Stribling Road Pavement Investigation

Pavement Engineering Report

November 29, 2023 | Terracon Project No. EB235138

Prepared for:

Madison County Board of Supervisors – Engineering Department
3137 South Liberty Street
Canton, Mississippi 39046

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859 S Pear Orchard Road
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P (601) 956-4467
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November 29, 2023

Madison County Board of Supervisors – Engineering Department
3137 South Liberty Street
Canton, Mississippi 39046

Attn: Mr. Tim Bryan, P.E., PTOE
P: (601) 790 2525
E: timothy.bryan@madison-co.com

Re: Pavement Engineering Report
Stribling Road Pavement Investigation
Gluckstadt, Mississippi
Terracon Project No. EB235138

Dear Mr. Bryan:

We have completed the scope of Pavement Engineering services for the above referenced project in general accordance with Terracon Proposal No. PEB235138 dated August 30th, 2023. This report presents the findings of the subsurface exploration and provides comment on the suitability of the existing pavement sections.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

Nicholas Leber

NICHOLAS KING LEBER
30041

Nicholas K. Leber, P.E.
Department Manager

Ryan P. Steiner, P.E.
Office Manager

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

Refer to each individual Attachment for a listing of contents.

Introduction

This report presents the results of our subsurface exploration and Pavement Engineering services performed for along Stribling Road in Gluckstadt, Mississippi. The purpose of these services was to provide information and engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Photographs of asphalt cores
- Suitability of existing pavement sections based on increased traffic loading conditions

The Scope of Services for this project included the advancement of soil borings, laboratory testing, engineering analysis, and preparation of this report. Drawings showing the site and boring locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs in the **Exploration Results** section.

Project Description

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

Item	Description
Site Information	The project is located along Stribling Road between Catlett Road and Dewees Road (approximately 1.25 miles) in Gluckstadt, Mississippi (approximately 32.5375° N, 90.1464° W). See **Site Location**
Project Description	Terracon was requested to perform a pavement evaluation (field investigation and laboratory testing) in order to determine the existing pavement structure along the alignment. The purpose of the investigation was to determine if the existing pavement sections are suitable for the traffic conditions associated with developments in the area.

Item	Description
Pavements	The existing pavement along the Stribling Road alignment consists of asphalt. Based on the MDOT traffic map, the average daily traffic (ADT) is 12,000 vehicles per day (VPD). Based on conversations with the client, we understand the traffic conditions as shown in the **Pavement** section of the report.

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

Geotechnical Overview

Pavement Structure

The pavement structure was investigated by coring the existing pavement at a total of fourteen (14) locations along the alignment. The locations were staggered in the east and west-bound lanes along the alignment. The thickness of the existing pavement section was determined in the field by measuring the sidewall thickness of the core hole to the nearest ¼ inch. Based on the field measurements, the minimum asphalt thickness was recorded to be about 10 inches, and the maximum thickness was recorded to be about 14 inches with an average thickness of about 11 ¾ inches. A crushed stone aggregate base course (MDOT No. 610 stone or equivalent material) was not found to be present beneath the asphalt sections. The thicknesses of the pavement sections at each location are presented on the Boring Logs and the Photo Log in **Exploration Results**.

Soil Conditions

After coring through the existing pavements, the soil and groundwater conditions were investigated by means of soil borings advanced to a depth of about 6 feet beneath the ground surface. Based on the results of the soil borings, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Asphalt**	Ranging in thickness from 10 to 14 inches
2	**Fill Soils**	Lean Clay with varying amounts of sand / Clayey Sands
3	**Lean Clays**	Lean Clay (CL) – very soft to stiff

Model Layer	Layer Name	General Description
4	**Fat Clays**	Fat Clay (CH) – medium stiff to stiff

Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** and the GeoModel can be found in the **Figures** attachment of this report.

Groundwater Conditions

Groundwater was not observed in the borings while drilling or for the short duration that the borings were allowed to remain open. However, this does not necessarily mean that the borings terminated above groundwater. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for the groundwater level to develop and stabilize in a borehole in these materials. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define the field or in-situ groundwater level in materials of this type.

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

Pavement Analysis

Pavement thickness analyses are provided for the traffic conditions that are noted in the **Design Traffic Analysis** table below and are based on the parameters presented in the **Pavement Design Parameters** table below.

Pavement Design Parameters

Based on experience with the soils encountered in the soil borings, an estimated California Bearing Ratio (CBR) of 3 was used for the pavement analysis. This value corresponds to a subgrade Resilient Modulus (Mr) of about 5,100 psi (pounds per square inch) for use for flexible pavement design. Support characteristics of subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade, such as soils observed on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

Analyses for the pavement design of the project have been based on the procedures of the AASHTO Guide for Design of Pavement Structures (1993). The following design parameters were utilized for pavement engineering analyses and the determination of design alternatives for the project:

Pavement Design Parameters		
Reliability	Level of Reliability	85%
	Flexible Overall Standard Deviation	0.45
Serviceability	Flexible Initial Serviceability	4.2
	Flexible Terminal Serviceability	2.0
	Design Serviceability	2.2
Subgrade Conditions	Estimated CBR	3
	Correlated Resilient Modulus, M_r	5,160 psi
Asphalt Layer Properties	New Asphalt Concrete (AC) Layer Coefficient	0.44
	Estimated Asphalt Concrete (AC) Layer Coefficient of the Existing Asphalt Pavements	0.30 [1]

1. The value for the existing asphalt layer coefficient was estimated per Table 5.2 – *Suggested Layer Coefficients for Existing AC Pavement Layer Materials* of AASHTO Guide for Design of Pavement Structures (1993).

Design Traffic Analysis

The anticipated traffic levels were converted into flexible AASHTO pavement 18-kip equivalent single axle loads (ESALs) for use in Asphalt Concrete (AC) pavement thickness design, as noted in the following table. Our office should be contacted if there are any changes in the reported traffic patterns or frequency to review the enclosed values.

Vehicle Type	Estimated Traffic Volume	Approximate 18-kip ESALs
Estimated Current Traffic Conditions		
Passenger cars and light trucks	12,000 vehicles per day	35,000
School buses	20 vehicles per day	53,000
Garbage trucks	4 vehicles per day	81,000
Package delivery trucks	8 vehicles per day	21,000
Semi-tractor trailer (loaded)	1 vehicle per day	18,000
	Total Current	**208,000**

Estimated Additional Traffic Conditions		
Passenger cars and light trucks	3,000 vehicles per day	8,000
Garbage trucks	1 vehicle per day	20,000
Package delivery trucks	2 vehicles per day	5,000
Semi-tractor trailer (loaded)	2 vehicle per day	36,000
	Total Additional	**69,000**
	New Traffic Design Condition	**277,000**

1. If this pavement will be subjected to higher traffic counts during the design life, we should be contacted to revise our recommendations.

