ECS Southeast, LLP

Geotechnical Engineering Report

REDI Arkansas Manufacturing Center

US Highway 67 at Miller County Rd. 64
Texarkana, Arkansas

ECS Project No. 62:1116

March 23, 2021

ECS SOUTHEAST, LLP

"Setting the Standard for Service"

Geotechnical • Construction Materials • Environmental • Facilities

March 23, 2021

Mr. Rob Sitterley, P. E.
President & CEO
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2900 Saint Michael Drive
5th Floor
Texarkana, TX 75503

ECS Project No. 62:1116

Reference: Geotechnical Engineering Report
REDI Arkansas Manufacturing Center
US Highway 67 at Miller County Road 64
Texarkana, Arkansas

Dear Mr. Sitterley:

ECS Southeast, LLP (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to AR-TX REDI 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 verify 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 contact us.

Respectfully submitted,

ECS Southeast, LLP

STATE OF ARKANSAS LICENSED PROFESSIONAL ENGINEER No. 17702 APRIL M. TUTOR

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TABLE OF CONTENTS

APPENDICES

EXECUTIVE SUMMARY

ECS Southeast, LLP (ECS) has completed the subsurface exploration for the proposed construction of a new warehouse facility on a 1350-acre site in Texarkana, Arkansas. The project information summarized below is based exclusively on the information made available to us by the client at the time of this report and the results of our subsurface exploration. Our findings, conclusions, and recommendations are summarized below.

PROJECT INFORMATION:

- Site Location: US Highway 67 and Miller County 64 in Texarkana, Arkansas
- Building Scope: 1-story warehouse type facility
- Assumed Loads: Max. column loads = 250 kips, Max. wall loads = 6 klf
- Earthwork: Less than 10 feet of cut and fill anticipated
- Sitework: Parking lot, drive lanes, SWM facility and underground utilities

SUBSURFACE CONDITIONS:

- Field Exploration: 14 SPT borings in the proposed construction area
- Surface Material: Approximately 2 to 3-inches of topsoil encountered
- Existing Fill: Not encountered in our boring locations
- Native Material: Lean CLAY (CL), SILTY CLAY (CL-ML), and Silty SAND (SM)
- Groundwater: Not encountered in our boring locations

GEOTECHNICAL CONCERNS:

- Presence of Alluvium soils

DESIGN & CONSTRUCTION RECOMMENDATIONS:

- Foundations: 2,500 psf shallow foundations
- Slabs-on-Grade: Modulus of Subgrade Reaction, k = 110 pci
- Seismic Design: Seismic Site Class "D"

This summary should not be considered apart from the entire text of the report with all the qualifications and considerations mentioned herein. Details of our conclusions and recommendations are discussed in the report text.

1.0 INTRODUCTION

The purpose of this study was to provide geotechnical information for the design of foundations, slab-on-grades, loading dock walls, drive lanes, parking and drainage structures for the proposed REDI Arkansas Manufacturing Center. The project will include warehouse type facility on a 1350-acre site with associated drive lanes and flatwork. The recommendations developed for this report are based on project information supplied by you.

Our services were provided in accordance with our Proposal No. 62:1240P, dated January 22, 2021, as authorized by you on February 2, 2021, which includes our Terms and Conditions of Service.

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.

- A brief review and description of our field and laboratory test procedures and the results of testing conducted.
- A review of surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil/rock stratigraphy with pertinent physical properties.
- Final soil test boring logs.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills and identification of potentially unsuitable soils and/or soils exhibiting excessive moisture at the time of sampling.
- Recommended foundation types and allowable bearing capacities.
- Recommended slab-on-grade design criteria including estimated modulus of subgrade reaction value.
- Recommended lateral earth pressures and sliding resistance for use in designing below grade and/or retaining walls.
- Recommended cut and fill slope design criteria.
- General recommendations for pavement design, including a recommended design CBR value.
- Evaluation and recommendations relative to groundwater control, including recommendations for pavement underdrains.
- An evaluation of soil excavation issues.

2.0 PROJECT INFORMATION

2.1 Project Location/Current Site Use

The project site is located at intersection of US Highway 67 and Miller County Road 64 in Texarkana, Arkansas. The site is currently a grass covered field with power lines on the northeastern to southeastern portion of site.

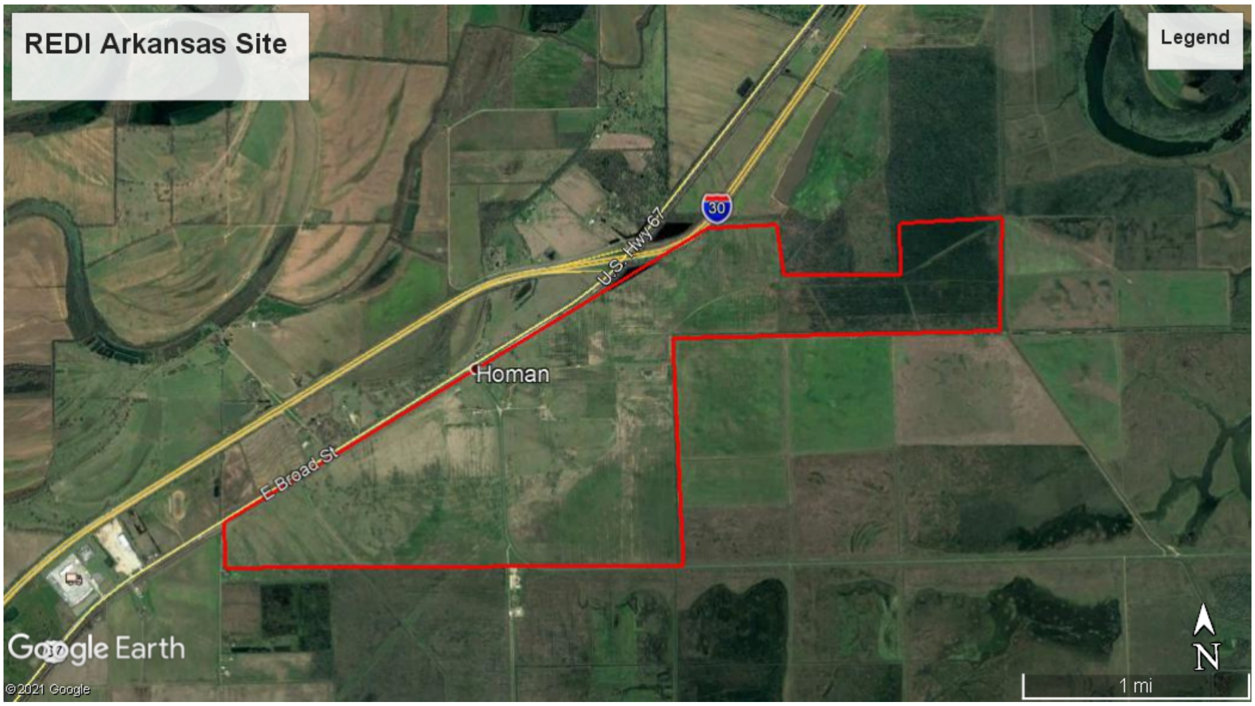


Figure 2.1.1. Approximate Site Location Outlined in Red

2.2 Proposed Construction

The following information explains our understanding of the planned development including proposed buildings and related infrastructure:

SUBJECT	DESIGN INFORMATION / ASSUMPTIONS
Building Footprint	Not Available
# of Stories	Single-Story
Usage	Warehouse type facility
Framing	Steel Framed Building with Reinforced CMU Walls (Assumed)
Assumed Column Loads	Less than 250 kips (Full Dead and Factored Live)
Assumed Wall Loads	Less than 6 kips per linear foot (klf) maximum

The planned site will also have a stormwater retention pond in the southwest corner of the site. The drive lanes and parking are assumed to be asphaltic concrete pavement.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedures. Our scope of work included drilling twelve (14) borings. Our borings were located with a handheld GPS unit and their approximate locations are shown on the Boring Location Diagram in Appendix A.

3.1 Subsurface characterization

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil. Please refer to the boring logs in Appendix B.

The site sits on a Loess formation underlain by the Kosciusko Formation. The Loess Formation primarily consists of grayish to yellowish brown silt. The Kosciusko Formation primarily consists of irregularly bedded sand, clay, and quartzite.

Approximate Depth (ft)	Stratum	Description	Ranges of SPT(1) N-values (bpf)(1)
0 - 0.3 (Surface cover)	n/a	Approximately 1 to 3 inches of Topsoil	N/A
0.3 – 2.5	I	Agriculturally Disturbed Soil – Firm to Very Stiff, SILT (ML) Moist (Not encountered in Borings B-11 and B-14)	5 - 21
2.5 - 16.5	II	ALLUVIUM – Very Loose to Medium Dense, SILTY SAND (SM), Moist (Only Borings B-1 through B-6)	3 to 14
0.3 – 26.5	III	ALLUVIUM - Soft to Hard, Lean CLAY (CL), and Silty CLAY (CL-ML), Moist	4 to 40

Notes:
(1) Standard Penetration Testing; bpf – blows per foot

3.2 Groundwater Observations

During drilling operations, groundwater was not encountered. It should be noted that it is possible for perched water to exist within the depths explored at the borings during other times of the year depending upon climatic and rainfall conditions. Additionally, discontinuous zones of perched water may exist within the native materials.

