ECS Southeast, LLC

Revised Geotechnical Engineering Report

Tractor Supply – Houma, LA

E. Park Avenue
Houma, Louisiana

ECS Project No. 65:1673 Revision 01

December 20, 2024

ECS SOUTHEAST, LLC
Geotechnical • Construction Materials • Environmental • Facilities

December 20, 2024

Mr. Trey Hart
Mainland Houma, LA LLC
Tractor Supply Company

ECS Project No. 65:1673 REV.01

Reference: Revised Geotechnical Engineering Report
Tractor Supply – Houma, LA
E. Park Avenue
Houma, Louisiana

Mr. Hart,

ECS Southeast, LLC (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the Tractor Supply project in Houma, LA. Our services were performed in accordance with our agreed to scope of work. This report presents our geotechnical analysis of the project along with the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

Revision 01: This revision includes additional boring data to 75 feet below existing grade and revised deep foundation recommendations.

It has been our pleasure to be of service to Mainland Houma, LA LLC and Tractor Supply Company during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to evaluate subsurface conditions assumed for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please feel free to contact us. Both Mainland Houma, LA LLC and Tractor Supply Company may rely on this report.

Respectfully submitted,
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EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. Information gleaned from the Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

PROJECT UNDERSTANDING:

- Structure Information: 21,930 square foot building with metal framing
- Considerations: Moisture sensitive soils, highly compressible soils

SUBSURFACE CONDITIONS:

- Surface Material: Topsoil, approximately 6 inches
- Probable Fill: Not encountered
- Potential Undercuts: Approximately 6 inches to remove topsoil
- Natural Material: Brown and Gray Fat Clay (CH), Brown and Gray Lean Clay (CL), Gray Silty Clay (CL-ML), Gray Silty Sand (SM), Gray Silty Clay With Sand (CL-ML), Gray Sand with Silt (SP-SM), Dark Brown and Black Organics (OL/OH)
- Groundwater: Based on our observations during drilling and the laboratory test results, we anticipate the groundwater table to be approximately 5 feet below existing grade

GEOTECHNICAL CONCERNS:

- Soft and highly compressible clays were encountered at depths ranging from 4 to 58 feet below existing grades. Due to anticipated column loadings, total and differential settlements were estimated to be greater than 1 inch for shallow spread footings. Therefore, a driven timber pile foundation system with a structural floor slab is recommended to support the structure.

DESIGN & CONSTRUCTION RECOMMENDATIONS:

- Deep Foundations: Driven Round Tapered Timber Piles
    - ASTM D25 Class B Timber Pile (12-inch butt/7-inch tip)
        - Ultimate Compression Load = 31 tons at 55 ft embedment depth
        - Ultimate Compression Load = 38 tons at 65 ft embedment depth
- Slab-on-Grade: Modulus of Subgrade Reaction of 115 pci
- Seismic Design: IBC Site Class “E”

ECS should be retained to review all project documents to confirm conformance with our recommendations, and to perform CMT testing for earthwork and foundation construction activities to document that our recommendations are strictly followed. This also allows us to quickly provide recommendations for remedial activities, where necessary.

1.0 INTRODUCTION

The purpose of this study was to provide geotechnical information for the design of a new Tractor Supply store in Houma, LA. The project will include a single-story building design with associated parking and drive areas, and an outdoor display area. Also, the site will include stormwater detention ponds. We anticipate the plan area of the building to encompass approximately 21,930 square feet. The recommendations developed for this report are based on project information supplied in an August 8, 2024, email from Mr. Trey Hart with Mainland Retail, LLC.

Our services were provided in accordance with our Proposal No. 2580-P, dated August 12, 2024, as authorized by Trey Hart of Mainland Retail, LLC on August 13, 2024, which includes our Terms and Conditions of Service. Additional services included in REV.01 were performed in accordance with Change Order 01 dated December 4, 2024, as authorized by Mr. Ryan Cazana of Mainland Retail, LLC on December 10, 2024.

This report contains the procedures and results of our subsurface exploration and laboratory testing programs, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items:

- Observations from our site reconnaissance including current site conditions and surface topographic conditions.
- Description of the field exploration and laboratory tests performed.
- Final logs of soil test borings and records of the field exploration and laboratory tests in accordance with the standard practice of geotechnical engineers. This includes a location diagram.
- Recommendations for deep foundation systems consisting of 55 or 65-foot-long timber piles. This will include specific project information provided by Trey Hart with Mainland Retail, LLC and design loads assumed by ECS.
- Recommendations for structural floor slab and pavement construction, including recommendations for subgrade modulus and subgrade improvements.
- Recommendations regarding seismic site classification for this project site, in accordance with IBC 2021 and ASCE 7-16.
- Evaluation of the on-site soil characteristics encountered in the soil boring. Specifically, we will discuss the suitability of the on-site materials for reuse as engineered fill to support ground slabs. A discussion of groundwater and its potential impact on structures and project construction.
- Recommendations regarding site preparation and construction observations and testing.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION/CURRENT SITE USE/PAST SITE USE

The project is located adjacent to the existing Rouses Market on E. Park Avenue in Houma, LA. The site is an undeveloped grass covered parcel between a commercial development and residential neighborhood. Historical aerial imagery shows the parcel and adjacent developments have been as they were since 1989. The topography of the site is relatively flat with surface elevations ranging from +7 feet to MSL to +8 feet MSL. The elevations and topographic variations were estimated from Google-Earth©. The location is depicted in Figure 2.1.1 shown below:

Figure 2.1.1: General Site Location Outlined in Red

2.2 PROPOSED CONSTRUCTION

The following information explains our understanding of the planned development including proposed buildings and related infrastructure. If ECS's understanding of the project is not correct, especially if the structural loads or elevations are different, please contact ECS so that we may review these changes and revise our recommendations, as appropriate.

SUBJECT	DESIGN INFORMATION / ASSUMPTIONS
Building Footprint	Approximately 21,930 Square Feet
Number of Stories	Single-Story
Usage	Retail Store
Framing	Steel
Assumed Column Loads	25 kips Maximum
Assumed Wall Loads	2 Kips Per Linear Foot (klf) Maximum
Finish Floor Elevation	EL. 9 ft MSL (Est. to be less than 2 ft above present site grades)

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION PROGRAM

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field and laboratory data to assist in the determination of geotechnical recommendations.

3.1.1 Test Borings

Our scope of work included drilling a total of nine (9) soil test borings. Three (3) test borings located in the footprint of the proposed building, and one (1) test boring located in the footprint of the fenced outdoor display area, were planned to advance to a depth of approximately 55 feet; however, heaving sands were encountered at various depths and prevented the drill rig from deeper exploration due to sands and water entering the hollow stem auger. Borings B-1, B-2, B-3, and B-4 were terminated at depths of approximately 25 feet, 25 feet, 30 feet, and 40 feet below existing site grades, respectively. Two (2) soil test borings located within the detention pond footprints were advanced to a depth of approximately 10 feet below the existing site grades. Also, three (3) test borings were drilled for the parking and drive pavements to a depth of approximately 6 feet below the existing site grades. ECS mobilized back to the site on December 11, 2024 and drilled one (1) test boring in the footprint of the proposed building that was extended to a depth of 75 feet below existing grade. Our borings (labeled "B" in building footprints, "DP" in detention pond footprints, and labeled "P" in pavement footprints) were located with a handheld GPS unit, and their approximate locations are shown on the Boring Location Diagram in Appendix A. The approximate ground surface elevations noted in this report were estimated from Google Earth©.

