ARKANSAS DEPARTMENT OF TRANSPORTATION

SUBSURFACE INVESTIGATION

STATE JOB NO. 070415

FEDERAL AID PROJECT NO. NHPP-0013(18)

BAYOU DERRISEAUX STRS. & APPRS. (S)

STATE HIGHWAY 212 **SECTION** 1

IN CLEVELAND **COUNTY**

The information contained herein was obtained by the Department for design and estimating purposes only. It is being furnished with the express understanding that said information does not constitute a part of the Proposal or Contract and represents only the best knowledge of the Department as to the location, character and depth of the materials encountered. The information is only included and made available so that bidders may have access to subsurface information obtained by the Department and is not intended to be a substitute for personal investigation, interpretation and judgment of the bidder. The bidder should be cognizant of the possibility that conditions affecting the cost and/or quantities of work to be performed may differ from those indicated herein.

Revised Geotechnical Engineering Report

Job No. 070415

Bayou Derriseaux Structures and Approaches

Staves, Cleveland County, Arkansas

September 28, 2018

Terracon Project No. 35185047.R1

Prepared for:

Michael Baker International, Inc.

Little Rock, Arkansas

Prepared by:

Terracon Consultants, Inc.

Little Rock, Arkansas

September 28, 2018

Michael Baker International, Inc.
1400 West Markham, Suite 204
Little Rock, Arkansas 72201

Attn: Mr. Scott Thornsberry
P: (501) 244-1004
E: scott.thornsberry@mbakerintl.com

Re: Revised Geotechnical Engineering Report
Job No. 070415
Bayou Derriseaux Structures and Approaches
Arkansas Highway 212
Staves, Cleveland County, Arkansas
Terracon Project No. 35185047.R1

Dear Mr. Thornsberry:

We are pleased to submit this revised Geotechnical Engineering Report for the above-referenced project. This study was performed in general accordance Task Order No. 025 dated April 10, 2018. In an email dated September 13, 2018, Fred Harper with Michael Baker International, Inc. (Michael Baker) requested additional pile diameters. In addition to supplementary pile diameters, a new resistance factor was applied to the factored resistances consistent with a higher level of control that will be applied at the time of pile installation. All other recommendations provided in Terracon Geotechnical Engineering Report No. 35185047 remain applicable to the project.

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

Sincerely,
Terracon Consultants, Inc.
Certificate of Authorization #223, Expires 12/31/2019

Kimberly A. Daggitt, P.E.
Project Engineer
Arkansas No. 16398

Greg J. Klein, P.E.
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STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 16398
KIMBERLY A. DAGGITT

REPORT TOPICS

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

ATTACHMENTS

Revised Geotechnical Engineering Report

Job No. 070415

Arkansas Highway 212

Staves, Cleveland County, Arkansas

Terracon Project No. 35185047.R1

September 28, 2018

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed bridge replacements located on Arkansas Highway 212 in Staves, Cleveland County, Arkansas. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- site preparation and earthwork
- lateral earth pressures
- foundation design and construction
- floor slab design and construction
- seismic site classification per AASHTO

The geotechnical engineering scope of work for this project included the advancement of thirteen test borings to depths ranging from approximately 10 to 100 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section of this report.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel information	Two bridges have been proposed for replacement: 1. Bridge No. M3994 Latitude: 34.0456°, Longitude: -92.2338° 2. Bridge No. M3995 Latitude: 34.0462°, Longitude: -92.2311° See **Site Location Plan** attached to the end of this report
Existing improvements	Existing bridge structures
Current ground cover	Asphalt pavement along the existing road and bridge alignment. Embankment and natural ground cover along the proposed alignment areas
Geology [1, 2]	Alluvium (Channel Meander), Qcm - This unit represents more recent channel meanders and current flood plain deposits of significant streams. Channel meander scars are distinct in this unit. The partition of this unit from other Holocene alluvial deposits was based more on geomorphic consideration than lithic or age consideration. The lower contact is unconformable. The thickness is variable Jackson Group – the Jackson Group is divided into two distinct units in Arkansas: the White Bluff Formation and the Redfield Formation. The White Bluff Formation contains: sand rich in molluscan fossils, glauconitic clay with common invertebrate fossils, and a blocky clay with some silt and a trace of sand. The Redfield Formation is typically a sequence of light-gray, thinly laminated silts, silty clays, and silty sands.

1. Interactive Geologic Map of Arkansas and Geological Google Earth files published by the Arkansas Geological Survey, 2015, www.geology.ar.gov
2. "Stratigraphic Summary of Arkansas", published by the Arkansas Geological Commission, 1998, revised 2004

PROJECT DESCRIPTION

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

Item	Description
Project description	The Arkansas Department of Transportation (ArDOT) is proposing structures and approach improvements on Highway 212, Section 1 in Cleveland County. The purpose of the project is to replace two structures: Bridge Number M3994, Log Mile 2.63 and Bridge Number M3995, Log Mile 2.78.

Item	Description
Bridge Construction	The bridge replacement construction plans were not available at the time of this report. Through coordination with Michael Baker, we understand that the bridge will likely be supported on pipe pile foundations
Finished elevation	We assume the final bridge grade will match the existing bridge grade
Maximum loads	Not known at the time of this report
Grading/Slopes	We assume that final grade will be at or near existing grade, unless major roadway improvements are included with the bridge improvements.
Below-grade structures	None anticipated
Free-standing retaining walls	None anticipated
Estimated start of construction	2019

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

Based on the results of the borings, subsurface conditions at the boring locations can be generalized as follows:

Bridge No. M3994 (Borings B-1 and B-2)

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density
1	5	Fill: Lean clay	N/A
2	18.5	Lean clay, lean clay with sand, fat clay with sand	Medium stiff
3	28.5	Sandy lean clay and silty sand	Medium stiff clay and loose to medium dense sand
4	38.5	Poorly graded sand and poorly graded sand with gravel	Medium dense to very dense
5	100	Fat clay, sandy fat clay, fat clay with sand, sandy lean clay, and lean clay with sand	Very stiff to hard

Roadway and shoulder borings were also performed for Bridge Structure No. M3994. The borings generally consisted of fill soils consisting of fat clay and lean clay soils with varying amounts of sand to depths of about 2 to 5 feet below the existing ground surface. Native lean clay and lean

clay with sand soils were observed underlying the fill soils in the roadway and shoulder borings to a termination depth of about 10 feet.

Bridge No. M3995 (Borings B-3, B-4, and B-5)

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density
1	5	Fill: Poorly graded sand, lean clay with sand and sandy lean clay	N/A
2	18.5	Sandy lean clay, lean clay, clayey sand, and poorly graded sand with clay	Very soft to medium stiff clay and very loose to dense sand
3	33.5	Silty sand, clayey sand, fat clay and sandy lean clay	Loose sand and medium stiff to hard clay
4	100	Sandy lean clay, fat clay and fat clay with sand	Stiff to hard

Roadway and shoulder borings were also performed for Bridge Structure No. M3995. The borings generally consisted of fill soils containing sandy lean clay soils to depths of about 2 to 8.5 feet below the existing ground surface. Native sandy lean clay, lean clay with sand, clayey sand, and silty sand soils were observed underlying the existing fill soils to the termination depths of about 10 feet in the roadway and shoulder borings.

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed in the boreholes can be found on the boring logs in **Exploration Results**, and are summarized below.

Structure	Boring number	Approximate depth to groundwater while drilling (feet) [1]
M3994	B-1	Not observed prior to wash boring set-up
	B-2	Not observed prior to wash boring set-up
	R-1	Not observed
	R-2	8.5
	S-1	Not observed
	S-2	Not observed
M3995	B-3	Not observed prior to wash boring set-up
	B-4	7
	B-5	Not observed prior to wash boring set-up
	R-3	Not observed
	R-4	8.5
	S-3	Not observed
	S-4	8.5

1. Below the existing ground surface

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

Groundwater was not observed in Borings B-1, B-2, B-3 or B-5 prior to wash-boring set-up. This does not mean that groundwater is not present in these borings. An accurate water level cannot be determined in these borings because the wash boring procedure introduces water to the borehole.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Two bridge replacements are planned along Highway 212 near Staves, Arkansas in Cleveland County. Based on experience in the project area, the native soils encountered at both bridge sites are associated with alluvial deposits. Variable layers of lean and fat clay soils with varying amounts of sand as well as clayey and silty sand soils were observed in the borings drilled for this project. Generalized profiles of the soils observed at each bridge structure location were developed. The results of our study indicated that the site can be developed for the proposed bridge replacements. During our study the following geotechnical conditions were identified:

- Existing fill
- Low-Strength Soils
- Expansive Soils
- Moisture-Sensitive Soils

The following discussion addresses these items and provides the basis for design recommendations present in the subsequent sections. Additional construction-related concepts are provided in the various **Construction Consideration** sections of this report.

Existing Fill

Existing fill consisting of lean and fat clay soils with varying amounts of sand and poorly graded sand was observed to depths ranging from the surface to 8.5 feet below the existing surface. Many of the borings were drilled in the roadway or along the existing embankment therefore we believe the fill is associated from the previous roadway and bridge construction. Information regarding the placement of the existing fill was not available at the time of this report. There is an inherent risk that otherwise unsuitable material within or buried by the fill will not be discovered that could result in unpredictable post-construction performance of the bridge foundations or roadway supported on existing fill.

Low-Strength Soils

Low-strength (soils with SPT N-values less than or equal to 5 blows per foot) existing fill and native soils were observed in all of the borings except Boring B-5 to depths extending up to about 18.5 feet below the existing ground surface. In their present condition, the low-strength soils are not suitable for providing direct support to shallow foundations and would be expected to settle significantly under new embankment loads. The low-strength soils listed above would also provide low skin friction and lateral resistance, which were factored into the deep foundation parameters and resistances provided in the **Deep Foundations** section.

Expansive Soils

Fat clay with sand soils were observed in Boring B-2 within the zone of seasonal moisture change. Fat clay soils are expansive and have a high potential for shrinking and swelling with variations in moisture content. We understand that the bridge foundations are to be supported on driven piles.

Moisture-Sensitive Soils

The lean clay, clayey sand and silty sand existing fill and native near-surface soils are moisture-sensitive and prone to further strength loss with increased moisture content. These soils could become unstable with typical earthwork and construction traffic, especially after precipitation events; therefore, effective drainage should be completed early in the construction sequence and maintained after construction. If possible, the grading should be performed during the warmer and drier times of the year. If grading or construction is performed during the winter months, an increased risk for possible treatment of unstable subgrade will persist.

Based on the subsurface conditions observed as well as the conversations with the client, we understand that driven piles are being considered for support of the bridge replacements. The **Deep Foundations** section addresses the support of the two bridges on driven piles. The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork should be performed as required in the ArDOT Standard Specifications for Highway Construction, 2014 edition. The following recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project are considered general recommendations for earthwork on-site. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, and other geotechnical conditions during construction of the project. Terracon should be retained during the site preparation operations.

Fill Material Types

Fill materials should be free of organic matter and debris. Portions of the on-site soils or approved imported borrow materials may be used as fill material. Near-surface existing fill and native soils in borings B-1, B-2, R-1, R-2, S-2 and S-4 exhibited plasticity indices greater than 20, which is typically considered unsuitable for use as engineered fill in the upper 2 feet of pavement subgrade. Existing fill soils observed in Borings S-1, B-3, R-3, R-4 and S-3 appeared to be suitable for use as engineered fill. We expect that materials from borings will be intermixed during construction; therefore, if it is desired to use on-site material as engineered fill for this project, we recommend thorough testing prior to reuse. Materials with plasticity indices greater than 20 should not be used within the upper 2 feet of the finished pavement subgrade.

While ArDOT has no specific requirement for borrow materials, they do require that the materials must be capable of forming and maintaining stable embankment when compacted. Therefore, we recommend specifically avoiding elastic silts (MH) and organic soils (OL, OH and PT) when considering materials for use as borrow,

We suggest that on-site soils or approved imported borrow soils should meet the following material property requirements:

Sieve Size	Percent Finer by Weight (ASTM C136)
3 inch	100
No. 4	50-100
No. 200	15-50

- Plasticity Index…… 20 (max)

Fill Placement

Where fill is placed on existing slopes steeper than 5H:1V, benches should be cut into the existing slopes prior to fill placement. The benches should have a minimum vertical face height of 1 foot and a maximum vertical face height of 3 feet and should be cut wide enough to accommodate the compaction equipment. This benching will help provide a positive bond between the fill and natural soils and reduce the possibility of failure along the fill/natural soil interface. We recommend that fill slopes be filled beyond the planned final slope face and then cut back to develop an adequately compacted slope face.

Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. It is strongly recommended that a qualified person provide full-time observation and compaction testing of trench backfill within pavement areas.

Earthwork Construction Considerations

Shallow excavations, are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of foundations or pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Any water that collects over, or adjacent to, construction areas should be promptly removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or these materials should be scarified, moisture conditioned. All these processes should be observed by Terracon.

If unstable subgrade conditions are encountered, the methods described below can be considered to improve subgrade strength. Common methods include scarification, moisture conditioning and compaction, removal of unstable materials and replacement with granular fill (with or without geosynthetics), and chemical stabilization. The appropriate method of improvement, if required, depends on factors such as schedule, weather, the size of area to be stabilized, and the nature of the instability.

If the exposed subgrade becomes unstable, methods outlines below can be considered.

- **Scarification and Compaction –** It may be feasible to scarify, dry and compact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Stable subgrades likely would not be achievable if the thickness of the unstable soil is greater than about 1 foot, if the unstable soil is at or near the groundwater levels, or if construction is performed during a period of wet or cool weather when drying is difficult.

- **Crushed Stone –** The use of crushed stone or crushed gravel is the most common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 6 to 30 inches below the finished subgrade elevation. The use of high modulus geosynthetics (i.e., geotextile or geogrid) can also be considered after underground work such as utility construction is completed. Prior to placing the geotextile or geogrid, we recommend that all below-grade construction, such as utility line installation, be completed to avoid damaging the geosynthetics. Equipment should not be operated above the geosynthetics until one full lift of crushed stone fill is placed above it. The maximum particle size of granular material placed over the geosynthetics should conform to the manufacturer's recommendations and generally should not exceed 1½ inches.

Furhter evaluation of the need for subgrade stabilization should be provided by a qualified geotechnical engineer during construction as the subgrade conditions are exposed on a broad scale.

Temporary excavations will probably be required during grading operations. As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming any responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. This monitoring should include documentation of adequate removal of vegetation and topsoil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation. In the event unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

PRELIMINARY SHALLOW FOUNDATIONS

No information was provided regarding the bridge design at the time of this report. Typically bridges are designed with wingwalls or retaining wall structures located on the embankments. Based on the findings from our borings and the observed low-strength soils in a majority of the borings, it is our opinion that any planned wingwalls or retaining walls associated with the new bridge be supported on driven pile foundations. Shallow foundation support would require significant subgrade improvement to avoid bearing on the very soft soils encountered in our borings; additional structure information (such as planned grades) and consultation with our geotechnical engineer would be required to analyze and develop recommendations for shallow foundations.

LATERAL EARTH PRESSURE

For planned wingwall or retaining walls planned at the bridge locations, the following lateral earth pressures can be utilized.

Lateral Earth Pressure Design Parameters				
Earth Pressure Condition [1]	**Coefficient for Backfill Type**	**Surcharge Pressure** [2, 3, 4] **p_1 (psf)**	**Effective Fluid Pressures (psf)** [4, 5]	
			Unsaturated [6]	**Submerged** [6]
Active (Ka)	Granular - 0.31	(0.31)S	(40)H	(80)H
	Fine Grained - 0.41	(0.41)S	(50)H	(85)H
At-Rest (Ko)	Granular - 0.47	0.47)S	(55)H	(90)H
	Fine Grained - 0.58	(0.58)S	(70)H	(95)H
Passive (Kp)	Granular - 3.25	---	(390)H	(250)H
	Fine Grained - 2.46	---	(295)H	(205)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance
2. Uniform surcharge, where S is surcharge pressure.
3. Loading from heavy compaction equipment is not included in surcharge or earth pressures
4. No safety factor is included in these values.
5. Uniform, final graded backfill, compacted to at least 95 percent of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf
6. In order to achieve "Unsaturated" conditions, wall drainage must be provided. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.

Lateral Earth Pressure Design Parameters				
Earth Pressure Condition [1]	Coefficient for Backfill Type	Surcharge Pressure [2, 3, 4] p_1 (psf)	Effective Fluid Pressures (psf) [4, 5]	
			Unsaturated [6]	Submerged [6]
Active (Ka)	Granular - 0.31	(0.31)S	(40)H	(80)H
	Fine Grained - 0.41	(0.41)S	(50)H	(85)H
At-Rest (Ko)	Granular - 0.47	0.47)S	(55)H	(90)H
	Fine Grained - 0.58	(0.58)S	(70)H	(95)H
Passive (Kp)	Granular - 3.25	---	(390)H	(250)H
	Fine Grained - 2.46	---	(295)H	(205)H

7. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance
8. Uniform surcharge, where S is surcharge pressure.
9. Loading from heavy compaction equipment is not included in surcharge or earth pressures
10. No safety factor is included in these values.
11. Uniform, final graded backfill, compacted to at least 95 percent of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf
12. In order to achieve "Unsaturated" conditions, follow guidelines in **Subsurface Drainage for Below Grade Walls** below. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.

DEEP FOUNDATIONS

Driven pile foundations have been analyzed for support of the proposed bridge bents based on the geotechnical data available from the borings performed in the vicinity of the structure. Driven piles capacities for compressive loads were estimated in accordance with procedures and recommendations outlined in Article 10.5.5.2.3 of 2017 AASHTO LRFD Bridge Design Specifications 6th Edition.

Soil Strength Parameters

Driven pile parameters used to determine the nominal and factored resistances of piles are shown below. The values were developed based on our interpretation of the generalized stratigraphy of the borings near each bridge and our experience with the soils in the project area.

Bridge No. M3994 (Borings B-1 and B-2)

Driven Pipe Pile Parameters				
Approximate depth below ground surface (feet)	**Material**	**Unit Weight (pcf)**	**Undrained Shear Strength (psf)**	**Friction Angle (°)**
5	Fill: Lean clay	115	500	N/A
20	Lean clay, lean clay with sand, fat clay with sand	115	500	N/A
30	Sandy lean clay and silty sand	115	750 (B-1)	30 (B-2)
40	Poorly graded sand and poorly graded sand with gravel	115	N/A	32
100	Fat clay, sandy fat clay, fat clay with sand, sandy lean clay, and lean clay with sand	120	2,500	N/A

Bridge No. M3995 (Borings B-3, B-4, and B-5)

Stratum	Approximate Depth to Bottom of Stratum (feet)			Material Description	Unit Weight (pcf)	Undrained Shear Strength (psf)	Friction Angle (°)
	B-3	B-4	B-5				
1	5	5	5	Fill: Poorly graded sand, lean clay with sand, and sandy lean clay	115	250	--
2	18.5	13.5	18.5	Sandy lean clay and lean clay	115	300	--
3	23.5	18.5	33.5	Silty sand, poorly graded sand with silt and clayey sand	115	--	30
4	28	23.5	--	Fat clay and sandy lean clay	115	750	--
5	43.5	33.5	38.5	Fat clay and sandy lean clay	120	2500	--
6	68	85	68.5	Fat clay and sandy lean clay	120	3000	--
7	80	100	80	Fat clay and sandy lean clay	125	3500	--

Driven Pile Resistances

Based on the general profiles above, the driven piles resistances for an open ended pipe with various diameters was determined at different depths. The following tables and graphical representation of the pile capacity for each bridge replacement follows:

Bridge No. M3994 Boring B-1

Pipe Pile Depth (feet)	Nominal Resistance[1] (kips)					Factored Compression Resistance[2] (kips)				
	Pile Diameter (inches)					Pile Diameter (inches)				
	12	16	18	20	24	12	16	18	20	24
40	80	130	155	190	235	40	65	75	95	120
50	140	205	240	260	325	70	100	120	130	160
60	180	270	315	345	425	90	135	155	170	210
70	230	325	375	425	520	115	160	185	210	260
80	280	395	455	500	615	140	195	225	250	305

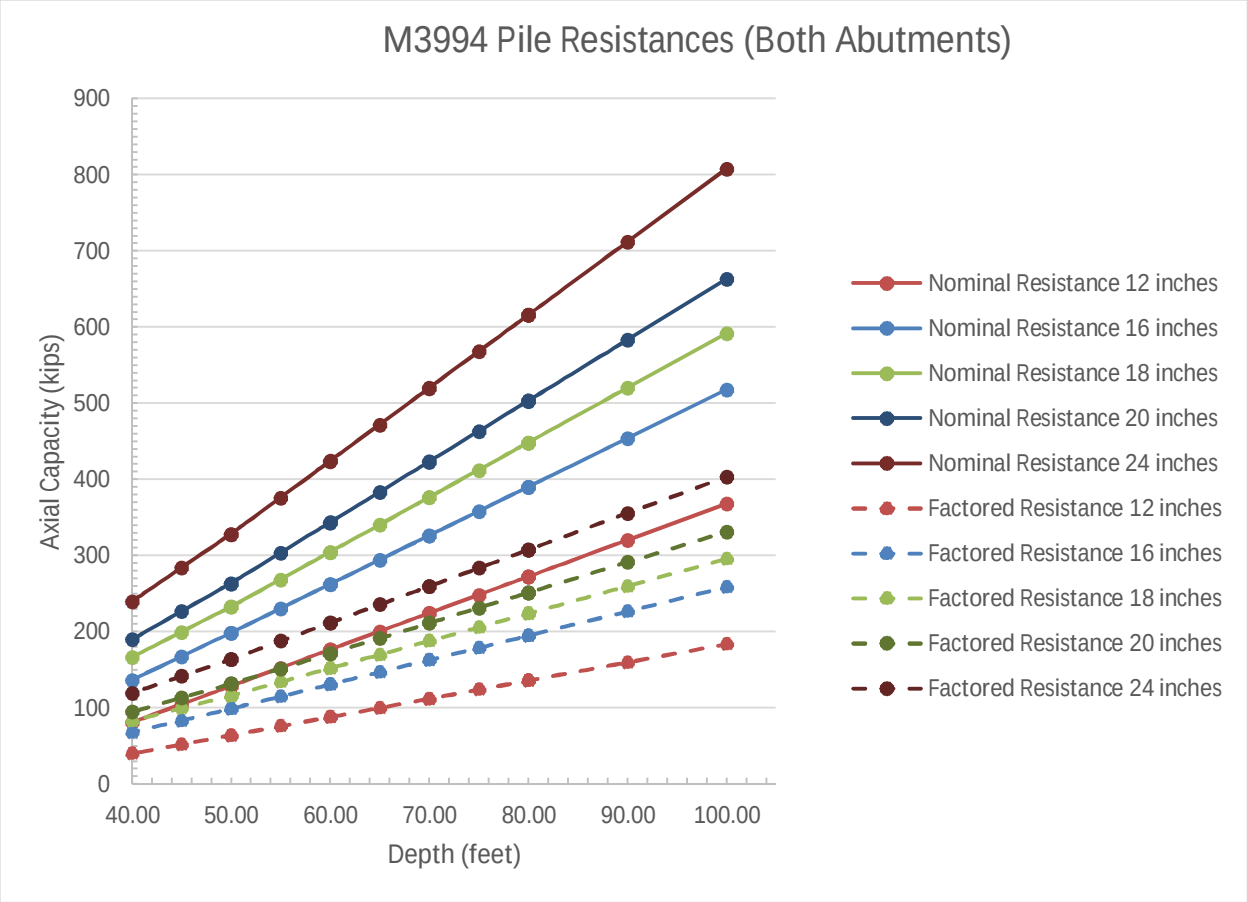
1. These nominal resistances are applicable if the center-to-center spacing of the piles is equal to or greater than 3 times the maximum pile section dimension
2. The factored resistance values are based on the nominal resistance multiplied by the structural resistance factor of 0.5 from **Resistance Factors for Geotechnical Resistance of Driven Piles, φ** [AASHTO 10.5.5.2.3-1]. The resistance factor can be increased if pile dynamic analysis or wave equation analyses is specified to be performed prior to construction.

Bridge No. M3994 Boring B-2

Pipe Pile Depth (feet)	Nominal Resistance[1] (kips)					Factored Compression Resistance[2] (kips)				
	Pile Diameter (inches)					Pile Diameter (inches)				
	12	16	18	20	24	12	16	18	20	24
40	80	135	165	190	240	40	65	80	95	120
50	130	200	230	265	325	65	100	115	130	160
60	175	260	305	345	425	85	130	150	170	210
70	225	325	375	425	520	110	160	185	210	260
80	270	390	445	500	615	135	195	220	250	305

1. These nominal resistances are applicable if the center-to-center spacing of the piles is equal to or greater than 3 times the maximum pile section dimension
2. The factored resistance values are based on the nominal resistance multiplied by the structural resistance factor of 0.5 from **Resistance Factors for Geotechnical Resistance of Driven Piles, φ** [AASHTO 10.5.5.2.3-1]. The resistance factor can be increased if pile dynamic analysis or wave equation analyses is specified to be performed prior to construction.

Because of the similarities in calculated resistances for Boring B-1 and B-2 on Structure M3994, the graphed resistances have been presented on one graph below.



Bridge No. M3995 Boring B-3

Pipe Pile Depth (feet)	Nominal Resistance[1] (kips)					Factored Compression Resistance[2] (kips)				
	Pile Diameter (inches)					Pile Diameter (inches)				
	12	16	18	20	24	12	16	18	20	24
50	155	210	235	265	335	75	105	115	130	165
60	195	260	295	335	415	95	130	145	165	205
70	240	325	365	410	510	120	160	180	205	255
80	280	375	425	480	595	140	185	210	240	295

1. These nominal resistances are applicable if the center-to-center spacing of the piles is equal to or greater than 3 times the maximum pile section dimension
2. The factored resistance values are based on the nominal resistance multiplied by the structural resistance factor of 0.5 from **Resistance Factors for Geotechnical Resistance of Driven Piles, φ** [AASHTO 10.5.5.2.3-1]. The resistance factor can be increased if pile dynamic analysis or wave equation analyses is specified to be performed prior to construction.

Bridge No. M3995 Boring B-4

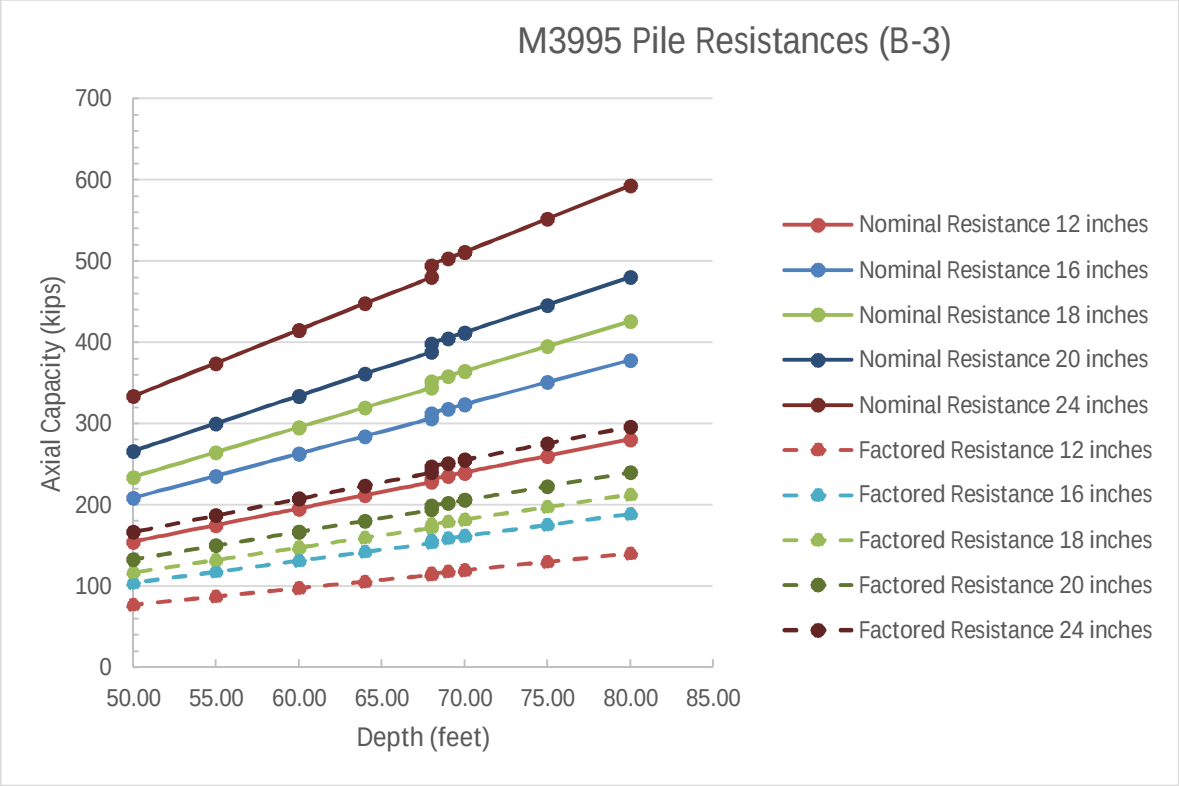
Pipe Pile Depth (feet)	Nominal Resistance[1] (kips)					Factored Compression Resistance[2] (kips)				
	Pile Diameter (inches)					Pile Diameter (inches)				
	12	16	18	20	24	12	16	18	20	24
50	160	210	235	270	335	80	105	115	135	165
60	200	265	300	335	420	100	130	150	165	210
70	240	320	360	405	500	120	160	180	200	250
80	280	375	420	475	580	140	185	210	235	290

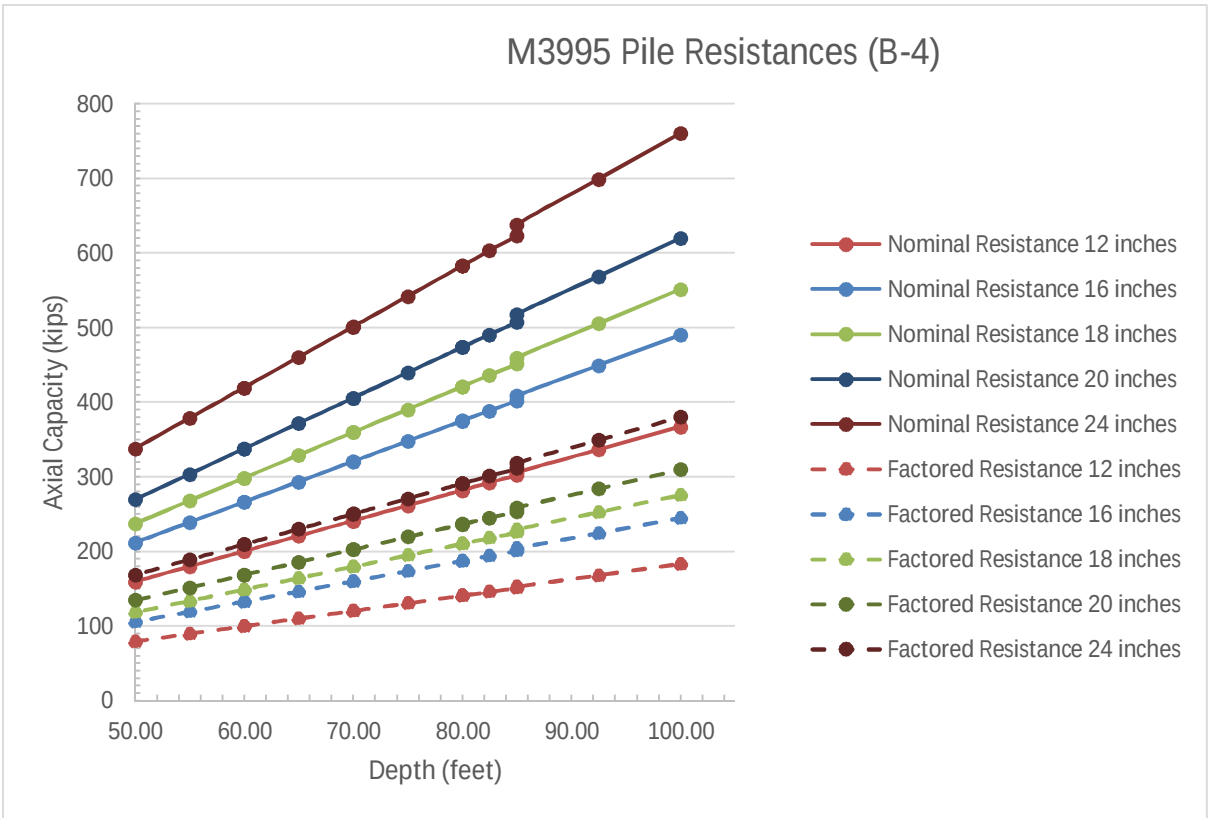
1. These nominal resistances are applicable if the center-to-center spacing of the piles is equal to or greater than 3 times the maximum pile section dimension
2. The factored resistance values are based on the nominal resistance multiplied by the structural resistance factor of 0.5 from **Resistance Factors for Geotechnical Resistance of Driven Piles, φ** [AASHTO 10.5.5.2.3-1]. The resistance factor can be increased if pile dynamic analysis or wave equation analyses is specified to be performed prior to construction.

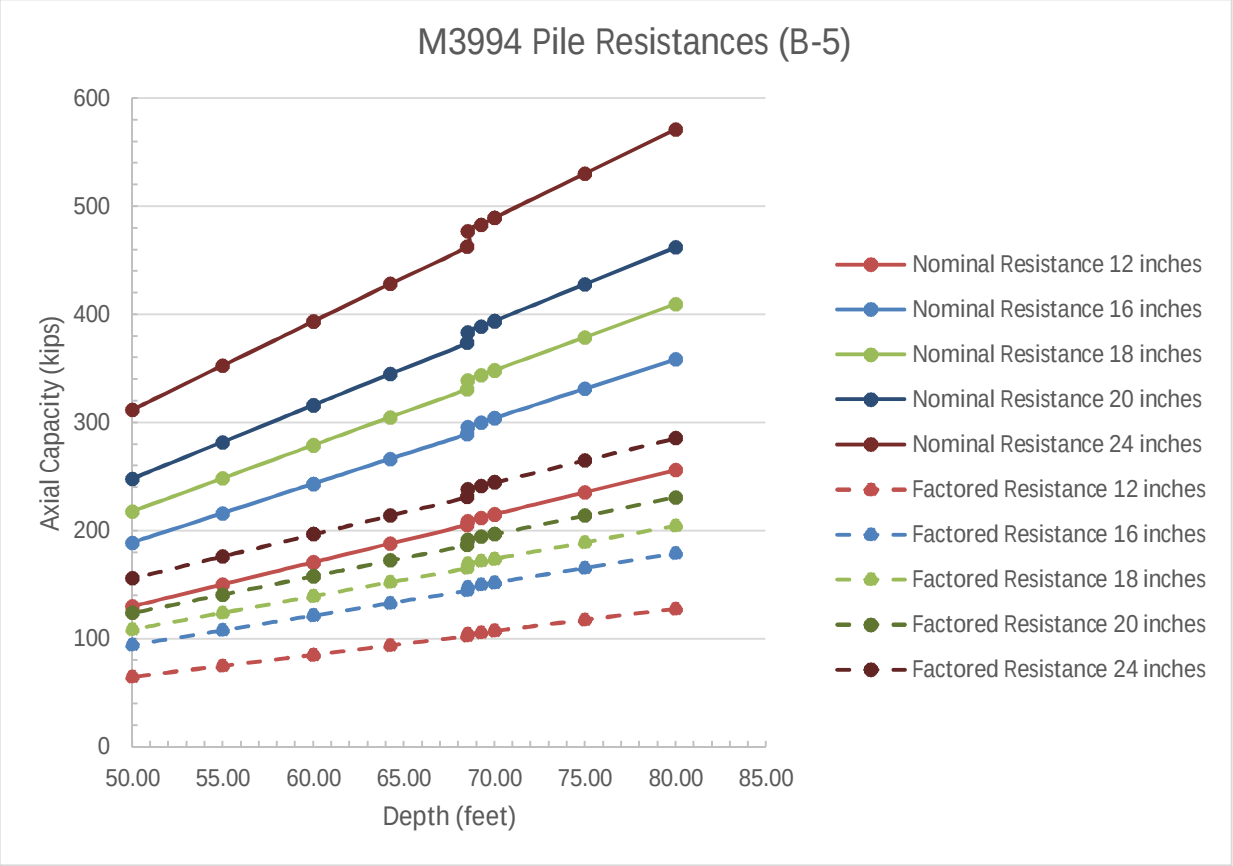
Bridge No. M3995 Boring B-5

Pipe Pile Depth (feet)	Nominal Resistance[1] (kips)					Factored Compression Resistance[2] (kips)				
	Pile Diameter (inches)					Pile Diameter (inches)				
	12	16	18	20	24	12	16	18	20	24
50	130	190	215	250	310	65	95	105	125	155
60	170	240	280	315	395	85	120	140	155	195
70	215	305	350	395	490	105	150	175	195	245
80	255	360	410	460	570	125	180	205	230	285

3. These nominal resistances are applicable if the center-to-center spacing of the piles is equal to or greater than 3 times the maximum pile section dimension
4. The factored resistance values are based on the nominal resistance multiplied by the structural resistance factor of 0.5 from **Resistance Factors for Geotechnical Resistance of Driven Piles, φ** [AASHTO 10.5.5.2.3-1]. The resistance factor can be increased if pile dynamic analysis or wave equation analyses is specified to be performed prior to construction.


