Addendum No. 1

VOLKERT

PROJECT NO:	1149210 (RFP NO. 2023-018)
PROJECT DESCRIPTION:	BID PACKAGE #2B – BUILDING PADS
PROJECT OWNER:	MOBILE AIRPORT AUTHORITY
CMAR:	JESCO INC.
ENGINEER OF RECORD:	VOLKERT INC. / NICK ROSE, P.E.
DATE OF ISSUE:	NOVEMBER 7, 2023
RECEIPENT:	All Plan Holders

ADDENDUM NO. 1

The information included in Addendum No. 1 and attachments hereto shall be considered in preparation of the proposal for the above referenced project and shall be made part of the Contract Documents and Specifications of the above referenced project.

RECEIPT OF THIS ADDENDUM SHALL BE ACKNOWLEDGED BY INITIALING THE "ACKNOWLEDGED RECEIPT" SPACE ON PAGE 2 OF THIS DOCUMENT. FAILURE TO ACKNOWLEDGE THIS ADDENDUM MAY RESULT IN NON-RESPONSIVE PROPOSAL.

PROPOSAL MODIFICATIONS, ITEMS OF CLARIFICATION, RESPONSES

CONTRACT SPECIFICATION MODIFICATIONS

- **CONTRACT DOCUMENTS**
  - **Insurance requirements have been updated to reflect current limits of the Mobile Airport Authority (MAA). Updated requirements are attached.**

- **GENERAL SPECIFICATIONS**
  - **Section I, General Specifications, II. Summary of Work, Supplemental General Conditions/Project Protocol on Page I-4**
    - **Shall be amended as follows:**

      30. Textura-CPM™ payment management system is being used for the Project and unless otherwise directed or authorized in writing by Contractor all Applications for Payment and all supporting documents (including but not limited to lien waivers, sworn statements, and the like) for Subcontractor and its sub-subcontractors and suppliers, shall be in electronic format and shall be submitted to Contractor using the Textura-CPM™ payment manage system. Subcontractor shall be responsible for the fees and costs owed associated with Subcontractor's use of the Textura-CPM™ payment management system. Subcontractor shall include a similar provision in its sub-subcontracts and purchase orders. Fees to

Subcontractors are calculated as 0.22% (22 basis points) of contract value (plus applicable taxes), with a maximum fee of $5,000. Fees to Subcontractors' sub-subcontractors and suppliers are a fixed fee of $100 per sub-subcontractor or supplier contract. Textura fees should be included in your bid.

- **MISCELLANEOUS**
  - **Milestone schedule is attached.**
  - **Pre-Bid Meeting:**
    - **A non-mandatory pre-bid meeting was held on Thursday, November 2, 2023, at 10:00 A.M. at Building 23 East, 1886 5th Street, Section 23 East, Mobile, AL. The minutes and sign-in sheet from that meeting are attached.**

Please acknowledge receipt: Addendum No. 1 ____________________________________

(Signature)

Addendum No. 1 Issued By ____________________________________

Nick Rose, P.E.
Project Manager

Enclosure:

- MAA Insurance Requirements
- Milestone Schedule
- Pre -Bid Meeting Agenda/Minutes
- Pre-Bid Sign-in Sheet
- Terminal Materials Report
- Parking Garage Materials Report (Draft)

MOBILE AIRPORT AUTHORITY

Insurance Requirements

Company **MUST** agree to insurance requirements as outlined below, as well a complete vendor agreement. Evidence of all required coverage to be furnished in the form of a Certificate of Insurance stating that policy shall not be canceled, changed, allowed to lapse or allowed to expire without 30 days written notice. The policies shall be endorsed to stipulate that the insurance afforded the additional insureds shall apply as primary insurance and that any other insurance or self-insurance maintained by Mobile Airport Authority shall be excess only. Company shall ensure that its subcontractors of any tier shall procure and maintain insurance that complies with the requirements set forth.

A copy of each endorsement shall be attached to the Certificate of Insurance. The Certificate shall indicate the Certificate Holder as:

Mobile Airport Authority
1891 9th Street
Mobile, AL 36615

Where appropriate, copies of endorsements should be attached to the Certificate of Insurance (COI).

**Waiver of Subrogation must be indicated "YES"
**"Mobile Airport Authority" must be listed on the bottom left of the COI form
**Must specify MAA as insured
**The MAA must always keep a current policy on file

The following is a list of the minimum requirements for the Mobile Airport Authority. Please note, that each project is different and the minimum insurance requirements may change without notice.

	Commercial General Liability	General Aggregate	Auto Liability	Umbrella	Worker's Compensation
Non-Airside <$100,000	$1,000,000	$2,000,000	$500,000	$0	State Law
Non-Airside $100,001-$500,000	$1,000,000	$2,000,000	$1,000,000	$0	State Law
Non-Airside $500,001-$2,000,000	$1,000,000	$2,000,000	$1,000,000	$2,000,000	$1,000,000
Non-Airside >$2,000,000	$1,000,000	$2,000,000	$1,000,000	$5,000,000	$1,000,000
Service Vendor	$1,000,000	$2,000,000	Exposure Dependent	$0	State Law
Terminal/Non-Airside	$1,000,000	$2,000,000	$1,000,000	$5,000,000	$1,000,000
FAA Projects/Airside	$1,000,000	$2,000,000	$1,000,000	$9,000,000	$1,000,000

Company shall indemnify, defend and hold harmless Mobile Airport Authority and its affiliates, and all of their employees, officers, directors, shareholders, etc. (collectively "Indemnitees") from and against any and all claims, demands, losses, damages, liabilities, expenses, obligations, judgments, recoveries and deficiencies, arising out of or resulting from the performance of the services provided.

The Mobile Airport Authority has a right to terminate the contract for non-compliance with insurance requirements.

MAA Terminal/Parking Deck

BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE		30	20-Oct-23 A	08-Dec-23
A3480	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-BID DOCUMENTS-FSB / IFP SET	0	20-Oct-23 A	20-Oct-23 A
A3490	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-MAA / HPM REVIEW	0	23-Oct-23 A	25-Oct-23 A
A3500	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-POST TO MAA WEBSITE / ADVERTISE	0	26-Oct-23 A	26-Oct-23 A
A3530	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-7460 PERMIT	14	30-Oct-23 A	16-Nov-23
A3540	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-CITY PERMIT	10	30-Oct-23 A	10-Nov-23
A3510	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-PRE-BID	1	02-Nov-23	02-Nov-23
A3520	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-RFI PROCESS / ADDENDUM	4	03-Nov-23	08-Nov-23
A3550	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-RECEIVE BIDS	1	09-Nov-23	09-Nov-23
A3560	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-RECOMMEND AND APPROVAL BY MAA/HPM	3	10-Nov-23	14-Nov-23
A3570	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-AWARD TO CONTRACTOR	1	15-Nov-23	15-Nov-23
A3580	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-PRE-CONSTRUCTION MEETING	1	16-Nov-23	16-Nov-23

A3590	BID PACKAGE-#2A-TEMPORARY FENCING-RELOCATE MICHIGAN AVE-CONSTRUCTION	16	17-Nov-23	08-Dec-23
BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK		58	20-Oct-23 A	22-Jan-24
A3600	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-BID DOCUMENTS-FSB / 60% SET	0	20-Oct-23 A	20-Oct-23 A
A3610	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-MAA / HPM REVIEW	0	23-Oct-23 A	25-Oct-23 A
A3620	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-POST TO MAA WEBSITE / ADVERTISE	0	26-Oct-23 A	26-Oct-23 A
A3650	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-7460 PERMIT	14	30-Oct-23 A	16-Nov-23
A3630	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-PRE-BID	1	02-Nov-23	02-Nov-23
A3640	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-RFI PROCESS / ADDENDUM	4	03-Nov-23	08-Nov-23
A3670	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-RECEIVE BIDS	1	09-Nov-23	09-Nov-23
A3680	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-RECOMMEND AND APPROVAL BY MAA/HPM	3	10-Nov-23	14-Nov-23
A3690	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-AWARD TO CONTRACTOR	1	15-Nov-23	15-Nov-23
A3655	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-RECEIVE 100% IFP SET FROM FSB	1	15-Nov-23	15-Nov-23
A3660	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-CITY PERMIT	10	16-Nov-23	29-Nov-23
A3700	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-PRE-CONSTRUCTION MEETING	1	16-Nov-23	16-Nov-23
A3710	BID PACKAGE-#2B-BUILDING PADS TERMINAL AND PARKING DECK-CONSTRUCTION	35	30-Nov-23	22-Jan-24

Date of Meeting:	November 2, 2023	**Time of Meeting: 10:00 a.m.**	
Meeting Location:	1886 5th Street, Section 23 East, Mobile, AL 36615	**Minutes Issued: YES**	
Project Name:	Mobile International Airport Terminal Bid Package #2A – Temp Access Road Bid Package #2B – Building Pads	**Dept. Project File No.:**	
Project Owner:	Mobile Airport Authority		
CMAR:	JESCO, Inc.		

Attendees – See the attached sign in sheet

Name	Organization	Contact #	Email

Regrets

Name	Initials	Title	Organization	Contact #	Email

Agenda

1.0 Introduction
2.0 Purpose of Meeting
3.0 Discussion Topics
4.0 DBE/MBE Requirements
5.0 Schedule
6.0 Bid Process

Minutes

1.0	**Introduction**
1.1	Safety Short:
1.2	Introduction of personnel.
1.3	Obtain contact information for attendees and additional project staff.

2.0	**Purpose of Meeting**
2.1	Pre-Bid Conference is held to provide bidders, vendors, suppliers and interested parties an overview of the proposed project and allow parties to ask questions concerning project specific requirements as it relates to the construction project. This meeting was not mandatory.

3.0	**Discussion Topics**
3.1	Availability of Electronic Documents – In order to be listed on plan holders list you must request plans **Via Email:** bdwilliams@jescoinc.net Only registered bidders will receive documents and updates via addenda.
	All documents can be viewed on the Mobile Airport Authority website. www.mobileairportauthority.com/

3.2 Project Description- included but not limited to:

Bid Package 2A – Temporary Access Road

a) Installation of temporary fencing and gates
b) Miscellaneous demolition
c) Install permanent fencing and remove temporary fencing
d) Provide grading and asphalt surfacing to connect existing apron to Michigan Ave
e) Install inlets and drainage piping
f) Temporary striping and signage
g) Erosion control, seeding
h) Traffic Control

Bid Package 2B – Building Pads

a) Building pad installations and 6" stone working surface
b) Demolition to include Aerostar Buildings – Feb 1, 2024, Michigan Ave and miscellaneous site demo.
c) Storm drainage
d) Utility removals and relocation
e) Sheet piling at Rabby Creek
f) Provide grading and asphalt surfacing to connect existing apron to Michigan Ave
g) Install inlets and drainage piping
h) Temporary striping and signage
i) Erosion control, seeding
j) Traffic Control

Airport Security

Safety Plan & Construction Sequence

General Project / Construction Requirements

Permitting – COM, FAA, ADEM

Please review the General Specifications in Division IV, Section 1, pages 2-9 for Supplemental Conditions, Project Protocol and Scope of Work.

This is a Prime Contract. All prospective bidders must meet the requirements of the bid documents to include Alabama general contractors license, bond ability, insurance requirements and any other qualifications listed in the documents to submit a bid.

	DBE / MBE Requirements
4.1	Established Goals – 14.63% Section 150 & 151

5.0	**Schedule**
5.1	*Project Schedule is as follows:* ☐ Plan Distribution: October 25, 2023 ☐ Pre-Bid Conference: November 2, 2023, at 10:00 a.m. ☐ Bid Date: November 9, 2023, at 2:00 p.m. ☐ Bidder Evaluation & Recommendation to MAA: November 14, 2023 ☐ Notice to Proceed: November 15, 2023 ☐ Work Complete: December 8, 2023- BP2A ☐ Work Complete: December 18, 2023- BP2B

6.0	**Bid Process**
6.1	Sealed Proposals will be received by the Mobile Airport Authority. Bids to be received and opened at 1891 Ninth Street at 2:00 p.m. local time on November 9, 2023. Bids will be opened publicly and read aloud. Afterwards, all responsive bids will then be evaluated privately based on the Bidder Selection Criteria and scoring system. Recommendation and award will be based on Best Value to the owner. *Bid Requirements:* ☐ All items in Division I ☐ Proposal Form- submitted in compliance with Project Specifications – Section C ☐ Subcontractor Information – Section E ☐ DBE / MBE Program and Certificate of Compliance- Section F ☐ DBE Letters of Intent ☐ See Attached Bidders Checklist ☐ No clarifications to proposal ☐ Provide two copies of proposal documents
6.2	Questions/Requests for Information: To be transmitted in writing to Construction Managers using the following emails: bdwilliams@jescoinc.net and jbuckner@jescoinc.net. Requests for Information will be answered and distributed via addendum. Information will be directly uploaded to the Pipeline and notifications will be sent to all registered plan holders. Cut-off for questions is set at 72 hours prior to bid opening. Jobsite visits are to be scheduled with the Construction Manager.

Meeting Adjourned at:

Report any errors or omissions in these Pre-Bid Meeting Minutes within **three (3) business days** to the Construction Manager or by e-mail at bdwilliams@jescoinc.net , otherwise these Minutes are considered accurate and accepted.

Attachment(s):

Distribution (to be completed by CMAR)

- Attendees
- Registered plan holders

BIDDER CHECKLIST

- ❑ Completed and Signed Bid Form- All blanks or spaces for information need to be filled out. One copy required
- ❑ Acknowledgement of all addenda
- ❑ DBE Program and Certificate of Compliance
- ❑ DBE Letter of Intents
- ❑ Certification of Nonsegregated Facilities
- ❑ Double check and Confirm all Allowances are included within Base Bid.
- ❑ Turn-In Time and Turn-In Date
- ❑ Turn-In Location- Note: all bids should be submitted physically- hand delivered to the CM and Owner prior to Turn-In Time.
- ❑ NO CLARIFICATIONS
- ❑ Alternates Specified and Included where Required
- ❑ SEALED ENVELOPE- Envelope must note name of your company, name of project as listed in the specifications, and general contractor's license number.
- ❑ E-Verify
- ❑ Unit Prices, where Applicable.
- ❑ List of Subcontractors
- ❑ Thorough review of specified "Instructions for Bidders"

Mobile Airport Authority

HPM

JESCO, Inc.
Construction

Bid Packages 2A - Temporary Access Road & 2B - Building Pads @ Mobile International Airport

RFP No. 2023-017 & RFP No. 2023-018

PRE-BID MEETING SIGN-IN SHEET

DATE/TIME: **Thursday, 11/2/2023 @ 10:00 A.M.** (Local)

LOCATION: **Building 23 East @ Brookley Aeroplex**
1886 5th Street, Section 23 East, Mobile, AL 36615

	Name (Please Print)	Company	Phone #	Email
1.	Courtney Fitchard	Clean Supreme, LLC	256-323-3600	courtney@cleansupreme.us
2.	Bryan Marchiolo	GA WEST	251-410-6259	bryan.marchiolo@gawest.com
3.	Greg Hall	R & R	251-979-5704	ghall@randrcontractingllc.com
4.	DANNY JACKSON	JACKSON PRIME CONSTRUCTION	334-328-4490	DJACKSON@JACKSONPRIME.COM
5.	KEN DONOGHUE	H.O. WEAVER & SONS	251.342.3025	KDONOGHUE@HOSWEAVER.COM
6.	Josh Meek	McElhenney Const.	251-402-2869	jmeek@mcelhenneyconst.com
7.	Randall H. Carter	Chris Brewer Contracting Inc.	251-721-5100	randall@chrisbrewercontracting.com
8.	Ed Booth	Chris Brewer Contracting Inc	251-263-2299	ed.booth@att.net
9.	ANTHONY JOHNSON	INNOVATIVE CONTRACTING SRVC.	(214) 490-4027	AJOHNSON.ICS@GMAIL.COM
10.	Michele Bright	Everbee's Bright [illegible]	251 348 2252	michele.bright@everbeesbright.com
11.	OSCAR FOLSOM	[illegible]	404 787 4599	[illegible]
12.	KEN WEEDEN	Ken Weeden & Assoc. Inc.	910.547.8047	kenneth-weeden@kwaplanning.com

Mobile Airport Authority

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JESCO, Inc.
Construction

13.	Gretta Smith	Easy Heating & Cooling	(251) 298-7287	info@easyheatingcooling.com
14.	Andrea McCants	Gulf Coast Realty Group LLC	251 423-1697	gulfcoastrealtygroup@gmail.com
15.	Jermaine Gaines	Gaines Utility Construction Company, LLC	251-586-7501	Jermainegaines@gainesutility.com
16.	Shaun Stapleton	John G. Walton Const	251-342-6250	shaun@johngwalton.com
17.	Sonya Harris	H F Glande Construction	251-367-4980	harris.sonyar@gmail.com
18.	Rashad Chapman	Dortch Figures & Sons, Inc	251 802-0020	dortchfigures@gmail.com rashadchapman_1@yahoo.com
19.	Ritah. Barren	Mobile Airport Auth.	(251) 382-5494	RBarren@mobAirport.com
20.	Wanda Lewis	World Financial Grp	(251) 421-7576	wandalewiswfg@gmail.com
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Construction

36	Preston Hughes	HCI	251 610 9674	phughes@hcicontractors.com
37	JEFF BUCKNER	JESCO, INC.	334-277-2612	jbuckner@jescoinc.net
38	BRIAN SLAUGHTER	JESCO, INC.	334-277-2612	bslaughter@jescoinc.net
39	MATTHEW PALMER	JESCO, INC.	334-277-2612	mpalmer@jescoinc.net
40	BEN WILLIAMS	JESCO, INC	334-277-2612	BDWILLIAMS@jescoinc.net
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Mobile International Airport
Proposed Terminal Building

Mobile Aeroplex at Brookley

Report of Subsurface Investigation and Geotechnical Engineering Evaluation

Prepared for:
VOLKERT, INC
Mobile, AL
SESI Project No: M23-442
October 20, 2023

SOUTHERN EARTH SCIENCES

MOBILE OFFICE
5460 Rangeline Road
Mobile, AL 36619
Tel: (251) 344-7711
Fax: (251) 443-9000
www.soearth.com

October 20, 2023

VOLKERT, INC
1110 Montlimar Drive
Suite 1050
Mobile, AL 36609

ATTENTION: Mr. "Hank" Harold Z. Eubanks, P.E.
Asst. Vice President

REFERENCE: Report of Subsurface Investigation and Geotechnical Engineering Evaluation
Mobile International Airport – Proposed Terminal Building
Mobile Aeroplex at Brookley
Mobile, AL
SESI Project No: M23-442

Dear Mr. Eubanks:

Southern Earth Sciences, Inc. (SESI) has completed the subsurface investigation and geotechnical engineering evaluation for the referenced project. This report presents our understanding of the available project information and outlines our soil related recommendations and comments regarding construction and foundation support for the proposed building structure.

We appreciate this opportunity to be of service and look forward to our continued involvement throughout pile testing and construction phases of the project. Please do not hesitate to contact us if you have any questions.

Sincerely,

SOUTHERN EARTH SCIENCES, INC.

Matt Coaker, P.E.
Vice President
Registered, Alabama 30835

Curran Nicholas, E.I.
Geotechnical Project Manager

MC/CN
Attachments

1.0 PROJECT INFORMATION

Based on our understanding of the provided information, the project will consist of a new airport terminal structure totaling approximately 105,000 ft^2 in plan area. The project site is located on Michigan Avenue north of the existing Mobile Downtown Airport Terminal Building. Based on the preliminary structural loading information provided to us by Mr. Min Koo, P.E. with FSB Architects and Engineers, we understand maximum column loads are expected to be on the order of approximately 720 kips. No additional detailed project information was available at this time. SES should be consulted to review project plans and details as the design progresses.

2.0 SITE DESCRIPTION, TOPOGRAPHY AND PROPOSED SITE GRADING

The majority of the proposed terminal building will be located in currently undeveloped, grassed areas. Michigan Avenue and various existing asphalt and concrete drives transect the proposed building area along the western boundary and near the center. Existing ground elevations estimated from the provided topographic data range from approximately elevation (EL) +19 within the southwest corner of the proposed terminal to EL +24 within the northeast corner of the structure.

Based on our correspondence with Mr. Nick Rose with Volkert, Inc., we understand that the Finished Floor Elevation of the terminal structure is set at EL+26 feet, which is approximately 2 to 7 feet above current site elevation. All reference to elevation has been estimated based on the provided topographic survey data attached for reference in **Appendix 5**.

3.0 FIELD INVESTIGATION

Ten (10) Cone Penetrometer Test (CPT) soundings, one (1) SCPT sounding (CPT_u sounding with Shear Wave Velocity measurements), and one (1) Standard Penetration Test (SPT) boring were performed within the project area. CPT soundings and the soil boring were performed by SES field crews at the approximate locations shown on the Test Location Plan included in **Appendix 1**. Test locations were selected by SES engineering staff and were cleared in the field of underground utilities using Ground Penetrating Radar (GPR) by E.F. Thompson Geotechnologies, Inc.

CPT soundings were advanced to refusal at depths ranging from approximately 57 to 140 feet below ground surface in general accordance with ASTM Specification D-5778 using a truck mounted 20-ton Hogentogler Electronic CPT rig. Soil classifications were interpreted from methods recommended by

Robertson and Campanella. Correlations between Cone Resistance values and Standard Penetration Testing "N" values were performed according to the methods developed by Robertson, Campanella and Wightman. The soil types and stratigraphy shown on the CPT Log sheets are based upon material parameters measured and evaluated as the cone is advanced. CPT Log sheets graphically showing the cone tip resistance, friction, equivalent N60-value and interpreted soil behavior type at each sounding location are attached in **Appendix 2**.

The Seismic CPT sounding was advanced to approximately 100 feet below existing grade in general accordance with ASTM Specification D-5778 and D-7400 using the same truck mounted 20-ton Hogentogler Electronic CPT rig as used for the conventional CPT soundings. The sounding was conducted with a piezo cone that is equipped with a geophone sensor to measure the magnitude and arrival time of seismic shear and compression waves. Seismic shear waves are generated at the soil surface by striking the end of a steel plate that is pressed onto the ground using the leveling jack of the rig. An electronic trigger attached to the hammer records the exact time of the strike. As seismic waves are registered by the geophone sensors, data is transferred from the cone to the soil surface by wires that run though the push rods. The SCPT data acquisition system logs this data and analyzes it to determine the speed of the waves based on their arrival time and the distance between the wave generator and the sensors. Shear wave velocity measurements were taken at five (5) foot intervals to full depth of the sounding. Shear wave velocities with depth are attached in **Appendix 2**.

The soil boring with Standard Penetration Tests (SPTs) was advanced to a depth of approximately 102 feet below the existing ground surface using truck mounted drilling equipment. Soil sampling and penetration testing in the soil test borings were performed in general accordance with ASTM Specification D 1586 using solid stem auger until groundwater was encountered and mud rotary drilling techniques below the groundwater level for the remainder of the boring. At regular intervals during the process, the drill rods were removed, and soil samples were obtained with a standard 2-inch split tube sampler. Soils were sampled at 2.5 ft intervals to 10 feet and then at 5 ft sample intervals to boring termination. Representative portions of soil samples obtained during the investigation were transported to our laboratory for classification testing. Samples were examined by an engineer and classified in accordance with the Unified Soil Classification System. Soil descriptions, penetration resistances and laboratory testing results are shown on the appropriate Soil Boring Log sheets attached in **Appendix 2**.

4.0 LABORATORY TESTING

Laboratory testing included physical examination and general classification testing of samples obtained from the soil test borings in SES laboratories. Testing included Moisture Content Determination (ASTM D2216), No. 200 Sieve Washes (ASTM D1140), Sieve Analysis (ASTM D6913), Atterberg Limits Tests (ASTM D4318), Consolidation Tests (ASTM D2435) and Unconsolidated Undrained (UU) Triaxial Tests (ASTM D2850). Test results are included on Soil Boring Logs attached in **Appendix 2** and on Laboratory Test Data Summary Sheets attached in **Appendix 3.** Test reports for the consolidation and UU Triaxial tests are also included in **Appendix 3**.

4.1 Laboratory Chemical Analysis and Corrosion Potential

Selected soil samples obtained from within the upper 10 feet of the site were forwarded to Pace Analytical Services, LLC for analytical testing. Testing included pH (EPA 9045), Resistivity (EPA 9050), Sulfate (EPA9038) and Chloride (EPA 9251). In some instances, test results of samples collected within nearby buildings and during previous explorations within areas of similar subsurface conditions have been used to supplement our assessment of the potential for corrosion of buried steel and deterioration of concrete foundation elements. Test results are summarized in the following table and are attached in **Appendix 3** for reference. Our conclusions, based on these test results and our experience with similar soils present across the Mobile Aeroplex at Brookley, are discussed in the following sections.

SOUTHERN EARTH SCIENCES

TABLE 1

CORROSION SERIES LABORATORY TEST RESULTS

Soil Test Location	Sample Depth (ft)	pH	Resistivity (Kohm-cm)	Sulfate (mg/kg)	Chloride (mg/kg)
PG-7, S-2	2.5 – 4.0	5.1	53.2	78.8	<33.3
PG-7, S-4	5.0 – 6.5	5.4	82.4	<33.3	<33.3
PG-7, S-5	10 – 11.5	5.2	95.5	321	<33.3
T-7, S-2	2.5 – 4.0	5.0	44.4	<33.3	<33.3
T-7, S-3	5.0 – 6.5	5.7	79.5	69.5	<33.3
T-7, S-4	7.5 – 9.0	5.3	51.8	105	<33.3
T-7, S-5	10 – 11.5	4.0	1.23	1000	<33.3

4.1.1 Soil Resistivity

Laboratory results indicate measured resistivity values ranging from 1.23 to 95.5 kohm-cm. This range of resistivity values is considered highly corrosive to essentially non-corrosive to buried steel infrastructure. The table below summarizes the relative corrosivity rating as a function of soil resistivity. Variation in soil resistivity at this site is anticipated as upper soils vary considerably in density, moisture content, gradation, and organic content.

SOUTHERN EARTH SCIENCES

TABLE 2

CORROSION SEVERITY RATING BASED ON RESISTIVITY

(From Unified Facilities Criteria (UFC) 3-570-01 and Corrosion Basics: An Introduction 2nd Edition, by Pierre R. Roberge, 2006 by NACE Press Book)

Soil Resistivity Range (*Kohm-cm)*	Relative Corrosivity Rating
< 1	Extremely Corrosive
1 to 3	Highly Corrosive
3 to 5	Corrosive
5 to 10	Moderately Corrosive
10 to 20	Mildly Corrosive
20 to 30	Progressively Less Corrosive
> 30	Essentially Non-Corrosive

4.1.2 Soil pH

Acidic attack of concrete is generally not a concern unless it is exposed to a relatively continuous flow of groundwater and a pH of less than 5.5. pH of tested samples ranged from 4.0 to 5.7. Although pH values are relatively low at some locations and depths, foundation infrastructure is anticipated to be constructed well above the groundwater level. Our opinion is that the effect of pH on concrete foundations at this site is not a concern.

4.1.3 Chlorides

Chloride test results in accordance with EPA 9251 indicate that concentrations on tested samples are generally less than 33.3 mg/kg. According to guidelines established by the Federal Highway Administration (FHWA), soil chloride concentrations less than 500 mg/kg are not considered severe. Chloride concentrations are not considered severe at this site.

4.1.4 Sulfates

Soluble sulfate testing of soils in accordance with test method EPA 9038 indicates that sulfate concentrations of tested samples range from below the reporting limit of 33.3 mg/kg to approximately 1000 mg/kg. Sulfate exposure is considered to be moderate to negligible by ACI standards with respect to effects on buried concrete foundations. The use of Type I/II cement will be suitable for use in buried foundation elements at this site. The following table presents a summary of guidelines for cement type selection as recommended in Table 4.3.1 of the American Concrete Institute (ACI) Code.

TABLE 3

CEMENT TYPE FOR CONCRETE EXPOSED TO SULFATES

(Table 4.3.1 of the American Concrete Institute (ACI) Code)

Sulfate as SO_4 (mg/Kg)	Relative Degree of Sulfate Attack	Cement Type
0 – 1,000	Negligible	I
1,000 to 2,000	Moderate	II
2,000 to 20,000	Severe	V
20,000 or more	Extreme	V plus pozzalan

5.0 GENERALIZED SUBSURFACE CONDITIONS

The subsurface descriptions below are generalized to highlight the major subsurface stratigraphy encountered across the site. The Soil Boring Logs and CPT Sounding Logs attached in **Appendix 2** and Soil Profiles attached in **Appendix 1** present specific information at individual boring location including soil description, stratification, approximate elevation, ground water level, soil strength and laboratory tests results. This information is representative of conditions encountered at boring locations. Variations may occur and should be expected between boring locations. The stratification represents the approximate boundary between subsurface materials as the actual transition may be gradual. Approximate ground elevations at test locations were estimated using the topographic data provided to us in **Appendix 5**.

Soils within approximately the upper 5 to 8 ft of the site generally consist of medium dense to dense silty and clayey sands and medium stiff clays underlain by very soft to soft silts and clays to approximately 20 feet. A thin, loose silty sand substrata was encountered at depths ranging between approximately 20 ft and 22 ft. Below this level, soft to medium stiff silts and clays were encountered to depths of approximately 55 to 60 feet, underlain by medium dense to very dense sands and silty sands to termination of most CPT Soundings at depths ranging from approximately 95 to 100 feet. Stiff sandy silts and medium dense silty sands were encountered to approximately 138 feet at test location T-1 before termination of the investigation due to refusal in the very dense sands approximately 140 feet below existing ground surface. Detailed descriptions of soils encountered at each test location are shown on the appropriate CPT Sounding logs included in **Appendix 2**.

6.0 GROUNDWATER

Direct groundwater measurements were not possible at CPT locations at the time of our investigation due to most of the CPT sounding holes collapsing upon rod removal. Caved depths ranged from approximately 1 to 11 feet below the existing ground surface, likely indicating proximity to perched water levels or saturated soil conditions near or above the collapsed depths. Depth to sounding collapse at each test location at the time of our investigation are shown on the appropriate CPT sounding sheet attached in **Appendix 2**. Soil boring T-7 encountered water at a depth of approximately 5 feet below existing ground surface at the time of our investigation, likely indicating proximity to perched water level. The groundwater level encountered at T-7 at the time of our investigation is shown on the appropriate Soil Boring Logs attached in **Appendix 2.**

Estimation of static groundwater levels using measured porewater pressure from CPT data indicates that a hydrostatic water level exists at depths of approximately 20 to 23 feet below ground surface or near EL+0. While the true static groundwater table is deep, our experience at this site indicates that shallow groundwater (perched water) levels will fluctuate with weather conditions at the time of construction. The low permeability silty and clayey soils present within the upper reaches of this site will create shallow perched water conditions within imported granular fill soils after periods of rainfall.

Groundwater depths or elevations should be verified at the time of construction for cases where groundwater variations are potentially significant for construction. Fluctuation in the groundwater table will occur due to variances in rainfall, elevation, drainage, types of soil encountered and other factors not evident at the time measurements were made. Reference to depth has been made with respect to the existing ground surface encountered at the time of our field investigation.

7.0 SEISMIC CONSIDERATIONS AND GEOLOGIC HAZARDS

Down-hole shear wave velocities measured within the upper 100 feet of site at test locations performed within the proposed terminal building area indicate a weighted average shear wave velocity of approximately 643 feet per second. Shear wave velocity measurements plotted vs. depth are attached in **Appendix 2**. Per ASCE-7-2016 and the International Building Code (IBC) 2018 Edition, our opinion is that this site would best be categorized as **Site Class D**. The site is not within a special seismic hazard or earthquake fault zone. Based on subsurface information collected at the site and our experience in this geologic area, supplemental geologic hazard evaluations are not recommended for this site. Potentially liquefiable soils were not encountered. Liquefaction induced settlement and/or lateral spread is not a concern at this site.

8.0 GEOTECHNICAL OVERVIEW

Our evaluation of subsurface conditions and foundation alternatives for this project has been based on the project information previously described in this report and subsurface data obtained during the investigation. In evaluating the CPT sounding and soil boring data, we have used empirical correlations previously established between standard penetration resistances, cone tip and side resistance values, soil index properties and foundation stability. Soil parameters used in the evaluation were derived from the CPT sounding data using the interpretation software RAPID CPT® by Dataforensics.

8.1 Building Foundations

Soils encountered between approximately 8 and 40 feet consist of highly compressible, loose clayey sands and very soft to soft clays. Considering the anticipated magnitude of structural loads for this project and the presence of these highly compressible soils, shallow foundations are not considered a viable option for this structure. Pile foundations will be required for support of building foundations. Pile foundations will provide positive foundation support by transferring structural loads into the medium dense sand bearing strata encountered beginning at depths ranging from approximately 55 to 60 feet beneath the existing ground surface.

Augercast piles and Drilled Displacement Piles would be acceptable pile types for this project from a geotechnical capacity standpoint. Driven piles would be an acceptable alternative from a geotechnical perspective but have not been addressed in this report due to expected hard driving that would be encountered above design tip elevation and resulting vibrations and noise during pile installation that could be problematic to the nearby facilities and operations. Pile design recommendations are provided in the following sections of this report.

8.2 Ground Level Floor Slabs

The soft clay soils present at this site between depths of approximately 8 and 40 feet are not capable of providing uniform support for a soil supported floor slab concept at the proposed Finished Floor Elevation. When subjected to the weight of up to approximately 7 feet of anticipated fill, these soft and loose materials will be susceptible to settlements estimated to range from less than approximately 1 inch in areas of minimal fill up to approximately 6 inches in areas of maximum fill. A portion of the anticipated settlement at this site would consist of a relatively short-term strain-type settlement that would occur during and shortly after fill placement, but most of the settlement would consist of long-term consolidation settlement that would occur over a period of several years after fill placement and completion of construction. Secondary compression would theoretically continue indefinitely throughout the design life of the facility. Fill induced settlement of soil supported floor slabs and hardscape would be differential with respect to pile supported foundation elements and will vary across the proposed terminal building area with fill height above existing grade. Based on our experience with similar soil conditions and many existing structures across Mobile Aeroplex at Brookley, we have assumed that pile foundations will likely be the preferred approach to minimize the potential for ground level floor slab settlement on this project.

As an alternative to pile supporting the ground level floor slabs, surcharging the building area with earthen fill above final design grade and prefabricated vertical wick drains for a period of time prior building construction could be considered to help reduce post construction settlement. A surcharge program at this site could be designed to reduce primary consolidation settlement to less than approximately 1-inch, but surcharging would not eliminate post construction differential settlement of grade supported floor slabs with respect to pile supported foundation elements over the life of the facility as some consolidation settlement potential will remain after surcharging, and secondary compression settlement in these soft soils can continue indefinitely.

A surcharge program for this project site would generally consist of installing prefabricated vertical wick drains to a depth of approximately 60 feet below existing grade on an approximate 4 to 5 ft center to center triangular spacing followed by preloading areas within and extending a lateral distance of approximately 25 – 50 feet outside the building perimeter with 6 to 10 feet of earthen surcharge material above FFE for a period of 90 to 120 days. For reporting purposes, we have anticipated that surcharging will not be considered a viable option for this project due to construction scheduling constraints. Should construction scheduling allow for a surcharge program, SES should be consulted to provide detailed recommendations for surcharge height, duration, and a settlement monitoring plan.

9.0 FOUNDATION RECOMMENDATIONS

Building foundations and the ground level floor slab system should be structurally supported by deep foundations. Ideally, the building and first level floor system could be constructed as an elevated structure to minimize fill heights above existing grade. This approach would result in a more efficient pile design since down-drag reduction would not be necessary and would also reduce the potential for differential settlement of grade supported hardscape and utilities with respect to pile supported foundation elements. If fill placement beneath and surrounding the structure cannot be limited, and up to approximately 7 feet of fill will be placed above original grade to achieve FFE EL +26, a reduction in allowable compressive pile capacity will be required to account for down-drag forces and special provisions will be necessary to manage differential settlement between pile supported foundations and grade supported hardscape, pavements, utilities, etc.

The following tables present our recommended pile penetration depths and corresponding allowable compression and tension capacities from static analysis. **Table 1** presents pile capacities that could be considered in areas where fill placement above existing grade can be limited to approximately 18 inches above existing grade. **Table 2** presents pile capacities that should be used if fill heights will exceed approximately 18 inches above existing grade. Piles at this site must be adequately embedded into the dense sand strata encountered generally beginning at depths ranging from approximately 55 to 60 feet below the existing ground surface. Compression capacity of piles that are not adequately embedded into the dense sand bearing strata will be considerably less than those presented in the following tables.

SOUTHERN EARTH SCIENCES

9.1 Estimated Pile Capacities

Recommended pile penetration depth and corresponding allowable compression and tension capacities for Augercast Piles and Drilled Displacement Piles are presented in the following tables. Piles are expected to develop their capacity as a result of side resistance in the various sand and clay strata above approximately 55 feet and from a combination of side resistance and end bearing in the dense sands encountered below this level. Estimated pile capacities are based on a Factor of Safety of 2.0 (FOS). The Pile lengths, sizes and capacities presented are based on soil-pile interaction and do not consider structural aspects of the pile. Pile penetration depths are referenced to the existing ground surface.

TABLE 1

ALLOWABLE PILE CAPACITIES – AUGER-CAST PILING

NO DOWNDRAG REDUCTION

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity (tons)	Allowable Tension Capacity (tons)
70 feet	16” Augercast	65	25
	18” Augercast	75	30
	20” Augercast	85	35
80 feet	16” Augercast	75	30
	18” Augercast	90	35
	20” Augercast	100	40

***Referenced to existing ground surface at the time of field investigation**

TABLE 2

ALLOWABLE PILE CAPACITIES – DRILLED DISPLACEMENT PILING

NO DOWNDRAG REDUCTION

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity (tons)	Allowable Tension Capacity (tons)
65 to 70 feet	14” Drilled Displacement	85	40
	16” Drilled Displacement	100	45

***Referenced to existing ground surface at the time of field investigation**

Using known FFE of the proposed structure and topographic data provided to us, we estimate that FFE will be as much as approximately 7 feet above existing site grade; therefore, an approximate 15 to 23 percent reduction in axial compressive pile capacity has been incorporated into the estimated capacities to account for negative side friction forces (down-drag) that will be induced on the piles as deep compressible soils consolidate over time.

TABLE 3

ALLOWABLE PILE CAPACITIES – AUGER-CAST PILING

REDUCED FOR DOWNDRAG

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity** (tons)	Allowable Tension Capacity (tons)
70 feet	16" Augercast	50	25
	18" Augercast	60	30
	20" Augercast	70	35
80 feet	16" Augercast	60	30
	18" Augercast	75	35
	20" Augercast	85	40

***Referenced to existing ground surface at the time of field investigation**
****Capacities reduced to account for down drag**

TABLE 4

ALLOWABLE PILE CAPACITIES – DRILLED DISPLACEMENT PILING

REDUCED FOR DOWNDRAG

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity** (tons)	Allowable Tension Capacity (tons)
65 to 70 feet	14" Drilled Displacement	65	40
	16" Drilled Displacement	80	45

***Referenced to existing ground surface at the time of field investigation**
****Capacities reduced to account for down drag**

SES should be consulted as the Geotechnical Engineer of Record to assist the design team with further evaluation of pile type, design capacity and corresponding pile length based on loading requirements and optimum pile cap configurations. SES should also be consulted to review the Pile Load Test Plan, Pile Load Test Results, and Production Pile Installation Criteria.

9.2 Auger-Cast and Augered Displacement Pile Installation Considerations

The dense sand bearing strata vary in strength and depth across the site; therefore, considerations should be taken to account for difficult drilling that may occur at varying elevations. Drilled displacement piles may experience hard drilling in intermittent dense sand strata that may be encountered at some locations above the intended bearing strata beginning at approximately 55 feet below ground surface. Pile penetration/refusal depth may vary by several feet across this building area. Contingency should be set up in the contract documents to account for pile length variation and installation method modification that may be required by the contractor to advance piles to the recommended tip elevation/pile penetration or as needed to develop the intended design capacity.

The equipment, experience, and installation technique on the part of the contractor are crucial to successful pile performance of augercast piles and drilled displacement piles. Careful monitoring and recording of the pile installation should be performed by an experienced technician to help identify possible installation problems.

Closely spaced piles will become increasingly more difficult to install to the desired tip elevation if a proper installation pattern is not established. It may be necessary to start installation towards the center of the pile cap and work outwards. Piles should not be installed within 3 pile diameters of newly placed piling until the grout has cured for at least 24 hours or within 6 pile diameters until the grout has cured for at least 12 hours.

9.3 Pile Response to Lateral Loading

Pile response to assumed shear forces applied to the pile top were evaluated using LPILE® version 22 software. LPILE software employs p-y analysis to determine deflections at the pile top under specific loading conditions. Parameters used in the analysis have been correlated from empirical data using standard penetration resistance "N" values (correlated with accepted geotechnical references), measured CPT tip and side resistances and our knowledge of and experience with similar soil conditions.

Based on our correspondence with the project design team, we have evaluated a 14-inch diameter Drilled Displacement pile under various loading scenarios. Shear forces applied to the pile top were varied based on pile response to produce deflections ranging from approximately 0.25 to 0.75 inch. The P-Y curves were factored for group effects for piles in groups using a p-multiplier of 0.8 for the front row piles and a multiplier of 0.4 for the second-row piles.

Piles were modeled using fixed head conditions with lateral loads applied at the pile top at an average depth of 4 feet below existing grade. ULTIMATE Lateral Deflection, Moment and Shear vs. Depth plots are attached in **Appendix 4**. Piles were modeled with no axial load or bending moment applied to the top of the pile. It should be considered that axial uplift loads generally reduce the lateral capacity from that indicated by this analysis, while axial compressive loads increase the lateral capacity.

An appropriate Factor of Safety should be applied by the designer depending on the sensitivity of the design to deflection or moment capacity. Evaluation of the structural capacity of the piles to withstand shear forces and bending moments generated by lateral loading is beyond the scope of this investigation and should be determined by the structural design engineer of record.

Assumed pile reinforcement configurations, concrete strength, and lateral loads resulting in approximately 0.25, 0.50 and 0.75-inch deflection for piles in first row and second row configurations are provided in the following table. Deflection, moment, and shear curves along the length of the pile corresponding to the load scenarios listed below are attached in **Appendix 4.**

TABLE 5

DRILLED DISPLACEMENT CONCRETE PILE LATERAL LOAD CASE SUMMARY

Pile Type and Size	Assumed Reinforcement Configuration	L-Pile® Loading Case Designation	Applied Shear Force	
			Row 1	Row 2
14-inch Drilled Displacement Concrete Pile (5,000 psi grout)	20 ft cage with 6 - #6 rebar	Loading Case 1	12.2 kips	7.9 kips
		Loading Case 2	17.2 kips	11.1 kips
		Loading Case 3	20.6 kips	13.7 kips

9.4 Individual Pile Settlement and Group Efficiency

We recommend installing piles at a minimum center to center spacing of 3 pile diameters. A reduction in capacity due to group effects for properly spaced piles at the recommended pile penetration depths will not be required.

Detailed structural loading information and pile cap configurations were not available at this time. Estimated settlement of individual piles properly installed to the recommended depth are expected to be less than 0.5 inch at service load. Piles installed in groups (up to 8 to 10 piles per pile group) at the recommended minimum center-to-center spacing of 3 pile diameters at the recommended pile penetration depths are not expected to undergo additional settlement at service load due to group effects. SES should be consulted to review plans and design details and to evaluate larger pile groups once pile type, pile loading, and pile cap configurations have been established.

9.5 Pile Settlement and Drag Force Considerations

Estimated settlement of individual piles properly installed to the design depth are expected to be less than 0.5 inch at service load. These capacities and lengths consider down-drag, drag forces and downward pile movement resulting from residual primary consolidation and secondary compression settlement that will occur at this site where more than approximately 18 inches of fill is placed above existing grade.

Considering that piles for this project will be bearing in a reasonably thick deposit of medium dense to dense sands, we estimate that pile groups (assumed maximum of 8 to 10 piles per cap) installed at the recommended minimum center-to-center spacing of 3 pile diameters or greater are not expected to undergo additional settlement at service load due to group effects.

Our evaluation of the effects of fill induced settlement on pile foundations and resulting drag forces at this site have been based on methods outlined in "Neutral Plane Method for Drag Force of Deep Foundations" (Siegel, et.al, 2014) and in the Federal Highway Administration Publication No. FHWA-NHI-16-009. These references explain that the direction in which side resistance acts on a deep foundation depends on the relative movement between the deep foundation and the adjacent soil. When the pile moves downward relative to the soil, then the side resistance is positive and acts upward (pile resistance). Conversely, when the soil moves downward relative to the deep foundation, the side resistance is negative and acts downward (down-drag). The side resistance distribution and direction of relative pile movement with respect to surrounding soil is a function of the soil strength and stiffness, the applied pile top load, and whether the top load is sustained, transient, or a combination of sustained and transient loads. (Siegal).

The accumulation of negative shaft resistance with depth produces a drag force on the pile. The maximum drag force and the maximum axial compression stress in the pile occur at the depth along the pile equal to the depth of the "Neutral Plane". The depth of the Neutral Plane is defined as the depth along a pile where the sum of the permanent structural load (sustained dead and live load) plus the negative shaft resistance on the pile (down-drag) is equal to the positive shaft resistance plus the mobilized toe resistance.

Below the level of the neutral plane at the Geotechnical Service Limit State, there is no movement of the soil relative to the pile and any ground settlement below the neutral plane is equal to the vertical movement of the pile. At the Geotechnical Strength Limit State, the entire pile is moving downward relative to the soil and therefore negative skin friction is not present. This is premise of the Neutral Plane Method evaluating down-drag as a Geotechnical Service Limit State or settlement consideration rather than considering the drag force as an additional load that must be supported by the pile in the Geotechnical Strength Limit State evaluation.

9.6 Post Construction Hardscape Settlement Potential

A critical issue to consider for this project site will be differential settlements between pile supported and non-pile supported, grade supported hardscape, pavements, and utility elements where fill heights exceed approximately 18 inches above existing grade. Pavements and hardscape constructed over areas of fill in excess of approximately 18 inches above the existing site elevation have the potential to settle differentially with respect to pile supported building foundations and floor slabs. Where differential settlement between the building foundations and adjacent pavements or slabs is a concern, consideration should be given to pile supporting critical slabs, aprons, sidewalks, and landings immediately adjacent to pile supported buildings. Hinging concrete slabs, aprons, pavement, sidewalks, and other hardscape at the pile-supported to grade-supported transition of critical entrance/exits would help limit the formation of trip hazards/drops caused by differential settlement between pile supported and grade supported elements around the buildings. All utility lines in the building area should be hung from the slab using hangers and connections that meet applicable Building Codes. Connections should be flexible and capable of withstanding fill-induced differential settlement.

Installation of utilities, adjacent pavements and hardscape of the facility should generally be delayed after fill placement for as long as practical in the construction schedule to allow for as much settlement as possible to occur prior to their construction. We are of the opinion that up to approximately 30 to 40 percent of the anticipated 5 to 6 inches of fill induced settlement will occur within approximately 6 months after fill placement, with the remaining settlement occurring over a period of several years. A maintenance schedule should include a contingency for leveling critical areas of pavement and hardscape that settle differentially with respect to the pile supported building and floor slabs.

9.7 Pile Load Test Program

We suggest installing one (1) test pile within the proposed building area for Static Load Testing for each pile size/loading configuration. The static compressive load test should be conducted as described in ASTM Specification D1143 to at least 3 times the design load or to failure.

If design tension loads exceed 60 percent of the recommended allowable tension capacity, plans should be made to install an additional tension test pile for Static Tension Load testing at each planned compression test pile location. Tension testing of a tested compression pile is not recommended. Static tension load testing should be conducted as described in ASTM Specification D3689 to at least 2 times the design load. Piling reinforcement for the tension test pile should be cast to allow for connection to a full-length center bar during testing. Since the purpose of the tension load test is to assess the geotechnical capacity of the soil-pile interaction (not the structural capacity of the pile), the tension test pile reinforcement should be over-designed to minimize elongation of the pile during the test. Elongation of the test pile and center bar during tension testing often causes structural failure of the pile grout near the bottom of the reinforcement cage, resulting in excessive deflection during the test that is not representative of the geotechnical performance of the pile in tension. **The test pile reinforcement, connection systems and reaction frame should be designed for the loadings specific to this project by a licensed professional structural engineer.**

Alternately, in lieu of a separate static tension load test, tension capacity could be assessed by instrumenting the compression test pile with vibrating wire strain gauges that would be used to measure and record the capacity distribution along the length of the pile. The strain gauge data would be supplemented by monitoring deflection of at least two reaction piles during the compression load test. SES will be available to discuss with the design team as the design progresses.

If pile response to lateral loading is a controlling aspect of the foundation design and lateral load testing is determined to be necessary by the project Structural Engineer, static lateral load testing may be performed on either the compression or the tension pile to at least twice the design load in accordance with ASTM D3966.

The test pile(s) should be located within the building/structure footprint to obtain representative data, but should be positioned within the structure such that it is not incorporated into the foundation system and does not interfere with construction of foundations, utilities, infrastructure, etc. Upon completion of the test pile program, the test piles should be cut off at a level such that it will not affect future construction.

All test sections, equipment and installation procedures should be the same as those to be used during production pile installation. Pile load test results would be used to verify the placement procedures and that the pile section produces the desired design capacity. Since adjustments of the pile lengths or installation procedures may be made based on the test pile installation and load test results, we recommend the test pile program and production pile installation be performed under the direct supervision of the SES project geotechnical engineer of record. SES should be consulted to collaborate with the design team to establish detailed Pile Load Test Program recommendations once site, civil, and structural plans have been developed.

9.8 Thermal Integrity Profiling (TIP) for Auger-Cast Piling

We recommend that installation of all Auger-Cast test piles **(and 2 % of all production auger cast piling on this project)** be monitored using Thermal Integrity Profiling (TIP) technology in general accordance with ASTM D7949 - *Standard Test Methods for Thermal Integrity Profiling of Concrete Deep Foundations*. The TIP system, manufactured by Pile Dynamics, Inc. (PDI) in association with Foundation and Geotechnical Engineering, LLC (FGE), uses instrumented Thermal Wire® cables and Thermal Acquisition Ports (TAPs) to measure concrete temperatures during curing. The Thermal Wire® cables have temperature sensors spaced every 12-inches along the ordered cable length and are cast into the concrete along the pile/shaft length. The battery powered Thermal Acquisition Ports automatically measure temperature at each sensor at specified time intervals (typically every 15 minutes) allowing the concrete curing process to be monitored. During the curing process, heat generated during cement hydration is recorded and used to create a profile of temperature versus depth.

Analysis of the temperature measurements can then be used to evaluate concrete quality and cover at each cross section along the pile/shaft length. After the peak temperature is achieved (approximately 10 hours after placement of the concrete), the TAP box(es) are disconnected from the Thermal Wires® and connected to the TIP Processing Unit. Data is downloaded and saved to the unit's hard drive for further review, data adjustment, analysis and output. Graphical results of the collected thermal data are presented as an estimate of the vertical pile profile relative to the theoretical pile diameter. The profile will indicate changes in pile diameter or material quality within the grout column.

10.0 LATERAL EARTH PRESSURES

Presented in the following table are recommended design values of Equivalent Fluid Pressure and soil-foundation Friction Coefficients for calculation of resistance to lateral loadings. These values have been generalized to be representative of improved subgrade conditions and imported Select Structural Fill. Imported Select Structural Fill should consist of a sandy material with less than about 30 percent of the soil particles (by weight) passing the No. 200 mesh sieve, less than 80 percent passing the No. 40 sieve, and a Liquid Limit less than 25. Fill material should be compacted in 12-inch (maximum) lifts to at least 95 percent of the soil's Modified Proctor maximum dry density as determined by ASTM D 1557. In place density tests should be made at frequent intervals to measure the effectiveness of the compaction operations.

Empirical correlation and data obtained from the soil borings and CPT soundings have been used to estimate active, passive, at-rest earth pressure coefficients and equivalent fluid densities presented in the following table for select structural fill. These parameters have been developed using correlation of laboratory test results with accepted geotechnical references and our general knowledge of and experience with similar soil conditions.

This information may be used for lateral resistance calculations for small shallow retaining structures and foundation walls. Foundation elements extending more than approximately 6 feet above original site elevation should be brought to our attention and evaluated on a case-by-case structure specific basis. The designers should exercise sound engineering judgment when using these parameters for design and should apply an appropriate Factor of Safety.

Soil Unit Weight values and Equivalent Fluid Density values have been presented in terms of Total Soil Unit Weight. The Total Soil Unit Weight Scenario is applicable to foundation elements anticipated to be constructed several feet above groundwater levels where in-situ and fill soils are expected to be near their natural moist unit weight. These parameters do not include hydrostatic pressures. Positive grading and adequate drainage are assumed to be installed to prevent buildup of hydrostatic pressure that could act differentially on shallow retaining structures, sumps, etc. If failsafe positive drainage provisions are not provided behind retaining walls/subsurface walls, then hydrostatic pressure should be included in the design loadings in addition to the lateral earth pressures.

At-rest earth pressures should be used for foundation walls that will be restrained from deflecting by adjacent floor slabs or structures. Active and Passive pressures should be used in situations where shallow walls will not be restrained and will be allowed to deflect.

Fine grained soils (clays and silts) are not recommended for use as backfill behind retaining walls within a distance of 2x the height of the wall. Where clayey or silty soils are present behind retaining walls or below grade walls, these soils should be over excavated and replaced to a lateral distance of at least 2x the wall height.

TABLE 6

GENERALIZED EARTH PRESSURE COEFFICIENTS AND EQUIVALENT FLUID PRESSURES

Total Moist Soil Unit Weight Scenario (Above Groundwater level)

Soil	Earth Pressure Condition	Total Moist Unit Weight (pcf)	Equivalent Fluid Density (pcf)	Internal Angle of Friction ϕ (deg)	Cohesion c (psf)	Lateral Earth Pressure Coefficient
Imported Select Structural Fill	Active (k_a)	120	40	30	--	0.33
	Passive (k_p)		350	30	--	3.0
	At Rest (k_o)		60	30	--	0.50

* **NOT representative of in-situ soft/loose silty and clayey soils that will be over-excavated and replaced as required to create stable construction surfaces.**

10.1 Coefficient of Friction for Sliding Resistance

A Coefficient of Friction equal to 0.40 may be used for cast-in-place concrete retaining wall foundations in direct contact with Select Structural Fill.

11.0 GENERAL COMMENTS AND LIMITATIONS

While the CPT soundings and soil borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and may be encountered. The delineation between soil types shown on the logs is approximate and the description represents our interpretation of subsurface conditions at the designated test locations and on the particular date explored.

This report has been prepared in order to aid in the evaluation of this project and to assist the engineers in the project planning and structural design. At the time of writing, changes were still being considered to foundations, site grading, and other aspects of the project that could have a significant impact on the applicability or relevance of the recommendations provided in this report. SESI should be consulted as the design process continues to ensure that the recommendations provided in this report are still applicable, and that they are being properly interpreted.

This report is intended for use with regard to the specific project discussed herein as we understand it at this time, and any substantial changes in the project, loads, locations, or assumed grades should be brought to our attention so that we may determine how such changes may affect our conclusions and recommendations. We would appreciate the opportunity to review the plans and specifications for construction to ensure that our conclusions and recommendations are interpreted correctly.

Professional judgments on design alternatives and criteria are presented in this report. These are based partly on our evaluations of technical information gathered, partly on our understanding of the characteristics of the project being planned, and partly on our general experience with subsurface conditions in the area. We do not guarantee performance of the project in any respect, only that our engineering work and judgments rendered meet the standard of care of our profession.

The Geotechnical Engineer of Record should be retained by the Owner in the construction phase of the project so they can observe subsurface conditions revealed during construction, confirm that design assumptions are still applicable or provide revised recommendations based on conditions encountered during construction, and to help ensure that our recommendations are properly interpreted. We recommend that Southern Earth Sciences, Inc. be retained to perform observation and field-testing services during the site preparation and foundation construction.

This report is exclusively for the use and benefit of the addressee(s) identified on the first page of this report and is not for the use or benefit of, nor may it be relied upon by any other person or entity. The contents of this report may not be quoted in whole or in part or distributed to any person or entity other than the addressee(s) hereof without, in each case, advanced written consent.

APPENDIX 1

Test Location Plans

Soil Profile

NOT TO SCALE

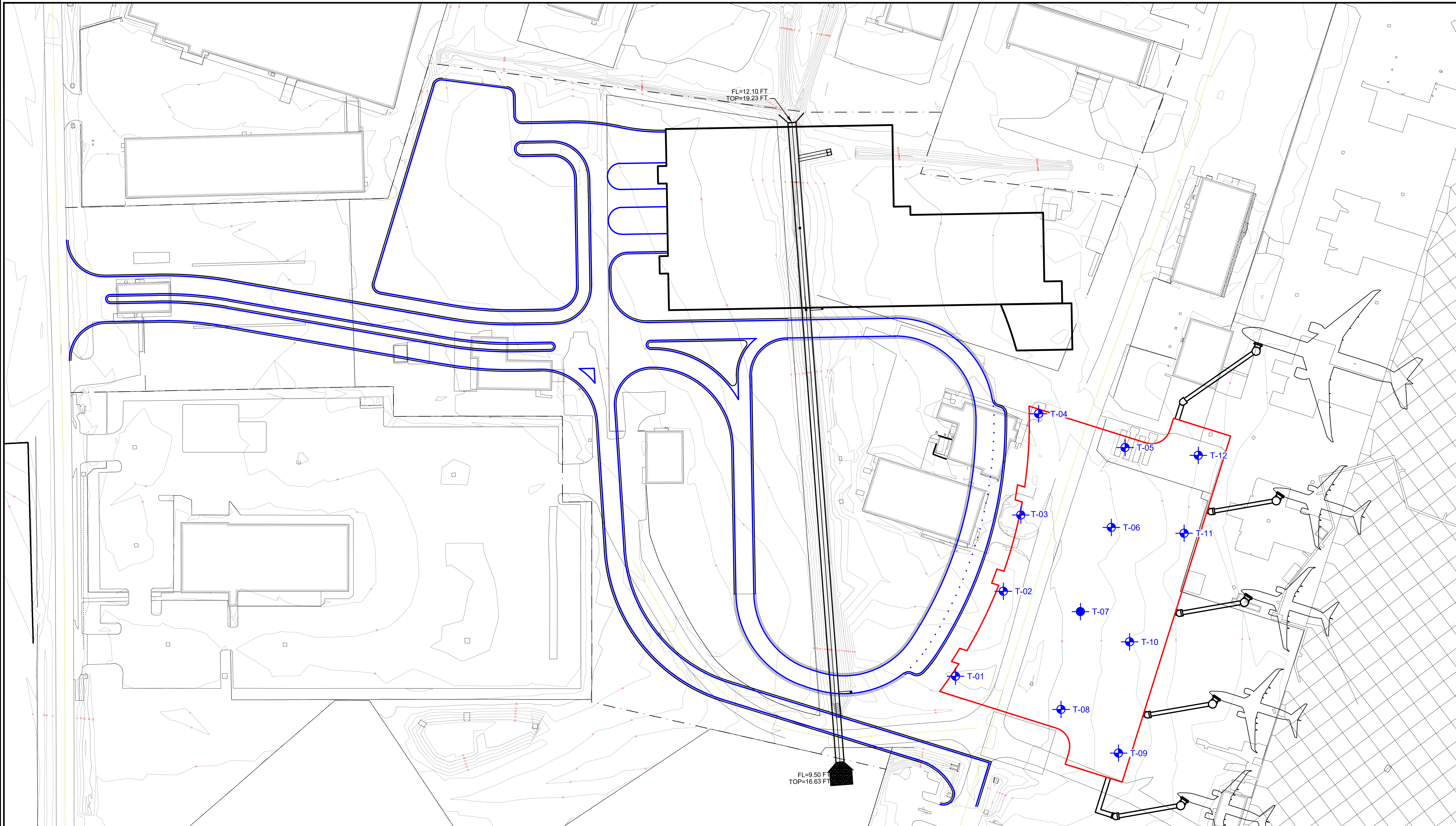
CPT SOUNDING

SOIL TEST BORING

MAA - BFM TERMINAL
MOBILE, AL

SOUTHERN EARTH SCIENCES
Geotechnical | Environmental | Materials Testing

TEST LOCATION PLAN
PAGE 1 OF 2
SESI JOB #: M23-442



SOIL TEST BORING

CPT SOUNDING

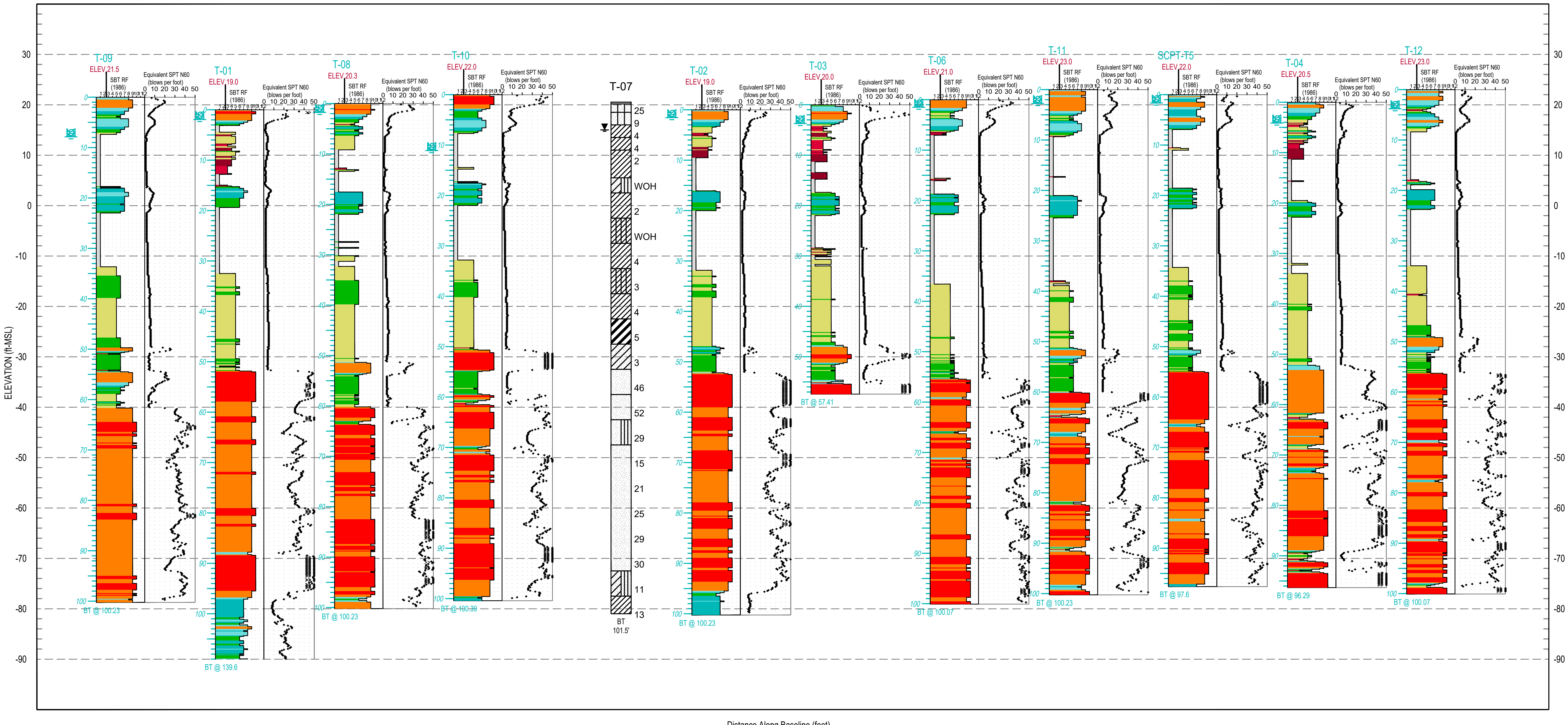
120 60 0 120

SCALE, IN FEET

MAA - BFM TERMINAL
MOBILE, AL

SOUTHERN EARTH SCIENCES
Geotechnical | Environmental | Materials Testing

TEST LOCATION PLAN
PAGE 1 OF 2
SESI JOB NO.: M23-442



SOIL BEHAVIOR TYPE (SBT)
(Robertson, 1986)

- 1 - Sensitive, Fine Grained
- 2 - Organic Material
- 3 - Clay
- 4 - Silty Clay to Clay
- 5 - Clayey Silt to Silty Clay
- 6 - Sandy Silt to Clayey Silt
- 7 - Silty Sand to Sandy Silt
- 8 - Sand to Silty Sand
- 9 - Sand
- 10 - Gravelly Sand to Sand
- 11 - Very Stiff Fine Grained (*)
- 12 - Sand to Clayey Sand (*)

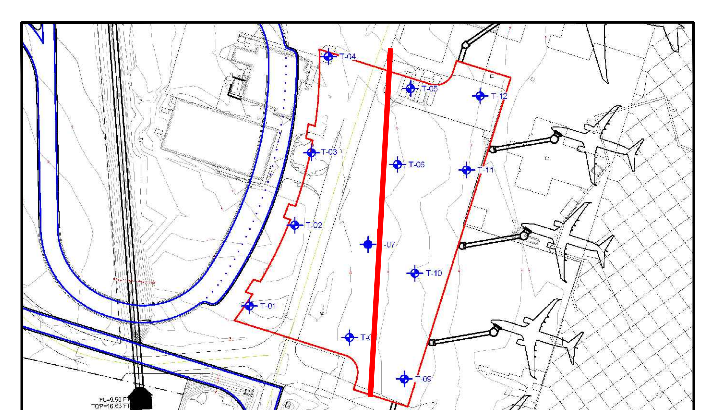
*cemented or heavily overconsolidated

Note: Ground surface elevations are estimated and have not been surveyed. All Elevations should be considered approximate.

