APPENDIX D GEOTECHNICAL LABORATORY TEST RESULTS

Appendix D

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Figure D-1.3: Direct Shear Test Results (Prior Projects)
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D LABORATORY TESTING

The following descriptions of laboratory procedures and methods are applicable for the entire Section 2 of the Westside Purple Line Extension project and hence are not repeated in the reports for other stations or tunnel reaches.

D.1 Geotechnical Testing

Laboratory tests were performed on selected samples obtained from the borings to aid in the classification of the soils and to determine pertinent engineering properties of the soils. A list of the laboratory tests performed on the samples is presented in Table D-1.

Table D-1: Laboratory Tests Performed for ACE, PE and Adv. PE Phases

Laboratory Test	Laboratory*	ASTM Designation (or) other	ACE Phase	PE Phase	Adv. PE Phase
Field Moisture Content	Amec Foster Wheeler/AP Engineering	D 2216	X	X	X
Field Dry Density	Amec Foster Wheeler/AP Engineering	D 2937	X	X	X
Sieve Analysis	Amec Foster Wheeler/AP Engineering	D 422	X	X	X
Passing No. 200 Sieve	Amec Foster Wheeler/AP Engineering	D 1140	X	X	X
Atterberg Limits	Amec Foster Wheeler/AP Engineering	D 4318	X	X	X
Direct Shear	Amec Foster Wheeler/AP Engineering	D 3080	X	X	X
Consolidation	Amec Foster Wheeler/AP Engineering	D 2435	X	X	X
Expansion/Collapse	Amec Foster Wheeler/AP Engineering	D 2435	-	X	X
Triaxial Unconsolidated-Drained	AP Engineering	D 4767	-	X	X
Soil Abrasion	University of Texas, Austin	NTNU-SINTEF	-	X	X
Specific Gravity	Amec Foster Wheeler	D 854	-	X	X
Corrosion	HDR-Schiff Associates/**AP Engineering**	Caltrans method	X	X	X

*AMEC, MACTEC, Law/Crandall, LeRoy Crandall are Amec Foster Wheeler's predecessor companies

Field Moisture Content and Dry Density

Field moisture content and dry density of undisturbed ring and pitcher tube samples were determined in the laboratory in accordance with ASTM D 2216. For disturbed samples obtained from SPT sampling and sonic core borings, only moisture content was determined. The results of the tests are shown on the boring logs and in the lab summary tables included in the report.

Sieve Analysis and Passing No. 200 Sieve

Sieve analysis and tests to determine the percentage of fines (material passing through No. 200 sieve) were performed on selected samples collected from the rotary-wash and sonic core borings to determine the size of the different particles in the samples, in accordance with ASTM D 422. The percentage of fines passing No. 200 sieve is shown to the left on the boring logs. The gradation curves obtained from sieve tests are presented in the report. The percentage of fines, sand, and gravel in each sample tested are presented in lab summary tables included in the report.

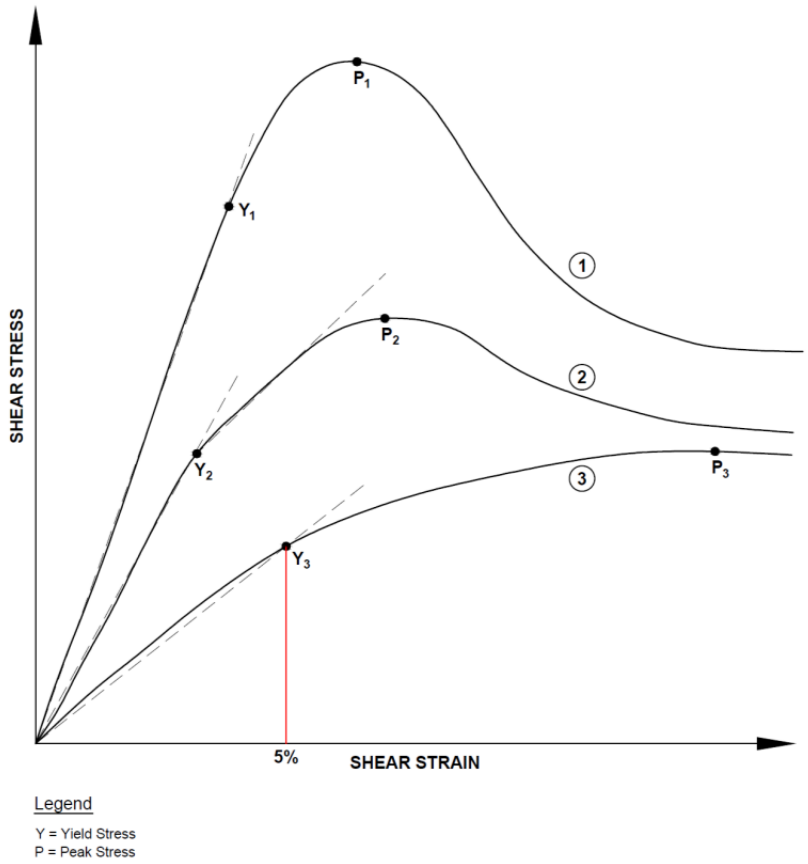
Atterberg Limits

Atterberg Limits were performed on selected samples collected from rotary-wash borings and sonic core borings to determine the plasticity of the materials in accordance with ASTM D 4318. The results of the tests are presented in the report. The summary of the test results (liquid limit, plastic limit and plasticity index) are presented in lab summary tables included in the report.

Direct Shear

Direct shear tests were performed on selected undisturbed samples obtained from rotary-wash borings to determine the strength of the soils in accordance with ASTM D 3080. The tests were performed after soaking to near-saturated moisture content and at three surcharge pressures. The yield-point values determined from the tests were taken as the shear strength of the sample. The direct shear test results are presented in the report. **For reports presented in 2015, peak shear strength values instead of yield strength were reported.**

The determination of the yield point on a stress-strain curve is subjective and could vary between two different users. Some examples of how the yield values are picked are illustrated in the figure below. For stress-strain curve 1, the yield point is picked on the initial straight-line portion of the curve; for curve 2, the yield point is picked at the first yield beyond which the strength behavior becomes non-linear; for curve 3, the yield point is picked at a shear strain of 5 percent.



The rate of shearing varied depending on the type of soil tested (fine-grained versus granular material). The rate of shearing was estimated using the time-consolidation rate reading taken from one-dimensional laboratory consolidation tests performed in accordance with ASTM D 2435. The rate of shearing for different materials is listed in Table D-2.

Table D-2: Direct Shear Rate of Shearing

Test Material	Rate of Shearing (inch/minute)	Test Duration (minutes)
Fine-Grained	0.01	45
Coarse-Grained	0.02	25

Consolidation

Confined consolidation tests were performed on undisturbed (ring) samples obtained from rotary-wash borings to determine the compressibility of the soils in accordance with ASTM D 2435. Water was added to the samples during the tests to illustrate the effect of moisture on the compressibility. The results of the tests are presented in the report. The estimated compression and the recompression indices are presented in lab summary tables included in the report.

Expansion/Collapse

In addition to the confined consolidation tests, "quick" consolidation tests were performed on selected undisturbed samples obtained from rotary-wash borings to determine the hydrocompaction potential of the soils in accordance with ASTM D 2435. The tests were performed by confining the sample under a surcharge pressure of 1,800 pounds per square foot, allowing the sample to consolidate at its field moisture content, and then saturating the sample and measuring the consolidation resulting from the addition of water. The estimated expansion/collapse potential as percentage of test sample height are presented in lab summary tables included in the report.

Triaxial Consolidation-Undrained

Triaxial consolidated-undrained (CU) tests with pore pressure measurements were performed on selected undisturbed samples obtained from rotary-wash borings to determine the strength of the soils in accordance with ASTM D 4767. A three-stage load test method was used by testing the sample at three confining pressures. The results of the tests are presented in the report. The estimate cohesion and friction angle for each sample tested are presented in lab summary tables included in the report.

Soil Abrasion

Soil abrasion testing (SAT) was performed on selected samples of predominately granular material collected from sonic core borings. Samples obtained from rotary-wash borings did not provide sufficient quantity of sample to perform abrasion testing. The soil abrasion tests were performed in accordance with the Norwegian University of Science and Technology (NTNU) test procedure by the rock mechanics laboratory at the University of Texas, Austin.

The SAT method was developed by the NTNU and the associated SINTEF organization as a modification of the Abrasion Value Steel (AVS) test. The purpose of the test is to quantify the abrasivity of soils in soft ground tunneling. The test consists of measuring the weight loss in a steel piece caused by soil grinding. Transported by a wheel that rotates at 20 revolutions per minute, the soil passes underneath the test piece, which is subject to one kilogram (about 2.5 pounds) of soil or rock. The SAT value is the weight loss in milligrams (e.g., SAT = 5 means that the steel test piece lost 5 milligrams (mg) after 20 revolutions. Therefore, a higher SAT value indicates that the soil or rock is more abrasive.

Based on the NTNU/SINTEF test database, a classification of abrasivity of soil and rock was developed by the University of Texas, Austin, as presented in Table D-4, to provide guidance on evaluating the SAT test values.

Table D-4: Classification of Abrasivity of Soil and Rock

Abrasivity Category	SAT Value
Extremely Low	< 1
Very Low	2 – 3
Low	4 – 12
Medium	13 – 25
High	26 – 35
Very High	36 – 44
Extremely High	> 45

The results of the abrasion tests are presented in lab summary tables included in the report.

Corrosion

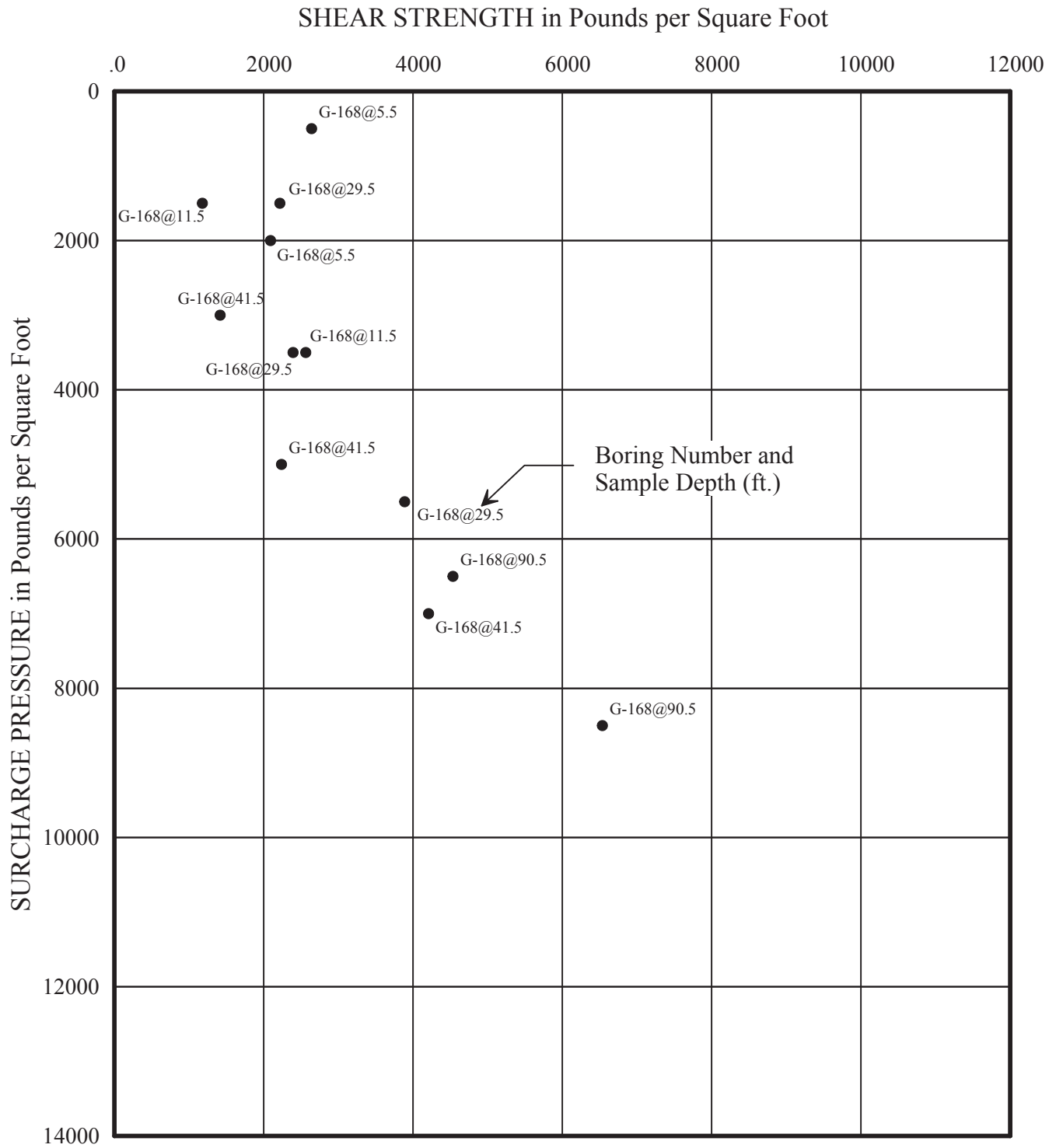
To evaluate the potential for deleterious effects of the on-site soils on structural concrete and steel and on metal piping, chemical testing was performed on selected soil samples from rotary-wash and sonic core borings. The corrosion tests were performed by HDR-Schiff Associates **and AP Engineering**. The results of the corrosion tests are presented in the report. The pH, sulfate and chloride content and minimum resistivity of samples tests are summarized in the lab summary tables included in the report.

The corrosion test results were reviewed for each station, and a separate report for each station summarizing the test results, conclusions regarding the corrosivity, and recommendations for mitigation procedures were prepared by HDR-Schiff Associates. The corrosion mitigation reports are included as an appendix in the reports.

D.2 Subsurface Gas Testing

The samples of gas collected from soil gas wells were analyzed at a state-certified laboratory for hydrogen sulfide, methane, longer chain hydrocarbons (e.g. butane, propane, etc.), and fixed gases using standard EPA testing procedures. The results of these analyses are presented in the report; the associated laboratory analytical reports are provided in the appendix.

For testing of groundwater sampled from the soil gas wells, the sampling container remained under pressure until the analytical laboratory extracted the water for analysis through the quick-connect fittings. These groundwater samples were analyzed for dissolved methane, hydrogen sulfide, and other fixed gases using standard EPA analytical procedures. The results of these analyses are presented in the report; the associated laboratory analytical reports are provided in the appendix.

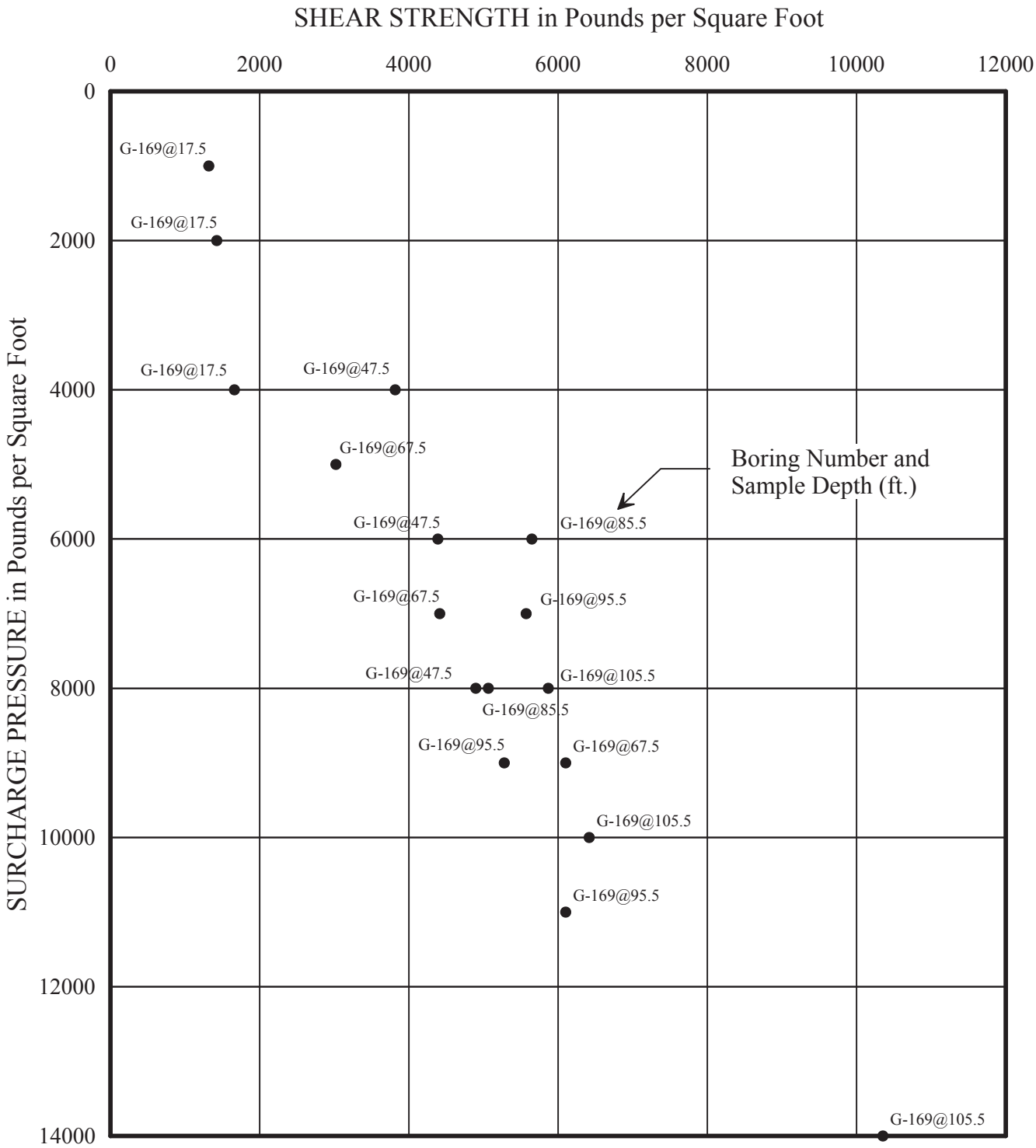


○ Samples tested at field moisture content

● Samples tested after soaking to a moisture content near saturation

Prepared/Date: YZ 5/19/15
Checked/Date: FW 5/19/15

MTA Westside Subway Extension Los Angeles, California	amec foster wheeler	DIRECT SHEAR TEST DATA Project No. 4953-11-1423 Figure D-1.1.1

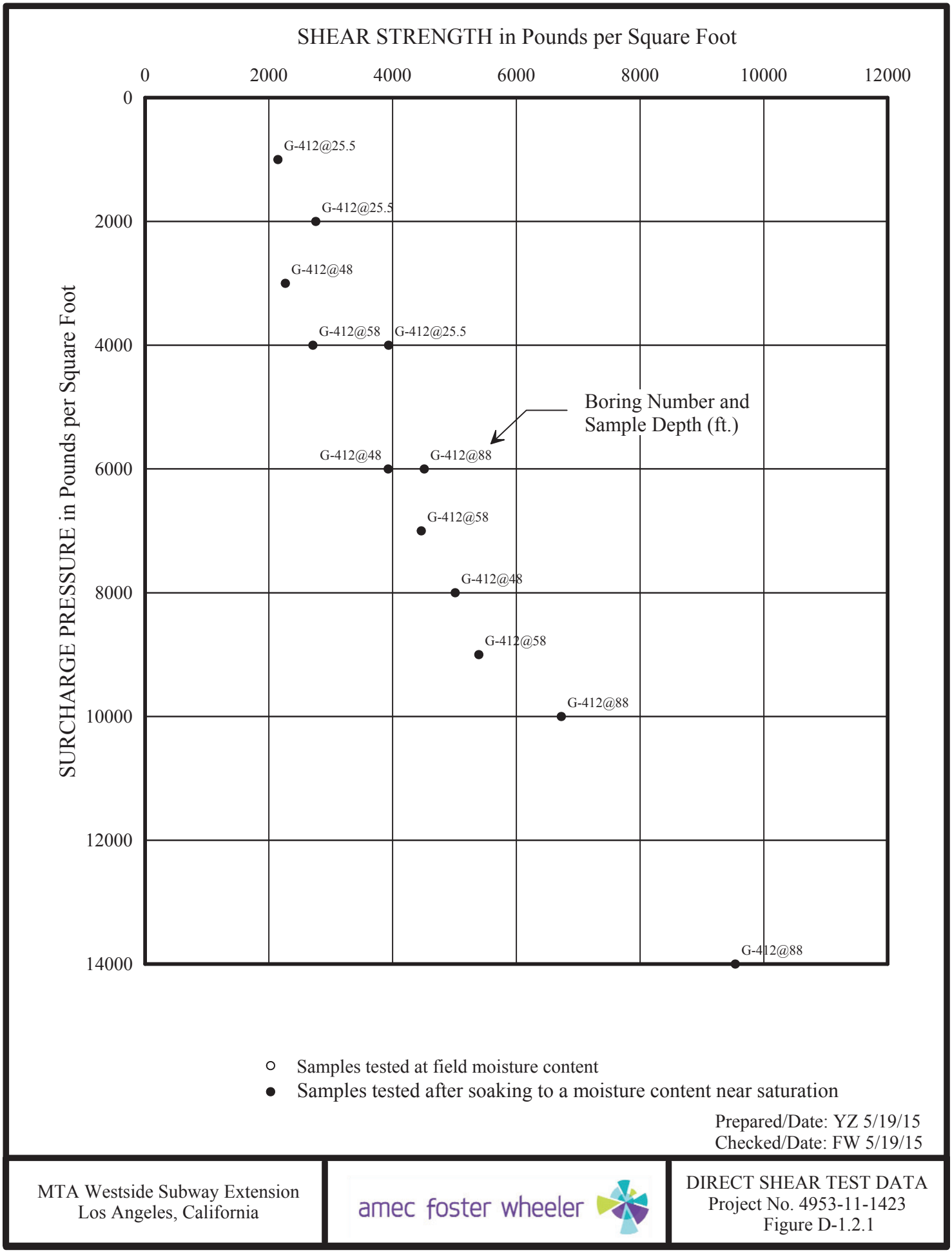


○ Samples tested at field moisture content

● Samples tested after soaking to a moisture content near saturation

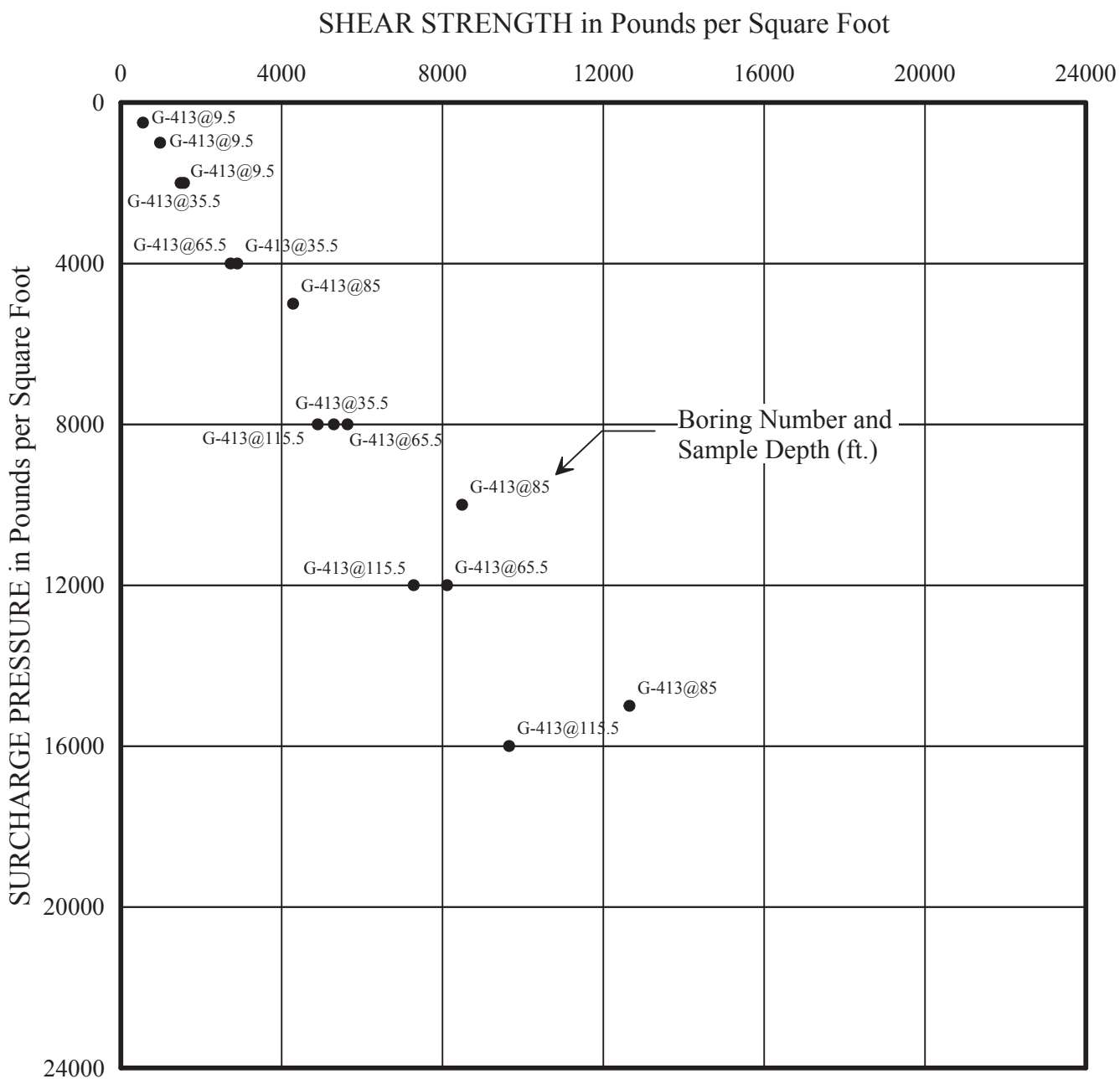
Prepared/Date: YZ 5/19/15
Checked/Date: FW 5/19/15

MTA Westside Subway Extension Los Angeles, California	amec foster wheeler	DIRECT SHEAR TEST DATA Project No. 4953-11-1423 Figure D-1.1.2



Prepared/Date: YZ 5/19/15
Checked/Date: FW 5/19/15

MTA Westside Subway Extension Los Angeles, California	amec foster wheeler	DIRECT SHEAR TEST DATA Project No. 4953-11-1423 Figure D-1.2.1

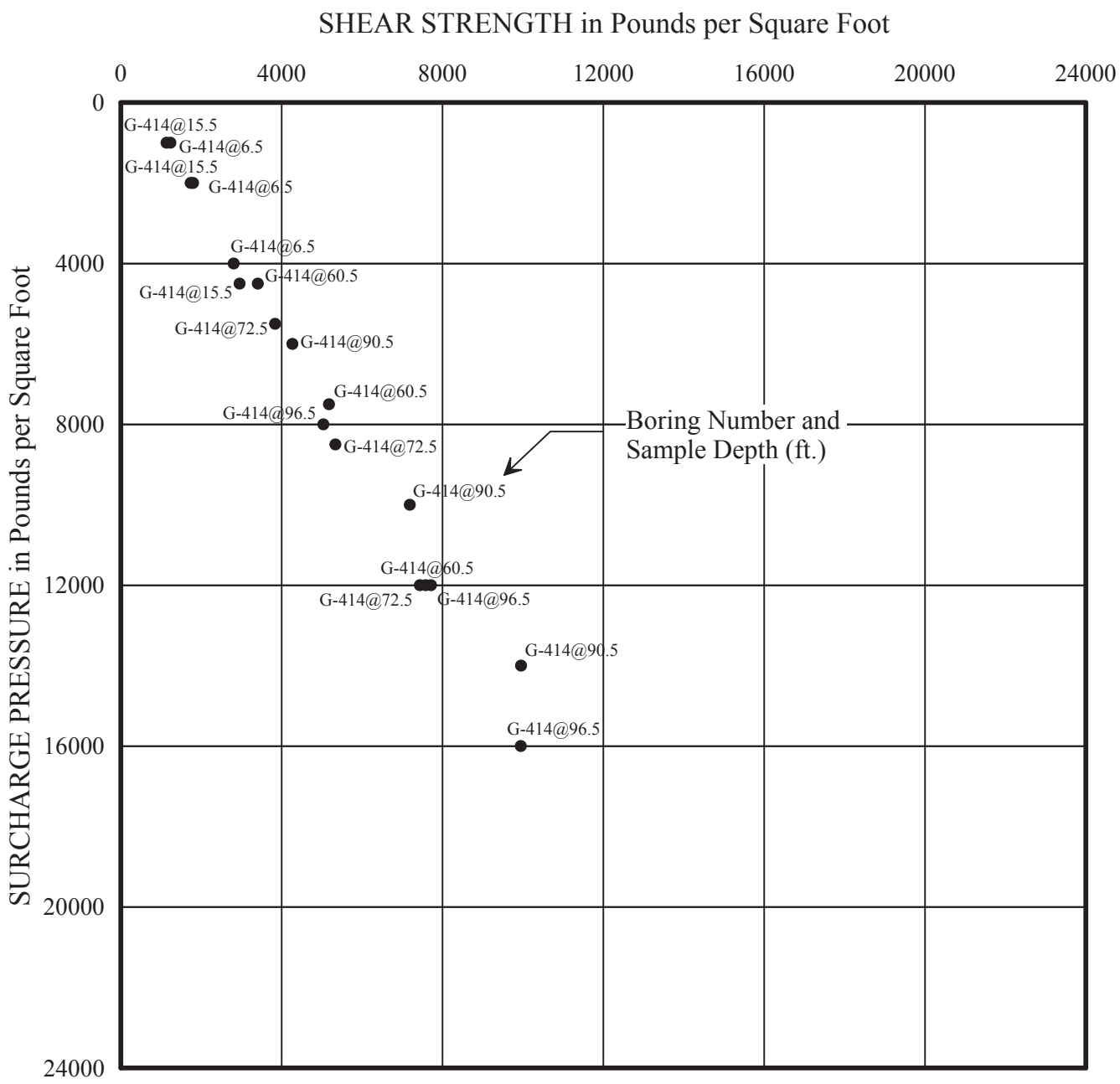


○ Samples tested at field moisture content

● Samples tested after soaking to a moisture content near saturation

Prepared/Date: YZ 5/19/15
Checked/Date: FW 5/19/15

MTA Westside Subway Extension Los Angeles, California	amec foster wheeler	DIRECT SHEAR TEST DATA Project No. 4953-11-1423 Figure D-1.2.2

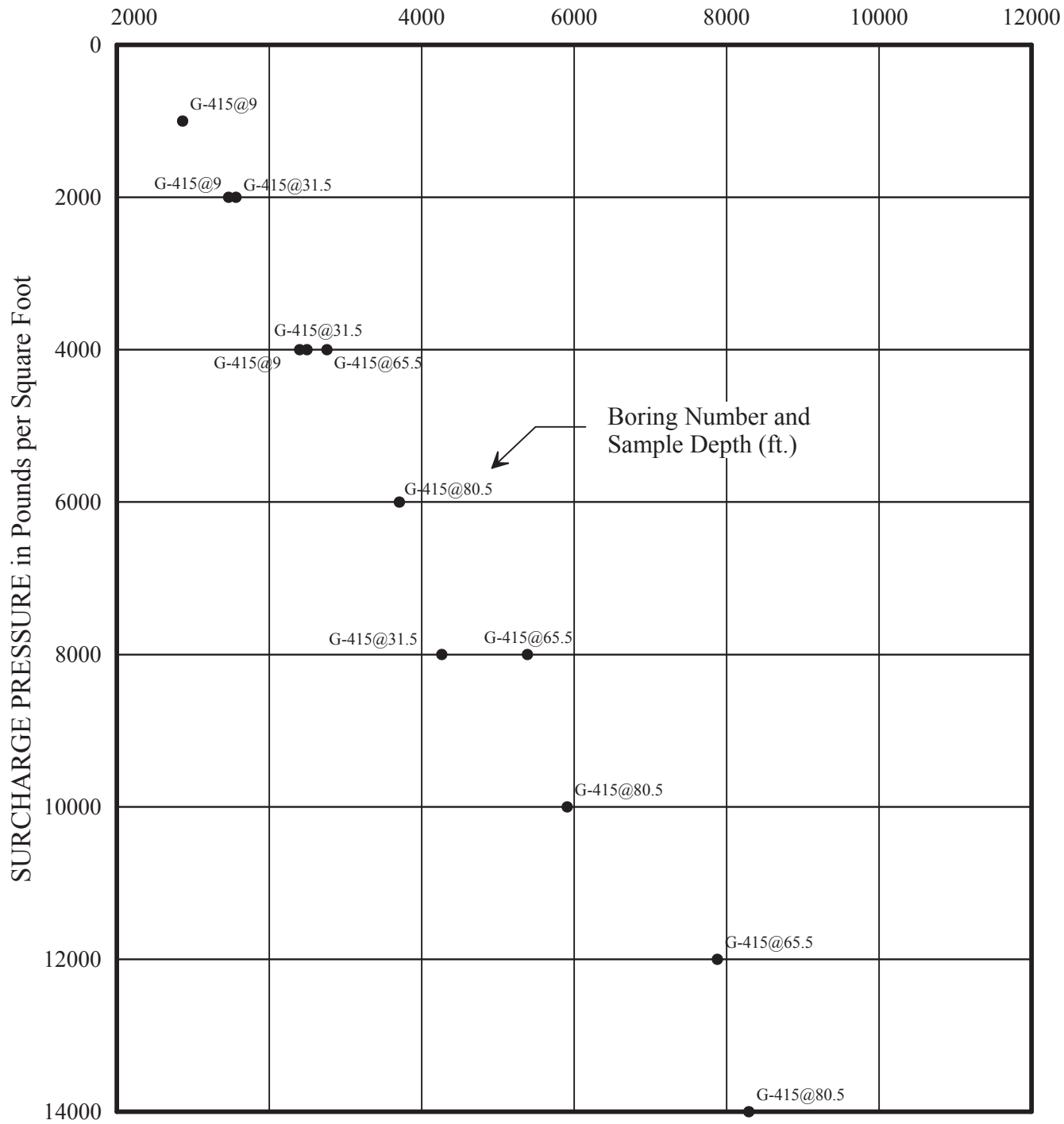


○ Samples tested at field moisture content

● Samples tested after soaking to a moisture content near saturation

Prepared/Date: YZ 5/19/15
Checked/Date: FW 5/19/15

MTA Westside Subway Extension Los Angeles, California	amec foster wheeler	DIRECT SHEAR TEST DATA Project No. 4953-11-1423 Figure D-1.2.3

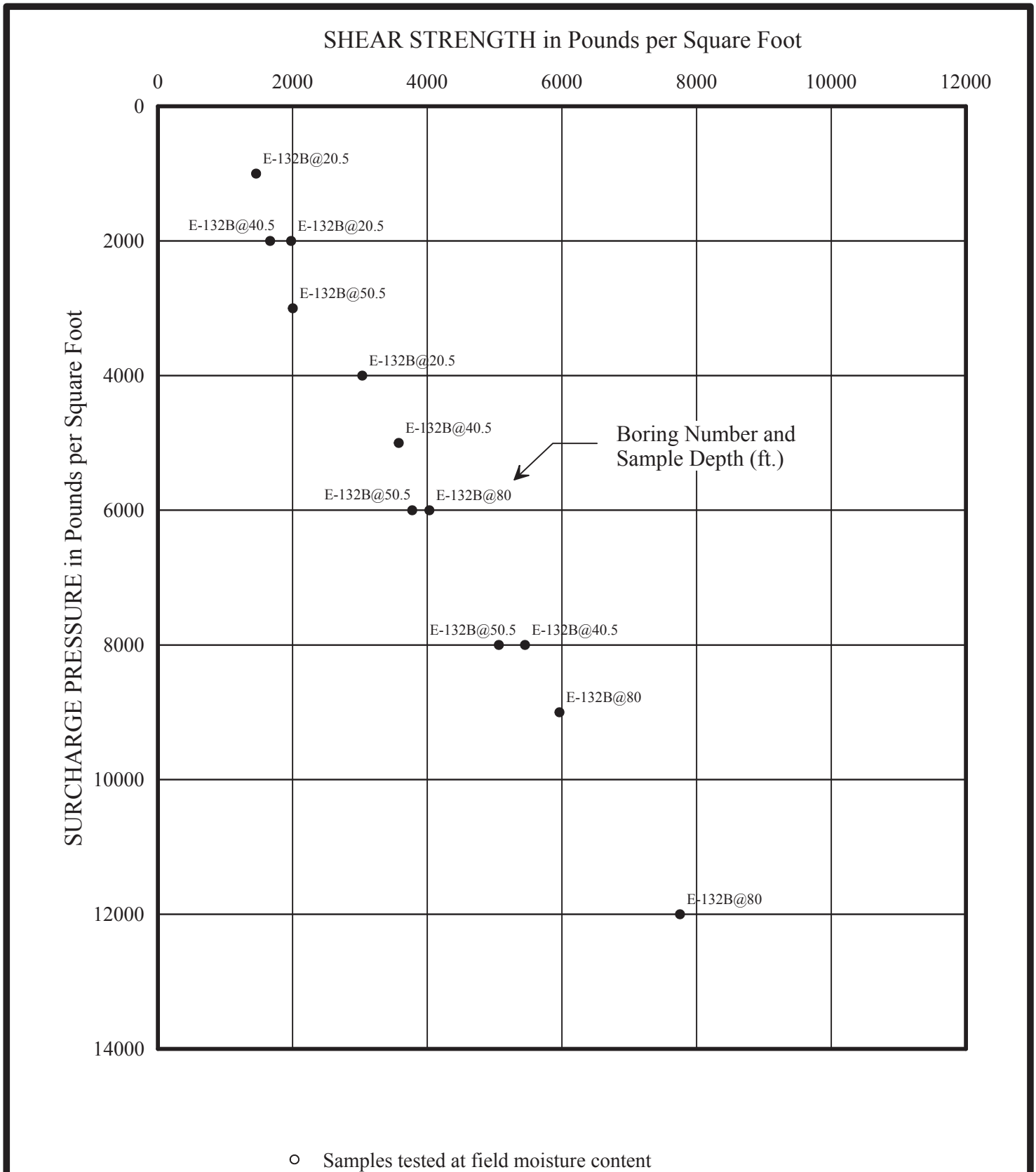


○ Samples tested at field moisture content

● Samples tested after soaking to a moisture content near saturation

Prepared/Date: YZ 5/19/15
Checked/Date: FW 5/19/15

MTA Westside Subway Extension Los Angeles, California	amec foster wheeler	DIRECT SHEAR TEST DATA Project No. 4953-11-1423 Figure D-1.2.4

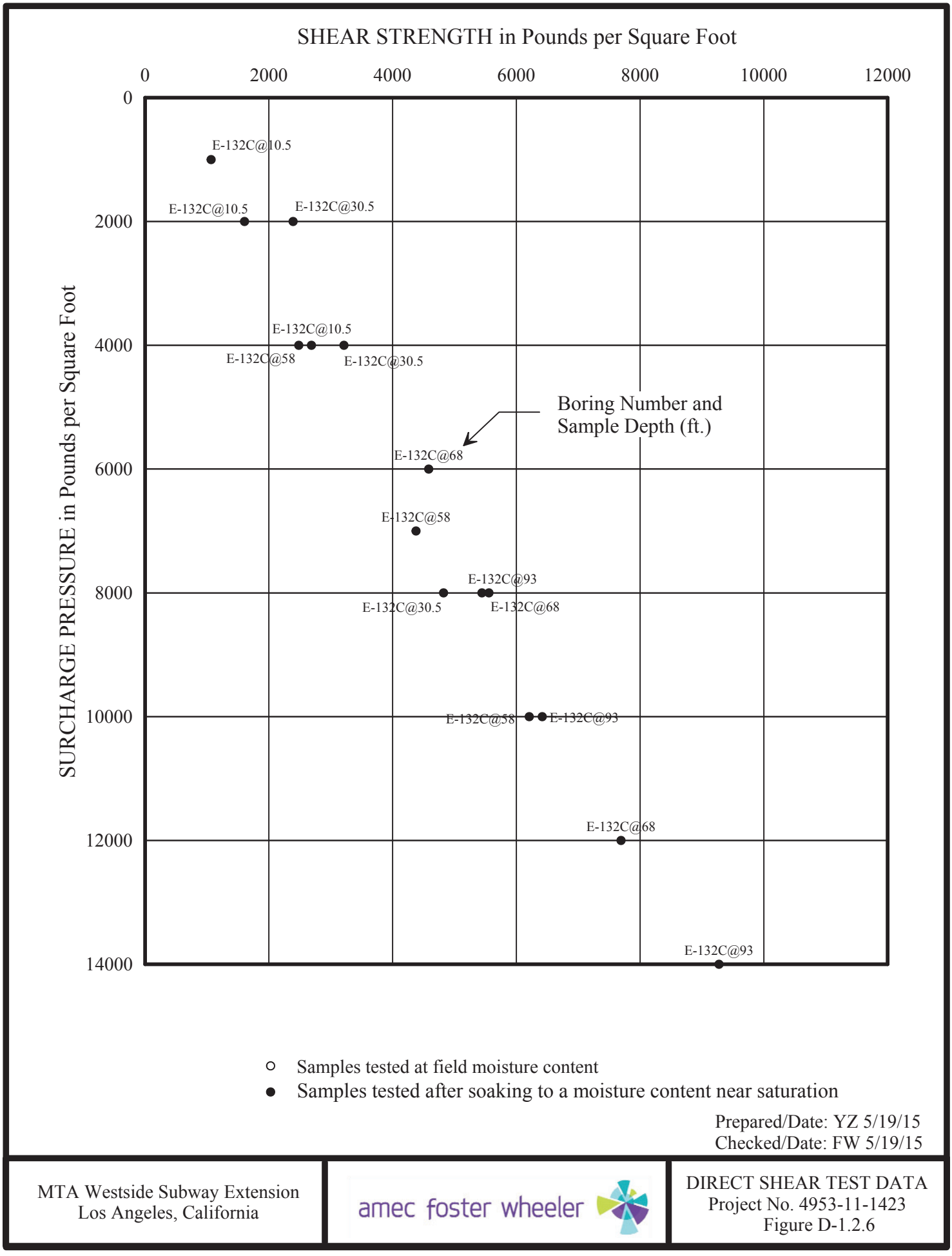


○ Samples tested at field moisture content

● Samples tested after soaking to a moisture content near saturation

Prepared/Date: YZ 5/19/15
Checked/Date: FW 5/19/15

MTA Westside Subway Extension Los Angeles, California	amec foster wheeler	DIRECT SHEAR TEST DATA Project No. 4953-11-1423 Figure D-1.2.5

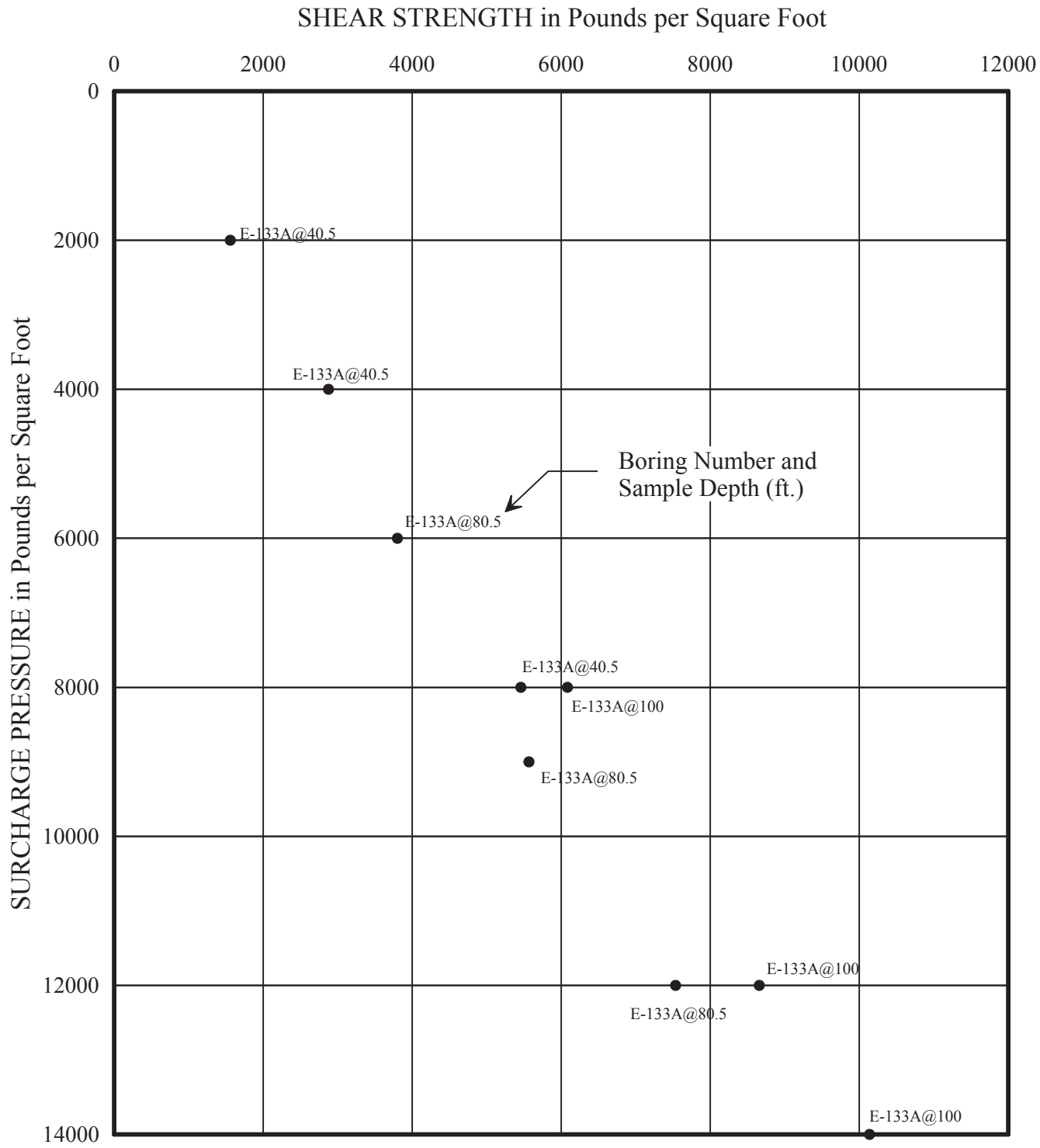


○ Samples tested at field moisture content

● Samples tested after soaking to a moisture content near saturation

Prepared/Date: YZ 5/19/15
Checked/Date: FW 5/19/15

MTA Westside Subway Extension Los Angeles, California	amec foster wheeler	DIRECT SHEAR TEST DATA Project No. 4953-11-1423 Figure D-1.2.6

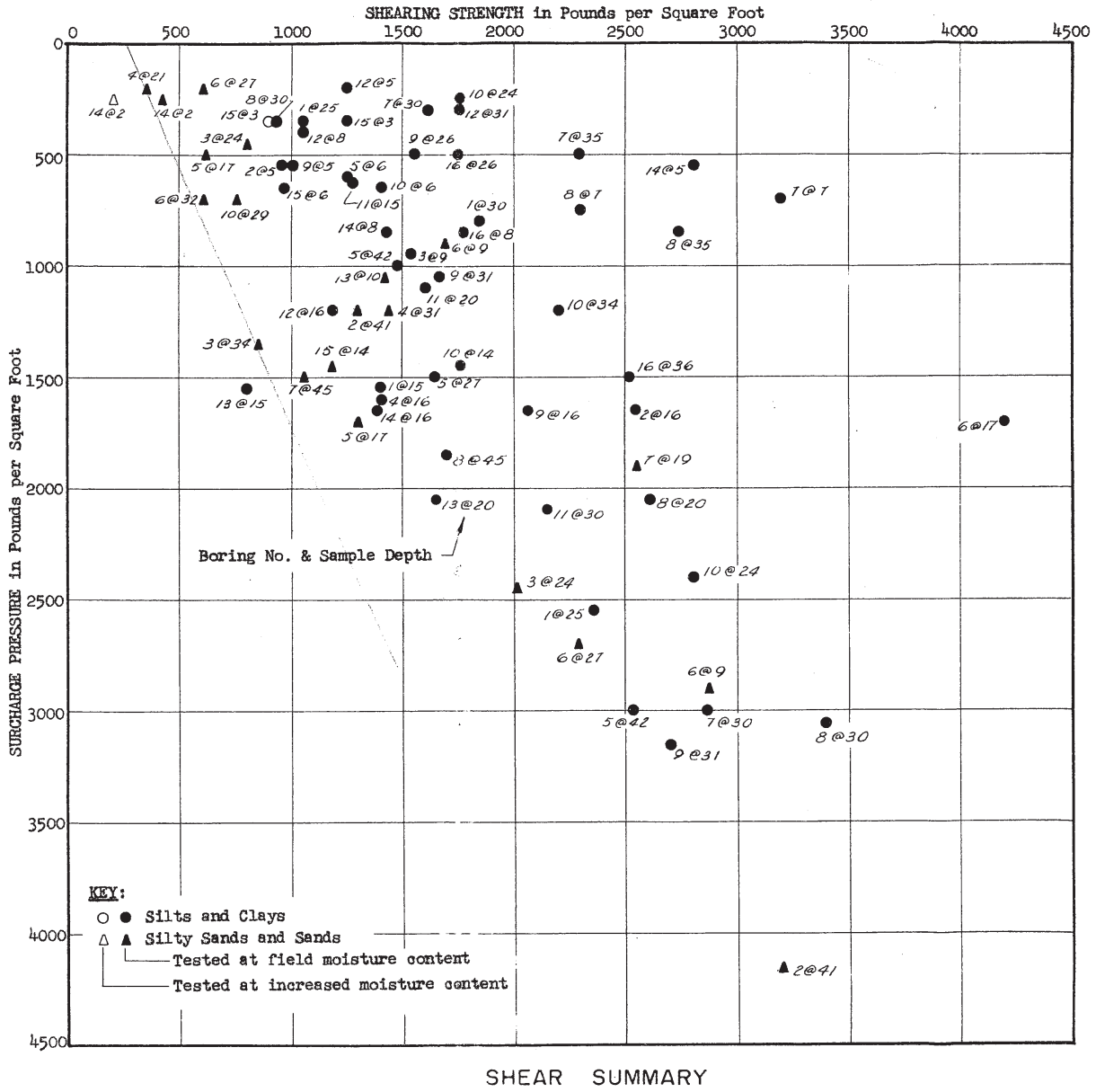


- ○ Samples tested at field moisture content
- ● Samples tested after soaking to a moisture content near saturation

Prepared/Date: YZ 5/19/15
Checked/Date: FW 5/19/15

MTA Westside Subway Extension Los Angeles, California	amec foster wheeler	DIRECT SHEAR TEST DATA Project No. 4953-11-1423 Figure D-1.2.7

JOB 59446 DATE 11-19-59 BY FKL



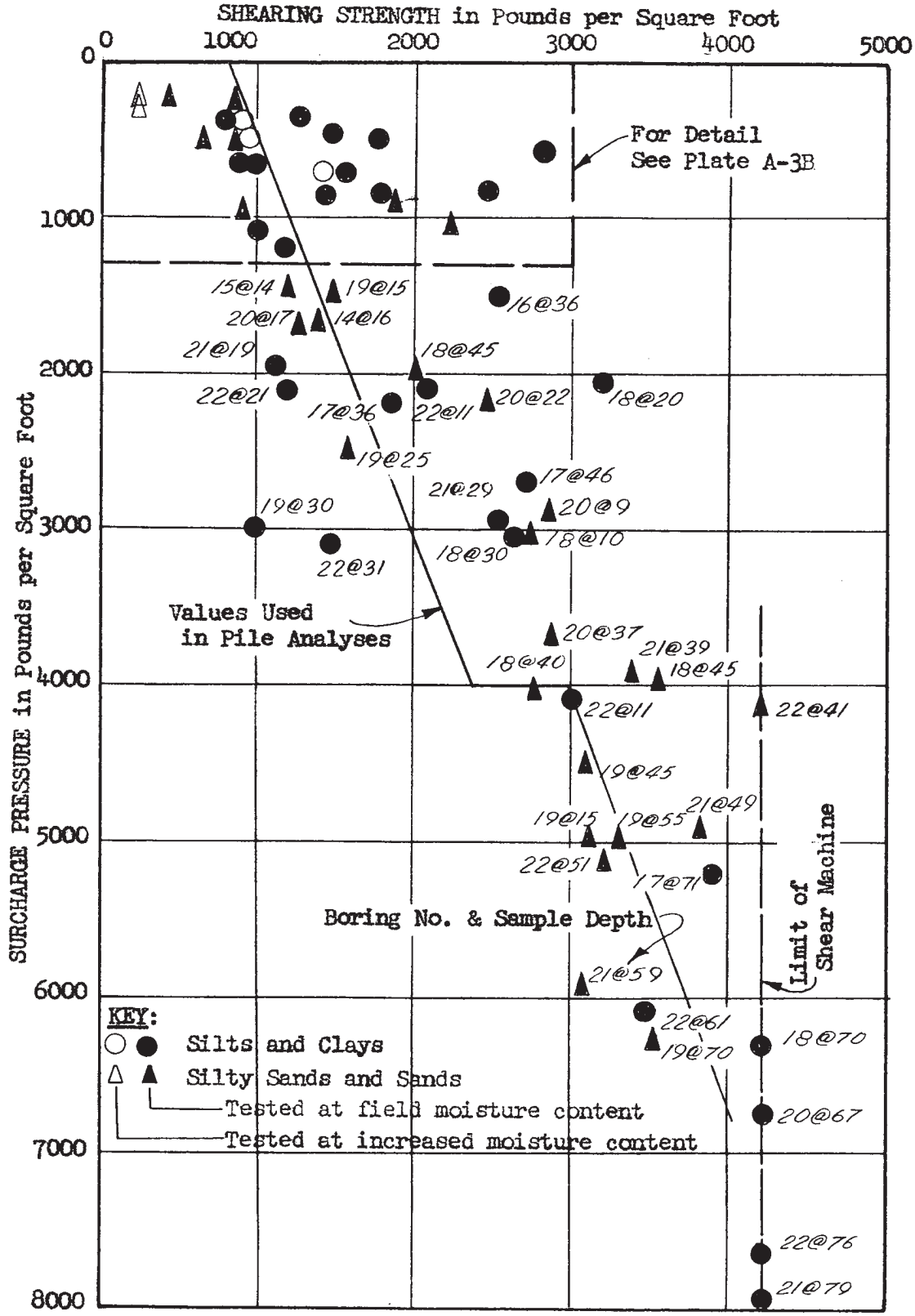
SHEAR SUMMARY

Figure D-1.3.1

LEROY CRANDALL & ASSOCIATES

PLATE A-3

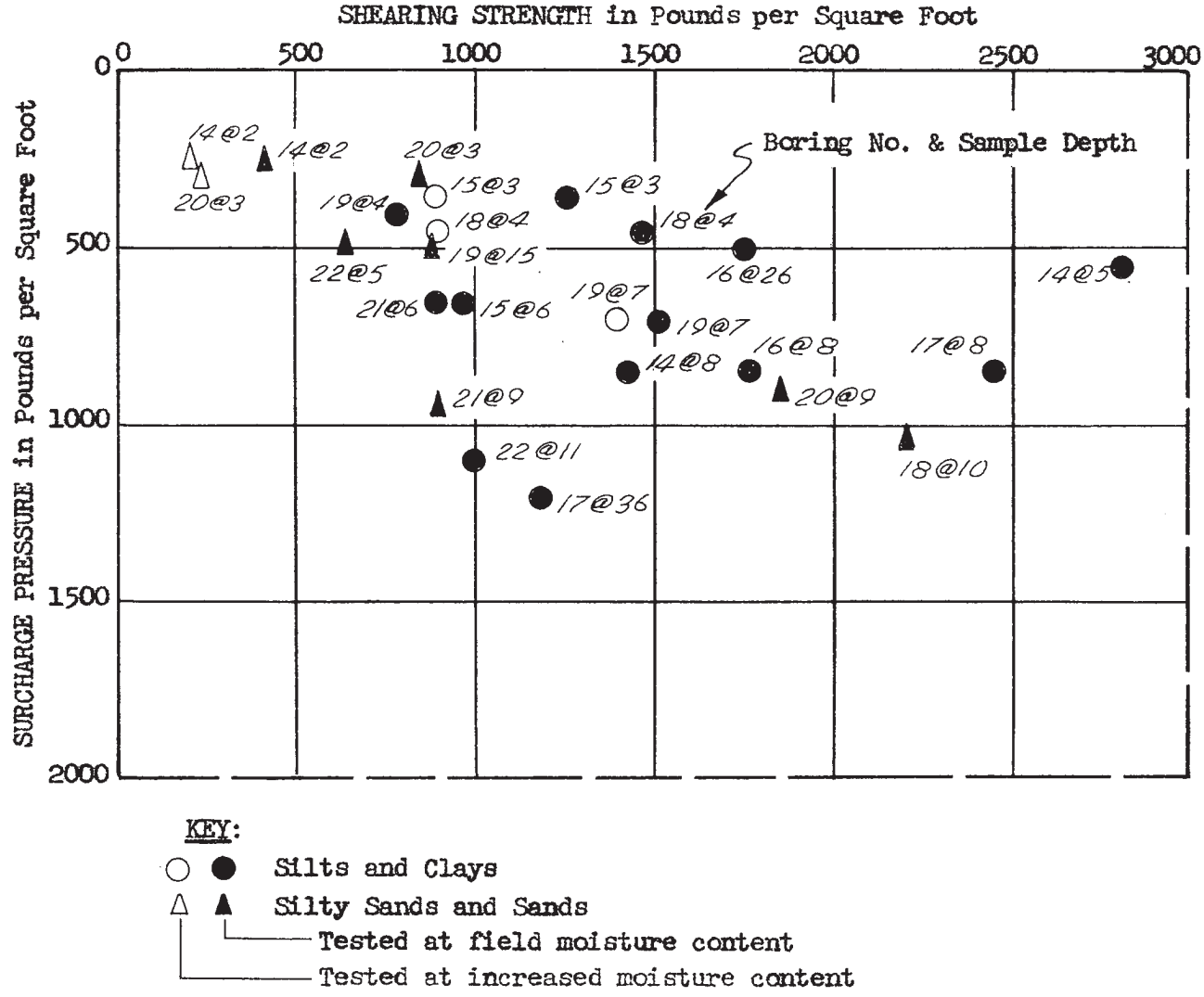
JOB 59446-3 DATE 3-29-60 BY Carr Al Cito



SHEAR SUMMARY

Figure D-1.3.2 LEROY CRANDALL & ASSOCIATES

PLATE A-3A



JOB _____ DATE 3-24-61 BY B.A.K.

SHEAR SUMMARY
(Upper Soils)

Figure D-1.3.3

LEROY CRANDALL & ASSOCIATES

PLATE A-3B

JOB 62353 DATE 6-26-62 BY TODD fg

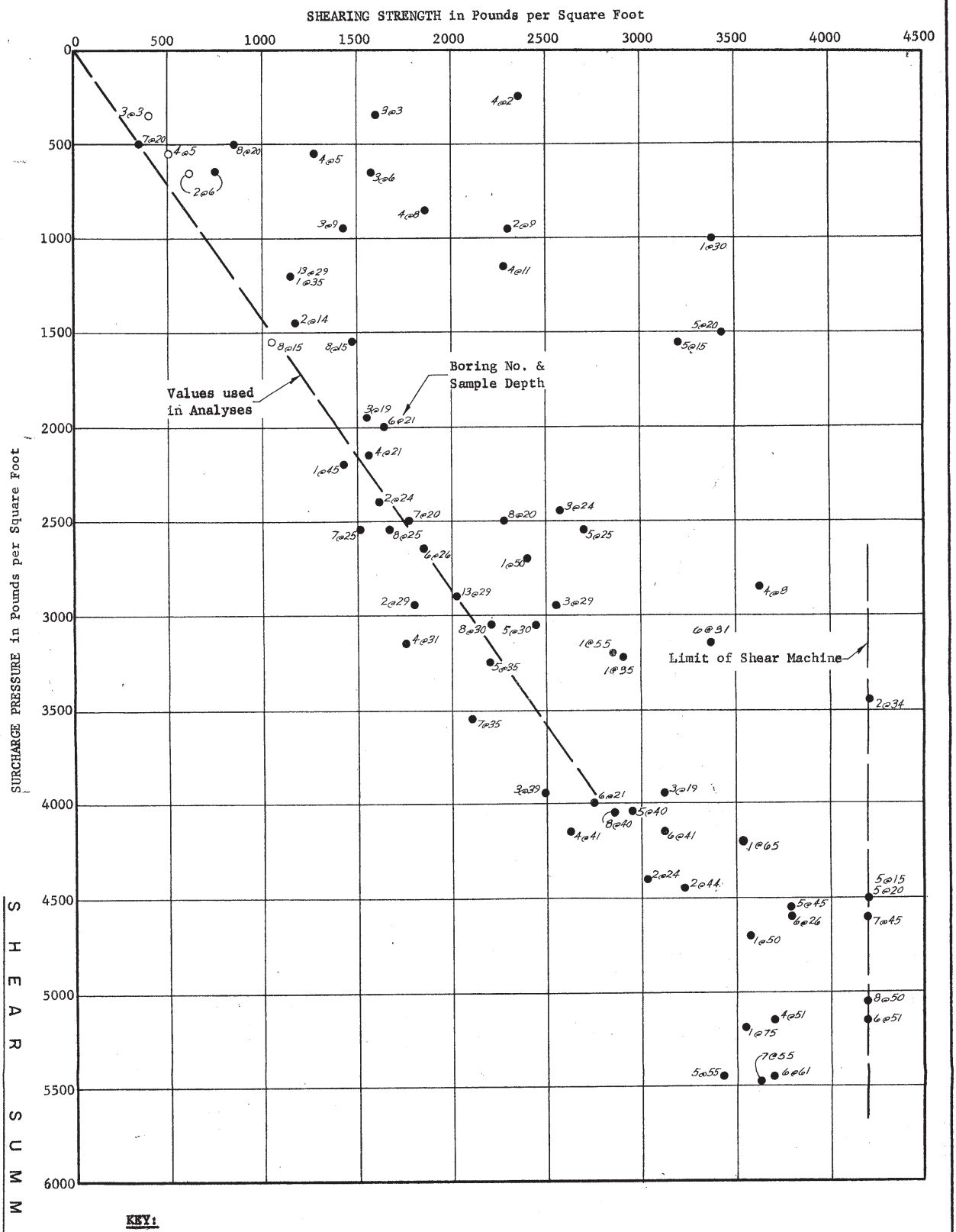


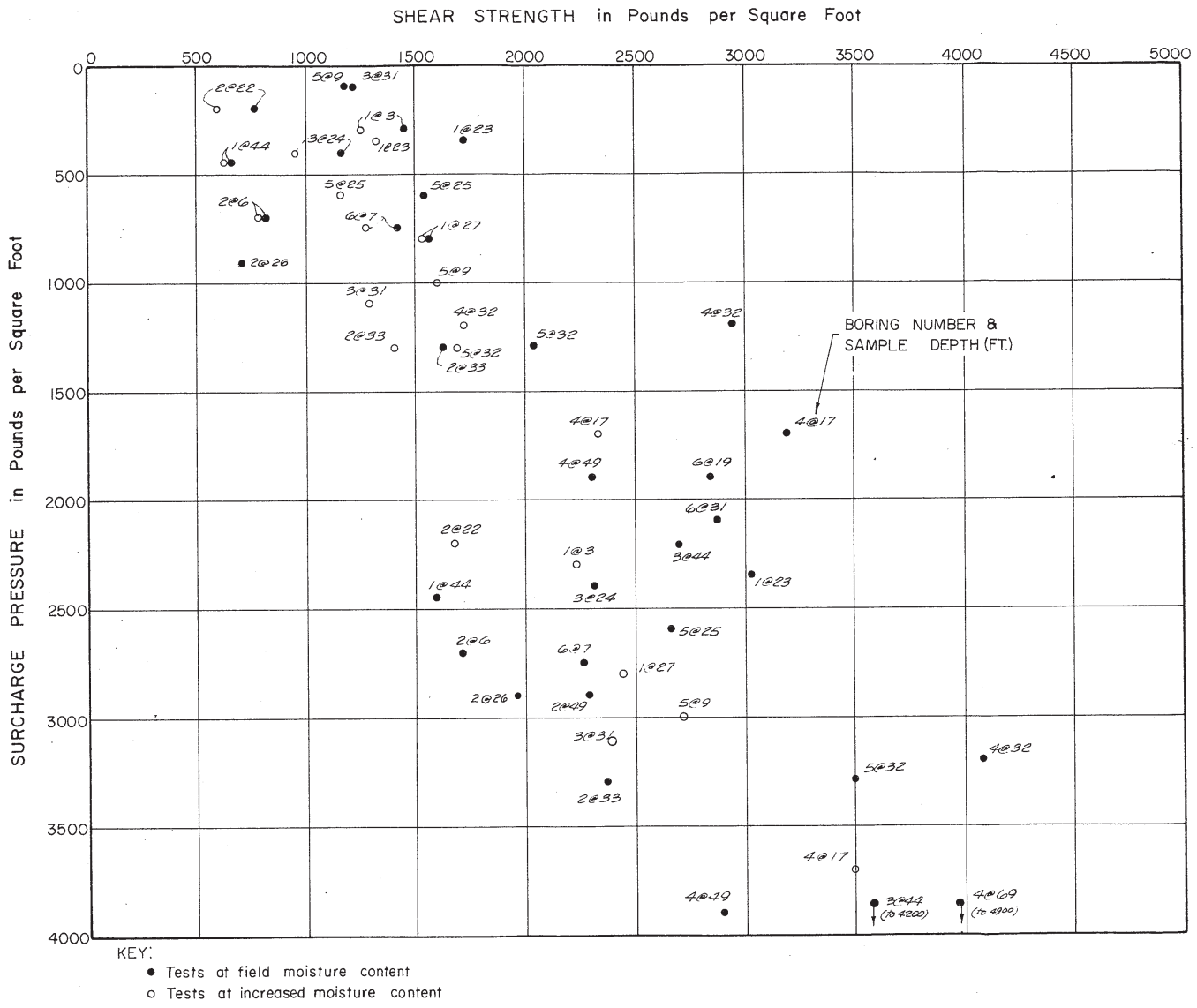
Figure D-1.3.4

SHEAR SUMMARY

LEROY CRANDALL & ASSOCIATES

PLATE A-3

JOB A-66362 DATE 1-6-67 DR. [illegible] O.E. [illegible] CHKD. [illegible]



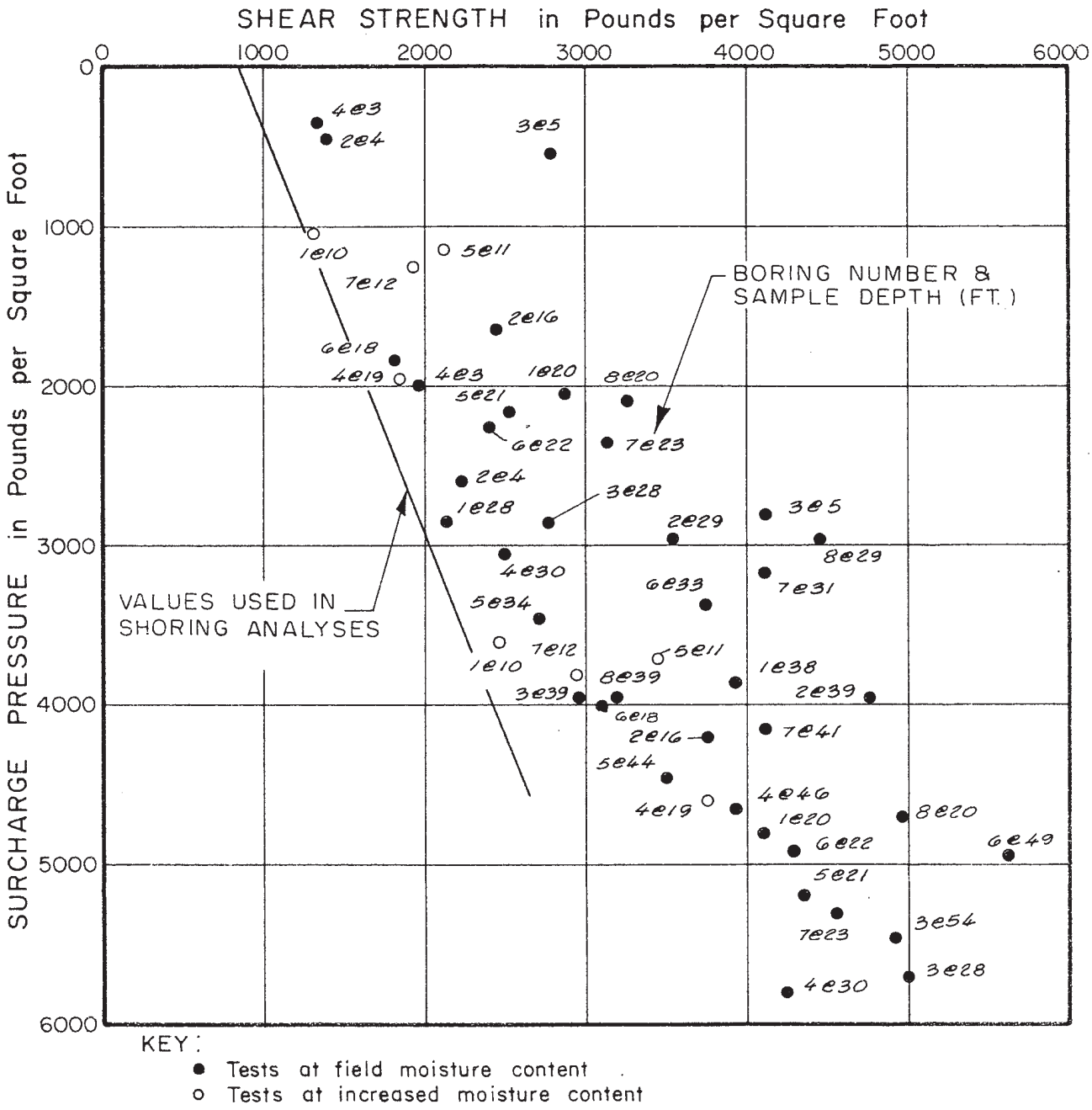
DIRECT SHEAR TEST DATA

Figure D-1.3.5

LEROY CRANDALL & ASSOCIATES

PLATE C

JOB 467065 DATE 5-2-67 DR GMC O.E. CHKD. [illegible]



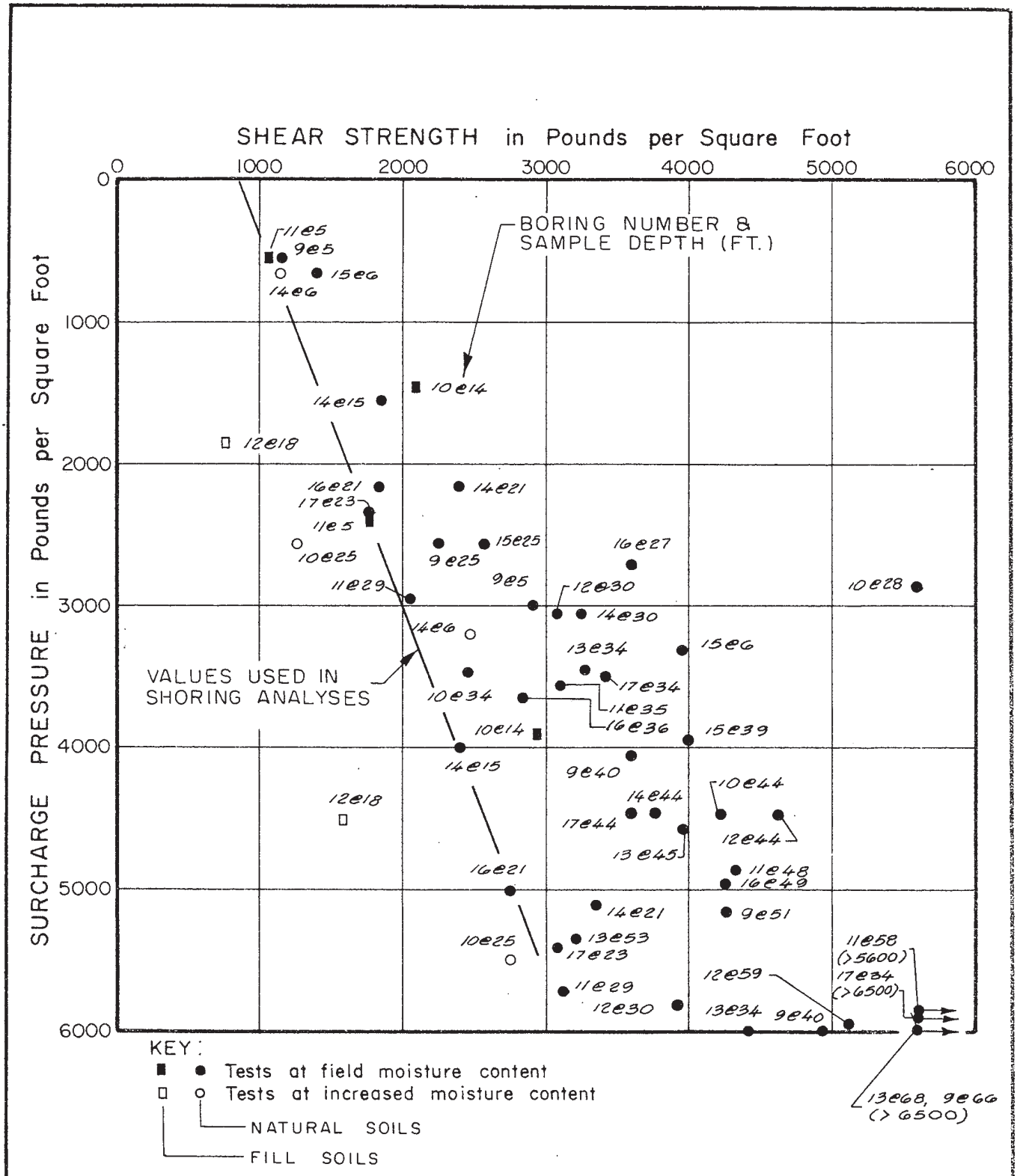
DIRECT SHEAR TEST DATA

(BORINGS 1 THROUGH 8)

Figure D-1.3.6 LEROY CRANDALL & ASSOCIATES

PLATE C-1

JOB 467065 DATE 5-2-67 DR GMC O.E. JP CHKD. REC Lyle



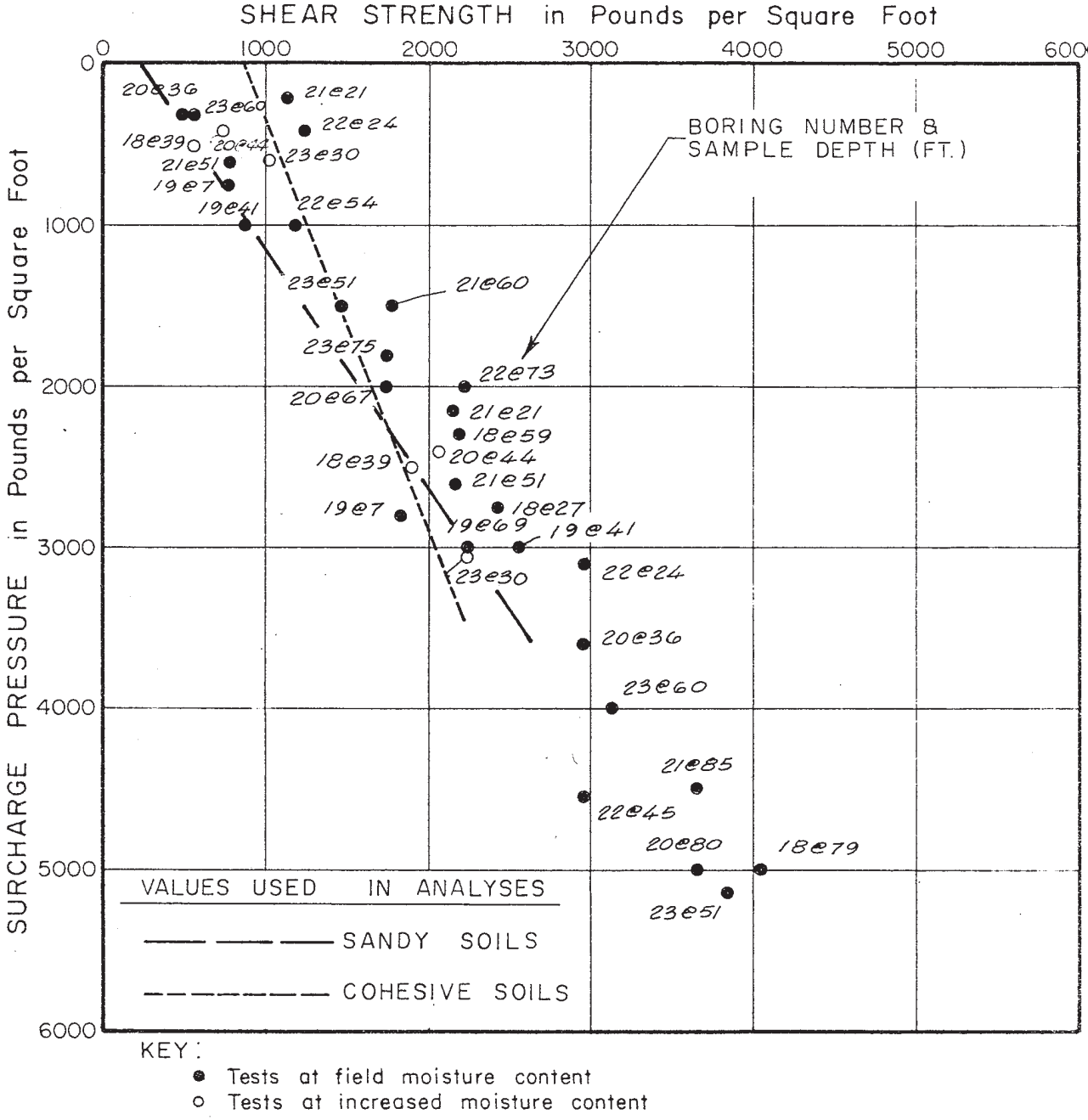
DIRECT SHEAR TEST DATA
(BORINGS 9 THROUGH 17)

Figure D-1.3.7

LEROY CRANDALL & ASSOCIATES

PLATE C-2

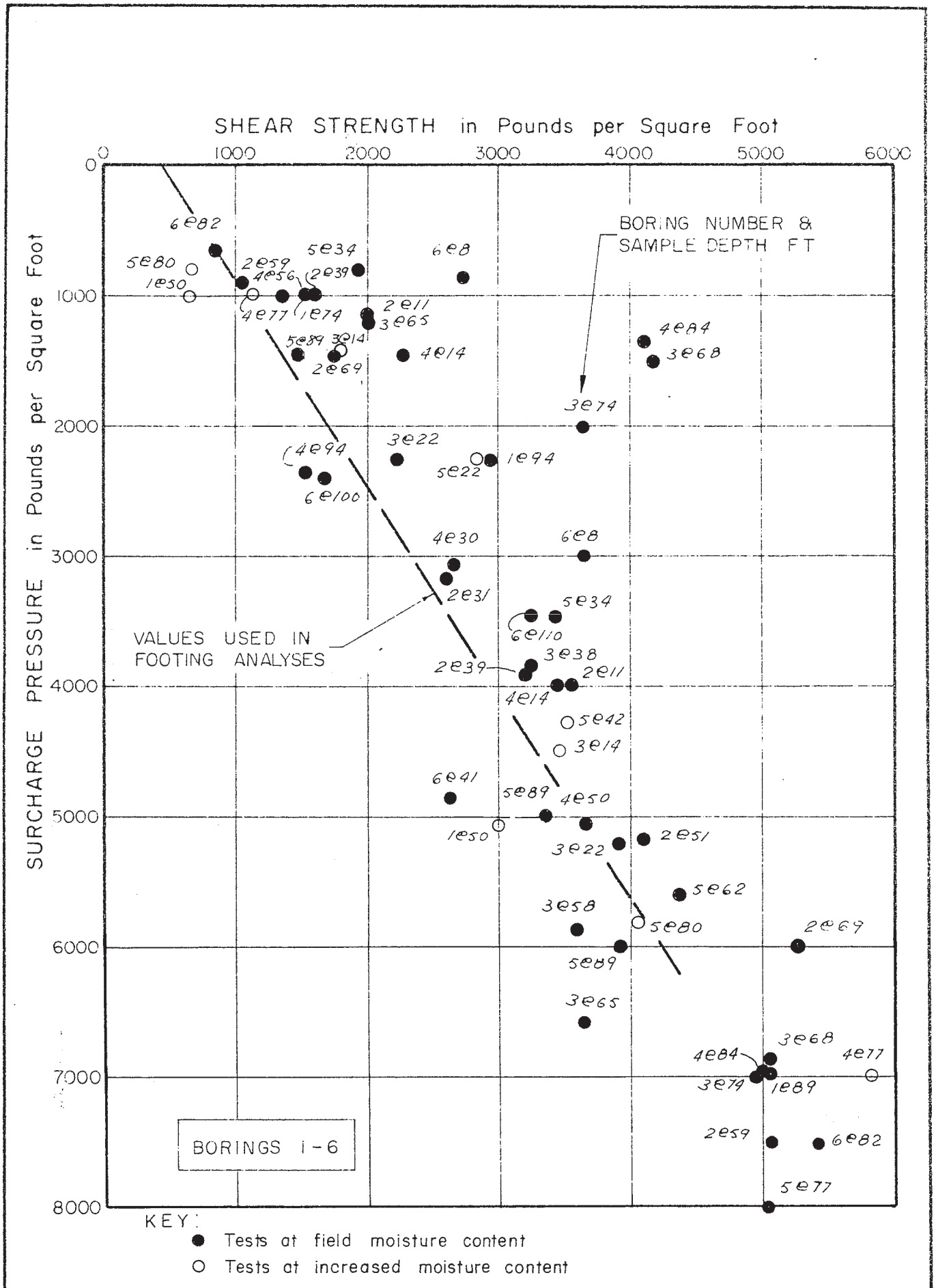
JOB 467065-B DATE 6-6-68 DR GMC O.E. ____ CHKD. ____



DIRECT SHEAR TEST DATA

Figure D-1.3.8 LEROY CRANDALL & ASSOCIATES

PLATE 4



DIRECT SHEAR TEST DATA

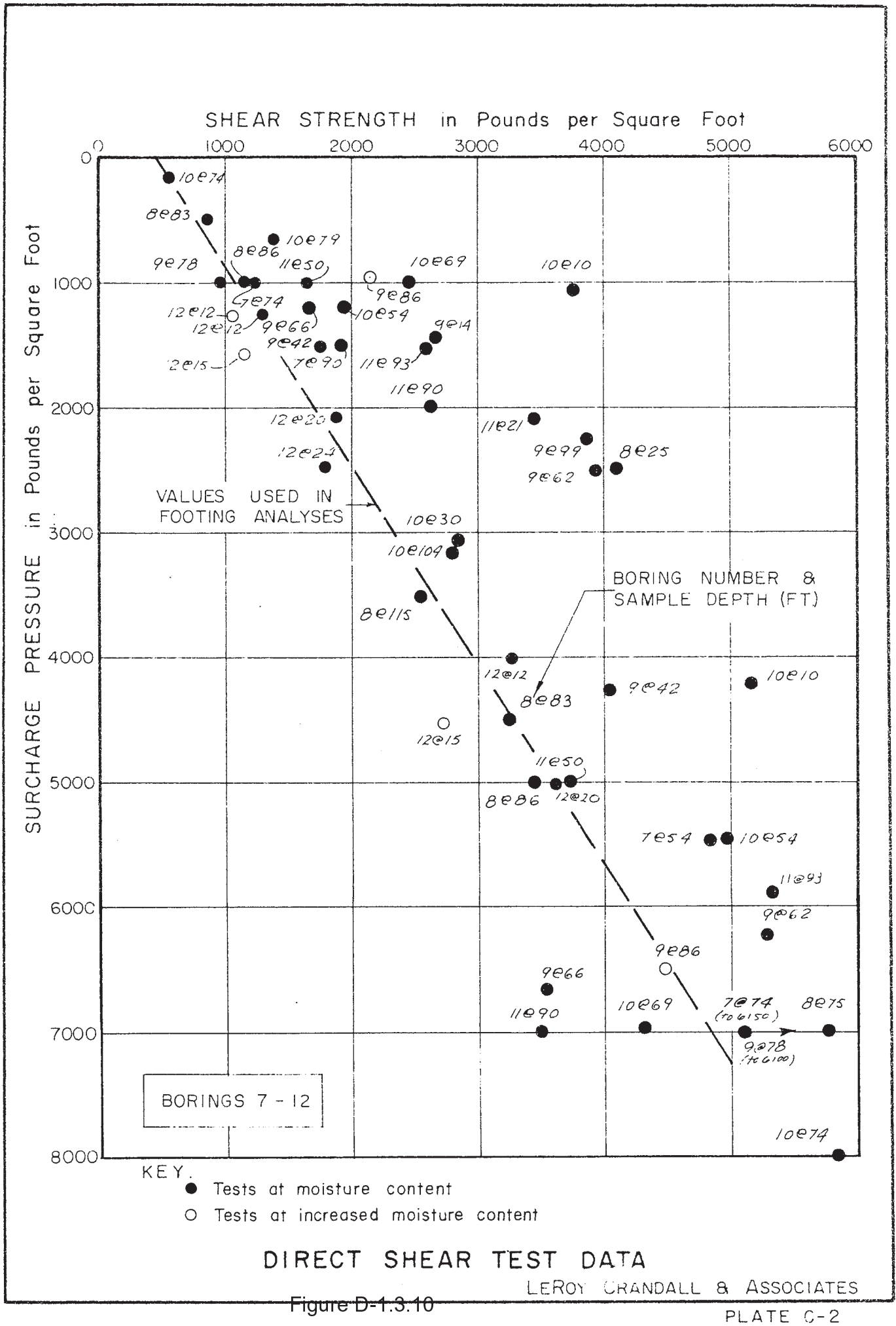
LEROY CRANDALL & ASSOCIATES

PLATE C-1

JOB A-69036 DATE 4-12-69 DR MAU O.E. CHKD. CMC

Figure D-1.3.9

JOB A-69036 DATE 4-12-69 DR. rau O.E. ____ CHKD. arc

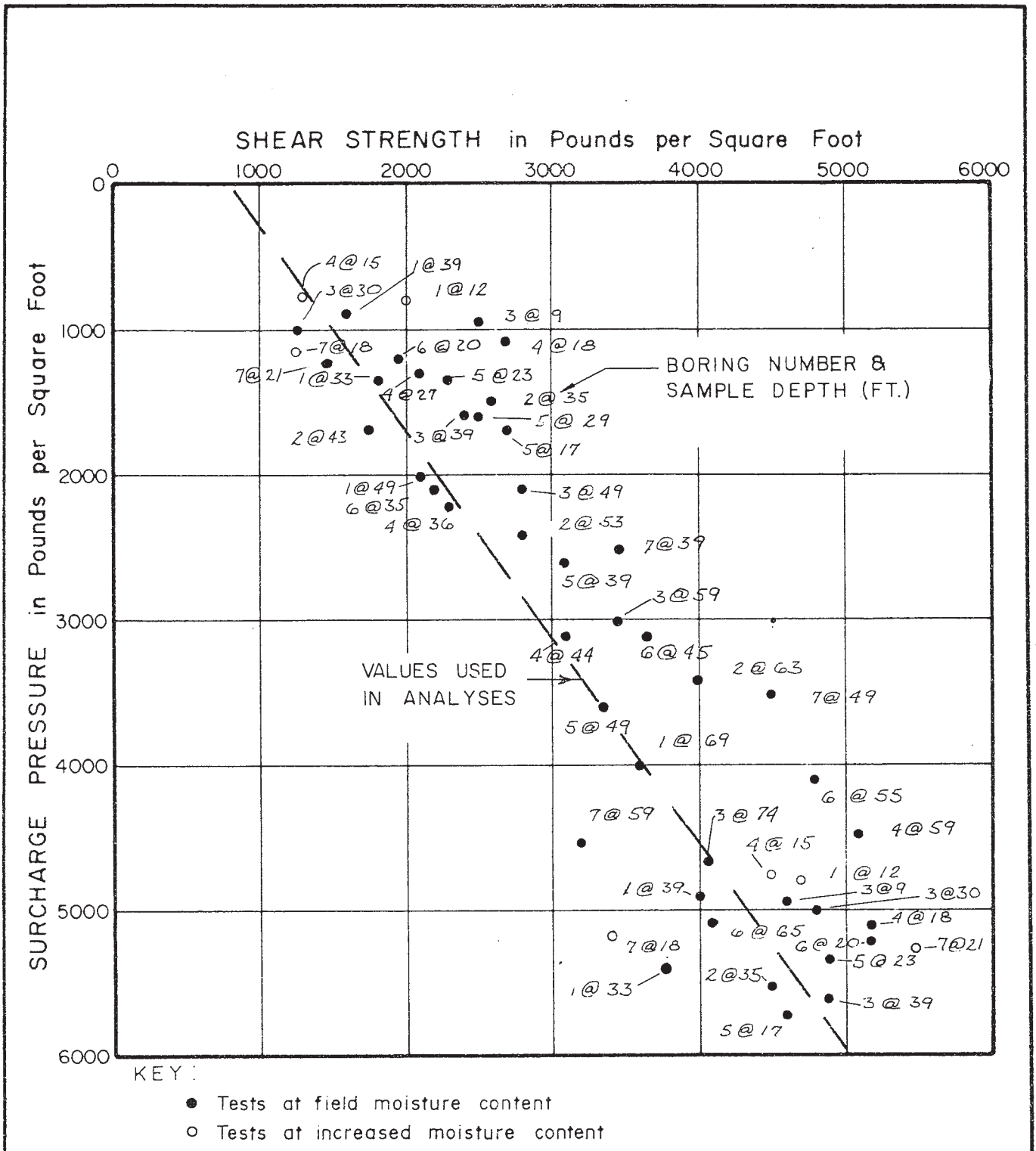


DIRECT SHEAR TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE C-2

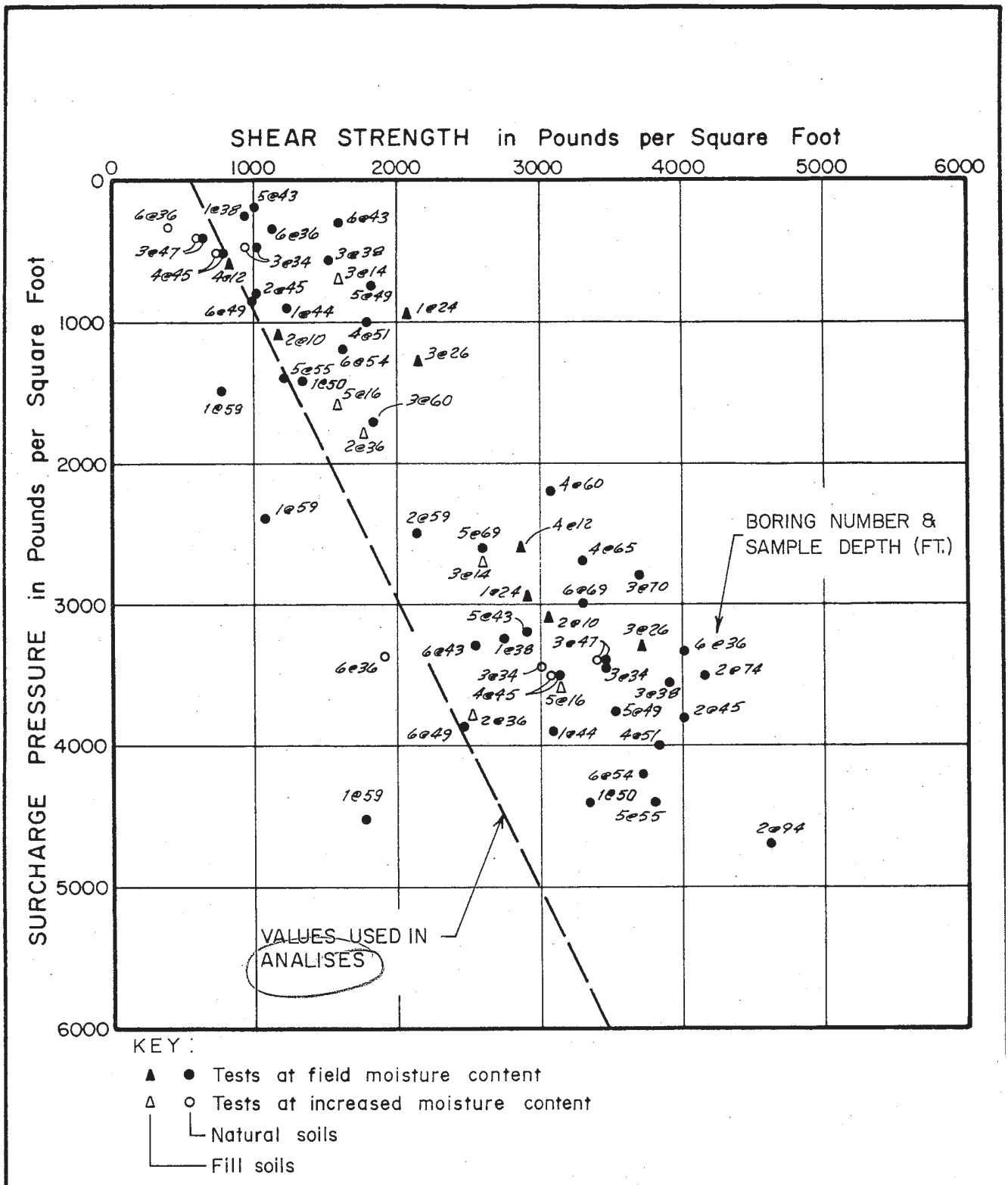
Figure D-1.3.10



DIRECT SHEAR TEST DATA

Figure D-1.3.11 LEROY CRANDALL & ASSOCIATES

PLATE A-3

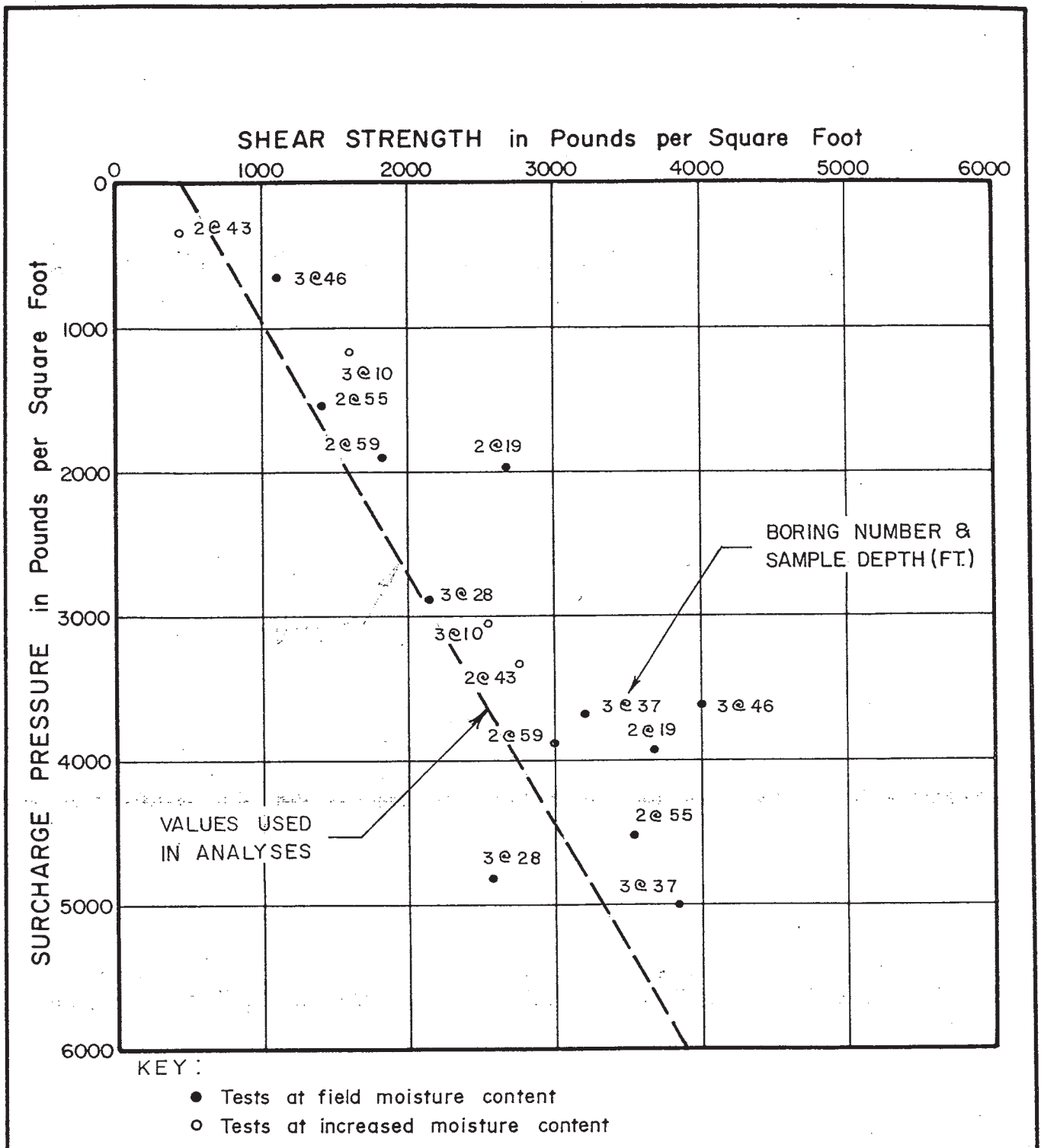


DIRECT SHEAR TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-1.3.12

PLATE A-3



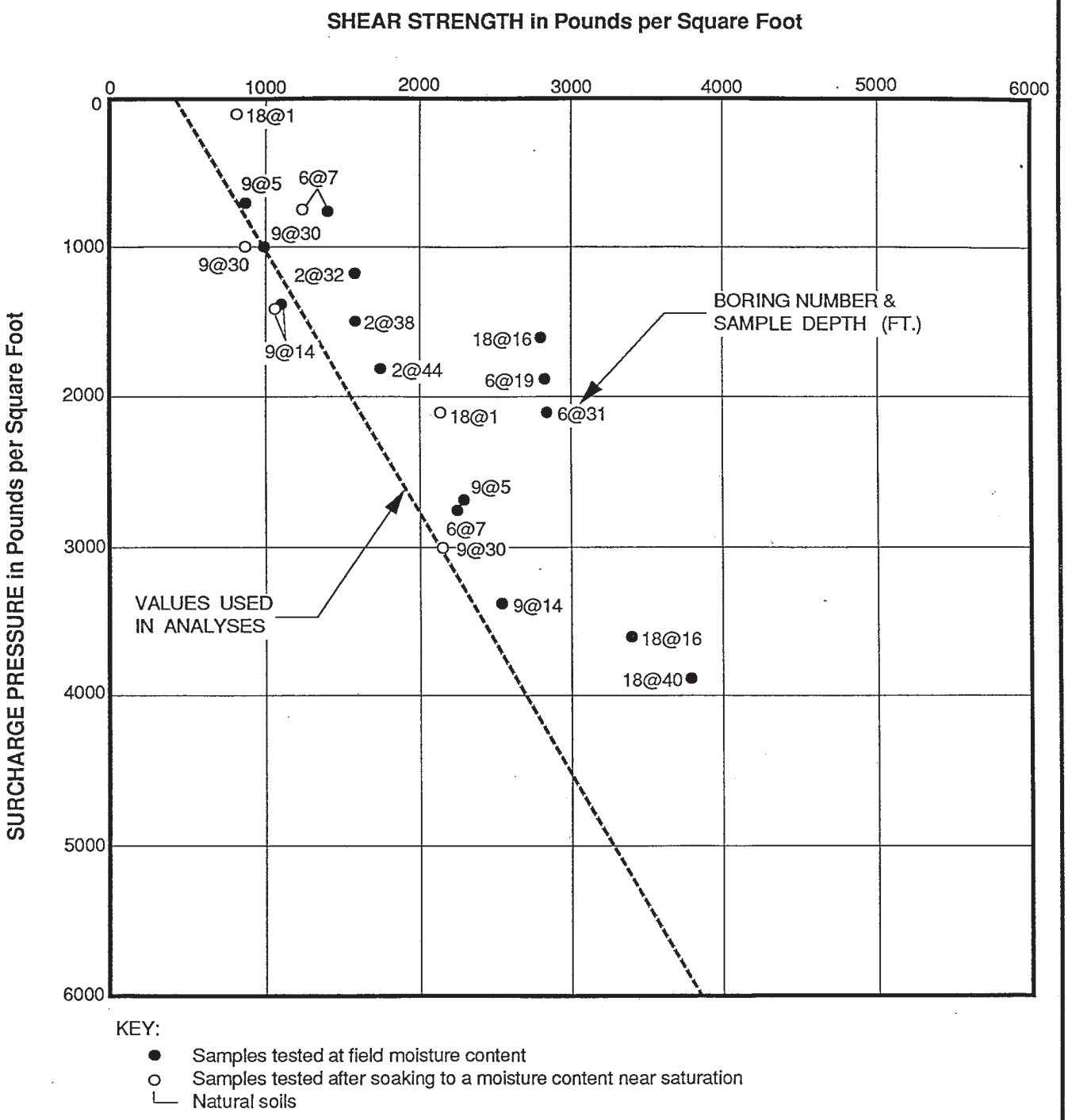
DIRECT SHEAR TEST DATA
(CURRENT INVESTIGATION)

Figure D-1.3.13

LAW/CRANDALL, INC.

PLATE A-3.1

JOB L90354.ADEO DATE 8/6/91 D.R. lk O.E. FH CHKD FS



DIRECT SHEAR TEST DATA
(Prior Investigations)

LAW/CRANDALL, INC.

PLATE A-3.2

Figure D-1.3.14

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	E-133A	Reviewed by:	AP	Date:	04-17-15
Sample No.:	2	Sample Description:	Brown Sandy Lean Clay		
Depth(ft):	10.5				
Sample Type:	Mod. Cal.	Confining Pressure = 5.0 psi			

Diameter (in)	2.589	2.589	2.589	Avg. =	2.589
Height (in)	5.586	5.586	5.586	Avg. =	5.586

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.264	5.264
Moisture Content (%)	13.82	16.91
Wet Weight (gms)	18.28	1192.02
Dry Weight (gms)	16.37	1041.38
Container Weight (gms)	2.55	150.73
Density and Saturation		
Wet Weight (gms)	1033.14	
Container Weight (gms)	0.00	
Wet Density (pcf)	133.8	
Dry Density (pcf)	117.6	
Initial Void Ratio	0.433	
% Saturation	86.2	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	98	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	35.0	Initial Burette Ht.(cm)=	0.0
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	0.0
Eff. Consol. Stress (psi) =	5.0	Final Height (in)=	5.586
Induced OCR =	1.0	Initial Volume (cu.in)=	29.407
Change in Ht. of Specimen (in) =	0.0000	Final Volume (cu.in) =	29.407

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	2.75
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	0.42
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	3.17
		Axial Strain (%) =	5.01

Figure D-2.1

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	E-133A	Reviewed by:	AP	Date:	04-17-15
Sample No.:	2	Sample Description:	Brown Sandy Lean Clay		
Depth(ft):	10.5				
Sample Type:	Mod. Cal.	Confining Pressure = 10.0 psi			

Diameter (in)	2.589	2.589	2.589	Avg. =	2.589
Height (in)	5.586	5.586	5.586	Avg. =	5.586

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.264	5.501
Moisture Content (%)	13.82	16.91
Wet Weight (gms)	18.28	1192.02
Dry Weight (gms)	16.37	1041.38
Container Weight (gms)	2.55	150.73
Density and Saturation		
Wet Weight (gms)	1033.14	
Container Weight (gms)	0.00	
Wet Density (pcf)	133.8	
Dry Density (pcf)	117.6	
Initial Void Ratio	0.433	
% Saturation	86.2	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	98	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	40.0	Initial Burette Ht.(cm)=	82.0
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	78.2
Eff. Consol. Stress (psi) =	10.0	Final Height (in)=	5.584
Induced OCR=	1.0	Initial Volume (cu.in)=	29.407
Change in Ht. of Specimen (in) =	0.0021	Final Volume (cu.in) =	29.175

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	3.75
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	0.94
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	4.69
		Axial Strain (%) =	5.10

Figure D-2.2

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	E-133A	Reviewed by:	AP	Date:	04-17-15
Sample No.:	2	Sample Description:	Brown Sandy Lean Clay		
Depth(ft):	10.5				
Sample Type:	Mod. Cal.	Confining Pressure = 20.0 psi			

Diameter (in)	2.589	2.589	2.589	Avg. =	2.589
Height (in)	5.586	5.586	5.586	Avg. =	5.586

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.264	5.485
Moisture Content (%)	13.82	16.91
Wet Weight (gms)	18.28	1192.02
Dry Weight (gms)	16.37	1041.38
Container Weight (gms)	2.55	150.73
Density and Saturation		
Wet Weight (gms)	1033.14	
Container Weight (gms)	0.00	
Wet Density (pcf)	133.8	
Dry Density (pcf)	117.6	
Initial Void Ratio	0.433	
% Saturation	86.2	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	98	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	50.0	Initial Burette Ht.(cm)=	78.2
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	72.7
Eff. Consol. Stress (psi) =	20.0	Final Height (in)=	5.585
Induced OCR =	1.0	Initial Volume (cu.in)=	29.407
Change in Ht. of Specimen (in) =	0.0010	Final Volume (cu.in) =	29.072

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	5.77
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	2.15
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	7.93
		Axial Strain (%) =	19.14

Figure D-2.3

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	35.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	E-133A	Consolidation Pressure :	5.0	psi
Depth(ft):	10.5	Initial Sample Height:	5.586	in
Sample No.:	2	Initial Area of Sample:	5.264	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.586	in
Sample Description:	Brown Sandy Lean Clay	Final Sample Area (A)*:	5.264	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
35.0	-1	0.000	30.0	-0.03	0.00	0.00	-0.01	0.71
35.0	22	0.005	30.8	0.60	0.09	0.11	0.30	0.91
35.0	37	0.012	31.3	1.01	0.21	0.18	0.50	1.05
35.0	44	0.018	31.6	1.20	0.32	0.22	0.60	1.10
35.0	49	0.024	31.8	1.33	0.44	0.25	0.67	1.14
35.0	53	0.032	31.9	1.44	0.57	0.28	0.72	1.17
35.0	56	0.040	32.1	1.52	0.71	0.29	0.76	1.19
35.0	59	0.047	32.2	1.60	0.83	0.31	0.80	1.21
35.0	62	0.053	32.2	1.68	0.95	0.32	0.84	1.24
35.0	64	0.061	32.3	1.73	1.10	0.33	0.87	1.26
35.0	66	0.068	32.4	1.78	1.22	0.34	0.89	1.28
35.0	68	0.076	32.4	1.83	1.36	0.34	0.92	1.30
35.0	70	0.082	32.4	1.89	1.47	0.35	0.94	1.32
35.0	71	0.089	32.5	1.91	1.60	0.35	0.96	1.33
35.0	73	0.097	32.5	1.96	1.73	0.35	0.98	1.35
35.0	74	0.104	32.5	1.99	1.86	0.35	0.99	1.36
35.0	75	0.111	32.5	2.01	1.99	0.36	1.01	1.37
35.0	77	0.118	32.5	2.06	2.11	0.36	1.03	1.39
35.0	78	0.125	32.5	2.09	2.23	0.36	1.04	1.40
35.0	80	0.132	32.5	2.14	2.36	0.36	1.07	1.43
35.0	82	0.140	32.6	2.19	2.50	0.36	1.09	1.45
35.0	83	0.146	32.6	2.21	2.62	0.37	1.11	1.46
35.0	85	0.154	32.6	2.26	2.75	0.37	1.13	1.48
35.0	87	0.161	32.6	2.31	2.88	0.37	1.16	1.51
35.0	88	0.168	32.5	2.33	3.01	0.36	1.17	1.52
35.0	89	0.176	32.5	2.36	3.15	0.36	1.18	1.54
35.0	87	0.182	32.5	2.30	3.26	0.35	1.15	1.52
35.0	96	0.218	32.4	2.52	3.90	0.34	1.26	1.64
35.0	98	0.240	32.3	2.57	4.30	0.33	1.28	1.67
35.0	106	0.280	32.1	2.75	5.01	0.30	1.38	1.80

Figure D-2.4

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	40.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	E-133A	Consolidation Pressure :	10.0	psi
Depth(ft):	10.5	Initial Sample Height:	5.586	in
Sample No.:	2	Initial Area of Sample:	5.264	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.584	in
Sample Description:	Brown Sandy Lean Clay	Final Sample Area (A)*:	5.501	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
40.0	0	0.000	30.0	0.00	0.00	0.00	0.00	1.44
40.0	35	0.003	31.5	0.92	0.05	0.22	0.46	1.68
40.0	59	0.009	32.4	1.54	0.16	0.34	0.77	1.87
40.0	72	0.015	32.8	1.88	0.27	0.40	0.94	1.98
40.0	83	0.021	33.2	2.16	0.38	0.45	1.08	2.07
40.0	91	0.028	33.4	2.37	0.51	0.49	1.19	2.14
40.0	99	0.035	33.6	2.58	0.63	0.52	1.29	2.21
40.0	106	0.042	33.8	2.75	0.75	0.54	1.38	2.28
40.0	112	0.049	33.9	2.91	0.88	0.55	1.45	2.34
40.0	116	0.056	33.9	3.01	1.01	0.56	1.50	2.38
40.0	119	0.064	34.0	3.08	1.14	0.57	1.54	2.41
40.0	122	0.072	34.0	3.15	1.28	0.58	1.58	2.44
40.0	124	0.078	34.0	3.20	1.40	0.58	1.60	2.46
40.0	126	0.085	34.0	3.25	1.52	0.58	1.62	2.49
40.0	127	0.093	34.0	3.27	1.66	0.58	1.63	2.50
40.0	129	0.100	34.0	3.32	1.79	0.58	1.66	2.52
40.0	130	0.107	34.0	3.34	1.92	0.57	1.67	2.53
40.0	131	0.113	34.0	3.36	2.03	0.57	1.68	2.55
40.0	132	0.121	34.0	3.38	2.16	0.57	1.69	2.56
40.0	133	0.128	34.0	3.40	2.29	0.57	1.70	2.57
40.0	133	0.135	33.9	3.40	2.41	0.56	1.70	2.57
40.0	135	0.142	33.9	3.44	2.54	0.56	1.72	2.60
40.0	135	0.148	33.9	3.44	2.66	0.56	1.72	2.60
40.0	137	0.156	33.9	3.49	2.79	0.55	1.74	2.63
40.0	138	0.162	33.9	3.51	2.90	0.55	1.75	2.64
40.0	139	0.170	33.9	3.53	3.04	0.55	1.76	2.65
40.0	140	0.178	33.9	3.55	3.18	0.55	1.77	2.66
40.0	141	0.185	33.8	3.57	3.31	0.55	1.78	2.67
40.0	142	0.199	33.8	3.59	3.56	0.54	1.79	2.69
40.0	143	0.206	33.8	3.61	3.69	0.54	1.80	2.70
40.0	145	0.235	33.7	3.64	4.21	0.53	1.82	2.73
40.0	146	0.242	33.6	3.66	4.34	0.52	1.83	2.75
40.0	149	0.263	33.6	3.72	4.71	0.51	1.86	2.79
40.0	151	0.285	33.5	3.75	5.10	0.50	1.88	2.82

Figure D-2.5

AP Engineering & Testing, Inc.