Representative soil samples were obtained by means of Standard Penetration Test (SPT) procedures in accordance with ASTM Specifications D-1586 in granular soils and by means of Shelby tube sampling procedures in accordance with ASTM Specifications D-1587 in cohesive soils. SPT sampling is performed by driving a split-barrel sampler into the soil in 1.5-foot intervals with a 140-lb hammer and measures the resistance of the soil to penetration of the 2-inch diameter sampler. In the Shelby tube sampling

procedure, a thin walled, steel, seamless tube with sharp cutting edges is pushed hydraulically into the soil, and a relatively undisturbed sample is obtained.

Field logs of the soils encountered in the borings were maintained by ECS's field engineer. After recovery, each geotechnical soil sample was removed for the sampler and visually classified. Representative portions of each soil sample were then wrapped in plastic and transported to our laboratory for further visual examination and laboratory testing. After completion of the drilling operations, the boreholes were backfilled with grout or cuttings to the existing ground surface.

3.2 SUBSURFACE CHARACTERIZATION

The following text provides generalized characterizations of the soil strata encountered during our subsurface exploration. For subsurface information specific information, please refer to the Boring Logs in Appendix B:

GENERALIZED SUBSURFACE CONDITIONS

Approximate Depth (ft)	Stratum No.	Soil Description
0 – 0.5	-	**TOPSOIL APPROX. 6 INCHES WITH GRASS COVER**
0.5 – 4.0	I	**LEAN CLAY (CL) or FAT CLAY (CH),** Firm to Very Stiff, Brown and Gray
4.0 – 13.0	II	**LEAN CLAY (CL) or FAT CLAY (CH),** Very Soft to Soft, Gray
13.0 – 33.0	III	**SILTY CLAY (CL-ML),** Very Soft to Soft, Gray
33.0 – 48.0	IV	**SILTY SAND (SM),** Very Loose, Gray
48.0 – 53.0	V	**ORGANICS (OL/OH),** Dark Brown and Black
53.0 – 75.0	VI	**LEAN CLAY (CL),** Soft to Stiff, Gray

Notes:
(1) Soil descriptions show generalized strata to 40'. Strata in the borings vary with depth, please see attached Boring Logs in Appendix B.

Please refer to the attached boring logs and laboratory data summary for this field exploration for a more detailed description of the subsurface conditions encountered in the borings as the stratification descriptions above are generalized for presentation purposes.

3.3 GROUNDWATER OBSERVATIONS

Groundwater levels were measured in the borings during drilling operations. In auger drilling operations, water is not introduced into the borehole and the groundwater position can often be evaluated by observing water flowing into and out of the excavation. Furthermore, visual observation of soil samples retrieved can often be used in evaluating the groundwater conditions.

Based on our observations during drilling and the laboratory test results, we anticipate the groundwater table to be approximately 5 feet below existing grades.

The highest groundwater observations are normally encountered in the late winter or early spring or following seasonal heavy rainfall events. Fluctuations in the location of the long-term water table may occur due to changes in precipitation, evaporation, surface water runoff and other factors not immediately apparent at the time of his investigation. Therefore, the groundwater conditions at this site are expected to be significantly influenced by surface water runoff and seasonal rainfall.

3.4 LABORATORY TESTING

The laboratory testing consisted of selected tests performed on samples obtained during our field exploration operations. Classification and index property tests were performed on representative soil samples. The soil samples were tested for Moisture Content (ASTM D2216), Atterberg Limits (ASTM D4318), Percent Passing No. 200 Sieve (ASTM D1140), and Unconfined Compression (ASTM D2166).

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols. After classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposition.

4.0 DESIGN RECOMMENDATIONS

The following recommendations have been developed based on Sections 2 and 3. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, ECS should be consulted so that the recommendations of this report can be reviewed.

4.1 GEOTECHNICAL CONSIDERATIONS

The following recommendations have been developed based on Sections 2 and 3. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, ECS should be consulted so that the recommendations of this report can be reviewed.

Site grading information was not provided during this report; however, we have assumed that the foundation elevation will be less than 2 feet above existing site elevations. If the finished floor elevation deviates from this assumed site grades, the recommendations provided below should be evaluated by our office.

Based on the highly compressible subsurface conditions encountered at depths ranging from 4 to 58 feet below existing grade, the anticipated column and loading conditions and the lowest level bearing elevation, the site appears well suited for the proposed development with a properly designed deep foundation system such as driven timber piles, described herein. The following sections detail our recommendations for the proposed development regarding foundations and below grade work.

Recommendations for the pavement sections are based on our understanding of the assumed traffic loads, intended use, and subgrade preparation. The Pavements Section (4.5) provides our minimum section thicknesses for both rigid and flexible pavements.

4.1.1 Moisture Sensitive Soils

Based on the laboratory test results, fine grained, fat clay soils were encountered directly beneath the surface layer in various areas across the site. These soils are moisture sensitive, subject to volume changes and will become inadequate when wet of their optimum moisture content as evaluated by ASTM D698. Effective site drainage should be implemented at the onset of construction and maintained throughout the construction process. Care should be taken to keep construction traffic to a minimum across the site during wet periods. Water should not be allowed to pond on construction areas (building pads or pavement subgrade).

4.1.2 Perimeter Conditions

Positive drainage away from the structure should be provided during construction and maintained throughout the life of the proposed project. Water should not be allowed to infiltrate into the excavations during construction. Foundation soils should not be allowed to become wet. Grades must be sloped to provide effective drainage away from the building during and after construction. Adjacent concrete sidewalks and pavements should be sloped to provide drainage away from the building, and joints should be sealed; close attention should be paid to those directly abutting the building.

Roof runoff and surface drainage should be collected and discharged away from the structure to prevent wetting of the foundation soils. Roof gutters should be installed and connected to downspouts and pipes directing roof runoff into stormwater collection systems or discharged onto positively sloped pavements.

4.2 STRUCTURAL FLOOR SLAB

Due to potential settlement and regional subsidence, piles should be used for support of the floor slabs. Furthermore, the fenced outdoor area, loading docks, sidewalks, and landings immediately adjacent to the structure should also be pile-supported (if the anticipated long-term settlements are believed to be intolerable) or possibly hinged to the pile supported building at critical locations to prevent trip hazards from forming. The floor slab should have an adequate number of joints to reduce cracking resulting from some differential movement.

Under Slab Utilities: Under slab utility lines in the building areas should be hung from the slab hangers and connections used should be made of stainless steel, meeting the applicable Building Code. Flexible connections must be provided at the interface of pile-supported and non-pile-supported areas to accommodate at least two (2) inches of settlement over time.

Vapor Barrier: Before the placement of concrete, a vapor barrier may be placed on top of the granular drainage layer to provide additional protection against moisture penetration through the floor slab. When a vapor barrier is used, special attention should be given to surface curing of the slab to reduce the potential for uneven drying, curling and/or cracking of the slab. Depending on proposed flooring material types, the structural engineer and/or the architect may choose to eliminate the vapor barrier.

