REPORT OF GEOTECHNICAL EXPLORATION
LXT TERMINAL BUILDING
LEE'S SUMMIT, MISSOURI

Presented to:

CRAWFORD, MURPHY & TILLY, INC. (CMT)
St. Louis, Missouri

Attn: Mr. Tyler Horn, P.E.

Prepared by:

Otto J. Kruger, Jr., P.E.

Kruger Technologies, Inc.
Lenexa, Kansas

KTI Project No. 224081G

May 30, 2024

KRUGER TECHNOLOGIES, INC.

GEOTECHNICAL ▪ ENVIRONMENTAL ▪ TESTING ▪ INSPECTION
8271 MELROSE DRIVE ▪ LENEXA, KANSAS 66214 ▪ VOICE 913-498-1114 ▪ FAX 913-498-1116 ▪ EMAIL KTIKC@KTIONLINE.COM

May 30, 2024

Mr. Tyler Horn, P.E.
Crawford Murphy & Tilly, Inc. (CMT)
1627 Main St., Suite 600
Kansas City, MO 64108

Re: KTI Project No. 224081G
LXT Terminal Building
Lee's Summit, Missouri

Dear Mr. Horn:

Kruger Technologies, Inc. (KTI) has completed the subsurface exploration and geotechnical report for the above referenced project. The purpose of this report is to describe the surface and subsurface conditions encountered at the site, analyze and evaluate this information, and prepare a summary of existing conditions, subsurface material characteristics, and give site specific geotechnical design recommendations.

We thank you for the opportunity to work with Crawford, Murphy & Tilly, Inc. If you have any questions, please contact us at 913.498.1114.

Respectfully submitted,
Kruger Technologies, Inc.

Otto J. Kruger, Jr., P.E.
Missouri P.E: 23994

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AUTHORIZATION

The following table presents the authorization documentation history for the work performed and presented in this report by Kruger Technologies, Inc.

Project: LXT Terminal Building – Lee's Summit, Missouri		
Document:	**Date:**	**Requested/Provided:**
Request for Proposal	4-17-24	Tyler Horn – Crawford, Murphy & Tilly, Inc. (CMT)
KTI Proposal 24GT077	4-22-24	Dylan Kruger - Kruger Technologies Inc.
Notice to Proceed	5-10-24	Tyler Horn – Crawford, Murphy & Tilly, Inc. (CMT)

PURPOSE AND SCOPE

The purpose of this investigation was to explore the surface and subsurface conditions present within the site and provide recommendations regarding the following:

- Seismic Considerations
- Site Preparation and Engineered Fill
- Shallow Foundations Bearing on Soil
- Slab on Grade
- Surface and Subsurface Drainage
- Excavation Considerations
- Trench Backfill Recommendations
- Manhole/Inlet Structure Backfill Recommendations

SITE CONDITIONS

The proposed Terminal Building site is located to the north of NE Leinweber Road, west of Hagen Road and directly east of the existing apron on the east side of Lee's Summit Municipal Airport in Lee's Summit, Missouri. At the time of field exploration, the site was mostly grass covered and had an elevation difference of approximately 1 to 3 feet.

PROJECT DESCRIPTION

We understand that the project consists of the design and construction of a 2-story 12,000 square foot LXT Terminal Building to be built within the limits of the east side development area of the existing airport in Lee's Summit, Missouri. Although no boring elevations were provided at the time of this report preparation, a proposed finish floor elevation (FF) for the building of 993.5 was provided. Based on the identified FF elevation, existing grades and adjacent improvements, it appears that minimal cut/fill activities will be necessary during mass grading.

FIELD EXPLORATION PROCEDURES

Five (5) test borings were completed on May 15, 2024. The borings were selected and field located by Kruger Technologies using site layout plans provided by the client. The boring locations are shown on an attached Boring Location Diagram.

The borings were drilled using a Geo Probe 6620 Track Unit. Advancement of the test holes was accomplished using 4-inch Hollow Stem augers. Soil sampling was performed by hydraulically pushing thin wall steel (Shelby) tubes and Standard Penetration Test (SPT).

Site soils were visually and manually classified in general accordance with ASTM D 2488 by the drill crew chief as drilling progressed. All of the soil samples were delivered to the laboratory for applicable testing and verification of the field classifications. The boring logs were created as the borings were advanced, and the logs were supplemented with information from the laboratory tests to present data concerning the depth and classification of the various strata, water levels, and other pertinent information. The boring logs are attached in Appendix I.

During advancement of the borings, groundwater was not encountered at any boring location. It should be noted that water level determinations made in relatively impervious (clay) soils might not present a reliable indication of the actual water table. However, water level determinations made in relatively pervious (sand/silt) soils are considered an accurate indication of the water table at the time that those measurements are made. Fluctuations in the water table should be expected with changing seasons and annual differences.

LABORATORY TESTS

Laboratory tests were performed on the recovered samples to determine the engineering characteristics and for additional verification of the field classifications in accordance with ASTM

D 2487. The results of these tests, including moisture/density, plasticity (Atterberg Limits), and unconfined compressive strength of soil are presented in Appendix II.

GEOLOGY/SUBSURFACE CONDITIONS

The site overburden consists of 6 to 12 inches of topsoil underlain by native soil materials. The majority of the upper 3 to 5 feet of native soils are comprised of high plasticity clays. In general, higher plasticity clays were found in the upper 1 to 5 feet and within the area of influence of the slabs-on-grade and the parking/drive surfaces. Below 5 feet from existing grade, the site native soils are comprised of lean to fat and lean clays. The native soils exhibit medium to very stiff consistency and were moist to wet. The Unified Soil Classification System classifies silty lean clays (CL-ML), low plasticity (lean) clay soils as CL, medium plasticity (lean to fat) clay soils as CL/CH, and high plasticity (fat) clay soils as CH. Weathered shale and limestone bedrock material was encountered at most test borings at depth ranging from 15.0 to 25.0 feet below existing ground. As previously stated, no free groundwater was encountered at any of the boring locations.

DESIGN CRITERIA AND RECOMMENDATIONS

Laboratory test results of the recovered samples showed the following characteristics that were used as criteria for determining the recommendations for bearing values and design data:

Natural Dry Density	97.5 to 110.2 pcf
Natural Moisture Content	18.3 to 36.6 %
Liquid Limit	50 to 67
Plasticity Index …	27 to 42
Unconfined Compressive Strength of Soil	4,661 to 8,929 psf

Seismic Considerations

Based on the International Building Code (IBC) Section 1613.1 of the 2021 IBC, the subsurface stratigraphy, and the use of a shallow foundation system bearing on existing fill or site soils, the general Site Class Definition for the project area is Site Class C.

Site Preparation and Engineered Fill

Areas to receive fill should be stripped of vegetation, topsoil, and any other deleterious materials. Any isolated areas of soft or deleterious materials encountered at subgrade elevation should be removed and replaced with engineered fill. The moisture content of the subgrade soils should be appropriate to achieve the required compaction.

Proper drainage of the construction area should be provided to protect foundation and floor slab subgrade soils from the detrimental effects of weather conditions. Excavations should be kept as dry as possible. Any loose or soft materials that accumulate or develop on subgrade or bearing surfaces should be removed prior to the placement of concrete. Construction traffic, including foot traffic, should be minimized. Concrete should be placed in footing excavations as soon as possible after excavations are complete.

Trucks and other heavy construction vehicles should be restricted as much as possible from trafficking on the finished subgrade in the building to prevent unnecessary disturbances of subgrade soils. Excessive rutting or pumping of the subgrade could occur from construction traffic, particularly during periods of wet weather. If such disturbed areas develop, the subgrade may have to be excavated and replaced with properly compacted fill.