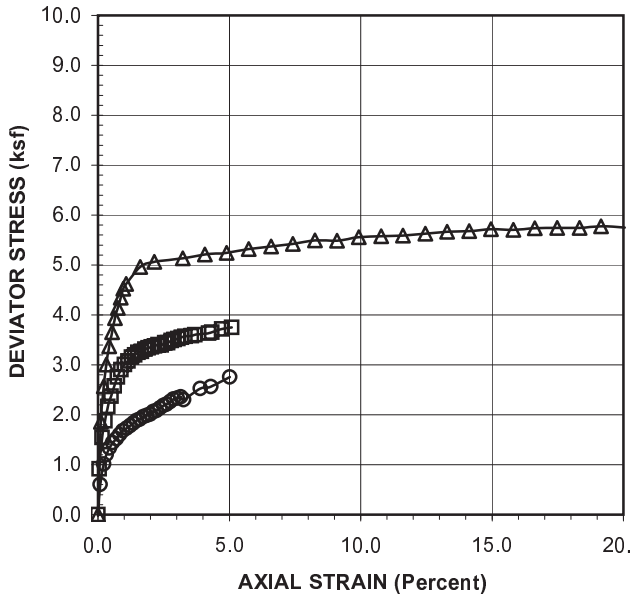
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

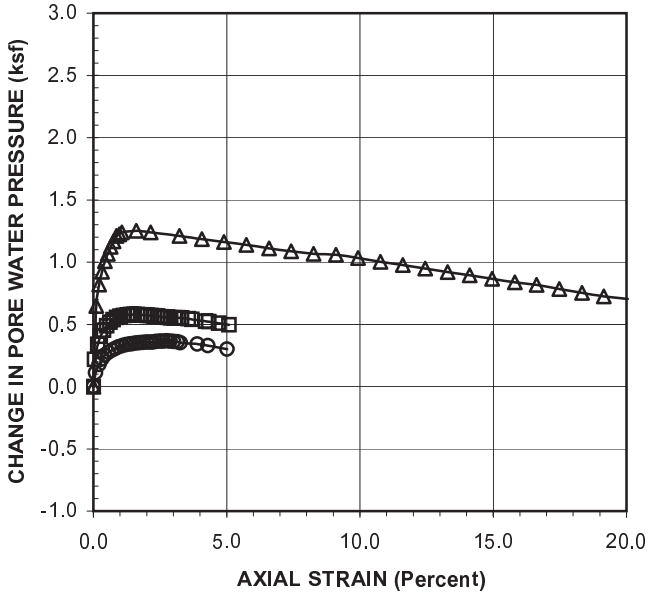
Project Name:	Westside Subway Extension	Cell Pressure:	50.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	E-133A	Consolidation Pressure :	20.0	psi
Depth(ft):	10.5	Initial Sample Height:	5.586	in
Sample No.:	2	Initial Area of Sample:	5.264	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.585	in
Sample Description:	Brown Sandy Lean Clay	Final Sample Area (A)*:	5.485	sq. in.
		Induced OCR=	1.0	

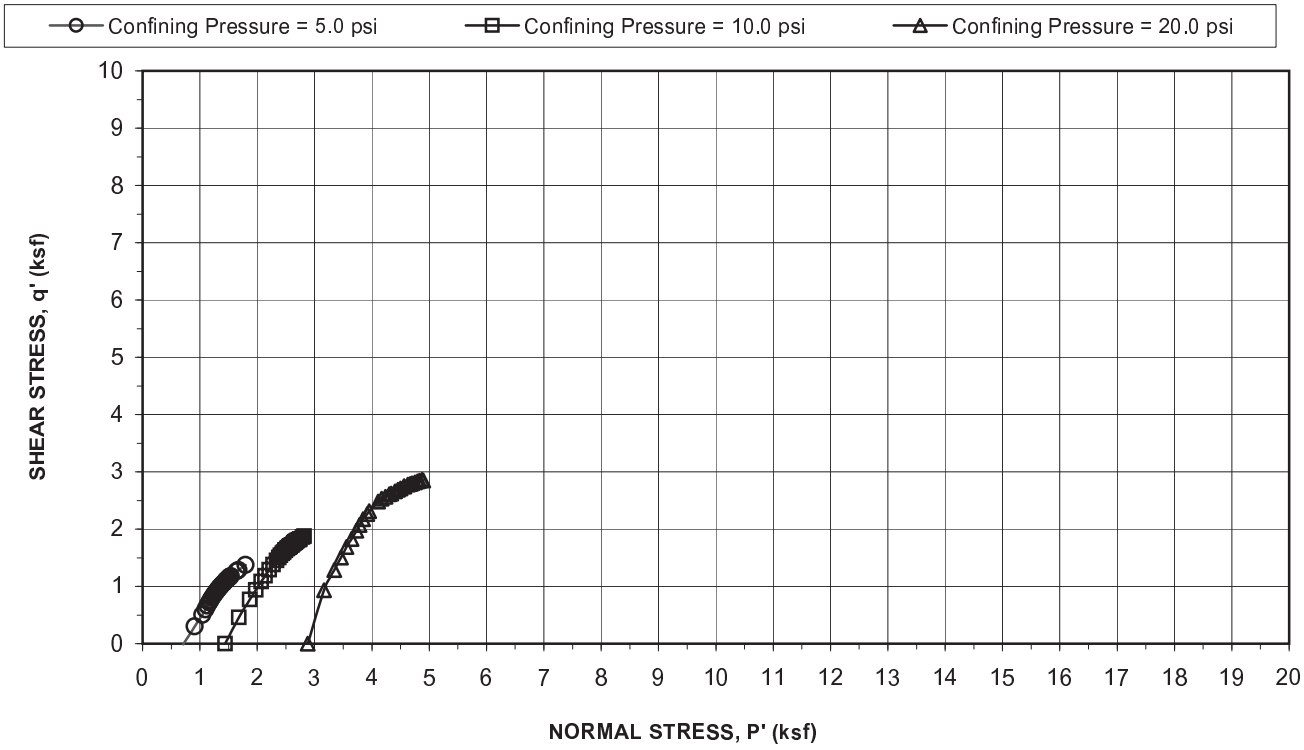
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
50.0	0	0.000	30.0	0.00	0.00	0.00	0.00	2.88
50.0	71	0.006	34.5	1.86	0.11	0.65	0.93	3.16
50.0	98	0.012	35.7	2.57	0.21	0.82	1.28	3.34
50.0	115	0.018	36.4	3.01	0.32	0.92	1.50	3.46
50.0	129	0.024	37.0	3.37	0.43	1.01	1.69	3.56
50.0	140	0.030	37.4	3.66	0.54	1.07	1.83	3.64
50.0	151	0.036	37.8	3.94	0.64	1.12	1.97	3.73
50.0	159	0.042	38.1	4.14	0.75	1.17	2.07	3.79
50.0	167	0.048	38.4	4.35	0.86	1.21	2.17	3.84
50.0	174	0.054	38.5	4.52	0.97	1.22	2.26	3.92
50.0	178	0.060	38.6	4.62	1.07	1.24	2.31	3.95
50.0	192	0.090	38.7	4.96	1.61	1.25	2.48	4.11
50.0	197	0.120	38.6	5.06	2.15	1.24	2.53	4.17
50.0	202	0.180	38.4	5.13	3.22	1.21	2.57	4.24
50.0	207	0.227	38.2	5.21	4.07	1.19	2.61	4.30
50.0	210	0.274	38.1	5.24	4.90	1.16	2.62	4.34
50.0	215	0.320	37.9	5.32	5.74	1.14	2.66	4.40
50.0	219	0.368	37.7	5.37	6.59	1.11	2.69	4.45
50.0	223	0.415	37.6	5.42	7.42	1.09	2.71	4.50
50.0	228	0.461	37.4	5.49	8.26	1.07	2.75	4.56
50.0	230	0.508	37.4	5.49	9.10	1.06	2.74	4.56
50.0	235	0.554	37.2	5.56	9.93	1.03	2.78	4.63
50.0	238	0.602	37.0	5.58	10.77	1.00	2.79	4.67
50.0	241	0.649	36.8	5.59	11.61	0.98	2.80	4.70
50.0	245	0.696	36.6	5.63	12.45	0.95	2.82	4.75
50.0	249	0.742	36.4	5.67	13.29	0.92	2.83	4.79
50.0	252	0.789	36.2	5.68	14.12	0.89	2.84	4.83
50.0	256	0.836	36.0	5.72	14.96	0.87	2.86	4.87
50.0	258	0.883	35.8	5.70	15.80	0.84	2.85	4.89
50.0	262	0.929	35.7	5.73	16.63	0.82	2.87	4.93
50.0	265	0.976	35.4	5.74	17.48	0.78	2.87	4.97
50.0	268	1.024	35.2	5.75	18.33	0.75	2.87	5.00
50.0	272	1.069	35.0	5.77	19.14	0.73	2.89	5.04
50.0	274	1.120	34.9	5.75	20.05	0.71	2.88	5.05

Figure D-2.6

AP Engineering & Testing, Inc.







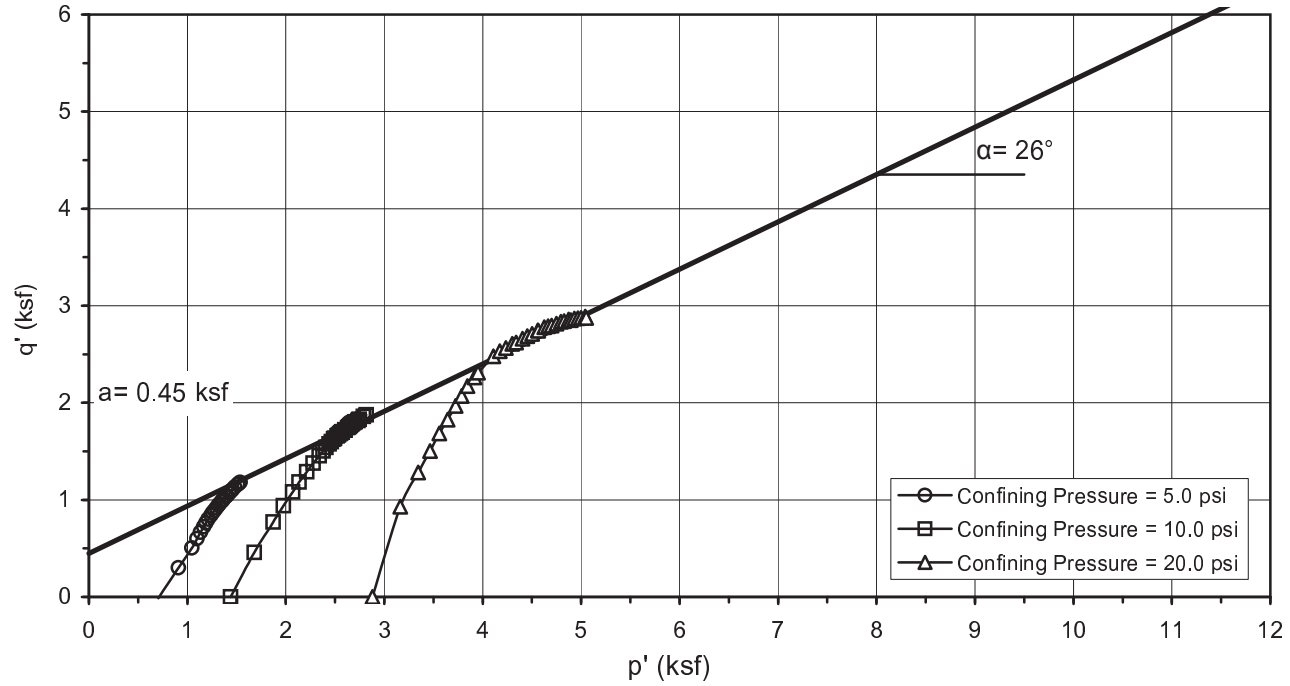
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Sandy Lean Clay
Test Pit:	E-133A	Avg. Dry Unit Weight (pcf):	117.6
Sample No.:	2	Avg. Initial Moisture Content (%):	13.8
Depth (ft):	10.5	Confining Pressure:	5.0, 10.0, 20.0 psi

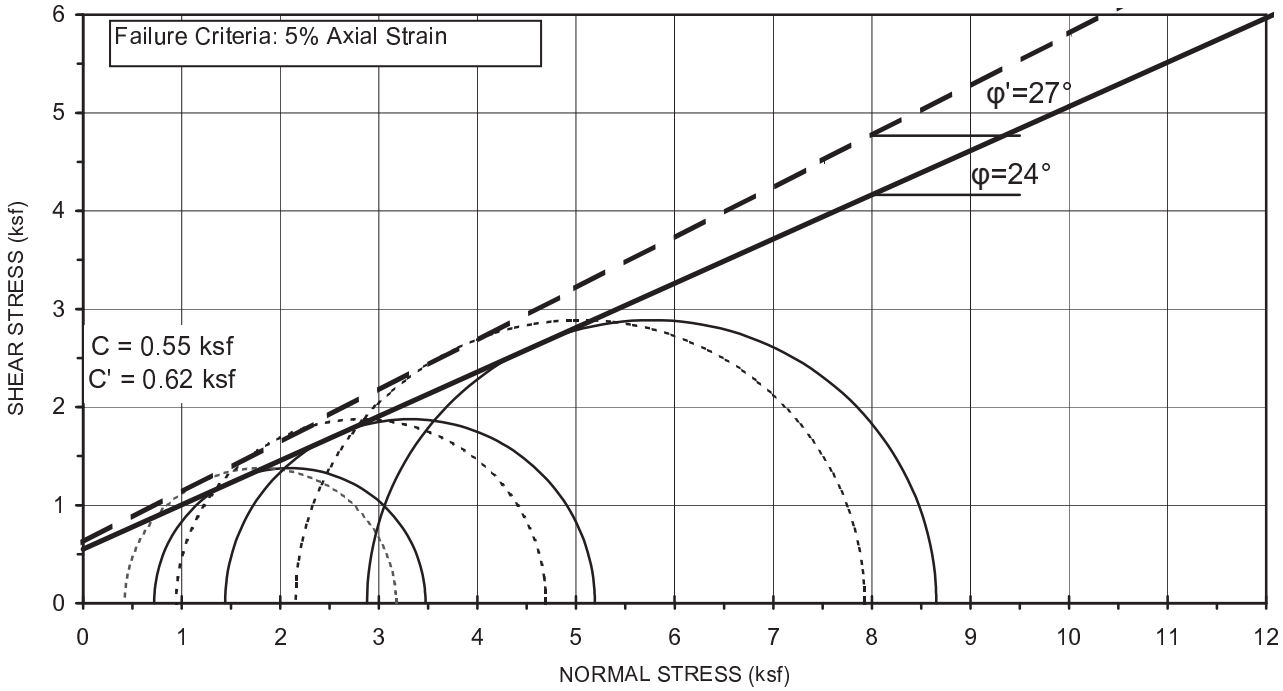
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.7

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Sandy Lean Clay
Test Pit:	E-133A	Avg. Dry Unit Weight (pcf):	117.6
Sample No.:	2	Avg. Initial Moisture Content (%):	13.8
Depth (ft):	10.5	Confining Pressures:	5.0, 10.0, 20.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.8

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	E-133A	Reviewed by:	AP	Date:	04-17-15
Sample No.:	6	Sample Description:	Dark Brown Clayey Sand		
Depth(ft):	30.5				
Sample Type:	Mod. Cal.	Confining Pressure = 15.0 psi			

Diameter (in)	2.615	2.615	2.615	Avg. =	2.615
Height (in)	5.608	5.608	5.608	Avg. =	5.608

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.371	5.332
Moisture Content (%)	11.74	14.02
Wet Weight (gms)	95.08	1203.31
Dry Weight (gms)	90.39	1073.52
Container Weight (gms)	50.43	148.05
Density and Saturation		
Wet Weight (gms)	1060.25	
Container Weight (gms)	0.00	
Wet Density (pcf)	134.1	
Dry Density (pcf)	120.0	
Initial Void Ratio	0.404	
% Saturation	78.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	55.0	Initial Burette Ht.(cm)=	81.4
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	75.8
Eff. Consol. Stress (psi) =	15.0	Final Height (in)=	5.585
Induced OCR =	1.0	Initial Volume (cu.in)=	30.119
Change in Ht. of Specimen (in) =	0.0229	Final Volume (cu.in) =	29.777

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	4.42
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	0.88
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	5.30
		Axial Strain (%) =	5.22

Figure D-2.9

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	E-133A	Reviewed by:	AP	Date:	04-17-15
Sample No.:	6	Sample Description:	Dark Brown Clayey Sand		
Depth(ft):	30.5				
Sample Type:	Mod. Cal.	Confining Pressure = 25.0 psi			

Diameter (in)	2.615	2.615	2.615	Avg. =	2.615
Height (in)	5.608	5.608	5.608	Avg. =	5.608

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.371	5.578
Moisture Content (%)	11.74	14.02
Wet Weight (gms)	95.08	1203.31
Dry Weight (gms)	90.39	1073.52
Container Weight (gms)	50.43	148.05
Density and Saturation		
Wet Weight (gms)	1060.25	
Container Weight (gms)	0.00	
Wet Density (pcf)	134.1	
Dry Density (pcf)	120.0	
Initial Void Ratio	0.404	
% Saturation	78.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	65.0	Initial Burette Ht.(cm)=	75.8
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	68.0
Eff. Consol. Stress (psi) =	25.0	Final Height (in)=	5.608
Induced OCR=	1.0	Initial Volume (cu.in)=	30.119
Change in Ht. of Specimen (in) =	0.0004	Final Volume (cu.in) =	29.643

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	6.92
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	2.17
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	9.09
		Axial Strain (%) =	5.24

Figure D-2.10

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	E-133A	Reviewed by:	AP	Date:	04-17-15
Sample No.:	6	Sample Description:	Dark Brown Clayey Sand		
Depth(ft):	30.5				
Sample Type:	Mod. Cal.	Confining Pressure = 45.0 psi			

Diameter (in)	2.615	2.615	2.615	Avg. =	2.615
Height (in)	5.608	5.608	5.608	Avg. =	5.608

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.371	5.537
Moisture Content (%)	11.74	14.02
Wet Weight (gms)	95.08	1203.31
Dry Weight (gms)	90.39	1073.52
Container Weight (gms)	50.43	148.05
Density and Saturation		
Wet Weight (gms)	1060.25	
Container Weight (gms)	0.00	
Wet Density (pcf)	134.1	
Dry Density (pcf)	120.0	
Initial Void Ratio	0.404	
% Saturation	78.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	75.0	Initial Burette Ht.(cm)=	68.0
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	56.5
Eff. Consol. Stress (psi) =	45.0	Final Height (in)=	5.607
Induced OCR =	1.0	Initial Volume (cu.in)=	30.119
Change in Ht. of Specimen (in) =	0.0012	Final Volume (cu.in) =	29.417

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	12.41
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	4.81
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	17.22
		Axial Strain (%) =	20.48

Figure D-2.11

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	55.0	psi
Project No:	4953-11-1423	Back Pressure :	40.0	psi
Test Pit:	E-133A	Consolidation Pressure :	15.0	psi
Depth(ft):	30.5	Initial Sample Height:	5.608	in
Sample No.:	6	Initial Area of Sample:	5.371	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.585	in
Sample Description:	Dark Brown Clayey Sand	Final Sample Area (A)*:	5.332	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
55.0	0	0.000	40.0	0.00	0.00	0.00	0.00	2.16
55.0	61	0.006	43.2	1.64	0.10	0.45	0.82	2.53
55.0	76	0.012	45.2	2.05	0.21	0.75	1.02	2.43
55.0	85	0.019	46.7	2.29	0.33	0.95	1.15	2.35
55.0	92	0.026	47.7	2.47	0.47	1.10	1.24	2.30
55.0	97	0.033	48.4	2.59	0.59	1.20	1.30	2.26
55.0	100	0.040	48.9	2.68	0.72	1.27	1.34	2.23
55.0	104	0.048	49.2	2.77	0.86	1.32	1.39	2.22
55.0	106	0.055	49.5	2.83	0.99	1.36	1.41	2.21
55.0	108	0.062	49.7	2.89	1.12	1.39	1.44	2.21
55.0	110	0.069	49.8	2.94	1.24	1.41	1.47	2.22
55.0	113	0.076	49.9	3.00	1.37	1.43	1.50	2.24
55.0	116	0.084	50.0	3.09	1.50	1.44	1.55	2.27
55.0	117	0.090	50.0	3.12	1.62	1.44	1.56	2.28
55.0	121	0.098	50.1	3.20	1.75	1.44	1.60	2.32
55.0	123	0.105	50.1	3.26	1.87	1.45	1.63	2.34
55.0	125	0.112	50.1	3.32	2.00	1.44	1.66	2.37
55.0	128	0.119	50.0	3.37	2.13	1.44	1.69	2.41
55.0	130	0.126	50.0	3.43	2.26	1.44	1.72	2.44
55.0	132	0.134	50.0	3.49	2.39	1.44	1.74	2.46
55.0	135	0.141	50.0	3.54	2.53	1.44	1.77	2.50
55.0	136	0.148	50.0	3.57	2.65	1.43	1.78	2.51
55.0	138	0.155	50.0	3.62	2.78	1.43	1.81	2.54
55.0	139	0.162	49.9	3.65	2.91	1.43	1.82	2.56
55.0	141	0.170	49.9	3.70	3.04	1.42	1.85	2.59
55.0	144	0.177	49.9	3.76	3.17	1.42	1.88	2.62
55.0	145	0.184	49.8	3.78	3.30	1.41	1.89	2.64
55.0	147	0.192	49.8	3.84	3.44	1.40	1.92	2.68
55.0	151	0.206	49.7	3.92	3.68	1.39	1.96	2.73
55.0	164	0.255	49.2	4.24	4.57	1.32	2.12	2.96
55.0	173	0.292	48.9	4.42	5.22	1.28	2.21	3.09

Figure D-2.12

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	65.0	psi
Project No:	4953-11-1423	Back Pressure :	40.0	psi
Test Pit:	E-133A	Consolidation Pressure :	25.0	psi
Depth(ft):	30.5	Initial Sample Height:	5.608	in
Sample No.:	6	Initial Area of Sample:	5.371	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.608	in
Sample Description:	Dark Brown Clayey Sand	Final Sample Area (A)*:	5.578	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
65.0	1	0.000	40.0	0.03	0.00	0.00	0.01	3.61
65.0	87	0.007	44.7	2.24	0.13	0.67	1.12	4.05
65.0	127	0.014	46.6	3.27	0.24	0.95	1.64	4.29
65.0	153	0.020	47.9	3.94	0.36	1.13	1.97	4.43
65.0	174	0.028	48.8	4.47	0.50	1.27	2.24	4.56
65.0	190	0.035	49.5	4.88	0.62	1.37	2.44	4.67
65.0	201	0.042	50.0	5.15	0.75	1.44	2.58	4.74
65.0	209	0.048	50.3	5.35	0.86	1.48	2.67	4.79
65.0	215	0.055	50.5	5.50	0.99	1.51	2.75	4.84
65.0	220	0.063	50.6	5.62	1.12	1.53	2.81	4.88
65.0	224	0.070	50.7	5.71	1.24	1.55	2.86	4.91
65.0	227	0.077	50.8	5.78	1.37	1.55	2.89	4.94
65.0	230	0.083	50.9	5.85	1.48	1.56	2.92	4.96
65.0	233	0.091	50.9	5.92	1.62	1.57	2.96	4.99
65.0	235	0.097	51.0	5.96	1.73	1.58	2.98	5.00
65.0	238	0.105	51.0	6.03	1.86	1.58	3.02	5.04
65.0	241	0.112	51.0	6.10	2.00	1.58	3.05	5.07
65.0	244	0.120	51.0	6.17	2.13	1.58	3.08	5.10
65.0	246	0.127	51.0	6.21	2.26	1.58	3.10	5.13
65.0	249	0.134	50.9	6.27	2.39	1.57	3.14	5.16
65.0	251	0.142	50.9	6.32	2.53	1.57	3.16	5.19
65.0	253	0.149	50.9	6.36	2.65	1.57	3.18	5.21
65.0	255	0.157	50.9	6.40	2.79	1.56	3.20	5.24
65.0	257	0.164	50.8	6.44	2.92	1.56	3.22	5.26
65.0	258	0.171	50.8	6.46	3.05	1.55	3.23	5.28
65.0	259	0.178	50.7	6.47	3.18	1.55	3.24	5.29
65.0	261	0.185	50.7	6.52	3.30	1.54	3.26	5.32
65.0	262	0.193	50.7	6.53	3.44	1.54	3.27	5.33
65.0	265	0.206	50.6	6.59	3.68	1.52	3.30	5.37
65.0	268	0.221	50.5	6.65	3.94	1.51	3.32	5.41
65.0	271	0.235	50.4	6.70	4.20	1.49	3.35	5.46
65.0	275	0.250	50.3	6.78	4.46	1.48	3.39	5.51
65.0	281	0.280	50.1	6.89	4.99	1.45	3.45	5.60
65.0	283	0.294	49.9	6.92	5.24	1.43	3.46	5.63

Figure D-2.13

AP Engineering & Testing, Inc.

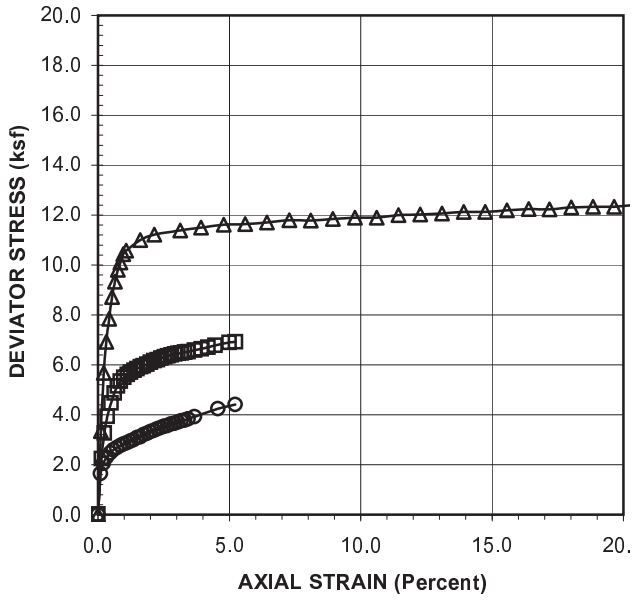
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

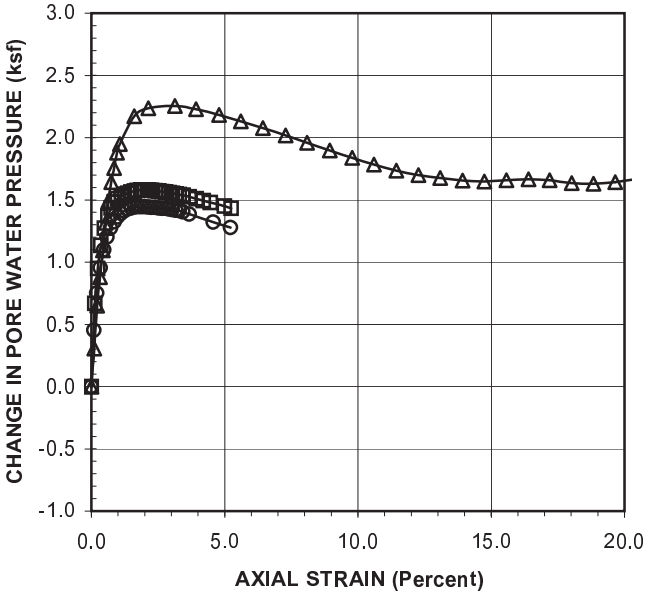
Project Name:	Westside Subway Extension	Cell Pressure:	75.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	E-133A	Consolidation Pressure :	45.0	psi
Depth(ft):	30.5	Initial Sample Height:	5.608	in
Sample No.:	6	Initial Area of Sample:	5.371	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.607	in
Sample Description:	Dark Brown Clayey Sand	Final Sample Area (A)*:	5.537	sq. in.
		Induced OCR=	1.0	

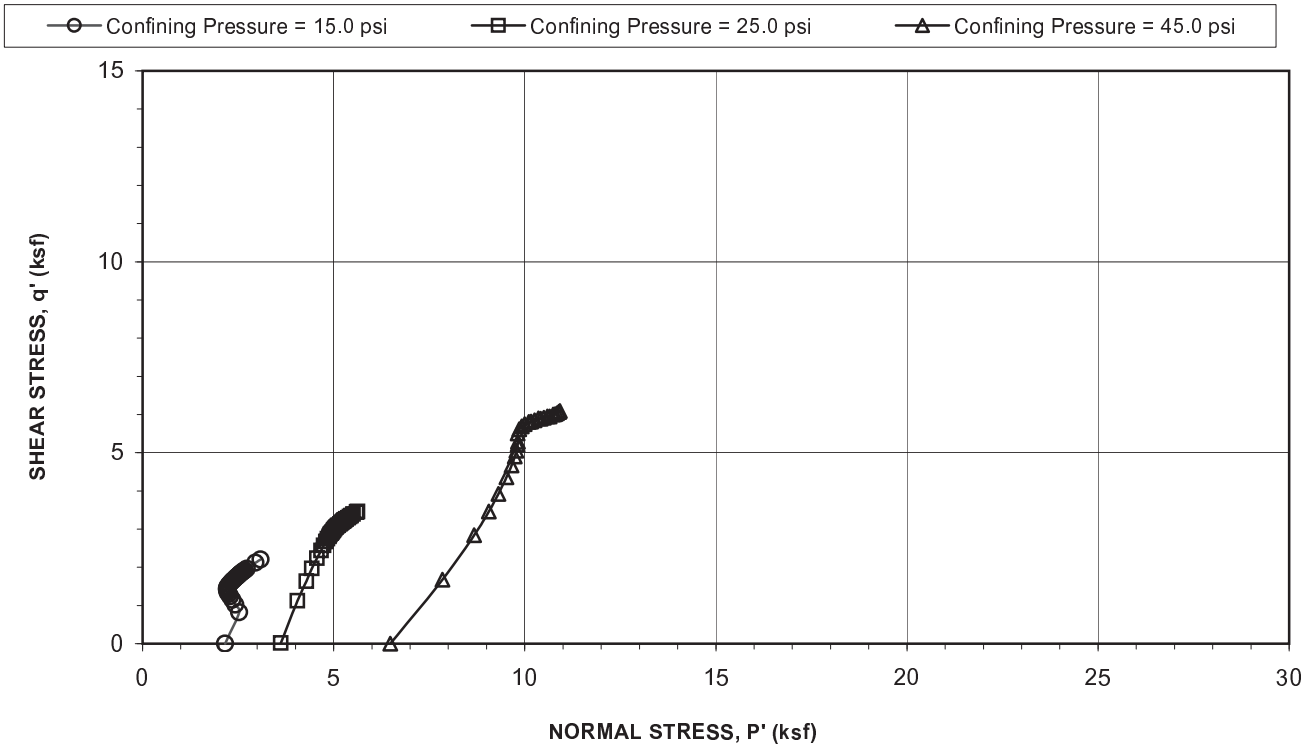
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
75.0	0	0.000	30.0	0.00	0.00	0.00	0.00	6.48
75.0	129	0.006	32.1	3.35	0.11	0.31	1.68	7.85
75.0	219	0.012	34.5	5.68	0.21	0.65	2.84	8.67
75.0	267	0.018	36.1	6.92	0.32	0.88	3.46	9.06
75.0	303	0.024	37.6	7.85	0.43	1.09	3.92	9.31
75.0	337	0.030	39.1	8.72	0.54	1.32	4.36	9.52
75.0	361	0.036	40.4	9.33	0.64	1.49	4.66	9.65
75.0	380	0.042	41.4	9.81	0.75	1.64	4.90	9.74
75.0	392	0.048	42.2	10.11	0.86	1.76	5.05	9.78
75.0	405	0.054	43.1	10.43	0.96	1.88	5.22	9.82
75.0	411	0.060	43.5	10.57	1.07	1.95	5.29	9.82
75.0	430	0.090	45.1	11.00	1.61	2.17	5.50	9.81
75.0	441	0.120	45.5	11.22	2.14	2.24	5.61	9.85
75.0	452	0.176	45.7	11.39	3.13	2.25	5.69	9.92
75.0	460	0.220	45.5	11.49	3.93	2.23	5.75	10.00
75.0	469	0.269	45.2	11.61	4.79	2.18	5.81	10.10
75.0	474	0.314	44.8	11.64	5.61	2.13	5.82	10.17
75.0	481	0.361	44.4	11.70	6.44	2.08	5.85	10.26
75.0	489	0.409	44.0	11.79	7.29	2.02	5.90	10.36
75.0	493	0.454	43.6	11.78	8.10	1.96	5.89	10.41
75.0	500	0.501	43.2	11.84	8.94	1.90	5.92	10.50
75.0	507	0.548	42.8	11.90	9.78	1.84	5.95	10.59
75.0	512	0.595	42.4	11.90	10.60	1.78	5.95	10.65
75.0	521	0.642	42.1	12.00	11.44	1.74	6.00	10.74
75.0	527	0.688	41.8	12.02	12.27	1.70	6.01	10.79
75.0	534	0.734	41.6	12.07	13.09	1.68	6.03	10.84
75.0	542	0.781	41.5	12.13	13.93	1.65	6.07	10.89
75.0	547	0.827	41.4	12.13	14.74	1.65	6.06	10.90
75.0	555	0.873	41.5	12.19	15.57	1.66	6.09	10.91
75.0	563	0.919	41.6	12.24	16.39	1.67	6.12	10.93
75.0	568	0.964	41.5	12.23	17.19	1.66	6.12	10.94
75.0	577	1.010	41.4	12.30	18.01	1.63	6.15	11.00
75.0	584	1.056	41.3	12.33	18.84	1.63	6.16	11.01
75.0	590	1.102	41.4	12.33	19.65	1.64	6.16	11.00
75.0	600	1.148	41.6	12.41	20.48	1.67	6.20	11.02

Figure D-2.14

AP Engineering & Testing, Inc.







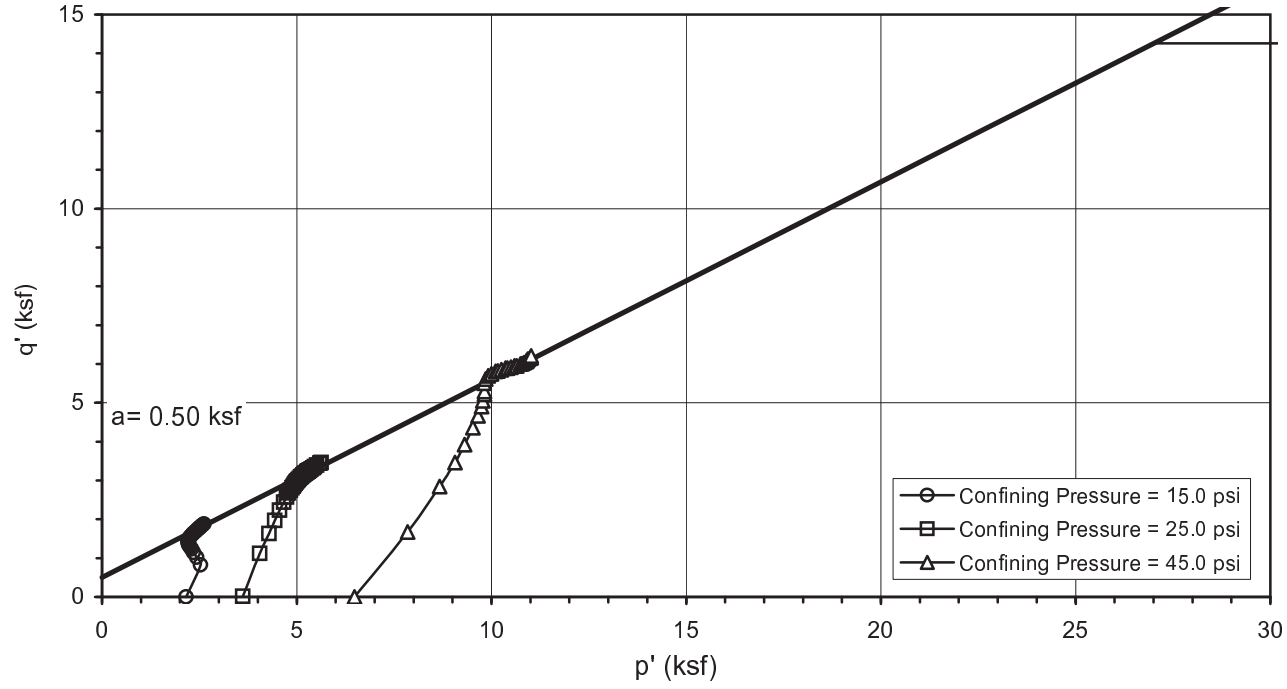
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Brown Clayey Sand
Test Pit:	E-133A	Avg. Dry Unit Weight (pcf):	120.0
Sample No.:	6	Avg. Initial Moisture Content (%):	11.7
Depth (ft):	30.5	Confining Pressure:	15.0, 25.0, 45.0 psi

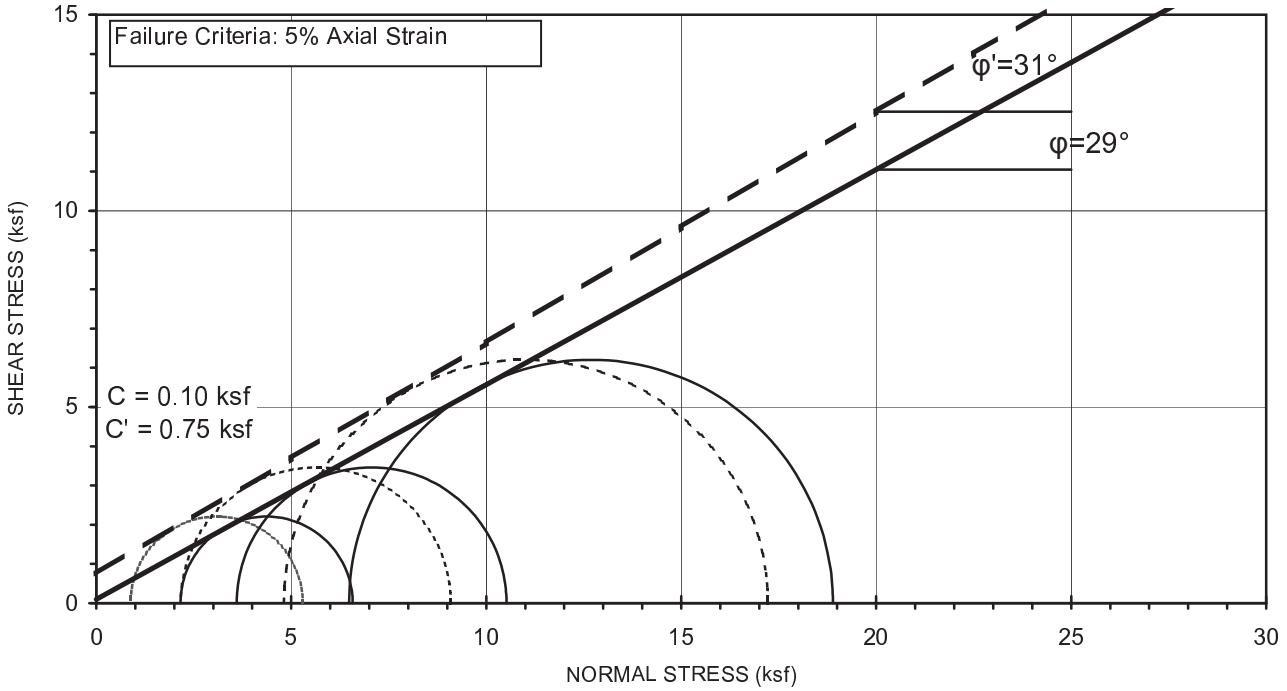
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.15

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Brown Clayey Sand
Test Pit:	E-133A	Avg. Dry Unit Weight (pcf):	120.0
Sample No.:	6	Avg. Initial Moisture Content (%):	11.7
Depth (ft):	30.5	Confining Pressures:	15.0, 25.0, 45.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.16

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	E-133A	Reviewed by:	AP	Date:	04-17-15
Sample No.:	14	Sample Description:	Lt Olive Brown Silty Sand		
Depth(ft):	70.5				
Sample Type:	Mod. Cal.	Confining Pressure = 40.0 psi			

Diameter (in)	2.615	2.615	2.615	Avg. =	2.615
Height (in)	5.824	5.824	5.824	Avg. =	5.824

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.371	5.331
Moisture Content (%)	14.10	19.14
Wet Weight (gms)	61.10	1178.38
Dry Weight (gms)	59.70	1013.15
Container Weight (gms)	49.77	149.71
Density and Saturation		
Wet Weight (gms)	1027.09	
Container Weight (gms)	0.00	
Wet Density (pcf)	125.1	
Dry Density (pcf)	109.6	
Initial Void Ratio	0.537	
% Saturation	70.9	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	70.0	Initial Burette Ht.(cm)=	85.2
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	77.3
Eff. Consol. Stress (psi) =	40.0	Final Height (in)=	5.777
Induced OCR =	1.0	Initial Volume (cu.in)=	31.279
Change in Ht. of Specimen (in) =	0.0469	Final Volume (cu.in) =	30.797

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	17.49
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	4.40
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	21.89
		Axial Strain (%) =	5.07

Figure D-2.17

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	E-133A	Reviewed by:	AP	Date:	04-17-15
Sample No.:	14	Sample Description:	Lt Olive Brown Silty Sand		
Depth(ft):	70.5				
Sample Type:	Mod. Cal.	Confining Pressure = 60.0 psi			

Diameter (in)	2.615	2.615	2.615	Avg. =	2.615
Height (in)	5.824	5.824	5.824	Avg. =	5.824

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.371	5.578
Moisture Content (%)	14.10	19.14
Wet Weight (gms)	61.10	1178.38
Dry Weight (gms)	59.70	1013.15
Container Weight (gms)	49.77	149.71
Density and Saturation		
Wet Weight (gms)	1027.09	
Container Weight (gms)	0.00	
Wet Density (pcf)	125.1	
Dry Density (pcf)	109.6	
Initial Void Ratio	0.537	
% Saturation	70.9	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	90.0	Initial Burette Ht.(cm)=	77.2
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	70.0
Eff. Consol. Stress (psi) =	60.0	Final Height (in)=	5.824
Induced OCR=	1.0	Initial Volume (cu.in)=	31.279
Change in Ht. of Specimen (in) =	0.0000	Final Volume (cu.in) =	30.840

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	30.07
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	9.21
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	39.28
		Axial Strain (%) =	5.14

Figure D-2.18

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	E-133A	Reviewed by:	AP	Date:	04-17-15
Sample No.:	14	Sample Description:	Lt Olive Brown Silty Sand		
Depth(ft):	70.5				
Sample Type:	Mod. Cal.	Confining Pressure = 80.0 psi			

Diameter (in)	2.615	2.615	2.615	Avg. =	2.615
Height (in)	5.824	5.824	5.824	Avg. =	5.824

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.371	5.600
Moisture Content (%)	14.10	19.14
Wet Weight (gms)	61.10	1178.38
Dry Weight (gms)	59.70	1013.15
Container Weight (gms)	49.77	149.71
Density and Saturation		
Wet Weight (gms)	1027.09	
Container Weight (gms)	0.00	
Wet Density (pcf)	125.1	
Dry Density (pcf)	109.6	
Initial Void Ratio	0.537	
% Saturation	70.9	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	110.0	Initial Burette Ht.(cm)=	70.0
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	64.3
Eff. Consol. Stress (psi) =	80.0	Final Height (in)=	5.823
Induced OCR =	1.0	Initial Volume (cu.in)=	31.279
Change in Ht. of Specimen (in) =	0.0010	Final Volume (cu.in) =	30.931

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	42.41
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	12.91
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	55.32
		Axial Strain (%) =	6.34

Figure D-2.19

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	70.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	E-133A	Consolidation Pressure :	40.0	psi
Depth(ft):	70.5	Initial Sample Height:	5.824	in
Sample No.:	14	Initial Area of Sample:	5.371	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.777	in
Sample Description:	Lt Olive Brown Silty Sand	Final Sample Area (A)*:	5.331	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
70.0	0	0.000	30.0	0.00	0.00	0.00	0.00	5.76
70.0	53	0.003	31.2	1.43	0.05	0.18	0.71	6.30
70.0	109	0.010	33.2	2.95	0.17	0.46	1.47	6.77
70.0	151	0.017	35.3	4.06	0.29	0.77	2.03	7.02
70.0	185	0.023	37.4	4.98	0.40	1.06	2.49	7.19
70.0	213	0.031	39.2	5.72	0.53	1.33	2.86	7.29
70.0	236	0.037	40.8	6.33	0.65	1.56	3.16	7.36
70.0	255	0.045	42.2	6.84	0.77	1.75	3.42	7.43
70.0	271	0.051	43.3	7.27	0.88	1.92	3.63	7.47
70.0	285	0.058	44.2	7.63	1.00	2.05	3.81	7.52
70.0	299	0.065	45.0	7.99	1.12	2.16	3.99	7.59
70.0	311	0.071	45.6	8.28	1.24	2.24	4.14	7.66
70.0	322	0.079	46.0	8.58	1.37	2.31	4.29	7.74
70.0	332	0.086	46.4	8.84	1.48	2.36	4.42	7.82
70.0	344	0.093	46.6	9.14	1.61	2.39	4.57	7.94
70.0	353	0.099	46.7	9.37	1.72	2.41	4.69	8.03
70.0	365	0.106	46.8	9.67	1.84	2.42	4.83	8.17
70.0	375	0.113	46.8	9.93	1.96	2.42	4.96	8.30
70.0	385	0.121	46.8	10.19	2.09	2.42	5.09	8.44
70.0	397	0.128	46.7	10.48	2.22	2.41	5.24	8.59
70.0	407	0.136	46.6	10.74	2.35	2.39	5.37	8.74
70.0	419	0.143	46.4	11.03	2.48	2.37	5.51	8.90
70.0	429	0.151	46.2	11.28	2.61	2.34	5.64	9.06
70.0	439	0.158	46.0	11.54	2.73	2.31	5.77	9.22
70.0	451	0.165	45.8	11.83	2.86	2.28	5.91	9.40
70.0	461	0.172	45.5	12.09	2.98	2.24	6.04	9.56
70.0	473	0.179	45.3	12.37	3.09	2.20	6.19	9.75
70.0	483	0.186	45.0	12.63	3.21	2.16	6.31	9.91
70.0	505	0.199	44.4	13.17	3.45	2.07	6.58	10.27
70.0	516	0.206	44.1	13.45	3.57	2.03	6.72	10.46
70.0	527	0.214	43.7	13.70	3.70	1.98	6.85	10.63
70.0	538	0.220	43.4	13.98	3.82	1.93	6.99	10.83
70.0	610	0.250	41.9	15.76	4.32	1.71	7.88	11.93
70.0	648	0.272	40.6	16.68	4.71	1.54	8.34	12.56
70.0	682	0.293	39.4	17.49	5.07	1.36	8.74	13.15

Figure D-2.20

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	90.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	E-133A	Consolidation Pressure :	60.0	psi
Depth(ft):	70.5	Initial Sample Height:	5.824	in
Sample No.:	14	Initial Area of Sample:	5.371	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.824	in
Sample Description:	Lt Olive Brown Silty Sand	Final Sample Area (A)*:	5.578	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
90.0	3	0.000	30.0	0.08	0.00	0.00	0.04	8.68
90.0	120	0.005	31.9	3.10	0.08	0.26	1.55	9.92
90.0	219	0.010	33.3	5.64	0.18	0.47	2.82	10.99
90.0	310	0.016	34.5	7.98	0.28	0.64	3.99	11.99
90.0	393	0.022	35.4	10.11	0.38	0.78	5.05	12.92
90.0	470	0.029	36.1	12.07	0.49	0.88	6.04	13.80
90.0	541	0.035	36.7	13.88	0.60	0.95	6.94	14.63
90.0	601	0.041	37.4	15.41	0.71	1.06	7.70	15.29
90.0	657	0.047	37.4	16.82	0.81	1.05	8.41	16.00
90.0	706	0.054	37.5	18.06	0.93	1.07	9.03	16.60
90.0	747	0.062	37.5	19.08	1.06	1.07	9.54	17.11
90.0	782	0.069	37.4	19.95	1.18	1.07	9.98	17.55
90.0	811	0.075	37.3	20.67	1.29	1.05	10.33	17.92
90.0	836	0.082	37.2	21.28	1.41	1.03	10.64	18.25
90.0	858	0.089	37.0	21.81	1.54	1.00	10.90	18.54
90.0	878	0.096	36.8	22.29	1.65	0.97	11.15	18.82
90.0	895	0.103	36.5	22.69	1.78	0.93	11.35	19.06
90.0	911	0.110	36.2	23.08	1.88	0.89	11.54	19.29
90.0	926	0.116	35.9	23.43	1.99	0.85	11.71	19.51
90.0	941	0.123	35.6	23.78	2.11	0.80	11.89	19.73
90.0	955	0.130	35.3	24.10	2.23	0.76	12.05	19.94
90.0	968	0.136	35.0	24.41	2.34	0.71	12.20	20.14
90.0	981	0.143	34.6	24.71	2.45	0.66	12.35	20.33
90.0	993	0.149	34.2	24.98	2.56	0.60	12.49	20.52
90.0	1006	0.156	33.9	25.28	2.67	0.55	12.64	20.72
90.0	1043	0.176	32.7	26.11	3.03	0.39	13.06	21.31
90.0	1056	0.184	32.4	26.40	3.15	0.33	13.20	21.51
90.0	1089	0.205	31.2	27.12	3.53	0.16	13.56	22.04
90.0	1131	0.233	29.6	28.03	4.00	-0.06	14.02	22.71
90.0	1172	0.259	28.3	28.91	4.44	-0.25	14.46	23.34
90.0	1200	0.278	27.2	29.50	4.78	-0.40	14.75	23.79
90.0	1228	0.299	26.1	30.07	5.14	-0.57	15.04	24.25

Figure D-2.21

AP Engineering & Testing, Inc.

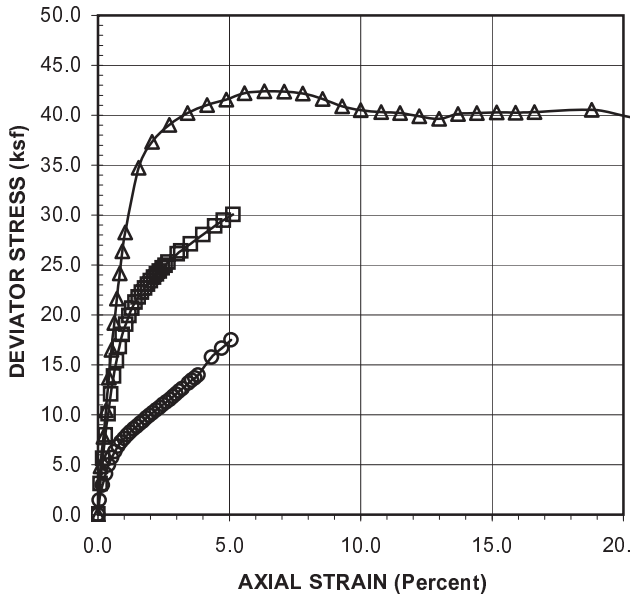
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

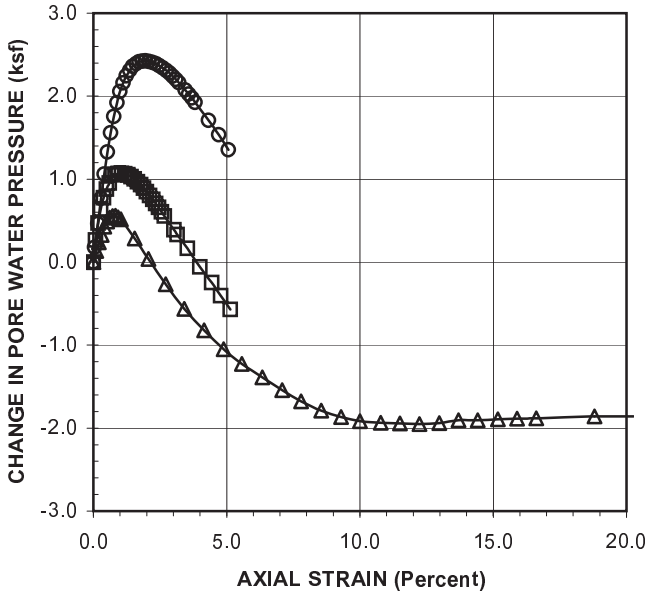
Project Name:	Westside Subway Extension	Cell Pressure:	110.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	E-133A	Consolidation Pressure :	80.0	psi
Depth(ft):	70.5	Initial Sample Height:	5.824	in
Sample No.:	14	Initial Area of Sample:	5.371	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.823	in
Sample Description:	Lt Olive Brown Silty Sand	Final Sample Area (A)*:	5.600	sq. in.
		Induced OCR=	1.0	

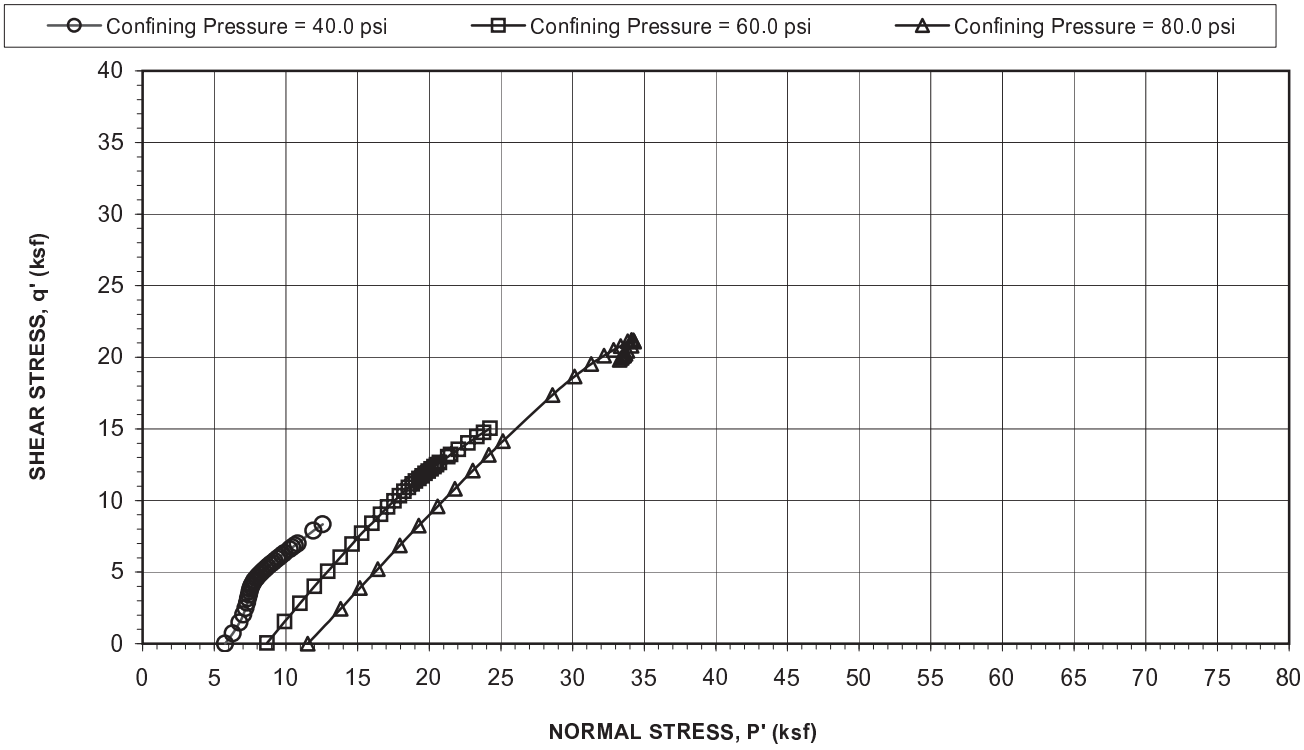
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
110.0	0	0.000	30.0	0.00	0.00	0.00	0.00	11.52
110.0	189	0.006	31.0	4.86	0.10	0.14	2.43	13.81
110.0	303	0.012	31.7	7.78	0.21	0.24	3.89	15.17
110.0	407	0.018	32.3	10.43	0.31	0.33	5.22	16.41
110.0	536	0.024	33.0	13.73	0.41	0.43	6.86	17.96
110.0	645	0.030	33.4	16.50	0.52	0.49	8.25	19.28
110.0	751	0.036	33.7	19.19	0.62	0.53	9.60	20.58
110.0	848	0.042	33.9	21.65	0.72	0.56	10.82	21.79
110.0	948	0.048	33.9	24.18	0.82	0.56	12.09	23.05
110.0	1035	0.054	33.8	26.37	0.93	0.54	13.18	24.16
110.0	1111	0.060	33.6	28.28	1.03	0.52	14.14	25.14
110.0	1372	0.090	32.0	34.74	1.55	0.28	17.37	28.60
110.0	1482	0.120	30.3	37.33	2.06	0.04	18.66	30.14
110.0	1561	0.158	28.2	39.05	2.72	-0.27	19.53	31.31
110.0	1620	0.199	26.1	40.24	3.41	-0.56	20.12	32.20
110.0	1665	0.242	24.3	41.04	4.16	-0.82	20.52	32.86
110.0	1700	0.285	22.7	41.58	4.89	-1.05	20.79	33.36
110.0	1739	0.325	21.5	42.23	5.58	-1.23	21.11	33.86
110.0	1761	0.369	20.4	42.41	6.34	-1.39	21.21	34.12
110.0	1773	0.413	19.3	42.36	7.09	-1.54	21.18	34.24
110.0	1779	0.454	18.4	42.18	7.79	-1.68	21.09	34.29
110.0	1770	0.498	17.6	41.63	8.55	-1.79	20.81	34.12
110.0	1753	0.541	17.0	40.89	9.29	-1.87	20.45	33.83
110.0	1750	0.582	16.7	40.50	10.00	-1.92	20.25	33.69
110.0	1757	0.628	16.6	40.31	10.78	-1.93	20.15	33.61
110.0	1768	0.670	16.5	40.24	11.50	-1.94	20.12	33.58
110.0	1768	0.712	16.5	39.90	12.23	-1.95	19.95	33.42
110.0	1772	0.756	16.5	39.65	12.98	-1.94	19.83	33.29
110.0	1808	0.798	16.8	40.12	13.70	-1.91	20.06	33.49
110.0	1828	0.840	16.8	40.23	14.42	-1.90	20.11	33.54
110.0	1847	0.884	16.8	40.29	15.18	-1.90	20.14	33.56
110.0	1862	0.926	16.9	40.27	15.90	-1.89	20.14	33.54
110.0	1880	0.968	16.9	40.31	16.62	-1.88	20.16	33.56
110.0	1941	1.095	17.1	40.53	18.80	-1.86	20.27	33.65
110.0	1941	1.180	17.1	39.80	20.26	-1.86	19.90	33.28

Figure D-2.22

AP Engineering & Testing, Inc.







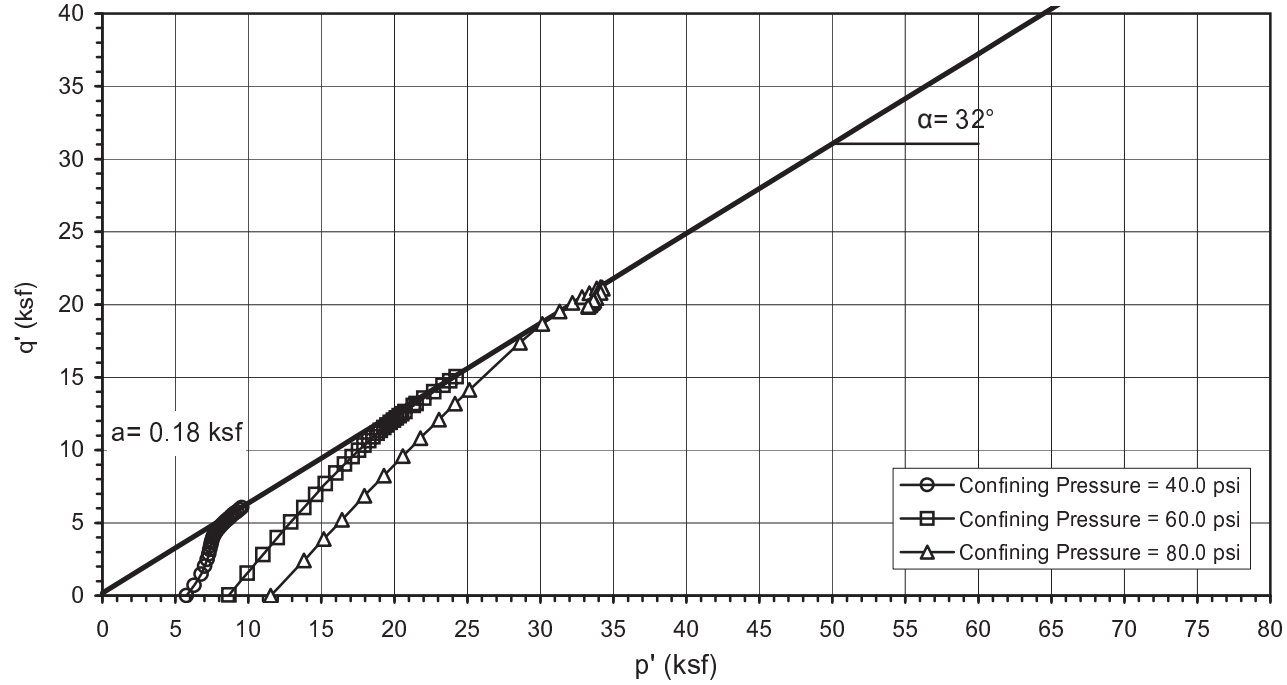
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Lt Olive Brown Silty Sand
Test Pit:	E-133A	Avg. Dry Unit Weight (pcf):	109.6
Sample No.:	14	Avg. Initial Moisture Content (%):	14.1
Depth (ft):	70.5	Confining Pressure:	40.0, 60.0, 80.0 psi

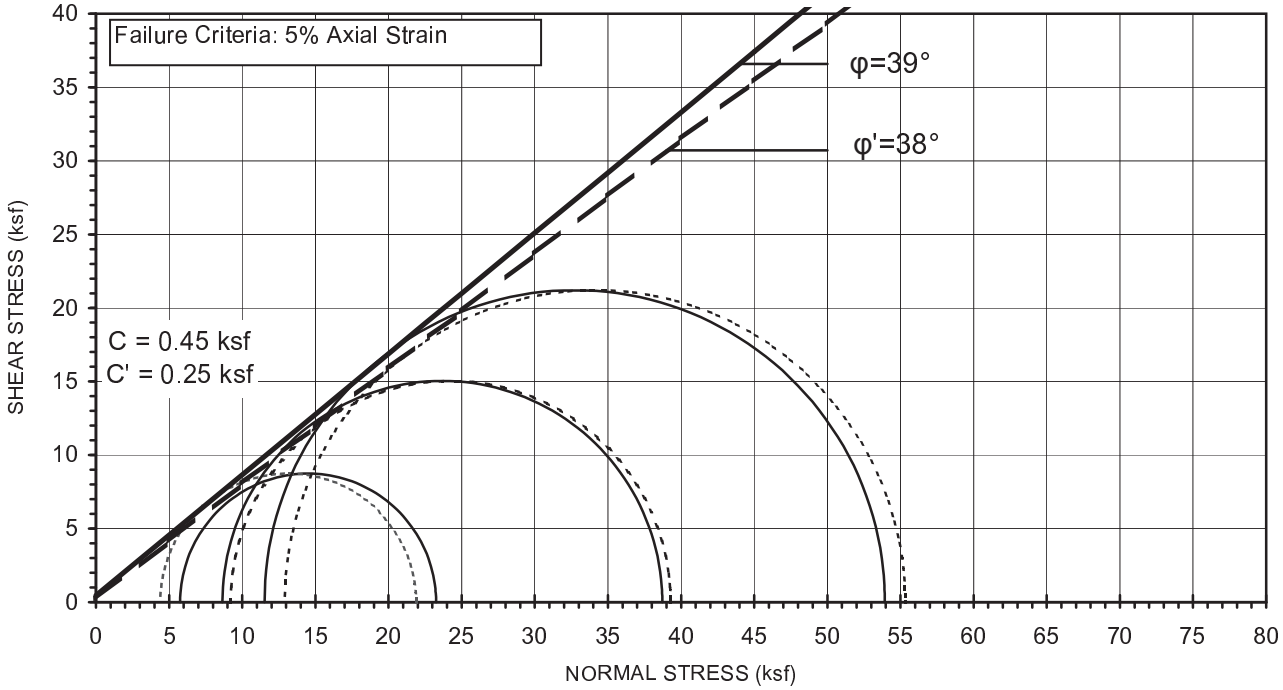
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.23

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Lt Olive Brown Silty Sand
Test Pit:	E-133A	Avg. Dry Unit Weight (pcf):	109.6
Sample No.:	14	Avg. Initial Moisture Content (%):	14.1
Depth (ft):	70.5	Confining Pressures:	40.0, 60.0, 80.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.24

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	G-142	Reviewed by:	AP	Date:	04-17-15
Sample No.:	3	Sample Description:	Brown Lean Clay with sand		
Depth(ft):	15.5				
Sample Type:	Mod. Cal.	Confining Pressure = 5.0 psi			

Diameter (in)	2.623	2.623	2.623	Avg. =	2.623
Height (in)	5.721	5.721	5.721	Avg. =	5.721

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.404	5.404
Moisture Content (%)	14.64	19.87
Wet Weight (gms)	15.82	1238.18
Dry Weight (gms)	14.13	1057.63
Container Weight (gms)	2.59	149.20
Density and Saturation		
Wet Weight (gms)	1079.47	
Container Weight (gms)	0.00	
Wet Density (pcf)	133.0	
Dry Density (pcf)	116.0	
Initial Void Ratio	0.452	
% Saturation	87.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	35.0	Initial Burette Ht.(cm)=	0.0
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	0.0
Eff. Consol. Stress (psi) =	5.0	Final Height (in)=	5.721
Induced OCR =	1.0	Initial Volume (cu.in)=	30.914
Change in Ht. of Specimen (in) =	0.0000	Final Volume (cu.in) =	30.914

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	4.90
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	0.55
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	5.45
		Axial Strain (%) =	5.19

Figure D-2.25

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	G-142	Reviewed by:	AP	Date:	04-17-15
Sample No.:	3	Sample Description:	Brown Lean Clay with sand		
Depth(ft):	15.5				
Sample Type:	Mod. Cal.	Confining Pressure = 15.0 psi			

Diameter (in)	2.623	2.623	2.623	Avg. =	2.623
Height (in)	5.721	5.721	5.721	Avg. =	5.721

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.404	5.664
Moisture Content (%)	14.64	19.87
Wet Weight (gms)	15.82	1238.18
Dry Weight (gms)	14.13	1057.63
Container Weight (gms)	2.59	149.20
Density and Saturation		
Wet Weight (gms)	1079.47	
Container Weight (gms)	0.00	
Wet Density (pcf)	133.0	
Dry Density (pcf)	116.0	
Initial Void Ratio	0.452	
% Saturation	87.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	45.0	Initial Burette Ht.(cm)=	88.3
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	84.6
Eff. Consol. Stress (psi) =	15.0	Final Height (in)=	5.715
Induced OCR=	1.0	Initial Volume (cu.in)=	30.914
Change in Ht. of Specimen (in) =	0.0060	Final Volume (cu.in) =	30.688

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	6.56
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	1.36
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	7.92
		Axial Strain (%) =	4.76

Figure D-2.26

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	G-142	Reviewed by:	AP	Date:	04-17-15
Sample No.:	3	Sample Description:	Brown Lean Clay with sand		
Depth(ft):	15.5				
Sample Type:	Mod. Cal.	Confining Pressure = 30.0 psi			

Diameter (in)	2.623	2.623	2.623	Avg. =	2.623
Height (in)	5.721	5.721	5.721	Avg. =	5.721

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.404	5.621
Moisture Content (%)	14.64	19.87
Wet Weight (gms)	15.82	1238.18
Dry Weight (gms)	14.13	1057.63
Container Weight (gms)	2.59	149.20
Density and Saturation		
Wet Weight (gms)	1079.47	
Container Weight (gms)	0.00	
Wet Density (pcf)	133.0	
Dry Density (pcf)	116.0	
Initial Void Ratio	0.452	
% Saturation	87.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	60.0	Initial Burette Ht.(cm)=	85.2
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	80.4
Eff. Consol. Stress (psi) =	30.0	Final Height (in)=	5.720
Induced OCR =	1.0	Initial Volume (cu.in)=	30.914
Change in Ht. of Specimen (in) =	0.0010	Final Volume (cu.in) =	30.621

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	9.53
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	3.72
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	13.25
		Axial Strain (%) =	14.84

Figure D-2.27

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	35.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	G-142	Consolidation Pressure :	5.0	psi
Depth(ft):	15.5	Initial Sample Height:	5.721	in
Sample No.:	3	Initial Area of Sample:	5.404	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.721	in
Sample Description:	Brown Lean Clay with sand	Final Sample Area (A)*:	5.404	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
35.0	0	0.000	30.0	0.00	0.00	0.00	0.00	0.72
35.0	27	0.005	30.8	0.72	0.08	0.11	0.36	0.97
35.0	47	0.012	31.4	1.25	0.21	0.19	0.62	1.15
35.0	57	0.019	31.7	1.51	0.32	0.24	0.76	1.24
35.0	64	0.026	31.9	1.70	0.45	0.27	0.85	1.30
35.0	70	0.033	32.1	1.85	0.57	0.29	0.93	1.35
35.0	75	0.040	32.2	1.98	0.70	0.31	0.99	1.40
35.0	80	0.047	32.3	2.11	0.82	0.32	1.06	1.45
35.0	83	0.055	32.4	2.19	0.96	0.33	1.10	1.48
35.0	88	0.062	32.4	2.32	1.08	0.34	1.16	1.54
35.0	92	0.069	32.4	2.42	1.21	0.35	1.21	1.59
35.0	95	0.076	32.5	2.50	1.32	0.35	1.25	1.62
35.0	99	0.084	32.5	2.60	1.46	0.35	1.30	1.67
35.0	102	0.090	32.5	2.68	1.57	0.35	1.34	1.71
35.0	106	0.096	32.5	2.78	1.68	0.35	1.39	1.76
35.0	110	0.104	32.5	2.88	1.82	0.35	1.44	1.81
35.0	113	0.111	32.5	2.95	1.94	0.35	1.48	1.85
35.0	117	0.118	32.4	3.05	2.07	0.35	1.53	1.90
35.0	120	0.125	32.4	3.13	2.18	0.34	1.56	1.94
35.0	124	0.132	32.4	3.23	2.31	0.34	1.61	1.99
35.0	127	0.140	32.4	3.30	2.44	0.34	1.65	2.04
35.0	131	0.147	32.3	3.40	2.57	0.33	1.70	2.09
35.0	134	0.154	32.3	3.48	2.68	0.32	1.74	2.13
35.0	137	0.161	32.2	3.55	2.81	0.32	1.77	2.18
35.0	141	0.168	32.2	3.65	2.93	0.31	1.82	2.23
35.0	144	0.175	32.2	3.72	3.06	0.31	1.86	2.27
35.0	148	0.182	32.1	3.82	3.18	0.30	1.91	2.33
35.0	151	0.189	32.1	3.89	3.31	0.30	1.95	2.37
35.0	154	0.197	32.1	3.96	3.43	0.29	1.98	2.41
35.0	158	0.203	32.0	4.06	3.55	0.29	2.03	2.46
35.0	166	0.224	31.9	4.25	3.92	0.26	2.13	2.58
35.0	175	0.246	31.7	4.46	4.30	0.24	2.23	2.72
35.0	184	0.268	31.5	4.67	4.69	0.21	2.34	2.85
35.0	192	0.290	31.3	4.86	5.06	0.18	2.43	2.97
35.0	194	0.297	31.2	4.90	5.19	0.17	2.45	3.00

Figure D-2.28

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	45.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Test Pit:	G-142	Consolidation Pressure :	15.0 psi
Depth(ft):	15.5	Initial Sample Height:	5.721 in
Sample No.:	3	Initial Area of Sample:	5.404 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.715 in
Sample Description:	Brown Lean Clay with sand	Final Sample Area (A)*:	5.664 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
45.0	0	0.005	30.0	0.00	0.09	0.00	0.00	2.16
45.0	18	0.002	30.9	0.46	0.03	0.14	0.23	2.25
45.0	56	0.009	32.6	1.42	0.16	0.37	0.71	2.50
45.0	76	0.017	33.3	1.93	0.29	0.48	0.96	2.64
45.0	92	0.024	33.9	2.33	0.42	0.57	1.16	2.76
45.0	106	0.032	34.4	2.68	0.55	0.64	1.34	2.86
45.0	119	0.038	34.8	3.01	0.67	0.70	1.50	2.96
45.0	132	0.045	35.2	3.33	0.79	0.75	1.66	3.07
45.0	144	0.053	35.6	3.63	0.92	0.80	1.81	3.17
45.0	155	0.060	35.9	3.90	1.05	0.85	1.95	3.26
45.0	167	0.066	36.1	4.20	1.16	0.89	2.10	3.37
45.0	178	0.073	36.4	4.47	1.28	0.92	2.23	3.48
45.0	187	0.080	36.5	4.69	1.40	0.94	2.34	3.56
45.0	195	0.087	36.7	4.88	1.52	0.96	2.44	3.64
45.0	202	0.094	36.8	5.05	1.65	0.97	2.53	3.71
45.0	207	0.100	36.8	5.17	1.75	0.98	2.59	3.76
45.0	212	0.108	36.8	5.29	1.88	0.98	2.64	3.82
45.0	217	0.115	36.8	5.41	2.02	0.98	2.70	3.88
45.0	221	0.123	36.8	5.50	2.15	0.98	2.75	3.93
45.0	225	0.130	36.8	5.59	2.27	0.98	2.80	3.98
45.0	228	0.137	36.7	5.66	2.39	0.97	2.83	4.02
45.0	231	0.144	36.7	5.72	2.53	0.97	2.86	4.06
45.0	234	0.151	36.6	5.79	2.65	0.96	2.90	4.10
45.0	237	0.159	36.6	5.86	2.78	0.95	2.93	4.14
45.0	240	0.166	36.5	5.92	2.90	0.94	2.96	4.18
45.0	242	0.173	36.5	5.97	3.03	0.94	2.98	4.21
45.0	245	0.180	36.4	6.03	3.15	0.93	3.02	4.25
45.0	247	0.188	36.4	6.07	3.28	0.92	3.04	4.28
45.0	249	0.194	36.4	6.12	3.40	0.93	3.06	4.29
45.0	252	0.201	36.3	6.18	3.51	0.90	3.09	4.35
45.0	254	0.208	36.2	6.22	3.64	0.90	3.11	4.38
45.0	260	0.229	36.0	6.35	4.00	0.86	3.17	4.47
45.0	266	0.251	35.8	6.47	4.38	0.83	3.23	4.56
45.0	271	0.272	35.5	6.56	4.76	0.80	3.28	4.64
45.0	268	0.293	35.1	6.46	5.12	0.74	3.23	4.65

Figure D-2.29

AP Engineering & Testing, Inc.

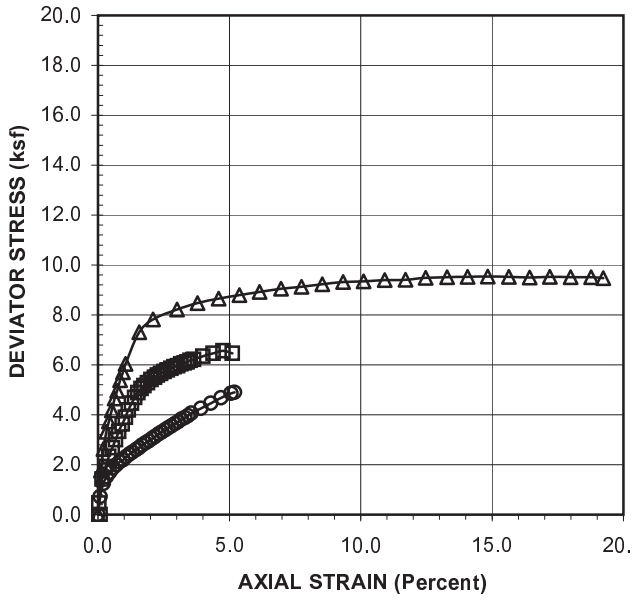
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

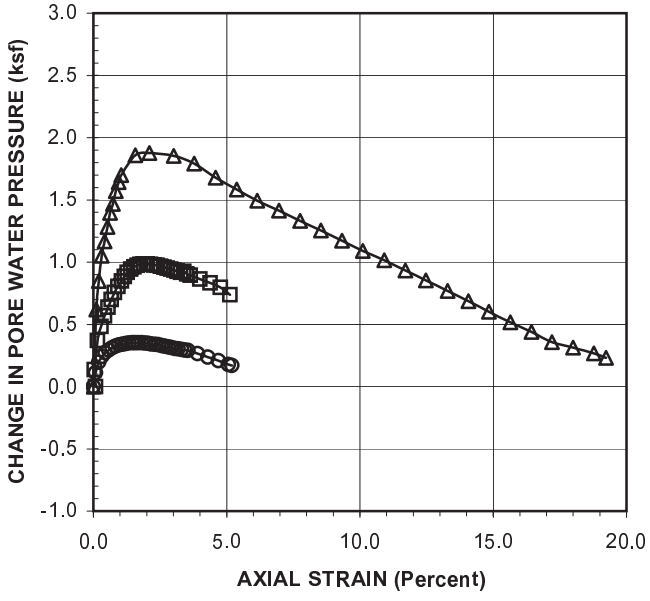
Project Name:	Westside Subway Extension	Cell Pressure:	60.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	G-142	Consolidation Pressure :	30.0	psi
Depth(ft):	15.5	Initial Sample Height:	5.721	in
Sample No.:	3	Initial Area of Sample:	5.404	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.720	in
Sample Description:	Brown Lean Clay with sand	Final Sample Area (A)*:	5.621	sq. in.
		Induced OCR=	1.0	

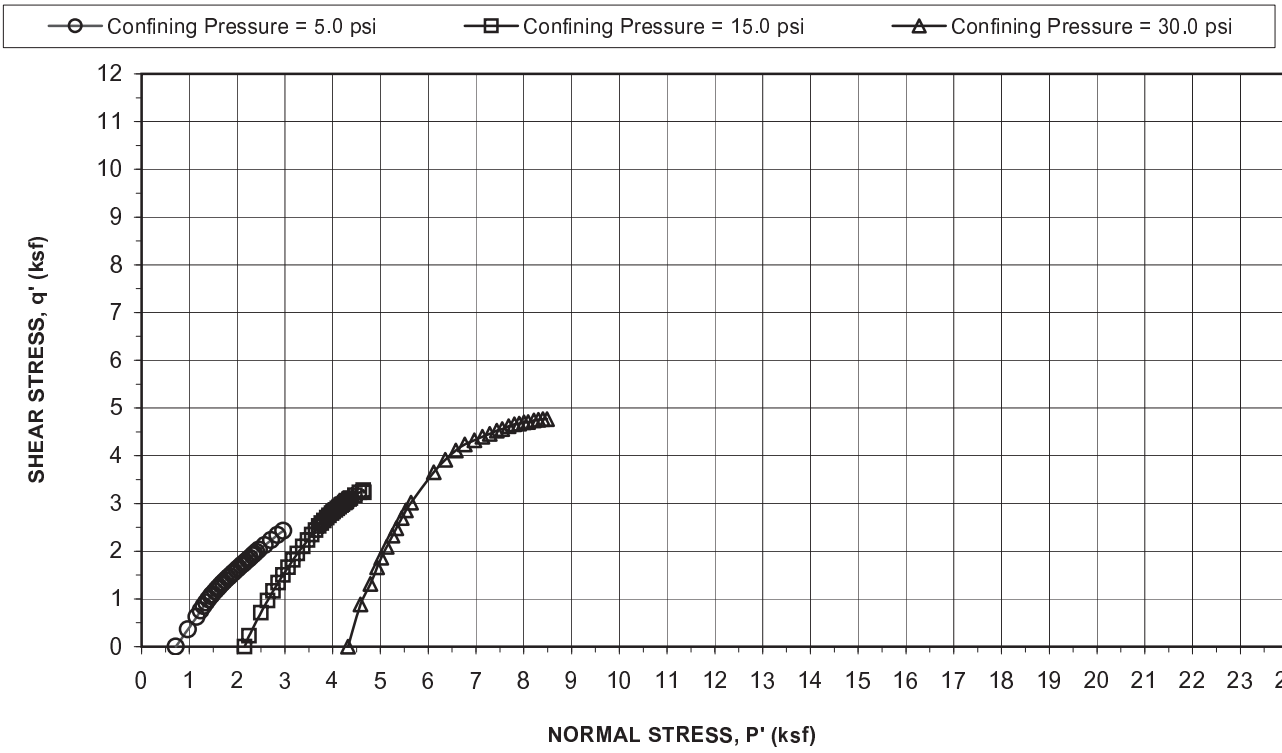
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
60.0	0	0.000	30.0	0.00	0.00	0.00	0.00	4.32
60.0	69	0.006	34.3	1.77	0.10	0.62	0.88	4.58
60.0	103	0.012	35.9	2.63	0.21	0.85	1.32	4.79
60.0	130	0.018	37.3	3.32	0.31	1.05	1.66	4.93
60.0	146	0.024	38.1	3.72	0.42	1.17	1.86	5.02
60.0	164	0.030	38.9	4.18	0.52	1.28	2.09	5.13
60.0	183	0.036	39.7	4.66	0.63	1.40	2.33	5.25
60.0	195	0.042	40.2	4.96	0.73	1.47	2.48	5.33
60.0	212	0.048	40.9	5.39	0.84	1.57	2.69	5.44
60.0	225	0.054	41.4	5.71	0.94	1.64	2.85	5.53
60.0	238	0.060	41.8	6.03	1.05	1.70	3.02	5.64
60.0	290	0.090	42.9	7.31	1.57	1.86	3.66	6.12
60.0	312	0.120	43.0	7.83	2.10	1.88	3.91	6.36
60.0	331	0.172	42.9	8.22	3.01	1.85	4.11	6.58
60.0	344	0.217	42.4	8.48	3.79	1.79	4.24	6.77
60.0	354	0.263	41.7	8.65	4.59	1.68	4.33	6.97
60.0	363	0.308	41.0	8.80	5.38	1.58	4.40	7.14
60.0	371	0.352	40.4	8.92	6.15	1.49	4.46	7.29
60.0	380	0.399	39.8	9.06	6.97	1.41	4.53	7.44
60.0	386	0.443	39.2	9.12	7.75	1.33	4.56	7.55
60.0	394	0.488	38.7	9.23	8.53	1.26	4.62	7.68
60.0	401	0.534	38.1	9.31	9.33	1.17	4.66	7.81
60.0	406	0.578	37.6	9.35	10.11	1.09	4.67	7.90
60.0	412	0.624	37.1	9.40	10.91	1.02	4.70	8.01
60.0	416	0.670	36.5	9.41	11.70	0.93	4.70	8.09
60.0	423	0.713	35.9	9.48	12.47	0.85	4.74	8.21
60.0	428	0.760	35.3	9.51	13.28	0.77	4.75	8.30
60.0	433	0.805	34.8	9.53	14.07	0.69	4.77	8.40
60.0	437	0.849	34.2	9.53	14.84	0.60	4.77	8.49
60.0	441	0.895	33.6	9.53	15.65	0.52	4.76	8.57
60.0	444	0.940	33.1	9.51	16.43	0.44	4.75	8.63
60.0	449	0.984	32.5	9.52	17.20	0.36	4.76	8.72
60.0	453	1.029	32.2	9.52	17.99	0.31	4.76	8.77
60.0	457	1.074	31.9	9.51	18.77	0.27	4.75	8.81
60.0	458	1.100	31.6	9.48	19.23	0.23	4.74	8.83

Figure D-2.30

AP Engineering & Testing, Inc.







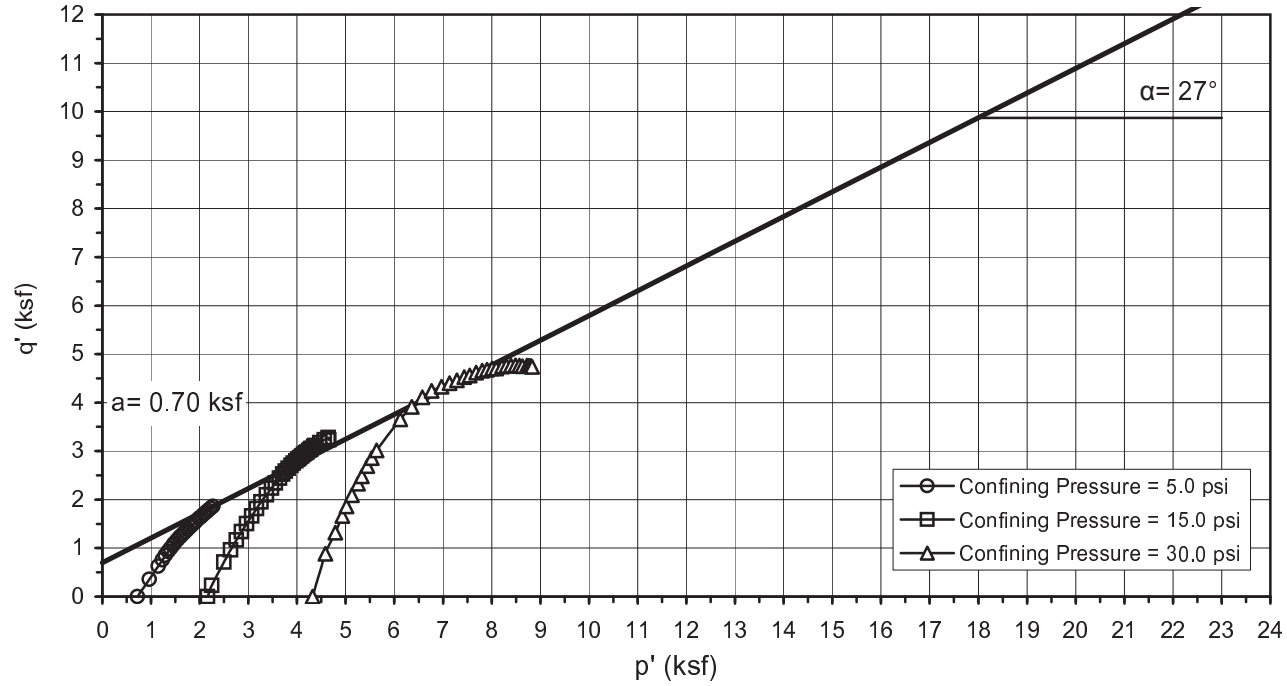
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Lean Clay with sand
Test Pit:	G-142	Avg. Dry Unit Weight (pcf):	116.0
Sample No.:	3	Avg. Initial Moisture Content (%):	14.6
Depth (ft):	15.5	Confining Pressure:	5.0, 15.0, 30.0 psi

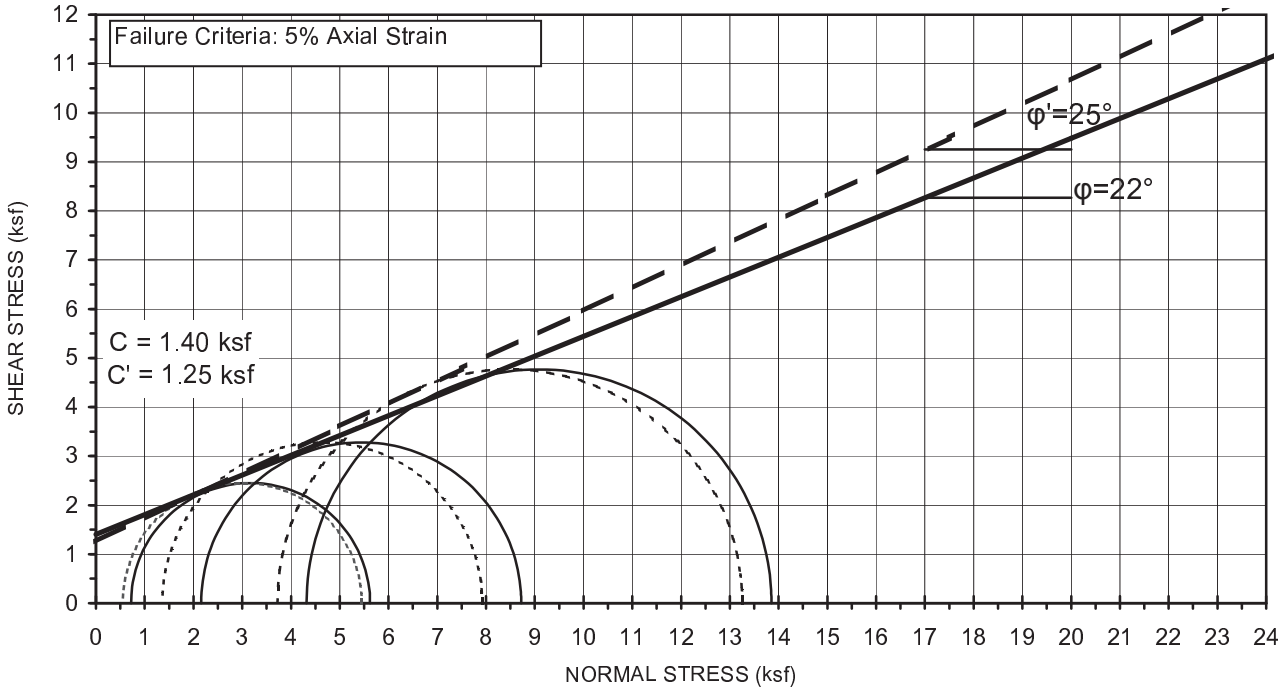
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.31

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Lean Clay with sand
Test Pit:	G-142	Avg. Dry Unit Weight (pcf):	116.0
Sample No.:	3	Avg. Initial Moisture Content (%):	14.6
Depth (ft):	15.5	Confining Pressures:	5.0, 15.0, 30.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.32

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	G-142	Reviewed by:	AP	Date:	04-17-15
Sample No.:	9	Sample Description:	Olive Brown Fat Clay		
Depth(ft):	43				
Sample Type:	Mod. Cal.	Confining Pressure = 25.0 psi			

Diameter (in)	2.615	2.615	2.615	Avg. =	2.615
Height (in)	5.710	5.710	5.710	Avg. =	5.710

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.371	5.371
Moisture Content (%)	18.21	24.20
Wet Weight (gms)	83.89	1214.25
Dry Weight (gms)	78.68	1012.68
Container Weight (gms)	50.07	179.79
Density and Saturation		
Wet Weight (gms)	1025.54	
Container Weight (gms)	0.00	
Wet Density (pcf)	127.4	
Dry Density (pcf)	107.8	
Initial Void Ratio	0.563	
% Saturation	87.3	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	55.0	Initial Burette Ht.(cm)=	0.0
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	0.0
Eff. Consol. Stress (psi) =	25.0	Final Height (in)=	5.710
Induced OCR =	1.0	Initial Volume (cu.in)=	30.667
Change in Ht. of Specimen (in) =	0.0000	Final Volume (cu.in) =	30.667

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	8.92
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	2.10
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	11.01
		Axial Strain (%) =	5.25

Figure D-2.33

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	G-142	Reviewed by:	AP	Date:	04-17-15
Sample No.:	9	Sample Description:	Olive Brown Clay		
Depth(ft):	43				
Sample Type:	Mod. Cal.	Confining Pressure = 35.0 psi			

Diameter (in)	2.615	2.615	2.615	Avg. =	2.615
Height (in)	5.710	5.710	5.710	Avg. =	5.710

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.371	5.633
Moisture Content (%)	18.21	24.20
Wet Weight (gms)	83.89	1214.25
Dry Weight (gms)	78.68	1012.68
Container Weight (gms)	50.07	179.79
Density and Saturation		
Wet Weight (gms)	1025.54	
Container Weight (gms)	0.00	
Wet Density (pcf)	127.4	
Dry Density (pcf)	107.8	
Initial Void Ratio	0.563	
% Saturation	87.3	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	65.0	Initial Burette Ht.(cm)=	88.3
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	84.6
Eff. Consol. Stress (psi) =	35.0	Final Height (in)=	5.704
Induced OCR=	1.0	Initial Volume (cu.in)=	30.667
Change in Ht. of Specimen (in) =	0.0060	Final Volume (cu.in) =	30.441

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	10.47
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	3.51
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	13.98
		Axial Strain (%) =	5.19

Figure D-2.34

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	04-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	04-17-15
Test Pit:	G-142	Reviewed by:	AP	Date:	04-17-15
Sample No.:	9	Sample Description:	Olive Brown Clay		
Depth(ft):	43				
Sample Type:	Mod. Cal.	Confining Pressure = 45.0 psi			

Diameter (in)	2.615	2.615	2.615	Avg. =	2.615
Height (in)	5.710	5.710	5.710	Avg. =	5.710

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.371	5.612
Moisture Content (%)	18.21	24.20
Wet Weight (gms)	83.89	1214.25
Dry Weight (gms)	78.68	1012.68
Container Weight (gms)	50.07	179.79
Density and Saturation		
Wet Weight (gms)	1025.54	
Container Weight (gms)	0.00	
Wet Density (pcf)	127.4	
Dry Density (pcf)	107.8	
Initial Void Ratio	0.563	
% Saturation	87.3	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	75.0	Initial Burette Ht.(cm)=	85.2
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	80.4
Eff. Consol. Stress (psi) =	45.0	Final Height (in)=	5.709
Induced OCR =	1.0	Initial Volume (cu.in)=	30.667
Change in Ht. of Specimen (in) =	0.0010	Final Volume (cu.in) =	30.374

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	13.20
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	5.53
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	18.73
		Axial Strain (%) =	7.97

Figure D-2.35

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	55.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Test Pit:	G-142	Consolidation Pressure :	25.0 psi
Depth(ft):	43	Initial Sample Height:	5.710 in
Sample No.:	9	Initial Area of Sample:	5.371 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.710 in
Sample Description:	Olive Brown Clay	Final Sample Area (A)*:	5.371 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
55.0	0	0.000	30.1	0.00	0.00	0.00	0.00	3.60
55.0	44	0.004	32.2	1.18	0.07	0.30	0.59	3.89
55.0	72	0.010	33.5	1.93	0.18	0.49	0.96	4.08
55.0	92	0.017	34.5	2.46	0.30	0.64	1.23	4.19
55.0	109	0.024	35.4	2.91	0.42	0.77	1.46	4.28
55.0	124	0.031	36.3	3.31	0.54	0.89	1.65	4.36
55.0	138	0.038	37.0	3.68	0.66	1.00	1.84	4.44
55.0	150	0.045	37.6	3.99	0.78	1.09	2.00	4.51
55.0	161	0.052	38.2	4.28	0.90	1.17	2.14	4.57
55.0	172	0.059	38.7	4.56	1.04	1.24	2.28	4.64
55.0	181	0.066	39.1	4.80	1.16	1.31	2.40	4.69
55.0	191	0.073	39.5	5.06	1.27	1.36	2.53	4.77
55.0	200	0.080	39.8	5.29	1.40	1.41	2.64	4.84
55.0	209	0.087	40.1	5.52	1.52	1.45	2.76	4.91
55.0	217	0.093	40.4	5.72	1.64	1.48	2.86	4.98
55.0	224	0.100	40.6	5.90	1.75	1.51	2.95	5.04
55.0	231	0.108	40.8	6.08	1.89	1.54	3.04	5.10
55.0	238	0.115	40.9	6.25	2.02	1.57	3.13	5.16
55.0	244	0.123	41.1	6.40	2.15	1.59	3.20	5.22
55.0	251	0.129	41.2	6.58	2.26	1.60	3.29	5.29
55.0	257	0.136	41.3	6.73	2.39	1.62	3.36	5.35
55.0	264	0.144	41.4	6.90	2.52	1.63	3.45	5.42
55.0	270	0.151	41.4	7.05	2.64	1.64	3.52	5.49
55.0	276	0.158	41.5	7.20	2.77	1.64	3.60	5.55
55.0	282	0.164	41.5	7.34	2.87	1.65	3.67	5.62
55.0	289	0.171	41.5	7.52	3.00	1.65	3.76	5.71
55.0	294	0.178	41.5	7.64	3.12	1.65	3.82	5.77
55.0	299	0.185	41.5	7.76	3.25	1.65	3.88	5.83
55.0	304	0.192	41.5	7.88	3.37	1.65	3.94	5.89
55.0	310	0.199	41.5	8.02	3.49	1.64	4.01	5.97
55.0	315	0.206	41.5	8.14	3.60	1.64	4.07	6.03
55.0	320	0.213	41.4	8.26	3.72	1.63	4.13	6.10
55.0	331	0.234	41.2	8.51	4.10	1.61	4.26	6.25
55.0	341	0.257	41.0	8.73	4.50	1.58	4.37	6.39
55.0	351	0.300	40.5	8.92	5.25	1.50	4.46	6.55

Figure D-2.36

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	65.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	G-142	Consolidation Pressure :	35.0	psi
Depth(ft):	43	Initial Sample Height:	5.710	in
Sample No.:	9	Initial Area of Sample:	5.371	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.704	in
Sample Description:	Olive Brown Clay	Final Sample Area (A)*:	5.633	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
65.0	1	0.000	30.0	0.03	0.00	0.00	0.01	5.05
65.0	34	0.002	31.6	0.87	0.04	0.22	0.43	5.25
65.0	86	0.008	33.9	2.20	0.13	0.56	1.10	5.57
65.0	120	0.014	35.5	3.06	0.25	0.78	1.53	5.79
65.0	145	0.021	36.7	3.69	0.37	0.96	1.85	5.93
65.0	167	0.028	37.7	4.25	0.49	1.10	2.12	6.06
65.0	187	0.035	38.5	4.75	0.62	1.23	2.38	6.19
65.0	205	0.041	39.3	5.20	0.73	1.33	2.60	6.31
65.0	223	0.049	39.9	5.65	0.85	1.43	2.83	6.44
65.0	241	0.055	40.5	6.10	0.96	1.51	3.05	6.58
65.0	258	0.062	41.0	6.52	1.09	1.59	3.26	6.72
65.0	275	0.069	41.5	6.95	1.21	1.65	3.47	6.86
65.0	291	0.075	41.9	7.34	1.32	1.71	3.67	7.00
65.0	306	0.082	42.3	7.71	1.44	1.76	3.86	7.13
65.0	321	0.089	42.5	8.08	1.56	1.80	4.04	7.28
65.0	334	0.095	42.7	8.40	1.67	1.83	4.20	7.41
65.0	345	0.103	42.9	8.66	1.80	1.85	4.33	7.52
65.0	354	0.109	42.9	8.88	1.92	1.86	4.44	7.62
65.0	361	0.116	43.0	9.04	2.04	1.86	4.52	7.70
65.0	367	0.124	42.9	9.18	2.17	1.86	4.59	7.77
65.0	373	0.131	42.9	9.32	2.30	1.86	4.66	7.84
65.0	377	0.139	42.9	9.40	2.44	1.85	4.70	7.89
65.0	382	0.146	42.8	9.52	2.56	1.84	4.76	7.96
65.0	386	0.153	42.7	9.60	2.68	1.83	4.80	8.01
65.0	390	0.160	42.6	9.69	2.81	1.82	4.85	8.07
65.0	394	0.167	42.6	9.78	2.93	1.81	4.89	8.12
65.0	397	0.174	42.5	9.84	3.05	1.79	4.92	8.17
65.0	400	0.181	42.4	9.90	3.17	1.78	4.95	8.21
65.0	403	0.188	42.3	9.96	3.29	1.77	4.98	8.26
65.0	411	0.209	42.0	10.12	3.66	1.73	5.06	8.37
65.0	418	0.229	41.7	10.26	4.02	1.68	5.13	8.48
65.0	422	0.252	41.4	10.31	4.42	1.63	5.16	8.56
65.0	427	0.274	41.0	10.39	4.81	1.58	5.20	8.65
65.0	432	0.296	40.6	10.47	5.19	1.53	5.24	8.75

Figure D-2.37

AP Engineering & Testing, Inc.

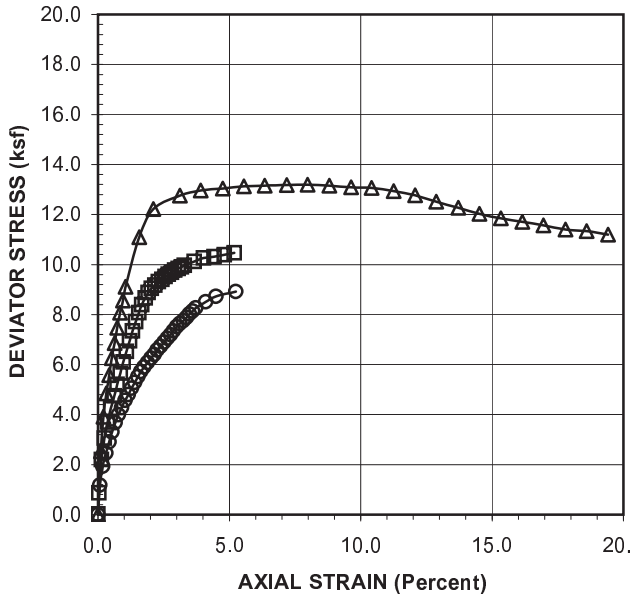
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

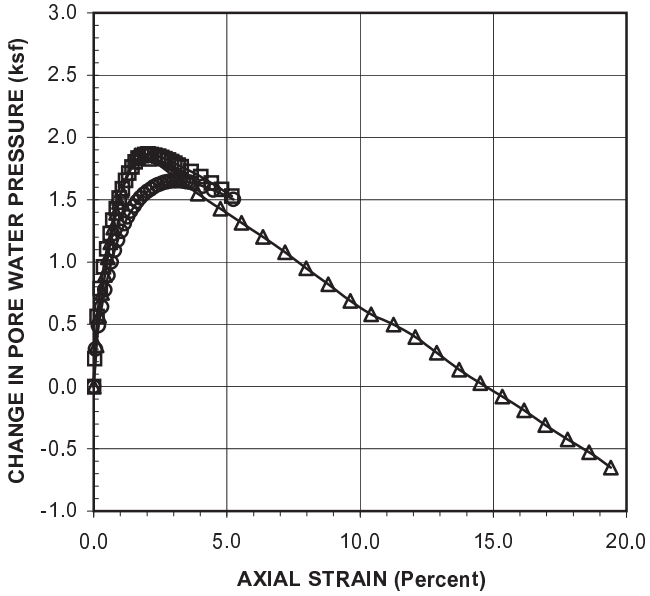
Project Name:	Westside Subway Extension	Cell Pressure:	75.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Test Pit:	G-142	Consolidation Pressure :	45.0	psi
Depth(ft):	43	Initial Sample Height:	5.710	in
Sample No.:	9	Initial Area of Sample:	5.371	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.709	in
Sample Description:	Olive Brown Clay	Final Sample Area (A)*:	5.612	sq. in.
		Induced OCR=	1.0	

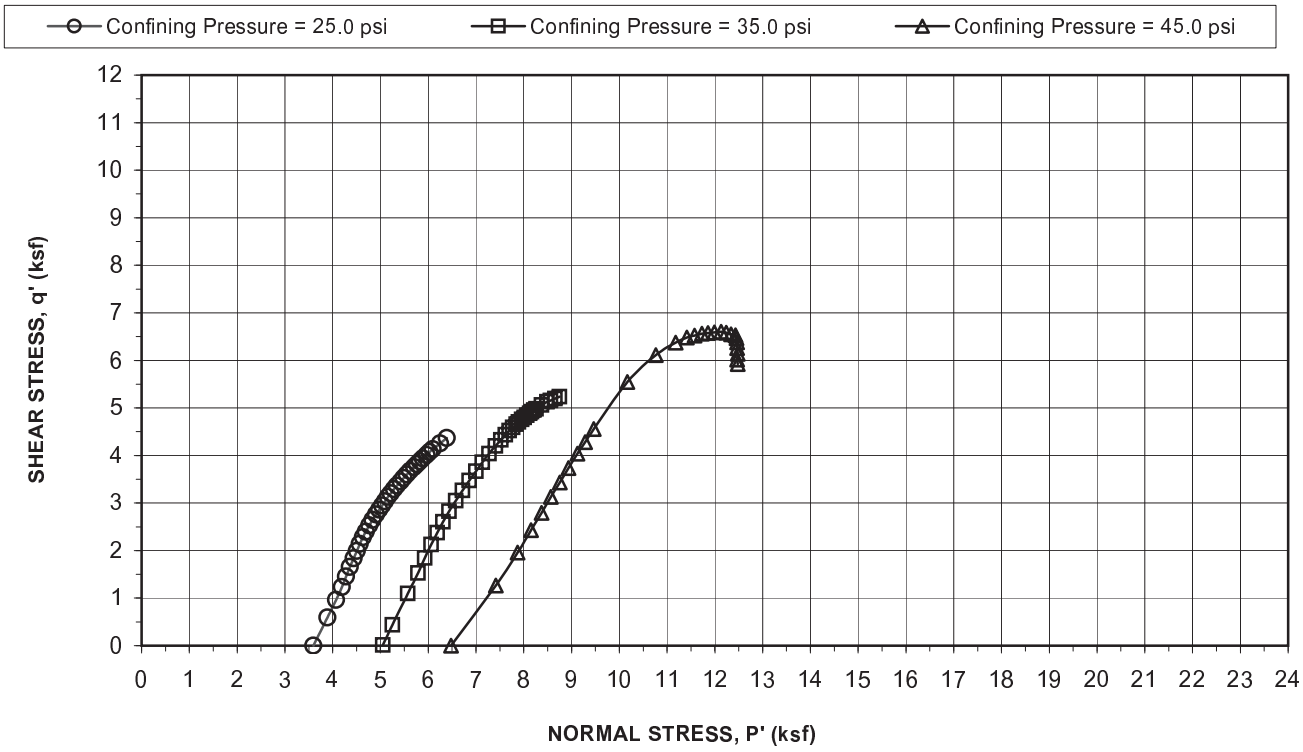
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
75.0	0	0.000	30.0	0.00	0.00	0.00	0.00	6.48
75.0	99	0.006	32.3	2.54	0.11	0.33	1.27	7.42
75.0	153	0.012	33.9	3.92	0.21	0.57	1.96	7.87
75.0	190	0.018	35.2	4.85	0.32	0.75	2.43	8.15
75.0	219	0.024	36.2	5.58	0.42	0.90	2.79	8.37
75.0	245	0.030	37.2	6.25	0.53	1.04	3.13	8.57
75.0	269	0.036	38.1	6.86	0.63	1.16	3.43	8.75
75.0	293	0.042	38.9	7.47	0.74	1.28	3.73	8.94
75.0	317	0.048	39.7	8.08	0.84	1.39	4.04	9.12
75.0	337	0.054	40.3	8.56	0.95	1.48	4.28	9.28
75.0	359	0.060	40.9	9.11	1.05	1.57	4.56	9.46
75.0	439	0.090	42.9	11.09	1.58	1.86	5.55	10.17
75.0	486	0.120	42.7	12.22	2.10	1.83	6.11	10.76
75.0	513	0.178	41.6	12.75	3.11	1.67	6.38	11.18
75.0	526	0.223	40.8	12.96	3.90	1.55	6.48	11.41
75.0	534	0.271	39.9	13.04	4.75	1.43	6.52	11.57
75.0	542	0.317	39.1	13.13	5.55	1.31	6.56	11.73
75.0	547	0.363	38.4	13.15	6.35	1.20	6.58	11.85
75.0	553	0.410	37.5	13.17	7.19	1.08	6.59	11.99
75.0	559	0.455	36.6	13.20	7.97	0.95	6.60	12.13
75.0	562	0.503	35.7	13.16	8.80	0.82	6.58	12.24
75.0	565	0.550	34.8	13.09	9.63	0.69	6.55	12.34
75.0	568	0.595	34.0	13.06	10.42	0.58	6.53	12.43
75.0	568	0.643	33.5	12.94	11.25	0.50	6.47	12.45
75.0	566	0.689	32.8	12.77	12.07	0.40	6.38	12.47
75.0	560	0.735	31.9	12.52	12.88	0.27	6.26	12.47
75.0	554	0.783	30.9	12.27	13.72	0.14	6.14	12.48
75.0	549	0.829	30.2	12.03	14.52	0.03	6.02	12.47
75.0	545	0.876	29.4	11.84	15.34	-0.08	5.92	12.48
75.0	544	0.922	28.7	11.70	16.16	-0.19	5.85	12.52
75.0	543	0.968	27.9	11.57	16.95	-0.31	5.78	12.57
75.0	541	1.016	27.1	11.40	17.79	-0.42	5.70	12.60
75.0	543	1.062	26.3	11.34	18.60	-0.53	5.67	12.68
75.0	542	1.108	25.5	11.20	19.41	-0.65	5.60	12.73

Figure D-2.38

AP Engineering & Testing, Inc.







