

# Geotechnical Engineering Report

Proposed LaQuinta Inn & Suites  
West Monroe, Louisiana

November 11, 2013  
Terracon Project No.EB135065

**Prepared for:**

MM Construction, LLC  
Mandeville, Louisiana

**Prepared by:**

Terracon Consultants, Inc.  
Ridgeland, Mississippi

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**Terracon**

November 11, 2013



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Re: Geotechnical Engineering Report  
Proposed LaQuinta Inn & Suites  
West Monroe, Louisiana  
Terracon Project No:EB135065

Dear Mr. Sarona:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal number PEB130193 dated September 4, 2013, as authorized on September 30, 2013.

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. Materials services are provided by Terracon. We would be happy to discuss these services with you. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

for

Adrienne Spencer  
Staff Engineer  
Geotechnical Services

Stephen E. Greaber, P.E.  
Principal  
Louisiana PE No. 26107

Enclosures cc: 1 – Client (PDF) & 1 – File



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## **EXECUTIVE SUMMARY**

This geotechnical investigation has been performed for the proposed LaQuinta Inn & Suites to be located along Constitution Drive in West Monroe, Louisiana. Nine (9) soil borings, designated Borings B-01 through B-09, were drilled to depths of approximately 6 to 26 feet below existing grades within the development area. This report specifically addresses the recommendations for the proposed development.

Based on the information obtained from our subsurface exploration, the site can be developed for the proposed project. The following geotechnical considerations were identified:

- Loose clayey sands (SC) were encountered in the upper 4 feet of the proposed building footprint and are not suitable in their current state for foundation support. These loose soils will be subject to the influence of weather variations and may weaken or stiffen dependent on the time of year.
- After stripping and grubbing the building pad area, extending 5 feet from the building perimeter, should be undercut 2 feet. The subgrade at the base of the excavation should then be compacted with a heavy smooth drum vibratory compactor (minimum 20 tons) making a minimum of 5 passes in both directions to densify the exposed clayey sands. The material that was excavated from the building pad area can be used to backfill the excavation placed and compacted in accordance with recommendations in the report.
- Provided the recommendations in this report are implemented, the proposed building can be supported by means of a shallow foundation system bearing on newly placed engineered fill.
- The 2006 International Building Code (IBC), Table 1613.5.2 seismic site classification for this site is D.
- The pavement design could consist of either a rigid or flexible pavement system.
- Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. We therefore recommend that Terracon be retained to monitor this portion of the work.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

**GEOTECHNICAL ENGINEERING REPORT  
PROPOSED LAQUINTA INN & SUITES  
WEST MONROE, LOUISIANA**

Terracon Project No. EB135065  
November 11, 2013

## **1.0 INTRODUCTION**

This geotechnical engineering report has been completed for the proposed LaQuinta Inn & Suites to be located along Constitution Drive in West Monroe, Louisiana. Nine (9) soil borings, designated Borings B-01 through B-09, were drilled to depths of approximately 6 to 26 feet below existing grades within the development area. Logs of the borings along with a site location plan and boring location plan are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- earthwork
- seismic considerations
- foundation design and construction
- slab design and construction
- pavement design

## **2.0 PROJECT INFORMATION**

The following sections present the project information that was available at the time this report was prepared. Should this information be incorrect, or change significantly, the project engineer should be contacted in order to evaluate the effect, if any, on our analysis and recommendations provided herein and make modifications if required.

### **2.1 Project Description**

<b>Item</b>	<b>Description</b>
<b>Site layout</b>	Appendix A, Exhibit A-2: Boring Location Plan
<b>Structure</b>	Four-story hotel building with a proposed footprint of approximately 46,860 square feet with a pool and associated pavements
<b>Building Construction</b>	Load bearing masonry walls and PTI concrete slab-on-grade
<b>Finished floor elevation</b>	Assumed to be within 3 feet of existing grade.

Item	Description
<b>Maximum loads</b>	Columns: 70 kips (assumed) Walls: 5 klf (assumed) Slabs: 125 psf (assume)
<b>Grading</b>	Cut/Fill: 3 feet (+/-) max
<b>Cut and fill slopes</b>	3H:1V (Horizontal to Vertical) max
<b>Below grade areas</b>	Pool

## 2.2 Site Location and Description

Item	Description
<b>Location</b>	Along Constitution Drive in West Monroe, Louisiana (Appendix A, Exhibit A-1: Site Location Plan)
<b>Existing improvements</b>	Undeveloped lot
<b>Current ground cover</b>	Short grass
<b>Existing topography</b>	Relatively level with an elevation difference of approximately 1 to 3 feet

## 3.0 SUBSURFACE CONDITIONS

Soil and groundwater conditions at the site were investigated by means of nine (9) soil borings. Borings B-01 through B-03 were drilled in the proposed building and pool areas. Borings B-04 through B-09 were drilled in areas of proposed pavement. The soil boring logs in Appendix A provide details of the conditions encountered at each boring location and the field and laboratory data collected.

### 3.1 Geology

Soils encountered at this site appear to be sediments of the Prairie Terraces formation. These Pleistocene Age deposits typically consist of silty clays and clays with silt and sand layering. The soils within the Prairie Terrace typically provide good foundation support for relatively light to moderate structures, are overconsolidated, and normally only marginally compressible.

### 3.2 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density
Surface	0.3	Topsoil	N/A
1	4 or Termination <sup>1</sup>	Clayey Sand (SC)	Loose to Medium Dense
2	8 to 14 or Termination <sup>2</sup>	Lean Clay (CL), Fat Clay (CH) <sup>4</sup> Silty Clay (CL-ML)	Medium Stiff to Stiff
4	Termination <sup>3</sup>	Poorly Graded Sand with Clay (SP-SC)	Loose to Medium Dense

1. Borings B-01, B-05, B-08 and B-09 were terminated in this stratum.
2. Borings B-03, B-04, B-06 and B-07 were terminated in this stratum.
3. Boring B-02 was terminated in this stratum.
4. Boring B-02 encountered fat clay (CH) from 8 to 14 feet below existing grade.

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A.

### 3.3 Groundwater

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed are noted on the attached boring logs, and are summarized below.