Supplemental engineered fill should be placed in uniform horizontal lifts, with loose thicknesses not exceeding eight inches. The thickness must be appropriate for the method of compaction and the type of equipment used. The geotechnical engineer should approve any off-site material proposed for use as fill. Engineered fill should be compacted to a minimum of 95 percent of maximum density as determined by ASTM D698 (standard Proctor test) at moisture content between 0 and 4 percent above optimum moisture for high plasticity clay material and from -2 to +2 from optimum moisture content for low plasticity clays.

The fill should be benched in any sloped areas greater than one vertical to five horizontal in order to maintain relatively horizontal lifts. The benching should be placed at not less than 12-inch rises over those areas where it is required as the work is brought up in layers.

Shallow Foundations Bearing on Native Soils

The existing undisturbed soils present at the site at anticipated footing elevations exhibit net allowable bearing capacities of 3,000 pounds per square foot (psf) for both continuous footings and rectangular footings. These bearing values are based on a minimum factor of safety of three against actual shear failure.

Anticipated settlements for these bearing capacities are 0.5-1.0 inches of total settlement, with a likely differential settlement of 0.25-0.5 inches over a horizontal distance of 30 feet. The

minimum frost depth for this area is 36 inches. A minimum width of 16 inches for continuous and 30 inches for isolated footings is recommended. For sliding resistance considerations, an allowable coefficient of friction equal to 0.33 can be used.

The base of all foundation excavations should be free of water and loose soil/rock prior to placing concrete. Concrete should be placed as soon as possible after excavation to reduce bearing soil disturbance. If the bearing level soils become disturbed, the affected soil should be removed prior to placing concrete.

Deleterious, soft or otherwise unsuitable bearing soils could be encountered during foundation excavations. If unsuitable soils are encountered the excavations should be extended deeper to suitable soils. Footings could bear directly on these soils at the lower level or a lean concrete backfill could be placed in the excavations to bottom of footing elevation. The footings could also bear on properly compacted backfill extending down to the suitable soils. Over excavation for compacted backfill placement below footings should extend laterally past the footing edges at least 9 inches per foot of over excavation depth below bottom of footing elevation and compacted per this report.

Slab on Grade

The site clays exhibit a mixture of low and high swell potential. To minimize the swell potential for slabs-on-grade where limited vertical rise is desired, it is recommended that site soils be over-excavated 12” (in addition to a capillary break material comprised of clean crushed stone) and replaced with low swell (LVC) material such as crushed limestone screenings, MoDOT Type 5, or 12 to 15% fly ash, 6% lime kiln dust or 5% cement stabilized parent soil. Acceptable LVC material is any soil type that has a Liquid Limit (LL) of less than 45 and Plasticity Index (PI) of less than 25.

Movement between slabs on grade and walls may occur. To minimize the effects of this movement, we recommend that slip joints be incorporated between all slabs and walls. All slabs should contain crack control and construction joints, which are formed on 15 to 25 foot centers, each way, or as designed by the project structural engineer. A capillary moisture barrier is recommended to be placed under the slabs. This barrier should be a minimum of a 4-inch thick layer of clean granular material extending to the limits of the foundation walls. Should

additional moisture protection be desired, it should be a minimum of 6-mil polyethylene sheeting placed between the slab and the base course.

For the purpose of slab design, a modulus of subgrade reaction (k) of 100-pounds/cubic inch is suggested. This value is based on a subgrade consisting of well-compacted, plastic clay fill. If a stabilized or crushed aggregate subgrade is used, a k-value of 200-pounds/cubic inch is suggested.

Surface Drainage

In order to reduce the problems related to water infiltration, it is recommended that the final grade around the structure perimeters have a positive slope extending at least six feet away from the structure. Backfill of soils around the foundation should be compacted at a minimum of 95 percent of maximum dry density at a moisture content between optimum and four percent above optimum in accordance with ASTM D 698.

Subsurface Drainage

Although groundwater is not expected to be a problem, infiltration of surface water and/or perched groundwater could occur. It would be prudent to construct a drain system around the perimeter of below-grade structures or footings. The perimeter drain system should consist of 4-inch PVC or equivalent pipe with at least ¼-inch perforations routed to a sump or by gravity to the exterior. The pipe should be laid with the perforations down and enveloped with gravel. The gravel should be surrounded with Mirafi 140 filter cloth or equivalent.

Excavation Considerations

We believe that the project soils are Type B as classified in the OSHA Excavation Standard Handbook 29 CFR Parts 1926.650 through 1926.652. Type B soils are characterized by cohesive soils above the water table with unconfined compressive strengths greater than 0.5 tons per square foot (tsf) but less than and 1.5 tsf. Type B soils include any fill soils meeting or exceeding the above criteria, as well as undisturbed soils with unconfined compressive strengths of >1.5 tsf which are subject to vibration from traffic. Temporary excavation slopes for Type B soils can be one horizontal to one vertical with a maximum excavation depth of 20 feet.

Excavations deeper than 20 feet may require the use of supplemental shoring and will require the preparation of an excavation design prepared by a registered professional engineer. Competent bedrock material may generally be cut vertically.

Trench Backfill Recommendations

Deleterious materials such as organic matter, topsoil, rock fragments larger than 3 inches in diameter, debris, and any other materials judged to be unsatisfactory by the geotechnical engineer, should not be included in the backfill. Backfill should not be placed on soft materials or frozen ground. Soil backfill overlying the bedding should be placed in uniform horizontal lifts, with loose thicknesses not exceeding eight inches. The thickness must be appropriate for the method of compaction and the type of equipment used. The geotechnical engineer should approve any off-site material proposed for use as fill. Trench backfill under driveways/parking lots should be compacted to a minimum of 95 percent of maximum density as defined by Standard Proctor (ASTM D 698) at a moisture content between 0 and 4 percent above optimum moisture (preferred average of plus 2 percent). In common yard areas, the soil backfill should be compacted to a minimum of 90 percent of maximum density (ASTM D 698) using the above moisture parameters. After preparation of the trench bottom, a pipe bed of a minimum of 6" shall be prepared using crushed stone or crushed gravel meeting the following requirements:

Nominal Pipe Size Diameter	AASHTO M43 Size
15" or Less	67, 7, 8 or washed #9
Greater than 15"	57, 6, or 67

Manhole/Inlet Structure Backfill Recommendations

Soil backfill around structures should be placed in uniform horizontal lifts, with loose thicknesses not exceeding eight inches. The thickness must be appropriate for the method of compaction and the type of equipment used. The geotechnical engineer should approve any off-site material proposed for use as fill. Backfill should be compacted to a minimum of 95 percent of maximum density as defined by Standard Proctor (ASTM D 698) at a moisture content between 0 and 4 percent above optimum moisture (preferred average of plus 2 percent). Another option is to backfill with a Controlled Low Strength Material (CLSM), or flowable fill. The flowable fill should exhibit a minimum unconfined compressive strength of 250 psi after 28 days. Bedding material for manhole/inlet structure should be clean crushed rock conforming to the following gradation:

Sieve Designation	Percent Passing by Weight
1 ½"	100
No. 4	0 – 35
No. 200	0 – 8

REMARKS

It is recommended that the geotechnical engineer be retained to review the plans and specifications for the project so that an evaluation and comments can be provided regarding the proper incorporation of information from this geotechnical report into the final construction documents. We further recommend that the geotechnical engineer be retained during construction phases for earthwork and foundations to provide observation and testing to aid in determining that design intent has been accomplished.

The findings in this report are based on data acquired to date and are assumed to be representative of conditions at locations between borings. Due to the fact that the area at the borings is very small relative to the overall site, and for other reasons, we make no statement warranting the conditions below our borings or at other locations throughout the site. In addition, we do not warrant that the general strata logged at the borings are necessarily typical of the remaining areas of the site.

