AEI

AMERICAN ENGINEERS, INC.

June 1, 2022

[redacted]

LG&E and KU
One Quality Street
Lexington, KY 40507

RE: Report of Geotechnical Exploration
Hardin Co. – Glendale South
Structure 10A
Glendale, KY
AEI Project No. 222-032

[redacted]

1. INTRODUCTION

A summary of the geotechnical parameters necessary to facilitate foundation design has been prepared for the immediate use of the design team. The project is a part of the Hardin Co. – Glendale South line in Glendale, KY. This summary is provided for Structure 10A, a 3CS Tower.

Table 1: Tower Details

Structure Number	Structure Description	Height (ft)	Centerline Elevation (ft)	Latitude (DMS)	Longitude (DMS)	Trans. Moment (ft-k)	Long. Moment (ft-k)
10A	3CS Tower	90	751.9	37°36’4.59”N	85°52’41.32”W	4,196	4,453
-	Leg 1	-	751.6	37°36’4.42”N	85°52’41.27”W	-	-
-	Leg 2	-	753.2	37°36’4.63”N	85°52’41.12”W	-	-
-	Leg 3	-	752.2	37°36’4.76”N	85°52’41.36”W	-	-
-	Leg 4	-	751.5	37°36’4.54”N	85°52’41.53”W	-	-

2. DRILLING AND SAMPLING

The geotechnical exploration consisted of four borings, including one soil test boring, one soil test boring with rock core and two rockline soundings. The soil test borings were advanced to a depth of 49 feet and about 61 feet beneath the surface. The rockline soundings were advanced to a depth of about 32 feet to 60 feet beneath the surface. The boring locations were staked by KU personnel. A boring layout is included in Appendix A of this report.

3. SUBSURFACE SOIL CONDITIONS

The generalized subsurface conditions encountered at the boring locations, including descriptions of the various strata and their depths and thicknesses are presented on the typed boring logs in Appendix B.

Topsoil was encountered at the surface with thicknesses of approximately five to six inches. Beneath the surface materials, sandy lean clay, clayey sand and poorly graded sand with clay were encountered to refusal depths in each of the borings. The sandy lean clay was typically described as brown in color, saturated to wet and very stiff in relative soil strength. The clayey sand was typically described as fine to medium grained, brown to gray in color, wet and loose to medium dense in relative density. The poorly graded sand with clay was typically described as fine to medium grained, yellowish brown to white in color, wet to saturated and medium dense in relative density.

Detailed laboratory results are included in Appendix C of this report.

4. BEDROCK CONDITIONS

Refusal, as would be indicated by the Driller on the field boring logs, indicates a depth where essentially no downward progress can be made by the auger. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface or where the N-value indicates essentially no penetration of the split-spoon sampler. Auger refusal was encountered in the soil test borings at the depths shown in the table below.

Table 2: Structure 10A – Summary of Borings

Hole No.	Latitude	Longitude	Surface Elevation (ft.) MSL	Auger Refusal	
				Depth (ft.)	Elevation (ft.) MSL
STR 10A L1	37°36’4.59”N	85°52’41.32”W	749.8	26.8	723.0
STR 10A L2	37°36’4.42”N	85°52’41.27”W	749.4	N/A*	N/A*
STR 10A L3	37°36’4.63”N	85°52’41.12”W	750.5	N/A*	N/A*
STR 10A L4	37°36’4.76”N	85°52’41.36”W	751.0	31.6	719.4

*Auger refusal was not encountered

5. FOUNDATION DESIGN PARAMETERS

5.1 **<u>Lateral Design Parameters</u>** – MFAD soil parameters are provided in the table below. These values are derived from the laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02. The soil deformation moduli provided below were derived from Figure 3-2 and Figure 3-4 of the User Guide for MFAD 5.0 (Moment Foundation Analysis and Design).

Table 3: MFAD Geotechnical Design Parameters

Structure Number	Soil Type	Depth (feet)	Approximate Angle of Internal Friction	Modulus of Deformation (ksi)
STR 10A	SC	5.0-11.0	32°	1.0
STR 10A	SC	11.0-19.0	32°	1.0
STR 10A	SP-SC	19.0-61.0*	35°	2.0

*Overburden depths vary from 26.8' to greater than 60'

Lateral soil parameters recommended for drilled shaft design are shown below in Table 4 using estimations by Reese, et. al. (1974) for sand above and below the water table. These values are derived from laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02.

Table 4: L-Pile Soil Parameters for Design of Drilled Shafts

Structure Number	Soil Type	Depth (feet)	Friction Factor, tan (delta)	Initial Soil Stiffness (k_{py}) (pci)
STR 10A	SC	5.0-11.0	0.4	90
STR 10A	SC	11.0-19.0	0.4	60
STR 10A	SP-SC*	19.0-61.0	0.4	60

*Overburden depths vary from 26.8' to greater than 60'

5.2 <u>**Axial Design Parameters**</u> – Due to the karst conditions at the site, it is recommended to design the drilled shaft as soil bearing. Axial soil parameters recommended for drilled shaft design are shown below in Table 5. These values are derived from laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02. An ultimate friction angle for clayey fine to medium sand in contact with concrete of 19° should be used for design. For cohesionless soils, utilize a skin friction resistance factor (φ) of 0.55 in accordance with the Brown et al. (2010) method. Utilize an uplift resistance factor of 0.45 for cohesionless soils in accordance with the Brown et al. (2018) method. **Due to karst features present at the proposed tower location, it is recommended that base resistance be neglected for design purposes.**

Table 5: Axial Soil Parameters for Design of Drilled Shafts

Structure Number	Soil Type	Depth (feet)	Effective Unit Weight* (pcf)	Nominal Side Resistance (q_s) (ksf)
STR 10A	SC	5.0-11.0	125	0.9
STR 10A	SC	11.0-19.0	62.6	0.9
STR 10A	SP-SC**	19.0-61.0	67.6	1.5

*Effective Unit Weight accounts for Buoyancy
**Overburden depths vary from 26.8’ to greater than 60’

The designer should feel free to contact AEI at 270-651-7220 for further recommendations or if any questions arise pertaining to this project.

Sincerely,

AMERICAN ENGINEERS, INC.

Aaron Anderson, EIT
Geotechnical Engineer

Dusty Barrett, PE, PMP
Director of Geotechnical Services

Attachments:

- Boring Layout
- Typed Boring Logs
- Laboratory Data

APPENDIX A

Boring Layout

LEGEND

- SOIL TEST BORING
- ROCKLINE SOUNDING
- SOIL TEST BORING WITH ROCK CORE

DRAWING NOT TO SCALE
ALL BORING LOCATIONS ARE APPROXIMATE

REVISIONS		
NO.	DATE	DESCRIPTION

BORING LAYOUT

CLIENT: LG&E and KU

PROJECT: FORD PROPERTY 345kV
HARDIN CO. - GLENDALE SOUTH
STRUCTURE 10A
GLENDALE, KY

AEI
AMERICAN ENGINEERS, INC.
DESIGNING YOUR FUTURE
65 Aberdeen Drive Glasgow KY
270.651.7220

SCALE: NTS

DATE: 06-01-2022

DRAWN BY: A. ANDERSON

CHECKED BY: D. BARRETT

FILE: T:/22 PROJECTS/222-032 LG&E KU Glendale Ford Plant\Geotech\Hardin Co. - Glendale South\STR 10A\Support Information

SHEET: A-1

APPENDIX B

Boring Logs

FIELD TESTING PROCEDURES

The general field procedures employed by the Field Services Center are summarized in the following outline. The procedures utilized by the AEI Field Service Center are recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Soil Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the surface conditions. Borings are advanced into the ground using continuous flight augers. At prescribed intervals throughout the boring depths, soil samples are obtained with a split-spoon or thin-walled sampler and sealed in airtight glass jars and labeled. The sampler is first seated 6 inches to penetrate loose cuttings and then driven an additional foot, where possible, with blows from a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler each six-inch increment is recorded. The penetration resistance, or "N-value" is designated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split spoon sampling procedures used during the exploration are in general accordance with ASTM D 1586. Split spoon samples are considered to provide *disturbed* samples, yet are appropriate for most engineering applications. Thin-walled (Shelby tube) samples are considered to provide *undisturbed* samples and obtained when warranted in general accordance with ASTM D 1587.

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Core Drilling Procedures for use on refusal materials. Prior to coring, casing is set in the boring through the overburden soils. Refusal materials are then cored according to ASTM D-2113 using a diamond bit attached to the end of a hollow double tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Samples of the material penetrated are protected and retained in the inner tube, which is retrieved at the end of each drill run. Upon retrieval of the inner tube the core is recovered, measured and placed in boxes for storage.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soil in general accordance with the procedures outlined in ASTM D 2487 and D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

Representative portions of soil samples are placed in sealed containers and transported to the laboratory. In the laboratory, the samples are examined to verify the driller's field classifications. Test Boring Records are attached which show the soil descriptions and penetration resistances.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designate the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

Water table readings are normally taken in conjunction with borings and are recorded on the "Boring Logs". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using as electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Sampling Terminology

Undisturbed Sampling: Thin-walled or Shelby tube samples used for visual examination, classification tests and quantitative laboratory testing. This procedure is described by ASTM D 1587. Each tube, together with the encased soil, is carefully removed from the ground, made airtight and transported to the laboratory. Locations and depths of undisturbed samples are shown on the "Boring Logs."

Bag Sampling: Bulk samples of soil are obtained at selected locations. These samples consist of soil brought to the surface by the drilling augers, or obtained from test pits or the ground surface using hand tools. Samples are placed in bags, with sealed jar samples of the material, and taken to our laboratory for testing where more mass material is required (i.e. Proctors and CBR's). The locations of these samples are indicated on the appropriate logs, or on the Boring Location Plan.

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIVE SOILS
(Clay, Silt, and Mixtures)

CONSISTENCY	SPT N-VALUE	Qu/Qp (tsf)
Very Soft	2 blows/ft or less	0 – 0.25
Soft	2 to 4 blows/ft	0.25 – 0.49
Medium Stiff	4 to 8 blows/ft	0.50 – 0.99
Stiff	8 to 15 blows/ft	1.00 – 2.00
Very Stiff	15 to 30 blows/ft	2.00 – 4.00
Hard	30 blows/ft or more	> 4.00

PLASTICITY

Degree of Plasticity	Plasticity Index (PI)
Low	0 – 7
Medium	8 – 22
High	over 22

NON-COHESIVE SOILS
(Silt, Sand, Gravel, and Mixtures)

DENSITY	SPT N-VALUE
Very Loose	4 blows/ft or less
Loose	4 to 10 blows/ft
Medium Dense	10 to 30 blows/ft
Dense	30 to 50 blows/ft
Very Dense	50 blows/ft or more

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 – 10
Trace to Some	11 – 20
Some	21 – 35
And	36 – 50

PARTICLE SIZE IDENTIFICATION

Boulders	12 inch diameter or more
Cobbles	3 to 12 inch diameter
Gravel	Coarse – 1 to 3 inch
	Medium – ½ to 1 inch
	Fine – ¼ to ½ inch
Sand	Coarse – 0.6mm to ¼ inch
	Medium – 0.2mm to 0.6mm
	Fine – 0.05mm to 0.2mm
Silt	0.05mm to 0.005mm
Clay	0.005mm

NOTES

Classification – The Unified Soil Classification System is used to identify soil unless otherwise noted.

Standard "N" Penetration Test (SPT) (ASTM D1586) – Driving a 2-inch O.D., 1 3/8-inch I.D. sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6-inches to seat the sampler into undisturbed soil, and then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the field drill long (e.g., 10/8/7). On the report log, the Standard Penetration Test result (i.e., the N value) is normally presented and consists of the sum of the 2nd and 3rd penetration counts (i.e., N = 8 + 7 = 15 blows/ft.)

Soil Property Symbols

Qu:	Unconfined Compressive Strength	N:	Standard Penetration Value (see above)
Qp:	Unconfined Comp. Strength (pocket pent.)	omc:	Optimum Moisture content
LL:	Liquid Limit, % (Atterberg Limit)	PL:	Plastic Limit, % (Atterberg Limit)
PI:	Plasticity Index	mdd:	Maximum Dry Density

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(270) 651-7220

CLIENT LG&E and KU
PROJECT NAME Hardin County - Glendale South 345kV
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY
DATE STARTED 3/31/22 **COMPLETED** 3/31/22
GROUND ELEVATION 749.8 ft
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD HSA/ Diamond impregnated coring bit
AT TIME OF DRILLING 17.00 ft / Elev 732.80 ft
LOGGED BY Adam Cash **CHECKED BY** Aaron Anderson
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0	TOPSOIL (6 INCHES)									
	(CL) sandy lean CLAY, brown, saturated to wet, very stiff									
5		ST 1	70		4.5+	21	25	14	11	Qu = 5,325 psf
10	(SC) clayey SAND, fine to medium grained, light brown and gray, wet, medium dense	ST 2	60		4.5+	35				
15		SPT 1	100	6-8-10 (18)	-	16				
17	∇									
20		SPT 2	100	3-6-9 (15)	4.5+	27	57	29	28	
25		ST 3	100		4.5+	16	37	23	14	
	LIMESTONE with clay seams, gray, fine to medium grained, thin to thick bedded, soft to hard	RC 1	14 (0)							
30		RC 2	88 (38)							
35		RC	58							

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CLIENT LG&E and KU
PROJECT NAME Hardin County - Glendale South 345kV
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
35		LIMESTONE with clay seams, gray, fine to medium grained, thin to thick bedded, soft to hard *(continued)*	3	(22)							
40			RC 4	80 (12)							
45			RC 5	56 (28)							

Refusal at 26.8 feet.
Bottom of borehole at 49.0 feet.

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CLIENT LG&E and KU
PROJECT NAME Hardin County - Glendale South 345kV
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY
DATE STARTED 4/1/22 **COMPLETED** 4/1/22
GROUND ELEVATION 749.4 ft
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Adam Cash **CHECKED BY** Aaron Anderson
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (5 INCHES)									
		OVERBURDEN (60.0 FEET)									
5											
10											
15											
20											
25											
30											
35											

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CLIENT LG&E and KU

PROJECT NAME Hardin County - Glendale South 345kV

PROJECT NUMBER 222-032

PROJECT LOCATION Glendale, KY

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
35		OVERBURDEN (60.0 FEET) *(continued)*									
40											
45											
50											
55											
60											

Bottom of borehole at 60.0 feet.

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STR 10A L3

CLIENT LG&E and KU
PROJECT NAME Hardin County - Glendale South 345kV
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY
DATE STARTED 4/7/22 **COMPLETED** 4/8/22
GROUND ELEVATION 750.5 ft
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING 11.00 ft / Elev 739.50 ft
LOGGED BY Adam Cash **CHECKED BY** Aaron Anderson
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (6 INCHES)									
		(SC) clayey SAND, fine to medium grained, brown, wet, loose to medium dense									
5			ST 1	100		4.25	16	21	11	10	Qu = 1,945 psf
10			ST 2	100		3.75	18	27	10	17	Qu = 3,225 psf
15			SPT 1	73	5-5-5 (10)	-	20				
20		(SP-SC) poorly graded SAND with clay, fine to medium grained, yellowish brown, wet, medium dense	SPT 2	100	6-6-7 (13)	-	19				
25		(SP-SC) poorly graded SAND with clay, fine to medium grained, white, wet to saturated, medium dense	SPT 3	67	8-8-16 (24)	-	22				
30			SPT 4	67	3-9-15 (24)	-	23				
35			SPT	87	8-8-17	-	18				

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CLIENT LG&E and KU **PROJECT NAME** Hardin County - Glendale South 345kV

PROJECT NUMBER 222-032 **PROJECT LOCATION** Glendale, KY

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
35		(SP-SC) poorly graded SAND with clay, fine to medium grained, white, wet to saturated, medium dense *(continued)*	5		(25)						
40			SPT 6	100	5-5-6 (11)	-	23				
45											
50			SPT 7	100	6-8-8 (16)	-	21				
55											
60			SPT 8	100	5-7-9 (16)	-	24				

Bottom of borehole at 60.5 feet.

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CLIENT LG&E and KU
PROJECT NAME Hardin County - Glendale South 345kV
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY
DATE STARTED 4/8/22 **COMPLETED** 4/8/22
GROUND ELEVATION 751 ft
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Adam Cash **CHECKED BY** Aaron Anderson
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (5 INCHES)									
		OVERBURDEN (31.6 FEET)									
5											
10											
15											
20											
25											
30											

Refusal at 31.6 feet.
Bottom of borehole at 31.6 feet.

APPENDIX C

Laboratory Testing Results

AEI
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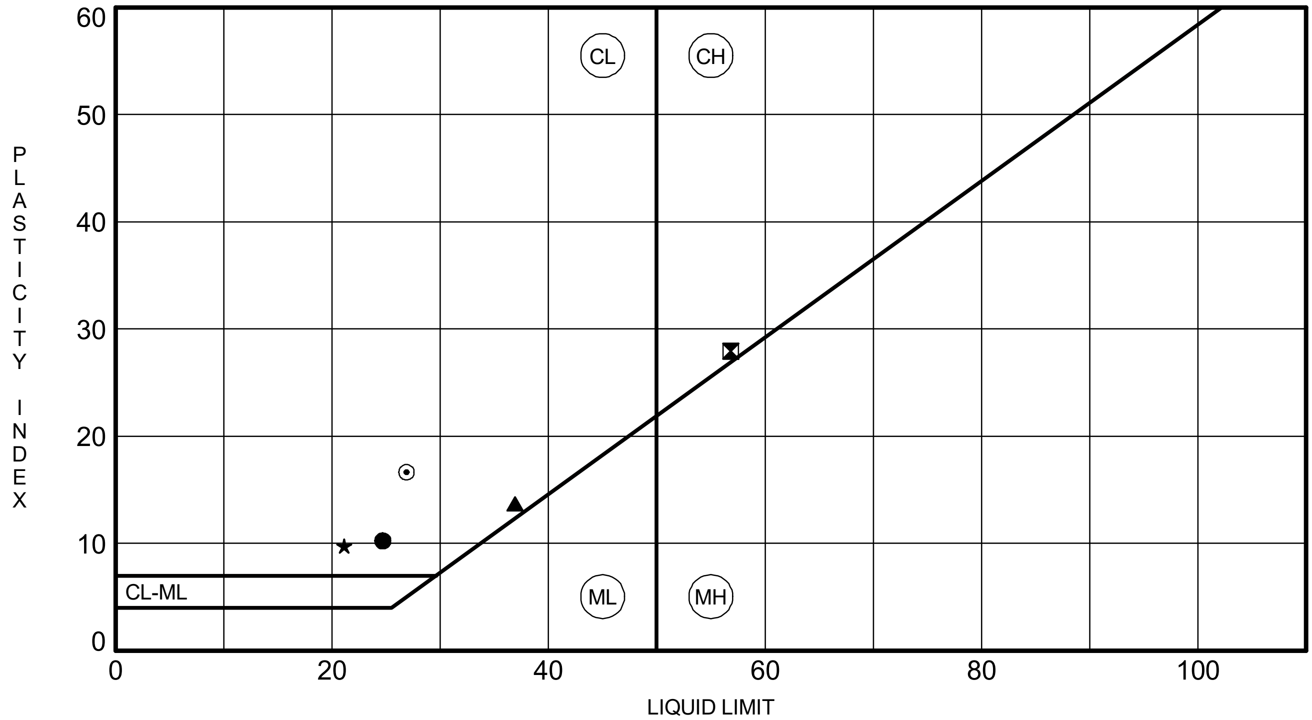
ATTERBERG LIMITS' RESULTS

CLIENT LG&E and KU
PROJECT NAME Hardin County - Glendale South 345kV
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**STR 10A L1**	**4.0**	**25**	**14**	**11**		**SANDY LEAN CLAY (CL)**
⊠	**STR 10A L1**	**19.0**	**57**	**29**	**28**		**CLAYEY SAND (SC)**
▲	**STR 10A L1**	**24.0**	**37**	**23**	**14**	**50**	**CLAYEY SAND (SC)**
★	**STR 10A L3**	**4.0**	**21**	**11**	**10**	**45**	**CLAYEY SAND (SC)**
⊙	**STR 10A L3**	**9.0**	**27**	**10**	**17**		**CLAYEY SAND (SC)**

GRAIN SIZE DISTRIBUTION

AMERICAN ENGINEERS, INC.
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65 Aberdeen Drive
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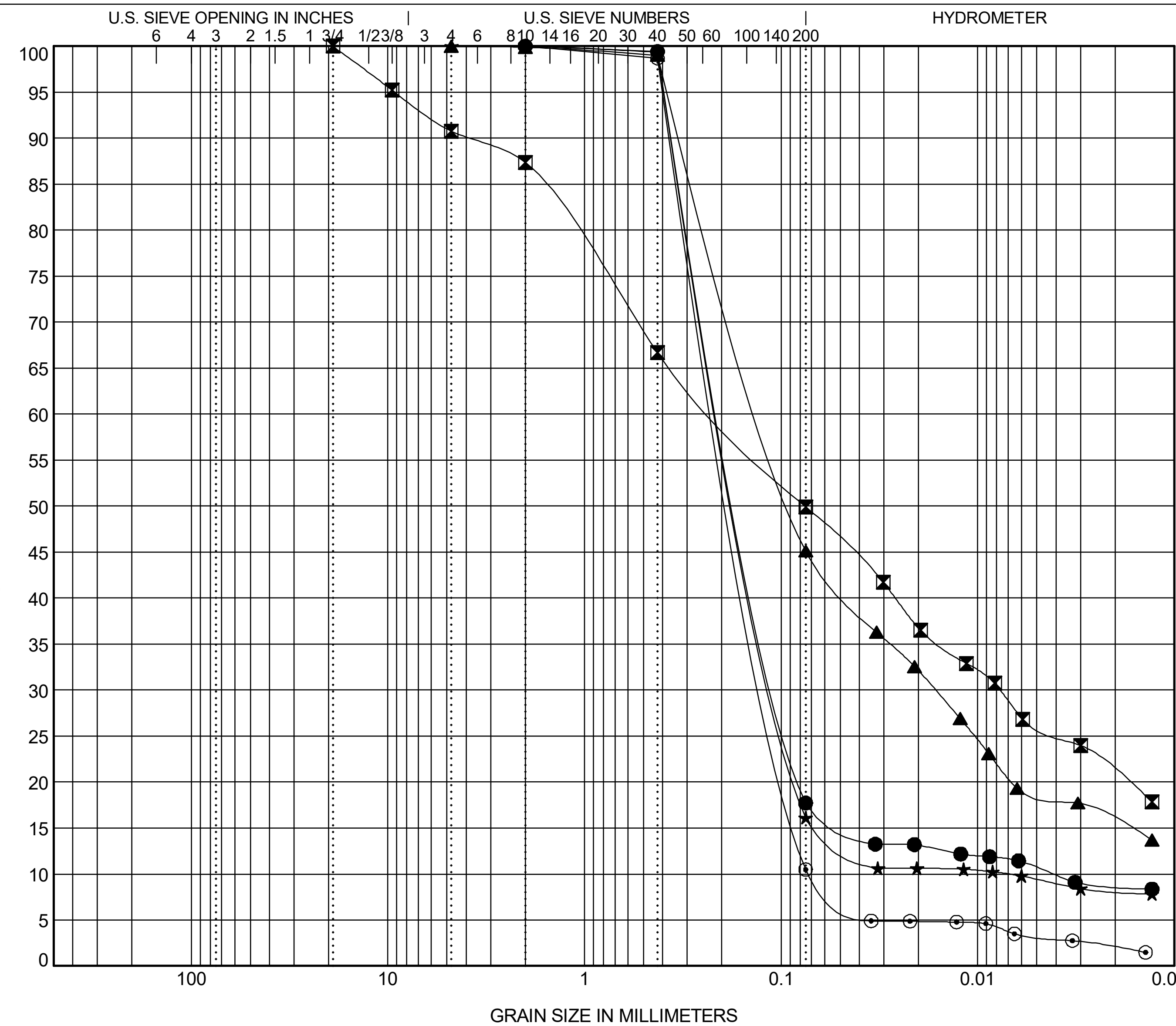
(270) 651-7220

CLIENT LG&E and KU **PROJECT NAME** Hardin County - Glendale South 345kV

PROJECT NUMBER 222-032 **PROJECT LOCATION** Glendale, KY



	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**STR 10A L1**	**14.0**	**CLAYEY SAND (SC)**				**12.47**	**44.55**
⧗	**STR 10A L1**	**24.0**	**CLAYEY SAND (SC)**	**37**	**23**	**14**		
▲	**STR 10A L3**	**4.0**	**CLAYEY SAND (SC)**	**21**	**11**	**10**		
★	**STR 10A L3**	**14.0**	**CLAYEY SAND (SC)**				**7.67**	**26.79**
⊙	**STR 10A L3**	**19.0**	**POORLY GRADED SAND WITH CLAY (SP-SC)**				**0.87**	**2.83**

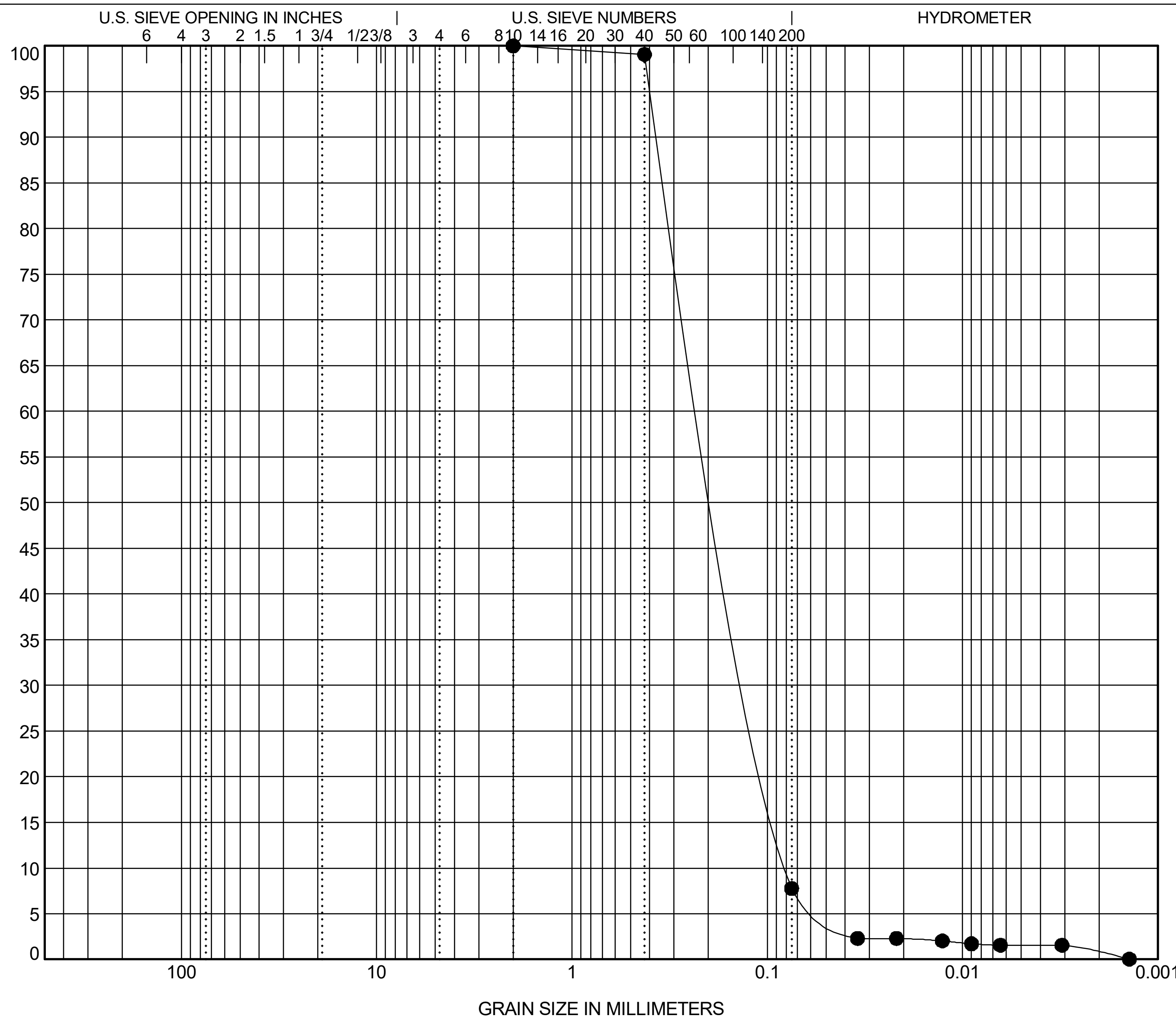
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**STR 10A L1**	**14.0**	**2**	**0.184**	**0.097**	**0.004**	**0.0**	**82.3**	**7.0**	**10.7**
⧗	**STR 10A L1**	**24.0**	**19**	**0.213**	**0.008**		**9.2**	**40.8**	**23.8**	**26.1**
▲	**STR 10A L3**	**4.0**	**4.75**	**0.121**	**0.016**		**0.0**	**54.9**	**26.3**	**18.8**
★	**STR 10A L3**	**14.0**	**4.75**	**0.187**	**0.1**	**0.007**	**0.0**	**83.9**	**6.7**	**9.4**
⊙	**STR 10A L3**	**19.0**	**2**	**0.199**	**0.11**	**0.07**	**0.0**	**89.5**	**7.3**	**3.2**

GRAIN SIZE DISTRIBUTION

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT LG&E and KU **PROJECT NAME** Hardin County - Glendale South 345kV

PROJECT NUMBER 222-032 **PROJECT LOCATION** Glendale, KY

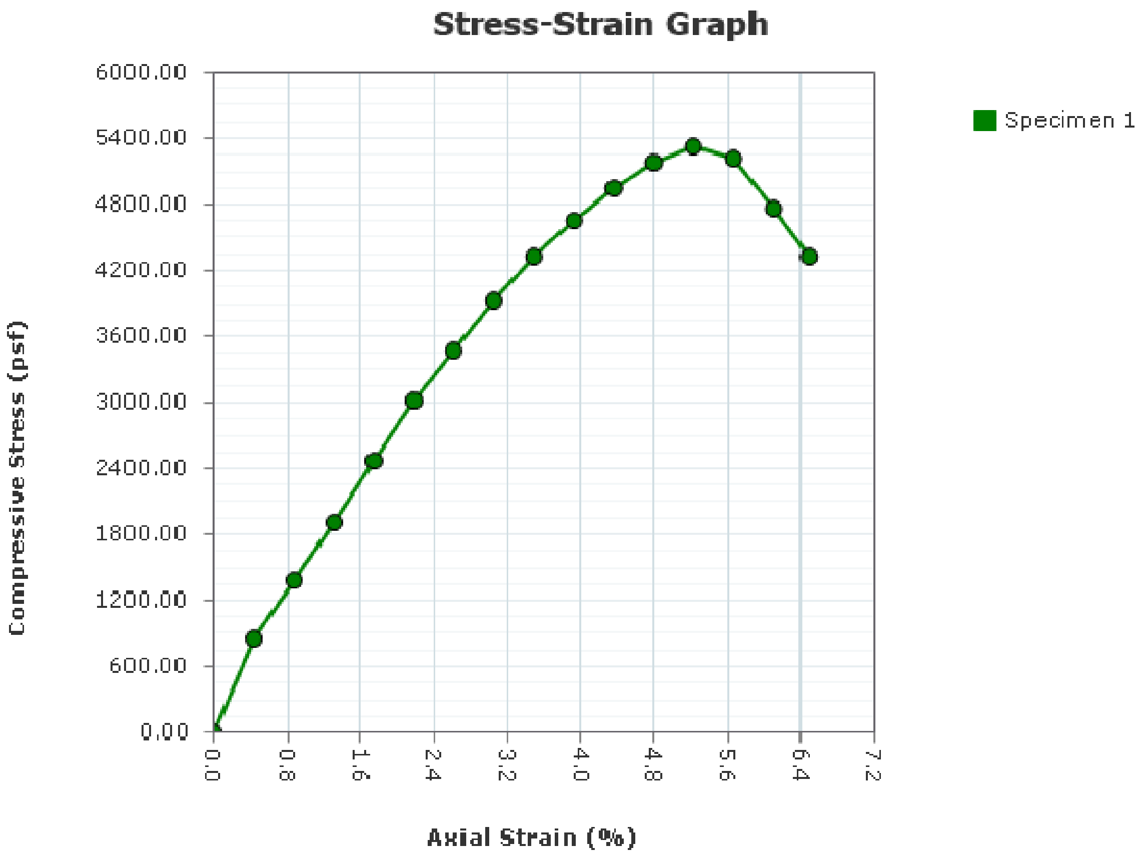


	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**STR 10A L3**	**49.0**	**POORLY GRADED SAND WITH CLAY (SP-SC)**				**0.83**	**2.59**

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**STR 10A L3**	**49.0**	**2**	**0.202**	**0.114**	**0.078**	**0.0**	**92.2**	**6.2**	**1.6**

Unconfined Compression Test

ASTM D2166



Project:	Hardin Co. - Glendale South
Project Number:	222-032
Received Date:	4/13/2022
Sampling Date:	4/13/2022
Sample Number:	ST 1
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 10A L1
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	1	2	3	4	5	6	7	8
Moisture Content (%):	21.0							
Wet Density (pcf)	142.9							
Dry Density (pcf)	118.1							
Saturation (%):	130.3							
Void Ratio:	0.437							
Height (in)	5.7400							
Diameter (in)	2.7600							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.08							
Test Data	1	2	3	4	5	6	7	8
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.74							
Unconfined Compressive Strength (psf)	5327.45							
Undrained Shear Strength (psf)	2663.72							
Strain at Failure (%):	5.23							

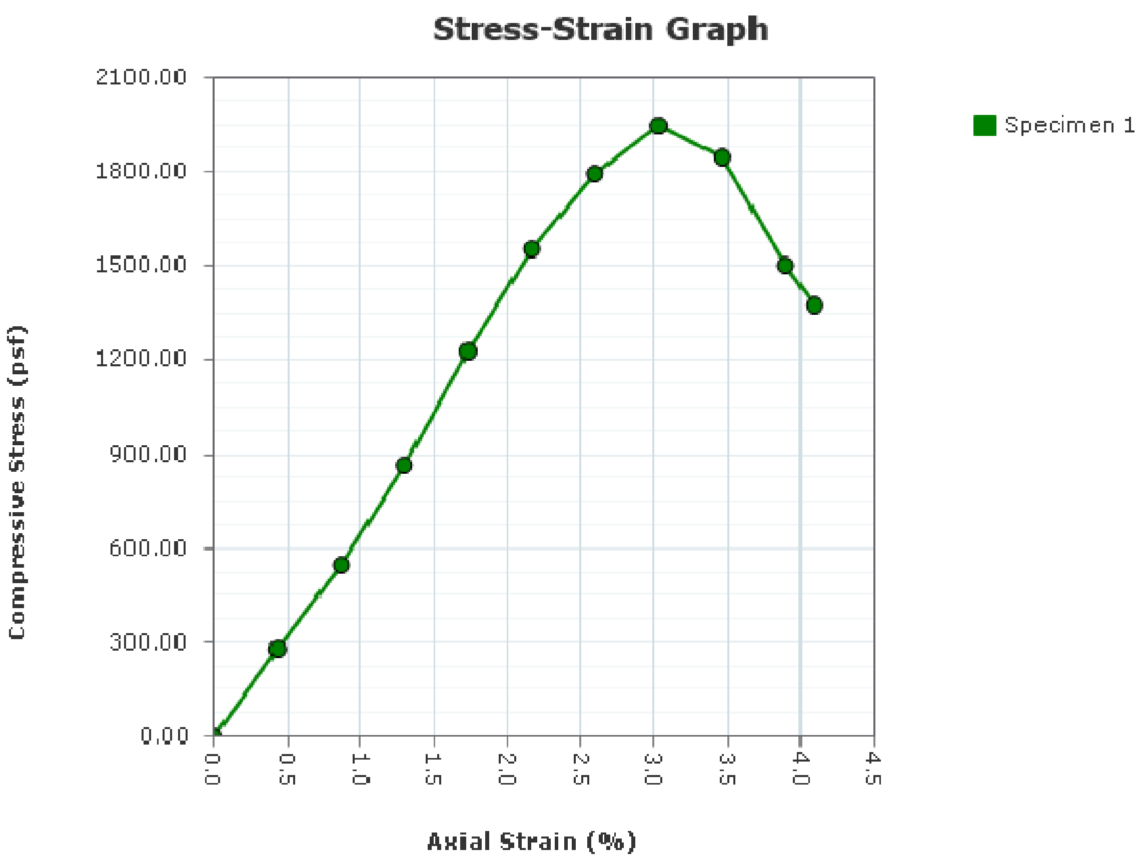
Specific Gravity:	2.72	Plastic Limit:	14	Liquid Limit:	25
Type:	UD	Soil Classification:	CL		

Project:	Hardin Co. - Glendale South
Project Number:	222-032
Sampling Date:	4/13/2022
Sample Number:	ST 1
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 10A L1
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Unconfined Compression Test

ASTM D2166



Project:	Hardin Co. - Glendale South
Project Number:	222-032
Received Date:	4/13/2022
Sampling Date:	4/13/2022
Sample Number:	ST 4
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 10A L3
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	1	2	3	4	5	6	7	8
Moisture Content (%):	15.6							
Wet Density (pcf)	134.1							
Dry Density (pcf)	116.0							
Saturation (%):	91.3							
Void Ratio:	0.464							
Height (in)	5.7800							
Diameter (in)	2.8400							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.04							
Test Data	1	2	3	4	5	6	7	8
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.73							
Unconfined Compressive Strength (psf)	1945.44							
Undrained Shear Strength (psf)	972.72							
Strain at Failure (%):	3.03							

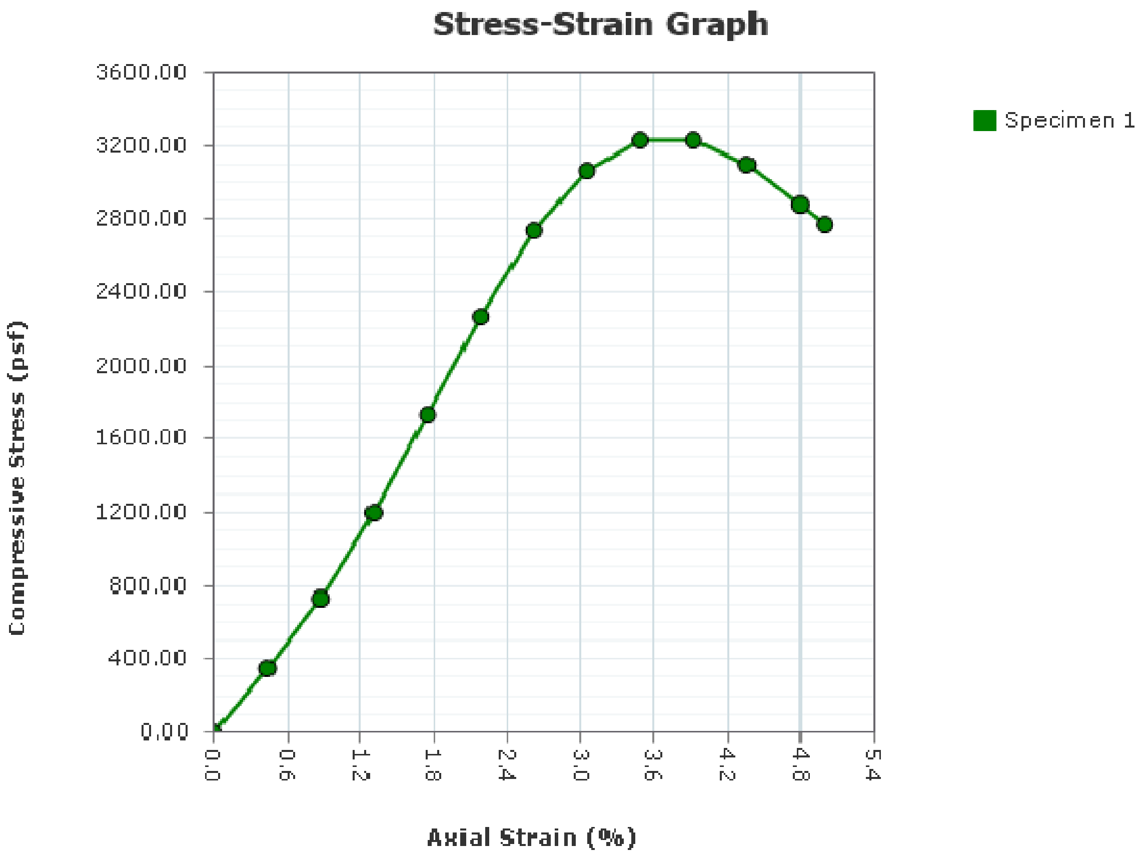
Specific Gravity:	2.72	Plastic Limit:	11	Liquid Limit:	21
Type:	UD	Soil Classification:	SC		

Project:	Hardin Co. - Glendale South
Project Number:	222-032
Sampling Date:	4/13/2022
Sample Number:	ST 4
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 10A L3
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Unconfined Compression Test

ASTM D2166



Project:	Hardin Co. - Glendale South
Project Number:	222-032
Received Date:	4/13/2022
Sampling Date:	4/13/2022
Sample Number:	ST 5
Sample Depth:	9.0-11.0 ft
Boring Number:	STR 10A L3
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Test Date: 4/13/2022 Checked By: ___________________ Date: _____________

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	1	2	3	4	5	6	7	8
Moisture Content (%):	17.9							
Wet Density (pcf)	134.7							
Dry Density (pcf)	114.3							
Saturation (%):	100.3							
Void Ratio:	0.486							
Height (in)	5.7400							
Diameter (in)	2.8200							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.04							
Test Data	1	2	3	4	5	6	7	8
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.74							
Unconfined Compressive Strength (psf)	3226.87							
Undrained Shear Strength (psf)	1613.44							
Strain at Failure (%):	3.92							

Specific Gravity:	2.72	Plastic Limit:	10	Liquid Limit:	27
Type:	UD	Soil Classification:	CL		

Project:	Hardin Co. - Glendale South
Project Number:	222-032
Sampling Date:	4/13/2022
Sample Number:	ST 5
Sample Depth:	9.0-11.0 ft
Boring Number:	STR 10A L3
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Your Geotechnical Engineering Report

To help manage your risks, this information is being provided because subsurface issues are a major cause of construction delays, cost overruns, disputes, and claims.

Geotechnical Services are Performed for Specific Projects, Purposes, and People

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering exploration conducted for an engineer may not fulfill the needs of a contractor or even another engineer. Each geotechnical engineering exploration and report is unique and is prepared solely for the client. No one except the client should rely on the geotechnical engineering report without first consulting with the geotechnical engineer who prepared it. The report should not be applied for any project or purpose except the one originally intended.

Read the Entire Report

To avoid serious problems, the full geotechnical engineering report should be read in its entirety. Do not only read selected sections or the executive summary.

A Unique Set of Project-Specific Factors is the Basis for a Geotechnical Engineering Report

Geotechnical engineers consider a numerous unique, project-specific factors when determining the scope of a study. Typical factors include: the client's goals, objectives, project costs, risk management preferences, proposed structures, structures on site, topography, and other proposed or existing site improvements, such as access roads, parking lots, and utilities. Unless indicated otherwise by the geotechnical engineer who conducted the original exploration, a geotechnical engineering report should not be relied upon if it was:

- not prepared for you or your project,
- not prepared for the specific site explored, or
- completed before important changes to the project were implemented.

Typical changes that can lessen the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a multi-story hotel to a parking lot
- finished floor elevation, location, orientation, or weight of the proposed structure, anticipated loads or
- project ownership

Geotechnical engineers cannot be held liable or responsible for issues that occur because their report did not take into account development items of which they were not informed. The geotechnical engineer should always be notified of any project changes. Upon notification, it should be requested of the geotechnical engineer to give an assessment of the impact of the project changes.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that exist at the time of the exploration. A geotechnical engineering report should not be relied upon if its reliability could be in question due to factors such as man-made events as construction on or adjacent to the site, natural events such as floods, earthquakes, or groundwater fluctuation, or time. To determine if a geotechnical report is still reliable, contact the geotechnical engineer. Major problems could be avoided by performing a minimal amount of additional analysis and/or testing.