Conclusion

Based on the results of the investigation, the existing asphalt thickness ranged in thickness from 10 to 14 inches and a crushed stone aggregate base course was not found to be present. Based on the existing asphalt thicknesses and conditions, a pavement structural number ranging from about 3.0 to 4.2 was estimated. These values were determined by utilizing the pavement design parameters above.

Based on the pavement design parameters, anticipated future traffic conditions presented above, and the current conditions of the asphalt pavements, an estimated pavement structural number of about 3.05 is required for the estimated traffic volumes. Based on this analysis, it appears that the existing pavement sections, in their current condition, are structurally adequate to support the estimated additional traffic volumes as presented above.

It should be noted that the pavement thicknesses and subsurface conditions between our boring locations may differ from those presented in this report and utilized in our analysis. Should the pavement thicknesses or subsurface/pavement conditions differ from those in this report, some pavement failure could occur. Additionally, this analysis does not comment on the future performance of the roadway and future maintenance of roadway/pavements will likely be required.

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

General Comments

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

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

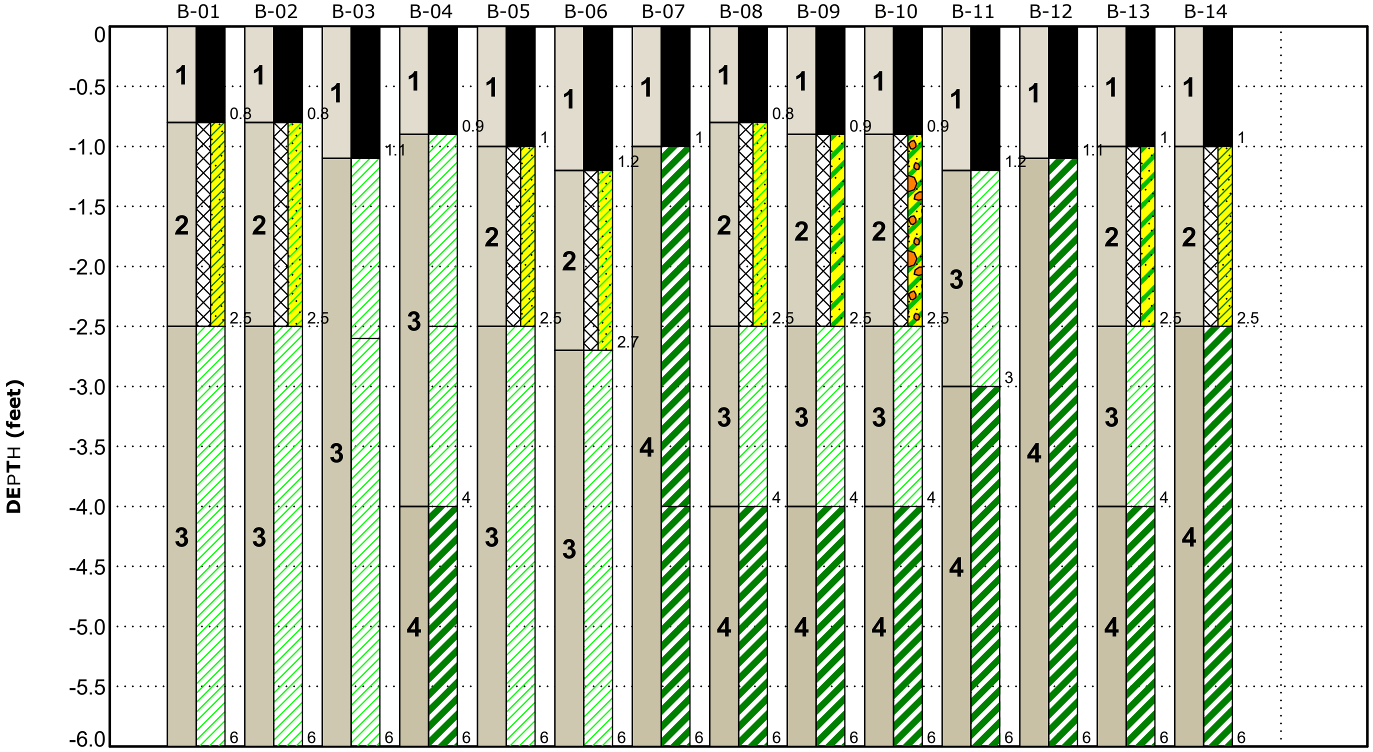
Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party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

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

Figures

Contents:

GeoModel



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

Model Layer	Layer Name	General Description
1	**Asphalt**	Ranging in thickness from 9 to 14 inches
2	**Fill Soils**	Lean Clay with varying amounts of sand / Clayey Sands
3	**Lean Clays**	Lean Clay (CL) - very soft to stiff
4	**Fat Clays**	Fat Clay (CH) - medium stiff to stiff

Legend

■ Asphalt	▨ Sandy Lean Clay
▨ Lean Clay	▨ Lean Clay with Sand
▨ Fat Clay	▨ Clayey Sand
▨ Clayey Sand with Gravel	

NOTES:

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

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Approx. Boring Depth (feet)	Location
14	6	Stribling Road alignment

Boring Layout: Terracon personnel established the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features.

Subsurface Exploration Procedures: Prior to advancing the soil borings, the existing asphalt pavements were cored, and the sidewalls of the core hole were measured to the nearest ¼ inch to obtain the approximate pavement thicknesses.

After coring through the existing pavements, we then advanced the soil borings with a tractor-mounted, rotary drill rig using continuous flight solid stem augers. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We also observed the boreholes while drilling and at the completion of drilling for the presence of groundwater. Groundwater was not observed at these times in the boreholes. For safety purposes, the borings were backfilled with auger cuttings after their completion. Pavements were patched with cold-mix asphalt.

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

Laboratory Testing

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

- Moisture content
- Atterberg limits
- 200 wash

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

Site Location and Exploration Plans

Contents:

Note: All attachments are one page unless noted above.

