PSI Information To Build On
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January 30, 2003

Mr. C. Douglas Clary, Jr.
Engineering Resources Corporation
107B Virginia St., Suite 2
Chapin, South Carolina 29036

Preliminary Geotechnical Engineering Services Report
Master Development Plan
210-Acre Kershaw County Industrial Park
Kershaw County, South Carolina
PSI Project 451-25063

Dear Mr. Clary:

Professional Service Industries, Inc. (PSI) is pleased to submit this preliminary geotechnical engineering services report for the above referenced project. Included in this report are the results of the exploration and our recommendations concerning general site development, preliminary design and construction of foundations and preliminary pavement design.

PROJECT INFORMATION

Project Authorization

Our services have been performed in general accordance with PSI Proposal 451-25073GT dated December 5, 2002. Written authorization on December 11, 2002 was given to perform the scope of services referenced within the proposal.

Project Location and Description

The project site is the Kershaw County Industrial Park located northeast of the intersection of Mount Olivet Road (Road S-28-189) and Dr. Humphries Road (Road S-28-329) in Kershaw County, South Carolina. We understand from information and plat provided by you that the proposed project is for developing the 210-acre Industrial Park Site. At this time, we were requested to provide this preliminary report in preparation for future development at this site.

Purpose and Scope of Services

The purpose of this exploration was to evaluate subsurface conditions at the site and to provide recommendations regarding preliminary and general foundation bearing capacity and general site development for the proposed industrial park development. The scope of the exploration and analysis

included the following:

- We contacted appropriate authorities to identify underground utilities at the site.
- We performed a total of five soil test borings each to a depth of 20 feet below the surface. We also performed a test boring to a depth of 35 feet below the existing surface. The boring locations were located by PSI.
- We prepared a boring log for each boring conducted describing the soil encountered and other pertinent information.
- We performed laboratory tests to determine soil characteristics such as grain size, Standard Proctor and CBR.
- We conducted a geotechnical engineering evaluation of the available data to provide recommendations regarding foundation type, including allowable foundation bearing pressure and construction considerations such as subgrade preparation, excavation characteristics, fill placement and pavement design at the site.
- We prepared this preliminary engineering report presenting data, soil boring records, observations and recommendations.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring log regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of the client.

SITE AND SUBSURFACE CONDITIONS

Site Conditions

The site is covered with trees and underbrush. The site is generally considered level to rolling with small hills and some ditches. Topsoil and vegetative depths were not noted during this preliminary exploration. Our truck-mounted drill rig accessed the site from the adjacent roadways and woods paths.

Exploratory Procedures

A total of six soil test borings were performed on the site at the approximate locations shown on the Boring Location Plan presented in the Appendix. Each of five borings were drilled to a depth of 20 feet below the surface and one boring was drilled to a depth of 35 feet below the surface. The borings were performed using truck-mounted drilling equipment. This equipment advanced a hollow stem auger and then used Standard Penetration Testing with a split barrel sampler to retrieve soil samples. The borings were located in the field by PSI utilizing a plat provided by Engineering Resources Corporation.

Standard Penetration Testing (ASTM D-1586) was performed at selected depths in the borings. The soil samples obtained from the drilling operations were classified in general accordance with

ASTM D-2488 (Visual-Manual Procedure for Description of Soils). Soil classifications include the use of the Unified Soil Classification System described in ASTM D-2487 (Classification of Soils for Engineering Purposes).

Subsurface Conditions

In general all borings encountered a stratum of soft to medium stiff sandy SILT (ML) ranging from the surface to depths of 1.5 feet in borings B-1 and B-6; 3.5 feet in borings B-3, B-4 and B-5; and 8.5 feet in boring B-2. The Standard Penetration Test N-Values ranged from 3 to 8 blows per foot (bpf). Boring B-3 encountered different stratums of silts and clays compared to the other borings. The stratums encountered in the borings below the silt layer were comprised of medium stiff to hard silty CLAY (CL-ML). The Standard Penetration Test N-Values ranged from 6 to 56 blows per foot (bpf). Boring B-6 was terminated at a depth of 35 feet below the surface due to auger refusal. Since topsoil and vegetative depths (i.e. root mats and/or other forest floor coverings) were not noted during this preliminary soil investigation, more specific subsurface explorations conducted in the future for specific developments will be required.

Note that the stratum of sandy SILTS in the upper stratum as indicated on the boring logs in the Appendix, represent soils with potential shrink-swell characteristics depending on weather conditions and development needs. The majority of the silts encountered in the upper stratum, also indicated blow count material that may need to be either excavated and replaced or compacted in place. Depending on the exact footing placement and loading conditions, the material encountered in the vicinity of the borings performed will need further exploration.

The above subsurface description is of a generalized nature, provided to highlight the major soil strata encountered. The boring records presented in the Appendix should be reviewed for specific information as to individual soil strata locations. The stratifications shown on the boring records represent the conditions only at the actual boring locations. Variations may occur and should be expected outside the boring location. The stratifications represent the approximate boundary between subsurface materials and the transition may be gradual.

Groundwater Information

Groundwater was not encountered during the boring operations. Groundwater levels will fluctuate and can be encountered at shallower depths during periods of heavy rainfall. We recommend that as more specific development plans are determined, that more subsurface explorations be performed to determine whether groundwater levels at the time of development could impact proposed construction procedures.

EVALUATION AND RECOMMENDATIONS

Based upon our review of the data obtained in the borings, it is our preliminary opinion that the site soil may be satisfactory for proposed future developments. More detailed discussion of our recommendations for design and construction are presented in the following sections of this

report

Site Preparation

In general, initial site preparation procedures should include removal of trees, grass, roots, topsoil, and any other unsuitable materials from within proposed development areas.

