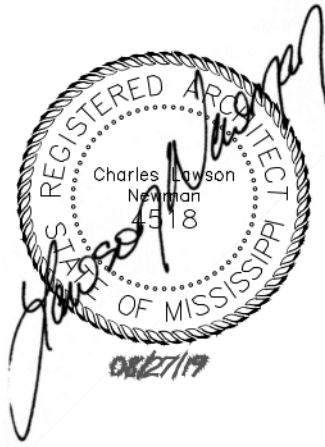


**Facility Improvement:  
(Site Improvements)**

**Project: GS 383-001**

WFT Architects, P.A.  
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**ADDENDUM NO. 1:**

**Date of Addendum: August 27, 2019**

**This addendum forms a part of the Contract Documents and modifies the original Drawings and Project Manual dated June 17, 2019.**

**PROJECT MANUAL**

<b>Item No. 1</b>	<b>Project Manual Appendix</b>
<b>Revise:</b>	Add to the end of the Project Manual the Geotechnical Exploration Report included in this Addendum as Attachment 1.

**END OF ADDENDUM NO. 1**

# BURNS COOLEY DENNIS, INC.

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April 12, 2019

Lawson Newman, AIA  
WFT Architects, P.A.  
770 North State Street  
Jackson, Mississippi 39202

Report No. 190137

**Geotechnical Exploration  
Proposed Parking Lot and Retaining Wall  
Wright & Ferguson Facility  
Jackson, Mississippi**

Dear Mr. Newman:

Submitted here is the report of our geotechnical exploration for the above-captioned project. This exploration was authorized by your execution of our contract agreement on March 13, 2019 and was generally performed in accordance with our Proposal No. 19001P-58 dated February 28, 2019.

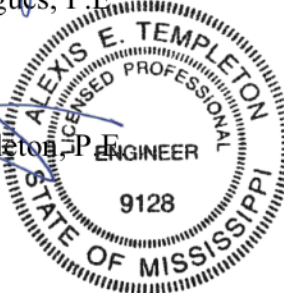
We appreciate the opportunity to be of service. If you should have any questions concerning this report, please do not hesitate to call us.

**Note:** At the time of the geotechnical exploration, a retaining wall was being considered as part of the design scope of work. It was later determined that the retaining wall would not be necessary. The current scope of work does not include a retaining wall. To avoid confusion, references to the retaining wall and its design have been struck from the report. Lawson Newman, WFT Architects, P.A. 08-27-2019

Very truly yours,

BURNS COOLEY DENNIS, INC.

*Marcos V. F. Rodrigues*  
Marcos V. F. Rodrigues, P.E.

*A. E. Templeton*  
A. E. (Eddie) Templeton, P.E.  


AET/MR/khb  
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FIGURES

## 1.0 INTRODUCTION

Plans are being made for the construction of new parking lots ~~and a retaining wall~~ at the Wright & Ferguson facility located at 350 High Street in Jackson, Mississippi. ~~The retaining wall will begin at the southwest corner of Building 2 and extend about 20 ft south of the building. We understand the retaining wall will have a maximum height of 6 ft.~~ New parking lots will be constructed around the existing buildings. The planned construction areas are open and covered with asphalt and/or concrete pavement. We understand the existing pavements are to be demolished and removed. A site plan showing the layout of the ~~retaining wall and~~ parking lots is presented on Figure 1 of this report.

The specific purposes of this exploration were:

- 1) to make exploratory soil borings within the areas planned for construction of the ~~retaining wall and~~ parking lots;
- 2) to verify field classifications and to evaluate pertinent physical properties of the soils encountered in the borings by means of visual examination of the soil samples in the laboratory and routine tests performed on the samples; and
- 3) after analysis of the soil boring and laboratory test data, to provide recommendations for site preparation and earthwork construction, and to also provide guideline recommendations for ~~retaining wall and~~ pavement design and construction.

## 2.0 FIELD INVESTIGATION

### 2.1 General

Subsurface soil conditions were explored for this exploration by means of eight borings. The approximate locations of the borings are shown on Figure 1. The borings were located in the field by means of visual sighting and taped measurements from existing site features using distances scaled from the site plan we were furnished.

All soils were classified in general accordance with the Unified Soil Classification System. A synopsis of the Unified Soil Classification System is presented on Figure 2 along with symbols and terminology typically utilized on graphical soil boring logs. Logs of the soil borings are presented on Figures 3 through 10. The graphical logs illustrate the types of soil and stratification encountered with depth below the existing ground surface at the individual boring

locations. Surface elevations included at the top of the graphical boring logs were estimated from elevation contours shown on a topographic survey map provided and therefore, should be considered approximate. Approximate GPS coordinates for the boring locations as determined using a hand-held device are shown at the bottom of the graphical logs within the "Comments" section.

## **2.2 Drilling Methods and Groundwater Observations**

Boring 1 was made to a depth 40 ft near the alignment of the proposed retaining wall. Borings 2 through 8 were made to an exploration depth of 6 ft within the parking lot areas. The borings were advanced full depth by dry augering. Observations were made continuously during auger drilling to detect free water entering the open boreholes. Notes pertaining to groundwater observations are included at the bottom right corner of the graphic boring logs.

## **2.3 Sampling Methods**

Relatively undisturbed samples of the soils encountered in Boring 1 were obtained by pushing a 3-in. OD Shelby tube sampler approximately 1.5 ft to 2 ft into the soil. The Shelby tube samples were obtained within the depth intervals illustrated as shaded portions of the "Samples" column of the graphic log for Boring 1. A disturbed sample of the soils encountered in Boring 1 was obtained by driving a standard 2-in. OD split-spoon sampler 18 in. into the soil with a 140-lb hammer falling freely a distance of 30 in. The depth at which the split-spoon sample was taken is illustrated as a crossed rectangular symbol under the "Samples" column of the graphic log for Boring 1. Standard penetration test (SPT) blow count resulting from split-spoon sampling is recorded under the "Blows Per Ft" column of the log for Boring 1. The Shelby tube and/or split-spoon samples were obtained at approximate 3-ft to 5.5-ft depth intervals in Boring 1. Disturbed auger cutting samples were obtained at approximate 2-ft to 3-ft depth intervals in Borings 2 through 8. A disturbed auger cutting sample was also obtained near the ground surface in Boring 1. The depths at which the auger cutting samples were taken are illustrated as small I-shaped symbols under the "Samples" column of the graphic boring logs.

## **2.4 Field Classification, Sample Preservation and Borehole Abandonment**

All soils encountered during drilling were examined and classified in the field by a geotechnical engineering technician. Each undisturbed Shelby tube sample was extruded from

the sampling tube in the field. An approximate 6-in. long portion of each Shelby tube sample was sealed with melted paraffin in a cylindrical cardboard container to prevent moisture loss and structural disturbance. An additional portion of each Shelby tube sample, a representative portion of the split- spoon sample and the auger cutting samples were sealed in jars to provide material for visual examination and testing in the laboratory. In compliance with Mississippi Department of Environmental Quality (MDEQ) regulations, the 40-ft deep borehole was filled with cement-bentonite grout after completion of drilling and sampling. The remaining boreholes were plugged with soil cuttings. The borings were also patched at the surface with cold mix asphalt.

### **3.0 LABORATORY TESTING**

#### **3.1 General**

All of the soil samples from the borings were examined in the laboratory and tests were performed on selected samples to verify field classifications and to assist in evaluating the strengths and volume change properties of the soils encountered. The types of laboratory tests performed are described in the following paragraphs.

#### **3.2 Strength Tests**

The undrained shear strength characteristics of the soils encountered in the borings were investigated by means of visual estimates of consistency, from the results of the field standard penetration test and from the results of one unconfined compression test and two unconsolidated undrained (UU) triaxial compression tests performed on selected undisturbed Shelby tube samples from Boring 1. The result of the unconfined compression test in terms of a cohesion is plotted as a small open circle in the data section of the graphic log for Boring 1. The cohesions resulting from the UU triaxial compression tests are plotted as small open triangles in the data section of the graphic log for Boring 1. The water content and dry density were also determined for each compression test specimen. The water contents are plotted as small shaded circles in the data section of the logs. The dry densities are tabulated to the nearest lb per cu ft under the “Dry Density” column of the graphic log for Boring 1.

### **3.3 Classification Tests**

The classifications and volume change properties of the fine-grained soils encountered in the borings were investigated by means of Atterberg liquid and plastic limit tests performed on selected representative samples. The results of the liquid and plastic limit tests are plotted as small crosses interconnected by dashed lines in the data section of the graphic boring logs. In accordance with the Unified Soil Classification System, fine-grained soils are classified as either clays or silts of low or high plasticity based on the results of Atterberg limit tests. The numerical difference between the liquid limit and plastic limit is defined as the plasticity index (PI). The magnitudes of the liquid limit and plasticity index and the proximity of the natural water content to the plastic limit are indicators of the potential for a fine-grained soil to shrink or swell upon changes in moisture content or to consolidate under loading. The proximity of the natural water content to the plastic limit is also an indicator of soil strength.

The classifications of soils consisting predominantly of sand were investigated by means of minus No. 200 sieve tests performed on selected samples. The percentages of fines resulting from the minus No. 200 sieve tests are tabulated at the appropriate depths under the “% Passing No. 200 Sieve” column of the graphic boring logs.

### **3.4 Water Content Tests**

Water content tests were performed on samples to corroborate field classifications and to extend the usefulness of the strength, plasticity and field SPT blow count data. The results of the water content tests are plotted as small shaded circles in the data section of the graphic boring logs. The water content data have been interconnected on the logs to illustrate a continuous profile with depth.

## **4.0 GENERAL SUBSURFACE CONDITIONS**

### **4.1 General**

A general description of subsurface soil and groundwater conditions revealed by the borings made for this exploration is provided in the following paragraphs. The graphical logs shown on Figures 2 through 10 should be referred to for specific soil and groundwater conditions encountered at each boring location. Stick logs of the borings are shown on Figure 11 to aid in visualizing subsurface soil conditions. Tabulated adjacent to the stick logs are Atterberg liquid

and plastic limits, water contents, dry densities, cohesions, field SPT blow count and percentages of fines passing the No. 200.

Fill materials were present at the boring locations. It should be understood that it is difficult to distinguish fill from natural soils, and the near-surface soils at some of the boring locations not designated as fill on the graphical logs could actually be fill materials. It is possible that the fill was placed in an “uncontrolled” manner without observation and testing by a geotechnical engineering firm. With the exception of Boring 6, the soil samples did not contain large concentrations of deleterious material. It should be understood that the borings are only representative of the conditions at the boring locations and there could be weaker and more compressible fill materials at locations not explored during this exploration. It is not practical to fully characterize old fill materials by means of borings.