Variations in the location of the long-term water table may occur as a result of change in precipitation, evaporation, surface water runoff, and other factors not immediately apparent at the time of this exploration.

3.3 Soil Survey

The Lafayette, Little River, and Miller Counties, Arkansas Soil Survey indicates the site is composed of three main soil groups – Rilla Silt Loam, Bossier Clay, and Billyhaw Clay. The Billyhaw Clay only represents approximately 10.5 percent of the total area of the site and the remaining areas are evenly split between the other two soil groups. These soil groups were classified as silty or clayey alluvium soils of previous flood plains or natural levees. The Soil Survey indicated that these soils were not susceptible to or are rarely flooded. Although no groundwater was measured in the boreholes at the time of drilling, the Soil Survey indicates approximate depths to groundwater ranging from the ground surface to 72 inches. Further, the Soil Survey indicates Fat CLAY (CH) within the eastern and southern one-third of the site. ECS's classification of the soil samples obtained in this area indicated Lean CLAY (CL) and Silty CLAY (CL-ML) soils.

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.

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, and ASTM D2487 Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS)). 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.

4.0 PRELIMINARY DESIGN RECOMMENDATIONS

The following recommendations are preliminary and additional borings will be required prior to finalizing the provided design recommendations. The preliminary design recommendations are on the basis of the previously described project characteristics and subsurface conditions. 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.

The planned structures at this site can be supported on underreamed drilled shaft (belled) foundations or shallow footings bearing in fat clay. The recommendations of this report must be reviewed once the finished grades for the buildings are established.

Preliminary geotechnical recommendations for foundations, floor slabs, retaining walls, pavements and earthwork are presented in the following report sections.

4.1 Potential Vertical Movements

The soils encountered at the boring locations were not classified as Fat CLAY (CH) which is generally an expansive soil susceptible to shrink and swell tendencies with the changes in moisture content, occurring seasonally. Based on the classification of the soil samples obtained at the boring locations, ECS believes that potential vertical soil movements (PVM) should likely not occur at this site. However, during the final investigation, additional laboratory testing should be performed for further analysis.

4.2 Foundations

Provided subgrades and structural fills are prepared as recommended in this report, the proposed structure can be supported by shallow foundations including column footings and continuous wall footings. We recommend the foundation design use the following parameters:

Design Parameter	Column Footing	Wall Footing
Net Allowable Bearing Pressure(1)	2,500 psf	2,500 psf
Acceptable Bearing Soil Material	Medium Dense Silty SAND (SM), Stiff LEAN (CL) or Silty CLAY (CL-ML) - Stratum II or III; Structural Fill	Medium Dense Silty SAND (SM), Stiff LEAN (CL) or Silty CLAY (CL-ML) - Stratum II or III; Structural Fill
Minimum Width	24 inches	18 inches
Minimum Footing Embedment Depth (below slab or finished grade) (2)	24 inches	24 inches
Minimum Exterior Frost Depth (below final exterior grade)	18 inches	18 inches
Estimated Total Settlement (3)	Less than 1- inch	Less than 1- inch
Estimated Differential Settlement (4)	Less than ¾ inches between columns	Less than ¾ inches

Notes:

(1) Net allowable bearing pressure is the applied pressure in excess of the surrounding overburden soils above the base of the foundation.
(2) For bearing considerations, frost penetration requirements or expansive soil concerns
(3) Based on assumed structural loads. If final loads are different, ECS must be contacted to update foundation recommendations and settlement calculations.
(4) Based on maximum column/wall loads and variability in borings. Differential settlement can be re-evaluated once the foundation plans are more complete.

Potential Undercuts: Most of the soils at the foundation bearing elevation are anticipated to be suitable for support of the proposed structure. It is important to have ECS observe the foundation subgrade prior to placing foundation concrete, to confirm the bearing soils are what was anticipated. Most borings encountered stratums at various depths, with N-values of less than 5 which generally will require some undercutting, depending on final grades and foundation locations, if encountered at the bottom of footing elevations. If soft or unsuitable soils are observed at the footing bearing elevations, the unsuitable soils should be undercut and removed. Any undercut should be backfilled with lean concrete ($f'_c \geq 1,000$ psi at 28 days) up to the original design bottom of footing elevation; the original footing shall be constructed on top of the hardened lean concrete.

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils 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.

4.3 Slabs On Grade

Provided subgrades and structural fills are prepared as discussed herein, the proposed floor slabs can be constructed as Ground Supported Slabs (or Slab-On-Grade). It appears that the slabs will bear on newly compacted fill or Stratum II or III – Silty SAND (SM), LEAN (CL), or Silty CLAY (CL-ML). Prior to placement of a drainage layer, the subgrade should be prepared in accordance with the recommendations found in **Section 5.1.2 Proofrolling**. Soft or yielding soils may be encountered in some areas. Those soils should be removed and replaced with compacted structural fill in accordance with the recommendations included in this report. The following graphic depicts our soil-supported slab recommendations:

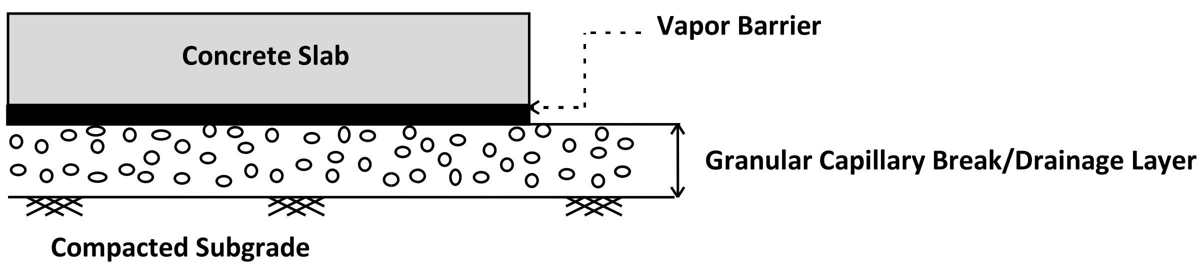


Figure 4.3.1

1. Drainage Layer Thickness: 6 inches
2. Drainage Layer Material: 6 inches of GRAVEL (GP, GW), SAND (SP, SW)

Subgrade Modulus: Provided the structural fill and granular drainage layer are constructed in accordance with our recommendations, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 110 pci (lbs./cu. inch). The modulus of subgrade reaction value is based on a 1 ft by 1 ft plate load test basis.

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.

Slab Isolation: Soil-supported slabs should be isolated from the foundations and foundation-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 suitable reinforcement and load transfer devices to preclude overstressing of the slab.

4.4 Seismic Design Considerations

Seismic Site Classification: The International Building Code (IBC) **2012** requires site classification for seismic design based on the upper 100 feet of a soil profile. At least two methods are utilized in classifying sites, namely the shear wave velocity (v_s) method and the Standard Penetration Resistance (N-value) method. The N-value method was used in this analysis.

SEISMIC SITE CLASSIFICATION			
Site Class	**Soil Profile Name**	**Shear Wave Velocity, Vs, (ft./s)**	**N value (bpf)**
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	>50
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	15 to 60
E	Soft Soil Profile	Vs < 600 fps	<15

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

Ground Motion Parameters: In addition to the seismic site classification, ECS has determined the design spectral response acceleration parameters following the IBC methodology. The Mapped Reponses were estimated from the USGS website https://earthquake.usgs.gov/ws/designmaps/. The design responses for the short (0.2 sec, S_{DS}) and 1-second period (S_{D1}) are noted in bold at the far right end of the following table.

GROUND MOTION PARAMETERS [IBC 2012 Method]								
Period (sec)	**Mapped Spectral Response Accelerations (g)**		**Values of Site Coefficient for Site Class**		**Maximum Spectral Response Acceleration Adjusted for Site Class (g)**		**Design Spectral Response Acceleration (g)**	
Reference	Figures 1613.3.1 (1) & (2)		Tables 1613.3.3 (1) & (2)		Eqs. 16-37 & 16-38		Eqs. 16-39 & 16-40	
0.2	S_S	0.811	F_a	1.175	$S_{MS}=F_aS_s$	0.954	$S_{DS}=2/3\ S_{MS}$	**0.636**
1.0	S_1	0.288	F_v	1.825	$S_{M1}=F_vS_1$	0.525	$S_{D1}=2/3\ S_{M1}$	**0.350**

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 subgrades in cuts will consist mainly of Silty SAND (SM), Stiff LEAN (CL) or Silty CLAY (CL-ML) material. The upper approximately 2.5 feet of agriculturally disturbed clayey Silt (ML) soils will probably not pass proofroll and will be moisture sensitive. These soils will potentially need to be undercut and replaced or treated with a soil-cement stabilization. California Bearing Ratio (CBR) testing was not performed as part of this study. Therefore, we have assumed a CBR value of 4 for preliminary design purposes.

We were not provided traffic loading information, so we have assumed loadings typical of this type of project. We have assumed a light traffic loading of 45,000 ESALs for parking and drive lanes.