Most Geotechnical Findings are Professional Opinions

Geotechnical site explorations identify subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field logs and laboratory data and apply their professional judgment to make conclusions about the subsurface conditions throughout the site. Actual subsurface conditions may differ from those indicated in the report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risk associated with unanticipated conditions.

The Recommendations within a Report Are Not Final

Do not put too much faith on the construction recommendations included in the report. The recommendations are not final due to geotechnical engineers developing them principally from judgment and opinion. Only by observing actual subsurface conditions revealed during construction can geotechnical engineers finalize their recommendations. Responsibility and liability cannot be assumed for the recommendations

within the report by the geotechnical engineer who developed the report if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Misinterpretation of geotechnical engineering reports has resulted in costly problems. The risk of misinterpretation can be lowered after the submittal of the final report by having the geotechnical engineer consult with appropriate members of the design team. The geotechnical engineer could also be retained to review crucial parts of the plans and specifications put together by the design team. The geotechnical engineering report can also be misinterpreted by contractors which can result in many problems. By participating in pre-bid and preconstruction meetings and providing construction observations by the geotechnical engineer, many risks can be reduced.

Final Boring Logs Should not be Re-drawn

Geotechnical engineers prepare final boring logs and testing results based on field logs and laboratory data. The logs included in a final geotechnical engineering report should never be redrawn to be included in architectural or design drawings due to errors that could be made. Electronic reproduction is acceptable, along with photographic reproduction, but it should be understood that separating logs from the report can elevate risk.

Contractors Need a Complete Report and Guidance

By limiting what is provided for bid preparation, contractors are not liable for unforeseen subsurface conditions although some owners and design professionals believe the opposite to be true. The complete geotechnical engineering report, accompanied with a cover letter or transmittal, should be provided to contractors to help prevent costly problems. The letter states that the report was not prepared for purposes of bid development and the report's accuracy is limited. Although a fee may be required, encourage the contractors to consult with the geotechnical engineer who prepared the report and/or to conduct additional studies to obtain the specific types of information they need or prefer. A prebid conference involving the owner, geotechnical engineer, and contractors can prove to be very valuable. If needed, allow contractors sufficient time to perform additional studies. Upon doing this you might be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Closely Read Responsibility Provisions

Geotechnical engineering is not as exact as other engineering disciplines. This lack of understanding by clients, design professionals, and contractors has created unrealistic expectations that have led to disappointments, claims, and disputes. To minimize such risks, a variety of explanatory provisions may be included in the report by the geotechnical engineer. To help others recognize their own responsibilities and risks, many of these provisions indicate where the geotechnical engineer's responsibilities begin and end. These provisions should be read carefully, questions asked if needed, and the geotechnical engineer should provide satisfactory responses.

Environmental Issues/Concerns are not Covered

Unforeseen environmental issues can lead to project delays or even failures. Geotechnical engineering reports do not usually include environmental findings, conclusions, or recommendations. As with a geotechnical engineering report, do not rely on an environmental report that was prepared for someone else.

AEI
AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING

65 Aberdeen Drive
Glasgow, KY 42141
270-651-7220

AMERICAN ENGINEERS, INC.

May 13, 2022

[redacted]

LG&E and KU
One Quality Street
Lexington, KY 40507

RE: Report of Geotechnical Exploration
Ford 138kV Glendale Industrial West
Structure 26W
Glendale, KY
AEI Project No. 222-032

[redacted]

1. INTRODUCTION

A summary of the geotechnical parameters necessary to facilitate foundation design has been prepared for the immediate use of the design team. The project is a part of the Ford 138kV Glendale Industrial West in Glendale, KY. This summary is provided for Structure 26W, a double circuit, tangent pole which will be supported by direct embedment.

Table 1: Tower Details

Structure Number	Structure Description	Height (ft)	Centerline Elevation (ft)	Structure Coordinates		Trans. Moment (ft-k)	Long. Moment (ft-k)
				Latitude (DMS)	Longitude (DMS)		
26W	Double Circuit	115	696.8	37°34’40.46”N	85°53’6.43”W	906	284

2. DRILLING AND SAMPLING

The geotechnical exploration consisted of one soil test boring. The soil test boring was advanced to a depth of about 25 feet beneath the surface. The boring location was staked by KU personnel. A boring layout is included in Appendix A of this report.

3. SUBSURFACE SOIL CONDITIONS

The generalized subsurface conditions encountered at the boring location, including descriptions of the various strata and their depths and thicknesses are presented on the typed boring log in Appendix B.

Topsoil was encountered at the surface with a thickness of eight inches. Beneath the surface material, lean clay was encountered to a depth of nine feet. Fat clay was encountered from nine feet to the auger refusal depth. The lean clay was typically described as brown to reddish brown in color, moist and stiff to very stiff in soil strength consistency. The fat clay was typically described as containing trace amounts of gravel, reddish brown in color, moist and stiff in soil strength consistency.

4. BEDROCK CONDITIONS

Refusal, as would be indicated by the Driller on the field boring log, indicates a depth where essentially no downward progress can be made by the auger. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface or where the N-value indicates essentially no penetration of the split-spoon sampler. The auger refusal depth is provided in the table below.

Table 2: Structure 26W – Summary of Boring

Hole No.	Latitude	Longitude	Surface Elevation (ft.) MSL	Auger Refusal	
				Depth (ft.)	Elevation (ft.) MSL
STR 26W	37°34’40.46”N	85°53’6.43”W	696.7	25.3	671.4

5. FOUNDATION DESIGN PARAMETERS

5.1 **<u>Lateral Design Parameters</u>** – MFAD soil parameters are provided in the table below. These values are derived from the laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02. The soil deformation moduli provided below were derived from Figure 3-2 and Figure 3-4 of the User Guide for MFAD 5.0 (Moment Foundation Analysis and Design).

Table 3: MFAD Geotechnical Design Parameters

Structure Number	Soil Type	Depth (feet)	Soil Undrained Shear Strength (ksf)	Modulus of Deformation (ksi)
STR 26W	CL	5.0-9.0	2.1	1.3
STR 26W	CH	9.0-25.0	0.5	0.3

Lateral soil parameters recommended for drilled shaft design are shown below in Table 4 using estimations by Matlock (1970) for soft clays with free water and by Reese, et. al (1975) for stiff clay with free water. These values are derived from laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02.

Table 4: L-Pile Soil Parameters for Design of Drilled Shafts

Structure Number	Soil Type	Depth (feet)	Estimated Strain at 50% Stress (ε_{50})	Initial Soil Stiffness (k_{py}) (pci)
STR 26W	CL	5.0-9.0	0.03	400
STR 26W	CH	9.0-25.0	0.02	-

5.2 **<u>Axial Design Parameters</u>** – Axial soil parameters recommended for drilled shaft design are shown below in Table 5. These values are derived from laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02. An ultimate friction angle for clay in contact with concrete of 17° should be used for design. For cohesive soils, utilize a skin friction resistance factor (φ) of 0.45 in accordance with the Brown et al. (2010) method. Utilize an uplift resistance factor of 0.35 for cohesive soils in accordance with the Brown et al. (2018) method. Due to karst features present at the proposed tower location, it is recommended that base resistance be neglected for design purposes.

Table 5: Axial Soil Parameters for Design of Drilled Shafts

Structure Number	Soil Type	Depth (feet)	Effective Unit Weight* (pcf)	Undrained Shear Strength (S_u) (ksf)	Nominal Side Resistance (q_s) (ksf)
STR 26W	CL	5.0-9.0	125.0	2.1	0.9
STR 26W	CH	9.0-25.0	120.0	0.5	0.6

*Effective Unit Weight accounts for Buoyancy

The designer should feel free to contact AEI at 270-651-7220 for further recommendations or if any questions arise pertaining to this project.

Sincerely,

AMERICAN ENGINEERS, INC.

Aaron Anderson, EIT
Geotechnical Engineer

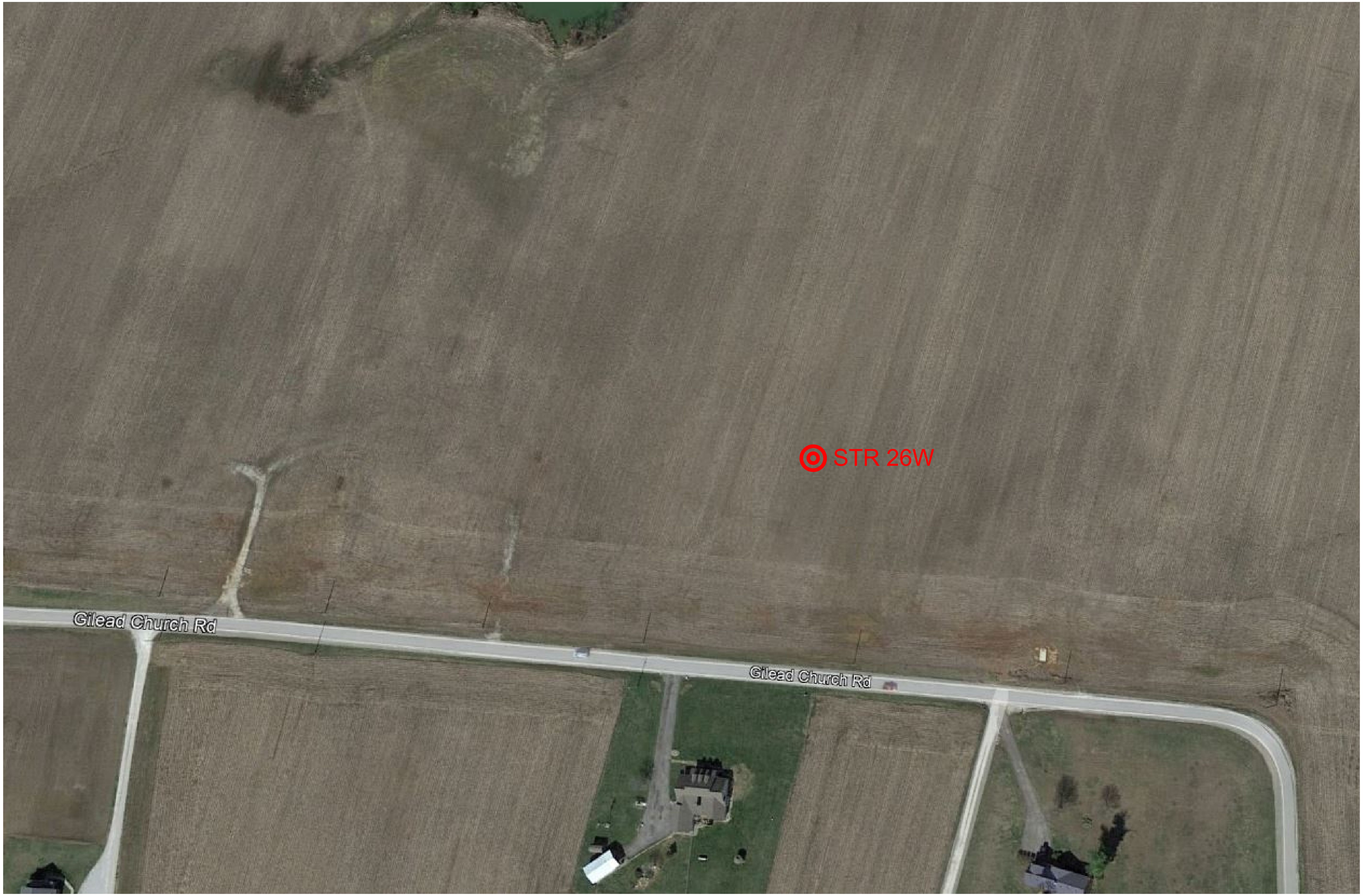
Dusty Barrett, PE, PMP
Director of Geotechnical Services

Attachments:

- Boring Layout
- Typed Boring Log
- Laboratory Data

APPENDIX A

Boring Layout



LEGEND

SOIL TEST BORING

DRAWING NOT TO SCALE
ALL BORING LOCATIONS ARE APPROXIMATE

NO.	DATE	REVISIONS DESCRIPTION

BORING LAYOUT

CLIENT: LG&E and KU

PROJECT: FORD 138kV GLENDALE INDUSTRIAL WEST STRUCTURE 26W GLENDALE, KY

AMERICAN ENGINEERS, INC.
DESIGNING YOUR FUTURE
65 Aberdeen Drive Glasgow KY
270.651.7220

SCALE: NTS

DATE: 04-13-2022

DRAWN BY: A. ANDERSON

CHECKED BY: D. BARRETT

FILE: T:/22 PROJECTS/222-032 LG&E KU Glendale Ford Plant\Geotech\Glendale 138kV West \STR #26W\Support Information

SHEET: A-1

APPENDIX B

Boring Log

FIELD TESTING PROCEDURES

The general field procedures employed by the Field Services Center are summarized in the following outline. The procedures utilized by the AEI Field Service Center are recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Soil Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the surface conditions. Borings are advanced into the ground using continuous flight augers. At prescribed intervals throughout the boring depths, soil samples are obtained with a split-spoon or thin-walled sampler and sealed in airtight glass jars and labeled. The sampler is first seated 6 inches to penetrate loose cuttings and then driven an additional foot, where possible, with blows from a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler each six-inch increment is recorded. The penetration resistance, or "N-value" is designated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split spoon sampling procedures used during the exploration are in general accordance with ASTM D 1586. Split spoon samples are considered to provide *disturbed* samples, yet are appropriate for most engineering applications. Thin-walled (Shelby tube) samples are considered to provide *undisturbed* samples and obtained when warranted in general accordance with ASTM D 1587.

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Core Drilling Procedures for use on refusal materials. Prior to coring, casing is set in the boring through the overburden soils. Refusal materials are then cored according to ASTM D-2113 using a diamond bit attached to the end of a hollow double tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Samples of the material penetrated are protected and retained in the inner tube, which is retrieved at the end of each drill run. Upon retrieval of the inner tube the core is recovered, measured and placed in boxes for storage.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soil in general accordance with the procedures outlined in ASTM D 2487 and D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

Representative portions of soil samples are placed in sealed containers and transported to the laboratory. In the laboratory, the samples are examined to verify the driller's field classifications. Test Boring Records are attached which show the soil descriptions and penetration resistances.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designate the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

Water table readings are normally taken in conjunction with borings and are recorded on the "Boring Logs". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using as electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Sampling Terminology

Undisturbed Sampling: Thin-walled or Shelby tube samples used for visual examination, classification tests and quantitative laboratory testing. This procedure is described by ASTM D 1587. Each tube, together with the encased soil, is carefully removed from the ground, made airtight and transported to the laboratory. Locations and depths of undisturbed samples are shown on the "Boring Logs."

Bag Sampling: Bulk samples of soil are obtained at selected locations. These samples consist of soil brought to the surface by the drilling augers, or obtained from test pits or the ground surface using hand tools. Samples are placed in bags, with sealed jar samples of the material, and taken to our laboratory for testing where more mass material is required (i.e. Proctors and CBR's). The locations of these samples are indicated on the appropriate logs, or on the Boring Location Plan.

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIVE SOILS

(Clay, Silt, and Mixtures)

CONSISTENCY	SPT N-VALUE	Qu/Qp (tsf)
Very Soft	2 blows/ft or less	0 – 0.25
Soft	2 to 4 blows/ft	0.25 – 0.49
Medium Stiff	4 to 8 blows/ft	0.50 – 0.99
Stiff	8 to 15 blows/ft	1.00 – 2.00
Very Stiff	15 to 30 blows/ft	2.00 – 4.00
Hard	30 blows/ft or more	> 4.00

PLASTICITY

Degree of Plasticity	Plasticity Index (PI)
Low	0 – 7
Medium	8 – 22
High	over 22

NON-COHESIVE SOILS

(Silt, Sand, Gravel, and Mixtures)

DENSITY	SPT N-VALUE
Very Loose	4 blows/ft or less
Loose	4 to 10 blows/ft
Medium Dense	10 to 30 blows/ft
Dense	30 to 50 blows/ft
Very Dense	50 blows/ft or more

PARTICLE SIZE IDENTIFICATION

Boulders	12 inch diameter or more
Cobbles	3 to 12 inch diameter
Gravel	Coarse – 1 to 3 inch
	Medium – ½ to 1 inch
	Fine – ¼ to ½ inch
Sand	Coarse – 0.6mm to ¼ inch
	Medium – 0.2mm to 0.6mm
	Fine – 0.05mm to 0.2mm
Silt	0.05mm to 0.005mm
Clay	0.005mm

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 – 10
Trace to Some	11 – 20
Some	21 – 35
And	36 – 50

NOTES

Classification – The Unified Soil Classification System is used to identify soil unless otherwise noted.

Standard "N" Penetration Test (SPT) (ASTM D1586) – Driving a 2-inch O.D., 1 3/8-inch I.D. sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6-inches to seat the sampler into undisturbed soil, and then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the field drill long (e.g., 10/8/7). On the report log, the Standard Penetration Test result (i.e., the N value) is normally presented and consists of the sum of the 2^{nd} and 3^{rd} penetration counts (i.e., N = 8 + 7 = 15 blows/ft.)

Soil Property Symbols

Qu:	Unconfined Compressive Strength	N:	Standard Penetration Value (see above)
Qp:	Unconfined Comp. Strength (pocket pent.)	omc:	Optimum Moisture content
LL:	Liquid Limit, % (Atterberg Limit)	PL:	Plastic Limit, % (Atterberg Limit)
PI:	Plasticity Index	mdd:	Maximum Dry Density

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

STR 26W

CLIENT LG&E and KU
PROJECT NAME Ford 138kV Glendale Industrial West
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY
DATE STARTED 3/18/22 **COMPLETED** 3/18/22
GROUND ELEVATION 696.7 ft
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY Peyton Linder **CHECKED BY** Aaron Anderson
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
0		TOPSOIL (8 INCHES)									
		(CL) lean CLAY, brown to reddish brown, moist, stiff to very stiff	ST 1	85		4.0	24				Qu = 3,340 psf
5			ST 2	90		4.5+	27	44	24	20	Qu = 5,400 psf
10		(CH) fat CLAY, trace gravel, reddish brown, moist, stiff	SPT 1	100	4-6-6 (12)	3.25	30				
15			ST 3	100		3.5	32				Qu = 990 psf
20			SPT 2	73	5-5-4 (9)	3.25	35				
25			ST 4	100		3.25	28	56	24	32	

Refusal at 25.3 feet.
Bottom of borehole at 25.3 feet.

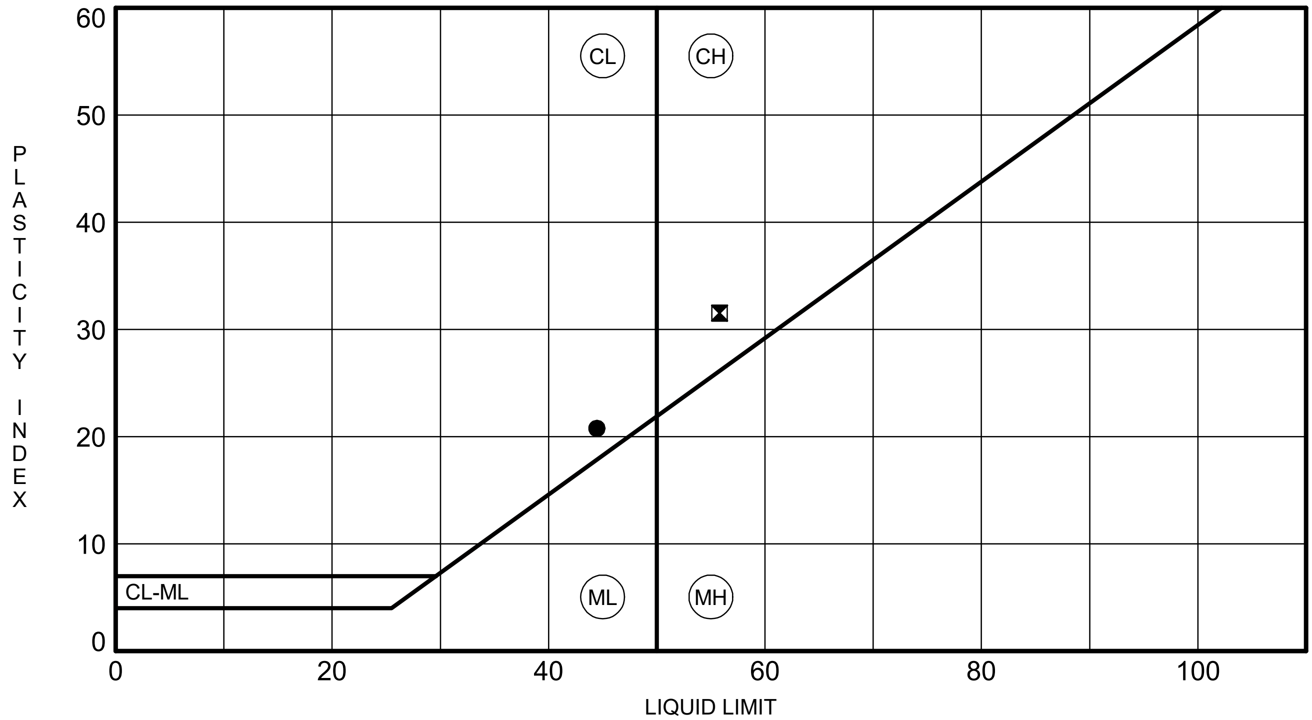
APPENDIX C

Laboratory Testing Results

ATTERBERG LIMITS' RESULTS

AEI AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

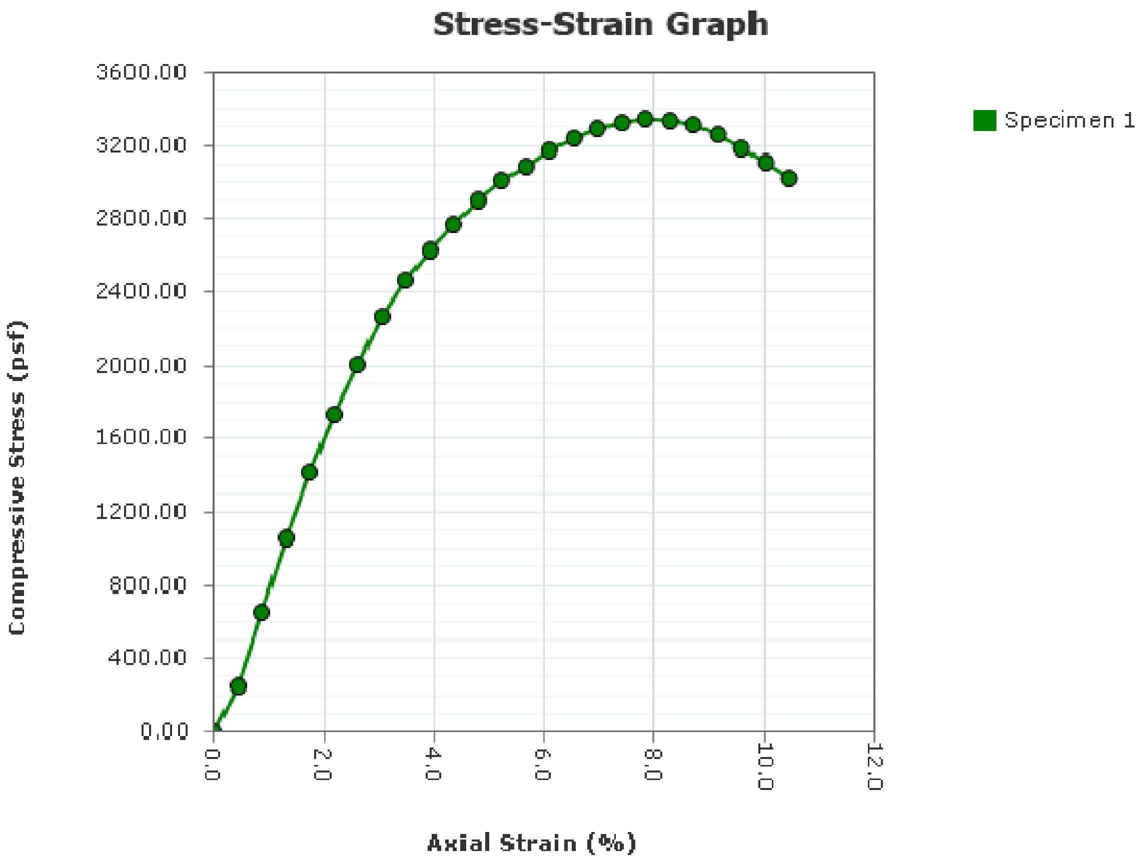
CLIENT LG&E and KU
PROJECT NAME Ford 138kV Glendale Industrial West
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**STR 26W**	**4.0**	**44**	**24**	**20**		**(CL) LEAN CLAY**
⊠	**STR 26W**	**24.0**	**56**	**24**	**32**		**(CH) FAT CLAY**

Unconfined Compression Test

ASTM D2166



Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Received Date:	3/21/2022
Sampling Date:	3/21/2022
Sample Number:	ST 1
Sample Depth:	1.0-3.0 ft
Boring Number:	STR 26W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Moisture Content (%):	24.1							
Wet Density (pcf)	125.5							
Dry Density (pcf)	101.1							
Saturation (%):	96.6							
Void Ratio:	0.679							
Height (in)	5.7400							
Diameter (in)	2.8500							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.01							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.74							
Unconfined Compressive Strength (psf)	3343.57							
Undrained Shear Strength (psf)	1671.79							
Strain at Failure (%):	8.28							

Specific Gravity:	2.72	Plastic Limit:	0	Liquid Limit:	0
Type:	UD	Soil Classification:	CL		

Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Sampling Date:	3/21/2022
Sample Number:	ST 1
Sample Depth:	1.0-3.0 ft
Boring Number:	STR 26W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

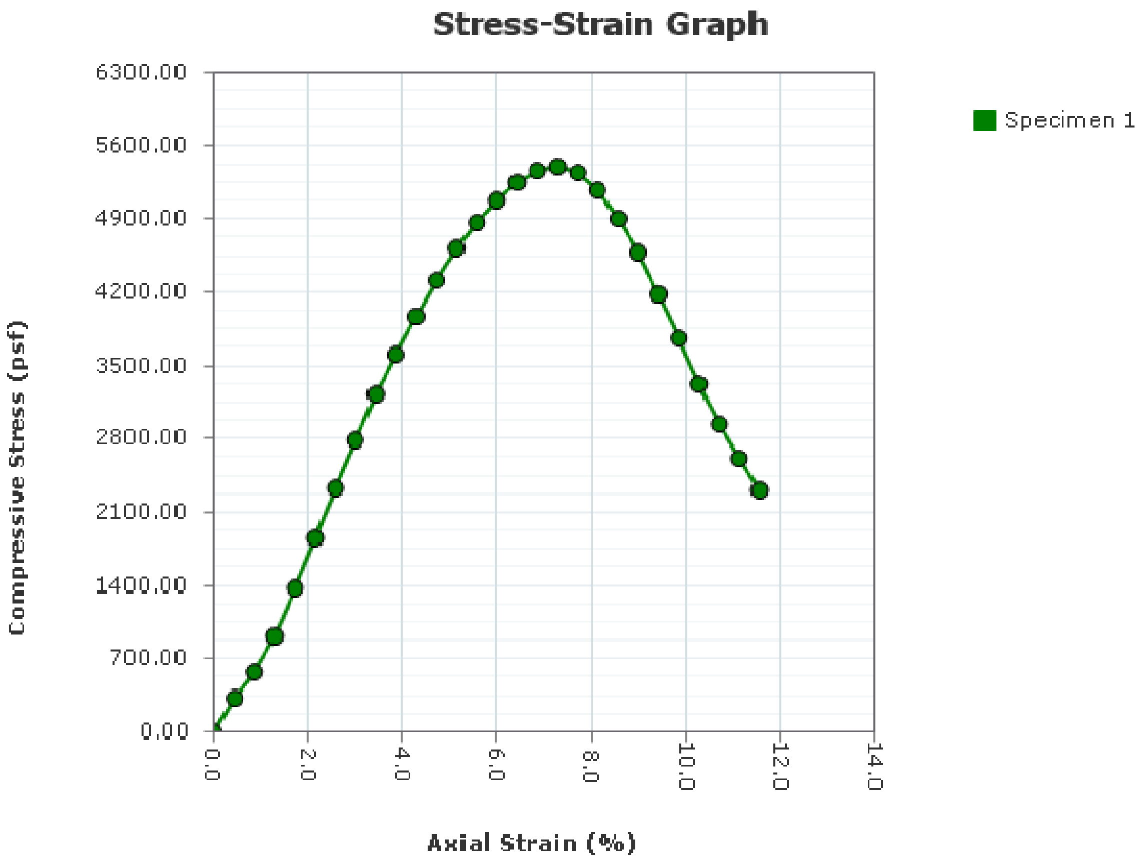
Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Test Date: 3/21/2022

Checked By: ____________________ Date: _____________

Unconfined Compression Test

ASTM D2166



Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Received Date:	3/21/2022
Sampling Date:	3/21/2022
Sample Number:	ST 2
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 26W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

Before Test	1	2	3	4	5	6	7	8
	Specimen Number							
Moisture Content (%):	26.6							
Wet Density (pcf)	122.9							
Dry Density (pcf)	97.1							
Saturation (%):	96.7							
Void Ratio:	0.750							
Height (in)	5.8400							
Diameter (in)	2.8550							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.05							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.71							
Unconfined Compressive Strength (psf)	5401.10							
Undrained Shear Strength (psf)	2700.55							
Strain at Failure (%):	7.28							

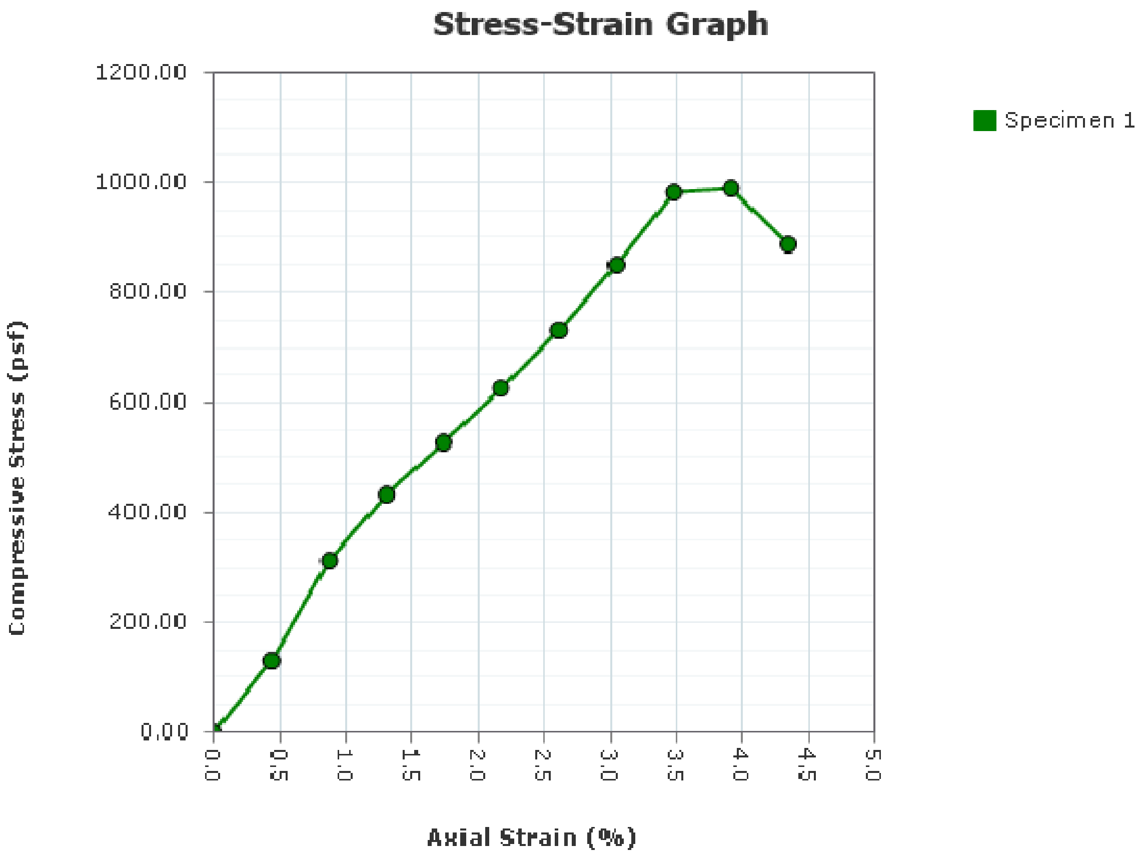
Specific Gravity:	2.72	Plastic Limit:	24	Liquid Limit:	44
Type:	UD	Soil Classification:	CL		

Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Sampling Date:	3/21/2022
Sample Number:	ST 2
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 26W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Unconfined Compression Test

ASTM D2166



Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Received Date:	3/21/2022
Sampling Date:	3/21/2022
Sample Number:	ST 3
Sample Depth:	14.0-16.0 ft
Boring Number:	STR 26W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Moisture Content (%):	31.8							
Wet Density (pcf)	114.1							
Dry Density (pcf)	86.6							
Saturation (%):	90.0							
Void Ratio:	0.961							
Height (in)	5.7500							
Diameter (in)	2.8700							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.00							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.74							
Unconfined Compressive Strength (psf)	990.28							
Undrained Shear Strength (psf)	495.14							
Strain at Failure (%):	3.91							

Specific Gravity:	2.72	Plastic Limit:	0	Liquid Limit:	0
Type:	UD	Soil Classification:	CH		

Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Sampling Date:	3/21/2022
Sample Number:	ST 3
Sample Depth:	14.0-16.0 ft
Boring Number:	STR 26W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Your Geotechnical Engineering Report

To help manage your risks, this information is being provided because subsurface issues are a major cause of construction delays, cost overruns, disputes, and claims.

Geotechnical Services are Performed for Specific Projects, Purposes, and People

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering exploration conducted for an engineer may not fulfill the needs of a contractor or even another engineer. Each geotechnical engineering exploration and report is unique and is prepared solely for the client. No one except the client should rely on the geotechnical engineering report without first consulting with the geotechnical engineer who prepared it. The report should not be applied for any project or purpose except the one originally intended.

Read the Entire Report

To avoid serious problems, the full geotechnical engineering report should be read in its entirety. Do not only read selected sections or the executive summary.

A Unique Set of Project-Specific Factors is the Basis for a Geotechnical Engineering Report

Geotechnical engineers consider a numerous unique, project-specific factors when determining the scope of a study. Typical factors include: the client's goals, objectives, project costs, risk management preferences, proposed structures, structures on site, topography, and other proposed or existing site improvements, such as access roads, parking lots, and utilities. Unless indicated otherwise by the geotechnical engineer who conducted the original exploration, a geotechnical engineering report should not be relied upon if it was:

- not prepared for you or your project,
- not prepared for the specific site explored, or
- completed before important changes to the project were implemented.

Typical changes that can lessen the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a multi-story hotel to a parking lot
- finished floor elevation, location, orientation, or weight of the proposed structure, anticipated loads or
- project ownership

Geotechnical engineers cannot be held liable or responsible for issues that occur because their report did not take into account development items of which they were not informed. The geotechnical engineer should always be notified of any project changes. Upon notification, it should be requested of the geotechnical engineer to give an assessment of the impact of the project changes.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that exist at the time of the exploration. A geotechnical engineering report should not be relied upon if its reliability could be in question due to factors such as man-made events as construction on or adjacent to the site, natural events such as floods, earthquakes, or groundwater fluctuation, or time. To determine if a geotechnical report is still reliable, contact the geotechnical engineer. Major problems could be avoided by performing a minimal amount of additional analysis and/or testing.

Most Geotechnical Findings are Professional Opinions

Geotechnical site explorations identify subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field logs and laboratory data and apply their professional judgment to make conclusions about the subsurface conditions throughout the site. Actual subsurface conditions may differ from those indicated in the report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risk associated with unanticipated conditions.

The Recommendations within a Report Are Not Final

Do not put too much faith on the construction recommendations included in the report. The recommendations are not final due to geotechnical engineers developing them principally from judgment and opinion. Only by observing actual subsurface conditions revealed during construction can geotechnical engineers finalize their recommendations. Responsibility and liability cannot be assumed for the recommendations

within the report by the geotechnical engineer who developed the report if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Misinterpretation of geotechnical engineering reports has resulted in costly problems. The risk of misinterpretation can be lowered after the submittal of the final report by having the geotechnical engineer consult with appropriate members of the design team. The geotechnical engineer could also be retained to review crucial parts of the plans and specifications put together by the design team. The geotechnical engineering report can also be misinterpreted by contractors which can result in many problems. By participating in pre-bid and preconstruction meetings and providing construction observations by the geotechnical engineer, many risks can be reduced.

Final Boring Logs Should not be Re-drawn

Geotechnical engineers prepare final boring logs and testing results based on field logs and laboratory data. The logs included in a final geotechnical engineering report should never be redrawn to be included in architectural or design drawings due to errors that could be made. Electronic reproduction is acceptable, along with photographic reproduction, but it should be understood that separating logs from the report can elevate risk.

Contractors Need a Complete Report and Guidance

By limiting what is provided for bid preparation, contractors are not liable for unforeseen subsurface conditions although some owners and design professionals believe the opposite to be true. The complete geotechnical engineering report, accompanied with a cover letter or transmittal, should be provided to contractors to help prevent costly problems. The letter states that the report was not prepared for purposes of bid development and the report's accuracy is limited. Although a fee may be required, encourage the contractors to consult with the geotechnical engineer who prepared the report and/or to conduct additional studies to obtain the specific types of information they need or prefer. A prebid conference involving the owner, geotechnical engineer, and contractors can prove to be very valuable. If needed, allow contractors sufficient time to perform additional studies. Upon doing this you might be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Closely Read Responsibility Provisions

Geotechnical engineering is not as exact as other engineering disciplines. This lack of understanding by clients, design professionals, and contractors has created unrealistic expectations that have led to disappointments, claims, and disputes. To minimize such risks, a variety of explanatory provisions may be included in the report by the geotechnical engineer. To help others recognize their own responsibilities and risks, many of these provisions indicate where the geotechnical engineer's responsibilities begin and end. These provisions should be read carefully, questions asked if needed, and the geotechnical engineer should provide satisfactory responses.

Environmental Issues/Concerns are not Covered

Unforeseen environmental issues can lead to project delays or even failures. Geotechnical engineering reports do not usually include environmental findings, conclusions, or recommendations. As with a geotechnical engineering report, do not rely on an environmental report that was prepared for someone else.

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING

65 Aberdeen Drive
Glasgow, KY 42141
270-651-7220

AMERICAN ENGINEERS, INC.

May 13, 2022

[redacted]
LG&E and KU
One Quality Street
Lexington, KY 40507

RE: Report of Geotechnical Exploration
Ford 138kV Glendale Industrial West
Structure 27W
Glendale, KY
AEI Project No. 222-032

[redacted]

1. INTRODUCTION

A summary of the geotechnical parameters necessary to facilitate foundation design has been prepared for the immediate use of the design team. The project is a part of the Ford 138kV Glendale Industrial West in Glendale, KY. This summary is provided for Structure 27W, a double circuit, angle dead end which will be supported by a drilled shaft foundation.

Table 1: Tower Details

Structure Number	Structure Description	Height (ft)	Centerline Elevation (ft)	Structure Coordinates		Trans. Moment (ft-k)	Long. Moment (ft-k)
				Latitude (DMS)	Longitude (DMS)		
27W	Double Circuit	105	697.4	37°34’39.41”N	85°52’58.82”W	1,820	6,664

2. DRILLING AND SAMPLING

The geotechnical exploration consisted of one soil test boring. The soil test boring was advanced to a depth of about 54 feet beneath the surface. The boring location was staked by KU personnel. A boring layout is included in Appendix A of this report.

3. SUBSURFACE SOIL CONDITIONS

The generalized subsurface conditions encountered at the boring location, including descriptions of the various strata and their depths and thicknesses are presented on the typed boring log in Appendix B.

Topsoil was encountered at the surface with a thickness of four inches. Beneath the surface material, lean clay was encountered to a depth of 19 feet. Fat clay was encountered from 19 feet to the auger refusal depth. The lean clay was typically described as brown to red in color, wet and stiff to very stiff in soil strength consistency. The fat clay was typically described as reddish brown to red in color, containing varying amounts of gravel, wet to saturated and medium stiff to stiff in soil strength consistency.

4. BEDROCK CONDITIONS

Refusal, as would be indicated by the Driller on the field boring log, indicates a depth where essentially no downward progress can be made by the auger. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface or where the N-value indicates essentially no penetration of the split-spoon sampler. The auger refusal depth is provided in the table below.

Table 2: Structure 27W – Summary of Boring

Hole No.	Latitude	Longitude	Surface Elevation (ft.) MSL	Auger Refusal	
				Depth (ft.)	Elevation (ft.) MSL
STR 27W	37°34’39.41”N	85°52’58.82”W	697.3	40.6	656.7

5. FOUNDATION DESIGN PARAMETERS

5.1 **<u>Lateral Design Parameters</u>** – MFAD soil parameters are provided in the table below. These values are derived from the laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02. The soil deformation moduli provided below were derived from Figure 3-2 and Figure 3-4 of the User Guide for MFAD 5.0 (Moment Foundation Analysis and Design).

Table 3: MFAD Geotechnical Design Parameters

Structure Number	Soil Type	Depth (feet)	Soil Undrained Shear Strength (ksf)	Modulus of Deformation (ksi)
STR 27W	CL	5.0-19.0	1.8	1.0
STR 27W	CH	19.0-40.0	1.0	0.6

Lateral soil parameters recommended for drilled shaft design are shown below in Table 4 using estimations by Matlock (1970) for soft clays with free water and by Reese, et. al (1975) for stiff clay with free water. These values are derived from laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02.

Table 4: L-Pile Soil Parameters for Design of Drilled Shafts

Structure Number	Soil Type	Depth (feet)	Estimated Strain at 50% Stress (ε_{50})	Initial Soil Stiffness (k_{py}) (pci)
STR 27W	CL	5.0-19.0	0.02	200
STR 27W	CH	19.0-40.0	0.02	-

5.2 **<u>Axial Design Parameters</u>** – Axial soil parameters recommended for drilled shaft design are shown below in Table 5. These values are derived from laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02. An ultimate friction angle for clay in contact with concrete of 17° should be used for design. For cohesive soils, utilize a skin friction resistance factor (φ) of 0.45 in accordance with the Brown et al. (2010) method. Utilize an uplift resistance factor of 0.35 for cohesive soils in accordance with the Brown et al. (2018) method. Due to karst features present at the proposed tower location, it is recommended that base resistance be neglected for design purposes.

Table 5: Axial Soil Parameters for Design of Drilled Shafts

Structure Number	Soil Type	Depth (feet)	Effective Unit Weight* (pcf)	Undrained Shear Strength (S_u) (ksf)	Nominal Side Resistance (q_s) (ksf)
STR 27W	CL	5.0-19.0	125.0	1.8	1.0
STR 27W	CH	19.0-40.0	57.6	1.0	0.8

*Effective Unit Weight accounts for Buoyancy

The designer should feel free to contact AEI at 270-651-7220 for further recommendations or if any questions arise pertaining to this project.

Sincerely,

AMERICAN ENGINEERS, INC.