After preliminary clearing and grading is complete and prior to beginning fill placement activities, we recommend that all areas receiving new fill be proofrolled. In areas to be excavated, proofrolling should be performed after final grades have been achieved. Proofrolling should be performed using a tandem axle loaded dump truck, or similar rubber-tired equipment, weighing at least 20 tons. Proofrolling operations should be observed by a representative of PSI. Soils which deflect or indicate soft areas, revealed by proofrolling and which cannot be adequately densified in place, should be removed and replaced under the recommendations of the PSI representative.

During site preparation burn pits, trash pits or other such buried disposal areas are all too frequently encountered in isolated areas outside boring locations. If such items are encountered during construction, PSI should be notified immediately to address the situation and have the opportunity to provide recommendations on how to proceed with construction.

Structural Fill Selection and Placement

In general, materials selected for use as structural fill should not contain more than 3 percent by weight of organic matter, waste construction debris or other deleterious materials. Fill materials should have a Standard Proctor (ASTM D698) maximum dry density greater than 100 pounds per cubic foot (pcf) and the moisture content of fill soils at the time of placement and compaction should generally be within plus or minus three percentage points of their optimum moisture content. More stringent moisture limits may be necessary with certain soils.

Fill material in "mass" fill areas should be placed and compacted in individual lifts of 8 inches or less loose measurement. Within small excavations such as in utility trenches, around manholes, or behind retaining walls, we recommend the use of smaller, hand or remote-guided equipment. Loose lift thicknesses of 4 inches or less are recommended when using such equipment.

Depending on future development of the site and specific loading situations, more specific subsurface investigations will be required for recommendations regarding density and compaction needs. A representative of PSI should observe fill placement operations and perform density tests concurrently to indicate if specified compaction requirements are being achieved.

Drainage and Groundwater Considerations

Since groundwater was not encountered in the soil borings, it is unknown at this point if groundwater will impact the proposed development. In general, wet surficial soils may lead to unstable soil conditions during initial site preparation activities on the site. During construction all

precautions should be taken to promote positive drainage away from footing areas of the site. Soils may degrade with increasing moisture contents and generally become unsuitable as subgrade material when in an overly moist condition. In general, water should not be allowed to collect near the foundation areas during or after construction. Undercut or excavated areas should be sloped away from the construction area to facilitate removal of any collected rainwater, groundwater or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the foundations and beneath the slabs.

Foundation Recommendations

Once development plans are finalized, it is our opinion that site specific subsurface explorations should be performed to determine suitable bearing capacity for the site. At that time, site specific foundation recommendations will be offered.

Pavement Recommendations

Once development plans are finalized, it is our opinion that site specific subsurface explorations should be performed to determine suitable pavement design recommendations. The laboratory testing results performed for this preliminary site evaluation are included in the Appendix. The CBR results indicate good soil support values for construction of pavement sections, but it should be noted that traffic loading and drainage considerations will be required for further site specific design recommendations.

Seismic Information

The 2000 International Building Code Section 1615 addresses Earthquake Loads and information to be considered in design of foundations in the vicinity of this site.

Table 1615.1.1 gives site class definitions. Based on the preliminary borings performed, the site classification appears to be D. Since the site classification is based on the subsurface conditions to a depth of 100 feet, we recommend further site specific subsurface explorations be performed to determine the site soil class.

REPORT LIMITATIONS

These preliminary recommendations submitted are based on the available soil information obtained and the assumptions made by PSI and site plats furnished by Engineering Resources Corporation for the proposed development. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during future site development considerations, PSI should be notified immediately to determine if changes in the recommendations are required. If PSI is not retained to perform these functions, PSI can not be responsible for the impact of those conditions on the performance of the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or

professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, PSI recommends site specific subsurface explorations be performed so that more specific evaluations can be made regarding the geotechnical engineer should be provided the opportunity to review the final design plans and specifications to assess that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Engineering Resources Corporation, for the specific application to the proposed Kershaw Industrial Park in Kershaw County.

We appreciate the opportunity to have provided you with our geotechnical engineering services and look forward to participation in the construction phase of this project. If you have any questions concerning this report or if we may be of further service in any manner, please contact our office.

Respectfully submitted,
Professional Service Industries, Inc.