Boring Location	Depth to Groundwater During Drilling (feet)	Depth to Groundwater After Drilling (feet)
B-01	13	14.4 (after 3 hours)
B-02	14	13.5 (after 3.75 hours)

1. Borings B-03 through B-09 did not encounter groundwater to a depth of 13 feet in the borings while drilling, or for the short duration that the borings were allowed to remain open. However, this does not necessarily mean these borings terminated above groundwater. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

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 differ than indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

## **4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION**

The information provided by the designers for this project has been combined with our findings from the site investigation to develop recommendations for foundation and pavement design. The following sections summarize these considerations.

### **4.1 Geotechnical Considerations**

Loose clayey sands (SC) were encountered in the upper 4 feet at some boring locations within the proposed building footprint. These soils will be influenced by weather variations prior to and during construction and may weaken or stiffen dependent upon the time of year. The identified loose and variable soil conditions observed should be mitigated to improve their support characteristics allowing for a shallow foundation option.

After stripping and grubbing, the building pad area, extending 5 feet from the building perimeter, should be undercut 2 feet. The subgrade at the base of the excavation should then be compacted with a heavy smooth drum vibratory compactor (minimum 20 tons) making a minimum of 5 passes in both directions to densify the exposed clayey sands. After completion of the compaction, a proof-roll of the subgrade should be conducted with a loaded tandem axle dump truck to evaluate the condition of the subgrade prior to backfilling. The material that was excavated from the building pad can be used to backfill the excavation placed in accordance with Section 4.2.3. We recommend that the geotechnical engineer be retained to evaluate the subgrade soils and provide construction monitoring and materials testing during the time of construction.

### **4.2 Earthwork**

A critical aspect of the successful construction project is earthwork construction and site preparation. Proper site preparation is critical to the overall performance of the foundation system for the proposed structure. The following sections provide recommendations for site preparation.

#### **4.2.1 Site Preparation**

The project site is currently undeveloped and contains ground cover consisting of short grass. Stripping and grubbing of the entire site will be necessary to remove topsoil, roots and any other

organic matter that could otherwise be detrimental to subsequent construction. Soils containing these objectionable materials should not be used for backfill. Stripping should be carried to a depth where all organic containing soils have been removed. Any topsoil encountered within construction limits should be stripped and could be stockpiled for landscaping purposes.

The in-place soils must be stable prior to the placement of fill materials or structures. After achieving finished subgrade elevation in cut areas and the recommended undercut area, and prior to placing fill in any areas that are currently below finished subgrade elevation, the exposed subgrade should be evaluated to confirm that all soft, yielding and unsuitable materials have been removed. During this evaluation, those areas which are at finished subgrade or are to receive fill should be proof-rolled with a loaded tandem-axle dump truck or similar pneumatic-tired equipment with a minimum weight of 15 tons and a maximum weight of 20 tons. Proof-rolling will help reveal the presence of unstable materials that were not identified during our drilling program.

Any areas that yield or pump under proof-roll equipment should be mitigated. 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.

The proof-roll should be conducted within 48 hours of the placement of fill or the construction of foundations and pavement. In the event a time period beyond 48 hours elapses, a supplemental proof-roll should be conducted. This is necessary because the subgrade is subject to water softening and rutting if exposed to weather or traffic.

#### **4.2.2 Engineered Fill Material Requirements**

Engineered fill should meet the following material property requirements:

<b>Fill Type<sup>1</sup></b>	<b>USCS Classification</b>	<b>Physical Properties</b>	<b>Acceptable Location for Placement</b>
Lean Clay	CL	$10 \leq PI \leq 25$ $LL \leq 45$	All locations and elevations
Clayey Sand	SC	$6 \leq PI \leq 25$ $LL \leq 45$	All locations and elevations
On-Site Soils	CL, SC	$10 \leq PI \leq 25$ $LL \leq 45$	Typically appear suitable for re-use as fill
On-Site Soils <sup>2</sup>	CL-ML	$4 \leq PI \leq 25$ $LL \leq 45$	Marginally suitable for use as fill.

Fill Type <sup>1</sup>	USCS Classification	Physical Properties	Acceptable Location for Placement
<ol style="list-style-type: none"> <li>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 Terracon for evaluation.</li> <li>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.</li> </ol>			

### 4.2.3 Engineered Fill Placement and Compaction Requirements

Engineered fill should be placed in accordance with the following requirements:

Item	Description
<b>Fill Lift Thickness</b>	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
<b>Minimum Compaction Requirements<sup>1</sup></b>	98% of the material's standard Proctor maximum dry density (ASTM D 698)
<b>Moisture Content - Cohesive Soil</b>	Within -2 to +2 percent of optimum moisture content as determined by the standard Proctor test at the time of placement and compaction
<b>Minimum Testing Frequency Requirements</b>	Building Area: 1 test per 2,500 square feet per lift Pavement Area: 1 test per 5,000 square feet per lift Utility Trench: 1 test per 100 linear feet per lift

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

### 4.2.4 Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches are backfilled with relatively clean granular material, they should be capped with at least 18 inches of cohesive fill in non-pavement areas to reduce the infiltration and conveyance of surface water through the trench backfill.

Utility trenches are a common source of water infiltration and migration. All utility trenches that penetrate beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate below the building. We recommended constructing an effective clay "trench plug" that extends at least 5 feet out from the face of the building exterior. The plug material should consist of clay compacted at a water content at or above the soils

optimum water content. The clay fill should be placed to completely surround the utility line and be compacted in accordance with recommendations in this report.

#### **4.2.5 Grading and Drainage**

Final surrounding grades should be sloped away from the structure on all sides to prevent ponding of water. Gutters and downspouts that drain water a minimum of 5 feet beyond the footprint of the proposed structures are recommended. This can be accomplished through the use of splash-blocks, downspout extensions, and flexible pipes that are designed to attach to the end of the downspout. Flexible pipe should only be used if it is daylighted in such a manner that it gravity-drains collected water. Splash-blocks should also be considered below hose bibs and water spigots.

It is recommended that all exposed earth slopes be seeded to provide protection against erosion. Seeded slopes should be protected with erosion control mats or other measures until the vegetation is established.

#### **4.2.6 Earthwork Construction Considerations**

Although the exposed subgrade is anticipated to be relatively stable upon initial exposure, unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted or subjected to repetitive construction traffic. The use of light construction equipment would aid in reducing subgrade disturbance. Should unstable subgrade conditions develop, stabilization measures will need to be employed.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to foundation and pavement construction. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction.

Trees or other vegetation whose root systems have the ability to remove excessive moisture from the subgrade and foundation soils should not be planted next to the structure. 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.

Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Terracon should be retained during the construction phase of the project to observe subgrades, earthwork and to perform necessary tests and observations during subgrade preparation; proof-rolling; placement and compaction of controlled compacted fills; backfilling of excavations to the completed subgrade, and just prior to construction of building floor slabs.

### 4.3 Foundations

Provided the site preparation recommendations outlined in this report are implemented, the soil conditions are conducive for support of the planned structure using shallow foundations. The following paragraphs summarize design recommendations and construction considerations for a shallow foundation system.

#### 4.3.1 Foundation Design Recommendations

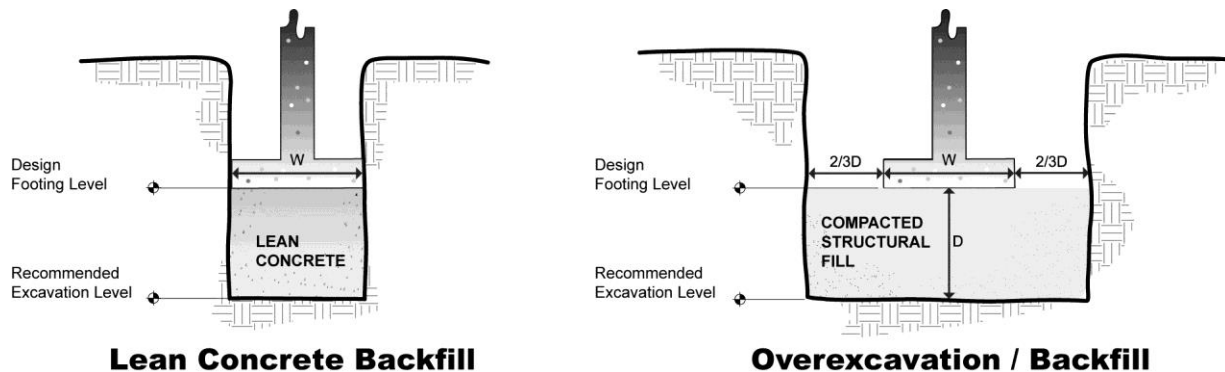
Description	Column	Wall
<b>Net allowable bearing pressure<sup>1</sup></b>		
■ <b>Compacted engineered fill or native clay</b>	2,000 psf	2,000 psf
<b>Minimum width dimensions</b>	24 inches	16 inches
<b>Minimum embedment below finished grade</b>	18 inches	18 inches
<b>Approximate total movement from foundation loads<sup>2</sup></b>	<1 inch	<1 inch
<b>Estimated differential movement from foundation loads<sup>2</sup></b>	<¾ inch between columns	<¾ inch over 40 feet
<b>Ultimate passive pressure<sup>3</sup></b>		
■ <b>Compacted engineered fill or native clay</b>	250 pcf, equivalent fluid density	
<b>Ultimate coefficient of sliding friction<sup>3</sup></b>	0.32	

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 loose/soft soils, where present, will be undercut and replaced with engineered fill.
2. The foundation movement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of engineered fill, and the quality of the earthwork operations.
3. The sides of the excavation for the spread footing 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 two feet of the soil profile should be neglected. If passive resistance is used to resist lateral loads, the base friction should be neglected.

### 4.3.2 Foundation Construction Considerations

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. Should the soils at bearing level become excessively dry, disturbed or saturated, or frozen, the affected soil should be removed prior to placing concrete. A lean concrete mud-mat should be placed over the bearing soils if the excavations must remain open for an extended period of time. It is recommended that the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

If unsuitable bearing soils are encountered in footing excavations, the excavation could be extended deeper to suitable soils and the footing could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. As an alternative, the footings could also bear on properly compacted engineered backfill extending down to the suitable soils. Overexcavation for compacted engineered fill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled with material specified in Section 4.2.2 and placed in accordance with Section 4.2.3. The overexcavation and backfill procedure is described in the following figure.



**Lean Concrete Backfill** **Overexcavation / Backfill**  
NOTE: Excavations in sketches shown vertical for convenience. Excavations should be sloped as necessary for safety.

## 4.4 Floor Slabs

The following paragraphs summarize design recommendations and construction considerations for the floor slab.

### 4.4.1 Conventional Floor Slab Design Recommendations

Item	Description
<b>Floor slab support</b> <sup>1</sup>	Upper 9-inches of subgrade should be compacted to 98% of the material's standard Proctor maximum dry density (ASTM D 698) as outlined in <b>Section 4.2.3.</b> <sup>2</sup>
<b>Modulus of subgrade reaction</b>	100 pounds per square inch per inch (psi/in) for point loading conditions
<b>Aggregate base course/capillary break</b> <sup>3</sup>	4-inch compacted layer of free draining, granular subbase material.

1. Floor slabs should be structurally independent of any building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Floor subgrades should be maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become desiccated prior to construction of floor slabs, the affected material should be removed or the materials scarified, moistened, and recompacted. Upon completion of grading operations in the building areas, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the building floor slabs.
3. The floor slab design should include a capillary break, comprised of free-draining, compacted, granular material, at least 6 inches thick. Free-draining granular material should have less than 5 percent fines (material passing the #200 sieve). Other design considerations such as cold temperatures and condensation development could warrant more extensive design provisions.

Where appropriate, 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.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be 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.

### 4.4.2 Post-Tensioned Floor Slab Design Recommendations

The slab foundation design parameters presented below are based on the criteria published by the Building Research Advisory Board (BRAB), the Prestressed Concrete Institute (PCI), the Wire Reinforcement Institute (WRI), and the Post-Tensioning Institute (PTI) 3<sup>rd</sup> Edition. These

are essentially empirical design methods and the recommended design parameters are based on our understanding of the proposed project, our interpretation of the information and data collected as a part of this study, our area experience, and the criteria published in the BRAB, PCI, WRI, and PTI design manuals.

<b>BRAB/WRI/PCI Parameters</b>		
<b>Design Plasticity Index (PI)</b> <sup>1</sup>	<b>BRAB</b>	10
	<b>WRI/PCI</b>	10
<b>Climatic Rating (C<sub>w</sub>)</b>		17
<b>Unconfined Compressive Strength</b>		1.0 tsf
<b>Soil Support Index (C) for BRAB</b>		0.95

1. The BRAB effective PI is equal to the near surface PI if that PI is greater than all of the PI values in the upper 15 feet. If the near-surface PI is not highest (i.e., after the building pad is prepared), then the effective PI is the weighted average of the upper 15 feet. The WRI/PCI effective PI is always the weighted average of the PI values in the upper 15 feet.