Site Location

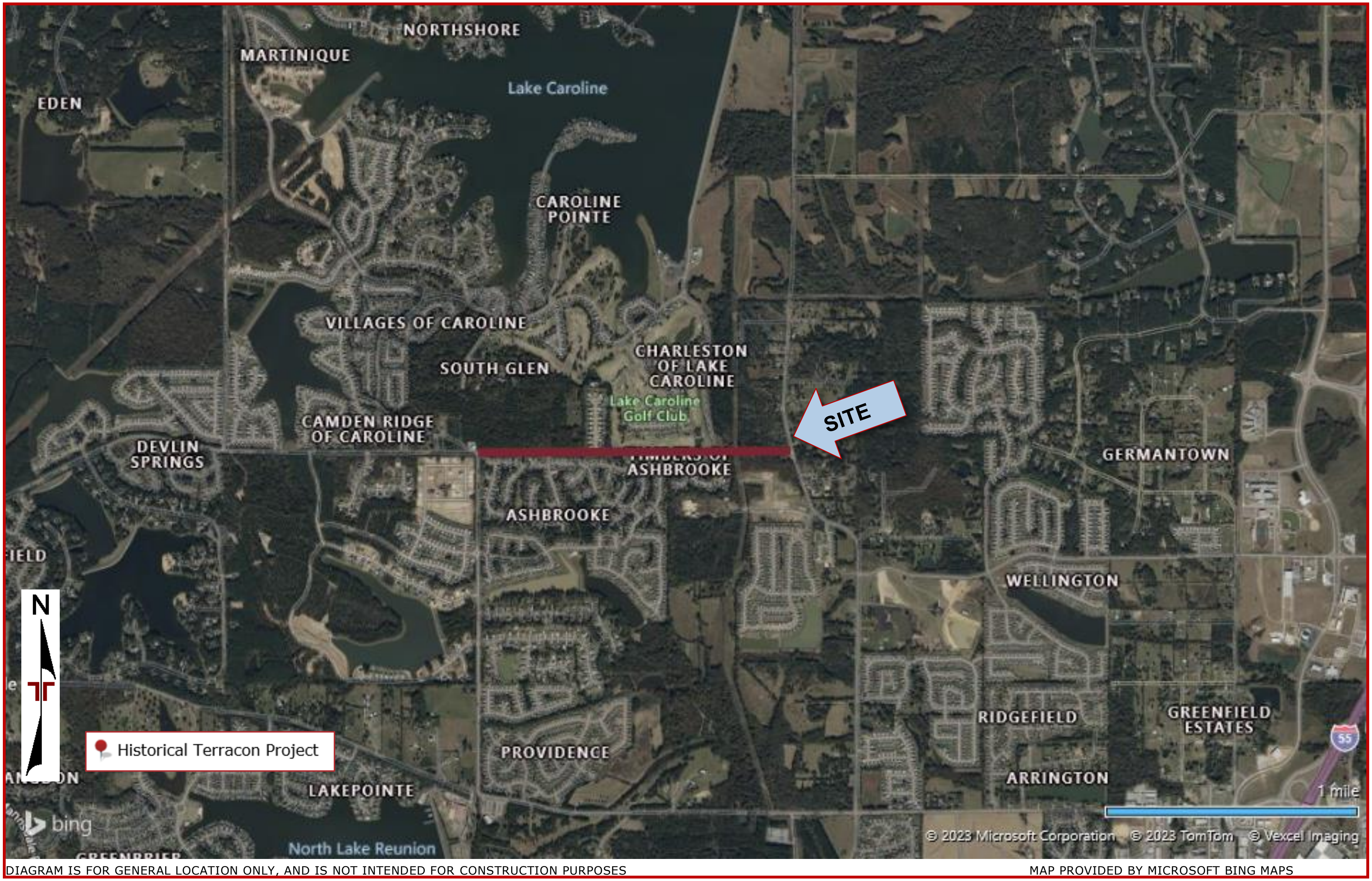


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

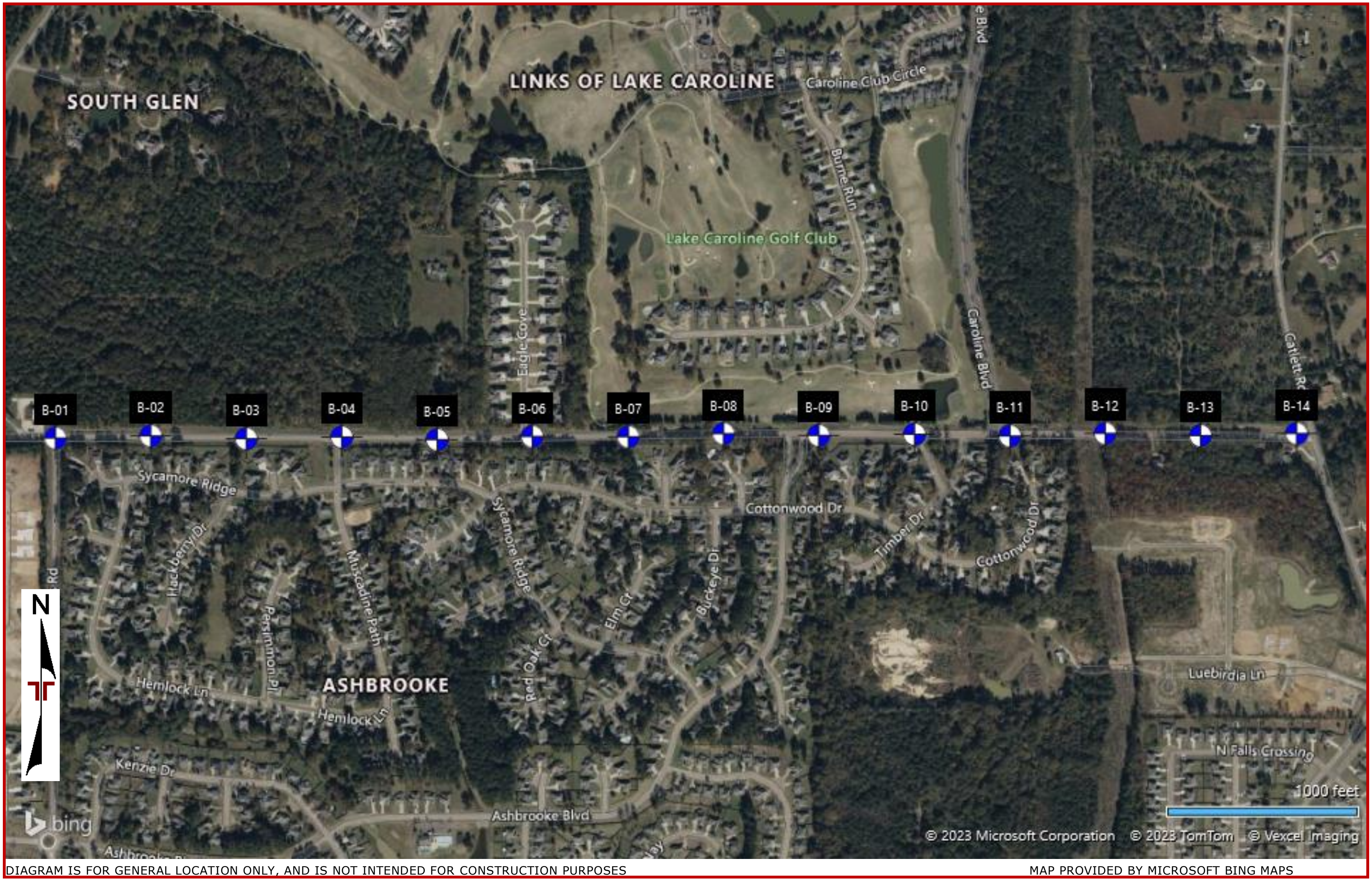


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (B-01 through B-14)
Photo Log of Asphalt Cores (7 pages)

Note: All attachments are one page unless noted above.