The preliminary pavement sections below are guidelines that may or may not comply with local jurisdictional minimums.

PROPOSED PAVEMENT SECTIONS		
	FLEXIBLE PAVEMENT	RIGID PAVEMENT
MATERIAL	Light Duty	Light Duty
Portland Cement Concrete (f'_c = 4000 psi)	-	5.0 in.
Asphaltic Concrete Surface Course	1.5 in.	-
Asphaltic Concrete Binder Course	2.0 in.	-
Graded Aggregate Base Course	8.0 in.	6.0 in

In general, heavy duty sections are areas that will be subjected to trucks, buses, or other similar vehicles including main drive lanes of the development. Light duty sections are appropriate for vehicular traffic and parking areas.

Large, front loading trash dumpsters 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 a 6-inch thick, 4,000 psi, reinforced concrete slab over 6-inches of dense graded aggregate. When traffic loading becomes available ECS or the Civil Engineer can design the pavements.

Prior to subbase placement and paving, CBR testing of the subgrade soils (both natural and fill soils) should be performed to determine the soil engineering properties for final pavement design.

Pavement Maintenance: Regular maintenance and occasional repairs should be implemented to keep pavements in a serviceable condition. In addition, to help reduce water infiltration to the pavement section and within the base course layer resulting in softening of the subgrade and deterioration of the pavement, we recommend the timely sealing of joints and cracks using proper sealants. We recommend exterior pavements be reviewed for distress/cracks twice a year, once in the spring and once in the fall.

Sound maintenance programs should help maintain and enhance the performance of pavements and attain the design service life. A preventative maintenance program should be implemented early in the pavement life to be effective. The "standard in the industry" supported by research indicates that preventative maintenance should begin within 2 to 5 years of the pavement construction. Failure to perform preventative maintenance will reduce the service life of the pavement and increase the costs for both corrective maintenance and full pavement rehabilitation.

4.6 Site Retaining Walls

Site retaining walls may be required. Retaining walls associated with the structure should be supported on footings as discussed in ***Section 4.2 Foundations*** of this report. Cast-in-place concrete cantilever retaining walls supported on shallow footings in clay soils can be used for site retaining walls. Recommendations for site retaining walls are provided below.

4.6.1 Lateral Earth Pressure

The lateral pressure acting on the walls will depend on the backfill material type, the amount of wall movement and drainage conditions behind the walls. Recommended lateral design parameters are provided in Table 4.6.1.1 below. The values in the table that follows under "Active Conditions" pertain to retaining walls free to tilt outward as a result of lateral earth pressures. For rigid, non-yielding walls (such as below grade walls) which are not allowed to rotate, the values under "At-Rest Conditions" should be used.

Table 4.6.1.1 Lateral Earth Pressure Design Values

Backfill Type (Level Backfill)	Total Unit Weight (pcf)	Active Condition		At Rest Condition	
		Earth Pressure Coefficient, k_a	Equivalent Fluid Pressure (psf/ ft)	Earth Pressure Coefficient, k_o	Equivalent Fluid Pressure (psf/ft)
On Site Clay/ Imported Clay Fill	125	0.45	56	0.62	78
Select Fill	125	0.36	45	0.53	67
Granular Fill	125	0.26	33	0.41	51

Properties of backfill materials are provided in the Structural Fill section. The Select fill or granular backfill limits should extend outward at least 2 feet from the base of the wall footing and then upward on a 1H:1V slope. For narrower backfill widths of select or granular fill, the equivalent fluid pressures for on-site soils should be used.

The values presented above assume the surface of the backfill materials to be level. Sloping the surface of the backfill materials will increase the earth pressures acting on the retaining wall and can be evaluated if required. The above values also do not include the effect of surcharge loads such as construction equipment, vehicular loads, or future buildings or paving near the walls. Surcharge loads should be considered if they apply at the surface above the wall within an angle of 45° extending up from the base of the wall.

4.6.2 Wall Drainage

The lateral pressure design values presented above assume a drained condition behind the wall. Hydrostatic pressures resulting from groundwater seepage entering and ponding within the backfill materials should be considered in the design if proper drainage is not provided.

For walls with a height of 4 feet or less, weep holes can be used for drainage. For walls with a height greater than 4 feet, vertical wall drains consisting of a composite geosynthetic drainage medium is recommended if select fill or on-site soil is chosen as backfill. The vertical drain should be located immediately behind the wall system and extend from the level of longitudinal drains, upward to not higher than 2 feet below the top of the wall. The vertical drains should transport water to the longitudinal drains and then to a storm water line. Composite geosynthetic drainage systems are typically proprietary systems. They are available in different sizes and with different flow rates. The manufacturer should be consulted for installation and spacing guidelines.

If free-draining granular backfill is used, a vertical wall drain would not be necessary. The granular backfill should transport water to longitudinal drains and then to a storm water line. However, in this case, we recommend that a 2-foot thickness of well-compacted, impervious clay cover be placed over the backfill surface to reduce infiltration in areas that are not covered by pavement. A geotextile filter fabric should be placed between the aggregate backfill and the clay cover materials and between the aggregate backfill and the backslope of the native material to minimize infiltration of fines into the backfill.

4.6.3 Backfill Settlement

Backfill placed behind the walls should be well compacted. Special care must be exercised to “tie in” the backfill with adjacent undisturbed, firm, natural soils by providing deep benches into the firm natural soil during placement of each fill lift. All loose materials and “slope wash” that may accumulate in the wall excavation during construction should be completely removed prior to placement of the backfill materials.

Some post-construction settlement of the backfill surface should be anticipated. This is typically on the order of one percent of the backfill height, even if satisfactory compaction of the backfill materials is achieved. This will lead to potential differential settlement. Therefore, it is recommended that special consideration be given to the design of any foundation elements, floor slabs, and pavements that may extend over this backfill as a result of the potential for differential settlements introduced by this condition.

5.0 PRELIMINARY SITE CONSTRUCTION RECOMMENDATIONS

5.1 Subgrade Preparation

5.1.1 Stripping and Grubbing

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, existing fill, and any soft or unsuitable materials from the 10-foot expanded building and 5-foot expanded pavement limits, and 5 feet beyond the toe of structural fills. Borings performed in “undisturbed” areas of the site contained an observed approximately 1 or 3 inches of topsoil. The boring encountered approximately 2.5 feet of agriculturally disturbed clayey Silt (ML) soils. These soils will potentially need to be undercut and replaced or treated with a soil-cement stabilization. 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 verify that topsoil and unsuitable surficial materials have been removed prior to the placement of structural fill or construction of structures.

5.1.2 Proofrolling

Prior to fill placement or other construction on subgrades, the subgrades should be evaluated by an ECS field technician. The exposed subgrade should be thoroughly proofrolled with construction equipment having a minimum axle load of 10 tons [e.g. fully loaded tandem-axle dump truck]. 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 any localized yielding materials. The upper approximately 2.5 feet of agriculturally disturbed clayey Silt (ML) soils will probably not pass proofroll and will be moisture sensitive. These soils will potentially need to be undercut and replaced or treated with a soil-cement stabilization

Where proofrolling identifies areas that are unstable or “pumping” subgrade those areas should be repaired prior to the placement of any subsequent structural fill or other construction materials. Methods of stabilization include undercutting, moisture conditioning, or chemical stabilization. The situation should be discussed with ECS to determine the appropriate procedure. Test pits may be excavated to explore the shallow subsurface materials to help in determining the cause of the observed unstable materials, and to assist in the evaluation of appropriate remedial actions to stabilize the subgrade.

5.1.3 Site Temporary Dewatering

Limited Excavation Dewatering: Based upon our subsurface exploration at this site, as well as significant experience on sites in nearby areas of similar geologic setting, we believe construction dewatering at this site will be mainly limited to removing accumulated rain water and some minor seepage from the support of excavation (SOE). It appears that the permanent static groundwater for this site is well below the planned deepest excavation.

Deep wells should not be required for the temporary dewatering system. However, the dewatering operations can be handled by the use of conventional submersible pumps directly in the excavation, temporary trenches, or French drains.

5.1.4 Alluvium Deposits

The project site is underlain by Alluvium soils. This unit is comprised of sediments including gravels, sands, silts, clays, and mixtures of any these from present streams. Due to their natural depositional nature, these deposits can vary significantly in character and consistency over relatively short distances, necessitating more detailed and careful observation of subgrades and foundations during construction. Soft to very moist soils are common in these deposits and likely will be encountered during construction. Some undercutting should be anticipated in foundation (if conventional shallow foundations utilized), floor slab, and pavement areas due to the presence of these deposits.

The strength of these deposits can be partially derived from natural cementation of the deposits. The natural cementation is easily destroyed. Disturbance of these soils can result in the loss of the apparent strength resulting from the cementation process, causing once apparently firm deposits to loose strength and produce a quagmire with repeated disturbance and/or vibration. Disturbance of these soils should be kept to a minimum, and construction traffic should be concentrated on stabilized haul roads.