<b>Post Tensioning Institute (PTI) Parameters<sup>1</sup></b>		
<b>Depth of Seasonal Moisture Change<sup>2</sup></b>		Up to 10 feet
<b>Plasticity Index (average)<sup>3</sup></b>		10
<b>Percent Finer than 2 Microns (estimated)<sup>3</sup></b>		50
<b>Soil Fabric Factor</b>		1.0
<b>Approximate Thornthwaite Moisture Index</b>		40
<b>Estimated Constant Soil Suction</b>		3.2 pF
<b>Range of Soil Suction</b>		3.0 to 4.5 pF
<b>Edge Moisture Variation Distance, e<sub>m</sub><sup>4,5</sup></b>	<b>Center Lift</b>	8.7 feet <sup>6</sup>
	<b>Edge Lift</b>	5.1 feet <sup>6</sup>
<b>Differential Soil Movement, y<sub>m</sub> (Center Lift)<sup>5</sup></b>	<b>Center Lift</b>	0.9 inches <sup>6</sup>
	<b>Edge Lift</b>	1.3 inches <sup>6</sup>

1. Based on our analysis of the field and laboratory data, design parameters were computed using the Addendum to the 2004 Post-Tensioning Institute (PTI) method<sup>1</sup> for slab-on-grade design and the subsequent Errata to the Addendum approved by the PTI Slab-on-Grade Committee on February 7, 2008.
2. The moisture beneath a shallow foundation will change in response to wetting and drying conditions around the foundation perimeter. The moisture condition has a significant effect on slab behavior and is highly variable with time, changing seasonally, with annual climate conditions, drainage patterns, ground cover, and vegetation (trees and shrubs).

1. Post-Tensioning Institute, "Addendum No. 1 to the 3<sup>rd</sup> Edition of the Design of Post-Tensioned Slabs-on-Ground", Post-Tensioning Institute, Phoenix, AZ, May 2007.

**Post Tensioning Institute (PTI) Parameters<sup>1</sup>**

3. The plasticity index and the clay mineral percentage are values of the soil that can be estimated by laboratory tests, and, although variable from location to location, remain relatively constant with time.
4. The maximum moisture variation distance is termed the edge moisture variation distance,  $e_m$ , and is an important factor governing the design of post-tensioned floor slabs. The  $e_m$  is related to percent fine clay and climatic conditions as well as other parameters, such as soil fabric factor and unsaturated diffusion coefficient.
5. The differential movements,  $y_m$ , and edge moisture variation distances,  $e_m$ , were calculated by modeling soil profiles using the commercial software program VOLFLO as recommended by the PTI manual.
6. Values given above may be used provided subgrade preparation is implemented as described in **Section 4.2**.

When considering a grade-supported floor slab, the design of the floor slab involves the interaction of the floor slab and the soil support system to resist moments and shears induced by the applied structural loads. Floor slabs can be thickened, or stiffening beams can be added, to aid in resisting moments and shears. Joints should be constructed at regular intervals as recommended by the American Concrete Institute (ACI) to help control the location of any cracking.

For a slab foundation system designed and constructed as recommended, post construction settlements should be less than 1 inch. Settlement response of a select fill supported slab is influenced more by the quality of construction than by soil-structure interaction. Therefore, it is essential that the recommendations for foundation construction be strictly followed during the construction phases of the building pad and foundation.

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

If utilized, the post-tensioned slab-on-grade construction technique should be carefully monitored by qualified personnel. The sophistication of this construction procedure requires careful attention to details such as concrete integrity and anchorages, along with tendon spacing, support, covering, and stressing. Poor construction could result in a non-functional slab foundation system.

**4.4.3 Floor Slab Construction Considerations**

On most project sites, the site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the floor slab subgrade may not be suitable for placement of base rock and concrete and corrective action will be required.

We recommend the area underlying the floor slab be rough graded and then thoroughly proof-rolled with a loaded tandem axle dump truck prior to final grading and placement of base rock. 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 affected material with properly compacted fill. All floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the concrete.

#### **4.5 Seismic Considerations**

The International Building Code (IBC) Site Classification is presented in the following table:

<b>Code Used</b>	<b>Site Classification</b>
2006 International Building Code (IBC) <sup>1</sup>	D - Per Table 1613.5.2

---

1. In general accordance with the *2006 International Building Code*, Table 1613.5.2.
2. The 2006 International Building Code (IBC) requires a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100 foot soil profile determination. Borings for the building extended to a maximum depth of approximately 26 feet and this seismic site class definition considers that the soils encountered continues below the maximum depth of the subsurface exploration. Additional exploration to greater depths could be performed to confirm the conditions below the current depth of exploration. Alternatively, a geophysical exploration could be utilized in order to attempt to justify a higher seismic site class.

#### **4.6 Pavements**

The following sections present recommendations for pavement design and construction. Based on experience with similar projects, either asphalt cement concrete (flexible) or a Portland cement concrete (rigid) pavement system could be used for the proposed project. Detailed pavement designs were performed for estimated traffic types and volumes. We would be pleased to provide revised pavement thickness designs upon your request and the provision of additional data related to the anticipated traffic.

##### **4.6.1 Subgrade Preparation**

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 saturate some areas, heavy traffic from concrete trucks and other delivery vehicles disturb the subgrade and many surface irregularities are filled in with loose soils to improve trafficability 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 9 inches of the subgrade be evaluated and the pavement subgrades be proof-rolled within two days 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.

After proof-rolling and repairing deep subgrade deficiencies, the entire subgrade should be scarified and developed as recommended in Section 4.2 Earthwork to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. 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.

#### **4.6.2 Design Considerations**

Detailed traffic patterns and anticipated loading conditions were not available at the time that this report was prepared. We anticipate that traffic loads will be produced primarily by automobile traffic and occasional delivery and trash removal trucks. The thickness of pavements subjected to heavy truck traffic should be determined using expected traffic volumes, vehicle types, and vehicle loads and should be in accordance with local, city, or county ordinances.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%;
- The subgrade and pavement surface should have a minimum 2% slope to promote proper surface drainage;
- Install below pavement drainage systems surrounding areas anticipated for frequent wetting;
- Install joint sealant and seal cracks immediately;
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils;
- Place compacted, low permeability backfill against the exterior side of curb and gutter; and,
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

Estimates of minimum thicknesses for new pavement sections for this project have been based on the procedures outlined in the 1993 Guideline for Design of Pavement Structures by the American Association of State Highway and Transportation Officials (AASHTO-1993). The

following minimum thicknesses were estimated based upon our estimated traffic loading, limited soils information, variation across the project area, and experience with similar projects and soil conditions.