Terracon
859 S Pear Orchard Rd
Ridgeland, MS

Boring Log No. B-01

Location: See Exploration Plan

Latitude: 32.3746° Longitude: -90.1577°

Model Layer	Graphic Log	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.8	**ASPHALT**							
2		2.5	**FILL - SANDY LEAN CLAY**, light brown	1 2		☒	4-6-4 N=10	17.7	34-15-19	65
3			**LEAN CLAY (CL)**, light brown, medium stiff	3 4		☒	1-3-2 N=5	26.1		
		6.0		5 6		☒	1-3-4 N=7	23.9		
			Boring Terminated at 6 Feet							

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-02

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 32.5375° Longitude: -90.1561° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	**ASPHALT** 0.8							
2	▨	**FILL - LEAN CLAY WITH SAND**, brown and gray 2.5	1 2		☒	4-7-7 N=14	21.4		
3	▨	**LEAN CLAY (CL)**, light brown, medium stiff	3 4		☒	2-2-3 N=5	24.9	34-15-19	
		6.0	5		☒	2-3-4 N=7	22.1		
		Boring Terminated at 6 Feet	6						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-03

Location: See Exploration Plan

Latitude: 32.5375° Longitude: -90.1545°

Model Layer	Graphic Log	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	1.1	**ASPHALT**	1						
3	▨	2.6	**LEAN CLAY (CL)**, brown and gray, soft	2		☒	1-1-2 N=3	24.4	33-15-18	
3	▨		**LEAN CLAY (CL)**, light brown, medium stiff	3		☒	2-2-4 N=6	21.3		
			- stiff below 4'	4						
		6.0		5		☒	3-8-5 N=13	20.0		
			Boring Terminated at 6 Feet	6						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-04

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 32.5375° Longitude: -90.1528° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	**ASPHALT** 0.9							
3	▨	**LEAN CLAY (CL)**, light brown, medium stiff 2.5	1 2		☒	3-6-2 N=8	25.2	32-11-21	
	▨	**LEAN CLAY (CL)**, brown, very soft 4.0	3		☒	WOH N=0	29.4		
4	▨	**FAT CLAY (CH)**, gray, stiff 6.0	4 5 6		☒	2-7-5 N=12	30.8		
		Boring Terminated at 6 Feet							

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-05

Location: See Exploration Plan

Latitude: 32.5374° Longitude: -90.1512°

Model Layer	Graphic Log	Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	**ASPHALT** 1.0	0 - 1						
2	▨	**FILL - SANDY LEAN CLAY**, brown 2.5	1 - 2.5		☒	4-4-4 N=8	16.9		
3	▨	**LEAN CLAY (CL)**, light brown, medium stiff	2.5 - 4		☒	1-2-2 N=4	24.1	42-13-29	
			4 - 4.5						
		6.0	4.5 - 6		☒	2-3-5 N=8	21.2		
		Boring Terminated at 6 Feet							

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-06

Location: See Exploration Plan

Latitude: 32.5375° Longitude: -90.1496°

Model Layer	Graphic Log	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	1.2	**ASPHALT**	1						
2	▨	2.7	**FILL - LEAN CLAY WITH SAND**, brown	2		☒	1-4-4 N=8	23.8		
3	▨		**LEAN CLAY (CL)**, light brown, stiff	3		☒	3-4-5 N=9	20.3	43-15-28	
			- medium stiff below 4'	4						
		6.0		5		☒	4-3-1 N=4	23.9		
			Boring Terminated at 6 Feet	6						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-07

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 32.5375° Longitude: -90.1480° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	**ASPHALT**							
		1.0	1						
4	▨	**FAT CLAY (CH)**, brown, stiff - medium stiff below 2'	2		☒	3-5-7 N=12	19.0	50-21-29	
	▨		3		☒	2-4-4 N=8	25.6		
		4.0	4						
	▨	**FAT CLAY (CH)**, olive yellow and light gray, stiff, (weathered Yazoo)	5		☒	2-4-5 N=9	32.9		
		6.0	6						
		Boring Terminated at 6 Feet							

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-08

Location: See Exploration Plan

Latitude: 32.5375° Longitude: -90.1464°

Model Layer	Graphic Log	Depth (Ft.)		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	0.8	**ASPHALT**							
2	▨	2.5	**FILL - LEAN CLAY WITH SAND**, brown	1 2		☒	1-4-3 N=7	18.9	34-13-21	
3	▨	4.0	**LEAN CLAY (CL)**, light brown, medium stiff	3 4		☒	2-2-2 N=4	15.5		
4	▨	6.0	**FAT CLAY (CH)**, olive yellow and light gray, medium stiff, (weathered Yazoo)	5 6		☒	1-2-3 N=5	36.6	100-22-78	

Boring Terminated at 6 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-09

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 32.5375° Longitude: -90.1447° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	**ASPHALT** 0.9							
2	▨	**FILL - CLAYEY SAND**, brown 2.5	1 2		☒	5-10-6 N=16	9.3	17-12-5	29
3	▨	**LEAN CLAY (CL)**, light brown, medium stiff 4.0	3		☒	2-3-3 N=6	19.9		
4	▨	**FAT CLAY (CH)**, brown, medium stiff 6.0	4 5		☒	2-5-3 N=8	23.2		
		Boring Terminated at 6 Feet	6						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-10

Location: See Exploration Plan

Latitude: 32.5375° Longitude: -90.1431°

Model Layer	Graphic Log	Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	**ASPHALT** 0.9							
2	▨	**FILL - CLAYEY SAND WITH GRAVEL**, brown 2.5	1 2		☒	7-7-4 N=11	11.4	17-8-9	28
3	▨	**LEAN CLAY (CL)**, brown, medium stiff 4.0	3 4		☒	2-4-4 N=8	23.3		
4	▨	**FAT CLAY (CH)**, brown, medium stiff 6.0	5 6		☒	2-4-3 N=7	24.3	70-16-54	
		Boring Terminated at 6 Feet							