WATER LEVELS

- Water Level In Sounding Hole
- Hole Cave In

- Shell (SHELL)
- USCS Low Plasticity Silty Clay (CL-ML)
- USCS High Plasticity Clay (CH)
- USCS Low Plasticity Clay (CL)
- USCS Clayey Sand (SC)
- USCS Silty Sand (SM)
- USCS Clayey Sand (SC-SM)
- USCS Poorly-graded Sand (SP)
- USCS Poorly-graded Sand with Silt (SP-SM)



Location Plan

Not to Scale

SOUTHERN EARTH SCIENCES
Geotechnical | Environmental | Materials Testing

MAA - BFM TERMINAL
MOBILE, ALABAMA

SOIL PROFILE
PAGE 1 OF 2
SESI JOB NO.: M23-442

APPENDIX 2

CPT Sounding Logs

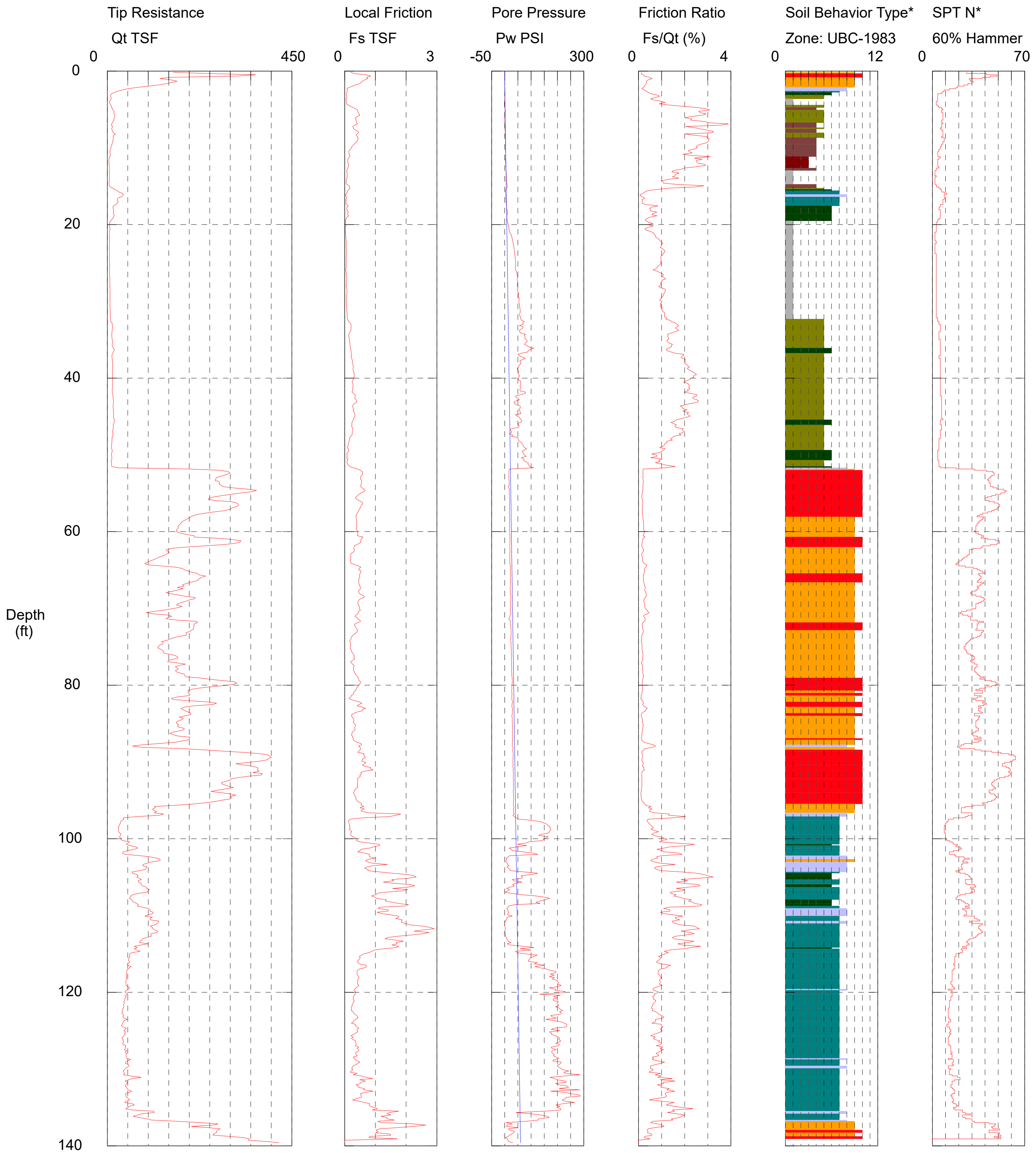
Soil Boring Logs

Shear Wave Velocity vs Depth

Southern Earth Sciences

Operator: Brandon Green
Sounding: T-1
Cone Used: DPG1210
GPS Data: N30.63832 W88.07967

CPT Date/Time: 8/30/2023 8:39:04 AM
Location: MAA TERMINAL
Job Number: M23-442
Groundwater: Collapsed Dry At 1.9-ft.



Maximum Depth = 139.60 feet

Depth Increment = 0.164 feet

1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

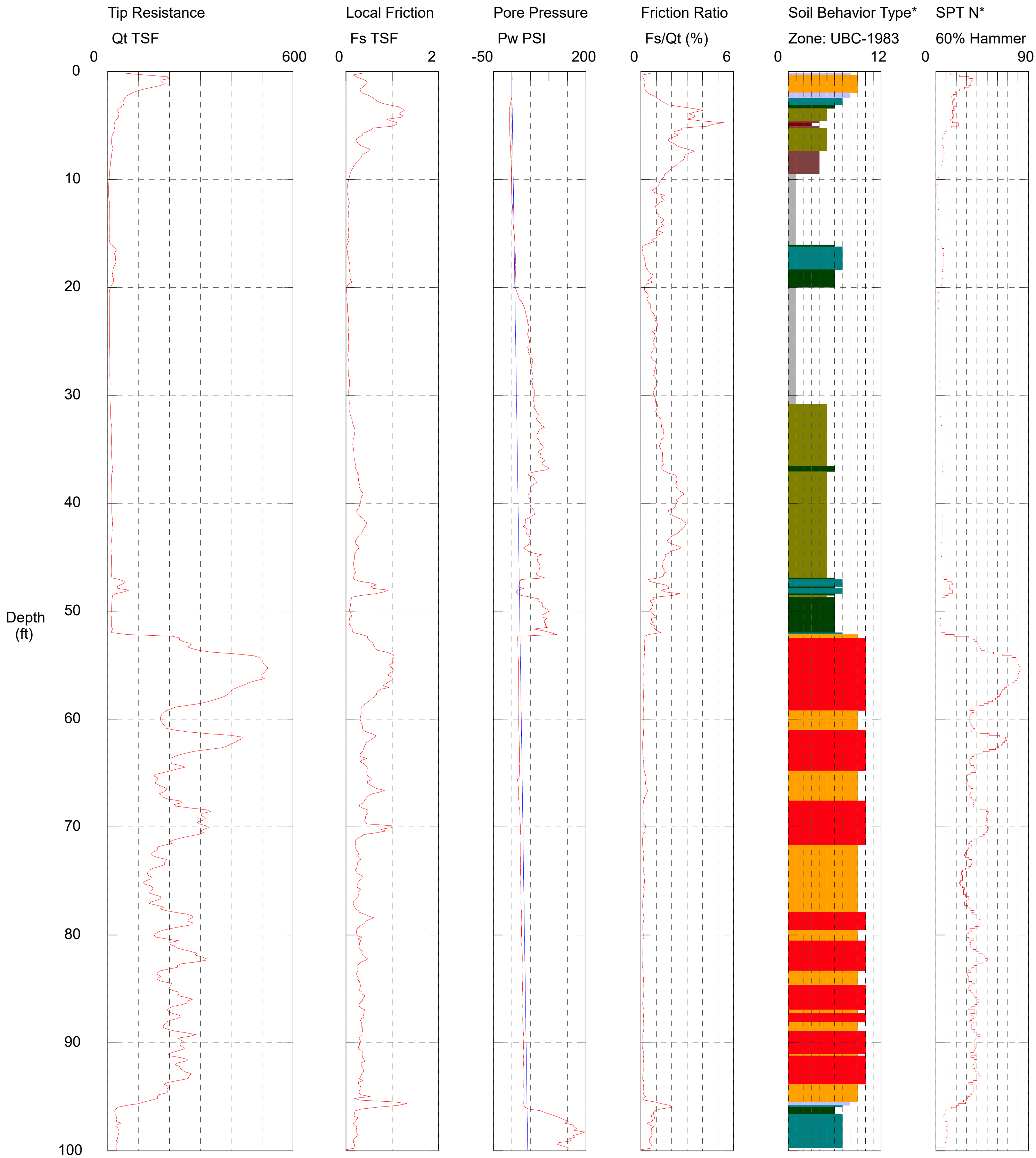
Refusal Due To Rebound

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: T-2
Cone Used: DPG1210
GPS Data: N30.63874 W88.07950

CPT Date/Time: 8/30/2023 9:59:41 AM
Location: MAA TERMINAL
Job Number: M23-442
Groundwater: Collapsed Dry At 1.6-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

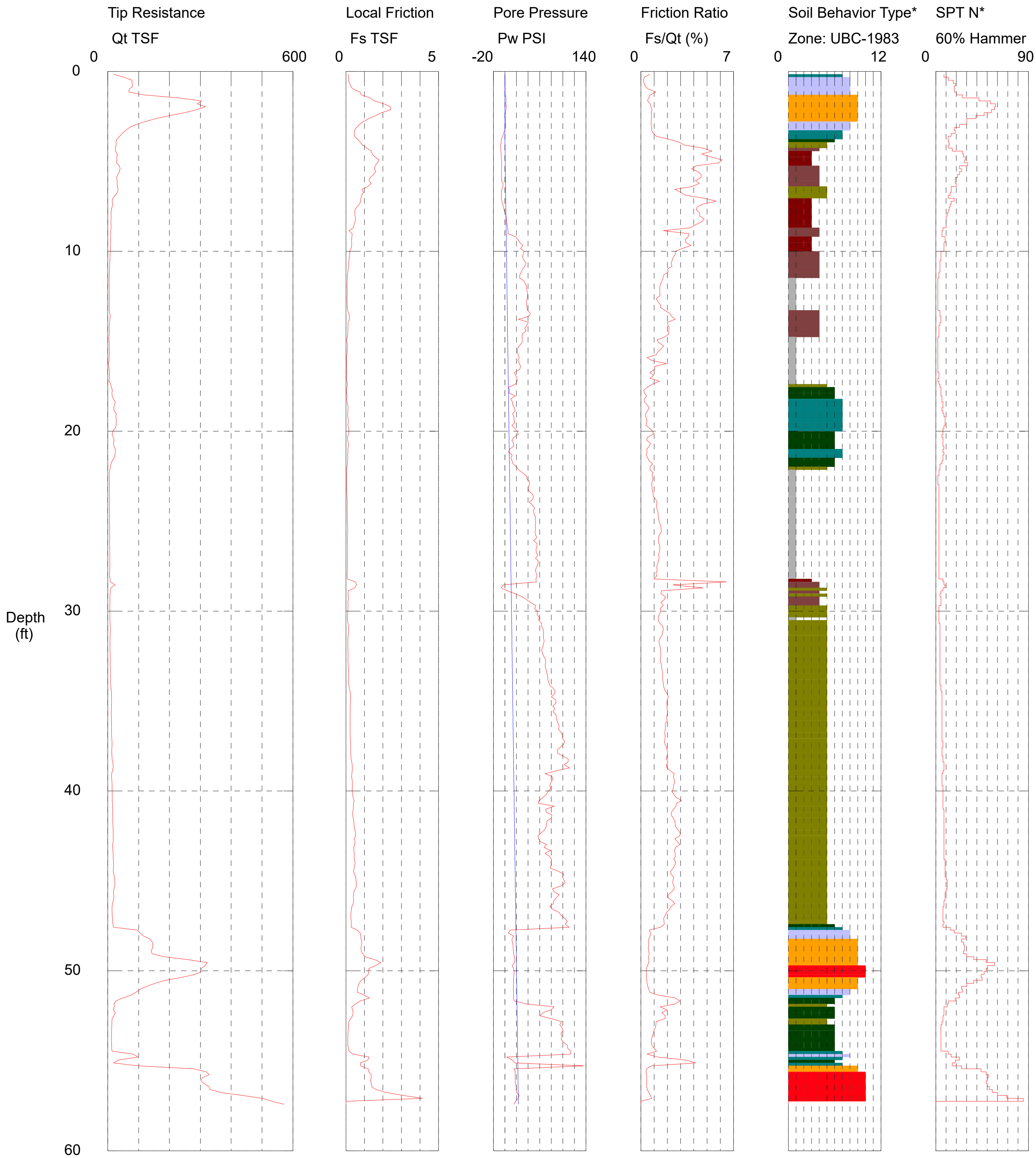
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: D. Hines
Sounding: T-3
Cone Used: DDG1526
GPS Data: N30.63894 W88.07940

CPT Date/Time: 8/29/2023 10:30:42 AM
Location: MAA Parking Terminal
Job Number: M23-442
Groundwater: collapsed and dry at 3.6-ft.



Maximum Depth = 57.41 feet

Depth Increment = 0.164 feet

1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

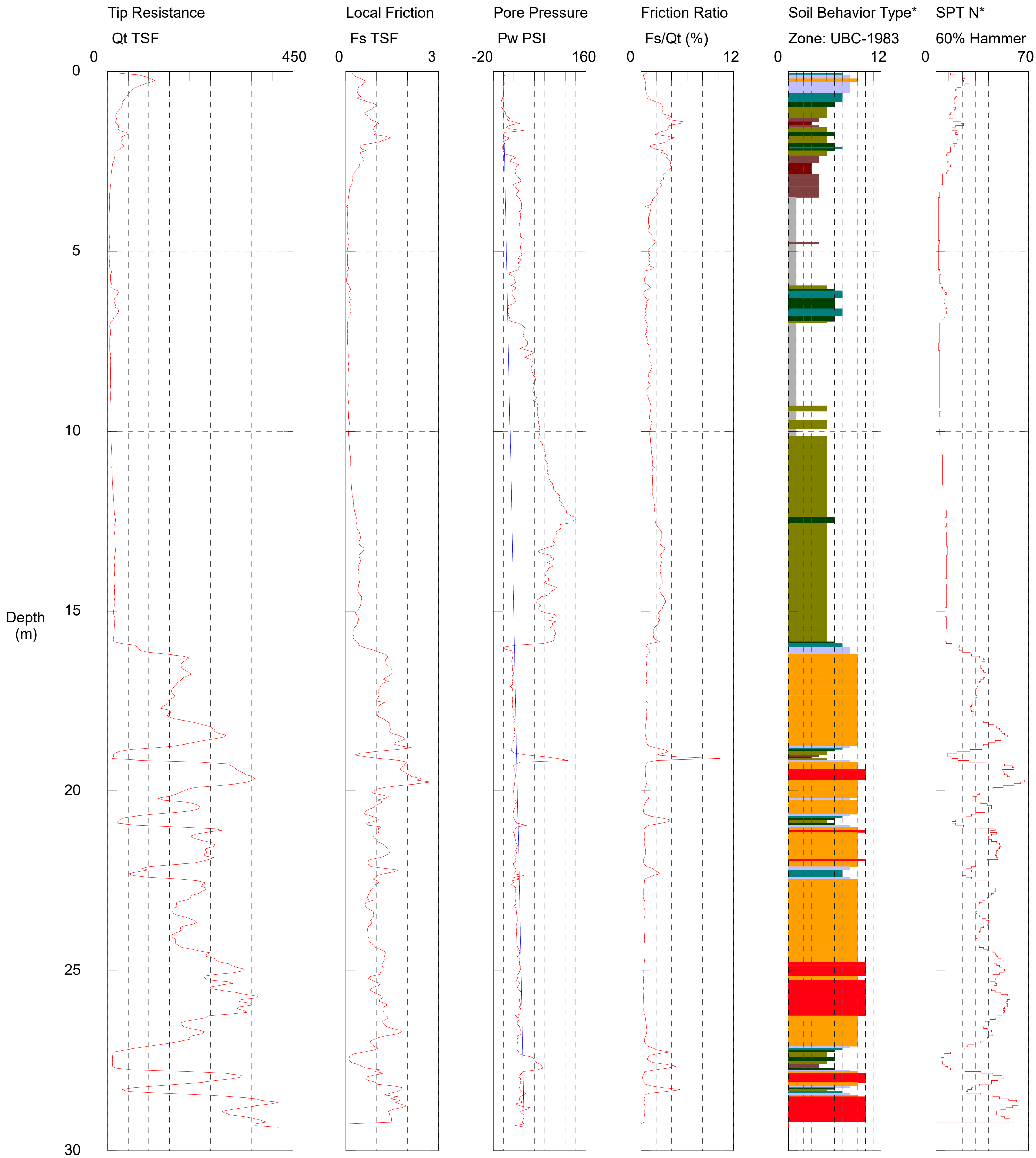
Refusal: rod-buckling.

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: T-4
Cone Used: DDG1648
GPS Data: N30.63930 W88.07931

CPT Date/Time: 9/1/2023 10:45:30 AM
Location: MAA TERMINAL
Job Number: M23-442
Groundwater: Collapsed Dry At 4.1-ft.



Maximum Depth = 29.35 meters

Depth Increment = 0.050 meters

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

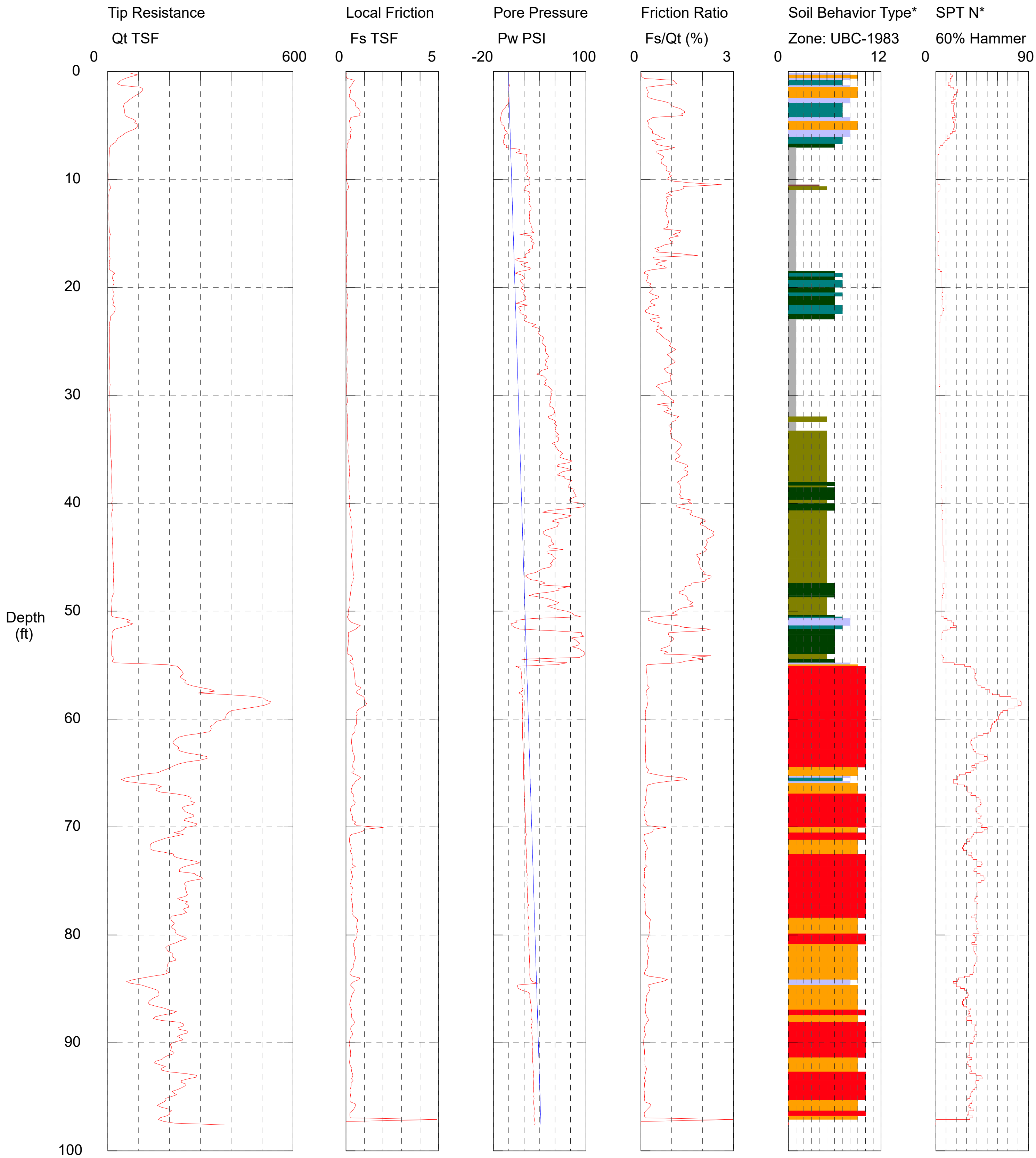
Refusal Due To Rebound

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: SCPT-T5
Cone Used: DPG1210
GPS Data: N30.63908 W88.07896

CPT Date/Time: 8/29/2023 2:43:50 PM
Location: MAA TERMINAL
Job Number: M23-442
Groundwater: Collapsed Dry At 1.7-ft.



Maximum Depth = 97.60 feet

Depth Increment = 0.164 feet

1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

Refusal Due To Rebound

*Soil behavior type and SPT based on data from UBC-1983

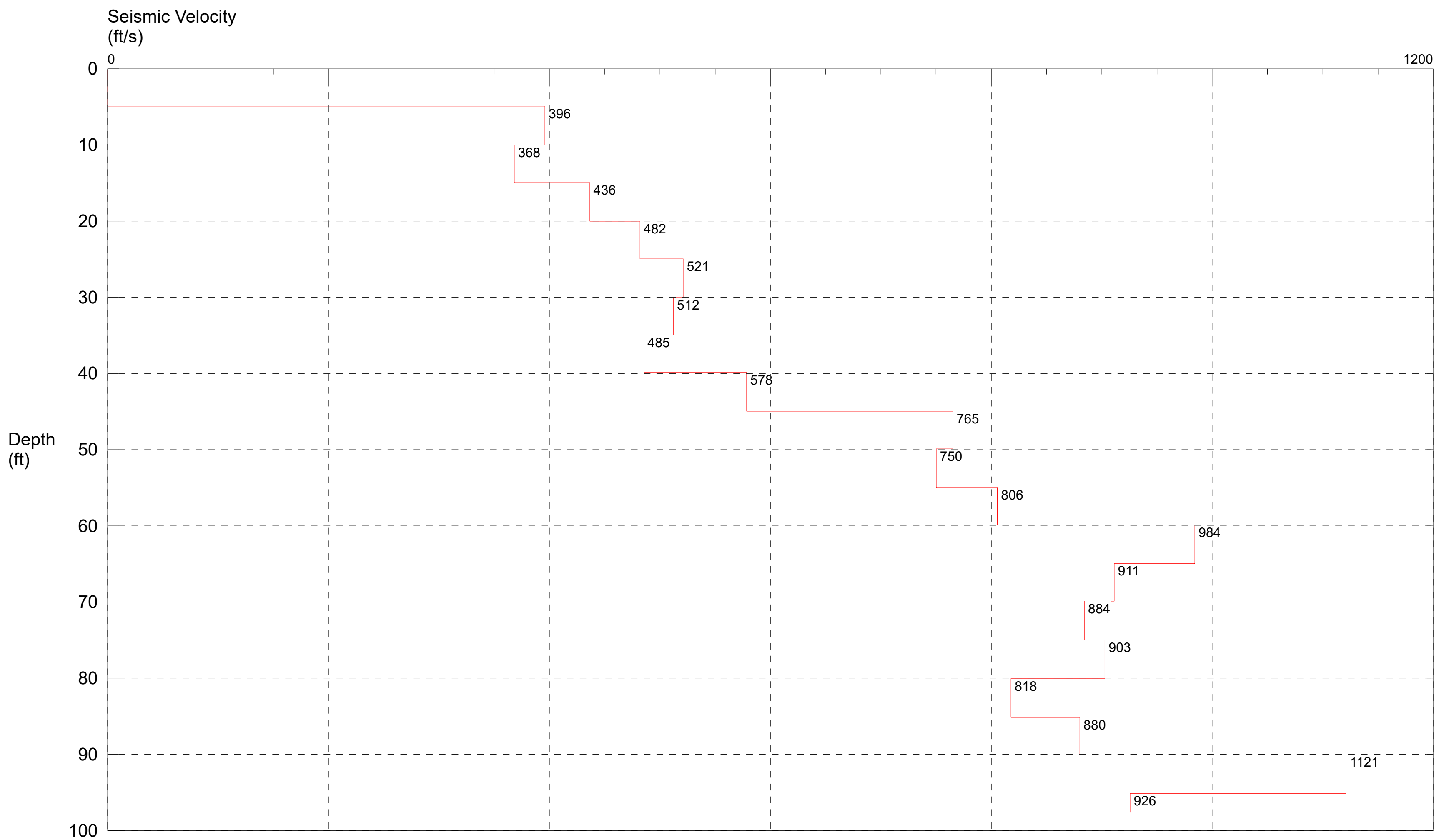
SOUNDING

SOUNDING
CUSTOMER: Southern Earth Sciences
OPERATOR: Brandon Green
CONE ID: DPG1210
LOCATION: MAA TERMINAL

JOB NUMBER: M23-442
HOLE NUMBER: SCPT-T5
TEST DATE: 8/29/2023 2:43:50 PM
COMMENT: N30.63908 W88.07896
COMMENT: Refusal Due To Rebound

COMMENT:

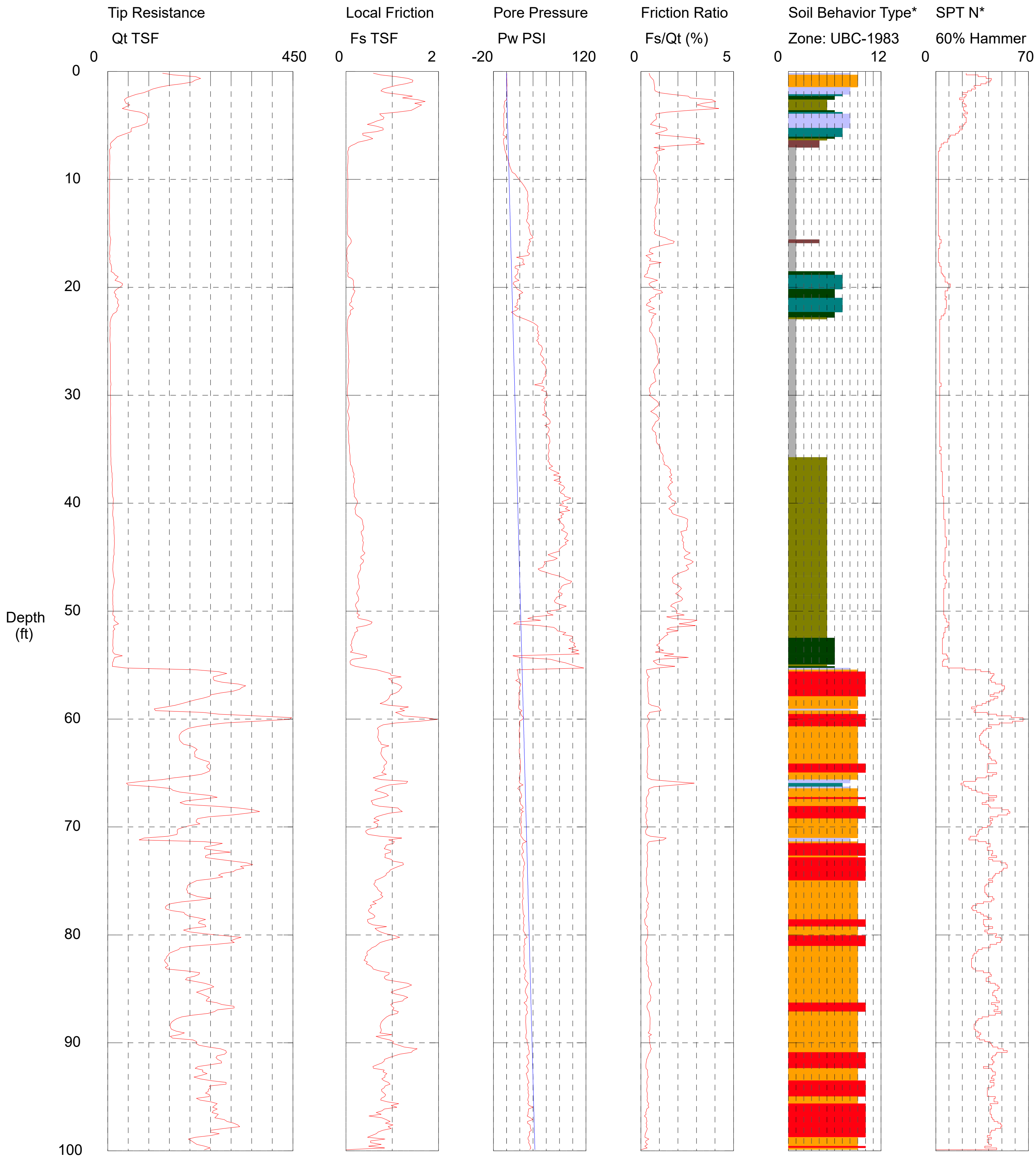
LOCATION: MAA TERMINAL
Groundwater: Collapsed Dry At 1.7-ft.



Southern Earth Sciences

Operator: D. Hines
Sounding: T-6
Cone Used: DDG1526
GPS Data: N30.63887 W88.07901

CPT Date/Time: 8/29/2023 11:22:37 AM
Location: MAA Parking Terminal
Job Number: M23-442
Groundwater: collapsed and dry at 1.3-ft.



Maximum Depth = 100.07 feet

Depth Increment = 0.164 feet

1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

SOIL BORING LOG

BORING NO.: T-7

PROJECT: MAA - BFM TERMINAL **PROJECT NO.:** M23-442

PROJECT LOCATION: MOBILE, AL **METHOD:** FLIGHT/MUD DRILLING

BORING LOCATION: SEE TEST LOCATION PLAN **BORING ELEVATION:** 20.5 ft

DATE DRILLED: 08/29/23 **DATE COMPLETED:** 08/29/23

WATER LEVEL: 5 ft **WATER LEVEL DATE:** 08/29/23

GEOL / ENGR: E. REYES **DRILLER:** P. BYRD

Sampler Symbols and Field Test Data	USCS	Description	SPT N	Moist. %	LL %	PI %	% passing #200 / #40 sieve
17/6 11/6 14/6	SM	4" CRUSHED SHELL	25				
	SM	Medium Dense White, Orange and Gray Silty SAND					
3/6 4/6 5/6		Loose Orange and Gray Silty SAND	9				
3/6 2/6 2/6	CL	Soft Orange CLAY	4				
1/6 2/6 2/6	CL	Soft Orange CLAY with Crushed Shell	4				
1/6 1/6 1/6	CL	Soft Gray CLAY	2	39.4	27	11	52 / 96
WOH/6	SC-SM	Very Loose Gray Clayey Silty SAND	WOH	35.0	22	5	39 / 99
3/6 1/6 1/6	CL	Soft Gray CLAY with Trace Wood	2				
WOH/6	CL-ML	Very Soft Gray Silty CLAY	WOH				
3/6 2/6 2/6	CL	Soft Gray CLAY with Wood	4	45.1	45	22	91 / 96
2/6 1/6 2/6	CL-ML	Soft CLAY with Organics	3				
2/6 2/6 2/6	CL	Soft Green and Gray CLAY	4				
2/6 3/6 2/6	CH	Medium Stiff Green and Gray CLAY	5	33.8	69	44	96 / 100
2/6 1/6 2/6	SC	Very Loose Green and Gray Clayey SAND	3				
14/6 18/6 28/6	SP	Dense Gray SAND	46				

Remarks: N30.63856 W88.07914
Elevation estimated from Provided Topo Drawing

SOUTHERN EARTH SCIENCES

SOIL BORING LOG

BORING NO.: T-7
PROJECT: MAA - BFM TERMINAL
PROJECT NO.: M23-442
PROJECT LOCATION: MOBILE, AL
METHOD: FLIGHT/MUD DRILLING
BORING LOCATION: SEE TEST LOCATION PLAN
BORING ELEVATION: 20.5 ft
DATE DRILLED: 08/29/23
DATE COMPLETED: 08/29/23
WATER LEVEL: 5 ft
WATER LEVEL DATE: 08/29/23
GEOL / ENGR: E. REYES
DRILLER: P. BYRD

Elevation / Depth	Soil Symbols Sampler Symbols and Field Test Data	USCS	Description	SPT N	Moist. %	LL %	PI %	% passing #200 / #40 sieve
-40 / 60	12/6 20/6 32/6	SP	Very Dense Gray SAND with Gravel	52				
	12/6 12/6 17/6	SP-SM	Medium Dense Gray SAND with Silt and Gravel	29	16.9	NP	NP	6 / 54
-50 / 70	11/6 8/6 7/6	SP	Medium Dense Gray SAND	15				
	14/6 10/6 11/6			21				
-60 / 80	18/6 11/6 14/6			25				
	24/6 16/6 13/6			29				
-70 / 90	20/6 12/6 18/6			30				
	5/6 5/6 6/6	SC-SM	Medium Dense Gray Clayey Silty SAND	11	24.8	21	4	46 / 100
-80 / 100	6/6 6/6 7/6	CL	Stiff Gray CLAY	13				
-90 / 110								

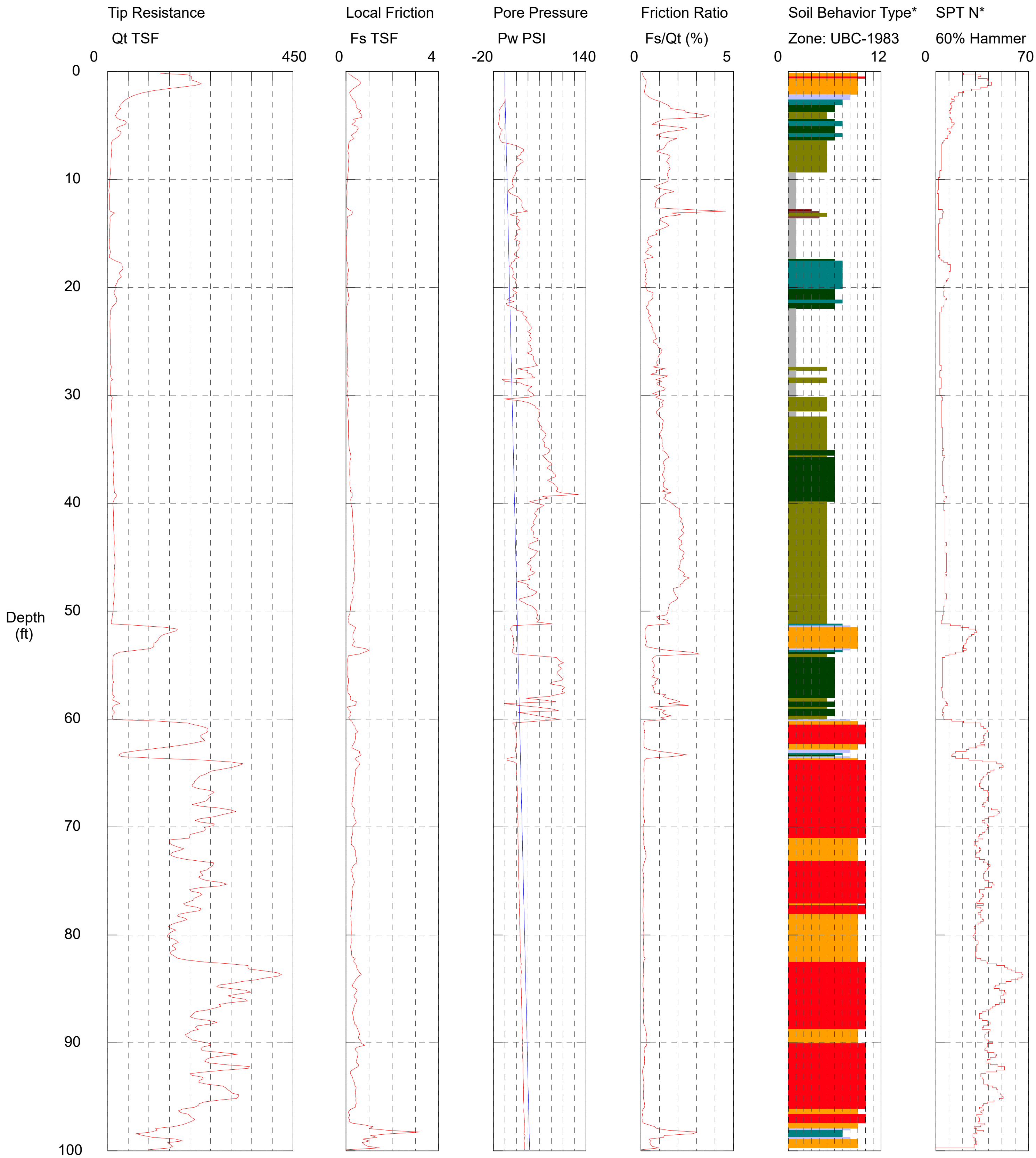
Remarks: N30.63856 W88.07914
Elevation estimated from Provided Topo Drawing

SOUTHERN EARTH SCIENCES

Southern Earth Sciences

Operator: Brandon Green
Sounding: T-8
Cone Used: DPG1210
GPS Data: N30.63820 W88.07922

CPT Date/Time: 8/30/2023 7:40:26 AM
Location: MAA TERMINAL
Job Number: M23-442
Groundwater: Collapsed Dry At 1.8-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

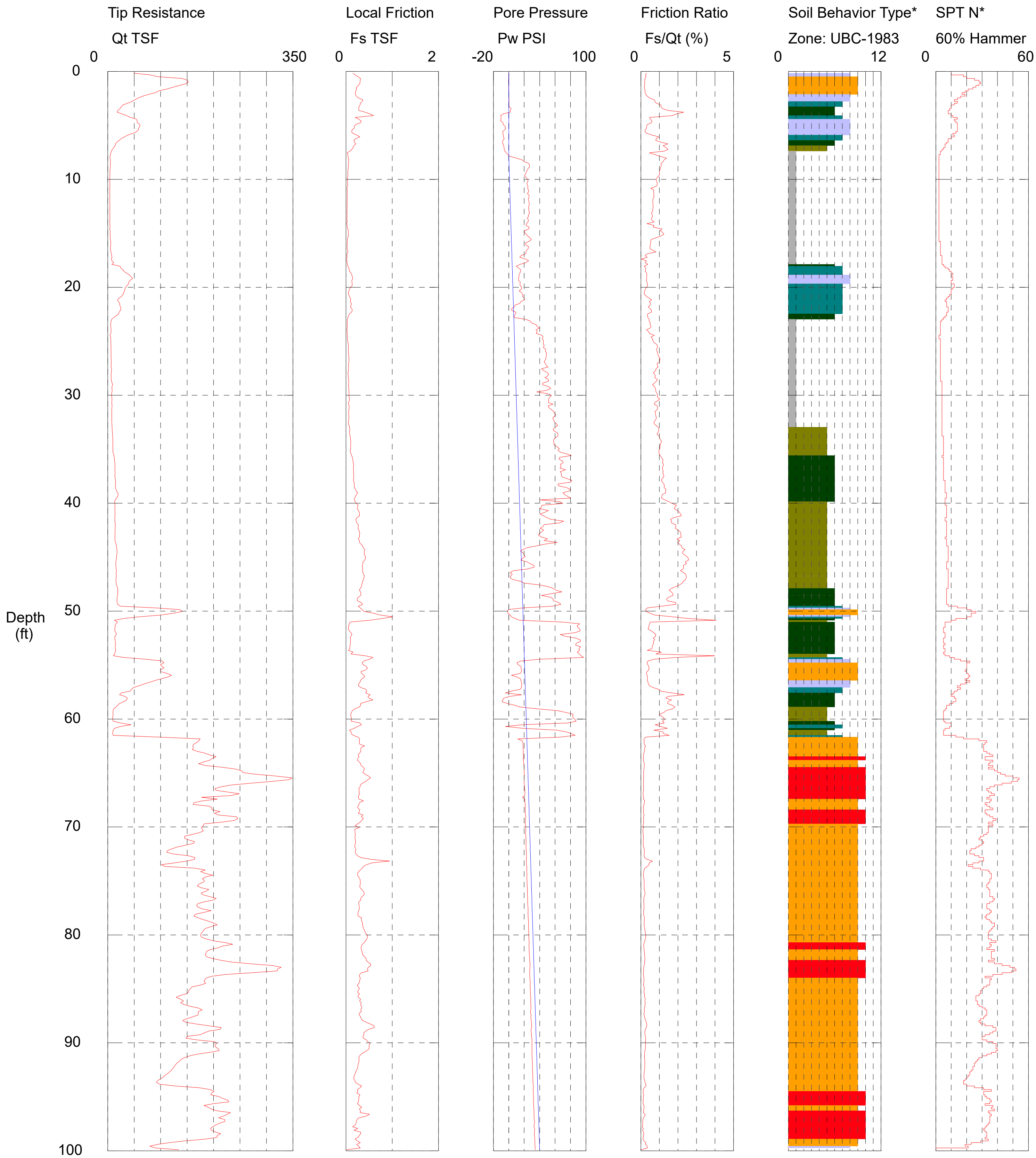
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: T-9
Cone Used: DPG1210
GPS Data: N30.63808 W88.07897

CPT Date/Time: 8/29/2023 9:37:01 AM
Location: MAA TERMINAL
Job Number: M23-442
Groundwater: Collapsed Wet At 7.9-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

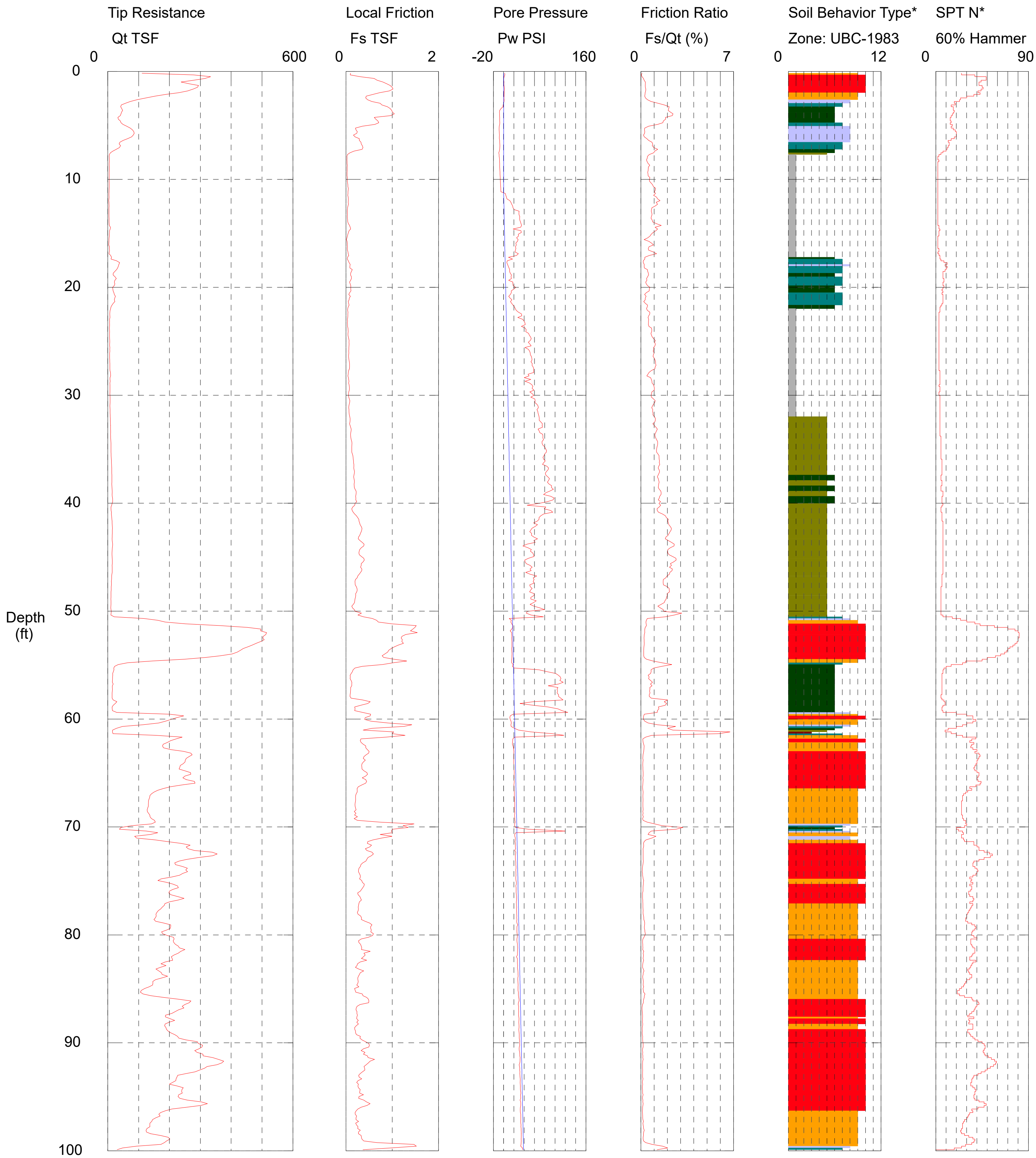
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: T-10
Cone Used: DPG1210
GPS Data: N30.63845 W88.07893

CPT Date/Time: 8/29/2023 10:34:22 AM
Location: MAA TERMINAL
Job Number: M23-442
Groundwater: Collapsed Wet At 11.1-ft.



Maximum Depth = 100.39 feet

Depth Increment = 0.164 feet

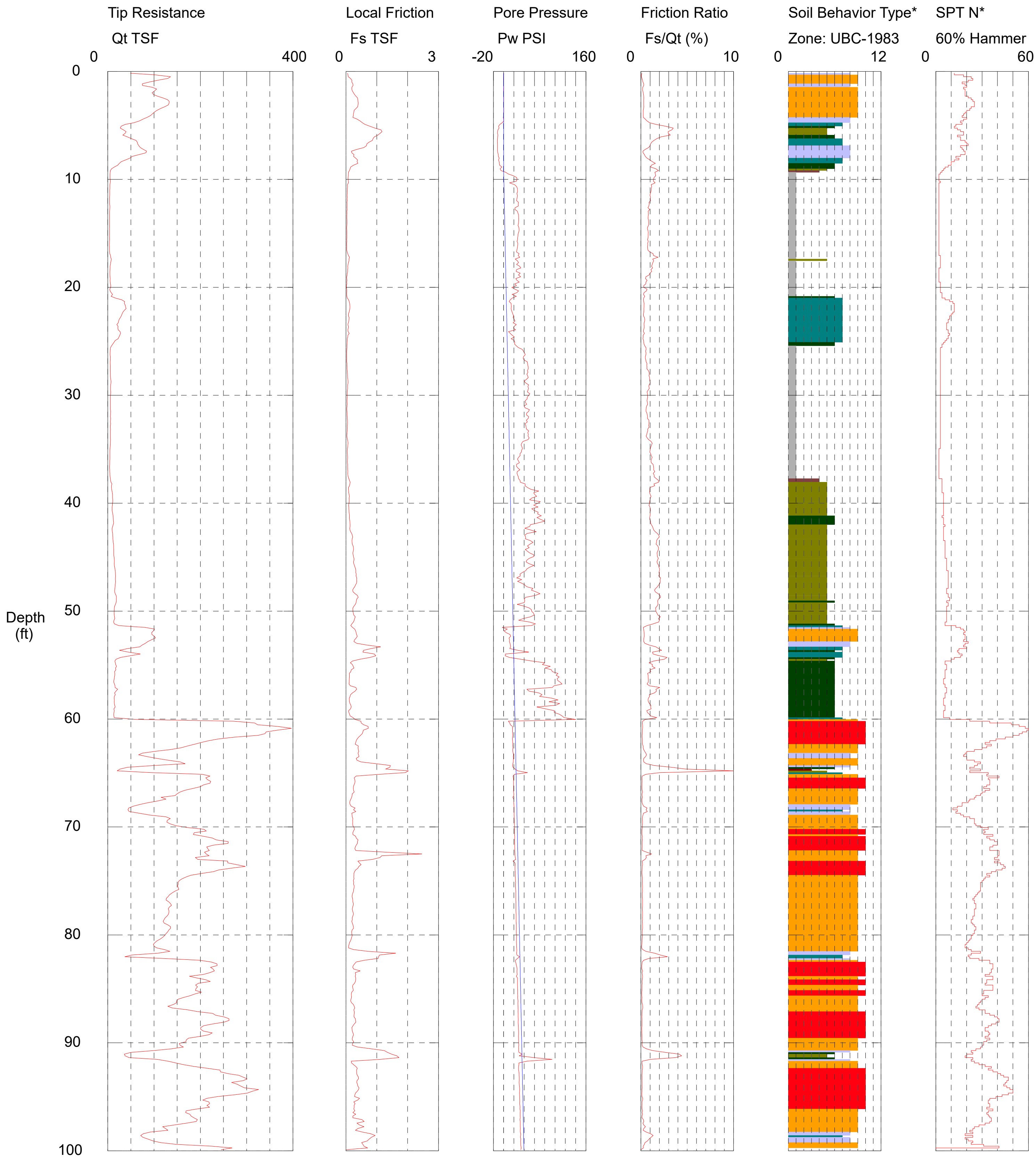
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: T-11
Cone Used: DPG1210
GPS Data: N30.63885 W88.07870

CPT Date/Time: 8/29/2023 12:40:02 PM
Location: MAA TERMINAL
Job Number: M23-442
Groundwater: Collapsed Wet At 9.2-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

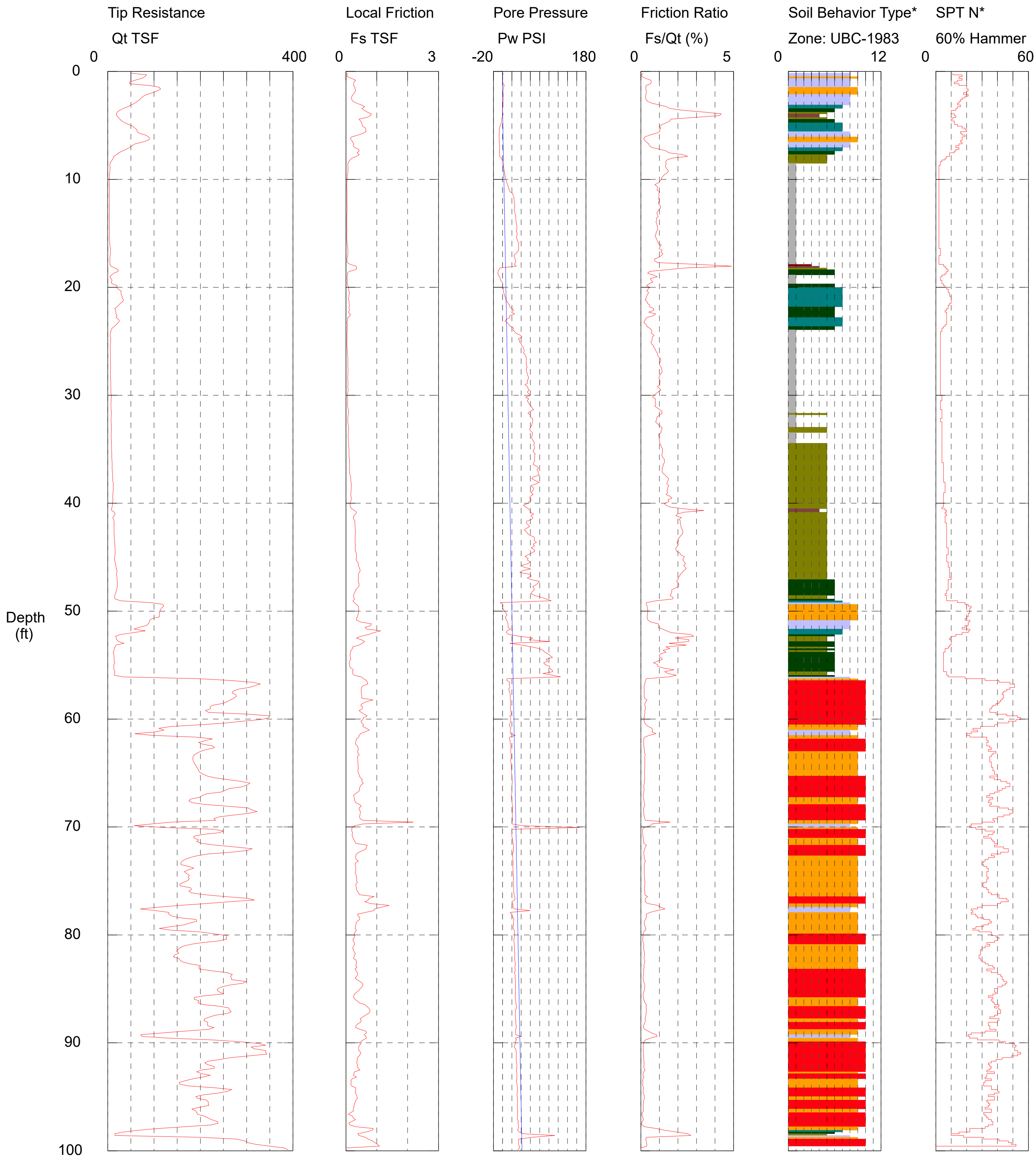
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: T-12
Cone Used: DPG1210
GPS Data: N30.63895 W88.07868

CPT Date/Time: 8/29/2023 1:41:57 PM
Location: MAA TERMINAL
Job Number: M23-442
Groundwater: Collapsed Dry At 3.8-ft.



Maximum Depth = 100.07 feet

Depth Increment = 0.164 feet

1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

APPENDIX 3

Laboratory Test Data

Laboratory Test Data Summary

SOUTHERN EARTH SCIENCES

Client: Volkert, Inc.

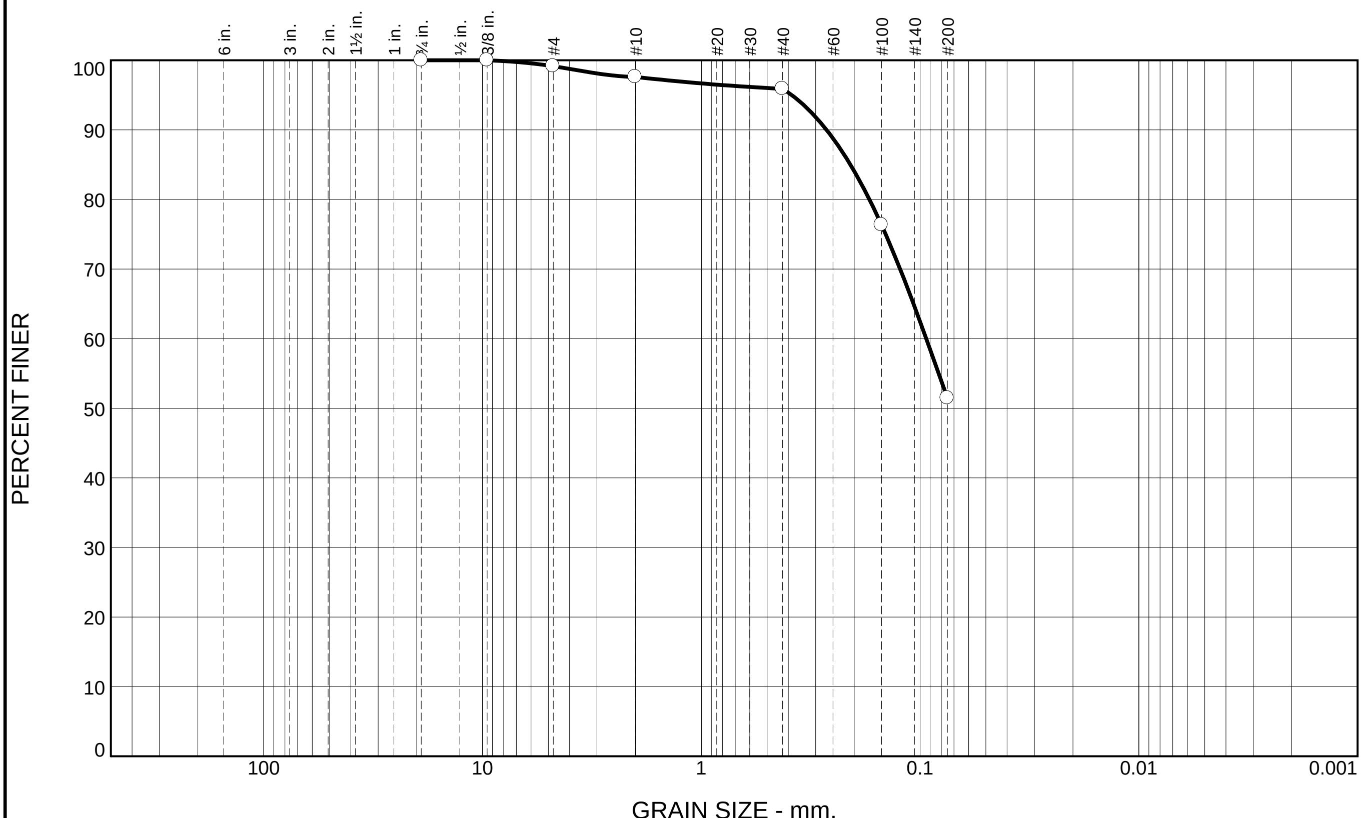
Date: 09/22/23

Project: MAA - Terminal Building

Project No: M23-442

Test Location	Sample	Sample Depth (ft)	USCS Classification	AASHTO Classification	Moisture Content (%)	Atterberg Limits		Passing No. 200 (%)	Passing No. 40 (%)
						LL	PI		
T-7	T-1	13.0-15.0	CL	A-6(3)	39.4	27	11	51.5	95.9
T-7	S-6	15.0-16.5	SC-SM	A-4(0)	35.0	22	5	39.3	99.2
T-7	T-2	28.0-30.0	CL	A-7-6(22)	45.1	45	22	90.7	96.3
T-7	T-3	43.0-45.0	CH	A-7-6(49)	33.8	69	44	96.0	99.7
T-7	S-16	65.0-66.5	SP-SM	A-3	16.9	NV	NP	5.9	53.5
T-7	S-22	95.0-96.5	SC-SM	A-4(0)	24.8	21	4	45.8	99.6

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	1.5	1.7	44.4	51.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	99.1		
#10	97.6		
#40	95.9		
#100	76.3		
#200	51.5		

* (no specification provided)

Soil Description

GRAY SANDY CLAY WITH SOME ORGANICS

Atterberg Limits

PL= 16 LL= 27 PI= 11

Coefficients

D_{90}= 0.2675 D_{85}= 0.2082 D_{60}= 0.0937
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(3)

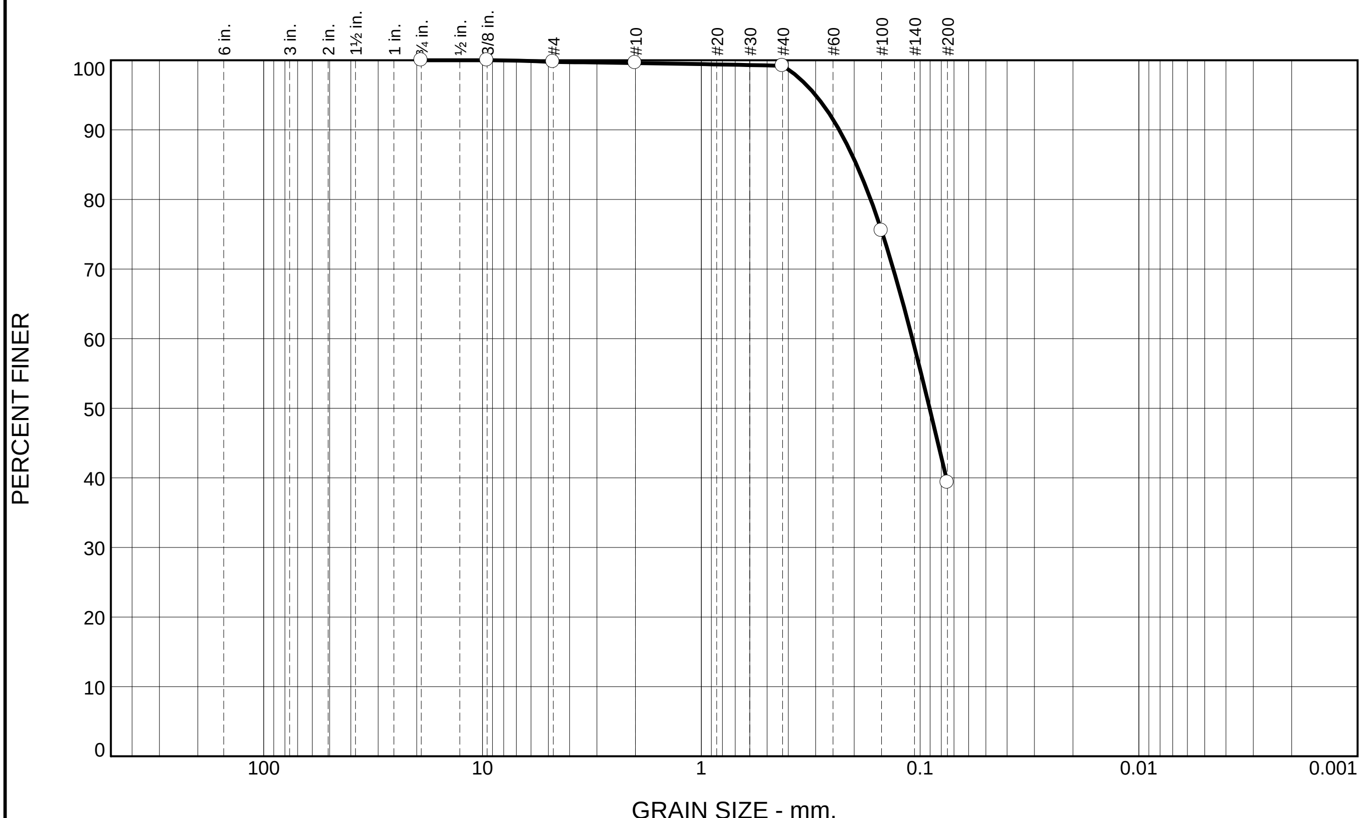
Remarks

Source of Sample: T-7 **Depth:** 13.0'-15.0'
Sample Number: T-1 **Date:**

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA - TERMINAL BUILDING
Project No: M23-442 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.2	0.4	59.9	39.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	99.8		
#10	99.6		
#40	99.2		
#100	75.5		
#200	39.3		

* (no specification provided)

Soil Description

GRAY SILTY CLAYEY SAND

Atterberg Limits

PL= 17 LL= 22 PI= 5

Coefficients

D_{90}= 0.2342 D_{85}= 0.1951 D_{60}= 0.1085
D_{50}= 0.0904 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

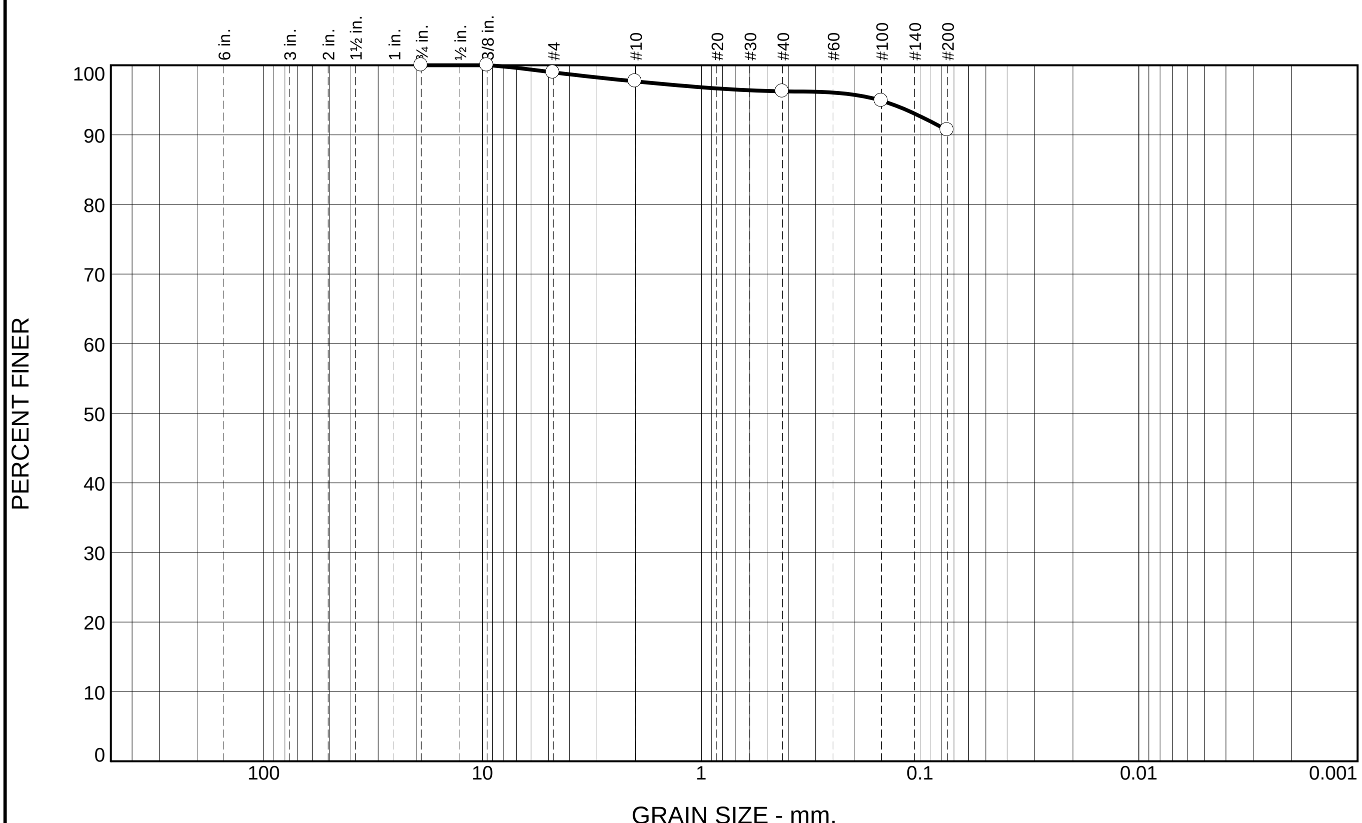
Source of Sample: T-7 **Depth:** 15.0'-16.5'
Sample Number: S-6 **Date:**