### 4.6.3 Estimates of Minimum Pavement Thickness

Typical Pavement Section Thickness (inches)							
Traffic Area	Alternative	Asphalt Concrete Surface Course <sup>3</sup>	Asphalt Concrete Binder Course <sup>3</sup>	Portland Cement Concrete <sup>1,2</sup>	Aggregate Base Course <sup>4</sup>	Soil-Cement Base Course <sup>6</sup>	Total Thickness
Light Duty (Car Parking Stalls)	PCC	--	--	5.0	4.0 <sup>7</sup>	--	9.0
	AC-AGG	2.5	--	--	6.0	--	8.5
	AC-SC	2.5	--	--	--	9.0	11.5
Standard Duty (Drive Areas)	PCC	--	--	6.0	4.0 <sup>7</sup>		10.0
	AC-AGG	1.5	2.0	--	6.0		9.5
	AC-SC	1.5	2.0	--	--	10.0	13.5
Entrances & Trash Container Pad <sup>5</sup>	PCC	--	--	8.0	4.0 <sup>7</sup>		12.0

- 4,000 psi at 28 days, 4-inch maximum slump and 5 to 7 percent air entrained. PCC pavements are recommended for trash container pads and in any other areas subjected to heavy wheel loads and/or turning traffic.
- Standard design and construction details for rigid pavements are contained in ACI330R-08. It is recommended that the design engineer refer to this document for more detailed information. A critical aspect of concrete pavements for facilities of this nature is joint spacing and related details. ACI330R-08 addresses these important details.
- Design and construction of asphaltic or bituminous concrete should be in accordance with Louisiana Department of Transportation Specifications for Roads and Bridges 2006 (LSSRB).
- Aggregate base course should be a No. 610 limestone or similarly graded recycled concrete compacted to 100% of its max dry density as determined by ASTM D-698, Standard Proctor Test with stability present.
- The trash container pad should be large enough to support the container and the tipping axle of the collection truck. The trash container pad should be designed as a structural slab for the anticipated axle loads.
- A soil cement base should be constructed in general accordance with Section 305 of the 2006 LSSRB. The lime (if needed) and cement addition rates should be based upon classification testing performed on the actual proposed soils at the time of construction in accordance with Section 305.04(a).
- The aggregate base will serve to protect the subgrade, reduce pumping of fines, and reduce shrink/swell affects for the concrete pavement applications.

### 4.6.4 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. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

#### **4.6.5 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. Maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. 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. Additional engineering observation is recommended to determine the type and extent of a cost effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

### **5.0 GENERAL COMMENTS**

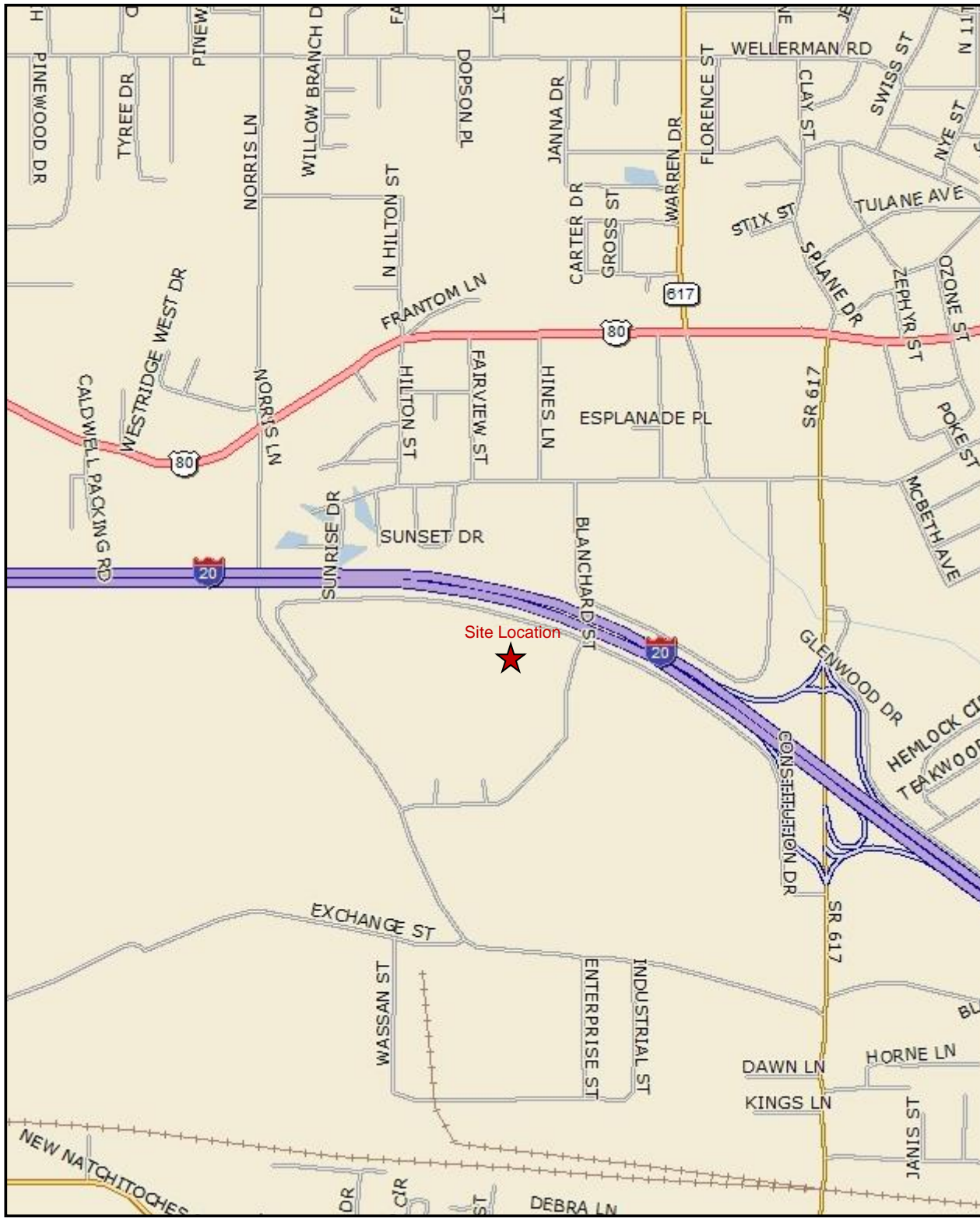
Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, 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. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

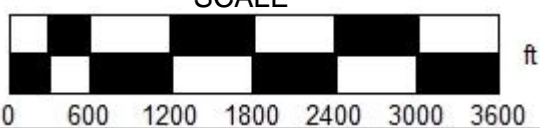
The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential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

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the 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.

