Geotechnical Engineering Report

Preliminary Site Evaluation

Veterans Boulevard, Queensway Street, and East Booth Road
Searcy, Arkansas
GTS Project No. 23-55033

October 18, 2023

Prepared For:

Davidson Engineering
210 West Arch Avenue, Suite D
Searcy, Arkansas, 72143

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October 18, 2023

Davidson Engineering
210 West Arch Avenue, Suite D
Searcy, Arkansas, 72143

Attention: Mr. Bear Davidson, P.E.

RE: Preliminary Geotechnical Site Evaluation Report
Queensway Industrial Site
Veterans Boulevard, Queensway Street, and East Booth Road
Searcy, Arkansas
GTS Project No. 23-55033

Mr. Davidson:

This report provides the results of the preliminary subsurface exploration and geotechnical site evaluation performed for potential site development. The project site is an approximately 108-acre property comprised of existing recreational facilities located between Veterans Boulevard and Queensway Street approximately 600 feet north of East Booth Road in Searcy, Arkansas. The approximate project site boundary is shown in Figure 1 within this report.

We appreciate the opportunity to be of assistance to you on this project. We encourage retaining GTS, Inc. to provide supplemental geotechnical services when development plans are more developed and to be involved in any design and pre-construction meetings to allow us to discuss the findings and preliminary recommendations presented herein.

Please contact us if further explanation or clarification is required for portions of the report.

Sincerely,

GTS, Inc.
Geotechnical & Testing Services

Certificate of Authorization No. 1251, expires 12/31/2023

Echo J. Cox, E.I.
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Shaun P. Baker, P.E.
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STATE OF ARKANSAS
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LICENSED PROFESSIONAL ENGINEER
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TABLE OF CONTENTS

LIST of TABLES

LIST OF APPENDICES

PROJECT DESCRIPTION and INFORMATION

Introduction

Our geotechnical engineering services were performed in accordance with GTS Proposal No. GTS5235058, dated July 28, 2023, and authorized by Mr. Bear Davidson, P.E. with Davidson Engineering on August 24, 2023. The intent of the authorized scope of services was to explore the subsurface soil conditions at the project site and to prepare preliminary geotechnical engineering recommendations and considerations for future foundations, floor slabs, pavements, and mass grading.

Our scope of services included evaluating the subsurface conditions at 10 boring locations, identified as Borings B-1 through B-7 and FB-1 through FB-3. The borings were drilled to depths of about 14 to 15 feet below existing grades in potential development areas.

We recommend that supplemental soil borings should be performed by GTS to further evaluate subsurface conditions once development plans have been finalized. More specifically, supplemental borings should be planned within the footprint(s) of planned buildings and other structures.

The Scope of Work provided in this report pertains to the preliminary evaluation of the Queensway Industrial Site for future development. Our currently authorized scope of geotechnical engineering services will be concluded with the issuance of this Geotechnical Engineering Report.

Project Site

The project site is an approximately 108-acre property located between Veterans Boulevard (formerly known as Higginson Street) and Queensway Street approximately 600 feet north of East Booth Road in Searcy, Arkansas. The site is currently occupied by recreational facilities including baseball/softball fields, parks, an outdoor concert venue, and several parking areas. In addition to the features and structures mentioned, the site is covered by grass, pavement, and bare ground. The general boundary of the project site is shown in yellow in Figure 1 on the following page.

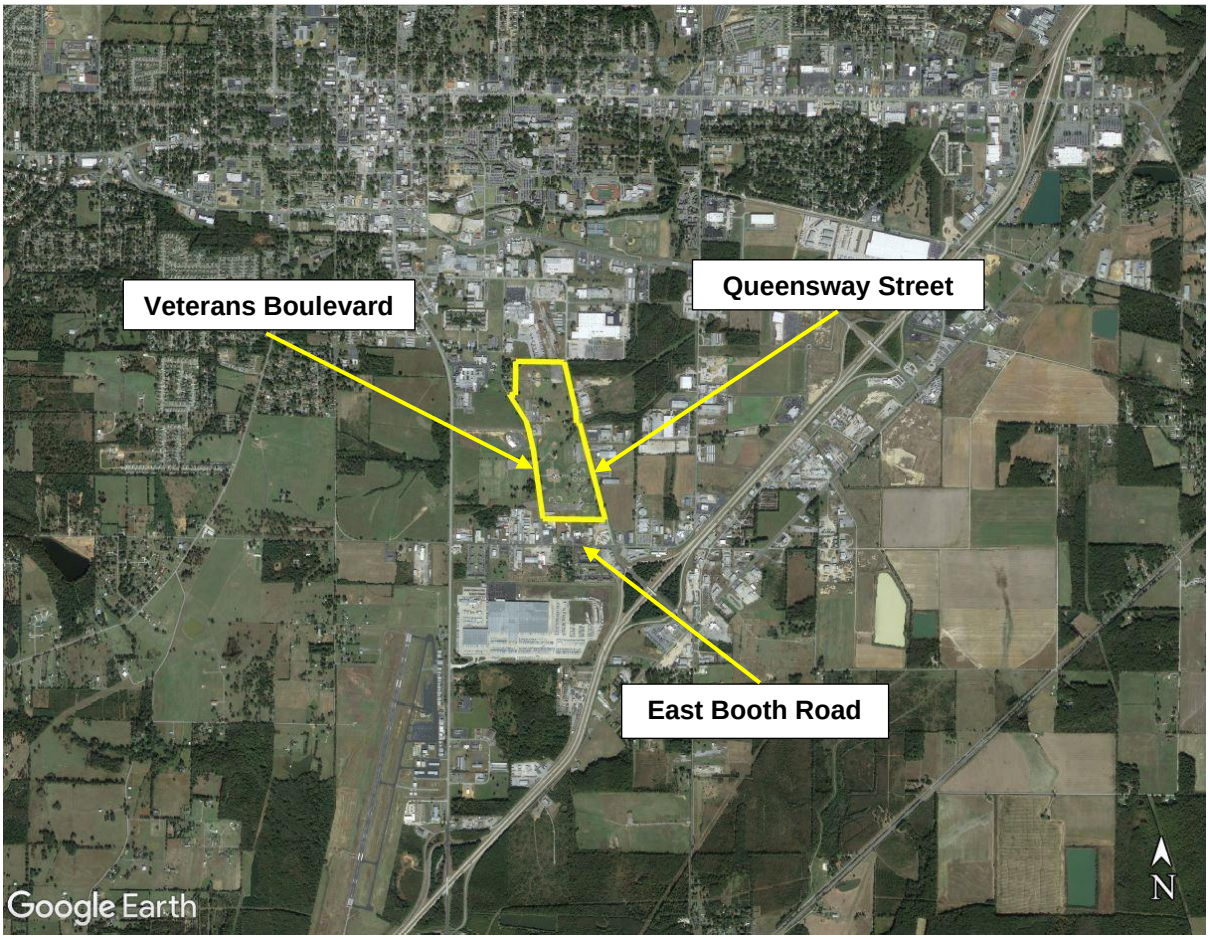

Figure 1 - General Boundary of the Project Site

Planned Development

At this time, site development plans have not been prepared. We understand that future re-development will likely consist of constructing industrial and commercial building structures supported on conventional footing foundations with slab-on-grade floors as well as associated paved drives and parking areas.

Planned Site Grading

This report uses the terms “existing grade” and “finished subgrade”. Existing grade is used in this report to describe the site elevations at the time of our field drilling and sampling. Finished subgrade is used in this report to describe the Civil Engineer-designed top-of-soil elevations at the site upon completion of grading.