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA - TERMINAL BUILDING

Project No: M23-442 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	1.3	1.4	5.6	90.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	99.0		
#10	97.7		
#40	96.3		
#100	94.9		
#200	90.7		

* (no specification provided)

Soil Description

GRAY CLAY WITH SOME SHELLS

Atterberg Limits

PL= 23 LL= 45 PI= 22

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(22)

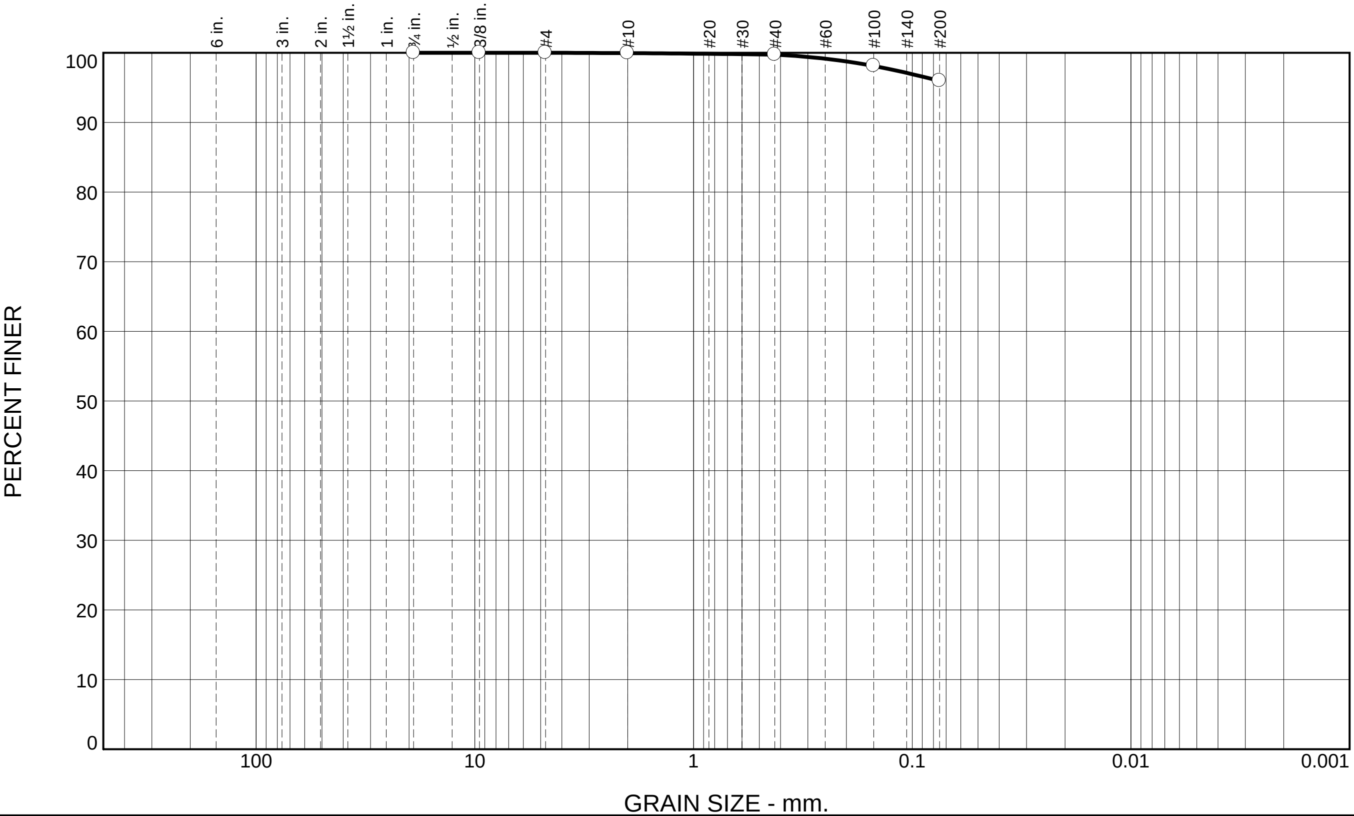
Remarks

Source of Sample: T-7 **Depth:** 28.0'-30.0'
Sample Number: T-2 **Date:**

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA - TERMINAL BUILDING
Project No: M23-442 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	3.7	96.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#40	99.7		
#100	98.1		
#200	96.0		

* (no specification provided)

Soil Description

GRAY FAT CLAY

Atterberg Limits

PL= 25 LL= 69 PI= 44

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(49)

Remarks

Source of Sample: T-7 **Depth:** 43.0'-45.0'
Sample Number: T-3 **Date:**

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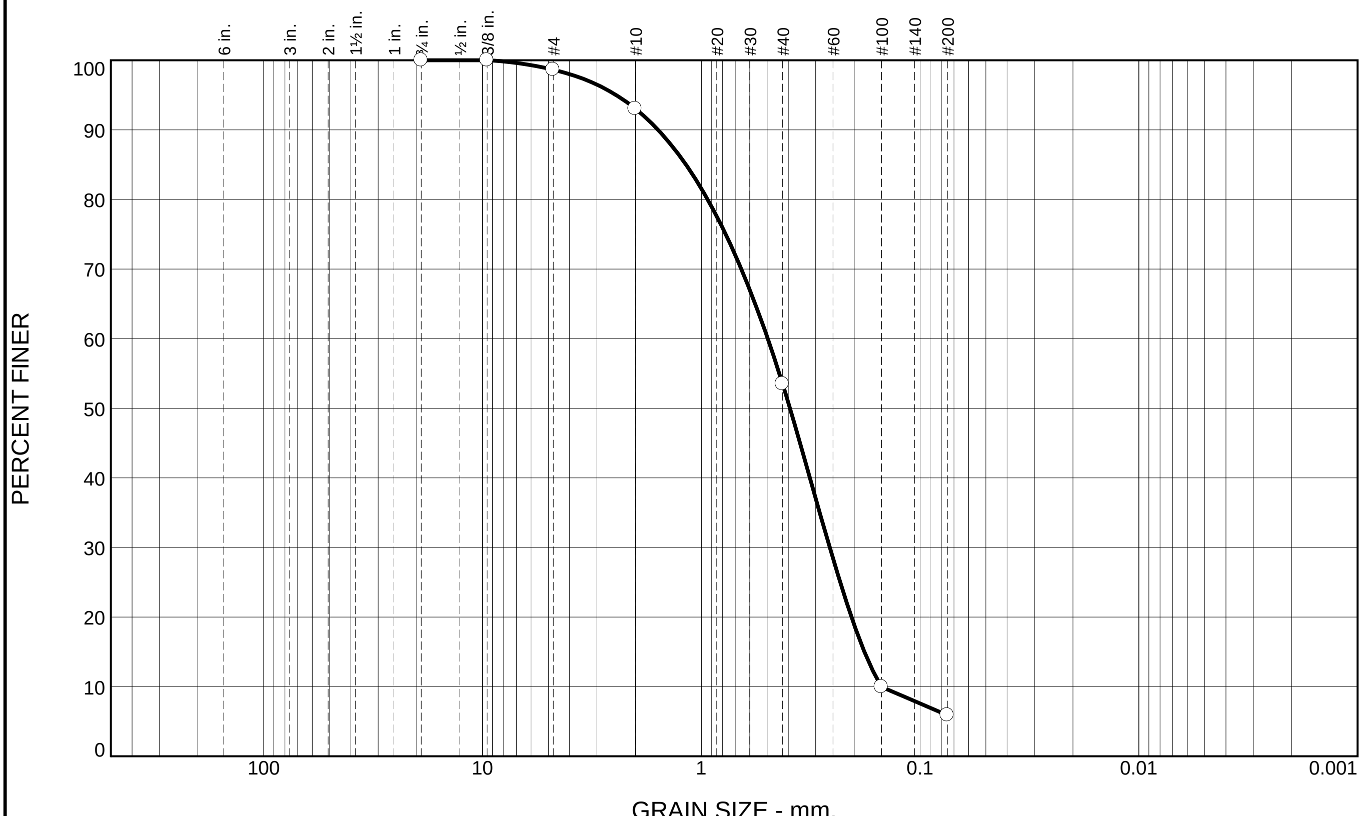
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA - TERMINAL BUILDING
Project No: M23-442 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.4	5.6	39.5	47.6	5.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	98.6		
#10	93.0		
#40	53.5		
#100	10.0		
#200	5.9		

* (no specification provided)

Soil Description

GRAY SAND WITH SILT

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.5759 D_{85}= 1.1751 D_{60}= 0.4967
D_{50}= 0.3934 D_{30}= 0.2586 D_{15}= 0.1795
D_{10}= 0.1503 C_u= 3.31 C_c= 0.90

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Source of Sample: T-7 **Depth:** 65.0'-66.5'
Sample Number: S-16

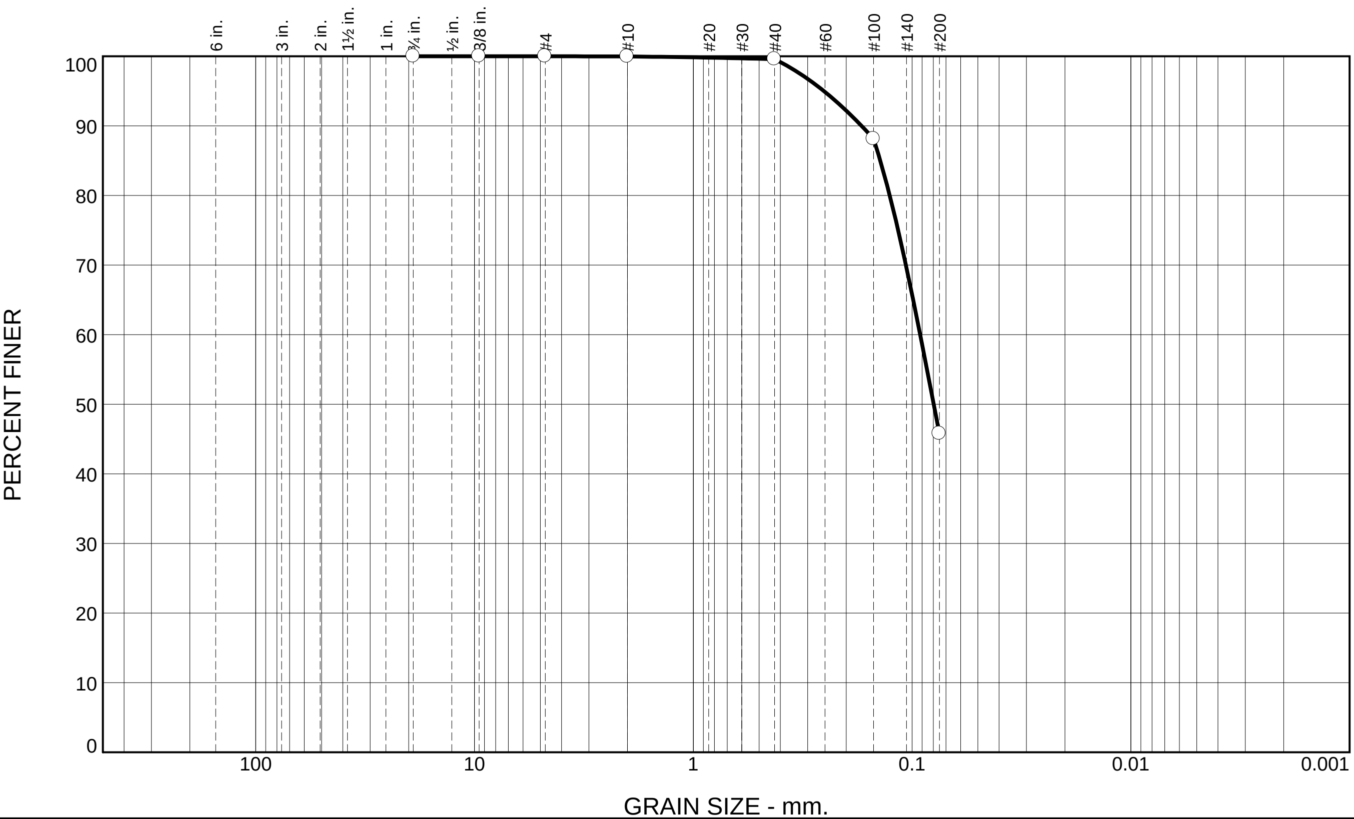
Date:

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA - TERMINAL BUILDING

Project No: M23-442 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	53.8	45.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#40	99.6		
#100	88.1		
#200	45.8		

* (no specification provided)

Soil Description

GRAY SILTY CLAYEY SAND

Atterberg Limits

PL= 17 LL= 21 PI= 4

Coefficients

D_{90}= 0.1702 D_{85}= 0.1396 D_{60}= 0.0918
D_{50}= 0.0796 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

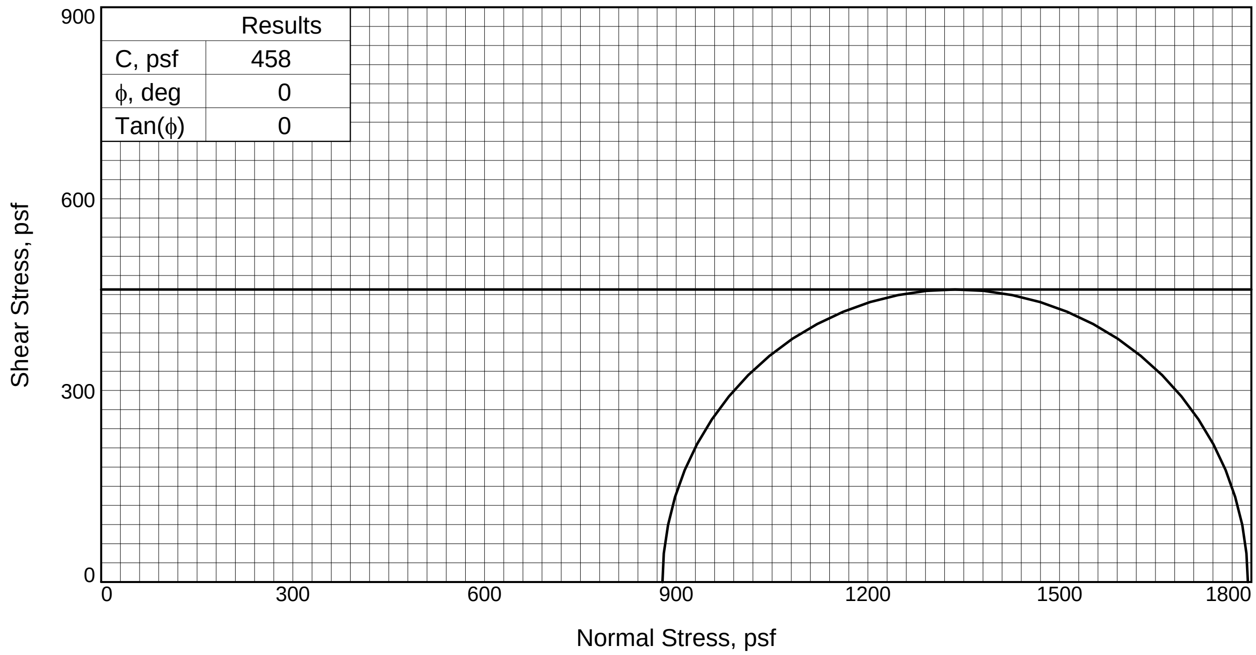
USCS= SC-SM AASHTO= A-4(0)

Remarks

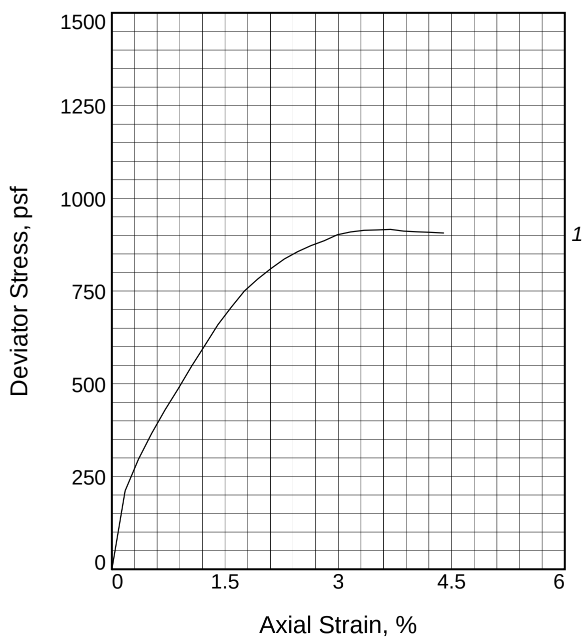
Source of Sample: T-7 **Depth:** 95.0'-96.5'
Sample Number: S-22 **Date:**

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA - TERMINAL BUILDING
Project No: M23-442 **Figure**



	Results
C, psf	458
ϕ, deg	0
Tan(ϕ)	0



Sample No.		1
Initial	Water Content, %	36.5
	Dry Density, pcf	84.8
	Saturation, %	96.5
	Void Ratio	1.0603
	Diameter, in.	2.44
	Height, in.	5.69
At Test	Water Content, %	37.9
	Dry Density, pcf	84.8
	Saturation, %	100.0
	Void Ratio	1.0603
	Diameter, in.	2.44
	Height, in.	5.69
Strain rate, in./min.		0.050
Back Pressure, psi		0.00
Cell Pressure, psi		6.10
Fail. Stress, psf		916
Strain, %		3.7
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		1795
σ_3 Failure, psf		878

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: GRAY SANDY CLAY WITH SOME ORGANICS
LL= 27 **PL=** 16 **PI=** 11
Assumed Specific Gravity= 2.8
Remarks:

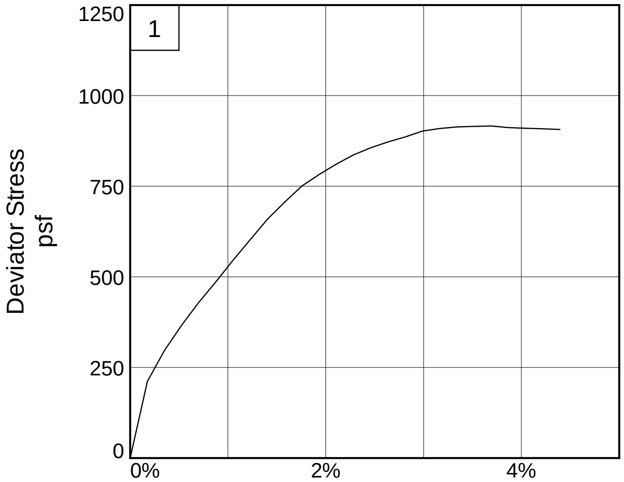
Figure ________

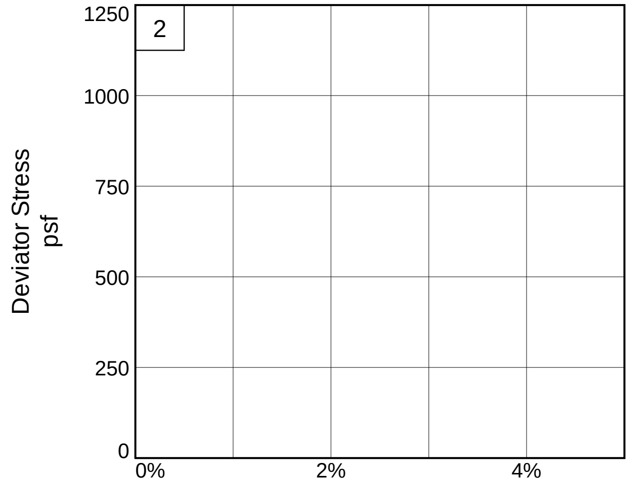
Client: VOLKERT, INC.

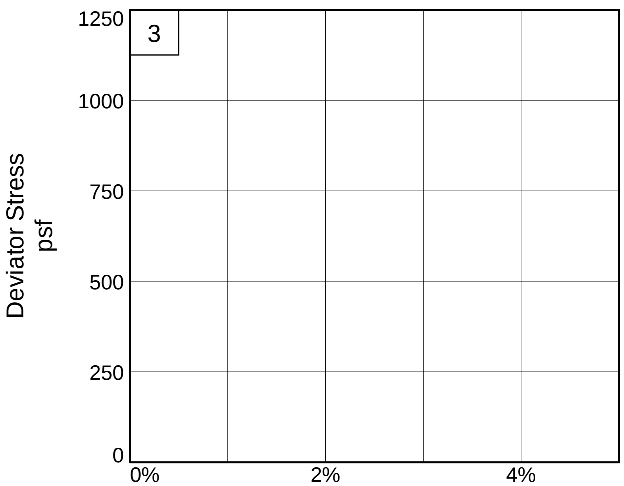
Project: MAA - TERMINAL BUILDING

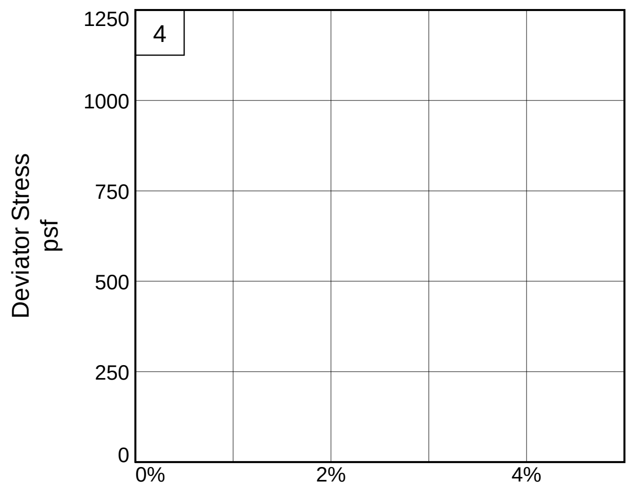
Source of Sample: T-7 **Depth:** 13.0'-15.0'
Sample Number: T-1
Proj. No.: M23-442 **Date Sampled:**

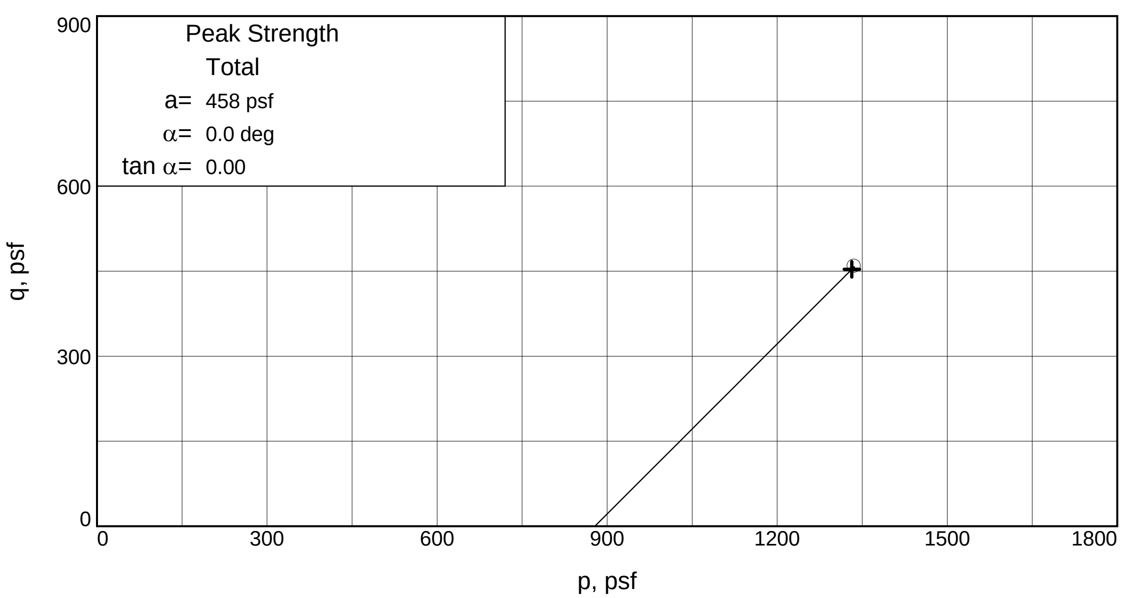
TRIAXIAL SHEAR TEST REPORT
SOUTHERN EARTH SCIENCES
Mobile, Alabama











Stress Paths: o indicates peak + indicates end

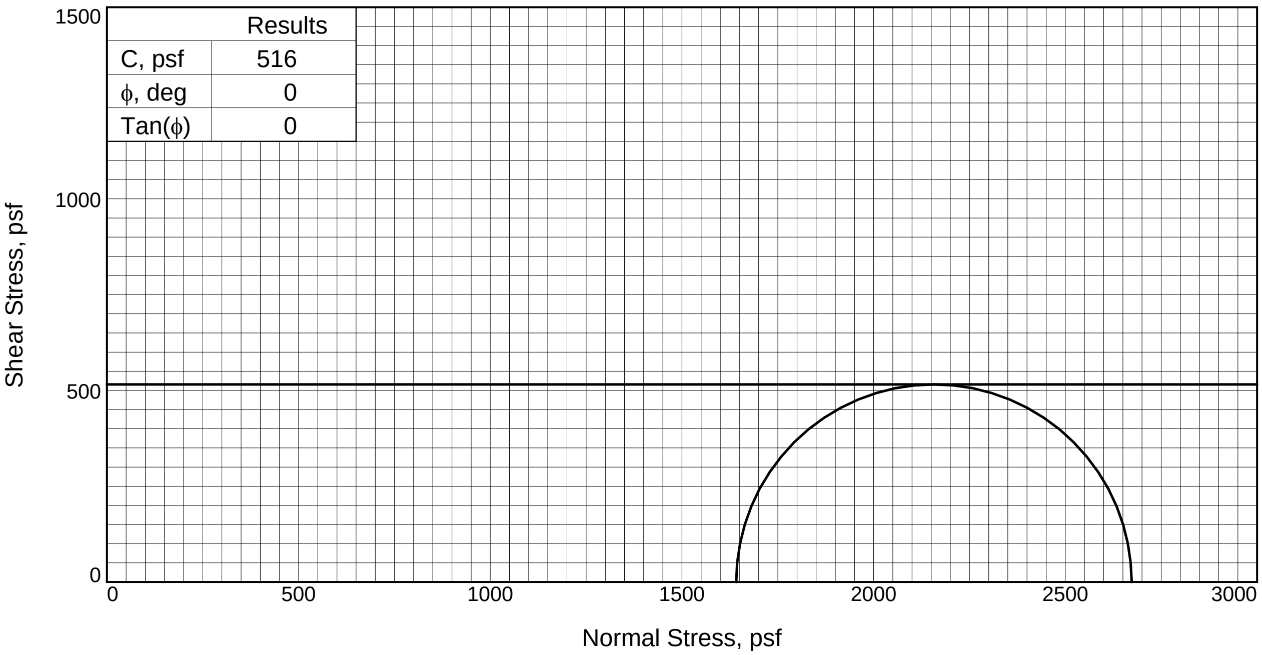
Client: VOLKERT, INC.

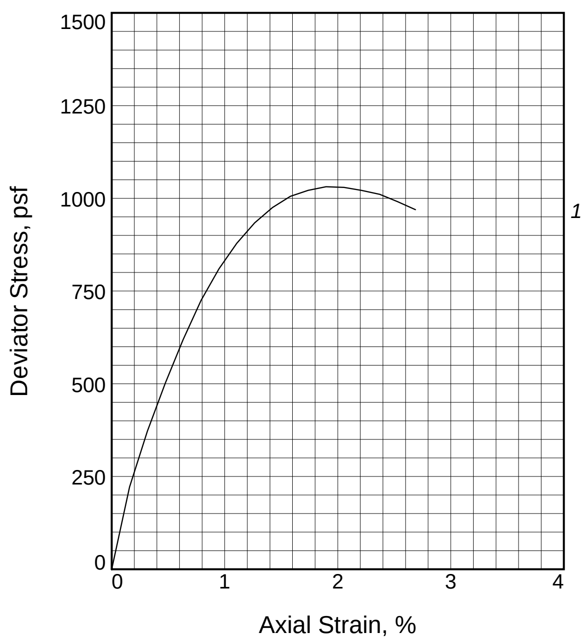
Project: MAA - TERMINAL BUILDING

Source of Sample: T-7 **Depth:** 13.0'-15.0' **Sample Number:** T-1

Project No.: M23-442 **Figure** ________

SOUTHERN EARTH SCIENCES





Sample No.		1
Initial	Water Content, %	43.8
	Dry Density, pcf	77.8
	Saturation, %	98.5
	Void Ratio	1.2458
	Diameter, in.	2.83
	Height, in.	6.33
At Test	Water Content, %	44.5
	Dry Density, pcf	77.8
	Saturation, %	100.0
	Void Ratio	1.2458
	Diameter, in.	2.83
	Height, in.	6.33
Strain rate, in./min.		0.050
Back Pressure, psi		0.00
Cell Pressure, psi		11.40
Fail. Stress, psf		1031
Strain, %		1.9
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		2673
σ_3 Failure, psf		1642

Type of Test:
Unconsolidated Undrained
Sample Type: UNDISTURBED
Description: GRAY CLAY WITH SOME SHELLS

LL= 45 **PL=** 23 **PI=** 22
Assumed Specific Gravity= 2.8
Remarks:

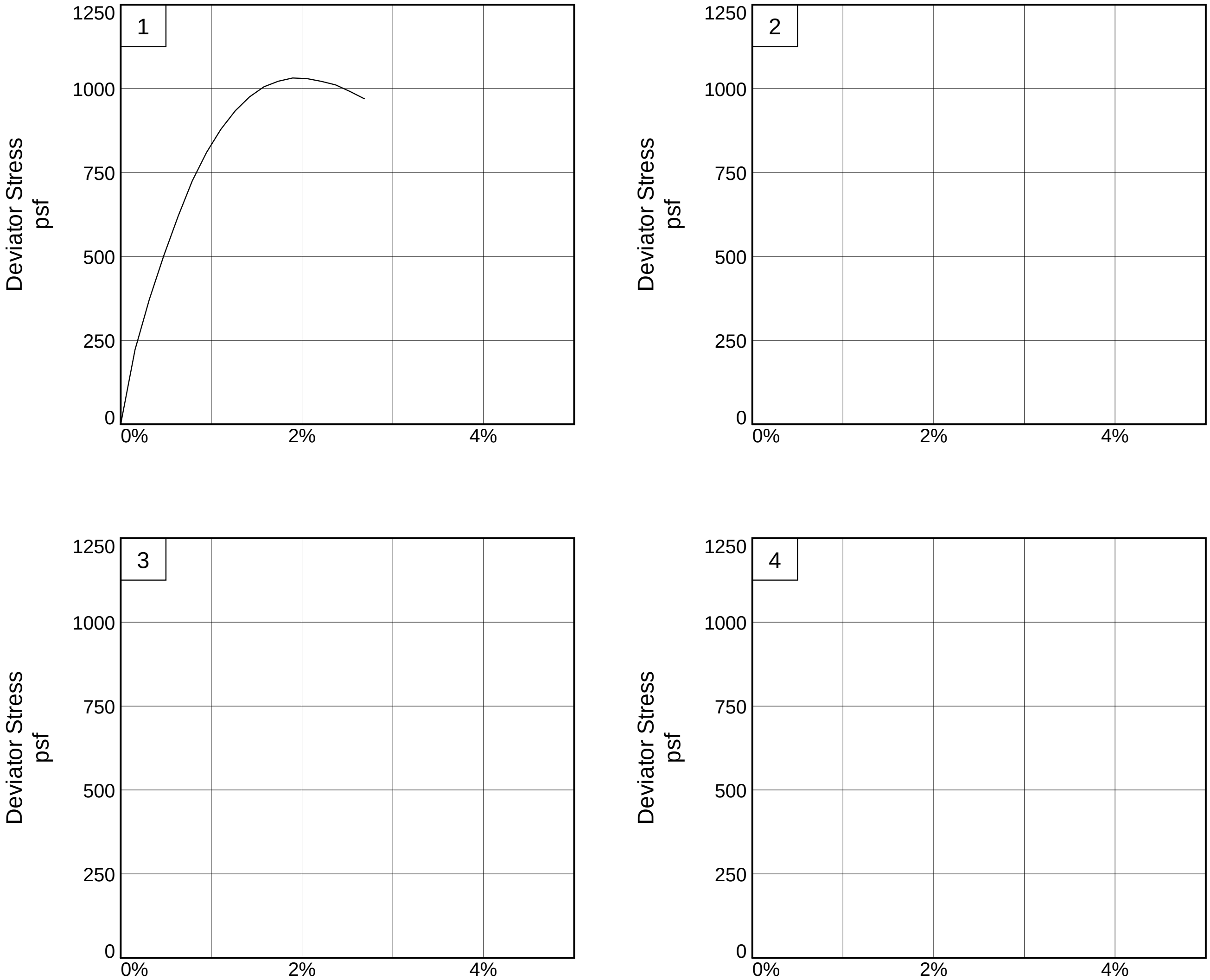
Figure ________

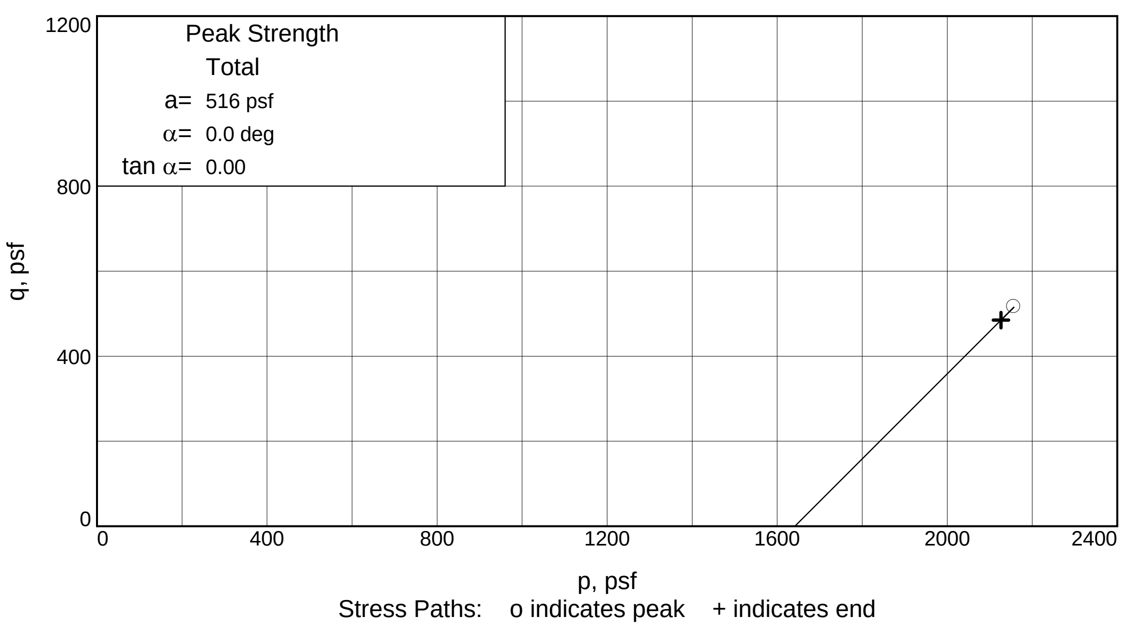
Client: VOLKERT, INC.

Project: MAA - TERMINAL BUILDING

Source of Sample: T-7 **Depth:** 28.0'-30.0'
Sample Number: T-2
Proj. No.: M23-442 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
SOUTHERN EARTH SCIENCES
Mobile, Alabama



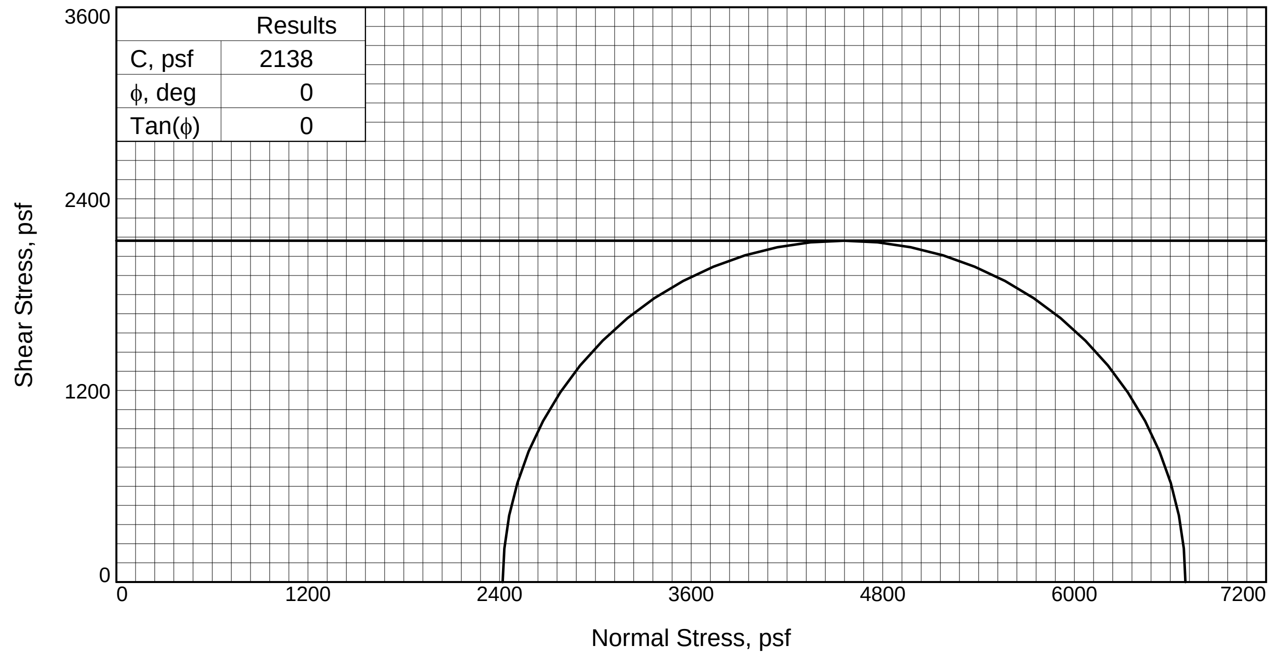


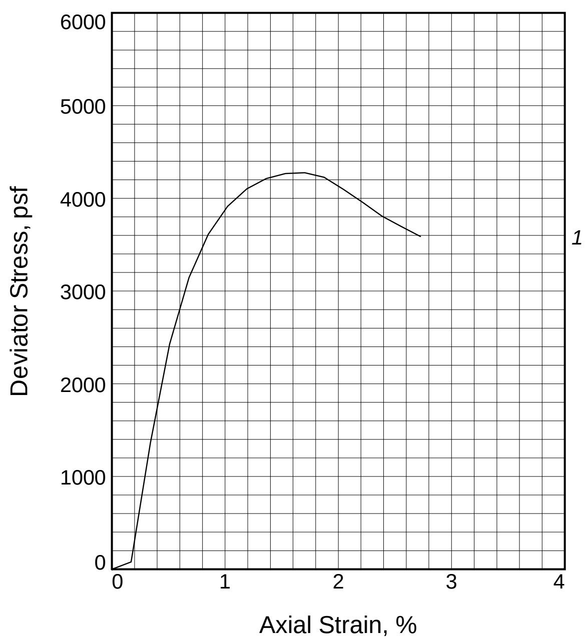
Client: VOLKERT, INC.

Project: MAA - TERMINAL BUILDING

Source of Sample: T-7 **Depth:** 28.0'-30.0' **Sample Number:** T-2

Project No.: M23-442 **Figure** ________ **SOUTHERN EARTH SCIENCES**





Sample No.		1
Initial	Water Content, %	33.7
	Dry Density, pcf	89.3
	Saturation, %	98.8
	Void Ratio	0.9567
	Diameter, in.	2.82
	Height, in.	5.87
At Test	Water Content, %	34.2
	Dry Density, pcf	89.3
	Saturation, %	100.0
	Void Ratio	0.9567
	Diameter, in.	2.82
	Height, in.	5.87
Strain rate, in./min.		0.050
Back Pressure, psi		0.00
Cell Pressure, psi		16.80
Fail. Stress, psf		4276
Strain, %		1.7
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		6695
σ_3 Failure, psf		2419

Type of Test:
Unconsolidated Undrained

Sample Type: UNDISTURBED

Description: GRAY FAT CLAY

LL= 69 **PL=** 25 **PI=** 44

Assumed Specific Gravity= 2.8

Remarks:

Figure ________

Client: VOLKERT, INC.

Project: MAA - TERMINAL BUILDING

Source of Sample: T-7 **Depth:** 43.0'-45.0'

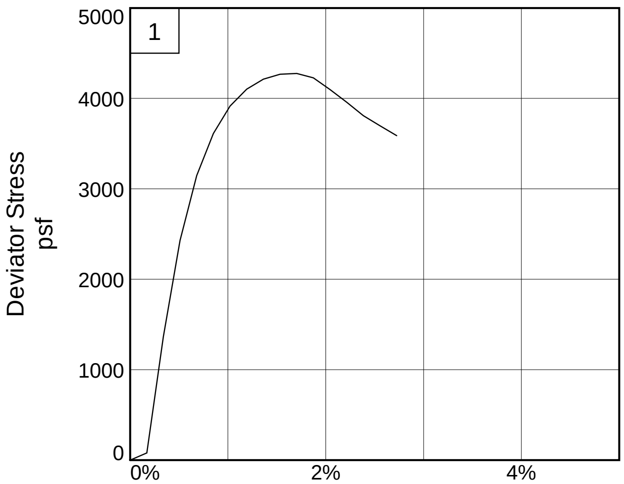
Sample Number: T-3

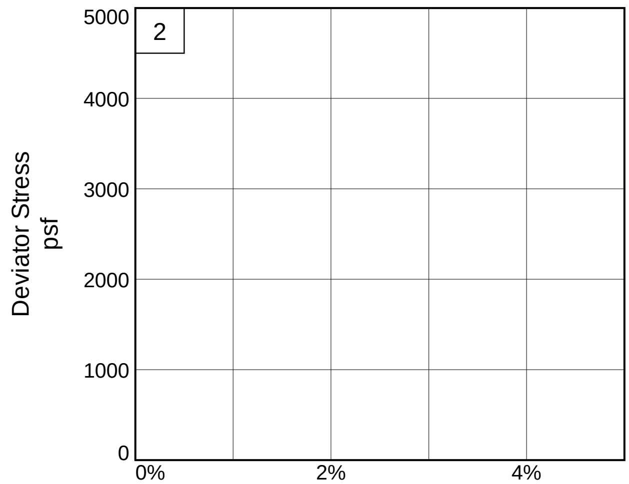
Proj. No.: M23-442 **Date Sampled:**

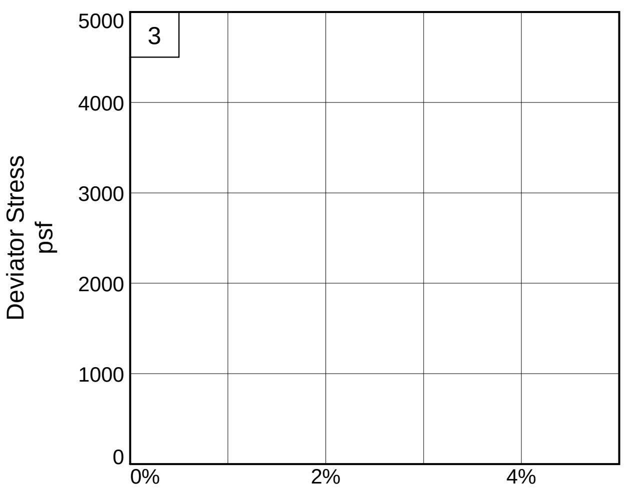
TRIAXIAL SHEAR TEST REPORT

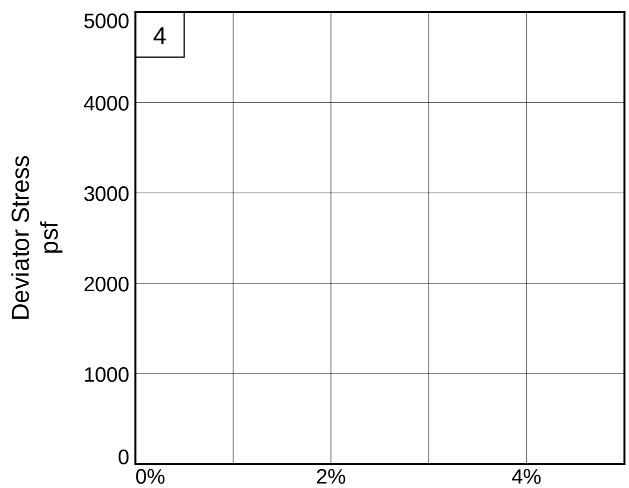
SOUTHERN EARTH SCIENCES

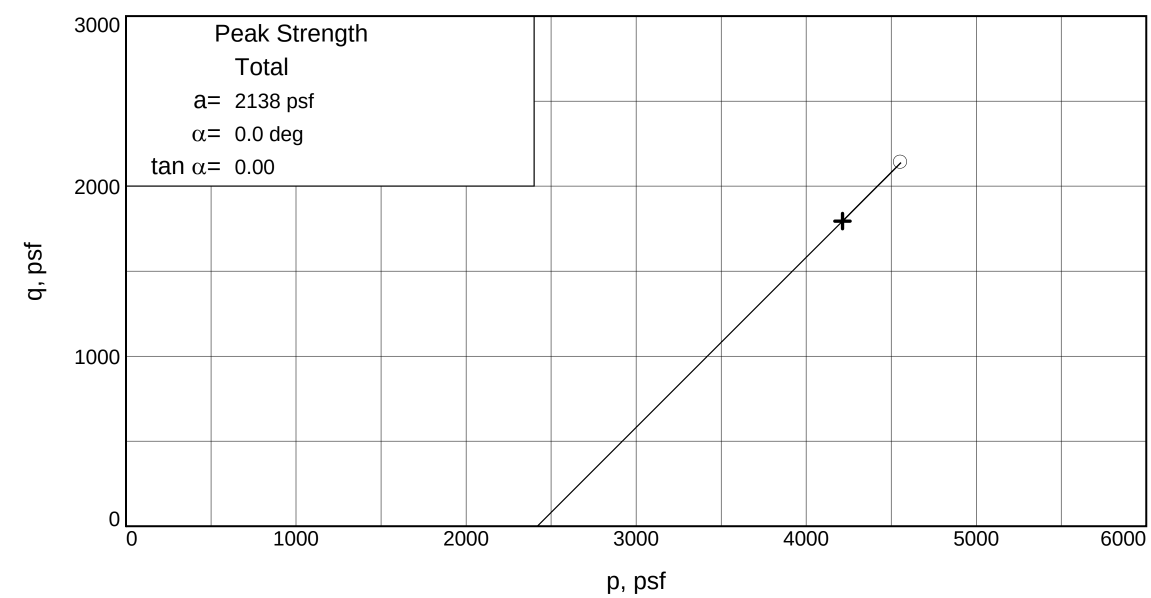
Mobile, Alabama









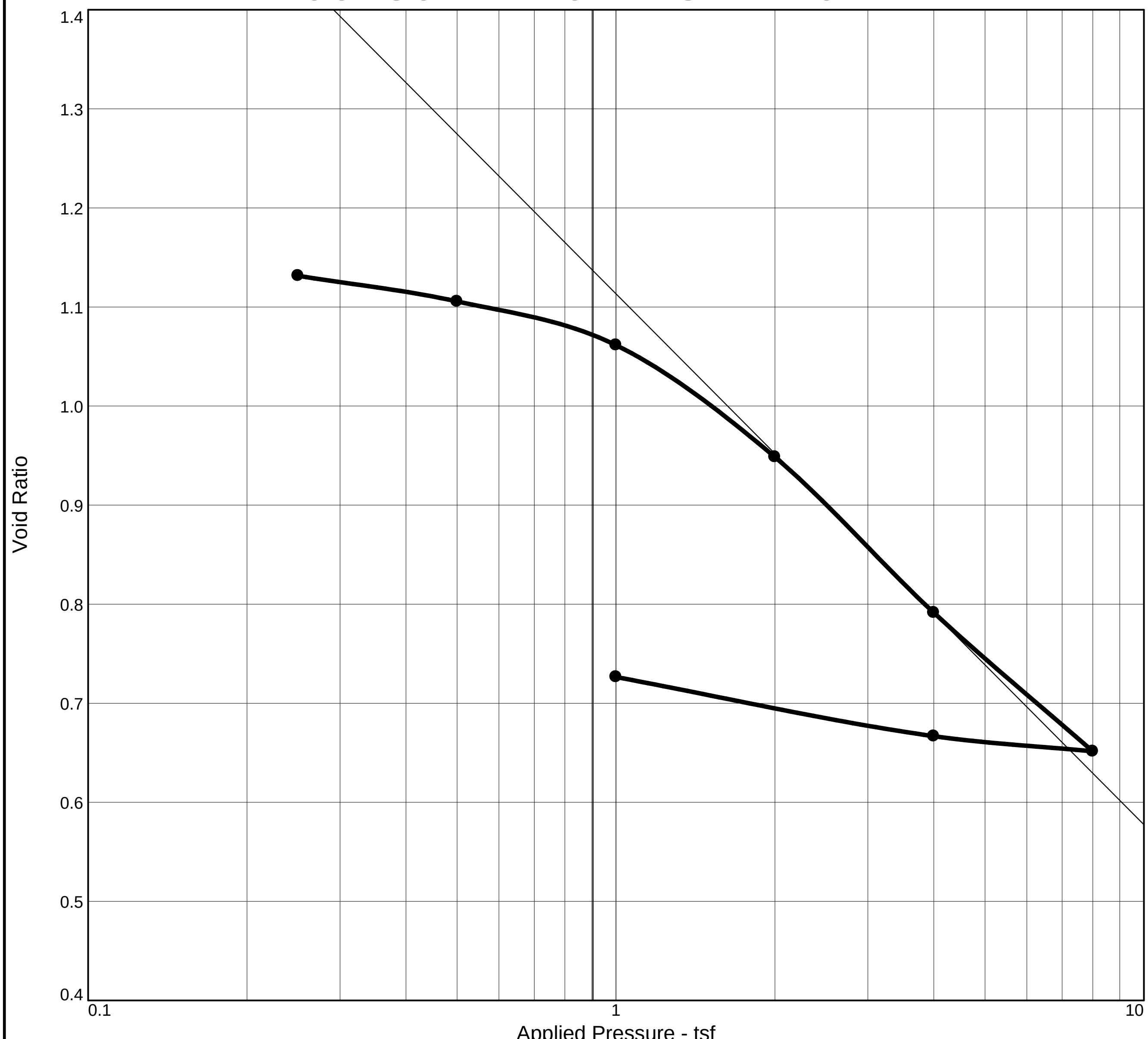


Stress Paths: o indicates peak + indicates end

Client: VOLKERT, INC.
Project: MAA - TERMINAL BUILDING
Source of Sample: T-7 **Depth:** 43.0'-45.0' **Sample Number:** T-3
Project No.: M23-442 **Figure** ________

SOUTHERN EARTH SCIENCES

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
Sat.	Moist.											
88.5 %	36.8 %	80.8	27	11	2.80		1.3	0.54				1.163

MATERIAL DESCRIPTION	USCS	AASHTO
GRAY SANDY CLAY WITH SOME ORGANICS	CL	A-6(3)

Project No. M23-442 **Client:** VOLKERT, INC.

Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: T-7 **Depth:** 13.0'-15.0' **Sample Number:** T-1

SOUTHERN EARTH SCIENCES

Mobile, Alabama

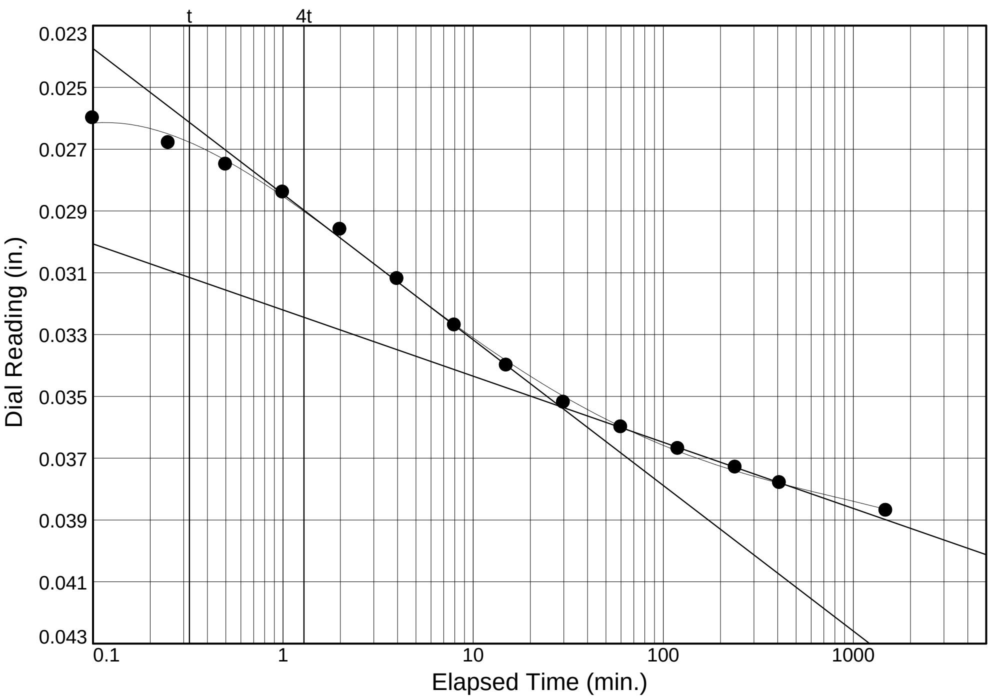
Remarks:
SPECIFIC GRAVITY ASSUMED TO BE 2.80

Figure

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

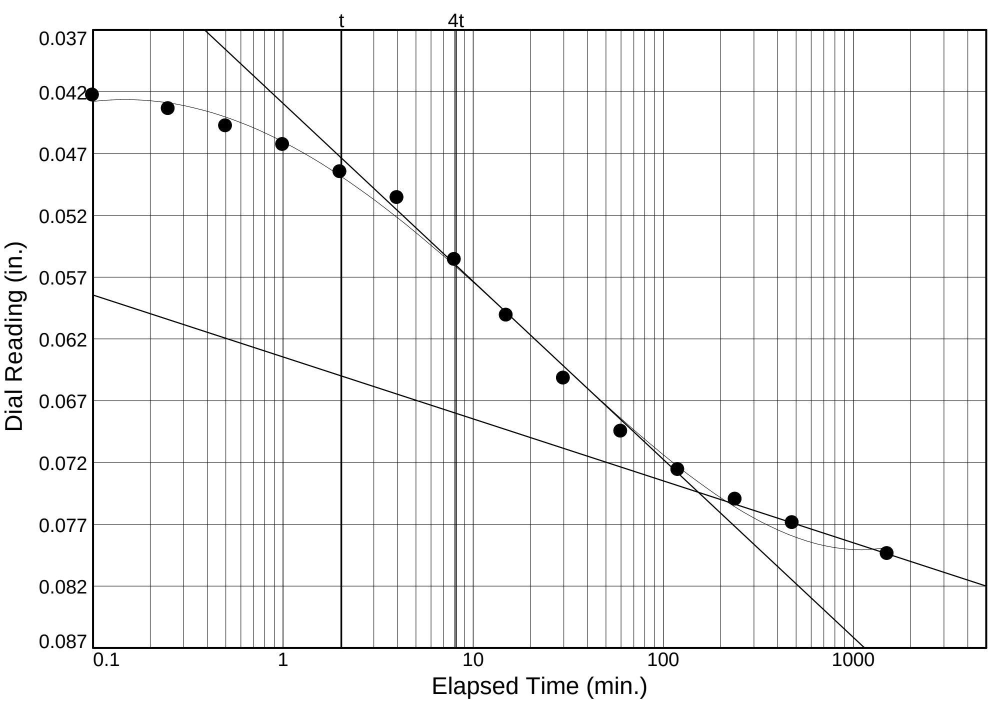
Source of Sample: T-7 Depth: 13.0'-15.0' Sample Number: T-1



Load No.= 3
Load= 1.00 tsf
D_0 = 0.0245
D_{50} = 0.0299
D_{100} = 0.0353
T_{50} = 2.05 min.

C_v @ T_{50}
0.135 $ft.^2$/day

C_α = 0.006



Load No.= 4
Load= 2.00 tsf
D_0 = 0.0416
D_{50} = 0.0580
D_{100} = 0.0744
T_{50} = 11.02 min.

C_v @ T_{50}
0.023 $ft.^2$/day

C_α = 0.014

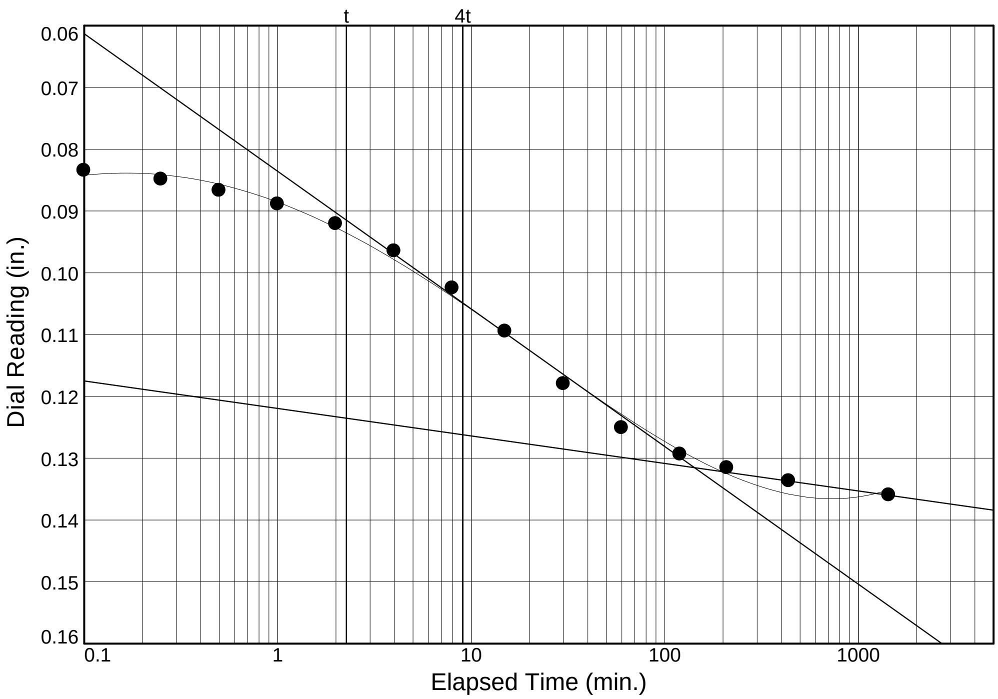
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

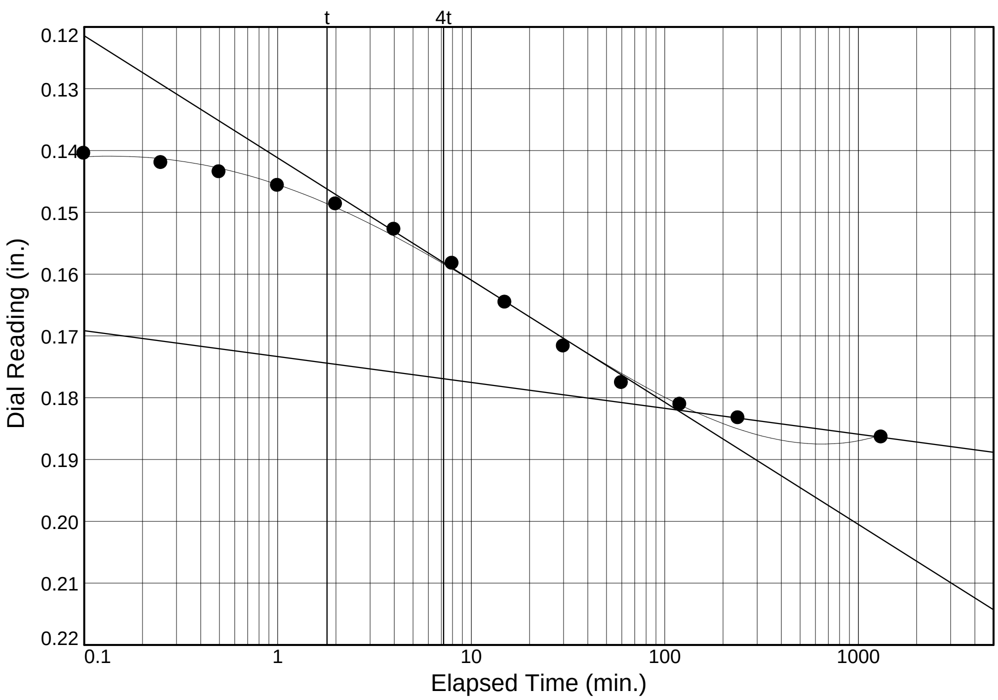
Source of Sample: T-7 Depth: 13.0'-15.0' Sample Number: T-1



Load No.= 5
Load= 4.00 tsf
D_0 = 0.0821
D_{50} = 0.1068
D_{100} = 0.1315
T_{50} = 10.97 min.

C_v @ T_{50}
0.020 ft.^{2}/day

C_α = 0.012



Load No.= 6
Load= 8.00 tsf
D_0 = 0.1389
D_{50} = 0.1604
D_{100} = 0.1820
T_{50} = 9.28 min.

C_v @ T_{50}
0.020 ft.^{2}/day

C_α = 0.012

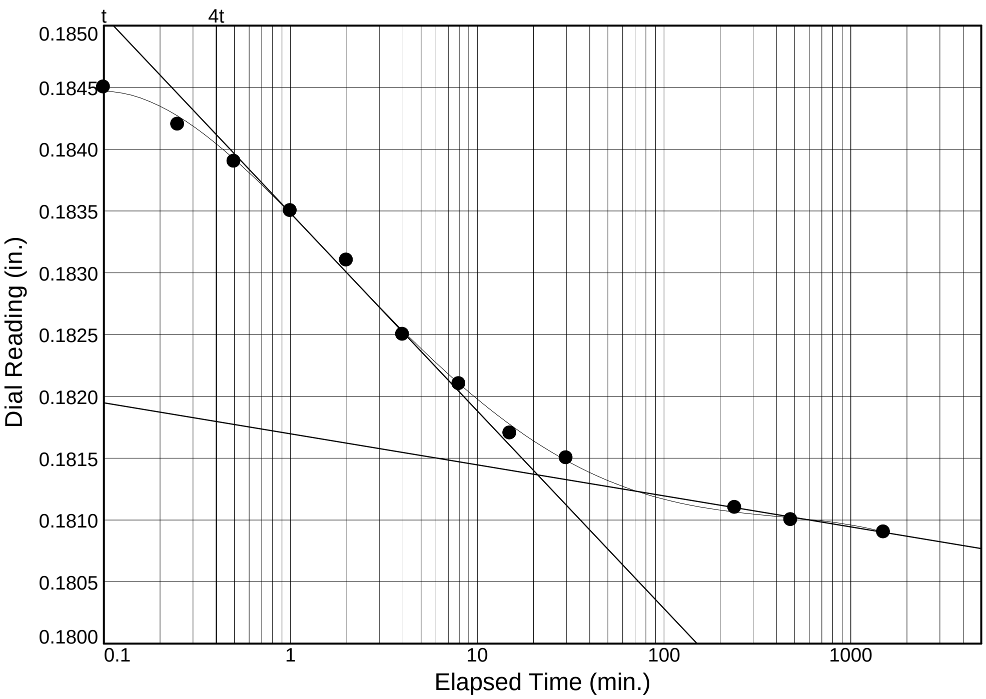
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

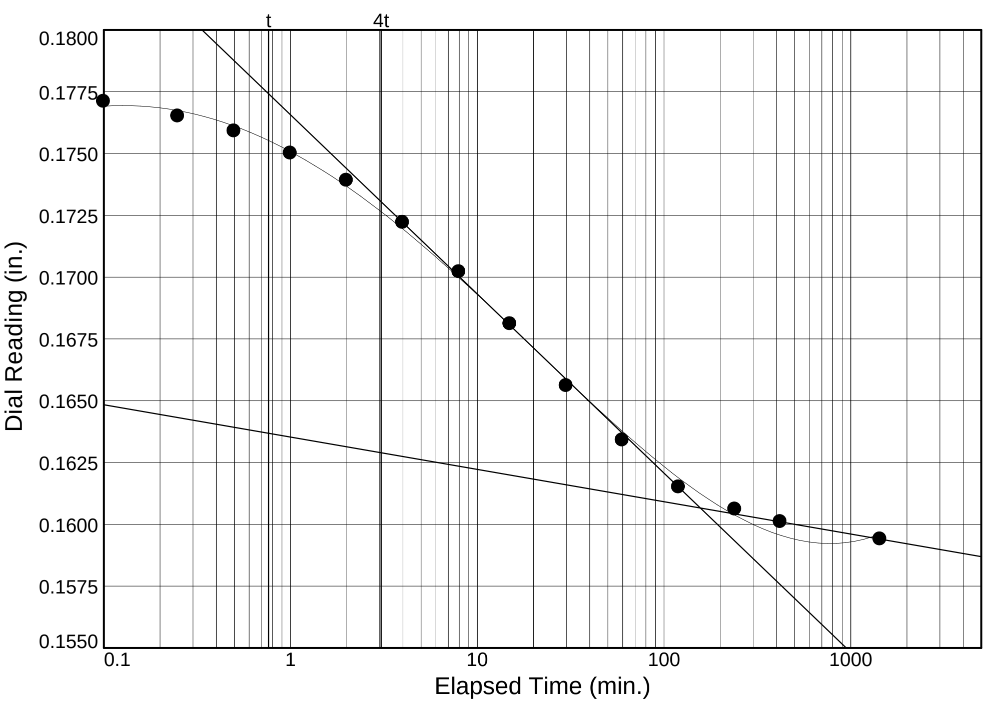
Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: T-7 Depth: 13.0'-15.0' Sample Number: T-1



Load No.= 7
Load= 4.00 tsf
D_0 = 0.1849
D_{50} = 0.1831
D_{100} = 0.1814
T_{50} = 1.66 min.

