VA CLC Neighborhood

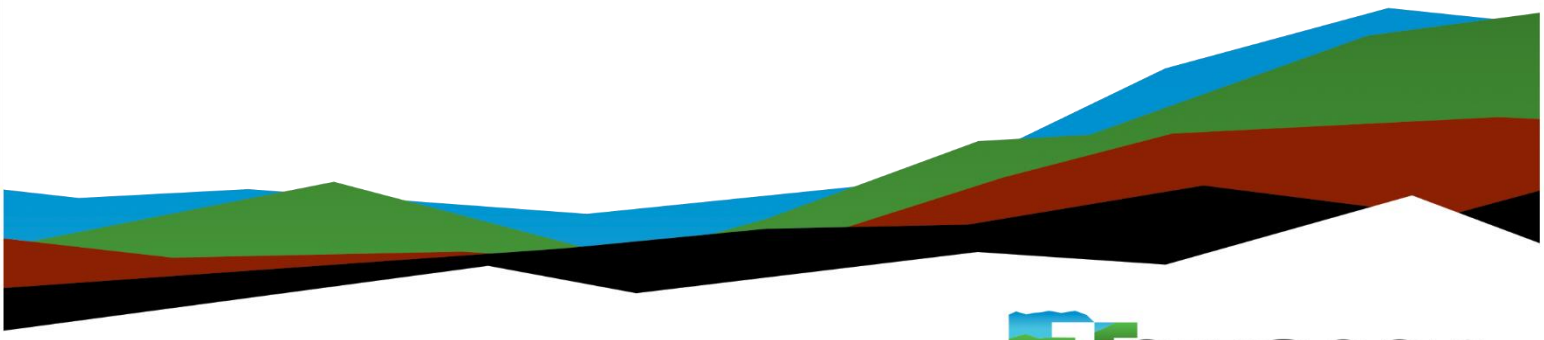
Geotechnical Engineering Report

Jackson, Mississippi

July 24, 2024 | Terracon Project No. EB245012

Prepared for:

Apogee Consulting Group
1151 Kildaire Farm Road
Cary, North Carolina 27511



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July 24, 2024

Apogee Consulting Group
1151 Kildaire Farm Road
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Attn: Mr. Jim Matchett
P: 919-535-3791
E: jamtchett@acg-pa.com

Re: Geotechnical Engineering Report
VA CLC Neighborhood
1500 E. Woodrow Wilson Avenue
Jackson, Mississippi
Terracon Project No. EB245012

Dear Mr. Jim Matchett:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PEB245012 dated February 6, 2024. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs 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

David Shin, E.I.
Staff Engineer

Ryan P. Steiner
Ryan P. Steiner, P.E.
Office Manager

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Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**.

Refer to each individual Attachment for a listing of contents.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed Community Living Center (CLC) addition to be located at 1500 E. Woodrow Wilson Avenue in Jackson, Mississippi. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per IBC
- Site preparation and earthwork
- Demolition considerations
- Foundation design and construction
- Floor slab design and construction

The geotechnical engineering Scope of Services for this project included the advancement of soil borings, laboratory testing, engineering analysis, and preparation of this report.

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

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	An email request for proposal was provided by Mr. Jim Matchett with Apogee Consulting Group on January 26, 2024. The request included a Google Earth image of the proposed location of the community living center (CLC).
Project Description	Veterans Affairs (VA) is planning the construction of an approximate 12,000 to 15,000 sq. ft. CLC addition at the G.V. Montgomery VA Medical Center.

Item	Description
Finished Floor Elevation	The finished floor is planned at approximately Elev. 345.86 feet.
Maximum Loads	Anticipated structural loads were not provided. In the absence of information provided by the design team, we will use the following loads in estimating settlement based on our experience with similar projects. ▪ Columns: 250 kips ▪ Walls: 3 kips per linear foot (klf) ▪ Slabs: 100 pounds per square foot (psf)
Grading/Slopes	Based on our understanding of the preliminary grading plans, fill depths ranging from 1 to 5 feet are anticipated to bring the site to final grade.
Building Code	2018 IBC

Terracon should be notified if any of the above information is inconsistent with the planned construction, especially the grading limits, as modifications to our recommendations may be necessary.

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
Site Information	The project is located at 1500 E. Woodrow Wilson Avenue in Jackson, Mississippi. 32.3277° N, 90.1658° W (approximate) See **Site Location**
Existing Improvements	The site is fenced with an existing patio structure, paved walkways, and benches. There is an adjacent CLC building to the west.
Current Ground Cover	The area surrounding the central paved patio structure is grassy with spread shrubbery and trees.
Existing Topography	Based on the provided topographic survey, the site is sloping downwards away from the building with elevations ranging between 345 and 336 feet.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** and the GeoModel can be found in the **Figures** attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Fill Soils**	Undocumented Fill Soils – Fat Clays & Lean Clays
2	**Lean Clay**	Lean Clays (CL) – medium stiff to stiff
3	**Transitional Fat Clay**	Fat Clays (CH) – medium stiff to stiff
4	**Weathered Yazoo**	Fat Clays (CH) – stiff to very stiff
5	**Unweathered Yazoo**	Fat Clays (CH) – hard

Groundwater was not observed in the borings while augering or for the short duration that the borings were allowed to remain open. Below a depth of 20 feet, the bore holes were advanced using rotary-wash drilling techniques and prevented an accurate determination of groundwater conditions below that depth. However, this does not necessarily mean these borings terminated above groundwater.

Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for the groundwater level to develop and stabilize in a borehole in these materials. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define the field or in-situ groundwater level in materials of this type.

Groundwater conditions may be different at the time of construction. Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Seismic Site Class

Terracon performed a seismic survey at the site of the proposed CLC addition to obtain shear wave velocity values of the soil within the upper 100 feet. The goal of this survey was to refine the seismic site classification in general accordance with procedures outlined in ASCE 7-16 and IBC 2018.

Terracon completed a limited geophysical survey consisting of two (2) Multi-Channel Analysis of Surface Waves (MASW) arrays on the site. The lines were performed intersecting each other within the footprint of the proposed building. For discussions on the methodology of the geophysical survey see **Exploration and Testing Procedures**. Our approximate line locations are presented below.

Figure 1 – MASW line locations (orange) with nearby geotechnical boring locations. Label locations indicate the start or "0-foot" mark of the arrays.

In addition, the 1D shear-wave velocity profile generated from the MASW testing are displayed in **Exploration and Laboratory Results**. Average shear wave velocities in the upper 100 feet were utilized to assign an average shear wave velocity value of about 840 ft/second, which corresponds to a Seismic Site Classification D as defined by IBC 2018 and Chapter 20 of ASCE 7-16.