Foundation Isolation: Soil-supported slabs or other elements should be isolated from the pile-supported elements of the structure so that differential movement between the foundations and slab will not induce excessive shear and bending stresses in the floor slab. Where the structural configuration prevents the use of a free-floating slab such as in a drop-down footing/monolithic slab configuration, the slab should

be designed with adequate reinforcement and load transfer devices to reduce risk of overstressing of the slab.

4.3 DEEP FOUNDATION RECOMENDATIONS

4.3.1 Driven Timber Piles

Our analysis was performed based on the field and laboratory test data for round tapered timber pile foundations for support of the proposed structure(s).

The piles will derive their capacity through skin resistance within Stratum II through Stratum VI along the length of the pile with end bearing considered negligible. The provided capacities were determined using APILE software by Ensoft. Ultimate compression and tension capacities for driven timber pile foundations are provided in the Tables below. A Factor of Safety (FOS) of 2.0 and 3.0 must be applied to the provided axial capacities for allowable compression and tension, respectively. Additionally, a field load test, as described further in Section 4.3.7, is recommended to confirm the anticipated capacities.

ESTIMATED AXIAL LOAD PARAMETERS FOR TIMBER FRICTION PILES

Soil Layer	Depth Interval (ft)	Soil Type	Total Shear Strength C (psf)	Friction Angle Ø (deg)	Effective Unit Weight γ' (pcf)	Ultimate Side Shear (ksf)
1	0.0 – 4.0	Firm to Very Stiff Lean or Fat Clay	1030	-	112	0.567
2	4.0 – 13.0	Very Soft to Soft Lean Clay or Fat Clay	460	-	57	0.253
3	13.0 – 33.0	Very Soft to Soft Silty Clay	310	-	67	0.171
4	33.0 – 48.0	Very Loose Silty Sand	-	27	62	0.459
5	48.0 – 53.0	Organic Clay	-	-	20	-
6	53.0 – 75.0	Firm Lean Clay	525	-	59	0.289

ULTIMATE SINGLE PILE AXIAL CAPACITIES

Timber Pile Type	Embedment Depth (ft)	Ultimate Compression Capacity (tons)	Ultimate Tension Capacity (tons)
ASTM D25 Class B (12" butt/7" tip)	55	31	29
	65	38	36

4.3.2 ASD Design Factors

The following Table presents the required field load testing methods and associated design factors for Allowable Stress Design (ASD) for timber piles:

ASD DESIGN CRITERIA

Minimum ASD Factor of Safety	Required Quality Control
2.0	Minimum 2 test piles are monitored with PDA & full-time monitoring of production pile installation
3.0	All tension capacities unless a tension static load test is performed

4.3.3 Pile Settlement and Down Drag Considerations

Settlement of individual piles properly driven to the design depths and loaded to the design capacities as described above are estimated to be approximately one (1) inch or less. The estimated settlement accounts for weight of the structure(s) and no change to existing grade. If grade will be raised more than 2 feet with fill material, ECS must be notified for additional evaluation of the down drag forces on the piles and revised settlement estimates.

4.3.4 Pile Group Efficiency

For this project, we recommend installing piles at a minimum center to center spacing of three (3) pile diameters. A reduction in capacity due to group effects at this spacing should not be required. We recommend using a group efficiency factor of 1.0. ECS will be available to confirm once the final pile loading, pile tip elevations and pile cap configurations have been established.

4.3.5 Driven Pile Installation Considerations

All pile driving operations shall be performed under experienced supervision and with efficiently operating mechanical equipment. The hammer selection is the responsibility of the contractor and shall be adequately large enough to reach proposed tip elevations and develop the required capacities but considering the potential vibrations resulting from pile driving operations.

Silty sand layers were encountered at depths ranging from 23 to 48 feet below existing grade across the site. We recommend at least 2 test piles be installed in order to optimize pile lengths and installation techniques prior to production pile installation. If refusal, or multiple successive blows with little to no pile penetration occurs, the contractor should evaluate if predrilling is necessary to bypass the sand layer.

Piles in large groups should be driven from the center outward. Piles which have heaved a quarter of an inch (¼”) or more during driving of subsequent piles shall be re-driven to their original final resistance or their original embedment if originally driven to full penetration. In no case shall the contractor be allowed to change pile driving equipment, pile types and or sizes without written approval from ECS.

4.3.6 Vibration Monitoring (Driven Piles)

Infrastructure and underground utilities can be damaged by vibrations and subsidence caused by vibrations during pile driving. If piles will be driven near existing settlement sensitive buildings or infrastructure or if concrete forming and pouring will commence while pile driving operations continues, monitoring ground vibrations during installation of the foundation system using a seismograph should be considered. ECS will be available upon request to assist with monitoring vibrations and assessing pile installation technique alterations if needed to help reduce vibrations.

4.3.7 Dynamic Load Testing (PDA)

Due to the size of the project a static load test program is likely not economical, so we suggest verifying pile capacities using dynamic testing during pile installation. PDA data should be evaluated using signal matching through the Case Method Wave Analysis Program (CAPWAP) to estimate the installed capacity of the test pile. High Strain Dynamic Testing (HSDT) would be acceptable in lieu of static load testing if acceptable to the design team. We will be available to discuss this possibility with the design team as additional project information is developed.

4.4 SEISMIC DESIGN CONSIDERATIONS

Seismic Site Classification: The International Building Code (IBC) 2015/2018 requires site classification for seismic design based on the upper 100 feet of a soil profile. The methods are utilized in classifying sites, namely the shear wave velocity (v_s) method; the unconfined compressive strength (s_u) method; and the Standard Penetration Resistance (N-value) method. The unconfined compressive strength (s_u) method was used in classifying this site.

SEISMIC SITE CLASSIFICATION			
Site Class	**Soil Profile Name**	**Shear Wave Velocity, Vs, (ft./s)**	**Soil Undrained Shear Strength (psf)**
A	Hard Rock	Vs > 5,000 fps	N/A
B	Rock	2,500 < Vs ≤ 5,000 fps	N/A
C	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	≥ 2000
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	1000 ≤ Su≤ 2000
E	**Soft Soil Profile**	**Vs < 600 fps**	**<1000**

Based upon our interpretation of the subsurface conditions, the appropriate **Seismic Site Classification is "E"** as shown in the preceding Table.

The Site Class definition should not be confused with the Seismic Design Category designation which the Structural Engineer typically assesses. If a higher site classification is beneficial to the project, we can provide additional testing methods that may yield more favorable results.

4.5 PAVEMENTS

Subgrade Characteristics: Based on the results of our borings, it appears that the pavement subgrade will consist mainly of lean clay or fat clay soils. The soils across the site are moisture sensitive and will become difficult to work with when wet. Care should be taken if construction is performed during wet weather periods.

California Bearing Ratio [CBR] testing was not performed as part of this study. Therefore, we have assumed a CBR value of the onsite subsoil to be 3 for preliminary design purposes and have estimated a subgrade modulus of approximately 115 pci.

We were not provided traffic loading information, so we have assumed loadings typical of this type of project. We assumed a maximum daily traffic volume of 500 automobiles and 12 delivery trucks for medium duty pavement areas, and a maximum daily traffic volume of 250 automobiles, and three delivery trucks for light duty pavement areas. Our pavement section recommendations for medium duty (drives) pavements should accommodate occasional heavier loadings due to trash trucks, delivery vehicles and light truck traffic and may be considered for main drives. Typical pavement sections are presented below. Actual pavements sections and joint spacing, if applicable, should be designed based on specific traffic loads.

