ST. JOHN'S & ASSOCIATES INC.
508 FIRST AVENUE S.E.
CULLMAN, ALABAMA 35055

REPORT OF GEOTECHNICAL ENGINEERING EVALUATION
PROPOSED JACKS FAMILY RESTAURANT
INTERSECTION OF HACKS CROSS ROAD AND WOODS BOULEVARD
OLIVE BRANCH, DESOTO COUNTY, MISSISSIPPI
PROJECT NO.: 20-1187

NOVEMBER 13, 2020

PREPARED BY:

GEO SOLUTIONS, L.L.C.
Geotechnical Engineering and Materials Testing Services

GEO SOLUTIONS, L.L.C.
7201 OPPORTUNITY BOULEVARD
HUNTSVILLE, ALABAMA 35810

GEO SOLUTIONS, L.L.C.

Geotechnical Engineering and Materials Testing Services

November 13, 2020

St. John's & Associates Inc.
508 1st Avenue SE
Cullman, Alabama 35055

ATTENTION: Mr. Dale Bright

SUBJECT: Report of Geotechnical Engineering Evaluation
Proposed Jack's Family Restaurant
Intersection of Hacks Cross Road and Woods Boulevard
Olive Branch, Desoto County, Mississippi
Project No.: 20-1187

Dear Mr. Bright:

We are pleased to present the results of our geotechnical engineering evaluation for the proposed Jack's Family Restaurant in Olive Branch, Mississippi. The services performed were in general accordance with the scope of services presented in our Proposal No. G-20-273, dated October 26, 2020. This report explains our understanding of the project, documents our findings and presents our conclusions and geotechnical engineering recommendations.

We appreciate the opportunity to be of service to you. If you have any questions, please contact the undersigned.

Respectfully submitted,
GEO SOLUTIONS, L.L.C.

David L. Martin, P.E.
Project Manager

William T. Kennard, P.E.
Partner

WILLIAM T. KENNARD
REGISTERED PROFESSIONAL
ENGINEER
15500
STATE OF MISSISSIPPI

Distribution: (1) Addressee

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EXECUTIVE SUMMARY

The findings of this subsurface exploration and geotechnical engineering analysis indicate the proposed development at the site is feasible from a geotechnical standpoint. However, there are site conditions and features that will have to be addressed during design and construction. The purpose of this section is to briefly summarize a few of these features/conditions.

- The site consists of an approximate 2-acre parcel located at the southeast corner of Hacks Cross Road and Woods Boulevard in Olive Branch, Mississippi.
- A grading plan was not available at the time of this report, however, based on site observations, cuts and fills up to 2 feet will be required to achieve design grades.
- The site is clear and gently sloping. Partial grading has occurred during development of the surrounding roads.
- If earthwork is performed during the typically wetter seasons of the year, cement/lime stabilization will likely be required to obtain a stable subgrade. The percent lime/cement should be determined by the specialty contractor. A minimum treatment depth of 12 inches is typical.
- Proposed building loads were not available at the time of this report. We have assumed maximum column loads of 75 kips and strip foundations loads on the order of 4 to 5 kips per lineal foot. Conventional foundations bearing in stiff loess or properly compacted fill may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot.
- Foundations bearing in soil are expected to experience a total settlement of 1 inch and a differential settlement of ½ inch.
- Surface drainage will have a significant impact on excavations and grading operations, especially if construction occurs during the typically wetter seasons of the year. Accordingly, provisions such as temporary berms or drainage swales should be made to divert surface runoff away from deep excavations. Temporary dewatering of the excavations should be anticipated, particularly in the western lower portion of the site.

1.0 INTRODUCTION

GEO Solutions has conducted a geotechnical evaluation for the proposed construction of a new Jack's Family Restaurant at the southeast corner of the intersection of Hacks Cross Road and Woods Boulevard in Olive Branch, Mississippi (see Figure 1). The purpose of our services was to evaluate general subsurface conditions and provide geotechnical design criteria and earthwork recommendations for the proposed development.

2.0 PROJECT INFORMATION

2.1 Existing Site

The site consists of an approximate 2 acre parcel located at the southeast corner of the intersection of Hacks Cross Road and Woods Boulevard in Olive Branch, Mississippi. The site was previously mass graded. The site may be generally described as gently sloping, clear and currently vegetated with grass. There is an existing asphalt drive bisecting the site from east to west. The site is bordered by Hacks Cross Road to the west, along the north side by Woods Boulevard, along the east side by an unnamed road and an existing Waffle House on the south side. The north half of the parcel generally drains west towards the existing drainage feature along Hacks Cross Road. The south half of the parcel generally drains to the south.

2.2 Proposed Construction

Based on a conceptual layout plan, the new structure will include an approximate 3,500 square foot, single story structure with pavement parking areas and associated drives. We anticipate a portion of the unnamed road bisecting the property will be demolished to re-establish new

grades and tie the north and south proposed pavement areas together. The structure will be supported by a conventional shallow soil bearing foundation with a slab on grade.

2.2.1 General/Mass Grading

Preliminary grading information was not available at the time of this report. Based on site observations, we anticipate cuts and fill will generally be on the order of 2 feet or less to achieve design grades.

2.2.2 Preliminary Foundation Loads

Preliminary foundation loads were not available for the planned structures. Once design foundation loads are available, we request the opportunity to review them. For the purpose of this report, we have assumed the following information.

- Individual column loads will not exceed 75 kips.
- Exterior wall loads will be in the range of 4 to 5 kips per lineal foot.
- The structures can withstand normal settlements of 1-inch total and ½ inch differential.
- An allowable foundation bearing capacity of 2,000 pounds per square foot (PSF) for design purposes.

3.0 SCOPE OF SERVICES

3.1 Geotechnical Evaluation

The following services were performed.

