PRELIMINARY GEOTECHNICAL ENGINEERING REPORT

542 Acre Fair Oaks Development
Tulsa, Oklahoma

Prepared for:

PartnerTulsa

Tulsa, Oklahoma

September 2023

Olsson Project No. 023-04565

Oklahoma Certificate
of Authorization #: 2483

olsson®

September 12, 2023

PartnerTulsa
Attn: Michelle Barnett
100 South Cincinnati Avenue
Tulsa, Oklahoma 74103

RE: Preliminary Geotechnical Engineering Report
542 Acre Fair Oaks Development
Tulsa, Oklahoma
Olsson Project No. 023-04565

Dear Ms. Barnett

In general accordance with our "Joint Development Agreement" dated June 16, 2023, Olsson, Inc. has completed the authorized geotechnical exploration for the above referenced project. The geotechnical exploration was conducted to evaluate physical characteristics of subsurface conditions with respect to design and construction of the project. The enclosed report summarizes the project characteristics as we understand them, presents the findings of the field exploration and laboratory testing, discusses the observed subsurface conditions, and provides our geotechnical engineering recommendations.

A boring location map, boring logs, and a description of our exploration program, is provided in **Appendix A**. Laboratory test results are presented in **Appendix B.**

We appreciate the opportunity to provide our geotechnical engineering services for this project. We are prepared to provide construction phase services as well. If you have any questions or need further assistance, please contact us at your convenience.

Respectfully submitted,
Olsson, Inc.
Oklahoma Certificate of Authority No. 2483

Sydney Brinkley
Assistant Engineer
sbrinkley@olsson.com

Thomas C. Kettler, PE
Senior Geotechnical Engineer
tkettler@olsson.com

Shameem Dewan, PE
Senior Geotechnical Engineer
sdewan@olsson.com

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

EXECUTIVE SUMMARY

Our subsurface exploration generally encountered low to moderate plasticity clays with varying sand contents and isolated silty clay layers. High plasticity clays were encountered in two of our borings, and softer soils were encountered in the upper 5 feet in isolated areas across the project site. The upper layer soils were generally underlain by shale and limestone with interbedded sandstone seams.

Based on the findings of the preliminary geotechnical exploration and analyses, the soils encountered generally appear suitable for support of shallow and/or deep foundation systems. Due to the presence of high plasticity and soft soils in the isolated areas, some additional earthwork of the existing soils may be required, depending on final site grades. Additional testing during the final geotechnical exploration will be required to determine whether certain on-site soils can be reused as structural fill.

Additionally, due to the presence of shallow bedrock in some areas and depending on final site grades, the use of rock excavation equipment such as rock rippers, carbide tipped trenchers, or hydraulic breakers may be required.

This Executive Summary provides a limited overview of the report outcomes and is subject to any and all clarifications, conditions, contingencies, limitations and/or qualifications that may exist in the body of the report. The Client nor any other party may rely solely on this Executive Summary. Client and any other party using this report must review the entire report and interpret the information contained in this Executive Summary in conjunction with the remainder of the report.

1. PROJECT UNDERSTANDING

1.1 Project Information

We understand the purpose of this preliminary geotechnical exploration is to provide an evaluation of subgrade conditions and feasibility of the proposed 542-acre site for planning and future construction. At the time of this report, no specific structures or uses were planned of the site. However, we anticipate the future development will comprise light to medium industrial properties.

While acknowledging the recommended minimum number of borings in the request for proposals (RFP) as one boring per 100 acres, we have reviewed USDA soil survey and geologic well logs data at and surrounding the project site and estimated up to seven soil series/formations could be encountered. Based on our experience with similar developments and our evaluation of the expected conditions, the proposed boring numbers and depths are expected to provide sufficient delineation of the subsurface strata to prepare our preliminary geotechnical recommendations.

1.2 Site Description

The project site is located at the northwest corner of East 31st Street and the Creek Turnpike near Tulsa, Oklahoma. The site generally comprised pastured land surface and was accessible to a track-mounted drilling rig.

Based on available aerial topographic information, existing site grades range from an elevation of approximately 665.0 to 695.0 feet. The site generally appears to slope from northeast to southwest. The site comprises a rolling terrain with associated wooded areas in the northwest corner and ponds and streams scattered across the site. The project site outline is shown in **Figure 1**.

Figure 1. 2022 Aerial Photograph/Project Site Outline.

2. SUBSURFACE CONDITIONS

2.1 Site Geology

The project site is located in the northeastern region of Oklahoma and is mapped as being underlain by three different formations. The western portion of the site is underlain by the Pennsylvanian-Aged Fort Scott and Labette Formations, and the eastern portion of the site is underlain by the Senora Formation.

The Fort Scott Formation generally consists of multiple limestone units with interbedded shale layers, and the Labette Formation generally comprises grayish brown to dark gray silty to sandy shales with isolated limestones. Lastly, the Senora Formation generally consists mostly of shale with thin and lenticular sandstone, minor limestone, and coal seams.

2.2 Subsurface Profile

The subsurface profile was determined based on our field exploration and laboratory testing. Field exploration included seven borings and rock coring to depths up to 25 feet and field testing including standard penetration tests (see **Appendix A**). Laboratory tests (**Appendix B**) included gradation, fines content (passing #200 sieve), Atterberg limits, moisture content, density, swell/consolidation, and unconfined compression tests.

The appended borehole reports represent subsurface conditions at the specific boring locations at the time of our field exploration; variations may occur between or beyond the borings. The stratification lines shown on the logs represent the approximate boundary between material types. However, the transition between layers may be gradual. The depths referenced in the following paragraphs are relative to the site grade at the time of our exploration.

The subsurface soils at this site comprised native low to moderate plasticity clays with isolated high plasticity clay soils and were underlain by sedimentary bedrock comprising limestone, sandstone, and shale. The general characteristics of each soil stratum are summarized below, with more detailed descriptions provided on the borehole reports in **Appendix A**.

Surfacing and Topsoil

We encountered a topsoil layer, approximately 3 to 4 inches thick, in the borings. Varying topsoil thicknesses may be encountered at locations not explored.

Native Clays

We encountered native low to high plasticity clay soils in the borings, extending to depths ranging from 3 to 13.5 feet. The clay soils generally comprised lean clay (CL) and lean clay with

sand, fat clay (CH), and sandy silty lean clay (CL-ML). The low plasticity soils were described as soft to hard, dark brown to brown and gray to reddish brown, and slightly moist to moist.

Limestone

We encountered limestone in borings B-01 and B-03 at depths ranging from 3 to 10 feet and extended to the termination depth of the borings, where encountered. Rock coring was performed at B-01, and the limestone had a recovery ranging from 78.3% to 100% and a rock quality designation (RQD) ranging from 13% to 78.3%. The limestone was described as light gray to dark gray, dry, hard, and contained chert fragments.

Shale

We encountered shale bedrock in the borings, at depths ranging from 3 to 13.5 feet and generally extended to termination depths of the borings or transitioned to limestone. In a few areas, highly weathered shale layers were encountered. An isolated 1.5-foot layer of coal was encountered in boring B-03 at a depth of 6 feet. Rock coring was performed at B-01 in the shale and had a recovery of 75.0% and a RQD of 31.7%. The shale was described as dark gray to gray to light gray to brown, dry to wet, hard, and contained limestone and sandstone seams.

Sandstone

We encountered weathered sandstone in borings B-05 and B-06 at a depth of 8.5 feet below existing grades. The sandstone was weathered and contained interbedded shale seams. The sandstone materials were described as brown to light gray, moist, and hard.

2.3 Water Level Observations

We observed water in our soil borings as summarized in **Table 1** and as indicated on the boring logs presented in **Appendix A**.

Table 1. Water Level Observations.

Boring No.	Water Level Depth While Drilling (feet)	Water Level Elevation While Drilling (feet)	Water Level Depth Immediately After Drilling (feet)	Water Level Elevation Immediately After Drilling (feet)
B-01	NE	NA	NE	NA
B-02	13.0	677.0	10.0	680.0
B-03	9.0	671.0	NE	NA
B-04	12.5	662.5	11.0	664.0
B-05	7.5	677.5	NE	NA
B-06	18.0	662.0	NE	NA
B-07	16.0	654.0	24.0	646.0
**NE—Not Encountered; NP—Not Performed; NA—Not Applicable*				

The above observations provide an indication of the on-site water levels at the time the borings were drilled but should not be construed to represent a permanent or absolute condition. Variations and uncertainties exist with relatively short-term water level observations in boreholes, especially with the presence of bedrocks at different depths potentially resulting in perched water.

Subsurface water levels will fluctuate over time with variations in precipitation, site grading, drainage, and adjacent land use. Perched water conditions can also develop in seams of loose or granular soil. Any foundation design or global stability analysis must take into consideration changing groundwater conditions.

Long-term monitoring with piezometers generally provides a more representative indication of the potential range of subsurface water conditions. Such monitoring was not completed as part of this exploration. Olsson can provide additional monitoring upon written request of the Owner and/or Olsson's client. Recommendations for addressing effects of water in design and during construction are presented in **Section 4.3** and **Section 6.3** of this report.

3. GEOTECHNICAL CONSIDERATIONS

Lower SPT blow counts, which correlate to lower strength materials, were observed in isolated pockets in the upper 5.0 feet of the subsurface across the site. These softer or lower strength materials may be present in varying degrees at locations not explored. As such, depending on final site grades, some over-excavation or additional earthwork of the existing soils may be required if these materials are encountered during construction operations.