PROPOSED MINIMUM PAVEMENT SECTIONS					
MATERIAL	FLEXIBLE PAVEMENT		RIGID PAVEMENT		
	Medium Duty	Light Duty	Heavy [2] Duty	Medium Duty	Light Duty
Portland Cement Concrete [4]	-	-	8 in.	6 in.	5 in.
Asphaltic Concrete Surface Course	2 inches	1 ½ inches	-		-
Asphaltic Concrete Binder Course	2 inches	1 ½ inches	-		-
Graded Aggregate Base Course [1]	6 inches	6 inches	4 inches	4 inches	4 inches
Prepared Subgrade [3]	12 inches	12 inches	12 inches	12 inches	12 inches

Notes:

(1) Lime treated fill for rigid pavement and cement treated fill for flexible pavement may be used as an alternative to aggregate base course. Review Section 5.2.1 for additional information.
(2) Large, front loading garbage trucks frequently impose concentrated front wheel loads on pavements during loading. This type of loading typically results in rutting of asphalt pavement and ultimately pavement failures. For preliminary design purposes, we recommend that the pavement in trash pickup areas consist of an 8-inch thick, 4,000 psi, reinforced concrete slab over at least 12 inches of properly compacted engineered fill material.
(3) Properly prepared material consisting of proofrolled in-situ soils or compacted engineered structural fill.
(4) 4,000 psi concrete at 28 days

Pavement Considerations: In regions of improper surface and/or subsurface drainage, a softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Esurance of positive drainage will reduce the possibility of the subgrade materials becoming saturated during the normal service period of the pavement.

The reinforced pavement in the trash pick-up area should extend to a minimum of 5 feet past the location of the expected wheel loads. When traffic loading becomes available, ECS or the Civil Engineer can design the pavements. Appropriate jointing should also be incorporated into the design of the PCC pavement which should be specified, constructed, and tested to meet the following requirements:

1. Proper pavement joint spacing and saw-cutting will be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer and saw cutting should be performed while the concrete is in its "green' state. The design engineer should refer to ACI330R-08 for more detailed for the design of rigid pavement.

2. Portland Cement Concrete: Minimum compressive strength of 4,000 psi at 28 days.

3. Hot Mix asphaltic concrete should conform to the 2016 edition of the Louisiana Standard Specifications for Roads and Bridges (LSSRB) Section 502. Engineered fill should meet the criteria for material properties and compaction recommended in Section 5.1 of this report.

4. Crushed aggregate base should be compacted to maximum lift height of eight inches to a minimum of 95 percent of the Standard Proctor (ASTM D698) maximum dry density. Aggregate should conform to the 2016 edition of the LSSRB Section 1003.03.

Representative soil samples should be collected from the upper 2 feet of the final pavement subgrade to assess the suitability of the in-situ CBR values, prior to implementation of the pavement sections provided herein. Often during construction and preparation of the roadway subgrade, the soil materials may be improved and can sometimes yield reduced pavement sections based on the actual CBR values and traffic loads.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

The existing soils are moisture sensitive and will become inadequate when above their optimum moisture content as evaluated by ASTM D698. Effective site drainage should be implemented at the beginning of and maintained throughout construction activities. Care should be taken to keep construction traffic to a minimum during and immediately after times of inclement weather.

ECS should be on-site full-time during earthwork and foundation construction activities to document that our recommendations are strictly followed and to provide recommendations for remedial activities, if necessary.

5.1.1 Stripping and Grubbing

The subgrade preparation should consist of undercutting approximately 6 inches of topsoil, existing fill, debris, and utilities and soft or yielding materials from the 10-foot expanded building limits, and 5 feet beyond the toe of engineered fills.

Note: Following stripping and grubbing the entire pavement construction area should be proofrolled as outlined in Section 5.1.2 of this report. Soils observed to rut or deflect greater than an inch in depth should be undercut and replaced or otherwise mitigated.

Deeper topsoil or organic laden soils may be present in wet, low-lying, and poorly drained areas. In wooded areas, the root balls may extend as deep as about 2 feet and will require additional localized stripping depth to completely remove the organics. ECS should be retained to evaluate that topsoil and poor surficial materials have been removed prior to the placement of engineered fill or construction of structures.

5.1.2 Proofrolling

Prior to fill placement or other construction on subgrades, the pavement subgrades should be evaluated by an ECS field technician. The exposed subgrade should be thoroughly proofrolled with a half loaded tandem-axle dump truck or similar construction equipment weighing a minimum of 10 tons. Proofrolling should be traversed in two perpendicular directions with overlapping passes of the vehicle under the observation of an ECS technician. This procedure is intended to assist in identifying localized yielding materials.

Where proofrolling identifies areas of yielding or "pumping" subgrade those areas should be repaired prior to the placement of subsequent engineered fill or other construction materials. Observations of yielding or "pumping" should be addressed with ECS to establish the appropriate remediation as outlined in Section 5.2.1.

5.2 EARTHWORK OPERATIONS

5.2.1 Subgrade Stabilization

Methods of stabilization include undercutting, moisture conditioning, or chemical stabilization. Test pits may be excavated to explore the shallow subsurface materials to help in determining the cause of the observed inadequate materials, and to assist in the evaluation of appropriate remedial actions to stabilize the subgrade. Anticipated methods of subgrade stabilization of the near surface soils are provided below:

Moisture Conditioning: If it is established that high moisture content is the cause of the inadequate subgrade, the geotechnical engineer may require the earthwork contractor process the upper 12 to 18 inches of in-situ subgrade by windrowing with a dozer or plowing with a set of heavy-duty disk harrows until soil moisture is observed to be within 2 percent of its optimum moisture content as evaluated by ASTM D698 to improve subgrade conditions before consideration other mitigation approaches. The drying effort should begin after the exposed subgrade is free of standing water and the windrowing/disking should be continuous during a period of dry weather. ECS should be onsite to periodically perform soil moisture testing. The processed areas should be sealed with compaction equipment and a flat drum roller or dozer blade at the end of the day in case of overnight rain. If weather conditions do not allow appropriate time to dry the native subgrade, the geotechnical engineer may recommend chemical treatment with lime or cement in order to provide an adequate working surface for fill placement.

Undercut and Replace: If other means of soil stabilization are not practical, the undercutting or removal of the inadequate subsurface material may be required. The undercutting of such material will be conducted, inspected, and tested in accordance with Section 5.1.

Lime Stabilization: Lime stabilization may be used to modify onsite clay soils to achieve an adequate working surface and achieve PIs between 10 and 25 for reuse as engineered fill. The amount of lime necessary to achieve lime stabilization will vary depending on the clay mineral, plasticity and type of lime used for stabilization. For estimating purposes 8% percent of lime by volume should be used; however, a laboratory lime series should be performed at the time of construction to establish the optimum lime content. Surficial samples should be collected from across the site and testing should be conducted on the composite sample. The subgrade soils should meet the requirements of Section 305.4, and lime treatment of the subbase should meet the requirements of Section 304 - Type B, of the 2016 LSSRB. An ECS Field Engineer or Senior Technician should be present during lime treatment activities to observe lime quantities and document that treated areas are in conformance with the project requirements. Please note that caution should be used when powdered lime in used in closely populated areas. To control dust, a lime slurry or pelletized lime may be used where dust must be controlled. In addition, pelletized lime will generally require 2 to 3 times the effort to properly pulverize and mix into the clay soils than a powder or slurry.