Reports shall not be reproduced, except in full, without written approval of KTI. Information in this report applies only to the referenced project in its present configuration and location and shall not be used for any other project or location.

BORING LOCATION DIAGRAM

Boring Location Diagram
LXT Terminal Building
Lee's Summit, Missouri

KRUGER TECHNOLOGIES, INC.

Drawn: DZK	**Date:** 5/30/24	**KTI Project No**. 224081G

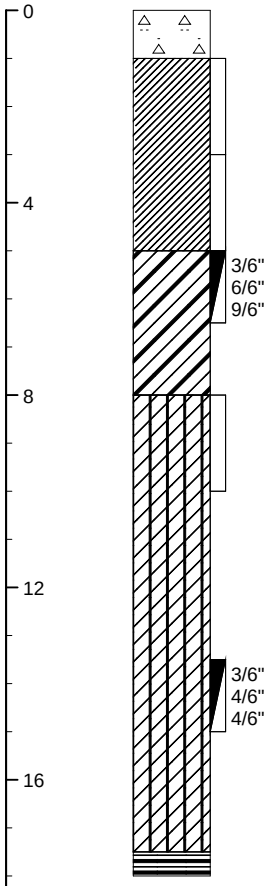
APPENDIX I

Boring Logs

LOG OF TEST BORING
BORING B-1

PROJECT: LXT Terminal Building
CLIENT: Crawford, Murphy & Tilly, Inc. (CMT)
PROJECT NO.: 224081G **START:** 5/15/24
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 5/30/2024
ELEVATION:
FINISH: 5/15/24
LOGGER: AU
DATE CHECKED:



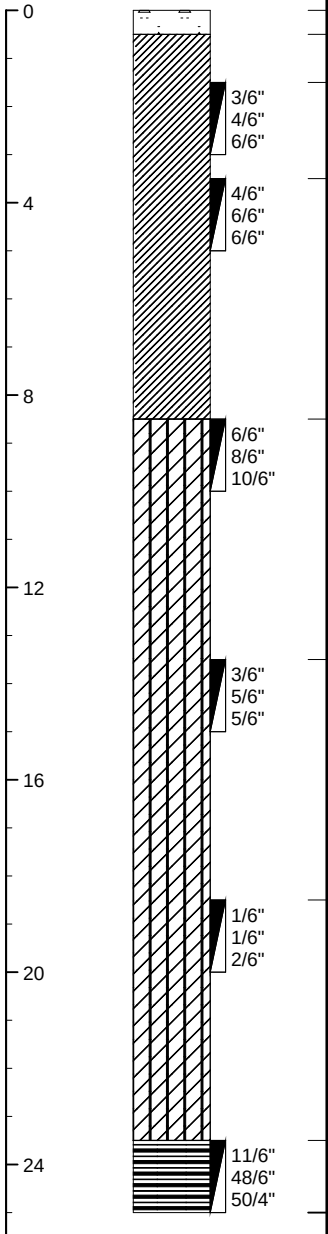
ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	T	Topsoil				
	CH	Fat clay, stiff, black to dark brown, moist	1, ST	100.3	22.6	
	CH	Fat clay, very stiff, dark brown, moist	2, ST	102.1	20.8	6837
	CL-CH	Lean to fat clay, stiff, dark grayish brown, moist	1, SS		18.3	
	CL	Lean clay, stiff, dark and light brown, moist	3, ST	97.5	24.1	
	CL	Lean clay, medium stiff, reddish brown, moist	2, SS		27.5	
	W	Weathered shale, hard				
		Drilling discontinued at auger refusal at 18.0 feet				

Notes:

LOG OF TEST BORING
BORING B-2

PROJECT: LXT Terminal Building
CLIENT: Crawford, Murphy & Tilly, Inc. (CMT)
PROJECT NO.: 224081G **START:** 5/15/24
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 5/30/2024
ELEVATION:
FINISH: 5/15/24
LOGGER: AU
DATE CHECKED:



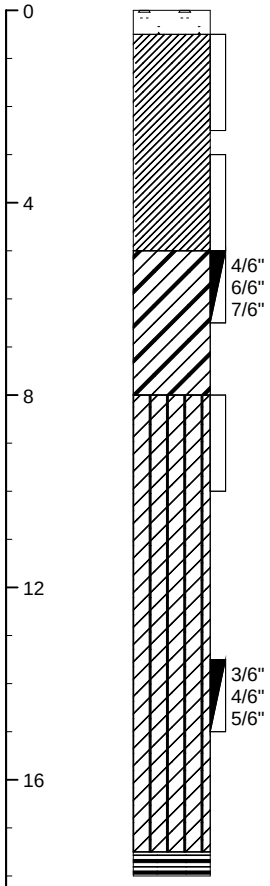
USCS	Description	Sample # & Type	Density pcf	Moisture, %	Qu, psf
T	Topsoil				
CH	Fat clay, stiff, black to dark brown, moist				
CH	Fat clay, stiff, black to dark brown, moist	1, SS		22.3	
	Fat clay, stiff, dark grayish brown, moist	2, SS		21.3	
CH					
	Lean clay, very stiff, dark reddish brown, moist	3, SS		22.2	
CL					
	Lean clay, stiff, red, moist	4, SS		27.0	
CL					
	Lean clay, soft, orange brown, moist	5, SS		36.6	
CL					
W	Weathered shale, hard, light brown, moist	6, SS		26.2	
	Drilling discontinued at sample refusal 25.0 feet				

Notes:

LOG OF TEST BORING
BORING B-3

PROJECT: LXT Terminal Building
CLIENT: Crawford, Murphy & Tilly, Inc. (CMT)
PROJECT NO.: 224081G **START:** 5/15/24
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 5/30/2024
ELEVATION:
FINISH: 5/15/24
LOGGER: AU
DATE CHECKED:



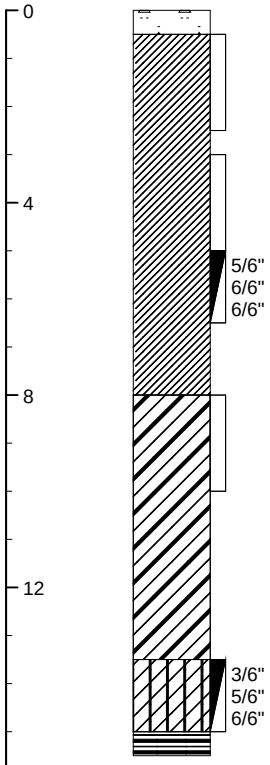
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		T	Topsoil				
		CH	Fat clay, stiff, black to dark brown, moist	1, ST	108.2	20.8	
		CH	Fat clay, stiff, light to dark brown, moist	2, ST	107.4	20.8	6239
		CL-CH	Lean to fat clay, stiff, orange brown, moist	1, SS		19.3	
		CL	Lean clay, stiff, light brown, moist	3, ST	98.4	22.9	
		CL	Lean clay, stiff, orange brown, moist	2, SS		21.5	
		W	Weathered limestone, hard				
			Drilling discontinued at auger refusal at 18.0 feet				

Notes:

LOG OF TEST BORING
BORING B-4

PROJECT: LXT Terminal Building
CLIENT: Crawford, Murphy & Tilly, Inc. (CMT)
PROJECT NO.: 224081G **START:** 5/15/24
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 5/30/2024
ELEVATION:
FINISH: 5/15/24
LOGGER: AU
DATE CHECKED:



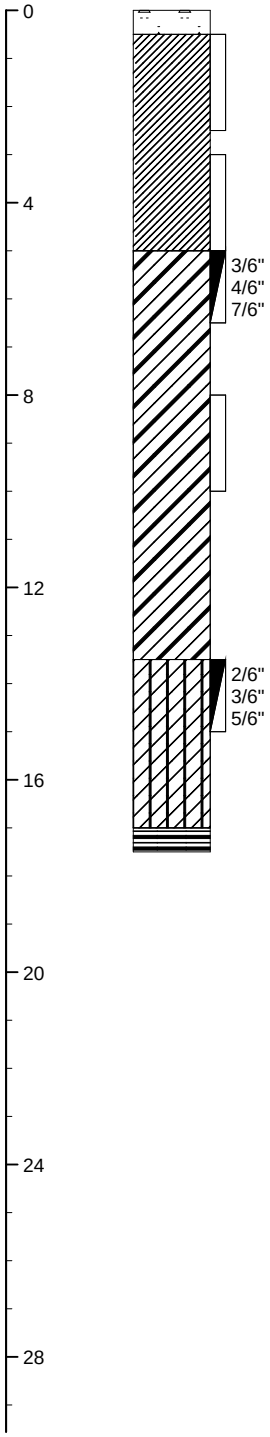
USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
T	Topsoil				
CH	Fat clay, stiff, black to dark grayish brown, moist	1, ST	105.0	20.7	
CH	Fat clay, trace gravel, very stiff, dark brown, moist	2, ST	110.2	19.2	8929
CH	Fat clay, stiff, grayish brown, moist	1, SS		19.9	
CL-CH	Lean to fat clay, stiff, dark brown, moist	3, ST	98.4	24.3	5499
CL	Lean clay, stiff, light grayish brown, moist	2, SS		22.9	
W	Weathered limestone, hard				
	Drilling discontinued at auger refusal at 15.5 feet				

Notes:

LOG OF TEST BORING
BORING B-5

PROJECT: LXT Terminal Building
CLIENT: Crawford, Murphy & Tilly, Inc. (CMT)
PROJECT NO.: 224081G **START:** 5/15/24
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 5/30/2024
ELEVATION:
FINISH: 5/15/24
LOGGER: AU
DATE CHECKED:



ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
0	T	Topsoil				
	CH	Fat clay, stiff, dark brown, moist	1, ST	101.1	22.3	
4	CH	Fat clay, very stiff, dark and orange brown, moist	2, ST	103.9	20.5	4661
	CL-CH	Lean to fat clay, stiff, light brown, moist	1, SS		21.6	
8	CL-CH	Lean to fat clay, stiff, light brown, moist	3, ST	97.8	25.8	
12	CL	Lean clay, stiff, light brown, moist	2, SS		19.6	
16	W	Weathered shale, hard				
		Drilling discontinued at auger refusal at 17.5 feet				
20						
24						
28						

Notes:

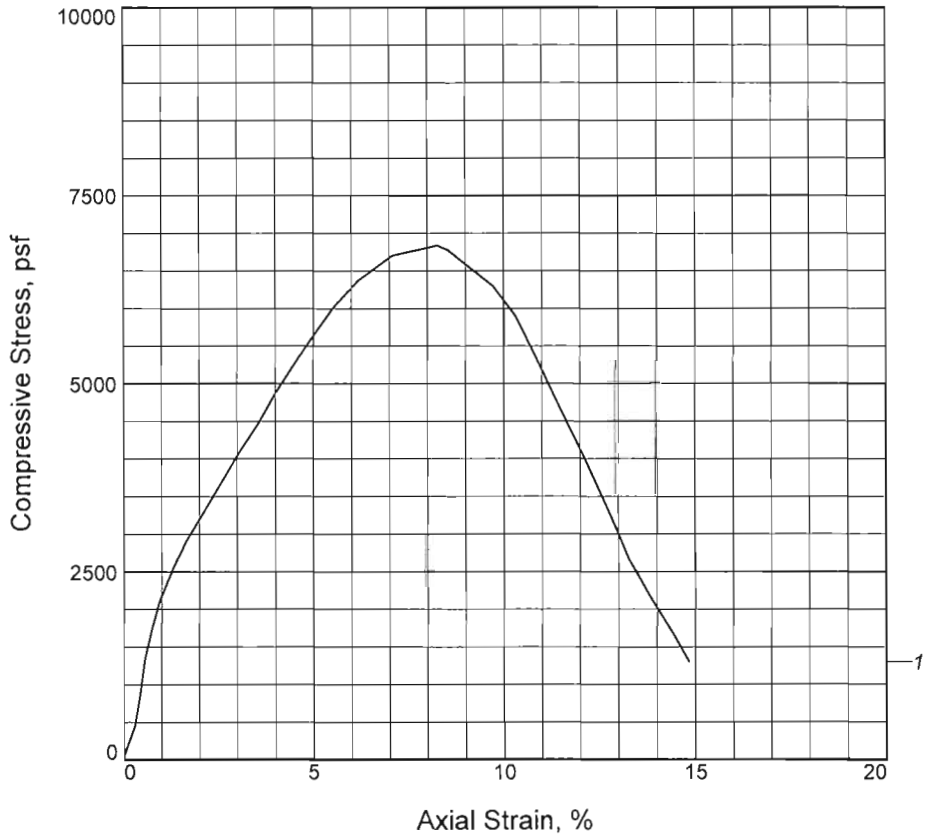
APPENDIX II

Laboratory Results

SUMMARY OF LABORATORY TEST RESULTS OF UNDISTURBED SAMPLE

Boring	Depth (Ft)	Sample No./Type	Natural Moisture %	Natural Dry Density (pcf)	Unconfined Compressive Strength (psf)	Atterberg Limits		Soil Type
						Liquid Limit %	Plasticity Index %	
B-1	1.0-3.0	ST-1	22.6	100.3		50	27	CH
B-1	3.0-5.0	ST-2	20.8	102.1	6837			
B-1	5.0-6.5	SS-1	18.3					
B-1	8.0-10.0	ST-3	24.1	97.5				
B-1	13.5-15.0	SS-2	27.5					
B-2	1.5-3.0	SS-1	22.3			62	36	CH
B-2	3.5-5.0	SS-2	21.3					
B-2	8.5-10.0	SS-3	22.2					
B-2	13.5-15.0	SS-4	27.0					
B-2	18.5-20.0	SS-5	36.6					
B-2	23.5-25.0	SS-6	26.2					
B-3	1.0-3.0	ST-1	20.8	108.2		58	32	CH
B-3	3.0-5.0	ST-2	20.8	107.4	6239			
B-3	5.0-6.5	SS-1	19.3					
B-3	8.0-10.0	ST-3	22.9	98.4				
B-3	13.5-15.0	SS-2	21.5					
B-4	1.0-3.0	ST-1	20.7	105.0		67	42	CH
B-4	3.0-5.0	ST-2	19.2	110.2	8929			
B-4	5.0-6.5	SS-1	19.9					
B-4	8.0-10.0	ST-3	24.3	98.4	5499			
B-4	13.5-15.0	SS-2	22.9					
B-5	1.0-3.0	ST-1	22.3	101.1		57	31	CH
B-5	3.0-5.0	ST-2	20.5	103.9	4661			
B-5	5.0-6.5	SS-1	21.6					
B-5	8.0-10.0	ST-3	25.8	97.8				
B-5	13.5-15.0	SS-2	19.6					

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	6837			
Undrained shear strength, psf	3419			
Failure strain, %	8.3			
Strain rate, in./min.	0.050			
Water content, %	20.8			
Wet density, pcf	123.3			
Dry density, pcf	102.1			
Saturation, %	78.9			
Void ratio	0.7556			
Specimen diameter, in.	2.84			
Specimen height, in.	5.62			
Height/diameter ratio	1.98			