Isolated high plasticity soils with low to moderate swelling potential were also observed across the site in the upper 3.5 to 8 feet and may require additional laboratory testing to determine whether certain on-site soils can be reused as structural fill depending on final site grades.

Given the presence of groundwater in the upper 7.5 feet, dewatering and supplemental drainage may be necessary depending on the depths of excavations and the final site grades.

Lastly, bedrock was encountered as shallow as 3 feet in some areas and harder lenses of limestone and sandstone may be encountered during construction operations. Depending on final site grades, the use of rock excavation equipment such as rock rippers or hydraulic breakers may be required.

4. PRELIMINARY STRUCTURE DESIGN

4.1 Preliminary Foundations

Based on the results of our exploration and engineering evaluation, site structures may be supported on a conventional shallow foundation system. We estimate a maximum net allowable soil bearing pressure of 1,500 to 4,000 pounds per square foot (psf) may be used to design shallow foundations supported on approved native soils or properly placed and compacted structural fill. We estimate total post-construction settlements for foundations sized using the above bearing pressures will be less than 1 inch.

Please note that the above recommendations are intended only to provide a range of possible foundation design values. Final foundation type design values or required soil improvement programs must be based on site-specific geotechnical explorations, site grading, and proposed structure types.

4.2 Seismic Site Classification

For this project site, the soil conditions encountered at the boring are consistent with Site Class “C” as defined by ASCE 7-18. Our review of the site class is based on the soil conditions encountered in the borings during the exploration and our assumption that the encountered soil conditions are underlain by similar native materials to those encountered which extend to a depth of at least 100 feet.

4.3 Foundation Drainage

We encountered groundwater at the time of our exploration as indicated in **Table 1**, at depths ranging from 7.5 to 24 feet. Depending on final site grades, groundwater may need to be addressed in facility design and during construction, particularly in areas where excavations are deeper than 7.5 feet. Please note that variations in groundwater elevations can also be expected from seasonal changes in rainfall, temperature, snowmelt, runoff, localized irrigation demand, or other factors.

5. PRELIMINARY PAVEMENTS

Based on the results of our exploration and engineering evaluation, the on-site soils generally appear suitable for support of future pavements. Potentially expansive and relatively low strength soils were encountered in isolated areas across the site and some subgrade remediation may be required depending on final site grades and pavement locations.

We estimate a CBR value range of 2 to 4 and a modulus of subgrade reaction, k, ranging from 75 to 140 pounds per cubic inch (pci) be used for pavement design. However, please note that these recommendations are intended only to provide a range of possible design values. Final pavement design parameters or required soil improvement programs must be based on site-specific geotechnical explorations, site grading, and anticipated traffic usage.

6. PRELIMINARY EARTHWORK CONSIDERATIONS

6.1 Site Preparation

Vegetation, topsoil, roots, and other deleterious materials deemed unsuitable by an Olsson geotechnical engineer, or his/her authorized field representative should be removed from the proposed construction area and replaced with controlled fill. We recommend site clearing, grubbing, and stripping be performed during dry weather conditions. Operation of heavy equipment on the site during wet conditions could result in excessive rutting and mixing of organic debris with the underlying soils.

We anticipate the weathered shale and sandstone bedrock in the project areas can be excavated with standard excavation equipment. However, lenses of harder sandstone or limestone may be present, requiring the use of rock excavation equipment such as rock rippers or hydraulic breakers.

6.2 Structural Fill

We recommend that fill materials placed have a liquid limit less than 45, a plasticity index less than 25. Soils with Atterberg limits greater than these values will require removal, blending with less plastic materials, or chemical stabilization. All structural fill soils should also be relatively free of organic materials (less than about 2 percent by weight), debris, and particles larger than 3 inches in nominal diameter.

Based on our site observations and laboratory testing performed as part of this preliminary exploration, the on-site soils generally appear suitable for reuse as pavement and building slab-on-grade subgrade. However, portions of the on-site soils may present a risk of unacceptable differential movements. Depending on final site grades and subsurface conditions encountered at specific building pads, overexcavation and replacement of the soils may be required to provide structural fill beneath floor slabs or pavements. Chemical stabilization methods such as lime, cement kiln dust (CKD) or Portland cement could also be considered with direction from the geotechnical engineer.

The suitability of the site soils should be determined based on additional laboratory testing completed as part of the final site-specific geotechnical exploration and at or prior to the time of construction.

6.3 Dewatering Considerations

We encountered groundwater at the time of our exploration as indicated in **Table 1**. Variations in groundwater elevation could occur because of seasonal changes in rainfall, temperature, snow

melt, runoff, localized irrigation demand, or other factors. Saturated soils and higher groundwater elevations should be anticipated in areas near drainage channels and ditches.

The contractor should utilize their experience in this area and experience with similar projects to determine the most effective method of dewatering and the effects of such methods on nearby structures, utilities, or pavements.

7. REPORT LIMITATIONS

The preliminary conclusions and recommendations presented in this preliminary report are based on the information available regarding the proposed construction, the results obtained from our soil test borings and sampling procedures, the results of the laboratory testing program, and our experience with similar projects. In addition, this report serves as a preliminary evaluation of the geotechnical considerations associated with the proposed project. Recommendations for specific structures within the development are beyond the scope of this preliminary exploration.

The soil test borings represent a limited statistical sampling of subsurface soils, and it is possible that conditions may be encountered during the final geotechnical exploration or construction that are substantially different from those indicated by the soil test borings. In these instances, adjustments to design and construction may be necessary.

The scope of this exploration did not include any environmental assessment for the presence of wetlands and/or hazardous or toxic materials in the soil or groundwater on or near the site. Any statements in this report regarding odors, discoloration, or suspicious conditions are strictly for the information of our client.

This preliminary report is prepared based on generally accepted professional geotechnical engineering practice at the time of this report, within this geographic area. No warranty, express or implied, is intended or made. This report has been prepared for the exclusive use of our client and client's authorized representatives for specific application to the discussed project.

We trust that this preliminary report will assist you in the planning of the proposed project. Olsson appreciates the opportunity to provide our services on this project and looks forward to working with you during full design and construction of this project. Should you have any questions, please do not hesitate to contact us.

APPENDIX A

Exploration Maps, Logs, and Information

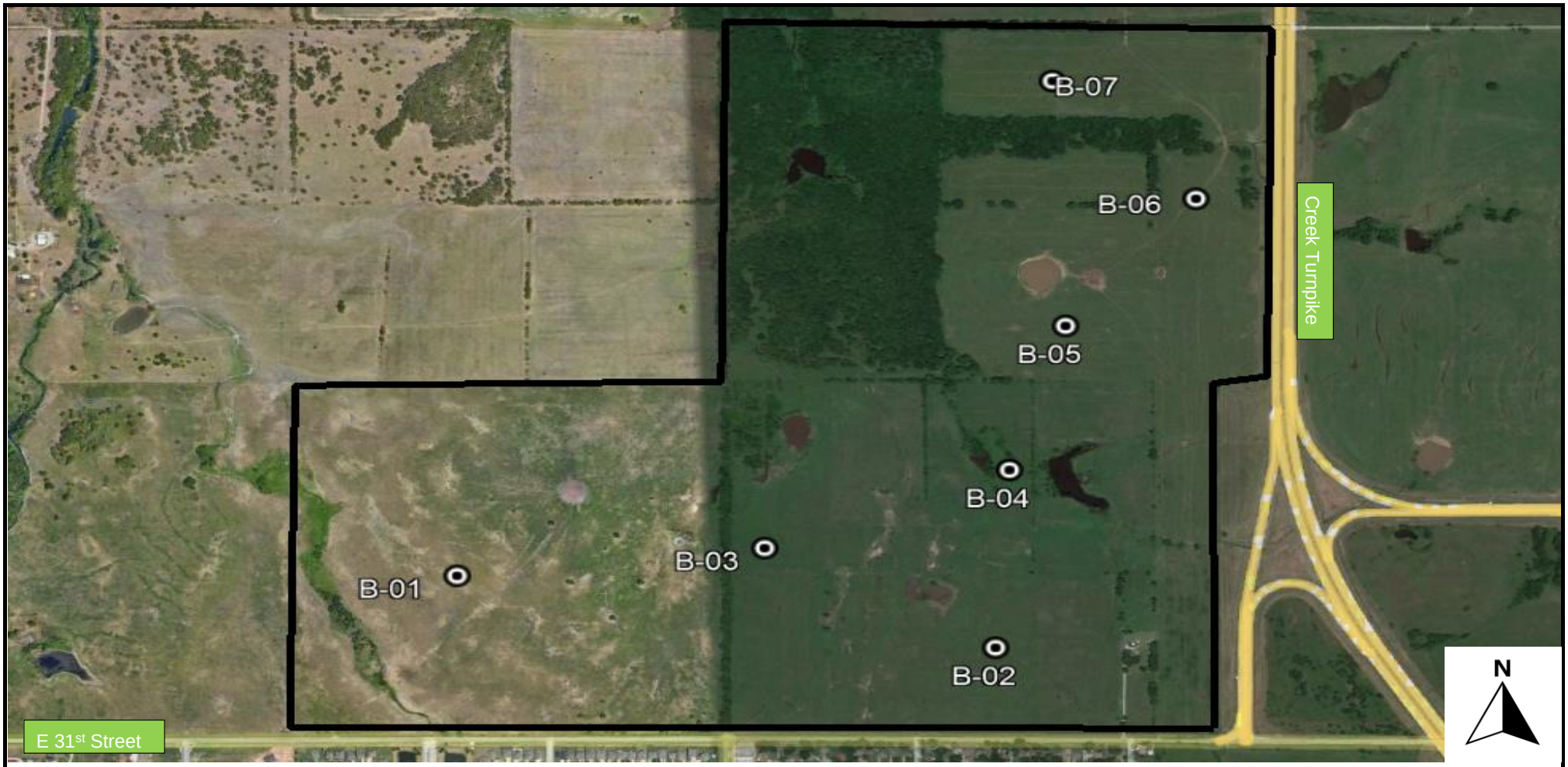
FIELD EXPLORATION

Our drill crew advanced the borings for this exploration with a track-mounted drill rig using continuous-flight auger and rock coring drilling methods. Boring locations were located in the field by the drill crew using a hand-held GPS unit. The approximate locations of the borings are shown on the Boring Location Map.