Cement Stabilization: ECS does not anticipate cement treatment due to the high plasticity soils, however; when soils have PI values of 15 or below**,** cement stabilization should be used in lieu of lime treatment. Additionally, 12 inches of cement stabilized soil can be used as an alternative to aggregate base course for light and medium duty flexible pavement. A minimum of 10% by volume of cement is recommended to use for a cement stabilized base course and should be prepared in general accordance with LSSRB, Section 303-04. Note that the cement treatment of the roadways should be conducted in general accordance with LSSRB, Section 303. Cement stabilized base course should yield a compressive strength of at least 250 psi at 7 days as evaluated by a mix design in accordance with DOTD TR 432 Standard Procedure. The treated soil should be compacted at least 95% of maximum dry density +/-3% the optimum moisture content in accordance with the Sub-section 303.11 of LSSRB.

5.2.2 Probable Fill

Fill material was not encountered during the subsurface exploration, but the site may have been used as a laydown yard for construction of the surrounding developments. If fill or deleterious material/debris is encountered, ECS recommends removing the existing fill and debris in its entirety and replacing it with properly compacted engineered fill material meeting the parameters outlined in this report.

5.2.3 Engineered Fill

Prior to placement of engineered fill, representative bulk samples (approximately 50 pounds) of on-site and/or off-site borrow should be submitted to ECS for laboratory testing, which will typically include Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships (i.e., Proctors) for compaction. Import materials should be tested prior to being hauled to the site to evaluate if they meet project specifications. Alternatively, Proctor data from other accredited laboratories can be submitted if the test results are within the last 90 days.

Satisfactory Engineered Fill Materials: Materials satisfactory for use as Engineered Fill should consist of inorganic soils with the following engineering properties and compaction requirements.

ENGINEERED FILL INDEX PROPERTIES		
Soil Type	**USCS Classification**	**Property**
Imported Clay Fill	CL, SC	LL < 45, 10 < PI < 25
Imported Sand Fill	SP, SP-SM	Less than 10% passing #200 sieve
Aggregate Base	GP	LADOTD 610 crushed limestone or similarly graded recycled aggregate
On-Site Soils	CL/CH	The fat clay soils encountered in the soil borings do not meet the requirements for reuse as engineered fill without lime treatment due to avg. LL's greater than 45.

ENGINEERED FILL COMPACTION REQUIREMENTS	
Subject	**Requirement**
Compaction Standard	Standard Proctor, ASTM D698
Required Compaction	95% of Max. Dry Density
Moisture Content	Optimum to +3 % Points of the Soil's Optimum Value
Loose Thickness	8 Inches Prior to Compaction

Fill Placement: Excessively wet fill soils or aggregates should be scarified, aerated, and moisture conditioned prior to compaction.

On-Site Borrow Suitability: Natural deposits of soils that meet the definition above may be used as engineered fill on the site.

5.3 FOUNDATION AND SLAB OBSERVATIONS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open; therefore, foundation concrete should be placed the same day that excavations are made. Bearing soils that are weakened by surface water intrusion or exposure must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, a 1 to 3-inch thick "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

5.4 UTILITY INSTALLATIONS

Utility Subgrades: For areas outside of the building pad, the soils encountered in our exploration are expected to be generally adequate for support of utility pipes. The pipe subgrades should be observed and probed for stability by ECS. Loose or inadequate materials encountered should be removed and replaced with adequate compacted Engineered Fill, or pipe stone bedding material.

Utility Backfilling: The granular bedding material (often AASHTO #57 stone) should be at least 4 inches thick, but not less than that specified by the civil engineer's project drawings and specifications. We recommend that the bedding materials be placed up to the springline of the pipe. Fill placed for support of the utilities, as well as backfill over the utilities, should conform to Section 5.2.

Excavation Safety: Excavations and slopes should be constructed and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing, constructing, and maintaining adequate excavations and slopes. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation expressed or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS by Mainland Retail, LLC. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

Appendix A - Drawings and Reports

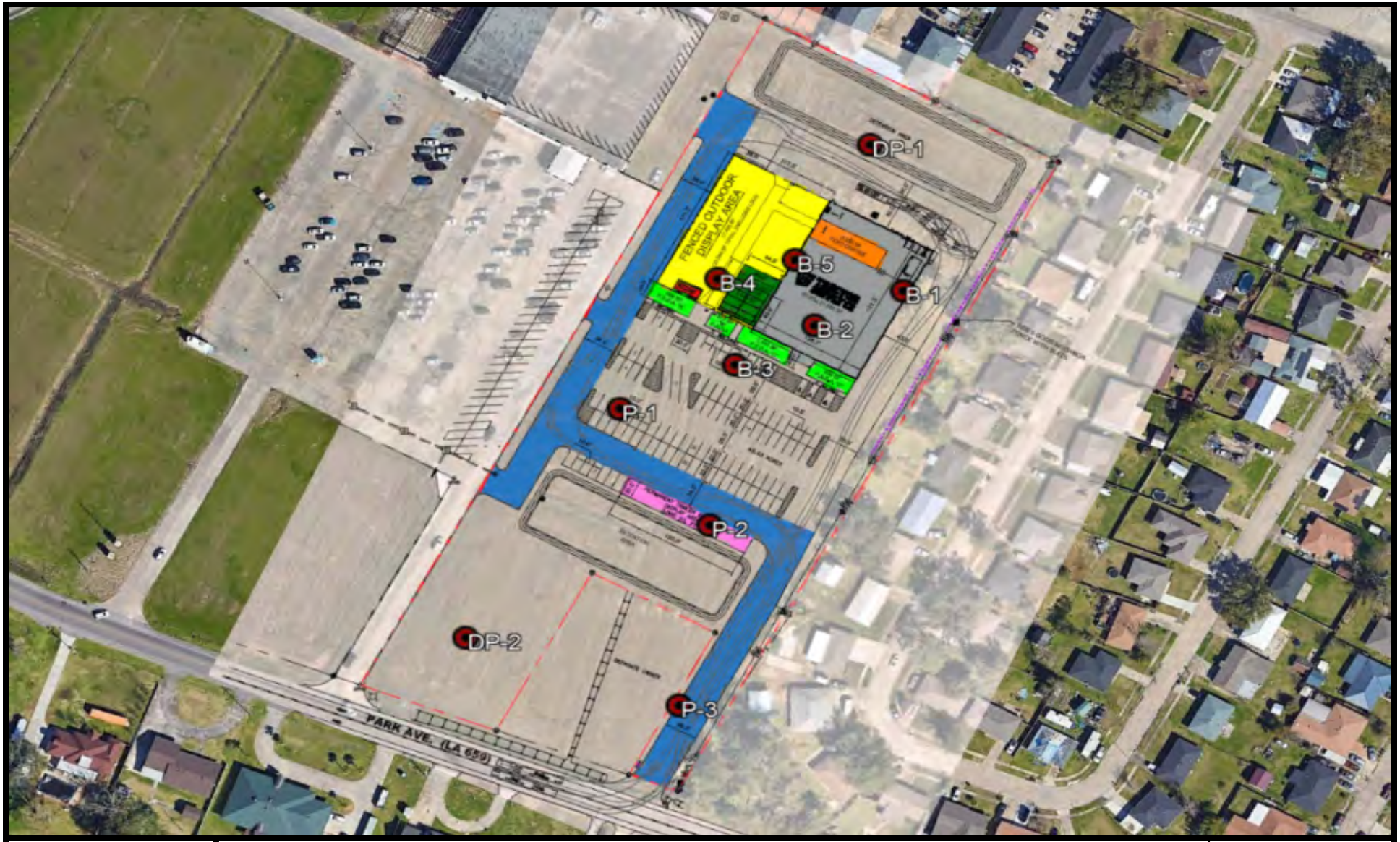
Site Location Diagram
Boring Location Diagram(s)