**APPENDIX A**  
**FIELD EXPLORATION**



SCALE



Project Manager:	RPS	Project No.	EB135065
Drawn by:	AS	Scale:	As Shown
Checked by:	AS	File Name:	Exhibit A-1.EB135065
Approved by:	RPS	Date:	October 2013

**Terracon**

859 Pear Orchard Road  
PHONE (601) 956 4467

Ridgeland, Mississippi 39157  
FAX (601) 956 9533

**SITE LOCATION PLAN**  
**GEOTECHNICAL ENGINEERING REPORT**  
**PROPOSED LAQUINTA INN & SUITES**  
**CONSTITUTION DRIVE**  
**WEST MONROE, LOUISIANA**

EXHIBIT  
**A-1**

GRASS

GRASS

CONSTITUTION DRIVE

WOODED

B-5

B-4

B-1

PARKING LOT

PARKING LOT

PARKING LOT

PROPOSED LAQUINTA INN & SUITES

HOOTERS

B-6

B-3

PARKING LOT

WOODED

POOL AREA

B-2

PARKING LOT

B-7

PARKING LOT

PARKING LOT

B-8

B-9

COMMERCIAL PARKWAY

N



**LEGEND**



SITE APPROXIMATE BORING LOCATION

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

Project Mngr:	RPS	Project No.	EB135065
Drawn By:	RLW	Scale:	AS SHOWN
Checked By:	RPS/MRF	File No.	EGOE135065-2
Approved By:	RPS	Date:	NOV. 2013

**Terracon**  
Consulting Engineers and Scientists

859 Pear Orchard Road  
(601) 956-4467

Ridgeland, MS 39157  
(601) 956-9533

**BORING LOCATION PLAN**  
 GEOTECHNICAL ENGINEERING REPORT  
 PROPOSED LAQUINTA INN & SUITES  
 CONSTITUTION DRIVE  
 WEST MONROE, LA

**EXHIBIT**  
 A-2

## **Field Exploration Description**

The subsurface exploration consisted of drilling and sampling nine (9) borings at the property. The boring locations were laid out by the drill crew using a scaled drawing and GPS coordinates. Ground surface elevations at the boring locations were not available and have been omitted from the boring logs. The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled with a truck-mounted rotary drill rig using hollow-stem augers to advance the boreholes. Samples of the soil encountered in the borings were obtained using the undisturbed and split-barrel sampling procedures.

In the thick-wall tube sampling procedure, the relatively undisturbed samples were obtained by pushing a three-inch diameter, Shelby tube sampler a distance of two feet into the soil in general accordance with ASTM D1587. Depths at which these undisturbed samples were obtained are indicated by a shaded portion in the "Samples" column of the attached boring logs.

In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the middle 12 inches of the typical total 24-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N value). This value is used to estimate the in-situ relative density of cohesionless soils and consistency of cohesive soils.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the SPT-N value. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled in accordance with Mississippi state regulations.

A field log of each boring was prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

# BORING LOG NO. B-01

**PROJECT:** Proposed Laquinta Inn & Suites

**CLIENT:** MM Construction, LLC  
Mandeville, Louisiana

**SITE:** Constitution Drive  
West Monroe, Louisiana

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 32.5093° Longitude: 92.16574°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)				
0.3	<b>TOPSOIL</b>												
	<b>CLAYEY SAND (SC)</b> , brown and gray, loose to medium dense				18	1.25 (HP)				8			
4.0	<b>LEAN CLAY WITH SAND (CL)</b> , brown and gray, medium stiff to stiff				12	1.25 (HP)	UC	0.65	13.4	18	113	29-15-14 48	
		5			24	3.00 (HP)				13			
					10	2.50 (HP)				16			
8.0	<b>POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC)</b> , brown and gray, medium dense				16	8-11-13-18 N=24				10			
					16	5-8-10-9 N=18				14		12	
	- loose below 14'				16	3-3-2-5 N=5				20			
					16	3-3-4-6 N=7				18			
22.0	<b>CLAYEY SAND WITH GRAVEL (SC)</b> , brown and gray, loose				14	0-0-3-3 N=3				19		18	
					14	3-3-5-4 N=8				17			
26.0	<b>Boring Terminated at 26 Feet</b>												

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

Hammer Type: Automatic

Advancement Method:  
Hollow Stem Auger: 0' to 26'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:  
Borings backfilled with cement-bentonite grout upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

- Initially encountered
- After 3 hours



859 Pear Orchard Road  
Ridgeland, Mississippi

Boring Started: 10/2/2013

Boring Completed: 10/2/2013

Drill Rig: ATV

Driller: Contract

Project No.: EB135065

Exhibit: A-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-02

**PROJECT:** Proposed Laquinta Inn & Suites

**CLIENT:** MM Construction, LLC  
Mandeville, Louisiana

**SITE:** Constitution Drive  
West Monroe, Louisiana

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 32.50875° Longitude: 92.16561°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS		PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI		
0.3	<b>TOPSOIL</b>													
4.0	<b>CLAYEY SAND (SC)</b> , brown and gray, loose				12	3-3-4-9 N=7				8				
5.0	<b>LEAN CLAY WITH SAND (CL)</b> , brown and gray, stiff				12	5-3-2-2 N=5				8		26-13-13		
8.0	<b>FAT CLAY WITH SAND (CH)</b> , brown and gray, stiff				16	4-4-7-5 N=11				13				
10.0	<b>FAT CLAY WITH SAND (CH)</b> , brown and gray, stiff				16	3-4-5-8 N=9				15				
14.0	<b>POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC)</b> , brown and gray, dense		▽		16	3-6-7-10 N=13				22				
15.0	<b>POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC)</b> , brown and gray, dense				18	4-5-8-10 N=13				25		69-19-50	81	
20.0	- loose below 18'				18	11-15-15-16 N=30				12				
24.0	<b>Boring Terminated at 24 Feet</b>				18	4-4-3-7 N=7				17				
24.0	<b>Boring Terminated at 24 Feet</b>				20	3-4-5-9 N=9				18				