## 4.2 Soil Stratification

**4.2.1 Retaining Wall Boring.** ~~Boring 1 was made near the alignment of the proposed retaining wall.~~ Boring 1 was made within existing asphalt pavement and the pavement thickness was found to be about 3 in. The asphalt pavement at Boring 1 was found to be underlain by silty clay (CL) fill materials to a depth of about 8 ft. The silty clay (CL) fill materials are classified as stiff with respect to consistency to a depth of about 4 ft, and then medium stiff to a depth of about 8 ft. The stiff silty clay (CL) fill materials are considered to have moderate strength and moderate compressibility. The medium stiff silty clay (CL) fill materials are considered to have low-moderate strength and moderate-high compressibility. The silty clay (CL) fill materials are considered to have low shrink/swell potential.

Natural silty clays (CL) were encountered within the approximate depth interval of 8 ft to 12 ft at Boring 1. The silty clays (CL) are classified as very stiff with respect to consistency and are considered to have high strength and low compressibility. The silty clays (CL) are considered to have low shrink/swell potential.

Weathered Yazoo clays (CH) were encountered within the approximate depth interval of 12 ft to 27 ft at Boring 1. The weathered Yazoo clays (CH) are classified as very stiff with respect to consistency and are considered to high strength and low compressibility. Slickensides were noted in the weathered Yazoo clays (CH). Slickensides are randomly oriented micro-failure planes within weathered Yazoo clays (CH) caused by differential shrink/swell movements in the

geologic past. The weathered Yazoo clays (CH) are expansive with very high shrink/swell potential.

Clayey sands (SC) of the Moody's Branch formation were encountered within the approximate depth interval of 27 ft to 36 ft at Boring 1. The clayey sands (SC) are characterized as medium dense and are considered to have moderate-high strength and low compressibility. The clayey sands (SC) have no potential for shrinking and swelling.

Sandy clays (CL) of the Moody's Branch formation were encountered from a depth of about 36 ft to the 40-ft termination depth of Boring 1. The sandy clays (CL) are classified as medium stiff with respect to consistency and are considered to have low-moderate strength and moderate-high compressibility. The sandy clays (CL) are considered to have low shrink/swell potential.

**4.2.2 Pavement Borings.** Borings 2 through 8 were made within the proposed parking lot areas. The borings were made within existing asphalt pavement. The pavement thickness was found to be about 2 in. at Boring 2 through 7 and about 3 in. at Boring 8. Fill materials were encountered beneath the asphalt pavement at the locations of Borings 2, 3, 5, 6 and 8. The fill materials extend to depths of 2 ft and 2.5 ft at Borings 2, 3 and 8 and to the 6-ft termination depths of Borings 5 and 6. The fill materials encountered in the borings were noted to contain traces of organic matter, roots, sand and gravel within some depth intervals. The apparent fill materials consist of silty clays (CL), clays (CH) and clayey sand (SC). The silty clay (CL) fill materials are classified as medium stiff and stiff with respect to consistency. The clayey sand (SC) fill materials are characterized as medium dense. The silty clay (CL) fill materials are considered to have low shrink/swell potential. The clayey sand (SC) fill materials have no potential for shrinking and swelling. Stiff silty clays (CL) and medium dense clayey sands (SC) provide moderate support for pavements. At their current moisture contents, the medium stiff silty clays (CL) will provide poor support for pavements.

Clay (CH) fill materials were encountered from a depth of about 2 ft to the 6-ft termination depth of Boring 5. The clay (CH) fill materials are classified as very stiff with respect to consistency. The clay (CH) fill materials are considered to have moderate shrink/swell potential. Clays (CH) are generally considered to provide poor support for pavements.

Apparent natural silty clays (CL) were encountered from the asphalt pavement to the 6-ft termination depth of Boring 7 and from depths of about 2 ft and 2.5 ft to the 6-ft termination

depths of Borings 2, 3 and 8. The natural silty clays (CL) encountered at Boring 7 are classified as stiff with respect to consistency. The remaining silty clays (CL) are classified as medium stiff. The silty clays (CL) are considered to have low shrink/swell potential. Stiff silty clays (CL) provide moderate support for pavements. At their current moisture contents, the medium stiff silty clays (CL) will provide poor support for pavements.

Natural clays (CH) were encountered directly below the pavement at Boring 4. The clays (CH) are classified as stiff with respect to consistency. The clays (CH) are considered to have moderate shrink/swell potential. Clays (CH) are generally considered to provide poor support for pavements.

### **4.3 Groundwater**

Free water was not encountered during auger drilling for the borings. In our opinion, groundwater conditions at the site will be influenced by rainfall, surface drainage, and by the rise and fall of water levels in any nearby ditches, creeks, ponds, or other bodies of water. Groundwater conditions at the site can also be influenced by man-made changes. Surficial soils can become saturated and weak to relatively shallow depths during periods of prolonged and heavy rainfall.

## **5.0 DISCUSSION**

### **5.1 General Soil Conditions**

Subsurface soils encountered within the 40-ft maximum exploration depth of the borings made for this exploration include silty clay (CL), clay (CH) and clayey sand (SC) fill materials and natural soils consisting silty clays (CL), clays (CH), weathered Yazoo clays (CH) and clayey sands (SC) and sandy clays (CL) of the Moody's Branch formation. The silty and sandy clays (CL) are considered to have low shrink/swell potential. The clayey sands (SC) have no potential for shrinking and swelling. The clays (CH) are considered to have moderate shrink/swell potential. The weathered Yazoo clays (CH) are expansive with very high shrink/swell potential. Stiff silty clays (CL) and medium dense clayey sands (SC) provide moderate support for pavements. Clays (CH) and medium stiff silty clays (CL) provide poor support for pavements.

The fill materials encountered in the borings were noted to contain traces of organic matter, roots, sand and gravel within some depth intervals. It should be understood that the borings are

only representative of the conditions at the boring locations and there could be relatively weak and compressible fill materials at locations not explored during this investigation. It is not practical to fully characterize old fill materials by means of borings.

## 5.2 Geotechnical-Related Design Considerations

~~It is our understanding that a cast-in-place, reinforced concrete cantilever retaining wall will be required to accommodate changes in grade near the southwest corner of Building 2. We also understand the proposed retaining wall will have a maximum height of about 6 ft. Based on the conditions encountered at Boring 1, it appears the base of the wall will be founded in stiff and/or medium stiff silty clay (CL) fill materials. The highly expansive weathered Yazoo clays (CH) were encountered at a depth of about 12 ft in Boring 1. We do not consider the weathered Yazoo clays (CH) to be a concern related to design and performance of the retaining wall.~~

It is our opinion that either flexible asphalt concrete or rigid Portland cement concrete pavement can be utilized for the parking lots, provided not less than 3 ft of strong, low shrink/swell subgrade soils directly underlie the asphalt concrete pavement and/or Portland cement concrete pavement. Within the planned construction areas for the parking lots, expansive clays (CH) were encountered directly beneath the asphalt pavement at Boring 4 and at a depth of about 2 ft at Boring 5. Expansive clays (CH) were not encountered at the other pavement boring locations. Depending on pavement finished grades, undercutting and backfilling could be required to remove expansive clays (CH) and provide for the placement of the recommended minimum buffer thickness beneath the pavement structures.

Some excavation and replacement of medium stiff silty clay (CL) fill and natural soils may be required to provide a stable subgrade for pavements. Medium stiff silty clays (CL) were encountered directly beneath the pavement at Boring 6 and at depths ranging from 2 ft to 2.5 ft at Borings 2, 3 and 8. Due to the elevated moisture contents in the medium stiff silty clays (CL), pumping or yielding of the subgrade could occur within the pavement areas during scarification/compaction. Depending on the time of year when earthwork is performed, the relatively high moisture content silty clays (CL) could dry and become stronger. This would particularly be the case in the late summer and early fall. If the high moisture content silty clays (CL) have not dried and become stronger by the time earthwork is initiated and pumping or yielding of the subgrade does occur, it may be necessary to either process and dry, bridge, chemically stabilize or remove weak subgrade soils within the pavement areas.

Details of our recommendations for site preparation and earthwork construction for the parking lots ~~and retaining wall~~ are included in the following subsections of this report. Guideline recommendations for retaining wall design and pavement construction are also provided.

## 6.0 RECOMMENDATIONS

### 6.1 Site Preparation and Earthwork Construction

Unless otherwise noted, our recommendations for earthwork construction are the same for the ~~retaining wall and~~ pavement areas. As an initial step of site preparation within the planned construction areas, existing structures, foundations, pavement, underground utilities or pipes, and any other subsurface obstructions that might interfere with earthwork, retaining wall and pavement construction should be removed and/or relocated. Stripping should then be performed throughout the construction areas to remove organic-laden surficial soils, vegetation, debris, brush and roots. Next, excavation should be performed to remove any weak soils encountered during stripping. As previously mentioned, some excavation and replacement of medium stiff silty clay (CL) fill and natural soils may be required to provide a stable subgrade for pavements. Medium stiff silty clays (CL) were encountered directly beneath the pavement at Boring 6 and at depths ranging from 2 ft to 2.5 ft at Borings 2, 3 and 8. The medium stiff soils extend to a depth of 2 ft at Boring 6 and to the 6-ft termination depth of Borings 2, 3 and 8. The actual vertical and lateral extent of excavation required to remove weak soils and fill materials must be determined in the field during earthwork construction. Excavation of weak and fill soils should extend laterally not less than 3 ft beyond the edges of pavements and not less than 4 ft beyond the edges of the retaining wall footing.

Depending on finished grades, undercutting should then be performed within the pavement areas within the vicinities of Borings 4 and 5 to create the recommended 3-ft thick buffer of low permeability and low shrink/swell potential soils over the moderately expansive clays (CH). The actual vertical and lateral extent of undercutting required to remove expansive clays (CH) must be determined in the field during earthwork construction. Undercutting to remove expansive clays (CH) should extend laterally not less than 3 ft beyond the edges of pavements.

In order to minimize the amount of excavation and undercutting, we recommend that a representative of Burns Cooley Dennis, Inc. be present to observe excavation/undercutting

operations and assist in evaluating any evidence of poor compaction and/or isolated areas containing high concentrations of organic matter, wood, rubble and other deleterious matter and the depth and lateral extent of any excavation and undercutting required. Excavation and undercutting should be performed in accordance with all applicable OSHA regulations. Depending on the season when earthwork is performed, groundwater could be encountered during any excavation and undercutting. The means and methods for intercepting, collecting and removing groundwater entering excavations should be the sole responsibility of the earthwork contractor.