Geotechnical Overview

Based on the results of the geotechnical investigation, the following **Geotechnical Hazards** were identified and will require mitigation for this project:

- Existing uncontrolled fill
- Swell potential

Mitigation efforts for the identified geotechnical hazards are provided in the **Earthwork** section. The soils which form the bearing stratum for shallow foundations are plastic and exhibit potential for shrink-swell movements with changes in moisture. The **Shallow Foundations** section addresses support of the building bearing on engineered fill. The **Deep Foundations** section addresses support of the structure on drilled and belled shafts with a ground supported floor or a structural suspended floor slab. The **Floor Slabs** section addresses slab-on-grade support of the building.

Additionally, the subgrade soils could become unstable with typical earthwork and repeated construction traffic, especially after precipitation events. Effective drainage should be completed and maintained during construction to avoid potential subgrade issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

Expansive soils are present on this site. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and (at least minor) cracking in the structure should be anticipated. The severity of cracking and other damage such as uneven floor slabs will probably increase if modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. Some of these options are discussed in this report such as complete replacement of expansive soils or a structural slab.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

Earthwork

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

Demolition

The proposed building will be constructed within the footprint of an existing patio which will need to be demolished, as well as exterior sidewalks and utilities. We recommend existing foundations, slabs, and utilities be removed from within the proposed building footprint and at least 10 feet beyond the outer edge of foundations.

Geotechnical Hazards

As discussed in the **Geotechnical Overview**, the following sections provide mitigation recommendations for the identified Geotechnical Hazards.

Existing Fill

As noted in **Geotechnical Characterization**, the borings encountered previously placed fill to depths ranging from about 6 to 8 feet below existing grade (ranging from about Elev. 332 to Elev. 339). Currently, we have no records to indicate the degree of control that these materials were placed. Consequently, the fill is considered unreliable for support of shallow foundation or engineered fill placement. Support of foundations and floor slabs on or above existing fill soils is discussed in this report. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill.

Therefore, should the building be supported on a shallow foundation system, we would recommend that the existing fills be removed in their entirety and replaced with new engineered fill as specified in **Fill Material Types** and placed in accordance with **Fill Placement and Compaction Requirements**.

Should the building be supported on a deep foundation system, the existing fill soils may remain in place provided the owner understands of the potential risks of unforeseen conditions within the fill during the installation of the deep foundation system. Additionally, we would recommend a minimum of a 3-foot crawl space be developed beneath the grade beams and the finished subgrade elevation when the building is supported on a deep foundation system.

Swell Potential

As noted in **Geotechnical Overview**, fat clay fill soils were encountered as shallow as directly beneath the ground surface and extended to varying depths of about 6 to 8 feet below existing grade. Additionally, deeper natural (native) fat clay (CH) soils were typically encountered at a depth of about 13 feet below existing grade. The fat clay (CH) soils exhibit a moderate to high potential for shrink/swell related movement with variation in the moisture content of the soils.

If the building addition is founded on a shallow foundation system, the shallow fat clay (CH) soils will require mitigation. In order to limit the post-construction movement to about 1 inch or less for structures, a minimum eight (8) foot "buffer" of low volume change engineered fill should be present between the bottom of floor slabs and the top of the fat clay (CH). This "buffer" should extend a minimum of ten (10) feet beyond the footprint of the building.

Provided that the fill soils are mitigated as noted in the **Existing Fill** section above, then the fat clay (CH) soils within the upper 8 feet of the borings will be mitigated during that effort. Further recommendations regarding ground-supported floor slabs can be found in **Floor Slabs**.

If the building addition is supported on a deep foundation system, the fat clay (CH) soils can remain in place, but we would recommend a minimum of a 3-foot crawl space be developed beneath the grade beams and the finished subgrade elevation. Further recommendations can be found in **Deep Foundations.**

Final grades will greatly affect the buffer thickness. This office should be notified upon completion of site grading plans to confirm the mitigation recommendations contained herein were implemented at completion of grading.

Subgrade Preparation

All existing above and below grade improvements within the proposed development area, including footings, slabs, sidewalks, any vegetation and topsoil, or other loose, soft or otherwise unsuitable material should be removed from the entire construction area.

Prior to placing fill, existing vegetation, topsoil, and root mats should be removed. Complete stripping of the topsoil should be performed in the proposed building areas. Stripped materials consisting of vegetation and organic materials should be wasted off site or used to vegetate landscaped areas or exposed slopes after completion of grading operations. Stripping depths between our boring locations and across the site could vary considerably as such we recommend actual stripping depths be evaluated by a representative of Terracon during construction to aid in preventing removal of excess material. The demolition phase may also encounter buried foundations, old fills, or other past site improvements. Former utility lines and utility backfill should be removed from

beneath the building, and the resulting excavations should be properly backfilled as outlined herein. These conditions should be evaluated at the time of construction by the geotechnical engineer.

Mature trees are located within or near the footprint of the proposed buildings, which will require removal at the onset of construction. Tree root systems can remove substantial moisture from surrounding soils. Where trees are removed, the full root ball and all associated dry and desiccated soils should be removed. The soil materials which contain less than 5 percent organics can be reused as engineered fill provided the material is moisture conditioned and properly compacted.

No root balls from the trees should be left in the ground after the site clearing process. The root ball should be excavated such that the roots remaining in the ground are smaller that ½-inch in diameter. The voids left behind by the removal of the root balls should be replaced with engineered fill as outlined in this report.

Where fill is placed on existing slopes steeper than 5H:1V, benches should be cut into the existing slopes prior to fill placement. The benches should have a minimum vertical face height of 1 foot and a maximum vertical face height of 3 feet and should be cut wide enough to accommodate the compaction equipment. This benching will help provide a positive bond between the fill and natural soils and reduce the possibility of failure along the fill/natural soil interface.

The subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck. The proofrolling should be performed under the observation of the Geotechnical Engineer or representative. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Mitigation might include processing to remove excess moisture, overexcavation and backfilling, chemical stabilization, or modification with geotextile reinforcement. Should mitigation of wet and pumping soils be required, our office should be notified so that appropriate mitigation can be prescribed by the project geotechnical engineer.

Fill Material Types

Reuse of On-Site Soil: Excavated on-site soil may be reused as fill. Material property requirements for on-site soil for use as Engineered Fill are noted in the table below:

Property	Engineered Fill
Composition	Free of deleterious material
Fines content	Greater than 60% Passing No. 200 sieve
Plasticity	10 ≤ Plasticity Index (PI) ≤ 25 Liquid Limit (LL) ≤ 45

Property	Engineered Fill
GeoModel Layer Expected to be Suitable [1]	2

1. Based on subsurface exploration. Actual material suitability should be determined in the field at time of construction.
2. High silt content soils are extremely sensitive to variations in moisture content and can lose strength rapidly with increases in moisture. It should be noted that the moisture content of the silt must be closely controlled in order to achieve the desired degree of compaction. The contractor should expect difficulties with controlling the soil's moisture content to near optimal levels in order to achieve adequate density of the compacted soil. Cement modification may be necessary for highly silty soils to maintain stability.