Aaron Anderson, EIT
Geotechnical Engineer

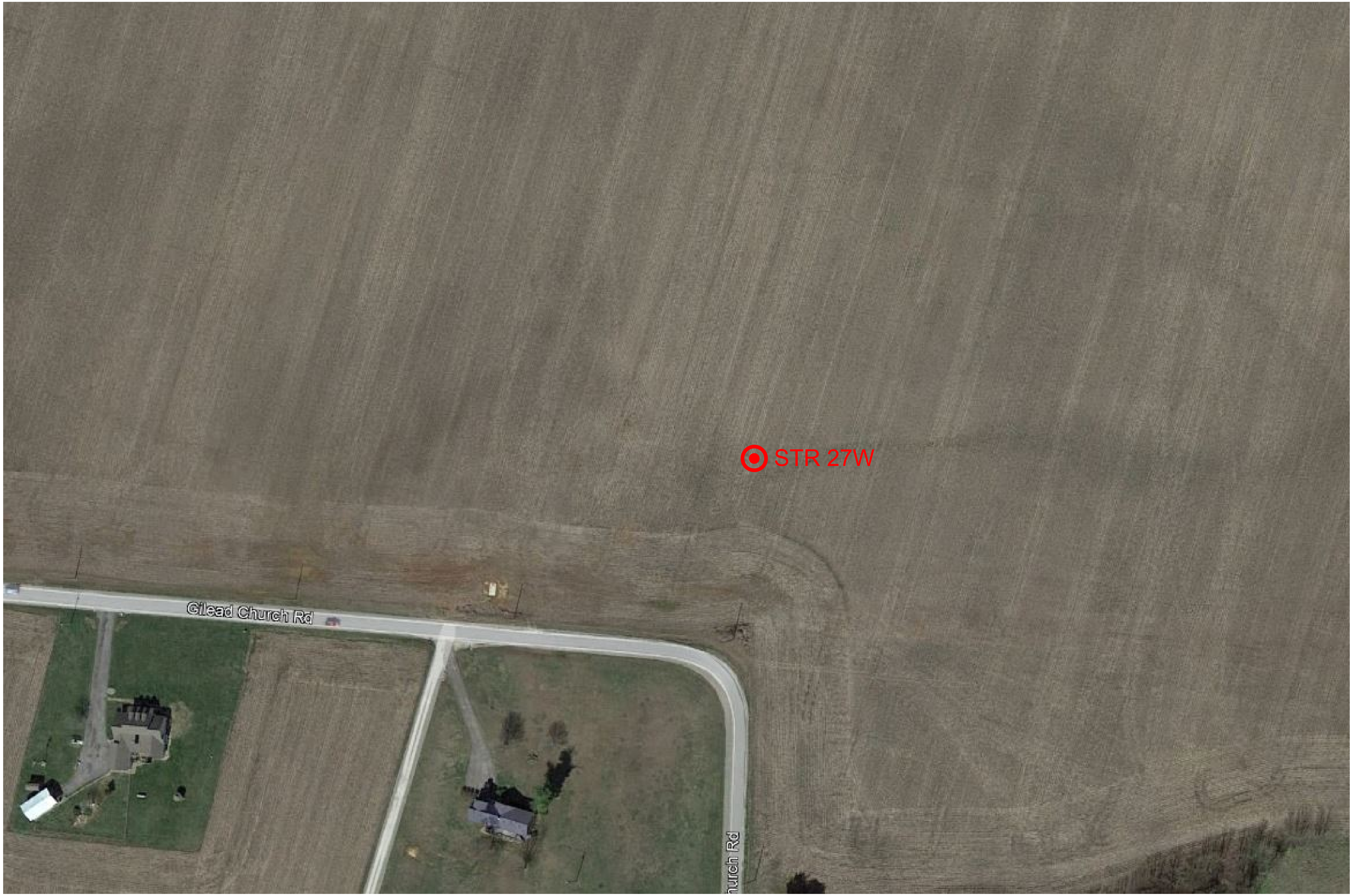
Dusty Barrett, PE, PMP
Director of Geotechnical Services

Attachments:

- Boring Layout
- Typed Boring Log
- Laboratory Data

APPENDIX A

Boring Layout



LEGEND

SOIL TEST BORING WITH ROCK CORE

DRAWING NOT TO SCALE
ALL BORING LOCATIONS ARE APPROXIMATE

REVISIONS	NO. / DATE / DESCRIPTION
	BORING LAYOUT
CLIENT:	LG&E and KU
PROJECT:	FORD 138kV GLENDALE INDUSTRIAL WEST STRUCTURE 27W GLENDALE, KY
	AMERICAN ENGINEERS, INC. DESIGNING YOUR FUTURE 65 Aberdeen Drive Glasgow KY 270.651.7220
SCALE:	NTS
DATE:	04-13-2022
DRAWN BY:	A. ANDERSON
CHECKED BY:	D. BARRETT
FILE:	T:/22 PROJECTS/222-032 LG&E KU Glendale Ford Plant\Geotech\Glendale 138kV West \STR #27W\Support Information
SHEET:	A-1

APPENDIX B

Boring Logs

FIELD TESTING PROCEDURES

The general field procedures employed by the Field Services Center are summarized in the following outline. The procedures utilized by the AEI Field Service Center are recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Soil Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the surface conditions. Borings are advanced into the ground using continuous flight augers. At prescribed intervals throughout the boring depths, soil samples are obtained with a split-spoon or thin-walled sampler and sealed in airtight glass jars and labeled. The sampler is first seated 6 inches to penetrate loose cuttings and then driven an additional foot, where possible, with blows from a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler each six-inch increment is recorded. The penetration resistance, or "N-value" is designated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split spoon sampling procedures used during the exploration are in general accordance with ASTM D 1586. Split spoon samples are considered to provide *disturbed* samples, yet are appropriate for most engineering applications. Thin-walled (Shelby tube) samples are considered to provide *undisturbed* samples and obtained when warranted in general accordance with ASTM D 1587.

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Core Drilling Procedures for use on refusal materials. Prior to coring, casing is set in the boring through the overburden soils. Refusal materials are then cored according to ASTM D-2113 using a diamond bit attached to the end of a hollow double tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Samples of the material penetrated are protected and retained in the inner tube, which is retrieved at the end of each drill run. Upon retrieval of the inner tube the core is recovered, measured and placed in boxes for storage.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soil in general accordance with the procedures outlined in ASTM D 2487 and D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

Representative portions of soil samples are placed in sealed containers and transported to the laboratory. In the laboratory, the samples are examined to verify the driller's field classifications. Test Boring Records are attached which show the soil descriptions and penetration resistances.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designate the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

Water table readings are normally taken in conjunction with borings and are recorded on the "Boring Logs". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using as electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Sampling Terminology

Undisturbed Sampling: Thin-walled or Shelby tube samples used for visual examination, classification tests and quantitative laboratory testing. This procedure is described by ASTM D 1587. Each tube, together with the encased soil, is carefully removed from the ground, made airtight and transported to the laboratory. Locations and depths of undisturbed samples are shown on the "Boring Logs."

Bag Sampling: Bulk samples of soil are obtained at selected locations. These samples consist of soil brought to the surface by the drilling augers, or obtained from test pits or the ground surface using hand tools. Samples are placed in bags, with sealed jar samples of the material, and taken to our laboratory for testing where more mass material is required (i.e. Proctors and CBR's). The locations of these samples are indicated on the appropriate logs, or on the Boring Location Plan.

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIVE SOILS

(Clay, Silt, and Mixtures)

CONSISTENCY	SPT N-VALUE	Qu/Qp (tsf)
Very Soft	2 blows/ft or less	0 – 0.25
Soft	2 to 4 blows/ft	0.25 – 0.49
Medium Stiff	4 to 8 blows/ft	0.50 – 0.99
Stiff	8 to 15 blows/ft	1.00 – 2.00
Very Stiff	15 to 30 blows/ft	2.00 – 4.00
Hard	30 blows/ft or more	> 4.00

PLASTICITY

Degree of Plasticity	Plasticity Index (PI)
Low	0 – 7
Medium	8 – 22
High	over 22

NON-COHESIVE SOILS

(Silt, Sand, Gravel, and Mixtures)

DENSITY	SPT N-VALUE
Very Loose	4 blows/ft or less
Loose	4 to 10 blows/ft
Medium Dense	10 to 30 blows/ft
Dense	30 to 50 blows/ft
Very Dense	50 blows/ft or more

PARTICLE SIZE IDENTIFICATION

Boulders	12 inch diameter or more
Cobbles	3 to 12 inch diameter
Gravel	Coarse – 1 to 3 inch
	Medium – ½ to 1 inch
	Fine – ¼ to ½ inch
Sand	Coarse – 0.6mm to ¼ inch
	Medium – 0.2mm to 0.6mm
	Fine – 0.05mm to 0.2mm
Silt	0.05mm to 0.005mm
Clay	0.005mm

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 – 10
Trace to Some	11 – 20
Some	21 – 35
And	36 – 50

NOTES

Classification – The Unified Soil Classification System is used to identify soil unless otherwise noted.

Standard "N" Penetration Test (SPT) (ASTM D1586) – Driving a 2-inch O.D., 1 3/8-inch I.D. sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6-inches to seat the sampler into undisturbed soil, and then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the field drill long (e.g., 10/8/7). On the report log, the Standard Penetration Test result (i.e., the N value) is normally presented and consists of the sum of the 2^{nd} and 3^{rd} penetration counts (i.e., N = 8 + 7 = 15 blows/ft.)

Soil Property Symbols

Qu:	Unconfined Compressive Strength	N:	Standard Penetration Value (see above)
Qp:	Unconfined Comp. Strength (pocket pent.)	omc:	Optimum Moisture content
LL:	Liquid Limit, % (Atterberg Limit)	PL:	Plastic Limit, % (Atterberg Limit)
PI:	Plasticity Index	mdd:	Maximum Dry Density

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT LG&E and KU
PROJECT NAME Ford 138kV Glendale Industrial West
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY
DATE STARTED 3/23/22 **COMPLETED** 3/23/22
GROUND ELEVATION 697.3 ft
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD HSA/ Diamond impregnated coring bit
AT TIME OF DRILLING 19.00 ft / Elev 678.30 ft
LOGGED BY Adam Cash **CHECKED BY** Aaron Anderson
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0		TOPSOIL (4 INCHES)									
		(CL) lean CLAY, brown to red, wet to saturated, stiff to very stiff	ST 1	90		-	24				Qu = 3,460 psf
5			ST 2	100		-	25	42	22	20	Qu = 4,570 psf
10			SPT 1	100	4-5-7 (12)	-	29				
15											
20		(CH) fat CLAY with gravel, reddish brown to red, wet to saturated, medium stiff to stiff	ST 3	100		-	45	70	20	50	Qu = 1,715 psf
25											
30			SPT 2	100	3-4-9 (13)	-	44				
35											
40			ST 4	100		-	38				Qu = 1,400 psf
		LIMESTONE, interbedded with clay, gray with brown staining, fine to medium grained, soft to moderately hard, highly fractured, highly weathered	RC 1	47 (0)							

(Continued Next Page)

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PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT LG&E and KU
PROJECT NAME Ford 138kV Glendale Industrial West
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	REMARKS
45		LIMESTONE, gray, fine to medium grained, thin to thick bedded, moderately hard to hard	RC 2	68 (34)							Vertical fracture (46.0'-46.2')
50			RC 3	52 (16)							

Refusal at 40.6 feet.
Bottom of borehole at 53.8 feet.

APPENDIX C

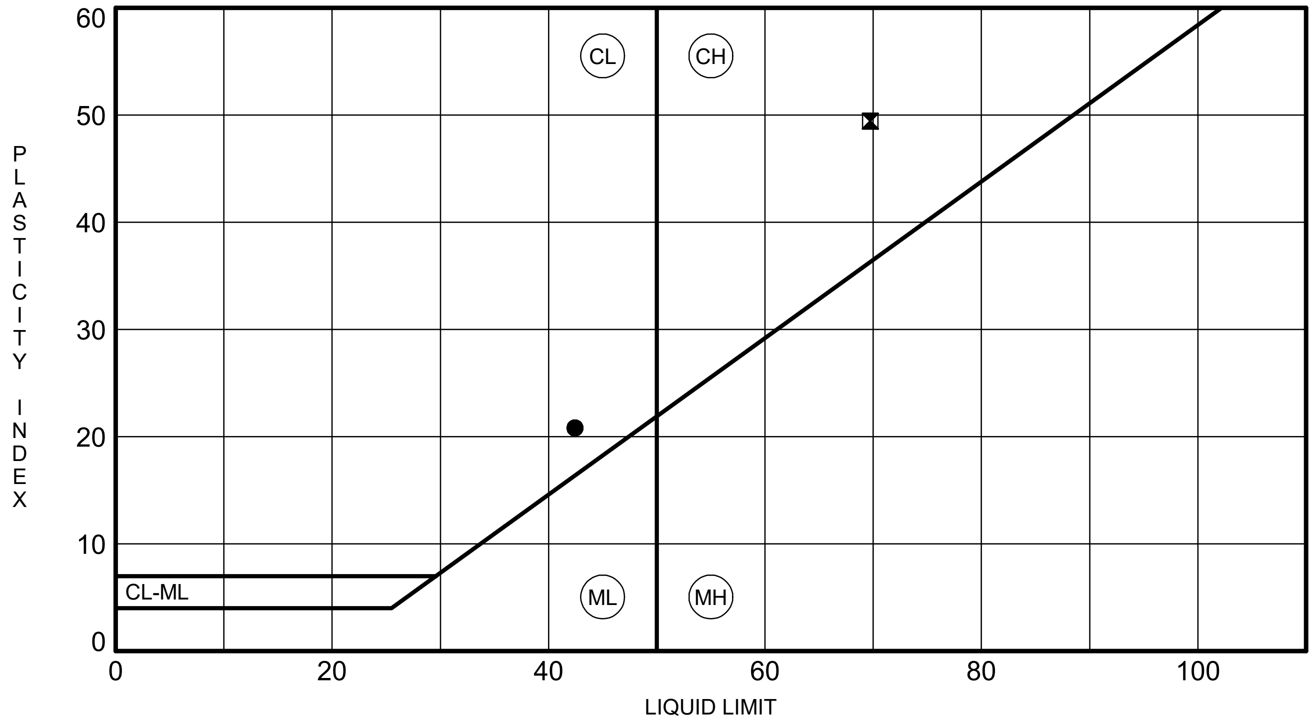
Laboratory Testing Results

ATTERBERG LIMITS' RESULTS

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT LG&E and KU | **PROJECT NAME** Ford 138kV Glendale Industrial West

PROJECT NUMBER 222-032 | **PROJECT LOCATION** Glendale, KY

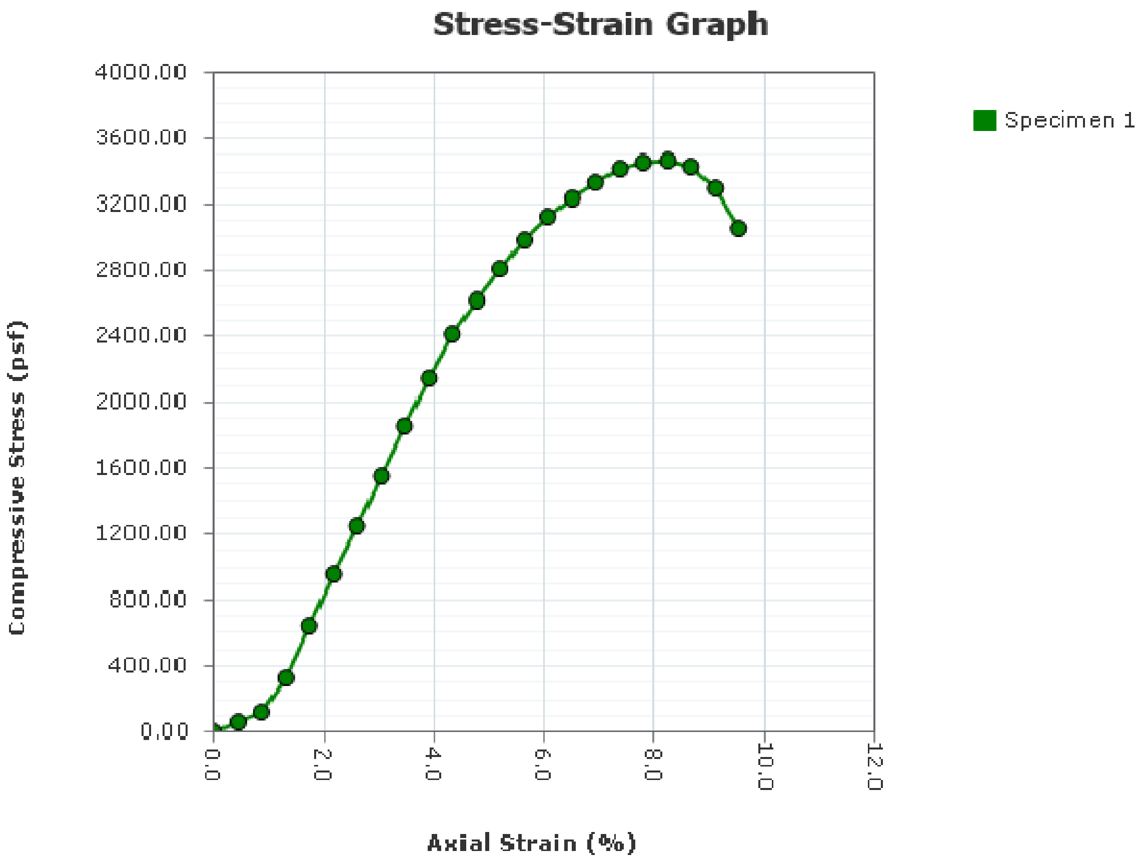


	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**STR 27W**	**4.0**	**42**	**22**	**20**		**(CL) LEAN CLAY**
⊠	**STR 27W**	**19.0**	**70**	**20**	**50**		**(CH) FAT CLAY**

ATTERBERG LIMITS - GINT STD US LAB.GDT - 5/12/22 15:32 - T:\22 PROJECTS\222-032 LG&E KU GLENDALE FORD PLANT\GEOTECH\GLENDALE 138KV WEST\LAB\FORD 138KV GLENDALE INDUSTRIAL WEST.GPJ

Unconfined Compression Test

ASTM D2166



Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Received Date:	3/24/2022
Sampling Date:	3/24/2022
Sample Number:	ST 1
Sample Depth:	1.0-3.0 ft
Boring Number:	STR #27W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Moisture Content (%):	24.4							
Wet Density (pcf)	125.0							
Dry Density (pcf)	100.4							
Saturation (%):	96.2							
Void Ratio:	0.691							
Height (in)	5.7700							
Diameter (in)	2.8400							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.03							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.73							
Unconfined Compressive Strength (psf)	3464.88							
Undrained Shear Strength (psf)	1732.44							
Strain at Failure (%):	8.23							

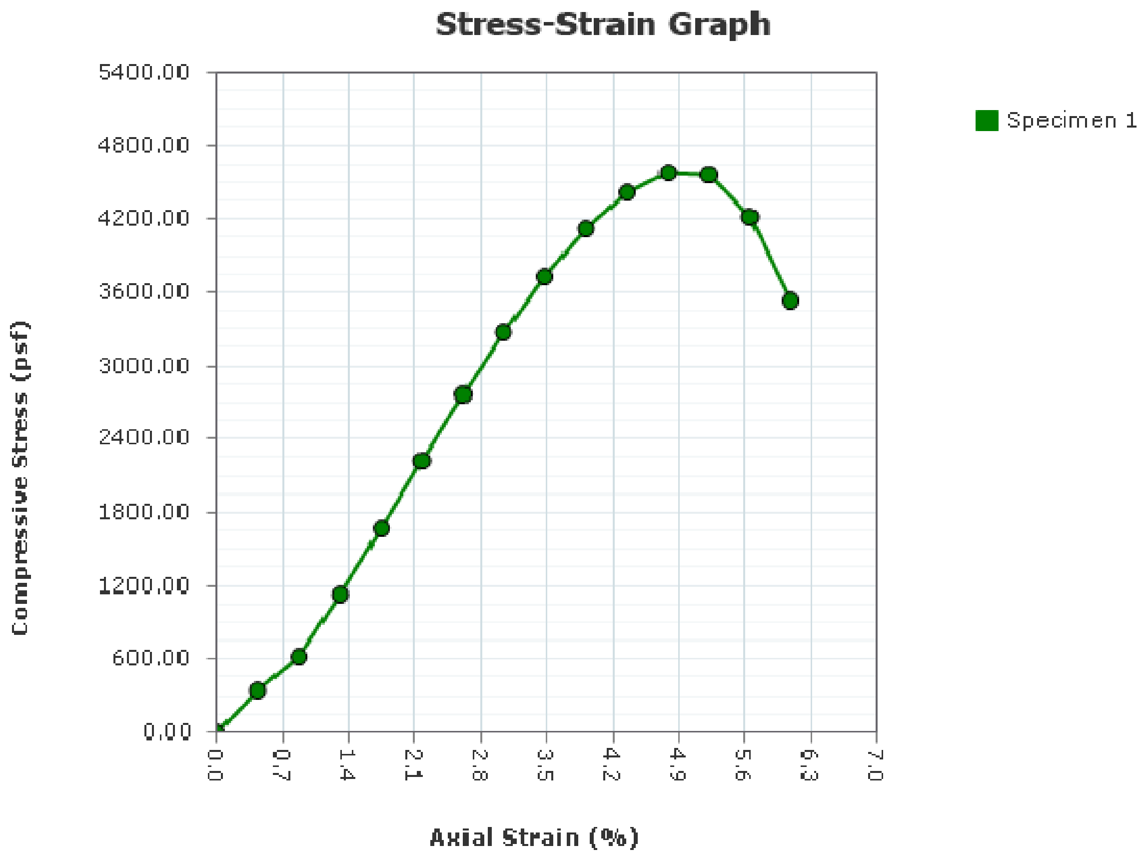
Specific Gravity:	2.72	Plastic Limit:	0	Liquid Limit:	0
Type:	UD	Soil Classification:	CL		

Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Sampling Date:	3/24/2022
Sample Number:	ST 1
Sample Depth:	1.0-3.0 ft
Boring Number:	STR #27W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch

Unconfined Compression Test

ASTM D2166



Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Received Date:	3/24/2022
Sampling Date:	3/24/2022
Sample Number:	ST 2
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 27W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Moisture Content (%):	25.3							
Wet Density (pcf)	124.8							
Dry Density (pcf)	99.6							
Saturation (%):	97.7							
Void Ratio:	0.704							
Height (in)	5.7500							
Diameter (in)	2.8500							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.02							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.74							
Unconfined Compressive Strength (psf)	4572.26							
Undrained Shear Strength (psf)	2286.13							
Strain at Failure (%):	5.22							

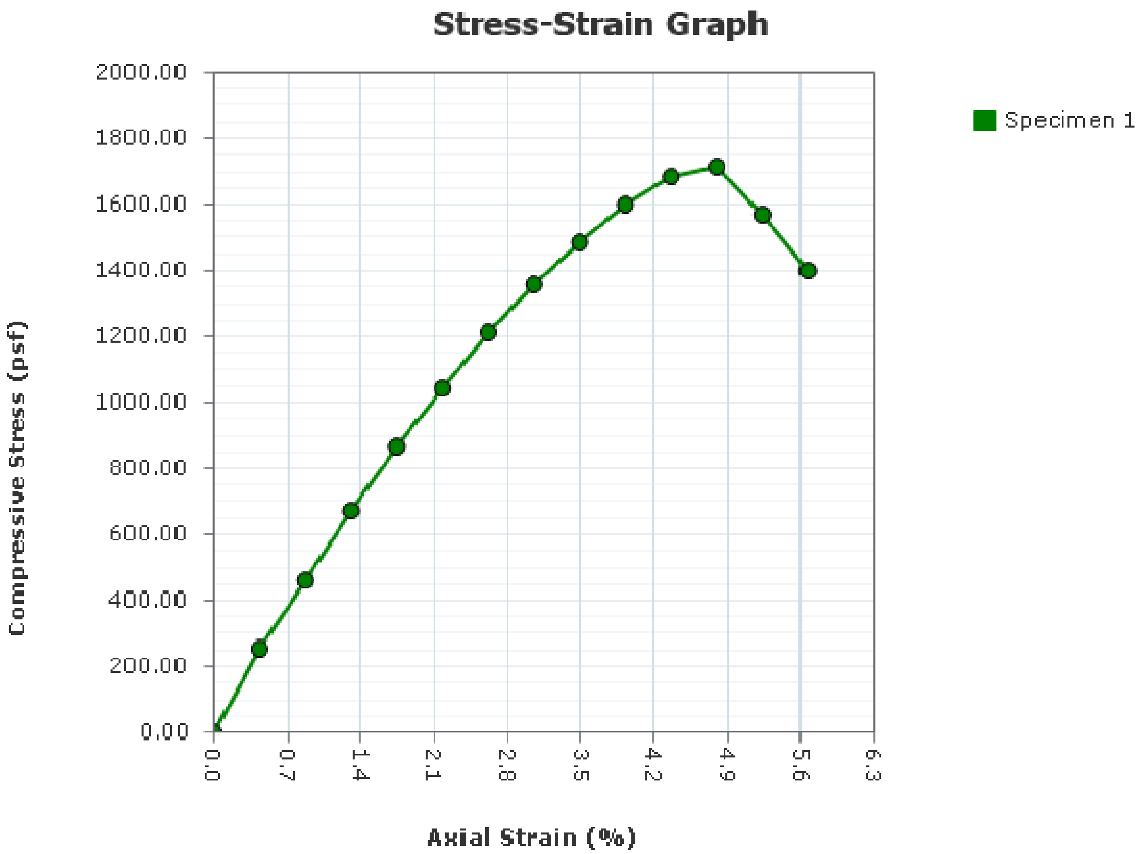
Specific Gravity:	2.72	Plastic Limit:	22	Liquid Limit:	42
Type:	UD	Soil Classification:	CL		

Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Sampling Date:	3/24/2022
Sample Number:	ST 2
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 27W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Unconfined Compression Test

ASTM D2166



Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Received Date:	3/24/2022
Sampling Date:	3/24/2022
Sample Number:	ST 3
Sample Depth:	19.0-21.0 ft
Boring Number:	STR #27W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Moisture Content (%):	45.2							
Wet Density (pcf)	111.8							
Dry Density (pcf)	77.0							
Saturation (%):	102.0							
Void Ratio:	1.206							
Height (in)	5.7400							
Diameter (in)	2.8500							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.01							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.74							
Unconfined Compressive Strength (psf)	1716.51							
Undrained Shear Strength (psf)	858.25							
Strain at Failure (%):	4.79							

Specific Gravity:	2.72	Plastic Limit:	20	Liquid Limit:	70
Type:	UD	Soil Classification:	CH		

Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Sampling Date:	3/24/2022
Sample Number:	ST 3
Sample Depth:	19.0-21.0 ft
Boring Number:	STR #27W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch

Specimen 2 Failure Sketch

Specimen 3 Failure Sketch

Specimen 4 Failure Sketch

Specimen 5 Failure Sketch

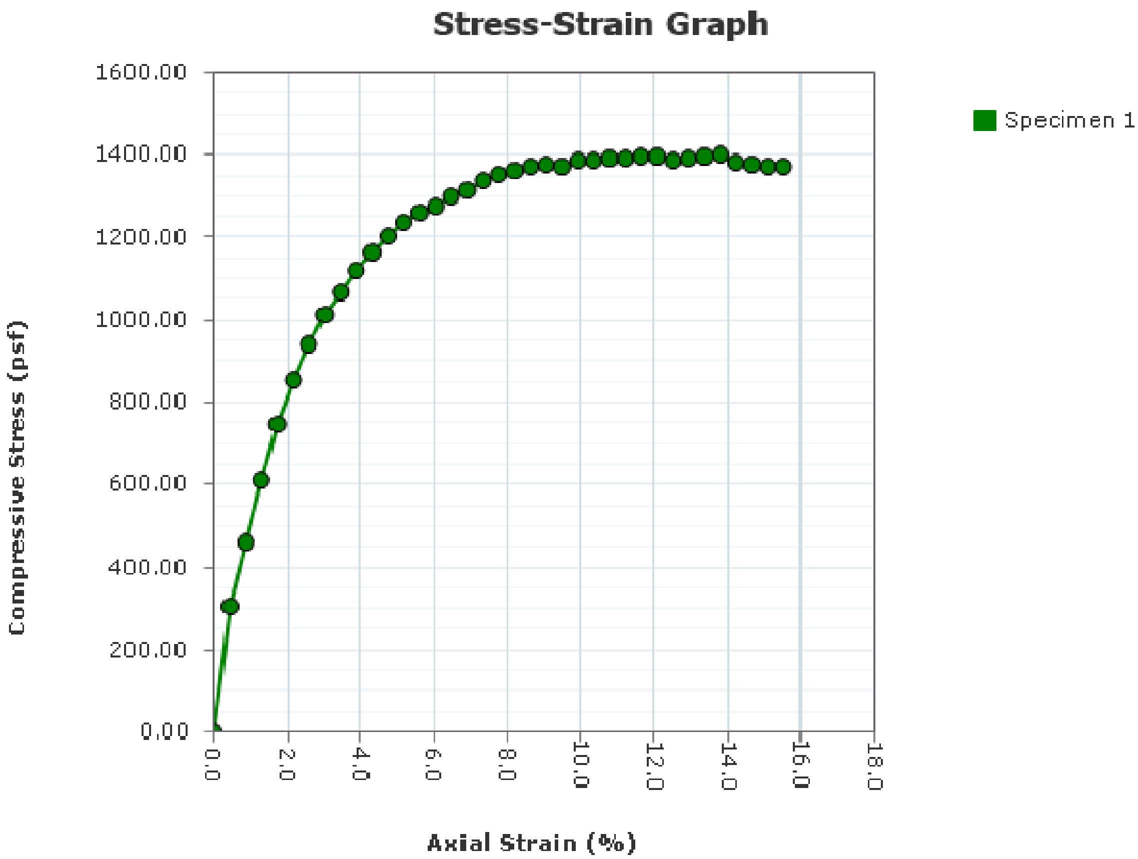
Specimen 6 Failure Sketch

Specimen 7 Failure Sketch

Specimen 8 Failure Sketch

Unconfined Compression Test

ASTM D2166



Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Received Date:	3/24/2022
Sampling Date:	3/24/2022
Sample Number:	ST 4
Sample Depth:	39.0-40.2 ft
Boring Number:	STR #27W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	1	2	3	4	5	6	7	8
Moisture Content (%):	38.1							
Wet Density (pcf)	113.2							
Dry Density (pcf)	82.0							
Saturation (%):	96.7							
Void Ratio:	1.071							
Height (in)	5.8000							
Diameter (in)	2.8600							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.03							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.72							
Unconfined Compressive Strength (psf)	1399.46							
Undrained Shear Strength (psf)	699.73							
Strain at Failure (%):	13.79							

Specific Gravity:	2.72	Plastic Limit:	0	Liquid Limit:	0
Type:	UD	Soil Classification:	CH		

Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Sampling Date:	3/24/2022
Sample Number:	ST 4
Sample Depth:	39.0-40.2 ft
Boring Number:	STR #27W
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Your Geotechnical Engineering Report

To help manage your risks, this information is being provided because subsurface issues are a major cause of construction delays, cost overruns, disputes, and claims.

Geotechnical Services are Performed for Specific Projects, Purposes, and People

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering exploration conducted for an engineer may not fulfill the needs of a contractor or even another engineer. Each geotechnical engineering exploration and report is unique and is prepared solely for the client. No one except the client should rely on the geotechnical engineering report without first consulting with the geotechnical engineer who prepared it. The report should not be applied for any project or purpose except the one originally intended.

Read the Entire Report

To avoid serious problems, the full geotechnical engineering report should be read in its entirety. Do not only read selected sections or the executive summary.

A Unique Set of Project-Specific Factors is the Basis for a Geotechnical Engineering Report

Geotechnical engineers consider a numerous unique, project-specific factors when determining the scope of a study. Typical factors include: the client's goals, objectives, project costs, risk management preferences, proposed structures, structures on site, topography, and other proposed or existing site improvements, such as access roads, parking lots, and utilities. Unless indicated otherwise by the geotechnical engineer who conducted the original exploration, a geotechnical engineering report should not be relied upon if it was:

- not prepared for you or your project,
- not prepared for the specific site explored, or
- completed before important changes to the project were implemented.

Typical changes that can lessen the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a multi-story hotel to a parking lot
- finished floor elevation, location, orientation, or weight of the proposed structure, anticipated loads or
- project ownership

Geotechnical engineers cannot be held liable or responsible for issues that occur because their report did not take into account development items of which they were not informed. The geotechnical engineer should always be notified of any project changes. Upon notification, it should be requested of the geotechnical engineer to give an assessment of the impact of the project changes.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that exist at the time of the exploration. A geotechnical engineering report should not be relied upon if its reliability could be in question due to factors such as man-made events as construction on or adjacent to the site, natural events such as floods, earthquakes, or groundwater fluctuation, or time. To determine if a geotechnical report is still reliable, contact the geotechnical engineer. Major problems could be avoided by performing a minimal amount of additional analysis and/or testing.

Most Geotechnical Findings are Professional Opinions

Geotechnical site explorations identify subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field logs and laboratory data and apply their professional judgment to make conclusions about the subsurface conditions throughout the site. Actual subsurface conditions may differ from those indicated in the report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risk associated with unanticipated conditions.

The Recommendations within a Report Are Not Final

Do not put too much faith on the construction recommendations included in the report. The recommendations are not final due to geotechnical engineers developing them principally from judgment and opinion. Only by observing actual subsurface conditions revealed during construction can geotechnical engineers finalize their recommendations. Responsibility and liability cannot be assumed for the recommendations

within the report by the geotechnical engineer who developed the report if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Misinterpretation of geotechnical engineering reports has resulted in costly problems. The risk of misinterpretation can be lowered after the submittal of the final report by having the geotechnical engineer consult with appropriate members of the design team. The geotechnical engineer could also be retained to review crucial parts of the plans and specifications put together by the design team. The geotechnical engineering report can also be misinterpreted by contractors which can result in many problems. By participating in pre-bid and preconstruction meetings and providing construction observations by the geotechnical engineer, many risks can be reduced.

Final Boring Logs Should not be Re-drawn

Geotechnical engineers prepare final boring logs and testing results based on field logs and laboratory data. The logs included in a final geotechnical engineering report should never be redrawn to be included in architectural or design drawings due to errors that could be made. Electronic reproduction is acceptable, along with photographic reproduction, but it should be understood that separating logs from the report can elevate risk.

Contractors Need a Complete Report and Guidance

By limiting what is provided for bid preparation, contractors are not liable for unforeseen subsurface conditions although some owners and design professionals believe the opposite to be true. The complete geotechnical engineering report, accompanied with a cover letter or transmittal, should be provided to contractors to help prevent costly problems. The letter states that the report was not prepared for purposes of bid development and the report's accuracy is limited. Although a fee may be required, encourage the contractors to consult with the geotechnical engineer who prepared the report and/or to conduct additional studies to obtain the specific types of information they need or prefer. A prebid conference involving the owner, geotechnical engineer, and contractors can prove to be very valuable. If needed, allow contractors sufficient time to perform additional studies. Upon doing this you might be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Closely Read Responsibility Provisions

Geotechnical engineering is not as exact as other engineering disciplines. This lack of understanding by clients, design professionals, and contractors has created unrealistic expectations that have led to disappointments, claims, and disputes. To minimize such risks, a variety of explanatory provisions may be included in the report by the geotechnical engineer. To help others recognize their own responsibilities and risks, many of these provisions indicate where the geotechnical engineer's responsibilities begin and end. These provisions should be read carefully, questions asked if needed, and the geotechnical engineer should provide satisfactory responses.

Environmental Issues/Concerns are not Covered

Unforeseen environmental issues can lead to project delays or even failures. Geotechnical engineering reports do not usually include environmental findings, conclusions, or recommendations. As with a geotechnical engineering report, do not rely on an environmental report that was prepared for someone else.

AEI
AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING

65 Aberdeen Drive
Glasgow, KY 42141
270-651-7220

AMERICAN ENGINEERS, INC.

May 16, 2022

[redacted]

LG&E and KU
One Quality Street
Lexington, KY 40507

RE: Report of Geotechnical Exploration
Ford 138kV Glendale Industrial West
Structure 28BW
Glendale, KY
AEI Project No. 222-032

[redacted]

1. INTRODUCTION

A summary of the geotechnical parameters necessary to facilitate foundation design has been prepared for the immediate use of the design team. The project is a part of the Ford 138kV Glendale Industrial West in Glendale, KY. This summary is provided for Structure 28BW, a single circuit, angle dead end which will be supported by a drilled shaft foundation.

Table 1: Tower Details

Structure Number	Structure Description	Height (ft)	Centerline Elevation (ft)	Structure Coordinates		Trans. Moment (ft-k)	Long. Moment (ft-k)
				Latitude (DMS)	Longitude (DMS)		
28BW	Single Circuit	110	685.5	37°34’37.90”N	85°52’48.70”W	2,660	3,856

2. DRILLING AND SAMPLING

The geotechnical exploration consisted of one soil test boring. The soil test boring was advanced to a depth of about 41 feet beneath the surface. The boring location was staked by KU personnel. A boring layout is included in Appendix A of this report.

3. SUBSURFACE SOIL CONDITIONS

The generalized subsurface conditions encountered at the boring location, including descriptions of the various strata and their depths and thicknesses are presented on the typed boring log in Appendix B.

Topsoil was encountered at the surface with a thickness of six inches. Beneath the surface material, lean clay was encountered to a depth of nine feet. Fat clay was encountered from nine feet to the auger refusal depth. The lean clay was typically described as reddish brown in color, wet and very stiff in soil strength consistency. The fat clay was typically described as reddish brown to red in color, wet to saturated and stiff in soil strength consistency.

4. BEDROCK CONDITIONS

Refusal, as would be indicated by the Driller on the field boring log, indicates a depth where essentially no downward progress can be made by the auger. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface or where the N-value indicates essentially no penetration of the split-spoon sampler. The auger refusal depth is provided in the table below.

Table 2: Structure 28BW – Summary of Boring

Hole No.	Latitude	Longitude	Surface Elevation (ft.) MSL	Auger Refusal	
				Depth (ft.)	Elevation (ft.) MSL
STR 28BW	37°34’37.90”N	85°52’48.70”W	685.9	40.7	645.2

5. FOUNDATION DESIGN PARAMETERS

5.1 **Lateral Design Parameters** – MFAD soil parameters are provided in the table below. These values are derived from the laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02. The soil deformation moduli provided below were derived from Figure 3-2 and Figure 3-4 of the User Guide for MFAD 5.0 (Moment Foundation Analysis and Design).

Table 3: MFAD Geotechnical Design Parameters

Structure Number	Soil Type	Depth (feet)	Soil Undrained Shear Strength (ksf)	Modulus of Deformation (ksi)
STR 28BW	CL	5.0-9.0	3.0	2.0
STR 28BW	CH	9.0-36.0	1.4	0.8
STR 28BW	CH	36.0-40.0	1.2	0.7

Lateral soil parameters recommended for drilled shaft design are shown below in Table 4 using estimations by Matlock (1970) for soft clays with free water and by Reese, et. al (1975) for stiff clay with free water. These values are derived from laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02.

Table 4: L-Pile Soil Parameters for Design of Drilled Shafts

Structure Number	Soil Type	Depth (feet)	Estimated Strain at 50% Stress (ε_{50})	Initial Soil Stiffness (k_{py}) (pci)
STR 28BW	CL	5.0-9.0	0.01	400
STR 28BW	CH	9.0-36.0	0.01	200
STR 28BW	CH	36.0-40.0	0.01	200

5.2 **Axial Design Parameters** – Axial soil parameters recommended for drilled shaft design are shown below in Table 5. These values are derived from laboratory and standard penetration testing in combination with recommended soil properties from the Naval Engineering Command (NAVFAC) Design Manual 7.02. An ultimate friction angle for clay in contact with concrete of 17° should be used for design. For cohesive soils, utilize a skin friction resistance factor (φ) of 0.45 in accordance with the Brown et al. (2010) method. Utilize an uplift resistance factor of 0.35 for cohesive soils in accordance with the Brown et al. (2018) method. Due to karst features present at the proposed tower location, it is recommended that base resistance be neglected for design purposes.

Table 5: Axial Soil Parameters for Design of Drilled Shafts

Structure Number	Soil Type	Depth (feet)	Effective Unit Weight* (pcf)	Undrained Shear Strength (S_u) (ksf)	Nominal Side Resistance (q_s) (ksf)
STR 28BW	CL	5.0-9.0	125.0	3.0	1.2
STR 28BW	CH	9.0-36.0	120.0	1.4	1.0
STR 28BW	CH	36.0-40.0	57.6	1.2	1.0

*Effective Unit Weight accounts for Buoyancy

The designer should feel free to contact AEI at 270-651-7220 for further recommendations or if any questions arise pertaining to this project.

Sincerely,

AMERICAN ENGINEERS, INC.

Aaron Anderson, EIT
Geotechnical Engineer

Dusty Barrett, PE, PMP
Director of Geotechnical Services

Attachments:
- Boring Layout
- Typed Boring Log
- Laboratory Data

APPENDIX A

Boring Layout

LEGEND

SOIL TEST BORING

DRAWING NOT TO SCALE
ALL BORING LOCATIONS ARE APPROXIMATE

REVISIONS
NO. | DATE | DESCRIPTION

BORING LAYOUT

CLIENT: LG&E and KU

PROJECT: FORD 138kV GLENDALE INDUSTRIAL WEST STRUCTURE 28BW GLENDALE, KY

AMERICAN ENGINEERS, INC.
DESIGNING YOUR FUTURE
65 Aberdeen Drive Glasgow KY
270.651.7220

SCALE: NTS

DATE: 04-13-2022

DRAWN BY: A. ANDERSON

CHECKED BY: D. BARRETT

FILE: T:/22 PROJECTS/222-032 LG&E KU Glendale Ford Plant\Geotech\Glendale 138kV West \STR #28 BW\Support Information

SHEET: A-1

APPENDIX B

Boring Log

FIELD TESTING PROCEDURES

The general field procedures employed by the Field Services Center are summarized in the following outline. The procedures utilized by the AEI Field Service Center are recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Soil Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the surface conditions. Borings are advanced into the ground using continuous flight augers. At prescribed intervals throughout the boring depths, soil samples are obtained with a split-spoon or thin-walled sampler and sealed in airtight glass jars and labeled. The sampler is first seated 6 inches to penetrate loose cuttings and then driven an additional foot, where possible, with blows from a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler each six-inch increment is recorded. The penetration resistance, or "N-value" is designated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split spoon sampling procedures used during the exploration are in general accordance with ASTM D 1586. Split spoon samples are considered to provide *disturbed* samples, yet are appropriate for most engineering applications. Thin-walled (Shelby tube) samples are considered to provide *undisturbed* samples and obtained when warranted in general accordance with ASTM D 1587.

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Core Drilling Procedures for use on refusal materials. Prior to coring, casing is set in the boring through the overburden soils. Refusal materials are then cored according to ASTM D-2113 using a diamond bit attached to the end of a hollow double tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Samples of the material penetrated are protected and retained in the inner tube, which is retrieved at the end of each drill run. Upon retrieval of the inner tube the core is recovered, measured and placed in boxes for storage.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soil in general accordance with the procedures outlined in ASTM D 2487 and D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

Representative portions of soil samples are placed in sealed containers and transported to the laboratory. In the laboratory, the samples are examined to verify the driller's field classifications. Test Boring Records are attached which show the soil descriptions and penetration resistances.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designate the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

Water table readings are normally taken in conjunction with borings and are recorded on the "Boring Logs". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using as electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Sampling Terminology

Undisturbed Sampling: Thin-walled or Shelby tube samples used for visual examination, classification tests and quantitative laboratory testing. This procedure is described by ASTM D 1587. Each tube, together with the encased soil, is carefully removed from the ground, made airtight and transported to the laboratory. Locations and depths of undisturbed samples are shown on the "Boring Logs."

Bag Sampling: Bulk samples of soil are obtained at selected locations. These samples consist of soil brought to the surface by the drilling augers, or obtained from test pits or the ground surface using hand tools. Samples are placed in bags, with sealed jar samples of the material, and taken to our laboratory for testing where more mass material is required (i.e. Proctors and CBR's). The locations of these samples are indicated on the appropriate logs, or on the Boring Location Plan.

