ADDENDUM #1

The following items shall take precedence over the drawings and specifications for the above named project and shall become a part of the contract documents. Where any item called for in the specifications, or indicated on the drawings, is not supplemented hereby, the original requirements shall remain in effect. Where any original item is amended, voided, or superseded hereby, the provisions of such item not specifically amended, voided or superseded shall remain in effect.

General

Item No.	Description
1	Attached is a copy of the Non-Mandatory Pre-Bid Sign in Sheet.
2	Attached is a revised SE-330.
3	Geotechnical Report

END OF ADDENDUM #1

SE-330
LUMP SUM BID FORM

Bidders shall submit bids on only Bid Form SE-330.

BID SUBMITTED BY: ______________________________

(Bidder's Name)

BID SUBMITTED TO: University of South Carolina

(Owner's Name)

FOR: PROJECT NAME: USC Union - Patrons Park Renovations

PROJECT NUMBER: H40-I305

OFFER

§ 1. In response to the Invitation for Construction Services and in compliance with the Instructions to Bidders for the above-named Project, the undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Contract with the Owner on the terms included in the Bidding Documents, and to perform all Work as specified or indicated in the Bidding Documents, for the prices and within the time frames indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

§ 2. Pursuant to SC Code § 11-35-3030(1), Bidder has submitted Bid Security as follows in the amount and form required by the Bidding Documents:

☐ **Bid Bond with Power of Attorney** ☐ **Electronic Bid Bond** ☐ **Cashier's Check**

(Bidder check one)

§ 3. Bidder acknowledges the receipt of the following Addenda to the Bidding Documents and has incorporated the effects of said Addenda into this Bid:

(Bidder, check all that apply. Note, there may be more boxes than actual addenda. Do not check boxes that do not apply)

ADDENDA: ☐ **#1** ☐ **#2** ☐ **#3** ☐ **#4** ☐ **#5**

§ 4. Bidder accepts all terms and conditions of the Invitation for Bids, including, without limitation, those dealing with the disposition of Bid Security. Bidder agrees that this Bid, including all Bid Alternates, if any, may not be revoked or withdrawn after the opening of bids, and shall remain open for acceptance for a period of **60** Days following the Bid Date, or for such longer period of time that Bidder may agree to in writing upon request of the Owner.

§ 5. Bidder herewith offers to provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fees, permits, licenses and applicable taxes necessary to complete the following items of construction work:

§ 6.1 BASE BID WORK ***(as indicated in the Bidding Documents and generally described as follows)*****:** Construction of parking lot with four handicap spaces and small concrete plaza. Removal of existing pavement area and construction of new curb and gutter and sidewalk.Small and minority participation encouraged.

$ ______________________________, which sum is hereafter called the Base Bid.

(Bidder to insert Base Bid Amount on line above)

SE-330
LUMP SUM BID FORM

§ 6.2 BID ALTERNATES as indicated in the Bidding Documents and generally described as follows:

ALTERNATE # 1 *(Brief Description)*: NA

☐ **ADD TO** or ☐ **DEDUCT FROM BASE BID: $**

(Bidder to mark appropriate box to clearly indicate the price adjustment offered for each Alternate)

ALTERNATE # 2 *(Brief Description)*: NA

☐ **ADD TO** or ☐ **DEDUCT FROM BASE BID: $**

(Bidder to mark appropriate box to clearly indicate the price adjustment offered for each Alternate)

ALTERNATE # 3 *(Brief Description)*: NA

☐ **ADD TO** or ☐ **DEDUCT FROM BASE BID: $**

(Bidder to mark appropriate box to clearly indicate the price adjustment offered for each Alternate)

§ 6.3 UNIT PRICES:

BIDDER offers for the Agency's consideration and use, the following UNIT PRICES. The UNIT PRICES offered by BIDDER indicate the amount to be added to or deducted from the CONTRACT SUM for each item-unit combination. UNIT PRICES include all costs to the Agency, including those for materials, labor, equipment, tools of trades and labor, fees, taxes, insurance, bonding, overhead, profit, etc. The Agency reserves the right to include or not to include any of the following UNIT PRICES in the Contract and to negotiate the UNIT PRICES with BIDDER.

No.	ITEM	UNIT OF MEASURE	ADD	DEDUCT
1.			$	$
2.			$	$
3.			$	$
4.			$	$
5.			$	$
6.			$	$

SE-330
LUMP SUM BID FORM

§ 7. LISTING OF PROPOSED SUBCONTRACTORS PURSUANT TO SECTION 3020(b)(i), CHAPTER 35, TITLE 11 OF THE SOUTH CAROLINA CODE OF LAWS, AS AMENDED

(See Instructions on the following page BF-2A)

Bidder shall use the below-listed Subcontractors in the performance of the Subcontractor Classification work listed:

SUBCONTRACTOR CLASSIFICATION *(Completed by Owner)*	**LICENSE CLASSIFICATION AND/OR SUBCLASSIFICATION** *(Completed by Owner)*	**SUBCONTRACTOR'S and/or PRIME CONTRACTOR'S NAME** *(Must be completed by Bidder)*	**SUBCONTRACTOR'S and/or PRIME CONTRACTOR'S SC LICENSE NUMBER** *(Requested, but not Required)*
BASE BID			
No Subcontractor Listing Required			
ALTERNATE #1			
ALTERNATE #2			
ALTERNATE #3			
			.

If a Bid Alternate is accepted, Subcontractors listed for the Bid Alternate shall be used for the work of both the Alternate and the Base Bid work.