Imported Fill Materials: Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade.

Soil Type [1]	USCS Classification	Acceptable Parameters
Low Plasticity Cohesive "Buffer"	CL	10 ≤ Plasticity Index (PI) ≤ 25 Liquid Limit (LL) ≤ 45 ≥ 60% passing the #200 sieve

1. Engineered fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.

Fill Placement and Compaction Requirements

Engineered Fill should meet the following compaction requirements.

Item	Engineered Fill
Maximum Lift Thickness	9 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e., jumping jack or plate compactor) is used
Minimum Compaction Requirements [1]	98% of maximum dry density with stability present
Water Content Range [1]	Within -2% to +2% of optimum

Item	Engineered Fill

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).

Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with Engineered Fill or bedding material in accordance with public works specifications for the utility be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility. Trench excavation should not be conducted below a downward 1:1 projection from existing foundations without engineering review of shoring requirements and geotechnical observation during construction.

On-site materials are considered suitable for backfill of utility and pipe trenches from 1 foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

For low permeability subgrades, utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the building 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 Engineered Fill stated previously in this report.

In order to help limit the potential for shrink/swell related movement in the expansive fat clay, we recommend limiting the potential avenues for water infiltration into the subgrade by limiting the use of granular backfill to the extent practical. Utility trench backfill should consist of engineered fill as described in **Fill Placement and Compaction Requirements**.

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% 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 have been completed, 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

The near-surface soils are sensitive to increases in moisture content and have a tendency to lose strength and stability as the moisture content increases or as a result of construction traffic. We suggest earthwork construction take place during generally dryer months of the year. Wet season earthwork has an increased risk that may require additional mitigation measures beyond that which would be expected during the drier summer and fall months.

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 grade-supported improvements such as 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.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/ precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation and topsoil), evaluation and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 5,000 square feet of compacted fill in the building areas. Where not specified by local ordinance, one density and water content test should be performed for every 150 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unanticipated conditions are observed, 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

Item	Description
Maximum Net Allowable Bearing Pressure [1, 2]	2,500 psf
Required Bearing Stratum [3]	Engineered Fill
Minimum Foundation Dimensions	Per IBC 1809.7
Ultimate Passive Resistance [4] **(equivalent fluid pressures)**	250 pcf
Sliding Resistance [5]	130 psf allowable cohesion
Minimum Embedment below Finished Grade [6]	18 inches
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch
Estimated Differential Settlement [2, 7]	About ½ of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2. Values provided are for maximum loads noted in **Project Description**. Additional geotechnical consultation will be necessary if higher loads are anticipated.
3. Unsuitable or soft soils should be overexcavated and replaced per the recommendations presented in **Earthwork**.
4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted Engineered Fill be placed against the vertical footing face. Assumes no hydrostatic pressure.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Frictional resistance for granular materials is dependent on the bearing pressure which may vary due to load combinations. For fine-grained materials, lateral resistance using cohesion should not exceed ½ the dead load.
6. Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
7. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 50 feet.

Trees or other vegetation whose root systems can remove excessive moisture from the subgrade and foundation soils should not be planted next to critical structures. Trees and shrubbery should be kept away from the exterior edges of the foundation element a distance at least equal to 1.5 times their expected mature height.

Construction Adjacent to Existing Building

Differential settlement between the addition and the existing building is expected to approach the magnitude of the total settlement of the addition. Expansion joints should be provided between the existing building and the proposed addition to accommodate differential movements between the two structures. Underground piping between the two structures should be designed with flexible couplings and utility knockouts in foundation walls should be oversized so minor deflections in alignment do not result in breakage or distress. Care should be taken during excavation adjacent to existing foundations to avoid disturbing existing foundation bearing soils.

New footings should bear at or near the bearing elevation of immediately adjacent existing foundations. Depending upon their locations and current loads on the existing footings, footings for the new addition could cause settlement of adjacent walls. To reduce this concern and risk, clear distances at least equal to the new footing widths should be maintained between the addition's footings and footings supporting the existing building.

Any excavations adjacent to existing foundations should extend vertically to the bottom of the existing grade beam/footing. Below that depth, the excavation should be sloped no steeper than two vertical to one horizontal (2V:1H). Excavation and backfill along existing foundations should be performed in sections that allow for excavation and backfill full depth of the section to the bottom of the adjacent foundation within a working day. We recommend excavation sections adjacent to existing foundations not extend greater than 50 linear feet along the existing structure. Excavations adjacent to existing foundations should not be allowed to remain open overnight.

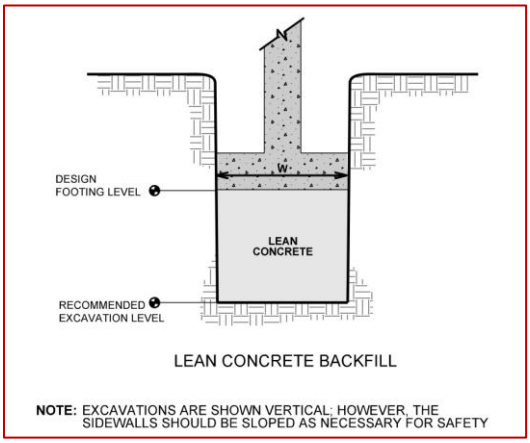
We understand existing foundations may support additional load from the walls of the new additions. Additional loads on the existing foundations could cause other building settlements to occur. The structural capacity of existing foundations should be evaluated by a licensed structural engineer, where increases in loading are planned.

Foundation Construction Considerations

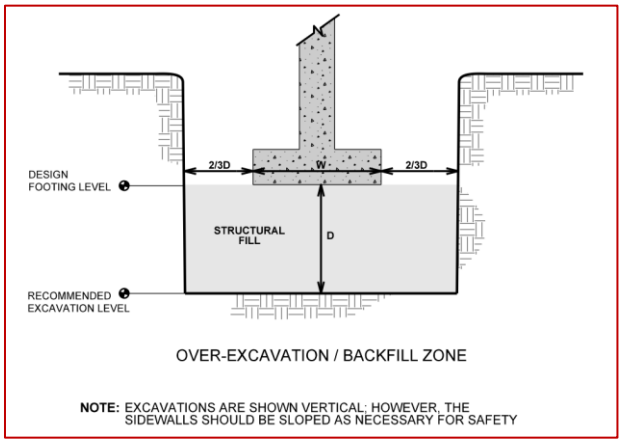
As noted in **Earthwork**, the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. 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 observed 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. The lean concrete replacement zone is illustrated on the sketch below.