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIVE SOILS
(Clay, Silt, and Mixtures)

CONSISTENCY	SPT N-VALUE	Qu/Qp (tsf)
Very Soft	2 blows/ft or less	0 – 0.25
Soft	2 to 4 blows/ft	0.25 – 0.49
Medium Stiff	4 to 8 blows/ft	0.50 – 0.99
Stiff	8 to 15 blows/ft	1.00 – 2.00
Very Stiff	15 to 30 blows/ft	2.00 – 4.00
Hard	30 blows/ft or more	> 4.00

PLASTICITY

Degree of Plasticity	Plasticity Index (PI)
Low	0 – 7
Medium	8 – 22
High	over 22

NON-COHESIVE SOILS
(Silt, Sand, Gravel, and Mixtures)

DENSITY	SPT N-VALUE
Very Loose	4 blows/ft or less
Loose	4 to 10 blows/ft
Medium Dense	10 to 30 blows/ft
Dense	30 to 50 blows/ft
Very Dense	50 blows/ft or more

PARTICLE SIZE IDENTIFICATION

Boulders	12 inch diameter or more
Cobbles	3 to 12 inch diameter
Gravel	Coarse – 1 to 3 inch
	Medium – ½ to 1 inch
	Fine – ¼ to ½ inch
Sand	Coarse – 0.6mm to ¼ inch
	Medium – 0.2mm to 0.6mm
	Fine – 0.05mm to 0.2mm
Silt	0.05mm to 0.005mm
Clay	0.005mm

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 – 10
Trace to Some	11 – 20
Some	21 – 35
And	36 – 50

NOTES

Classification – The Unified Soil Classification System is used to identify soil unless otherwise noted.

Standard "N" Penetration Test (SPT) (ASTM D1586) – Driving a 2-inch O.D., 1 3/8-inch I.D. sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6-inches to seat the sampler into undisturbed soil, and then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the field drill long (e.g., 10/8/7). On the report log, the Standard Penetration Test result (i.e., the N value) is normally presented and consists of the sum of the 2nd and 3rd penetration counts (i.e., N = 8 + 7 = 15 blows/ft.)

Soil Property Symbols

Qu:	Unconfined Compressive Strength	N:	Standard Penetration Value (see above)
Qp:	Unconfined Comp. Strength (pocket pent.)	omc:	Optimum Moisture content
LL:	Liquid Limit, % (Atterberg Limit)	PL:	Plastic Limit, % (Atterberg Limit)
PI:	Plasticity Index	mdd:	Maximum Dry Density

AEI
AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT LG&E and KU
PROJECT NAME Ford 138kV Glendale Industrial West
PROJECT NUMBER 222-032
PROJECT LOCATION Glendale, KY
DATE STARTED 3/30/22 **COMPLETED** 3/30/22
GROUND ELEVATION 685.9 ft
DRILLING CONTRACTOR Adam Thompson
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Augers
▽ **AT TIME OF DRILLING** 36.00 ft / Elev 649.90 ft
LOGGED BY Adam Cash **CHECKED BY** Aaron Anderson
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	REMARKS
0	TOPSOIL (6 INCHES)									
	(CL) lean CLAY, reddish brown, wet, very stiff	ST 1	90		2.0	26				
5		ST 2	90		4.5+	25	40	17	23	Qu = 7,010 psf
10	(CH) fat CLAY, reddish brown to red, wet to saturated, stiff	SPT 1	100	4-5-6 (11)	-	33				
15										
20		ST 3	65		2.5	35	57	21	36	Qu = 3,730 psf
25										
30		SPT 2	20	1-4-5 (9)	-	33				
35	▽									
40		SPT 3	53	3-5-5 (10)	-	34				

Refusal at 40.7 feet.
Bottom of borehole at 40.7 feet.

APPENDIX C

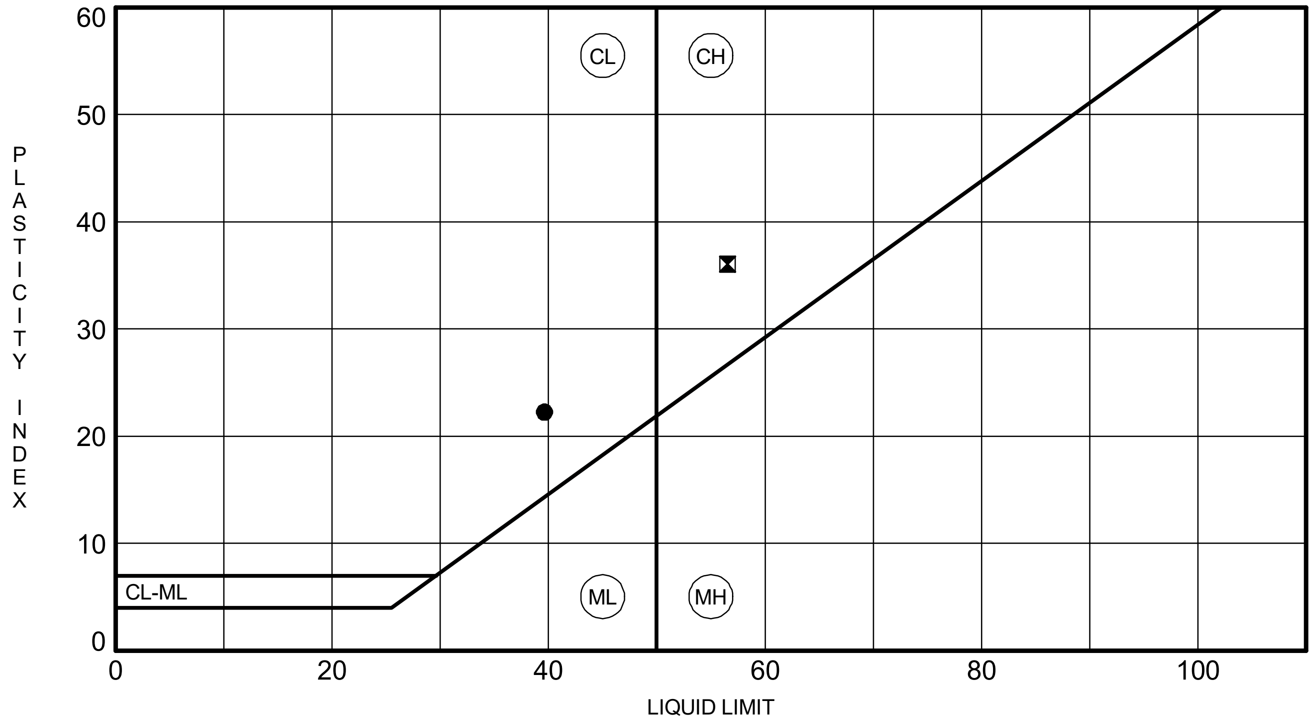
Laboratory Testing Results

ATTERBERG LIMITS' RESULTS

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
65 Aberdeen Drive
Glasgow, KY 42141
(270) 651-7220

CLIENT LG&E and KU **PROJECT NAME** Ford 138kV Glendale Industrial West

PROJECT NUMBER 222-032 **PROJECT LOCATION** Glendale, KY

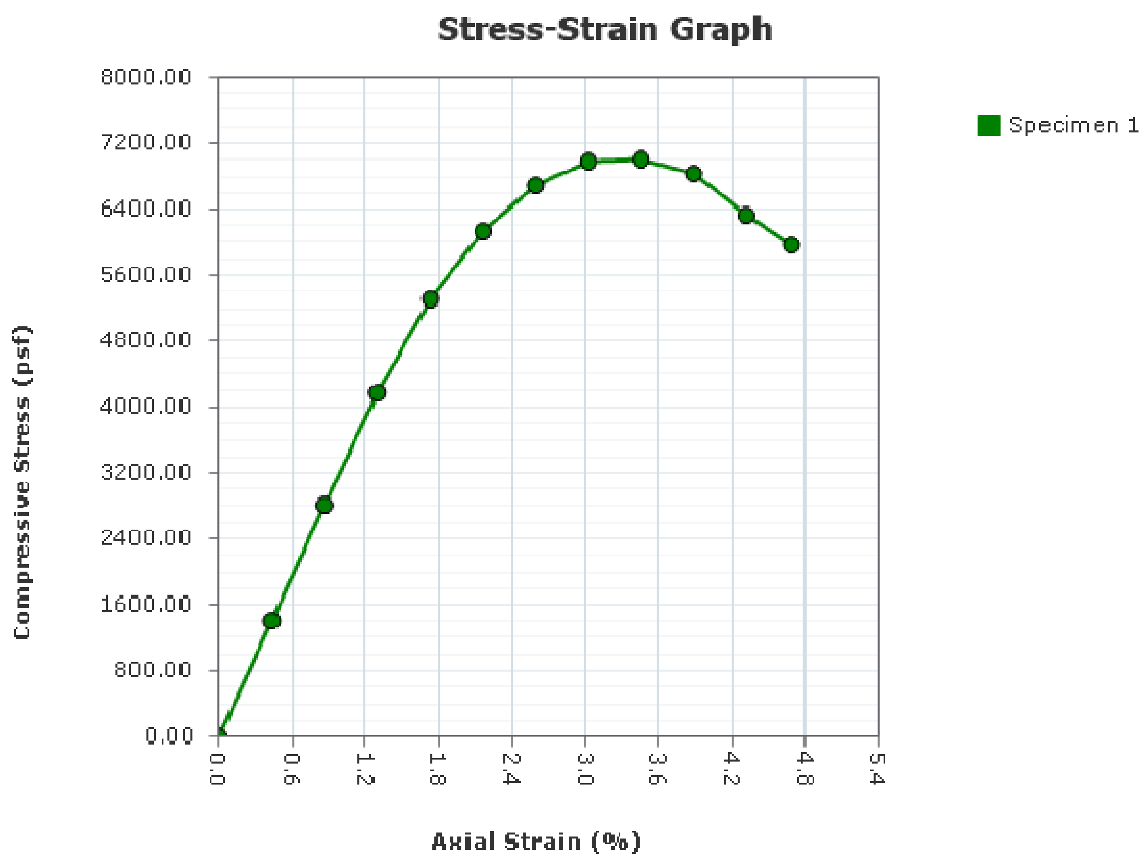


	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**STR 28BW**	**4.0**	**40**	**17**	**23**		**(CL) LEAN CLAY**
⊠	**STR 28BW**	**19.0**	**57**	**21**	**36**		**(CH) FAT CLAY**

ATTERBERG LIMITS - GINT STD US LAB.GDT - 5/13/22 09:59 - T:\22 PROJECTS\222-032 LG&E KU GLENDALE FORD PLANT\GEOTECH\GLENDALE 138KV WEST\LAB\FORD 138KV GLENDALE INDUSTRIAL WEST.GPJ

Unconfined Compression Test

ASTM D2166



Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Received Date:	4/12/2022
Sampling Date:	4/12/2022
Sample Number:	ST 2
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 28BW
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

ASTM D2166

	Specimen Number							
Before Test	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Moisture Content (%):	24.5							
Wet Density (pcf)	126.7							
Dry Density (pcf)	101.8							
Saturation (%):	99.7							
Void Ratio:	0.668							
Height (in)	5.7900							
Diameter (in)	2.7200							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.13							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.73							
Unconfined Compressive Strength (psf)	7010.25							
Undrained Shear Strength (psf)	3505.13							
Strain at Failure (%):	3.45							

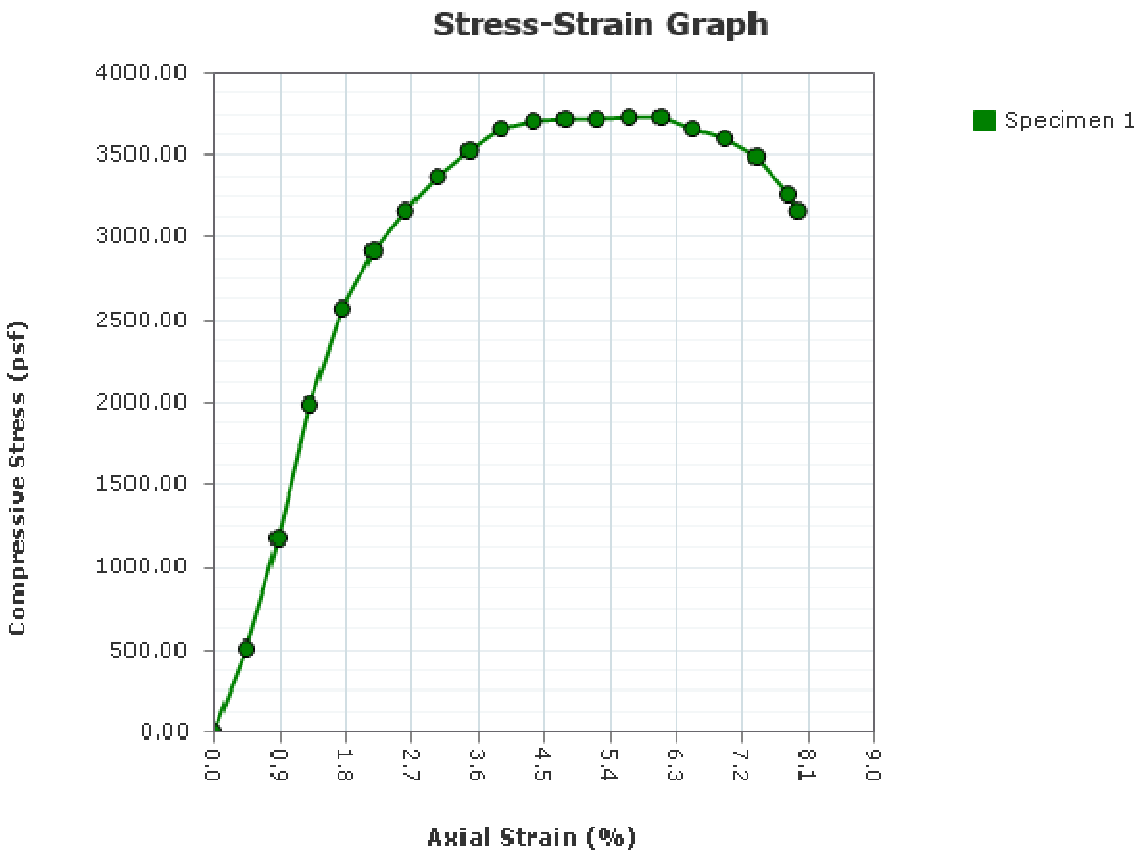
Specific Gravity:	2.72	Plastic Limit:	17	Liquid Limit:	40
Type:	UD	Soil Classification:	CL		

Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Sampling Date:	4/12/2022
Sample Number:	ST 2
Sample Depth:	4.0-6.0 ft
Boring Number:	STR 28BW
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch	Specimen 2 Failure Sketch	Specimen 3 Failure Sketch	Specimen 4 Failure Sketch	Specimen 5 Failure Sketch	Specimen 6 Failure Sketch	Specimen 7 Failure Sketch	Specimen 8 Failure Sketch
							

Unconfined Compression Test

ASTM D2166



Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Received Date:	4/12/2022
Sampling Date:	4/12/2022
Sample Number:	ST 3
Sample Depth:	19.0-21.0 ft
Boring Number:	STR 28BW
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Unconfined Compression Test

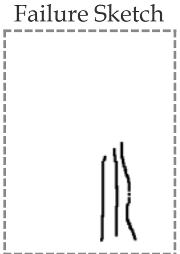
ASTM D2166

	Specimen Number							
Before Test	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Moisture Content (%):	32.4							
Wet Density (pcf)	117.0							
Dry Density (pcf)	88.4							
Saturation (%):	95.5							
Void Ratio:	0.922							
Height (in)	5.7500							
Diameter (in)	2.8500							
Strain Limit @ 15% (in)	0.9							
Height To Diameter Ratio:	2.02							
Test Data	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Failure Angle (°):	0							
Strain Rate (in/min)	0.1							
Strain Rate (%/min):	1.74							
Unconfined Compressive Strength (psf)	3734.65							
Undrained Shear Strength (psf)	1867.32							
Strain at Failure (%):	6.09							

Specific Gravity:	2.72	Plastic Limit:	21	Liquid Limit:	57
Type:	UD	Soil Classification:			

Project:	Ford 138kV Glendale Industrial West
Project Number:	222-032
Sampling Date:	4/12/2022
Sample Number:	ST 3
Sample Depth:	19.0-21.0 ft
Boring Number:	STR 28BW
Location:	Glendale, KY
Client Name:	LG&E and KU
Remarks:	

Specimen 1 Failure Sketch



Specimen 2 Failure Sketch

Specimen 3 Failure Sketch

Specimen 4 Failure Sketch

Specimen 5 Failure Sketch

Specimen 6 Failure Sketch

Specimen 7 Failure Sketch

Specimen 8 Failure Sketch

Your Geotechnical Engineering Report

To help manage your risks, this information is being provided because subsurface issues are a major cause of construction delays, cost overruns, disputes, and claims.

Geotechnical Services are Performed for Specific Projects, Purposes, and People

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering exploration conducted for an engineer may not fulfill the needs of a contractor or even another engineer. Each geotechnical engineering exploration and report is unique and is prepared solely for the client. No one except the client should rely on the geotechnical engineering report without first consulting with the geotechnical engineer who prepared it. The report should not be applied for any project or purpose except the one originally intended.

Read the Entire Report

To avoid serious problems, the full geotechnical engineering report should be read in its entirety. Do not only read selected sections or the executive summary.

A Unique Set of Project-Specific Factors is the Basis for a Geotechnical Engineering Report

Geotechnical engineers consider a numerous unique, project-specific factors when determining the scope of a study. Typical factors include: the client's goals, objectives, project costs, risk management preferences, proposed structures, structures on site, topography, and other proposed or existing site improvements, such as access roads, parking lots, and utilities. Unless indicated otherwise by the geotechnical engineer who conducted the original exploration, a geotechnical engineering report should not be relied upon if it was:

- not prepared for you or your project,
- not prepared for the specific site explored, or
- completed before important changes to the project were implemented.

Typical changes that can lessen the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a multi-story hotel to a parking lot
- finished floor elevation, location, orientation, or weight of the proposed structure, anticipated loads or
- project ownership

Geotechnical engineers cannot be held liable or responsible for issues that occur because their report did not take into account development items of which they were not informed. The geotechnical engineer should always be notified of any project changes. Upon notification, it should be requested of the geotechnical engineer to give an assessment of the impact of the project changes.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that exist at the time of the exploration. A geotechnical engineering report should not be relied upon if its reliability could be in question due to factors such as man-made events as construction on or adjacent to the site, natural events such as floods, earthquakes, or groundwater fluctuation, or time. To determine if a geotechnical report is still reliable, contact the geotechnical engineer. Major problems could be avoided by performing a minimal amount of additional analysis and/or testing.

Most Geotechnical Findings are Professional Opinions

Geotechnical site explorations identify subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field logs and laboratory data and apply their professional judgment to make conclusions about the subsurface conditions throughout the site. Actual subsurface conditions may differ from those indicated in the report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risk associated with unanticipated conditions.

The Recommendations within a Report Are Not Final

Do not put too much faith on the construction recommendations included in the report. The recommendations are not final due to geotechnical engineers developing them principally from judgment and opinion. Only by observing actual subsurface conditions revealed during construction can geotechnical engineers finalize their recommendations. Responsibility and liability cannot be assumed for the recommendations

within the report by the geotechnical engineer who developed the report if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Misinterpretation of geotechnical engineering reports has resulted in costly problems. The risk of misinterpretation can be lowered after the submittal of the final report by having the geotechnical engineer consult with appropriate members of the design team. The geotechnical engineer could also be retained to review crucial parts of the plans and specifications put together by the design team. The geotechnical engineering report can also be misinterpreted by contractors which can result in many problems. By participating in pre-bid and preconstruction meetings and providing construction observations by the geotechnical engineer, many risks can be reduced.

Final Boring Logs Should not be Re-drawn

Geotechnical engineers prepare final boring logs and testing results based on field logs and laboratory data. The logs included in a final geotechnical engineering report should never be redrawn to be included in architectural or design drawings due to errors that could be made. Electronic reproduction is acceptable, along with photographic reproduction, but it should be understood that separating logs from the report can elevate risk.

Contractors Need a Complete Report and Guidance

By limiting what is provided for bid preparation, contractors are not liable for unforeseen subsurface conditions although some owners and design professionals believe the opposite to be true. The complete geotechnical engineering report, accompanied with a cover letter or transmittal, should be provided to contractors to help prevent costly problems. The letter states that the report was not prepared for purposes of bid development and the report's accuracy is limited. Although a fee may be required, encourage the contractors to consult with the geotechnical engineer who prepared the report and/or to conduct additional studies to obtain the specific types of information they need or prefer. A prebid conference involving the owner, geotechnical engineer, and contractors can prove to be very valuable. If needed, allow contractors sufficient time to perform additional studies. Upon doing this you might be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Closely Read Responsibility Provisions

Geotechnical engineering is not as exact as other engineering disciplines. This lack of understanding by clients, design professionals, and contractors has created unrealistic expectations that have led to disappointments, claims, and disputes. To minimize such risks, a variety of explanatory provisions may be included in the report by the geotechnical engineer. To help others recognize their own responsibilities and risks, many of these provisions indicate where the geotechnical engineer's responsibilities begin and end. These provisions should be read carefully, questions asked if needed, and the geotechnical engineer should provide satisfactory responses.

Environmental Issues/Concerns are not Covered

Unforeseen environmental issues can lead to project delays or even failures. Geotechnical engineering reports do not usually include environmental findings, conclusions, or recommendations. As with a geotechnical engineering report, do not rely on an environmental report that was prepared for someone else.

AEI
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PROFESSIONAL ENGINEERING

65 Aberdeen Drive
Glasgow, KY 42141
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GEOTECHNICAL ENGINEERING INVESTIGATION

LG&E-KU FORD GLENDALE 345 KV TRANSMISSION

HODGENVILLE WEST ROAD, GLENDALE, KENTUCKY

ATLAS PROJECT NO. LOUGE22043

PREPARED FOR:

Southeast Power Corporation
136 Precision Court
Lancaster, KY 40444

PREPARED BY:

Atlas Technical Consultants LLC
2724 River Green Circle
Louisville, KY 40206

June 15, 2022

ATLAS

2724 River Green Circle
Louisville, KY 40206
(502) 722-1401 | oneatlas.com

June 15, 2022

MR. GREG CRUTCHFIELD
SOUTHEAST POWER CORPORATION
136 PRECISION COURT
LANCASTER, KENTUCKY 40444

Subject: **Geotechnical Engineering Investigation**
LG&E-KU Ford Glendale 345 kV Transmission
Hodgenville Road West, Glendale, Kentucky
Atlas Project No. LOUGE22043

Dear Mr. Crutchfield:

Atlas Technical Consultants LLC has completed a geotechnical exploration in support of improvements for proposed overhead electrical transmission towers at the referenced site. The attached report presents a review of project information provided to us, descriptions of observed site and subsurface conditions, and a summary of foundation recommendations for use in project design and construction. The report Appendix contains site and test boring location plans, and results of field and laboratory testing. Our services have been provided in accordance with Atlas proposal number LOUGE22043 dated March 11, 2022.

We appreciate the opportunity to have provided these services and we look forward to serving as your geotechnical consultant throughout project design and execution. Please contact us with any questions regarding the information presented.

Respectfully submitted,
Atlas Technical Consultants LLC

Ryan Ortiz, PE
Senior Geotechnical Engineer
Licensed Kentucky 33219

STATE OF KENTUCKY
RYAN CHRISTOPHER ORTIZ
33219
LICENSED PROFESSIONAL ENGINEER

Travis Andres, PE
Senior Geotechnical Engineer
Licensed Kentucky 29429

CONTENTS

APPENDICES

1. PURPOSE AND SCOPE OF EXPLORATION

Atlas Technical Consultants LLC (Atlas) has completed a geotechnical engineering exploration for proposed transmission line alignments in Glendale, Kentucky. The purpose of this exploration has been to obtain site-specific subsurface data, to review available site development and geologic information, and to develop recommendations for use in design and construction of the foundations. Geotechnical services reported herein include drilling at nine structures including engineering soil test borings at 28 self-support tower legs and two monopole structures, analysis of resulting data, and geotechnical recommendations.

2. PROJECT INFORMATION

Two transmission line alignments are planned in Glendale, Kentucky. A west route extends from south of the intersection of Jaggers Road and Hodgenville Road West to the intersection of Gaither Station Road and Ring Road. An east route extends from southwest of the intersection of Hodgenville Road West and Robey Drive to Meadowview Drive West. The lines are planned to service Ford's Blue Oval SK Battery Park in Glendale, Ky. A Vicinity map, Figure 1, appears in Appendix.

Proposed improvements are expected to include new self-support towers and monopole structures supported on driller pier foundations. Boring locations were provided by LG&E-KU based on the location of planned additions. Based on maximum loading conditions provided by LG&E-KU, the maximum axial, shear, and moment loads are about 200 kips, 60 kips, and 2 kip-feet. We understand the drilled piers may have a minimum diameter of about 6 feet. The planned depth of the drilled piers is not known at the issuance of this report.

In the case of drilled pier foundations, overturning and lateral resistance will be provided through a combination of the dead weight of the buried foundation structure, along with side capacity through the interaction of the concrete pile and surrounding soil. In case of use of a buried structural mat foundation, overturning and lateral resistance will be provided through the dead weight of the buried foundation structures and placed soil fill above the foundation and surrounding soil.

3. EXPLORATORY FINDINGS

3.1 Surface Conditions

The site extends through rolling agricultural fields and karst topography. Based on review of publicly available survey data provided by LG&E-KU, elevations at the east route structure locations range from 720.8 to 753.2 feet. Elevations at the west route range from 663.5 to 698.3 feet. The boring locations were selected by LG&E-KU. The borings were marked in the field using a using the approximate coordinates provided.

3.2 Site Geology

Based on review of the Kentucky Geological Survey (KGS) Geologic Survey Map, the following bedrock formations underlie the site.

Table 1: Geologic Formations Descriptions

Geologic Formations	Descriptions	Location on Site
St. Louis Limestone	Limestone, yellowish-gray to olive-gray, medium- to fine-grained, argillaceous, dolomitic, silty, thin to thick-bedded, massive; contains several zones of gray chert, some irregular and scattered and some nodular, along bedding planes. Silty clay shale weathers yellowish to greenish gray. Limestone, dolomite, and shale: Limestone is yellowish gray, light olive gray to medium bluish gray; very fine to fine grained; thin to thick bedded; locally laminated to very thin bedded where clayey or dolomitic. Dolomite is light olive gray; weathers yellowish gray, very fine to fine grained, thin to thick bedded; commonly spalls: contains fist-sized pockets of crystalline calcite. Shale is yellowish green to dark brown, calcareous, carbonaceous near base of unit, in thin beds.	Mapped Underlying Structures 4, 5, 21, 26, and 23A Mapped Near Structures 16, 17, 21 25, and 25A
Alluvium	Sand, silt, clay, and gravel: Sand is very fine to fine, poorly sorted; interbedded with silt and clay. Gravel composed of pebbles, cobbles, and scattered boulders of chert, limestone, silicified limestone, and some limonite-cemented sandstone concretions. Loess soil as thick as 2 feet covers some of area, not mapped. Slumped sandstone and shale Sand, sandstone, silt, shale, and limestone: Loose, poorly indurated, jumbled sandstone, silt, and shale, mixed with soil, sand, and scattered boulders of limestone. Derived from rocks that overlay the Ste. Genevieve Limestone and which slumped into sinkholes in the Ste. Genevieve and St. Louis Limestones, probably during an early cycle of karst erosion.	Mapped Underlying Structures 25 Mapped Near Structures 5, 16, 17, 21 23A, and 26
Ste. Genevieve Limestone	Limestone, dolomite, and shale: Limestone is light yellowish gray; weathers to light gray; characteristically oolitic in beds 0.5 to 4 feet thick, massive; interbedded with about equal amounts of bioclastic limestone, locally shaly, cherty, or pyritic; weathers to smooth rounded surfaces. Dolomite is yellowish gray, very fine grained, massive; locally calcareous: bed near base contains fist-sized vugs filled with crystalline calcite. Silty clay shale is yellowish to greenish gray, locally calcareous. Soil cover is commonly as thick as 30 feet.	Mapped Underlying Structure 16, 17, 21, and 25A Mapped Near Structures 5, 16, 17, 23A, and 26
Lost River Chert of Elrod	Limestone, very pale orange to yellowish-gray, medium- to coarse grained; contains very coarse fossil fragments; slightly oolitic; medium bedded, massive; rarely exposed except in road cuts or sinks; generally silicified in one or more beds 0.1 to 1.5 feet thick; resulting chert marked by well-preserved casts of bryozoans and brachiopods, including Orthotetes, and is probably the Lost River Chert of Elrod (1899); top of chert is only mappable horizon in this part of stratigraphic section.	Not mapped, but expected at the contact between the Ste. Genevieve and St. Louis Limestone

Based on review of publicly available KGS Karst Potential Maps, the underlying limestone formations are severely karst susceptible. KGS mapped sinkholes are located east of Structures 4 and 5. A karst feature is also mapped near Structure 39 along the alignment; however, borings at this particular structure were excluded from the exploration scope.

Karst in the region is typically characterized as solution weathering caused by slightly acidic groundwater moving down and through the bedrock along vertical joints and horizontal bedding planes. The limestone dissolves in this weak acid, resulting in an irregular upper rock surface and development of open channels and cavities in the underlying rock. As the openings widen, overburden soils may collapse into the rock voids and be carried away by water movement. The void of collapsing soil progresses upward and outward until the overlying soil arch cannot support the load above it. When the surface soils collapse into the underlying void, the resultant surface feature is termed a sinkhole. Evidence of severe sinkhole development was not evident from the surface during the subsurface exploration in the immediate area of the planned structures; however, our experience in the vicinity indicates incipient sinkholes and other karstic activity may be encountered outside of the boring locations on site and potentially subsurface during construction.

3.3 Subsurface Conditions

Subsurface conditions were explored at nine proposed structures via engineering test borings for 28 self-support structure legs and 2 monopole structures. Borings were drilled for a location for Structure 5, that was abandoned due to an underlying sewer. The results for this abandoned location is presented in the appendix as “OLD STR 5”, but are not considered in this report. The results are described on boring logs in the Appendix. Subsurface strata descriptions represent our interpretation based on visual examination of recovered samples. Contacts between various strata on the test boring logs represent approximate depths, as transitions between strata may be gradual.

Surface Cover: The ground surface consisted of topsoil and/or organic agriculturally aerated soil. Interpreted topsoil or organic soils thicknesses were observed ranging from 2 to 12 inches.

Existing Fill: Apparent existing fill comprised of lean to fat clay soils was encountered beneath surface materials in borings at STR 16 to about 22 feet below existing grade (BEG) and at STR 17 L1 to about 2.5 feet BEG. The clay was visually classified as brown with Standard Penetration Tests (SPT) resulting in N-Values ranging from 9 to 16 blows per foot (bpf). The existing fill at both locations contained various types of organic soils, including topsoil, root fragments, and wood fragments.

Native Cohesive Soil: Lean and/or Fat Clay (CL) with variable quantities of silt, sand, and limestone fragments was encountered beneath the surface materials at all borings. The clay was visually classified as brown, reddish brown and gray and very soft to hard with SPT N-Values resulting in ranging from Weight of Hammer (WOH is defined as no blows of the sampling equipment required for sampler penetration) to 9 bpf. The clay materials extended to depths ranging from 4.1 to 12 feet BEG.

Native Granular Soil: Sand soil types with variable amounts of silt, sand, and gravel were encountered at several locations. We expect these sandy soils are deposits from nearby alluvial formations or are residual weathered limestone layers. Granular soils were encountered at Structure 5 L3 and Structure 25A L1 as 2 foot thick layers, and were visually classified as light brown and loose to medium dense with SPT N-values ranging 8 to 12 bpf.

Weathered and/or Karst Limestone: Weathered/karstic limestone was commonly encountered with in overburden soil layers. Typically, indications of these conditions were observed based on drilling performance and/or in recovered soil samples. These observations included limestone fragments in recovered split spoon samples, difficult augering performance (slow augering or auger chatter), by encountering auger refusal shallower than competent limestone bedrock, and through coring through weathered or karst limestone prior to encountering competent limestone bedrock. These drilling conditions are interpreted (pending boring-specific drilling performance or notes) as possible limestone boulders, limestone pinnacles, interbedded limestone and soil, weathered limestone, or as voids encountered in bedrock.

Limestone Bedrock: Auger refusal was encountered at the boring locations ranging from 17 to 64.5 feet BEG. Rock sampling methods were used to advance monopole structure borings and one tower leg boring at each structure beyond where auger refusal, if encountered. Recovered core samples were generally comprised of limestone. Based on coring performance, voids and/or clay layers were commonly interpreted based on low down pressure and/or coring tooling drops during drilling operations. The recovered bedrock samples were described as slightly to highly weathered. Approximate recoveries ranging from 0 to 100 percent were measured and exhibited Rock Quality Designation (RQD) values ranging from 0 to 100 percent. Please refer to the boring logs in the Appendix for specific conditions.

The majority of the borings for this project were drilled to auger refusal. Auger refusal is defined herein as the depth at which a boring can no longer be advanced using conventional soil drilling methods. In an area of limestone bedrock overlain by residual soil, auger refusal can result on weathered bedrock that includes fractured bedrock with clay filled joints or seams, on slabs of un-weathered limestone suspended in the residual soil matrix (“floaters”), on rock “pinnacles” rising above the surrounding bedrock surface, in crevices, or on the upper surface of continuous bedrock. It is important to understand that auger refusal is not necessarily coincident with the bedrock surface since the augers can penetrate the upper weathered or fractured bedrock in some cases. Auger refusal can also occur on obstructions (such as debris, old foundations, slabs, etc.) above the bedrock surface. As is evident based on the test borings that were drilled for this project, the bedrock surface at this site is variable with differences in bedrock surface elevations occurring over relatively short lateral distances. It should be noted that bedrock may be encountered much shallower or deeper than the depths noted during this exploration, which is relatively common in the area.

3.4 Groundwater Conditions

Groundwater level observations were made both during and at the completion of drilling operations. Groundwater was observed at the following locations and depths:

Table 2: Observed Groundwater Conditions

Boring ID	Free Water Depth (ft)	Boring ID	Free Water Depth (ft)
STR 4	25	STR 23A L3	22
OLD STR 5 L3	9	STR 25A L1	22
STR 16	32.7	STR 25A L3	26
STR 17 L1	31	STR 25A L4	44
STR 17 L3	32	STR 26 L3	18
STR 23A L1	22	--	--

Water was introduced into the borings for rock coring operations so water levels could not be obtained beyond auger refusal depth. Groundwater levels may fluctuate in response to short-term and seasonal variations in precipitation and surface runoff, and local pockets of groundwater may be present at shallower depths in the profile during wetter periods. Due to the cohesive materials of relatively low permeability encountered at this site, the boring may not have been allowed to remain open for a duration for the groundwater table to stabilize. Due to the presence of water encountered, groundwater should generally be expected across the site. Subsurface water is likely to be encountered perched near the natural soil-bedrock interface or above more competent layers of weathered limestone. Groundwater may also be encountered within voids and fractures in the bedrock.

3.5 Seismic Site Class

Based on geologic mapping, our experience in the project area, and the results of the test borings, it is our opinion that the majority of subsurface conditions at this site meet the criteria for **Site Class C** based on Section 1613.3.2 of the 2018 International Building Code. However, there were several exceptions where the subsurface strata encountered met the criteria of other site classes. At Structure 4 and 17, the encountered subsurface conditions meet the criteria for a **Site Class E**. At Structure 16, 23A, and 26, the encountered subsurface conditions meet the criteria for a **Site Class D**. We should be allowed to review the final grading plan to confirm the provided site class for each structure. Site specific seismic studies may be considered.

4. RECOMMENDATIONS

The following recommendations were developed on the basis of previously described Project Information (Section 2), Subsurface Conditions (Section 3), and our experience. If there is any change in the project criteria, including the location of structures on the site, foundation loading, etc., a review should be made by this office and any modifications to our recommendations should be implemented accordingly. Foundation and other design recommendations presented herein are based, in part, on the assumption that the site will be prepared as recommended in this report. We understand that driller pier foundations are primarily considered for support of the structures. We understand that shallow foundations will not be considered for this project.

Karst Considerations

The proposed project site is underlain by a limestone formation that has an irregular surface and is subject to dissolution along joints and bedding planes within the rock mass. It is understood that karst features (such as clay-filled zones, solution channels, voids and sinkholes) have developed in the project vicinity and on site. Construction within an area of severe karst terrain and geology, such as on this site, is accompanied by a major degree of risk due to the potential for future ground subsidence. Karst conditions and indicators were encountered in the borings, including variable auger refusal depths/elevations, voids/clay layers in bedrock, weathered bedrock, free water encountered in overlying bedrock, and soil softening shallower than auger refusal. Groundwater was encountered in the borings shallower than auger refusal and is a critical factor in karst development. Due to the presence of significant amounts of groundwater in the borings, the risk of future development of karst features should be considered high and will present some difficulty to foundation excavation and construction.

The deep foundation parameters provided herein represent the current subsurface soil and bedrock conditions, and do not consider future subsidence, or changing geologic conditions. If a design for future subsidence is desired, the parameters shallower than the bottom of voids should be reduced or neglected.

Due to the presence of karst features at the site and in our borings, and the highly variable nature of karst bedrock over a short distance, it is likely that additional karst features may be found during foundation inspections, and the drilled pier contractor should be prepared to deepen drilled pier excavations, as required. Any karst features identified during construction should be evaluated by a qualified geotechnical engineer on a base-by-case basis. Due to the severely karst prone bedrock and encountered karst features, a geotechnical engineer's representative should observe drilled pier excavations and bearing conditions on a full-time basis. Full-time observation by a geotechnical engineer's representative will yield more efficient karst solutions, when encountered (compared to delayed site visit, standby time by drill crew). Full-time observation may also indicate potential karst conditions otherwise not identified by the contractor.

The primary concern regarding karst features is support of structures, managing subsidence, and the possibility of collapse. However, the karst conditions encountered in these borings also present some constructability issues and risks for deep foundations. Difficult drilling performance was observed in the subsurface exploration due to limestone floaters, weathered limestone layers, and other conditions encountered shallower than bedrock. Based on auger refusal depths encountered, the bedrock surface appeared variable over short distances. Further, groundwater and soft soils were encountered above bedrock. Casing should be available, if not required, to manage groundwater and potential soft soil caving. Further, poured concrete may be “washed” or “sloughed” into underlying or adjacent voids, soft clay layers, or areas with flowing water. The contractor, owner, and design team should be prepared with alternative installation techniques where these circumstances are encountered during construction. Alternatives may include phased concrete placement, to “seal” karst features, or to install permanent casing. A qualified deep foundations contractor should be selected with experience in similar karst conditions, and with methods readily available onsite to manage karst, groundwater, seepage, soil collapse, and other constructability issues identified in the borings.

The planned drilled pier bearing elevations should be investigated by test holes via additional drilling (i.e. air track test holes, downhole pier test holes, borings, etc) to inspect for voids or otherwise soft layers below foundations. The method of advancement for the test holes may be at the contractor's discretion, but the testing program should be approved and observed by a qualified geotechnical engineer. The contractor should be able to perform test holes (number and extents depending on the deep foundation dimensions and depths), to confirm depth of bedrock, and the presence of quality bedrock below the deep foundation bearing surface. The test holes should extend at least 2 to 3 diameters below the bottom of the foundation. The contractor performed test holes, observed by a qualified geotechnical engineer or representative, will be adequate to estimate and manage the risk of karst effects on deep foundations.

Additional exploration options are available to further explore karst conditions. Air track test holes performed in the project planning stage will be beneficial to further quantify the bedrock surface (i.e. pinnacle/cutter bedrock topography). Further, geophysical services will provide information to determine the size, width, and location of karst features, thus further quantifying the risk to foundations.

Post construction testing will be beneficial to confirm the integrity of the pile after concrete placement. Post construction testing is particularly important on this project, due to the presence of groundwater and, in particular, flowing water and karst conditions. These issues may cause washout of placed concrete or cement, or outflow into underground voids. The most common type of testing is thermal integrity profiling. Commonly, thermal integrity instrumentation is placed in the foundation element attached to the rebar cage, and may also be used with PVC placed in the drilled pier. Other options for evaluating pile integrity may include downhole seismic testing or destructive methods (i.e. performing test holes in finished concrete). The contractor should provide methods to evaluate pile integrity, for approval by the design team, prior to mobilization for construction.

Existing Fill

Existing fill comprised of lean to fat clay soils was encountered beneath the surface materials in borings at STR 16 to about 22 feet below existing grade (BEG) and at STR 17 L1 to about 2.5 feet BEG. The existing fill at both locations contained various types of organic soils, including topsoil, root fragments, and wood fragments. Existing fill material, without documentation of compaction, has potential to be highly variable and unsuitable for foundation support. The existing fill materials encountered present a potential risk of long-term differential settlements for any structures bearing on such materials. We recommend bearing all foundation below the existing fill material.

4.1 Drilled Pier Foundations

We understand that drilled piers are the primary foundation type considered for this project. We have also provided alternative foundation types and/or ground improvement that may be more economical and feasible for the conditions encountered.

If selected, drilled piers should be designed to resist both uplift and axial loads. For purposes of this study, axial load is defined as the downward vertical load imparted to the foundation. The drilled pier subgrade should be judged suitable for the proposed loading by the geotechnical engineer.

The proposed improvements are in a severe karst geologic setting. To bear drilled piers below any known karst features or soft soil layers, we recommend the following structures bear at the minimum depths and/or elevations.

Table 3: Drilled Pier Minimum Bearing Strata Depth and/or Elevation

Structure ID	Bearing Depth (ft) [1,2]	Bearing Elevation (ft) [2]	Bedrock Depth (ft) [1,3]	Bedrock Elevations (ft) [3]
Structure 4	45.0 [4]	~625.0	45.0 [4]	~625.0
OLD Structure 5	17.0 [5]	~651.0	17.0 [5]	~651.0
Structure 16	45.0	~703.0	51.0	~697.0
Structure 17	33.5	~711.5	43.5	~701.5
Structure 21	N/A	N/A	31.0	~656.0
Structure 23A	60.0	~660.0	60.0	~660.0
Structure 25	20.0	~645.0	48.0	~697.0
Structure 25A	N/A	N/A	53.5	~678.0
Structure 26	38.0	~648.0	65.0	~621.0

1. Depths are below existing grade. The final depths should consider any grading performed after the geotechnical field services.
2. Drilled piers are recommended to bear deeper than the bearing depth or elevation provided, due to interpreted karst features or soft soils.
3. Drilled piers are recommended to bear deeper than the bedrock depth or elevation provided, where the competent limestone bedrock parameters are used.
4. Structure may require bearing as deep as 55 feet, pending inspection and contractor test holes.
5. Drilled piers should bear in competent limestone bedrock, to limit differential settlements across the structure.

Due to the severe karst potential at this site, the piers should be inspected by a geotechnical engineer's representative. We recommend the contractor perform additional coring or inspection of the underlying rock in foundation areas (i.e. test holes or down hole coring/testing), to confirm soft layers are not present within 2 to 3 pier diameters below the drilled pier footprint. Following approval by a specialty contractor and the design team, the foundations may bear shallower than the required bearing depth, if the ground improvement measures in Section 4.2.3 are implemented prior to construction.

The drilled piers for **Structure 4** should be designed based on the following parameters:

Drilled Pier Foundations:

Allowable **Overburden Soil and Rock** skin friction:	100 psf
Allowable **Competent Limestone Bedrock** skin friction:	400 psf
Recommended **Competent Limestone Bedrock** allowable bearing pressure:	5,000 psf

The drilled piers for **Structures 16, 23A, 25, 26** should be designed based on the following parameters:

Drilled Pier Foundations:

Allowable **Overburden Soil and Rock** skin friction:	300 psf
Recommended **Overburden Soil and Rock** allowable bearing pressure:	2,000 psf
Allowable **Competent Limestone Bedrock** skin friction:	800 psf
Recommended **Competent Limestone Bedrock** allowable bearing pressure:	10,000 psf

The drilled piers for **Structures 5, 17, 21, 25A** should be designed based on the following parameters:

Drilled Pier Foundations:

Allowable **Overburden Soil and Rock** skin friction:	400 psf
Recommended **Overburden Soil and Rock** allowable bearing pressure:	3,000 psf
Allowable **Competent Limestone Bedrock** skin friction:	4,000 psf
Recommended **Competent Limestone Bedrock** allowable bearing pressure:	40,000 psf

Based on parameters outlined in LPILE 5.0Plus, we have estimated values for use in lateral loading analysis. Several of the provided values are based on engineering properties, laboratory testing, and public correlations, such as the unit weight values and unconfined compressive strength.