- Review of available geologic literature including published geologic maps and USDA soil maps.
- Subsurface exploration program consisting of the following:

Summary of Subsurface Exploration		
Boring Location	**Number of Borings**	**Boring Depth (Ft)**
Building	4	15
Pavement Areas	5	5

  The borings included Standard Penetration Tests at selected intervals. The borings were left open until the end of the work day, groundwater levels recorded and then backfilled with soil auger cuttings. The drilling, logging and sampling of the borings was coordinated and overseen by a member of our engineering staff.
- Laboratory testing was performed on selected representative samples including moisture content and grain size characteristics.
- Compilation and analysis of the field and laboratory data.
- Preparation of this geotechnical engineering report. This report will address the following:
  - Site preparation requirements;
  - Anticipated excavation conditions including the presence of poor soils, construction debris and undercutting requirements;
  - Slab-on-grade subgrade preparation requirements;
  - Fill material requirements and compaction criteria;
  - Design criteria for foundations, including foundation type, an allowable bearing capacity and anticipated total and differential settlement;
  - Design criteria for slabs-on-grade;
  - Recommended light and heavy-duty pavement sections; and
  - **Other pertinent discussions and recommendations relative to the proposed improvements.**

4.0 SITE INFORMATION

4.1 Geology

The "Geologic Map of the Olive Branch Quadrangle, Desoto County, Mississippi, and Shelby County, Tennesssee" dated 2003, published by the Mississippi Department of Environmental

Quality, Office of Geology, was used to review the geology of the area. The site is underlain by the Pre-Loess Terrace Deposits. The Pre-Loess Terrace Deposits is described as sand, dark red, reddish orange, pink, bright yellowish brown, brown, and occasionally whit, fine- to very coarse-grained, predominantly quartzose, locally micaceous, poorly sorted and massive to well sorted and cross-bedded; typically graveliferous with quartz and chert pebbles, especially at base. Commonly exhibits clay clast conglomerate with perulish red to white, kaolinitic, rip-up clast. Locally interbedded with clay, light gray to purplish red to white, kaolonitic, plastic.

4.2 Soil Survey

Descriptions of soils present on the subject property were obtained from the Soil Survey, DeSoto County Alabama – U.S. Department of Agriculture, Soil Conservation Service.

Calloway silt loam, severely eroded, gently sloping (Ce)
These poorly drained soils develop in deep loess along long narrow slopes. Erosion has removed a majority of the surface layer. The subsoil may be exposed and is typically a yellowish-brown silt loam with dark brown mottles. There is a light gray fragipan that occurs below the upper 12 to 14 inches that transitions to a yellowish-brown to light yellowish-brown silt loam with dark yellowish-brown and white mottles.

Falaya and Waverly silt loam, local alluvium (Fc)
These poorly drained silty soils are found in drainage ways and depressions as well as the toe of slopes borders flood plains. They are formed from silty alluvium washed in from acid loess. The surface layer is a dark brown silt loam. The subsoil is a grayish-brown to light brownish-gray silt loam with brown mottles.

Grenada silt loam, eroded very gently sloping (Ga)
These well-drained soils occupy the loess uplands. The surface layer is a dark grayish-brown, silt loam. The subsoil is a dark yellowish-brown heavy silt loam that transitions to a yellowish-brown silty clay loam with brown and some gray mottles and manganese concretions. At approximately 24 inches, there is a light-gray silty clay loam fragipan with dark yellowish-brown mottles and few manganese concretions.

5.0 EXPLORATION METHODS

The procedures used for field and laboratory sampling and testing were conducted according to ASTM procedures and established engineering practice.

Our exploration consisted of the drilling and sampling of 9 soil test borings. The boring locations are indicated in Figure 2 in Appendix A. The boring locations were established in the field by taping and pacing from property corners. Accordingly, the boring locations should be considered approximate. The drillers took soil samples using a split-barrel sampler driven by an automatic hammer system according to ASTM D1586. The automatic hammer system typically results in SPT N-values approximately 15 to 20 percent lower than those obtained with a rope and cathead hammer system. An engineer was on site during drilling operations to record and log the results of Standard Penetration Tests (SPT N-values).

6.0 SUBSURFACE CONDITIONS

6.1 Surface Cover

Surface cover at the site consisted of topsoil. The following table presents a summary of the topsoil thicknesses encountered.

Summary of Surface Cover		
Boring No.	**Topsoil Thickness (In)**	**Remarks**
B-1	8	---
B-2	8	---
B-3	8	---

Summary of Surface Cover (Continued)		
Boring No.	Topsoil Thickness (In)	Remarks
B-4	4	---
P-1	6	---
P-2	12	---
P-3	4	---
P-4	9	---
P-5	9	---

6.2 Fill

Fill was encountered at a portion of the boring locations. The fill consisted of gray, yellowish brown, brown, yellow and white, dry, silty CLAY (CL). The fill exhibited SPT N-values ranging from 11 to 30 blows per foot. The following table presents a summary of the fill conditions encountered.

Summary of Fill Conditions			
Boring No.	Depth to Bottom of Fill (Ft)*	SPT N-Values (blows/Ft)	Comments
B-1	1.5	21	Underlain by Loess
B-4	1.5	30	Underlain by Loess
P-1	2.0	25	Underlain by Loess
P-2	2.0	19	Underlain by Loess
P-4	1.5	11	Underlain by Loess
P-5	1.5	20	Underlain by Loess

*Depth as measured from the existing ground surface.

6.3 Loess

Loess was encountered at all of the boring locations. The loess consisted of brown, gray and yellow, dry to moist, stiff to very stiff, silty CLAY (CL) with varying amounts of manganese dioxide nodules.

The loess exhibited SPT N-values ranging from 10 to 27 blows per foot. The following table presents a summary of the fill conditions encountered.

Summary of Loess Conditions			
Boring No.	Depth to Bottom of Loess (Ft)*	SPT N-Values (blows/Ft)	Comments
B-1	8.5	14 to 24	Underlain by Pre-Loess Terrace Deposits
B-2	8.5	12 to 22	Underlain by Pre-Loess Terrace Deposits
B-3	13.5	17 to 23	Underlain by Pre-Loess Terrace Deposits
B-4	13.5	12 to 25	Underlain by Pre-Loess Terrace Deposits
P-1	Not encountered	11 to 15	---
P-2	Not encountered	13 to 15	---
P-3	Not encountered	18 to 24	---
P-4	Not encountered	23 to 27	---
P-5	Not encountered	10	---

*Depth as measured from the existing ground surface.