Timothy S. Ray, P.E.
Senior Engineer
SC PE #07498

Harold Pruitt, P.E.
Regional Engineer
SC PE #15760

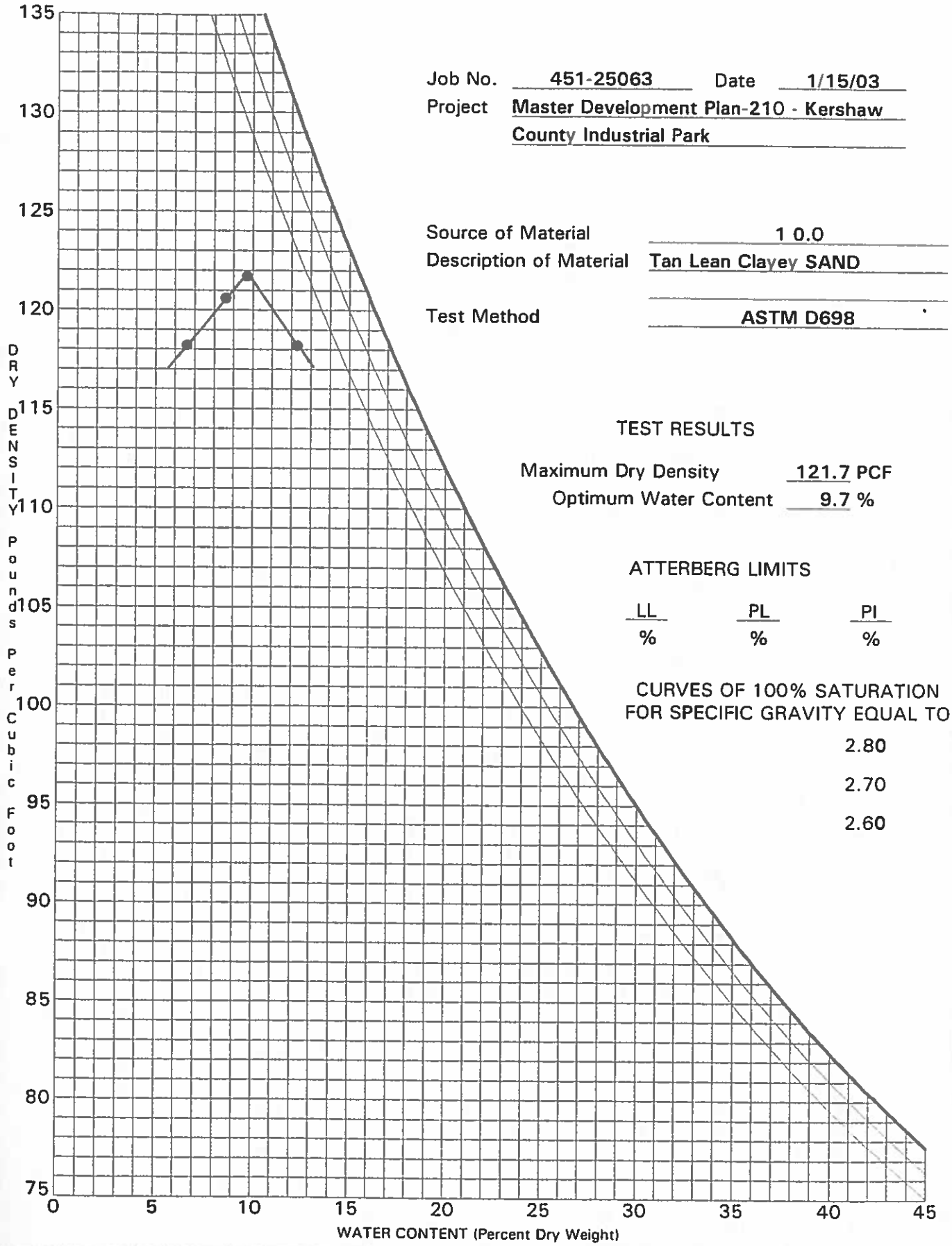
APPENDIX

Poctor Results

Grain Size Results

CBR Results

Boring Logs



Job No. 451-25063 Date 1/15/03

Project Master Development Plan-210 - Kershaw County Industrial Park

Source of Material 1 0.0

Description of Material Tan Lean Clayey SAND

Test Method ASTM D698

TEST RESULTS

Maximum Dry Density 121.7 PCF

Optimum Water Content 9.7 %

ATTERBERG LIMITS

LL	PL	PI
%	%	%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

2.80

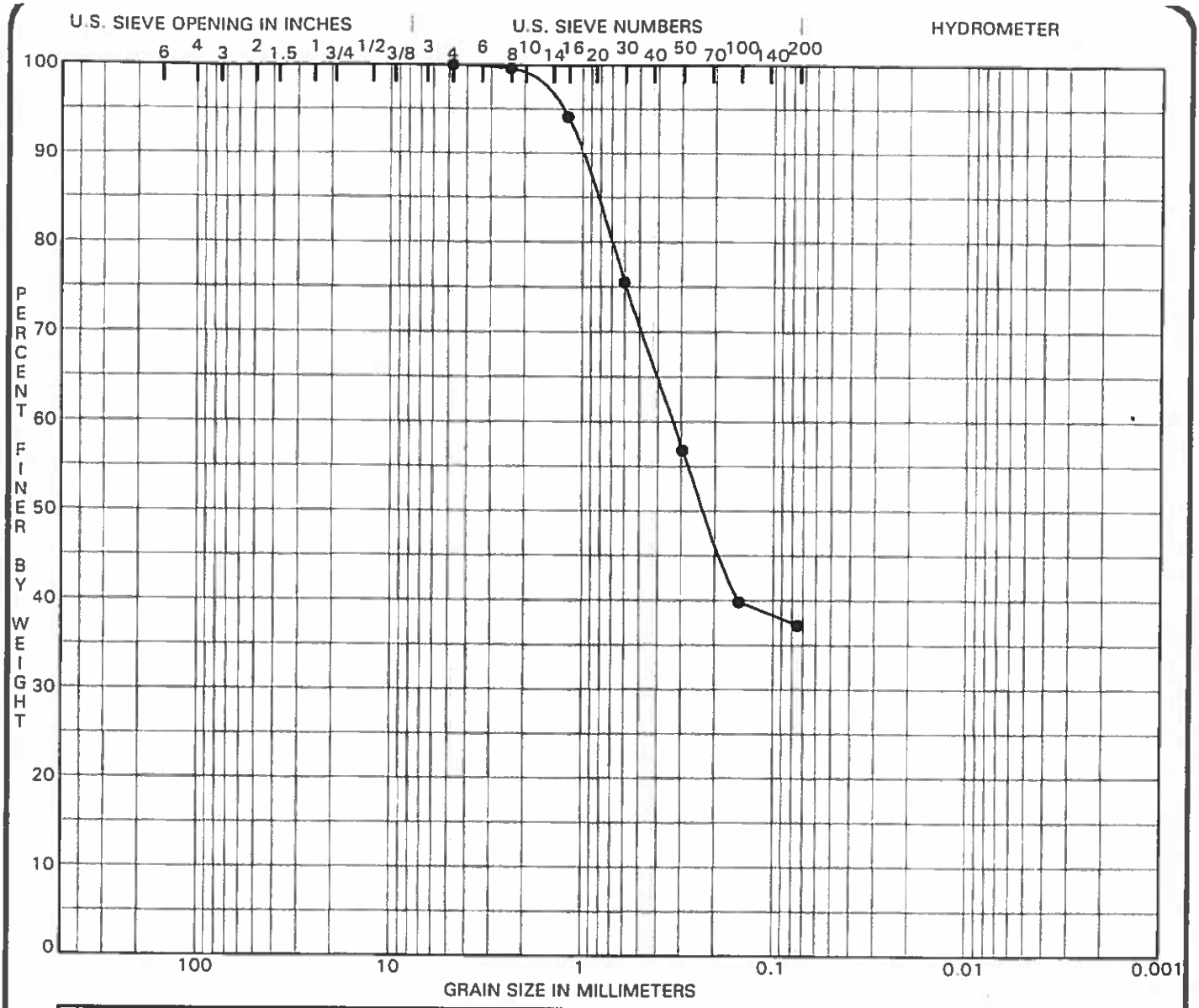
2.70

2.60

MOISTURE-DENSITY RELATIONSHIP

PSI

Columbia, South Carolina



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
● 1	Tan Lean Clayey SAND						

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 1	4.75	0.34			0.0	62.8	37.2	

PROJECT Master Development Plan-210 - Kershaw County Industrial Park

JOB NO. 451-25063

DATE 1/15/03

PARTICLE SIZE DISTRIBUTION CURVES

PSI

Columbia, South Carolina

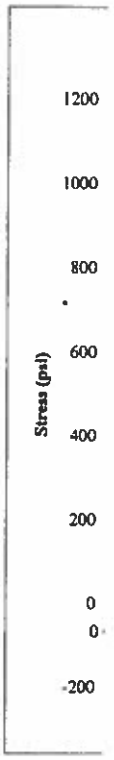
CBR TEST DATA AND RESULTS

Project: Kershaw Industrial Park
Location: Composite Sample
Client: ERC
Project Number: 451-25063

Sample ID Composite
Proctor ASTM-1557
Max Dens. 119.7
Opt Moist 9.7

Mold S-047, 3000 lbf

Pen. (inches)	Dial Reading (*10E-4)	Load (lbs)	Stress (psi)	Corrected Stress
0.000	0	0.0	0.0	
0.025	31	73.2	24.8	
0.050	81	249.9	84.7	
0.075	183	355.9	120.6	
0.100	219	508.1	172.2	340
0.125	302	748.6	253.8	
0.150	384	951.8	322.6	
0.175	459	1124.8	381.3	
0.200	530	1313.1	445.1	700
0.300	789	1943.6	658.8	
0.400	995	2442.2	827.9	
0.500	1175	2876.5	975.1	



MC as Molded			9.7
Density as Molded			119.7
% Compaction			**100.0**
Final MC, percent			**11.9**
Final Density			**117.3**
Swell	Initial	1.394	
	Final	1.396	
