Geotechnical Engineering Report

Proposed Hwy 55 Restaurant
Lillington, North Carolina
October 31, 2019
Terracon Project No. 70195236

Prepared for:
CSC Properties, LLC
Clearwater, Florida

Prepared by:
Terracon Consultants, Inc.
Raleigh, North Carolina

October 31, 2019

CSC Properties, LLC
5795 Ulmerton Road, Suite 200
Clearwater, Florida 33760

Attn: Mr. Jake Seaton
P: [205] 263-4582

Re: Geotechnical Engineering Report
Proposed Hwy 55 Restaurant
North Main Street (Hwy 210)
Lillington, North Carolina
Terracon Project No. 70195236

Dear Mr. Seaton:

We have completed Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P70195236 dated September 18, 2019. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

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REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section.

ATTACHMENTS

REPORT SUMMARY

Topic [1]	Overview Statement [2]
Project Description	Approximately 2,950 square foot restaurant building structure with adjacent parking and driving areas. Max. Column loads: 50 kips (assumed); Max. Wall loads: 3 klf (assumed) Finished floor elevation: unknown, assumed to be within 2 feet of existing grade Expected traffic for pavement areas: ■ 2,000 autos/light trucks per day ■ Up to 10 medium-duty delivery/trash trucks and 1 tractor-trailer per week Pavement design period of 20 years.
Geotechnical Characterization	At the proposed restaurant building location, subsurface conditions generally consist of very loose to medium dense silty sands underlain by clayey sands. Groundwater was not encountered at restaurant building test boring locations.
Earthwork	Remove & replace existing fill soils for pavement subgrade preparation. Materials proposed to be used for engineered fill should be tested & approved. Clayey sand soils are sensitive to moisture variation and have slight expansive potential.
Shallow Foundations	Shallow foundations will be sufficient; however, we recommend field observations and testing in the footing excavations during construction. Allowable bearing pressure = 2,000 lbs/sq ft Expected settlements: < 1 inch total, < ½ inch differential Detect and remove zones of unsuitable soils as noted in **Earthwork**
Lateral Earth Pressure Recommendations	We have provided recommendations for the installation of retaining structures if on-site walls are to be constructed.
Pavements	For subgrade prepared as noted in **Earthwork**, we have provided estimated minimum pavement sections and general construction recommendations.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Geotechnical Engineering Report

Proposed Hwy 55 Restaurant
North Main Street (Hwy 210)
Lillington, North Carolina
Terracon Project No. 70195236
October 31, 2019

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Hwy 55 Restaurant to be located on North Main Street (Hwy 210) in Lillington, North Carolina. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC
- Lateral earth pressures
- Pavement design and construction

The geotechnical engineering scope of services for this project included the advancement of eight test borings to depths ranging from 10 to 20 feet below existing site grade.

Maps showing the site and boring locations are shown in the **Site Map** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and in the **Exploration Results** section of this report.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The proposed Hwy 55 Restaurant project property is a one-acre commercial parcel located immediately north of the existing Bojanges Restaurant at 1536 N. Main Street in Lillington, North Carolina. Latitude: 35.4191, Longitude: -78.8018 (See **Site Map**)
Existing Improvements	The project property was part of a larger farmland property containing several barns or outbuildings.
Current Ground Cover	The site is currently wooded land.
Existing Topography	The ground surface slopes slightly downward from southwest to northeast.
Site History	The project property was previously used as farmland, but has since been overgrown by trees and underbrush.

EXPLORATION AND TESTING PROCEDURES

Field Exploration

As requested, our field exploration work included the drilling and sampling of exploratory soil borings consistent with the following schedule.

Number of Borings	Boring Depth (ft) [1]	Planned Location [2]
4	20	Proposed Building Location
4	10	Proposed Parking and Driveway Areas

1. Below existing ground surface
2. See **Exploration Plan**

Boring Layout: A Terracon representative used handheld GPS equipment to locate borings with an estimated horizontal accuracy of +/-3 feet.

Subsurface Exploration Procedures: We advanced soil borings with a track-mounted drill rig using continuous hollow-stem flight augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Soil sampling was performed using split-barrel sampling procedures. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. Soil samples were sealed and taken to our soil laboratory for testing and classified by a geotechnical engineer. In addition, we observed and recorded groundwater levels during and after drilling.

Our exploration team prepared field boring logs as part of standard drilling operations including sampling depths, penetration distances, and other relevant sampling information. Field logs include visual classifications of materials encountered during drilling, and our interpretation of subsurface conditions between samples. Final boring logs, prepared from field logs, represent the geotechnical engineer's interpretation, and include modifications based on observations and laboratory tests.

Property Disturbance: We backfilled borings with auger cuttings after delayed water levels were measured. Our services did not include repair of the site beyond backfilling our boreholes. Because backfill material often settles below the surface after a period, we recommend boreholes be checked periodically and backfilled, if necessary.

Laboratory Testing

The project engineer reviewed field data and assigned various laboratory tests to better understand the engineering properties of various soil strata. Testing included visual classification, moisture content, Atterberg Limits and washed sieve analyses. Procedural standards noted below are for reference to methodology in general. In some cases, local practices and professional judgement require method variations. Standards noted below include reference to other related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2488 Description and Identification of Soils (Visual-Manual Procedure)
- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D1140 Standard Test Methods for Amount of Material in Soils Finer than No. 200 Sieve

Our laboratory testing program included examination of soil samples by an engineer. Based on the material’s texture and plasticity, we describe and classify soil samples in accordance with the Unified Soil Classification System (USCS).

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The following table provides our geotechnical characterization.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density
Surface	0.2 to 0.7	Topsoil	
1	1.5 to 5.5	Silty Fine Sand	Very Loose to Medium Dense
2	Greater than 10	Clayey Fine to Coarse Sand/ Silty Clayey Sand	Loose to Dense

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

No free water was observed during drilling. Delayed measurements taken after completion also indicated that the borings were dry. Water level observations are noted on the boring logs in **Exploration Results** and are summarized below.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project. Perched water is common in the area.

