



Reference: 014004.100

August 8, 2014

Mr. Greg Pratt
Humboldt Transit Authority
133 V Street
Eureka, CA 95501

Subject: Geotechnical Investigation, Proposed New Aboveground Storage Tank and Fueling Area Canopy Foundation, Humboldt Transit Authority Facility, 133 V St., Eureka, California

Dear Mr. Pratt:

This report documents the results of a geotechnical investigation for the proposed new aboveground storage tank (AST) and fueling area canopy foundation to be constructed at the Humboldt Transit Authority (HTA) facility at 133 V Street, Eureka, California (Figure 1). Our investigation and this report are intended to provide findings, conclusions, and recommendations related to geotechnical aspects of project design and construction. This report is also intended to satisfy the requirements of the 2013 California Building Code (CBC) and provide the necessary information to obtain a City of Eureka building permit.

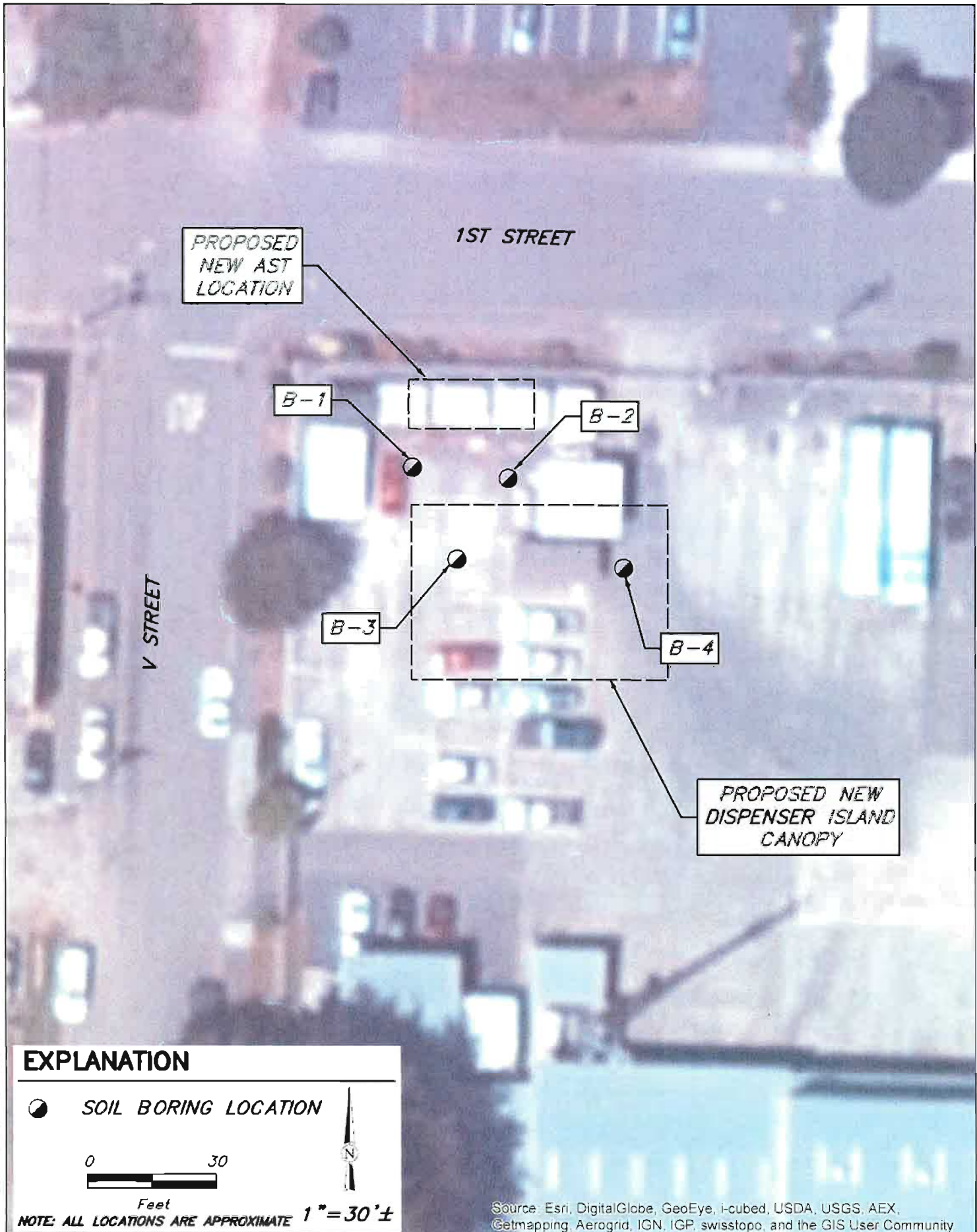
1.0 Introduction/Project Description

The proposed project consists of the removal of three 2,000-gallon ASTs followed by the construction of footings to support a new 15,000-gallon AST. Work also includes the construction of a foundation for a new fueling island canopy that will be 60 feet long by 44 feet wide. We anticipate that the fuel island canopy will be founded on deepened isolated spread footings. This project will be constructed in the northwest portion of the HTA maintenance yard (Figure 2).

2.0 Field Investigation and Laboratory Testing

On June 5, 2014, a geologist from SHN logged and sampled four soil borings at the project site. The four geotechnical soil borings (B-1 through B-4; Figure 2) were advanced to depths ranging from 11.5 feet and 16.5 feet below existing ground surface (BGS). Approximate boring locations are shown on Figure 2. Borings were advanced using a track-mounted Geoprobe drill rig outfitted with rotary hollow-stem auger drilling equipment and operated by Fisch Drilling. The completed borings were backfilled with bentonite chips and cuttings to the ground surface. Borings were finished with concrete.

Penetration resistance during sample driving was recorded as the borings were advanced. Split-spoon samplers were driven by a 140-pound hammer dropping 30 inches inside the boring, controlled with an auto-hammer. Two samplers were used: a Modified California split-spoon, with nominal inside diameter of 2.5 inches, with liners; and a 2-inch outside diameter standard penetration test (SPT) sampler, without liners. Sampler types are noted on the boring logs. The subsurface materials encountered were logged and field classified in general accordance with the



EXPLANATION


● SOIL BORING LOCATION



Feet

NOTE: ALL LOCATIONS ARE APPROXIMATE 1"=30'±

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

 Consulting Engineers & Geologists, Inc.	Humboldt Transit Authority AST Replacement Eureka, California July 2014	Site Map Showing Proposed Developments SHN 014004.100 Figure2_SiteMap	Figure 2
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Mr. Greg Pratt

Engineering Soils Report for Proposed AST and Fueling Area Canopy Foundation, Humboldt Transit Authority, Eureka, Humboldt County, California

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Manual-Visual Classification Method (American Society for Testing and Materials-International [ASTM] D 2488). Final boring logs, presented in Attachment 1, were prepared based on the field logs, examination of samples in the laboratory, and laboratory test results

Selected soil samples were submitted to SHN's materials testing laboratory for analysis. Laboratory testing for index properties included in-place moisture content, dry density, percent passing #200 sieve (silt and clay), Atterberg Limits, unconfined compression and triaxial compression tests. Test results are presented on the boring logs (Attachment 1) and are included in Attachment 2.

3.0 Site Conditions

3.1 Geology

The project site is situated roughly 1,200 feet south of Humboldt Bay at an elevation of approximately 17 feet (Google Earth). The City of Eureka, in general, occupies a flight of late-Pleistocene age marine terraces deposited on Pleistocene Hookton formation. The northern portion of Eureka, in the vicinity of the HTA site, is underlain by undifferentiated marine terrace deposits (Curtis and Hamilton, 1972). At the project site, alluvial sediments composed of sand, silt, and clay were encountered to the maximum depth explored of about 16.5 feet.

The Little Salmon fault is the nearest fault zone with documented Holocene activity (Clarke and Carver, 1992). The Little Salmon fault is a northwest-striking and northeast-dipping thrust fault located approximately 7.5 miles to the southwest of the project site.

3.2 Subsurface Conditions

Based on the results of our field exploration, the site is underlain by heterogeneous layers of soft sandy silts, loose to medium dense silty and poorly graded sands, and soft to medium stiff lean and sandy clays to the maximum depth explored (16.5 feet). See Attachment 1 for detailed descriptions of the soils encountered in our borings.

Groundwater was generally encountered at a depth of approximately 7.5 feet. The subsurface investigation was conducted during the dry season of a relatively dry year. Water levels can be expected to fluctuate in response to seasons, storm events, and other factors, and may become higher or lower than indicated by our subsurface observations.

From our site investigation and our understanding of site geology and soil conditions, we estimate the site can be categorized as a Site Class D (stiff soil profile) in the upper 100 feet, for determining seismic loads for structural design as outlined in the 2013 CBC. Detailed descriptions of site soils encountered within our exploratory borings are presented on the attached boring logs (Attachment 1).