A preliminary grading plan was not available to GTS during this phase of development planning. Based on information in the Preliminary Engineering Report provided to us by Davidson

Engineering, we understand the central portion of the site is designated as a floodplain zone with a drainage channel known as Iorio Creek running directionally northeast to southwest. To prepare the recommendations in this report, we assumed cut depths of less than 2 feet and fill depths of up to 5 feet could be necessary to develop final grades above floodwater levels across the entire site. If our assumption of site grading plans is incorrect or if a preliminary site grading plan is available, please contact us to allow the recommendations in this report to be reviewed and, if necessary, revised.

SUMMARY of SUBSURFACE FINDINGS

Site Geology

Based on the available geologic maps, the project site is located in the geologic units mapped as the Pennsylvanian Middle Atoka Formation and the Quaternary Terrace Deposits (Qt). The following descriptions of the units were obtained from the Stratigraphic Summary of Arkansas (Arkansas Geological Commission IC-36, 2004).

> *The Atoka Formation is a sequence of marine, mostly tan to gray silty sandstones and grayish black shales. Some rare calcareous beds and siliceous shales are known. In the Arkansas River Valley and the frontal Ouachita Mountains, the Atoka Formation has been subdivided into upper, middle, and lower lithic members based on regionally mappable shale and sandstone intervals. The unit may reach up to 25,000 feet thick in the Ouachita Mountains although only large incomplete sections are known.*
>
> *The Quaternary Terrace Deposits include a complex sequence of unconsolidated gravels, sandy gravels, sands, silty sands, silts, clayey silts, and clays. The individual deposits are often lenticular and discontinuous. At least three terrace levels are recognized with the lowest being the youngest. Fossils are rare. The lower contact is unconformable. The thickness is variable.*

Surface

At the time of the field exploration, grass overlain by approximately 4 to 7 inches of root mat was encountered at Borings B-1, B-3, B-4, and FB-1 through FB-3. Approximately 3 to 4 inches of asphalt pavement was encountered at Borings B-2, B-5, and B-6. The site was generally level.

Subsurface Conditions

Existing Fill

Existing fill materials were encountered to depths of about 1 foot and 3 ½ feet beneath the ground surface at Borings B-6 and B-5, respectively. The composition generally consisted of lean clay soils and contained varying amounts of sandstone pieces, shale pieces, and gravel.

The existing fill materials had moderate shear strength. Standard Penetration Test (SPT) N-values from 7 to 27 blows per foot (bpf) were recorded within the existing fill.

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Stratum I – Native, Silt, Silty Lean Clay, and Lean Clay Soils

Native, medium stiff, silt soils were encountered beneath the ground surface and extended to a depth of about 5 feet at Boring B-1. Native, soft to very stiff, silty lean clay soils were encountered beneath the existing fill materials and ground surface and extended to depths of about 2 feet at Borings B-2, B-3, B-4, and B-6, and to a depth of about 3 ½ feet at Boring FB-2. Native, very soft to hard, lean clay soils were encountered beneath the existing fill materials, silty lean clays, silts, and the ground surface, and extended to depths of about 2 to 15 feet at all boring locations. The Stratum I soils extended to the boring termination depths of about 15 feet below existing grade at Borings B-5, FB-2, and FB-3.

The Stratum I soils had low to moderate, predominantly moderate, shear strength at the time of the field exploration. SPT N-values ranged from 1 to 32 bpf within the Stratum II soils. Hand penetrometer tests performed on selected portions of relatively intact clays measured from 2.5 to over 4.5 tons per square foot (tsf).

Stratum II – Native, Shaley Lean Clay and Highly Weathered Shale

Native, hard, shaley lean clay soils were encountered beneath the Stratum I soils to depths of about 5 to 15 feet at Borings B-1, B-3, B-4, B-6, and B-7. Native, soft, highly weathered shales were encountered beneath the Stratum I soils to depths of about 13 ½ to 15 feet at Borings B-2, B-4, B-7, and FB-1. The Stratum II materials extended to the boring termination depths of about 14 ½ to 15 feet below existing grade at Borings B-1, B-3, B-4, B-6, and FB-1. Stratum II materials were not encountered at Borings B-5, FB-2, or FB-3.

A layer of soft, sandy shale was encountered between the shaley lean clay soils and highly weathered shale from a depth of about 5 to 8 ½ feet at Boring B-7.

The Stratum II materials had moderate to high, predominantly high, shear strength at the time of the field exploration. SPT N-values ranged from 58 bpf to 50 blows for 3 inches of penetration within this stratum.

Stratum III – Shale and Sandstone Bedrock

Moderately hard, shale was encountered beneath the Stratum II materials at a depth of about 13 ½ feet extending to the boring termination depth of about 14 feet below existing grade at Boring B-2. Hard, sandstone was encountered beneath the Stratum II materials at a depth of about 13 ½ feet extending to the boring termination depth of about 15 feet below existing grade at Boring B-7.

Stratum III shale and sandstone were encountered at Borings B-2 and B-7, only.

The Stratum III bedrock had high shear strength at the time of the field exploration. SPT N-values ranging from 50 blows for 2 to 5 inches of penetration were recorded within this stratum.

Auger Refusal/Hard Drilling Conditions

Difficult drilling conditions were encountered at depths of about 13 ½ feet below existing grade at Borings B-1, B-3, and B-6, at a depth of about 8 ½ feet below existing grade at Borings B-2, and at a depth of about 2 feet below existing grade at Boring B-7. Difficult drilling conditions and auger refusal materials were not encountered within the terminal depths of 15 feet below existing grade at Borings B-5 and FB-1 through FB-3.

Water Measurements

Water observations were made by the drill crew while drilling and immediately after completing the borings. No free water was observed in the borings at these times. The borings were backfilled after completing the fieldwork and further water observations were not possible.

The depths to water are date-dependent measurements of groundwater levels at the time of the field exploration. Perched water could develop in the existing fill materials underlain by the less permeable native Stratum I and II clays and near the soil-rock interface. Long-term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in these soil and rock types. The installation and periodic measurement of monitoring wells would be required to establish seasonal piezometric surfaces below this project site.

GEOTECHNICAL ENGINEERING ANALYSIS

Based on the subsurface conditions encountered at the boring locations, the site appears suitable for constructing future buildings and pavements. Preliminary geotechnical considerations and recommendations are provided in the following sections.

Preliminary Geotechnical Considerations

Existing Fill

Existing fill materials extended from the ground surface to depths of about 1 foot and 3 ½ feet at Borings B-6 and B-5, respectively. The existing fill materials observed at the boring locations had moderate shear strength. GTS has no information regarding the placement and compaction history of the existing fill material throughout the project site. Due to the multiple structures and type of existing site development, we assume that the presence, composition, and strength could vary across the site. We anticipate that the existing fill will likely be localized. Based on the lack of history, the thickness, varying SPT N-values, and composition of the existing fill, GTS considers the existing fill materials to be uncontrolled at this site.

Because there can be variations in the thickness, quality, and composition of existing fill and given the potential for unsuitable materials to be buried in or under the existing fill, it should be recognized that there is assumed risk of unpredictable settlement and structural performance associated with supporting shallow foundations, on-grade slabs, and pavements over existing fill. This risk cannot be eliminated unless the full depth of the existing fill is removed and replaced with approved fill.

The preliminary recommendations presented in this report are based on removing and replacing any existing fill materials full depth with new select fill.