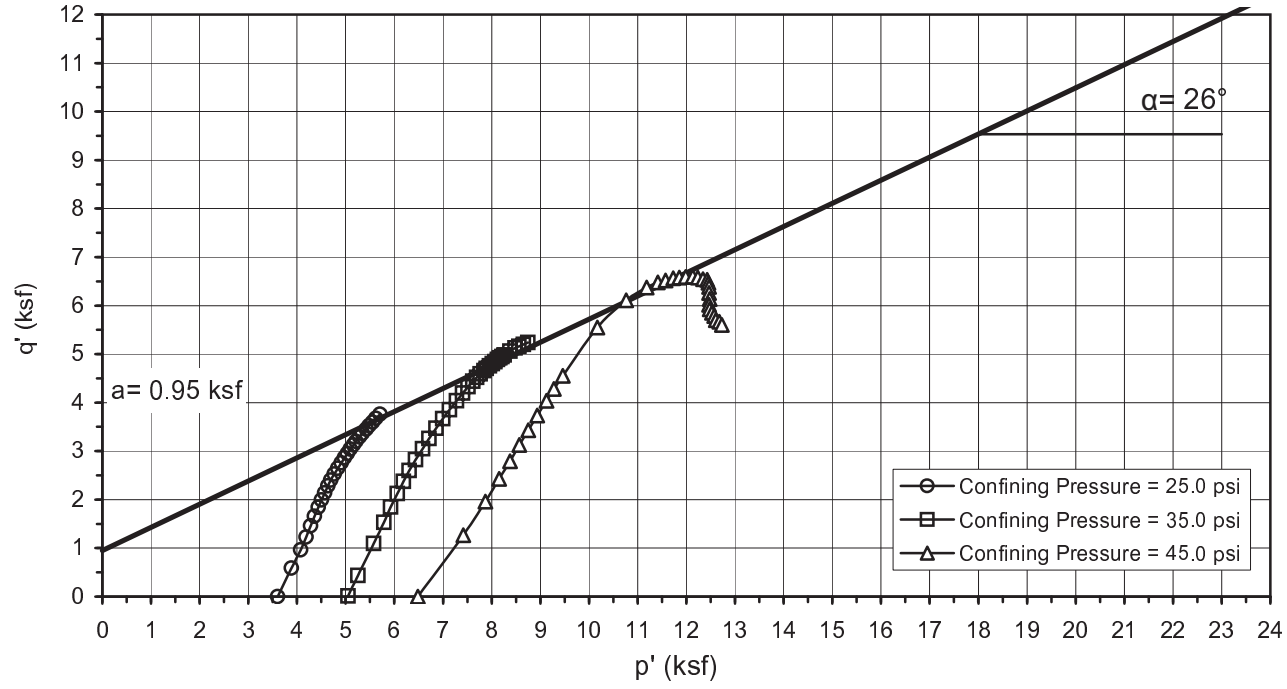
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Olive Brown Clay
Test Pit:	G-142	Avg. Dry Unit Weight (pcf):	107.8
Sample No.:	9	Avg. Initial Moisture Content (%):	18.2
Depth (ft):	43	Confining Pressure:	25.0, 35.0, 45.0 psi

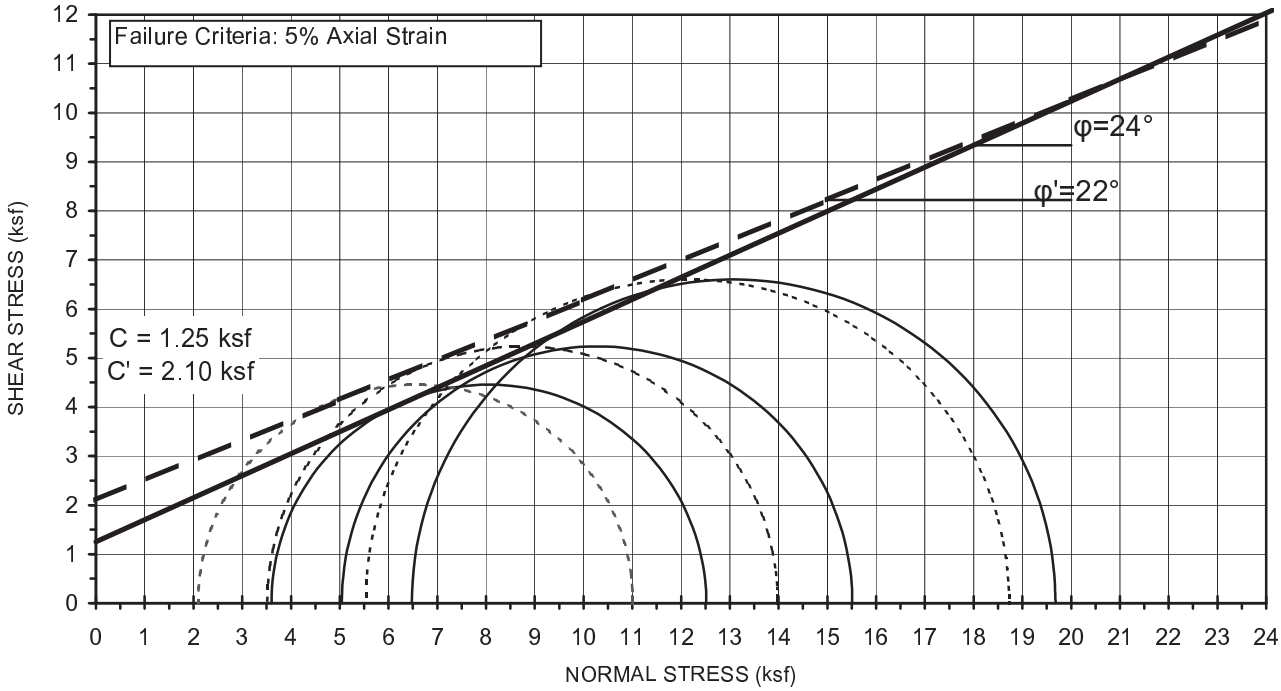
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.39

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Olive Brown Clay
Test Pit:	G-142	Avg. Dry Unit Weight (pcf):	107.8
Sample No.:	9	Avg. Initial Moisture Content (%):	18.2
Depth (ft):	43	Confining Pressures:	25.0, 35.0, 45.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.40

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-413	Reviewed by:	AP	Date:	05-14-15
Sample No.:	4	Sample Description:	Brown Lean Clay w/sand		
Depth(ft):	18.5				
Sample Type:	Mod. Cal.	Confining Pressure = 5.0 psi			

Diameter (in)	2.618	2.618	2.618	Avg. =	2.618
Height (in)	5.812	5.812	5.812	Avg. =	5.812

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.383	5.383
Moisture Content (%)	20.62	22.73
Wet Weight (gms)	65.60	1197.99
Dry Weight (gms)	62.88	1002.46
Container Weight (gms)	49.69	142.12
Density and Saturation		
Wet Weight (gms)	1049.16	
Container Weight (gms)	0.00	
Wet Density (pcf)	127.7	
Dry Density (pcf)	105.9	
Initial Void Ratio	0.591	
% Saturation	94.2	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	96	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	35.0	Initial Burette Ht.(cm)=	0.0
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	0.0
Eff. Consol. Stress (psi) =	5.0	Final Height (in)=	5.812
Induced OCR =	1.0	Initial Volume (cu.in)=	31.286
Change in Ht. of Specimen (in) =	0.0000	Final Volume (cu.in) =	31.286

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	3.48
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	0.55
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	4.02
		Axial Strain (%) =	5.16

Figure D-2.41

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-413	Reviewed by:	AP	Date:	05-14-15
Sample No.:	4	Sample Description:	Brown Lean Clay w/sand		
Depth(ft):	18.5				
Sample Type:	Mod. Cal.	Confining Pressure = 15.0 psi			

Diameter (in)	2.618	2.618	2.618	Avg. =	2.618
Height (in)	5.812	5.812	5.812	Avg. =	5.812

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.383	5.598
Moisture Content (%)	20.62	22.73
Wet Weight (gms)	65.60	1197.99
Dry Weight (gms)	62.88	1002.46
Container Weight (gms)	49.69	142.12
Density and Saturation		
Wet Weight (gms)	1049.16	
Container Weight (gms)	0.00	
Wet Density (pcf)	127.7	
Dry Density (pcf)	105.9	
Initial Void Ratio	0.591	
% Saturation	94.2	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	96	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	45.0	Initial Burette Ht.(cm)=	75.3
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	68.2
Eff. Consol. Stress (psi) =	15.0	Final Height (in)=	5.812
Induced OCR=	1.0	Initial Volume (cu.in)=	31.286
Change in Ht. of Specimen (in) =	0.0003	Final Volume (cu.in) =	30.853

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	5.34
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	1.34
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	6.69
		Axial Strain (%) =	5.13

Figure D-2.42

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-413	Reviewed by:	AP	Date:	05-14-15
Sample No.:	4	Sample Description:	Brown Lean Clay w/sand		
Depth(ft):	18.5				
Sample Type:	Mod. Cal.	Confining Pressure = 25.0 psi			

Diameter (in)	2.618	2.618	2.618	Avg. =	2.618
Height (in)	5.812	5.812	5.812	Avg. =	5.812

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.383	5.622
Moisture Content (%)	20.62	22.73
Wet Weight (gms)	65.60	1197.99
Dry Weight (gms)	62.88	1002.46
Container Weight (gms)	49.69	142.12
Density and Saturation		
Wet Weight (gms)	1049.16	
Container Weight (gms)	0.00	
Wet Density (pcf)	127.7	
Dry Density (pcf)	105.9	
Initial Void Ratio	0.591	
% Saturation	94.2	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	96	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	55.0	Initial Burette Ht.(cm)=	85.2
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	80.4
Eff. Consol. Stress (psi) =	25.0	Final Height (in)=	5.811
Induced OCR =	1.0	Initial Volume (cu.in)=	31.286
Change in Ht. of Specimen (in) =	0.0010	Final Volume (cu.in) =	30.993

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	7.44
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	3.24
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	10.68
		Axial Strain (%) =	18.89

Figure D-2.43

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	35.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-413	Consolidation Pressure :	5.0 psi
Depth(ft):	18.5	Initial Sample Height:	5.812 in
Sample No.:	4	Initial Area of Sample:	5.383 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.812 in
Sample Description:	Brown Lean Clay w/sand	Final Sample Area (A)*:	5.383 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
35.0	0	0.000	30.0	0.00	0.00	0.00	0.00	0.72
35.0	28	0.006	31.0	0.75	0.11	0.14	0.37	0.96
35.0	39	0.013	31.5	1.04	0.22	0.20	0.52	1.04
35.0	45	0.020	31.7	1.20	0.34	0.24	0.60	1.08
35.0	50	0.027	31.9	1.33	0.46	0.27	0.67	1.11
35.0	54	0.034	32.1	1.44	0.58	0.30	0.72	1.14
35.0	57	0.041	32.2	1.51	0.70	0.31	0.76	1.16
35.0	60	0.048	32.3	1.59	0.83	0.33	0.80	1.19
35.0	62	0.055	32.4	1.64	0.94	0.34	0.82	1.21
35.0	65	0.061	32.4	1.72	1.06	0.34	0.86	1.24
35.0	68	0.068	32.4	1.80	1.18	0.35	0.90	1.27
35.0	70	0.075	32.4	1.85	1.29	0.35	0.92	1.30
35.0	73	0.081	32.4	1.93	1.39	0.35	0.96	1.34
35.0	75	0.088	32.4	1.98	1.51	0.35	0.99	1.36
35.0	77	0.095	32.4	2.03	1.63	0.34	1.01	1.39
35.0	80	0.103	32.4	2.10	1.76	0.34	1.05	1.43
35.0	82	0.110	32.4	2.15	1.90	0.34	1.08	1.46
35.0	84	0.118	32.3	2.20	2.03	0.33	1.10	1.49
35.0	86	0.126	32.3	2.25	2.16	0.33	1.13	1.52
35.0	89	0.133	32.3	2.33	2.29	0.32	1.16	1.56
35.0	91	0.141	32.2	2.38	2.42	0.32	1.19	1.59
35.0	93	0.148	32.2	2.42	2.55	0.31	1.21	1.62
35.0	95	0.155	32.2	2.47	2.67	0.31	1.24	1.65
35.0	97	0.163	32.1	2.52	2.80	0.30	1.26	1.68
35.0	99	0.170	32.1	2.57	2.93	0.29	1.29	1.71
35.0	101	0.177	32.0	2.62	3.05	0.29	1.31	1.74
35.0	104	0.184	32.0	2.69	3.17	0.28	1.35	1.78
35.0	106	0.191	31.9	2.74	3.29	0.28	1.37	1.82
35.0	108	0.198	31.9	2.79	3.41	0.27	1.40	1.85
35.0	110	0.205	31.9	2.84	3.53	0.26	1.42	1.88
35.0	117	0.226	31.7	3.01	3.89	0.24	1.50	1.98
35.0	121	0.241	31.6	3.10	4.15	0.23	1.55	2.04
35.0	127	0.264	31.5	3.24	4.54	0.21	1.62	2.13
35.0	133	0.286	31.3	3.38	4.91	0.19	1.69	2.23
35.0	137	0.300	31.2	3.48	5.16	0.17	1.74	2.29

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	45.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-413	Consolidation Pressure :	15.0 psi
Depth(ft):	18.5	Initial Sample Height:	5.812 in
Sample No.:	4	Initial Area of Sample:	5.383 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.812 in
Sample Description:	Brown Lean Clay w/sand	Final Sample Area (A)*:	5.598 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
45.0	0	0.000	30.0	0.00	0.00	0.00	0.00	2.16
45.0	34	0.004	32.1	0.87	0.07	0.32	0.44	2.28
45.0	55	0.010	33.3	1.41	0.17	0.48	0.71	2.39
45.0	70	0.016	34.0	1.80	0.28	0.58	0.90	2.47
45.0	83	0.023	34.6	2.13	0.40	0.67	1.06	2.55
45.0	95	0.030	35.1	2.43	0.52	0.74	1.22	2.63
45.0	106	0.036	35.5	2.71	0.62	0.80	1.35	2.71
45.0	116	0.043	35.9	2.96	0.73	0.86	1.48	2.78
45.0	125	0.050	36.2	3.19	0.86	0.90	1.59	2.85
45.0	134	0.057	36.5	3.41	0.97	0.94	1.71	2.93
45.0	142	0.064	36.7	3.61	1.10	0.97	1.81	3.00
45.0	149	0.070	36.9	3.79	1.21	0.99	1.89	3.06
45.0	155	0.077	36.9	3.93	1.32	1.01	1.97	3.12
45.0	160	0.083	37.0	4.06	1.43	1.02	2.03	3.17
45.0	164	0.090	37.0	4.15	1.55	1.02	2.08	3.22
45.0	168	0.097	37.1	4.25	1.67	1.03	2.12	3.26
45.0	171	0.104	37.1	4.32	1.79	1.02	2.16	3.30
45.0	174	0.111	37.0	4.39	1.90	1.02	2.20	3.33
45.0	177	0.118	37.0	4.46	2.03	1.02	2.23	3.37
45.0	180	0.125	37.0	4.53	2.15	1.02	2.27	3.41
45.0	182	0.133	37.0	4.57	2.29	1.01	2.29	3.44
45.0	184	0.140	36.9	4.62	2.40	1.01	2.31	3.46
45.0	187	0.147	36.9	4.69	2.53	1.00	2.34	3.51
45.0	188	0.154	36.9	4.71	2.65	0.99	2.35	3.52
45.0	190	0.161	36.8	4.75	2.77	0.99	2.38	3.55
45.0	192	0.168	36.8	4.80	2.89	0.98	2.40	3.58
45.0	194	0.176	36.7	4.84	3.02	0.97	2.42	3.61
45.0	196	0.182	36.7	4.88	3.13	0.97	2.44	3.64
45.0	198	0.189	36.6	4.93	3.26	0.96	2.46	3.67
45.0	199	0.196	36.5	4.95	3.38	0.95	2.47	3.68
45.0	207	0.225	36.3	5.12	3.87	0.91	2.56	3.81
45.0	210	0.240	36.2	5.18	4.13	0.90	2.59	3.85
45.0	214	0.262	36.0	5.26	4.52	0.87	2.63	3.92
45.0	217	0.284	35.8	5.31	4.88	0.84	2.65	3.98
45.0	219	0.298	35.6	5.34	5.13	0.82	2.67	4.01

Figure D-2.45

AP Engineering & Testing, Inc.

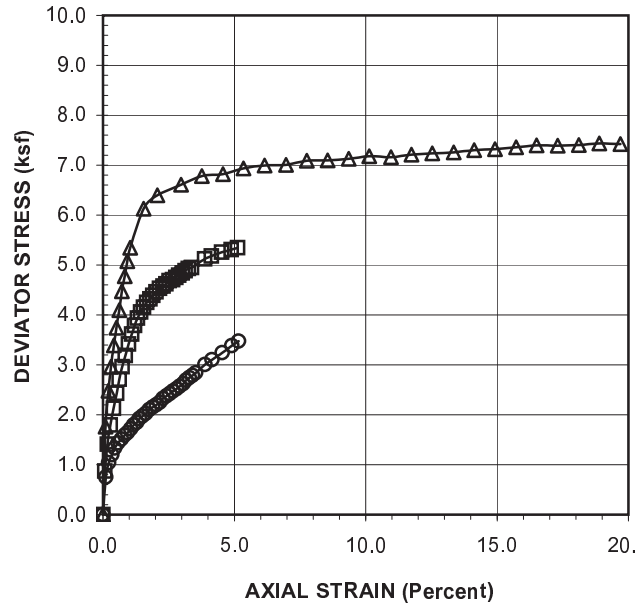
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

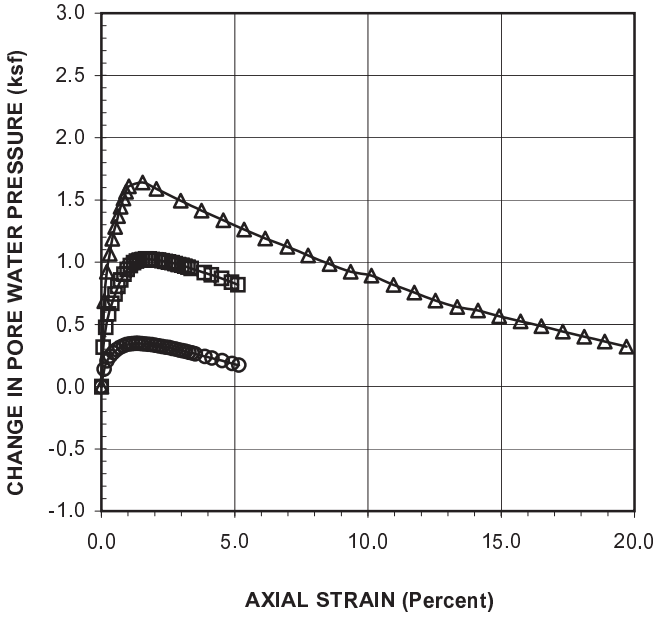
Project Name:	Westside Subway Extension	Cell Pressure:	55.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-413	Consolidation Pressure :	25.0 psi
Depth(ft):	18.5	Initial Sample Height:	5.812 in
Sample No.:	4	Initial Area of Sample:	5.383 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.811 in
Sample Description:	Brown Lean Clay w/sand	Final Sample Area (A)*:	5.622 sq. in.
		Induced OCR=	1.0

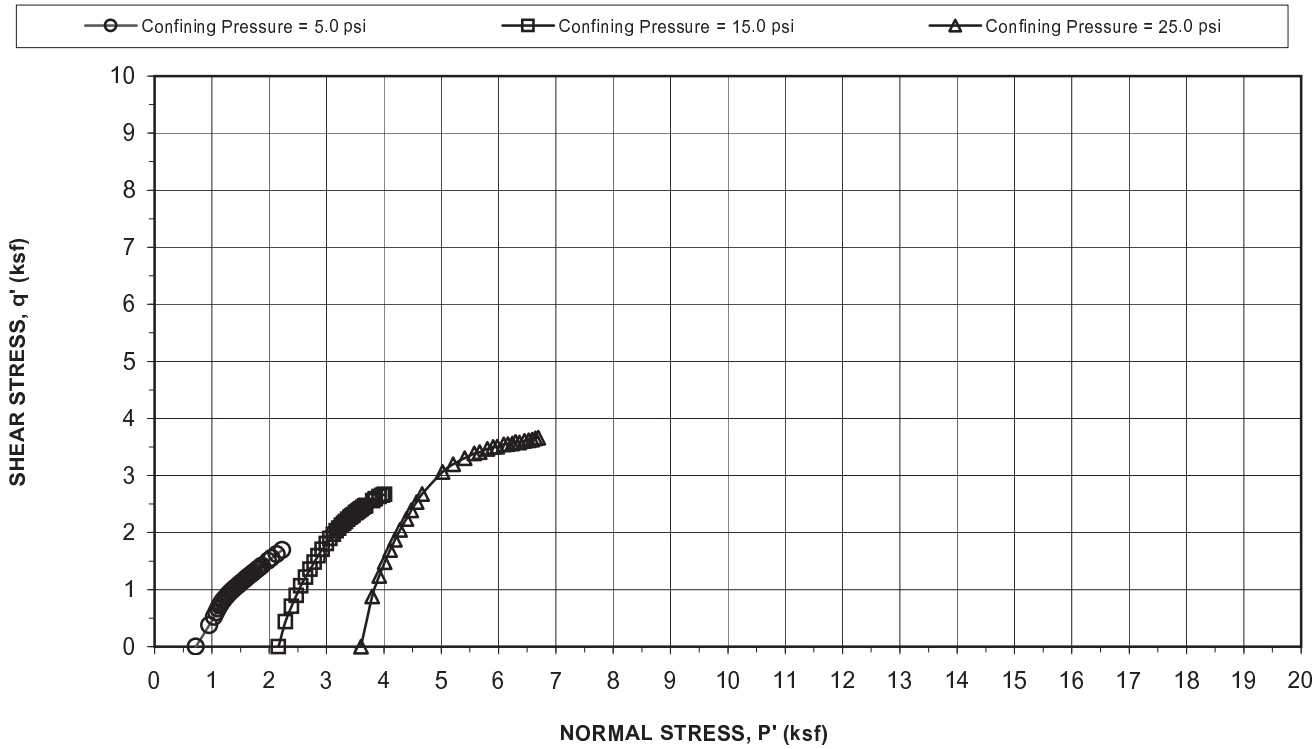
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
55.0	0	0.000	30.0	0.00	0.00	0.00	0.00	3.60
55.0	69	0.006	34.8	1.77	0.10	0.69	0.88	3.80
55.0	97	0.012	36.4	2.48	0.21	0.92	1.24	3.92
55.0	116	0.018	37.4	2.96	0.31	1.07	1.48	4.01
55.0	133	0.024	38.2	3.39	0.41	1.19	1.70	4.11
55.0	147	0.030	38.9	3.75	0.52	1.28	1.87	4.19
55.0	161	0.036	39.5	4.10	0.62	1.37	2.05	4.28
55.0	176	0.042	40.0	4.48	0.72	1.45	2.24	4.39
55.0	188	0.048	40.5	4.78	0.83	1.51	2.39	4.48
55.0	200	0.054	40.9	5.08	0.93	1.57	2.54	4.57
55.0	211	0.060	41.2	5.35	1.03	1.61	2.67	4.67
55.0	243	0.090	41.4	6.13	1.55	1.64	3.06	5.02
55.0	255	0.120	41.0	6.40	2.07	1.59	3.20	5.21
55.0	266	0.173	40.4	6.61	2.98	1.49	3.31	5.41
55.0	275	0.219	39.8	6.78	3.76	1.41	3.39	5.58
55.0	279	0.266	39.3	6.82	4.57	1.34	3.41	5.67
55.0	286	0.311	38.8	6.93	5.35	1.26	3.47	5.81
55.0	291	0.357	38.3	7.00	6.15	1.19	3.50	5.91
55.0	294	0.405	37.8	7.01	6.97	1.12	3.50	5.98
55.0	300	0.451	37.3	7.09	7.76	1.05	3.54	6.09
55.0	303	0.497	36.8	7.10	8.56	0.98	3.55	6.16
55.0	307	0.543	36.4	7.13	9.35	0.92	3.56	6.24
55.0	312	0.589	36.2	7.18	10.14	0.89	3.59	6.30
55.0	314	0.637	35.7	7.16	10.96	0.82	3.58	6.36
55.0	319	0.683	35.2	7.21	11.75	0.75	3.61	6.45
55.0	323	0.729	34.8	7.24	12.54	0.69	3.62	6.53
55.0	327	0.775	34.5	7.26	13.34	0.64	3.63	6.59
55.0	332	0.821	34.2	7.30	14.13	0.61	3.65	6.64
55.0	336	0.867	33.9	7.32	14.93	0.57	3.66	6.69
55.0	341	0.914	33.6	7.36	15.73	0.52	3.68	6.76
55.0	346	0.959	33.4	7.40	16.50	0.49	3.70	6.81
55.0	349	1.006	33.1	7.39	17.31	0.44	3.70	6.85
55.0	353	1.052	32.8	7.40	18.11	0.40	3.70	6.90
55.0	358	1.098	32.5	7.44	18.89	0.36	3.72	6.96
55.0	361	1.145	32.2	7.43	19.70	0.32	3.71	6.99

Figure D-2.46

AP Engineering & Testing, Inc.







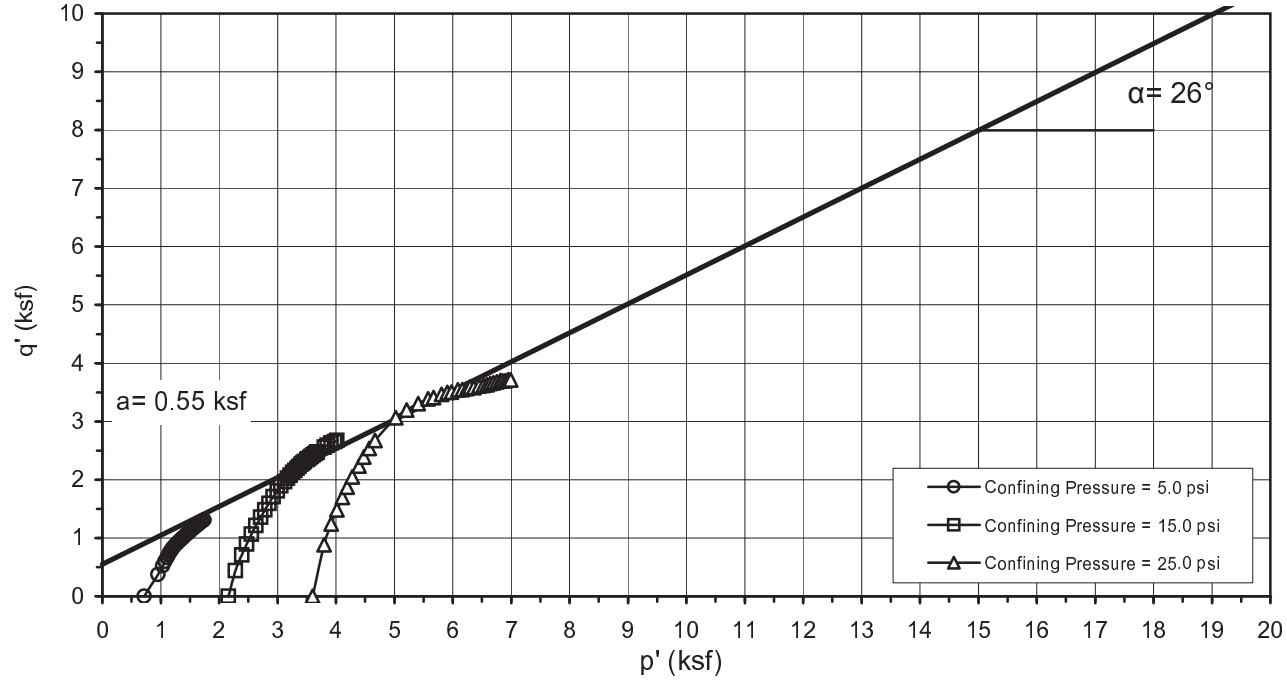
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Lean Clay w/sand
Boring No.:	G-413	Avg. Dry Unit Weight (pcf):	105.9
Sample No.:	4	Avg. Initial Moisture Content (%):	20.6
Depth (ft):	18.5	Confining Pressure:	5.0, 15.0, 25.0 psi

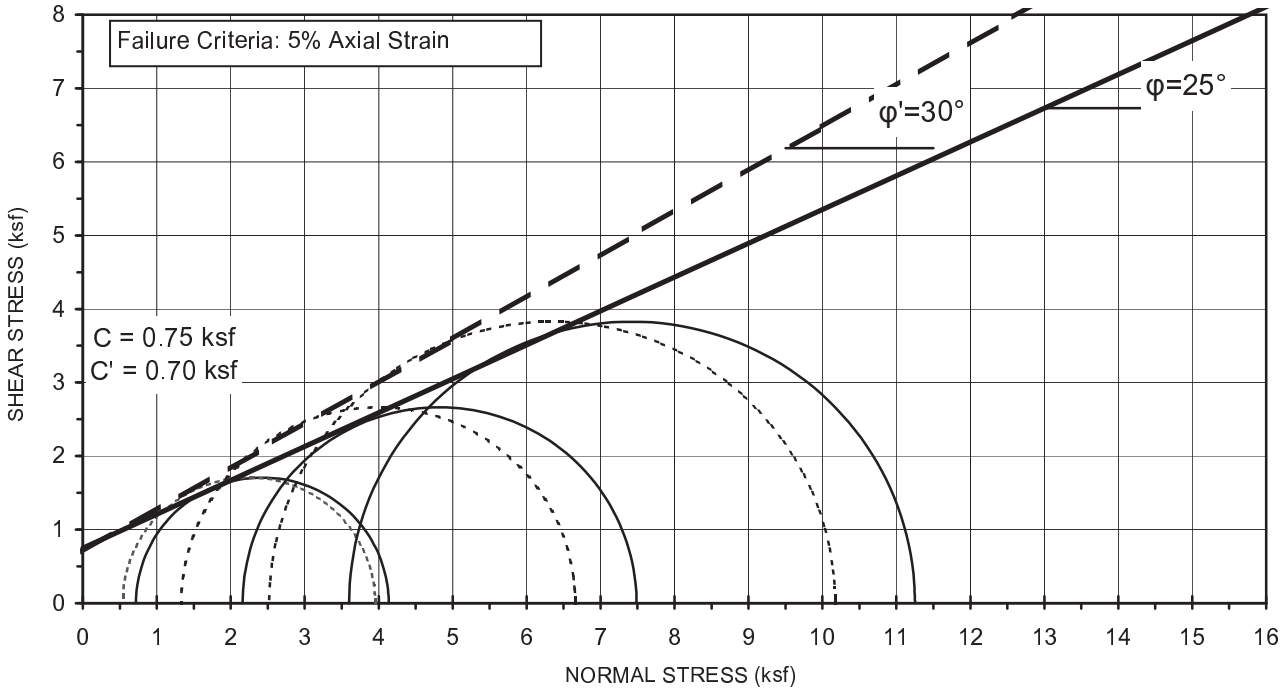
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.47

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Lean Clay w/sand
Boring No.:	G-413	Avg. Dry Unit Weight (pcf):	105.9
Sample No.:	4	Avg. Initial Moisture Content (%):	20.6
Depth (ft):	18.5	Confining Pressures:	5.0, 15.0, 25.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.48

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-413	Reviewed by:	AP	Date:	05-14-15
Sample No.:	6	Sample Description:	Olive Brown Sandy Lean Clay		
Depth(ft):	24.5				
Sample Type:	Mod. Cal.	Confining Pressure = 10.0 psi			

Diameter (in)	2.618	2.618	2.618	Avg. =	2.618
Height (in)	5.856	5.856	5.856	Avg. =	5.856

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.383	5.398
Moisture Content (%)	18.12	17.43
Wet Weight (gms)	1087.48	1229.50
Dry Weight (gms)	920.62	1069.04
Container Weight (gms)	0.00	148.42
Density and Saturation		
Wet Weight (gms)	1087.48	
Container Weight (gms)	0.00	
Wet Density (pcf)	131.4	
Dry Density (pcf)	111.3	
Initial Void Ratio	0.514	
% Saturation	95.1	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	95	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	40.0	Initial Burette Ht.(cm)=	74.8
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	72.5
Eff. Consol. Stress (psi) =	10.0	Final Height (in)=	5.814
Induced OCR =	1.0	Initial Volume (cu.in)=	31.523
Change in Ht. of Specimen (in) =	0.0417	Final Volume (cu.in) =	31.383

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	4.60
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	0.90
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	5.50
		Axial Strain (%) =	5.19

Figure D-2.49

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-413	Reviewed by:	AP	Date:	05-14-15
Sample No.:	6	Sample Description:	Olive Brown Sandy Lean Clay		
Depth(ft):	24.5				
Sample Type:	Mod. Cal.	Confining Pressure = 20.0 psi			

Diameter (in)	2.618	2.618	2.618	Avg. =	2.618
Height (in)	5.856	5.856	5.856	Avg. =	5.856

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.383	5.610
Moisture Content (%)	18.12	17.43
Wet Weight (gms)	1087.48	1229.50
Dry Weight (gms)	920.62	1069.04
Container Weight (gms)	0.00	148.42
Density and Saturation		
Wet Weight (gms)	1087.48	
Container Weight (gms)	0.00	
Wet Density (pcf)	131.4	
Dry Density (pcf)	111.3	
Initial Void Ratio	0.514	
% Saturation	95.1	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	95	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	50.0	Initial Burette Ht.(cm)=	72.4
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	66.0
Eff. Consol. Stress (psi) =	20.0	Final Height (in)=	5.853
Induced OCR=	1.0	Initial Volume (cu.in)=	31.523
Change in Ht. of Specimen (in) =	0.0029	Final Volume (cu.in) =	31.133

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	8.21
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	2.11
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	10.32
		Axial Strain (%) =	5.13

Figure D-2.50

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-413	Reviewed by:	AP	Date:	05-14-15
Sample No.:	6	Sample Description:	Olive Brown Sandy Lean Clay		
Depth(ft):	24.5				
Sample Type:	Mod. Cal.	Confining Pressure = 25.0 psi			

Diameter (in)	2.618	2.618	2.618	Avg. =	2.618
Height (in)	5.856	5.856	5.856	Avg. =	5.856

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.383	5.621
Moisture Content (%)	18.12	17.43
Wet Weight (gms)	1087.48	1229.50
Dry Weight (gms)	920.62	1069.04
Container Weight (gms)	0.00	148.42
Density and Saturation		
Wet Weight (gms)	1087.48	
Container Weight (gms)	0.00	
Wet Density (pcf)	131.4	
Dry Density (pcf)	111.3	
Initial Void Ratio	0.514	
% Saturation	95.1	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	95	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	60.0	Initial Burette Ht.(cm)=	65.9
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	61.1
Eff. Consol. Stress (psi) =	30.0	Final Height (in)=	5.856
Induced OCR =	1.0	Initial Volume (cu.in)=	31.523
Change in Ht. of Specimen (in) =	0.0000	Final Volume (cu.in) =	31.230

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	13.60
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	5.09
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	18.69
		Axial Strain (%) =	19.35

Figure D-2.51

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	40.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Boring No.:	G-413	Consolidation Pressure :	10.0	psi
Depth(ft):	24.5	Initial Sample Height:	5.856	in
Sample No.:	6	Initial Area of Sample:	5.383	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.814	in
Sample Description:	Olive Brown Sandy Lean Clay	Final Sample Area (A)*:	5.398	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
40.0	0	0.000	30.2	0.00	0.00	0.00	0.00	1.44
40.0	30	0.006	31.8	0.80	0.10	0.23	0.40	1.61
40.0	41	0.013	32.7	1.09	0.23	0.36	0.55	1.62
40.0	50	0.020	33.3	1.33	0.34	0.46	0.66	1.65
40.0	56	0.027	33.8	1.49	0.46	0.52	0.74	1.66
40.0	62	0.034	34.2	1.64	0.59	0.57	0.82	1.69
40.0	66	0.041	34.4	1.75	0.71	0.61	0.87	1.70
40.0	71	0.049	34.7	1.88	0.84	0.65	0.94	1.73
40.0	75	0.056	34.8	1.98	0.96	0.67	0.99	1.76
40.0	79	0.063	35.0	2.08	1.08	0.69	1.04	1.79
40.0	83	0.071	35.1	2.19	1.22	0.70	1.09	1.83
40.0	86	0.078	35.1	2.26	1.34	0.71	1.13	1.86
40.0	90	0.085	35.2	2.37	1.46	0.72	1.18	1.90
40.0	93	0.092	35.2	2.44	1.58	0.73	1.22	1.93
40.0	97	0.099	35.3	2.54	1.70	0.73	1.27	1.98
40.0	100	0.107	35.3	2.62	1.83	0.74	1.31	2.01
40.0	103	0.114	35.3	2.69	1.96	0.74	1.35	2.05
40.0	107	0.121	35.3	2.80	2.08	0.74	1.40	2.10
40.0	110	0.128	35.3	2.87	2.21	0.74	1.43	2.14
40.0	114	0.136	35.3	2.97	2.33	0.74	1.49	2.19
40.0	117	0.143	35.3	3.04	2.46	0.73	1.52	2.23
40.0	120	0.150	35.2	3.12	2.58	0.73	1.56	2.27
40.0	123	0.157	35.2	3.19	2.70	0.72	1.60	2.31
40.0	126	0.165	35.2	3.27	2.83	0.72	1.63	2.35
40.0	129	0.172	35.1	3.34	2.95	0.71	1.67	2.40
40.0	132	0.179	35.1	3.41	3.08	0.71	1.71	2.44
40.0	135	0.186	35.0	3.49	3.21	0.70	1.74	2.48
40.0	138	0.193	35.0	3.56	3.32	0.69	1.78	2.53
40.0	141	0.200	34.9	3.63	3.44	0.69	1.82	2.57
40.0	150	0.222	34.8	3.85	3.82	0.66	1.92	2.71
40.0	159	0.244	34.6	4.06	4.19	0.63	2.03	2.84
40.0	168	0.266	34.3	4.28	4.57	0.60	2.14	2.98
40.0	177	0.287	34.1	4.49	4.94	0.56	2.24	3.12
40.0	182	0.302	33.9	4.60	5.19	0.54	2.30	3.20

Figure D-2.52

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	50.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-413	Consolidation Pressure :	20.0 psi
Depth(ft):	24.5	Initial Sample Height:	5.856 in
Sample No.:	6	Initial Area of Sample:	5.383 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.853 in
Sample Description:	Olive Brown Sandy Lean Clay	Final Sample Area (A)*:	5.610 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
50.0	0	0.000	30.1	0.00	0.00	0.00	0.00	2.88
50.0	58	0.007	33.1	1.49	0.11	0.44	0.74	3.18
50.0	89	0.014	34.8	2.28	0.23	0.68	1.14	3.34
50.0	114	0.021	36.0	2.92	0.36	0.85	1.46	3.49
50.0	136	0.028	36.9	3.47	0.47	0.98	1.74	3.64
50.0	157	0.035	37.6	4.01	0.60	1.08	2.00	3.80
50.0	175	0.042	38.2	4.46	0.72	1.16	2.23	3.95
50.0	193	0.049	38.6	4.91	0.84	1.23	2.46	4.11
50.0	207	0.057	38.9	5.26	0.97	1.27	2.63	4.24
50.0	219	0.063	39.1	5.56	1.07	1.30	2.78	4.36
50.0	229	0.070	39.2	5.81	1.20	1.31	2.90	4.48
50.0	237	0.077	39.2	6.00	1.31	1.31	3.00	4.57
50.0	244	0.084	39.2	6.17	1.43	1.30	3.09	4.66
50.0	250	0.091	39.1	6.32	1.56	1.29	3.16	4.74
50.0	255	0.098	39.0	6.44	1.67	1.28	3.22	4.82
50.0	260	0.105	38.9	6.55	1.79	1.27	3.28	4.89
50.0	264	0.112	38.8	6.65	1.92	1.25	3.32	4.95
50.0	268	0.120	38.7	6.74	2.04	1.23	3.37	5.02
50.0	272	0.127	38.5	6.83	2.18	1.22	3.41	5.08
50.0	276	0.134	38.4	6.92	2.30	1.20	3.46	5.14
50.0	280	0.142	38.3	7.01	2.43	1.18	3.51	5.21
50.0	283	0.149	38.2	7.08	2.55	1.16	3.54	5.26
50.0	286	0.157	38.0	7.14	2.67	1.14	3.57	5.31
50.0	289	0.164	37.9	7.21	2.80	1.12	3.61	5.36
50.0	292	0.171	37.8	7.28	2.92	1.11	3.64	5.41
50.0	295	0.178	37.6	7.34	3.05	1.09	3.67	5.46
50.0	298	0.186	37.5	7.41	3.17	1.07	3.70	5.52
50.0	300	0.192	37.4	7.45	3.29	1.05	3.72	5.56
50.0	303	0.199	37.2	7.51	3.40	1.03	3.76	5.61
50.0	306	0.206	37.1	7.58	3.52	1.01	3.79	5.66
50.0	314	0.227	36.7	7.75	3.88	0.95	3.87	5.80
50.0	319	0.242	36.5	7.85	4.13	0.92	3.92	5.89
50.0	326	0.264	36.1	7.99	4.51	0.86	3.99	6.02
50.0	333	0.286	35.7	8.13	4.89	0.80	4.06	6.14
50.0	337	0.300	35.4	8.21	5.13	0.77	4.10	6.21

Figure D-2.53

AP Engineering & Testing, Inc.

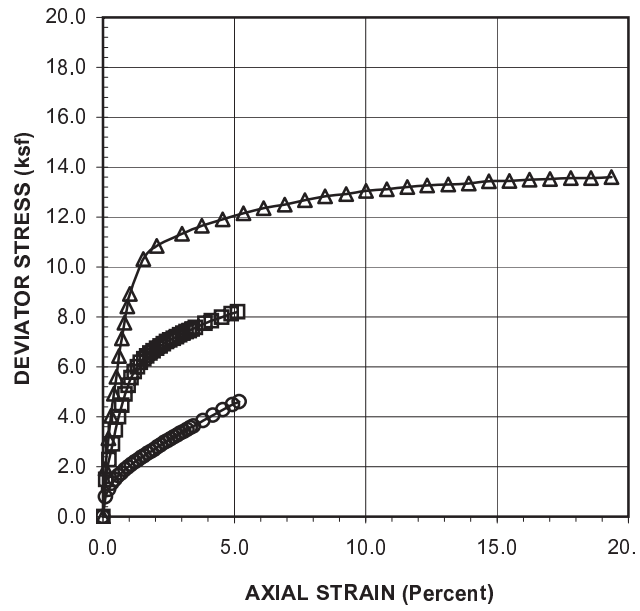
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

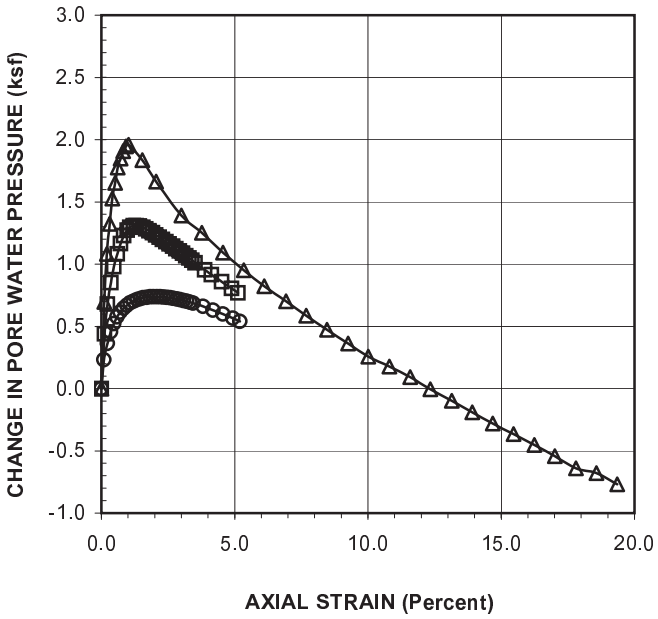
Project Name:	Westside Subway Extension	Cell Pressure:	60.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Boring No.:	G-413	Consolidation Pressure :	30.0	psi
Depth(ft):	24.5	Initial Sample Height:	5.856	in
Sample No.:	6	Initial Area of Sample:	5.383	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.856	in
Sample Description:	Olive Brown Sandy Lean Clay	Final Sample Area (A)*:	5.621	sq. in.
		Induced OCR=	1.0	

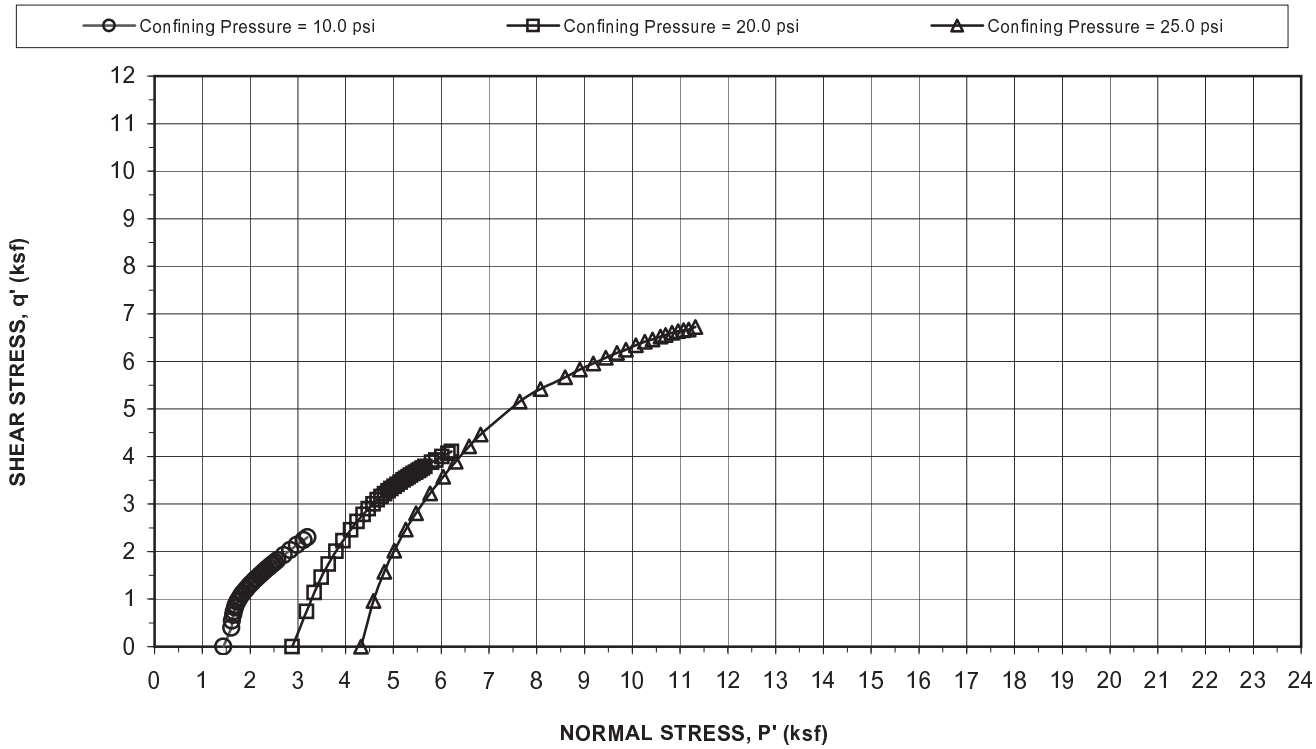
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
60.0	0	0.000	30.0	0.00	0.00	0.00	0.00	4.32
60.0	75	0.006	34.8	1.92	0.10	0.70	0.96	4.58
60.0	123	0.012	37.5	3.14	0.20	1.08	1.57	4.81
60.0	158	0.018	39.2	4.04	0.31	1.32	2.02	5.01
60.0	193	0.024	40.6	4.92	0.41	1.53	2.46	5.26
60.0	220	0.030	41.5	5.61	0.51	1.65	2.80	5.47
60.0	253	0.036	42.3	6.44	0.61	1.78	3.22	5.77
60.0	281	0.042	42.8	7.15	0.72	1.85	3.57	6.04
60.0	306	0.048	43.2	7.77	0.82	1.91	3.89	6.30
60.0	332	0.054	43.5	8.43	0.92	1.95	4.21	6.59
60.0	352	0.060	43.6	8.92	1.02	1.96	4.46	6.82
60.0	409	0.090	42.7	10.32	1.54	1.83	5.16	7.64
60.0	432	0.120	41.6	10.84	2.05	1.66	5.42	8.08
60.0	456	0.176	39.7	11.33	3.00	1.39	5.67	8.59
60.0	473	0.221	38.7	11.66	3.77	1.25	5.83	8.90
60.0	487	0.267	37.6	11.91	4.56	1.09	5.95	9.18
60.0	501	0.313	36.6	12.15	5.34	0.95	6.07	9.44
60.0	514	0.358	35.7	12.36	6.11	0.82	6.18	9.68
60.0	524	0.405	34.9	12.49	6.92	0.70	6.25	9.87
60.0	536	0.450	34.1	12.68	7.68	0.59	6.34	10.07
60.0	547	0.495	33.3	12.83	8.46	0.47	6.41	10.26
60.0	556	0.542	32.5	12.92	9.26	0.36	6.46	10.42
60.0	566	0.587	31.8	13.05	10.02	0.26	6.52	10.59
60.0	574	0.633	31.2	13.11	10.81	0.18	6.56	10.70
60.0	583	0.679	30.7	13.20	11.59	0.09	6.60	10.83
60.0	591	0.723	30.0	13.27	12.34	0.00	6.64	10.96
60.0	598	0.770	29.3	13.31	13.14	-0.10	6.65	11.07
60.0	605	0.815	28.7	13.34	13.92	-0.19	6.67	11.18
60.0	615	0.860	28.1	13.44	14.69	-0.28	6.72	11.32
60.0	621	0.906	27.5	13.45	15.47	-0.37	6.72	11.41
60.0	629	0.951	26.9	13.50	16.24	-0.45	6.75	11.52
60.0	636	0.996	26.2	13.52	17.01	-0.54	6.76	11.62
60.0	644	1.043	25.5	13.56	17.81	-0.64	6.78	11.74
60.0	650	1.087	25.3	13.56	18.57	-0.68	6.78	11.78
60.0	658	1.133	24.7	13.60	19.35	-0.77	6.80	11.89

Figure D-2.54

AP Engineering & Testing, Inc.







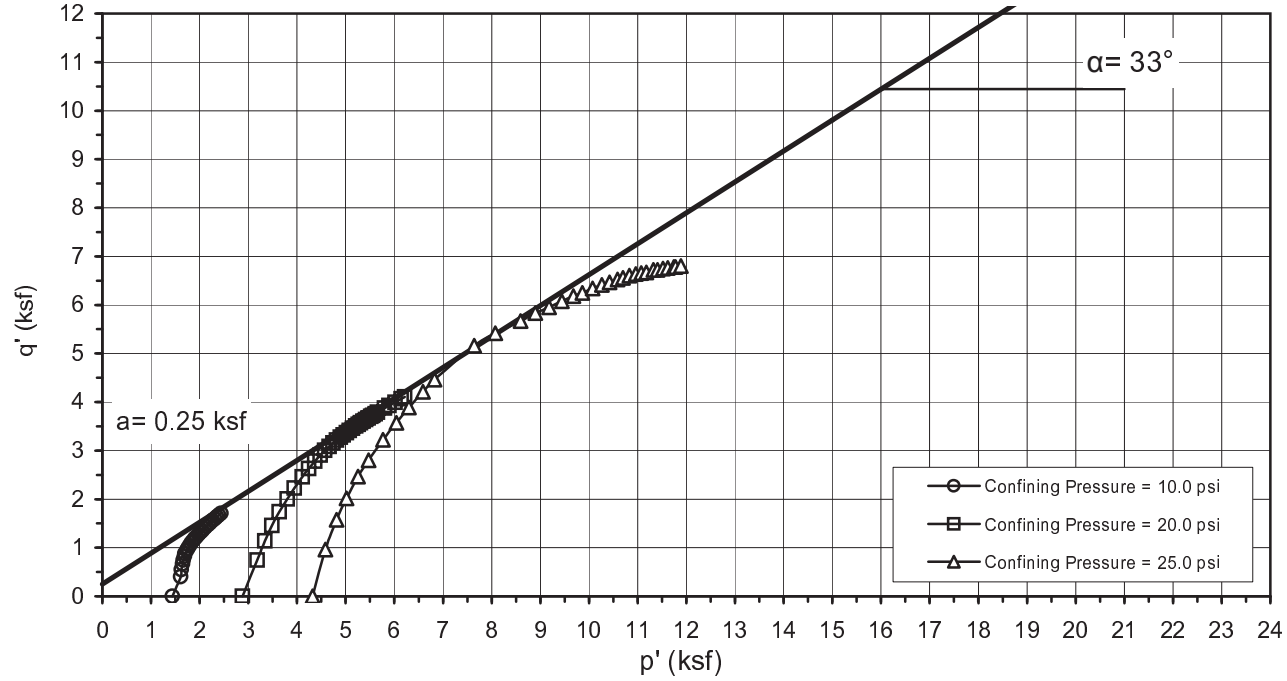
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Olive Brown Sandy Lean Clay
Boring No.:	G-413	Avg. Dry Unit Weight (pcf):	111.3
Sample No.:	6	Avg. Initial Moisture Content (%):	18.1
Depth (ft):	24.5	Confining Pressure:	10.0, 20.0, 25.0 psi

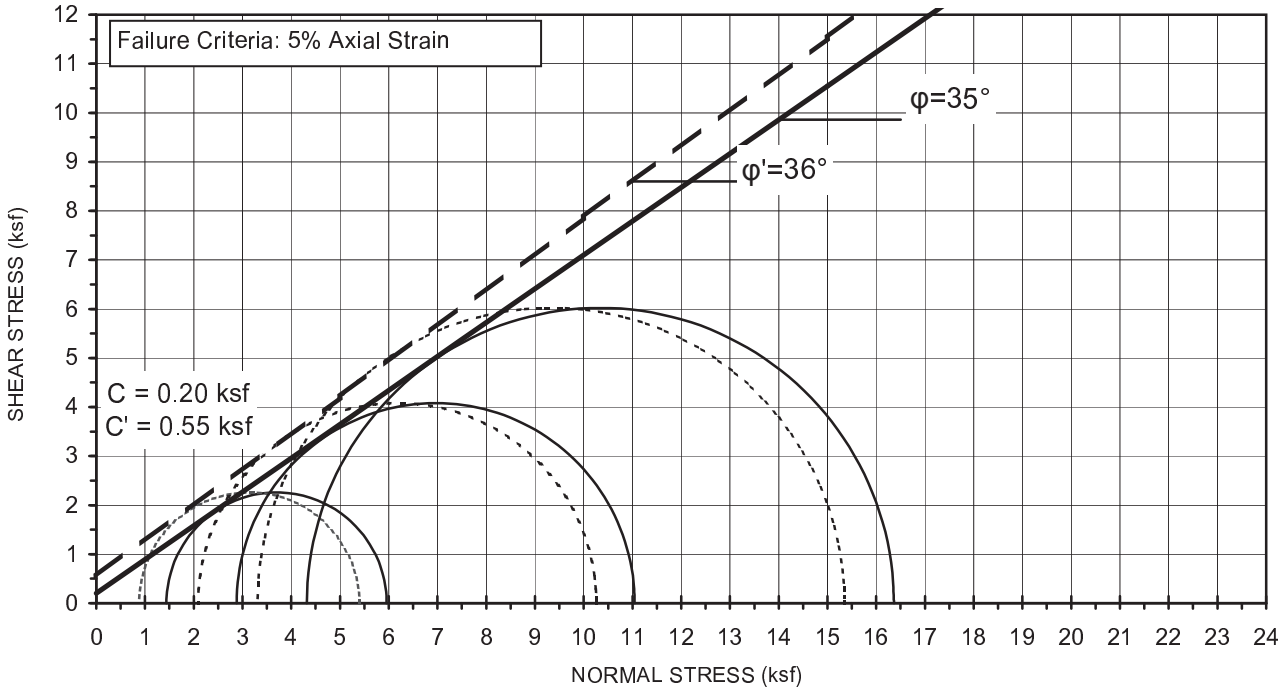
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.55

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Olive Brown Sandy Lean Clay
Boring No.:	G-413	Avg. Dry Unit Weight (pcf):	111.3
Sample No.:	6	Avg. Initial Moisture Content (%):	18.1
Depth (ft):	24.5	Confining Pressures:	10.0, 20.0, 25.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.56

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-414	Reviewed by:	AP	Date:	05-14-15
Sample No.:	5	Sample Description:	Dark Brown Sandy Lean Clay		
Depth(ft):	25.5				
Sample Type:	Mod. Cal.	Confining Pressure = 10.0 psi			

Diameter (in)	2.621	2.621	2.621	Avg. =	2.621
Height (in)	5.713	5.713	5.713	Avg. =	5.713

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.395	5.381
Moisture Content (%)	16.71	16.44
Wet Weight (gms)	1049.75	1188.70
Dry Weight (gms)	899.46	1040.85
Container Weight (gms)	0.00	141.39
Density and Saturation		
Wet Weight (gms)	1049.75	
Container Weight (gms)	0.00	
Wet Density (pcf)	129.7	
Dry Density (pcf)	111.2	
Initial Void Ratio	0.516	
% Saturation	87.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	40.0	Initial Burette Ht.(cm)=	83.8
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	81.4
Eff. Consol. Stress (psi) =	10.0	Final Height (in)=	5.701
Induced OCR =	1.0	Initial Volume (cu.in)=	30.824
Change in Ht. of Specimen (in) =	0.0120	Final Volume (cu.in) =	30.678

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	2.82
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	0.63
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	3.44
		Axial Strain (%) =	5.20

Figure D-2.57

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-414	Reviewed by:	AP	Date:	05-14-15
Sample No.:	5	Sample Description:	Dark Brown Sandy Lean Clay		
Depth(ft):	25.5				
Sample Type:	Mod. Cal.	Confining Pressure = 20.0 psi			

Diameter (in)	2.621	2.621	2.621	Avg. =	2.621
Height (in)	5.713	5.713	5.713	Avg. =	5.713

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.395	5.594
Moisture Content (%)	16.71	16.44
Wet Weight (gms)	1049.75	1188.70
Dry Weight (gms)	899.46	1040.85
Container Weight (gms)	0.00	141.39
Density and Saturation		
Wet Weight (gms)	1049.75	
Container Weight (gms)	0.00	
Wet Density (pcf)	129.7	
Dry Density (pcf)	111.2	
Initial Void Ratio	0.516	
% Saturation	87.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	50.0	Initial Burette Ht.(cm)=	81.5
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	72.8
Eff. Consol. Stress (psi) =	20.0	Final Height (in)=	5.713
Induced OCR=	1.0	Initial Volume (cu.in)=	30.824
Change in Ht. of Specimen (in) =	0.0003	Final Volume (cu.in) =	30.293

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	4.65
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	1.58
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	6.23
		Axial Strain (%) =	5.02

Figure D-2.58

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-414	Reviewed by:	AP	Date:	05-14-15
Sample No.:	5	Sample Description:	Dark Brown Sandy Lean Clay		
Depth(ft):	25.5				
Sample Type:	Mod. Cal.	Confining Pressure = 30.0 psi			

Diameter (in)	2.621	2.621	2.621	Avg. =	2.621
Height (in)	5.713	5.713	5.713	Avg. =	5.713

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.395	5.611
Moisture Content (%)	16.71	16.44
Wet Weight (gms)	1049.75	1188.70
Dry Weight (gms)	899.46	1040.85
Container Weight (gms)	0.00	141.39
Density and Saturation		
Wet Weight (gms)	1049.75	
Container Weight (gms)	0.00	
Wet Density (pcf)	129.7	
Dry Density (pcf)	111.2	
Initial Void Ratio	0.516	
% Saturation	87.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	60.0	Initial Burette Ht.(cm)=	72.8
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	66.6
Eff. Consol. Stress (psi) =	30.0	Final Height (in)=	5.713
Induced OCR =	1.0	Initial Volume (cu.in)=	30.824
Change in Ht. of Specimen (in) =	0.0000	Final Volume (cu.in) =	30.446

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	7.89
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	3.35
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	11.24
		Axial Strain (%) =	21.57

Figure D-2.59

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	40.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-414	Consolidation Pressure :	10.0 psi
Depth(ft):	25.5	Initial Sample Height:	5.713 in
Sample No.:	5	Initial Area of Sample:	5.395 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.701 in
Sample Description:	Dark Brown Sandy Lean Clay	Final Sample Area (A)*:	5.381 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
40.0	0	0.000	30.0	0.00	0.00	0.00	0.00	1.44
40.0	31	0.007	32.3	0.83	0.13	0.33	0.41	1.53
40.0	42	0.014	33.0	1.12	0.25	0.44	0.56	1.56
40.0	50	0.021	33.6	1.33	0.37	0.52	0.67	1.59
40.0	55	0.028	34.1	1.46	0.50	0.59	0.73	1.58
40.0	59	0.036	34.5	1.57	0.63	0.64	0.78	1.58
40.0	62	0.044	34.8	1.65	0.76	0.69	0.82	1.57
40.0	65	0.050	35.0	1.72	0.88	0.73	0.86	1.58
40.0	68	0.057	35.3	1.80	1.00	0.76	0.90	1.58
40.0	70	0.065	35.4	1.85	1.14	0.78	0.93	1.58
40.0	72	0.072	35.6	1.90	1.26	0.80	0.95	1.59
40.0	75	0.079	35.7	1.98	1.39	0.82	0.99	1.61
40.0	77	0.086	35.8	2.03	1.51	0.84	1.01	1.62
40.0	78	0.093	35.9	2.05	1.64	0.85	1.03	1.62
40.0	80	0.100	36.0	2.10	1.75	0.86	1.05	1.63
40.0	83	0.107	36.0	2.18	1.88	0.87	1.09	1.66
40.0	84	0.114	36.1	2.20	2.00	0.87	1.10	1.67
40.0	86	0.122	36.1	2.25	2.14	0.88	1.13	1.69
40.0	87	0.129	36.1	2.28	2.26	0.88	1.14	1.70
40.0	89	0.136	36.1	2.32	2.39	0.88	1.16	1.72
40.0	90	0.144	36.1	2.35	2.52	0.88	1.17	1.73
40.0	92	0.151	36.1	2.40	2.65	0.88	1.20	1.76
40.0	93	0.159	36.1	2.42	2.78	0.88	1.21	1.77
40.0	94	0.166	36.1	2.44	2.91	0.88	1.22	1.78
40.0	95	0.174	36.1	2.46	3.04	0.88	1.23	1.79
40.0	95	0.181	36.1	2.46	3.17	0.88	1.23	1.80
40.0	96	0.188	36.1	2.48	3.30	0.87	1.24	1.81
40.0	97	0.195	36.1	2.51	3.42	0.87	1.25	1.82
40.0	98	0.202	36.0	2.53	3.55	0.87	1.26	1.84
40.0	102	0.224	36.0	2.62	3.93	0.86	1.31	1.89
40.0	106	0.245	35.9	2.71	4.30	0.85	1.36	1.95
40.0	108	0.260	35.8	2.76	4.56	0.84	1.38	1.98
40.0	110	0.282	35.7	2.80	4.94	0.82	1.40	2.02
40.0	111	0.296	35.7	2.82	5.20	0.81	1.41	2.03

Figure D-2.60

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	50.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-414	Consolidation Pressure :	20.0 psi
Depth(ft):	25.5	Initial Sample Height:	5.713 in
Sample No.:	5	Initial Area of Sample:	5.395 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.713 in
Sample Description:	Dark Brown Sandy Lean Clay	Final Sample Area (A)*:	5.594 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
50.0	1	0.000	30.0	0.03	0.00	0.00	0.01	2.89
50.0	59	0.007	34.1	1.52	0.12	0.59	0.76	3.05
50.0	86	0.014	35.7	2.21	0.24	0.82	1.10	3.17
50.0	103	0.020	36.7	2.64	0.35	0.96	1.32	3.24
50.0	116	0.027	37.4	2.97	0.48	1.06	1.49	3.30
50.0	127	0.034	38.0	3.25	0.60	1.15	1.62	3.35
50.0	136	0.042	38.5	3.48	0.73	1.22	1.74	3.40
50.0	142	0.049	38.8	3.62	0.86	1.27	1.81	3.43
50.0	147	0.057	39.0	3.75	0.99	1.30	1.87	3.46
50.0	151	0.064	39.2	3.84	1.11	1.32	1.92	3.48
50.0	154	0.071	39.2	3.92	1.24	1.33	1.96	3.51
50.0	156	0.077	39.3	3.96	1.35	1.34	1.98	3.52
50.0	159	0.084	39.3	4.03	1.48	1.34	2.02	3.56
50.0	160	0.091	39.3	4.05	1.60	1.34	2.03	3.56
50.0	163	0.098	39.3	4.12	1.72	1.34	2.06	3.60
50.0	164	0.106	39.4	4.14	1.85	1.35	2.07	3.61
50.0	166	0.113	39.4	4.19	1.97	1.35	2.09	3.63
50.0	167	0.120	39.4	4.21	2.10	1.35	2.10	3.64
50.0	169	0.128	39.4	4.25	2.23	1.35	2.13	3.66
50.0	170	0.135	39.4	4.27	2.37	1.35	2.14	3.67
50.0	171	0.142	39.4	4.29	2.48	1.35	2.15	3.68
50.0	172	0.149	39.3	4.31	2.61	1.34	2.16	3.69
50.0	174	0.157	39.3	4.36	2.74	1.34	2.18	3.71
50.0	174	0.164	39.3	4.35	2.87	1.34	2.18	3.71
50.0	175	0.171	39.3	4.37	3.00	1.34	2.18	3.72
50.0	175	0.179	39.3	4.36	3.14	1.34	2.18	3.72
50.0	176	0.186	39.3	4.38	3.25	1.34	2.19	3.74
50.0	177	0.193	39.3	4.40	3.38	1.33	2.20	3.75
50.0	178	0.200	39.2	4.42	3.50	1.33	2.21	3.76
50.0	182	0.221	39.2	4.50	3.87	1.32	2.25	3.81
50.0	186	0.243	39.1	4.58	4.25	1.31	2.29	3.86
50.0	188	0.265	39.1	4.62	4.63	1.30	2.31	3.88
50.0	190	0.287	39.0	4.65	5.02	1.30	2.32	3.91

Figure D-2.61

AP Engineering & Testing, Inc.

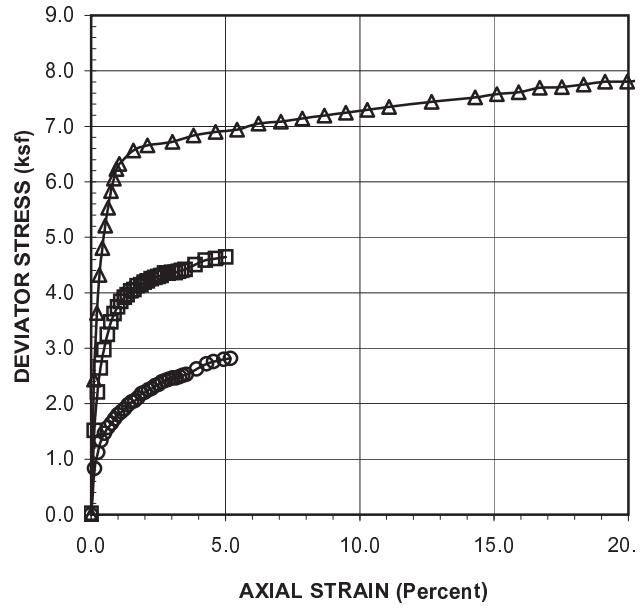
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

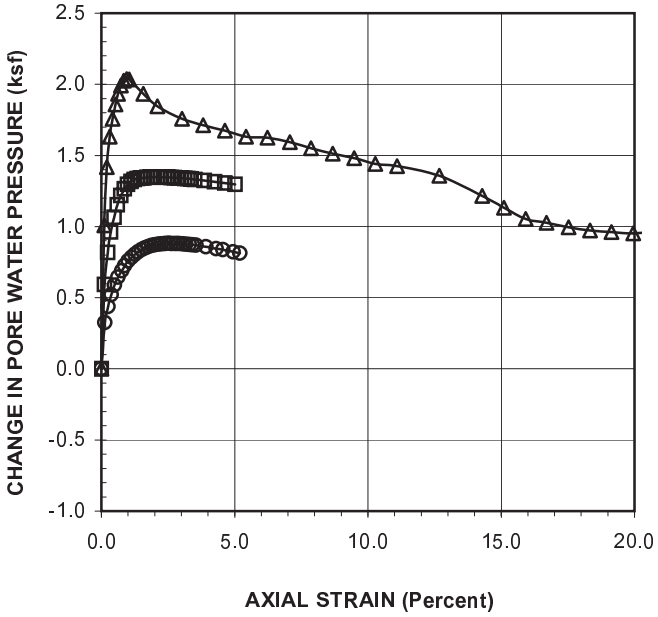
Project Name:	Westside Subway Extension	Cell Pressure:	60.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Boring No.:	G-414	Consolidation Pressure :	30.0	psi
Depth(ft):	25.5	Initial Sample Height:	5.713	in
Sample No.:	5	Initial Area of Sample:	5.395	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.713	in
Sample Description:	Dark Brown Sandy Lean Clay	Final Sample Area (A)*:	5.611	sq. in.
		Induced OCR=	1.0	

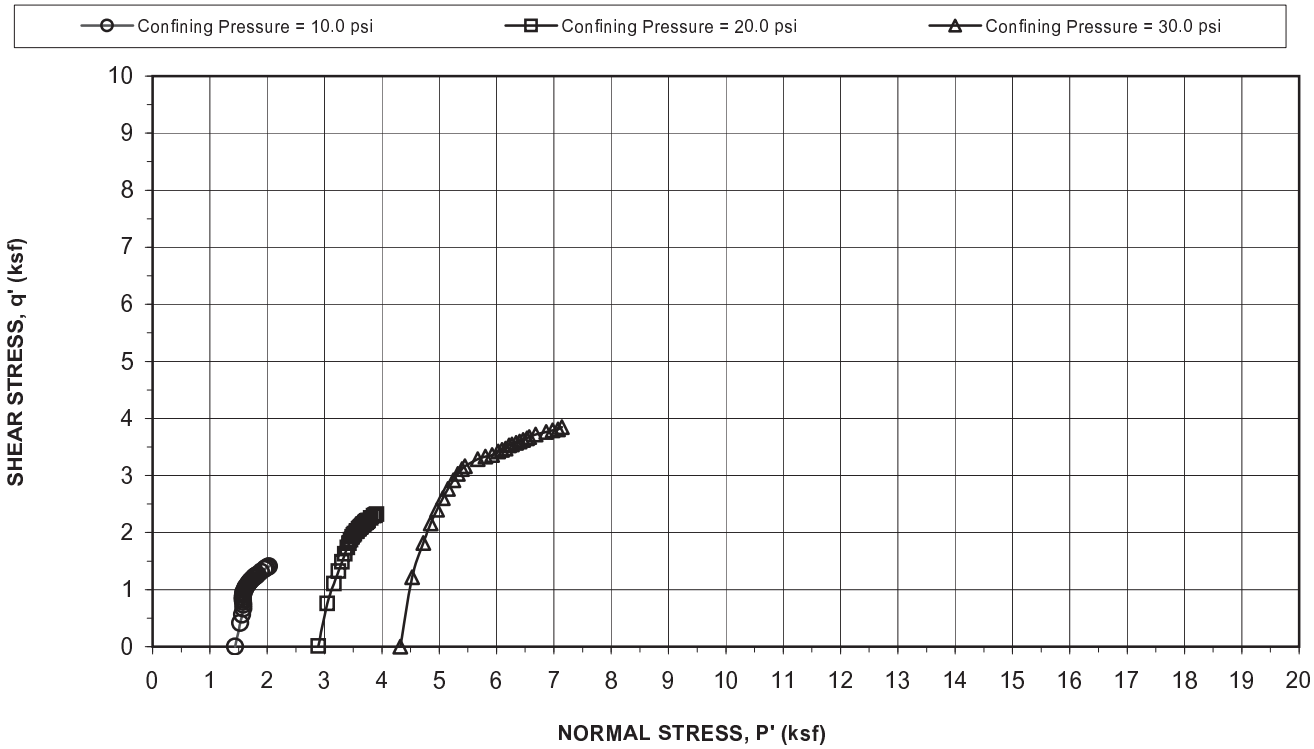
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
60.0	0	0.000	30.0	0.00	0.00	0.00	0.00	4.32
60.0	95	0.006	37.0	2.44	0.11	1.01	1.22	4.53
60.0	142	0.012	39.9	3.64	0.21	1.42	1.82	4.72
60.0	169	0.018	41.3	4.32	0.32	1.63	2.16	4.85
60.0	188	0.024	42.2	4.80	0.42	1.76	2.40	4.96
60.0	204	0.030	42.9	5.21	0.53	1.86	2.60	5.07
60.0	217	0.036	43.4	5.53	0.63	1.93	2.77	5.15
60.0	229	0.042	43.8	5.83	0.74	1.99	2.92	5.25
60.0	238	0.048	44.1	6.06	0.84	2.03	3.03	5.32
60.0	245	0.054	44.2	6.23	0.95	2.04	3.11	5.40
60.0	249	0.060	44.1	6.32	1.05	2.03	3.16	5.45
60.0	260	0.090	43.4	6.57	1.58	1.93	3.28	5.67
60.0	265	0.120	42.8	6.66	2.10	1.85	3.33	5.80
60.0	270	0.173	42.2	6.72	3.02	1.76	3.36	5.92
60.0	277	0.218	41.9	6.84	3.82	1.71	3.42	6.03
60.0	282	0.265	41.6	6.90	4.64	1.67	3.45	6.10
60.0	286	0.310	41.3	6.94	5.43	1.63	3.47	6.16
60.0	293	0.356	41.3	7.05	6.23	1.63	3.53	6.22
60.0	297	0.404	41.1	7.08	7.07	1.59	3.54	6.27
60.0	302	0.449	40.8	7.14	7.86	1.55	3.57	6.34
60.0	307	0.496	40.5	7.20	8.68	1.51	3.60	6.40
60.0	312	0.542	40.3	7.25	9.48	1.48	3.62	6.46
60.0	317	0.587	40.0	7.30	10.28	1.44	3.65	6.53
60.0	322	0.634	39.9	7.35	11.09	1.42	3.67	6.57
60.0	332	0.724	39.4	7.44	12.67	1.36	3.72	6.68
60.0	342	0.816	38.4	7.52	14.29	1.22	3.76	6.87
60.0	348	0.863	37.9	7.58	15.10	1.13	3.79	6.98
60.0	353	0.909	37.3	7.62	15.91	1.05	3.81	7.07
60.0	360	0.954	37.1	7.70	16.70	1.03	3.85	7.14
60.0	364	1.001	36.9	7.70	17.52	1.00	3.85	7.18
60.0	370	1.047	36.8	7.76	18.33	0.97	3.88	7.23
60.0	376	1.093	36.7	7.80	19.13	0.96	3.90	7.26
60.0	380	1.140	36.6	7.81	19.95	0.95	3.90	7.27
60.0	386	1.185	36.7	7.85	20.75	0.96	3.93	7.28
60.0	392	1.232	36.7	7.89	21.57	0.97	3.95	7.29

Figure D-2.62

AP Engineering & Testing, Inc.







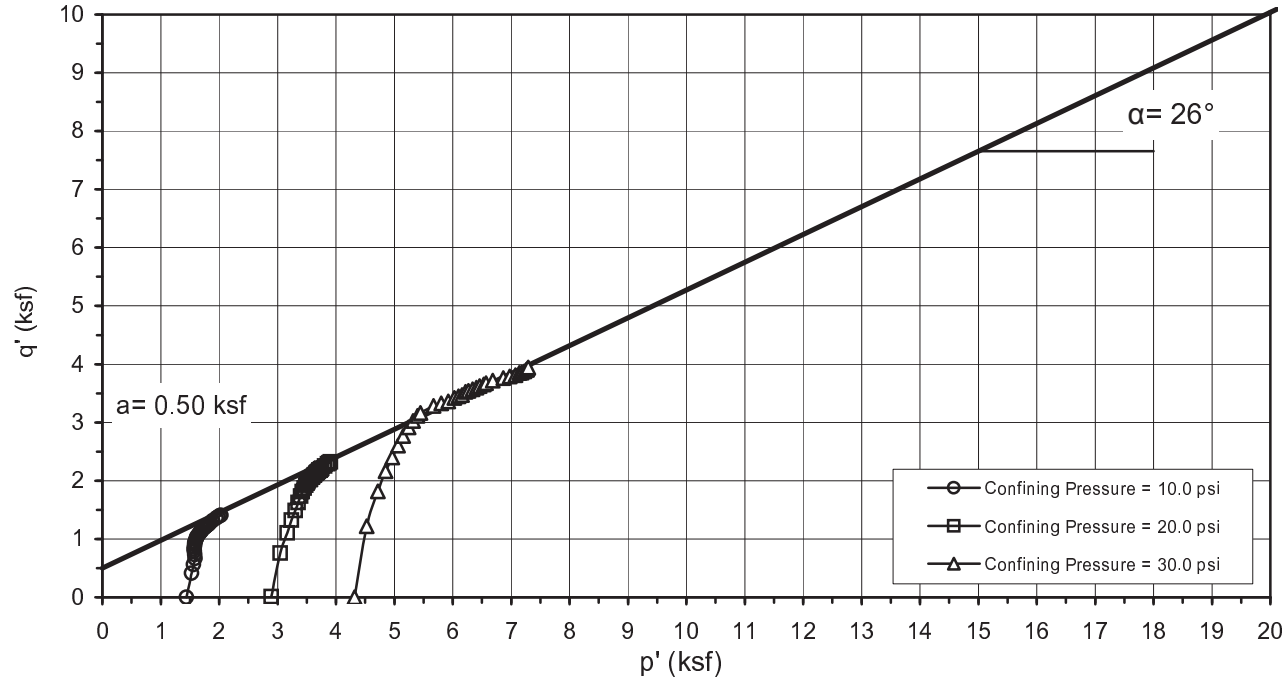
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Brown Sandy Lean Clay
Boring No.:	G-414	Avg. Dry Unit Weight (pcf):	111.2
Sample No.:	5	Avg. Initial Moisture Content (%):	16.7
Depth (ft):	25.5	Confining Pressure:	10.0, 20.0, 30.0 psi

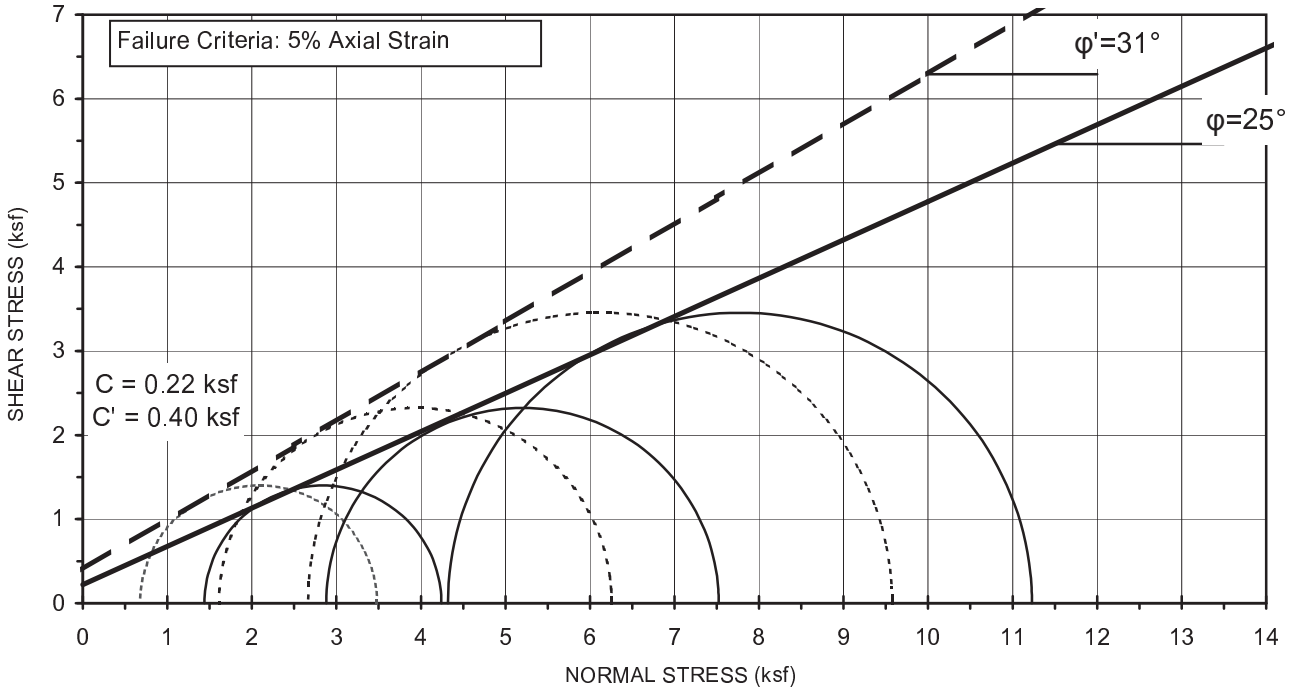
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.63

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Brown Sandy Lean Clay
Boring No.:	G-414	Avg. Dry Unit Weight (pcf):	111.2
Sample No.:	5	Avg. Initial Moisture Content (%):	16.7
Depth (ft):	25.5	Confining Pressures:	10.0, 20.0, 30.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.64

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-414	Reviewed by:	AP	Date:	05-14-15
Sample No.:	7	Sample Description:	Dark Brown Sandy Lean Clay		
Depth(ft):	35.5				
Sample Type:	Mod. Cal.	Confining Pressure = 15.0 psi			

Diameter (in)	2.617	2.617	2.617	Avg. =	2.617
Height (in)	5.580	5.580	5.580	Avg. =	5.580

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.379	5.341
Moisture Content (%)	13.30	14.90
Wet Weight (gms)	1047.74	1205.36
Dry Weight (gms)	924.73	1067.57
Container Weight (gms)	0.00	142.84
Density and Saturation		
Wet Weight (gms)	1047.74	
Container Weight (gms)	0.00	
Wet Density (pcf)	133.0	
Dry Density (pcf)	117.4	
Initial Void Ratio	0.435	
% Saturation	82.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	55.0	Initial Burette Ht.(cm)=	79.3
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	75.4
Eff. Consol. Stress (psi) =	15.0	Final Height (in)=	5.576
Induced OCR =	1.0	Initial Volume (cu.in)=	30.015
Change in Ht. of Specimen (in) =	0.0044	Final Volume (cu.in) =	29.777

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	8.19
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	2.00
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	10.19
		Axial Strain (%) =	5.38

Figure D-2.65

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-414	Reviewed by:	AP	Date:	05-14-15
Sample No.:	7	Sample Description:	Dark Brown Sandy Lean Clay		
Depth(ft):	35.5				
Sample Type:	Mod. Cal.	Confining Pressure = 30.0 psi			

Diameter (in)	2.617	2.617	2.617	Avg. =	2.617
Height (in)	5.580	5.580	5.580	Avg. =	5.580

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.379	5.690
Moisture Content (%)	13.30	14.90
Wet Weight (gms)	1047.74	1205.36
Dry Weight (gms)	924.73	1067.57
Container Weight (gms)	0.00	142.84
Density and Saturation		
Wet Weight (gms)	1047.74	
Container Weight (gms)	0.00	
Wet Density (pcf)	133.0	
Dry Density (pcf)	117.4	
Initial Void Ratio	0.435	
% Saturation	82.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	70.0	Initial Burette Ht.(cm)=	0.0
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	0.0
Eff. Consol. Stress (psi) =	30.0	Final Height (in)=	5.576
Induced OCR=	1.0	Initial Volume (cu.in)=	30.015
Change in Ht. of Specimen (in) =	0.0044	Final Volume (cu.in) =	30.015

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	12.09
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	3.88
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	15.97
		Axial Strain (%) =	5.05

Figure D-2.66

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-414	Reviewed by:	AP	Date:	05-14-15
Sample No.:	7	Sample Description:	Dark Brown Sandy Lean Clay		
Depth(ft):	35.5				
Sample Type:	Mod. Cal.	Confining Pressure = 45.0 psi			

Diameter (in)	2.617	2.617	2.617	Avg. =	2.617
Height (in)	5.580	5.580	5.580	Avg. =	5.580

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.379	5.634
Moisture Content (%)	13.30	14.90
Wet Weight (gms)	1047.74	1205.36
Dry Weight (gms)	924.73	1067.57
Container Weight (gms)	0.00	142.84
Density and Saturation		
Wet Weight (gms)	1047.74	
Container Weight (gms)	0.00	
Wet Density (pcf)	133.0	
Dry Density (pcf)	117.4	
Initial Void Ratio	0.435	
% Saturation	82.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	94	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	85.0	Initial Burette Ht.(cm)=	71.8
Back Pressure(psi) =	40.0	Final Burette Ht.(cm)=	69.1
Eff. Consol. Stress (psi) =	45.0	Final Height (in)=	5.580
Induced OCR =	1.0	Initial Volume (cu.in)=	30.015
Change in Ht. of Specimen (in) =	0.0000	Final Volume (cu.in) =	29.850

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	20.01
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	7.34
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	27.36
		Axial Strain (%) =	20.03

Figure D-2.67

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	55.0 psi
Project No:	4953-11-1423	Back Pressure :	40.0 psi
Boring No.:	G-414	Consolidation Pressure :	15.0 psi
Depth(ft):	35.5	Initial Sample Height:	5.580 in
Sample No.:	7	Initial Area of Sample:	5.379 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.576 in
Sample Description:	Dark Brown Sandy Lean Clay	Final Sample Area (A)*:	5.341 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
55.0	0	0.000	40.0	0.00	0.00	0.00	0.00	2.16
55.0	44	0.008	42.9	1.18	0.14	0.42	0.59	2.33
55.0	67	0.015	44.5	1.80	0.26	0.65	0.90	2.41
55.0	81	0.022	45.6	2.18	0.39	0.80	1.09	2.45
55.0	93	0.029	46.4	2.49	0.53	0.91	1.25	2.49
55.0	105	0.037	46.9	2.81	0.65	1.00	1.41	2.57
55.0	115	0.044	47.3	3.08	0.79	1.06	1.54	2.64
55.0	125	0.051	47.6	3.34	0.92	1.10	1.67	2.73
55.0	135	0.059	47.8	3.60	1.05	1.12	1.80	2.84
55.0	144	0.065	47.9	3.84	1.17	1.14	1.92	2.94
55.0	154	0.072	48.0	4.10	1.29	1.15	2.05	3.06
55.0	162	0.079	47.9	4.31	1.42	1.14	2.15	3.17
55.0	170	0.086	47.9	4.51	1.55	1.13	2.26	3.28
55.0	178	0.094	47.8	4.72	1.68	1.12	2.36	3.40
55.0	186	0.101	47.7	4.92	1.82	1.10	2.46	3.52
55.0	194	0.108	47.5	5.13	1.94	1.08	2.56	3.64
55.0	201	0.115	47.3	5.31	2.07	1.06	2.65	3.76
55.0	208	0.123	47.2	5.48	2.20	1.03	2.74	3.87
55.0	214	0.130	47.0	5.64	2.34	1.00	2.82	3.98
55.0	221	0.137	46.7	5.81	2.46	0.97	2.91	4.10
55.0	228	0.145	46.5	5.99	2.60	0.94	2.99	4.22
55.0	233	0.152	46.3	6.11	2.73	0.91	3.06	4.31
55.0	239	0.159	46.1	6.26	2.86	0.87	3.13	4.42
55.0	245	0.166	45.8	6.41	2.98	0.84	3.20	4.53
55.0	250	0.173	45.6	6.53	3.11	0.80	3.27	4.62
55.0	255	0.180	45.3	6.65	3.24	0.77	3.33	4.72
55.0	260	0.188	45.1	6.77	3.36	0.73	3.39	4.81
55.0	265	0.194	44.8	6.90	3.49	0.70	3.45	4.91
55.0	269	0.201	44.6	6.99	3.61	0.66	3.50	5.00
55.0	278	0.215	44.1	7.21	3.85	0.59	3.60	5.18
55.0	282	0.222	43.8	7.30	3.97	0.55	3.65	5.26
55.0	294	0.243	43.1	7.58	4.36	0.44	3.79	5.51
55.0	305	0.266	42.4	7.83	4.76	0.34	3.92	5.74
55.0	315	0.286	41.6	8.06	5.13	0.23	4.03	5.96
55.0	321	0.300	41.1	8.19	5.38	0.16	4.09	6.09

Figure D-2.68

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	70.0 psi
Project No:	4953-11-1423	Back Pressure :	40.0 psi
Boring No.:	G-414	Consolidation Pressure :	30.0 psi
Depth(ft):	35.5	Initial Sample Height:	5.580 in
Sample No.:	7	Initial Area of Sample:	5.379 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.576 in
Sample Description:	Dark Brown Sandy Lean Clay	Final Sample Area (A)*:	5.690 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
70.0	0	0.000	40.0	0.00	0.00	0.00	0.00	4.32
70.0	106	0.005	45.1	2.68	0.09	0.73	1.34	4.93
70.0	169	0.012	46.7	4.27	0.21	0.97	2.13	5.49
70.0	218	0.017	47.8	5.50	0.31	1.13	2.75	5.94
70.0	260	0.024	48.7	6.55	0.43	1.25	3.28	6.35
70.0	299	0.031	49.3	7.53	0.55	1.33	3.76	6.75
70.0	332	0.037	49.7	8.35	0.66	1.40	4.17	7.10
70.0	356	0.044	50.0	8.94	0.78	1.44	4.47	7.35
70.0	373	0.050	50.2	9.36	0.90	1.47	4.68	7.53
70.0	384	0.056	50.3	9.62	1.00	1.49	4.81	7.65
70.0	393	0.063	50.4	9.84	1.12	1.49	4.92	7.75
70.0	399	0.069	50.3	9.97	1.24	1.49	4.99	7.82
70.0	406	0.077	50.3	10.13	1.37	1.48	5.07	7.91
70.0	411	0.083	50.2	10.25	1.49	1.46	5.12	7.98
70.0	416	0.089	50.0	10.36	1.60	1.45	5.18	8.05
70.0	421	0.097	49.9	10.47	1.73	1.42	5.24	8.13
70.0	425	0.103	49.7	10.56	1.85	1.40	5.28	8.20
70.0	429	0.110	49.5	10.64	1.98	1.37	5.32	8.27
70.0	434	0.118	49.3	10.75	2.11	1.34	5.38	8.36
70.0	437	0.125	49.1	10.81	2.23	1.31	5.41	8.42
70.0	441	0.131	48.8	10.90	2.36	1.27	5.45	8.50
70.0	445	0.139	48.6	10.98	2.49	1.24	5.49	8.57
70.0	448	0.146	48.4	11.04	2.62	1.20	5.52	8.64
70.0	451	0.153	48.1	11.10	2.74	1.17	5.55	8.70
70.0	455	0.160	47.9	11.19	2.87	1.13	5.59	8.78
70.0	458	0.167	47.6	11.24	3.00	1.09	5.62	8.85
70.0	462	0.175	47.3	11.33	3.13	1.06	5.66	8.93
70.0	465	0.181	47.1	11.39	3.25	1.02	5.69	8.99
70.0	468	0.188	46.8	11.44	3.38	0.98	5.72	9.06
70.0	471	0.196	46.3	11.50	3.51	0.90	5.75	9.17
70.0	483	0.224	45.3	11.73	4.02	0.76	5.87	9.43
70.0	491	0.245	44.5	11.88	4.39	0.65	5.94	9.61
70.0	498	0.267	43.7	12.00	4.79	0.53	6.00	9.79
70.0	503	0.281	43.1	12.09	5.05	0.44	6.04	9.92

Figure D-2.69

AP Engineering & Testing, Inc.

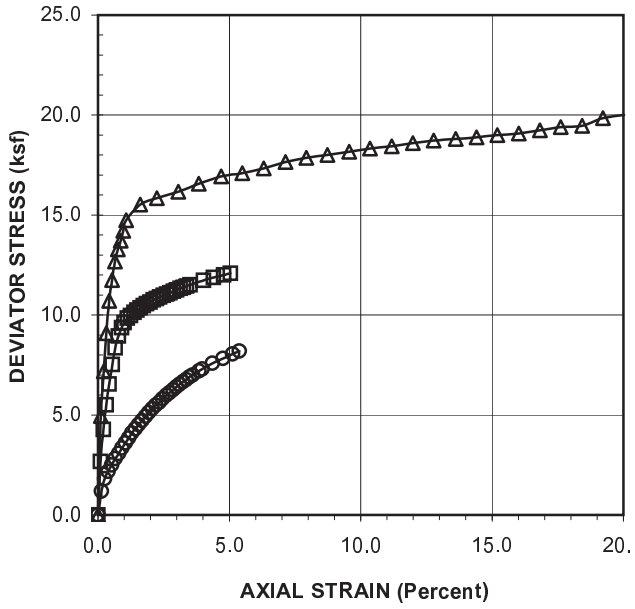
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

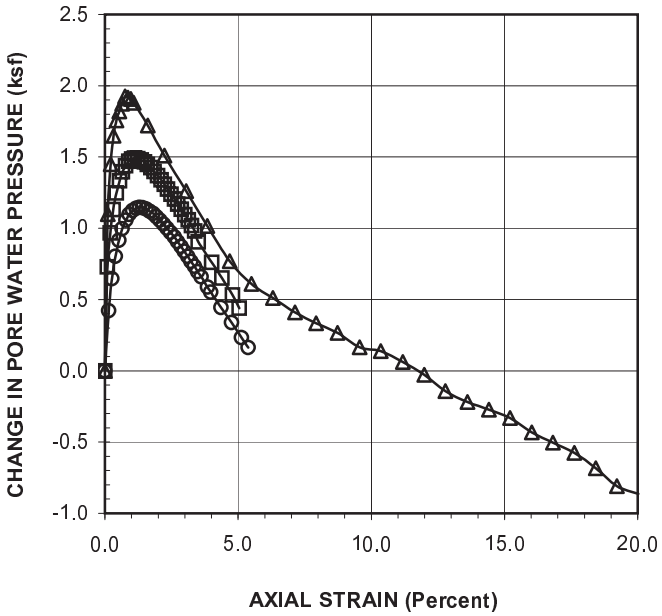
Project Name:	Westside Subway Extension	Cell Pressure:	85.0	psi
Project No:	4953-11-1423	Back Pressure :	40.0	psi
Boring No.:	G-414	Consolidation Pressure :	45.0	psi
Depth(ft):	35.5	Initial Sample Height:	5.580	in
Sample No.:	7	Initial Area of Sample:	5.379	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.580	in
Sample Description:	Dark Brown Sandy Lean Clay	Final Sample Area (A)*:	5.634	sq. in.
		Induced OCR=	1.0	

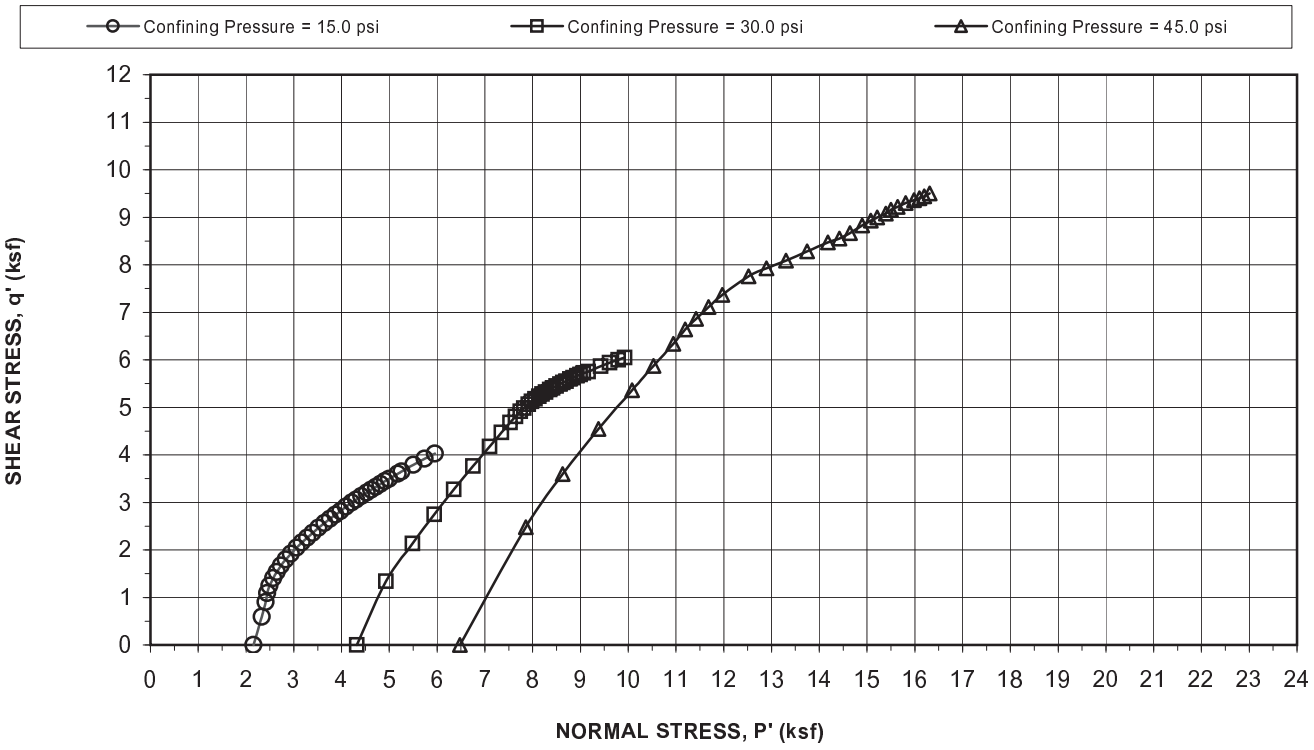
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
85.0	0	0.000	40.0	0.00	0.00	0.00	0.00	6.48
85.0	194	0.006	47.6	4.95	0.11	1.10	2.48	7.86
85.0	282	0.012	50.1	7.19	0.22	1.45	3.60	8.63
85.0	357	0.018	51.5	9.10	0.32	1.65	4.55	9.38
85.0	421	0.024	52.2	10.71	0.43	1.76	5.36	10.08
85.0	462	0.030	52.6	11.74	0.54	1.82	5.87	10.53
85.0	499	0.036	53.0	12.68	0.65	1.87	6.34	10.95
85.0	523	0.042	53.4	13.28	0.75	1.93	6.64	11.19
85.0	541	0.048	53.3	13.72	0.86	1.92	6.86	11.42
85.0	562	0.054	53.3	14.22	0.97	1.91	7.11	11.68
85.0	583	0.060	53.1	14.74	1.08	1.88	7.37	11.97
85.0	617	0.090	51.9	15.52	1.61	1.72	7.76	12.52
85.0	634	0.125	50.5	15.85	2.24	1.51	7.93	12.90
85.0	653	0.170	48.8	16.17	3.05	1.26	8.09	13.31
85.0	674	0.214	47.0	16.56	3.84	1.02	8.28	13.75
85.0	695	0.261	45.3	16.94	4.68	0.77	8.47	14.18
85.0	708	0.307	44.2	17.10	5.50	0.61	8.55	14.42
85.0	724	0.352	43.5	17.34	6.30	0.51	8.67	14.64
85.0	744	0.398	42.8	17.66	7.13	0.41	8.83	14.90
85.0	759	0.442	42.3	17.86	7.92	0.33	8.93	15.08
85.0	772	0.487	41.8	18.00	8.73	0.27	9.00	15.21
85.0	786	0.533	41.1	18.16	9.56	0.17	9.08	15.40
85.0	799	0.578	41.0	18.32	10.35	0.14	9.16	15.50
85.0	812	0.624	40.4	18.44	11.18	0.06	9.22	15.64
85.0	827	0.669	39.8	18.60	11.99	-0.03	9.30	15.81
85.0	840	0.713	39.0	18.72	12.78	-0.14	9.36	15.98
85.0	851	0.760	38.5	18.80	13.61	-0.22	9.40	16.10
85.0	863	0.804	38.1	18.88	14.41	-0.27	9.44	16.19
85.0	877	0.848	37.7	19.00	15.20	-0.33	9.50	16.31
85.0	889	0.894	37.0	19.08	16.02	-0.43	9.54	16.45
85.0	905	0.938	36.5	19.24	16.82	-0.50	9.62	16.61
85.0	921	0.983	36.0	19.39	17.62	-0.58	9.70	16.75
85.0	933	1.028	35.3	19.46	18.43	-0.68	9.73	16.89
85.0	961	1.072	34.4	19.84	19.22	-0.81	9.92	17.21
85.0	979	1.117	34.0	20.01	20.03	-0.86	10.01	17.35

Figure D-2.70

AP Engineering & Testing, Inc.







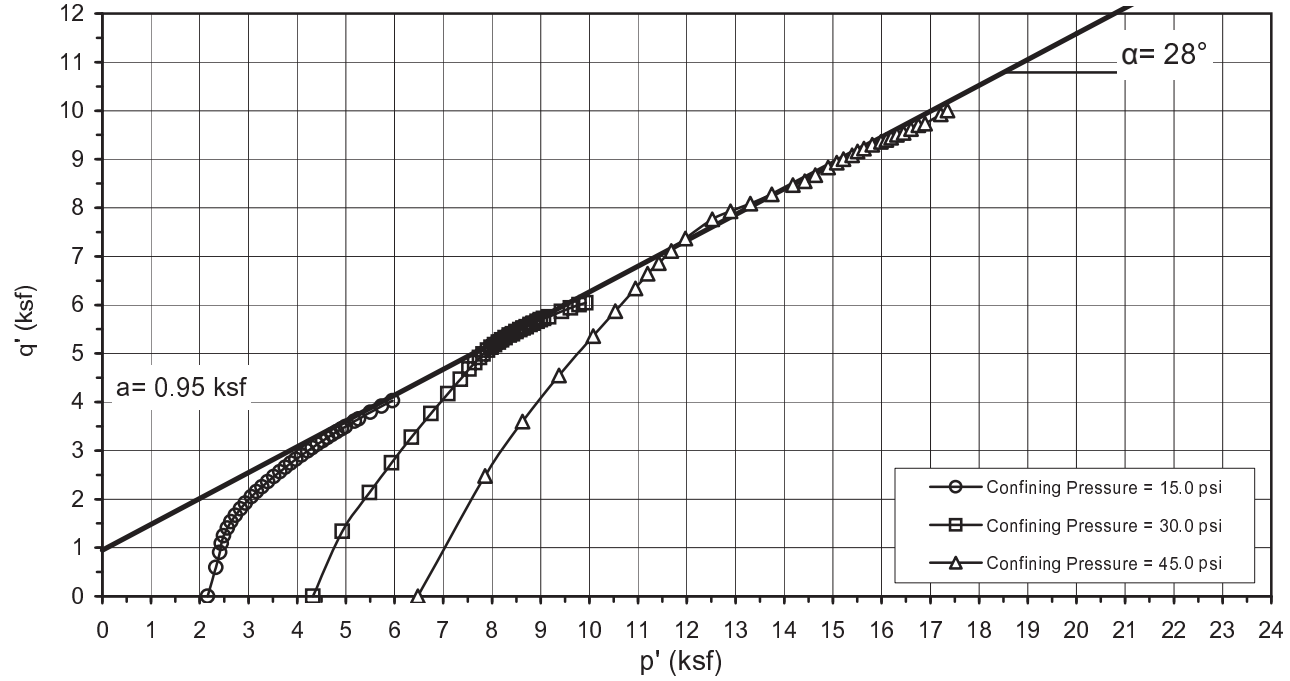
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Brown Sandy Lean Clay
Boring No.:	G-414	Avg. Dry Unit Weight (pcf):	117.4
Sample No.:	7	Avg. Initial Moisture Content (%):	13.3
Depth (ft):	35.5	Confining Pressure:	15.0, 30.0, 45.0 psi

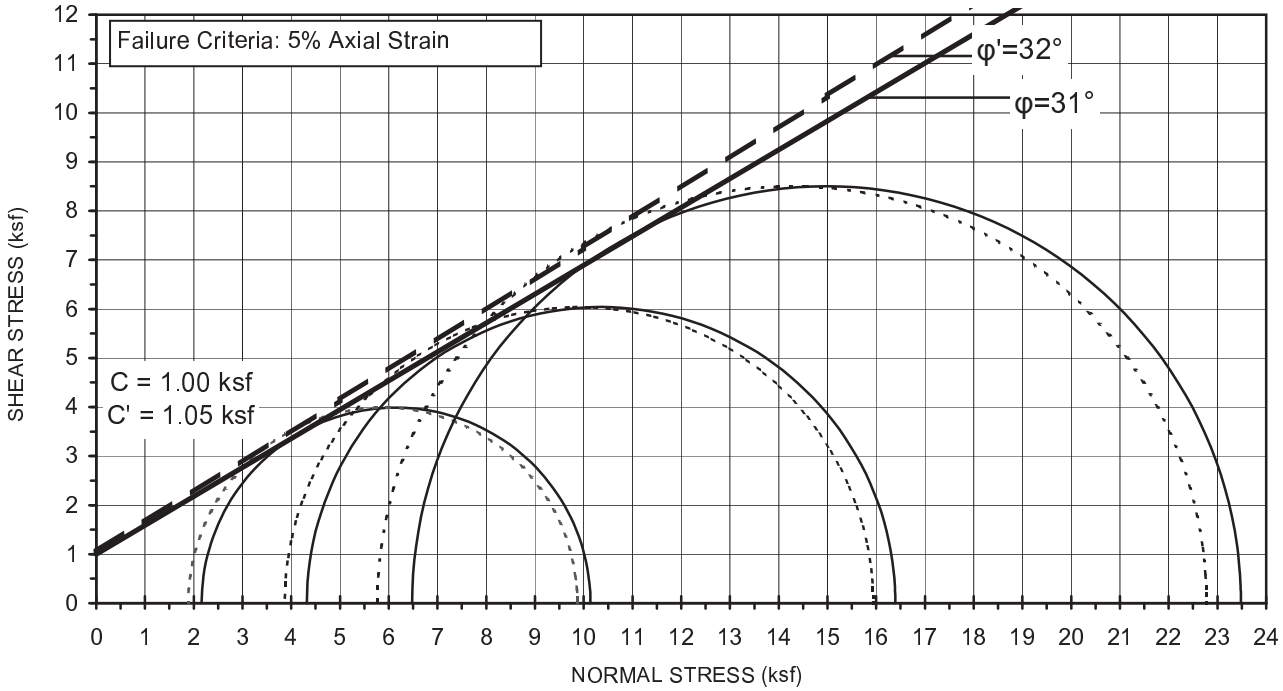
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.71

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Brown Sandy Lean Clay
Boring No.:	G-414	Avg. Dry Unit Weight (pcf):	117.4
Sample No.:	7	Avg. Initial Moisture Content (%):	13.3
Depth (ft):	35.5	Confining Pressures:	15.0, 30.0, 45.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.72

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-414	Reviewed by:	AP	Date:	05-14-15
Sample No.:	11	Sample Description:	Dark Brown Sandy Lean Clay		
Depth(ft):	51.5				
Sample Type:	Mod. Cal.	Confining Pressure = 20.0 psi			

Diameter (in)	2.616	2.616	2.616	Avg. =	2.616
Height (in)	5.504	5.504	5.504	Avg. =	5.504

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.375	5.326
Moisture Content (%)	13.71	16.49
Wet Weight (gms)	92.78	1194.69
Dry Weight (gms)	87.63	1046.60
Container Weight (gms)	50.07	148.57
Density and Saturation		
Wet Weight (gms)	1052.09	
Container Weight (gms)	0.00	
Wet Density (pcf)	135.5	
Dry Density (pcf)	119.1	
Initial Void Ratio	0.414	
% Saturation	89.4	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	98	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	50.0	Initial Burette Ht.(cm)=	77.8
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	71.3
Eff. Consol. Stress (psi) =	20.0	Final Height (in)=	5.480
Induced OCR =	1.0	Initial Volume (cu.in)=	29.583
Change in Ht. of Specimen (in) =	0.0241	Final Volume (cu.in) =	29.187

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	5.64
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	1.44
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	7.09
		Axial Strain (%) =	5.12

Figure D-2.73

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-414	Reviewed by:	AP	Date:	05-14-15
Sample No.:	11	Sample Description:	Dark Brown Sandy Lean Clay		
Depth(ft):	51.5				
Sample Type:	Mod. Cal.	Confining Pressure = 40.0 psi			

Diameter (in)	2.616	2.616	2.616	Avg. =	2.616
Height (in)	5.504	5.504	5.504	Avg. =	5.504

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.375	5.578
Moisture Content (%)	13.71	16.49
Wet Weight (gms)	92.78	1194.69
Dry Weight (gms)	87.63	1046.60
Container Weight (gms)	50.07	148.57
Density and Saturation		
Wet Weight (gms)	1052.09	
Container Weight (gms)	0.00	
Wet Density (pcf)	135.5	
Dry Density (pcf)	119.1	
Initial Void Ratio	0.414	
% Saturation	89.4	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	98	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	70.0	Initial Burette Ht.(cm)=	71.4
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	63.6
Eff. Consol. Stress (psi) =	40.0	Final Height (in)=	5.500
Induced OCR=	1.0	Initial Volume (cu.in)=	29.583
Change in Ht. of Specimen (in) =	0.0042	Final Volume (cu.in) =	29.107

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	8.96
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	3.36
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	12.32
		Axial Strain (%) =	5.43

Figure D-2.74

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-414	Reviewed by:	AP	Date:	05-14-15
Sample No.:	11	Sample Description:	Dark Brown Sandy Lean Clay		
Depth(ft):	51.5				
Sample Type:	Mod. Cal.	Confining Pressure = 60.0 psi			

Diameter (in)	2.616	2.616	2.616	Avg. =	2.616
Height (in)	5.504	5.504	5.504	Avg. =	5.504

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.375	5.623
Moisture Content (%)	13.71	16.49
Wet Weight (gms)	92.78	1194.69
Dry Weight (gms)	87.63	1046.60
Container Weight (gms)	50.07	148.57
Density and Saturation		
Wet Weight (gms)	1052.09	
Container Weight (gms)	0.00	
Wet Density (pcf)	135.5	
Dry Density (pcf)	119.1	
Initial Void Ratio	0.414	
% Saturation	89.4	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	98	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	90.0	Initial Burette Ht.(cm)=	63.7
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	57.1
Eff. Consol. Stress (psi) =	60.0	Final Height (in)=	5.487
Induced OCR =	1.0	Initial Volume (cu.in)=	29.583
Change in Ht. of Specimen (in) =	0.0166	Final Volume (cu.in) =	29.180

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	13.41
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	6.29
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	19.70
		Axial Strain (%) =	18.68

Figure D-2.75

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	50.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-414	Consolidation Pressure :	20.0 psi
Depth(ft):	51.5	Initial Sample Height:	5.504 in
Sample No.:	11	Initial Area of Sample:	5.375 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.480 in
Sample Description:	Dark Brown Sandy Lean Clay	Final Sample Area (A)*:	5.326 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
50.0	0	0.000	30.1	0.00	0.00	0.00	0.00	2.88
50.0	55	0.005	33.4	1.49	0.09	0.48	0.74	3.14
50.0	77	0.012	35.2	2.08	0.22	0.74	1.04	3.18
50.0	91	0.019	36.5	2.45	0.35	0.92	1.23	3.18
50.0	103	0.026	37.5	2.77	0.47	1.06	1.39	3.20
50.0	111	0.033	38.3	2.98	0.60	1.18	1.49	3.19
50.0	119	0.039	38.9	3.19	0.72	1.26	1.60	3.21
50.0	126	0.046	39.3	3.38	0.84	1.33	1.69	3.24
50.0	133	0.053	39.7	3.56	0.96	1.39	1.78	3.27
50.0	140	0.060	40.0	3.74	1.10	1.43	1.87	3.32
50.0	145	0.066	40.3	3.87	1.21	1.47	1.94	3.35
50.0	149	0.073	40.5	3.98	1.33	1.50	1.99	3.37
50.0	153	0.080	40.7	4.08	1.45	1.52	2.04	3.39
50.0	157	0.087	40.8	4.18	1.59	1.55	2.09	3.42
50.0	161	0.094	40.9	4.28	1.72	1.56	2.14	3.46
50.0	165	0.101	41.0	4.38	1.84	1.57	2.19	3.50
50.0	168	0.108	41.1	4.45	1.97	1.58	2.23	3.52
50.0	171	0.115	41.1	4.53	2.10	1.59	2.26	3.55
50.0	173	0.123	41.1	4.57	2.25	1.59	2.29	3.57
50.0	176	0.131	41.2	4.64	2.39	1.60	2.32	3.61
50.0	179	0.138	41.2	4.72	2.53	1.60	2.36	3.64
50.0	182	0.145	41.2	4.79	2.65	1.60	2.40	3.68
50.0	184	0.153	41.2	4.84	2.79	1.59	2.42	3.70
50.0	187	0.160	41.1	4.91	2.92	1.59	2.45	3.74
50.0	189	0.167	41.1	4.95	3.04	1.59	2.48	3.77
50.0	191	0.174	41.1	5.00	3.17	1.58	2.50	3.80
50.0	194	0.181	41.0	5.07	3.31	1.58	2.54	3.84
50.0	197	0.189	41.0	5.14	3.44	1.57	2.57	3.88
50.0	199	0.195	40.9	5.19	3.56	1.56	2.59	3.91
50.0	202	0.202	40.9	5.26	3.69	1.56	2.63	3.95
50.0	206	0.222	40.7	5.34	4.06	1.53	2.67	4.03
50.0	210	0.245	40.5	5.42	4.47	1.49	2.71	4.10
50.0	216	0.267	40.2	5.56	4.86	1.46	2.78	4.20
50.0	220	0.280	40.1	5.64	5.12	1.44	2.82	4.26

Figure D-2.76

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	70.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-414	Consolidation Pressure :	40.0 psi
Depth(ft):	51.5	Initial Sample Height:	5.504 in
Sample No.:	11	Initial Area of Sample:	5.375 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.500 in
Sample Description:	Dark Brown Sandy Lean Clay	Final Sample Area (A)*:	5.578 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
70.0	1	0.000	30.1	0.03	0.00	0.00	0.01	5.77
70.0	97	0.004	36.7	2.50	0.08	0.96	1.25	6.05
70.0	148	0.011	40.2	3.81	0.20	1.46	1.91	6.20
70.0	183	0.018	42.5	4.71	0.32	1.80	2.35	6.32
70.0	211	0.025	44.3	5.42	0.45	2.04	2.71	6.43
70.0	235	0.031	45.6	6.03	0.57	2.23	3.02	6.54
70.0	255	0.038	46.5	6.54	0.70	2.37	3.27	6.66
70.0	271	0.045	47.2	6.94	0.82	2.47	3.47	6.76
70.0	283	0.053	47.7	7.24	0.95	2.54	3.62	6.84
70.0	293	0.060	48.0	7.48	1.09	2.58	3.74	6.92
70.0	300	0.066	48.2	7.65	1.20	2.61	3.83	6.98
70.0	306	0.073	48.3	7.80	1.32	2.63	3.90	7.03
70.0	311	0.079	48.3	7.91	1.44	2.63	3.96	7.08
70.0	315	0.087	48.4	8.00	1.58	2.64	4.00	7.13
70.0	318	0.094	48.4	8.07	1.70	2.64	4.04	7.16
70.0	322	0.102	48.4	8.16	1.85	2.64	4.08	7.20
70.0	324	0.109	48.4	8.20	1.97	2.64	4.10	7.22
70.0	327	0.116	48.3	8.26	2.11	2.63	4.13	7.26
70.0	329	0.124	48.3	8.30	2.26	2.63	4.15	7.28
70.0	331	0.132	48.2	8.34	2.39	2.62	4.17	7.31
70.0	333	0.139	48.2	8.38	2.53	2.61	4.19	7.34
70.0	335	0.147	48.1	8.42	2.67	2.60	4.21	7.37
70.0	337	0.154	48.1	8.46	2.80	2.59	4.23	7.40
70.0	339	0.161	48.0	8.50	2.93	2.58	4.25	7.42
70.0	340	0.168	47.9	8.51	3.05	2.57	4.25	7.44
70.0	342	0.175	47.9	8.55	3.19	2.57	4.27	7.47
70.0	344	0.182	47.8	8.59	3.31	2.56	4.29	7.49
70.0	345	0.190	47.7	8.60	3.45	2.55	4.30	7.51
70.0	347	0.196	47.7	8.64	3.57	2.54	4.32	7.54
70.0	348	0.203	47.6	8.65	3.69	2.53	4.33	7.56
70.0	353	0.225	47.4	8.74	4.08	2.50	4.37	7.63
70.0	356	0.240	47.3	8.79	4.37	2.48	4.39	7.67
70.0	360	0.262	47.1	8.85	4.77	2.45	4.43	7.74
70.0	365	0.284	46.8	8.94	5.17	2.42	4.47	7.81
70.0	367	0.299	46.7	8.96	5.43	2.40	4.48	7.84

Figure D-2.77

AP Engineering & Testing, Inc.