C_v @ T_{50}
0.106 $ft.^2$/day



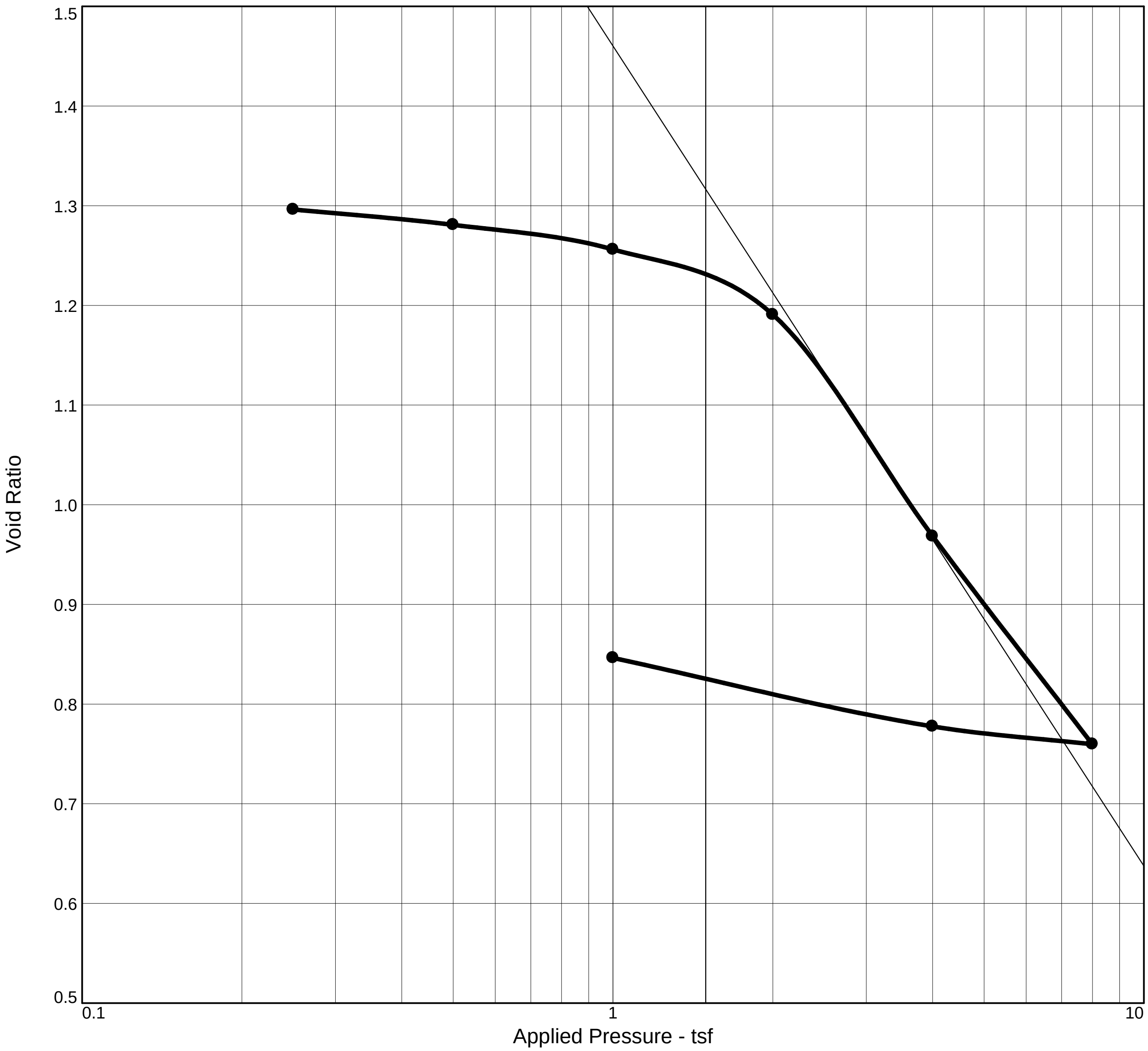
Load No.= 8
Load= 1.00 tsf
D_0 = 0.1784
D_{50} = 0.1695
D_{100} = 0.1607
T_{50} = 9.25 min.

C_v @ T_{50}
0.020 $ft.^2$/day

Figure

SOUTHERN EARTH SCIENCES

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
Sat.	Moist.											
91.4 %	42.7 %	75.7	45	22	2.8		1.9	0.82				1.310

MATERIAL DESCRIPTION	USCS	AASHTO
GRAY CLAY WITH SOME SHELLS	CL	A-7-6(22)

Project No. M23-442 **Client:** VOLKERT, INC.

Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: T-7 **Depth:** 28.0'-30.0' **Sample Number:** T-2

SOUTHERN EARTH SCIENCES

Mobile, Alabama

Remarks:

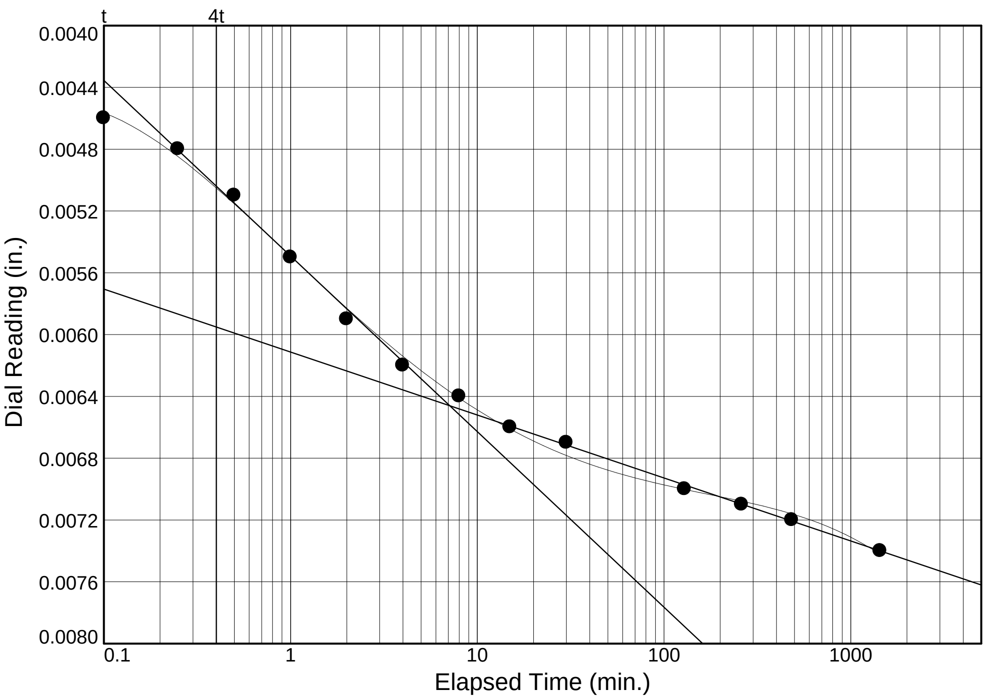
SPECIFIC GRAVITY ASSUMED TO BE 2.80

Figure

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

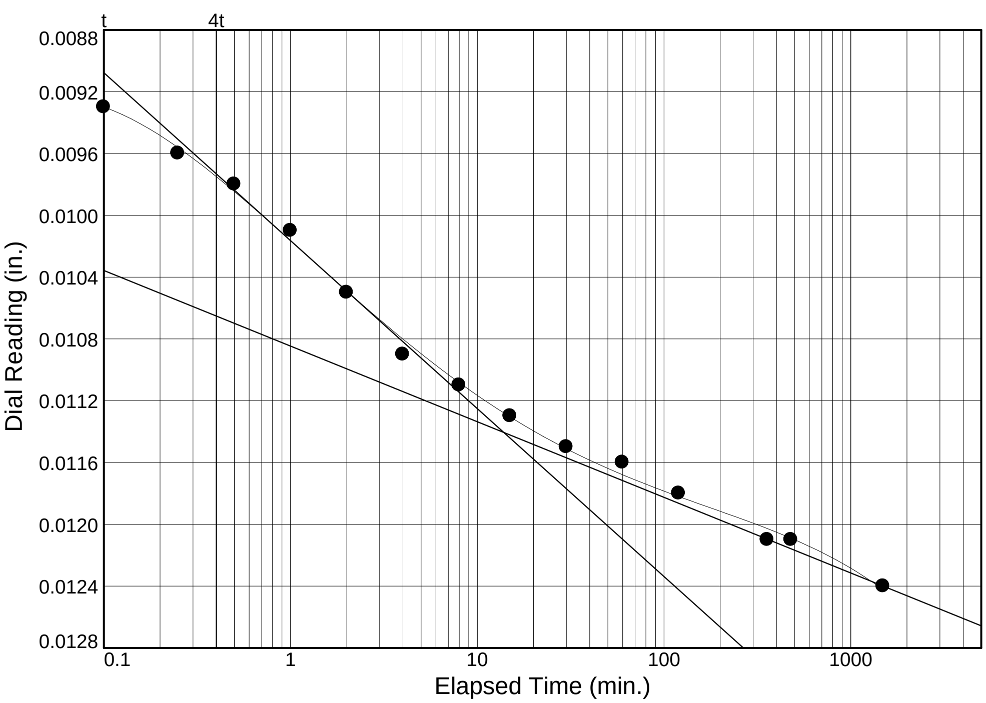
Source of Sample: T-7 Depth: 28.0'-30.0' Sample Number: T-2



Load No.= 1
Load= 0.25 tsf
D_0 = 0.0041
D_{50} = 0.0053
D_{100} = 0.0065
T_{50} = 0.64 min.

C_v @ T_{50}
0.432 ft.^{2}/day

C_α = 0.001



Load No.= 2
Load= 0.50 tsf
D_0 = 0.0088
D_{50} = 0.0101
D_{100} = 0.0114
T_{50} = 0.92 min.

C_v @ T_{50}
0.294 ft.^{2}/day

C_α = 0.002

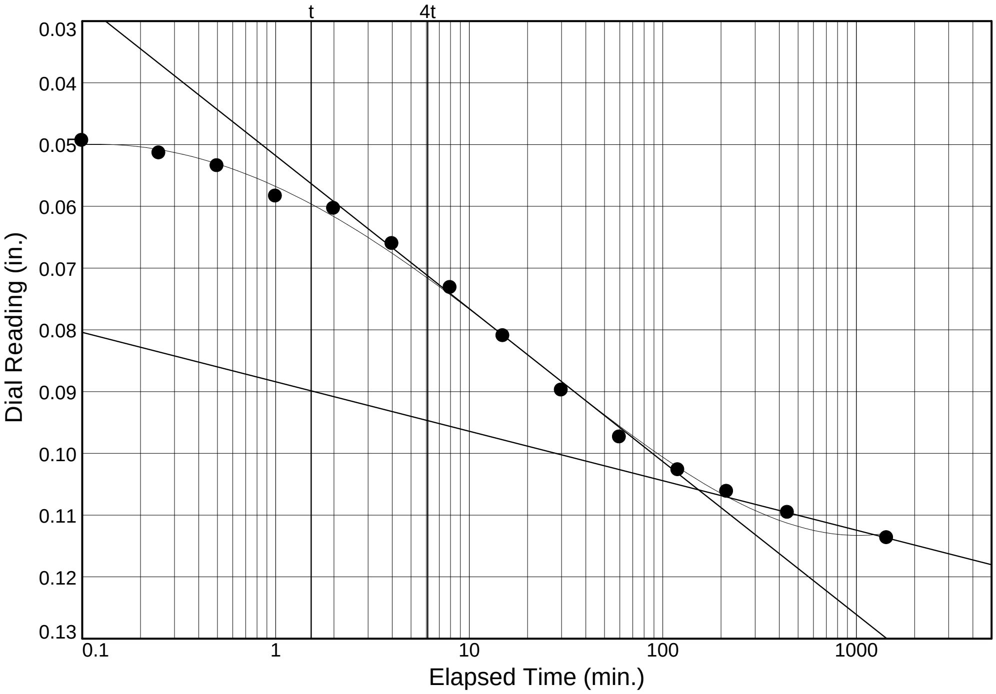
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

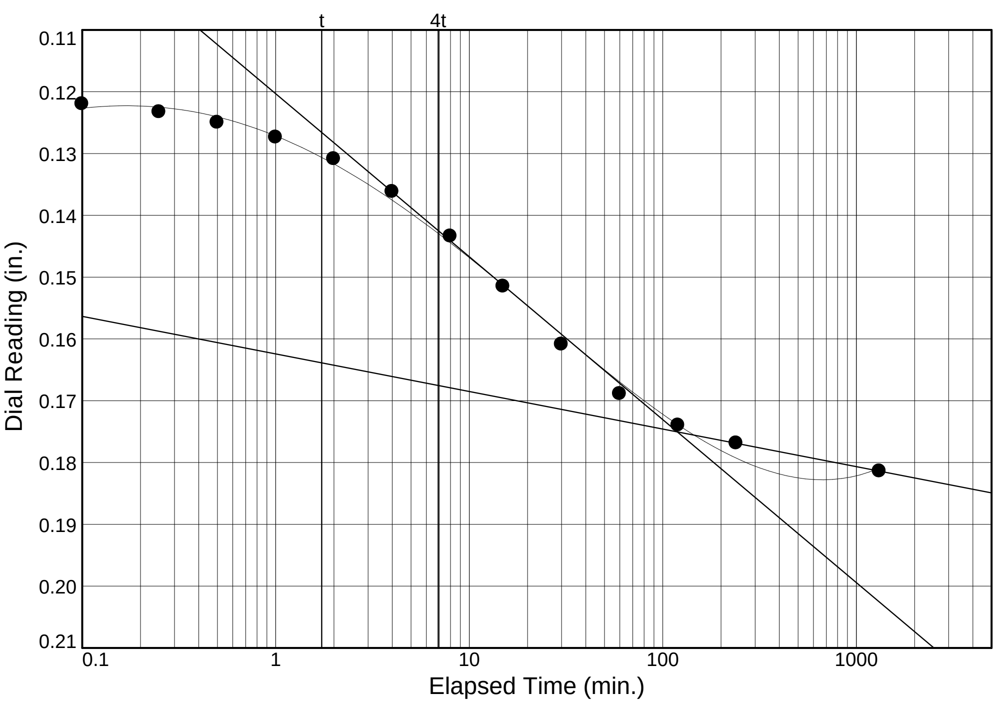
Source of Sample: T-7 Depth: 28.0'-30.0' Sample Number: T-2



Load No.= 5
Load= 4.00 tsf
D_0 = 0.0476
D_{50} = 0.0768
D_{100} = 0.1059
T_{50} = 10.10 min.

C_v @ T_{50}
0.022 ft.^{2}/day

C_α = 0.025



Load No.= 6
Load= 8.00 tsf
D_0 = 0.1183
D_{50} = 0.1467
D_{100} = 0.1750
T_{50} = 9.85 min.

C_v @ T_{50}
0.018 ft.^{2}/day

C_α = 0.019

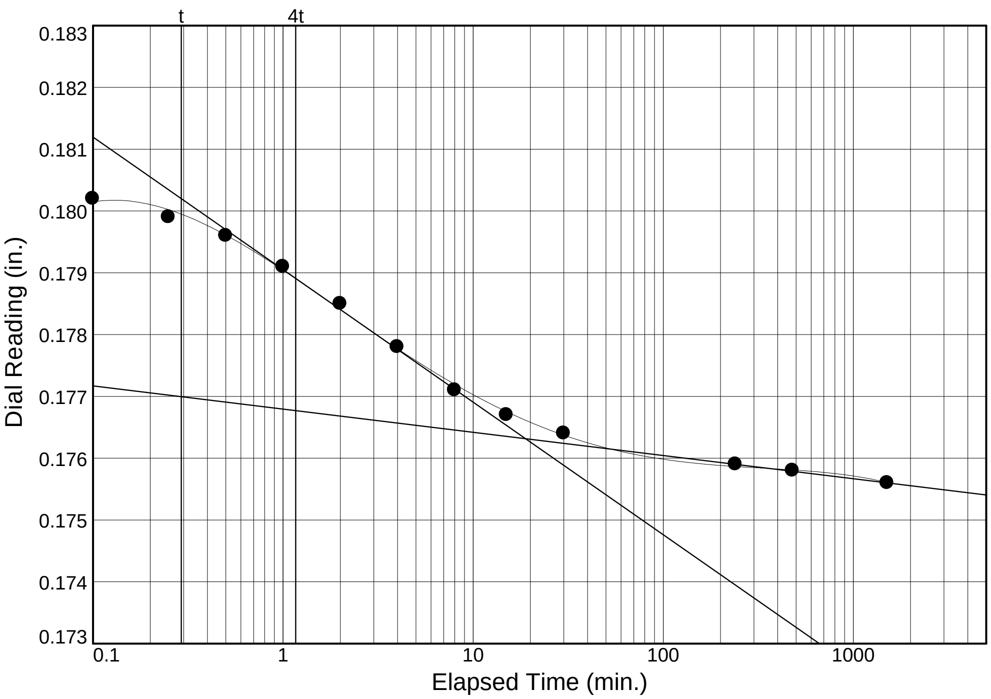
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

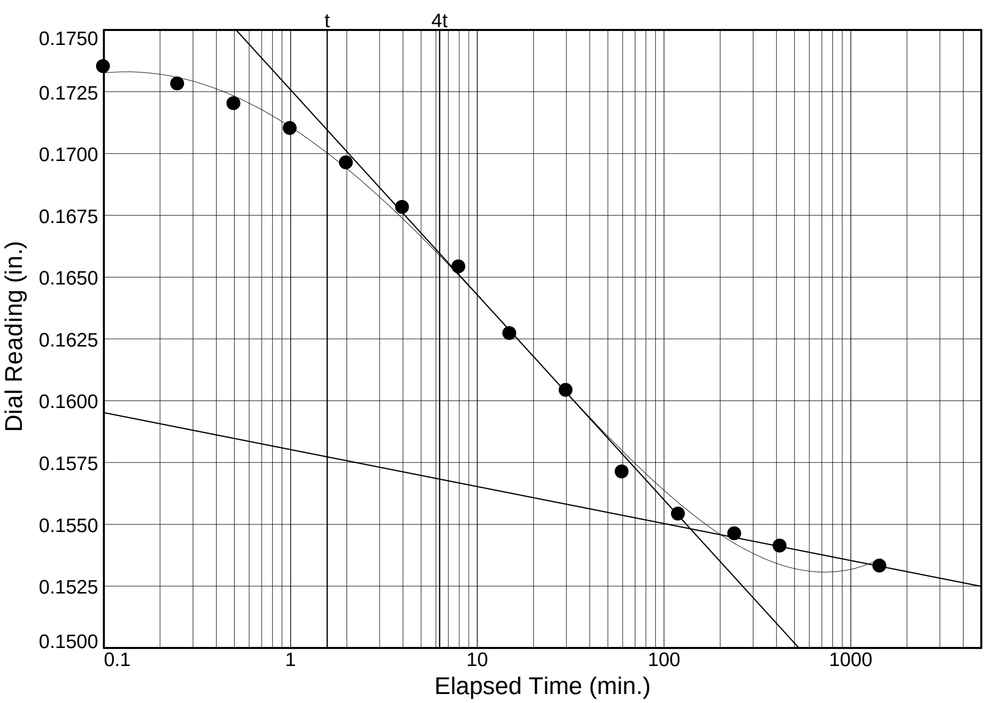
Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: T-7 Depth: 28.0'-30.0' Sample Number: T-2



Load No.= 7
Load= 4.00 tsf
D_0 = 0.1810
D_{50} = 0.1787
D_{100} = 0.1763
T_{50} = 1.53 min.

C_v @ T_{50}
0.106 ft.^{2}/day



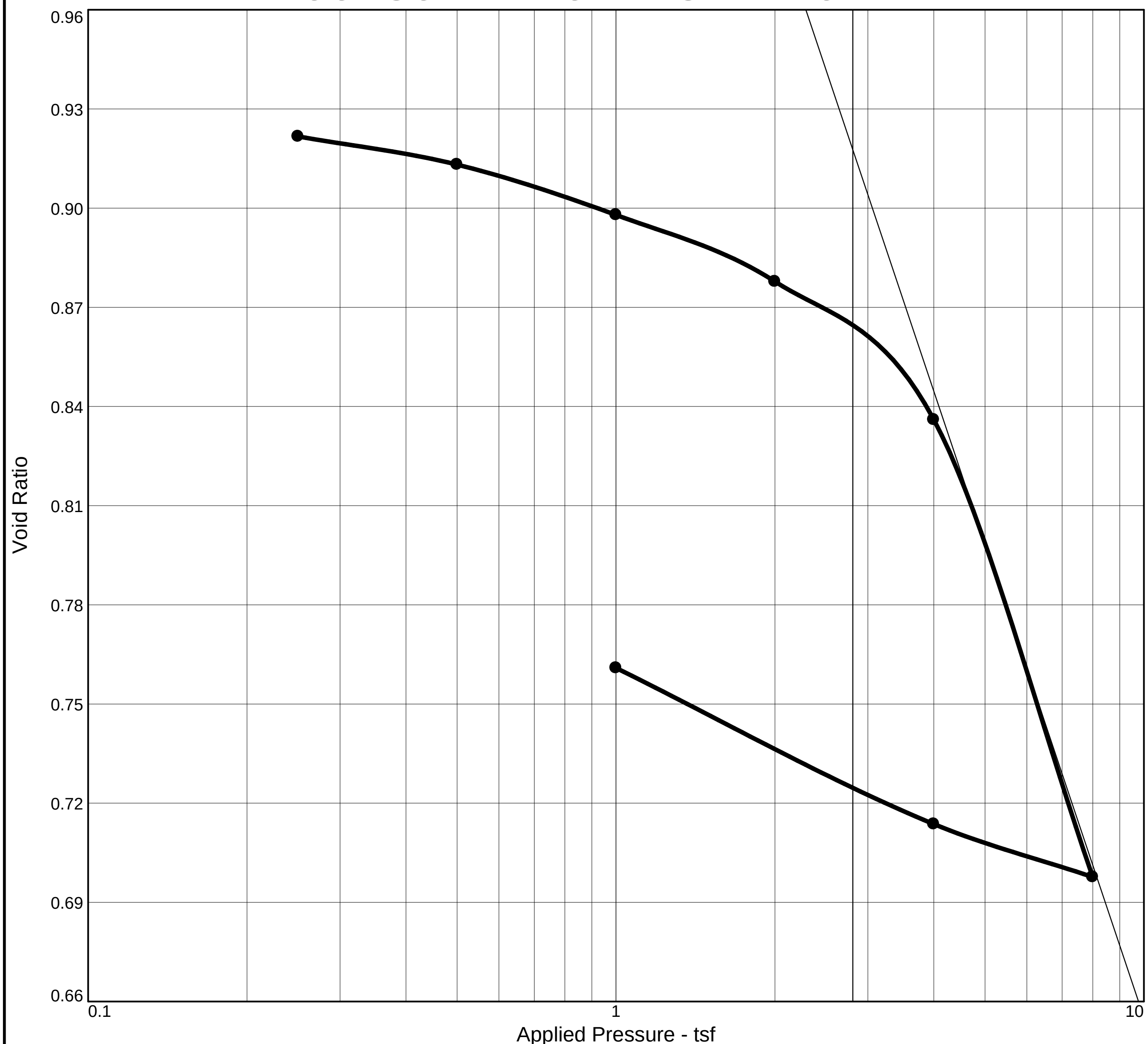
Load No.= 8
Load= 1.00 tsf
D_0 = 0.1742
D_{50} = 0.1645
D_{100} = 0.1548
T_{50} = 9.38 min.

C_v @ T_{50}
0.018 ft.^{2}/day

Figure

SOUTHERN EARTH SCIENCES

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
Sat.	Moist.											
87.6 %	29.2 %	90.4	69	44	2.8		3.7	0.48				0.934

MATERIAL DESCRIPTION	USCS	AASHTO
GRAY FAT CLAY	CH	A-7-6(49)

Project No. M23-442 **Client:** VOLKERT, INC.

Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: T-7 **Depth:** 43.0'-45.0' **Sample Number:** T-3

SOUTHERN EARTH SCIENCES

Mobile, Alabama

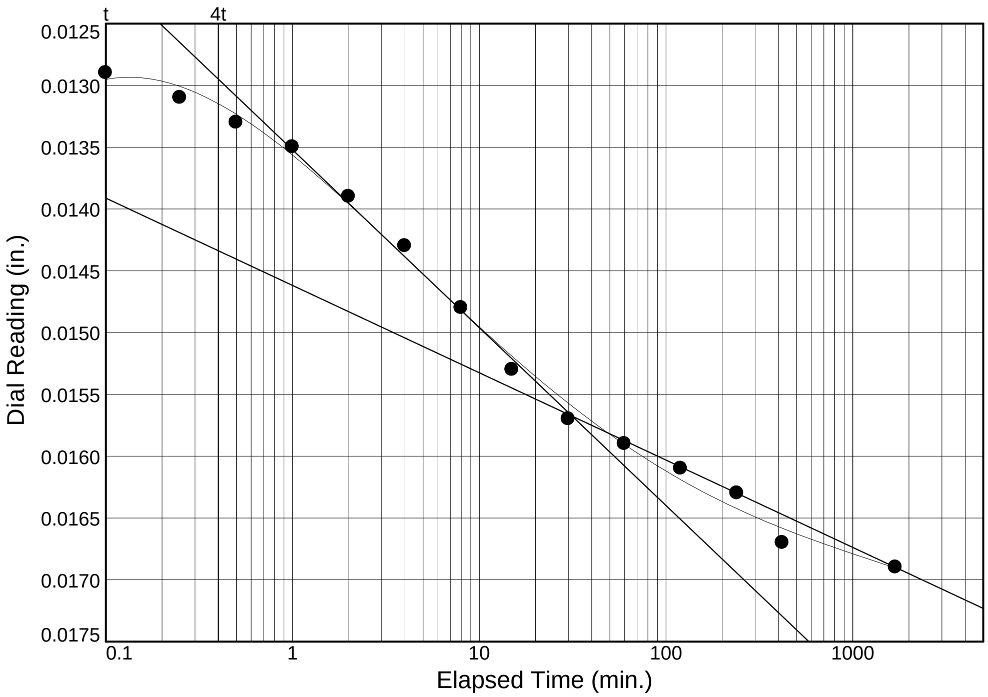
Remarks:
SPECIFIC GRAVITY ASSUMED TO BE 2.80

Figure

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

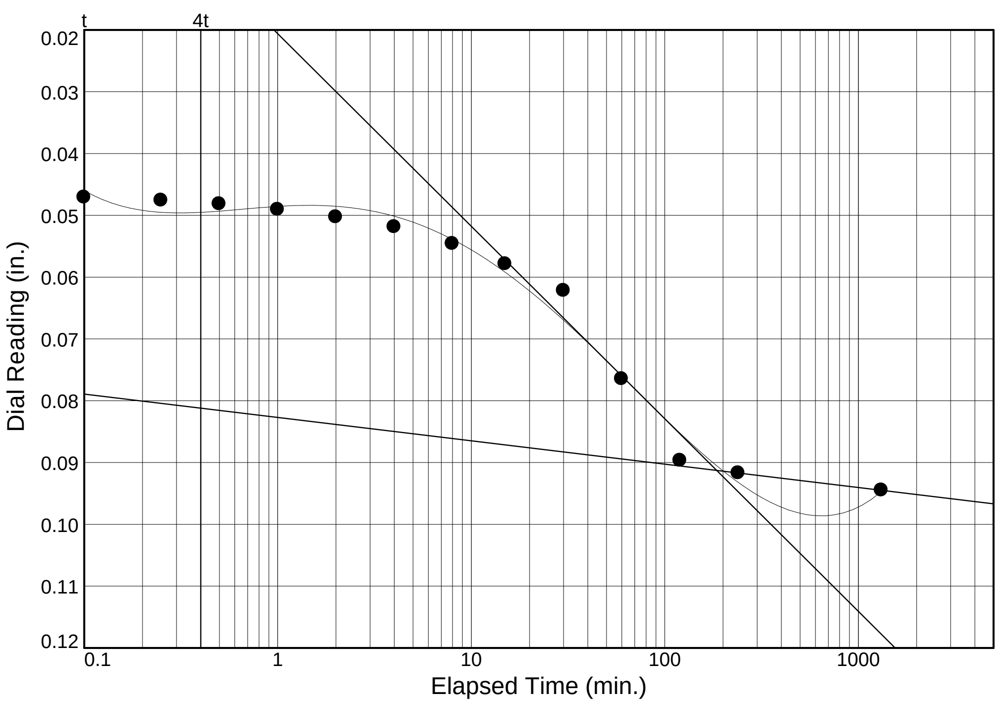
Source of Sample: T-7 Depth: 43.0'-45.0' Sample Number: T-3



Load No.= 3
Load= 1.00 tsf
D_0 = 0.0128
D_{50} = 0.0142
D_{100} = 0.0157
T_{50} = 3.04 min.

C_v @ T_{50}
0.088 ft.^{2}/day

C_α = 0.002



Load No.= 6
Load= 8.00 tsf
D_0 = 0.0425
D_{50} = 0.0669
D_{100} = 0.0913
T_{50} = 29.76 min.

C_v @ T_{50}
0.008 ft.^{2}/day

C_α = 0.010

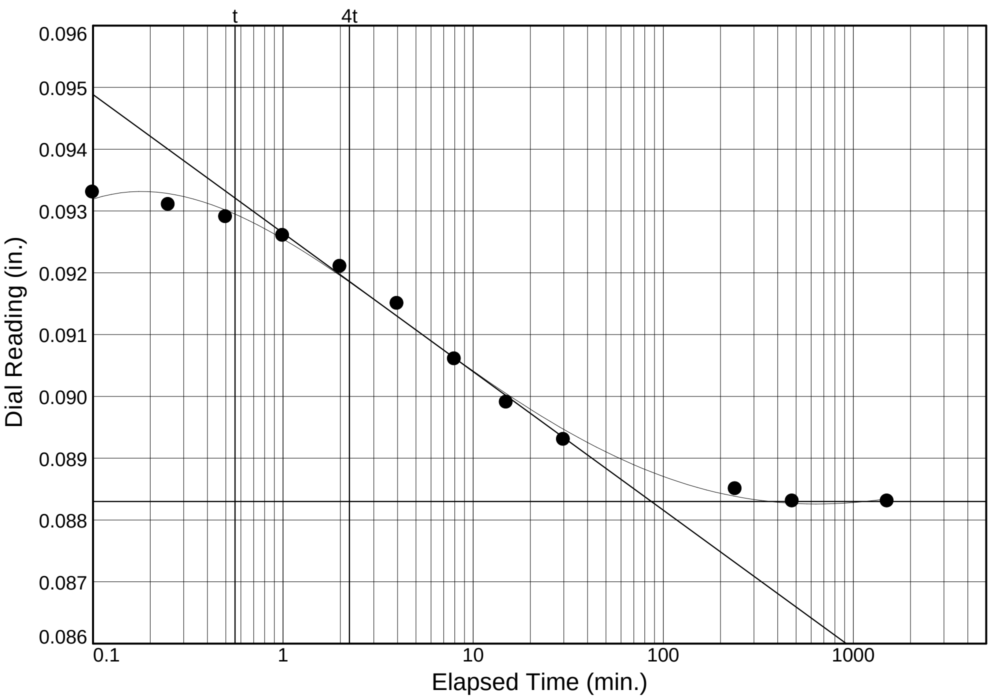
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

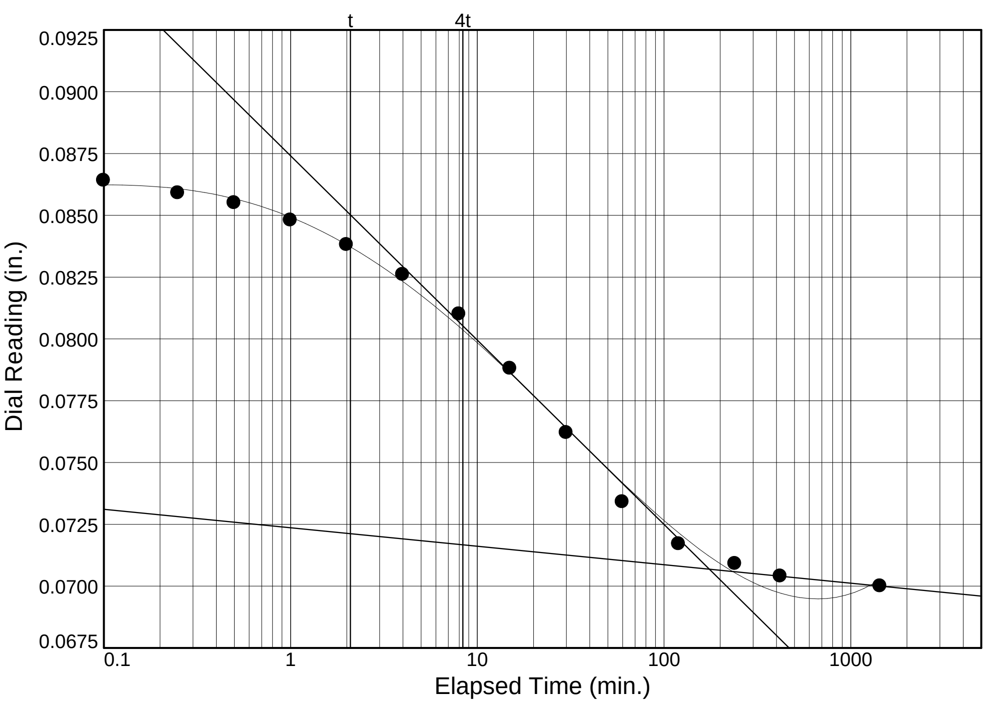
Source of Sample: T-7 Depth: 43.0'-45.0' Sample Number: T-3



Load No.= 7
Load= 4.00 tsf
D_0 = 0.0941
D_{50} = 0.0912
D_{100} = 0.0883
T_{50} = 4.51 min.

C_v @ T_{50}
0.048 $ft.^2$/day

C_α = 0.000



Load No.= 8
Load= 1.00 tsf
D_0 = 0.0871
D_{50} = 0.0789
D_{100} = 0.0707
T_{50} = 13.74 min.

C_v @ T_{50}
0.016 $ft.^2$/day

Figure

SOUTHERN EARTH SCIENCES

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 36609
251-344-9106

October 13, 2023

Kris Shantazio
Southern Earth Sciences, Inc.
Rangeline Rd.
Mobile, AL 36619

RE: Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Dear Kris Shantazio:

Enclosed are the analytical results for sample(s) received by the laboratory on September 27, 2023. The results relate only to the samples included in this report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - New Orleans

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

MK Brenner

Mary Kathryn Brenner
marykathryn.brenner@pacelabs.com
251-344-9106
Project Manager

Enclosures

cc: Jennifer Allen, Southern Earth Sciences, Inc.

Pace Analytical Services, LLC
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CERTIFICATIONS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Pace Analytical Services New Orleans

Florida Department of Health (NELAC): E87595
Illinois Environmental Protection Agency: 2000662023-7
Kansas Department of Health and Environment (NELAC): E-10266
Louisiana Dept. of Environmental Quality (NELAC/LELAP): 02006
Texas Commission on Env. Quality (NELAC): T104704405-23-18
U.S. Dept. of Agriculture Foreign Soil Import: 525-23-117-89728

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SAMPLE SUMMARY

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Lab ID	Sample ID	Matrix	Date Collected	Date Received
20290747001	**PG-7, S-2**	Solid	08/30/23 08:00	09/27/23 09:11
20290747003	**PG-7, S-4**	Solid	08/30/23 08:00	09/27/23 09:11
20290747004	**PG-7, S-5**	Solid	08/30/23 08:00	09/27/23 09:11
20290747005	**T-7, S-2**	Solid	08/30/23 08:00	09/27/23 09:11
20290747006	**T-7, S-3**	Solid	08/30/23 08:00	09/27/23 09:11
20290747007	**T-7, S-4**	Solid	08/30/23 08:00	09/27/23 09:11
20290747008	**T-7, S-5**	Solid	08/30/23 08:00	09/27/23 09:11

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SAMPLE ANALYTE COUNT

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Lab ID	Sample ID	Method	Analysts	Analytes Reported
20290747001	**PG-7, S-2**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747003	**PG-7, S-4**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747004	**PG-7, S-5**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747005	**T-7, S-2**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747006	**T-7, S-3**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	SKN	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747007	**T-7, S-4**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747008	**T-7, S-5**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1

PASI-N = Pace Analytical Services - New Orleans

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ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: PG-7, S-2 **Lab ID: 20290747001** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.1**	Std. Units	0.010	1		09/29/23 10:38		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**29.8**	%	0.50	1		09/29/23 07:55		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**53200**	ohms-cm	0.50	1		10/03/23 16:53		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**78.8**	mg/kg	65.4	1	09/29/23 16:04	10/02/23 12:08	14808-79-8	H1,H2, H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	13.1	1	09/29/23 16:04	10/02/23 11:20	16887-00-6	H1,H3

Sample: PG-7, S-4 **Lab ID: 20290747003** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.4**	Std. Units	0.010	1		09/29/23 10:47		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**26.6**	%	0.50	1		09/29/23 07:55		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**82400**	ohms-cm	0.50	1		10/03/23 15:33		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	ND	mg/kg	63.5	1	09/29/23 16:04	10/02/23 12:08	14808-79-8	H1,H2, H3

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ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: PG-7, S-4 **Lab ID: 20290747003** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	12.7	1	09/29/23 16:04	10/02/23 11:20	16887-00-6	H1,H3

Sample: PG-7, S-5 **Lab ID: 20290747004** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.2**	Std. Units	0.010	1		09/29/23 10:49		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**20.2**	%	0.50	1		09/29/23 07:55		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**95500**	ohms-cm	0.50	1		10/03/23 15:36		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**321**	mg/kg	294	5	09/29/23 16:04	10/02/23 12:08	14808-79-8	D4,H1, H2,H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	58.8	5	09/29/23 16:04	10/02/23 11:30	16887-00-6	D3,H1, H3

Sample: T-7, S-2 **Lab ID: 20290747005** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.0**	Std. Units	0.010	1		09/29/23 10:54		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**15.1**	%	0.50	1		09/29/23 07:55		N2

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ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: T-7, S-2 **Lab ID: 20290747005** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**44400**	ohms-cm	0.50	1		10/03/23 15:40		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	ND	mg/kg	58.0	1	09/29/23 16:04	10/02/23 12:08	14808-79-8	H1,H2, H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	11.6	1	09/29/23 16:04	10/02/23 11:30	16887-00-6	H1,H3

Sample: T-7, S-3 **Lab ID: 20290747006** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.7**	Std. Units	0.010	1		10/06/23 11:03		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**22.8**	%	0.50	1		10/12/23 09:54		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**79500**	ohms-cm	0.50	1		10/08/23 14:01		H1,H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**69.5**	mg/kg	63.1	1	10/06/23 13:33	10/09/23 11:02	14808-79-8	H1,H2, H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	12.6	1	10/06/23 13:33	10/09/23 10:57	16887-00-6	H1,H2, H3

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ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: T-7, S-4 **Lab ID: 20290747007** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.3**	Std. Units	0.010	1		09/29/23 10:50		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**29.5**	%	0.50	1		09/29/23 07:56		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**51800**	ohms-cm	0.50	1		10/03/23 15:42		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**105**	mg/kg	66.7	1	09/29/23 16:04	10/02/23 12:15	14808-79-8	H1,H2, H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	13.3	1	09/29/23 16:04	10/02/23 11:30	16887-00-6	H1,H3

Sample: T-7, S-5 **Lab ID: 20290747008** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**4.0**	Std. Units	0.010	1		09/29/23 10:51		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**26.1**	%	0.50	1		09/29/23 07:56		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**1230**	ohms-cm	0.50	1		10/03/23 15:44		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**1000**	mg/kg	320	5	09/29/23 16:04	10/02/23 12:17	14808-79-8	H1,H2, H3

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ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: T-7, S-5 **Lab ID: 20290747008** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	12.8	1	09/29/23 16:04	10/02/23 11:30	16887-00-6	H1,H3

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QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch:	301288	Analysis Method:	EPA 9045
QC Batch Method:	EPA 9045	Analysis Description:	9045 pH
		Laboratory:	Pace Analytical Services - New Orleans

Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

LABORATORY CONTROL SAMPLE: 1442185

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
pH at 25 Degrees C	Std. Units	6	6.0	100	97-103	

SAMPLE DUPLICATE: 1442186

Parameter	Units	20290747001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	5.1	6.1	17	20	

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QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch:	302398	Analysis Method:	EPA 9045
QC Batch Method:	EPA 9045	Analysis Description:	9045 pH
		Laboratory:	Pace Analytical Services - New Orleans

Associated Lab Samples: 20290747006

LABORATORY CONTROL SAMPLE: 1447348

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
pH at 25 Degrees C	Std. Units	6	6.0	100	97-103	

SAMPLE DUPLICATE: 1447349

Parameter	Units	20290747006 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	5.7	5.1	11	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch:	301298	Analysis Method:	Moisture
QC Batch Method:	Moisture	Analysis Description:	Dry Weight/Percent Moisture
		Laboratory:	Pace Analytical Services - New Orleans

Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

SAMPLE DUPLICATE: 1442231

Parameter	Units	20290747001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	29.8	29.5	1	20	N2

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 303229 | Analysis Method: Moisture
QC Batch Method: Moisture | Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - New Orleans

Associated Lab Samples: 20290747006

SAMPLE DUPLICATE: 1450901

Parameter	Units	20290747006 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	22.8	21.0	8	20	N2

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 301404
QC Batch Method: EPA 9038
Analysis Method: EPA 9038
Analysis Description: 9038 Sulfate, Turbidimetric
Laboratory: Pace Analytical Services - New Orleans
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

METHOD BLANK: 1442614 Matrix: Solid
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/kg	ND	50.0	10/02/23 12:08	

LABORATORY CONTROL SAMPLE: 1442615

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	200	198	99	90-110	

MATRIX SPIKE SAMPLE: 1442617

Parameter	Units	20290635001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	ND	98.3	105	98	75-125	

SAMPLE DUPLICATE: 1442616

Parameter	Units	20290635001 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfate	mg/kg	ND	ND		20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 302526
QC Batch Method: EPA 9038
Analysis Method: EPA 9038
Analysis Description: 9038 Sulfate, Turbidimetric
Laboratory: Pace Analytical Services - New Orleans
Associated Lab Samples: 20290747006

METHOD BLANK: 1447768 Matrix: Solid
Associated Lab Samples: 20290747006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/kg	ND	50.0	10/09/23 11:00	

LABORATORY CONTROL SAMPLE: 1447769

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	200	190	95	90-110	

MATRIX SPIKE SAMPLE: 1447771

Parameter	Units	20291109002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	3740	950	3690	-5	75-125	D4,H3,M1

SAMPLE DUPLICATE: 1447770

Parameter	Units	20291109002 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfate	mg/kg	3740	3700	1	20	D4,H3

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 36609
251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 301405
QC Batch Method: EPA 9251
Analysis Method: EPA 9251
Analysis Description: 9251 Chloride
Laboratory: Pace Analytical Services - New Orleans
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

METHOD BLANK: 1442620 Matrix: Solid
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/kg	ND	10.0	10/02/23 11:20	

LABORATORY CONTROL SAMPLE: 1442621

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	666	614	92	90-110	

MATRIX SPIKE SAMPLE: 1442623

Parameter	Units	20290635001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	ND	983	928	94	75-125	

SAMPLE DUPLICATE: 1442622

Parameter	Units	20290635001 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	mg/kg	ND	ND		20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 36609
251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 302525
QC Batch Method: EPA 9251
Analysis Method: EPA 9251
Analysis Description: 9251 Chloride
Laboratory: Pace Analytical Services - New Orleans

Associated Lab Samples: 20290747006

METHOD BLANK: 1447764
Matrix: Solid
Associated Lab Samples: 20290747006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/kg	ND	10.0	10/09/23 10:57	

LABORATORY CONTROL SAMPLE: 1447765

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	666	616	93	90-110	

MATRIX SPIKE SAMPLE: 1447767

Parameter	Units	20291109002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	554	9500	9560	95	75-125	D4,H3

SAMPLE DUPLICATE: 1447766

Parameter	Units	20291109002 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	mg/kg	554	553	0	20	D4,H3

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

QUALIFIERS

Project:	MAA/M23-442 08/30/23
Pace Project No.:	20290747

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

ANALYTE QUALIFIERS

D3	Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.
D4	Sample was diluted due to the presence of high levels of target analytes.
H1	Analysis conducted outside the EPA method holding time.
H2	Extraction or preparation conducted outside EPA method holding time.
H3	Sample was received or analysis requested beyond the recognized method holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
N2	The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 36609
251-344-9106

QUALITY CONTROL DATA CROSS REFERENCE TABLE

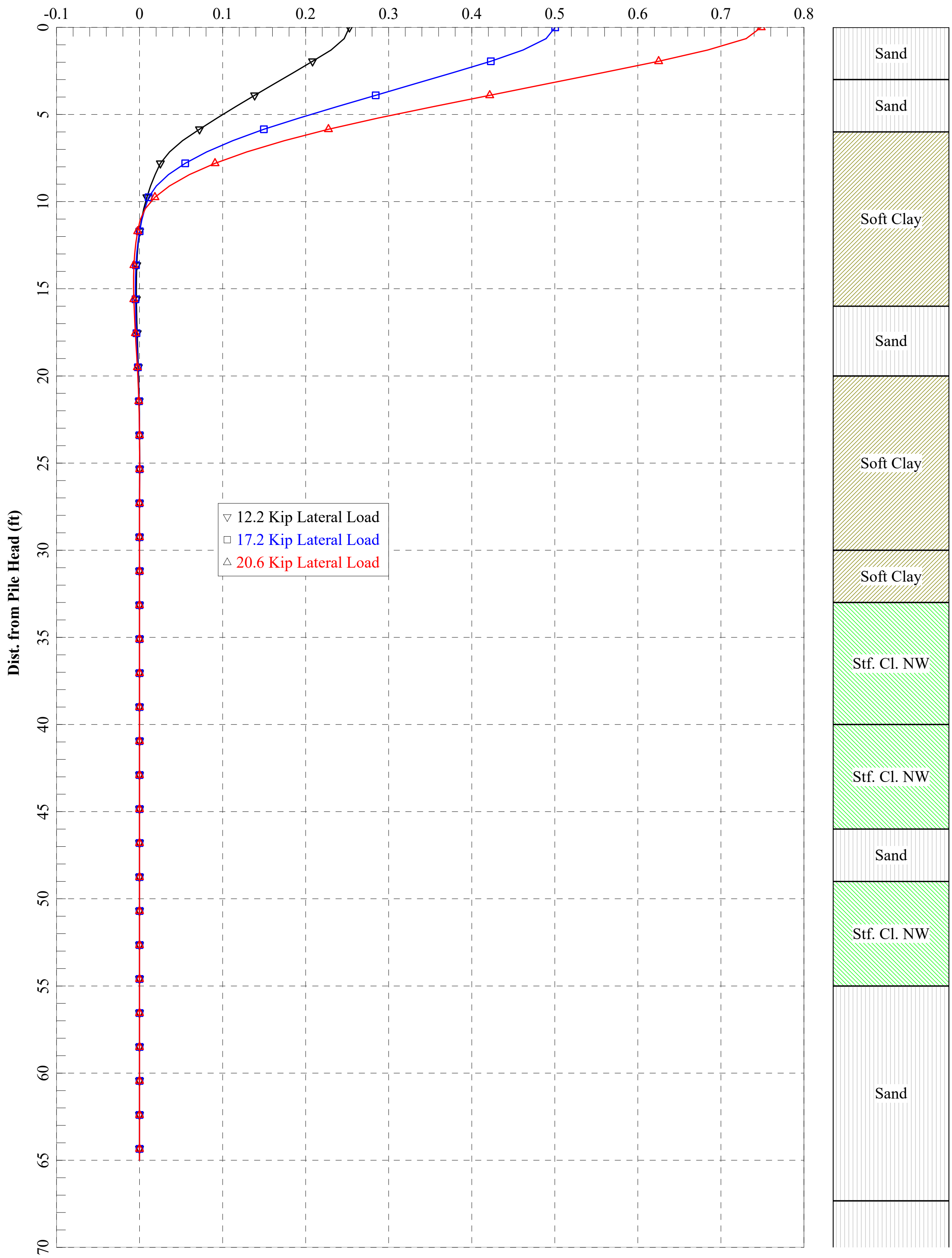
Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

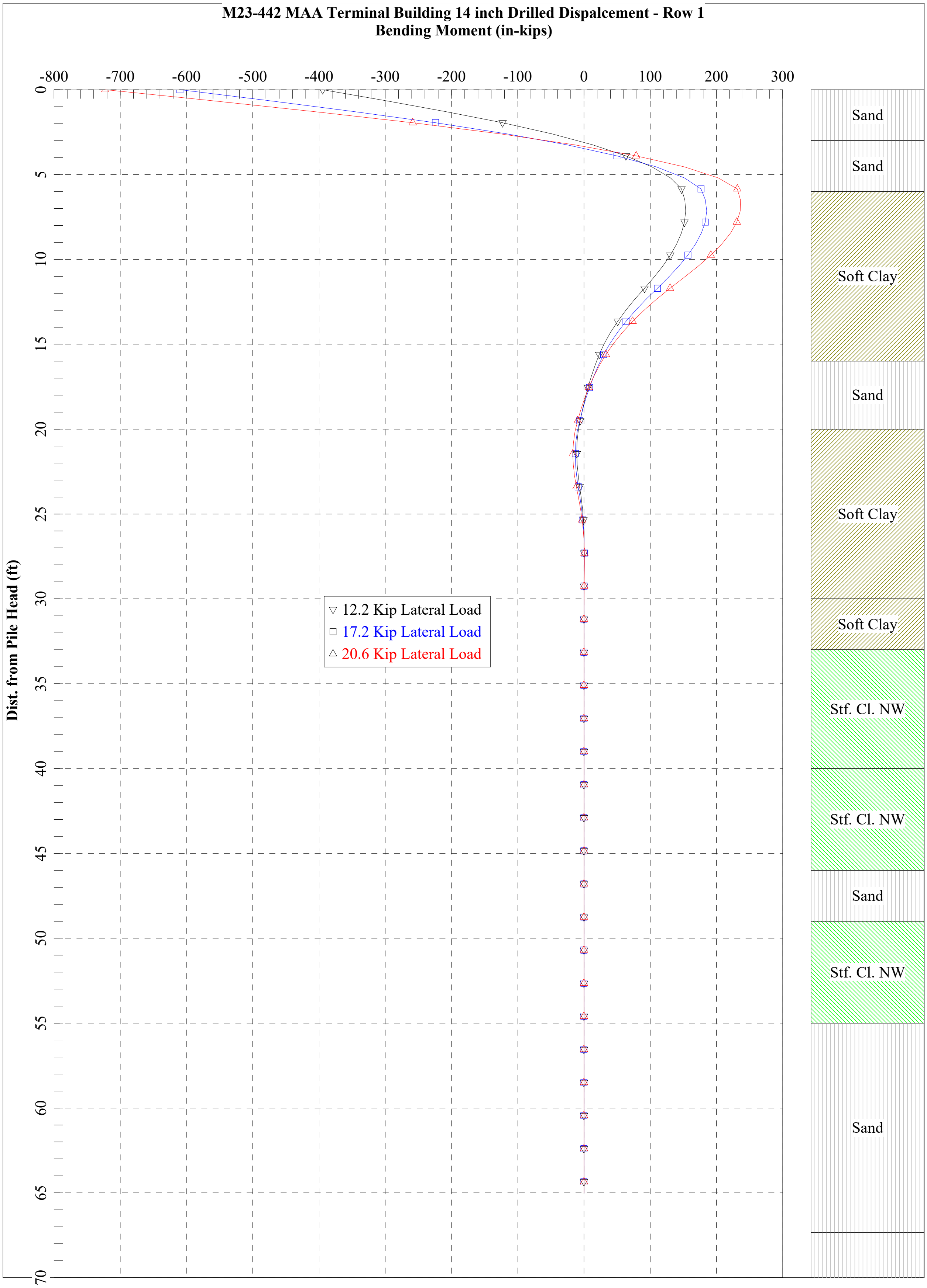
Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
20290747001	**PG-7, S-2**	EPA 9045	301288		
20290747003	**PG-7, S-4**	EPA 9045	301288		
20290747004	**PG-7, S-5**	EPA 9045	301288		
20290747005	**T-7, S-2**	EPA 9045	301288		
20290747006	**T-7, S-3**	EPA 9045	302398		
20290747007	**T-7, S-4**	EPA 9045	301288		
20290747008	**T-7, S-5**	EPA 9045	301288		
20290747001	**PG-7, S-2**	Moisture	301298		
20290747003	**PG-7, S-4**	Moisture	301298		
20290747004	**PG-7, S-5**	Moisture	301298		
20290747005	**T-7, S-2**	Moisture	301298		
20290747006	**T-7, S-3**	Moisture	303229		
20290747007	**T-7, S-4**	Moisture	301298		
20290747008	**T-7, S-5**	Moisture	301298		
20290747001	**PG-7, S-2**	EPA 120.1 Resistivity	301882		
20290747003	**PG-7, S-4**	EPA 120.1 Resistivity	301882		
20290747004	**PG-7, S-5**	EPA 120.1 Resistivity	301882		
20290747005	**T-7, S-2**	EPA 120.1 Resistivity	301882		
20290747006	**T-7, S-3**	EPA 120.1 Resistivity	302601		
20290747007	**T-7, S-4**	EPA 120.1 Resistivity	301882		
20290747008	**T-7, S-5**	EPA 120.1 Resistivity	301882		
20290747001	**PG-7, S-2**	EPA 9038	301404	EPA 9038	301668
20290747003	**PG-7, S-4**	EPA 9038	301404	EPA 9038	301668
20290747004	**PG-7, S-5**	EPA 9038	301404	EPA 9038	301668
20290747005	**T-7, S-2**	EPA 9038	301404	EPA 9038	301668
20290747006	**T-7, S-3**	EPA 9038	302526	EPA 9038	302557
20290747007	**T-7, S-4**	EPA 9038	301404	EPA 9038	301668
20290747008	**T-7, S-5**	EPA 9038	301404	EPA 9038	301668
20290747001	**PG-7, S-2**	EPA 9251	301405	EPA 9251	301667
20290747003	**PG-7, S-4**	EPA 9251	301405	EPA 9251	301667
20290747004	**PG-7, S-5**	EPA 9251	301405	EPA 9251	301667
20290747005	**T-7, S-2**	EPA 9251	301405	EPA 9251	301667
20290747006	**T-7, S-3**	EPA 9251	302525	EPA 9251	302556
20290747007	**T-7, S-4**	EPA 9251	301405	EPA 9251	301667
20290747008	**T-7, S-5**	EPA 9251	301405	EPA 9251	301667

APPENDIX 4

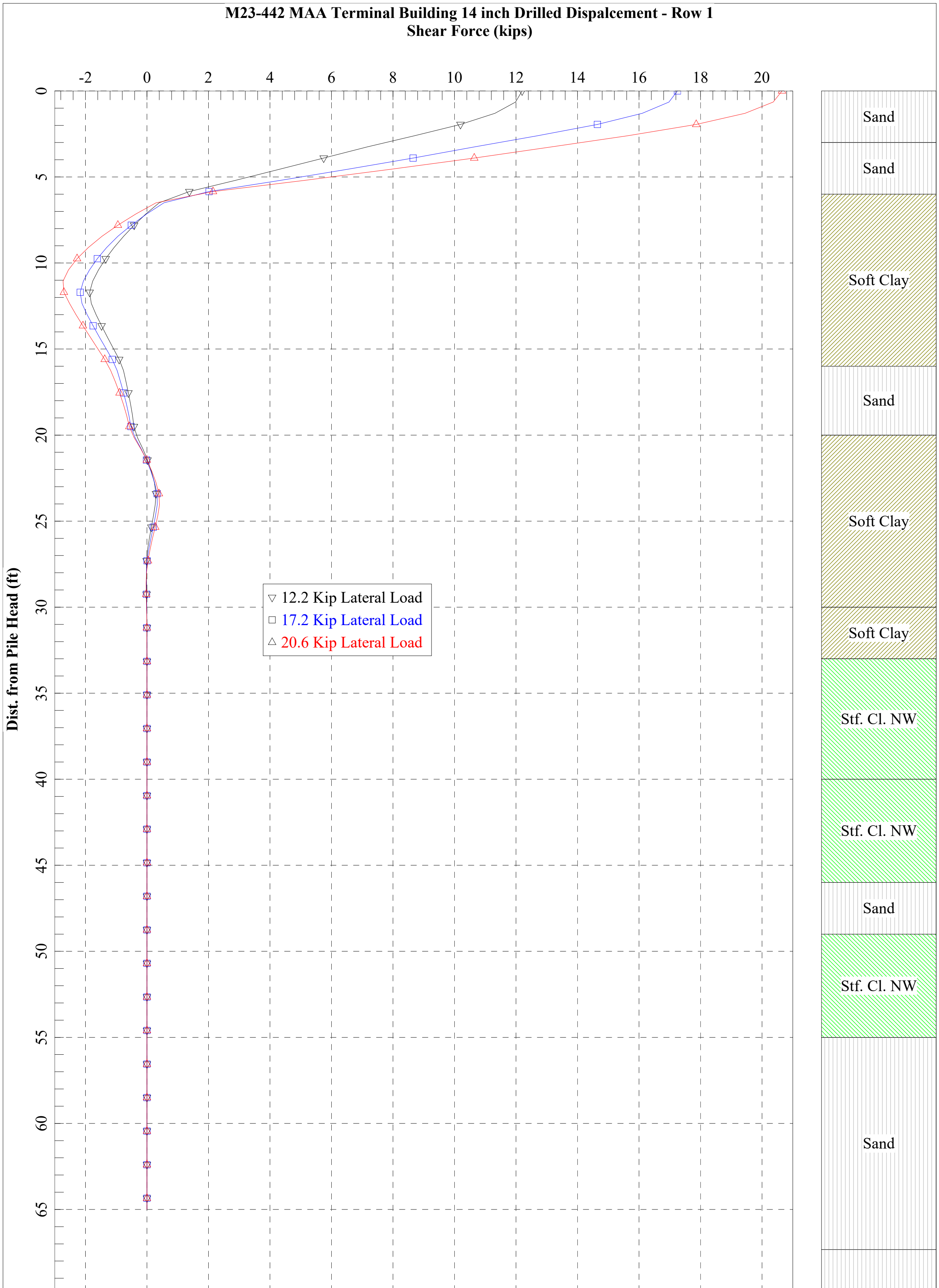
L-Pile Analysis Results

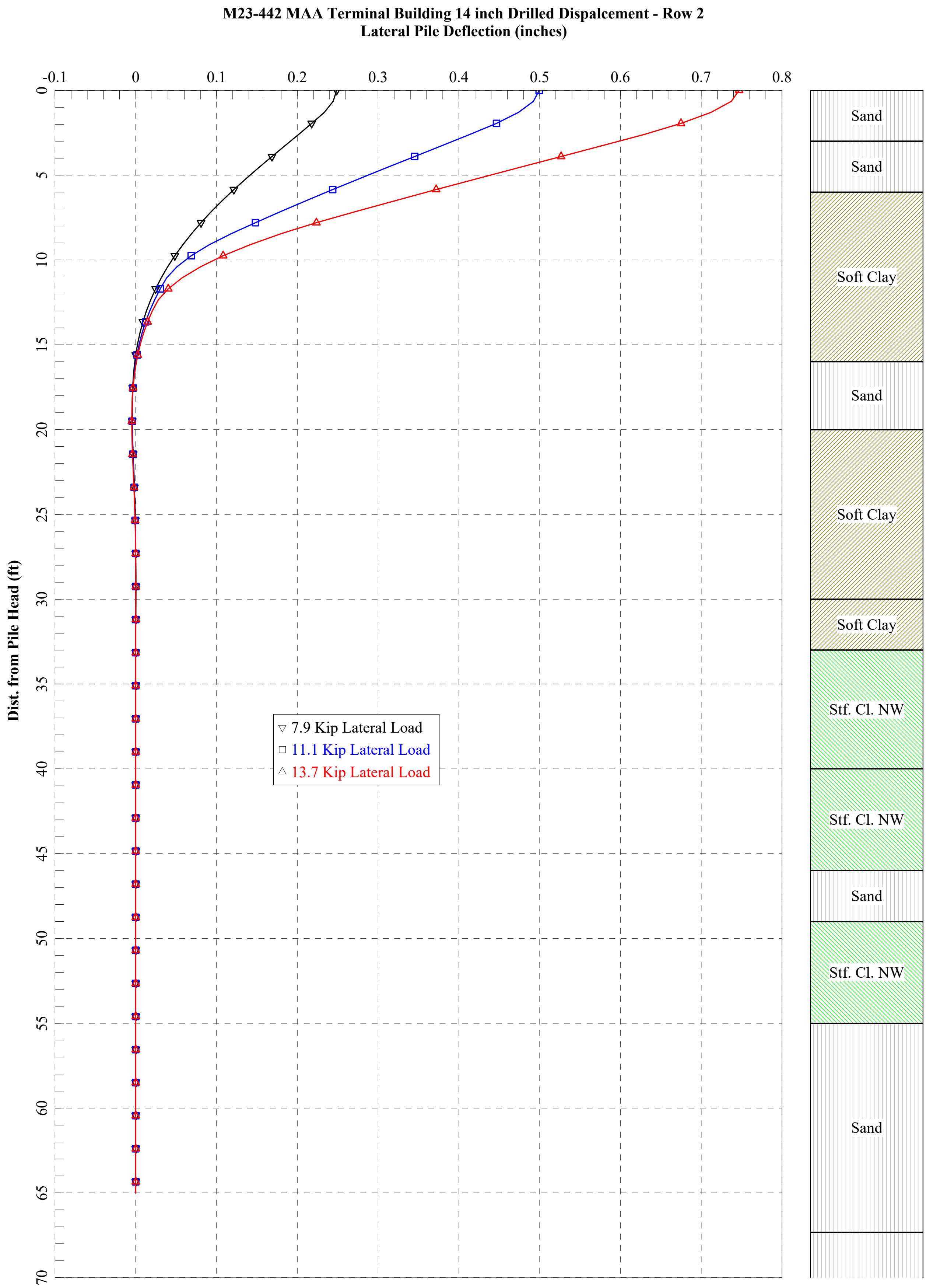
M23-442 MAA Terminal Building 14 inch Drilled Dispalcement - Row 1
Lateral Pile Deflection (inches)

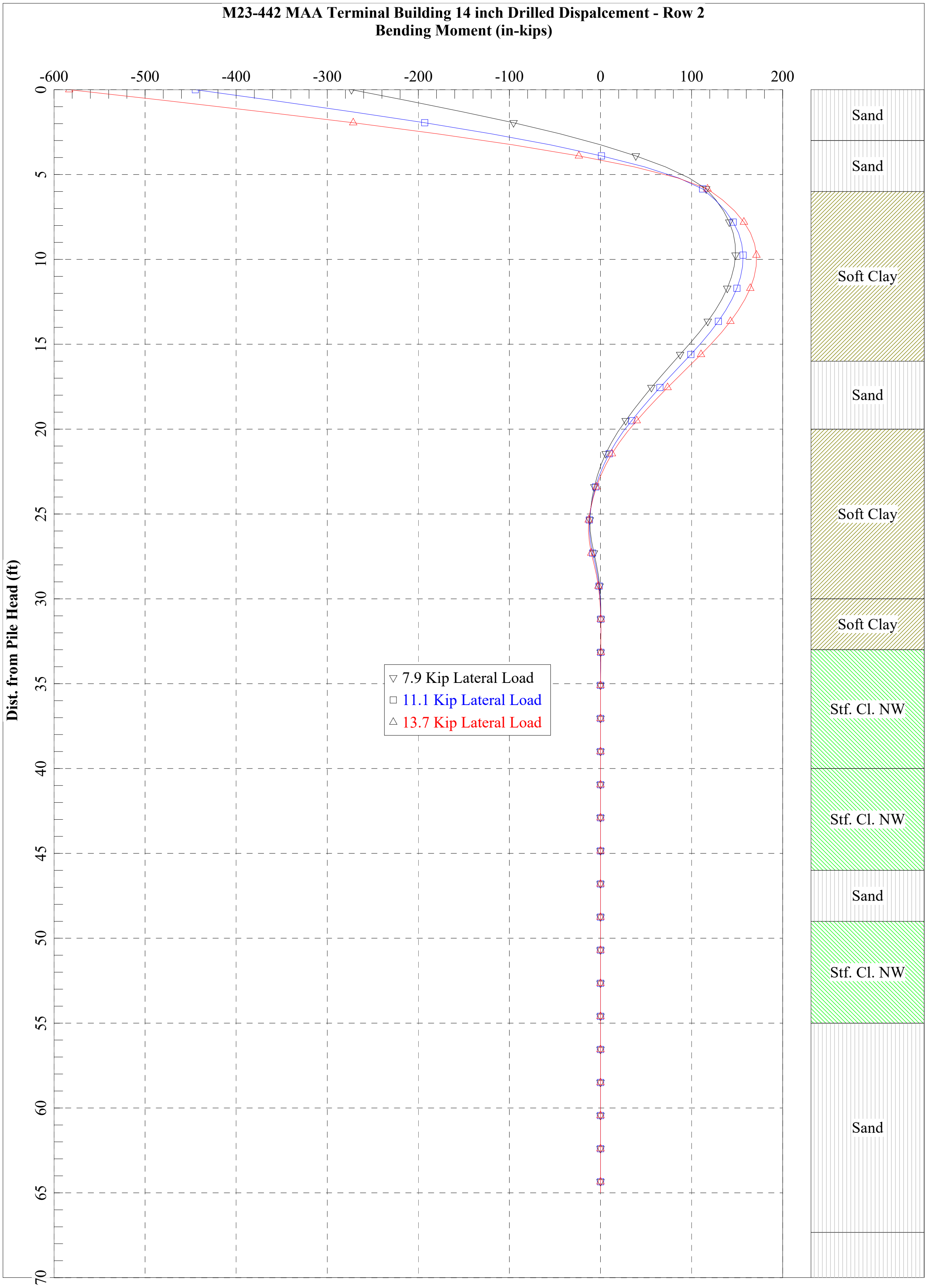




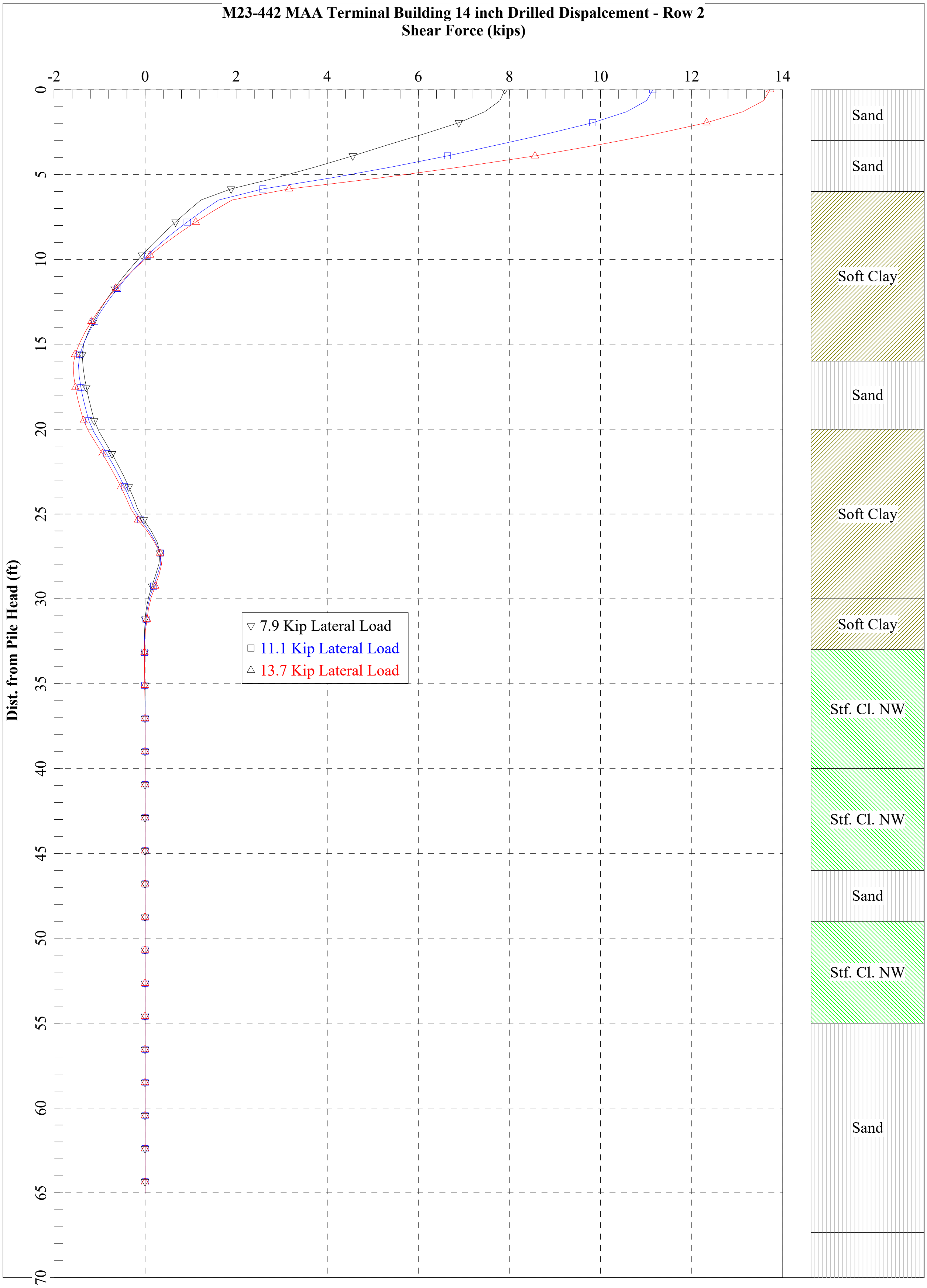
M23-442 MAA Terminal Building 14 inch Drilled Dispalcement - Row 1
Bending Moment (in-kips)
-800
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
12.2 Kip Lateral Load
17.2 Kip Lateral Load
20.6 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand


M23-442 MAA Terminal Building 14 inch Drilled Dispalcement - Row 1
Shear Force (kips)
-2
0
2
4
6
8
10
12
14
16
18
20
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
12.2 Kip Lateral Load
17.2 Kip Lateral Load
20.6 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand


M23-442 MAA Terminal Building 14 inch Drilled Dispalcement - Row 2
Lateral Pile Deflection (inches)
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
7.9 Kip Lateral Load
11.1 Kip Lateral Load
13.7 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand



M23-442 MAA Terminal Building 14 inch Drilled Dispalcement - Row 2
Bending Moment (in-kips)
-600
-500
-400
-300
-200
-100
0
100
200
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
7.9 Kip Lateral Load
11.1 Kip Lateral Load
13.7 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand



M23-442 MAA Terminal Building 14 inch Drilled Dispalcement - Row 2
Shear Force (kips)
-2
0
2
4
6
8
10
12
14
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
7.9 Kip Lateral Load
11.1 Kip Lateral Load
13.7 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand

APPENDIX 5

Provided Plans

PERIMETER ROAD
AVENUE O
MICHIGAN AVE

SOUTHERN EARTH SCIENCES

Geotechnical | Environmental | Materials Testing

Mobile International Airport Proposed Parking Garage

Mobile Aeroplex at Brookley

Report of Subsurface Investigation and Geotechnical Engineering Evaluation

Prepared for:
VOLKERT, INC
Mobile, AL
SESI Project No: M23-442
October 25, 2023

SOUTHERN EARTH SCIENCES

MOBILE OFFICE
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Mobile, AL 36619

Tel: (251) 344-7711
Fax: (251) 443-9000
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October 25, 2023

VOLKERT, INC
1110 Montlimar Drive
Suite 1050
Mobile, AL 36609

ATTENTION: Mr. "Hank" Harold Z. Eubanks, P.E.
Asst. Vice President

REFERENCE: Report of Subsurface Investigation and Geotechnical Engineering Evaluation
Mobile International Airport – Proposed Parking Garage
Mobile Aeroplex at Brookley
Mobile, AL
SESI Project No: M23-442

Dear Mr. Eubanks:

Southern Earth Sciences, Inc. (SESI) has completed the subsurface investigation and geotechnical engineering evaluation for the referenced project. This report presents our understanding of the available project information and outlines our soil related recommendations and comments regarding construction and foundation support for the proposed parking garage structure.