6.4 Pre-Loess Terrace Deposits

Pre-Loess Terrace Deposits were encountered at all of the building boring locations beneath the surface cover, fill and loess. Pre-Loess Terrace Deposits were not encountered at any of the pavement boring locations. The Pre-Loess Terrace Deposits typically consisted of red, yellow, gray and brown, damp to moist, stiff to very stiff, silty CLAY (CL) with varying amounts of sand. Standard Penetrometer Test N-values ranged from 8 to 25 blows per foot.

Summary of Pre-Loess Terrace Deposit (PLTD) Conditions			
Boring No.	Depth to PLTD (Ft)*	Range of SPT N-Values (blows/Ft)	Comments
B-1	8.5	8 to 25	---
B-2	8.5	14 to 16	---
B-3	13.5	22	---
B-4	13.5	9	---

*Depth as measured from the existing ground surface.

6.5 Groundwater

Groundwater levels were checked during drilling operations and at the completion of the work day. Groundwater was not encountered at any of the boring locations. Groundwater levels can fluctuate due to seasonal variables, geologic features and other conditions that are not readily apparent. In order to more accurately evaluate groundwater conditions at the site, the installation and monitoring of piezometers would be required.

6.6 Laboratory Testing

Laboratory testing of representative soil samples consisted of Atterberg Limits, moisture content and grain size analysis. Appendix C contains the results of the laboratory testing program.

7.0 RECOMMENDATIONS

7.1 Site Preparation

The following recommendations are presented for site preparation. These recommendations are based on the results of our geotechnical exploration, assumed building load information and the grading plans provided to us.

7.1.1 Site Grading

Development of the site will include stripping of topsoil. Topsoil stripping depths across the site will range from 4 to 12 inches in depth. We anticipate demolition will be required of the unnamed roadway that traverses the site. After stripping and demolition, the site will be significantly disturbed, it is recommended that soft or loose soils and any remaining debris be removed. Variable soils conditions including fill and loess will be exposed.

After topsoil stripping, demolition and cuts to grade, the exposed soils should be carefully reviewed by the geotechnical engineer-of-record or his representative according to the section below titled "7.3 Subgrade Evaluation/Proofrolling". Areas which pump, rut or are identified as unstable during this process should will require further review and stabilization.

Stabilization of the onsite soils will be highly dependent upon the time of year that grading occurs. During the "drier seasons" of the year any unstable soils encountered may be undercut to stable soils and the resulting excavation should be backfilled with select soil fill.

During the typically "wetter seasons" of the year soil cement/lime stabilization will likely be required to maintain a stable subgrade due to the high silt content of the loess soils.

- **After achieving design grades the site should be stabilized with a cement/lime stabilization and design provided by a specialty contractor. A minimum**

stabilization depth of 12 inches should be utilized. Cement/Lime percentages of 5 to 7 percent by weight are typically considered.

Subgrade improvements shall extend at least 5 feet beyond planned building and pavement limits.

The parcels adjacent to the site have been developed in the past. It has been our experience in the past with similar sites, that there is a possibility of encountering additional unforeseen poor subgrade conditions (construction debris, poorly backfilled utilities, septic tanks, etc.) during construction. Accordingly, provisions should be made in the project budget to undercut any unforeseen poor subgrade conditions, if encountered, and replace with structural fill.

7.2 Weather Conditions

The time of year when grading occurs will have a significant impact on site preparation and subsequent fill placement and compaction. If grading occurs during the wetter seasons of the year, additional effort on the part of the contractor will be required to properly prepare the site, as well as establish and maintain an acceptable subgrade during earthwork.

The on-site soils typically consist of a silt to silty clay. Exposed soils with a high silt or clayey content will be sensitive to changes in moisture content. It has been our experience that when these soils become wet and are subjected to construction equipment traffic, they quickly breakdown and pump and/or rut. If grading occurs during the typically wetter months, the control of surface water will be critical. After a period of inclement weather has occurred, construction equipment should not be allowed back on the site until the soils have adequately dried.

If inclement weather appears imminent, we recommend the pad surfaces be graded to drain and sealed off to the extent possible with a smooth drum roller. Areas which birdbath should be pumped dry prior to fill placement. Earthwork equipment should not be allowed back on the pad until the upper soils have adequately dried. If the schedule does not allow drying of the subgrade soils, undercutting and replacement may be an alternative.

7.3 Subgrade Evaluation/Proofrolling

A member of the GEO Solutions engineering staff should evaluate areas that are at final subgrade elevation or are to receive structural fill. The geotechnical engineer can visually evaluate whether any further treatment of the soils will be necessary to prepare an improved subgrade for subsequent fill placement. The evaluation of the subgrade should include proofrolling to reveal areas containing soft, near surface soils. Unstable areas typically exhibit pumping and/or rutting during the proofrolling process. Proofrolling should be accomplished with repeated passes of a fully loaded tandem axle dump truck or similar loaded pneumatic-tired equipment. We suggest that the project specifications include provisions for undercutting of unstable areas, or moisture conditioning and recompaction of upper loose soil zones.

7.4 Groundwater Control

7.4.1 Groundwater and Surface Runoff

Groundwater was not encountered at any of the boring locations. Depending upon the time of year, water may be encountered. At this time, we anticipate that temporary dewatering of deeper utility trenches may be required.

Groundwater control and surface runoff will be essential during earthwork activities and particularly during the excavation of the deeper utilities. At this time, we anticipate that the control of surface water and shallow groundwater can be accomplished with drainage ditches, berms and sumps and pumps. The contractor should make provisions to provide for positive drainage across the site.