5.2 Earthwork Operations

5.2.1 Structural Fill

Prior to placement of structural fill, representative bulk samples (about 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 determine 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 Structural Fill Materials: Materials satisfactory for use as structural fill should consist of inorganic soils with the following engineering properties and compaction requirements.

STRUCTURAL FILL INDEX PROPERTIES	
Subject	**Property**
Building and Pavement Areas	LL < 40, PI < 20
Max. Particle Size	4 inches
Fines Content	Max. 25 % > #200 sieve
Max. organic content	5% by dry weight

STRUCTURAL FILL COMPACTION REQUIREMENTS	
Subject	**Requirement**
Compaction Standard	Standard Proctor, ASTM D698
Required Compaction	95% of Max. Dry Density
Moisture Content	-2 to +3 % points of the soil's optimum value
Loose Thickness	8 inches prior to compaction

On-Site Borrow Suitability: Significant natural deposits of soils that meet the definition of satisfactory structural fill are present on the site.

Fill Placement: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and frozen or frost-heaved soils should be removed prior to placement of structural fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

5.3 Utility Installations

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrades should be observed and probed for stability by ECS. Any loose or unsuitable materials encountered should be removed and replaced with suitable compacted Structural 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 satisfy the requirements for Structural Fill and Fill Placement.

Excavation Safety: All 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 stable temporary 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 the client. 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 – Diagrams & Reports

Site Location Diagram
Boring Location Diagram

Boring Location Diagram

REDI ARKANSAS MANUFACTURING CENTER

US HIGHWAY 67 AT MILLER COUNTY ROAD 64, TEXARKANA, ARKANSAS

AR-TX REDI

ENGINEER	JDG2
SCALE	AS NOTED
PROJECT NO.	62:1116
SHEET	1 OF 1
DATE	3/16/2021

Boring Location Diagram
REDI ARKANSAS MANUFACTURING CENTER

US HIGHWAY 67 AT MILLER COUNTY ROAD 64, TEXARKANA, ARKANSAS

AR-TX REDI

ENGINEER	JDG2
SCALE	AS NOTED
PROJECT NO.	62:1116
SHEET	1 OF 1
DATE	3/11/2021

APPENDIX B – Field Operations

Reference Notes for Boring Logs
Subsurface Exploration Procedure: Standard Penetration Testing (SPT)
Boring Logs B-1 through B-14

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, QP[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<3	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

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

GRAVELS, SANDS & NON-COHESIVE SILTS

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

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.

SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT) ASTM D 1586 Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

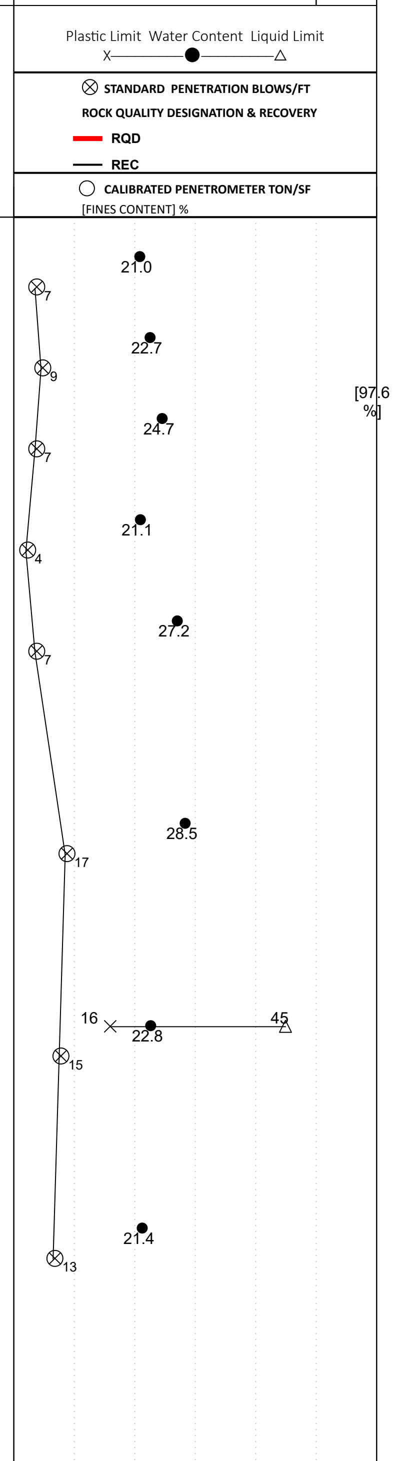
- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 12 inches (in 3 or 4 Increments of 6 inches each)
- Auger is advanced* and an additional SPT is performed
- One SPT test is typically performed for every two to five feet
- Obtain two-inch diameter soil sample

**Drilling Methods May Vary—* The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

CLIENT: AR-TX REDI	PROJECT NO.: 62:1116	BORING NO.: B-1	SHEET: 1 of 1
PROJECT NAME: REDI Arkansas Manufacturing Center	DRILLER/CONTRACTOR: Anderson Engineering Consultants, Inc		
SITE LOCATION: US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854		LOSS OF CIRCULATION	
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[3.00"]			
	S-1	SS	18	18	(ML) SILT, brown, moist, firm			2-3-4 (7)
	S-2	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, firm			2-4-5 (9)
5	S-3	SS	18	18	(SM) SILTY SAND, brown, moist, loose		-5	2-3-4 (7)
	S-4	SS	18	18				3-2-2 (4)
10	S-5	SS	18	18			-10	2-3-4 (7)
					(CL) LEAN CLAY, brown, moist, very stiff			
15	S-6	SS	18	18			-15	6-6-11 (17)
20	S-7	SS	18	18			-20	4-5-10 (15)
					(CL) LEAN CLAY, brown, moist, very stiff to stiff			
25	S-8	SS	18	18			-25	5-4-9 (13)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	62:1116	B-2	1 of 1

PROJECT NAME: **REDI Arkansas Manufacturing Center**

DRILLER/CONTRACTOR: **Anderson Engineering Consultants, Inc**

SITE LOCATION: **US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854**

LOSS OF CIRCULATION

BOTTOM OF CASING

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

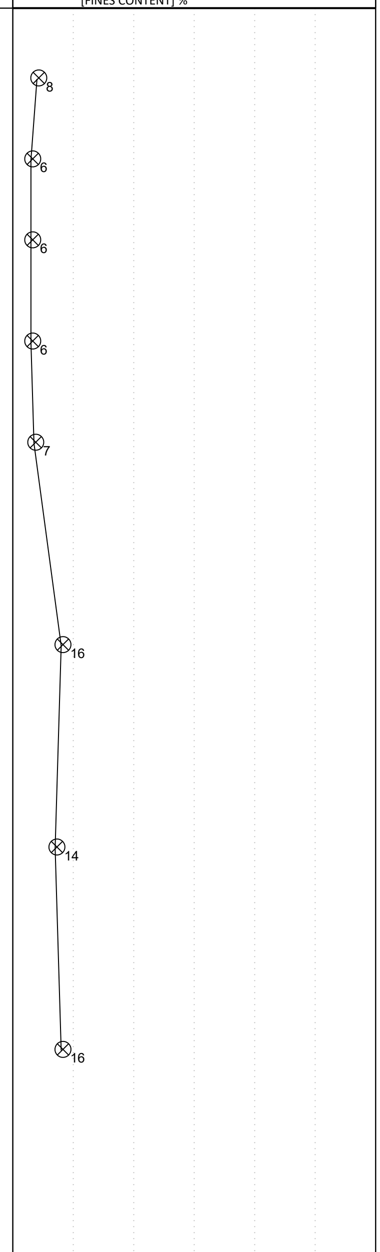
RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(ML) SILT, brown, moist, firm			3-4-4 (8)
	S-2	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, firm			2-2-4 (6)
5	S-3	SS	18	18	(SM) SILTY SAND, brown, moist, loose		-5	3-3-3 (6)
	S-4	SS	18	18				9-2-4 (6)
10	S-5	SS	18	18			-10	3-3-4 (7)
					(CL) LEAN CLAY, brown, moist, stiff to very stiff			
15	S-6	SS	18	18			-15	4-6-10 (16)
20	S-7	SS	18	18			-20	4-6-8 (14)
25	S-8	SS	18	18			-25	6-7-9 (16)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-3**	**1 of 1**

ECS

PROJECT NAME:	DRILLER/CONTRACTOR:
REDI Arkansas Manufacturing Center	**Anderson Engineering Consultants, Inc**