SE-330
LUMP SUM BID FORM

INSTRUCTIONS FOR SUBCONTRACTOR LISTING

1. Section 7 of the Bid Form sets forth an Owner developed list of contractor/subcontractor classifications by contractor license category and/or subcategory for which bidder is required to identify the entity (subcontractor(s) and/or himself) Bidder will use to perform the work of each listed classification.

a. **Columns A & B**: The Owner fills out these columns, which identify the contractor/subcontractor classification and related license for which the bidder must list either a subcontractor or himself as the entity that will perform this work. In Column A, subcontractor classifications are identified by name and in Column B, the related contractor license categories or subcategories are listed per with Title 40 of the South Carolina Code of laws. Abbreviations of licenses can be found at: http://www.llr.state.sc.us/POL/Contractors/PDFFiles/CLBClassificationAbbreviations.pdf . If the owner has not identified a classification, the bidder does not list a subcontractor.

b. **Columns C and D:** In these columns, the Bidder identifies the subcontractors it will use for the work of each classification and license listed by the Owner in Columns A & B. Bidder must identify only the subcontractor(s) who will perform the work and no others. Bidders should make sure that their identification of each subcontractor is clear and unambiguous. A listing that could be any number of different entities may be cause for rejection of the bid as non-responsive. For example, a listing of M&M without more may be problematic if there are multiple different licensed contractors in South Carolina whose names start with M&M.

2. **Subcontractor Defined:** For purposes of subcontractor listing, a subcontractor is an entity who will perform work or render service to the prime contractor to or about the construction site pursuant to a contract with the prime contractor. Bidder should not identify sub-subcontractors in the spaces provided on the bid form but only those entities with which bidder will contract directly. Likewise, do not identify material suppliers, manufacturers, and fabricators that will not perform physical work at the site of the project but will only supply materials or equipment to the bidder or proposed subcontractor(s).

3. **Subcontractor Qualifications:** Bidder must only list subcontractors who possess a South Carolina Contractor's license with the license classification and/or subclassification identified by the Owner in the first column on the left. The subcontractor license must also be within the appropriate license group for the work of the specialty. If Bidder lists a subcontractor who is not qualified to perform the work, the Bidder will be rejected as non-responsible.

4. **Use of Own forces:** If under the terms of the Bidding Documents, Bidder is qualified to perform the work of a listed specialty and Bidder does not intend to subcontract such work but to use Bidder's own employees to perform such work, the Bidder must insert its own name in the space provided for that specialty.

5. **Use of Multiple Subcontractors:**

a. If Bidder intends to use multiple subcontractors to perform the work of a single specialty listing, Bidder must insert the name of each subcontractor Bidder will use, preferably separating the name of each by the word **"and"**. If Bidder intends to use both his own employees to perform a part of the work of a single specialty listing and to use one or more subcontractors to perform the remaining work for that specialty listing, bidder must insert his own name and the name of each subcontractor, preferably separating the name of each with the word **"and"**. Bidder must use each entity listed for the work of a single specialty listing in the performance of that work.

b. **Optional Listing Prohibited:** Bidder may not list multiple subcontractors for a specialty listing, in a form that provides the Bidder the option, after bid opening or award, to choose to use one or more but not all the listed subcontractors to perform the work for which they are listed. A listing, which on its face requires subsequent explanation to determine whether it is an optional listing, is non-responsive. If bidder intends to use multiple entities to perform the work for a single specialty listing, bidder must clearly set forth on the bid form such intent. Bidder may accomplish this by simply inserting the word "**and**" between the names of each entity listed for that specialty. Agency will reject as non-responsive a listing that contains the names of multiple subcontractors separated by a blank space, the word "or", a virgule (that is a /), or any separator that the Agency may reasonably interpret as an optional listing.

6. If Bidder is awarded the contract, bidder must, except with the approval of the Agency for good cause shown, use the listed entities to perform the work for which they are listed.

7. If bidder is awarded the contract, bidder will not be allowed to substitute another entity as subcontractor in place of a subcontractor listed in Section 7 of the Bid except for one or more of the reasons allowed by the SC Code of Laws.

8. Bidder's failure to identify an entity (subcontractor or himself) to perform the work of a subcontractor specialty listed in the first column on the left will render the Bid non-responsive.

SE-330
LUMP SUM BID FORM

§ 8. LIST OF MANUFACTURERS, MATERIAL SUPPLIERS, AND SUBCONTRACTORS OTHER THAN SUBCONTRACTORS LISTED IN SECTION 7 ABOVE *(FOR INFORMATION ONLY):*

Pursuant to instructions in the Invitation for Construction Services, if any, Bidder will provide to Owner upon the Owner's request and within 24 hours of such request, a listing of manufacturers, material suppliers, and subcontractors, other than those listed in Section 7 above, that Bidder intends to use on the project. Bidder acknowledges and agrees that this list is provided for purposes of determining responsibility and not pursuant to the subcontractor listing requirements of SC Code § 11-35-3020(b)(i).

§ 9. TIME OF CONTRACT PERFORMANCE AND LIQUIDATED DAMAGES

a) CONTRACT TIME

Bidder agrees that the Date of Commencement of the Work shall be established in a Notice to Proceed to be issued by the Owner. Bidder agrees to substantially complete the Work within **45** Calendar Days from the Date of Commencement, subject to adjustments as provided in the Contract Documents.

b) LIQUIDATED DAMAGES

Bidder further agrees that from the compensation to be paid, the Owner shall retain as Liquidated Damages the amount of $ **500.00** for each Calendar Day the actual construction time required to achieve Substantial Completion exceeds the specified or adjusted time for Substantial Completion as provided in the Contract Documents. This amount is intended by the parties as the predetermined measure of compensation for actual damages, not as a penalty for nonperformance.

§ 10. AGREEMENTS

a) Bidder agrees that this bid is subject to the requirements of the laws of the State of South Carolina.

b) Bidder agrees that at any time prior to the issuance of the Notice to Proceed for this Project, this Project may be canceled for the convenience of, and without cost to, the State.

c) Bidder agrees that neither the State of South Carolina nor any of its agencies, employees or agents shall be responsible for any bid preparation costs, or any costs or charges of any type, should all bids be rejected or the Project canceled for any reason prior to the issuance of the Notice to Proceed.

§ 11. ELECTRONIC BID BOND

By signing below, the Principal is affirming that the identified electronic bid bond has been executed and that the Principal and Surety are firmly bound unto the State of South Carolina under the terms and conditions of the AIA Document A310, Bid Bond, included in the Bidding Documents.