Overexcavation for Engineered Fill placement below footings should be conducted as shown below. The overexcavation should be backfilled up to the footing base elevation, with engineered fill placed, as recommended in the **Earthwork** section.



Deep Foundations

As noted in **Swell Potential**, if the building addition is supported on a deep foundation system, the shallow fat clay (CH) soils may remain provided that a minimum of a 3 foot crawl space is developed between the bottom of the grade beams and the finished subgrade. Recommendations regarding suspended floor slabs can be found in **Suspended Structural Floor Slab on Grade Beams**.

Drilled Shaft Design Parameters

Soil design parameters are provided in the table below for the design of belled drilled shaft foundations. The values presented for allowable side friction and end bearing include a factor of safety of 3.

Item	Description
Net allowable skin friction of soils above the unweathered Yazoo "blue" clay	200 psf
New allowable skin friction of unweathered Yazoo "blue" clay	500 psf
Net allowable end bearing pressure [1, 2, 3]	12 kips per square foot, ksf
Minimum embedment	3-ft into competent unweathered Yazoo "blue" clay
Approximate elevation to top of competent unweathered Yazoo "blue" clay [4]	Varies, ranges from about Elev. 312 ft. to Elev 307 ft.
Approximate total movement [5]	½ inch

1. Values calculated with an approximate Factor of Safety of 3.0.
2. Tensile uplift from expansive soils is not anticipated within the upper 10 feet of the pier. The fat clay (CH) soils encountered below a depth of 11 feet possess the potential to shrink/swell; however, these soils appear to be below the zone of influence for moisture variation and should not adversely affect the performance of the piers.
3. The drilled shafts should be designed and constructed with an underream (bell) that is a minimum of two times and not greater than three times the diameter of the shaft. The piers should be spaced a minimum of two bell diameters center to center to avoid reduction of the end bearing values due to overlap of loading stresses. A minimum bell-to-shaft diameter ratio of two to one (2:1) is recommended. A maximum bell-to-shaft diameter ratio of 3:1 is recommended to limit possible caving of the bells.

Item	Description

4. Surface elevations are estimates and were based on the client provided grading plan. The surface elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.
5. The foundation movement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the piers, and the quality of the foundation installation.

Shafts should be adequately reinforced as designed by the Structural Engineer for both tension and shear to sufficient depths. Buoyant unit weights of the soil and concrete should be used in the calculations below the highest anticipated groundwater elevation.

Drilled shaft should have a minimum (center-to-center) spacing of three diameters. Closer spacing may require a reduction in axial load capacity. Axial capacity reduction can be determined by comparing the allowable axial capacity determined from the sum of individual piles in a group versus the capacity calculated using the perimeter and base of the pile group acting as a unit. The lesser of the two capacities should be used in design.

A minimum shaft diameter of 24 inches should be used. Drilled shafts should have a minimum length of 3 feet into the unweathered "blue" Yazoo clay and should extend into the bearing strata at least one shaft/pile/bell diameter for the allowable end-bearing pressures listed in the above table.

Post-construction settlements of drilled shafts designed and constructed as described in this report are estimated to range from about ½ to ¾ inch. Differential settlement between individual shafts is expected to be ½ to ⅔ of the total settlement.

Uplift Capacity

Piers will be subjected to uplift associated with swelling within the upper clays. The piers should contain reinforcing steel throughout the shaft to resist the tensile uplift forces. Reinforcing requirements may be estimated based on an uplift pressure of 1.0 ksf acting over the top 15 feet of per surface area. The estimated uplift value is considered a working load. Appropriate factors of safety should be applied in calculating the percent of reinforcement. Uplift resistance for underreamed piers will be provided by the weight of the soil overlying the bell and the dead load from the structure.

Drilled Shaft Construction Considerations

A minimum bell-to-shaft diameter ratio of two to one (2:1) is recommended to resist uplift associated with swelling of the upper soils. A maximum bell-to-shaft diameter ratio of 3:1 is recommended to limit possible caving of the bells. "Mushrooming", or widening of the

upper portion of the pier shaft, will significantly increase the uplift pressure from the upper clays. "Mushrooms" should be removed from the piers prior to backfill operations.

The concrete should be placed immediately after excavation and inspection of the shaft and bell. The presence of groundwater is not anticipated within the near-surface soils. Any groundwater exceeding 6 inches in depth should be pumped from the excavation prior to concrete placemen, or the concrete should be placed with a tremie. Although seepage is not expected, the potential need for casing or the use of slurry to construct these shafts may be required. However, the contractor should have sufficient casing available should it be required.

For drilled shafts, belling is expected to be feasible where the shafts extend at least 3 feet into the unweathered "blue" Yazoo clay strata. However, slickensided clays were observed in the borings. Based on our experience, we would expect problems with installation of the shafts through these zones. Provided the concrete is placed immediately after the bell is completed, we expect risk of cave-in of the bell is minimal. If significant slickendsided clays, sand or saturated silt seams are observed at the bell elevation, the shaft may have to be extended deeper to facilitate belling. It may also be necessary to extend temporary casing to prevent cave-in of cohesionless soils and create a water-tight seal. Alternatively, the shafts could be extended deeper and be redesigned as straight-sided shafts.

Because the field engineer or field technician will not be lowered into the excavation to observe the base of the bell excavation due to safety concerns, the bell area should be oversized by extending the bell diameter 1 foot. Alternatively, an explosion-proof camera could be lowered into the bell, after final cleanup, to verify the bell is suitably free of loose material and the oversize eliminated.

The use of temporary steel casing and/or slurry drilling procedures should be anticipated at this site during drilled shaft construction to reduce the potential for collapse of the sidewalls within slickendsided clay/sand seams and layers and control groundwater seepage. If casing is removed during concrete placement, care should be exercised to maintain concrete inside the casing at a sufficient level to resist earth and hydrostatic pressures present on a casing exterior. Water or loose soil should be removed from the bottom of the drilled shafts prior to placement of the concrete.

Continuous observation of the pier construction by Terracon is recommended. Observation is recommended to confirm the bearing stratum and that the excavation is dry prior to placement of concrete.

Floor Slabs

The following 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.

Ground-Supported Floor Slab Design Parameters

Item	Description
Floor Slab Support[1]	▪ Subgrade per recommendations in **Earthwork** ▪ Eight (8) foot "buffer" of low volume change engineered fill ▪ Minimum 6 inches of crushed aggregate compacted to at least 98% of ASTM D 698 [3]
Estimated Modulus of Subgrade Reaction [2]	100 pounds per square inch per inch (psi/in) for point loads

1. Floor slabs may 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.
3. Aggregate base layer should consist of a free-draining material, less than 10% fines (i.e., clean sand or size 610 crushed stone).

