SECTION 00911 - ADDENDUM 2

PART 1 - GENERAL

1.1 PROJECT INFORMATION

A. Project Name: South Main Corridor Improvement Project

B. Engineer: SK Design Group, Inc.

C. Engineer's Project Number: 16-108.

D. Date of Addendum: March 2, 2021

1.2 NOTICE TO BIDDERS

A. This Addendum is issued to all registered plan holders pursuant to the Instructions to Bidders and Conditions of the Contract. This Addendum serves to clarify, revise, and supersede information in the Project Manual, Drawings, and previously issued Addenda. Portions of the Addendum affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.

B. The Bidder shall acknowledge receipt of this Addendum in the appropriate space on the Bid Form.

C. The date for receipt of bids is unchanged by this Addendum at same time and location.

1.3 ATTACHMENTS

A. This Addendum includes the following attached Documents:

1. Prebid agenda and attendance sheet
2. Revised specification section Table of Contents
3. Geotechnical Reports.

1.4 GENERAL REVISIONS

A. Questions and answers*:*

1. HDPP pipe for crossroad pipes
   a. Question: Is HDPP pipe allowed for crossroad pipes in lieu of RCP if the trench is flow filled to the sub-grade.
   b. Answer: The use of high-density polypropylene pipe (HDPP), meeting the requirements of MODOT specifications section 724 for crossroad pipes in lieu of RCP is acceptable, provided that the pipe is bedded properly per manufacturer recommendation and the trench is backfilled with flowable fill up to the subgrade of the pavement.

2. Streetlight poles:
   a. Question: Would Valmont be accepted for streetlight poles? They can match. Says Lumec and Sternberg. And Signify/Cooper Lighting has fixture equivalent to the Signify/Lumec ped fixture. I have a similar fixture to the ATB2 Autobahn as well if it would be allowed.
   b. Answer: We would need additional information in order to review this substitution. Design team did quite a bit of coordination during the design process regarding the streetlight/pedestrian light assembly and want to make sure all pieces and parts are covered. We would request the following:
      1) A detailed pole elevation with part numbers and dimensions along with associated cutsheets. I didn't see any information in the email regarding the decorative 8ft streetlight arms or fluted pole.
      2) A photometric study of the streetlighting proving that the luminaire substitution offers equal illuminance and luminance levels to the specified product.
3. Traffic signal pole lamping for luminaires:
   a. Question: Provide information on the lamping for luminaires on the traffic signal poles.
   b. Answer: the streetlighting drawings indicate the luminaires on these poles and they are specified to be LED with manufacturer to match the other streetlights.
4. Planholders list and prebid attendee list:
   a. Question: Can I get a copy of the planholders list and the attendee list of the prebid meeting?
   b. Answer: Please refer to the Drexel Technologies planroom for a planholders list. http://www.drexeltech.com, additional assistance is available at distribution@drexeltech.com or 913-371-4430. The prebid meeting information is attached to this addendum.

B. It is our understanding that depending on the equipment used, there may be some difficulty in printing some of the drawing pdfs that are posted to Drexel's website. We have been requested to post compressed pdfs to aid in printing. Please note that file compression may cause resolution issues as well as the loss of some content. We have compressed the drawing pdfs and posted them to our FTP site. See link below. Therefore, these compressed drawing pdfs in no way replace the project drawing pdfs on Drexel's website, and are for information only. **It is the bidder's responsibility to use the documents on Drexel's website for bidding purposes. Bidders shall not rely on the compressed files for preparation of their bid as data may be missing due to compression.**

ftp://ftp.skdg.com/

Username: 16-108 contractor 2

Password: 16-108 contractor 2

1.5 SPECIFICATION REVISIONS

A. General: All instances of SK Design Group, Inc. contact information shall be deleted and replaced with the following:

SK Design Group, Inc.: 4600 College Blvd., Suite 100 / Overland Park, KS 66211 / 913-451-1818

Sassan Mahobian, Principal in Charge	sassan@skdg.com	913-238-3178
Jonathon Smith, Project Manager	jsmith@skdg.com	469-525-1891
Stephen Brefo, Project Manager, Submittals	sbrefo@skdg.com	816-510-1126
Matt Matthews, Field Representative	mmatthews@skdg.com	913-378-7079

The specification sections where the SK Design contacts were revised include:

a. Invitation to Bid Item 1.4.A.1. Revised SK Design Contacts
b. Bidder Checklist Next to Last Paragraph. Revised SK Design Contacts
c. Job Special Provisions: Items 3.1.B and 3.1.C. Revised SK Design Contacts
d. Section 01100 Summary, Item 1.2.C. Revised SK Design Contacts
e. Section 2160 SWPPP, Page 1. Revised SK Design Contacts

B. Table of Contents: Delete and replace with the attached Table of Contents.

C. Unit Price Bid Form: Add the following note to the top of page 1:

Note: Refer to Section 01270 for measurement and payment of unit price items. Section 01270 supersedes any other references to measurement and payment in the contract documents.

D. Appendices: Add attached Geotechnical Reports as Appendix B.

PART 2 - PRODUCTS - NOT USEDEXECUTION - NOT USED

END OF SECTION 00911

S. Main Improvements
Pre-Bid Meeting
2021-02-25

Introductions and Project Overview

- Project limits, main work items
- City personnel

Name, Title	Email	Phone
Greg McDanel, City Manager	gmcdanel@maryville.org	660-541-1353
Ryan Heiland, Assistant City Manager	rheiland@maryville.org	660-541-4402
CE Goodall, Public Works Director	cgoodall@maryville.org	660-562-8001

- Engineer's personnel: SK Design Group, Inc. 913-451-1818

Name, Title	Email	Cell Phone
Sassan Mahobian, Principal in Charge	sassan@skdg.com	913-238-3178
Jonathon Smith, Project Manager	jsmith@skdg.com	469-525-1891
Stephen Brefo, Project Manager, Submittals	sbrefo@skdg.com	816-510-1126
Mehrdad Givechi,Traffic Signals	mgivechi@sunflower.com	785-766-0712
Matt Matthews, Field Representative	mmatthews@skdg.com	913-378-7079

- Engineer's Consultants:

Name, Company	Email	Phone
Adam Teal, Midland Survey	ateal@midlandsurvey.com	660-582-8633
Allyson Evans, LightWorks	allyson@lightworkskc.com	816-640-9948
Doug Pickert, Indigo	doug@indigoparks.com	913-583-1370
Dylan Kruger, KTI	dzkruger@ktionline.com	913-498-1114

Bidding

- Review "Invitation to Bid"
- Review Bidder Checklist (please complete before submitting bid)
- Review "Notice to Contractors". Bidder to complete and sign this form.
- Review Unit Price Bid Form. Bidder to complete the unit prices form. Note: refer to section 01270 for measurement and payment of unit price items. Section 01270 supersedes any other references to measurement and payment in the contract documents.
- Bid Prep. - Electronic copies of the bid form will be provided upon request
- Bid Bond. Bidder to complete.
- DBE Submittal forms to be completed by bidder (will be modified). DBE Goal is 6% of total Construction cost
- Qualifications of Bidders.

  To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five (5) days of OWNER's request written evidence, which demonstrates the Bidder's; financial ability to purchase equipment and materials for the Work, previous experience and qualifications for similar Work, present commitments, and other such data as may be requested to evaluate the Bidder's qualifications. Each Bid must contain evidence of Bidder's qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract.

S. Main Improvements
Pre-Bid Meeting
2021-02-25

Job Special Provisions

- Traffic management schedule to be submitted by contractor
- Work hour restrictions during holidays. For night-time paving requirements see notes on drawing C00.51.
- Utility contacts
- Letters of Certification. Utilities "Status"
  - Evergy has facilities that must be relocated for base bid work. The extent of relocations is shown on the plans. Contractor's responsibilities are identified on the plans.
  - Telecom lines will need to be relocated and coordinated with the telecom companies. Contractor's responsibilities are identified on the plans.
  - Gas lines will need to be relocated and coordinated with the gas company. Contractor's responsibilities are identified on the plans.
  - Waterlines will need to be relocated under this contract
- Order of work: Refer to Drawing C00.51
- ADA per plans and reviewed per MODOT checklist
- Possession of Right-of-Way: Parcel 17 and 29 are subject to delayed possession. Do not enter these properties until possession. Mid must account for this delayed possession.

Schedule

- Open bids March 10th
- Approval from City Council on March 22, 2021 *(tentative)*
- Contractor NTP on April 1, 2021 *(tentative)*
- Substantial completion by October 1, 2022
- Final completion by January 1, 2023

Questions and answers

SIGN-IN SHEET
Pre-Bid Meeting
SOUTH MAIN CORRIDOR IMPROVEMENT PROJECT STP-4300(112)

February 25, 2021
1:00 p.m.

	NAME	ADDRESS	PHONE	E-MAIL ADDRESS
1.	Matt Matthew		913-378-7879	MMatthew@SKdg.com
2.	Mike Lee Midwest Silo	550 Stanley Rd.	816-694-1851	MLEE@MIDWESTSILOCOMPANY.COM
3.	Dave Robison		913-702-4005	dave.robison@ads-pipe.com
4.	Dirk Hudson		816-602-4201	dirk.hudson@ads-pipe.com
5.	Tony Keller		816 232 5406	tjk74@hotmail.com
6.	Lonnie Wales		816 387-3408	lonniewales59@gmail.com
7.	Noah Gibson	6131 Indiana Ave Kcmo	816 507-3368	noahg@kissickco.com
8.	CE Goodall		660-562-8025	cgoodall@maryville.org
9.	David Seeman		913-334-2330	DSEEMAN@Aminobros.com
10.	Ryan McMaster		913.334.2330	ryan@aminobros.com
11.	ADAM TEALE	501 N. MARKET	660-582-8633	ateale@midlandsurvey.com
12.	Eric T. Lance		660-562-8019	elance@maryville.org
13.				
14.				
15.				

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2800a Street Lights

2800bcd Roadway Lighting

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Appendix

Evergy Underground Construction Specification

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

December 27, 2019

Mr. John D. Chamberlin, P.E.
SK Design Group, Inc.
4600 College Boulevard Suite 100
Overland Park, KS 66211

Re: KTI Project No. 219181G
South Main Street Reconstruction
Maryville, Missouri

Dear Mr. Chamberlin:

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

These recommendations should be used in conjunction with the original KTI Geotechnical Report No. 219122G dated September 20, 2019. We thank you for the opportunity to work with SK Design Group, 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

Tadele M. Akalu
Laboratory Manager

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REPORT OF GEOTECHNICAL EXPLORATION
SOUTH MAIN STREET RECONSTRUCTION
MARYVILLE, MISSOURI

AUTHORIZATION

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

Project: South Main Street Reconstruction-Maryville, Missouri		
Document:	**Date:**	**Requested/Provided:**
Request for Proposal	11-20-19	John Chamberlin – SK Design Group, Inc.
KTI Proposal 19GT200	11-22-19	Dylan Kruger – Kruger Technologies, Inc.
Notice to Proceed	11-22-19	John Chamberlin – SK Design Group, Inc.

PURPOSE AND SCOPE

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

- Site Preparation and Engineered Fill
- Lateral Earth Pressure
- Subgrade Recommendations

PROJECT DESCRIPTION

We understand that the project consists of the design and reconstruction of the existing South Main Street and the intersection at South Avenue located in Maryville, Missouri. Proposed improvements include widening, partial and full depth pavement replacement, driveway reconfiguration and traffic control. It appears that 5 to 8 feet of fill could be required in the widening areas, depending on the final alignment and cross section of the proposed reconstruction.

FIELD EXPLORATION PROCEDURES

A total of 12 additional borings were completed on December 6, 2019 along the center line of the drive lane. The borings were selected by the client and field located by Kruger Technologies using site layout plans provided by the client. The boring locations are shown on the attached Boring Location Diagram. Depths indicated on the boring logs are referenced from the ground surface at the time of the exploration.

The borings were drilled using a track mounted Geoprobe. Advancement of the test holes was accomplished using macro cores and direct push. Soil sampling was performed by hydraulically pushing thin wall steel (Shelby) tubes to the drilling plan depth.

Site soils were visually and manually classified in general accordance with ASTM D 2488 by the drill crew chief as drilling progressed. The soil samples collected in the field 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.

Ground water was not encountered at any test borings. 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 in-situ moisture/density, plasticity (Atterberg Limits) and unconfined compressive strength of soil are presented in Appendix II.

SITE CONDITIONS

The explored areas are South Main Street and the intersection at South Avenue, a two-lane asphaltic concrete paved roadway in Maryville, Missouri. Commercial buildings, parking and scattered drive entrances occupy the east and west sides of the roadway.

SUBSURFACE DISCUSSIONS

The test borings drilled at the center line of South Main Street are represented by borings B-25, B-26, B-27, B-28, B-29, B-30, B-31, B-32, B-33 and B-34. The profile at these locations consisted of 4.5 to 6.2 inches of asphaltic cement concrete (ACC) pavement underlain by 5.0 to 7.8 inches

of concrete pavement. The test borings drilled at the center line of East South Avenue is represented by B-35 and at this location the profile consists 7.8 inches of concrete underlain by 2 inches of poorly graded aggregate. The test boring drilled at the center line of West South Avenue is represented by boring B-36 and at this location the profile consisted of 6.2 inches of asphaltic cement concrete underlain by 2.0 inches of poorly graded aggregate. Soil materials below the concrete and or asphalt at all locations except for B-27 consisted of high plasticity (CH) clays, and low to high plasticity (CL-CH) clays were encountered throughout the 5.0-foot planned drilling depth. Underlying soils at B-27 consisted of low plasticity lean (CL) clays up to 3.0 feet below existing ground and underlain by fat clays (CH) throughout the 5.0-foot planned drilling depth.

The majority of subgrade soils below the concrete and or asphalt pavement consist of high plasticity (CH) clays and low to high plasticity (CL-CH) clay soils that are generally moist and exhibit medium to very stiff consistency. Laboratory results indicate moisture contents ranging from 16.9 to 20.4 percent. Dry unit weights range from 95.5 to 111.3 pcf. Atterberg limits were determined from selected borings and ranged from liquid limits of 48 to 64 and a plasticity indicates ranged from 33 to 45. As previously stated, free groundwater was not encountered at any test borings. The borings were dry during and upon completion of coring and sampling operations.

Table 1

Asphalt and Concrete Pavement Thickness

Boring ID	Asphalt Thickness (in)	Concrete Thickness (in)
B-25	5.0	6.0
B-26	5.5	6.5
B-27	4.5	5.5
B-28	4.5	6.5
B-29	5.0	6.0
B-30	4.5	6.0
B-31	4.5	5.0
B-32	4.5	6.0
B-33	4.5	5.5
B-34	5.0	5.5
B-35	-	7.8
B-36	6.2	-

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 ……95.5 to 111.3 pcf
Natural Moisture Content ……...16.9 to 20.4%
Liquid Limit…….48 to 64
Plastic Limit……... 33 to 45
Unconfined Compressive Strength of soil ……...… 3,132 to 6,698 psf

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.

Trucks and other heavy construction vehicles should be restricted as much as possible from trafficking on the finished subgrade in the pavement 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 8 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 -2 to +2 percent from optimum moisture content for low plasticity clays. Most of the site soils encountered during the exploration are not suitable for reuse as engineered fill below the pavement.

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.

Lateral Earth Pressure

The following K values, based on the clay soils encountered on the site, and crushed rock backfill obtained from off-site source, may be used for the determination of lateral soil resistance for retaining structures or buried walls. These values do not take into account surcharges caused by construction equipment or spoil piles placed adjacent to retaining structures.

Compacted High Plasticity Clay Backfill

Angle of internal friction (ϕ) = 20° (estimated)

K_a = 0.49 K_p = 2.05 K_o = 0.66

Wet density of in place soil, average (γ) = 125.0 pcf

Compacted Low Plasticity Clay Backfill

Angle of internal friction (ϕ) = 26° (estimated)

K_a = 0.39 K_p = 2.56 K_o = 0.56

Wet density of in place soil, average (γ) = 125.0 pcf

Crushed Rock Backfill

Angle of internal friction (ϕ) = 35° (estimated)

K_a = 0.27 K_p = 3.70 K_o = 0.42

Wet density of backfill (γ) = 135.0 pcf

Pavement Subgrade Preparation

Pavement subgrades should be prepared in accordance with the recommendations presented in the SITE PREPARATION and ENGINEERED FILL section of this report. Construction scheduling, involving paving and grading by separate contractors, typically results in a time lapse between the end of grading operations and the commencement of paving. Disturbance, desiccation, and/or wetting of the subgrade between grading and paving can result in deterioration of the previously completed subgrade. A non-uniform subgrade can result in poor pavement performance and local failures soon after pavements are constructed.

We recommend that the upper 12'' of subgrade soils consist of a low volume change (LVC) material. Acceptable LVC material is any soil type that has a Liquid Limit (LL) of less than 45 and

a Plasticity Index (PI) of less than 25. Any borrow material brought to the site and placed in these strata should be LVC material or should be stabilized as described below.

Based on the test results, the majority of the site soils at the pavement subgrade are highly expansive clays (CH). These soils show a strong tendency to swell with changes in water content. To limit the volume change of these materials, we recommend at a minimum stabilizing the upper 12" of the parent soil subgrade with 15% flyash, 5% of hydrated lime, 6% of lime kiln dust or removed and replaced with crushed limestone such as MoDOT Type-5 placed in 6 inch lifts and compacted at 95 percent of maximum dry density per ASTM D698. Replacing the upper 12'' of the parent soil subgrade with milling and recycling the existing asphalt and concrete pavement may be used in this project. The grading of the recycled material shall meet the criteria below when a representative sample of a mass at least the size required in Method ASTM C136.

Table 2

Grading Requirement for Asphalt and Concrete Recycled Material

Sieve Opening Size	Percent Passing (by mass)
37.5mm (1 1/2in)	100%
25 mm (1 in)	90-100 %
9.5 mm (3/8 in)	50-90%
No.200 sieve (75 μm)	10% max

The recycled aggregate shall be delivered to the roadbed as uniform mixtures. The mixture shall be deposited and spread with the maximum of 8" loose thickness per lift. At the time recycled aggregate is spread it shall have a moisture content sufficient to obtain adequate compaction. The recycled material does not provide sufficient cohesion to develop a Standard Proctor density test and will require performance testing for compaction acceptance. This compacted material should be proof rolled with a fully loaded, tandem-axle dump truck between lifts and prior to paving.

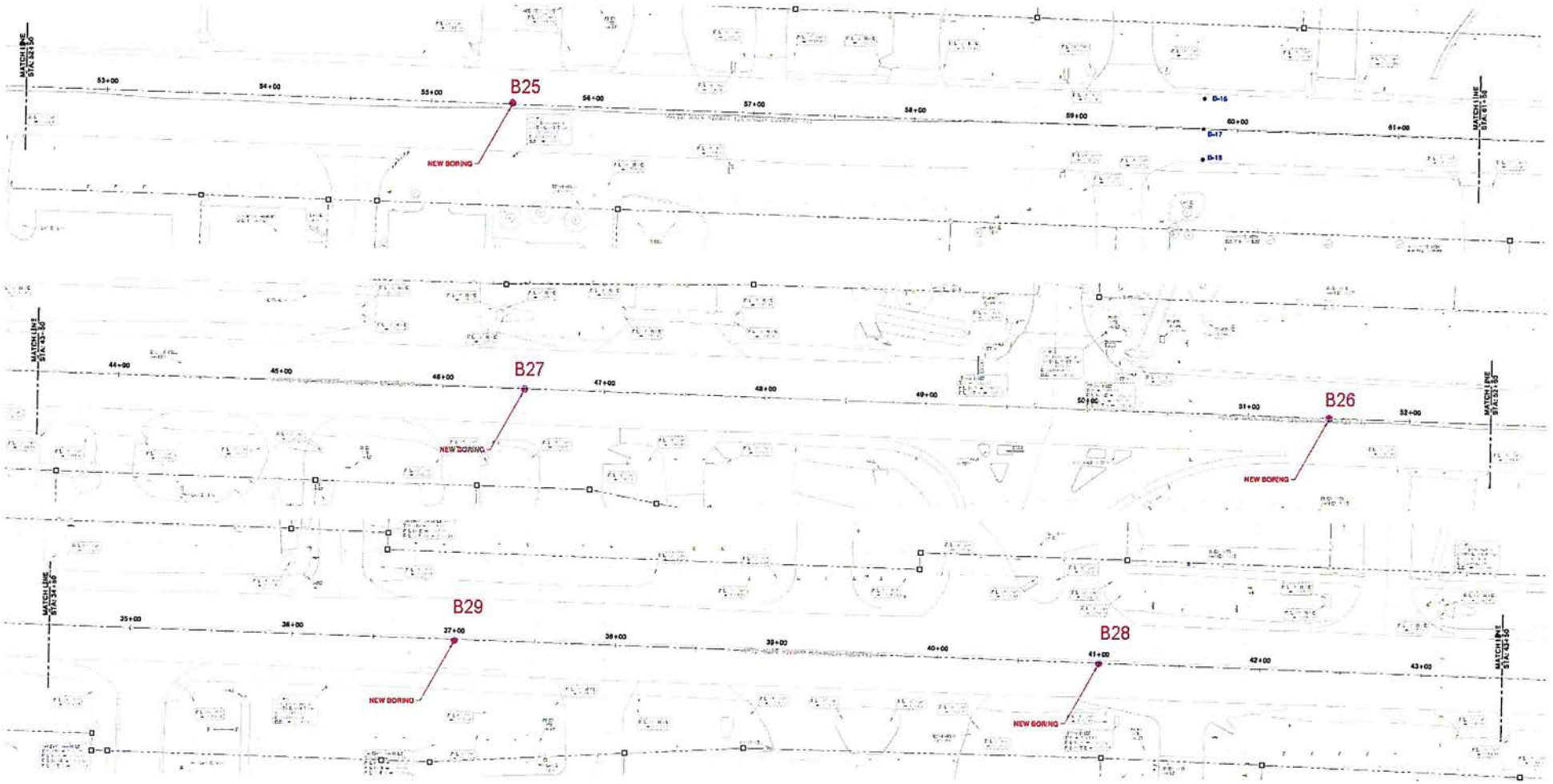
REMARKS

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.

