REPORT OF PRELIMINARY SUBSURFACE EXPLORATION
LANCASTER COUNTY AIRPORT PARK
LANCASTER, SOUTH CAROLINA

SUMMIT PROJECT NO. C-2396-12

Prepared For:

Mr. Steve Willis
Lancaster County
101 North Main Street
Lancaster, South Carolina 29720

Prepared By:

SUMMIT Engineering and Construction Services, Inc. (**SUMMIT**)
3575 Centre Circle
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May 9, 2012

SUMMIT

ENGINEERING·LABORATORY·SURVEYING

May 9, 2012

Mr. Steve Willis
Lancaster County
101 North Main Street
Lancaster, South Carolina 29720

Subject: **Report of Preliminary Subsurface Exploration**
Lancaster County Airport Park
Lancaster, South Carolina
SUMMIT Project No. C-2396-12

Dear Mr. Willis:

SUMMIT ENGINEERING AND Construction Services, Inc. (**SUMMIT**) has completed the subsurface exploration for the proposed facility located at the proposed Lancaster County Airport Park Lancaster, South Carolina. This investigation was performed in general accordance with our response to the RFP for Testing and Environmental Services dated February 16, 2012. This report contains a brief description of the project information provided to us, general site and subsurface conditions revealed during our geotechnical exploration and our general recommendations regarding foundation design and construction.

SUMMIT appreciates the opportunity to be of service to you on this project. If you have any questions concerning the information presented herein or if we can be of further assistance, please feel free to call us at (704) 504-1717.

Sincerely yours,
SUMMIT ENGINEERING AND CONSTRUCTION SERVICES, INC. **(SUMMIT**

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EXECUTIVE SUMMARY

SUMMIT ENGINEERING AND CONSTRUCTION SERVICES, INC. (**SUMMIT**) has completed a Subsurface Exploration for the proposed facility to be located on Lot No. 6 (Parcel B) in the Gaston Tech Park.

Sixteen (16) soil test borings (B-1 through B-16) were performed at the approximate locations shown on the attached "Boring Location Plan," Figure No. 2 included in the Figure's section. Soil Test Boring Nos. B-1 through B-8 were performed in and near the proposed building pad on Lot No. 2, B-9 was performed in the approximate center of the proposed building pad on Lot No. 3, B-10 was performed in the approximate center of the proposed building pad on Lot No. 1, B-11 was performed in the approximate center of the proposed building pad on Lot No. 4, B-12 was performed in the approximate center of the proposed building pad on Lot No. 5, B-13 was performed in the approximate center of the proposed building pad on Lot No. 6, B-14 through B-16 were performed in the approximate center of the proposed building pad and outside the building pad on Lot No. 7 as indicated by the provided plan. The borings were located by a professional from our office using existing topographic and infrastructure (existing structures, property lines, etc.) as reference. Boring locations were not surveyed and should be considered approximate. The soil test borings were performed using CME 550X drill rig and extended to depths of twenty-five (25) feet below the existing ground surface. Hollow-stem, continuous flight auger drilling techniques were used to advance the borings into the ground. Water level measurements were attempted at the termination of drilling and at the time of backfilling. The following geotechnical engineering information was obtained as a result of the soil test borings:

- **Topsoil** (grass and surface soils with organic matter) was encountered in all of the borings, with the exception of Boring Nos. B-2 through B-5 and B-8 and extended down to approximately 6 to 12 inches below the existing ground surface.

- **Fill** (disturbed) soils were encountered underlying the topsoil in Boring Nos. B-12 and B-14. The fill soils typically consisted of soft Sandy SILT and very loose Silty SAND. Based on visual observations of the split spoon samples recovered and the driller's field observations, the fill soils encountered in Boring Nos. B-12 and B-14 extended to a depth of approximately 3.0 feet below existing ground surface. Standard Penetration Resistances (N-values) in the fill ranged from 3 to 4 blows per foot (BPF).

- **Residuum** (undisturbed) soils were encountered below the topsoil layer, fill soils, or at the ground surface in all of our borings. The residual soils generally consist of firm to very stiff Sandy SILTS, stiff to hard Elastic SILTS, stiff to very stiff Fat CLAYS, and dense Silty SANDS. Standard Penetration Resistances (N-values) in the residuum ranged from 7 to 50 BPF. Residual soils extended to beyond the maximum depth of exploration of twenty-five (25) feet below existing ground surface.

- **Partially Weathered Rock** (PWR) was not encountered in any of our borings. Partially weathered rock is defined as soil-like material exhibiting N-values in excess of 100 bpf. When sampled, the PWR generally breaks down into silty sands with rock fragments.

- **Auger Refusal** was not encountered in any of our borings. Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project. Auger refusal material may consist of large boulders, rock ledges, lenses, seams or the top of parent bedrock. Core drilling techniques would be required to evaluate the character and continuity of the refusal material. However, rock coring was beyond the scope of this study. The depth and thickness of partially weathered rock, boulders, and rock lenses or seams can vary dramatically in short distances and between the boring locations; therefore, soft/hard weathered rock, boulders or bedrock may be encountered during construction at locations or depths, between the boring locations, not encountered during this exploration.

- **Groundwater** was encountered in Boring No. B-12 at and approximate depth of 19.5 feet below existing ground surface at the time of drilling.

- The borings (B-1 through B-11, B-13, B-15, and B-16) encountered soils which are suitable for a **3,000 psf** bearing capacity. Boring Nos. B-12 and B-14 encountered soft moist fill soils which will require undercut and fill or foundation extension ranging from 2 to 4 feet below existing ground surface.

- We have evaluated the Site Classification for an adjacent site according to International Building Code (IBC), Section 1615, *Earthquake Loads – Site Ground Motion* (2000) using Refraction Microtremor Analysis of Surface Waves (ReMi). We recommend that this project should be designed using a Site Classification of “D” (stiff soil profile) as defined in Table 1615.1.1 of the IBC.

1.0 INTRODUCTION

1.1 Project Description

The proposed facility is situated in the proposed Lancaster County Airport Park in Lancaster County, South Carolina. The proposed facility is located across SC Highway No. 9 from the existing Lancaster County Airport. Please refer to the “Site Location Map,” Figure No. 1 included in the Figures Section for the approximate location of the site.

As we understand, the proposed project will consist of industrial buildings located on approximately seven (7) lots. The first proposed building will consist of an approximately 50,000 square-foot footprint expandable to 100,000 square feet, with associated parking and drive areas and loading dock. We have not been provided preliminary estimated building loads nor building plans, however, we have estimated column loads will be on the order of 100 kips (total) and wall loads will be on the order of 2 to 3 kips per foot (total). Proposed foundation bearing grades can have a major impact on the recommendations in this report, when this data becomes available we should be contacted to review the data and determine the applicability to the recommendations in this report.

The following evaluation and recommendations are based upon an understanding of the proposed construction and the field exploration performed. If the above-described project conditions are incorrect or changed after this report, or if subsurface conditions encountered during construction are different from those reported, **SUMMIT** should be notified and these recommendations should be re-evaluated based on the changed conditions.