7.4.2 Drainage of Exposed Subgrade

Positive drainage should be maintained over the exposed subgrade. The soils encountered at the site are moisture sensitive and will be adversely affected by surface water that is allowed to enter the subgrade. The control of surface water will be critical both during and after construction. Construction plans should provide for positive drainage away from the exposed subgrade during construction.

7.5 General Excavation Considerations

A preliminary grading plan was not available for review at the time of this evaluation. However, based on site observations we anticipate minimal cuts and fills up to 2 feet will be required to achieve design grades. We anticipate mass excavations can be accomplished with a combination of dozers and track mounted excavators.

Excavations deeper than 4 feet and in which workers will enter should either be braced or laid back in accordance with OSHA requirements. At this time, we anticipate a 4(H):1(V) temporary construction slope up to a maximum height of 10 feet and in properly compacted soil fill should be stable. However, the final slope configuration should be selected by the geotechnical engineer-of-record based on his observations in the field at the time of excavation. Further, periodic review of slope conditions should be performed by the geotechnical engineer-of-record, or his representative.

7.6 Structural Fill Material

We recommend that structural fill be free of organic matter and debris, rocks greater than 3 inches and composed of soils with a Plasticity Index of less than 20 percent and a standard Proctor maximum dry density of greater than 100 pounds per cubic foot. We anticipate select soil fill will be imported to the site from an offsite borrow source.

We request at least a 72-hour notice prior to fill being imported to the site, if required. This will allow us time to obtain samples of the fill and perform the necessary laboratory tests. Under no circumstances should fill be imported to the site without first being approved by the geotechnical engineer-of-record or his representative.

The geotechnical engineer-of-record or his representative should observe fill placement and compaction on a full-time basis. The purpose of this observation is to evaluate that the fill is being placed, spread and compacted in a uniform and consistent manner. Soil fill should be placed in 8-inch loose lifts and compacted to the following percentages of ASTM D-698, standard Proctor.

BUILDING PAD
98 % ASTM D698
PAVEMENT AREAS
95 % ASTM D698
Upper 12" of Subgrade, 100 % ASTM D698

Fill soils should be aerated or moistened, as necessary, to achieve a moisture content from +/-2 percent of the standard Proctor Optimum at the time of compaction. The contractor should acknowledge that both compaction and soil moisture content requirements must be met.

Fill should be tested by an engineering technician to document that the contractor is achieving the recommended percent compaction and moisture content. The following table presents commonly accepted testing frequencies.

Location	Test Frequency	Retest Frequency
Building Pad	1 test per lift per 2,500 ft² (minimum of 4 tests per lift)	1 retest per failing test
Pavement Areas	1 test per lift per 5,000 ft²	1 retest per failing test
Trench backfill	1 test per lift per 250 ft of trench	1 retest per failing test

7.7 Backfilling Utility Trenches

Backfilling of storm drains and utility trenches is often accomplished in an uncontrolled manner leading to the subsequent settlement of the fill and cracking of floor slabs and pavements. Utility trench backfill should consist of an open-graded stone, such as MDOT No. 57, or sand, placed in controlled lifts and consolidated in place. If not properly backfilled, settlement of soils may cause damage to the above-ground structures.

7.8 Shallow Soil Bearing Foundations

Building loads were not available at the time of this report. Based on prior experience with similar type structures we have assumed column loads up to 75 kips and wall loads on the order of 4 to 5 kips per lineal foot.

Based on the results of our subsurface exploration, laboratory testing program, our understanding of the proposed building loads and assuming the site is prepared and graded in accordance with recommendations of this report, it is our opinion the proposed buildings can be supported on conventional soil bearing foundations.

Interior and exterior foundations should bear a minimum of 24 inches below the proposed lowest outside adjacent subgrade elevations. Foundations bearing on properly compacted select soil fill or stiff loess may be designed for a maximum allowable bearing pressure of 2,000 pounds per square foot. Foundations should be designed assuming a total settlement of 1 inch and a differential settlement of ½ inch. The following should be considered an integral part of the spread foundation design recommendations.

- Minimum dimensions of 24 inches for isolated column footings and 18 inches for rectangular or continuous foundations should be included in the design. Interior and exterior foundations should have embedment depth of 18 to 24 inches, respectively.
- All foundation excavations should be evaluated by the geotechnical engineer-of-record or his representatives prior to concrete placement, to confirm that the bearing surface is in compliance with the anticipated bearing soils. Any material disturbed during excavation should be removed prior to concrete placement.
- **Foundation concrete should be placed the same day the excavation is made. If this is not possible, the foundation excavation should be adequately protected. One acceptable method of protection is to place a 2 to 3-inch thick layer of lean concrete in the bottom of the foundation excavation for a "mudmat".**
- All roof drains should be directed away from the foundations and positive drainage should be established and maintained to reduce the amount of surface water entering the near surface soils.
- Site grading plans should be prepared, which provide for positive drainage away from the structure, and the contractor should be directed to conduct grading operations in such a manner as to provide positive drainage during the construction period. Positive drainage is typically described as a gradient of at least 2 percent for a distance of 10 feet away from the structure.

7.9 Floor Slabs

We believe floor slabs for the proposed structures can be built on-grade achieving support from stiff loess soil or properly compacted select soil fill. In order to provide a capillary break and more uniform bearing, slabs should be underlain by a minimum of 4 inches of compacted open-

graded granular material. A polyethylene vapor barrier, (6 mil minimum) should be installed if moisture sensitive floor coverings are proposed.

On most projects, there is a significant time lag between initial grading and the time when the contractor is ready to place concrete for the slab-on-grade. The geotechnical engineer-of-record or his representative should evaluate floor subgrades prior to construction of concrete floors. This may include proofrolling with a loaded dump truck. We suggest that provisions be included in the project specifications for the contractor to restore subgrade soils to an acceptable condition prior to the construction of floor slabs. Such restoration may include moisture conditioning of the surficial soils and recompaction to the project requirements.

7.10 Pavement Considerations

7.10.1 General

At this time, we anticipate pavement at the site will include typical sections associated with standard duty pavement and heavy-duty pavement. Heavy-duty pavement is expected to include areas associated with main entrance and travel areas, delivery truck unloading/turn-around areas and waste disposal dumpsters. Standard-duty areas are expected to be associated with automobile parking lots.