We appreciate this opportunity to be of service and look forward to our continued involvement throughout pile testing and construction phases of the project. Please do not hesitate to contact us if you have any questions.

Sincerely,

SOUTHERN EARTH SCIENCES, INC.

Matt Coaker, P.E.
Vice President
Registered, Alabama 30835

Curran Nicholas, E.I.
Geotechnical Project Manager

MC/CN
Attachments

APPENDIX 1

Test Location Plans

Soil Profile

APPENDIX 2

CPT Sounding Logs

Soil Boring Logs

Shear Wave Velocity vs Depth

APPENDIX 3

Laboratory Test Data

APPENDIX 4

L-Pile Analysis Results

APPENDIX 5

Pile Penetration Plan

APPENDIX 6

Provided Plans

1.0 PROJECT INFORMATION

Based on our understanding of the provided information, the project will consist of a new multi-level airport parking garage structure totaling approximately 100,000 ft^2 in plan area. The project site is located on the west side of Michigan Avenue north of the existing Mobile Downtown Airport Terminal Building. The proposed parking garage will be constructed over the recently enclosed Rabby Creek. Based on the preliminary structural loading information provided to us by Mr. Thiago Leao, P.E. with Walker Consultants, we understand maximum interior and exterior column loads are expected to be on the order of approximately 1,400 kips and 700 kips, respectively. No additional detailed project information was available at this time. SES should be consulted to review project plans and details as the design progresses.

2.0 SITE DESCRIPTION, TOPOGRAPHY AND PROPOSED SITE GRADING

Based on our review of historical aerial imagery, the majority of the proposed parking garage structure will be located in areas previously used for automobile and tractor trailer parking and container storage. Rabby Creek was enclosed in 2022 with a cast-in-place concrete culvert. The culvert approximately bisects the proposed parking garage structure. Existing ground elevations estimated from the provided topographic data (post Rabby Creek enclosure) range from approximately elevation (EL) +17 within the southcentral portion of the proposed garage (Rabby Creek alignment) to EL +22 within the eastern portion of the structure.

Based on our correspondence with Mr. Nick Rose with Volkert, Inc., we understand that the Finished Floor Elevation of the garage structure is set at EL+25 feet, which is approximately 3 to 8 feet above current site elevation. Based on the topographic survey performed prior to the Rabby Creek enclosure, the lowest grade along Rabby Creek and within the proposed parking garage footprint was near EL +12, meaning that final grade of the proposed parking garage may be as much as 13 feet above the original pre-enclosure site elevation along the previous Rabby Creek Alignment. All reference to elevation has been estimated based on the provided topographic survey data attached for reference in **Appendix 6**.

3.0 FIELD INVESTIGATION

Ten (10) Cone Penetrometer Test (CPT) soundings, one (1) SCPT sounding (CPT_u sounding with Shear Wave Velocity measurements), and one (1) Standard Penetration Test (SPT) boring were performed within the project area. CPT soundings and the soil boring were performed by SES field crews at the approximate locations shown on the Test Location Plan included in **Appendix 1**. Test locations were selected by SES engineering staff and were cleared in the field of underground utilities using Ground Penetrating Radar (GPR) by E.F. Thompson Geotechnologies, Inc.

CPT soundings were advanced to depths ranging from approximately 100 to 150 feet below ground surface in general accordance with ASTM Specification D-5778 using a truck mounted 20-ton Hogentogler Electronic CPT rig. Soil classifications were interpreted from methods recommended by Robertson and Campanella. Correlations between Cone Resistance values and Standard Penetration Testing "N" values were performed according to the methods developed by Robertson, Campanella and Wightman. The soil types and stratigraphy shown on the CPT Log sheets are based upon material parameters measured and evaluated as the cone is advanced. CPT Log sheets graphically showing the cone tip resistance, friction, equivalent N60-value and interpreted soil behavior type at each sounding location are attached in **Appendix 2**.

The Seismic CPT sounding was advanced to approximately 100 feet below existing grade in general accordance with ASTM Specification D-5778 and D-7400 using the same truck mounted 20-ton Hogentogler Electronic CPT rig as used for the conventional CPT soundings. The sounding was conducted with a piezo cone that is equipped with a geophone sensor to measure the magnitude and arrival time of seismic shear and compression waves. Seismic shear waves are generated at the soil surface by striking the end of a steel plate that is pressed onto the ground using the leveling jack of the rig. An electronic trigger attached to the hammer records the exact time of the strike. As seismic waves are registered by the geophone sensors, data is transferred from the cone to the soil surface by wires that run though the push rods. The SCPT data acquisition system logs this data and analyzes it to determine the speed of the waves based on their arrival time and the distance between the wave generator and the sensors. Shear wave velocity measurements were taken at five (5) foot intervals to full depth of the sounding. Shear wave velocities with depth are attached in **Appendix 2**.

The soil boring with Standard Penetration Tests (SPTs) was advanced to a depth of approximately 90 feet below the existing ground surface using truck mounted drilling equipment. Soil sampling and penetration testing in the soil test borings were performed in general accordance with ASTM Specification D 1586 using solid stem auger until groundwater was encountered and mud rotary drilling techniques below the groundwater level for the remainder of the boring. At regular intervals during the process, the drill rods were removed, and soil samples were obtained with a standard 2-inch split tube sampler. Soils were sampled at 2.5 ft intervals to 10 feet and then at 5 ft sample intervals to boring termination.

Representative portions of soil samples obtained during the investigation were transported to our laboratory for classification testing. Samples were examined by an engineer and classified in accordance with the Unified Soil Classification System. Soil descriptions, penetration resistances and laboratory testing results are shown on the appropriate Soil Boring Log sheets attached in **Appendix 2**.

4.0 LABORATORY TESTING

Laboratory testing included physical examination and general classification testing of samples obtained from the soil test borings in SES laboratories. Testing included Moisture Content Determination (ASTM D2216), No. 200 Sieve Washes (ASTM D1140), Sieve Analysis (ASTM D6913), Atterberg Limits Tests (ASTM D4318), Consolidation Tests (ASTM D2435) and Unconsolidated Undrained (UU) Triaxial Tests (ASTM D2850). Test results are included on Soil Boring Logs attached in **Appendix 2** and on Laboratory Test Data Summary Sheets attached in **Appendix 3.** Test reports for the consolidation and UU Triaxial tests are also included in **Appendix 3**.

4.1 Laboratory Chemical Analysis and Corrosion Potential

Selected soil samples obtained from within the upper 10 feet of the site were forwarded to Pace Analytical Services, LLC for analytical testing. Testing included pH (EPA 9045), Resistivity (EPA 9050), Sulfate (EPA9038) and Chloride (EPA 9251). In some instances, test results of samples collected within nearby buildings and during previous explorations within areas of similar subsurface conditions have been used to supplement our assessment of the potential for corrosion of buried steel and deterioration of concrete foundation elements. Test results are summarized in the following table and are attached in **Appendix 3** for reference. Our conclusions, based on these test results and our experience with similar soils present across the Mobile Aeroplex at Brookley, are discussed in the following sections.

TABLE 1

CORROSION SERIES LABORATORY TEST RESULTS

Soil Test Location	Sample Depth (ft)	pH	Resistivity (Kohm-cm)	Sulfate (mg/kg)	Chloride (mg/kg)
PG-7, S-2	2.5 – 4.0	5.1	53.2	78.8	<33.3
PG-7, S-4	5.0 – 6.5	5.4	82.4	<33.3	<33.3
PG-7, S-5	10 – 11.5	5.2	95.5	321	<33.3
T-7, S-2	2.5 – 4.0	5.0	44.4	<33.3	<33.3
T-7, S-3	5.0 – 6.5	5.7	79.5	69.5	<33.3
T-7, S-4	7.5 – 9.0	5.3	51.8	105	<33.3
T-7, S-5	10 – 11.5	4.0	1.23	1000	<33.3

4.1.1 Soil Resistivity

Laboratory results indicate measured resistivity values ranging from 1.23 to 95.5 kohm-cm. This range of resistivity values is considered highly corrosive to essentially non-corrosive to buried steel infrastructure. The table below summarizes the relative corrosivity rating as a function of soil resistivity. Variation in soil resistivity at this site is anticipated as upper soils vary considerably in density, moisture content, gradation, and organic content.

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TABLE 2

CORROSION SEVERITY RATING BASED ON RESISTIVITY

(From Unified Facilities Criteria (UFC) 3-570-01 and Corrosion Basics: An Introduction 2nd Edition, by Pierre R. Roberge, 2006 by NACE Press Book)

Soil Resistivity Range (*Kohm-cm)*	Relative Corrosivity Rating
< 1	Extremely Corrosive
1 to 3	Highly Corrosive
3 to 5	Corrosive
5 to 10	Moderately Corrosive
10 to 20	Mildly Corrosive
20 to 30	Progressively Less Corrosive
> 30	Essentially Non-Corrosive

4.1.2 Soil pH

Acidic attack of concrete is generally not a concern unless it is exposed to a relatively continuous flow of groundwater and a pH of less than 5.5. pH of tested samples ranged from 4.0 to 5.7. Although pH values are relatively low at some locations and depths, foundation infrastructure is anticipated to be constructed well above the groundwater level. Our opinion is that the effect of pH on concrete foundations at this site is not a concern.

4.1.3 Chlorides

Chloride test results in accordance with EPA 9251 indicate that concentrations on tested samples are generally less than 33.3 mg/kg. According to guidelines established by the Federal Highway Administration (FHWA), soil chloride concentrations less than 500 mg/kg are not considered severe. Chloride concentrations are not considered severe at this site.

4.1.4 Sulfates

Soluble sulfate testing of soils in accordance with test method EPA 9038 indicates that sulfate concentrations of tested samples range from below the reporting limit of 33.3 mg/kg to approximately 1000 mg/kg. Sulfate exposure is considered to be moderate to negligible by ACI standards with respect to effects on buried concrete foundations. The use of Type I/II cement will be suitable for use in buried foundation elements at this site. The following table presents a summary of guidelines for cement type selection as recommended in Table 4.3.1 of the American Concrete Institute (ACI) Code.

TABLE 3

CEMENT TYPE FOR CONCRETE EXPOSED TO SULFATES

(Table 4.3.1 of the American Concrete Institute (ACI) Code)

Sulfate as SO_4 (mg/Kg)	Relative Degree of Sulfate Attack	Cement Type
0 – 1,000	Negligible	I
1,000 to 2,000	Moderate	II
2,000 to 20,000	Severe	V
20,000 or more	Extreme	V plus pozzalan

5.0 GENERALIZED SUBSURFACE CONDITIONS

The subsurface descriptions below are generalized to highlight the major subsurface stratigraphy encountered across the site. The Soil Boring Logs and CPT Sounding Logs attached in **Appendix 2** and Soil Profiles attached in **Appendix 1** present specific information at individual boring location including soil description, stratification, approximate elevation, ground water level, soil strength and laboratory tests results. This information is representative of conditions encountered at boring locations. Variations may occur and should be expected between boring locations. The stratification represents the approximate boundary between subsurface materials as the actual transition may be gradual. Approximate ground elevations at test locations were estimated using the topographic data provided to us in **Appendix 6**.

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Soils within approximately the upper 1 to 4 ft of the site generally consist of loose to medium dense silty and clayey sands underlain by very soft to stiff silts and clays to approximately 10 feet. Below approximately 10 ft, very soft to soft silts and clays were encountered to depths ranging from approximately 15 to 20 feet. A thin, loose silty sand substrata was encountered at depths ranging between approximately 15 ft and 24 ft. Below this level, soft to medium stiff silts and clays were encountered to depths of approximately 50 to 60 feet.

Soils below depths ranging from 50 to 60 feet are variable across the building area. The approximate delineation between East and West Site Regions is shown on the Pile Penetration Plan discussed in the following sections and attached in **Appendix 5**. Below approximately 50 ft within the western portion of the proposed structure (PG-3, PG-4, PG-5, PG-6, PG-7, PG-8, PG-9, SCPT-PG-10), alternating strata of medium dense sands and stiff silts and clays were encountered to approximately 70 to 75 ft. Below this layer, dense sands were encountered to the termination of most CPT Soundings at a depth of approximately 100 ft. SCPT-PG-10 is considered an outlier with alternating strata of medium dense sands and stiff silts and clays to approximately 60 ft underlain by medium dense to dense sands to 80 ft followed by stiff silts and clays to 85 ft before terminating in the dense sands to a depth of 100 ft. Below approximately 100 ft at the deepest test location, PG-9, loose to medium dense sands were encountered to termination of the investigation approximately 150 feet below the existing ground surface.

Below approximately 55 ft within the eastern portion of the proposed structure (PG-1, PG-2, PG-11, PG-12), soils generally consisted of medium dense to dense sands to termination of most CPT Soundings at a depth of approximately 100 ft. PG-1 is considered an outlier and encountered medium dense to dense sands below approximately 60 ft to approximately 68 ft underlain by alternating strata of loose sands and medium stiff silts and clays to approximately 75 ft terminating in the dense sands to a depth of 100 ft. Below approximately 90 ft at test location, PG-12 stiff sandy silts were encountered to approximately 100 ft followed by loose to medium dense sands to termination of the investigation approximately 150 feet below the existing ground surface. Detailed descriptions of soils encountered at each test location are shown on the appropriate CPT Sounding logs included in **Appendix 2**.

6.0 GROUNDWATER

Direct groundwater measurements were not possible at CPT locations at the time of our investigation due to most of the CPT sounding holes collapsing upon rod removal. Caved depths ranged from approximately 1 to 4 feet below the existing ground surface, likely indicating proximity to perched water levels or saturated soil conditions near or above the collapsed depths. Depth to sounding collapse at each test location at the time of our investigation are shown on the appropriate CPT sounding sheet attached in **Appendix 2**. Soil boring PG-7 encountered water at a depth of approximately 6 feet below existing ground surface at the time of our investigation, likely indicating proximity to perched water level. The groundwater level encountered at PG-7 at the time of our investigation is shown on the appropriate Soil Boring Log attached in **Appendix 2.**

Estimation of static groundwater levels using measured porewater pressure from CPT data indicates that a hydrostatic water level exists at depths of approximately 19 to 21 feet below ground surface or near EL+0. While the true static groundwater table is deep, our experience at this site indicates that shallow groundwater (perched water) levels will usually be present and will fluctuate with weather conditions at the time of construction. The low permeability silty and clayey soils present within the upper reaches of this site will create shallow perched water conditions within imported granular fill soils after periods of rainfall.

Groundwater depths or elevations should be verified at the time of construction for cases where groundwater variations are potentially significant for construction. Fluctuation in the groundwater table will occur due to variances in rainfall, elevation, drainage, types of soil encountered and other factors not evident at the time measurements were made. Reference to depth has been made with respect to the existing ground surface encountered at the time of our field investigation.

7.0 SEISMIC CONSIDERATIONS AND GEOLOGIC HAZARDS

Down-hole shear wave velocities measured within the upper 100 feet of site at test locations performed within the proposed garage building area indicate a weighted average shear wave velocity of approximately 625 feet per second. Shear wave velocity measurements plotted vs. depth are attached in **Appendix 2**. Per ASCE-7-2016 and the International Building Code (IBC) 2018 Edition, our opinion is that this site would best be categorized as **Site Class D**. The site is not within a special seismic hazard or earthquake fault zone. Based on subsurface information collected at the site and our experience in this geologic area, supplemental geologic hazard evaluations are not recommended for this site. Potentially liquefiable soils were not encountered. Liquefaction induced settlement and/or lateral spread is not a concern at this site.

8.0 GEOTECHNICAL OVERVIEW

Our evaluation of subsurface conditions and foundation alternatives for this project has been based on the project information previously described in this report and subsurface data obtained during the investigation. In evaluating the CPT sounding and soil boring data, we have used empirical correlations previously established between standard penetration resistances, cone tip and side resistance values, soil index properties and foundation stability. Soil parameters used in the evaluation were derived from the CPT sounding data using the interpretation software RAPID CPT® by Dataforensics.

8.1 Parking Garage Foundations

Soils encountered between approximately 4 and 40 feet consist of highly compressible, loose clayey sands and very soft to soft clays. Considering the anticipated magnitude of structural loads for this project and the presence of these highly compressible soils, shallow foundations are not considered a viable option for this structure. Pile foundations will be required for support of building foundations. Pile foundations will provide positive foundation support by transferring structural loads into the medium dense sand bearing strata encountered beginning at depths ranging from approximately 55 to 75 feet beneath the existing ground surface.

Pile lengths will vary considerably across the building area due to the variation in depth to the top of the dense sand bearing strata and due to the intermediate clay strata present between approximately 60 and 75 feet below grade within the western portion of the site. The approximate delineation of anticipated pile length variation is depicted on the Pile Penetration Plan in **Appendix 5**. Test locations SCPT-PG-10 and PG-1 are considered outliers and will require deeper pile penetration than the other piles in their respective areas of the project site. To help delineate required pile penetration in these areas, we recommend performing several supplemental CPT Soundings in each area to assist with refining final pile lengths. This supplemental exploration should be performed prior to the test pile program by or under the direct supervision of the SES Geotechnical Engineer of Record.

Augercast piles and Drilled Displacement Piles would be acceptable pile types for this project from a geotechnical capacity standpoint. Driven piles would be an acceptable alternative from a geotechnical perspective but have not been addressed in this report due to expected hard driving that would be encountered above design tip elevation and resulting vibrations and noise during pile installation that could be problematic to the nearby facilities and operations. Pile design recommendations are provided in the following sections of this report.

8.2 Ground Level Floor Slabs

The soft clay soils present at this site between depths of approximately 4 and 40 feet are not capable of providing uniform support for a soil supported floor slab concept at the proposed Finished Floor Elevation. When subjected to the weight of fill soils that have been placed during enclosing Rabby Creek and the planned addition of up to approximately 8 feet of anticipated fill, these soft and loose materials will be susceptible to settlements estimated to range from approximately 2 inches in areas of minimal fill up to approximately 6.5 inches in areas of maximum fill. A portion of the anticipated settlement at this site would consist of a relatively short-term strain-type settlement that would occur during and shortly after fill placement, but most of the settlement would consist of long-term consolidation settlement that would occur over a period of several years after fill placement and completion of construction. Secondary compression would theoretically continue indefinitely throughout the design life of the facility. Fill induced settlement of soil supported floor slabs and hardscape would be differential with respect to pile supported foundation elements and will vary across the proposed garage structure area with fill height above existing grade. Based on our experience with similar soil conditions and many existing structures across Mobile Aeroplex at Brookley, we have assumed that pile foundations will likely be the preferred approach to minimize the potential for ground level floor slab settlement on this project.

As an alternative to pile supporting the ground level floor slabs, surcharging the building area with earthen fill above final design grade and prefabricated vertical wick drains for a period of time prior building construction could be considered to help reduce post construction settlement. A surcharge program at this site could be designed to reduce primary consolidation settlement to less than approximately 1-inch, but surcharging would not eliminate post construction differential settlement of grade supported floor slabs with respect to pile supported foundation elements over the life of the facility as some consolidation settlement potential will remain after surcharging, and secondary compression settlement in these soft soils can continue indefinitely.

A surcharge program for this project site would generally consist of installing prefabricated vertical wick drains to a depth of approximately 60 feet below existing grade on an approximate 4 to 5 ft center to center triangular spacing followed by preloading areas within and extending a lateral distance of approximately 25 – 50 feet outside the building perimeter with 6 to 10 feet of earthen surcharge material above FFE for a period of 90 to 120 days. For reporting purposes, we have anticipated that surcharging will not be considered a viable option for this project due to construction scheduling constraints. Should construction scheduling allow for a surcharge program, SES should be consulted to provide detailed recommendations for surcharge height, duration, and a settlement monitoring plan.

9.0 FOUNDATION RECOMMENDATIONS

Building foundations and the ground level floor slab system should be structurally supported by deep foundations. Ideally, the building and first level floor system could be constructed as an elevated structure to minimize fill heights above existing grade. This approach would result in a more efficient pile design since down-drag reduction would not be necessary and would also reduce the potential for differential settlement of grade supported hardscape and utilities with respect to pile supported foundation elements. If fill placement beneath and surrounding the structure cannot be limited, and up to approximately 8 feet of fill will be placed above original grade to achieve FFE EL +25, a reduction in allowable compressive pile capacity will be required to account for down-drag forces and special provisions will be necessary to manage differential settlement between pile supported foundations and grade supported hardscape, pavements, utilities, etc.

The following tables present our recommended pile penetration depths and corresponding allowable compression and tension capacities from static analysis. **Tables 4, 5, 8 and 9** present pile capacities that could be considered in areas where fill placement above existing grade can be limited to approximately 18 inches above existing grade. **Tables 6, 7, 10 and 11** present pile capacities that should be used if fill heights will exceed approximately 18 inches above existing grade. Piles at this site must be adequately embedded into the dense sand strata encountered generally beginning at depths ranging from approximately 55 to 75 feet below the existing ground surface. Compression capacity of piles that are not adequately embedded into the dense sand bearing strata will be considerably less than those presented in the following tables.

9.1 Estimated Pile Capacities

Recommended pile penetration depth and corresponding allowable compression and tension capacities for Augercast Piles and Drilled Displacement Piles are presented in the following tables. Piles are expected to develop their capacity as a result of side resistance in the various sand and clay strata above approximately 55 to 75 feet and from a combination of side resistance and end bearing in the dense sands encountered below this level. Estimated pile capacities are based on a Factor of Safety of 2.0 (FOS). The Pile lengths, sizes and capacities presented are based on soil-pile interaction and do not consider structural aspects of the pile. Pile penetration depths are referenced to the existing ground surface.

TABLE 4 - WEST

ALLOWABLE PILE CAPACITIES – AUGER-CAST PILING

NO DOWNDRAG REDUCTION

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity (tons)	Allowable Tension Capacity (tons)
80 feet**	16” Augercast	85	35
	18” Augercast	100	40
	20” Augercast	120	45

***Referenced to existing ground surface at the time of field investigation**
****Up to 88 feet in the area of PG-10. To be verified upon completion of supplemental CPTs.**

TABLE 5 - WEST

ALLOWABLE PILE CAPACITIES – DRILLED DISPLACEMENT PILING

NO DOWNDRAG REDUCTION

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity (tons)	Allowable Tension Capacity (tons)
78 to 88 feet	14” Drilled Displacement	100	45
	16” Drilled Displacement	120	50

***Referenced to existing ground surface at the time of field investigation**

SOUTHERN EARTH SCIENCES

Using known FFE of the proposed structure and topographic data provided to us, we estimate that FFE will be as much as approximately 8 feet above existing site grade; therefore, an approximate 15 to 21 percent reduction in axial compressive pile capacity has been incorporated into the estimated capacities to account for negative side friction forces (down-drag) that will be induced on the piles as deep compressible soils consolidate over time.

TABLE 6 - WEST

ALLOWABLE PILE CAPACITIES – AUGER-CAST PILING

REDUCED FOR DOWNDRAG

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity*** (tons)	Allowable Tension Capacity (tons)
80 feet**	16” Augercast	70	35
	18” Augercast	85	40
	20” Augercast	95	45

***Referenced to existing ground surface at the time of field investigation**

****Up to 88 feet in the area of PG-10. To be verified upon completion of supplemental CPTs.**

*****Capacities reduced to account for down drag**

TABLE 7 - WEST

ALLOWABLE PILE CAPACITIES – DRILLED DISPLACEMENT PILING

REDUCED FOR DOWNDRAG

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity** (tons)	Allowable Tension Capacity (tons)
78 to 88 feet	14" Drilled Displacement	80	45
	16" Drilled Displacement	100	50

***Referenced to existing ground surface at the time of field investigation**

****Capacities reduced to account for down drag**

TABLE 8 - WEST

ALLOWABLE PILE CAPACITIES – AUGER-CAST PILING

NO DOWNDRAG REDUCTION

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity** (tons)	Allowable Tension Capacity (tons)
65 feet	16" Augercast	70	25
	18" Augercast	80	30
	20" Augercast	95	35
75 feet	16" Augercast	80	30
	18" Augercast	95	35
	20" Augercast	115	40

***Referenced to existing ground surface at the time of field investigation**

TABLE 9 - EAST

ALLOWABLE PILE CAPACITIES – DRILLED DISPLACEMENT PILING
NO DOWNDRAG REDUCTION
(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity** (tons)	Allowable Tension Capacity (tons)
65 to 75 feet	14” Drilled Displacement	100	45
	16” Drilled Displacement	120	50

***Referenced to existing ground surface at the time of field investigation**

TABLE 10 - EAST

ALLOWABLE PILE CAPACITIES – AUGER-CAST PILING
REDUCED FOR DOWNDRAG
(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity** (tons)	Allowable Tension Capacity (tons)
65 feet	16” Augercast	55	25
	18” Augercast	65	30
	20” Augercast	75	35
75 feet	16” Augercast	65	30
	18” Augercast	80	35
	20” Augercast	95	40

***Referenced to existing ground surface at the time of field investigation**

TABLE 11 - EAST

ALLOWABLE PILE CAPACITIES – DRILLED DISPLACEMENT PILING

REDUCED FOR DOWNDRAG

(FACTOR OF SAFETY = 2.0)

Expected Pile Penetration Below Existing Grade*	Pile Diam/Size and Type (inches)	Allowable Compression Capacity** (tons)	Allowable Tension Capacity (tons)
65 to 75 feet	14" Drilled Displacement	80	45
	16" Drilled Displacement	100	50

***Referenced to existing ground surface at the time of field investigation**

SES should be consulted as the Geotechnical Engineer of Record to assist the design team with further evaluation of pile type, design capacity and corresponding pile length based on loading requirements and optimum pile cap configurations. SES should also be consulted to review the Pile Load Test Plan, Pile Load Test Results, and Production Pile Installation Criteria.

9.2 Auger-Cast and Augered Displacement Pile Installation Considerations

The dense sand bearing strata vary in strength and depth across the site; therefore, considerations should be taken to account for difficult drilling that may occur at varying elevations. Drilled displacement piles may experience hard drilling in intermittent dense sand strata that may be encountered at some locations above the intended bearing strata beginning at approximately 55 to 75 feet below ground surface. Pile penetration/refusal depth may vary by several feet across this building area. Supplemental CPT soundings are recommended in areas near SCPT-PG-10 and PG-1 to help delineate required pile penetration depths in these areas. Contingency should be set up in the contract documents to account for pile length variation and installation method modification that may be required by the contractor to advance piles to the recommended tip elevation/pile penetration or as needed to develop the intended design capacity.

The equipment, experience, and installation technique on the part of the contractor are crucial to successful pile performance of augercast piles and drilled displacement piles. Careful monitoring and recording of the pile installation should be performed by an experienced technician to help identify possible installation problems.

Closely spaced piles will become increasingly more difficult to install to the desired tip elevation if a proper installation pattern is not established. It may be necessary to start installation towards the center of the pile cap and work outwards. Piles should not be installed within 3 pile diameters of newly placed piling until the grout has cured for at least 24 hours or within 6 pile diameters until the grout has cured for at least 12 hours.

9.3 Pile Response to Lateral Loading

Pile response to assumed shear forces applied to the pile top were evaluated using LPILE® version 22 software. LPILE software employs p-y analysis to determine deflections at the pile top under specific loading conditions. Parameters used in the analysis have been correlated from empirical data using standard penetration resistance "N" values (correlated with accepted geotechnical references), measured CPT tip and side resistances and our knowledge of and experience with similar soil conditions.

Based on our correspondence with the project design team, we have evaluated a 14-inch diameter Drilled Displacement pile under various loading scenarios. Shear forces applied to the pile top were varied based on pile response to produce deflections ranging from approximately 0.25 to 0.75 inch. The P-Y curves were factored for group effects for piles in groups using a p-multiplier of 0.8 for the front row piles and a multiplier of 0.4 for the second-row piles.

Piles were modeled using both fixed and pinned head conditions with lateral loads applied at the pile top at an average depth of 4 feet below existing grade. ULTIMATE Lateral Deflection, Moment and Shear vs. Depth plots are attached in **Appendix 4**. Piles were modeled with no axial load or bending moment applied to the top of the pile. It should be considered that axial uplift loads generally reduce the lateral capacity from that indicated by this analysis, while axial compressive loads increase the lateral capacity.

An appropriate Factor of Safety should be applied by the designer depending on the sensitivity of the design to deflection or moment capacity. Evaluation of the structural capacity of the piles to withstand shear forces and bending moments generated by lateral loading is beyond the scope of this investigation and should be determined by the structural design engineer of record.

Assumed pile reinforcement configurations, concrete strength, and lateral loads resulting in approximately 0.25, 0.50 and 0.75-inch deflection for piles in first row and second row configurations are provided in the following table. Deflection, moment, and shear curves along the length of the pile corresponding to the load scenarios listed below are attached in **Appendix 4.**

TABLE 12

DRILLED DISPLACEMENT CONCRETE PILE LATERAL LOAD CASE SUMMARY

Pile Type and Size	Loading Condition	Assumed Reinforcement Configuration	L-Pile® Loading Case Designation	Applied Shear force	
				Row 1	Row 2
14-inch Drilled Displacement Concrete Pile (5,000 psi grout)	Fixed	20 ft cage with 6 - #6 rebar	Loading Case 1	12.2 kips	7.9 kips
			Loading Case 2	17.2 kips	11.1 kips
			Loading Case 3	20.6 kips	13.7 kips
14-inch Drilled Displacement Concrete Pile (5,000 psi grout)	Pinned	20 ft cage with 6 - #6 rebar	Loading Case 1	5.9 kips	4.2 kips
			Loading Case 2	8.1 kips	5.4 kips
			Loading Case 3	10.2 kips	6.6 kips

9.4 Individual Pile Settlement and Group Efficiency

We recommend installing piles at a minimum center to center spacing of 3 pile diameters. A reduction in capacity due to group effects for properly spaced piles at the recommended pile penetration depths will not be required.

Detailed structural loading information and pile cap configurations were not available at this time. Estimated settlement of individual piles properly installed to the recommended depth are expected to be less than 0.5 inch at service load. Piles installed in groups (up to 8 to 10 piles per pile group) at the recommended minimum center-to-center spacing of 3 pile diameters at the recommended pile penetration depths are not expected to undergo additional settlement at service load due to group effects. SES should be consulted to review plans and design details and to evaluate larger pile groups once pile type, pile loading, and pile cap configurations have been established.

9.5 Pile Settlement and Drag Force Considerations

Our evaluation of the effects of fill induced settlement on pile foundations and resulting drag forces at this site have been based on methods outlined in "Neutral Plane Method for Drag Force of Deep Foundations" (Siegel, et.al, 2014) and in the Federal Highway Administration Publication No. FHWA-NHI-16-009. These references explain that the direction in which side resistance acts on a deep foundation depends on the relative movement between the deep foundation and the adjacent soil. When the pile moves downward relative to the soil, then the side resistance is positive and acts upward (pile resistance). Conversely, when the soil moves downward relative to the deep foundation, the side resistance is negative and acts downward (down-drag). The side resistance distribution and direction of relative pile movement with respect to surrounding soil is a function of the soil strength and stiffness, the applied pile top load, and whether the top load is sustained, transient, or a combination of sustained and transient loads. (Siegal).

The accumulation of negative shaft resistance with depth produces a drag force on the pile. The maximum drag force and the maximum axial compression stress in the pile occur at the depth along the pile equal to the depth of the "Neutral Plane". The depth of the Neutral Plane is defined as the depth along a pile where the sum of the permanent structural load (sustained dead and live load) plus the negative shaft resistance on the pile (down-drag) is equal to the positive shaft resistance plus the mobilized toe resistance.

Below the level of the neutral plane at the Geotechnical Service Limit State, there is no movement of the soil relative to the pile and any ground settlement below the neutral plane is equal to the vertical movement of the pile. At the Geotechnical Strength Limit State, the entire pile is moving downward relative to the soil and therefore negative skin friction is not present. This is premise of the Neutral Plane Method evaluating down-drag as a Geotechnical Service Limit State or settlement consideration rather than considering the drag force as an additional load that must be supported by the pile in the Geotechnical Strength Limit State evaluation.

9.6 Post Construction Hardscape Settlement Potential

A critical issue to consider for this project site will be differential settlements between pile supported and non-pile supported, grade supported hardscape, pavements, and utility elements where fill heights exceed approximately 18 inches above existing grade. Pavements and hardscape constructed over areas of fill in excess of approximately 18 inches above the existing site elevation have the potential to settle differentially with respect to pile supported building foundations and floor slabs. Where differential settlement between the building foundations and adjacent pavements or slabs is a concern, consideration should be given to pile supporting critical slabs, aprons, sidewalks, and landings immediately adjacent to pile supported buildings. Hinging concrete slabs, aprons, pavement, sidewalks, and other hardscape at the pile-supported to grade-supported transition of critical entrance/exits would help limit the formation of trip hazards/drops caused by differential settlement between pile supported and grade supported elements around the buildings. All utility lines in the building area should be hung from the slab using hangers and connections that meet applicable Building Codes. Connections should be flexible and capable of withstanding fill-induced differential settlement.

Installation of utilities, adjacent pavements and hardscape of the facility should generally be delayed after fill placement for as long as practical in the construction schedule to allow for as much settlement as possible to occur prior to their construction. A maintenance schedule should include a contingency for leveling critical areas of pavement and hardscape that settle differentially with respect to the pile supported building and floor slabs.

9.7 Pile Load Test Program

We suggest installing a minimum of one (1) test pile within the east portion of the building area and one (1) test pile in the west portion of the building area for Static Load Testing for each pile size/loading configuration. The static compressive load test should be conducted as described in ASTM Specification D1143 to at least 3 times the design load or to failure.

If design tension loads exceed 60 percent of the recommended allowable tension capacity, plans should be made to install an additional tension test pile for Static Tension Load testing at each planned compression test pile location. Tension testing of a tested compression pile is not recommended. Static tension load testing should be conducted as described in ASTM Specification D3689 to at least 2 times the design load. Piling reinforcement for the tension test pile should be cast to allow for connection to a full-length center bar during testing. Since the purpose of the tension load test is to assess the geotechnical capacity of the soil-pile interaction (not the structural capacity of the pile), the tension test pile reinforcement should be over-designed to minimize elongation of the pile during the test. Elongation of the test pile and center bar during tension testing often causes structural failure of the pile grout near the bottom of the reinforcement cage, resulting in excessive deflection during the test that is not representative of the geotechnical performance of the pile in tension. **The test pile reinforcement, connection systems and reaction frame should be designed for the loadings specific to this project by a licensed professional structural engineer.**

Alternately, in lieu of a separate static tension load test, tension capacity could be assessed by instrumenting the compression test pile with vibrating wire strain gauges that would be used to measure and record the capacity distribution along the length of the pile. The strain gauge data would be supplemented by monitoring deflection of at least two reaction piles during the compression load test. SES will be available to discuss with the design team as the design progresses.

If pile response to lateral loading is a controlling aspect of the foundation design and lateral load testing is determined to be necessary by the project Structural Engineer, static lateral load testing may be performed on either the compression or the tension pile to at least twice the design load in accordance with ASTM D3966.

The test pile(s) should be located within the building/structure footprint to obtain representative data, but should be positioned within the structure such that it is not incorporated into the foundation system and does not interfere with construction of foundations, utilities, infrastructure, etc. Upon completion of the test pile program, the test piles should be cut off at a level such that it will not affect future construction.

All test sections, equipment and installation procedures should be the same as those to be used during production pile installation. Pile load test results would be used to verify the placement procedures and that the pile section produces the desired design capacity. Since adjustments of the pile lengths or installation procedures may be made based on the test pile installation and load test results, we recommend the test pile program and production pile installation be performed under the direct supervision of the SES project geotechnical engineer of record. SES should be consulted to collaborate with the design team to establish detailed Pile Load Test Program recommendations once site, civil, and structural plans have been developed.

9.8 Thermal Integrity Profiling (TIP) for Auger-Cast Piling

We recommend that installation of all Auger-Cast test piles **(and 2 % of all production auger cast piling on this project)** be monitored using Thermal Integrity Profiling (TIP) technology in general accordance with ASTM D7949 - *Standard Test Methods for Thermal Integrity Profiling of Concrete Deep Foundations*. The TIP system, manufactured by Pile Dynamics, Inc. (PDI) in association with Foundation and Geotechnical Engineering, LLC (FGE), uses instrumented Thermal Wire® cables and Thermal Acquisition Ports (TAPs) to measure concrete temperatures during curing. The Thermal Wire® cables have temperature sensors spaced every 12-inches along the ordered cable length and are cast into the concrete along the pile/shaft length. The battery powered Thermal Acquisition Ports automatically measure temperature at each sensor at specified time intervals (typically every 15 minutes) allowing the concrete curing process to be monitored. During the curing process, heat generated during cement hydration is recorded and used to create a profile of temperature versus depth.

Analysis of the temperature measurements can then be used to evaluate concrete quality and cover at each cross section along the pile/shaft length. After the peak temperature is achieved (approximately 10 hours after placement of the concrete), the TAP box(es) are disconnected from the Thermal Wires® and connected to the TIP Processing Unit. Data is downloaded and saved to the unit's hard drive for further review, data adjustment, analysis and output. Graphical results of the collected thermal data are presented as an estimate of the vertical pile profile relative to the theoretical pile diameter. The profile will indicate changes in pile diameter or material quality within the grout column.

10.0 <u>LATERAL EARTH PRESSURES</u>

Presented in the following table are recommended design values of Equivalent Fluid Pressure and soil-foundation Friction Coefficients for calculation of resistance to lateral loadings. These values have been generalized to be representative of improved subgrade conditions and imported Select Structural Fill. Imported Select Structural Fill should consist of a sandy material with less than about 30 percent of the soil particles (by weight) passing the No. 200 mesh sieve, less than 80 percent passing the No. 40 sieve, and a Liquid Limit less than 25. Fill material should be compacted in 12-inch (maximum) lifts to at least 95 percent of the soil's Modified Proctor maximum dry density as determined by ASTM D 1557. In place density tests should be made at frequent intervals to measure the effectiveness of the compaction operations.

Empirical correlation and data obtained from the soil borings and CPT soundings have been used to estimate active, passive, at-rest earth pressure coefficients and equivalent fluid densities presented in the following table for select structural fill. These parameters have been developed using correlation of laboratory test results with accepted geotechnical references and our general knowledge of and experience with similar soil conditions.

This information may be used for lateral resistance calculations for small shallow retaining structures and foundation walls. Foundation elements extending more than approximately 6 feet above original site elevation should be brought to our attention and evaluated on a case-by-case structure specific basis. The designers should exercise sound engineering judgment when using these parameters for design and should apply an appropriate Factor of Safety.

Soil Unit Weight values and Equivalent Fluid Density values have been presented in terms of Total Soil Unit Weight. The Total Soil Unit Weight Scenario is applicable to foundation elements anticipated to be constructed several feet above groundwater levels where in-situ and fill soils are expected to be near their natural moist unit weight. These parameters do not include hydrostatic pressures. Positive grading and adequate drainage are assumed to be installed to prevent buildup of hydrostatic pressure that could act differentially on shallow retaining structures, sumps, etc. If failsafe positive drainage provisions are not provided behind retaining walls/subsurface walls, then hydrostatic pressure should be included in the design loadings in addition to the lateral earth pressures.

At-rest earth pressures should be used for foundation walls that will be restrained from deflecting by adjacent floor slabs or structures. Active and Passive pressures should be used in situations where shallow walls will not be restrained and will be allowed to deflect.

TABLE 13

GENERALIZED EARTH PRESSURE COEFFICIENTS AND EQUIVALENT FLUID PRESSURES

Total Moist Soil Unit Weight Scenario (Above Groundwater level)

Soil	Earth Pressure Condition	Total Moist Unit Weight (pcf)	Equivalent Fluid Density (pcf)	Internal Angle of Friction ϕ (deg)	Cohesion c (psf)	Lateral Earth Pressure Coefficient
Imported Select Structural Fill	Active (k_a)	120	40	30	--	0.33
	Passive (k_p)		350	30	--	3.0
	At Rest (k_o)		60	30	--	0.50

* **NOT representative of in-situ soft/loose silty and clayey soils that will be over-excavated and replaced as required to create stable construction surfaces.**

11.0 GENERAL COMMENTS AND LIMITATIONS

While the CPT soundings and soil borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and may be encountered. The delineation between soil types shown on the logs is approximate and the description represents our interpretation of subsurface conditions at the designated test locations and on the particular date explored.

This report has been prepared in order to aid in the evaluation of this project and to assist the engineers in the project planning and structural design. At the time of writing, changes were still being considered to foundations, site grading, and other aspects of the project that could have a significant impact on the applicability or relevance of the recommendations provided in this report. SESI should be consulted as the design process continues to ensure that the recommendations provided in this report are still applicable, and that they are being properly interpreted.

This report is intended for use with regard to the specific project discussed herein as we understand it at this time, and any substantial changes in the project, loads, locations, or assumed grades should be brought to our attention so that we may determine how such changes may affect our conclusions and recommendations. We would appreciate the opportunity to review the plans and specifications for construction to ensure that our conclusions and recommendations are interpreted correctly.

Professional judgments on design alternatives and criteria are presented in this report. These are based partly on our evaluations of technical information gathered, partly on our understanding of the characteristics of the project being planned, and partly on our general experience with subsurface conditions in the area. We do not guarantee performance of the project in any respect, only that our engineering work and judgments rendered meet the standard of care of our profession.

The Geotechnical Engineer of Record should be retained by the Owner in the construction phase of the project so they can observe subsurface conditions revealed during construction, confirm that design assumptions are still applicable or provide revised recommendations based on conditions encountered during construction, and to help ensure that our recommendations are properly interpreted. We recommend that Southern Earth Sciences, Inc. be retained to perform observation and field-testing services during the site preparation and foundation construction.

This report is exclusively for the use and benefit of the addressee(s) identified on the first page of this report and is not for the use or benefit of, nor may it be relied upon by any other person or entity. The contents of this report may not be quoted in whole or in part or distributed to any person or entity other than the addressee(s) hereof without, in each case, advanced written consent.

APPENDIX 1

Test Location Plans

Soil Profile

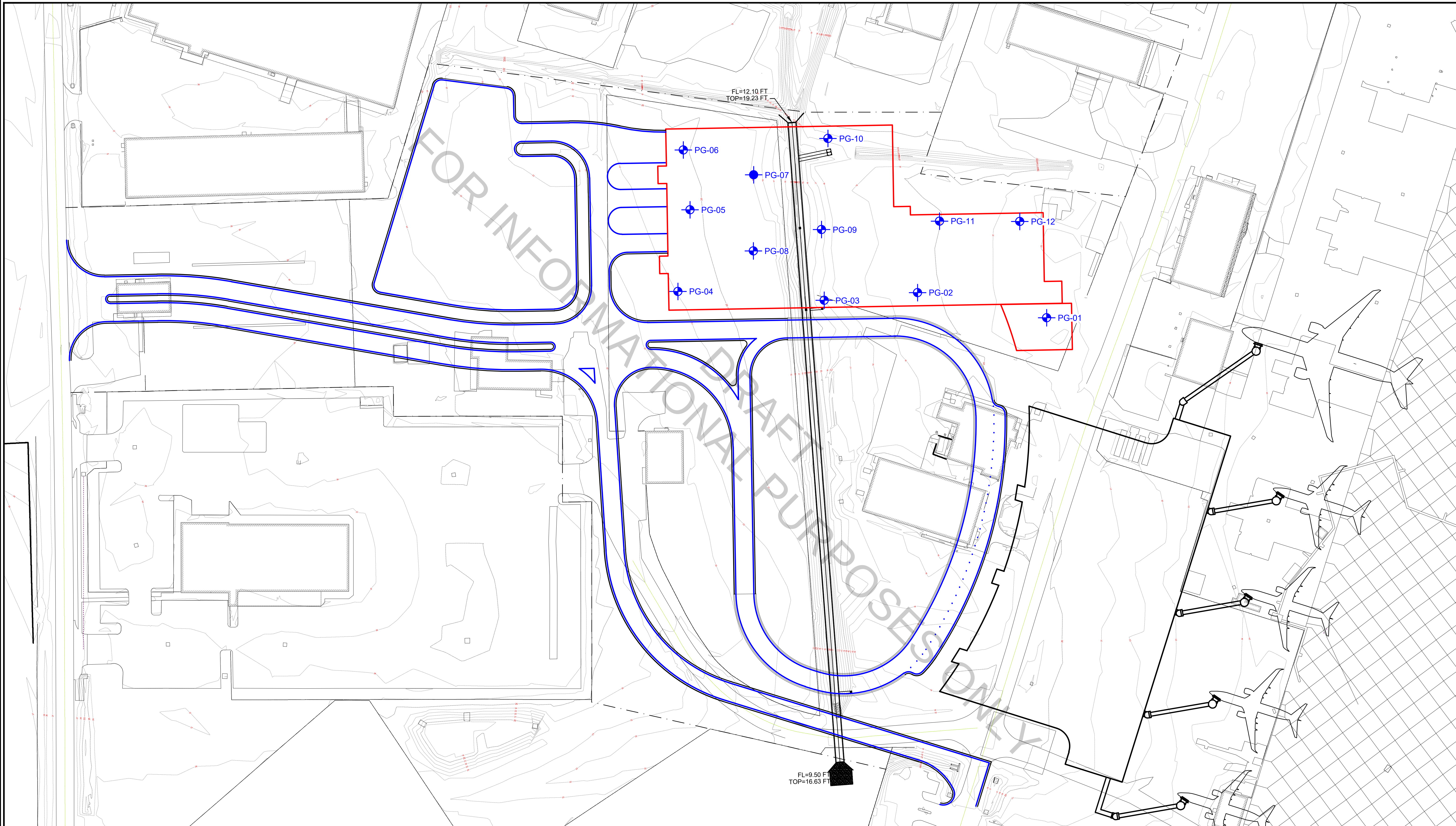
NOT TO SCALE

- CPT SOUNDING
- SOIL TEST BORING

MAA - PARKING GARAGE
MOBILE, AL

SOUTHERN EARTH SCIENCES
Geotechnical | Environmental | Materials Testing

TEST LOCATION PLAN
PAGE 2 OF 2
SESI JOB #: M23-442



SOIL TEST BORING

CPT SOUNDING

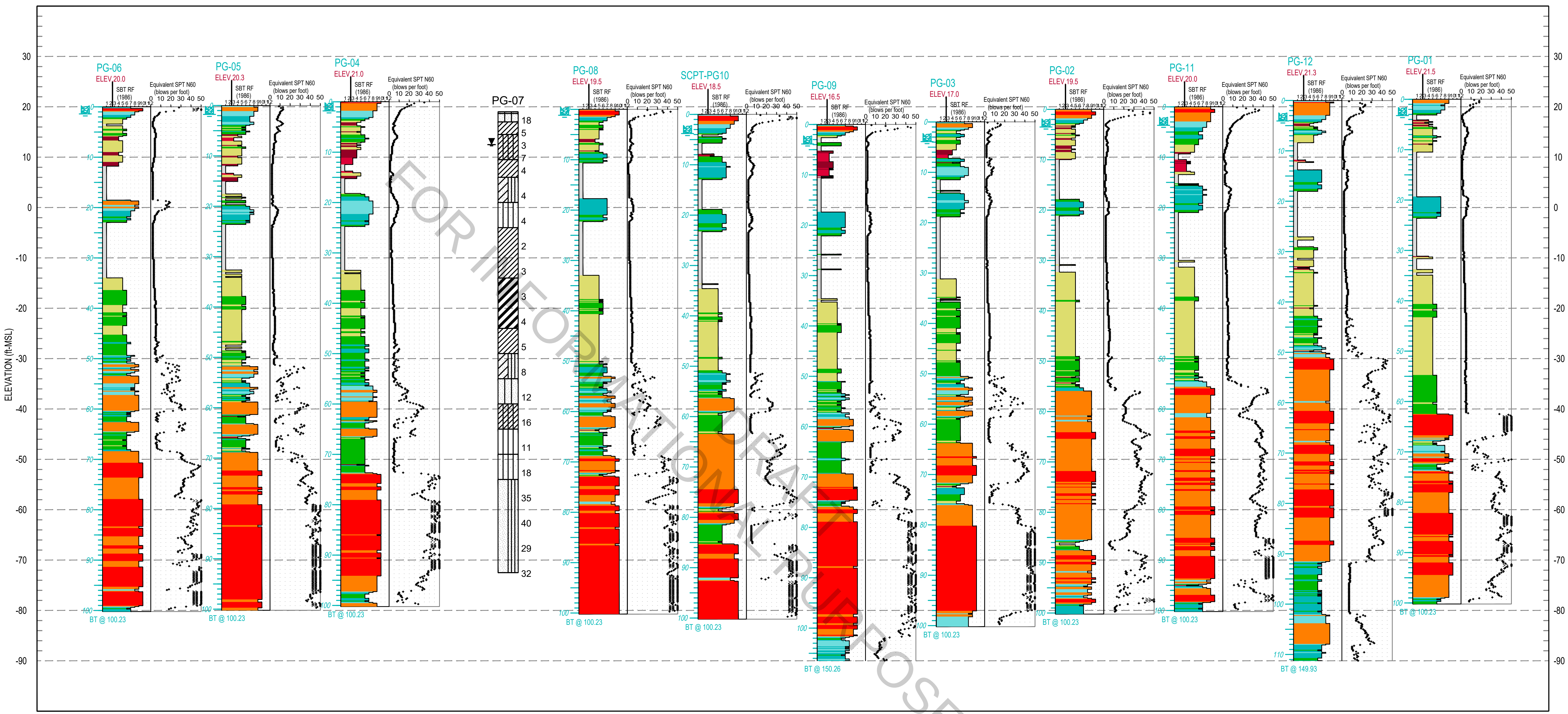
120 60 0 120

SCALE, IN FEET

MAA - PARKING GARAGE
MOBILE, AL

SOUTHERN EARTH SCIENCES
Geotechnical | Environmental | Materials Testing

TEST LOCATION PLAN
PAGE 2 OF 2
SESI JOB NO.: M23-442



SOIL BEHAVIOR TYPE (SBT)
(Robertson, 1986)

- 1 - Sensitive, Fine Grained
- 2 - Organic Material
- 3 - Clay
- 4 - Silty Clay to Clay
- 5 - Clayey Silt to Silty Clay
- 6 - Sandy Silt to Clayey Silt
- 7 - Silty Sand to Sandy Silt
- 8 - Sand to Silty Sand
- 9 - Sand
- 10 - Gravelly Sand to Sand
- 11 - Very Stiff Fine Grained (*)
- 12 - Sand to Clayey Sand (*)

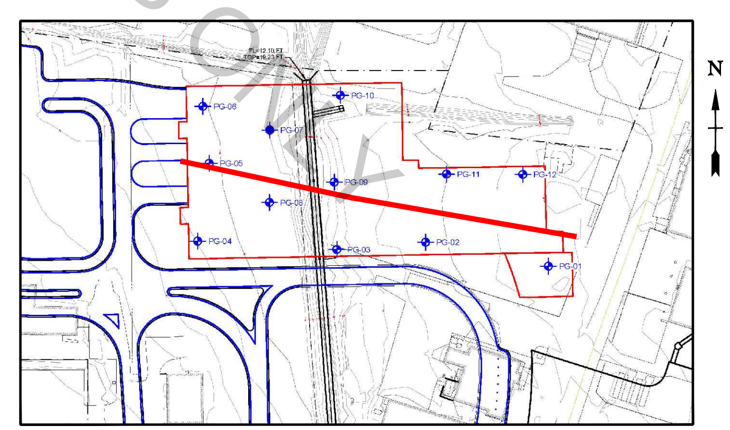
*cemented or heavily overconsolidated

Note: Ground surface elevations are estimated and have not been surveyed. All Elevations should be considered approximate.