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-11

Location: See Exploration Plan

Latitude: 32.5375° Longitude: -90.1415°

Model Layer	Graphic Log	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	1.2	**ASPHALT**	1						
3	▨	3.0	**LEAN CLAY (CL)**, light brown, medium stiff	2		☒	1-2-2 N=4	20.4	40-17-23	
4	▨	6.0	**FAT CLAY (CH)**, olive yellow and light gray, medium stiff, (weathered Yazoo)	3 4		☒	1-2-2 N=4	27.8		
				5 6		☒	1-2-3 N=5	48.6		
			Boring Terminated at 6 Feet							

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-12

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 32.5375° Longitude: -90.1399° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	**ASPHALT**							
		1.1	1						
4	▨	**FAT CLAY (CH)**, brown and gray, medium stiff	2		☒	1-4-3 N=7	24.4		
		- soft from 2.5' - 4'	3		☒	1-1-2 N=3	23.8		
			4						
			5		☒	1-2-2 N=4	33.4		
		6.0	6						
		Boring Terminated at 6 Feet							

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-13

Location: See Exploration Plan

Latitude: 32.5375° Longitude: -90.1382°

Model Layer	Graphic Log	Depth (Ft.)		Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	1.0	**ASPHALT**	1						
2	▨	2.5	**FILL - CLAYEY SAND**, brown	2		☒	8-7-5 N=12	10.5	17-7-10	27
3	▨	4.0	**LEAN CLAY (CL)**, light brown, medium stiff	3 4		☒	2-3-4 N=7	23.2		
4	▨	6.0	**FAT CLAY (CH)**, brown, medium stiff	5 6		☒	1-3-3 N=6	29.2		
			Boring Terminated at 6 Feet							

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring Log No. B-14

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 32.5375° Longitude: -90.1366° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	■	**ASPHALT** 1.0	1						
2	▨	**FILL - SANDY LEAN CLAY**, brown 2.5	2		☒	8-9-3 N=12	21.2	38-8-30	
4	▨	**FAT CLAY (CH)**, olive yellow and light gray, medium stiff, (weathered Yazoo) 6.0	3 4 5 6		☒	1-3-3 N=6	30.6		
					☒	1-3-4 N=7	31.2		
		Boring Terminated at 6 Feet							

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
Solid-flight Auger: 0' - 6'

Abandonment Method
Boring backfilled with Auger Cuttings
Surface capped with asphalt

Drill Rig
Tractor

Hammer Type
Automatic

Driller
Subcontractor

Logged by
R. James

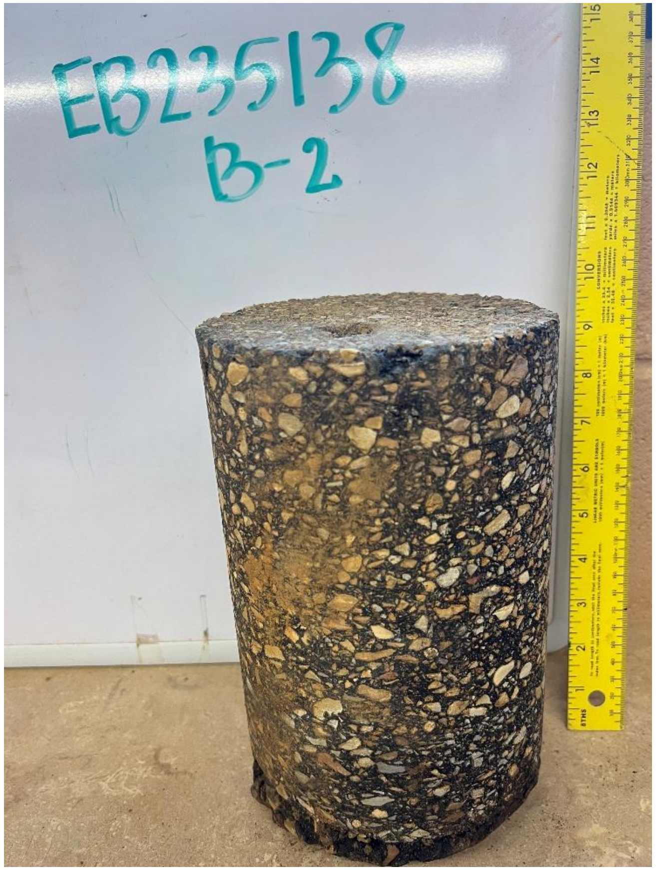
Boring Started
09-25-2023

Boring Completed
09-25-2023

Boring B-01

Field Measured Thickness: 10 inches
Core Recovery Thickness: 10 inches

Boring B-02



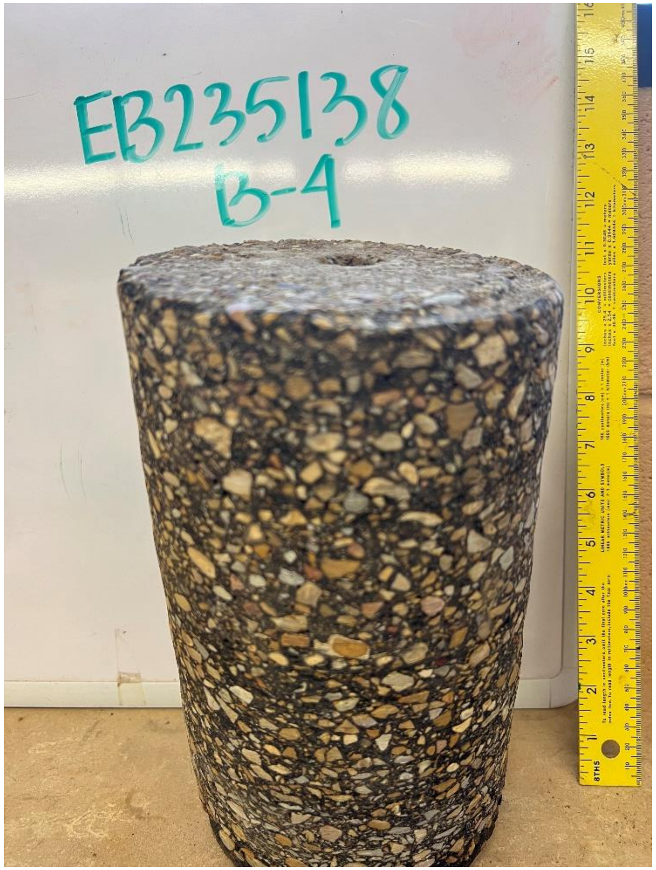
Field Measured Thickness: 10 inches
Core Recovery Thickness: 9 ½ inches

** Field measured thickness was determined by measuring the sidewall thickness of the core hole. The measurements were taken to the nearest ¼ inch.
** The core recovery thickness was determined by measuring the extracted core. The measurements were taken to the nearest ¼ inch.