Samples were obtained using the methods and at the depths shown on the logs. Recovered samples were sealed in containers, labeled, and protected for transportation to the laboratory for testing. The rock core samples were visually examined, and percent recovery (REC) and Rock Quality Designation (RQD) was calculated for each core run.

We interpolated the ground surface elevation at the boring locations using publicly available topographic information. The surface elevations at the boring locations, rounded to the nearest five-foot interval, are presented on the boring logs.

The drill crew prepared field boring logs during drilling operations. The field logs include drilling and sampling methods, sampling intervals, groundwater measurements, and general descriptions of the observed soil conditions. The final boring logs represent our engineering interpretation of the field logs based on visual classification and laboratory testing of the collected samples.



Boring ID	Depth (ft)	Elevation (ft)	Geographic Coordinates, NAD83 (degrees)	
			Latitude	Longitude
B-01	15.0	675.0	36.12239	-95.74954
B-02	25.0	690.0	36.12093	-95.73837
B-03	10.5	680.0	36.12295	-95.74316
B-04	25.0	675.0	36.12454	-95.73808
B-05	25.0	685.0	36.12747	-95.73692
B-06	25.0	680.5	36.13005	-95.73422
B-07	25.0	670.0	36.13244	-95.73719

olsson

Drawn by: SLB
Date: 08-11-2023

Appendix A - Boring Location Map

542 Acre Fair Oaks Development
Tulsa, Oklahoma

SYMBOLS AND NOMENCLATURE

DRILLING NOTES

DRILLING AND SAMPLING SYMBOLS

SS:	Split-Spoon Sample (1.375" ID, 2.0" OD)	HSA:	Hollow Stem Auger	NE:	Not Encountered
U:	Thin-Walled Tube Sample (3.0" OD)	CFA:	Continuous Flight Auger	NP:	Not Performed
CS:	Continuous Sample	HA:	Hand Auger	NA:	Not Applicable
BS:	Bulk Sample	CPT:	Cone Penetration Test	% Rec:	Percent Recovery
MC:	Modified California Sampler	WB:	Wash Bore	WD:	While Drilling
GB:	Grab Sample	RB:	Rock Bit	IAD:	Immediately After Drilling
SPT:	Standard Penetration Test Blows per 6.0"	PP:	Pocket Penetrometer	AD:	After Drilling

DRILLING PROCEDURES

Soil samples designated as "U" samples on the boring logs were obtained using thin-walled tube sampling techniques. Soil samples designated as "SS" samples were obtained using a split-spoon barrel sampler while performing Standard Penetration Tests (SPT). The standard penetration resistance 'N' value is the number of blows to drive the split-spoon sampler 1 foot using a 140-pound hammer falling 30 inches. Soil samples designated as "MC" were obtained in using thick-walled, ring-lined, split-barrel drive sampling techniques (Modified California sampler). Recovered samples were sealed in containers, labeled, and protected for transportation to the laboratory for testing.

WATER LEVEL MEASUREMENTS

Water levels indicated on the boring logs are levels measured in the borings at the times indicated. In highly permeable materials, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with only short-term observations.

SOIL PROPERTIES & DESCRIPTIONS

Descriptions of the soils encountered in the soil test borings were prepared using Visual-Manual Procedures for Descriptions and Identification of Soils.

PARTICLE SIZE

Boulders	12 in. +	Coarse Sand	4.75mm-2.0mm	Silt	0.075mm-0.002mm
Cobbles	12 in.-3 in.	Medium Sand	2.0mm-0.425mm	Clay	<0.002mm
Gravel	3 in.-4.75mm	Fine Sand	0.425mm-0.075mm		

COHESIVE SOILS

Consistency	Unconfined Compressive Strength (Qu) (tsf)
Very Soft	<0.25
Soft	0.25 – 0.5
Firm	0.5 – 1.0
Stiff	1.0 – 2.0
Very Stiff	2.0 – 4.0
Hard	> 4.0

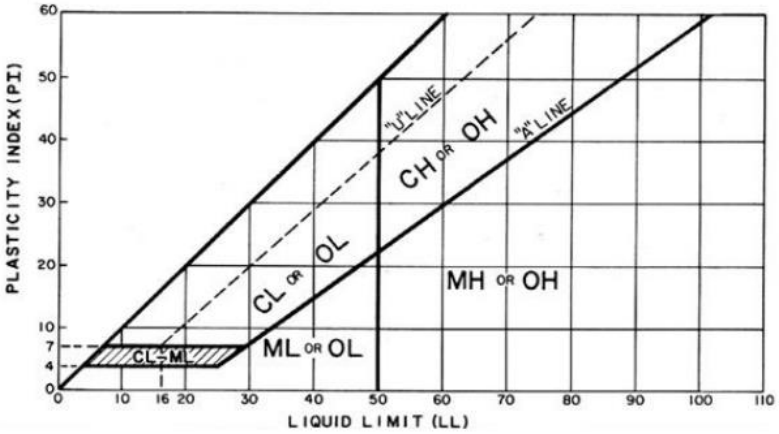
COHESIONLESS SOILS

Relative Density	'N' Value
Very Loose	0 – 3
Loose	4 – 9
Medium Dense	10 – 29
Dense	30 – 49
Very Dense	≥ 50

COMPONENT %

Description	Percent (%)
Trace	<5
Few	5 - 10
Little	15 - 25
Some	30 - 45
Mostly	50 - 100

PLASTICITY CHART



ROCK QUALITY DESIGNATION (RQD)

Description	RQD (%)
Very Poor	0 – 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 – 100

BOREHOLE REPORT NO. B-01

Sheet 1 of 1

PROJECT NAME	CLIENT
542 Acre Fair Oaks Development	PartnerTulsa
PROJECT NUMBER	**LOCATION**
023-04565	Tulsa, Oklahoma

Split Spoon ☒ Rock Core ▮

LAT: 36.122388 **LONG**: -95.749538
APPROX. SURFACE ELEV. (ft): 675.0

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
675			0								
	ROOT ZONE *0.3'*										
	3-inches thick			SS 1		3-4-50/4.8"		23.5			
	LEAN CLAY										
	dark gray and brown; moist; few gravel; hard *3.0'*										
	CHERTY LIMESTONE										
670	*light gray; dry; hard* *4.5'*		5	RC 2							Recovery 100.0% RQD 13.0%
	SHALE										
	dark gray to light gray; dry; hard			RC 3			316.0	3.0	154.9		Recovery 75.0% RQD 31.7%
665	*10.0'*		10								
	LIMESTONE										
	light gray to dark gray; dry; hard			RC 4			559.0	0.2	166.7		Recovery 78.3% RQD 78.3%
660	*15.0'*		15								

BASE OF BORING AT 15.0 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ Not Encountered
IAD	▼ Not Encountered
AD	▼ Not Performed

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

STARTED:	7/27/23	FINISHED:	7/27/23
DRILL CO.:	AIMRIGHT	DRILL RIG:	ATV
DRILLER:	P. SCARBOR	LOGGED BY:	E. THOM
METHOD: CONTINUOUS FLIGHT AUGER			

BOREHOLE REPORT NO. B-02

Sheet 1 of 1

PROJECT NAME	CLIENT
542 Acre Fair Oaks Development	PartnerTulsa
PROJECT NUMBER	**LOCATION**
023-04565	Tulsa, Oklahoma

Shelby Tube Split Spoon

LAT: 36.120928 **LONG**: -95.738372
APPROX. SURFACE ELEV. (ft): 690.0

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
690	0	***ROOT ZONE*** *0.3'*									
		4-inches thick		U 1	CH		1.1	25.6	93.4	61/34	
		FAT CLAY									
		brown and gray; moist; soft to stiff									
685	5			SS 2	CH	2-1-3 N=4		28.1		59/39	
				SS 3		3-4-6 N=10					
		8.0'									
		LEAN CLAY WITH SAND									
680	10	*brown and gray; slightly moist to wet; very stiff*		SS 4		10-11-14 N=25		12.3			P-200 = 78.8%
		13.0'									
		WEATHERED SHALE WITH LIMESTONE SEAMS		SS 5		42-50/2.5"		12.3			
675	15	*brown to gray; slightly moist to wet; hard*									
				SS 6		50/1"					
670	20										
				SS 7		50/1.5"					
665	25	*25.0'*									

BASE OF BORING AT 25.0 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ 13.0 ft
IAD	▼ 10.0 ft
AD	▼ Not Performed

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

STARTED:	7/25/23	FINISHED:	7/25/23
DRILL CO.:	AIMRIGHT	DRILL RIG:	ATV
DRILLER:	P. SCARBOR	LOGGED BY:	E. THOM
METHOD: CONTINUOUS FLIGHT AUGER			