4.0 Geologic Hazards

- The principal geologic hazard at the site is the potential for strong levels of seismic shaking produced by earthquakes generated on the Little Salmon fault (approximately 7.5 miles to the southwest) or Mad River Fault (approximately 8.3 miles to the north east) or other regional seismic sources along the north coast.
- The site is not located within an Alquist Priolo Earthquake Fault Zone. The project site is situated on undifferentiated marine terrace deposits with no indication of displacement. The surface fault rupture hazard is considered negligible.
- The project site is at an elevation of approximately 17 feet (Google Earth) and 1,200 feet south of Humboldt Bay. The entire project development is outside the Federal Emergency Management Agency (FEMA) Flood Zone A (100-year flood zone; FEMA, 1986).
- The site is within the mapped tsunami inundation area (CaleMA, 2009).
- The subject property is situated on a generally flat marine terrace surface. No significant slopes exist within 500 feet of the project site. The slope stability hazards to the project are negligible.
- Loose to medium dense cohesionless soil was encountered in all four borings near or below the groundwater level. Risk of liquefaction is concluded to be moderate.
- No high plasticity clayey soil was identified in the field, indicated by our laboratory test program, or generally expected in the geologic formation underlying the site; risk of adverse consequences to the structure from expansive soils is considered low.

5.0 Conclusions and Discussion

The key geotechnical concern is the presence of soft silts and clays and loose sands in the upper 7 feet of the soil column. These materials may be prone to consolidation settlement (both total and differential) under new dynamic and static loads from the proposed 15,000 gallon AST and fueling island canopy. Therefore, the risk of differential settlement is of concern. Based on the results of our investigation, it is our opinion that the new fueling island canopy can be supported on deepened isolated spread footings.

6.0 Recommendations

6.1 CBC Seismic Parameters

Based on the results of our field and laboratory testing, we classify the geologic subgrade at the project site as Site Class D (stiff soil profile), in accordance with Table 20.3-1 in American Society of Civil Engineers ASCE 7-10 (ASCE, 2010). Based on the Site Class, Occupancy Category (I) and a latitude and longitude of 40.806985° and -124.149040°, respectively, we obtained the "code-based" design spectral response acceleration parameters using the United States Geological Survey "U.S. Seismic Design Maps tool," v. 3.1.0, updated July 11, 2013. Calculated values are presented in Table 1.

Table 1 Seismic Design Criteria HTA AST, Eureka, CA	
S_s	3.055
S_1	1.185
F_a	1.0
F_v	1.5
S_{MS}	3.055
S_{M1}	1.778
S_{DS}	2.037
S_{D1}	1.185
Seismic Design Category	D

6.2 Foundations

The proposed fueling island canopy can be supported by deepened spread footings. Spread footings should be at least 18 inches in width and be bottomed a minimum of 24 inches into the underlying soil. Such foundations may be designed for an allowable bearing capacity of 1,600 pounds per square foot (psf) plus 200 psf for each additional depth of embedment for dead plus long-term live loads. This value may be increased by one-third to account for short-term effects of wind and seismic loading.

A horizontal friction coefficient of 0.30 times the net vertical dead load may be used for the footing/soil contact. Frictional resistance may be calculated in conjunction with an allowable lateral passive pressure represented by an equivalent fluid weighing 150 pounds per cubic foot for short-term loading, such as lateral foundation response to wind or earthquake loadings. The passive resistance should be neglected within the upper 12 inches of the ground surface unless these materials are protected and confined by slab-on-grade or pavement.

6.3 Construction Phase Monitoring

In order to assess construction conformance with the intent of our recommendations, it is important that a representative of our firm monitor the excavation and construction of new foundations. This construction phase monitoring is important because it provides the owner and SHN the opportunity to verify anticipated site conditions, and recommend appropriate changes in design or construction procedures if site conditions encountered during construction vary from those described in this report. It also allows SHN to recommend appropriate changes in design or construction procedures if construction methods adversely affect the competence of onsite soils to support the structural improvements.

7.0 Closure and Limitations

The analyses, conclusions, and recommendations presented in this report are based on site conditions that we observed at the time of our investigation, data from our subsurface explorations and laboratory tests, our current understanding of proposed project elements, and on our experience with similar projects in similar geotechnical environments. We have assumed that the information obtained from our limited subsurface explorations is representative of subsurface conditions throughout the site.

If the scope of the proposed construction, including the proposed loads, grades, or structural locations, changes from that described in this report, our recommendations should also be reviewed.

If there is a substantial lapse of time between the submission of our report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we should review our report to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse. This report is applicable only to the project and site studied.

Mr. Greg Pratt

Engineering Soils Report for Proposed AST and Fueling Area Canopy Foundation, Humboldt Transit Authority, Eureka, Humboldt County, California

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The conclusions and recommendations presented in this report are professional opinions derived in accordance with current standards of professional practice. Our recommendations are tendered on the assumption that design of the improvements will conform to their intent. No representation, express or implied, of warranty or guarantee is included or intended.

The field work was conducted to investigate the site characteristics specifically addressed by this report. Assumptions about other site characteristics (such as, hazardous materials contamination, or environmentally sensitive or culturally significant areas) should not be made from this report.

This report concludes our work on the project in accordance with our current agreement. If you have any questions, please call 707-441-8855.

Sincerely,

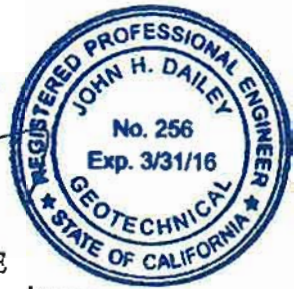
SHN Consulting Engineers & Geologists, Inc.



Paul Sundberg
Staff Geologist



John H. Dailey, PE, GE
Senior Geotechnical Engineer



PRS:JHD:lms

- Attachments:
1. Boring Logs
 2. Laboratory Test Results

Mr. Greg Pratt

Engineering Soils Report for Proposed AST and Fueling Area Canopy Foundation, Humboldt Transit Authority, Eureka, Humboldt County, California

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References Cited

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METHOD OF SOIL CLASSIFICATION

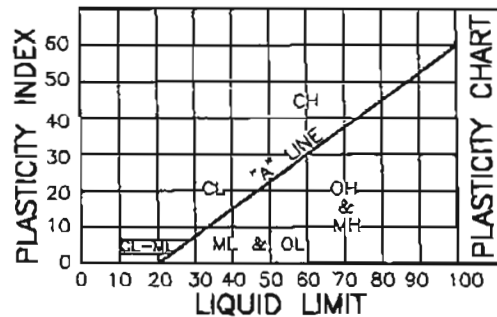
MAJOR DIVISIONS		SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN 1/2 OF SOIL > NO. 200 SIEVE SIZE)	<u>GRAVELS</u> (MORE THAN 1/2 OF COARSE FRACTION > NO.4 SIEVE SIZE)	GW	WELL GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	<u>SANDS</u> (MORE THAN 1/2 OF COARSE FRACTION < NO.4 SIEVE SIZE)	SW	WELL GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
		SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
		SM	SILTY SANDS, SAND-SILT MIXTURES
		SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 1/2 OF SOIL < NO. 200 SIEVE SIZE)	<u>SILTS & CLAYS</u> LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	<u>SILTS & CLAYS</u> LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTY CLAYS, ORGANIC SILTS
HIGHLY ORGANIC SOILS		PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

CLASSIFICATION CHART

CLASSIFICATION CHART

CLASSIFICATION	U.S. STANDARD SIEVE SIZE
BOULDERS	ABOVE 12"
COBBLES	12" TO 3"
GRAVEL COARSE FINE	3" TO NO. 4 3" TO 3/4" 3/4" TO NO. 4
SAND COARSE MEDIUM FINE	NO. 4 TO NO. 200 NO. 4 TO NO. 10 NO. 10 TO NO. 40 NO. 40 TO NO. 200
SILT & CLAY	BELOW NO. 200

GRAIN SIZE CHART



PLASTICITY CHART

CONSISTENCY OF FINE GRAINED SOILS		DENSITY OF COARSE GRAINED SOILS	
CLASSIFICATION	COHESION (PSF)	CLASSIFICATION	STANDARD PENETRATION (BLOW COUNT)
VERY SOFT	0-250	VERY LOOSE	0-4
SOFT	250-500	LOOSE	4-10
MEDIUM STIFF	500-1000	MEDIUM	10-30
STIFF	1000-2000	DENSE	30-50
VERY STIFF	2000-4000	VERY DENSE	50+
HARD	4000+		









MOISTURE CLASSIFICATIONS

DRY
DAMP
MOIST
WET

BASED ON UNIFIED
SOILS CLASSIFICATION
SYSTEM



BORING LOG KEY

<u>SAMPLE TYPES</u>		<u>SYMBOLS</u>	
	DISTURBED SAMPLE (BULK)		INITIAL WATER LEVEL
	HAND DRIVEN TUBE SAMPLE		STABILIZED WATER LEVEL
	1.4" I.D. STANDARD PENETRATION TEST SAMPLE (SPT)	-----	GRADATIONAL CONTACT
	2.5" I.D. MODIFIED CALIFORNIA SAMPLE (SOLID WHERE RETAINED)	—————	WELL DEFINED CONTACT
	CORE BARREL SAMPLE (NOT RETAINED)	SS	SPLIT SPOON
	CORE BARREL SAMPLE (RETAINED)		



Consulting Engineers & Geologists, Inc.