WATER LEVELS

- Water Level In Sounding Hole
- Hole Cave In

- USCS Silty Sand (SM)
- USCS Sandy Silt (MLS)
- USCS Low Plasticity Silty Clay (CL-ML)
- USCS Silt (ML)
- USCS Low Plasticity Clay (CL)
- USCS High Plasticity Clay (CH)
- USCS Clayey Sand (SC-SM)
- USCS Poorly-graded Sand with Silt (SP-SM)



Location Plan

Not to Scale

SOUTHERN EARTH SCIENCES
Geotechnical | Environmental | Materials Testing

MAA - PARKING GARAGE
MOBILE, ALABAMA

SOIL PROFILE
PAGE 2 OF 2
SESI JOB NO.: M23-442

APPENDIX 2

CPT Sounding Logs

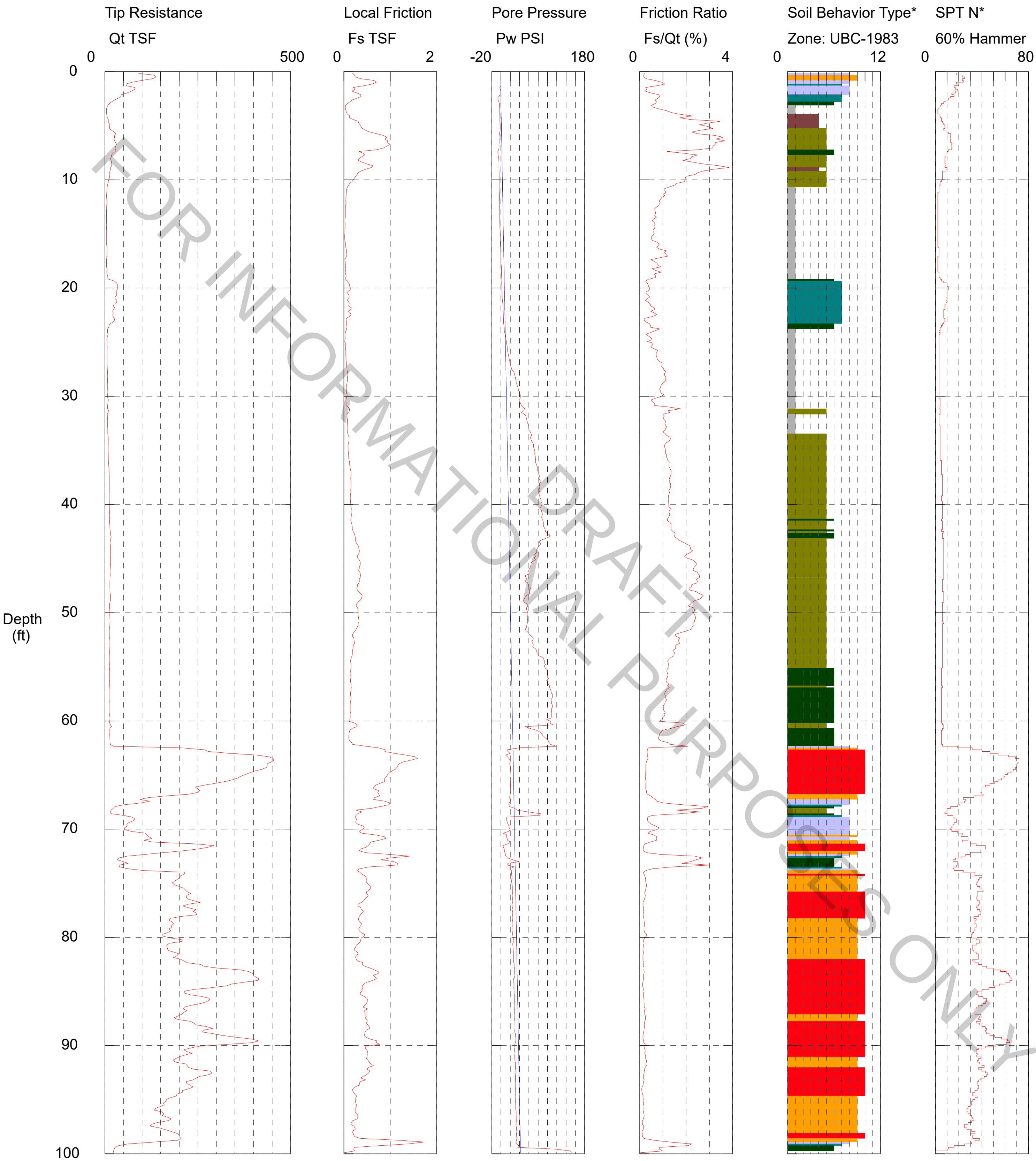
Soil Boring Logs

Shear Wave Velocity vs Depth

Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-1
Cone Used: DPG1210
GPS Data: N30.63964 W88.07929

CPT Date/Time: 8/31/2023 12:42:52 PM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 3.2-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

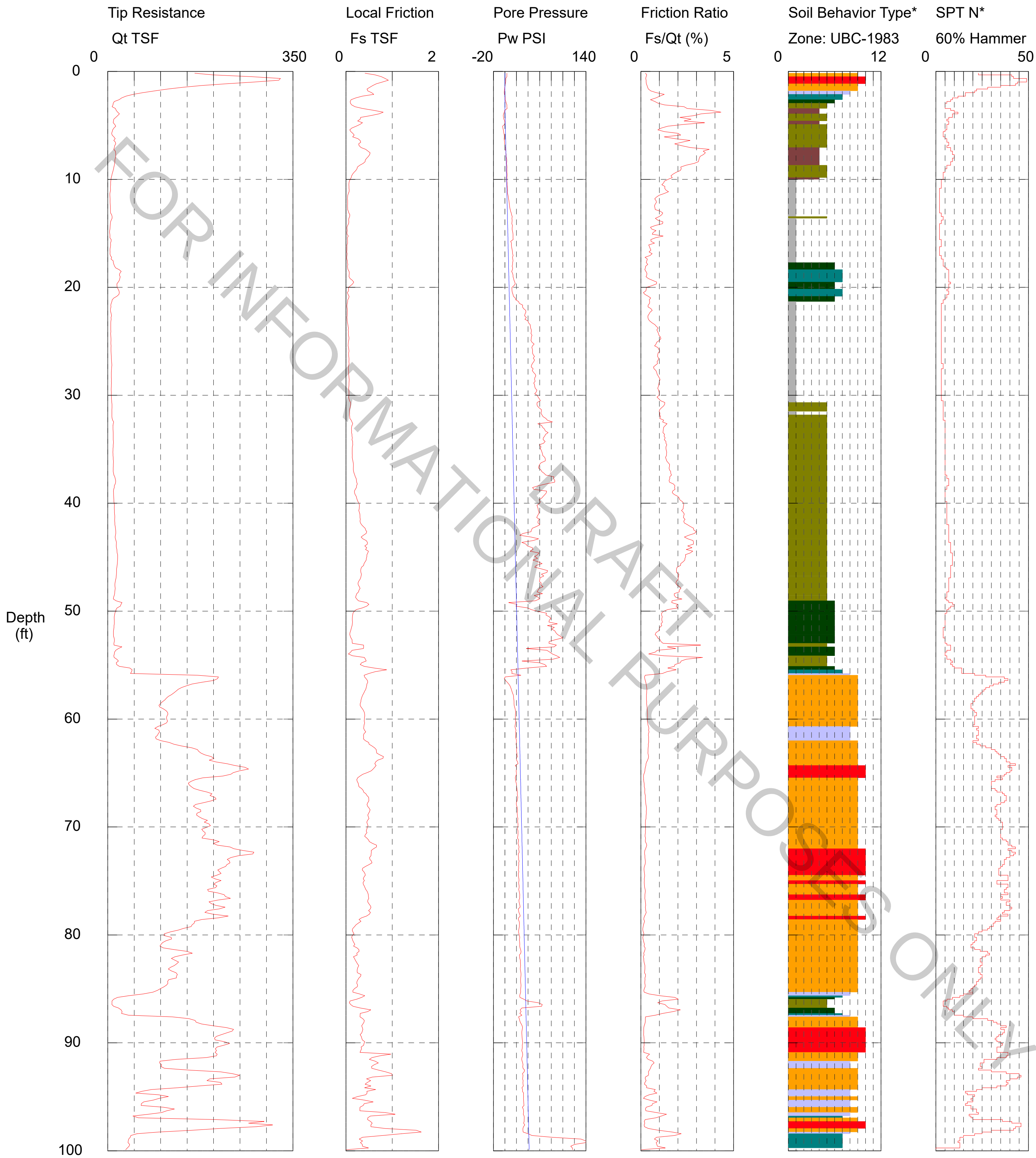
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-2
Cone Used: DPG1210
GPS Data: N30.63973 W88.07984

CPT Date/Time: 9/1/2023 8:44:01 AM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 3.5-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

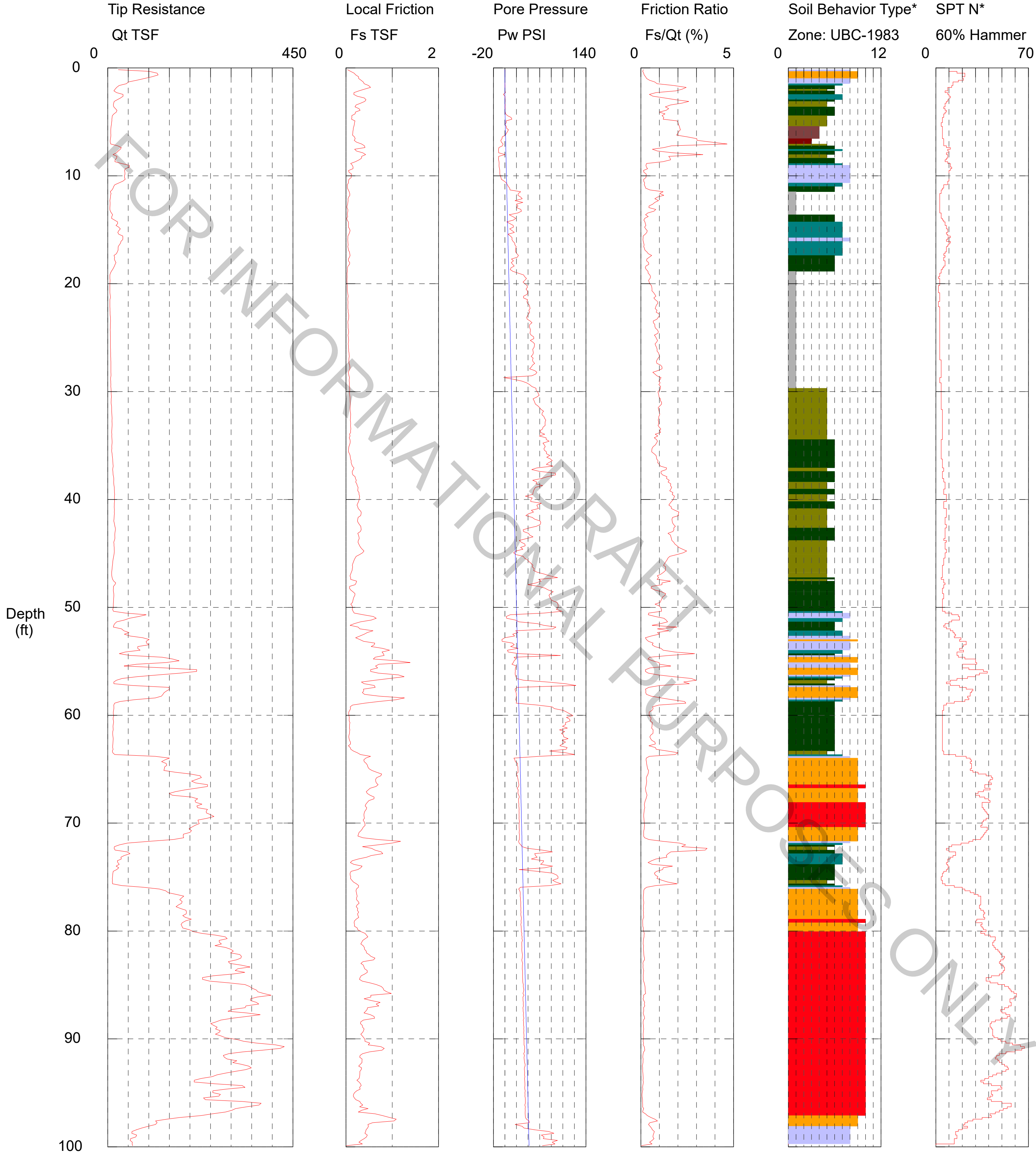
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-3
Cone Used: DPG1210
GPS Data: N30.63947 W88.08038

CPT Date/Time: 8/31/2023 6:46:07 AM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 3.9-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

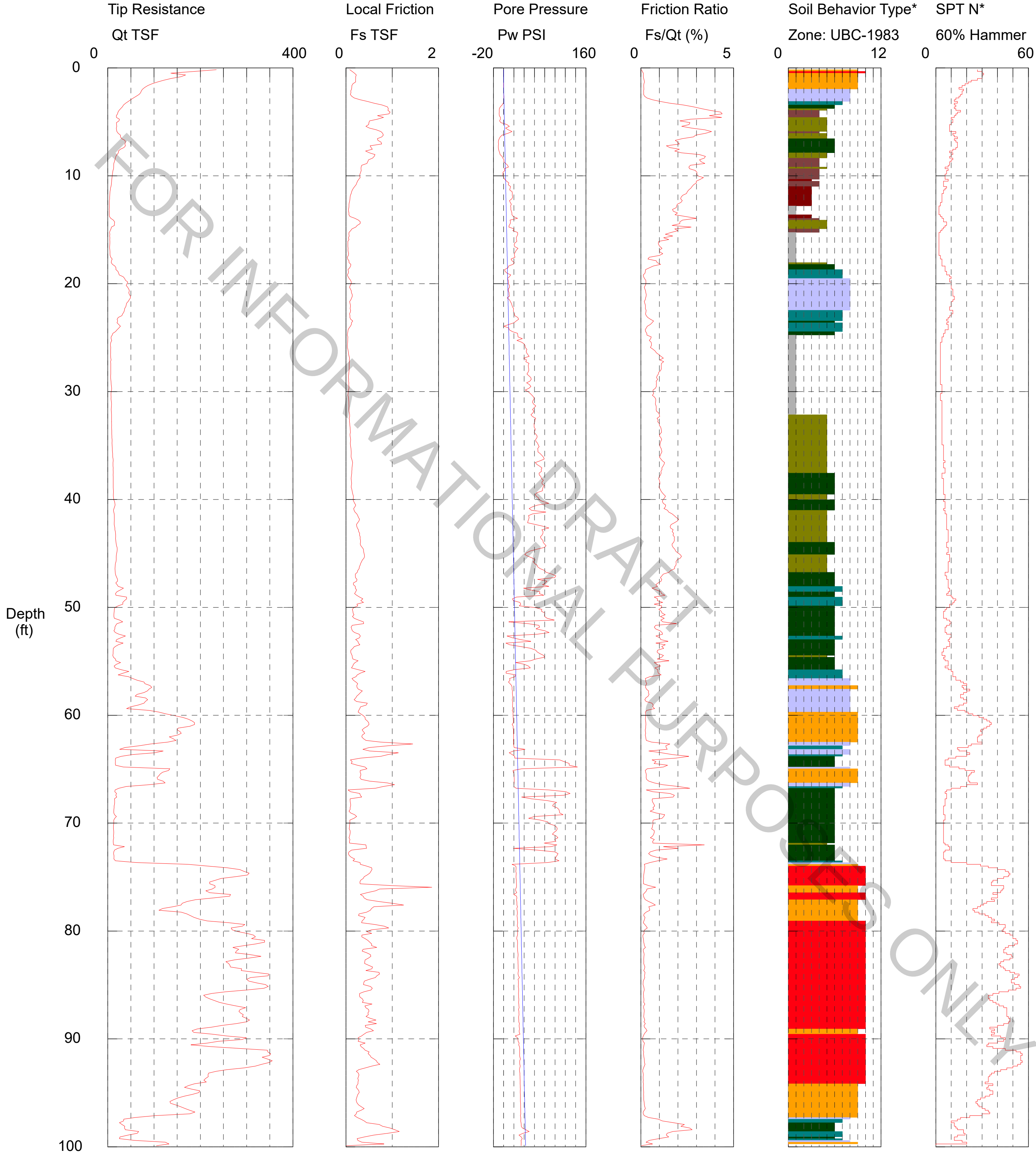
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-4
Cone Used: DPG1210
GPS Data: N30.63973 W88.08086

CPT Date/Time: 8/30/2023 12:30:40 PM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 1.7-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

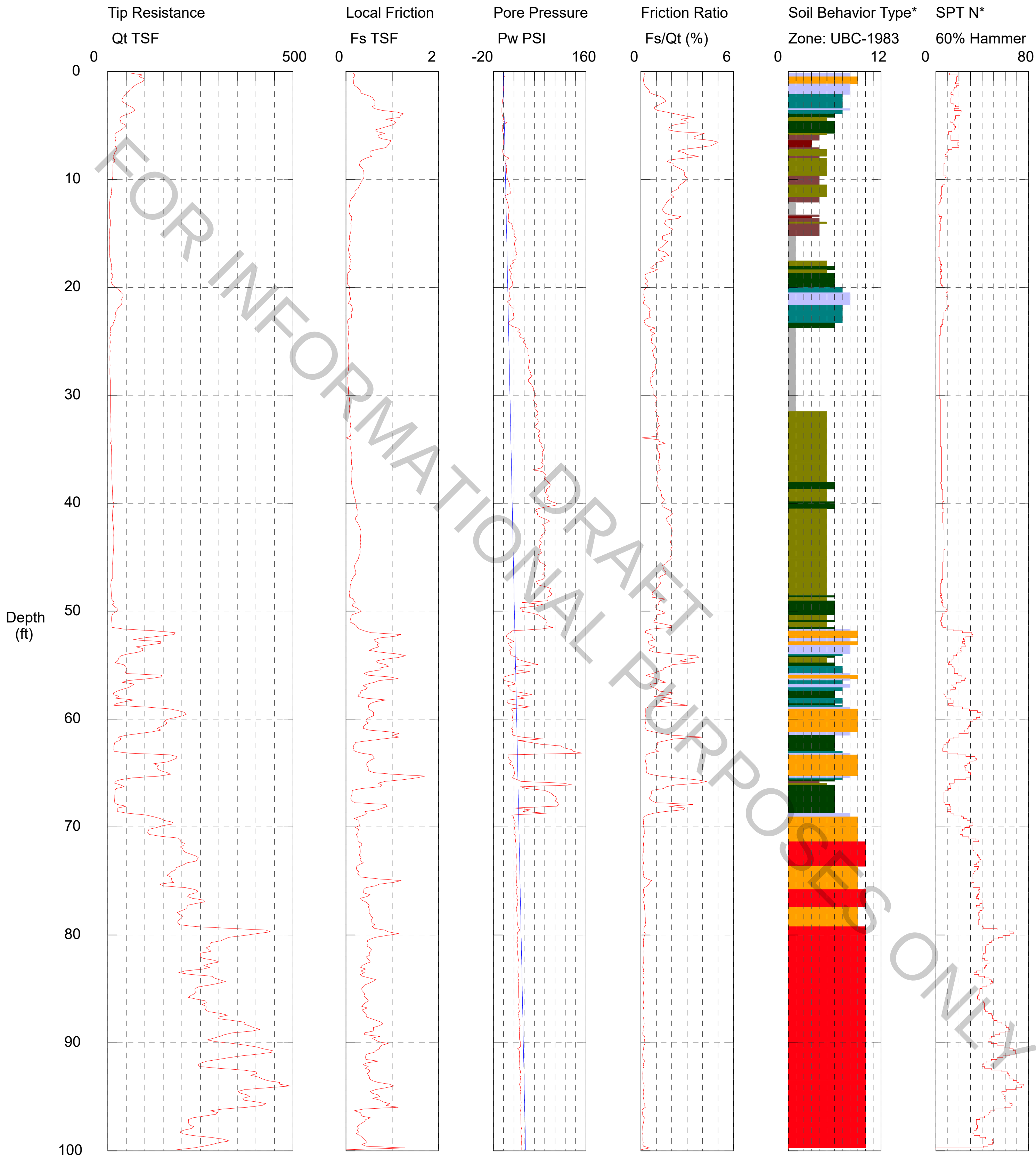
1	sensitive fine grained
2	organic material
3	clay
4	silty clay to clay
5	clayey silt to silty clay
6	sandy silt to clayey silt
7	silty sand to sandy silt
8	sand to silty sand
9	sand
10	gravelly sand to sand
11	very stiff fine grained (*)
12	sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-5
Cone Used: DPG1210
GPS Data: N30.64003 W88.08081

CPT Date/Time: 8/30/2023 1:26:28 PM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 1.8-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

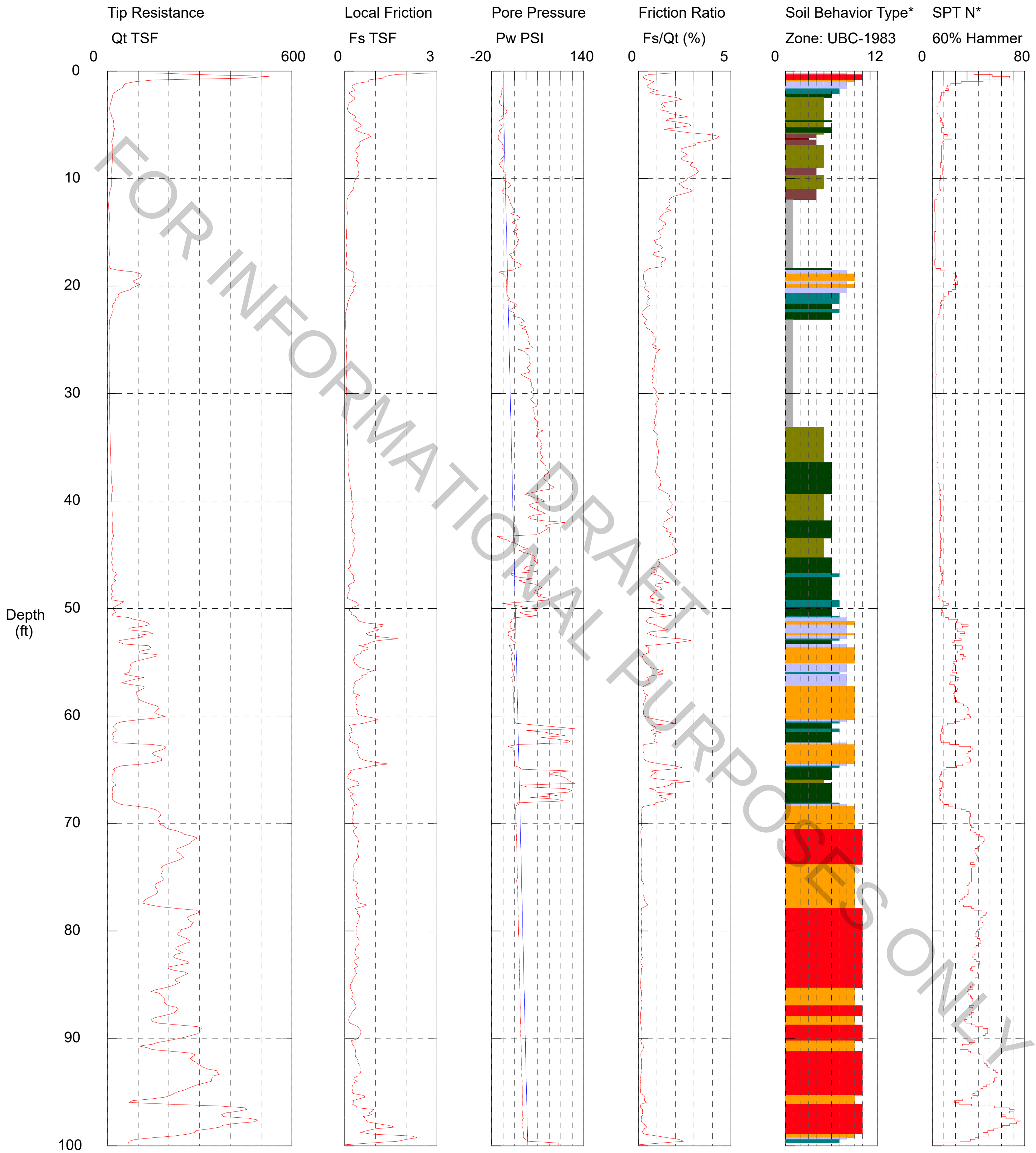
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-6
Cone Used: DPG1210
GPS Data: N30.64025 W88.08084

CPT Date/Time: 8/30/2023 2:30:13 PM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 1.4-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

SOIL BORING LOG

BORING NO.: PG-7
PROJECT: MAA - PARKING GARAGE
PROJECT NO.: M23-442
PROJECT LOCATION: MOBILE, AL
METHOD: FLIGHT/MUD DRILLING
BORING LOCATION: SEE TEST LOCATION PLAN
BORING ELEVATION: 19 ft
DATE DRILLED: 08/30/23
DATE COMPLETED: 08/30/23
WATER LEVEL: 6 ft
WATER LEVEL DATE: 08/30/23
GEOL / ENGR: E. REYES
DRILLER: P. BYRD

Elevation / Depth	Soil Symbols Sampler Symbols and Field Test Data	USCS	Description	SPT N	Moist. %	LL %	PI %	% passing #200 / #40 sieve
19 / 0	15/6 10/6 8/6	SM	Medium Dense Orange Silty SAND with Gravel	18				
	2/6 2/6 3/6	SM	Medium Dense Orange Silty SAND with Shell and Wood	5				
		CL	Medium Stiff Orange, Red and Gray CLAY					
	1/6 2/6 1/6	CL-ML	Soft to Medium Stiff Orange and Gray Silty CLAY	3	23.1	20	5	59 / 100
10	3/6 3/6 4/6			7				
10	3/6 2/6 2/6	CL	Soft Gray CLAY	4				
	2/6 2/6 2/6	SC-SM	Very Loose Gray Clayey Silty SAND	4	25.7	23	5	39 / 100
0 / 20	3/6 1/6 3/6	ML	Soft Gray Sandy SILT	4				
	1/6 1/6 1/6	CL	Very Soft Gray CLAY	2				
-10 / 30					42.9	39	16	90 / 99
	WOH/6 1/6 2/6			3				
	WOH/6 2/6 1/6	CH	Very Soft Gray CLAY	3				
-20 / 40					86.1	60	30	99 / 100
	2/6 2/6 2/6			4				
	2/6 2/6 3/6	CL	Medium Stiff Green CLAY	5				
-30 / 50	4/6 4/6 4/6	SC-SM	Loose Gray Clayey Silty SAND	8				

Remarks: N30.64016 W88.08054
Elevation estimated from Provided Topo Drawing
Refusal at 95 Feet due to Gravel caving in

SOUTHERN EARTH SCIENCES

SOIL BORING LOG

BORING NO.: PG-7
PROJECT: MAA - PARKING GARAGE
PROJECT NO.: M23-442
PROJECT LOCATION: MOBILE, AL
METHOD: FLIGHT/MUD DRILLING
BORING LOCATION: SEE TEST LOCATION PLAN
BORING ELEVATION: 19 ft
DATE DRILLED: 08/30/23
DATE COMPLETED: 08/30/23
WATER LEVEL: 6 ft
WATER LEVEL DATE: 08/30/23
GEOL / ENGR: E. REYES
DRILLER: P. BYRD

Elevation / Depth scale: Elevation -40, -50, -60, -70, -80; Depth 60, 70, 80, 90, 100

Field Test Data	USCS	Description	SPT N	Moist. %	LL %	PI %	% passing #200 / #40 sieve
7/6 5/6 7/6	SM	Medium Dense Gray Silty SAND	12	29.0	NP	NP	43 / 100
9/6 8/6 8/6	CL-ML	Stiff to Very Stiff Gray Silty CLAY	16				
5/6 5/6 6/6	ML	Stiff Gray SILT	11				
8/6 9/6 9/6	ML	Very Stiff Gray Sandy SILT	18	15.1	NP	NP	55 / 79
20/6 17/6 18/6	SP-SM	Medium Dense to Dense Gray SAND with Gravel	35				
23/6 21/6 19/6			40				
10/6 11/6 18/6			29				
12/6 15/6 17/6			32				

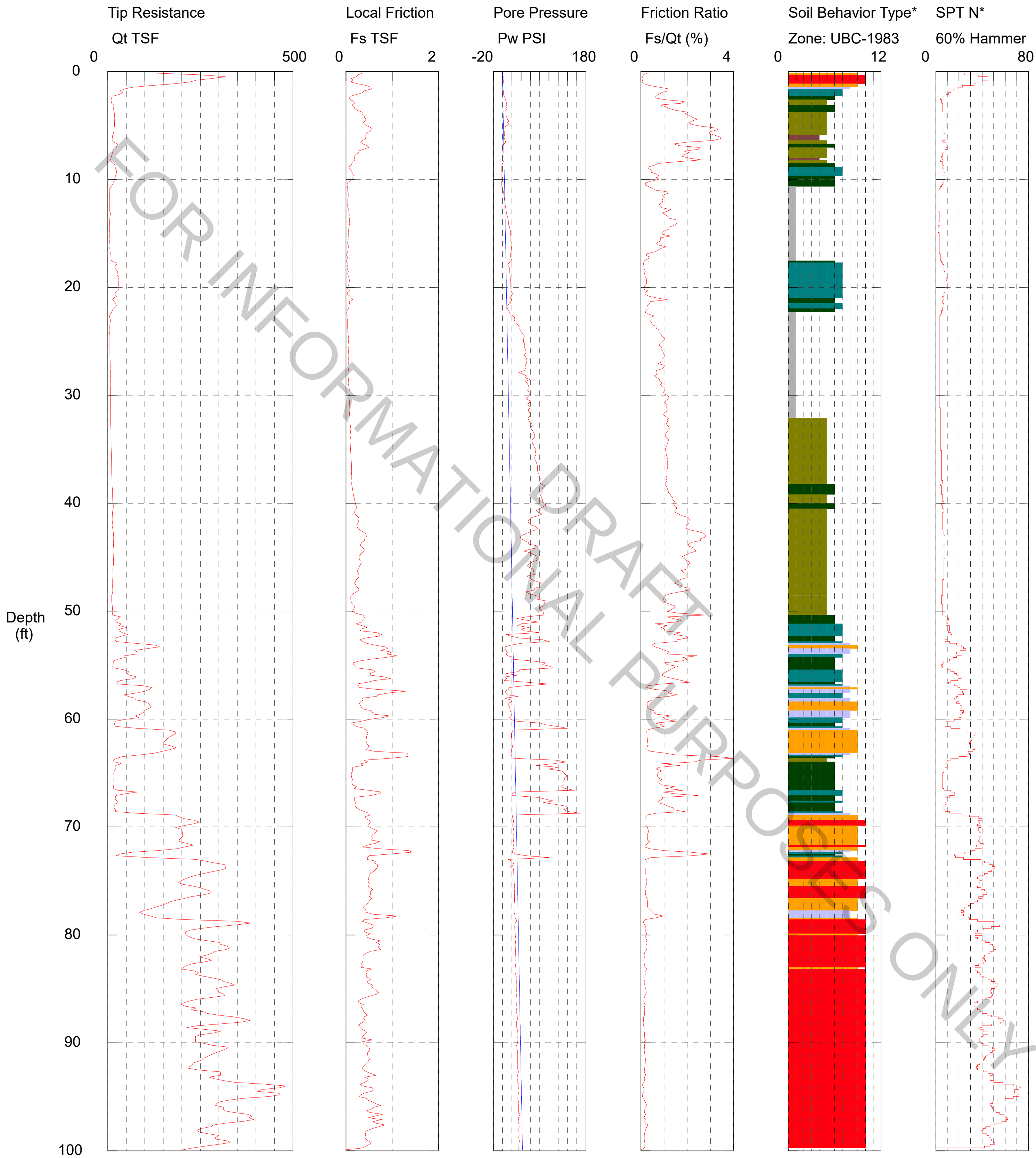
Remarks: N30.64016 W88.08054
Elevation estimated from Provided Topo Drawing
Refusal at 95 Feet due to Gravel caving in

SES SOUTHERN EARTH SCIENCES

Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-8
Cone Used: DPG1210
GPS Data: N30.63988 W88.08054

CPT Date/Time: 8/30/2023 3:30:42 PM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 1.2-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

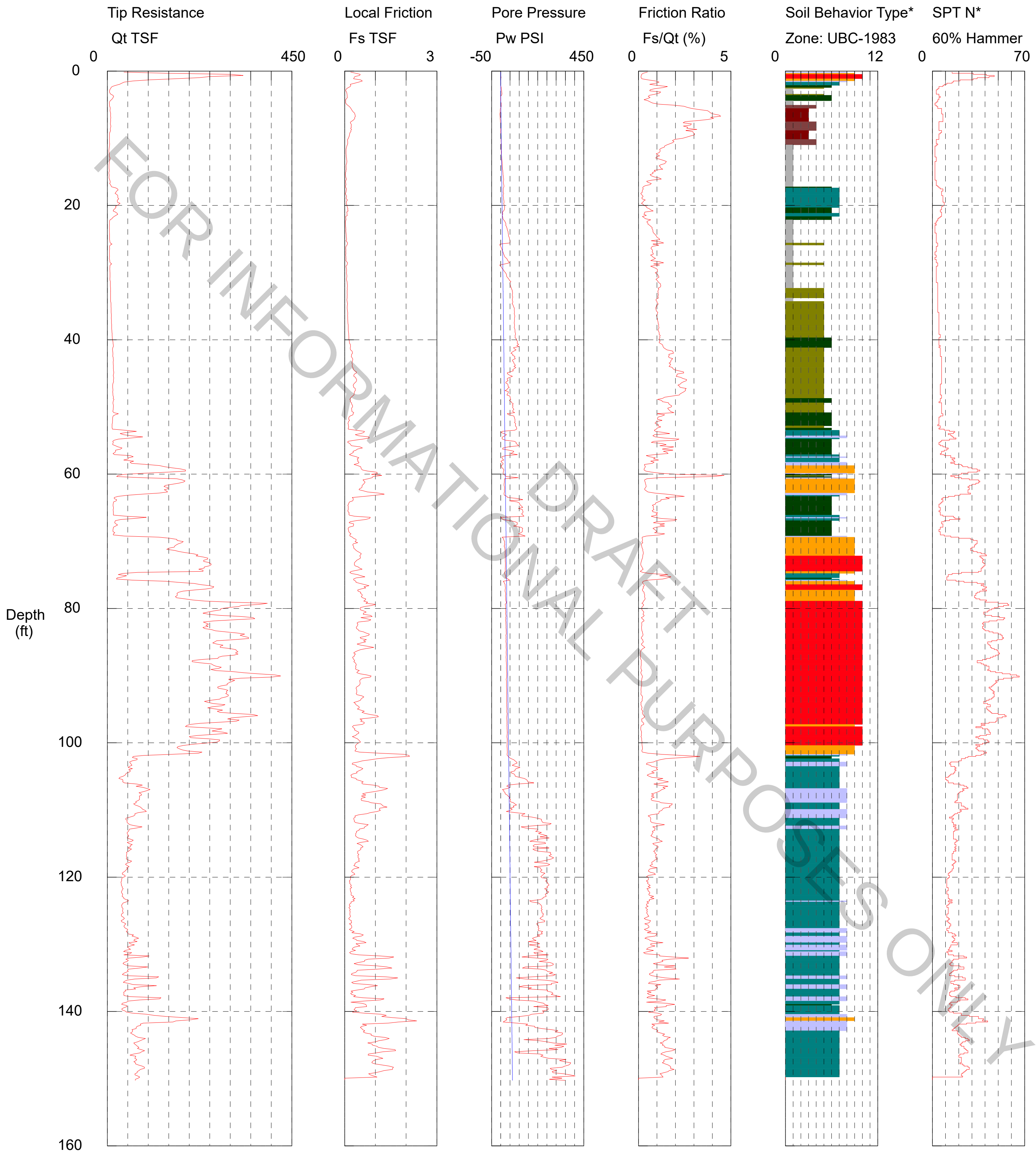
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-9
Cone Used: DPG1210
GPS Data: N30.63996 W88.08055

CPT Date/Time: 8/31/2023 7:47:43 AM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 3.8-ft.



Maximum Depth = 150.26 feet

Depth Increment = 0.164 feet

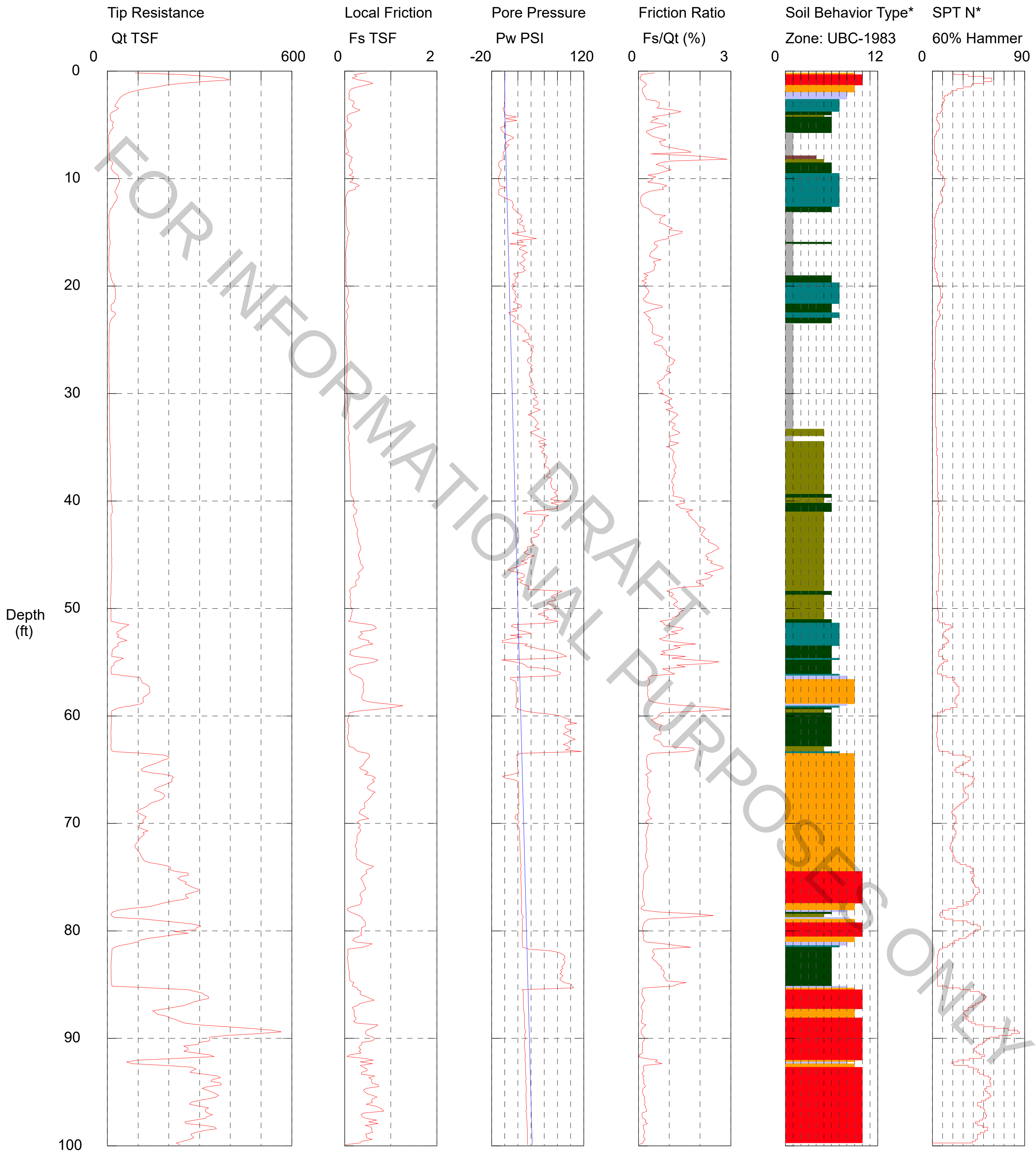
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: SCPT-PG10
Cone Used: DPG1210
GPS Data: N30.64037 W88.08026

CPT Date/Time: 8/31/2023 9:17:10 AM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 3.9-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

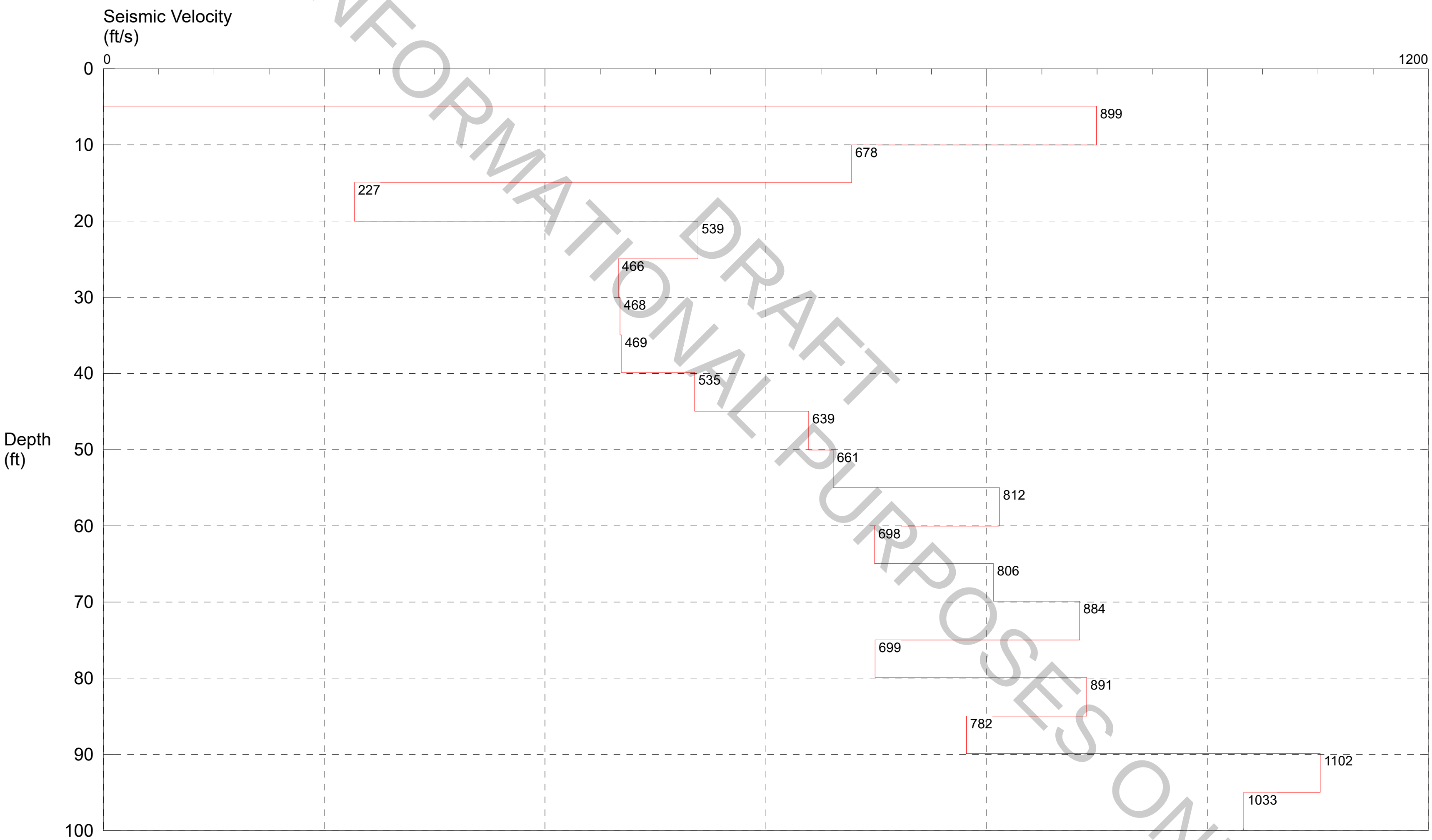
*Soil behavior type and SPT based on data from UBC-1983

SOUNDING

SOUNDING
CUSTOMER: Southern Earth Sciences
OPERATOR: Brandon Green
CONE ID: DPG1210
LOCATION: MAA PARKING GARAGE

JOB NUMBER: M23-442
HOLE NUMBER: SCPT-PG10
TEST DATE: 8/31/2023 9:17:10 AM
COMMENT: N30.64037 W88.08026
COMMENT:

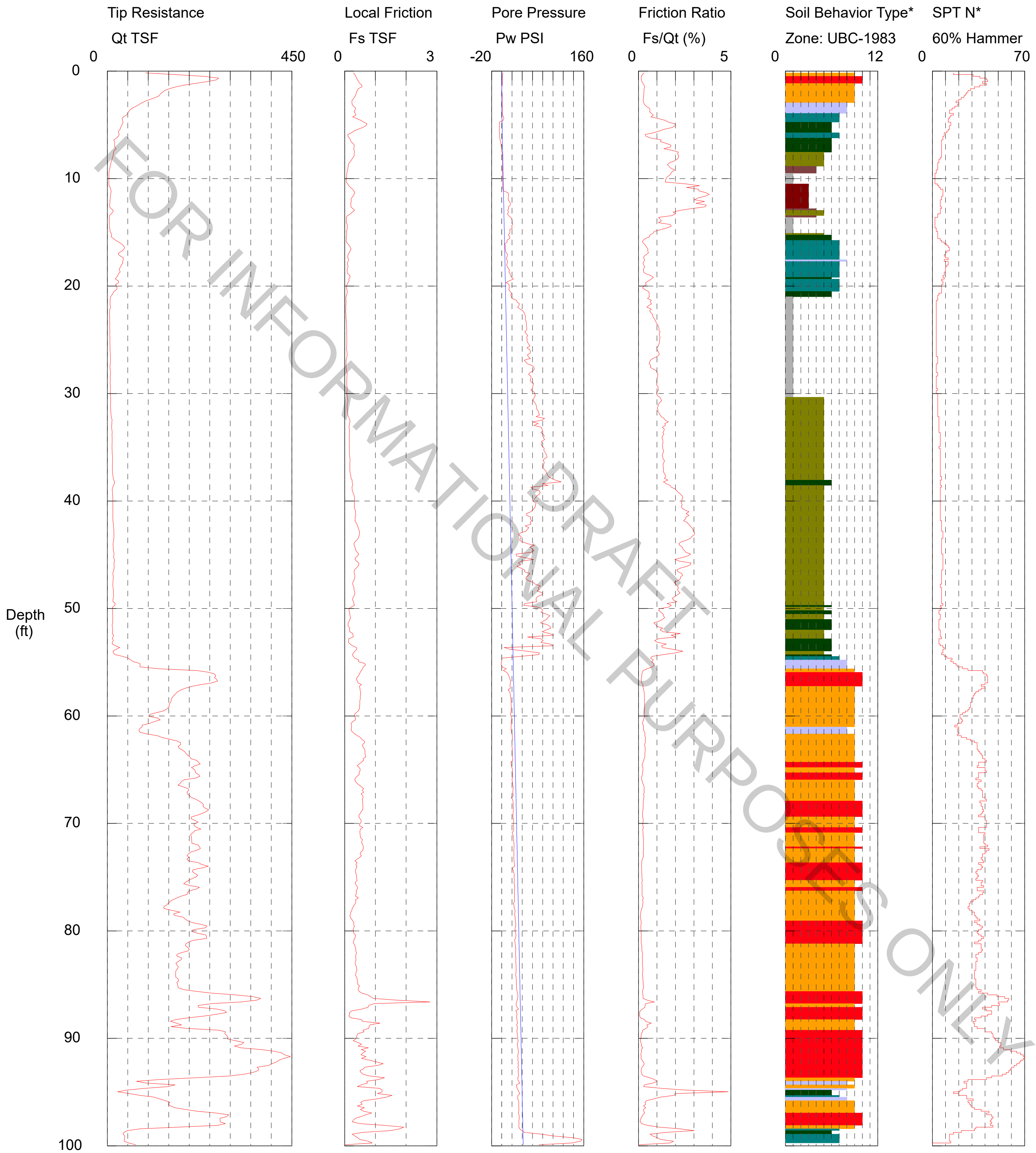
COMMENT:
LOCATION: MAA PARKING GARAGE
Groundwater: Collapsed Dry At 3.9-ft.



Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-11
Cone Used: DPG1210
GPS Data: N30.64002 W88.07973

CPT Date/Time: 9/1/2023 9:37:00 AM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 3.7-ft.



Maximum Depth = 100.23 feet

Depth Increment = 0.164 feet

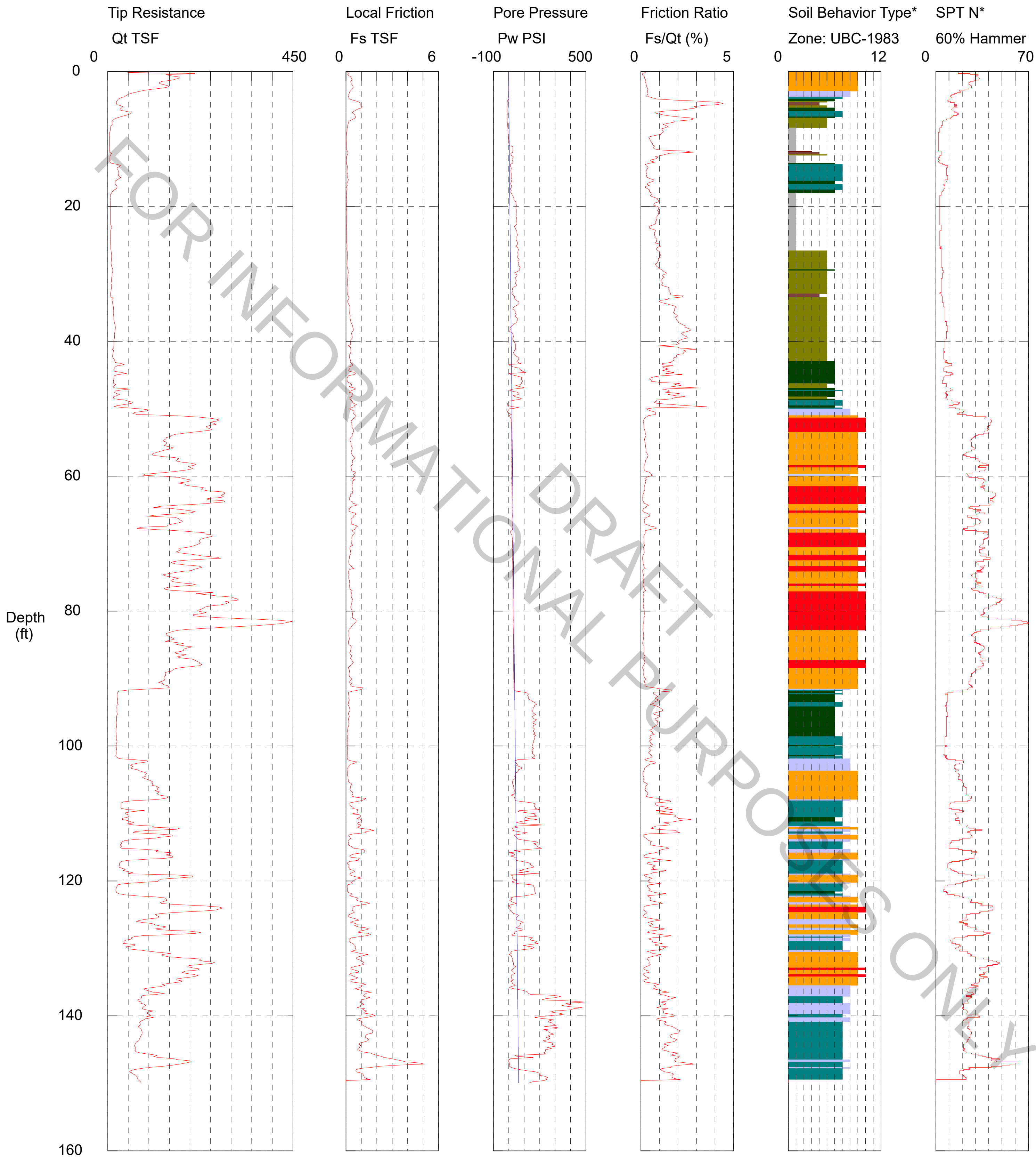
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

Southern Earth Sciences

Operator: Brandon Green
Sounding: PG-12
Cone Used: DPG1210
GPS Data: N30.64004 W88.07942

CPT Date/Time: 9/1/2023 7:22:56 AM
Location: MAA PARKING GARAGE
Job Number: M23-442
Groundwater: Collapsed Dry At 4.1-ft.



Maximum Depth = 149.93 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*Soil behavior type and SPT based on data from UBC-1983

APPENDIX 3

Laboratory Test Data

SOUTHERN EARTH SCIENCES

Laboratory Test Data Summary

SOUTHERN EARTH SCIENCES

Client: Volkert, Inc.

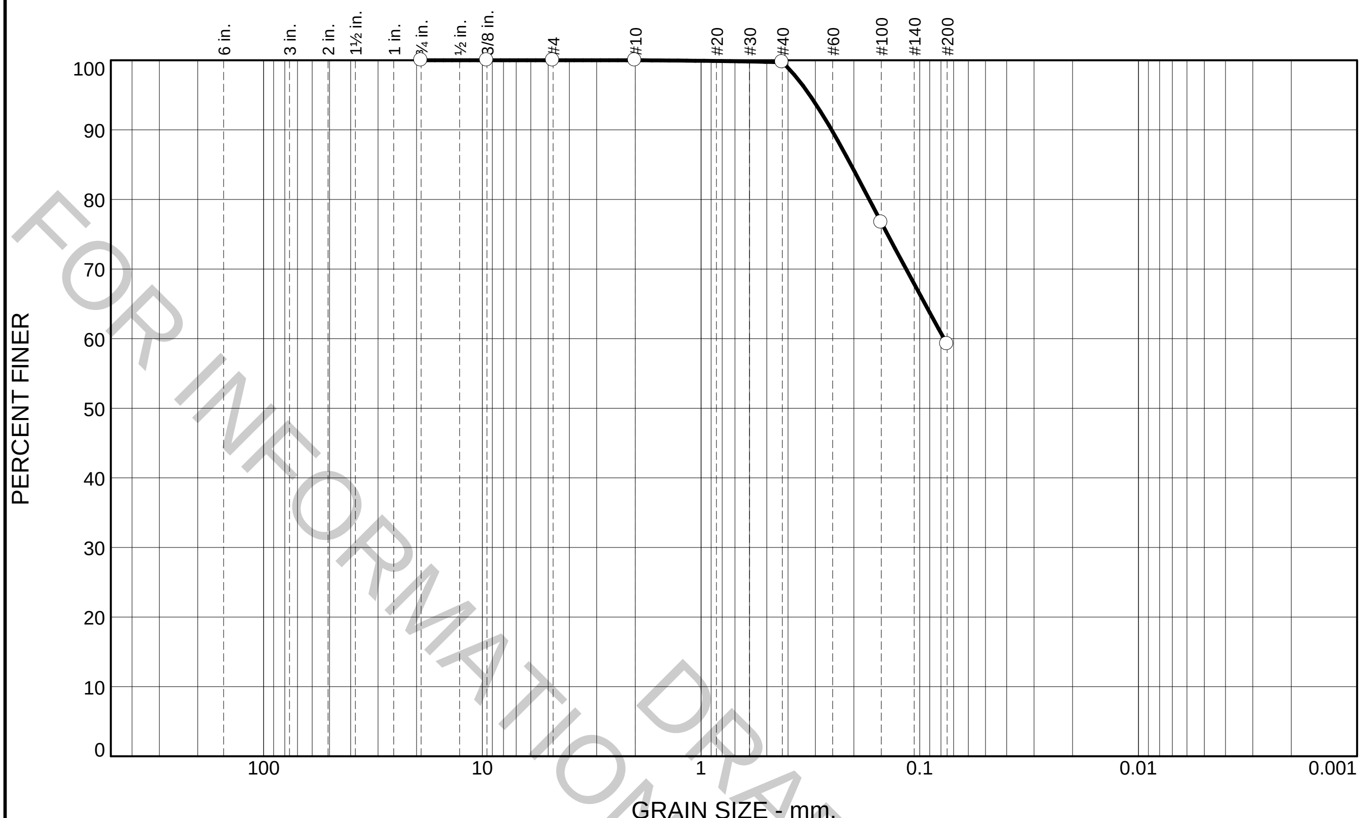
Date: 09/22/23

Project: MAA - Parking Garage

Project No: M23-442

Test Location	Sample	Sample Depth (ft)	USCS Classification	AASHTO Classification	Moisture Content (%)	Atterberg Limits		Passing No. 200 (%)	Passing No. 40 (%)
						LL	PI		
PG-7	S-3	5.0-6.5	CL-ML	A-4(0)	23.1	20	5	59.2	99.7
PG-7	S-6	15.0-16.5	SC-SM	A-4(0)	25.7	23	5	38.7	99.6
PG-7	T-2	28.0-30.0	CL	A-6(15)	42.9	39	16	89.9	99.1
PG-7	T-3	38.0-40.0	CH	A-7-5(36)	86.1	60	30	99.4	99.8
PG-7	S-14	55.0-56.5	SM	A-4(0)	29.0	NV	NP	42.9	99.6
PG-7	S-17	70.0-71.5	ML	A-4(0)	15.1	NV	NP	54.7	79.0

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	40.5	59.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#40	99.7		
#100	76.7		
#200	59.2		

* (no specification provided)

Soil Description

GRAYISH BROWN SANDY SILTY CLAY

Atterberg Limits

PL= 15 LL= 20 PI= 5

Coefficients

D_{90}= 0.2529 D_{85}= 0.2063 D_{60}= 0.0774
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(0)

Remarks

Source of Sample: PG-7 **Depth:** 5.0'-6.5'
Sample Number: S-3 **Date:**

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA PARKING GARAGE & TERMINAL BUILDING
Project No: M23-442 **Figure**

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.3	60.9	38.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.9		
#40	99.6		
#100	70.1		
#200	38.7		

* (no specification provided)

Soil Description

GRAY SILTY CLAYEY SAND

Atterberg Limits

PL= 18 LL= 23 PI= 5

Coefficients

D_{90}= 0.2678 D_{85}= 0.2261 D_{60}= 0.1186
D_{50}= 0.0953 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

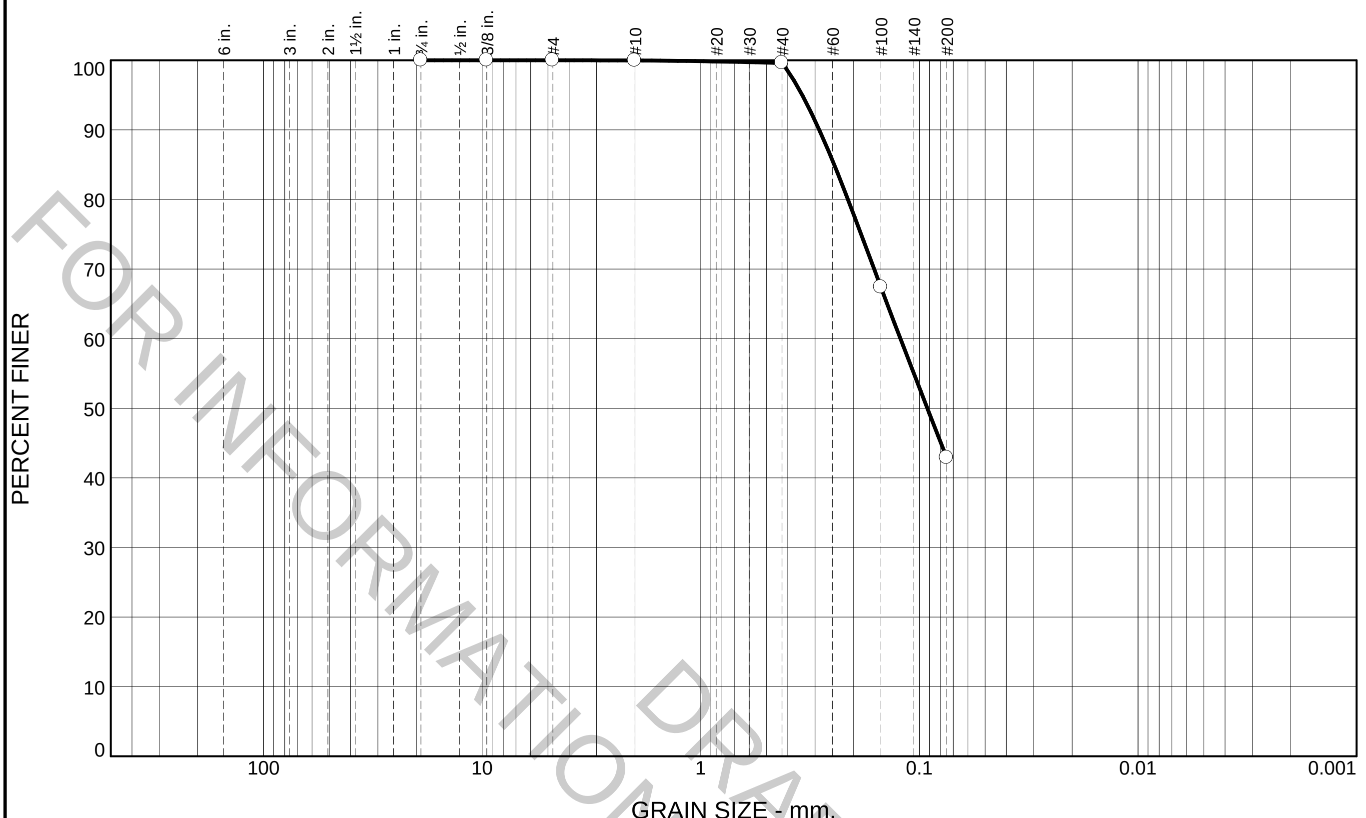
Remarks

Source of Sample: PG-7 **Depth:** 15.0'-16.5'
Sample Number: S-6 **Date:**

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA PARKING GARAGE & TERMINAL BUILDING
Project No: M23-442 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	56.7	42.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#40	99.6		
#100	67.4		
#200	42.9		

* (no specification provided)

Soil Description

GRAY SILTY SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.2870 D_{85}= 0.2454 D_{60}= 0.1221
D_{50}= 0.0919 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Source of Sample: PG-7 **Depth:** 55.0'-56.5'
Sample Number: S-14

Date:

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA PARKING GARAGE & TERMINAL BUILDING
Project No: M23-442 **Figure**

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	1.0	19.8	24.3	54.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	99.8		
#10	98.8		
#40	79.0		
#100	57.6		
#200	54.7		

* (no specification provided)

Soil Description

GRAY SANDY SILT

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7754 D_{85}= 0.5727 D_{60}= 0.1782
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Source of Sample: PG-7 **Depth:** 70.0'-71.5'
Sample Number: S-17 **Date:**

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA PARKING GARAGE & TERMINAL BUILDING
Project No: M23-442 **Figure**

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.8	9.2	89.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.9		
#40	99.1		
#100	92.5		
#200	89.9		

* (no specification provided)

Soil Description

GRAY CLAY WITH SOME ORGANICS

Atterberg Limits

PL= 23 LL= 39 PI= 16

Coefficients

D_{90}= 0.0765 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(15)

Remarks

Source of Sample: PG-7 **Depth:** 28.0'-30.0'
Sample Number: T-2

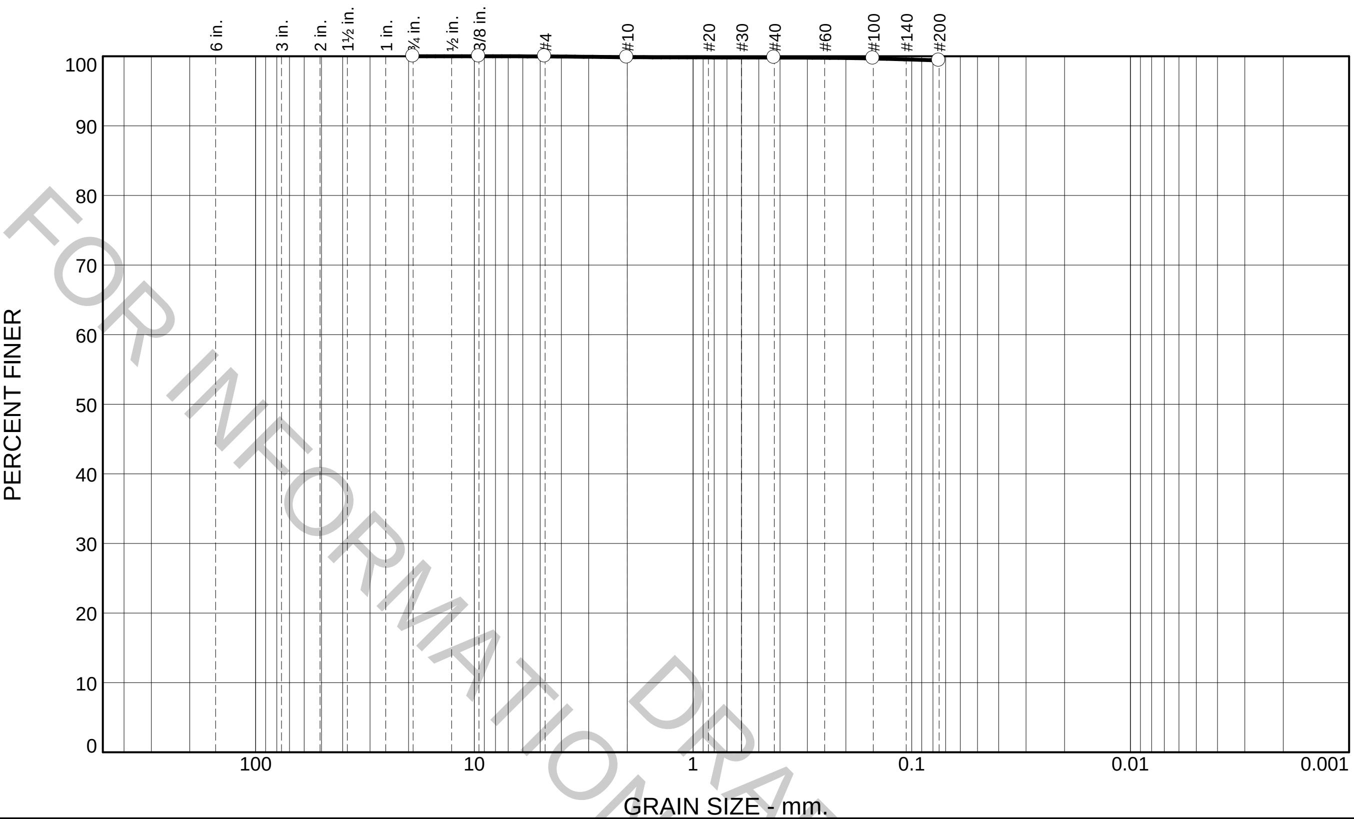
Date:

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Project No: M23-442 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.1	0.4	99.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.9		
#40	99.8		
#100	99.7		
#200	99.4		

* (no specification provided)

Soil Description

GRAYISH BROWN FAT CLAY

Atterberg Limits

PL= 30 LL= 60 PI= 30

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(36)

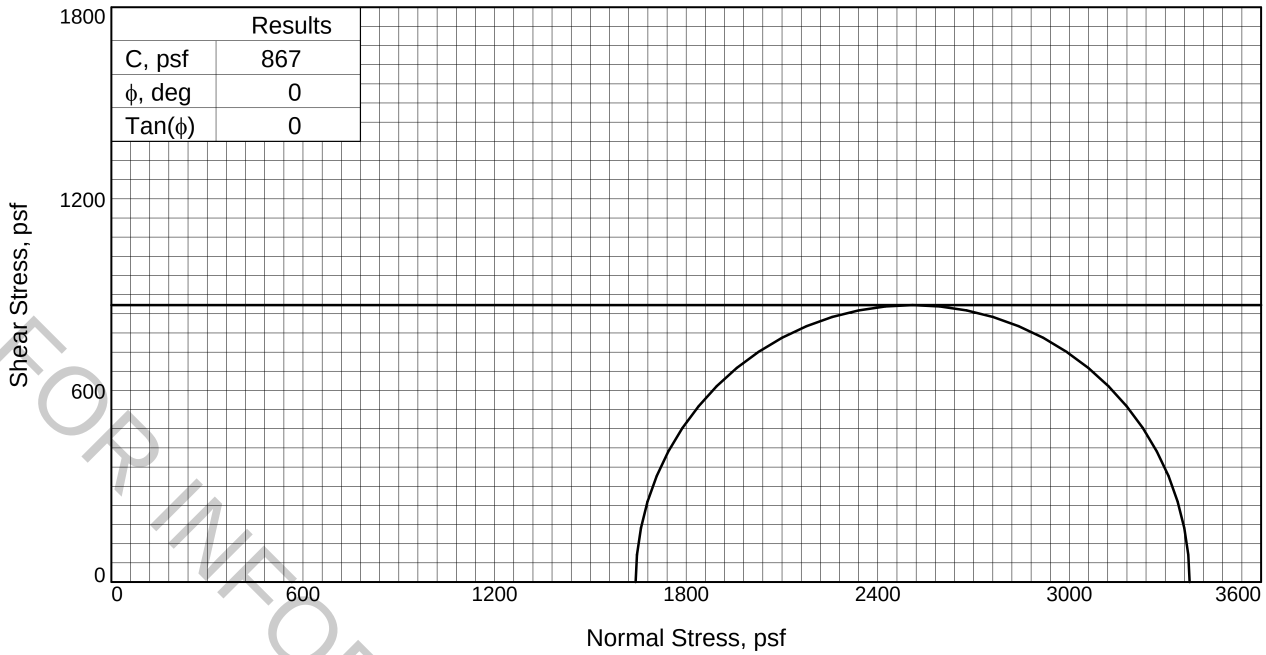
Remarks

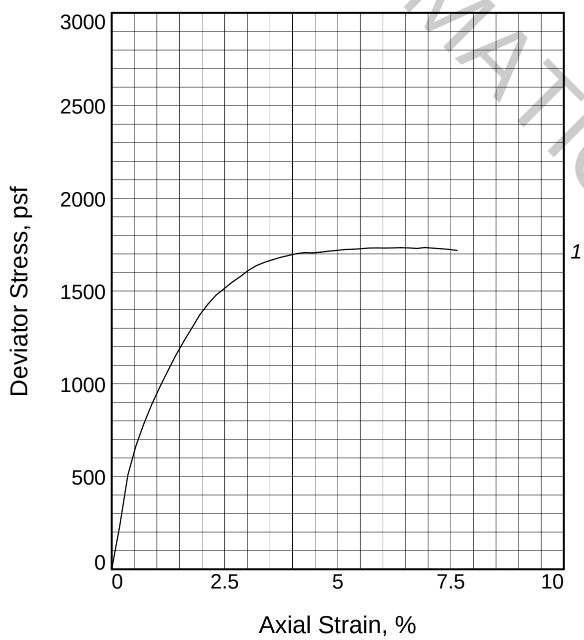
Source of Sample: PG-7 **Depth:** 38.0'-40.0'
Sample Number: T-3 **Date:**

SOUTHERN EARTH SCIENCES
Mobile, Alabama

Client: VOLKERT, INC.
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Project No: M23-442 **Figure**





Sample No.		1
Initial	Water Content, %	41.3
	Dry Density, pcf	80.5
	Saturation, %	98.6
	Void Ratio	1.1713
	Diameter, in.	2.82
	Height, in.	5.63
At Test	Water Content, %	41.8
	Dry Density, pcf	80.5
	Saturation, %	100.0
	Void Ratio	1.1713
	Diameter, in.	2.82
	Height, in.	5.63
Strain rate, in./min.		0.050
Back Pressure, psi		0.00
Cell Pressure, psi		11.40
Fail. Stress, psf		1735
Strain, %		6.9
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		3376
σ_3 Failure, psf		1642

Type of Test:
Unconsolidated Undrained

Sample Type: UNDISTURBED

Description: GRAY CLAY WITH SOME ORGANICS

LL= 39 **PL=** 23 **PI=** 16

Assumed Specific Gravity= 2.8

Remarks:

Figure ________

Client: VOLKERT, INC.

Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 **Depth:** 28.0'-30.0'

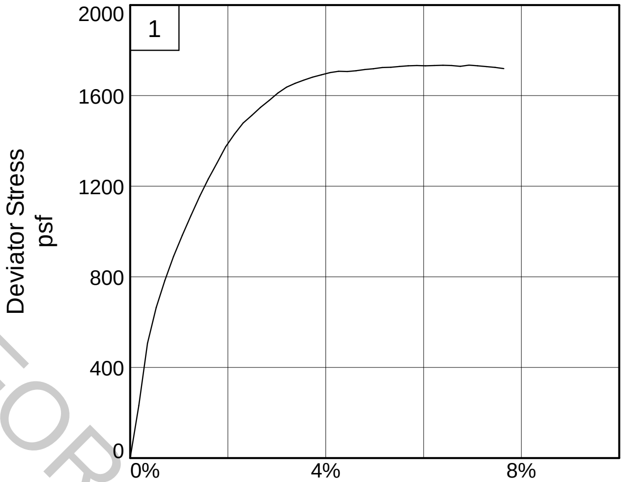
Sample Number: T-2

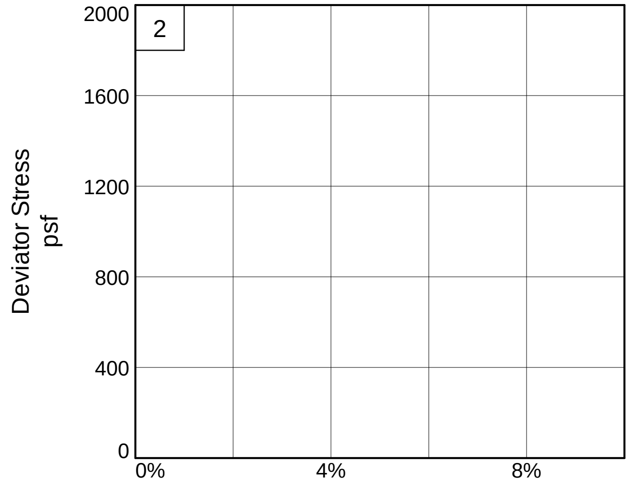
Proj. No.: M23-442 **Date Sampled:**

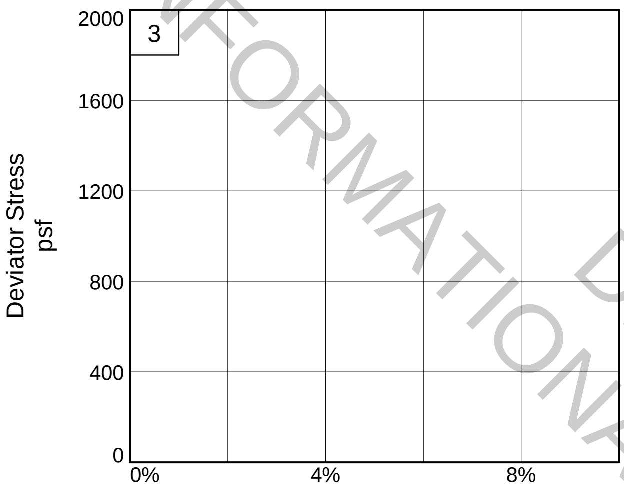
TRIAXIAL SHEAR TEST REPORT

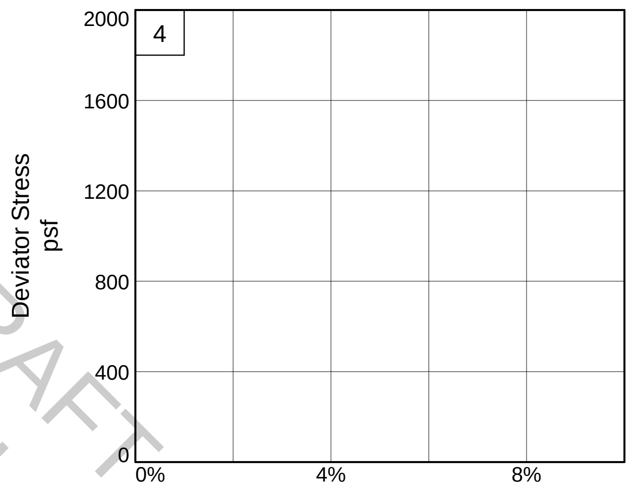
SOUTHERN EARTH SCIENCES

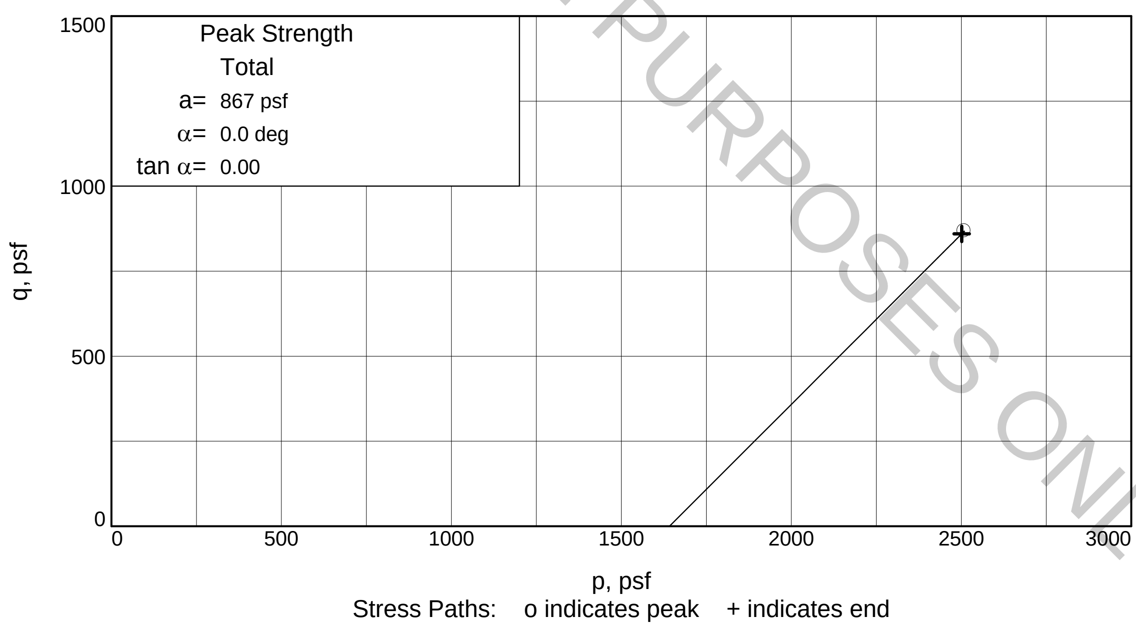
Mobile, Alabama











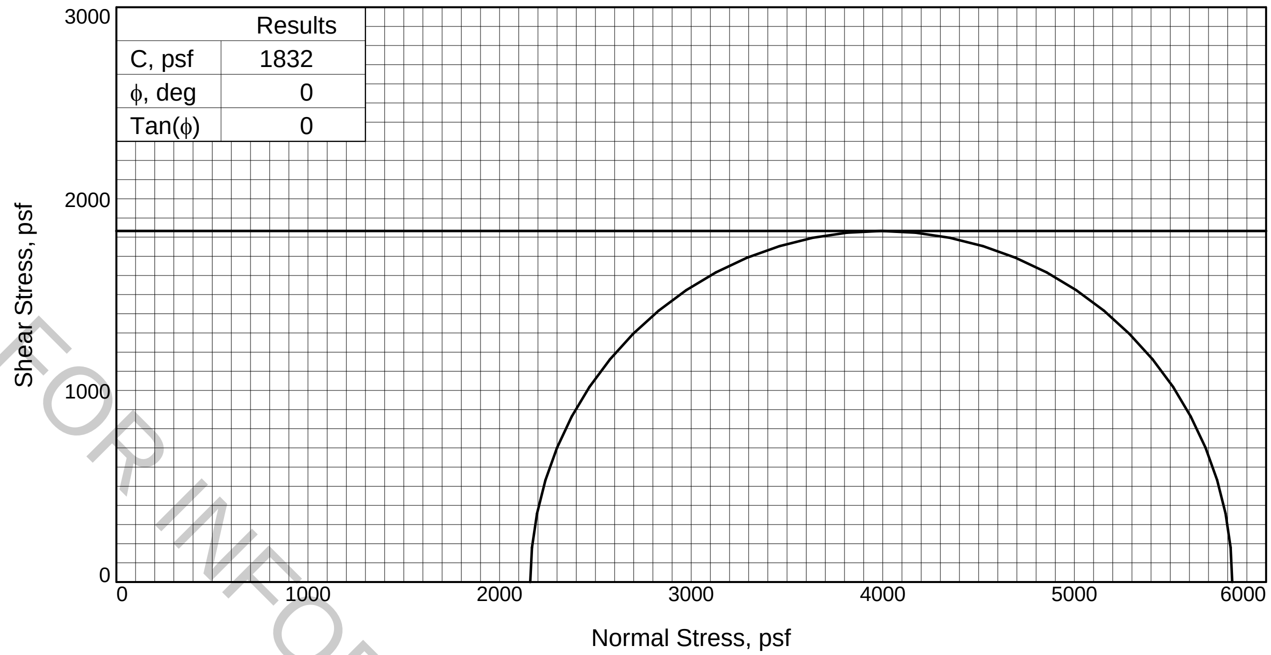
Client: VOLKERT, INC.

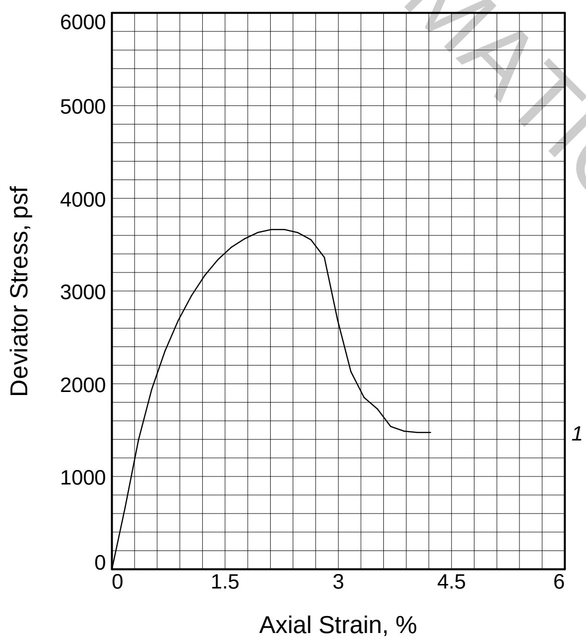
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 **Depth:** 28.0'-30.0' **Sample Number:** T-2

Project No.: M23-442 **Figure** ________

SOUTHERN EARTH SCIENCES





Sample No.		1
Initial	Water Content, %	85.0
	Dry Density, pcf	50.9
	Saturation, %	97.7
	Void Ratio	2.4353
	Diameter, in.	2.84
	Height, in.	5.69
At Test	Water Content, %	87.0
	Dry Density, pcf	50.9
	Saturation, %	100.0
	Void Ratio	2.4353
	Diameter, in.	2.84
	Height, in.	5.69
Strain rate, in./min.		0.050
Back Pressure, psi		0.00
Cell Pressure, psi		15.00
Fail. Stress, psf		3664
Strain, %		2.3
Ult. Stress, psf		
Strain, %		
σ_1 Failure, psf		5824
σ_3 Failure, psf		2160

Type of Test:
Unconsolidated Undrained

Sample Type: UNDRAINED

Description: GRAYISH BROWN FAT CLAY

LL= 60 **PL=** 30 **PI=** 30

Assumed Specific Gravity= 2.8

Remarks:

Figure ________

Client: VOLKERT, INC.

Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 **Depth:** 38.0'-40.0'

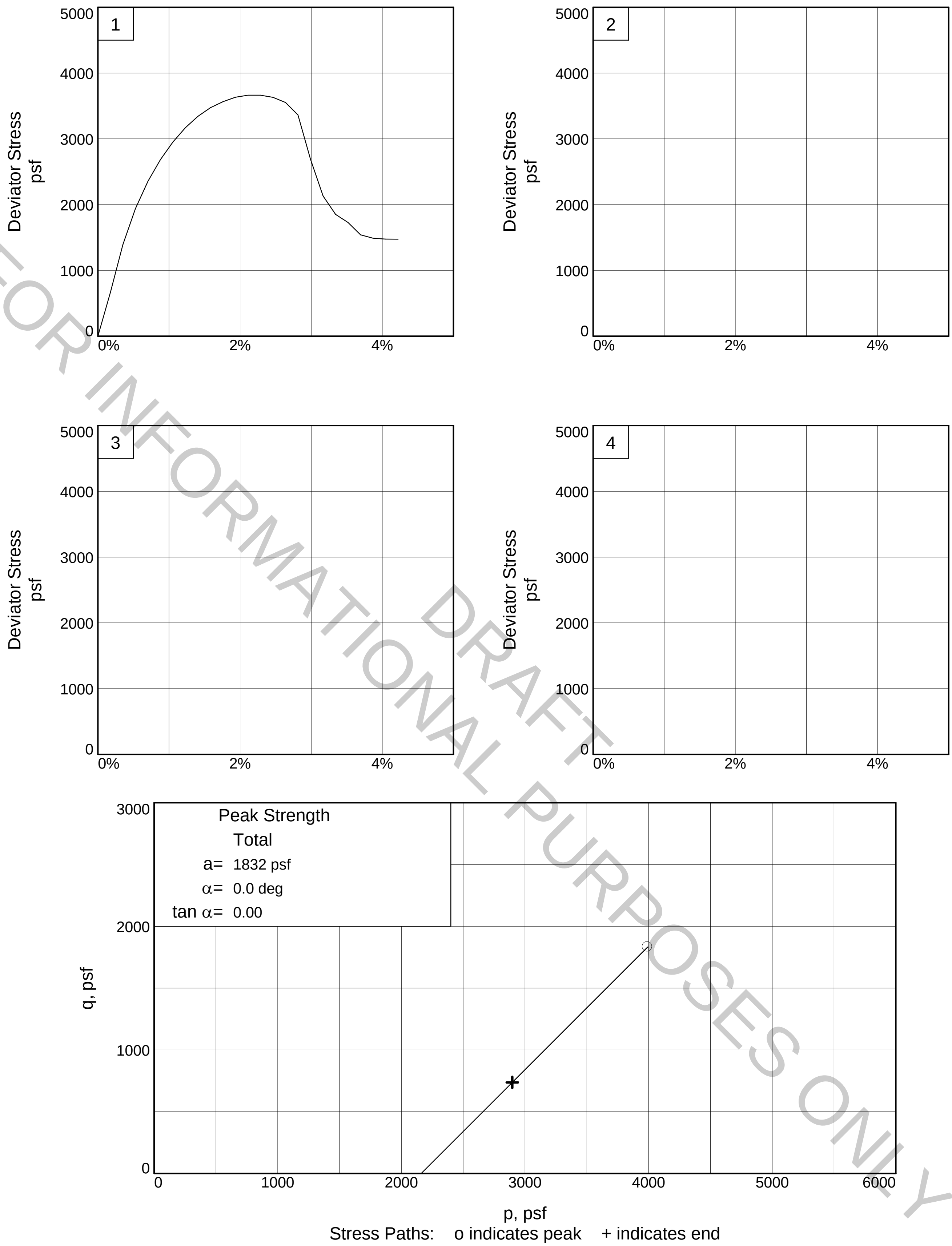
Sample Number: T-3

Proj. No.: M23-442 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

SOUTHERN EARTH SCIENCES

Mobile, Alabama



Client: VOLKERT, INC.

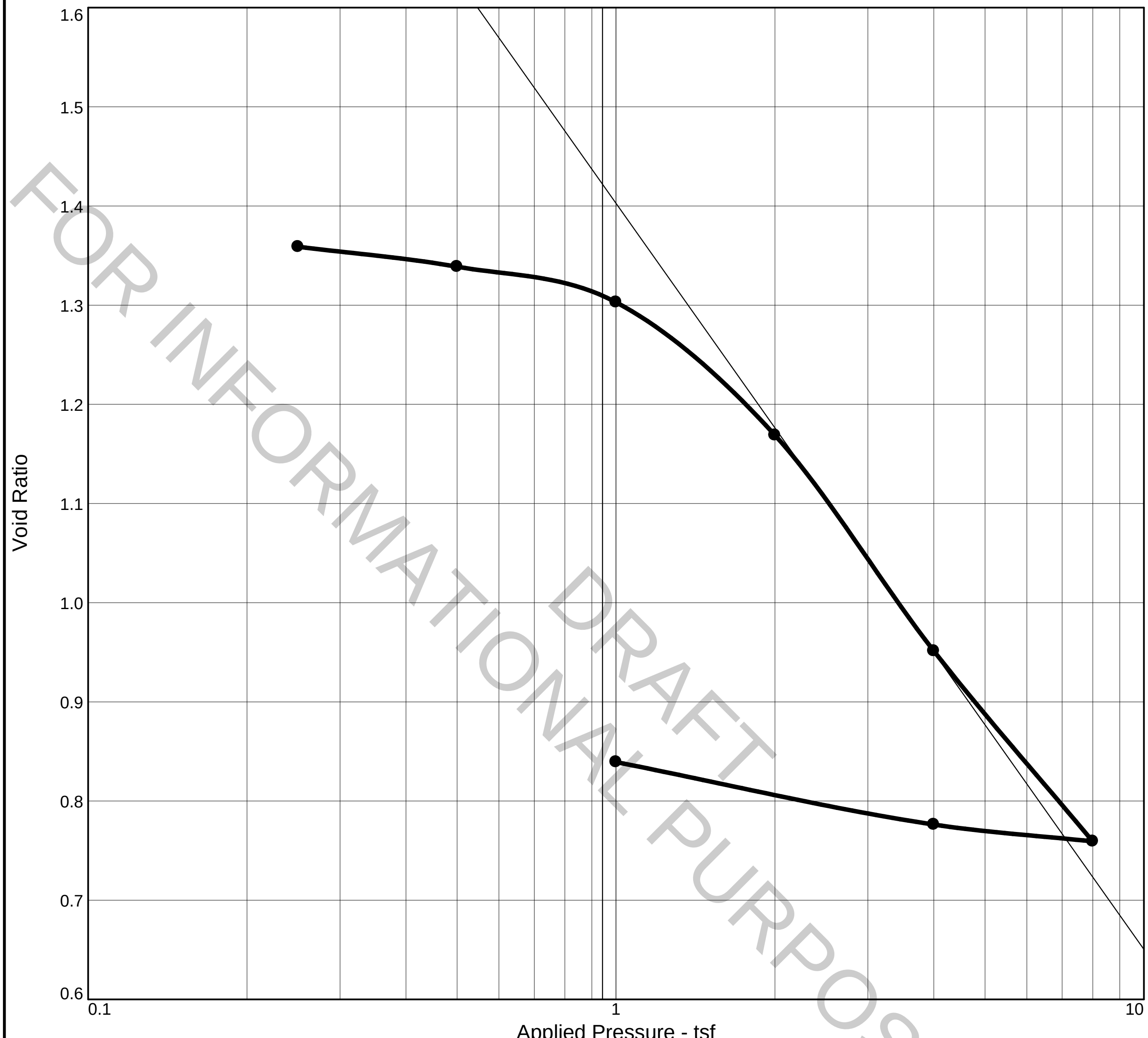
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 **Depth:** 38.0'-40.0' **Sample Number:** T-3

Project No.: M23-442 **Figure** ________

SOUTHERN EARTH SCIENCES

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
92.0 %	45.5 %	73.3	39	16	2.80		1.4	0.75				1.386

MATERIAL DESCRIPTION	USCS	AASHTO
GRAY CLAY WITH SOME ORGANICS	CL	A-6(15)

Project No. M23-442 **Client:** VOLKERT, INC.

Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 **Depth:** 28.0'-30.0' **Sample Number:** T-2

SOUTHERN EARTH SCIENCES

Mobile, Alabama

Remarks:

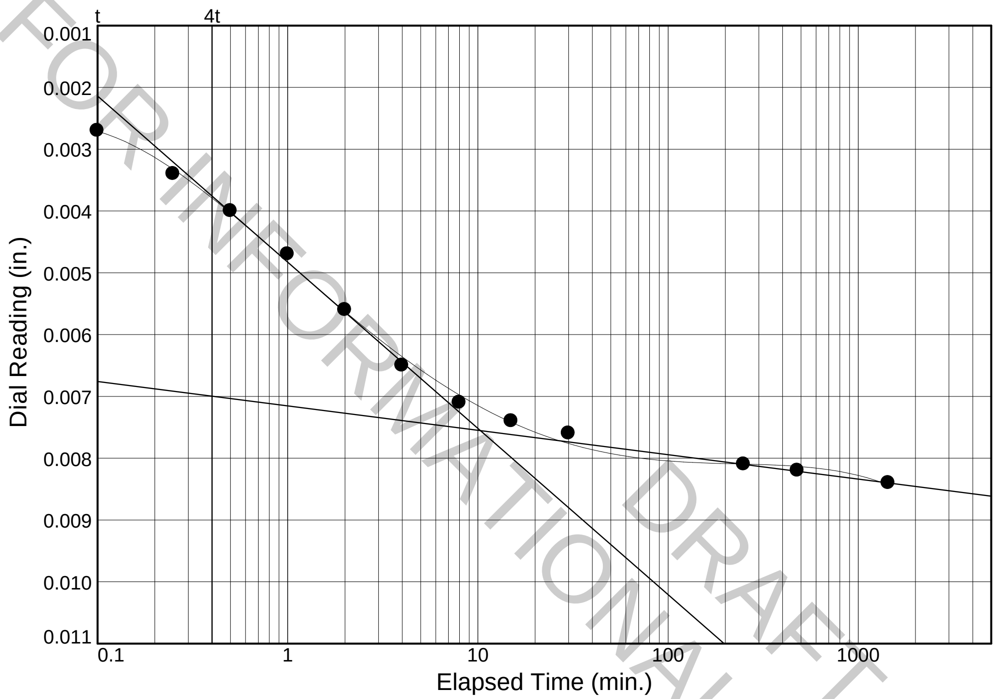
SPECIFIC GRAVITY ASSUMED TO BE 2.80

Figure

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

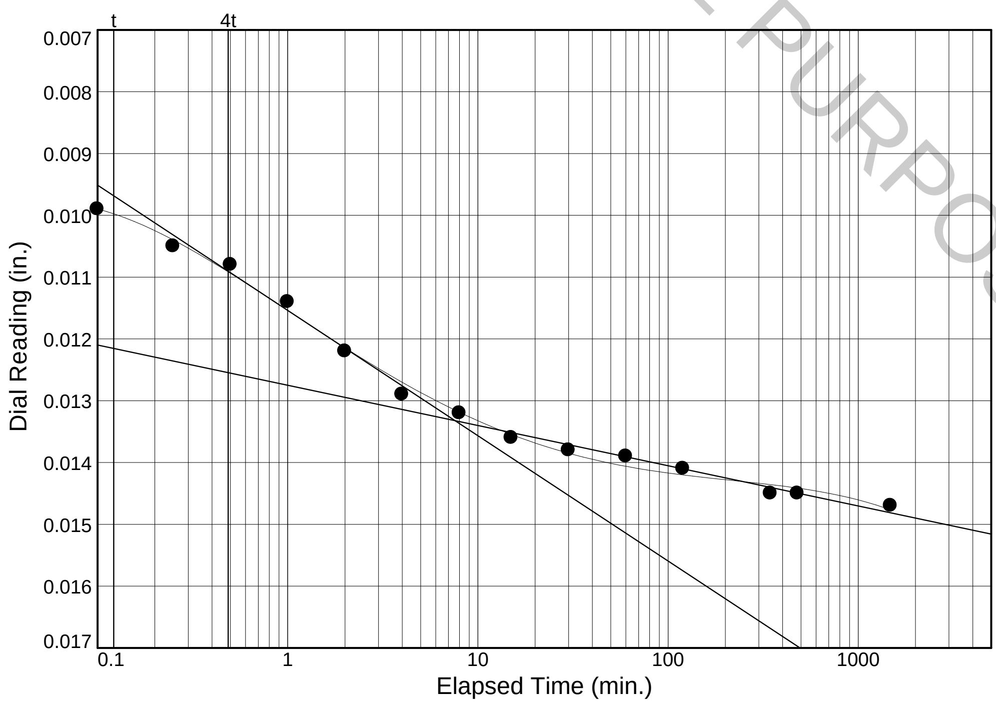
Source of Sample: PG-7 Depth: 28.0'-30.0' Sample Number: T-2



Load No.= 1
Load= 0.25 tsf
D_0 = 0.0016
D_{50} = 0.0046
D_{100} = 0.0076
T_{50} = 0.82 min.

C_v @ T_{50}
0.332 ft.^{2}/day

C_α = 0.001



Load No.= 2
Load= 0.50 tsf
D_0 = 0.0090
D_{50} = 0.0112
D_{100} = 0.0133
T_{50} = 0.66 min.

C_v @ T_{50}
0.401 ft.^{2}/day

C_α = 0.002

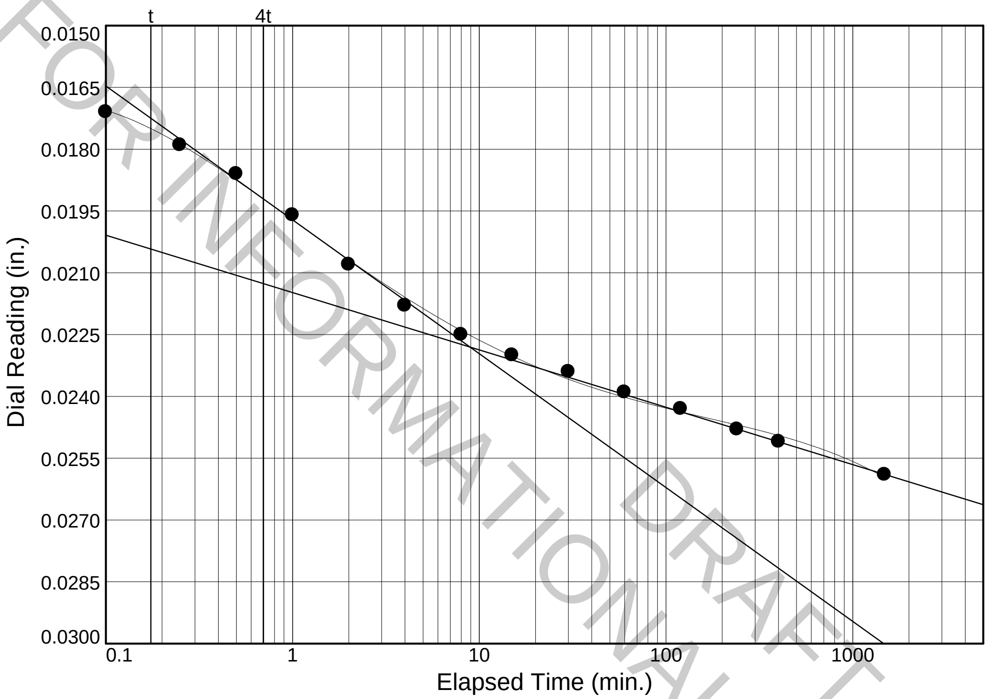
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 Depth: 28.0'-30.0' Sample Number: T-2



Load No.= 3

Load= 1.00 tsf

D_0 = 0.0158

D_{50} = 0.0193

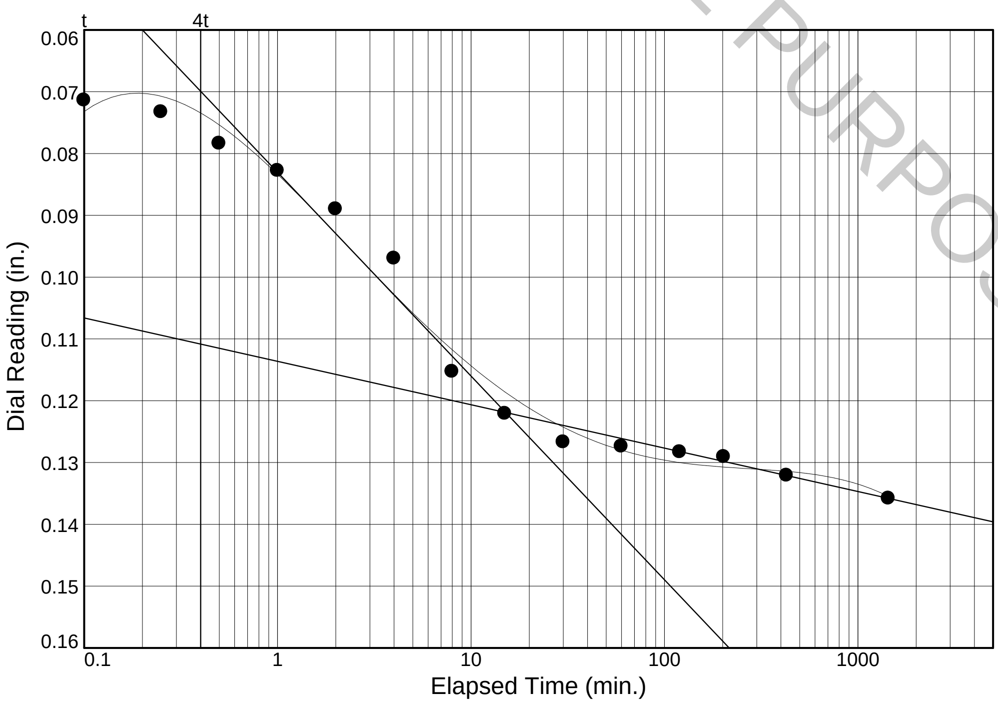
D_{100} = 0.0228

T_{50} = 0.74 min.

C_V @ T_{50}

0.349 ft.^{2}/day

C_α = 0.004



Load No.= 5

Load= 4.00 tsf

D_0 = 0.0730

D_{50} = 0.0974

D_{100} = 0.1219

T_{50} = 2.74 min.

C_V @ T_{50}

0.075 ft.^{2}/day

C_α = 0.022

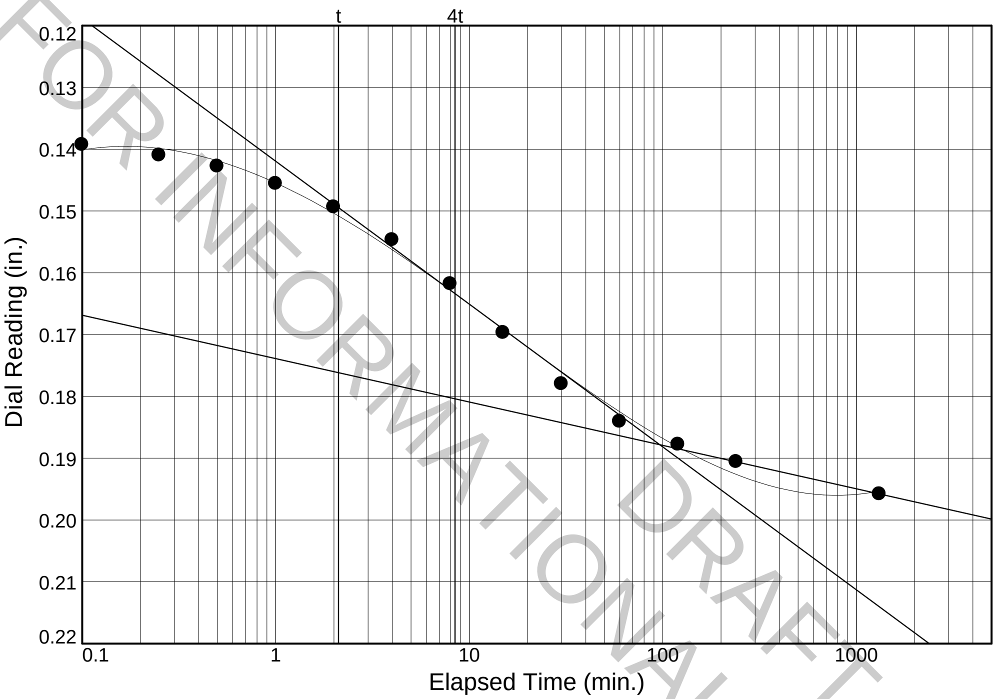
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

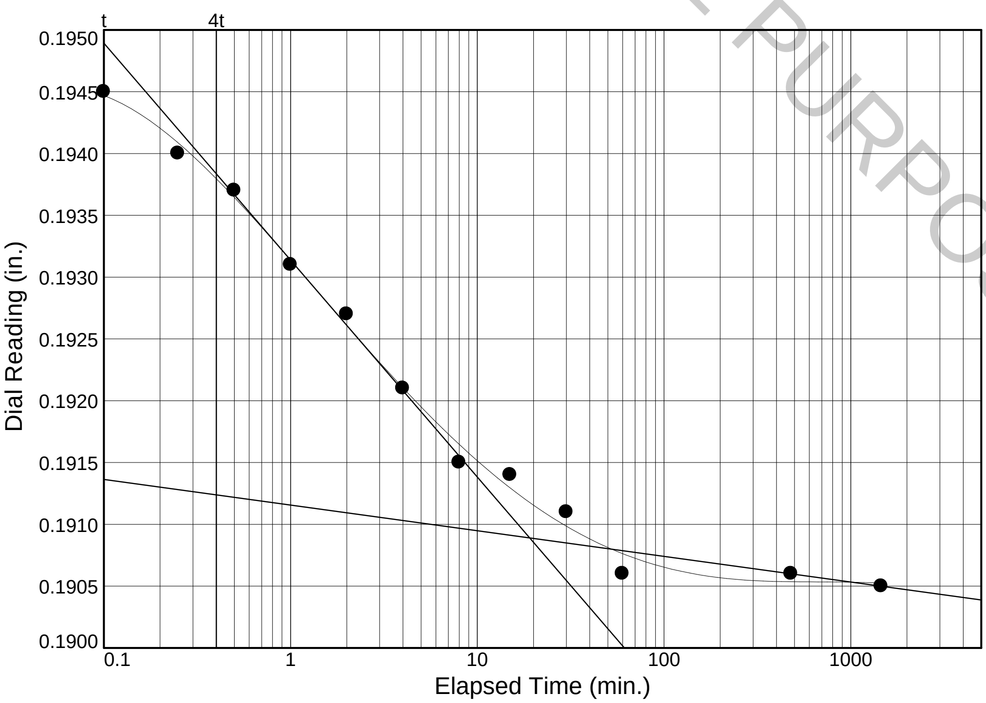
Source of Sample: PG-7 Depth: 28.0'-30.0' Sample Number: T-2



Load No.= 6
Load= 8.00 tsf
D_0 = 0.1382
D_{50} = 0.1630
D_{100} = 0.1878
T_{50} = 8.13 min.

C_v @ T_{50}
0.020 ft.^{2}/day

C_α = 0.022



Load No.= 7
Load= 4.00 tsf
D_0 = 0.1951
D_{50} = 0.1930
D_{100} = 0.1909
T_{50} = 1.17 min.

C_v @ T_{50}
0.128 ft.^{2}/day

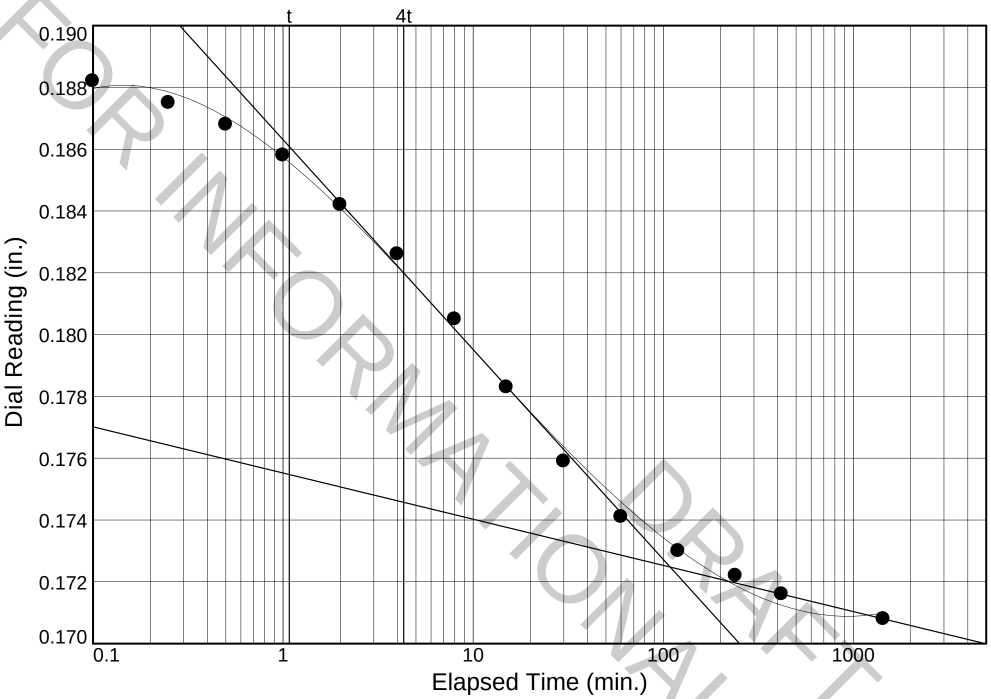
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 Depth: 28.0'-30.0' Sample Number: T-2



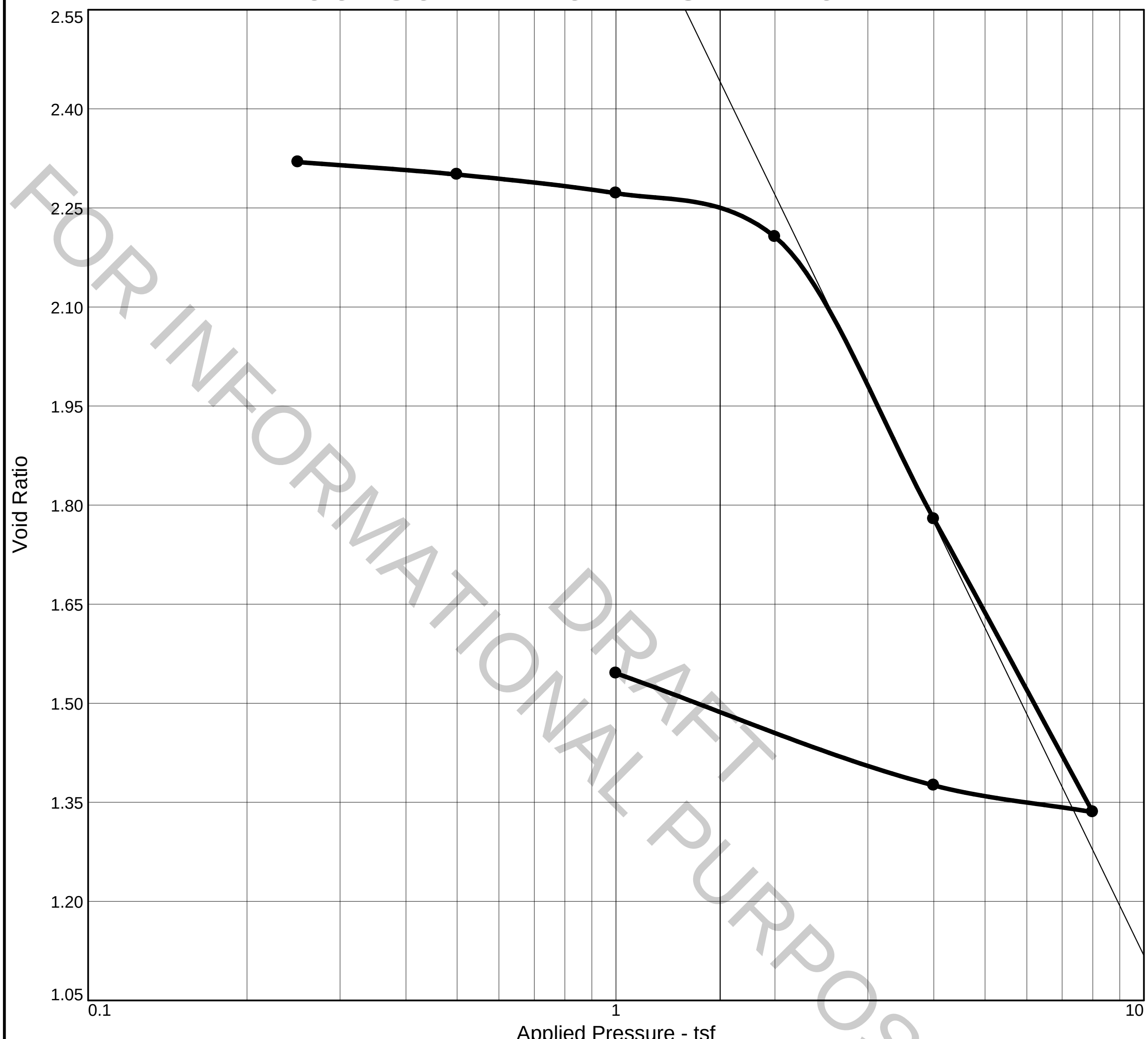
Load No.= 8
Load= 1.00 tsf
D_0 = 0.1892
D_{50} = 0.1808
D_{100} = 0.1725
T_{50} = 6.41 min.

C_v @ T_{50}
0.025 ft.^{2}/day

SOUTHERN EARTH SCIENCES

Figure

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Swell Press. (tsf)	Swell %	e_o
94.5 %	79.1 %	52.3	60	30	2.80		2.1	1.65				2.342

MATERIAL DESCRIPTION	USCS	AASHTO
GRAYISH BROWN FAT CLAY	CH	A-7-5(36)

Project No. M23-442 **Client:** VOLKERT, INC.

Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 **Depth:** 38.0'-40.0' **Sample Number:** T-3

Remarks:
SPECIFIC GRAVITY ASSUMED TO BE 2.80

SOUTHERN EARTH SCIENCES

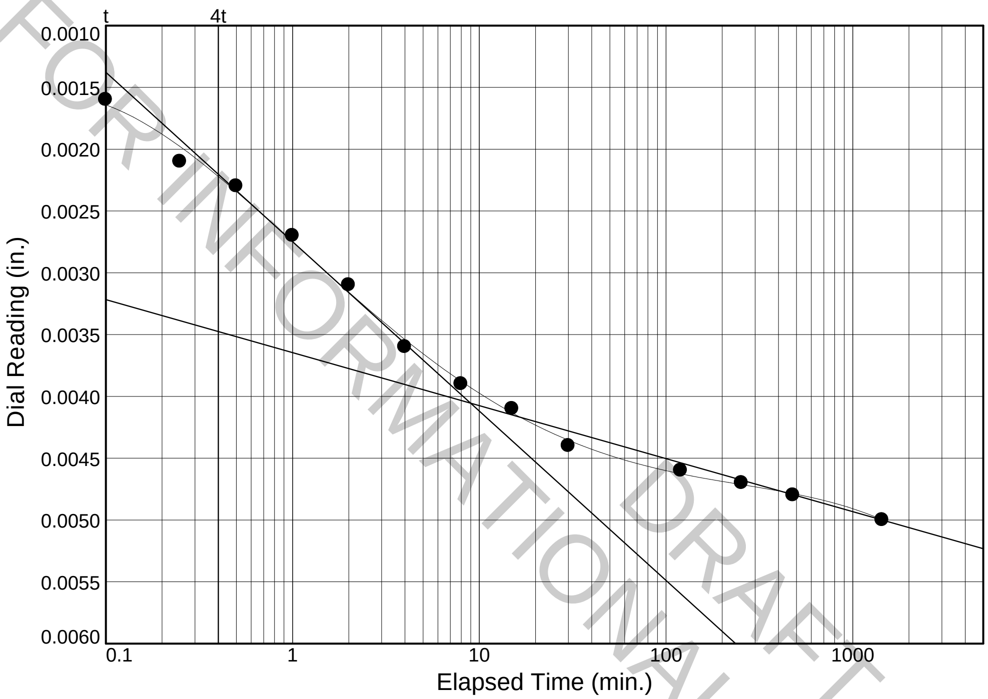
Mobile, Alabama

Figure

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

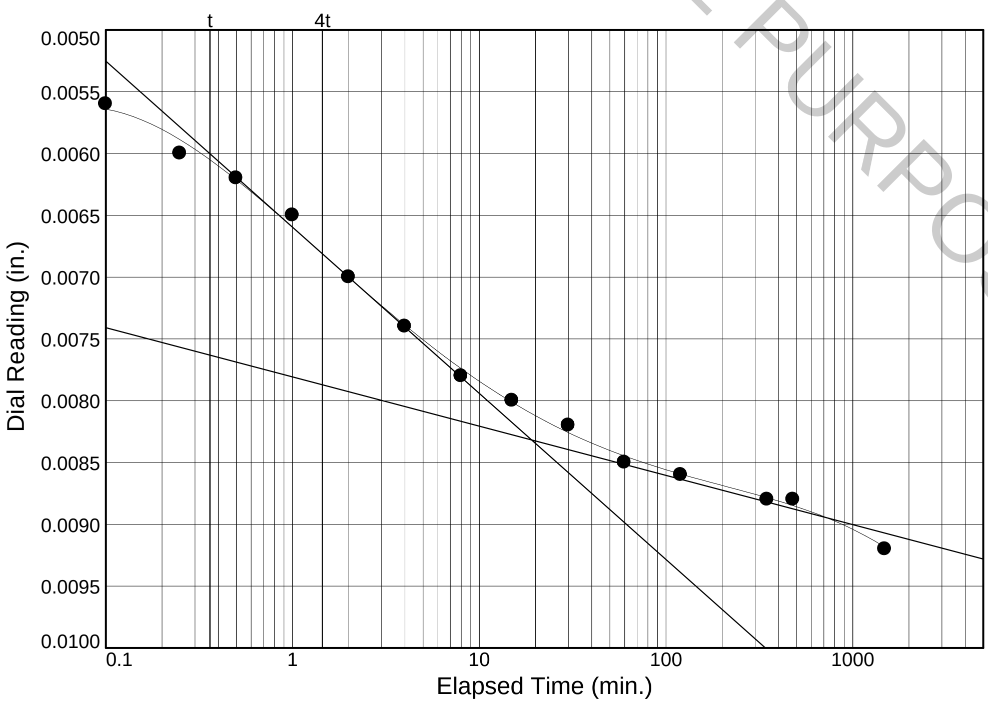
Source of Sample: PG-7 Depth: 38.0'-40.0' Sample Number: T-3



Load No.= 1
Load= 0.25 tsf
D_0 = 0.0011
D_{50} = 0.0026
D_{100} = 0.0041
T_{50} = 0.73 min.

C_v @ T_{50}
0.373 ft.^{2}/day

C_α = 0.002



Load No.= 2
Load= 0.50 tsf
D_0 = 0.0053
D_{50} = 0.0068
D_{100} = 0.0083
T_{50} = 1.42 min.

C_v @ T_{50}
0.188 ft.^{2}/day

C_α = 0.002

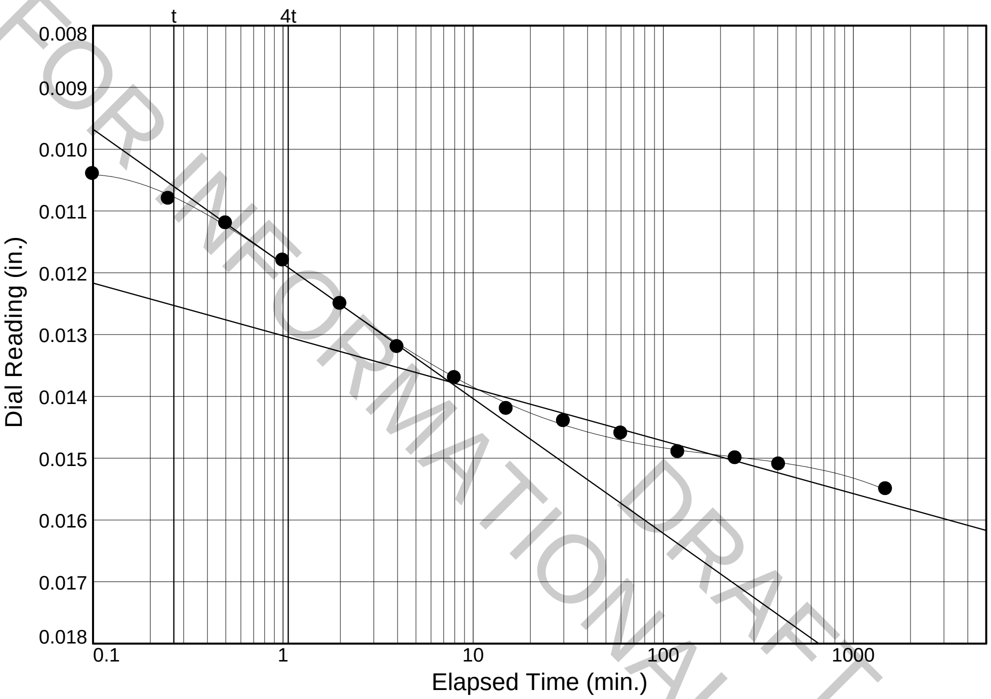
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 Depth: 38.0'-40.0' Sample Number: T-3



Load No.= 3
Load= 1.00 tsf
D_0 = 0.0096
D_{50} = 0.0117
D_{100} = 0.0138
T_{50} = 0.84 min.

C_v @ T_{50}
0.314 ft.^{2}/day

C_α = 0.004

Load No.= 4
Load= 2.00 tsf
D_0 = 0.0166
D_{50} = 0.0208
D_{100} = 0.0250
T_{50} = 1.78 min.

C_v @ T_{50}
0.144 ft.^{2}/day

C_α = 0.012

Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

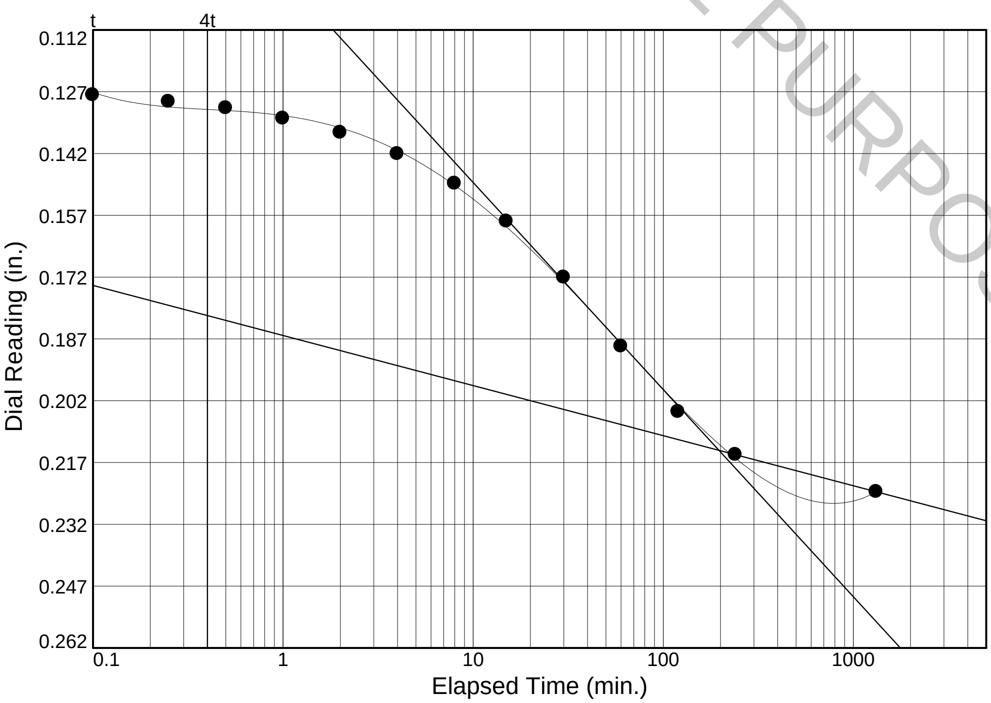
Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 Depth: 38.0'-40.0' Sample Number: T-3

Load No.= 5
Load= 4.00 tsf
D_0 = 0.0337
D_{50} = 0.0723
D_{100} = 0.1109
T_{50} = 29.37 min.

C_v @ T_{50}
0.007 ft.^{2}/day

C_α = 0.088



Load No.= 6
Load= 8.00 tsf
D_0 = 0.1230
D_{50} = 0.1685
D_{100} = 0.2140
T_{50} = 23.74 min.

C_v @ T_{50}
0.007 ft.^{2}/day

C_α = 0.055

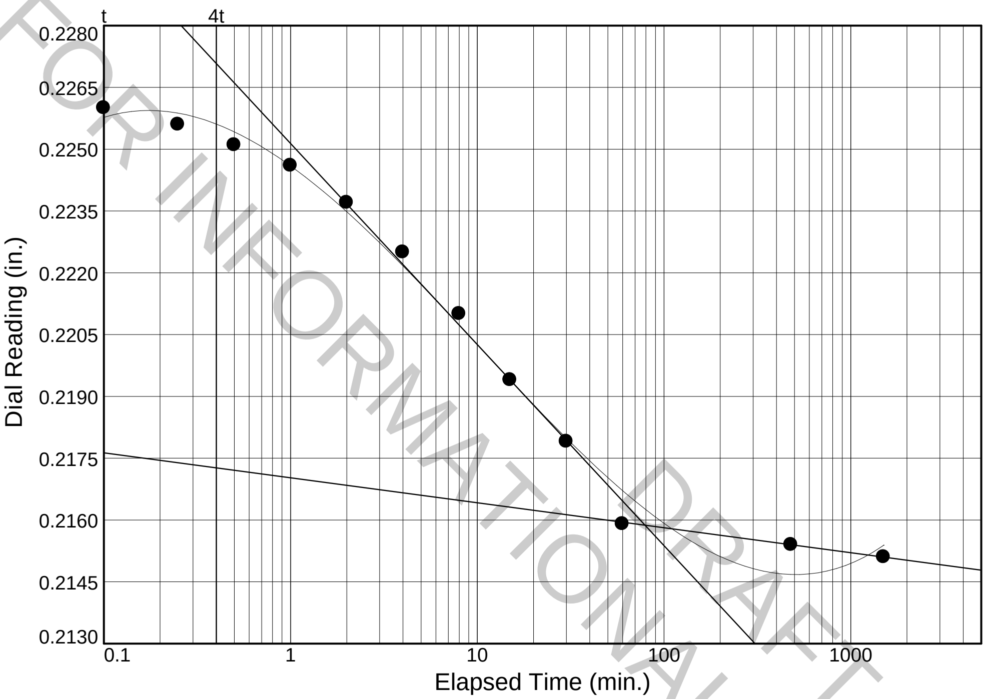
Figure

SOUTHERN EARTH SCIENCES

Dial Reading vs. Time

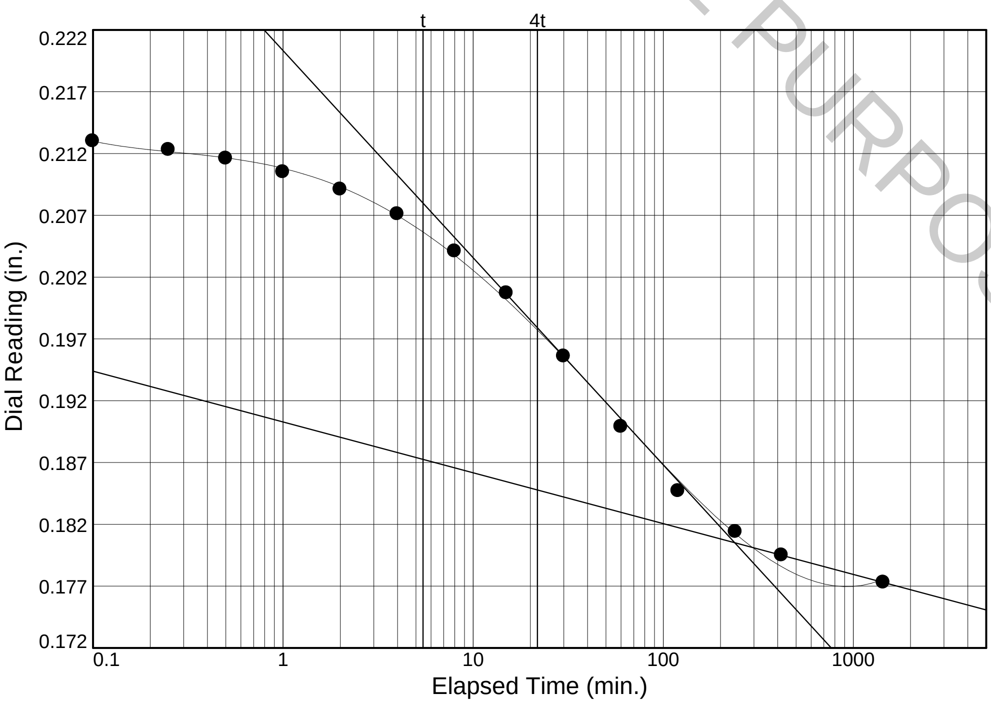
Project No.: M23-442
Project: MAA PARKING GARAGE & TERMINAL BUILDING

Source of Sample: PG-7 Depth: 38.0'-40.0' Sample Number: T-3



Load No.= 7
Load= 4.00 tsf
D_0 = 0.2259
D_{50} = 0.2209
D_{100} = 0.2159
T_{50} = 7.36 min.

C_v @ T_{50}
0.018 ft.^{2}/day



Load No.= 8
Load= 1.00 tsf
D_0 = 0.2136
D_{50} = 0.1971
D_{100} = 0.1805
T_{50} = 24.04 min.

C_v @ T_{50}
0.006 ft.^{2}/day

Figure

SOUTHERN EARTH SCIENCES

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 36609
251-344-9106

October 13, 2023

Kris Shantazio
Southern Earth Sciences, Inc.
Rangeline Rd.
Mobile, AL 36619

RE: Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Dear Kris Shantazio:

Enclosed are the analytical results for sample(s) received by the laboratory on September 27, 2023. The results relate only to the samples included in this report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - New Orleans

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

MK Brenner

Mary Kathryn Brenner
marykathryn.brenner@pacelabs.com
251-344-9106
Project Manager

Enclosures

cc: Jennifer Allen, Southern Earth Sciences, Inc.