Prior to the placement of any fill materials, the soils exposed after stripping, excavation and/or undercutting should be scarified to a minimum depth of 6 in. and compacted to not less than 95 percent of standard Proctor maximum dry density (ASTM D 698) with stability present. Alternatively, the exposed soils can be proofrolled with a loaded dump truck to demonstrate stability. Stability is defined as the absence of significant pumping, rutting or yielding or soils during compaction or proofrolling. Scarification/compaction or proofrolling are not recommended in areas where bridging will be performed. If stability is not evident in some areas, either additional excavation, drying by processing, treatment of the in-situ soils with an admixture, or a combination of these approaches, might be required to achieve stable conditions.

The effort required to mitigate unstable soils will be influenced by the season of the year when earthwork is performed. At the time of our field exploration, some of the subsurface soils encountered at the boring locations were found to have water contents higher than the optimum moisture content, and these soils will most likely exhibit instability when exposed to construction traffic after stripping and excavation. The subsurface soils would likely be dryer during the hot late summer and could weaken during heavy rainfall events. We recommend that earthwork be performed during a dry summer or fall season, if the schedule permits. It should be recognized that soils which are demonstrated to be adequately stable during stripping, excavation, scarification/compaction and/or proofrolling can become unstable if they are disturbed by construction traffic or if they are exposed to rainfall prior to filling.

The construction techniques and types of equipment utilized and site drainage provided during construction will have a great effect on the performance of these soils throughout the project. The routing of heavy rubber-tired equipment should be controlled to minimize, as much as possible, traffic over the site. All traffic should be discouraged during periods of inclement weather. It should be recognized that soils which are demonstrated to be adequately stable during

stripping, excavation or compaction in-place can become unstable if they are disturbed by construction traffic or are exposed to additional rainfall prior to filling.

If pumping is initiated, the pumping can be counteracted by treating these materials with hydrated lime. It is estimated that about 4 to 6 percent hydrated lime by dry weight of soil could be required.

For the parking lot areas, if excessive excavation is required to remove weak soils and expose stable soils, bridging over unstable soils could be performed. Excavation of weak soils should extend to a sufficient depth to provide for the placement of the bridging lift and not less than 3 ft of strong subgrades soils to directly underlie the pavement structure. Bridging should only be performed with the approval and under the observation of the project geotechnical engineer or his representative. Bridging materials should consist of either clean sands (SP) or slightly silty sands (SP-SM) with less than 10 percent fines passing the No. 200 sieve. We recommend that the bridging lift be no more than 18 in. thick. No specific compaction is required for the bridging lifts. A geotextile could be utilized beneath the bridging materials to initiate compaction with stability. We recommend that the geotextile utilized for this purpose consist of Type V geotextile as specified in the Mississippi Standard Specifications for Road and Bridge Construction

We recommend that backfilling and filling to achieve planned grades follow immediately after stripping, excavation, undercutting, bridging, scarification/compaction and/or proofrolling. Imported fill materials should consist of select, nonorganic and debris-free silty clays (CL) or sandy clays (CL) having a plasticity index (PI) within the range of 10 to 24 and a liquid limit less than 45. Excavated on-site soils that are free of organic matter, do not include other deleterious materials, and meet the requirements described above for imported select fill materials can be used as fill within the ~~retaining wall and~~ pavement areas. Any excavated soils that do not meet these recommendations for select fill can be used as fill materials outside the ~~retaining wall and~~ pavement areas.

The fill soils should be compacted from lifts not exceeding 9 in. in loose thickness to not less than 98 percent of standard Proctor maximum dry density (ASTM D 698) at moisture contents within 3 percentage points of the optimum water content. Where hand-held compactors are used, the loose lift thickness should be limited to a maximum of 5 in. Stability must be evident during compaction of each lift before any subsequent lifts of fill material are added. Fill materials should extend laterally not less than 3 ft beyond pavement edges and then slope down

to natural ground at an inclination not steeper than 3H:1V. Finished site grades should be sloped to promote quick runoff of storm water and provide positive drainage across the parking lot areas.

Laboratory classification tests, including Atterberg limit determinations and grain-size analyses, should be performed on the fill soils initially and routinely during earthwork operations to check for compliance with the recommendations provided herein. Field moisture/density tests should be performed frequently in the scarified and compacted on-site soils and in each compacted lift of fill material to assist in evaluating whether the recommended moisture contents and dry densities are being achieved. As a guide for pavement earthwork construction, we suggest one moisture/density test per lift for each 5,000 sq ft of surface area or portion thereof.

## **6.2 ~~Guideline Retaining Wall Recommendations~~**

~~It is our understanding that a cast-in-place, reinforced concrete cantilever retaining wall will be required to accommodate changes in grade near the southwest corner of Building 2. We also understand the proposed retaining wall will have a maximum height of about 6 ft. Based on the conditions encountered at Boring 1, it appears the base of the wall will be founded in stiff and/or medium stiff silty clay (CL) fill materials.~~

~~The cantilever retaining wall will be subjected to lateral earth and water pressures. We expect the retaining wall will experience sufficient rotation or lateral deflection for active earth pressure conditions to develop. For the relatively short retaining wall, we recommend that backfill soils consist of silty or sandy clays (CL). The silty or sandy clays (CL) should have a liquid limit less than 45, a plasticity index (PI) within the range of 10 to 24. Our recommendations for estimating active earth pressures and water pressures are illustrated on Figure 12.~~

~~Analyses should be conducted to check the sliding and overturning stability of the cantilever retaining wall. For those analyses, we recommend that a friction angle of 20 degrees be utilized in computing the frictional resistance between the soil and concrete along the base of wall footing. We recommend the use of equivalent fluid unit weights of 200 lbs per cu ft for unsubmerged conditions and 150 lbs per cu ft for submerged conditions in developing a triangular passive earth pressure distribution. For the continuous wall footing bearing on strong fill materials or strong natural soils or compacted select fill, we recommend a maximum allowable bearing pressure of 1,500 lbs per sq ft.~~

~~To facilitate drainage and to minimize the development of water pressures acting on the retaining wall, we recommend the inclusion of some form of drainage system at the base of the wall stem. The drainage system should consist of a coarse open-graded aggregate separated from the backfill by a nonwoven geotextile. The drainage system should include a perforated PVC collector pipe placed adjacent to the wall on top of the footings. The collector pipe should be sloped to drain by gravity to some point downhill from the retaining wall.~~

~~We recommend that wall backfill materials be compacted to not less than 95 percent of standard Proctor maximum dry density (ASTM D 698) at moisture contents within 3 percentage points of the optimum water content. We recommend that wall backfill materials be compacted from maximum 9-in. thick loose lifts to not less than 95 percent of standard Proctor maximum dry density at moisture contents within 3 percentage points of the optimum water content. To avoid inducing excessive lateral pressures upon the wall, we recommend that motorized compaction equipment such as rollers or vibratory compactors be operated no closer than 3 ft from the wall. In this 3-ft wide zone immediately adjacent to the cantilever retaining wall, we recommend compaction of the backfill in maximum 5-in. thick loose lifts utilizing hand-operated mechanical tampers. Stability must be evident during compaction of each lift before any subsequent lifts of fill material are added. Stability is defined as the absence of significant pumping, rutting or yielding of soils during compaction.~~

~~Laboratory classification tests, including grain size analyses and Atterberg limit determinations, should be performed on the cantilever retaining wall backfill soils initially and routinely during earthwork operations to check for compliance with the recommendations provided herein. Field moisture/density tests should be performed frequently in each compacted lift of backfill to assist in evaluating whether the recommended moisture contents and dry densities are being achieved.~~

### **6.3 Guideline Pavement Recommendations**

In areas to be paved, there is often some delay between completion of earthwork operations and placement of the pavement structure materials, possibly resulting in deterioration of subgrade conditions. Therefore, we recommend that density and stability of the subgrade soils be confirmed or re-established immediately prior to construction of the pavement.

In our opinion, either flexible asphalt concrete or rigid Portland cement concrete (PCC) pavement can be utilized for the pavement areas. Site preparation and earthwork construction

should be performed for the parking lots in accordance with the recommendations given in the "Site Preparation and Earthwork Construction" section of this report. Guideline pavement recommendations are given in the following paragraphs that represent typical construction practice. However, we recommend that pavement thicknesses be verified for the actual expected traffic volumes and loadings using appropriate design parameters for the subgrade soils and pavement structure materials. If the subgrade soils are prepared and select fill materials are placed within the areas to be paved in accordance with recommendations provided in this report, it is our opinion that a CBR of 5 would be appropriate to use as the subgrade support value for flexible asphalt concrete pavement. For PCC pavements, it is our opinion that a modulus of subgrade reaction (k) of 150 lbs per cu in. would be appropriate for the subgrade support value. Where a 6-in. thick granular subbase is utilized under PCC pavements as described in this report, the modulus of subgrade reaction can be increased up to 325 lbs per cu in.

It is our opinion that chemical treatment of the subgrade soils with hydrated lime will provide the best performing pavement system during construction and will extend the service life of the pavement. We recommend lime treatment for the top 12 in. of the subgrade utilizing 6 percent hydrated lime by dry weight of soil. The lime-treated subgrade soils should be compacted to not less than **98 percent** of standard Proctor maximum dry density (ASTM D 698). The lime treatment should be in accordance with Section 307 of the 2017 Edition of the Mississippi Standard Specifications for Road and Bridge Construction using the Class C lime treatment procedure. The lime treatment should extend not less than 2 ft beyond the back of curb or edge of pavement.

For light automobile and pickup truck traffic, the flexible pavement structure could consist of a 2-in. thick asphalt surface course and a 4-in. thick asphalt base course on the prepared subgrade soils. A thicker asphalt concrete pavement section should be utilized if the flexible pavement will be subjected to heavy truck traffic. For the heavier loading, the flexible pavement structure could consist of a 2-in. thick asphalt surface course and a 6-in. thick asphalt base course on the prepared subgrade soils. The asphalt concrete surface course materials should conform with all applicable specifications for SC-1, Type 8 presented in the 1990 Edition of the Mississippi Standard Specifications for Road and Bridge Construction. The asphalt concrete base course materials should conform with all applicable specifications for BB-1, Type 6.

For rigid pavement, jointed plain (un-reinforced) PCC pavement can be utilized with limited use of steel reinforcement such as described herein. The minimum compressive strength

of the concrete mixture should be 4,000 lbs per sq in. It is our opinion that a 5-in. thick PCC pavement cast directly upon the prepared subgrade soils would be appropriate for light automobile and pickup truck traffic. For heavy truck traffic, a 7-in. thick PCC pavement directly underlain and separated from the prepared subgrade soils by a granular subbase would likely be required. We recommend the use of 8-in. thick PCC pavement directly underlain and separated from the prepared subgrade soils by a granular subbase immediately in front of any garbage dumpsters to provide support for the wheels of a garbage truck during loading.