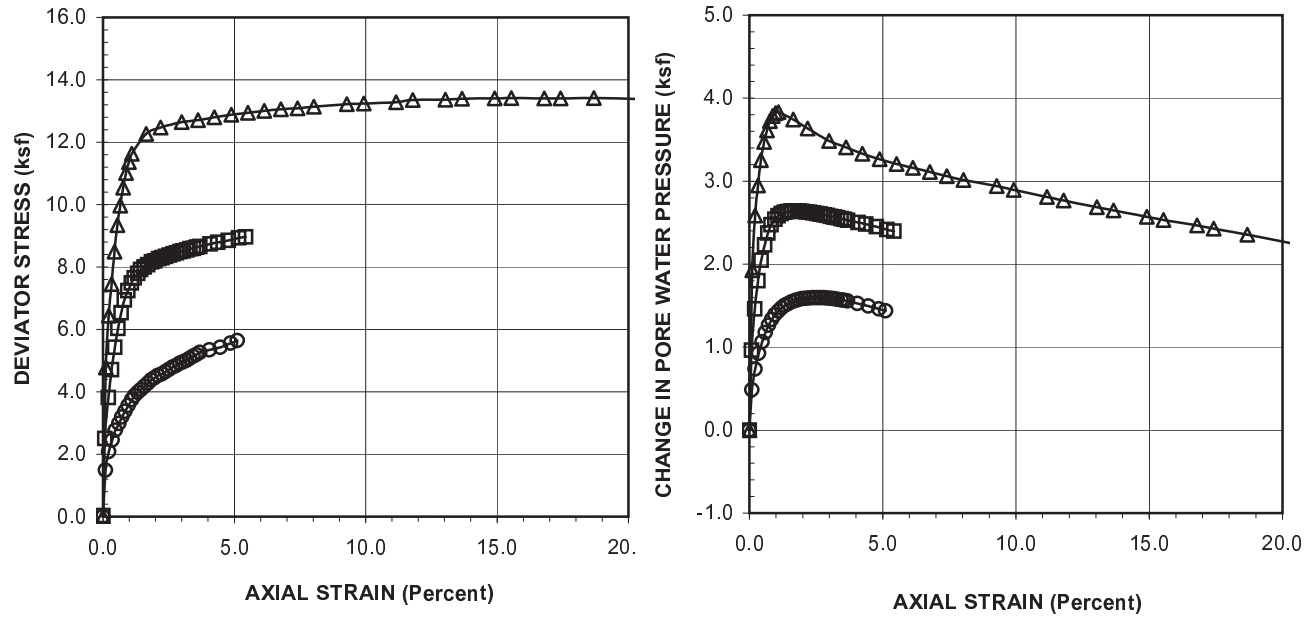
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

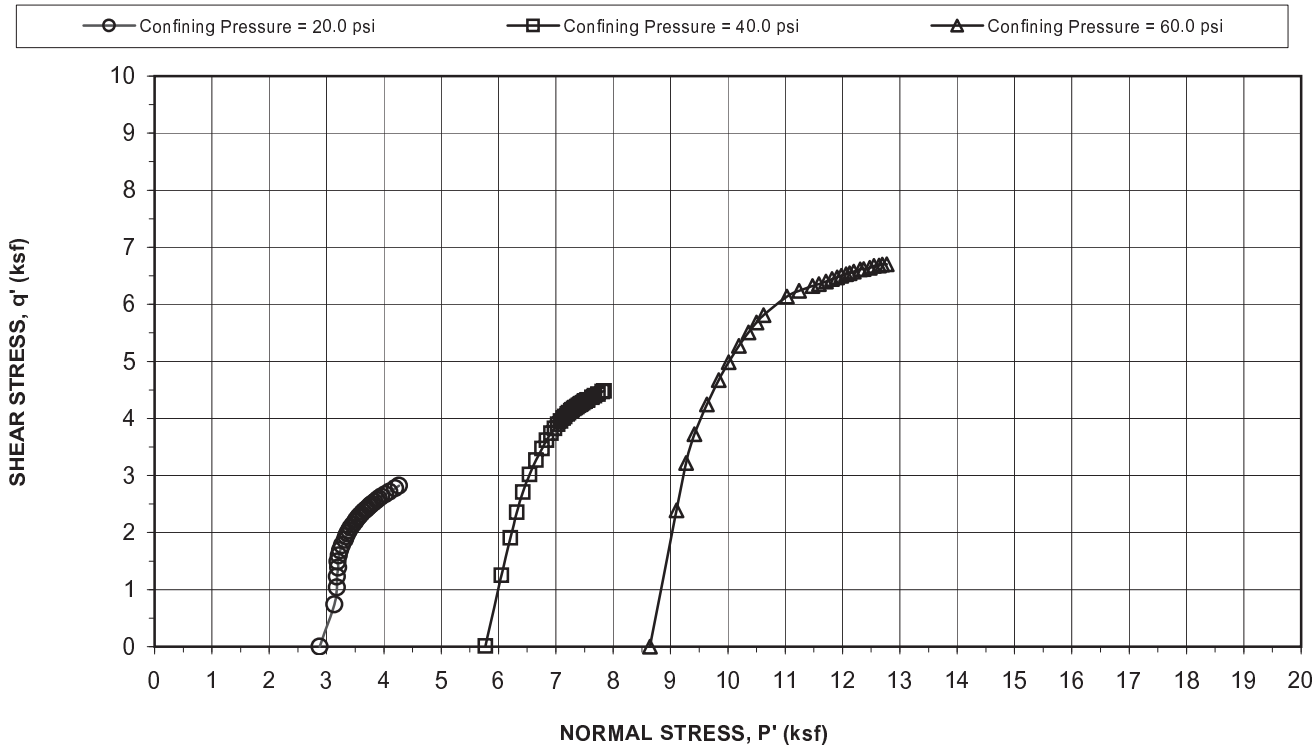
Project Name:	Westside Subway Extension	Cell Pressure:	90.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-414	Consolidation Pressure :	60.0 psi
Depth(ft):	51.5	Initial Sample Height:	5.504 in
Sample No.:	11	Initial Area of Sample:	5.375 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.487 in
Sample Description:	Dark Brown Sandy Lean Clay	Final Sample Area (A)*:	5.623 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
90.0	0	0.000	30.0	0.00	0.00	0.00	0.00	8.64
90.0	187	0.006	43.4	4.78	0.11	1.93	2.39	9.11
90.0	252	0.012	48.0	6.44	0.22	2.59	3.22	9.27
90.0	292	0.018	50.5	7.45	0.33	2.95	3.73	9.42
90.0	333	0.024	52.6	8.49	0.44	3.25	4.25	9.63
90.0	367	0.030	54.1	9.35	0.55	3.47	4.67	9.84
90.0	392	0.036	55.1	9.97	0.66	3.61	4.99	10.01
90.0	415	0.042	55.9	10.55	0.77	3.72	5.27	10.19
90.0	434	0.048	56.3	11.02	0.87	3.79	5.51	10.36
90.0	448	0.054	56.5	11.36	0.98	3.82	5.68	10.50
90.0	459	0.060	56.6	11.63	1.09	3.83	5.81	10.62
90.0	487	0.090	56.0	12.27	1.64	3.74	6.13	11.03
90.0	498	0.120	55.3	12.47	2.19	3.64	6.24	11.24
90.0	509	0.164	54.2	12.64	2.99	3.48	6.32	11.48
90.0	515	0.199	53.7	12.71	3.62	3.41	6.36	11.59
90.0	522	0.233	53.1	12.80	4.24	3.33	6.40	11.71
90.0	529	0.268	52.7	12.89	4.89	3.27	6.44	11.82
90.0	535	0.303	52.3	12.94	5.52	3.21	6.47	11.91
90.0	541	0.337	52.0	13.00	6.13	3.16	6.50	11.98
90.0	547	0.372	51.6	13.06	6.77	3.11	6.53	12.06
90.0	552	0.406	51.2	13.09	7.40	3.06	6.54	12.13
90.0	558	0.441	50.9	13.14	8.03	3.01	6.57	12.20
90.0	569	0.509	50.4	13.22	9.28	2.94	6.61	12.31
90.0	574	0.544	50.1	13.24	9.92	2.89	6.62	12.37
90.0	584	0.612	49.5	13.29	11.16	2.81	6.64	12.47
90.0	591	0.647	49.2	13.35	11.79	2.77	6.67	12.55
90.0	600	0.716	48.7	13.36	13.04	2.69	6.68	12.64
90.0	606	0.750	48.4	13.40	13.66	2.65	6.70	12.69
90.0	615	0.818	47.8	13.40	14.91	2.57	6.70	12.77
90.0	620	0.853	47.6	13.41	15.54	2.53	6.71	12.81
90.0	629	0.922	47.1	13.40	16.80	2.47	6.70	12.87
90.0	634	0.956	46.9	13.41	17.42	2.43	6.70	12.92
90.0	644	1.025	46.4	13.41	18.68	2.35	6.71	12.99
90.0	658	1.128	45.6	13.39	20.56	2.24	6.69	13.09
90.0	666	1.197	44.9	13.34	21.81	2.15	6.67	13.16

Figure D-2.78

AP Engineering & Testing, Inc.





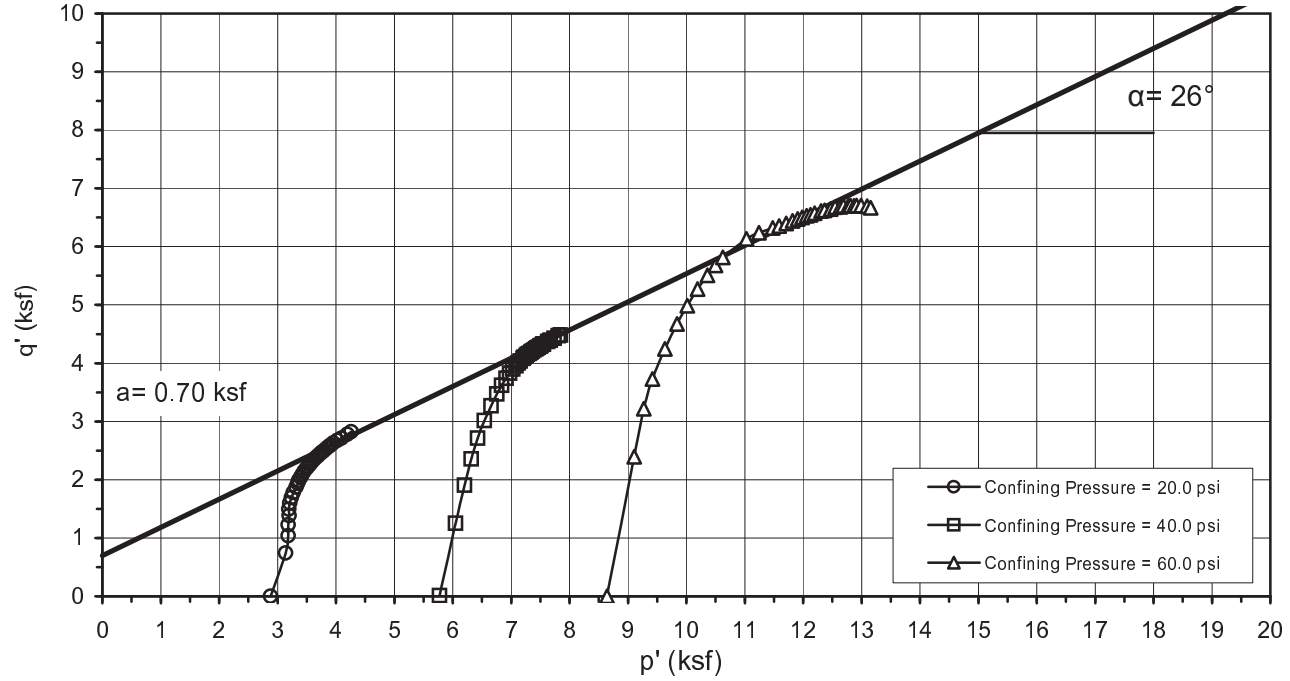
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Brown Sandy Lean Clay
Boring No.:	G-414	Avg. Dry Unit Weight (pcf):	119.1
Sample No.:	11	Avg. Initial Moisture Content (%):	13.7
Depth (ft):	51.5	Confining Pressure:	20.0, 40.0, 60.0 psi

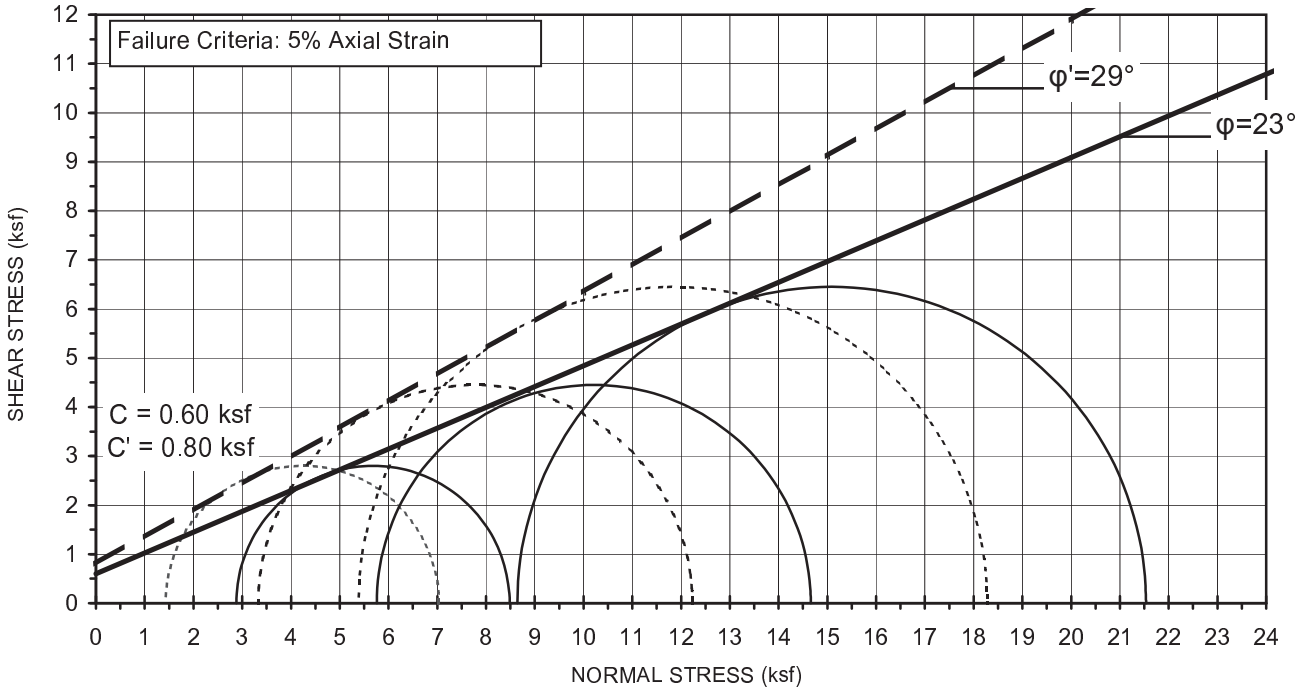
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.79

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Brown Sandy Lean Clay
Boring No.:	G-414	Avg. Dry Unit Weight (pcf):	119.1
Sample No.:	11	Avg. Initial Moisture Content (%):	13.7
Depth (ft):	51.5	Confining Pressures:	20.0, 40.0, 60.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.80

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-415	Reviewed by:	AP	Date:	05-14-15
Sample No.:	6	Sample Description:	Brown Sandy Lean Clay		
Depth(ft):	25.5				
Sample Type:	Mod. Cal.	Confining Pressure = 10.0 psi			

Diameter (in)	2.621	2.621	2.621	Avg. =	2.621
Height (in)	5.467	5.467	5.467	Avg. =	5.467

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.395	5.402
Moisture Content (%)	13.47	18.17
Wet Weight (gms)	103.31	1167.55
Dry Weight (gms)	97.04	1011.22
Container Weight (gms)	50.48	150.82
Density and Saturation		
Wet Weight (gms)	1016.39	
Container Weight (gms)	0.00	
Wet Density (pcf)	131.3	
Dry Density (pcf)	115.7	
Initial Void Ratio	0.456	
% Saturation	79.7	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	95	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	40.0	Initial Burette Ht.(cm)=	84.4
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	82.7
Eff. Consol. Stress (psi) =	10.0	Final Height (in)=	5.441
Induced OCR =	1.0	Initial Volume (cu.in)=	29.497
Change in Ht. of Specimen (in) =	0.0258	Final Volume (cu.in) =	29.393

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	4.99
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	1.01
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	6.00
		Axial Strain (%) =	5.55

Figure D-2.81

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-415	Reviewed by:	AP	Date:	05-14-15
Sample No.:	6	Sample Description:	Brown Sandy Lean Clay		
Depth(ft):	25.5				
Sample Type:	Mod. Cal.	Confining Pressure = 20.0 psi			

Diameter (in)	2.621	2.621	2.621	Avg. =	2.621
Height (in)	5.467	5.467	5.467	Avg. =	5.467

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.395	5.665
Moisture Content (%)	13.47	18.17
Wet Weight (gms)	103.31	1167.55
Dry Weight (gms)	97.04	1011.22
Container Weight (gms)	50.48	150.82
Density and Saturation		
Wet Weight (gms)	1016.39	
Container Weight (gms)	0.00	
Wet Density (pcf)	131.3	
Dry Density (pcf)	115.7	
Initial Void Ratio	0.456	
% Saturation	79.7	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	95	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	50.0	Initial Burette Ht.(cm)=	82.7
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	78.7
Eff. Consol. Stress (psi) =	20.0	Final Height (in)=	5.467
Induced OCR=	1.0	Initial Volume (cu.in)=	29.497
Change in Ht. of Specimen (in) =	0.0002	Final Volume (cu.in) =	29.253

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	6.41
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	2.30
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	8.71
		Axial Strain (%) =	5.53

Figure D-2.82

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-04-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-415	Reviewed by:	AP	Date:	05-14-15
Sample No.:	6	Sample Description:	Brown Sandy Lean Clay		
Depth(ft):	25.5				
Sample Type:	Mod. Cal.	Confining Pressure = 30.0 psi			

Diameter (in)	2.621	2.621	2.621	Avg. =	2.621
Height (in)	5.467	5.467	5.467	Avg. =	5.467

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.395	5.668
Moisture Content (%)	13.47	18.17
Wet Weight (gms)	103.31	1167.55
Dry Weight (gms)	97.04	1011.22
Container Weight (gms)	50.48	150.82
Density and Saturation		
Wet Weight (gms)	1016.39	
Container Weight (gms)	0.00	
Wet Density (pcf)	131.3	
Dry Density (pcf)	115.7	
Initial Void Ratio	0.456	
% Saturation	79.7	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	95	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	60.0	Initial Burette Ht.(cm)=	78.7
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	75.0
Eff. Consol. Stress (psi) =	30.0	Final Height (in)=	5.467
Induced OCR =	1.0	Initial Volume (cu.in)=	29.497
Change in Ht. of Specimen (in) =	0.0004	Final Volume (cu.in) =	29.271

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	8.42
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	4.35
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	12.77
		Axial Strain (%) =	20.15

Figure D-2.83

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	40.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Boring No.:	G-415	Consolidation Pressure :	10.0	psi
Depth(ft):	25.5	Initial Sample Height:	5.467	in
Sample No.:	6	Initial Area of Sample:	5.395	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.441	in
Sample Description:	Brown Sandy Lean Clay	Final Sample Area (A)*:	5.402	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
40.0	0	0.000	30.1	0.00	0.00	0.00	0.00	1.44
40.0	39	0.006	31.5	1.04	0.11	0.20	0.52	1.75
40.0	57	0.013	32.8	1.52	0.24	0.39	0.76	1.81
40.0	68	0.019	33.6	1.81	0.35	0.51	0.90	1.83
40.0	77	0.025	34.2	2.04	0.47	0.60	1.02	1.86
40.0	85	0.032	34.7	2.25	0.59	0.67	1.13	1.90
40.0	92	0.040	35.1	2.43	0.73	0.72	1.22	1.94
40.0	98	0.046	35.3	2.59	0.84	0.76	1.30	1.98
40.0	104	0.052	35.5	2.75	0.96	0.78	1.37	2.03
40.0	109	0.059	35.7	2.87	1.09	0.81	1.44	2.07
40.0	114	0.066	35.8	3.00	1.21	0.82	1.50	2.12
40.0	119	0.072	35.9	3.13	1.33	0.84	1.57	2.17
40.0	123	0.079	35.9	3.23	1.44	0.84	1.62	2.21
40.0	127	0.085	36.0	3.33	1.56	0.85	1.67	2.26
40.0	131	0.091	36.0	3.43	1.67	0.85	1.72	2.31
40.0	135	0.097	36.0	3.53	1.79	0.85	1.77	2.36
40.0	138	0.104	35.9	3.61	1.91	0.84	1.80	2.40
40.0	142	0.110	35.9	3.71	2.03	0.84	1.85	2.46
40.0	145	0.117	35.8	3.78	2.14	0.83	1.89	2.50
40.0	147	0.124	35.8	3.83	2.28	0.82	1.91	2.54
40.0	150	0.131	35.7	3.90	2.40	0.81	1.95	2.58
40.0	153	0.138	35.6	3.98	2.54	0.80	1.99	2.63
40.0	156	0.145	35.5	4.05	2.67	0.79	2.02	2.68
40.0	158	0.152	35.5	4.09	2.80	0.77	2.05	2.71
40.0	161	0.159	35.4	4.17	2.93	0.76	2.08	2.76
40.0	163	0.167	35.3	4.21	3.07	0.75	2.11	2.80
40.0	165	0.174	35.2	4.26	3.19	0.73	2.13	2.84
40.0	167	0.180	35.1	4.30	3.31	0.72	2.15	2.87
40.0	170	0.187	34.9	4.38	3.44	0.70	2.19	2.93
40.0	172	0.194	34.8	4.42	3.56	0.69	2.21	2.97
40.0	180	0.222	34.4	4.60	4.08	0.62	2.30	3.12
40.0	186	0.243	34.0	4.74	4.47	0.57	2.37	3.24
40.0	190	0.265	33.7	4.82	4.87	0.52	2.41	3.33
40.0	195	0.287	33.3	4.92	5.28	0.46	2.46	3.44
40.0	198	0.302	33.1	4.99	5.55	0.43	2.49	3.50

Figure D-2.84

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	50.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-415	Consolidation Pressure :	20.0 psi
Depth(ft):	25.5	Initial Sample Height:	5.467 in
Sample No.:	6	Initial Area of Sample:	5.395 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.467 in
Sample Description:	Brown Sandy Lean Clay	Final Sample Area (A)*:	5.665 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
50.0	2	0.000	30.0	0.05	0.00	0.00	0.03	2.91
50.0	79	0.004	32.4	2.01	0.08	0.35	1.00	3.53
50.0	118	0.011	34.2	2.99	0.21	0.60	1.50	3.77
50.0	143	0.017	35.3	3.62	0.32	0.76	1.81	3.93
50.0	164	0.025	36.1	4.15	0.45	0.87	2.07	4.08
50.0	182	0.031	36.6	4.60	0.57	0.96	2.30	4.22
50.0	197	0.038	37.0	4.97	0.70	1.02	2.49	4.35
50.0	209	0.045	37.3	5.27	0.82	1.05	2.63	4.46
50.0	216	0.052	37.4	5.44	0.95	1.07	2.72	4.53
50.0	222	0.058	37.5	5.58	1.07	1.08	2.79	4.59
50.0	226	0.065	37.5	5.68	1.19	1.08	2.84	4.64
50.0	229	0.071	37.4	5.75	1.30	1.07	2.87	4.68
50.0	232	0.077	37.3	5.81	1.41	1.06	2.91	4.73
50.0	234	0.084	37.2	5.86	1.53	1.04	2.93	4.77
50.0	236	0.091	37.1	5.90	1.66	1.03	2.95	4.80
50.0	237	0.098	37.0	5.92	1.79	1.01	2.96	4.83
50.0	239	0.106	36.9	5.96	1.93	0.99	2.98	4.87
50.0	240	0.113	36.8	5.97	2.06	0.98	2.99	4.89
50.0	241	0.120	36.7	5.99	2.20	0.96	3.00	4.91
50.0	242	0.127	36.6	6.01	2.33	0.94	3.00	4.94
50.0	243	0.135	36.4	6.02	2.47	0.93	3.01	4.96
50.0	245	0.143	36.3	6.06	2.62	0.91	3.03	5.00
50.0	245	0.150	36.2	6.06	2.75	0.89	3.03	5.01
50.0	246	0.157	36.1	6.07	2.88	0.88	3.04	5.04
50.0	248	0.164	36.0	6.11	3.01	0.86	3.06	5.08
50.0	250	0.172	35.9	6.15	3.14	0.84	3.08	5.11
50.0	251	0.180	35.7	6.17	3.28	0.83	3.09	5.14
50.0	252	0.186	35.6	6.19	3.40	0.81	3.09	5.16
50.0	254	0.193	35.5	6.23	3.53	0.80	3.11	5.20
50.0	255	0.201	35.4	6.24	3.67	0.78	3.12	5.22
50.0	258	0.221	35.1	6.29	4.05	0.73	3.15	5.29
50.0	259	0.244	34.8	6.29	4.47	0.69	3.14	5.33
50.0	261	0.266	34.5	6.31	4.87	0.65	3.16	5.39
50.0	263	0.280	34.3	6.34	5.13	0.62	3.17	5.43
50.0	267	0.303	34.0	6.41	5.53	0.58	3.21	5.51

Figure D-2.85

AP Engineering & Testing, Inc.

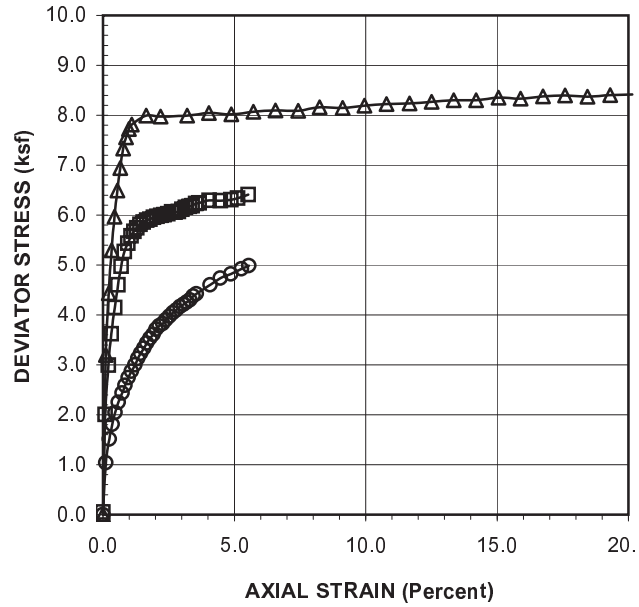
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

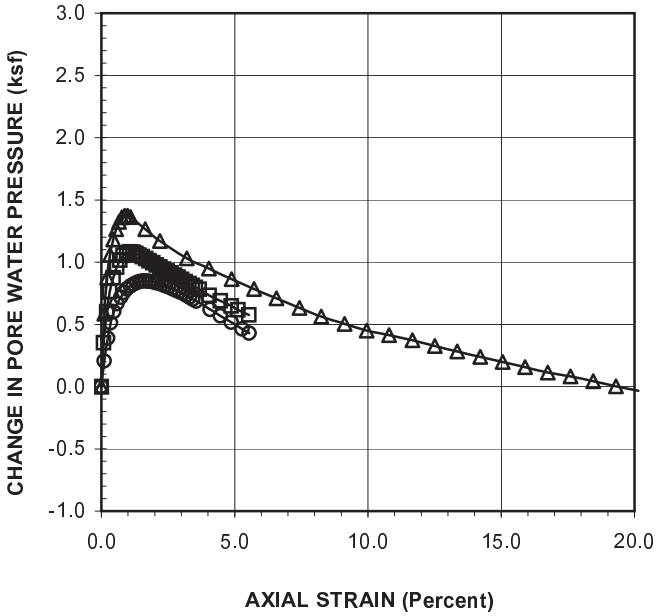
Project Name:	Westside Subway Extension	Cell Pressure:	60.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Boring No.:	G-415	Consolidation Pressure :	30.0	psi
Depth(ft):	25.5	Initial Sample Height:	5.467	in
Sample No.:	6	Initial Area of Sample:	5.395	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.467	in
Sample Description:	Brown Sandy Lean Clay	Final Sample Area (A)*:	5.668	sq. in.
		Induced OCR=	1.0	

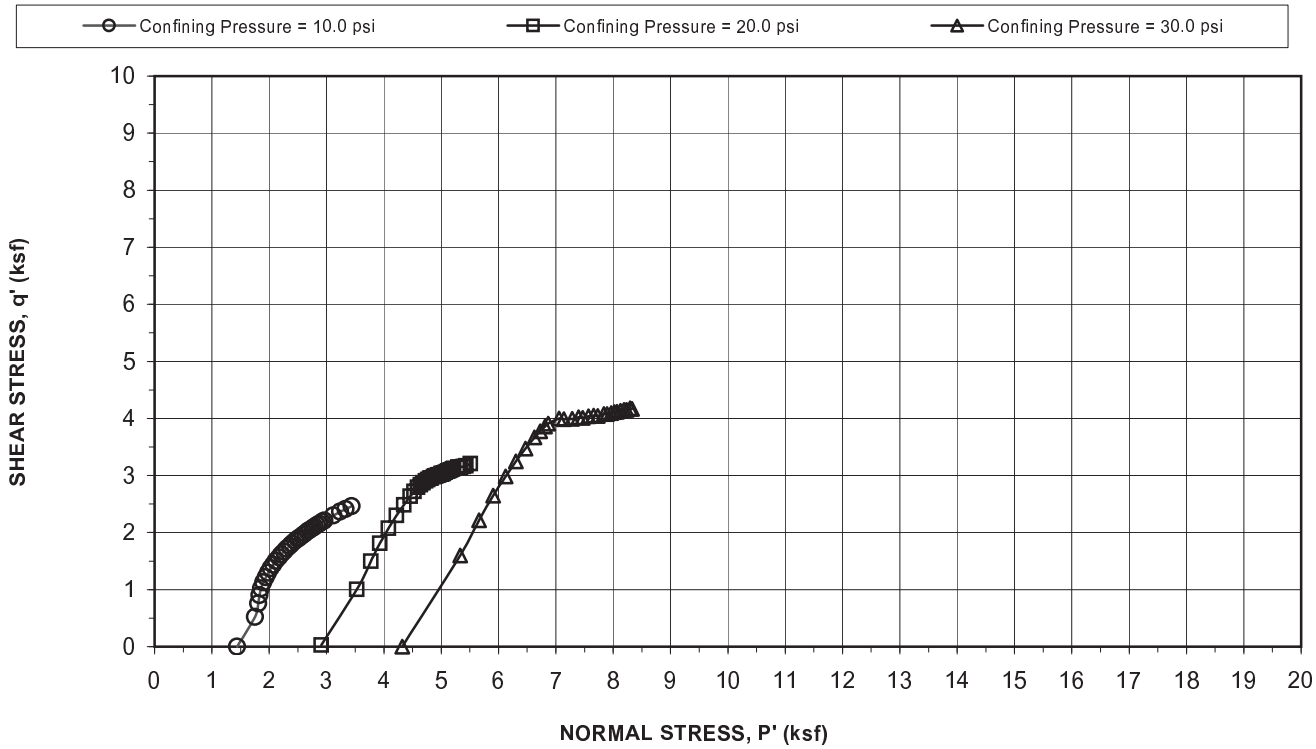
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
60.0	0	0.000	30.0	0.00	0.00	0.00	0.00	4.32
60.0	126	0.006	34.1	3.20	0.11	0.59	1.60	5.33
60.0	175	0.012	36.1	4.44	0.22	0.88	2.22	5.66
60.0	209	0.018	37.4	5.29	0.33	1.06	2.65	5.91
60.0	236	0.024	38.2	5.97	0.44	1.18	2.98	6.12
60.0	257	0.030	38.8	6.49	0.55	1.26	3.25	6.30
60.0	275	0.036	39.2	6.94	0.66	1.32	3.47	6.47
60.0	291	0.042	39.5	7.34	0.77	1.36	3.67	6.63
60.0	300	0.048	39.5	7.55	0.88	1.37	3.78	6.72
60.0	307	0.054	39.5	7.72	0.99	1.37	3.86	6.81
60.0	311	0.060	39.5	7.81	1.10	1.36	3.91	6.86
60.0	320	0.090	38.8	8.00	1.65	1.26	4.00	7.05
60.0	321	0.120	38.1	7.98	2.20	1.17	3.99	7.14
60.0	325	0.175	37.2	7.99	3.21	1.03	4.00	7.28
60.0	330	0.220	36.6	8.05	4.03	0.95	4.02	7.40
60.0	332	0.267	36.0	8.02	4.89	0.86	4.01	7.47
60.0	337	0.313	35.5	8.07	5.72	0.78	4.04	7.57
60.0	341	0.359	34.9	8.09	6.56	0.71	4.05	7.66
60.0	344	0.406	34.4	8.09	7.43	0.63	4.04	7.73
60.0	350	0.451	33.9	8.16	8.25	0.56	4.08	7.84
60.0	353	0.499	33.5	8.15	9.12	0.50	4.08	7.89
60.0	358	0.544	33.1	8.19	9.96	0.45	4.09	7.96
60.0	363	0.590	32.9	8.23	10.79	0.41	4.11	8.02
60.0	367	0.638	32.6	8.24	11.67	0.37	4.12	8.07
60.0	372	0.684	32.3	8.27	12.51	0.33	4.13	8.13
60.0	377	0.730	32.0	8.30	13.34	0.28	4.15	8.19
60.0	381	0.777	31.7	8.30	14.21	0.24	4.15	8.23
60.0	387	0.823	31.4	8.35	15.05	0.20	4.18	8.30
60.0	390	0.869	31.1	8.33	15.90	0.16	4.17	8.33
60.0	396	0.916	30.8	8.38	16.75	0.11	4.19	8.39
60.0	401	0.962	30.6	8.40	17.59	0.08	4.20	8.43
60.0	404	1.008	30.3	8.37	18.45	0.04	4.19	8.46
60.0	410	1.055	30.0	8.41	19.30	0.00	4.20	8.52
60.0	415	1.101	29.8	8.42	20.15	-0.03	4.21	8.56

Figure D-2.86

AP Engineering & Testing, Inc.







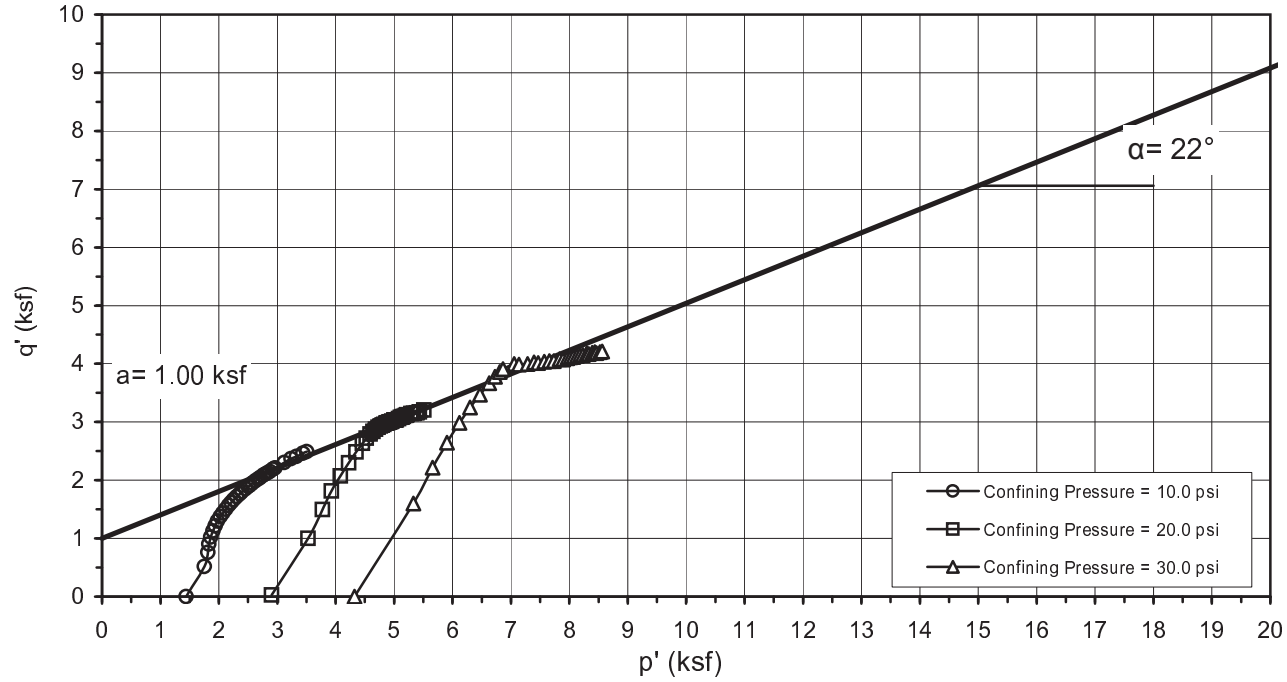
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Sandy Lean Clay
Boring No.:	G-415	Avg. Dry Unit Weight (pcf):	115.7
Sample No.:	6	Avg. Initial Moisture Content (%):	13.5
Depth (ft):	25.5	Confining Pressure:	10.0, 20.0, 30.0 psi

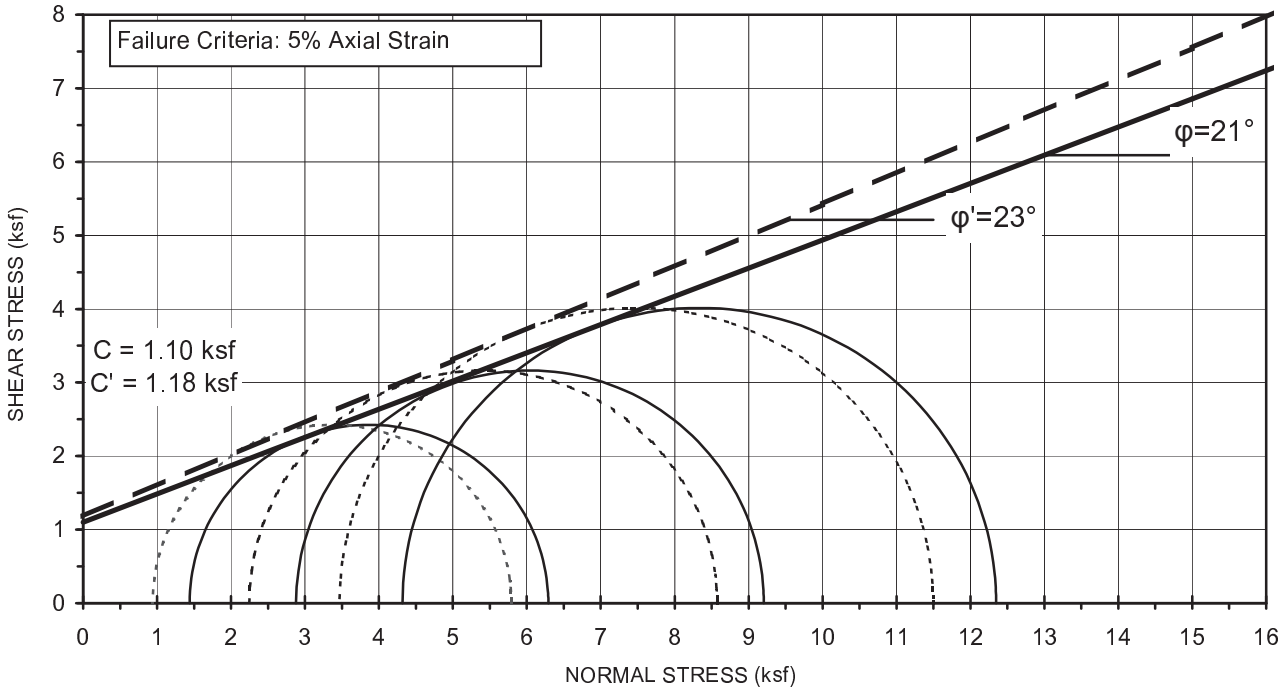
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.87

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Sandy Lean Clay
Boring No.:	G-415	Avg. Dry Unit Weight (pcf):	115.7
Sample No.:	6	Avg. Initial Moisture Content (%):	13.5
Depth (ft):	25.5	Confining Pressures:	10.0, 20.0, 30.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.88

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-415	Reviewed by:	AP	Date:	05-14-15
Sample No.:	15	Sample Description:	Brown Sandy Lean Clay		
Depth(ft):	60.5				
Sample Type:	Mod. Cal.	Confining Pressure = 25.0 psi			

Diameter (in)	2.614	2.614	2.614	Avg. =	2.614
Height (in)	5.600	5.600	5.600	Avg. =	5.600

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.367	5.297
Moisture Content (%)	17.73	15.34
Wet Weight (gms)	1048.13	1175.75
Dry Weight (gms)	890.28	1039.18
Container Weight (gms)	0.00	148.90
Density and Saturation		
Wet Weight (gms)	1048.13	
Container Weight (gms)	0.00	
Wet Density (pcf)	132.9	
Dry Density (pcf)	112.9	
Initial Void Ratio	0.493	
% Saturation	97.1	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	96	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	55.0	Initial Burette Ht.(cm)=	83.5
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	73.3
Eff. Consol. Stress (psi) =	25.0	Final Height (in)=	5.556
Induced OCR =	1.0	Initial Volume (cu.in)=	30.053
Change in Ht. of Specimen (in) =	0.0443	Final Volume (cu.in) =	29.431

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	6.51
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	1.47
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	7.98
		Axial Strain (%) =	5.37

Figure D-2.89

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-415	Reviewed by:	AP	Date:	05-14-15
Sample No.:	15	Sample Description:	Brown Sandy Lean Clay		
Depth(ft):	60.5				
Sample Type:	Mod. Cal.	Confining Pressure = 50.0 psi			

Diameter (in)	2.614	2.614	2.614	Avg. =	2.614
Height (in)	5.600	5.600	5.600	Avg. =	5.600

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.367	5.569
Moisture Content (%)	17.73	15.34
Wet Weight (gms)	1048.13	1175.75
Dry Weight (gms)	890.28	1039.18
Container Weight (gms)	0.00	148.90
Density and Saturation		
Wet Weight (gms)	1048.13	
Container Weight (gms)	0.00	
Wet Density (pcf)	132.9	
Dry Density (pcf)	112.9	
Initial Void Ratio	0.493	
% Saturation	97.1	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	96	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	80.0	Initial Burette Ht.(cm)=	73.2
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	63.6
Eff. Consol. Stress (psi) =	50.0	Final Height (in)=	5.591
Induced OCR=	1.0	Initial Volume (cu.in)=	30.053
Change in Ht. of Specimen (in) =	0.0087	Final Volume (cu.in) =	29.467

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	11.43
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	3.66
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	15.09
		Axial Strain (%) =	5.36

Figure D-2.90

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-415	Reviewed by:	AP	Date:	05-14-15
Sample No.:	15	Sample Description:	Brown Sandy Lean Clay		
Depth(ft):	60.5				
Sample Type:	Mod. Cal.	Confining Pressure = 75.0 psi			

Diameter (in)	2.614	2.614	2.614	Avg. =	2.614
Height (in)	5.600	5.600	5.600	Avg. =	5.600

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.367	5.562
Moisture Content (%)	17.73	15.34
Wet Weight (gms)	1048.13	1175.75
Dry Weight (gms)	890.28	1039.18
Container Weight (gms)	0.00	148.90
Density and Saturation		
Wet Weight (gms)	1048.13	
Container Weight (gms)	0.00	
Wet Density (pcf)	132.9	
Dry Density (pcf)	112.9	
Initial Void Ratio	0.493	
% Saturation	97.1	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	96	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	105.0	Initial Burette Ht.(cm)=	63.6
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	53.8
Eff. Consol. Stress (psi) =	75.0	Final Height (in)=	5.595
Induced OCR =	1.0	Initial Volume (cu.in)=	30.053
Change in Ht. of Specimen (in) =	0.0047	Final Volume (cu.in) =	29.455

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	17.66
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	7.29
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	24.96
		Axial Strain (%) =	8.78

Figure D-2.91

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	55.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-415	Consolidation Pressure :	25.0 psi
Depth(ft):	60.5	Initial Sample Height:	5.600 in
Sample No.:	15	Initial Area of Sample:	5.367 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.556 in
Sample Description:	Brown Sandy Lean Clay	Final Sample Area (A)*:	5.297 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
55.0	0	0.000	30.0	0.00	0.00	0.00	0.00	3.60
55.0	54	0.005	32.6	1.46	0.09	0.38	0.73	3.96
55.0	78	0.012	35.0	2.12	0.21	0.71	1.06	3.95
55.0	92	0.019	36.6	2.50	0.34	0.95	1.25	3.90
55.0	102	0.027	37.9	2.77	0.48	1.13	1.38	3.85
55.0	111	0.033	38.9	3.00	0.59	1.28	1.50	3.82
55.0	118	0.041	39.8	3.18	0.74	1.41	1.59	3.78
55.0	125	0.048	40.6	3.38	0.87	1.52	1.69	3.77
55.0	131	0.056	41.2	3.52	1.01	1.62	1.76	3.74
55.0	135	0.063	41.8	3.64	1.14	1.70	1.82	3.71
55.0	141	0.070	42.4	3.78	1.27	1.78	1.89	3.71
55.0	145	0.077	42.8	3.89	1.39	1.85	1.95	3.70
55.0	151	0.084	43.3	4.03	1.52	1.91	2.02	3.71
55.0	156	0.091	43.6	4.18	1.64	1.96	2.09	3.73
55.0	161	0.098	43.9	4.29	1.77	2.01	2.14	3.74
55.0	165	0.106	44.2	4.40	1.90	2.05	2.20	3.75
55.0	169	0.113	44.5	4.51	2.04	2.08	2.26	3.77
55.0	174	0.120	44.7	4.62	2.16	2.11	2.31	3.80
55.0	178	0.128	44.8	4.73	2.31	2.13	2.37	3.83
55.0	184	0.135	45.0	4.87	2.44	2.16	2.44	3.88
55.0	187	0.143	45.1	4.95	2.57	2.17	2.48	3.90
55.0	190	0.150	45.2	5.03	2.70	2.19	2.52	3.93
55.0	195	0.158	45.3	5.14	2.84	2.20	2.57	3.97
55.0	199	0.165	45.3	5.25	2.97	2.21	2.63	4.02
55.0	201	0.173	45.4	5.30	3.11	2.22	2.65	4.03
55.0	205	0.181	45.4	5.38	3.25	2.22	2.69	4.07
55.0	209	0.188	45.5	5.49	3.39	2.22	2.74	4.12
55.0	212	0.195	45.5	5.57	3.51	2.23	2.78	4.16
55.0	215	0.202	45.5	5.62	3.64	2.23	2.81	4.18
55.0	218	0.209	45.5	5.70	3.77	2.22	2.85	4.22
55.0	224	0.224	45.4	5.85	4.02	2.22	2.93	4.31
55.0	233	0.246	45.3	6.06	4.43	2.20	3.03	4.43
55.0	239	0.261	45.1	6.18	4.69	2.18	3.09	4.52
55.0	249	0.284	44.9	6.41	5.10	2.15	3.21	4.66
55.0	253	0.299	44.8	6.51	5.37	2.13	3.25	4.73

Figure D-2.92

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	80.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-415	Consolidation Pressure :	50.0 psi
Depth(ft):	60.5	Initial Sample Height:	5.600 in
Sample No.:	15	Initial Area of Sample:	5.367 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.591 in
Sample Description:	Brown Sandy Lean Clay	Final Sample Area (A)*:	5.569 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
80.0	0	0.000	30.0	0.00	0.00	0.00	0.00	7.20
80.0	85	0.005	32.9	2.20	0.09	0.42	1.10	7.88
80.0	158	0.011	37.5	4.08	0.20	1.07	2.04	8.17
80.0	206	0.018	41.3	5.31	0.32	1.63	2.65	8.22
80.0	242	0.025	44.5	6.23	0.45	2.09	3.11	8.22
80.0	271	0.032	47.2	6.97	0.57	2.47	3.48	8.21
80.0	296	0.039	49.4	7.60	0.70	2.79	3.80	8.21
80.0	316	0.046	51.2	8.10	0.83	3.05	4.05	8.21
80.0	332	0.053	52.6	8.50	0.95	3.25	4.25	8.20
80.0	345	0.061	53.7	8.82	1.09	3.41	4.41	8.21
80.0	356	0.067	54.5	9.09	1.20	3.52	4.55	8.22
80.0	365	0.075	55.1	9.31	1.33	3.61	4.66	8.25
80.0	371	0.082	55.5	9.45	1.46	3.67	4.73	8.25
80.0	378	0.088	55.9	9.62	1.58	3.73	4.81	8.28
80.0	385	0.096	56.2	9.78	1.71	3.77	4.89	8.32
80.0	389	0.103	56.4	9.87	1.84	3.80	4.94	8.34
80.0	395	0.110	56.5	10.01	1.97	3.82	5.01	8.39
80.0	398	0.118	56.6	10.07	2.11	3.83	5.04	8.41
80.0	402	0.125	56.7	10.16	2.23	3.84	5.08	8.44
80.0	406	0.132	56.7	10.25	2.36	3.85	5.12	8.48
80.0	410	0.140	56.7	10.34	2.50	3.85	5.17	8.52
80.0	413	0.147	56.7	10.40	2.64	3.84	5.20	8.55
80.0	416	0.154	56.7	10.46	2.76	3.84	5.23	8.59
80.0	419	0.162	56.6	10.52	2.89	3.83	5.26	8.63
80.0	423	0.169	56.6	10.61	3.03	3.82	5.30	8.68
80.0	426	0.176	56.5	10.67	3.15	3.82	5.33	8.72
80.0	428	0.184	56.4	10.70	3.28	3.81	5.35	8.74
80.0	431	0.191	56.4	10.76	3.41	3.79	5.38	8.79
80.0	434	0.198	56.3	10.82	3.54	3.78	5.41	8.83
80.0	436	0.205	56.2	10.86	3.67	3.77	5.43	8.86
80.0	444	0.226	55.9	11.02	4.05	3.72	5.51	8.99
80.0	449	0.241	55.6	11.11	4.31	3.69	5.55	9.06
80.0	456	0.264	55.2	11.23	4.72	3.63	5.62	9.19
80.0	461	0.285	54.9	11.31	5.10	3.58	5.66	9.28
80.0	467	0.300	54.6	11.43	5.36	3.54	5.71	9.37

Figure D-2.93

AP Engineering & Testing, Inc.

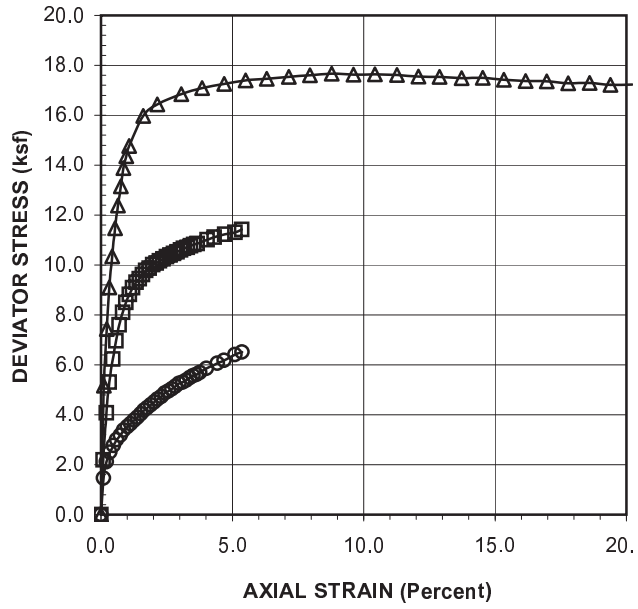
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

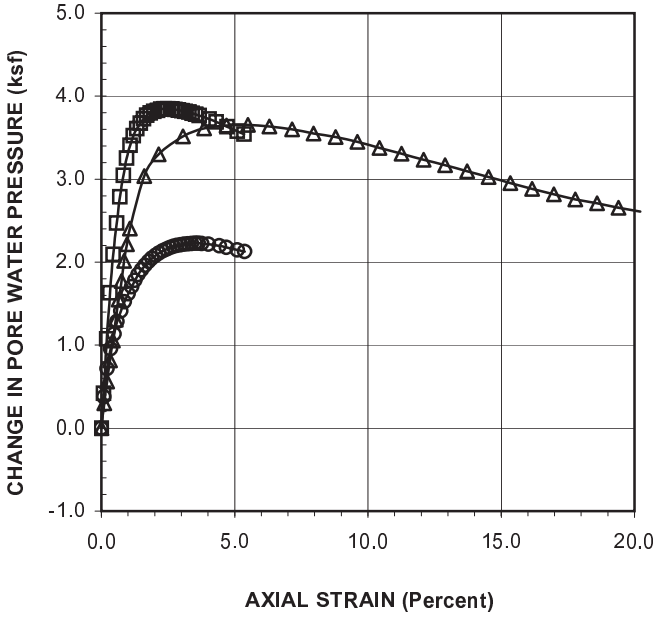
Project Name:	Westside Subway Extension	Cell Pressure:	105.0	psi
Project No:	4953-11-1423	Back Pressure :	30.0	psi
Boring No.:	G-415	Consolidation Pressure :	75.0	psi
Depth(ft):	60.5	Initial Sample Height:	5.600	in
Sample No.:	15	Initial Area of Sample:	5.367	sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.595	in
Sample Description:	Brown Sandy Lean Clay	Final Sample Area (A)*:	5.562	sq. in.
		Induced OCR=	1.0	

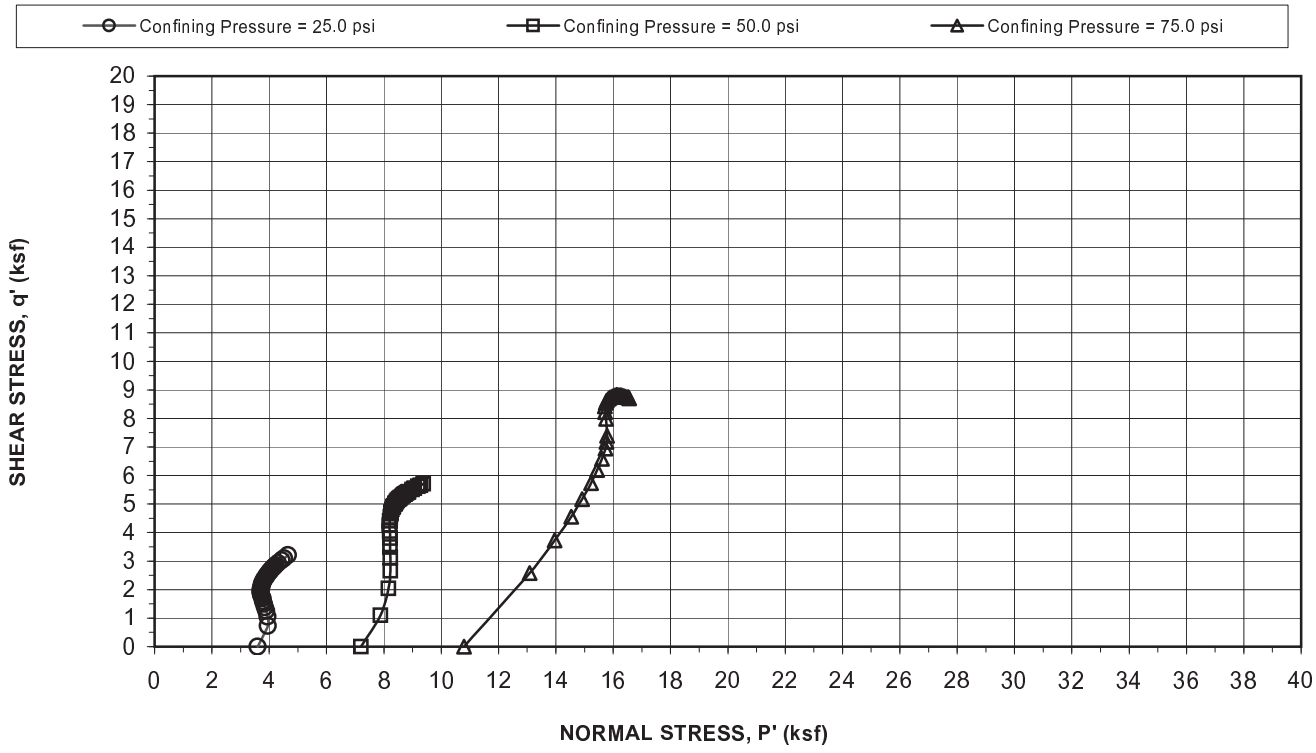
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
105.0	0	0.000	30.0	0.00	0.00	0.00	0.00	10.80
105.0	200	0.006	32.1	5.17	0.11	0.30	2.58	13.08
105.0	288	0.012	33.9	7.44	0.21	0.56	3.72	13.96
105.0	353	0.018	35.7	9.10	0.32	0.82	4.55	14.54
105.0	401	0.024	37.3	10.35	0.43	1.06	5.17	14.92
105.0	446	0.030	39.1	11.47	0.54	1.31	5.74	15.23
105.0	482	0.036	40.8	12.39	0.64	1.55	6.19	15.44
105.0	512	0.042	42.3	13.16	0.75	1.77	6.58	15.61
105.0	541	0.048	44.0	13.88	0.86	2.02	6.94	15.73
105.0	560	0.054	45.4	14.35	0.97	2.21	7.18	15.76
105.0	577	0.060	46.7	14.78	1.07	2.41	7.39	15.78
105.0	627	0.090	51.1	15.98	1.61	3.04	7.99	15.75
105.0	649	0.120	52.9	16.44	2.14	3.30	8.22	15.72
105.0	671	0.171	54.4	16.85	3.06	3.52	8.43	15.71
105.0	687	0.215	55.1	17.09	3.85	3.61	8.55	15.74
105.0	699	0.262	55.3	17.26	4.69	3.65	8.63	15.78
105.0	711	0.308	55.4	17.39	5.50	3.65	8.70	15.84
105.0	720	0.353	55.2	17.47	6.30	3.63	8.73	15.90
105.0	730	0.400	55.0	17.54	7.15	3.60	8.77	15.97
105.0	739	0.445	54.7	17.61	7.95	3.55	8.80	16.05
105.0	748	0.492	54.4	17.66	8.78	3.51	8.83	16.12
105.0	753	0.537	54.0	17.63	9.60	3.45	8.81	16.16
105.0	761	0.583	53.5	17.64	10.43	3.38	8.82	16.24
105.0	767	0.630	53.0	17.62	11.26	3.31	8.81	16.30
105.0	771	0.676	52.5	17.55	12.09	3.24	8.78	16.34
105.0	778	0.721	52.0	17.54	12.89	3.17	8.77	16.40
105.0	783	0.768	51.5	17.49	13.72	3.10	8.74	16.45
105.0	791	0.813	51.0	17.51	14.53	3.03	8.75	16.53
105.0	795	0.858	50.5	17.42	15.34	2.95	8.71	16.56
105.0	800	0.904	50.0	17.37	16.16	2.88	8.68	16.60
105.0	807	0.950	49.6	17.35	16.97	2.82	8.68	16.66
105.0	812	0.995	49.1	17.28	17.78	2.76	8.64	16.68
105.0	821	1.041	48.8	17.30	18.60	2.71	8.65	16.74
105.0	825	1.085	48.4	17.22	19.39	2.66	8.61	16.76
105.0	834	1.131	48.1	17.23	20.22	2.61	8.62	16.81

Figure D-2.94

AP Engineering & Testing, Inc.







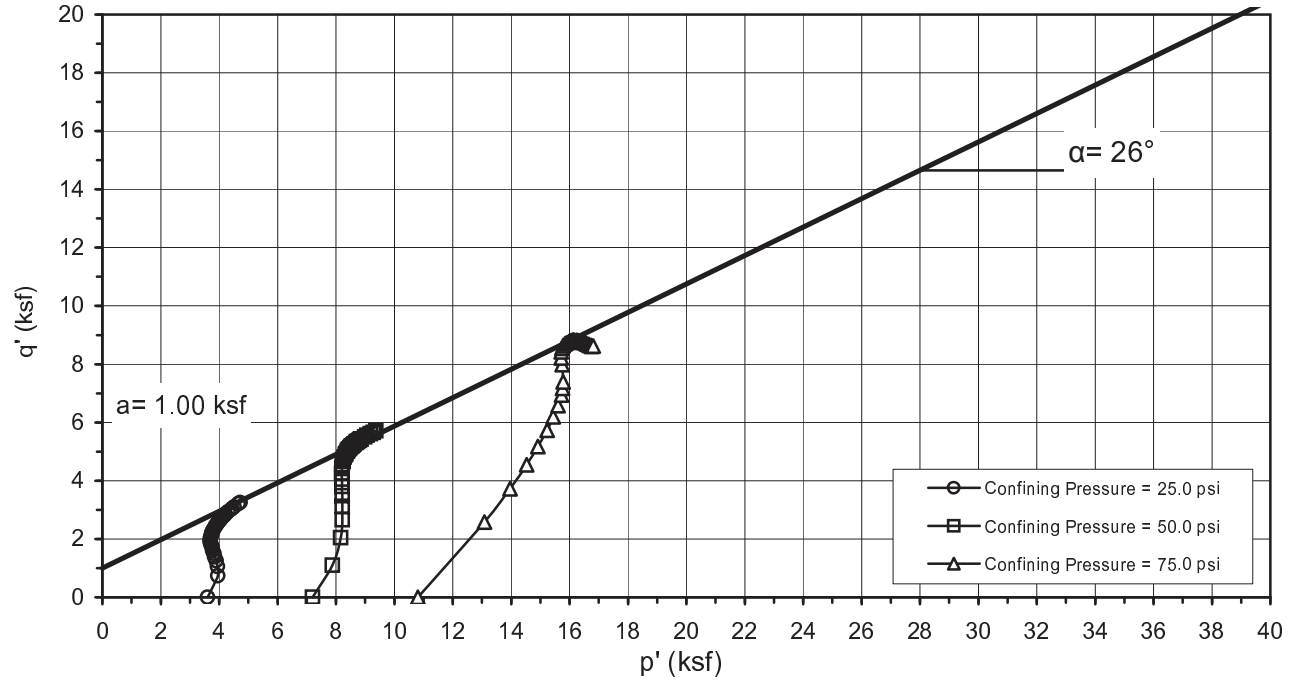
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Sandy Lean Clay
Boring No.:	G-415	Avg. Dry Unit Weight (pcf):	112.9
Sample No.:	15	Avg. Initial Moisture Content (%):	17.7
Depth (ft):	60.5	Confining Pressure:	25.0, 50.0, 75.0 psi

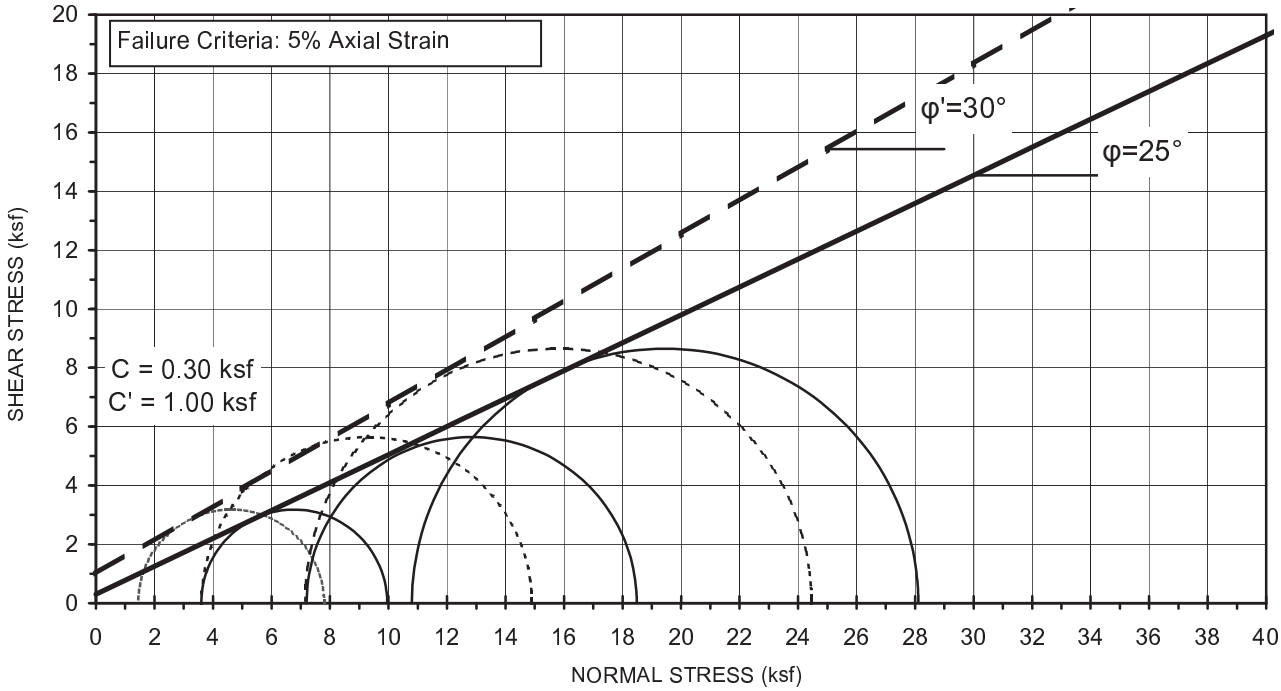
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.95

AP Engineering & Testing, Inc.





Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Brown Sandy Lean Clay
Boring No.:	G-415	Avg. Dry Unit Weight (pcf):	112.9
Sample No.:	15	Avg. Initial Moisture Content (%):	17.7
Depth (ft):	60.5	Confining Pressures:	25.0, 50.0, 75.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.96

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-415	Reviewed by:	AP	Date:	05-14-15
Sample No.:	21	Sample Description:	Dark Gray Fat Clay		
Depth(ft):	90.5				
Sample Type:	Mod. Cal.	Confining Pressure = 40.0 psi			

Diameter (in)	2.627	2.627	2.627	Avg. =	2.627
Height (in)	5.645	5.645	5.645	Avg. =	5.645

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.420	5.293
Moisture Content (%)	38.18	38.87
Wet Weight (gms)	39.65	1042.40
Dry Weight (gms)	29.41	789.95
Container Weight (gms)	2.59	140.54
Density and Saturation		
Wet Weight (gms)	907.31	
Container Weight (gms)	0.00	
Wet Density (pcf)	113.0	
Dry Density (pcf)	81.8	
Initial Void Ratio	1.061	
% Saturation	97.2	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	96	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	70.0	Initial Burette Ht.(cm)=	85.6
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	67.4
Eff. Consol. Stress (psi) =	40.0	Final Height (in)=	5.570
Induced OCR =	1.0	Initial Volume (cu.in)=	30.597
Change in Ht. of Specimen (in) =	0.0747	Final Volume (cu.in) =	29.486

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	6.94
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	3.26
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	10.20
		Axial Strain (%) =	5.47

Figure D-2.97

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-415	Reviewed by:	AP	Date:	05-14-15
Sample No.:	21	Sample Description:	Dark Gray Fat Clay		
Depth(ft):	90.5				
Sample Type:	Mod. Cal.	Confining Pressure = 60.0 psi			

Diameter (in)	2.627	2.627	2.627	Avg. =	2.627
Height (in)	5.645	5.645	5.645	Avg. =	5.645

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.420	5.651
Moisture Content (%)	38.18	38.87
Wet Weight (gms)	39.65	1042.40
Dry Weight (gms)	29.41	789.95
Container Weight (gms)	2.59	140.54
Density and Saturation		
Wet Weight (gms)	907.31	
Container Weight (gms)	0.00	
Wet Density (pcf)	113.0	
Dry Density (pcf)	81.8	
Initial Void Ratio	1.061	
% Saturation	97.2	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	96	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	90.0	Initial Burette Ht.(cm)=	67.3
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	59.2
Eff. Consol. Stress (psi) =	60.0	Final Height (in)=	5.635
Induced OCR=	1.0	Initial Volume (cu.in)=	30.597
Change in Ht. of Specimen (in) =	0.0100	Final Volume (cu.in) =	30.102

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	10.03
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	4.59
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	14.62
		Axial Strain (%) =	4.73

Figure D-2.98

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	Westside Subway Extension	Tested by:	ST	Date:	05-08-15
Project No.:	4953-11-1423	Input Data by:	KM	Date:	05-14-15
Boring No.:	G-415	Reviewed by:	AP	Date:	05-14-15
Sample No.:	21	Sample Description:	Dark Gray Fat Clay		
Depth(ft):	90.5				
Sample Type:	Mod. Cal.	Confining Pressure = 80.0 psi			

Diameter (in)	2.627	2.627	2.627	Avg. =	2.627
Height (in)	5.645	5.645	5.645	Avg. =	5.645

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	5.420	5.583
Moisture Content (%)	38.18	38.87
Wet Weight (gms)	39.65	1042.40
Dry Weight (gms)	29.41	789.95
Container Weight (gms)	2.59	140.54
Density and Saturation		
Wet Weight (gms)	907.31	
Container Weight (gms)	0.00	
Wet Density (pcf)	113.0	
Dry Density (pcf)	81.8	
Initial Void Ratio	1.061	
% Saturation	97.2	

Assumed Specific Gravity = 2.70

Back Pressure Saturation			
B Value (%) =	96	Change in Ht. of the Specimen (in)=	0

Consolidation			
Cell Pressure (psi) =	110.0	Initial Burette Ht.(cm)=	59.2
Back Pressure(psi) =	30.0	Final Burette Ht.(cm)=	49.6
Eff. Consol. Stress (psi) =	80.0	Final Height (in)=	5.642
Induced OCR =	1.0	Initial Volume (cu.in)=	30.597
Change in Ht. of Specimen (in) =	0.0027	Final Volume (cu.in) =	30.011

Shear		At Failure	
Rate of Deformation (in/min)=	0.005	Deviator Stress (ksf) =	13.54
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	6.75
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	20.29
		Axial Strain (%) =	6.44

Figure D-2.99

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	70.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-415	Consolidation Pressure :	40.0 psi
Depth(ft):	90.5	Initial Sample Height:	5.645 in
Sample No.:	21	Initial Area of Sample:	5.420 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.570 in
Sample Description:	Dark Gray Fat Clay	Final Sample Area (A)*:	5.293 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
70.0	0	0.000	30.0	0.00	0.00	0.00	0.00	5.76
70.0	66	0.005	31.3	1.79	0.08	0.18	0.90	6.47
70.0	93	0.011	32.4	2.52	0.20	0.35	1.26	6.67
70.0	109	0.018	33.5	2.96	0.33	0.50	1.48	6.74
70.0	122	0.026	34.5	3.30	0.46	0.65	1.65	6.77
70.0	131	0.032	35.5	3.54	0.58	0.78	1.77	6.75
70.0	140	0.040	36.3	3.78	0.71	0.91	1.89	6.74
70.0	147	0.047	37.2	3.96	0.85	1.03	1.98	6.71
70.0	153	0.055	37.9	4.12	0.98	1.14	2.06	6.68
70.0	158	0.062	38.7	4.25	1.11	1.25	2.13	6.64
70.0	163	0.069	39.3	4.38	1.23	1.34	2.19	6.61
70.0	168	0.076	40.0	4.51	1.36	1.43	2.25	6.58
70.0	172	0.083	40.5	4.61	1.49	1.52	2.30	6.55
70.0	177	0.091	41.1	4.74	1.62	1.59	2.37	6.54
70.0	181	0.098	41.5	4.84	1.75	1.66	2.42	6.52
70.0	185	0.105	42.0	4.94	1.88	1.73	2.47	6.50
70.0	189	0.112	42.4	5.04	2.01	1.79	2.52	6.49
70.0	193	0.119	42.8	5.14	2.14	1.85	2.57	6.48
70.0	197	0.127	43.2	5.24	2.28	1.90	2.62	6.48
70.0	200	0.134	43.5	5.31	2.40	1.95	2.66	6.47
70.0	204	0.141	43.9	5.41	2.54	1.99	2.70	6.47
70.0	207	0.149	44.1	5.48	2.67	2.04	2.74	6.46
70.0	210	0.156	44.4	5.55	2.81	2.07	2.78	6.46
70.0	213	0.164	44.6	5.62	2.94	2.11	2.81	6.47
70.0	216	0.171	44.8	5.70	3.08	2.14	2.85	6.47
70.0	219	0.179	45.1	5.77	3.22	2.17	2.88	6.48
70.0	222	0.187	45.3	5.84	3.35	2.20	2.92	6.48
70.0	224	0.193	45.4	5.88	3.47	2.22	2.94	6.48
70.0	227	0.201	45.6	5.95	3.61	2.25	2.98	6.49
70.0	231	0.208	45.8	6.05	3.74	2.27	3.02	6.51
70.0	237	0.223	46.1	6.19	4.00	2.32	3.09	6.53
70.0	246	0.245	46.5	6.40	4.40	2.38	3.20	6.58
70.0	256	0.268	46.9	6.63	4.80	2.43	3.31	6.64
70.0	262	0.282	47.1	6.77	5.06	2.47	3.38	6.68
70.0	270	0.305	47.4	6.94	5.47	2.50	3.47	6.73

Figure D-2.100

AP Engineering & Testing, Inc.

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	Westside Subway Extension	Cell Pressure:	90.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-415	Consolidation Pressure :	60.0 psi
Depth(ft):	90.5	Initial Sample Height:	5.645 in
Sample No.:	21	Initial Area of Sample:	5.420 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.635 in
Sample Description:	Dark Gray Fat Clay	Final Sample Area (A)*:	5.651 sq. in.
		Induced OCR=	1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
90.0	1	0.000	30.0	0.03	0.00	0.00	0.01	8.65
90.0	89	0.005	34.0	2.27	0.09	0.58	1.13	9.19
90.0	137	0.012	37.5	3.48	0.21	1.08	1.74	9.30
90.0	170	0.019	40.4	4.32	0.34	1.49	2.16	9.31
90.0	196	0.026	42.8	4.97	0.46	1.85	2.49	9.28
90.0	218	0.033	45.1	5.52	0.59	2.18	2.76	9.22
90.0	238	0.040	47.3	6.02	0.71	2.49	3.01	9.17
90.0	257	0.047	49.2	6.49	0.84	2.77	3.25	9.12
90.0	273	0.054	50.9	6.89	0.96	3.01	3.44	9.07
90.0	287	0.061	52.4	7.23	1.08	3.23	3.62	9.03
90.0	301	0.068	53.7	7.58	1.21	3.41	3.79	9.01
90.0	312	0.075	54.7	7.84	1.34	3.56	3.92	9.00
90.0	321	0.082	55.6	8.06	1.46	3.69	4.03	8.98
90.0	331	0.089	56.4	8.30	1.58	3.80	4.15	8.99
90.0	338	0.096	57.0	8.47	1.71	3.88	4.23	8.99
90.0	346	0.104	57.5	8.65	1.84	3.96	4.33	9.01
90.0	353	0.111	57.9	8.82	1.97	4.01	4.41	9.03
90.0	359	0.118	58.2	8.96	2.10	4.07	4.48	9.05
90.0	365	0.126	58.5	9.09	2.23	4.11	4.55	9.08
90.0	370	0.134	58.7	9.20	2.37	4.14	4.60	9.11
90.0	374	0.141	58.9	9.29	2.50	4.17	4.65	9.12
90.0	378	0.148	59.1	9.38	2.63	4.18	4.69	9.15
90.0	382	0.156	59.2	9.46	2.76	4.20	4.73	9.17
90.0	385	0.163	59.2	9.53	2.89	4.21	4.76	9.19
90.0	388	0.171	59.2	9.59	3.03	4.21	4.79	9.22
90.0	392	0.178	59.2	9.67	3.16	4.21	4.84	9.27
90.0	394	0.186	59.2	9.71	3.29	4.20	4.85	9.29
90.0	397	0.193	59.2	9.77	3.42	4.20	4.89	9.33
90.0	399	0.200	59.1	9.81	3.54	4.19	4.90	9.35
90.0	401	0.207	59.1	9.84	3.67	4.19	4.92	9.37
90.0	406	0.222	59.0	9.94	3.94	4.17	4.97	9.44
90.0	411	0.244	58.7	10.02	4.34	4.13	5.01	9.52
90.0	413	0.267	58.1	10.03	4.73	4.05	5.01	9.60
90.0	407	0.282	57.3	9.85	5.00	3.92	4.93	9.64
90.0	402	0.304	55.1	9.70	5.39	3.62	4.85	9.87

Figure D-2.101

AP Engineering & Testing, Inc.

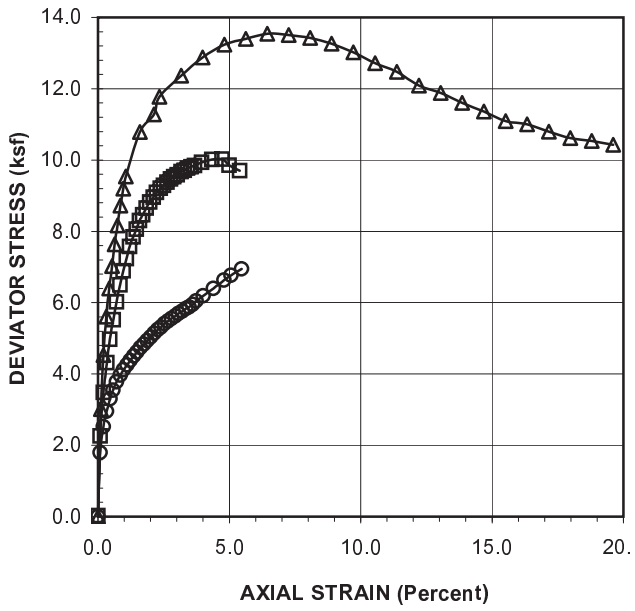
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

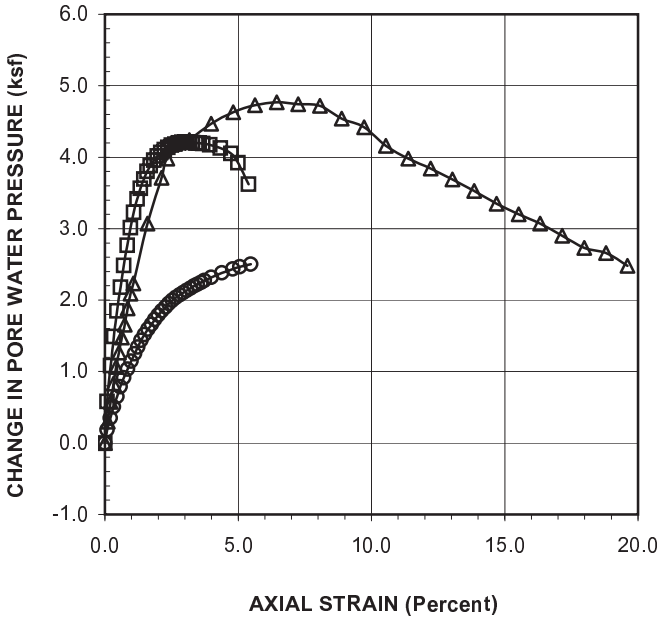
Project Name:	Westside Subway Extension	Cell Pressure:	110.0 psi
Project No:	4953-11-1423	Back Pressure :	30.0 psi
Boring No.:	G-415	Consolidation Pressure :	80.0 psi
Depth(ft):	90.5	Initial Sample Height:	5.645 in
Sample No.:	21	Initial Area of Sample:	5.420 sq. in.
Sample Type:	Mod. Cal.	Final Sample Ht.* (L):	5.642 in
Sample Description:	Dark Gray Fat Clay	Final Sample Area (A)*:	5.583 sq. in.
		Induced OCR=	1.0

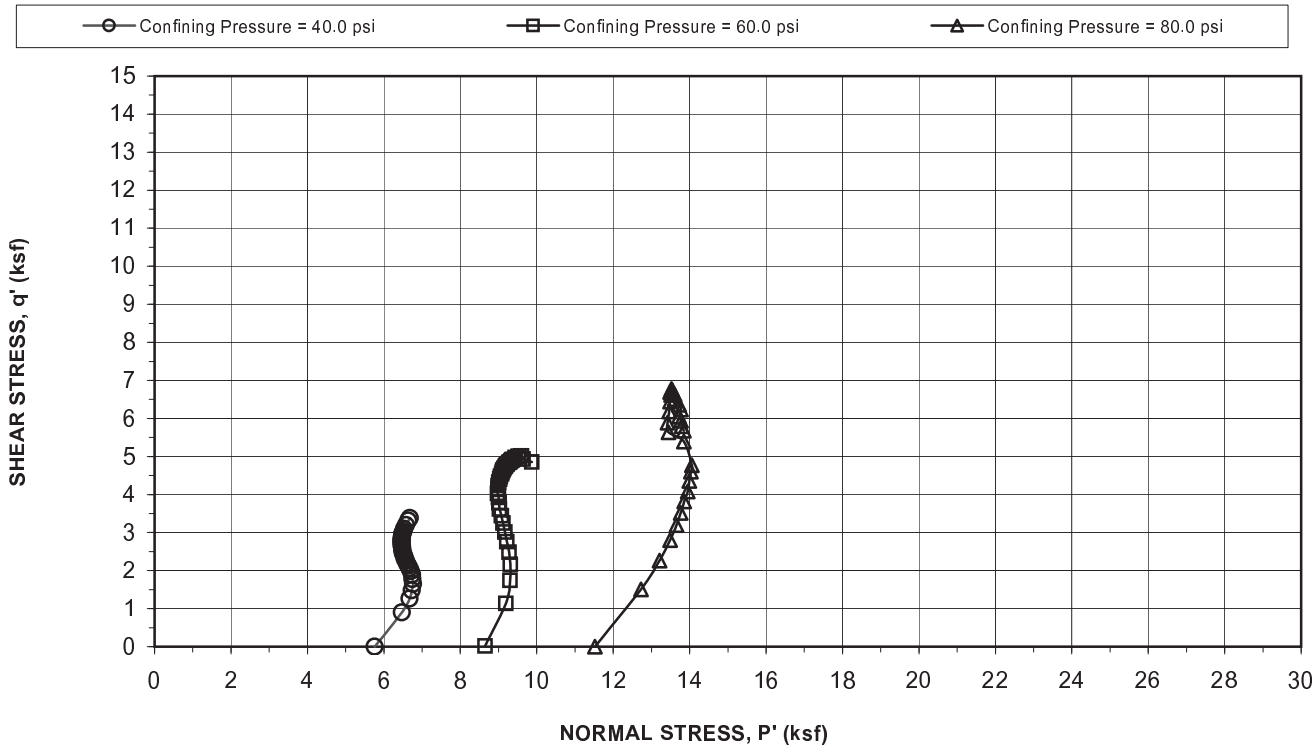
Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
110.0	0	0.000	30.0	0.00	0.00	0.00	0.00	11.52
110.0	117	0.006	32.1	3.01	0.11	0.30	1.51	12.73
110.0	176	0.012	34.0	4.53	0.21	0.57	2.26	13.21
110.0	218	0.018	35.8	5.60	0.32	0.83	2.80	13.49
110.0	249	0.024	37.4	6.39	0.43	1.06	3.20	13.65
110.0	274	0.030	38.8	7.03	0.53	1.27	3.51	13.77
110.0	298	0.036	40.3	7.64	0.64	1.48	3.82	13.86
110.0	319	0.042	41.5	8.17	0.74	1.66	4.08	13.95
110.0	341	0.048	43.1	8.72	0.85	1.88	4.36	14.00
110.0	360	0.054	44.5	9.20	0.96	2.09	4.60	14.03
110.0	374	0.060	45.5	9.54	1.06	2.23	4.77	14.06
110.0	425	0.090	51.3	10.79	1.60	3.07	5.40	13.85
110.0	447	0.120	55.8	11.28	2.13	3.71	5.64	13.45
110.0	467	0.132	57.6	11.77	2.34	3.98	5.89	13.43
110.0	495	0.179	59.4	12.37	3.17	4.24	6.19	13.47
110.0	520	0.225	61.0	12.88	3.98	4.47	6.44	13.49
110.0	539	0.271	62.2	13.24	4.81	4.63	6.62	13.51
110.0	551	0.318	62.8	13.40	5.63	4.73	6.70	13.49
110.0	561	0.363	63.1	13.54	6.44	4.77	6.77	13.52
110.0	565	0.409	62.9	13.51	7.25	4.74	6.76	13.54
110.0	566	0.456	62.8	13.43	8.07	4.72	6.72	13.52
110.0	564	0.501	61.5	13.26	8.89	4.54	6.63	13.61
110.0	559	0.549	60.7	13.02	9.72	4.42	6.51	13.61
110.0	551	0.595	58.9	12.72	10.54	4.16	6.36	13.72
110.0	546	0.642	57.6	12.47	11.38	3.98	6.24	13.78
110.0	534	0.689	56.7	12.09	12.22	3.84	6.05	13.73
110.0	530	0.736	55.6	11.88	13.04	3.69	5.94	13.77
110.0	522	0.782	54.5	11.60	13.86	3.53	5.80	13.79
110.0	516	0.829	53.3	11.36	14.69	3.35	5.68	13.85
110.0	509	0.876	52.2	11.09	15.52	3.20	5.55	13.86
110.0	510	0.922	51.3	11.00	16.33	3.07	5.50	13.95
110.0	505	0.968	50.1	10.80	17.16	2.90	5.40	14.02
110.0	502	1.015	49.0	10.62	17.98	2.73	5.31	14.10
110.0	503	1.061	48.5	10.54	18.80	2.66	5.27	14.13
110.0	503	1.106	47.2	10.43	19.61	2.48	5.22	14.26

Figure D-2.102

AP Engineering & Testing, Inc.







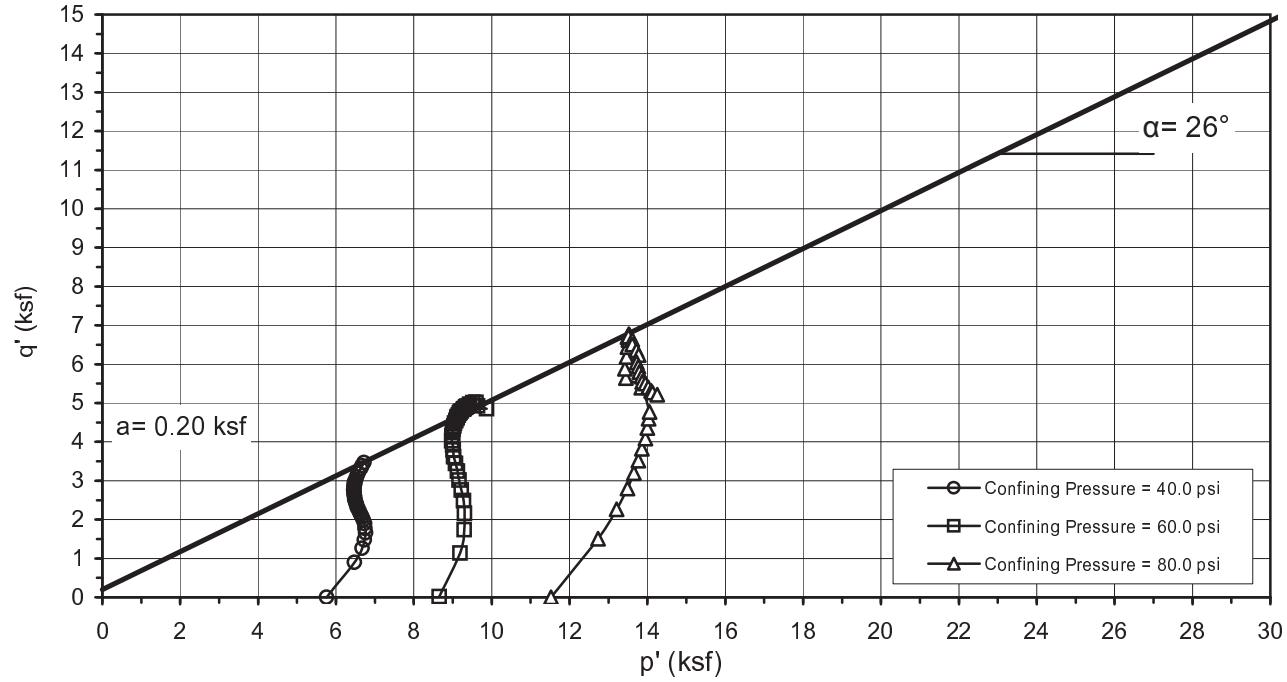
Project Name:	Westside Subway Extension	Confining Pressures:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Gray Fat Clay
Boring No.:	G-415	Avg. Dry Unit Weight (pcf):	81.8
Sample No.:	21	Avg. Initial Moisture Content (%):	38.2
Depth (ft):	90.5	Confining Pressure:	40.0, 60.0, 80.0 psi

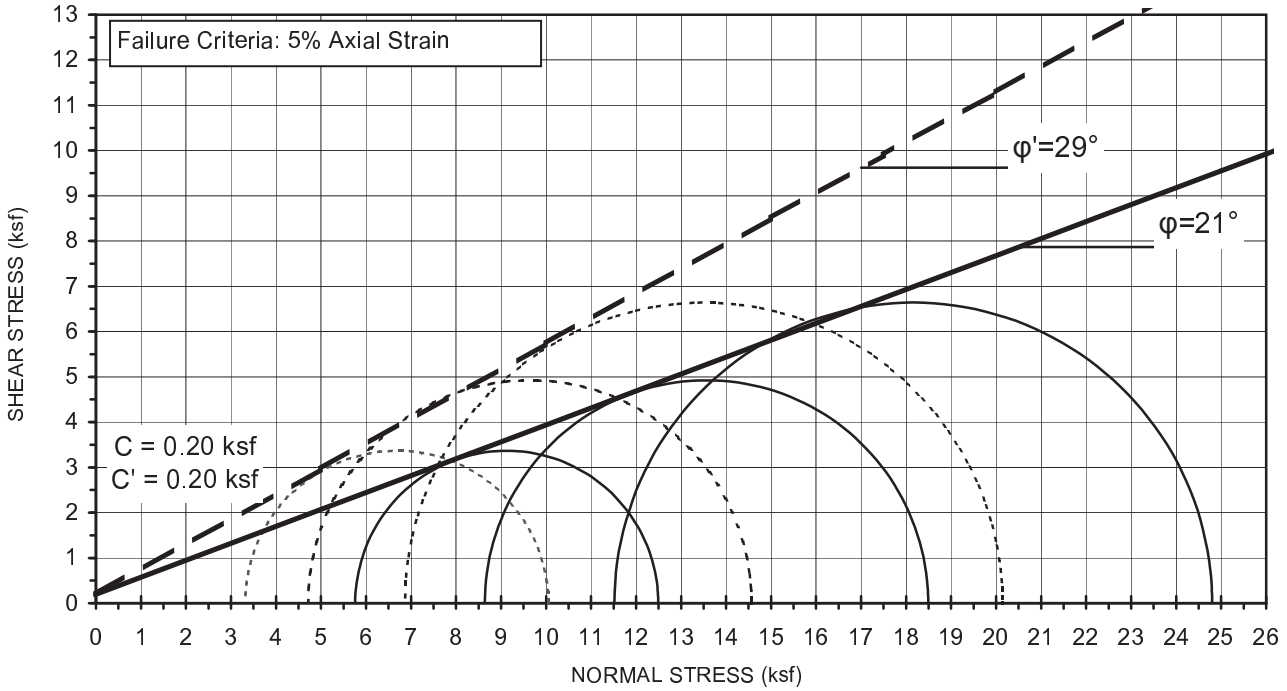
CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

Figure D-2.103

AP Engineering & Testing, Inc.



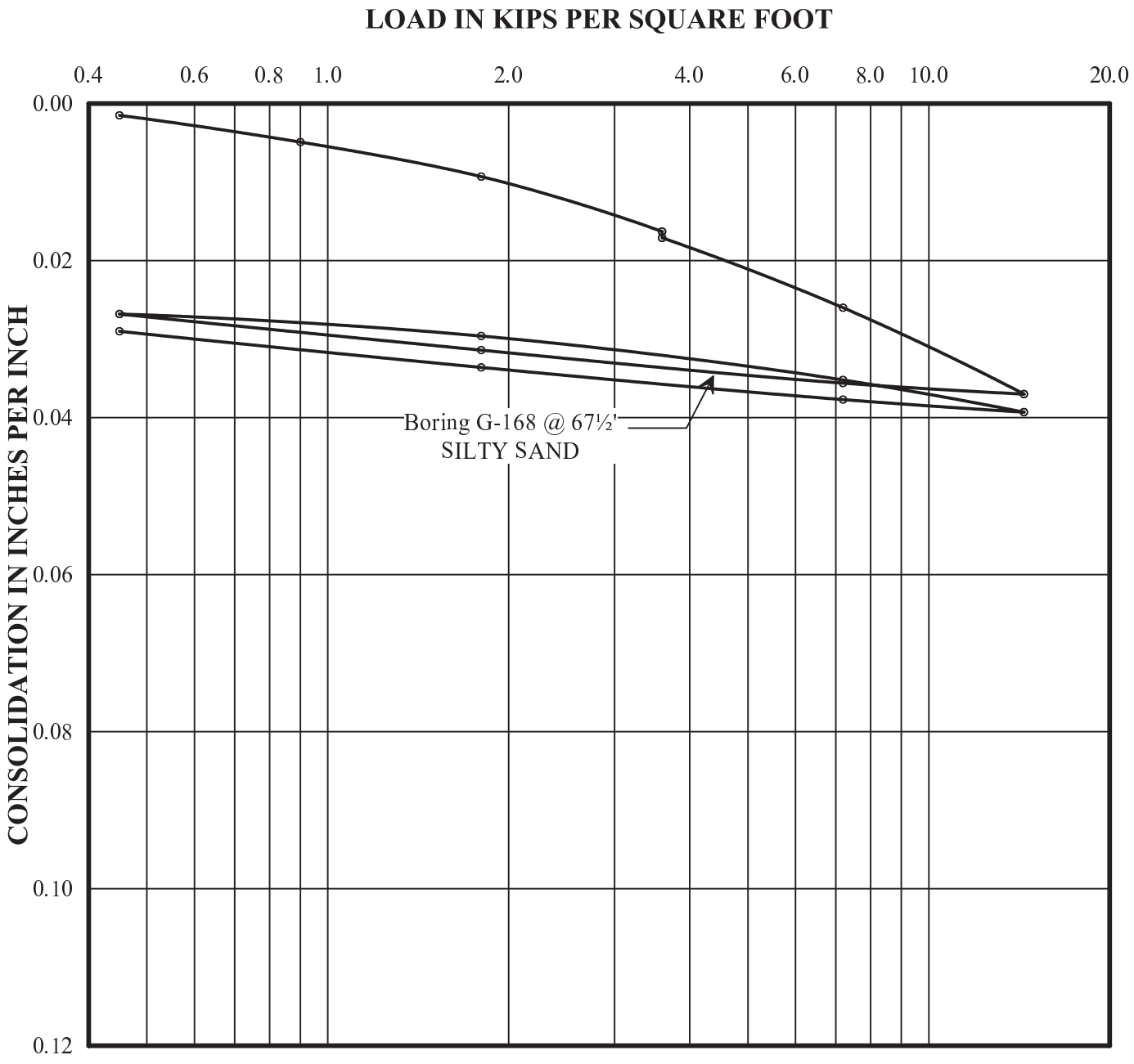


Project Name:	Westside Subway Extension	Sample Type:	Mod. Cal.
Project No.:	4953-11-1423	Sample Description:	Dark Gray Fat Clay
Boring No.:	G-415	Avg. Dry Unit Weight (pcf):	81.8
Sample No.:	21	Avg. Initial Moisture Content (%):	38.2
Depth (ft):	90.5	Confining Pressures:	40.0, 60.0, 80.0 psi

CU TRIAXIAL MULTI-STAGE TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

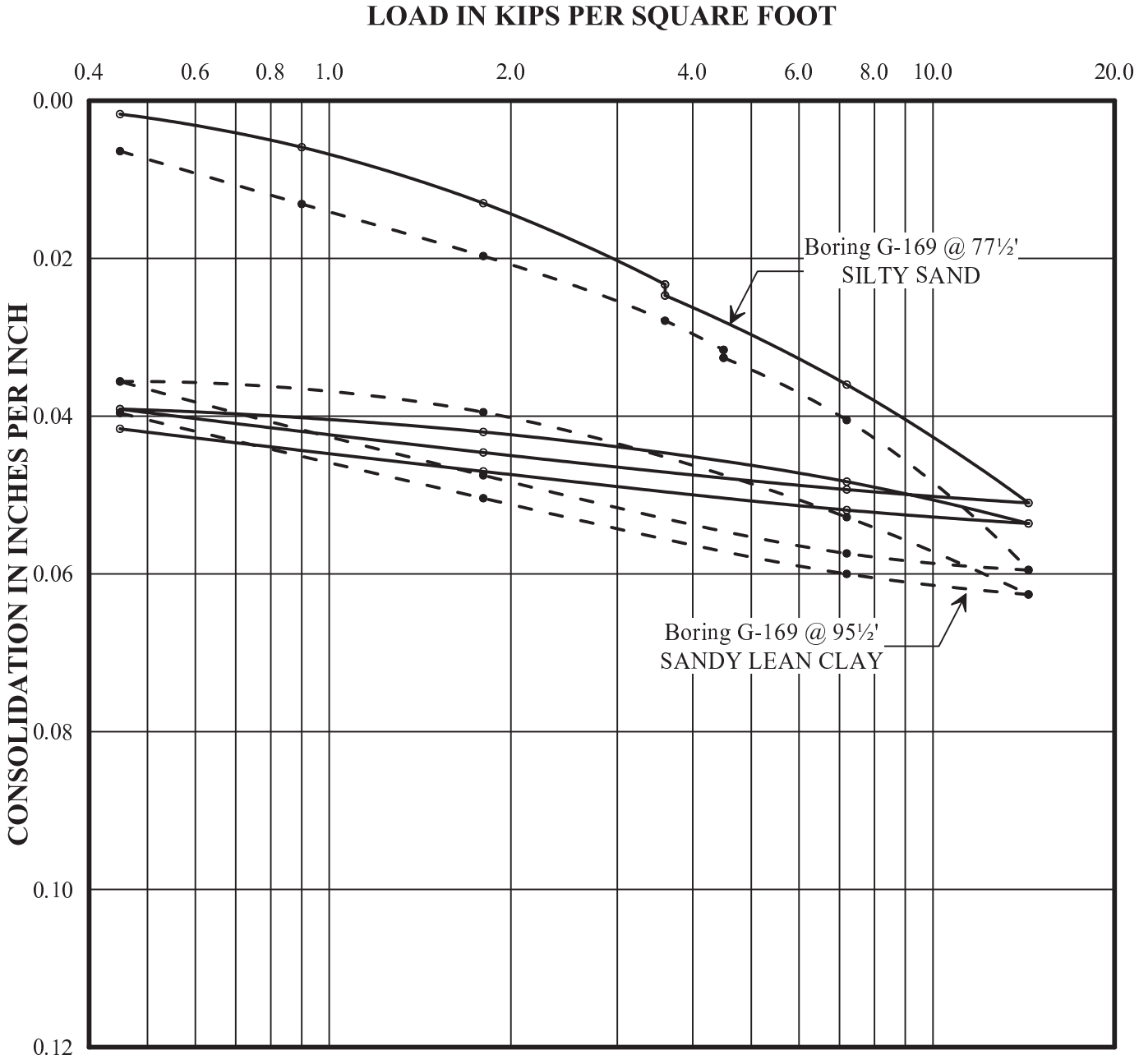
Figure D-2.104



Note: Water added to sample after consolidation under a load of 3.6 kips per square foot.

Prepared/Date: AH/JF 5/16/11
Checked/Date: LT 8/16/11

MTA Westside Subway Extension Los Angeles, California	amec	CONSOLIDATION TEST DATA Project No.: 4953-10-1561 Figure D-3.1.1

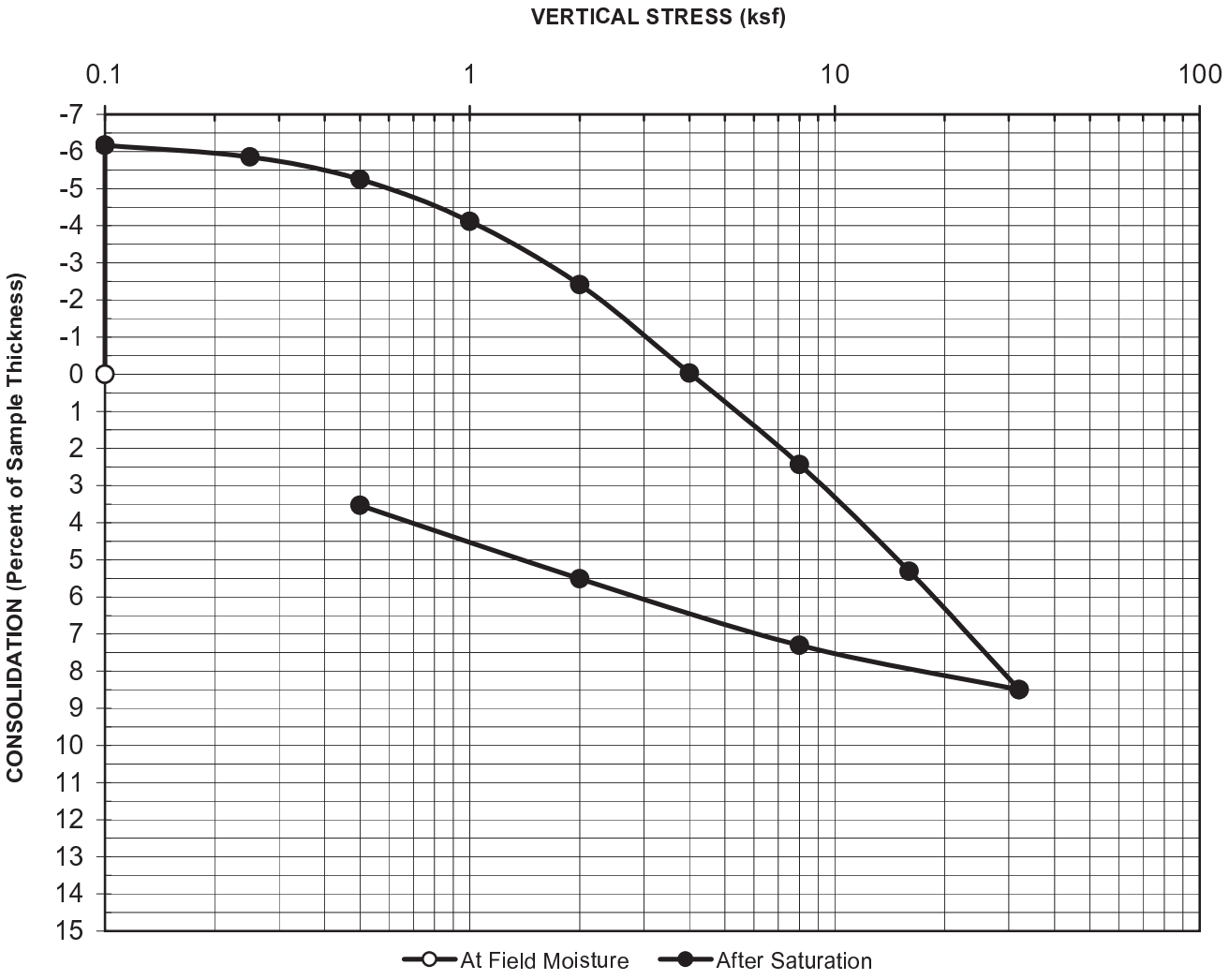


Note: Water added to samples at 77½' and 95½' after consolidation under a load of 3.6 and 4.5 kips per square foot, respectively.