Description: Fat clay, very stiff, dark brown, moist

LL =	**PL =**	**PI =**	**Assumed GS=** 2.87	**Type:** ST

Project No.: 224081G
Date Sampled: 5/27/24
Remarks:

Client: Crawford, Murphy & Tilly, Inc. (CMT)

Project: LXT Terminal Building

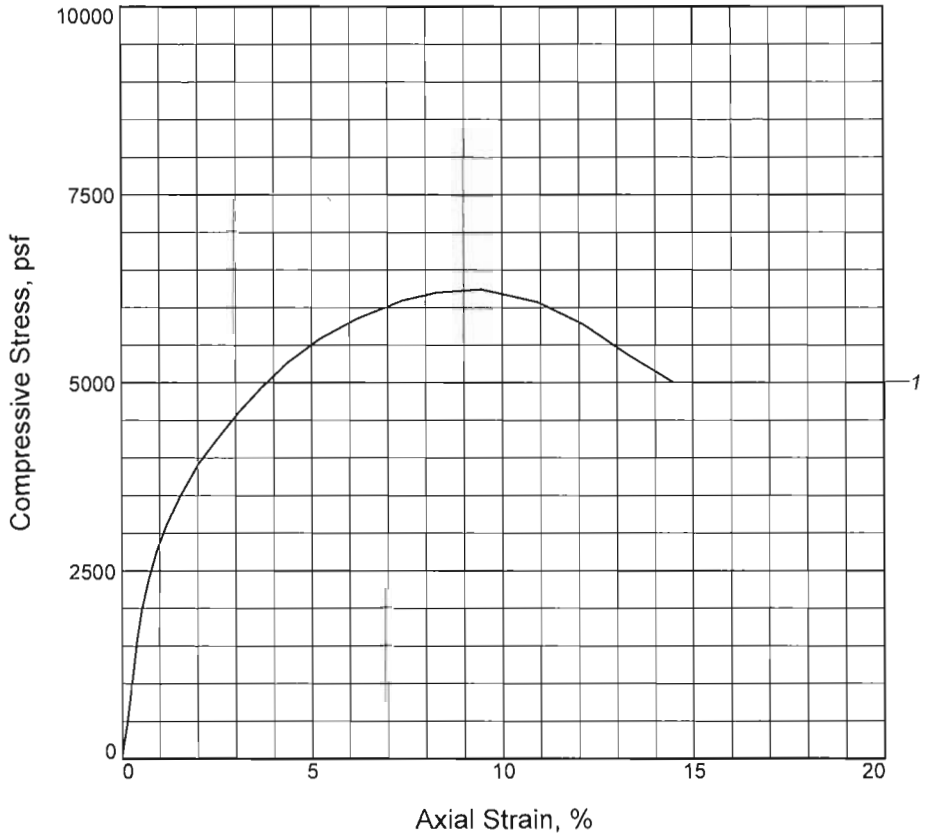
Source of Sample: B-1 **Depth:** 3
Sample Number: 2

Figure _____

[redacted]KTI[redacted]

Tested By: TA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	6239			
Undrained shear strength, psf	3120			
Failure strain, %	9.5			
Strain rate, in./min.	0.050			
Water content, %	20.8			
Wet density, pcf	129.8			
Dry density, pcf	107.4			
Saturation, %	97.4			
Void ratio	0.5803			
Specimen diameter, in.	2.84			
Specimen height, in.	5.62			
Height/diameter ratio	1.98			

Description: Fat clay, stiff, light to dark brown, moist

LL =	**PL =**	**PI =**	**Assumed GS=** 2.72	**Type:** ST

Project No.: 224081G
Date Sampled: 5/15/24
Remarks:

Client: Crawford, Murphy & Tilly, Inc. (CMT)

Project: LXT Terminal Building

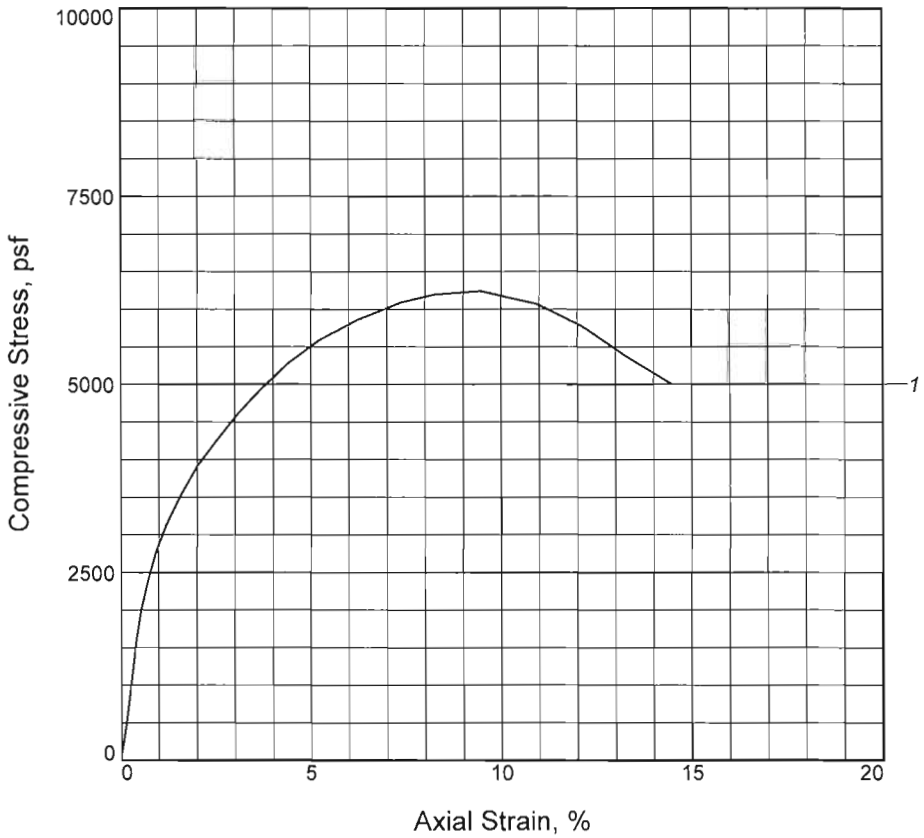
Source of Sample: B-3 **Depth:** 3
Sample Number: 2

Figure _____

[redacted]KTI[redacted]

Tested By: TA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	6239			
Undrained shear strength, psf	3120			
Failure strain, %	9.5			
Strain rate, in./min.	0.050			
Water content, %	20.8			
Wet density, pcf	129.8			
Dry density, pcf	107.4			
Saturation, %	97.4			
Void ratio	0.5803			
Specimen diameter, in.	2.84			
Specimen height, in.	5.62			
Height/diameter ratio	1.98			

Description: Fat clay, stiff, light to dark brown, moist

LL =	PL =	PI =	Assumed GS= 2.72	Type: ST

Project No.: 224081G
Date Sampled: 5/15/24
Remarks:

Figure _____

Client: Crawford, Murphy & Tilly, Inc. (CMT)