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, when the project includes humidity-controlled areas, 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 contraction 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 waterproof, 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 **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.

Ground Supported Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 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 Engineered 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 observe 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.

Suspended Structural Floor Slab on Grade Beams

It is anticipated the drilled piers will be connected at the ground surface by the means of concrete grade beams. The grade beams should be isolated from contact with the ground surface by means of a suitable spacer. These spacer materials may consist of carboard boxes filled with commercial grade vermiculite, "J-voids", closed cell Styrofoam or other suitable materials. These grade beams should be designed and constructed with a minimum 36-inch void between the bottom of the grade beam and the ground surface.

All utility lines should be suspended from the slab to minimize the possibility of damage due to the shrinking and swelling movements of the underlying soils. However, at the point where the utilities enter the building, provisions for differential movements between the ground-supported lines and the suspended lines should be made. The design of the utility lines should be such that a minimum 18-inch void space will exist between the suspended utility lines and the surface of the exposed ground surface within the crawl space.

Proper drainage of the under slab area and the area beneath the grade beams is required. Positive drainage of the area beneath the grade beams, as well as the crawl space area is strongly recommended. We recommend that the sub-floor areas be graded to drain to exterior drains or to interior sumps that promote the gravity drainage of water from beneath the structure. Drainage should be provided beneath the entire area of the floor slab. The use of several collection areas may be required.

Shafts should be adequately reinforced as designed by the Structural Engineer for both tension and shear to sufficient depths. Buoyant unit weights of the soil and concrete should be used in the calculations below the highest anticipated groundwater elevation.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation

costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

Figures

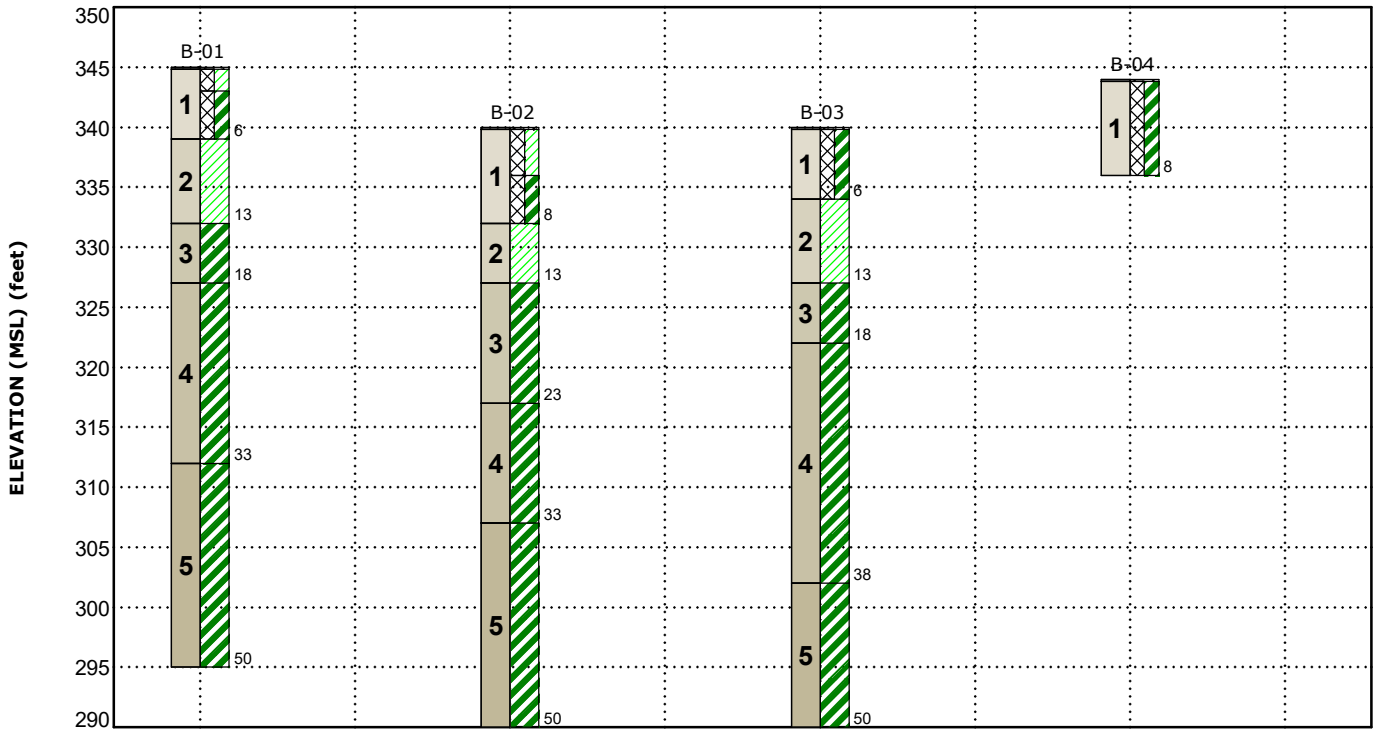
Contents:

GeoModel

VA CLC Neighborhood
VA Center Drive | Jackson, Mississippi
Terracon Project No. EB245012

Terracon
1919 Lakeland Dr Ste A
Jackson, MS

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Fill Soils**	Undocumented Fill Soils - Fat Clay & Lean Clay
2	**Lean Clay**	Lean Clays (CL) - medium stiff to stiff
3	**Transitional Fat Clay**	Fat Clays (CH) - medium stiff to stiff
4	**Weathered Yazoo**	Fat Clays (CH) - stiff to very stiff
5	**Unweathered Yazoo**	Fat Clays (CH) - hard

Legend

Topsoil
Lean Clay
Fat Clay

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Approximate Boring Depth (feet)	Location
B-01 through B-03	50	CLC Expansion area
B-04	8 (hand auger)	

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced Borings B-01 through B-03 with an ATV-mounted, rotary drill rig using continuous flight solid stem auger and/or rotary wash boring techniques as necessary depending on soil conditions. Five (5) samples were obtained at depth intervals of approximately 2 feet in the upper 10 feet and at intervals of 5 feet thereafter within each boring to the terminal depth of the borehole. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. For safety purposes and in accordance with Mississippi State Regulations, all borings were backfilled with bentonite grout after their completion.

Boring B-04 was advanced with hand auger equipment, in which disturbed soil samples were obtained for visual classification. For safety purposes and in accordance with Mississippi State Regulations, Boring B-01 was backfilled with auger cuttings after its completion.

We also observed the boreholes while drilling and for a short duration at the completion of drilling for the presence of groundwater. Groundwater was not observed at these times in the boreholes.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Geophysical Testing

Terracon performed geophysical exploration services consisting of a seismic survey using both active and passive MASW testing at each of the two lines. Our method of investigation utilized a standard fixed-array set of MASW geophones. The arrays consisted of 24 4.5Hz geophones, spaced 10 and 5 feet apart, respectively, along a sensor cable.

