April 9, 2010

Reference: **Report of Seismic Site Classification**
Technical College Industrial Park – 143 Acres
Darlington County, South Carolina
S&ME Project No. 1634-10-039, P02

S&ME, Inc. has completed limited geotechnical services for the referenced project. Our work was conducted in general accordance with our Proposal for Professional Services No. 1634-0039-10, dated February 3, 2010, authorized by you on March 3, 2010.

PURPOSE AND SCOPE

The purpose of this work was to preliminarily characterize the surface soils at the proposed site as they relate to the proposed development, and to evaluate the subsurface shear wave velocity profile of the site at several locations in order to estimate the Seismic Site Class per the requirements of the International Building Code (IBC) 2006 edition.

It is important to realize that since this preliminary work did not include any soil test borings nor cone penetration soundings, it is insufficient to serve as a formal "due diligence" study regarding evaluation of soils. Additional geotechnical exploration and evaluation will be required in order to complete the due diligence phase of work.

PROJECT AND SITE DESCRIPTION

Project information was provided to us in an email from Mr. Walter Warren, P.E., dated February 1, 2010, which included a Request for Qualifications (RFQ), prepared by Darlington County, dated January 27, 2010. We understand the site consists of approximately 143 acres located southeast of the town of Darlington in Darlington County, SC. The site is situated north of the intersection of U.S. Highway 52 and Palmetto Road. Based on the provided 2006 aerial photograph, the site consists of open fields, planted pines, one dilapidated house, a functioning building for the Technical College, and some structural remnants and debris.

EXPLORATION PROCEDURES

On March 23, 2010 representatives of S&ME, Inc. visited the site. Using the information provided, we performed the following tasks:

- We performed a site walkover, observing features of topography, ground cover, and surface soils at the project site.

- We measured compressional and shear wave velocities at three locations using MASW methods (Multi-Channel Analysis of Surface Waves).

Multi-Channel Analysis of Surface Waves (MASW) Procedure

Shear wave velocities were measured at the site using MASW and MAM (Microtremor Array Method) with non-linear array geometry, combining the dispersion curves from both tests prior to the inversion process. Performing both MASW and MAM provides the greater depth of penetration associated with microtremor analyses (low frequency surface waves) without sacrificing resolution at shallower depths from MASW (higher frequency surface waves). In addition, our experience indicates using a combination of both methods to develop a shear wave velocity profile is more accurate than using Refraction Microtremor (ReMi™) exclusively, particularly when the ReMi™ array geometry is linear.

The MASW and MAM testing was conducted using the 16-channel Geometrics ES3000 seismograph and 4.5 Hz vertical geophones. For the MASW testing, the geophones were spaced in a linear geometry at intervals of 5 to 6 feet and surface waves generated by a 16-pound sledgehammer striking a metal plate. MAM testing was conducted using "L-shaped" array geometry with geophone spacing of 30 feet. Because the source locations of the microtremors are not known, the 2-dimensional array geometry is used for the MAM. The analysis was conducted using the OYO Corporation's SeisImager/SW software (*Pickwin v. 3.14* and *WaveEq).*

A combination of active and passive sources was used to develop the wave frequencies required to obtain velocities to a depth of 100 feet or more. The results of the active and passive sources were combined to produce a single shear wave velocity profile. Based on Section 1613.5.5 and Equation 16-41 of the 2006 International Building Code, the calculated weighted average shear wave velocities, v_s, using the developed Shear Wave Velocity Profiles were determined.

A test location sketch showing the approximate location of each MASW array is attached to this letter as Figure 1.

The results of the three shear wave velocity versus depth profile plots are attached to this letter as Figures 2 through 4, as well as a plot that shows all three profiles together on one page, attached as Figure 5.

SURFACE CONDITIONS

The southern and western portions of the site have been utilized as agricultural fields in the recent past. The northern and eastern portions of the site are moderately to heavily wooded with mixed hardwoods and pines. Several ditches, typically measuring approximately 3 to 4 feet wide and 2 to 3 feet in depth are present along the perimeter of the fields. No standing water was observed in the ditches at the time of our site visit.