Boring B-03

Field Measured Thickness: 13 inches
Core Recovery Thickness: 13 inches

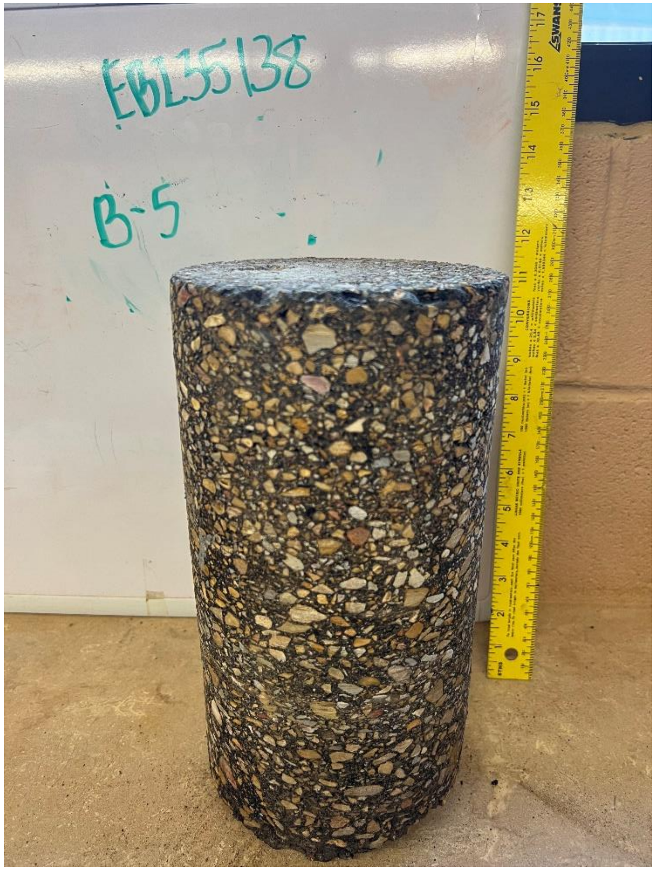
Boring B-04



Field Measured Thickness: 11 inches
Core Recovery Thickness: 10 ¼ inches

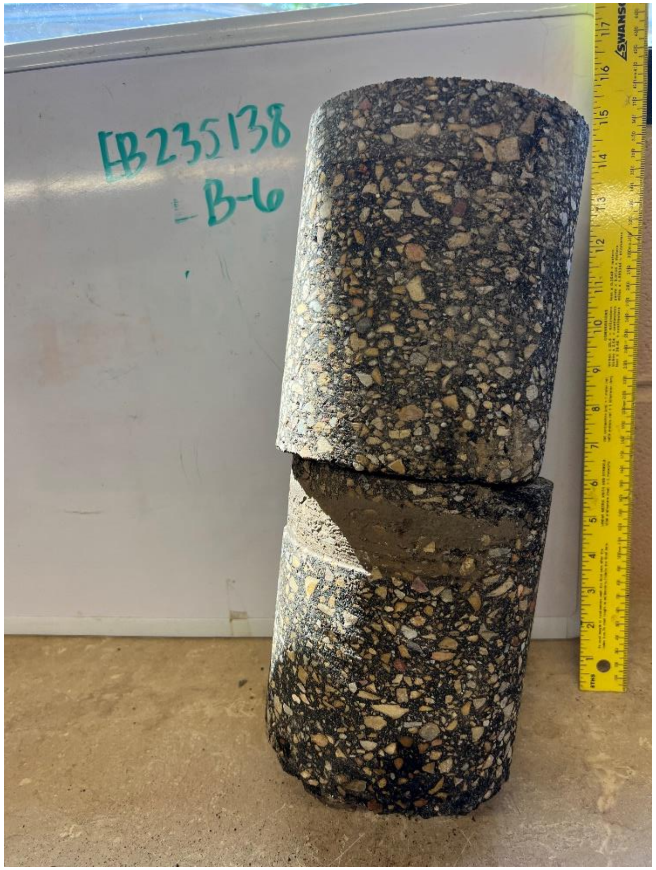
** Field measured thickness was determined by measuring the sidewall thickness of the core hole. The measurements were taken to the nearest ¼ inch.
** The core recovery thickness was determined by measuring the extracted core. The measurements were taken to the nearest ¼ inch.

Boring B-05



Field Measured Thickness: 12 inches
Core Recovery Thickness: 11 ½ inches

Boring B-06



Field Measured Thickness: 14 inches
Core Recovery Thickness: 14 inches

** Field measured thickness was determined by measuring the sidewall thickness of the core hole. The measurements were taken to the nearest ¼ inch.
** The core recovery thickness was determined by measuring the extracted core. The measurements were taken to the nearest ¼ inch.

Boring B-07

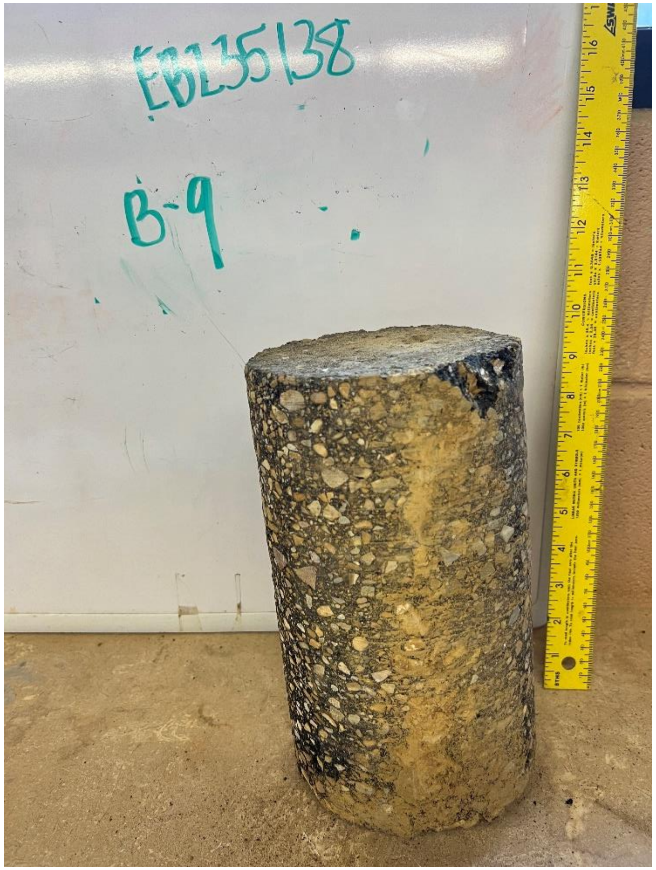
Field Measured Thickness: 12 inches
Core Recovery Thickness: 11 ¾ inches