Prepared/Date: AH/JF 5/25/11
Checked/Date: LT 8/16/11

MTA Westside Subway Extension Los Angeles, California	amec	CONSOLIDATION TEST DATA Project No.: 4953-10-1561 Figure D-3.1.2

AP Engineering & Testing, Inc.



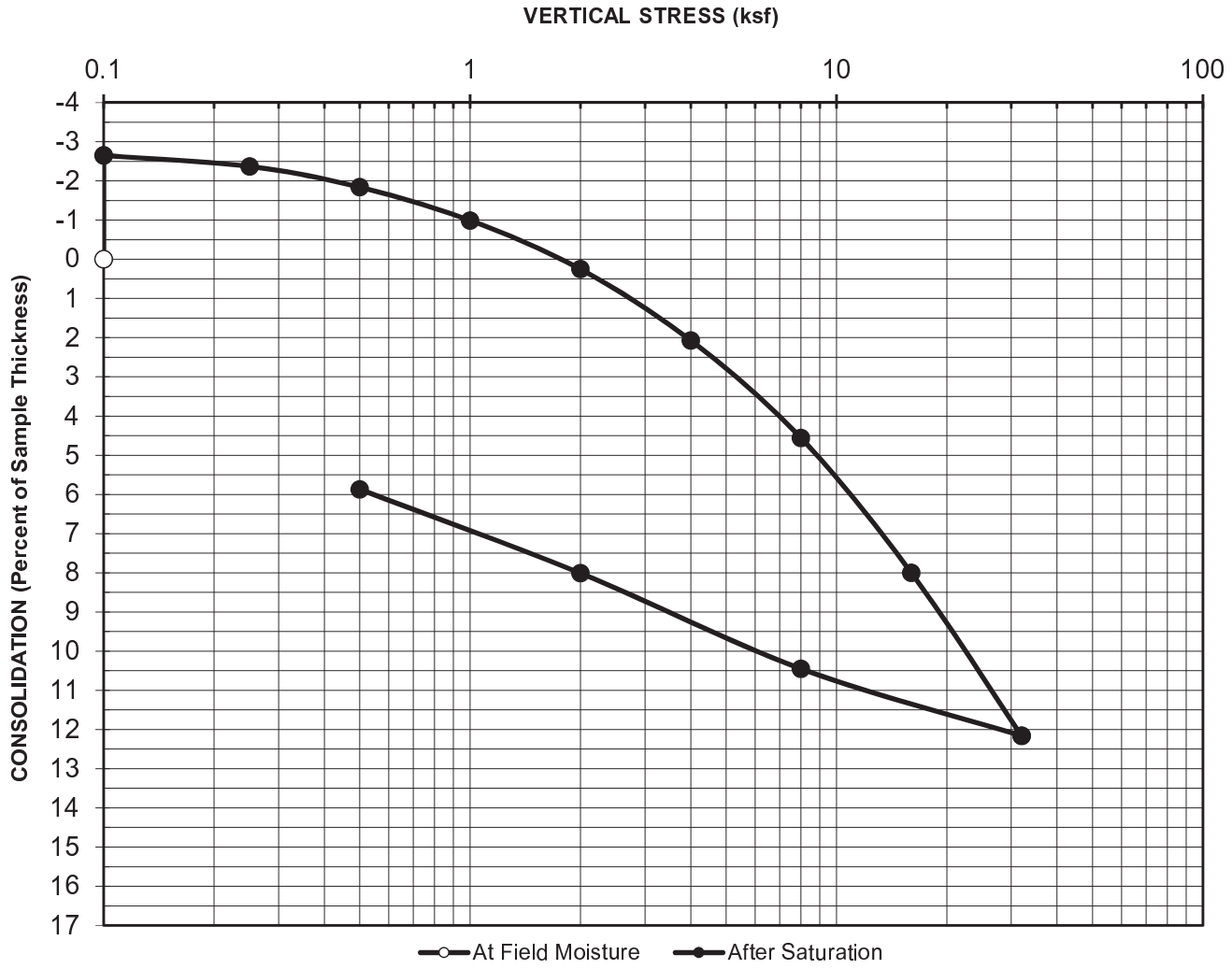
Boring No. :	E-132B	Initial Dry Unit Weight (pcf):	116.0
Sample No.:	2	Initial Moisture Content (%):	13.8
Depth (feet):	10.5	Final Moisture Content (%):	18.1
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Lean Clay	Initial Void Ratio:	0.45
Remarks:	Swell = 6.17% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/25/2015
AP No:	15-0361

Figure D-3.2.1

AP Engineering & Testing, Inc.



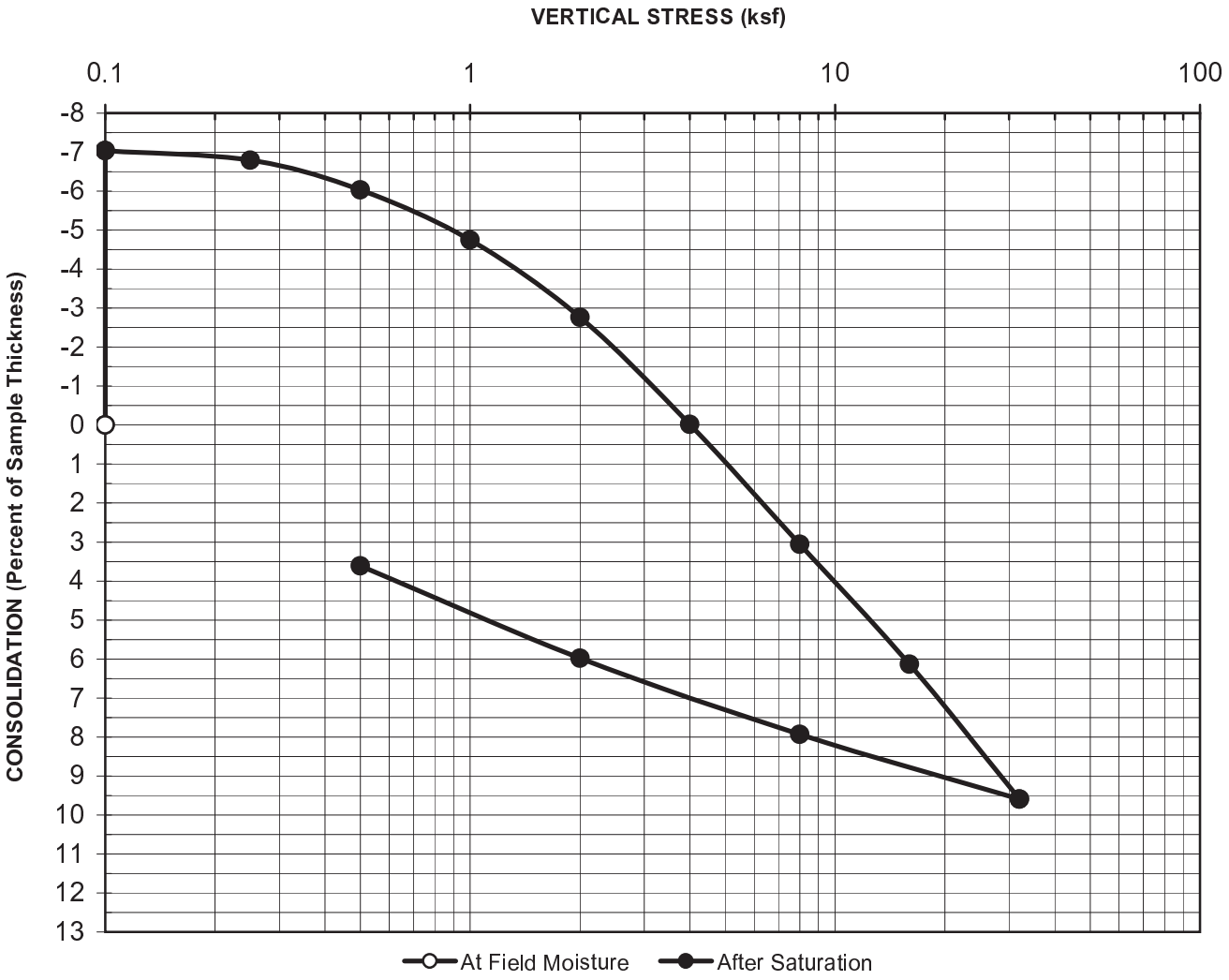
Boring No. :	E-132B	Initial Dry Unit Weight (pcf):	96.8
Sample No.:	4	Initial Moisture Content (%):	26.3
Depth (feet):	20.5	Final Moisture Content (%):	27.6
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Fat Clay w/sand	Initial Void Ratio:	0.74
Remarks:	Swell = 2.65% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/25/2015
AP No:	15-0361

Figure D-3.2.2

AP Engineering & Testing, Inc.



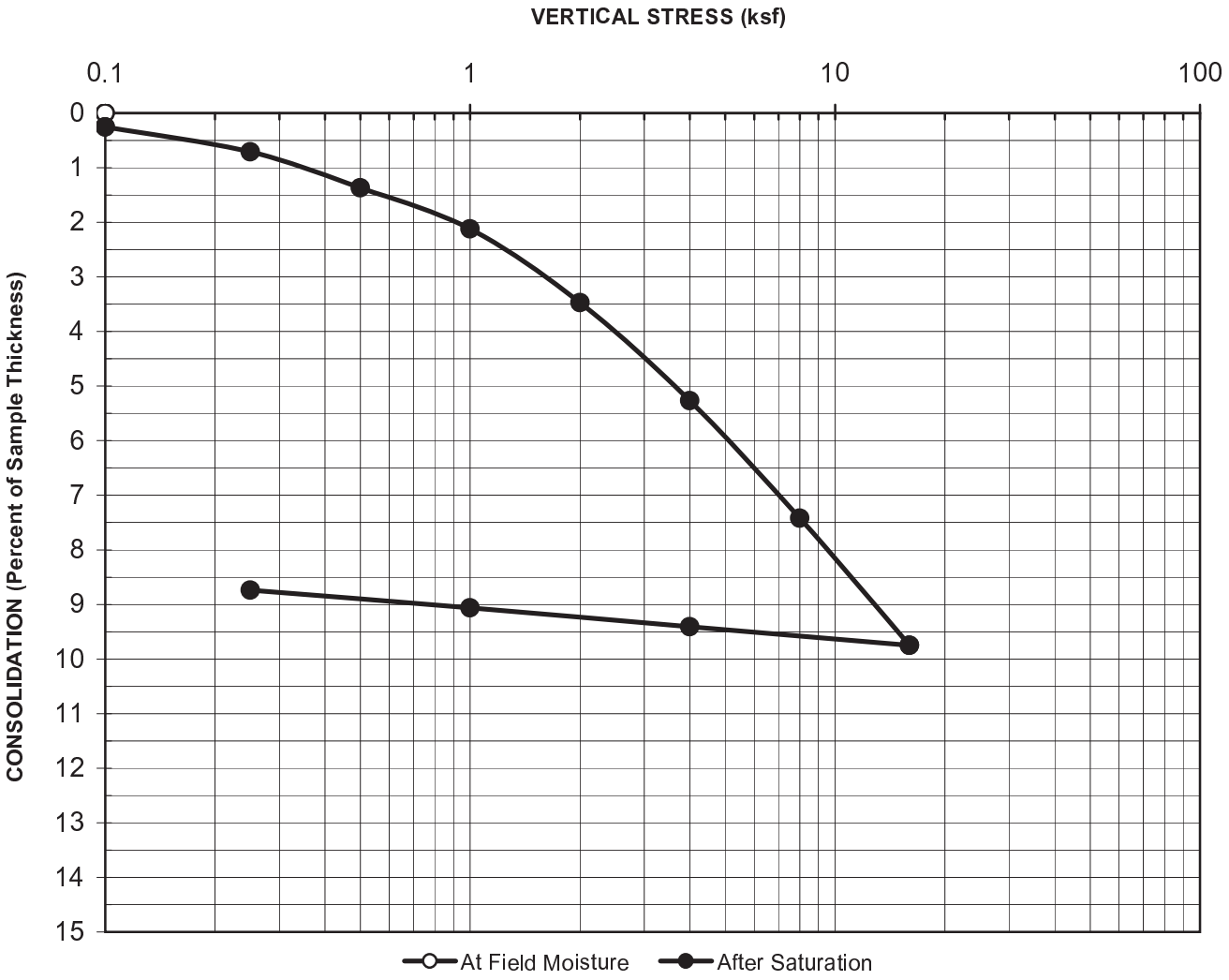
Boring No. :	E-132B	Initial Dry Unit Weight (pcf):	112.8
Sample No.:	6	Initial Moisture Content (%):	16.4
Depth (feet):	30.5	Final Moisture Content (%):	18.6
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Lean Clay	Initial Void Ratio:	0.49
Remarks:	Swell = 7.04% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/25/2015
AP No:	15-0361

Figure D-3.2.3

AP Engineering & Testing, Inc.



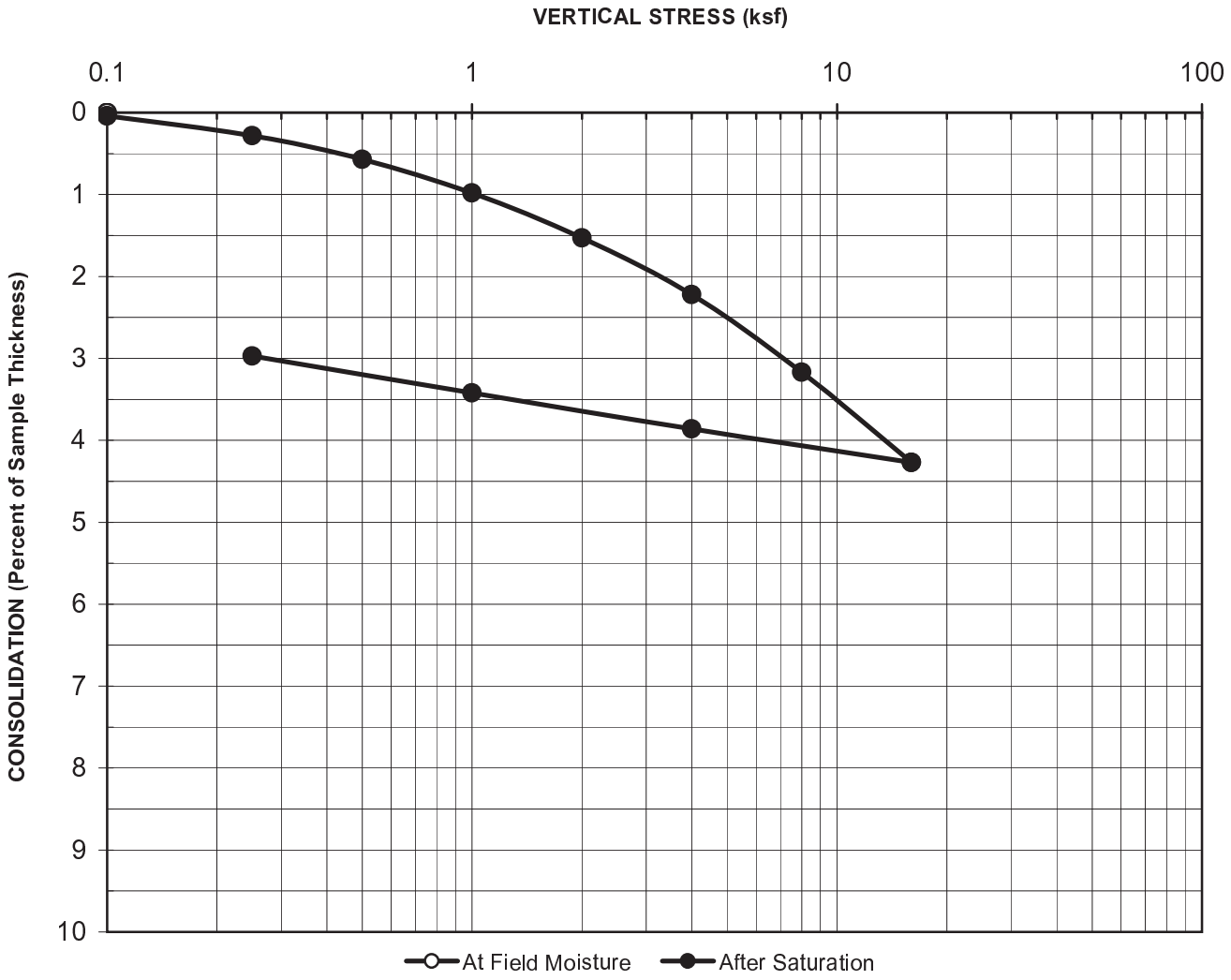
Boring No. :	E-132B	Initial Dry Unit Weight (pcf):	104.3
Sample No.:	12	Initial Moisture Content (%):	8.8
Depth (feet):	60.5	Final Moisture Content (%):	16.8
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Poorly-Graded Sand w/silt & gravel	Initial Void Ratio:	0.62
Remarks:	Collapse= 0.25% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/25/2015
AP No:	15-0361

Figure D-3.2.4

AP Engineering & Testing, Inc.



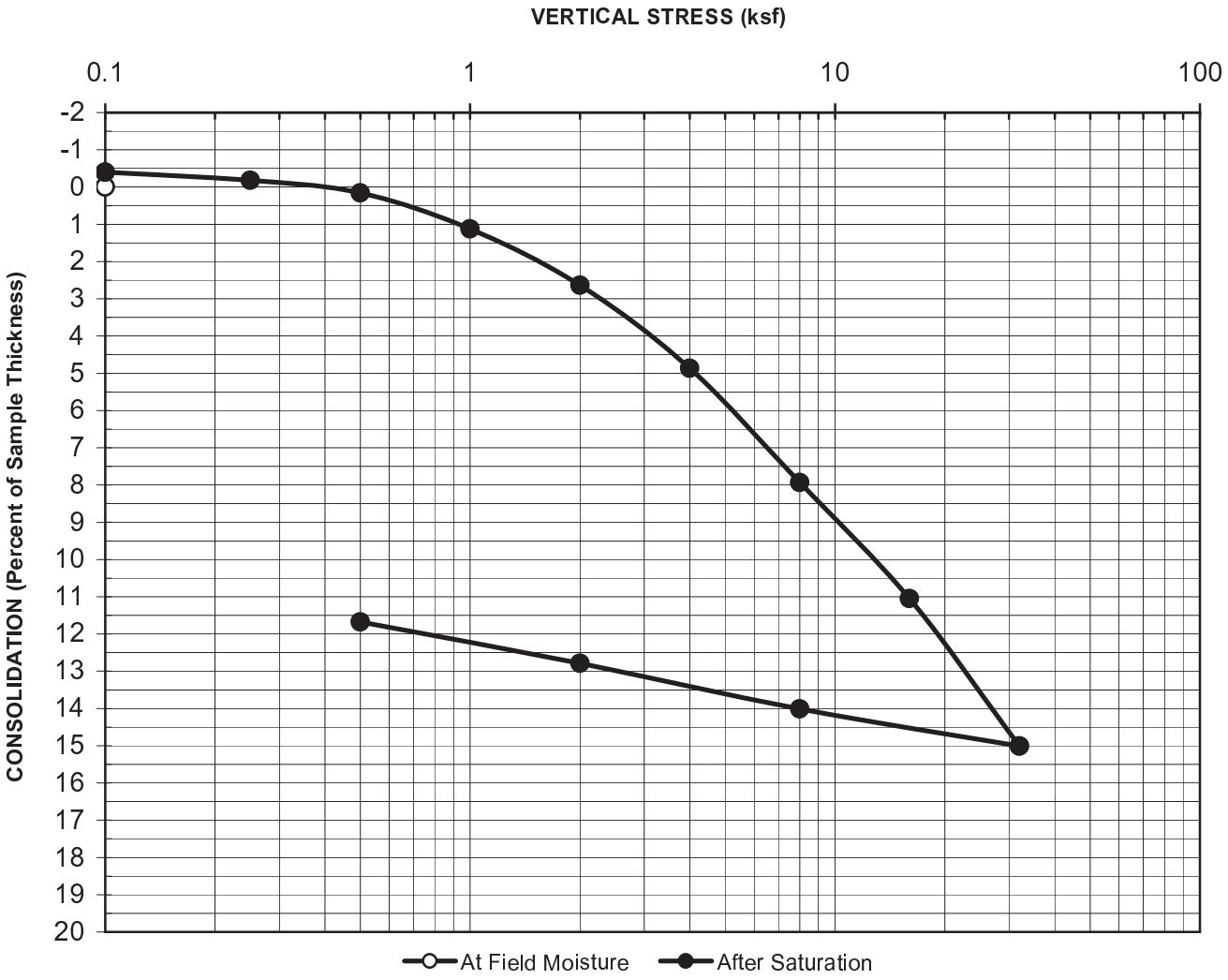
Boring No. :	E-132B	Initial Dry Unit Weight (pcf):	101.5
Sample No.:	14	Initial Moisture Content (%):	15.9
Depth (feet):	70.5	Final Moisture Content (%):	20.1
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.66
Remarks:	Collapse= 0.04% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/25/2015
AP No:	15-0361

Figure D-3.2.5

AP Engineering & Testing, Inc.



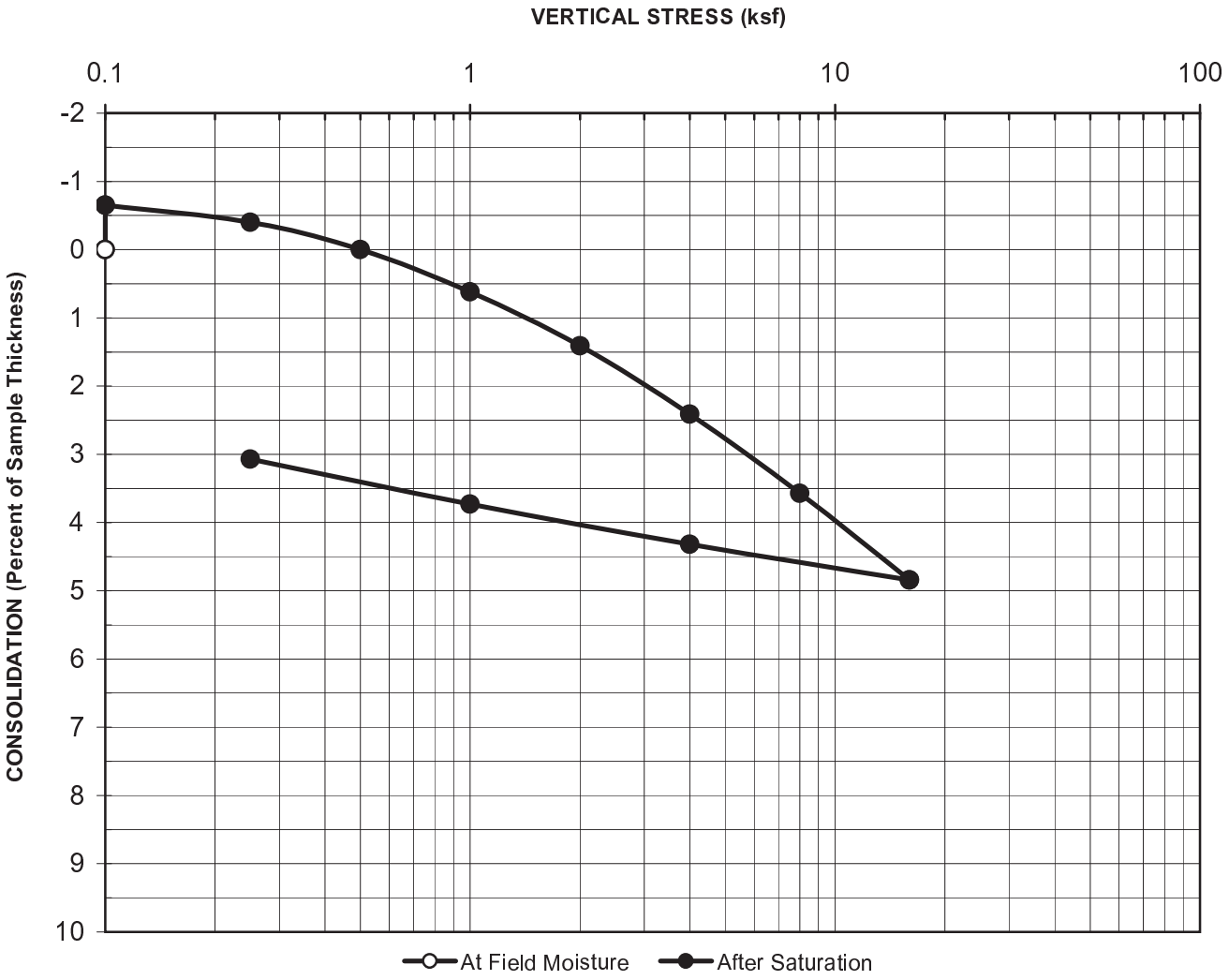
Boring No. :	E-132C	Initial Dry Unit Weight (pcf):	109.9
Sample No.:	2	Initial Moisture Content (%):	18.2
Depth (feet):	10.5	Final Moisture Content (%):	16.3
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Clayey Sand	Initial Void Ratio:	0.53
Remarks:	Swell = 0.40% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.6

AP Engineering & Testing, Inc.



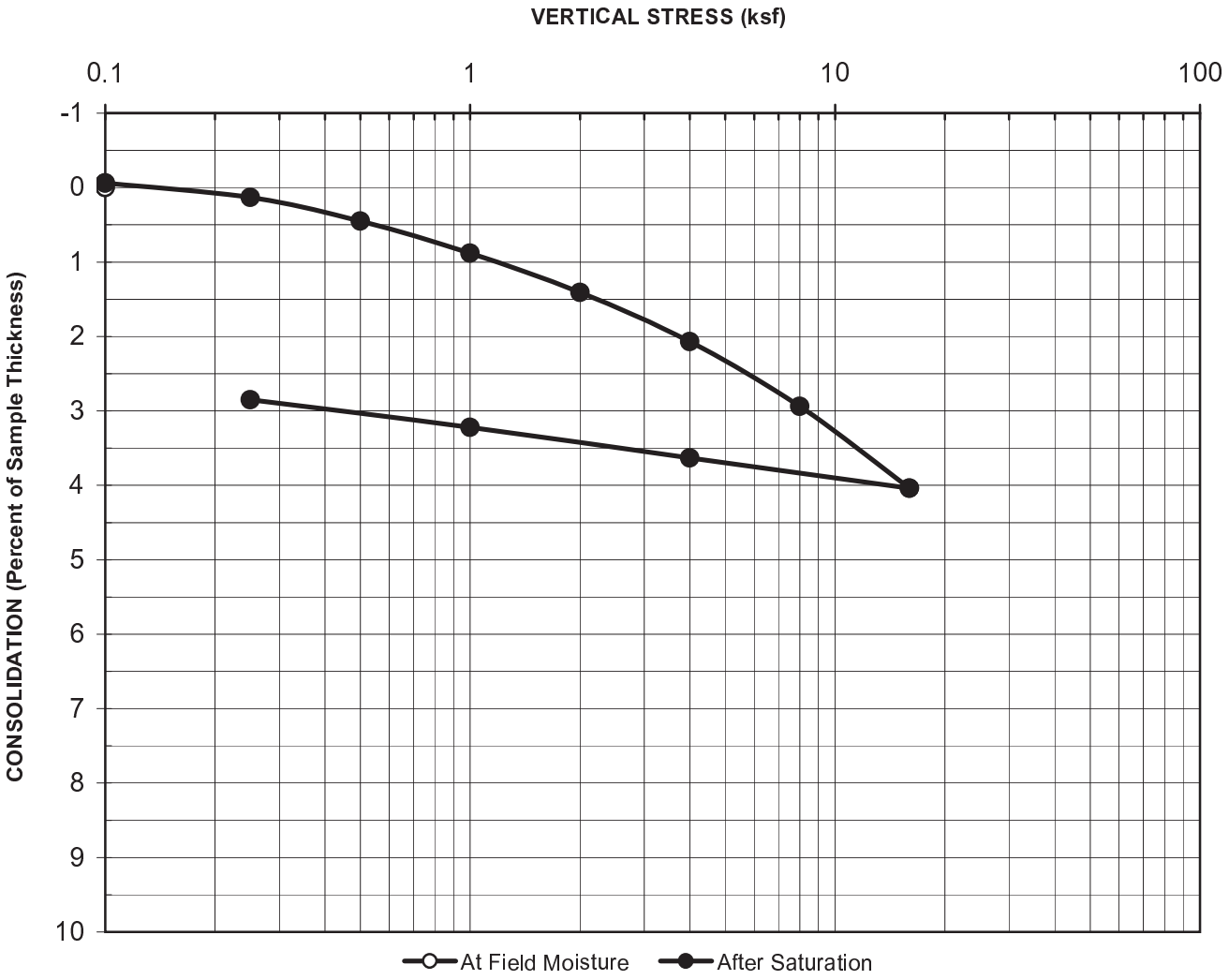
Boring No. :	E-132C	Initial Dry Unit Weight (pcf):	105.3
Sample No.:	8	Initial Moisture Content (%):	11.8
Depth (feet):	40.5	Final Moisture Content (%):	21.2
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Clayey Sandstone	Initial Void Ratio:	0.60
Remarks:	Swell = 0.65% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.7

AP Engineering & Testing, Inc.



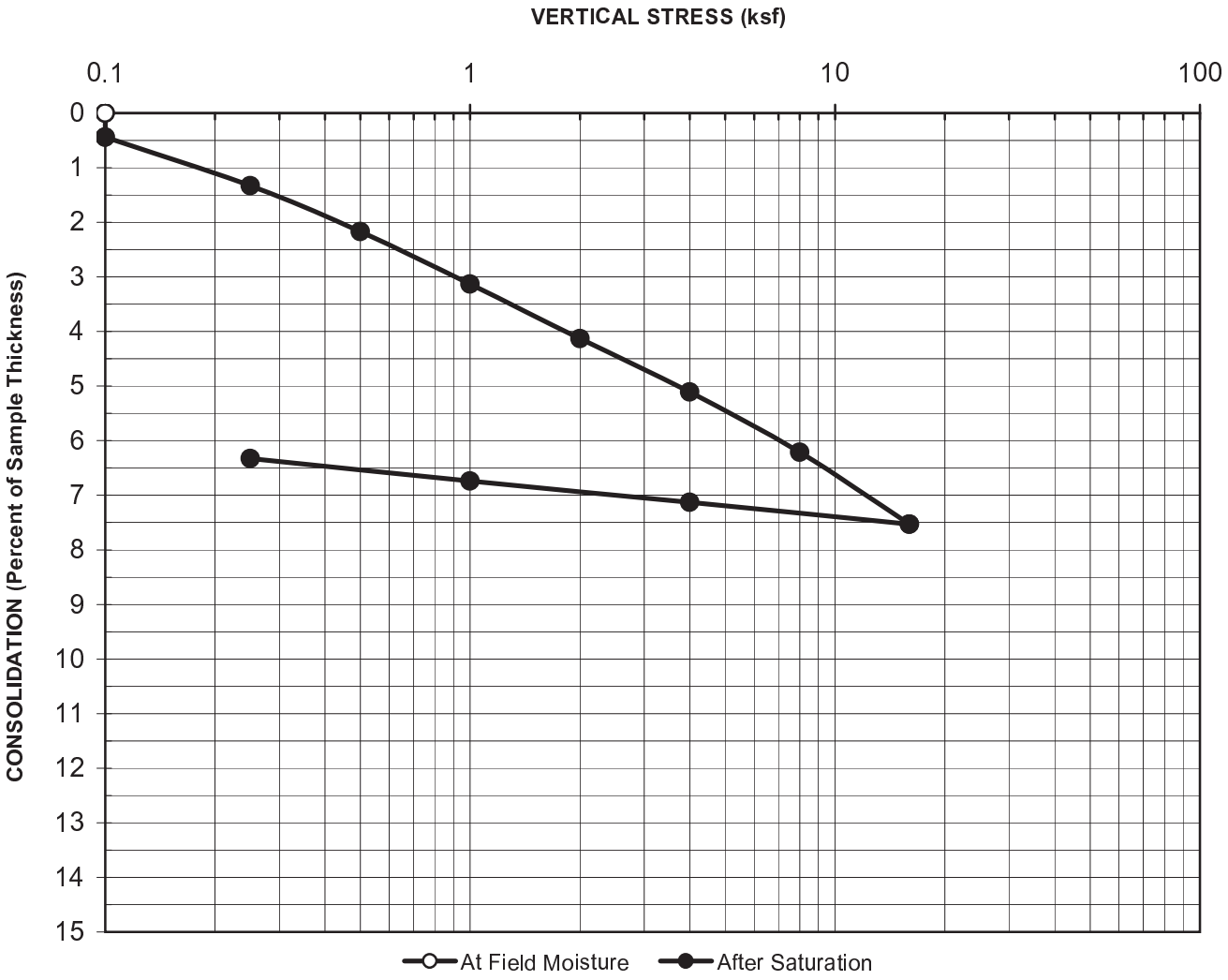
Boring No. :	E-132C	Initial Dry Unit Weight (pcf):	105.9
Sample No.:	16	Initial Moisture Content (%):	13.8
Depth (feet):	63	Final Moisture Content (%):	19.5
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.59
Remarks:	Swell = 0.06% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.8

AP Engineering & Testing, Inc.



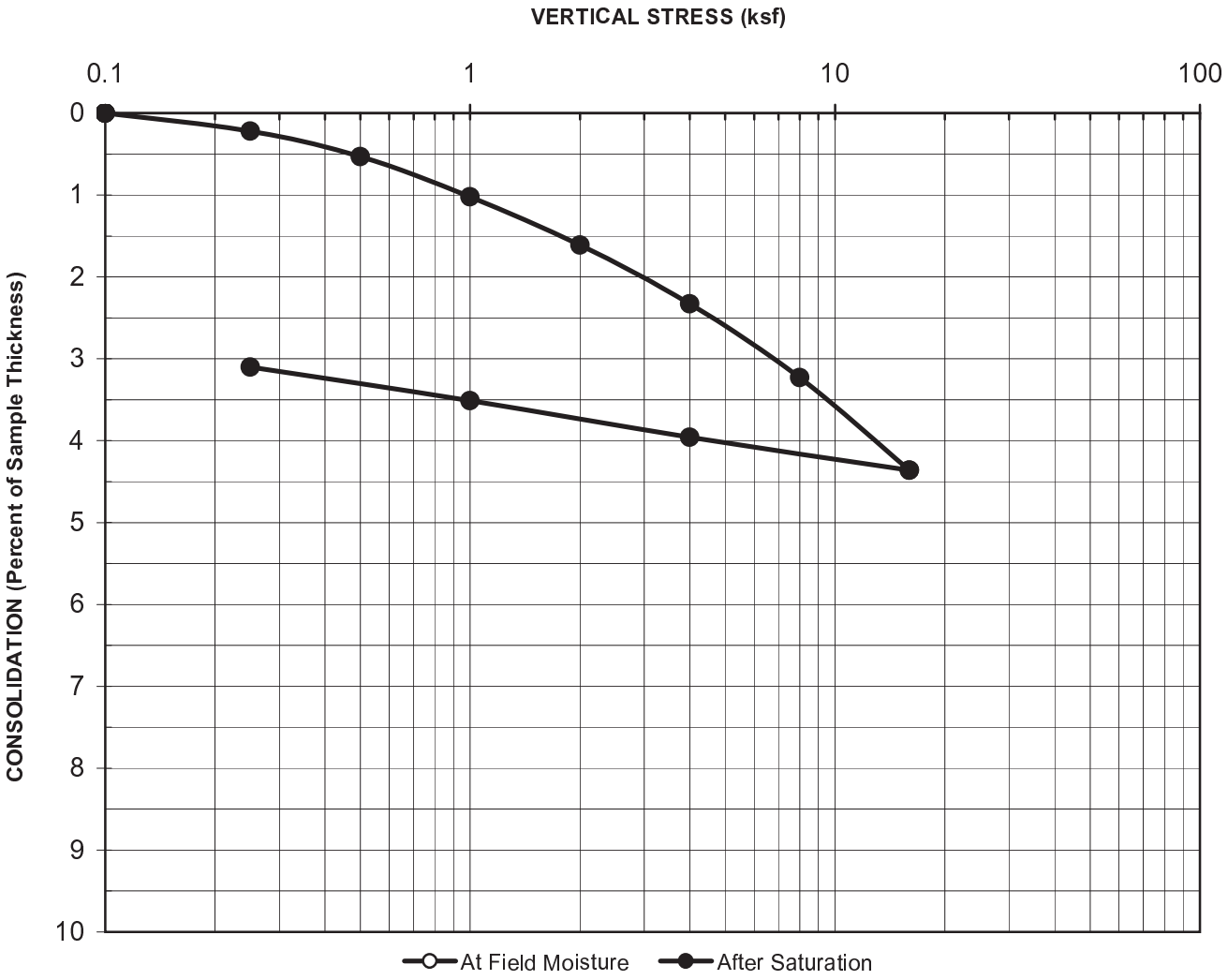
Boring No. :	E-132C	Initial Dry Unit Weight (pcf):	91.8
Sample No.:	24	Initial Moisture Content (%):	6.0
Depth (feet):	83	Final Moisture Content (%):	24.5
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Poorly-Graded Sand w/silt	Initial Void Ratio:	0.83
Remarks:	Collapse= 0.44% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.9

AP Engineering & Testing, Inc.



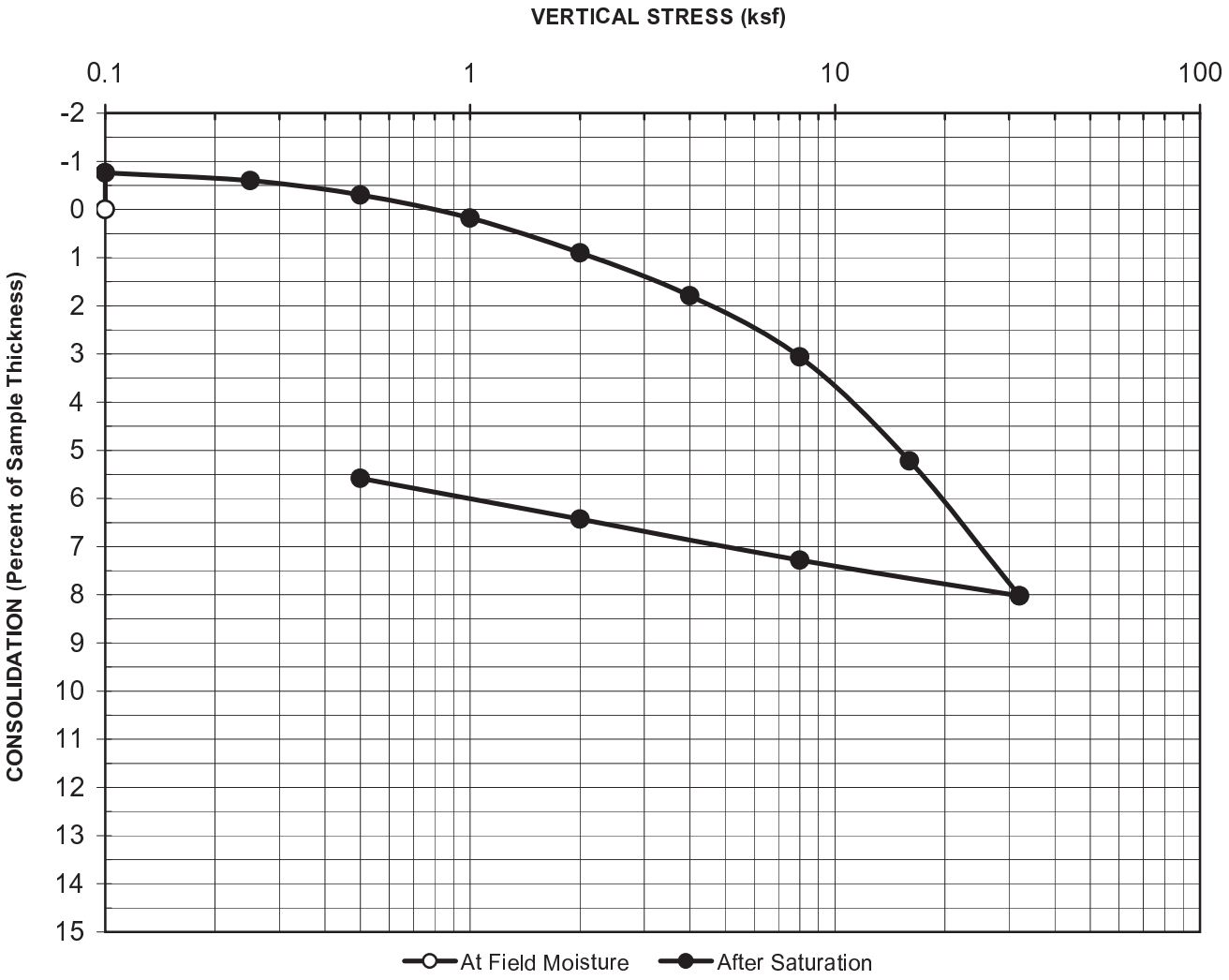
Boring No. :	E-132C	Initial Dry Unit Weight (pcf):	121.8
Sample No.:	28	Initial Moisture Content (%):	13.1
Depth (feet):	93	Final Moisture Content (%):	13.0
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.38
Remarks:	Swell = 0.00% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.10

AP Engineering & Testing, Inc.



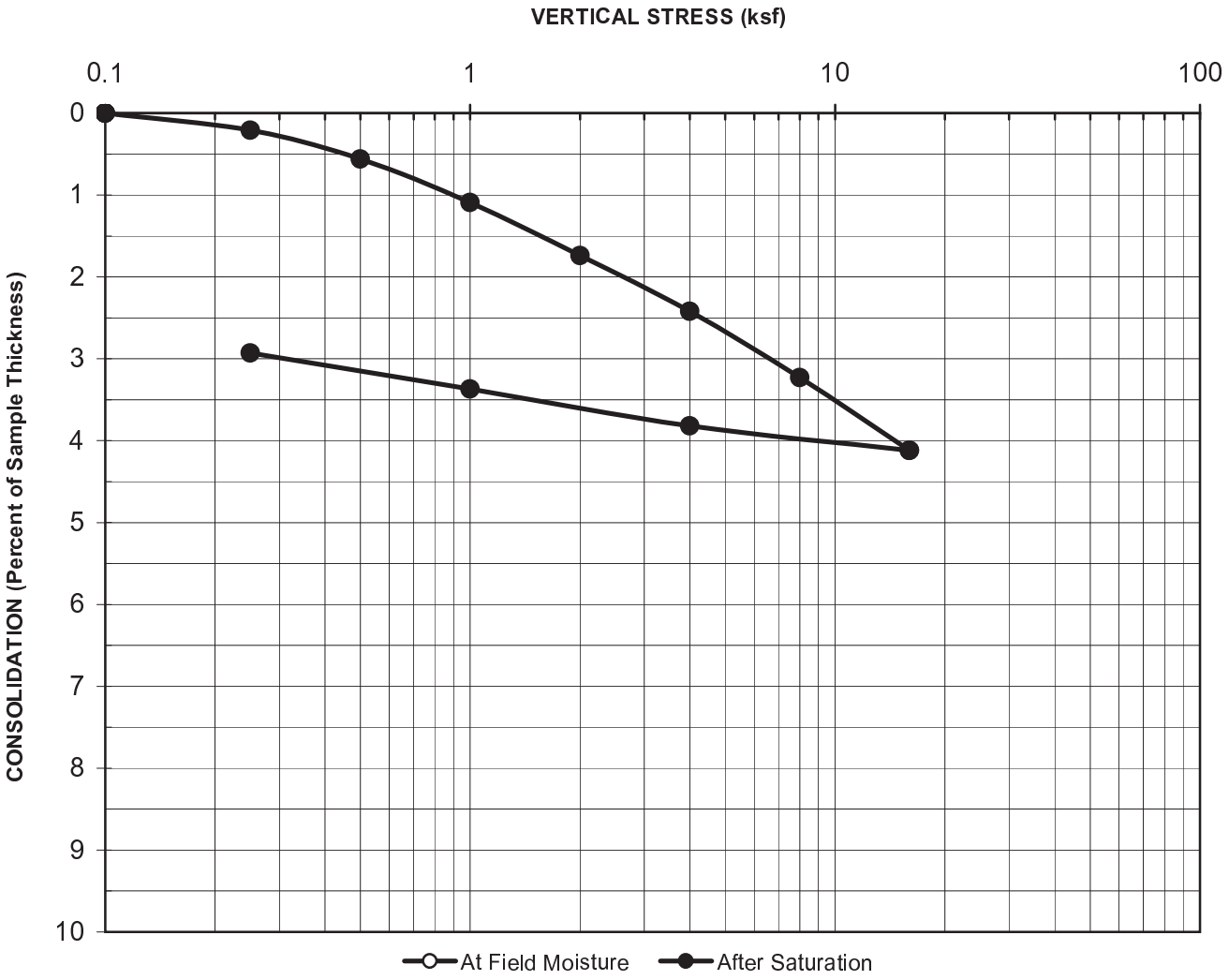
Boring No. :	E-133A	Initial Dry Unit Weight (pcf):	115.5
Sample No.:	4	Initial Moisture Content (%):	14.8
Depth (feet):	20.5	Final Moisture Content (%):	14.5
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Clay	Initial Void Ratio:	0.46
Remarks:	Swell = 0.76% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.11

AP Engineering & Testing, Inc.



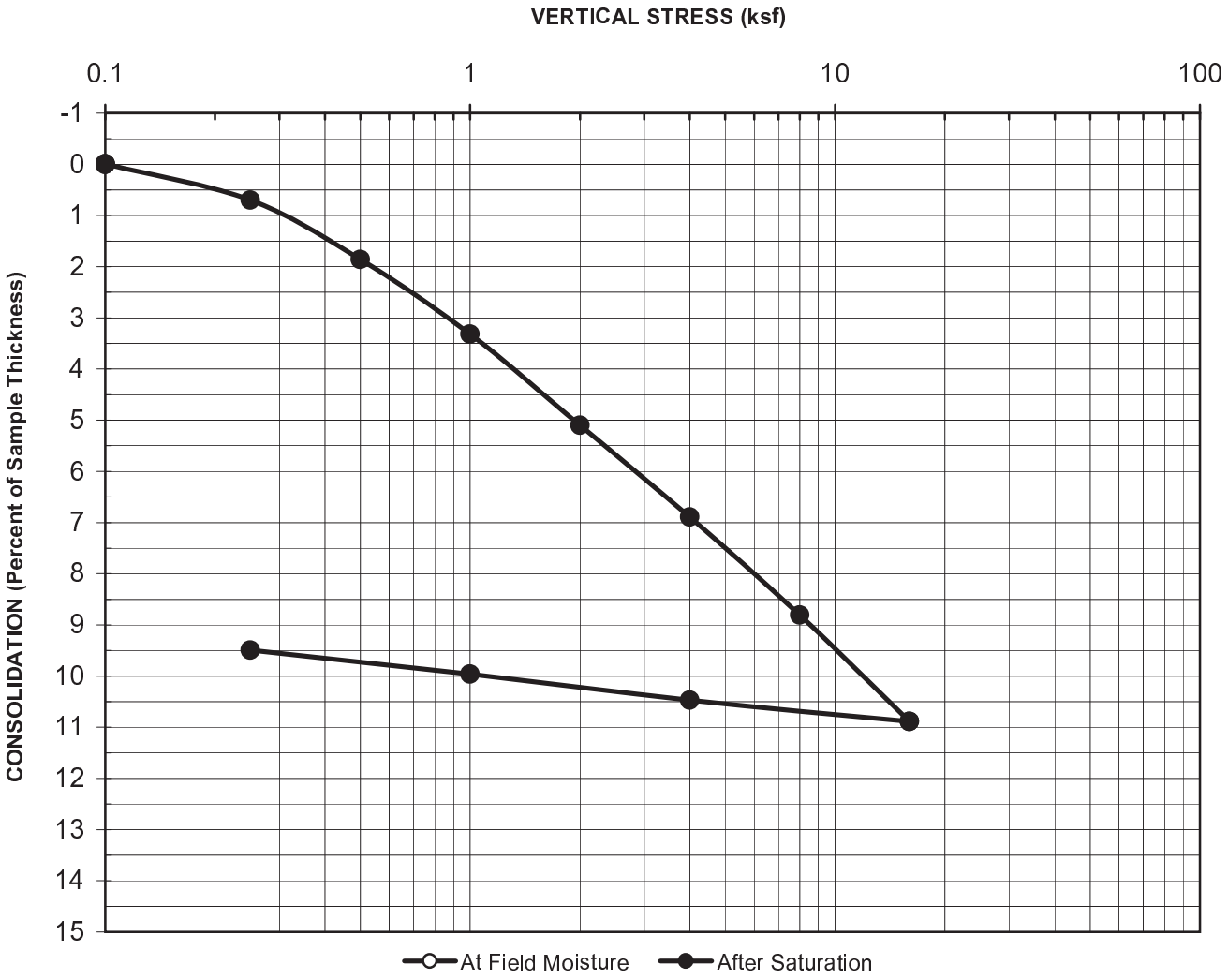
Boring No. :	E-133A	Initial Dry Unit Weight (pcf):	109.7
Sample No.:	8	Initial Moisture Content (%):	8.7
Depth (feet):	40.5	Final Moisture Content (%):	15.3
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.54
Remarks:	Swell = 0.00% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.12

AP Engineering & Testing, Inc.



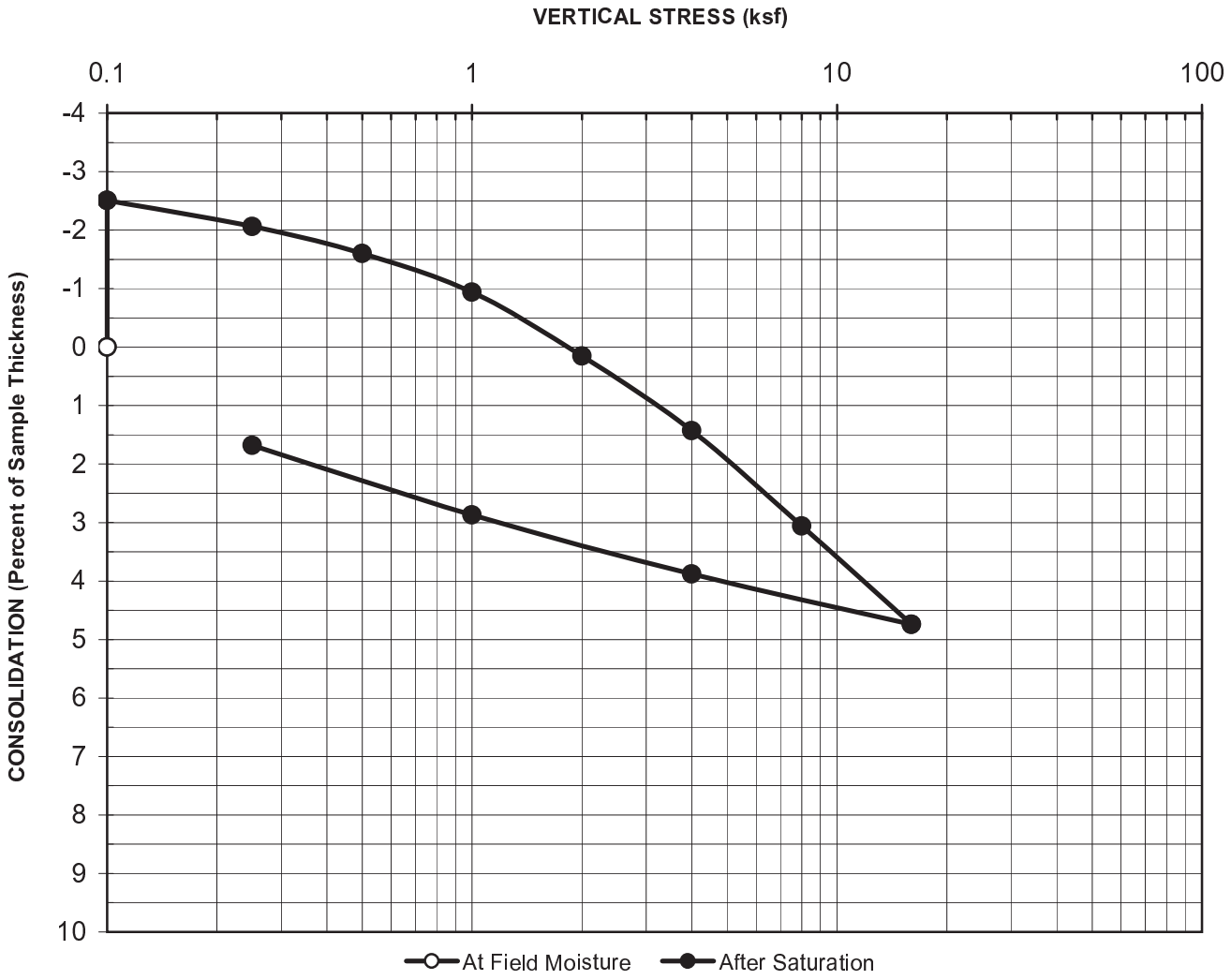
Boring No. :	E-133A	Initial Dry Unit Weight (pcf):	91.6
Sample No.:	12	Initial Moisture Content (%):	12.0
Depth (feet):	60.5	Final Moisture Content (%):	25.6
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.84
Remarks:	Swell = 0.01% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.13

AP Engineering & Testing, Inc.



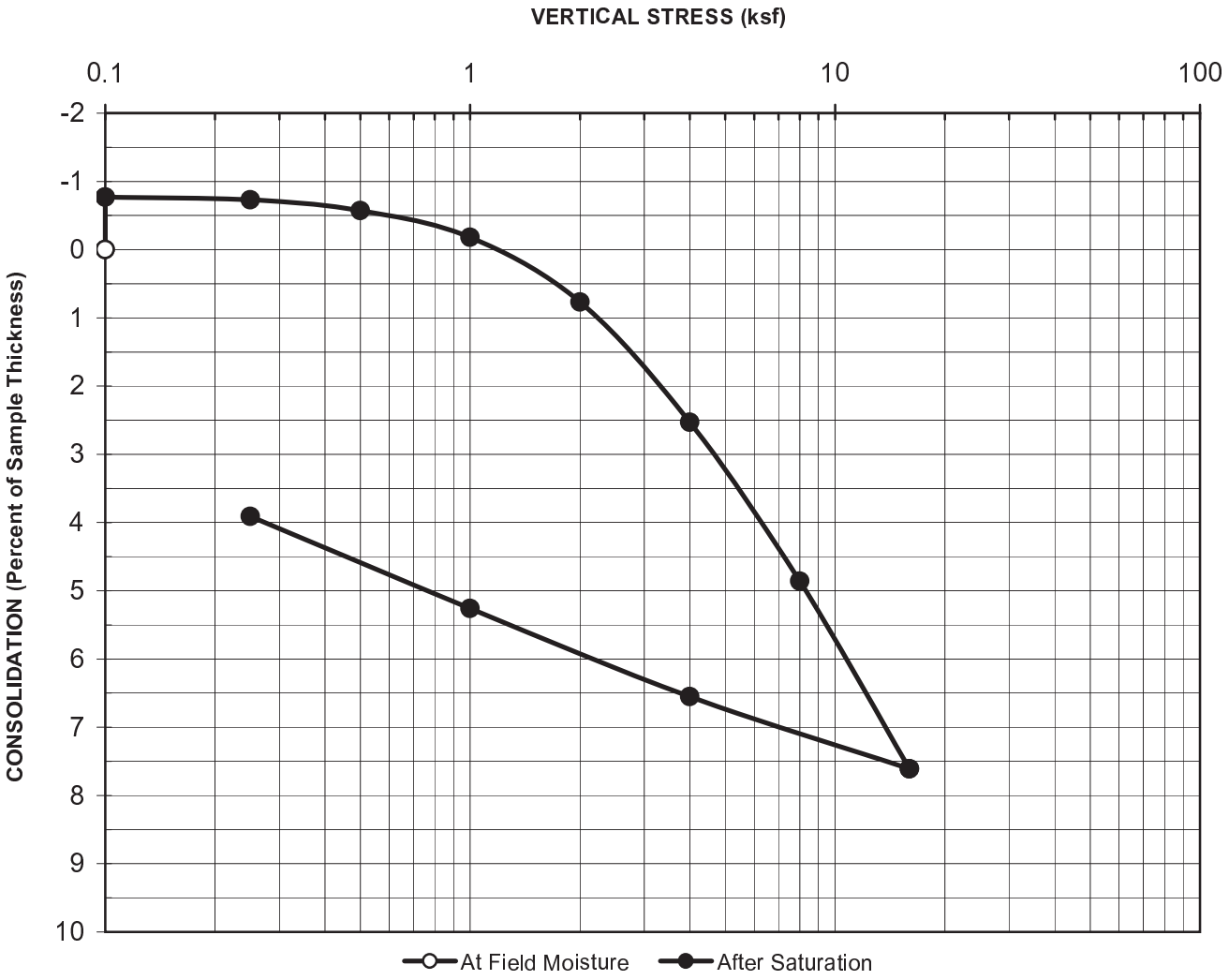
Boring No. :	E-133A	Initial Dry Unit Weight (pcf):	94.1
Sample No.:	20	Initial Moisture Content (%):	27.3
Depth (feet):	100	Final Moisture Content (%):	27.4
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Claystone	Initial Void Ratio:	0.79
Remarks:	Swell = 2.51% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.14

AP Engineering & Testing, Inc.



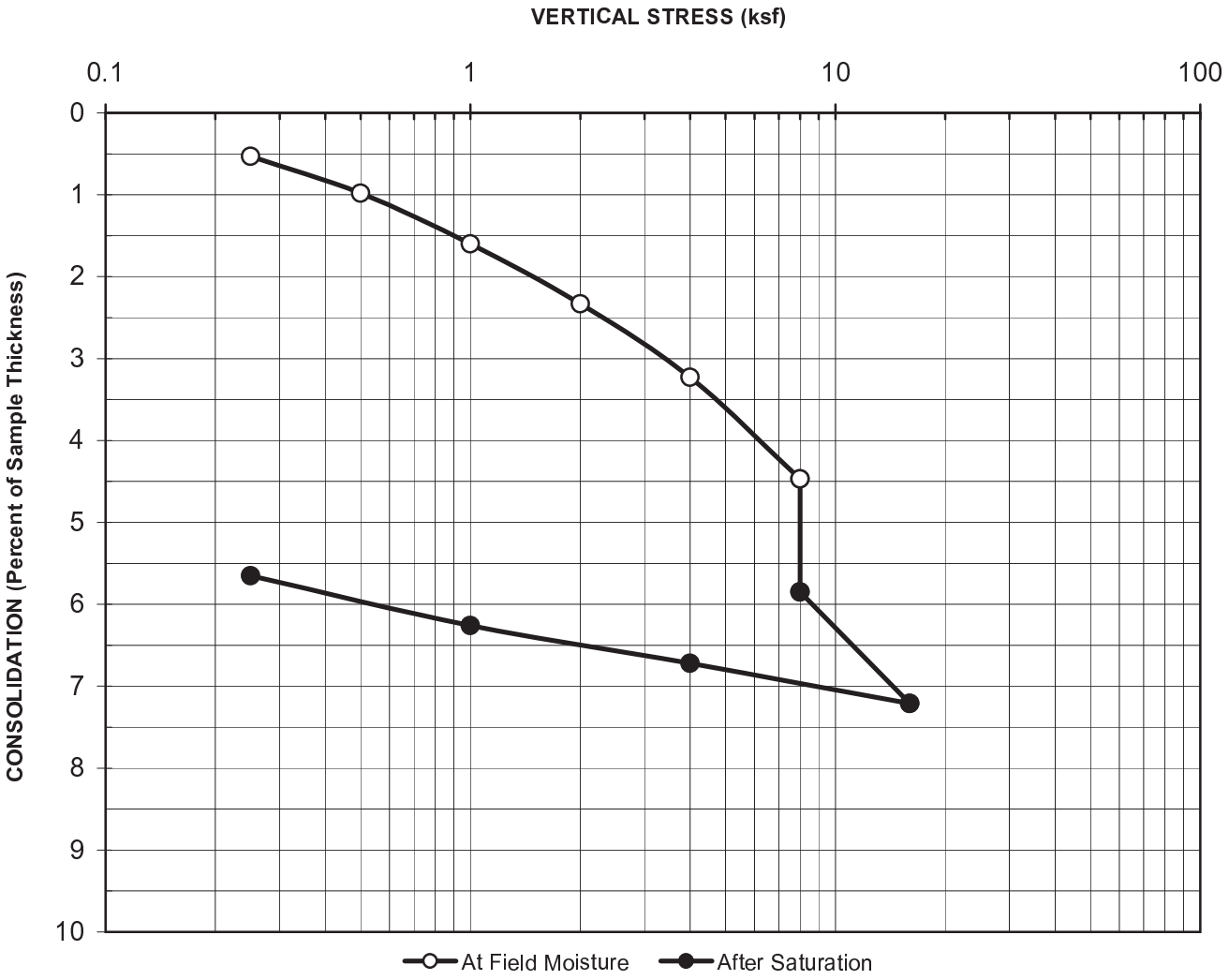
Boring No. :	E-133A	Initial Dry Unit Weight (pcf):	107.4
Sample No.:	22	Initial Moisture Content (%):	15.8
Depth (feet):	110	Final Moisture Content (%):	22.5
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Clay	Initial Void Ratio:	0.57
Remarks:	Swell = 0.77% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.15

AP Engineering & Testing, Inc.



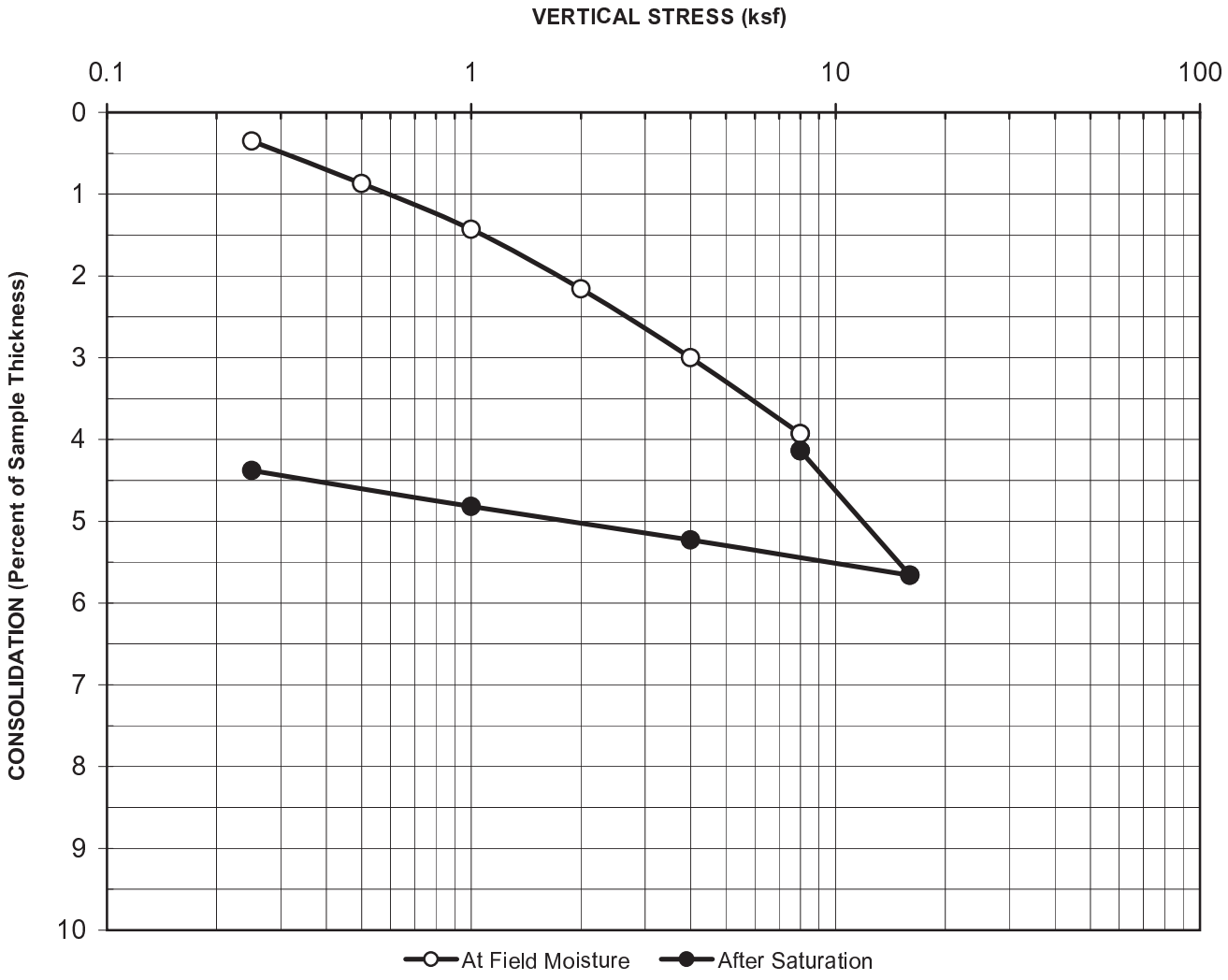
Boring No. :	G-412	Initial Dry Unit Weight (pcf):	84.3
Sample No.:	19	Initial Moisture Content (%):	7.9
Depth (feet):	68	Final Moisture Content (%):	29.0
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	1.00
Remarks:	Collapse= 1.38% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.16

AP Engineering & Testing, Inc.



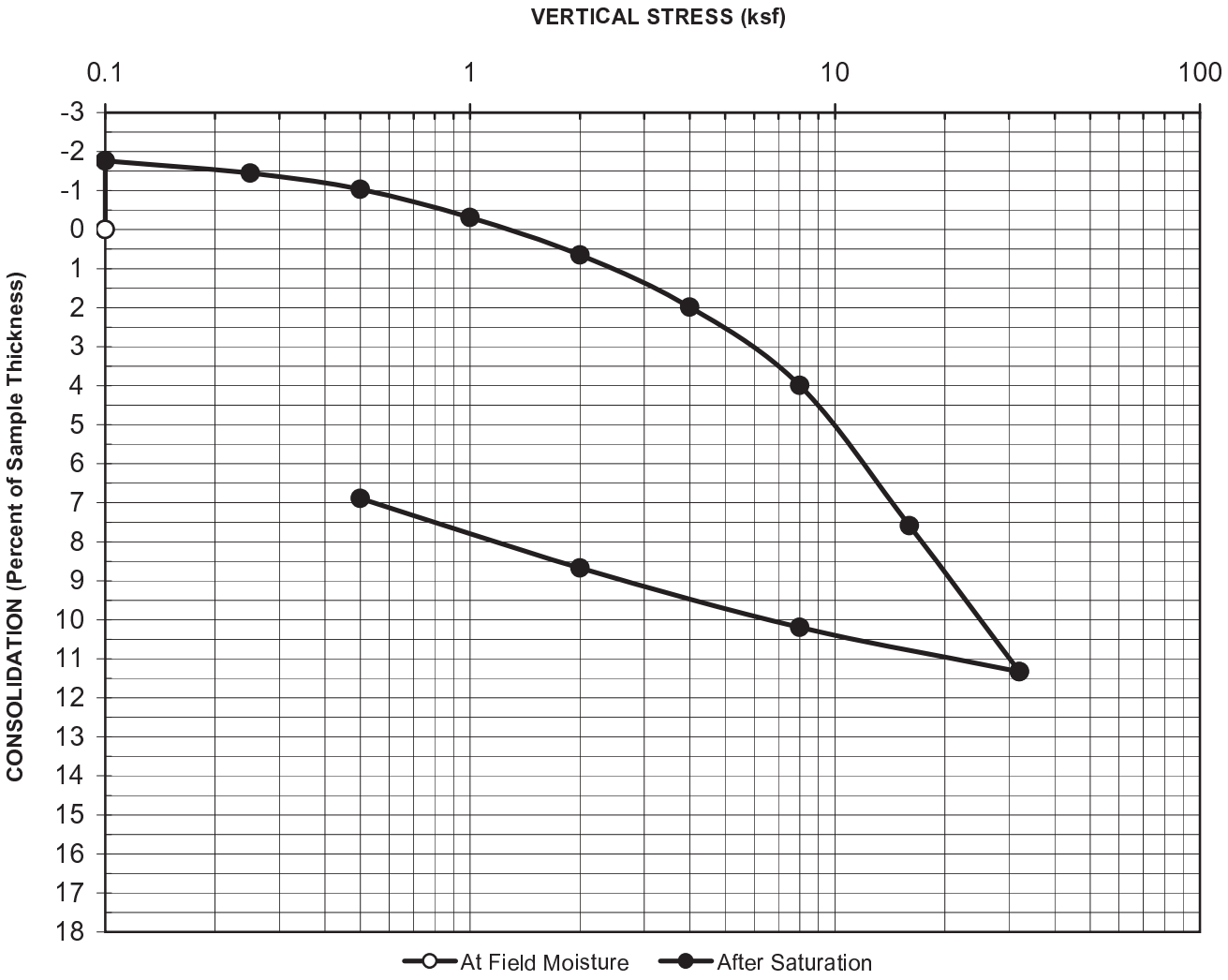
Boring No. :	G-412	Initial Dry Unit Weight (pcf):	98.8
Sample No.:	25	Initial Moisture Content (%):	4.1
Depth (feet):	83	Final Moisture Content (%):	19.9
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Poorly-Graded Sand w/silt	Initial Void Ratio:	0.71
Remarks:	Collapse= 0.21% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	4/18/2015
AP No:	15-0361

Figure D-3.2.17

AP Engineering & Testing, Inc.



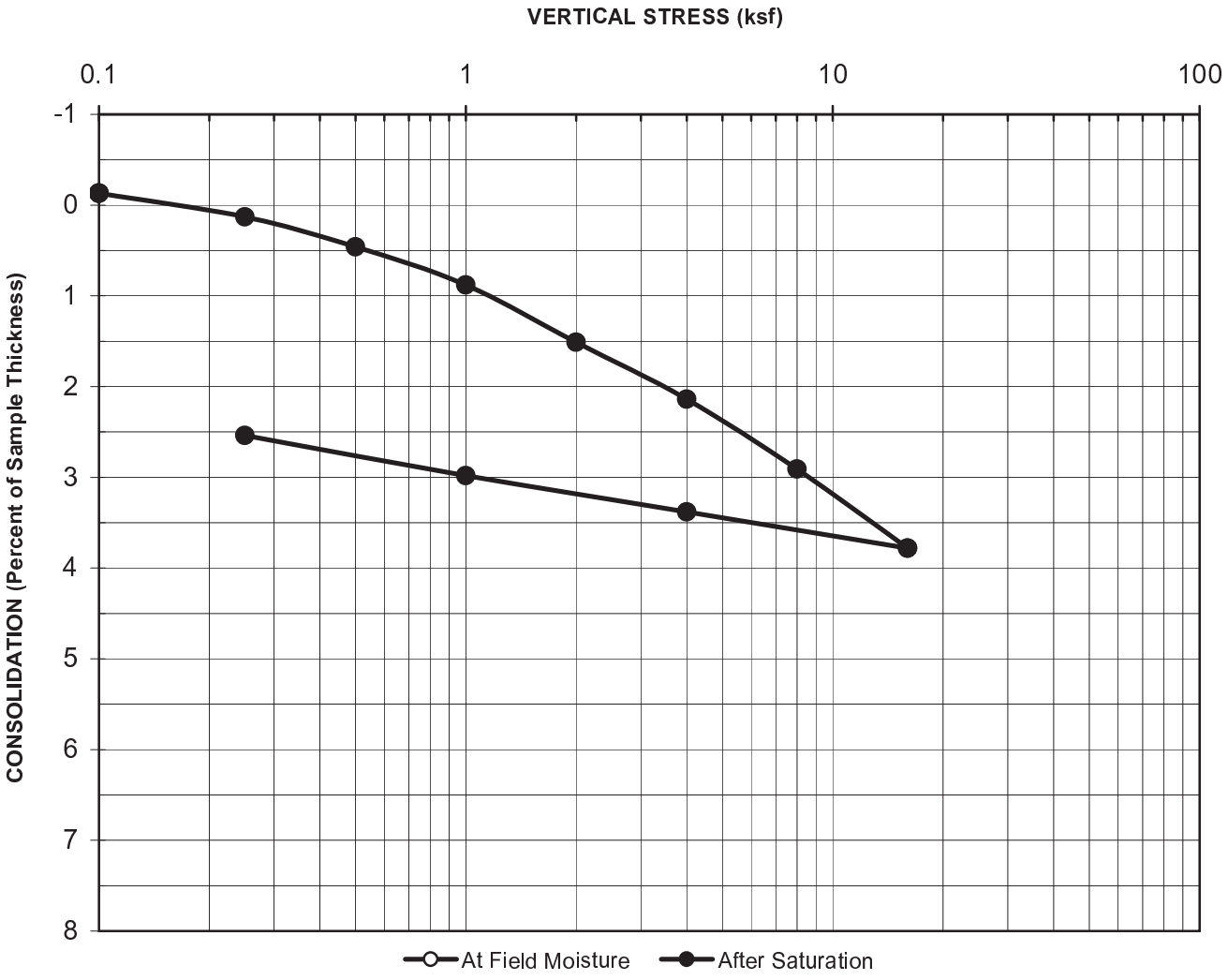
Boring No. :	G-413	Initial Dry Unit Weight (pcf):	104.0
Sample No.:	2	Initial Moisture Content (%):	20.3
Depth (feet):	9.5	Final Moisture Content (%):	21.7
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Lean Clay	Initial Void Ratio:	0.62
Remarks:	Swell = 1.76% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.18

AP Engineering & Testing, Inc.



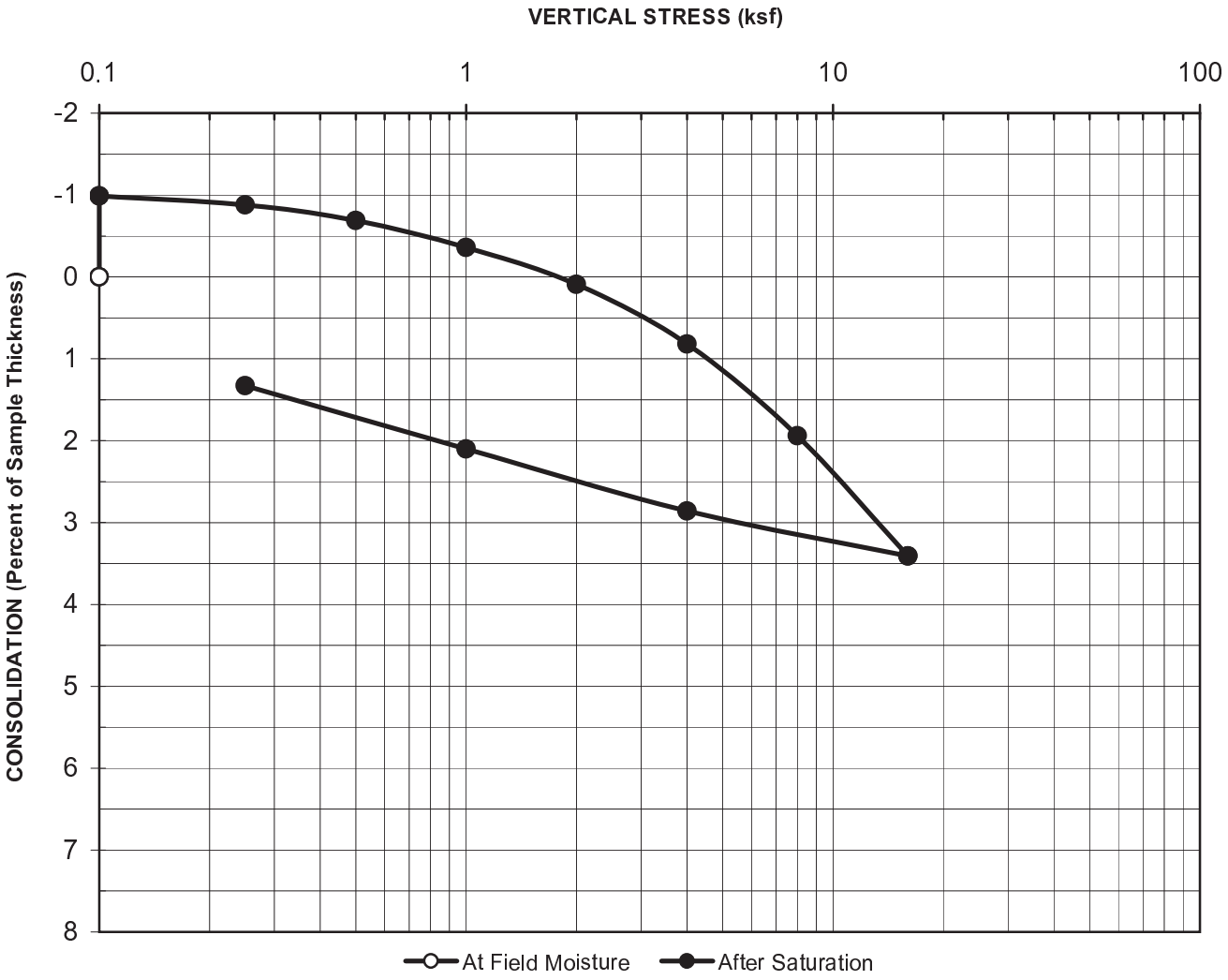
Boring No. :	G-413	Initial Dry Unit Weight (pcf):	108.0
Sample No.:	10	Initial Moisture Content (%):	9.2
Depth (feet):	45.5	Final Moisture Content (%):	17.5
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.56
Remarks:	Swell = 0.00% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.19

AP Engineering & Testing, Inc.



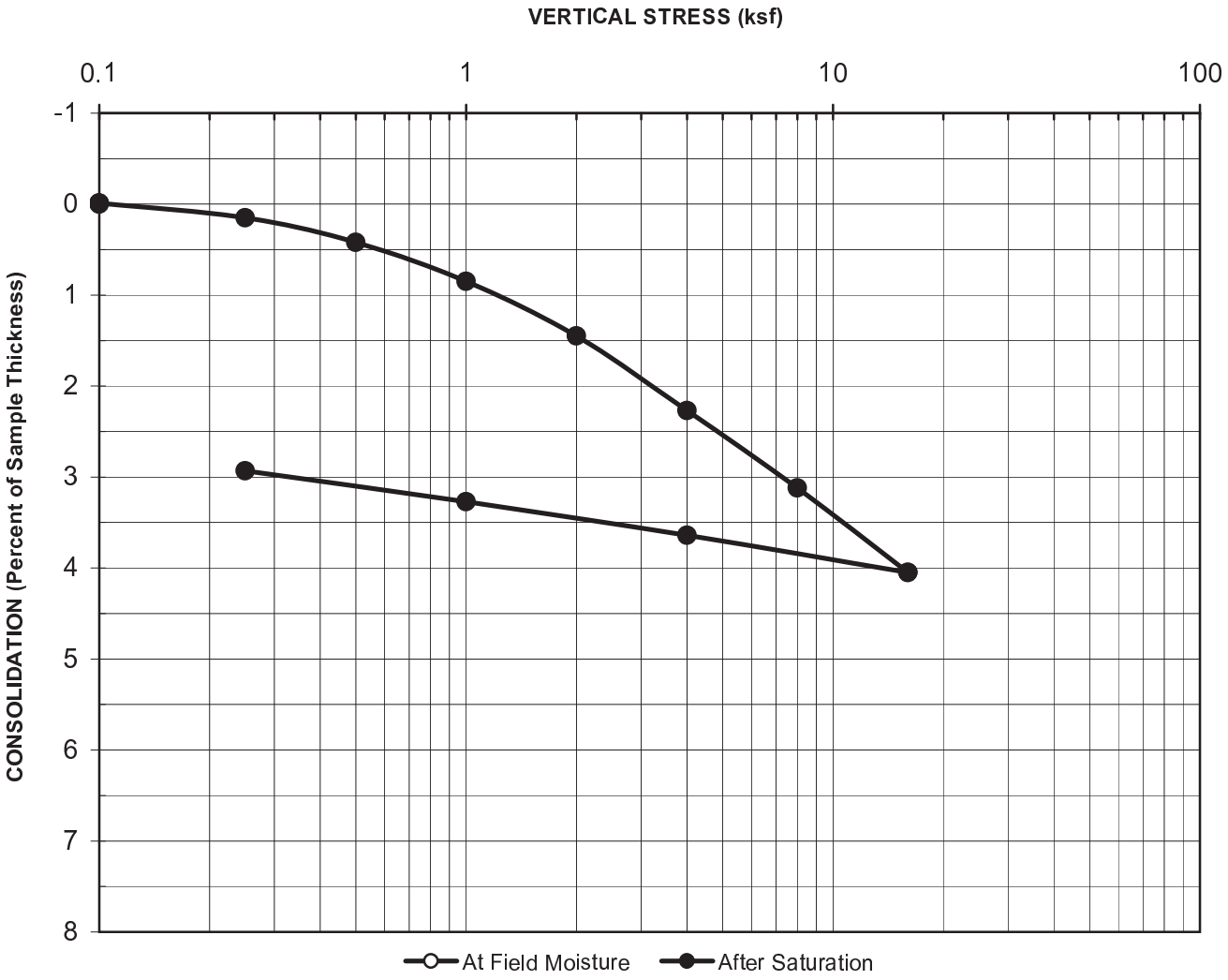
Boring No. :	G-413	Initial Dry Unit Weight (pcf):	117.3
Sample No.:	20	Initial Moisture Content (%):	16.0
Depth (feet):	95.5	Final Moisture Content (%):	17.1
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Clayey Sand	Initial Void Ratio:	0.44
Remarks:	Swell = 0.99% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.20

AP Engineering & Testing, Inc.



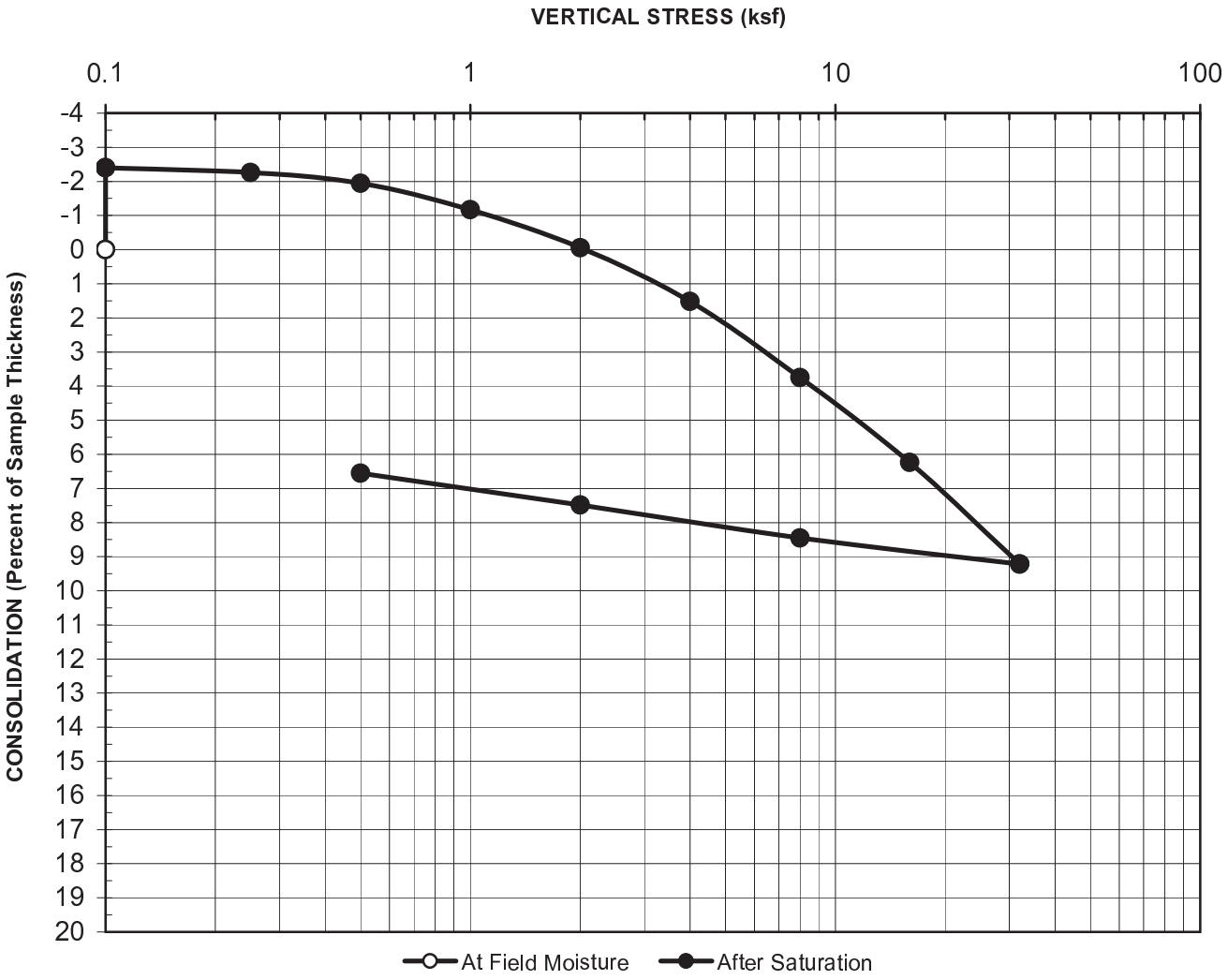
Boring No. :	G-413	Initial Dry Unit Weight (pcf):	95.2
Sample No.:	24	Initial Moisture Content (%):	13.7
Depth (feet):	115.5	Final Moisture Content (%):	27.8
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.77
Remarks:	Swell = 0.01% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.21

AP Engineering & Testing, Inc.



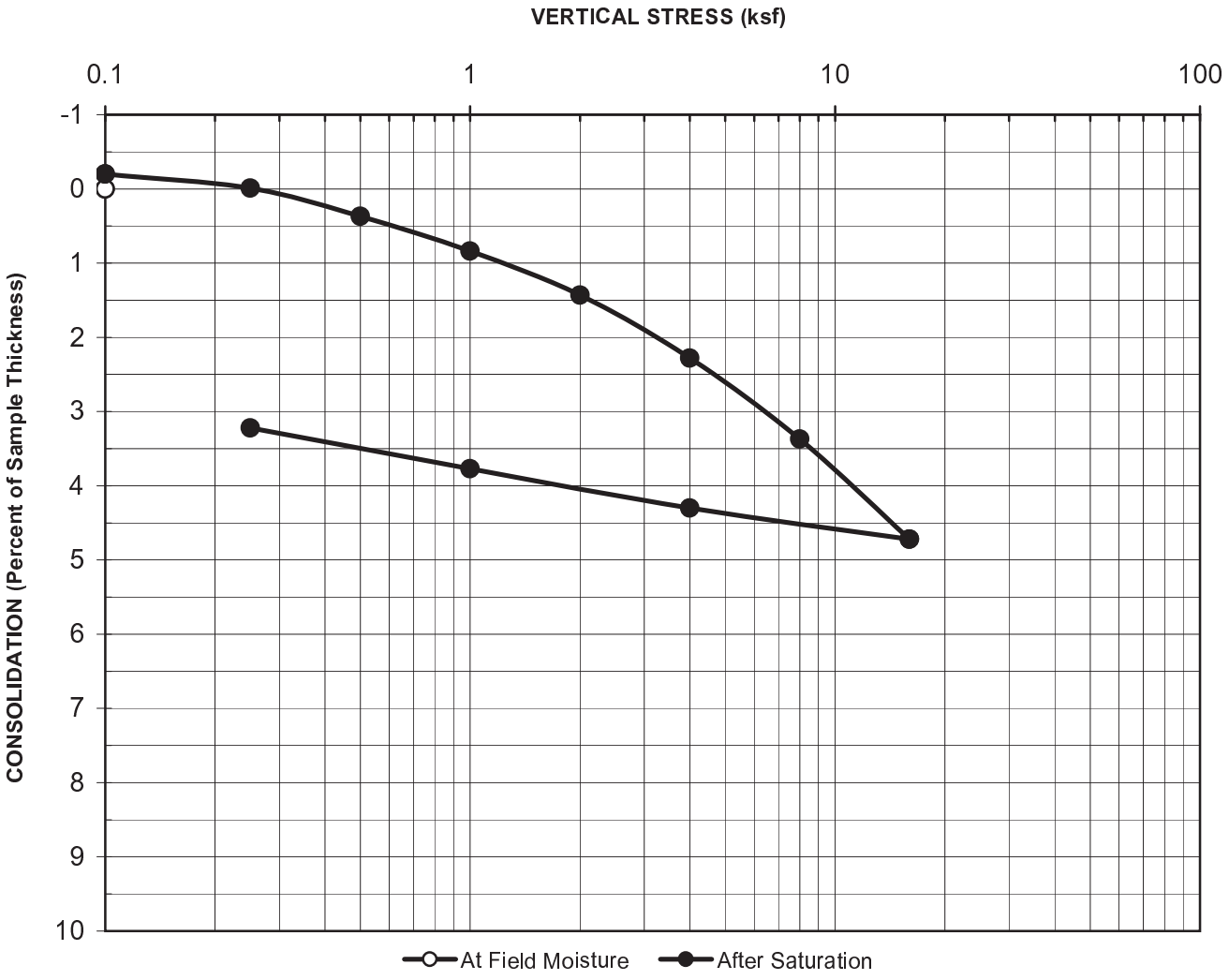
Boring No. :	G-414	Initial Dry Unit Weight (pcf):	119.0
Sample No.:	3	Initial Moisture Content (%):	10.7
Depth (feet):	15.5	Final Moisture Content (%):	14.2
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Lean Clay	Initial Void Ratio:	0.42
Remarks:	Swell = 2.40% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/7/2015
AP No:	15-0361

Figure D-3.2.22

AP Engineering & Testing, Inc.



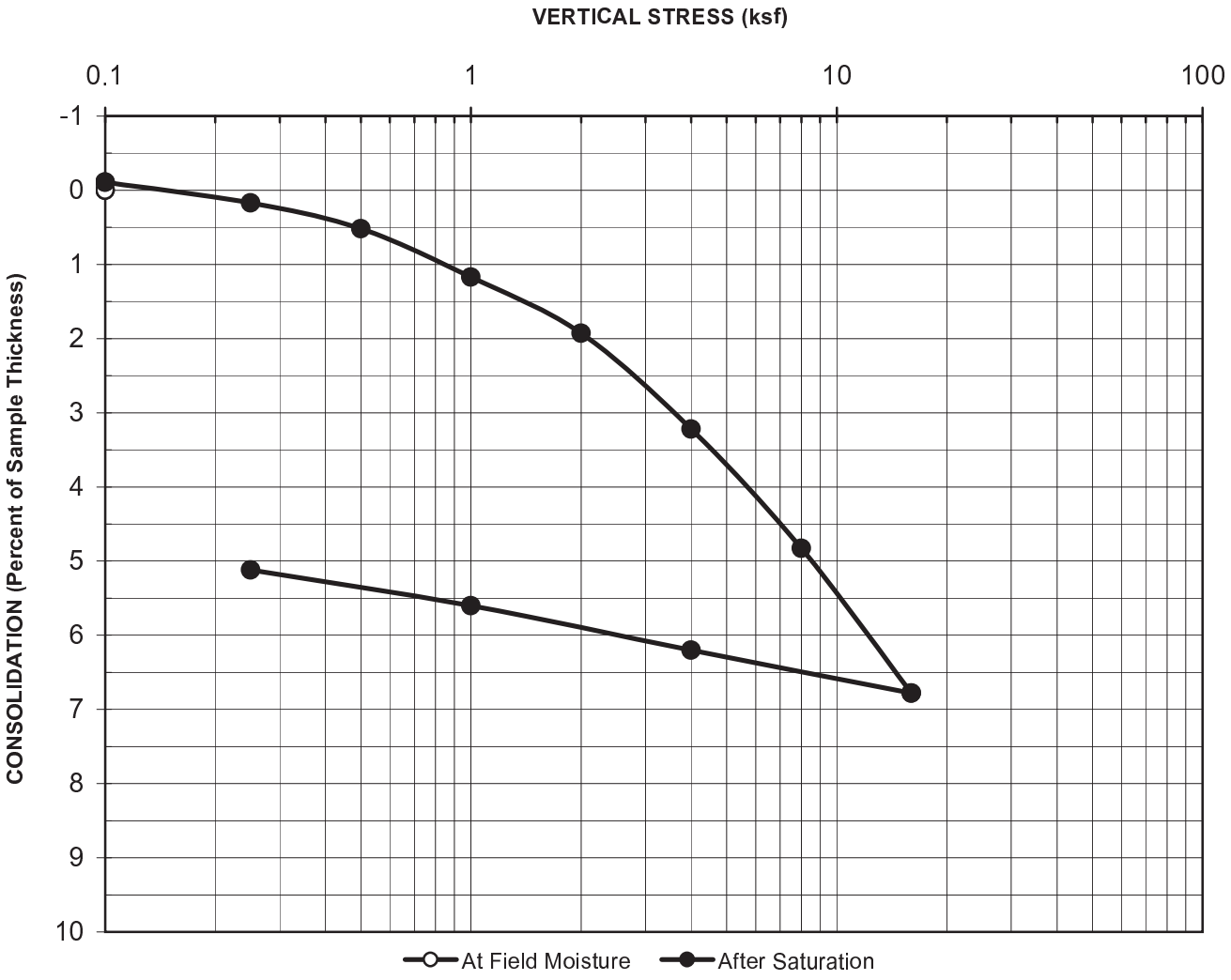
Boring No. :	G-414	Initial Dry Unit Weight (pcf):	104.4
Sample No.:	16	Initial Moisture Content (%):	18.9
Depth (feet):	66.5	Final Moisture Content (%):	22.0
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.61
Remarks:	Swell = 0.20% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.23

AP Engineering & Testing, Inc.



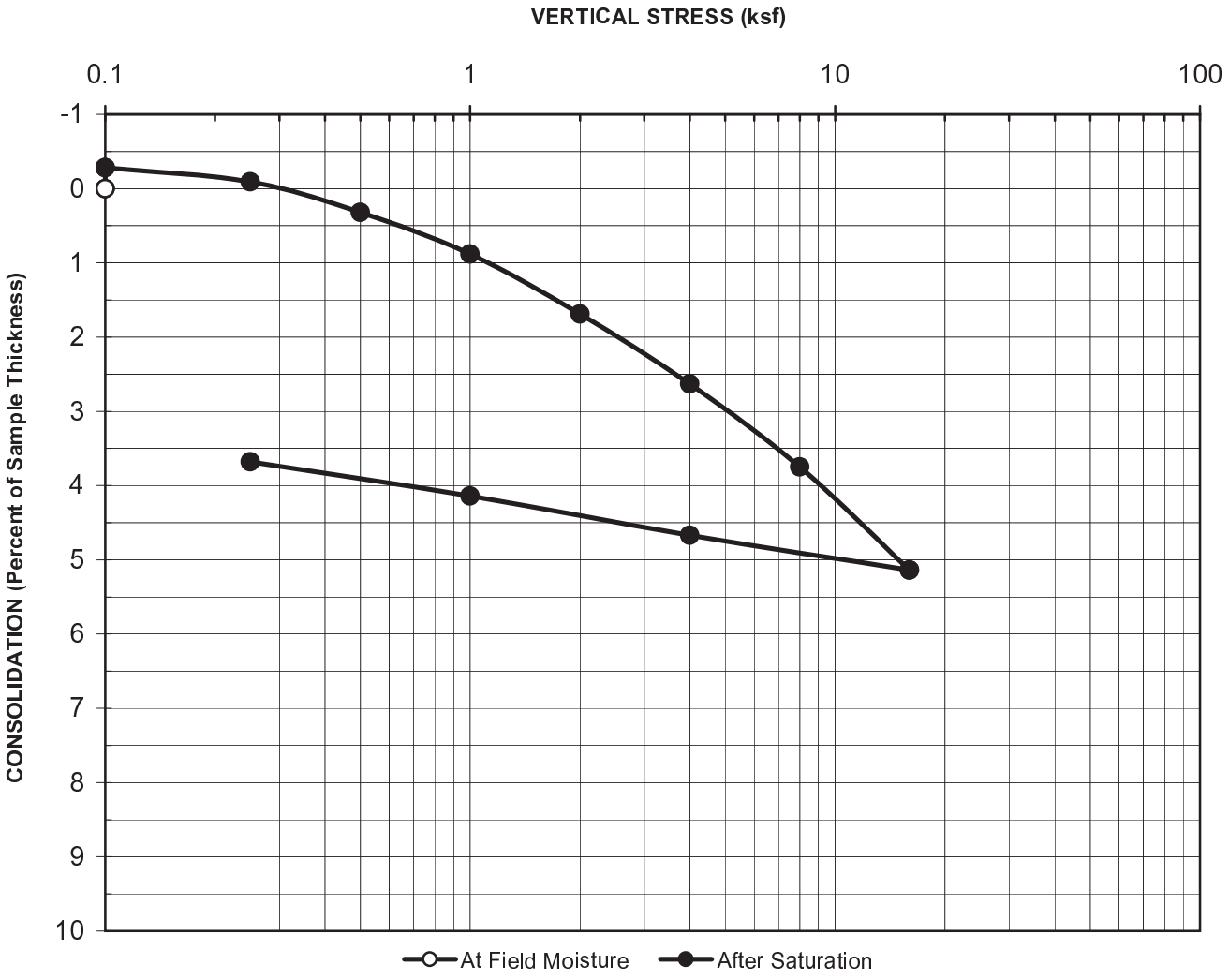
Boring No. :	G-414	Initial Dry Unit Weight (pcf):	95.2
Sample No.:	20	Initial Moisture Content (%):	26.2
Depth (feet):	78.5	Final Moisture Content (%):	27.8
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.77
Remarks:	Swell = 0.11% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.24

AP Engineering & Testing, Inc.



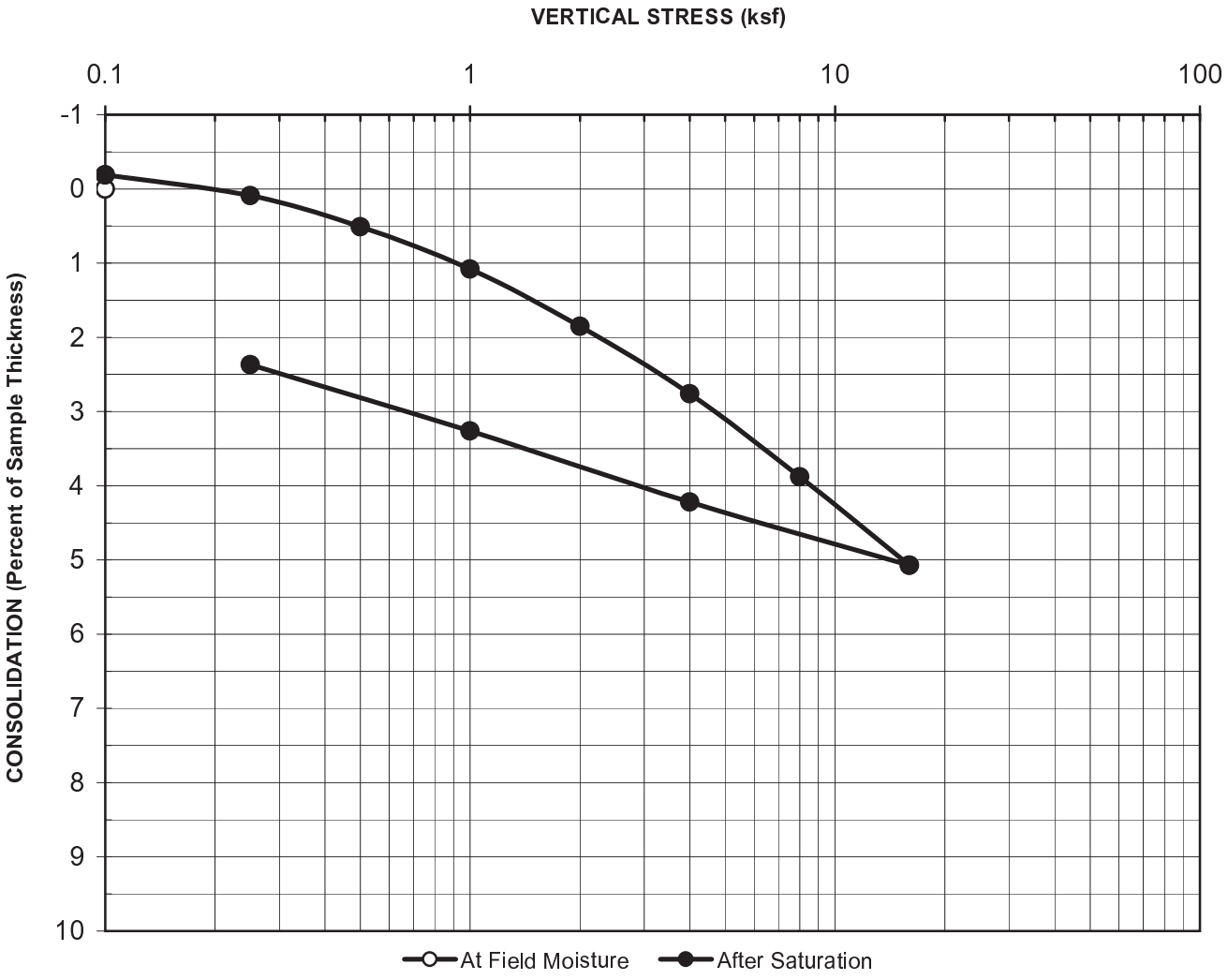
Boring No. :	G-414	Initial Dry Unit Weight (pcf):	106.4
Sample No.:	26	Initial Moisture Content (%):	20.3
Depth (feet):	96.5	Final Moisture Content (%):	20.0
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.58
Remarks:	Swell = 0.28% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.25

AP Engineering & Testing, Inc.



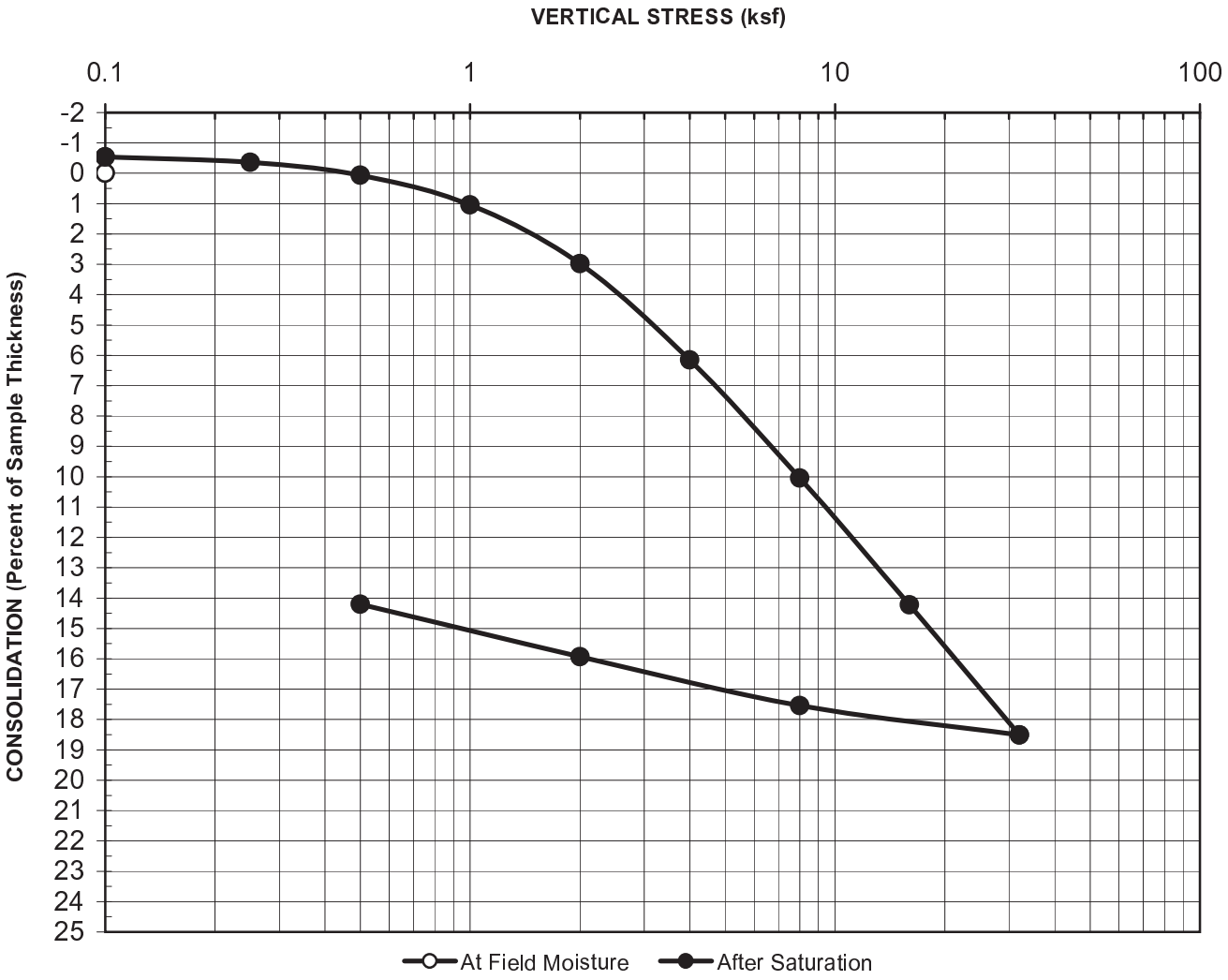
Boring No. :	G-414	Initial Dry Unit Weight (pcf):	108.7
Sample No.:	30	Initial Moisture Content (%):	14.7
Depth (feet):	115.5	Final Moisture Content (%):	23.7
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Silty Sand	Initial Void Ratio:	0.55
Remarks:	Swell = 0.19% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.26

AP Engineering & Testing, Inc.



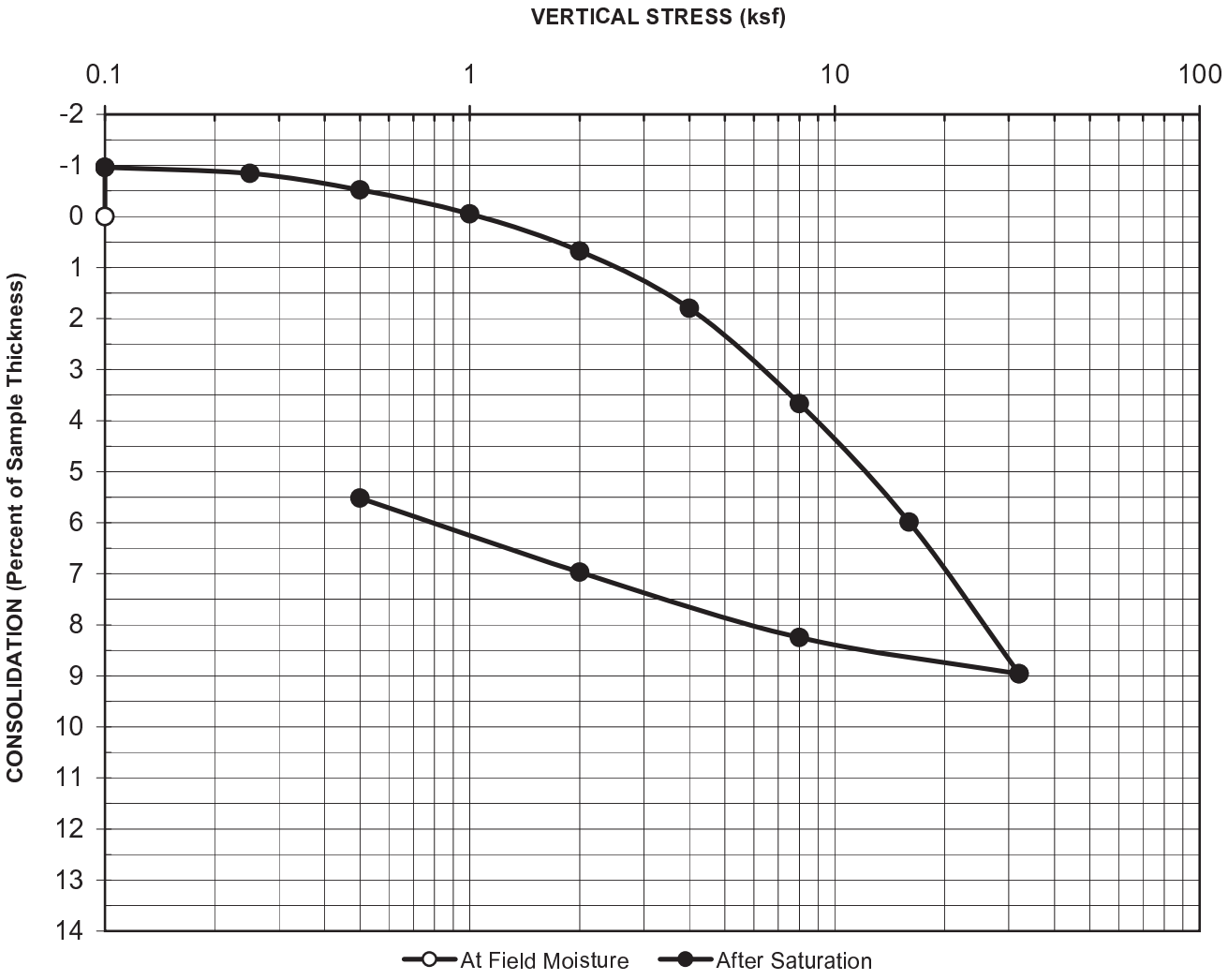
Boring No. :	G-415	Initial Dry Unit Weight (pcf):	105.7
Sample No.:	2	Initial Moisture Content (%):	19.2
Depth (feet):	9.5	Final Moisture Content (%):	18.5
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Lean Clay	Initial Void Ratio:	0.59
Remarks:	Swell = 0.54% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.27

AP Engineering & Testing, Inc.