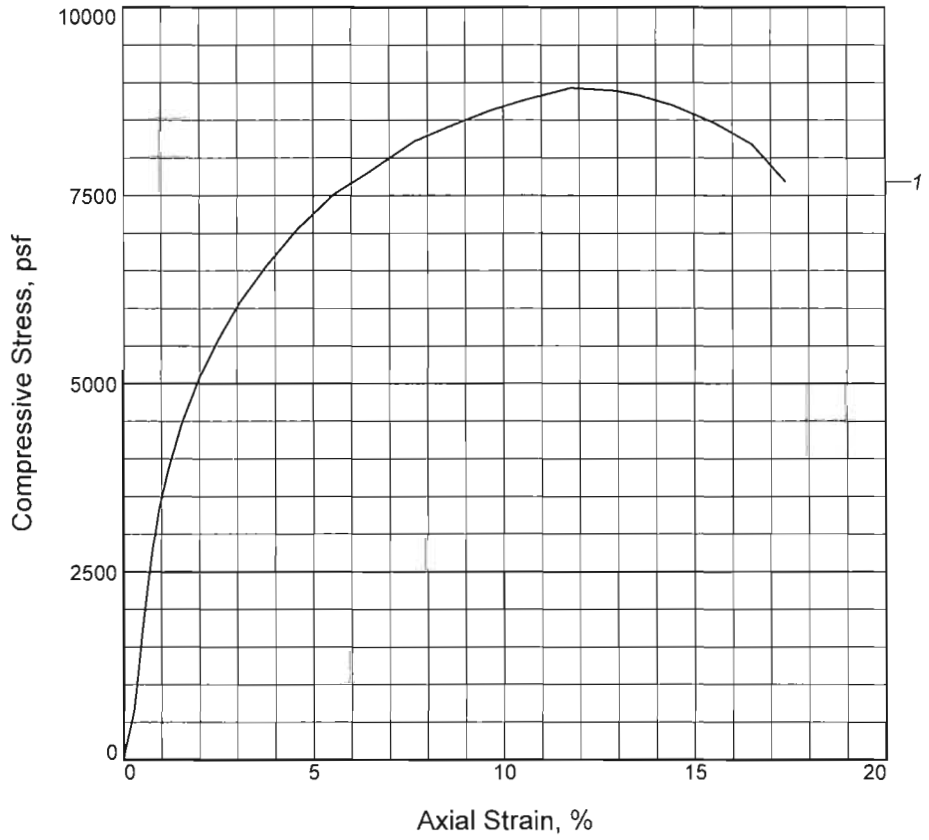
Project: LXT Terminal Building

Source of Sample: B-3 **Depth:** 3
Sample Number: 2

[redacted]KTI[redacted]

Tested By: TA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	8929			
Undrained shear strength, psf	4465			
Failure strain, %	11.8			
Strain rate, in./min.	0.050			
Water content, %	19.4			
Wet density, pcf	131.5			
Dry density, pcf	110.2			
Saturation, %	97.5			
Void ratio	0.5413			
Specimen diameter, in.	2.84			
Specimen height, in.	5.62			
Height/diameter ratio	1.98			

Description: Fat clay, trace gravel, very stiff, dark brown, moist

LL =	**PL =**	**PI =**	**Assumed GS=** 2.72	**Type:** ST

Project No.: 224081G
Date Sampled: 5/15/24
Remarks:

Client: Crawford, Murphy & Tilly, Inc. (CMT)

Project: LXT Terminal Building

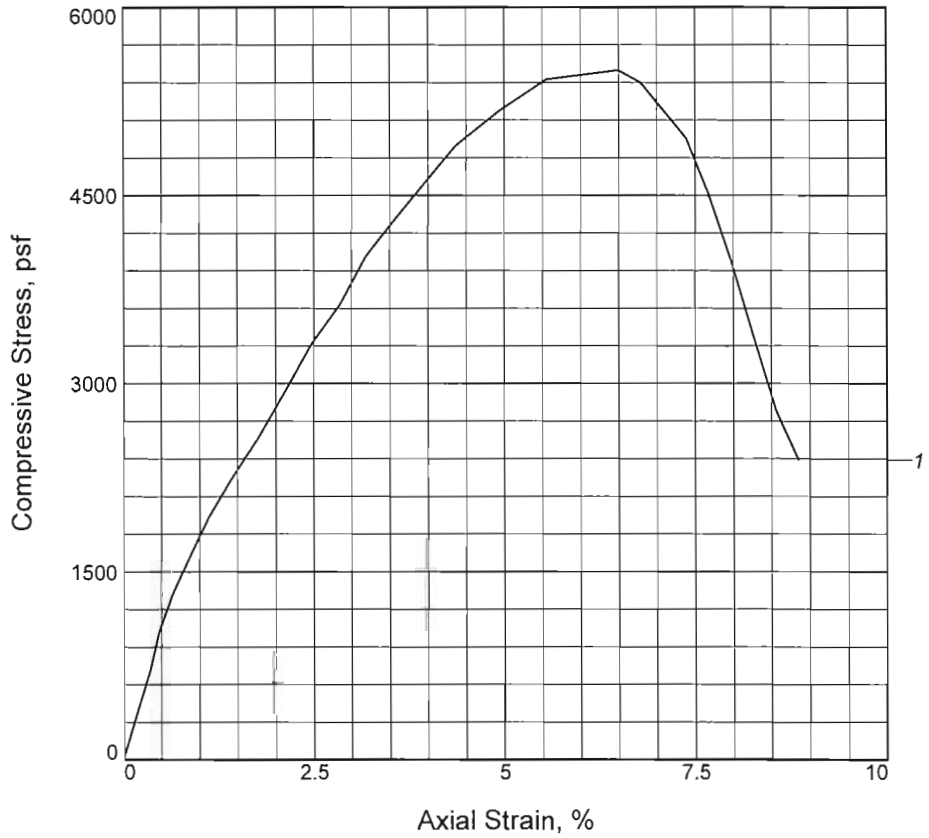
Source of Sample: B-4 **Depth:** 3
Sample Number: 2

Figure _____

[redacted]KTI[redacted]

Tested By: TA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	5499			
Undrained shear strength, psf	2749			
Failure strain, %	6.5			
Strain rate, in./min.	0.050			
Water content, %	24.3			
Wet density, pcf	122.2			
Dry density, pcf	98.4			
Saturation, %	90.9			
Void ratio	0.7262			
Specimen diameter, in.	2.86			
Specimen height, in.	5.62			
Height/diameter ratio	1.97			

Description: Lean to fat clay, stiff, dark brown, moist

LL =	PL =	PI =	Assumed GS= 2.72	Type: ST

Project No.: 224081G
Date Sampled: 5/15/24
Remarks:

Client: Crawford, Murphy & Tilly, Inc. (CMT)

Project: LXT Terminal Building

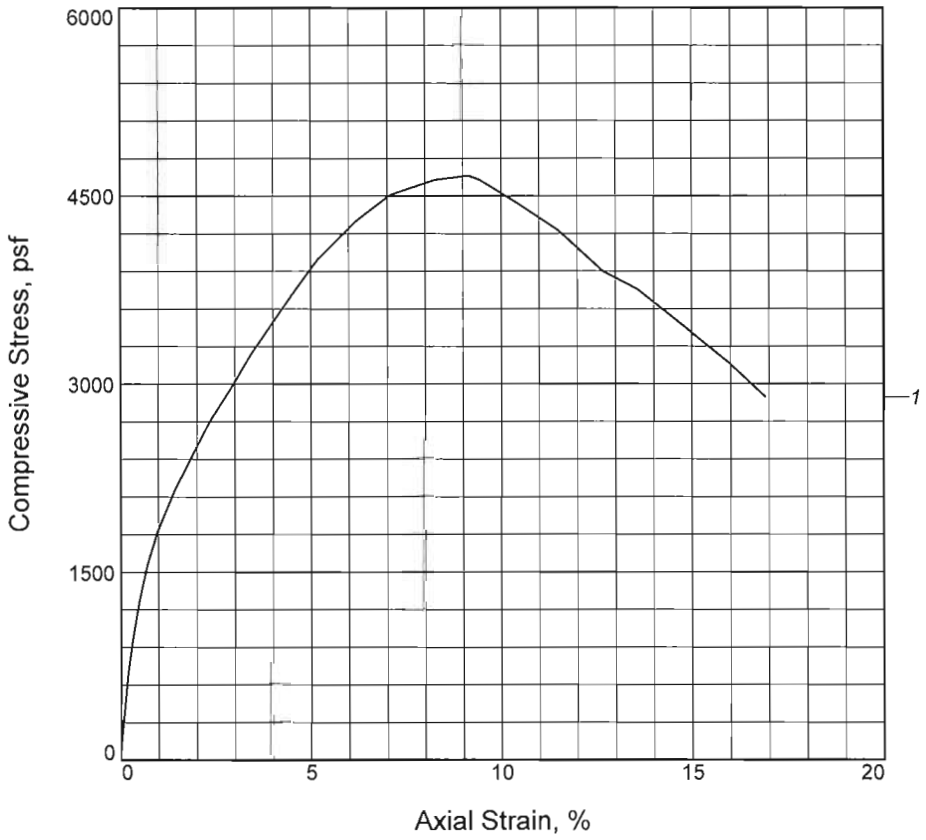
Source of Sample: B-4 **Depth:** 8
Sample Number: 3