SITE LOCATION DIAGRAM

Tractor Supply - Houma, LA

East Park Avenue, Houma, Louisiana
Mainland Retail, LLC

ENGINEER	NBurk
SCALE	1" = 450'
PROJECT NO.	65:1673
SHEET	
DATE	9/3/2024



BORING LOCATION DIAGRAM

Tractor Supply - Houma, LA

East Park Avenue, Houma, Louisiana
Mainland Retail, LLC

ENGINEER	NBurk
SCALE	1" = 200'
PROJECT NO.	65:1673
SHEET	
DATE	12/20/2024

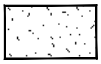
Appendix B – Field Operations

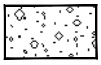
Reference Notes
Boring Logs

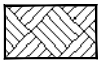
REFERENCE NOTES FOR BORING LOGS

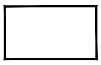
MATERIAL[1,2]

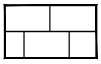

ASPHALT


CONCRETE


GRAVEL

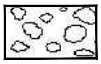

TOPSOIL

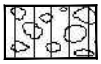

VOID


BRICK

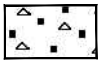

AGGREGATE BASE COURSE

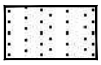

GW **WELL-GRADED GRAVEL**
gravel-sand mixtures, little or no fines

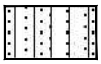

GP **POORLY-GRADED GRAVEL**
gravel-sand mixtures, little or no fines


GM **SILTY GRAVEL**
gravel-sand-silt mixtures


GC **CLAYEY GRAVEL**
gravel-sand-clay mixtures

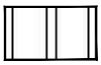

SW **WELL-GRADED SAND**
gravelly sand, little or no fines

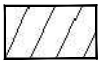

SP **POORLY-GRADED SAND**
gravelly sand, little or no fines


SM **SILTY SAND**
sand-silt mixtures

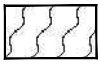

SC **CLAYEY SAND**
sand-clay mixtures

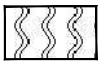

ML **SILT**
non-plastic to medium plasticity

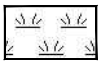

MH **ELASTIC SILT**
high plasticity


CL **LEAN CLAY**
low to medium plasticity


CH **FAT CLAY**
high plasticity


OL **ORGANIC SILT or CLAY**
non-plastic to low plasticity


OH **ORGANIC SILT or CLAY**
high plasticity


PT **PEAT**
highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

WATER LEVELS[6]

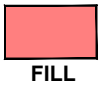

WL (First Encountered)


WL (Completion)


WL (Seasonal High Water)


WL (Stabilized)

FILL AND ROCK


FILL


POSSIBLE FILL


PROBABLE FILL


ROCK

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7]Minor deviation from ASTM D 2488-17 Note 14.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**B-01**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.592722	**-90.673083**		**7.0**

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 | 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY: RQD; REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)	UNIT WEIGHT (PCF)	COMPRESSIVE STR. (TSF)
	S-01	ST	24	24	Topsoil Thickness[6.00"] (CL) LEAN CLAY, brown and gray, very soft to very stiff						25.6	3.75			
	S-02	ST	24	24							27.3	2.25			
5	S-03	ST	24	24			2		39	20	32.0	0.25		122.7	0.42
	S-04	ST	24	24							43.2	0.00			
	S-05	ST	24	24							35.1	0.00			
10							-3								
	S-06	ST	24	24					39	18	34.2	0.00	95.6	124.9	0.23
15							-8								
	S-07	ST	24	24	(CL/ML) SILTY CLAY WITH SAND, gray, very soft						41.0	0.00			
20							-13								
	S-08	SS	18	18				WOH-WOH-WOH (0)			31.0				
25					**AUGER REFUSAL AT 25.0 FT**		-18								
30							-23								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **5.00**	BORING STARTED: **Aug 29 2024**	CAVE IN DEPTH:	
▼ WL (Completion)	BORING COMPLETED: **Aug 29 2024**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **TRC1**	DRILLING METHOD: **Hollow Stem Auger**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**B-02**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.592610	**-90.673378**		**8.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)	UNIT WEIGHT (PCF)	COMPRESSIVE STR. (TSF)
	S-01	ST	24	24	Topsoil Thickness[6.00"] (CH) FAT CLAY, brown, firm to stiff		8					2.25			
	S-02	ST	24	24					60	42	27.7	1.00		113.0	0.76
5	S-03	ST	24	24	(CL) LEAN CLAY, brown and gray, very soft to firm		3					0.25			
	S-04	ST	24	24								0.75			
	S-05	ST	24	24					35	14	32.5	0.75		125.3	0.41
10							-2								
	S-06	ST	24	24								0.00			
15							-7								
20	S-07	SS	18	18	(SM) SILTY SAND, gray, very loose to medium dense		-12	WOH-WOH-WOH (0)							
	S-08	SS	18	18				6-9-8 (17)			26.8		29.0		
25					**AUGER REFUSAL AT 25.0 FT**		-17								
30							-22								

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 | 20 40 60 80 100

ROCK QUALITY DESIGNATION & RECOVERY: RQD; REC

MC SAMPLER BLOWS/FT: 10 20 30 40 50

TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Aug 28 2024**	CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Aug 28 2024**	HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Unknown** / LOGGED BY: **TRC1**	DRILLING METHOD: **Hollow Stem Auger**
▽ WL (Stabilized)		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**B-03**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.592483	**-90.673643**		**7.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)	UNIT WEIGHT (PCF)	COMPRESSIVE STR. (TSF)
	S-01	ST	24	24	Topsoil Thickness[6.00"] (CH) FAT CLAY, brown and gray, soft to stiff						28.3	3.75			
	S-02	ST	24	24							41.9	2.25			
5	S-03	ST	24	24			2				38.9	1.25			
	S-04	ST	24	24					76	52	40.6	0.25		104.5	0.57
	S-05	ST	24	24							44.6	0.25			
10							-3								
	S-06	ST	24	24	(CL/ML) SILTY CLAY WITH SAND, gray, very soft						32.3	0.00			
15							-8								
	S-07	SS	18	18				WOH-WOH-WOH (0)			33.3		79.8		
20							-13								
	S-08	SS	18	18	(SM) SILTY SAND, gray, very loose			WOH-WOH-WOH (0)			26.9				
25							-18								
	S-09	SS	18	18				WOH-WOH-WOH (0)			28.8		21.5		
30					**AUGER REFUSAL AT 30.0 FT**		-23								

