

May 24, 2017



Northwest Shoals Community College  
800 George Wallace Boulevard  
Muscle Shoals, Alabama 35661

Attn: Dr. Humphrey Lee

Re: Report of Expected Geotechnical Conditions  
NWSCC Paradise Drive Property  
Florence, Lauderdale County, Alabama  
Terracon Project No. E1175113

Dear Dr. Lee:

We are pleased to present this Report of Expected Geotechnical Conditions for the project referenced above. This report includes:

Exhibit A	Project Understanding
Exhibit B	Scope of Services and Limitations
Exhibit C	Information Sources
Exhibit D	Confidence Estimate
Exhibit E	Expected Subsurface Conditions
Exhibit F	Expected Foundation Design Parameters
Exhibit G	Expected Construction Considerations
Exhibit H	Recommended Geotechnical Exploration Program

This report references a web-based, GIS portal that has been developed specifically for this project using Terracon's proprietary GIS platform, providing you with dynamic access to the information compiled for this project. Access to this information can be gained by using this link: <https://tinyurl.com/jvh9ok7>

Exhibit B provides important details about the preliminary nature of these opinions. If you have any questions, or if we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

Frank Whitman, P.E.  
Senior Engineer  
Alabama P.E. 23152

Jerome A. Smith, P.E.  
Manager, Geotechnical Services  
Alabama P.E. 20478

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## EXHIBIT A PROJECT INFORMATION

Northwest Shoals Community College (NWSCC) is evaluating the feasibility of future development of 166 acres of mostly undeveloped, wooded land in the area of Paradise Drive, south of Florence Boulevard.

Our understanding of the project was developed based upon information provided by NWSCC. The purpose of this project is to assess the surface and subsurface soil and rock conditions based on publicly-available information regarding soils, geologic settings, topography, depth to groundwater and other site-specific data in conjunction with a review of Terracon's historic geotechnical data in the area for use in rendering an opinion of the expected subsurface conditions anticipated for the site.

Item	Description
<b>Project Description</b>	The approximately 166 acre site would be used for future development of a new educational campus
<b>Project Location</b>	The approximate centroid of the site is located at: Latitude: 34.836458°, Longitude: -87.591091° Refer to the site map presented as Figure 1 below. This map was generated from property boundaries provided by NWSCC.
<b>Planned Construction</b>	Undetermined at this stage, though multi-story buildings are possible
<b>Expected Foundations</b>	Conventional, shallow, soil-supported spread footings

**Figure 1:**



## **EXHIBIT B**

### **SCOPE OF SERVICES AND LIMITATIONS**

#### **Scope of Services**

This Report of Expected Geotechnical Conditions (REGC) provides an expectation of subsurface properties from a geotechnical engineering perspective. It is intended to assist in considering preliminary concepts for site development and foundation options for the project described in **Exhibit A**. It is also intended to provide a basis for a subsequent exploration program to confirm the expected conditions as necessary to develop plans for site preparation and foundation construction.

This REGC utilizes the following information:

- Relevant, publically-available, spatial data for use with GIS delivery platforms,
- Terracon's database of historic documents from geotechnical investigations conducted in the vicinity of the project site using our proprietary GIS-based information retrieval system

This information is displayed on a proprietary, web-based map sequence developed for this project. The information can be accessed through this web page: <https://tinyurl.com/jvh9ok7>

A geotechnical engineer with local experience in the area of the planned project has formed an opinion of expected geotechnical conditions by reviewing the information as provided on the web page and our historic data in the vicinity of the project. The opinion rendered by the geotechnical engineer also includes an estimate of the confidence in that opinion. Finally, based upon the planned project, the information available and the confidence in the estimation of expected geotechnical conditions, the engineer has developed a general plan for exploration that will be necessary to confirm the expectations and to finalize the REGC.