Low-Strength Soils

Low-strength (SPT N-values of 5 bpf or less), native, silty lean clay and lean clay (Stratum I) soils were encountered at varying depths and extended to depths of about 3 ½ to 5 feet below existing grades at Borings B-1, B-2, B-6, and FB-2.

The depths of the low-strength soils encountered at the boring locations are shown in Table 1, on the following page. The borings where no low-strength soils were encountered are omitted from the table.

Table 1: Depths of Low-Strength Soils at Boring Locations

Boring Number	Depths of Low-Strength Soils (feet below existing grades)	SPT N-Values (blows per foot)
B-1	2 to 5	3 and 4
B-2	0 to 3 ½	4
B-6	2 to 5	2 and 5
FB-2	3 ½ to 5	1

These low-strength soils are not suitable for supporting new fill, footing foundations, slabs-on-grade, and pavements in their current condition. We anticipate localized cuts will be necessary to remove and replace any low-strength soils full depth with new select fill where encountered at or near finished subgrade elevations. More detailed recommendations regarding the low-strength soils are provided in the Preliminary Mass Grading Recommendations section of this report.

For preliminary budgeting consideration, undercut depths of about 2 to 5 feet below existing grades could likely be required to remove the low-strength soils based on the subsurface conditions encountered at the boring locations.

Moisture-Sensitive Soils

The on-site fill materials and native soils consisting of silt, silty lean clay, and lean clay are moisture-sensitive and prone to further strength loss with increases in moisture content and when exposed to repetitive construction traffic. We anticipate that subgrade improvement will likely be required, particularly if moderate to wet conditions develop during construction.

Difficult Excavation Potential

As previously described, difficult drilling conditions were encountered at depths of about 13 ½ feet below existing grade at Borings B-1, B-3, and B-6, at a depth of about 8 ½ feet below existing grade at Borings B-2, and at a depth of about 2 feet below existing grades at Boring B-7. Auger refusal was not encountered at any of the boring locations. We expect that the existing fill materials and native Stratum I and II soils can be excavated with conventional earthwork equipment. We anticipate that rock excavation means will likely be necessary for excavations below 2 feet in the vicinity of Boring B-7.

Preliminary Nature of the Project

At the time of preparing this report, specific information regarding site development, the type and location of buildings, and location of pavements was not available to us. Therefore, we recommend performing supplemental field exploration and laboratory testing once site

development plans are finalized. More specifically, supplemental borings should be planned within the footprint(s) of planned buildings and other structures. More comprehensive geotechnical engineering recommendations should be provided specifically for designing and constructing the planned structures.

Preliminary Foundation Considerations

Based on the subsurface conditions encountered at the boring locations and preparing the subgrade in the future building areas as recommended in the Preliminary Mass Grading Recommendations section of this report, we anticipate that the footing foundations will bear in tested and approved, native clay soils, existing fill, or new select fill.

For the purposes of preliminary design, typical one- to two-story buildings could be supported on footing foundations bearing on tested and approved, native, stiff to very stiff, lean clay soils or new select fill after preparing the subgrade as recommended in this report. Shallow foundations bearing on tested and approved, new select fill and/or native lean clay soils could be designed using a maximum net allowable bearing pressure of 2,500 pounds per square foot (psf) for spread/column footings and 2,000 psf for continuous/strip footings.

If higher structural loads are expected, drilled pier foundations bearing in soft to hard, shale and sandstone could be used to support the buildings/equipment. For preliminary design considerations, drilled pier foundations could be designed using an allowable end bearing pressure of 15,000 to 20,000 psf. Again, additional exploration and analysis should be performed to develop the recommendations for designing and constructing drilled pier foundations.

Preliminary IBC Site Classification

Based on the subsurface conditions encountered at the boring locations, the subsurface conditions at this project are consistent with a Site Class C per the International Building Code (IBC), 2021 Edition.

Preliminary Floor Slab and Pavement Support Considerations

Based on preparing the subgrade as recommended in this report, we expect that new floor slabs and pavements associated with future development could be supported on tested and approved, native lean clay soils and new select fill.

For preliminary design purposes, floor slabs and rigid (Portland cement) concrete pavements could be designed using a modulus of subgrade reaction of 100 pci when supported on tested and approved, native lean clay soils and/or new select fill. New asphalt pavements could be designed using a California Bearing Ratio (CBR) of 3 for tested and approved, native lean clay soils and/or new select fill.

PRELIMINARY MASS GRADING RECOMMENDATIONS

Stripping of Surface Materials

Mass grading should extend a minimum of 5 feet outside of the building footprint in all directions and a minimum lateral distance of 2 feet behind back of curb.

At a minimum, surface organics, rootmat, and any topsoil should be removed from the areas of planned new construction. The topsoil material may be stockpiled and reused for landscaping, at the discretion of the design team. Stripping depths of about 6 inches are anticipated to remove the grass and root zone.

Existing floor slabs, foundations, or other structures associated with existing and pre-existing structures should be removed full depth. Curbs, pavements, and culverts should also be removed. Excavations to remove these structures should be backfilled as recommended in this report. The pavement and concrete may be crushed, stockpiled, and reused as fill material in non-structural areas, at the discretion of the design team.

It is our experience that properties with previously existing structures have a higher potential for encountering unknown conditions during mass grading and construction. These conditions include backfilled basements, trash pits, concrete foundations, and underground utilities associated with the previous structures. We recommend that test pits be performed in the footprints of the pre-existing buildings prior to or during construction to evaluate for the presence of any remaining structures.

Buried utility lines should be relocated or abandoned, as necessary. Excavations after removing buried utilities should be backfilled with new select fill as recommended in this report. Abandoned utility lines should be grouted and plugged.

Preliminary Mass Grading Considerations

The on-site native silt, silty lean clay, and lean clay soils as well as the existing lean clay fill materials are moisture-sensitive and prone to further strength loss when wet and/or subjected to repetitive construction traffic. We expect that unstable soil conditions will likely exist after the initial site stripping/grubbing during moderately wet to wet conditions.

Furthermore, the silt and silty lean clay soils (portions of Stratum I) are susceptible to freeze-thaw. Where the silty soils are exposed in the building and pavement subgrade, these soils should be removed and replaced with new select fill to a depth of at least 1 foot below planned finished subgrade elevations. For preliminary planning, we recommend budgeting for a minimum undercut depth of 1 foot where planned grades will remain near or below existing grades.

After stripping, undercutting any surficial low-strength soils, existing fill materials, and silty soils, and before placing new fill, the exposed soils should be evaluated for stability through proofrolling with a loaded, tandem-axle dump truck weighing at least 25 tons. Where unstable soils are identified by proofrolling or testing, they should be scarified, moisture conditioned, and compacted. Alternately, the unstable soils could be removed and replaced with new select fill if they cannot effectively be stabilized in-place.

Preliminary Ground Improvement Considerations

Soil stability is directly related to the moisture within and below the exposed soils. If the on-site soils are moist to wet or have undergone freeze-thaw cycles after mass grading and/or placement and compaction, we anticipate that the subgrade soils will likely be unstable.

It may be feasible to scarify, dry, and recompact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Even with adequate time and weather, stable subgrade may not be achievable if the thickness of the unstable soils is greater than 1 to 1 ½ feet. For preliminary budgeting consideration, we recommend using an average undercut depth of 3 ½ feet below existing grades for removing low-strength soils during wet periods of the year.

