Report of Reconnaissance Level Geotechnical Exploration
Blythewood Industrial Site - Northern Portion (658 Acres)
Blythewood, South Carolina
S&ME Project No. 4261-18-077

PREPARED FOR:

Richland County Economic Development
1201 Main Street, Suite 910
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PREPARED BY:

S&ME, Inc.
134 Suber Road
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June 18, 2018

June 18, 2018

Richland County Economic Development
1201 Main Street, Suite 910
Columbia, South Carolina 29201

Attention: Ms. Tiffany Harrison, Deputy Director (harrisont@rcgov.us)

Reference: **Report of Reconnaissance Level Geotechnical Exploration**
Blythewood Industrial Site - Northern Portion (658 Acres)
Blythewood, Richland County, South Carolina
S&ME Project No. 4261-18-077

Dear Ms. Harrison:

As requested, S&ME, Inc. has completed field testing for the proposed Blythewood Industrial Site – Northern Portion (658 Acres), in Blythewood, Richland County, South Carolina. Our work was performed in general accordance with S&ME Proposal Number 42-1800248, dated March 12, 2018. This report only addresses the Reconnaissance Level Geotechnical Exploration scope of services of the aforementioned proposal. Results and reports of other scopes of services regarding this site are provided under a separate cover.

This report provides information on the exploration and testing procedures used, our boring records, our geophysical testing results and our preliminary analysis regarding IBC 2015 site class, likely required site preparation, potential for use of on-site soils as structural fill, and potential foundation types.

S&ME appreciates this opportunity to work with you as your geotechnical engineering consultant on this project. Please contact us at (803) 561-9024 if you have any questions or need any additional information regarding this report.

Sincerely,

S&ME, Inc.

Robert C. Bruorton, P.E.
Senior Engineer/Project Manager

Matthew F. Cooke, P.G.
Geotechnical Group Leader

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 26144 ROBERT C. BRUORTON 6-18-18

SOUTH CAROLINA S&ME, INC. No. C00473 CERTIFICATE OF AUTHORIZATION

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Appendices

1.0 Project Information

Information that we have concerning the subject site was provided by Ms. Tiffany Harrison of Richland County Economic Development on March 9, 2018, Mr. Jeff Ruble with the Richland County Economic Development office during a March 24, 2016 meeting with Mr. Marty Baltzegar of S&ME, and Mr. Nelson Lindsay of the South Carolina Department of Commerce. Additional information was provided via e-mail correspondence between Mr. Ruble and Mr. Baltzegar on March 31, 2016. In the e-mail, a tax parcel map depicting the site boundaries were provided. The majority of the approximate 658-acre site is located south and east of Blythewood Road and west of Locklier Road near Blythewood, Richland County, South Carolina, as shown on the *Site Location Plan,* attached as Figure 1 in Appendix I. A portion of the site is located to the east of Locklier Road as shown on Figure 1. The following property owners and their respective tax parcels comprise the site:

- Tinsley – R12500-02-06 (237.56 ac.)
- Swygert - R12600-03-03 (83 ac.), R15100-01-07 (80.73 ac.), R15100-03-01 (18.84 ac.), R12600-03-20 (30 ac.), R15100-01-06 (117 ac.), and R15100-01-04 (27.54 ac.)
- Lux - R15100-03-04 (62.30 ac.)

S&ME is familiar with the area southwest of the site having conducted due diligence services in late 2015 (S&ME Project No. 4261-15-181). It is understood that the site is being explored for the possibility of future industrial development.

2.0 Exploration Procedures

The subsurface exploration of this project included ten (10) Standard Penetration Test (SPT) borings and geophysical testing of two (2) MASW/MAM arrays. A summary of our exploration procedures is included in Appendix II. The approximate locations of the tests are shown in the *Testing Location Plan,* attached as Figure 2 in Appendix I.

2.1 Reconnaissance of Project Area

On May 21, 2018, a representative from S&ME visited the site to observe current site conditions and layout the proposed test locations.

Test locations were laid out using our handheld GPS unit and were marked in the field with white pin flags and pink flagging tape, with the boring numbers and S&ME company name. The locations indicated on the attached plans must be considered as approximate. The elevations shown on our boring records were estimated from on-line GIS mapping and should be considered approximate. No survey of boring locations or elevations was conducted by S&ME.

2.2 Field Testing and Sampling

2.2.1 Soil Test (SPT) Borings

Ten soil test borings (labeled B-1 through B-10) with SPT sampling and testing were performed between June 4 and 5, 2018. The SPT soil test borings were performed by Southern Drill, Inc. under subcontract to S&ME using a truck-mounted CME 550 drill rig. The borings were advanced using 2¼-inch inside diameter hollow-stem augers to refusal/termination depths ranging from roughly 17½ to 25 feet below the existing ground surface.

Split-spoon samples and Standard Penetration Test Resistance N-values were obtained at selected intervals in general accordance with ASTM D-1586. Representative samples of the soils obtained by the split-spoon sampler were collected and placed in suitably identified glass jars and transported to our laboratory. Boring records are attached in Appendix II.

Ground water measurements were attempted in the borings shortly after drilling was completed and after at least 24 hours. After ground water measurements, the boreholes were backfilled with auger cuttings and a plastic hole plug was placed at a depth of roughly 2 feet below the existing ground surface.

2.2.2 Shear Wave Velocity Measurements

Two geophysical measurement of soil properties (SW-1 and SW-2) were conducted by S&ME at the site on May 31, 2018 at the locations shown on the *Testing Location Plan*. Shear wave velocity measurements were performed using Multi-Channel Analysis of Surface Waves (MASW) and Microtremor Array Method (MAM) arrays. Each method measures the travel times of surface generated (active) or ambient (passive) vibrations to geophones mounted on the ground surface at various incremental distances along the array.

The passive (MAM) method utilizes a two-dimensional or L-shaped array because the direction of the passive energy sources is not known. Since the direction of the source wave is known with the active (MASW) method, the geophones were arranged in a linear pattern. The results of the active and passive sources were combined to produce a single shear wave velocity profile at the test location. A 1-D shear wave velocity versus depth profile for each of the MASW/MAM arrays performed on-site is attached in Appendix II.

3.0 Site Conditions

S&ME's assessment of the geotechnical conditions began with a reconnaissance of the topography and physical features of the site. We also consulted various available topographic and geologic maps for relevant information.

3.1 Surface Conditions

The overall site consists of approximately 658 acres of property located in Blythewood, Richland County, South Carolina. The site is bordered by Blythewood Road to the north and west, residential and undeveloped properties to the south and southeast, and I-77 to the northeast. The Fairfield Electric Cooperative office is located to the northwest of the site. Locklier Road traverses through the site from north to south near the eastern border. An existing electrical transmission line right-of-way traverses the southern portion of the site. The existing Smith Pond borders the site to the southwest.

The majority of the site is wooded and undeveloped, with various unpaved trails used to access different portions of the site. A home, barn, shed, and various pieces of construction equipment were observed near the northern border of the site, just off of Blythewood Road. Five existing ponds are located throughout the site, ranging from roughly 2½ to roughly 7 acres in area. Along Locklier Road, multiple areas where evidence of trash dumping were observed.

Existing ground cover consisted of topsoil, grass, underbrush, and poorly graded sands with varying silt contents. All-terrain-vehicles were necessary to access certain parts of the site, particularly the southern portion.

The site slopes from north to south, with existing site grades ranging from roughly 590 feet to roughly 430 feet. This was confirmed upon review of USGS topographical mapping.

3.2 Subsurface Conditions

Boring data and split-spoon soil samples were reviewed in the laboratory by a member of our geotechnical staff. Boring records and other field data are assembled in Appendix II.

3.2.1 Site Geology

The site lies within the White Sand Hills Physiographic Region of the Upper Coastal Plain of South Carolina. The White Sand Hills form the most inland portion of the coastal plain and are underlain by mostly sandy Cretaceous age sediments of the Black Mingo and Middendorf formations. These soils were eroded from a range of mountains in the northwest portion of the state approximately 65,000,000 years ago and laid down in their present positions as fan deposits, where they have weathered in place. In the Columbia metropolitan area these sediments rest unconformably on top of the underlying Piedmont rocks at depths of between 20 and 120 feet. Massive, buff or tan kaolin beds are prevalent throughout the sequence, alternating with coarse-grained water-bearing sands and gravels which become increasingly prevalent near the base of the formation. Soil layers exhibit considerable lateral and vertical discontinuity. In many areas groundwater is relatively shallow and supports heavy forest cover. Fresh soil exposures are typically white, but become pink, purple or rusty orange with weathering. Iron-oxide cemented sandstone beds are common.

In the local area, Coastal Plain sediments have been deeply eroded, exposing underlying Piedmont residuum and weathered rock in some of the deeper swales and depressions. Residual soils of the Carolina Piedmont consist of stiff or very stiff micaceous silts and clays, grading to firm sands with depth. These soils have been completely weathered in place from the parent bedrock material, but below depths of a few feet retain most of the relict rock structure. Soil strength derives largely from relict intermolecular bonding and remolded materials generally exhibit lower shear strength than do undisturbed samples.

The term partially weathered rock (PWR) is applied to very dense micaceous sands or silty sands of the Carolina Piedmont, which register SPT N-values in excess of 100 blows per foot. PWR generally varies widely within even small areas owing to minute differences in the chemical properties of the parent bedrock, which results in widely varying rates of weathering. Isolated lenses or seams of PWR often are present within Piedmont Residuum well above the overall PWR level within a given area. PWR is considered excellent bearing material for foundations and is relatively incompressible except in highly stressed deep foundations.

3.2.2 USDA Soil Survey Information

From a qualitative standpoint, the USDA Natural Resources Conservation Service's Soil Surveys can often provide helpful information. The surveys map the near surface soils (i.e., depths ≤ 6 ft.) and provide general descriptions. The data is not intended to replace geotechnical evaluations and testing but it can help identify trends. Soil maps are often a useful indication of the geologic environment governing soil behavior as well as the seasonal depth to ground water and depth to rock.