For the passive surveys, ambient noise (such as nearby traffic or construction) on the site was recorded by a seismograph. For the active surveys, a source strike was completed with a sledgehammer against a rubber plate at every geophone from one to eighteen and at one geophone spacing off the start of the line.

The data was returned to our office and processed using dispersion analysis software (SurfSeis, engineered by the Kansas Geological Survey) that extracts the fundamental-mode dispersion curve(s). The active and passive surveys performed at each line were combined to produce a broader-band overtone image to better identify the dispersion trends. The resulting curves were inverted and modeled to yield a 1D shear-wave velocity profile along the array for a corresponding depth. The results of the MASW surveys are presented in **Exploration and Laboratory Results**.

Geophysical Testing Limitations - All geophysical testing methods rely on instrument signals to indicate physical conditions in the field. Signal information can be affected by on-site conditions beyond the control of the operator, such as, but not limited to, cultural features, standing water, high subsurface moisture content, and other buried objects. Interpretation of those signals is based on a combination of known factors combined with the experience of the operator and geophysical scientist evaluating the results. The provided depth measurements are estimations based on an estimation of the density and seismic properties of the subsurface material.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture content
- Unit dry weight
- Atterberg limits
- Unconfined Compressive (UC) strength
- Undrained Unconsolidated (UU) triaxial compression

Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Site Location and Exploration Plans

Contents:

Site Location Plan
Exploration Plan

Note: All attachments are one page unless noted above.

Site Location

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

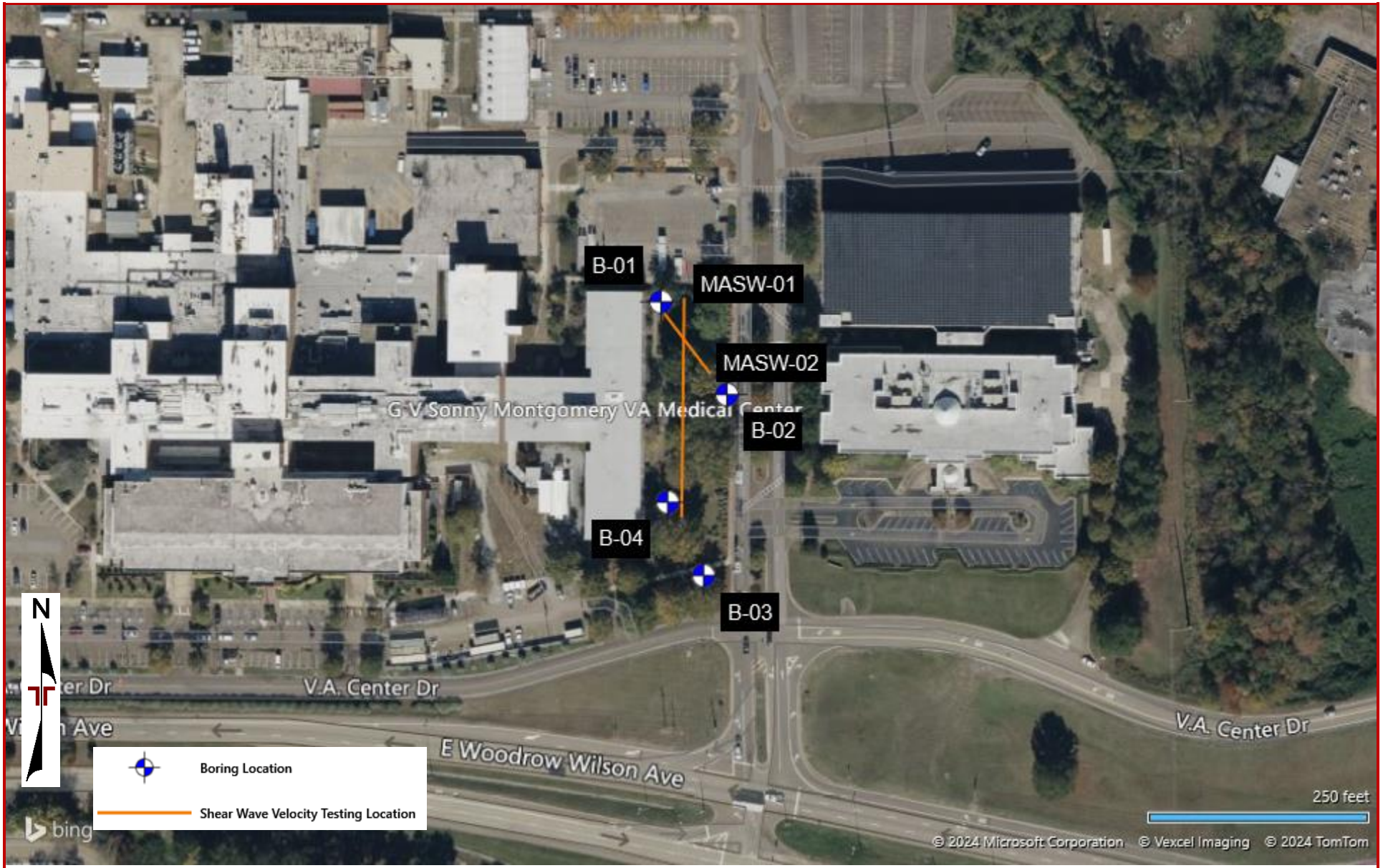


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (B-01 through B-04)
Shear Wave Testing

Note: All attachments are one page unless noted above.

VA CLC Neighborhood
VA Center Drive | Jackson, Mississippi
Terracon Project No. EB245012

Terracon
1919 Lakeland Dr Ste A
Jackson, MS

Boring Log No. B-01

Location: See Exploration Plan

Latitude: 32.3281° Longitude: -90.1659°

Model Layer	Depth (Ft.)	Elevation.: 345 (Ft.)	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Strength Test: Confining Pressure (psi)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI
	0.2	**TOPSOIL** 344.8	4.50 (HP)					17.4		
	2.0	**FILL - LEAN CLAY**, brown 343								
1		**FILL - FAT CLAY**, brown	1.00 (HP)	UC	0.69	6.3		49.1	73	82-24-58
	6.0	339	1.50 (HP)					32.0		
2		**LEAN CLAY (CL)**, brown and gray, medium stiff to stiff	4.50 (HP)					22.5		
	13.0	332	3.00 (HP)					23.3		
3		**FAT CLAY (CH)**, brown and gray, medium stiff to stiff	2.50 (HP)					26.8		
	18.0	327	4.50 (HP)					35.3		
4		**FAT CLAY (CH)**, olive yellow and light gray, stiff to very stiff, (weathered Yazoo)	2.00 (HP)	UU	1.73	3.3	18	42.3	79	109-27-82
			3.00 (HP)					37.5		
	33.0	312	4.50 (HP)					34.4		
5		**FAT CLAY (CH)**, bluish gray, hard, (unweathered Yazoo)	4.50 (HP)	UU	5.17	5.5	24.5	38.4	84	92-31-61
			4.50 (HP)					26.8		
	50.0	295	4.50 (HP)					37.7		
		Boring Terminated at 50 Feet								

Depth (Ft.): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

Water Level Observations

Sample Type

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.