1.2 Purpose of Study

The purpose of this preliminary study was to obtain general geotechnical information regarding the subsurface conditions and to provide general recommendations regarding the geotechnical aspects of site preparation and foundation design. This report contains the following items:

- Executive Summary, test procedures and findings,
- Boring Logs, soil classifications and descriptions with standard penetration values,
- Water level measurements,
- Construction recommendations for compaction,
- Cut and fill slope limits,
- Recommendations regarding estimated foundation settlements;
- Removal of difficult excavation and rock,
- Soil parameters and pressures for design considerations,
- Seismic Site Classification as per Section 1615.1 of the International Building Code (IBC),
- Core results for existing pavements on Nebo Road, Bowers Road, and Aviation Road.
- If requested, provide the soil series for site soils developed by the Soil Survey Staff of the U. S. Department of Agriculture and published as Soil Taxonomy.

2.0 EXPLORATION PROCEDURES

2.1 Field

Sixteen (16) soil test borings (B-1 through B-16) and four (4) pavement cores (C-1 through C-4) were performed at the approximate locations shown on the attached "Boring Location Plan," Figure No. 2 and "Core Location Plan," Figure No. 3 included in the Figures Section.

The soil test borings were performed using CME 550X drill rig and extended to a depth of approximately twenty-five (25) feet below the existing ground surface. Hollow-stem, continuous flight auger drilling techniques were used to advance the borings into the ground. Water level measurements were attempted at the termination of drilling and at the time of backfilling.

The existing pavement cores were collected using a mechanical coring machine equipped with a diamond tipped core bit.

The collected soil and core samples were transported to **SUMMIT's** office to be visually examined and classified in general accordance with ASTM D 2488. The classification symbols are depicted on the attached "Boring Logs." Standard Penetration Tests (SPTs) were performed at designated intervals as the augers were advanced to evaluate the shear strength and relative density of the soils encountered. The SPT "N" value represents the number of blows required to drive a split-barrel sampler 12 inches with a 140-pound hammer falling from a height of 30 inches. The results of these tests are depicted graphically on the individual "Boring Logs" at the respective test depth.

3.0 AREA GEOLOGY AND SUBSURFACE CONDITIONS

3.1 Physiography and Area Geology

The property is located in Lancaster County, South Carolina, which is located in the south central Piedmont Physiographic Province. The Piedmont Province generally consists of well rounded hills and ridges which are dissected by a well developed system of draws and streams. The Piedmont Province is predominantly underlain by metamorphic rock (formed by heat, pressure and/or chemical action) and igneous rock (formed directly from molten material) which were initially formed during the Precambrian and Paleozoic eras. The volcanic and sedimentary rocks deposited in the Piedmont Province during the Precambrian era were the host from the metamorphism and were changed to gneiss and schist. The more recent Paleozoic era had periods of igneous emplacement, with at least episodes of regional metamorphism resulting in the majority of the rock types seen today.

The topography and relief of the Piedmont Province has developed from differential weathering of the igneous and metamorphic rock. Ridges have been developed on the more easily weathered and erodible rock. Because of the continued chemical and physical weathering, the rocks in the Piedmont Province are now generally covered with a mantle of soil that has weathered in place from the parent bedrock. These soils have variable thicknesses and are referred to as residuum or residual soils. The residuum is typically finer grained and has higher clay contents near the surface because of the advanced weathering. Similarly, the soils typically become coarser grained with increasing depth because of decreased weathering. As the weathering decreases, the residual soils generally retain the overall appearance, texture, gradation and foliations of the parent rock.

3.2 Generalized Subsurface Stratigraphy

General subsurface conditions encountered during our geotechnical exploration are described herein. For more detailed soil descriptions and stratifications at a particular soil test boring or asphalt core location, the respective "Boring Logs" or "Asphalt Core Results" should be reviewed. The horizontal stratification lines designating the interface between various strata represent approximate boundaries. Transition between different strata in the field may be gradual in both the horizontal and vertical directions.

3.2.1 Surface/Topsoil: Topsoil (grass and surface soils with organic matter) was encountered in all of the borings, with the exception of Boring Nos. B-2 through B-5 and B-8 where residual soils were encountered and extended down to approximately 6 to 12 inches below the existing ground surface. Asphalt Pavement was encountered in all of our pavement cores (C-1 through C-4) and ranged from approximately 1.2 inches to 4.4 inches in thickness.

3.2.2 Fill: Fill (disturbed) soils were encountered underlying the topsoil in Boring Nos. B-12 and B-14. The fill soils typically consisted of soft Sandy SILT and very loose Silty SAND. Based on visual observations of the split spoon samples recovered and the driller's field observations, the fill soils encountered in Boring Nos. B-12 and B-14 extended to a depth of approximately 3.0 feet below existing ground surface. Standard Penetration Resistances (N-values) in the fill ranged from 3 to 4 blows per foot (BPF).

3.2.3 Residuum Soils: Residual (undisturbed) soils were encountered below the topsoil layer, fill soils, or at the ground surface in all of our borings. The residual soils generally consist of firm to very stiff Sandy SILTS, stiff to hard Elastic SILTS, stiff to very stiff Fat CLAYS, and dense Silty SANDS. Standard Penetration Resistances (N-values) in the residuum ranged from 7 to 50 BPF. Residual soils extended to beyond the maximum depth of exploration of twenty-five (25) feet below existing ground surface.

3.2.4 Partially Weathered Rock: Partially Weathered Rock (PWR) was not encountered in any of our borings. Partially weathered rock is defined as soil-like material exhibiting N-values in excess of 100 bpf. When sampled, the PWR generally breaks down into silty sands with rock fragments.

3.2.5 Auger Refusal: Auger Refusal was not encountered in any of our borings. Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project. Auger refusal material may consist of large boulders, rock ledges, lenses, seams or the top of parent bedrock. Core drilling techniques would be required to evaluate the character and continuity of the refusal material. However, rock coring was beyond the scope of this study. Although partially weathered rock was not encountered in this exploration, the depth and thickness of partially weathered rock, boulders, and rock lenses or seams can vary dramatically in short distances and between the boring locations; therefore, soft/hard weathered rock, boulders or bedrock may be encountered during construction at locations or depths, between the boring locations, not encountered during this exploration.

3.3 Water Level Measurements

Groundwater was encountered in Boring No. B-12 at a depth below ground surface of approximately 19.5 feet after completion of drilling.

Water levels tend to fluctuate with seasonal and climatic variations, as well as with some types of construction operations. Therefore, water may be encountered during construction at depths not indicated during this study.

4.0 EVALUATIONS AND RECOMMENDATIONS

4.1 General

Our evaluation and recommendations are based on the project information outlined previously and on the data obtained from the field testing program. If the structural loading, geometry, or proposed building locations are changed or significantly differ from those outlined, or if conditions are encountered during construction that differ from those encountered by the soil test borings, **SUMMIT** requests the opportunity to review our recommendations based on the new information and make the necessary changes.

Final grading plan information was not available for our review at the time of this report. Finish grade elevations of proposed improvements can have a significant effect on design and construction considerations. **SUMMIT** should be provided the opportunity to review the project grading plans prior to their finalization to determine if they are in conformance with the recommendations contained in this report.