M3995 Pile Resistances (B-3)
Axial Capacity (kips)
0
100
200
300
400
500
600
700
50.00
55.00
60.00
65.00
70.00
75.00
80.00
85.00
Depth (feet)
Nominal Resistance 12 inches
Nominal Resistance 16 inches
Nominal Resistance 18 inches
Nominal Resistance 20 inches
Nominal Resistance 24 inches
Factored Resistance 12 inches
Factored Resistance 16 inches
Factored Resistance 18 inches
Factored Resistance 20 inches
Factored Resistance 24 inches


M3995 Pile Resistances (B-4)
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
50.00
60.00
70.00
80.00
90.00
100.00
Depth (feet)
Nominal Resistance 12 inches
Nominal Resistance 16 inches
Nominal Resistance 18 inches
Nominal Resistance 20 inches
Nominal Resistance 24 inches
Factored Resistance 12 inches
Factored Resistance 16 inches
Factored Resistance 18 inches
Factored Resistance 20 inches
Factored Resistance 24 inches

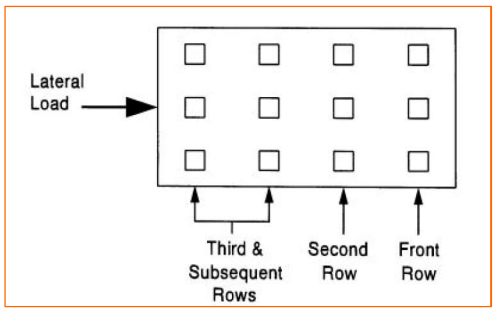


Wall thickness for pipe piles should be selected in consideration of the design nominal resistance (or conversely, the maximum nominal resistance, or structural limit state, should be established for the selected PP section). The critical event occurs during driving, and pile stresses should be maintained less than $0.9*F_y$ to reduce the potential for damage to the pile, where F_y = yield strength of the steel. This driving stress was often correlated to a maximum allowable design capacity of $0.25*F_y*A_{st}$ using ASD methods (where A_{st} = cross sectional steel area). For LRFD design methods, resistance factors for the strength limit state are provided in AASHTO Article 6.5.4.2 for pipe pile sections; use of a pile tip is not considered necessary on these sites.

Driven Pile Lateral Loading

The strength parameters listed in the Soil Strength Parameters can be used as input values for use in LPILE analyses. LPILE will estimate values of k_h and E_{50} based on the provided strength values.

When piles are used in groups, the lateral resistances of the piles in the second, third, and subsequent rows of the group should be reduced as compared to the resistance of a single, independent pile. Guidance for applying p-multiplier factors to the p values in the p-y curves for each row of pile foundations within a pile group are as follows:



- Front row: P_m = 0.8;
- Second row: P_m = 0.4
- Third and subsequent row: P_m = 0.3.

The load resistances provided herein are based on the stresses induced in the supporting soil strata. The structural capacity of the piles should be checked to assure that they can safely accommodate the combined stresses induced by axial and lateral forces. Lateral deflections of piles should be evaluated using an appropriate analysis method, and will depend upon the pile's diameter, length, configuration, stiffness and "fixed head" or "free head" condition. We can provide additional analyses and estimates of lateral deflections for specific loading conditions upon request. The load-carrying capacity of piles may be improved by increasing the diameter of pipe piles.

Driven Pile Construction Considerations

The contractor should select a driving hammer and cushion combination which can install the selected piling without overstressing the pile material. The hammer should have a rated energy in foot-pounds at least equal to 15 percent of the design compressive load capacity in pounds. The contractor should submit the pile driving plan and the pile hammer-cushion combination to the engineer for evaluation of the driving stresses in advance of pile installation. During driving a maximum of 10 blows per inch is recommended to reduce the potential of damage to the piles.

If practical refusal is experienced above the anticipated rock surface elevation, then the pile may be on a boulder or other obstruction and a replacement pile should be driven. If this occurs, the situation should be evaluated by Terracon during the pile driving operations.

Difficult driving could also be encountered in the weathered rock. Consideration should be given to using protective points and/or flange stiffening if H-piles are used. The contractor should be prepared to cut or splice piles, as necessary. Splicing of piles should be in accordance with specifications provided by the project structural engineer.

Pile driving conditions, hammer efficiency, and stress on the pile during driving could be better evaluated during installation using a Pile Driving Analyzer (PDA). A Terracon representative should observe pile driving operations. Each pile should be observed and checked for buckling, crimping and alignment in addition to recording penetration resistance, depth of embedment, and general pile driving operations.

The pile driving process should be performed under the direction of the Geotechnical Engineer. The Geotechnical Engineer should document the pile installation process including soil/rock and groundwater conditions encountered, consistency with expected conditions, and details of the installed pile.

Excavations for pile caps should be evaluated under the direction of a Geotechnical Engineer. The base of all excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design.

Description	Value
2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design	D [1]
Site Latitude [2]	34.0459 ° N
Site Longitude [2]	92.2326° W
S_{DS} Spectral Acceleration for a Short Period [3]	0.352g
S_{D1} Spectral Acceleration for a 1-Second Period [3]	0.179g

1. The 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design uses a site profile extending to a depth of 100 feet for seismic site classification. Borings at this site were extended to a maximum depth of 100 feet. . Geophysical testing may be performed to confirm the conditions below the current boring depth.
2. Site latitude and longitude are at an arbitrary location between the two bridge replacement structures. Values for the reported spectral accelerations have been calculated at this midpoint location.
3. These values were obtained using online seismic design maps and tools provided by the USGS (http://earthquake.usgs.gov/hazards/designmaps/).

GENERAL COMMENTS

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

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

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

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Our field exploration work included the drilling and sampling of exploratory soil borings consistent with the following schedule:

Number of Borings	Planned Boring Depth (feet) [1]	Planned Location
5	80 to 100	Bridge borings
8	10	Roadway and shoulder borings

1. Below existing ground surface

The locations of field exploration points (borings) were measured in the field by Terracon's exploration team using a hand-held GPS unit to measure the latitude and longitude coordinates. The accuracy of the exploration points is usually within about +/-20 feet horizontally of the noted location. It is our understanding Michael Baker also surveyed the boring locations. The Northing and Easting coordinates and ground surface elevations of the borings were provided by Michael Baker from a performed field survey.

We advanced the soil borings with a track-mounted drill rig using continuous flight augers (solid stem and/or hollow stem) and/or and rotary wash techniques, as necessary, depending on soil conditions. Five samples are obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. We obtained representative samples primarily by the split-barrel sampling procedure. In the split-barrel sampling procedure, a standard, 2-inch O.D., split-barrel sampling barrel was driven into the boring with a 140-pound SPT (Standard Penetration Test) hammer falling 30 inches. We recorded the number of blows required to advance the sampling barrel the last 12 inches of an 18-inch sampling interval as the standard penetration resistance value, N. This value is used to estimate the in-situ relative density of cohesionless soils, consistency of cohesive soils. Soil samples obtained by the SPT were placed in containers and taken to our laboratory.

An automatic SPT hammer was used to advance the split-barrel sampler in the boreholes. 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.

We reported the sampling depths, penetration distances, hand penetrometer test values, and the standard penetration resistance values on the boring logs. In the field the samples were tagged, placed the samples into containers, sealed to reduce moisture loss, and taken to our laboratory for observation, testing and classification.

Groundwater observations were also recorded while drilling by dry auger. Because the rotary-wash/rock coring technique introduced water and drilling mud into the borehole, we were unable to record accurate groundwater readings during drilling operations by that method or immediately after boring completion.

Our exploration team prepares field boring logs as part of standard drilling operations, these include sampling depths, penetration distances, and other relevant sampling information. Field logs include visual classifications of materials encountered during drilling, and our interpretation of subsurface conditions between samples. Final boring logs, prepared from field logs, represent the geotechnical engineer's interpretation, and include modifications based on observations and laboratory tests.

All borings were backfilled immediately after their completion with auger cuttings and/or bentonite chips. Excess auger cuttings were disposed of on the site by spreading around the boring location. Because backfill material often settles below the surface after a period of time, you should observe the exploration points periodically for signs of depressions and backfill them if necessary. We could provide this service at your request, but this would involve additional costs.

Laboratory Testing

Representative soil samples were tested in the laboratory to measure their natural water content, gradation and Atterberg limits. The test results are provided on the appended boring logs and laboratory test reports.

The soil samples were classified in the laboratory based on visual observation, texture, plasticity, and the laboratory testing described above. The soil descriptions presented on the boring logs are in accordance with the enclosed General Notes and Unified Soil Classification System (USCS). The estimated USCS group symbols for native soils are shown on the boring logs, and a brief description of the USCS is included in this report.

Resilient Modulus Testing

Bulk Samples were obtained from the shoulder Borings and Resilient Modulus testing in accordance with AASHTO T307-99 was performed on the combined sample from each bridge. For structure M3994 a resilient modulus of 6,095 psi was calculated for the on-site material. For structure M3995 a resilient modulus of 6,030 psi was determined for the on-site material.

SITE LOCATION AND EXPLORATION PLANS

SITE LOCATION PLAN

Bayou Derriseaux Structures and Approaches ■ Staves, Arkansas
July 31, 2018 ■ Terracon Project No. 35185047

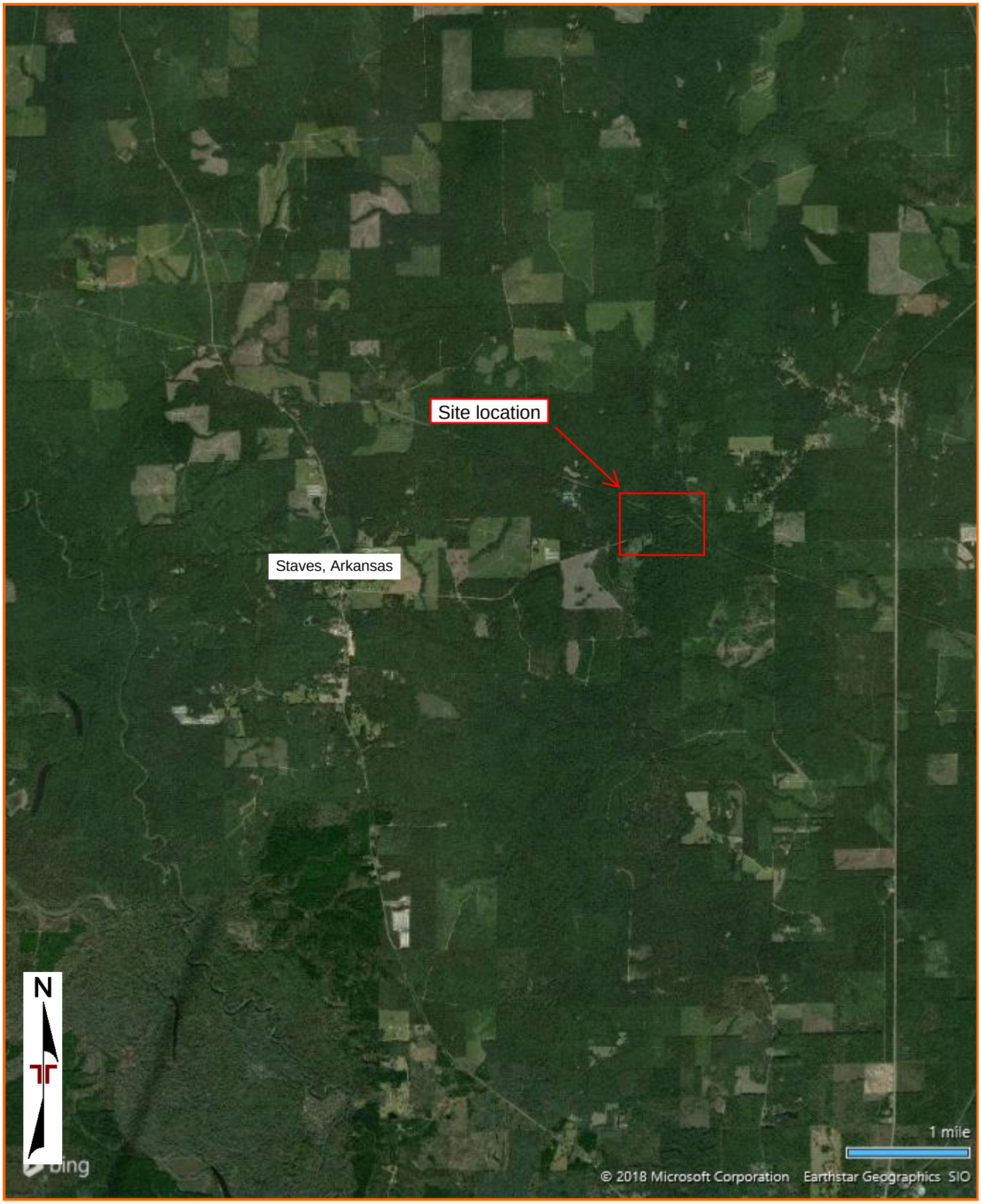


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

SITE: Highway 212
Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0455° Longitude: -92.2341°
Northing: 1814182.807 Easting: 1241394.331

Surface Elev.: 188.6310 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.5	188	**ASPHALTIC CEMENT CONCRETE - 7 inches**
		FILL - LEAN CLAY (CL), trace sand and gravel, dark brown and grayish brown
5.0	183.5	
		LEAN CLAY WITH SAND (CL), trace gravel, brown and gray, medium stiff
13.5	175	
		LEAN CLAY (CL), trace sand, brown and gray, medium stiff
18.5	170	
		SANDY LEAN CLAY (CL), brown and gray, medium stiff
28.5	160	

DEPTH (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	14-4-3 N=7	25			
	2-3-3 N=6	23			
	2-3-3 N=6	22			
5	2-2-2 N=4	25		48-19-29	76
	2-2-2 N=4	28			
10					
	2-2-2 N=4	28			
15					
	3-4-4 N=8	21		37-14-23	50
20					
	3-3-3 N=6	22			
25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-02-2018 | Boring Completed: 05-02-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-1

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

SITE: Highway 212
Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0455° Longitude: -92.2341°
Northing: 1814182.807 Easting: 1241394.331

Surface Elev.: 188.6310 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND WITH SILT (SP-SM), trace gravel, fine to coarse grained, brown, medium dense					7-7-7 N=14	18			7
			30								
		- travel gravel below about 32 feet					4-3-7 N=10	22			
			35								
	38.5	150									
		FAT CLAY (CH), brown and gray, stiff to very stiff					5-7-9 N=16	35		97-31-66	99
			40								
							5-7-7 N=14	41			
			45								
		- sand seams below about 48.5 feet					6-8-11 N=19	38			
			50								
							6-7-10 N=17	34			
			55								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-02-2018 | Boring Completed: 05-02-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-1

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0455° Longitude: -92.2341°
Northing: 1814182.807 Easting: 1241394.331

Surface Elev.: 188.6310 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FAT CLAY (CH), brown and gray, stiff to very stiff *(continued)*					
58.5	130						
		SANDY FAT CLAY (CH), gray, stiff to very stiff	5-6-8 N=14	26		51-15-36	56
			5-7-9 N=16	28			
			6-8-9 N=17	25			
			5-7-11 N=18	26			
78.5	110						
		SANDY LEAN CLAY (CL), gray, very stiff	7-7-8 N=15	28		39-15-24	58
			6-8-9 N=17	27			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-02-2018 | Boring Completed: 05-02-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-1

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0455° Longitude: -92.2341°
Northing: 1814182.807 Easting: 1241394.331

Surface Elev.: 188.6310 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDY LEAN CLAY (CL), gray, very stiff *(continued)*									
					X		6-8-11 N=19	24			
	93.5		90								
		FAT CLAY WITH SAND (CH), gray, very stiff to hard - increasing sand seams below about 93.5 feet			X		13-22-25 N=47	32		53-15-38	83
			95								
	100.0				X		7-9-13 N=22	33			
	88.5		100								
		Boring Terminated at 100 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-02-2018 | Boring Completed: 05-02-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-2

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

SITE: Highway 212
Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0456° Longitude: -92.2337°
Northing: 1814226.072 Easting: 1241569.057

Surface Elev.: 184.9290 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.5	184.5	**ASPHALTIC CEMENT CONCRETE - 6 inches**
2.0	183	**FILL - LEAN CLAY (CL)**, with sand and gravel, dark brown and reddish-brown
13.5	171.5	**FAT CLAY WITH SAND (CH)**, trace gravel, gray and brown, medium stiff
18.5	166.5	**LEAN CLAY (CL)**, trace sand, brown, medium stiff
28.5	156.5	**SILTY SAND (SM)**, fine grained, brown and gray, medium dense to loose

DEPTH (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3-3-3 N=6	21			
	2-2-3 N=5	23			
5	2-2-2 N=4	23		51-20-31	84
	2-3-3 N=6	27			
	2-2-2 N=4	28			
10					
	2-3-3 N=6	28			
15					
	4-5-5 N=10	22			30
20					
	3-3-4 N=7	21			
25					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 5 feet: Solid-stem auger
5 to 80 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-2

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0456° Longitude: -92.2337°
Northing: 1814226.072 Easting: 1241569.057

Surface Elev.: 184.9290 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND WITH GRAVEL (SP), fine to coarse grained, gray, medium dense to very dense	30	11-10-8 N=18	11			3
			35	13-33-38 N=71	25			
38.5	146.5							
		FAT CLAY (CH), trace sand, brown and gray, very stiff, laminated and blocky, occasional sand seams	40	13-15-15 N=30	42			
			45	6-7-9 N=16	42		101-28-73	97
			50	6-8-10 N=18	40			
53.5	131.5							
		FAT CLAY (CH), gray, very stiff	55	6-8-10 N=18	34			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 5 feet: Solid-stem auger
5 to 80 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-2

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0456° Longitude: -92.2337°
Northing: 1814226.072 Easting: 1241569.057

Surface Elev.: 184.9290 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			60								
					X		6-8-8 N=16	32		70-22-48	87
			65								
					X		6-8-7 N=15	28			
			70								
					X		6-8-8 N=16	29			
	73.5	111.5	75								
					X		6-8-10 N=18	27		54-17-37	78
	80.0	105	80								
					X		6-7-8 N=15	25			

FAT CLAY (CH), gray, very stiff *(continued)*

FAT CLAY WITH SAND (CH), gray, very stiff

Boring Terminated at 80 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 5 feet: Solid-stem auger
5 to 80 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. R-1

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0455° Longitude: -92.2344°
Northing: 1814136.23 Easting: 1241254.002

Surface Elev.: 184.6790 (Ft.)

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	184.5										
ASPHALTIC CEMENT CONCRETE - 3 inches											
FILL - FAT CLAY (CH), with sand, gray							3-4-4 N=8	20			
2.0	182.5										
LEAN CLAY WITH SAND (CL), trace gravel, brown and gray, medium stiff							2-2-2 N=4	8		40-19-21	70
							1-2-2 N=4	20			
			5				2-2-3 N=5	24		47-19-28	81
10.0	174.5						2-2-3 N=5	26			
Boring Terminated at 10 Feet			10								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. R-2

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0458° Longitude: -92.2331°
Northing: 1814260.621 Easting: 1241713.689

Surface Elev.: 184.6370 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.3	184.5	**ASPHALTIC CEMENT CONCRETE - 3 inches**
2.0	182.5	**FILL - SANDY LEAN CLAY (CL)**, trace gravel, brown and dark gray
5.0	179.5	**FILL - FAT CLAY WITH SAND (CH)**, trace gravel, gray and dark brown
10.0	174.5	**LEAN CLAY (CL)**, trace sand, gray and brown, medium stiff
		Boring Terminated at 10 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
				12-5-5 N=10	21			
				2-3-2 N=5	19			
				3-3-3 N=6	19		50-20-30	73
5				2-3-3 N=6	20			
	▽							
10				2-3-2 N=5	27			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *During Drilling by dry auger*

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. S-1

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0456° Longitude: -92.2343°
Northing: 1814165.586 Easting: 1241318.65

Surface Elev.: 183.0210 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.5	182.5									
	FILL - CLAYEY CHERT GRAVEL (GC), gray										
	FILL - SANDY LEAN CLAY (CL), trace gravel, gray and brown						3-4-3 N=7	17			
							3-3-4 N=7	17		36-18-18	58
							2-2-2 N=4	21			
	5.0	178	5								
	LEAN CLAY (CL), with sand, gray and brown, medium stiff						2-2-2 N=4	23			
	10.0	173					2-2-2 N=4	25			
	Boring Terminated at 10 Feet		10								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. S-2

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0457° Longitude: -92.2335°
Northing: 1814222.757 Easting: 1241653.627

Surface Elev.: 184.2160 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.5	183.5	**FILL - CHERTY CLAYEY GRAVEL (GC)**, gray
		FILL - LEAN CLAY WITH SAND (CL), trace gravel, dark brown and brown
5.0	179	
		LEAN CLAY (CL), trace sand, gray and brown, medium stiff
10.0	174	
		Boring Terminated at 10 Feet

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			2-3-2 N=5	17			
			2-3-4 N=7	22		46-20-26	77
			2-2-2 N=4	19			
5			1-2-3 N=5	29			
10			2-2-3 N=5	33			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-3

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0461° Longitude: -92.2316°
Northing: 1814367.404 Easting: 1242188.128

Surface Elev.: 185.4120 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - POORLY GRADED SAND (SP), with gravel, red brown					18-16-17 N=33	9			
	2.0	183.5									
		FILL - LEAN CLAY WITH SAND (CL), trace gravel, brown gray					2-2-2 N=4	21		34-23-11	74
							3-2-2 N=4	17			
	5.0	180.5	5								
		SANDY LEAN CLAY (CL), trace gravel, gray and brown, soft to medium stiff					1-1-1 N=2	20			
							1-2-2 N=4	24			
			10								
	13.5	172									
		LEAN CLAY (CL), trace sand, gray brown, very soft					0-0-0 N=0	28			
			15								
	18.5	167									
		SILTY SAND (SM), fine grained, gray brown, loose					3-3-3 N=6	22		NP	17
			20								
	23.5	162									
		FAT CLAY (CH), trace sand, brown and gray, medium stiff to very stiff					3-4-3 N=7	40			
			25								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-03-2018 | Boring Completed: 05-03-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-3

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0461° Longitude: -92.2316°
Northing: 1814367.404 Easting: 1242188.128

Surface Elev.: 185.4120 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), trace sand, brown and gray, medium stiff to very stiff *(continued)*	30			11-13-16 N=29	41		67-22-45	94
33.5	152								
	SANDY LEAN CLAY (CL), gray, very stiff to hard	35			5-11-18 N=29	31			
		40			15-17-27 N=44	33			
43.5	142								
	FAT CLAY (CH), trace sand, brown and gray, very stiff, laminated and blocky	45			4-7-8 N=15	41			
		50			5-8-9 N=17	38		95-37-58	99
		55			5-7-11 N=18	38			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-03-2018 | Boring Completed: 05-03-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-3

PROJECT: Bayou Derriseaux Structures and Approaches

**CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas**

**SITE: Highway 212
Staves, Arkansas**

LOCATION See Exploration Plan

Latitude: 34.0461° Longitude: -92.2316°
Northing: 1814367.404 Easting: 1242188.128

Surface Elev.: 185.4120 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	58.5	**FAT CLAY (CH)**, trace sand, brown and gray, very stiff, laminated and blocky *(continued)*	127									
		FAT CLAY (CH), gray, very stiff to hard		60		X		6-7-10 N=17	29			
				65		X		5-7-9 N=16	32		50-19-31	90
				70		X		6-13-24 N=37	26			
				75		X		6-8-10 N=18	25			
	80.0		105.5	80		X		5-8-11 N=19	26			
		Boring Terminated at 80 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-03-2018	Boring Completed: 05-03-2018
Drill Rig: CME 850X No. 884	Driller: DB
Project No.: 35185047	

BORING LOG NO. B-4

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0462° Longitude: -92.2312°

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.5										
		ASPHALTIC CEMENT CONCRETE - 6 inches									
		FILL - SANDY LEAN CLAY (CL), trace gravel and asphalt, gray and brown					3-2-2 N=4	17			
							1-1-1 N=2	23			
							0-0-0 N=0	23			
	5.0		5								
		SANDY LEAN CLAY (CL), brown, very soft					0-0-0 N=0	27			56
				▽							
							0-0-0 N=0	22			
	13.5		10								
		WELL GRADED GRAVEL WITH SILT AND SAND (GW-GM), fine to coarse grained, brown, dense					13-20-14 N=34	11			11
	18.5		15								
		FAT CLAY (CH), trace sand, brown and gray, stiff					4-5-6 N=11	45			
	23.5		20								
		SANDY LEAN CLAY (CL), with sand seams, gray, hard					14-26-35 N=61	27			
			25								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *During Drilling by dry auger*

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-04-2018 | Boring Completed: 05-04-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-4

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0462° Longitude: -92.2312°

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SANDY LEAN CLAY (CL), with sand seams, gray, hard *(continued)*	30				17-17-18 N=35	35		33-22-11	54
	33.5 **SANDY LEAN CLAY (CL)**, gray, very stiff, laminated	35				6-7-10 N=17	38			
		40				6-7-10 N=17	33			
		45				5-8-10 N=18	33			
	48.5 **FAT CLAY (CH)**, trace sand, gray, very stiff, occasional sand seams	50				5-6-10 N=16	34		90-23-67	95
	53.5 **SANDY LEAN CLAY (CL)**, gray, stiff to very stiff	55				5-6-7 N=13	25			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *During Drilling by dry auger*

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-04-2018 | Boring Completed: 05-04-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-4

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0462° Longitude: -92.2312°

DEPTH ELEVATION (Ft.)

DEPTH (Ft.)	GRAPHIC LOG	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SANDY LEAN CLAY (CL), gray, stiff to very stiff *(continued)*							
		X		5-6-8 N=14	27		43-18-25	60
60								
		X		6-8-8 N=16	24			
65								
		X		5-7-9 N=16	28			
70								
		X		5-7-9 N=16	28			
75								
	78.5							
	FAT CLAY WITH SAND (CH), gray, very stiff to hard	X		5-7-8 N=15	30		51-18-33	82
80								
		X		6-8-9 N=17	23			
85								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *During Drilling by dry auger*

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-04-2018 | Boring Completed: 05-04-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-4

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0462° Longitude: -92.2312°

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY WITH SAND (CH), gray, very stiff to hard *(continued)*									
		90		X		16-16-16 N=32	25			
	- dark gray at about 93.5 feet	95		X		8-10-10 N=20	32			
	100.0	100		X		8-11-12 N=23	30			
	Boring Terminated at 100 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 100 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *During Drilling by dry auger*

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-04-2018 | Boring Completed: 05-04-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-5

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

SITE: Highway 212
Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0463° Longitude: -92.2307°
Northing: 1814424.815 Easting: 1242433.715

Surface Elev.: 184.3560 (Ft.)

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.3	184	**ASPHALTIC CEMENT CONCRETE - 3 inches**
0.5	184	**AGGREGATE BASE COURSE - 3 inches**
		FILL - SANDY LEAN CLAY (CL), trace gravel, brown
5.0	179.5	**SANDY LEAN CLAY (CL)**, with sand seams, brown, stiff
8.5	176	**CLAYEY SAND (SC)**, brown, loose
18.5	166	**SILTY SAND (SM)**, brown, medium dense
23.5	161	**CLAYEY SAND (SC)**, fine to coarse grained, brown, loose to dense

DEPTH (Ft.)	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
	5-8-4 N=12	11	
	3-4-5 N=9	13	
	3-2-1 N=3	12	
5	8-5-4 N=9	12	
	3-4-4 N=8	12	22
10			
	3-3-4 N=7	22	
15			
	3-3-11 N=14	23	31
20			
	2-2-4 N=6	15	
25			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 80 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018
Drill Rig: CME 850X No. 884 | Driller: DB
Project No.: 35185047

BORING LOG NO. B-5

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0463° Longitude: -92.2307°
Northing: 1814424.815 Easting: 1242433.715

Surface Elev.: 184.3560 (Ft.)

DEPTH	ELEVATION (Ft.)	DESCRIPTION	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		CLAYEY SAND (SC), fine to coarse grained, brown, loose to dense *(continued)*	30			7-8-33 N=41	17			16
33.5	151									
		SANDY LEAN CLAY (CL), with sand seams, gray, hard	35			12-18-33 N=51	33			
38.5	146									
		FAT CLAY (CH), trace sand, gray and brown, very stiff	40			6-7-8 N=15	35			
			45			5-8-9 N=17	38		96-28-68	94
			50			6-7-11 N=18	38			
53.5	131									
		FAT CLAY (CH), gray, very stiff to stiff	55			6-8-10 N=18	29			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 80 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. B-5

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0463° Longitude: -92.2307°
Northing: 1814424.815 Easting: 1242433.715

Surface Elev.: 184.3560 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), gray, very stiff to stiff *(continued)*								
			X		6-8-9 N=17	29		82-22-60	87
		60							
			X		6-6-8 N=14	25			
		65							
68.5	116								
	SANDY LEAN CLAY (CL), gray, hard to very stiff								
			X		35-22-24 N=46	31		43-13-30	60
		70							
			X		6-8-12 N=20	25			
		75							
80.0	104.5		X		5-7-10 N=17	27			
	Boring Terminated at 80 Feet	80							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger
10 to 80 feet: Wash boring

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water level not determined

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. R-3

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.046° Longitude: -92.2319°
Northing: 1814345.909 Easting: 1242084.187

Surface Elev.: 185.2890 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.3	185	**ASPHALTIC CEMENT CONCRETE - 3.5 inches**
		FILL - SANDY LEAN CLAY (CL), trace gravel, gray brown
2.0	183.5	
		SANDY LEAN CLAY (CL), with sand seams, trace gravel, gray and brown, medium stiff to soft
10.0	175.5	
		Boring Terminated at 10 Feet

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			13-10-8 N=18	15			
			4-3-3 N=6	13			
5			4-3-3 N=6	8		31-16-15	59
			2-1-2 N=3	21			
10			1-1-1 N=2	27			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. R-4

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0465° Longitude: -92.2303°

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3											
ASPHALTIC CEMENT CONCRETE - 3.5 inches											
FILL - SANDY LEAN CLAY (CL), with gravel, brown and reddish-brown							12-6-3 N=9	10			
2.0											
LEAN CLAY WITH SAND (CL), with sand seams, gray and brown, medium stiff							3-3-5 N=8	15		29-16-13	73
							3-2-2 N=4	14			
			5				2-2-2 N=4	15			
8.5				▽							
CLAYEY SAND (SC), fine grained, brown, very loose							0-0-0 N=0	22			
10.0			10								
Boring Terminated at 10 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *During Drilling by dry auger*

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. S-3

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0461° Longitude: -92.2317°
Northing: 1814382.746 Easting: 1242141.382

Surface Elev.: 184.8220 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - SANDY LEAN CLAY (CL), with gravel, reddish-brown and grayish brown						6-4-2 N=6	16			
	2.0	183									
	SANDY LEAN CLAY (CL), trace gravel, brown and gray, medium stiff to soft						2-2-3 N=5	18			
							2-3-5 N=8	15		31-17-14	55
			5				2-2-2 N=4	19			
	10.0	175					1-1-1 N=2	22			
	Boring Terminated at 10 Feet		10								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
25809 I 30
Bryant, AR

Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

BORING LOG NO. S-4

PROJECT: Bayou Derriseaux Structures and Approaches

CLIENT: Michael Baker International, Inc. Little Rock, Arkansas

SITE: Highway 212 Staves, Arkansas

LOCATION See Exploration Plan

Latitude: 34.0463° Longitude: -92.2306°
Northing: 1814479.344 Easting: 1242490.187

Surface Elev.: 185.3010 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - SANDY LEAN CLAY (CL), brown						3-3-3 N=6	16		40-15-25	60
							2-2-2 N=4	15			
			5				2-1-1 N=2	12			
							1-1-1 N=2	12			
	8.5	177		▽							
	SILTY SAND (SM), fine grained, brown, loose						2-1-2 N=3	18			
	10.0	175.5	10								
	Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0 to 10 feet: Solid-stem auger

Abandonment Method:
Boring backfilled with Auger Cuttings

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *During Drilling by dry auger*

Terracon
25809 I 30
Bryant, AR

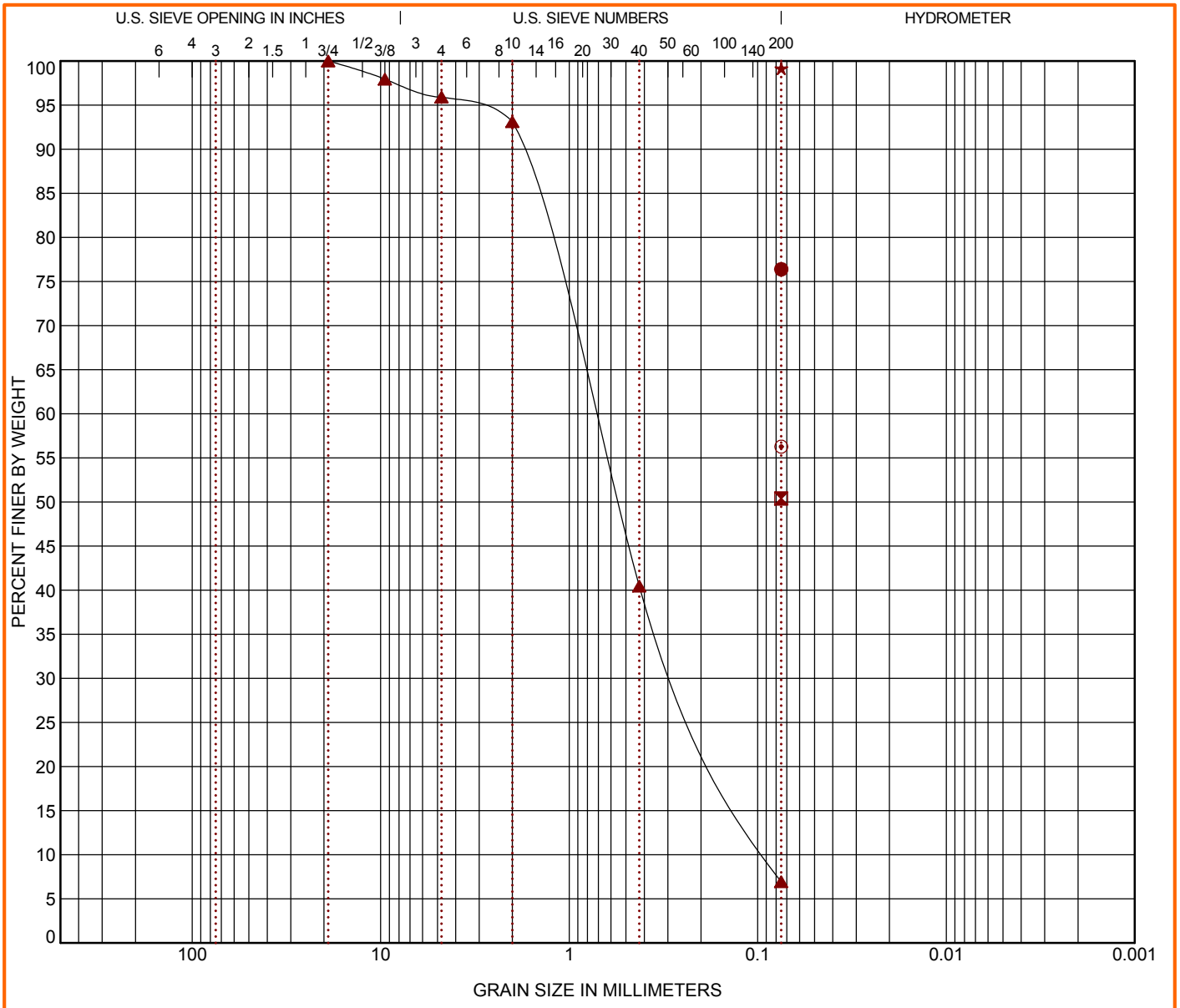
Boring Started: 05-01-2018 | Boring Completed: 05-01-2018