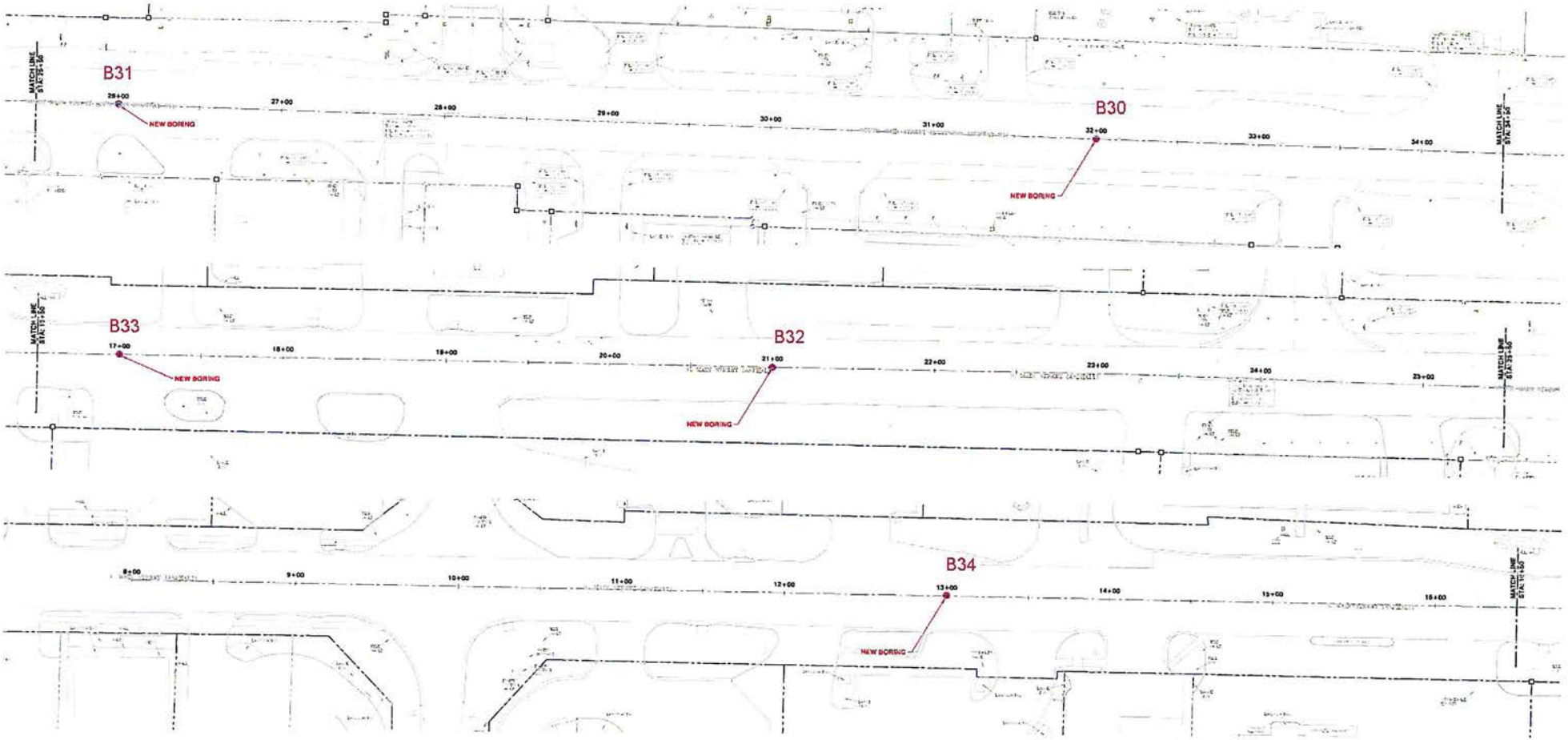
BORING LOCATION DIAGRAM



Boring Location Diagram
South Main Street Reconstruction
Maryville, Missouri

KRUGER TECHNOLOGIES, INC.

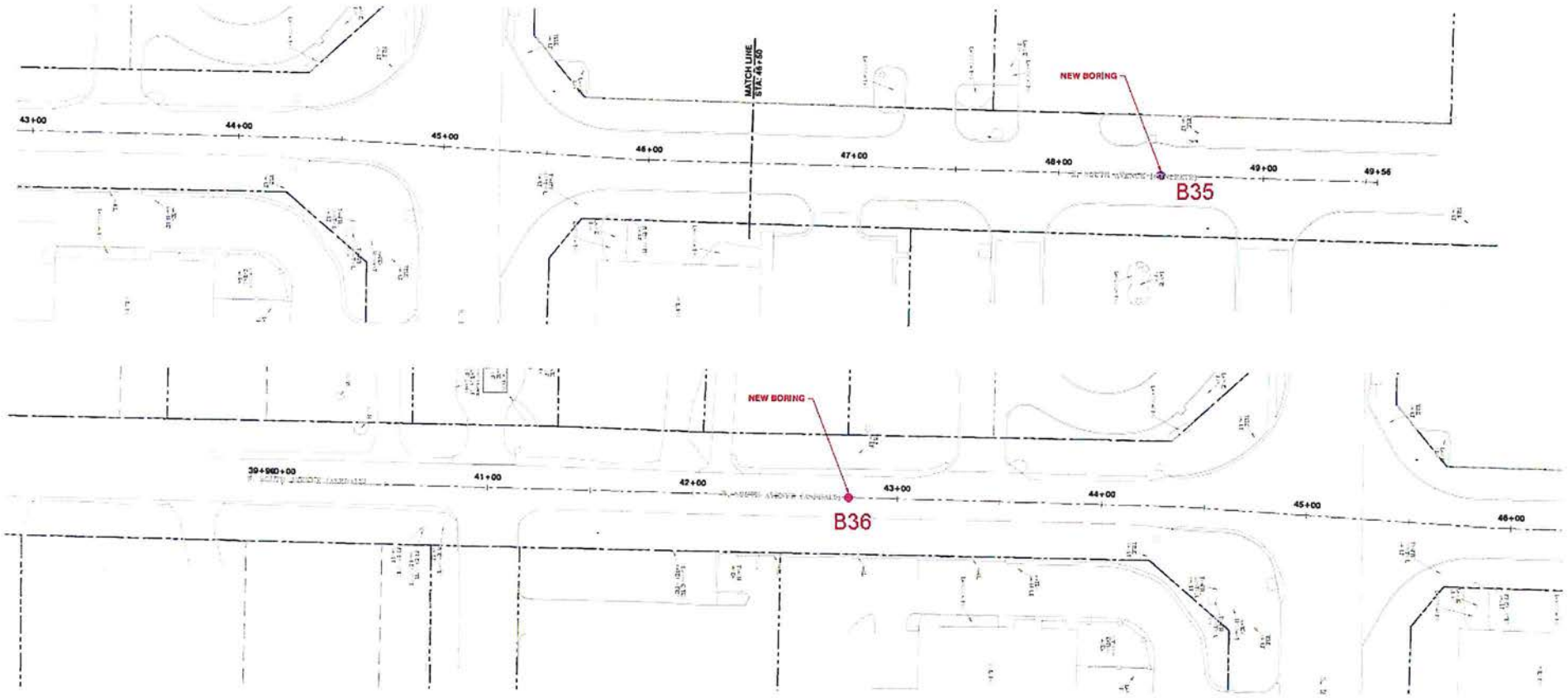
Drawn: TMA	Date: 12/20/19	KTI Project No. 219181G



Boring Location Diagram
South Main Street Reconstruction
Maryville, Missouri

Drawn: TMA	Date: 12/20/19	KTI Project No. 219181G

KRUGER TECHNOLOGIES, INC.



Boring Location Diagram
South Main Street Reconstruction
Maryville, Missouri

Drawn: TMA	Date: 12/20/19	KTI Project No. 219181G

KRUGER TECHNOLOGIES, INC.

APPENDIX I

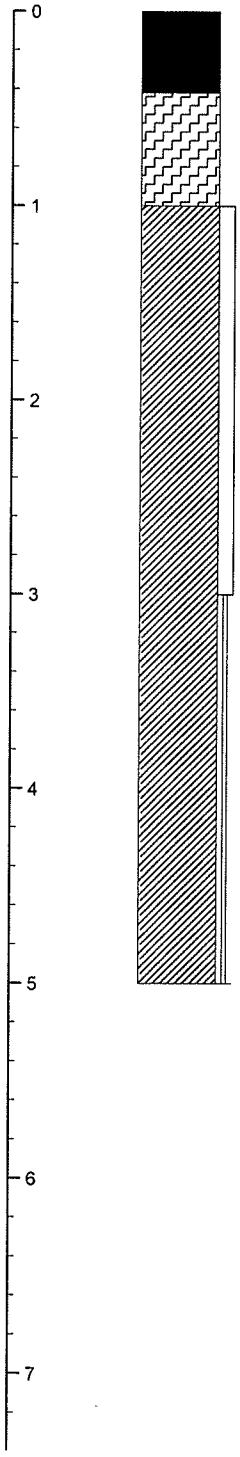
Boring Logs

LOG OF TEST BORING
BORING B-25

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19

LOGGER: TMA
DATE CHECKED:



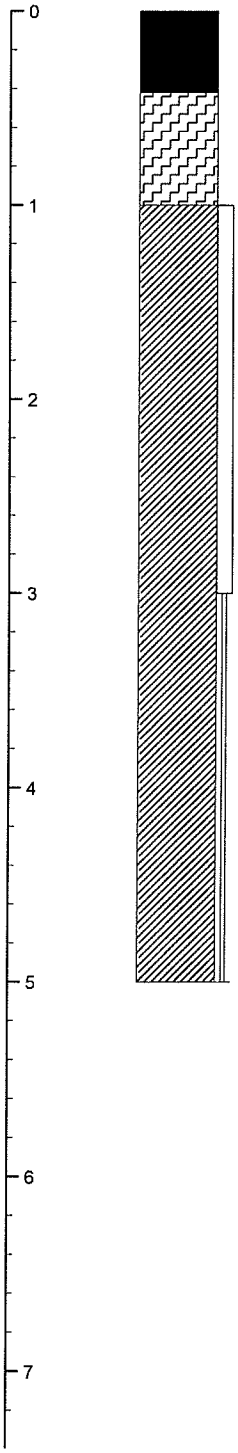
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	5" Asphalt				
		C	6" Concrete				
			Fat clay, trace organics, brown, moist				
				1, ST	106.9	17.0	
		CH	Becoming dark grayish brown				
				1, V			
			Drilling discontinued at 5.0'				

Notes:

LOG OF TEST BORING
BORING B-26

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19
LOGGER: TMA
DATE CHECKED:



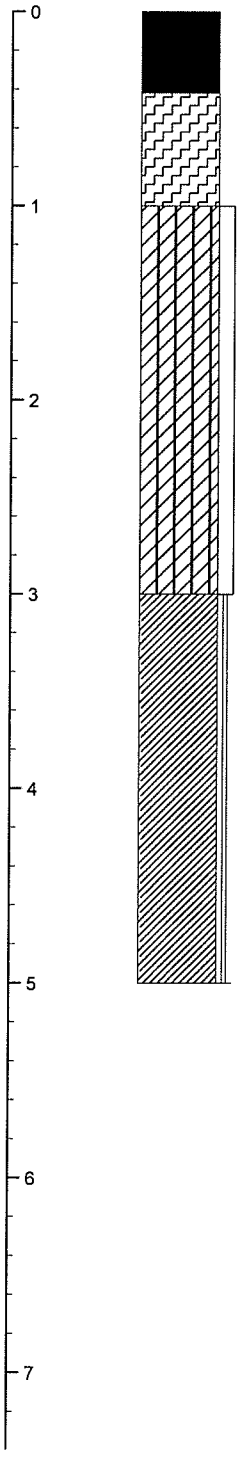
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	5.5" Asphalt				
		C	6.5" Concrete				
			Fat clay, with organics, medium stiff, dark grayish brown, moist				
				1, ST	101.8	16.9	
		CH	Becoming dark gray				
				1, V			
			Drilling discontinued at 5.0 feet				

Notes:

LOG OF TEST BORING
BORING B-27

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19
LOGGER: TMA
DATE CHECKED:



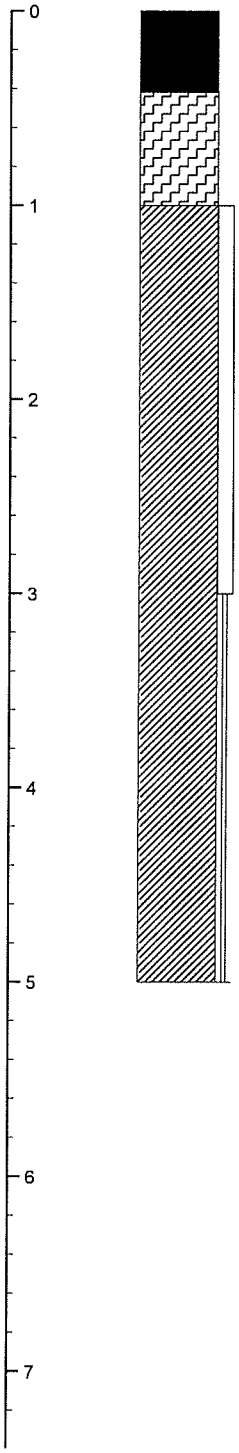
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	4.5" Asphalt				
		C	5.5" Concrete				
		CL	Lean clay, stiff, yellowish brown, moist	1, ST	111.0	18.8	6666
		CH	Fat clay, stiff, dark brown, moist	1, V			
			Drilling Discontinued at 5.0 feet				

Notes:

LOG OF TEST BORING
BORING B-28

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19
LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	ACC	4.5" Asphalt				
	C	6.5" Concrete				
	CH	Fat clay, stiff, black, moist	1, ST	105.3	17.7	
	CH	Fat clay, trace organics, dark grayish brown, stiff, moist	1, V			
		Drilling discontinued at 5.0 feet				

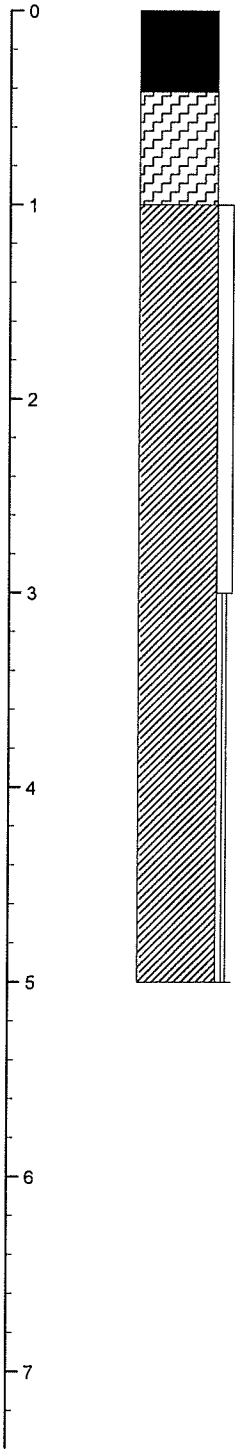
Notes:

LOG OF TEST BORING
BORING B-29

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19

LOGGER: TMA
DATE CHECKED:



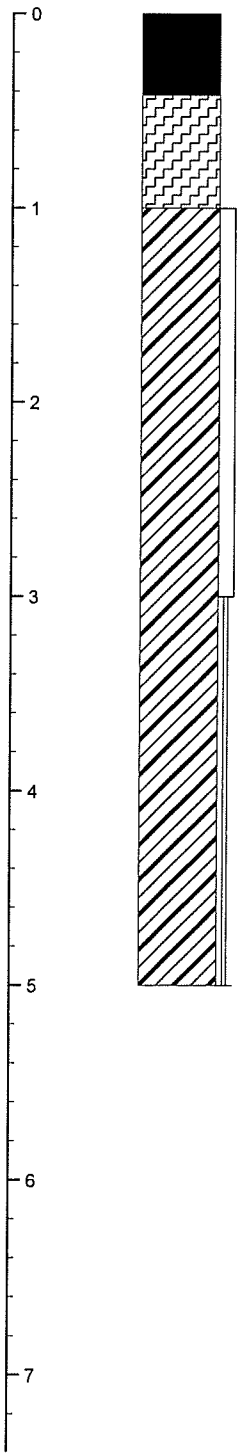
ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	ACC	5" Asphalt				
	C	6" Concrete				
		Fat clay, stiff, gray, moist				
			1, ST	101.1	22.9	3899
	CH	Becoming light grayish brown				
			1, V			
		Drilling discontinued at 5.0 feet				

Notes:

LOG OF TEST BORING
BORING B-30

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19
LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	4.5" Asphalt				
		C	6" Concrete				
			Lean to fat clay, stiff, light gray, moist				
				1, ST	95.6	23.9	
		CL-CH	Becoming dark, grayish brown				
				1, V			
			Drilling discontinued at 5.0 feet				

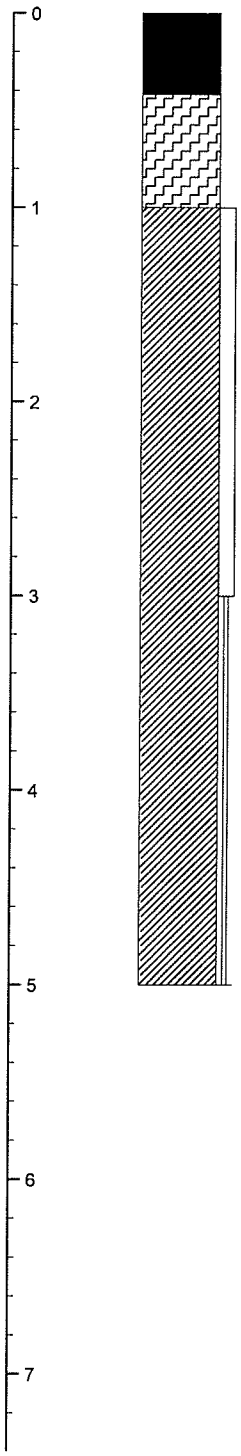
Notes:

LOG OF TEST BORING
BORING B-31

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	ACC	4.5" Asphalt				
	C	5.0" Concrete				
		Fat clay, stiff, grayish brown, moist				
			1, ST	95.5	26.7	3132
	CH	Becoming dark grayish brown, moist				
			1, V			
		Drilling discontinued at 5.0 feet				

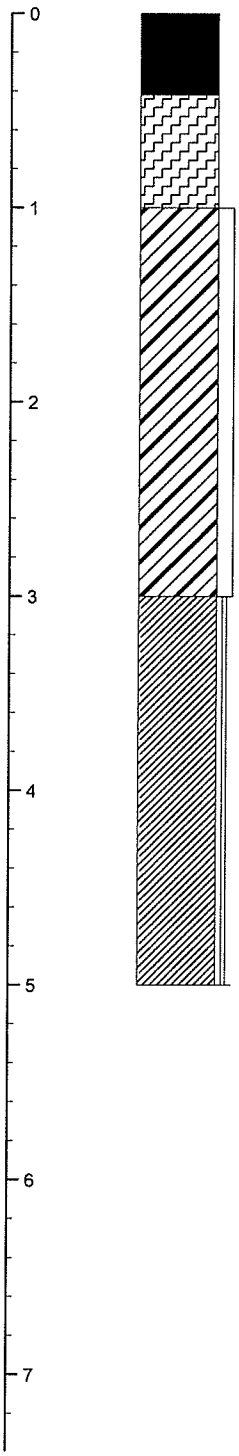
Notes:

LOG OF TEST BORING
BORING B-32

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	4.5" Asphalt				
		C	6" Concrete				
		CL-CH	Lean to fat clay, trace organics, stiff, red and yellowish brown, moist	1, ST	111.3	19.2	
		CH	Fat clay, stiff, reddish brown, moist	1, V			
			Drilling discontinued at 5.0 feet				

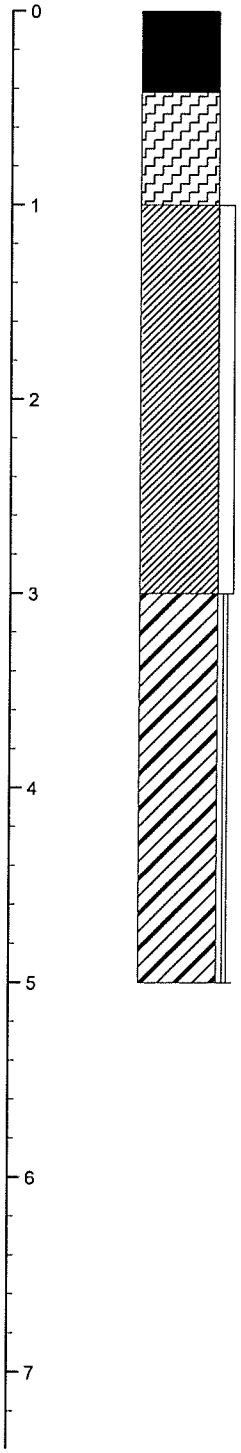
Notes:

LOG OF TEST BORING
BORING B-33

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19

LOGGER: TMA
DATE CHECKED:



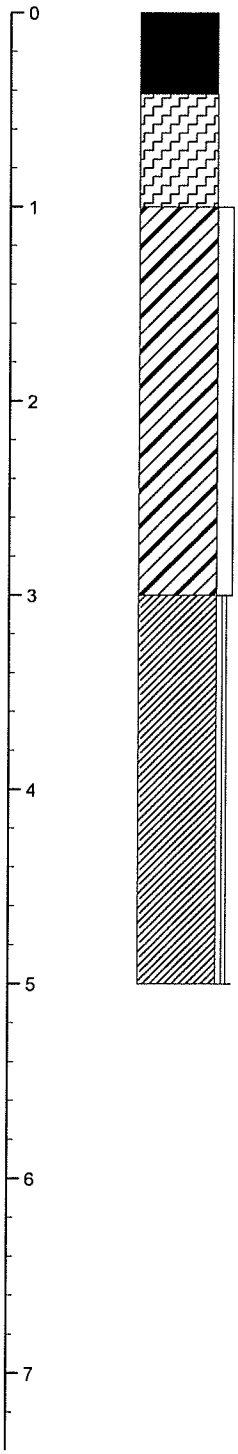
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	4.5" Asphalt				
		C	5.5" Concrete				
		CH	Fat clay, trace organics, stiff, grayish brown, moist	1, ST	105.1	20.4	6698
		CL-CH	Lean to fat clay, stiff, brown, moist	1, V			
			Drilling discontinued at 5.0 feet				

Notes:

LOG OF TEST BORING
BORING B-34

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G
START: 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19
LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	ACC	5" Asphalt				
	C	5.5" Concrete				
	CL-CH	Lean to fat clay, with organics, stiff, gray & black, moist	1, ST	110.2	17.2	
	CH	Fat clay, stiff, gray, moist	1, V			
		Drilling discontinued at 5.0 feet				

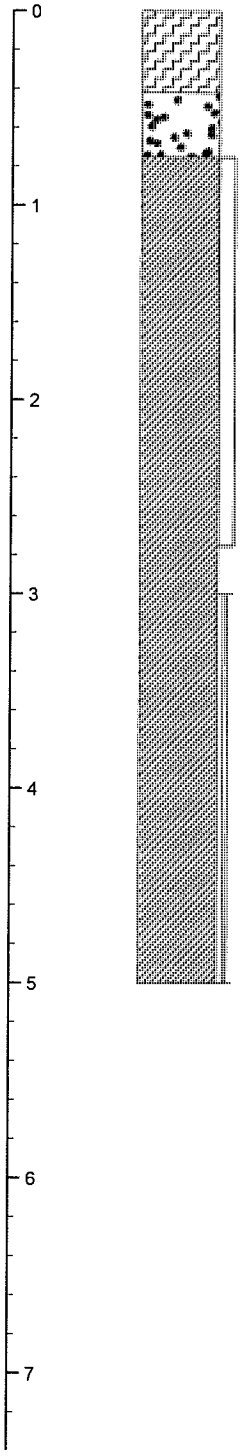
Notes:

LOG OF TEST BORING
BORING B-35

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moisture, %	Qu, psf
		C	7.8" Concrete				
		GP	2.0" Gravel				
			Fat clay with organics, stiff, dark gray and black, moist	1, ST	100.8	22.5	4857
		CH	Becoming grayish brown	1, V			
			Drilling discontinued at 5.0 feet				

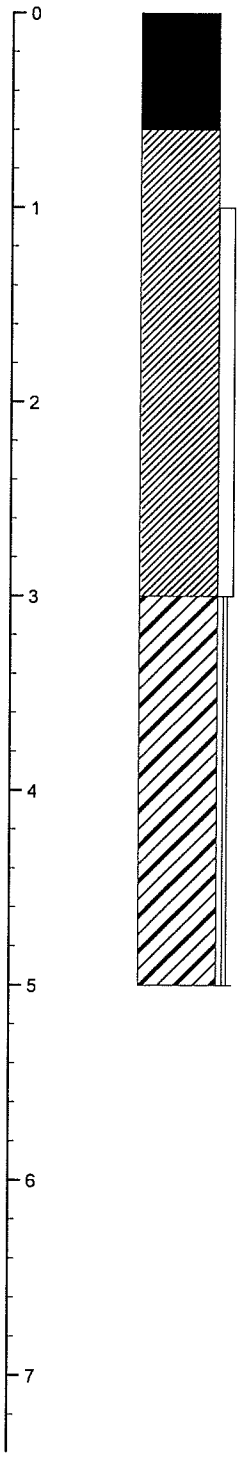
Notes:

LOG OF TEST BORING
BORING B-36

PROJECT: South Main Street Reconstruction STP-4300
CLIENT: SK Design Group
PROJECT NO.: 219181G **START:** 12/6/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 12/23/2019
ELEVATION:
FINISH: 12/6/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	6.2" Asphalt				
		CH	Fat clay, gray				
		CH	Fat clay, trace organics, stiff, greenish gray, moist	1, ST	104.3	20.4	6639
		CL-CH	Lean to fat clay, stiff, light gray, moist	1, V			
			Drilling discontinued at 5.0 feet				

Notes:

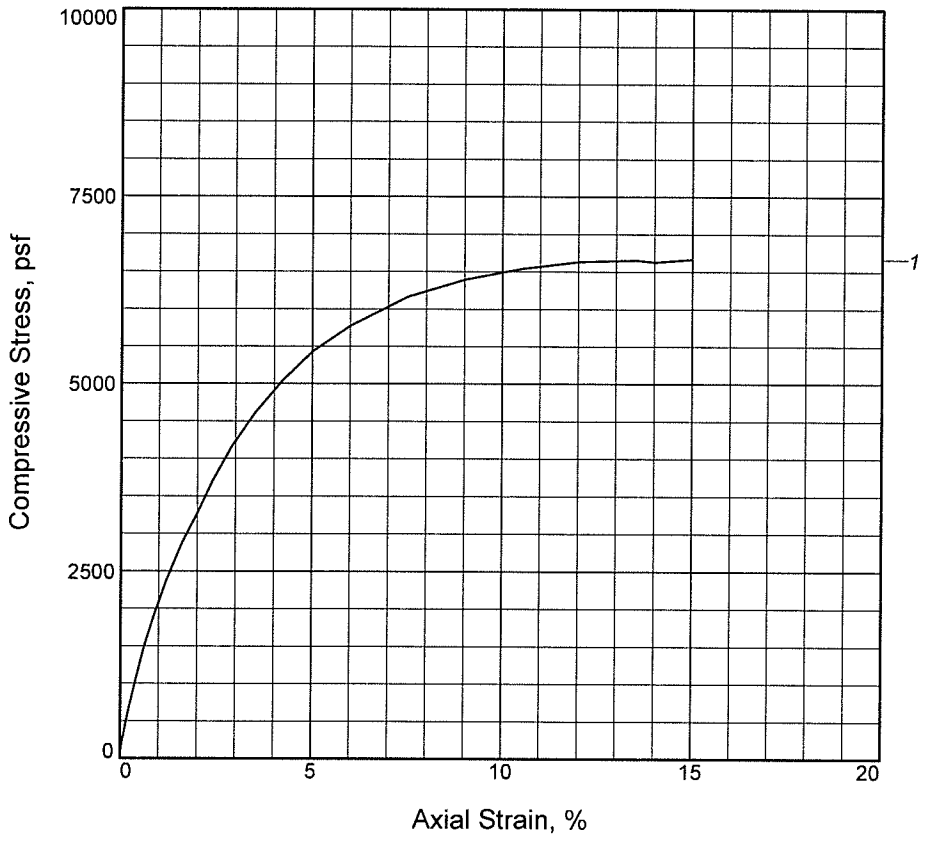
APPENDIX II

Laboratory Results

SUMMARY OF LABORATORY TEST RESULTS 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 Index0 %	
B-25	1.0-3.0	ST-1	17.0	106.9		51	35	CH
B-26	1.0-3.0	ST-1	16.9	101.8				
B-27	1.0-3.0	ST-1	18.8	111.0	6666	48	33	CL
B-28	1.0-3.0	ST-1	17.7	105.3				
B-29	1.0-3.0	ST-1	22.9	101.1	3899	64	45	CH
B-30	1.0-3.0	ST-1	23.9	95.6				
B-31	1.0-3.0	ST-1	26.7	95.5	3132	54	36	CH
B-32	1.0-3.0	ST-1	19.2	111.3				
B-33	1.0-3.0	ST-1	20.4	105.1	6698	52	35	CH
B-34	1.0-3.0	ST-1	17.2	110.2				
B-35	1.0-3.0	ST-1	22.5	100.8	4857	59	39	CH
B-36	1.0-3.0	ST-1	20.4	104.3	6639			

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	6666			
Undrained shear strength, psf	3333			
Failure strain, %	15.0			
Strain rate, in./min.	0.050			
Water content, %	18.8			
Wet density, pcf	131.9			
Dry density, pcf	111.0			
Saturation, %	96.8			
Void ratio	0.5292			
Specimen diameter, in.	1.81			
Specimen height, in.	3.98			
Height/diameter ratio	2.20			

Description: Lean clay, stiff, yellowish brown, moist

LL = 48	**PL** = 15	**PI** = 33	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219181G
Date Sampled: 12/6/19
Remarks:

Figure _____

Client: SK Design Group

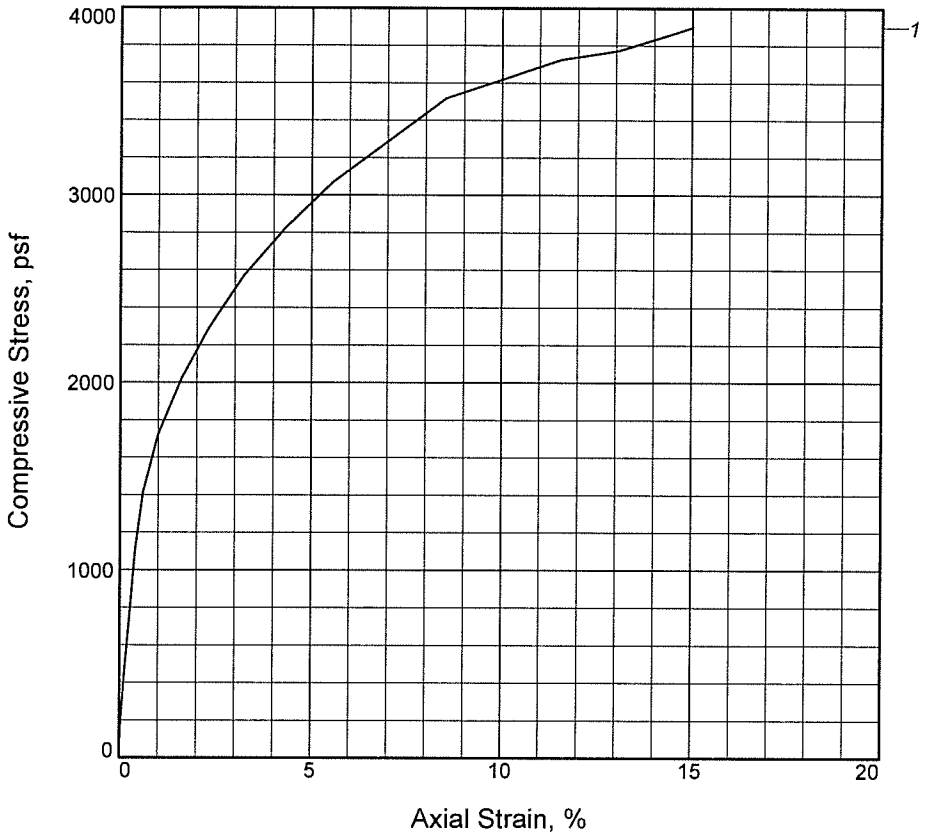
Project: South Main Street Reconstruction STP-4300

Source of Sample: B-27 **Depth:** 1
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3899			
Undrained shear strength, psf	1950			
Failure strain, %	15.0			
Strain rate, in./min.	0.050			
Water content, %	22.9			
Wet density, pcf	124.3			
Dry density, pcf	101.1			
Saturation, %	91.6			
Void ratio	0.6788			
Specimen diameter, in.	1.80			
Specimen height, in.	3.96			
Height/diameter ratio	2.20			

Description: Fat clay, stiff, gray, moist

LL = 64	**PL =** 19	**PI =** 45	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219181G
Date Sampled: 12/6/19
Remarks:

Figure _____

Client: SK Design Group

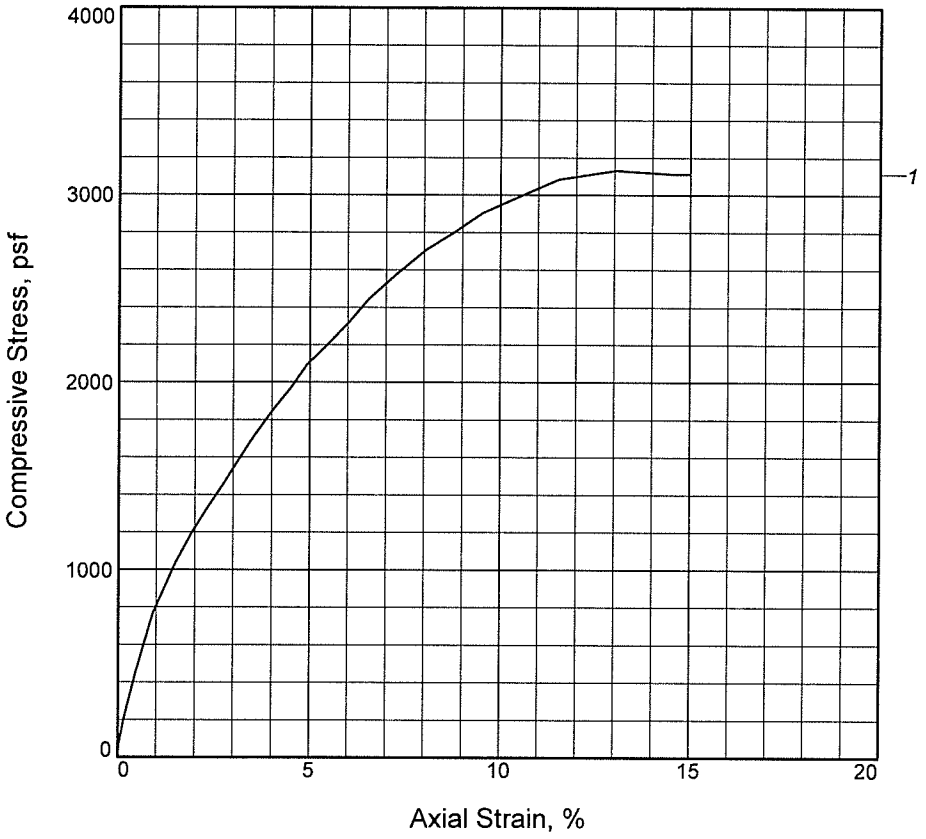
Project: South Main Street Reconstruction STP-4300

Source of Sample: B-29 **Depth:** 1
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3132			
Undrained shear strength, psf	1566			
Failure strain, %	13.0			
Strain rate, in./min.	0.050			
Water content, %	26.7			
Wet density, pcf	120.9			
Dry density, pcf	95.5			
Saturation, %	93.2			
Void ratio	0.7785			
Specimen diameter, in.	1.81			
Specimen height, in.	3.98			
Height/diameter ratio	2.20			

Description: Fat clay, stiff, grayish brown, moist

LL = 54	**PL =** 18	**PI =** 36	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219181G
Date Sampled: 12/6/19
Remarks:

Figure _____

Client: SK Design Group

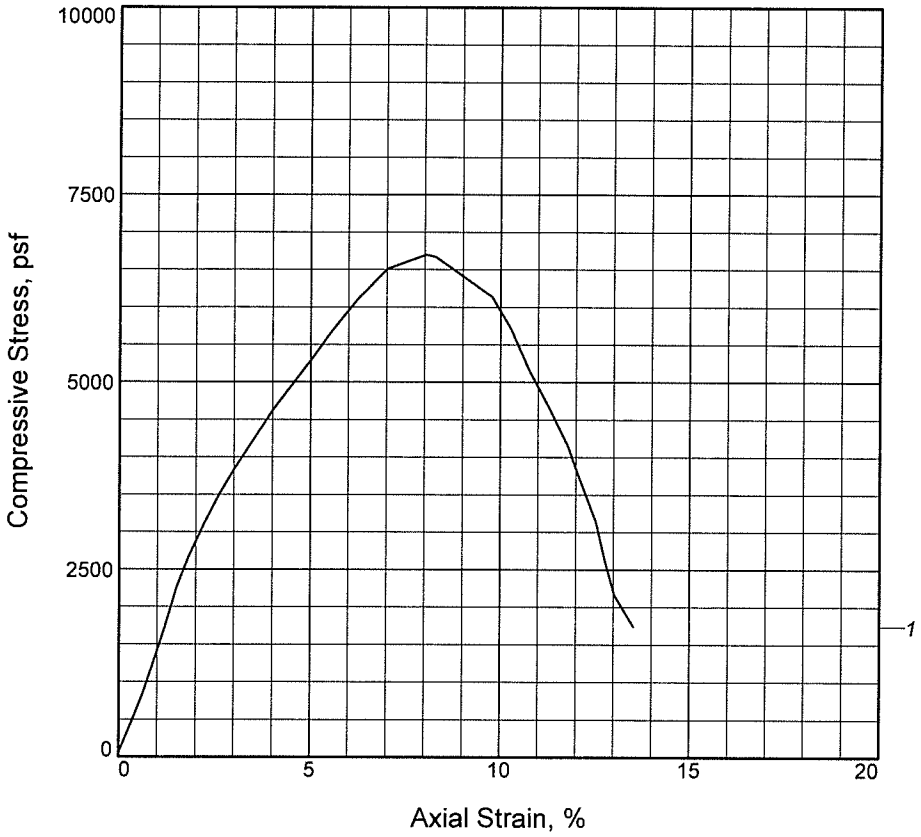
Project: South Main Street Reconstruction STP-4300

Source of Sample: B-31 **Depth:** 1
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	6698			
Undrained shear strength, psf	3349			
Failure strain, %	8.0			
Strain rate, in./min.	0.050			
Water content, %	20.4			
Wet density, pcf	126.6			
Dry density, pcf	105.1			
Saturation, %	90.4			
Void ratio	0.6149			
Specimen diameter, in.	1.82			
Specimen height, in.	3.97			
Height/diameter ratio	2.18			

Description: Fat clay, trace organics, stiff, grayish brown, moist

LL = 52	**PL =** 17	**PI =** 35	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219181G
Date Sampled: 12/6/19
Remarks:

Figure _____

Client: SK Design Group

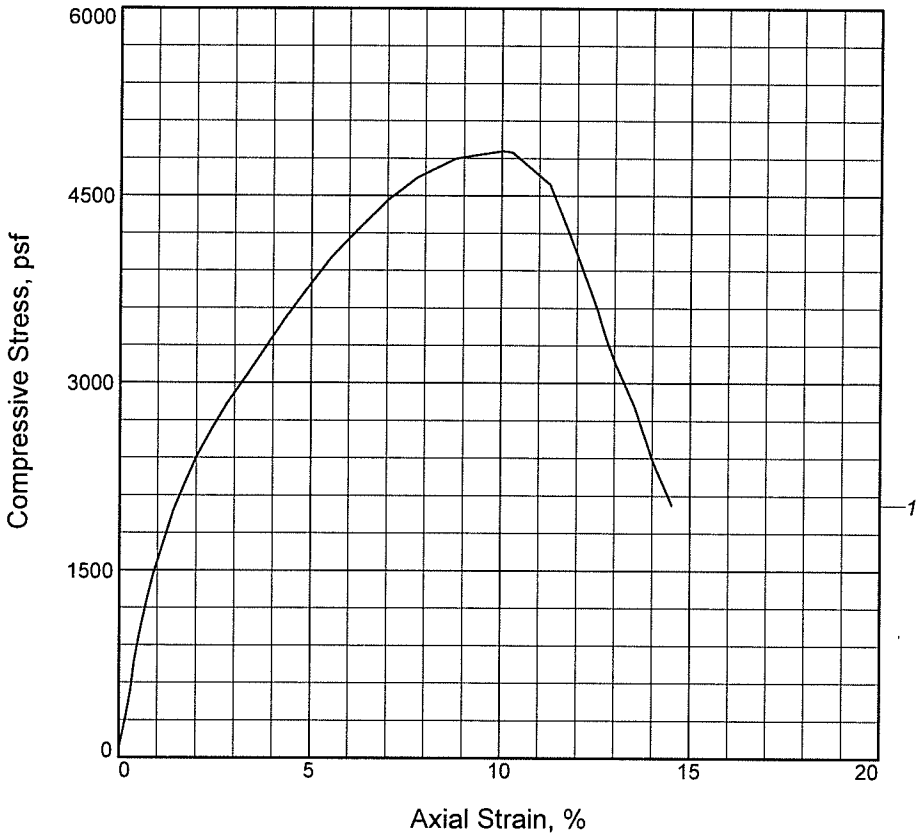
Project: South Main Street Reconstruction STP-4300

Source of Sample: B-33 **Depth:** 1
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	4857			
Undrained shear strength, psf	2429			
Failure strain, %	10.0			
Strain rate, in./min.	0.050			
Water content, %	22.5			
Wet density, pcf	123.5			
Dry density, pcf	100.8			
Saturation, %	89.5			
Void ratio	0.6851			
Specimen diameter, in.	1.83			
Specimen height, in.	3.98			
Height/diameter ratio	2.17			

Description: Fat clay with organics, stiff, dark gray and black, moist

LL = 59	**PL** = 20	**PI** = 39	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219181G
Date Sampled: 12/6/19
Remarks:

Figure _____

Client: SK Design Group

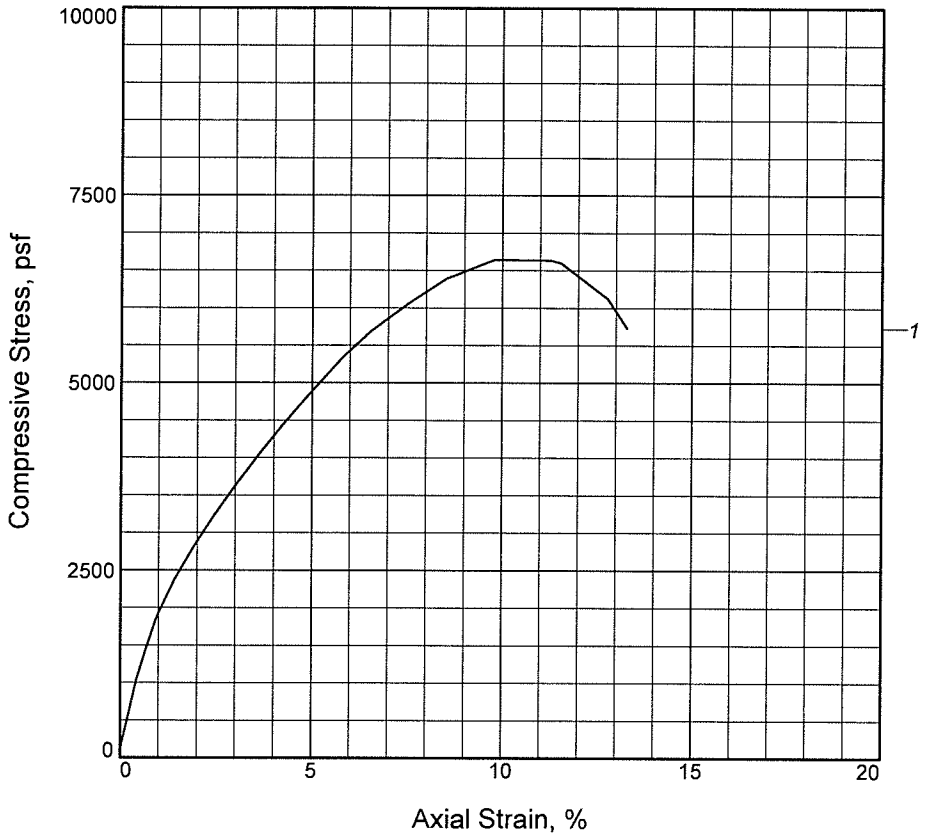
Project: South Main Street Reconstruction STP-4300

Source of Sample: B-35 **Depth:** 1
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	6639			
Undrained shear strength, psf	3319			
Failure strain, %	9.8			
Strain rate, in./min.	0.050			
Water content, %	20.4			
Wet density, pcf	125.5			
Dry density, pcf	104.3			
Saturation, %	88.0			
Void ratio	0.6288			
Specimen diameter, in.	1.83			
Specimen height, in.	3.99			
Height/diameter ratio	2.18			

Description: Fat clay, trace organics, stiff, greenish gray, moist

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

Project No.: 219181G
Date Sampled: 12/6/19
Remarks:

Figure _____

Client: SK Design Group

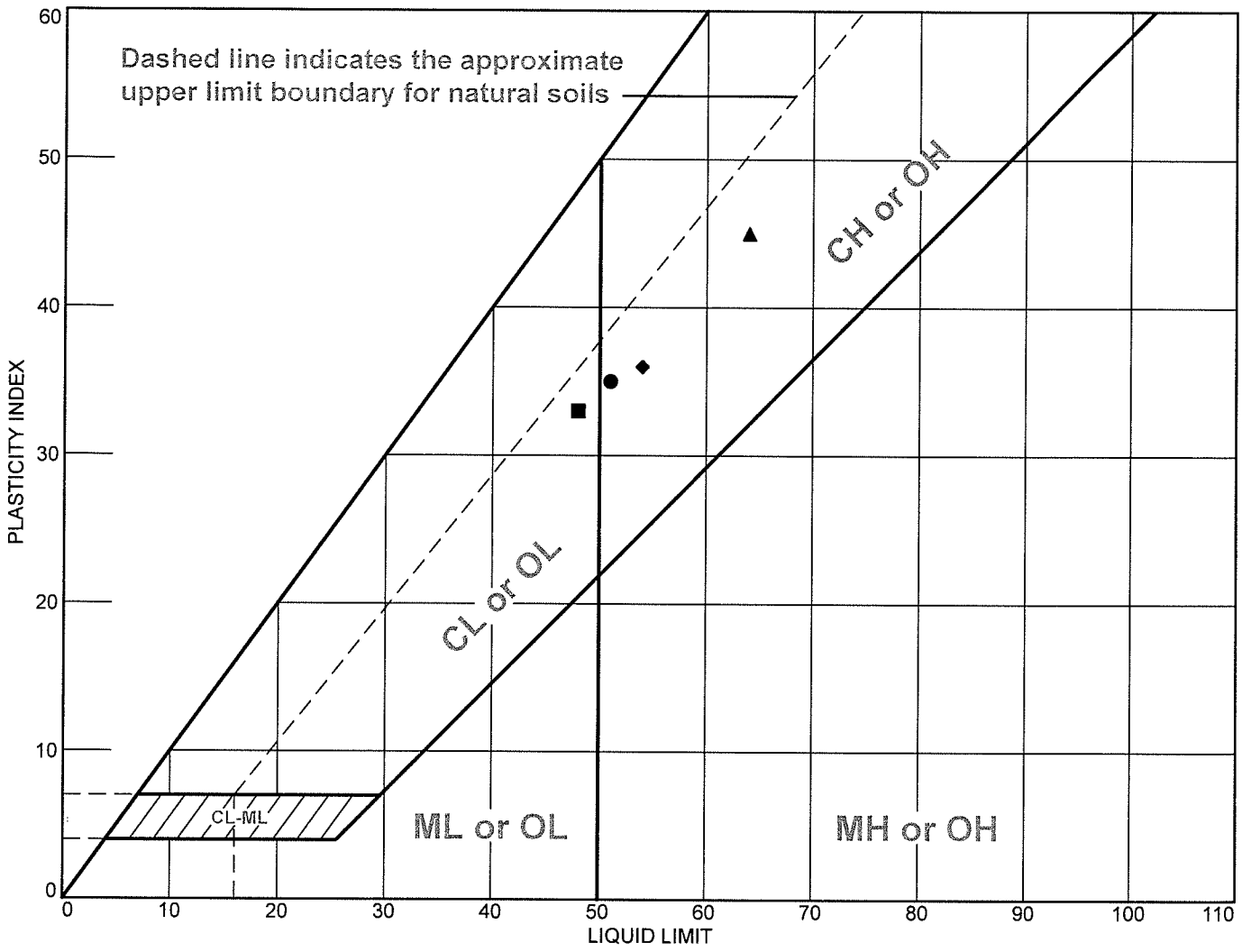
Project: South Main Street Reconstruction STP-4300

Source of Sample: B-36 **Depth:** 1
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D 4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Fat clay, trace organics, brown, moist	51	16	35			CH
■	Lean clay, stiff, yellowish brown, moist	48	15	33			CL
▲	Fat clay, stiff, gray, moist	64	19	45			CH
◆	Fat clay, stiff, grayish brown, moist	54	18	36			CH

Project No. 219181G **Client:** SK Design Group

Project: South Main Street Reconstruction STP-4300

● **Source of Sample:** B-25 **Depth:** 1 **Sample Number:** 1

■ **Source of Sample:** B-27 **Depth:** 1 **Sample Number:** 1

▲ **Source of Sample:** B-29 **Depth:** 1 **Sample Number:** 1

◆ **Source of Sample:** B-31 **Depth:** 1 **Sample Number:** 1

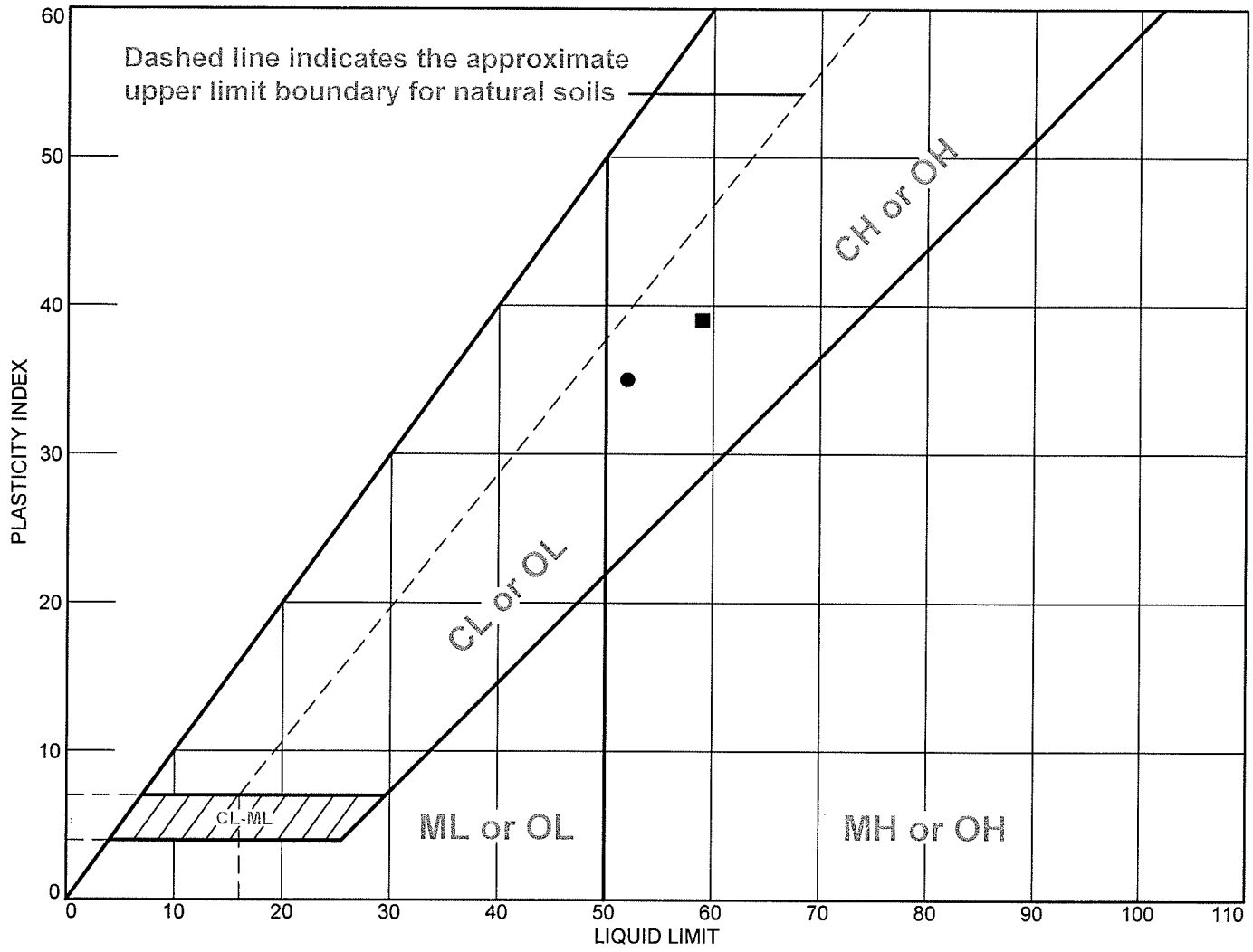
KRUGER TECHNOLOGIES, INC.

LENEXA, KS

Remarks:

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D 4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Fat clay, trace organics, stiff, grayish brown, moist	52	17	35			CH
■	Fat clay with organics, stiff, dark gray and black, moist	59	20	39			CH

Project No. 219181G **Client:** SK Design Group

Project: South Main Street Reconstruction STP-4300

● **Source of Sample:** B-33 **Depth:** 1 **Sample Number:** 1

■ **Source of Sample:** B-35 **Depth:** 1 **Sample Number:** 1

Remarks:

KRUGER TECHNOLOGIES, INC.

LENEXA, KS

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

REPORT OF GEOTECHNICAL EXPLORATION
SOUTH MAIN STREET RECONSTRUCTION
MARYVILLE, MISSOURI

Presented to:

Mr. John D. Chamberlin, P.E.
SK Design Group, Inc.

Prepared by:

Otto J. Kruger, Jr., P.E.
Tadele M. Akalu

Kruger Technologies, Inc.
Lenexa, Kansas

KTI Project No. 219122G
September 20, 2019

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

September 20, 2019

Mr. John D. Chamberlin, P.E.
SK Design Group, Inc.
4600 College Boulevard Suite 100
Overland Park, KS 66211

Re: KTI Project No. 219122G
South Main Street Reconstruction
Maryville, Missouri

Dear Mr. Chamberlin:

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

We thank you for the opportunity to work with SK Design Group, 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

Tadele M. Akalu
Laboratory Manager

TABLE OF CONTENTS

REPORT OF GEOTECHNICAL EXPLORATION
SOUTH MAIN STREET RECONSTRUCTION
MARYVILLE, MISSOURI

AUTHORIZATION

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

Project: South Main Street Reconstruction-Maryville, Missouri		
Document:	**Date:**	**Requested/Provided:**
Request for Proposal	6-7-19	Toby Williams – SK Design Group, Inc.
KTI Proposal 19GT079	6-26-19	Dylan Kruger – Kruger Technologies, Inc.
Notice to Proceed	8-7-19	John Chamberlin – SK Design Group, Inc.

PURPOSE AND SCOPE

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

- Site Preparation and Engineered Fill
- Subgrade Recommendations

PROJECT DESCRIPTION

We understand that the project consists of the design and reconstruction of the existing South Main Street located in Maryville, Missouri. This is the second phase of this project extending from just south of 285th Street to approximately 2,500 feet north. Proposed improvements include widening, full depth pavement replacement, driveway reconfiguration and traffic control. It appears that 5 to 8 feet of fill could be required in the widening areas, depending on the final alignment and cross section of the proposed reconstruction.

FIELD EXPLORATION PROCEDURES

A total of 24 borings were completed on August 30, 2019, including twelve (12) test borings drilled outside the lane demarcation line on the asphalt shoulder area of northbound and south bound lanes, six (6) test borings drilled along the center line of the drive lane and six (6) test borings drilled in grass areas at an approximate 6’ offset from the asphalt roadway edge of both north and southbound lanes. The borings were selected by the client and field located by Kruger

Technologies using site layout plans provided by the client. The boring locations are shown on the attached Boring Location Diagram. Depths indicated on the boring logs are referenced from the ground surface at the time of the exploration.

The borings were drilled using a track mounted Geoprobe. Advancement of the test holes was accomplished using macro cores and direct push. Soil sampling was performed by hydraulically pushing thin wall steel (Shelby) tubes to the drilling plan depth.

Site soils were visually and manually classified in general accordance with ASTM D 2488 by the drill crew chief as drilling progressed. The soil samples collected in the field were delivered to the laboratory for applicable testing and verification of the field classifications. The boring logs were created as the borings 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.

Ground water was not encountered at any test borings. 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 in-situ moisture/density, plasticity (Atterberg Limits) and unconfined compressive strength of soil are presented in Appendix II.

SITE CONDITIONS

The explored area is approximately 2500 feet long. South Main Street is a two-lane asphaltic concrete paved roadway in Maryville, Missouri. Commercial buildings, parking and scattered drive entrances occupy the east and west sides of the roadway. The topography is rolling, exhibiting approximately 20-25 feet of vertical relief across the borings.

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SUBSURFACE DISCUSSIONS

The test borings drilled outside the lane demarcation line of northbound and southbound lanes are represented by borings B-1, B-3, B-4, B-6, B-7, B-9, B-10, B-12, B-13, B-15, B-16, and B-18. The profile at these locations consisted of 4.0 to 6.0 inches of asphaltic cement concrete (ACC) pavement underlain by 2.0 to 3.0 inches of base rock. Soil materials below the base rock at all locations except for B-15 consisted of high plasticity (fat) clays, and low to high plasticity (lean to fat) clays were encountered throughout the 5.0 foot planned drilling depth. Underlying soils at B-15 consisted of low plasticity (lean to silty) clays throughout the 5.0 foot planned drilling depth.

The test borings drilled along the center line are represented by borings B-2, B-5, B-8, B-11, B-14, and B-17. The profile at these locations consisted of 7.0 to 8.5 inches of ACC pavement underlain by 2.0 to 3.0 inches of base rock. Soil materials below the base rock at all locations except for B-14 consisted of high plasticity (fat) clays and medium to high plasticity (lean-fat) clays were encountered throughout the 5.0 foot planned drilling depth. Underlying soils at B-14 consisted of low plasticity (lean) clays throughout the 5.0 foot planned drilling depth.

The test borings drilled in grass (potential widening) areas are represented by borings B-19, B-20, B-21, B-22, B-23 and B-24. The profile at these locations consisted of approximately 1.0-foot of topsoil. Below the topsoil, the site soils consisted of high plasticity (fat) clays that are generally moist and exhibit medium to stiff consistency. The Unified Soil Classification System classifies 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

The majority of subgrade soils below the asphaltic concrete (ACC) and the topsoil consist of high plasticity (fat) clays and low to high plasticity (lean to fat) clay soils that are generally moist and exhibit medium to very stiff consistency. Laboratory results indicate moisture contents ranging from 17.1 to 31.2 percent. Dry unit weights range from 91.4 to 114.5 pcf. Atterberg limits were determined from selected borings and ranged from liquid limits of 45 to 69 and a plasticity indicates ranged from 29 to 50. As previously stated, free groundwater was not encountered at any test borings. The borings were dry during and upon completion of coring and sampling operations.

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 ……..….91.4 to 114.5 pcf
Natural Moisture Content ……...17.1 to 31.2%
Liquid Limit…….45 to 69
Plastic Limit……... 29 to 50
Unconfined Compressive Strength of soil ……...… 1,116 to 6,095 psf

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.

Trucks and other heavy construction vehicles should be restricted as much as possible from trafficking on the finished subgrade in the pavement 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 8 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 -2 to +2 percent from optimum moisture content for low plasticity clays. Most of the site soils encountered during the exploration are not suitable for reuse as engineered fill below the pavement.

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.

LATERAL EARTH PRESSURE

The following K values, based on the clay soils encountered on the site, and crushed rock backfill obtained from off-site source, may be used for the determination of lateral soil resistance for retaining structures or buried walls. These values do not take into account surcharges caused by construction equipment or spoil piles placed adjacent to retaining structures.

Compacted High Plasticity Clay Backfill

Angle of internal friction (ϕ) = 20° (estimated)

K_a = 0.49 K_p = 2.05 K_o = 0.66

Wet density of in place soil, average (γ) = 125.0 pcf

Compacted Low Plasticity Clay Backfill

Angle of internal friction (ϕ) = 26° (estimated)

K_a = 0.39 K_p = 2.56 K_o = 0.56

Wet density of in place soil, average (γ) = 125.0 pcf

Crushed Rock Backfill

Angle of internal friction (ϕ) = 35° (estimated)

K_a = 0.27 K_p = 3.70 K_o = 0.42

Wet density of backfill (γ) = 135.0 pcf

Pavement Subgrade Preparation

Pavement subgrades should be prepared in accordance with the recommendations presented in the SITE PREPARATION and ENGINEERED FILL section of this report. Construction scheduling, involving paving and grading by separate contractors, typically results in a time lapse between the end of grading operations and the commencement of paving. Disturbance, desiccation, and/or wetting of the subgrade between grading and paving can result in deterioration of the previously completed subgrade. A non-uniform subgrade can result in poor pavement performance and local failures soon after pavements are constructed.

We recommend that the upper 12’ of subgrade soils consist of a low volume change (LVC) material. Acceptable LVC material is any soil type that has a Liquid Limit (LL) of less than 45

and a Plasticity Index (PI) of less than 25. Any borrow material brought to the site and placed in this strata should be LVC material or should be stabilized as described below.

Based on the test results, the site soils at the pavement subgrade are highly expensive clays (CH). These soils show a strong tendency to swell with changes in water content. To limit the volume change of these materials, we recommend at a minimum stabilizing the upper 12" of the parent soil subgrade with 15% flyash, 5% of hydrated lime, 6% of lime kiln dust or removed and replaced with crushed limestone such as MoDOT Type-5 placed in 6 inches lifts and compacted at 95 percent of maximum dry density per ASTM D698.

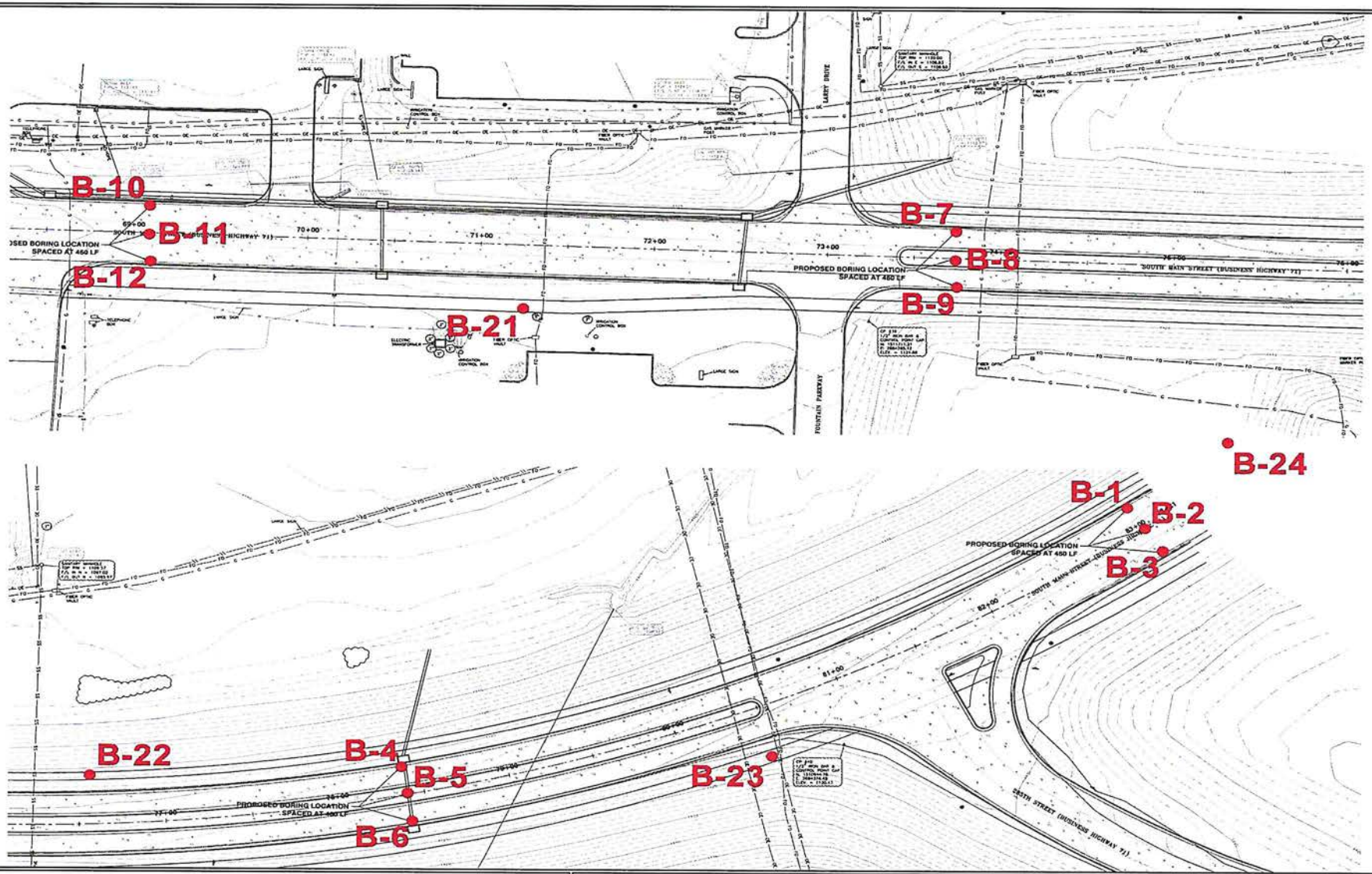
REMARKS

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.