ELECTRONIC BID BOND NUMBER: ______________________________

SIGNATURE AND TITLE: ______________________________

SE-330
LUMP SUM BID FORM

CONTRACTOR'S CLASSIFICATIONS AND SUBCLASSIFICATIONS WITH LIMITATION

SC Contractor's License Number(s):____

Classification(s) & Limits:____

Subclassification(s) & Limits:____

By signing this Bid, the person signing reaffirms all representation and certification made by both the person signing and the Bidder, including without limitation, those appearing in Article 2 of the SCOSE Version of the AIA A701, Instructions to Bidders, is expressly incorporated by reference.

BIDDER'S LEGAL NAME:____

ADDRESS:____

____

TELEPHONE:____

EMAIL:____

SIGNATURE:____________________________________ **DATE:**____________

PRINT NAME:____

TITLE:____

University of South Carolina
Pre Bid Sign In Sheet
Columbia, South Carolina

Project Name: USC Union - Patrons Park Renovation
Project Number: H40-I305
Pre Bid Date & Time: March 1, 2018 at 10:00 AM

SWMBE?	Name	Company Name	Address	Phone #	Email
Yes No	Juaquana Brookins	USC	1300 Pickens Street, Columbia SC 29208	803.777.3596	jbrookin@fmc.sc.edu
Yes No	Thatcher Hurst	USC	1300 Pickens St Columbia SC	457-5138	Hursth@mailbox.sc.edu
Yes No	Ducky Lawson	USC-Union		864-466-2607	
Yes No	Richard Linton	RBTodd	7436 Broad River Rd. Suite 212	803-781-3141 ex. 307	richard@rbtodd.com
Yes No	John Catalano	USC Union		864 424 8015	jcat@mailbox.sc.edu
Yes (No)	Tyler Meyer	First Class Construction	126 B Suber Rd. Cola, SC 29210	803 926-1922	tmeyer@fccon.com
(Yes) No	Tyrone Alexander	TJT Construction LLC	4394 Wade Hampton blvd Taylors	864-626-0800	TJTconstructionllc@gmail.com
Yes No					
Yes No					

*****By signing this sheet you agree to receive information electronically.*

REPORT OF SUBSURFACE EXPLORATION
USC Union – Patron's Park
Union, South Carolina
S&ME Project No. 1461-16-072

Prepared for:
LCK, LLC
1301 Gervais Street, Suite 601
Columbia, South Carolina 29201

Prepared by:
S&ME, Inc.
134 Suber Road
Columbia, South Carolina 29210

January 12, 2017

January 12, 2017

LCK, LLC
1301 Gervais Street, Suite 601
Columbia, South Carolina 29201

Attention: Mr. Van Hauser, Senior Project Manager

Reference: **REPORT OF SUBSURFACE EXPLORATION**
USC Union – Patron's Park
Area bounded by E Academy, E Main, N Church, and N Mountain Streets
Union, South Carolina 29379
S&ME Project No. 1461-16-072

Dear Mr. Hauser:

As requested, S&ME, Inc. (S&ME) has completed field testing for the USC Union – Patron's Park site in Union, South Carolina. Our work was performed in general accordance with our proposal No. 14-1600825, dated November 23, 2016.

This report provides information on the exploration and testing procedures used, our boring records, and our recommendations regarding site conditions, site preparation, suitability of on-site soils for use as structural fill, fill placement and compaction, drainage considerations, and flexible pavement thickness and construction.

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.

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

Hunter G. McKenzie, E.I.T.
Geotechnical Staff Professional

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 26144 1-12-17 ROBERT C. BRUORTON

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

Table of Contents

Appendices

1.0 Project Information

Initial information about the project was received via email correspondence between Mr. Van Hauser of LCK, LLC and Mr. Tom Behnke of S&ME on November 15, 2016. Included in the correspondence was an aerial photograph of the subject area with the locations of the existing parking lot, abandoned road bed and requested borings sketched. Additional information was obtained during email correspondence between Mr. Hauser and Mr. Chad Bruorton, P.E. of S&ME on November 18, 2016.

The planned development consists of a landscape/hardscape project within the existing USC Union campus called Patron's Park. The site of the planned development is the block bounded by E Academy, E Main, N Church, and N Mountain Streets, as shown on the *Site Location Plan*, attached as Figure 1 in Appendix I. The existing parking lot pavement to the South of the existing Truluck Activity Center at the site will be expanded and improved. The existing abandoned road bed at the site was reported to have had the asphalt pavement removed, however an underlying layer of concrete was reportedly left in-place and covered with sand. This area was to be assessed for drainage and compaction for landscaping growth. Planned cuts and fills were unavailable at the time of this report.

On January 11, 2017, Mr. Hauser spoke with Mr. Jason Jansante, E.I.T. of S&ME regarding the anticipated traffic loading for the expanded parking lot. Precise traffic volumes were not available at this time, but it is anticipated that the parking lot will have ten available parking spots and that one tractor trailer will enter the parking area per month.

2.0 Exploration Procedures

The subsurface exploration of this project included four hand auger soil borings. However, three of the proposed hand auger borings were located within the abandoned road bed portion of the site. Due to the underlying layer of concrete discovered, these three borings refused at extremely shallow depths. After discussing with Mr. Hauser, we understand that the purpose of these borings was to confirm the existence of the concrete layer. Therefore, relevant data was only retrieved from one of the performed borings at the site (HA-4). The approximate locations of each of the borings are shown in the *Boring Location Plan*, attached as Figure 2 in Appendix I.

2.1 Field Testing and Sampling

Requested testing locations were provided by Mr. Hauser on November 18, 2016. These locations were located in the field with a handheld sub-meter GPS. The method used to perform the hand auger borings is provided below. The boring locations indicated on the attached *Boring Location Plan* must be considered as approximate. No formal survey was completed by S&ME. Table 2-1 shows the hand auger locations:

Table 2-1 – Hand Auger Locations

Portion of Site	Boring Number
Existing Road Bed	HA-1 through HA-3
Pavement Improvements	HA-4

Hand Auger Borings

Four soil test borings were performed on January 10, 2017, using a hand operated auger. The soils encountered were identified in the field by cuttings brought to the surface. Soil consistency was qualitatively estimated by the relative difficulty of advancing the augers. At selected intervals, the augers were withdrawn and soil consistency measured with a dynamic cone penetrometer (DCP). The conical point of the penetrometer was first seated 1-3/4 inches to penetrate any loose cuttings in the boring, then driven two additional 1-3/4 inch increments by a 15 pound hammer falling 20 inches. The number of hammer blows required to achieve this penetration was recorded. When properly evaluated by qualified professional staff, the blow count is an index to the soil strength and ability to support foundations.