Other ground improvement methods, such as the use of geotextiles/geogrids, could be provided during construction based on the actual site conditions at that time. Bridging lifts could be considered in pavement areas and non-structural areas; however, bridging lifts should not be used within future building footprints. The appropriate method of improvement, if required, would depend on factors such as schedule, weather, the size of area to be improved, and the nature of the instability. Performing site grading operations during warm, dry periods would help reduce the amount of subgrade stabilization required.

Fill Placement

Lifts of fill material required to reach plan finished subgrade elevation should be composed of tested and approved fill material and placed per the specifications shown in this report. Fill should be placed in near-horizontal lifts beginning in areas requiring the deepest amount of fill. The fill should be benched into the native soils each lift. Fill should not be placed on frozen, saturated, desiccated, or unstable soils.

The requirements to meet for select fill material, aggregate base course material, and flowable fill material are provided in the Preliminary Geotechnical Report Requirements and Specifications section of this report.

Re-Use of On-Site Soils as Fill

The on-site existing lean clay fill materials and native, Stratum I lean clay soils appear to be suitable for re-use as select fill. The silt and silty lean clay portion of the Stratum I soils are not suitable for re-use as select fill, but they could be used as fill in non-structural areas.

If the Stratum II shaley lean clay and highly weathered shale materials are excavated, we expect that these materials will likely be suitable for re-use as select fill.

Unless specifically separated, we anticipate that the on-site existing fill, native silt, silty lean clay, and lean clay soils (all of Stratum I) will likely be intermixed during mass grading. We anticipate that the intermixed soils will likely meet the requirements for select fill. Larger, bulk samples of the on-site soils proposed for use as fill by the contractor should be sampled by GTS during mass grading and laboratory tested to evaluate their suitability prior to reuse. Test pits and/or supplemental borings could be performed prior to construction to collect bulk samples of the on-site soils for further evaluation and planning once the building and pavement areas are known.

Imported fill should also be tested and approved prior to use as select fill on this site. Imported fill containing rock will need to be screened or crushed into pieces no greater than 3 inches in any dimension prior to reuse.

PRELIMINARY GEOTECHNICAL REPORT REQUIREMENTS and SPECIFICATIONS

Unless otherwise stated in this report, the preliminary recommendations contained in this report are based on the compaction specifications and material types noted in Table 1, Table 2, and the paragraphs on the following page.

Table 2: Compaction Criteria

Type of Material	Moisture-Density Specification	Minimum Dry Density (percentage of Proctor)	Range from Optimum Moisture Content (%)
Soil Fill Material – Building Footprint and Pavement Areas	ASTM D698 (Standard Proctor)	98	-2 to +2
Soil Fill Material – Outside of Building Footprint and Pavement Areas	ASTM D698 (Standard Proctor)	95	-2 to +2
Scarified and Recompacted Native Soils – Building Footprint and Pavement Areas	ASTM D698 (Standard Proctor)	98	-2 to +2
ARDOT Class 7 Aggregate Base Course	ASTM D1557 (Modified Proctor)	95	Adequate to Achieve Compaction
Flowable Fill Material	ARDOT Section 206	Not applicable	

Table 3: Soil Fill Material Requirements

Type of Soil Fill	Location/Use	Maximum LL	Maximum PI	USCS Classifications
Select	All Areas	45	20	CL, SC, SP, SP-SC, SW, GC, GP, GM, GP-GC, GW

Fill material should have a maximum nominal aggregate size of 3 inches or less after placement and compaction. If there are questions regarding the effectiveness of compaction equipment breaking down the fill material, a test pad should be constructed using the fill material and observed by GTS during compaction.

Fill proposed for use as pavement subgrade should have a laboratory CBR value of at least 3.

Fill needed for site grading should be placed in loose lifts not exceeding 9 inches in thickness (compacted lift thickness of approximately 6 to 7 inches). We recommend the fill be tested for density every lift during site grading, with a minimum of one test every 2,500 square feet of building area and every 10,000 square feet of pavement area.

The recommended moisture content and compaction of the fill should be maintained until fills are completed and aggregate base material for floor slabs and pavements are constructed.

SUBSURFACE EXPLORATION and PROCEDURES

The subsurface exploration consisted of evaluating and sampling at 10 boring locations, designated B-1 through B-7 and FB-1 through FB-3. The borings were drilled to terminal depths of approximately 14 to 15 feet below existing grades.

The boring locations were established in the field by GTS using a recreation-grade hand-held GPS unit. The approximate boring locations are shown on the Boring Location Diagrams provided in Appendix A. The locations of the borings should be considered accurate only to the degree implied by the methods used to define them. The results of the borings are provided in Appendix A.

The borings were drilled with a truck-mounted Geoprobe 3100GT drill rig. Disturbed samples and estimates of the in-situ shear strengths of the soil and rock were obtained using an automatic-hammer-driven split-barrel sampler in general accordance with the Standard Penetration Test (SPT) at the boring locations.

An automatic SPT-hammer was used to advance the split-barrel sampler in some of the boreholes for this project. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the SPT-N value. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The soil and rock samples obtained in the field were sealed to reduce moisture loss and taken to the GTS soil laboratory for further examination, testing, and classification. The results of laboratory tests on select samples are shown on the boring logs in Appendix A and summarized in Appendix B.

Field logs were prepared during the drilling and sampling of the borings. These logs report sampling methods, sampling intervals, soil, rock, and groundwater conditions, and notes regarding soil, rock, and drilling conditions observed between sample depths. The final boring logs, included in this report, have been prepared based on the field logs and have been modified, where appropriate, based on the results of the laboratory observation.

LABORATORY TESTING and PROCEDURES

The soil samples were examined in the laboratory by an experienced geotechnical engineer and classified based on the soil's texture and plasticity, in accordance with the Unified Soil Classification System. The estimated Unified Soil Classification System group symbols are shown on the boring logs.

Hand penetrometer tests were performed on select portions of the intact cohesive soil samples. Unfactored hand penetrometer test values are shown on the boring logs as filled squares.

The laboratory testing was performed by GTS in general accordance with the American Society for Testing and Materials (ASTM) test designations shown in the table below:

Table 4: Laboratory Test Method Designations

Laboratory Test	Test Designation	Method (if applicable)
Moisture Content of Soil	ASTM D2216-10	Method A
Visual Classification of Soil Types	ASTM D2488	
USCS Classification	ASTM D2487	
Atterberg Limits	ASTM D4318	Method A

The results of the classification tests are presented on the boring logs and summarized in Appendix B.

GEOTECHNICAL REPORT LIMITATIONS

The preliminary recommendations contained in this report are based on our interpretation of subsurface conditions encountered at the discrete boring locations. Variations between the subsurface conditions anticipated in this report and actual project site conditions may occur away from the boring locations.

The recommendations provided in this report are intended to be preliminary in nature and should be verified through performing and evaluating additional borings at the project site once site planning has been finalized.

If significant differences between the findings of the borings and site conditions are observed, GTS should be contacted to assess the variation and, if necessary, reevaluate the preliminary recommendations contained in this report.

ENVIRONMENTAL EXCLUSION

A Geotechnical Engineering Report assesses the engineering properties of soil and rock. No environmental assessment of a project site is performed during a geotechnical exploration. If the Owner is concerned about the potential for environmental hazards at the project site, additional studies should be performed by GTS.