The USDA Natural Resource Conservation Service's soils map of Richland County, South Carolina, issued in 1978, indicates ten soil series within the project area:

- Blanton sand, 0 to 6 percent slopes (BaB) – deep, moderately well drained, nearly level to gently sloping soil on convex side slopes in the Coastal Plain uplands.
- Fuquay sand, 2 to 6 percent slopes (FuB) – deep, well drained, gently sloping soil on narrow to broad ridgetops and on narrow side slopes parallel to streams and drainageways in the Sandhills and Coastal Plain uplands.
- Georgeville silt loam, 2 to 6 percent slopes (GeB) – deep, well drained, gently sloping soil on smooth, convex ridgetops on the Piedmont plateau.
- Herndon silt loam, 6 to 10 percent slopes (HeC) – deep, well drained, sloping soil on ridegtops and side slopes in the Piedmont province.
- Lakeland sand, 2 to 6 percent slopes (LaB) – deep, excessively drained, gently sloping, sandy soil on smooth, convex ridgetops in the Sandhills.
- Nason complex, 10 to 30 percent slopes (NaE) – strongly sloping to steep, well drained, deep to shallow soils on side slopes, toe slopes and narrow ridges in the Slate Belt of the Piedmont province.
- Pelion loamy sand, 2 to 6 percent slopes (PeB) – deep, moderately well drained, gently sloping soil on side slopes and toe slopes, mainly in the Sandhills.
- Pelion loamy sand, 6 to 15 percent slopes (PeD) – deep, moderately well drained, sloping to strongly sloping soil on irregular side slopes and knolls, mainly in the Sandhills.
- State sandy loam, 0 to 2 percent slopes (StA) – deep, well drained, nearly level soil on smooth, uniform stream terraces in the piedmont province and adjacent Coastal Plain sections.
- Troup sand, 0 to 6 percent slopes (TrB) – deep, nearly level or gently sloping, well drained soil on smooth convex ridgetops in Coastal Plain uplands.

The soil series information is provided in the table below:

Table 3-1 – USDA Soil Series Survey

Soil Series	Soil Type	Depth to Seasonal High GW Table	Depth to Bedrock	Permeability with Depth	Shrink / Swell Potential	Corrosive Potential
BaB	SP-SM, SC, SM, SM-SC	>6.0 ft.	>60 in.	Rapid to Moderate	Low	Very Strongly to Medium Acid
FuB	SP-SM, SM, SC, SM-SC, CL, CL-ML	2.5-4.0 ft. (perched Jan-Mar)	>60 in.	Rapid then Moderate then Slow	Low	Very Strongly to Strongly Acid
GeB	ML, CL-ML, MH	>6.0 ft.	>60 in.	Moderate	Low	Very Strongly to Medium Acid
HeC	ML, CL-ML, MH	>6.0 ft.	>60 in.	Moderate to Moderately Rapid	Low	Extremely to Slightly Acid
LaB	SP, SP-SM	>6.0 ft.	>72 in.	Very Rapid	Low	Very Strongly to Medium Acid
NaE	ML, CL, CL-ML, MH, CH	>6.0 ft.	40-60 in (rippable)	Moderate	Low to Moderate	Very Strongly to Strongly Acid
PeB	SM, SM-SC, SC, CL-ML, CL	1.0-2.5 ft. (perched Nov-Apr)	>60 in.	Moderately rapid then Slow to Moderately rapid then Moderate	Low	Extremely to Strongly Acid
PeD	SM, SM-SC, SC, CL-ML, CL	1.0-2.5 ft. (perched Nov-Apr)	>60 in.	Moderately rapid then Moderate then Slow to Moderately rapid then Moderate	Low	Extremely to Strongly Acid
StA	SM, SC, SM-SC, ML, CL, CL-ML	>6.0 ft.	>60 in.	Moderately Rapid to Moderate	Low	Very Strongly to Medium Acid

Soil Series	Soil Type	Depth to Seasonal High GW Table	Depth to Bedrock	Permeability with Depth	Shrink / Swell Potential	Corrosive Potential
TrB	SM, SC, SM-SC, CL, CL-ML	>6.0 ft.	>60 in.	Rapid to Moderate	Low	Very Strongly to Strongly Acid

The USDA information provided for this site points to a few items that could influence geotechnical recommendations for specific structures within the site.

- Soil series labeled FuB, PeB and PeD are noted to experience a perched seasonal high ground water table which may affect construction.
- Soil series labeled GeB, HeC and NaE are noted to have high plasticity silts and clays (MH and CH) present.
- Soil series labeled NaE is noted to have shallow, but rippable, bedrock.
- Soil series across the site are extremely to very strongly acidic in nature.

The USDA Soil Survey is shown on the *USDA Soil Survey Map*, attached as Figure 3 in Appendix I.

3.2.3 Interpreted Subsurface Profile

The generalized subsurface conditions at the site are described below. The discussed subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. Soil test boring records are attached in Appendix II, and should be reviewed for specific information at each boring location. The depth and thickness of the subsurface strata indicated on the boring records was estimated based on the drill cuttings and the samples recovered. The transition between materials may be more gradual than indicated on the boring records. Information on actual subsurface conditions exists only at the specific boring locations and is relevant to the time the exploration was performed. Variations may occur and should be expected at locations remote from the boring. The stratification lines were used for our analytical purposes and, unless specifically stated otherwise, should not be used as the basis for design or construction cost estimates.

Surface Materials

Surface materials in the form of topsoil were encountered in each of our soil test borings across the site. Topsoil thickness penetrated by our borings ranged from 4 to 8 inches below the existing ground surface. These soils are typically identified as part of the "A" horizon on USDA pedological soil maps. Samples were weakly cohesive to cohesionless when manipulated by hand. Samples contained minor amounts of organic plant debris, and some samples appeared stained black or dark brown. Samples exhibited a faint discernable organic odor at the surface but below had no discernable odor.

While these measurements are likely representative of the surface materials that will be encountered during construction, the potential exists that greater thicknesses may be encountered at other locations on the site.

Coastal Plain Deposits

Beneath the surface materials, our borings encountered native Coastal Plain deposits consisting of fine to course sands with varying amounts of non-plastic to medium plasticity fines (SP, SP-SM, SP-SC, SM and SC). The Coastal Plain deposits were encountered to depths of roughly 10 to 25 feet below the existing ground surface.

Recovered samples were generally tan, brown, red, orange and gray in color and were dry to wet to the touch, with moisture content typically increasing with depth. SPT N-values ranged from 4 to 81 blows per foot (bpf), increasing with depth, with greater than 50 bpf samples occurring at the transition between Coastal Plain and underlying Piedmont residuum. These SPT N-values indicate very loose to very dense relative densities, with the general trend of the sandy soils being medium dense.

Piedmont Residuum

Beneath the native Coastal Plain deposits in Borings B-3 through B-10, residual Piedmont residual soils consisting of fine to medium sands with varying amounts of non-plastic to low plasticity fines (SP-SM and SM) and low plasticity fine grained soils with varying amounts of fine sands (ML and CL-ML), with one isolated instance of medium to high plasticity fine grained soil (CH). The residual soils were encountered to the termination or refusal depths ranging from 17½ to 25 feet below the existing ground surface. It is important to note that although Piedmont residuum was not penetrated by Borings B-1 and B-2, the native Coastal Plain deposits tended to become more dense and more coarse, giving the appearance that the transition into the Piedmont was nearing, however, the borings reached their planned termination depths prior to penetrating the residuum.

Recovered samples were generally gray, tan and white in color and were dry to wet to the touch. SPT N-values ranged from 6 to 80 bpf, but generally 20 to 50 bpf. These SPT N-values indicate medium dense to dense relative densities and firm to very hard consistencies, with the general trend of the silty and clayey soils being very stiff to hard.

Partially Weathered Rock (PWR)

As previously mentioned, the term partially weathered rock (PWR) is applied to very dense to very hard Piedmont residuum that register SPT N-values in excess of 100 blows per foot. PWR was encountered across the southern half of the site, as provided below:

- Boring B-6 – encountered from roughly 20 feet to the termination depth of 25 feet below the existing ground surface,
- Boring B-7 – encountered from roughly 15 to 20 feet below the existing ground surface, and
- Boring B-10 – encountered from roughly 10 feet to the refusal depth of 17½ feet below the existing ground surface.

Recovered samples of the PWR were generally similar in classification to the overlying Piedmont residual sands and silts (SM and ML).

Refusal to Drilling

Refusal to drilling occurred in Boring B-10 at a depth of approximately 17½ feet below the existing ground surface. Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project. Auger refusal material may consist of large boulders, rock ledges, lenses, seams or the top of parent bedrock. Core drilling techniques would be required to evaluate the character and continuity of the refusal material.

Refusal at this location possibly indicates top of rock. However, depth to rock often varies widely over short distances in the Piedmont and the potential exists that rock will be encountered in areas other than our boring locations.

Ground Water

Ground water was encountered at the time of boring in Boring B-7 at a depth of roughly 15 feet below the existing ground surface. The boreholes were left open for at least 24 hours in an attempt to obtain delayed ground water measurements. Ground water was encountered in Borings B-7 and B-8 after 24 hours at depths ranging from roughly 4 to 5½ feet below the existing ground surface.

Although the remaining borings did not encounter ground water at the time of drilling or after 24 hours, borehole cave in was observed in these borings at depths ranging from roughly 13 to 17 feet below the existing ground surface. Borehole cave-in is sometimes and indicator of ground water elevation. In several of these borings, borehole cave-in depth roughly coincides with increased moisture content of the recovered samples.

Additionally, ground water and borehole cave-in depths measured at the site appear to sometimes coincide with increased SPT N-value, change from sandy to silty/clayey soils and the transition between the Coastal Plain and Piedmont soils. This would generally be indicative of a perched ground water condition. Perched ground water is surface storm water that infiltrates through the upper less dense, more permeable soils and becomes trapped or perched on the underlying more dense, less permeable soils.

We note that ground-water levels are influenced by precipitation, long term climatic variations, and nearby construction. Measurements of ground water made at different times than our exploration may indicate ground-water levels substantially different than indicated on the boring records in Appendix II.

4.0 Building Code Seismic Provisions

Seismic induced ground shaking at the foundation is the effect taken into account by building code seismic-resistant design provisions. Other effects, such as soil liquefaction, are not addressed in building codes but must also be considered.

4.1 IBC Site Class

As of July 1, 2016, the 2015 edition of the International Building Code (IBC) has been adopted for use in South Carolina. We classified the site as one of the Site Classes listed in IBC Section 1613.3, using the procedures described in Chapter 20 of ASCE 7-10.

The initial step in site class definition is a check for the four conditions described for Site Class F, which would require a site-specific evaluation to determine site coefficients F_A and F_V. Soils vulnerable to potential failure under item 1) including quick and highly sensitive clays or collapsible weakly cemented soils were not observed in the borings. Three other conditions, 2) peats and highly organic clays; 3) very high plasticity clays (H>25 feet); and 4) very thick soft/medium stiff clays were also not evident in the borings performed. The remaining vulnerability, liquefaction, appears unlikely at this site due to the age, density and fines content of the soils encountered.

Two MASW-MAM arrays (SW-1 within the northeastern portion of the site and SW-2 within the west-central portion of the site) were completed during this exploration for the site. The calculated average shear wave velocity using the shear wave velocity profile for our SW-1 was 1,382 feet per second and for our SW-2 was 1,466 feet per second. Based on this data and our knowledge of the general geologic profile of the area, we recommend Site Class C be used.