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 site is located at the existing University of South Carolina Union Campus in Union, South Carolina. The site is bounded by E Academy Street to the north, N Church Street to the east, E Main Street to the south and N Mountain Street to the west. The site consists of multiple existing structures along the southern border as well as the existing Truluck Activity Center on the eastern border. The remainder of the site consists of associated parking for the existing buildings and a grassed area with multiple trees and a shaded gazebo.

As previously mentioned, an abandoned roadbed (formally Faith Lane) traversed the northeastern portion of the site, beginning along the northern boundary at E Academy Street, extending south into the site, then east to the eastern boundary at N Church Street. The roadbed's asphalt was reported to have been previously removed, but the underlying concrete layer was still apparent. Currently the area had grass ground cover.

From our visual observations, the site appears to be relatively flat with only a gently slope in elevation. From our review of Google Earth, this was confirmed with the site elevations on the order of approximately 629 to 631 feet across the site.

3.2 Subsurface Conditions

Recovered field samples and field boring logs were reviewed in the laboratory by a member of our geotechnical staff. Soil test boring records and other field data are assembled in Appendix II.

3.2.1 Site Geology

The site lies within the Piedmont Physiographic Province of South Carolina, an area underlain by soils weathered in place from the parent crystalline bedrock material. 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 less exhibit lower shear strength than do undisturbed samples. Piedmont soils are normally consolidated to slightly overconsolidated.

3.2.2 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. The boring records included in Appendix II 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. Soil test boring records are attached in Appendix II.

<u>Surface Materials</u>

Surface materials consisting of approximately eight inches of topsoil were penetrated in Boring HA-4. Within the abandoned roadbed, a layer of silty sand material was found to overlay the existing concrete which caused the shallow refusal of the borings. It is our understanding that this sandy material was used to fill overtop the concrete when the asphalt pavement was initially removed.

<u>Piedmont Residuum</u>

Beneath the surface materials, boring HA-4 encountered native Piedmont Residuum to the termination depth of 5 feet below the existing ground surface. The residuum penetrated by the boring generally consisted of sands with varying amounts of fines (SP-SC and SC) with an intermediate layer of low plasticity clay with sand (CL) from depths of roughly 3½ feet to 4½ feet below the existing ground surface. The sandy soils will form the immediate and underlying bearing surface for the proposed pavements.

Recovered samples of the Piedmont Residuum were generally reddish-brown and red in color and were moist to the touch. DCP blow counts ranged from 4 to 23 blows per increment.

<u>Refusal to Drilling</u>

Auger refusal is defined as material that could not be penetrated with the hand-powered auger equipment used on the project. Borings HA-1 through HA-3 along the abandoned roadbed encountered auger refusal at depths of roughly 4 to 5 inches below the existing ground surface. Auger refusal material in this case is most likely attributed to the reported concrete that had been filled over after asphalt removal. Mechanical drilling or core drilling techniques would be required to evaluate the character and continuity of the refusal material.

During the field exploration, Mr. Hunter McKenzie, E.I.T. of S&ME spoke with Mr. Hauser regarding the shallow refusal depths encountered on-site. Mr. Hauser informed Mr. McKenzie that the purposes of the three hand auger boring locations within the abandoned roadbed were to confirm the existence of the concrete, and offset borings were deemed unnecessary.

Ground Water

Groundwater was not encountered at the time of boring. It appears that ground-water will not likely impact construction on this site. However, 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.

It is important to note that based upon the elevation of the previously mentioned underlying concrete layer of the abandoned roadbed at shallow depths in three of our borings on-site, there is the potential for water to pond at the surface or in the near surface soils and become perched after a period of precipitation. "Perched" ground water is surface water that infiltrates through the upper, more permeable soils at the site that then gets trapped or "perched" on underlying more dense or less permeable soil layers, or concrete in this case.

4.0 Conclusions & Recommendations

The following paragraphs include our conclusions and recommendations regarding site preparation, suitability of on-site soils for use as structural fill, fill placement and compaction, drainage considerations and flexible pavement thickness and construction. The soil profile encountered at this site would appear generally suitable for the proposed development.

4.1 Site Preparation

Site preparation should include removal of all unsuitable surface materials within pavement areas. This should include, surface debris, surface vegetation and any organic laden topsoil, stumps, root bulbs, as well as any unstable surface or subsurface soils. The existing layer of concrete found underlying the abandoned roadbed may also need to be removed, depending on planned grades at the site, to provide a suitable subgrade for landscape growth.

In most areas, surface preparation can likely be limited to proofrolling of the surface. Areas that rut, pump, or move excessively under movement of the equipment will require stabilization prior to the placement of structural fill, graded aggregate base or asphalt.

4.1.1 Existing Utilities

Remove or plug existing utilities to be abandoned prior to construction. If not removed or plugged, pipes may serve as conduits for subsurface erosion resulting in formation of voids below pavements. Where existing utilities are left in place and plugged in the pavement footprint, it may be necessary to undercut poorly compacted backfill to provide adequate support for pavements.

4.1.2 Proofrolling and Stabilization

After removal of topsoil and unsuitable soils/materials and cutting to grade, but prior to fill placement, the exposed ground surface should be observed by the geotechnical engineer or a representative of the geotechnical engineer to confirm that poor soils have been removed and that the exposed subgrade is suitable for placement of structural fill or support of pavements.

To aid in evaluation of the exposed soils, the area should be proofrolled using a loaded dump truck or similarly loaded piece of equipment. Areas that rut, pump, or move excessively under movement of the equipment should be stabilized prior to placement of fill soil. If left in place, soft or wet soils will exhibit substantially lower bearing for foundations and pavements. Stabilization, if required, may consist of removing and replacing unstable material or, where unstable soils are thin, drying and compacting in-place.