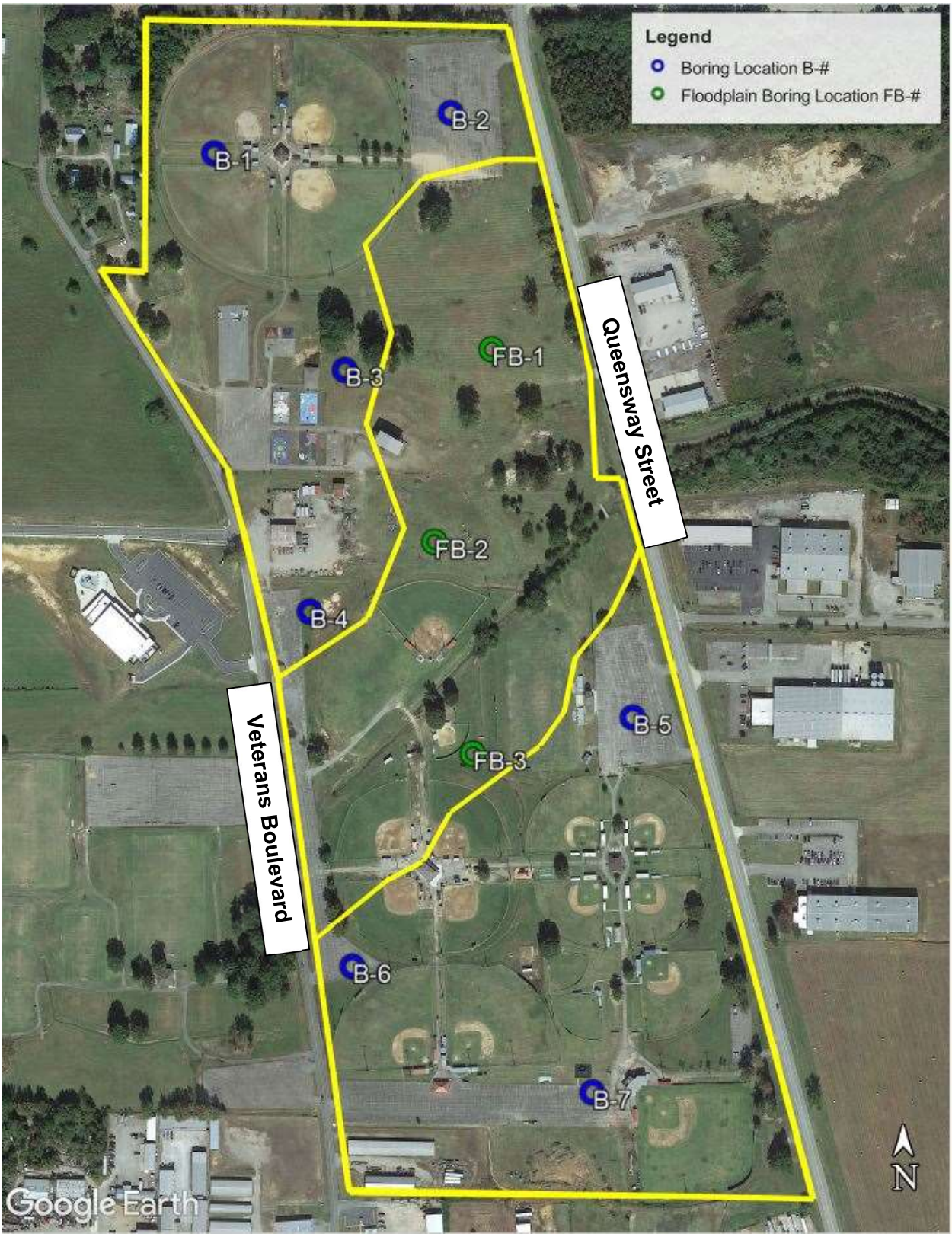
APPENDIX A

Boring Location Diagrams

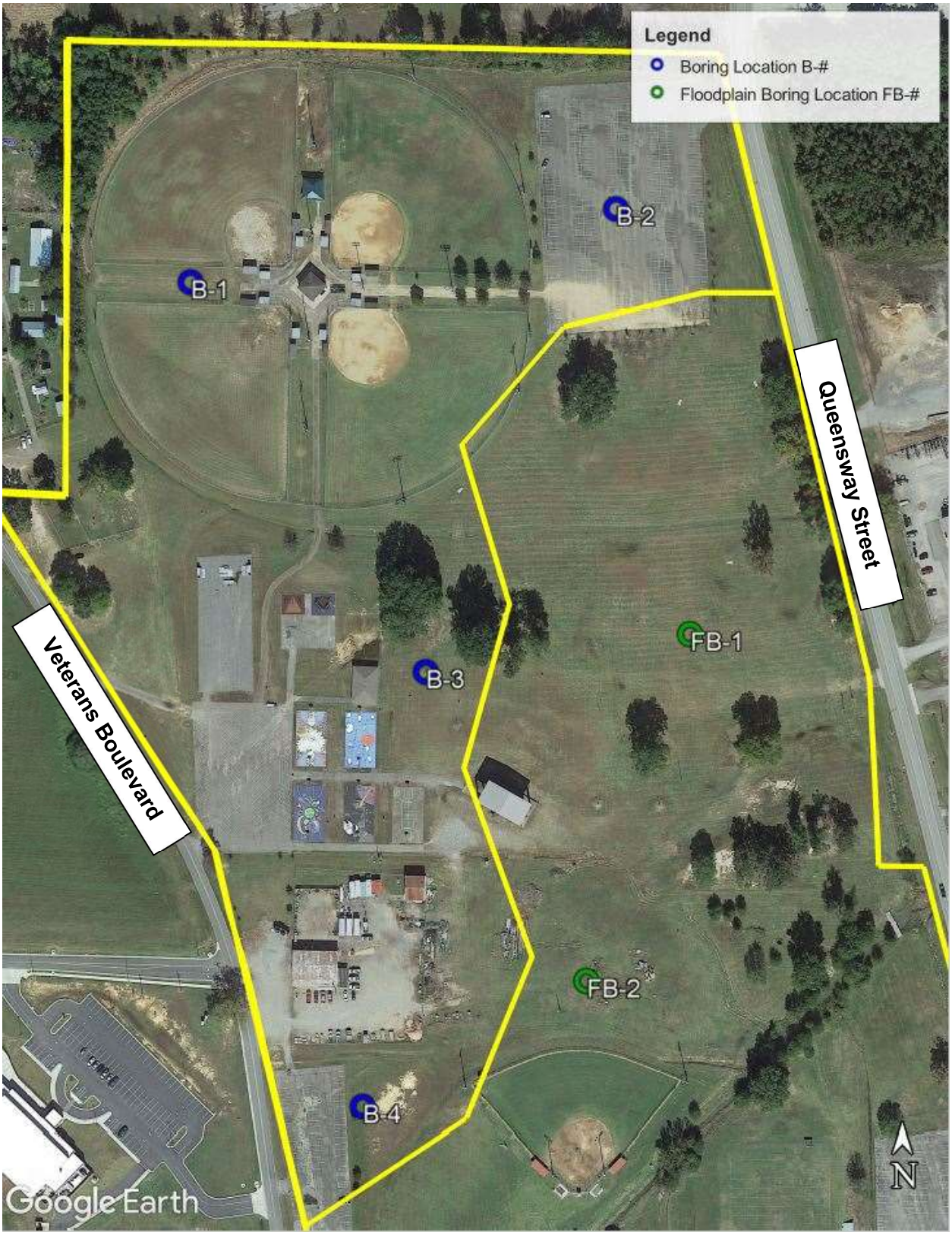
Boring Logs

Soil Classification Legend

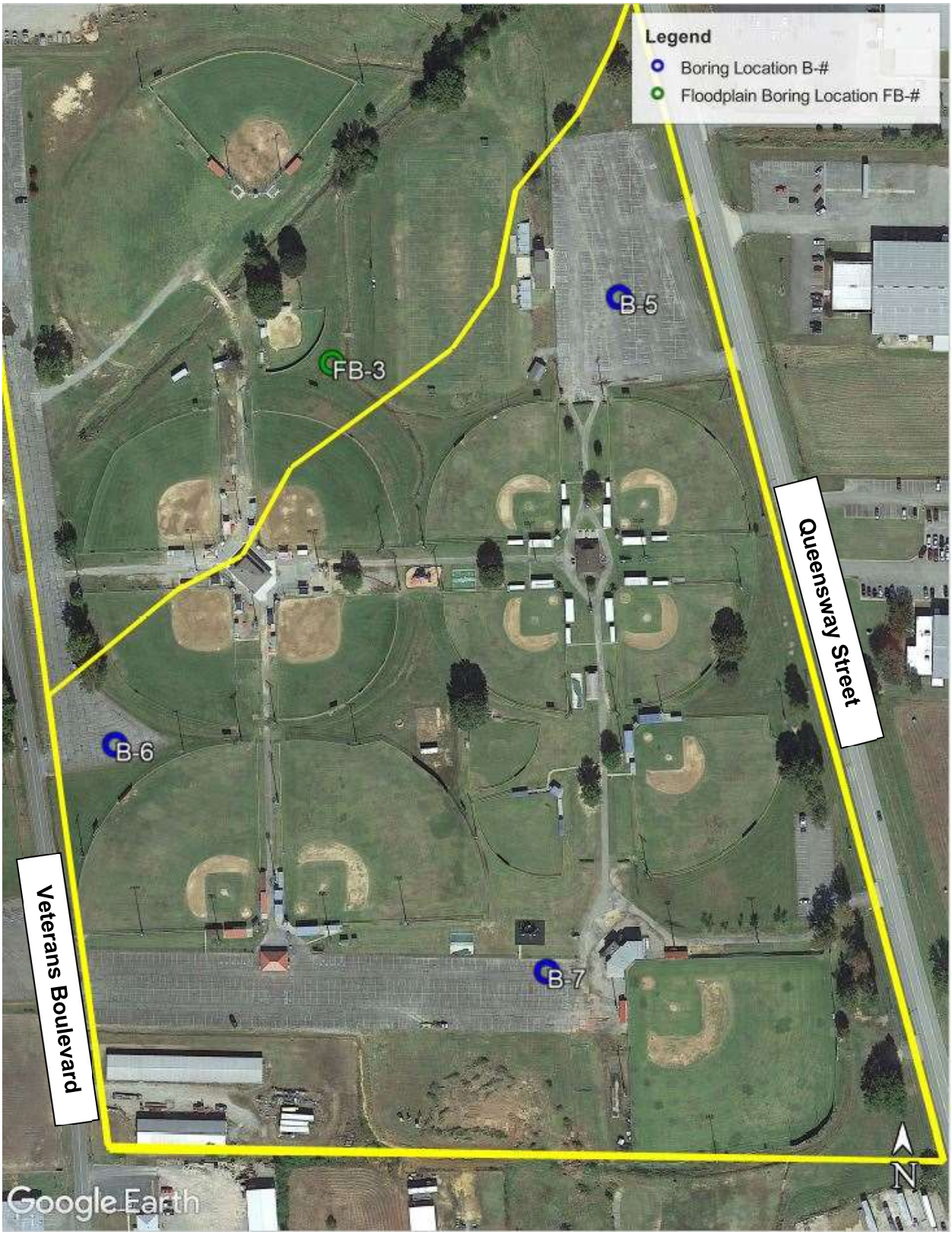
Rock Classification Legend



Boring Location Diagram of Overall Site



Boring Location Diagram of Northern Half Portion of Site



Boring Location Diagram of Southern Half Portion of Site

LOG OF BORING NO.B-1

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4 0.8 1.2 1.6) / WATER CONTENT, % ● (PL — LL, 20 40 60 80)	BLOWS PER FT
0					Surface Description=Grass Rootmat: 4 inches				
			1	12	SILT, with clay, trace rootlets medium stiff to soft, grayish brown and orange-brown, trace dark brown iron staining	ML		4.5+	6
2.5			2	15				2.5	4
			3	17					3
5			4	18	LEAN CLAY, with sand stiff to very stiff, orange-brown, reddish brown, and gray	CL		2.5	8
7.5									
			5	18				4.0	12
10									
12.5									
			6	18	SHALEY LEAN CLAY hard, brown, orange-brown, reddish brown, and gray, with dark brown iron staining	CL		4.0	24/6", 50/5"
15					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 9/19/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-2

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
0					Surface Description=Asphalt: 3 inches				
					SILTY LEAN CLAY soft, brown and gray				
			1	15		CL-ML		■ 3.5	4
2.5			2	16	LEAN CLAY soft, light brown, orange-brown, and light gray	CL			4
			3	18	LEAN CLAY, trace sandstone and shale fragments very stiff, orange-brown, light gray, and light brown			■ 4.5+	12
5			4	18		CL		■ 4.5+	18
7.5									
			5	11	HIGHLY WEATHERED SHALE soft, dark brown and light gray				20/6", 50/5"
10						ROCK			
12.5									