We recommend the use of a 6-in. thick granular subbase directly under PCC pavements that support heavy truck traffic. This granular subbase is part of the pavement structure and prevents subgrade soils from pumping up through joints. We recommend that the granular subbase materials consist of No. 610 crushed limestone. The portion of the crushed limestone passing the No. 40 sieve should have a liquid limit not greater than 25 and a plasticity index not greater than 5. The crushed limestone should be compacted to not less than **100 percent** of standard Proctor maximum dry density (ASTM D 698) at moisture contents within 2 percentage points of the optimum water content. The pavement surface should be sufficiently elevated to allow drainage of the granular subbase.

General guidance for the design and construction of PCC pavements is presented in ACI 330 “Guide for the Design and Construction of Concrete Parking Lots,” including proper jointing, thickened edges that receive heavy truck traffic, thickened edges or load transfer devices at construction joints, tie-bars, and steel reinforcement in irregular shaped slabs or panels. Joints should form panels that are approximately square with the longest panel dimension no more the 1.25 times the shortest panel dimension. The maximum joint spacing should be 10 ft for 5-in. thick and 15 ft for the 7-in. or 8-in. thick PCC pavements. The pavement joints should be properly sealed and maintained. We recommend that a jointing plan and details be developed for construction of the PCC pavements. Burns Cooley Dennis, Inc. can be contracted to provide this additional service if we are provided with a CAD file of the proposed site. As an alternative, BCD can be contracted to review and approve jointing layouts and details that are generated by others. The surface of the pavement should be crowned and sloped to promote quick runoff of storm water.

#### **6.4 Other Design and Construction Considerations**

We recommend that foundation excavations be left open for the shortest possible duration to minimize exposure of the bearing soils to rainfall. Drainage should be maintained away from the foundation excavations during construction. Soils exposed in the bottom of the excavations should be observed prior to concrete placement. If these materials are found to be weak or loose, overexcavation and backfilling will be required to provide strong soils immediately beneath the structures.

Trees remove water from the ground by transpiration causing vertical and horizontal shrinkage of fine-grained soils. To minimize these effects, we recommend that any trees planted for landscaping purposes be located at least one-half their anticipated mature height away from the retaining wall. If the risk of more movement is acceptable to the owner, a less strict retaining walls-to-tree spacing of about 25 ft for hardwoods and 15 ft for pines could be utilized.

#### **7.0 REPORT LIMITATIONS**

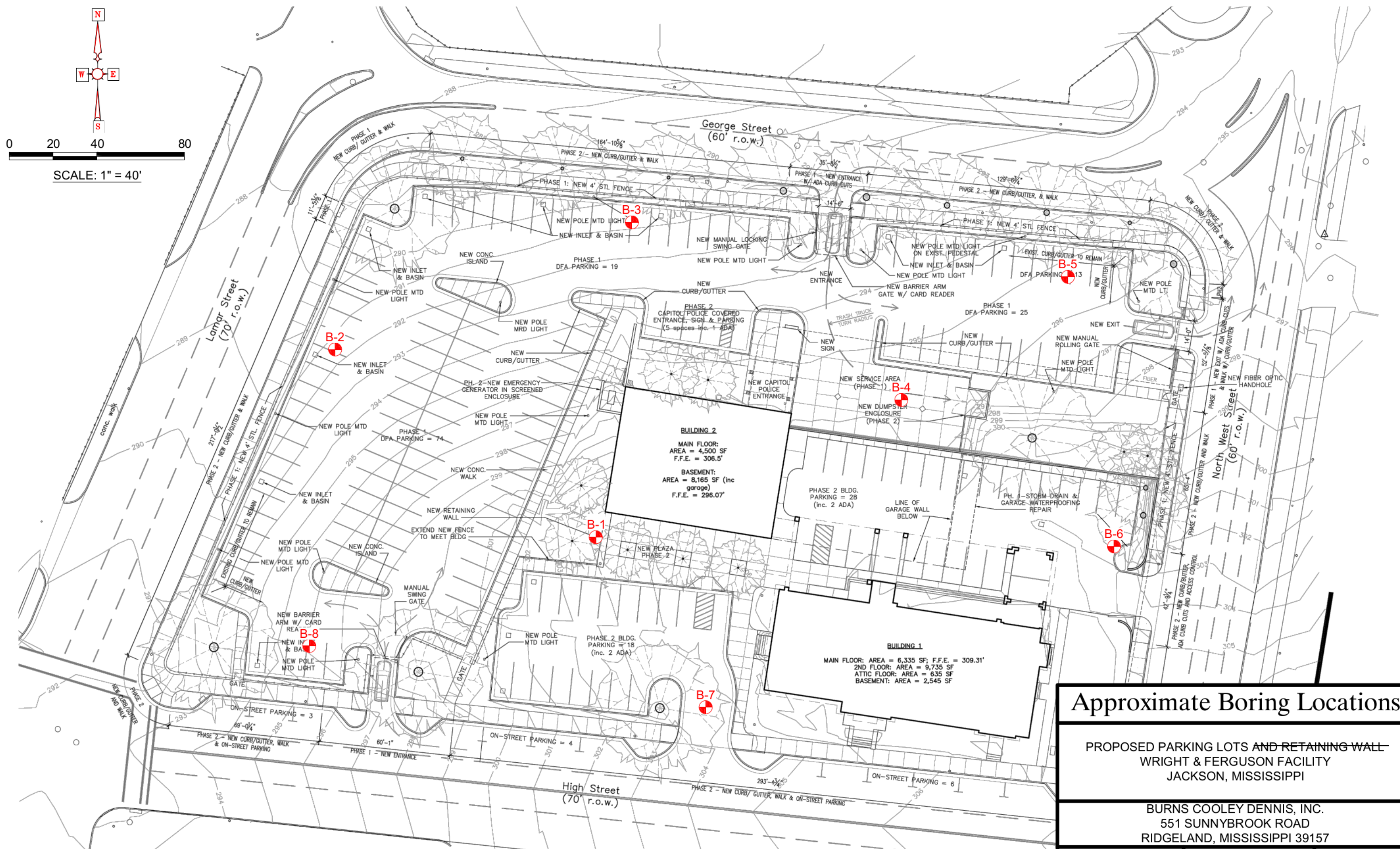
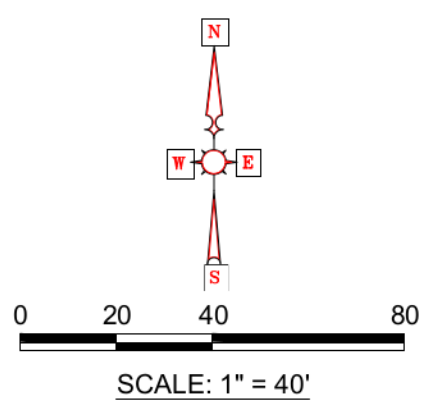
The analyses, conclusions, and recommendations discussed in this report are based on conditions as they existed at the time of our field exploration and further on the assumption that the exploratory borings are representative of subsurface conditions throughout the areas investigated. It should be noted that actual subsurface conditions between and beyond the borings might differ from those encountered at the boring locations. If subsurface conditions are encountered during construction that vary from those discussed in this report, Burns Cooley Dennis, Inc. should be notified immediately in order that we may evaluate the effects, if any, on earthwork, retaining wall and pavement design and construction.

Burns Cooley Dennis, Inc. should be retained for a general review of final design drawings and specifications. It is advised that we be retained to observe earthwork, retaining wall and pavement construction for the project in order to help confirm that our recommendations are valid or to modify them accordingly. Burns Cooley Dennis, Inc. cannot assume responsibility or liability for the adequacy of recommendations if we do not observe construction.

This report has been prepared for the exclusive use of WFT Architects, P.A., for specific application to the geotechnical-related aspects of design and construction for the new parking lots and a retaining wall at the Wright & Ferguson facility located at 350 High Street in Jackson, Mississippi. The only warranty made by us in connection with the services provided is we have

used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, express or implied, is made or intended.

# **FIGURES**



### Approximate Boring Locations

PROPOSED PARKING LOTS AND RETAINING WALL-  
 WRIGHT & FERGUSON FACILITY  
 JACKSON, MISSISSIPPI

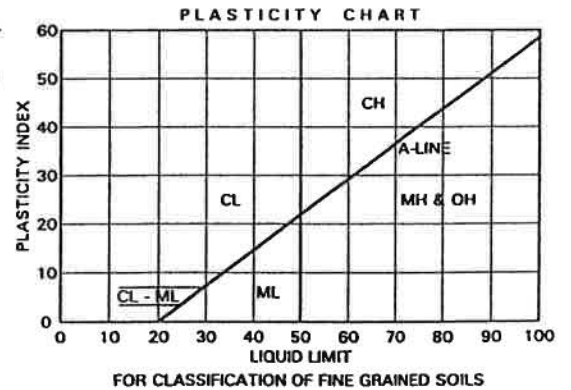
BURNS COOLEY DENNIS, INC.  
 551 SUNNYBROOK ROAD  
 RIDGELAND, MISSISSIPPI 39157

JOB NO. 190137 SCALE: AS SHOWN FIGURE 1  
 ADDENDUM 1: ATTACHMENT 1

UNIFIED SOIL CLASSIFICATION SYSTEM					
MAJOR DIVISIONS			SYMBOL & LETTER	DESCRIPTION	
COARSE-GRAINED SOILS More than half of material larger than No. 200 sieve size	GRAVELS More than half of coarse fraction larger than No. 4 sieve size	Clean Gravels (Little or no fines)	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE	
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE	
		Gravels with fines (Appreciable amount of fines)	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE	
			GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE	
	SANDS More than half of coarse fraction smaller than No. 4 sieve size	Clean Sands (Little or no fines)	SW	WELL GRADED SAND, GRAVELLY SAND	
			SP	POORLY GRADED SAND, GRAVELLY SAND	
		Sands with fines (Appreciable amount of fines)	SM	SILTY SAND, SAND-SILT MIXTURE	
			SC	CLAYEY SAND, SAND-CLAY MIXTURE	
FINE-GRAINED SOILS More than half of material smaller than No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50		ML	SILT WITH LITTLE OR NO PLASTICITY	
			ML	CLAYEY SILT, SILT WITH SLIGHT TO MEDIUM PLASTICITY	
			CL	SILTY CLAY, LOW TO MEDIUM PLASTICITY	
			CL	SANDY CLAY, LOW TO MEDIUM PLASTICITY (30% TO 50% SAND)	
	SILTS AND CLAYS Liquid limit greater than 50		MH	SILT, FINE SANDY OR SILTY SOIL WITH HIGH PLASTICITY	
			CH	CLAY, HIGH PLASTICITY	
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY	
			PT	PEAT, HUMUS, SWAMP SOIL	
HIGHLY ORGANIC SOILS					

**TERMS CHARACTERIZING SOIL STRUCTURE**

- Slickensided** - Clays with polished and striated planes created as a result of volume changes related to shrinking, swelling and/or changes in overburden pressure.
- Fissured** - Clays with a blocky or jointed structure generally created by seasonal shrinking and swelling.
- Laminated** - Composed of thin alternating layers of varying color and texture.
- Calcareous** - Containing appreciable quantities of calcium carbonate.
- Parting** - Paper thin (less than 1/8 inch).
- Seam** - 1/8 inch to 3 inch thickness.
- Layer** - Greater than 3 inches in thickness.