Boring B-08

Field Measured Thickness: 10 inches
Core Recovery Thickness: Disintegrated

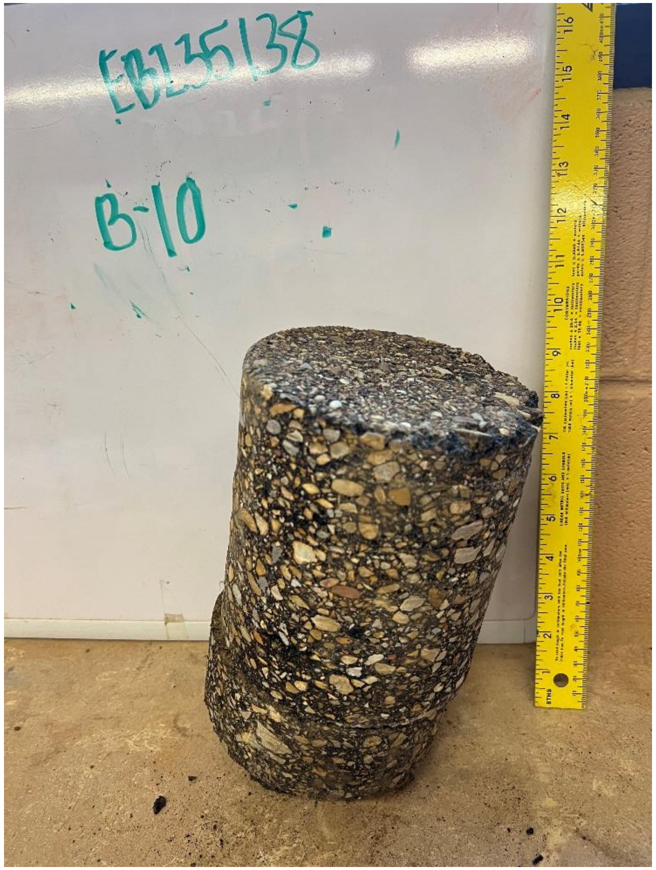
** Field measured thickness was determined by measuring the sidewall thickness of the core hole. The measurements were taken to the nearest ¼ inch.
** The core recovery thickness was determined by measuring the extracted core. The measurements were taken to the nearest ¼ inch.

Boring B-09



Field Measured Thickness: 11 inches
Core Recovery Thickness: 9 ¾ inches

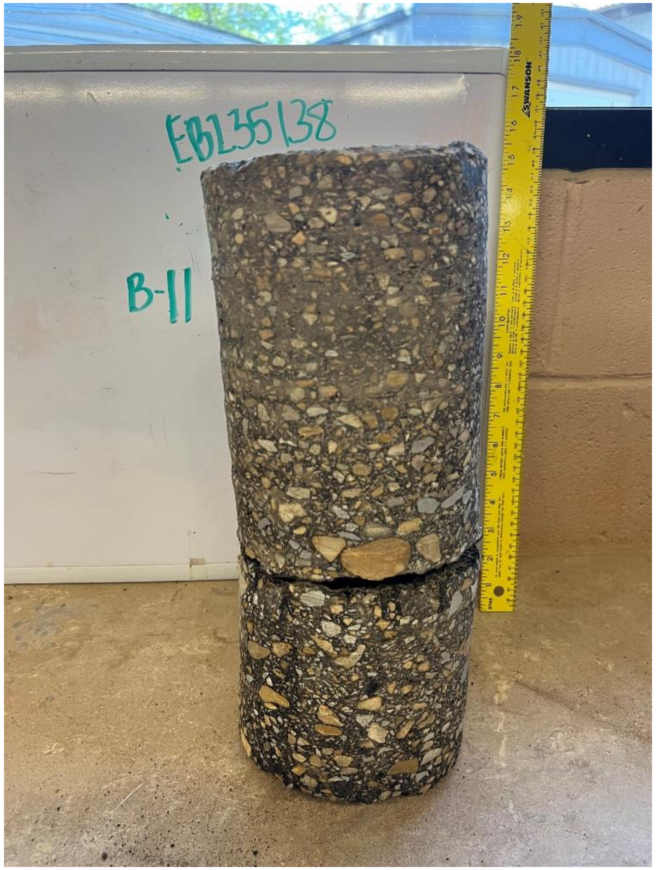
Boring B-10



Field Measured Thickness: 11 inches
Core Recovery Thickness: 9 ½ inches

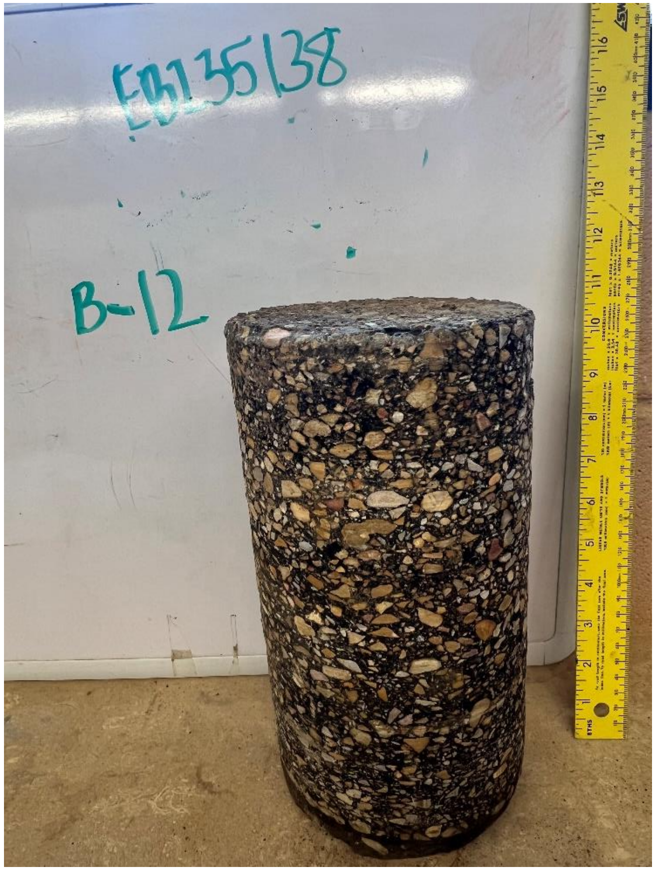
** Field measured thickness was determined by measuring the sidewall thickness of the core hole. The measurements were taken to the nearest ¼ inch.
** The core recovery thickness was determined by measuring the extracted core. The measurements were taken to the nearest ¼ inch.