4.2 Moderate to High Plasticity and Moisture Sensitive Soils

Elastic Silt and Fat Clay (moderate to high plasticity) soils were encountered within Boring Nos. B-1, B-6, B-7, B-9, B-10, and B-16. These materials are suitable for direct support of the proposed building foundations if the recommendations in this report are implemented. However, these fine grained soils are susceptible to moisture intrusion and can become soft when moisture content is increased. Consequently, some undercutting and/or reworking (drying) of the near-surface soils may be required depending upon the site management practices and weather conditions present during construction.

Should these high plasticity materials be left in-place, special consideration should be given to providing positive drainage away from the building, limiting irrigation/plantings adjacent to the structure and discharging roof drains a minimum of 5 feet from the foundations to reduce infiltration of surface water to the subgrade materials. If these materials are allowed to become saturated during the life of the slab section, a strength reduction of the materials may result causing a reduced life of the section. Additionally, the use of a vapor barrier should be considered to reduce the potential for vapor transmission through the slab. However, proper curing techniques must be employed when using a vapor barrier to prevent uneven curing or curling of the slab. If additional testing for the purpose of estimating volumetric change (shrink/swell) potential is desired, SUMMIT can provide services.

4.3 Foundation Support

Based on the results of the soil test borings performed at the test locations, the proposed structures can be adequately supported on shallow foundations bearing on the residual soils or newly compacted fill soils provided the site preparation, and compacted fill recommendation procedures outlined in this report are implemented. An allowable net bearing pressure of up to 3,000 pounds per square foot (psf) can be used for design of the foundations bearing on undisturbed residual soils, existing fill, or on new structural fill compacted to at least 95 percent of its Standard Proctor maximum dry density. Preliminary settlement analyses result in maximum total settlement of approximately 1.0 inches with differential settlement less than 0.5 inches.

The footings/slab in the vicinity of Boring Nos. B-12 and B-14, where the soft moist existing fill soils were encountered, will have to be undercut at least 2 to 4 feet, possibly more or less depending on footing bearing levels, and backfilled with structural fill, compacted stone, or flowable fill (low strength concrete).

Minimum wall and column footing dimensions of 24 and 36 inches, respectively, should be maintained to reduce the possibility of a localized, punching-type shear failure. Exterior foundations and foundations in unheated areas should be designed to bear at least 18 inches below finished grade for frost protection.

Based upon our understanding of the proposed construction and our test data, the following table summarizes soil parameters associated with foundations within the residual soils and suitable fill soils.

SOIL PARAMETERS FOR WALL BACKFILL

Allowable Bearing Capacity (psf)	Friction Angle	Modulus of Subgrade Reaction (pci)	Active Earth Pressure Coefficient K_a	Passive Earth Pressure Coefficient K_p	Coefficient of Earth Pressure at Rest, K_o	Slide Friction
3,000 (Residual and Fill Soils)	30° (Residual) 24° (Fill)	200 (Residual) 150 (Fill)	0.333 (Residual) 0.422 (Fill)	3.00 (Residual) 2.37 (Fill)	0.500(Residual) 0.593 (Fill)	0.40 (Residual and Fill)

Design parameters for backfill properties (i.e., friction angle, active earth pressure, etc.) should use the values in the above table. This recommendation is made with the understanding the backfill soils will be similar to the soils encountered during this investigation. **SUMMIT** should be retained to test the actual soils used for construction to verify these design assumptions.

4.4 Seismic Site Classification

Refraction Microtremor (ReMi) survey methodology, developed by John Louie of the University of Nevada, Reno, was utilized to measure shear wave velocities on the site. ReMi is a quick, non-intrusive method for determining a one-dimensional shear wave velocity profile by recording and analyzing surface waves. The survey was conducted by establishing a 12-geophone spread along a straight line and recording random surface wave energy. The random energy was primarily provided by street traffic, over flying aircraft, and nearby construction activities, an artificial seismic source was not required. The data was processed and modeled using SeisOpt ReMi V3.0 software (Optim, LLC, 2005). The results of the test can be found in Appendix B – ReMi Shear Wave Testing Results

The shear wave velocity profile was constrained using drill data which provided approximate depth to rock and standard penetration test results at the survey locations. The results were used to identify the soil type and establish seismic design parameters in accordance with International Building Code (IBC) guidelines.

We have evaluated the Site Classification for this site according to International Building Code (IBC), Section 1615, *Earthquake Loads – Site Ground Motion* (2000) using Shear Wave Velocity

Measurements. We recommend that this project should be designed using a **Site Classification of "D" (stiff soil profile)** as defined in Table 1615.1.1 of the IBC.

4.5 Floor Slabs

The slab-on-grade floor systems can be adequately supported on the residual soils or newly compacted fill provided the fill placement procedures outlined in this report are implemented. The floor slabs should be completely isolated from the structural components to allow independent movement of the slab and building foundations.

Immediately prior to constructing the floor slabs, we recommend that the areas be proofrolled to detect any softened, loosened or disturbed areas that may have been exposed to wet weather or construction traffic. Areas that are found to be disturbed or indicate pumping action during the proofrolling should be undercut and replaced with adequately compacted structural fill. This proofrolling should be observed by the staff professional or a senior soils technician under his/her direction. Proofrolling procedures are outlined in the "Site Preparation" section of this report.

We recommend that special care be given to providing adequate drainage away from the building areas to reduce infiltration of surface water to the base course and subgrade materials. If these materials are allowed to become saturated during the life of the slab section, a strength reduction of the materials may result causing a reduced life of the section.

4.6 Cut and Fill Slopes

Permanent project slopes should be designed at 3 horizontal to 1 vertical or flatter. The tops and bases of all slopes should be located a minimum of 10 feet from structural limits and a minimum of 5 feet from parking limits. The fill slopes should be adequately compacted, as outlined below, and all slopes should be seeded and maintained after construction.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Abandoned Utilities/Structures

We recommend that all utility lines and foundations be removed from within proposed building areas. The utility backfill and foundation material should be removed and the subgrade in the excavations should be evaluated by a geotechnical professional prior to fill placement. The subgrade evaluation should consist of visual observations, probing with a steel rod and/or performing hand auger borings with Dynamic Cone Penetrometer tests to evaluate their suitability of receiving structural fill. Once the excavations are evaluated and approved, they should be backfilled with adequately compacted structural fill. Excavation backfill under proposed new foundations should consist of properly compacted structural fill, crushed stone or lean concrete.

5.2 Site Preparation

The entire building and parking areas should be stripped of all topsoil, asphalt, organic laden soil, trash (visible on the ground surface at time of exploration), construction debris and other organic materials to a minimum of 10 feet outside the structural limits. Upon completion of the stripping operations, we recommend that areas to provide support for the foundations, floor slab, parking areas and structural fill areas be proofrolled with a loaded dump truck or similar pneumatic tired vehicle (minimum loaded weight of 20 tons) under the observations of a staff professional. After excavation of the site has been completed, the exposed subgrade in cut areas should also be proofrolled. The proofrolling procedures should consist of four complete passes of the exposed areas, with two of the passes being in a direction perpendicular to the proceeding ones. Any areas which deflect, rut or pump excessively during proofrolling or fail to “tighten up” after successive passes should be undercut to suitable soils and replaced with compacted fill. **It should be noted that Boring Nos. B-12 and B-14 encountered 2 to 4 feet soft moist fill soils that will require undercut or foundation extension.**

The extent of the undercut required should be determined in the field by an experienced staff professional while monitoring construction activity. After the proofrolling operation has been completed and approved, final site grading should proceed immediately. If construction progresses during wet weather, the proofrolling operation should be repeated with at least one pass in each direction immediately prior to placing fill material or aggregate base course stone. If unstable conditions are experienced during this operation, then undercutting or scarifying may be required.