			6	5	SHALE moderately hard, brown and dark gray	ROCK			50/5"
15					BOTTOM OF BORING AT ABOUT 14 FEET				
17.5									

COMPLETION DEPTH: 14 ft.
DATE: 9/19/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-3

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
0					Surface Description=Grass Rootmat: 5 inches				
			1	9	SILTY LEAN CLAY very stiff, brown, dry	CL-ML		●	17
2.5			2	15	LEAN CLAY very stiff, light brown, light gray, and orange-brown	CL		● ■ 3.5	13
			3	18	LEAN CLAY stiff to very stiff, orange-brown, gray, light brown, and light gray, with dark brown iron staining and nodules			● ■ 3.5	10
5			4	18		CL		●	14
7.5									
			5	18	LEAN CLAY, trace sand stiff, light brown and light gray, trace dark brown iron staining			● ■ 3.0	11
10						CL			
12.5									
			6	16	SHALEY LEAN CLAY hard, light gray, brown, orange-brown, and dark brown	CL		● ■ 4.0	31/6", 50/4"
15					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 9/19/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-4

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4 0.8 1.2 1.6) / WATER CONTENT, % ● (PL — LL, 20 40 60 80)	BLOWS PER FT
0					Surface Description=Grass Rootmat: 6 inches				
			1	12	SILTY LEAN CLAY, with rootlets very stiff, brown, dry	CL-ML		●	13
2.5			2	18	LEAN CLAY very stiff, orange-brown, gray, light gray, and light brown, trace dark brown iron staining	CL		■ 4.5+	15
			3	12				■ 4.5+	17
5			4	18				■ 4.5+	29
7.5									
			5	18	SHALEY LEAN CLAY hard, brown	CL		■ 4.5+	77
10									
12.5									
			6	17	HIGHLY WEATHERED SHALE soft, brown, light gray, and grayish brown	ROCK		●	33/6", 50/5"
15					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 9/19/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-5