Figure _____

[redacted]KTI[redacted]

Tested By: TA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	4661			
Undrained shear strength, psf	2330			
Failure strain, %	9.1			
Strain rate, in./min.	0.050			
Water content, %	20.5			
Wet density, pcf	125.2			
Dry density, pcf	103.9			
Saturation, %	87.9			
Void ratio	0.6347			
Specimen diameter, in.	2.84			
Specimen height, in.	5.62			
Height/diameter ratio	1.98			

Description: Fat clay, very stiff, dark and orange brown, moist

LL =	**PL =**	**PI =**	**Assumed GS=** 2.72	**Type:** ST

Project No.: 224081G
Date Sampled: 5/15/24
Remarks:

Client: Crawford, Murphy & Tilly, Inc. (CMT)

Project: LXT Terminal Building

Source of Sample: B-5 **Depth:** 3
Sample Number: 2

Figure _____

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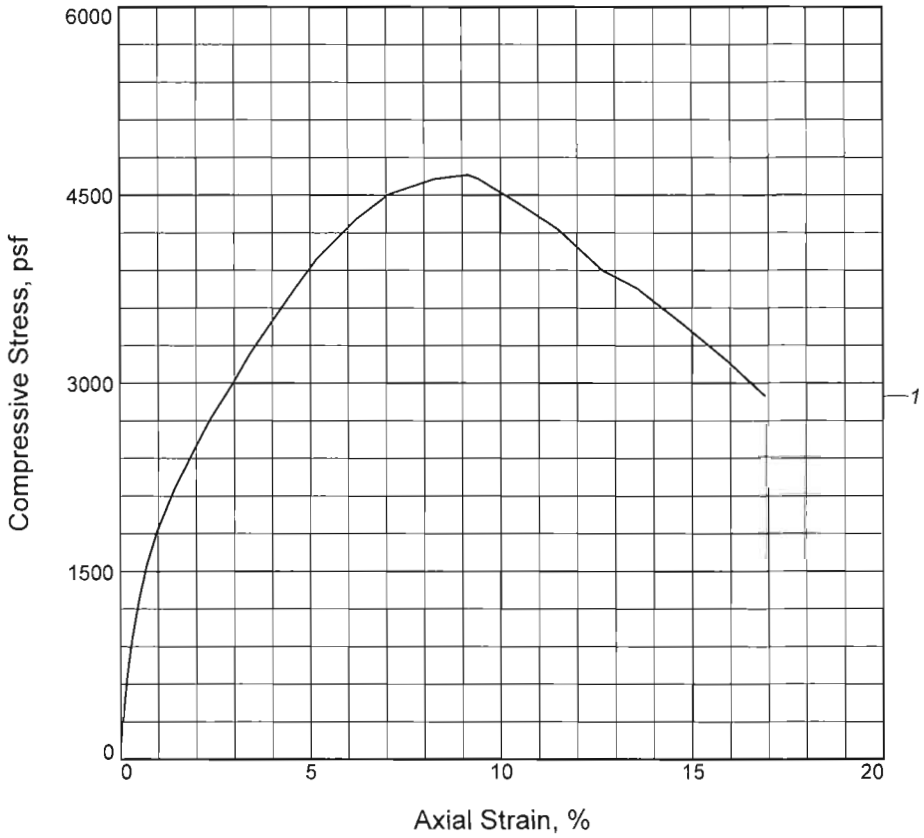
Tested By: TA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	4661			
Undrained shear strength, psf	2330			
Failure strain, %	9.1			
Strain rate, in./min.	0.050			
Water content, %	20.5			
Wet density, pcf	125.2			
Dry density, pcf	103.9			
Saturation, %	87.9			
Void ratio	0.6347			
Specimen diameter, in.	2.84			
Specimen height, in.	5.62			
Height/diameter ratio	1.98			

Description: Fat clay, stiff to very stiff, dark and orange brown, moist

LL =	PL =	PI =	Assumed GS= 2.72	Type: ST

Project No.: 224081G
Date Sampled: 5/15/24
Remarks:

Client: Crawford, Murphy & Tilly, Inc. (CMT)

Project: LXT Terminal Building

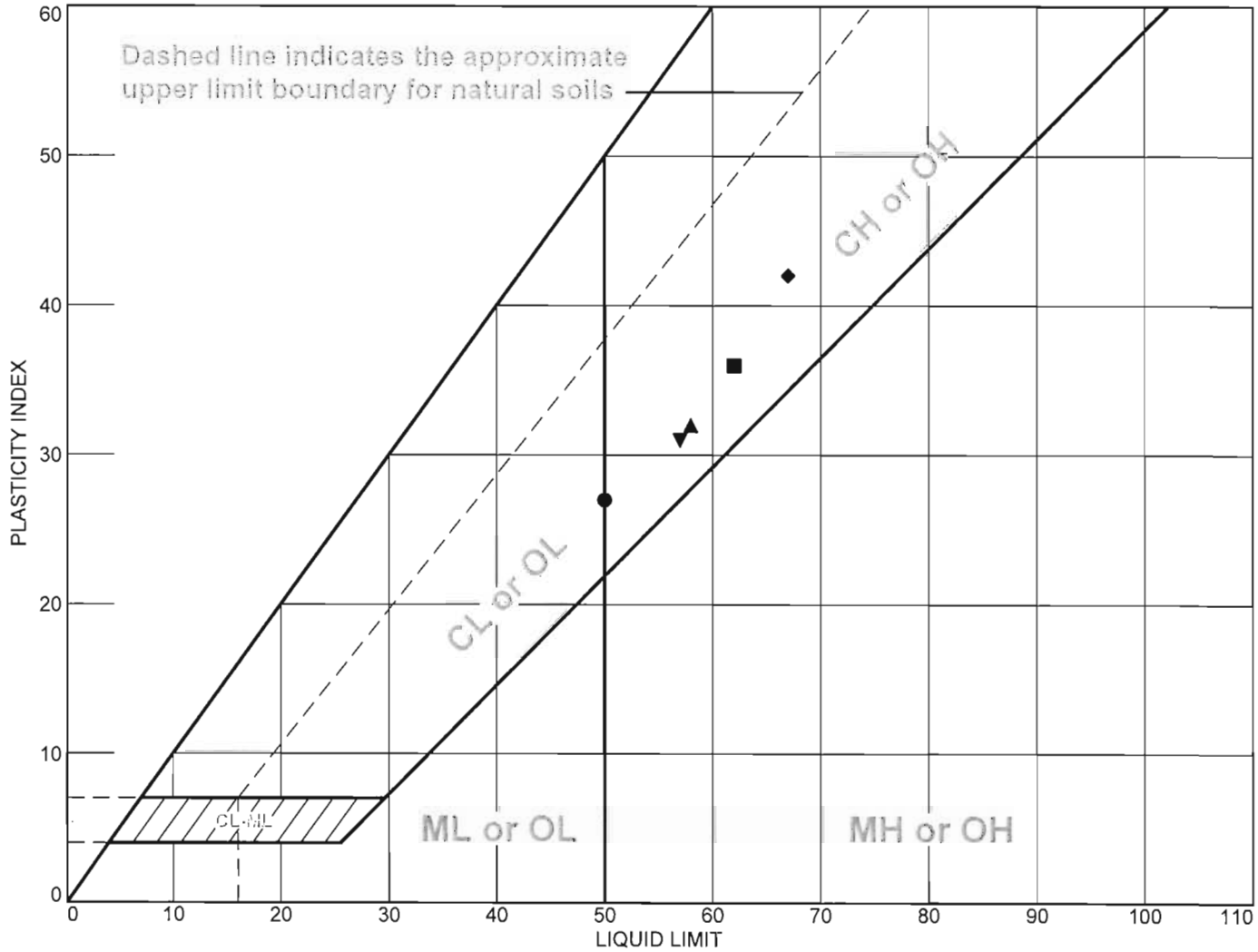
Source of Sample: B-5 **Depth:** 3
Sample Number: 2