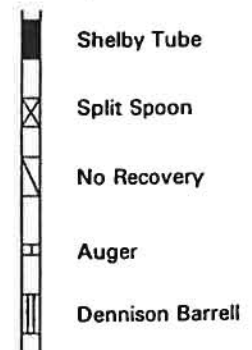


**DENSITY AND CONSISTENCY**

COARSE-GRAINED SOILS		FINE-GRAINED SOILS		
	PENETRATION RESISTANCE, N		COHESION	PENETRATION RESISTANCE, N
DENSITY	Blows per Foot	CONSISTENCY	Kips/Sq.Ft.	Blows per Foot
Very loose	0 - 4	Very Soft	<0.25	0 - 1
Loose	5 - 10	Soft	0.25 - 0.50	2 - 4
Medium Dense	11 - 30	Medium Stiff	0.50 - 1.00	5 - 8
Dense	31 - 50	Stiff	1.00 - 2.00	9 - 15
Very Dense	> 50	Very Stiff	2.00 - 4.00	16 - 30
		Hard	>4.00	>30

PARTICLE SIZE IDENTIFICATION		RELATIVE COMPOSITION	
Cobbles	- Greater than 3 inches	Slightly	5 - 15%
Gravel	- Coarse - 3/4 inch to 3 inches	With	16 - 29%
	- Fine - 4.76 mm to 3/4 inch	Sandy	30 - 50%
Sand	- Coarse - 2 mm to 4.76mm	(or gravelly)	
	- Medium - 0.42 mm to 2 mm		
	- Fine - 0.074 mm to 0.42 mm		
Silt & Clay	- Less than 0.074 mm		

**SAMPLE TYPES**  
(Shown in Sample Column)



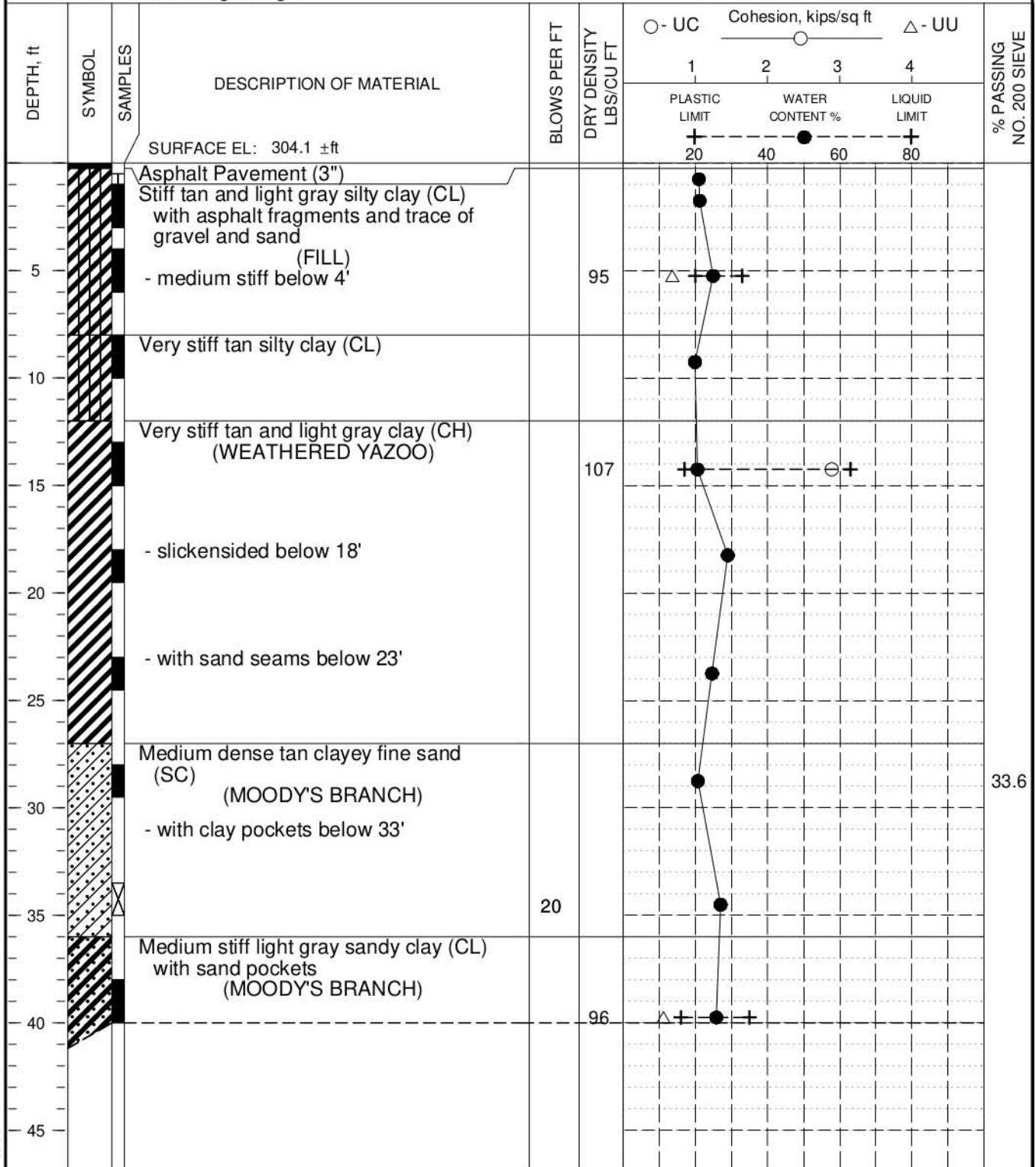
**CLASSIFICATION, SYMBOLS AND TERMS USED ON GRAPHICAL BORING LOGS**

# LOG OF BORING NO. 1

## PROPOSED PARKING LOT AND RETAINING WALL WRIGHT & FERGUSON FACILITY JACKSON, MISSISSIPPI

TYPE: 4" Short-flight auger

LOCATION: See Figure 1



190137 4/12/2019 2:30:06 PM

BORING DEPTH: 40 ft

DATE: 03/19/19

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

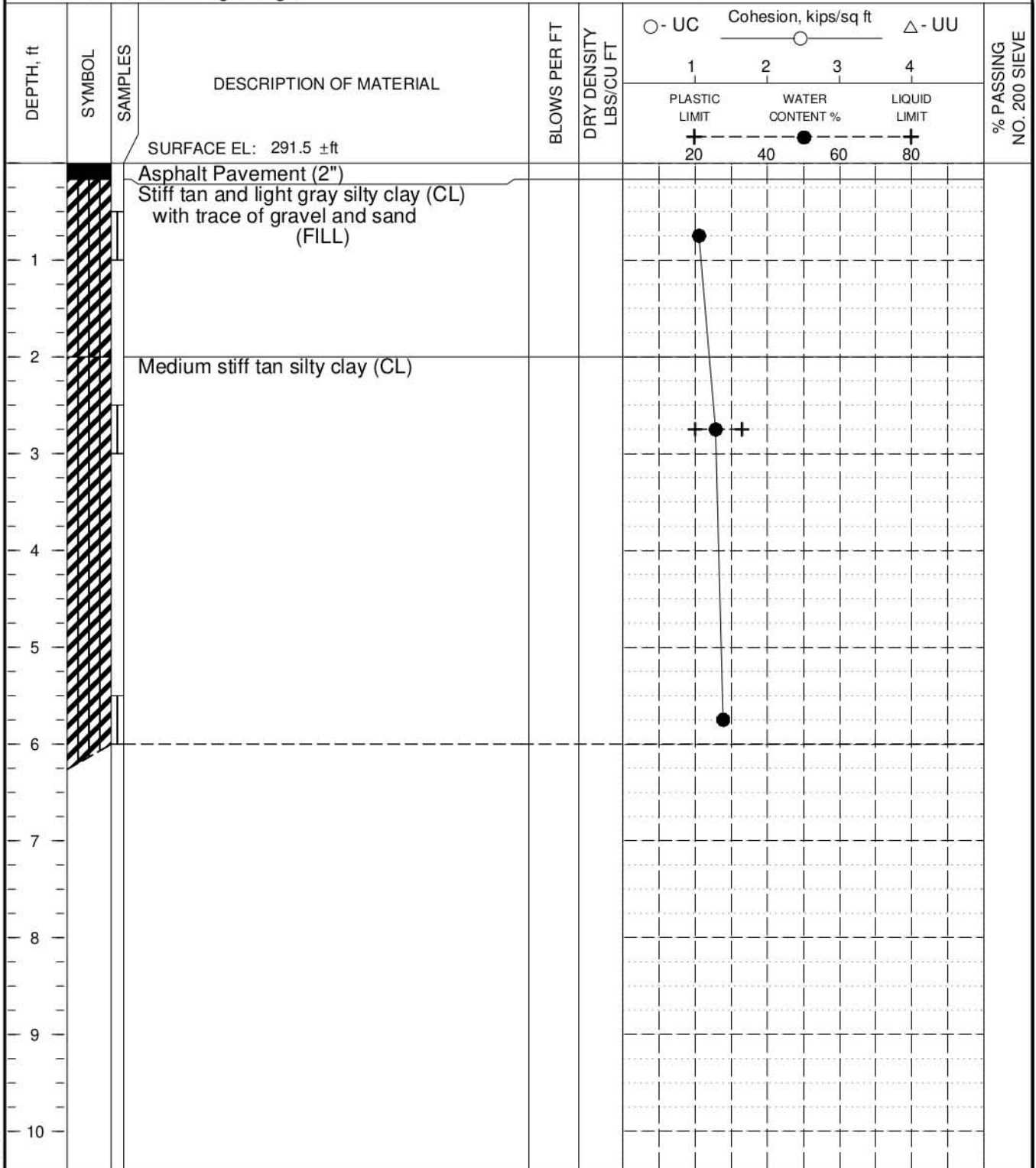
GPS Coordinates  
N 32° 18' 19.4"  
W 90° 11' 2.1"

GROUNDWATER DATA: No free water encountered during auger drilling.