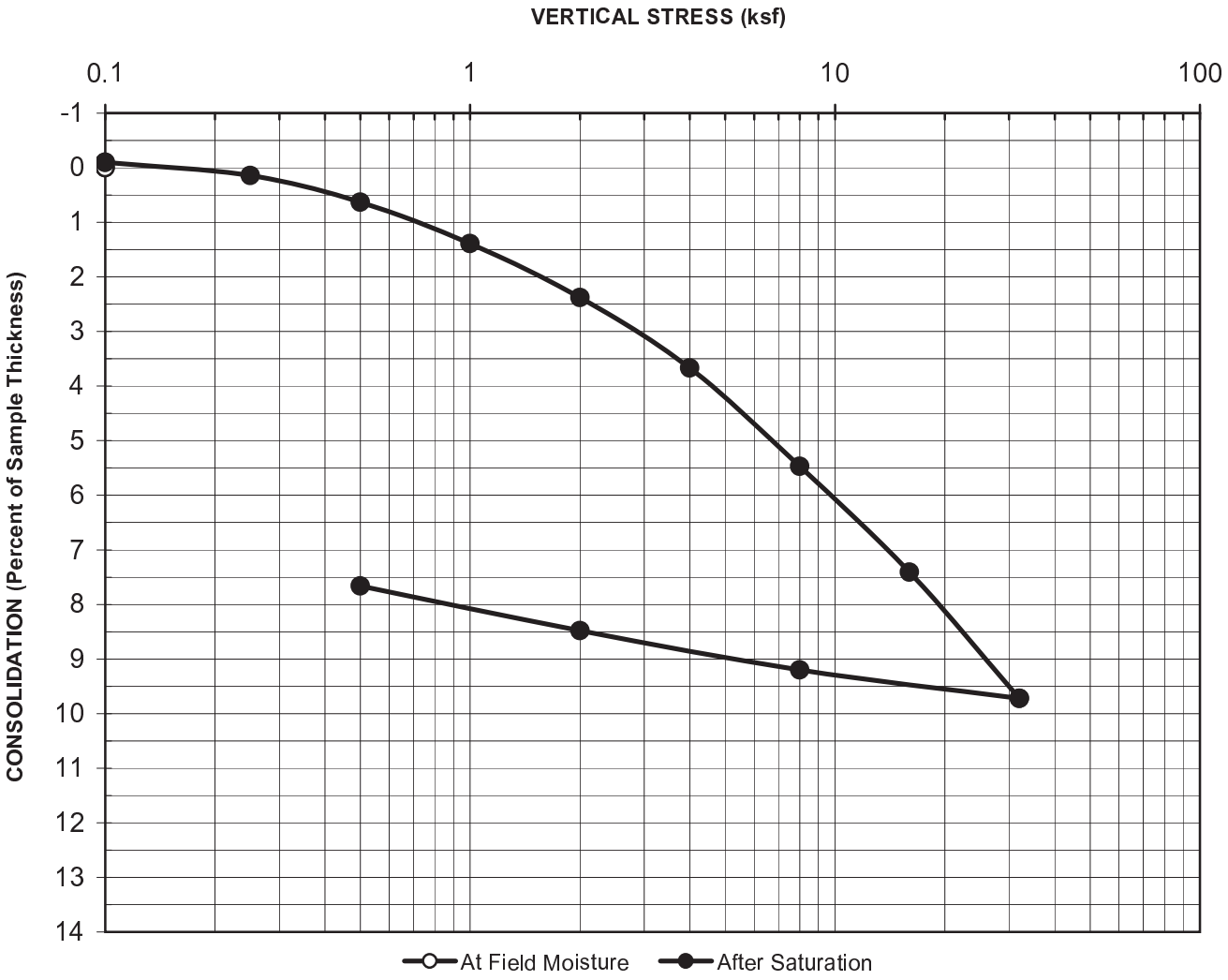
Boring No. :	G-415	Initial Dry Unit Weight (pcf):	109.4
Sample No.:	10	Initial Moisture Content (%):	17.3
Depth (feet):	37.5	Final Moisture Content (%):	17.9
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Sandy Lean Clay	Initial Void Ratio:	0.54
Remarks:	Swell = 0.96% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.28

AP Engineering & Testing, Inc.



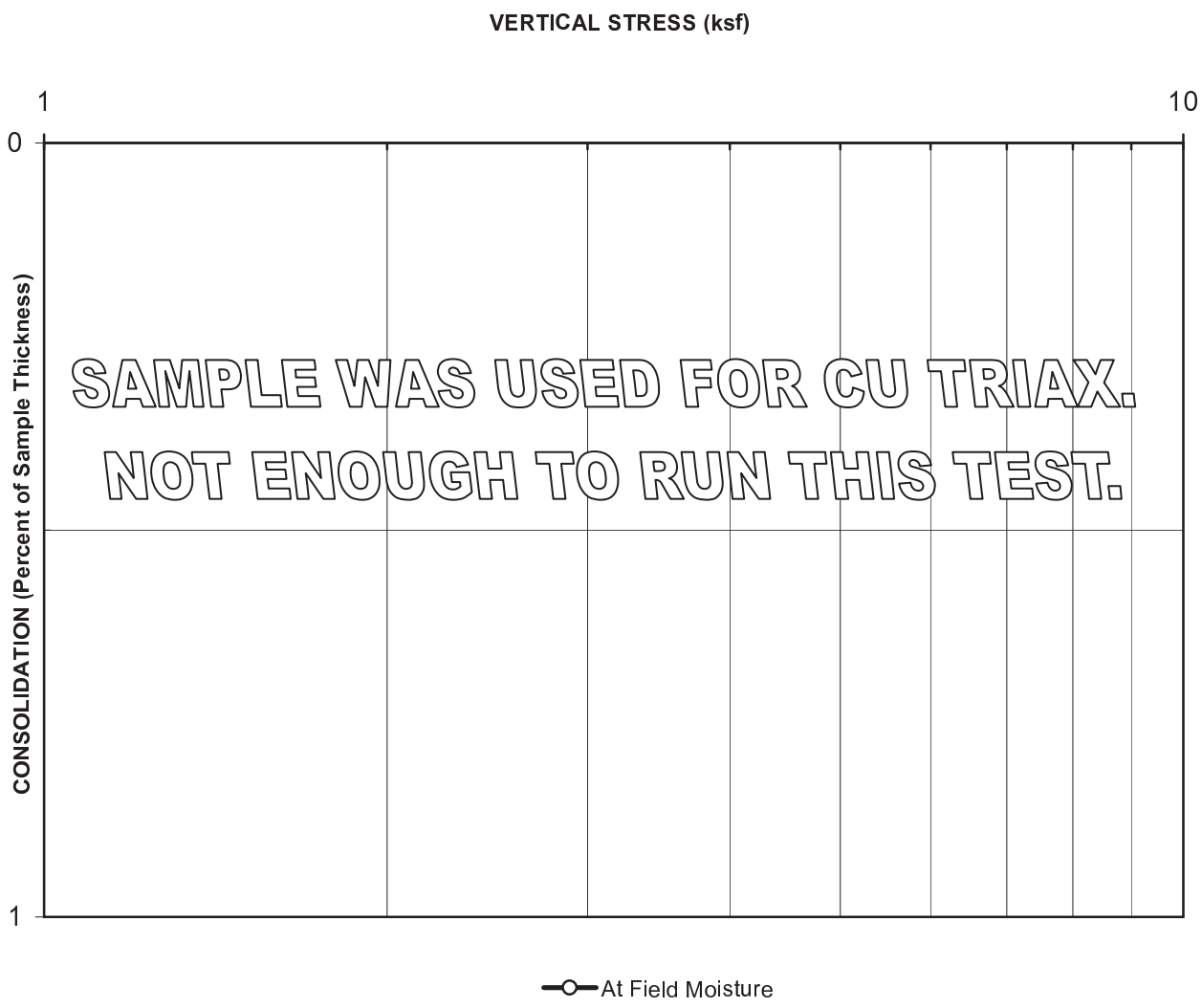
Boring No. :	G-415	Initial Dry Unit Weight (pcf):	114.9
Sample No.:	14	Initial Moisture Content (%):	16.6
Depth (feet):	55.5	Final Moisture Content (%):	15.5
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Clay	Initial Void Ratio:	0.47
Remarks:	Swell = 0.10% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.29

AP Engineering & Testing, Inc.



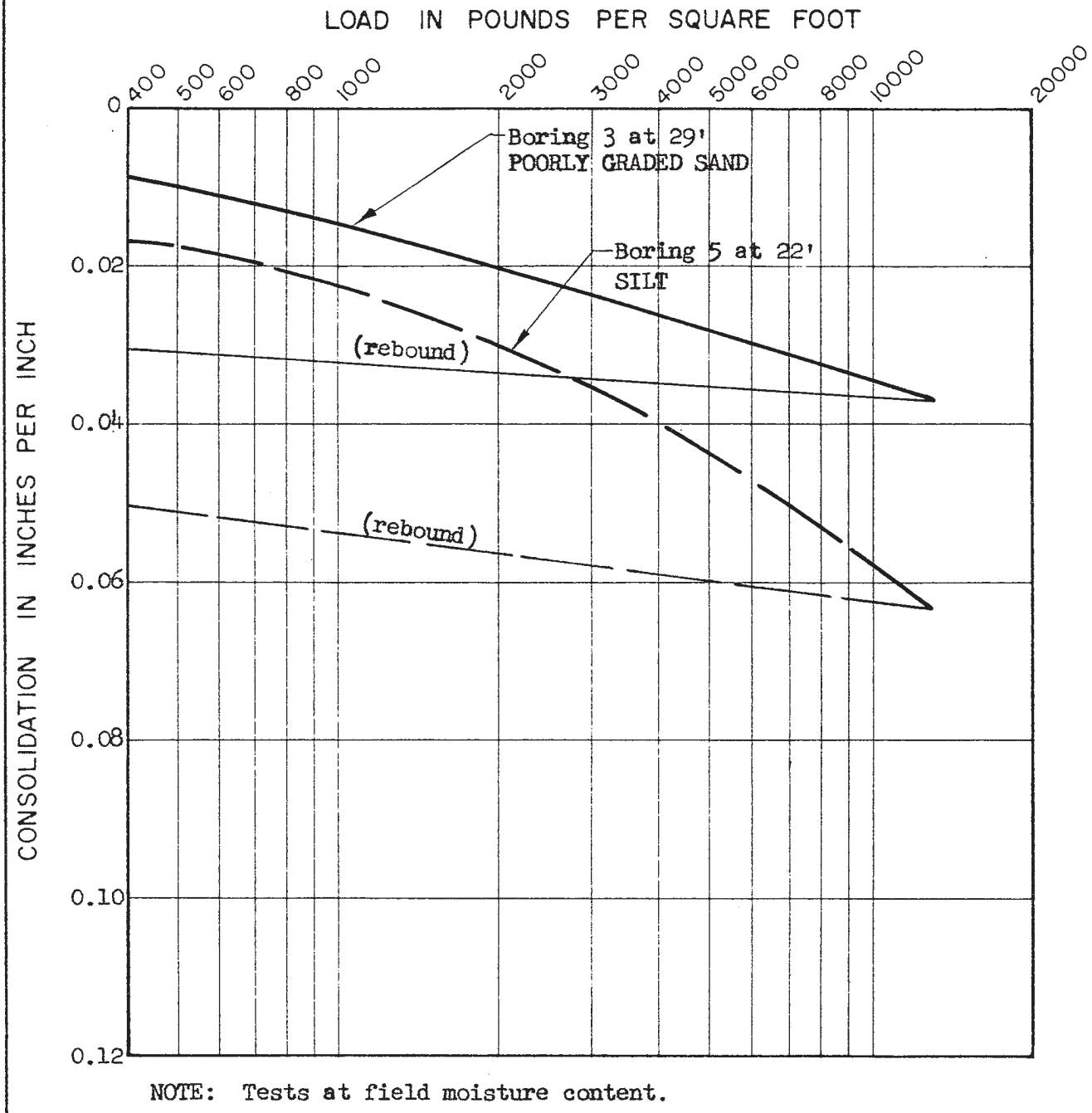
Boring No. :	G-415	Initial Dry Unit Weight (pcf):	
Sample No.:	21	Initial Moisture Content (%):	
Depth (feet):	90.5	Final Moisture Content (%):	
Sample Type:	Mod Cal	Assumed Specific Gravity:	
Soil Description:	Claystone	Initial Void Ratio:	
Remarks:			

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Westside Subway Extension
Project No.:	4953-11-1423
Date:	5/1/2015
AP No:	15-0361

Figure D-3.2.30

JOB 59446 DATE 11-19-59 BY RLL



NOTE: Tests at field moisture content.

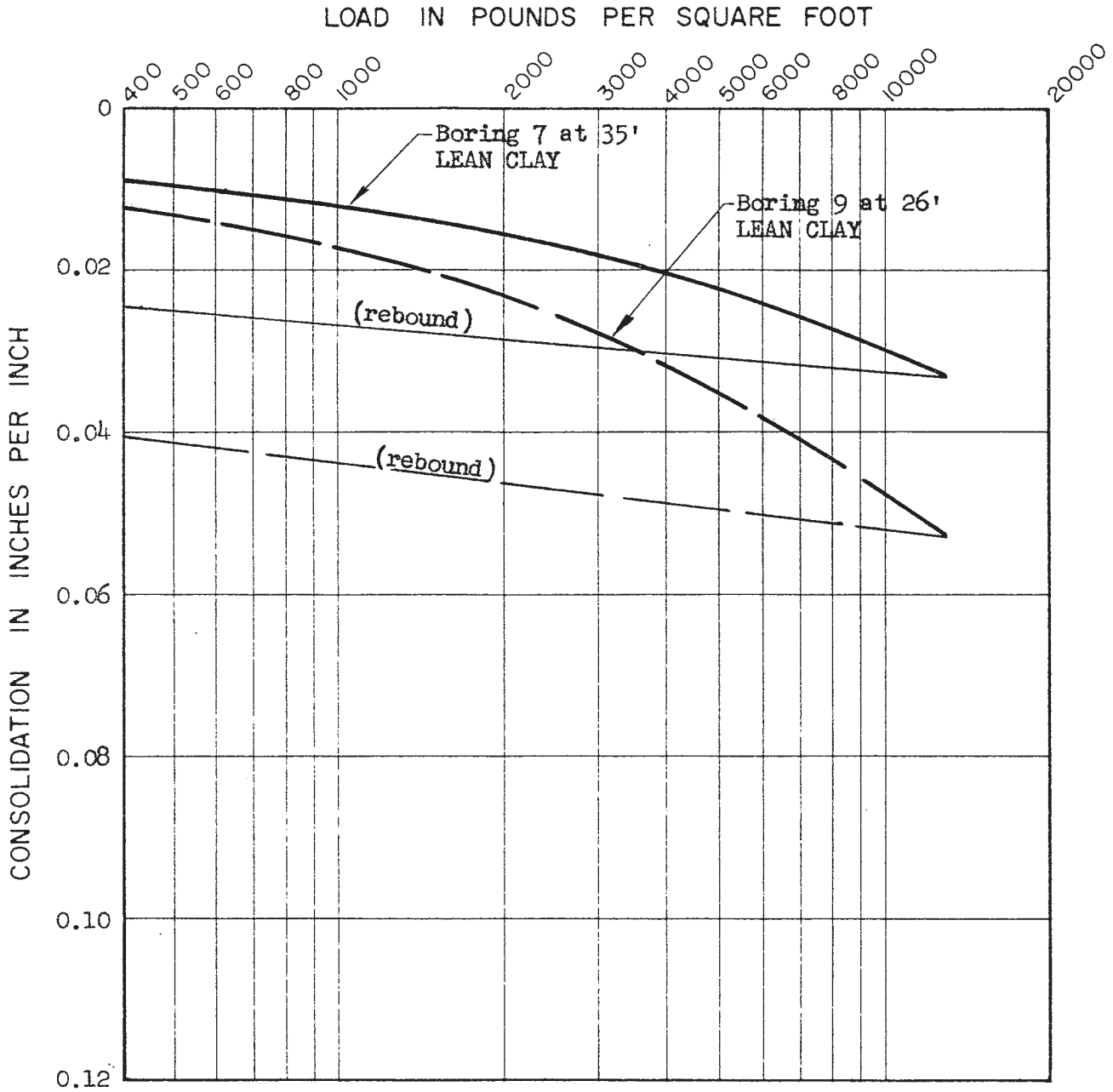
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.1

PLATE A-4A

JOB 5946 DATE 11-19-59 BY LLC



NOTE: Tests at field moisture content.

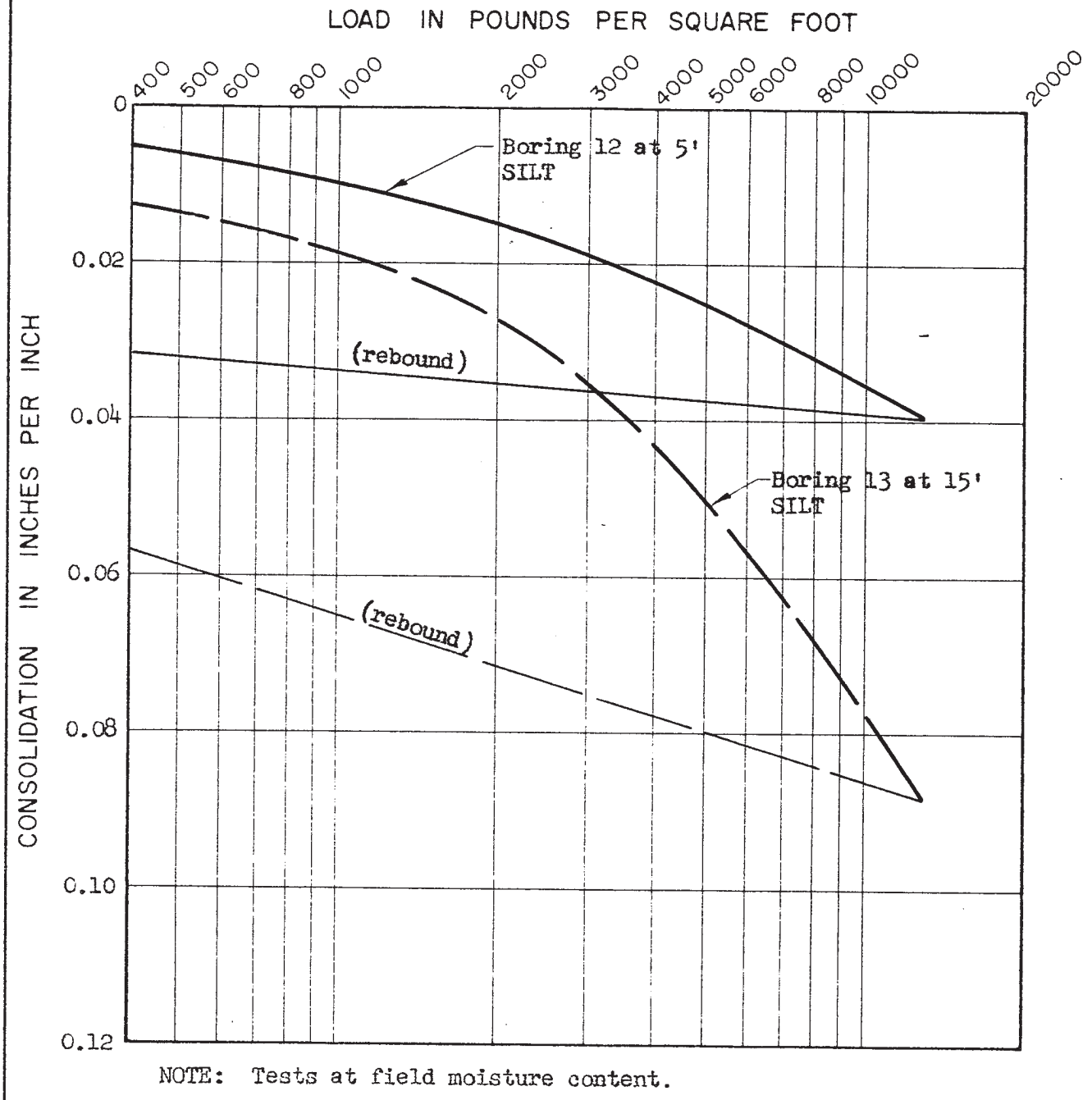
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.2

PLATE A-4B

JOB 59446 DATE 11 19 59 BY ACC



NOTE: Tests at field moisture content.

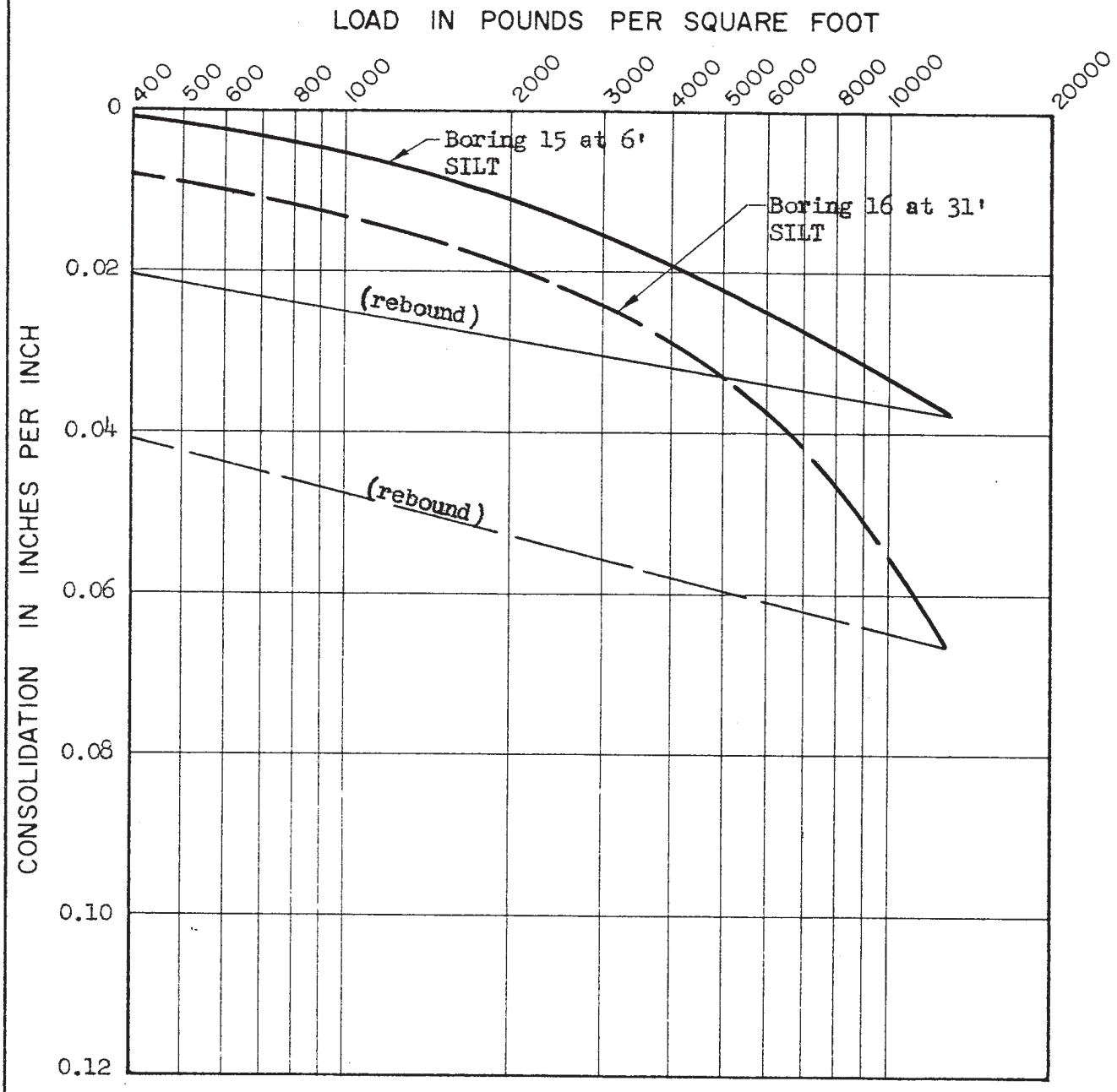
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.3

PLATE A-4C

JOB 59446 DATE 11-19-59 BY FKL



NOTE: Tests at field moisture content.

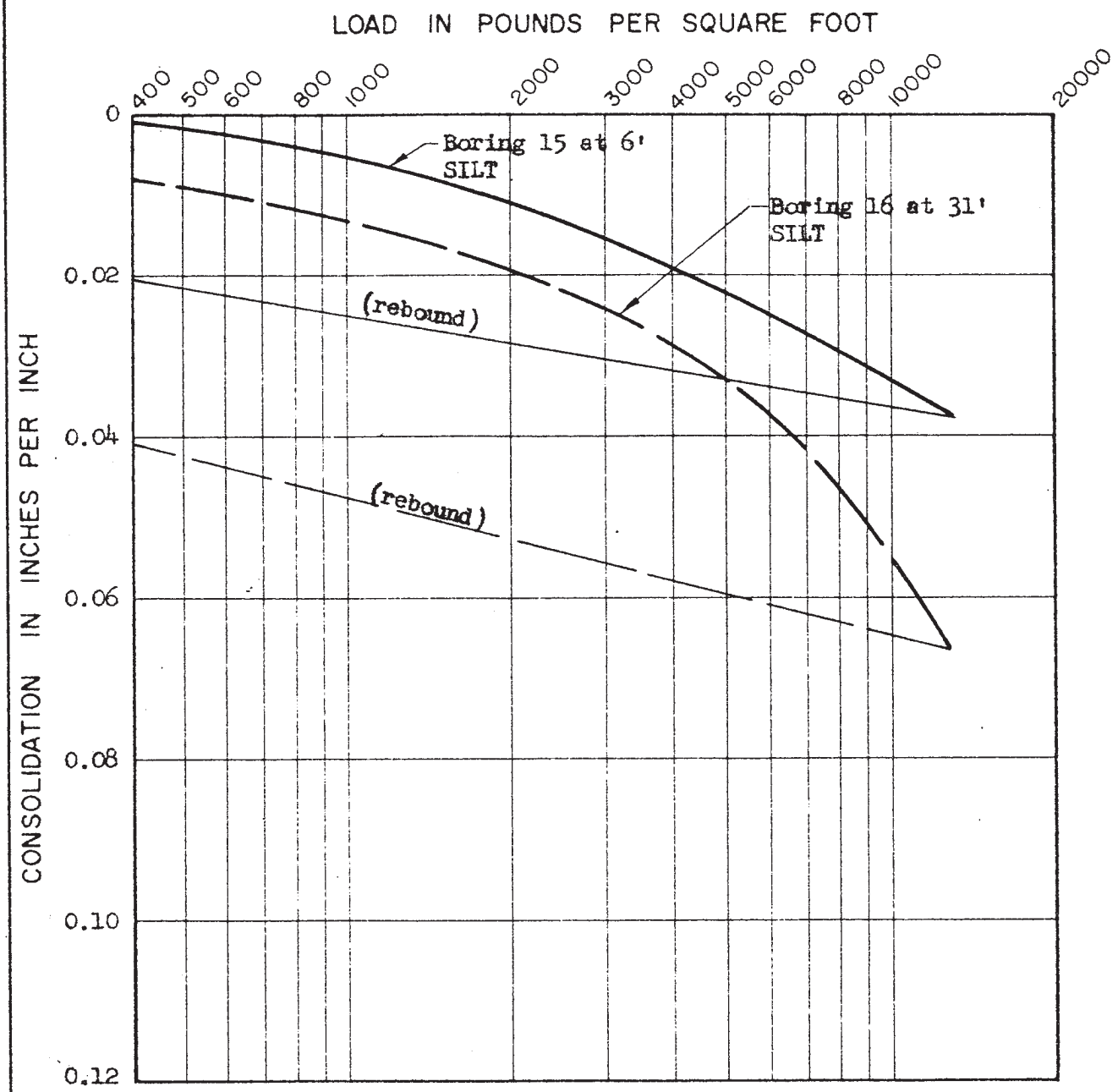
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.4

PLATE A-4D

JOB 59446 DATE 11-19-59 BY FEC



NOTE: Tests at field moisture content.

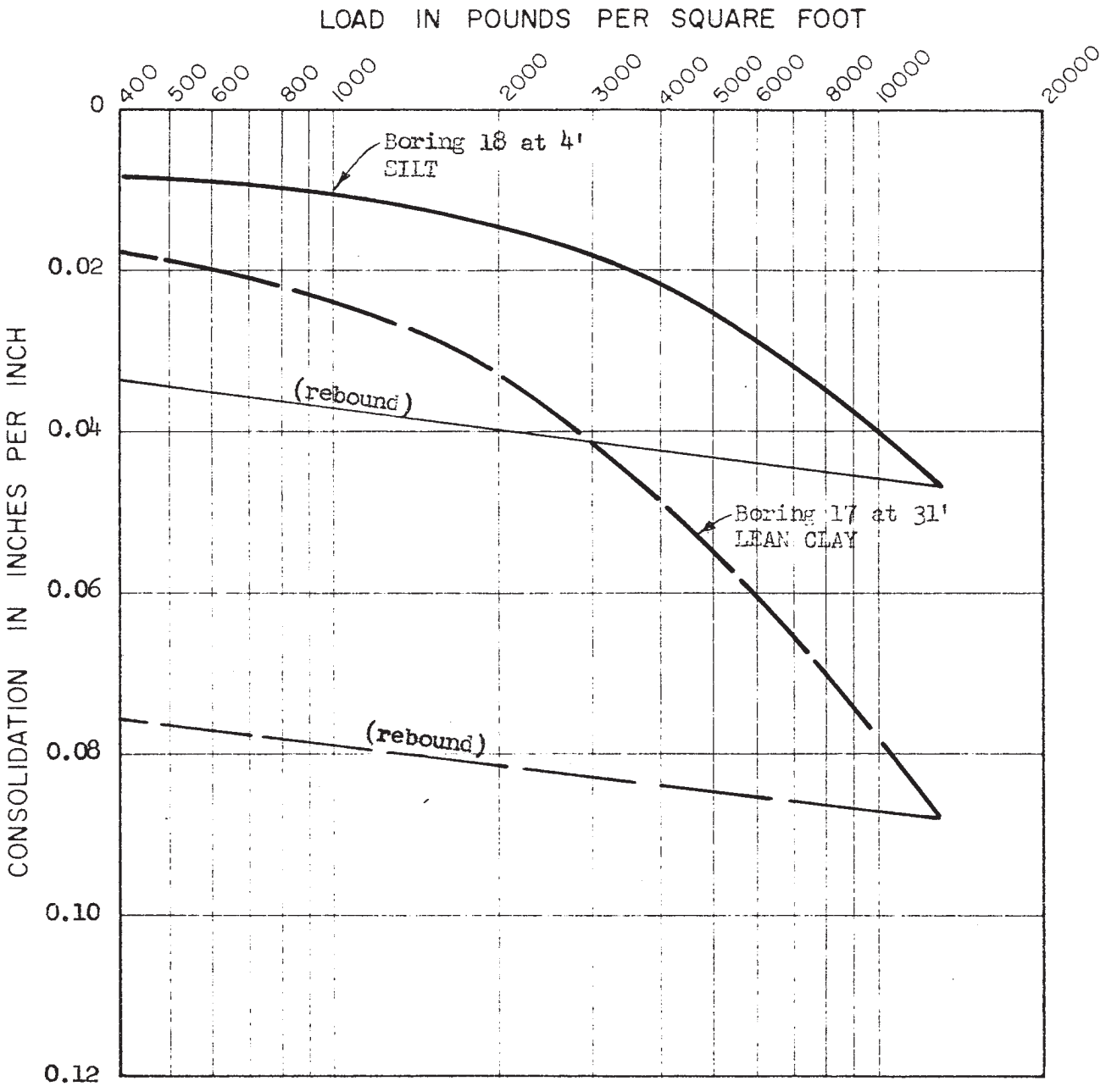
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.5

PLATE A-4A

JOB , DATE BY



NOTE: Water added to sample from Boring 18 at 4' after consolidation due to 6,400 p.s.f. load. Remaining test at field moisture content.

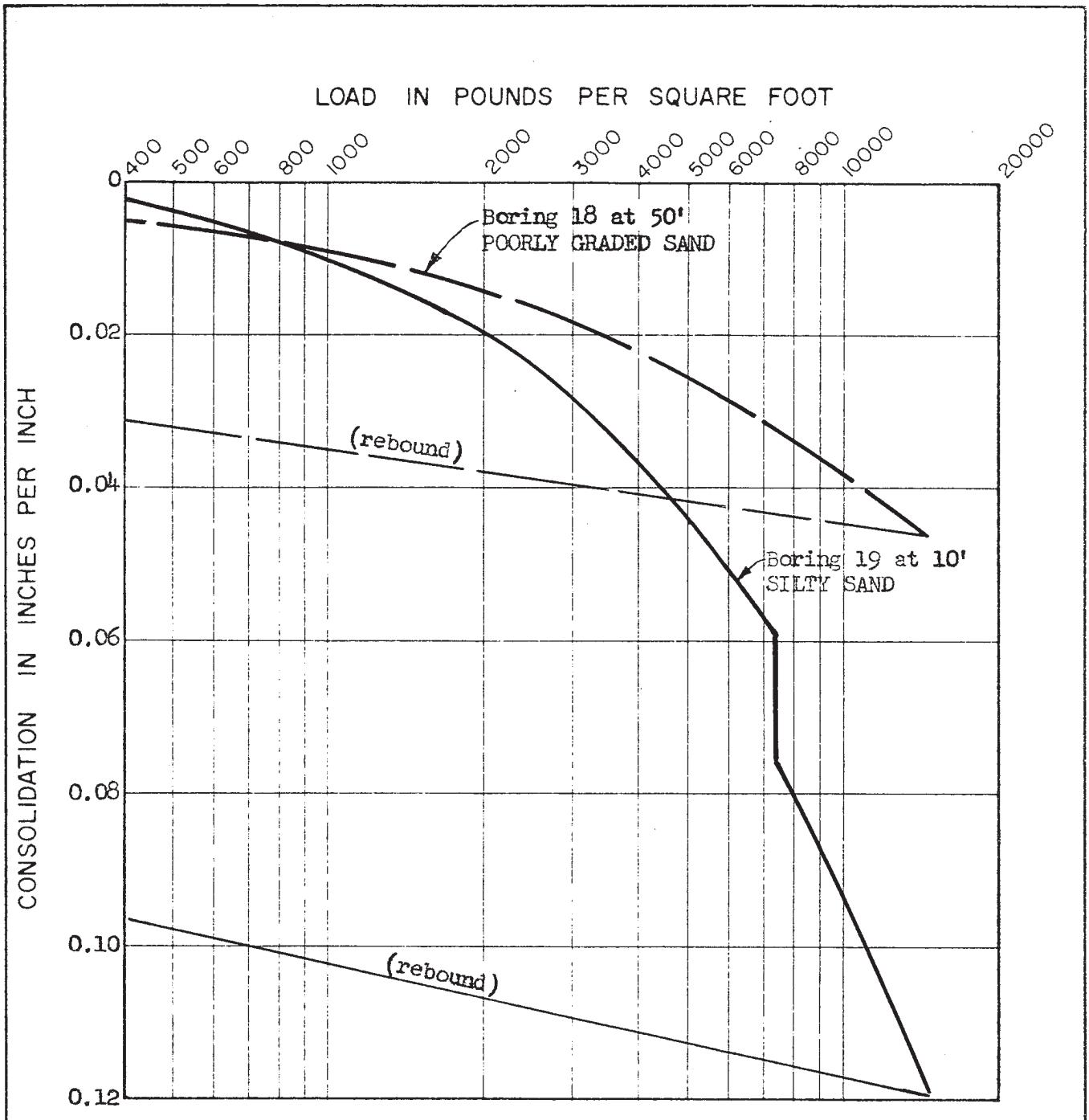
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.6

PLATE A-4B

JOB _____ DATE _____ BY _____



NOTE: Water added to sample from Boring 19 at 10' after consolidation due to 7,250 p.s.f. load. Remaining test at field moisture content.

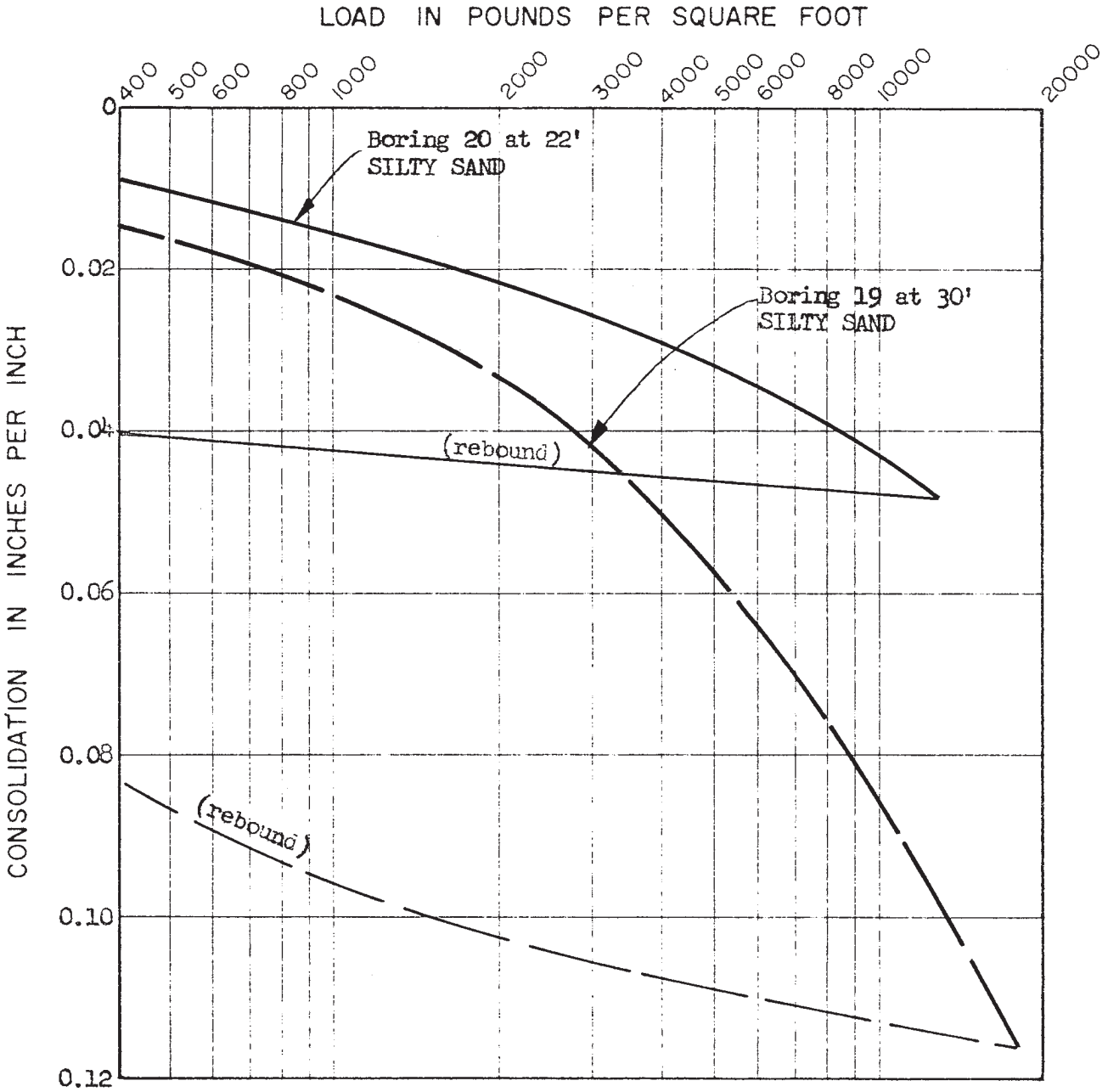
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.7

PLATE A-4C

JOB _____ DATE _____ BY _____



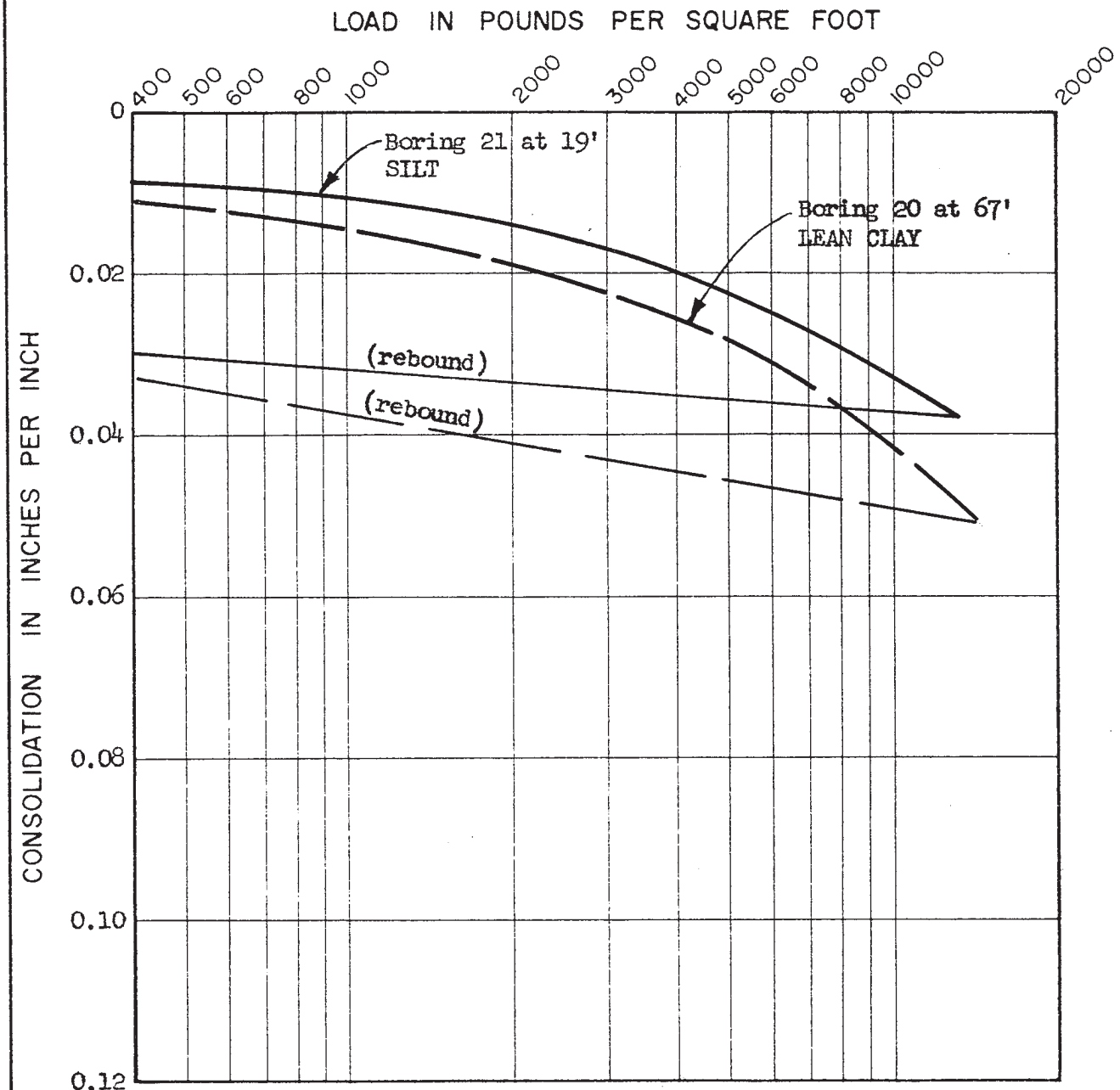
NOTE: Tests at field moisture content.

CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.8

PLATE A-4D



NOTE: Tests at field moisture content.

CONSOLIDATION TEST DATA

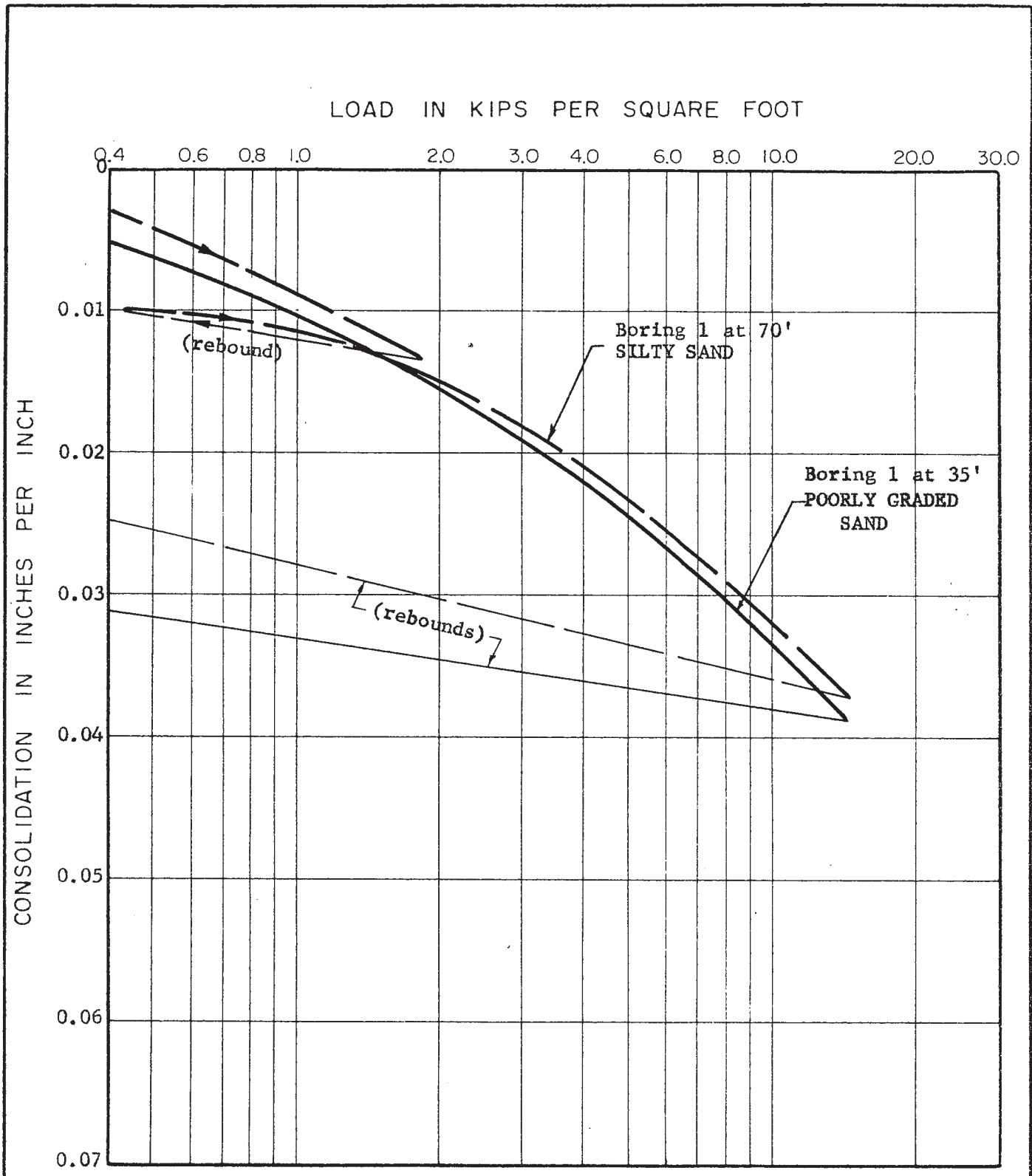
LEROY CRANDALL & ASSOCIATES

Figure D-3.3.9

PLATE A-4E

JOB 5[illegible] DATE 3-25-60 BY [illegible]

JOB 62353 DATE 6-26-62 BY TDD fig



NOTE: Tests at field moisture content.

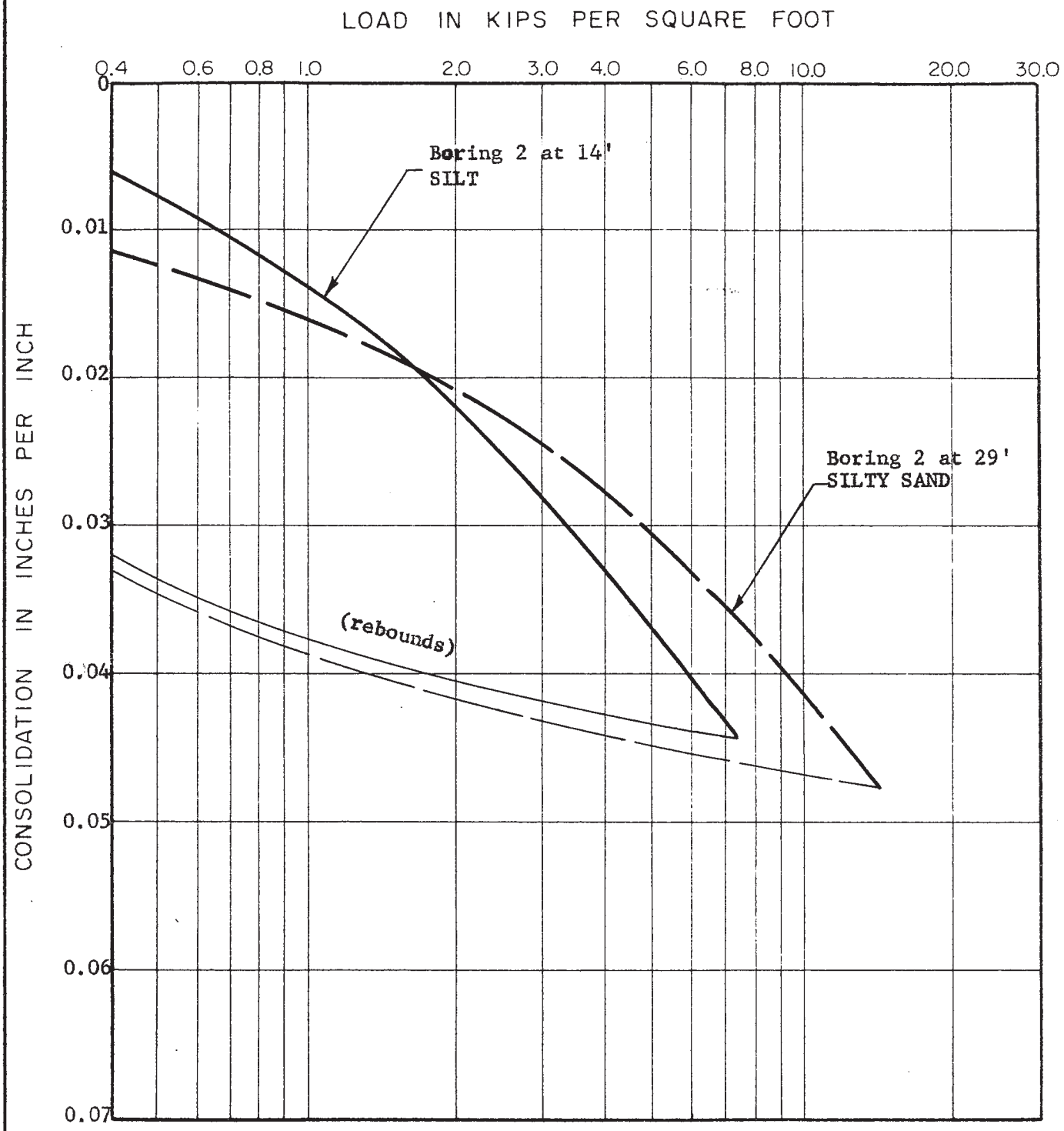
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE A-4A

Figure D-3.3.10

JOB 62353 DATE 6-26-62 BY Todd fg



NOTE: Water added to sample at 14' after consolidation under a load of 3.6 kips per square foot. The other sample tested at field moisture content.

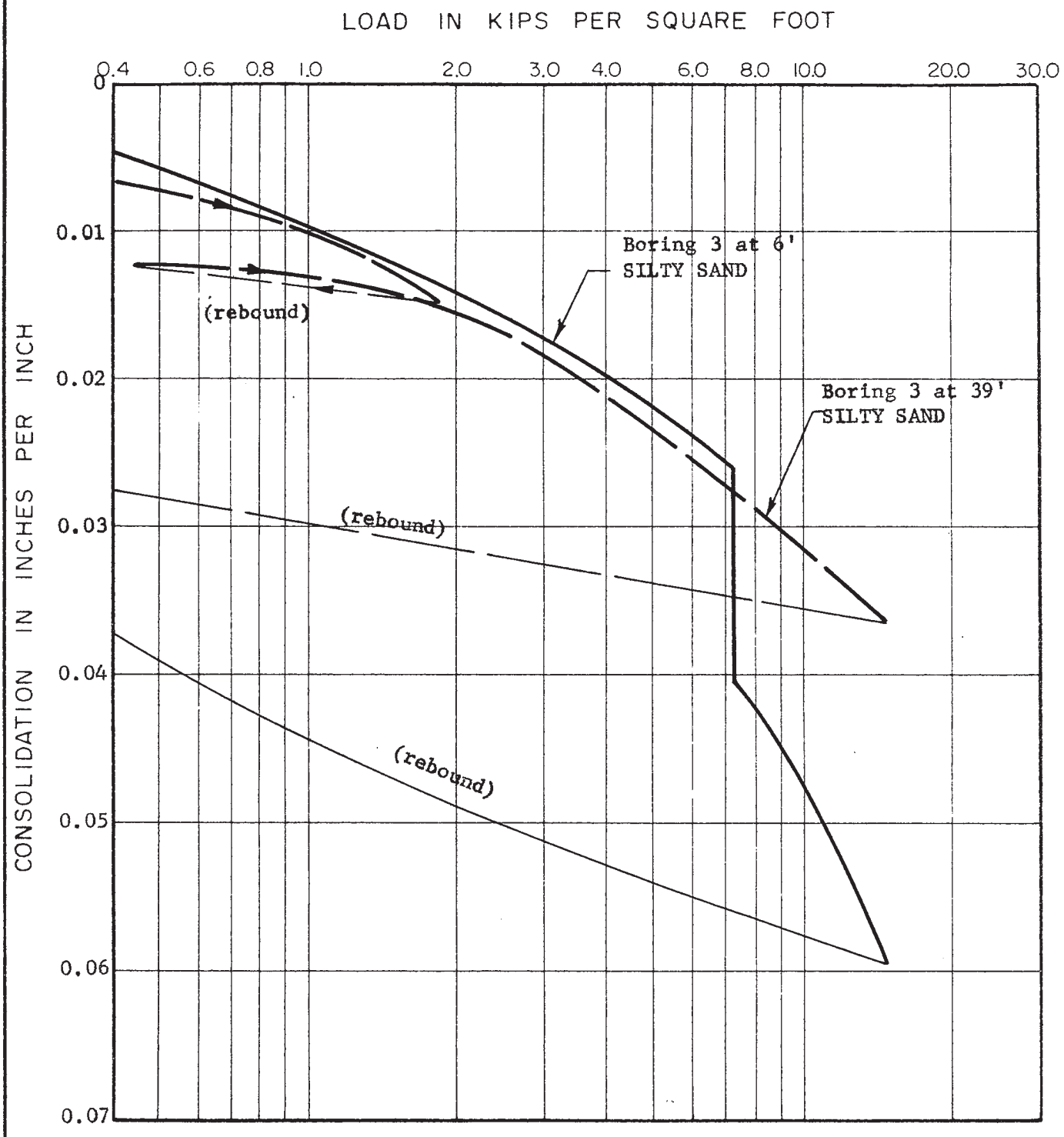
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.11

PLATE A-4B

JOB 62353 DATE 6-26-62 BY Todd fg



NOTE: Water added to sample at 6' after consolidation under a load of 7.2 kips per square foot. The other sample tested at field moisture content.

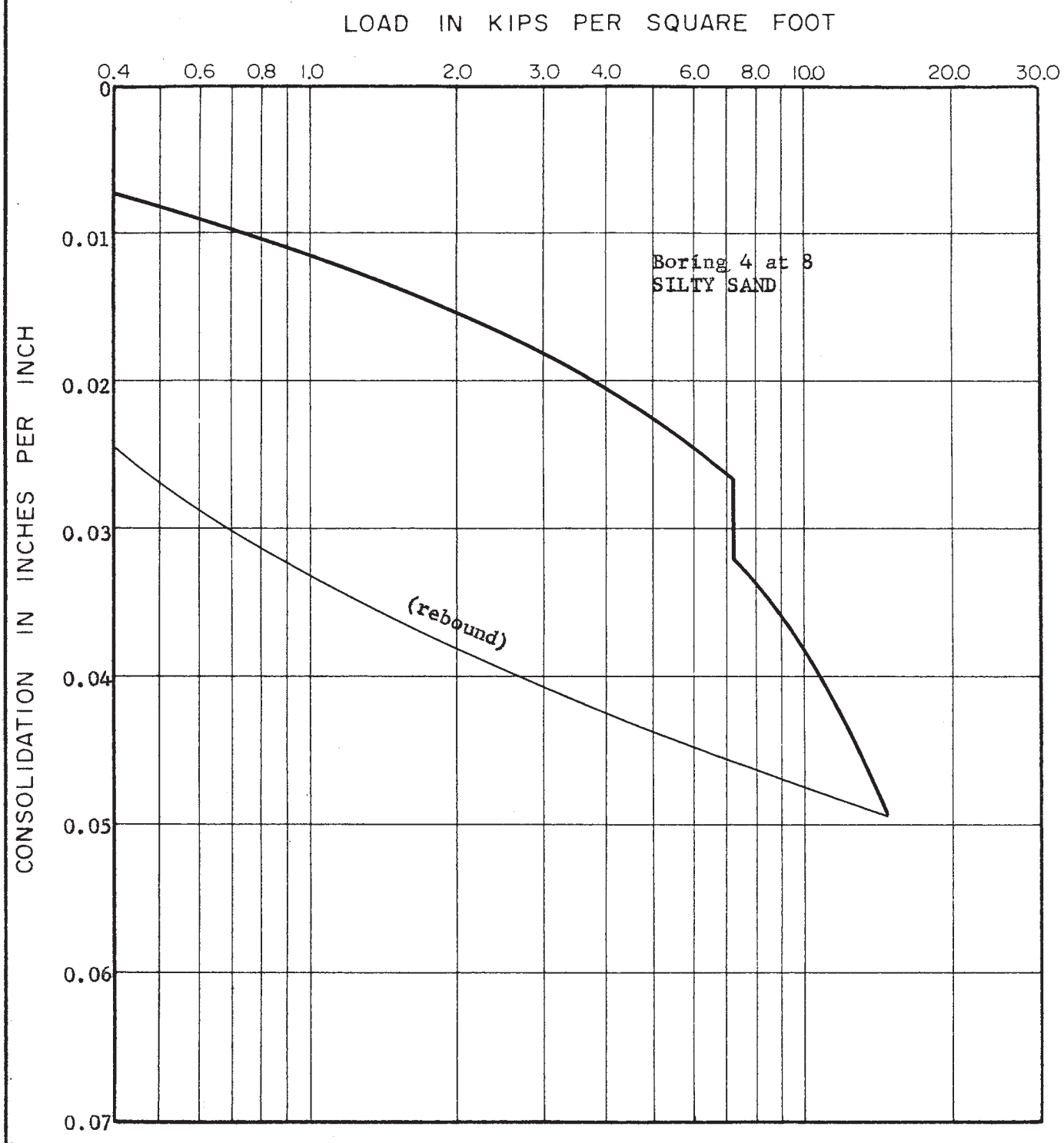
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.12

PLATE A-4C

JOB 62353 DATE 6-26-62 BY Todd fg



NOTE: Water added to sample after consolidation under a load of 7.2 kips per square foot.

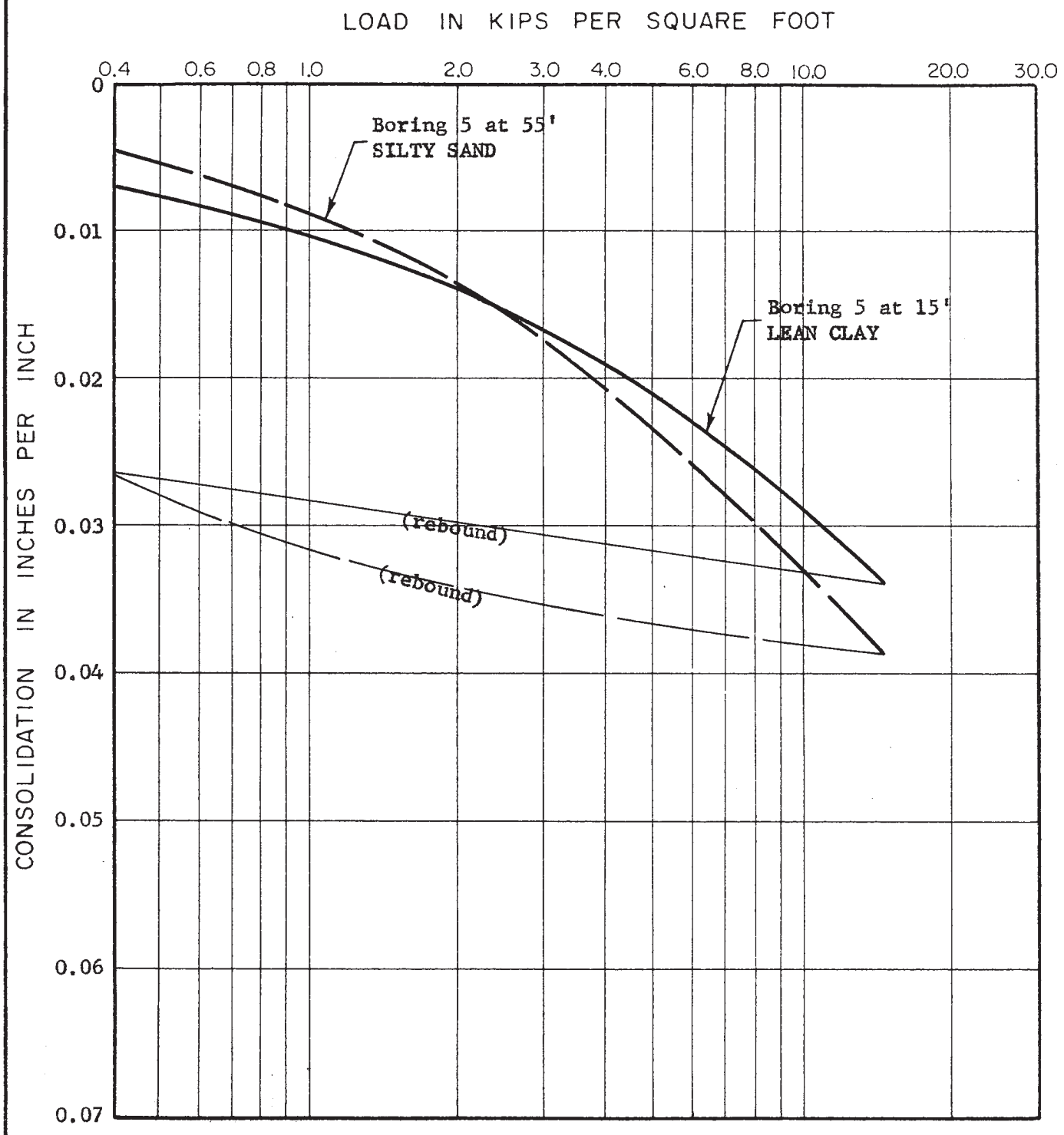
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.13

PLATE A-4D

JOB 62353 DATE 6-26-62 BY TDD fg



NOTE: Tests at field moisture content.

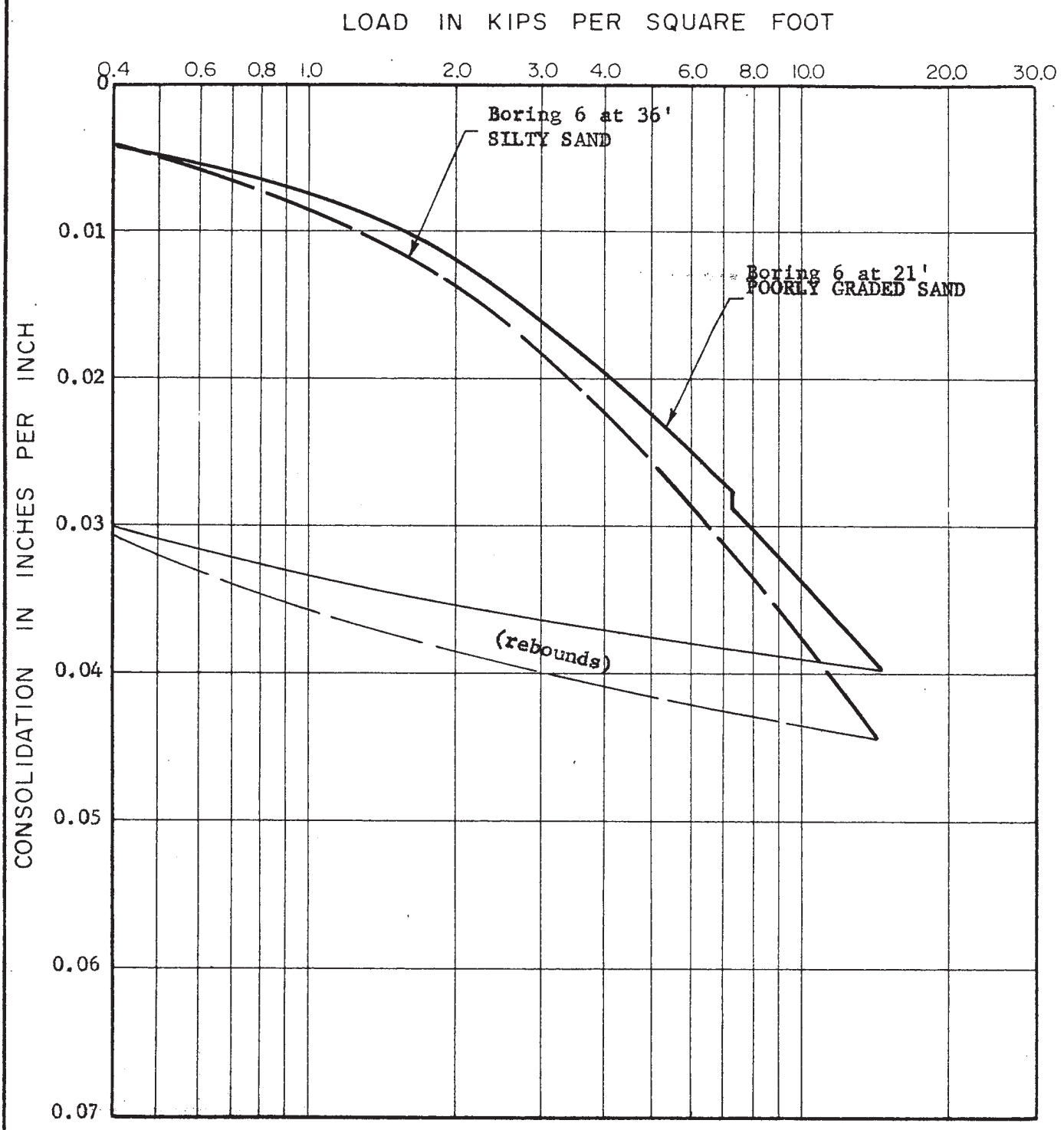
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.14

PLATE A-4E

JOB 62353 DATE 6-26-62 BY Todd fg



NOTE: Water added to sample at 21' after consolidation under a load of 7.2 kips per square foot. The other sample tested at field moisture content.

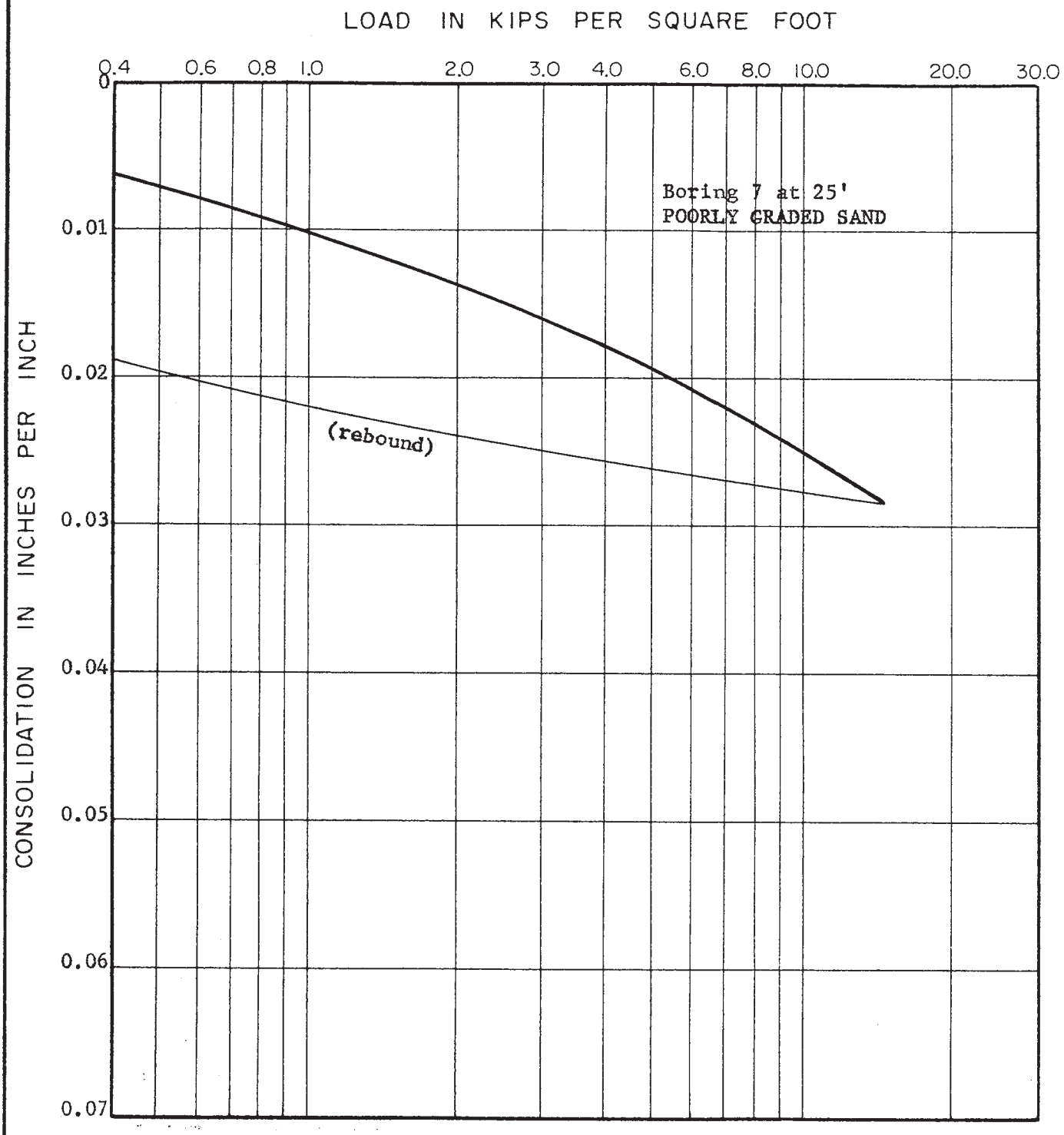
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.15

PLATE A-4F

JOB 62353 DATE 6-26-62 BY Todd fg



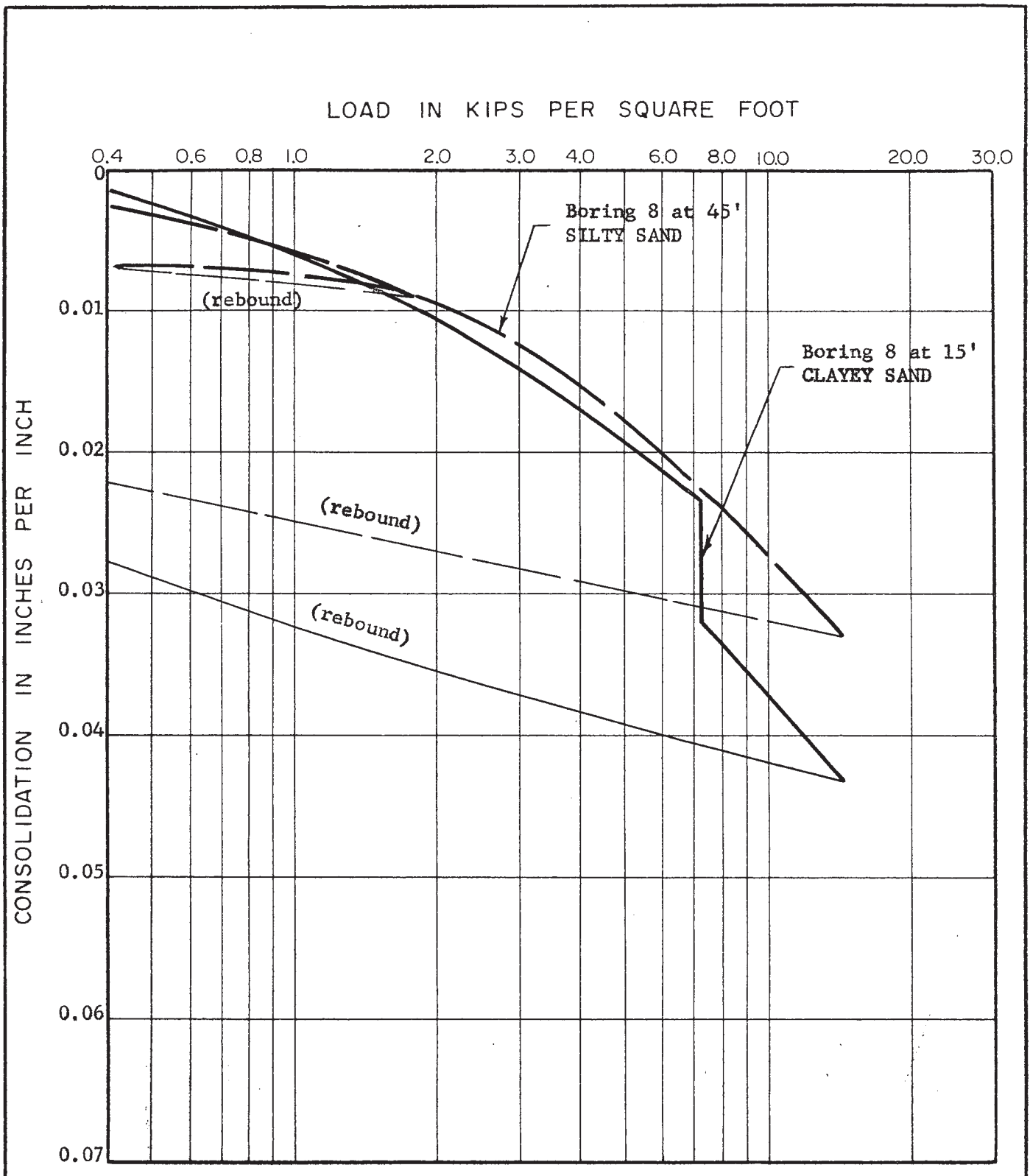
NOTE: Sample tested at field moisture content.

CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.16

PLATE A-4G



NOTE: Water added to sample at 15'' after consolidation under a load of 7.2 kips per square foot. The other sample tested at field moisture content.

JOB 62353 DATE 6-26-62 BY Todd fg

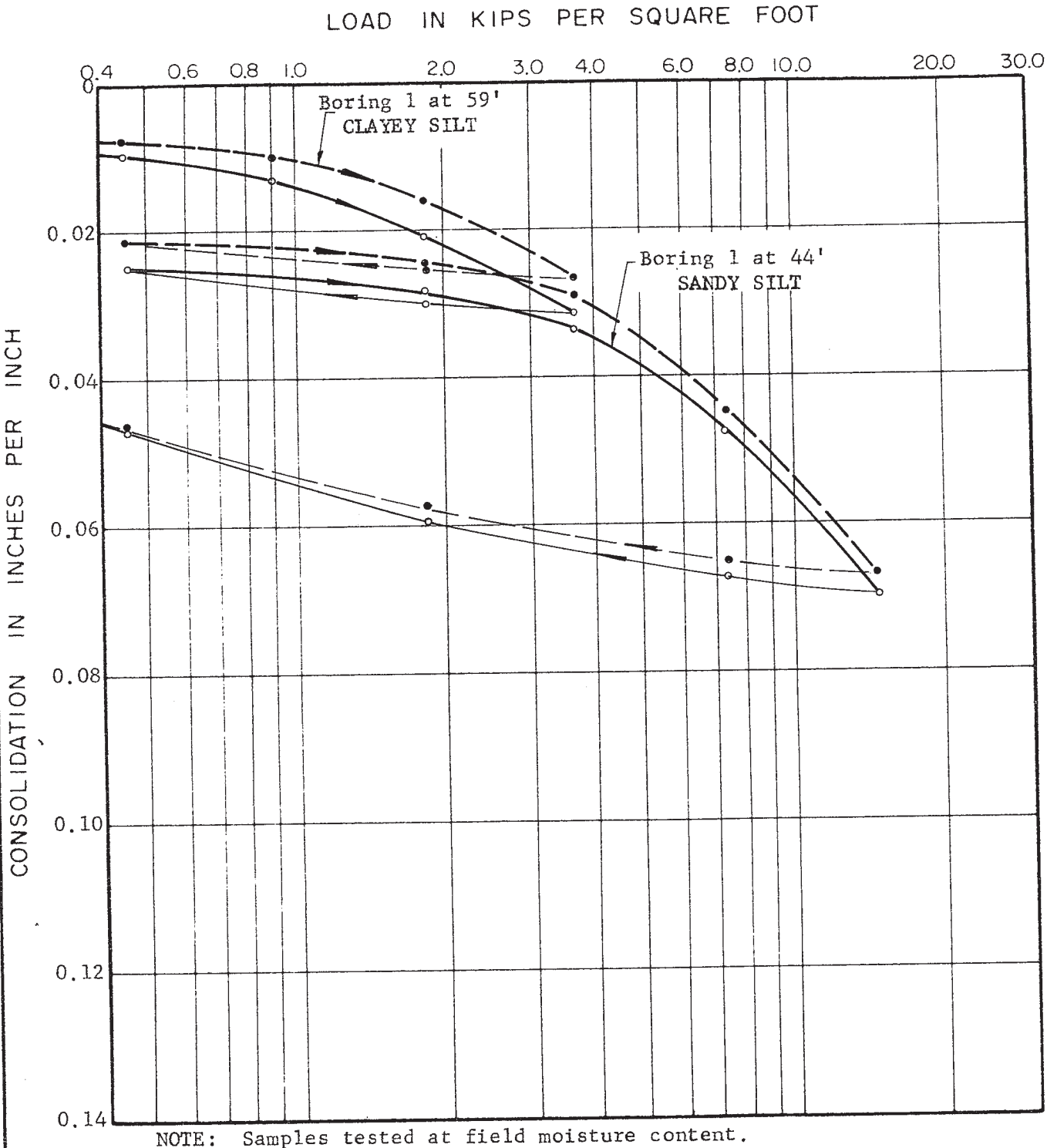
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.17

PLATE A-4H

JOB A-66362 DATE 1-6-67 DR. VM O.E. 28 CHKD. RBC



NOTE: Samples tested at field moisture content.

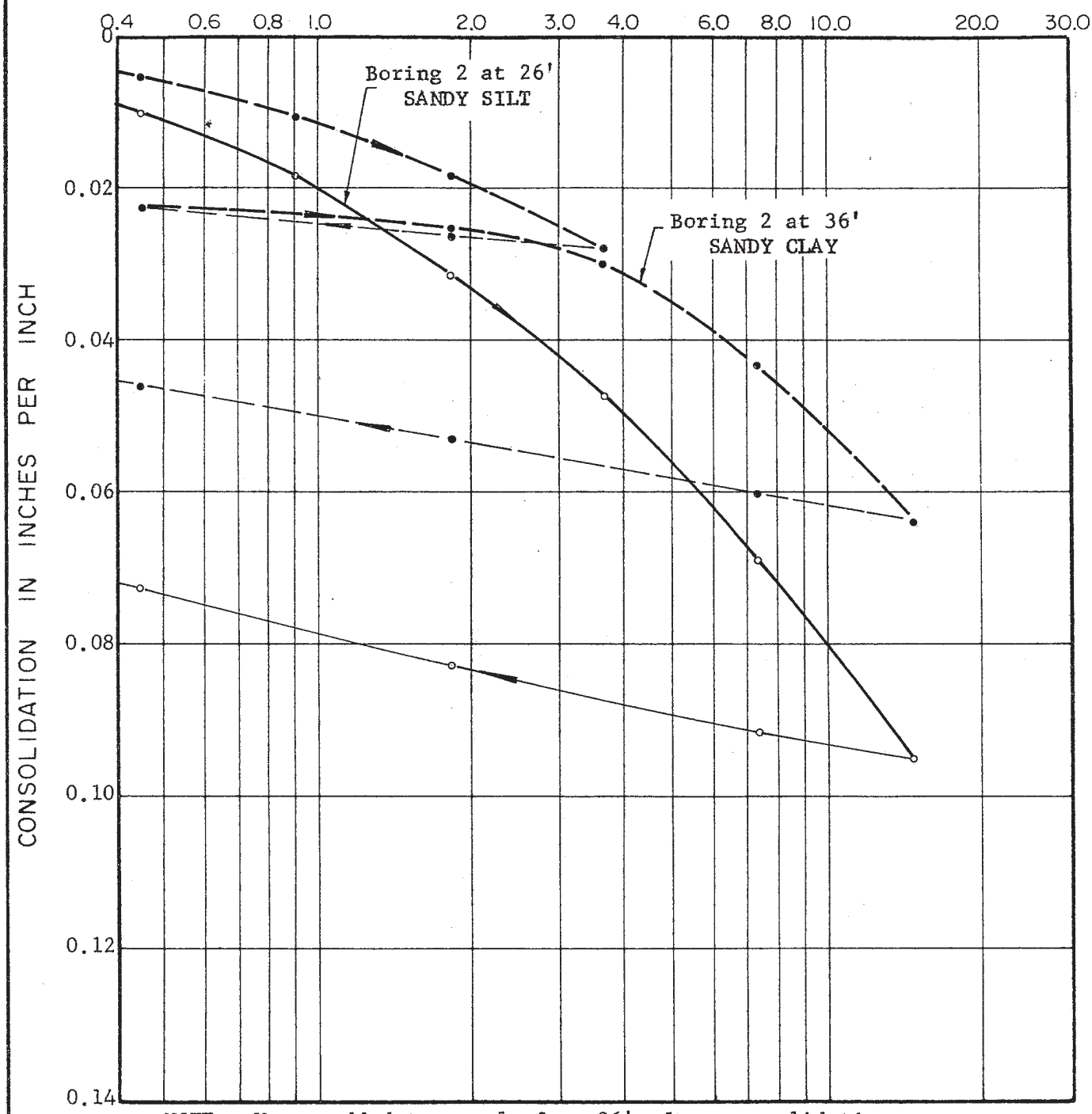
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.18

PLATE D-1

JOB A-6C362 DATE 1-6-67 DR. VM O.E. 28 lb CHKD. REC



NOTE: Water added to sample from 26' after consolidation under a load of 3.6 kips per square foot. The other sample tested at field moisture content.

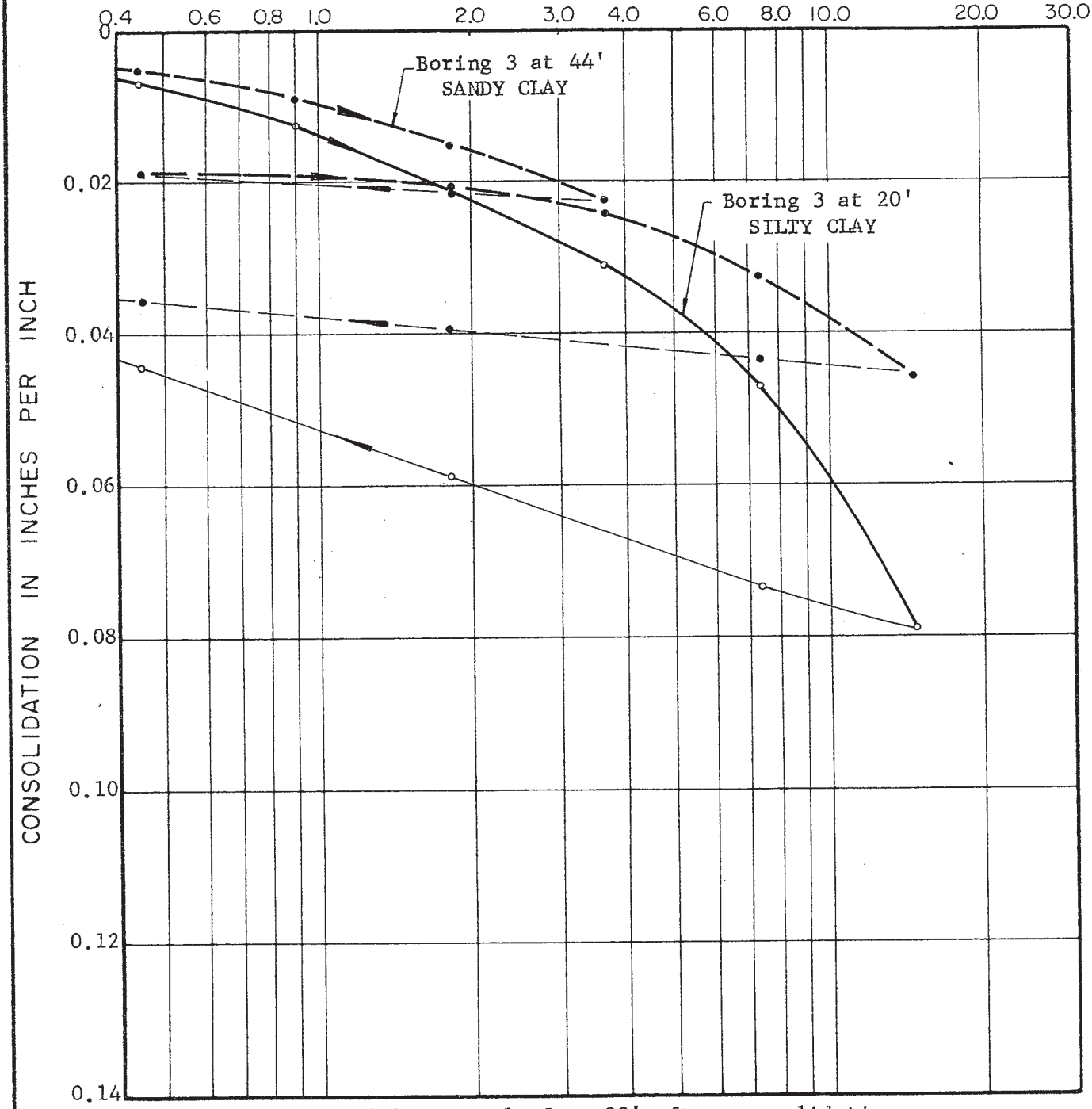
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.19

PLATE D-2

JOB ____ DATE ____ DR. ____ O.E. 28 CHKD. PEC



NOTE: Water added to sample from 20' after consolidation under a load of 3.6 kips per square foot. The other sample tested at field moisture content.

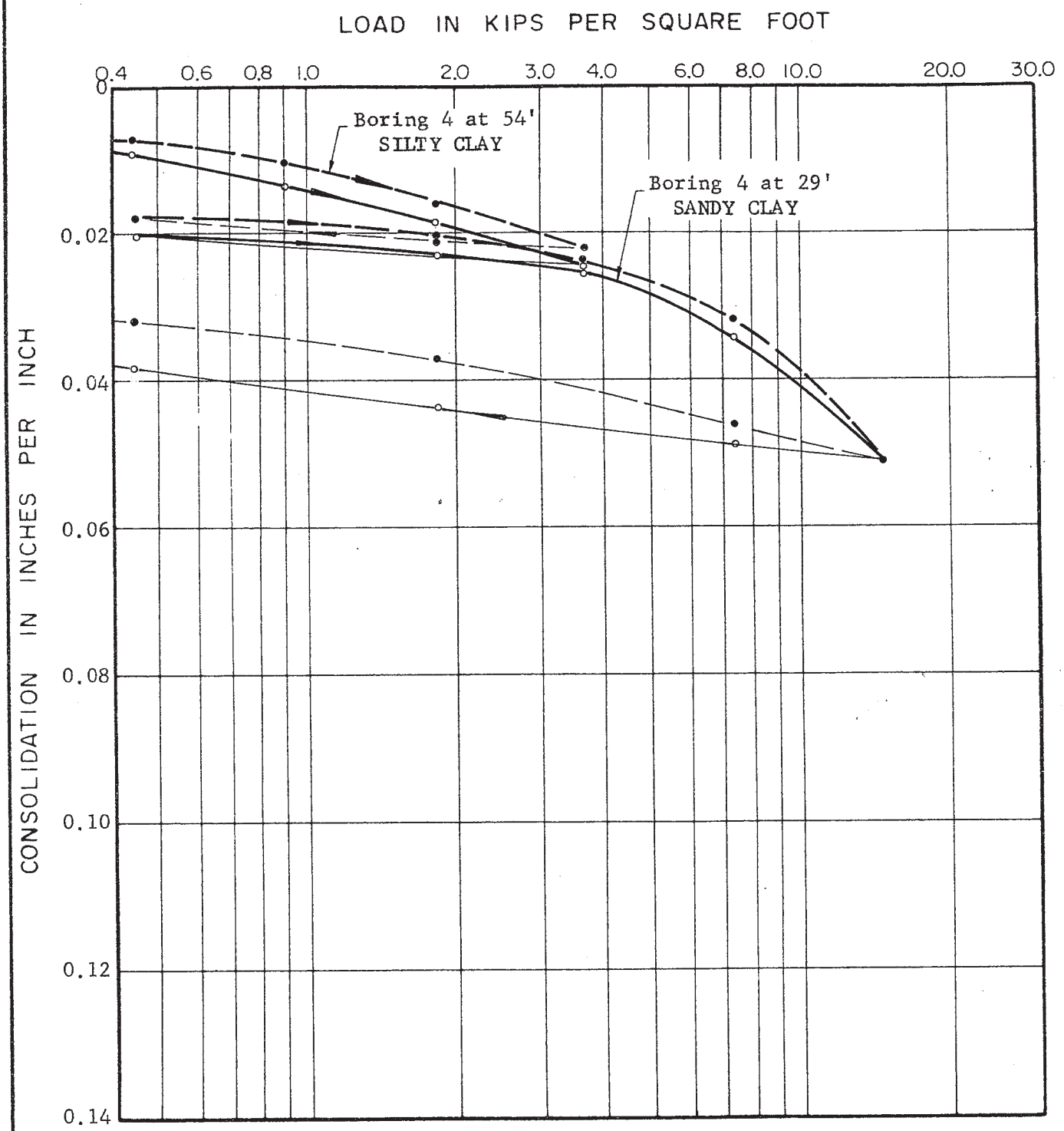
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.20

PLATE D-3

JOB A-663362 DATE 1-6-67 DR. VM O.E. 28 lb CHKD. RLC



NOTE: Samples tested at field moisture content.

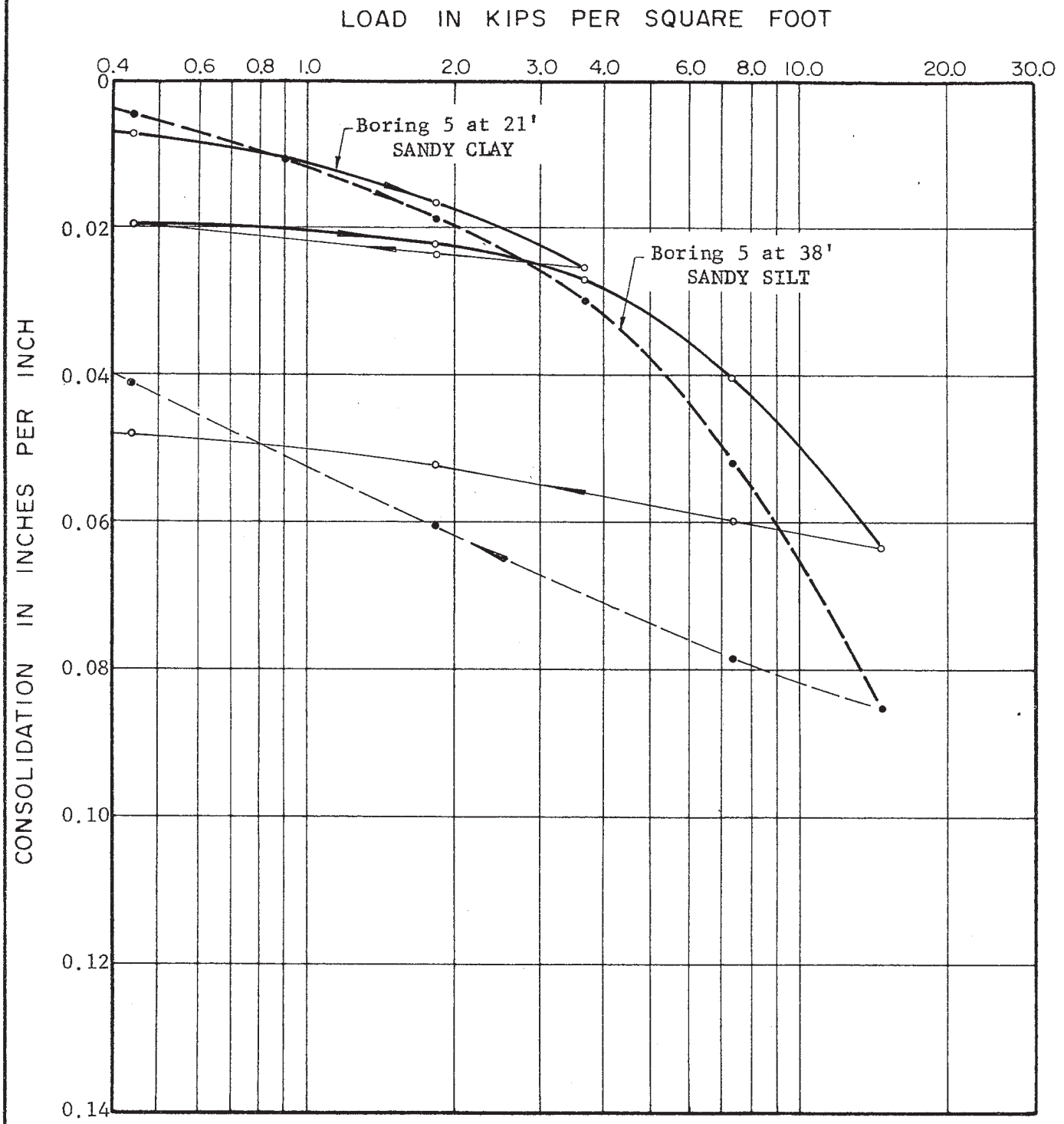
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.21

PLATE D-4

JOB A-CC362 DATE 1-6-67 DR. V.M. O.E. BB CHKD. FRC



NOTE: Water added to sample from 38' after consolidation under a load of 3.6 kips per square foot. The other sample tested at field moisture content.

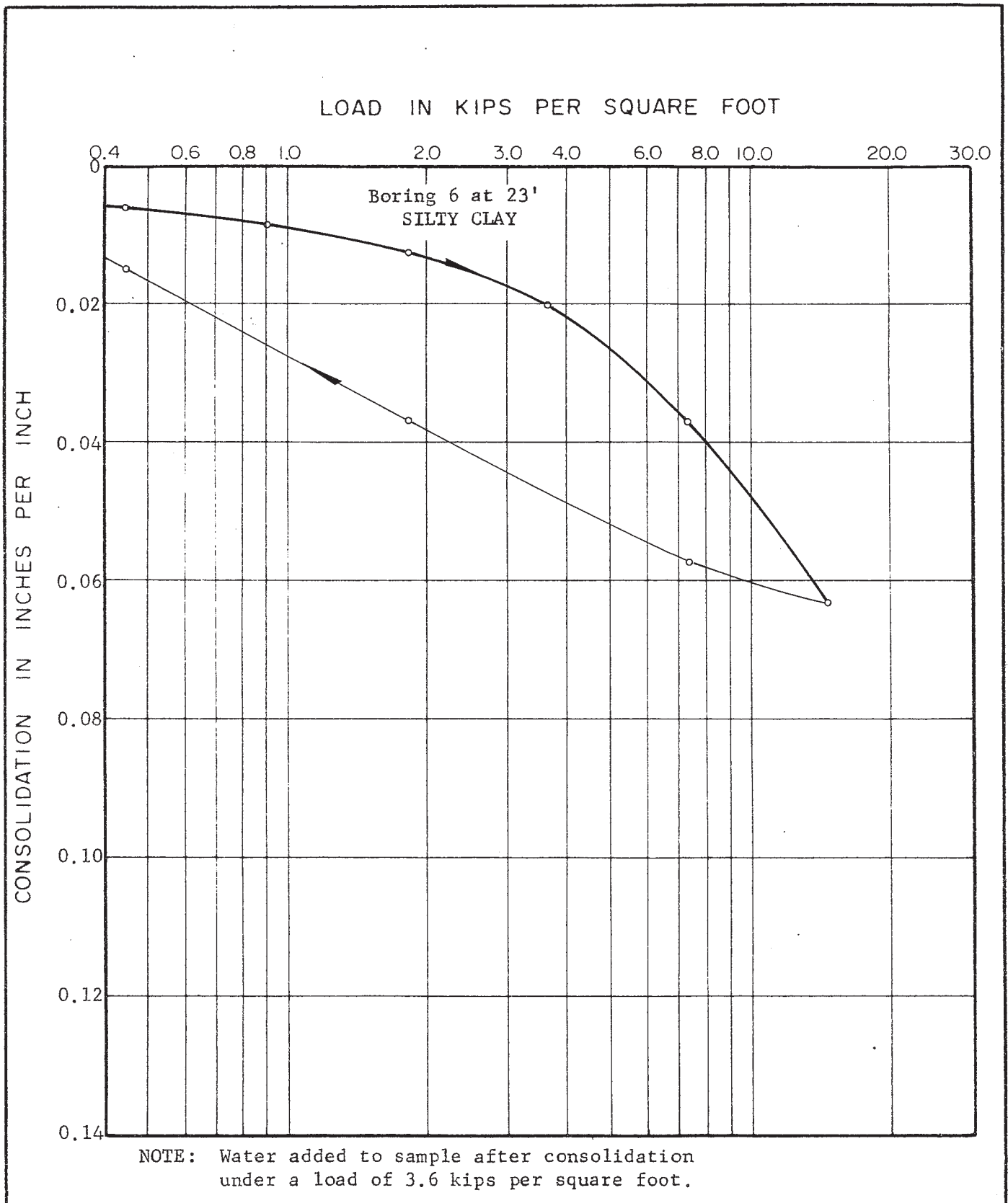
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.22

PLATE D-5

JOB A-66362 DATE 1-6-67 DR. V.M. O.E. 28 lb CHKD. REC



NOTE: Water added to sample after consolidation under a load of 3.6 kips per square foot.

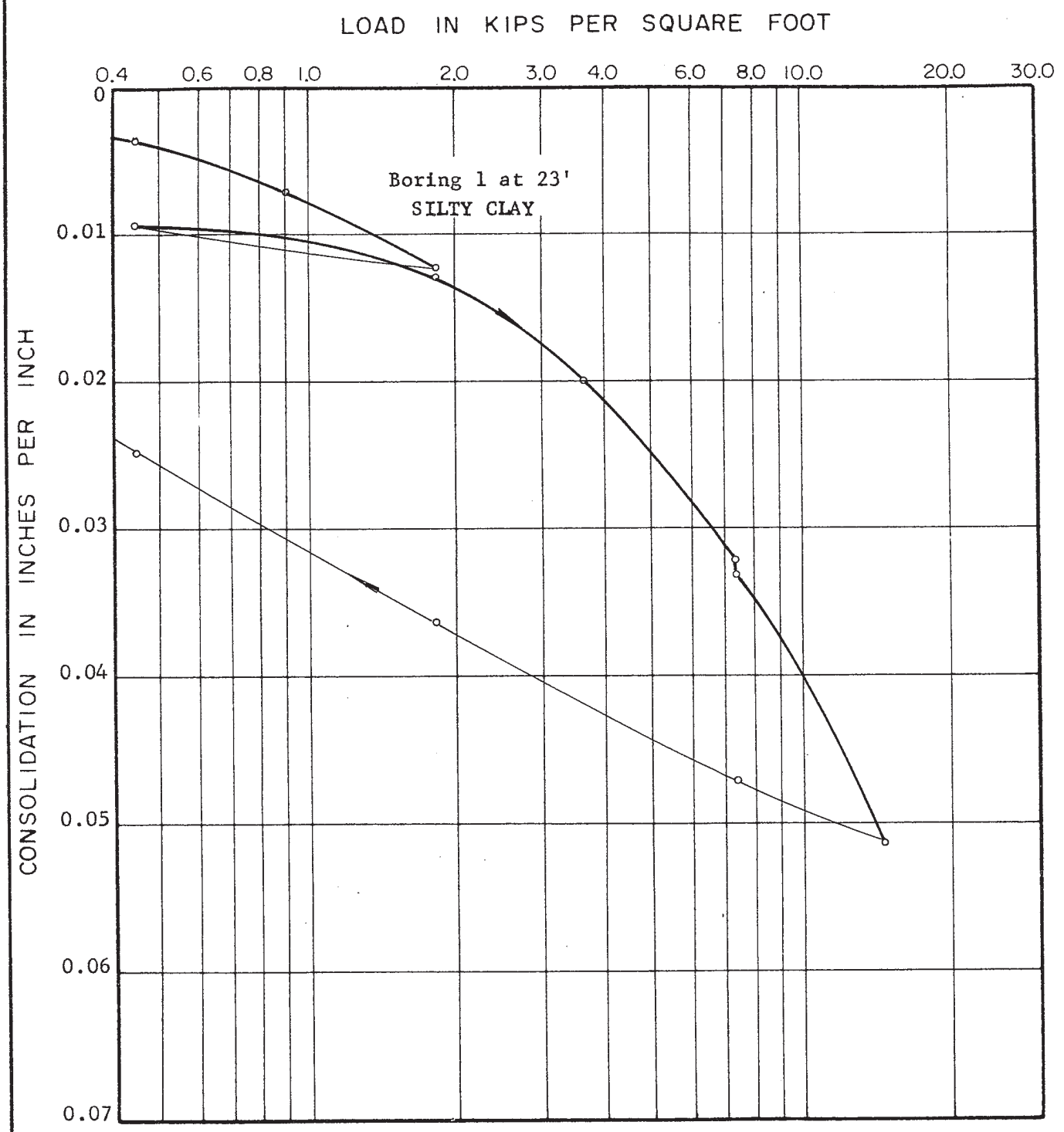
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.23

PLATE D-6

JOB A-6706S DATE 4-28-67 DR VM O.E. 11 CHKD. EGL



NOTE: Water added to sample after consolidation under a load of 7.2 kips per square foot.

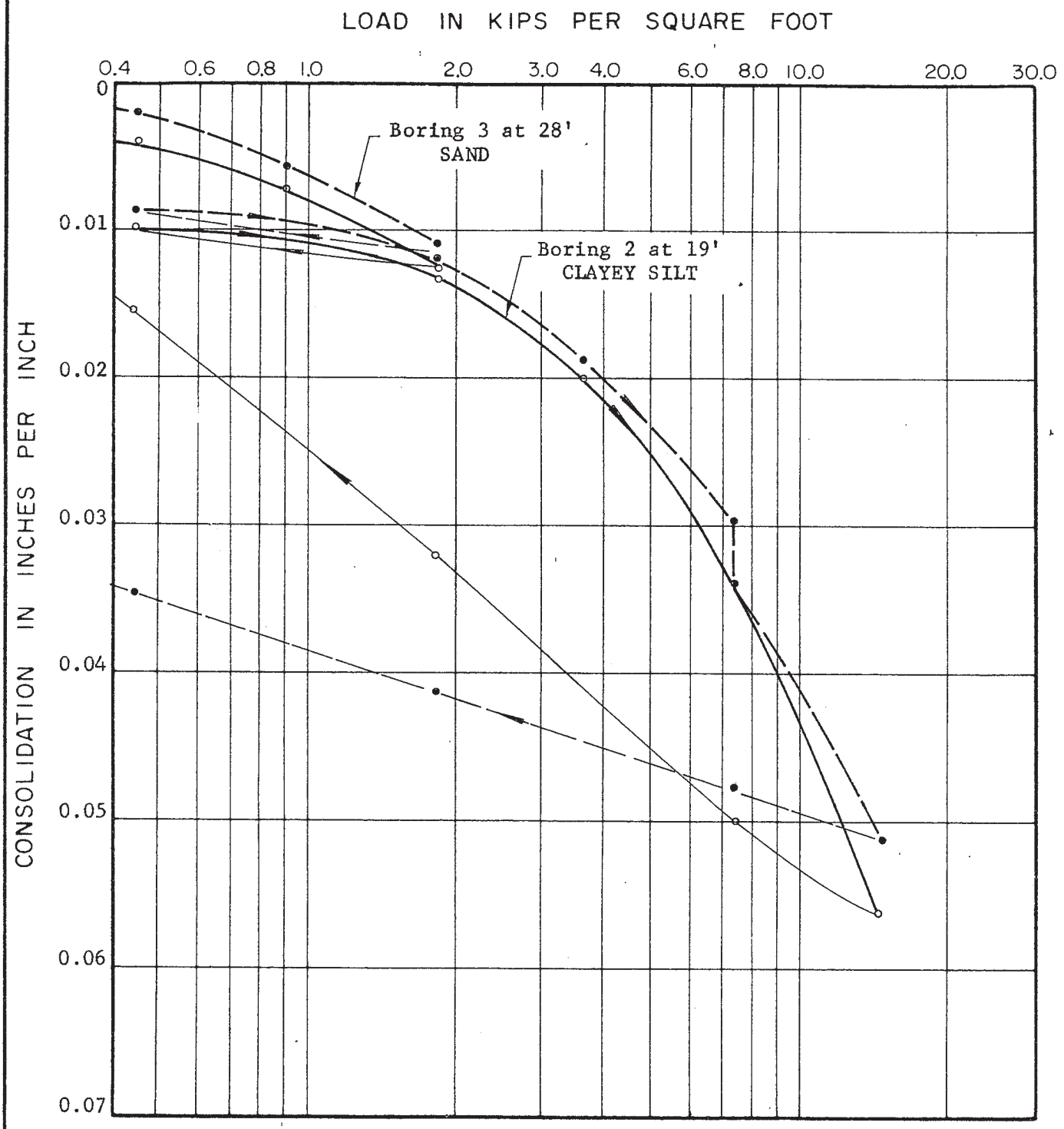
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.24

PLATE D-1

JOB A-67065 DATE 4-28-67 DR. V.M. O.E. T.I. CHKD. RC SK



NOTE: Water added to samples after consolidation under a load of 7.2 kips per square foot.

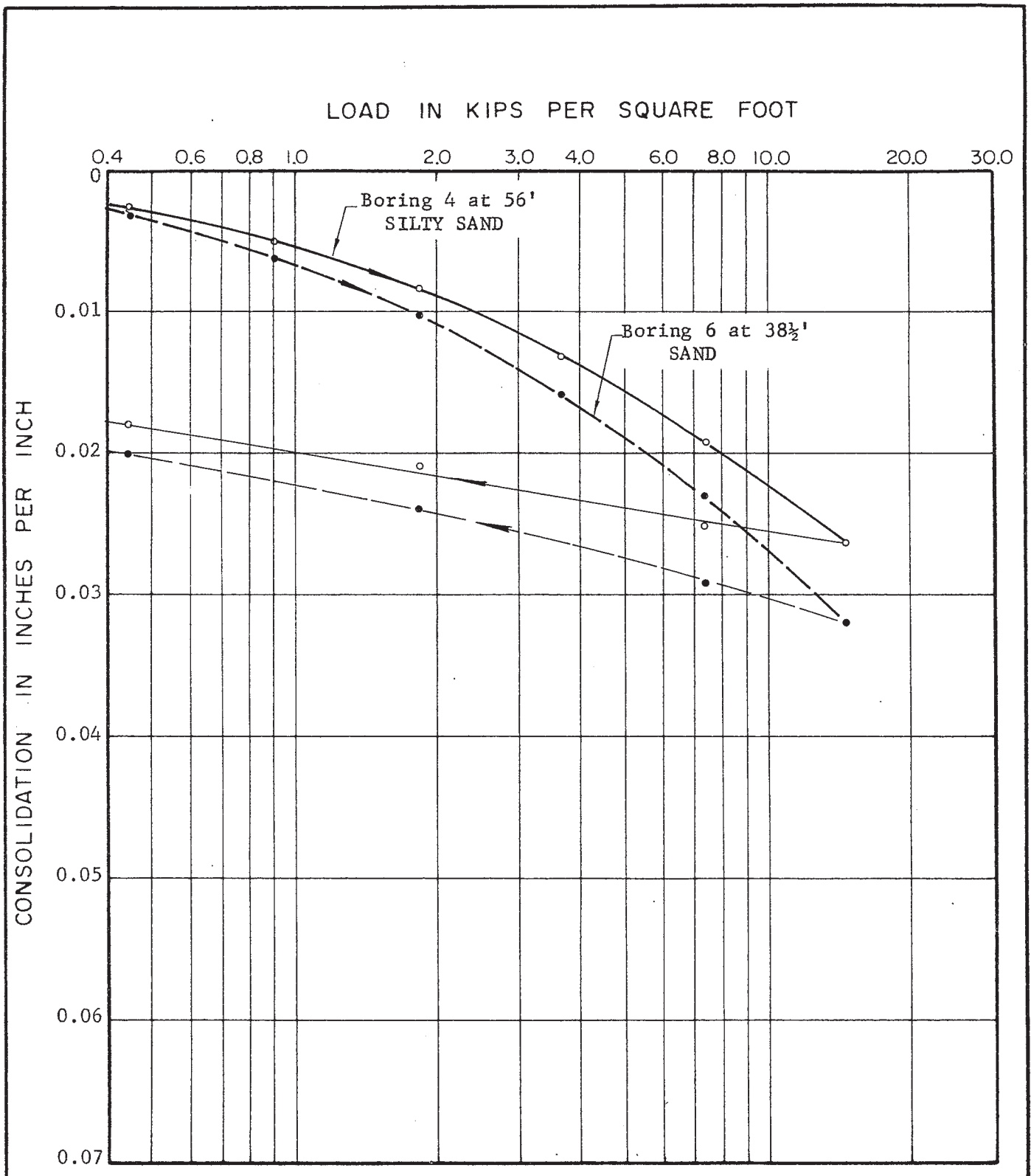
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.25

PLATE D-2

JOB A-67065 DATE 4-28-67 DR. V.M O.E. JT CHKD. REC 5/6



NOTE: Samples tested at field moisture content.