	% Swell		**0.14**

Pen. (inches)	CBR
0.100	34.0
0.200	46.7

BORING RECORD

Project No: 451-25063

Client: Engineering Resources Corporation

Project: Master Development Plan-210

Boring No.: B-1 (1 of 1) | Total Depth 20.0' | Elev: ± | Location: Kershaw County Industrial Park

Type of Boring: HSA | Started: 12/20/02 | Completed: 12/20/02 | Driller: Frick & Lewis

Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	PPV / REC/RQD	Sample	N	N VALUE (bpf) PL %MC LL (10 20 30 40 50 60 70 80 90)	-#200 Sieve	Remarks
	1.5	Medium Stiff Brown and Tan Fine to Medium Sandy SILT (ML)			7			
		Stiff to Hard Gray, Brown and Tan Silty CLAY (CL-ML)			13			
					13			Moist
					14			
					15			
					14			
	20.0				33			
		Boring Terminated at 20.0 Feet No Groundwater Encountered at Time of Boring						

N- Standard Penetration Resistance in Blows per Foot (ASTM D-1586)
PPV-Pocket Penetrometer Value in Tons per Square Foot.

BORING RECORD

Project No: **451-25063**

Client: **Engineering Resources Corporation**

Project: **Master Development Plan-210**

Boring No.: **B-2** (1 of 1) | Total Depth **20.0'** | Elev: **±** | Location: **Kershaw County Industrial Park**

Type of Boring: **HSA** | Started: **12/20/02** | Completed: **12/20/02** | Driller: **Frick & Lewis**

Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	PPV / REC/RQD	Sample	N	N VALUE (bpf) PL %MC LL (10 20 30 40 50 60 70 80 90)	#200 Sieve	Remarks
		Soft to Medium Stiff Tan and Brown Fine to Medium Sandy SILT (ML)			5			
					5			
					4			
					5			
	8.5	Very Stiff to Hard Gray and Pink Silty CLAY (CL-ML)			19			
					27			
	20.0	Boring Terminated at 20.0 Feet No Groundwater Encountered at Time of Boring			31			

N- Standard Penetration Resistance in Blows per Foot (ASTM D-1586)
PPV-Pocket Penetrometer Value in Tons per Square Foot.