Water Level Observations
Groundwater not encountered

Drill Rig
ATV

Hammer Type
Automatic

Driller
R. Warren

Notes
UC strength test failure at low strain rate at 23'

Advancement Method
Solid-Flight Auger: 0' - 20'
Rotary Wash: 20' - 50'

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Logged by
B. Moore

Boring Started
06-21-2024

Boring Completed
06-21-2024

VA CLC Neighborhood
VA Center Drive | Jackson, Mississippi
Terracon Project No. EB245012

Terracon
1919 Lakeland Dr Ste A
Jackson, MS

Boring Log No. B-02

Location: See Exploration Plan

Latitude: 32.3278° Longitude: -90.1657°

Depth (Ft.) Elevation.: 340 (Ft.)

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Strength Test: Confining Pressure (psi)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI
		0.2 **TOPSOIL** 339.8								17.2		
		FILL - LEAN CLAY, brown and red			4.50 (HP)	UC	4.37	3.4		14.1	115	33-12-21
1		4.0 336			4.50 (HP)					26.5		
		FILL - FAT CLAY, brown and gray			4.00 (HP)					25.6		
		8.0 332			4.50 (HP)					17.3		
2		**LEAN CLAY (CL)**, brown, medium stiff to stiff										
		13.0 327			4.50 (HP)					29.7		
3		**FAT CLAY (CH)**, brown, medium stiff to stiff										
		23.0 317			4.00 (HP)					29.7		
		FAT CLAY (CH), olive yellow and light gray, stiff to very stiff, (weathered Yazoo)										
4					2.50 (HP)					43.5		
					3.00 (HP)	UU	3.38	7.7	20.5	36.6	84	90-28-62
		33.0 307			3.50 (HP)					39.9		
		FAT CLAY (CH), bluish gray, hard, (unweathered Yazoo)										
5					4.50 (HP)					36.6		
					4.50 (HP)					37.8		
		50.0 290			4.50 (HP)					36.1		
		Boring Terminated at 50 Feet										

Depth (Ft.): 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

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.

Water Level Observations
Groundwater not encountered

Drill Rig
ATV

Hammer Type
Automatic

Driller
R. Warren

Notes
UC strength test failure at low strain rate at 2'

Advancement Method
Solid-Flight Auger: 0' - 20'
Rotary Wash: 20' - 50'

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Logged by
B. Moore

Boring Started
06-20-2024

Boring Completed
06-20-2024

VA CLC Neighborhood
VA Center Drive | Jackson, Mississippi
Terracon Project No. EB245012

Terracon
1919 Lakeland Dr Ste A
Jackson, MS

Boring Log No. B-03

Location: See Exploration Plan

Latitude: 32.3273° Longitude: -90.1659°

Model Layer	Graphic Log	Depth (Ft.)	Elevation.: 340 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Strength Test: Confining Pressure (psi)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI
1		0.2	**TOPSOIL** 339.8				1.00 (HP)					41.2		
			FAT CLAY, brown and gray				1.00 (HP)					50.8		
		6.0	334	5			0.50 (HP)	UC	0.76	4.1		50.1	72	106-24-82
2			**LEAN CLAY (CL)**, brown and red, medium stiff to stiff				1.50 (HP)					20.3		
							2.50 (HP)					17.1		
		13.0	327	10										
3			**FAT CLAY (CH)**, gray, medium stiff				1.00 (HP)					28.6		
		18.0	322	15										
4			**FAT CLAY (CH)**, olive yellow and light gray, stiff to very stiff, (weathered Yazoo)	20			2.50 (HP)	UC	1.86	2.2		33.6	90	83-25-58
							2.50 (HP)					39.6		
				25										
							4.00 (HP)					33.8		
				30										
							4.00 (HP)					33.1		
				35										
		38.0	302				4.00 (HP)					37.1		
5			**FAT CLAY (CH)**, bluish gray, hard, (unweathered Yazoo)	40										
							4.50 (HP)	UU	5.18	4.3	26.5	37.8	84	97-28-69
				45										
		50.0	290				4.50 (HP)					32.1		
			Boring Terminated at 50 Feet	50										

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.

Water Level Observations
Groundwater not encountered

Drill Rig
ATV

Hammer Type
Automatic

Driller
R. Warren

Notes
UC/UU strength test failure at low strain rate at 4', 18', and 43'

Advancement Method
Solid-Flight Auger: 0' - 20'
Rotary Wash: 20' - 50'

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Logged by
B. Moore

Boring Started
06-21-2024

Boring Completed
06-21-2024

VA CLC Neighborhood
VA Center Drive | Jackson, Mississippi
Terracon Project No. EB245012

Terracon
1919 Lakeland Dr Ste A
Jackson, MS

Boring Log No. B-04

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 32.3275° Longitude: -90.1659° Depth (Ft.) / Elevation.: 344 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI
1		0.2 **TOPSOIL** 343.8 **FAT CLAY**, olive yellow and light gray, medium stiff to stiff, possible fill	5							32.3		
										27.7		85-23-62
										23.9		
		8.0 336 ***Boring Terminated at 8 Feet***								25.7		

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.

Water Level Observations
Groundwater not encountered

Drill Rig
ATV

Driller
B. Moore

Notes

Advancement Method
Hand Auger: 0' - 8'