5.3 Difficult Excavation

Based on the results of our soil test borings, it appears that the majority of general excavation for footings and utilities will be possible with conventional excavating techniques. We anticipate that the residual soils can be excavated using pans, scrapers, backhoes, and front end loaders.

Although rock and partially weathered rock (PWR) was not encountered in any of our borings (B-1 through B-16) in this exploration, the depth and thickness of partially weathered rock, boulders, and rock lenses or seams, can vary dramatically in short distances and between the boring locations; therefore, soft/hard weathered rock, boulders or bedrock may be encountered during construction at locations or depths between the boring locations not encountered during this exploration. Our experience in this geologic region is that materials with SPT “N”-values less than 60 bpf can generally be excavated with heavy-duty equipment such as a Caterpillar D-8 with a single-shank ripper. The actual rippability of these in-place materials is, however, dependent on many factors such as the operator’s skill level, the techniques used during grading, degrees of weathering, rock hardness, rock structure (i.e., foliations or bedding), jointing and fracture spacing. Blasting and/or removal with impact hammers are typically required for materials with SPT “N”-values greater than 100 blows per 0.5 feet. Materials with SPT “N”-values greater than 60 bpf and less than 100 blows per 0.5 feet are considered marginally excavatable.

Care should be exercised during excavations for footings on rock to reduce disturbance to the foundation elevation. The bottom of each footing should be approximately level. When blasting is utilized for foundation excavation in rock, charges should be held above design grades. Actual grades for setting charges should be selected by the contractor and he should be responsible for any damage caused by the blasting. All loose rock should be carefully cleaned from the bottom of the excavation prior to pouring concrete. Footing excavations in which the rock subgrade has been loosened due to blasting should be deepened to an acceptable bearing elevation.

It is our opinion that a clear and appropriate definition of rock be included in the project specifications to reduce the potential for misunderstandings. A sample definition of rock for excavation specifications is provided below:

> *Rock is defined as any material that cannot be dislodged by a Caterpillar D-8 tractor, or equivalent, equipped with a hydraulically operated power ripper (or by a Cat 325 hydraulic backhoe, or equivalent) without the use of drilling and blasting. Boulders or masses of rock exceeding ½ cubic yard in volume shall also be considered rock excavation. This classification does not include materials such as loose rock, concrete, or other materials that can be removed by means other than drilling and blasting, but which for any reason, such as economic reasons, the Contractor chooses to remove by drilling and blasting.*

5.4 Temporary Excavation Stability

Localized areas of soft or unsuitable soils not detected by our borings, or in unexplored areas, such as in the existing buildings on site, may be encountered once grading operations begin. Vertical cuts in these soils may be unstable and may present a significant hazard because they can fail without warning. Therefore, temporary construction slopes greater than 5 feet high should not be steeper than one horizontal to one vertical (1H:1V), and excavated material should not be placed within 10 feet of the crest of any excavated slope. In addition, runoff water should be diverted away from the crest of the excavated slopes to prevent erosion and sloughing.

Should excavations extend below final grades, shoring and bracing or flattening (laying back) of the slopes may be required to obtain a safe working environment. Excavation should be sloped or shored in accordance with local, state and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards.

5.5 Structural Fill

The soils to be used as structural fill placed within structural areas should be free of organics, roots or other deleterious materials. The structural fill should be non-plastic soil material with a Plasticity Index (PI) less than 25 within 3 feet of the foundation elevation, pavement subgrade and slab subgrade. Compacted structural fill should consist of material classified as *CL, ML, SC, SM, SP, SW, GC, GM, GP, or GW* per ASTM D-2487. Off-site borrow soil should also meet these same classification requirements. Non-organic low plasticity, on-site soils are expected to meet this criterion. However, successful reuse of the excavated, on-site soils as compacted structural fill will depend on the moisture content of the soils encountered during excavation. We anticipate that scarifying and drying of portions of the on-site soils will be required before the recommended compaction can be achieved. Drying of these soils will likely result in some time delays.

All structural fill soils should be placed in thin (8 to 12 inches) lifts and compacted to a minimum of 95 percent of the soil's Standard Proctor maximum dry density (ASTM D698) at near optimum moisture content. The upper 1 foot of structural fill within the parking and drive areas should be compacted to a minimum of 100 percent of the soil's Standard Proctor maximum dry density (ASTM D698) at near optimum moisture content. Some manipulation of the moisture content (such as wetting, drying) may be required during the filling operation to obtain the required degree of compaction. The manipulation of the moisture content is highly dependent on weather conditions and site drainage conditions. Therefore, the grading contractor should be prepared to both dry and wet the fill materials to obtain the specified compaction during grading. Sufficient density tests should be performed to confirm the required compaction of the fill material.

5.6 Engineering Services During Construction

The engineering recommendations provided in this report are based on the information obtained from the subsurface exploration. However, unlike other engineering materials like steel and concrete, the extent and properties of geologic materials (soil) may vary significantly. Regardless of the thoroughness of a geotechnical engineering exploration, there is always a possibility that conditions between borings and soundings will be different from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the subsurface conditions. This report does not reflect variations that may occur between the boring and sounding locations. Therefore, conditions on the site may vary between the discrete locations observed at the time of our subsurface exploration.

The nature and extent of variations between the borings and soundings may not become evident until during construction. To account for this variability professional observation, testing, and monitoring of subsurface conditions during construction should be provided as an extension of our engineering services. These services will help in evaluating the Contractor's conformance with the plans and specifications. Because of our unique position to understand the intent of the geotechnical engineering recommendations, retaining us for these services will also allow us to provide consistent service through the project construction. Geotechnical engineering construction observations should be performed under the supervision of a Geotechnical Engineer from our office who is familiar with the intent of the recommendations presented herein. This observation is recommended to evaluate whether the conditions anticipated in the design actually exist or whether the recommendations presented herein should be modified where necessary. Observation and testing of compacted structural fill and backfill should also be provided by our firm.

6.0 QUALIFICATIONS OF REPORT

The analyses and recommendations submitted in this report were based, in part, on data obtained from the subsurface exploration. If the above-described project conditions are incorrect or changed after the issuing of this report, or subsurface conditions encountered during construction are different from those reported, **SUMMIT** should be notified and these recommendations should be re-evaluated based on the changed conditions to make appropriate revisions. We have prepared this report according to generally accepted geotechnical engineering practices. No warranty, express or implied, is made as to the professional advice included in this report.