For lateral loading, the following design parameters are recommended for use in design using the program L-Pile input parameters:

Table 4: Parameters for Lateral Pile Capacity Analysis for Structure 4

Strata Description	Model	Soil or Rock Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Design RQD (%)	Soil Modulus (pci)	Strain ε_{50} (in/in)
Overburden	Soft Soil	90	2	-	50	0.03
Limestone	Hard Soil	120	50	-	800	0.004

Table 5: Parameters for LPILE Capacity Analysis for Structures 16, 23A, 25, 26

Strata Description	Model	Soil or Rock Unit Weight (pcf) [2]	Unconfined Compressive Strength (psi)	Design RQD (%)	Soil Modulus (pci) [1]	Strain ε_{50} (in/in) [1]
Overburden	Stiff Soil	110	13.5	-	200	0.01
Limestone	Weak Rock[1]	130	2,000	30	-	--

1- Limestone should be modelled as weak rock, with K_{rm} of 0.0005 and E_{ri} of 1500 psi

Table 6: Parameters for LPILE Capacity Analysis for Structures 5, 17, 21, 25A

Strata Description	Model	Soil or Rock Unit Weight (pcf) [2]	Unconfined Compressive Strength (psi)	Design RQD (%)	Soil Modulus (pci) [1]	Strain ε_{50} (in/in)[1]
Overburden	Stiff Soil	120	20	-	400	0.005
Limestone	Strong Rock	150	4,000	60	-	--

4.1.1 Uplift Resistance

In order to resist uplift, the weight of the reinforced portion of the pier along with the ultimate unit side friction values provided in this report should be considered. Skin friction in the upper 5 feet of the drilled pier should be neglected. A minimum safety factor of 1.5 is recommended to determine allowable design values.

4.1.2 Drilled Pier Construction Considerations

We recommend subsurface conditions in pier excavations be monitored until concrete is placed to verify that an otherwise competent bearing condition is not compromised by ground water seepage, surface water infiltration, or sidewall cave-in. It is recommended that pier excavations be observed by qualified personnel in order to confirm an acceptable bearing surface is constructed and to identify significant deviations from the specified or anticipated conditions. Observed soil conditions suggest steel casing may be required to provide stable shaft excavations. The potential for groundwater entering shaft excavations should be considered minimal; casing will serve to prevent water from filling the shaft. Construction phase observations and documentation should include:

- Pier top locations within tolerances,
- Correct plan dimensions,
- Plumbness within tolerances,
- Materials excavated match boring data,
- Construction procedures with respect to excavation, groundwater management and concreting,
- Correct placement of steel reinforcing and anchorage bolts,
- Sampling and testing of plastic concrete,
- Concrete placement procedures,
- Proper temporary casing removal.

Significant deviations from specified or anticipated conditions should be reported immediately to the owner’s representative and the project design team.

If pier excavations are to be entered, temporary casing will be required and all local, state and federal safety regulations regarding confined space entry should be followed. No open flame should be permitted on the site near a drilled pier excavation and no personnel should be allowed to enter the excavation until proper safety precautions for confined space entry have been taken. Such precautions should include proper personal protective equipment and monitoring of the excavations for explosive vapors and oxygen deficiency. Additional safety measures may be needed depending upon specific conditions at the foundation location, construction procedures employed and applicable local, state and federal Occupational Health and Safety Regulations and LG&E/KU safety requirements. The following recommendations are provided to aid in the successful construction of drilled shafts at this site:

- Retain the project geotechnical consultant to observe drilled shaft construction.
- Once a pier design is available, it is suggested that the contractor perform a subsurface exploration (i.e. using air track rig or other methods) to two to three pier diameters below the bearing surface. The purpose of this exploration is to confirm that that voids or other discontinuities are present below the foundations, and to confirm the subsurface conditions (i.e. groundwater) just prior to construction.
- Make provisions for ground water removal from the drilled shaft excavations. Use appropriate measures to remove water accumulation from the drilled shaft excavations. If the shaft can be fully dewatered (i.e., less than 2 inches of water on the bottom of the shaft) and concrete can be placed in the shaft quickly (i.e., more than 1 truck discharging into the shaft at one time) then the concrete can be placed by conventional methods. If the shaft cannot be fully dewatered and/or if there is continual flow of water into the shaft, then the concrete should be placed by tremie methods. If this condition should occur, it should be evaluated and excavation methods should be revised accordingly.
- Place concrete in the drilled shafts immediately upon completion of excavation. To minimize the potential for lateral movement of the drilled shafts during loading, the contractor must place the drilled shaft concrete in direct contact with undisturbed natural soil and rock, filling

any voids or enlargements in the drilled shaft excavations with concrete at the time of concrete placement.

- Utilize drilled shaft concrete with a mix designed for a slump of 5 to 7 inches to reduce the potential for arching and to provide a workable material. Should tremie placement of the concrete be required, the concrete mix should be designed with a slump ranging from 7 to 9 inches, without reduction in design strength, to facilitate placement with the tremie tube. A means of preventing concrete from intermixing with the water or slurry, such as a bottom discharge gate or rubber ball for a tremie pipe, or a pig for use in a concrete pump must be provided. In no case should concrete be placed through standing water in the drilled shaft excavation or tremie pipe.
- Maintain a positive head of concrete within the temporary casing, relative to water trapped outside the casing, to reduce the risk of water and/or soil from infiltrating into the drilled shaft excavation and contaminating the concrete. An improper head balance could potentially cause water and/or soil to flow into the shaft and compromise the concrete integrity. Should tremie placement be required, water which typically becomes intermixed with the uppermost portion of the concrete, contaminating the concrete, must be completely removed, down to fresh concrete, prior to final concrete placement to complete the drilled shaft. The drilled shaft contractor must be experienced and prepared to deal with potentially difficult soil, rock and groundwater conditions.
- Install a temporary protective steel casing to prevent side wall collapse, prevent excessive mud and water intrusion, and to allow workers to safely enter, clean and inspect the drilled shaft, if required.
- Direct the concrete placement into the drilled hole through a centering chute to reduce side flow or segregation.
- Extract the protective steel casing as the concrete is placed, to provide a sufficient head of concrete to prevent soil or water intrusion into the newly placed concrete.
- Maintain the shaft reinforcing steel cage in the proper position and at the correct elevation during removal of the temporary casing in order to permit the proper location of the structure anchor bolts.

4.2 Deep Foundation or Ground Improvement Alternatives

Based on the boring data, the following stability concerns or construction feasibility issues are noted in regard to construction of drilled piers:

- Groundwater table – Drilled pier construction is less feasible and more costly in subsurface conditions with a groundwater table or seepage conditions. Casing may be needed for the full length of the drilled pier, due to soft, wet soils and groundwater/seepage. The contractor should be prepared to dewater the excavation with groundwater and active seepage.
- Confirmation of bearing surface – Drilled piers are commonly socketed in competent bedrock. As depths to bedrock are highly variable over short distances, it will be difficult to confirm the bearing surface of the pier. Piers that bear partially on soil and rock may experience poor performance. These will be difficult to inspect due to the depths underground.
- Concrete wash out – Karst features were encountered in this exploration, including voids, soft clay layers, and water flow conditions, which are susceptible to result in concrete wash out or sloughing during construction.

These conditions are often cost-prohibitive for drilled piers, and alternative deep foundation options increasingly become more cost efficient. With these conditions and constructability issues for this project, driven piles, auger-cast piles, or micropiles may be a more feasible from a constructability perspective.

For these specialty foundation or ground improvement alternatives, a design/build contractor must be aware of the groundwater or seepage conditions, the underlying voids, where encountered, soil and rock conditions, and confirm that the design and installation methods are compatible with the site conditions. Since these foundation alternatives are proprietary specialty foundation elements, the specific design criteria and pile characteristics shall be developed and prepared by an engineer registered in the State of Kentucky on behalf of the specialty geotechnical contractor who shall be entirely responsible for the design, installation, performance and warranty of the deep foundation or ground improvement system.

We understand that drilled pier foundations are the primary foundation type considered for this project. However, the following deep foundation alternatives may provide a more cost effective or lower risk solution due to the free water, obstructions prior to auger refusal, and karst conditions encountered in the subsurface exploration. We are available to provide additional details, and qualified contractors, on request.

4.2.1 Ground Improvement

Ground improvement options are available and applicable for karst conditions to reduce risk of karst development in the footprint of foundations. In particular, the primary methods for improving karst bedrock conditions include infilling voids and/or infilling at the top of bedrock. The material used for infilling is commonly a low mobility grout. These materials are injected under pressure to infill voids, solution cavities, and soft soils. Confirmation of grouting success is typically achieved by monitoring the pressure required for grouting and the grout quantity the subsurface accepts. These methods should be considered where drilled piers bear shallower than karst features. Any ground improvement should be performed by a speciality contractor experienced with karst conditions.

Infilling of voids should be considered where drilled piers bear shallower than karst features. Infilling of voids commonly includes a planned grid of locations in and some distance outside the footprint of the proposed foundation. A grouting program in karst bedrock may influence the local hydrology, resulting in accelerated karst feature development outside of the infilled voids. However, where nearby structures are not at risk, this ground improvement option may be considered. Grouting activities should extend 3 pier diameters below the drilled pier bearing elevation, and a 1 horizontal to 1 vertical below the bottom of the deep foundation. If this option is implemented, we should be allowed to review the final deep foundation plans to provide additional recommendations, if warranted.

Infilling at the top of bedrock (e.g. cap grouting) may be performed where deep foundations bear in the soil and rock overburden. This foundation option is not warranted or beneficial where deep foundation bear below the top of competent bedrock. This remediation option is generally performed in a grid spacing pattern of 5 to 10 ft, and individual grout column locations are terminated when grout quantities exceeds design volume or grout pressure exceeds the design limit. The purpose of this remediation option is to seal the top of bedrock surface, so that subsidence risk is reduced. Further, this remediation option has reduced risk of hydrologic impact.

4.2.2 Augered Cast-in-Place Piles

Cast-in-place piles can be placed with minimal vibration, without driving equipment noise, and with minimal disturbance to adjacent footings and structures. These piles are constructed by advancing hollow stem augers to the design bearing depth and injecting grout through the bottom of augers as they are withdrawn. The advantage of cast-in-place piles over drilled piers is the contact between the pile grout and the supporting soils. On the other hand, if the pile is withdrawn ahead of the grout placed, a gap in the pile will form, rendering the pile useless. For this reason, only qualified contractors should be employed to install the piles, and pile installation should be subject to continuous inspection.

Cast-in-place piles may be advantageous in conditions with groundwater conditions, such as this project. The piles may be required to be pre-drilled, due to the obstructions encountered in this project. Locally, cast-in-place piles are typically not installed in bedrock. Where bedrock bearing foundations are required, a qualified contactor should be consulted for feasibility considerations. In general, due to the extensive dewatering required for drilled piers, cast-in-place piles may be a more feasible and cost efficient alternative. However, where seepage conditions are present, cast-in-place piles have risk of wash out or sloughing due to flowing water and voids.

4.2.3 Micropiles

Micropiles may be used to support structures, and are particularly beneficial below any karst features. The micropiles should be installed at least a pile diameter below any encountered voids. Micropiles are relatively small diameter drilled and grouted in-place piles with diameters ranging from about 5 inches to 10 inches. Since micropiles are proprietary foundation elements, the actual pile capacities, pile diameters, pile lengths, etc. must be determined by the specialty geotechnical contractor working in conjunction with the design structural engineers.

Micropiles should be designed and installed as a design/build component of the project and as such the specific characteristics of the micropiles should be designed by a specialty geotechnical contractor based upon the loading conditions required in conjunction with their specific materials and installation methods. The micropile design and construction should be in general accordance with the FHWA Document NHI-05-039 “Micropile Design and Construction”.

Similar to cast-in place piles, micropiles are advantageous where groundwater or free water conditions are expected. Further, micropiles are commonly rock bearing foundations, and may be an economical alternative for foundation support. In addition, micropiles often are considered a minimal risk option for karst considerations.

4.2.4 Driven Piles

Driven piles into a rock bearing surface are typically driven into place using a hammer source. Typical pile types considered for driven piles are steel H-piles or pipe piles, however, other pile types may be considered. These foundation types do not required dewatering, rendering these more economical and feasible where a groundwater table is expected. These foundations are not easily installed where obstructions are present, such as wood fragments, limestone fragments, weathered rock, etc. Pre-drilling of driven pile locations will likely be required, to limit risk of obstructions damaging or skewing the driven pile installation.

4.3 Site Preparation

We understand that the project sites will not contain slabs or pavements that will require typical site preparation, such as topsoil stripping, proofrolling, and other considerations. However, we do expect some site grading may be performed prior to construction of foundations. Further, we site preparation activities described herein will be beneficial to provide support for construction equipment. The recommendations in the following section should be adhered to, particularly in the footprint of structures or where new fill is placed.

All areas that will support pavements, new fill, or any manmade or earthen structures should be properly prepared. After rough grade has been established and prior to placement of new fill, the exposed subgrade should be carefully observed by the geotechnical engineer, or a qualified soils technician working under the direction of the geotechnical engineer, by probing, testing, and proofrolling as needed. Any organic material still in place, frozen, wet, soft or loose soil, uncontrolled fill, existing demolition debris and pavements, foundation remnants, utilities, and other undesirable materials should be removed. The exposed subgrade should be evaluated by proofrolling with suitable equipment to check for pockets of soft material hidden beneath a thin crust of better soil. Any unsuitable materials thus exposed should be removed and replaced with well-compacted, engineered fill as outlined in Section 4.4.

It is important that positive surface drainage be established at the beginning of the earthwork operations and be maintained throughout the project. Surface water must not be allowed to pond. Furthermore, compaction and sealing of the subgrade surface is important when precipitation is expected. The site storm drainage elements (i.e., catch basins, pipes, manholes, etc.) should be installed as early as possible, which will aid in control of surface and ground water.

Care should be exercised during the grading operations at the site. Due to the nature of the near surface soils, the traffic of construction equipment may create pumping and general deterioration of the shallower soils, especially if excess surface water is present. The grading, therefore, should be done during a dry season, if at all possible. Based on our experience on other nearby sites, it is likely that the subgrade soils in some areas will be wet and soft when exposed. The extent to which yielding subgrade may be a problem is difficult to predict beforehand since it is dependent upon several factors including seasonal conditions, precipitation, cut depths, sequencing and scheduling of the earthwork, surface and subsurface drainage measures, the weight and traffic patterns of construction equipment, etc. Therefore, it is suggested that provisions be made in the contract documents for subgrade improvements to be used where determined to be necessary in the field at the time of construction.

It may be possible to improve or stabilize the subgrade soils in the areas that are found to be excessively wet, soft or yielding at the time of construction, by discing, aerating and recompacting. However, this will require a combination of time to allow for working the soils, favorable weather conditions for drying and firmer soils at shallow depth below the yielding soils in order to be successful. If site grading operations are planned through the winter months, subgrade stabilization is expected to be required as part of fill construction to aid in moisture conditioning during fill construction through the seasonably wetter winter months.

If it is not possible to improve the subgrade soils in this manner because of weather conditions, scheduling or other constraints or site conditions (which is most often the case); mechanical stabilization (i.e., a geogrid with additional crushed limestone placed over the subgrade), or removal of the unsuitable soils and replacement with crushed limestone or engineered soil fill.

The best method for stabilizing the subgrade should be determined in the field at the time of construction based upon the actual field conditions in conjunction with the specific soil type encountered at the locations requiring stabilization, the size of the areas requiring stabilization and the construction schedule.

4.4 Fill Compaction

All new engineered fill beneath footings, floor slabs and pavements should be compacted to a dry density of at least 98 percent of the standard Proctor maximum dry density (ASTM D-698). For soil, the compaction should be accomplished by placing the new fill in about 8 inches (or less) loose lifts and mechanically compacting each lift to at least the specified minimum dry density.

We recommend that only well-graded granular material, such as pit-run sand, gravel, or KYTC DGA or lean concrete be used to fill excavations of limited lateral dimensions where proper compaction of cohesive materials is difficult and compaction can only be accomplished with small vibratory equipment.

Clay fill materials should be compacted using a non-vibratory sheeps-foot roller and aggregate fill materials should be compacted using a vibratory smooth-drum roller or as judged acceptable by the geotechnical engineer. Field density tests should be performed on each lift as necessary to insure that adequate moisture conditioning and compaction is being achieved.

Prior to beginning fill construction, we recommend samples of proposed borrow materials be collected for standard Proctor testing. The following criteria are recommended where soil material is utilized for structural fill:

- Limit maximum particle sizes to 4-inches (in the largest dimension) and less than 3 percent organic material by weight.
- Maintain the moisture content of the fill soils to within ±2 percentage points of the soils' optimum moisture content.
- Perform one in-place density test in every 5,000 square feet for each one-foot-thick fill layer, with a minimum of two tests per lift.
- Retain the geotechnical engineer to observe, document and test fill placement and compaction operations.
- Provide and maintain efficient drainage of building and pavement subgrades both during and after construction to prevent ponding of water and to promote rapid and efficient surface drainage.
- Maintain positive surface drainage to prevent water from ponding on surfaces during all earthwork operations.
- Roll fill surfaces with a rubber-tired or steel-drummed roller prior to precipitation events to improve surface runoff if precipitation is expected.
- Contact the geotechnical engineer should the subgrade soils become excessively wet, dry, or frozen.

4.5 Site Drainage

We recommend the site be adequately drained throughout construction to prevent ponding of water. Final site grading should prevent stormwater from accumulating near foundation components and to provide rapid runoff of stormwater. Water accumulating in excavations should be removed in a timely manner to keep it from causing deterioration of the foundation bearing surface.

4.6 Excavation Safety

Excavation for construction of the proposed foundation may exceed 4 feet depth. Excavations of this depth require protective systems. A *competent person* should evaluate the excavation and determine that protective measures are appropriate and adequate. For purposes of trenching and excavations, a competent person is a person who is capable of identifying existing and predictable hazards or working conditions that are hazardous to workers. For design purposes, the natural site soils meet the requirements of OSHA soil type "B" to OSHA soil type "C", and temporary excavations less than 20 feet in height may be sloped at a rate of 1 H to 1 V to 1.5H to 1 V. This condition should be confirmed by a competent person during the excavation process. Additional excavation safety requirements typically include:

- Keep heavy equipment away from trench edges with distance a function of trench height and vehicle type.
- Identify sources, such as ground water, external factors associated with construction operations, or natural subsurface conditions that may affect sidewall stability.
- Keep excavated spoils and equipment a minimum of two feet beyond trench edges.
- Identify and stabilize underground utilities.
- Perform LEL and O_2 testing.
- Check trench edges and condition for stability prior to the start of work shifts, following precipitation events, and if excavations become inundated.

These recommendations are presented as guidelines for trenching and excavation operations and do not constitute an excavation safety plan. A complete excavation safety plan is recommended for any excavations over five feet in depth.

5. BASIS FOR RECOMMENDATIONS

Recommendations presented herein are based, in part, on project information provided to Atlas and only apply to the specific project and site described in this report. If the project information section in this report contains incorrect information or if additional information is available, please convey the correct or additional information to Atlas and retain us to review the recommendations within this report. Atlas can then modify recommendations if they are inappropriate for the proposed project.

Neither assessment of site environmental conditions nor efforts to detect the presence of contaminants in the soil, rock, surface water or ground water of the site included in the scope of this exploration.

Regardless of the thoroughness of a geotechnical exploration, there is always a possibility that conditions between borings will be different from those at specific boring locations and that conditions will not be as anticipated by the designers or contractors. In addition, the construction process may itself alter soil conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures used and the conditions encountered. Unanticipated conditions and inadequate procedures should be reported to the design team along with timely recommendations to solve the problems created. We recommend that the owner retain Atlas to provide this service based upon our familiarity with the project, the subsurface conditions and the intent of the recommendations.

Atlas recommends that this complete report be provided to the various design team members, the contractors and the project owner. Potential contractors should be informed of this report in the "instructions to bidders" section of the bid documents. The report should not be included or referenced in the actual contract documents.

We wish to remind you that our exploration services include storing the samples collected and making them available for inspection for 30 days. The samples are then discarded unless you request otherwise.

Important Information about This

Geotechnical-Engineering Report

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

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

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

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

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

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

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

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

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

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

This Report's Recommendations Are Confirmation-Dependent

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

This Report Could Be Misinterpreted

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

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

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

Give Constructors a Complete Report and Guidance

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

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

LEGEND TO CLASSIFICATION AND SYMBOLS

SOIL TYPES
(Shown in Graphic Log)

SAMPLER TYPES
(Shown in Sampler Column)

CONSISTENCY OF COHESIVE SOILS
(Automatic Hammer)

SPT "N" VALUE	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (PSF)
<2	Very Soft	<500
2-3	Soft	500-1,000
4-6	Medium Stiff	1,000-2,000
7-12	Stiff	2,000-4,000
13-26	Very Stiff	4,000-8,000
>26	Hard	>8,000

RELATIVE DENSITY OF COHESIONLESS SOILS

SPT "N" VALUE	RELATIVE DENSITY
<5	Very Loose
5 to 10	Loose
11 to 30	Medium Dense
31 to 50	Dense
>50	Very Dense

ESTIMATES RELATIVE MOISTURE CONDITION
(Visual classification relative to assumed optimum moisture content (OMC) of standard proctor)

Dry	-Air dry to dusty
Slightly Moist	-Dusty to approximate -2% OMC
Moist	-Approximate ±2% OMC
Very Moist	-Approximate +2% OMC to saturated
Wet	-Contains free water and/or saturated

RELATIVE HARDNESS OF ROCK
(Automatic Hammer)

Very Soft	-Pieces 1 inch or more in thickness can be broken by finger pressure.
Soft	-May be broken with fingers
Medium	-Corners and edges may be broken with fingers
Moderately Hard	-Moderate blow of hammer required to break sample
Hard	-Hard blow of hammer required to break sample
Very Hard	-Several hard blows of hammer required to break sample

RELATIVE WEATHERING OF ROCK

Fresh	-No visible sign of weathering, slight discoloration
Slightly	-Discoloration and discontinuity surfaces
Moderately	-Less than half disintegrated, significant discoloration
Highly	-More than half disintegrated
Completely	-All rock disintegrated into soil. Rock matrix intact.
Residual Soil	-All rock converted to soil. Rock matrix destroyed.

PARTICLE SIZE IDENTIFICATION
(ASTM D2488)

Boulders	> 12 inches
Cobbles	12 to 3 inches
Gravel	
Coarse	3 to ¾ inches
Fine	¾ to 4.75 mm
Sand [1]	
Coarse	4.75 to 2 mm
Medium	2 to 0.425
Fine	0.425 to 0.075 mm
Silt or Clay [2]	<0.075 mm

1. *No. 4 Sieve to No. 200 Sieve*
2. *Finer than No. 200 Sieve*

PROPORTION OF SAND AND GRAVEL
(By Dry Weight)

Trace	<15%
With	15 to 29%
Modifier	>29%

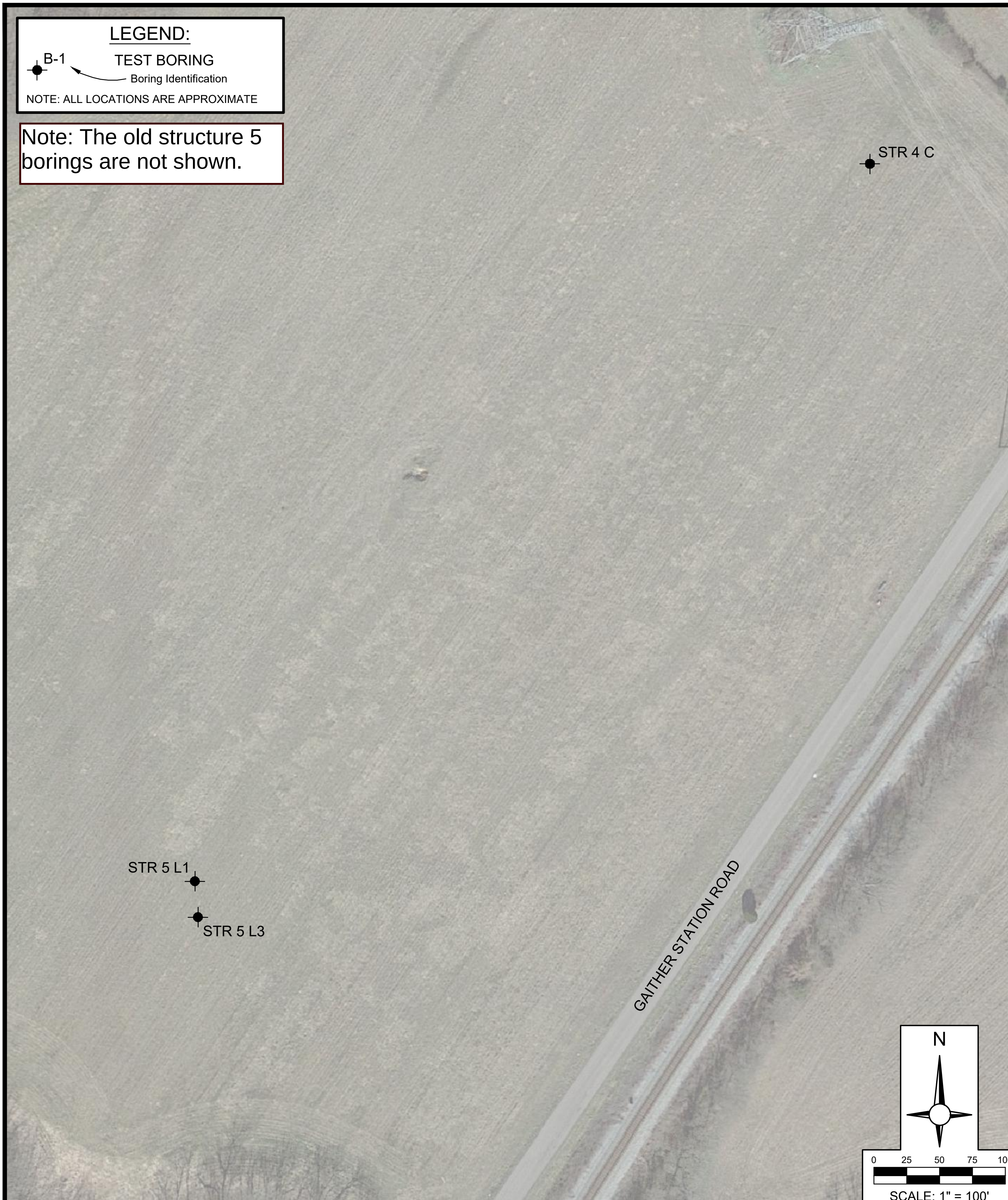
PROPORTION OF FINES
(By Dry Weight)

Trace	<5%
With	5 to 12%
Modifier	>12%

TERMS

Standard Penetration Test "N" Value (SPT "N" Value)	Number of blows required to drive a 1.4 inch (inside diameter) split spoon sampler 1 foot by a 140 pound hammer falling 30 inches
Recovery (REC)	Total length of rock recovered in the core barrel divided by the total length of the core run
Rock Quality Designation (RQD)	Total length of sound rock segments recovered longer or equal to 4 inches divided by the total length of core run

ATLAS



BORING PLAN

LG&E-KU FORD GLENDALE 345 kV TRANSMISSION
HODGENVILLE ROAD WEST
GLENDALE, KENTUCKY

Project Number: LOUGE22043		Drn. By: BH
Date: 04/20/2022	Scale: AS SHOWN	Ckd. By: RO
ATLAS		1

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BORING PLAN

LG&E-KU FORD GLENDALE 345 kV TRANSMISSION
HODGENVILLE ROAD WEST
GLENDALE, KENTUCKY

Project Number: LOUGE22043		Drn. By: BH
Date: 04/20/2022	Scale: AS SHOWN	Ckd. By: RO
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BORING PLAN

LG&E-KU FORD GLENDALE 345 kV TRANSMISSION
HODGENVILLE ROAD WEST
GLENDALE, KENTUCKY

Project Number: LOUGE22043		Drn. By: BH
Date: 04/20/2022	Scale: AS SHOWN	Ckd. By: RO
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BORING PLAN

LG&E-KU FORD GLENDALE 345 kV TRANSMISSION
HODGENVILLE ROAD WEST
GLENDALE, KENTUCKY

Project Number: LOUGE22043		Drn. By: BH
Date: 04/20/2022	Scale: AS SHOWN	Ckd. By: RO
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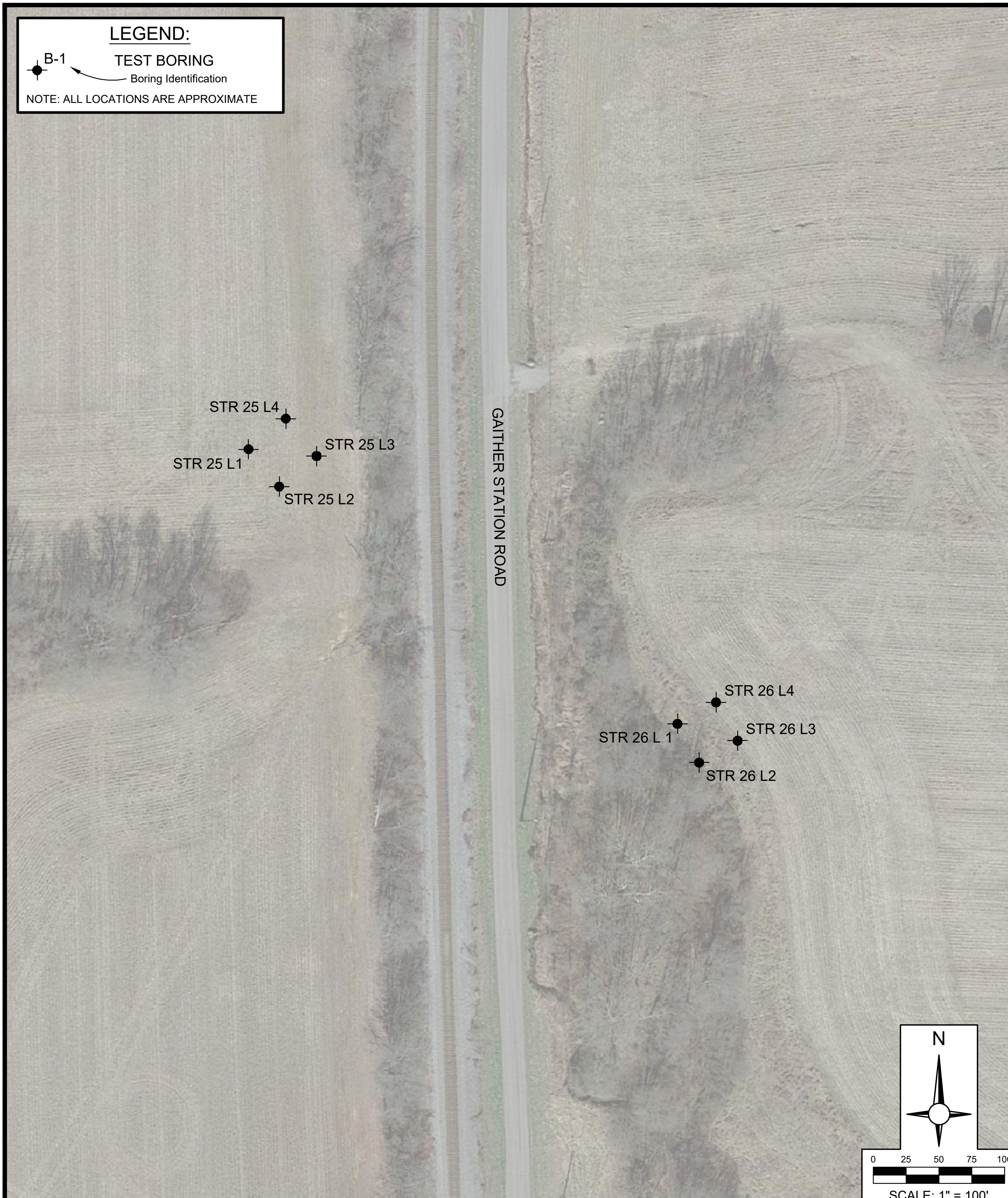
BORING PLAN

LG&E-KU FORD GLENDALE 345 kV TRANSMISSION
HODGENVILLE ROAD WEST
GLENDALE, KENTUCKY

Project Number: LOUGE22043
Drn. By: BH
Date: 04/20/2022
Scale: AS SHOWN
Ckd. By: RO

ATLAS

5



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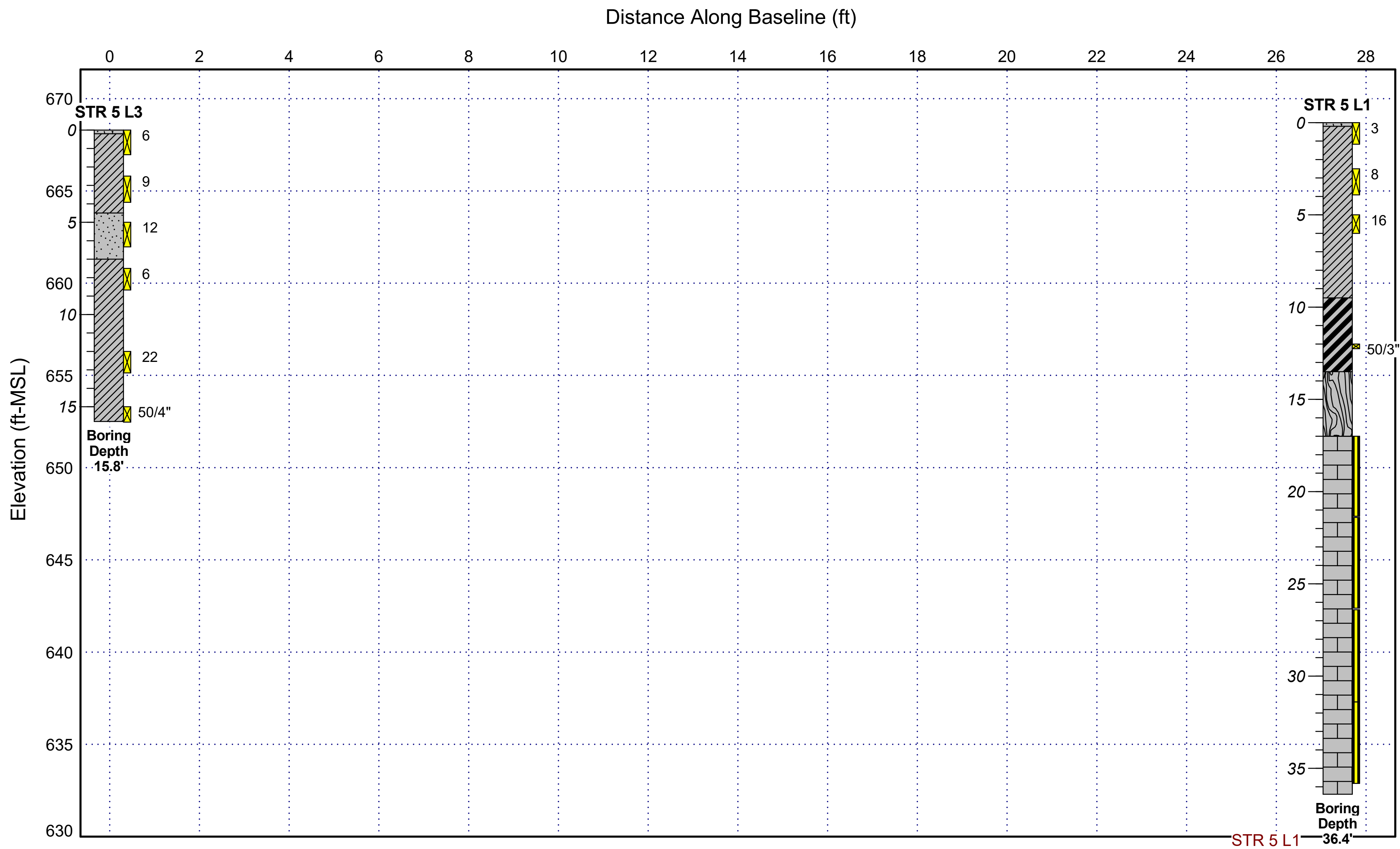
BORING PLAN

LG&E-KU FORD GLENDALE 345 kV TRANSMISSION
HODGENVILLE ROAD WEST
GLENDALE, KENTUCKY

Project Number: LOUGE22043		Drn. By: BH
Date: 04/20/2022	Scale: AS SHOWN	Ckd. By: RO
ATLAS		6



SAMPLER TYPES

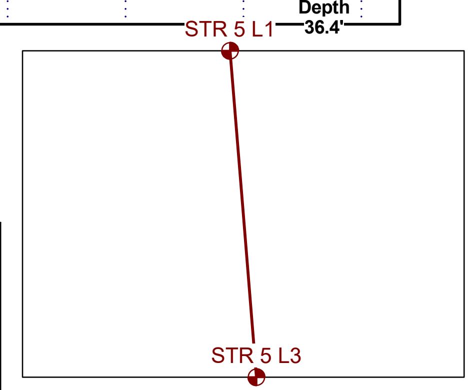
(Shown in Sampler Column)

- Shelby Tube
- Split Spoon
- Rock Core
- Grab Sample
- No Recovery

SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale



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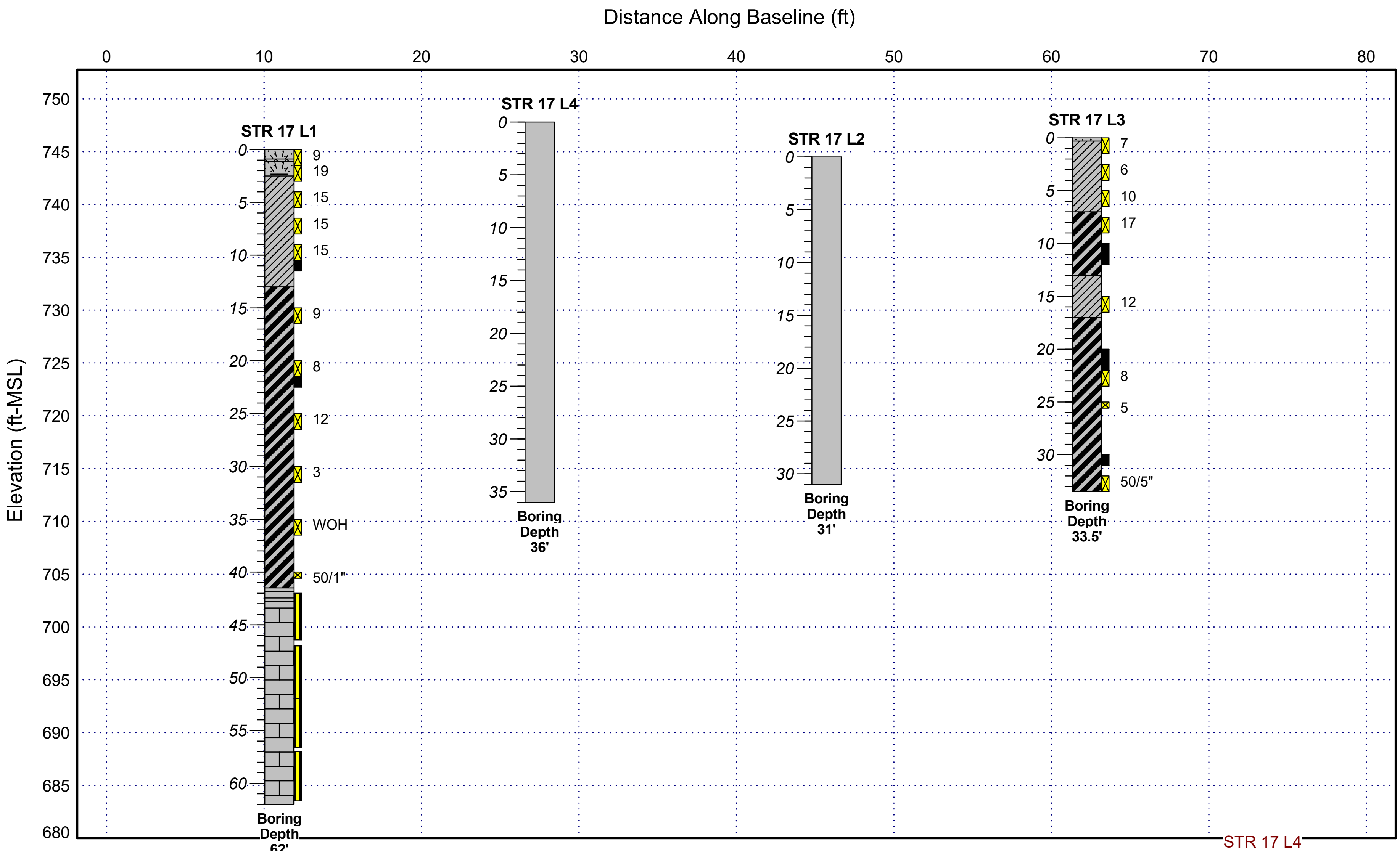
LG&E-KU Ford
Glendale 345 kV
Transmission
LOUGE22043

FENCE DIAGRAM

Fig. 7

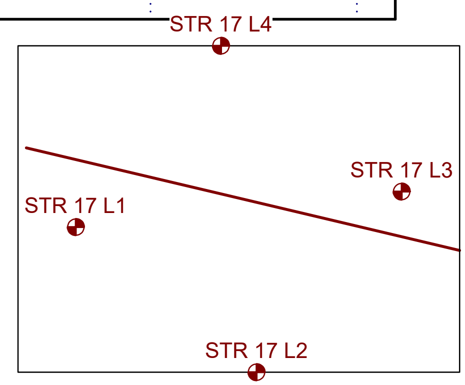


SAMPLER TYPES
(Shown in Sampler Column)

Shelby Tube
Split Spoon
Rock Core
Grab Sample
No Recovery

SOIL TYPES
(Shown in Graphic Log)

Fill
Asphalt
Topsoil
Gravel
Sand
Silt
Lean Clay
Fat Clay
Silty Sand
Clayey Sand
Sandy Silt
Clayey Silt
Sandy Clay
Silty Clay
Limestone
Sandstone
Siltstone
Shale



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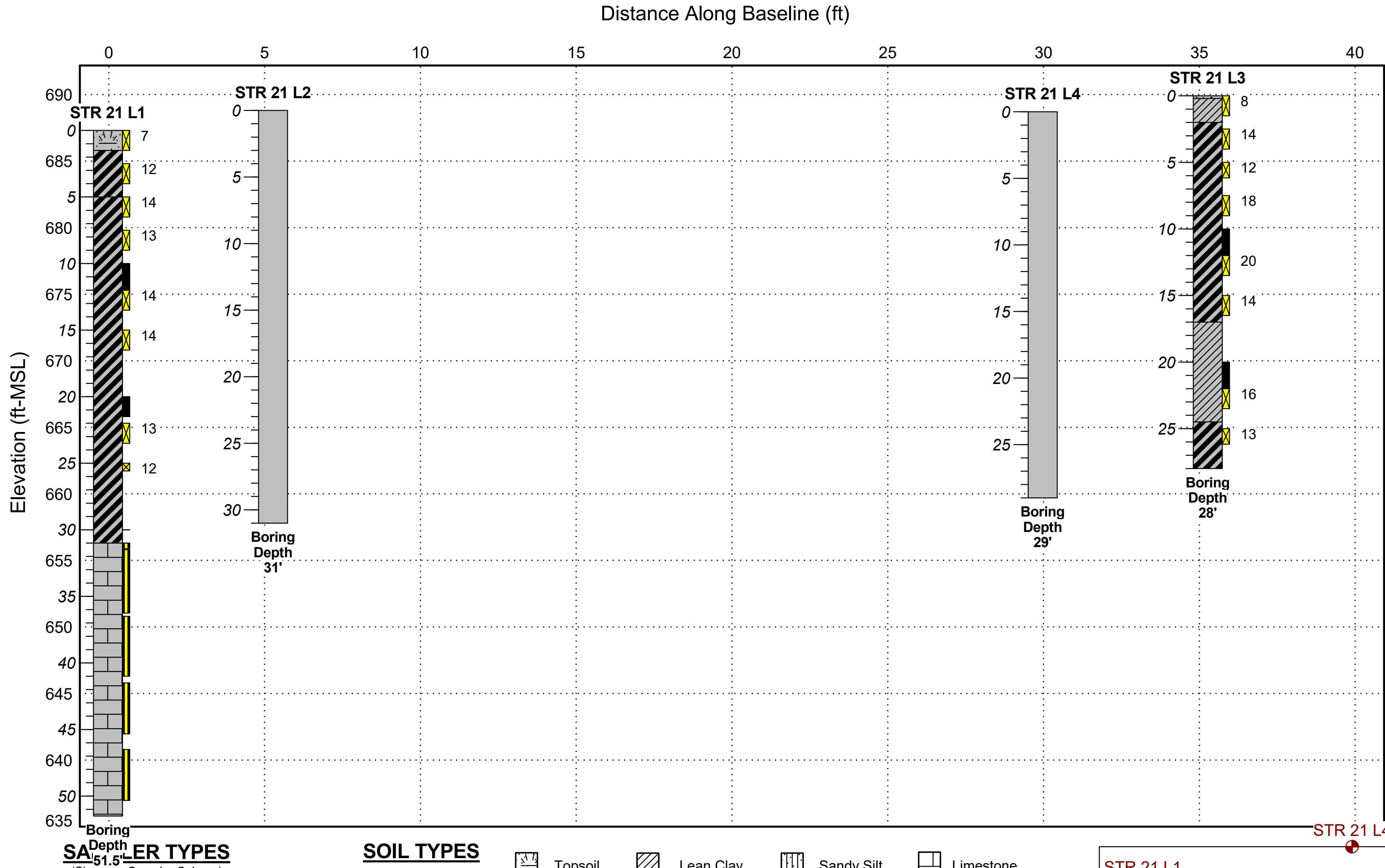
Glendale 345 kV
Transmission
LOUGE22043