1/6/03

BORING RECORD

Project No: 451-25063

Client: Engineering Resources Corporation

Project: Master Development Plan-210

Boring No.: B-3 (1 of 1) | Total Depth 20.0' | Elev: ± | Location: Kershaw County Industrial Park

Type of Boring: HSA | Started: 12/20/02 | Completed: 12/20/02 | Driller: Frick & Lewis

Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	PPV / REC/RQD	Sample	N	N VALUE (bpf) PL %MC LL (10 20 30 40 50 60 70 80 90)	#200 Sieve	Remarks
		Soft to Medium Stiff Brown and Tan Fine to Medium Sandy SILT (ML)			4			
					6			
	3.5	Stiff Brown and Tan Silty CLAY (CL-ML)			11			Moist
					13			Moist
	8.5	Very Stiff Brown, Tan and Gray Fine to Medium Sandy SILT (ML)			24			
	13.5	Very Stiff Gray and Pink Silty CLAY (CL-ML)			24			
	20.0				30			
		Boring Terminated at 20.0 Feet No Groundwater Encountered at Time of Boring						

NBLG3 2(1/6/03

N- Standard Penetration Resistance in Blows per Foot (ASTM D-1586)
PPV-Pocket Penetrometer Value in Tons per Square Foot.

BORING RECORD

Project No: 451-25063

Client: Engineering Resources Corporation

Project: Master Development Plan-210

Boring No.: B-4 (1 of 1) | Total Depth 20.0' | Elev: ± | Location: Kershaw County Industrial Park

Type of Boring: HSA | Started: 12/20/02 | Completed: 12/20/02 | Driller: Frick & Lewis

Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	PPV / REC/RQD	Sample	N	N VALUE (bpf) PL %MC LL (10 20 30 40 50 60 70 80 90)	-#200 Sieve	Remarks
		Soft Dark Brown Fine to Medium Sandy SILT (ML)			3	●		
					4	●		
	3.5	Medium Stiff to Hard Brown, Tan and Gray Silty CLAY (CL-ML)			6	●		Moist
					48	●		
					70	●		
					26	●		
	18.5							
	20.0	Stiff to Very Stiff Gray and White Fine Sandy SILT (ML)			12	●		
		Boring Terminated at 20.0 Feet No Groundwater Encountered at Time of Boring						

N- Standard Penetration Resistance in Blows per Foot (ASTM D-1586)
PPV-Pocket Penetrometer Value in Tons per Square Foot.

BORING RECORD

Project No: 451-25063

Client: Engineering Resources Corporation

Project: Master Development Plan-210

Boring No.: B-5 (1 of 1) | Total Depth 20.0' | Elev: ± | Location: Kershaw County Industrial Park

Type of Boring: HSA | Started: 12/20/02 | Completed: 12/20/02 | Driller: Frick & Lewis

Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	PPV / REC/RQD	Sample	N	N VALUE (bpf) PL %MC LL (10 20 30 40 50 60 70 80 90)	-#200 Sieve	Remarks
		Medium Stiff Brown and Tan Fine to Medium Sandy SILT (ML)			6			
					8			
	3.5	Stiff to Hard Gray, Tan and Pink Silty CLAY (CL-ML)			10			
					12			Moist
					20			
					27			
	20.0	Boring Terminated at 20.0 Feet No Groundwater Encountered at Time of Boring			33			

N- Standard Penetration Resistance in Blows per Foot (ASTM D-1586)
PPV-Pocket Penetrometer Value in Tons per Square Foot.

BORING RECORD

Project No: 451-25063

Client: Engineering Resources Corporation

Project: Master Development Plan-210

Boring No.: B-6 (1 of 1) | Total Depth 35.0' | Elev: ± | Location: Kershaw County Industrial Park

Type of Boring: HSA | Started: 12/20/02 | Completed: 12/20/02 | Driller: Frick & Lewis

Elevation	Depth	DESCRIPTION OF MATERIALS (Classification)	PPV / REC/RQD / Sample	N	N VALUE (bpf) PL %MC LL (10 20 30 40 50 60 70 80 90)	-#200 Sieve	Remarks
	1.5	Medium Stiff Brown and Tan Fine Sandy SILT (ML)		7			
		Medium Stiff to Hard Brown, Gray and Pink Silty CLAY (CL-ML)		6			
				9			Moist
				12			Moist
				21			
				32			
				31			
				42			
				56			
	35.0	Boring Terminated at 35.0 Feet Due to Auger Refusal No Groundwater Encountered at Time of Boring					

1/6/03

NBLG3

N- Standard Penetration Resistance in Blows per Foot (ASTM D-1586)
PPV-Pocket Penetrometer Value in Tons per Square Foot.

SURFACE WAVE MEASUREMENT & SEISMIC SITE CLASS

Governors Hill Site
Kershaw County, South Carolina
S&ME Project No. 1461-14-016

Prepared For:

Kershaw County
PO Box 763
Camden, South Carolina 29021

Prepared By:

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

April 4, 2014

April 4, 2014

Kershaw County
PO Box 763
Camden, South Carolina 29021

Attention: Peggy B. McLean

Reference: **SURFACE WAVE MEASUREMENT & SEISMIC SITE CLASS**
Governors Hill Site
Kershaw County, South Carolina
S&ME Project No. 1461-14-016

Dear Ms. McLean:

As requested, S&ME, Inc. has performed Multi-Channel Analysis of Shear Waves (MASW) testing at the above referenced site. This work was performed in general accordance with S&ME Proposal No. 14-1400112 dated February 7, 2014.

The purpose of this testing was to provide the recommended seismic site classification and seismic design parameters according to the 2012 International Building Code (IBC). The recommendations contained herein are not valid for design without the confirmation of an additional design level investigation after the locations of proposed structures are determined.