**LOG OF BORING NO. 2**  
**PROPOSED PARKING LOT AND RETAINING WALL**  
**WRIGHT & FERGUSON FACILITY**  
**JACKSON, MISSISSIPPI**

TYPE: 4" Short-flight auger

LOCATION: See Figure 1



190137 4/12/2019 2:30:06 PM

BORING DEPTH: 6 ft

DATE: 03/19/19

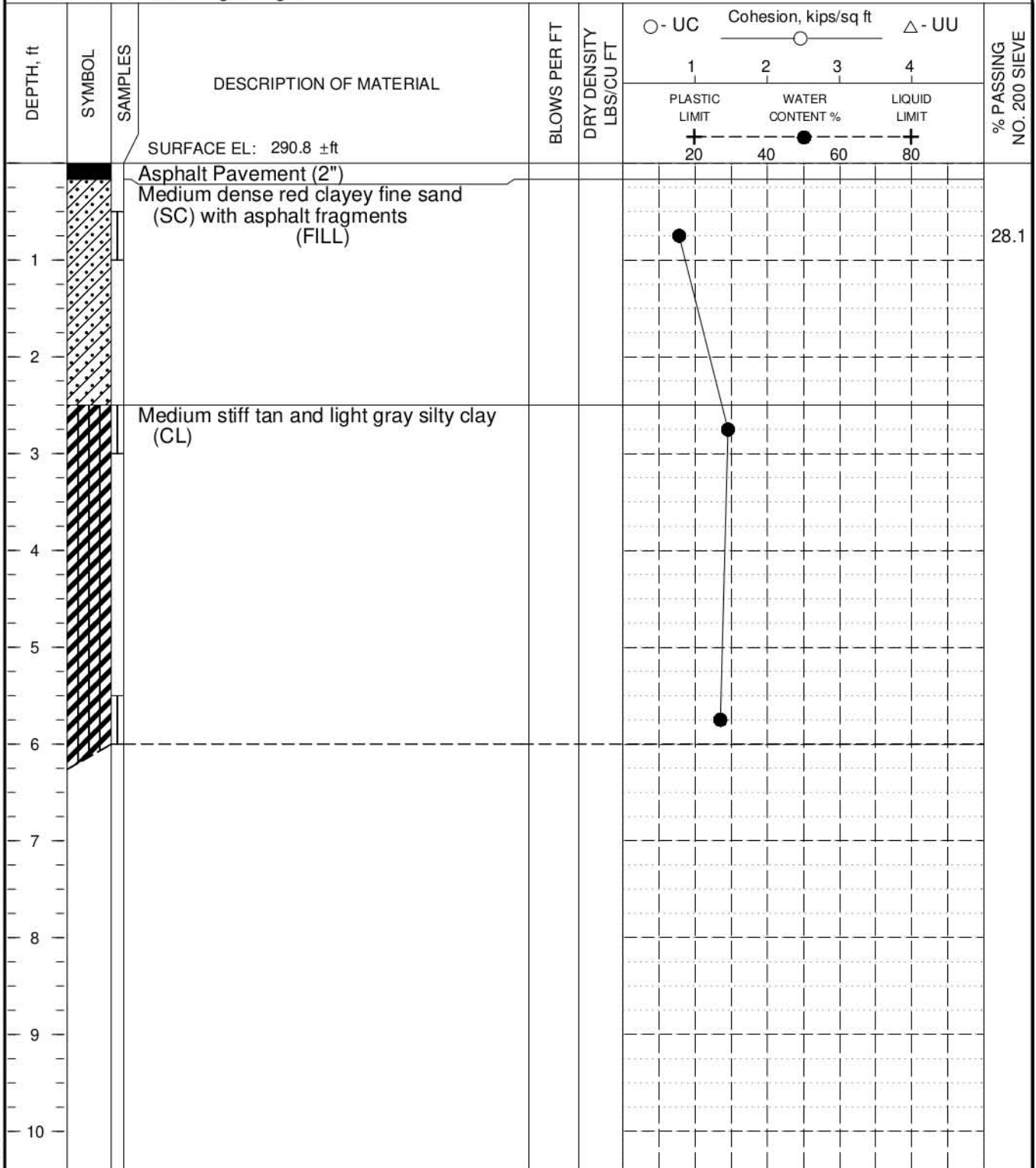
COMMENTS: Borehole backfilled with cuttings and sealed at surface with an asphalt patch.  
GPS Coordinates  
 N 32° 18' 20.1"  
 W 90° 11' 3.4"

GROUNDWATER DATA: No free water encountered during auger drilling.

**LOG OF BORING NO. 3**  
**PROPOSED PARKING LOT AND RETAINING WALL**  
**WRIGHT & FERGUSON FACILITY**  
**JACKSON, MISSISSIPPI**

TYPE: 4" Short-flight auger

LOCATION: See Figure 1



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BORING DEPTH: 6 ft

DATE: 03/19/19

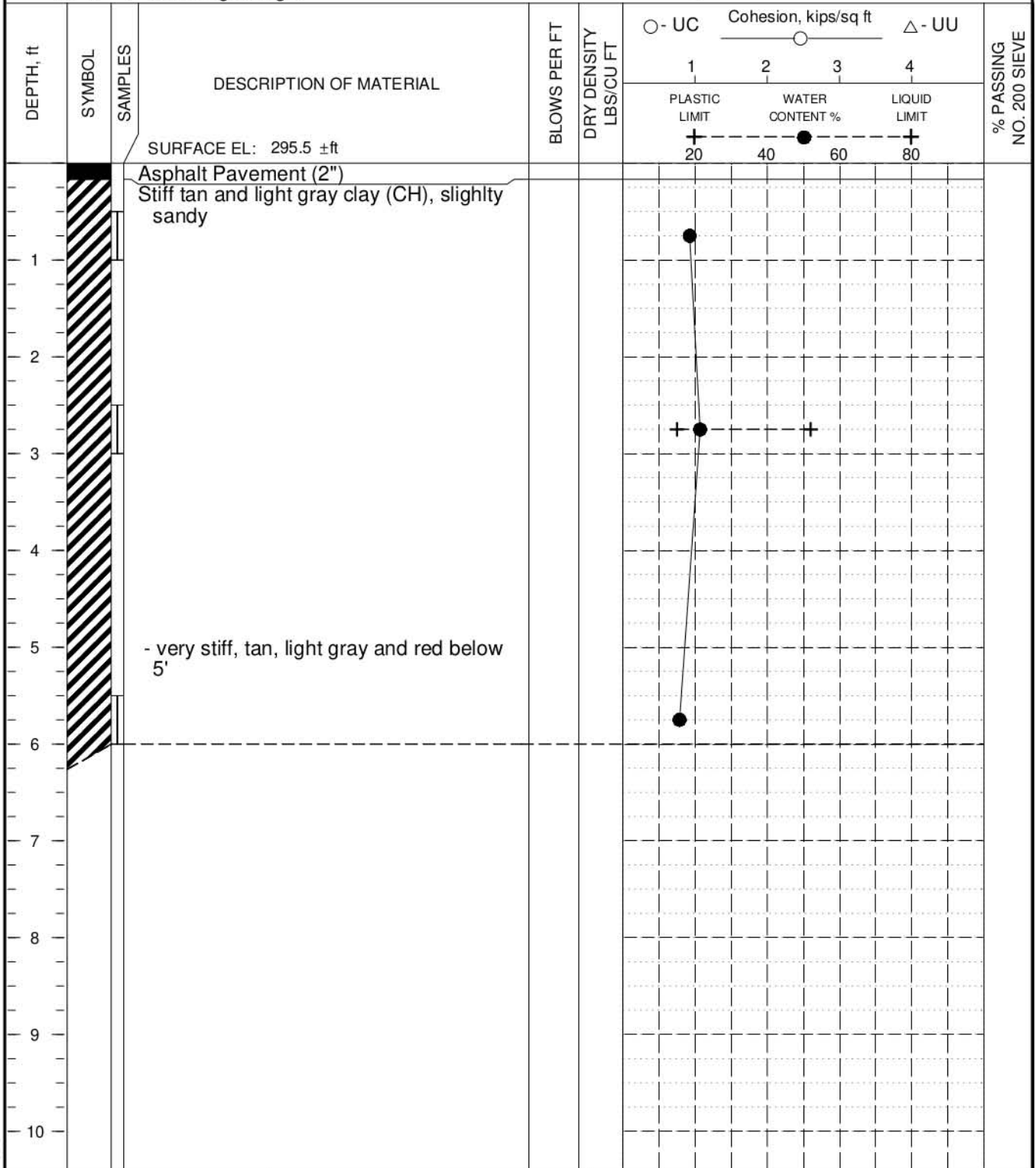
COMMENTS: Borehole backfilled with cuttings and sealed at surface with an asphalt patch.  
GPS Coordinates  
 N 32° 18' 20.9"  
 W 90° 11' 1.8"

GROUNDWATER DATA: No free water encountered during auger drilling.