PROJECT DESCRIPTION

Our understanding of the project conditions is as follows:

Item	Description
Information Provided	Site Plan dated September 9, 2019 and schematic structural drawings dated August 20, 2019.
Project Description	Construction of Hwy 55 restaurant building, parking, and driving areas.
Proposed Structure	Single-story 2,929 SF restaurant building and adjacent 270 SF cooler and storage area.
Building Construction	Conventional steel/masonry framing supported on shallow foundations with slab-on-grade floor.
Finished Floor Elevation	Not provided, but assumed to be within two feet of existing grade.
Maximum Loads (assumed)	■ Column Loads: 50 kips ■ Walls Loads: 1 - 3 klf ■ Floor slab Load: 100 - 200 psf
Grading/Slopes	Proposed grading is assumed to be minimal, with assumed cut and fill of less than 4 feet.
Below Grade Structures	Below-grade stormwater storage structures will likely be included in the project. Its proposed location is currently unknown but will likely be constructed in the proposed parking area.
Free-Standing Retaining Walls	None shown, but anticipated. Lateral earth pressures have been provided.
Pavements	Parking areas are proposed to be constructed south, east, and west of the proposed building, containing a total of 42 parking spaces. A drive-through lane is to be constructed around the east and north sides of the building. A trash enclosure area is located on the southeast corner of the site. Proposed traffic will consist of primarily automobiles with occasional delivery and garbage trucks. Specific traffic loading has not been provided. We plan to use the following traffic volumes for design of the pavement: ■ Autos/Light Trucks: 2,000 vehicles per day ■ Light Delivery and Trash Collection Vehicles: 10 vehicles per week ■ Tractor-trailer trucks: Less than 1 vehicle per week. The pavement design period is 20 years.

GEOTECHNICAL OVERVIEW

Near surface clayey sands could become unstable with typical earthwork and construction traffic, especially after precipitation events. Effective site drainage should be completed during early site development and maintained after construction to avoid potential drainage issues. If possible, site grading should be performed during warmer and drier times of the year. Site grading during winter months, increases risk for undercutting and replacement of unstable subgrade. Additional site preparation recommendations including subgrade improvement and fill placement are provided in the **Earthwork** section.

Bearing stratum soils for shallow foundations are silty sands and clayey sands. These soils exhibit a low potential for shrink-swell movements with changes in moisture. The **Shallow Foundations** section addresses support of the building bearing on native silty/clayey sands or engineered fill. We recommend footing excavations to be inspected by Terracon for suitable preparation of bearing conditions.

The **Floor Slabs** section addresses slab-on-grade support of the building. Design parameters and construction considerations have been provided. Specific attention should be given to ensure proper subgrade preparation and positive drainage away from the structure and aggregate base beneath the floor slab.

A rigid/flexible pavement system is recommended for this site. The **Pavements** section addresses the design of pavement systems and subgrade preparation options and recommendations. A typical pavement section has been provided for car only/parking areas and an additional section has been provided for driving/truck delivery areas.

Support of floor slabs, footings, and pavements on or above existing fill materials is discussed in this report. However, even with the recommended construction procedures, there is an inherent risk to the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by following the recommendations contained in this report. To take advantage of the cost benefit of not removing the entire amount of undocumented fill, the owner must be willing to accept the risk associated with building over the undocumented fills following the recommended reworking of the material. The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Construction should begin with demolition of existing structures and complete removal of foundations and slabs if present. Existing utilities that are to be abandoned should be removed or filled with grout. Utilities that are to remain should be accurately located horizontally and vertically to minimize conflict with new construction. Any existing wells should be abandoned in accordance with local regulations.

Earthwork will include clearing and grubbing, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the earthwork. Recommendations include critical quality criteria as necessary to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Site Preparation

After demolition work and prior to placing fill, existing vegetation, root mat, should be removed. Complete stripping of the topsoil should be performed in the proposed building and parking/driveway areas.

Following removal of the vegetation and topsoil, the subgrade should be proof-rolled with an adequately loaded vehicle such as a fully loaded tandem axle dump truck. The proof-rolling should be performed under the direction of the Geotechnical Engineer. Areas excessively deflecting under the proof-roll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should be overexcavated and replaced with approved structural fill. Geotechnical fabric may be required. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

Existing Fill

Existing medium dense silty sand fill was encountered at B-1 to a depth of about 2.5 feet. The fill appears to have been placed in an uncontrolled manner. Support of floor slabs and pavements on or above existing fill soils is discussed in this report. However, even with the recommended construction procedures, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by following the recommendations contained in this report.

If the owner elects to construct floor slabs or pavements on existing fill, the following protocol should be followed. Once the planned demolition and grading has been completed, the area should be proof-rolled with heavy, rubber tire construction equipment, to aid in delineating areas of loose, soft, or otherwise unsuitable soil. Once unsuitable materials have been remediated, and the subgrade has passed the proof-roll test, approved imported fill materials can be used to be place structural fill beneath slab and pavement subgrade.

Fill Material Types

Fill required to achieve design grade should meet the following material property requirements:

Fill Material	USCS Classification	Acceptable Location for Placement
Imported Low- to Moderate-Plasticity Soil (min. 20% fines)	CL, ML, SC, SM	All locations and elevations except as backfill behind any retaining walls
Sand / Gravel with less than 10% fines [2]	GW/GP, SW/SP	NCDOT ABC – suitable beneath pavement sections and floor slabs
On-site Soils	SM, SC	All locations and elevations except as backfill behind retaining walls or mechanically stabilized earth walls

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Soil with less than 10% fines (silt and clay) should not be used as general fill to raise site grades to prevent perched water conditions where water infiltrating the surface zone can be trapped over the underlying less-permeable soil zone.
3. Underground stormwater structures should be backfilled with material specified by manufacturer

Fill Compaction Requirements

Structural and general fill should meet the following compaction requirements.