Drill Rig: CME 850X No. 884 | Driller: DB

Project No.: 35185047

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-1	5 - 6.5	LEAN CLAY with SAND (CL)	25	48	19	29		
⊠	B-1	18.5 - 20	SANDY LEAN CLAY (CL)	21	37	14	23		
▲	B-1	28.5 - 30	POORLY GRADED SAND with SILT (SP-SM)	18				0.92	8.59
★	B-1	38.5 - 40	FAT CLAY (CH)	35	97	31	66		
⊙	B-1	58.5 - 60	SANDY FAT CLAY (CH)	26	51	15	36		

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-1	5 - 6.5	0.075				0.0	0.0		76.4	
⊠	B-1	18.5 - 20	0.075				0.0	0.0		50.4	
▲	B-1	28.5 - 30	19	0.755	0.247	0.088	4.1	89.0		6.9	
★	B-1	38.5 - 40	0.075				0.0	0.0		99.2	
⊙	B-1	58.5 - 60	0.075				0.0	0.0		56.3	

PROJECT: Bayou Derriseaux Structures and Approaches

SITE: Highway 212
Staves, Arkansas

Terracon
25809 I 30
Bryant, AR

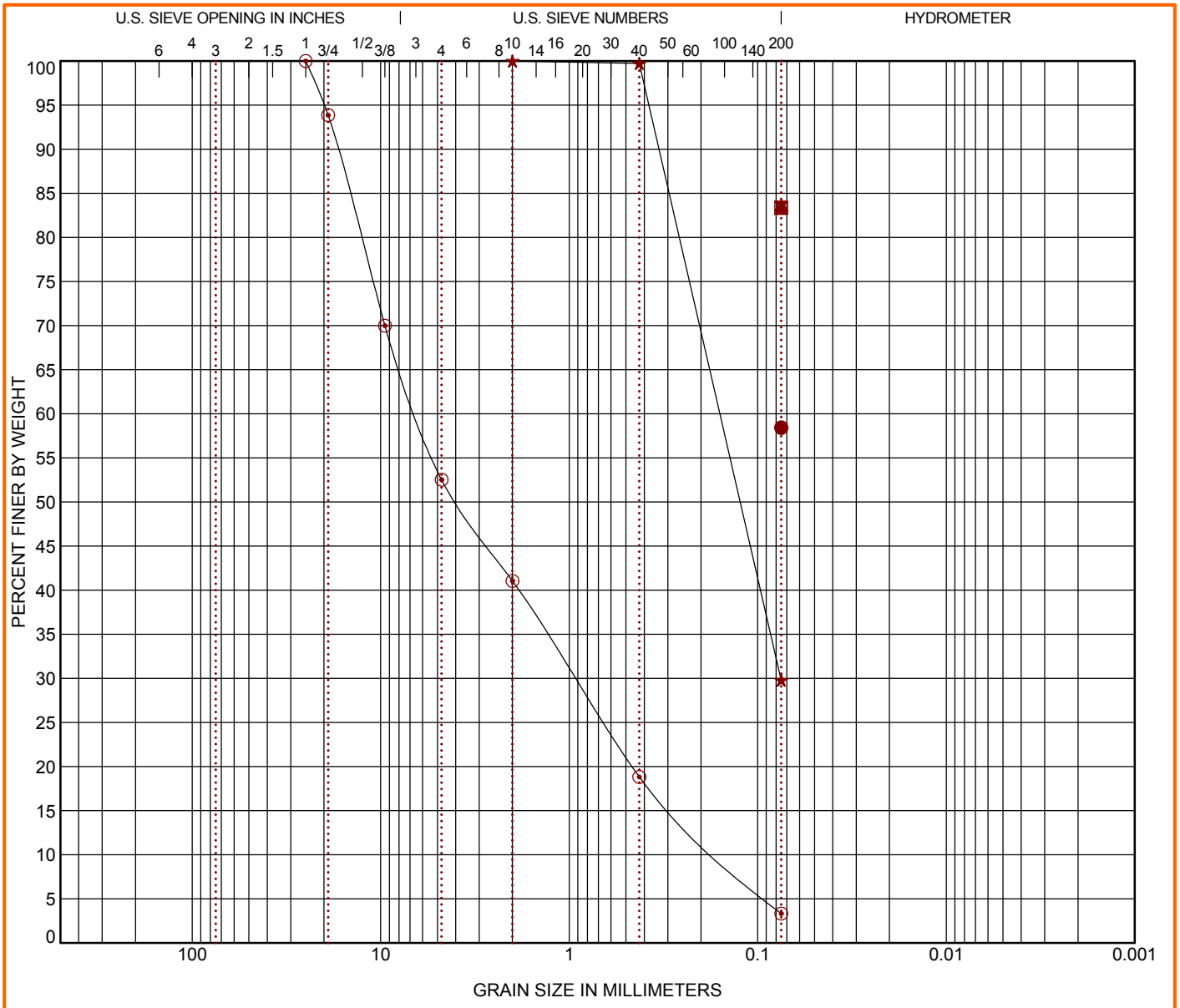
PROJECT NUMBER: 35185047

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 35185047 BAYOU DERRISEAUX.GPJ TERRACON_DATATEMPLATE.GDT 8/15/18

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-1	78.5 - 80	SANDY LEAN CLAY (CL)	28	39	15	24		
⊠	B-1	93.5 - 95	FAT CLAY with SAND (CH)	32	53	15	38		
▲	B-2	3.5 - 5	FAT CLAY with SAND (CH)	23	51	20	31		
★	B-2	18.5 - 20	SILTY SAND (SM)	22					
⊙	B-2	28.5 - 30	POORLY GRADED SAND with GRAVEL (SP)	11				0.85	40.36

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-1	78.5 - 80	0.075				0.0	0.0		58.4	
⊠	B-1	93.5 - 95	0.075				0.0	0.0		83.4	
▲	B-2	3.5 - 5	0.075				0.0	0.0		83.6	
★	B-2	18.5 - 20	2	0.159	0.075		0.0	70.2		29.8	
⊙	B-2	28.5 - 30	25	6.39	0.926	0.158	47.5	49.2		3.3	

PROJECT: Bayou Derriseaux Structures and Approaches

SITE: Highway 212
Staves, Arkansas

Terracon
25809 I 30
Bryant, AR

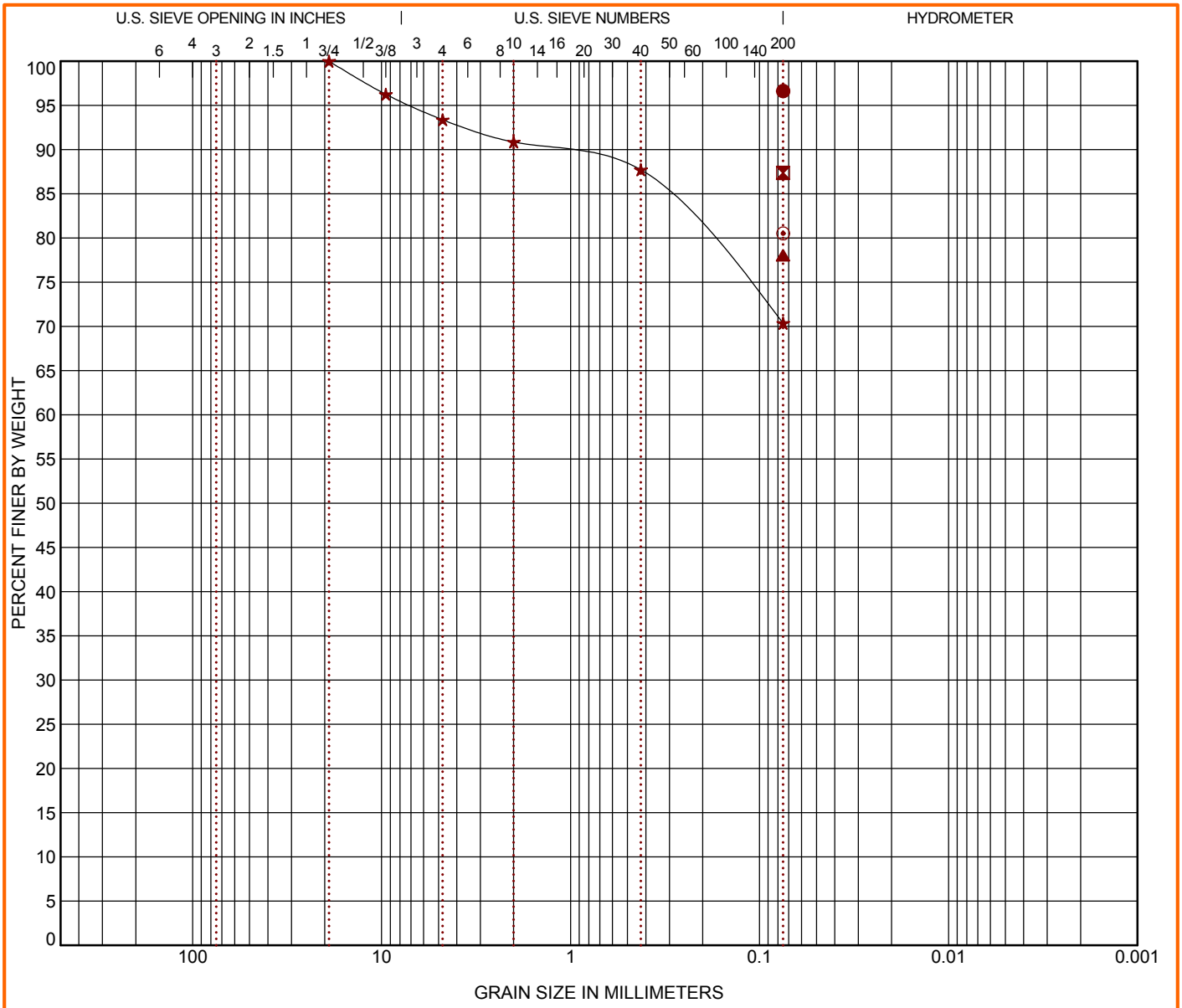
PROJECT NUMBER: 35185047

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 35185047 BAYOU DERRISEAUX.GPJ TERRACON_DATATEMPLATE.GDT 8/15/18

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-2	43.5 - 45	FAT CLAY (CH)	42	101	28	73		
⊠	B-2	58.5 - 60	FAT CLAY (CH)	32	70	22	48		
▲	B-2	73.5 - 75	FAT CLAY with SAND (CH)	27	54	17	37		
★	R-1	2 - 3.5	LEAN CLAY with SAND (CL)	8	40	19	21		
⊙	R-1	5 - 6.5	LEAN CLAY with SAND (CL)	24	47	19	28		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-2	43.5 - 45	0.075				0.0	0.0		96.6	
⊠	B-2	58.5 - 60	0.075				0.0	0.0		87.4	
▲	B-2	73.5 - 75	0.075				0.0	0.0		78.0	
★	R-1	2 - 3.5	19				6.6	23.0		70.4	
⊙	R-1	5 - 6.5	0.075				0.0	0.0		80.5	

PROJECT: Bayou Derriseaux Structures and Approaches

SITE: Highway 212
Staves, Arkansas

Terracon
25809 I 30
Bryant, AR

PROJECT NUMBER: 35185047

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 35185047 BAYOU DERRISEAUX.GPJ TERRACON_DATATEMPLATE.GDT 8/15/18

GRAIN SIZE DISTRIBUTION

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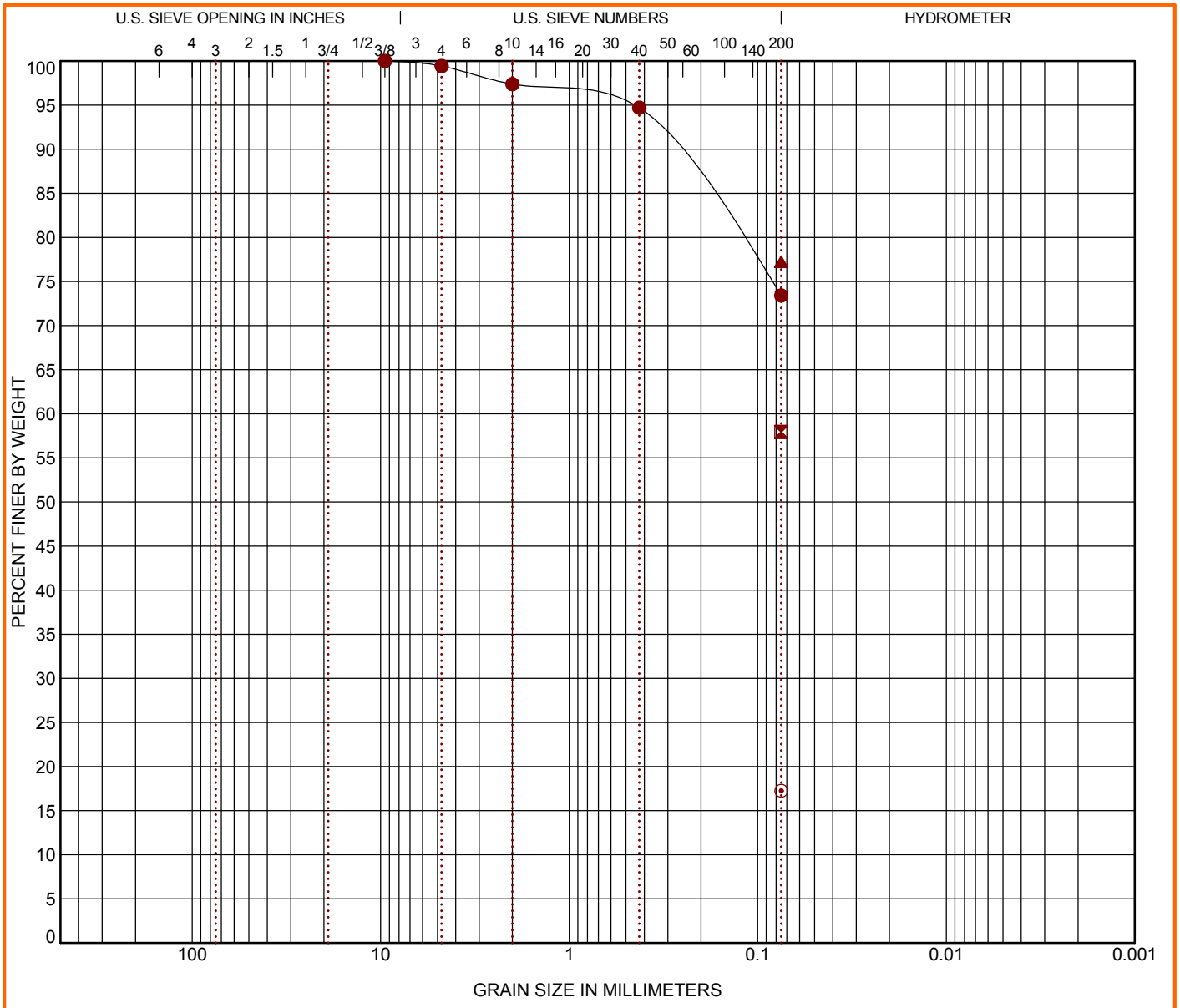


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	R-2	3.5 - 5	FAT CLAY with SAND (CH)	19	50	20	30		
⊠	S-1	2 - 3.5	SANDY LEAN CLAY (CL)	17	36	18	18		
▲	S-2	2 - 3.5	LEAN CLAY with SAND (CL)	22	46	20	26		
★	B-3	2 - 3.5	LEAN CLAY with SAND (CL)	21	34	23	11		
⊙	B-3	18.5 - 20	SILTY SAND (SM)	22	NP	NP	NP		

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	R-2	3.5 - 5	9.5				0.6	26.0		73.4	
⊠	S-1	2 - 3.5	0.075				0.0	0.0		57.9	
▲	S-2	2 - 3.5	0.075				0.0	0.0		77.2	
★	B-3	2 - 3.5	0.075				0.0	0.0		73.7	
⊙	B-3	18.5 - 20	0.075				0.0	0.0		17.2	

PROJECT: Bayou Derriseaux Structures and Approaches

SITE: Highway 212
Staves, Arkansas

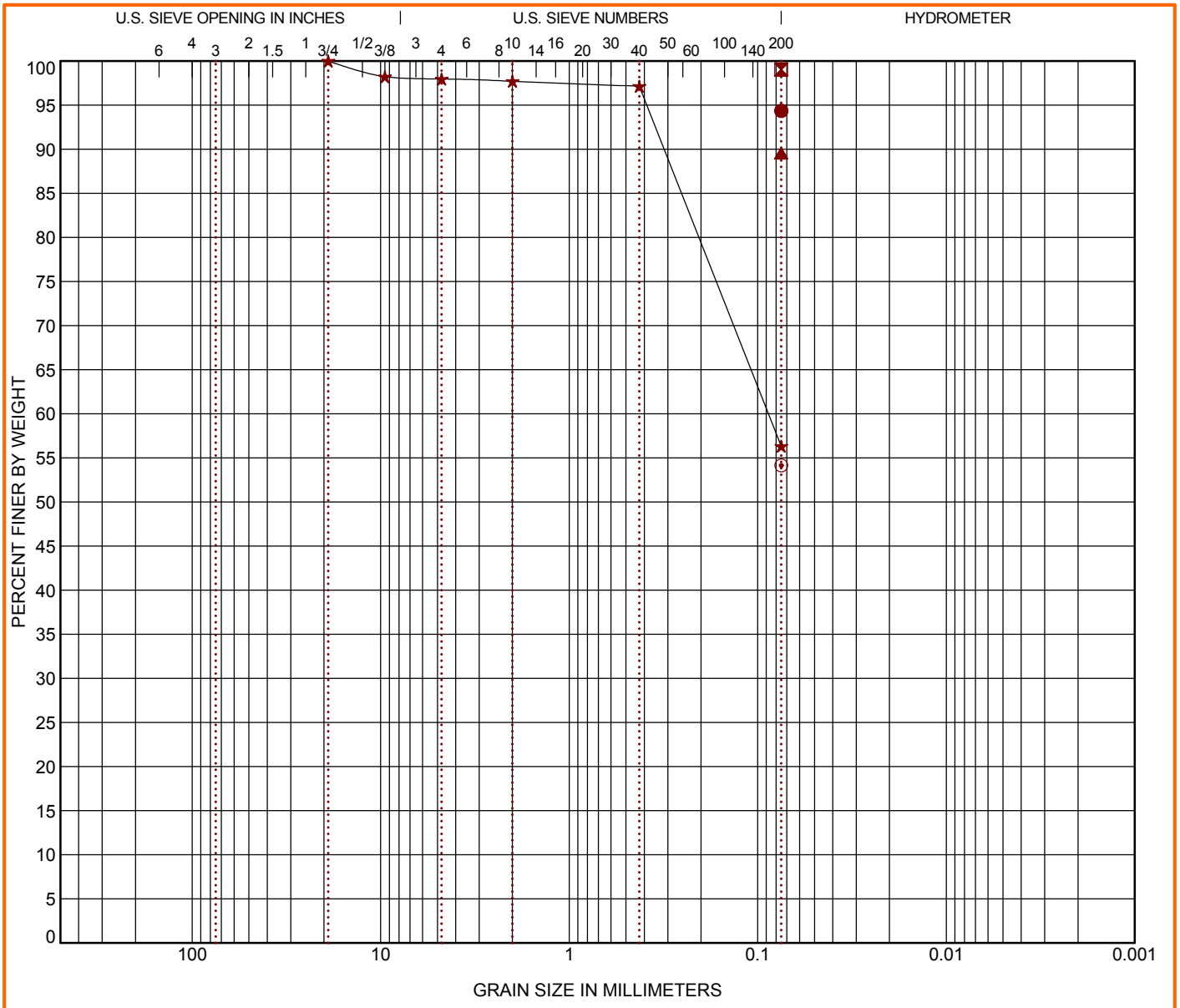
Terracon
25809 I 30
Bryant, AR

PROJECT NUMBER: 35185047

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-3	28.5 - 30	FAT CLAY (CH)	41	67	22	45		
⊠	B-3	48.5 - 50	FAT CLAY (CH)	38	95	37	58		
▲	B-3	63.5 - 65	FAT CLAY (CH)	32	50	19	31		
★	B-4	5 - 6.5	SANDY LEAN CLAY (CL)	27					
⊙	B-4	28.5 - 30	SANDY LEAN CLAY (CL)	35	33	22	11		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-3	28.5 - 30	0.075				0.0	0.0		94.3	
⊠	B-3	48.5 - 50	0.075				0.0	0.0		99.0	
▲	B-3	63.5 - 65	0.075				0.0	0.0		89.5	
★	B-4	5 - 6.5	19	0.088			2.0	41.6		56.3	
⊙	B-4	28.5 - 30	0.075				0.0	0.0		54.1	

PROJECT: Bayou Derriseaux Structures and Approaches

SITE: Highway 212
Staves, Arkansas

Terracon
25809 I 30
Bryant, AR

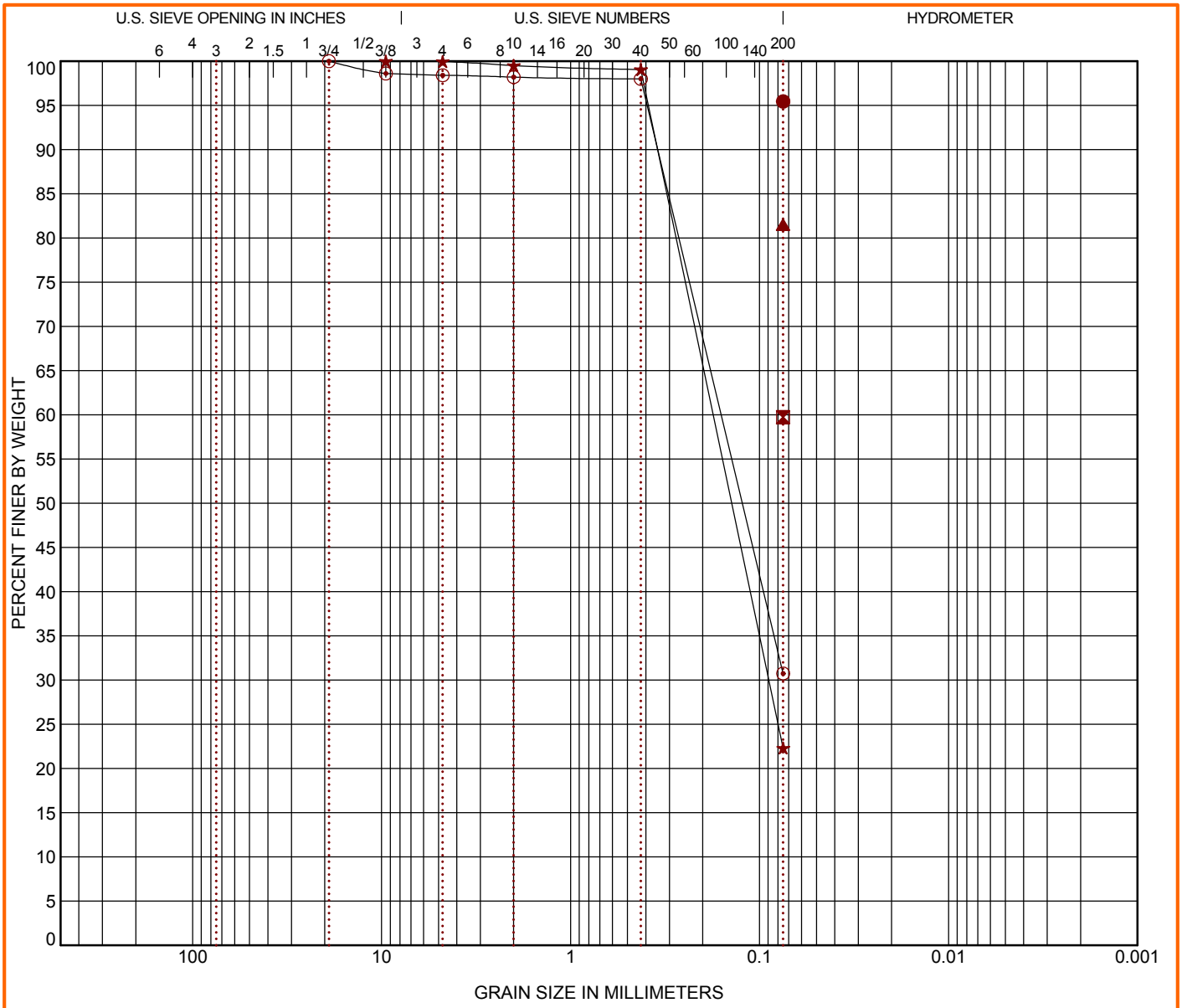
PROJECT NUMBER: 35185047

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 35185047 BAYOU DERRISEAUX.GPJ TERRACON_DATATEMPLATE.GDT 8/15/18

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-4	48.5 - 50	FAT CLAY (CH)	34	90	23	67		
⊠	B-4	58.5 - 60	SANDY LEAN CLAY (CL)	27	43	18	25		
▲	B-4	78.5 - 80	FAT CLAY with SAND (CH)	30	51	18	33		
★	B-5	8.5 - 10	CLAYEY SAND (SC)	12					
⊙	B-5	18.5 - 20	SILTY SAND (SM)	23					

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-4	48.5 - 50	0.075				0.0	0.0		95.4	
⊠	B-4	58.5 - 60	0.075				0.0	0.0		59.7	
▲	B-4	78.5 - 80	0.075				0.0	0.0		81.5	
★	B-5	8.5 - 10	9.5	0.176	0.089		0.0	77.6		22.3	
⊙	B-5	18.5 - 20	19	0.16			1.6	67.7		30.7	

PROJECT: Bayou Derriseaux Structures and Approaches

SITE: Highway 212
Staves, Arkansas

Terracon
25809 I 30
Bryant, AR

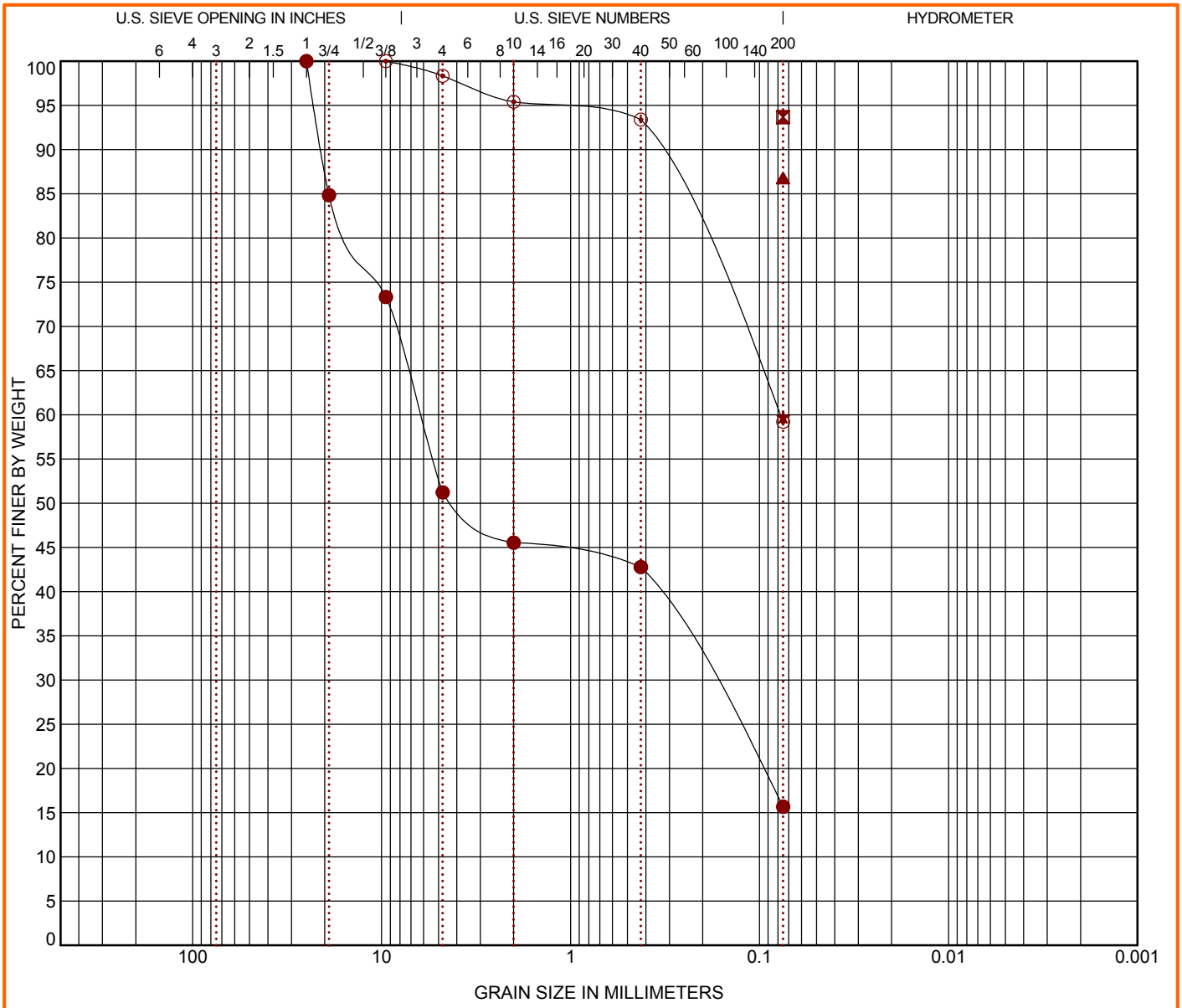
PROJECT NUMBER: 35185047

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 35185047 BAYOU DERRISEAUX .GPJ TERRACON_DATATEMPLATE.GDT 8/15/18

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-5	28.5 - 30	CLAYEY SAND (SC)	17					
⊠	B-5	43.5 - 45	FAT CLAY (CH)	38	96	28	68		
▲	B-5	58.5 - 60	FAT CLAY (CH)	29	82	22	60		
★	B-5	68.5 - 70	SANDY LEAN CLAY (CL)	31	43	13	30		
⊙	R-3	3.5 - 5	SANDY LEAN CLAY (CL)	8	31	16	15		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-5	28.5 - 30	25	6.255	0.188		48.8	35.6		15.7	
⊠	B-5	43.5 - 45	0.075				0.0	0.0		93.7	
▲	B-5	58.5 - 60	0.075				0.0	0.0		86.8	
★	B-5	68.5 - 70	0.075				0.0	0.0		59.7	
⊙	R-3	3.5 - 5	9.5	0.078			1.7	39.1		59.2	

PROJECT: Bayou Derriseaux Structures and Approaches

SITE: Highway 212
Staves, Arkansas

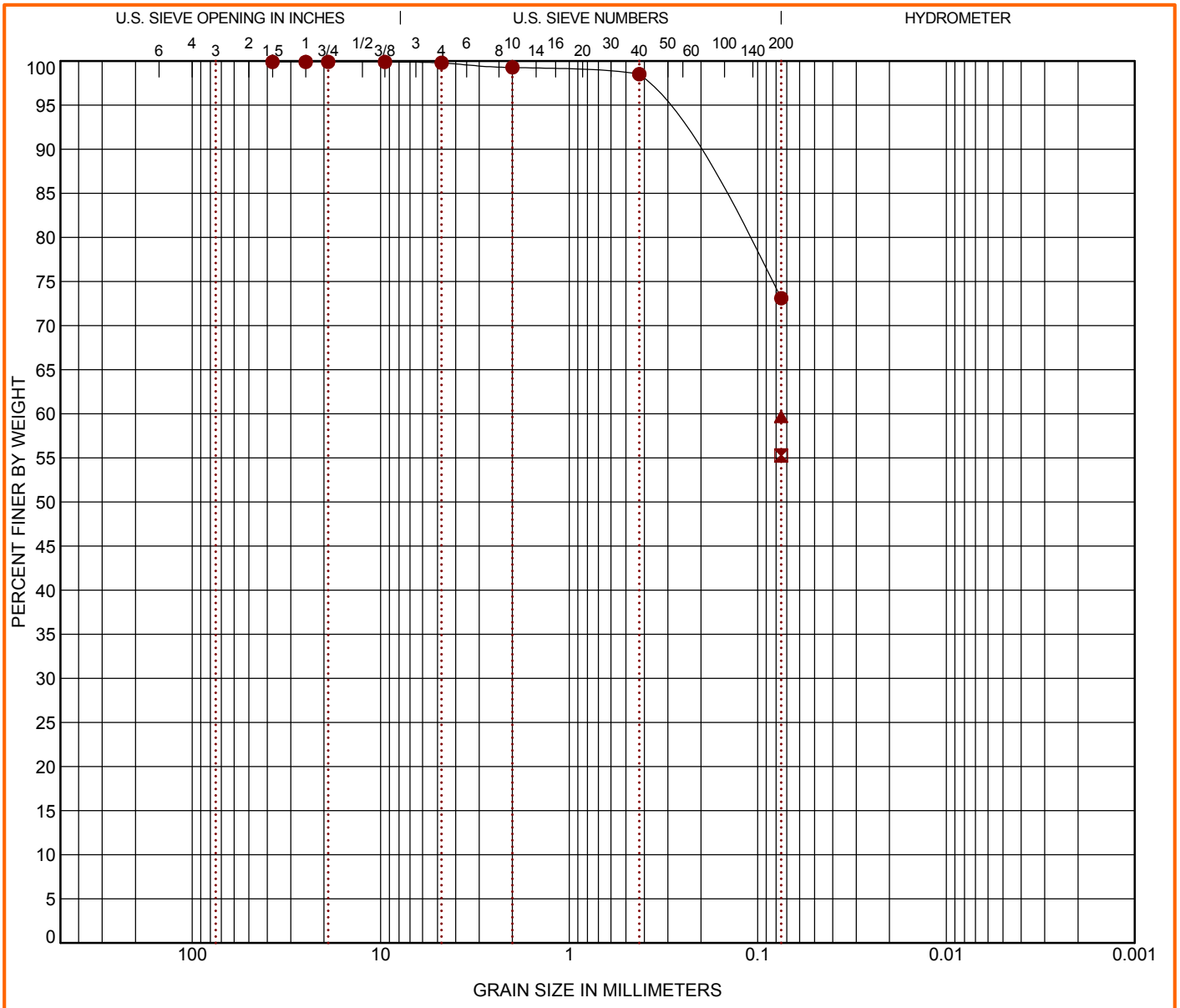
Terracon
25809 I 30
Bryant, AR

PROJECT NUMBER: 35185047

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	R-4	2 - 3.5	LEAN CLAY with SAND (CL)	15	29	16	13		
⊠	S-3	3.5 - 5	SANDY LEAN CLAY (CL)	15	31	17	14		
▲	S-4	0.5 - 2	SANDY LEAN CLAY (CL)	16	40	15	25		