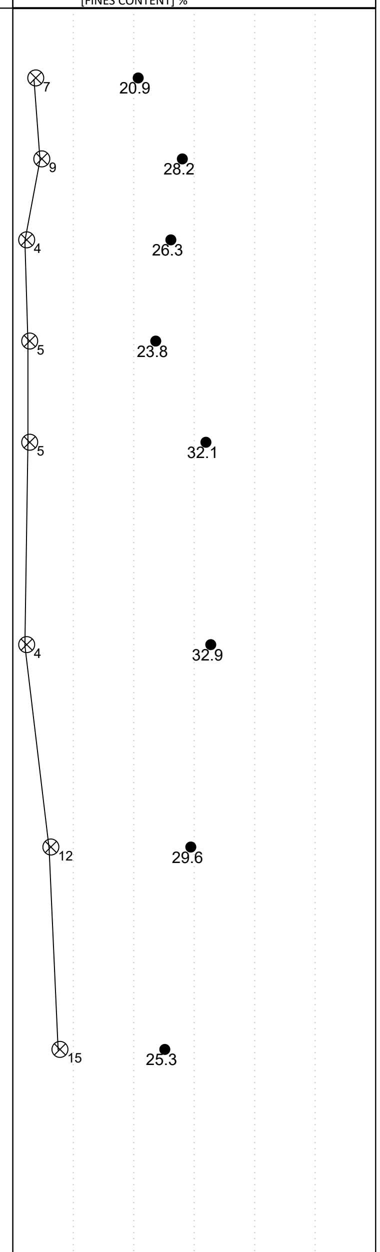
SITE LOCATION:
US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854

LOSS OF CIRCULATION 100%
BOTTOM OF CASING

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(ML) SILT, brown, moist, loose			3-3-4 (7)
	S-2	SS	18	18	(SM) SILTY SAND, brown, moist, very loose to loose			4-4-5 (9)
5	S-3	SS	18	18			-5	1-2-2 (4)
	S-4	SS	18	18				2-3-2 (5)
10	S-5	SS	18	18			-10	2-2-3 (5)
15	S-6	SS	18	18			-15	2-2-2 (4)
					(CL) LEAN CLAY, brown, moist, stiff			
20	S-7	SS	18	18			-20	4-7-5 (12)
25	S-8	SS	18	18			-25	5-8-7 (15)
					END OF DRILLING AT 26.5 FT			
30							-30	

Plastic Limit Water Content Liquid Limit
X——●——△
⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
○ CALIBRATED PENETROMETER TON/SF
[FINES CONTENT] %



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

▽ WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE:
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

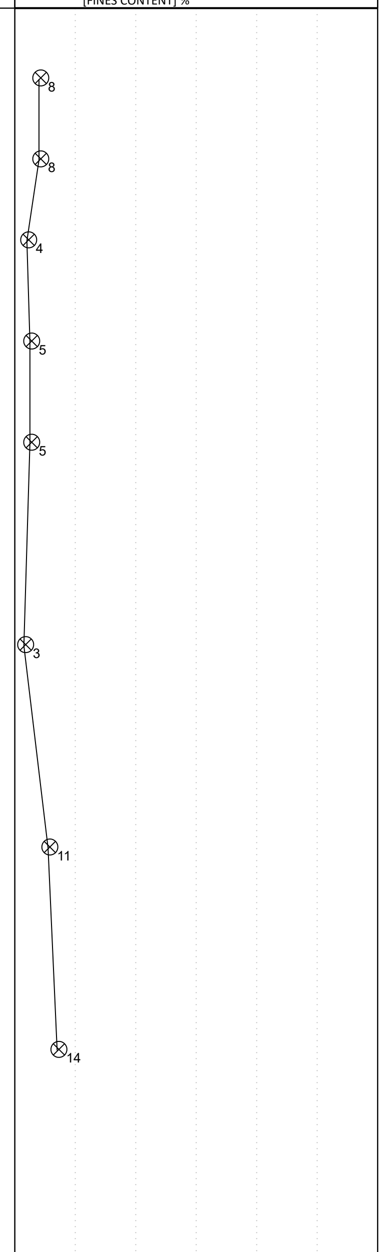
GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-4**	**1 of 1**
PROJECT NAME: **REDI Arkansas Manufacturing Center**	DRILLER/CONTRACTOR: **Anderson Engineering Consultants, Inc**		
SITE LOCATION: **US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854**		LOSS OF CIRCULATION	
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
			BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
CALIBRATED PENETROMETER TON/SF
[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(ML) SILT, brown, moist, loose			4-4-4 (8)
	S-2	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, firm			3-4-4 (8)
5	S-3	SS	18	18	(SM) SILTY SAND, brown, moist, very loose to loose		-5	3-2-2 (4)
	S-4	SS	18	18				3-2-3 (5)
10	S-5	SS	18	18			-10	3-3-2 (5)
15	S-6	SS	18	18			-15	3-2-1 (3)
					(CL) LEAN CLAY, brown, moist, stiff			
20	S-7	SS	18	18			-20	3-5-6 (11)
25	S-8	SS	18	18			-25	4-6-8 (14)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-5**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
REDI Arkansas Manufacturing Center	**Anderson Engineering Consultants, Inc**

SITE LOCATION:
US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

LOSS OF CIRCULATION 100%
BOTTOM OF CASING

Plastic Limit X — Water Content ● — Liquid Limit △
⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
○ CALIBRATED PENETROMETER TON/SF
[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	SPT (BLOWS/FT)	WATER CONTENT	LIQUID LIMIT	[FINES CONTENT] %
0					Topsoil Thickness[2.00"]							
	S-1	SS	18	18	(ML) SILT, brown, loose			3-2-3 (5)	5	25.0	20	
	S-2	SS	18	18	(SM) SILTY SAND, brown, moist, loose to medium dense			4-4-4 (8)	8	24.8		[95.2%]
5	S-3	SS	18	18			-5	3-2-3 (5)	5	26.7		
	S-4	SS	18	18				4-6-8 (14)	14	23.9		
10	S-5	SS	18	18	(SM) SILTY SAND, trace clay, brown, moist, loose		-10	4-4-4 (8)	8	37.0		[93.6%]
15	S-6	SS	18	18			-15	2-2-6 (8)	8	29.0		
					(CL) LEAN CLAY, brown, moist, stiff to very stiff							
20	S-7	SS	18	18			-20	7-7-7 (14)	14	24.3		
25	S-8	SS	18	18			-25	8-10-11 (21)	21	26.8		
					END OF DRILLING AT 26.5 FT							
30							-30					

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

▽ WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT: AR-TX REDI	PROJECT NO.: 62:1116	BORING NO.: B-6	SHEET: 1 of 1
PROJECT NAME: REDI Arkansas Manufacturing Center	DRILLER/CONTRACTOR: Anderson Engineering Consultants, Inc		
SITE LOCATION: US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

LOSS OF CIRCULATION

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

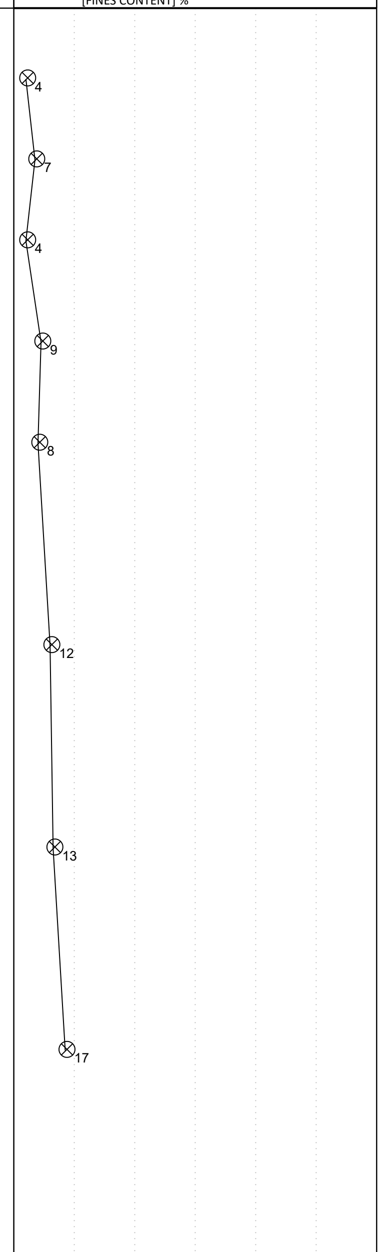
RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[3.00"]			
	S-1	SS	18	18	(ML) SILT, brown, moist, soft			2-2-2 (4)
	S-2	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, firm			3-3-4 (7)
5	S-3	SS	18	18	(SM) SILTY SAND, brown, moist, very loose to medium dense		-5	2-2-2 (4)
	S-4	SS	18	18				3-5-4 (9)
10	S-5	SS	18	18			-10	3-3-5 (8)
					(CL) LEAN CLAY, brown, moist, stiff to very stiff			
15	S-6	SS	18	18			-15	1-8-4 (12)
20	S-7	SS	18	18			-20	4-5-8 (13)
25	S-8	SS	18	18			-25	4-8-9 (17)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD:
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-7**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
REDI Arkansas Manufacturing Center	**Anderson Engineering Consultants, Inc**