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

Hammer Type: Automatic

Advancement Method:  
Hollow Stem Auger: 0' to 24'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

- ▽ Initially encountered
- ▽ After 3.75 hours



Boring Started: 10/2/2013

Boring Completed: 10/2/2013

Drill Rig: ATV

Driller: Contract

Project No.: EB135065

Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-03

**PROJECT:** Proposed Laquinta Inn & Suites

**CLIENT:** MM Construction, LLC  
Mandeville, Louisiana

**SITE:** Constitution Drive  
West Monroe, Louisiana

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 32.50904° Longitude: 92.16567°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)				
0.3	<b>TOPSOIL</b>												
4.0	<b>CLAYEY SAND (SC)</b> , brown and gray, medium dense				16	3-4-6-7 N=10							
5.0	<b>LEAN CLAY WITH SAND (CL)</b> , brown and gray, very stiff  - stiff below 6'	5			14	8-6-7-6 N=13			9		23-15-8		
6.0					16	5-7-9-9 N=16			13				
7.0						10	7-7-6-7 N=13			11			
8.0						14	4-5-8-9 N=13			17		32-14-18	77
13.0	<b>Boring Terminated at 13 Feet</b>				12	1.75 (HP)			18				

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

Hammer Type: Automatic

Advancement Method:  
Hollow Stem Auger: 0' to 13'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



859 Pear Orchard Road  
Ridgeland, Mississippi

Boring Started: 10/2/2013

Boring Completed: 10/2/2013

Drill Rig: ATV

Driller: Contract

Project No.: EB135065

Exhibit: A-6

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-04

**PROJECT: Proposed Laquinta Inn & Suites**

**CLIENT: MM Construction, LLC  
Mandeville, Louisiana**

**SITE: Constitution Drive  
West Monroe, Louisiana**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 32.50943° Longitude: 92.1659°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)				
0.3	<b>TOPSOIL</b>												
	<b>SILTY CLAY (CL-ML)</b> , brown, very stiff - trace sand - medium stiff below 2'				16	3-7-12-11 N=19			7		17-13-4		
					16	6-3-4-4 N=7			11				
		5			14	2-2-2-3 N=4			16				
6.0	<b>Boring Terminated at 6 Feet</b>												

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

Hammer Type: Automatic

Advancement Method:  
Hollow Stem Auger: 0' to 6'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



859 Pear Orchard Road  
Ridgeland, Mississippi

Boring Started: 10/2/2013

Boring Completed: 10/2/2013

Drill Rig: ATV

Driller: Contract

Project No.: EB135065

Exhibit: A-7

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-05

**PROJECT:** Proposed Laquinta Inn & Suites

**CLIENT:** MM Construction, LLC  
Mandeville, Louisiana

**SITE:** Constitution Drive  
West Monroe, Louisiana

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 32.50952° Longitude: 92.16592°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)				
0.1	<b>TOPSOIL</b>												
	<b>CLAYEY SAND (SC)</b> , brown and gray, medium dense			X	14	6-8-8-11 N=16				11			
				X	14	7-7-9-11 N=16				13	24-13-11		
		5		X	12	8-10-11-10 N=21				15			
6.0	<b>Boring Terminated at 6 Feet</b>												

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

Hammer Type: Automatic

Advancement Method:  
Hollow Stem Auger: 0' to 6'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



859 Pear Orchard Road  
Ridgeland, Mississippi

Boring Started: 10/2/2013

Boring Completed: 10/2/2013

Drill Rig: ATV

Driller: Contract

Project No.: EB135065

Exhibit: A-8

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-06

**PROJECT:** Proposed Laquinta Inn & Suites

**CLIENT:** MM Construction, LLC  
Mandeville, Louisiana

**SITE:** Constitution Drive  
West Monroe, Louisiana

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 32.50909° Longitude: 92.16591°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)				
0.4	<b>TOPSOIL</b>												
0.4	<b>SILTY CLAY (CL-ML)</b> , brown, medium stiff				12	2-2-5-9 N=7			8		20-13-7		
	- stiff from 2' to 4'				10	8-6-5-6 N=11			6				
	- very stiff below 4'	5			14	3-4-12-18 N=16			7				
6.0	<b>Boring Terminated at 6 Feet</b>												

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

Hammer Type: Automatic

Advancement Method:  
Hollow Stem Auger: 0' to 6'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



859 Pear Orchard Road  
Ridgeland, Mississippi

Boring Started: 10/2/2013

Boring Completed: 10/2/2013

Drill Rig: ATV

Driller: Contract

Project No.: EB135065

Exhibit: A-9

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-07

**PROJECT:** Proposed Laquinta Inn & Suites

**CLIENT:** MM Construction, LLC  
Mandeville, Louisiana

**SITE:** Constitution Drive  
West Monroe, Louisiana

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 32.50873° Longitude: 92.16589°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)				
0.3	<b>TOPSOIL</b>												
	<b>SILTY CLAY (CL-ML)</b> , brown, stiff				12	3-3-7-9 N=10			9				
	- very stiff from 2' to 4'				14	8-8-8-6 N=16			7		18-13-5		
	- hard below 4'	5			16	9-15-21-22 N=36			7				
6.0	<b>Boring Terminated at 6 Feet</b>												

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

Hammer Type: Automatic

Advancement Method:  
Hollow Stem Auger: 0' to 6'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



859 Pear Orchard Road  
Ridgeland, Mississippi

Boring Started: 10/2/2013

Boring Completed: 10/2/2013

Drill Rig: ATV

Driller: Contract

Project No.: EB135065

Exhibit: A-10

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-08

**PROJECT: Proposed Laquinta Inn & Suites**

**CLIENT: MM Construction, LLC  
Mandeville, Louisiana**

**SITE: Constitution Drive  
West Monroe, Louisiana**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 32.50851° Longitude: 92.16566°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)				
0.3	<b>TOPSOIL</b>												
	<b>CLAYEY SAND (SC)</b> , brown and gray, loose - medium dense below 2'				16	3-4-4-4 N=8				12			
					14	3-4-6-7 N=10				14			
		5			14	2-4-7-6 N=11				12			
6.0	<b>Boring Terminated at 6 Feet</b>												

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

Hammer Type: Automatic

Advancement Method:  
Hollow Stem Auger: 0' to 6'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



859 Pear Orchard Road  
Ridgeland, Mississippi

Boring Started: 10/2/2013

Boring Completed: 10/2/2013

Drill Rig: ATV

Driller: Contract

Project No.: EB135065

Exhibit: A-11

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-09

**PROJECT:** Proposed Laquinta Inn & Suites

**CLIENT:** MM Construction, LLC  
Mandeville, Louisiana

**SITE:** Constitution Drive  
West Monroe, Louisiana

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 32.5085° Longitude: 92.16532°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)				
0.3	<b>TOPSOIL</b>												
	<b>CLAYEY SAND (SC)</b> , brown and gray, loose			X	18	4-5-3-2 N=8				12			
				X	16	2-3-2-3 N=5				14	27-14-13		
	- medium dense below 4'	5		X	16	2-5-8-11 N=13				14			
6.0	<b>Boring Terminated at 6 Feet</b>												

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

Hammer Type: Automatic

Advancement Method:  
Hollow Stem Auger: 0' to 6'

See Exhibit A-3 for description of field procedures.