Figure _____

[redacted]KTI[redacted]

Tested By: TA **Checked By:** OJK

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D 4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Fat clay, stiff, black to dark brown, moist	50	23	27			CH
■	Fat clay, stiff, black to dark brown, moist	62	26	36			CH
▲	Fat clay, stiff, black to dark brown, moist	58	26	32			CH
◆	Fat clay, stiff, black to dark grayish brown, moist	67	25	42			CH
▼	Fat clay, stiff, dark brown, moist	57	26	31			CH

Project No. 224081G **Client:** Crawford, Murphy & Tilly, Inc. (CMT)

Project: LXT Terminal Building

Remarks:

● **Source of Sample:** B-1 **Depth:** 1 **Sample Number:** 1

■ **Source of Sample:** B-2 **Depth:** 1.5 **Sample Number:** 1

▲ **Source of Sample:** B-3 **Depth:** 0.5 **Sample Number:** 1

◆ **Source of Sample:** B-4 **Depth:** 0.5 **Sample Number:** 1

▼ **Source of Sample:** B-5 **Depth:** 0.5 **Sample Number:** 1

KTI

Figure

GLOSSARY OF GEOTECHNICAL TERMS

ALLUVIUM	Sediments deposited by streams, including riverbeds and floodplains.
ARGILLACEOUS	Rocks composed of or having a notable portion of fine silt and/or clay in their composition.
ATTERBERG LIMITS	Water contents, in percentage of dry weight of soil, that correspond to the boundaries between the states of consistency, i.e. the boundary between the liquid and plastic states (liquid limit) and the boundary between the plastic and solid states (plastic limit).
BEDROCK-IN-PLACE	Continuous rock mass which essentially has not moved from its original depositional position.
CALCAREOUS	Containing calcium carbonate determined by effervescence when tested with dilute hydrochloric acid.
CHANNEL SANDSTONE	Sandstone that has been deposited in a streambed or other channel eroded into the underlying beds.
COLLUVIAL	Rock debris of various sizes loose from in-place bedrock mass, often shifted down gradient in conjunction with soil.
CROSS-BEDDING	Stratification which is inclined to the original horizontal surface upon which the sediment accumulated.
FISSILE BEDDING	Term applied to bedding which consists of laminae less than 2 millimeters in thickness.
FORMATION	A distinctive body of rock that serves as a convenient unit for study and mapping.
FOSSIL DETRITUS	The accumulation of broken, fragmented fossil debris.
FOSSILIFEROUS	Containing organic remains.
GLACIAL ERRATIC	A transported rock fragment different from the bedrock on which it lies, either free or as part of a sediment.
GLACIAL TILL	Nonsorted, nonstratified sediment carried or deposited by a glacier.
GLACIOFLUVIAL	Primarily deposited by streams from glaciers.
GROUP	A lithostratigraphic unit consisting of two or more formations.
JOINT	A fracture in a rock along which no appreciable displacement has occurred.
LIMESTONE	A sedimentary rock composed mostly of calcium carbonate ($CaCO_3$).

LOESS	A homogenous, nonstratified, unindurated deposit consisting predominantly of silt, with subordinate amounts of very fine sand and/or clay.
MICA	A mineral group, consisting of phyllosilicates, with sheetlike structures.
MEMBER	A specially developed part of a varied formation is called a member, if it has considerable geographic extent.
NODULE	A small, irregular, knobby, or rounded rock that is generally harder than the surrounding rock.
PERMEABILITY	The capacity of a material to transmit a fluid.
RECOVERY	The percentage of bedrock core recovered from a core run length.
RELIEF	The difference in elevation between the high and low points of a land surface.
RESIDUAL SOIL	Soil formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials.
ROCK QUALITY DESIGNATION (RQD)	Refers to percentage of core sample recovered in unbroken lengths of 4 inches or more.
SANDSTONE	Sedimentary rock composed mostly of sand sized particles, usually cemented by calcite, silica, or iron oxide.
SERIES	A time-stratigraphic unit ranked next below a system.
SHALE	A fine-grained plastic sedimentary rock formed by consolidation of clay and mud.
STRATIGRAPHY	Branch of geology that treats the formation, compositions, sequence, and correlation of the stratified rocks as parts of the earth's crust.
SYSTEM	Designates rocks formed during a fundamental chronological unit, a period.
UNCONFORMITY	A surface of erosion or nondeposition, usually the former, which separates younger strata from older rocks.
WEATHERING	The physical and chemical disintegration and decomposition of rocks and minerals.

General Notes

Laboratory Test Symbols	
Symbol	**Definition**
LL	Liquid Limit (ASTM D4318)
PL	Plastic Limit (ASTM D4318)
PI	Plasticity Index (LL minus PL)
Qu	Unconfined Compressive Strength, Pounds per Square Foot (psf)
Qp	Pocket Penetrometer Reading, Tons per Square Foot (TSF)
RQD	Rock Quality Designation % (Sum of rock core pieces >4 inches/length of core run)

Common Soil Classification Symbols

Clay	
Symbol	**Soil Type**
CL	Low plasticity clay
CL-ML	Low plasticity clay and silt
CL/CH	Medium plasticity clay
CH	High plasticity clay

Silt	
Symbol	**Soil Type**
ML	Low plasticity silt
MH	High plasticity silt

Sand	
Symbol	**Soil Type**
SW	Well graded sand
SP	Poorly graded sand
SM	Silty sand
SC	Clayey sand

Gravel	
Symbol	**Soil Type**
GW	Well graded gravel
GP	Poorly graded gravel
GM	Silty gravel
GC	Clayey gravel

Descriptive Terminology

Cohesionless Soils

Relative Density Term	"N" Value
Very Loose	0 - 4
Loose	5 - 9
Medium Dense	10 - 29
Dense	30 – 49
Very Dense	50 or more

Cohesive Soils

Consistency Term	"N" Value
Very soft	0 – 2
Soft	3 – 4
Medium	5 – 8
Stiff	9 – 15
Very Stiff	16 - 30
Hard	> 30

Relative Proportions and Sizes

Term	Range
Trace	< 5%
A Little	5 – 15%
Some	15 – 30%
With	30 – 50%

Material	Size
Boulder	> 12"
Cobble	3" – 12"
Gravel	4.75 - 76.2 mm
Sand	0.075 – 4.75 mm
Silt and Clay	< 0.075 mm