Topography

The project site appears to be relatively level across much of the site. Based upon the USGS topographic quadrangle (Florence West, SC, 1986), it appears that topographic relief across the upland portion site is less than about 10 feet (excluding the bottom of the ditches) and ranges from about 130 feet MSL to about 140 feet MSL.

Plow Zone

A surficial plow zone layer was present within the agricultural fields at the site. The surface of this plow zone layer appears to consist of relatively loose, sandy soils that have been repeatedly disturbed by agricultural activities. Some buried vegetable matter and plant roots should be anticipated within the plow zone. Our past experience suggests that plow zone soils can often contain greater than 5 percent organics, in which case removal during stripping operations would be recommended, and the re-use of plow zone soils as structural fill material is not generally recommended where the organic content is significant. In addition, plow zone soils can often contribute to a perched water condition during periods of wet weather, complicating grading operations.

Further information regarding plow zone soils and these potential detrimental conditions should be determined in the next phase of the due diligence study, and additional data regarding the organic content of the plow zone material and its potential suitability for re-use as fill can be gathered during the design phase geotechnical exploration. Because of the size of this site, the plow zone soils in some areas are likely to be suitable for re-use, while the plow zone soils in other areas may not be suitable.

SUBSURFACE CONDITIONS

Preliminary geotechnical explorations have been previously conducted by others at this site. Subsurface conditions were not explored as part of this due diligence work.

Geology

The site is located in the Coastal Plain Physiographic Region of South Carolina. A review of local geologic mapping indicates that the site area lies within an outcrop area of the Duplin Formation (Td), typically inter-layered terrestrial clays, silts, and sands laid down during the Lower Pliocene Epoch approximately 3 million years ago.

These materials weathered in place and have formed a mantle of clayey sands and poorly graded sands which overlie less weathered, much older (65 million years), calcareous soils below. The surface has been reworked by erosional processes over geologic time, and the limestone residuum has been masked by deposits of loose to dense sands or stiff to very stiff clays. The upper contact of the lower sands may be irregular due to localized scouring and redeposition of the overlying clays. Soils below the Duplin Formation are mapped as Cretaceous-age sediments of the Donoho Creek Formation (Kdc).

SEISMIC SITE CLASS AND DESIGN PARAMETERS

Seismic-induced ground shaking at the foundation is the effect taken into account by seismic-resistant design provisions of the 2006 International Building Code (IBC). Other effects, including landslides or soil liquefaction, must also be considered. We classified the site as one of the site classes defined in IBC Section 1613.1 (Table 1613.1.1) using the procedures described in Section 1613.5.2. The site class is used in conjunction with mapped spectral accelerations S_S and S_1 to determine Site Coefficients F_A and F_V in IBC Section 1613.5.3, Tables 1613.5.3(1) and 1613.5.3(2).

Shear Wave Velocity Site Class Determination

At the request of the client, three shear wave velocity analyses were performed on the site in order to estimate the seismic site class, which is a very important component of the structural design. A combination of active and passive sources was used to develop the wave frequencies required to obtain shear wave velocities to a depth of 100 feet. The results of the active and passive sources were combined to produce individual shear wave velocity profiles. The resulting profiles are attached as Figures 2 through 5. Based on Section 1613.5.5 and Equation 16-41 of the 2006 International Building Code, the calculated weighted average shear wave velocities, v_s, using the Shear Wave Velocity Profile, were 875, 881, and 908 feet per second. All three of these average shear wave velocities satisfy the criteria for **Seismic Site Class D**, according to IBC Section 1613.5, as shown in Table 1 below.