Care should be taken during construction so that the subgrade soils are not disturbed any more than necessary. If heavily reworked or disturbed, stabilization may be required for what could otherwise be considered an acceptable subgrade.

4.2 Fill Placement and Compaction

Before beginning to place fill, sample and test each proposed fill material to determine maximum dry density, optimum moisture content, natural moisture content, gradation and plasticity of the soil. Structural soil fill material should have less than 5 percent organic matter, a standard Proctor maximum dry density of 90 pcf or greater and a plasticity index (PI) of 30 percent or less. We recommend that any off-site borrow meet the organic content, PI and density requirements of this section. Testing will be required before fill placement begins to determine the optimum moisture-density condition for the fill materials. All material to be used as soil fill should be tested and approved by the geotechnical engineer before being placed.

The upper existing sandy (SP-SC and SC) Piedmont Residuum soils appear suitable for re-use as compacted fill based on visual examination; however, classification, moisture content and compaction tests should be performed to verify this assessment. The underlying existing low plasticity clayey (CL) Piedmont Residuum soils appear marginally suitable, if encountered during grading activities.

It is important to note that the layers of existing sandy soils with varying amounts of fines (SC) and intermediate low plasticity clays (CL), if encountered, are moisture sensitive to some degree and can be difficult to work if allowed to become wet. These difficulties can include softening of exposed subgrade soils, excessive rutting or deflection under construction traffic, and the difficulty associated with adequately drying and compacting wet soil. Moisture-related earthwork difficulties can be reduced by performing the earthwork during the typically drier months of the year (May through October).

4.2.1 *Density and Moisture Requirements*

Place new fill in maximum 8-inch loose lifts and compact to at least 95 percent of maximum dry density (ASTM D-698 Standard Proctor). Fill moisture content should be maintained within +/- 3 percent of the optimum moisture content. Contractor should be prepared to wet or dry soils as necessary to achieve compaction. Fill should be placed level at least 5 feet beyond the pavement footprint before sloping. In addition to meeting the compaction requirement, fill material must be stable under movement of the construction equipment and must not exhibit rutting or pumping after compacting.

4.2.2 *Compaction of Granular Soils*

A vibratory smooth-drum roller will likely be effective for compaction of the sandy soils with trace to few low plasticity fines content (SP-SC) encountered at the site.

A vibratory sheeps-foot roller will likely be more effective for compaction of the clayey sandy (SC) soils encountered at the site. Sheeps-foot compactors will likely be preferable because the pads better penetrate the soil and they tend to break down the natural cohesive bonds between the particles.

Sandy soils excavated above the water table are usually close enough to optimum moisture content to place and compact efficiently. Soils that are initially too wet or are allowed to become wet due to rainfall are more difficult to use.

4.2.3 *Compaction of Cohesive Soils*

The compaction characteristics of clayey soils with plastic properties encountered at this site, if excavated during construction activities, will be highly dependent on the soil moisture content at the time of construction. Sheeps-foot compactors will likely be preferable because the pads better penetrate the soil and they tend to break down the natural cohesive bonds between the particles. Pneumatic tire compactors can also be used but will likely be better suited only where the soils have a low to medium plasticity index.

The water content of these soils is usually very difficult to modify in the field. Above or below the optimum moisture content, the soils become progressively more difficult to manipulate and compact. Soils excavated above the water table are usually close enough to optimum moisture content to place and compact efficiently. Soils that are initially too wet or are allowed to become wet due to rainfall are more difficult to use. Drying wet clayey soils usually requires favorable weather conditions and often requires repeated disking and rolling with sheeps-foot rollers to lower the moisture content.

Slope the fill surface to drain and prevent ponding water. If rain is expected while filling is temporarily halted, roll the surface with rubber tire or steel drum equipment to improve surface run-off.

4.2.4 *Monitoring and Testing*

Fill placement should be witnessed by an experienced soils technician working under the guidance of the geotechnical engineer. We recommend full time observation by a qualified soils technician with testing at random intervals to confirm compaction is being achieved.

4.2.5 *Wet Weather Grading*

Based on our experience, low plasticity clayey soils (CL) similar to those encountered in our borings can be difficult to work if allowed to become wet and may also require extended drying times. The grading contractor should take measures so that periodic rain does not significantly affect grading. This includes diverting rainwater runoff away from the construction area and sealing the ground surface with a smooth drum roller to help prevent rainwater from migrating below the surface soils.

Our experience indicates that allowing heavy equipment to run on the existing ground surface will result in heavy rutting. Running heavy equipment on previously placed fill during rain events or where water is ponded will result in degradation of the fill. If these conditions are evident or persist and routinely cause issues, then during construction, gravity-drained surface ditches should be installed around the site to promote surface runoff. Ditches should have at least 6 inches of relief per 100 feet of length to facilitate flow.

4.3 Drainage Considerations

4.3.1 *General*

Although ground water was not encountered during our exploration of the site, as previously mentioned, the potential for "perched" ground water is evident due to the elevation of the existing concrete layer underneath the silty sand material within the footprint of the abandoned roadbed that traverses the site. Water may infiltrate through the more permeable sandy material, but concrete tends to be an impervious material. Following precipitation, the water could be trapped or "perched" at a depth of roughly four to five inches beneath the existing ground surface, where the concrete was discovered. This concrete should be excavated in order to remove the possibility of "perched" ground water.

4.4 Pavement Thickness and Construction

4.4.1 *Subgrade Support Value*

As previously mentioned, the hand auger soil test boring within the pavement area generally encountered sands with varying amounts of fines (SP-SC and SC) as well as low plasticity clays (CL) within the upper roughly 5 feet of existing soils. Considering the soils encountered and our experience with the surrounding area, a CBR value of 8 percent, corresponding to a resilient modulus (MR) of 12,000 psi, is recommended for use in design of the pavement sections. Recommended CBR value assumes that pavement subgrades are prepared in accordance with site preparation and fill placement sections of this report. Pavement thicknesses computed below also assume that the upper 12 inches of subgrade material is compacted to at least 95 percent of the Standard Proctor maximum dry density. Imported fill, if utilized in pavement areas, should be tested to determine that it exhibits a CBR of at least 8 percent.