FIGURES

Figure 1
Site Location Map

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Proposed Lancaster County
Airport Business Park
Lancaster Co., South Carolina

Project: C-2396-12

Figure 2B
Boring Location Plan

Approx. Soil Test Boring Location

SCALE: NTS

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Proposed Lancaster County Airport
Business Park
Lancaster County, South Carolina

SUMMIT Project No.: C-2396-12

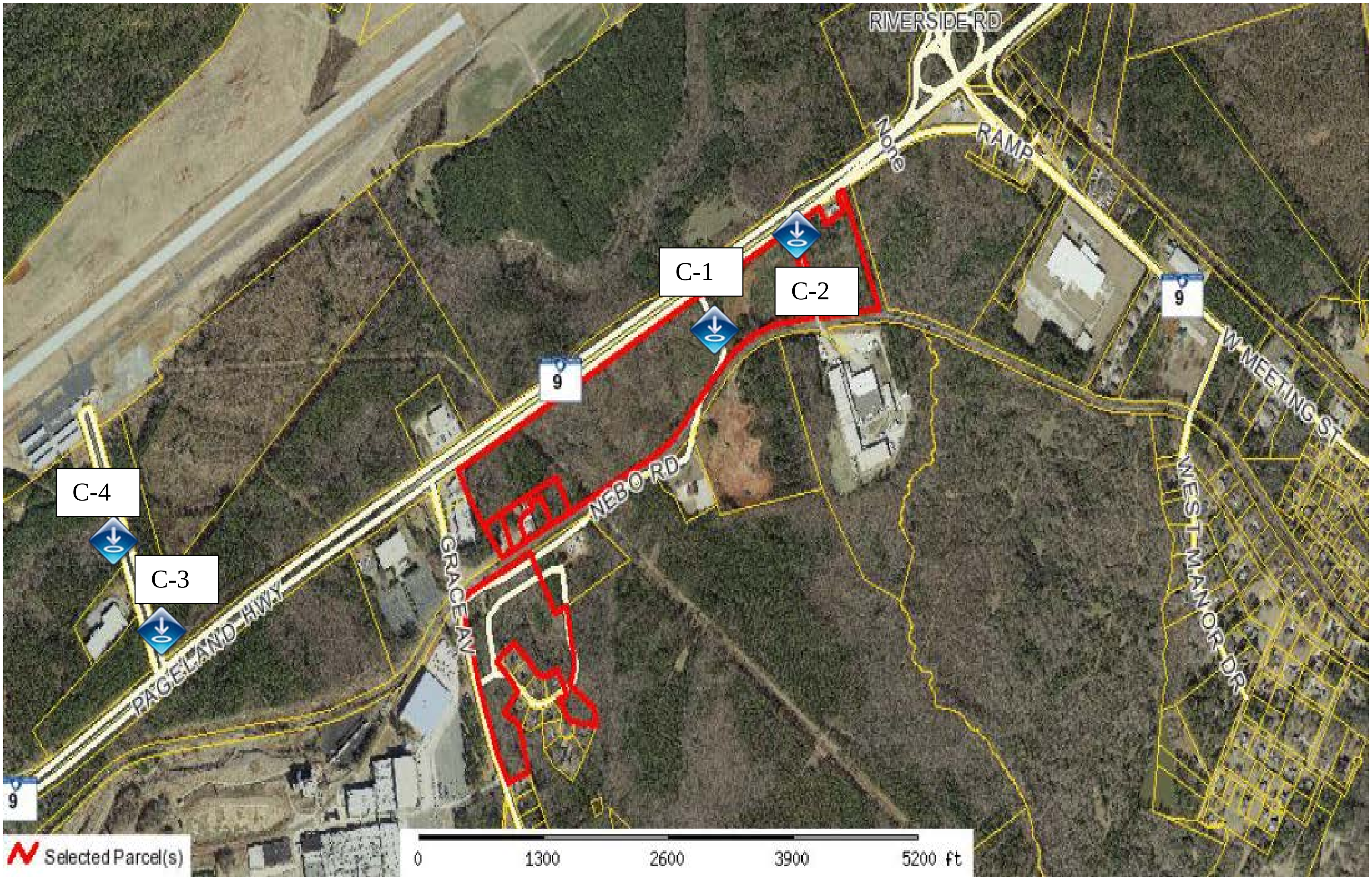

Figure 3 Core Location Plan NTS	**Proposed Lancaster County Airport Business Park**	SUMMIT Project: C-2396-12

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APPENDIX A

BORING LOGS

Project: Lancaster County Airport Park **Project Location: Lancaster County, South Carolina** **Project Number: C-2396-12**	**Key to Log of Boring** **Sheet 1 of 1**

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
5 Graphic Log: Graphic depiction of the subsurface material encountered.
6 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
7 Water Level: The approx. groundwater level from top of bore hole
8 Cave-in Depth (feet): Collapse of boring at depth interval shown
9 REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
Fill
Elastic SILT
Sandy SILT
Silty SAND
Topsoil

TYPICAL SAMPLER GRAPHIC SYMBOLS

Shelby Tube (Thin-walled, fixed head)
Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
2.5-inch-OD Modified California w/ brass liners
Pitcher Sample
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
? Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

SUMMIT

Project: Lancaster County Airport Park	**Log of Boring B-1**
Project Location: Lancaster County, South Carolina	**Sheet 1 of 1**
Project Number: C-2396-12	

Date(s) Drilled: **April 16, 2012**	Logged By: **Jeremy Johnson**	Checked By: **Todd Costner, EIT**
Drilling Method: **Hollow Stem Auger**	Drill Bit Size/Type: **6 inch soil bit**	Total Depth of Borehole: **25.0**
Drill Rig Type: **CME 550X**	Drilling Contractor: **SUMMIT**	Approximate Surface Elevation:
Groundwater Level and Date Measured: **Not Encountered ATD**	Sampling Method(s): **SPT**	Hammer Data: **140 lb, 30 inch drop, auto trip**
Borehole Backfill: **Cuttings**	Location:	

Elevation (feet)	Depth (feet)	Sampling Resistance, blows/ft	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0		Topsoil			
		19	RESIDUAL: Very Stiff Brownish Red Fat CLAY (CH)			LL = 57 and PI = 28
		27				
	5					
		30	Very Stiff Red and Tan Slightly Clayey Sandy SILT (ML)			
	10	20				
	15	16				
			Very Stiff Red, Tan and Black Sandy SILT (ML)			
	20	17				
					22'	
	25	16				
			Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park
Project Location: Lancaster County, South Carolina
Project Number: C-2396-12

Log of Boring B-2
Sheet 1 of 1

Date(s) Drilled **April 16, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				RESIDUAL: Very Stiff Red and Tan Sandy SILT (ML)			
			21					
					Stiff Red and Tan Sandy SILT (ML)			
			14					
	5							
					Very Stiff Brown, Red and Tan Sandy SILT (ML)			
			17					
			20					
	10							
			19					
	15							
			17					
	20							
							21'	
			21					
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park **Project Location: Lancaster County, South Carolina** **Project Number: C-2396-12**	# Log of Boring B-3 **Sheet 1 of 1**

Date(s) Drilled **April 20, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				RESIDUAL: Stiff Red and Tan Slightly Clayey Sandy SILT (ML)			
			11					
					Firm Red and Tan Sandy SILT (ML)			
			8					
	5				Stiff Red and Tan Sandy SILT (ML)			
			9					
			12					
	10							
			14					
	15							
					Stiff Red and Tan Micaceous Sandy SILT (ML)			
			14					
	20							
							22'	
			14					
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park
Project Location: Lancaster County, South Carolina
Project Number: C-2396-12