Table 1 – Site Class Definitions as defined in IBC Section 1613.5

SITE CLASS	SOIL PROFILE NAME	AVERAGE PROPERTIES IN TOP 100 FEET, AS PER SECTION 1613.5		
		Soil Shear Wave Velocity Vs (ft/s)	Standard Penetration Resistance, N	Soil Undrained Shear Strength, Su psf
A	HARD ROCK	Vs > 5000	Not applicable	Not applicable
B	ROCK	2500 < Vs < 5000	Not applicable	Not applicable
C	VERY DENSE SOIL AND SOFT ROCK	1200 < Vs < 2500	N > 50 bpf	Su > 2000
D	STIFF SOIL PROFILE	600 < Vs < 1200	15 < N < 50 bpf	1000 < Su < 2000
E	SOFT SOIL PROFILE	Vs < 600	N < 15 bpf	Su < 1000
E		Any profile with more than 10 feet of soil having the following characteristics: 1. Plasticity index, PI > 20 2. Moisture Content, w > 40 percent, and 3. Undrained shear strength, Su < 500 psf		
F		Any profile containing soils having one or more of the following characteristics 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and highly organic clays (H>10 ft of peat and/or highly organic clay where H=thickness of soil) 3. Very high plasticity clays (H>25 ft with plasticity index PI > 75) 4. Very thick soft/medium stiff clays (H>120 ft)		

Note about Improving Site Seismic Design Parameters

The International Building Code defines sites having an average shear wave velocity of between 600 and 1,200 fps as Site Class D. Therefore, this site falls within the middle of the Site Class D range. On sites such as this, S&ME has had some success in the past with improving the site seismic design parameters using a Site Specific Seismic Analysis approach, which is a procedure endorsed by the Code.

Selection of Base Shear Values

Selection of the base shear values for a building code-based structural design for earthquake loading is the responsibility of the structural engineer. However, for the purpose of evaluating seismic hazards at this site, we have evaluated earthquake design factors from Section 1613 of the 2006 International Building Code as follows. As stated above, these values may be able to be improved by performance of a site-specific seismic response analysis.

Based upon an earthquake with a probability of return of 2 percent in 50 years, the mapped spectral acceleration for short periods (S_S) is 0.68g, and the mapped spectral acceleration for a 1-second period (S_1) is 0.19g. Since the mapped S_S values for the site do not exceed 1.25g, nor do S_1 values exceed 0.5g, the Site Coefficients F_A and F_V may be obtained from table 1613.5.3(1) and 1613.5.3(2). Therefore, per these tables, coefficient F_A is interpolated to be 1.26 and coefficient F_V is interpolated to be 2.06, if Site Class D is assumed. Using these values, the maximum spectral response acceleration parameters are as follows:

- $S_{MS} = 0.85g$
- $S_{M1} = 0.38g$
- $S_{DS} = 0.57g$
- $S_{D1} = 0.26g$
- PGA = 0.23g

LIMITATIONS OF THIS REPORT

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

The analyses and recommendations submitted herein are based, in part, upon the data obtained. The nature and extent of variations will not become evident until construction. If variations appear evident, then we should be given the opportunity to re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the project are planned, the results, conclusions, and recommendations contained in this report will not be considered valid unless the changes are reviewed and the report is modified or verified in writing by the submitting engineers.

Assessment of site environmental conditions; sampling of soils, groundwater or other materials for environmental contaminants; identification of jurisdictional wetlands, rare or endangered species, geological hazards or potential air quality and noise impacts was beyond the scope of this letter. Some information about these items is contained in other sections of the site feasibility package of which this letter is a part.

CLOSURE

S&ME appreciates this opportunity to work as your geotechnical engineering consultant. If you should have any questions concerning this report, please do not hesitate to contact us.

Very truly yours,
S&ME, Inc.