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Fines	%Clay
●	R-4	2 - 3.5	37.5				0.1	26.7		73.1	
⊠	S-3	3.5 - 5	0.075				0.0	0.0		55.3	
▲	S-4	0.5 - 2	0.075				0.0	0.0		59.7	

PROJECT: Bayou Derriseaux Structures and Approaches

SITE: Highway 212
Staves, Arkansas

Terracon
25809 I 30
Bryant, AR

PROJECT NUMBER: 35185047

CLIENT: Michael Baker International, Inc.
Little Rock, Arkansas

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 35185047 BAYOU DERRISEAUX.GPJ TERRACON_DATATEMPLATE.GDT 8/15/18

Laboratory Compaction Characteristics of Soil

4701 North Stiles Ave.
Oklahoma City, OK 73105
(405) 525 0453

Client Name: Michael Baker International, Inc.
Project Name: Bayou Derriseaux
Location: Staves, Cleveland County, Arkansas

Source Material: Bulk #1: S-1, S-2
Sample Description: Lean Clay with Gravel, Brown

Material Designation: Lab 280 Sample date:
Test Method: Method A
Test Procedure: ASTM D-698
Sample Preparation: Dry
Rammer: X Mechanical ____ Manual

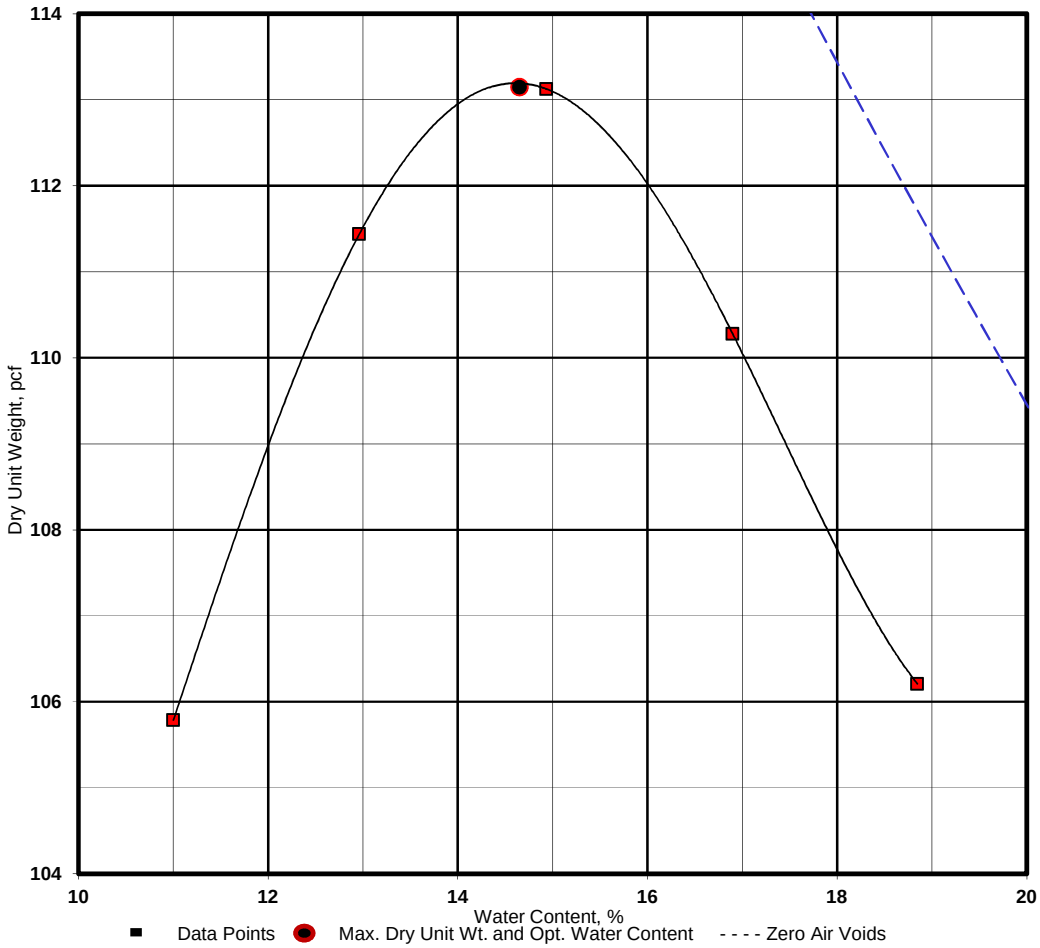
Project No.: 35185047 Date: 05/17/18

TEST RESULTS

Maximum Dry Unit Wt.: 113.2 pcf
Optimum Water Content: 14.7 %

Liquid Limit: 35 Plastic Limit: 17
Plasticity Index: 18
% passing # 200 sieve: 52.6
AASHTO Class. A-6 USCS: CL
Reviewed by:

Zero air voids for specific gravity of 2.70



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 07-Aug-18
Lab No.: 35185047 Lab 280 RM 15 omc
Project No.: 35185047

Soil Map Unit: Bulk 1: S1, S2 OMC
Soil Symbol: A-6 / CL
Depth (in.) 0
Compaction Method Static
Max. Dry Density (pcf) 113.2
Opt. Moisture Content (%) 14.7
Inside Mold Diameter (in) 3.94

Weight of Wet Soil (lb) 6.85
Initial Sample Diameter (in) 3.94
Initial Sample Height (in) 7.87
Initial Sample Area (in^2) 12.17
Sample Volume (in^3) 95.86
Compacted Moisture Content(%) 15.0
Wet Density (pcf) 123.5
Dry Density (pcf) 107.4

Test Date: May 21, 2018

Final Sample Height (in) 7.9
Final Sample Wet Weight (lb) 6.85
Final Moisture Content (%) 14.9
Accumulated Strain (%) 0.06

Percent Passing No. 10 79
Percent Passing No. 200 52.6
Liquid Limit 35
Plasticity Index 18

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	18.8	12.2	6.6	1.54	1.00	0.546	0.0004	0.0004	0.0004	0.000053	18,746
6.00	4.00	42.7	33.8	8.9	3.51	2.78	0.730	0.0012	0.0013	0.0013	0.000162	17,151
6.00	6.00	67.5	55.9	11.6	5.55	4.59	0.954	0.0023	0.0024	0.0023	0.000295	15,561
6.00	8.00	92.1	78.1	14.0	7.57	6.42	1.150	0.0035	0.0036	0.0036	0.000454	14,133
6.00	10.00	116.4	100.3	16.1	9.56	8.24	1.325	0.0050	0.0051	0.0050	0.000638	12,902
4.01	2.00	20.7	13.1	7.6	1.70	1.08	0.622	0.0004	0.0005	0.0005	0.000061	17,791
4.01	4.00	45.1	35.5	9.6	3.71	2.92	0.789	0.0013	0.0015	0.0014	0.000178	16,348
4.01	6.00	69.5	57.5	12.0	5.71	4.72	0.988	0.0024	0.0026	0.0025	0.000318	14,862
4.01	8.00	93.9	79.5	14.4	7.71	6.53	1.180	0.0037	0.0039	0.0038	0.000486	13,439
4.01	10.00	118.0	101.3	16.7	9.69	8.32	1.368	0.0053	0.0054	0.0054	0.000680	12,243
2.00	2.00	21.3	15.0	6.3	1.75	1.23	0.514	0.0006	0.0007	0.0006	0.000078	15,733
2.00	4.00	45.6	37.0	8.5	3.74	3.04	0.701	0.0015	0.0018	0.0017	0.000210	14,460
2.00	6.00	69.8	58.9	10.9	5.73	4.84	0.895	0.0028	0.0030	0.0029	0.000367	13,189
2.00	8.00	93.9	80.6	13.2	7.71	6.62	1.088	0.0043	0.0045	0.0044	0.000553	11,973
2.00	10.00	118.1	102.7	15.4	9.70	8.44	1.264	0.0059	0.0061	0.0060	0.000763	11,052

Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 07-Aug-18
Lab No.: 35185047 Lab 280 RM 15 omc+2
Project No.: 35185047

Soil Map Unit: Bulk 1: S1, S2 OMC+2%
Soil Symbol: A-6 / CL
Depth (in.) 0
Compaction Method Static
Max. Dry Density (pcf) 113.2
Opt. Moisture Content (%) 14.7
Inside Mold Diameter (in) 3.94

Weight of Wet Soil (lb) 6.97
Initial Sample Diameter (in) 3.94
Initial Sample Height (in) 7.87
Initial Sample Area (in^2) 12.17
Sample Volume (in^3) 95.86
Compacted Moisture Content(%) 16.7
Wet Density (pcf) 125.6
Dry Density (pcf) 107.6

Test Date: May 21, 2018

Final Sample Height (in) 7.9
Final Sample Wet Weight (lb) 6.97
Final Moisture Content (%) 16.2
Accumulated Strain (%) 0.21

Percent Passing No. 10 79
Percent Passing No. 200 52.6
Liquid Limit 35
Plasticity Index 18

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	23.4	20.9	2.5	1.92	1.71	0.205	0.0011	0.0009	0.0010	0.000125	13,713
6.00	4.00	46.8	42.0	4.9	3.84	3.45	0.399	0.0023	0.0021	0.0022	0.000284	12,137
6.00	6.00	71.3	63.9	7.4	5.86	5.25	0.609	0.0043	0.0040	0.0041	0.000524	10,029
6.00	8.00	96.0	85.9	10.1	7.89	7.06	0.829	0.0067	0.0063	0.0065	0.000825	8,550
6.00	10.00	120.5	107.9	12.6	9.90	8.86	1.036	0.0091	0.0087	0.0089	0.001131	7,836
4.00	2.00	24.7	21.4	3.3	2.03	1.75	0.275	0.0012	0.0010	0.0011	0.000144	12,167
4.01	4.00	48.8	43.0	5.8	4.01	3.53	0.478	0.0028	0.0025	0.0026	0.000336	10,514
4.00	6.00	73.1	64.7	8.4	6.00	5.31	0.692	0.0049	0.0046	0.0047	0.000601	8,835
4.00	8.00	97.4	86.6	10.8	8.00	7.11	0.885	0.0075	0.0071	0.0073	0.000924	7,693
4.01	10.00	121.4	108.2	13.2	9.97	8.88	1.086	0.0101	0.0097	0.0099	0.001262	7,042
2.00	2.00	24.3	21.1	3.2	2.00	1.73	0.264	0.0014	0.0012	0.0013	0.000164	10,572
2.00	4.00	48.5	42.8	5.6	3.98	3.52	0.464	0.0032	0.0030	0.0031	0.000395	8,900
2.00	6.00	72.8	64.8	8.1	5.98	5.32	0.662	0.0058	0.0055	0.0056	0.000715	7,438
2.00	8.00	97.0	86.5	10.5	7.97	7.11	0.861	0.0087	0.0083	0.0085	0.001081	6,572
2.00	10.00	121.0	108.0	13.1	9.94	8.87	1.072	0.0117	0.0112	0.0115	0.001455	6,095

Laboratory Compaction Characteristics of Soil

4701 North Stiles Ave.
Oklahoma City, OK 73105
(405) 525 0453

Client Name: Michael Baker International, Inc.
Project Name: Bayou Derriseaux
Location: Staves, Cleveland County, Arkansas

Source Material: Bulk 2: S3, S4
Sample Description: Clayey Sand with Gravel, Brown

Material Designation: lab 281 Sample date:
Test Method: Method A
Test Procedure: ASTM D-698
Sample Preparation: Dry
Rammer: X Mechanical ___ Manual

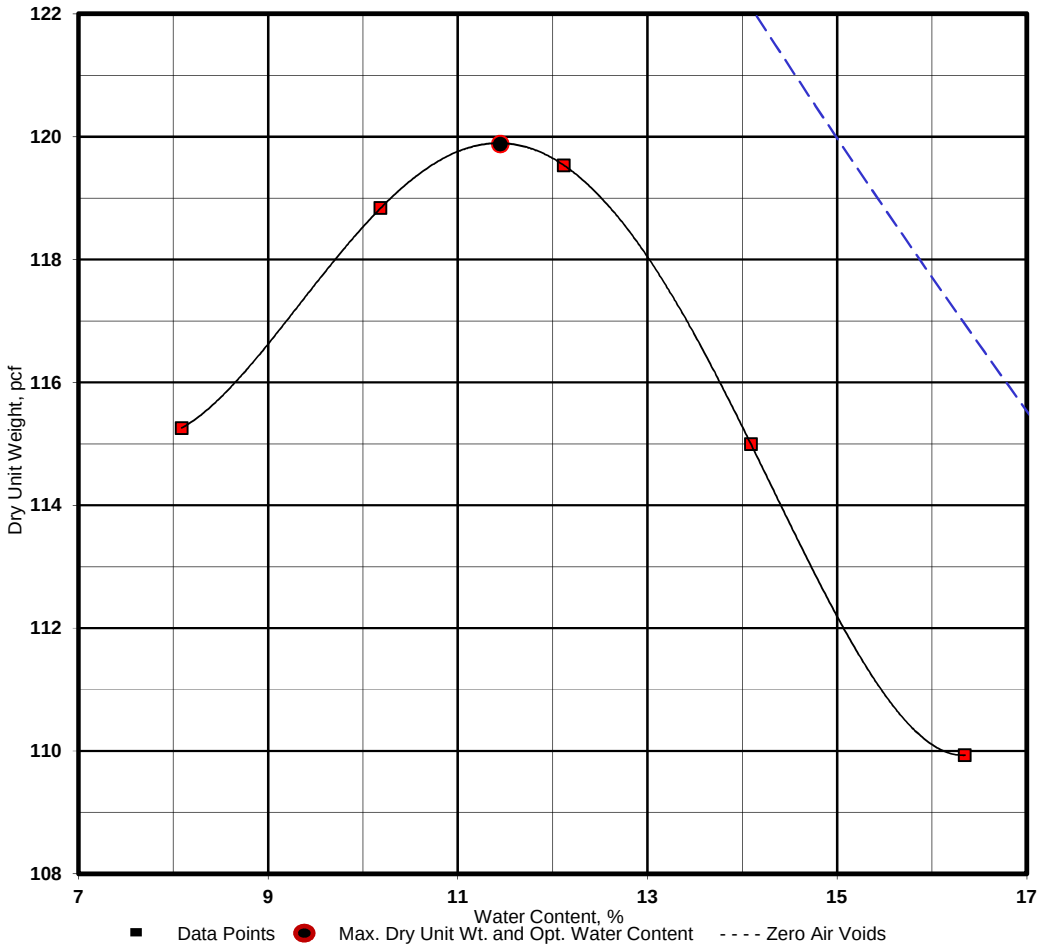
Project No.: 35185047 Date: 05/17/18

TEST RESULTS

Maximum Dry Unit Wt.: 119.9 pcf
Optimum Water Content: 11.5 %

Liquid Limit: 25 Plastic Limit: 15
Plasticity Index: 10
% passing # 200 sieve: 45.9
AASHTO Class. A-4 USCS: SC
Reviewed by:

Zero air voids for specific gravity of 2.70



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 07-Aug-18
Lab No.: 35185047 Lab 281 RM 16 omc
Project No.: 35185047

Soil Map Unit:	Bulk 2: S3, S4 OMC
Soil Symbol:	0
Depth (in.)	A-4 / SC
Compaction Method	Static
Max. Dry Density (pcf)	119.9
Opt. Moisture Content (%)	11.5
Inside Mold Diameter (in)	3.94

Weight of Wet Soil (lb)	7.04
Initial Sample Diameter (in)	3.94
Initial Sample Height (in)	7.87
Initial Sample Area (in^2)	12.17
Sample Volume (in^3)	95.86
Compacted Moisture Content(%)	11.8
Wet Density (pcf)	126.9
Dry Density (pcf)	113.5

Test Date: May 21, 2018

Final Sample Height (in)	7.9
Final Sample Wet Weight (lb)	7.04
Final Moisture Content (%)	11.8
Accumulated Strain (%)	0.15
Percent Passing No. 10	80
Percent Passing No. 200	45.9
Liquid Limit	25
Plasticity Index	10

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	22.9	19.7	3.1	1.88	1.62	0.258	0.0008	0.0009	0.0008	0.000106	15,271
6.00	4.00	46.6	41.2	5.4	3.83	3.39	0.442	0.0018	0.0020	0.0019	0.000240	14,097
6.00	6.00	71.0	63.0	7.9	5.83	5.18	0.651	0.0031	0.0035	0.0033	0.000416	12,446
6.00	8.00	95.0	84.7	10.3	7.81	6.96	0.847	0.0046	0.0051	0.0049	0.000619	11,241
6.00	10.00	119.1	106.0	13.0	9.78	8.71	1.070	0.0062	0.0067	0.0065	0.000822	10,596
4.01	2.00	24.4	20.8	3.6	2.00	1.71	0.296	0.0010	0.0011	0.0011	0.000134	12,795
4.00	4.00	48.5	42.3	6.2	3.98	3.47	0.507	0.0022	0.0026	0.0024	0.000305	11,380
4.00	6.00	72.4	63.9	8.5	5.95	5.25	0.700	0.0038	0.0042	0.0040	0.000510	10,279
4.01	8.00	96.7	85.7	10.9	7.94	7.04	0.898	0.0056	0.0060	0.0058	0.000736	9,572
4.01	10.00	120.3	107.0	13.3	9.88	8.78	1.092	0.0073	0.0078	0.0075	0.000958	9,165
2.00	2.00	24.3	21.0	3.3	2.00	1.73	0.269	0.0012	0.0014	0.0013	0.000166	10,421
2.00	4.00	48.3	42.7	5.6	3.97	3.50	0.462	0.0029	0.0032	0.0031	0.000387	9,044
2.00	6.00	72.3	64.1	8.2	5.94	5.27	0.673	0.0049	0.0053	0.0051	0.000643	8,187
2.00	8.00	96.6	86.0	10.6	7.93	7.07	0.868	0.0069	0.0073	0.0071	0.000905	7,804
2.00	10.00	120.4	107.3	13.1	9.89	8.81	1.072	0.0088	0.0094	0.0091	0.001160	7,597

Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 07-Aug-18
Lab No.: 35185047 Lab 281 RM 16 omc+2
Project No.: 35185047

Soil Map Unit: Bulk 2: S3, S4 OMC+2%
Soil Symbol: A-4 / SC
Depth (in.) 0
Compaction Method Static
Max. Dry Density (pcf) 119.9
Opt. Moisture Content (%) 11.5
Inside Mold Diameter (in) 3.94

Weight of Wet Soil (lb) 7.18
Initial Sample Diameter (in) 3.94
Initial Sample Height (in) 7.87
Initial Sample Area (in^2) 12.17
Sample Volume (in^3) 95.86
Compacted Moisture Content(%) 13.2
Wet Density (pcf) 129.4
Dry Density (pcf) 114.3

Test Date: May 21, 2018

Final Sample Height (in) 7.8
Final Sample Wet Weight (lb) 7.18
Final Moisture Content (%) 13.2
Accumulated Strain (%) 0.34

Percent Passing No. 10 80
Percent Passing No. 200 45.9
Liquid Limit 25
Plasticity Index 10

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	23.6	21.2	2.4	1.94	1.74	0.197	0.0010	0.0011	0.0011	0.000134	12,969
6.00	4.00	47.8	43.0	4.8	3.93	3.53	0.395	0.0023	0.0025	0.0024	0.000306	11,525
6.00	6.00	71.9	64.6	7.3	5.90	5.30	0.600	0.0040	0.0044	0.0042	0.000538	9,853
6.00	8.00	95.5	85.7	9.8	7.85	7.04	0.809	0.0060	0.0064	0.0062	0.000789	8,920
6.00	10.00	119.1	107.0	12.1	9.78	8.79	0.994	0.0078	0.0083	0.0080	0.001021	8,608
4.01	2.00	24.2	20.9	3.3	1.99	1.72	0.270	0.0011	0.0014	0.0013	0.000161	10,678
4.01	4.00	48.4	42.7	5.7	3.97	3.51	0.466	0.0028	0.0032	0.0030	0.000386	9,091
4.00	6.00	72.4	64.2	8.2	5.95	5.28	0.671	0.0050	0.0054	0.0052	0.000661	7,982
4.00	8.00	96.5	86.1	10.4	7.92	7.07	0.853	0.0072	0.0076	0.0074	0.000941	7,515
4.00	10.00	120.2	107.3	12.9	9.87	8.82	1.058	0.0092	0.0098	0.0095	0.001206	7,310
2.00	2.00	23.9	20.7	3.2	1.96	1.70	0.265	0.0015	0.0017	0.0016	0.000204	8,310
2.00	4.00	47.9	42.4	5.5	3.93	3.48	0.451	0.0038	0.0042	0.0040	0.000508	6,849
2.00	6.00	71.8	64.0	7.8	5.89	5.25	0.638	0.0065	0.0070	0.0067	0.000857	6,131
2.00	8.00	95.9	85.6	10.3	7.87	7.03	0.845	0.0089	0.0094	0.0092	0.001166	6,029
2.00	10.00	119.6	106.9	12.8	9.83	8.78	1.050	0.0112	0.0118	0.0115	0.001455	6,030

SUPPORTING INFORMATION

GENERAL NOTES
DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING	WATER LEVEL	FIELD TESTS
Standard Penetration Test	**Water Initially Encountered** **Water Level After a Specified Period of Time** **Water Level After a Specified Period of Time** Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	**N** Standard Penetration Test Resistance (Blows/Ft.) **(HP)** Hand Penetrometer **(T)** Torvane **(DCP)** Dynamic Cone Penetrometer **UC** Unconfined Compressive Strength **(PID)** Photo-Ionization Detector **(OVA)** Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

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

LOCATION AND ELEVATION NOTES

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

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF FINES	
Descriptive Term(s) of other constituents	Percent of Dry Weight	**Descriptive Term(s) of other constituents**	**Percent of Dry Weight**
Trace	<15	Trace	<5
With	15-29	With	5-12
Modifier	>30	Modifier	>12

GRAIN SIZE TERMINOLOGY		PLASTICITY DESCRIPTION	
Major Component of Sample	**Particle Size**	**Term**	**Plasticity Index**
Boulders	Over 12 in. (300 mm)	Non-plastic	0
Cobbles	12 in. to 3 in. (300mm to 75mm)	Low	1 - 10
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)	Medium	11 - 30
Sand	#4 to #200 sieve (4.75mm to 0.075mm	High	> 30
Silt or Clay	Passing #200 sieve (0.075mm)		

UNIFIED SOIL CLASSIFICATION SYSTEM

Job No. 070415 ■ Staves, Cleveland County, Arkansas

August 20, 2018 ■ Terracon Project No. 35185047

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

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ³ 15% sand, add “with sand” to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add “with organic fines” to group name.

[I] If soil contains ³ 15% gravel, add “with gravel” to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.

[L] If soil contains ³ 30% plus No. 200 predominantly sand, add “sandy” to group name.

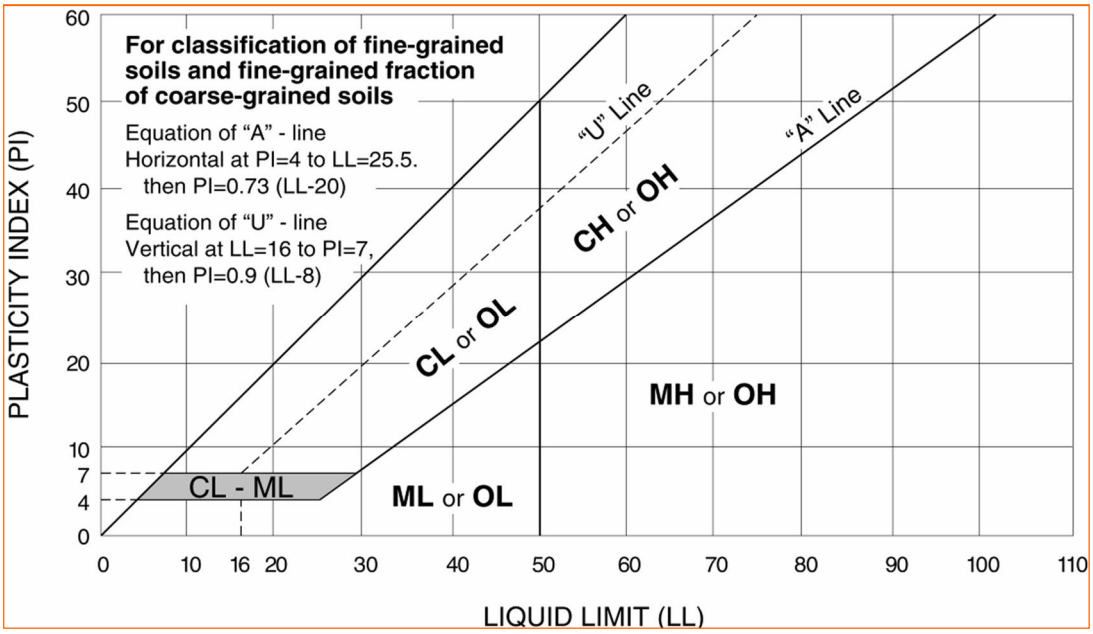
[M] If soil contains ³ 30% plus No. 200, predominantly gravel, add “gravelly” to group name.

[N] PI ³ 4 and plots on or above “A” line.

[O] PI < 4 or plots below “A” line.

[P] PI plots on or above “A” line.

[Q] PI plots below “A” line.



February 17, 2020

Michael Baker International,
1400 West Markham, Suite 204
Little Rock, Arkansas 72201

Attn: Mr. Scott Thornsberry
P: (501) 244-1004
E: scott.thornsberry@mbakerintl.com

Re: WEAP Driveability Study
Bayou Derriseaux Structures
Highway 212
Staves, Cleveland County, Arkansas
Terracon Project No. 35185047

Dear Mr. Thornsberry:

This letter provides supplemental geotechnical recommendations for the above referenced project. Geotechnical recommendations for this project were provided in Terracon Report No. 35185047.R1, dated September 28, 2018.

Terracon Consultants, Inc. (Terracon) has completed preliminary Wave Equation analyses to evaluate the suitability of a hammer and pile system for the above referenced project. For these analyses, a Delmag D 30-32 diesel hammer driving system with a rated energy of 58.3 kip-ft was assumed to drive both the 18-inch and 24-inch close ended steel pipe piles, without concrete fill, at the referenced project to depths between 65 to 90 feet on bridge structures M3994 and M3995.

The preliminary wave equation drivability analyses were performed using GRLWEAP 2010, developed by GRL Engineers and maintained and further developed by Pile Dynamics, Inc. For these analyses, we have used hammer system default input values provided by the software when using steel pipe piles along with soil input parameters consisting of shaft and toe damping values, shaft and toe quake values, the soil profile from borings B-1 to B-5, and hammer efficiency of 0.75 as summarized in Table 1 below.

Table 1. WEAP Input Table for Drivability Analyses

WEAP Input	
Pile Types	18-inch and 24-inch steel pipe piles with ½ inch wall thickness
Pile Length	65 to 90 feet
Pile Penetration	65 to 90 feet
Soil Borings Used	Borings B-1 thru B-5

WEAP Input		
Hammer Efficiency (Default)		0.75
Rated Energy (ft-kip)		75.4
Hammer Cushion	Area	415 in^2
	Elastic Modulus	530 ksi
	Thickness	2 inches (1-inch Nylon + 2 x ½-inch Aluminum)
	C.O.R. (Equivalent)	0.8
Pile Cushion	Elastic Modulus (assumed)	NA
	Initial Thickness (assumed)	NA
Helmet	Total Weight (kips) (provided)	2.5 kips
Damping (Estimated)	Shaft	0.185 sec/ft
	Toe	0.15 sec/ft
Quake (Estimated)	Shaft	0.1 in
	Toe	0.298 in
Stroke Height (max. Rated)		11.4 ft
Resistance Gain/Loss Factor		0.5 (Shaft) / 1.0 (Toe) – Initial Drive Condition 1.0 (Shaft) / 1.0 (Toe) – Restrike Condition (Soil Setup)
Soil Profile		See Borings B-1 thru B-5
Steel yield strength (fy)		50 ksi
Estimated maximum allowable pile driving stresses (Using AASHTO Specifications)		.90(50 ksi)=45 ksi (compression and tension)

Based on the preliminary WEAP drivability analyses, an Delmag D30-32 hammer system appears to be capable of driving piles without achieving practical refusal. The analyses also indicate that the maximum hammer stroke height did not exceed 9.2 feet and the compressive stresses stayed below 30.4 ksi during initial drive and beginning of restrike for all WEAP runs.

	Summary of Pile Lengths based on WEAP Analysis Results					
Bridge Name	End Bent 1 18" Dia Length (ft)	Bent 2 24" Dia Length (ft)	Bent 3 24" Dia Length (ft)	Bent 4 24" Dia or End Bent 4 18" Diameter Length (ft)	Bent 5 24" Dia Length (ft)	End Bent 6 18" Dia Length (ft)
M3994	68	88	90	68		
M3995	65	85	85	85	90	68

Many assumptions are made in the performance of WEAP drivability analyses; therefore, the WEAP results above are preliminary. **Acceptance of all pile driving equipment and procedures are subject to satisfactory field performance during test pile program.** We suggest test piles be located on piles to confirm drivability and capacity using PDA testing and subsequent CAPWAP analysis.

If pile type or dimensions change and if hammer type or size change, additional analyses should be performed.

Sincerely,
Terracon Consultants, Inc.

Kimberly A. Daggitt, P.E.
Project Engineer

Christopher S. Handley, P.E.
Department Manager

SME: Alfred H. Hartley, M.S.C.E. – Birmingham, Alabama Office

Attachment: Preliminary WEAP Analysis

WEAP Analysis Attachments

WEAP Estimated Ultimate Capacity

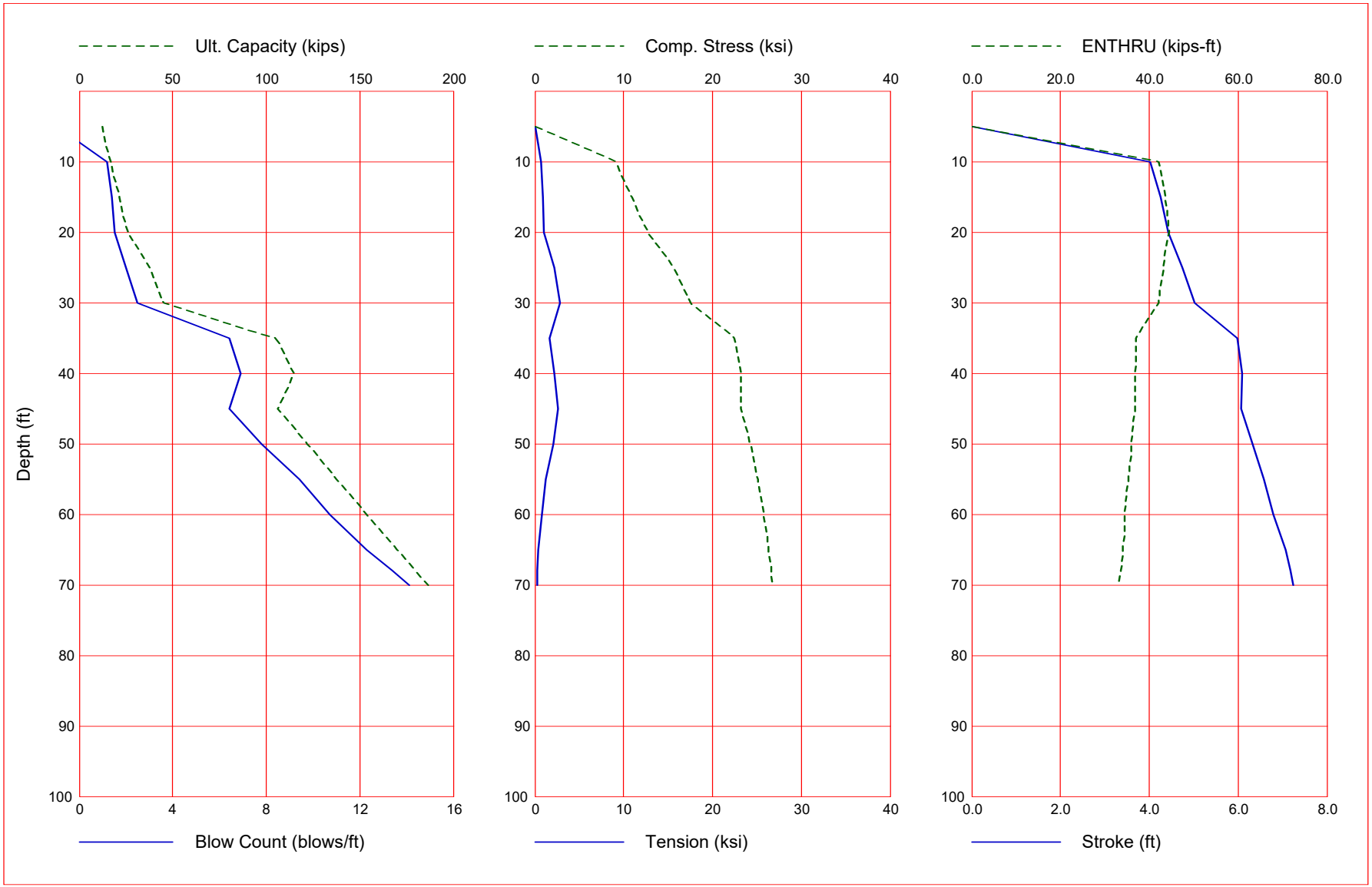
Bridge Name	Embedment Pile Length	Pile Diameter (in)	**End of Initial Drive Capacity (kips)**	**7 Day Setup Capacity (kips)**	**Required Ultimate Capacity (kips)**
M3994					
Abutment 1	68+	18	179.7	**305.5**	**292**
Bent 2	88+	24	336.4	**583.2**	**568**
Bent 3	90+	24	337.7	**585.7**	**568**
Abutment 4	68+	18	180.0	**306.1**	**292**
M3995					
Abutment 1	65+	18	230.4	**300.9**	**280**
Bent 2	85+	24	441.6	**558.3**	**532**
Bent 3	85+	24	441.6	**558.3**	**532**
Bent 4	85+	24	441.6	**558.3**	**532**
Bent 5	90+	24	399.6	**564.0**	**532**
Abutment 6	68+	18	223.3	**288.7**	**280**

Using Delmag D30-32 Diesel Hammer
Pile driven down to estimated tip
without concrete

TSVC, INC. - BIRMINGHAM
35185047 M3994 BT 1 18 in Pile EOD

May 07 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



TSVC, INC. - BIRMINGHAM May 07 2020
35185047 M3994 BT 1 18 in Pile EOD GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