4.2 Design Spectral Values

S&ME determined the spectral response parameters for the site using the general procedures outlined under the 2015 International Building Code Section 1613.3. This approach utilizes a mapped acceleration response spectrum reflecting a targeted risk of structural collapse equal to 1 percent in 50 years to determine the spectral response acceleration at the top of seismic bedrock for any period. The 2015 IBC seismic provisions of Section 1613 use Chapter 20 of ASCE 7-10 to define the base rock motion spectra.

The Site Class is used in conjunction with mapped spectral accelerations S_S and S_1 to determine Site Amplification Coefficients F_A and F_V in IBC Section 1613.3.3, tables 1613.3.3(1) and 1613.3.3(2). For purposes of computation, the Code includes probabilistic mapped acceleration parameters at periods of 0.2 seconds (S_S) and 1.0 seconds (S_1), which are then used to derive the remainder of the response spectra at all other periods. The mapped S_S and S_1 values represent motion at the top of seismic bedrock, defined as the Site Class B-C boundary. The surface ground motion response spectrum, accounting for inertial effects within the soil column overlying rock, is then determined for the design earthquake using spectral coefficients F_A and F_V for the appropriate Site Class.

The design ground motion at any period is taken as 2/3 of the smoothed spectral acceleration as allowed in section 1613.3.4. The design spectral response acceleration values at short periods, S_{DS}, and at one second periods, S_{D1}, are tabulated below for the unimproved soil profile using the IBC 2015 criteria.

ASCE 7-10 was referenced for determination of peak ground acceleration values for computation of seismic hazard. Peak ground acceleration is separately mapped in ASCE 7-10 and corresponds to the geometric mean maximum credible earthquake (MCEG). The mapped PGA value is adjusted for site class effects to arrive at a design peak ground acceleration value, designated as PGA_M.

Table 4-1 – Spectral Design Values

Spectral Design Value	2015 IBC – Site Class C
S_{DS}	0.313 g
S_{D1}	0.151 g
Spectral Design Value	**ASCE 7-10 – Site Class C**
PGA_M	0.249 g

Under the 2015 IBC, for a structure having a Seismic Use Group classification of I, II or III, spectral response acceleration factors given above correspond to Seismic Design Category C as defined in section 1613.3.5 and Tables 1613.3.5(1) and 1613.3.5(2) of the 2015 IBC.

5.0 Preliminary Comments and Conclusions

The preliminary analyses and conclusions submitted herein are based, in part, upon data obtained from the test locations. Subsurface conditions across the site will vary, as will grading and construction details. For the future assumed industrial development on the site, we only provide general comments about the suitability of the property for the anticipated construction. Additional geotechnical exploration and analysis will be required to provide recommendations for site preparation and foundation design, in the event the site is developed for industrial use.

Based on the boring data, we make the following preliminary comments and conclusions. Conditions at this site do not appear to pose issues for site preparation, grading or foundation construction that differ substantially from the surrounding region. However, it is important to note that the near-surface very loose sands and the apparently isolated high plasticity fine grained soils penetrated by our borings can adversely affect site construction.

5.1 Site Preparation

Site preparation should include removal of the existing surface materials across the site. This should include surface vegetation, plow zone materials, organic laden topsoil, stumps, root bulbs and any unstable surface or subsurface soils. Additionally, debris remaining from structure demolition should be removed prior to grading activities. Removal of stumps and roots will result in disturbance of the upper soils. As previously mentioned, up to roughly 8 inches of topsoil were encountered across the site. Topsoil and organic matter may be thicker in areas not explored at this time.

If the site is chosen for development and planned grades are near existing grades, the very loose sandy soil conditions encountered near the existing ground surface will require stabilization. Stabilization may include in-place densification of the very loose sandy soils.

Depending on potential grades and the extent of the isolated high plasticity fine grained soils encountered in our Boring B-3, these materials will require stabilization. Stabilization of the clayey soils may include scarifying and densification, chemical stabilization or over-excavation. Areas of high plasticity clayey soils should be further tested for plasticity characteristics and may include chemical stabilization or over-excavation.

As previously mentioned, ground water was encountered in Borings B-7 and B-8 after 24 hours at depths ranging from roughly 4 to 5½ feet below the existing ground surface. The planned grades for the development were unknown at the time of this report. Therefore, if encountered, a temporary dewatering system that has performed adequately on previous projects with similar conditions consists of temporary ditches and sump pumps.

5.2 Use of On-site Soils as Structural Fill

The native Coastal Plain sandy soils (SP, SP-SM, SP-SC, SM and SC) and Piedmont residual sandy soils (SP-SM and SM) encountered during our exploration are typically well-suited for reuse as structural fill.

While not ideal, encountered low plasticity fine-grained Piedmont residuum (CL-ML and ML) have been successfully re-used as structural fill. With the use of this material, if encountered, strict attention to moisture control during placement will impact the performance during construction. If allowed to become too wet of optimum moisture content, it will be very difficult to work with extended drying times to be expected.

It is important to note that the high plasticity clays (CH) encountered in Boring B-3 are considered unsuitable for re-use as structural fill.

Depending on potential grades at the site, PWR may be encountered. Shot rock or PWR excavated in large chunks can be used in deep fill areas, provided you place them well apart to allow compaction of soil between them. Avoid placing heaped large boulders in the fill, particularly in the building pad. Also, avoid placing large boulders within 2 feet of subgrades. Shot rock or PWR used as mass fill often contains so many fines that considerable settling will occur if the fill is not compacted. Rock fill is usually spread in 18-inch to 48-inch lifts, depending on maximum fragment size. Lift thickness must typically be greater than the maximum size. Typically, the uppermost lift should consist of a layer of fine gravel or soil to choke off the voids in the rock fill and limit risk of dropouts forming on the surface.

Drainage from the site should be provided and maintained to reduce the potential for ponding of water on exposed subgrades. Before beginning to place fill, sample and test each proposed fill material to determine its maximum dry density, optimum moisture content, natural moisture content, and suitability as a structural fill material.

5.3 Foundations

The soil profile encountered across the site appears generally suitable for development for industrial use considering static loading of up to 200 kips. Under these conditions, we anticipate net allowable bearing pressure ranging from 2,500 to 3,000 pounds per square foot (psf) on well-engineered, compacted fill and 3,000 to 3,500 psf on undisturbed or stabilized native soils, provided that settlements of about 1 inch are able to be tolerated. If heavier loading is anticipated, a more rigorous evaluation of foundation settlements will need to be carried out to demonstrate acceptable settlements under these loads. Preliminary settlement estimates given above are based on widely-spaced borings and are subject to change once a final geotechnical exploration of specific building areas is carried out.

6.0 Qualifications of Report

This preliminary 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 upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty either express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

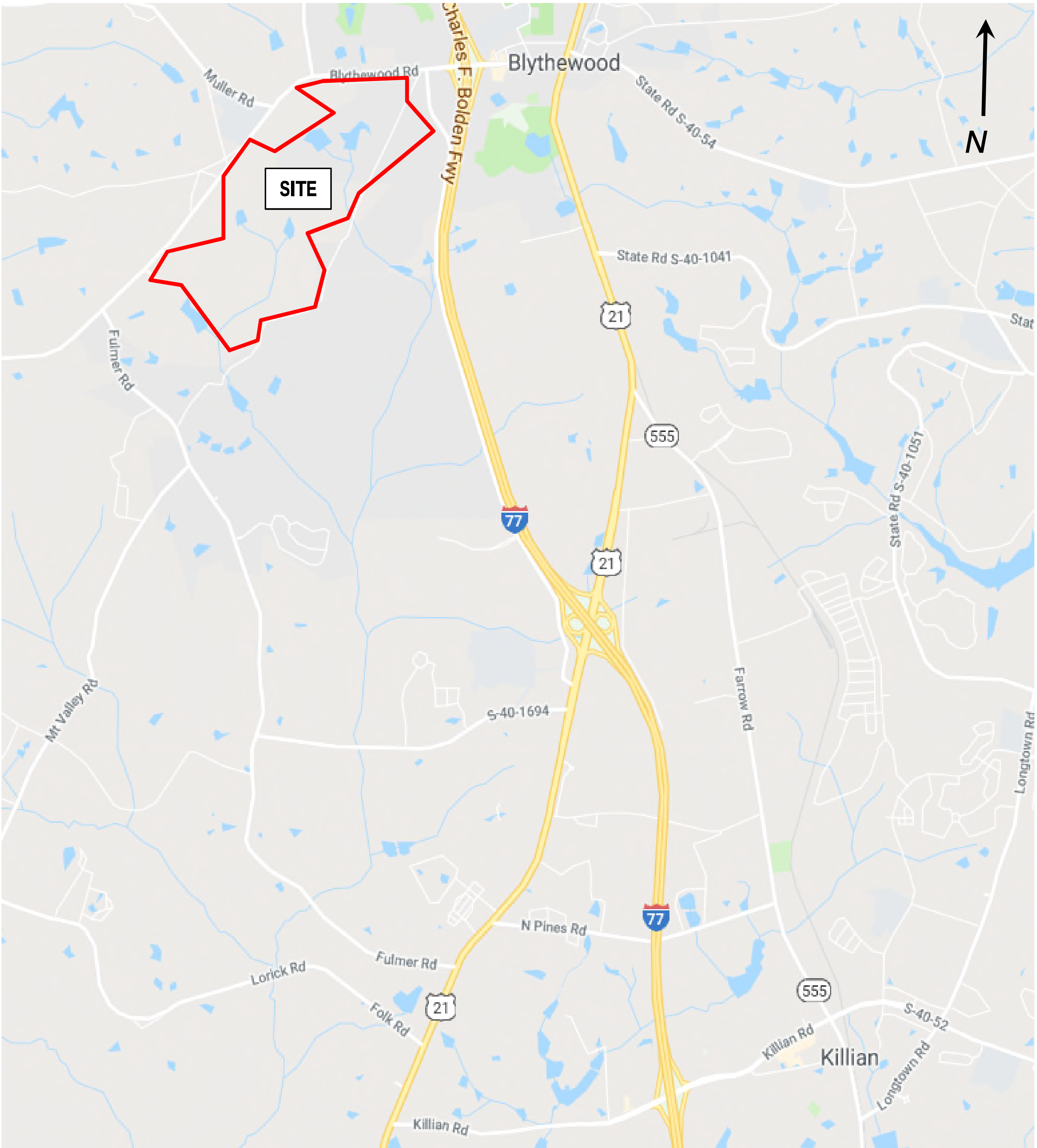
Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