	Description
Fill Lift Thickness	9-inches or less in loose thickness (4-inch to 6-inch lifts when hand-operated equipment is used).
Compaction Requirements [1]	Minimum of 95% of the material's standard Proctor maximum dry density (ASTM D698). The top lift of engineered fill should be compacted to a minimum of 98% of the material's standard Proctor maximum dry density (ASTM D698) for retaining walls, buildings and pavements.

Moisture Content	Within the range of -2% to +2% of optimum moisture content as determined by the standard Proctor test at the time of placement and compaction.

1. Engineered fill should be tested for moisture content and compaction during placement. If in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the tests should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

Utility Trench Backfill

Utility trenches are a common source of water infiltration and migration. Utility trenches penetrating the building perimeter should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the building. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exterior. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5 percent away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary as part of the structure's maintenance program. Where paving or flatwork abuts the structure a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Shallow excavations for the proposed structure are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over, or adjacent to, construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted, prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, “Excavations” and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and top soil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation. Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer’s evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Design Parameters – Compressive Loads

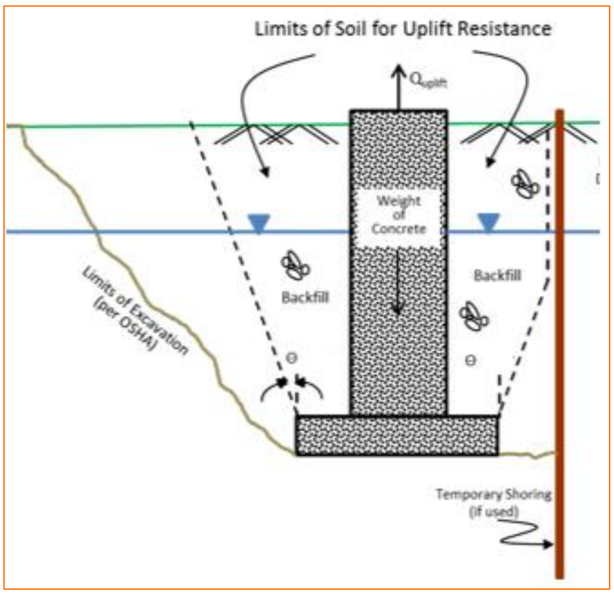
Description	Column	Wall
Net allowable soil bearing pressure [1]	2,000 psf	2,000 psf
Minimum dimensions	30 inches	18 inches
Minimum embedment	12 inches	12 inches
Estimated total settlement [2]	< 1 inch	< 1 inch
Estimated differential settlement [2]	1/2-inch between columns	1/2-inch over 40 feet
Equivalent fluid pressure [3]	288 pcf	
Ultimate coefficient of sliding friction [4]	0.35	

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes any unsuitable fill or soft soils, if encountered, will be undercut and replaced with engineered fill. Disturbance of wet soils may require the need for a granular stabilization layer for an appropriate working surface. Terracon should be consulted if this issue becomes apparent.
2. The foundation settlement will depend upon the variations within the soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations. The above settlement estimates assume the maximum footing size is 8 feet for column footings, 4.5 feet for continuous footings, and relatively uniform loading.
3. The sides of the excavation for the spread footing foundation must be nearly vertical and the concrete should be placed neat against these vertical faces for the passive earth pressure values to be valid. If the loaded side is sloped or benched and then backfilled, the allowable passive pressure will be significantly reduced. Passive resistance in the upper 12 inches of the soil profile should be neglected.

A representative of the geotechnical engineer should be retained at this time to carefully evaluate the foundation excavations through a combination of hand auger borings, dynamic cone penetrometer (DCP) testing, and probing. The materials within a depth of at least 4 feet below foundation bearing elevations should be evaluated. Soft, loose, or otherwise unsuitable materials, if encountered, should be over-excavated and replaced with compacted engineered fill.

Design Parameters - Uplift Loads

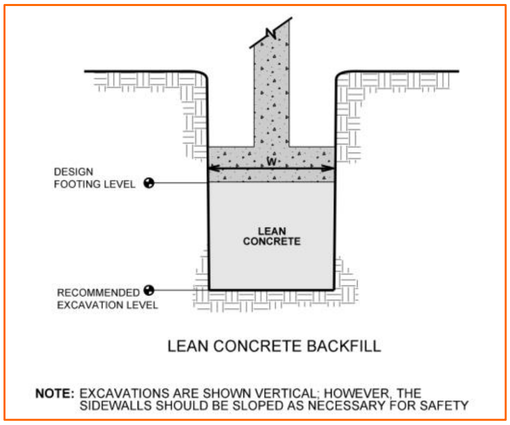
Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ, of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 100 pcf should be used for the backfill. This unit weight should be reduced to 40 pcf for portions of the backfill or natural soils below the groundwater elevation.



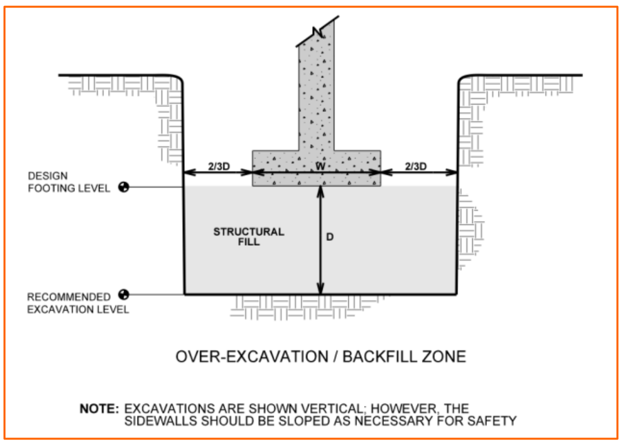
Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with approved fill material placed, as recommended in the **Earthwork** section.



SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7-10.

Seismic Design Parameters

Description	Value
2015 International Building Code Site Classification	D [2]
Site Latitude	35.4191
Site Longitude	-78.8018
S_{DS} Spectral Acceleration for a Short Period [3]	0.141g
S_{D1} Spectral Acceleration for a 1-Second Period [3]	0.104g

1. Seismic site classification in general accordance with the *2015 International Building Code*, which refers to ASCE 7-10.
2. The 2015 International Building Code (IBC) uses a site profile extending to a depth of 100 feet for seismic site classification. Borings at this site were extended to a maximum depth of 20 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.
3. These values were obtained using online seismic design maps and tools provided by the USGS (http://earthquake.usgs.gov/hazards/designmaps/).

Liquefaction Potential

Soils with the potential to liquefy under seismic loadings were not observed in project test borings.

FLOOR SLABS

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor slab support [1]	Aggregate base (see below) underlain by subgrade prepared according to **Site Preparation.**
Modulus of subgrade reaction [2]	100 pounds per square inch per in (psi/in)
Aggregate base course	4 inches of NCDOT ABC

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Settlement of floor slabs supported on existing fill materials cannot be accurately predicted but could be larger than normal and result in some cracking. Mitigation measures as noted in **Existing Fill** within **Earthwork** are critical to the performance of floor slabs. In addition to the mitigation measures, the floor slab can be stiffened by adding steel reinforcement, grade beams and/or post-tensioned elements.

Floor Slab Construction Considerations

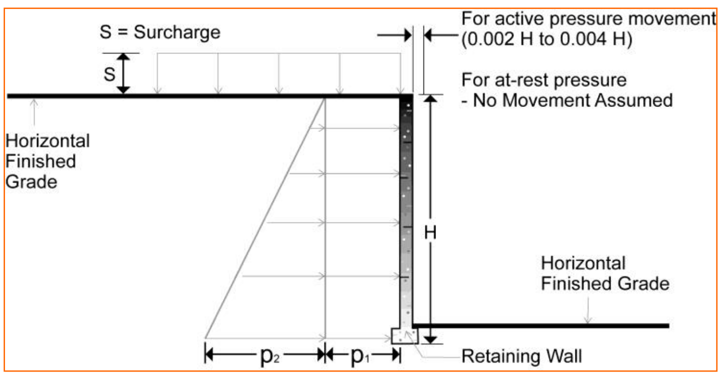
Finished subgrade within and for at least 5 feet beyond the floor slab should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

LATERAL EARTH PRESSURES

Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters				
Earth Pressure Condition [1]	Coefficient for Backfill Type[2]	Surcharge Pressure [3, 4, 5] p_1 (psf)	Effective Fluid Pressures (psf) [2, 4, 5]	
			Unsaturated	Submerged
Active (Ka)	Granular - 0.33 Lean Clay - 0.40	(0.33)S (0.40)S	(40)H (48)H	(80)H (85)H
At-Rest (Ko)	Granular - 0.46 Lean Clay - 0.56	(0.46)S (0.56)S	(55)H (67)H	(90)H (95)H
Passive (Kp)	Granular - 3.0 Lean Clay - 2.4	--- ---	(300)H (288)H	(250)H (205)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95 percent of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

PAVEMENTS

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs, noted in this section, must be applied to the site, which has been prepared as recommended in the **Earthwork** section.

Subgrade Preparation

The following are general subgrade preparation consideration, which apply for pavement subgrades prepared as recommended in the **Earthwork** section. On most project sites, the site grading is accomplished relatively early in the construction phase. Fills are placed and compacted in a uniform manner. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy traffic from concrete trucks and other delivery vehicles disturbs the subgrade and many surface irregularities are filled in with loose soils to improve traffic conditions temporarily. As a result, the pavement subgrades, initially prepared early in the project, should be carefully evaluated as the time for pavement construction approaches.

We recommend the moisture content and density of the top 12 inches of the subgrade be evaluated and the pavement subgrades be proofrolled within two days or after a rainfall prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

Estimates of Minimum Pavement Thickness

As a minimum, we recommend the following typical pavement section be considered for car only areas.

Material[2]	Thickness (inches)	Preparation
Asphalt Surface Course (NCDOT S-9.5C)	3.0[1]	Per NCDOT Specifications
Aggregate Base (NCDOT ABC)	6.0	100% of Modified Proctor
Subgrade	Upper 12 inches of tested and approved existing soil or engineered fill	98% of Standard Proctor -2% to +2% optimum moisture content

1. Place in two 1.5 inch-thick lifts.
2. All materials should meet the current North Carolina Department of Transportation (NCDOT) mix design criteria found in Table 610-3 (updated 12-6-17) of the *Standard Specifications for Roads and Structures*.

As a minimum, we suggest the following typical pavement section be considered for combined car and delivery truck traffic.

Material[2]	Thickness (inches)	Preparation
Asphalt Surface Course (NCDOT S-9.5C)	3.0[1]	Per NCDOT Specifications
Aggregate Base (NCDOT ABC)	8.0	100% of Modified Proctor
Subgrade	Upper 12 inches of tested and approved existing soil or engineered fill	98% of Standard Proctor -2% to +2% optimum moisture content

1. Place in two 1.5 inch-thick lifts.
2. All materials should meet the current North Carolina Department of Transportation (NCDOT) mix design criteria found in Table 610-3 (updated 12-6-17) of the Standard Specifications for Roads and Structures.

The graded aggregate base should be compacted to a minimum of 98 percent of the material's modified Proctor (ASTM D-1557, Method C) maximum dry density. Where base course thickness exceeds 6 inches, the material should be placed and compacted in two or more lifts of equal thickness.

The listed pavement component thicknesses should be used as a guide for pavement systems at the site for the traffic classifications stated herein. These recommendations assume a 20-year pavement design life. If pavement frequencies or loads will be different than that specified Terracon should be contacted and allowed to review these pavement sections.