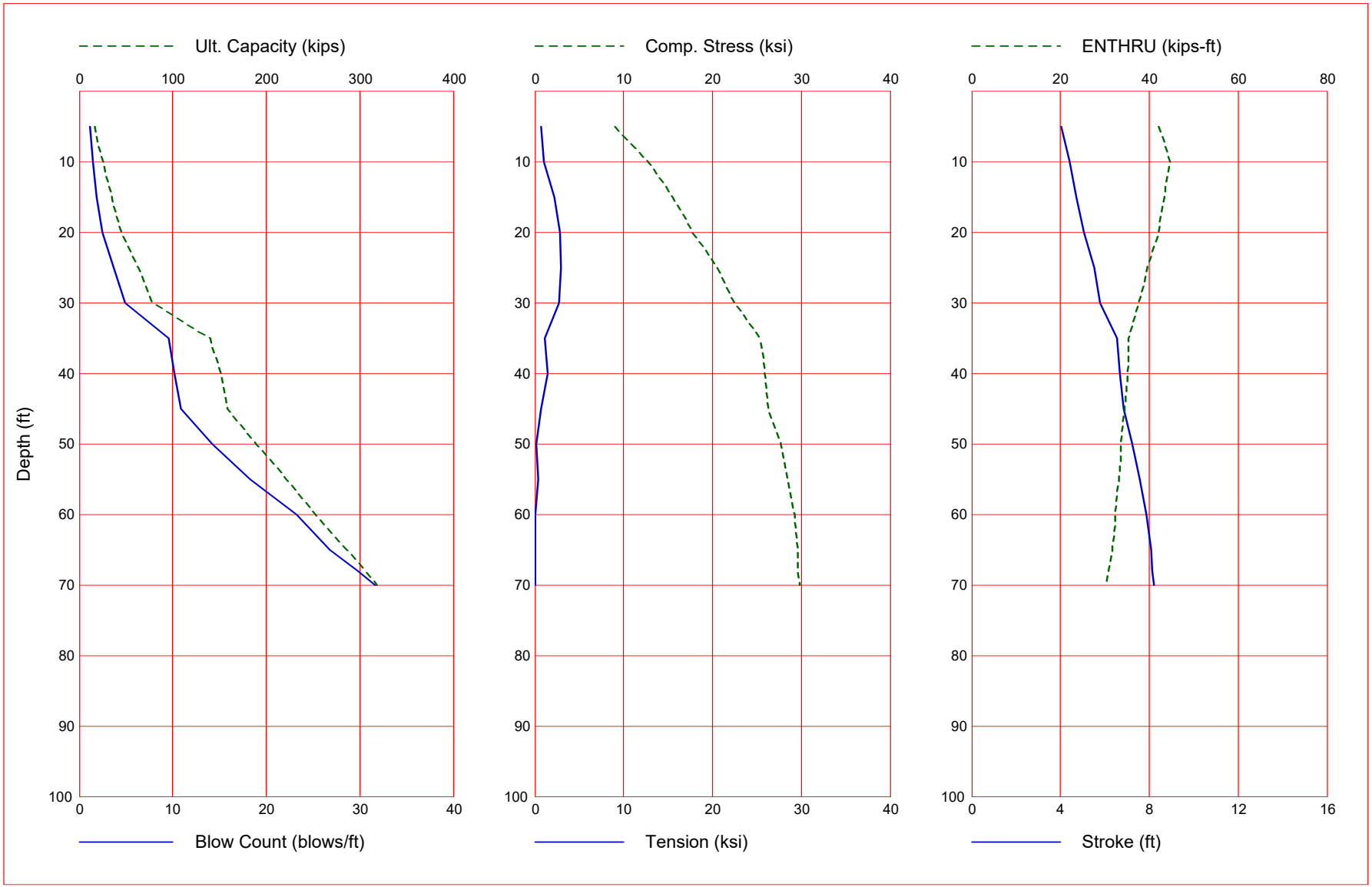
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	12.3	4.4	7.9	-1.0	0.000	0.000	0.00	0.0
10.0	16.9	8.9	7.9	1.2	9.108	-0.712	4.03	42.1
15.0	21.5	13.6	7.9	1.4	10.948	-0.866	4.25	43.6
20.0	26.3	18.3	7.9	1.5	12.784	-1.047	4.42	44.4
25.0	37.6	25.7	11.9	2.0	15.678	-2.151	4.75	43.2
30.0	45.1	33.2	11.9	2.5	17.549	-2.790	5.03	42.1
35.0	105.5	41.6	64.0	6.4	22.484	-1.657	5.98	37.1
40.0	114.9	50.9	64.0	6.9	23.193	-2.177	6.09	36.7
45.0	106.1	66.3	39.8	6.4	23.167	-2.623	6.06	36.7
50.0	121.7	81.9	39.8	7.8	24.238	-2.058	6.33	35.9
55.0	137.5	97.7	39.8	9.4	25.068	-1.277	6.59	35.2
60.0	153.5	113.8	39.8	10.7	25.749	-0.825	6.80	34.5
65.0	169.8	130.1	39.8	12.3	26.331	-0.399	7.08	34.0
68.0	179.7	140.0	39.8	13.4	26.600	-0.245	7.18	33.5
70.0	186.4	146.6	39.8	14.1	26.724	-0.252	7.25	33.2

Total Continuous Driving Time 8.00 minutes; Total Number of Blows 372 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3994 BT 1 18 in Pile BOR

May 07 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

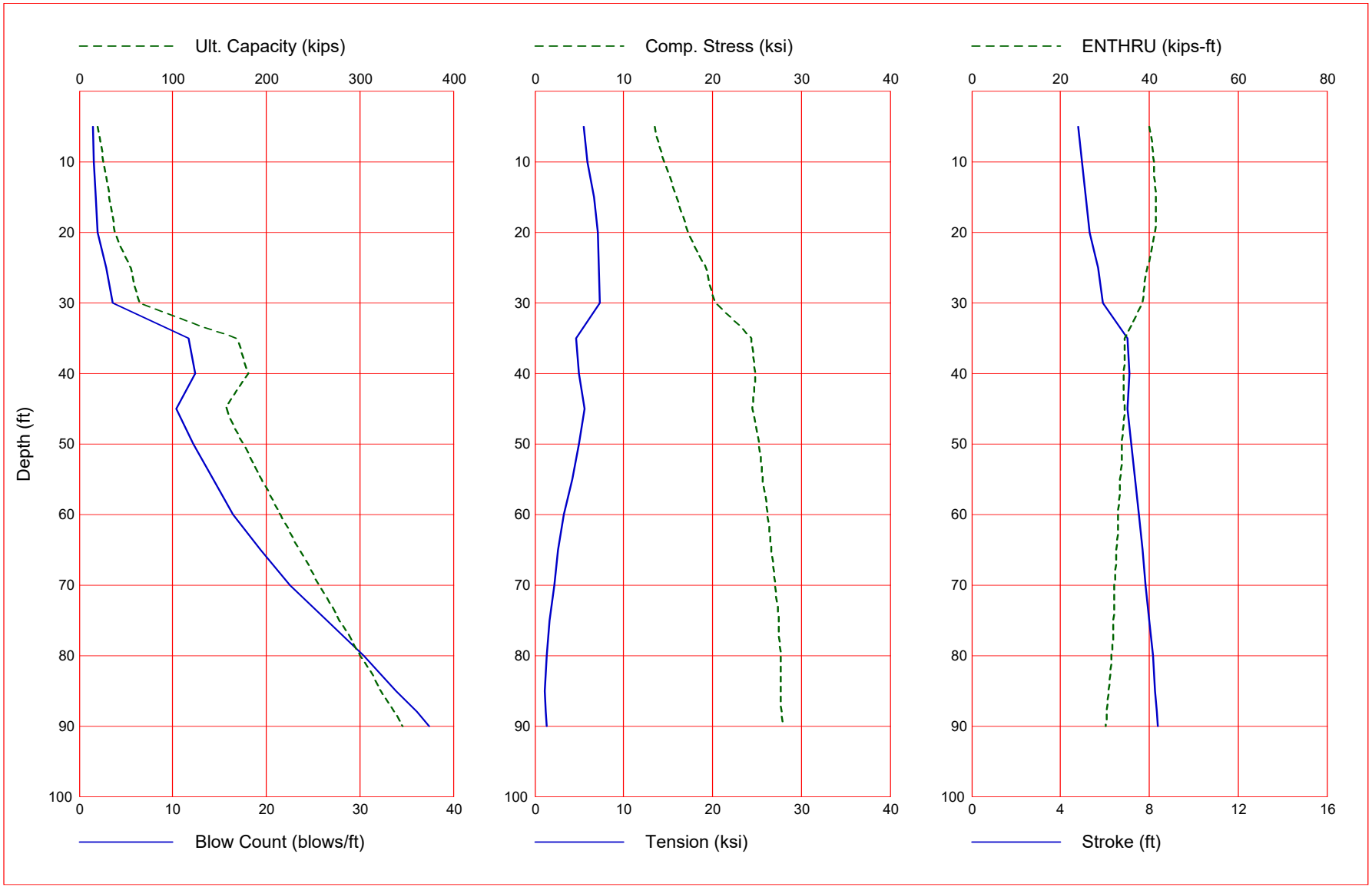
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	16.7	8.8	7.9	1.2	9.046	-0.677	4.02	42.1
10.0	25.8	17.8	7.9	1.5	12.705	-1.015	4.42	44.6
15.0	35.1	27.1	7.9	1.9	15.502	-2.161	4.71	43.5
20.0	44.6	36.7	7.9	2.5	17.801	-2.845	5.04	42.1
25.0	63.3	51.4	11.9	3.7	20.564	-2.913	5.51	39.5
30.0	78.3	66.3	11.9	4.9	22.428	-2.702	5.78	37.7
35.0	140.4	76.4	64.0	9.6	25.293	-1.139	6.57	35.4
40.0	151.6	87.7	64.0	10.2	25.840	-1.443	6.66	35.0
45.0	158.1	118.4	39.8	10.9	26.320	-0.737	6.83	34.4
50.0	189.3	149.6	39.8	14.2	27.645	-0.114	7.23	33.6
55.0	221.0	181.2	39.8	18.3	28.405	-0.334	7.57	33.1
60.0	253.1	213.4	39.8	23.2	29.312	-0.041	7.86	32.4
65.0	285.7	245.9	39.8	26.8	29.609	0.000	8.10	31.7
68.0	305.5	265.7	39.8	29.7	29.595	0.000	8.14	30.8
70.0	318.8	279.0	39.8	31.6	29.818	0.000	8.23	30.5

Total Continuous Driving Time 16.00 minutes; Total Number of Blows 722 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3994 BT 2 24 in Pile EOD

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



TSVC, INC. - BIRMINGHAM May 08 2020
35185047 M3994 BT 2 24 in Pile EOD GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

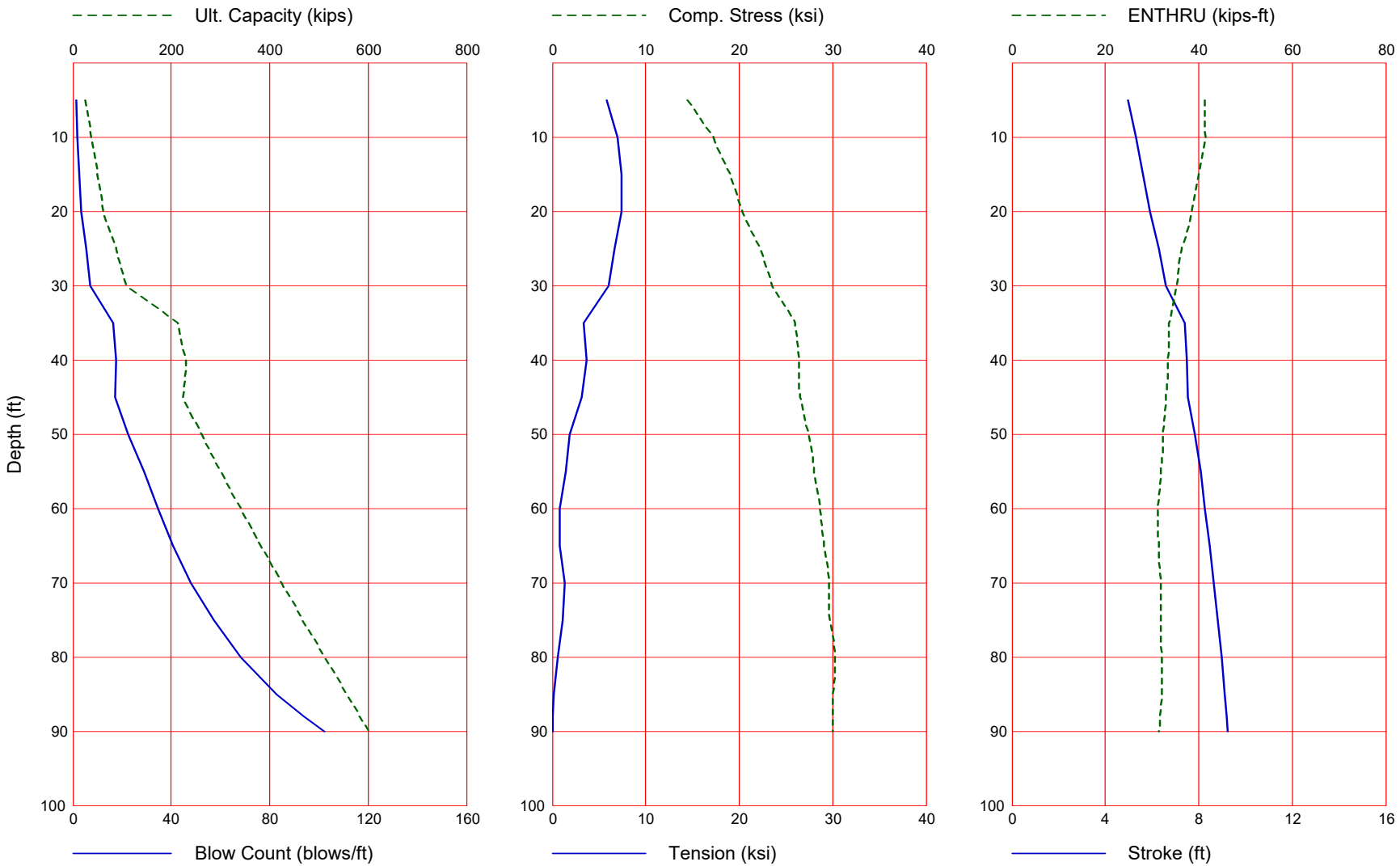
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	20.0	5.8	14.1	1.5	13.459	-5.488	4.81	40.0
10.0	25.9	11.8	14.1	1.6	14.552	-5.908	4.97	41.1
15.0	32.0	17.9	14.1	1.8	15.995	-6.625	5.16	41.4
20.0	38.2	24.1	14.1	2.0	17.267	-7.080	5.33	41.2
25.0	54.9	33.7	21.2	2.9	19.237	-7.241	5.68	39.5
30.0	64.6	43.4	21.2	3.6	20.331	-7.356	5.89	38.4
35.0	168.3	54.6	113.7	11.7	24.379	-4.636	7.02	34.5
40.0	180.8	67.1	113.7	12.4	24.794	-4.940	7.11	34.3
45.0	156.4	85.8	70.7	10.4	24.487	-5.606	7.00	34.4
50.0	175.6	104.9	70.7	12.2	25.192	-4.998	7.18	33.9
55.0	195.2	124.5	70.7	14.3	25.704	-4.172	7.36	33.4
60.0	215.3	144.6	70.7	16.5	26.196	-3.281	7.51	32.9
65.0	235.8	165.2	70.7	19.4	26.629	-2.562	7.68	32.6
70.0	256.9	186.2	70.7	22.5	27.036	-2.154	7.84	32.1
75.0	278.4	207.7	70.7	26.5	27.428	-1.704	8.00	31.8
80.0	300.3	229.6	70.7	30.4	27.716	-1.317	8.15	31.5
85.0	322.8	252.1	70.7	33.9	27.716	-1.161	8.25	30.8
88.0	336.4	265.8	70.7	36.1	27.832	-1.246	8.34	30.4
90.0	345.7	275.0	70.7	37.4	27.864	-1.320	8.40	30.2

Total Continuous Driving Time 28.00 minutes; Total Number of Blows 1209 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3994 BT 2 24 in Pile BOR

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

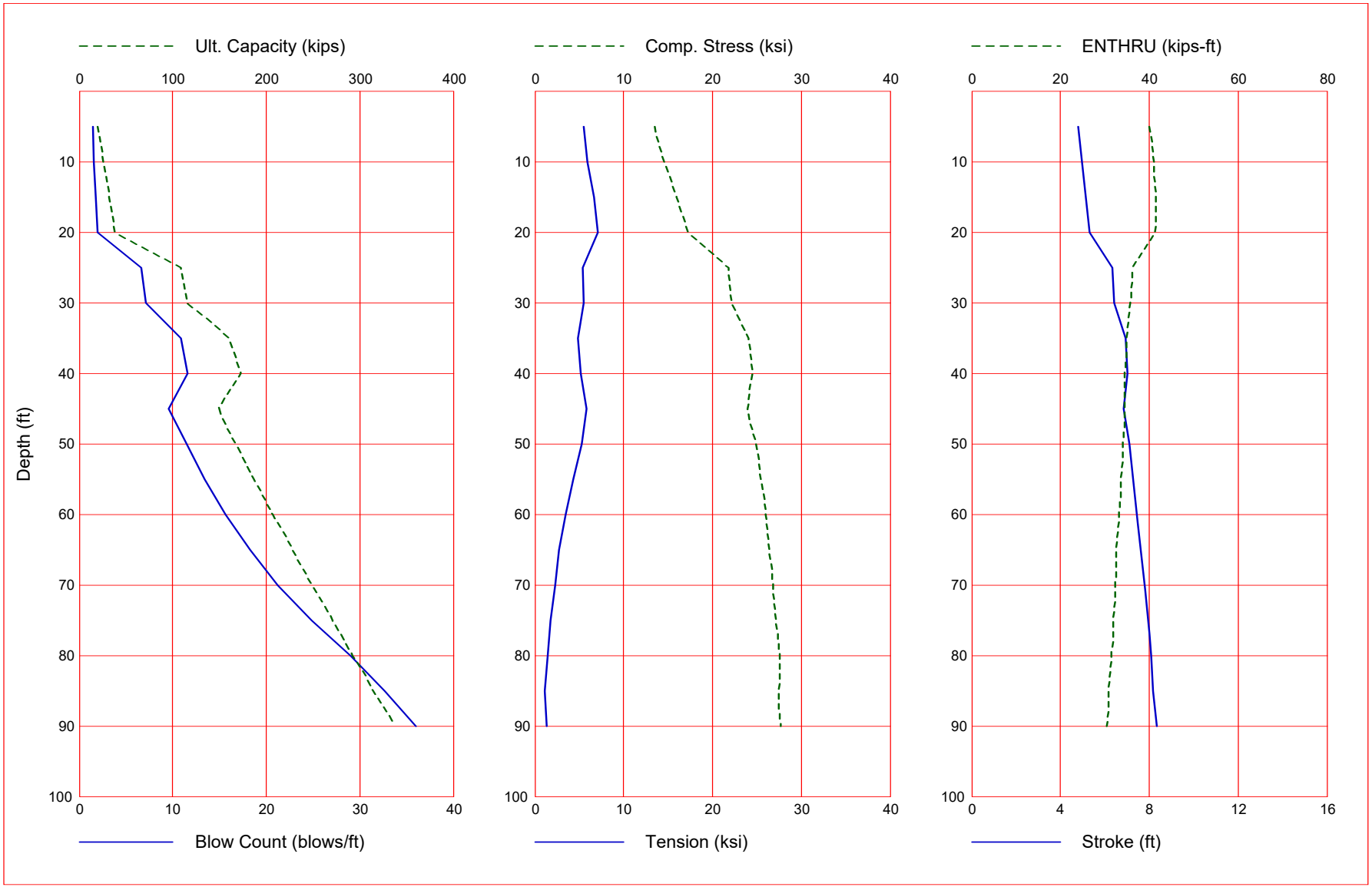
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	25.8	11.7	14.1	1.6	14.505	-5.823	4.97	41.3
10.0	37.7	23.6	14.1	2.0	17.204	-6.967	5.32	41.4
15.0	49.9	35.7	14.1	2.6	19.012	-7.406	5.62	39.9
20.0	62.3	48.2	14.1	3.5	20.363	-7.435	5.89	38.4
25.0	88.5	67.3	21.2	5.4	22.227	-6.660	6.30	36.3
30.0	108.0	86.8	21.2	7.1	23.531	-6.012	6.59	35.2
35.0	213.9	100.2	113.7	16.5	25.988	-3.335	7.42	33.5
40.0	228.9	115.2	113.7	17.7	26.451	-3.648	7.50	33.3
45.0	223.2	152.6	70.7	17.2	26.559	-3.176	7.55	32.9
50.0	261.5	190.9	70.7	22.6	27.484	-1.878	7.82	32.4
55.0	300.8	230.1	70.7	29.0	28.011	-1.390	8.07	31.9
60.0	340.9	270.3	70.7	34.5	28.654	-0.790	8.24	31.2
65.0	382.0	311.4	70.7	40.7	29.022	-0.780	8.47	31.5
70.0	424.1	353.4	70.7	48.1	29.568	-1.301	8.65	31.8
75.0	467.1	396.4	70.7	57.2	29.720	-1.128	8.83	31.9
80.0	511.0	440.3	70.7	68.4	30.202	-0.553	8.98	32.1
85.0	555.9	485.2	70.7	82.9	30.075	-0.112	9.11	32.0
88.0	583.2	512.6	70.7	93.8	30.060	0.000	9.18	31.7
90.0	601.7	531.0	70.7	102.2	30.038	0.000	9.22	31.4

Total Continuous Driving Time 62.00 minutes; Total Number of Blows 2533 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3994 BT 3 24 in Pile EOD

May 07 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

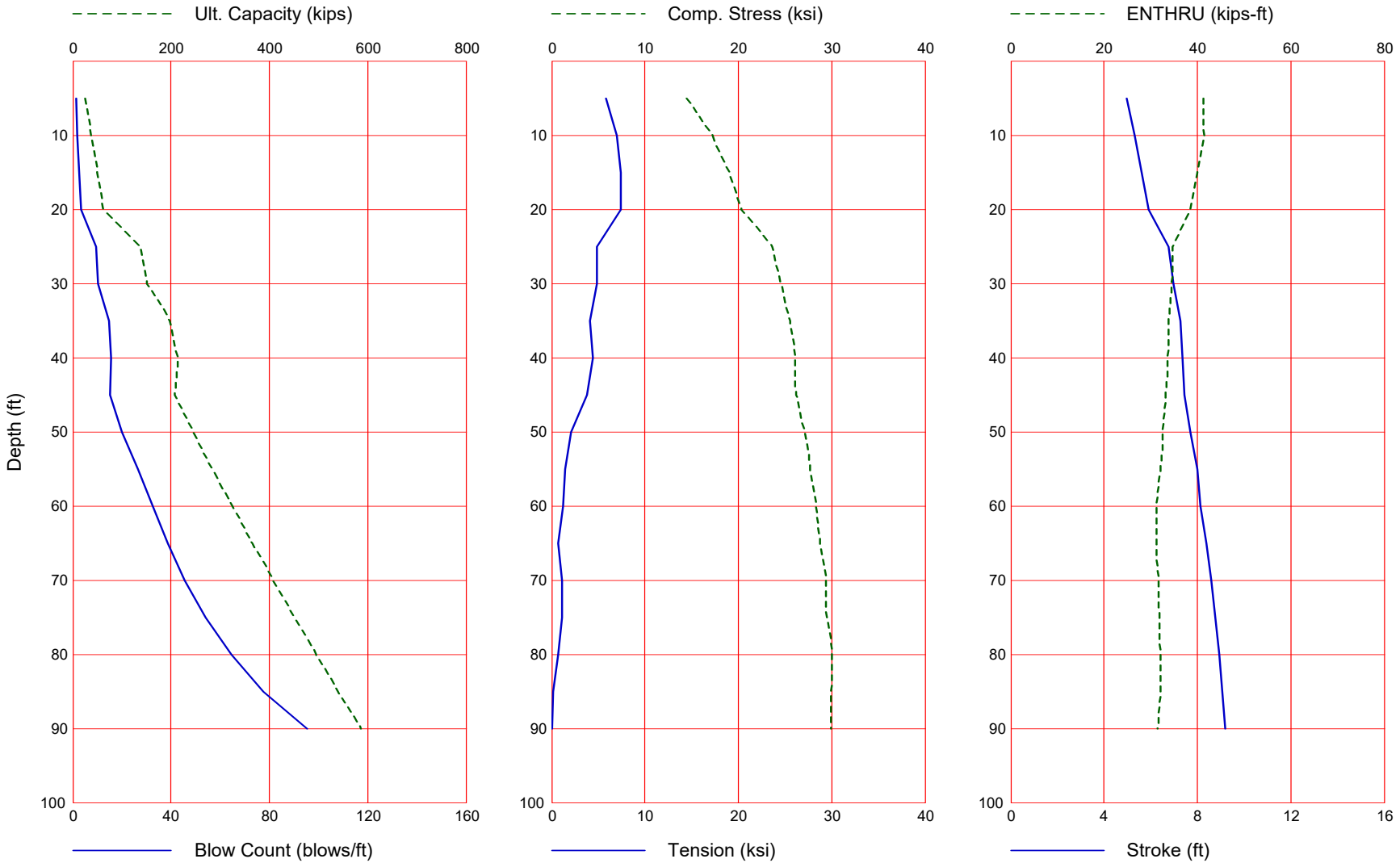
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	20.0	5.8	14.1	1.5	13.459	-5.488	4.81	40.0
10.0	25.9	11.8	14.1	1.6	14.552	-5.908	4.97	41.1
15.0	32.0	17.9	14.1	1.8	15.995	-6.625	5.16	41.4
20.0	38.2	24.1	14.1	2.0	17.267	-7.080	5.33	41.2
25.0	108.6	29.3	79.3	6.6	21.781	-5.394	6.34	36.2
30.0	114.7	35.4	79.3	7.1	22.177	-5.455	6.44	35.8
35.0	160.3	46.6	113.7	10.9	24.001	-4.864	6.94	34.8
40.0	172.8	59.1	113.7	11.6	24.494	-5.205	7.03	34.5
45.0	148.5	77.8	70.7	9.6	23.999	-5.809	6.84	34.5
50.0	167.6	96.9	70.7	11.5	24.940	-5.252	7.10	34.1
55.0	187.2	116.5	70.7	13.4	25.438	-4.354	7.28	33.6
60.0	207.3	136.6	70.7	15.6	26.002	-3.463	7.45	33.1
65.0	227.9	157.2	70.7	18.3	26.417	-2.693	7.62	32.6
70.0	248.9	178.2	70.7	21.2	26.831	-2.281	7.77	32.3
75.0	270.4	199.7	70.7	24.9	27.182	-1.800	7.94	31.9
80.0	292.3	221.7	70.7	29.0	27.585	-1.421	8.09	31.5
85.0	314.8	244.1	70.7	32.7	27.499	-1.124	8.18	30.8
90.0	337.7	267.0	70.7	36.0	27.722	-1.326	8.34	30.3

Total Continuous Driving Time 28.00 minutes; Total Number of Blows 1185 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3994 BT 3 24 in Pile BOR

May 07 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



TSVC, INC. - BIRMINGHAM May 07 2020
35185047 M3994 BT 3 24 in Pile BOR GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

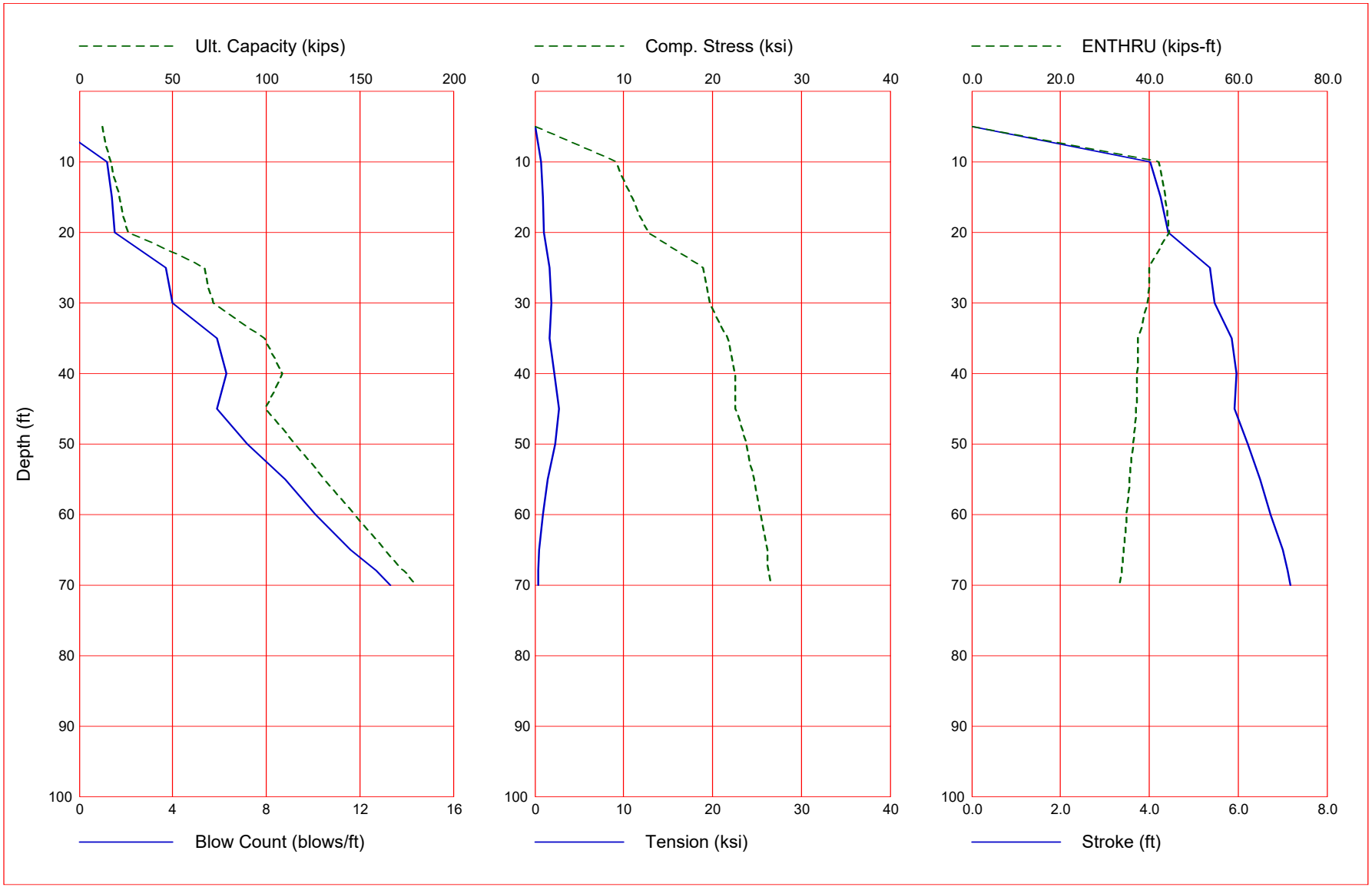
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	25.8	11.7	14.1	1.6	14.505	-5.823	4.97	41.3
10.0	37.7	23.6	14.1	2.0	17.204	-6.967	5.32	41.4
15.0	49.9	35.7	14.1	2.6	19.012	-7.406	5.62	39.9
20.0	62.3	48.2	14.1	3.5	20.363	-7.435	5.89	38.4
25.0	138.0	58.7	79.3	9.4	23.638	-4.875	6.76	34.7
30.0	150.1	70.8	79.3	10.5	24.626	-4.810	6.98	34.5
35.0	198.0	84.2	113.7	14.7	25.537	-4.111	7.29	33.8
40.0	213.0	99.3	113.7	15.7	26.037	-4.382	7.38	33.5
45.0	207.3	136.6	70.7	15.3	26.147	-3.824	7.43	33.2
50.0	245.6	174.9	70.7	20.2	27.148	-2.089	7.71	32.6
55.0	284.8	214.1	70.7	26.7	27.723	-1.452	7.98	32.1
60.0	325.0	254.3	70.7	32.8	28.313	-1.180	8.13	31.3
65.0	366.1	295.4	70.7	38.6	28.731	-0.687	8.39	31.2
70.0	408.1	337.5	70.7	45.6	29.427	-1.126	8.58	31.6
75.0	451.1	380.4	70.7	54.1	29.542	-1.105	8.76	31.8
80.0	495.0	424.4	70.7	64.8	29.997	-0.679	8.92	32.0
85.0	539.9	469.2	70.7	77.6	29.942	-0.137	9.06	32.1
90.0	585.7	515.0	70.7	95.4	29.949	0.000	9.18	31.5

Total Continuous Driving Time 59.00 minutes; Total Number of Blows 2413 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3994 BT 4 18 in Pile EOD

May 07 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



TSVC, INC. - BIRMINGHAM May 07 2020
35185047 M3994 BT 4 18 in Pile EOD GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

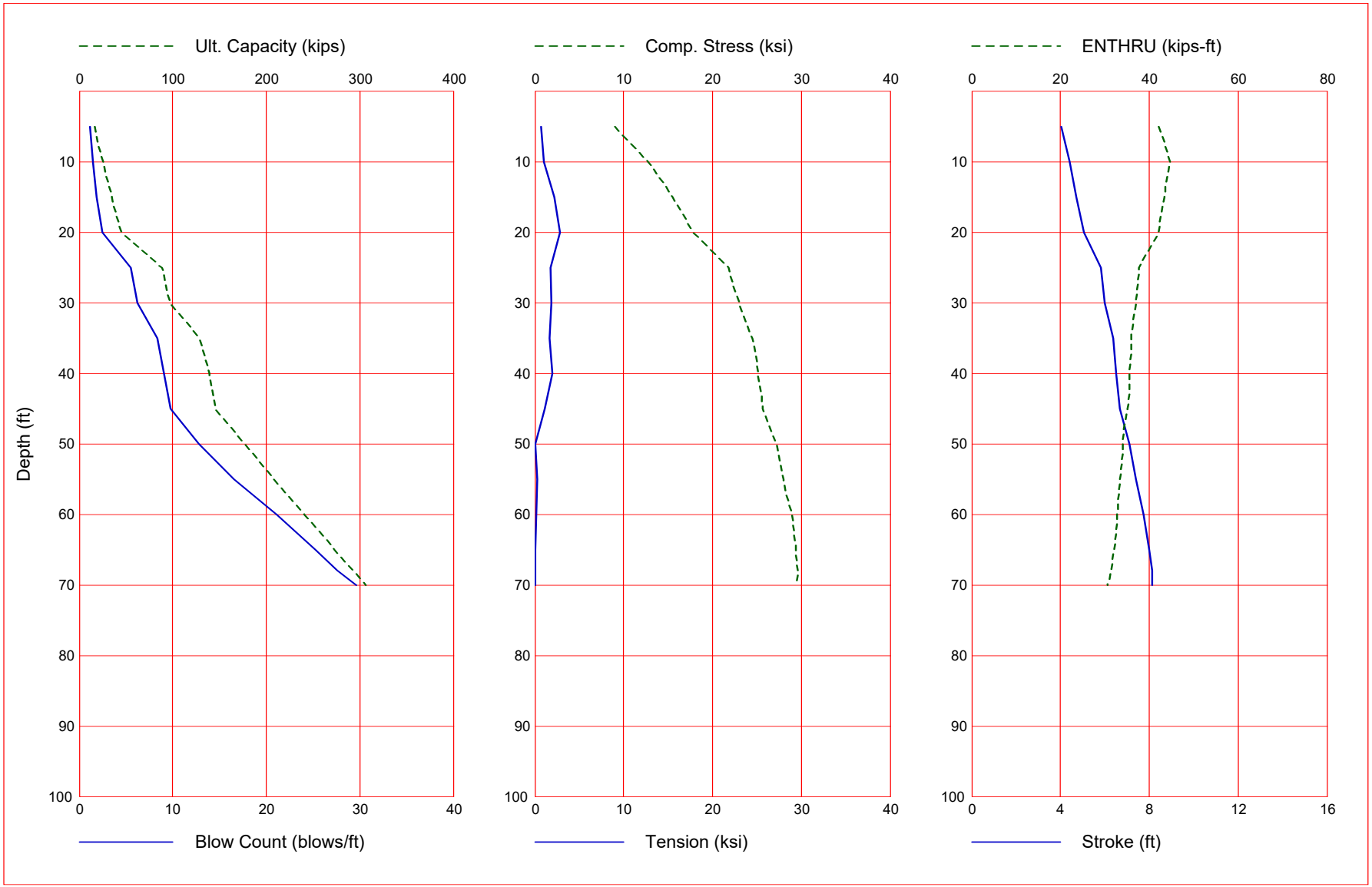
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	12.3	4.4	7.9	-1.0	0.000	0.000	0.00	0.0
10.0	16.9	8.9	7.9	1.2	9.108	-0.712	4.03	42.1
15.0	21.5	13.6	7.9	1.4	10.948	-0.866	4.25	43.6
20.0	26.3	18.3	7.9	1.5	12.784	-1.047	4.42	44.4
25.0	66.9	22.3	44.6	3.7	18.929	-1.654	5.36	40.1
30.0	71.4	26.8	44.6	4.0	19.709	-1.862	5.47	39.6
35.0	99.2	35.2	64.0	5.9	21.749	-1.682	5.85	37.5
40.0	108.6	44.6	64.0	6.3	22.576	-2.236	5.97	37.2
45.0	99.7	60.0	39.8	5.9	22.604	-2.705	5.93	37.1
50.0	115.3	75.5	39.8	7.2	23.837	-2.246	6.22	36.3
55.0	131.1	91.4	39.8	8.8	24.666	-1.439	6.49	35.5
60.0	147.2	107.4	39.8	10.1	25.422	-0.929	6.72	34.8
65.0	163.5	123.7	39.8	11.6	26.147	-0.516	7.00	34.3
68.0	173.4	133.6	39.8	12.7	26.329	-0.378	7.11	33.8
70.0	180.0	140.3	39.8	13.3	26.477	-0.388	7.18	33.4