#### **Limitations**

The data and opinions provided are estimates of geotechnical parameters. They are preliminary in nature and not for design purposes. Any opinions regarding the subsurface conditions for this project may not represent actual conditions encountered during project exploration or construction. In no case should the information or opinions provided in the REGC be utilized for final design.

Confirmation of opinions stated in this document is essential. Confirmation should include the conduct of a site-specific geotechnical investigation consisting of exploratory soil borings and/or related exploration methods consistent with the guidelines set forth in **Exhibit H**. Terracon should develop a specific scope of work that would be necessary to confirm these preliminary findings to

the extent necessary to provide adequate geotechnical site characterization for the planned construction.

The scope of services for this project addresses a preliminary, unverified opinion of geotechnical conditions only. The scope does not include either specifically or by implication any environmental assessment of the site or identification or prevention of pollutants, hazardous materials or conditions.

This report has been prepared for the exclusive use of Northwest Shoals Community College (NWSCC) to represent a preliminary opinion of geotechnical conditions for specific application to the project described in **Exhibit A** and in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made.

Furthermore, given the limitations described above based on the preliminary nature of this report, all parties are advised that any decisions or actions taken by any party based on the information contained herein, including decisions with financial implications are done solely at the risk of that party. By providing this information in this preliminary form, Terracon expressly disclaims any duties or obligations associated with the usage of this information for decision-making purposes.

In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the preliminary conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing. In the event the project moves into the design phase, Terracon should be retained to develop and complete a scope of work that includes site specific explorations to confirm or to modify this preliminary opinion of geotechnical conditions.

Terracon and NWSCC recognize that we have entered into an agreement that may contain certain confidential or non-disclosure obligations relating to our services. NWSCC recognizes however that while Terracon will not violate any such terms or obligations, none of these obligations create an exclusivity obligation to Terracon relating to the service or data in question and that Terracon has the unfettered ability to provide similar services to any other party and use any public or previously available data or information for the service of others even if included as part of this report.

## EXHIBIT C INFORMATION SOURCES

### Public Data Sources Reviewed

The web-map series that can be reviewed at <https://tinyurl.com/jvh9ok7> includes the following sources of public information.

Category	Source
Topographic Overview	USGS National Map web mapping service provided by ESRI
Aerial Imagery Overview	USDA FSA imagery provider, data source NAIP
USGS Geology	USGS Preliminary Integrated Geologic Map Database for the U.S.
Karst Geology	US Karst Areas web mapping service provided by ESRI
Slope of Terrain	USGS National Elevation Dataset provided by ESRI
Soil Parent Materials	NRCS Soil Survey Geographic (SSURGO) Databases for the U.S.
Depth to Shallow Bedrock	NRCS Soil Survey Geographic (SSURGO) Databases for the U.S.
Depth to Shallow Water Table	NRCS Soil Survey Geographic (SSURGO) Databases for the U.S.
Soil Hydrologic Groups	USGS Preliminary Integrated Geologic Map Database for the U.S.
Flooding Frequency	NRCS Soil Survey Geographic (SSURGO) Databases for the U.S.
National Wetlands Inventory	U.S. Fish and Wildlife Service National Wetlands Inventory