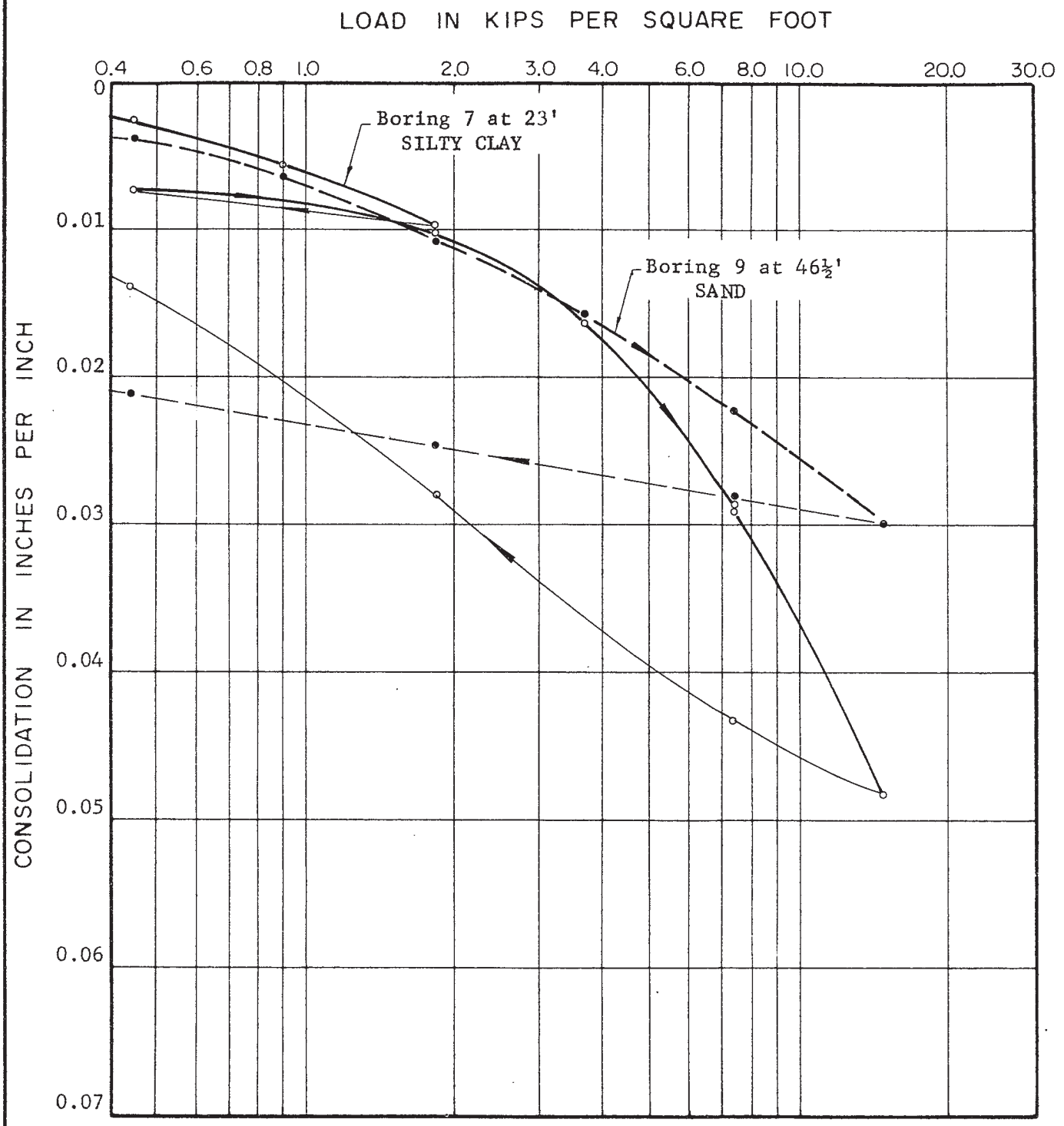
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.26

PLATE D-3

JOB A-67065 DATE 4-28-67 DR. VM O.E. VI CHKD. RLC



NOTE: Water added to sample from Boring 7 after consolidation under a load of 7.2 kips per square foot. The other sample tested at field moisture content.

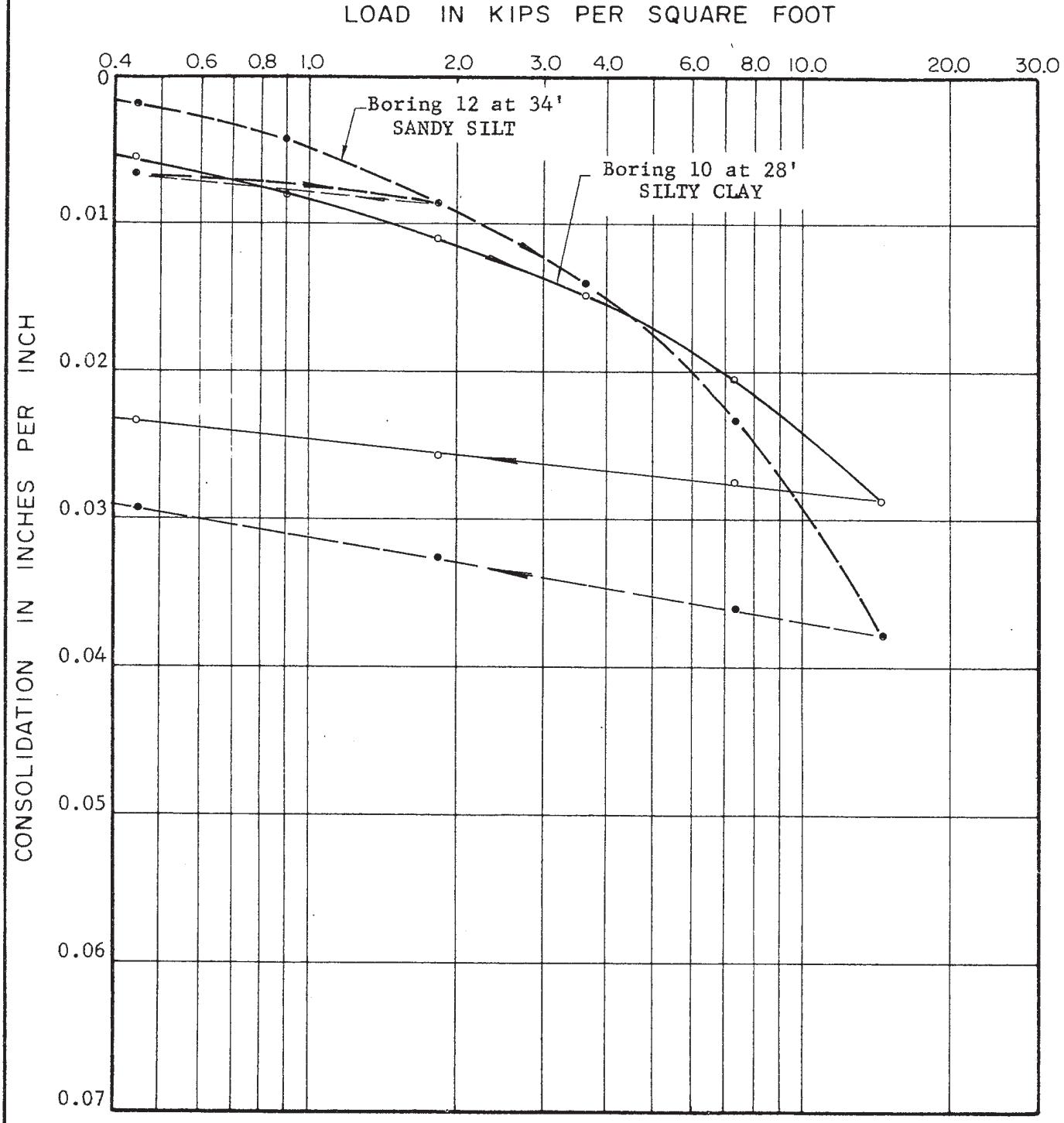
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.27

PLATE D-4

JOB A670605 DATE 4-28-67 DR. V.M. O.E. JP CHKD. RC



NOTE: Samples tested at field moisture content.

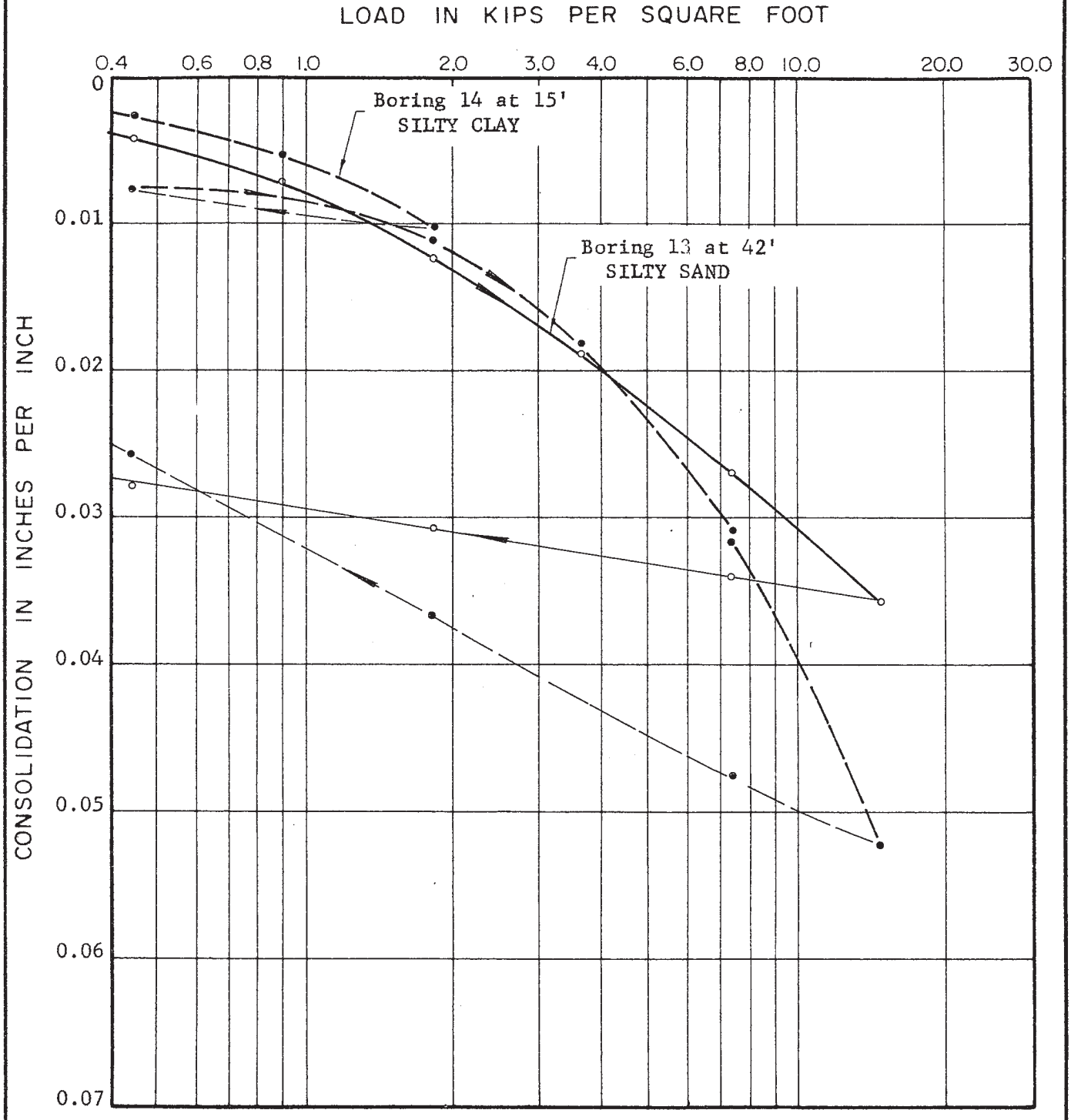
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.28

PLATE D-5

JOB A-6706S DATE 4-28-67 DR. V.M O.E. JL CHKD. ADC



NOTE: Water added to sample from Boring 14 after consolidation under a load of 7.2 kips per square foot. The other sample tested at field moisture content.

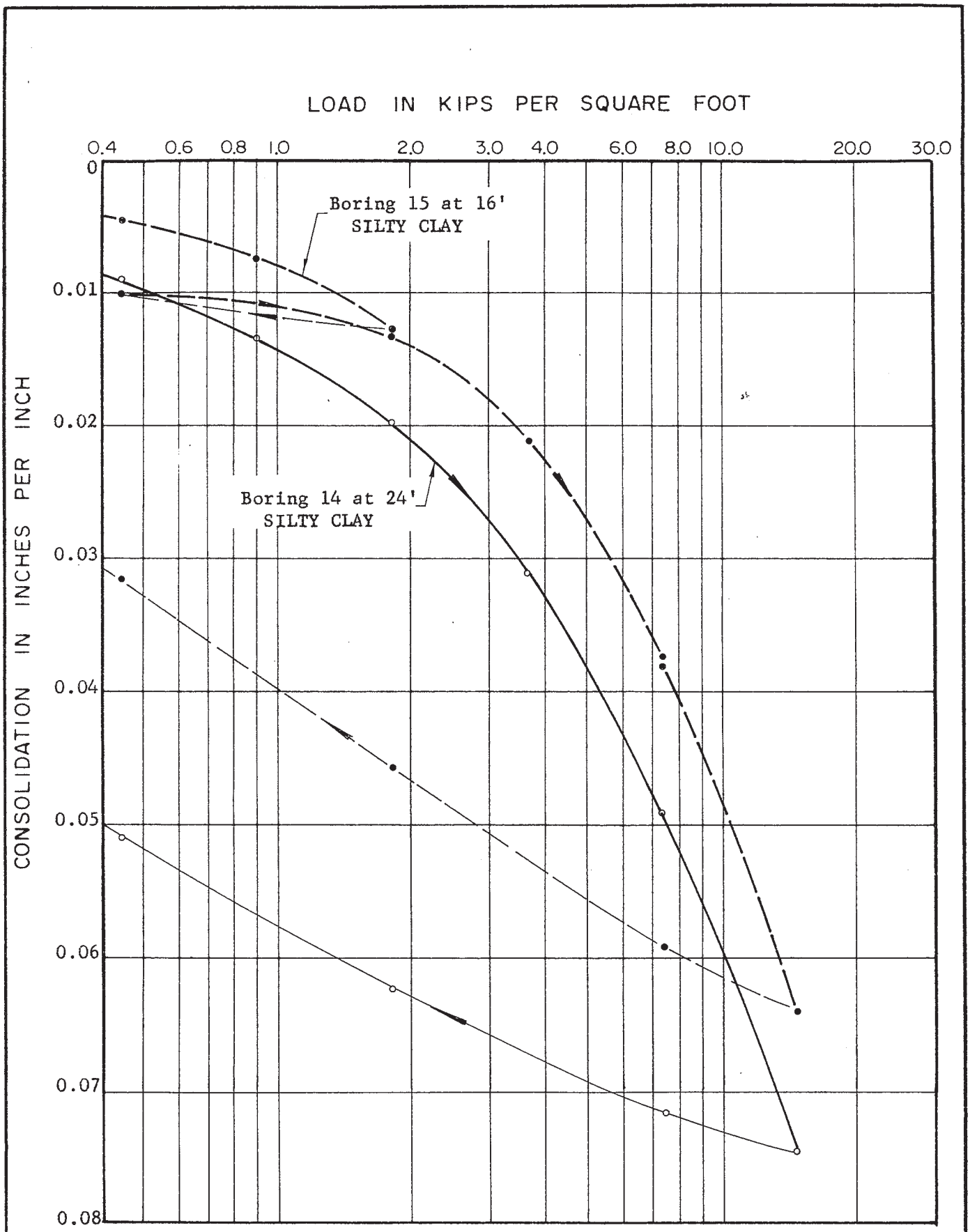
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.29

PLATE D-6

JOB A-6706S DATE 4-28-67 DR. SM O.E. JL CHKD. REC 5/6



NOTE: Water added to sample from Boring 15 after consolidation under a load of 7.2 kips per square foot. The other sample tested at field moisture content.

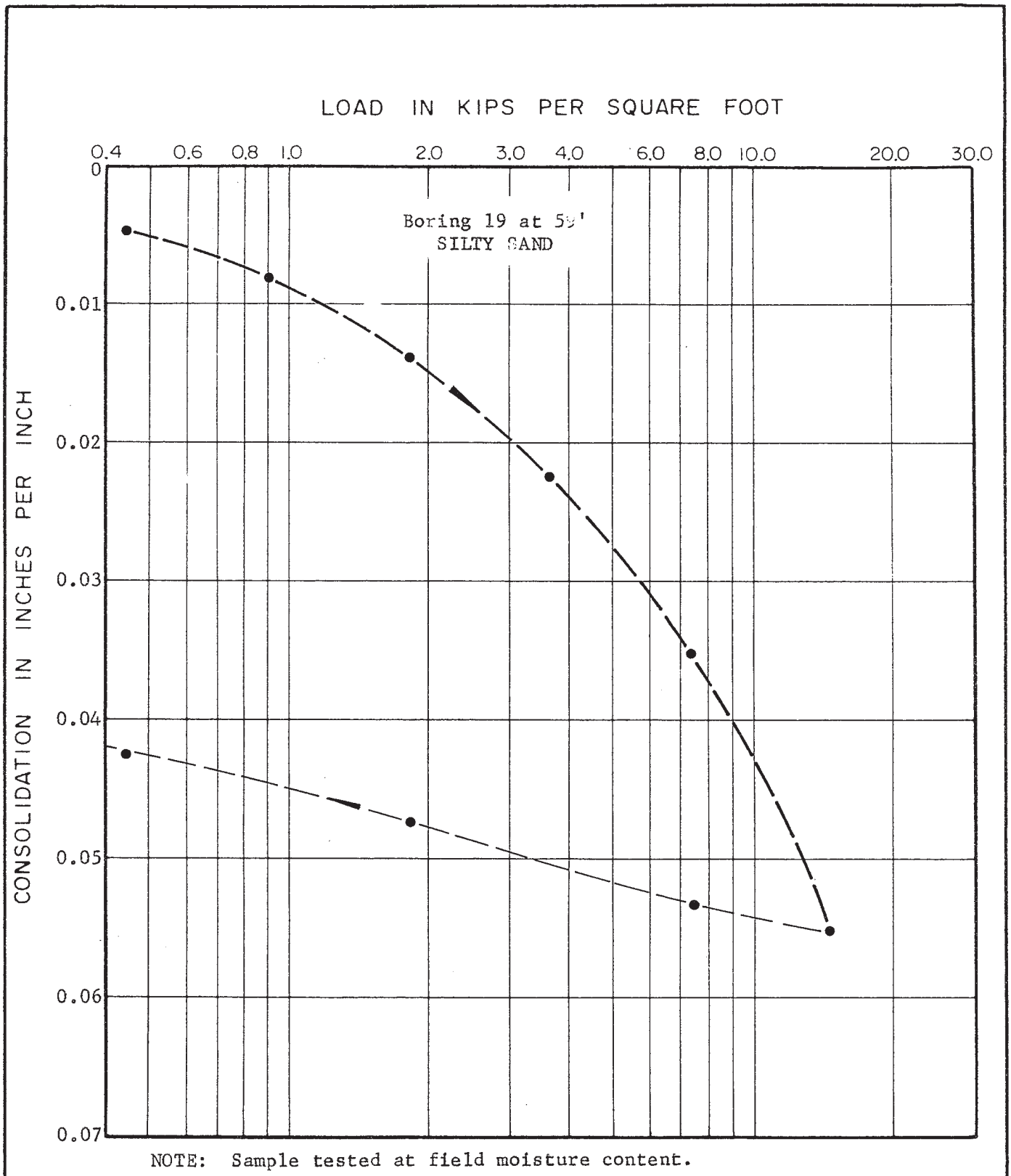
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.30

PLATE D-7

JOB A 67065-8 DATE 6-11-68 DR. K. H. O.E. SC CHKD.



NOTE: Sample tested at field moisture content.

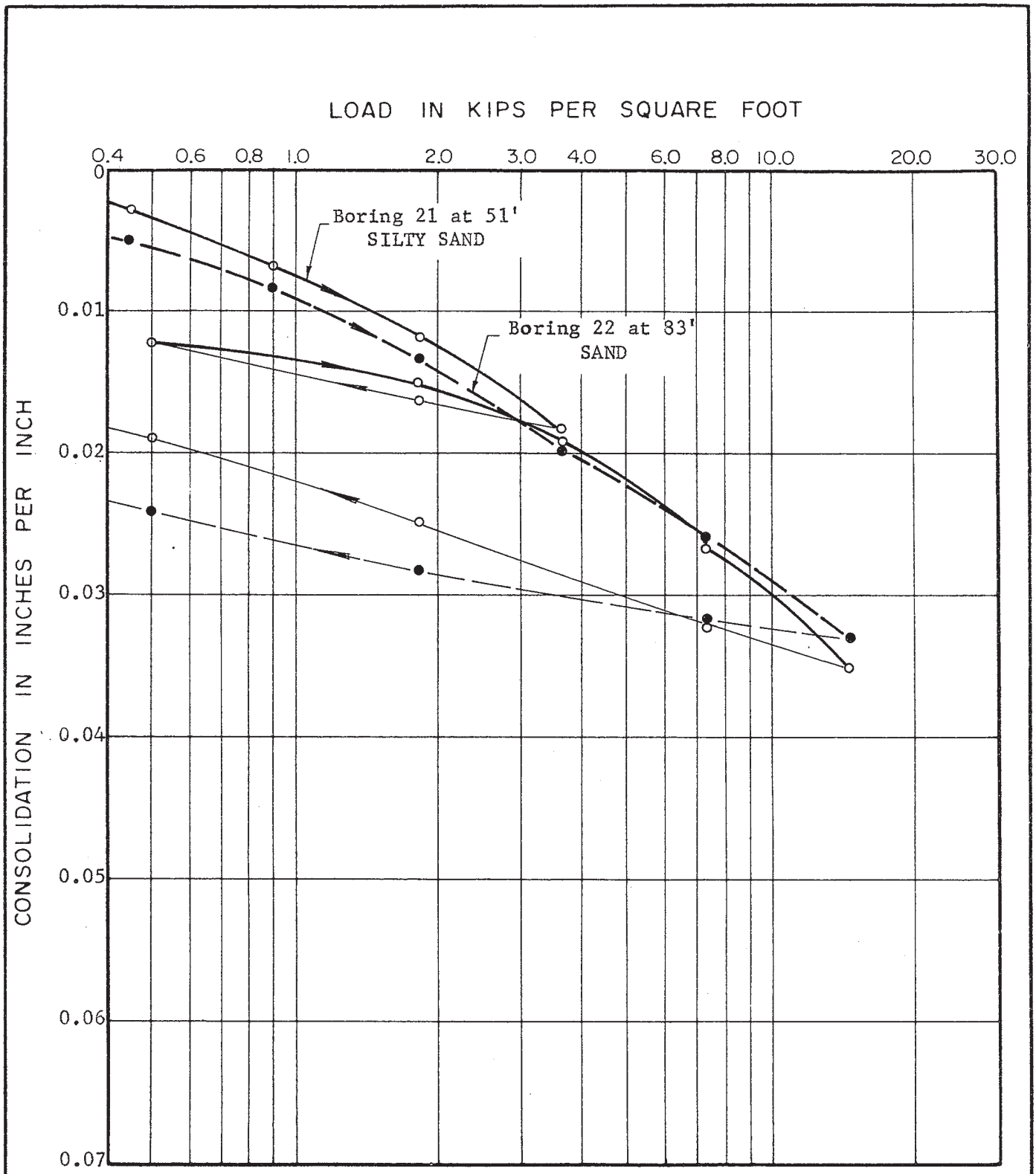
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE 5-A

Figure D-3.3.31

JOB A-6706S-13 DATE 6-12-68 DR. VM O.E. SC CHKD. RC



NOTE: Water added to sample from Boring 21 after consolidation under a load of 7.2 kips per square foot. The other sample tested at field moisture content.

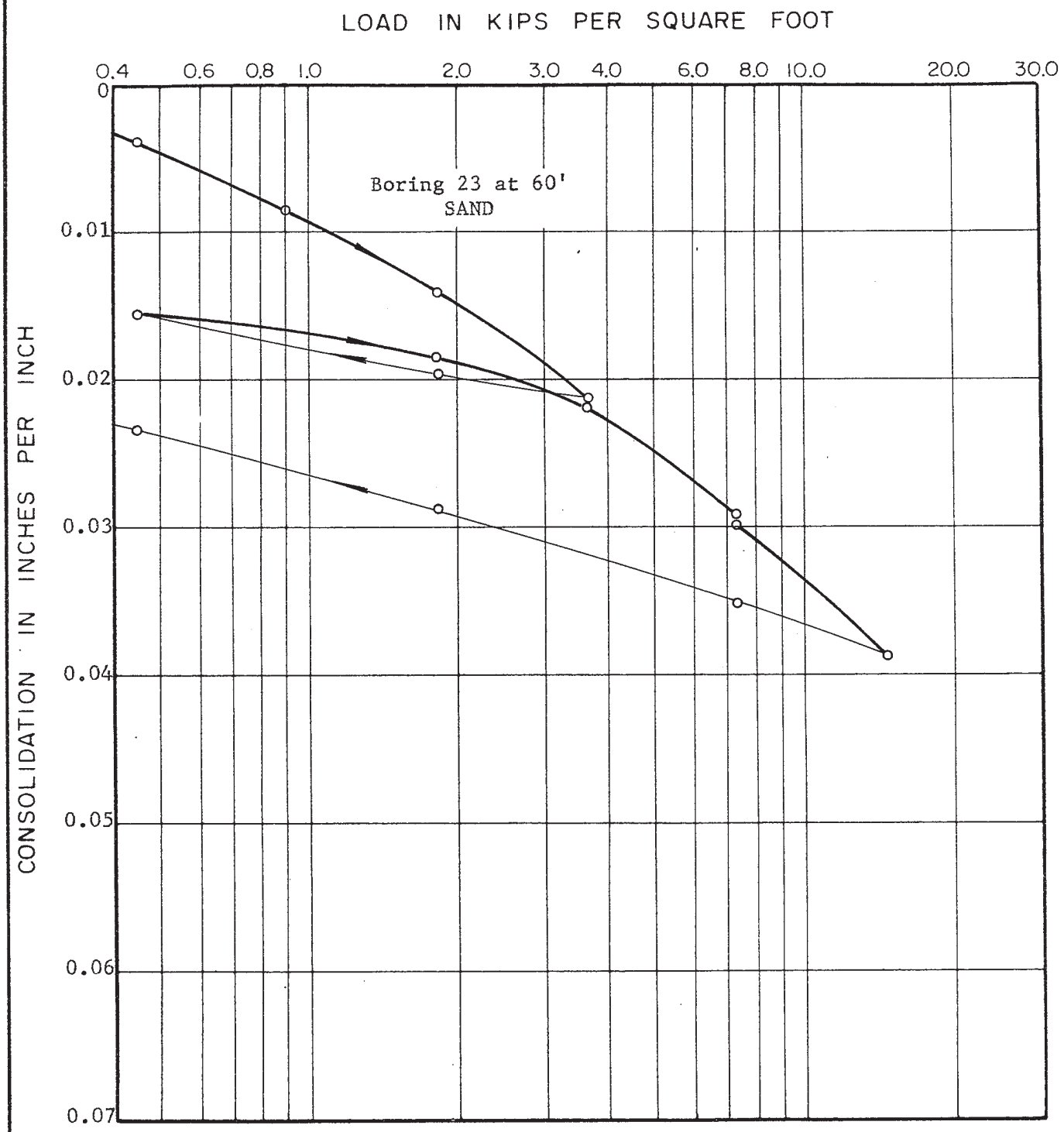
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE 5-B

Figure D-3.3.32

JOB A-67065-B DATE 6-12-68 DR. LB O.E. SK CHKD. RLC



NOTE: Water added to sample after consolidation under a load of 7.2 kips per square foot.

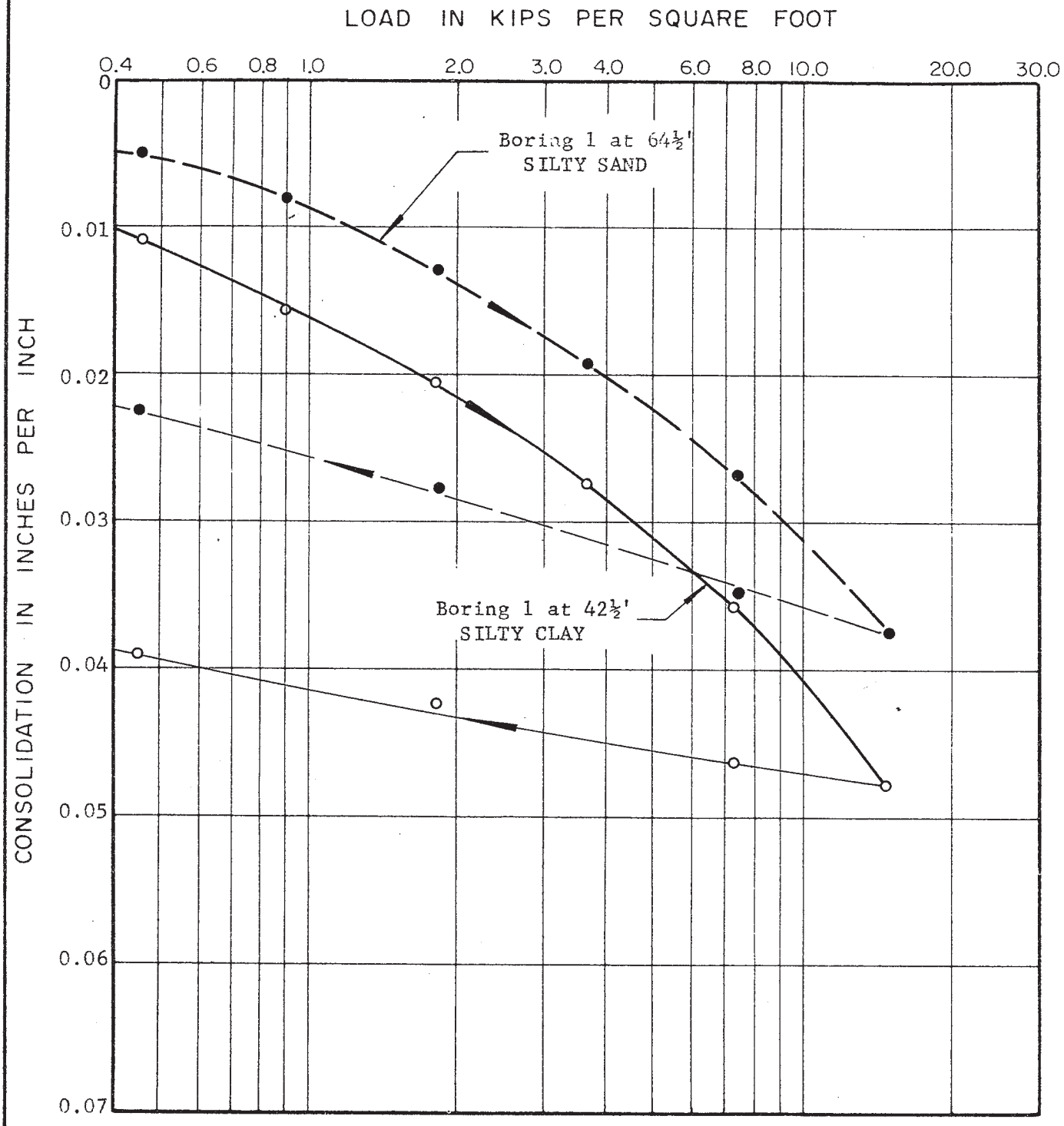
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE 5-C

Figure D-3.3.33

JOB A-6811 DATE 7-8-68 DR. K.H. O.E. CHKD. RLC



NOTE: Samples tested at field moisture content.

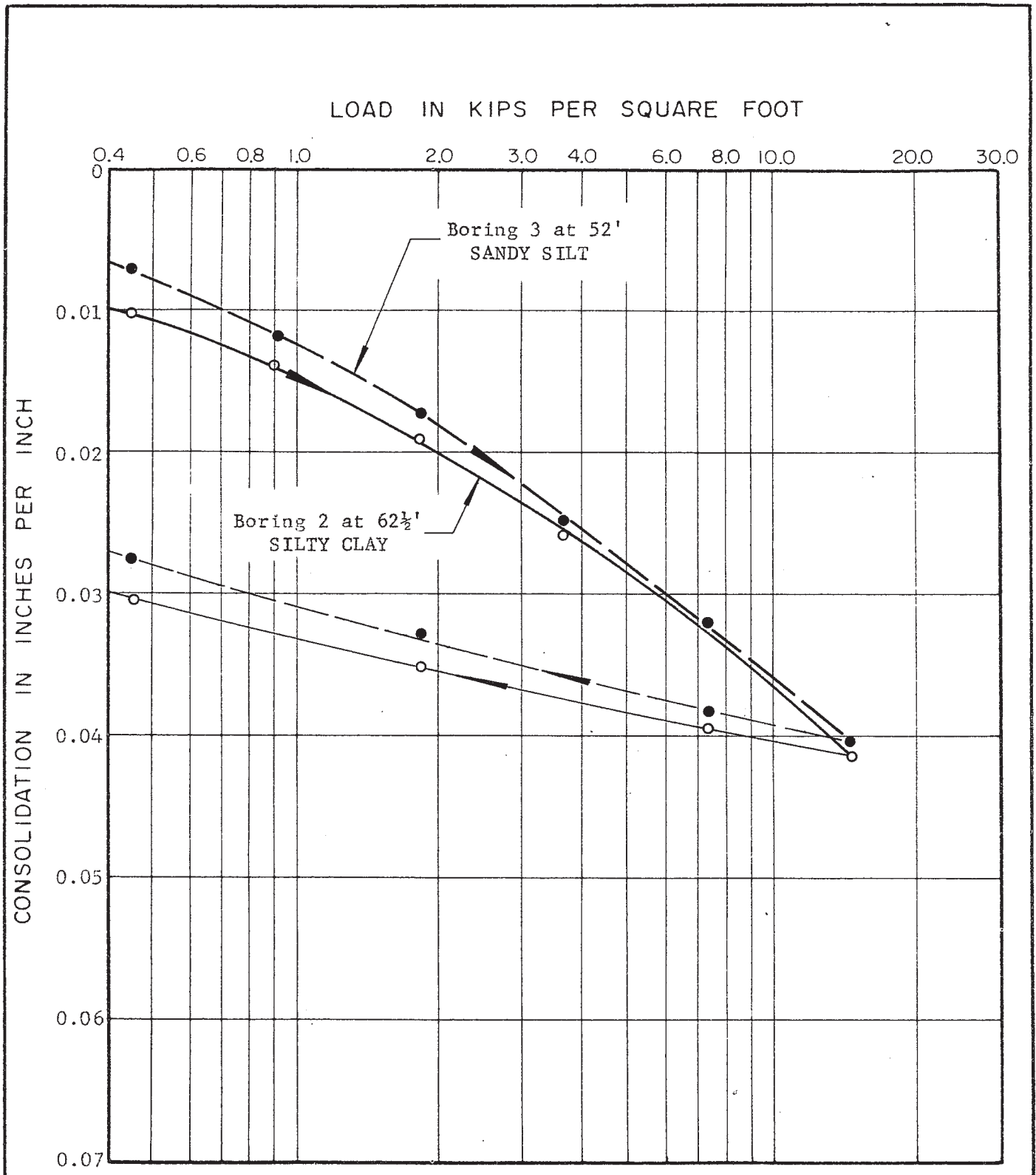
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.34

PLATE C-1

JOB A-6811L DATE 7-8-68 DR K.H. O.E. CHKD. CCL



NOTE: Samples tested at field moisture content.

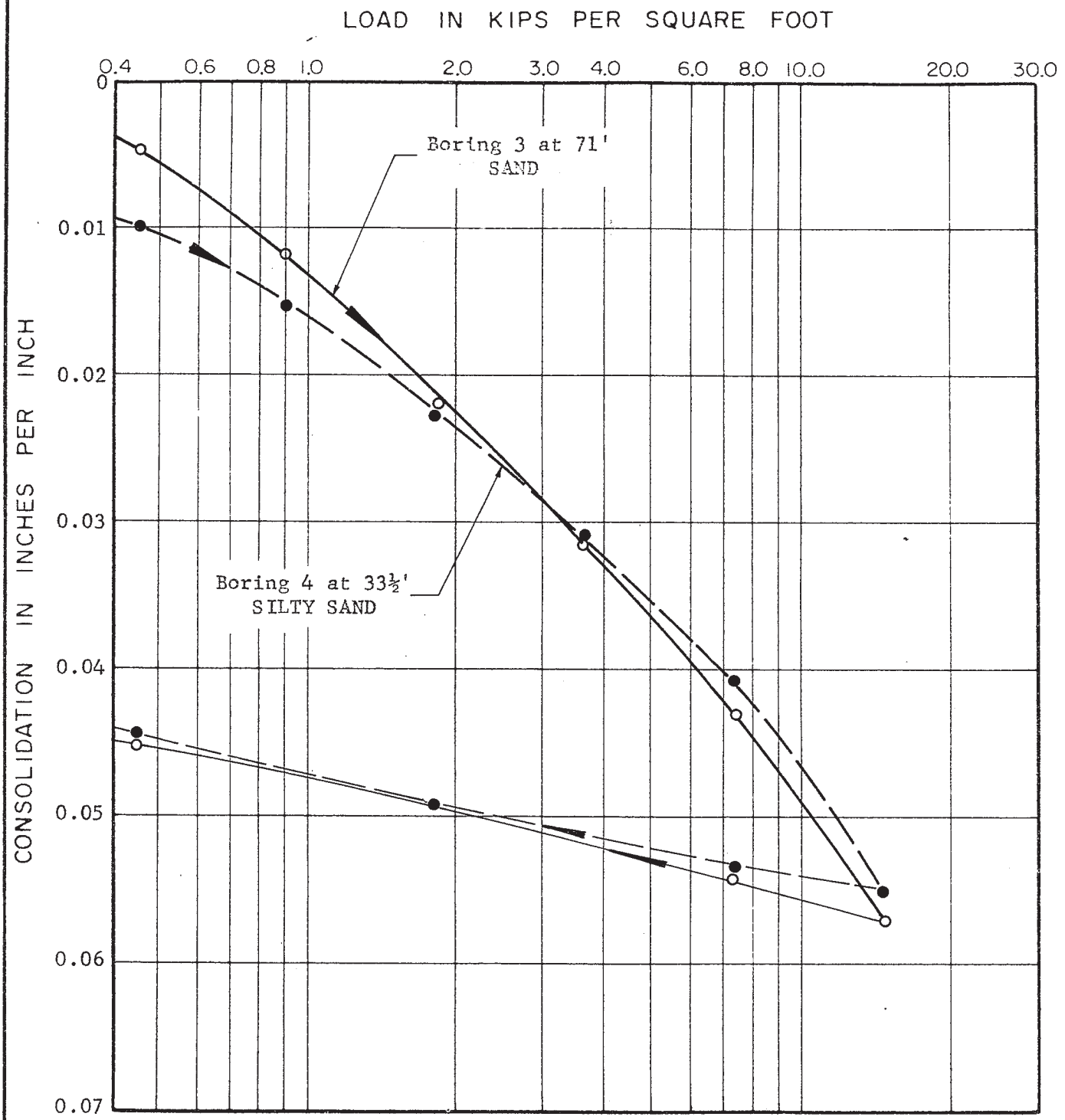
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.35

PLATE C-2

JOB A68111 DATE 7-3-68 DR. K. H. O.E. CHKD.



NOTE: Samples tested at field moisture content.

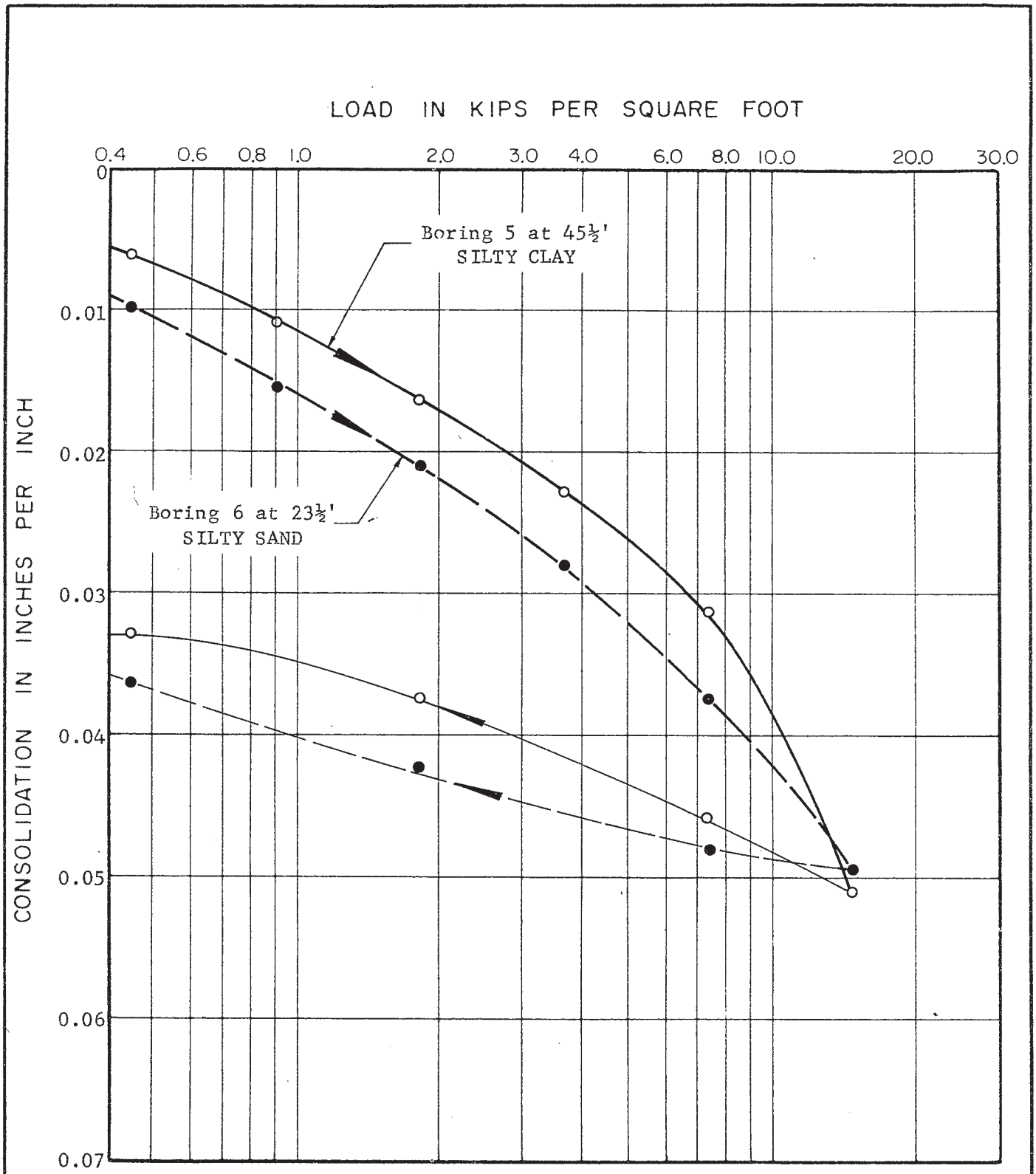
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.36

PLATE C-3

JOB A68111 DATE 7-3-68 DR. IC. H. O.E. CHKD.



NOTE: Samples tested at field moisture content.

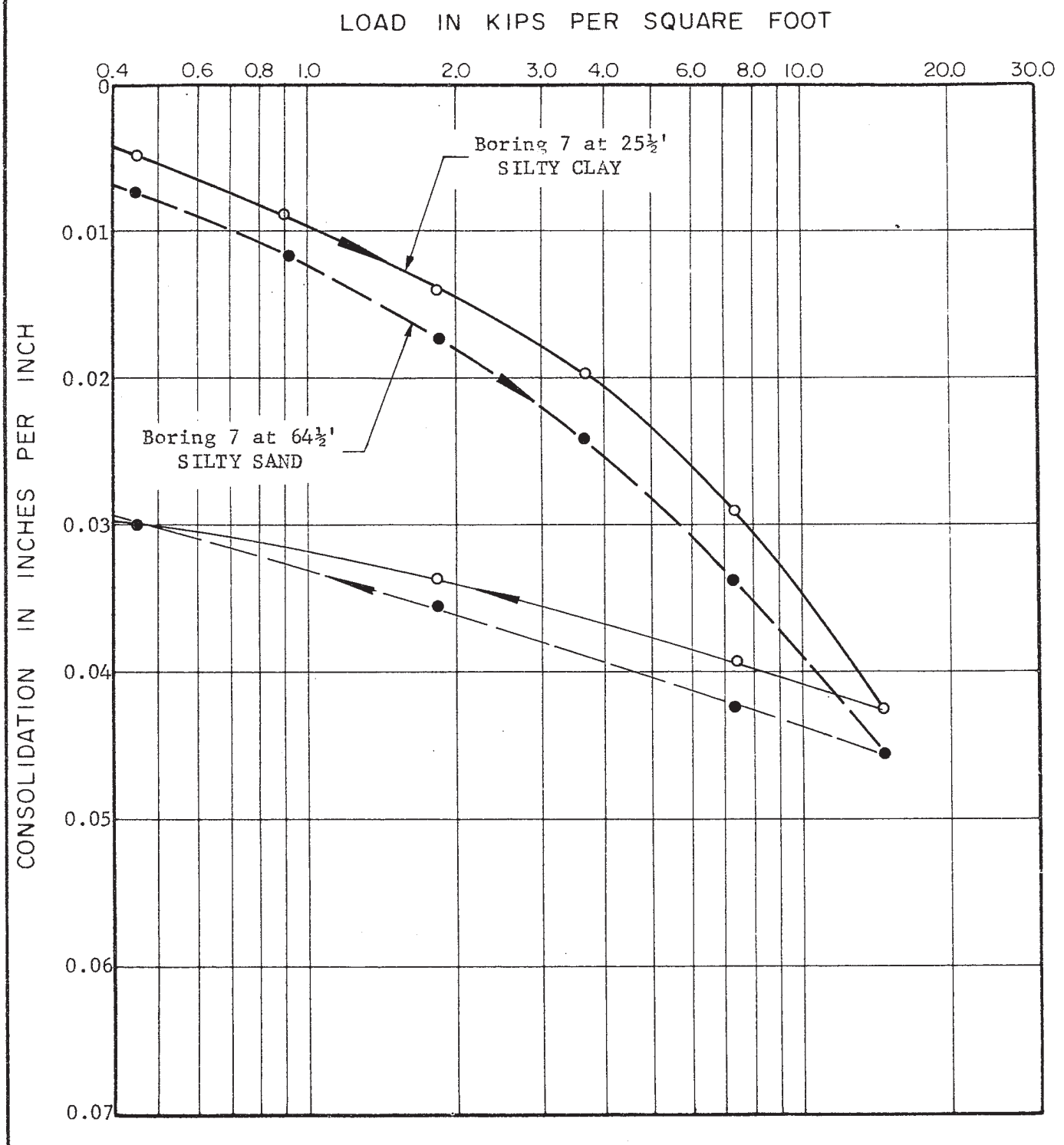
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.37

PLATE C-4

JOB A68111 DATE 7-3-68 DR K. H. O.E. CHKD.



NOTE: Samples tested at field moisture content.

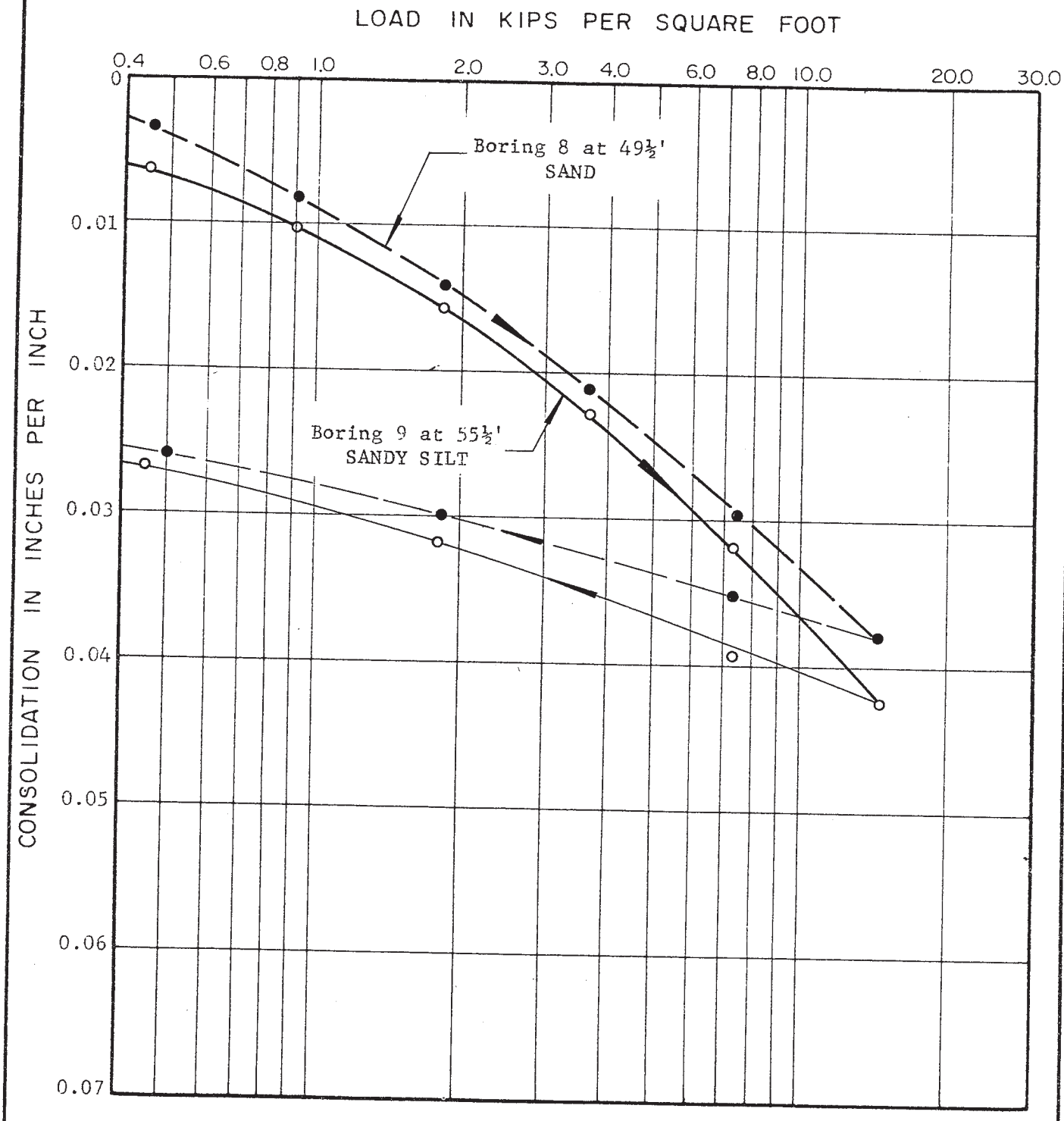
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.38

PLATE C-5

JOB A-6811 DATE 7-8-68 DR. K.H. O.E. CHKD. ALL



NOTE: Samples tested at field moisture content.

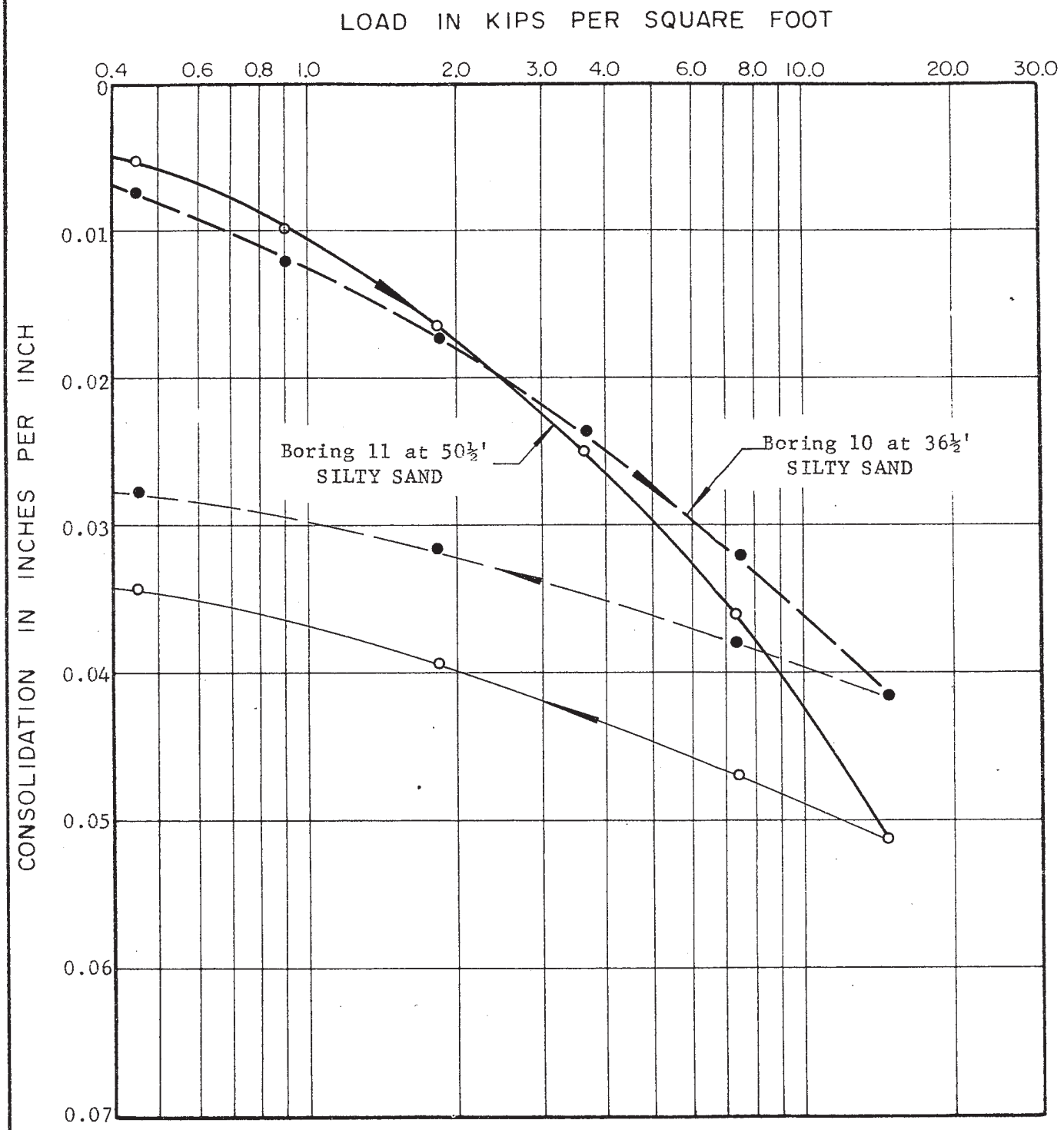
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.39

PLATE C-6

JOB A-68 111 DATE 7-8-68 DR. K. H. O.E. CHKD. ALL



NOTE: Samples tested at field moisture content.

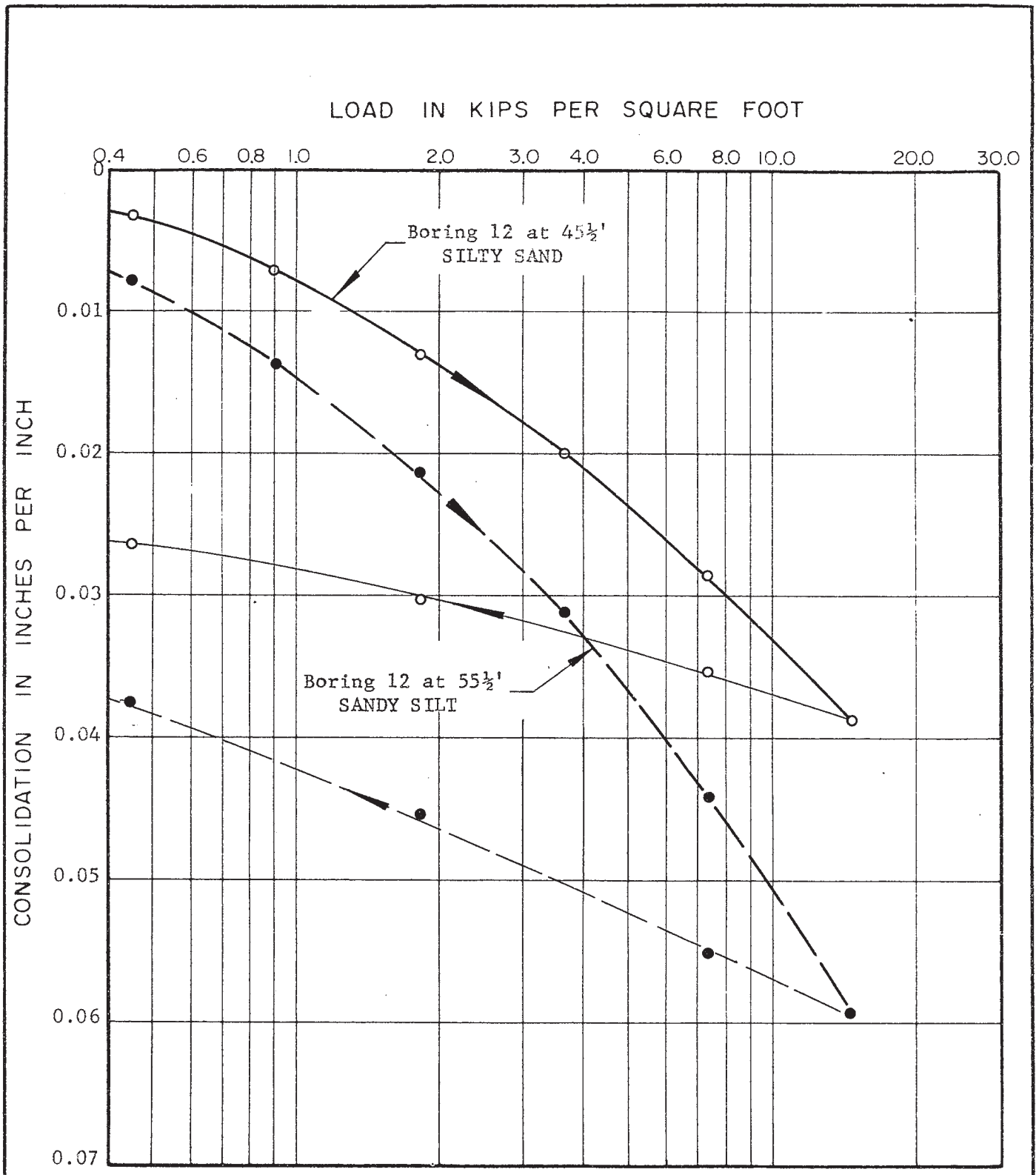
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.40

PLATE C-7

JOB A-68111 DATE 7-8-68 DR K.H. O.E. CHKD. LEC



NOTE: Samples tested at field moisture content.

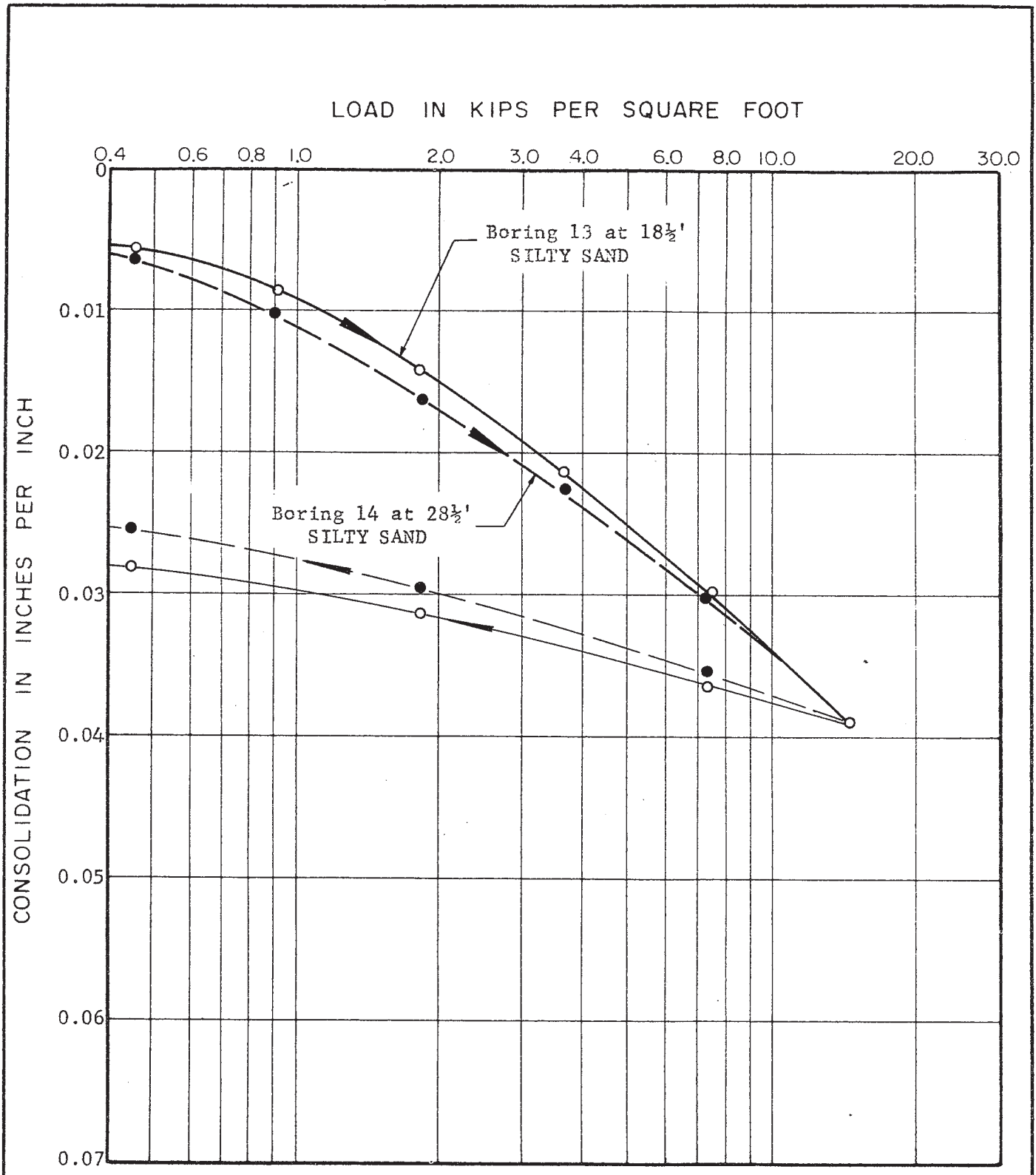
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE C-8

Figure D-3.3.41

JOB A68111 DATE 7-3-68 DR. K. H. O.E. CHKD.



NOTE: Samples tested at field moisture content.

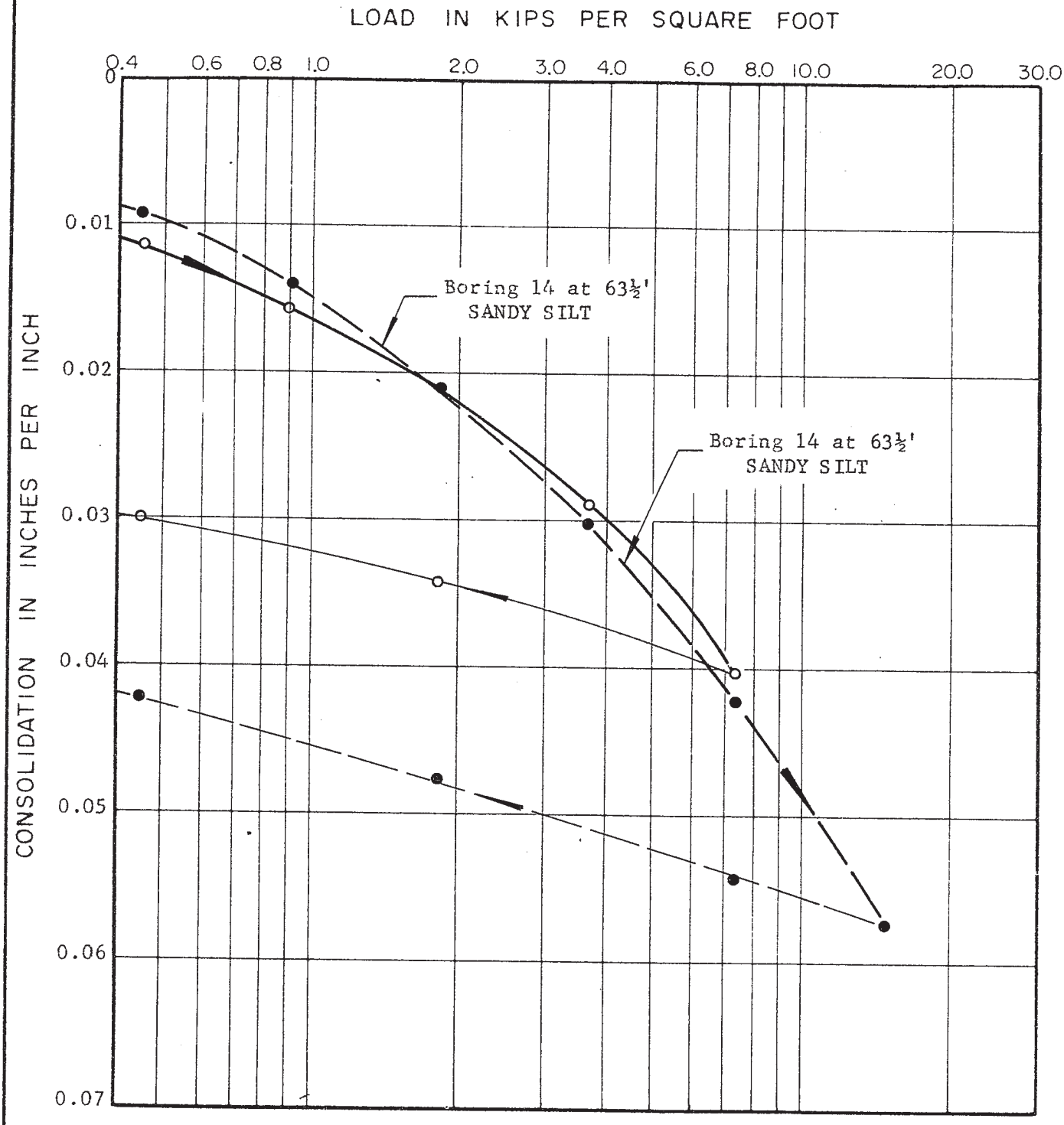
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE C-9

Figure D-3.3.42

JOB 468111 DATE 7-8-68 DR. KC.4 O.E. CHKD. rec



NOTE: Samples tested at field moisture content.

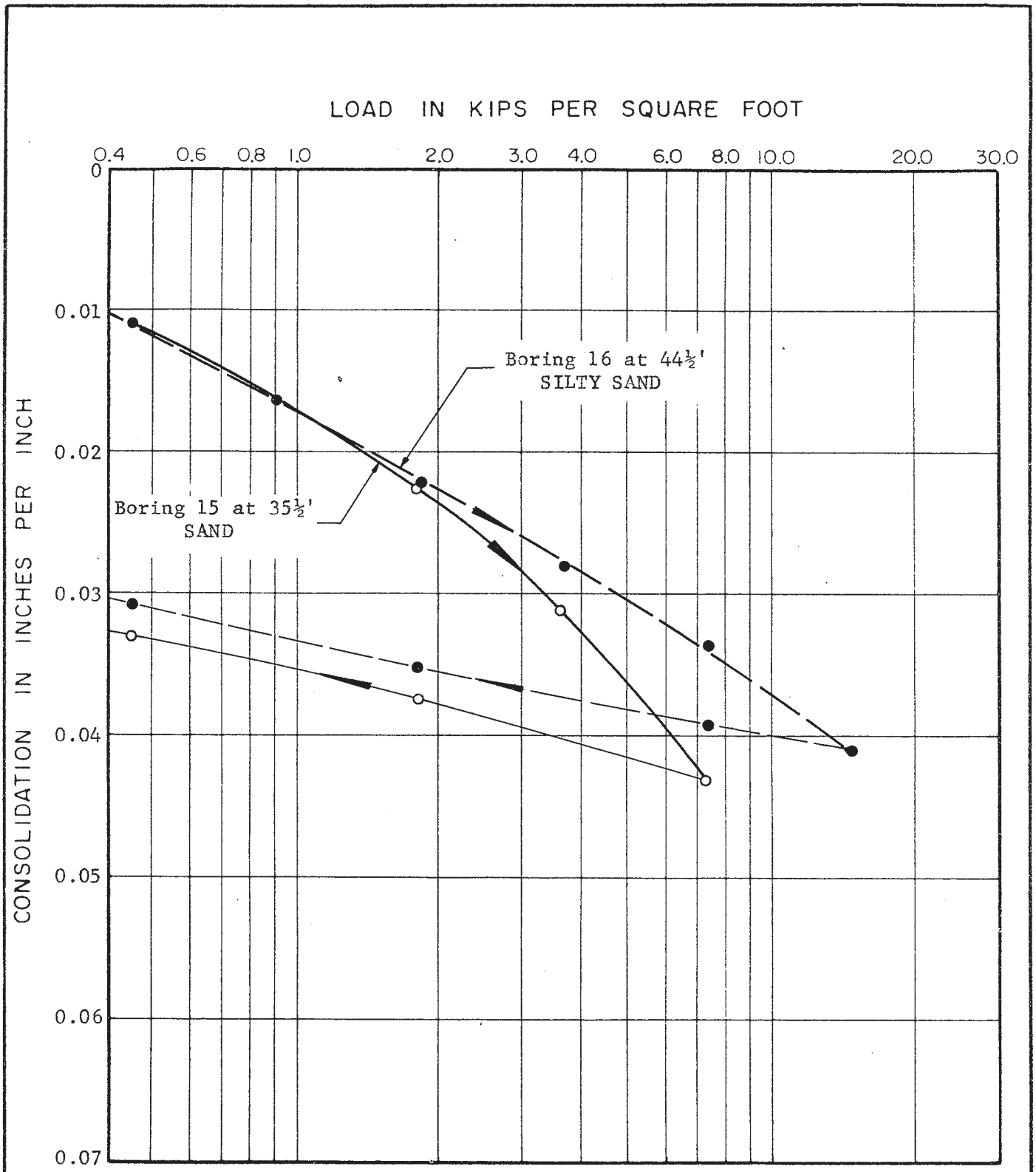
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE C-10

Figure D-3.3.43

JOB A68111 DATE 7-3-68 DR. K. H. O.E. CHKD.



NOTE: Samples tested at field moisture content.

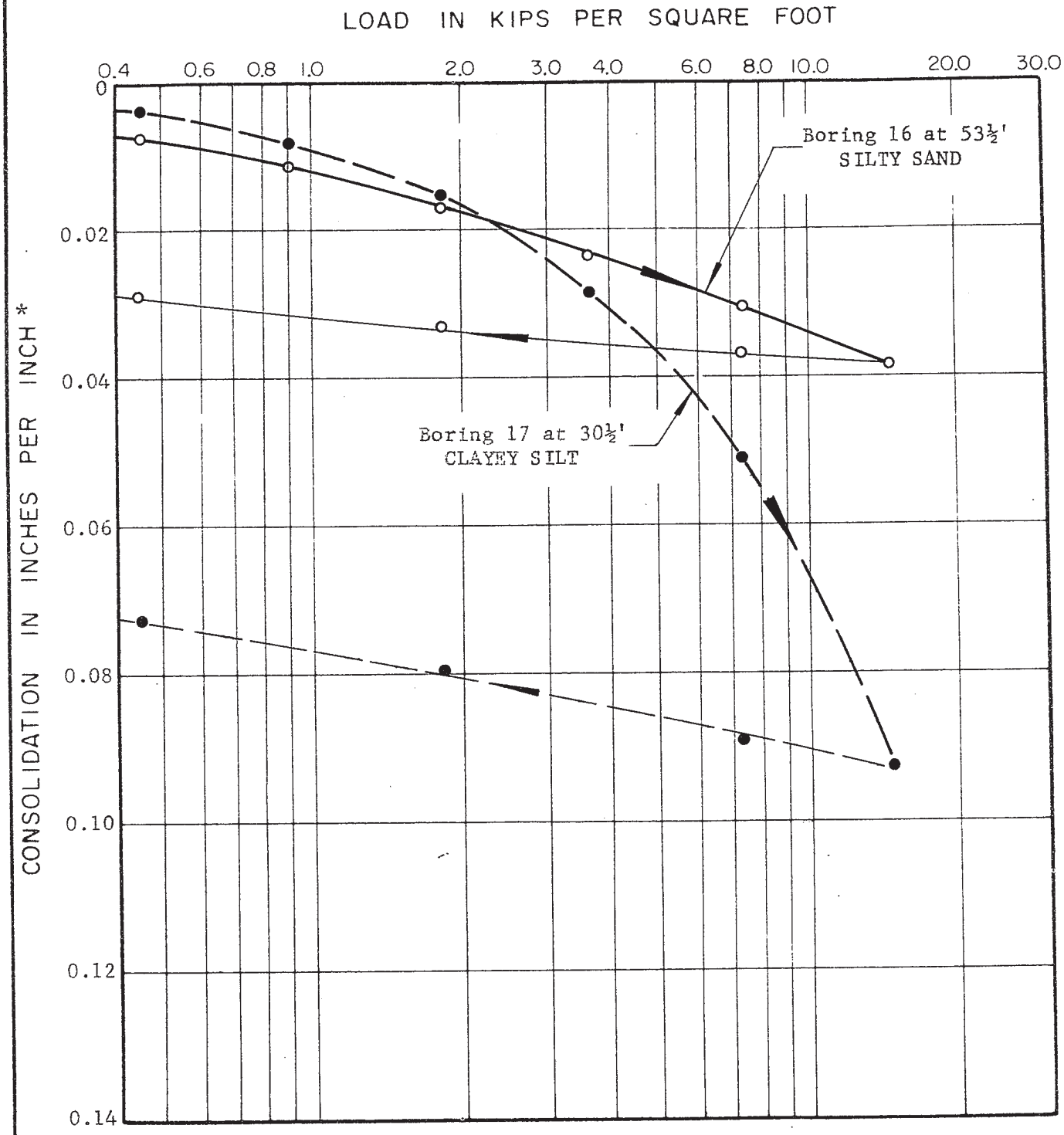
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.44

PLATE C-11

JOB A-68111 DATE 7-8-6 DR. KC. H. O.E. CHKD. RRC



NOTE: Samples tested at field moisture content.

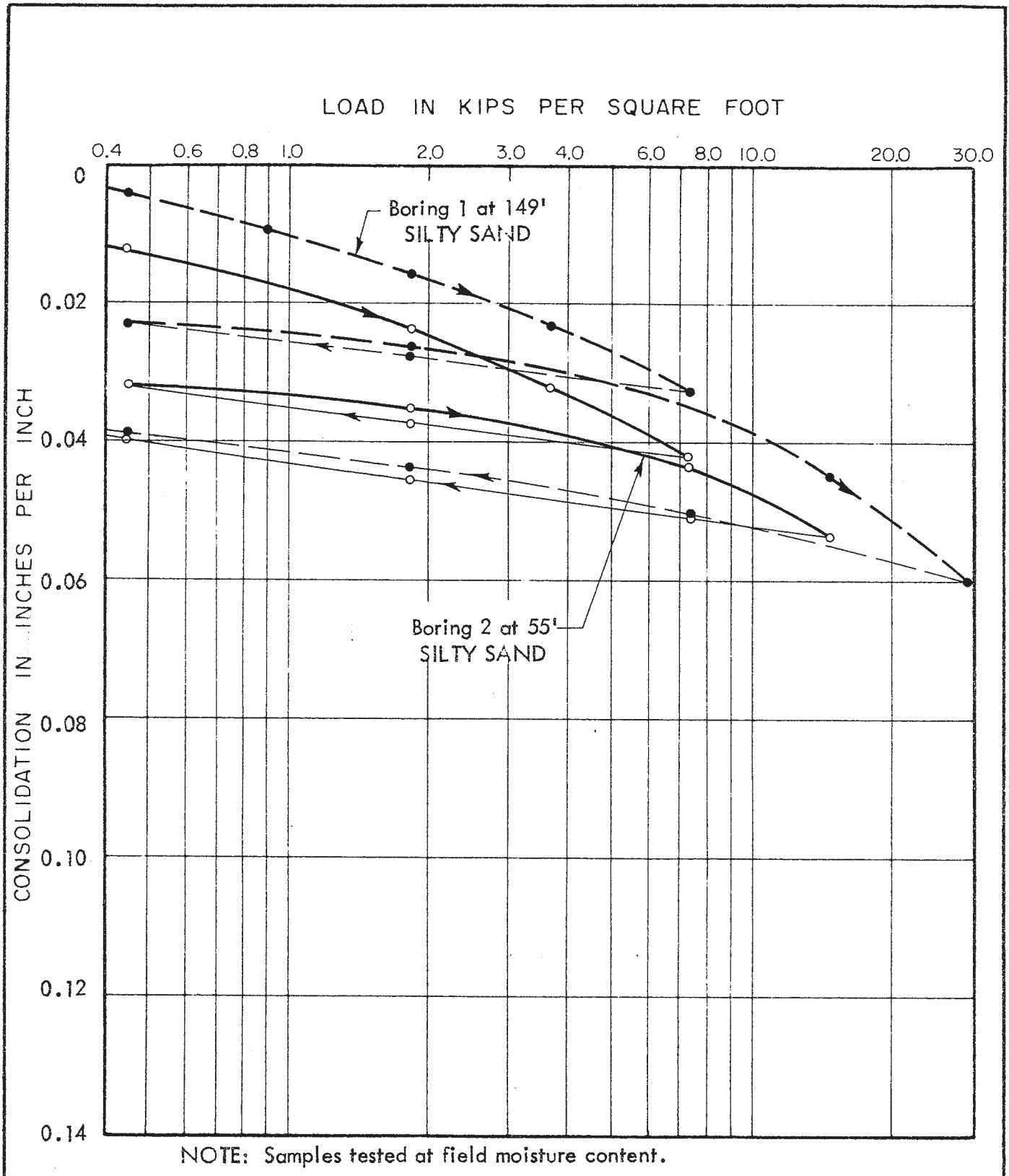
* NOTE CHANGE IN SCALE

CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE C-12

Figure D-3.3.45



NOTE: Samples tested at field moisture content.

JOB 469036 DATE 4-17-69 DR TRD O.E. CHKD.

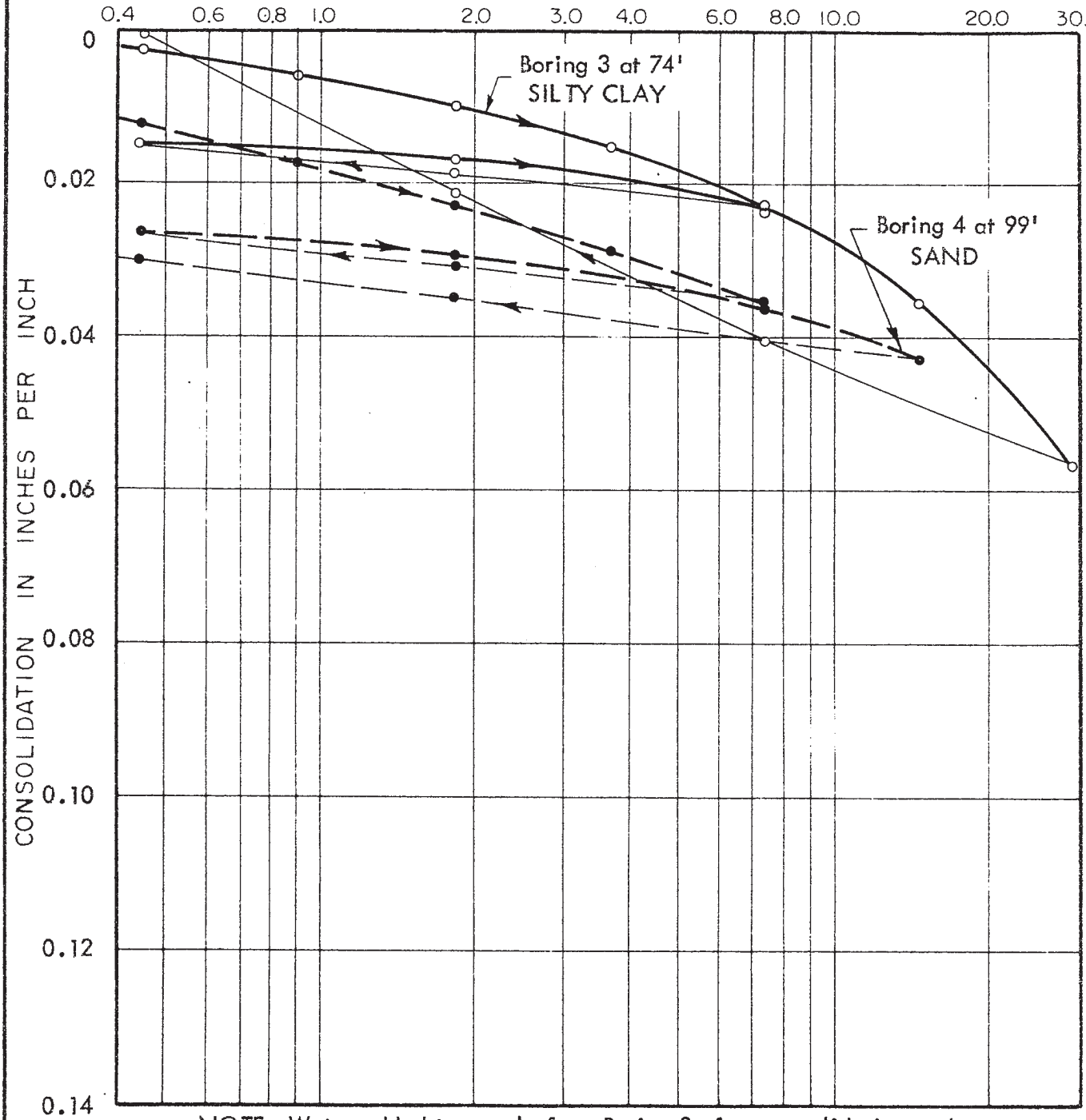
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.46

PLATE D-1

JOB 490-36 DATE 4-17-69 DR. Fld O.E. S CHKD. MC



NOTE: Water added to sample from Boring 3 after consolidation under a load of 7.2 kips per square foot. The other sample tested at field moisture content.

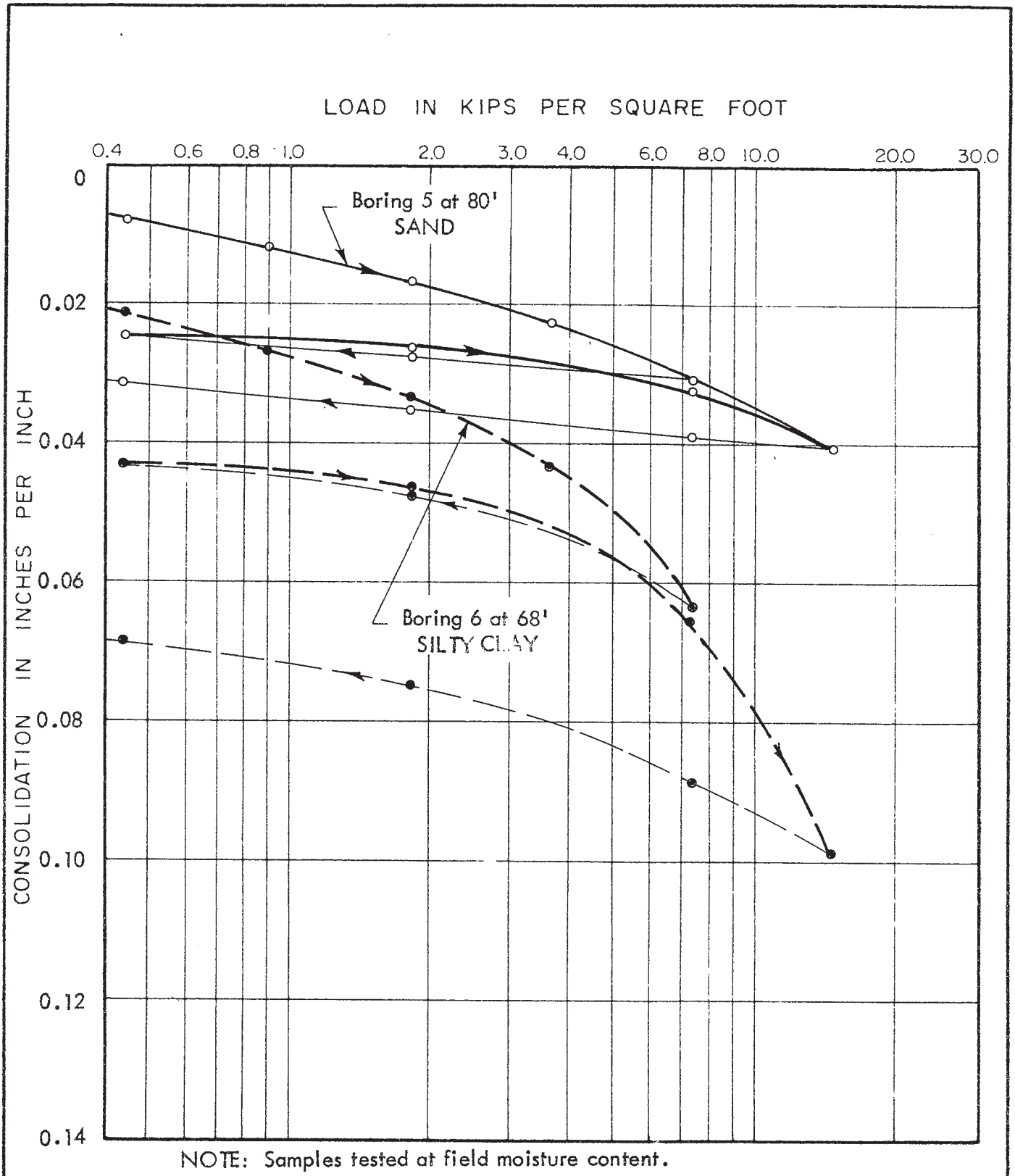
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.47

PLATE D-2

JOB 1697.36 DATE 4-17-64 DR. Todd O.E. CHKD. Per



NOTE: Samples tested at field moisture content.

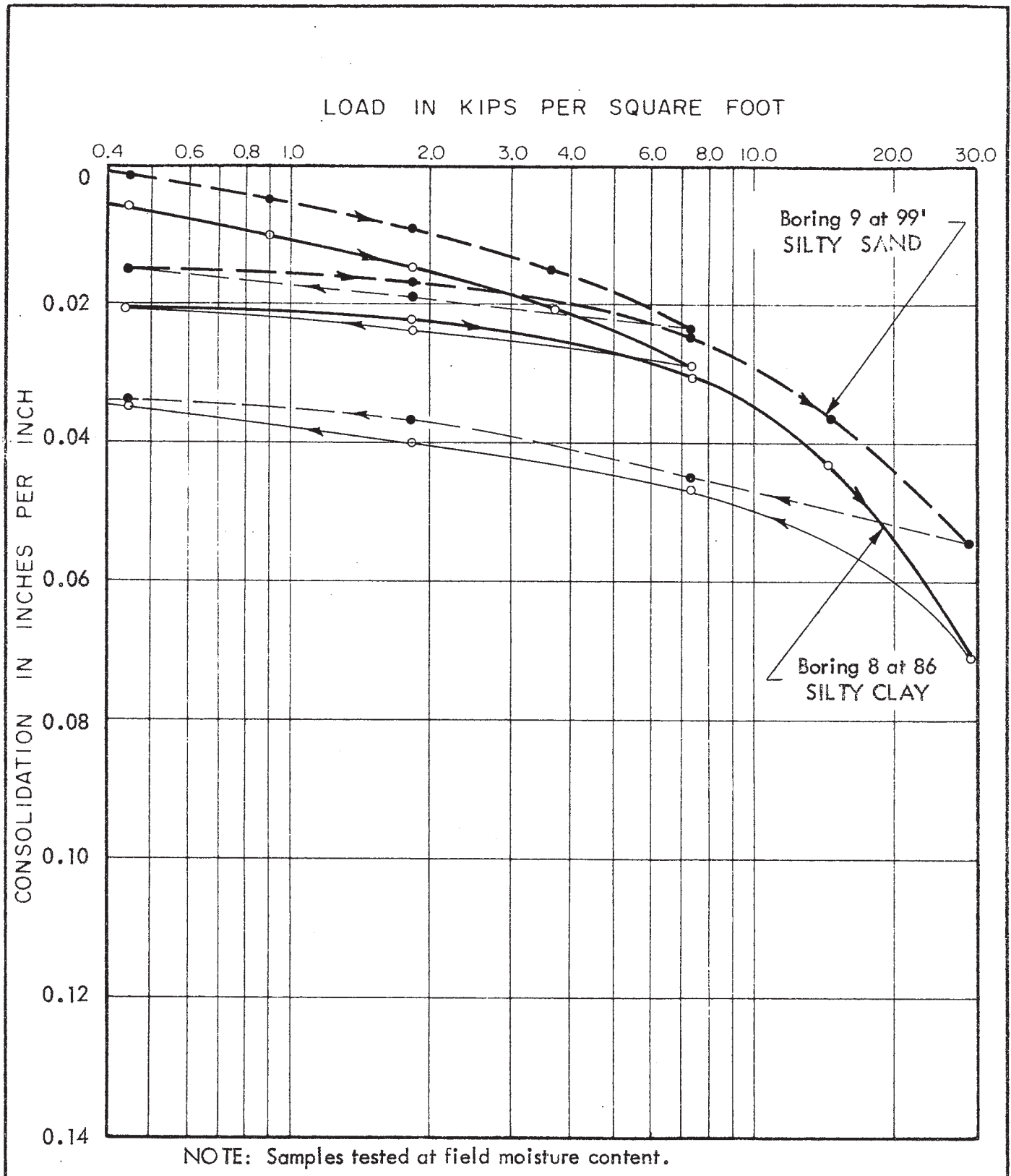
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.48

PLATE D-3

JOB A690 36 DATE 4-17-69 DR. Field O.E. [illegible] CHKD. [illegible]



NOTE: Samples tested at field moisture content.

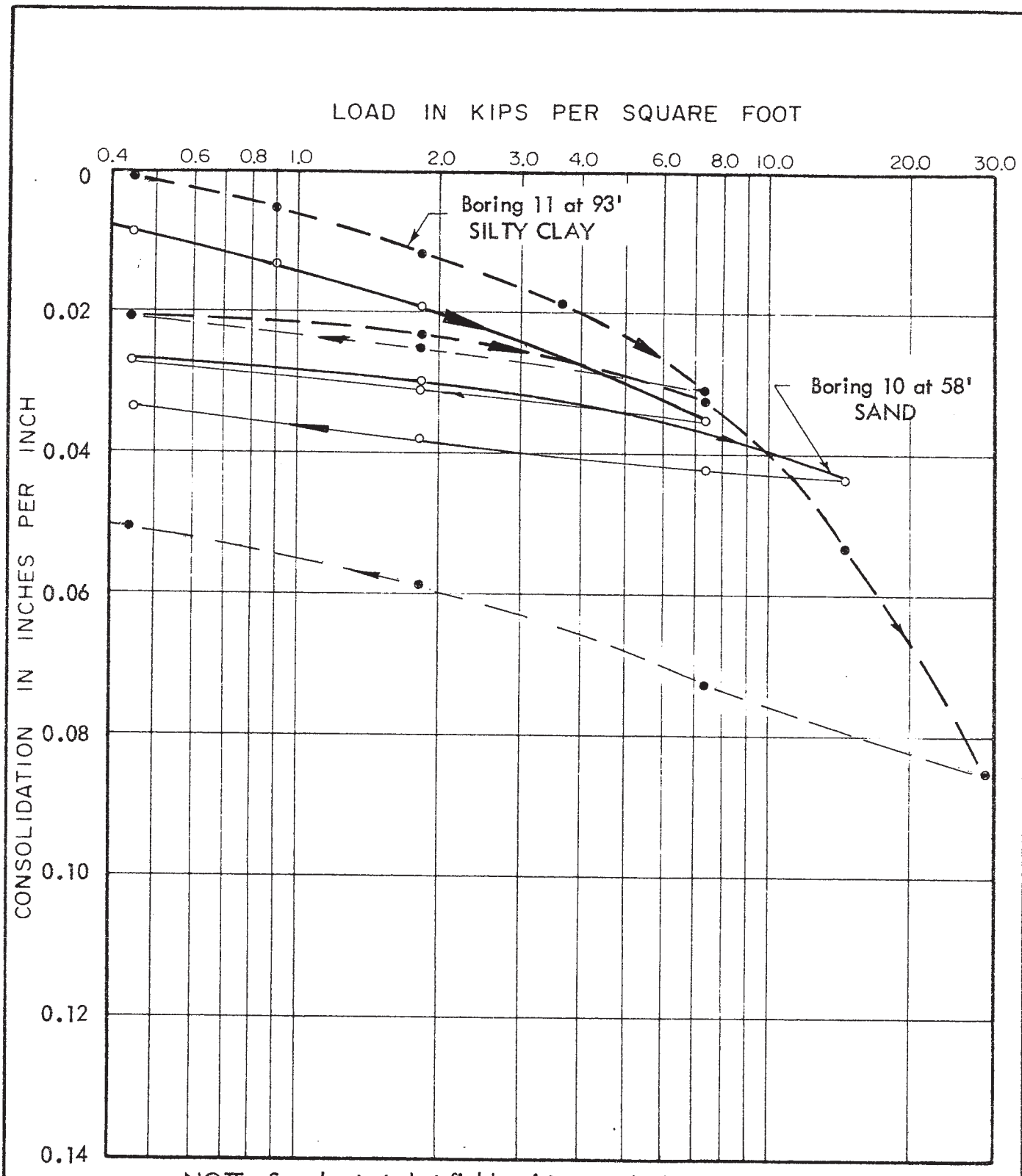
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.49

PLATE D-4

JOB A69036 DATE 4-16 DR ALAN O.E. CHKD.



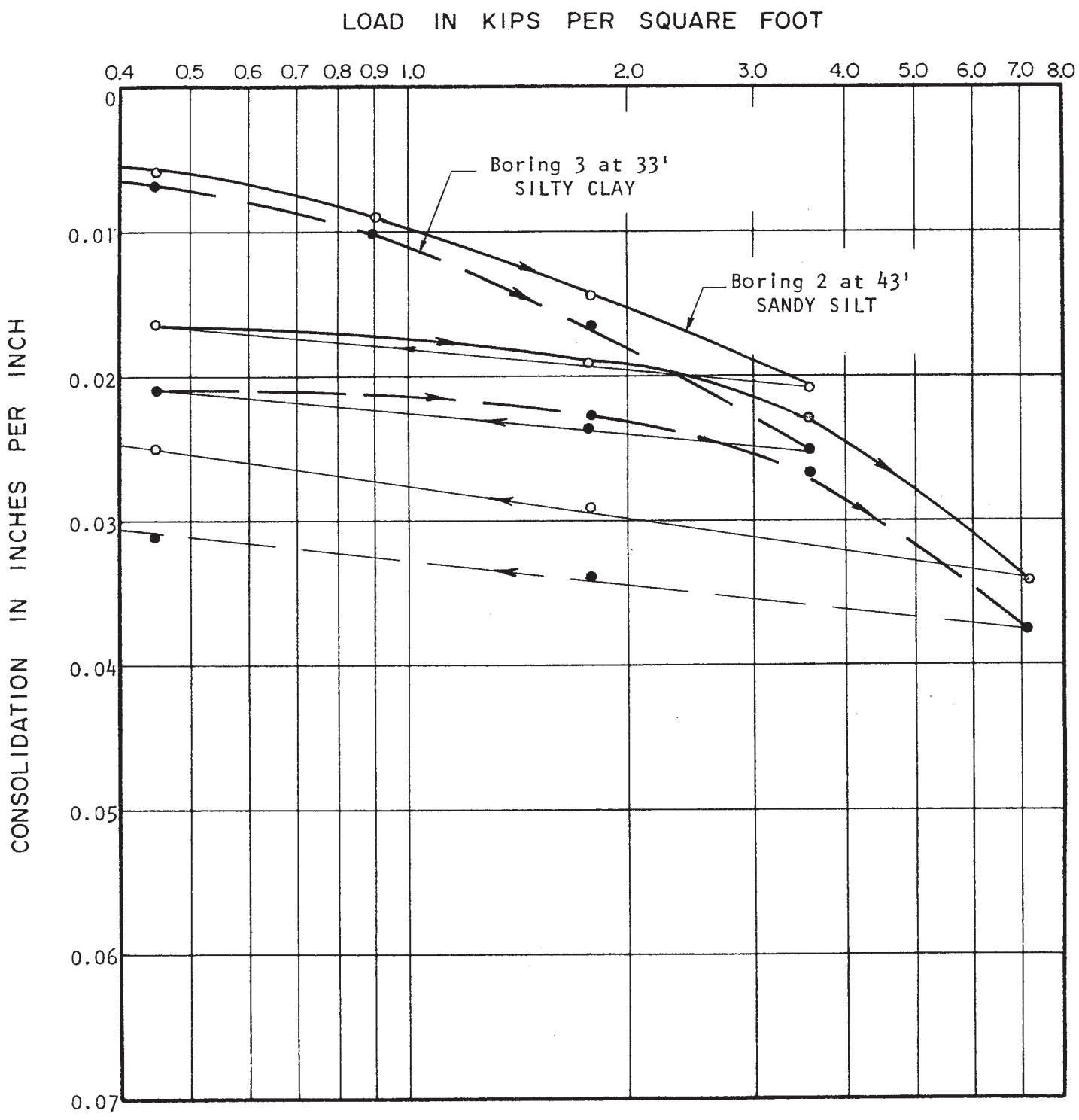
NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

Figure D-3.3.50

PLATE D-5



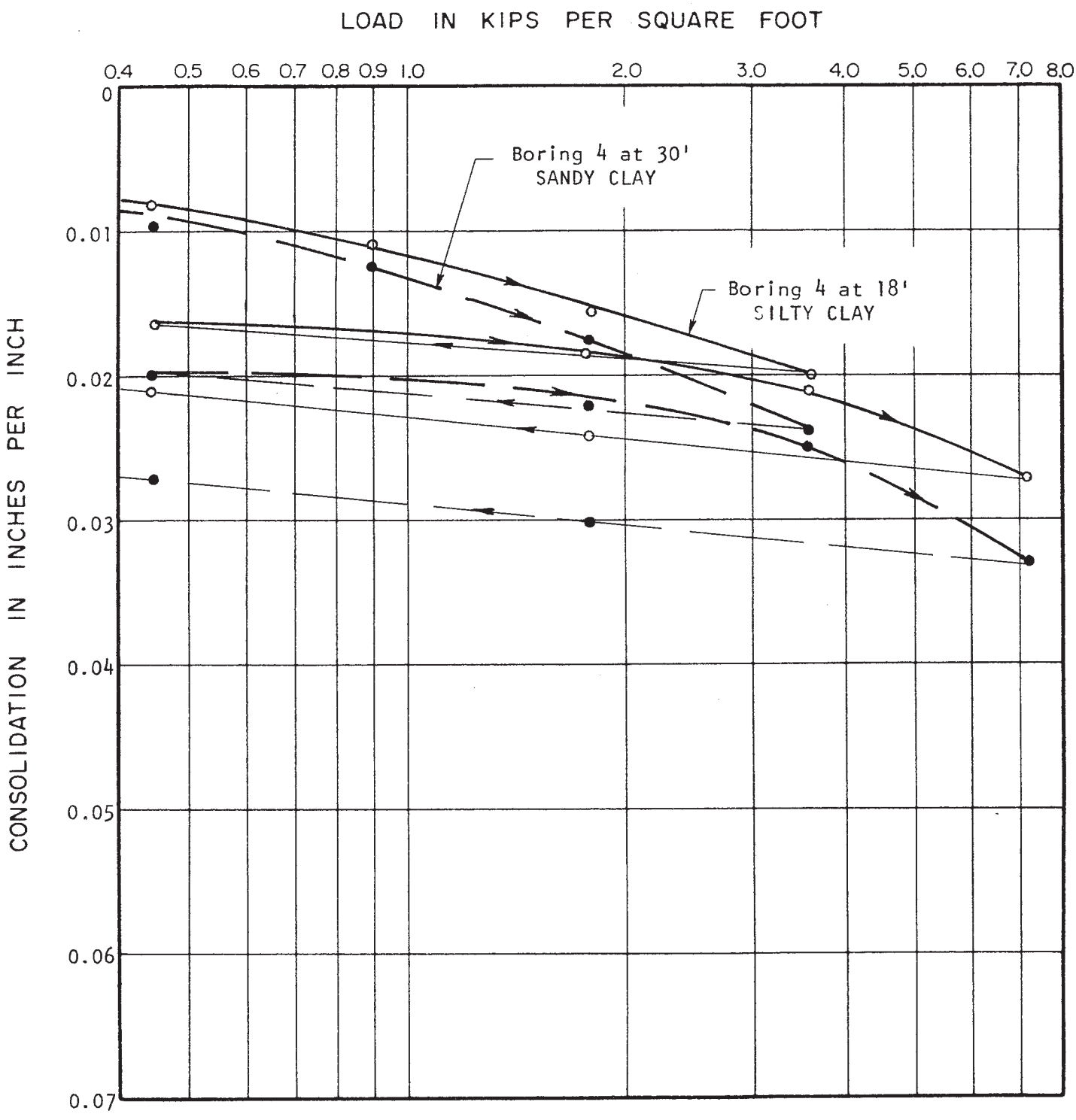
NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.1

Figure D-3.3.51



NOTE: Samples tested at field moisture content.

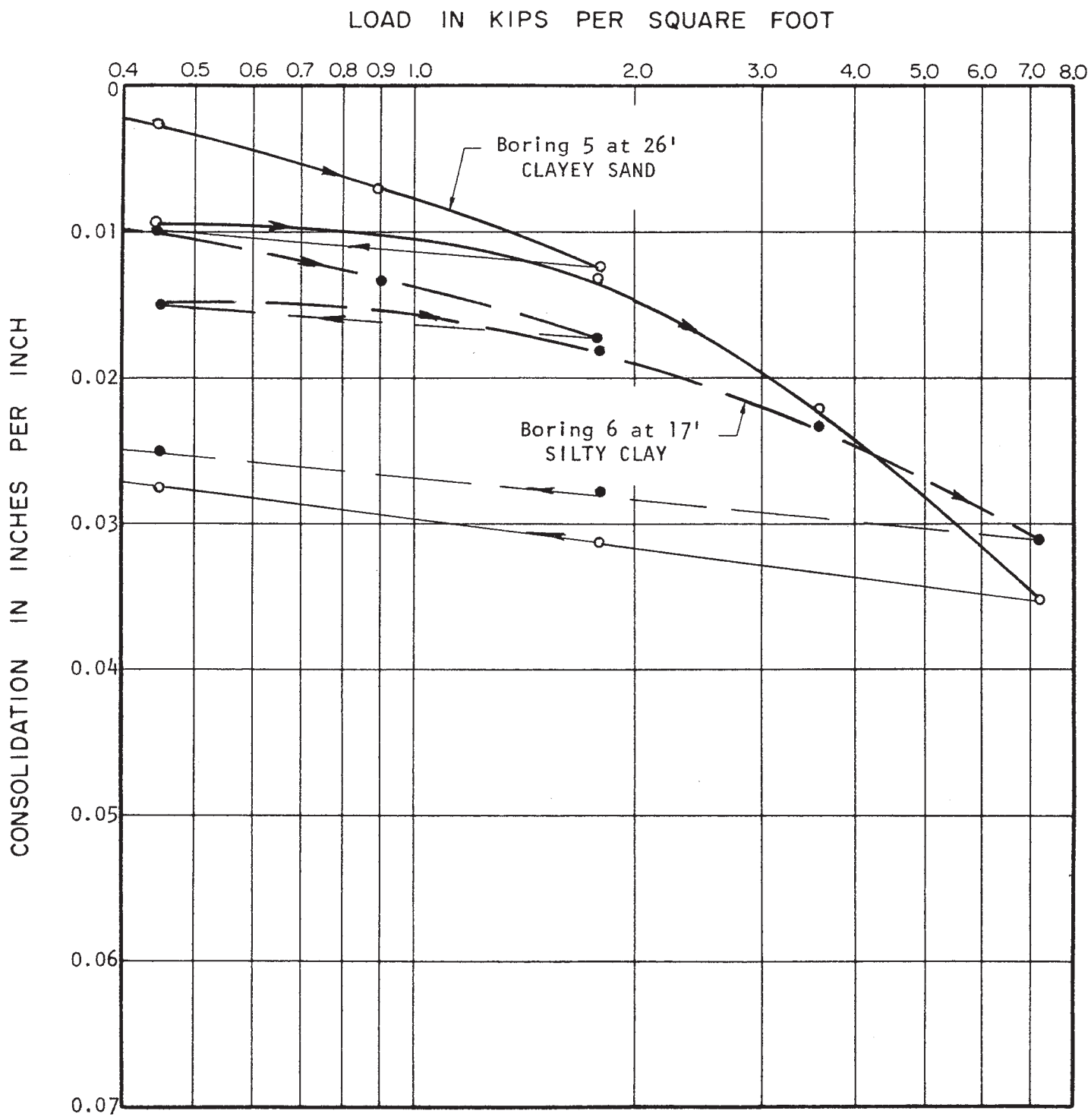
JOB A-7707 DATE 7-10-67 DR. A.T. O.E. LA W.P. CHKD

CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.2

Figure D-3.3.52



NOTE: Samples tested at field moisture content.

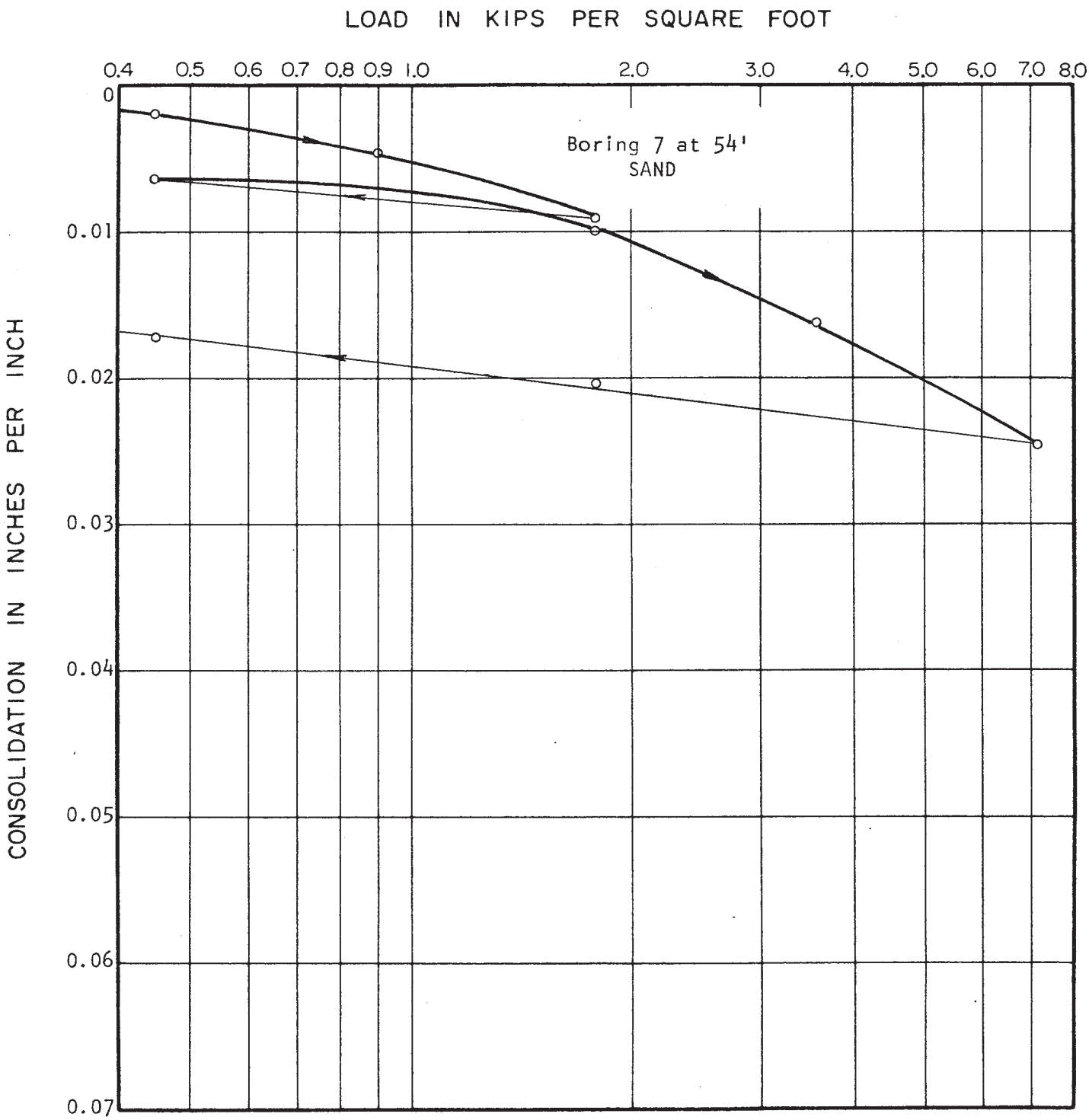
CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.3

Figure D-3.3.53

JOB A-1 mor' DATE 7-10-77 DR. A.T O.E. W.P. SW CHKD



NOTE: Sample tested at field moisture content.