**LOG OF BORING NO. 4**  
**PROPOSED PARKING LOT AND RETAINING WALL**  
**WRIGHT & FERGUSON FACILITY**  
**JACKSON, MISSISSIPPI**

TYPE: 4" Short-flight auger

LOCATION: See Figure 1



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BORING DEPTH: 6 ft

DATE: 03/19/19

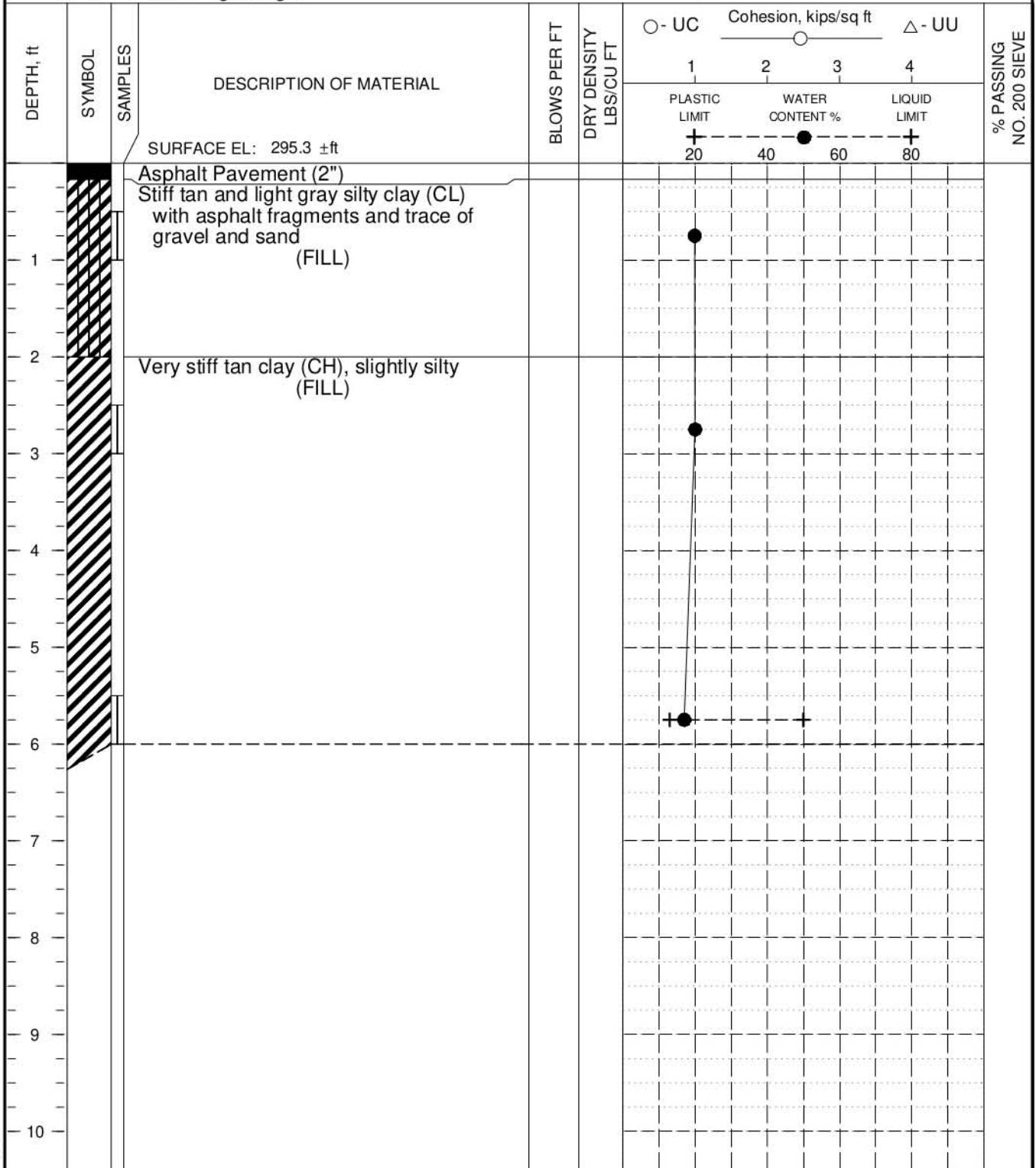
COMMENTS: Borehole backfilled with cuttings and sealed at surface with an asphalt patch.  
GPS Coordinates  
 N 32° 18' 20.1"  
 W 90° 11' 0.5"

GROUNDWATER DATA: No free water encountered during auger drilling.

**LOG OF BORING NO. 5**  
**PROPOSED PARKING LOT AND RETAINING WALL**  
**WRIGHT & FERGUSON FACILITY**  
**JACKSON, MISSISSIPPI**

TYPE: 4" Short-flight auger

LOCATION: See Figure 1



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BORING DEPTH: 6 ft

DATE: 03/19/19

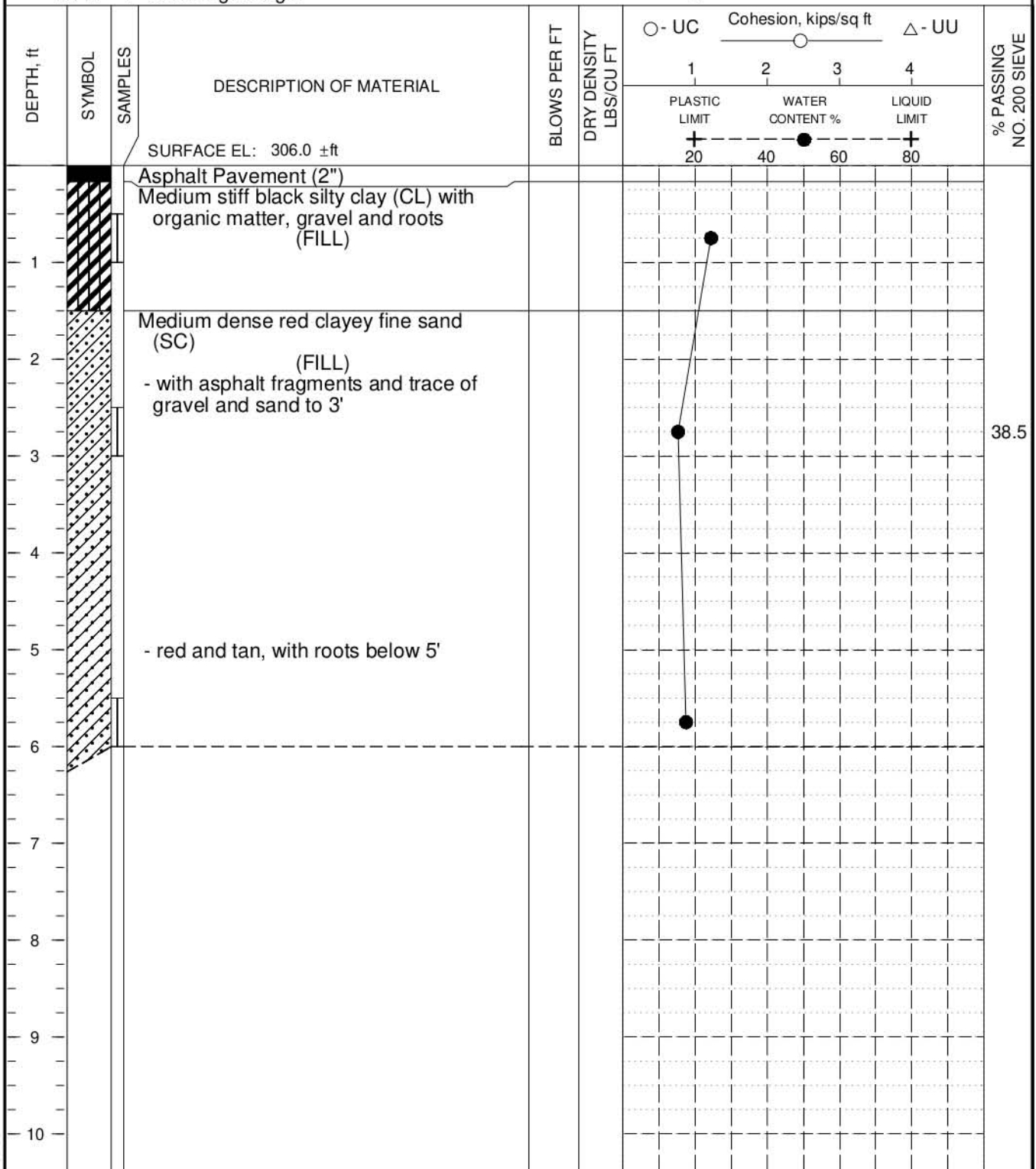
COMMENTS: Borehole backfilled with cuttings and sealed at surface with an asphalt patch.  
GPS Coordinates  
 N 32° 18' 20.5"  
 W 90° 10' 59.5"

GROUNDWATER DATA: No free water encountered during auger drilling.

**LOG OF BORING NO. 6**  
**PROPOSED PARKING LOT AND RETAINING WALL**  
**WRIGHT & FERGUSON FACILITY**  
**JACKSON, MISSISSIPPI**

TYPE: 4" Short-flight auger

LOCATION: See Figure 1



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BORING DEPTH: 6 ft

DATE: 03/19/19

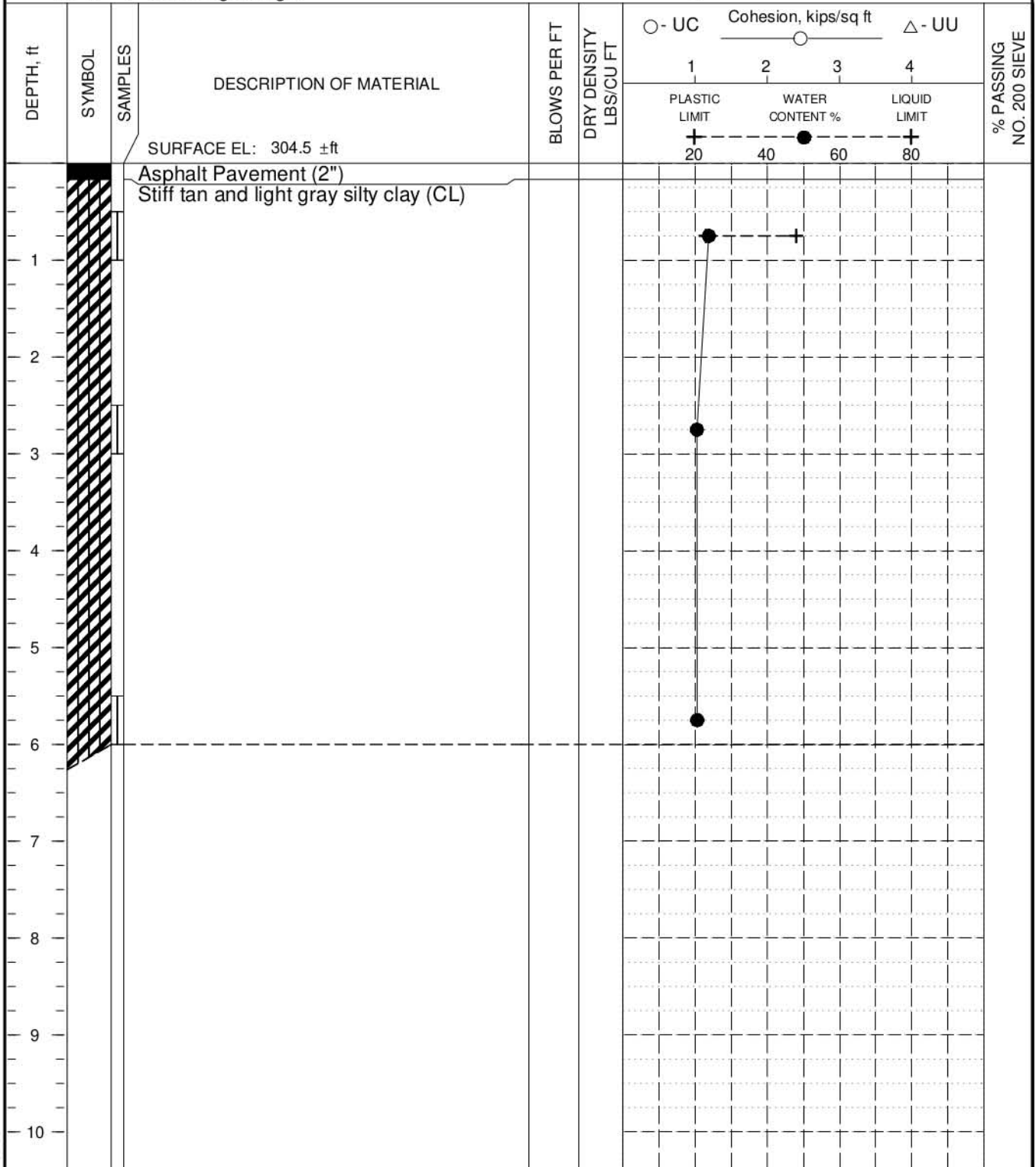
COMMENTS: Borehole backfilled with cuttings and sealed at surface with an asphalt patch.  
GPS Coordinates  
 N 32° 18' 19.5"  
 W 90° 10' 59.1"

GROUNDWATER DATA: No free water encountered during auger drilling.