7.10.2 Anticipated Subgrade Conditions

Provided the site preparation and earthwork recommendations presented in this report are followed, stiff loess, properly compacted select soil fill or cement/lime treated soil will be exposed at the finish soil subgrade.

Based on our experience with similar projects the following pavement sections are presented.

7.10.3 Asphalt Pavement Sections

Asphalt Standard-Duty Pavement
1" Asphaltic Concrete Wearing Surface
2" Asphaltic Concrete Binder Layer
9" Sand Clay Base (Alternatively: 6" Dense Graded Basestone)

Asphalt Heavy-Duty Pavement
1" Asphaltic Concrete Wearing Surface
3" Asphaltic Concrete Binder Layer
12" Sand Clay Base (Alternatively: 8" Dense Graded Basestone)

7.10.4 Concrete Pavement Sections

Concrete Standard-Duty Pavement*
6" Portland Cement Concrete Pavement**
6" Sand Clay Base

*Pad should be large enough to accommodate dumpster and truck.
**28-day unconfined compressive strength of 4,000 psi.

American Concrete Institute (ACI) literature indicates that reinforcing is typically not necessary in concrete pavements if a liberal joint pattern is used in design and proper workmanship is conducted. ACI recommends that construction joints not exceed a spacing of 30 times the concrete thickness or a maximum of 15 feet.

8.0 FOLLOW-UP SERVICES

8.1 Plan Review

Final grading and building plans were not available during our exploration. We request the opportunity to review these plans when they become available. Based on our findings, our conclusions and recommendations may be altered to better accommodate the design criteria of the project.

8.2 Subgrade Observation

The purpose of this initial evaluation will be to evaluate whether site preparation (grubbing, topsoil stripping, undercutting, etc.) has been done in accordance with good earthwork practice. The geotechnical engineer can determine the depth and extent of the area that will require undercutting.

8.3 Fill Monitoring

Fill placement and compaction operations should be monitored on a full-time basis by the geotechnical engineer or his representative. Further, we recommend that in-place density tests be performed in the field by an engineering technician to evaluate the contractor's performance with regard to meeting the project specifications for fill placement.

8.4 Concrete Testing

Concrete construction and placement should be monitored and tested by the geotechnical engineer-of-record or his representative. Testing should include the construction of test cylinders for every 50 cubic yards of poured concrete. These test specimens should be tested at 7 and 28 days to determine if the placed concrete meets the project specifications.

8.5 Structural Steel Inspection

Inspection of all structural welds and bolted connections is recommended. GEO Solutions can provide qualified and certified personnel to perform these services.

8.6 Shallow Foundation Evaluation

The geotechnical engineer-of-record or his representative should evaluate each of the foundation excavations to determine if they meet the proper bearing capacity. He may also give recommendations for remediation of soils not meeting the project specifications.

9.0 LIMITATIONS

This report has been prepared for the exclusive use of St. John's & Associates and their designers for the specific application to the project previously discussed. If other parties wish to rely on this report for other than informational purposes, they may do so by executing our standard terms and conditions upon written request.

Our recommendations have been prepared using generally accepted standards of geotechnical engineering practice in the State of Mississippi. No other warranty is expressed or implied. This company is not responsible for the conclusions, opinions or recommendations of others based on this data.

Our recommendations are based on the design information furnished to us, the data obtained from the previously described subsurface exploration and our past experience. They do not reflect variations in the subsurface conditions, which are likely to exist between our borings and in unexplored portions of the site due to the inherent variability of the subsurface conditions in this geologic region as well as previous site usage. If such variations are found during construction, it will be necessary to re-evaluate our conclusions and recommendations based upon onsite observations of the conditions.

If changes are made in the overall design, elevations or location of the alignment, the recommendations contained in this report must not be considered valid unless our firm reviews the changes and our recommendations modified or verified in writing. We should be given the opportunity to review the grading plans and applicable portions of the project specifications when the design is finalized. This review will allow us to check whether these documents are consistent with the intent of our recommendations.