4.4.2 *Traffic Volumes*

As previously stated, Mr. Hauser spoke with Mr. Jansante of S&ME on January 11, 2017 to discuss expected traffic volumes. Although exact traffic volumes were not provided, Mr. Hauser informed Mr. Jansante that there will be ten proposed parking spots within the planned pavement area, and that one tractor trailer per month was assumed to enter the site.

4.4.3 Flexible Pavements

Pavement thickness computations were performed using the SCDOT *Pavement Design Guidelines* – 2008 and AASHTO '93 *Flexible Pavement Design Method* for analysis of the unreinforced flexible pavement section. Based on the subsurface conditions and assuming our grading recommendations will be implemented as specified, the following presents our recommendations regarding typical pavement sections and materials.

The following assumptions were used to compute traffic volumes for the flexible pavements areas:

Light Duty Flexible Pavement (No Trucks):

- A design life of 20 years with 12,440 Equivalent Single Axle Loads (ESAL) over the design life.
- Average Weekly Traffic of 2,880 passenger car passes (provided 10 parking spaces, assumed 30 minutes per space, 12 hours per day, 6 days per week) with 0.006 ESAL per vehicle.

Heavy Duty Flexible Pavement (with Trucks):

- A design life of 20 years with 13,020 Equivalent Single Axle Loads (ESAL) over the design life.
- Average Weekly Traffic of 2,880 passenger car passes (provided 10 parking spaces, assumed 30 minutes per space, 12 hours per day, 6 days per week) with 0.006 ESAL per vehicle.
- Average Weekly Traffic of 0.233 fully-loaded 5-axle semi-trucks (1 truck per month) with 2.37 ESAL per vehicle.

Using these provided/assumed traffic loadings, we recommend the minimum flexible pavement sections indicated below.

Table 4-1 – Recommended Flexible Pavement Section Thickness

Pavement Designation	Graded Aggregate Base Couse	Asphalt Intermediate Course	Asphalt Surface Course
Light Duty Asphalt	6 in.	-	1½ in.
Heavy Duty Asphalt	8 in.	-	2 in.

It is our opinion that the flexible pavement should consist of a wearing course of hot mix asphaltic (HMA) concrete and a base course of graded aggregate Macadam Base Course material. Graded aggregate material is necessary for structural support and to help transport any rainwater that seeps below the pavement.

All materials and workmanship should meet the minimum requirements of the SCDOT *Standard Specifications for Highway Construction*, 2007 Edition and supplemental specifications. The applicable sections include the following:

Take 4-2 – SCDOT Bituminous Pavements Specifications

Section	2007 SCDOT Standard Specification Section
Subgrade	Section 208, page 130
Graded Aggregate Base Course	Section 305, page 159
Hot Mixed Asphalt Pavement	Section 401, page 188
Hot Mix Asphalt Surface Course	Section 403, page 220

Supplemental Specifications
HMA Material Properties, dated July 1, 2006
HMA Courses, dated July 2, 2006

Sufficient testing should be performed during flexible pavement installation to confirm that the required thickness, density, and quality requirements of the pavement specifications are followed. This is very important for the long-term performance of the pavement, and can be performed by S&ME, Inc. as part of our construction materials testing services.

4.4.4 Base Course Materials

Base course materials assumed in computation of pavement sections above consists of materials meeting the hardness, durability and gradation requirements of graded aggregate base course (GABC) defined in current SCDOT *Standard Specifications* (2007 ed.) section 305. The crushed stone graded aggregate base course (GABC) used in pavement section construction should meet the requirements of Section 305 of the SCDOT *Standard Specifications* (2007 ed.), and should consist of "Macadam Base Course" as defined by Section 305.02 of the SCDOT specification.

Fill placed in pavement areas should be compacted as recommended in preceding sections. Prior to pavement installation, all exposed pavement subgrades should be methodically proofrolled at final subgrade elevation under the observation of the S&ME, Inc. geotechnical engineer, and any identified unstable areas should be repaired as directed.

As stated in the SCDOT Section 305, new base course should be compacted to at least 100 percent of the modified Proctor maximum dry density (ASTM D-1557), and should not exhibit pumping or rutting under equipment traffic. Heavy compaction equipment is likely to be required in order to achieve the required base course compaction, and the moisture content of the material will likely need to be maintained very near the optimum moisture content in order to facilitate proper compaction. Base course of greater than 8 inches total thickness must be constructed in two lifts of approximately equal thickness. S&ME, Inc. should be contacted to perform field density and thickness testing of the base course prior to paving.

4.4.5 General

Pavement performance is very dependent on subgrade condition. Drainage will have a major impact on subgrade condition. Drainage should be designed to result in subsurface water levels being at least 2 feet below the top of the pavement subgrade. Design should not result in water standing on the pavement surface or behind curbing. Landscaped areas behind curbing should be at or above the elevation of the curbing. Design should result in positive drainage being available from the stone base material.

The performance of the pavement will be influenced by a number of factors including the actual condition of subgrade soils at the time of pavement installation, installed thicknesses and compaction, and drainage. The subgrade soils should be re-evaluated by proofrolling immediately prior to placement of base course stone and any unstable areas repaired. This recommendation is very important to the long-term performance of the pavements. Areas adjacent to pavements (embankments, landscaped island, ditching, etc.) which can drain water (rainwater or sprinklers) should be designed so that water does not seep below the pavements. This may require the use of French drains or swales. Sufficient tests and inspections should be performed during pavement installation to confirm that the required thickness, density, and quality requirements of the specifications are followed.