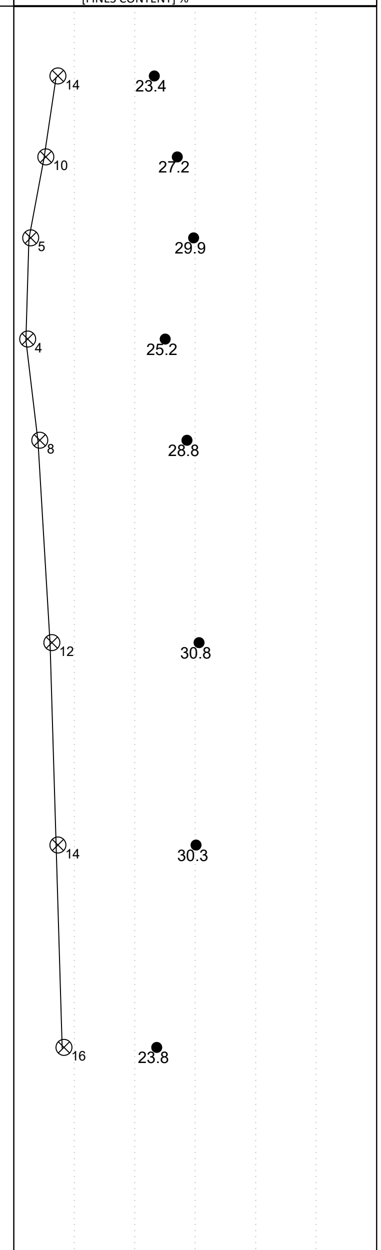
SITE LOCATION:
US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

LOSS OF CIRCULATION 100%
BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit
⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
○ CALIBRATED PENETROMETER TON/SF
[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(ML) SILT, brown, loose			3-8-6 (14)
	S-2	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, firm to stiff			3-4-6 (10)
5	S-3	SS	18	18			-5	2-2-3 (5)
	S-4	SS	18	18	(CL/ML) SILTY CLAY WITH SAND, brown, moist, soft			4-2-2 (4)
10	S-5	SS	18	18	(CL) LEAN CLAY, brown, moist, firm to very stiff		-10	4-4-4 (8)
15	S-6	SS	18	18			-15	3-4-8 (12)
20	S-7	SS	18	18			-20	3-5-9 (14)
25	S-8	SS	18	18			-25	6-6-10 (16)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED:	**Feb 10 2021**	CAVE IN DEPTH:	
WL (Completion)	BORING COMPLETED:	**Mar 03 2021**	HAMMER TYPE:	**Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD:	**3.25" HSA**
WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-8**	**1 of 1**

PROJECT NAME: **REDI Arkansas Manufacturing Center**

DRILLER/CONTRACTOR: **Anderson Engineering Consultants, Inc**

SITE LOCATION: **US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854**

NORTHING: | EASTING: | STATION: | SURFACE ELEVATION:

LOSS OF CIRCULATION (100%)

BOTTOM OF CASING

Plastic Limit X — Water Content ● — Liquid Limit △

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

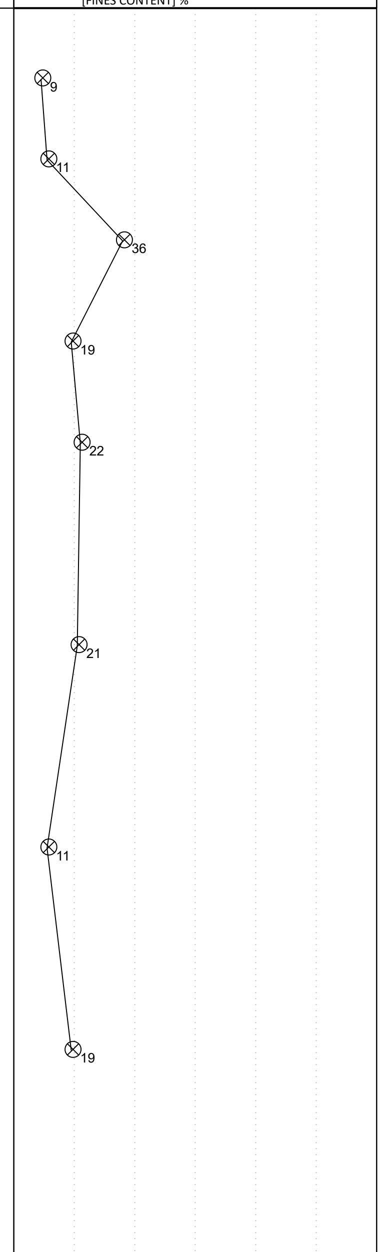
RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[1.00"]			
	S-1	SS	18	18	(ML) SILT, brown, loose			6-4-5 (9)
	S-2	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, stiff			4-5-6 (11)
5	S-3	SS	18	18	(CL) LEAN CLAY, brown, moist, stiff to hard		-5	14-17-19 (36)
	S-4	SS	18	18				5-10-9 (19)
10	S-5	SS	18	18			-10	7-9-13 (22)
15	S-6	SS	18	18			-15	4-7-14 (21)
20	S-7	SS	18	18			-20	3-3-8 (11)
25	S-8	SS	18	18			-25	5-8-11 (19)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-9**	**1 of 1**
PROJECT NAME: **REDI Arkansas Manufacturing Center**	DRILLER/CONTRACTOR: **Anderson Engineering Consultants, Inc**		
SITE LOCATION: **US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854**			
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

LOSS OF CIRCULATION 100%

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

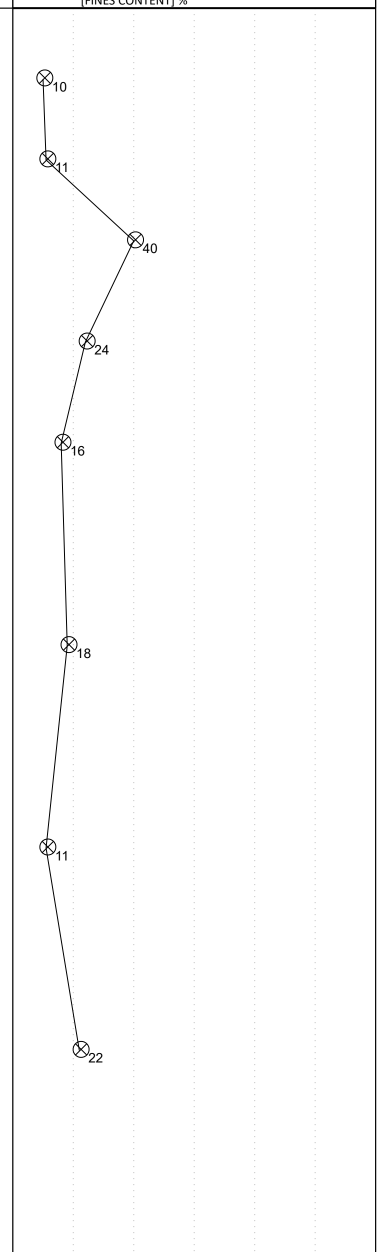
RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(ML) SILT, brown, moist, loose			3-3-7 (10)
	S-2	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, stiff			6-6-5 (11)
5	S-3	SS	18	18	(CL) LEAN CLAY, brown, moist, stiff to hard		-5	11-20-20 (40)
	S-4	SS	18	18				8-11-13 (24)
10	S-5	SS	18	18			-10	5-6-10 (16)
15	S-6	SS	18	18			-15	7-7-11 (18)
20	S-7	SS	18	18			-20	5-4-7 (11)
25	S-8	SS	18	18			-25	7-9-13 (22)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-10**	**1 of 1**
PROJECT NAME: **REDI Arkansas Manufacturing Center**	DRILLER/CONTRACTOR: **Anderson Engineering Consultants, Inc**		
SITE LOCATION: **US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854**		LOSS OF CIRCULATION	
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
		BOTTOM OF CASING	

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

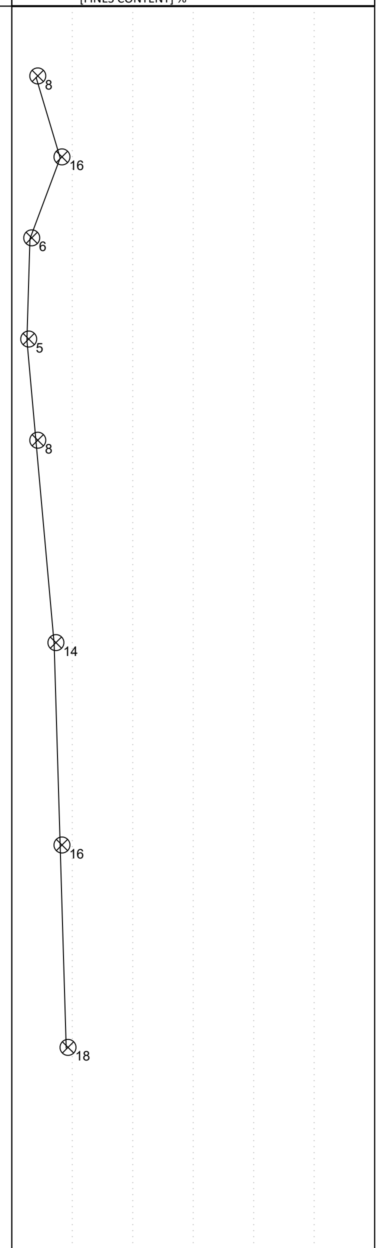
RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(ML) SILT, brown, moist, loose			3-4-4 (8)
	S-2	SS	18	18	(SM) SILTY SAND, brown, moist, loose to medium dense			4-8-8 (16)
5	S-3	SS	18	18			-5	2-2-4 (6)
	S-4	SS	18	18				3-3-2 (5)
10	S-5	SS	18	18	(CL) LEAN CLAY, brown, moist, firm to very stiff		-10	3-3-5 (8)
15	S-6	SS	18	18			-15	4-5-9 (14)
20	S-7	SS	18	18			-20	4-7-9 (16)
25	S-8	SS	18	18			-25	5-6-12 (18)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-11**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
REDI Arkansas Manufacturing Center	**Anderson Engineering Consultants, Inc**