APPENDIX A

ILLUSTRATIONS

JACK'S FAMILY RESTAURANT
OLIVE BRANCH, MISSISSIPPI

FIGURE 1

SITE LOCATION PLAN

GEO SOLUTIONS, L.L.C.
Geotechnical Engineering and Materials Testing Services

7201 Opportunity Boulevard
Huntsville, Alabama 35810
PH (256)837-6708 FX (256)837-6702

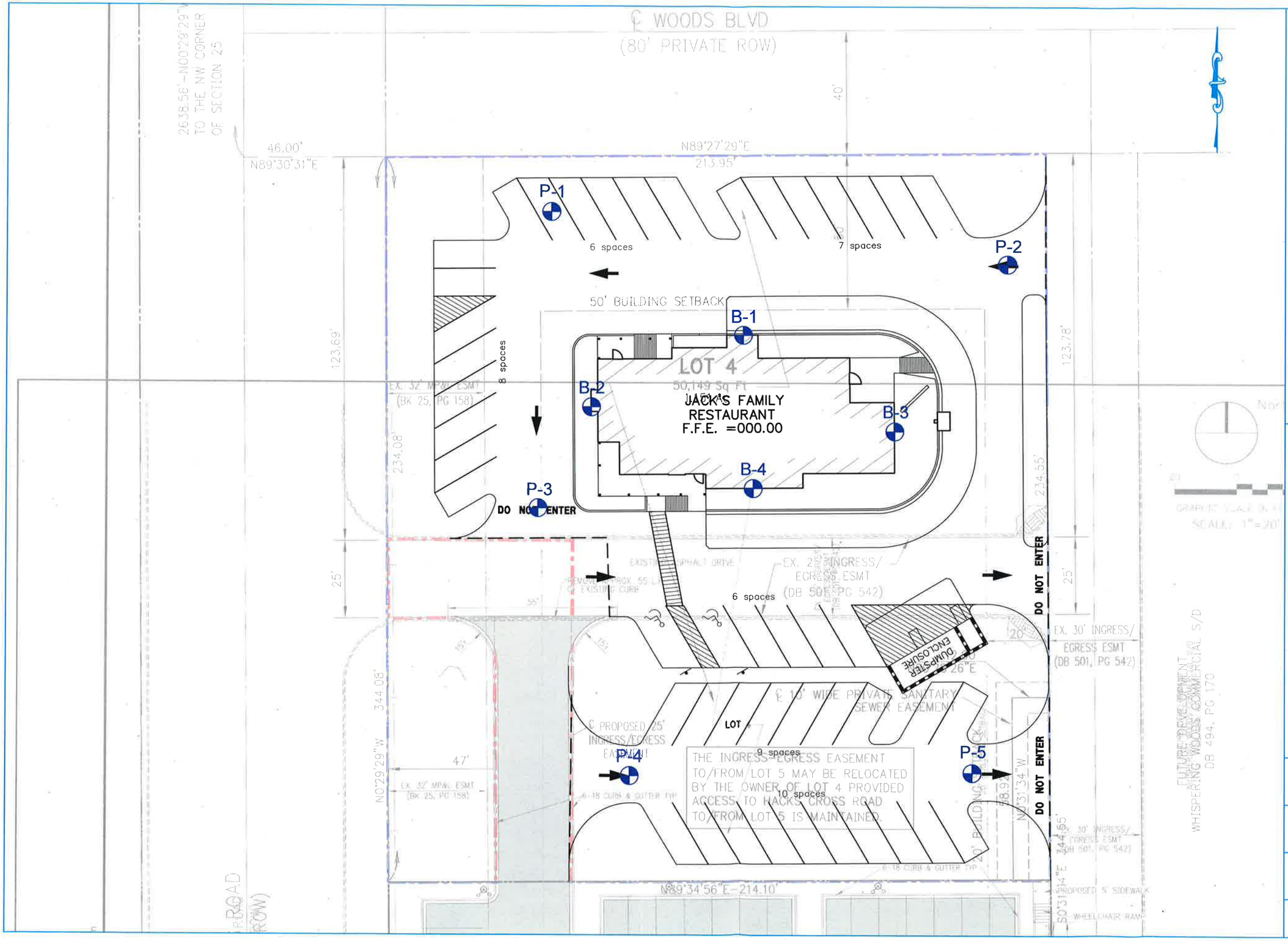
SCALE: 1/2500

PROJ: 20-1188

DATE: 11/12/20

JACK'S FAMILY RESTUARANT OLIVE BRANCH, MS

FIGURE 2
BORING LOCATION PLAN



GEO SOLUTIONS, LLC
Geotechnical Engineering and Materials Testing Services
7201 Opportunity Boulevard
Huntsville, Alabama 35810
PH (256)837-6708 FX (256)837-6702

SCALE: 1"=30'

PROJ: 20-1187

DATE: 11/12/2020

APPENDIX B

SOIL BORING RECORDS

BORING NO: **B-1**

TEST BORING RECORD

PROJECT: Jack's Family Restaurant		JOB NO: 20-1187
PROJECT LOCATION: Olive Branch, Mississippi		
ELEVATION:	BORING DATE: 11/4/2020	BORING BACKFILLED: 11/4/2020
DRILLING METHOD: H.S.A.	RIG TYPE: Geo Probe 7720 DT	HAMMER: Automatic
GROUNDWATER:	BORING DIAMETER (IN): 3.25	SHEET 1 OF 1
Remarks:		

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS / 6"	PP (TSF)
		0	Topsoil: 8 inches						
			Gray and yellowish brown, dry, silty CLAY FILL					4 - 9 - 12	1
			Yellowish brown with gray, dry, very stiff, silty CLAY LOESS					7 - 11 - 13	2
								9 - 10 - 10	3.25
		5	stiff					4 - 5 - 9	3
			Reddish yellow and brown, damp, very stiff, silty CLAY with sand PRE-LOESS TERRACE DEPOSIT					6 - 10 - 15	1.75
		10							
			moist, stiff					2 - 3 - 5	2.25
		15	Boring terminated at 15 feet.						
		20							

BORING RECORD 20-1187 BORINGS.GPJ GEO SOLUTIONS.GDT 11/13/20

BORING NO: **B-2**

TEST BORING RECORD

PROJECT: Jack's Family Restaurant		JOB NO: 20-1187
PROJECT LOCATION: Olive Branch, Mississippi		
ELEVATION:	BORING DATE: 11/4/2020	BORING BACKFILLED: 11/4/2020
DRILLING METHOD: H.S.A.	RIG TYPE: Geo Probe 7720 DT	HAMMER: Automatic
GROUNDWATER:	BORING DIAMETER (IN): 3.25	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS / 6"	PP (TSF)
		0	Topsoil: 8 inches						
			Light yellowish brown, dry, very stiff, silty CLAY with manganese dioxide nodules and rootlets LOESS					3 - 6 - 12	2.5
			grayish brown					5 - 11 - 11	3
			gray and brown, stiff					3 - 5 - 7	2.5
		5							
								3 - 7 - 8	3.5
			Yellow and gray, moist, very stiff to stiff, silty CLAY with sand PRE-LOESS TERRACE DEPOSIT					4 - 8 - 8	1.5
		10							
								4 - 6 - 8	2
		15	Boring terminated at 15 feet.						
		20							