5.0 Qualifications of Report

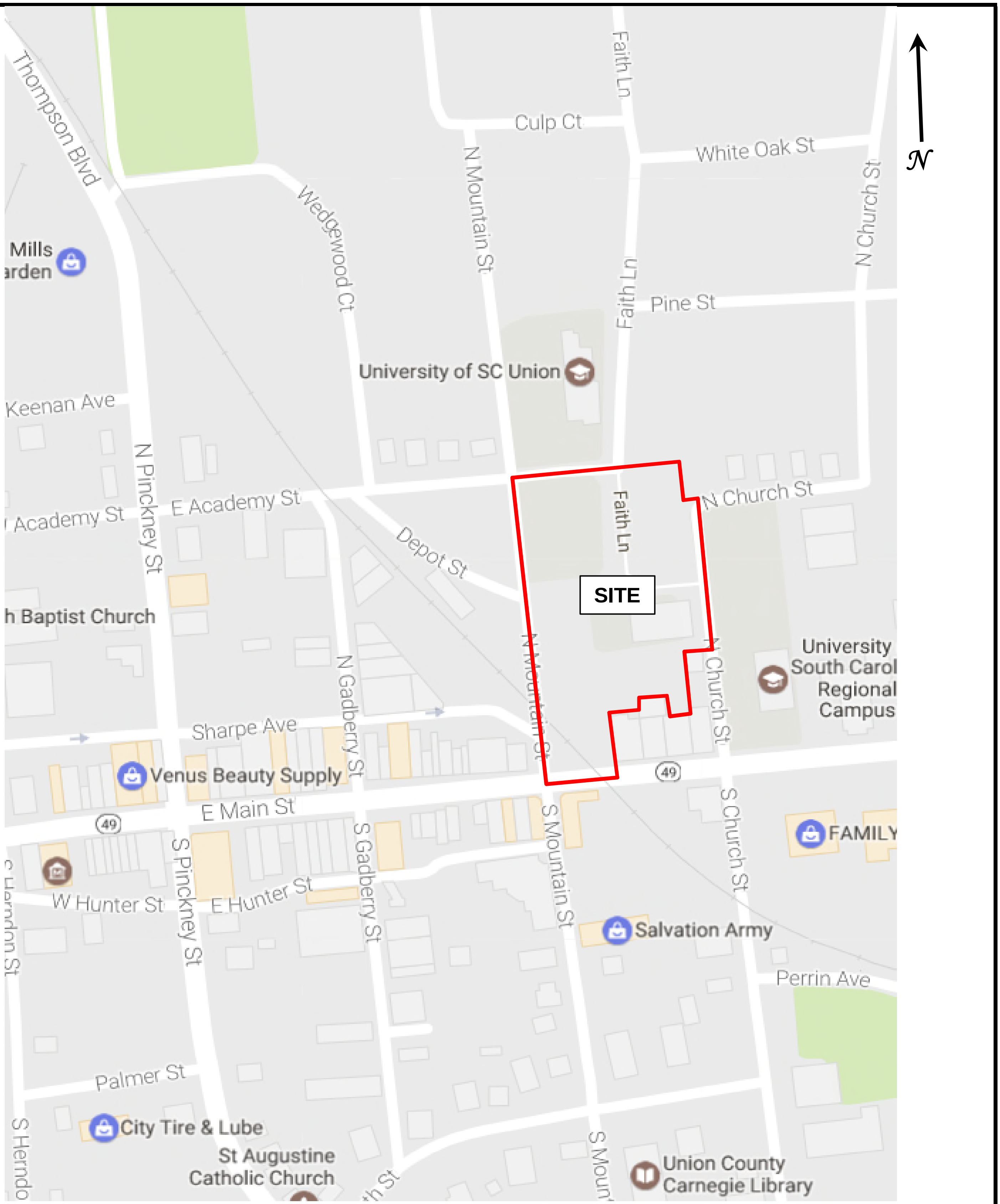
This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report were based on the applicable standards of our profession at the time this report was prepared. No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

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

We recommend that S&ME, Inc. be provided the opportunity to review the final design plans and specifications in order to ensure that earthwork and foundation recommendations are properly interpreted and implemented.