### Terracon Historic Records in Project Vicinity

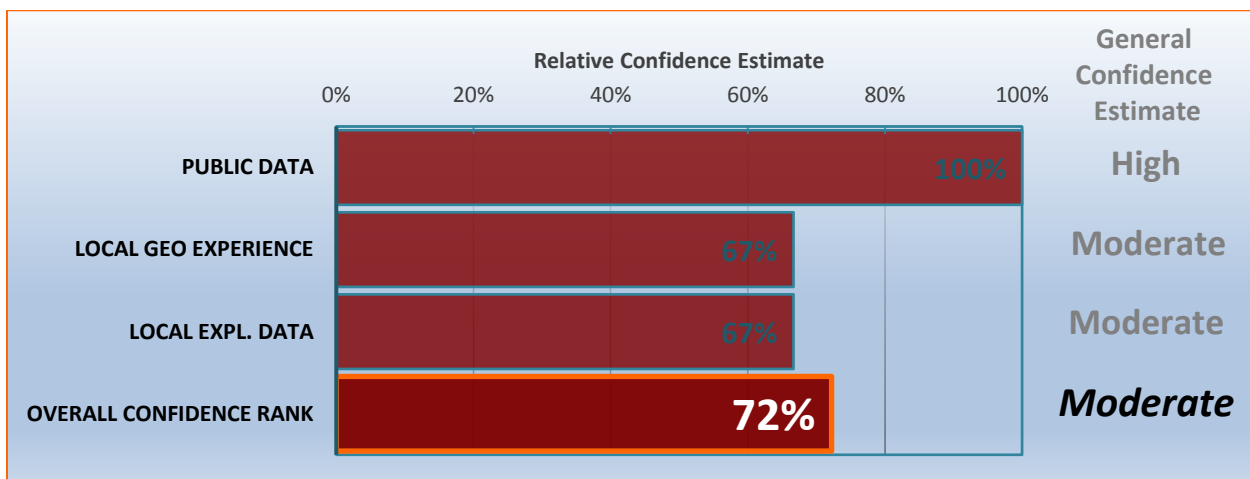
Our research of Terracon's proprietary database of historic soil, groundwater and rock conditions in the vicinity of the site indicated several projects located about 2 to 3 miles to the west of the project site, including one specific project performed within comparable topography, geology, and NRCS-mapped soils. The project locations are illustrated on the web-based map sequence.

## EXHIBIT D CONFIDENCE ESTIMATE

The project geotechnical engineer has assigned confidence estimates for the data sets based upon the engineer's local practice in the vicinity of the sites. The results of this confidence ranking are presented in the chart below and is expressed as **Low**, **Moderate** or **High**. Using a weighted averaging approach we derive an overall confidence interval for all of the combined information sources.

Low confidence implies that the level of data availability and/or consistency is such that little confidence can be placed in the Expected Geotechnical Conditions. Conversely, a high confidence ranking implies that sufficient data and consistency exists to derive a high confidence in the statement of expected conditions.

Regardless of the confidence ranking, the expected conditions must be confirmed with site-specific exploration data, and significant variations from the expected conditions are possible. (See **Exhibit B** for more details regarding the limitations of this report). The confidence ranking process is valuable in guiding the plan for exploration of the site to confirm the geotechnical conditions as necessary for design.



As the chart above illustrates, using our weighted average confidence estimator we have assigned a confidence estimate of **“Moderate”** for this project.

Using the publically available data, Terracon’s proprietary database of soils information from projects near the proposed project, and our knowledge of general soil and bedrock conditions within the various geologic settings, we developed anticipated soil stratigraphy to a depth of 15 feet for the listed geologic settings at the project area.

## EXHIBIT E EXPECTED SUBSURFACE CONDITIONS

The information reviewed suggest that the soils at the higher elevations are residuum weathered from limestone or cherty limestone, and that soils on slopes or at the lower elevations are a combination of colluvium and residuum originating from cherty limestone.

Soil conditions at the higher elevations of the site are expected to consist of the following general profile.

Depth (Feet BGS)	Layer Number	Layer Description (Consistency)	Comments <sup>1</sup>
0 to 2	I	Topsoil / Organics	
2 to 6	II	Lean Clay (CL)	Containing variable amounts of sand and chert gravel, likely medium-stiff to stiff in consistency
6 to 15	III	Fat Clay (CH)	Containing variable amounts of sand and chert gravel, likely stiff to very-stiff in consistency

1. The conditions described have been assigned a confidence level of moderate. See **Exhibit D** for details related to our estimate of confidence.

Soil conditions on slopes and at the lower elevations of the site are expected to consist of the following general profile.