BOREHOLE REPORT NO. B-03

Sheet 1 of 1

PROJECT NAME	CLIENT
542 Acre Fair Oaks Development	PartnerTulsa
PROJECT NUMBER	**LOCATION**
023-04565	Tulsa, Oklahoma

Split Spoon ▪ Shelby Tube

LAT: 36.122951 **LONG**: -95.743159
APPROX. SURFACE ELEV. (ft): 680.0

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
680			0								
	ROOT ZONE *0.3'*										
	3-inches thick										
	LEAN CLAY			SS 1		2-2-3 N=5		25.3			P-200 = 93.9%
	brown and gray; moist; few sand; medum stiff to stiff										
675			5	SS 2		4-6-6 N=12					
	6.0'										
	COAL			U 3	ML			22.0		47/18	
	dark brown to black; moist *7.5'*										
	WEATHERED SHALE										
	▽ *dark gray; moist to wet; hard*			SS 4		15-30-50/2.5"					
670	*10.0'*		10								
	LIMESTONE *10.5'*										
	dark gray; dry										

REFUSAL AT 10.5 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ 9.0 ft
IAD	▼ Not Encountered
AD	▼ Not Performed

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

STARTED:	7/25/23	FINISHED:	7/25/23
DRILL CO.:	AIMRIGHT	DRILL RIG:	ATV
DRILLER:	P. SCARBOR	LOGGED BY:	E. THOM
METHOD: CONTINUOUS FLIGHT AUGER			

BOREHOLE REPORT NO. B-04

Sheet 1 of 1

PROJECT NAME: **542 Acre Fair Oaks Development**	CLIENT: **PartnerTulsa**
PROJECT NUMBER: **023-04565**	LOCATION: **Tulsa, Oklahoma**

LAT: 36.124538 **LONG**: -95.738084
APPROX. SURFACE ELEV. (ft): 675.0

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
675	0	***ROOT ZONE*** *0.3'*								
		4-inches thick								
		LEAN CLAY	U 1	CL		1.1	20.3	107.0	44/24	P-200 = 85.6%
		brown and gray; moist; few sand; hard								
670	5		SS 2		3-35-28 N=63					
			SS 3	CL	8-16-23 N=39		20.2		41/27	
		9.0'								
665	10	***WEATHERED SHALE WITH LIMESTONE SEAMS***	SS 4		14-24-34 N=58					
		gray to light gray; moist to wet; hard								
			SS 5		50/3.8"					
660	15									
			SS 6		50/1.5"					
655	20									
			SS 7		50/0.8"					
650	25	***25.0'***								

BASE OF BORING AT 25.0 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ 12.5 ft
IAD	▼ 11.0 ft
AD	▼ Not Performed

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

STARTED:	7/27/23	FINISHED:	7/27/23
DRILL CO.:	AIMRIGHT	DRILL RIG:	ATV
DRILLER:	P. SCARBOR	LOGGED BY:	E. THOM
METHOD: CONTINUOUS FLIGHT AUGER			

BOREHOLE REPORT NO. B-05

Sheet 1 of 1

PROJECT NAME: 542 Acre Fair Oaks Development	CLIENT: PartnerTulsa
PROJECT NUMBER: 023-04565	LOCATION: Tulsa, Oklahoma

LAT: 36.127466 **LONG**: -95.736921
APPROX. SURFACE ELEV. (ft): 685.0

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
685	***ROOT ZONE*** *0.3'*		0								
	4-inches thick			SS 1	CH	5-6-6 N=12		21.2		58/29	
	FAT CLAY										
	reddish brown; moist; stiff *3.5'*										
680	***LEAN CLAY***		5	SS 2		6-8-7 N=15		17.3			
	brown and gray; slightly moist to wet; stiff to hard										
	▽			SS 3		8-14-16 N=30		12.0			
	8.5'										
	WEATHERED SANDSTONE WITH INTERBEDDED SHALE			SS 4		50/5.8"					
675	*10.0'*		10								
	gray and light gray; moist to wet; hard										
	HIGHLY WEATHERED SHALE										
	gray; moist to wet; hard										
670			15	SS 5		34-18-17 N=35					
	18.5'										
	WEATHERED SHALE WITH LIMESTONE SEAMS			SS 6		50/1.8"					
665			20								
	gray to light gray; moist to wet; hard										
				SS 7		50/1.3"					
660	*25.0'*		25								

BASE OF BORING AT 25.0 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ 7.5 ft
IAD	▼ Not Encountered
AD	▼ Not Performed

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

STARTED:	7/25/23	FINISHED:	7/25/23
DRILL CO.:	AIMRIGHT	DRILL RIG:	ATV
DRILLER:	P. SCARBOR	LOGGED BY:	E. THOM
METHOD: CONTINUOUS FLIGHT AUGER			

BOREHOLE REPORT NO. B-06

Sheet 1 of 1

PROJECT NAME	CLIENT
542 Acre Fair Oaks Development	PartnerTulsa
PROJECT NUMBER	**LOCATION**
023-04565	Tulsa, Oklahoma

Split Spoon ☒ Shelby Tube ■

LAT: 36.130047 **LONG**: -95.734216
APPROX. SURFACE ELEV. (ft): 680.5

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
680	***ROOT ZONE*** *0.3'* *4-inches thick* ***LEAN CLAY*** *dark brown to brown and gray; moist; soft to stiff*		0	SS 1	CL	3-2-2 N=4		18.0		31/14	
				SS 2		2-3-4 N=7		18.3			
675			5	U 3	CL		1.9	19.4	107.5	40/24	
	WEATHERED SANDSTONE WITH INTERBEDDED SHALE *8.5'* *brown and light gray; moist; hard* *10.0'*		10	SS 4		50/4.5"					
670	***WEATHERED SHALE WITH LIMESTONE AND SANDSTONE SEAMS*** *gray and brown; moist to wet; hard*			SS 5		50/2"					
665	▽		15								
				SS 6		50/1.8"					
660			20								
				SS 7		50/1.3"					
	25.0'		25								

BASE OF BORING AT 25.0 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ 18.0 ft
IAD	▼ Not Encountered
AD	▼ Not Performed

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

STARTED:	7/25/23	FINISHED:	7/25/23
DRILL CO.:	AIMRIGHT	DRILL RIG:	ATV
DRILLER:	P. SCARBOR	LOGGED BY:	E. THOM
METHOD: CONTINUOUS FLIGHT AUGER			

BOREHOLE REPORT NO. B-07

Sheet 1 of 1

PROJECT NAME: 542 Acre Fair Oaks Development	CLIENT: PartnerTulsa
PROJECT NUMBER: 023-04565	LOCATION: Tulsa, Oklahoma

Split Spoon ☒ Shelby Tube ■

LAT: 36.132439 **LONG**: -95.737193
APPROX. SURFACE ELEV. (ft): 670.0

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" N-VALUE	UNC. STR. (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
670	0	***ROOT ZONE*** *0.3'*								
		4-inches thick								
		SANDY SILTY LEAN CLAY	SS 1		2-3-3 N=6		18.0			P-200 = 67.1%
		dark brown; slightly moist to moist; medium stiff								
665	5	*5.0'*	U 2	CL-ML			11.9		27/7	
		LEAN CLAY								
		brown and gray; moist; few sand; hard	SS 3		12-17-26 N=43		18.7			
660	10		SS 4	CL	12-13-17 N=30		17.0		42/17	P-200 = 86.1%
		13.5'								
		WEATHERED SHALE WITH LIMESTONE SEAMS	SS 5		50/4"					
655	15	*light gray; moist to wet; hard*								
		▽								
			SS 6		50/1.3"					
650	20									
		▼	SS 7		50/1"					
645	25	*25.0'*								

BASE OF BORING AT 25.0 FEET

WATER LEVEL OBSERVATIONS	
WD	▽ 16.0 ft
IAD	▼ 24.0 ft
AD	▼ Not Performed

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

STARTED:	7/25/23	FINISHED:	7/25/23
DRILL CO.:	AIMRIGHT	DRILL RIG:	ATV
DRILLER:	P. SCARBOR	LOGGED BY:	E. THOM
METHOD: CONTINUOUS FLIGHT AUGER			

olsson

Project #:	023-04565
Date:	8/10/2023

Project Name: 542 Acre Fair Oaks Development
Site Location Tulsa, Oklahoma

GEO-ID:		B-01	Core Run No.:	1	Core Run No.:	2	Core Run No.:	3
			Depth:	3.5-5.0'	Depth:	5.0-10.0	Depth:	10.0-15.0
GPS Location:	Latitude:	36.12239	Recovery (%):	100.0%	Recovery (%):	75.0%	Recovery (%):	78.3%
	Longitude:	-95.74954	RQD (%):	13.0%	RQD (%):	31.7%	RQD (%):	78.3%