We recommend a Portland cement concrete (PCC) pavement be utilized in entrance and exit sections, dumpster pads, loading dock areas, or other areas where extensive wheel maneuvering are expected. The dumpster pad should be large enough to support the wheels of the truck which will bear the load of the dumpster. We recommend a minimum of 7 inches of PCC underlain by 4 inches of NCDOT ABC. Although not required for structural support, the base course layer is utilized to help reduce potentials for slab curl, shrinkage cracking, and subgrade "pumping" through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

A Portland cement concrete mix design with a minimum 28-day modulus of rupture of 550 psi should be used for concrete pavements (ASTM C 78-84, Third Point Loading Method). This is roughly equivalent to a 28-day compressive strength of 4,000 psi. In addition, Portland cement concrete paving should contain about 5 to 7 percent entrained air and should have a maximum water-cement ratio of about 0.45. Adequate reinforcement and number of longitudinal and transverse control joints should be placed in the rigid pavement in accordance with ACI requirements. The joints should be sealed as soon as possible (in accordance with sealant manufacturer's instructions) to minimize infiltration of water into the soil.

Construction Considerations

Construction scheduling often involves grading and paving by separate contractors and can involve a time lapse between the end of grading operations and the commencement of paving. Disturbance, desiccation or wetting of subgrade soils between grading and paving can result in deterioration of the previously completed subgrade. A non-uniform subgrade can result in poor pavement performance and local failures relatively soon after pavements are constructed. We recommend the moisture content and density of the subgrade be evaluated within two days prior to commencing paving operations. A proof roll using heavy equipment similar to that required for pavement construction is also recommended to verify subgrade stability for pavement construction. Scarification and recompaction may also be required.

Construction traffic on the pavements was not considered in developing the recommended minimum pavement thicknesses. Construction traffic can cause significant damage to pavements, especially to partially-completed pavement sections (e.g., base course lifts). If the pavements will be subject to traffic by construction equipment/vehicles, the pavement thicknesses should be revised to consider the effects of the additional loading.

Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. If significant precipitation occurs after the evaluation or if the surface becomes disturbed, the subgrade condition should be reviewed by Terracon personnel immediately prior to paving.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section.

If a granular aggregate base is pursued, we recommend drainage be included at the bottom of the aggregate layer at the storm structures to aid in removing water that may enter this layer. Drainage can consist of small diameter weep holes excavated around the perimeter of the storm structures. The weep holes should be excavated at the elevation of the aggregate and soil interface. The excavation should be covered with No. 57 stone which is encompassed in Mirafi 140 NL or approve equivalent which will aid in reducing fines from entering the storm system.

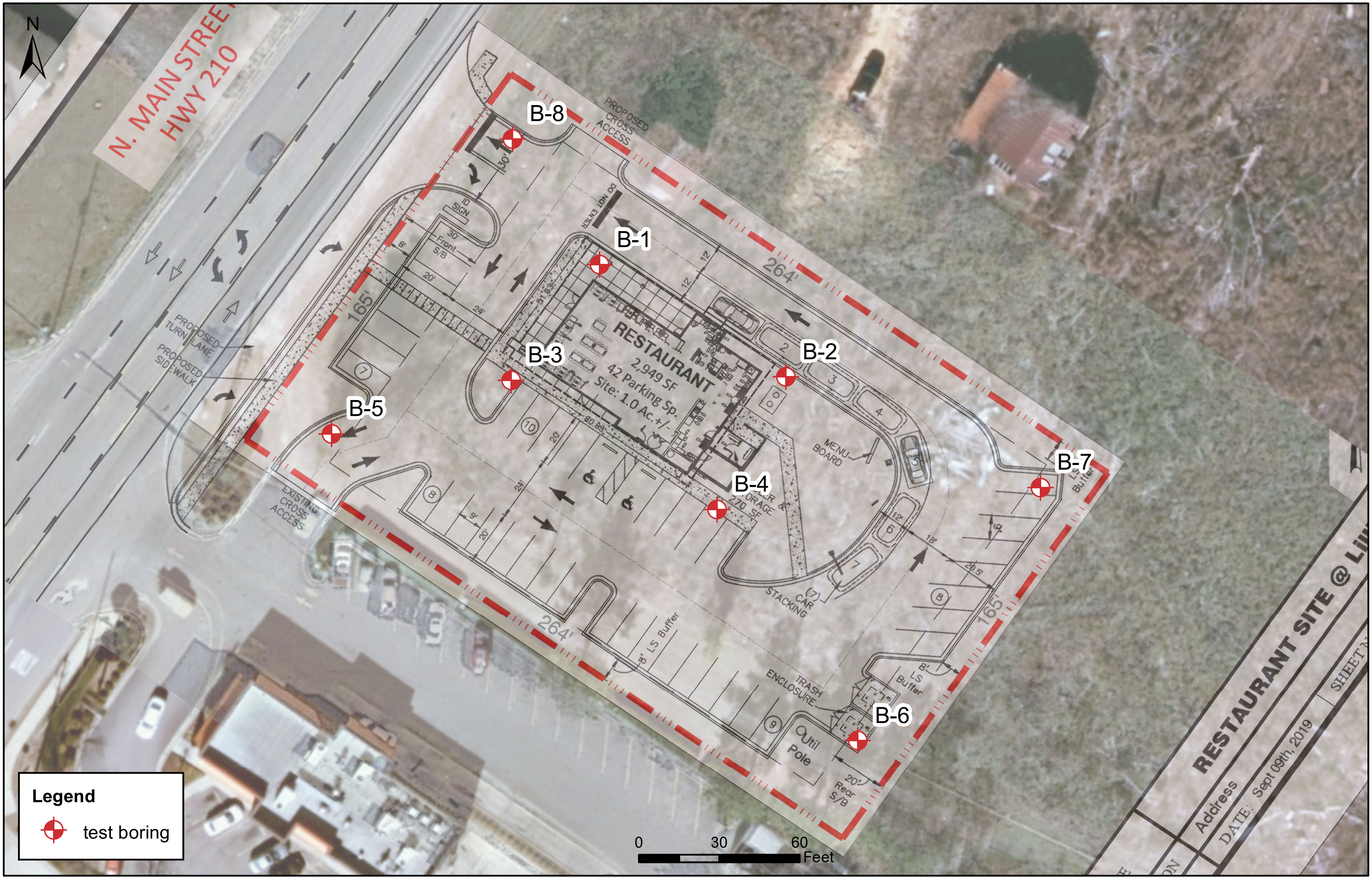
Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