S&ME appreciates this opportunity to work with Kershaw County 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 NOTIFICATION OF AUTHORIZATION CERTIFICATE OF AUTHORIZATION S&ME, INC. No. C00473

Stephen M. Jones, E.I.T.
Staff Geotechnical Professional

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER 4/3/14 No. 14133 JOHN C. LESSLEY

John C. Lessley, P.E.
Vice President/Technical Principal

PROJECT INFORMATION

Information about the project was obtained through e-mail correspondence between Peggy McLean of Kershaw County Economic Development and Marty Baltzegar of S&ME on January 10, 2014. Information provided by Ms. McLean included general site information and boundaries, and a vicinity map with approximate lot boundaries and wetlands locations.

The Governors Hill site is approximately 210 acres and is adjacent to the intersection of Mt. Olivet Road and Dr. Humphries Road near Camden, South Carolina. The property is currently undeveloped and is heavily wooded forestland. Six soil test borings were previously conducted within the site boundaries by PSI in 2003. The number of borings previously conducted generally meets the requirements of the SC Commerce Site Certification program. However, we understand IBC seismic site class was not previously addressed.

Evaluation of seismic site class will require performing shear wave velocity measurements at the site using Multi-Channel Analysis of Surface Waves (MASW) and Microtremor Array Method (MAM) methods for near-surface characterization of shear-wave velocities (V_S).

FIELD TESTING

Geophysical measurements of soil properties were conducted by S&ME at the site on March 21, 2014. 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. Three traverses were performed at the site at the approximate locations shown on Figure 2.

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 composite shear wave velocity versus depth profile for the MASW/MAM array performed on site is attached.

The calculated average shear wave velocities using the shear wave velocity profiles for SW-1, SW-2, and SW-3 are 1305 feet per second (fps), 2030 fps, and 1155 fps, respectively over a depth of 100 feet. These values are tabulated below for your convenience. The shear wave velocity profiles are attached and also include measured shear wave velocities below a depth of 100 feet.

Table 1: Average Shear Wave Velocities

MASW/MAM Test Location	Shear Wave Velocity, V_s (feet per second)
SW-1	1305
SW-2	2030
SW-3	1155

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 explicitly in building codes but must also be considered.

IBC Site Class

As of July 1, 2013, the 2012 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.

Based on the MASW shear wave velocity data, soil profiles at SW-1 and SW-2 have weighted average shear wave velocities consistent with **Site Class C**. Profile SW-3, in the central portion of the site, had a weighted average shear wave velocity just below the threshold value of 1200 feet per second required for Site Class C, so it would be **Site Class D**. Since the park will be subdivided, site class of individual parcels may differ from those determined at the locations of these profiles. The site class should be established for each individual site development within the project site during the design level geotechnical exploration.

Design Spectral Values

S&ME determined the spectral response parameters for the site using the general procedures outlined under the 2012 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 2012 IBC seismic provisions of Section 1613 use the 2008 Seismic Hazard Maps published by the National Earthquake Hazard Reduction Program (NEHRP) 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 2012 criteria.

The 2012 IBC specifically references ASCE 7-10 for determination of peak ground acceleration value for computation of seismic hazard. Peak ground acceleration is separately mapped in ASCE 7-10 and corresponds to the geometric mean maximum credible earthquake (MCE_G). The mapped PGA value is adjusted for site class effects to arrive at a design peak ground acceleration value, designated as PGA_M.

Table 1: Spectral Design Values

	2012 IBC (2008 Seismic Hazard Maps)	2012 IBC (2008 Seismic Hazard Maps)
	SW-1/SW-2 (Site Class C)	SW-3 (Site Class D)
S_{DS}	0.338 g	0.411 g
S_{D1}	0.162 g	0.217 g
PGA_M	0.268 g	0.307 g

Under the 2012 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** for SW-1 and SW-2, and **Seismic Design Category D** for SW-3.

Recommendations for Additional Exploration

The shear wave velocity profiles provide some indication of the range of conditions that may be encountered at the site. However, the spacing and number of profiles does not provide a reliable basis for design. A seismic site class determination should be conducted on each proposed parcel development prior to design.

We note that it may be feasible to demonstrate Design Category C to apply to profile SW-3 despite the classification as Site Class D, by performing a dynamic site response analysis using the shear wave velocity data as input.

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.

Due to the distance between each test, subsurface conditions can be expected to vary from the conditions described herein. This report was intended to give general information about overall site conditions only. Additional geotechnical explorations should be conducted for each proposed structure, railway, pavement area or roadway.