APPENDIX B
Laboratory Test Results

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

SUMMARY OF LABORATORY RESULTS

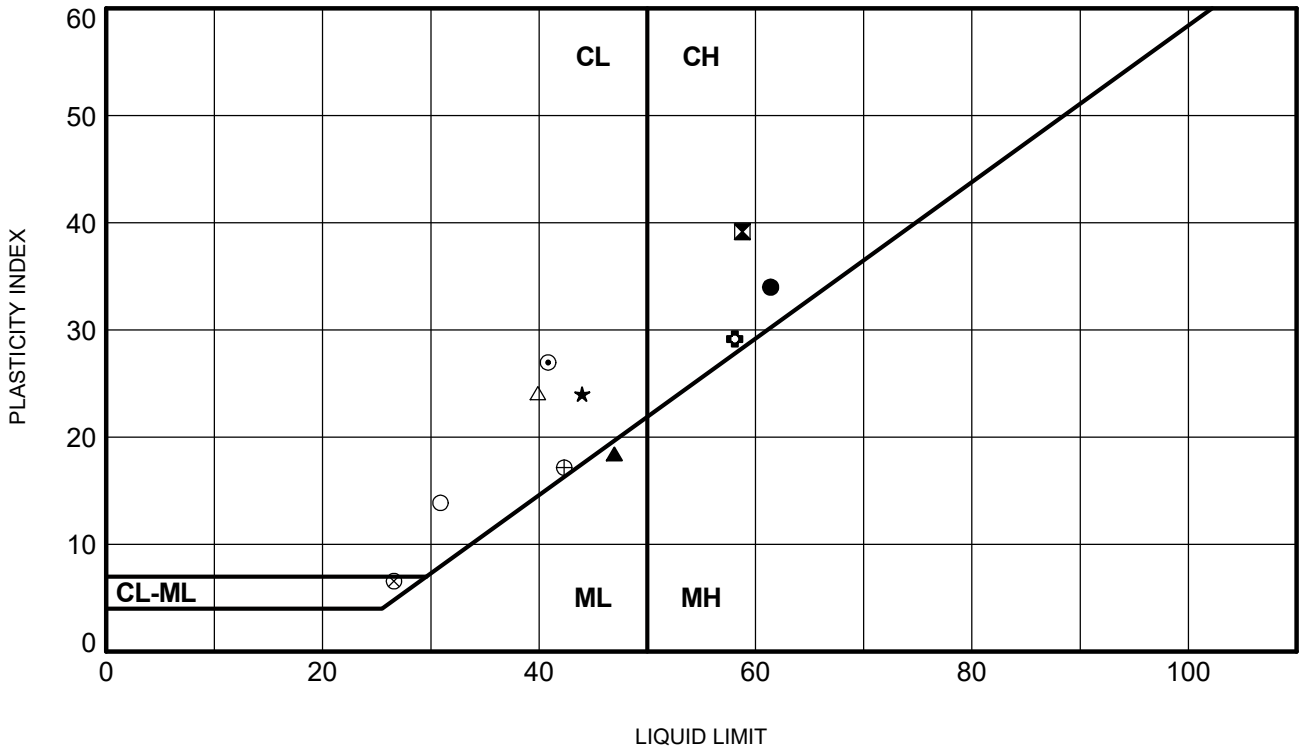
PROJECT NAME: 542 Acre Fair Oaks Development
PROJECT NUMBER: 023-04565
CLIENT: PartnerTulsa
PROJECT LOCATION: Tulsa, Oklahoma

BORING NUMBER	SAMPLE I.D.	SAMPLE DEPTH (ft)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	SATURATION (%)	UNCONFINED STRENGTH (tsf)	STRAIN (%)	ATTERBERG LIMITS			P-200	USCS CLASS.
									LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX		
B-01	SS-1	1.0 - 2.4'	23.5										
B-01	RC-3	5.0 - 10.0'	3.0	154.9	0.088	93.0	316.0						
B-01	RC-4	10.0 - 15.0'	0.2	166.7	0.011	35.9	559.0						
B-02	U-1	1.0 - 3.0'	25.6	93.4	0.805	85.8	1.1	5.4	61	27	34		CH
B-02	SS-2	3.5 - 5.0'	28.1						59	20	39		CH
B-02	SS-4	8.5 - 10.0'	12.3									78.8	
B-02	SS-5	13.5 - 14.2'	12.3										
B-03	SS-1	1.0 - 2.5'	25.3									93.9	
B-03	U-3	6.0 - 6.8'	22.0						47	29	18		ML
B-04	U-1	1.0 - 3.0'	20.3	107.0	0.575	95.2	1.1	6.6	44	20	24	85.6	CL
B-04	SS-3	6.0 - 7.5'	20.2						41	14	27		CL
B-05	SS-1	1.0 - 2.5'	21.2						58	29	29		CH
B-05	SS-2	3.5 - 5.0'	17.3										
B-05	SS-3	6.0 - 7.5'	12.0										
B-06	SS-1	1.0 - 2.5'	18.0						31	17	14		CL
B-06	SS-2	3.5 - 5.0'	18.3										
B-06	U-3	6.0 - 8.0'	19.4	107.5	0.568	92.3	1.9	5.5	40	16	24		CL
B-07	SS-1	1.0 - 2.5'	18.0									67.1	
B-07	U-2	3.5 - 4.4'	11.9						27	20	7		CL-ML
B-07	SS-3	6.0 - 7.5'	18.7										
B-07	SS-4	8.5 - 10.0'	17.0						42	25	17	86.1	CL

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

ATTERBERG LIMITS RESULTS

PROJECT NAME: 542 Acre Fair Oaks Development **CLIENT:** PartnerTulsa
PROJECT NUMBER: 023-04565 **PROJECT LOCATION:** Tulsa, Oklahoma



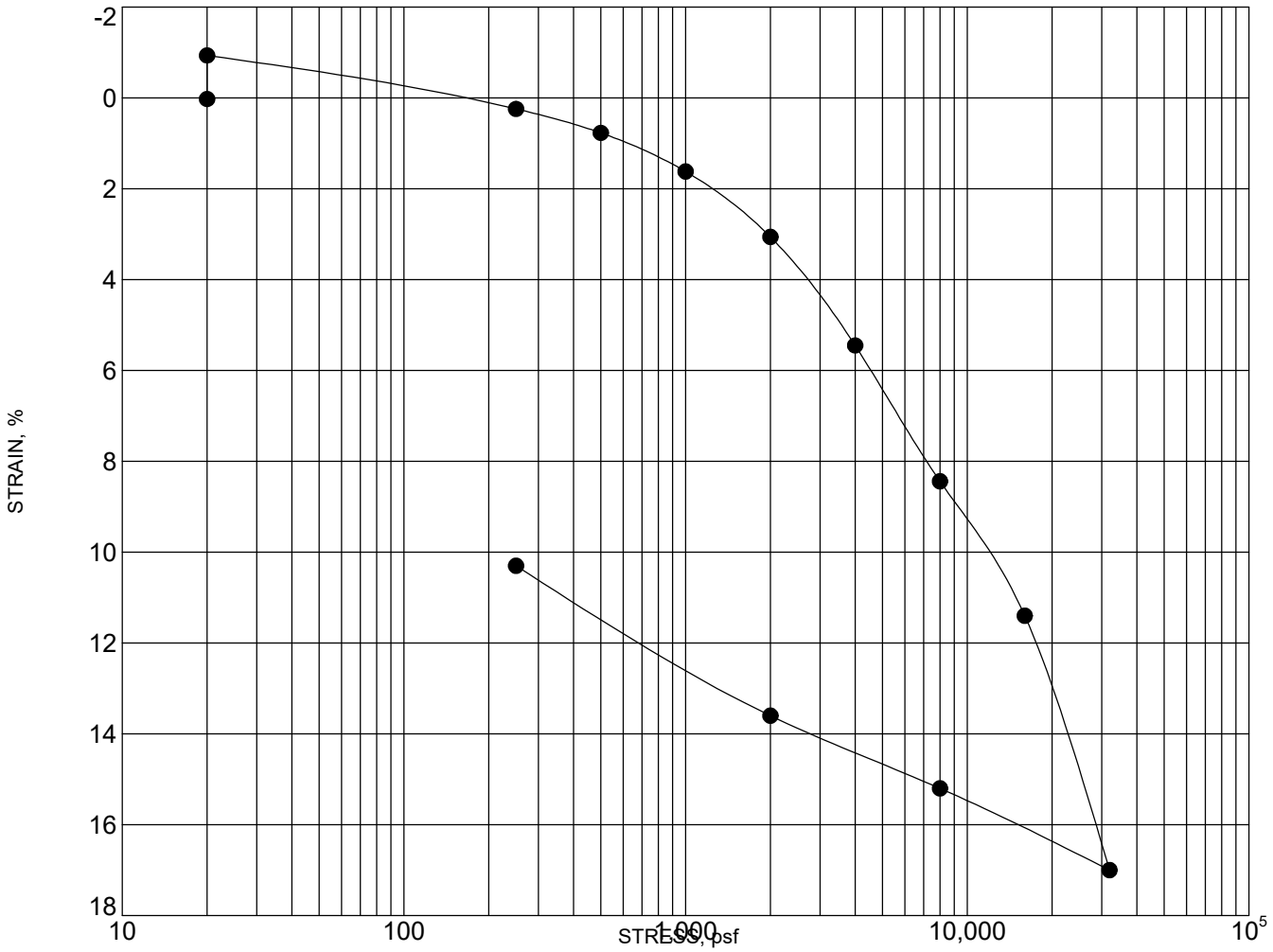
Boring No.	Sample ID	Depth (ft)	Liquid Limit (%)	Plastic Limit (%)	Plastic Index (%)	Fines (%)	Classification (USCS)
● B-02	U-1	1.0 - 3	61	27	34		CH
⊠ B-02	SS-2	3.5 - 5	59	20	39		CH
▲ B-03	U-3	6.0 - 6.792	47	29	18		ML
★ B-04	U-1	1.0 - 3	44	20	24	85.6	CL
⊙ B-04	SS-3	6.0 - 7.5	41	14	27		CL
✿ B-05	SS-1	1.0 - 2.5	58	29	29		CH
○ B-06	SS-1	1.0 - 2.5	31	17	14		CL
△ B-06	U-3	6.0 - 8	40	16	24		CL
⊗ B-07	U-2	3.5 - 4.375	27	20	7		CL-ML
⊕ B-07	SS-4	8.5 - 10	42	25	17	86.1	CL