812 West Wabash, Eureka, CA 95501 ph. (707) 441-8855 fax. (707) 441-8877

PROJECT: HTA AST Replacement

JOB NUMBER: 014004.100

LOCATION: North West Yard

DATE DRILLED: 6/5/14

GROUND SURFACE ELEVATION: 17 Feet MSL (Google Earth)

TOTAL DEPTH OF BORING: 16.5 Feet

EXCAVATION METHOD: HSRA

SAMPLER TYPE: MOD CAL

LOGGED BY: PRS

**BORING
NUMBER
B-1**

DEPTH (FT)	BULK SAMPLES SHELBY TUBE	BLOWS PER 0.5'	USCS	PROFILE	DESCRIPTION	% Moisture	Dry Density (pcf)	Unc. Cor. (pcf)	% Passing 200	Atterberg Limits		REMARKS
										Liquid Limit	Plastic Index	
0.0					Concrete (5")							
-1.0				ML	Base Rock							
-2.0					SILT with SAND; Dark brown, medium stiff, moist.							
-3.0	1			CL	LEAN CLAY; Yellowish-brown (mottled), soft, moist, silty with fine sand.	21	101	1159				
-4.0	2			CL								
-5.0	3				SANDY LEAN CLAY; Yellowish-brown to strong brown (mottled), soft to medium stiff, moist, ~20% fine to medium sand.							
-6.0	7			SP								
-7.0	12			SM	SAND with CLAY AND SILT; Yellowish-brown to dark yellowish-brown (slightly mottled), medium dense, wet, poorly graded medium sand, ~5-10% fines.	19	99		9.6			TXUU; See Attachment 2
-8.0	14			SP								
-9.0	20				POORLY GRADED SAND; Dark yellowish-brown, dense, saturated, ~5-10% silt.	22	89					
-10.0	21											
-11.0	4								2.3			
-12.0	8			CL	SANDY LEAN CLAY; Yellowish-brown to strong brown (mottled), very stiff, wet.	16	115	1487				
-13.0	17											
-14.0												
-15.0	6											
-16.0	7											
-17.0	11											
-18.0					Boring terminated at a depth of 16.5 feet. Groundwater encountered at a depth of 7.5 feet. Bore hole backfilled with soil cuttings, bentonite and capped with cement.							
-19.0												
-20.0												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time

LOG OF BORING



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PROJECT: HTA AST Replacement

JOB NUMBER: 014004.100

LOCATION: North West Yard

DATE DRILLED: 6/5/14

GROUND SURFACE ELEVATION: 17 Feet MSL (Google Earth)

TOTAL DEPTH OF BORING: 11.5 Feet

EXCAVATION METHOD: HSRA

SAMPLER TYPE: SPT

LOGGED BY: PRS

BORING
NUMBER
B-2

DEPTH (FT)	BULK SAMPLES SHELBY TUBE	BLOWS PER 0.5'	USCS	PROFILE	DESCRIPTION	% Moisture	Dry Density (pcf)	Unc. Cor. (pcf)	% Passing 200	Atterberg Limits		REMARKS
										Liquid Limit	Plastic Index	
0.0					Concrete (6")							
-1.0					Base Rock							
-2.0					SANDY SILT; Dark brown, soft, moist.							
-3.0		1	CL		LEAN CLAY; Yellowish-brown (slightly mottled), soft, moist, contains silt and sand.					33	14	
-4.0		2										
-5.0		3										
-6.0		1	CL		SANDY LEAN CLAY; Yellowish-brown to strong brown (mottled), soft, moist, ~30% medium sand.							
-7.0		1										
-8.0		3	SC		CLAYEY SAND; Yellowish-brown (slightly mottled), loose, wet.				39			
-9.0		6										
-10.0		11	SP-SM		POORLY GRADED SAND with SILT; Dark yellowish-brown (slightly mottled), medium dense, wet to saturated, ~10% silt.							
-11.0		11										
-12.0		1										
-13.0		1	CL		SANDY CLAY; Strong brown to yellowish-brown (slightly mottled), medium stiff, moist to wet, ~20-30% sand.							
-14.0		4										
-15.0					Boring terminated at a depth of 11.5 feet.							
-16.0					Groundwater encountered at a depth of 7.5 feet.							
-17.0					Bore hole backfilled with soil cuttings, bentonite and capped with cement.							
-18.0												
-19.0												
-20.0												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

LOG OF BORING



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JOB NUMBER: 014004.100

LOCATION: North West Yard

DATE DRILLED: 6/5/14

GROUND SURFACE ELEVATION: 17 Feet MSL (Google Earth)

TOTAL DEPTH OF BORING: 11.5 Feet

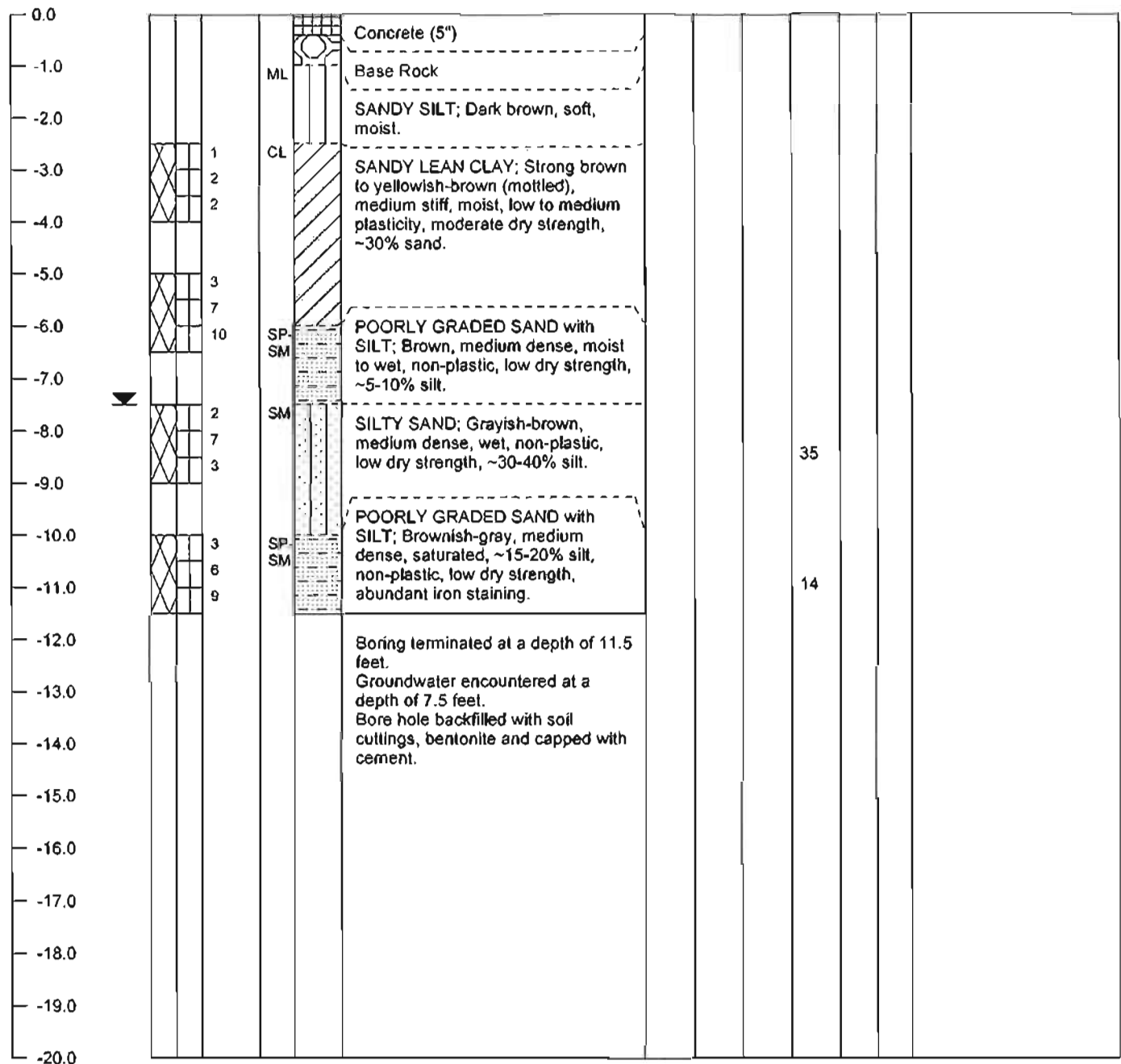
EXCAVATION METHOD: HSRA

SAMPLER TYPE: SPT

LOGGED BY: PRS

BORING
NUMBER
B-3

DEPTH (FT)	BULK SAMPLES SHELBY TUBE	BLOWS PER 0.5'	USCS	PROFILE	DESCRIPTION	% Moisture	Dry Density (pcf)	Unc. Cor. (pcf)	% Passing 200	Atterberg Limits		REMARKS
										Liquid Limit	Plastic Index	