Total Continuous Driving Time 8.00 minutes; Total Number of Blows 367 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3994 BT 4 18 in Pile BOR

May 07 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

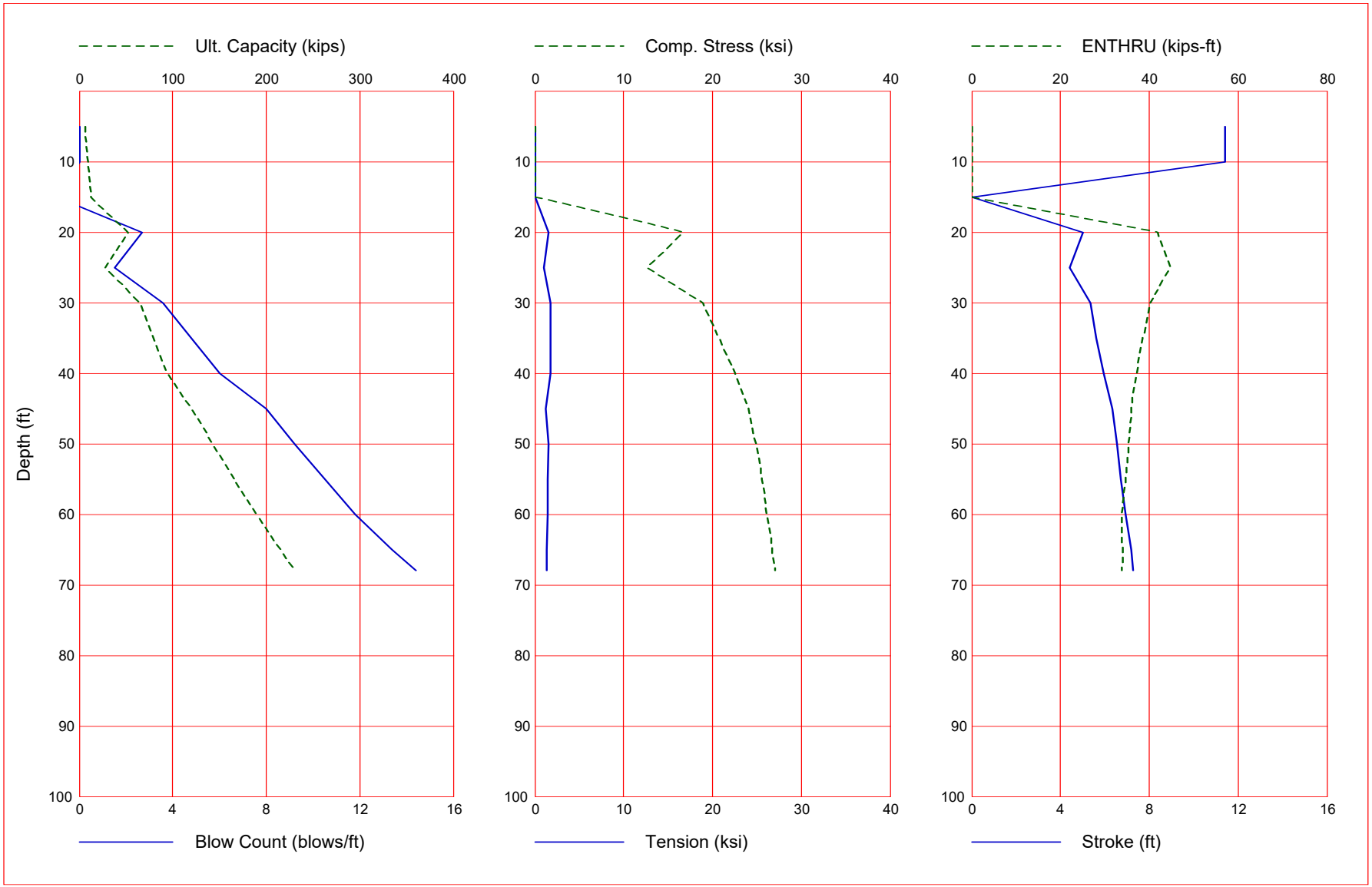
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	16.7	8.8	7.9	1.2	9.046	-0.677	4.02	42.1
10.0	25.8	17.8	7.9	1.5	12.705	-1.015	4.42	44.6
15.0	35.1	27.1	7.9	1.9	15.502	-2.161	4.71	43.5
20.0	44.6	36.7	7.9	2.5	17.801	-2.845	5.04	42.1
25.0	89.1	44.5	44.6	5.5	21.827	-1.763	5.81	37.6
30.0	98.2	53.6	44.6	6.2	23.038	-1.908	6.00	37.0
35.0	127.7	63.7	64.0	8.4	24.492	-1.681	6.37	36.0
40.0	138.9	75.0	64.0	9.1	25.101	-2.015	6.49	35.6
45.0	145.4	105.7	39.8	9.8	25.702	-1.132	6.67	35.0
50.0	176.6	136.9	39.8	12.8	27.224	0.000	7.10	34.0
55.0	208.3	168.5	39.8	16.6	27.959	-0.287	7.42	33.3
60.0	240.4	200.7	39.8	21.1	28.917	-0.171	7.75	32.7
65.0	273.0	233.2	39.8	25.3	29.352	0.000	8.01	32.0
68.0	292.8	253.0	39.8	27.6	29.575	0.000	8.13	31.4
70.0	306.1	266.3	39.8	29.6	29.518	0.000	8.14	30.6

Total Continuous Driving Time 15.00 minutes; Total Number of Blows 678 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 1 18 in Pile EOD

May 07 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

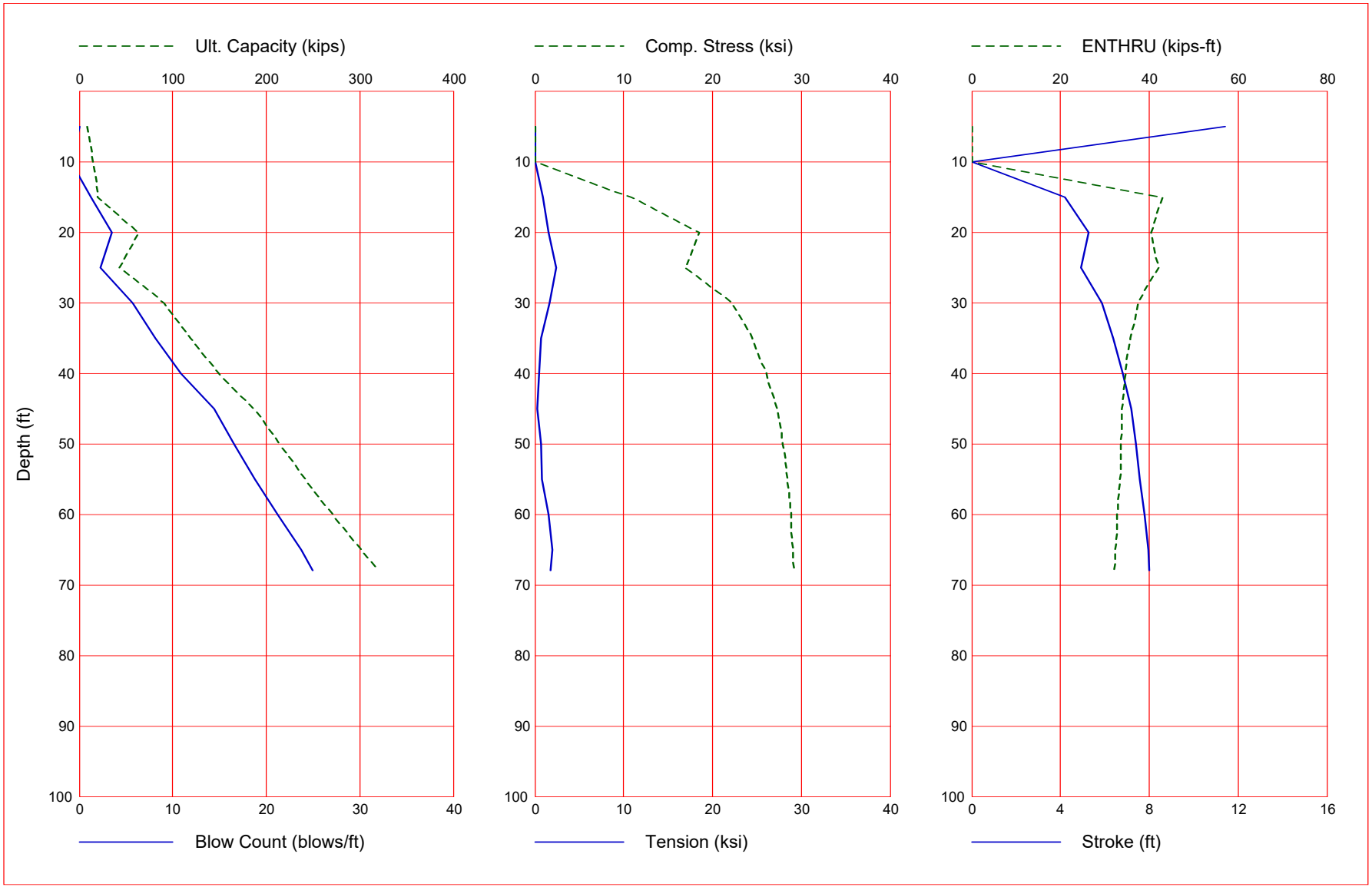
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	6.2	2.2	4.0	0.0	0.000	0.000	11.43	0.0
10.0	9.6	4.9	4.8	0.0	0.000	0.000	11.43	0.0
15.0	12.4	7.6	4.8	-1.0	0.000	0.000	0.00	0.0
20.0	52.3	10.7	41.6	2.7	16.673	-1.584	5.01	42.0
25.0	27.5	15.6	11.9	1.5	12.655	-0.968	4.42	44.6
30.0	65.3	25.5	39.8	3.6	18.981	-1.762	5.35	40.2
35.0	79.5	39.7	39.8	4.8	20.798	-1.808	5.62	38.4
40.0	94.3	54.6	39.8	6.0	22.552	-1.709	5.94	37.2
45.0	119.8	72.1	47.7	8.0	24.047	-1.222	6.33	36.0
50.0	142.5	94.8	47.7	9.2	24.898	-1.504	6.54	35.4
55.0	165.9	118.2	47.7	10.5	25.519	-1.491	6.74	34.6
60.0	190.1	142.4	47.7	11.8	26.036	-1.437	6.92	33.9
65.0	215.1	167.4	47.7	13.4	26.756	-1.363	7.18	34.1
68.0	230.4	182.7	47.7	14.4	27.060	-1.382	7.29	33.9

Total Continuous Driving Time 8.00 minutes; Total Number of Blows 366 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 1 18 in Pile BOR

May 07 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

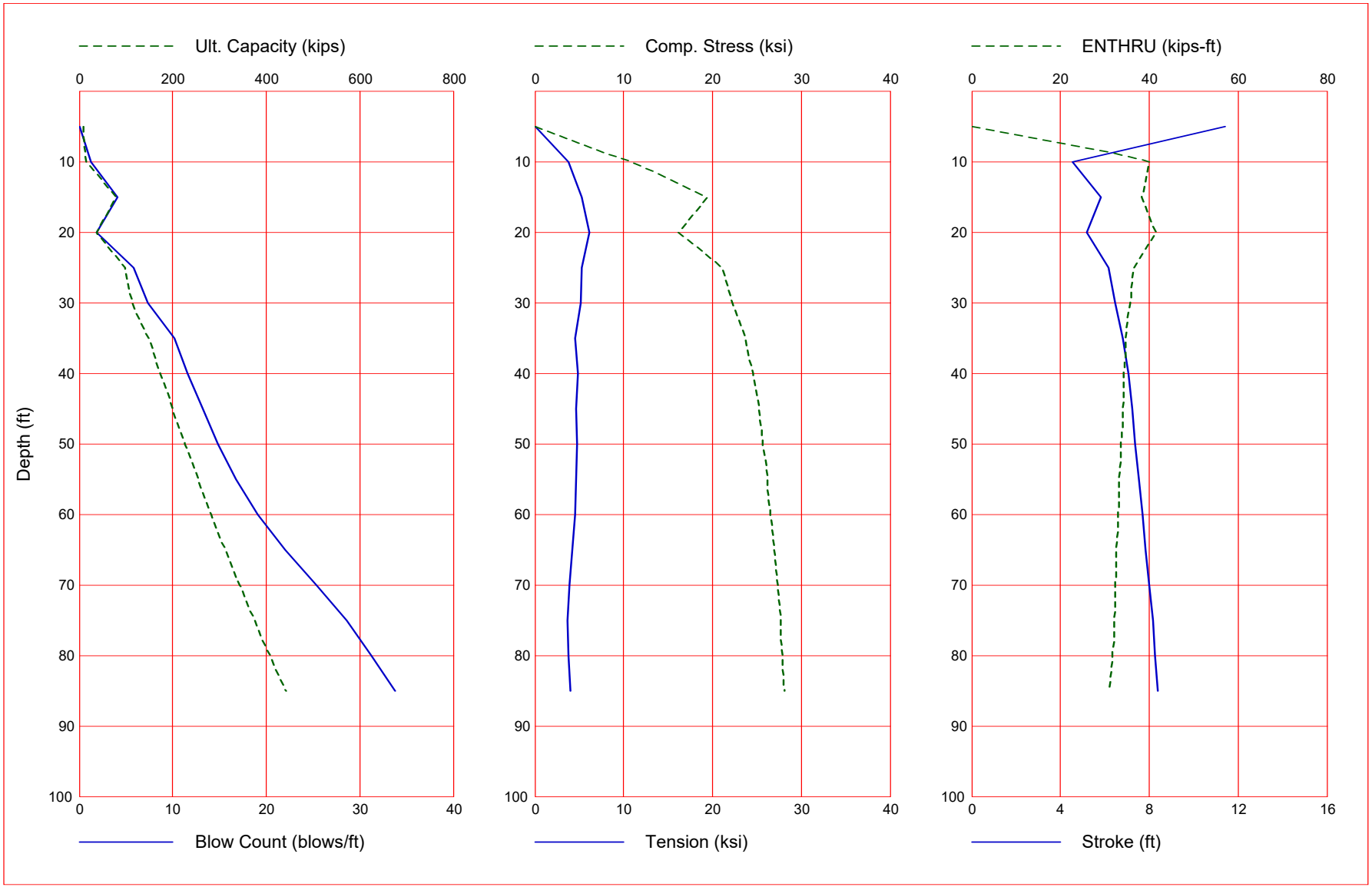
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	8.3	4.3	4.0	0.0	0.000	0.000	11.43	0.0
10.0	14.5	9.7	4.8	-1.0	0.000	0.000	0.00	0.0
15.0	20.0	15.3	4.8	1.3	10.836	-0.909	4.22	43.0
20.0	63.0	21.3	41.6	3.5	18.466	-1.585	5.28	40.5
25.0	43.1	31.1	11.9	2.3	16.876	-2.437	4.91	42.2
30.0	90.8	51.0	39.8	5.7	22.212	-1.656	5.87	37.4
35.0	119.2	79.4	39.8	8.2	24.468	-0.689	6.38	35.8
40.0	148.9	109.2	39.8	10.9	26.090	-0.471	6.80	34.6
45.0	186.6	138.8	47.7	14.4	27.263	-0.308	7.21	33.8
50.0	213.8	166.1	47.7	16.6	27.889	-0.709	7.39	33.5
55.0	241.9	194.2	47.7	18.8	28.404	-0.850	7.59	33.3
60.0	270.9	223.2	47.7	21.2	28.814	-1.597	7.78	32.8
65.0	300.9	253.2	47.7	23.7	29.094	-1.925	7.94	32.4
68.0	319.3	271.6	47.7	25.0	29.224	-1.779	8.02	32.0

Total Continuous Driving Time 15.00 minutes; Total Number of Blows 645 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 2 24in Pile EOD

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 2 24in Pile EOD

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

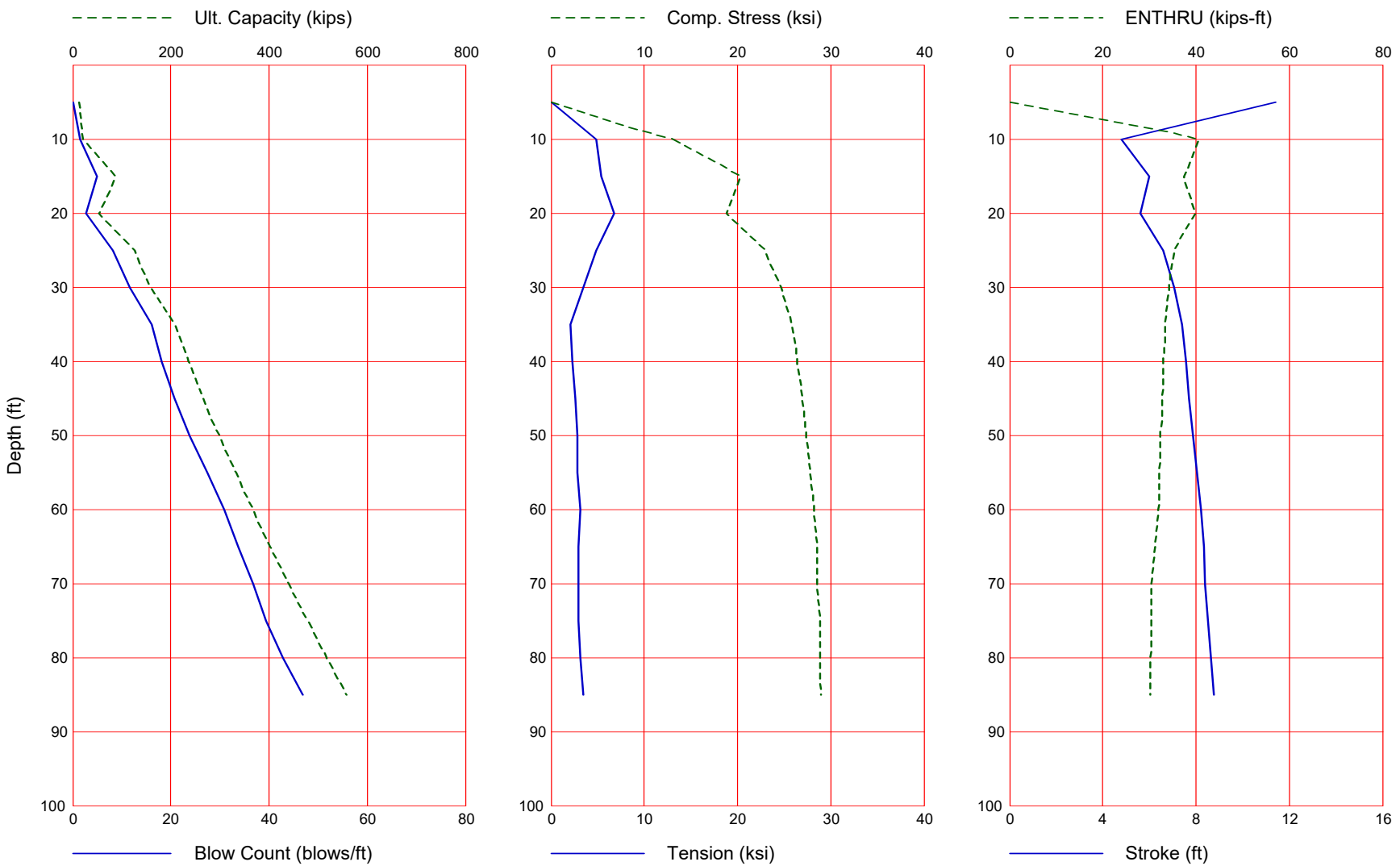
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	10.0	2.9	7.1	0.0	0.000	0.000	11.43	0.0
10.0	14.9	6.4	8.5	1.3	10.942	-3.836	4.54	39.9
15.0	77.6	10.2	67.4	4.1	19.314	-5.241	5.82	38.3
20.0	37.5	16.3	21.2	1.9	16.171	-6.144	5.18	41.4
25.0	98.6	27.9	70.7	5.8	21.044	-5.252	6.17	36.6
30.0	115.2	44.6	70.7	7.3	22.278	-5.198	6.45	35.7
35.0	148.7	63.9	84.8	10.2	23.783	-4.543	6.82	34.6
40.0	173.4	88.6	84.8	11.6	24.630	-4.808	7.07	34.3
45.0	199.1	114.3	84.8	13.2	25.177	-4.687	7.23	34.0
50.0	225.8	141.0	84.8	14.8	25.673	-4.759	7.37	33.6
55.0	253.6	168.8	84.8	16.8	26.157	-4.662	7.53	33.1
60.0	282.4	197.5	84.8	19.1	26.542	-4.497	7.68	32.9
65.0	312.2	227.3	84.8	22.0	26.985	-4.201	7.84	32.6
70.0	343.0	258.2	84.8	25.4	27.387	-3.871	8.00	32.4
75.0	374.8	290.0	84.8	28.6	27.680	-3.710	8.15	32.1
80.0	407.7	322.9	84.8	31.2	27.875	-3.810	8.27	31.6
85.0	441.6	356.8	84.8	33.8	28.110	-3.982	8.38	31.0

Total Continuous Driving Time 27.00 minutes; Total Number of Blows 1153 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 2 24in Pile BOR

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

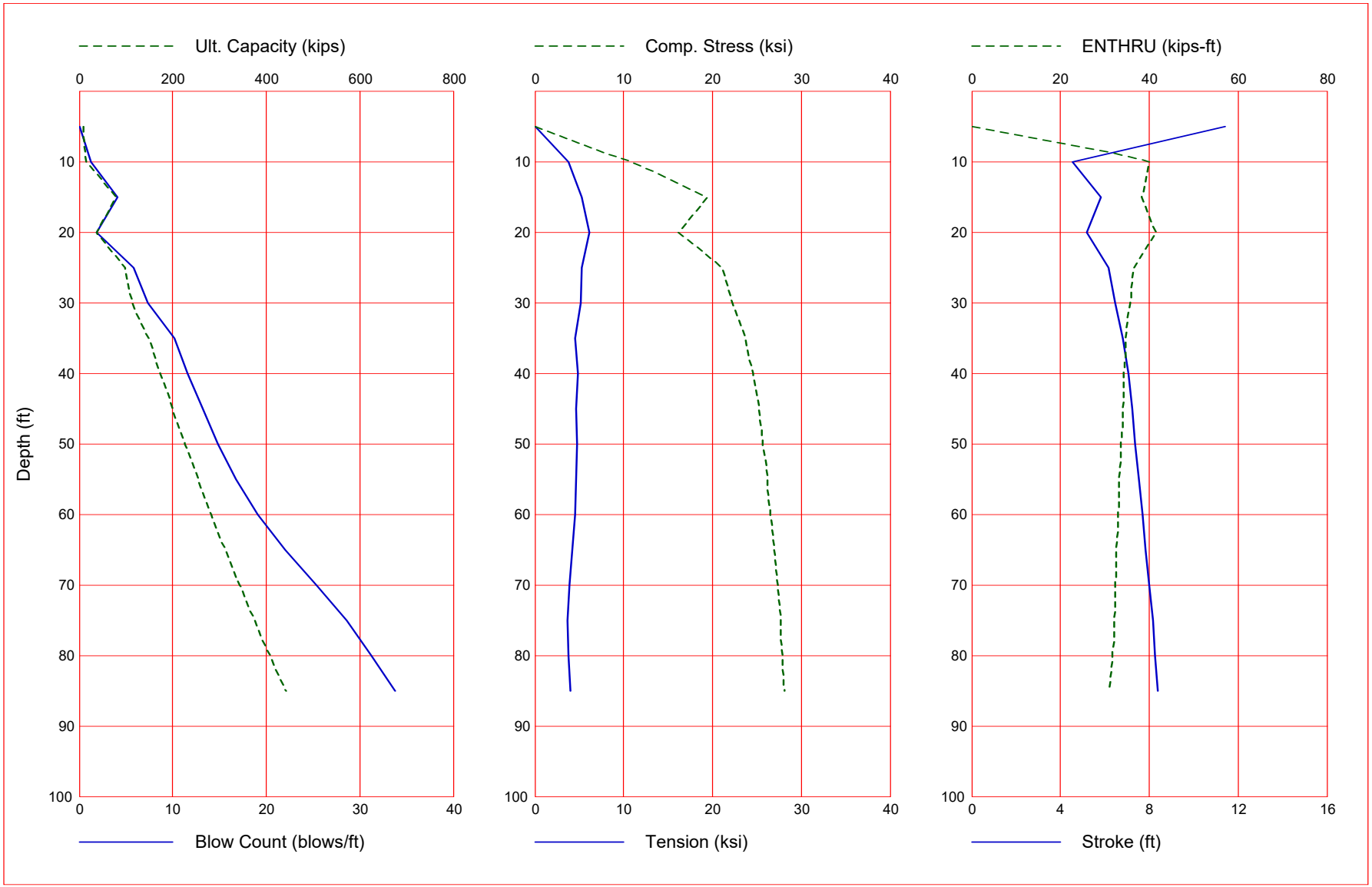
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	12.9	5.8	7.1	0.0	0.000	0.000	11.43	0.0
10.0	21.3	12.9	8.5	1.5	13.132	-4.836	4.78	40.6
15.0	87.8	20.4	67.4	5.0	20.279	-5.346	6.01	37.5
20.0	53.8	32.6	21.2	2.8	18.810	-6.797	5.60	39.8
25.0	126.4	55.7	70.7	8.3	23.002	-4.813	6.61	35.3
30.0	159.8	89.1	70.7	11.6	24.705	-3.479	7.07	34.3
35.0	206.8	122.0	84.8	16.0	25.869	-2.036	7.42	33.4
40.0	236.4	151.6	84.8	18.2	26.418	-2.330	7.57	33.0
45.0	267.3	182.4	84.8	20.8	26.917	-2.597	7.72	32.7
50.0	299.3	214.5	84.8	23.8	27.343	-2.834	7.89	32.3
55.0	332.7	247.8	84.8	27.5	27.837	-2.867	8.05	32.1
60.0	367.2	282.4	84.8	30.9	28.188	-3.127	8.21	31.8
65.0	403.0	318.1	84.8	33.8	28.548	-2.966	8.34	31.3
70.0	439.9	355.1	84.8	36.7	28.560	-2.889	8.39	30.5
75.0	478.2	393.3	84.8	39.3	28.837	-2.921	8.52	30.3
80.0	517.6	432.8	84.8	42.9	28.905	-3.148	8.64	30.2
85.0	558.3	473.4	84.8	46.9	28.993	-3.489	8.77	30.1

Total Continuous Driving Time 41.00 minutes; Total Number of Blows 1715 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 3 24in Pile EOD

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

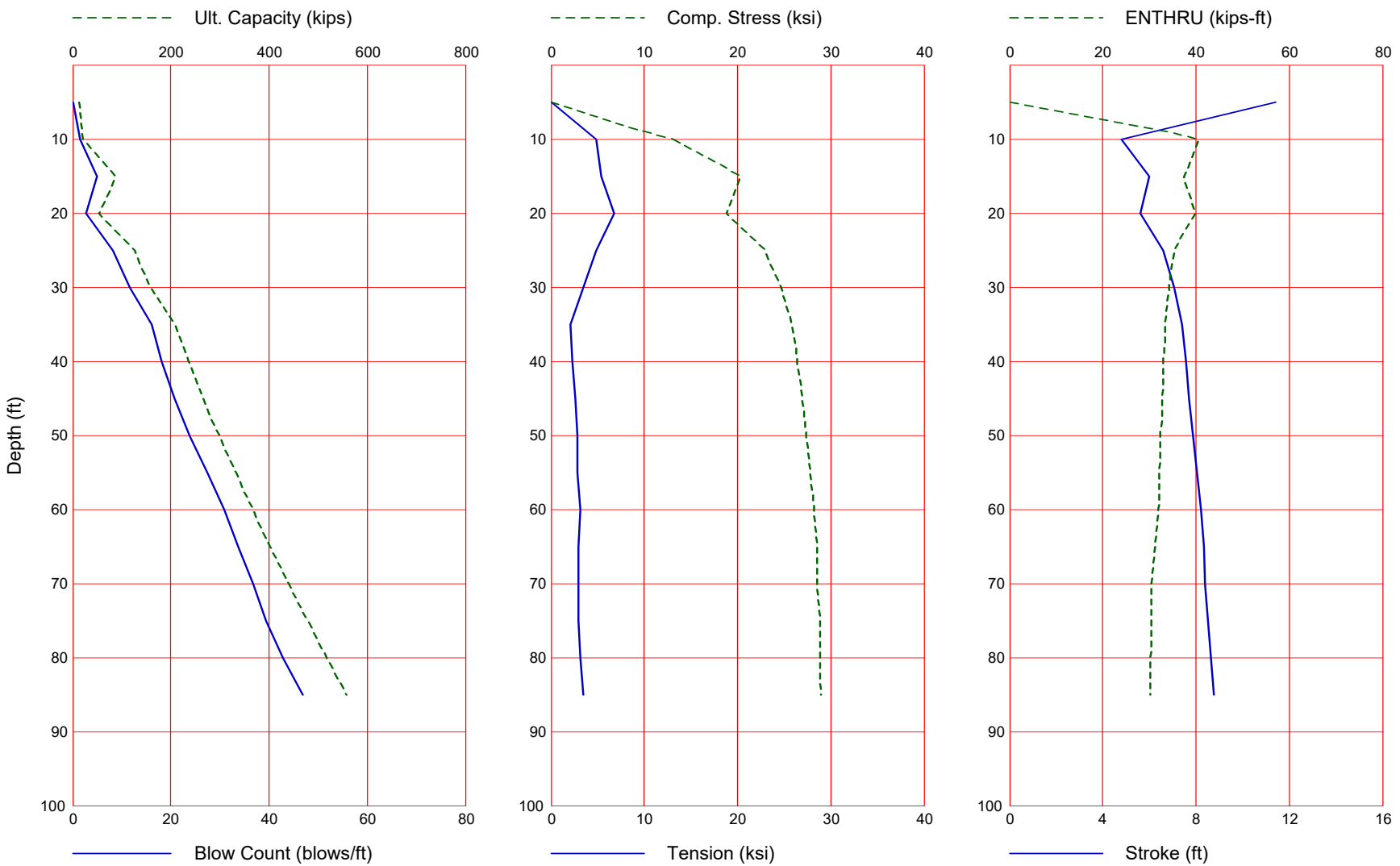
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	10.0	2.9	7.1	0.0	0.000	0.000	11.43	0.0
10.0	14.9	6.4	8.5	1.3	10.942	-3.836	4.54	39.9
15.0	77.6	10.2	67.4	4.1	19.314	-5.241	5.82	38.3
20.0	37.5	16.3	21.2	1.9	16.171	-6.144	5.18	41.4
25.0	98.6	27.9	70.7	5.8	21.044	-5.252	6.17	36.6
30.0	115.2	44.6	70.7	7.3	22.278	-5.198	6.45	35.7
35.0	148.7	63.9	84.8	10.2	23.783	-4.543	6.82	34.6
40.0	173.4	88.6	84.8	11.6	24.630	-4.808	7.07	34.3
45.0	199.1	114.3	84.8	13.2	25.177	-4.687	7.23	34.0
50.0	225.8	141.0	84.8	14.8	25.673	-4.759	7.37	33.6
55.0	253.6	168.8	84.8	16.8	26.157	-4.662	7.53	33.1
60.0	282.4	197.5	84.8	19.1	26.542	-4.497	7.68	32.9
65.0	312.2	227.3	84.8	22.0	26.985	-4.201	7.84	32.6
70.0	343.0	258.2	84.8	25.4	27.387	-3.871	8.00	32.4
75.0	374.8	290.0	84.8	28.6	27.680	-3.710	8.15	32.1
80.0	407.7	322.9	84.8	31.2	27.875	-3.810	8.27	31.6
85.0	441.6	356.8	84.8	33.8	28.110	-3.982	8.38	31.0

Total Continuous Driving Time 27.00 minutes; Total Number of Blows 1153 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 3 24in Pile BOR

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

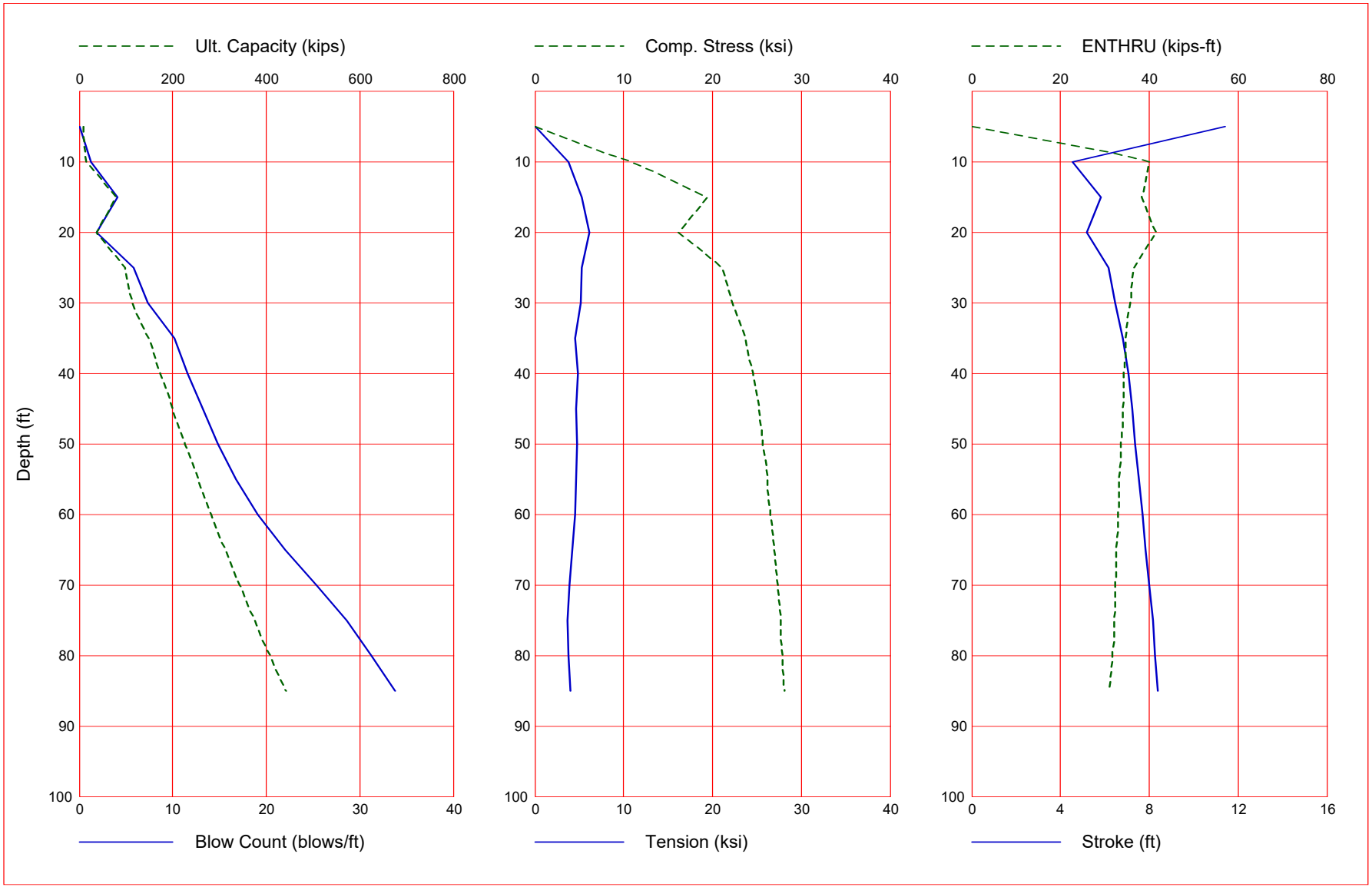
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	12.9	5.8	7.1	0.0	0.000	0.000	11.43	0.0
10.0	21.3	12.9	8.5	1.5	13.132	-4.836	4.78	40.6
15.0	87.8	20.4	67.4	5.0	20.279	-5.346	6.01	37.5
20.0	53.8	32.6	21.2	2.8	18.810	-6.797	5.60	39.8
25.0	126.4	55.7	70.7	8.3	23.002	-4.813	6.61	35.3
30.0	159.8	89.1	70.7	11.6	24.705	-3.479	7.07	34.3
35.0	206.8	122.0	84.8	16.0	25.869	-2.036	7.42	33.4
40.0	236.4	151.6	84.8	18.2	26.418	-2.330	7.57	33.0
45.0	267.3	182.4	84.8	20.8	26.917	-2.597	7.72	32.7
50.0	299.3	214.5	84.8	23.8	27.343	-2.834	7.89	32.3
55.0	332.7	247.8	84.8	27.5	27.837	-2.867	8.05	32.1
60.0	367.2	282.4	84.8	30.9	28.188	-3.127	8.21	31.8
65.0	403.0	318.1	84.8	33.8	28.548	-2.966	8.34	31.3
70.0	439.9	355.1	84.8	36.7	28.560	-2.889	8.39	30.5
75.0	478.2	393.3	84.8	39.3	28.837	-2.921	8.52	30.3
80.0	517.6	432.8	84.8	42.9	28.905	-3.148	8.64	30.2
85.0	558.3	473.4	84.8	46.9	28.993	-3.489	8.77	30.1