Boring B-11



Field Measured Thickness: 14 inches
Core Recovery Thickness: 14 inches

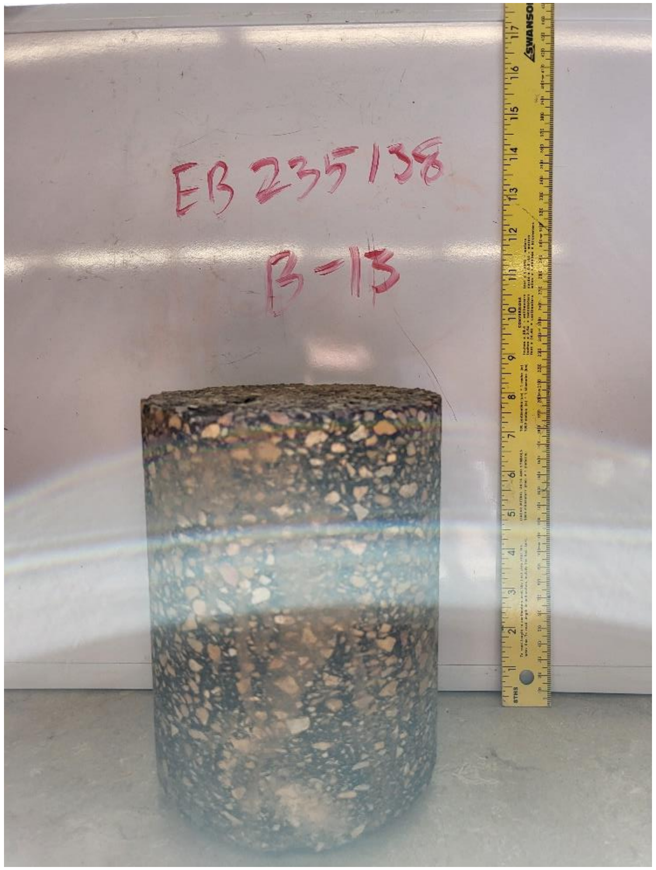
Boring B-12



Field Measured Thickness: 13 inches
Core Recovery Thickness: 10 ¾ inches

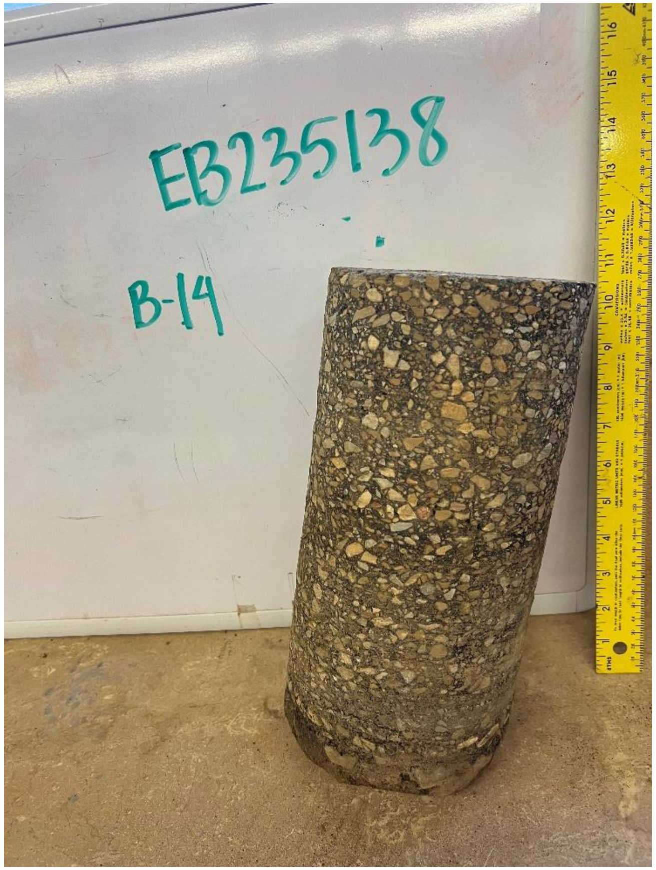
** Field measured thickness was determined by measuring the sidewall thickness of the core hole. The measurements were taken to the nearest ¼ inch.
** The core recovery thickness was determined by measuring the extracted core. The measurements were taken to the nearest ¼ inch.

Boring B-13



Field Measured Thickness: 12 inches
Core Recovery Thickness: 8 inches

Boring B-14



Field Measured Thickness: 12 inches
Core Recovery Thickness: 10 ½ inches

** Field measured thickness was determined by measuring the sidewall thickness of the core hole. The measurements were taken to the nearest ¼ inch.
** The core recovery thickness was determined by measuring the extracted core. The measurements were taken to the nearest ¼ inch.

Supporting Information

Contents:

Note: All attachments are one page unless noted above.

General Notes

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

Auger	**Split Spoon**
Shelby Tube	**Macro Core**
Ring Sampler	**Rock Core**
Grab Sample	**No Recovery**

WATER LEVEL

- ▽ **Water Initially Encountered**
- ▽ **Water Level After a Specified Period of Time**
- ▼ **Water Level After a Specified Period of Time**

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	**Hand Penetrometer**
(T)	**Torvane**
(b/f)	**Standard Penetration Test (blows per foot)**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 Sieve) Density determined by Standard Penetration Resistance. Includes gravels, sands and silts.			**CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve). Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance.**			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, tsf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 – 3	0 – 6	Very Soft	Less than 0.25	0 – 1	< 3
Loose	4 – 9	7 – 18	Soft	0.25 to 0.50	2 – 4	3 – 4
Medium Dense	10 – 29	19 – 58	Medium-Stiff	0.50 to 1.00	4 – 8	5 – 9
Dense	30 – 50	59 – 98	Stiff	1.00 to 2.00	8 – 15	10 – 18
Very Dense	> 50	≥ 99	Very Stiff	2.00 to 4.00	15 – 30	19 – 42
			Hard	> 4.00	> 30	> 42

RELATIVE PROPERTIONS OF SAND AND GRAVEL

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

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

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

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 – 10
Medium	11 – 30
High	> 30

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				**Soil Classification**	
				Group Symbol	**Group Name [B]**
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.