The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

LOG OF BORING



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PROJECT: HTA AST Replacement

JOB NUMBER: 014004.100

LOCATION: North West Yard

DATE DRILLED: 6/5/14

GROUND SURFACE ELEVATION: 17 Feet MSL (Google Earth)

TOTAL DEPTH OF BORING: 16.5 Feet

EXCAVATION METHOD: HSRA

SAMPLER TYPE: MOD CAL/SPT

LOGGED BY: PRS

BORING
NUMBER
B-4

DEPTH (FT)	BULK SAMPLES SHELBY TUBE	BLOWS PER 0.5'	USCS	PROFILE	DESCRIPTION	% Moisture	Dry Density (pcf)	Unc. Cor. (pcf)	% Passing 200	Atterberg Limits		REMARKS
										Liquid Limit	Plastic Index	
0.0					Concrete (6")							
-1.0					Base Rock							
-2.0					SANDY SILT; Dark brown, soft, moist.							
-3.0					SILT with SAND; Dark brown, very soft, moist, ~10% sand.							
-4.0					SANDY SILT; Grayish-brown to yellowish-brown (mottled), soft, moist, contains clay.	21	104					
-5.0												
-6.0					POORLY GRADED SAND with SILT; Grayish-brown, medium dense, moist, ~10-15% silt.							
-7.0												
-8.0					POORLY GRADED SAND with SILT; Strong brown to grayish-brown (mottled), medium dense, saturated, abundant iron staining and cementation.	23	102					
-9.0												
-10.0					grades brown							
-11.0					SANDY SILT; Dark yellowish-brown to strong brown (mottled), medium stiff to stiff, wet to saturated, ~30-40% sand.	20	104					
-12.0												
-13.0												
-14.0												
-15.0					SILTY SAND; Brownish-gray, medium dense, saturated, ~40% silt.							
-16.0												
-17.0					Boring terminated at a depth of 16.5 feet.							
-18.0					Groundwater encountered at a depth of 7.5 feet.							
-19.0					Bore hole backfilled with soil cuttings, bentonite and capped with cement.							
-20.0												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

LOG OF BORING


**DENSITY BY DRIVE- CYLINDER METHOD (ASTM D2937)**

Project Name:	HTA AST Replacement	Project Number:	014004.100
Performed By:	LA	Date:	7/9/14
Checked By:	Dh	Date:	7/16/14
Project Manager:	PB		

Lab Sample Number	14-432	14-444	14-447	14-449	
Boring Label	B1	B4	B4	B4	
Sample Depth (ft)	8.5-9	3.5-4	8.5-9	11-11.5	
Diameter of Cylinder, in	2.42	2.42	2.42	2.42	
Total Length of Cylinder, in.	6.04	6.00	5.96	6.00	
Length of Empty Cylinder A, in.	0.09	0.76	0.74	0.72	
Length of Empty Cylinder B, in.	0.00	0.00	0.00	0.00	
Length of Cylinder Filled, in	5.95	5.24	5.22	5.28	
Volume of Sample, in ³	27.39	24.10	24.01	24.29	
Volume of Sample, cc.	448.78	394.96	393.45	397.97	

Pan #	a11	a10	s31	a2	
Weight of Wet Soil and Pan	870.7	883.5	868.9	885.2	
Weight of Dry Soil and Pan	728.4	745.8	721.9	751.7	
Weight of Water	142.3	137.7	147.0	133.5	
Weight of Pan	86.1	87.4	76.8	87.6	
Weight of Dry Soil	642.3	658.4	645.1	664.1	
Percent Moisture	22.2	20.9	22.8	20.1	
Dry Density, g/cc	1.43	1.67	1.64	1.67	
Dry Density, lb/ft ³	89.3	104.1	102.4	104.2	

**PERCENT PASSING # 200 SIEVE (ASTM - D1140)**

Project Name:	HTA AST Replacement	Project Number:	014004.100
Performed By:	LA	Date:	7/9/14
Checked By:		Date:	7/16/14
Project Manager:	PB		

Lab Sample Number	14-430	14-432	14-436	14-441	14-442
Boring Label	B1	B1	B2	B3	B3
Sample Depth (ft)	6-6.5	8.5-9	5-6.5	7.5-9	10-11.5
Pan Number	a8	ss8	ss1	ss3	ss7
Dry Weight of Soil & Pan	322.2	425.8	402.6	430.0	486.2
Pan Weight	87.4	193.0	195.0	197.2	193.2
Weight of Dry Soil	234.8	232.8	207.6	232.8	293.0
Soil Weight Retained on #200&Pan	299.7	420.5	321.3	348.4	444.5
Soil Weight Passing #200	22.5	5.3	81.3	81.6	41.7
Percent Passing #200	9.6	2.3	39.2	35.1	14.2

Lab Sample Number					
Boring Label					
Sample Depth (ft)					
Pan Number					
Dry Weight of Soil & Pan					
Pan Weight					
Weight of Dry Soil					
Soil Weight Retained on #200&Pan					
Soil Weight Passing #200					
Percent Passing #200					



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812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

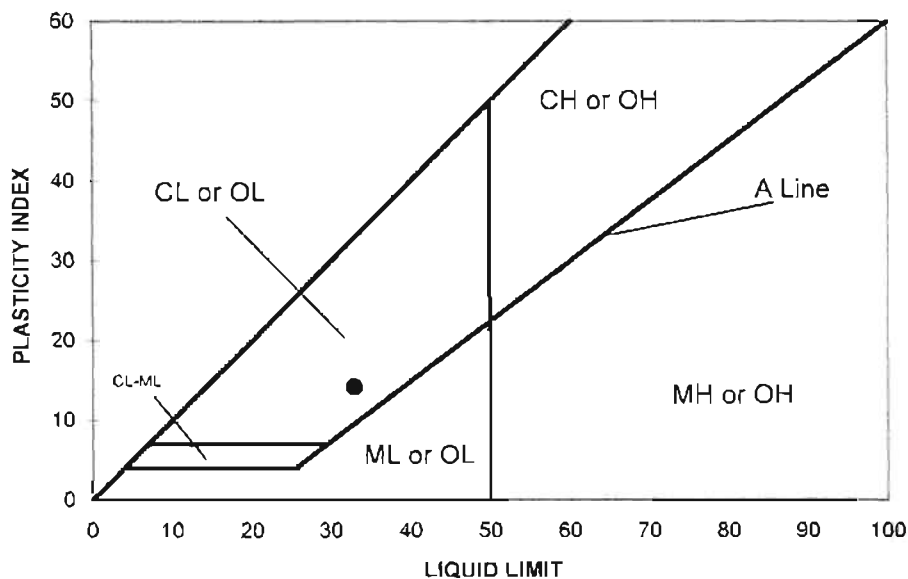
LIQUID LIMIT, PLASTIC LIMIT, and PLASTICITY INDEX (ASTM-D4318)

JOB NAME:	HTA AST Replaceme	JOB #:	014004.100	LAB SAMPLE #:	14-435
SAMPLE ID:	B2 2.5-4'	PERFORMED BY:	LA	DATE:	7/10/14
PROJECT MANGER:	PB	CHECKED BY:	<i>[Signature]</i>	DATE:	<i>[Signature]</i>

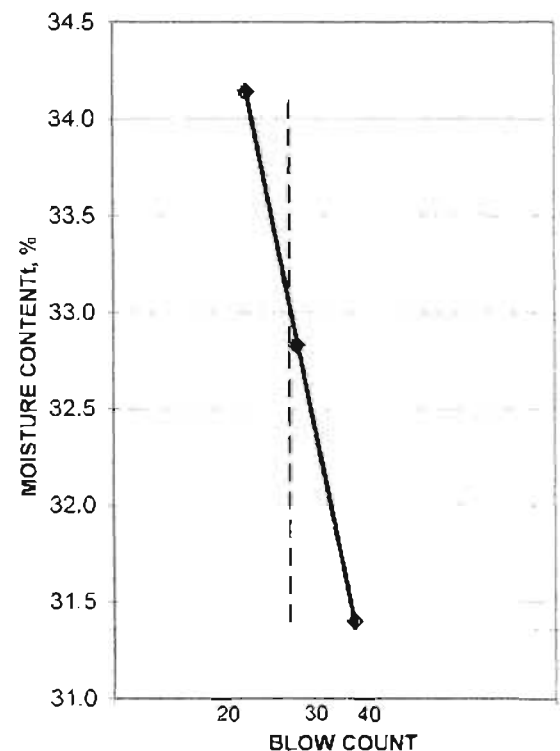
LINE NO.		TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 3
A	PAN #	22	23	A	B	C
B	PAN WT. (g)	17.240	16.970	29.400	29.640	28.720
C	WT. WET SOIL & PAN (g)	24.630	25.490	35.300	36.760	34.770
D	WT. DRY SOIL & PAN (g)	23.470	24.130	33.890	35.000	33.230
E	WT. WATER (C-D)	1.160	1.360	1.410	1.760	1.540
F	WT. DRY SOIL (D-B)	6.230	7.160	4.490	5.360	4.510
G	BLOW COUNT	--	--	35	26	20
H	MOISTURE CONTENT (E/F*100)	18.6	19.0	31.4	32.8	34.1