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4 0.8 1.2 1.6) / WATER CONTENT, % ● (PL — LL; 20 40 60 80)	BLOWS PER FT
0					Surface Description=Asphalt: 3 inches				
			1	9	FILL: Lean Clay, with broken shale and sandstone pieces brown, gray, and reddish brown	FILL			27
2.5			2	12					18
			3	18	LEAN CLAY stiff, brown, light gray, orange-brown, and gray			4.0	10
5			4	18		CL			11
7.5									
			5	18	LEAN CLAY medium stiff, brown, orange-brown, and light gray			2.5	7
10									
12.5						CL			
			6	18	- becomes wet at about 13 ½ feet				6
15					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 9/19/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-6

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
					Surface Description=Asphalt: 4 inches				
0					FILL: Lean Clay, with gravel brown and orange-brown	FILL			
			1	18	SILTY LEAN CLAY medium stiff, gray, original topsoil	CL-ML		■ 3.5	7
2.5			2	GS	LEAN CLAY medium stiff to soft, grayish brown and gray	CL			5
			3	GS					2
5			4	12	LEAN CLAY, with silt medium stiff, brown, orange-brown, and light gray	CL		■	7
7.5									
			5	14	SHALEY LEAN CLAY hard, orange-brown, brown, and light gray	CL		■ 3.5	58
10									
12.5									
			6	10					33/6", 50/4"
15					BOTTOM OF BORING AT ABOUt 14 ½ FEET				
17.5									

COMPLETION DEPTH: 14.5 ft.
DATE: 9/18/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-7

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4 0.8 1.2 1.6) / WATER CONTENT, % ● (PL — LL, 20 40 60 80)	BLOWS PER FT
0					LEAN CLAY, with sand hard, brown, orange-brown, and light gray	CL			
			1					4.0 ■→	32
2.5			2		SHALEY LEAN CLAY, with sand and shale fragments hard, brown, orange-brown, and light gray, trace dark brown iron staining	CL		4.5+ ■→	37/6", 50/5"
			3					4.5+ ■→	48/6", 50/3"
5			4		SANDY SHALE, with sandstone seams soft, brown and grayish brown	ROCK			50/3"
7.5									
			5		HIGHLY WEATHERED SHALE, with sandstone seams soft, brown, orange-brown, gray, and dark brown	ROCK			48/6", 50/3"
10									
12.5									
			6		SANDSTONE hard, gray	ROCK			50/2"
15					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 9/18/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.FB-1

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4 0.8 1.2 1.6) / WATER CONTENT, % ● (PL 20 40 60 80 LL)	BLOWS PER FT
0					Surface Description=Grass Rootmat: 5 inches				
					LEAN CLAY, trace shale fragments very stiff, brown and grayish brown, dry				
			1	13		CL			12
2.5			2	15	LEAN CLAY stiff, light gray and yellow-brown, dry	CL		4.5	10
			3	15	LEAN CLAY stiff to very stiff, light brown, light gray, gray, orange-brown, and yellow-brown			4.0	10
5			4	15		CL		4.5+	24
7.5									
			5	18	LEAN CLAY medium stiff, brown, gray, and grayish brown			3.5	7
10						CL			
12.5									
			6	18	HIGHLY WEATHERED SHALE soft, brown, dark brown, and light gray	ROCK			67
15					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 9/19/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.FB-2

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
0					Surface Description=Grass Rootmat: 7 inches				
			1	12	SILTY LEAN CLAY, with gravel, trace rootlets very stiff, brown and light gray, dry	CL-ML		●	20
2.5			2	12	SILTY LEAN CLAY, with gravel stiff, dark brown, brown, and dark gray, dry	CL-ML		● ⊢	8
			3	18	LEAN CLAY, with silt very soft, brown, gray, and dark gray, wet	CL		●	1
5			4	18	LEAN CLAY stiff, light brown, light gray, and orange-brown, moist	CL			10
7.5									
			5	9	LEAN CLAY stiff to medium stiff, brown, orange-brown, and light gray, with dark brown iron staining and nodules	CL		■	10
10									
12.5									
			6	18				3.0 ■→	6
15					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 9/19/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.FB-3

Queensway Preliminary Site Evaluation
Veterans Boulevard, Queensway Street, and Hastings Avenue

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-55033 Location: Refer to Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
0					Surface Description=Grass Rootmat: 5 inches				
					LEAN CLAY very stiff, light brown, trace brown	CL		4.5+	
			1	11					13
2.5			2	18	LEAN CLAY very stiff to stiff, brown, light gray, and orange-brown	CL		4.5+	21
			3	18				2.5	9
5			4	12	LEAN CLAY very stiff, light brown and brown, with dark brown iron staining and nodules	CL			15
7.5									
			5	11	LEAN CLAY, with silt very stiff to stiff, brown, orange-brown, and light gray	CL			14
10									
12.5					- becomes wet at about 13 ½ feet				
			6	18				2.5	11
15					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 9/19/2023
RIG: Geoprobe 3100GT, Truck-Mounted Rig, Automatic Hammer

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

SOIL CLASSIFICATION LEGEND

APPARENT CONSISTENCY OF COHESIVE SOILS (PECK, HANSON & THORNBURN 1974, AASHTO 1988)				
Descriptor	**SPT N_{60} (blows/foot)***	**Pocket Penetrometer, Qp (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 2	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	2 – 4	0.25 – 0.50	0.12 – 0.25	Easily penetrated several inches by thumb
Medium Stiff	5 – 7	0.50 – 1.0	0.25 – 0.50	Penetrated several inches by thumb w/moderate effort
Stiff	8 – 12	1.0 – 2.0	0.50 – 1.0	Readily indented by thumbnail
Very Stiff	12 – 30	2.0 – 4.0	1.0 – 2.0	Indented by thumb but penetrated only with great effort
Hard	> 30	> 4.0	> 2.0	Indented by thumbnail with difficulty

* Using SPT N_{60} is considered a crude approximation for cohesive soils.

APPARENT DENSITY OF COHESIONLESS SOILS (AASHTO 1988)	
Descriptor	**SPT N_{60} Value (blows/foot)**
Very Loose	0 – 3
Loose	4 – 8
Medium Dense	9 – 29
Dense	30 – 49
Very Dense	$\geq$ 50

MOISTURE (ASTM D2488-06)	
Descriptor	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch, well below optimum moisture content (per ASTM D698 or D1557)
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table, well above optimum moisture content (per ASTM D698 or D1557)

PERCENT OR PROPORTION OF SOILS (ASTM D2488-06)	
Descriptor	**Criteria**
Trace	Particles are present but estimated < 5%
Few	5 – 10%
Little	15 – 25%
Some	30 – 45%
Mostly	50 – 100%
Percentages are estimated to nearest 5% in the field. Use "about" unless percentages are based on laboratory testing.	