FENCE DIAGRAM

Fig. 8



SAMPLER TYPES

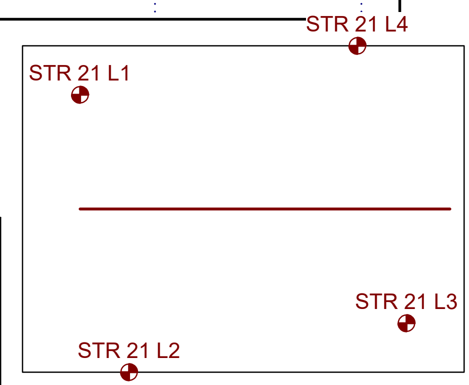
(Shown in Sampler Column)

- Shelby Tube
- Split Spoon
- Rock Core
- Grab Sample
- No Recovery

SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale



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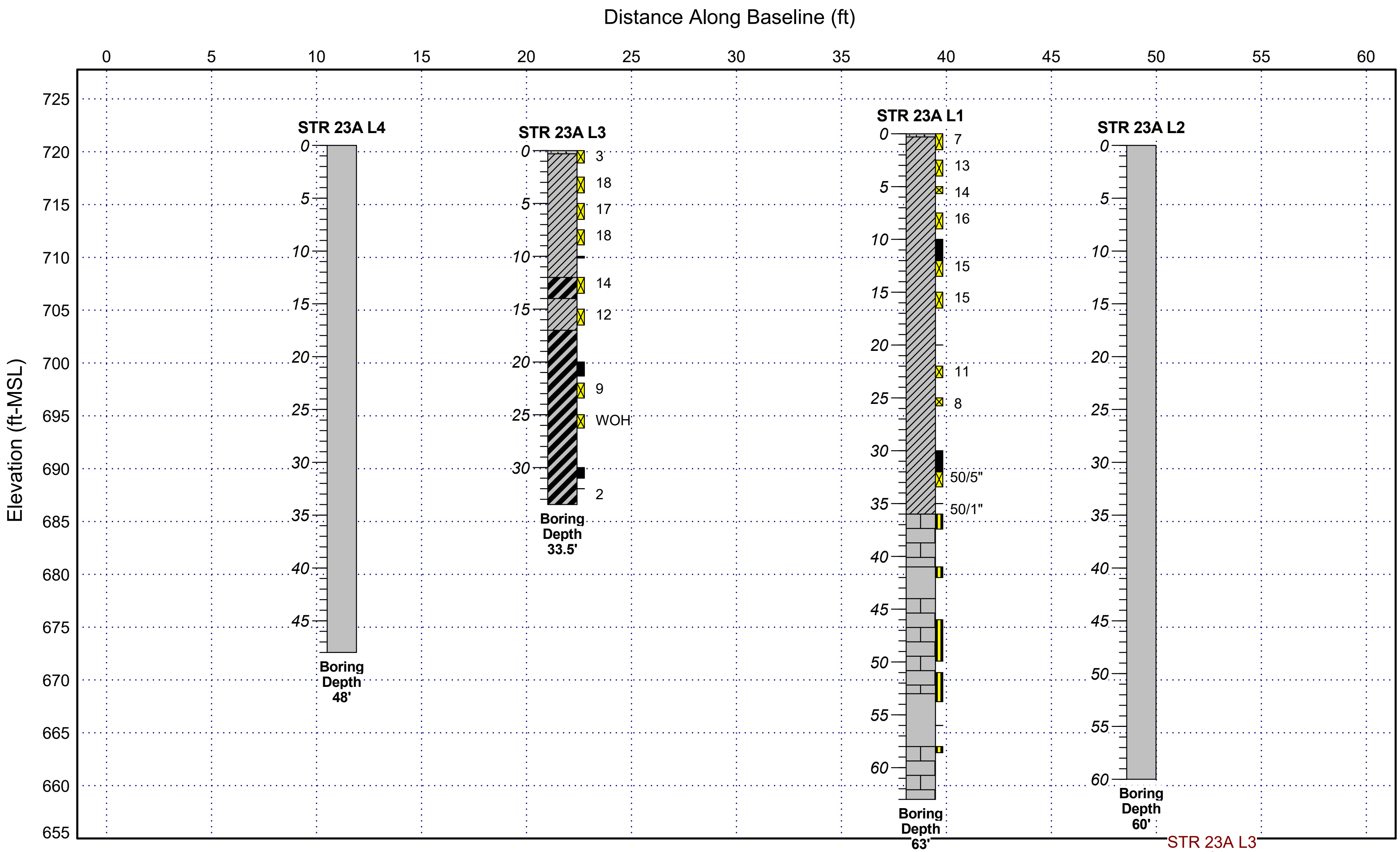
LOUGE22043

FENCE DIAGRAM

Fig. 9



SAMPLER TYPES

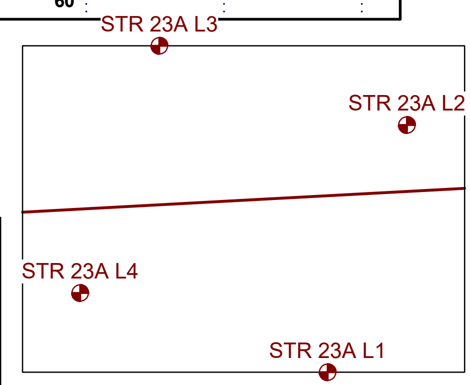
(Shown in Sampler Column)

- Shelby Tube
- Split Spoon
- Rock Core
- Grab Sample
- No Recovery

SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale



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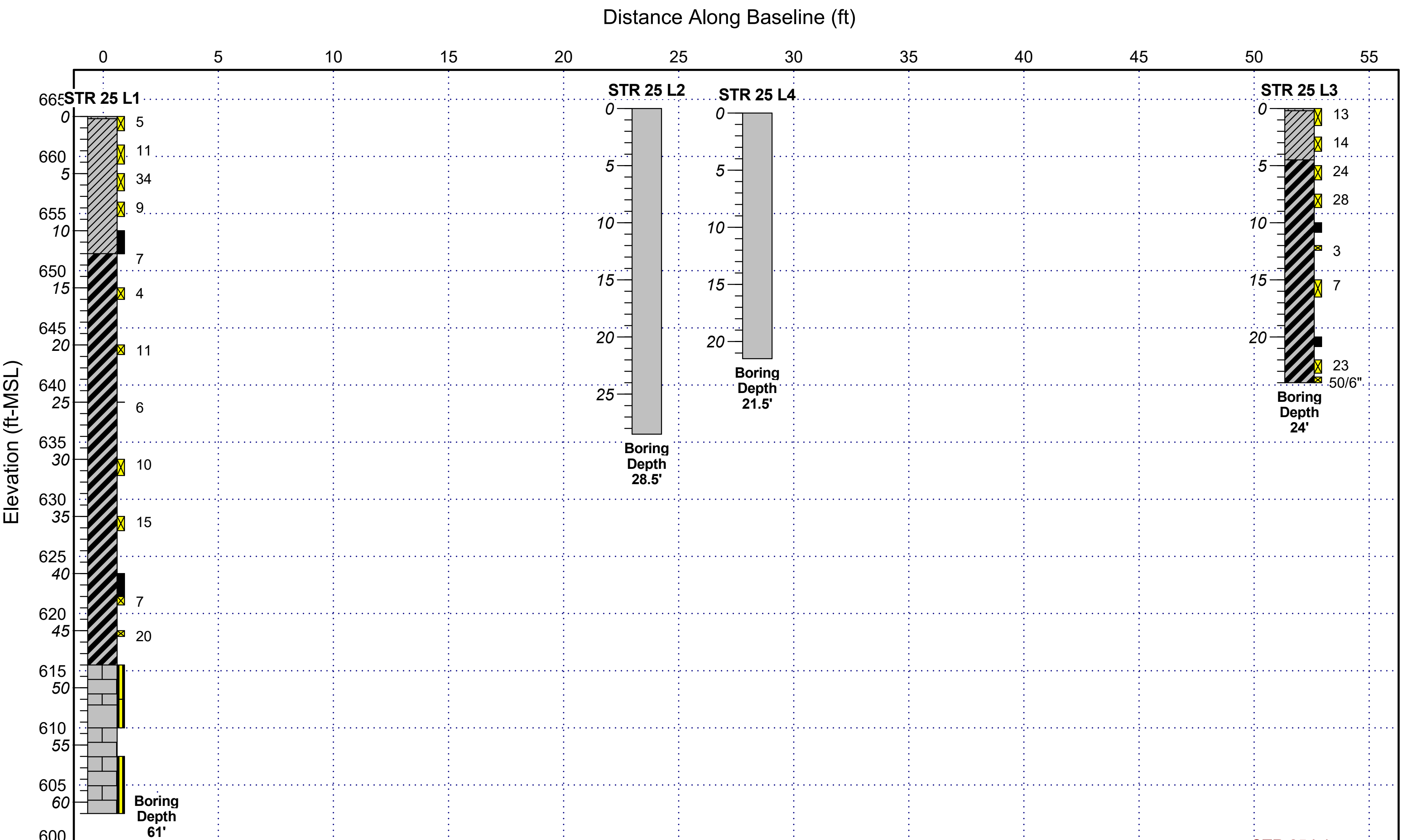
FENCE DIAGRAM

Fig. 10

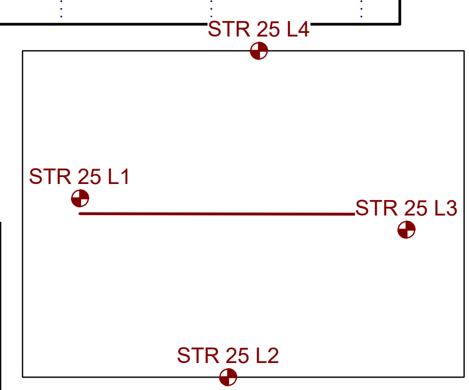


SAMPLER TYPES
(Shown in Sampler Column)

- Shelby Tube
- Split Spoon
- Rock Core
- Grab Sample
- No Recovery

SOIL TYPES
(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale



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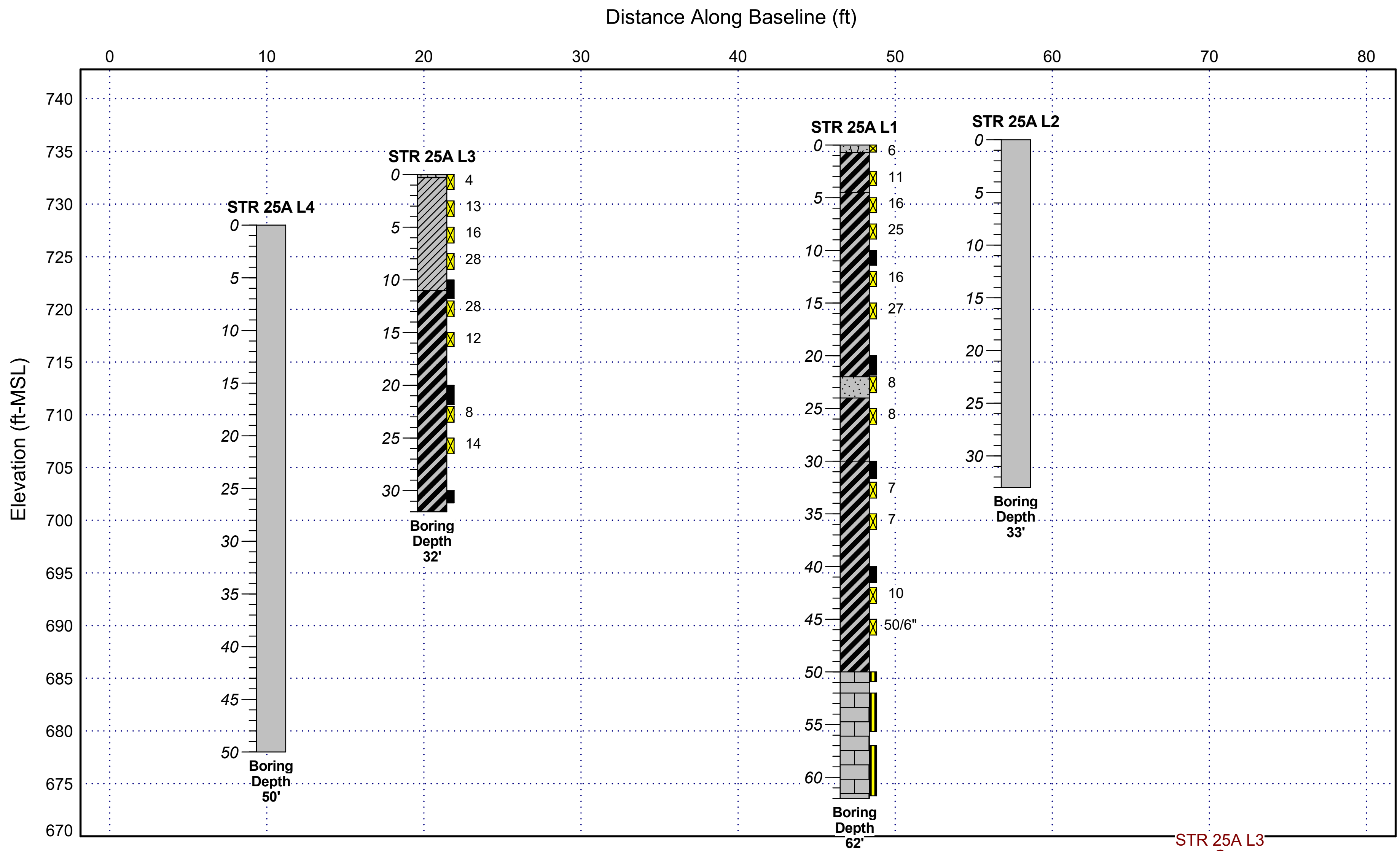
FENCE DIAGRAM

Fig. 11

ATC STRATIGRAPHY (GINT 7) GLENDALE TRANSMISSION LINE.GPJ ATC GINT7 OFFICIAL TEMPLATE.GDT 6/15/22



SAMPLER TYPES

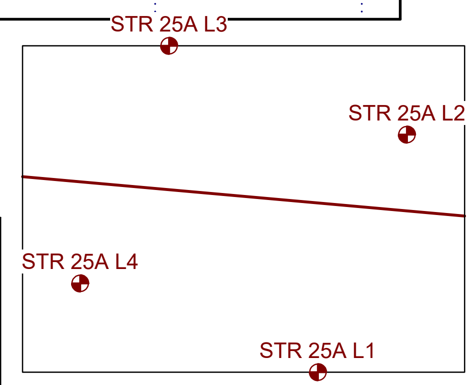
(Shown in Sampler Column)

- Shelby Tube
- Split Spoon
- Rock Core
- Grab Sample
- No Recovery

SOIL TYPES

(Shown in Graphic Log)

- Fill
- Asphalt
- Topsoil
- Gravel
- Sand
- Silt
- Lean Clay
- Fat Clay
- Silty Sand
- Clayey Sand
- Sandy Silt
- Clayey Silt
- Sandy Clay
- Silty Clay
- Limestone
- Sandstone
- Siltstone
- Shale



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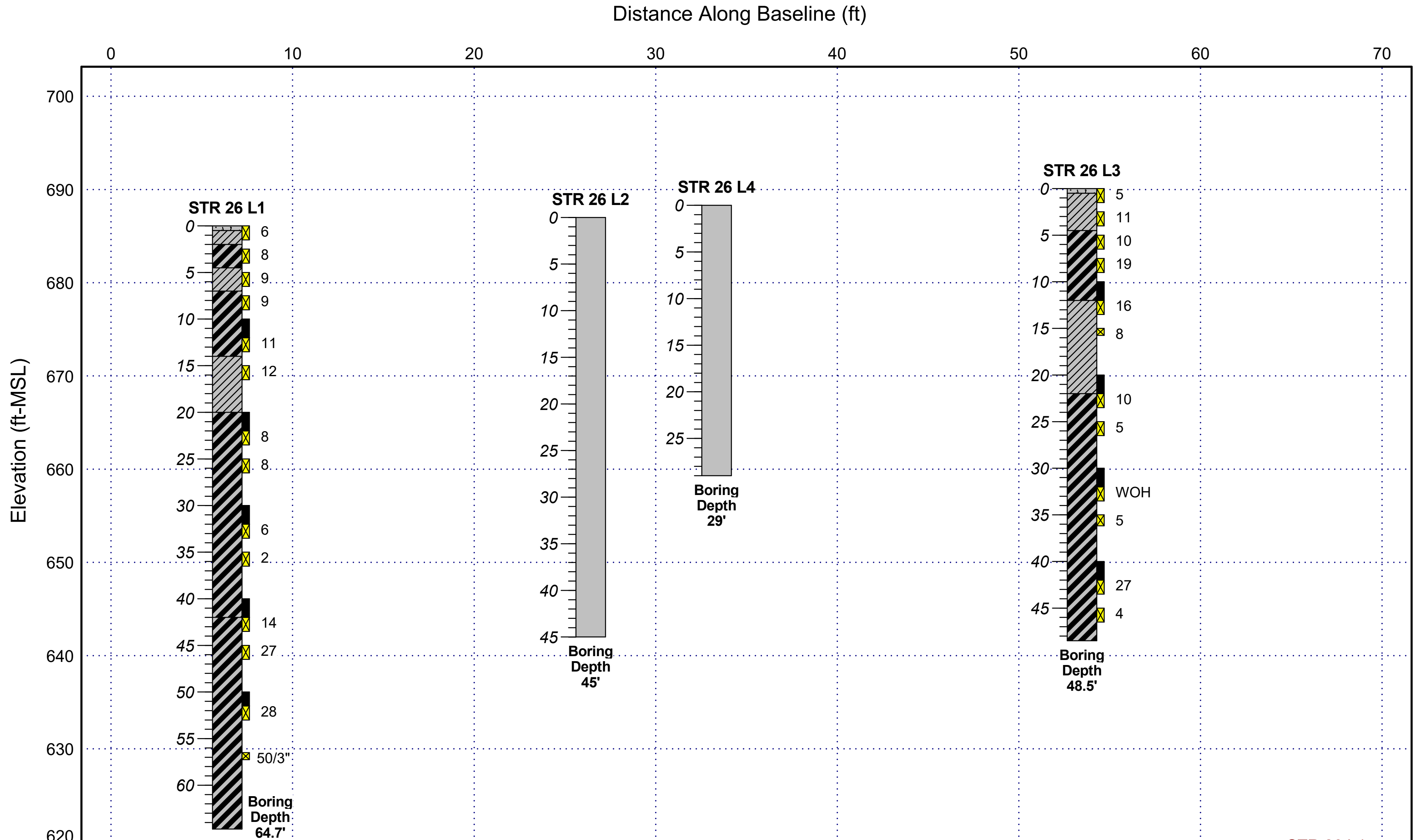
FENCE DIAGRAM

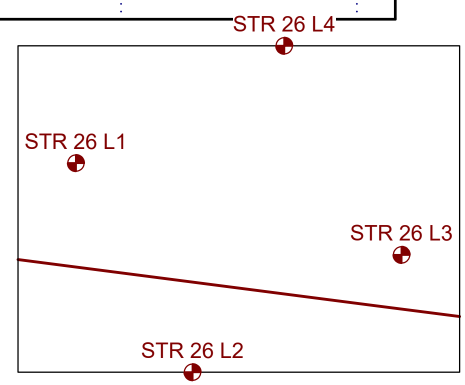
Fig. 12

ATC STRATIGRAPHY (GINT 7) GLENDALE TRANSMISSION LINE.GPJ ATC GINT7 OFFICIAL TEMPLATE.GDT 6/15/22



SAMPLER TYPES
(Shown in Sampler Column)
Shelby Tube
Split Spoon
Rock Core
Grab Sample
No Recovery

SOIL TYPES
(Shown in Graphic Log)
Fill
Asphalt
Topsoil
Gravel
Sand
Silt
Lean Clay
Fat Clay
Silty Sand
Clayey Sand
Sandy Silt
Clayey Silt
Sandy Clay
Silty Clay
Limestone
Sandstone
Siltstone
Shale



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LOUGE22043

FENCE DIAGRAM

Fig. 13

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TEST BORING LOG

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 4**
JOB # **LOUGE22043**
DRAWN BY **Z. Nichols**
APPROVED BY **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	3/29/22	Hammer Wt.	140 lbs.
Date Completed	3/29/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	P. Presnell	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 670.1
Latitude (deg): 37.659837, Longitude (deg): -85.900735

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	1.0		1	SS		4-4-3- [7]		21.1				
LEAN CLAY (CL), Yellowish brown and reddish brown, MEDIUM STIFF to STIFF, with limestone fragments - with sand			2	SS		4-4-4- [8]		19.5				
		5	3	SS		2-2-4- [6]		16.2				
			4	SS		3-50/0"-- [50/0"]		29.1				PP=1.5 tsf
		10	5	SS		WOH-WOH-WOH- [WOH]						PP=0 tsf
			6	SH			0.85	20.2	34	19		
FAT CLAY (CH), with sand, Reddish brown, VERY SOFT, with limestone fragments	13.0	15	7	SS		WOH-WOH-WOH- [WOH]		33.2				
- gray												Undisturbed sample attempt at about 20 ft, no recovery
		20	8	SS		WOH-WOH-WOH- [WOH]		36.9				
- with sand, groundwater at about 25 feet - with gray		25	9	SS	●	3-1-WOH- [1]		61.9				
												Undisturbed sample attempt at about 30 ft, push refusal on rock fragments
		30	10	SS		WOH-WOH-WOH- [WOH]		57.3				
	33.5		RC-1	RC								Auger refusal at 33.5 feet. Begin Coring. RQD=37%

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools 25.0 ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

(Continued)

CLIENT **Southeast Power Corporation**

PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**

PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 4**

JOB # **LOUGE22043**

DRAWN BY **Z. Nichols**

APPROVED BY **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	3/29/22	Hammer Wt.	140 lbs.
Date Completed	3/29/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	P. Presnell	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION (continued)
Latitude (deg): 37.659837, Longitude (deg): -85.900735

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
WEATHERED LIMESTONE, gray, fine-grained (possible boulder or weathered limestone layer)	36.0		RC-2	RC									
INTERPRETED SOIL LAYER		40											
INTERBEDDED LIMESTONE AND SOIL LAYERS, Gray	45.0	45	RC-3	RC									RQD=36%
		50											
LIMESTONE, Gray, with shale streamers	51.0		RC-4	RC									RQD=63%
Boring Terminated at 53.5 feet	53.5												Skewed boring and auger bit run off at 53.5 feet.

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools 25.0 ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**STR 4-A**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/29/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/29/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**P. Presnell**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 670.1 Latitude (deg): 37.661484, Longitude (deg): -85.898728	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5											Offset 5 feet north from Boring STR 4 Auger refusal at 10 feet. Unable to core due to skewed boring and auger bit run off at refusal.
Auger Refusal at 10 feet	10.0	10											

Sample Type

SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

Noted on Drilling Tools	-- ft.
At Completion (in augers)	-- ft.
At Completion (open hole)	-- ft.
After -- hours	-- ft.
After -- hours	-- ft.
Cave Depth	-- ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	STR 4-B
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	Z. Nichols
	Glendale, KY	APPROVED BY	R. Ortiz

DRILLING and SAMPLING INFORMATION

Date Started	3/29/22	Hammer Wt.	140 lbs.
Date Completed	3/29/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	P. Presnell	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 670.1

Latitude (deg): 37.661471, Longitude (deg): -85.898713

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED													Offset 5 feet east from Boring STR 4
		5											
	10.0	10											Auger refusal at 10 feet. Unable to core due to skewed boring and auger bit run off at refusal.
Auger Refusal at 10 feet													

Sample Type

SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 4-C**
JOB #: **LOUGE22043**
DRAWN BY: **Z. Nichols**
APPROVED BY: **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	3/29/22	Hammer Wt.	140 lbs.
Date Completed	3/29/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	P. Presnell	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 670.1
Latitude (deg): 37.66146, Longitude (deg): -85.89873

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED													Offset 5 feet south from Boring STR 4
		5											
	10.0	10											Auger refusal at 10 feet. Unable to core due to skewed boring and auger bit run off at refusal.
Auger Refusal at 10 feet													

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	STR 4-D
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	Z. Nichols
	Glendale, KY	APPROVED BY	R. Ortiz

DRILLING and SAMPLING INFORMATION

Date Started	3/29/22	Hammer Wt.	140 lbs.
Date Completed	3/29/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	P. Presnell	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 670.1

Latitude (deg): 37.661472, Longitude (deg): -85.898746

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED													Offset 5 feet west from Boring STR 4
		5											
	10.0	10											Auger refusal at 10 feet. Unable to core due to skewed boring and auger bit run off at refusal.
Auger Refusal at 10 feet													

Sample Type

SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**STR 4-E**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**R. Ortiz**
	Glendale, KY	APPROVED BY	**T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/11/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/11/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**C. Clouser**	Rock Core Dia.	**2** in.
Boring Method	**DC, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 670.1 Latitude (deg): 37.659837, Longitude (deg): -85.900735	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK CASING ADVANCEMENT - NO SAMPLES OBTAINED													Boring performed at staked tower center. Boring completed to desired depth.
- difficult drilling performance from 4 to 5 feet		5											
- difficult drilling performance from 7 to 10 feet		10											
		15											
- difficult drilling performance from 18 to 21 feet		20											
		25											
- difficult drilling performance from 28 to 30 feet		30											
- difficult drilling performance from 31.5 to 32.5 feet													

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG
(Continued)

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 4-E**
JOB # **LOUGE22043**
DRAWN BY **R. Ortiz**
APPROVED BY **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/11/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/11/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**C. Clouser**	Rock Core Dia.	**2** in.
Boring Method	**DC, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION (continued)
Latitude (deg): 37.659837, Longitude (deg): -85.900735

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK CASING ADVANCEMENT - NO SAMPLES OBTAINED													
INTERBEDDED LIMESTONE AND SOIL LAYERS, moderately weathered and fractured	37.0		1	RC									RQD=38%
		40	2	RC									RQD=22%
		45	3	RC									RQD=0%
		50	4	RC									RQD=8%
- slightly weathered, slightly to moderately fractured		55											
- highly fractured to about 59 feet			5	RC									RQD=35%
- light gray, chalky		60	6	RC									RQD=42%
Boring Terminated at 65 feet	65.0	65											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**OLD STR 5 L1**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/22/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/23/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 667.8

Latitude (deg): 37.659837, Longitude (deg): -85.900735

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.2												
LEAN CLAY (CL), Brown, STIFF to VERY STIFF - with limestone fragments			1	SS			3-3-8- [11]						PP=2.5 tsf
			2	SS			7-9-16- [25]						PP=4.5+ tsf
													Auger refusal at 5 feet.
WEATHERED LIMESTONE, gray, medium-grained (possible boulder or weathered limestone layer)	5.0	5	RC-1	RC									RQD=0%
			RC-2	RC									RQD=0%
NO RECOVERY - INTERPRETED SOIL AND LIMESTONE FRAGMENT LAYER	10.0	10	3	SS			4-3-3- [6]						Boring advanced using coring. Split spoon performed once refusal material penetrated. Core barrel advanced (by pushing) to 15 feet.
Auger Refusal at 15 feet	15.0	15											Refusal at 15 feet. Unable to core due to skewed boring and auger bit run off at refusal.

Sample Type
- SPT - Standard Penetration Test
- SS - Driven Split Spoon
- SH - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

Depth to Groundwater
- Noted on Drilling Tools -- ft.
- At Completion (in augers) -- ft.
- At Completion (open hole) -- ft.
- After -- hours -- ft.
- After -- hours -- ft.
- Cave Depth -- ft.

Boring Method
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- MH - Manual Hammer
- AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**OLD STR 5 L1-A**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/23/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/23/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 667.8 Latitude (deg): 37.659823, Longitude (deg): -85.900735	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED	2.5												Offset 5 feet south from Boring STR 5 L1
Auger Refusal at 2.5 feet													Auger refusal at 2.5 feet. Unable to core due to auger bit run off at refusal.

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**OLD STR 5 L1-B**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/23/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/23/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 667.8 Latitude (deg): 37.659807, Longitude (deg): -85.900734	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5											Offset 5 feet south from Boring STR 5 L1-A Auger refusal at 7.5 feet. Unable to core due to auger bit run off at refusal.
Auger Refusal at 7.5 feet	7.5												

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**OLD STR 5 L1-C**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/23/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/23/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 667.7

Latitude (deg): 37.659768, Longitude (deg): -85.900663

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5 10											Offset 5 feet west from Boring STR 5 L4
LIMESTONE, Gray, medium-grained	12.0		RC-1	RC									RQD=0%
		15	RC-2	RC									RQD=91%
Auger Refusal at 18 feet	18.0												Boring terminated at about 18 feet due to equipment failure during coring.

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	OLD STR 5 L1-D
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	Z. Nichols
	Glendale, KY	APPROVED BY	R. Ortiz

DRILLING and SAMPLING INFORMATION

Date Started	3/24/22	Hammer Wt.	140 lbs.
Date Completed	3/24/22	Hammer Drop	30 in.
Drill Foreman	M. Smith	Spoon Sampler OD	2 in.
Inspector	J. Semmer	Rock Core Dia.	2 in.
Boring Method	HSA	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 667.9

Latitude (deg): 37.659762, Longitude (deg): -85.900805

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED													Offset 5 feet east from STR 5 L2
		5											Auger refusal at 8 feet. Unable to core due to auger bit run off at refusal.
Auger Refusal at 8 feet	8.0												

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **OLD STR 5 L1-E**
JOB # **LOUGE22043**
DRAWN BY **Z. Nichols**
APPROVED BY **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/28/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/28/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**P. Presnell**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 667.8 Latitude (deg): 37.659837, Longitude (deg): -85.900735	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED	5.0	5											Boring performed at the staked tower leg 1 location
Boring Terminated at 5 feet													Boring terminated due to encountered sewer.

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **OLD STR 5 L2**
JOB # **LOUGE22043**
DRAWN BY **Z. Nichols**
APPROVED BY **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/22/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/22/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 667.9
Latitude (deg): 37.659763, Longitude (deg): -85.900822

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5				● (7.6)							
	10.0	10											
Auger Refusal at 10 feet													

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **7.6** ft.
At Completion (in augers) **--** ft.
At Completion (open hole) **--** ft.
After **--** hours **--** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **OLD STR 5 L3**
JOB #: **LOUGE22043**
DRAWN BY: **Z. Nichols**
APPROVED BY: **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/22/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/22/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 667.7
Latitude (deg): 37.659693, Longitude (deg): -85.900728

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
LEAN CLAY (CL), with silt			1	SS			2-4-6- [10]						PP=1.0 tsf
- with limestone fragments			2	SS			4-5-4- [9]						PP=1.5 tsf
Auger Refusal at 5.1 feet	5.1	5	3	SS			50/1"--- [50/1"]						PP=1.0 tsf

Sample Type		Depth to Groundwater		Boring Method	
SPT	Standard Penetration Test	Noted on Drilling Tools	-- ft.	HSA	Hollow Stem Augers
SS	Driven Split Spoon	At Completion (in augers)	-- ft.	CFA	Continuous Flight Augers
SH	Pressed Shelby Tube	At Completion (open hole)	-- ft.	DC	Driving Casing
CA	Continuous Flight Auger	After -- hours	-- ft.	MD	Mud Drilling
RC	Rock Core	After -- hours	-- ft.	MH	Manual Hammer
CU	Cuttings	Cave Depth	-- ft.	AH	Automatic Hammer
CT	Continuous Tube				

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	OLD STR 5 L4
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	Z. Nichols
	Glendale, KY	APPROVED BY	R. Ortiz

DRILLING and SAMPLING INFORMATION

Date Started	3/22/22	Hammer Wt.	140 lbs.
Date Completed	3/22/22	Hammer Drop	30 in.
Drill Foreman	M. Smith	Spoon Sampler OD	2 in.
Inspector	J. Semmer	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 667.7

Latitude (deg): 37.659768, Longitude (deg): -85.900641

TEST DATA

Soil Description	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
LEAN CLAY (CL), Brown, MEDIUM STIFF to STIFF, trace limestone fragments			1	SS			3-7-5- [12]						PP=2.5 tsf
- trace organics, with organic odor			2	SS			4-3-4- [7]						PP=1.0 tsf
		5	3	SS			2-2-3- [5]						PP=1.5 tsf
- with limestone fragments, wet			4	SS			4-4-4- [8]						PP=1.0 tsf
		10											
Auger Refusal at 12.5 feet	12.5												

Sample Type
- SPT - Standard Penetration Test
- SS - Driven Split Spoon
- SH - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

Depth to Groundwater
- Noted on Drilling Tools -- ft.
- At Completion (in augers) -- ft.
- At Completion (open hole) -- ft.
- After -- hours -- ft.
- After -- hours -- ft.
- Cave Depth -- ft.

Boring Method
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling
- MH - Manual Hammer
- AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**STR 5 L1**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**R. Ortiz**
	Glendale, KY	APPROVED BY	**T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/12/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/13/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**Clouser/Nichols**	Rock Core Dia.	**2** in.
Boring Method	**DC, AH**	Shelby Tube OD	**3** in.

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 668.7

Latitude (deg): 37.659969, Longitude (deg): -85.9005

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.2										
LEAN CLAY (CL), with silt, Brown, SOFT to STIFF			1	SS	1-1-2- [3]		22.6				PP=0.3 tsf
- trace sand			2	SS	4-4-4- [8]		21.9				PP=1.5 tsf
- trace limestone fragments		5	3	SS	4-6-10- [16]		21.8	28	16		PP=1.5 tsf
- with limestone fragments											Difficult augering through limestone fragments, split spoon not attempted
FAT CLAY (CH), with silt and sand, Brown, MEDIUM STIFF	10.0	10	4	SH		0.98	35.2	66	17		
			5	SS	50/3"--- [50/3"]		44.1				PP=0.5 tsf
WEATHERED LIMESTONE	13.5	15									
LIMESTONE, Light gray, fine to medium grained, unweathered to slightly weathered, - high angle fractures or bedding at about 17.7 and 18.2 ft	17.0			RC							Auger Refusal at about 17 ft
- with shale streamers		20	RC 1								RQD=100%
		25	RC 2	RC							RQD=93%
- with a 2-inch highly fractured layer		30	RC 3	RC							RQD=98%
			RC 4	RC							RQD=55%

Sample Type	Depth to Groundwater	Boring Method
SPT - Standard Penetration Test	Noted on Drilling Tools -- ft.	HSA - Hollow Stem Augers
SS - Driven Split Spoon	At Completion (in augers) -- ft.	CFA - Continuous Flight Augers
SH - Pressed Shelby Tube	At Completion (open hole) -- ft.	DC - Driving Casing
CA - Continuous Flight Auger	After -- hours -- ft.	MD - Mud Drilling
RC - Rock Core	After -- hours -- ft.	MH - Manual Hammer
CU - Cuttings	Cave Depth -- ft.	AH - Automatic Hammer
CT - Continuous Tube		

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TEST BORING LOG

(Continued)

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 5 L1**
JOB # **LOUGE22043**
DRAWN BY **R. Ortiz**
APPROVED BY **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/12/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/13/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**Clouser/Nichols**	Rock Core Dia.	**2** in.
Boring Method	**DC, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION (continued) Latitude (deg): 37.659969, Longitude (deg): -85.9005	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test Blows per 6" *[N-Value] blows/foot*	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
Boring Terminated at 36.4 feet	36.4												

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **--** ft.
At Completion (in augers) **--** ft.
At Completion (open hole) **--** ft.
After **--** hours **--** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 5 L3**
JOB # **LOUGE22043**
DRAWN BY **R. Ortiz**
APPROVED BY **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/13/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/13/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**Z. Nichols**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 668.3
Latitude (deg): 37.659894, Longitude (deg): -85.900492

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.2											
LEAN CLAY (CL), Dark brown, MEDIUM STIFF to STIFF			1	SS		2-3-3- [6]		19.8				PP=0.5 tsf
			2	SS		3-4-5- [9]		16.3				PP=1.5 tsf
POORLY GRADED SAND (SP), with gravel, Brown, MEDIUM DENSE	4.5	5	3	SS		4-4-8- [12]		10.5				PP=2.0 tsf
LEAN CLAY (CL), with silt and sand, Light brown, with limestone fragments	7.0		4	SS	● (9.0)	2-3-3- [6]		16.3				
		10	5	SH			0.39	34.9				
			6	SS		32-15-8- [22]		54.1				
		15	7	SS		15-50/4"-- [50/4"]		72.1				
Auger Refusal at 15.8 feet	15.8											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **9.0** ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	STR 16
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	R. Ortiz
	Glendale, KY	APPROVED BY	T. Andres

DRILLING and SAMPLING INFORMATION

Date Started	4/1/22	Hammer Wt.	140 lbs.
Date Completed	4/1/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	P. Presnell	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 748.0

Latitude (deg): 37.63039, Longitude (deg): -85.862444

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.3											
FILL - FAT CLAY, Brown with black oxidation nodules			1	SS		4-4-6- [10]		15.4				PP=4.0+ tsf
FILL - LEAN TO FAT CLAY, Dark brown, with cinders	3.0		2	SS		6-7-6- [13]		18.5				PP=4.0+ tsf
- with organic soil, with an organic odor, and wood fragments		5	3	SS		3-4-5- [9]		18.4				
			4	SS		4-5-50/5"- [50/5"]		19.6				
- with wood fragments, trace veiny roots, light reddish brown		10	5	SH								
			6	SS		7-7-9- [16]		17.6				PP=4.0+ tsf
FILL - LEAN CLAY, Brown, with wood fragments	15.0	15	7	SS		5-6-8- [14]		20.6				
FAT CLAY (CH), Reddish brown, STIFF to VERY STIFF	17.0											
		20	8	SH			3.33	31.7	68	22		
			9	SS		6-6-7- [13]		42.0				PP=4.0 tsf
- trace sand		25	10	SS		5-6-6- [12]		31.4				PP=3.0 tsf
		30	11	SH			0.31	35.9				
- yellowish brown, with sand			12	SS	●	5-7-7- [14]		29.9				PP=1.0 tsf

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools 32.7 ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

(Continued)

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West, Glendale, KY**

BORING #: **STR 16**
JOB #: **LOUGE22043**
DRAWN BY: **R. Ortiz**
APPROVED BY: **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	4/1/22	Hammer Wt.	140 lbs.
Date Completed	4/1/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	P. Presnell	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

SOIL CLASSIFICATION (continued)
Latitude (deg): 37.63039, Longitude (deg): -85.862444

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
FAT CLAY (CH), Reddish brown, STIFF to VERY STIFF - dark brown to reddish brown			13	SS	6-9-10- [19]		33.9				
		40	14	SS	2-3-WOH- [3]	0.31	22.3				
			15	SH							
- with limestone fragments		45	16	SS	WOH-18-6- [24]		41.0				
WEATHERED LIMESTONE	50.0	50	18	SH							
LIMESTONE, Light gray, fine grained, slightly weathered - with a 4-inch highly fractured layer	51.0		17	SS	50/0"--- [50/0"]						
			RC1	RC							RQD=68%
- with a 4-inch moderately fractured layer - with a 2-foot moderately fractured layer		55									
			RC2	RC							RQD=43%
		60									
Boring Terminated at 61 feet	61.0										

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools 32.7 ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**STR 17 L1**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/24/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/24/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**P. Presnell**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 745.2
Latitude (deg): 37.629323, Longitude (deg): -85.860813

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.9		1	SS		3-4-5- [9]		21.1				PP=4.5+ tsf
FILL- LEAN CLAY, Brown and Reddish brown, with limestone fragments	1.1		2	SS		7-8-11- [19]		24.7				PP=3.0 tsf
TOPSOIL, with roots	2.5											
LEAN CLAY (CL), Reddish brown, VERY STIFF		5	3	SS		7-7-8- [15]		21.2				PP=4.5+ tsf
- transition to red, with limestone fragments to 9 feet			4	SS		5-7-8- [15]		23.0				PP=4.5 tsf
- with black oxidation nodules		10	5	SS		4-5-10- [15]		26.0				PP=4.5 tsf
			6	SH			0.80	21.6	32	18		
FAT CLAY (CH), with sand, Reddish brown, SOFT to STIFF	13.0	15	7	SS		5-4-5- [9]						PP=3.0 tsf
		20	8	SS		4-4-4- [8]		31.8				PP=2.5 tsf
			9	SH			1.44	31.9				
- with limestone fragments		25	10	SS		5-5-7- [12]		34.3				PP=1.5 tsf
- groundwater on spoon at about 31 feet		30	11	SS	●	3-1-2- [3]		57.1				PP=0.5 tsf

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **31.0** ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG
(Continued)

CLIENT	**Southeast Power Corporation**	BORING #	**STR 17 L1**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/24/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/24/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**P. Presnell**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION (continued)
Latitude (deg): 37.629323, Longitude (deg): -85.860813

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
FAT CLAY (CH), with sand, Reddish brown, SOFT to STIFF - transition to yellowish brown and reddish brown			12	SS		WOH- WOH- WOH- [*WOH*]		86.7				PP=0 tsf
		40	13	SS		1-50/1"-- [*50/1"*]		81.1				PP=0 tsf
SHALE, Dark gray, clay stained	41.5											
LIMESTONE, Light gray, clay stained to 47 feet	43.4	45	RC-1	RC								RQD=72%
- no water return at 48 feet, moderately fractured from about 48 to 49 feet		50	RC-2	RC								RQD=73%
		55	RC-3	RC								RQD=92%
- with a 6-inch moderately fractured layer		60	RC-4	RC								RQD=85%
Boring Terminated at 62 feet	62.0											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **31.0** ft.
At Completion (in augers) **--** ft.
At Completion (open hole) **--** ft.
After **--** hours **--** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**STR 17 L2**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/28/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/28/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 744.5 Latitude (deg): 37.629256, Longitude (deg): -85.860709	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5 10 15 20 25 30											
Auger Refusal at 31 feet	31.0												

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 17 L3**
JOB #: **LOUGE22043**
DRAWN BY: **Z. Nichols**
APPROVED BY: **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/24/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/25/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**P. Presnell**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 746.3
Latitude (deg): 37.629339, Longitude (deg): -85.860626

TEST DATA

Soil Classification	Stratum Depth	Sample No.	Sample Type	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.3										
LEAN CLAY (CL), Brown, MEDIUM STIFF to STIFF		1	SS		2-3-4- [7]		25.2				PP=1.5 tsf
		2	SS		2-3-3- [6]		19.4	36	18		PP=1.5 tsf
- with reddish brown and gray		3	SS		3-3-7- [10]		18.7				PP=2.0 tsf
FAT CLAY (CH), Reddish brown, VERY STIFF	7.0	4	SS		4-7-10- [17]		22.5				PP=2.5 tsf
		5	SH			1.12	20.2				
LEAN CLAY (CL), Reddish brown, STIFF	13.0	6	SS		4-4-8- [12]		30.6				PP=3.0 tsf
- transition to light brown with shale fragments											
FAT CLAY (CH), Reddish brown and Gray, MEDIUM STIFF to STIFF	17.0	7	SH			1.59	22.9				
		8	SS		3-3-5- [8]		31.7				PP=2.0 tsf
		9	SS		2-2-3- [5]		27.8				PP=1.5 tsf
		10	SH			0.43	33.9				
- transition to brown with limestone fragments, groundwater at about 32 feet		11	SS	●	2-12-50/5"- [50/5"]		58.8				PP=1.0 tsf
Auger Refusal at 33.5 feet	33.5										

Depth Scale: 5, 10, 15, 20, 25, 30

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
- Noted on Drilling Tools **32.0** ft.
- At Completion (in augers) **--** ft.
- At Completion (open hole) **--** ft.
- After **--** hours **--** ft.
- After **--** hours **--** ft.
- Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 17 L4**
JOB #: **LOUGE22043**
DRAWN BY: **Z. Nichols**
APPROVED BY: **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/25/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/25/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**P. Presnell**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 747.8 Latitude (deg): 37.629405, Longitude (deg): -85.86073	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED													
		5											
		10											
		15											
		20											
		25											
		30											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG
(Continued)

CLIENT	**Southeast Power Corporation**	BORING #	**STR 17 L4**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/25/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/25/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**P. Presnell**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION (continued) Latitude (deg): 37.629405, Longitude (deg): -85.86073	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
Auger Refusal at 36 feet	36.0												

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**STR 21 L1**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**R. Ortiz**
	Glendale, KY	APPROVED BY	**T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/19/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/20/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**N/A**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 687.3
Latitude (deg): 37.631827, Longitude (deg): -85.910614

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL OR ORGANIC SOIL			1	SS		3-3-4- [7]		17.7				
FAT CLAY (CH), with sand, Dark brown with black oxidation nodules, STIFF	1.5		2	SS		4-5-7- [12]		18.1				PP=4.0+ tsf
FAT CLAY (CH), Reddish brown, STIFF to VERY STIFF, with limestone fragments, trace chert fragments	5.0	5	3	SS		7-6-8- [14]		23.4				PP=3.5 tsf
			4	SS		4-6-7- [13]		24.9				PP=3.0 tsf
		10	5	SH			2.62	22.4	57	19		
- light reddish brown			6	SS		7-7-7- [14]		25.6				PP=4+ tsf
- with black oxidation nodules		15	7	SS		6-7-7- [14]		29.3				PP=3.5 tsf
		20	8	SH			0.77	39.2				
- with limestone fragments, trace chert			9	SS		7-7-6- [13]		23.5				PP=3.5 tsf
		25	10	SS		9-6-6- [12]		33.3				
		30	11	SH								
LIMESTONE, Light gray, slightly weathered, fine grained, with fossils - with a 6-inch thick clay seam	31.0		RC1	RC								
			RC2	RC								RQD=55 %

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG
(Continued)

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 21 L1**
JOB #: **LOUGE22043**
DRAWN BY: **R. Ortiz**
APPROVED BY: **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started: **4/19/22**
Date Completed: **4/20/22**
Drill Foreman: **J. Burdette**
Inspector: **N/A**
Boring Method: **HSA, AH**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler OD: **2** in.
Rock Core Dia.: **2** in.
Shelby Tube OD: **3** in.