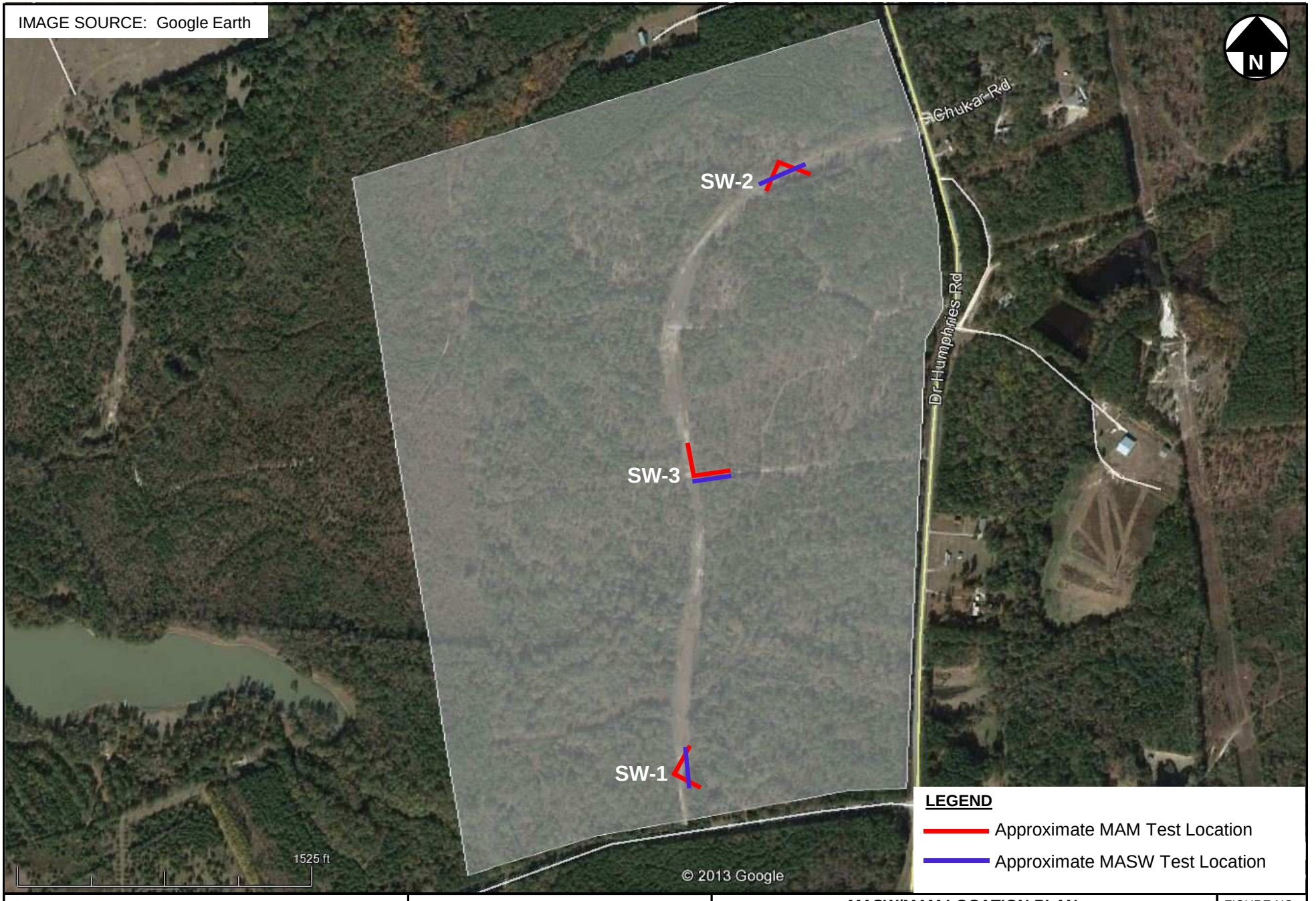
SCALE:	AS SHOWN
DRAWN BY:	SMJ
CHECKED BY:	JCL
DATE:	MARCH 14, 2014