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

SWELL TEST

PROJECT NAME: 542 Acre Fair Oaks Development **CLIENT:** PartnerTulsa

PROJECT NUMBER: 023-04565 **PROJECT LOCATION:** Tulsa, Oklahoma



Boring No:	B-02	Initial Water Content (%):	27.4	Est. Preconsolidation Stress (tsf):	3.1
Sample ID:	U-1	Final Water Content (%):	26.4	Laboratory Water Type:	Tap Water
Sample Depth:	1.0 - 3.0'	Initial Dry Density (pcf):	91.4	Test Procedure Method:	B
Start Date:	08/14	Initial Void Ratio:	0.840	Interpretation Procedure:	NA
Technician:	VT	Final Void Ratio:	0.710	Stress at Inundation (tsf):	0.01
Apparatus:	NA	Initial Degree of Saturation (%):	87.7	Specimen Trimming Method:	Cutting Shoe
Specific Gravity:	2.7	Final Degree of Saturation (%):	100.3		

ATTERBERG LIMITS

LL	PL	PI	Classification
61	**27**		**CH**

Sample Description: Dark Brown, Fat Clay (CH)

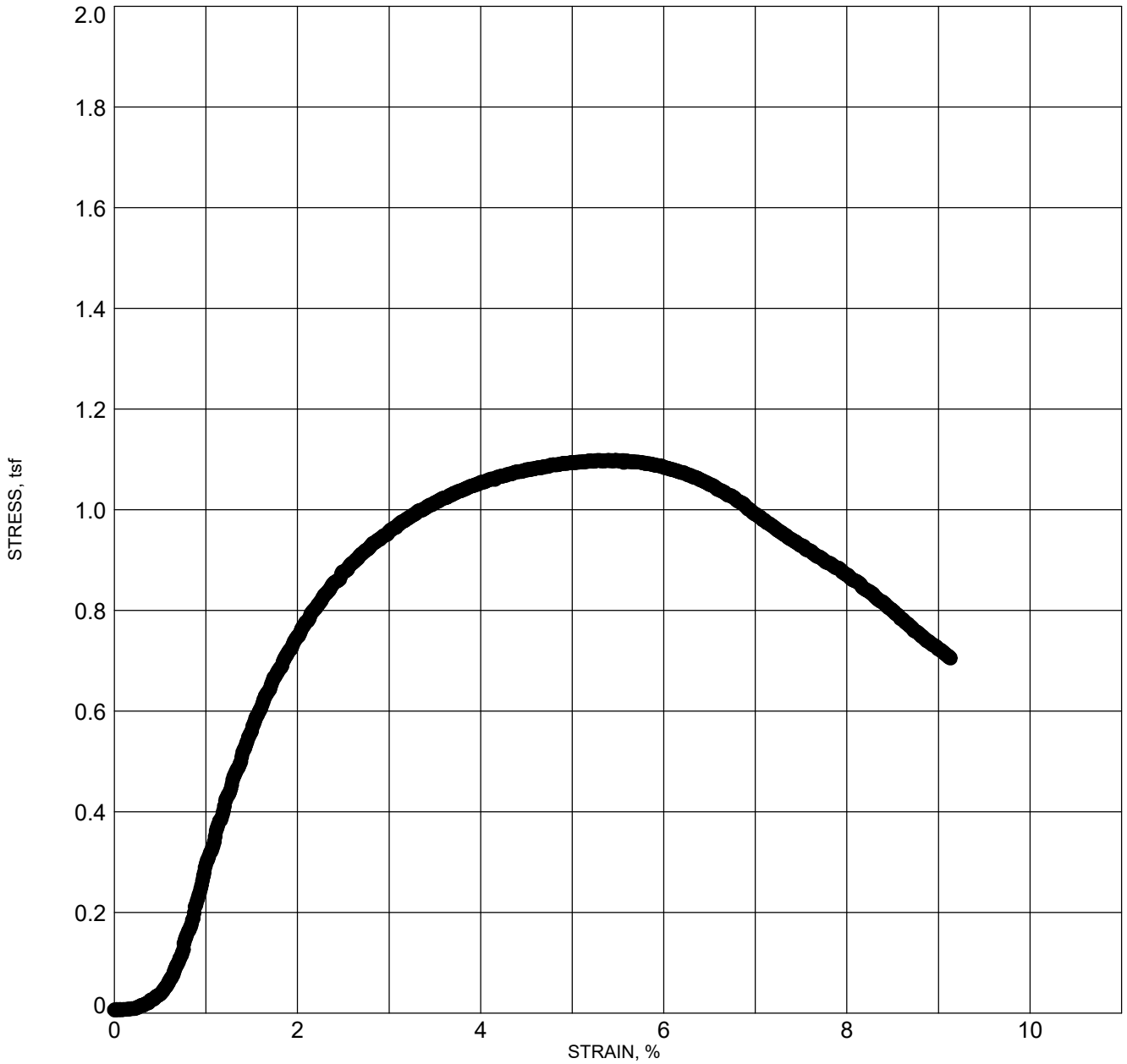
Notes: Swell Percent: 0.92% Swell Pressure: 175 psf

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

UNCONFINED COMPRESSION TEST

PROJECT NAME: 542 Acre Fair Oaks Development **CLIENT:** PartnerTulsa

PROJECT NUMBER: 023-04565 **PROJECT LOCATION:** Tulsa, Oklahoma



Boring No: B-02 Sample Height (ft): 5.6 Unconfined Strength (tsf): 1.1

Sample ID: U-1 Sample Diameter (ft): 2.8 Strain at Failure (%): 5.4

Sample Depth (ft): 1.0 - 3.0' Height to Diameter Ratio: 2:1

Initial Dry Density (pcf): 93.4 Degree of Saturation (%): 85.8

Initial Water Content (%): 25.6 Void Ratio: 0.805

Sample Break:

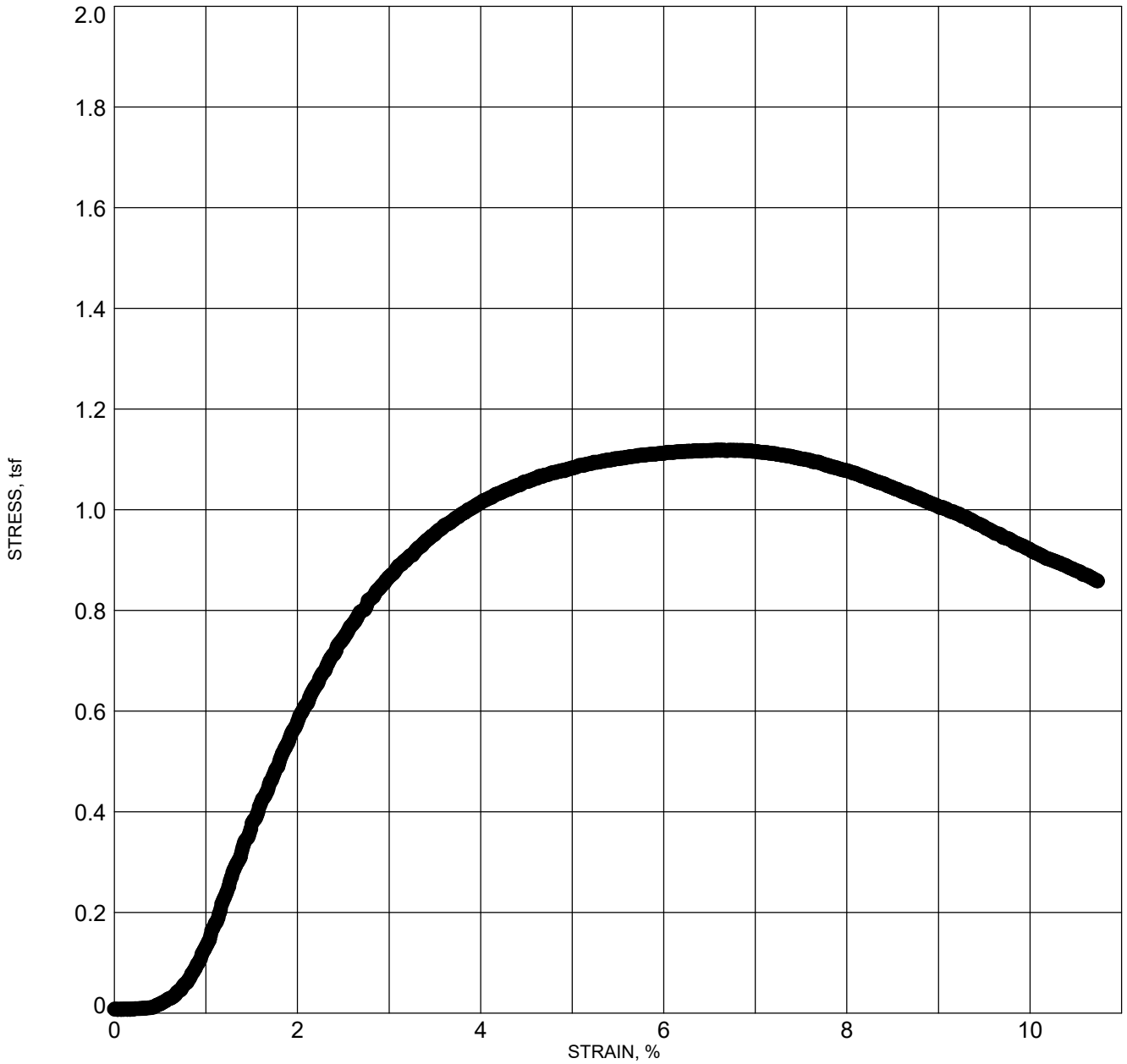
Sample Description: Brown and Gray, Fat Clay (CH)