Appendices

Appendix I – Figures



SOURCE: Google Maps

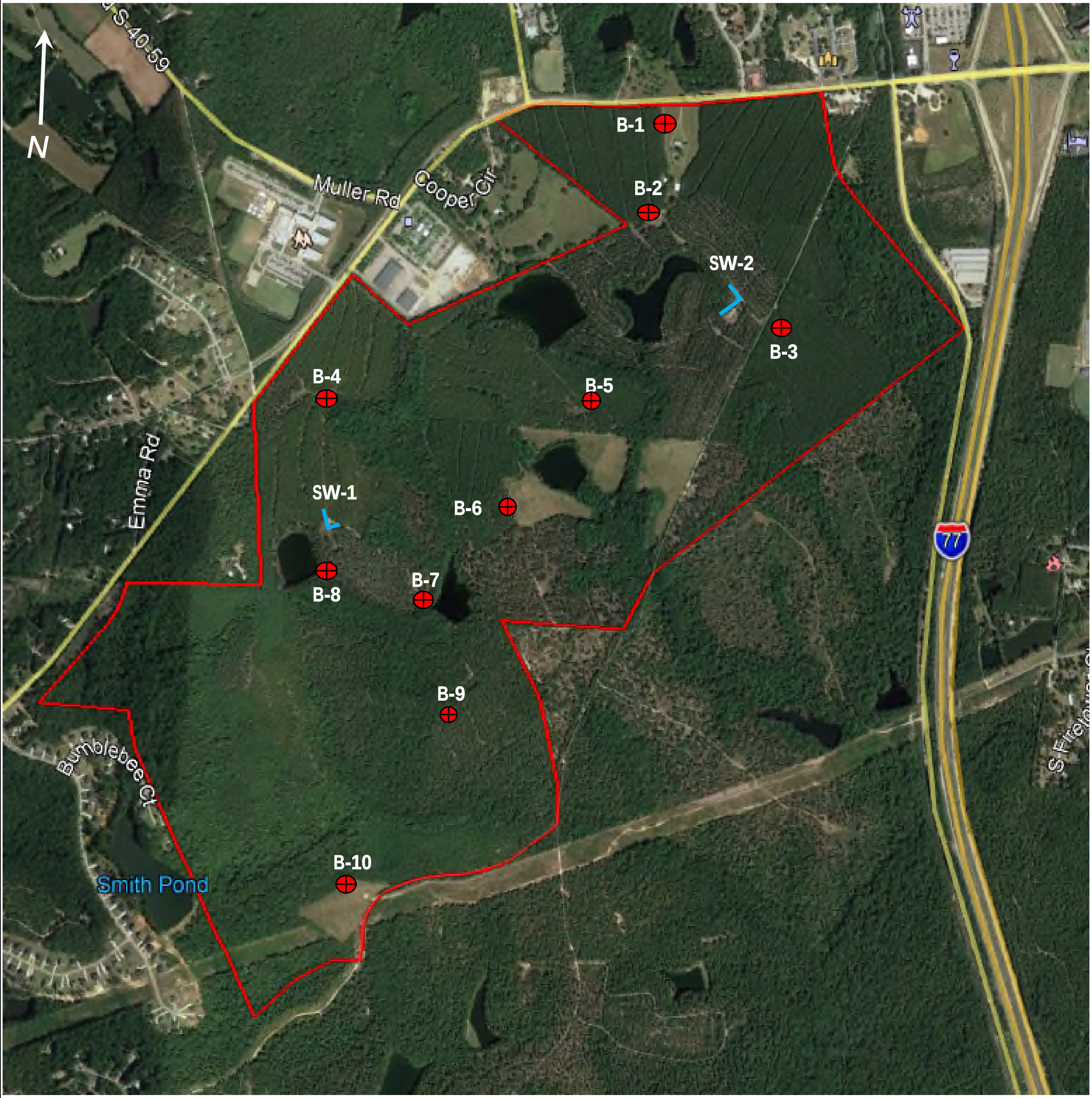
SITE LOCATION PLAN

JOB NAME: Blythewood Ind. Site - Northern Portion (658 Ac.)
LOCATION: Blythewod Road
CITY, STATE: Blythewood, Richland County, South Carolina
JOB NO.: 4261-18-077

SCALE:	NTS	CHECKED BY:	RCB
DATE:	6/18/2018	DRAWN BY:	HGM

FIGURE NO.

1



Approximate Boring Location
Approximate MASW/MAM Location

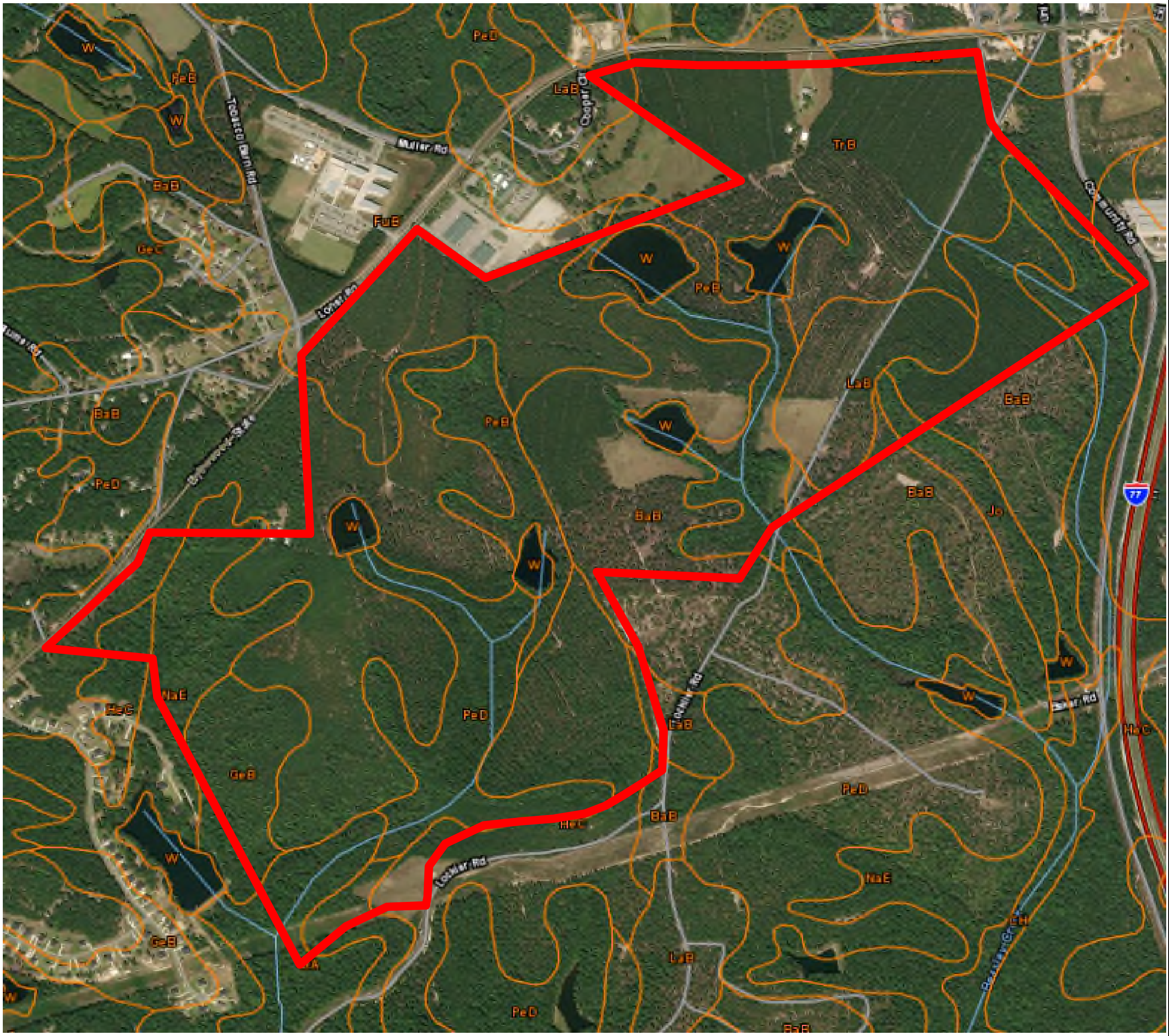
SOURCE: Google Earth

TESTING LOCATION PLAN

JOB NAME:	Blythewood Ind. Site - Northern Portion (658 Ac.)		
LOCATION:	Blythewood Road		
CITY, STATE:	Blythewood, Richland County, South Carolina		
JOB NO.:	4261-18-077		
SCALE:	NTS	CHECKED BY:	RCB
DATE:	6/18/2018	DRAWN BY:	HGM

FIGURE NO.

2



SOURCE: USGS Websoil Survey

USDA SOIL SURVEY MAP

JOB NAME: Blythewood Ind. Site - Northern Portion (658 Ac.)

LOCATION: Blythewood Road

CITY, STATE: Blythewood, Richland County, South Carolina

JOB NO.: 4261-18-077

SCALE:	NTS	CHECKED BY:	RCB
DATE:	6/18/2018	DRAWN BY:	HGM

FIGURE NO.

3

Appendix II – Field Data

LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Concrete
- Topsoil
- Gravel
- Sand
- Silt
- Clay
- Organic
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Partially Weathered Rock
- Cored Rock

WATER LEVELS

(Shown in Water Level Column)

- ▽ = Water Level At Termination of Boring
- ▼ = Water Level Taken After 24 Hours
- ◄ = Loss of Drilling Water
- HC = Hole Cave

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

RELATIVE DENSITY OF COHESIONLESS SOILS

RELATIVE DENSITY	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

SAMPLER TYPES

(Shown in Samples Column)

- Shelby Tube
- Split Spoon
- Rock Core
- No Recovery

TERMS

Standard Penetration Resistance - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

REC - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

RQD - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

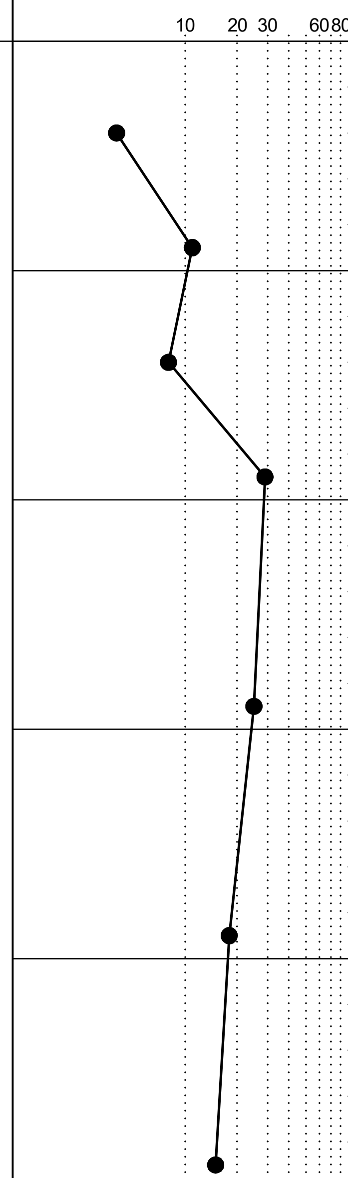
PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