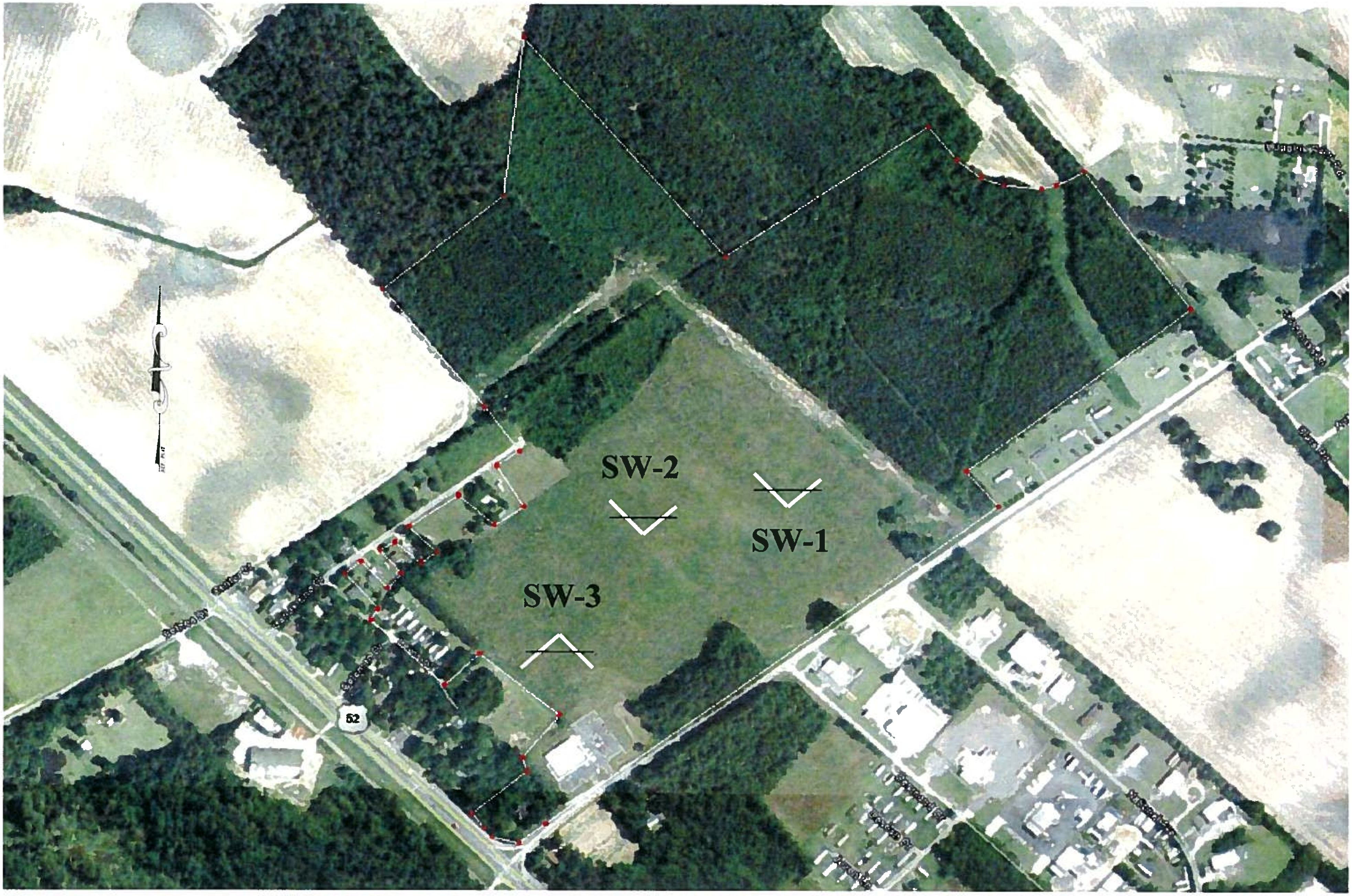
SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION S&ME, INC. No. C00473

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 21248 RON FOREST JR. 4/9/10

William D. Kannon, E.I.T.
Staff Professional

Ronald P. Forest, Jr., P.E.
Senior Engineer

Attachments: Figure 1: Test Location Sketch
Figure 2: Shear Wave Velocity Profile SW-1
Figure 3: Shear Wave Velocity Profile SW-2
Figure 4: Shear Wave Velocity Profile SW-3
Figure 5: Shear Wave Velocity Profiles (Summary)



SCALE: NTS	S&ME	TEST LOCATION SKETCH Technical College Industrial Park Darlington, South Carolina		FIGURE NO 1
CHECKED BY: ABG				
DRAWN BY: WDK				
DATE: April, 2010		JOB NO. 1634-10-039, P02		

S&ME

FIGURE 2 - Shear Wave Velocity Profile SW-1
Tech College Industrial Park
Florence, South Carolina
1634-10-039