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

UNCONFINED COMPRESSION TEST

PROJECT NAME: 542 Acre Fair Oaks Development **CLIENT:** PartnerTulsa

PROJECT NUMBER: 023-04565 **PROJECT LOCATION:** Tulsa, Oklahoma



Boring No: B-04 Sample Height (ft): 5.6 Unconfined Strength (tsf): 1.1

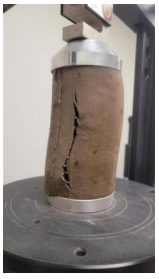
Sample ID: U-1 Sample Diameter (ft): 2.9 Strain at Failure (%): 6.6

Sample Depth (ft): 1.0 - 3.0' Height to Diameter Ratio: 1.9:1

Initial Dry Density (pcf): 107.0 Degree of Saturation (%): 95.2

Initial Water Content (%): 20.3 Void Ratio: 0.575

Sample Break:



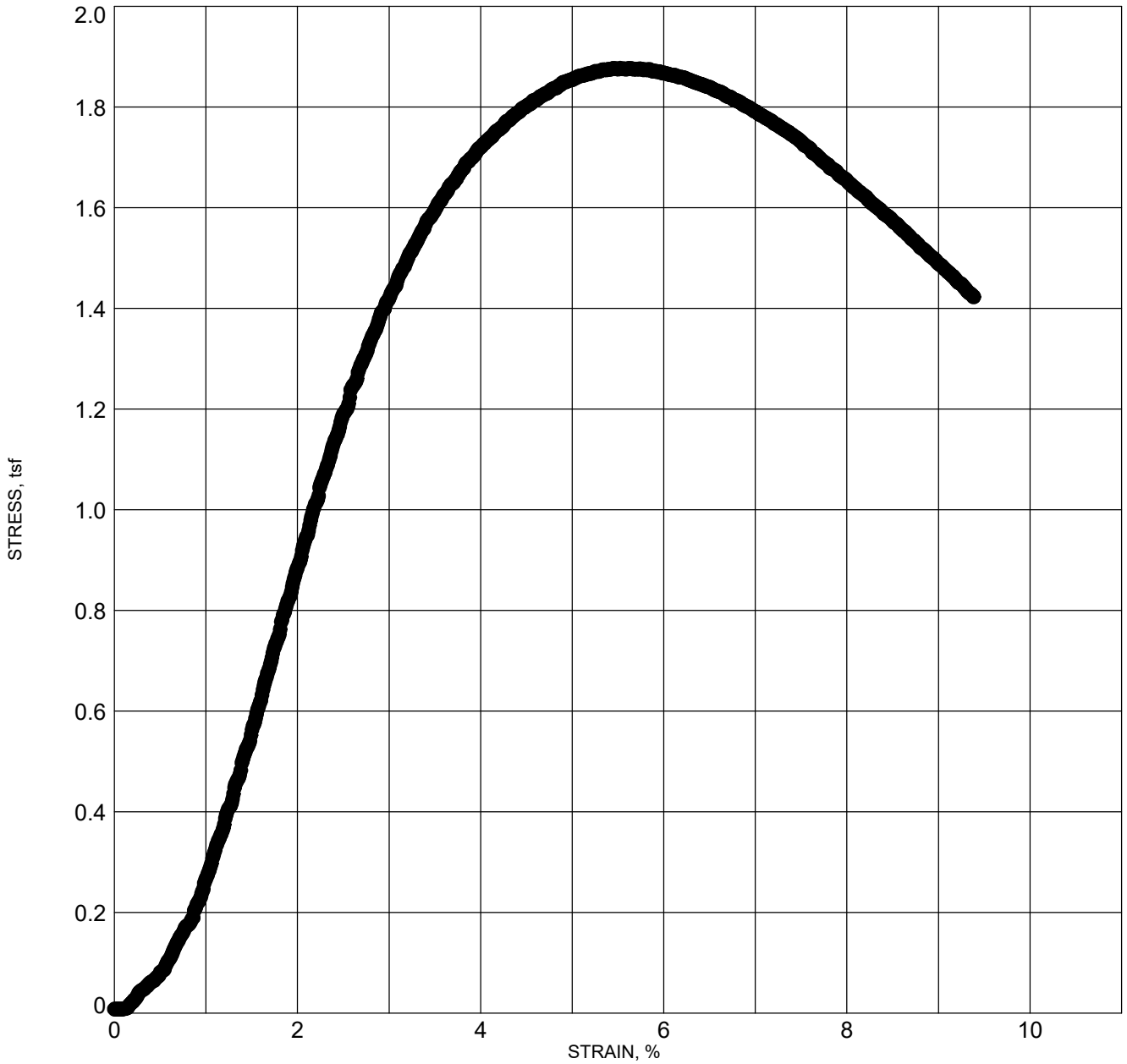
Sample Description: Brown and Gray, Lean Clay (CL)

OLSSON, INC.
9500 POLE ROAD
OKLAHOMA CITY, OK 73160

UNCONFINED COMPRESSION TEST

PROJECT NAME: 542 Acre Fair Oaks Development **CLIENT:** PartnerTulsa

PROJECT NUMBER: 023-04565 **PROJECT LOCATION:** Tulsa, Oklahoma



Boring No: B-06 Sample Height (ft): 5.6 Unconfined Strength (tsf): 1.9

Sample ID: U-3 Sample Diameter (ft): 2.9 Strain at Failure (%): 5.5

Sample Depth (ft): 6.0 - 8.0' Height to Diameter Ratio: 2:1 Sample Break:

Initial Dry Density (pcf): 107.5 Degree of Saturation (%): 92.3

Initial Water Content (%): 19.4 Void Ratio: 0.568

Sample Description: Dark Brown to Brown and Gray, Lean Clay (CL)

Laboratory Analytical Report

ENVIRONMENTAL TESTING, INC.
4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

18 August 2023

Mr. Wyat Grooms

Olsson Associates
9500 Pole Rd.
Moore, OK 73160

WO: E3H0224
RE: Tulsa, OK

Enclosed are the results of analyses for samples received by the laboratory on 8/10/2023. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Russell Britten

President

Original (P)

ENVIRONMENTAL TESTING, INC.

4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

Olsson Associates	Project: Tulsa, OK	
9500 Pole Rd.	Project Number: 023-04565	**Reported:**
Moore OK, 73160	Project Manager: Mr. Wyat Grooms	08/18/23 07:57

B-01 SS-1 1.0-2.4

E3H0224-01 (Solid) - Sampled: 08/10/23 00:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Qualifiers
Conventional Chemistry Parameters by EPA Methods									
pH	**7.60**		pH Units	1	ELH0491	MNM	08/17/23 08:51	EPA 9045D 2004	H-03
Conventional Chemistry Parameters by Standard Methods									
***x* Resistivity**	**135**	1.00	ohms.cm	1	ELH0447	MNM	08/16/23 12:12	SM 2510 B Mod	
***x* Temperature**	**19.3**		°C	1	ELH0447	MNM	08/16/23 12:12	SM 2550 B-2000	H-03
Anions by EPA Method 300.0									
Chloride	<16.0	16.0	mg/Kg	10	ELH0439	MNM	08/16/23 13:58	EPA 300.0 1993	
Sulfate as SO4	**3210**	150	mg/Kg	50	ELH0439	MNM	08/16/23 18:59	EPA 300.0 1993	T-01

Environmental Testing, Inc.

Russell Britten, President

The results in this report apply to the samples analyzed in accordance with the chain of custody document and meet all laboratory accreditation requirements unless noted otherwise. This analytical report must be reproduced in its entirety.

ENVIRONMENTAL TESTING, INC.

4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

Olsson Associates	Project: Tulsa, OK	
9500 Pole Rd.	Project Number: 023-04565	**Reported:**
Moore OK, 73160	Project Manager: Mr. Wyat Grooms	08/18/23 07:57

B-02 SS-2 3.5-5.0

E3H0224-02 (Solid) - Sampled: 08/10/23 00:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Qualifiers
Conventional Chemistry Parameters by EPA Methods									
pH	**5.83**		pH Units	1	ELH0491	MNM	08/17/23 08:51	EPA 9045D 2004	H-03
Conventional Chemistry Parameters by Standard Methods									
***x* Resistivity**	**3690**	1.00	ohms.cm	1	ELH0447	MNM	08/16/23 12:12	SM 2510 B Mod	
***x* Temperature**	**19.2**		°C	1	ELH0447	MNM	08/16/23 12:12	SM 2550 B-2000	H-03
Anions by EPA Method 300.0									
Chloride	**7.52**	1.60	mg/Kg	1	ELH0439	MNM	08/16/23 14:55	EPA 300.0 1993	
Sulfate as SO4	**105**	3.00	mg/Kg	1	ELH0439	MNM	08/16/23 14:55	EPA 300.0 1993	T-01

Environmental Testing, Inc.

Russell Britten, President

The results in this report apply to the samples analyzed in accordance with the chain of custody document and meet all laboratory accreditation requirements unless noted otherwise. This analytical report must be reproduced in its entirety.

ENVIRONMENTAL TESTING, INC.