BORING LOG B-1

DATE DRILLED: **6/4/18**	ELEVATION: **523.0 ft**	**NOTES:** SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.
DRILL RIG: **CME 550**	BORING DEPTH: **25.0 ft**	
DRILLER: **H. Wessinger**	WATER LEVEL: **Not Encountered**	
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**	
SAMPLING METHOD: **Split spoon**		NORTHING: **865779** / EASTING: **2001897**
DRILLING METHOD: **2¼" H.S.A.**		

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
0	**SURFACE MATERIALS** - 6 inches of TOPSOIL.							
	<u>COASTAL PLAIN</u> - POORLY GRADED SAND (SP) - mostly fine to medium sands, dry, light tan, very loose. - - - @ 3 feet - medium dense.			SS-1	1	2	2	4
				SS-2	4	6	5	11
5	**POORLY GRADED SAND WITH CLAY (SP-SC)** - mostly fine to medium sands, few low plasticity fines, moist, reddish-brown, loose.		518.0	SS-3	3	3	5	8
	CLAYEY SAND (SC) - mostly fine to medium sands, some low to medium plasticity fines, dry, mottled orange, tan and light gray, medium dense.			SS-4	8	12	17	29
10	**SILTY SAND (SM)** - mostly fine to medium sands, some low plasticity fines, moist, light orange, medium dense.	HC	513.0	SS-5	4	14	11	25
15	**POORLY GRADED SAND WITH SILT (SP-SM)** - mostly fine to medium sands, few non-plastic to low plasticity fines, wet, white, medium dense.		508.0	SS-6	4	7	11	18
20	**POORLY GRADED SAND (SP)** - mostly medium to coarse sands, wet, light gray and light tan, medium dense.		503.0	SS-7	5	6	9	15
25	Boring terminated at 25 ft		498.0					

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS



S&ME BORING LOG 4261-18-077 BORING LOGS.GPJ SME COLUMBIA GINT DATA TEMPLATE.GDT 6/18/18

NOTES:

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2. *BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.*
3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

BORING LOG B-2

DATE DRILLED: **6/4/18**	ELEVATION: **521.0 ft**
DRILL RIG: **CME 550**	BORING DEPTH: **25.0 ft**
DRILLER: **H. Wessinger**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**
SAMPLING METHOD: **Split spoon**	
DRILLING METHOD: **2¼" H.S.A.**	

NOTES: SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.

NORTHING: **864934** | EASTING: **2001555**

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
0	**SURFACE MATERIALS** - 6 inches of TOPSOIL.							
	<u>COASTAL PLAIN</u> - CLAYEY SAND (SC) - mostly fine sands, some low plasticity fines, moist, dark brown, very loose.			SS-1	3	2	2	4
	- - - @ 3 feet - mostly fine to medium sands, little low plasticity fines, moist, light brown, loose.			SS-2	2	3	4	7
5			516.0					
				SS-3	3	3	5	8
	- - - @ 8 feet - dry, red, dense.			SS-4	9	13	26	39
10	**SILTY SAND (SM)** - mostly fine sands, some non-plastic to low plasticity fines, wet, mottled orange, white and tan, medium dense.		511.0					
		<u>HC</u>		SS-5	6	8	10	18
15	**CLAYEY SAND (SC)** - mostly fine to medium sands, some low to medium plasticity fines, wet, tan and light orange, medium dense.		506.0					
				SS-6	4	6	6	12
20	- - - @ 20 feet - mostly medium to coarse sands, light gray and tan, dense.		501.0					
				SS-7	9	15	21	36
25	Boring terminated at 25 ft		496.0					

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS

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3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

BORING LOG B-3

DATE DRILLED: **6/4/18**	ELEVATION: **513.0 ft**
DRILL RIG: **CME 550**	BORING DEPTH: **25.0 ft**
DRILLER: **H. Wessinger**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**
SAMPLING METHOD: **Split spoon**	
DRILLING METHOD: **2¼" H.S.A.**	

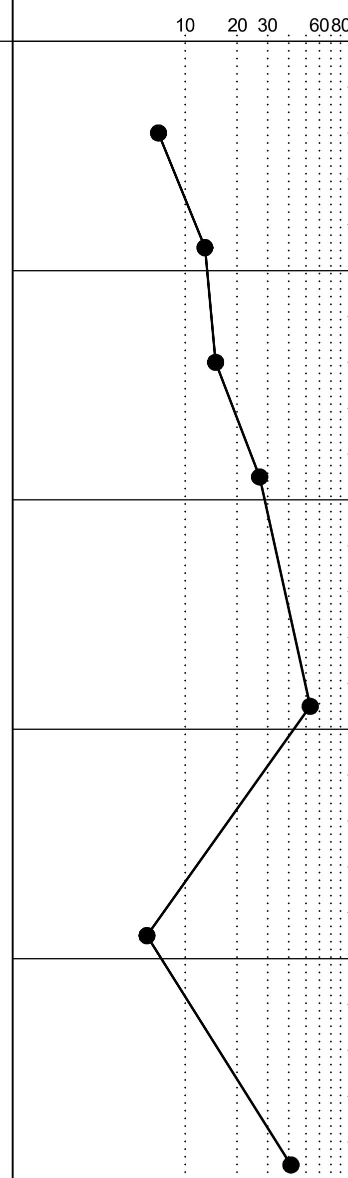
NOTES: SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.

NORTHING: **864015** EASTING: **2002710**

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)
0	**SURFACE MATERIALS** - 6 inches of TOPSOIL.		
	COASTAL PLAIN - POORLY GRADED SAND (SP) - mostly fine to medium sands, dry to moist, brown, loose.		
	POORLY GRADED SAND WITH CLAY (SP-SC) - mostly fine to medium sands, few low plasticity fines, dry to moist, mottled orange, tan and light gray, medium dense.		
5			508.0
	CLAYEY SAND (SC) - mostly fine to medium sands, some low plasticity fines, moist, mottled orange, tan and light gray, medium dense.		
	- - - @ 8 feet - dry to moist, tan and white.		
10			503.0
	- - - @ 10 feet - mostly fine sands, little low plasticity fines, wet, mottled light orange and tan, very dense.		
		HC	
15	**PIEDMONT - FAT CLAY (CH)** - mostly medium to high plasticity fines, moist, light gray and white, firm.		498.0
20	**POORLY GRADED SAND WITH SILT (SP-SM)** - mostly fine to medium sands, few non-plastic to low plasticity fines, wet, tannish-white, dense.		493.0
25	Boring terminated at 25 ft		488.0

SAMPLE NO.	BLOW COUNT / CORE DATA: 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
SS-1	3	4	3	7
SS-2	3	5	8	13
SS-3	6	6	9	15
SS-4	8	12	15	27
SS-5	16	21	32	53
SS-6	3	3	3	6
SS-7	16	21	20	41

STANDARD PENETRATION TEST DATA (blows/ft) REMARKS



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3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

BORING LOG B-4

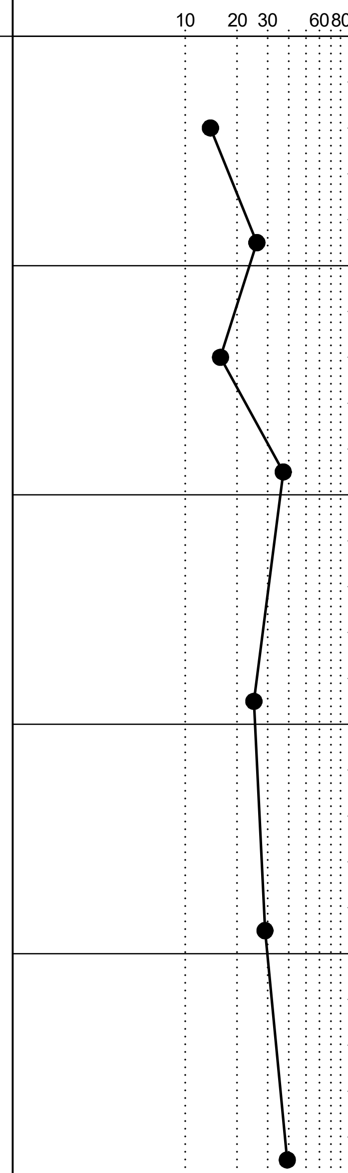
DATE DRILLED: **6/5/18**	ELEVATION: **542.0 ft**
DRILL RIG: **CME 550**	BORING DEPTH: **25.0 ft**
DRILLER: **H. Wessinger**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**
SAMPLING METHOD: **Split spoon**	
DRILLING METHOD: **2¼" H.S.A.**	

NOTES: SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.

NORTHING: **863347** EASTING: **1998589**

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
0	**SURFACE MATERIALS** - 4 inches of TOPSOIL.							
	COASTAL PLAIN - CLAYEY SAND (SC) - mostly fine to medium sands, some low to medium plasticity fines, dry to moist, reddish-orange, medium dense.			SS-1	4	6	8	14
	- - - @ 3 feet - light brown.			SS-2	9	12	14	26
5	- - - @ 5 feet - little low plasticity fines, mottled light brown and red.		537.0	SS-3	6	6	10	16
	- - - @ 8 feet - mostly medium to coarse sands, light orangish-red, dense.			SS-4	10	16	21	37
10	**SILTY SAND (SM)** - mostly fine to medium sands, some low plasticity fines, moist, light orange and white, medium dense.	HC	532.0	SS-5	8	10	15	25
15	- - - @ 15 feet - white.		527.0					
				SS-6	9	12	17	29
20	- - - @ 20 feet - wet, light tan and white, dense.		522.0					
				SS-7	11	19	20	39
25	Boring terminated at 25 ft		517.0					

STANDARD PENETRATION TEST DATA (blows/ft)
REMARKS



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PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

BORING LOG B-5

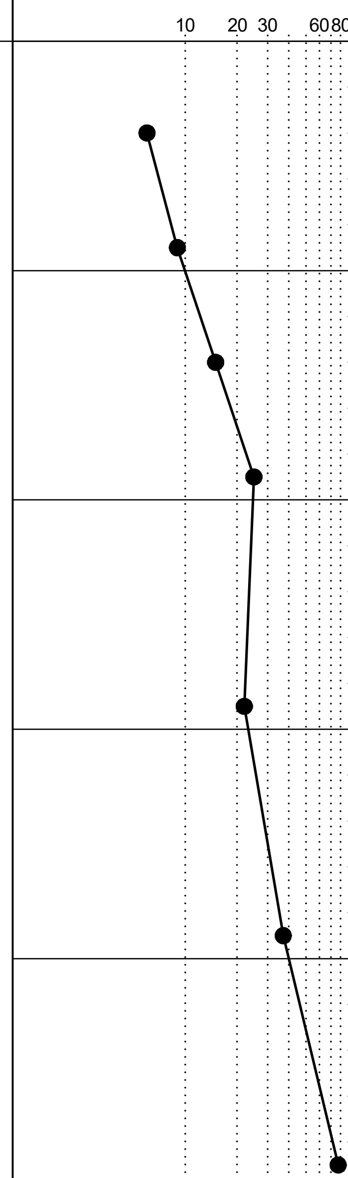
DATE DRILLED: **6/5/18**	ELEVATION: **506.0 ft**
DRILL RIG: **CME 550**	BORING DEPTH: **25.0 ft**
DRILLER: **H. Wessinger**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**
SAMPLING METHOD: **Split spoon**	
DRILLING METHOD: **2¼" H.S.A.**	

NOTES: SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.