Log of Boring B-4

Date(s) Drilled	**April 16, 2012**	Logged By	**Jeremy Johnson**	Checked By	**Todd Costner, EIT**
Drilling Method	**Hollow Stem Auger**	Drill Bit Size/Type	**6 inch soil bit**	Total Depth of Borehole	**25.0**
Drill Rig Type	**CME 550X**	Drilling Contractor	**SUMMIT**	Approximate Surface Elevation	
Groundwater Level and Date Measured	**Not Encountered ATD**	Sampling Method(s)	**SPT**	Hammer Data	**140 lb, 30 inch drop, auto trip**
Borehole Backfill	**Cuttings**	Location			

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				RESIDUAL: Very Stiff Red and Tan Micaceous Sandy SILT (ML)			
		SPT	17					
					Stiff Red and Tan Sandy SILT (ML)			
		SPT	12					
	5							
		SPT	15					
		SPT	15					
	10							
					Very Stiff Red, Tan and Black Micaceous Sandy SILT (ML)			
		SPT	20					
	15							
					Stiff Moist Brown and Tan Micaceous Sandy SILT (ML)			
		SPT	12					
	20							
							21'	
		SPT	9					
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park	Log of Boring B-5
Project Location: Lancaster County, South Carolina	Sheet 1 of 1
Project Number: C-2396-12	

Date(s) Drilled **April 16, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location **Lot No. 2 - Approx. Center of Proposed Building Pad**	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				RESIDUAL: Stiff Red and Tan Micaceous Sandy SILT (ML)			
		SPT	15					
		SPT	13					
	5				Stiff Red and Tan Sandy SILT (ML)			
		SPT	13					
					Very Stiff Brown and Tan Micaceous Sandy SILT (ML)			
		SPT	19					
	10							
		SPT	19					
	15							
		SPT	19					
	20							
							21.5'	
		SPT	16					
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park **Project Location: Lancaster County, South Carolina** **Project Number: C-2396-12**	# Log of Boring B-6 **Sheet 1 of 1**

Date(s) Drilled **April 16, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
			38		RESIDUAL: Hard Red and Tan Elastic SILT (MH)			
			18		Very Stiff Red and Tan Clayey Sandy SILT (ML)			
	5		18		Very Stiff Red, Tan and Black Slightly Clayey Sandy SILT (ML)			
	10		14		Stiff Red and Tan Sandy SILT (ML)			
	15		14		Stiff Red, Brown and Tan Micaceous Sandy SILT (ML)			
	20		15		Stiff Brown and Tan SILT (ML)		22.5'	
	25		13					
					Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park	Log of Boring B-7
Project Location: Lancaster County, South Carolina	Sheet 1 of 1
Project Number: C-2396-12	

Date(s) Drilled **April 16, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
			19		RESIDUAL: Very Stiff Brownish Red Fat CLAY (CH)			
			21		Very Stiff Red, Tan and Red Sandy SILT (ML)			
	5		21		Very Stiff Red and Tan Sandy SILT (ML)			
	10		17		Very Stiff Red and Tan Sandy SILT (ML)			
	15		16					
	20		16					
			16		Very Stiff Tan, Brown and Red SILT (ML)		23'	
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park **Project Location: Lancaster County, South Carolina** **Project Number: C-2396-12**	# Log of Boring B-8 ## Sheet 1 of 1

Date(s) Drilled **April 20, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				RESIDUAL: Firm Red and Tan Sandy SILT (ML)			
			8					
					Stiff Red and Tan Sandy SILT (ML)			
			11					
	5				Stiff Tan and Red Sandy SILT (ML)			
			13					
					Stiff Tan and Red Sandy SILT (ML)			
			12					
	10							
					Stiff Tan, White and Red Sandy SILT (ML)			
			12					
	15							
					Stiff Moist Tan, White and Red Sandy SILT (ML)			
			12					
	20							
					Stiff Very Moist Tan, White and Red Sandy SILT (ML)		21.5'	
			11					
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park	Log of Boring B-9
Project Location: Lancaster County, South Carolina	Sheet 1 of 1
Project Number: C-2396-12	

Date(s) Drilled **April 20, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location **Lot No. 3 - Approx. Center of Proposed Building Pad**	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
			11		RESIDUAL: Stiff Brownish Red Fat CLAY (CH)			
			23		Very Stiff Red and Tan Clayey Sandy SILT (ML)			
	5		22		Very Stiff Red and Tan Sandy SILT (ML)			
	10		18		Very Stiff Brown, Red and Tan Micaceous Sandy SILT (ML)			
	15		12		Stiff Moist Brown, Red and Tan Micaceous Sandy SILT (ML)			
	20		9		Stiff Very Moist Brown Red and Tan Micaceous Sandy SILT (ML)			
			8		Firm Very Moist Tan, Brown and Black Sandy SILT (ML)		21.5'	
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park	Log of Boring B-10
Project Location: Lancaster County, South Carolina	Sheet 1 of 1
Project Number: C-2396-12	

Date(s) Drilled: **April 23, 2012**	Logged By: **Jeremy Johnson**	Checked By: **Todd Costner, EIT**
Drilling Method: **Hollow Stem Auger**	Drill Bit Size/Type: **6 inch soil bit**	Total Depth of Borehole: **25.0**
Drill Rig Type: **CME 550X**	Drilling Contractor: **SUMMIT**	Approximate Surface Elevation:
Groundwater Level and Date Measured: **Not Encountered ATD**	Sampling Method(s): **SPT**	Hammer Data: **140 lb, 30 inch drop, auto trip**
Borehole Backfill: **Cuttings**	Location: **Lot No. 1 - Approx. Center of Proposed Building Pad**	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
		SPT	40		RESIDUAL: Hard Red Elastic SILT (MH)			
		SPT	22		Very Stiff Red Elastic SILT (MH)			
	5							
		SPT	22		Very Stiff Red and Tan Slightly Clayey Sandy SILT (ML)			
		SPT	19					
	10							
					Stiff Red and Tan Sandy SILT (ML)			
		SPT	14					
	15							
		SPT	11					
	20						22'	
		SPT	9					
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park

Project Location: Lancaster County, South Carolina

Project Number: C-2396-12

Log of Boring B-11

Sheet 1 of 1

Date(s) Drilled **April 23, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location **Lot No. 4 - Approx. Center of Proposed Building Pad**	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
		SPT	18		RESIDUAL: Very Stiff Red Micaceous Clayey Sandy SILT (ML)			
		SPT	9		Stiff Red and Tan Sandy SILT (ML)			
	5							
		SPT	14		Stiff Red, Tan and Black Sandy SILT (ML)			
		SPT	12					
	10							
					Stiff Brown, Black and Tan Micaceous Sandy SILT (ML)			
		SPT	13					
	15							
					Very Stiff Tan, Brown and Black Micaceous Sandy SILT (ML)			
		SPT	17					
	20							
					Stiff Tan, Brown and Black Micaceous Sandy SILT (ML)		22.5'	
		SPT	12					
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park
Project Location: Lancaster County, South Carolina
Project Number: C-2396-12