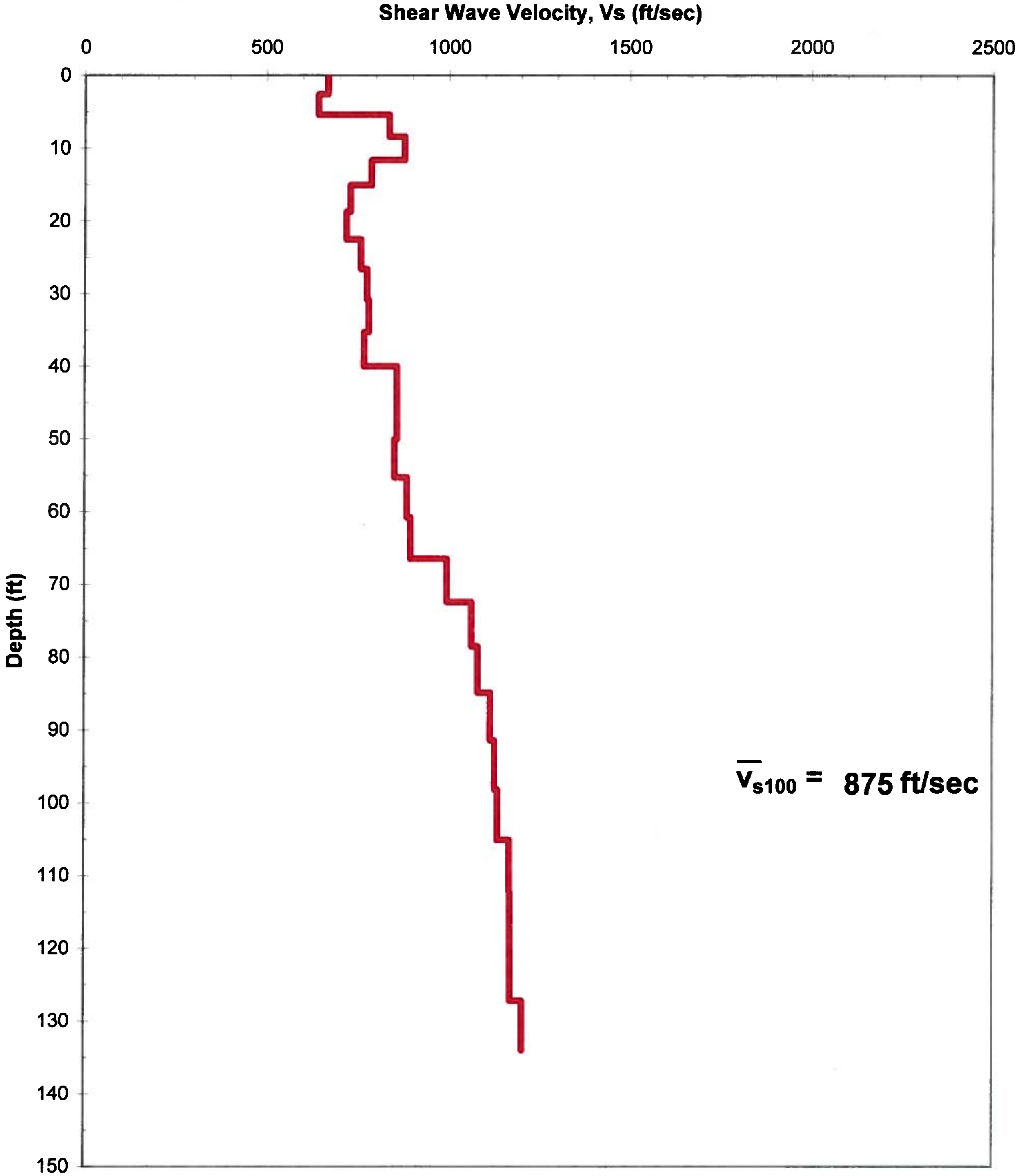


FIGURE 3 - Shear Wave Velocity Profile SW-2
Tech College Industrial Park
Florence, South Carolina
1634-10-039