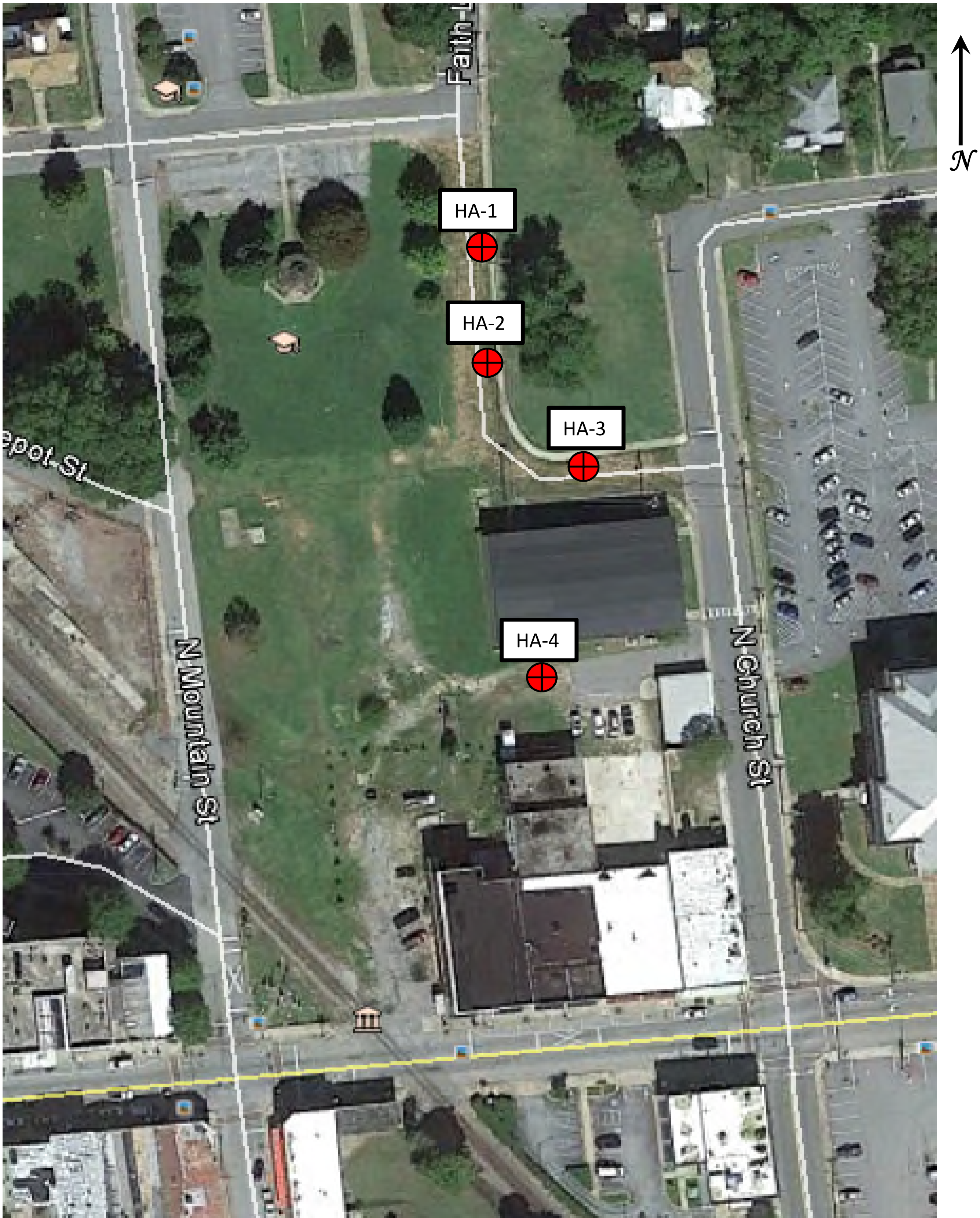
Appendices

Appendix I – Figures



SOURCE: Google Maps

SCALE:	NTS	S&ME	**SITE LOCATION PLAN**	FIGURE NO.
CHECKED BY:	RCB		USC-Union - Patron's Park	1
DRAWN BY:	HGM		Union, South Carolina	
DATE:	1/12/2017		JOB NO. 1461-16-072	



SOURCE: Google Earth

APPROXIMATE BORING LOCATION

SCALE:	NTS
CHECKED BY:	RCB
DRAWN BY:	HGM
DATE:	1/12/2017

S&ME

BORING LOCATION PLAN

USC-Union - Patron's Park

Union, South Carolina

JOB NO. 1461-16-072

FIGURE NO. 2

Appendix II – Field Data

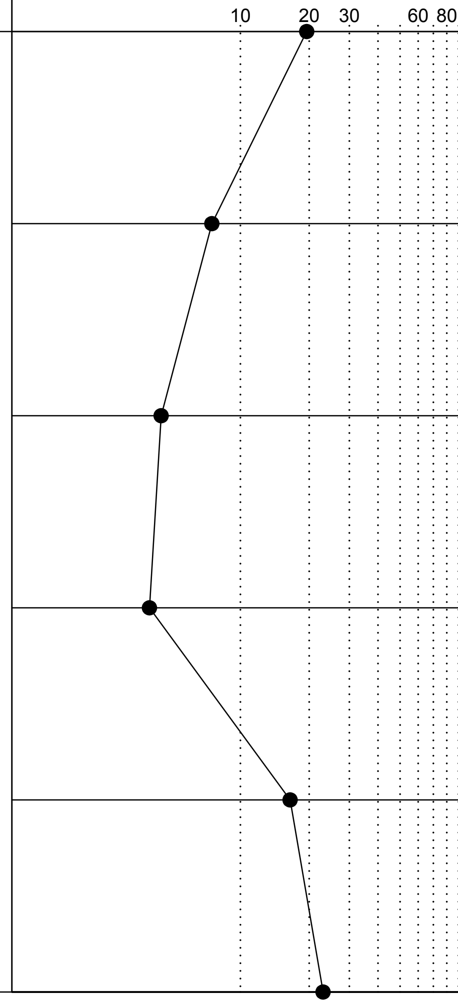
HAND AUGER BORING LOG: HA-4

PROJECT:	**USC Union - Patron's Park** **Union, South Carolina** **1461-16-072**
DATE STARTED: **1/10/17**	DATE FINISHED: **1/10/17**
NORTHING: **1049483**	EASTING: **1813489**
SAMPLING METHOD: **Hand Auger**	PERFORMED BY: **S&ME**
WATER LEVEL: **Not Encountered**	ELEVATION: **631**

NOTES: **Northing, Easting and Elevation estimated from Google Earth.**

Depth (feet)	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DCP VALUE
0	**SURFACE MATERIALS** - 8 inches of TOPSOIL.			20
	PIEDMONT - POORLY GRADED SAND WITH CLAY (SP-SC) - mostly fine to medium sands, few non-plastic fines, moist, reddish-brown.			
1		630.00		8
2	**CLAYEY SAND (SC)** - mostly fine to medium sands, some medium plasticity fines, moist, tan and reddish-brown.	629.00		5
3		628.00		4
	LEAN CLAY WITH SAND (CL) - mostly low to medium plasticity fines, little fine sands, trace mica, moist, red.			
4		627.00		17
	CLAYEY SAND (SC) - mostly fine to medium sands, little low to medium plasticity fines, trace mica, moist, red.			
5	Boring terminated at 5 ft	626.00		23

DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 15 LB HAMMER FALLING 20 IN., DRIVING A 1.5 IN. O.D. 45 DEGREE CONE 1.75 IN.

S&ME

Summary of Field Procedures

❖ Boring and Sampling

Hand Auger Borings

Auger borings were advanced using hand operated augers. The soils encountered were identified in the field by cuttings brought to the surface. Representative samples of the cuttings were placed in glass jars and later transported to the laboratory. Soil consistency was qualitatively estimated by the relative difficulty of advancing the augers. At selected intervals, the augers were withdrawn and soil consistency measured with a dynamic cone penetrometer. The conical point of the penetrometer was first seated 1¾ inches to penetrate any loose cuttings in the boring, then driven two additional 1¾-inch increments by a 15 pound hammer falling 20 inches. The number of hammer blows required to achieve this penetration was recorded. When properly evaluated by qualified professional staff, the blow count is an index to the soil strength and ability to support foundations.

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.