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 | 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Aug 28 2024**	CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Aug 28 2024**	HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Unknown** / LOGGED BY: **TRC1**	DRILLING METHOD: **Hollow Stem Auger**
▽ WL (Stabilized)		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**B-04**	**1 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.592761	**-90.673701**		**7.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)	UNIT WEIGHT (PCF)	COMPRESSIVE STR. (TSF)
	S-01	ST	24	24	Topsoil Thickness[6.00"] (CH) FAT CLAY, brown, stiff				82	55	31.4	2.50		111.9	1.30
	S-02	ST	24	24	(CL) LEAN CLAY, brown and gray, very soft to soft						33.3	0.00			
5	S-03	ST	24	24			2				39.2	0.25			
	S-04	ST	24	24							36.0	0.00			
	S-05	ST	24	24							35.8	0.00			
10							-3								
	S-06	ST	24	24	(CL/ML) SILTY CLAY, gray, very soft to soft						31.4	0.00			
15							-8								
	S-07	ST	24	24					27	4	31.2	0.00		134.3	0.39
20							-13								
	S-08	ST	24	24	(SM) SILTY SAND, gray, very loose						35.9	0.00			
25							-18								
	S-09	SS	18	18				WOH- WOH-3 (3)			32.5				
30							-23								
					CONT'D ON NEXT PAGE										

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 / 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **8.00**	BORING STARTED: **Aug 27 2024**	CAVE IN DEPTH:	
WL (Completion)	BORING COMPLETED: **Aug 27 2024**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **JT14**	DRILLING METHOD: **Hollow Stem Auger**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**B-04**	**2 of 2**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.592761	**-90.673701**		**7.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)	UNIT WEIGHT (PCF)	COMPRESSIVE STR. (TSF)
					(SM) SILTY SAND, gray, very loose										
35	S-10	SS	18	18			-28	2-WOH-WOH (0)			29.3				
40	S-11	SS	18	18			-33	WOH-WOH-WOH (0)			27.0		20.0		
					AUGER REFUSAL AT 40.0 FT										
45							-38								
50							-43								
55							-48								
60							-53								

STANDARD PENETRATION BLOWS/FT
10 20 30 40 50
20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
MC SAMPLER BLOWS/FT
10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **8.00**	BORING STARTED: **Aug 27 2024**	CAVE IN DEPTH:	
▼ WL (Completion)	BORING COMPLETED: **Aug 27 2024**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **JT14**	DRILLING METHOD: **Hollow Stem Auger**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**B-05**	**1 of 3**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.592822	**-90.673443**		**7.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)	UNIT WEIGHT (PCF)	COMPRESSIVE STR. (TSF)
	S-01	ST	24	24	Topsoil Thickness[6.00"] (CL) LEAN CLAY, brown and gray, very soft to very stiff						31.4	2.00			
	S-02	ST	24	24							32.3	0.50			
5	S-03	ST	24	24			2				35.6	0.50			
	S-04	ST	24	24							33.2	0.00			
	S-05	ST	24	24							27.8	0.00			
10							-3								
	S-06	ST	24	24	(CL) LEAN CLAY WITH SAND, gray, very soft to soft						29.0	0.00			
15							-8								
	S-07	ST	24	24							30.1	0.50			
20							-13								
	S-08	ST	24	24					39	18	35.3	0.25	85.1	117.0	0.32
25							-18								
	S-09	ST	24	24							35.3	0.00	76.4		
30							-23								
					CONT'D ON NEXT PAGE										

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 / 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **13.00**	BORING STARTED: **Dec 11 2024**	CAVE IN DEPTH:	
WL (Completion)	BORING COMPLETED: **Dec 11 2024**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **AD9**	DRILLING METHOD: **Fluid Rotary**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**B-05**	**2 of 3**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION: **Park Avenue, Houma, Louisiana, 70363**			LOSS OF CIRCULATION
LATITUDE: **29.592822**	LONGITUDE: **-90.673443**	STATION:	SURFACE ELEVATION: **7.0**

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50
ROCK QUALITY DESIGNATION & RECOVERY: 20 40 60 80 100
RQD
REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)	UNIT WEIGHT (PCF)	COMPRESSIVE STR. (TSF)
					(CL) LEAN CLAY WITH SAND, gray, very soft to soft							0.00			
35	S-10	ST	24	24	(SP-SM) SAND WITH SILT, gray, very loose		-28				27.8		11.4	103.4	0.13
40	S-11	ST	24	24			-33				28.7	0.00			
45	S-12	ST	24	24			-38		75	38	58.0	0.25	11.3	99.3	0.12
50	S-13	ST	24	24	(OL/OH) ORGANIC SOIL, dark brown and black, firm		-43				93.3	1.00			
55	S-14	ST	24	24	(CL) LEAN CLAY, gray, soft		-48		43	22	42.6	0.25		130.0	0.38
60	S-15	ST	24	24	(CL) LEAN CLAY, gray, stiff, w/ organics		-53				61.4	1.50			
					CONT'D ON NEXT PAGE										

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **13.00**	BORING STARTED: **Dec 11 2024**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Dec 11 2024**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **AD9**	DRILLING METHOD: **Fluid Rotary**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**B-05**	**3 of 3**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.592822	**-90.673443**		**7.0**

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)	UNIT WEIGHT (PCF)	COMPRESSIVE STR. (TSF)
					(CL) LEAN CLAY, gray, stiff, w/ organics							0.50			
65	S-16	ST	24	24	(CL) LEAN CLAY, gray, soft to firm		-58		49	25	40.8			117.6	0.45
70	S-17	ST	24	24			-63				38.9	0.75			
75	S-18	ST	24	24	(CH) FAT CLAY, gray, firm		-68		80	57	38.4	0.75		116.8	0.75
					END OF BORING AT 75.0 FT										
80							-73								
85							-78								
90							-83								

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 | 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **13.00**	BORING STARTED: **Dec 11 2024**	CAVE IN DEPTH:	
▼ WL (Completion)	BORING COMPLETED: **Dec 11 2024**	HAMMER TYPE: **Auto**	
▼ WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **AD9**	DRILLING METHOD: **Fluid Rotary**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**DP-01**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.593195	**-90.673194**		**7.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)
	S-01	ST	24	24	Topsoil Thickness[6.00"] (CH) FAT CLAY, gray, soft to stiff				102	76	41.7	1.00	
	S-02	ST	24	24							45.8	0.50	
5	S-03	ST	24	24			2					0.25	
	S-04	ST	24	24								0.75	
	S-05	ST	24	24		▽						0.25	
10					**END OF BORING AT 10.0 FT**		-3						
15							-8						
20							-13						
25							-18						
30							-23						

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 | 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **8.00**	BORING STARTED: **Aug 28 2024**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Aug 28 2024**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **TRC1**	DRILLING METHOD: **Hollow Stem Auger**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**DP-02**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.591599	**-90.674539**		**8.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)
					Topsoil Thickness[6.00"]							2.00	
	S-01	ST	24	24	(CL) LEAN CLAY, brown, very stiff						15.9	1.75	
	S-02	ST	24	24	(CH) FAT CLAY, brown and gray, soft to stiff				99	72	31.9	0.50	
5	S-03	ST	24	24			3					1.00	
	S-04	ST	24	24								0.25	
	S-05	ST	24	24									
10					**END OF BORING AT 10.0 FT**		-2						
15							-7						
20							-12						
25							-17						
30							-22						