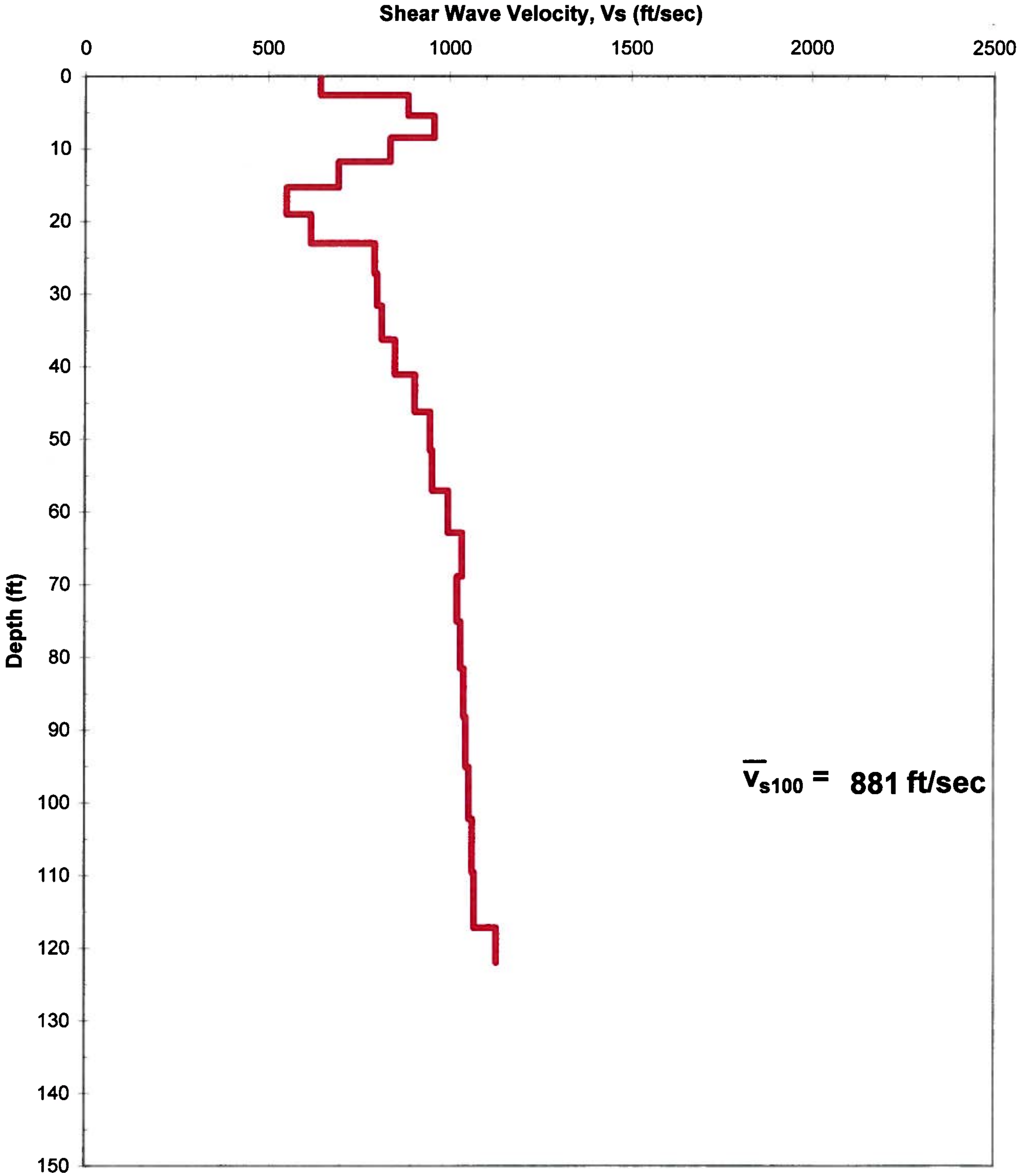


FIGURE 4 - Shear Wave Velocity Profile SW-3
Tech College Industrial Park
Florence, South Carolina
1634-10-039