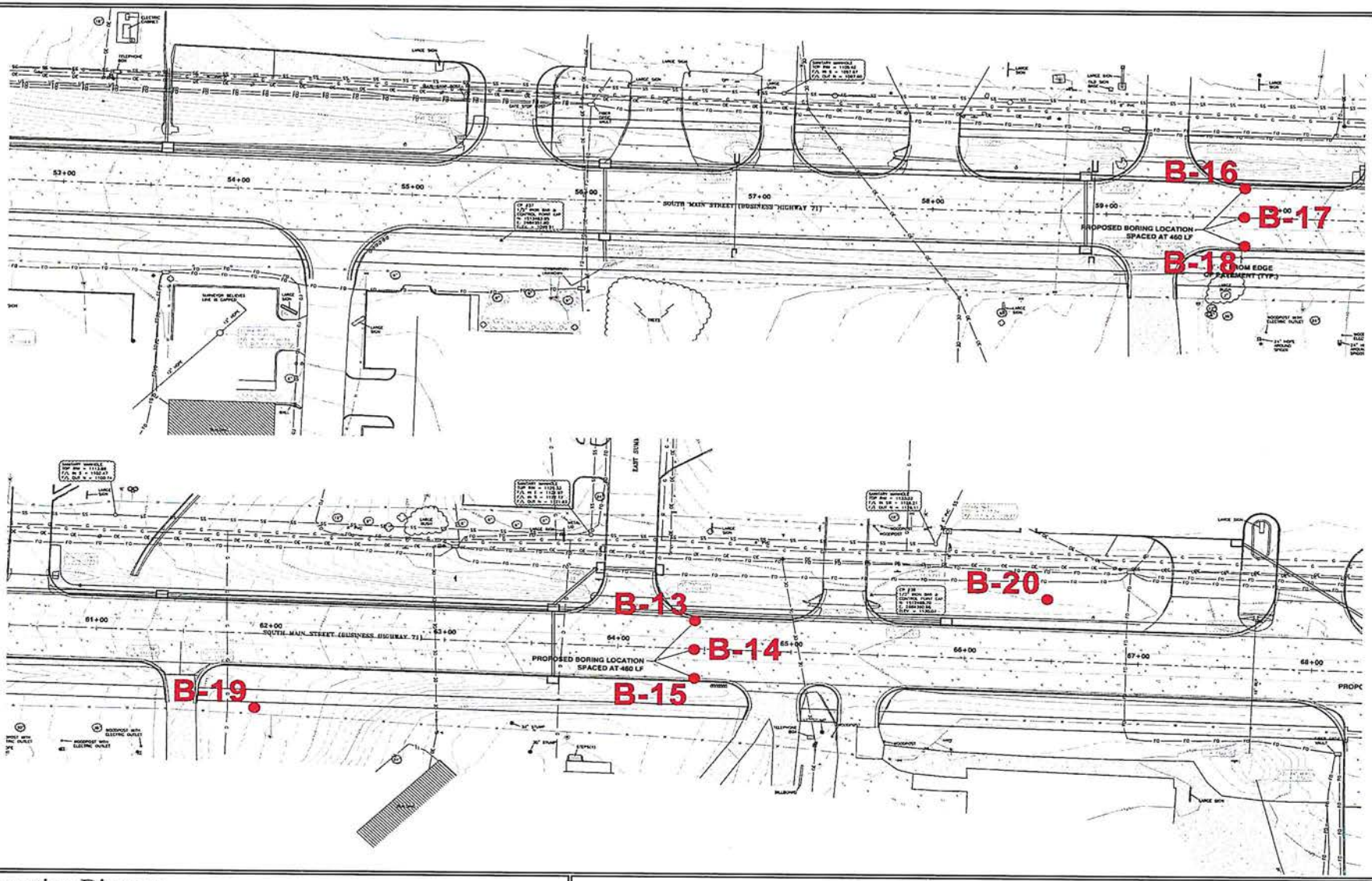
BORING LOCATION DIAGRAM



Boring Location Diagram
South Main Street Reconstruction
Maryville, Missouri

KRUGER TECHNOLOGIES, INC.

Drawn: TMA	**Date:** 9/3/2019	**KTI Project No.** 219122G



Boring Location Diagram
South Main Street Reconstruction
Maryville, Missouri

Drawn: TMA	**Date:** 9/3/2019	**KTI Project No.** 219122G

KRUGER TECHNOLOGIES, INC.

APPENDIX I

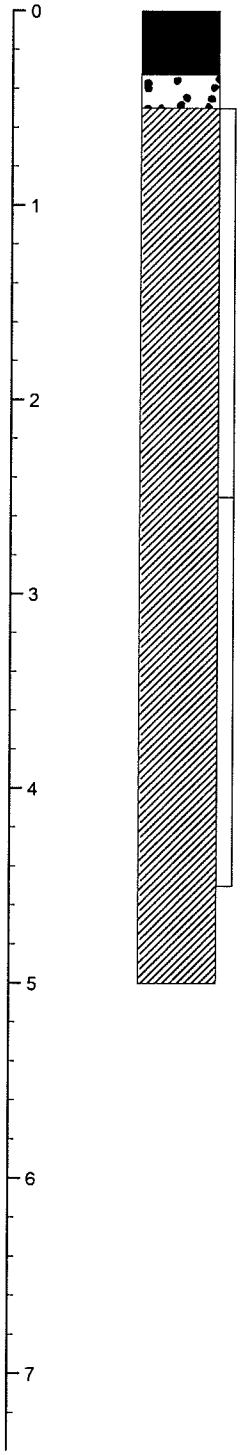
Boring Logs

LOG OF TEST BORING
BORING B-1

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 4"				
		GP	Poorly graded aggregate 2"				
		CH	Fat clay, stiff, gray, moist	1, ST	102.1	25.0	
		CH	Fat clay, stiff, grayish brown, moist	2, ST			
			Drilling discontinued at 5.0 feet				

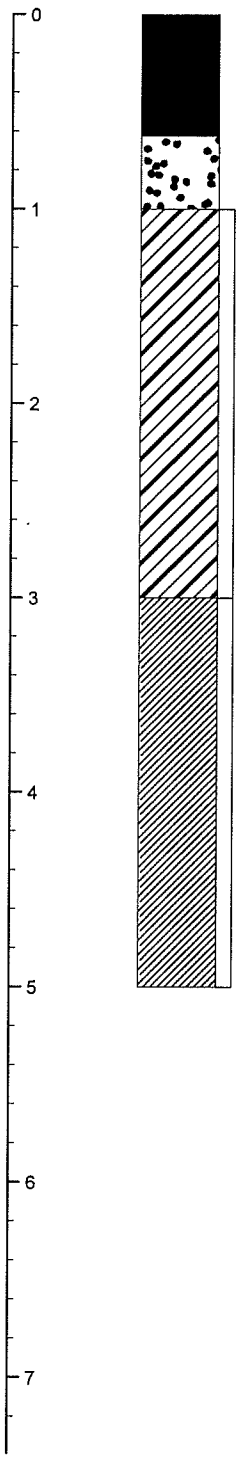
Notes:

LOG OF TEST BORING
BORING B-2

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 7.5"				
		GP	Poorly graded aggregate 4"				
		CL-CH	Lean to fat clay, stiff, grayish brown, moist	1, ST	91.4	31.2	1116
		CH	Fat clay, stiff, gray, moist	2, ST			
			Drilling discontinued at 5.0 feet				

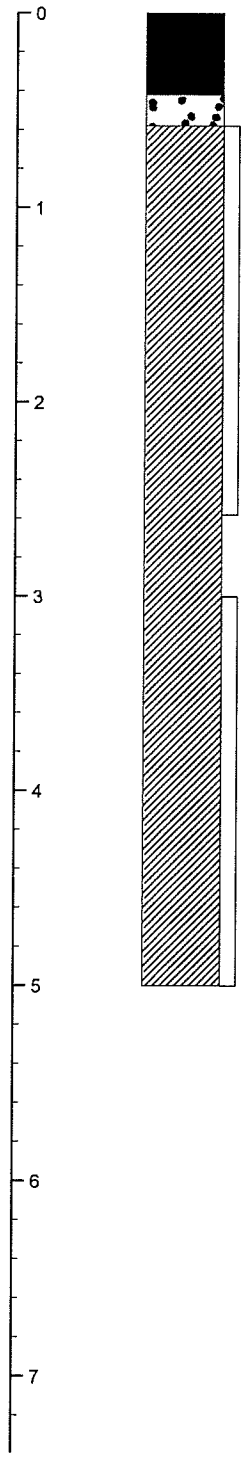
Notes:

LOG OF TEST BORING
BORING B-3

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 5.0"				
		GP	Poorly graded aggregate 2"				
			Fat clay, medium stiff, grayish brown, moist				
				1, ST	103.9	23.1	2309
		CH	Becoming stiff				
				2, ST			
			Drilling discontinued at 5.0 feet				

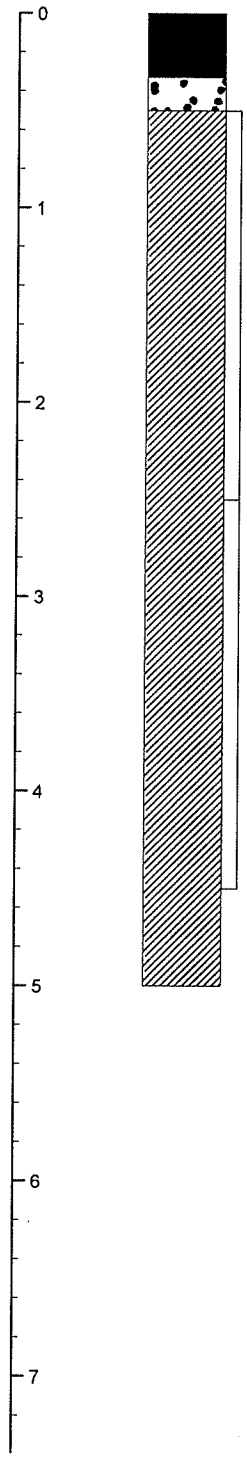
Notes:

LOG OF TEST BORING
BORING B-4

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 4"				
		GP	Poorly graded aggregate 2"				
		CH	Lean to fat clay, stiff, brown, moist	1, ST	105.7	20.1	
		CH	Fat clay, stiff, grayish brown, moist	2, ST			
			Drilling discontinued at 5.0 feet				

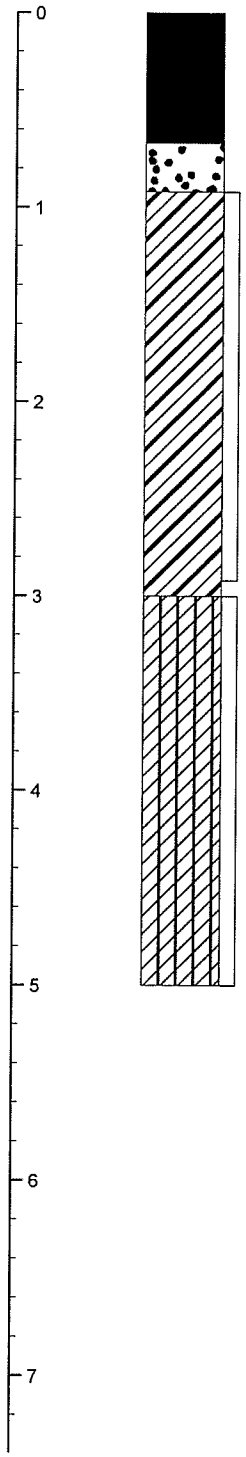
Notes:

LOG OF TEST BORING
BORING B-5

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/17/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 8.0"				
		GP	Poorly graded aggregate 4"				
		CL-CH	Lean to fat clay, stiff, brown, moist	1, ST	105.9	21.7	
		CL	Lean clay, medium stiff, brown & gray, moist	2, ST			
			Drilling discontinued at 5.0 feet				

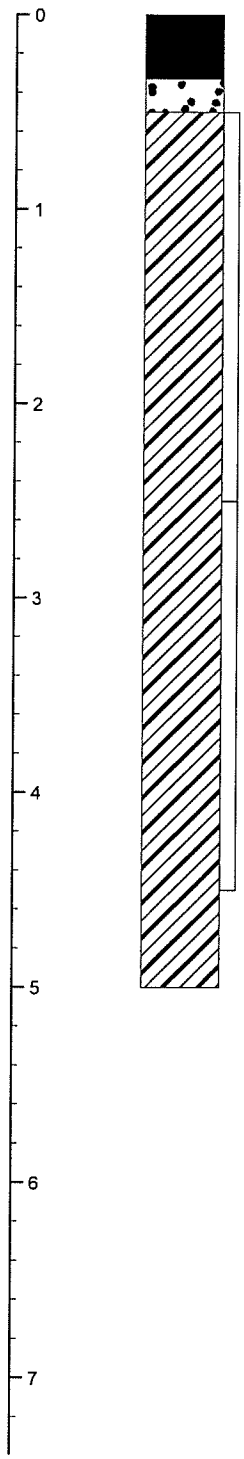
Notes:

LOG OF TEST BORING
BORING B-6

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	ACC	Asphalt 4"				
	GP	Poorly graded aggregate 2"				
		Lean to fat clay, stiff, grayish brown, moist	1, ST	104.4	22.2	3055
	CL-CH	Becoming dark grayish brown	2, ST			
		Drilling discontinued at 5.0 feet				

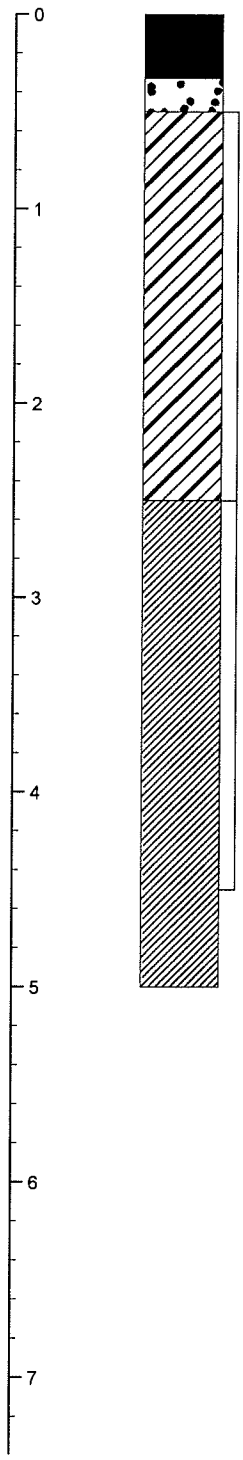
Notes:

LOG OF TEST BORING
BORING B-7

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	ACC	Asphalt 4"				
	GP	Poorly graded aggregate 2"				
	CL-CH	Lean to fat clay, medium stiff, brown, moist	1, ST	107.5	20.9	
	CH	Fat clay, medium stiff, grayish brown, moist	2, ST			
		Drilling discontinued at 5.0 feet				

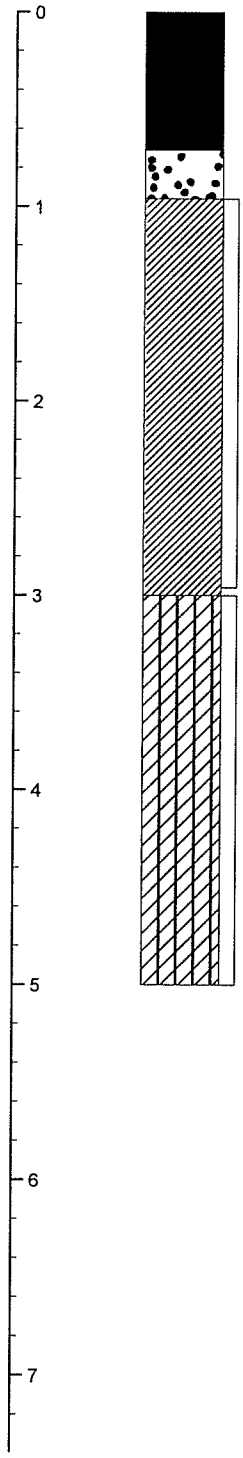
Notes:

LOG OF TEST BORING
BORING B-8

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 8.5"				
		GP	Poorly graded aggregate 3"				
		CH	Fat clay, stiff, light gray, moist	1, ST	101.7	23.6	1408
		CL	Lean to fat clay, stiff, light gray, moist	2, ST			
			Drilling discontinued at 5.0 feet				

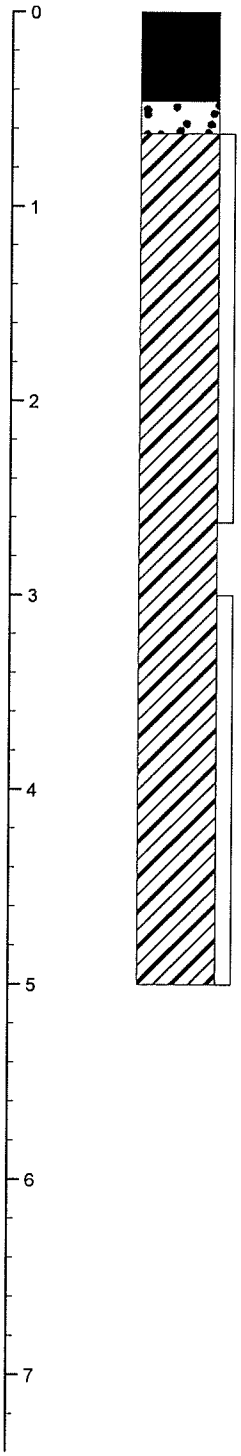
Notes:

LOG OF TEST BORING
BORING B-9

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/17/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	ACC	Asphalt 5.0"				
	GP	Poorly graded aggregate 2"				
	CL-CH	Lean to fat clay, stiff, light grayish brown, moist	1, ST	111.5	17.3	
	CL-CH	Lean to fat clay, stiff, gray, moist	2, ST			
		Drilling discontinued at 5.0 feet				

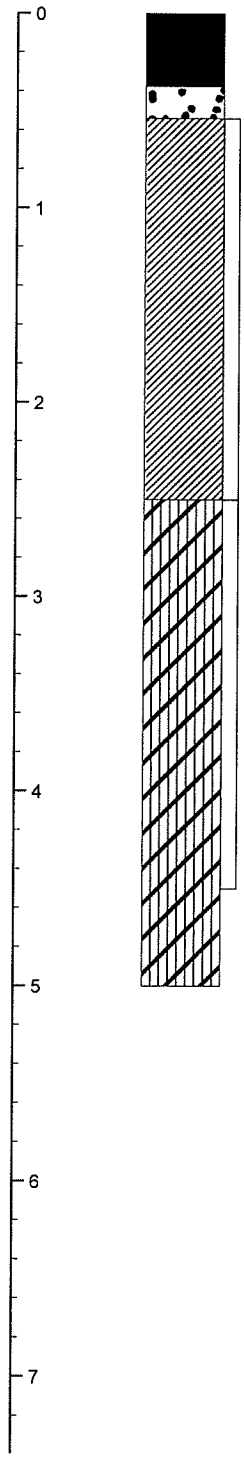
Notes:

LOG OF TEST BORING
BORING B-10

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 4.5"				
		GP	Poorly graded aggregate 2"				
		CH	Fat clay with topsoil, medium stiff, dark brown & black, moist	1, ST	102.7	19.2	
		CL-ML	Silty lean clay, medium stiff, brown, moist	2, ST			
			Drilling discontinued at 5.0 feet				