SITE LOCATION:
US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854

LOSS OF CIRCULATION 100%

BOTTOM OF CASING

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

Plastic Limit Water Content Liquid Limit

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	SPT N	Water Content	Liquid Limit
					Topsoil Thickness[2.00"]						
	S-1	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, firm			4-3-4 (7)	7	25.7	
	S-2	SS	18	18				3-4-3 (7)	7	30.8	
5	S-3	SS	18	18	(CL) LEAN CLAY, brown, moist, stiff to very stiff		-5	4-6-6 (12)	12	22.3	
	S-4	SS	18	18				4-5-6 (11)	11	30.6	23
10	S-5	SS	18	18			-10	7-9-9 (18)	18	28.8	
15	S-6	SS	18	18			-15	6-8-11 (19)	19	32.3	
20	S-7	SS	18	18			-20	4-8-9 (17)	17	33.5	
25	S-8	SS	18	18			-25	4-7-7 (14)	14	33.4	
					END OF DRILLING AT 26.5 FT						
30							-30				

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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-12**	**1 of 1**
PROJECT NAME: **REDI Arkansas Manufacturing Center**	DRILLER/CONTRACTOR: **Anderson Engineering Consultants, Inc**		
SITE LOCATION: **US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854**		LOSS OF CIRCULATION	
NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
		BOTTOM OF CASING	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

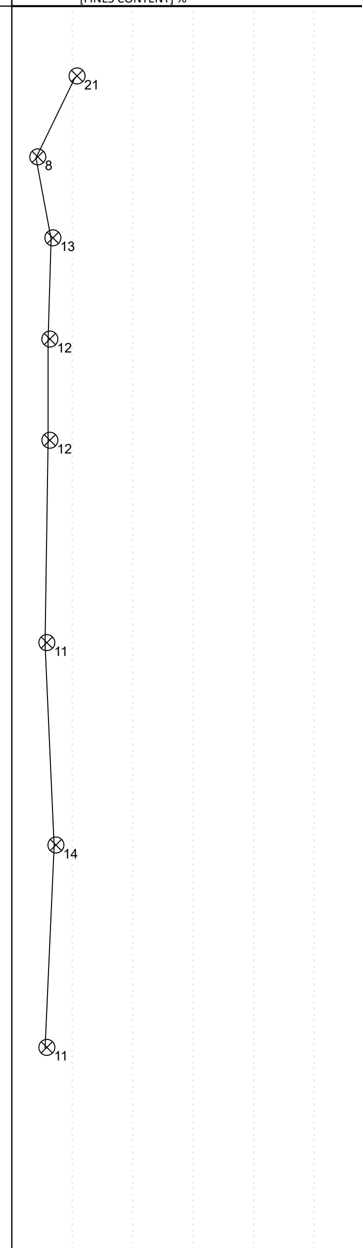
RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(ML) SILT, brown, moist, very stiff			3-10-11 (21)
	S-2	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, firm			4-4-4 (8)
5	S-3	SS	18	18	(CL) LEAN CLAY, brown, moist, stiff		-5	5-6-7 (13)
	S-4	SS	18	18				5-5-7 (12)
10	S-5	SS	18	18			-10	5-6-6 (12)
15	S-6	SS	18	18			-15	6-5-6 (11)
20	S-7	SS	18	18			-20	6-6-8 (14)
25	S-8	SS	18	18			-25	3-4-7 (11)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-13**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
REDI Arkansas Manufacturing Center	**Anderson Engineering Consultants, Inc**

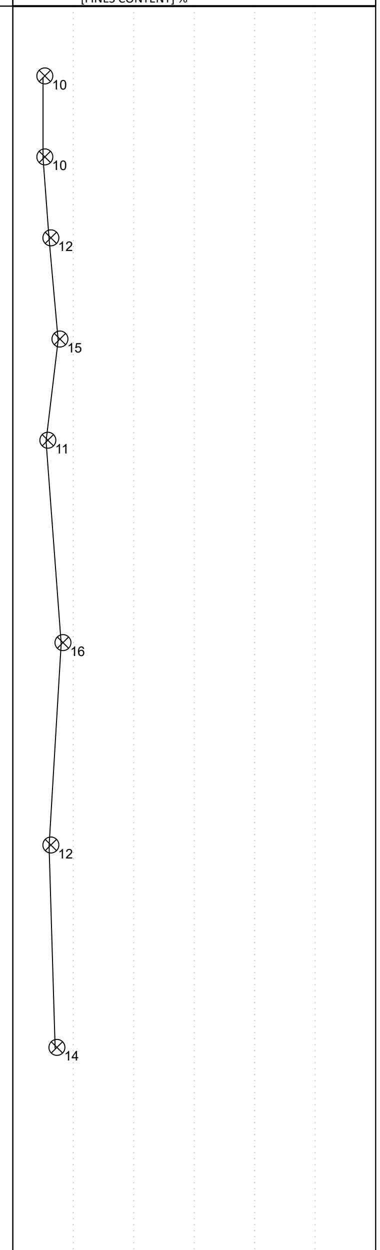
SITE LOCATION:
US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

LOSS OF CIRCULATION 100%
BOTTOM OF CASING

Plastic Limit X, Water Content ●, Liquid Limit △
⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
○ CALIBRATED PENETROMETER TON/SF
[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(ML) SILT, brown, stiff			4-5-5 (10)
	S-2	SS	18	18	(CL) LEAN CLAY, brown, moist, stiff to very stiff			3-3-7 (10)
5	S-3	SS	18	18			-5	4-6-6 (12)
	S-4	SS	18	18				4-5-10 (15)
10	S-5	SS	18	18			-10	4-5-6 (11)
15	S-6	SS	18	18			-15	6-7-9 (16)
20	S-7	SS	18	18			-20	4-5-7 (12)
25	S-8	SS	18	18			-25	7-7-7 (14)
					END OF DRILLING AT 26.5 FT			
30							-30	



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

WL (First Encountered) **Dry**	BORING STARTED: **Feb 10 2021**		CAVE IN DEPTH:
WL (Completion)	BORING COMPLETED: **Mar 03 2021**		HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
AR-TX REDI	**62:1116**	**B-14**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
REDI Arkansas Manufacturing Center	**Anderson Engineering Consultants, Inc**

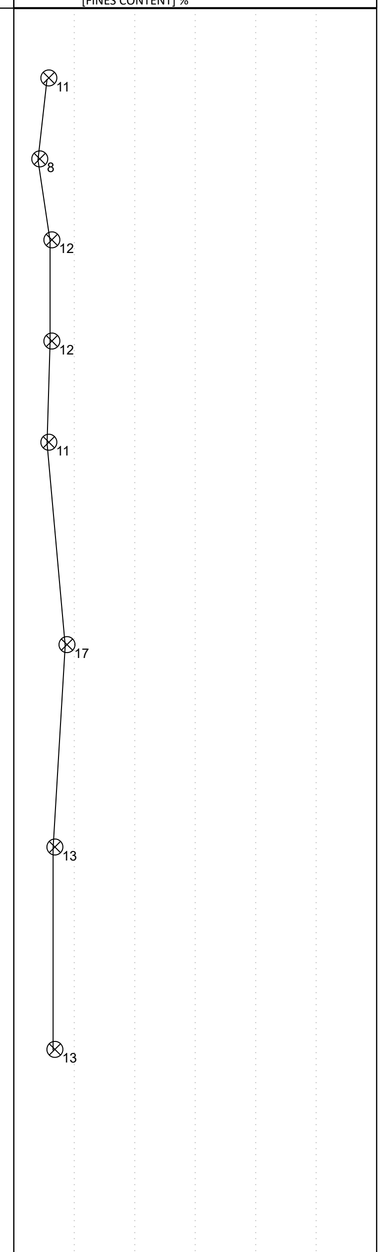
SITE LOCATION:
US Highway 67 at Miller County Road 64, Texarkana, Arkansas 71854

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:

LOSS OF CIRCULATION 100%
BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Thickness[2.00"]			
	S-1	SS	18	18	(CL/ML) SILTY CLAY, brown, moist, firm			4-4-7 (11)
	S-2	SS	18	18				4-3-5 (8)
5	S-3	SS	18	18	(CL) LEAN CLAY, brown, moist, stiff		-5	3-4-8 (12)
	S-4	SS	18	18				5-5-7 (12)
10	S-5	SS	18	18			-10	3-4-7 (11)
15	S-6	SS	18	18			-15	7-9-8 (17)
20	S-7	SS	18	18			-20	5-6-7 (13)
25	S-8	SS	18	18			-25	5-6-7 (13)
					END OF DRILLING AT 26.5 FT			
30							-30	