TEST DATA

SOIL CLASSIFICATION (continued)
Latitude (deg): 37.631827, Longitude (deg): -85.910614

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test Blows per 6" [*N-Value*] *blows/foot*	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
LIMESTONE, Light gray, slightly weathered, fine grained, with fossils - moderately to slightly weathered, with ooid crystials to 38.5 ft (difficult coring)		40	RC3	RC									RQD=33 %
- with calcite and fossils to about 46.5 ft, with a 1-inch clay layer		45	RC4	RC									RQD=24%
	51.5	50	RC5	RC									RQD=35 %
Boring Terminated at 51.5 feet													

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	STR 21 L2
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	Z. Nichols
	Glendale, KY	APPROVED BY	R. Ortiz

DRILLING and SAMPLING INFORMATION

Date Started	4/4/22	Hammer Wt.	140 lbs.
Date Completed	4/4/22	Hammer Drop	30 in.
Drill Foreman	M. Smith	Spoon Sampler OD	2 in.
Inspector	J. Phillips	Rock Core Dia.	2 in.
Boring Method	HSA	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 688.8

Latitude (deg): 37.631744, Longitude (deg): -85.910596

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5 10 15 20 25 30											
Auger Refusal at 31 feet	31.0												

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

Noted on Drilling Tools	--	ft.
At Completion (in augers)	--	ft.
At Completion (open hole)	--	ft.
After -- hours	--	ft.
After -- hours	--	ft.
Cave Depth	--	ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	STR 21 L3
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	R. Ortiz
	Glendale, KY	APPROVED BY	T. Andres

DRILLING and SAMPLING INFORMATION

Date Started	4/5/21	Hammer Wt.	140 lbs.
Date Completed	4/5/21	Hammer Drop	30 in.
Drill Foreman	M. Smith	Spoon Sampler OD	2 in.
Inspector	J. Phillips	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 689.9

Latitude (deg): 37.631759, Longitude (deg): -85.910492

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.2		1	SS		2-3-5- [8]		16.8	31	15		PP=1.5 tsf
LEAN CLAY (CL), trace sand, Brown to light reddish brown, STIFF	2.0											
FAT CLAY (CH), Reddish brown to light reddish brown, STIFF to VERY STIFF			2	SS		5-6-8- [14]		19.4	50	16		PP=3.0 tsf
		5	3	SS		4-5-7- [12]		19.6				PP=2.5 tsf
- trace sand			4	SS		6-7-11- [18]		23.2				PP=3.0 tsf
		10	5	SH			0.62	19.3				
- trace limestone fragments			6	SS		6-8-12- [20]		28.9				PP=2.5 tsf
- dark brown		15	7	SS		3-5-9- [14]		29.3	66	27		
LEAN CLAY (CL), trace sand, Dark brown to light reddish brown, VERY STIFF	17.0											
		20	8	SH			1.23	29.5				
			9	SS		6-7-9- [16]		25.8				
FAT CLAY (CH), trace sand, Dark brown, VERY STIFF, - trace limestone fragments	24.5	25	10	SS		3-4-9- [13]						
Auger Refusal at 28 feet	28.0											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**STR 21 L4**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**R. Ortiz**
	Glendale, KY	APPROVED BY	**T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/7/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/7/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**N/A**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 688.7 Latitude (deg): 37.631841, Longitude (deg): -85.910511	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5, 10, 15, 20, 25											
Auger Refusal at 29 feet	29.0												

Sample Type	Depth to Groundwater	Boring Method
SPT - Standard Penetration Test	Noted on Drilling Tools -- ft.	HSA - Hollow Stem Augers
SS - Driven Split Spoon	At Completion (in augers) -- ft.	CFA - Continuous Flight Augers
SH - Pressed Shelby Tube	At Completion (open hole) -- ft.	DC - Driving Casing
CA - Continuous Flight Auger	After -- hours -- ft.	MD - Mud Drilling
RC - Rock Core	After -- hours -- ft.	MH - Manual Hammer
CU - Cuttings	Cave Depth -- ft.	AH - Automatic Hammer
CT - Continuous Tube		

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TEST BORING LOG

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 23A L1**
JOB # **LOUGE22043**
DRAWN BY **R. Ortiz**
APPROVED BY **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started **3/30/22**
Date Completed **3/31/22**
Drill Foreman **J. Burdette**
Inspector **P. Presnell**
Boring Method **HSA, AH**

Hammer Wt. **140** lbs.
Hammer Drop **30** in.
Spoon Sampler OD **2** in.
Rock Core Dia. **2** in.
Shelby Tube OD **3** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 721.7
Latitude (deg): 37.626093, Longitude (deg): -85.863678

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.3											
LEAN CLAY (CL), with silt, Brown, STIFF to VERY STIFF			1	SS		2-3-4- [7]		22.6				PP=3.0 tsf
			2	SS		5-6-7- [13]		13.8				PP=3.0 tsf
		5	3	SS		6-7-7- [14]		19.5				PP=3.0 tsf
			4	SS		6-7-9- [16]		23.2				PP=3.0 tsf
- reddish brown		10	5	SH			1.63	22.6	45	20		
			6	SS		6-6-9- [15]		24.0				PP=3.0 tsf
- with sand		15	7	SS		6-7-8- [15]		18.0				
												PP=1.5 tsf
		20	8	SH								
					● (22.0)							
			9	SS		5-5-6- [11]		20.9				PP=1.0 tsf
		25	10	SS		7-5-3- [8]		28.6				PP=1.0 tsf
		30	11	SH			0.68	31.4				
- with chert fragments			12	SS		7-7-50/5"- [50/5"]		29.4				

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **22.0** ft.
At Completion (in augers) **--** ft.
At Completion (open hole) **--** ft.
After **--** hours **--** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

(Continued)

CLIENT	**Southeast Power Corporation**	BORING #	**STR 23A L1**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**R. Ortiz**
	Glendale, KY	APPROVED BY	**T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**3/30/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/31/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**P. Presnell**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION (continued)
Latitude (deg): 37.626093, Longitude (deg): -85.863678

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
			13	SS	50/1"--- [*50/1"*]						
LIMESTONE, fine grained, light gray, highly weathered and fractured	36.0			RC							RQD=13%
KARST FEATURE - INTERPRETED VOID, SOIL/WATER INFILLED VOID, OR CLAY LAYER	41.0	40		RC							RQD=11%
LIMESTONE, slightly weathered, fine grained, light gray	44.0	45		RC							RQD=52%
- highly weathered and fractured		50		RC							RQD=22%
KARST FEATURE - INTERPRETED VOID, SOIL/WATER INFILLED VOID, OR CLAY LAYER	53.0	55		RC							RQD=0%
LIMESTONE, highly weathered and fractured	58.0	60		RC							RQD=10%
Boring Terminated at 63 feet	63.0										

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **22.0** ft.
At Completion (in augers) **--** ft.
At Completion (open hole) **--** ft.
After **--** hours **--** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 23A L2**
JOB #: **LOUGE22043**
DRAWN BY: **Z. Nichols**
APPROVED BY: **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started: **3/30/22**
Date Completed: **3/30/22**
Drill Foreman: **M. Smith**
Inspector: **J. Semmer**
Boring Method: **HSA**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler OD: **2** in.
Rock Core Dia.: **2** in.
Shelby Tube OD: **3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 720.6 Latitude (deg): 37.62617, Longitude (deg): -85.863647	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5, 10, 15, 20, 25, 30											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG
(Continued)

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 23A L2**
JOB # **LOUGE22043**
DRAWN BY **Z. Nichols**
APPROVED BY **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started **3/30/22**
Date Completed **3/30/22**
Drill Foreman **M. Smith**
Inspector **J. Semmer**
Boring Method **HSA**

Hammer Wt. **140** lbs.
Hammer Drop **30** in.
Spoon Sampler OD **2** in.
Rock Core Dia. **2** in.
Shelby Tube OD **3** in.

TEST DATA

SOIL CLASSIFICATION (continued) Latitude (deg): 37.62617, Longitude (deg): -85.863647	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		40, 45, 50, 55											
Auger Refusal at 60 feet	60.0	60											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 23A L3**
JOB # **LOUGE22043**
DRAWN BY **Z. Nichols**
APPROVED BY **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/29/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/29/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 720.1
Latitude (deg): 37.626195, Longitude (deg): -85.863744

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.3											
LEAN CLAY (CL), Light brown, SOFT to VERY STIFF, with organics to 2 feet			1	SS		WOH-WOH-3- [3]		22.4				PP=1.5 tsf
- with sand			2	SS		3-4-5- [18]		17.6				PP=1.5 tsf
- transition to reddish brown and gray		5	3	SS		4-7-10- [17]		16.5				PP=3.0 tsf
- trace limestone fragments			4	SS		3-7-11- [18]		20.1				PP=3.5 tsf
		10	5	SH			1.60	19.8	43	17		
FAT CLAY (CH), Light reddish brown, VERY STIFF, trace limestone fragments	12.0		6	SS		4-5-9- [14]		30.7				PP=3.5 tsf
LEAN CLAY (CL), with sand, Brown, STIFF	14.0	15		SS		4-5-7- [12]		25.5				PP=3.0 tsf
FAT CLAY (CH), Light tan and Gray, VERY SOFT to STIFF, with limestone fragments, groundwater at about 22 feet	17.0											
		20		SH			1.82	20.3	50	19		
					● (22.0)							
				SS		4-4-5- [9]		40.1				PP=1.0 tsf
- with black oxidation nodules		25		SS		WOH-WOH-WOH- [WOH]		20.8				PP=2.0 tsf
		30		SH			0.19	22.5				
				SS		1-1-1- [2]						
Auger Refusal at 33.5 feet	33.5											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **22.0** ft.
At Completion (in augers) **--** ft.
At Completion (open hole) **--** ft.
After **--** hours **--** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 23A L4**
JOB # **LOUGE22043**
DRAWN BY **Z. Nichols**
APPROVED BY **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	3/30/22	Hammer Wt.	140 lbs.
Date Completed	3/30/22	Hammer Drop	30 in.
Drill Foreman	M. Smith	Spoon Sampler OD	2 in.
Inspector	J. Semmer	Rock Core Dia.	2 in.
Boring Method	HSA	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 720.6 Latitude (deg): 37.626117, Longitude (deg): -85.863775	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5 10 15 20 25 30											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG
(Continued)

CLIENT	**Southeast Power Corporation**	BORING #	**STR 23A L4**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/30/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/30/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION (continued) Latitude (deg): 37.626117, Longitude (deg): -85.863775	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		40											
		45											
Auger Refusal at 48 feet	48.0												

Sample Type

SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

Noted on Drilling Tools	-- ft.
At Completion (in augers)	-- ft.
At Completion (open hole)	-- ft.
After -- hours	-- ft.
After -- hours	-- ft.
Cave Depth	-- ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 25 L1**
JOB #: **LOUGE22043**
DRAWN BY: **R. Ortiz**
APPROVED BY: **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started: **4/14/22**
Date Completed: **4/14/22**
Drill Foreman: **J. Burdette**
Inspector: **C. Clouser**
Boring Method: **HSA**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler OD: **2** in.
Rock Core Dia.: **2** in.
Shelby Tube OD: **3** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 663.5
Latitude (deg): 37.62381, Longitude (deg): -85.906461

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.2		1	SS	3-2-3- [5]		20.9				PP=1.3 tsf
LEAN CLAY (CL), with silt, Tannish brown with brown, MEDIUM STIFF to HARD											
- brown to light brown, with sand			2	SS	4-5-6- [11]		68.8	22	14		PP=1.8 tsf
		5	3	SS	5-18-16- [34]		15.8				PP=4+ tsf
FAT CLAY (CH), with silt and sand, Gray, brown, and black, MEDIUM STIFF to STIFF	7.0		4	SS	4-6-3- [9]		25.9				PP=0.8 tsf
		10	5	SH		0.38	25.1	29	17		
			6	SS	3-3-4- [7]						
- light brown		15	7	SS	3-2-2- [4]		27.4				PP=0.3 tsf
- with limestone fragments											- tube not attempted due to limestone fragments
		20	8	SS	8-3-8- [11]		37.6				PP=0.5 tsf
		25	9	SS	6-2-4- [6]						
- with limestone fragments											- tube not attempted due to limestone fragments
		30	10	SS	3-6-4- [10]		36.8				PP=0.3 tsf

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

(Continued)

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 25 L1**
JOB #: **LOUGE22043**
DRAWN BY: **R. Ortiz**
APPROVED BY: **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	4/14/22	Hammer Wt.	140 lbs.
Date Completed	4/14/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	C. Clouser	Rock Core Dia.	2 in.
Boring Method	HSA	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION (continued)
Latitude (deg): 37.62381, Longitude (deg): -85.906461

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
FAT CLAY (CH), with silt and sand, Gray, brown, and black, MEDIUM STIFF to STIFF			11	SS	5-7-8- [15]		35.3				PP=0.5 tsf
		40	12	SH		0.05	31.1				
			13	SS	8-4-3- [7]		30.8				PP=1.3 tsf
- with limestone fragments		45	14	SS	4-10-10- [20]		34.7				PP=0.5 tsf
LIMESTONE, light gray, fine grained, moderately to highly fractured, to 49 feet	48.0	50	RC 1	RC							RQD=32%
- with a 6-inch moderately fractured layer	51.5										
KARST FEATURE - INTERPRETED VOID, SOIL/WATER INFILLED VOID, OR CLAY LAYER	53.5		RC 2	RC							RQD=25%
LIMESTONE		55									
- with a 2-inch diameter solution cavity - with a 6-inch moderately factured and weathered layers - transition to shaley limestone	61.0	60	RC 3	RC							RQD=50%

Boring Terminated at 61 feet

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 25 L2**
JOB #: **LOUGE22043**
DRAWN BY: **R. Ortiz**
APPROVED BY: **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	4/12/22	Hammer Wt.	140 lbs.
Date Completed	4/12/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	D. Melvin	Rock Core Dia.	2 in.
Boring Method	HSA	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 664.2
Latitude (deg): 37.623732, Longitude (deg): -85.90638

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED													
		5											
		10											
		15											
		20											
		25											
	28.5												
Auger Refusal at 28.5 feet													

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 25 L3**
JOB #: **LOUGE22043**
DRAWN BY: **R. Ortiz**
APPROVED BY: **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/12/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/12/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**D. Melvin**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 664.2
Latitude (deg): 37.623796, Longitude (deg): -85.906282

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.2											
LEAN CLAY (CL), with silt, Brown, VERY STIFF			1	SS		6-6-7- [13]		17.5				
			2	SS		7-7-7- [14]		18.7				
SANDY FAT CLAY (CH), Brown, SOFT to HARD	4.5	5	3	SS		5-10-14- [24]		18.4				
- with limestone fragments			4	SS		9-14-14- [28]		18.4				
		10	5	SH			0.09	35.4				
			6	SS		6-2-1- [3]		19.8				
		15	7	SS		2-2-5- [7]		24.2				
		20	8	SH			0.05	33.2				
			9	SS		7-16-7- [23]		29.2				
	24.0		10	SS		50/6"--- [50/6"]						
Auger Refusal at 24 feet												

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 25 L4**
JOB # **LOUGE22043**
DRAWN BY **R. Ortiz**
APPROVED BY **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/12/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/12/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**D. Melvin**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 663.8

Latitude (deg): 37.623874, Longitude (deg): -85.906363

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5											
		10											
		15											
		20											
Auger Refusal at 21.5 feet	21.5												

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

TEST BORING LOG

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CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West, Glendale, KY**

BORING #: **STR 25A L1**
JOB #: **LOUGE22043**
DRAWN BY: **R. Ortiz**
APPROVED BY: **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	4/4/22	Hammer Wt.	140 lbs.
Date Completed	4/4/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	P. Presnell	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 735.6
Latitude (deg): 37.62381, Longitude (deg): -85.906461

TEST DATA

Soil Description	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.7											
FAT CLAY (CH), Brown, MEDIUM STIFF to STIFF, with wood fragments			1	SS		3-3-3- [6]						
			2	SS		3-5-6- [11]		25.0				PP=3.0 tsf
SANDY FAT CLAY (CH), with sand, Brown with black and oxidation nodules, VERY STIFF	4.5	5	3	SS		7-8-8- [16]		14.4				PP=4.0+ tsf
			4	SS		7-11-14- [25]		16.4				PP=4.0+ tsf
		10	5	SH			1.46	22.6	66	21		
			6	SS		7-7-9- [16]		12.2				PP=4.0+ tsf
- with sand, light gray		15	7	SS		5-12-15- [27]		22.1				PP=3.0 tsf
		20	8	SH	●		0.25	20.8				
POORLY GRADED SAND (SP), Light brown, LOOSE	22.0		9	SS		3-4-4- [8]		20.3				
FAT CLAY (CH), with sand, Yellowish brown, STIFF	24.0	25	10	SS		4-3-5- [8]		36.7				PP=2.0 tsf
SANDY FAT CLAY (CH), Light reddish brown to yellowish brown, STIFF	30.0	30	11	SH			0.73	24.9				
			12	SS		3-3-4- [7]		20.5				

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools 22.0 ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

TEST BORING LOG

(Continued)

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CLIENT	**Southeast Power Corporation**	BORING #	**STR 25A L1**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**R. Ortiz**
	Glendale, KY	APPROVED BY	**T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/4/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/4/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**P. Presnell**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION (continued) Latitude (deg): 37.62381, Longitude (deg): -85.906461	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
SANDY FAT CLAY (CH), Light reddish brown to yellowish brown, STIFF			13	SS		3-3-4- [7]		32.2				PP=3.5 tsf
		40	14	SH			0.46	19.9				
			15	SS		4-4-6- [10]		22.5				
		45	16	SS		5-6-50/6"- [50/6"]		8.9				
LIMESTONE, Light gray, slightly weathered	50.0	50	RC1	RC								RQD=8%
KARST FEATURE - INTERPRETED VOID, SOIL/WATER INFILLED VOID, OR CLAY LYER - with a calcite streamer	51.0											
LIMESTONE, Light gray, fine grained, slightly weathered	52.0	55	RC2	RC								RQD=32%
		60	RC3	RC								RQD=87%
Boring Terminated at 62 feet	62.0											

Sample Type	Depth to Groundwater		Boring Method
SPT - Standard Penetration Test	Noted on Drilling Tools	**22.0** ft.	HSA - Hollow Stem Augers
SS - Driven Split Spoon	At Completion (in augers)	-- ft.	CFA - Continuous Flight Augers
SH - Pressed Shelby Tube	At Completion (open hole)	-- ft.	DC - Driving Casing
CA - Continuous Flight Auger	After -- hours	-- ft.	MD - Mud Drilling
RC - Rock Core	After -- hours	-- ft.	MH - Manual Hammer
CU - Cuttings	Cave Depth	-- ft.	AH - Automatic Hammer
CT - Continuous Tube			

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**STR 25A L2**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/29/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/29/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 736.1 Latitude (deg): 37.629876, Longitude (deg): -85.862759	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5 10 15 20 25 30											
Auger Refusal at 33 feet	33.0												

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 25A L3**
JOB #: **LOUGE22043**
DRAWN BY: **Z. Nichols**
APPROVED BY: **R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/29/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/29/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA, AH**	Shelby Tube OD	**3** in.

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 732.8
Latitude (deg): 37.629913, Longitude (deg): -85.862884

TEST DATA

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test Blows per 6" [N-Value] blows/foot	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.3											
LEAN CLAY (CL), Light brown, MEDIUM STIFF to HARD, trace organics to 2 feet			1	SS		2-1-3- [4]		20.7				PP=1.5 tsf
			2	SS		4-5-8- [13]		13.9				PP=1.5 tsf
- transition to reddish brown and gray, with sand		5	3	SS		3-7-9- [16]		17.4				PP=2.5 tsf
			4	SS		11-14-14- [28]		18.2				PP=4.0 tsf
		10	5	SH			1.26	15.0	28	15		
FAT CLAY (CH), Light brown, STIFF to VERY STIFF, with black oxidation nodules	11.0		6	SS		12-15-13- [28]		26.0				PP=4.0 tsf
		15	7	SS		3-5-7- [12]		29.2				PP=3.0 tsf
- transition to dark gray and dark brown												
		20	8	SH			1.79	27.4	62	22		
- transition to light tannish brown to light reddish brown, with sand and limestone fragments			9	SS		3-4-4- [8]		17.6				PP=2.0 tsf
- groundwater at about 26 feet		25	10	SS	●	4-4-10- [14]		36.1				PP=1.5 tsf
- transition to brown												
		30	11	SH			0.45	39.6				
Auger Refusal at 32 feet	32.0											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **26.0** ft.
At Completion (in augers) **--** ft.
At Completion (open hole) **--** ft.
After **--** hours **--** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	STR 25A L4
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	Z. Nichols
	Glendale, KY	APPROVED BY	R. Ortiz

DRILLING and SAMPLING INFORMATION

Date Started	3/28/22	Hammer Wt.	140 lbs.
Date Completed	3/28/22	Hammer Drop	30 in.
Drill Foreman	M. Smith	Spoon Sampler OD	2 in.
Inspector	J. Semmer	Rock Core Dia.	2 in.
Boring Method	HSA	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 728.0 Latitude (deg): 37.629813, Longitude (deg): -85.86293	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5 10 15 20 25 30											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools 44.0 ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG
(Continued)

CLIENT	**Southeast Power Corporation**	BORING #	**STR 25A L4**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**Z. Nichols**
	Glendale, KY	APPROVED BY	**R. Ortiz**

DRILLING and SAMPLING INFORMATION

Date Started	**3/28/22**	Hammer Wt.	**140** lbs.
Date Completed	**3/28/22**	Hammer Drop	**30** in.
Drill Foreman	**M. Smith**	Spoon Sampler OD	**2** in.
Inspector	**J. Semmer**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION (continued) Latitude (deg): 37.629813, Longitude (deg): -85.86293	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		40											
						● (44.0)							
		45											
	50.0	50											
Auger Refusal at 50 feet													

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

Noted on Drilling Tools	44.0	ft.
At Completion (in augers)	--	ft.
At Completion (open hole)	--	ft.
After -- hours	--	ft.
After -- hours	--	ft.
Cave Depth	--	ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT: **Southeast Power Corporation**
PROJECT NAME: **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION: **Hodgenville Road West**
Glendale, KY

BORING #: **STR 26 L1**
JOB #: **LOUGE22043**
DRAWN BY: **R. Ortiz**
APPROVED BY: **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started: **4/15/22**
Date Completed: **4/18/22**
Drill Foreman: **J. Burdette**
Inspector: **Clouser/Januzzi**
Boring Method: **HSA**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler OD: **2** in.
Rock Core Dia.: **2** in.
Shelby Tube OD: **3** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 686.1
Latitude (deg): 37.623237, Longitude (deg): -85.905332

Soil Classification	Stratum Depth	Sample No.	Sample Type	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.5	1	SS		3-2-4- [6]		22.8				PP=1.0 tsf
LEAN CLAY (CL), with silt, Light reddish brown, MEDIUM STIFF, (possible fill)	2.0										
FAT CLAY (CH), with silt, Reddish brown, STIFF, (possible fill)	4.5	2	SS		3-3-5- [8]		21.9				PP=1.5 tsf
LEAN CLAY (CL), with silt, Light brown with dark brown, with organic soil and an organic odor	7.0	3	SS	● (7.0 ft)	4-5-4- [9]		21.5				PP=0.3 tsf
FAT CLAY (CH), trace sand, Reddish brown, STIFF	14.0	4	SS		4-5-4- [9]		160.2				PP=0.8 tsf
		5	SH			0.92	19.4				
		6	SS		4-5-6- [11]		21.0				PP=1.3 tsf
LEAN CLAY (CL), Brown, STIFF	20.0	7	SS		5-5-7- [12]		26.1	49	15		PP=1.5 tsf
FAT CLAY (CH), with silt, Reddish brown, VERY SOFT to STIFF, with limestone fragments		8	SH			1.23	23.8				
		9	SS		3-3-5- [8]		41.0				PP=2.3 tsf
		10	SS		4-4-4- [8]		36.4				PP=0.5 tsf
		11	SH			0.72	36.6				
		12	SS		3-3-3- [6]		38.3				PP=0.5 tsf

Depth Scale: 5, 10, 15, 20, 25, 30

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **7.0** ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

(Continued)

CLIENT **Southeast Power Corporation**
PROJECT NAME **LG&E-KU Ford Glendale 345 kV Transmission**
PROJECT LOCATION **Hodgenville Road West**
Glendale, KY

BORING # **STR 26 L1**
JOB # **LOUGE22043**
DRAWN BY **R. Ortiz**
APPROVED BY **T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started **4/15/22** Hammer Wt. **140** lbs.
Date Completed **4/18/22** Hammer Drop **30** in.
Drill Foreman **J. Burdette** Spoon Sampler OD **2** in.
Inspector **Clouser/Januzzi** Rock Core Dia. **2** in.
Boring Method **HSA** Shelby Tube OD **3** in.

TEST DATA

SOIL CLASSIFICATION (continued) Latitude (deg): 37.623237, Longitude (deg): -85.905332	Stratum Depth	Depth Scale	Sample No.	Sample Type	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
FAT CLAY (CH), with silt, Reddish brown, VERY SOFT to STIFF, with limestone fragments - with black oxidation nodules			13	SS	WOH-WOH-2- [2]		39.2				PP=0.5 tsf
		40	14	SH		0.32	43.2				
FAT CLAY (CH), Light brown, SOFT to MEDIUM STIFF - with limestone fragments	42.0		15	SS	5-6-8- [14]						PP=0.5 tsf
		45	16	SS	20-15-12- [27]						PP=0.0 tsf
		50	17	SH							
			18	SS	18-16-12- [28]						PP=0.5 tsf
		55									PP=0.0 tsf
			19	SS	18-50/3"-- [50/3"]						
		60									
Auger Refusal at 64.7 feet	64.7										

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **7.0** ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	**Southeast Power Corporation**	BORING #	**STR 26 L2**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**R. Ortiz**
	Glendale, KY	APPROVED BY	**T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/11/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/11/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**D. Melvin**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION (ft): 687.0 Latitude (deg): 37.623156, Longitude (deg): -85.905275	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5 10 15 20 25 30											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG
(Continued)

CLIENT	**Southeast Power Corporation**	BORING #	**STR 26 L2**
PROJECT NAME	**LG&E-KU Ford Glendale 345 kV Transmission**	JOB #	**LOUGE22043**
PROJECT LOCATION	**Hodgenville Road West**	DRAWN BY	**R. Ortiz**
	Glendale, KY	APPROVED BY	**T. Andres**

DRILLING and SAMPLING INFORMATION

Date Started	**4/11/22**	Hammer Wt.	**140** lbs.
Date Completed	**4/11/22**	Hammer Drop	**30** in.
Drill Foreman	**J. Burdette**	Spoon Sampler OD	**2** in.
Inspector	**D. Melvin**	Rock Core Dia.	**2** in.
Boring Method	**HSA**	Shelby Tube OD	**3** in.

TEST DATA

SOIL CLASSIFICATION (continued) Latitude (deg): 37.623156, Longitude (deg): -85.905275	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		40											
	45.0	45											
Auger Refusal at 45 feet													

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	STR 26 L3
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	R. Ortiz
	Glendale, KY	APPROVED BY	T. Andres

DRILLING and SAMPLING INFORMATION

Date Started	4/8/22	Hammer Wt.	140 lbs.
Date Completed	4/8/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	D. Melvin	Rock Core Dia.	2 in.
Boring Method	HSA, AH	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION (ft): 690.1
Latitude (deg): 37.623202, Longitude (deg): -85.905174

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
TOPSOIL	0.5			SS		2-2-3- [5]		23.2				PP=1.0 tsf
LEAN CLAY (CL), with silt, Brown, MEDIUM STIFF to STIFF				SS		3-5-6- [11]		20.8				PP=1.5 tsf
FAT CLAY (CH), with sand, Reddish brown, STIFF to VERY STIFF	4.5	5		SS		4-4-6- [10]		23.2				
- with limestone fragments				SS		5-8-11- [19]		16.7				PP=2.0 tsf
		10		SH			1.16	38.1	76	29		
LEAN CLAY (CL), with silt, Reddish brown, STIFF to VERY STIFF	12.0			SS		5-7-9- [16]		32.9				PP=3.5 tsf
		15		SS		3-3-5- [8]		30.5				PP=2.0 tsf
					● (18.0)							
		20		SH			1.17	27.9				
FAT CLAY (CH), with sand, Reddish brown, MEDIUM STIFF to STIFF - with limestone fragments	22.0			SS		9-6-4- [10]		28.3				PP=2.0 tsf
		25		SS		2-3-2- [5]		38.4				
		30		SH			0.50	39.1				
- gray and reddish brown				SS		W-O-H- [WOH]		29.7				

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools 18.0 ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

(Continued)

CLIENT: Southeast Power Corporation
PROJECT NAME: LG&E-KU Ford Glendale 345 kV Transmission
PROJECT LOCATION: Hodgenville Road West, Glendale, KY
BORING #: STR 26 L3
JOB #: LOUGE22043
DRAWN BY: R. Ortiz
APPROVED BY: T. Andres

DRILLING and SAMPLING INFORMATION

Date Started: 4/8/22
Date Completed: 4/8/22
Drill Foreman: J. Burdette
Inspector: D. Melvin
Boring Method: HSA, AH
Hammer Wt.: 140 lbs.
Hammer Drop: 30 in.
Spoon Sampler OD: 2 in.
Rock Core Dia.: 2 in.
Shelby Tube OD: 3 in.

TEST DATA

SOIL CLASSIFICATION (continued)
Latitude (deg): 37.623202, Longitude (deg): -85.905174

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
FAT CLAY (CH), with sand, Reddish brown, MEDIUM STIFF to STIFF				SS		4-3-2- [5]		50.5				
		40		SH			0.16	39.7				
				SS		15-20-27- [27]		15.7				
		45		SS		3-3-1- [4]		42.5				
Auger Refusal at 48.5 feet	48.5											

Sample Type
SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools 18.0 ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

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TEST BORING LOG

CLIENT	Southeast Power Corporation	BORING #	STR 26 L4
PROJECT NAME	LG&E-KU Ford Glendale 345 kV Transmission	JOB #	LOUGE22043
PROJECT LOCATION	Hodgenville Road West	DRAWN BY	R. Ortiz
	Glendale, KY	APPROVED BY	T. Andres

DRILLING and SAMPLING INFORMATION

Date Started	4/7/22	Hammer Wt.	140 lbs.
Date Completed	4/7/22	Hammer Drop	30 in.
Drill Foreman	J. Burdette	Spoon Sampler OD	2 in.
Inspector	D. Melvin	Rock Core Dia.	2 in.
Boring Method	HSA	Shelby Tube OD	3 in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION (ft): 688.3

Latitude (deg): 37.623282, Longitude (deg): -85.905231

Soil Classification	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test N-Value (blows/foot)	Qu-tsf Unconfined Compressive Strength	Moisture Content %	Liquid Limit (LL)	Plastic Limit (PL)	Percent Passing #200 Sieve	Remarks
BLANK AUGERING- NO SAMPLES OBTAINED		5, 10, 15, 20, 25											Boring Offset 5 ft northeast towards tower center
Auger Refusal at 29 feet	29.0												

Sample Type

SPT - Standard Penetration Test
SS - Driven Split Spoon
SH - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

Noted on Drilling Tools -- ft.
At Completion (in augers) -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling
MH - Manual Hammer
AH - Automatic Hammer

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Class-ification	Water Content (%)	Unconfined Compressive Strength (psi)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Cc	Cr	pH
STR 16	0.0	SS					15.4												
STR 16	2.5	SS					18.5												
STR 16	5.0	SS					18.4												
STR 16	7.5	SS					19.6												
STR 16	12.0	SS					17.6												
STR 16	15.0	SS					20.6												
STR 16	20.0	SH	68	22	46	CH	31.7	3.33	85.3	112.3									
STR 16	22.0	SS					42.0												
STR 16	25.0	SS					31.4												
STR 16	30.0	SH					35.9	0.31	85.4	116.0									
STR 16	32.0	SS					29.9												
STR 16	35.0	SS					33.9												
STR 16	40.0	SS					22.3	0.31	70.5	106.5									
STR 16	45.0	SS					41.0												
STR 17 L1	0.0	SS					21.1												
STR 17 L1	1.5	SS					24.7												
STR 17 L1	4.0	SS					21.2												
STR 17 L1	6.5	SS					23.0												
STR 17 L1	9.0	SS					26.0												
STR 17 L1	10.5	SH	32	18	14	CL	21.6	0.80	101.1	122.9									
STR 17 L1	20.0	SS					31.8												
STR 17 L1	21.5	SH					31.9	1.44	87.6	115.5									
STR 17 L1	25.0	SS					34.3												
STR 17 L1	30.0	SS					57.1												
STR 17 L1	35.0	SS					86.7												
STR 17 L1	40.0	SS					81.1												

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Summary of Laboratory Results

Client: Southeast Power Corporation
Project: LG&E-KU Ford Glendale 345 kV Transmission
Location: Hodgenville Road West
City, State: Glendale, KY
Number: LOUGE22043 Date: 6/15/2022

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Class-ification	Water Content (%)	Unconfined Compressive Strength (psi)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Cc	Cr	pH
STR 17 L3	0.0	SS					25.2												
STR 17 L3	2.5	SS	36	18	18	CL	19.4												
STR 17 L3	5.0	SS					18.7												
STR 17 L3	7.5	SS					22.5												
STR 17 L3	10.0	SH					20.2	1.12	105.8	127.3									
STR 17 L3	15.0	SS					30.6												
STR 17 L3	20.0	SH					22.9	1.59	101.6	124.8									
STR 17 L3	22.0	SS					31.7												
STR 17 L3	25.0	SS					27.8												
STR 17 L3	30.0	SH					33.9	0.43	85.8	114.9									
STR 17 L3	32.0	SS					58.8												
STR 21 L1	0.0	SS					17.7												
STR 21 L1	2.5	SS					18.1												
STR 21 L1	5.0	SS					23.4												
STR 21 L1	7.5	SS					24.9												
STR 21 L1	10.0	SH	57	19	38	CH	22.4	2.62	101.4	124.2									
STR 21 L1	12.0	SS					25.6												
STR 21 L1	15.0	SS					29.3												
STR 21 L1	20.0	SH					39.2	0.77	81.6	113.6									
STR 21 L1	22.0	SS					23.5												
STR 21 L1	25.0	SS					33.3												
STR 21 L3	0.0	SS	31	15	16	CL	16.8												
STR 21 L3	2.5	SS	50	16	34	CH	19.4												
STR 21 L3	5.0	SS					19.6												
STR 21 L3	7.5	SS					23.2												
STR 21 L3	10.0	SH					19.3	0.62	96.9	115.6									

US LAB-SUMMARY LANDSCAPE GLENDALE TRANSMISSION LINE.GPJ ATC GINT7 OFFICIAL TEMPLATE.GDT 6/15/22

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Summary of Laboratory Results

Client: Southeast Power Corporation
Project: LG&E-KU Ford Glendale 345 kV Transmission
Location: Hodgenville Road West
City, State: Glendale, KY
Number: LOUGE22043 Date: 6/15/2022

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Class-ification	Water Content (%)	Unconfined Compressive Strength (psi)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Cc	Cr	pH
STR 21 L3	12.0	SS					28.9												
STR 21 L3	15.0	SS	66	27	39	CH	29.3												
STR 21 L3	20.0	SH					29.5	1.23	90.5	117.2									
STR 21 L3	22.0	SS					25.8												
STR 23A L1	0.0	SS					22.6												
STR 23A L1	2.5	SS					13.8												
STR 23A L1	5.0	SS					19.5												
STR 23A L1	7.5	SS					23.2												
STR 23A L1	10.0	SH	45	20	25	CL	22.6	1.63	104.1	127.6									
STR 23A L1	12.0	SS					24.0												
STR 23A L1	15.0	SS					18.0												
STR 23A L1	22.0	SS					20.9												
STR 23A L1	25.0	SS					28.6												
STR 23A L1	30.0	SH					31.4	0.68	91.4	120.0									
STR 23A L1	32.0	SS					29.4												
STR 23A L3	0.0	SS					22.4												
STR 23A L3	2.5	SS					17.6												
STR 23A L3	5.0	SS					16.5												
STR 23A L3	7.5	SS					20.1												
STR 23A L3	10.0	SH	43	17	26	CL	19.8	1.60	106.5	127.6									
STR 23A L3	12.0	SS					30.7												
STR 23A L3	15.0	SS					25.5												
STR 23A L3	20.0	SH	50	19	31	CH	20.3	1.82	103.8	124.8									
STR 23A L3	22.0	SS					40.1												
STR 23A L3	25.0	SS					20.8												
STR 23A L3	30.0	SH					22.5	0.19	102.2	125.3									

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Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Class-ification	Water Content (%)	Unconfined Compressive Strength (psi)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Cc	Cr	pH
STR 25 L1	0.0	SS					20.9												
STR 25 L1	2.5	SS	22	14	8	CL	68.8												
STR 25 L1	5.0	SS					15.8												
STR 25 L1	7.5	SS					25.9												
STR 25 L1	10.0	SH	29	17	12	CL	25.1	0.38	100.4	125.6									
STR 25 L1	15.0	SS					27.4												
STR 25 L1	20.0	SS					37.6												
STR 25 L1	30.0	SS					36.8												
STR 25 L1	35.0	SS					35.3												
STR 25 L1	40.0	SH					31.1	0.05	90.1	118.1									
STR 25 L1	42.0	SS					30.8												
STR 25 L1	45.0	SS					34.7												
STR 25 L3	0.0	SS					17.5												
STR 25 L3	2.5	SS					18.7												
STR 25 L3	5.0	SS					18.4												
STR 25 L3	7.5	SS					18.4												
STR 25 L3	10.0	SH					35.4	0.09	87.8	119.0									
STR 25 L3	12.0	SS					19.8												
STR 25 L3	15.0	SS					24.2												
STR 25 L3	20.0	SH					33.2	0.05	88.8	118.3									
STR 25 L3	22.0	SS					29.2												
TR 25A L1	0.0	SS					24.0												
TR 25A L1	2.5	SS					25.0												
TR 25A L1	5.0	SS					14.4												
TR 25A L1	7.5	SS					16.4												
TR 25A L1	10.0	SH	66	21	45	CH	22.6	1.46	99.4	121.8									

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Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Class-ification	Water Content (%)	Unconfined Compressive Strength (psi)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Cc	Cr	pH
STR 25A L1	12.0	SS					12.2												
STR 25A L1	15.0	SS					22.1												
STR 25A L1	20.0	SH					20.8	0.25	104.0	125.6									
STR 25A L1	22.0	SS					20.3												
STR 25A L1	25.0	SS					36.7												
STR 25A L1	30.0	SH					24.9	0.73	92.3	115.3									
STR 25A L1	32.0	SS					20.5												
STR 25A L1	35.0	SS					32.2												
STR 25A L1	40.0	SH					19.9	0.46	100.4	120.3									
STR 25A L1	42.0	SS					22.5												
STR 25A L1	45.0	SS					8.9												
STR 25A L3	0.0	SS					20.7												
STR 25A L3	2.5	SS					13.9												
STR 25A L3	5.0	SS					17.4												
STR 25A L3	7.5	SS					18.2												
STR 25A L3	10.0	SH	28	15	13	CL	15.0	1.26	112.3	129.2									
STR 25A L3	12.0	SS					26.0												
STR 25A L3	15.0	SS					29.2												
STR 25A L3	20.0	SH	62	22	40	CH	27.4	1.79	96.7	123.1									
STR 25A L3	22.0	SS					17.6												
STR 25A L3	25.0	SS					36.1												
STR 25A L3	30.0	SH					39.6	0.45	81.1	113.3									
STR 26 L1	0.0	SS					22.8												
STR 26 L1	2.5	SS					21.9												
STR 26 L1	5.0	SS					21.5												
STR 26 L1	7.5	SS					160.2												

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Number: LOUGE22043 Date: 6/15/2022

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Class-ification	Water Content (%)	Unconfined Compressive Strength (psi)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Cc	Cr	pH
STR 26 L1	10.0	SH					19.4	0.92	108.8	129.9									
STR 26 L1	12.0	SS					21.0												
STR 26 L1	15.0	SS	49	15	34	CL	26.1												
STR 26 L1	20.0	SH					23.8	1.23	102.0	126.3									
STR 26 L1	22.0	SS					41.0												
STR 26 L1	25.0	SS					36.4												
STR 26 L1	30.0	SH					36.6	0.72	84.5	115.4									
STR 26 L1	32.0	SS					38.3												
STR 26 L1	35.0	SS					39.2												
STR 26 L1	40.0	SH					43.2	0.32	77.9	111.6									
STR 26 L3	0.0	SS					23.2												
STR 26 L3	2.5	SS					20.8												
STR 26 L3	5.0	SS					23.2												
STR 26 L3	7.5	SS					16.7												
STR 26 L3	10.0	SH	76	29	47		38.1	1.16	81.4	112.3									
STR 26 L3	12.0	SS					32.9												
STR 26 L3	15.0	SS					30.5												
STR 26 L3	20.0	SH					27.9	1.17	92.1	117.8									
STR 26 L3	22.0	SS					28.3												
STR 26 L3	25.0	SS					38.4												
STR 26 L3	30.0	SH					39.1	0.50	81.9	114.0									
STR 26 L3	32.0	SS					29.7												
STR 26 L3	35.0	SS					50.5												
STR 26 L3	40.0	SH					39.7	0.16	81.3	113.6									
STR 26 L3	42.0	SS					15.7												
STR 26 L3	45.0	SS					42.5												