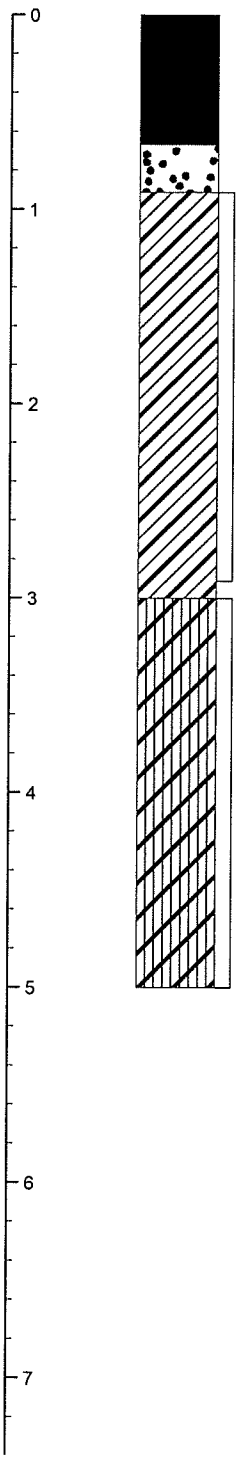
Notes:

LOG OF TEST BORING
BORING B-11

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/17/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 8.0"				
		GP	Poorly graded aggregate 3"				
		CL-CH	Lean to fat clay, stiff, reddish brown, moist	1, ST	104.9	25.9	
		CL-ML	Silty lean clay, medium stiff, grayish brown, moist	2, ST			
			Drilling discontinued at 5.0 feet				

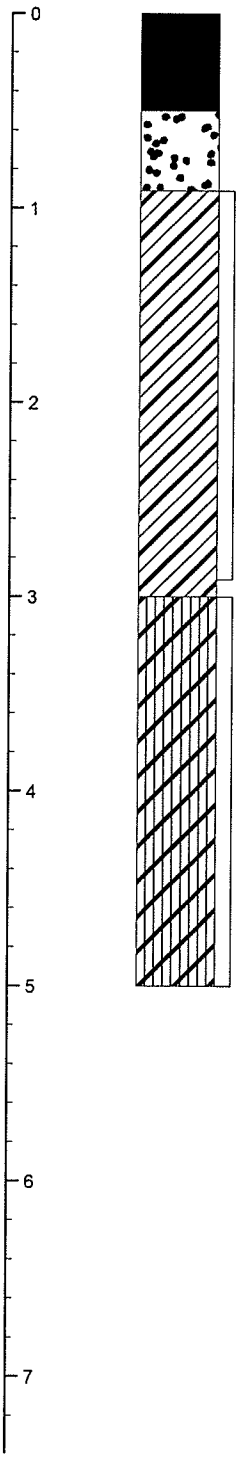
Notes:

LOG OF TEST BORING
BORING B-12

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/17/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



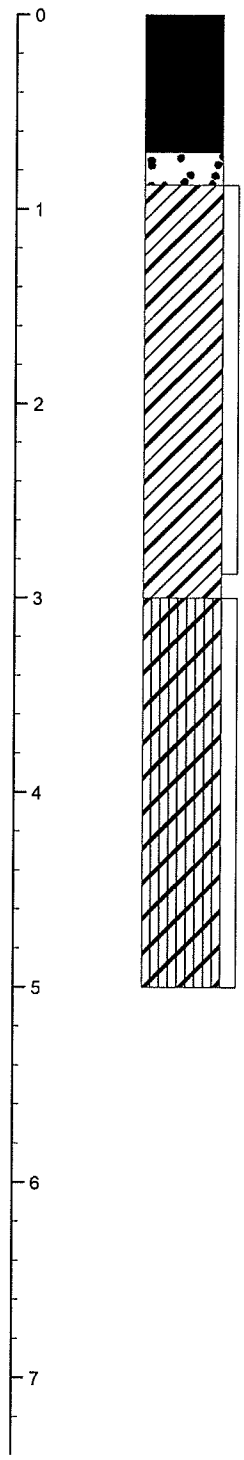
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 6.0"				
		GP	Poorly graded aggregate 2"				
		CL-CH	Lean to fat clay, stiff, brown, moist	1, ST	99.9	25.3	6095
		CL-ML	Silty lean clay, medium stiff, gray, moist	2, ST			
			Drilling discontinued at 5.0 feet				

Notes:

LOG OF TEST BORING
BORING B-13

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/17/2019
ELEVATION:
FINISH: 8/30/19
LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 4.5"				
		C	Concrete 4.0"				
		GP	Poorly graded aggregate 2"				
		CL-CH	Lean to fat clay, stiff, dark brown, moist	1, ST	101.9	21.5	
		CL-ML	Silty lean clay, medium stiff, brown, moist	2, ST			
			Drilling discontinued at 5.0 feet				

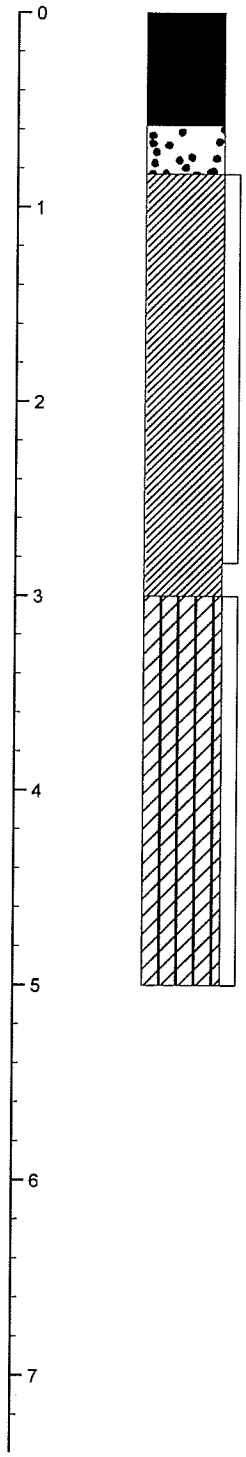
Notes:

LOG OF TEST BORING
BORING B-14

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 7.0"				
		GP	Poorly graded aggregate 2"				
		CL	Lean clay, stiff, light brown, moist	1, ST	106.6	19.4	3862
		CL	Becoming medium stiff	2, ST			
			Drilling discontinued at 5.0 feet				

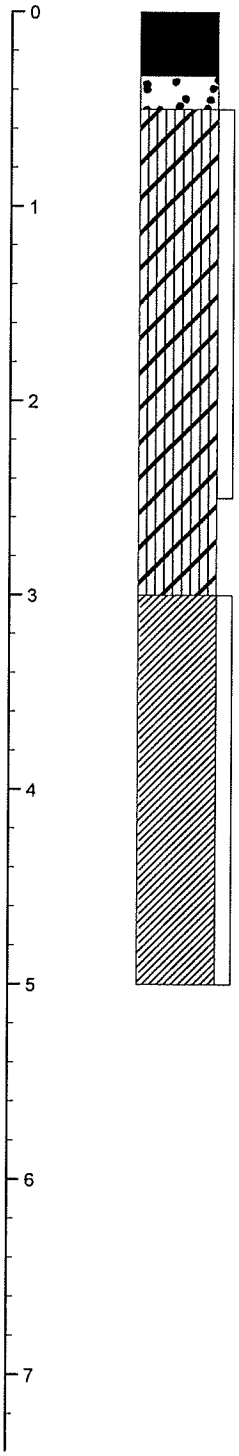
Notes:

LOG OF TEST BORING
BORING B-15

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 4.0"				
		GP	Poorly graded aggregate 2"				
		CL-ML	Silty lean clay, stiff, grayish brown, moist	1, ST	107.6	17.1	
		CH	Fat clay, stiff, gray, moist	2, ST			
			Drilling discontinued at 5.0 feet				

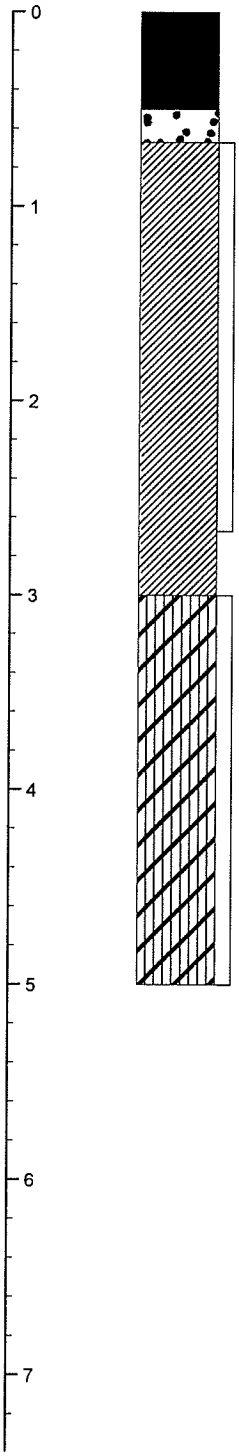
Notes:

LOG OF TEST BORING
BORING B-16

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 6.0"				
		GP	Poorly graded aggregate 2"				
		CH	Fat clay, trace organics, stiff, dark brown, moist	1, ST	97.4	27.0	1985
		CH	Fat clay, stiff, gray, moist	2, ST			
			Drilling discontinued at 5.0 feet				

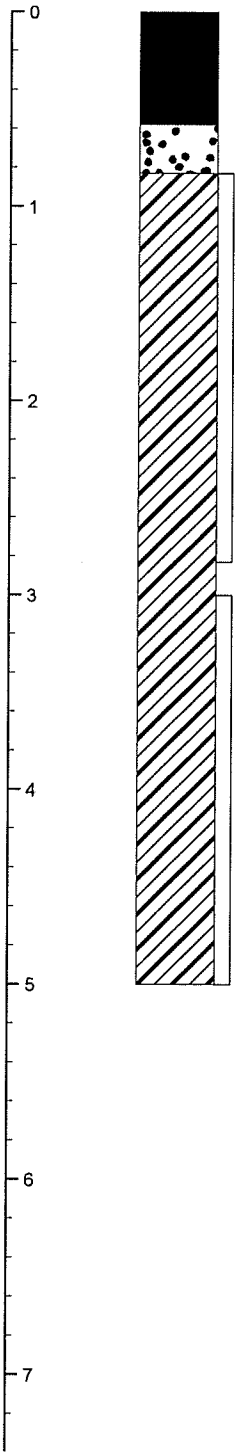
Notes:

LOG OF TEST BORING
BORING B-17

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/17/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		ACC	Asphalt 7.0"				
		GP	Poorly graded aggregate 3"				
		CL-CH	Lean to fat clay, stiff, dark gray, moist	1, ST	106.4	21.8	3115
		CL-CH	Lean to fat clay, stiff, gray, moist	2, ST			
			Drilling discontinued at 5.0 feet				

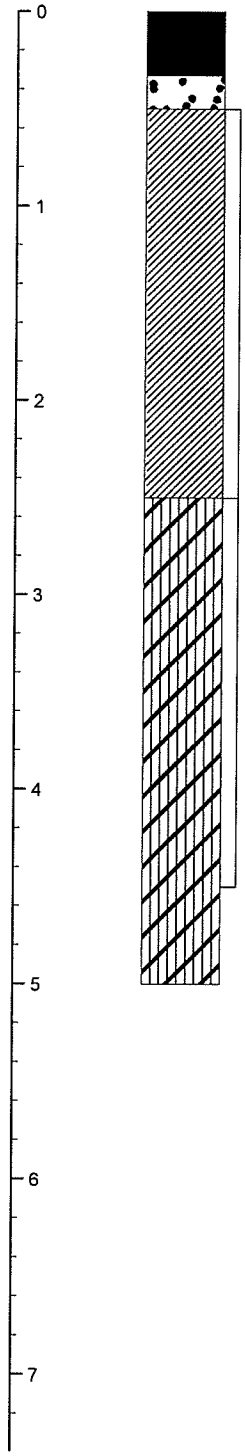
Notes:

LOG OF TEST BORING
BORING B-18

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



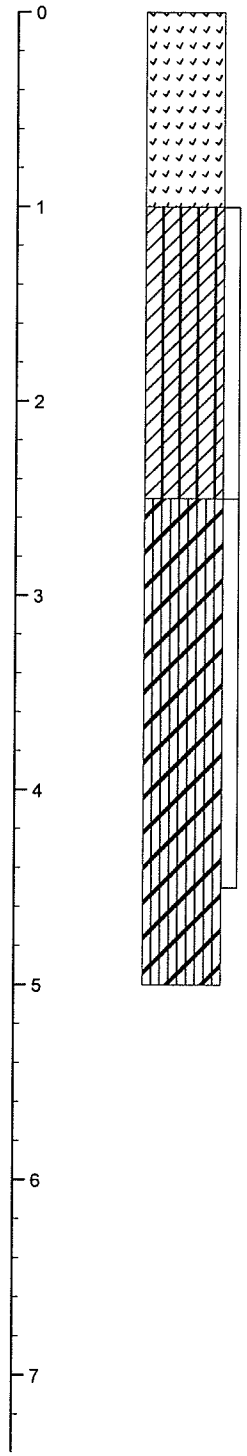
ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	ACC	Asphalt 4.0"				
	GP	Poorly graded aggregate 2"				
	CH	Fat clay, trace topsoil, stiff, dark gray & black, moist	1, ST	106.2	20.1	
	CH	Fat clay, stiff, light gray, moist	2, ST			
		Drilling discontinued at 5.0 feet				

Notes:

LOG OF TEST BORING
BORING B-19

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19
LOGGER: TMA
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, trace gravel, very stiff, yellowish brown, moist	1, ST	109.3	20.2	4750
		CH	Fat clay, stiff, light gray, moist	2, ST			
			Drilling discontinued at 5.0 feet				

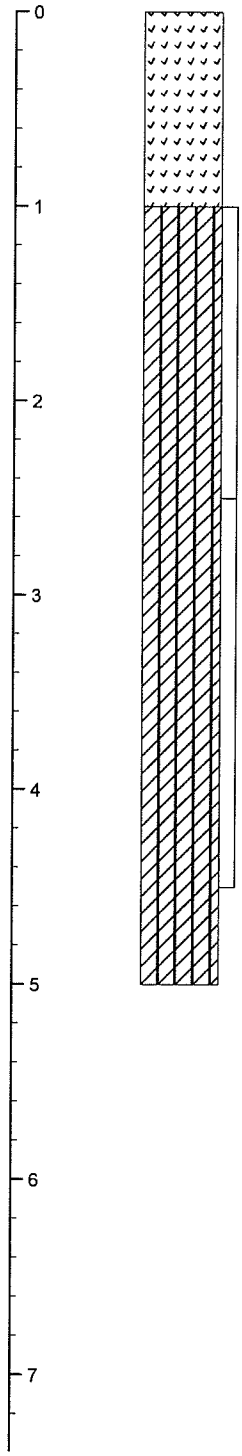
Notes:

LOG OF TEST BORING
BORING B-20

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:



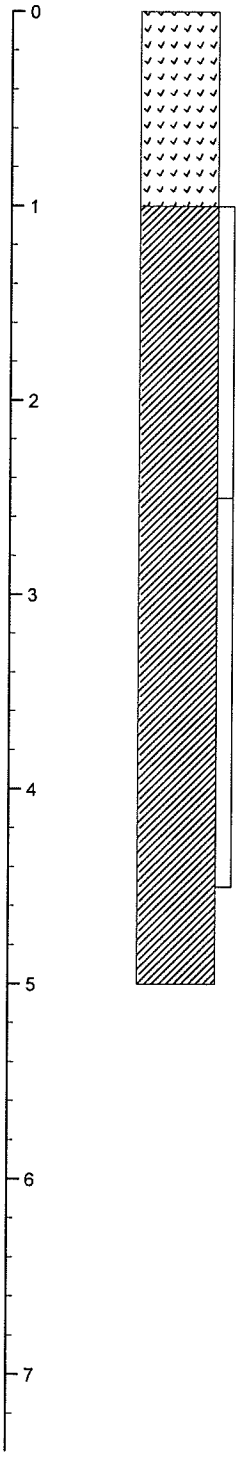
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		T	Topsoil				
		CL	Lean clay, stiff, light gray, moist	1, ST	95.6	29.8	
		CL	Lean clay, medium stiff, brown, moist	2, ST			
			Drilling discontinued at 5.0 feet				

Notes:

LOG OF TEST BORING
BORING B-21

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G
START: 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19
LOGGER: TMA
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, dark gray, moist	1, ST	95.1	28.6	1503
		CH	Fat clay, stiff, dark gray, moist	2, ST			
			Drilling discontinued at 5.0 feet				

Notes:

LOG OF TEST BORING
BORING B-22

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
DATE CHECKED:

ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
0			Topsoil				
		T					
1			Fat clay, stiff, gray, moist				
2				1, ST	103.4	22.9	
3		CH	Fat clay, stiff, gray, moist				
4				2, ST			
5			Drilling discontinued at 5.0 feet				
6							
7							

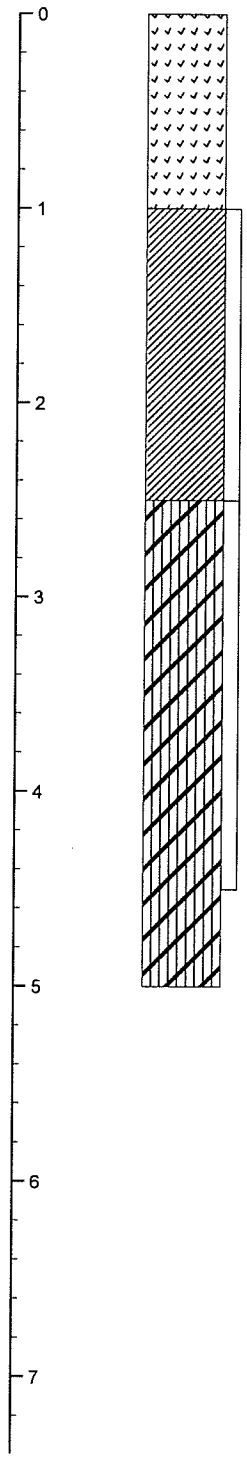
Notes:

LOG OF TEST BORING
BORING B-23

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G
START: 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/19/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
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, moist	1, ST	104.5	21.5	2609
		CH	Fat clay, stiff, strong brown, moist	2, ST			
			Drilling discontinued at 5.0 feet				

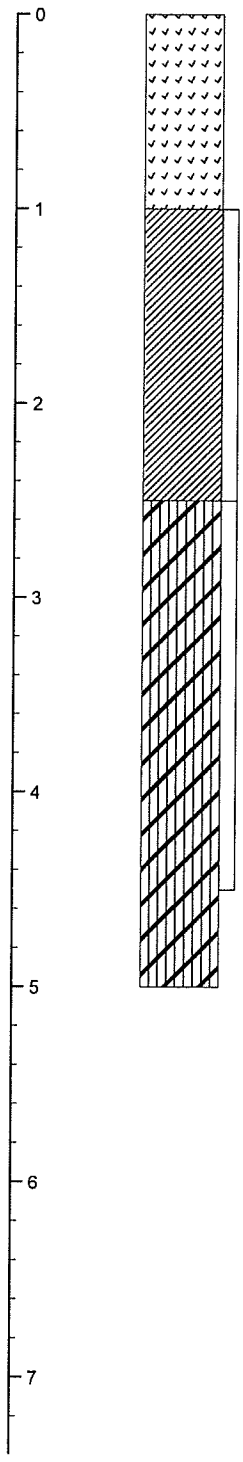
Notes:

LOG OF TEST BORING
BORING B-24

PROJECT: South Main Street Reconstruction
CLIENT: SK Design Group
PROJECT NO.: 219122G **START:** 8/30/19
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continues Flight Auger
DEPTH TO - water None **caving**

DATE: 9/16/2019
ELEVATION:
FINISH: 8/30/19

LOGGER: TMA
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, grey, moist	1, ST		25.7	100.6
		CH	Fat clay, stiff, greyish brown, moist	2, ST			
			Drilling discontinued at 5.0 feet				

Notes:

APPENDIX II

Summary of Pavement Profile

SUMMARY OF PAVEMENT PROFILE

Boring	Asphaltic Concrete thickness-inches	Base Rock thickness-inches	Subgrade Material	Remark
B-1	4.0	2.0	FAT CLAY	CH
B-2	7.5	4.0	LEAN TO FAT CLAY	CL-CH
B-3	5.0	2.0	FAT CLAY	CH
B-4	4.0	2.0	LEAN TO FAT CLAY	CL-CH
B-5	8.0	4.0	LEAN TO FAT CLAY	CL-CH
B-6	4.0	2.0	LEAN TO FAT CLAY	CL-CH
B-7	4.0	2.0	LEAN TO FAT CLAY	CL-CH
B-8	8.5	3.0	FAT CLAY	CH
B-9	5.0	2.0	LEAN TO FAT CLAY	CL-CH
B-10	4.5	2.0	FAT CLAY	CH
B-11	8.0	3.0	LEAN TO FAT CLAY	CL-CH
B-12	6.0	2.0	LEAN TO FAT CLAY	CL-CH
B-13	4.5	2.0	LEAN TO FAT CLAY	CL-CH
B-14	7.0	2.0	LEAN CLAY	CL
B-15	4.0	2.0	SILTY LEAN CLAY	CL-ML
B-16	6.0	2.0	FAT CLAY	CH
B-17	7.0	3.0	LEAN TO FAT CLAY	CL-CH
B-18	4.0	2.0	FAT CLAY	CH
B-19	12.0/TOPSOIL	0.0	FAT CLAY	Topsoil
B-20	12.0/TOPSOIL	0.0	LEAN CLAY	Topsoil
B-21	12.0/TOPSOIL	0.0	FAT CLAY	Topsoil
B-22	12.0/TOPSOIL	0.0	FAT CLAY	Topsoil
B-23	12.0/TOPSOIL	0.0	FAT CLAY	Topsoil
B-24	12.0/TOPSOIL	0.0	FAT CLAY	Topsoil