NORTHING: **863269** EASTING: **2000949**

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
0	**SURFACE MATERIALS** - 8 inches of TOPSOIL.							
	COASTAL PLAIN - CLAYEY SAND (SC) - mostly fine to medium sands, little low plasticity fines, dry to moist, mottled brown and red, loose.			SS-1	2	3	3	6
	- - - @ 3 feet - mottled tan and orange.			SS-2	3	5	4	9
5	- - - @ 5 feet - medium dense.		501.0	SS-3	5	5	10	15
	- - - @ 8 feet - mostly medium to coarse sands, some low to medium plasticity fines, trace gravel, moist, tannish-white.			SS-4	8	11	14	25
10	**PIEDMONT - SILTY CLAY (CL-ML)** - mostly low plasticity fines, dry to moist, white, very stiff, relict rock structure.		496.0					
15			491.0	SS-5	9	12	10	22
		HC						
				SS-6	10	16	21	37
20	**SILT WITH SAND (ML)** - mostly low plasticity fines, little fine sands, dry, white, very hard.		486.0					
				SS-7	19	31	46	77
25	Boring terminated at 25 ft		481.0					

STANDARD PENETRATION TEST DATA (blows/ft)
REMARKS



S&ME BORING LOG 4261-18-077 BORING LOGS.GPJ SME COLUMBIA GINT DATA TEMPLATE.GDT 6/18/18

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4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

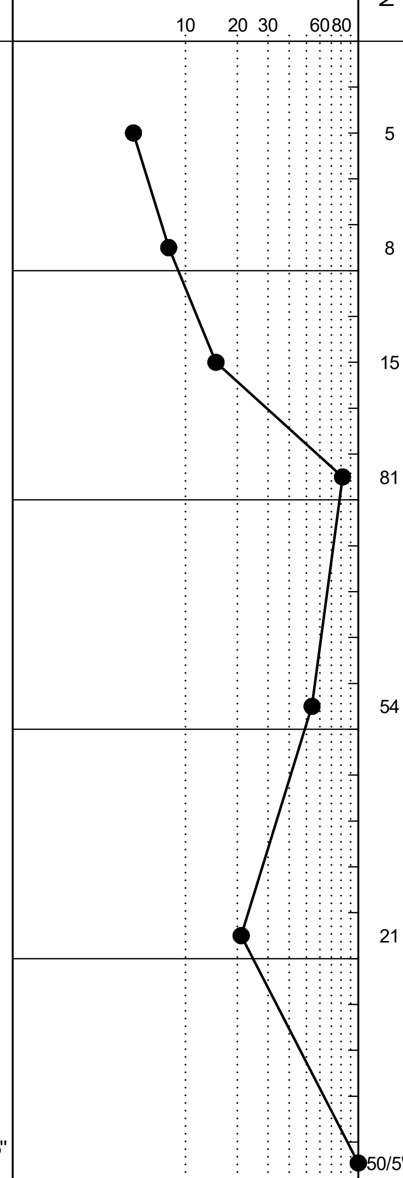
BORING LOG B-6

DATE DRILLED: **6/4/18**	ELEVATION: **509.0 ft**	**NOTES:** SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.
DRILL RIG: **CME 550**	BORING DEPTH: **25.0 ft**	
DRILLER: **H. Wessinger**	WATER LEVEL: **Not Encountered**	
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**	
SAMPLING METHOD: **Split spoon**		NORTHING: **862395** EASTING: **2000290**
DRILLING METHOD: **2¼" H.S.A.**		

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
0	**SURFACE MATERIALS** - 8 inches of TOPSOIL.							
	COASTAL PLAIN - POORLY GRADED SAND (SP) - mostly fine to medium sands, dry to moist, tannish-gray, loose.			SS-1	2	2	3	5
	POORLY GRADED SAND WITH CLAY (SP-SC) - mostly fine to medium sands, few low plasticity fines, moist, light brown, loose.			SS-2	3	3	5	8
5	- - - @ 5 feet - medium dense.		504.0	SS-3	4	6	9	15
	CLAYEY SAND (SC) - mostly fine to medium sands, some low to medium plasticity fines, dry to moist, mottled orange, tan and light gray, very dense.			SS-4	21	33	48	81
10			499.0					
				SS-5	16	20	34	54
15	**PIEDMONT - SILT (ML)** - mostly low to medium plasticity fines, moist, tannish-white, very stiff, relict rock structure.		494.0					
		HC		SS-6	6	8	13	21
20	**PARTIALLY WEATHERED ROCK (PWR) - SANDY SILT (ML)** - mostly low plasticity fines, some fine sands, dry, light gray to white, very hard, relict rock structure.		489.0					
				SS-7	12	31	50/5"	50/5"
25	Boring terminated at 25 ft		484.0					

STANDARD PENETRATION TEST DATA (blows/ft)

REMARKS



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PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

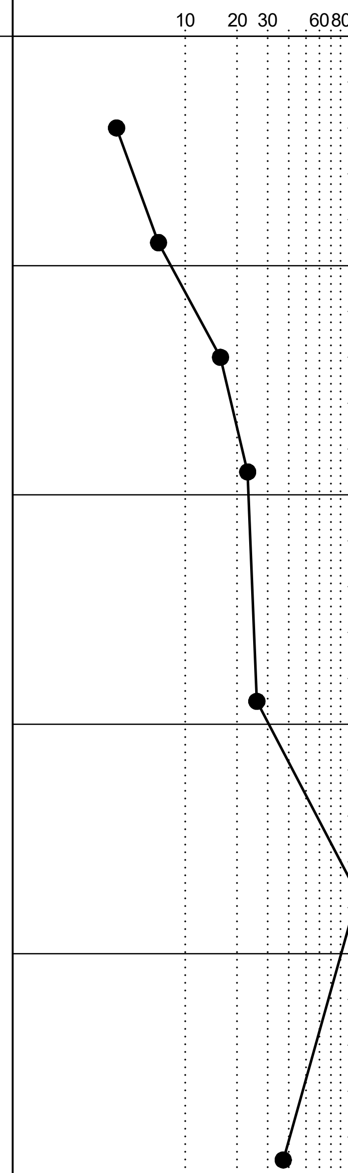
BORING LOG B-7

DATE DRILLED: **6/5/18**	ELEVATION: **496.0 ft**	**NOTES:** SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.
DRILL RIG: **CME 550**	BORING DEPTH: **25.0 ft**	
DRILLER: **H. Wessinger**	WATER LEVEL: **15' ATD, 5.4' 24 hr**	
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**	
SAMPLING METHOD: **Split spoon**		NORTHING: **862161** / EASTING: **1998605**
DRILLING METHOD: **2¼" H.S.A.**		

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	BLOW COUNT / CORE DATA: 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
0	**SURFACE MATERIALS** - 8 inches of TOPSOIL.							
	COASTAL PLAIN - POORLY GRADED SAND (SP) - mostly fine to medium sands, dry, light grayish-tan, very loose.			SS-1	1	2	2	4
	POORLY GRADED SAND WITH CLAY (SP-SC) - mostly fine to medium sands, few low plasticity fines, moist, brown, loose.			SS-2	3	4	3	7
5	**CLAYEY SAND (SC)** - mostly fine to medium sands, some low plasticity fines, moist, orangish-brown, medium dense.	▼	491.0	SS-3	5	7	9	16
	- - - @ 8 feet - mostly medium to coarse sands, some low to medium plasticity fines, light orange.			SS-4	6	10	13	23
10	**PIEDMONT - SILT (ML)** - mostly low plasticity fines, dry, yellowish-white, very stiff.		486.0					
		HC		SS-5	9	12	14	26
15	**PARTIALLY WEATHERED ROCK (PWR) - SANDY SILT (ML)** - mostly low plasticity fines, some fine to medium sands, dry, white, very hard, relict rock structure.	▽	481.0	SS-6	50/5"			50/5"
20	**SILT WITH SAND (ML)** - mostly low plasticity fines, little fine sands, dry, tannish-white, hard, relict rock structure.		476.0	SS-7	10	16	21	37
25	Boring terminated at 25 ft		471.0					

STANDARD PENETRATION TEST DATA (blows/ft)

REMARKS



S&ME BORING LOG 4261-18-077 BORING LOGS.GPJ SME COLUMBIA GINT DATA TEMPLATE.GDT 6/18/18

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4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

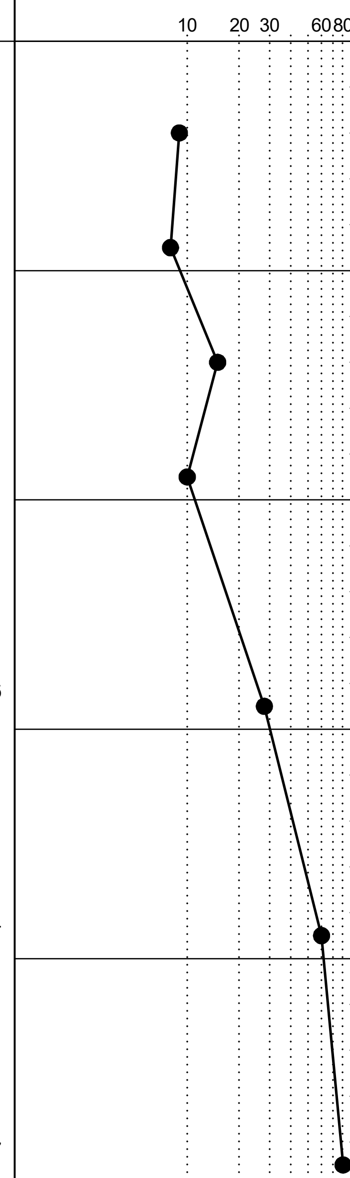
PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