Log of Boring B-12

Sheet 1 of 1

Date(s) Drilled **April 23, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **19.5' ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location **Lot No. 5 - Approx. Center of Proposed Building Pad**	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
			4		FILL: Very Loose Very Moist Tan Silty Fine to Coarse SAND (SM)			
			7		RESIDUAL: Firm Very Moist Tan and Light Grey SILT (ML)			
	5							
			10		Stiff Moist Tan and Light Grey SILT (ML)			
			10		Stiff Light Grey, White Red and Tan SILT (ML)			
	10							
			13		Stiff Red, Black and Tan SILT (ML)			
	15							
					Firm Wet Tan, Light Grey and Brown SILT (ML)			
∇			8			∇		
	20						20.5'	
			7					
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park	Log of Boring B-13
Project Location: Lancaster County, South Carolina	Sheet 1 of 1
Project Number: C-2396-12	

Date(s) Drilled **April 23, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location **Lot No. 6 - Approx. Center of Proposed Building Pad**	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
			7		RESIDUAL: Firm Moist Brown, Red and Tan Sandy SILT (ML)			
			24		Very Stiff Red and Tan Clayey Sandy SILT (ML)			
	5		27					
			11		Stiff Moist Red and Tan Micaceous Sandy SILT (ML)			
	10							
					Firm Very Moist Red, Tan and Black SILT (ML)			
	15		7					
					Firm Very Moist Red and Tan Sandy SILT (ML)			
	20		8				20.5'	
					Firm Very Moist Tan, Brown, Red and Black Sandy SILT (ML)			
	25		7					
					Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park	Log of Boring B-14
Project Location: Lancaster County, South Carolina	Sheet 1 of 1
Project Number: C-2396-12	

Date(s) Drilled **April 20, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location **Lot No. 7 - Approx. Center of Proposed Building Pad**	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
			3		POSSIBLE FILL: Soft Red Clayey Sandy SILT (ML)			
			21		Very Stiff Red and Tan Clayey Sandy SILT (ML)			
	5		20					
	10		19		Very Stiff Red and Tan Sandy SILT (ML)			
			14		Stiff Red and Tan Sandy SILT (ML)			
	15							
	20		15		Stiff Red, Black and Tan Sandy SILT (ML)			
			14				22.5'	
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park	Log of Boring B-15
Project Location: Lancaster County, South Carolina	Sheet 1 of 1
Project Number: C-2396-12	

Date(s) Drilled **April 20, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location **Lot No. 7**	

Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
			21		RESIDUAL: Very Stiff Red and Tan Slightly Clayey Sandy SILT (ML)			
			13		Stiff Red and Tan Sandy SILT (ML)			
	5							
			12					
			8		Firm Red and Tan Sandy SILT (ML)			
	10							
					Stiff Red, Black and Tan Sandy SILT (ML)			
			11					
	15							
			12					
	20							
							22'	
			12					
	25				Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

Project: Lancaster County Airport Park	**Log of Boring B-16**
Project Location: Lancaster County, South Carolina	**Sheet 1 of 1**
Project Number: C-2396-12	

Date(s) Drilled **April 20, 2012**	Logged By **Jeremy Johnson**	Checked By **Todd Costner, EIT**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **6 inch soil bit**	Total Depth of Borehole **25.0**
Drill Rig Type **CME 550X**	Drilling Contractor **SUMMIT**	Approximate Surface Elevation
Groundwater Level and Date Measured **Not Encountered ATD**	Sampling Method(s) **SPT**	Hammer Data **140 lb, 30 inch drop, auto trip**
Borehole Backfill **Cuttings**	Location **Lot No. 7**	

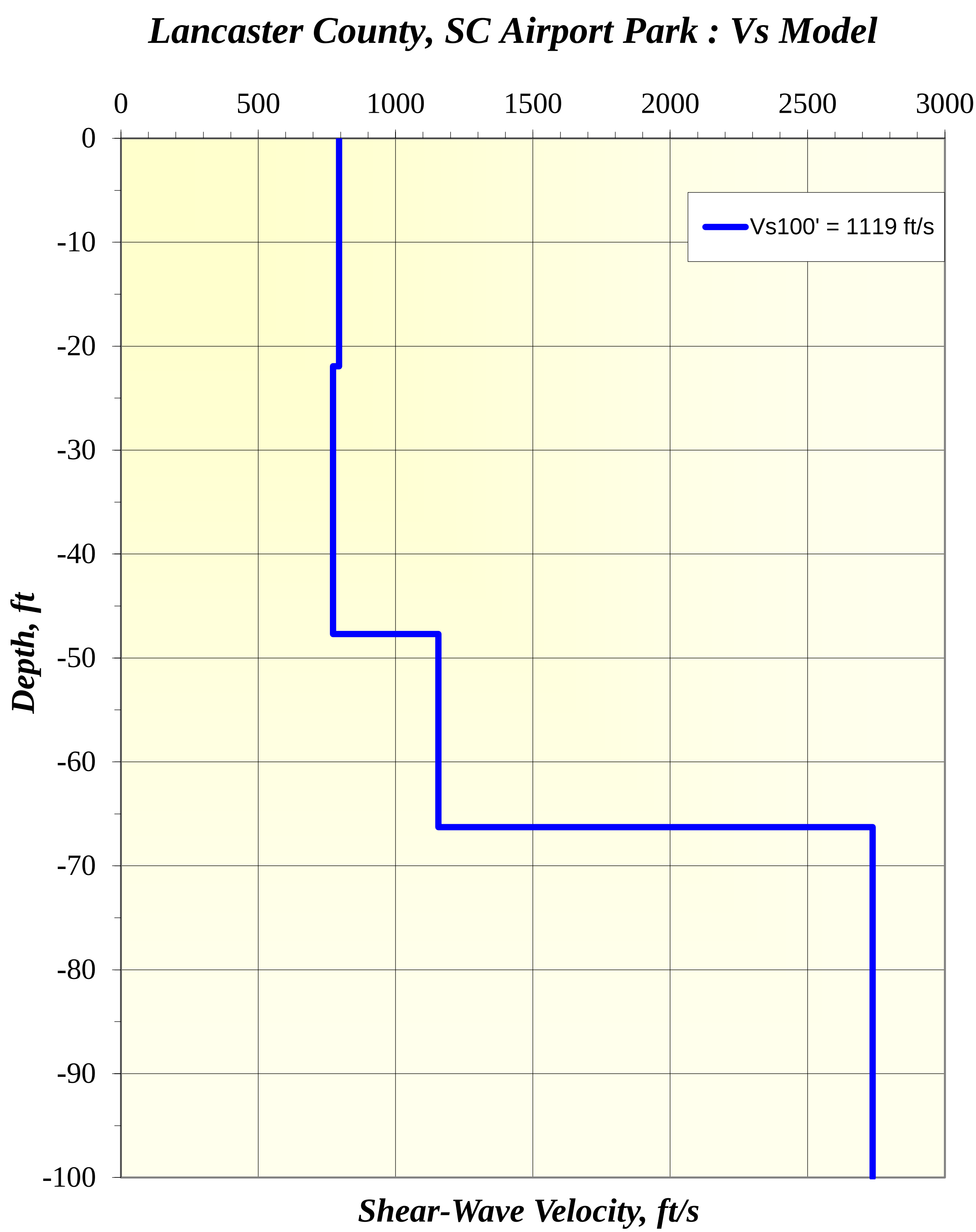
Elevation (feet)	Depth (feet)	Sample Type	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	Water Level	Cave-in Depth (feet)	REMARKS AND OTHER TESTS
	0				Topsoil			
			11		RESIDUAL: Stiff Red and Tan Elastic SILT (MH)			
			25		Very Stiff Red, White and Tan Clayey Sandy SILT (ML)			
	5		31		Dense Tan and Light Grey Slightly Clayey Silty Fine to Coarse SAND (SM)			
	10		50					
			25		Very Stiff Light Grey, Tan and Brown Sandy SILT (ML)			
	15							
	20		28					
							22'	
	25		21					
					Bottom of Boring at 25.0 feet bgs, Boring Terminated			