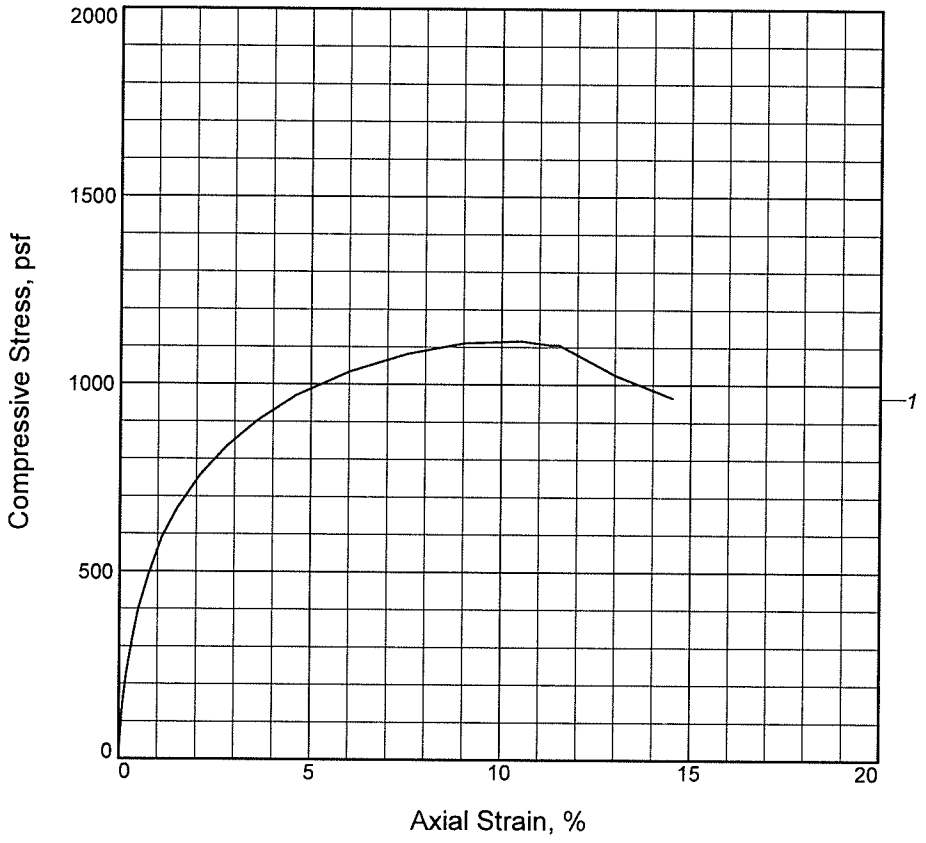
APPENDIX III

Laboratory Results

SUMMARY OF LABORATORY TEST RESULTS 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 Index0 %	
B-1	1.0-3.0	ST-1	25.0	102.1				
B-2	1.0-3.0	ST-1	31.2	91.4	1116			
B-3	1.0-3.0	ST-1	23.1	103.9	2306	62	42	CH
B-4	1.0-3.0	ST-1	20.1	105.7				
B-5	1.0-3.0	ST-1	21.7	105.9				
B-6	1.0-3.0	ST-1	22.2	104.4	3055			
B-7	1.0-3.0	ST-1	20.9	107.5				
B-8	1.0-3.0	ST-1	23.6	101.7	1408	55	35	CH
B-9	1.0-3.0	ST-1	17.3	111.5				
B-10	1.0-3.0	ST-1	19.2	102.7	3467			
B-11	1.0-3.0	ST-1	25.9	104.9				
B-12	1.0-3.0	ST-1	25.3	99.9	6095			
B-13	1.0-3.0	ST-1	21.5	101.9				
B-14	1.0-3.0	ST-1	19.4	106.6	3862	45	29	CL
B-15	1.0-3.0	ST-1	17.1	107.6				
B-16	1.0-3.0	ST-1	27.0	97.4	1985	52	33	CH
B-17	1.0-3.0	ST-1	21.8	106.4	3115			
B-18	1.0-3.0	ST-1	20.1	106.2				
B-19	1.0-3.0	ST-1	20.2	109.3	4750			
B-20	1.0-3.0	ST-1	29.8	95.6				
B-21	1.0-3.0	ST-1	28.6	95.1	1503			
B-22	1.0-3.0	ST-1	22.9	103.4				
B-23	1.0-3.0	ST-1	21.5	104.5	2609	69	50	CH
B-24	1.0-3.0	ST-1	25.7	100.6				

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	1116			
Undrained shear strength, psf	558			
Failure strain, %	10.5			
Strain rate, in./min.	0.050			
Water content, %	31.2			
Wet density, pcf	120.0			
Dry density, pcf	91.4			
Saturation, %	99.1			
Void ratio	0.8576			
Specimen diameter, in.	1.84			
Specimen height, in.	3.96			
Height/diameter ratio	2.15			

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

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

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Figure _____

Client: SK Design Group

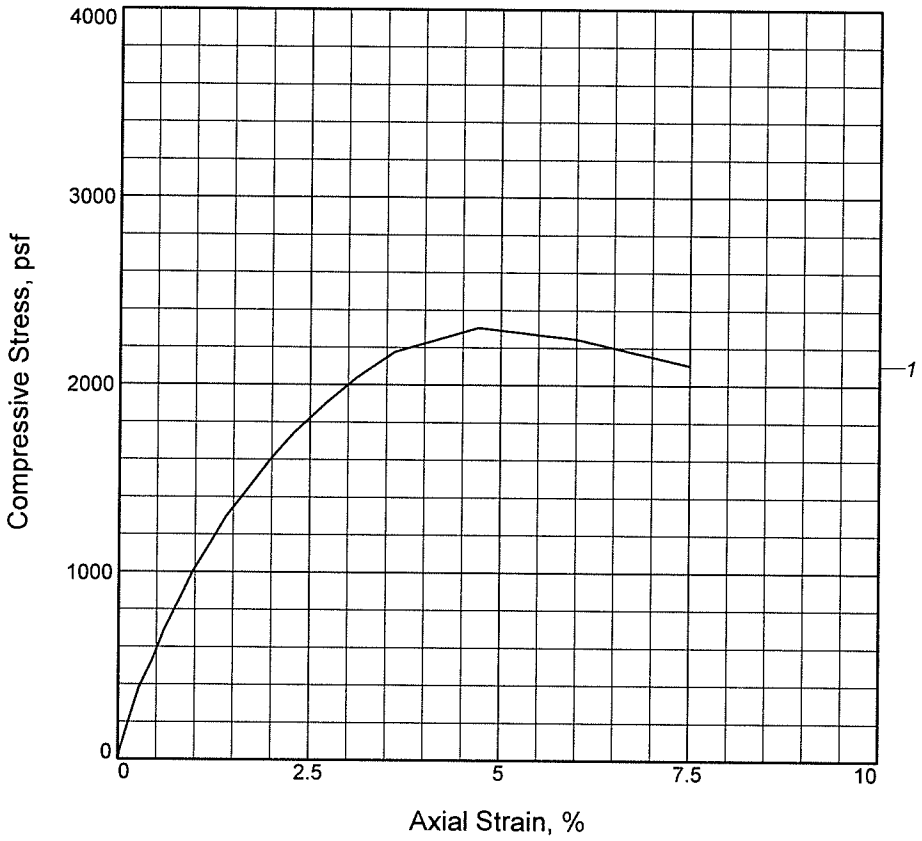
Project: South Main Street Reconstruction

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

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	2306			
Undrained shear strength, psf	1153			
Failure strain, %	4.7			
Strain rate, in./min.	0.050			
Water content, %	23.1			
Wet density, pcf	127.8			
Dry density, pcf	103.9			
Saturation, %	98.8			
Void ratio	0.6349			
Specimen diameter, in.	1.84			
Specimen height, in.	3.98			
Height/diameter ratio	2.16			

Description: Fat clay, medium stiff, grayish brown, moist

LL = 62	**PL =** 20	**PI =** 42	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Figure _____

Client: SK Design Group

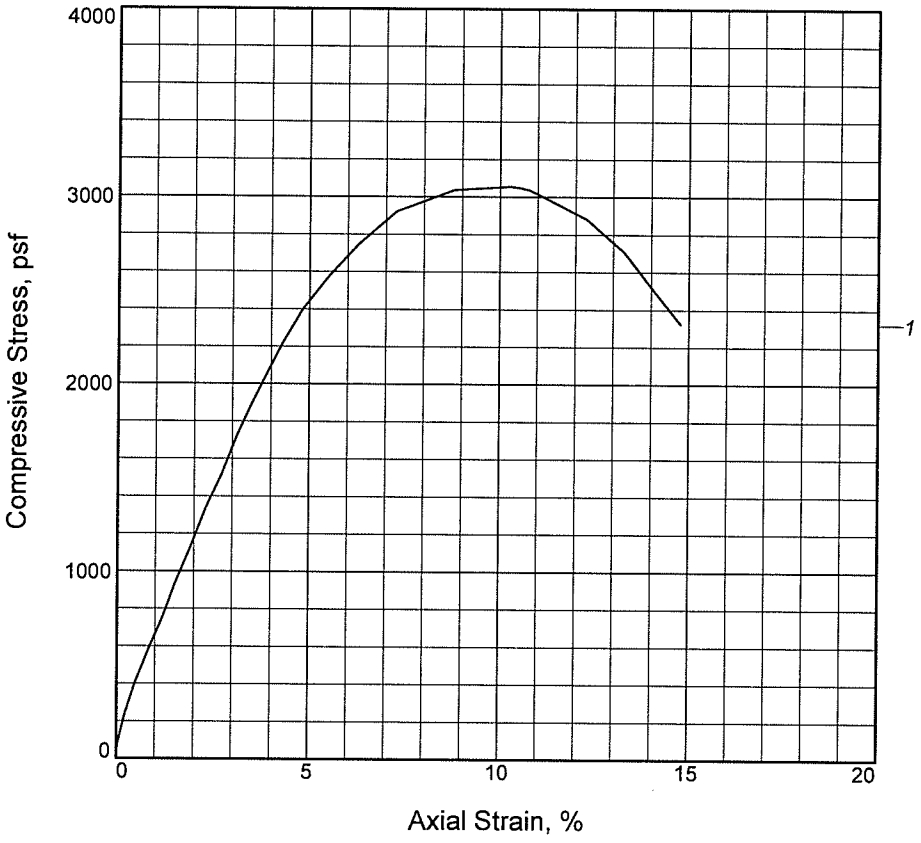
Project: South Main Street Reconstruction

Source of Sample: B-3 **Depth:** 0.58
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3055			
Undrained shear strength, psf	1528			
Failure strain, %	10.3			
Strain rate, in./min.	0.050			
Water content, %	22.2			
Wet density, pcf	127.6			
Dry density, pcf	104.4			
Saturation, %	96.3			
Void ratio	0.6262			
Specimen diameter, in.	1.84			
Specimen height, in.	3.98			
Height/diameter ratio	2.16			

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

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

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Figure _____

Client: SK Design Group

Project: South Main Street Reconstruction

Source of Sample: B-6 **Depth:** 0.5
Sample Number: 1

UNCONFINED COMPRESSION TEST
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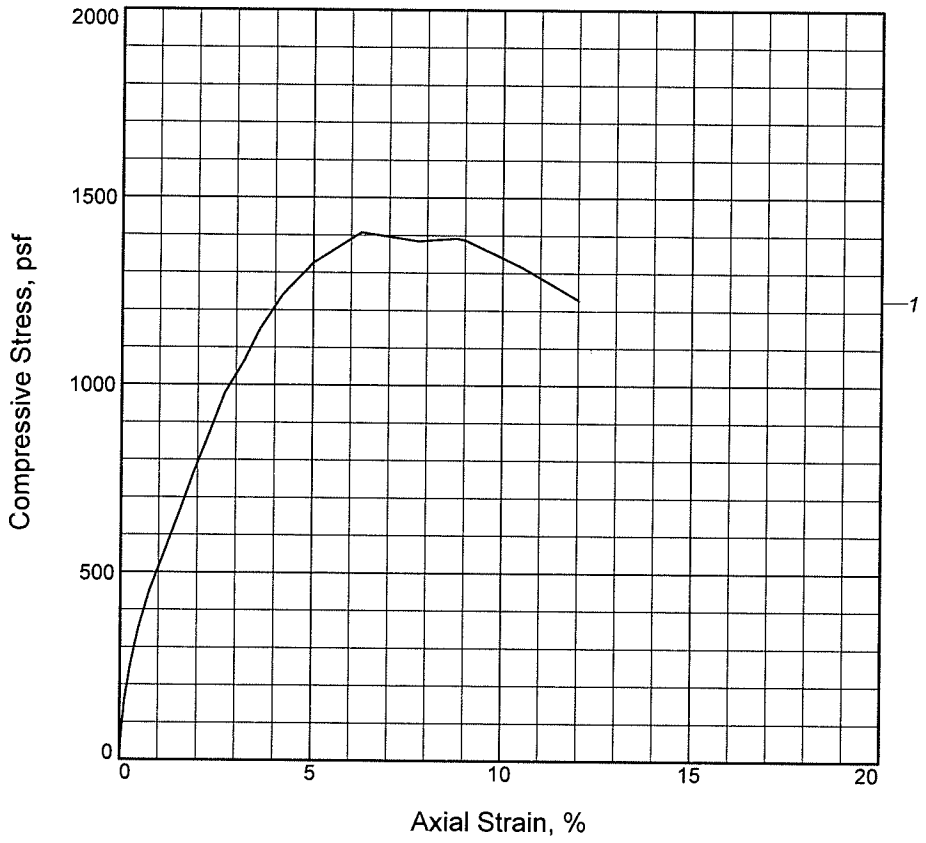
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	1408			
Undrained shear strength, psf	704			
Failure strain, %	6.3			
Strain rate, in./min.	0.050			
Water content, %	23.6			
Wet density, pcf	125.7			
Dry density, pcf	101.7			
Saturation, %	95.8			
Void ratio	0.6701			
Specimen diameter, in.	1.84			
Specimen height, in.	3.98			
Height/diameter ratio	2.16			

Description: Fat clay, stiff, light gray, moist

LL = 55	**PL =** 20	**PI =** 35	**Assumed GS=** 2.72	**Type:**

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Client: SK Design Group

Project: South Main Street Reconstruction

Source of Sample: B-8 **Depth:** 0.96
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
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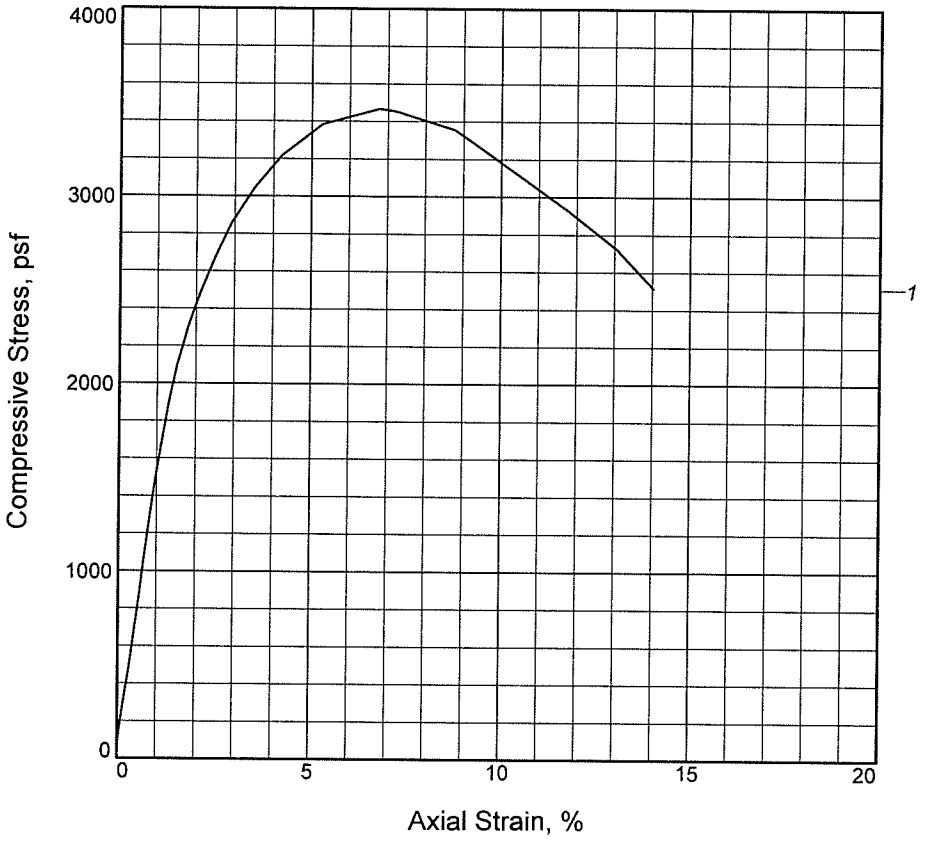
Figure _____

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3467			
Undrained shear strength, psf	1733			
Failure strain, %	6.8			
Strain rate, in./min.	0.050			
Water content, %	19.2			
Wet density, pcf	122.5			
Dry density, pcf	102.7			
Saturation, %	80.1			
Void ratio	0.6529			
Specimen diameter, in.	1.83			
Specimen height, in.	3.97			
Height/diameter ratio	2.17			

Description: Fat clay with topsoil, medium stiff, dark brown & black, moist

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

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Figure _____

Client: SK Design Group

Project: South Main Street Reconstruction

Source of Sample: B-10 **Depth:** 0.54
Sample Number: 1

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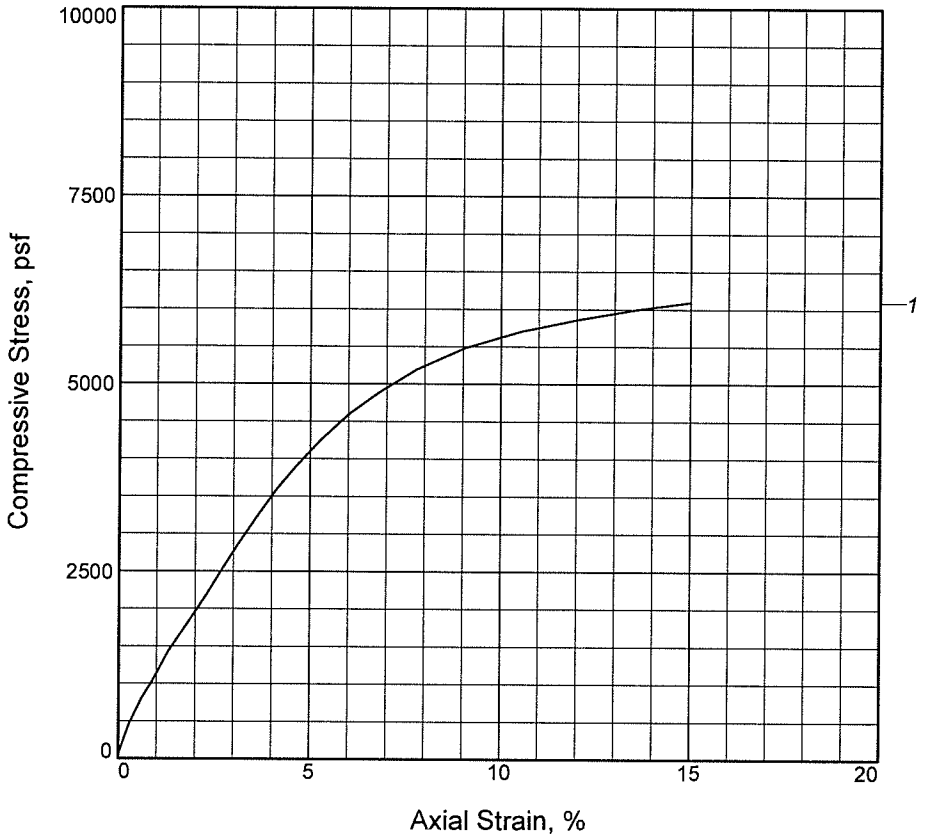
Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	6095			
Undrained shear strength, psf	3047			
Failure strain, %	15.0			
Strain rate, in./min.	0.050			
Water content, %	25.3			
Wet density, pcf	125.2			
Dry density, pcf	99.9			
Saturation, %	98.2			
Void ratio	0.6993			
Specimen diameter, in.	1.84			
Specimen height, in.	3.98			
Height/diameter ratio	2.16			

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

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

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Figure _____

Client: SK Design Group

Project: South Main Street Reconstruction

Source of Sample: B-12 **Depth:** 0.912
Sample Number: 1

UNCONFINED COMPRESSION TEST
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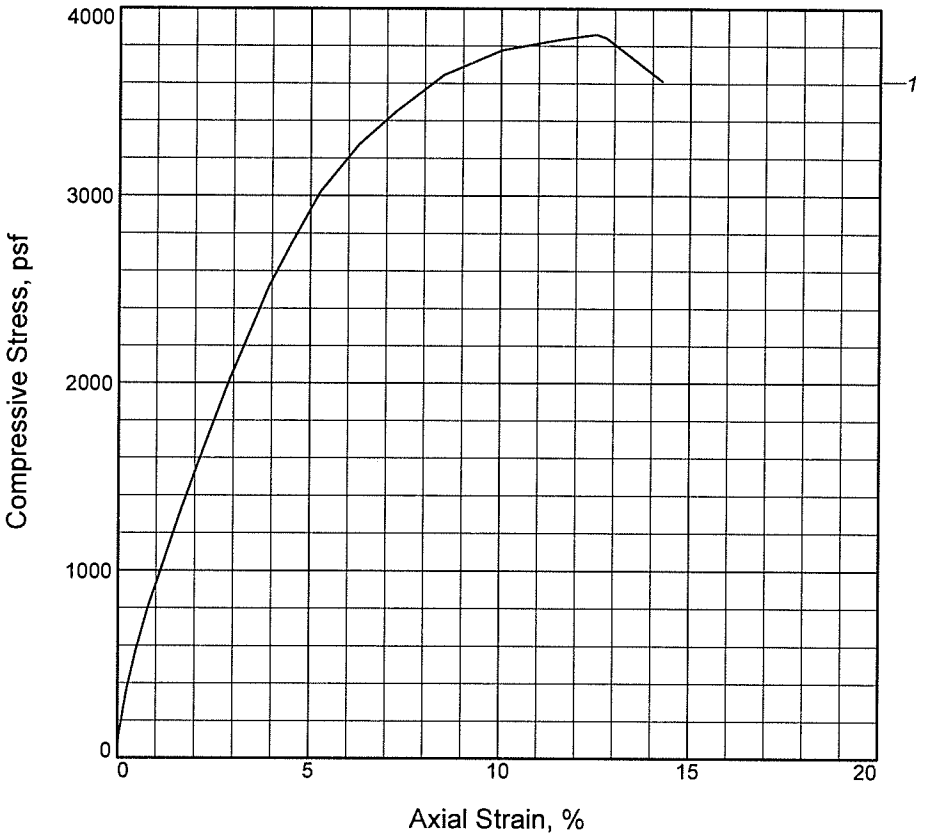
Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3862			
Undrained shear strength, psf	1931			
Failure strain, %	12.5			
Strain rate, in./min.	0.050			
Water content, %	19.4			
Wet density, pcf	127.2			
Dry density, pcf	106.6			
Saturation, %	88.9			
Void ratio	0.5934			
Specimen diameter, in.	1.85			
Specimen height, in.	3.96			
Height/diameter ratio	2.14			

