Weathered LIMESTONE seam from 16.7 to 17.4 feet, moist to wet - RESIDUUM	100	**Sample No. 5** - 10' to 12.5' No odors	0
		100	**Sample No. 6** - 12.5' to 15' No odors	0
15		100	**Sample No. 7** - 15' to 17.5' No odors	0.6
		100	**Sample No. 8** - 17.5' to 19' No odors	0.5
20	Boring refusal encountered at 19 feet.			
25				

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B6

SHEET 1 of 1

Logged by: P. Gribben, PG

Remarks:

Elevation: Not surveyed

Start Time/Date: 4/11/2017 1:15 PM

Finish Time/Date: 4/11/2017 1:22 PM

Detector: PID

Rig Type: Geo-Probe

Drilling Method: Direct Push

GROUNDWATER	
Date	Water Level
ATD	Not encountered

G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
	Well not installed		0	TOPSOIL, brown, moist					
				SILTY CLAY (CL-CH), slightly sandy with trace coal, brown and reddish brown, moist - FILL	▨		100	**Sample No. 1** - 0.3' to 1.4' No odors	0
				GRAVELLY CLAY (CL) with chert fragments, black iron nodules and trace SAND, orange-brown, moist - ALLUVIUM	▨		100	**Sample No. 2** - 1.4' to 3' No odors	0
							100	**Sample No. 3** - 3' to 5' No odors	0.5
			5				100	**Sample No. 4** - 5' to 7.5' No odors	0
							100	**Sample No. 5** - 7.5' to 10' No odors	0.2
				SILTY CLAY (CH) with scattered weathered gray LIMESTONE fragments, yellow-brown, moist - RESIDUUM	▨				
			10				100	**Sample No. 6** - 10' to 12.5' No odors	0.3
							100	**Sample No. 7** - 12.5' to 14.3' No odors	0.7
				Weathered LIMESTONE, gray, dry - RESIDUUM					
			15	Boring refusal encountered at 14.3 feet.					
			20						

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B7

SHEET 1 of 1

Logged by: P. Gribben, PG	Elevation: Not surveyed	GROUNDWATER
Remarks:	Start Time/Date: 4/11/2017 1:44 PM Finish Time/Date: 4/11/2017 1:50 PM Detector: PID Rig Type: Geo-Probe Drilling Method: Direct Push	Date: ATD Water Level: Not encountered

G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
			0	TOPSOIL, brown ,moist					
	Well not installed			SILTY CLAY (CL) with rock fragments, orange-brown with gray mottling, moist - ALLUVIUM			100	**Sample No. 1** - 0.4' to 2.5' No odors	0.7
							100	**Sample No. 2** - 2.5' to 5' No odors	0.7
			5	Boring terminated at 5 feet.					
			10						

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B8

SHEET 1 of 1

Logged by: P. Gribben, PG	Elevation: Not surveyed	GROUNDWATER	
Remarks:	Start Time/Date: 4/11/2017 2:00 PM Finish Time/Date: 4/11/2017 2:05 PM	Date	Water Level
	Detector: PID Rig Type: Geo-Probe Drilling Method: Direct Push	ATD	Not encountered

G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
	Well not installed		0	TOPSOIL, brown ,moist					
				SILTY CLAY (CL) with trace rock fragments and black iron nodules, slightly sandy, orange-brown, moist - ALLUVIUM	▨		100	**Sample No. 1** - 0.1' to 2.5' No odors	0
					▨		100	**Sample No. 2** - 2.5' to 5' No odors	0.9
			5	Boring terminated at 5 feet.					
			10						

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B9

SHEET 1 of 1

Logged by: P. Gribben, PG

Remarks:

Elevation: Not surveyed

Start Time/Date: 4/11/2017 2:15 PM

Finish Time/Date: 4/11/2017 2:20 PM

Detector: PID

Rig Type: Geo-Probe

Drilling Method: Direct Push

GROUNDWATER

Date	Water Level
ATD	Not encountered

G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
	Well not installed		0	TOPSOIL, brown, moist					
				SILTY CLAY (CL-CH) with trace coal and concrete fragments, brown, moist - FILL				**Sample No. 1** - 0.4' to 2.5' No odors	
				SILTY CLAY (CL) with trace chert fragments, reddish brown, moist - ALLUVIUM			100		0.2
								Sample No. 2 - 2.5' to 5' No odors	
							100		0.1
			5	Boring terminated at 5 feet.					
			10						

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B10

SHEET 1 of 1

Logged by: P. Gribben, PG

Remarks:

Elevation: Not surveyed

Start Time/Date: 4/11/2017 2:42 PM
Finish Time/Date: 4/11/2017 2:47 PM

Detector: PID
Rig Type: Geo-Probe
Drilling Method: Direct Push

GROUNDWATER

Date	Water Level
ATD	Not encountered

G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
	Well not installed		0	SILTY CLAY (CL) with trace coal and brick fragments, brown, moist - FILL	▨		100	**Sample No. 1** - 0' to 1.8' No odors	1.0
				SILTY CLAY (CH) with weathered gray LIMESTONE fragments, yellow-brown, moist - RESIDUUM	▨		100	**Sample No. 2** - 1.8' to 3' No odors	1.2
					▨		100	**Sample No. 3** - 3' to 5' No odors	1.6
			5	Boring terminated at 5 feet.					
			10						

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B11

SHEET 1 of 1

Logged by: P. Gribben, PG	Elevation: Not surveyed	GROUNDWATER	
Remarks:	Start Time/Date: 4/11/2017 3:08 PM Finish Time/Date: 4/11/2017 3:13 PM	Date	Water Level
	Detector: PID Rig Type: Geo-Probe Drilling Method: Direct Push	ATD	Not encountered

G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
	Well not installed		0	SILTY CLAY (CL) with rock, brick and coal fragments, brown, moist - FILL	▨		100	**Sample No. 1** - 0' to 1.7' No odors	0.8
				SILTY CLAY (CH) with trace weathered gray LIMESTONE fragments, yellow-brown with black oxide staining, moist - RESIDUUM	▨		100	**Sample No. 2** - 1.7' to 3' No odors	1.4
					▨		100	**Sample No. 3** - 3' to 5' No odors	1.0
			5	Boring terminated at 5 feet.					
			10						

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B12

SHEET 1 of 1

Logged by: P. Gribben, PG	Elevation: Not surveyed	GROUNDWATER
Remarks:	Start Time/Date: 4/11/2017 3:25 PM Finish Time/Date: 4/11/2017 3:30 PM	Date: ATD Water Level: Not encountered
	Detector: PID Rig Type: Geo-Probe Drilling Method: Direct Push	

G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
	Well not installed		0	ASPHALT- 2 inches	■				
				Crushed LIMESTONE gravel - FILL	▦				
				SILTYCLAY (CL-CH) with large blue-gray SLAG, brown, moist - FILL	▦		70	**Sample No. 1** - 0.7' to 2.5' No odors	0
				SILTY CLAY (CH), with organic matter, dark grayish brown, very moist - ALLUVIUM	▨		70	**Sample No. 2** - 2.5' to 5' No odors	0
				SILTY CLAY (CH) with LIMESTONE fragments, olive, moist - RESIDUUM	▨				
			5	Boring terminated at 5 feet.					
			10						

ENVIRONMENTAL BORING RECORD

City of Chattanooga-Avondale Recreation Center

Chattanooga, Tennessee

S&ME Job No. 4181-17-006

BORING NO. B13

SHEET 1 of 1

Logged by: P. Gribben, PG

Remarks:

Elevation: Not surveyed

Start Time/Date: 4/11/2017 3:17 PM
Finish Time/Date: 4/11/2017 3:22 PM

Detector: PID
Rig Type: Geo-Probe
Drilling Method: Direct Push

GROUNDWATER

Date	Water Level
ATD	Not encountered

G	Well Detail	Elev. (ft.)	Depth (ft.)	Material Description	Lith.	S	R	Sample Remarks	Detector Reading
	Well not installed		0	ASPHALT- 2 inches	■				
				Crushed LIMESTONE gravel - FILL	▨				
				Sand, brick, gravel, concrete fragments, and clay, moist - FILL	▨		80	**Sample No. 1** - 0.7' to 3.6' No odors	0.5
				SILTY CLAY (CH) with trace rock fragments, dark gray, olive, and yellow-brown, very moist to wet - ALLUVIUM	▨		80	**Sample No. 2** - 3.6' to 5' No odors	0.5
			5	Boring terminated at 5 feet.					
			10						

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CITY OF CHATTANOOGA

DEPARTMENT OF PUBLIC WORKS

ENGINEERING DIVISON

ADMINISTRATOR: JUSTIN C HOLLAND

CITY ENGINEER: WILLIAM C PAYNE P.E.

AVONDALE YOUTH AND FAMILY DEVELOPMENT CENTER
Y–15–008

NO.	DATE	REVISION	SIG.
0	X	X	
X	X	X	
X	X	X	
X	X	X	
X	X	X	
X	X	X	
X	X	X	
X	X	X	
X	X	X	
X	X	X	
X	X	X	
X	X	X	

CONTRACT#	Y-15-008
SCALE:	X
DRAWN:	X
DESIGN:	XXX
CHECKED:	XXX

PRELIMINARY (SUBJECT TO CHANGE)

SHEET: 0 OF 0