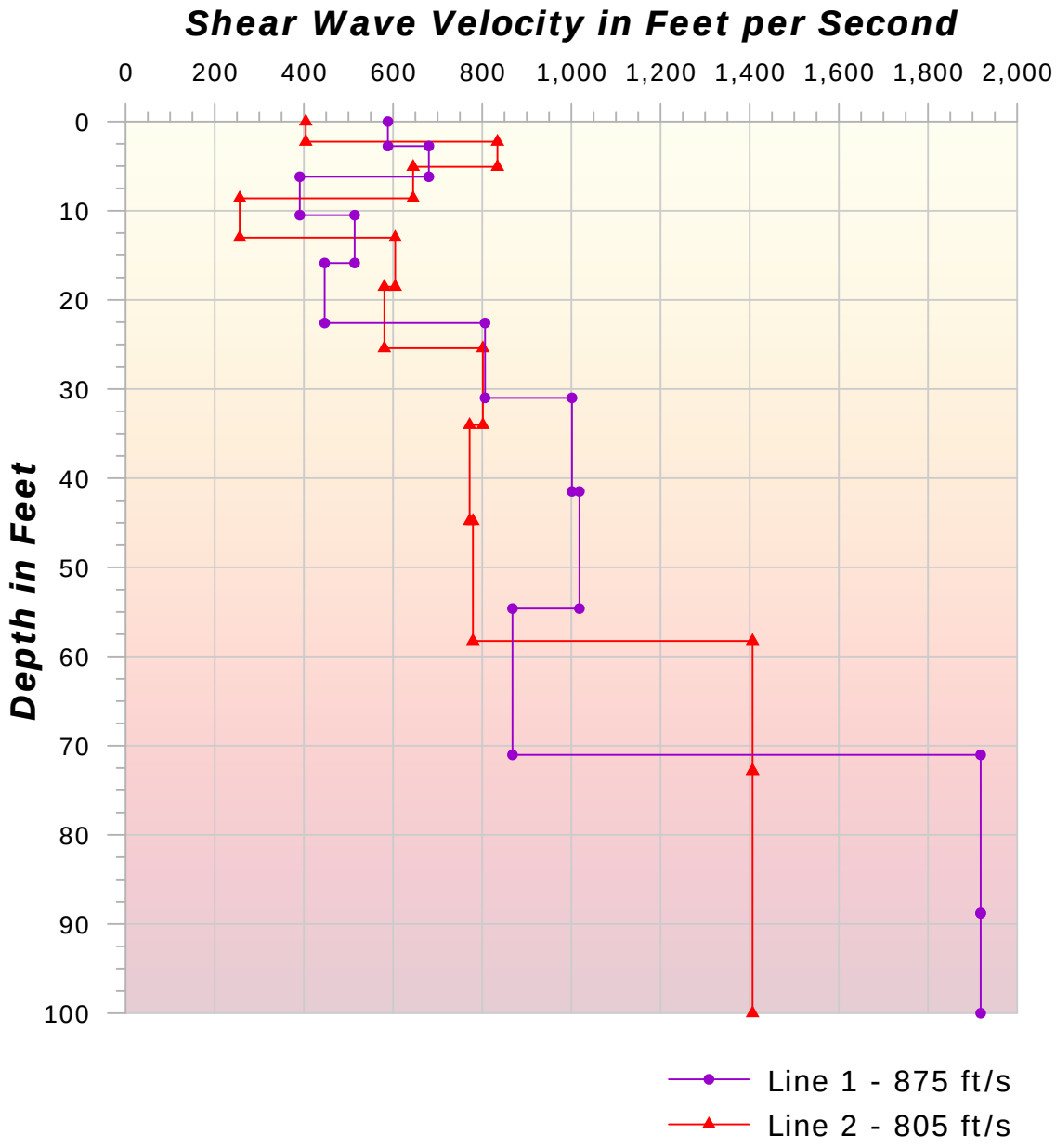
Logged by
B. Moore

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Boring Started
06-21-2024

Boring Completed
06-21-2024

Vs100' Model
VA CLC Neighborhood



Notes:
1) Shear wave velocity testing and calculations were conducted in general accordance with ASCE 7-16 and IBC 2018.

PROJECT MANAGER:	TSI
DRAWN BY:	AGW
CHECKED BY:	NBR
APPROVED BY:	RPS

PROJECT NUMBER:	EB245012
PROJECT TASK:	2
FILE NAME:	VAVs100.gpj
DATE:	7/22/2024

Terracon
1919 Lakeland Drive, Suite A
Jackson, MS 39216

Seismic Site Classification Data

VA CLC Neighborhood
1500 E Woodrow Wilson Ave
Jackson, Mississippi

EXHIBIT
1

Supporting Information

Contents:

General Notes
Unified Soil Classification System

Note: All attachments are one page unless noted above.

General Notes

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

Auger

Split Spoon

Shelby Tube

Macro Core

Ring Sampler

Rock Core

Grab Sample

No Recovery

WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

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.

FIELD TESTS

(HP)	**Hand Penetrometer**
(T)	**Torvane**
(b/f)	**Standard Penetration Test (blows per foot)**
(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. Includes gravels, sands and silts.			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.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, tsf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 – 3	0 – 6	Very Soft	Less than 0.25	0 – 1	< 3
Loose	4 – 9	7 – 18	Soft	0.25 to 0.50	2 – 4	3 – 4
Medium Dense	10 – 29	19 – 58	Medium-Stiff	0.50 to 1.00	4 – 8	5 – 9
Dense	30 – 50	59 – 98	Stiff	1.00 to 2.00	8 – 15	10 – 18
Very Dense	> 50	≥ 99	Very Stiff	2.00 to 4.00	15 – 30	19 – 42
			Hard	> 4.00	> 30	> 42

RELATIVE PROPERTIONS 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. (300mm)
Cobbles	12 in. to 3 in (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

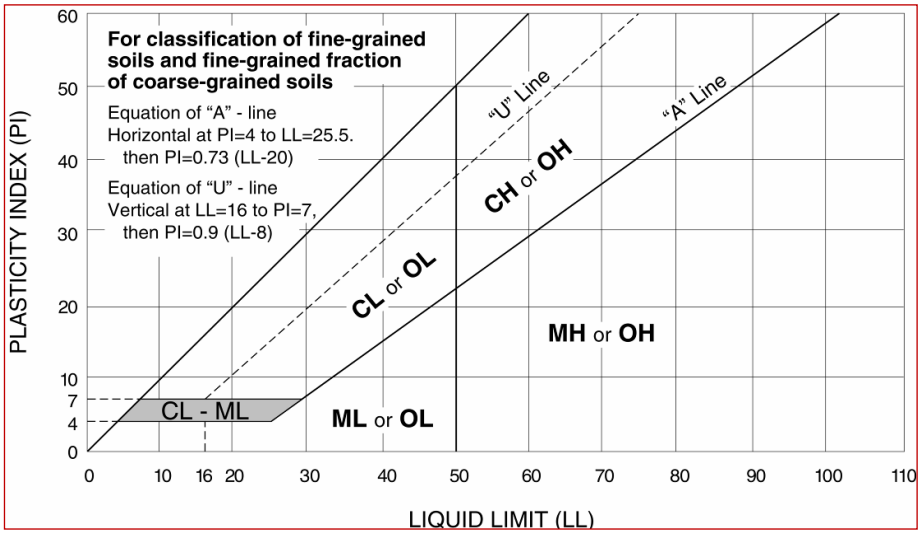
RELATIVE PROPORTIONS OF FINES

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

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 4 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 [Cc<1 or Cc>3.0] [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 [Cc<1 or Cc>3.0] [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 above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	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:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	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] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[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.