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 | 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Aug 28 2024**	CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Aug 28 2024**	HAMMER TYPE: **Auto**
▽ WL (Seasonal High Water)	EQUIPMENT: **Unknown** / LOGGED BY: **TRC1**	DRILLING METHOD: **Hollow Stem Auger**
▽ WL (Stabilized)		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**P-01**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.592340	**-90.674026**		**7.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)
	S-01	ST	24	24	Topsoil Thickness[6.00"] (CH) FAT CLAY, gray, firm to very stiff						28.7	2.50	
	S-02	ST	24	24								1.25	
5	S-03	ST	24	24			2					0.75	
					END OF BORING AT 6.0 FT								
10							-3						
15							-8						
20							-13						
25							-18						
30							-23						

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 | 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Aug 28 2024**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Aug 28 2024**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **TRC1**	DRILLING METHOD: **Hollow Stem Auger**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**P-02**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.591963	**-90.673728**		**7.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)	UNIT WEIGHT (PCF)	COMPRESSIVE STR. (TSF)
0	S-01	ST	24	24	Topsoil Thickness[6.00"] (CH) FAT CLAY, brown, firm to stiff		2		81	58	24.6	1.75		117.8	2.06
	S-02	ST	24	24								1.25			
5	S-03	ST	24	24								0.75			
					END OF BORING AT 6.0 FT		-3								
10							-8								
15							-13								
20							-18								
25							-23								
30															

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50 / 20 40 60 80 100
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
MC SAMPLER BLOWS/FT: 10 20 30 40 50
TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

WL (First Encountered) **5.00**	BORING STARTED: **Aug 28 2024**	CAVE IN DEPTH:	
WL (Completion)	BORING COMPLETED: **Aug 28 2024**	HAMMER TYPE: **Auto**	
WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **TRC1**	DRILLING METHOD: **Hollow Stem Auger**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
Mainland Retail, LLC	**65:1673**	**P-03**	**1 of 1**
PROJECT NAME:	DRILLER/CONTRACTOR:		
Tractor Supply - Houma, LA	**ECS**		
SITE LOCATION:			LOSS OF CIRCULATION
Park Avenue, Houma, Louisiana, 70363			
LATITUDE:	LONGITUDE:	STATION:	SURFACE ELEVATION:
29.591380	**-90.673829**		**8.0**

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6" (TCP/MC/SPT-N value)*	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)	QP (TSF)	FINES CONTENT (%)
					Topsoil Thickness[6.00"]								
	S-01	ST	24	24	(CL) LEAN CLAY, brown, very stiff				44	24	20.2	3.50	
	S-02	ST	24	24	(CH) FAT CLAY, brown and gray, stiff							1.25	
5	S-03	ST	24	24			3					1.00	
					END OF BORING AT 6.0 FT								
10							-2						
15							-7						
20							-12						
25							-17						
30							-22						

BLOWS/6" (TCP/MC/SPT-N value)*: STANDARD PENETRATION BLOWS/FT 10 20 30 40 50; 20 40 60 80 100 ROCK QUALITY DESIGNATION & RECOVERY; RQD; REC; MC SAMPLER BLOWS/FT 10 20 30 40 50; TEXAS CONE PENETRATION BLOWS/FT

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Aug 28 2024**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Aug 28 2024**		HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Unknown**	LOGGED BY: **TRC1**	DRILLING METHOD: **Hollow Stem Auger**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

Appendix C – Laboratory Testing

Laboratory Testing Summary

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-01	S-01	0.0-2.0	25.6										
B-01	S-02	2.0-4.0	27.3										
B-01	S-03	4.0-6.0	32.0		39	19	20						
B-01	S-04	6.0-8.0	43.2										
B-01	S-05	8.0-10.0	35.1										
B-01	S-06	13.0-15.0	34.2	*CL	39	21	18	95.6					
B-01	S-07	18.0-20.0	41.0										
B-01	S-08	23.5-25.0	31.0										
B-02	S-02	2.0-4.0	27.7		60	18	42						
B-02	S-05	8.0-10.0	32.5		35	21	14						

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: Tractor Supply - Houma, LA
Client: Mainland Retail, LLC

Project No.: 65:1673
Date Reported: 12/19/2024

Office / Lab	Address	Office Number / Fax
ECS Southeast LLC - Baton Rouge	11211 Industriplex Blvd Suite 300 Baton Rouge, LA 70809	(225)224-2583 (225)612-7062

Tested by	Checked by	Approved by	Date Received
JTortorich	NBurke	NBurke	8/27/2024

Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-02	S-08	23.5-25.0	26.8					29.0					
B-03	S-01	0.0-2.0	28.3										
B-03	S-02	2.0-4.0	41.9										
B-03	S-03	4.0-6.0	38.9										
B-03	S-04	6.0-8.0	40.6		76	24	52						
B-03	S-05	8.0-10.0	44.6										
B-03	S-06	13.0-15.0	32.3										
B-03	S-07	18.5-20.0	33.3					79.8					
B-03	S-08	23.5-25.0	26.9										
B-03	S-09	28.5-30.0	28.8					21.5					

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					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-04	S-01	0.0-2.0	31.4		82	27	55						
B-04	S-02	2.0-4.0	33.3										
B-04	S-03	4.0-6.0	39.2										
B-04	S-04	6.0-8.0	36.0										
B-04	S-05	8.0-10.0	35.8										
B-04	S-06	13.0-15.0	31.4										
B-04	S-07	18.0-20.0	31.2		27	23	4						
B-04	S-08	23.0-25.0	35.9										
B-04	S-09	28.5-30.0	32.5										
B-04	S-10	33.5-35.0	29.3										

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					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-04	S-11	38.5-40.0	27.0					20.0					
B-05	S-01	0.0-2.0	31.4										
B-05	S-02	2.0-4.0	32.3										
B-05	S-03	4.0-6.0	35.6										
B-05	S-04	6.0-8.0	33.2										
B-05	S-05	8.0-10.0	27.8										
B-05	S-06	13.0-15.0	29.0										
B-05	S-07	18.0-20.0	30.1										
B-05	S-08	23.0-25.0	35.3	*CL	39	21	18	85.1					
B-05	S-09	28.0-30.0	35.3					76.4					

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

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					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-05	S-10	33.0-35.0	27.8		NP	NP	NP	11.4					
B-05	S-11	38.0-40.0	28.7										
B-05	S-12	43.0-45.0	58.0		75	37	38	11.3					
B-05	S-13	48.0-50.0	93.3										
B-05	S-14	53.0-55.0	42.6		43	21	22						
B-05	S-15	58.0-60.0	61.4										
B-05	S-16	63.0-65.0	40.8		49	24	25						
B-05	S-17	68.0-70.0	38.9										
B-05	S-18	73.0-75.0	38.4		80	23	57						
DP-01	S-01	0.0-2.0	41.7		102	26	76						

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Laboratory Testing Summary

Sample Location	Sample Number	Depth (ft)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
DP-01	S-02	2.0-4.0	45.8										
DP-02	S-01	0.0-2.0	15.9										
DP-02	S-02	2.0-4.0	31.9		99	27	72						
P-01	S-01	0.0-2.0	28.7										
P-02	S-01	0.0-2.0	24.6		81	23	58						
P-03	S-01	0.0-2.0	20.2		44	20	24						

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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