ATTACHMENTS

SITE MAP AND EXPLORATION PLAN

PM: MW	Project No. 70195236	Terracon	**Site Map**
Drawn By: MW	Scale: 1 in = 2,000 ft		**Proposed Hwy 55 Restaurant** **North Main Street** **Lillington, North Carolina**
Checked By: AAN	File Path:	2401 Brentwood Road, Suite 107 — Raleigh, NC 27604	
Approved By:	Date: 9/26/2019	Phone: (919) 873-2211 — Fax: (919) 873-9555	



PM: MW	Project No. 70195236
Drawn By: MW	Scale: 1 in = 50 ft
Checked By: AAN	File Path:
Approved By:	Date: 9/26/2019

Terracon

2401 Brentwood Road, Suite 107 Raleigh, NC 27604
Phone: (919) 873-2211 Fax: (919) 873-9555

Exploration Plan

Proposed Hwy 55 Restaurant
North Main Street
Lillington, North Carolina

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: Hwy 55 Restaurant Lillington

CLIENT: CSC Properties, LLC
Clearwater, FL

SITE: Main Street
Lillington, NC

LOCATION See Exploration Plan

Latitude: 35.4193° Longitude: -78.8019°

DEPTH	Material Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.2	**TOPSOIL**, Topsoil - 2"							
2.5	**FILL - SILTY SAND (SM)**, brown, moist, medium dense, brick fragments			X	5-6-5 N=11			
5.5	**SILTY SAND (SM)**, fine grained, gray tan, moist, medium dense	5		X	5-7-10 N=17			
	CLAYEY SAND (SC), fine to coarse grained, rust brown , brown and gray, moist, loose to dense			X	6-14-24 N=38			
		10	cave in (9.5 ft)	X	6-8-9 N=17			
		15		X	7-8-8 N=16			
20.0		20		X	4-3-4 N=7			
	Boring Terminated at 20 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

cave in measured at 9.5 feet

Terracon
2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 10-11-2019	Boring Completed: 10-11-2019
Drill Rig: Acker Renegade	Driller: Duggins
Project No.: 70195236	

BORING LOG NO. B-2

PROJECT: Hwy 55 Restaurant Lillington

CLIENT: CSC Properties, LLC
Clearwater, FL

SITE: Main Street
Lillington, NC

LOCATION See Exploration Plan

Latitude: 35.4191° Longitude: -78.8017°

GRAPHIC LOG	DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.2	**TOPSOIL**, Topsoil - 2"							
	3.0	**SILTY SAND (SM)**, fine grained, gray tan, moist, medium dense			X	4-4-6 N=10			
					X	5-7-11 N=18			
		CLAYEY SAND (SC), fine to coarse grained, rust brown , brown and gray, moist, medium dense	5		X	5-6-7 N=13			
			10		X	5-8-8 N=16			
				cave in at 13 ft					
			15		X	5-8-11 N=19			
	20.0		20		X	4-5-8 N=13			
		Boring Terminated at 20 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

cave in measured at 13 feet

Terracon
2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 10-11-2019	Boring Completed: 10-11-2019
Drill Rig: Acker Renegade	Driller: Duggins
Project No.: 70195236	

BORING LOG NO. B-3

PROJECT: Hwy 55 Restaurant Lillington

CLIENT: CSC Properties, LLC
Clearwater, FL

SITE: Main Street
Lillington, NC

LOCATION See Exploration Plan

Latitude: 35.4191° Longitude: -78.802°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.2	**TOPSOIL**, Topsoil - 2"							
	SILTY SAND (SM), fine grained, gray brown, moist, medium dense	1-2.5		X	7-9-7 N=16			
3.0	**CLAYEY SAND (SC)**, fine to coarse grained, rust brown , brown and gray, moist, medium dense to dense, mottled	3.5-5		X	3-5-10 N=15			
		6-7.5		X	8-16-27 N=43			
		8.5-10	cave in at 9 ft	X	6-13-16 N=29			
		13.5-15		X	5-7-9 N=16			
17.0	**CLAYEY SAND (SC)**, fine to coarse grained, orange brown, very moist to wet, loose, mottled	18.5-20		X	3-2-2 N=4			
20.0	***Boring Terminated at 20 Feet***	20						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

cave in measured at 9 feet

Terracon
2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 10-11-2019	Boring Completed: 10-11-2019
Drill Rig: Acker Renegade	Driller: Duggins
Project No.: 70195236	

BORING LOG NO. B-4

PROJECT: Hwy 55 Restaurant Lillington

CLIENT: CSC Properties, LLC Clearwater, FL

SITE: Main Street Lillington, NC

LOCATION See Exploration Plan

Latitude: 35.419° Longitude: -78.8018°

DEPTH	Material Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.2	**TOPSOIL**, Topsoil - 2"							
3.0	**SILTY SAND (SM)**, fine grained, gray brown, moist, loose			X	3-2-2 N=4	4	NP	17
	CLAYEY SAND (SC), fine to coarse grained, rust brown , brown and gray, moist to very moist, loose to medium dense, mottled			X	2-3-4 N=7	15		
		5		X	7-8-11 N=19	18		
			cave in	X	6-7-9 N=16			
		10						
				X	8-7-11 N=18			
		15						
20.0				X	4-6-15 N=21			
	Boring Terminated at 20 Feet	20						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

cave in measured at 9 feet

Terracon

2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 10-11-2019	Boring Completed: 10-11-2019
Drill Rig: Acker Renegade	Driller: Duggins
Project No.: 70195236	