Total Continuous Driving Time 41.00 minutes; Total Number of Blows 1715 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 4 24in Pile EOD

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

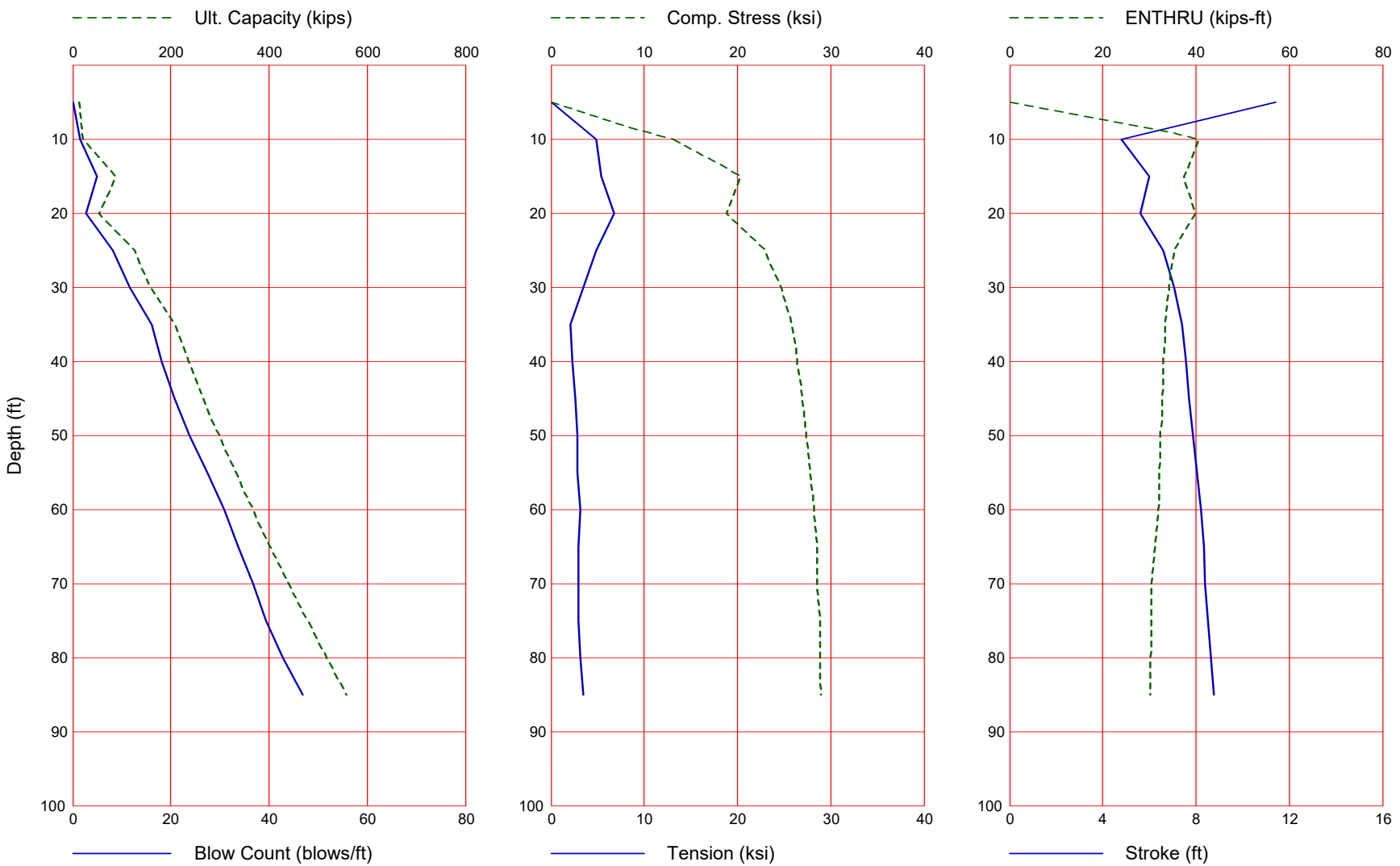
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	10.0	2.9	7.1	0.0	0.000	0.000	11.43	0.0
10.0	14.9	6.4	8.5	1.3	10.942	-3.836	4.54	39.9
15.0	77.6	10.2	67.4	4.1	19.314	-5.241	5.82	38.3
20.0	37.5	16.3	21.2	1.9	16.171	-6.144	5.18	41.4
25.0	98.6	27.9	70.7	5.8	21.044	-5.252	6.17	36.6
30.0	115.2	44.6	70.7	7.3	22.278	-5.198	6.45	35.7
35.0	148.7	63.9	84.8	10.2	23.783	-4.543	6.82	34.6
40.0	173.4	88.6	84.8	11.6	24.630	-4.808	7.07	34.3
45.0	199.1	114.3	84.8	13.2	25.177	-4.687	7.23	34.0
50.0	225.8	141.0	84.8	14.8	25.673	-4.759	7.37	33.6
55.0	253.6	168.8	84.8	16.8	26.157	-4.662	7.53	33.1
60.0	282.4	197.5	84.8	19.1	26.542	-4.497	7.68	32.9
65.0	312.2	227.3	84.8	22.0	26.985	-4.201	7.84	32.6
70.0	343.0	258.2	84.8	25.4	27.387	-3.871	8.00	32.4
75.0	374.8	290.0	84.8	28.6	27.680	-3.710	8.15	32.1
80.0	407.7	322.9	84.8	31.2	27.875	-3.810	8.27	31.6
85.0	441.6	356.8	84.8	33.8	28.110	-3.982	8.38	31.0

Total Continuous Driving Time 27.00 minutes; Total Number of Blows 1153 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 4 24in Pile BOR

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

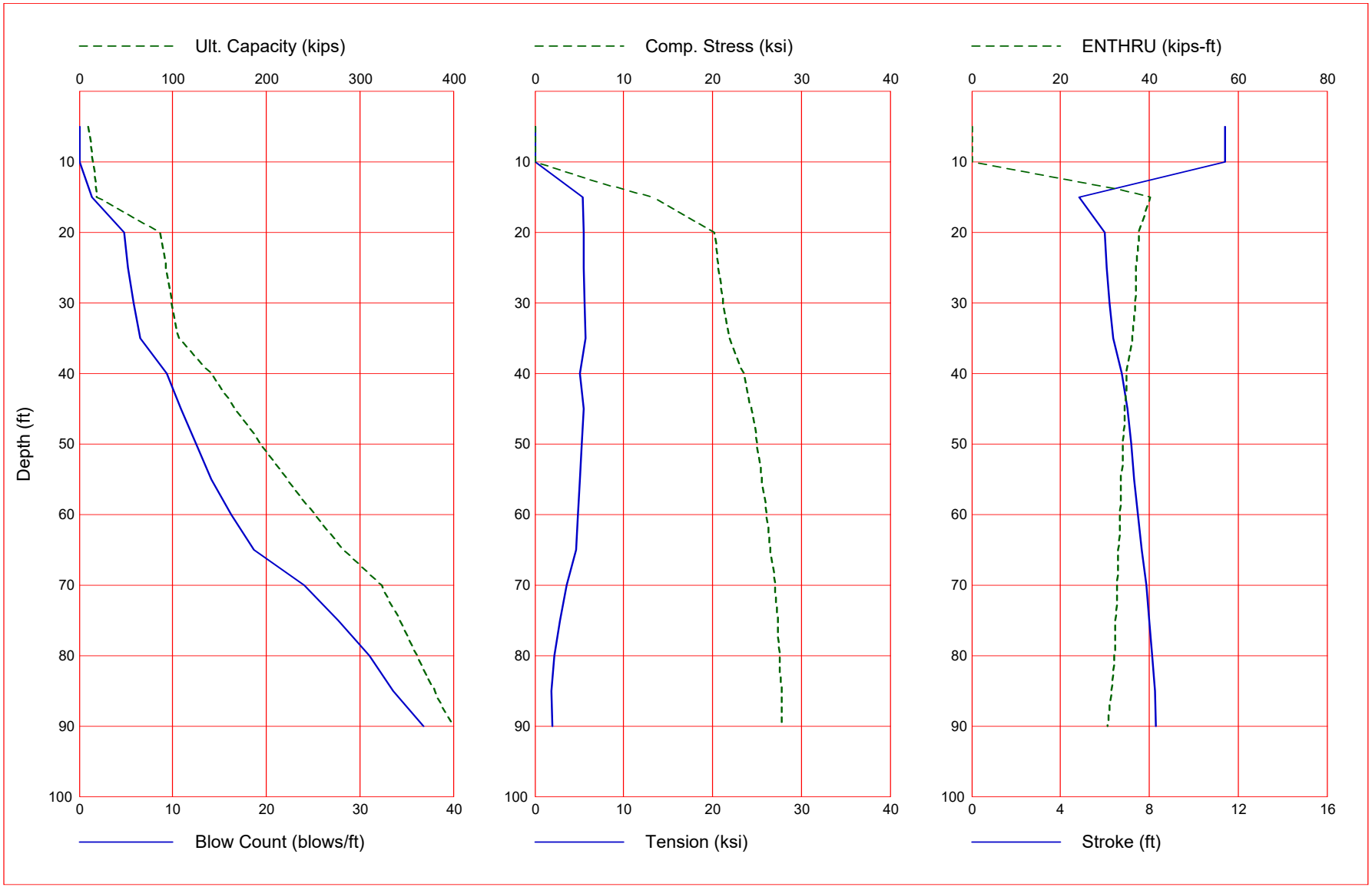
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	12.9	5.8	7.1	0.0	0.000	0.000	11.43	0.0
10.0	21.3	12.9	8.5	1.5	13.132	-4.836	4.78	40.6
15.0	87.8	20.4	67.4	5.0	20.279	-5.346	6.01	37.5
20.0	53.8	32.6	21.2	2.8	18.810	-6.797	5.60	39.8
25.0	126.4	55.7	70.7	8.3	23.002	-4.813	6.61	35.3
30.0	159.8	89.1	70.7	11.6	24.705	-3.479	7.07	34.3
35.0	206.8	122.0	84.8	16.0	25.869	-2.036	7.42	33.4
40.0	236.4	151.6	84.8	18.2	26.418	-2.330	7.57	33.0
45.0	267.3	182.4	84.8	20.8	26.917	-2.597	7.72	32.7
50.0	299.3	214.5	84.8	23.8	27.343	-2.834	7.89	32.3
55.0	332.7	247.8	84.8	27.5	27.837	-2.867	8.05	32.1
60.0	367.2	282.4	84.8	30.9	28.188	-3.127	8.21	31.8
65.0	403.0	318.1	84.8	33.8	28.548	-2.966	8.34	31.3
70.0	439.9	355.1	84.8	36.7	28.560	-2.889	8.39	30.5
75.0	478.2	393.3	84.8	39.3	28.837	-2.921	8.52	30.3
80.0	517.6	432.8	84.8	42.9	28.905	-3.148	8.64	30.2
85.0	558.3	473.4	84.8	46.9	28.993	-3.489	8.77	30.1

Total Continuous Driving Time 41.00 minutes; Total Number of Blows 1715 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 5 24in Pile EOD

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 5 24in Pile EOD

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

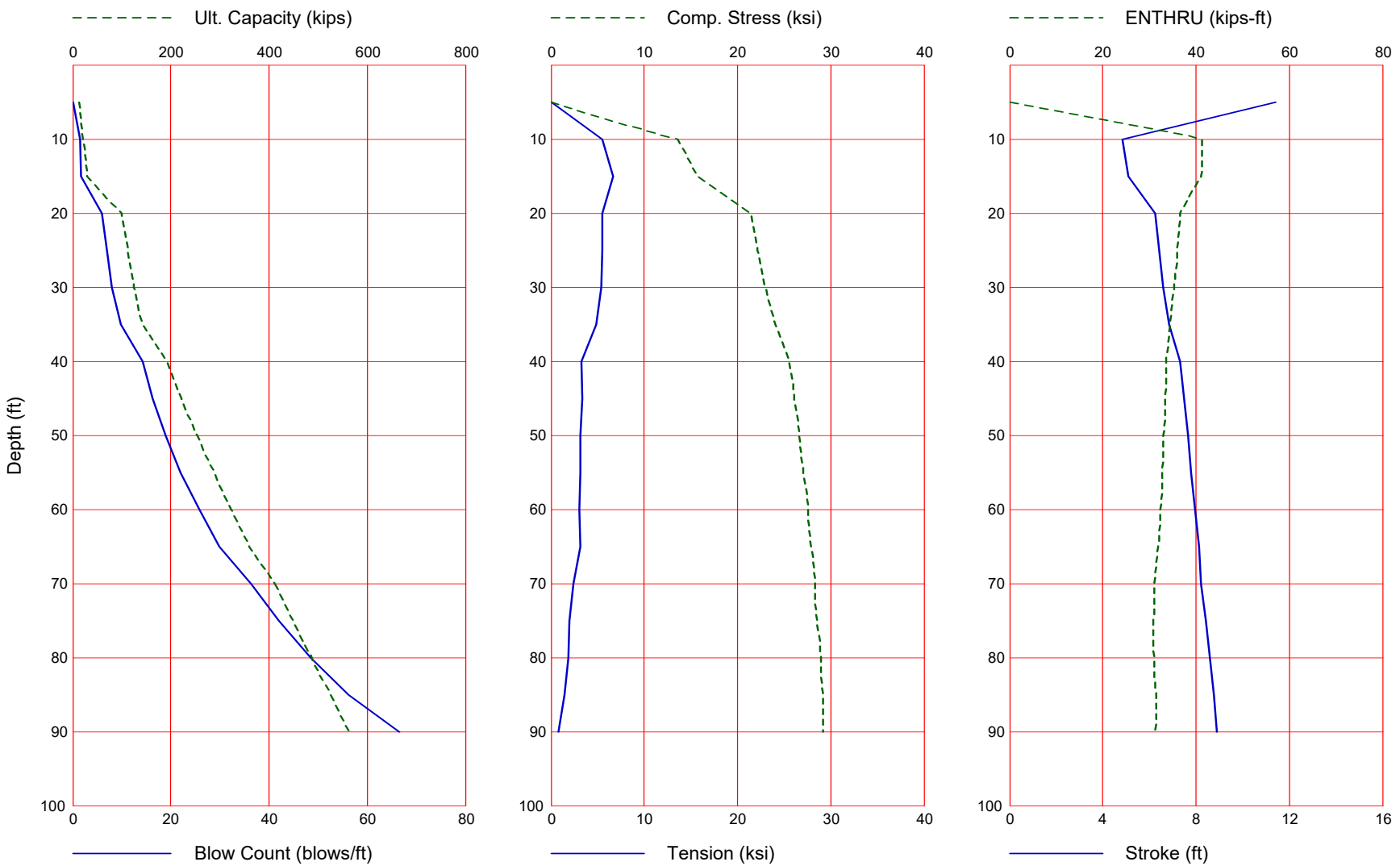
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	10.0	2.9	7.1	0.0	0.000	0.000	11.43	0.0
10.0	14.9	6.4	8.5	0.0	0.000	0.000	11.43	0.0
15.0	18.5	10.1	8.5	1.4	13.228	-5.385	4.83	40.2
20.0	87.0	14.0	73.1	4.8	20.211	-5.443	6.01	37.6
25.0	92.2	19.1	73.1	5.2	20.614	-5.466	6.09	37.1
30.0	98.6	25.6	73.1	5.8	21.197	-5.564	6.20	36.7
35.0	106.8	36.1	70.7	6.5	21.920	-5.697	6.36	36.1
40.0	141.1	56.3	84.8	9.4	23.510	-5.098	6.75	34.8
45.0	167.0	82.2	84.8	10.9	24.400	-5.464	7.02	34.5
50.0	194.0	109.2	84.8	12.5	25.065	-5.246	7.18	34.1
55.0	222.2	137.4	84.8	14.1	25.526	-5.083	7.33	33.7
60.0	251.5	166.7	84.8	16.3	26.095	-4.849	7.50	33.4
65.0	282.0	197.2	84.8	18.7	26.471	-4.606	7.65	33.0
70.0	323.6	224.7	99.0	24.1	27.090	-3.595	7.88	32.7
75.0	342.3	243.3	99.0	27.7	27.352	-2.850	8.00	32.4
80.0	361.2	262.2	99.0	31.0	27.611	-2.182	8.14	32.0
85.0	380.3	281.3	99.0	33.6	27.751	-1.860	8.25	31.5
90.0	399.6	300.7	99.0	36.8	27.788	-2.003	8.31	30.7

Total Continuous Driving Time 28.00 minutes; Total Number of Blows 1206 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 5 24in Pile BOR

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000



Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

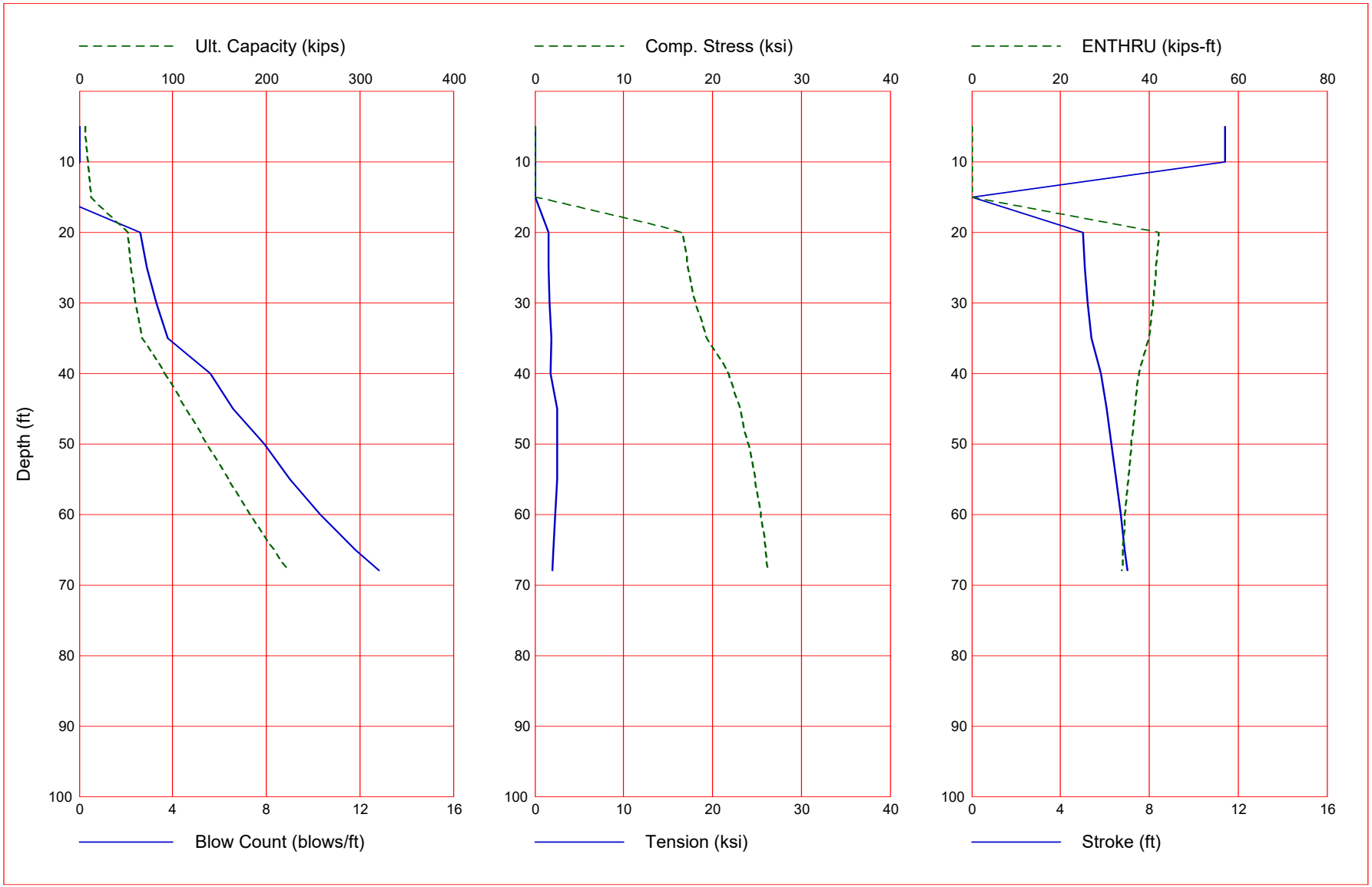
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	12.9	5.8	7.1	0.0	0.000	0.000	11.43	0.0
10.0	21.3	12.9	8.5	1.5	13.613	-5.441	4.86	41.2
15.0	28.6	20.1	8.5	1.7	15.779	-6.712	5.11	41.1
20.0	101.0	27.9	73.1	6.0	21.350	-5.482	6.24	36.5
25.0	111.4	38.3	73.1	6.9	22.122	-5.476	6.41	35.9
30.0	124.2	51.2	73.1	8.1	23.006	-5.350	6.60	35.3
35.0	142.9	72.2	70.7	9.9	24.023	-4.821	6.85	34.5
40.0	191.3	106.5	84.8	14.3	25.580	-3.274	7.30	33.7
45.0	222.4	137.6	84.8	16.4	26.055	-3.337	7.47	33.3
50.0	254.9	170.0	84.8	18.9	26.616	-3.153	7.64	33.0
55.0	288.7	203.9	84.8	22.0	27.048	-3.198	7.80	32.7
60.0	323.8	239.0	84.8	25.8	27.619	-3.091	7.97	32.4
65.0	360.4	275.6	84.8	29.9	27.882	-3.119	8.11	31.9
70.0	412.0	313.0	99.0	36.3	28.280	-2.443	8.23	31.1
75.0	449.3	350.3	99.0	42.0	28.585	-1.974	8.44	30.9
80.0	487.0	388.0	99.0	48.5	28.940	-1.882	8.61	31.1
85.0	525.2	426.3	99.0	56.3	29.126	-1.454	8.75	31.4
90.0	564.0	465.0	99.0	66.6	29.211	-0.774	8.90	31.2

Total Continuous Driving Time 46.00 minutes; Total Number of Blows 1888 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 6 18 in Pile EOD

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 0.500 / 1.000



Gain/Loss 1 at Shaft and Toe 0.500 / 1.000

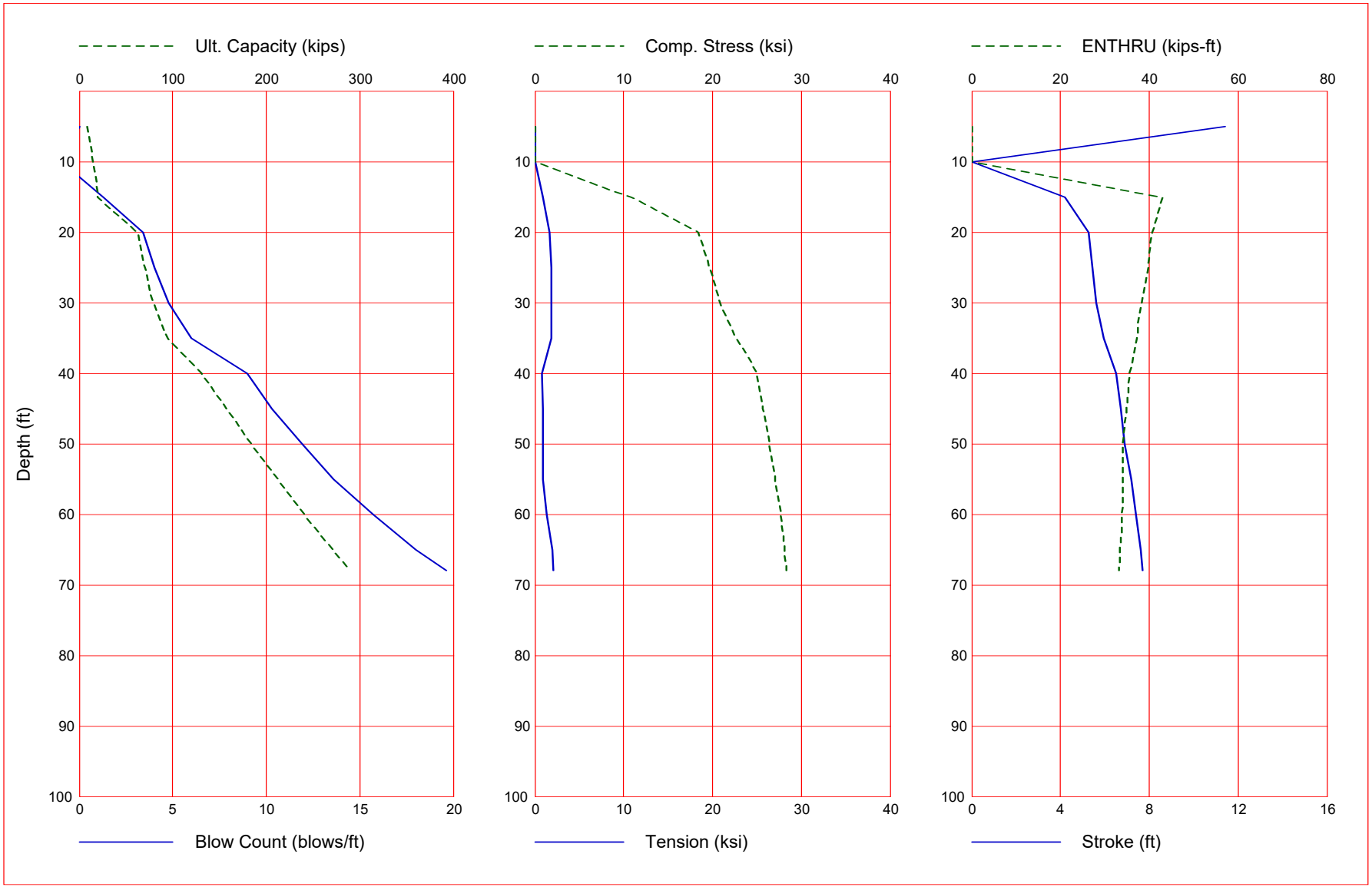
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	6.2	2.2	4.0	0.0	0.000	0.000	11.43	0.0
10.0	9.6	4.9	4.8	0.0	0.000	0.000	11.43	0.0
15.0	12.4	7.6	4.8	-1.0	0.000	0.000	0.00	0.0
20.0	51.7	10.6	41.1	2.6	16.594	-1.574	5.00	42.1
25.0	55.6	14.5	41.1	2.9	17.272	-1.599	5.10	41.5
30.0	60.4	19.3	41.1	3.3	18.107	-1.672	5.22	40.9
35.0	67.3	27.6	39.8	3.8	19.348	-1.918	5.41	39.9
40.0	92.0	44.3	47.7	5.6	21.793	-1.807	5.81	37.6
45.0	113.5	65.8	47.7	6.6	23.086	-2.502	6.06	36.8
50.0	135.9	88.2	47.7	7.9	24.030	-2.534	6.31	36.0
55.0	159.1	111.4	47.7	9.0	24.781	-2.550	6.52	35.4
60.0	183.1	135.4	47.7	10.3	25.392	-2.273	6.72	34.5
65.0	208.0	160.3	47.7	11.8	25.922	-2.103	6.91	34.1
68.0	223.3	175.5	47.7	12.8	26.227	-2.004	7.03	33.9

Total Continuous Driving Time 7.00 minutes; Total Number of Blows 325 (starting at penetration 5.0 ft)

TSVC, INC. - BIRMINGHAM
35185047 M3995 BT 6 18 in Pile BOR

May 08 2020
GRLWEAP Version 2010

Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

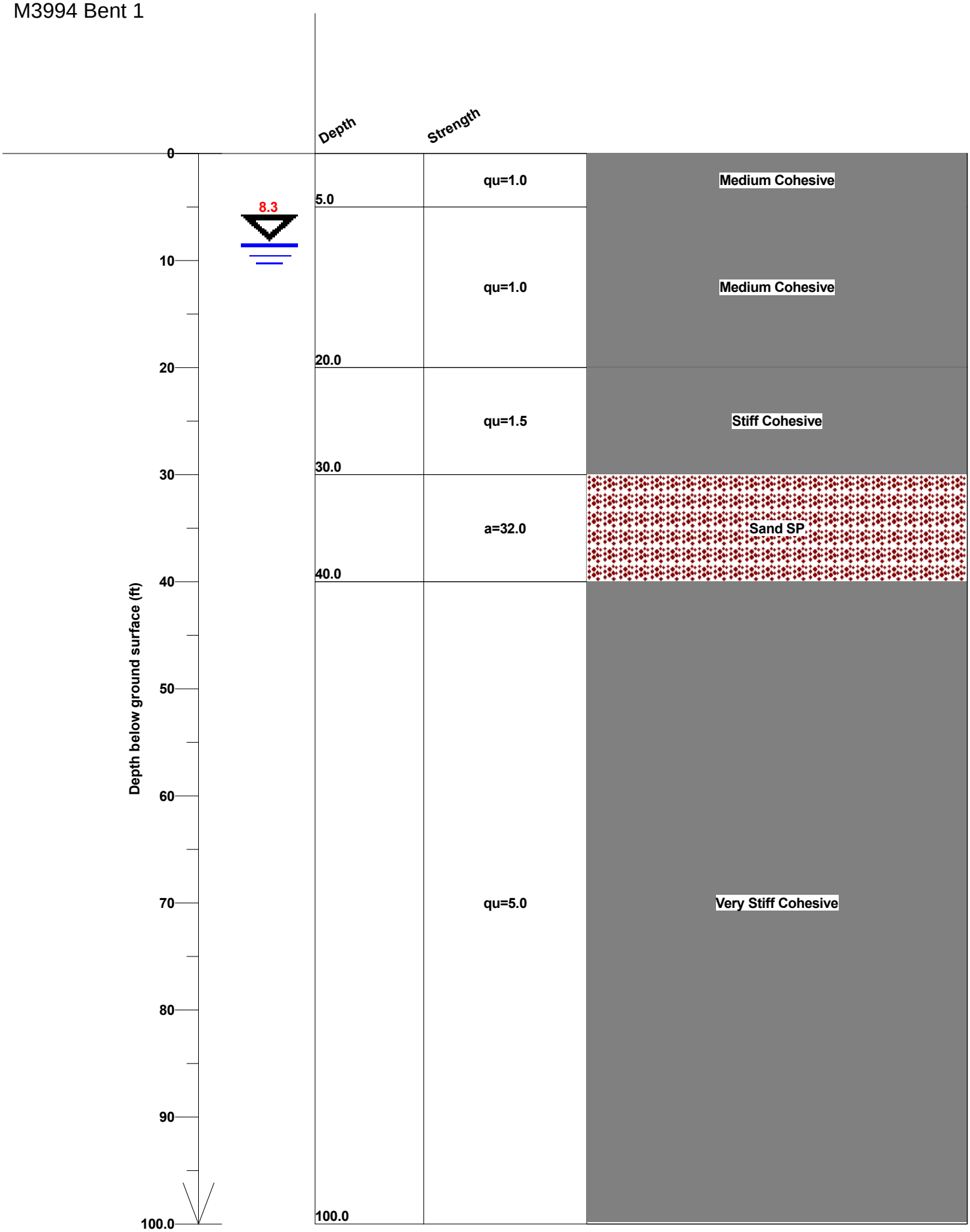


Gain/Loss 1 at Shaft and Toe 1.000 / 1.000

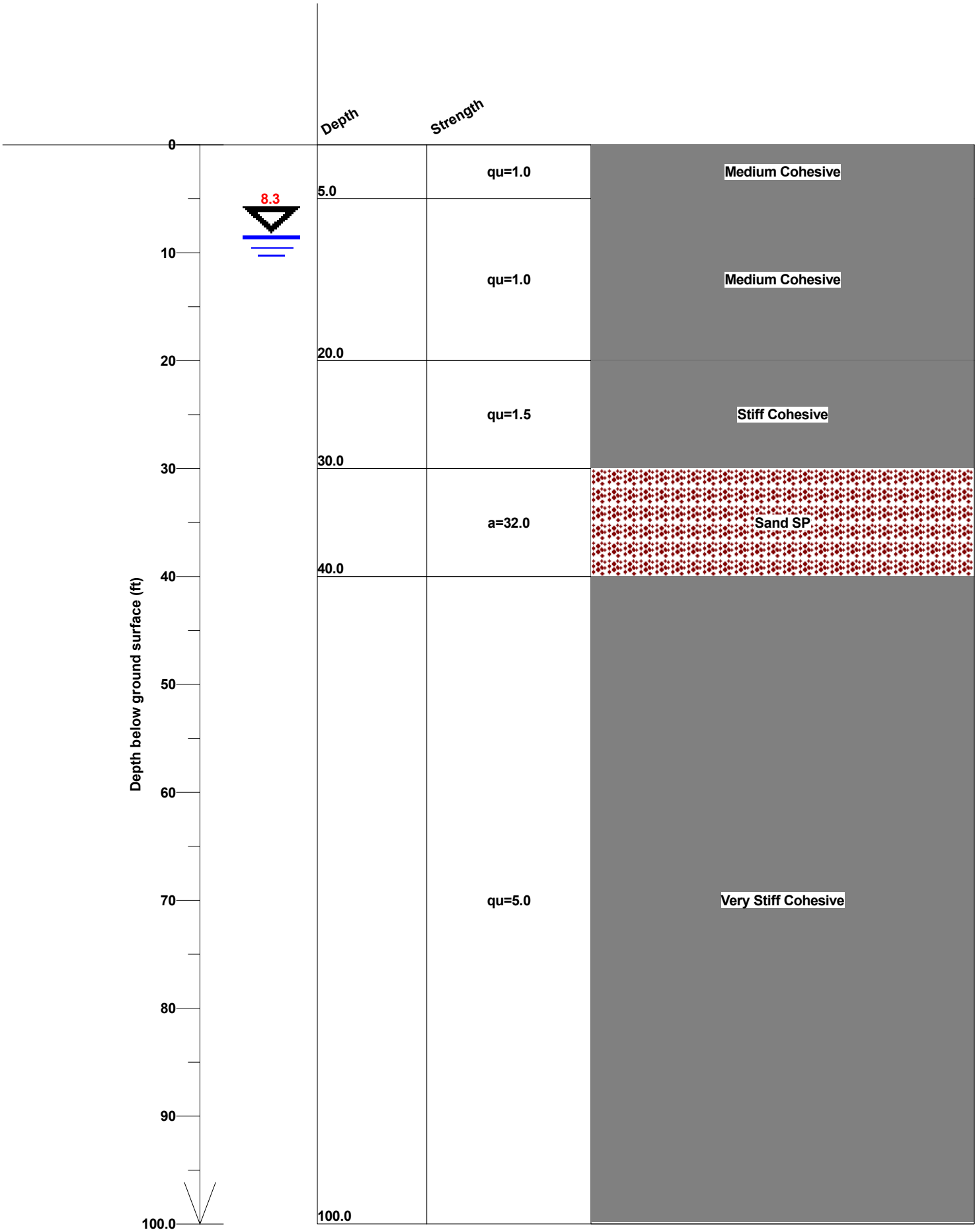
Depth ft	Ultimate Capacity kips	Friction kips	End Bearing kips	Blow Count blows/ft	Comp. Stress ksi	Tension Stress ksi	Stroke ft	ENTHRU kips-ft
5.0	8.3	4.3	4.0	0.0	0.000	0.000	11.43	0.0
10.0	14.5	9.7	4.8	-1.0	0.000	0.000	0.00	0.0
15.0	20.0	15.3	4.8	1.3	10.836	-0.909	4.22	43.0
20.0	62.3	21.2	41.1	3.4	18.415	-1.612	5.27	40.6
25.0	70.1	29.0	41.1	4.0	19.640	-1.830	5.46	39.7
30.0	79.7	38.6	41.1	4.8	20.851	-1.895	5.63	38.3
35.0	94.9	55.2	39.8	6.0	22.711	-1.831	5.95	37.2
40.0	131.2	83.4	47.7	9.0	24.966	-0.806	6.50	35.6
45.0	157.1	109.3	47.7	10.3	25.654	-0.938	6.71	34.8
50.0	183.9	136.2	47.7	11.9	26.380	-0.937	6.91	34.1
55.0	211.8	164.1	47.7	13.6	27.073	-0.884	7.19	34.0
60.0	240.6	192.9	47.7	15.7	27.708	-1.375	7.39	33.8
65.0	270.4	222.7	47.7	18.0	28.103	-1.941	7.60	33.4
68.0	288.7	241.0	47.7	19.6	28.340	-2.058	7.72	33.1