BORING RECORD 20-1187 BORINGS.GPJ GEO SOLUTIONS.GDT 11/13/20

BORING NO: **B-3**

TEST BORING RECORD

PROJECT: Jack's Family Restaurant		JOB NO: 20-1187
PROJECT LOCATION: Olive Branch, Mississippi		
ELEVATION:	BORING DATE: 11/4/2020	BORING BACKFILLED: 11/4/2020
DRILLING METHOD: H.S.A.	RIG TYPE: Geo Probe 7720 DT	HAMMER: Automatic
GROUNDWATER:	BORING DIAMETER (IN): 3.25	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS / 6"	PP (TSF)
		0	Topsoil: 8 inches						
			Brownish yellow and gray, dry, very stiff, silty CLAY LOESS					7 - 11 - 12	2.25
								4 - 11 - 12	2
								3 - 8 - 9	3
		5	yellow and gray					5 - 9 - 8	1.5
								5 - 7 - 12	1.5
		10							
			Yellow and gray, moist, very stiff, silty CLAY PRE-LOESS TERRACE DEPOSIT					11 - 12 - 10	1
		15	Boring terminated at 15 feet.						
		20							

BORING RECORD 20-1187 BORINGS.GPJ GEO SOLUTIONS.GDT 11/13/20

BORING NO: **B-4**

TEST BORING RECORD

PROJECT: Jack's Family Restaurant		JOB NO: 20-1187
PROJECT LOCATION: Olive Branch, Mississippi		
ELEVATION:	BORING DATE: 11/4/2020	BORING BACKFILLED: 11/4/2020
DRILLING METHOD: H.S.A.	RIG TYPE: Geo Probe 7720 DT	HAMMER: Automatic
GROUNDWATER:	BORING DIAMETER (IN): 3.25	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS / 6"	PP (TSF)
		0	Topsoil: 4 inches						
			Gray and brown, dry, silty CLAY FILL					7 - 15 - 15	4
			Dark brown and gray, moist, very stiff, silty CLAY LOESS					7 - 12 - 13	3.5
								4 - 8 - 10	3.25
		5	yellowish brown					4 - 7 - 8	2.5
								3 - 7 - 5	3.25
		10	yellow and gray, moist, stiff						
			Yellow and gray, moist, stiff, silty CLAY PRE-LOESS TERRACE DEPOSIT					2 - 3 - 6	2.5
		15	Boring terminated at 15 feet.						
		20							

BORING NO: **P-1**

TEST BORING RECORD

PROJECT: Jack's Family Restaurant		JOB NO: 20-1187
PROJECT LOCATION: Olive Branch, Mississippi		
ELEVATION:	BORING DATE: 11/4/2020	BORING BACKFILLED: 11/4/2020
DRILLING METHOD: H.S.A.	RIG TYPE: Geo Probe 7720 DT	HAMMER: Automatic
GROUNDWATER:	BORING DIAMETER (IN): 3.25	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS / 6"	PP (TSF)
		0	Topsoil: 6 inches						
			Yellow, brown and gray, dry, silty CLAY FILL					4 - 10 - 16	4.5
			Brownish tan and gray, moist, very stiff, silty CLAY LOESS					4 - 7 - 8	4
		5	Boring terminated at 5 feet.					3 - 5 - 6	3.25
		10							
		15							
		20							

BORING NO: **P-2**

TEST BORING RECORD

PROJECT: Jack's Family Restaurant		JOB NO: 20-1187
PROJECT LOCATION: Olive Branch, Mississippi		
ELEVATION:	BORING DATE: 11/4/2020	BORING BACKFILLED: 11/4/2020
DRILLING METHOD: H.S.A.	RIG TYPE: Geo Probe 7720 DT	HAMMER: Automatic
GROUNDWATER:	BORING DIAMETER (IN): 3.25	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS / 6"	PP (TSF)
		0	Topsoil: 12 inches						
			Light yellowish brown and white, dry, silty CLAY FILL				●	2 - 9 - 10	4.5
			Brown and gray, moist, very stiff, silty CLAY LOESS				●	5 - 8 - 7	2.5
			stiff				●	3 - 5 - 8	2.5
		5	Boring terminated at 5 feet.						
		10							
		15							
		20							

BORING NO: **P-3**

TEST BORING RECORD

PROJECT: Jack's Family Restaurant		JOB NO: 20-1187
PROJECT LOCATION: Olive Branch, Mississippi		
ELEVATION:	BORING DATE: 11/4/2020	BORING BACKFILLED: 11/4/2020
DRILLING METHOD: H.S.A.	RIG TYPE: Geo Probe 7720 DT	HAMMER: Automatic
GROUNDWATER:	BORING DIAMETER (IN): 3.25	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS / 6"	PP (TSF)
		0	Topsoil: 4 inches						
			Gray and light brown, dry, very stiff, silty CLAY LOESS				●	4 - 9 - 12	2.5
							●	7 - 12 - 12	2.5
							●	5 - 9 - 9	1.5
		5	Boring terminated at 5 feet.						
		10							
		15							
		20							

BORING RECORD 20-1187 BORINGS.GPJ GEO SOLUTIONS.GDT 11/13/20

BORING NO: **P-4**

TEST BORING RECORD

PROJECT: Jack's Family Restaurant		JOB NO: 20-1187
PROJECT LOCATION: Olive Branch, Mississippi		
ELEVATION:	BORING DATE: 11/4/2020	BORING BACKFILLED: 11/4/2020
DRILLING METHOD: H.S.A.	RIG TYPE: Geo Probe 7720 DT	HAMMER: Automatic
GROUNDWATER:	BORING DIAMETER (IN): 3.25	SHEET 1 OF 1

Remarks:

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS / 6"	PP (TSF)
		0	Topsoil: 9 inches						
			Light yellowish brown and white, dry, silty CLAY FILL				●	2 - 4 - 7	4.25
			Light brown and white, damp, very stiff, silty CLAY with manganese dioxide nodules LOESS				●	8 - 10 - 13	3.5
		5	Boring terminated at 5 feet.				●	4 - 11 - 16	2.5
		10							
		15							
		20							

BORING NO: **P-5**

TEST BORING RECORD

PROJECT: Jack's Family Restaurant		JOB NO: 20-1187
PROJECT LOCATION: Olive Branch, Mississippi		
ELEVATION:	BORING DATE: 11/4/2020	BORING BACKFILLED: 11/4/2020
DRILLING METHOD: H.S.A.	RIG TYPE: Geo Probe 7720 DT	HAMMER: Automatic
GROUNDWATER:	BORING DIAMETER (IN): 3.25	SHEET 1 OF 1
Remarks:		