Depth (Feet BGS)	Layer Number	Layer Description (Consistency)	Comments <sup>1</sup>
0 to 3	I	Topsoil / Surficial Silts	
3 to 15	II	Sands and Gravels (SC, SP, GC)	Relative density likely to be highly variable, ranging from loose to very dense

1. The conditions described have been assigned a confidence level of moderate. See **Exhibit D** for details related to our estimate of confidence.

## EXHIBIT F

### EXPECTED FOUNDATION DESIGN CONSIDERATIONS

Using the expected geotechnical conditions as noted above, and our understanding of the project as described in **Exhibit A**, we have developed a series of expected design parameters for foundations associated with the project.

We have assumed construction would take place on the higher elevations of the property, and that buildings would be supported by conventional spread footings bearing on clay soil.

DESCRIPTION	Columns	Walls
Net allowable bearing pressure <sup>1</sup>	2,500 psf	2,500 psf
Minimum dimensions	24 inches	18 inches
Minimum embedment below finished grade	18 inches	18 inches
Ultimate passive pressure equivalent fluid pressure <sup>2</sup>	300 pcf	
Ultimate coefficient of sliding friction	0.30	

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.
2. The sides of the excavation for the 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.



## **EXHIBIT G**

### **EXPECTED CONSTRUCTION CONSIDERATIONS**

Complete stripping of topsoil would be required in all building and pavement areas. Depths of topsoil and otherwise unsuitable silty or organic soils will vary across the site, but could be significant

We have assumed construction would take place on the higher elevations of the property, where residual lean clays overlying residual fat clays are anticipated.

The Lean Clays (CL) are expected to be generally adequate for the support of foundations, slabs and pavements, and may be used as engineered fill during site grading.

Fat Clays (CH) typically exhibit excessive shrink/swell behavior, defined as relatively large changes in volume in response to relatively small changes in moisture content. These changes in volume can cause settlement or uplift that damages structures and pavements.

However, many of the local fat clays contain significant sand and/or gravel content such that shrink/swell behavior is reduced, and these fat clays are in common use as fill and at finish subgrade elevations in the Florence area.

Fat clays without adequate sand/gravel content may not be used as engineered fill within the upper 3 feet of finish subgrade in building areas. Where such fat clays are encountered in-situ within building areas, they must be undercut to at least 3 feet below finish subgrade and replaced with lower-plasticity (lean clay) engineered fill. Similarly, such fat clays may not be used as engineered fill within the upper 1.5 feet of finish subgrade in pavement areas, and must be undercut to at least 1.5 feet below finish subgrade when encountered in-situ.

The exposed clays may be soft-to-medium-stiff at some locations. Within cut areas, these soils are expected to be generally adequate for reuse as engineered fill with moisture-conditioning (typically drying) prior to compaction.

Where soft-to-medium-stiff clays are present within fill areas or near finish subgrade elevation, they will require undercut or stabilization. The extent of undercut or stabilization will depend upon weather and moisture conditions at the time of the earthwork. The on-site soils will be less stable during wet seasons and more stable during dry seasons.

The local geologic formations are susceptible to sinkhole activity, and sinkholes have historically occurred within the general area. The owner must accept that there is some degree of risk in developing over limestone geology. If sinkholes are uncovered during earthwork or construction, the repair method will depend upon the size and depth of the sinkhole, and the location in relation to structures and pavements.

## **EXHIBIT H**

### **RECOMMENDED GEOTECHNICAL EXPLORATION PROGRAM**

The data and opinions of this report are preliminary in nature and not for design purposes. Prior to design and construction, Terracon should develop a specific scope of work to confirm these preliminary findings to the extent necessary to provide adequate geotechnical site characterization for the development of the site.

The geotechnical program would likely consist of conventional Standard Penetration Test (SPT) drilling and sampling. The appropriate locations and depths of the SPT borings can be recommended after the design team has developed preliminary site plans and grading plans for the project.