BORING LOG B-8

DATE DRILLED: **6/5/18**	ELEVATION: **514.0 ft**	**NOTES:** SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.
DRILL RIG: **CME 550**	BORING DEPTH: **25.0 ft**	
DRILLER: **H. Wessinger**	WATER LEVEL: **4.1' 24 hr**	
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**	
SAMPLING METHOD: **Split spoon**	NORTHING: **861714**	EASTING: **1997618**
DRILLING METHOD: **2¼" H.S.A.**		

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
0	**SURFACE MATERIALS** - 6 inches of TOPSOIL.							
	COASTAL PLAIN - POORLY GRADED SAND (SP) - mostly fine to medium sands, moist, light gray, loose.			SS-1	3	4	5	9
3	**CLAYEY SAND (SC)** - mostly fine to medium sands, some low to medium plasticity fines, moist, mottled orange, tan and gray, loose.	▼ (4.1')		SS-2	2	3	5	8
5	- - - @ 5 feet - medium dense.		509.0	SS-3	4	6	9	15
8	- - - @ 8 feet - mostly medium to coarse sands, some low plasticity fines, moist to wet, yellowish-tan, loose.			SS-4	4	4	6	10
10	**PIEDMONT - SILT WITH SAND (ML)** - mostly low plasticity fines, little fine sands, dry, white, very stiff, relict rock structure.	HC	504.0	SS-5	9	12	16	28
15	**SILT (ML)** - mostly low plasticity fines, dry, white, very hard, relict rock structure.		499.0					
20			494.0	SS-6	16	29	31	60
25			489.0	SS-7	20	33	47	80
	Boring terminated at 25 ft							

STANDARD PENETRATION TEST DATA (blows/ft)
REMARKS



NOTES:

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2. *BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.*
3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

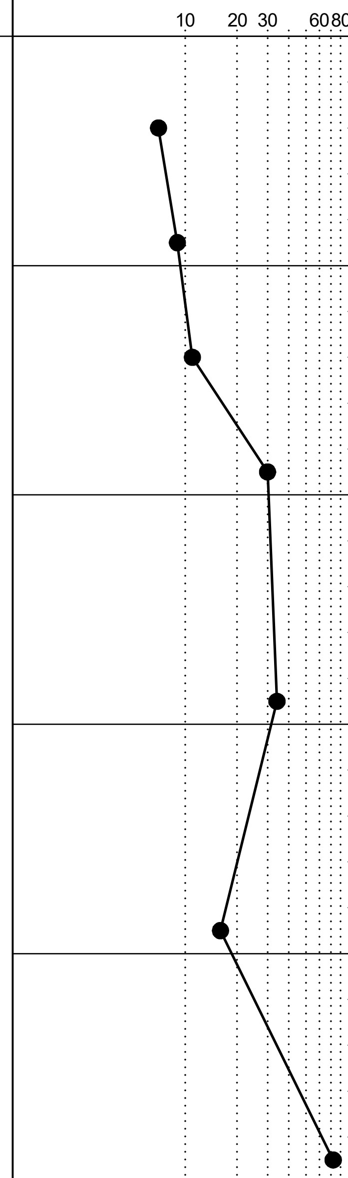
PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

BORING LOG B-9

DATE DRILLED: **6/5/18**	ELEVATION: **504.0 ft**	**NOTES:** SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.
DRILL RIG: **CME 550**	BORING DEPTH: **25.0 ft**	
DRILLER: **H. Wessinger**	WATER LEVEL: **Not Encountered**	
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**	
SAMPLING METHOD: **Split spoon**		NORTHING: **860961** / EASTING: **1999894**
DRILLING METHOD: **2¼" H.S.A.**		

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
0	**SURFACE MATERIALS** - 6 inches of TOPSOIL.							
	<u>COASTAL PLAIN</u> - POORLY GRADED SAND (SP) - mostly fine to medium sands, dry to moist, tannish-gray, loose. - - - @ 3 feet - tan.			SS-1	2	3	4	7
				SS-2	3	4	5	9
5	**POORLY GRADED SAND WITH CLAY (SP-SC)** - mostly fine to medium sands, few low plasticity fines, moist, mottled orange and tan, medium dense.		499.0	SS-3	5	5	6	11
	CLAYEY SAND (SC) - mostly fine to medium sands, little low plasticity fines, moist orangish-red, medium dense.			SS-4	12	14	16	30
10	- - - @ 10 feet - light tan and orange, dense.		494.0					
15		HC	489.0	SS-5	13	15	19	34
	- - - @ 15 feet - mostly medium to coarse sands, some low to medium plasticity fines, wet, light tan, medium dense.			SS-6	3	5	11	16
20	**<u>PIEDMONT</u> - SILT WITH SAND (ML)** - mostly low plasticity fines, little fine sands, dry, yellowish-white, very hard, relict rock structure.		484.0					
				SS-7	21	30	42	72
25	Boring terminated at 25 ft		479.0					

STANDARD PENETRATION TEST DATA (blows/ft) REMARKS



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2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

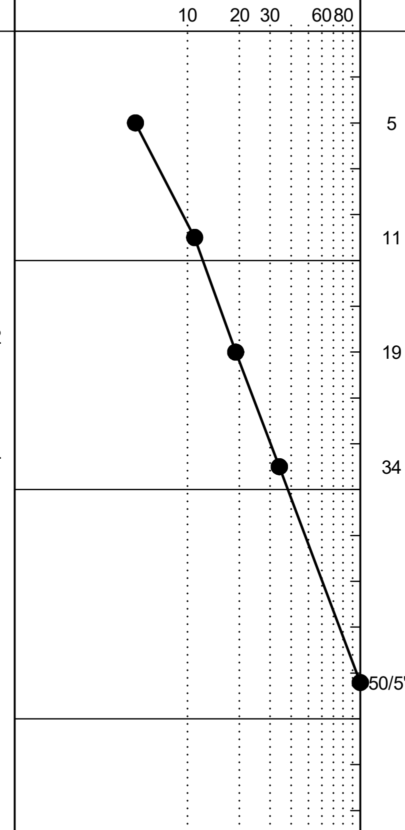
PROJECT: **Blythewood Industrial Site - Northern Portion (658 Acres)**
Blythewood, South Carolina
S&ME Project No. 4261-18-077

BORING LOG B-10

DATE DRILLED: **6/5/18**	ELEVATION: **486.0 ft**	**NOTES:** SC State Plane Northing & Easting converted from Latitude & Longitude estimated from Google Earth. Elevation estimated from the provided Topographic Map. No formal survey performed by S&ME.
DRILL RIG: **CME 550**	BORING DEPTH: **17.5 ft**	
DRILLER: **H. Wessinger**	WATER LEVEL: **Not Encountered**	
HAMMER TYPE: **Auto**	LOGGED BY: **RCB**	
SAMPLING METHOD: **Split spoon**		NORTHING: **859151** EASTING: **1998783**
DRILLING METHOD: **2¼" H.S.A.**		

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	BLOW COUNT 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
0	**SURFACE MATERIALS** - 8 inches of TOPSOIL.							
	COASTAL PLAIN - PORLY GRADED SAND (SP) - mostly fine to medium sands, moist, grayish-tan, loose.			SS-1	2	3	2	5
	CLAYEY SAND (SC) - mostly fine to medium sands, little low to medium plasticity fines, moist, mottled orange, gray and tan, medium dense.			SS-2	3	5	6	11
5	- - - @ 5 feet - some low to medium plasticity fines, mottled gray and tan.		481.0	SS-3	5	7	12	19
	- - - @ 8 feet - little low plasticity fines, orangish-tan, dense.			SS-4	10	13	21	34
10	**PIEDMONT - PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)** - mostly fine sands, little low plasticity fines, dry, tannish-orange, very dense, relict rock structure.	HC	476.0					
				SS-5	31	50/5"		50/5"
15			471.0					
17.5	Boring terminated at 17.5 ft due to auger refusal							

STANDARD PENETRATION TEST DATA (blows/ft)
REMARKS



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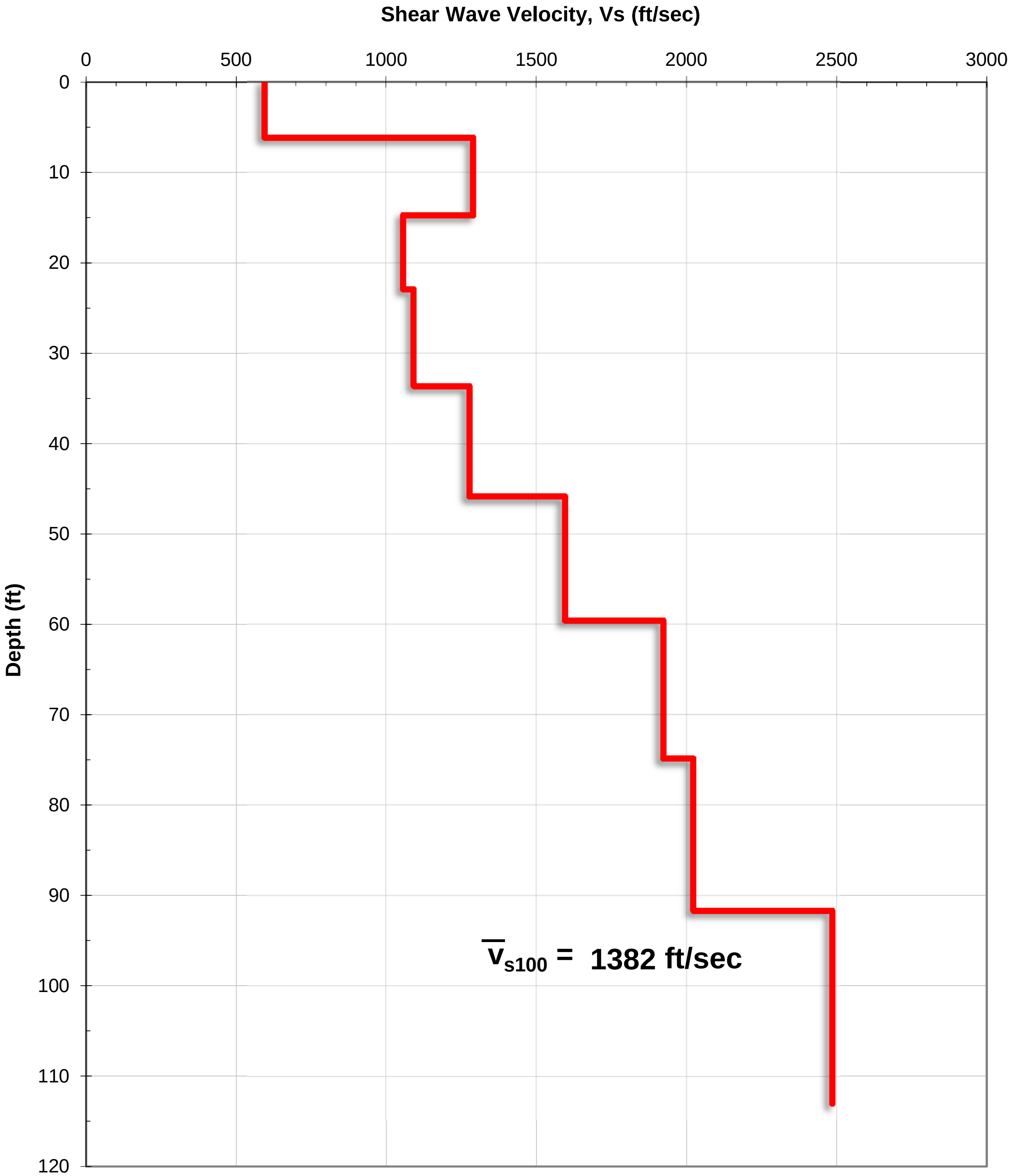
Shear Wave Velocity Profile SW-1
Blythewood Industrial Site - Northern Portion (658 Acres
Blythewood, South Carolina
4261-18-007