LIQUID LIMIT	PLASTIC INDEX	PLASTIC LIMIT
33	14	19

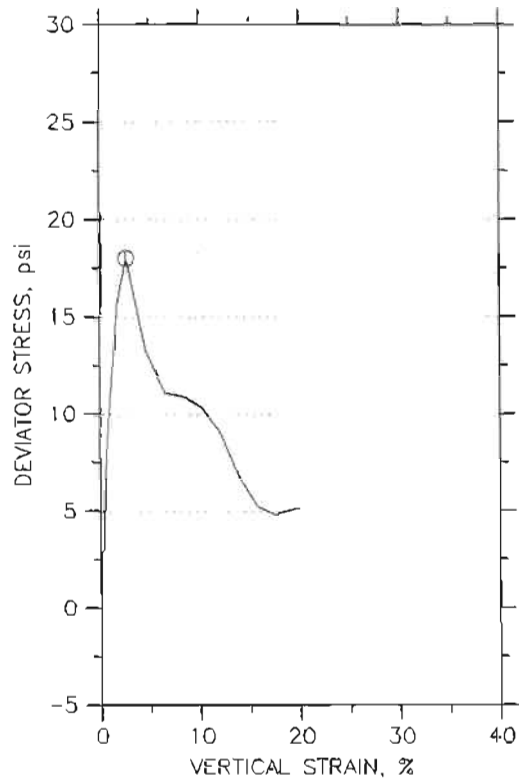
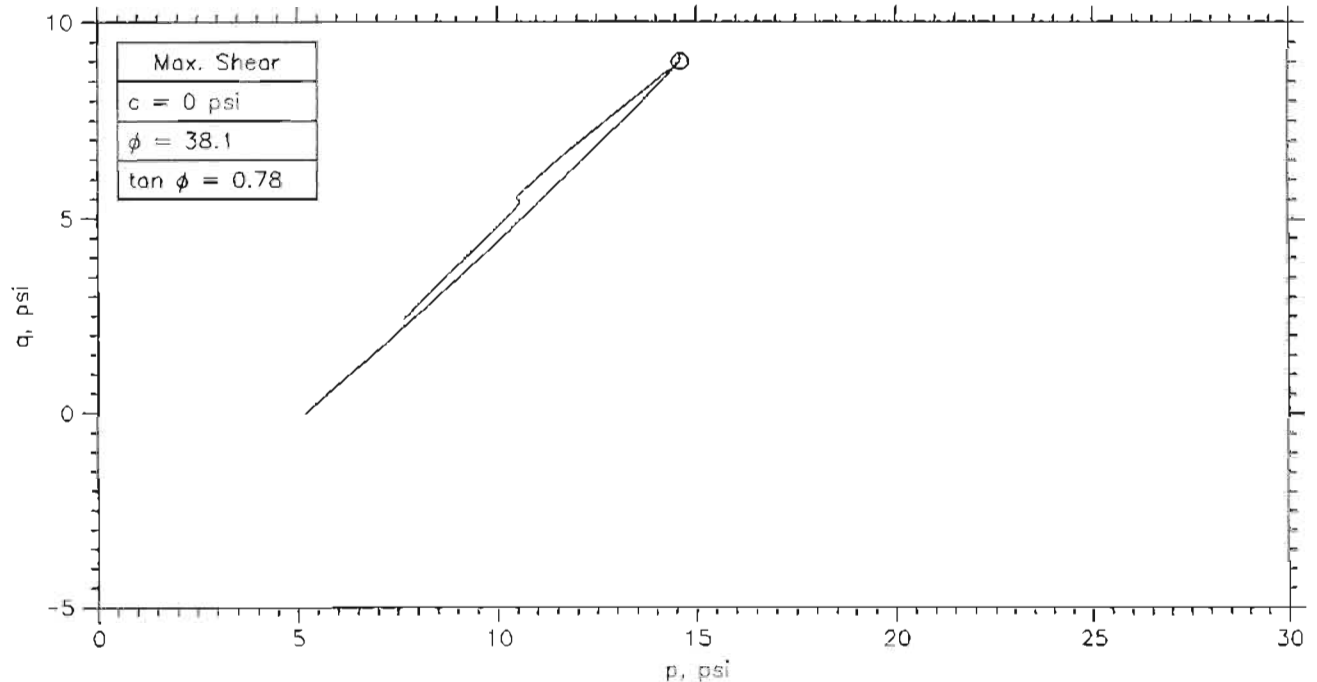
PLASTICITY CHART



LIQUID LIMIT DETERMINATION



CONSOLIDATED UNDRAINED TRIAXIAL TEST



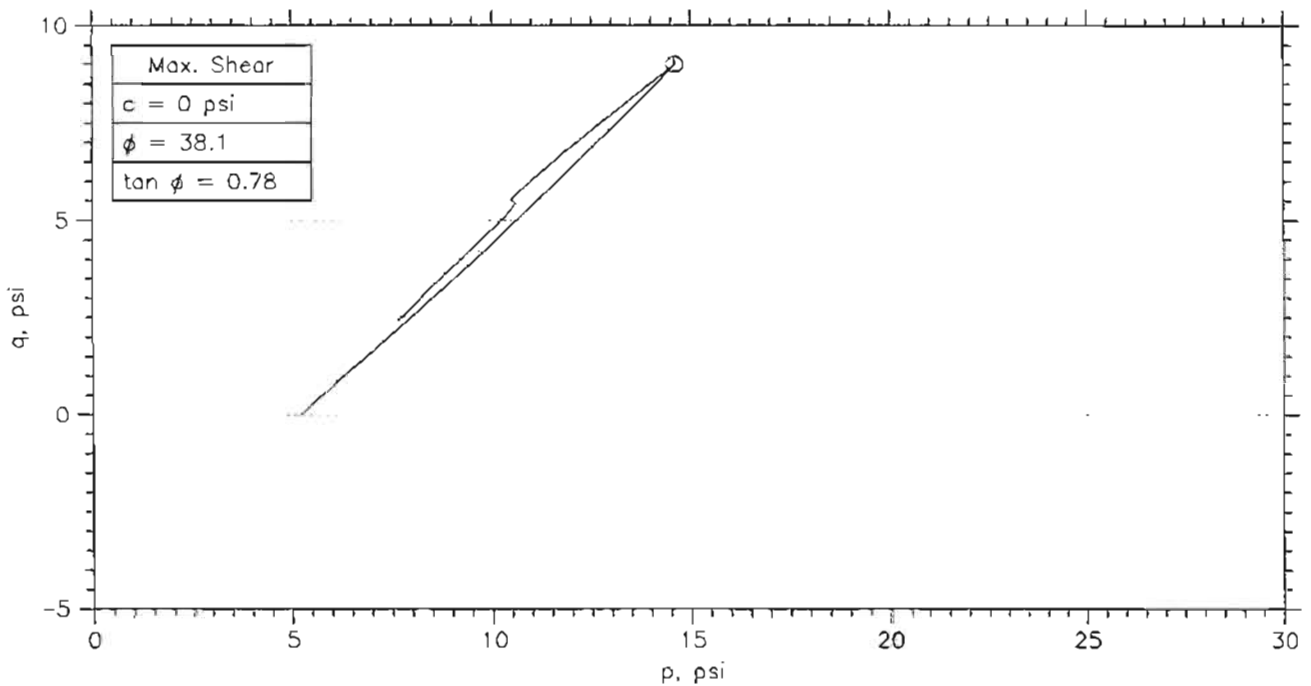
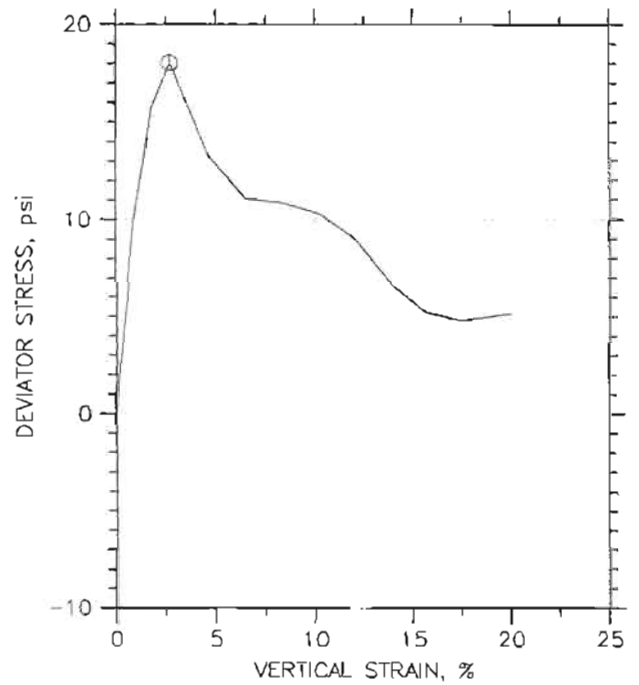
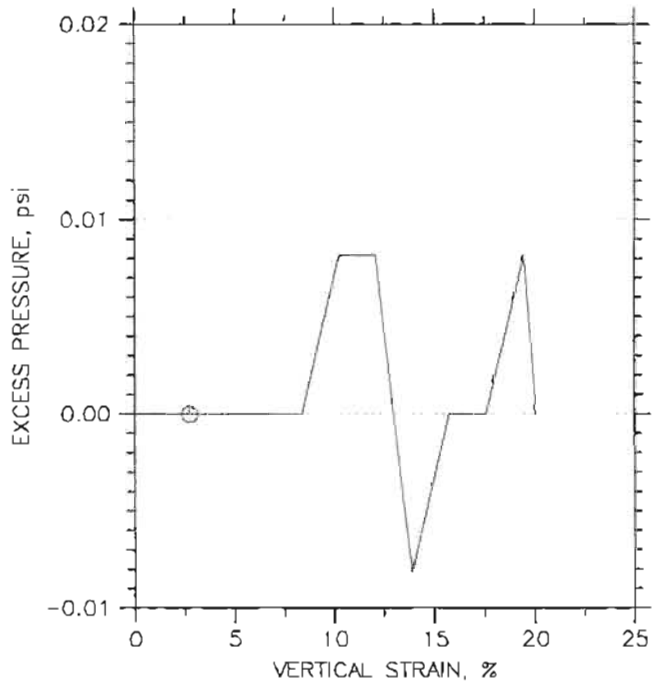
Symbol	Ⓚ			
Sample No.	14-430			
Test No.	14-430			
Depth	6-6.5'			
Initial	Diameter, in	2.42		
	Height, in	5.7		
	Water Content, %	18.8		
	Dry Density, pcf	99.37		
	Saturation, %	74.0		
Before Shear	Void Ratio	0.677		
	Water Content, %	18.8		
	Dry Density, pcf	99.78		
	Saturation*, %	74.7		
	Void Ratio	0.671		
	Back Press., psi	.E-17		
Ver. Eff. Cons. Stress, psi		5.199		
Shear Strength, psi		9.017		
Strain at Failure, %		2.71		
Strain Rate, %/min		1		
B-Value		---		
Estimated Specific Gravity		2.67		
Liquid Limit		---		
Plastic Limit		---		