G	ELEV. (FT.)	DEPTH (FT.)	MATERIAL DESCRIPTION	L	S	R	STANDARD PENETRATION RESISTANCE (N) 0 10 20 30 40 50 60 70 80 90 100	BLOWS / 6"	PP (TSF)
		0	Topsoil: 9 inches						
			Yellowish brown and white, dry, silty CLAY FILL					2 - 9 - 11	4.5
			Gray and yellow, dry, stiff, silty CLAY LOESS					5 - 5 - 5	2.75
								3 - 4 - 6	3
		5	Boring terminated at 5 feet.						
		10							
		15							
		20							

APPENDIX C

LABORATORY DATA

GEO SOLUTIONS, L.L.C.
Geotechnical Engineering and Materials Testing Services

ATTERBERG LIMITS, ASTM D 421/ASTM D 4318 (Method A)

Project: Jack's, Olive Branch, MS Job No.: 20-1187 Date: 11/13/20

LIQUID LIMIT

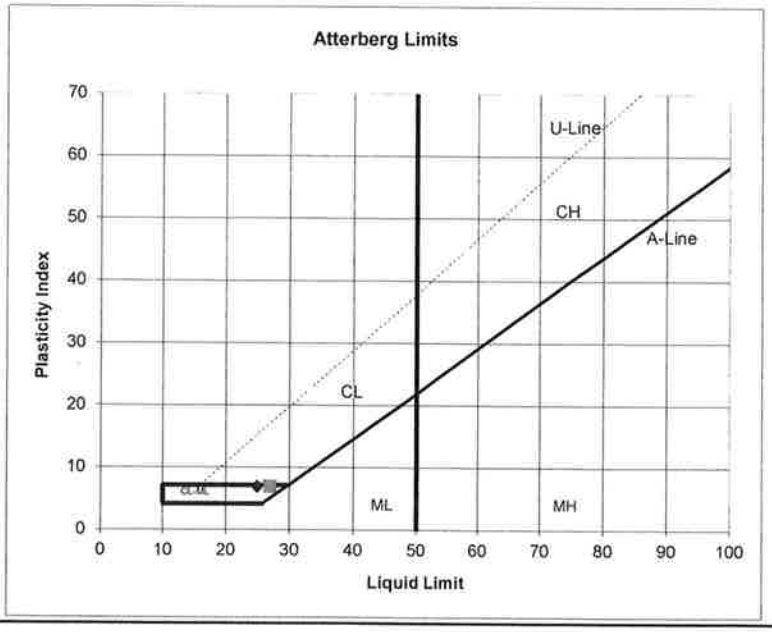
Sample Location		Tare No.	Tare Weight (grams)	Weight of Wet Soil & Tare (grams)	Weight of Dry Soil & Tare (grams)	Number of Blows	Moisture Content %	Liquid Limit
Boring No.	Depth							
B-2	3.5-5	L	21.50	37.49	34.31	24	24.8	25
B-2	3.5-5	C	21.66	34.60	32.04	24	24.7	25
B-3	3.5-5	3D	26.41	42.47	39.07	26	26.9	27
B-3	3.5-5	4E	21.35	41.52	37.35	27	26.1	26

PLASTIC LIMIT

Sample Location		Tare No.	Tare Weight (grams)	Weight of Wet Soil & Tare (grams)	Weight of Dry Soil & Tare (grams)	Moisture Content %	Plastic Limit
Boring No.	Depth						
B-2	3.5-5	1N	29.01	36.81	35.66	17.3	17
B-2	3.5-5	M	21.55	27.84	26.89	17.8	18
B-3	3.5-5	1R	28.98	36.45	35.20	20.1	20
B-3	3.5-5	1J	21.71	28.55	27.42	19.8	20

ATTERBERG LIMITS

Sample Location		Liquid Limit	Plastic Limit	Plasticity Index	Symbol
Boring No.	Depth				
B-2	3.5-5	25	18	7	♦
B-3	3.5-5	27	20	7	■



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GEO SOLUTIONS, L.L.C.
Geotechnical Engineering and Materials Testing Services

Moisture Content, ASTM D 2216

Project: Jack's, Olive Branch, MS Job No. 20-1187 Date: 11/13/20
Reviewed: @

Sample Location		Tare Weight	Wet Weight & Tare	Dry Weight & Tare	Weight of Wet Soil	Weight of Dry Soil	Moisture Content
Boring No.	Depth (ft.)	grams	grams	grams	grams	grams	%
B-2	0-1.5	8.5	312.6	278.4	304.1	269.9	12.7
	1.5-3	7.2	349.0	318.8	341.8	311.6	9.7
	3.5-5	7.2	348.5	294.3	341.3	287.1	18.9
	6-7.5	7.5	542.8	454.7	535.3	447.2	19.7
	8.5-10	7.6	478.4	421.1	470.8	413.5	13.9
	13.5-15	7.2	463.0	389.9	455.8	382.7	19.1
B-3	0-1.5	8.5	353.6	306.8	345.1	298.3	15.7
	1.5-3	7.3	277.4	250.6	270.1	243.3	11.0
	3.5-5	7.2	332.7	297.2	325.5	290.0	12.2
	6-7.5	7.6	343.8	297.7	336.2	290.1	15.9
	8.5-10	7.1	475.3	408.7	468.2	401.6	16.6
	13.5-15	7.1	460.9	401.4	453.8	394.3	15.1

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#200 Wash, ASTM D 1140

Project: Jack's, Olive Branch, MS

Job No. 20-1187

Date: 11/13/20

Reviewed: [signature]

Sample Location		Tare Weight	Dry Weight & Tare	Dry Weight	Dry Weight & Tare	Dry Weight	% Passing #200
Boring No.	Depth	grams	grams	grams	after wash, grams	after wash, grams	
B-2	3.5-5	481.1	783.9	302.8	502.3	21.2	93.0
B-3	3.5-5	655.2	947.3	292.1	669.3	14.1	95.2

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