BORING LOG NO. B-5

PROJECT: Hwy 55 Restaurant Lillington

CLIENT: CSC Properties, LLC
Clearwater, FL

SITE: Main Street
Lillington, NC

LOCATION See Exploration Plan

Latitude: 35.4191° Longitude: -78.8023°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.7	**TOPSOIL**, Topsoil - 8"							
2.0	**SILTY SAND (SM)**, fine grained, gray brown, moist, loose			X	5-4-4 N=8	5		
10.0	**CLAYEY SAND (SC)**, fine to coarse grained, rust brown , brown and gray, moist, medium dense, mottled		cave in	X	5-5-6 N=11	7	24-12-12	27
		5		X	5-10-15 N=25	18		
		10		X	5-7-12 N=19			
	Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

cave in measured at 3.5 feet

Terracon
2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 10-11-2019	Boring Completed: 10-11-2019
Drill Rig: Acker Renegade	Driller: Duggins
Project No.: 70195236	

BORING LOG NO. B-6

PROJECT: Hwy 55 Restaurant Lillington

CLIENT: CSC Properties, LLC
Clearwater, FL

SITE: Main Street
Lillington, NC

LOCATION See Exploration Plan

Latitude: 35.4188° Longitude: -78.8016°

DEPTH	Material Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.2	**TOPSOIL**, Topsoil - 2"							
1.5	**SILTY SAND (SM)**, fine grained, gray brown, moist, very loose		cave in	X	2-1-1 N=2	6		
	CLAYEY SAND (SC), fine to coarse grained, rust brown , brown and gray, moist, loose to medium dense, mottled			X	1-1-2 N=3	10		
		5		X	7-10-14 N=24			
10.0		10		X	6-11-17 N=28	13	50-13-37	28

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

cave in measured at 2 feet

Terracon
2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 10-11-2019	Boring Completed: 10-11-2019
Drill Rig: Acker Renegade	Driller: Duggins
Project No.: 70195236	

BORING LOG NO. B-7

PROJECT: Hwy 55 Restaurant Lillington

CLIENT: CSC Properties, LLC
Clearwater, FL

SITE: Main Street
Lillington, NC

LOCATION See Exploration Plan

Latitude: 35.419° Longitude: -78.8014°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.7	**TOPSOIL**, Topsoil - 8"							
3.0	**SILTY SAND (SM)**, fine grained, gray brown, moist, loose			X	4-4-2 N=6			
10.0	**CLAYEY SAND (SC)**, fine to coarse grained, rust brown , brown and gray, moist, loose to medium dense, mottled	5	cave in	X	2-2-7 N=9			
				X	4-6-7 N=13			
		10		X	4-12-8 N=20			

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

cave in measured at 4.5 feet

Terracon
2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 10-11-2019	Boring Completed: 10-11-2019
Drill Rig: Acker Renegade	Driller: Duggins
Project No.: 70195236	

BORING LOG NO. B-8

PROJECT: Hwy 55 Restaurant Lillington

CLIENT: CSC Properties, LLC
Clearwater, FL

SITE: Main Street
Lillington, NC

LOCATION See Exploration Plan

Latitude: 35.4194° Longitude: -78.802°

GRAPHIC LOG	DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.7	**TOPSOIL**, Topsoil - 8"							
	3.0	**SILTY SAND (SM)**, fine grained, gray brown, moist, loose			X	3-2-2 N=4	5		
	10.0	**SILTY CLAYEY SAND (SC-SM)**, fine to coarse grained, rust brown , brown and gray, moist, medium dense, mottled	5	cave in	X	3-5-5 N=10	10	18-12-6	28
					X	7-12-11 N=23	19		
			10		X	8-10-10 N=20			
		Boring Terminated at 10 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
HSA

Abandonment Method:
Boring backfilled with soil cuttings after delayed water levels were measured.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