SOIL PARTICLE SIZE (ASTM D2488-06)	
Descriptor	**Size**
Boulder	> 12 inches
Cobble	3 to 12 inches
Gravel - Coarse Fine	¾ inch to 3 inches No. 4 sieve to ¾ inch
Sand - Coarse Medium Fine	No. 10 to No. 4 sieve (4.75mm) No. 40 to No. 10 sieve (2mm) No. 200 to No. 40 sieve (.425mm)
Silt and Clay ("fines")	Passing No. 200 sieve (0.075mm)

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2488)				
Major Division			**Group Symbol**	**Description**
Coarse Grained Soils (more than 50% retained on #200 sieve)	**Gravel** (50% or more retained on No. 4 sieve)	Clean Gravel	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with fines	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	Sand (> 50% passing No. 4 sieve)	Clean sand	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly-graded sands and gravelly sands, little or no fines
		Sand with fines	SM	Silty sands and sand-silt mixtures
			SC	Clayey sands and sand-clay mixtures
Fine Grained Soils (50% or more passing #200 sieve)	**Silt and Clay** (liquid limit < 50)		ML	Inorganic silts, rock flour and clayey silts
			CL	Inorganic clays of low-medium plasticity, gravelly, sandy & lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silt and Clay (liquid limit > 50)		MH	Inorganic silts and clayey silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

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GRAPHIC SYMBOL LEGEND		
SPT		Standard Penetration Test (2" OD), ASTM D1586
GRAB		Grab Sample
ST		Shelby Tube, ASTM D1587 (pushed)
AUGER		Boring Advanced Through Drilling
CORE		Rock coring

ROCK CLASSIFICATION LEGEND

WEATHERING DESCRIPTORS FOR INTACT ROCK (USBR, 2001)						
Descriptor	**Chemical Weathering-Discoloration-Oxidation**		**Mechanical Weathering and Grain Boundary Conditions**	**Texture and Solutioning**		**General Characteristics**
	Body of Rock	**Fracture Surfaces**		**Texture**	**Solutioning**	
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck
Slightly Weathered	Discoloration or oxidation limited to surface or short distance from fractures; some feldspar crystals are dull	Minor or complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck; body of rock not weakened
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck; body of rock is slightly weakened
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent or chemical alteration produces in-situ disaggregation	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation; rock is friable; granitics are disaggregated in semi-arid conditions	Altered by chemical disaggregation such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow; rock is significantly weakened
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregation)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand; resistant minerals such as quartz may be present as "stringers" or "dikes"

RELATIVE STRENGTH OF INTACT ROCK	
Descriptor	**Uniaxial Compressive Strength (psi)**
Extremely Hard	> 30,000
Very Hard	14,500 – 30,000
Hard	7,000 – 14,500
Moderately Hard	3,500 – 7,000
Soft	700 – 3,500
Very Soft	150 – 700
Extremely Soft	< 150

BEDDING SPACING (modified USBR, 2001)	
Descriptor	**Thickness or Spacing**
Massive	> 10 feet
Very thickly bedded	3 to 10 feet
Thickly bedded	1 to 3 feet
Moderately bedded	3-5/8 inches to 1 foot
Thinly Bedded	1-1/4 inches to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

CORE RECOVERY CALCULATION (%)

$$= \frac{\text{length of recovered core pieces}}{\text{total length of core run}} \times 100\%$$

RQD CALCULATION (%)

$$= \frac{\text{length of intact core pieces} > 4 \text{ in}}{\text{total length of core run (inches)}} \times 100\%$$

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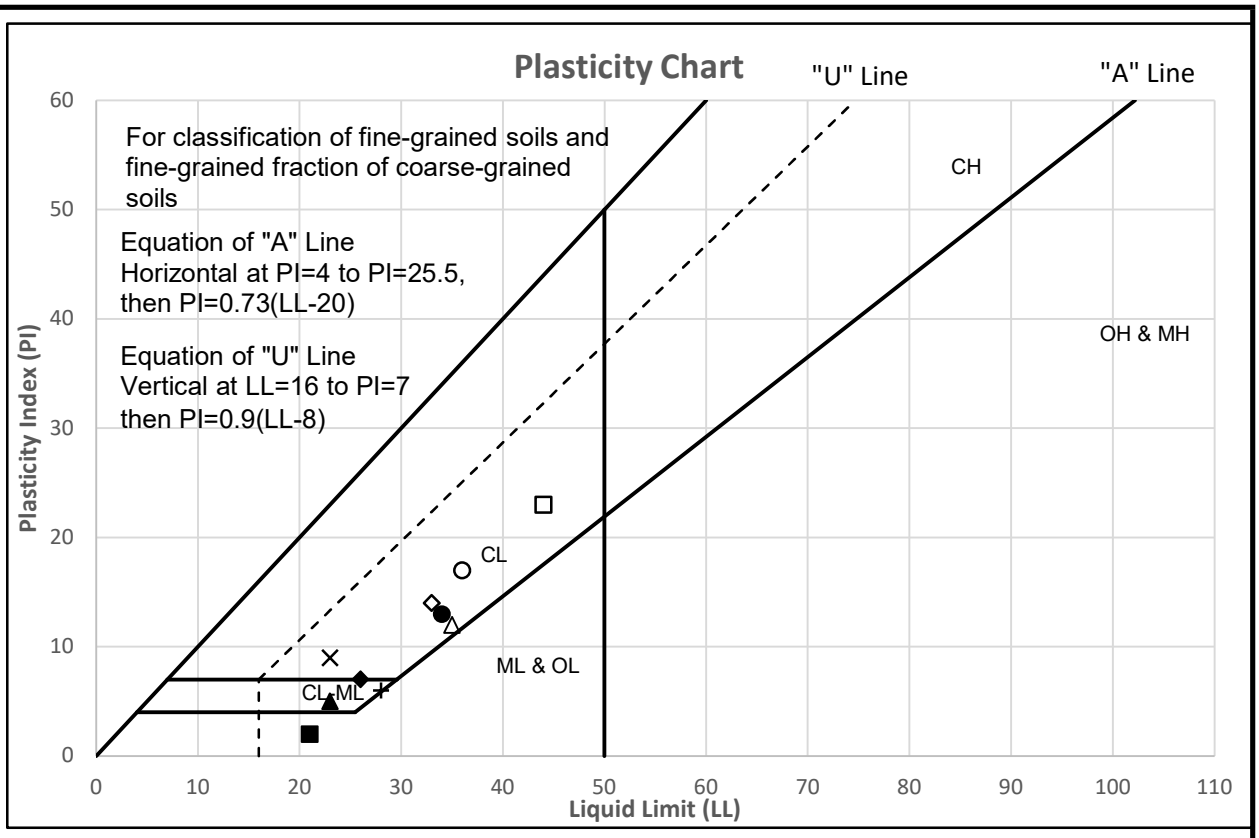
ROCK HARDNESS (modified USBR, 2001)	
Descriptor	**Criteria**
Extremely hard	Cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Can be scratched with pocket knife or sharp pick with heavy pressure, heavy hammer blows required to break specimen
Moderately hard	Can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately soft	Can be grooved 1/16 inch with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Can be grooved or gouged with pocket knife or sharp pick with light pressure; breaks with light to moderate hand pressure
Very soft	Can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

APPENDIX B

Results of Laboratory Classification Tests

Results of Classification Tests



	Boring No	Depth (ft)	LL	PL	PI	% Fines	USCS Classification
■	B-1, S-2	2-3.5	21	19	2	---	Silt, ML
□	B-1, S-4	5-6.5	44	21	23	---	Lean Clay, CL
◆	B-2, S-1	0.5-2	26	19	7	---	Silty Lean Clay, CL-ML
◇	B-2, S-3	3.5-5	33	19	14	---	Lean Clay, CL
●	B-4, S-2	2-3.5	34	21	13	---	Lean Clay, CL
○	B-5, S-4	5-6.5	36	19	17	---	Lean Clay, CL
▲	B-6, S-2	2-3.5	23	18	5	---	Silty Lean Clay, CL-ML
△	FB-1, S-3	3.5-5	35	23	12	---	Lean Clay, CL
+	FB-2, S-2	2-3.5	28	22	6	---	Silty Lean Clay, CL-ML
×	FB-3, S-3	3.5-5	23	14	9	---	Lean Clay, CL

Preliminary Geotechnical Site Evaluation
Queensway Industrial Site
Searcy, Arkansas

GTS Project No. 23-55033

GTS, Inc.
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