Plastic Limit X — Water Content ● — Liquid Limit △
⊗ STANDARD PENETRATION BLOWS/FT
ROCK QUALITY DESIGNATION & RECOVERY
RQD
REC
○ CALIBRATED PENETROMETER TON/SF
[FINES CONTENT] %



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

▽ WL (First Encountered) **Dry**	BORING STARTED:	**Feb 10 2021**	CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED:	**Mar 03 2021**	HAMMER TYPE: **Manual**
WL (Seasonal High Water)	EQUIPMENT: **ATV**	LOGGED BY: **BA1**	DRILLING METHOD: **3.25" HSA**
WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary
Plasticity Chart(s)

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^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-1	S-1	1-1	21										
B-1	S-2	3-3	22.7										
B-1	S-3	5-5	24.7					97.6					
B-1	S-4	7.5-7.5	21.1										
B-1	S-5	10-10	27.2										
B-1	S-6	15-15	28.5										
B-1	S-7	20-20	22.8		45	16	29						
B-1	S-8	25-25	21.4										
B-11	S-1	1-2.5	25.7										
B-11	S-2	3-4.5	30.8										

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

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: REDI Arkansas Manufacturing Center

Client: AR-TX REDI

Project No.: 62:1116

Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Memphis	4145 Willow Lake Blvd. Memphis, TN 38118	(901)250-4087 (901)457-0016

Tested by	Checked by	Approved by	Date Received

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^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-11	S-3	5-6.5	22.3										
B-11	S-4	7.5-9	30.6		23	NP							
B-11	S-5	10-11.5	28.8										
B-11	S-6	15-16.5	32.3										
B-11	S-7	20-21.5	33.5										
B-11	S-8	25-26.5	33.4										
B-3	S-1	1-2.5	20.9										
B-3	S-2	3-4.5	28.2										
B-3	S-3	5-6.5	26.3										
B-3	S-4	7.5-9	23.8										

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

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: REDI Arkansas Manufacturing Center
Client: AR-TX REDI
Project No.: 62:1116
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Memphis	4145 Willow Lake Blvd. Memphis, TN 38118	(901)250-4087 (901)457-0016

Tested by	Checked by	Approved by	Date Received

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^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-3	S-5	10-11.5	32.1										
B-3	S-6	15-16.5	32.9										
B-3	S-7	20-21.5	29.6										
B-3	S-8	25-26.5	25.3										
B-5	S-1	1-2.5	25		20	NP							
B-5	S-2	3-4.5	24.8					95.2					
B-5	S-3	5-6.5	26.7										
B-5	S-4	7.5-9	23.9										
B-5	S-5	10-11.5	37					93.6					
B-5	S-6	15-16.5	29										

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

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: REDI Arkansas Manufacturing Center
Client: AR-TX REDI
Project No.: 62:1116
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Memphis	4145 Willow Lake Blvd. Memphis, TN 38118	(901)250-4087 (901)457-0016

Tested by	Checked by	Approved by	Date Received

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^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-5	S-7	20-21.5	24.3										
B-5	S-8	25-26.5	26.8										
B-7	S-1	1-2.5	23.4										
B-7	S-2	3-4.5	27.2										
B-7	S-3	5-6.5	29.9										
B-7	S-4	7.5-9	25.2										
B-7	S-5	10-11.5	28.8										
B-7	S-6	15-16.5	30.8										
B-7	S-7	20-21.5	30.3										
B-7	S-8	25-26.5	23.8										

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

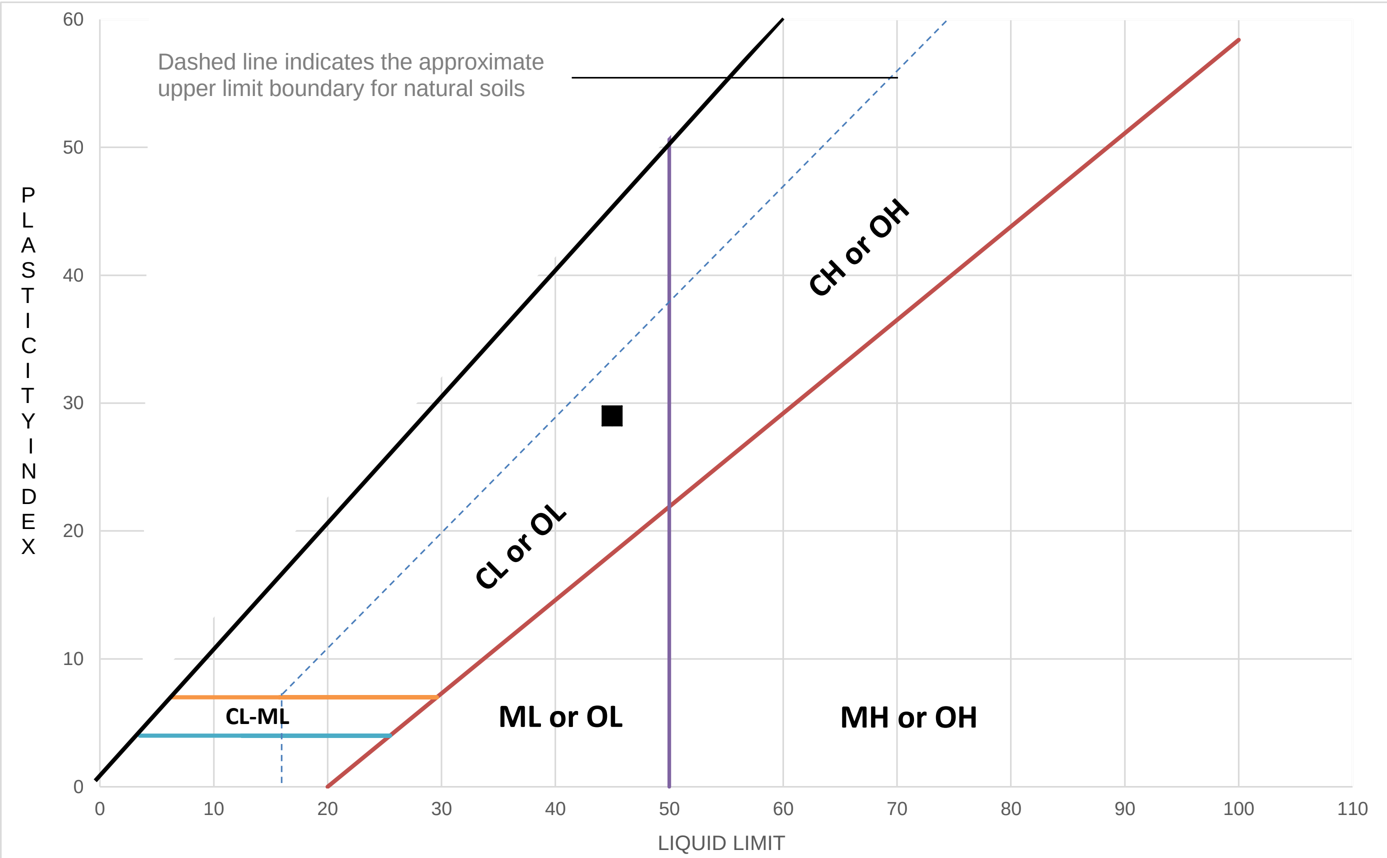
Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: REDI Arkansas Manufacturing Center
Client: AR-TX REDI
Project No.: 62:1116
Date Reported:

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Memphis	4145 Willow Lake Blvd. Memphis, TN 38118	(901)250-4087 (901)457-0016

Tested by	Checked by	Approved by	Date Received

LIQUID AND PLASTIC LIMITS TEST REPORT



TEST RESULTS (ASTM D4318-10 (MULTIPOINT TEST))

	Sample Location	Sample Number	Sample Depth (ft)	LL	PL	PI	%<#40	%<#200	AASHTO	USCS	Material Description
■	B-1	S-7	20-20	45	16	29					
◆	B-7	S-4	7.5-10	23	NP						
▲	B-5	S-1	1-2.5	20	NP						

Project: REDI Arkansas Manufacturing Center
Client: AR-TX REDI

Project No.: 62:1116
Date Reported:

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Standard Test Method for Material Finer Than # 200 Sieve (ASTM D1140, C117)

Location ID	Sample No.	Sample Top Depth (ft)	Tare No.	Tare Weight (g)	Tare Wt.+ Wet Wt (g)	Tare Wt. + Dry Wt (g)	Tare Wt. + Dry Wt. after Wash (g)	% Passing #200
B-5	S-2	3		11.47	235.93	192.32	20.20	**95.2**
B-1	S-3	5		14.07	221.05	180.79	18.00	**97.6**
B-5	S-5	10		11.47	251.40	187.53	22.76	**93.6**

Project:	REDI Arkansas Manufacturing Center	Project No.:	62:1116
Client:	AR-TX REDI	Date Reported:	

Office / Lab	Address	Office Number / Fax
ECS Southeast LLP - Memphis	4145 Willow Lake Blvd. Memphis, TN 38118	(901)250-4087 (901)457-0016

Tested by	Checked by	Approved by	Date Received
		BAllen	

APPENDIX D – Important Information

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.***

GBA GEOPROFESSIONAL BUSINESS ASSOCIATION

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