Notes:

Abandonment Method:  
Borings backfilled with soil cuttings upon completion.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

*No free water observed*



859 Pear Orchard Road  
Ridgeland, Mississippi

Boring Started: 10/2/2013

Boring Completed: 10/2/2013

Drill Rig: ATV

Driller: Contract

Project No.: EB135065

Exhibit: A-12

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

**APPENDIX B**  
**SUPPORTING INFORMATION**

## **Geotechnical Engineering Report**

Proposed LaQuinta Inn & Suites ■ West Monroe, Louisiana

November 11, 2013 ■ Terracon Project No.EB135065



### **Laboratory Testing**

The laboratory testing program consisted of performing water content tests, Atterberg Limits, grain size determination tests and unconfined compression tests on representative soil samples. Information from these tests was used in conjunction with field penetration test data to evaluate soil strength in-situ, volume change potential, and soil classification. Results of these tests are provided on the boring logs included in Appendix A.












Descriptive classifications of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Also shown are estimated Unified Soil Classification Symbols. A brief description of this classification system is attached to this report in Appendix C. All classification was by visual manual procedures. Selected samples were further classified using the results of Atterberg limits and grain size distribution testing. The Atterberg limits test results and percent fines (i.e. percent passing the No. 200 sieve) are also provided on the boring logs.

Atterberg Limits provide a quantitative measure of the soil plasticity and are useful in evaluating the potential for the soil to change volume with variation in water content. The calibrated hand penetrometer has been correlated with unconfined compression tests and provides a better estimate of soil consistency than visual examination alone. Information from these tests was used in conjunction with field penetration test data to evaluate in-situ soil strength and volume change potential.

**APPENDIX C**  
**SUPPORTING DOCUMENTS**

# GENERAL NOTES

## DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

<b>SAMPLING</b>			<b>WATER LEVEL</b>		Water Initially Encountered	<b>FIELD TESTS</b>	(HP) Hand Penetrometer	
	<b>Auger</b>	<b>Split Spoon</b>			Water Level After a Specified Period of Time		(T) Torvane	
					Water Level After a Specified Period of Time		(b/f) Standard Penetration Test (blows per foot)	
	<b>Shelby Tube</b>	<b>Macro Core</b>		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.			(PID) Photo-Ionization Detector	
							(OVA) Organic Vapor Analyzer	
								
<b>Grab Sample</b>	<b>No Recovery</b>							

## 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.

<b>STRENGTH TERMS</b>	<b>RELATIVE DENSITY OF COARSE-GRAINED SOILS</b> (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			<b>CONSISTENCY OF FINE-GRAINED SOILS</b> (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.
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 PROPORTIONS OF SAND AND GRAVEL

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

## GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
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

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

## PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
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 <sup>A</sup>				Soil Classification	
				Group Symbol	Group Name <sup>B</sup>
<b>Coarse Grained Soils:</b> More than 50% retained on No. 200 sieve	<b>Gravels:</b> More than 50% of coarse fraction retained on No. 4 sieve	<b>Clean Gravels:</b> Less than 5% fines <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3$ <sup>E</sup>	GW	Well-graded gravel <sup>F</sup>
		<b>Gravels with Fines:</b> More than 12% fines <sup>C</sup>	Fines classify as ML or MH	GP	Poorly graded gravel <sup>F</sup>
			Fines classify as CL or CH	GM	Silty gravel <sup>F,G,H</sup>
		<b>Sands:</b> 50% or more of coarse fraction passes No. 4 sieve	<b>Clean Sands:</b> Less than 5% fines <sup>D</sup>	$Cu \geq 6$ and $1 \leq Cc \leq 3$ <sup>E</sup>	GC
	<b>Sands with Fines:</b> More than 12% fines <sup>D</sup>		Fines classify as ML or MH	SW	Well-graded sand <sup>I</sup>
			Fines classify as CL or CH	SP	Poorly graded sand <sup>I</sup>
	<b>Silts and Clays:</b> Liquid limit less than 50		<b>Inorganic:</b>	$PI > 7$ and plots on or above "A" line <sup>J</sup>	SM
		<b>Organic:</b>	Liquid limit - oven dried < 0.75	SC	Clayey sand <sup>G,H,I</sup>
<b>Fine-Grained Soils:</b> 50% or more passes the No. 200 sieve	<b>Silts and Clays:</b> Liquid limit 50 or more	<b>Inorganic:</b>	$PI < 4$ or plots below "A" line <sup>J</sup>	CL	Lean clay <sup>K,L,M</sup>
		<b>Organic:</b>	Liquid limit - not dried < 0.75	ML	Silt <sup>K,L,M</sup>
			$PI$ plots on or above "A" line	OL	Organic clay <sup>K,L,M,N</sup>
		<b>Highly organic soils:</b>	<b>Inorganic:</b>	$PI$ plots below "A" line	OH
	<b>Organic:</b>		Liquid limit - oven dried < 0.75	CH	Fat clay <sup>K,L,M</sup>
			Liquid limit - not dried < 0.75	MH	Elastic Silt <sup>K,L,M</sup>
					OH
				OH	Organic silt <sup>K,L,M,Q</sup>
		PT		Peat	

<sup>A</sup> Based on the material passing the 3-inch (75-mm) sieve

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> 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.

<sup>D</sup> 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

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

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup>  $PI \geq 4$  and plots on or above "A" line.

<sup>O</sup>  $PI < 4$  or plots below "A" line.

<sup>P</sup>  $PI$  plots on or above "A" line.

<sup>Q</sup>  $PI$  plots below "A" line.