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Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Class-ification	Water Content (%)	Unconfined Compressive Strength (psi)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Cc	Cr	pH
STR 4	0.0	SS					21.1												
STR 4	1.5	SS					19.5												
STR 4	4.0	SS					16.2												
STR 4	6.5	SS					29.1												
STR 4	10.5	SH	34	19	15	CL	20.2	0.85	103.6	124.6									
STR 4	15.0	SS					33.2												
STR 4	20.0	SS					36.9												
STR 4	25.0	SS					61.9												
STR 4	30.0	SS					57.3												
STR 5 L1	0.0	SS					22.6												
STR 5 L1	2.5	SS					21.9												
STR 5 L1	5.0	SS	28	16	12	CL	21.8												
STR 5 L1	10.0	SH	66	17	49	CH	35.2	0.98	86.4	116.8									
STR 5 L1	12.0	SS					44.1												
STR 5 L3	0.0	SS					19.8												
STR 5 L3	2.5	SS					16.3												
STR 5 L3	5.0	SS					10.5												
STR 5 L3	7.5	SS					16.3												
STR 5 L3	10.0	SH					34.9	0.39	85.0	114.6									
STR 5 L3	12.0	SS					54.1												
STR 5 L3	15.0	SS					72.1												

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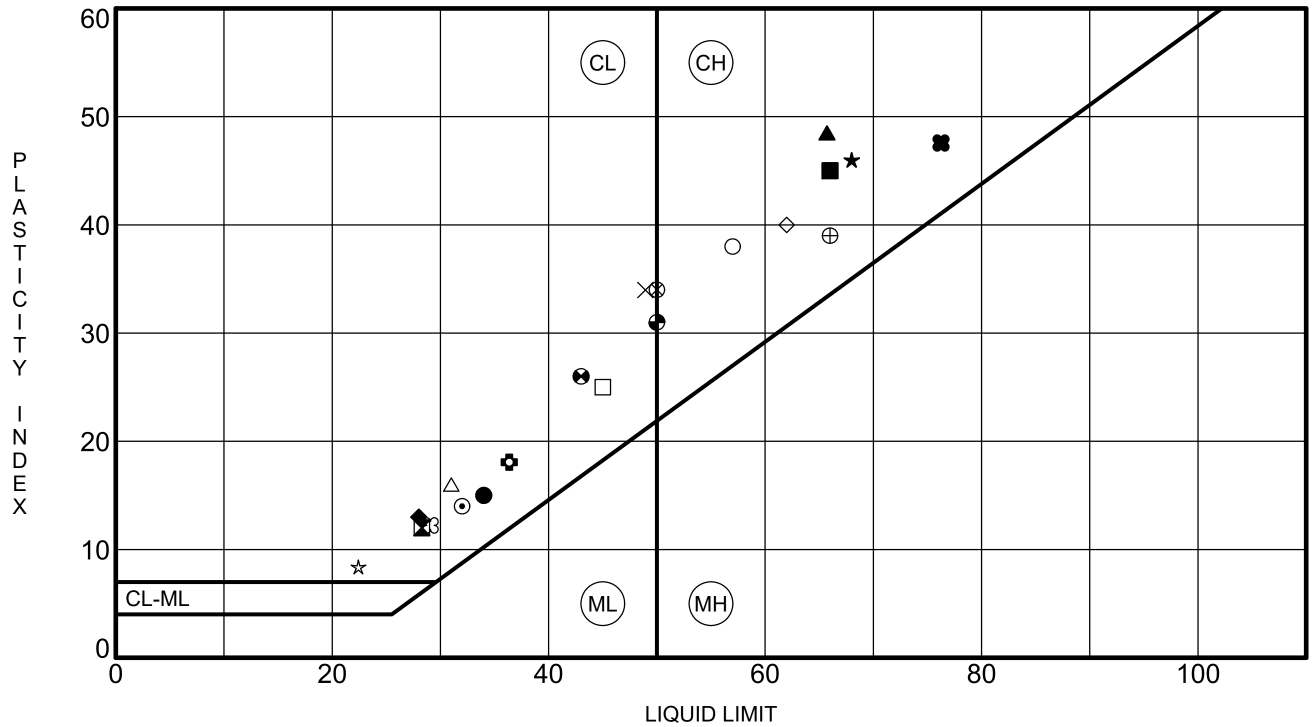

	Specimen Identification		LL	PL	PI	Water Content	Description
●	**STR 4**	**10.5**	**34**	**19**	**15**	**20.2**	**LEAN CLAY (CL), Yellowish brown**
⧗	**STR 5 L1**	**5.0**	**28**	**16**	**12**	**21.8**	**LEAN CLAY (CL), Brown**
▲	**STR 5 L1**	**10.0**	**66**	**17**	**49**	**35.2**	**FAT CLAY (CH), Brown**
★	**STR 16**	**20.0**	**68**	**22**	**46**	**31.7**	**FAT CLAY (CH), Reddish brown**
⊙	**STR 17 L1**	**10.5**	**32**	**18**	**14**	**21.6**	**LEAN CLAY (CL), Red**
✿	**STR 17 L3**	**2.5**	**36**	**18**	**18**	**19.4**	**LEAN CLAY (CL), Brown**
○	**STR 21 L1**	**10.0**	**57**	**19**	**38**	**22.4**	**FAT CLAY (CH), Reddish brown**
△	**STR 21 L3**	**0.0**	**31**	**15**	**16**	**16.8**	**LEAN CLAY (CL), Brown to light reddish brown**
⊗	**STR 21 L3**	**2.5**	**50**	**16**	**34**	**19.4**	**FAT CLAY (CH), Reddish brown to light reddish brown**
⊕	**STR 21 L3**	**15.0**	**66**	**27**	**39**	**29.3**	**FAT CLAY (CH), Dark brown**
□	**STR 23A L1**	**10.0**	**45**	**20**	**25**	**22.6**	**LEAN CLAY (CL), Reddish brown**
◉	**STR 23A L3**	**10.0**	**43**	**17**	**26**	**19.8**	**LEAN CLAY (CL), Reddish brown**
◕	**STR 23A L3**	**20.0**	**50**	**19**	**31**	**20.3**	**FAT CLAY (CH), Light tan and gray**
☆	**STR 25 L1**	**2.5**	**22**	**14**	**8**	**68.8**	**LEAN CLAY (CL), Brown to light brown**
☋	**STR 25 L1**	**10.0**	**29**	**17**	**12**	**25.1**	**LEAN CLAY (CL), Brown to light brown**
■	**STR 25A L1**	**10.0**	**66**	**21**	**45**	**22.6**	**FAT CLAY (CH), Brown**
◆	**STR 25A L3**	**10.0**	**28**	**15**	**13**	**15.0**	**LEAN CLAY (CL), Reddish brown**
◇	**STR 25A L3**	**20.0**	**62**	**22**	**40**	**27.4**	**FAT CLAY (CH), Dark gray/brown**
×	**STR 26 L1**	**15.0**	**49**	**15**	**34**	**26.1**	**LEAN CLAY (CL), Brown**

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ATTERBERG LIMITS RESULTS

Client: Southeast Power Corporation
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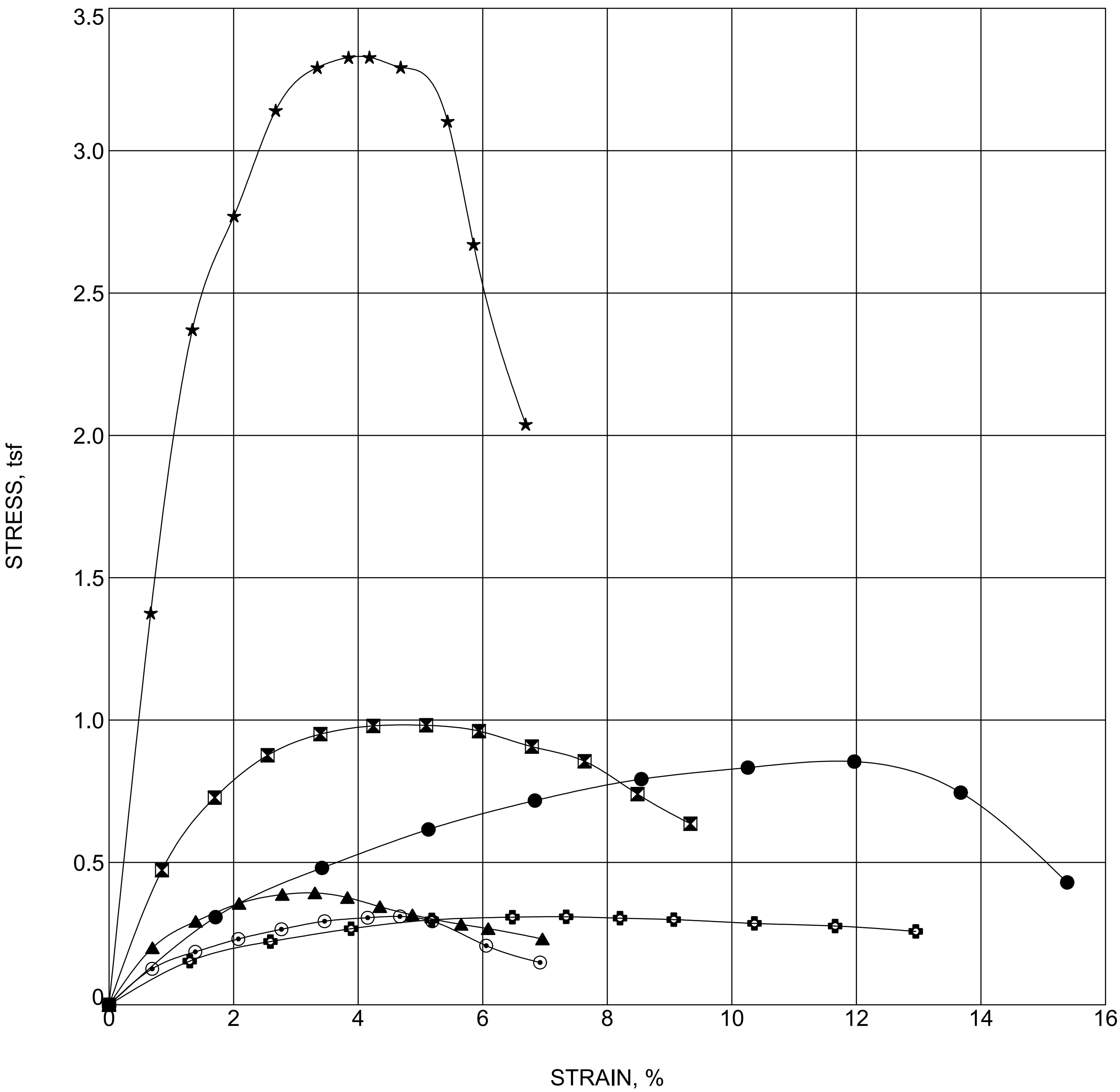
Location: Hodgenville Road West
City, State: Glendale, KY
Number: LOUGE22043
Date: 6/15/2022



	Specimen Identification		Description	Unconfined Compressive Strength (tsf)	Failure Strain (%)	γ_d	MC%
●	STR 4	10.5	LEAN CLAY (CL), Yellowish brown	0.85	12.0	104	20
⧗	STR 5 L1	10.0	FAT CLAY (CH), Brown	0.98	5.1	86	35
▲	STR 5 L3	10.0	LEAN CLAY (CL), Light brown	0.39	3.3	85	35
★	STR 16	20.0	FAT CLAY (CH), Reddish brown	3.33	4.2	85	32
⊙	STR 16	30.0	FAT CLAY (CH), Brown	0.31	4.7	85	36
✪	STR 16	40.0	FAT CLAY (CH), Dark brown	0.31	7.3	71	51

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UNCONFINED COMPRESSION TEST

Client: Southeast Power Corporation
Project: LG&E-KU Ford Glendale 345 kV Transmission
Location: Hodgenville Road West
City, State: Glendale, KY
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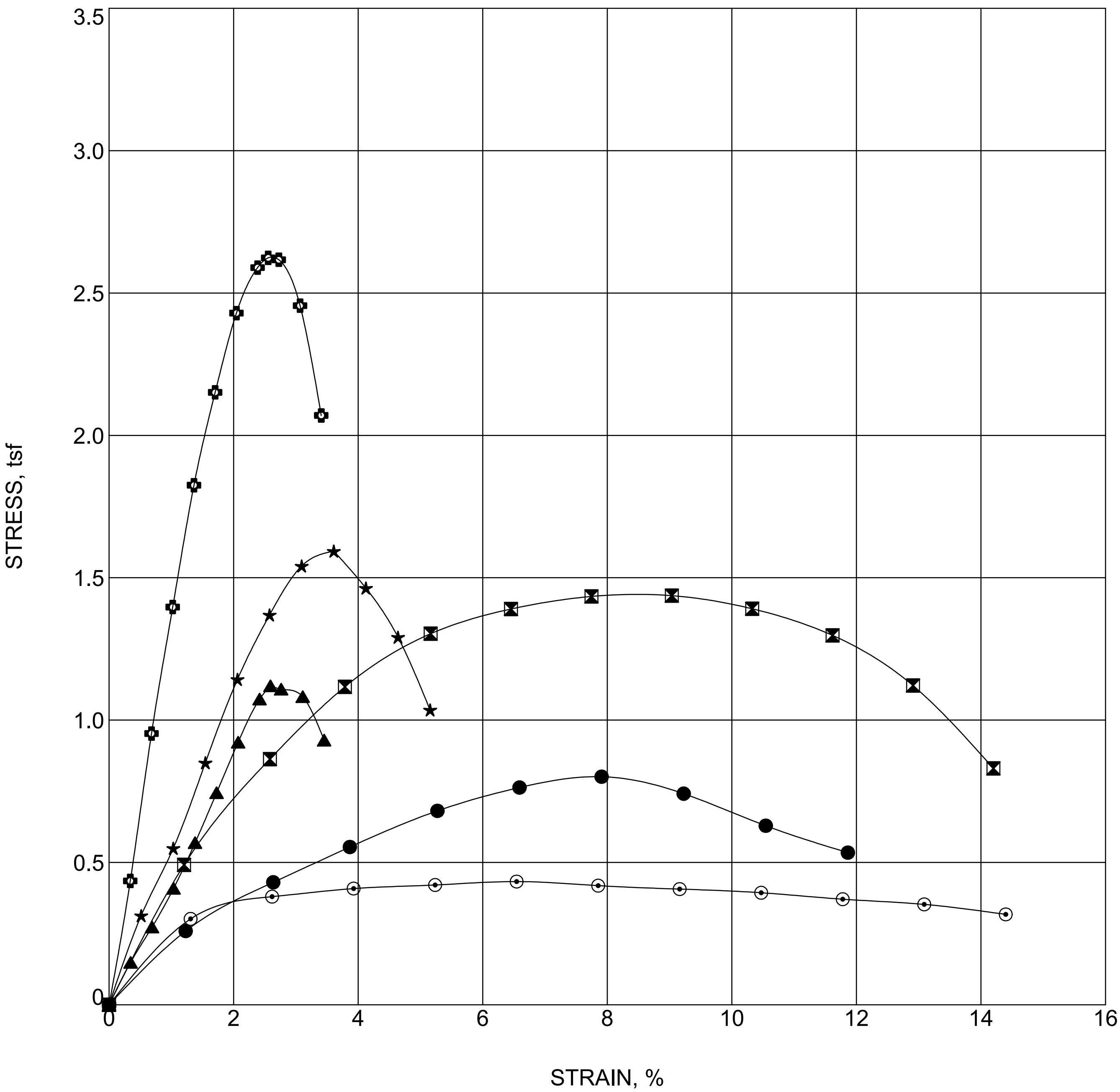
Date: 6/15/2022



Specimen Identification			Description	Unconfined Compressive Strength (tsf)	Failure Strain (%)	γ_d	MC%
●	**STR 17 L1**	**10.5**	**LEAN CLAY (CL), Red**	**0.80**	**7.9**	**101**	**22**
⧗	**STR 17 L1**	**21.5**	**FAT CLAY (CH), Reddish brown**	**1.44**	**9.0**	**88**	**32**
▲	**STR 17 L3**	**10.0**	**FAT CLAY (CH), Reddish brown**	**1.12**	**2.6**	**106**	**20**
★	**STR 17 L3**	**20.0**	**FAT CLAY (CH), Reddish brown**	**1.59**	**3.6**	**102**	**23**
⊙	**STR 17 L3**	**30.0**	**FAT CLAY (CH), Brown**	**0.43**	**6.5**	**86**	**34**
✿	**STR 21 L1**	**10.0**	**FAT CLAY (CH), Reddish brown**	**2.62**	**2.6**	**101**	**22**

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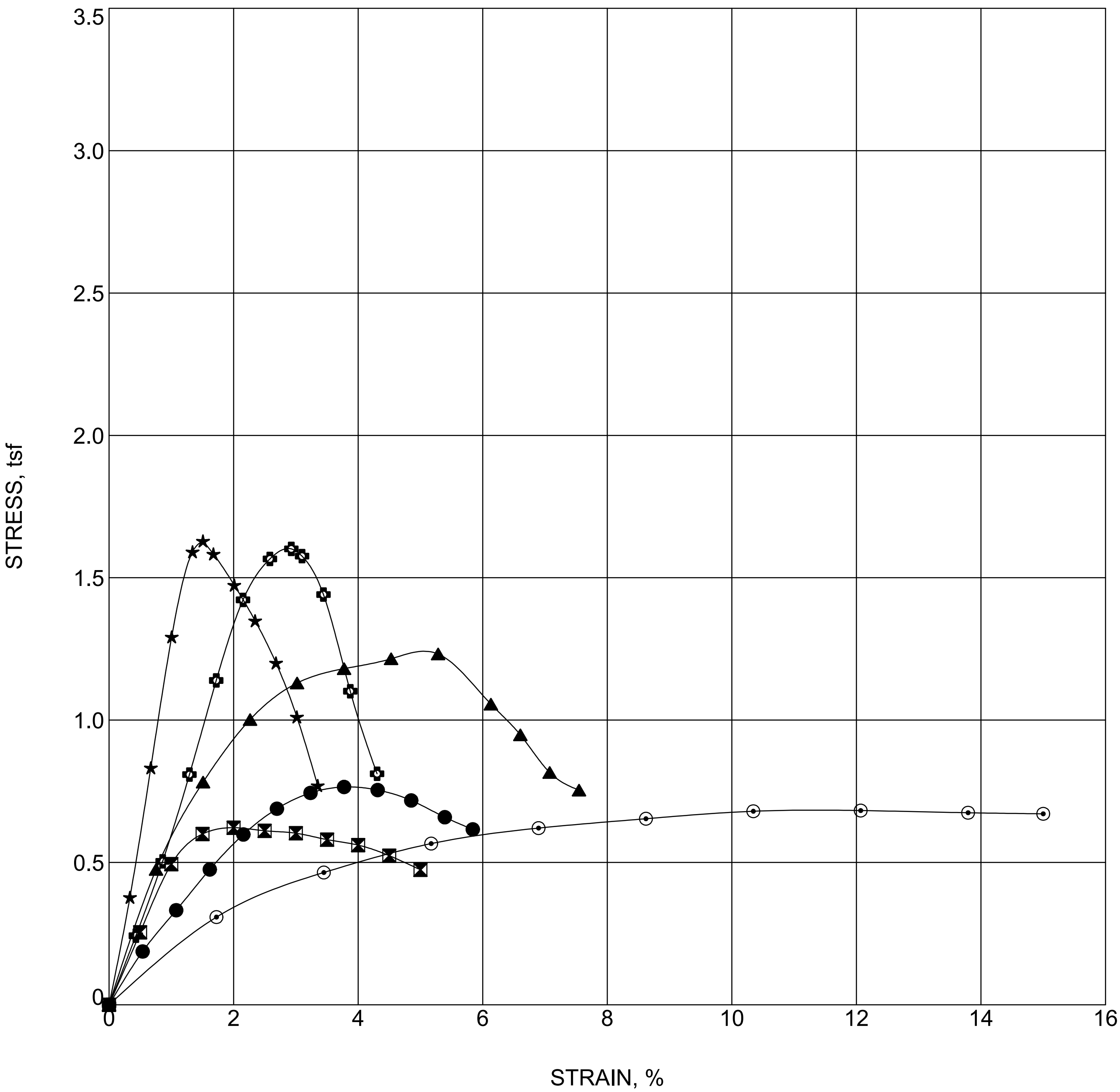

Specimen Identification			Description	Unconfined Compressive Strength (tsf)	Failure Strain (%)	γ_d	MC%
●	**STR 21 L1**	**20.0**	**FAT CLAY (CH), Light reddish brown**	**0.77**	**3.8**	**82**	**39**
⧗	**STR 21 L3**	**10.0**	**FAT CLAY (CH), Reddish brown**	**0.62**	**2.0**	**97**	**19**
▲	**STR 21 L3**	**20.0**	**LEAN CLAY (CL), Dark brown**	**1.23**	**5.3**	**91**	**29**
★	**STR 23A L1**	**10.0**	**LEAN CLAY (CL), Reddish brown**	**1.63**	**1.5**	**104**	**23**
⊙	**STR 23A L1**	**30.0**	**LEAN CLAY (CL), Reddish brown**	**0.68**	**12.1**	**91**	**31**
✪	**STR 23A L3**	**10.0**	**LEAN CLAY (CL), Reddish brown**	**1.60**	**2.9**	**107**	**20**

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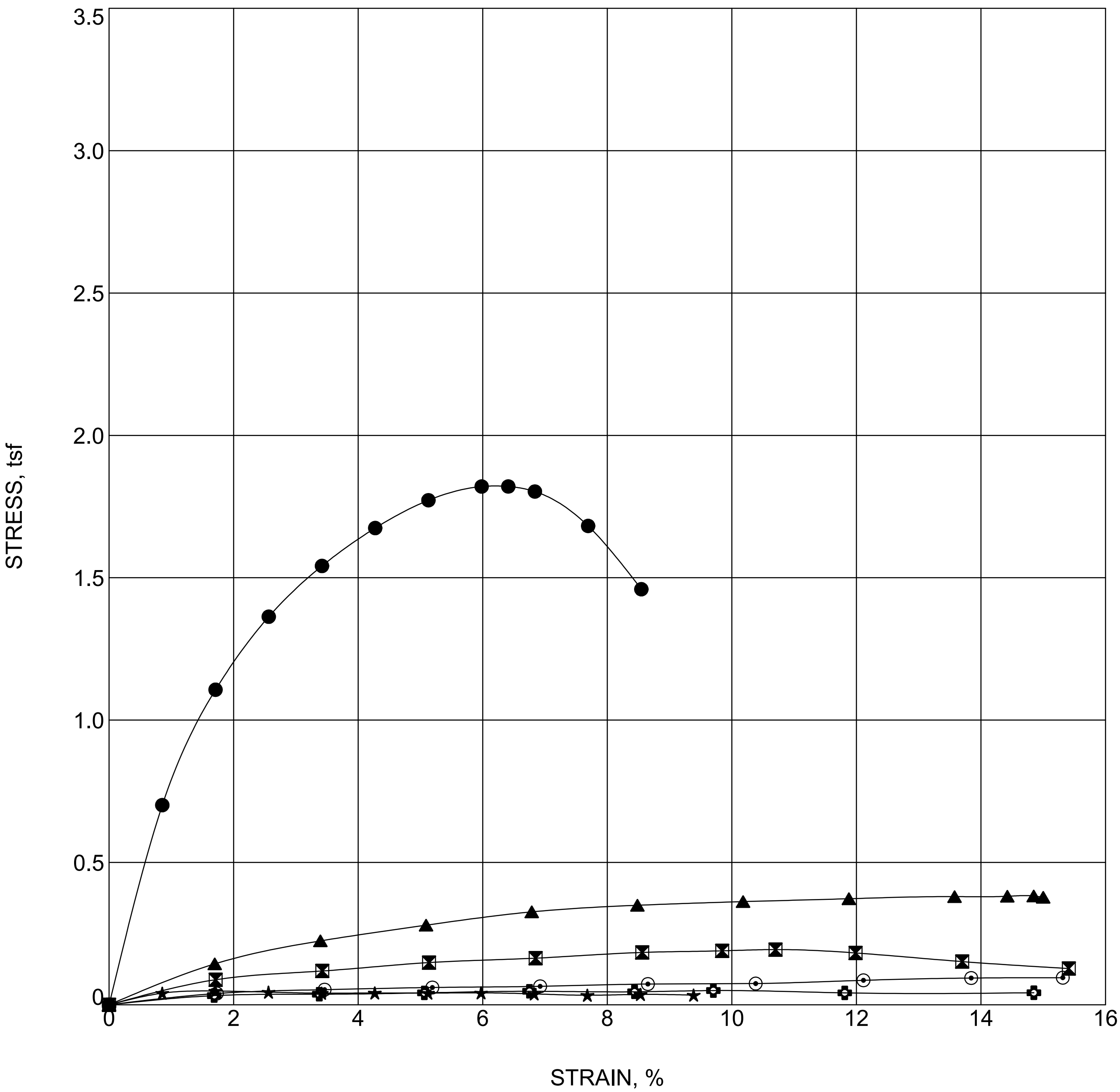

	Specimen Identification		Description	Unconfined Compressive Strength (tsf)	Failure Strain (%)	γ_d	MC%
●	STR 23A L3	20.0	FAT CLAY (CH), Light tan and gray	1.82	6.4	104	20
⧗	STR 23A L3	30.0	FAT CLAY (CH), Light tan and gray	0.19	10.7	102	23
▲	STR 25 L1	10.0	LEAN CLAY (CL), Brown to light brown	0.38	14.8	100	25
★	STR 25 L1	40.0	FAT CLAY (CH), Light brown	0.05	1.7	90	31
⊙	STR 25 L3	10.0	FAT CLAY (CH), Brown	0.09	15.0	88	35
✿	STR 25 L3	20.0	FAT CLAY (CH), Brown	0.05	9.7	89	33

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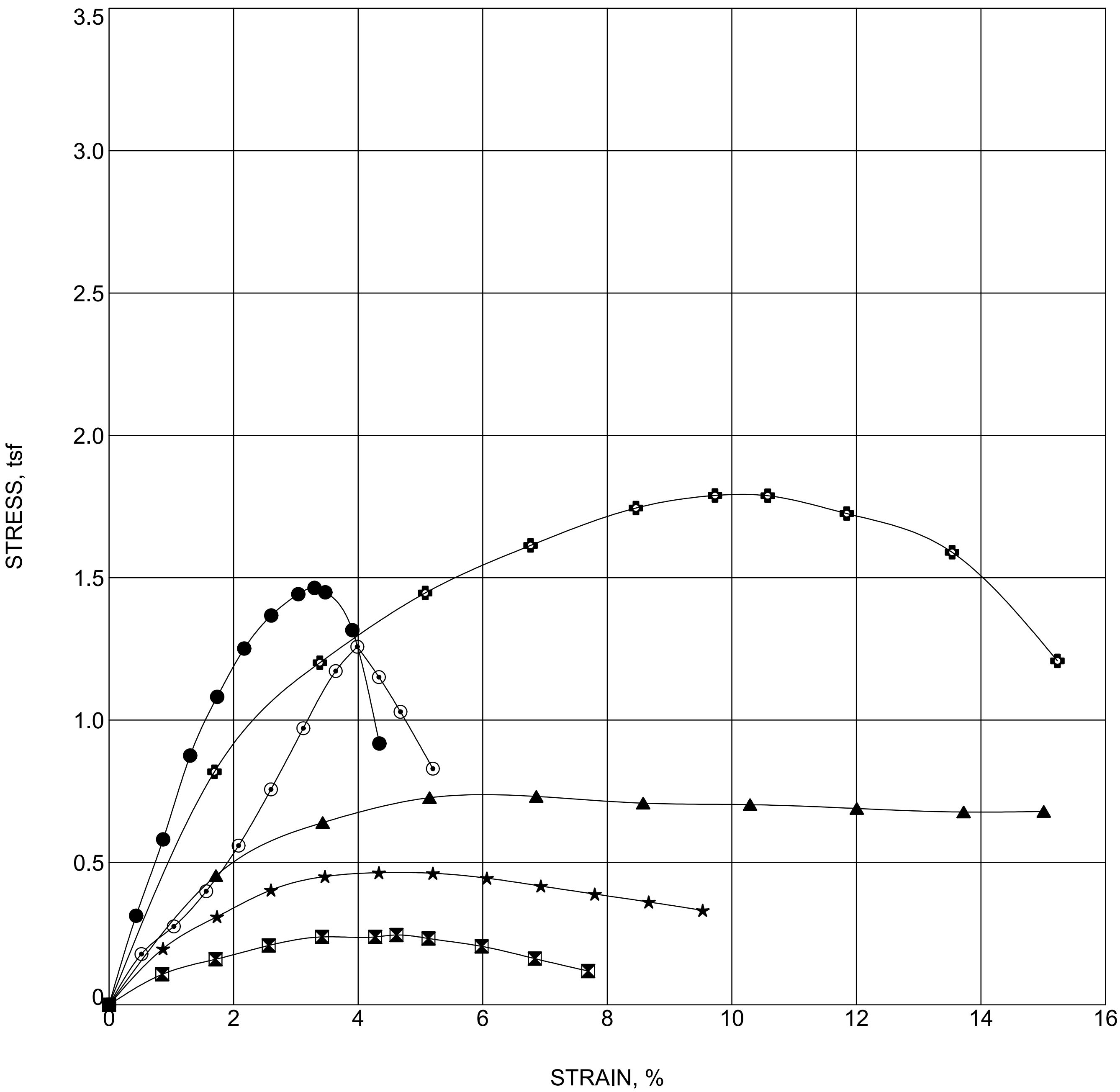

Specimen Identification			Description	Unconfined Compressive Strength (tsf)	Failure Strain (%)	γ_d	MC%
●	STR 25A L1	10.0	FAT CLAY (CH), Brown	1.46	3.3	99	23
⧗	STR 25A L1	20.0	FAT CLAY (CH), Light gray	0.25	4.6	104	21
▲	STR 25A L1	30.0	FAT CLAY (CH), Light reddish brown	0.73	6.9	92	25
★	STR 25A L1	40.0	FAT CLAY (CH), Light reddish brown	0.46	4.3	100	20
⊙	STR 25A L3	10.0	LEAN CLAY (CL), Reddish brown	1.26	4.0	112	15
✪	STR 25A L3	20.0	FAT CLAY (CH), Dark gray/brown	1.79	9.7	97	27

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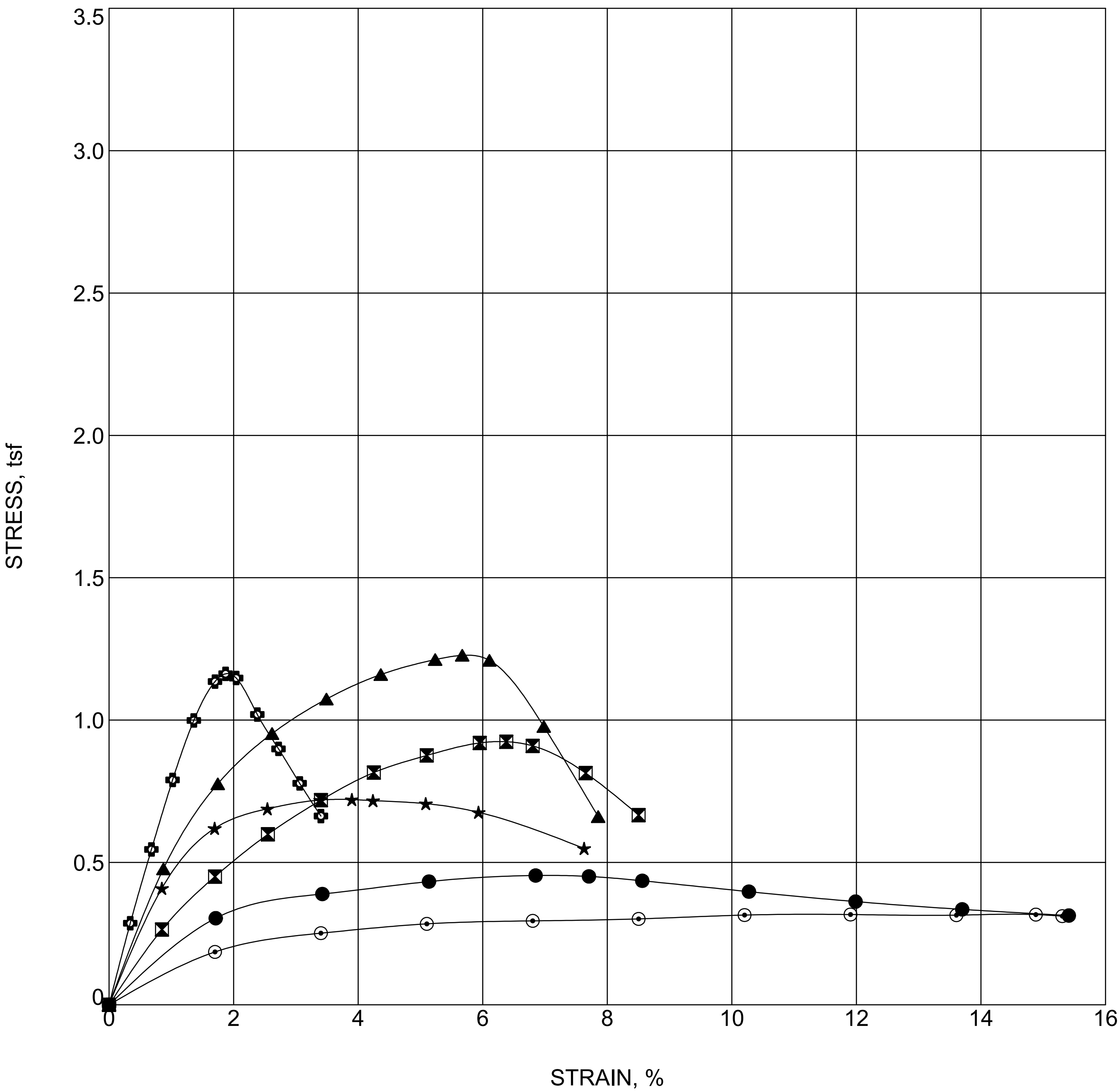

	Specimen Identification		Description	Unconfined Compressive Strength (tsf)	Failure Strain (%)	γ_d	MC%
●	**STR 25A L3**	**30.0**	**FAT CLAY (CH), Brown**	**0.45**	**6.8**	**81**	**40**
⧗	**STR 26 L1**	**10.0**	**FAT CLAY (CH), Reddish brown**	**0.92**	**6.4**	**109**	**19**
▲	**STR 26 L1**	**20.0**	**FAT CLAY (CH), Reddish brown**	**1.23**	**5.7**	**102**	**24**
★	**STR 26 L1**	**30.0**	**FAT CLAY (CH), Reddish brown**	**0.72**	**3.9**	**84**	**37**
⊙	**STR 26 L1**	**40.0**	**FAT CLAY (CH), Reddish brown**	**0.32**	**11.9**	**78**	**43**
✿	**STR 26 L3**	**10.0**	**FAT CLAY (CH), Reddish brown**	**1.16**	**1.9**	**81**	**38**

ATLAS
Atlas Technical Consultants
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Louisville, KY 40206
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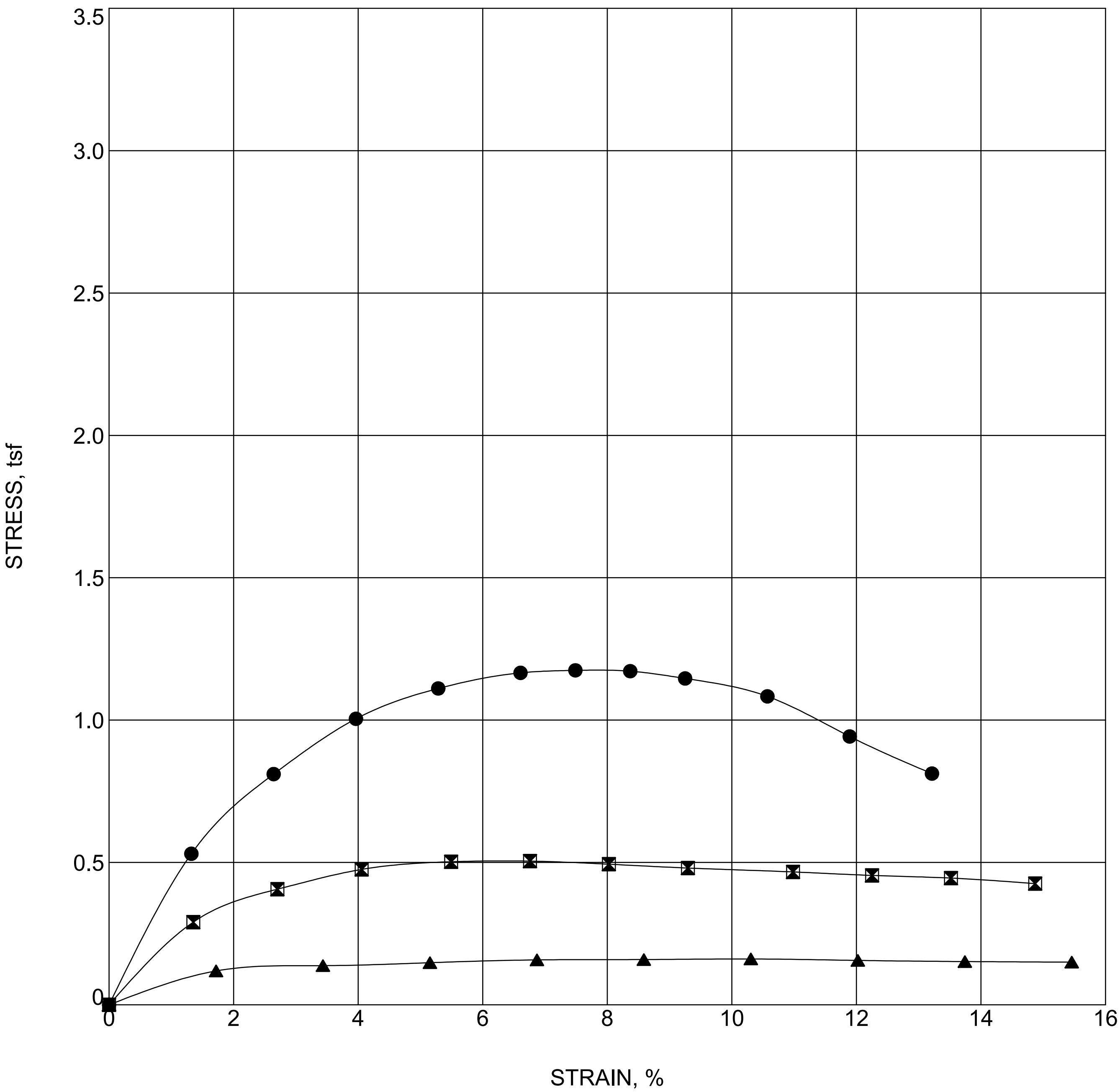
UNCONFINED COMPRESSION TEST

Client: Southeast Power Corporation
Project: LG&E-KU Ford Glendale 345 kV Transmission
Location: Hodgenville Road West
City, State: Glendale, KY
Number: LOUGE22043
Date: 6/15/2022



	Specimen Identification		Description	Unconfined Compressive Strength (tsf)	Failure Strain (%)	γ_d	MC%
●	STR 26 L3	20.0	FAT CLAY (CH), Reddish brown	1.17	7.5	92	28
⌧	STR 26 L3	30.0	FAT CLAY (CH), Reddish brown	0.50	6.8	82	39
▲	STR 26 L3	40.0	FAT CLAY (CH), Gray and reddish brown	0.16	10.3	81	40

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Project:	LG&E-KU Ford Glendale 345 kV Transmission		
Project No.:	LOUGE22043		
By:	ZN/JK	Date:	05/20/22
Checked By:	RCO	Date:	05/23/22

Unconfined Compression Test on Rock Cores

ASTM D7012 Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens

Equipment Usage: **Calipers, Scale, Compression Machine**

Compression Test Results

Core ID	Depth (feet)	Diameter (inches)	Area (in^2)	Length after Capping (inches)	L/D Ratio	Maximum Test Load (lbs)	Compressive Strength (psi)	Strength Correction Factor	Corrected Compressive Strength (psi)
STR4	51.9	1.98	3.09	4.24	2.14	15,790	5,120	1.00	5,120
STR4-E	56	1.98	3.07	4.30	2.18	18,735	6,100	1.00	6,100
STR5L1	21.4	1.83	2.62	4.11	2.25	17,893	6,830	1.00	6,830
STR16	51.5	1.97	3.05	3.78	1.92	10,975	3,600	0.99	3,560
STR17L1	42	1.96	3.00	3.67	1.88	10,040	3,340	0.99	3,310
STR17L1	52.3	1.97	3.06	3.65	1.85	10,340	3,380	0.99	3,350
STR21L1	41.7	1.96	3.03	4.01	2.04	10,567	3,490	1.00	3,490
STR23AL1	55.5	1.97	3.05	3.15	1.60	6,265	2,060	0.97	2,000

Unit Weight Determination

Core ID	Depth (feet)	Core Description	Diameter (inches)	Initial Length as Received (inches)	Length before Capping (inches)	Weight (grams)	Unit Weight (pcf)
STR4	51.9	LIMESTONE	1.98	11.00	4.24	460.58	134.3
STR4-E	56	LIMESTONE	1.98	16.00	4.30	566.78	163.3
STR5L1	21.4	LIMESTONE	1.83	35.00	4.11	544.01	192.6
STR16	51.5	LIMESTONE	1.97	7.00	3.78	481.8	159.4
STR17L1	42	LIMESTONE	1.96	15.00	3.67	502.3	173.6
STR17L1	52.3	LIMESTONE	1.97	7.00	3.65	529.9	180.9
STR21L1	41.7	LIMESTONE	1.96	9.00	4.01	491.5	154.2
STR23AL1	55.5	LIMESTONE	1.97	10.00	3.15	417.2	165.5

Specimens not prepared in accordance with ASTM D4543

Specimens are tested at the "as received" mositure condition.

Rate of loading: 100psi/s ±10% or 100 x area(in) lbs/s ±10%

Length-to-Diameter Ratio	Strength Correction Factor
1.00	0.87
1.25	0.93
1.50	0.96
1.75	0.98
2.00-2.50	1.00

Project:	LG&E-KU Ford Glendale 345 kV Transmission		
Project No.:	LOUGE22043		
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Unconfined Compression Test on Rock Cores

ASTM D7012 Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens

Equipment Usage: **Calipers, Scale, Compression Machine**

Compression Test Results

Core ID	Depth (feet)	Diameter (inches)	Area (in^2)	Length after Capping (inches)	L/D Ratio	Maximum Test Load (lbs)	Compressive Strength (psi)	Strength Correction Factor	Corrected Compressive Strength (psi)
STR25AL1	53.0	1.98	3.07	4.37	2.21	11,820	3,850	1.00	3,850
SR25L1	51.7	1.97	3.05	4.16	2.11	12,115	3,970	1.00	3,970

Unit Weight Determination

Core ID	Depth (feet)	Core Description	Diameter (inches)	Initial Length as Received (inches)	Length before Capping (inches)	Weight (grams)	Unit Weight (pcf)
STR25AL1	53.0	LIMESTONE	1.98	7.00	4.37	583.94	165.8
SR25L1	51.7	LIMESTONE	1.97	8.00	4.16	503.37	151.2

Specimens not prepared in accordance with ASTM D4543

Specimens are tested at the "as received" mositure condition.

Rate of loading: 100psi/s ±10% or 100 x area(in) lbs/s ±10%

Length-to-Diameter Ratio	Strength Correction Factor
1.00	0.87
1.25	0.93
1.50	0.96
1.75	0.98
2.00-2.50	1.00