**LOG OF BORING NO. 7**  
**PROPOSED PARKING LOT AND RETAINING WALL**  
**WRIGHT & FERGUSON FACILITY**  
**JACKSON, MISSISSIPPI**

TYPE: 4" Short-flight auger

LOCATION: See Figure 1



190137 4/12/2019 2:30:08 PM

BORING DEPTH: 6 ft

DATE: 03/19/19

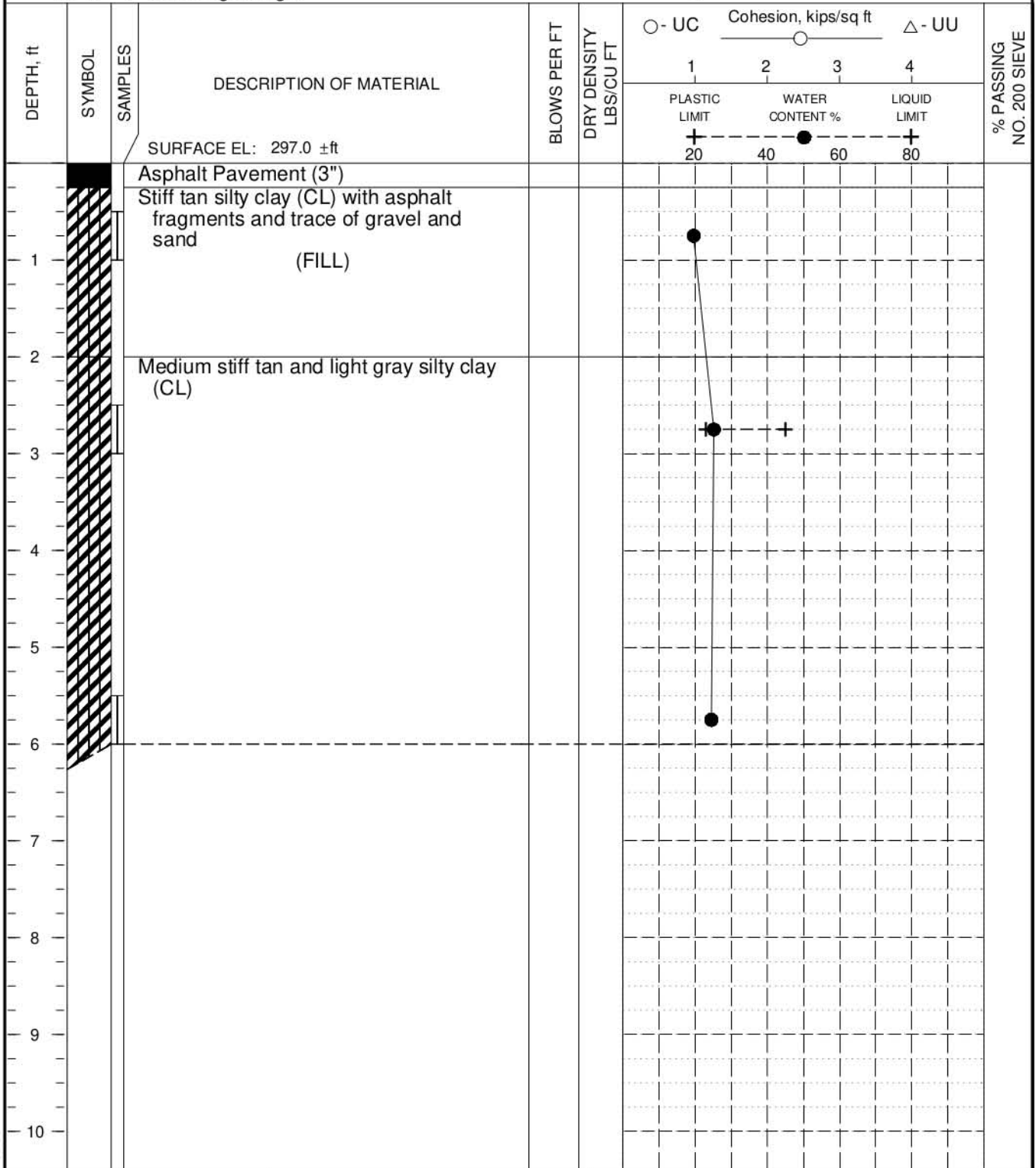
COMMENTS: Borehole backfilled with cuttings and sealed at surface with an asphalt patch.  
GPS Coordinates  
 N 32° 18' 18.8"  
 W 90° 11' 1.5"

GROUNDWATER DATA: No free water encountered during auger drilling.

**LOG OF BORING NO. 8**  
**PROPOSED PARKING LOT AND RETAINING WALL**  
**WRIGHT & FERGUSON FACILITY**  
**JACKSON, MISSISSIPPI**

TYPE: 4" Short-flight auger

LOCATION: See Figure 1



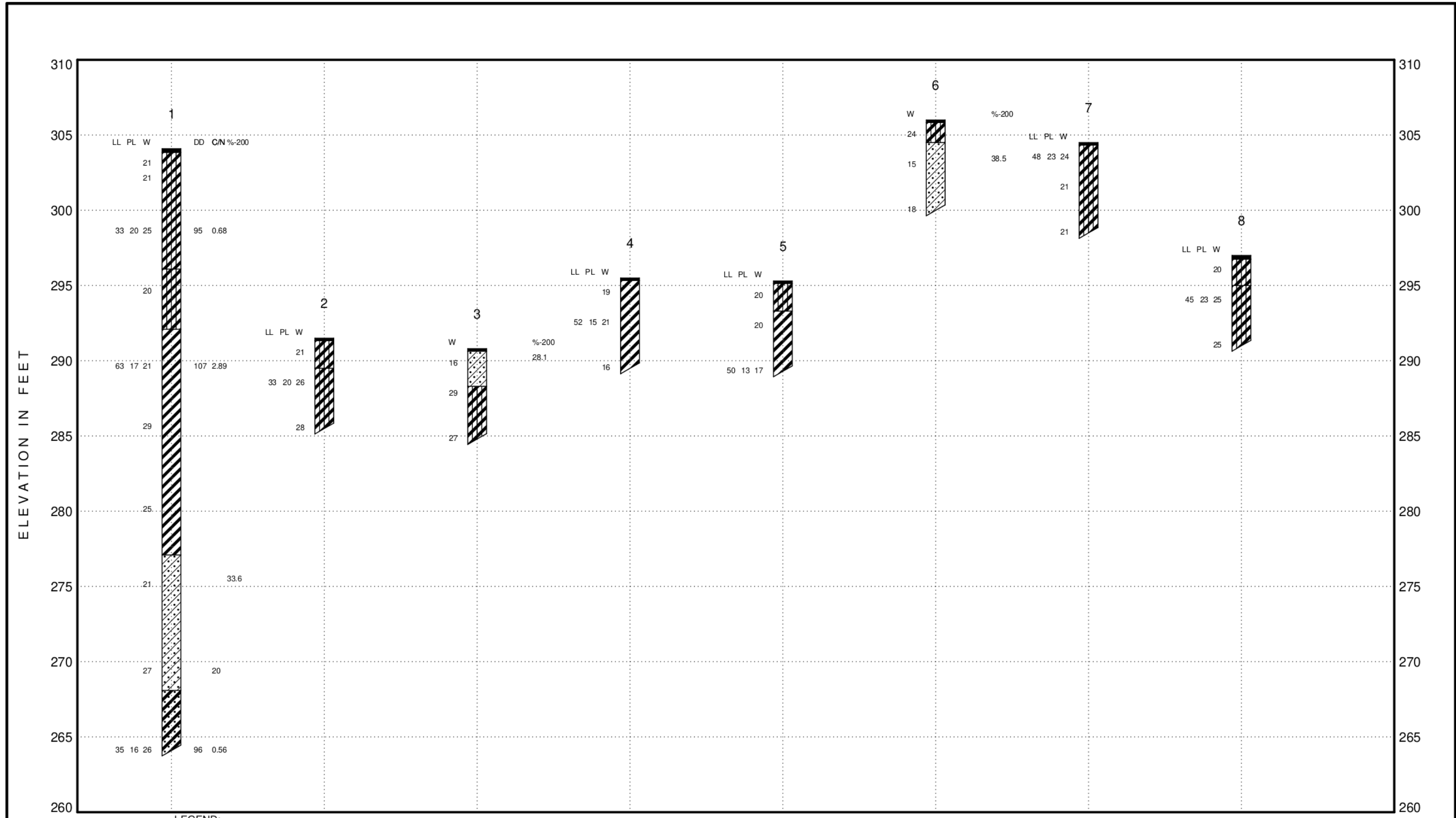
190137 4/12/2019 2:30:08 PM

BORING DEPTH: 6 ft

DATE: 03/19/19

COMMENTS: Borehole backfilled with cuttings and sealed at surface with an asphalt patch.  
GPS Coordinates  
 N 32° 18' 19.2"  
 W 90° 11' 3.8"

GROUNDWATER DATA: No free water encountered during auger drilling.



LEGEND:  
 LL = Liquid Limit  
 PL = Plastic Limit  
 W = Water Content  
 DD = Dry Density (pcf)  
 C/N = Cohesion (ksf)/Penetration Resistance, N (blows per ft) in the same column  
 % -200 = % Passing No. 200 Sieve

NOTE: See Figure 2 for boring log legend.

SUBSURFACE SOIL PROFILE			
PROPOSED PARKING LOT AND RETAINING WALL WRIGHT & FERGUSON FACILITY JACKSON, MISSISSIPPI			
Job No.	190137	Date	ADDENDUM 1: ATTACHMENT 1 11