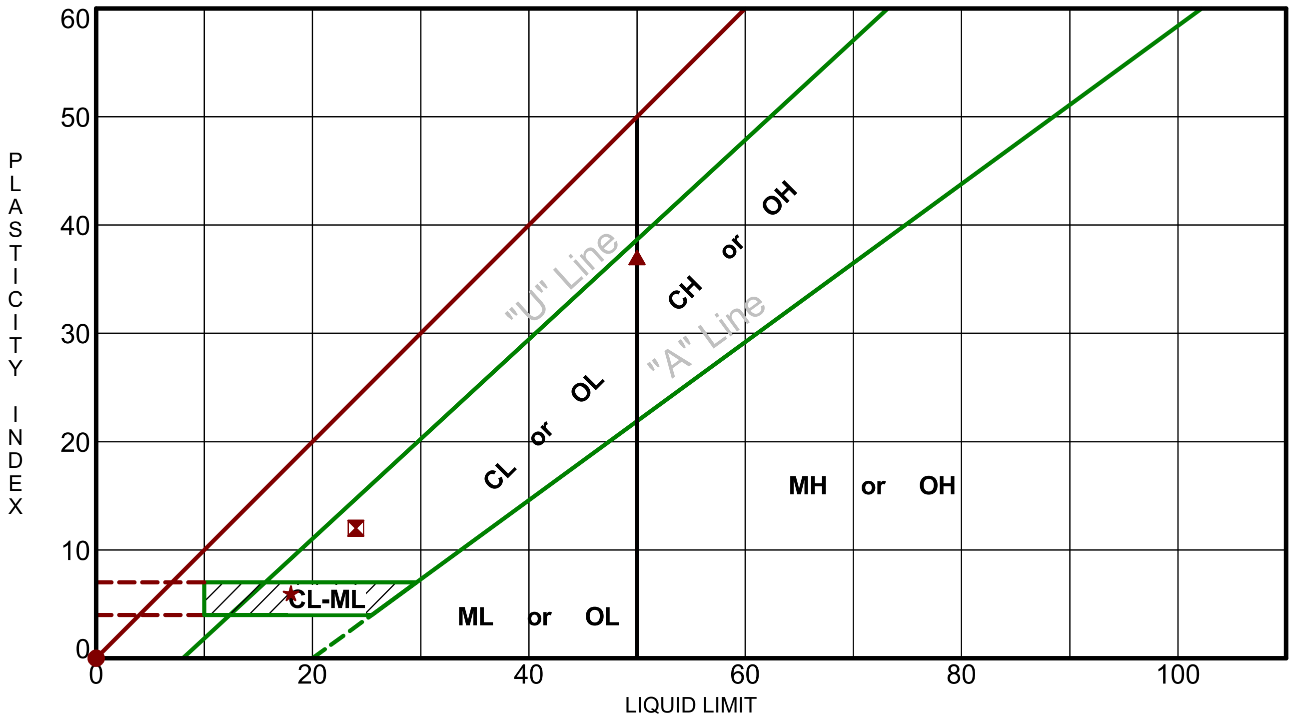
cave in measured at 5 feet

Terracon
2401 Brentwood Rd, Ste 107
Raleigh, NC

Boring Started: 10-11-2019	Boring Completed: 10-11-2019
Drill Rig: Acker Renegade	Driller: Duggins
Project No.: 70195236	

ATTERBERG LIMITS RESULTS

ASTM D4318



	Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
●	**B-4**	**1 - 2.5**	**NP**	**NP**	**NP**	**16.7**	**SM**	**SILTY SAND**
⊠	**B-5**	**3.5 - 5**	**24**	**12**	**12**	**27.4**	**SC**	**CLAYEY SAND**
▲	**B-6**	**8.5 - 10**	**50**	**13**	**37**	**28.1**	**SC**	**CLAYEY SAND**
★	**B-8**	**3.5 - 5**	**18**	**12**	**6**	**28.2**	**SC-SM**	**SILTY, CLAYEY SAND**

PROJECT: Hwy 55 Restaurant Lillington

SITE: Main Street
Lillington, NC

Terracon
2401 Brentwood Rd, Ste 107
Raleigh, NC

PROJECT NUMBER: 70195236

CLIENT: CSC Properties, LLC
Clearwater, FL

EXHIBIT: B-1

SUPPORTING INFORMATION

UNIFIED SOIL CLASSIFICATION SYSTEM

Proposed Hwy 55 Restaurant ■ Lillington, North Carolina

October 31, 2019 ■ Terracon Project No. 70195236

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification: Group Symbol	Soil Classification: Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ≥ 4 and 1 ≤ Cc ≤ 3 [E]	GW	Well-graded gravel [F]
			Cu < 4 and/or 1 > Cc > 3 [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [E]	SW	Well-graded sand [I]
			Cu < 6 and/or 1 > Cc > 3 [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

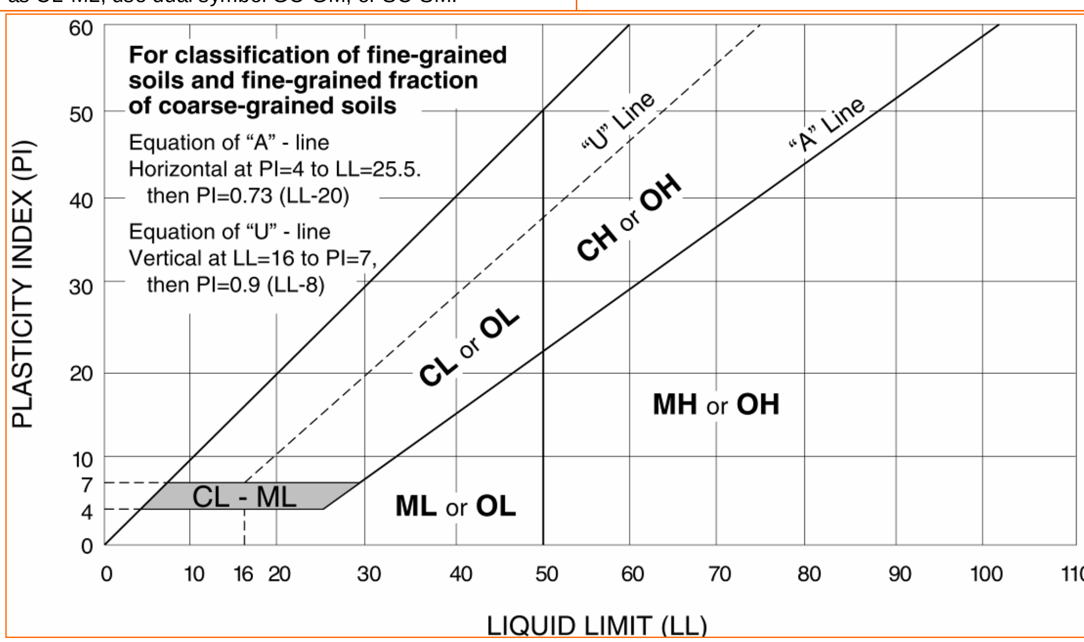
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING	WATER LEVEL		FIELD TESTS	
Split Spoon	▽	Water Initially Encountered	N	Standard Penetration Test Resistance (Blows/Ft.)
	▽	Water Level After a Specified Period of Time	(HP)	Hand Penetrometer
	▽	Water Level After a Specified Period of Time	(T)	Torvane
		Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	(DCP)	Dynamic Cone Penetrometer
			(PID)	Photo-Ionization Detector
			(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Terracon