Total Continuous Driving Time 11.00 minutes; Total Number of Blows 500 (starting at penetration 5.0 ft)

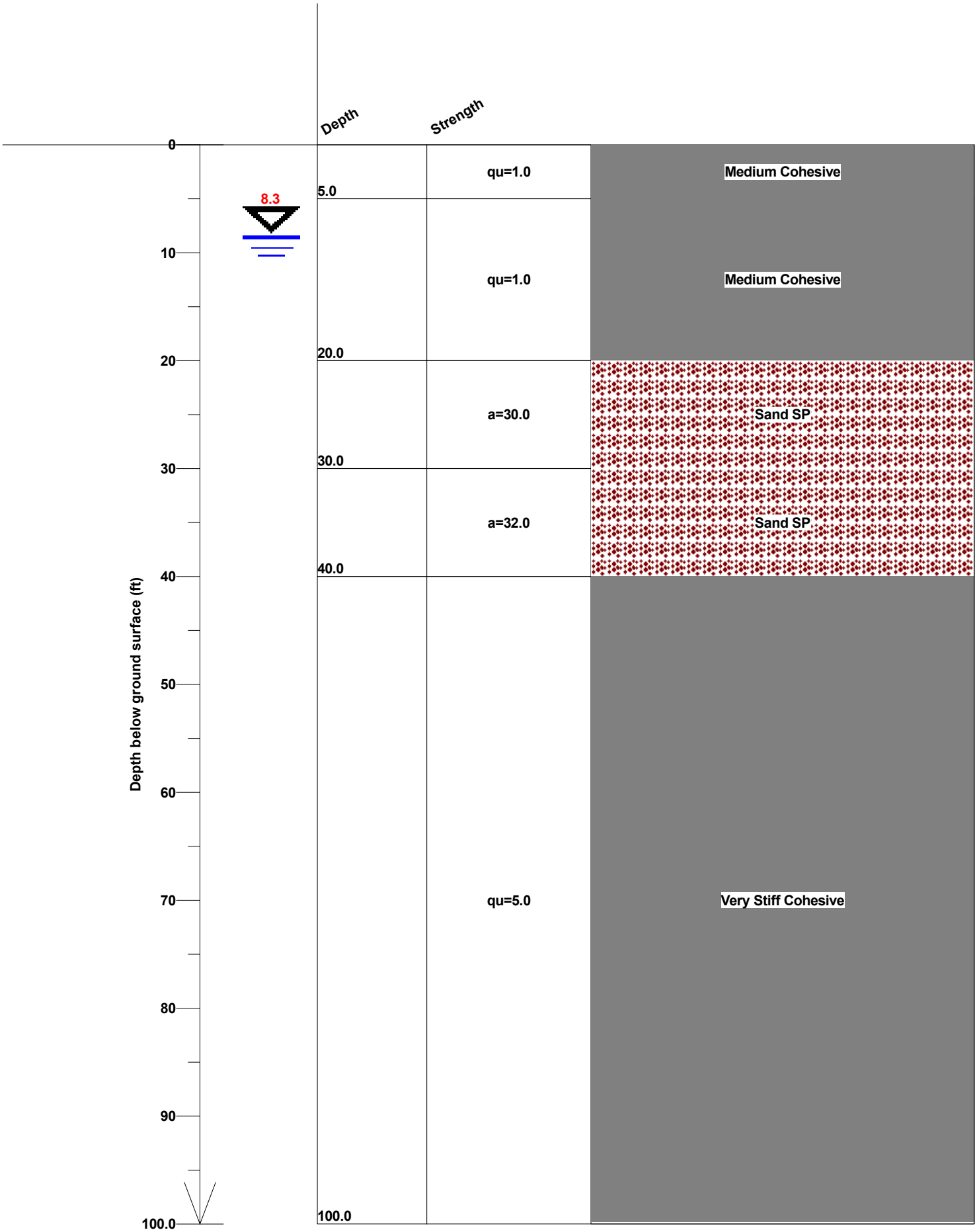
M3994 Bent 1


Depth
Strength
0
10
20
30
40
50
60
70
80
90
100.0
Depth below ground surface (ft)
8.3
5.0
20.0
30.0
40.0
100.0
qu=1.0
qu=1.0
qu=1.5
a=32.0
qu=5.0
Medium Cohesive
Medium Cohesive
Stiff Cohesive
Sand SP
Very Stiff Cohesive

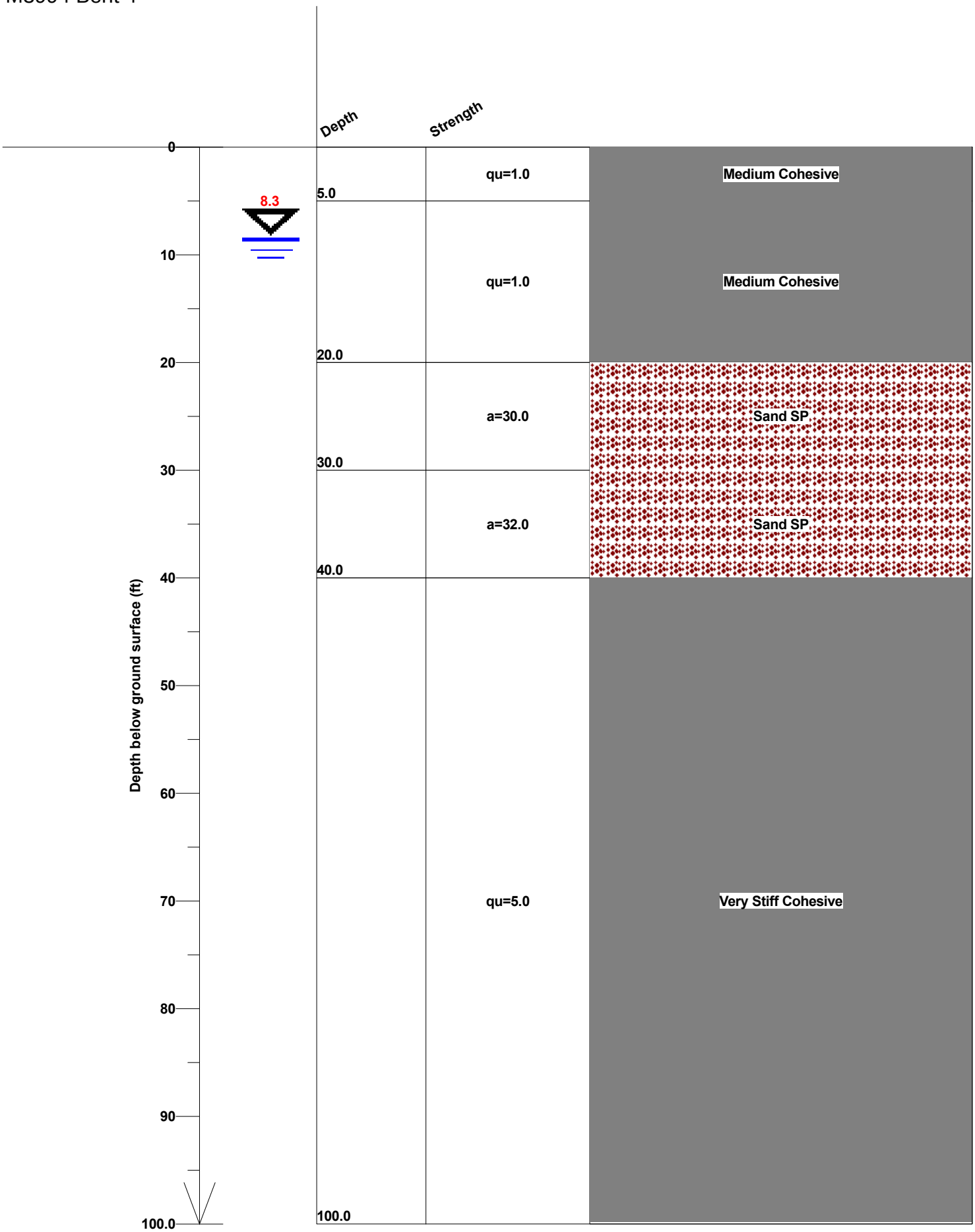
M3994 Bent 2


Depth
Strength
0
10
20
30
40
50
60
70
80
90
100.0
Depth below ground surface (ft)
8.3
5.0
20.0
30.0
40.0
100.0
qu=1.0
qu=1.0
qu=1.5
a=32.0
qu=5.0
Medium Cohesive
Medium Cohesive
Stiff Cohesive
Sand SP
Very Stiff Cohesive

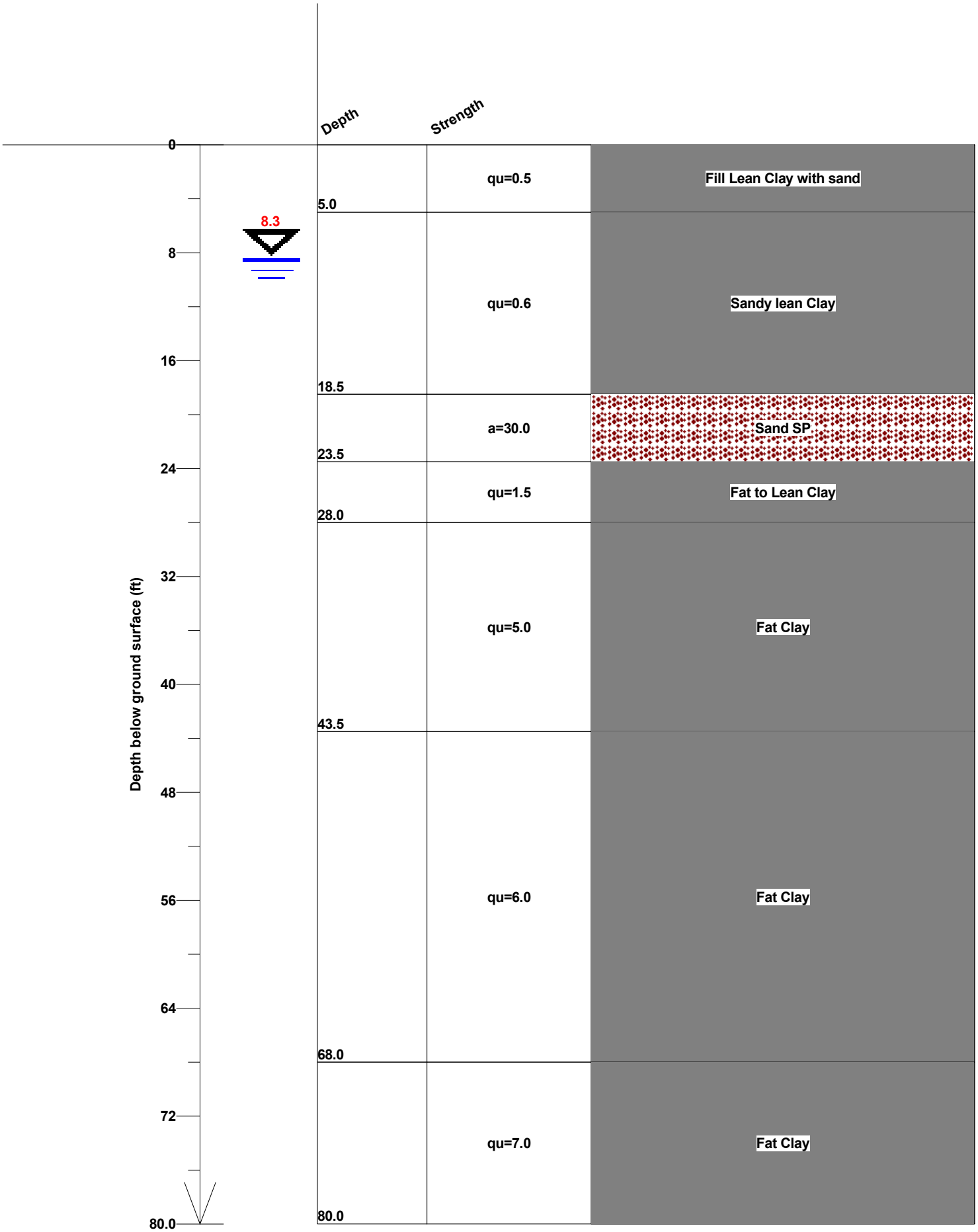
M3994 Bent 3


Depth
Strength
0
10
20
30
40
50
60
70
80
90
100.0
Depth below ground surface (ft)
8.3
5.0
20.0
30.0
40.0
100.0
qu=1.0
qu=1.0
a=30.0
a=32.0
qu=5.0
Medium Cohesive
Medium Cohesive
Sand SP
Sand SP
Very Stiff Cohesive

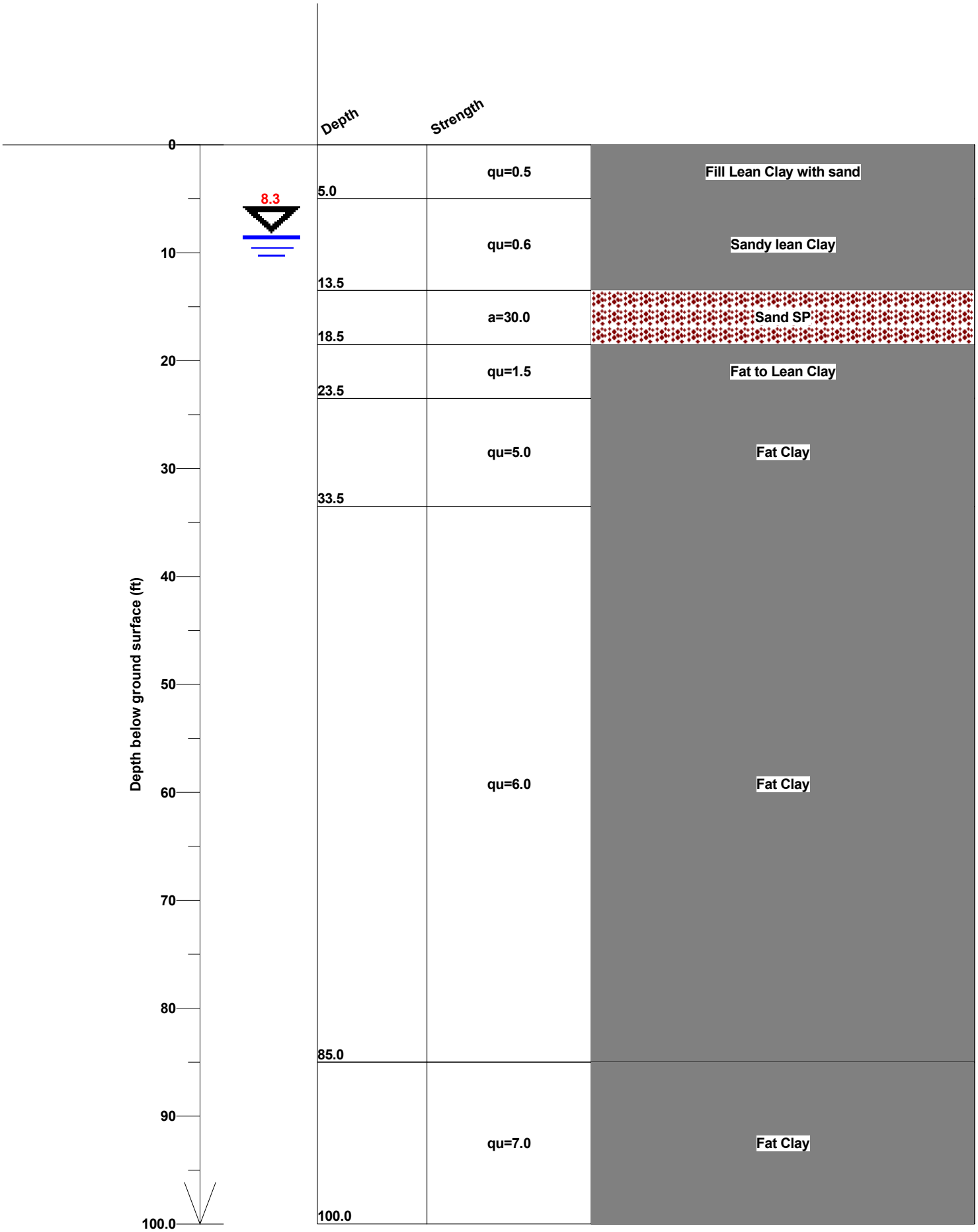
M3994 Bent 4


Depth
Strength
0
10
20
30
40
50
60
70
80
90
100.0
Depth below ground surface (ft)
8.3
5.0
20.0
30.0
40.0
100.0
qu=1.0
qu=1.0
a=30.0
a=32.0
qu=5.0
Medium Cohesive
Medium Cohesive
Sand SP
Sand SP
Very Stiff Cohesive

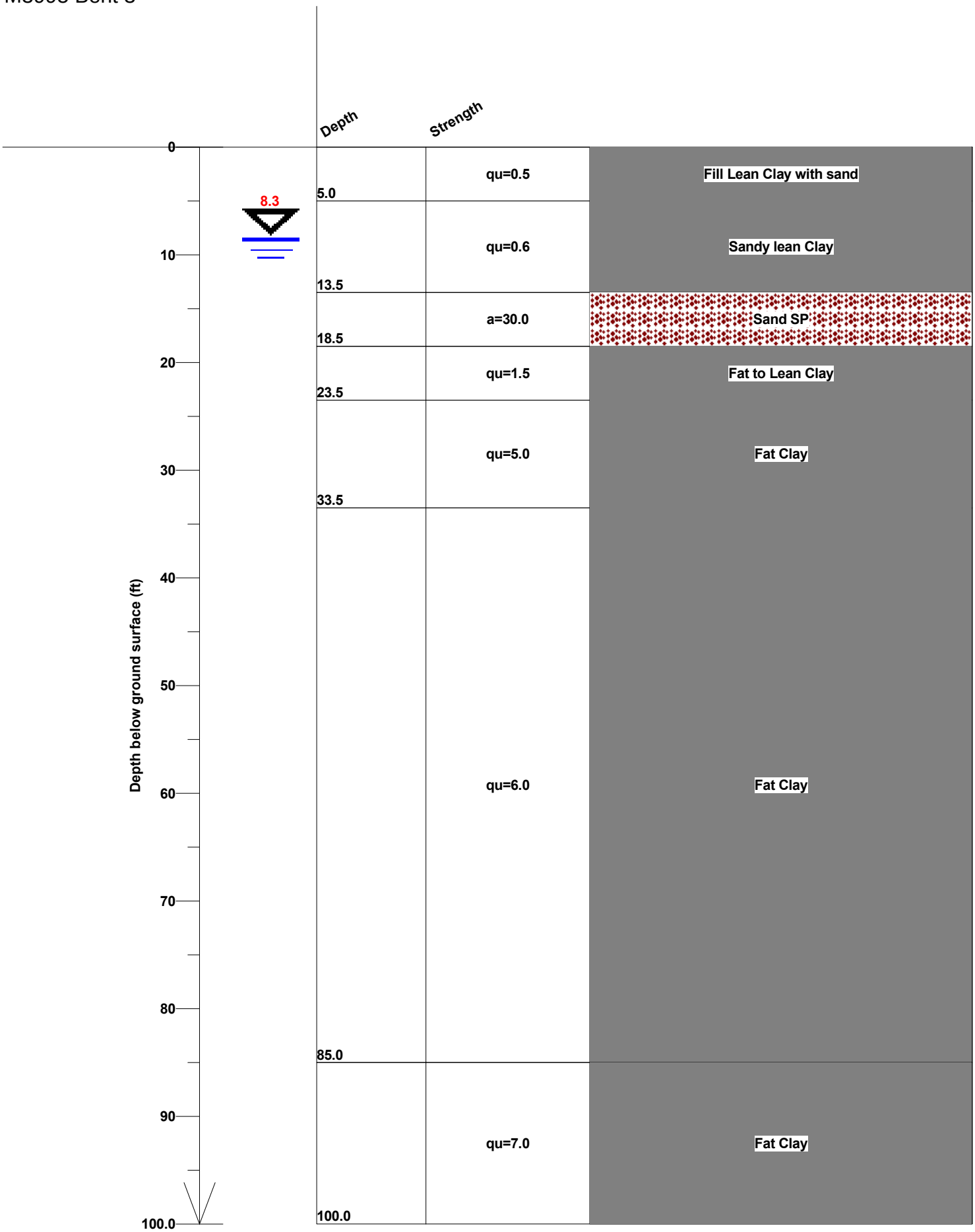
M3995 Bent 1


Depth
Strength
0
8
16
24
32
40
48
56
64
72
80.0
Depth below ground surface (ft)
8.3
5.0
18.5
23.5
28.0
43.5
68.0
80.0
qu=0.5
qu=0.6
a=30.0
qu=1.5
qu=5.0
qu=6.0
qu=7.0
Fill Lean Clay with sand
Sandy lean Clay
Sand SP
Fat to Lean Clay
Fat Clay
Fat Clay
Fat Clay

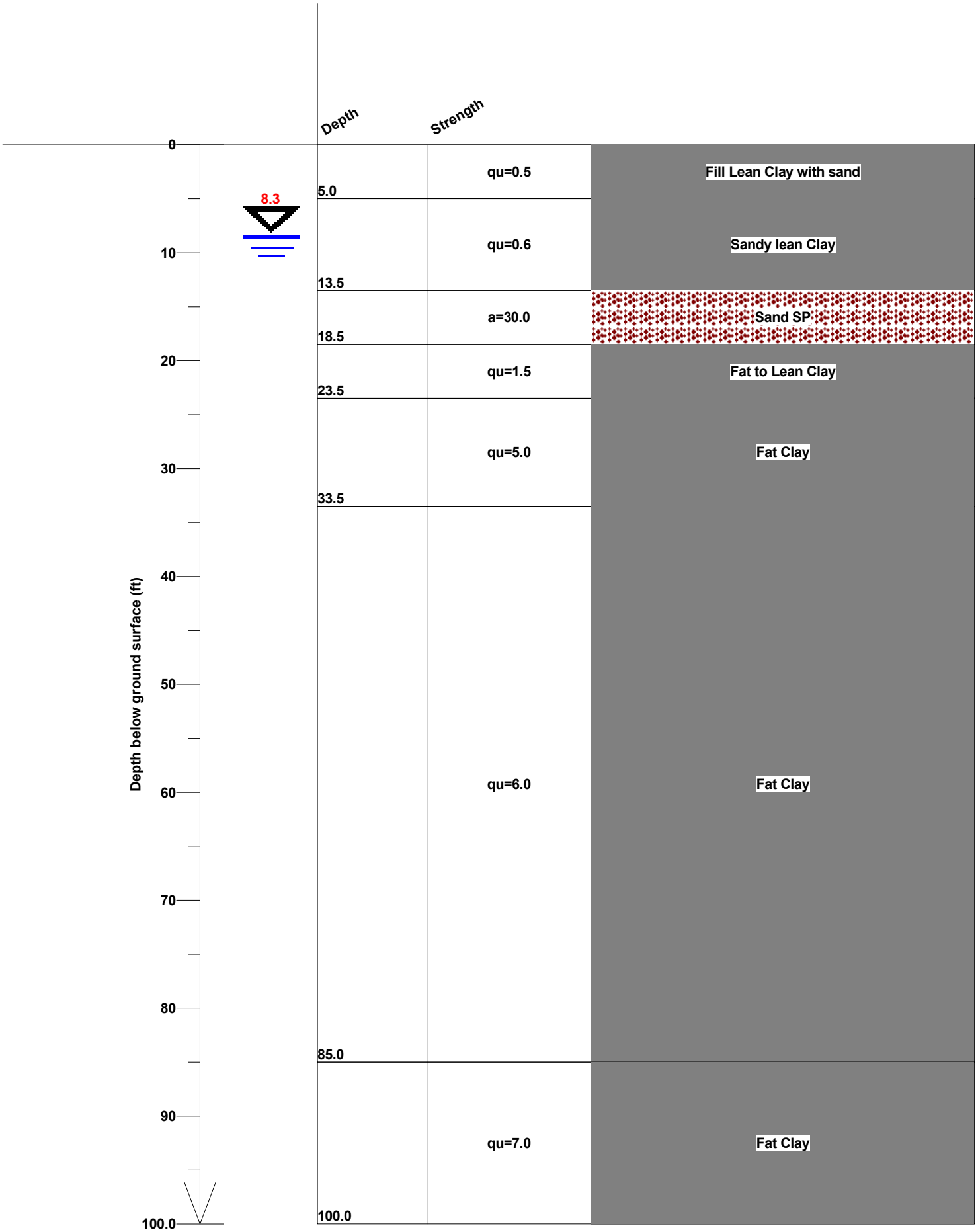
M3995 Bent 2


Depth
Strength
0
10
20
30
40
50
60
70
80
90
100.0
Depth below ground surface (ft)
8.3
5.0
13.5
18.5
23.5
33.5
85.0
100.0
qu=0.5
qu=0.6
a=30.0
qu=1.5
qu=5.0
qu=6.0
qu=7.0
Fill Lean Clay with sand
Sandy lean Clay
Sand SP
Fat to Lean Clay
Fat Clay
Fat Clay
Fat Clay

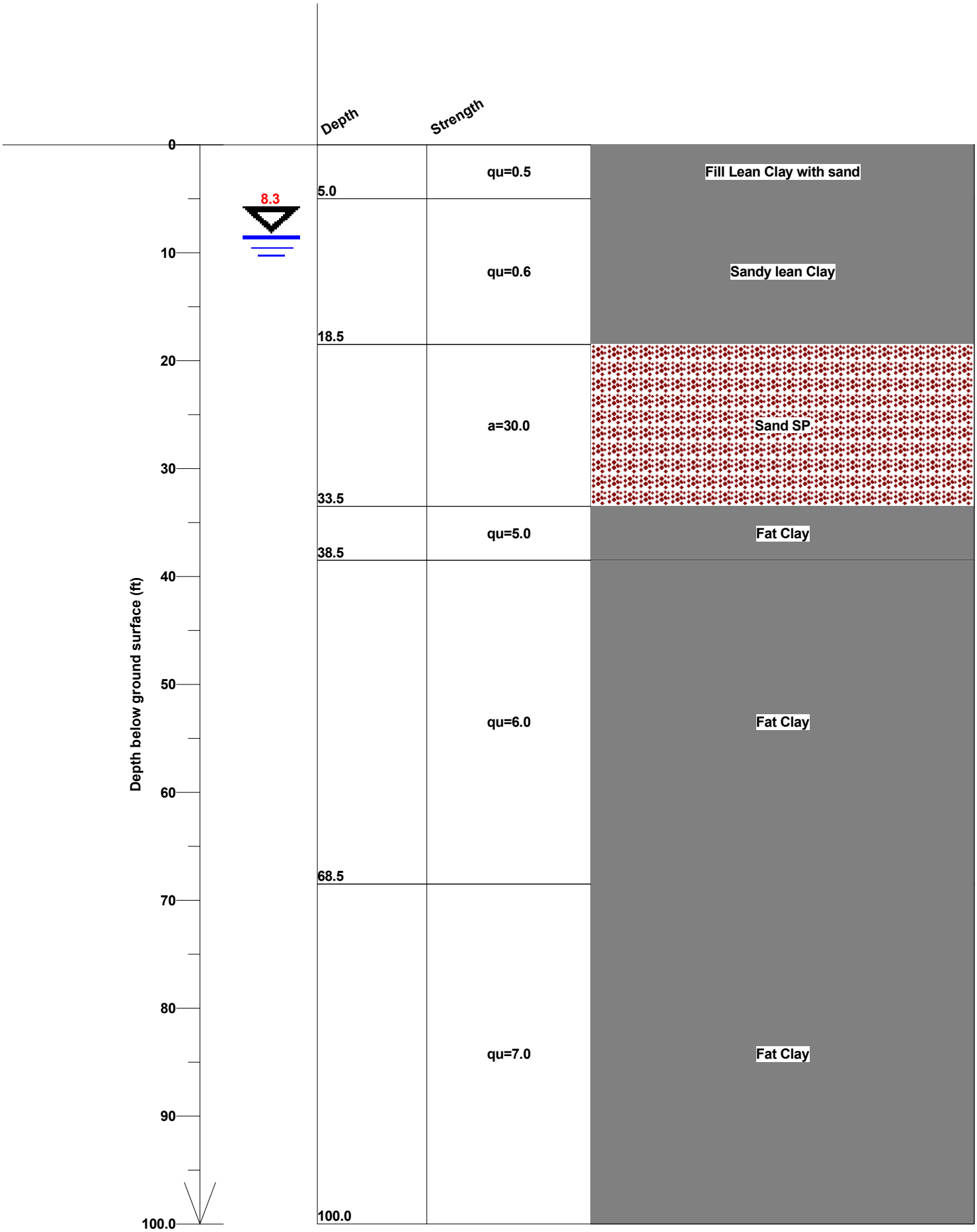
M3995 Bent 3


Depth
Strength
0
5.0
13.5
18.5
23.5
33.5
85.0
100.0
8.3
qu=0.5
qu=0.6
a=30.0
qu=1.5
qu=5.0
qu=6.0
qu=7.0
Fill Lean Clay with sand
Sandy lean Clay
Sand SP
Fat to Lean Clay
Fat Clay
Fat Clay
Fat Clay
Depth below ground surface (ft)
10
20
30
40
50
60
70
80
90

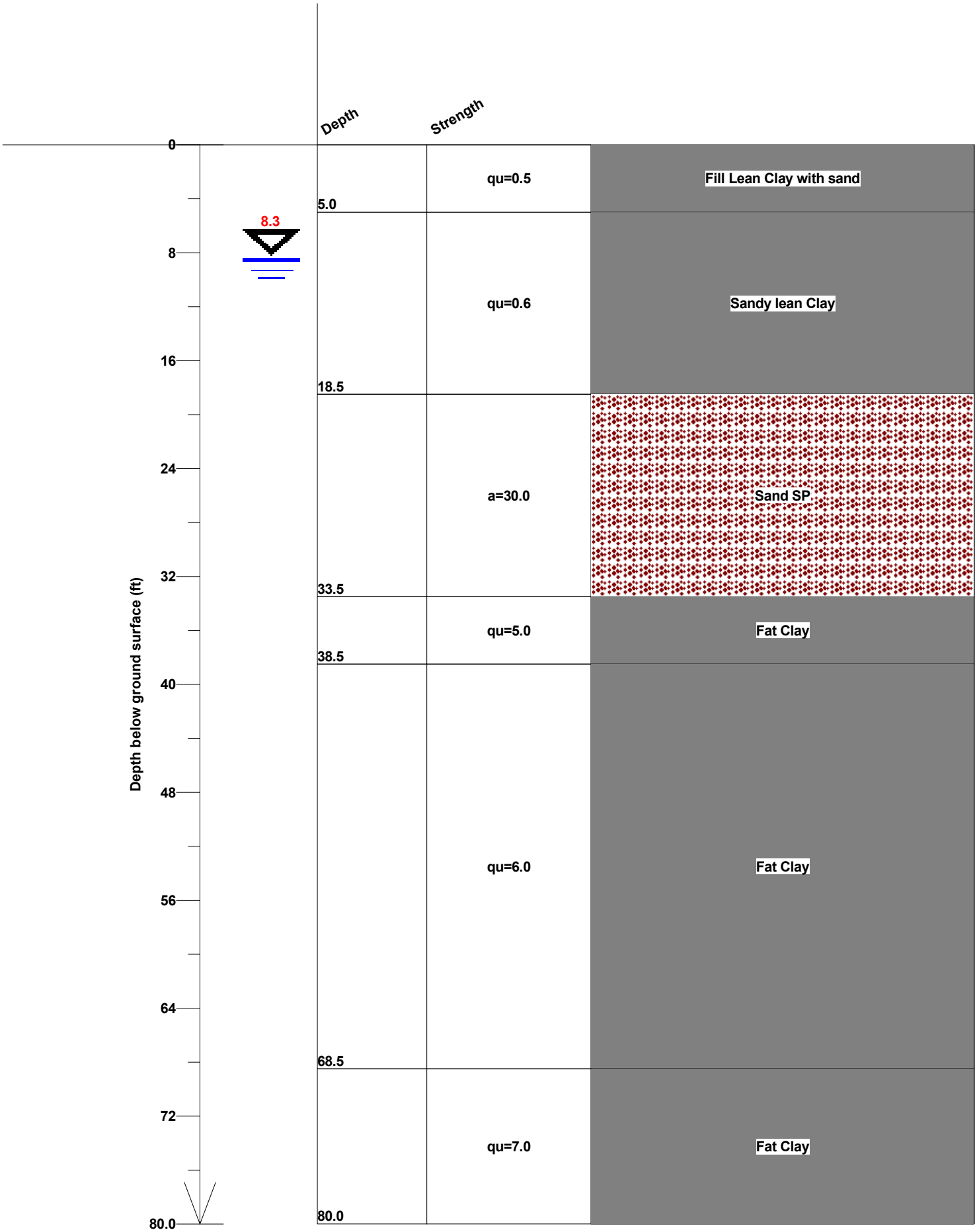
M3995 Bent 4


Depth
Strength
0
10
20
30
40
50
60
70
80
90
100.0
Depth below ground surface (ft)
8.3
5.0
13.5
18.5
23.5
33.5
85.0
100.0
qu=0.5
qu=0.6
a=30.0
qu=1.5
qu=5.0
qu=6.0
qu=7.0
Fill Lean Clay with sand
Sandy lean Clay
Sand SP
Fat to Lean Clay
Fat Clay
Fat Clay
Fat Clay

M3995 Bent 5


Depth
Strength
0
10
20
30
40
50
60
70
80
90
100.0
Depth below ground surface (ft)
8.3
5.0
18.5
33.5
38.5
68.5
100.0
qu=0.5
qu=0.6
a=30.0
qu=5.0
qu=6.0
qu=7.0
Fill Lean Clay with sand
Sandy lean Clay
Sand SP
Fat Clay
Fat Clay
Fat Clay

M3995 Bent 6


Depth
Strength
0
8
16
24
32
40
48
56
64
72
80.0
Depth below ground surface (ft)
8.3
qu=0.5
5.0
Fill Lean Clay with sand
qu=0.6
18.5
Sandy lean Clay
a=30.0
33.5
Sand SP
qu=5.0
38.5
Fat Clay
qu=6.0
68.5
Fat Clay
qu=7.0
80.0
Fat Clay