Summary of Field Procedures

♦ Boring and Sampling

Soil Test Boring with Hollow-Stem Auger

Soil sampling and penetration testing were performed in general accordance with ASTM D1586, *Standard Test Method for Penetration Test and Split Barrel Sampling of Soils*. Borings were made by mechanically twisting a continuous steel hollow stem auger into the soil. At regular intervals, soil samples were obtained with a standard 1.4-inch I. D., 2-inch O. D., split barrel sampler. The sampler was first seated six inches to penetrate any loose cuttings, then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler through the two final six inch increments was recorded as the penetration resistance (SPT N) value. The N-value, when properly interpreted by qualified professional staff, is an index of the soil strength and foundation support capability.

Refusal to Drilling

Refusal to the soil drilling methods used at this site may result from encountering hard cemented soil, soft weathered rock, coarse gravel, cobbles or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling would be required to determine the character and continuity of materials below refusal of the soil auger in natural soils. Where fills are present, refusal to drilling may also result from encountering buried debris, building materials, or objects. Backhoe test pits would be required to expose and identify buried materials below refusal levels in filled areas.

Borehole Closure

Following collection of relevant geotechnical data, boreholes were filled by slowly pouring auger cuttings into the open hole such that minimal “bridging” of the material occurred in the hole. Backfilling of the upper two feet of each hole was tamped as heavily as possible with a shovel handle or other hand held equipment, and the backfill crowned to direct rainfall away on the surface. Where boreholes exceeded five feet in depth, a plastic hole plug was firmly tamped into place within the backfill at a depth of about two feet.

Preservation and Transporting of Soil Samples with Control of Field Moisture

Procedures for preserving soil samples obtained in the field and transportation of samples to the laboratory generally followed those given in ASTM D4220, *Standard Practice for Preserving and Transporting Soil Samples* for Group B samples as defined in Section 4. Group B samples are those samples not suspected of being contaminated and for which only water content and classification, proctor, relative density, or profile logging will be performed. Group B samples also include bulk samples that are intended to be remolded in the laboratory for compaction, swell pressure, percent swell, consolidation, permeability, CBR, or shear testing. Representative samples of the cuttings or split spoon samples, or representative bulk samples, were placed in suitably identified, sealed glass jars or plastic containers and transported to the laboratory. Sample identification numbers on the containers corresponded to sample numbers recorded on field boring records or test pit records. Thin-walled tube samples were sealed at the ends with paraffin and capped with plastic end caps.

♦ Field Tests of Earth Materials

The subsurface conditions encountered during drilling were reported on a field test boring record by the chief driller. The record contains information about the drilling method, samples attempted and sample recovery, indications of materials in the borings such as coarse gravel, cobbles, etc., and indications of materials encountered between sample intervals. Representative soil samples were placed in glass jars and transported to the laboratory along with the field boring records. Recovered samples not expended in laboratory tests are commonly retained in our laboratory for 60 days following completion of drilling. Field boring records are retained at our office.

Measurement of Static Water Levels

Water level readings were made in the open boreholes immediately after completing drilling and withdrawal of the tools. Where feasible, measurements were repeated after an elapsed period of 24 hours to gauge the stabilized water level. Procedures for measurement of liquid levels in open boreholes are described in ASTM D4750, *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*. A weighted measuring tape was slowly lowered into each borehole until the liquid surface was penetrated by the weighted end. The reading on the tape was recorded at a reference point on the surface and compared to the reading at the demarcation of the wetted and unwetted portions of the tape. The difference between the two readings was recorded as the depth of the liquid surface below the reference point. Measurements made by this method were then repeated until approximately consistent values were obtained.

Measurement of Shear Wave Velocities using Surface Geophysical Methods – MASW with Microtremor Array Measurements (MAM)

MASW (Multi-Channel Analysis of Surface Waves) and MAM (Microtremor Array Measurement) methods are techniques for near-surface characterization of shear-wave velocity (Vs). Both utilize the Rayleigh-type surface waves ("ground roll") recorded by multiple receivers (geophones) deployed on an even spacing and connected to a common recording seismograph.

MASW and MAM methods utilize energy commonly considered noise on conventional seismic reflection surveys. Surface waves (R-waves) can be used to determine shear-wave velocities (vs) as surface waves are fundamentally similar in behavior to shear waves (S-waves).

MASW provides better resolution of the Vs profile at shallow depths, while MAM under certain conditions provides better resolution at depth. S&ME typically uses a combination of both methods to define the soil profile for the 100-foot interval required by the International Building Code site classification system in Section 16. Our experience indicates using a combination of both MASW and MAM with a non-linear array geometry provides a more accurate velocity profile than using ReMiTM alone, particularly if the ReMiTM array geometry is linear.

Performing both MASW and MAM provides the greater depth of penetration of microtremor analyses (low frequency surface waves) without sacrificing resolution at shallower depths from MASW (higher frequency surface waves). In cases where sufficient penetration depth (such as 100 feet) or material velocity (such as 2,500 fps) is achieved, often only the MASW method will be performed. The report text will state whether MASW only or MASW and MAM data are used to define the profile.

MASW Measurements

An active source array uses a striking surface to generate a source wave that is received by the geophones. The most important parameter is large receiver spread. MASW is capable of separating the fundamental mode from other noise on its own if the receiver spread is large enough. Since the direction of the source wave is known, the geophones can be arranged in a linear pattern with geophones on 5 to 10 foot centers. Using the active mode typical receiver spread is 75 to 150 feet. The higher frequency surface waves detected using this approach give better resolution of velocity profile at shallow depths (typically upper 0 to 20 feet). Larger spacing may be used to try to capture deeper depths using active source information.

The typical frequency range of surface waves generated by a sledgehammer striking a metal plate is approximately 8 Hz to 80 Hz. A 250 lb. weight dropping from 4 feet (using a drill rig cathead) will generate lower frequency surface waves, however our experience indicates frequencies only as low as about 6 Hz. Accordingly, typical frequency ranges using MASW methods may only range from 6 Hz to 80 Hz.

Microtremor Array Measurements (MAM)

MAM is a passive method which records background sources of seismic energy such as vehicle traffic. This yields lower frequency surface waves, which allows resolution of velocity profile at deeper depths (typically in excess of 60 feet). MAM utilizes a two-dimensional or L-shaped array because the direction of the passive energy sources is not known. Geophone spacing using this approach is typically 30 feet, giving a 150 foot length for each leg of an L-shaped array.

Frequency ranges of microtremors and ambient noise (vehicle traffic, building vibrations, tidal effects, etc.) typically range from about 1 Hz up to 30 Hz. Most researchers recommend only low frequency passive dispersion data (less than 10 Hz) be used for the composite dispersion curve due to near field effects. At "quiet sites" however, the passive sources may be absent, thereby limiting penetration depth to what is achievable using active sources.

Signal Enhancement

The Rayleigh-type surface wave is difficult to interpret and commonly requires enhancement during both data acquisition and processing steps. Accurate dispersion curve extraction is very important element of the MASW method because any error in the dispersion curve would cause inversion to produce an inaccurate vertical Vs section. However, often other types of the seismic wave field such as the direct wave, refracted waves, guided waves, the air wave as well as higher modes of the surface wave may act as noise and interfere with extraction of accurate dispersion curves. MASW can handle such types of noise only if several acquisition parameters are met.

Signal Recording

The surface waves propagate to depths that are proportional to their frequencies (i.e., dispersion). The surface waves are recorded at the ground surface along a spread of low-frequency geophones. Recorded surface waves are transformed from time domain into frequency domain, from which the phase characteristics of the surface waves can be determined. A dispersion curve (a.k.a., phase velocity curve, slowness curve) is developed allowing the phase velocity (Cf) of particular frequency waves to be calculated. The dispersion curve is then transformed into the shear-wave velocity profile through a complex inversion and iterative processing. Where both MASW and MAM tests are performed at a single location, dispersion curves from both tests are combined prior to the inversion process.

The testing is conducted using a 16-channel GeoMetrics ES-3000 seismograph and the test data reduced using the OYO Corporation SeisImager software. Surface waves recorded as they propagate along the receiver line are analyzed through multichannel processing techniques similar to a pattern-recognition approach. Either active or passive sources can be used, or used in combination, to develop the wave frequencies required to obtain velocities to a depth of 100 feet.

Depth of Penetration

Depth of penetration using surface wave methods is mainly controlled by the shear properties of the subsurface materials and frequency range of site surface waves (generated active or ambient passive). Generally, penetration depth is greater for stiffer profiles as the signal does not attenuate as rapidly. However, because very small strain is required to determine the shear properties, sometimes velocities of very stiff materials (competent igneous or metamorphic rock) are difficult to obtain using traditional active or ambient sources.

Assuming the frequency range of the microtremors/passive sources extends lower than the geophone frequency, only the material velocity would control the penetration depth. Literature suggests velocities of up to 300 feet in depth can be measured using surface wave methods, but more typically depths range up to 100 to 140 feet. We have successfully measured velocities to depths of up to approximately 250 feet. The report will provide data to the maximum depth of resolution allowed by the soil properties and source frequencies.

Summary of Laboratory Procedures

Recovered disturbed samples and the drillers' field logs were transported to the laboratory where they were examined by the geotechnical engineer. Selected samples representative of certain groups of soils were subjected to simple classification tests by hand or other simple means.

♦ Laboratory Tests of Soil

Examination of Split Spoon Soil Samples

Soil and rock samples and field boring records were reviewed in the laboratory by the geotechnical engineer. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Method)*. The geotechnical engineer also prepared the final boring records enclosed with this report.