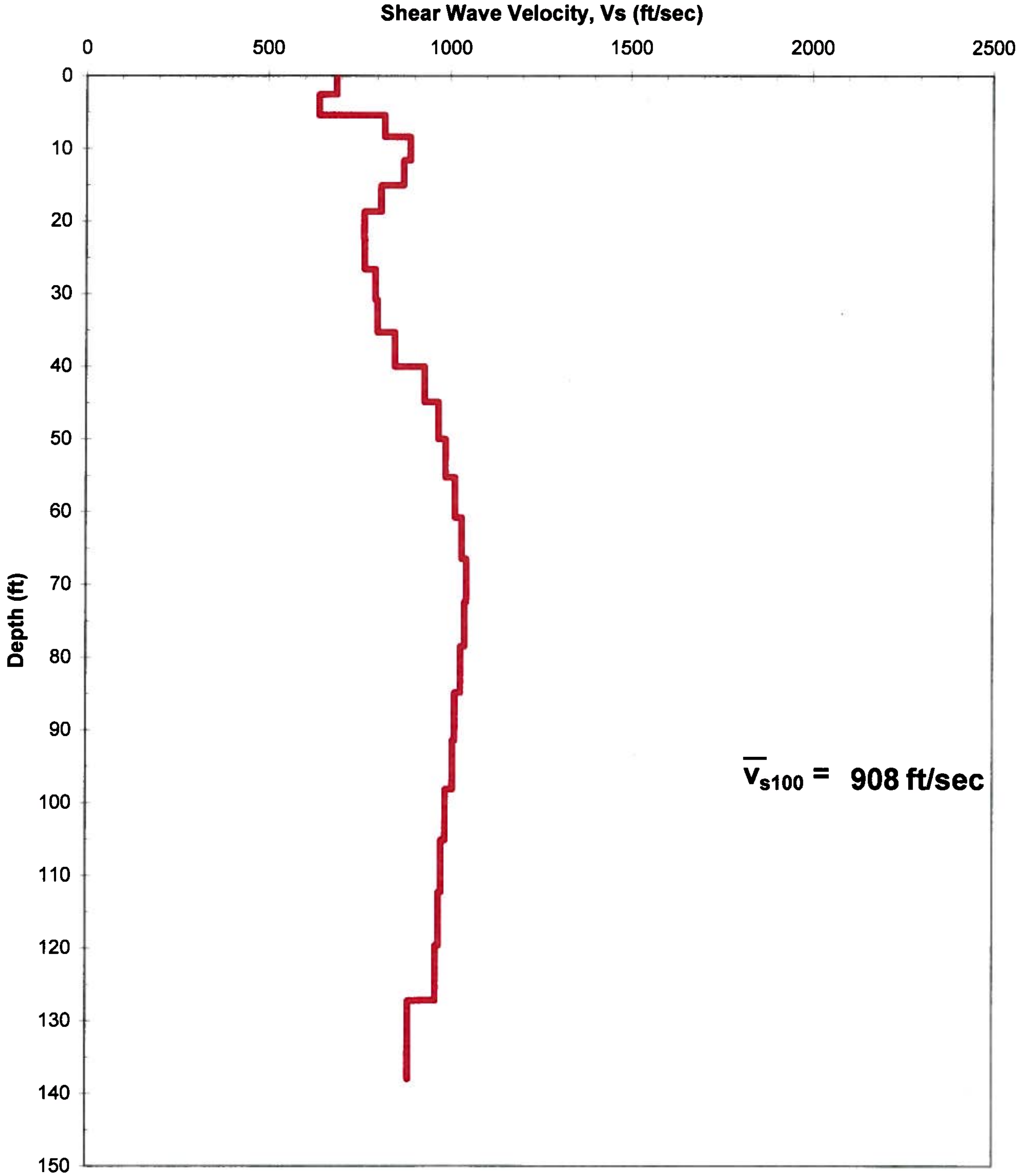


FIGURE 5 - Shear Wave Velocity Profiles
Tech College Industrial Park
Florence, South Carolina
1634-10-039