	Project: HTA AST Replacement				
	Location: Eureka				
	Project No.: 014004.1000				
	Boring No.: B1				
	Sample Type: 2.5" Calbri				
	Description: Grey Silty SAND				
	Remarks:				

Phase calculations based on start and end of test.

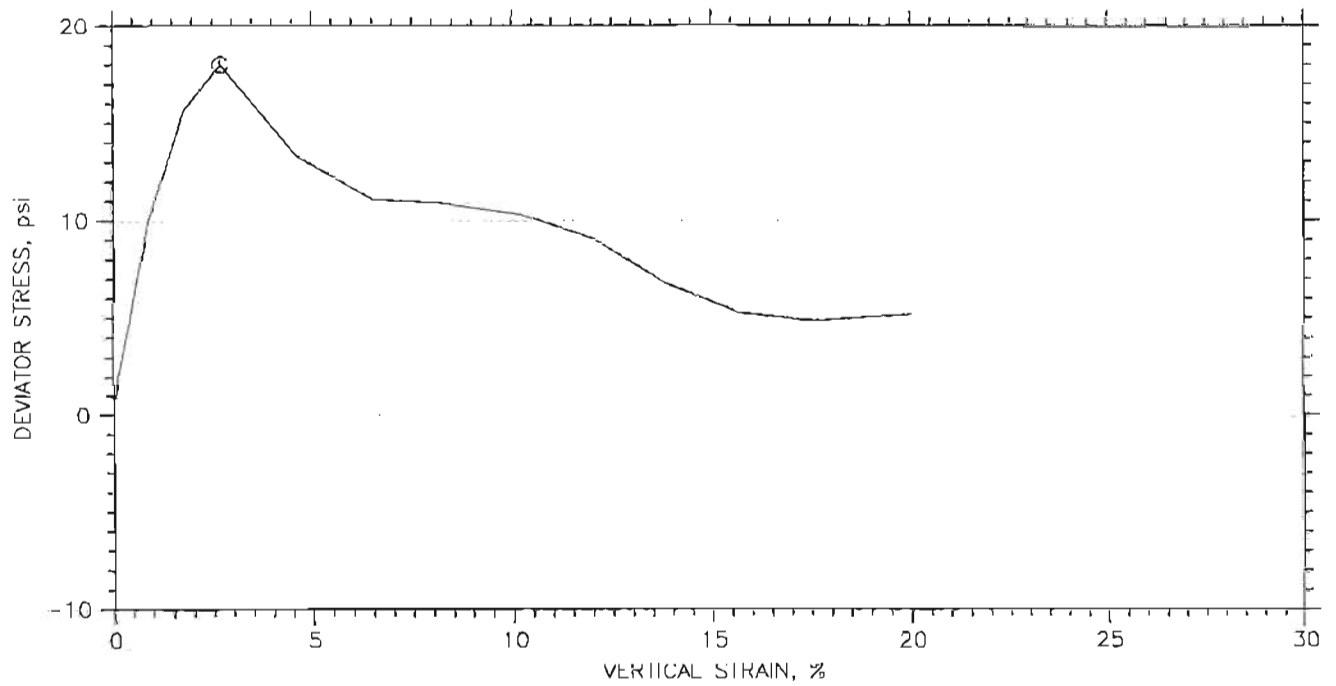
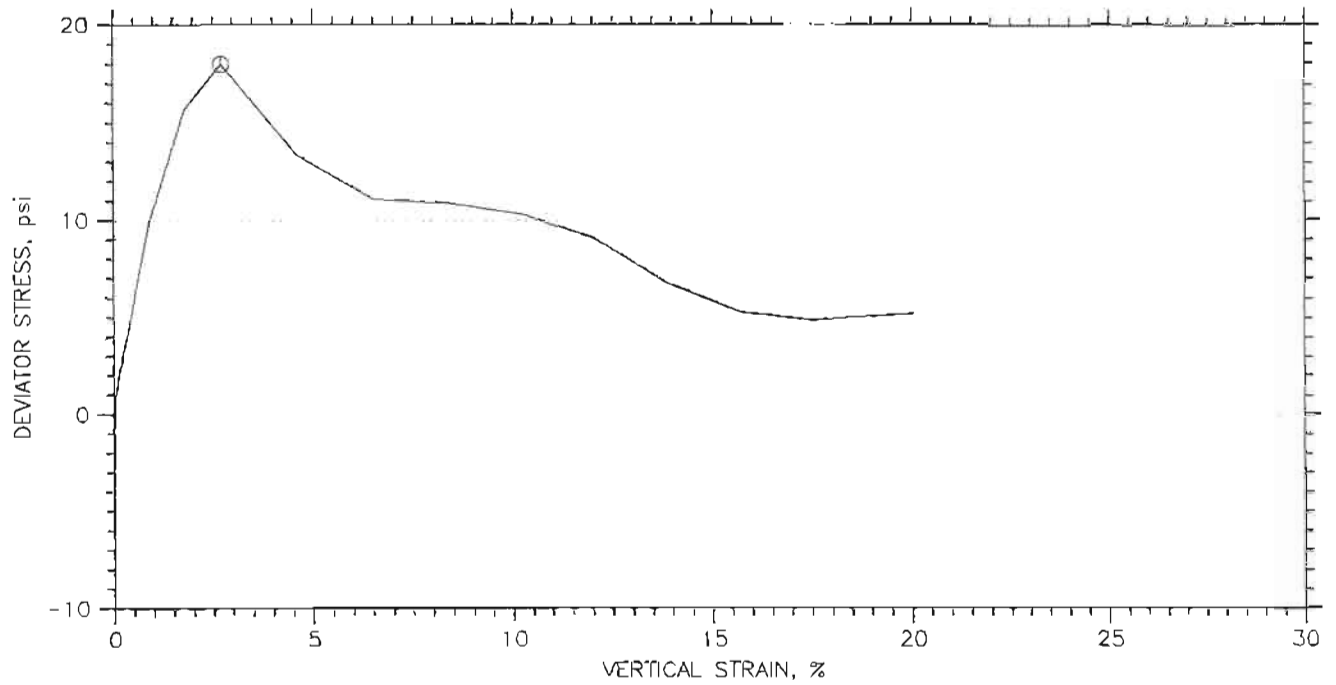
* Saturation is set to 100% for phase calculations.