S&ME

SITE VICINITY PLAN
GOVERNORS HILL SITE
KERSHAW COUNTY, SOUTH CAROLINA

JOB NO: **1461-14-016**

FIGURE NO.
1



SCALE:	AS SHOWN
DRAWN BY:	SMJ
CHECKED BY:	JCL
DATE:	MARCH 21, 2014

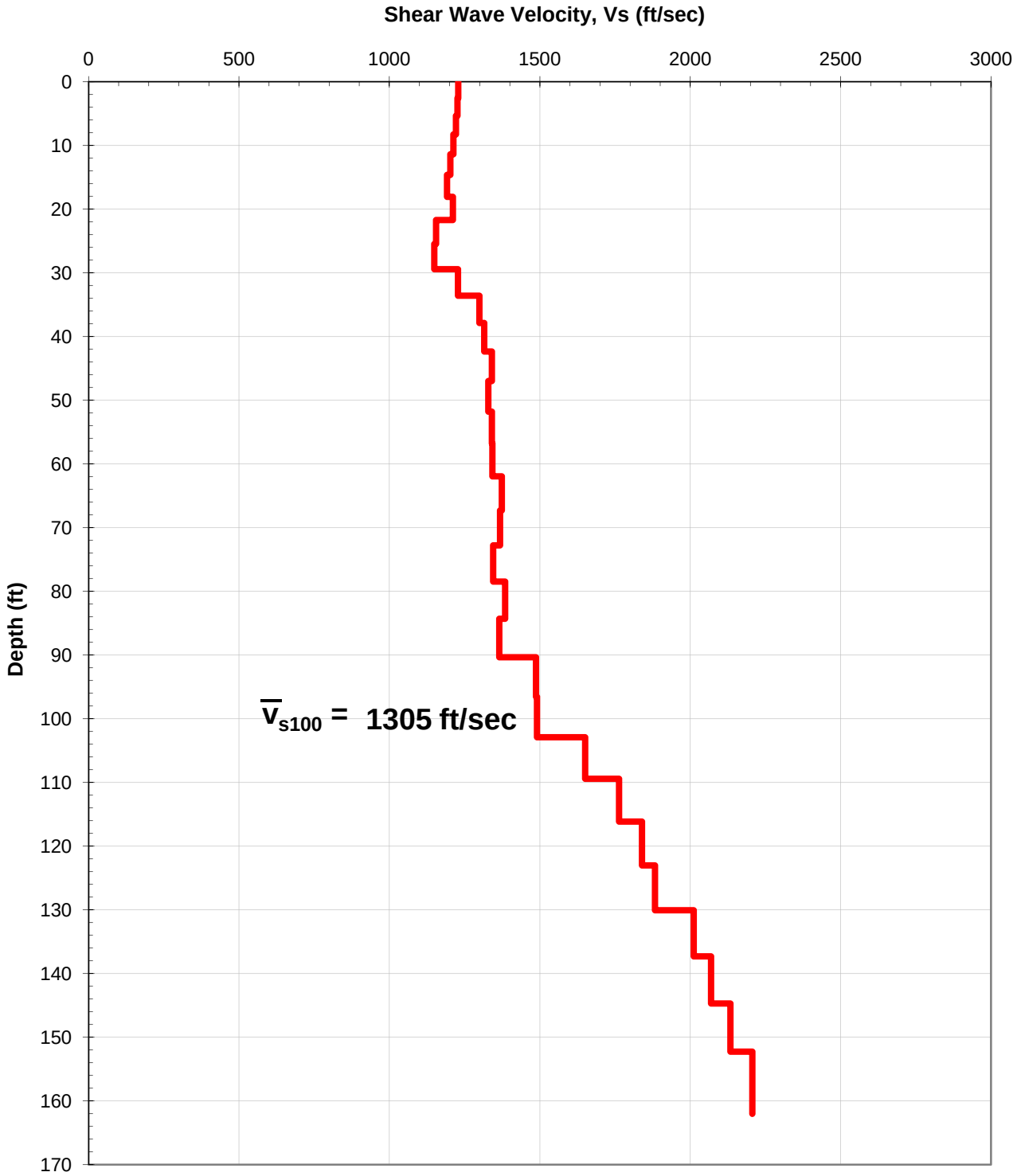
S&ME

MASW/MAM LOCATION PLAN
GOVERNORS HILL SITE
KERSAHW COUNTY, SOUTH CAROLINA

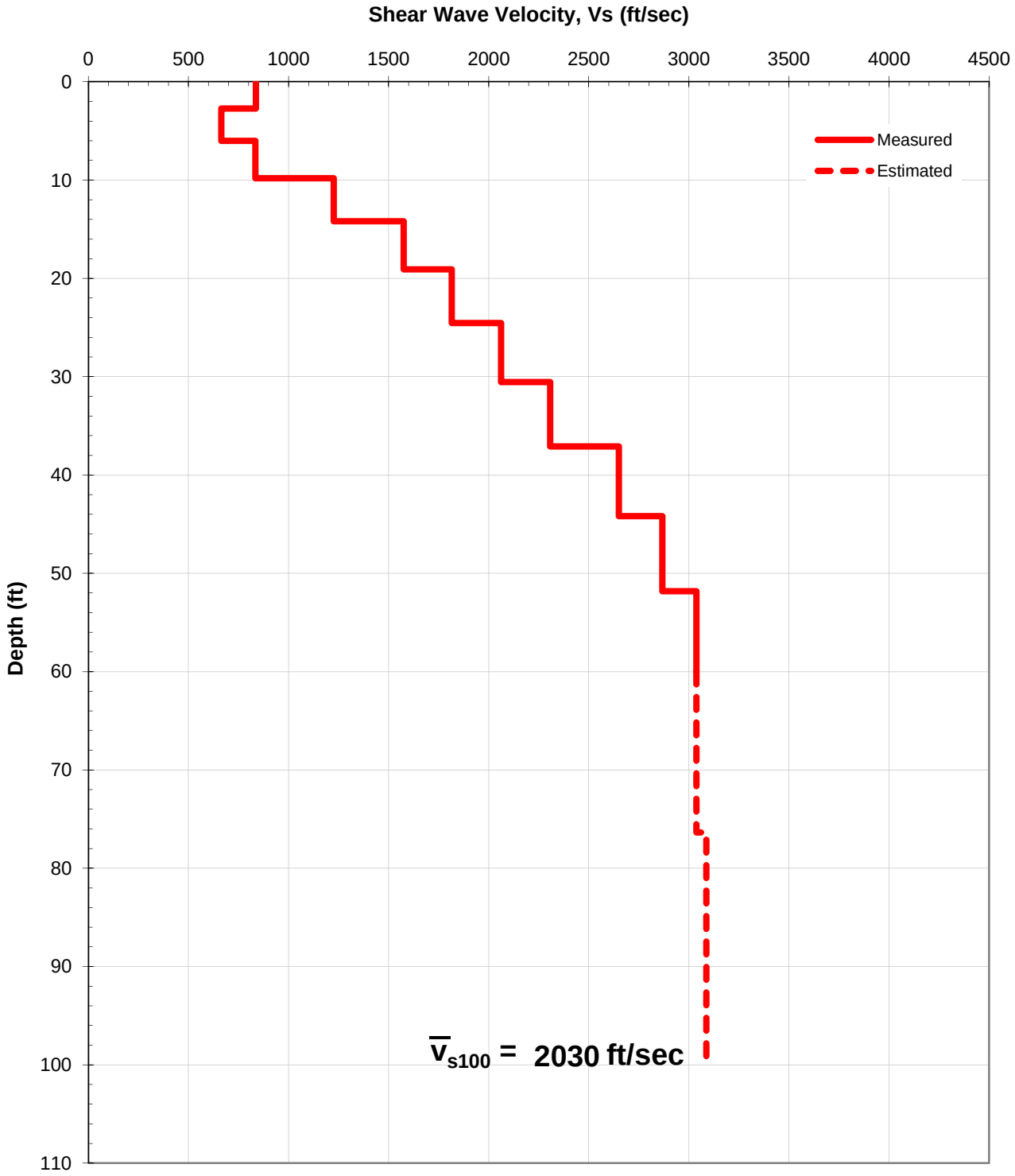
JOB NO: **1461-14-016**

FIGURE NO.
2

Shear Wave Velocity Profile SW-1
Governors Hill
Camden, South Carolina
4261-14-032



Shear Wave Velocity Profile SW-2
Governors Hill
Camden, South Carolina
4261-14-032



Shear Wave Velocity Profile SW-3
Governors Hill
Camden, South Carolina
4261-14-023