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 36609
251-344-9106

CERTIFICATIONS

Project:	MAA/M23-442 08/30/23
Pace Project No.:	20290747

Pace Analytical Services New Orleans

Florida Department of Health (NELAC): E87595
Illinois Environmental Protection Agency: 2000662023-7
Kansas Department of Health and Environment (NELAC): E-10266
Louisiana Dept. of Environmental Quality (NELAC/LELAP): 02006
Texas Commission on Env. Quality (NELAC): T104704405-23-18
U.S. Dept. of Agriculture Foreign Soil Import: 525-23-117-89728

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 36609
251-344-9106

SAMPLE SUMMARY

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Lab ID	Sample ID	Matrix	Date Collected	Date Received
20290747001	**PG-7, S-2**	Solid	08/30/23 08:00	09/27/23 09:11
20290747003	**PG-7, S-4**	Solid	08/30/23 08:00	09/27/23 09:11
20290747004	**PG-7, S-5**	Solid	08/30/23 08:00	09/27/23 09:11
20290747005	**T-7, S-2**	Solid	08/30/23 08:00	09/27/23 09:11
20290747006	**T-7, S-3**	Solid	08/30/23 08:00	09/27/23 09:11
20290747007	**T-7, S-4**	Solid	08/30/23 08:00	09/27/23 09:11
20290747008	**T-7, S-5**	Solid	08/30/23 08:00	09/27/23 09:11

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SAMPLE ANALYTE COUNT

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Lab ID	Sample ID	Method	Analysts	Analytes Reported
20290747001	**PG-7, S-2**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747003	**PG-7, S-4**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747004	**PG-7, S-5**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747005	**T-7, S-2**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747006	**T-7, S-3**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	SKN	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747007	**T-7, S-4**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1
20290747008	**T-7, S-5**	EPA 9045	GGG1	1
		Moisture	GGG1	1
		EPA 120.1 Resistivity	MHM	1
		EPA 9038	MHM	1
		EPA 9251	MHM	1

PASI-N = Pace Analytical Services - New Orleans

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ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: PG-7, S-2 **Lab ID: 20290747001** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.1**	Std. Units	0.010	1		09/29/23 10:38		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**29.8**	%	0.50	1		09/29/23 07:55		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**53200**	ohms-cm	0.50	1		10/03/23 16:53		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**78.8**	mg/kg	65.4	1	09/29/23 16:04	10/02/23 12:08	14808-79-8	H1,H2, H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	13.1	1	09/29/23 16:04	10/02/23 11:20	16887-00-6	H1,H3

Sample: PG-7, S-4 **Lab ID: 20290747003** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.4**	Std. Units	0.010	1		09/29/23 10:47		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**26.6**	%	0.50	1		09/29/23 07:55		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**82400**	ohms-cm	0.50	1		10/03/23 15:33		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	ND	mg/kg	63.5	1	09/29/23 16:04	10/02/23 12:08	14808-79-8	H1,H2, H3

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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251-344-9106

ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: PG-7, S-4 **Lab ID: 20290747003** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	12.7	1	09/29/23 16:04	10/02/23 11:20	16887-00-6	H1,H3

Sample: PG-7, S-5 **Lab ID: 20290747004** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.2**	Std. Units	0.010	1		09/29/23 10:49		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**20.2**	%	0.50	1		09/29/23 07:55		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**95500**	ohms-cm	0.50	1		10/03/23 15:36		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**321**	mg/kg	294	5	09/29/23 16:04	10/02/23 12:08	14808-79-8	D4,H1, H2,H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	58.8	5	09/29/23 16:04	10/02/23 11:30	16887-00-6	D3,H1, H3

Sample: T-7, S-2 **Lab ID: 20290747005** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.0**	Std. Units	0.010	1		09/29/23 10:54		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**15.1**	%	0.50	1		09/29/23 07:55		N2

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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251-344-9106

ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: T-7, S-2 **Lab ID: 20290747005** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**44400**	ohms-cm	0.50	1		10/03/23 15:40		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	ND	mg/kg	58.0	1	09/29/23 16:04	10/02/23 12:08	14808-79-8	H1,H2, H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	11.6	1	09/29/23 16:04	10/02/23 11:30	16887-00-6	H1,H3

Sample: T-7, S-3 **Lab ID: 20290747006** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.7**	Std. Units	0.010	1		10/06/23 11:03		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**22.8**	%	0.50	1		10/12/23 09:54		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**79500**	ohms-cm	0.50	1		10/08/23 14:01		H1,H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**69.5**	mg/kg	63.1	1	10/06/23 13:33	10/09/23 11:02	14808-79-8	H1,H2, H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	12.6	1	10/06/23 13:33	10/09/23 10:57	16887-00-6	H1,H2, H3

REPORT OF LABORATORY ANALYSIS

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251-344-9106

ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: T-7, S-4 **Lab ID: 20290747007** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**5.3**	Std. Units	0.010	1		09/29/23 10:50		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**29.5**	%	0.50	1		09/29/23 07:56		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**51800**	ohms-cm	0.50	1		10/03/23 15:42		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**105**	mg/kg	66.7	1	09/29/23 16:04	10/02/23 12:15	14808-79-8	H1,H2, H3
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	13.3	1	09/29/23 16:04	10/02/23 11:30	16887-00-6	H1,H3

Sample: T-7, S-5 **Lab ID: 20290747008** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9045 pH Soil	Analytical Method: EPA 9045 Pace Analytical Services - New Orleans							
pH at 25 Degrees C	**4.0**	Std. Units	0.010	1		09/29/23 10:51		
Percent Moisture	Analytical Method: Moisture Pace Analytical Services - New Orleans							
Percent Moisture	**26.1**	%	0.50	1		09/29/23 07:56		N2
Resistivity	Analytical Method: EPA 120.1 Resistivity Pace Analytical Services - New Orleans							
Resistivity	**1230**	ohms-cm	0.50	1		10/03/23 15:44		H3
9038 Sulfate, Turbidimetric	Analytical Method: EPA 9038 Preparation Method: EPA 9038 Pace Analytical Services - New Orleans							
Sulfate	**1000**	mg/kg	320	5	09/29/23 16:04	10/02/23 12:17	14808-79-8	H1,H2, H3

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4320 Midmost Dr
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251-344-9106

ANALYTICAL RESULTS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

Sample: T-7, S-5 **Lab ID: 20290747008** Collected: 08/30/23 08:00 Received: 09/27/23 09:11 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
9251 Chloride	Analytical Method: EPA 9251 Preparation Method: EPA 9251 Pace Analytical Services - New Orleans							
Chloride	ND	mg/kg	12.8	1	09/29/23 16:04	10/02/23 11:30	16887-00-6	H1,H3

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251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 301288
QC Batch Method: EPA 9045
Analysis Method: EPA 9045
Analysis Description: 9045 pH
Laboratory: Pace Analytical Services - New Orleans
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

LABORATORY CONTROL SAMPLE: 1442185

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
pH at 25 Degrees C	Std. Units	6	6.0	100	97-103	

SAMPLE DUPLICATE: 1442186

Parameter	Units	20290747001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	5.1	6.1	17	20	

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4320 Midmost Dr
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251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 302398
QC Batch Method: EPA 9045
Analysis Method: EPA 9045
Analysis Description: 9045 pH
Laboratory: Pace Analytical Services - New Orleans

Associated Lab Samples: 20290747006

LABORATORY CONTROL SAMPLE: 1447348

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
pH at 25 Degrees C	Std. Units	6	6.0	100	97-103	

SAMPLE DUPLICATE: 1447349

Parameter	Units	20290747006 Result	Dup Result	RPD	Max RPD	Qualifiers
pH at 25 Degrees C	Std. Units	5.7	5.1	11	20	

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251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 301298 | Analysis Method: Moisture
QC Batch Method: Moisture | Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - New Orleans
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

SAMPLE DUPLICATE: 1442231

Parameter	Units	20290747001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	29.8	29.5	1	20	N2

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251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 303229
QC Batch Method: Moisture
Analysis Method: Moisture
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - New Orleans

Associated Lab Samples: 20290747006

SAMPLE DUPLICATE: 1450901

Parameter	Units	20290747006 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	22.8	21.0	8	20	N2

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4320 Midmost Dr
Mobile, AL 36609
251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 301404
QC Batch Method: EPA 9038
Analysis Method: EPA 9038
Analysis Description: 9038 Sulfate, Turbidimetric
Laboratory: Pace Analytical Services - New Orleans
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

METHOD BLANK: 1442614 Matrix: Solid
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/kg	ND	50.0	10/02/23 12:08	

LABORATORY CONTROL SAMPLE: 1442615

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	200	198	99	90-110	

MATRIX SPIKE SAMPLE: 1442617

Parameter	Units	20290635001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	ND	98.3	105	98	75-125	

SAMPLE DUPLICATE: 1442616

Parameter	Units	20290635001 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfate	mg/kg	ND	ND		20	

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251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 302526 | Analysis Method: EPA 9038
QC Batch Method: EPA 9038 | Analysis Description: 9038 Sulfate, Turbidimetric
Laboratory: Pace Analytical Services - New Orleans

Associated Lab Samples: 20290747006

METHOD BLANK: 1447768 Matrix: Solid
Associated Lab Samples: 20290747006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/kg	ND	50.0	10/09/23 11:00	

LABORATORY CONTROL SAMPLE: 1447769

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	200	190	95	90-110	

MATRIX SPIKE SAMPLE: 1447771

Parameter	Units	20291109002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/kg	3740	950	3690	-5	75-125	D4,H3,M1

SAMPLE DUPLICATE: 1447770

Parameter	Units	20291109002 Result	Dup Result	RPD	Max RPD	Qualifiers
Sulfate	mg/kg	3740	3700	1	20	D4,H3

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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4320 Midmost Dr
Mobile, AL 36609
251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 301405
QC Batch Method: EPA 9251
Analysis Method: EPA 9251
Analysis Description: 9251 Chloride
Laboratory: Pace Analytical Services - New Orleans
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

METHOD BLANK: 1442620 Matrix: Solid
Associated Lab Samples: 20290747001, 20290747003, 20290747004, 20290747005, 20290747007, 20290747008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/kg	ND	10.0	10/02/23 11:20	

LABORATORY CONTROL SAMPLE: 1442621

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	666	614	92	90-110	

MATRIX SPIKE SAMPLE: 1442623

Parameter	Units	20290635001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	ND	983	928	94	75-125	

SAMPLE DUPLICATE: 1442622

Parameter	Units	20290635001 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	mg/kg	ND	ND		20	

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4320 Midmost Dr
Mobile, AL 36609
251-344-9106

QUALITY CONTROL DATA

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

QC Batch: 302525
QC Batch Method: EPA 9251
Analysis Method: EPA 9251
Analysis Description: 9251 Chloride
Laboratory: Pace Analytical Services - New Orleans

Associated Lab Samples: 20290747006

METHOD BLANK: 1447764 Matrix: Solid
Associated Lab Samples: 20290747006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/kg	ND	10.0	10/09/23 10:57	

LABORATORY CONTROL SAMPLE: 1447765

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	666	616	93	90-110	

MATRIX SPIKE SAMPLE: 1447767

Parameter	Units	20291109002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/kg	554	9500	9560	95	75-125	D4,H3

SAMPLE DUPLICATE: 1447766

Parameter	Units	20291109002 Result	Dup Result	RPD	Max RPD	Qualifiers
Chloride	mg/kg	554	553	0	20	D4,H3

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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4320 Midmost Dr
Mobile, AL 36609
251-344-9106

QUALIFIERS

Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

ANALYTE QUALIFIERS

D3	Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.
D4	Sample was diluted due to the presence of high levels of target analytes.
H1	Analysis conducted outside the EPA method holding time.
H2	Extraction or preparation conducted outside EPA method holding time.
H3	Sample was received or analysis requested beyond the recognized method holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
N2	The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

Pace Analytical Services, LLC
4320 Midmost Dr
Mobile, AL 36609
251-344-9106

QUALITY CONTROL DATA CROSS REFERENCE TABLE

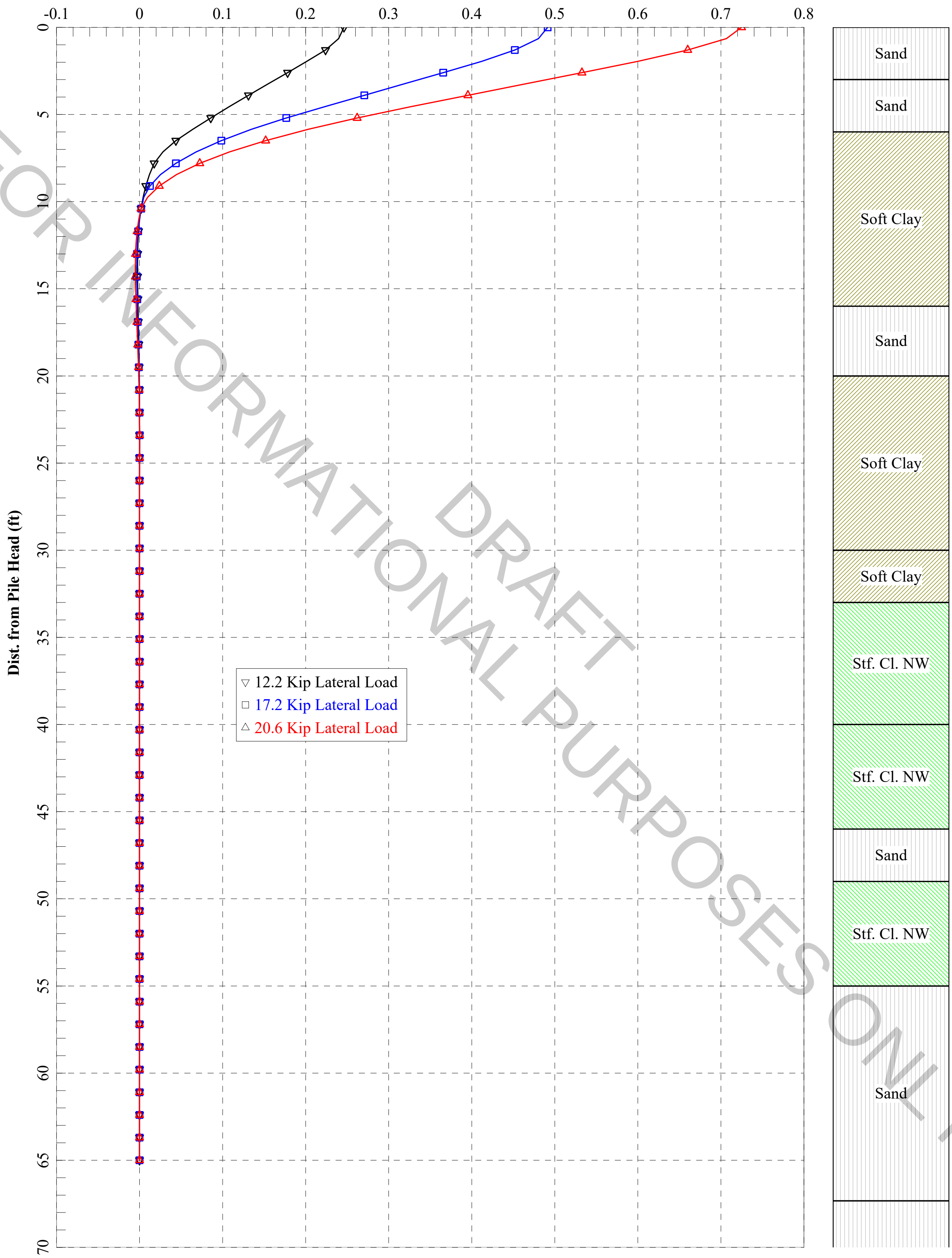
Project: MAA/M23-442 08/30/23
Pace Project No.: 20290747

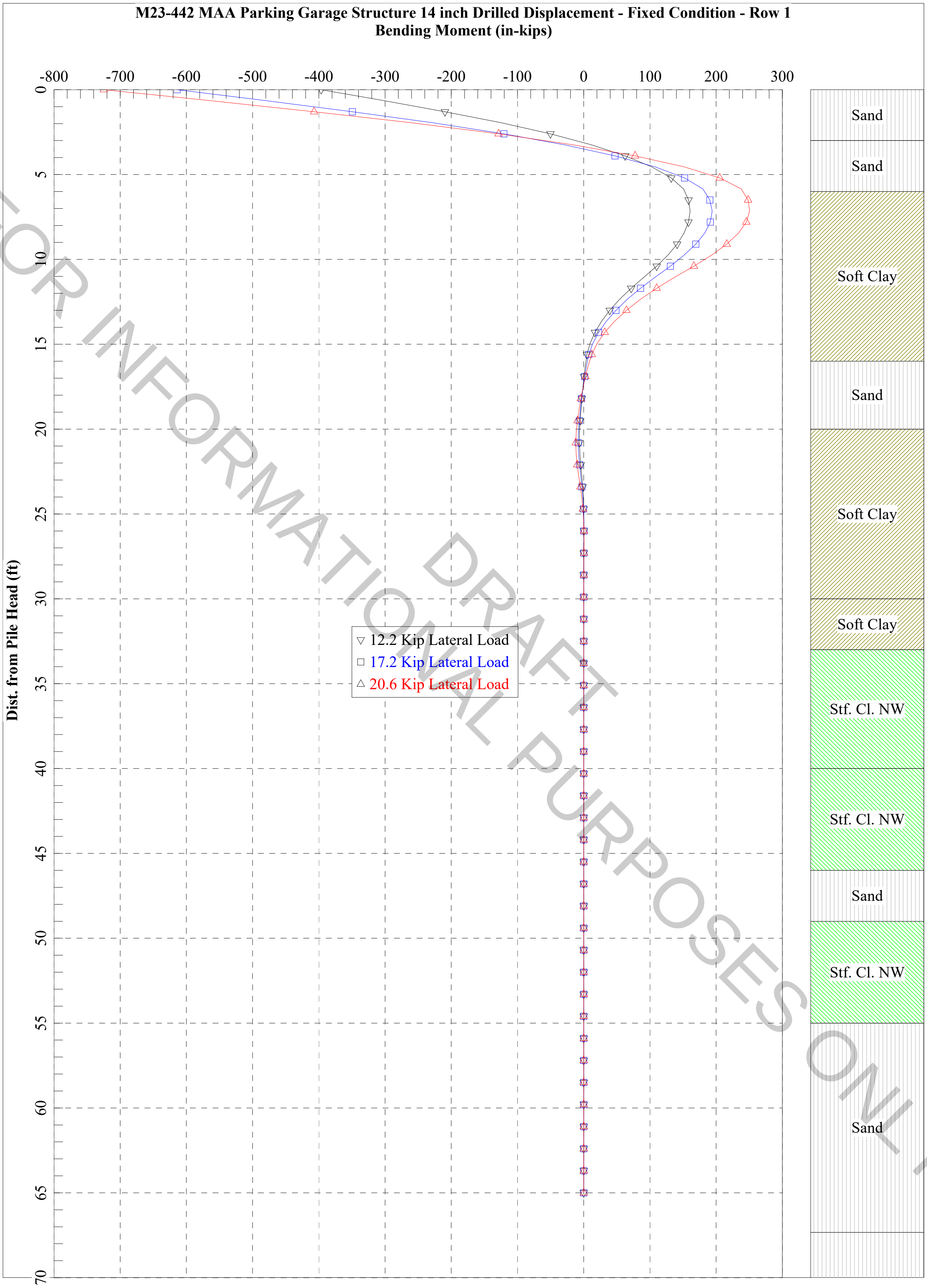
Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
20290747001	**PG-7, S-2**	EPA 9045	301288		
20290747003	**PG-7, S-4**	EPA 9045	301288		
20290747004	**PG-7, S-5**	EPA 9045	301288		
20290747005	**T-7, S-2**	EPA 9045	301288		
20290747006	**T-7, S-3**	EPA 9045	302398		
20290747007	**T-7, S-4**	EPA 9045	301288		
20290747008	**T-7, S-5**	EPA 9045	301288		
20290747001	**PG-7, S-2**	Moisture	301298		
20290747003	**PG-7, S-4**	Moisture	301298		
20290747004	**PG-7, S-5**	Moisture	301298		
20290747005	**T-7, S-2**	Moisture	301298		
20290747006	**T-7, S-3**	Moisture	303229		
20290747007	**T-7, S-4**	Moisture	301298		
20290747008	**T-7, S-5**	Moisture	301298		
20290747001	**PG-7, S-2**	EPA 120.1 Resistivity	301882		
20290747003	**PG-7, S-4**	EPA 120.1 Resistivity	301882		
20290747004	**PG-7, S-5**	EPA 120.1 Resistivity	301882		
20290747005	**T-7, S-2**	EPA 120.1 Resistivity	301882		
20290747006	**T-7, S-3**	EPA 120.1 Resistivity	302601		
20290747007	**T-7, S-4**	EPA 120.1 Resistivity	301882		
20290747008	**T-7, S-5**	EPA 120.1 Resistivity	301882		
20290747001	**PG-7, S-2**	EPA 9038	301404	EPA 9038	301668
20290747003	**PG-7, S-4**	EPA 9038	301404	EPA 9038	301668
20290747004	**PG-7, S-5**	EPA 9038	301404	EPA 9038	301668
20290747005	**T-7, S-2**	EPA 9038	301404	EPA 9038	301668
20290747006	**T-7, S-3**	EPA 9038	302526	EPA 9038	302557
20290747007	**T-7, S-4**	EPA 9038	301404	EPA 9038	301668
20290747008	**T-7, S-5**	EPA 9038	301404	EPA 9038	301668
20290747001	**PG-7, S-2**	EPA 9251	301405	EPA 9251	301667
20290747003	**PG-7, S-4**	EPA 9251	301405	EPA 9251	301667
20290747004	**PG-7, S-5**	EPA 9251	301405	EPA 9251	301667
20290747005	**T-7, S-2**	EPA 9251	301405	EPA 9251	301667
20290747006	**T-7, S-3**	EPA 9251	302525	EPA 9251	302556
20290747007	**T-7, S-4**	EPA 9251	301405	EPA 9251	301667
20290747008	**T-7, S-5**	EPA 9251	301405	EPA 9251	301667

APPENDIX 4

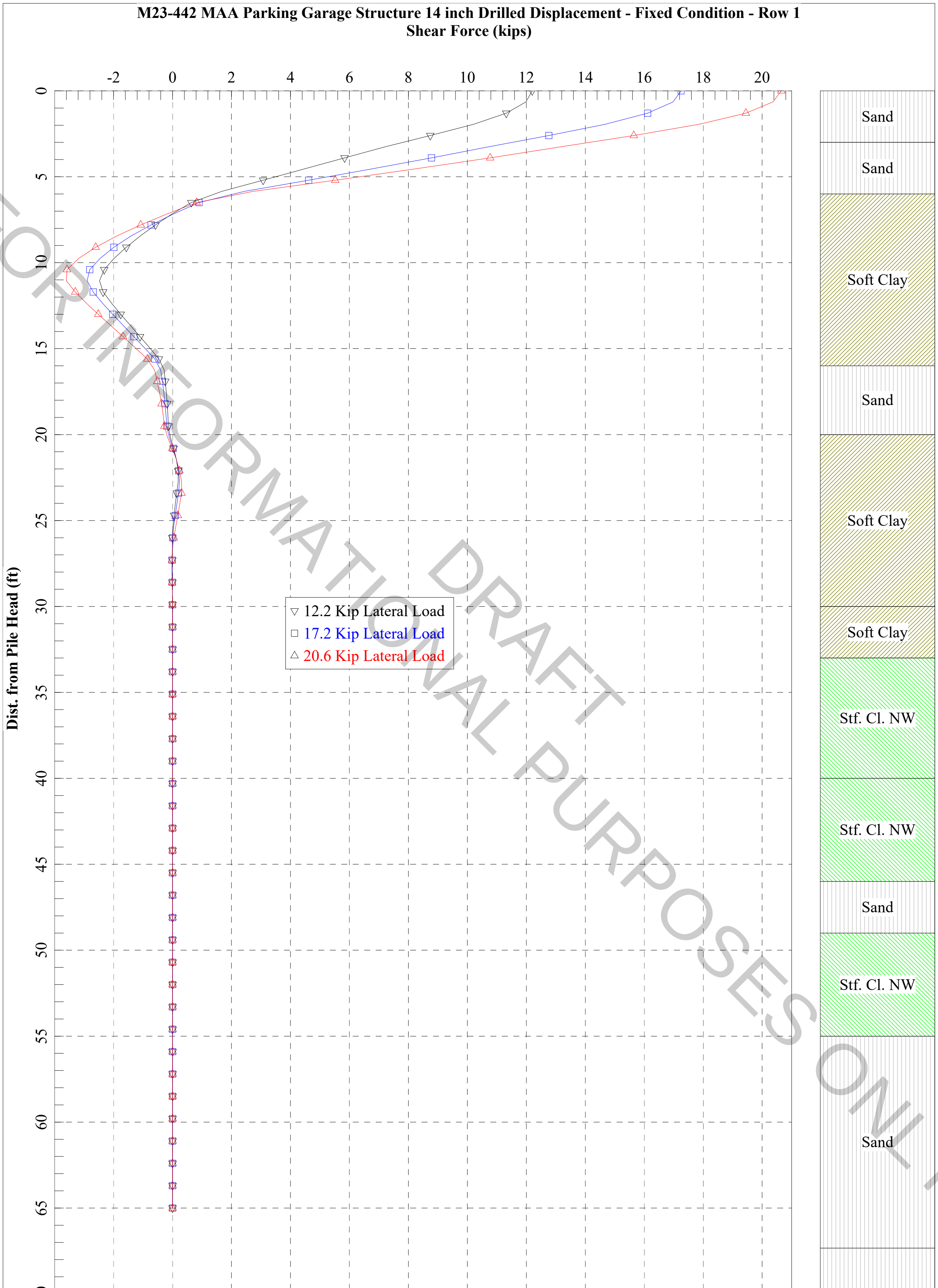
L-Pile Analysis Results

M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Fixed Condition - Row 1
Lateral Pile Deflection (inches)

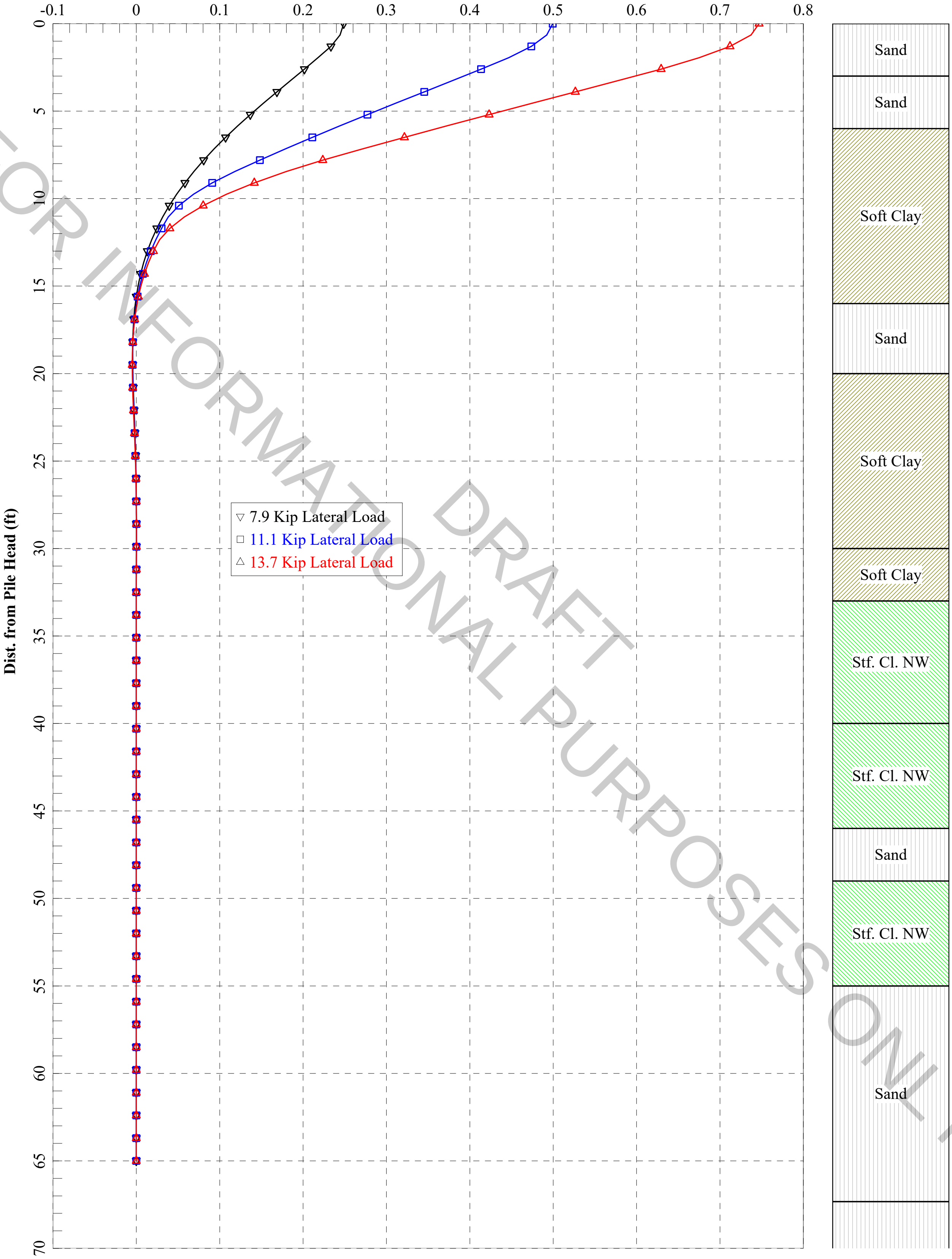


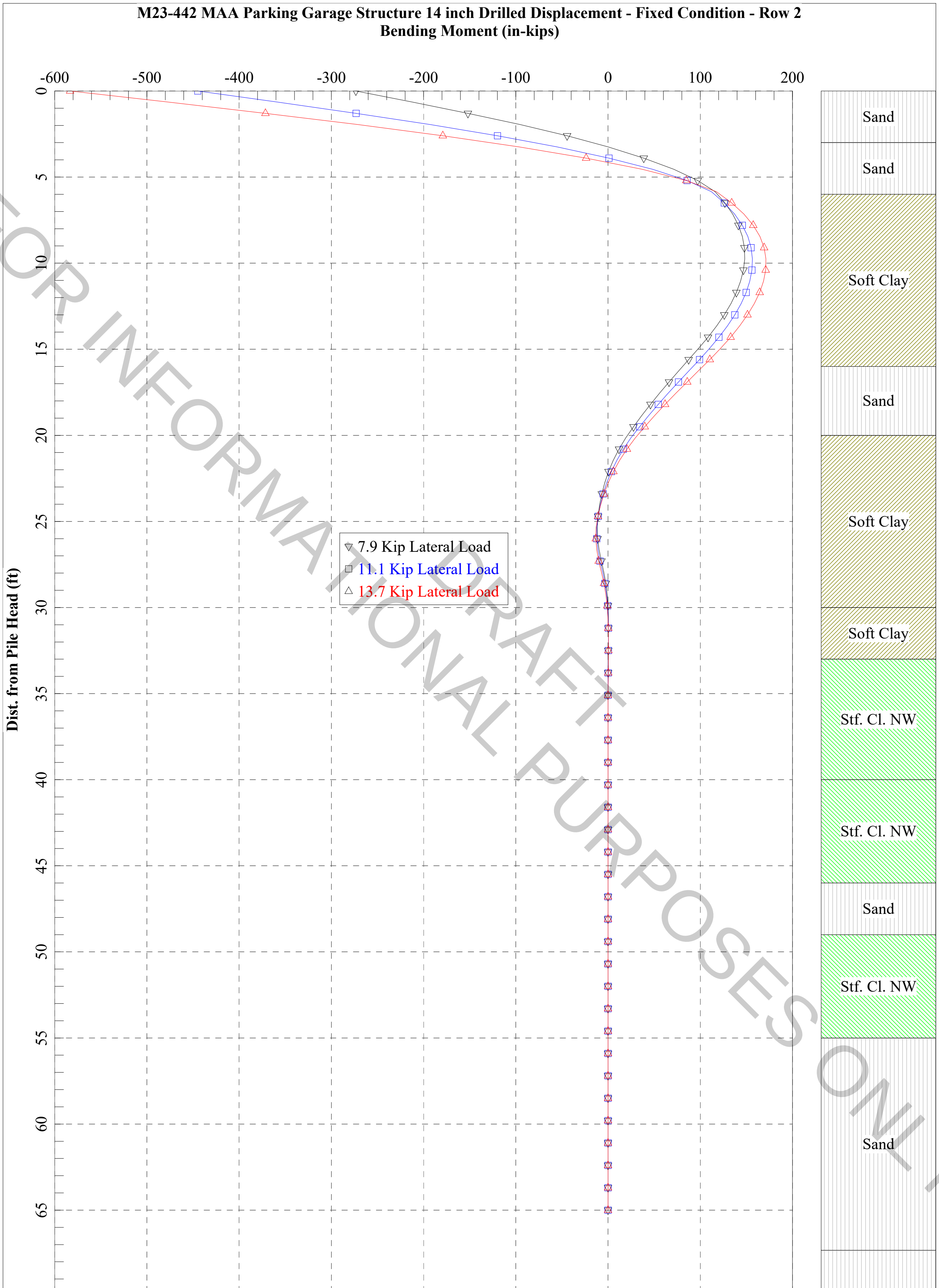


M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Fixed Condition - Row 1
Bending Moment (in-kips)
-800
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
12.2 Kip Lateral Load
17.2 Kip Lateral Load
20.6 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand

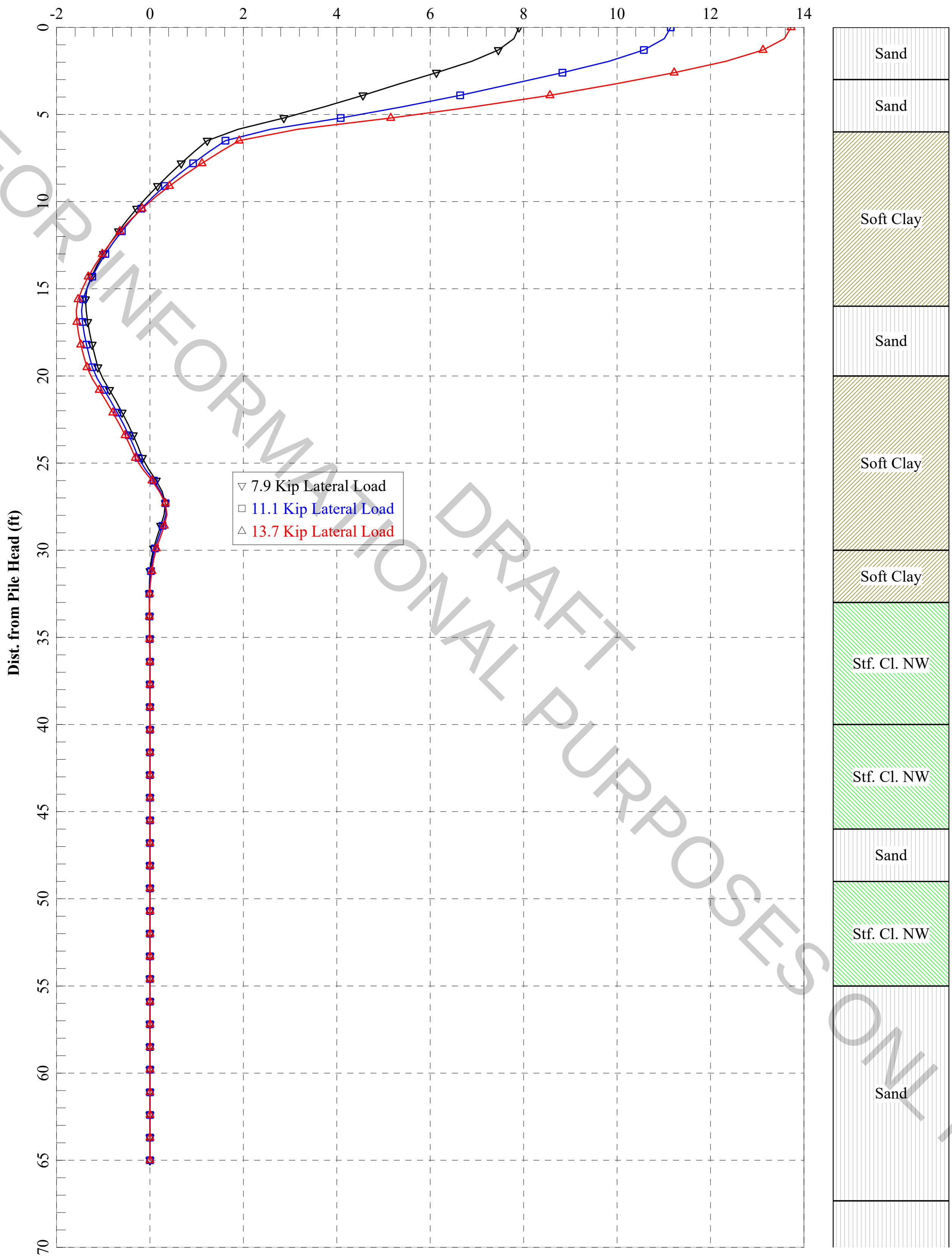

M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Fixed Condition - Row 1
Shear Force (kips)
-2
0
2
4
6
8
10
12
14
16
18
20
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
12.2 Kip Lateral Load
17.2 Kip Lateral Load
20.6 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand

M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Fixed Condition - Row 2
Lateral Pile Deflection (inches)

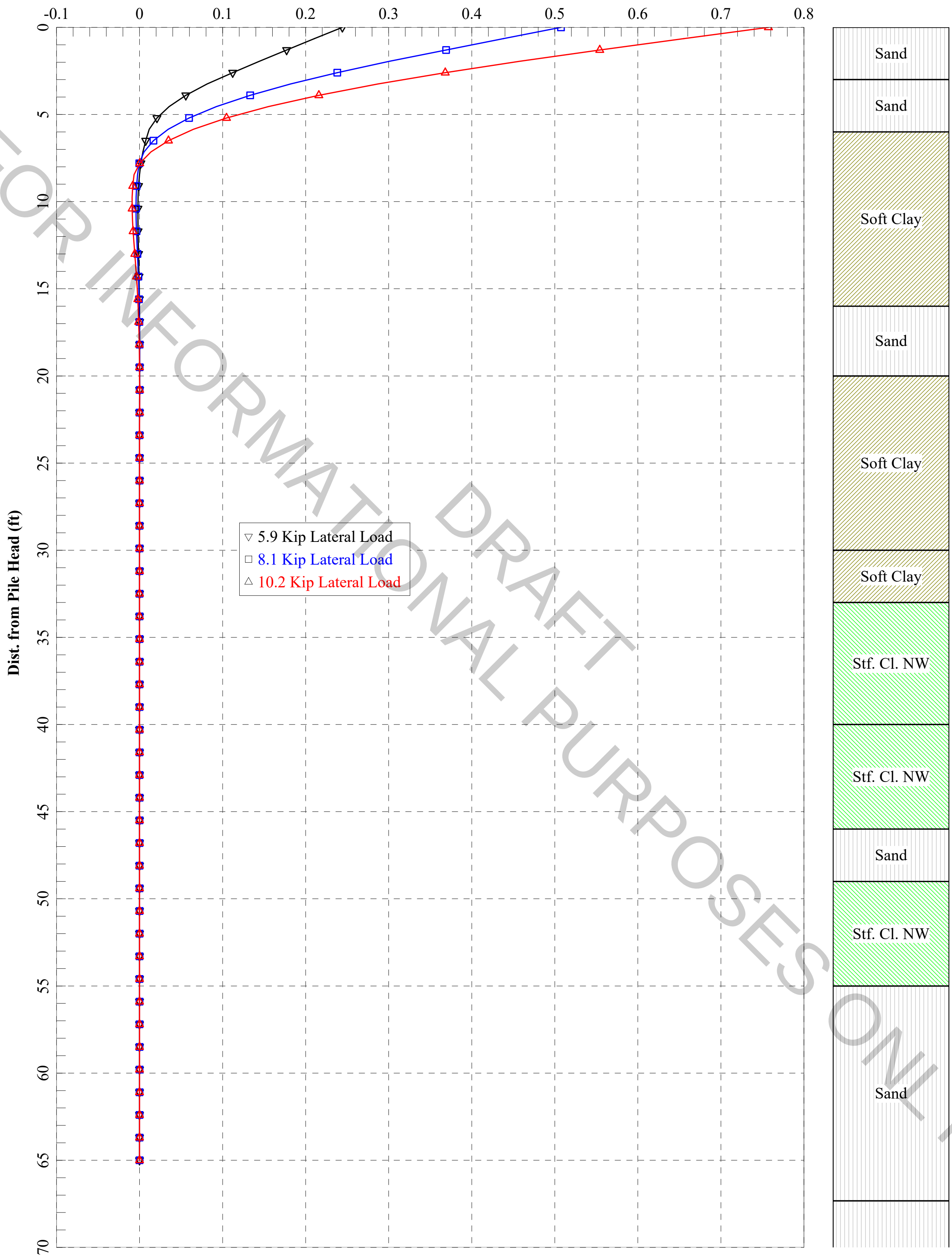


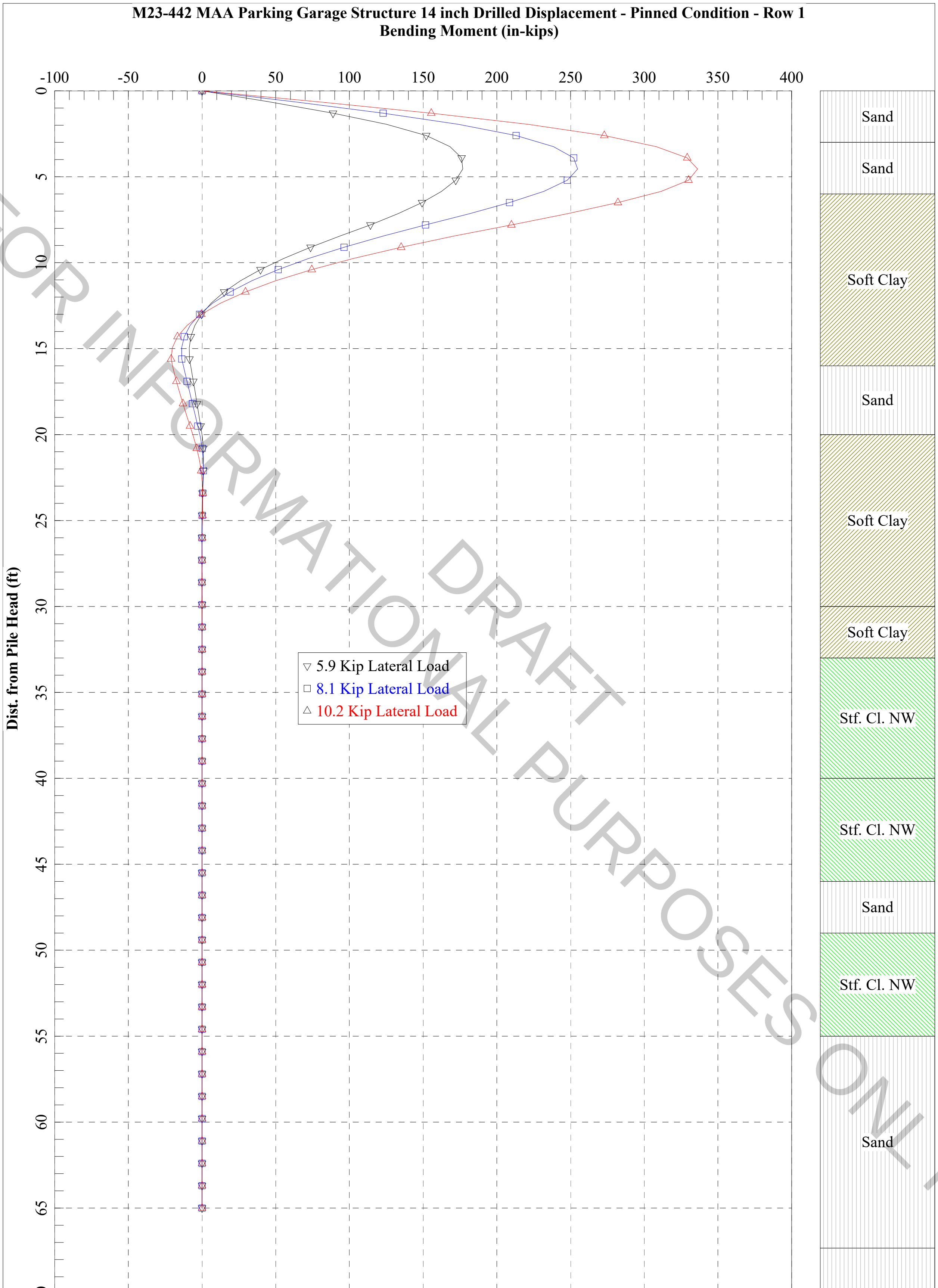

M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Fixed Condition - Row 2
Bending Moment (in-kips)
-600
-500
-400
-300
-200
-100
0
100
200
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
7.9 Kip Lateral Load
11.1 Kip Lateral Load
13.7 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand

M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Fixed Condition - Row 2
Shear Force (kips)

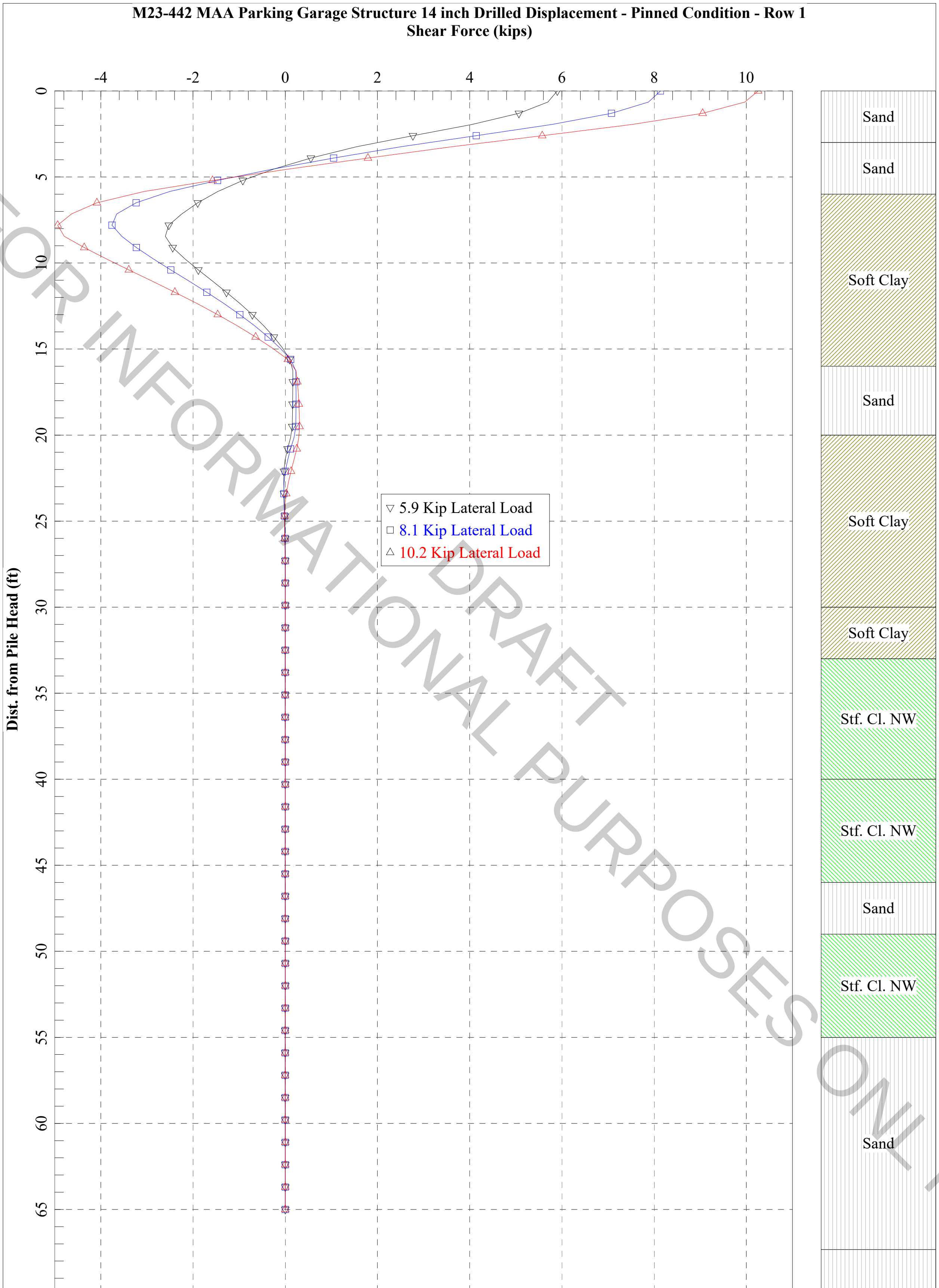


M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Pinned Condition - Row 1
Lateral Pile Deflection (inches)



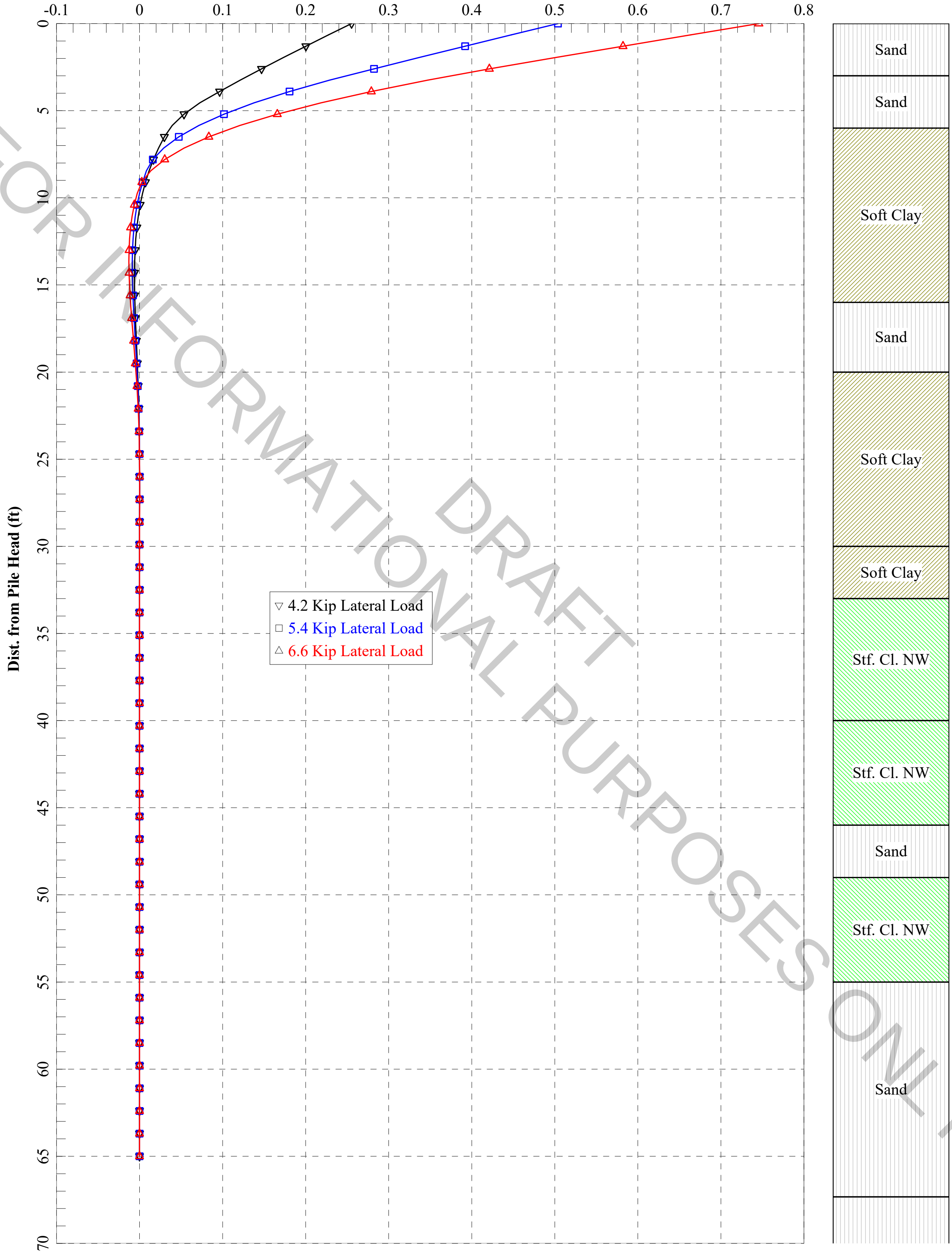


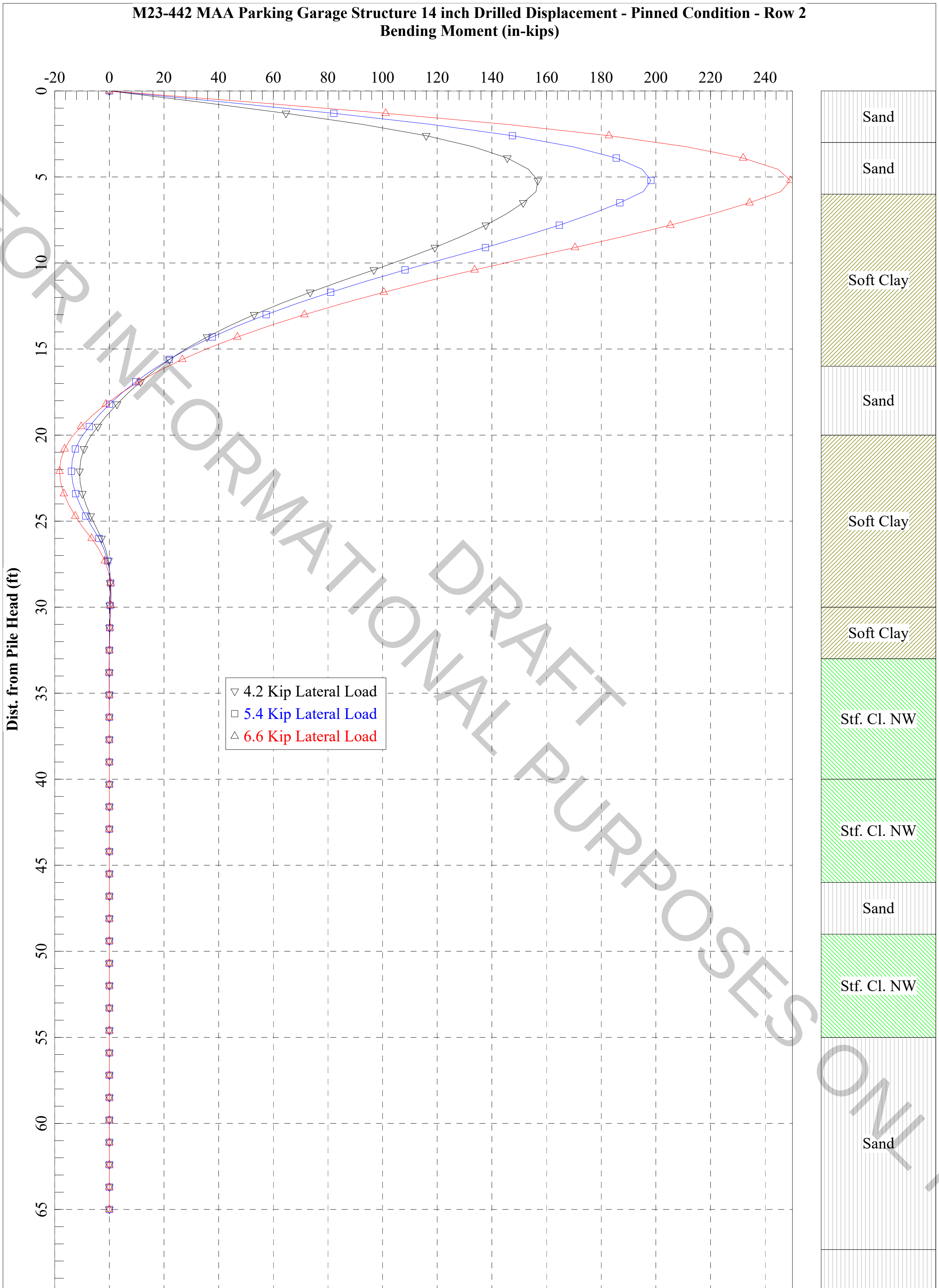
M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Pinned Condition - Row 1
Bending Moment (in-kips)
-100
-50
0
50
100
150
200
250
300
350
400
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
5.9 Kip Lateral Load
8.1 Kip Lateral Load
10.2 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand

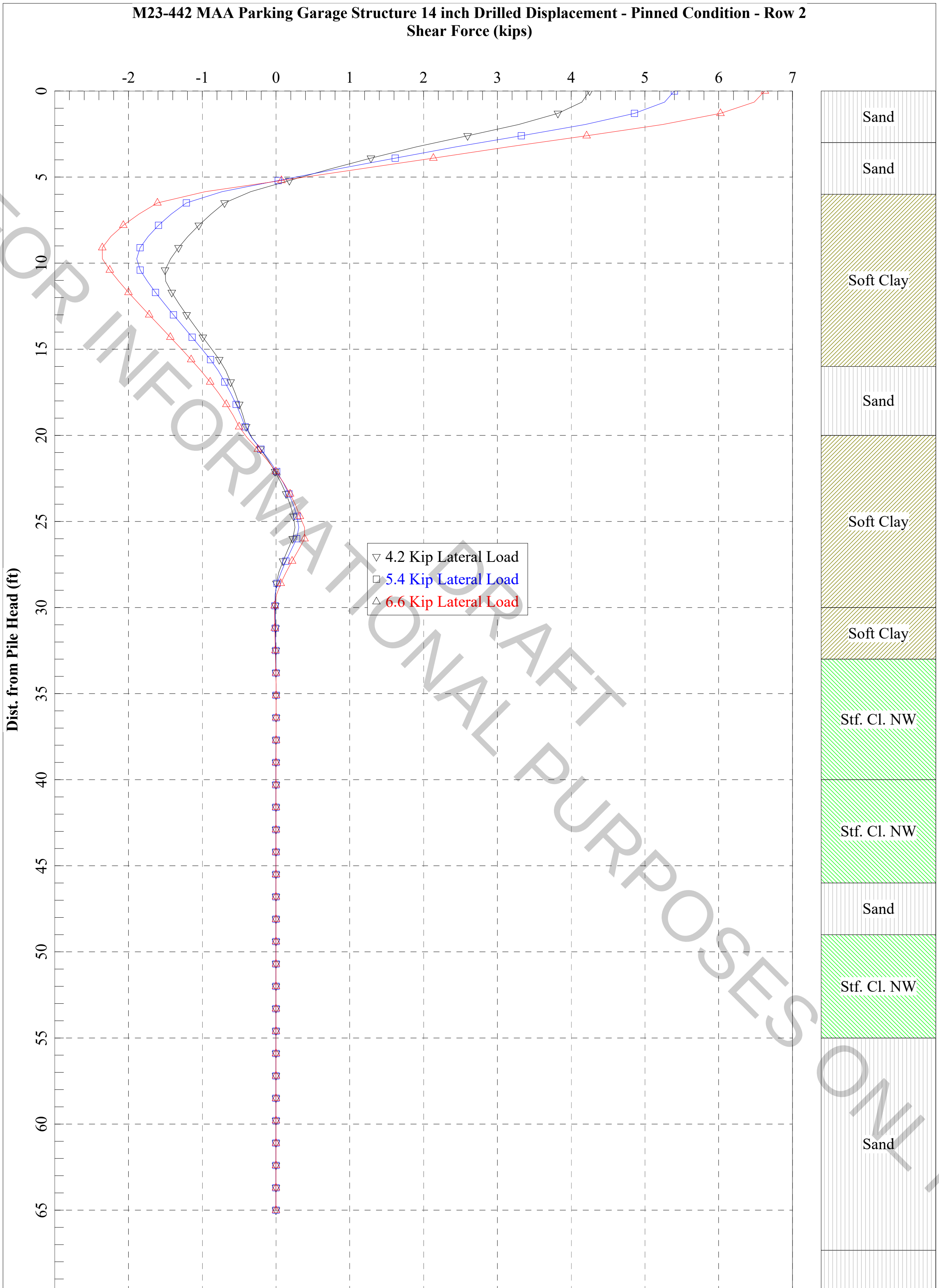


M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Pinned Condition - Row 1
Shear Force (kips)
-4
-2
0
2
4
6
8
10
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
5.9 Kip Lateral Load
8.1 Kip Lateral Load
10.2 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand

M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Pinned Condition - Row 2
Lateral Pile Deflection (inches)



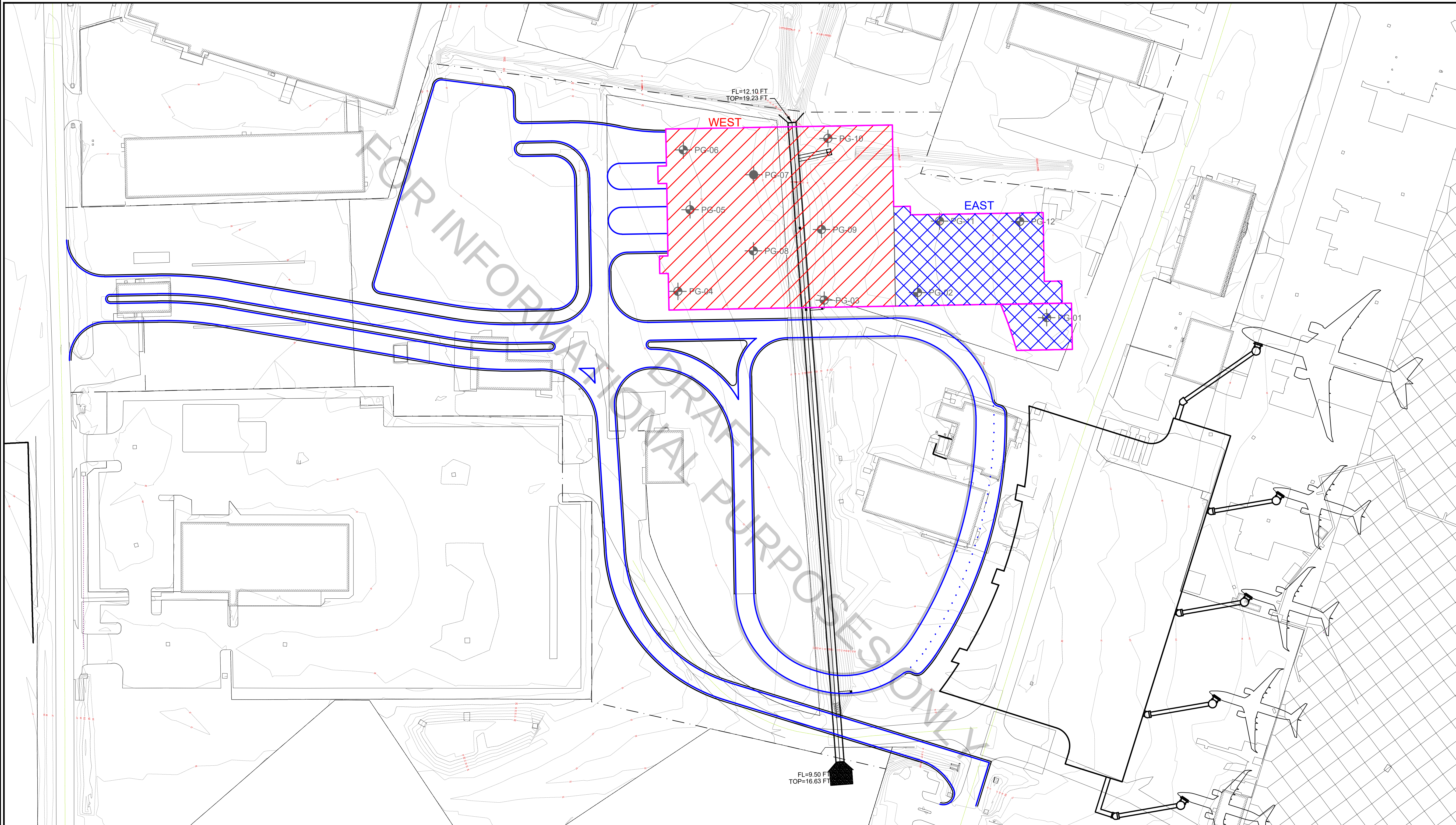

M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Pinned Condition - Row 2
Bending Moment (in-kips)
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
4.2 Kip Lateral Load
5.4 Kip Lateral Load
6.6 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand


M23-442 MAA Parking Garage Structure 14 inch Drilled Displacement - Pinned Condition - Row 2
Shear Force (kips)
-2
-1
0
1
2
3
4
5
6
7
Dist. from Pile Head (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
4.2 Kip Lateral Load
5.4 Kip Lateral Load
6.6 Kip Lateral Load
Sand
Sand
Soft Clay
Sand
Soft Clay
Soft Clay
Stf. Cl. NW
Stf. Cl. NW
Sand
Stf. Cl. NW
Sand

APPENDIX 5

Pile Penetration Plan

SOUTHERN EARTH SCIENCES



SOIL TEST BORING
CPT SOUNDING
80' - 88' (WEST)
65 - 75' (EAST)

120 60 0 120
SCALE, IN FEET

MAA - PARKING GARAGE
MOBILE, AL

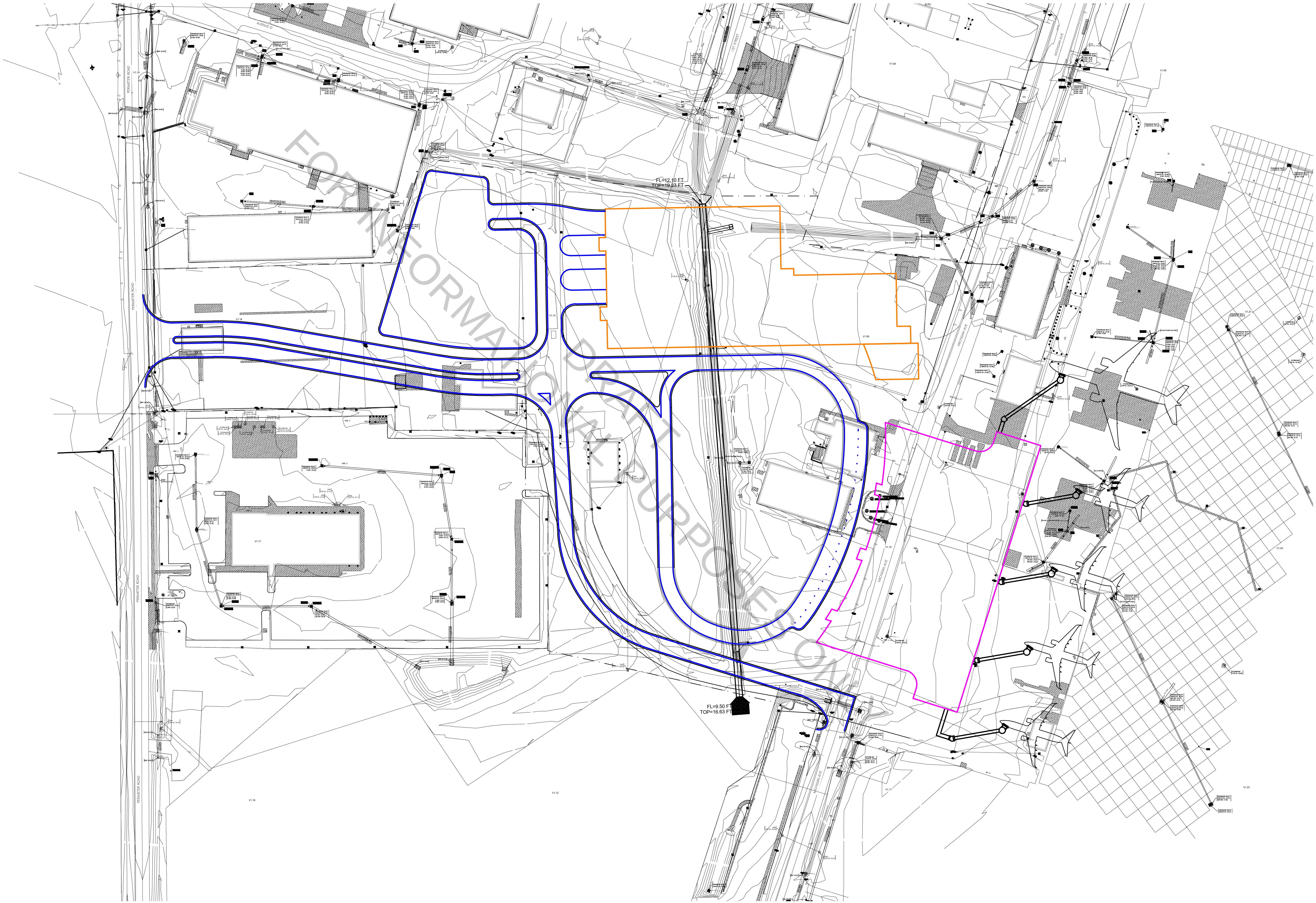
SOUTHERN EARTH SCIENCES
Geotechnical | Environmental | Materials Testing

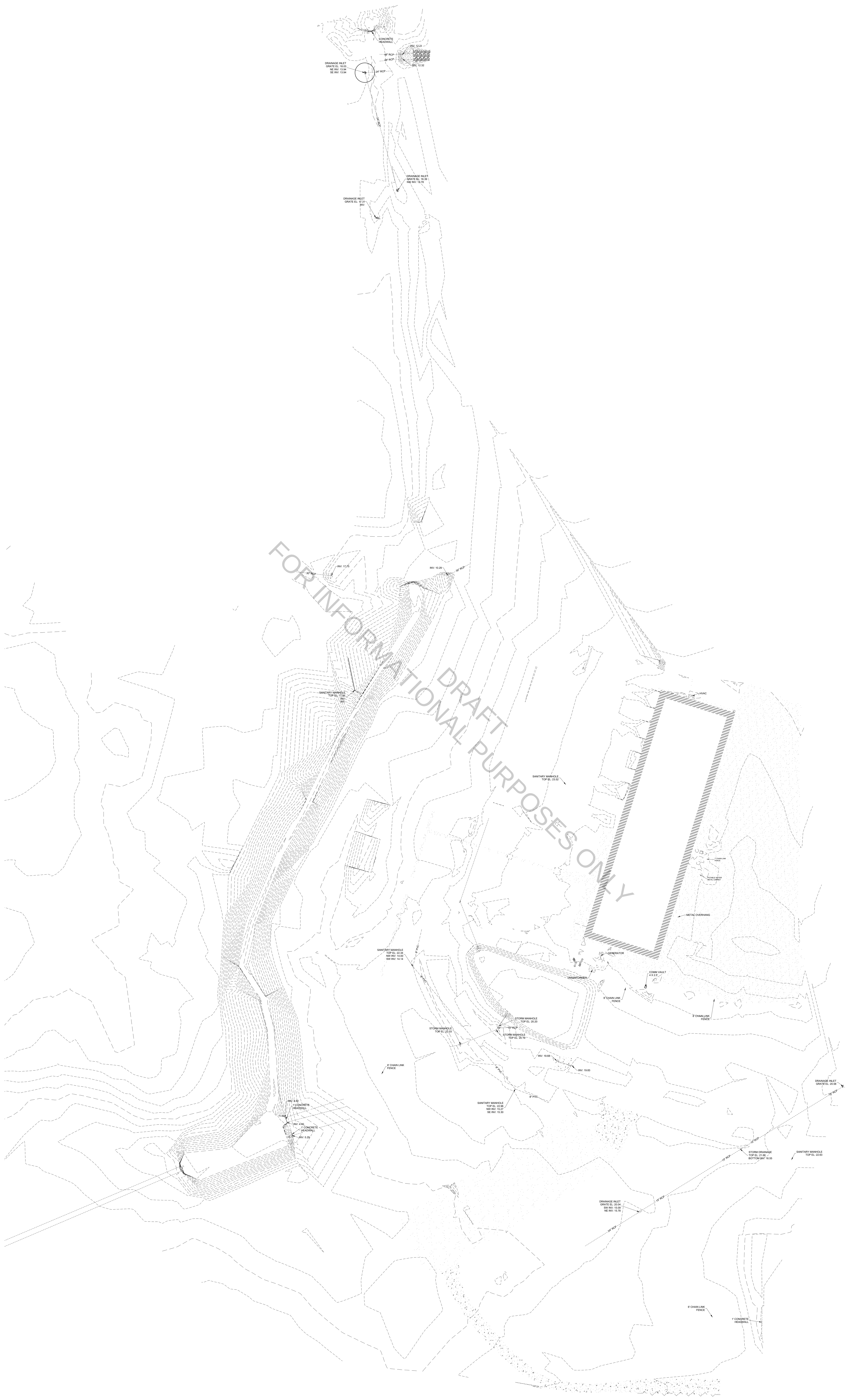
ESTIMATED PILE PENETRATION PLAN
SESI JOB NO.: M23-442

VOLKERT, INC
Report of Subsurface Investigation and Geotechnical Engineering Evaluation
Mobile International Airport – Proposed Parking Garage
Mobile Aeroplex at Brookley
Mobile, AL
SESI Project No: M23-442
October 25, 2023

APPENDIX 6

Provided Plans


FOR INFORMATIONAL DRAFT PURPOSES ONLY
FL=12.10 FT
TOP=19.23 FT
FL=9.50 FT
TOP=16.63 FT
PERIMETER ROAD
MICHIGAN AVE
AVENUE O
1ST STREET



CONCRETE HEADWALL
INV: 12.21
48" RCP
48" RCP
INV: 12.32
DRAINAGE INLET
GRATE EL: 18.03
NE INV: 13.94
SE INV: 13.94
24" RCP
24" RCP
DRAINAGE INLET
GRATE EL: 16.39
NW INV: 12.78
DRAINAGE INLET
GRATE EL: 17.31
INV:
INV: 17.75
30" RCP
INV: 10.29
30" RCP
SANITARY MANHOLE
TOP EL: 17.83
INV:
INV:
DRAFT
FOR INFORMATIONAL PURPOSES ONLY
HVAC
SANITARY MANHOLE
TOP EL: 23.52
7' CHAIN LINK FENCE
POTABLE WATER METAL CABINET
METAL OVERHANG
GENERATOR
TRANSFORMER
COMM VAULT
4 X 2.5'
9' CHAIN LINK
FENCE
8' CHAIN LINK
FENCE
SANITARY MANHOLE
TOP EL: 22.34
NW INV: 14.00
SW INV: 14.14
8" PVC
8" PVC
STORM MANHOLE
TOP EL: 20.20
18" RCP
STORM MANHOLE
TOP EL: 22.03
STORM MANHOLE
TOP EL: 20.19
INV: 19.68
INV: 19.83
6' CHAIN LINK
FENCE
8" PVC
8" PVC
SANITARY MANHOLE
TOP EL: 22.96
NW INV: 15.27
SE INV: 15.30
INV: 4.62
1' CONCRETE
HEADWALL
INV: 4.40
1' CONCRETE
HEADWALL
INV: 5.29
DRAINAGE INLET
GRATE EL: 20.58
15" RCP
15" RCP
STORM DRAINAGE
TOP EL: 21.68
BOTTOM INV: 16.55
SANITARY MANHOLE
TOP EL: 22.63
15" RCP
15" RCP
DRAINAGE INLET
GRATE EL: 20.04
SW INV: 15.09
NE INV: 15.78
24" RCP
6' CHAIN LINK
FENCE
1' CONCRETE
HEADWALL