CONSOLIDATED UNDRAINED TRIAXIAL TEST



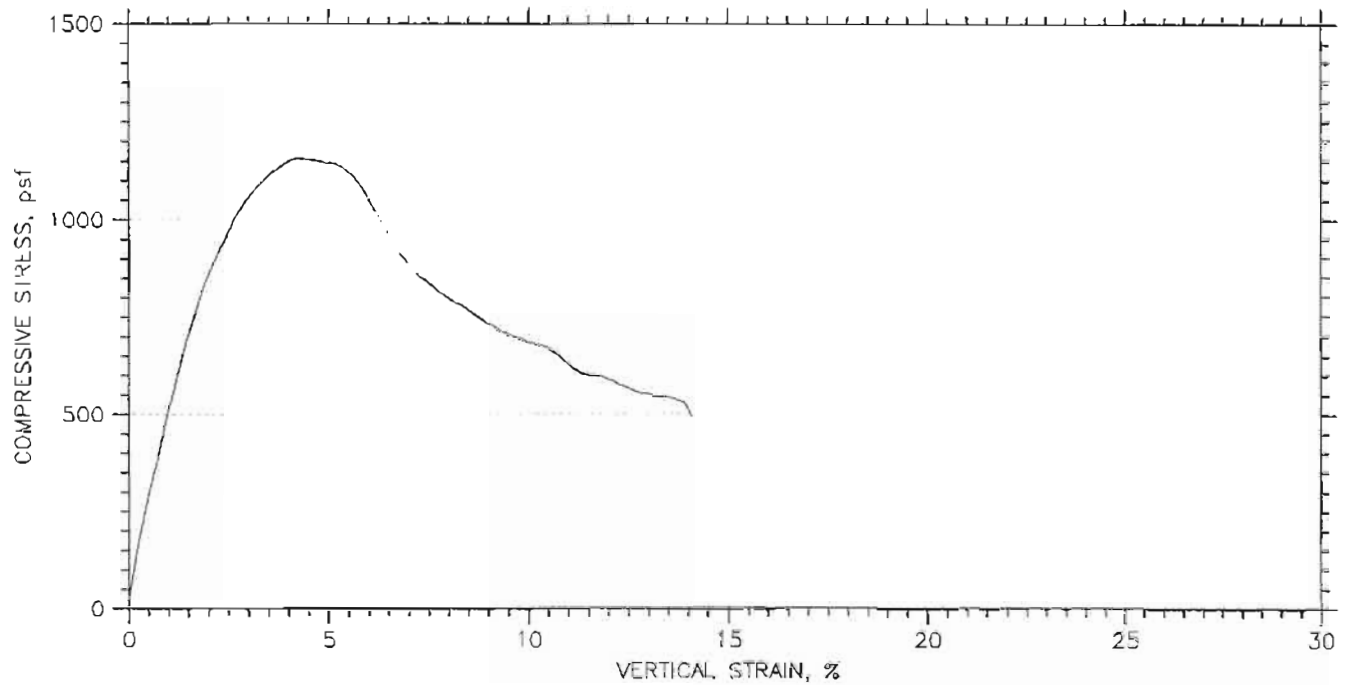
Project: HTA AST Replacement	Location: Eureka	Project No.: 014004.1000
Boring No.: B1	Tested By: LA	Checked By:
Sample No.: 14-430	Test Date: 7/2/14	Depth: 6-6.5'
Test No.: 14-430	Sample Type: 2.5" Calbrl	Elevation: <i>21 July</i>
Description: Grey Silty SAND		
Remarks:		

CONSOLIDATED UNDRAINED TRIAXIAL TEST



Project: HTA AST Replacement	Location: Eureka	Project No.: 014004.1000
Boring No.: B1	Tested By: LA	Checked By:
Sample No.: 14-430	Test Date: 7/2/14	Depth: 6-6.5'
Test No.: 14-430	Sample Type: 2.5" Calbrl	Elevation:
Description: Grey Silty SAND		
Remarks:		

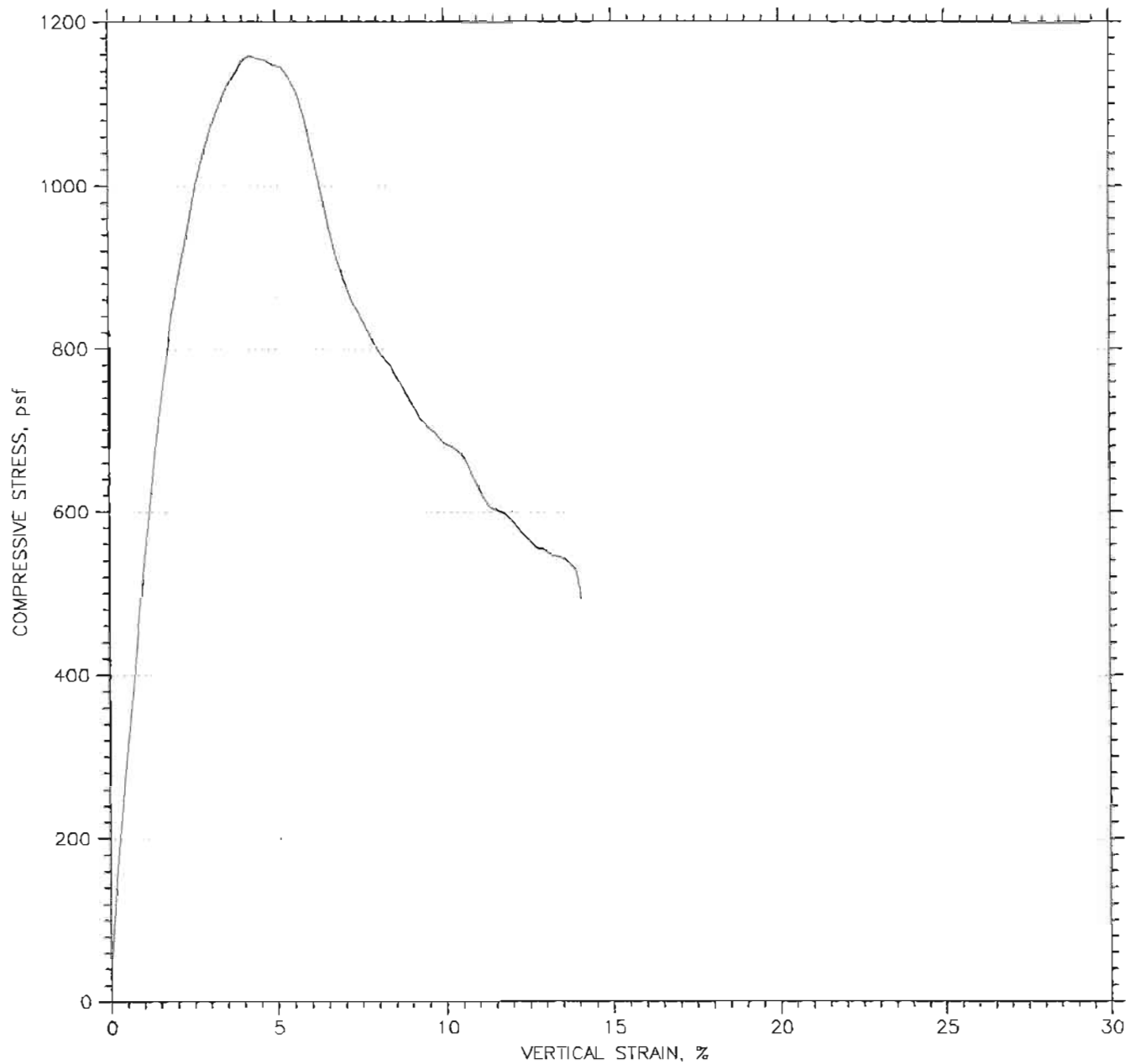
UNCONFINED COMPRESSION TEST REPORT



Symbol				
Test No.		14-428		
Initial	Diameter, in	2.42		
	Height, in	5.25		
	Water Content, %	21.36		
	Dry Density, pcf	100.86		
	Saturation, %	88.41		
	Void Ratio	0.64016		
Unconfined Compressive Strength, psf		1159		
Undrained Shear Strength, psf		579.51		
Time to Failure, min		4.5		
Strain Rate, %/min		1		
Specific Gravity		2.65		
Liquid Limit		0		
Plastic Limit		0		
Plasticity Index		0		
Failure Sketch				