Description: Lean clay, stiff, light brown, moist

LL = 45	**PL =** 16	**PI =** 29	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Client: SK Design Group

Project: South Main Street Reconstruction

Source of Sample: B-14 **Depth:** 0.83
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
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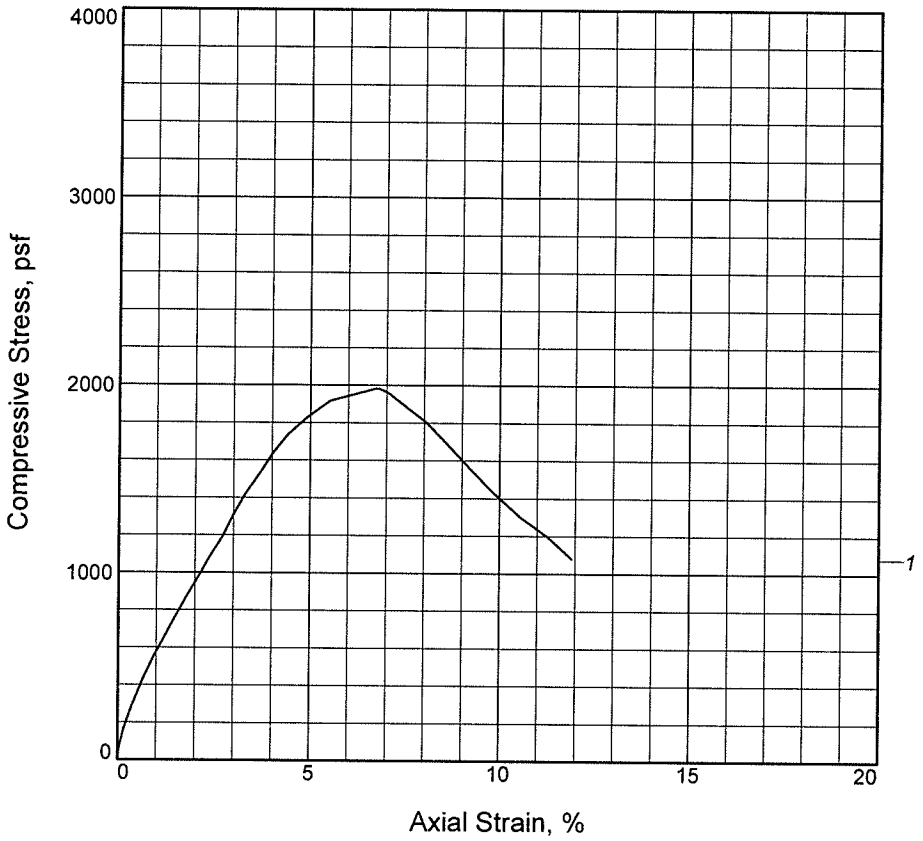
Figure _____

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	1985			
Undrained shear strength, psf	992			
Failure strain, %	6.8			
Strain rate, in./min.	0.050			
Water content, %	27.0			
Wet density, pcf	123.7			
Dry density, pcf	97.4			
Saturation, %	98.8			
Void ratio	0.7433			
Specimen diameter, in.	1.84			
Specimen height, in.	3.97			
Height/diameter ratio	2.16			

Description: Fat clay, trace organics, stiff, dark brown, moist

LL = 52	**PL =** 19	**PI =** 33	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Client: SK Design Group

Project: South Main Street Reconstruction

Source of Sample: B-16 **Depth:** 0.67
Sample Number: 1

UNCONFINED COMPRESSION TEST
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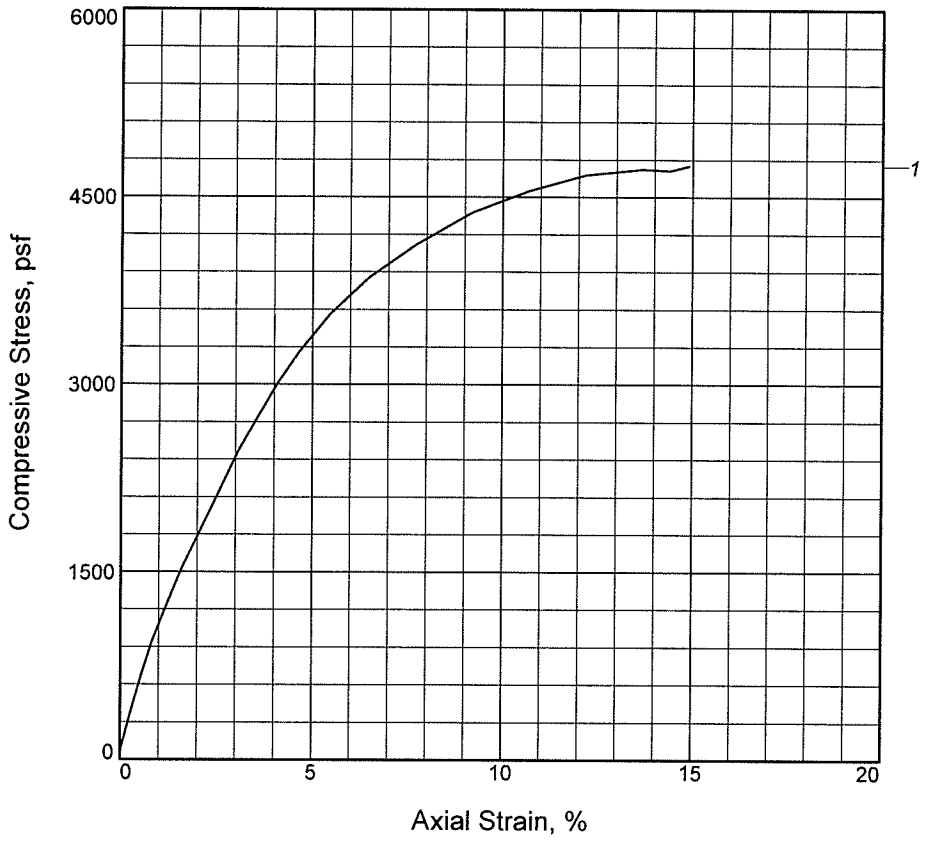
LENEXA, KS

Figure _____

Tested By: TMA

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	4750			
Undrained shear strength, psf	2375			
Failure strain, %	14.9			
Strain rate, in./min.	0.050			
Water content, %	20.2			
Wet density, pcf	131.4			
Dry density, pcf	109.3			
Saturation, %	99.4			
Void ratio	0.5531			
Specimen diameter, in.	1.85			
Specimen height, in.	4.01			
Height/diameter ratio	2.17			

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

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

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Client: SK Design Group

Project: South Main Street Reconstruction

Source of Sample: B-19 **Depth:** 1
Sample Number: 1

UNCONFINED COMPRESSION TEST
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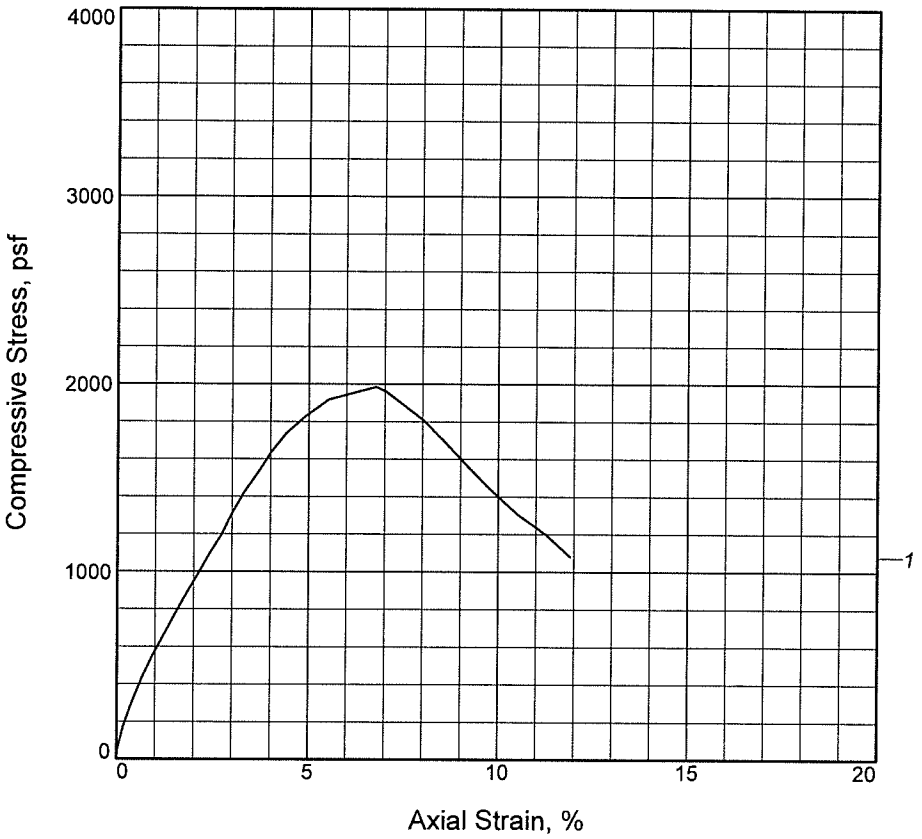
Figure _____

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	1985			
Undrained shear strength, psf	992			
Failure strain, %	6.8			
Strain rate, in./min.	0.050			
Water content, %	27.0			
Wet density, pcf	123.7			
Dry density, pcf	97.4			
Saturation, %	98.8			
Void ratio	0.7433			
Specimen diameter, in.	1.84			
Specimen height, in.	3.97			
Height/diameter ratio	2.16			

Description: Lean clay, trace organics, stiff, dark brown, moist

LL = 52	**PL =** 19	**PI =** 33	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Client: SK Design Group

Project: South Main Street Reconstruction

Source of Sample: B-16 **Depth:** 0.67
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
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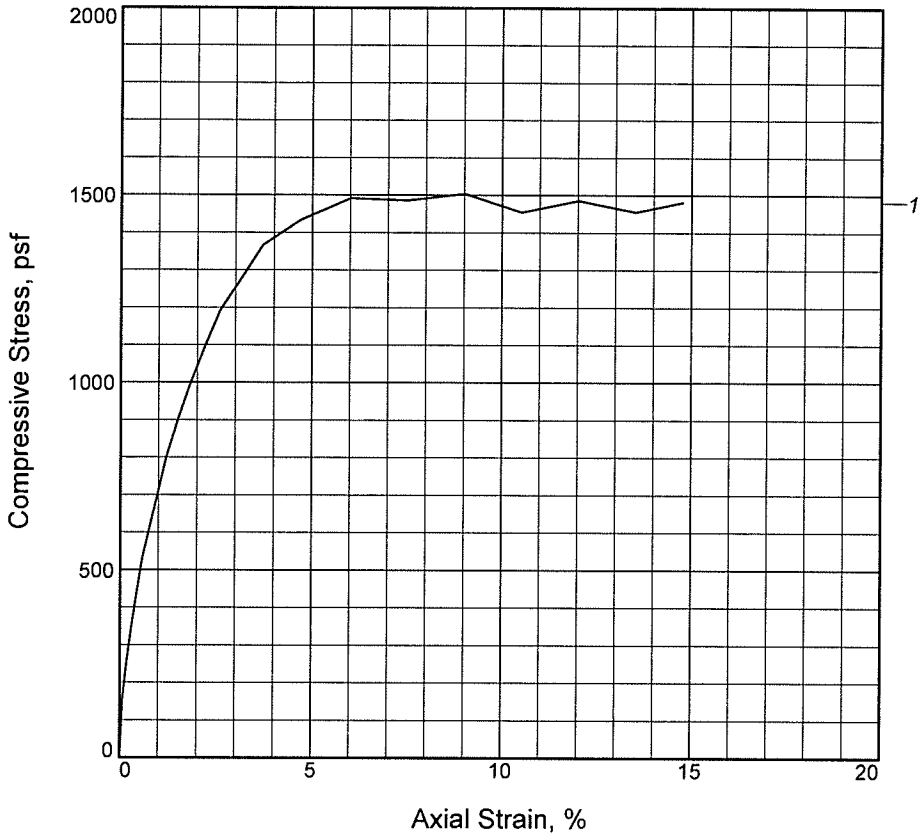
Figure _____

Tested By: TMA

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	1503			
Undrained shear strength, psf	752			
Failure strain, %	9.0			
Strain rate, in./min.	0.050			
Water content, %	28.6			
Wet density, pcf	122.3			
Dry density, pcf	95.1			
Saturation, %	99.0			
Void ratio	0.7848			
Specimen diameter, in.	1.84			
Specimen height, in.	3.96			
Height/diameter ratio	2.15			

Description: Fat clay, stiff, dark gray, moist

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

Project No.: 219122G
Date Sampled: 8/30/19
Remarks:

Client: SK Design Group

Project: South Main Street Reconstruction

Source of Sample: B-21 **Depth:** 1
Sample Number: 1

UNCONFINED COMPRESSION TEST
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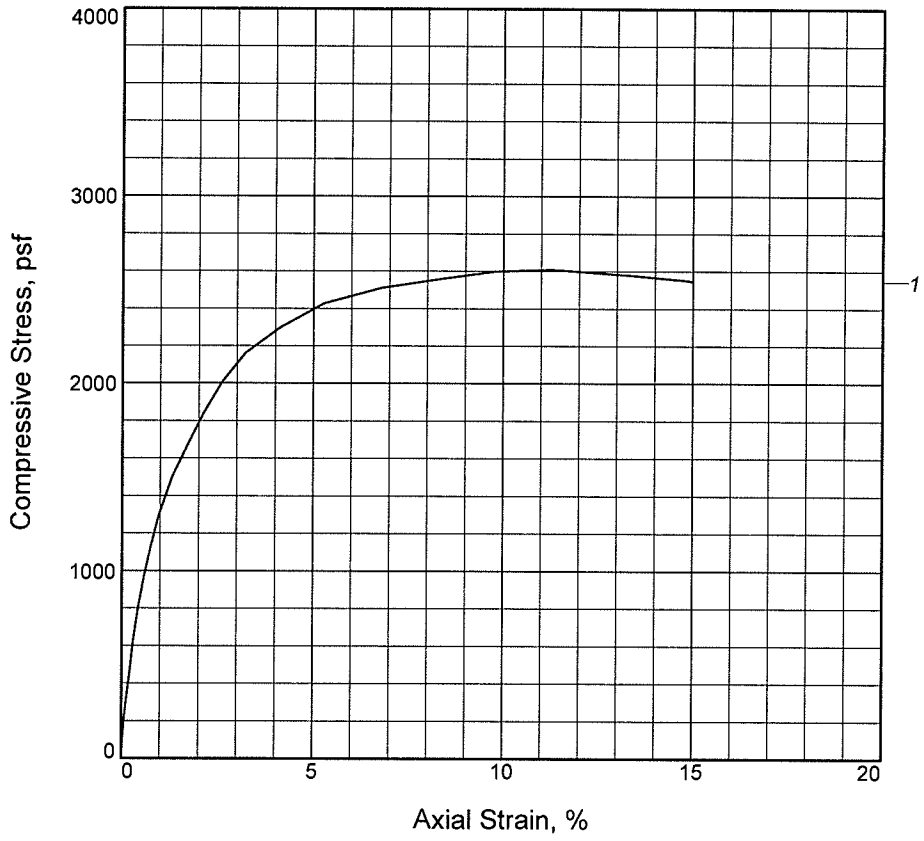
Figure _____

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	2609			
Undrained shear strength, psf	1305			
Failure strain, %	11.3			
Strain rate, in./min.	0.050			
Water content, %	21.5			
Wet density, pcf	127.0			
Dry density, pcf	104.5			
Saturation, %	93.6			
Void ratio	0.6247			
Specimen diameter, in.	1.83			
Specimen height, in.	3.97			
Height/diameter ratio	2.17			

Description: Fat clay, stiff, stiff, moist

LL = 69	**PL** = 19	**PI** = 50	**Assumed GS=** 2.72	**Type:** ST

Project No.: 219122G
Date Sampled:
Remarks:

Figure _____

Client: SK Design Group

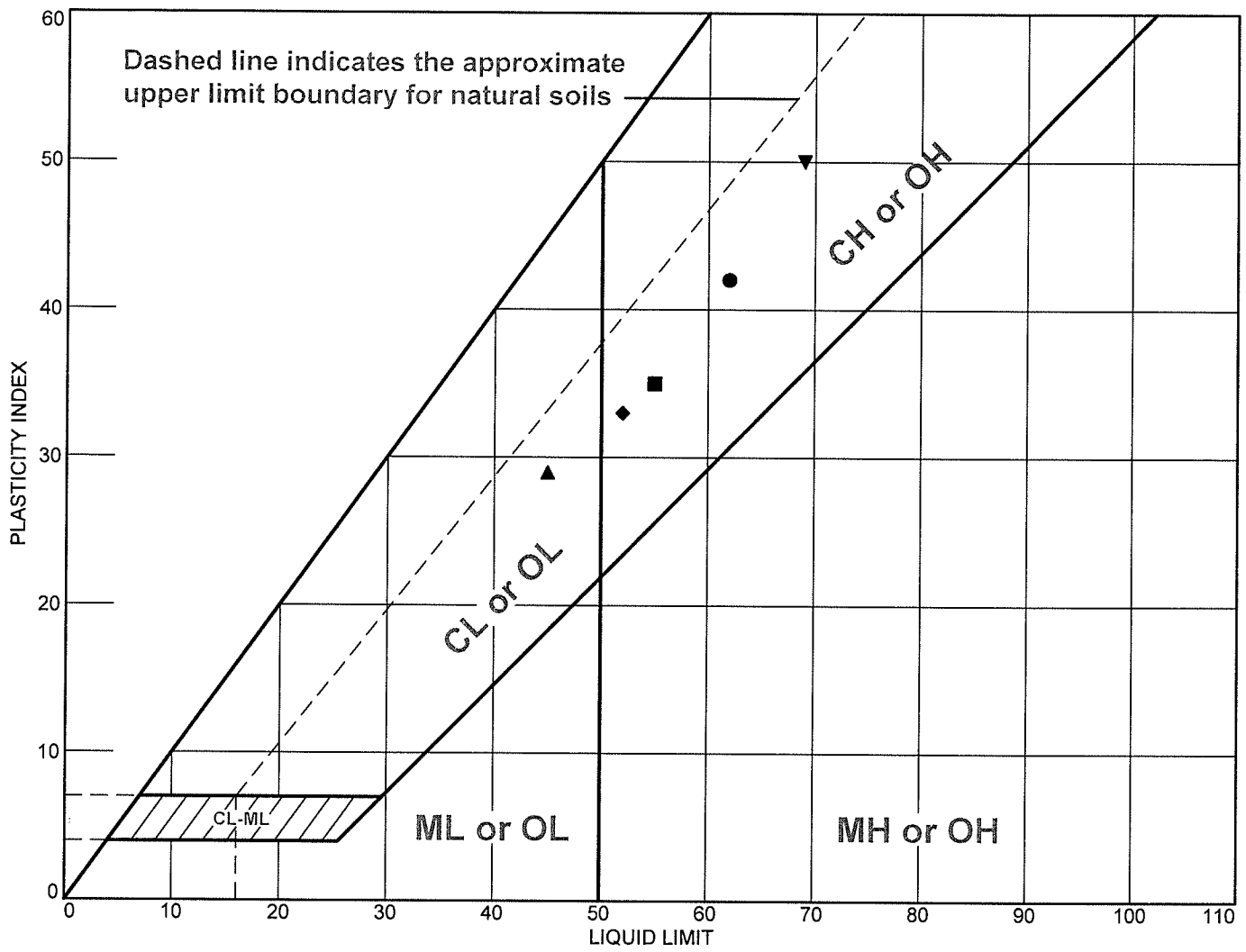
Project: South Main Street Reconstruction

Source of Sample: B-23 **Depth:** 1
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D 4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Fat clay, medium stiff, grayish brown, moist	62	20	42			CH
■	Fat clay, stiff, light gray, moist	55	20	35			CH
▲	Lean clay, stiff, light brown, moist	45	16	29			CL
◆	Lean clay, trace organics, stiff, dark brown, moist	52	19	33			CH
▼	Fat clay, stiff, stiff, moist	69	19	50			CH

Project No. 219122G **Client:** SK Design Group

Project: South Main Street Reconstruction

● **Source of Sample:** B-3 **Depth:** 0.58 **Sample Number:** 1

■ **Source of Sample:** B-8 **Depth:** 0.96 **Sample Number:** 1

▲ **Source of Sample:** B-14 **Depth:** 0.83 **Sample Number:** 1

◆ **Source of Sample:** B-16 **Depth:** 0.67 **Sample Number:** 1

▼ **Source of Sample:** B-23 **Depth:** 1 **Sample Number:** 1

KRUGER TECHNOLOGIES, INC.

LENEXA, KS

Remarks:

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