SUMMIT

APPENDIX B

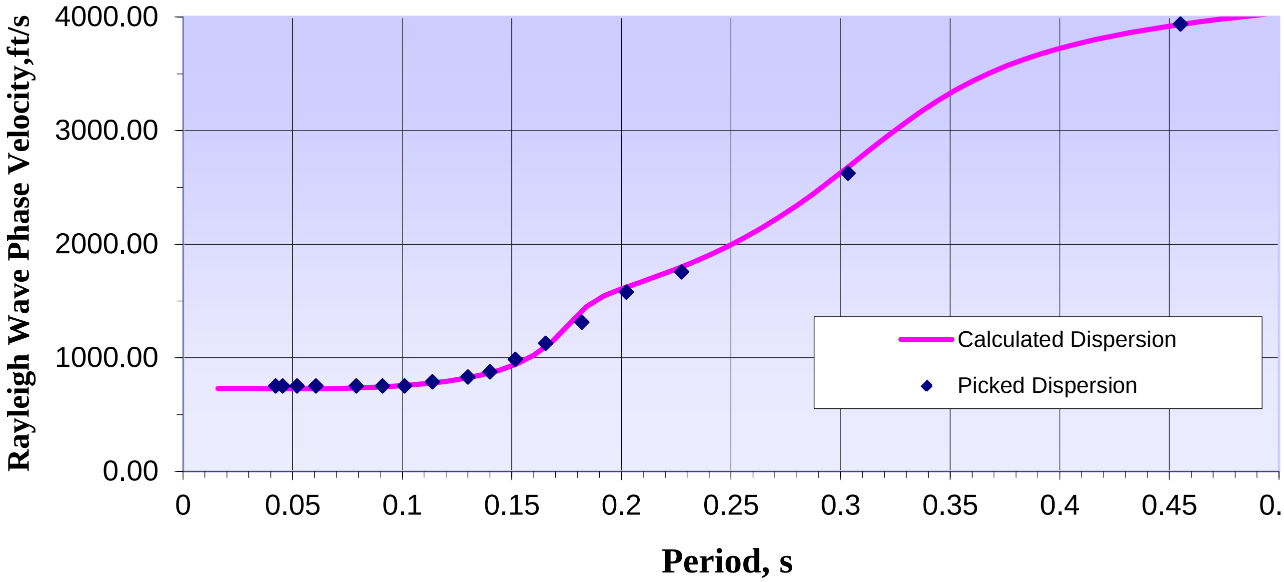
REFRACTION MICROTREMOR (REMI)

SHEAR WAVE VELOCITY TEST DATA

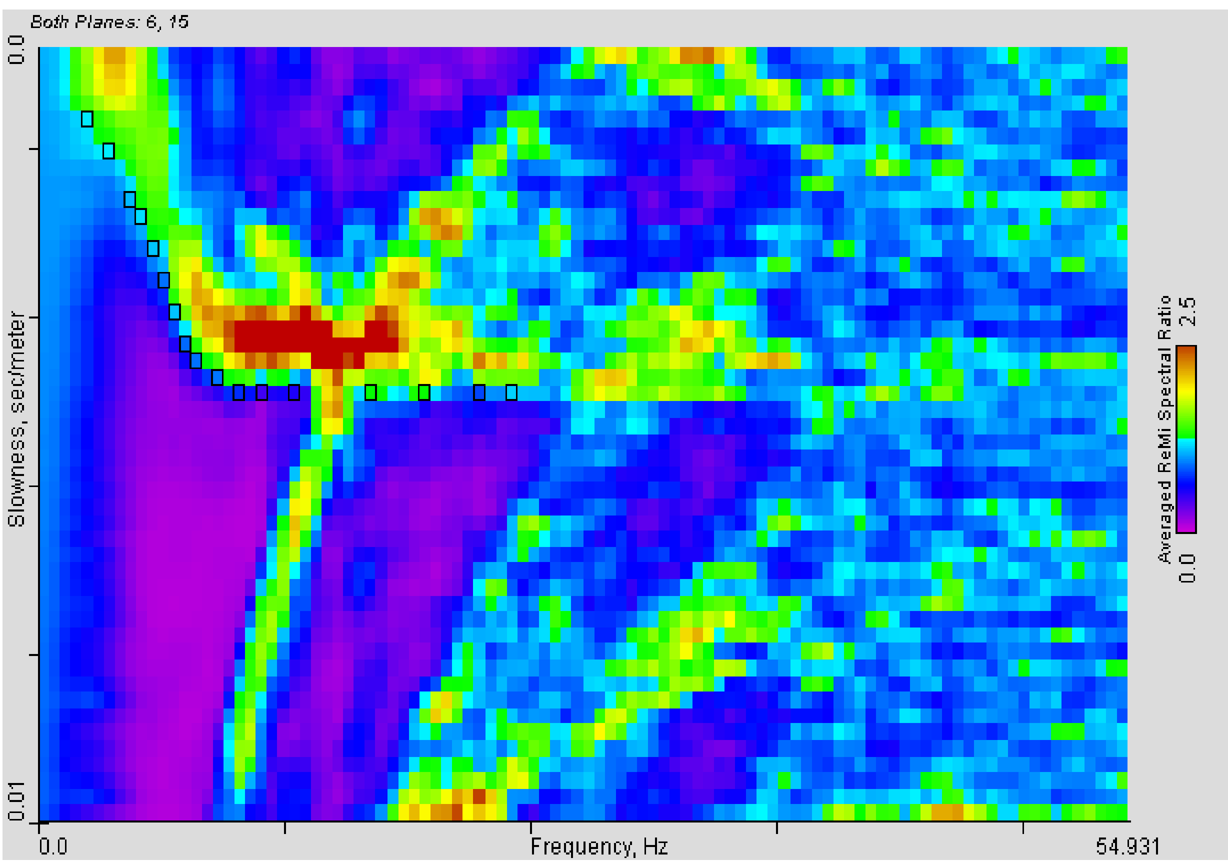

Lancaster County, SC Airport Park : Vs Model
0
500
1000
1500
2000
2500
3000
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Vs100' = 1119 ft/s
Depth, ft
Shear-Wave Velocity, ft/s

Lancaster County, SC Airport Park: Supportive Illustration

Dispersion Curve Showing Picks and Fit



p-f Image with Dispersion Modeling Picks



APPENDIX C

ASPHALT PAVEMENT CORE DATA

Asphalt Pavement Core Results

Core Number and Location	Estimated Asphalt Thickness (in)
C-1 Nebo Road	1.2
C-2 Bowers Road	3.4
C-3 Aviation Boulevard Outbound	4.4
C-4 Aviation Boulevard Inbound	3.6