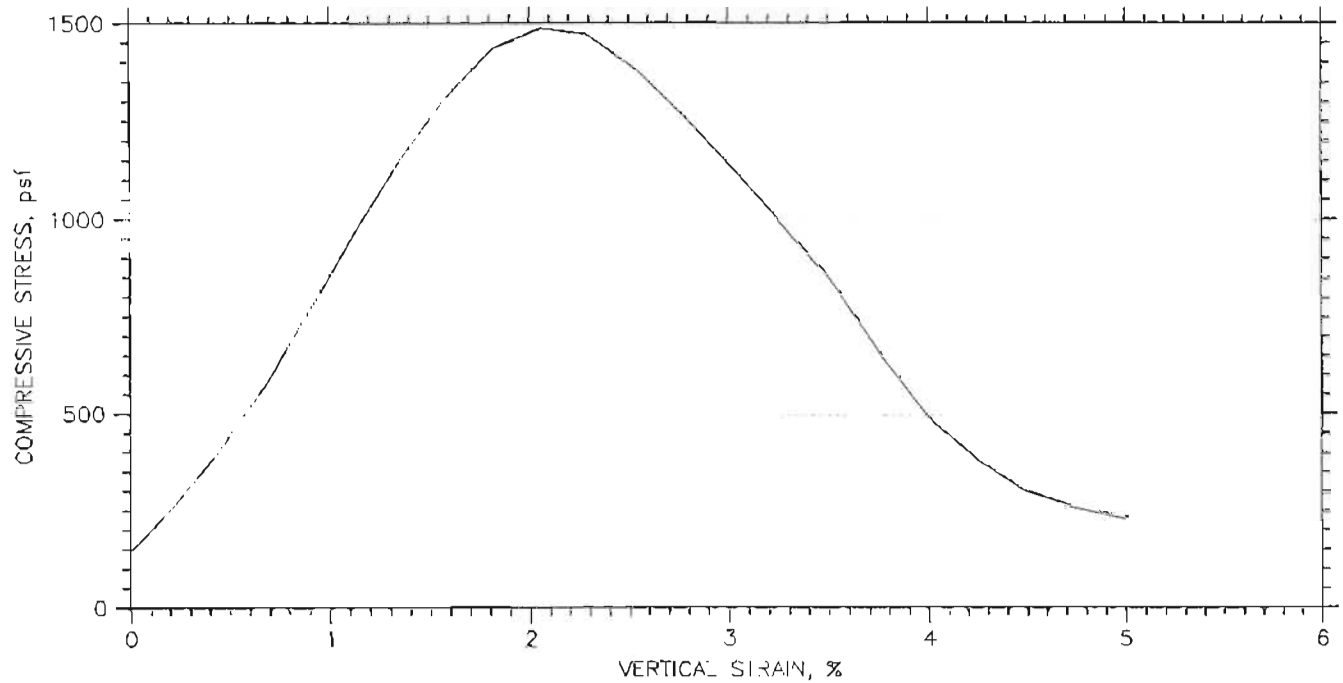
Project: HTA AST Replacement
Location: Eureka
Project No.: 014004.100
Boring No.: B1, 3-3.5
Sample Type: 2.5" calibr
Description: brown silty CLAY
Remarks:

UNCONFINED COMPRESSION TEST REPORT



Project: HTA AST Replacement	Location: Eureka	Project No.: 014004.100
Boring No.: B1	Tested By: LA	Checked By: DL 7/17/14
Sample No.: 14-428	Test Date: 7/2/14	Depth: 3-3.5'
Test No.: 14-428	Sample Type: 2.5" calbrl	Elevation:
Description: brown silty CLAY		
Remarks:		

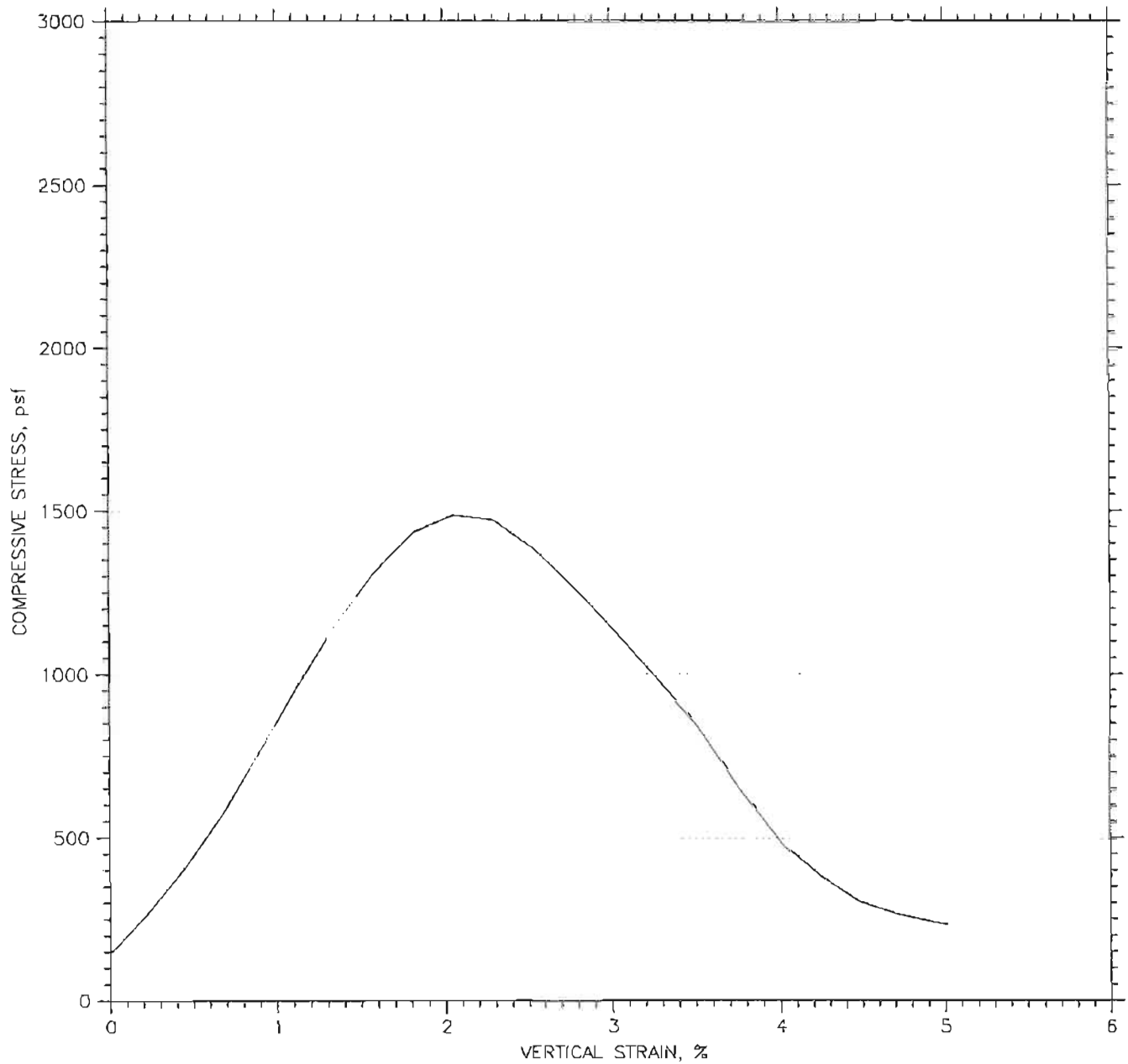
UNCONFINED COMPRESSION TEST REPORT



Symbol				
Test No.	14-434			
Initial	Diameter, in	2.42		
	Height, in	5.54		
	Water Content, %	16.35		
	Dry Density, pcf	115.13		
	Saturation, %	99.16		
	Void Ratio	0.43691		
Unconfined Compressive Strength, psf		1486.9		
Undrained Shear Strength, psf		743.46		
Time to Failure, min		2.25		
Strain Rate, %/min		1		
Specific Gravity		2.65		
Liquid Limit		0		
Plastic Limit		0		
Plasticity Index		0		
Failure Sketch				

Project: HTA AST Replacement
Location: Eureka
Project No.: 014004.100
Boring No.: B1; 11-11.5'
Sample Type: 2.5" calbr.
Description: brown sandy SILT
Remarks:

UNCONFINED COMPRESSION TEST REPORT



Project: HTA AST Replacement	Location: Eureka	Project No.: 014004.100
Boring No.: B1	Tested By: LA	Checked By: <i>DL 7/14</i>
Sample No.: 14-434	Test Date: 7/2/14	Depth: 11-11.5
Test No.: 14-434	Sample Type: 2.5" calbrl	Elevation:
Description: brown sandy SILT		
Remarks:		