4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

Olsson Associates	Project: Tulsa, OK	
9500 Pole Rd.	Project Number: 023-04565	**Reported:**
Moore OK, 73160	Project Manager: Mr. Wyat Grooms	08/18/23 07:57

B-04 SS-2 3.5-5.0

E3H0224-03 (Solid) - Sampled: 08/10/23 00:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Qualifiers
Conventional Chemistry Parameters by EPA Methods									
pH	**7.03**		pH Units	1	ELH0491	MNM	08/17/23 08:51	EPA 9045D 2004	H-03
Conventional Chemistry Parameters by Standard Methods									
***x* Resistivity**	**5100**	1.00	ohms.cm	1	ELH0447	MNM	08/16/23 12:12	SM 2510 B Mod	
***x* Temperature**	**18.9**		°C	1	ELH0447	MNM	08/16/23 12:12	SM 2550 B-2000	H-03
Anions by EPA Method 300.0									
Chloride	**3.70**	1.60	mg/Kg	1	ELH0439	MNM	08/16/23 15:14	EPA 300.0 1993	
Sulfate as SO4	**28.9**	3.00	mg/Kg	1	ELH0439	MNM	08/16/23 15:14	EPA 300.0 1993	T-01

Environmental Testing, Inc.

Russell Britten, President

The results in this report apply to the samples analyzed in accordance with the chain of custody document and meet all laboratory accreditation requirements unless noted otherwise. This analytical report must be reproduced in its entirety.

ENVIRONMENTAL TESTING, INC.

4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

Olsson Associates	Project: Tulsa, OK	
9500 Pole Rd.	Project Number: 023-04565	**Reported:**
Moore OK, 73160	Project Manager: Mr. Wyat Grooms	08/18/23 07:57

B-05 SS-2 3.5-5.0

E3H0224-04 (Solid) - Sampled: 08/10/23 00:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Qualifiers
Conventional Chemistry Parameters by EPA Methods									
pH	**6.65**		pH Units	1	ELH0491	MNM	08/17/23 08:51	EPA 9045D 2004	H-03
Conventional Chemistry Parameters by Standard Methods									
***x* Resistivity**	**7700**	1.00	ohms.cm	1	ELH0447	MNM	08/16/23 12:12	SM 2510 B Mod	
***x* Temperature**	**19.5**		°C	1	ELH0447	MNM	08/16/23 12:12	SM 2550 B-2000	H-03
Anions by EPA Method 300.0									
Chloride	**5.46**	1.60	mg/Kg	1	ELH0439	MNM	08/16/23 15:32	EPA 300.0 1993	
Sulfate as SO4	**49.2**	3.00	mg/Kg	1	ELH0439	MNM	08/16/23 15:32	EPA 300.0 1993	T-01

Environmental Testing, Inc.

Russell Britten, President

The results in this report apply to the samples analyzed in accordance with the chain of custody document and meet all laboratory accreditation requirements unless noted otherwise. This analytical report must be reproduced in its entirety.

ENVIRONMENTAL TESTING, INC.

4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

Olsson Associates	Project: Tulsa, OK	
9500 Pole Rd.	Project Number: 023-04565	**Reported:**
Moore OK, 73160	Project Manager: Mr. Wyat Grooms	08/18/23 07:57

B-07 SS-1 1.0-2.5

E3H0224-05 (Solid) - Sampled: 08/10/23 00:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Qualifiers
Conventional Chemistry Parameters by EPA Methods									
pH	**6.24**		pH Units	1	ELH0491	MNM	08/17/23 08:51	EPA 9045D 2004	H-03
Conventional Chemistry Parameters by Standard Methods									
***x* Resistivity**	**5360**	1.00	ohms.cm	1	ELH0447	MNM	08/16/23 12:12	SM 2510 B Mod	
***x* Temperature**	**19.6**		°C	1	ELH0447	MNM	08/16/23 12:12	SM 2550 B-2000	H-03
Anions by EPA Method 300.0									
Chloride	**2.56**	1.60	mg/Kg	1	ELH0439	MNM	08/16/23 15:51	EPA 300.0 1993	
Sulfate as SO4	**53.7**	3.00	mg/Kg	1	ELH0439	MNM	08/16/23 15:51	EPA 300.0 1993	T-01

Environmental Testing, Inc.

Russell Britten, President

The results in this report apply to the samples analyzed in accordance with the chain of custody document and meet all laboratory accreditation requirements unless noted otherwise. This analytical report must be reproduced in its entirety.

ENVIRONMENTAL TESTING, INC.

4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

Olsson Associates	Project: Tulsa, OK	
9500 Pole Rd.	Project Number: 023-04565	**Reported:**
Moore OK, 73160	Project Manager: Mr. Wyat Grooms	08/18/23 07:57

QUALITY CONTROL

Conventional Chemistry Parameters by EPA Methods
Environmental Testing, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifiers
Batch ELH0491 - General Prep - Wet Chem (Sd)										
LCS (ELH0491-BS1)				**Prepared & Analyzed: 08/17/23**						
pH	7.05		pH Units	7.000		101	99-101			
Duplicate (ELH0491-DUP1)		**Source: E3H0224-05**		**Prepared & Analyzed: 08/17/23**						
pH	6.08		pH Units		6.24			3	20	

ENVIRONMENTAL TESTING, INC.

4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

Olsson Associates	Project: Tulsa, OK	
9500 Pole Rd.	Project Number: 023-04565	**Reported:**
Moore OK, 73160	Project Manager: Mr. Wyat Grooms	08/18/23 07:57

QUALITY CONTROL

Conventional Chemistry Parameters by Standard Methods
Environmental Testing, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifiers
Batch ELH0447 - General Prep - Wet Chem (Sd)										
LCS (ELH0447-BS1)				**Prepared & Analyzed: 08/16/23**						
Resistivity	7110	10.0	ohms.cm	7077		100	80-120			
Duplicate (ELH0447-DUP1)		**Source: E3H0217-02**		**Prepared & Analyzed: 08/16/23**						
Resistivity	18200	10.0	ohms.cm		18400			0.9	20	

Environmental Testing, Inc.

Russell Britten, President

The results in this report apply to the samples analyzed in accordance with the chain of custody document and meet all laboratory accreditation requirements unless noted otherwise. This analytical report must be reproduced in its entirety.

ENVIRONMENTAL TESTING, INC.

4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

Olsson Associates	Project: Tulsa, OK	
9500 Pole Rd.	Project Number: 023-04565	**Reported:**
Moore OK, 73160	Project Manager: Mr. Wyat Grooms	08/18/23 07:57

QUALITY CONTROL

Anions by EPA Method 300.0
Environmental Testing, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifiers
Batch ELH0439 - General Prep - Wet Chem (Sd)										
Blank (ELH0439-BLK1)				**Prepared & Analyzed: 08/16/23**						
Chloride	<1.60	1.60	mg/Kg							
Sulfate as SO4	<3.00	3.00	mg/Kg							
LCS (ELH0439-BS1)				**Prepared & Analyzed: 08/16/23**						
Chloride	5.66	1.60	mg/Kg	6.000		94	90-110			
Sulfate as SO4	28.6	3.00	mg/Kg	30.00		95	90-110			
Matrix Spike (ELH0439-MS1)		**Source: E3H0224-01RE1**		**Prepared & Analyzed: 08/16/23**						
Chloride	60.8	16.0	mg/Kg	60.00	ND	101	80-120			
Sulfate as SO4	4210	30.0	mg/Kg	300.0	3810	134	80-120			M-05
Matrix Spike Dup (ELH0439-MSD1)		**Source: E3H0224-01RE1**		**Prepared & Analyzed: 08/16/23**						
Chloride	61.8	16.0	mg/Kg	60.00	ND	103	80-120	2	20	
Sulfate as SO4	4210	30.0	mg/Kg	300.0	3810	134	80-120	0.01	20	M-05

Environmental Testing, Inc.

Russell Britten, President

The results in this report apply to the samples analyzed in accordance with the chain of custody document and meet all laboratory accreditation requirements unless noted otherwise. This analytical report must be reproduced in its entirety.

ENVIRONMENTAL TESTING, INC.

4619 N. Santa Fe Ave
Oklahoma City, OK 73118
405.488.2400 Phone
405.488.2404 Fax
www.etilab.com

Olsson Associates	Project: Tulsa, OK	
9500 Pole Rd.	Project Number: 023-04565	**Reported:**
Moore OK, 73160	Project Manager: Mr. Wyat Grooms	08/18/23 07:57

Non-Certified Analytes included in this Report

Analysis	Analyte
SM 2510 B Mod in Solid	Resistivity
SM 2550 B-2000 in Solid	Temperature

Certifications

Code	Description	Number	Expires
NELAP/OK	NELAP Accredited (ODEQ)	2022-089	08/31/2023
TCEQ	Texas Accedited (TCEQ)	T104704498-23-13	03/31/2024

Qualifiers and Definitions

Abbreviation	Description
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
x	Non-Certified analyte
NA	Not Applicable

Qualifier	Description
H-03	Sample was received and analyzed past the method holding time.
M-05	The matrix spike recovery was outside of control limits.
T-01	The sample was received outside of the regulatory temperature for this analysis.

Environmental Testing, Inc.

Russell Britten, President

The results in this report apply to the samples analyzed in accordance with the chain of custody document and meet all laboratory accreditation requirements unless noted otherwise. This analytical report must be reproduced in its entirety.

542 ACRE FAIR OAKS DEVELOPMENT

Tulsa, Oklahoma

September 2023

Olsson Project No. 023-04565