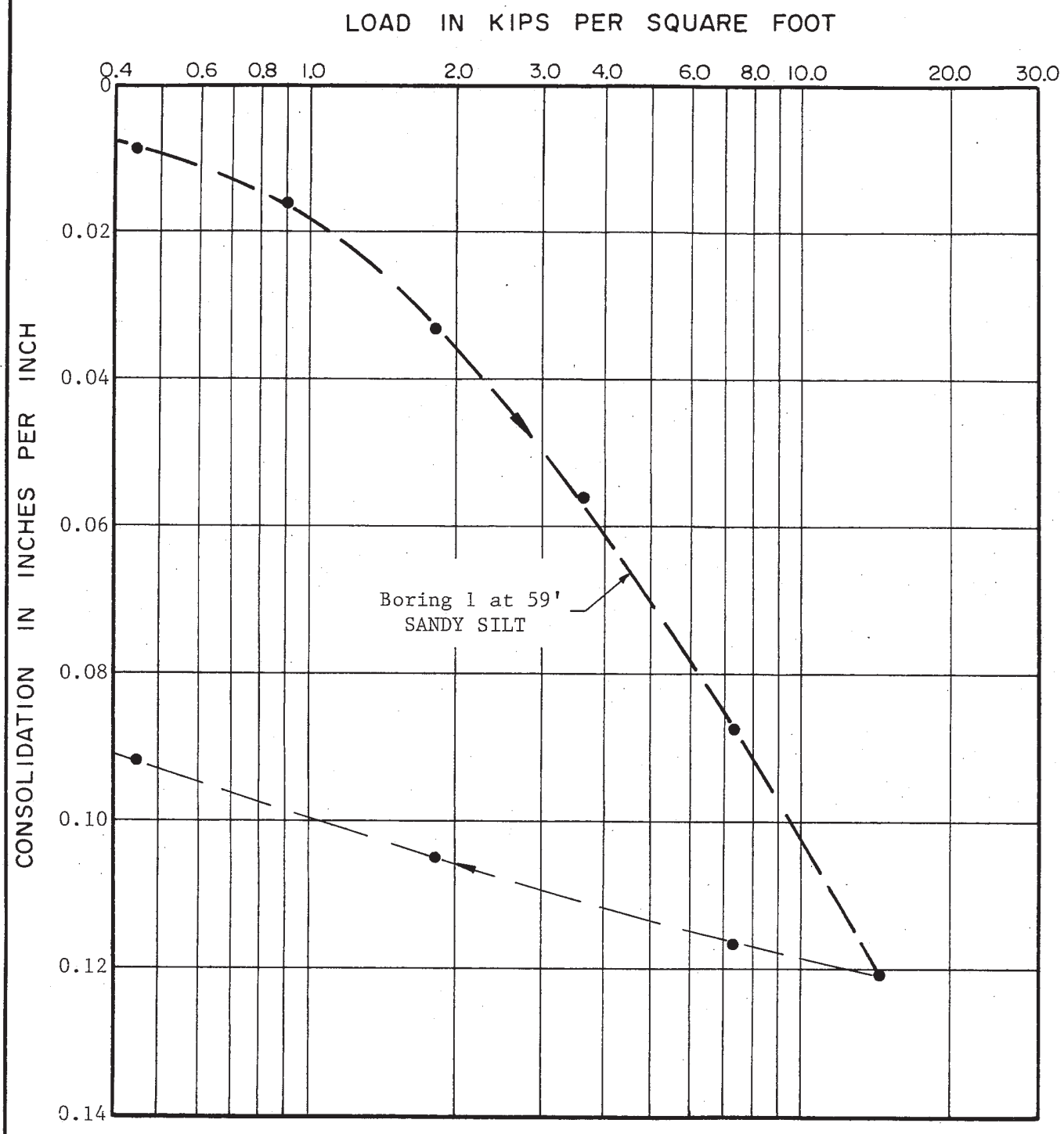
CONSOLIDATION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-4.4

Figure D-3.3.54

JOB A-1997 DATE 1-10-77 DR. A.T. O.E. W.P. SW CHKD



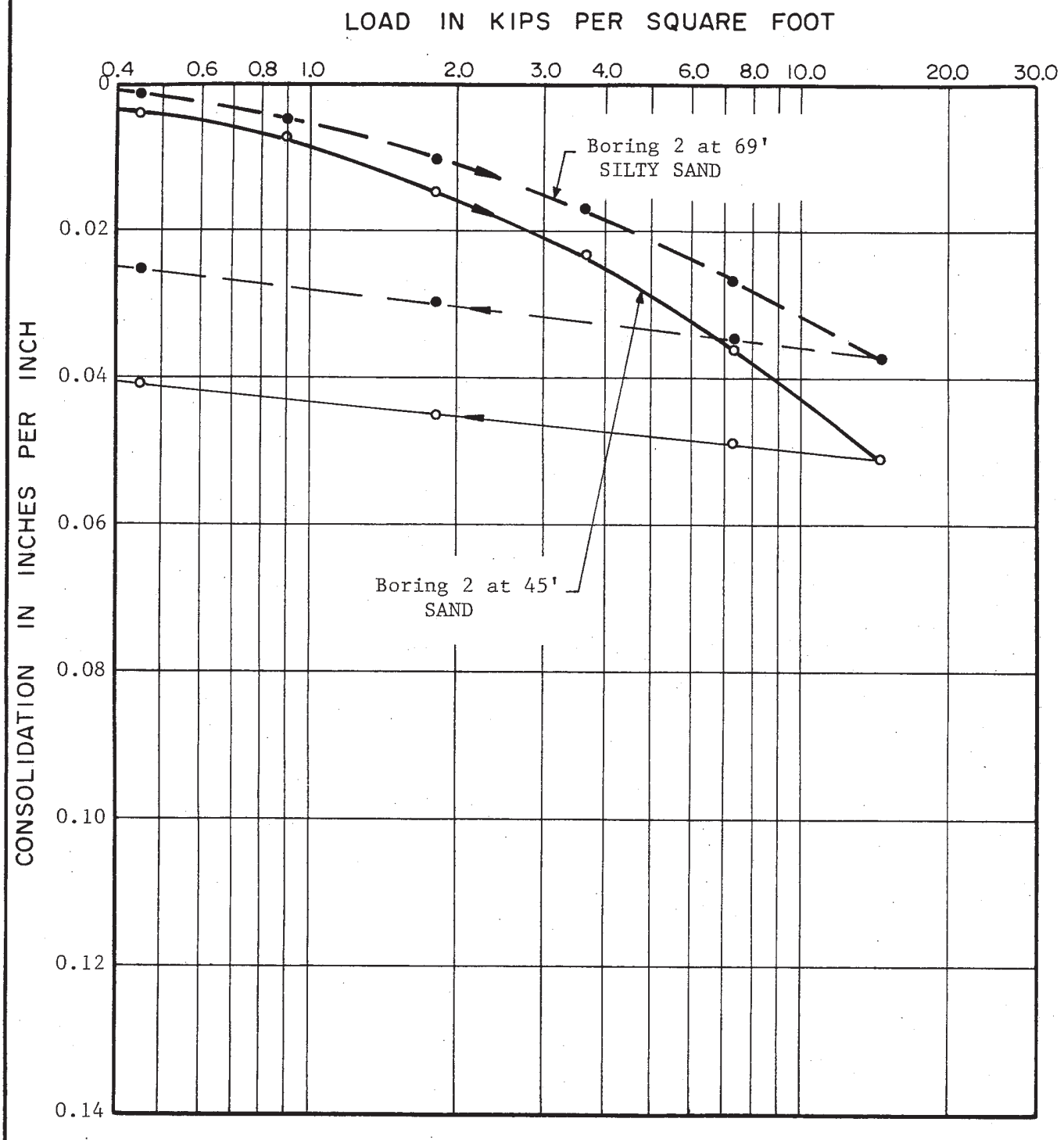
NOTE: Sample tested at field moisture content.

CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE A-4.1

Figure D-3.3.55



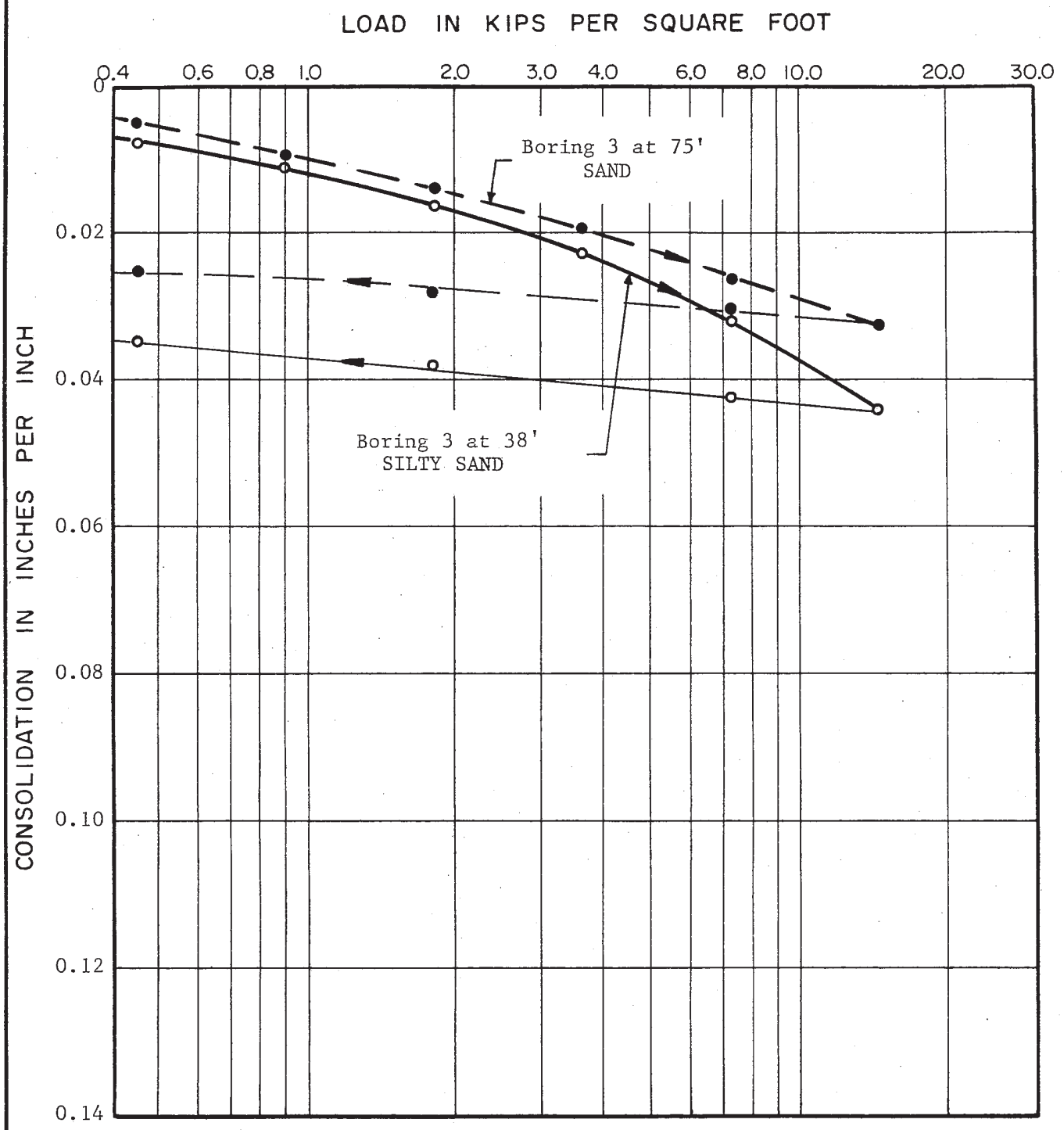
NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE A-4.2

Figure D-3.3.56



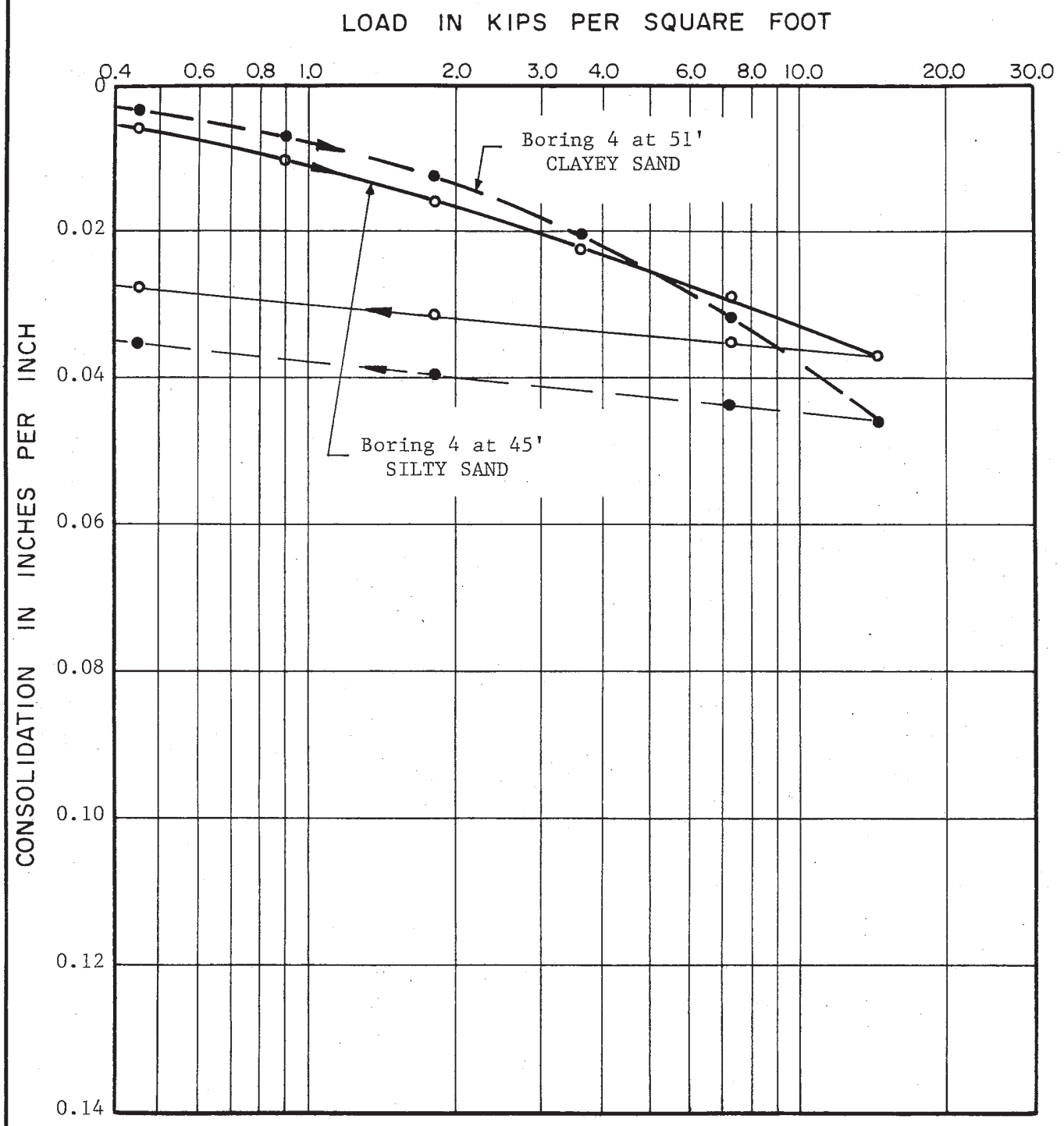
NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE A-4.3

Figure D-3.3.57



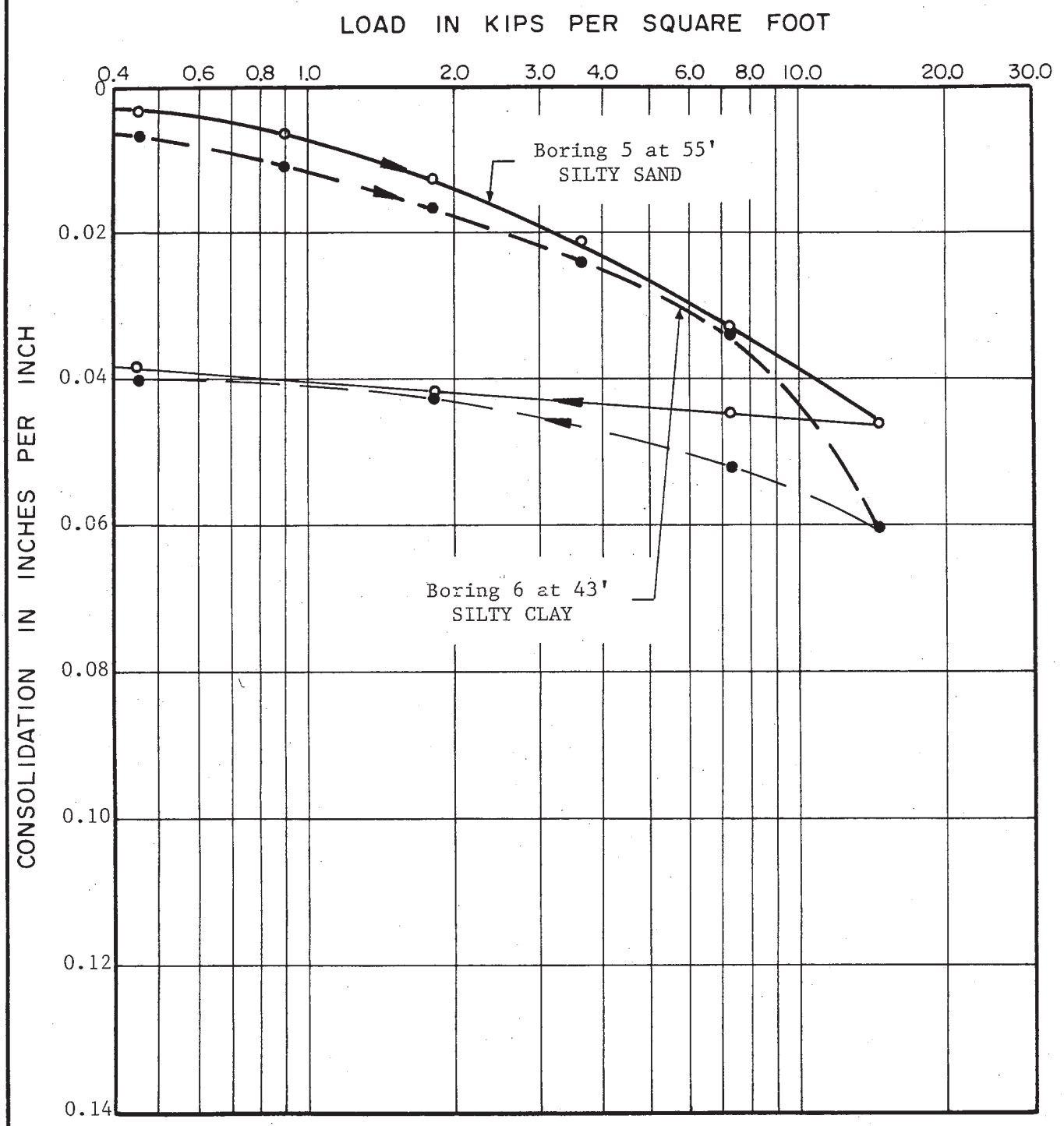
NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE A-4.4

Figure D-3.3.58



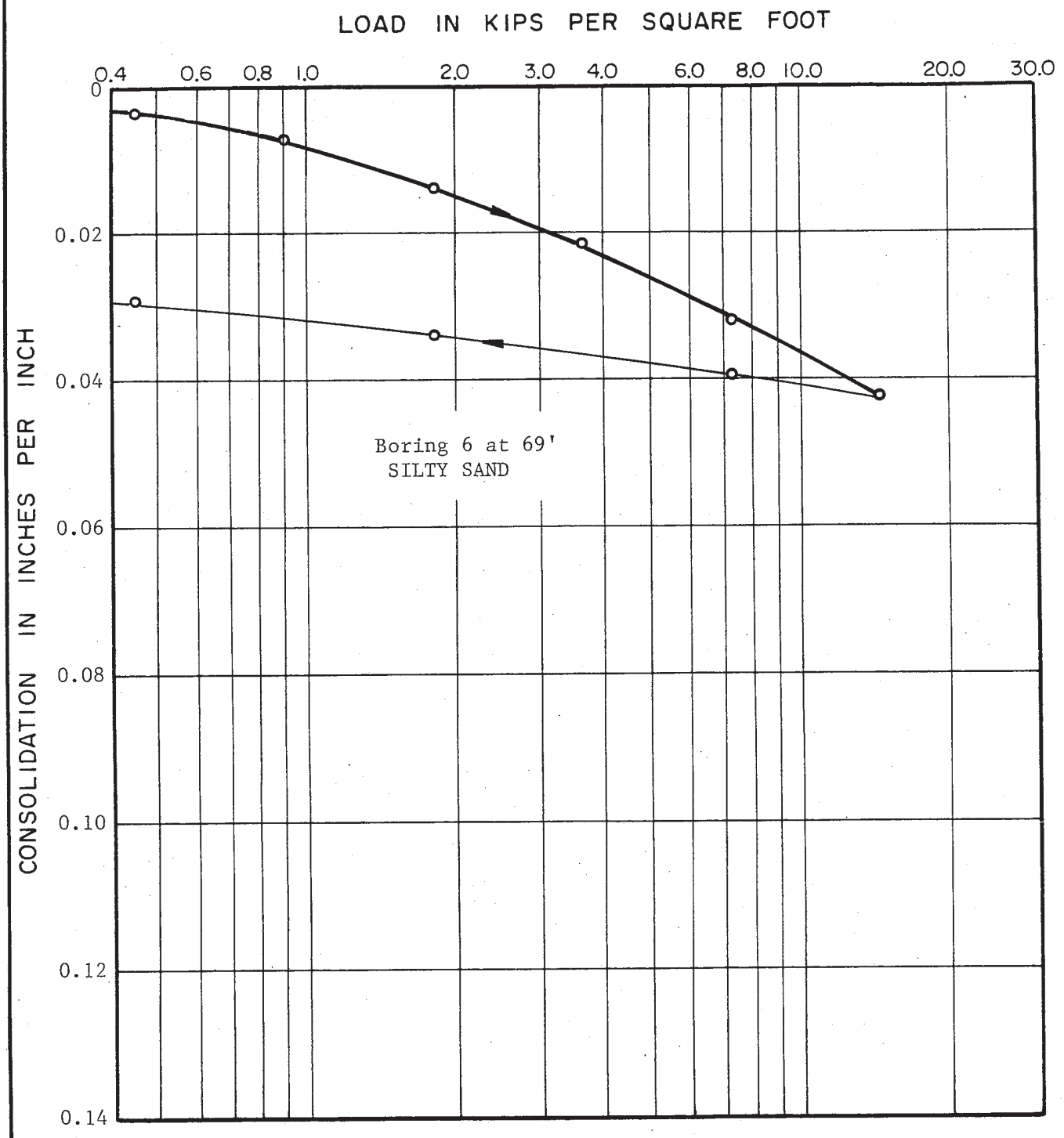
NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE A-4.5

Figure D-3.3.59



NOTE: Sample tested at field moisture content.

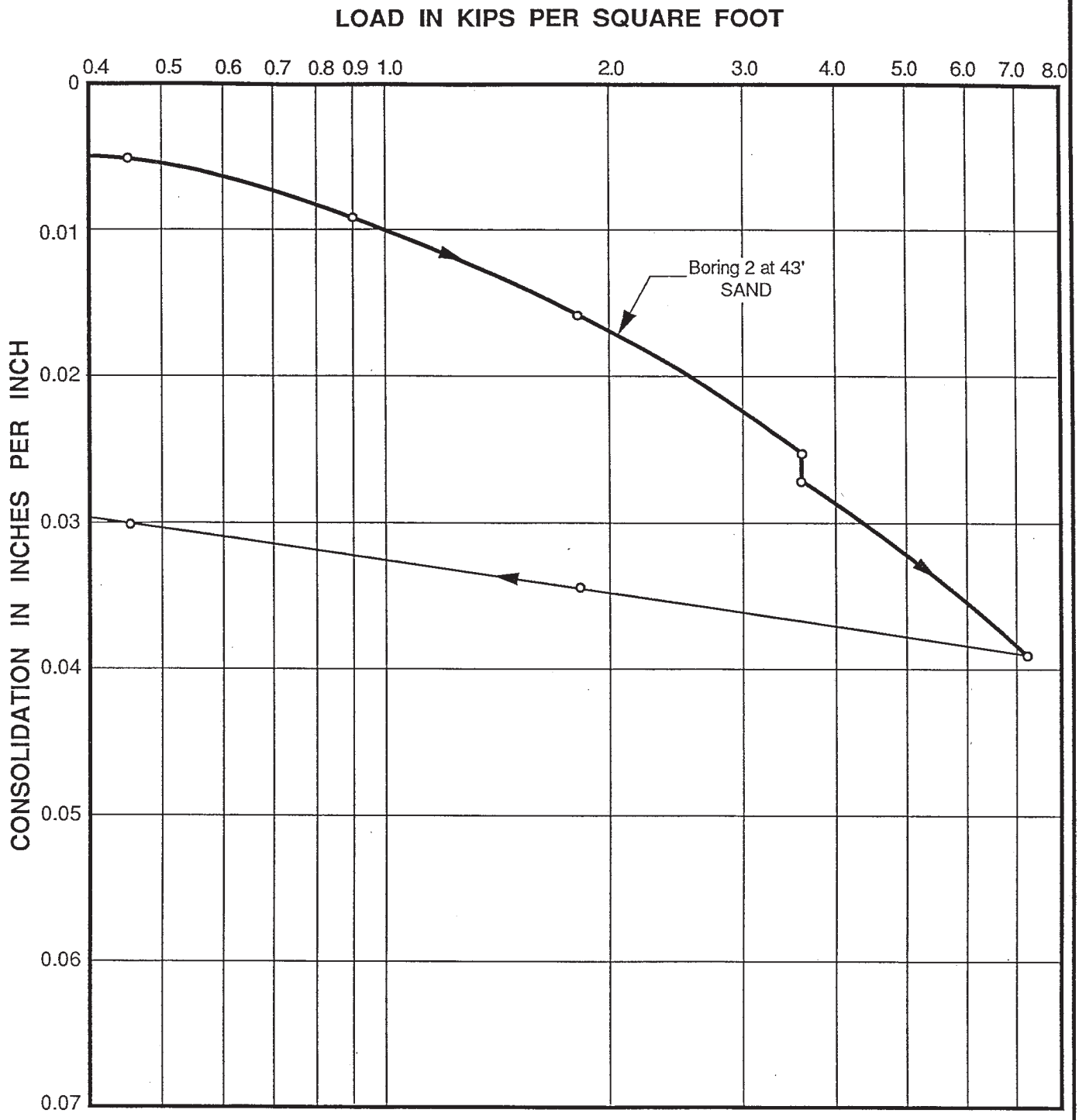
CONSOLIDATION TEST DATA

LEROY CRANDALL & ASSOCIATES

PLATE A-4.6

Figure D-3.3.60

JOB L90354.ADEO DATE 1/21/91 DR. ph W.P. ph O.E. HRL CHKD



NOTE: Water added to sample after consolidation under a load of 3.6 kips per square foot.

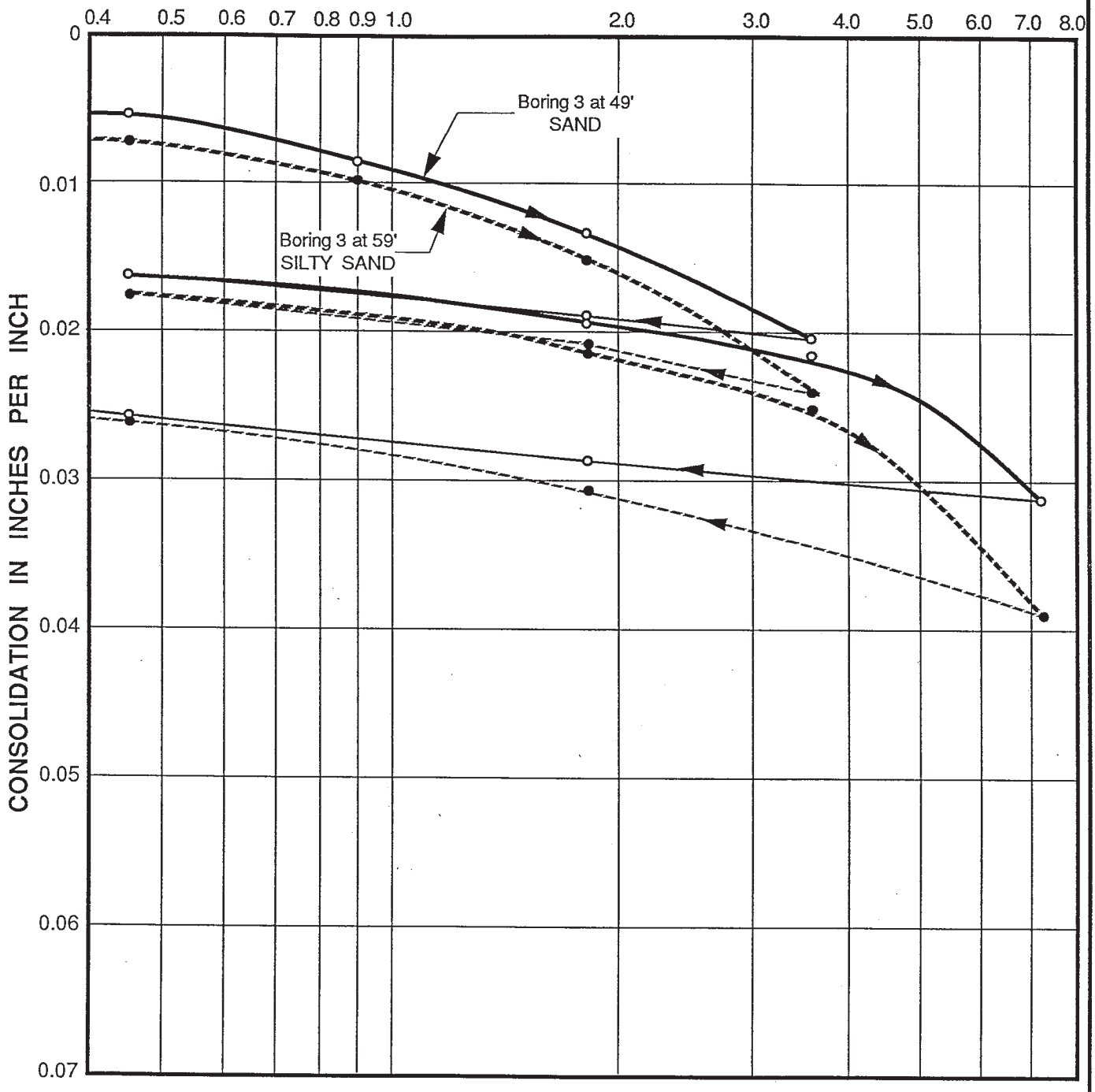
CONSOLIDATION TEST DATA
(CURRENT INVESTIGATION)

LAW/CRANDALL, INC.

PLATE A-4.1

Figure D-3.3.61

JOB L90354.ADEO DATE 1/21/91 DR. ph W.P. ph O.E. HRL CHKD



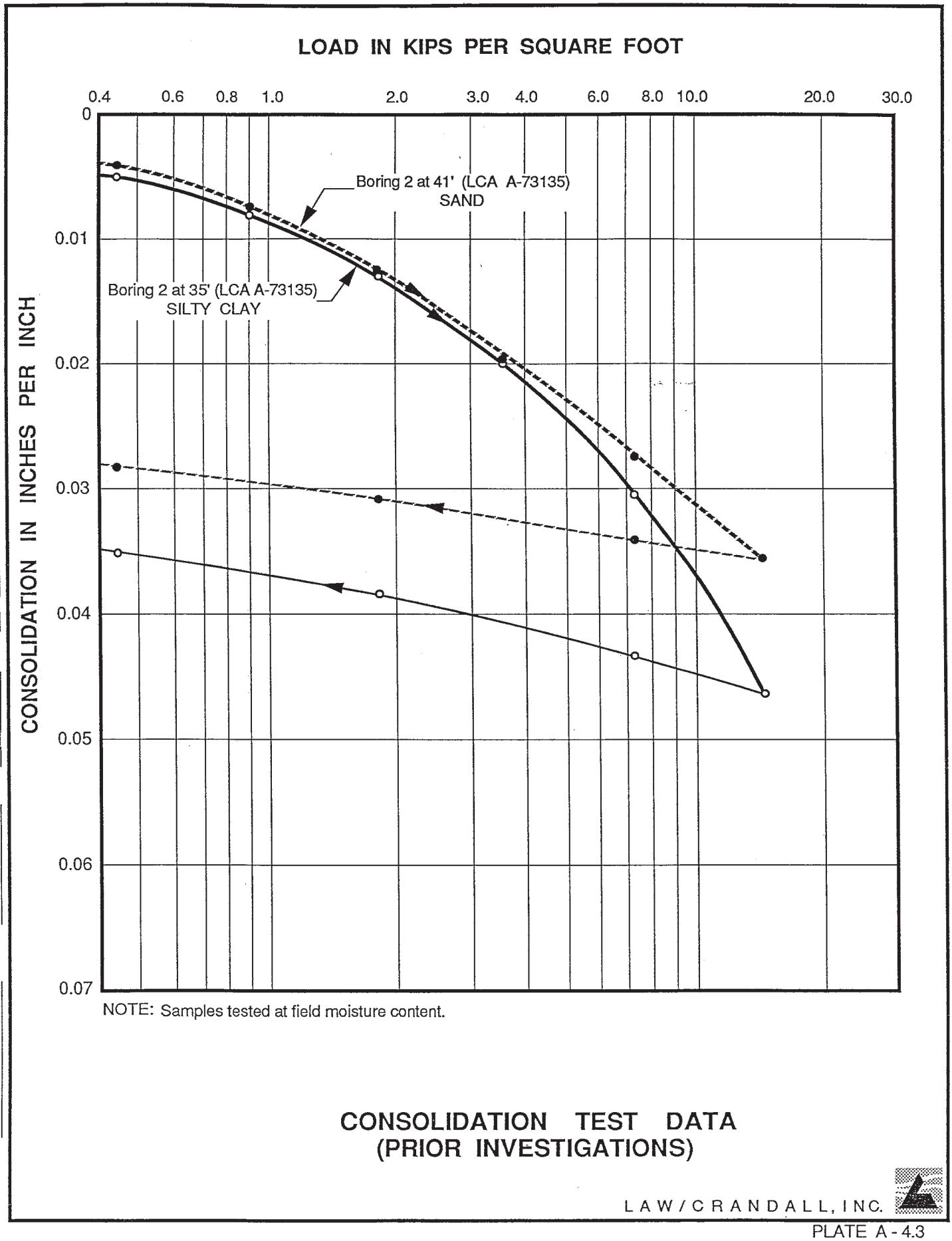
NOTE: Samples tested at field moisture content.

CONSOLIDATION TEST DATA
(CURRENT INVESTIGATION)

LAW/CRANDALL, INC.

PLATE A-4.2

Figure D-3.3.62



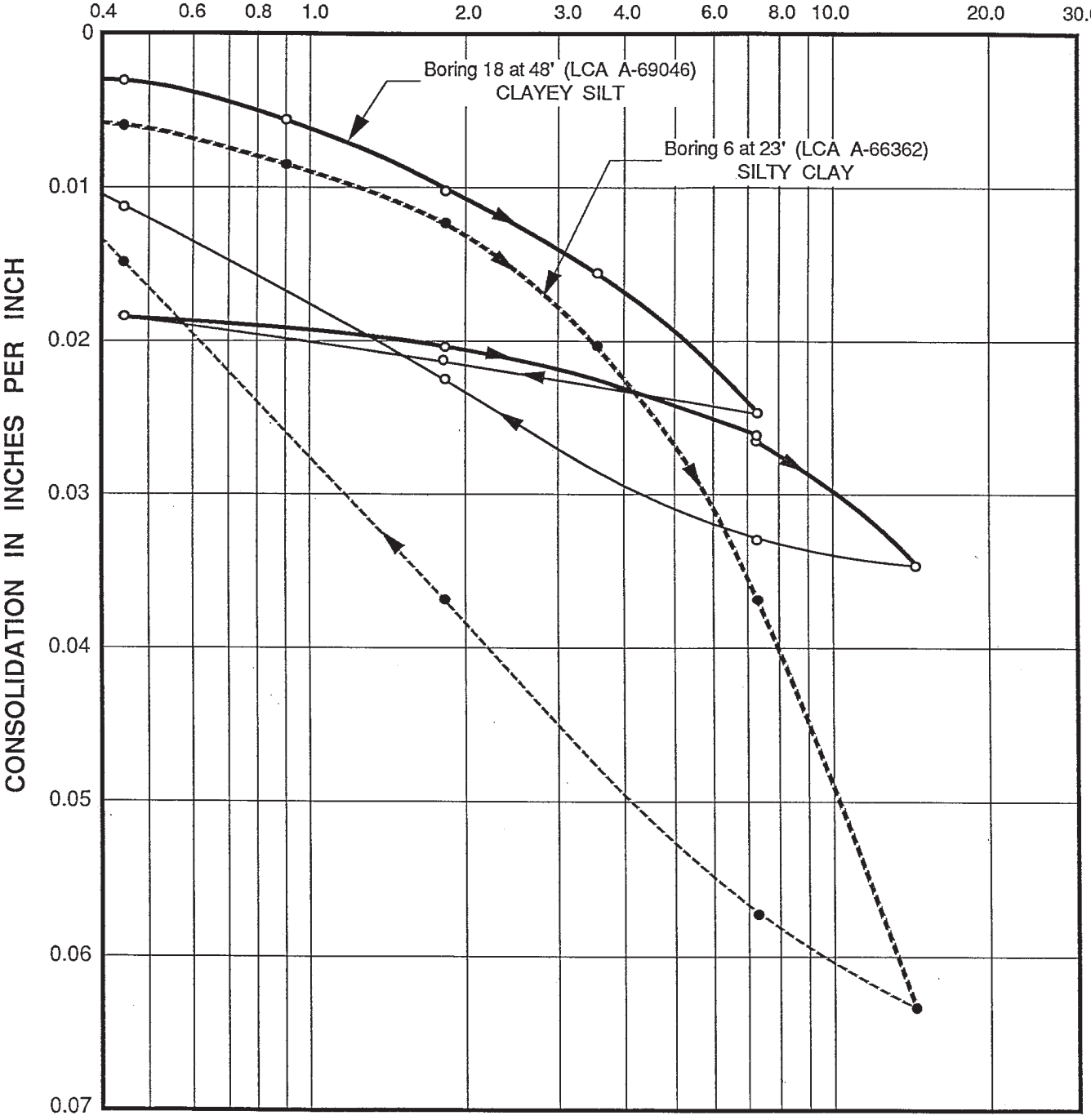
CONSOLIDATION TEST DATA (PRIOR INVESTIGATIONS)

LAW/CRANDALL, INC.

PLATE A-4.3

Figure D-3.3.63

JOB L90354.ADEO DATE 7/22/91 DR. ph W.P. ph O.E. FH CHKD



NOTE: Water added to samples from Boring 18 and Boring 6 after consolidation under loads of 7.2 and 3.6 kips per square foot, respectively.

CONSOLIDATION TEST DATA (PRIOR INVESTIGATIONS)

LAW/CRANDALL, INC.

PLATE A-4.4

Figure D-3.3.64

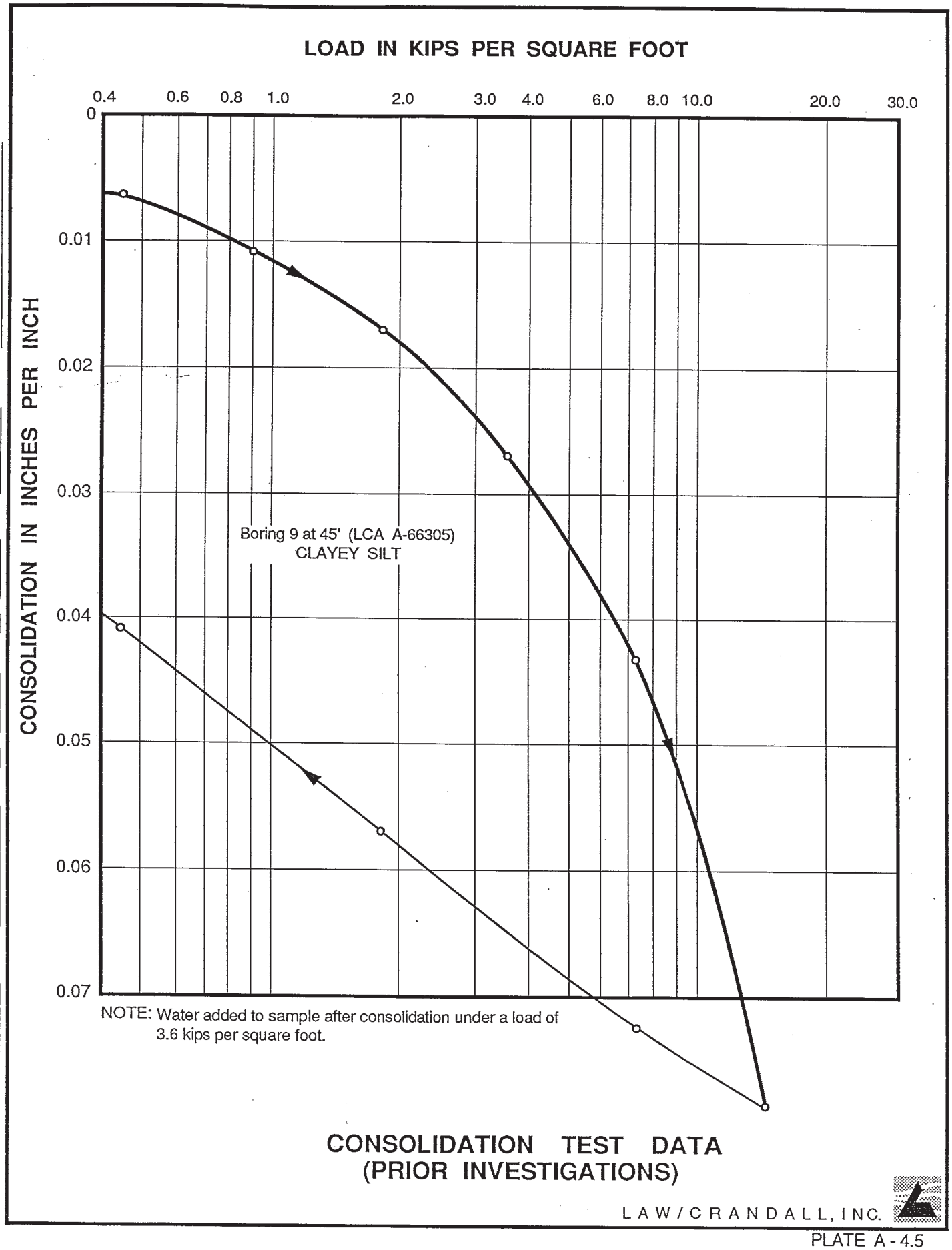


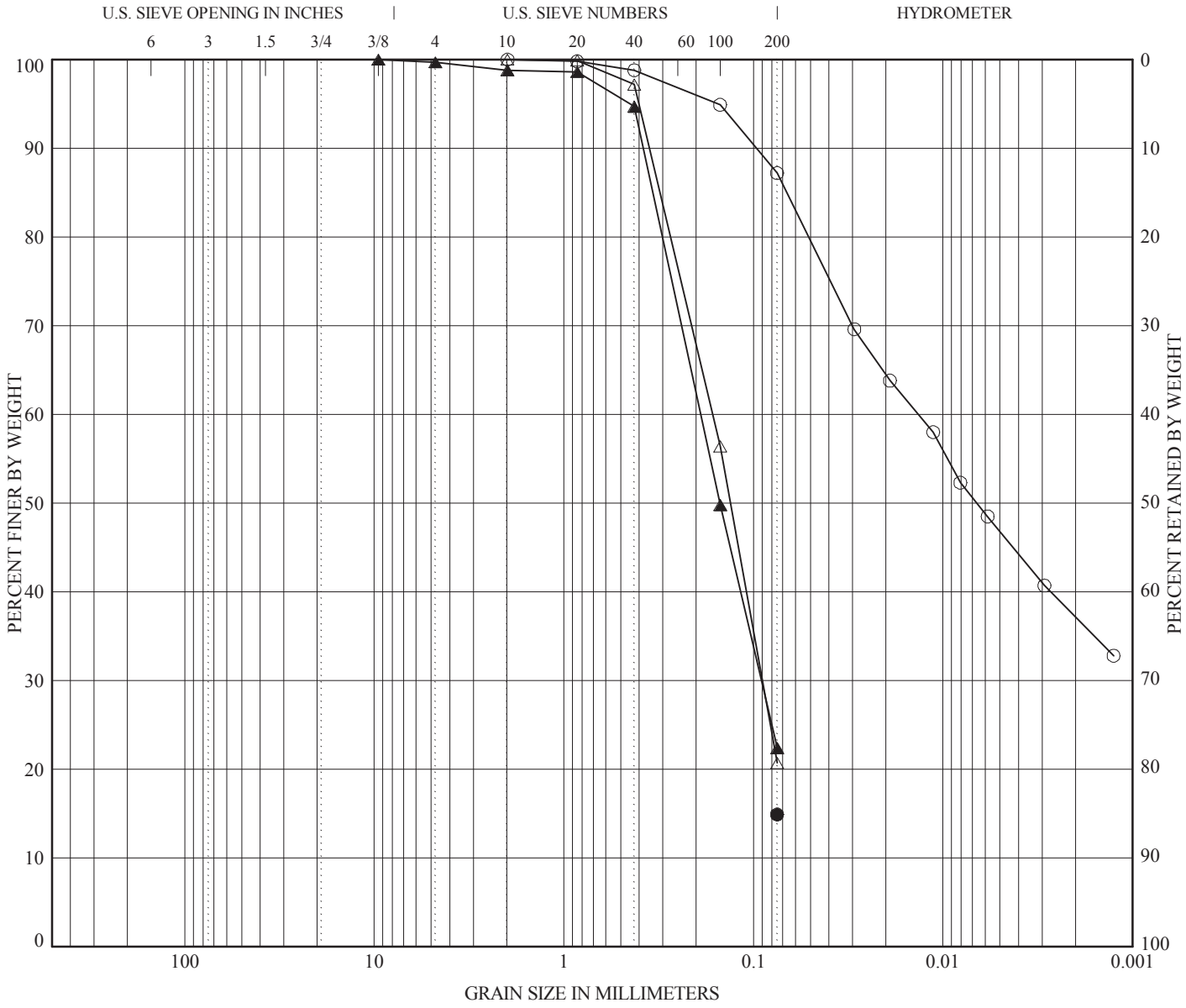
Figure D-3.3.65

BORING NUMBER AND SAMPLE DEPTH:	G-168 at 77½'	G-169 at 67½'
SOIL TYPE:	POORLY GRADED SAND	SILTY SAND
SURCHARGE PRESSURE: (lbs./sq.ft.)	2000	2000
PERCENT HYDROCONSOLIDATION: (%)	0.14	0.05

Prepared/Date: LH 09/29/11
Checked/Date: LT 10/2/11

MTA Westside Subway Extension
Los Angeles, California

HYDROCONSOLIDATION TEST DATA
Project No.: 4953-10-1561
Figure D-4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-168	38.5	LEAN CLAY (CL)	--	--	--	--	--
●	G-168	57.5	SILTY SAND (SM)	--	--	--	--	--
△	G-168	67.5	SILTY SAND (SM)	--	--	--	--	--
▲	G-168	82.5	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-168	38.5	1.98	0.013	--	--	0.0	12.8	87.2
●	G-168	57.5	0.08	--	--	--	0.0	0.0	14.9
△	G-168	67.5	1.98	0.164	0.090	--	0.0	79.3	20.7
▲	G-168	82.5	9.52	0.190	0.091	--	0.3	77.3	22.4

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

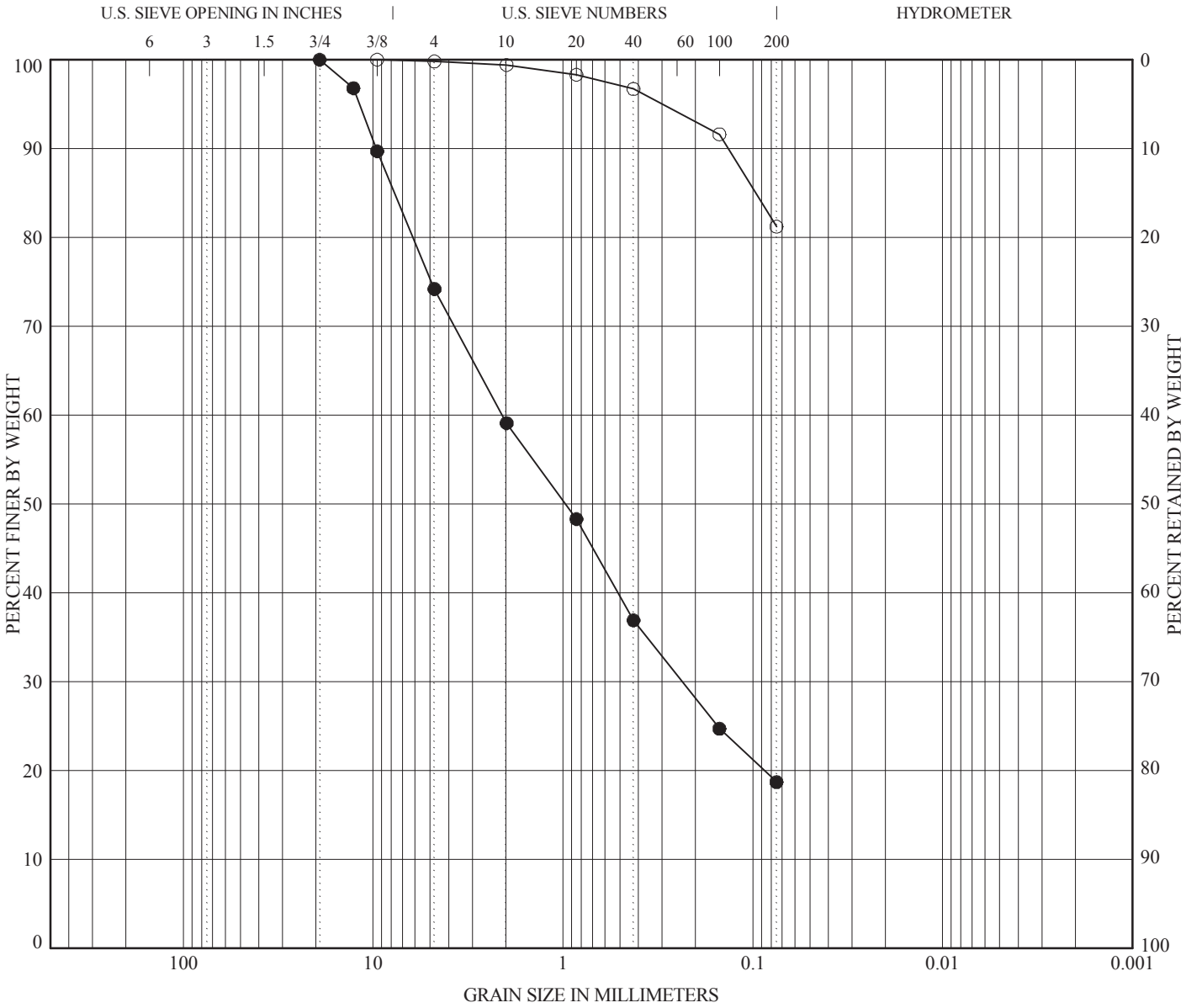
Prepared/Date: KC 6/14/2011
Checked/Date: JRG 6/27/2011

MTA Westside Subway Extension
Los Angeles, California

amec foster wheeler

PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: 5.1.1a

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\CONSTELLATION STATION GDR\4953-10-1561 (CONSTELLATION 20150528).GPJ 5/29/15



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-168	97.5	FAT CLAY with SAND (CH)	51	27	24	--	--
●	G-168	111.5	SILTY SAND with GRAVEL (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-168	97.5	9.52	--	--	--	0.2	18.6	81.2
●	G-168	111.5	19.10	2.086	0.236	--	25.8	55.5	18.7

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

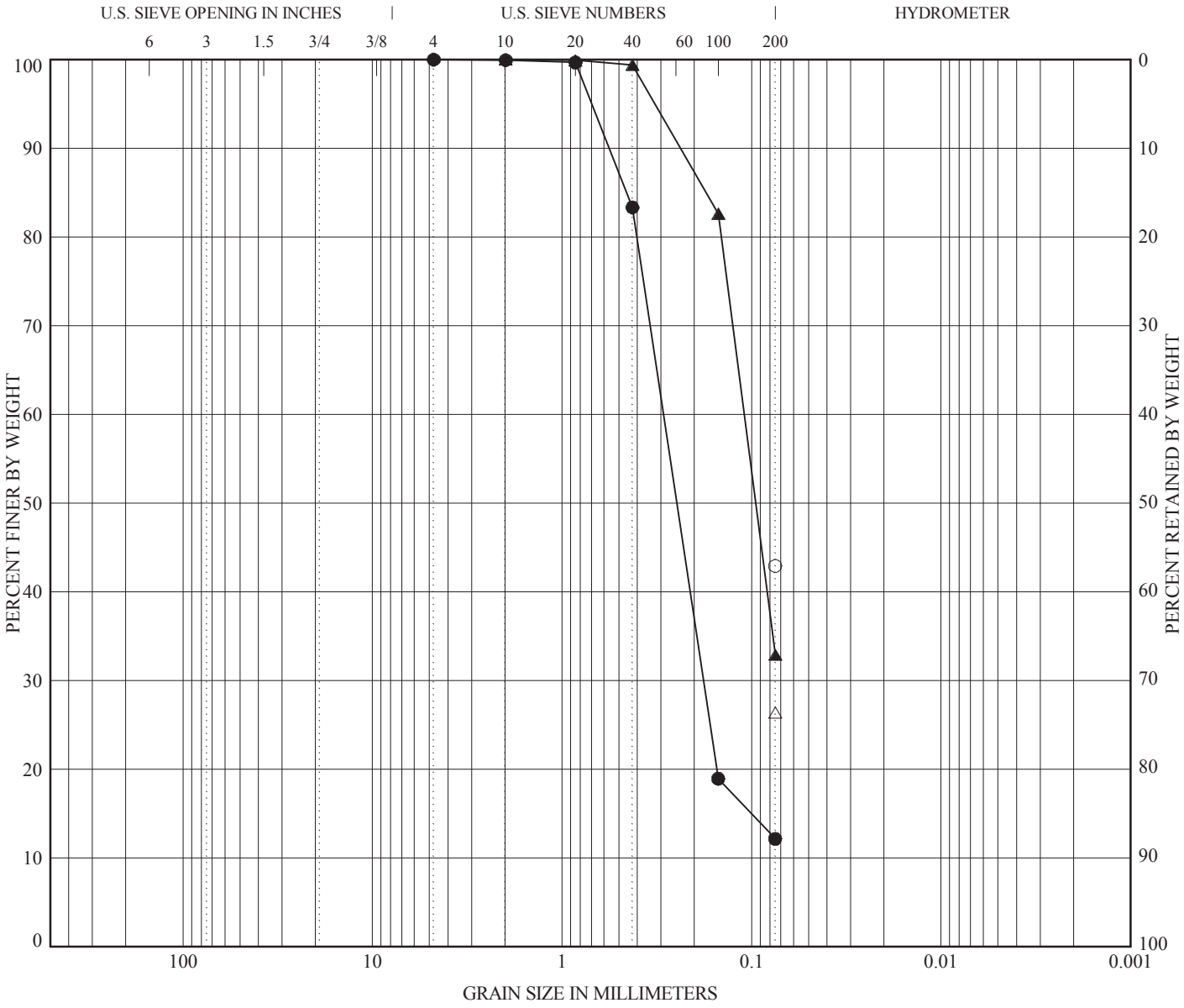
Prepared/Date: JF 6/14/2011
Checked/Date: JAG 6/27/2011

MTA Westside Subway Extension
Los Angeles, California

amec foster wheeler

PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.1.1b

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\CONSTELLATION STATION GDR\4953-10-1561 (CONSTELLATION 20150528).GPJ 5/29/15



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-169	32.5	SILTY SAND (SM)	--	--	--	--	--
●	G-169	38.5	POORLY GRADED SAND with SILT (SP-SM)	--	--	--	1.8	4.8
△	G-169	57.5	POORLY GRADED SAND with SILT (SP-SM)	--	--	--	--	--
▲	G-169	67.5	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-169	32.5	0.08	--	--	--	0.0	0.0	42.9
●	G-169	38.5	4.75	0.291	0.179	--	0.0	87.8	12.2
△	G-169	57.5	0.08	--	--	--	0.0	0.0	26.4
▲	G-169	67.5	1.98	0.109	--	--	0.0	67.1	32.9

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC 6/14/2011
Checked/Date: JRC 6/27/2011

MTA Westside Subway Extension
Los Angeles, California

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.1.2a

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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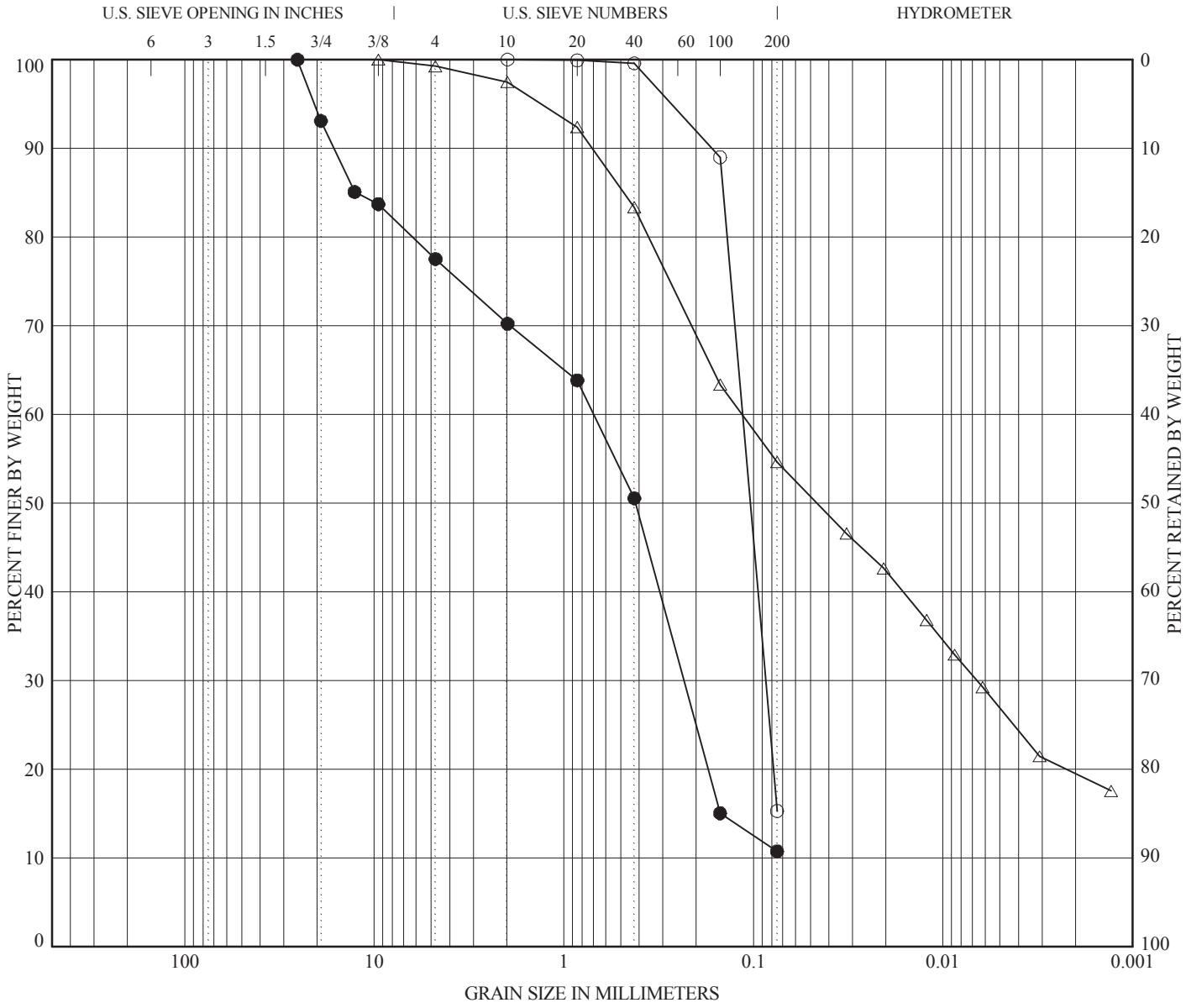

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-169	77.5	SILTY SAND (SM)	--	--	--	--	--
●	G-169	85.5	WELL GRADED SAND with SILT and GRAVEL (SW-SM)	--	--	--	1.2	10.5
△	G-169	95.5	SANDY LEAN CLAY (CL)	36	19	17	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-169	77.5	1.98	0.114	0.086	--	0.0	84.7	15.3
●	G-169	85.5	25.40	0.696	0.233	--	22.5	66.8	10.7
△	G-169	95.5	9.52	0.115	0.007	--	0.7	44.6	54.6

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: JF 6/14/2011
Checked/Date: JAG 6/27/2011

MTA Westside Subway Extension
Los Angeles, California

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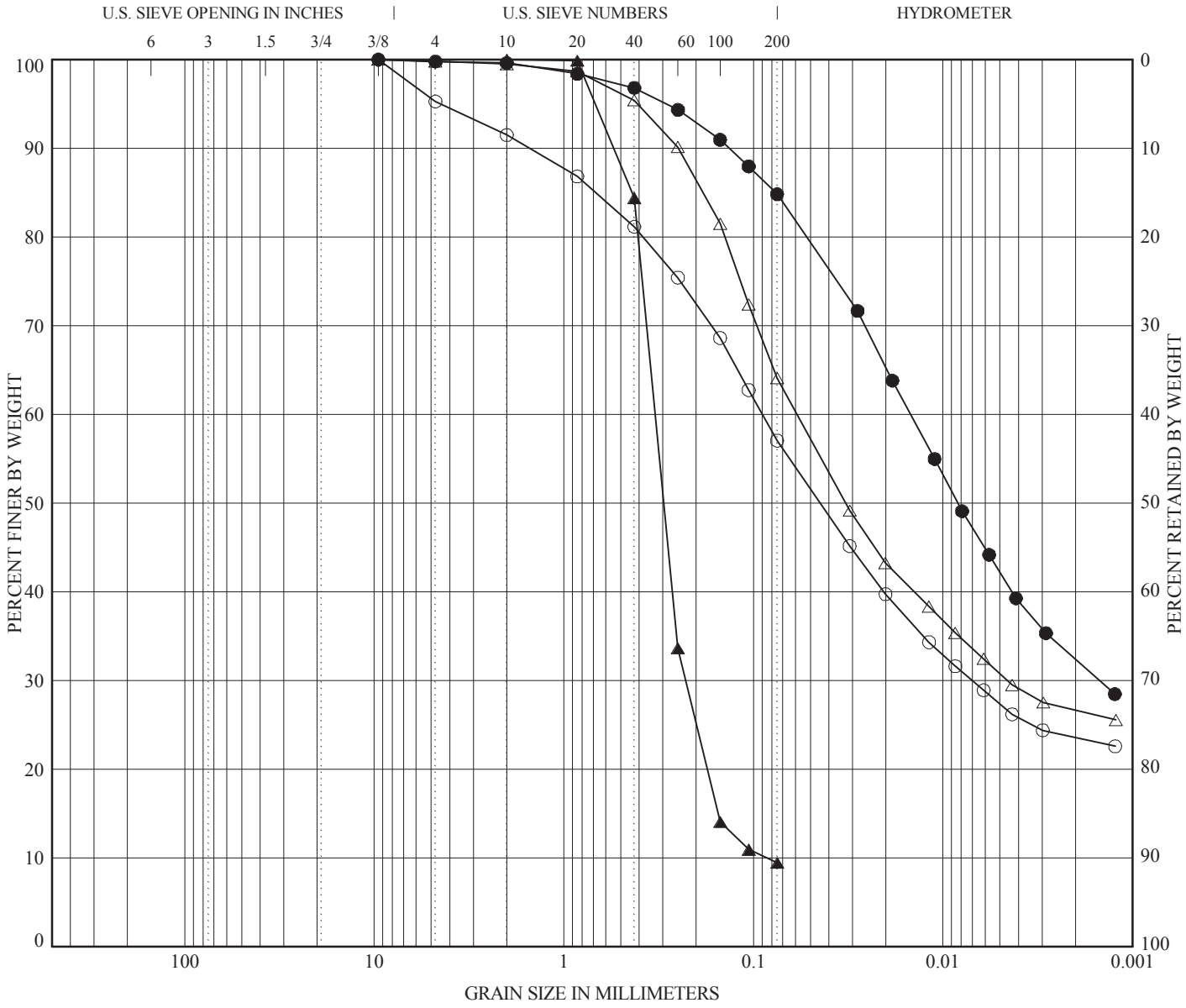
PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.1.2b

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\CONSTELLATION STATION GDR\4953-10-1561 (CONSTELLATION 20150528).GPJ 5/29/15



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	E-132B	10.5	Sandy LEAN CLAY (CL)	36	13	23	--	--
●	E-132B	20.5	FAY CLAY with SAND (CH)	53	14	39	--	--
△	E-132B	30.5	Sandy LEAN CLAY (CL)	44	13	31	--	--
▲	E-132B	50.5	POORLY GRADED SAND with SILT (SP-SM)	--	--	--	1.8	3.9

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	E-132B	10.5	9.50	0.090	0.007	--	4.7	38.2	57.0
●	E-132B	20.5	9.50	0.015	0.001	--	0.2	15.0	84.8
△	E-132B	30.5	9.50	0.059	0.005	--	0.2	35.7	64.1
▲	E-132B	50.5	2.00	0.329	0.227	0.085	0.0	90.5	9.5

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

MTA Westside Subway Extension
Los Angeles, California

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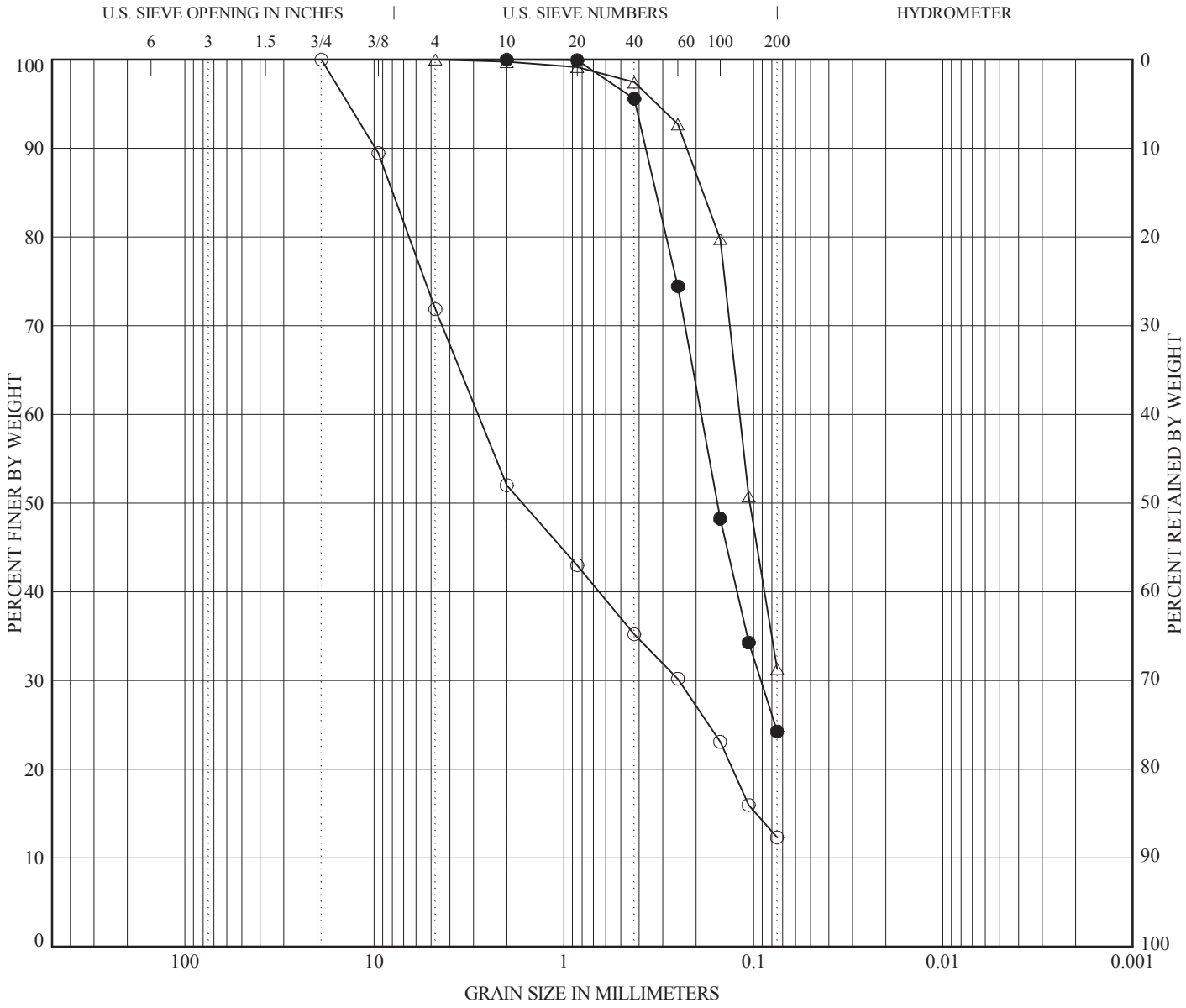
PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.1a

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\CONSTELLATION STATION GDR\4953-10-1561 (CONSTELLATION 20150528).GPJ 5/29/15



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	E-132B	60.5	POORLY GRADED SAND w/ SILT & GRAVEL (SP-SM)	--	--	--	0.4	47.1
●	E-132B	70.5	SILTY SAND (SM)	--	--	--	--	--
△	E-132B	80.5	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	E-132B	60.5	19.00	2.833	0.246	--	28.1	59.5	12.3
●	E-132B	70.5	2.00	0.189	0.091	--	0.0	75.7	24.3
△	E-132B	80.5	4.75	0.118	--	--	0.0	68.7	31.3

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

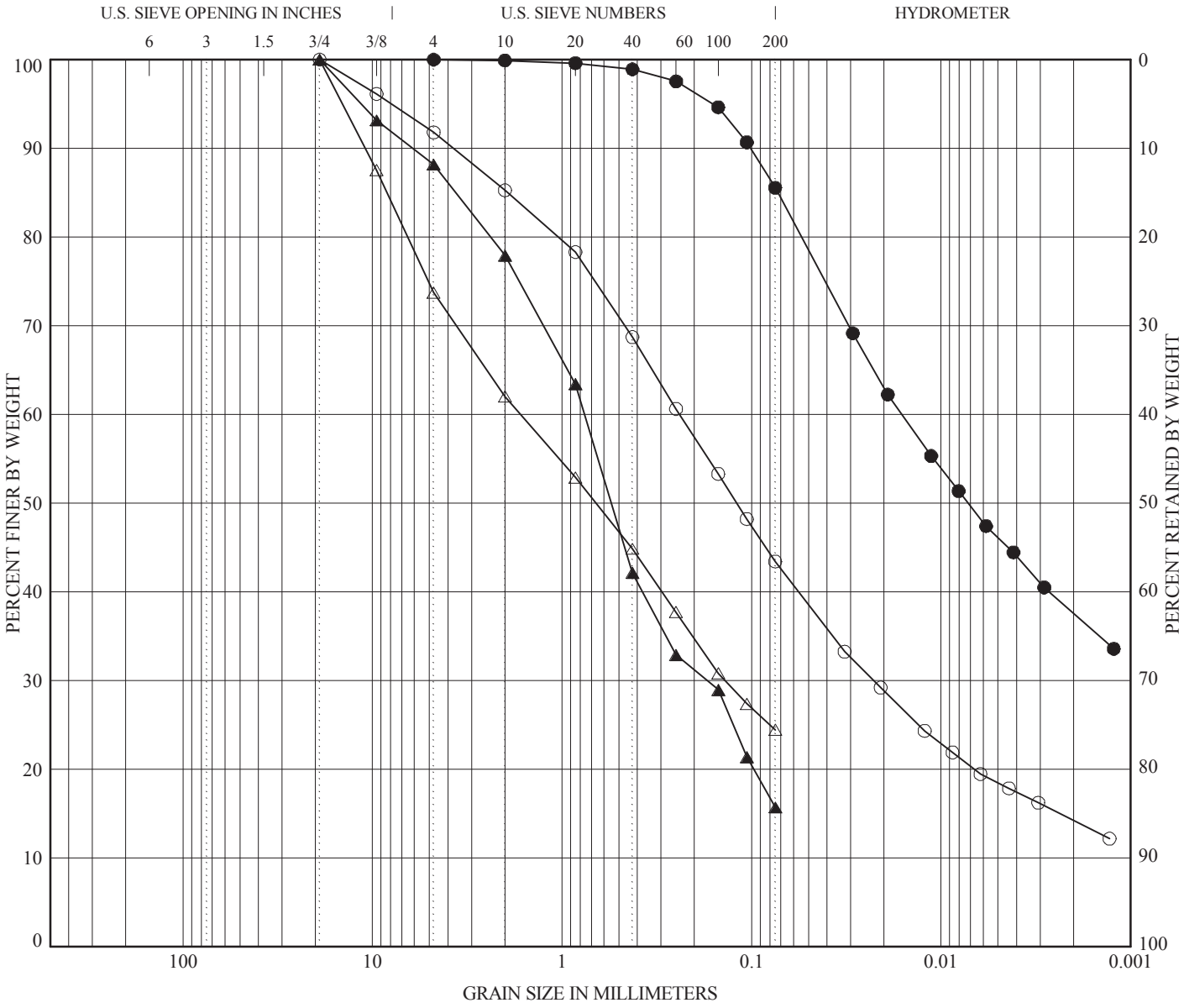
Prepared/Date: KC
Checked/Date: HP/DP

MTA Westside Subway Extension
Los Angeles, California

amec foster wheeler

PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.1b

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\CONSTELLATION STATION GDR\4953-10-1561 (CONSTELLATION 20150528).GPJ 5/29/15



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	E-132C/M-408	10.5	CLAYEY SAND (SC)	37	13	24	--	--
●	E-132C/M-408	30.5	FAT CLAY (CH)	52	15	37	--	--
△	E-132C/M-408	50.5	SILTY SAND with GRAVEL (SM)	--	--	--	--	--
▲	E-132C/M-408	55.5	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	E-132C/M-408	10.5	19.00	0.239	0.023	--	8.2	48.4	43.4
●	E-132C/M-408	30.5	4.75	0.016	--	--	0.0	14.4	85.6
△	E-132C/M-408	50.5	19.00	1.656	0.138	--	26.3	49.3	24.4
▲	E-132C/M-408	55.5	19.00	0.761	0.172	--	11.8	72.5	15.7

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

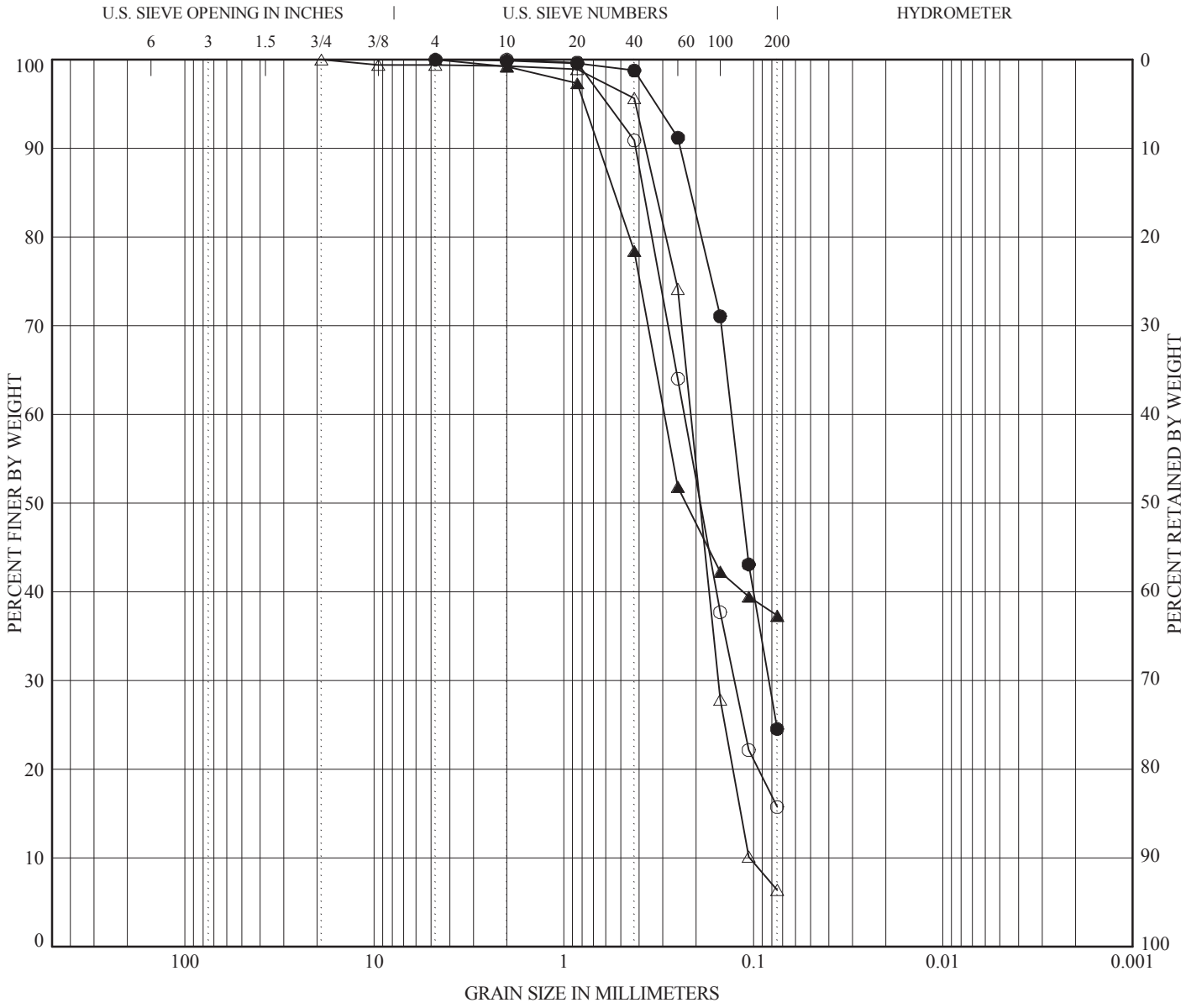
Prepared/Date: KC
Checked/Date: HP/DP

MTA Westside Subway Extension
Los Angeles, California

amec foster wheeler

PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.2a

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\CONSTELLATION STATION GDR\4953-10-1561 (CONSTELLATION 20150528).GPJ 5/29/15



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	E-132C/M-408	63.0	SILTY SAND (SM)	--	--	--	--	--
●	E-132C/M-408	68.0	SILTY SAND (SM)	--	--	--	--	--
△	E-132C/M-408	83.0	POORLY GRADED SAND with SILT (SP-SM)	--	--	--	1.1	2.0
▲	E-132C/M-408	93.0	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	E-132C/M-408	63.0	2.00	0.231	0.126	--	0.0	84.3	15.7
●	E-132C/M-408	68.0	4.75	0.131	0.083	--	0.0	75.5	24.5
△	E-132C/M-408	83.0	19.00	0.214	0.154	0.105	0.6	93.0	6.4
▲	E-132C/M-408	93.0	4.75	0.294	--	--	0.0	62.7	37.3

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

MTA Westside Subway Extension
Los Angeles, California

amec foster wheeler

PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.2b

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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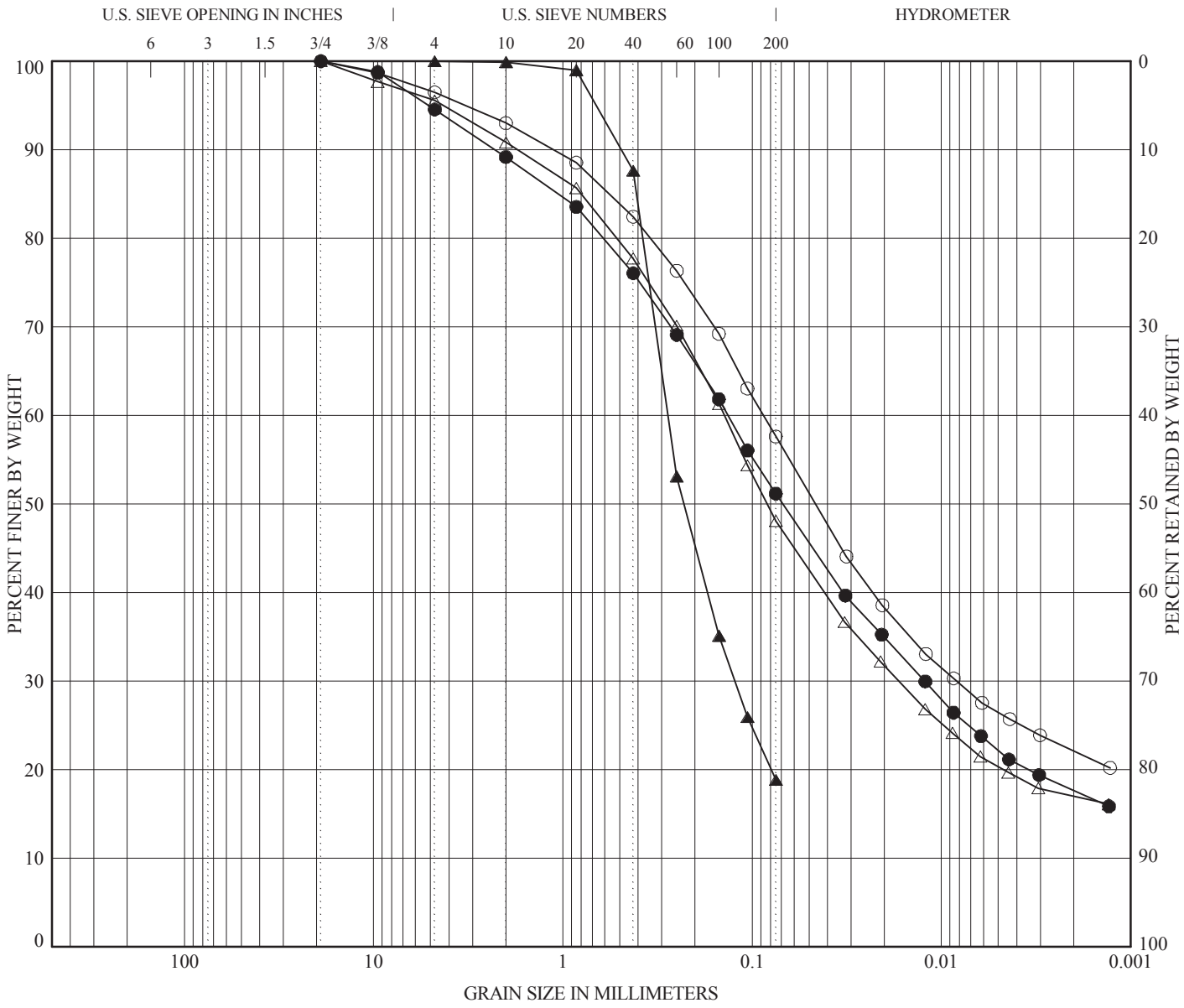

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	E-133A/M-409	10.5	Sandy LEAN CLAY (CL)	38	13	25	--	--
●	E-133A/M-409	20.5	Sandy LEAN CLAY (CL)	36	13	23	--	--
△	E-133A/M-409	30.5	CLAYEY SAND (SC)	33	12	21	--	--
▲	E-133A/M-409	40.5	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	E-133A/M-409	10.5	19.00	0.087	0.008	--	3.5	38.9	57.6
●	E-133A/M-409	20.5	19.00	0.134	0.012	--	5.5	43.4	51.2
△	E-133A/M-409	30.5	19.00	0.141	0.017	--	4.4	47.5	48.1
▲	E-133A/M-409	40.5	4.75	0.278	0.124	--	0.0	81.2	18.8

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

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Los Angeles, California

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.3a

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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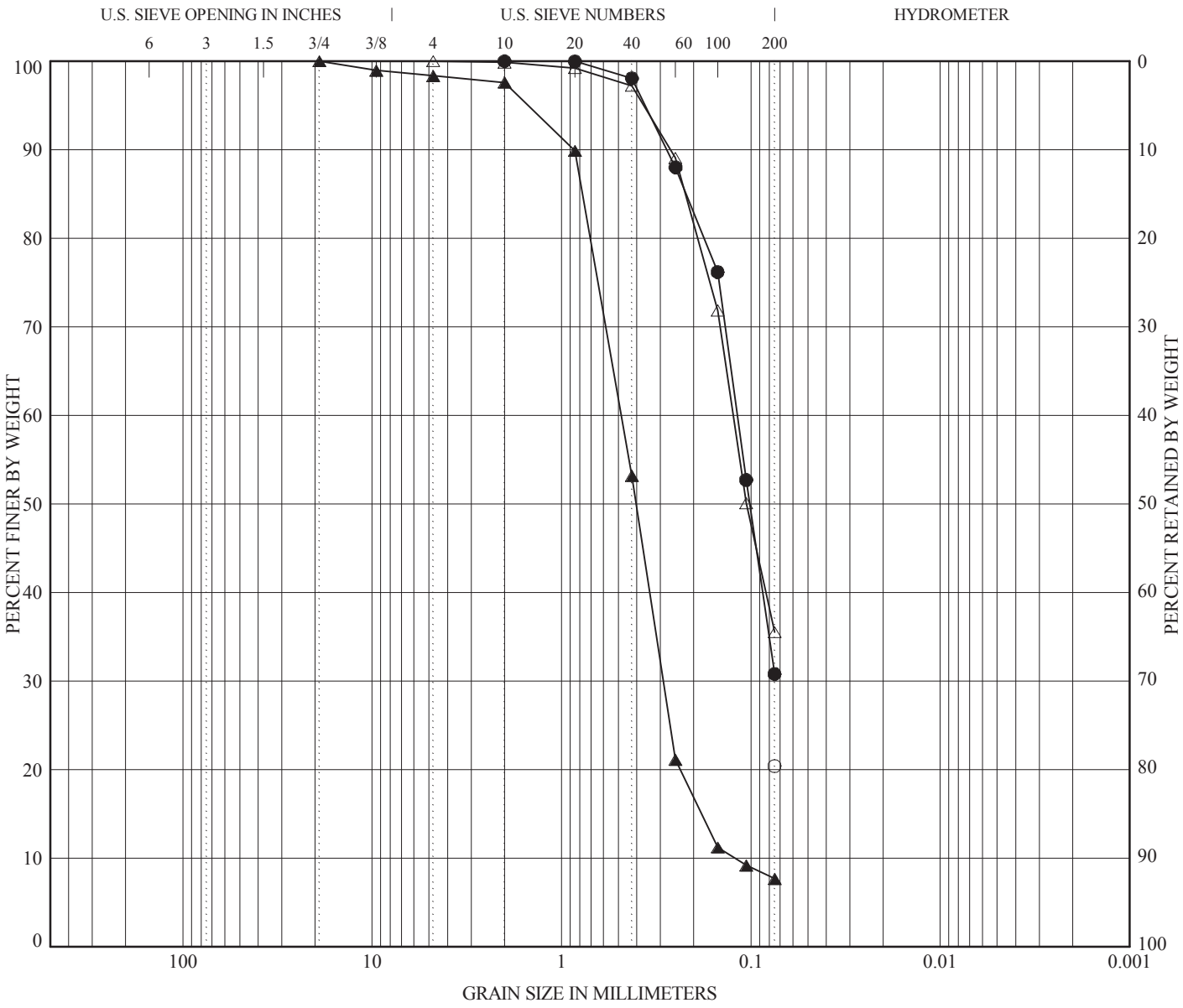

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	E-133A/M-409	55.5	SILTY SAND (SM)	--	--	--	--	--
●	E-133A/M-409	60.5	SILTY SAND (SM)	--	--	--	--	--
△	E-133A/M-409	70.5	SILTY SAND (SM)	--	--	--	--	--
▲	E-133A/M-409	80.5	POORLY GRADED SAND with SILT (SP-SM)	--	--	--	1.4	4.0

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	E-133A/M-409	55.5	0.08	--	--	--	0.0	0.0	20.4
●	E-133A/M-409	60.5	2.00	0.118	--	--	0.0	69.2	30.8
△	E-133A/M-409	70.5	4.75	0.124	--	--	0.0	64.5	35.5
▲	E-133A/M-409	80.5	19.00	0.483	0.289	0.122	1.7	90.7	7.7

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.3b

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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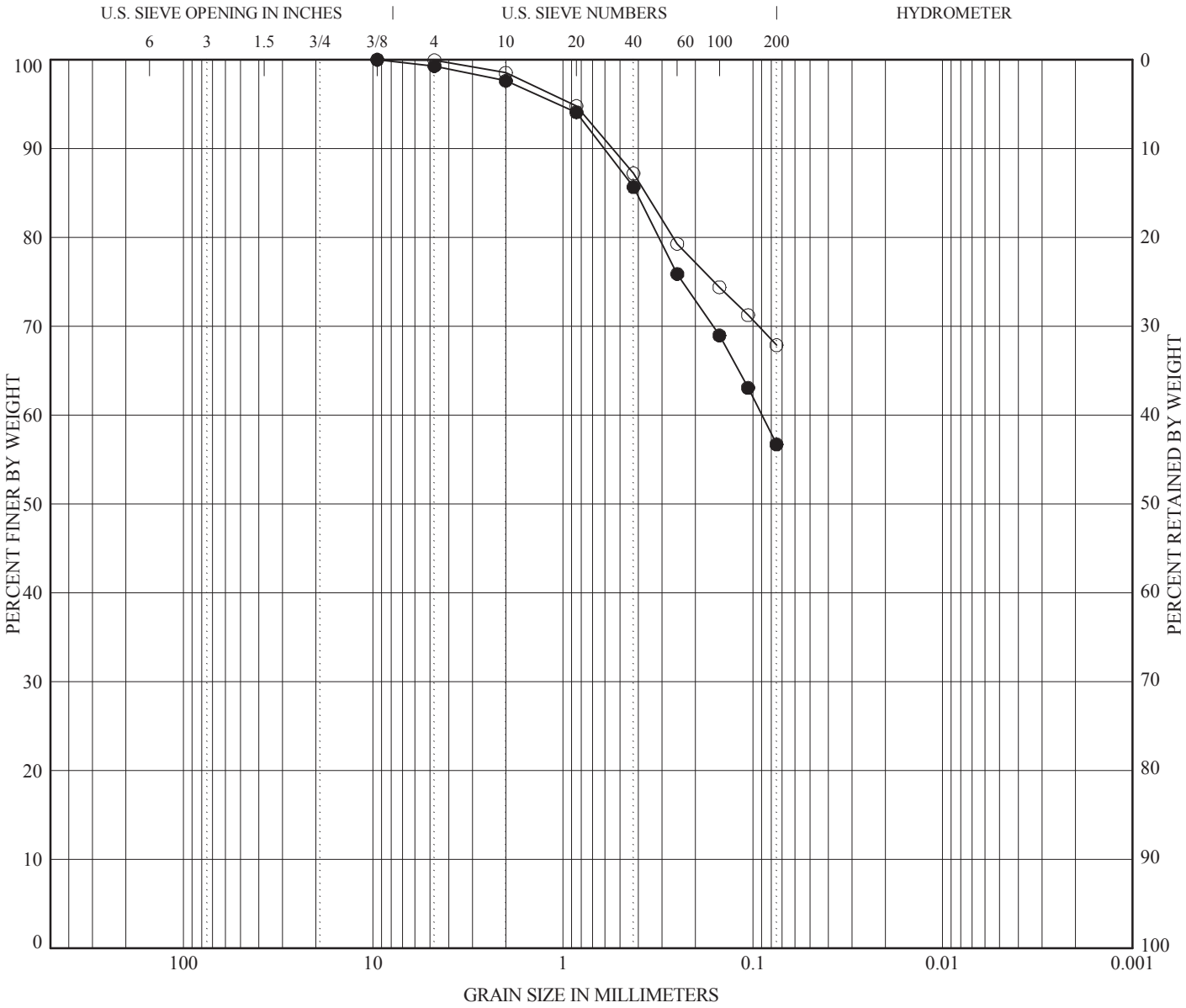

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	E-133A/M-409	100.5	Sandy LEAN CLAY (CL)	--	--	--	--	--
●	E-133A/M-409	110.0	Sandy LEAN CLAY (CL)	40	16	24	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	E-133A/M-409	100.5	9.50	--	--	--	0.1	32.1	67.9
●	E-133A/M-409	110.0	9.50	0.090	--	--	0.7	42.6	56.7

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

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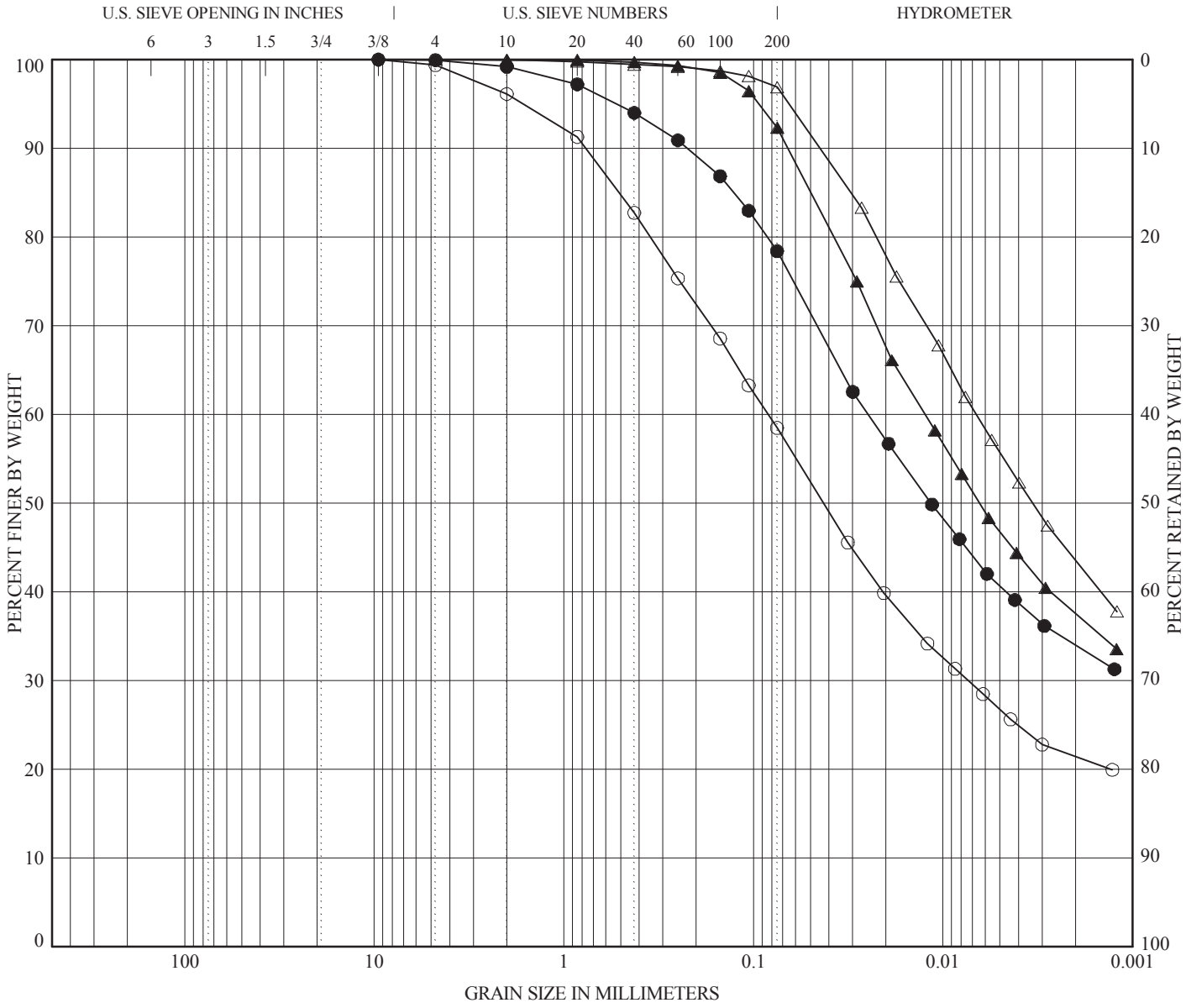
PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.3c

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\CONSTELLATION STATION GDR\4953-10-1561 (CONSTELLATION 20150528).GPJ 5/29/15



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-412/M-407/E-132A	10.5	Sandy LEAN CLAY (CL)	--	--	--	--	--
●	G-412/M-407/E-132A	15.5	Sandy LEAN CLAY (CL)	43	12	31	--	--
△	G-412/M-407/E-132A	25.5	FAT CLAY (CH)	71	18	53	--	--
▲	G-412/M-407/E-132A	43.0	FAT CLAY (CH)	60	17	43	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-412/M-407/E-132A	10.5	9.50	0.084	0.007	--	0.6	40.9	58.5
●	G-412/M-407/E-132A	15.5	9.50	0.025	--	--	0.1	21.5	78.4
△	G-412/M-407/E-132A	25.5	2.00	0.007	--	--	0.0	3.1	96.9
▲	G-412/M-407/E-132A	43.0	4.75	0.012	--	--	0.0	7.7	92.3

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.4a

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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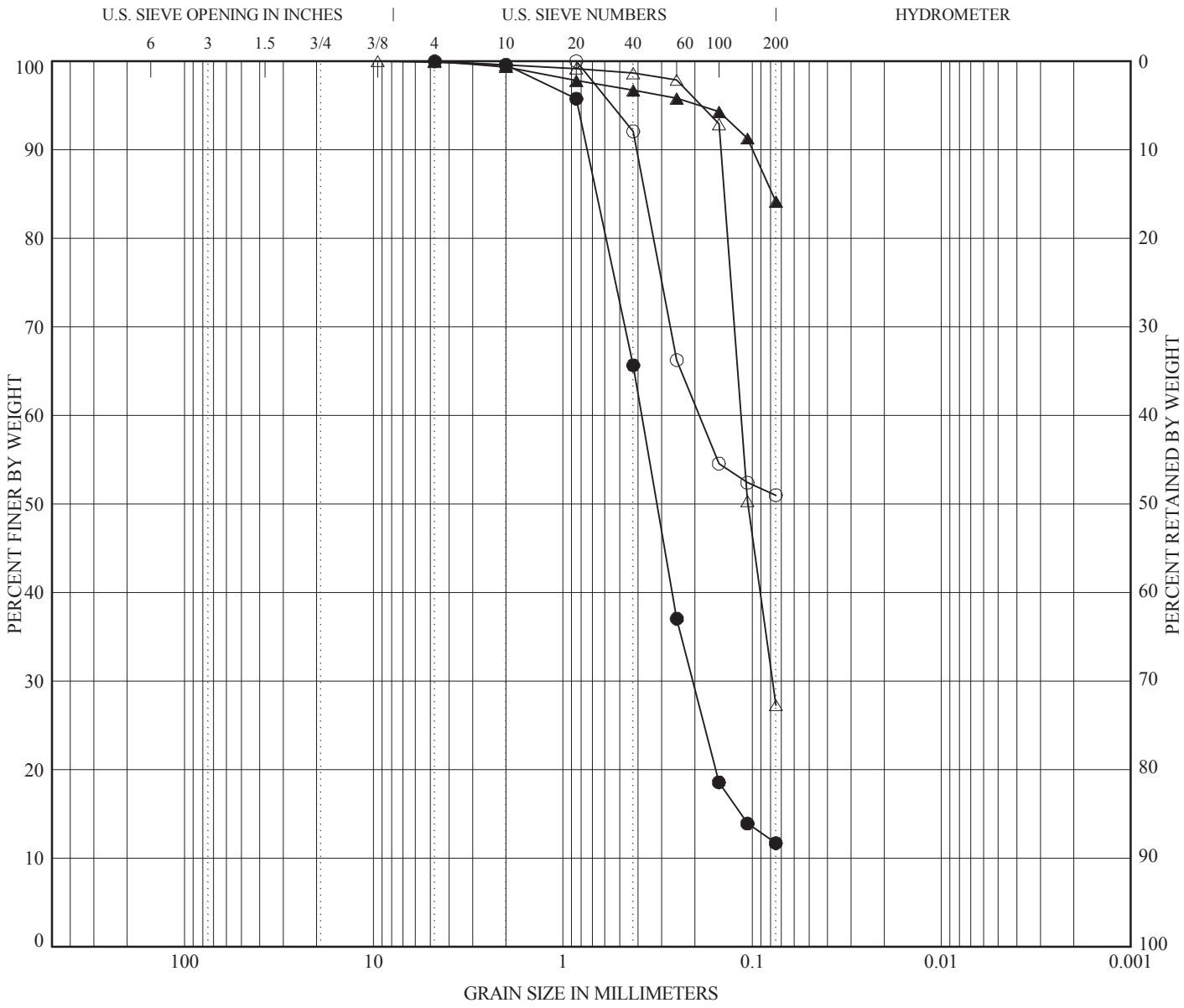

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-412/M-407/E-132A	48.0	Sandy LEAN CLAY (CL)	34	8	26	--	--
●	G-412/M-407/E-132A	58.0	WELL GRADED SAND with SILT (SW-SM)	--	--	--	1.9	6.7
△	G-412/M-407/E-132A	68.0	SILTY SAND (SM)	--	--	--	--	--
▲	G-412/M-407/E-132A	75.5	SILT with SAND (ML)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-412/M-407/E-132A	48.0	0.85	0.190	--	--	0.0	49.0	51.0
●	G-412/M-407/E-132A	58.0	4.75	0.383	0.206	--	0.0	88.3	11.7
△	G-412/M-407/E-132A	68.0	9.50	0.115	0.078	--	0.1	72.6	27.3
▲	G-412/M-407/E-132A	75.5	4.75	--	--	--	0.0	15.9	84.1

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.4b

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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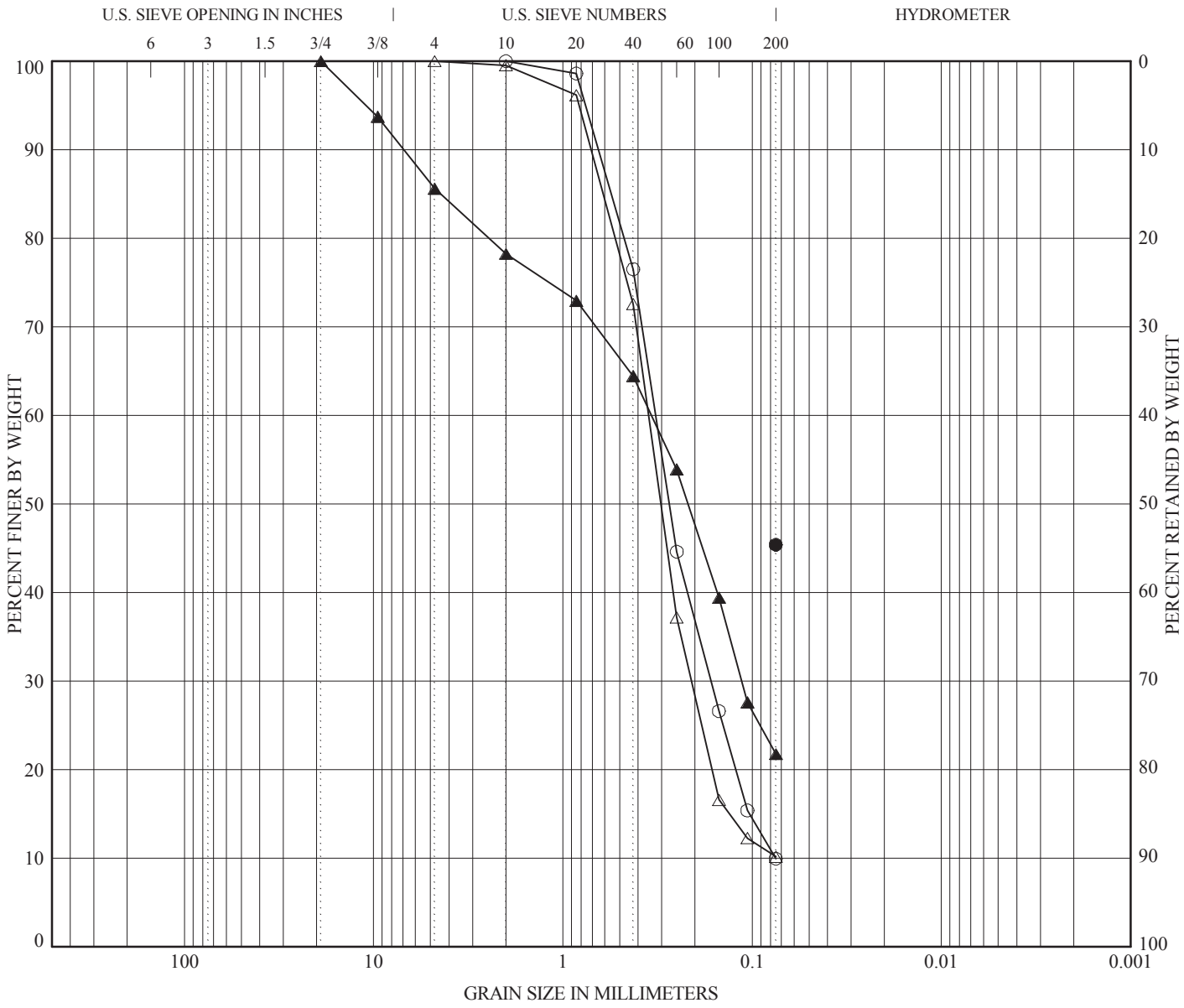

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-412/M-407/E-132A	83.0	POORLY GRADED SAND with SILT (SP-SM)	--	--	--	1.1	4.3
●	G-412/M-407/E-132A	88.0	SILTY SAND (SM)	--	--	--	--	--
△	G-412/M-407/E-132A	90.5	POORLY GRADED SAND with SILT (SP-SM)	--	--	--	1.7	4.8
▲	G-412/M-407/E-132A	95.0	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-412/M-407/E-132A	83.0	2.00	0.323	0.165	0.075	0.0	90.1	9.9
●	G-412/M-407/E-132A	88.0	0.08	--	--	--	0.0	0.0	45.4
△	G-412/M-407/E-132A	90.5	4.75	0.352	0.209	--	0.0	89.8	10.2
▲	G-412/M-407/E-132A	95.0	19.00	0.340	0.114	--	14.4	63.9	21.8

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

MTA Westside Subway Extension
Los Angeles, California

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.4c

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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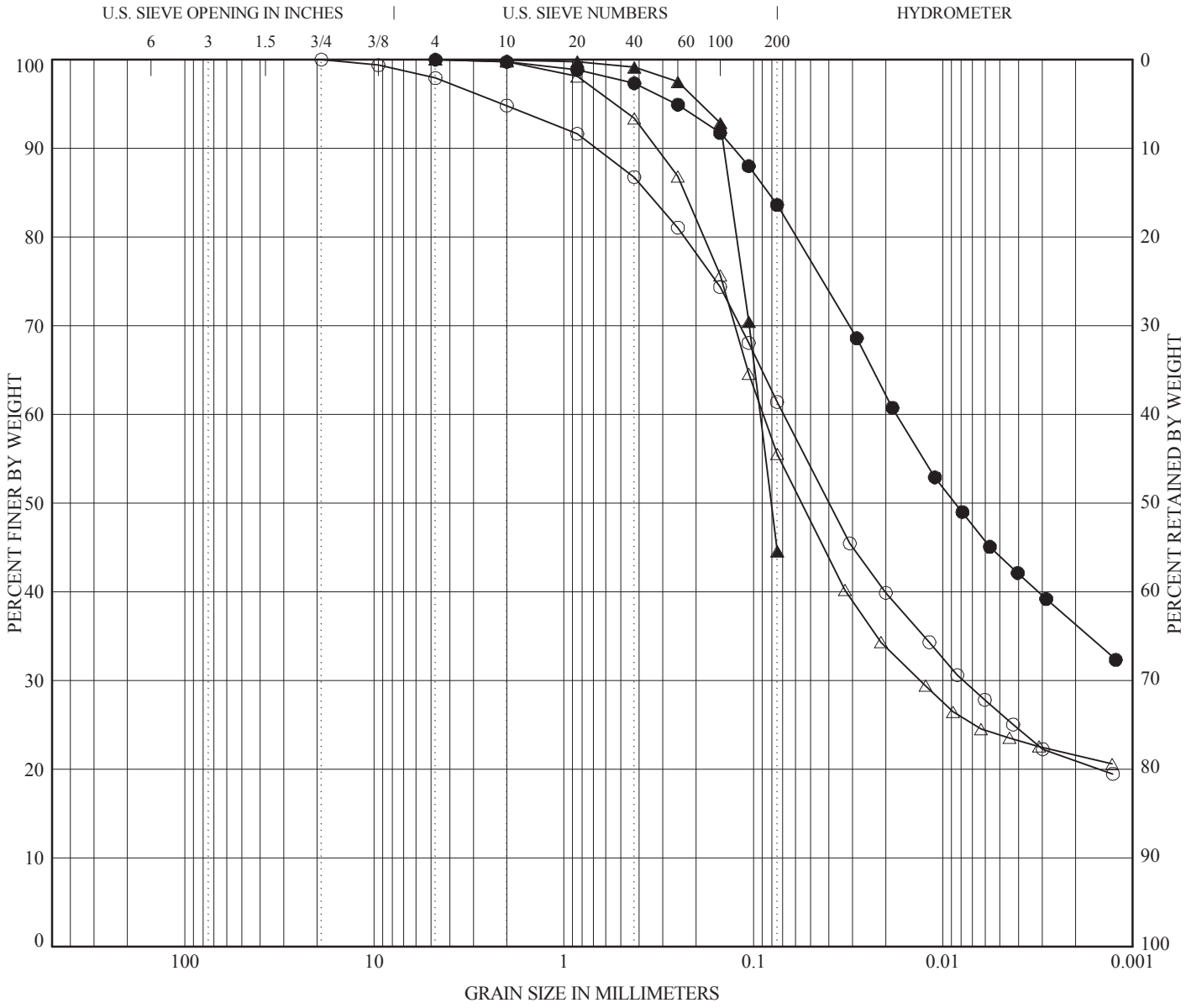

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-413	9.5	Sandy LEAN CLAY (CL)	40	14	26	--	--
●	G-413	18.5	LEAN CLAY with SAND (CL)	48	13	35	--	--
△	G-413	24.5	Sandy LEAN CLAY (CL)	32	12	20	--	--
▲	G-413	35.5	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-413	9.5	19.00	0.069	0.008	--	2.1	36.5	61.4
●	G-413	18.5	4.75	0.018	--	--	0.0	16.4	83.6
△	G-413	24.5	4.75	0.089	0.013	--	0.0	44.5	55.5
▲	G-413	35.5	4.75	0.092	--	--	0.0	55.4	44.6

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

MTA Westside Subway Extension
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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.5a

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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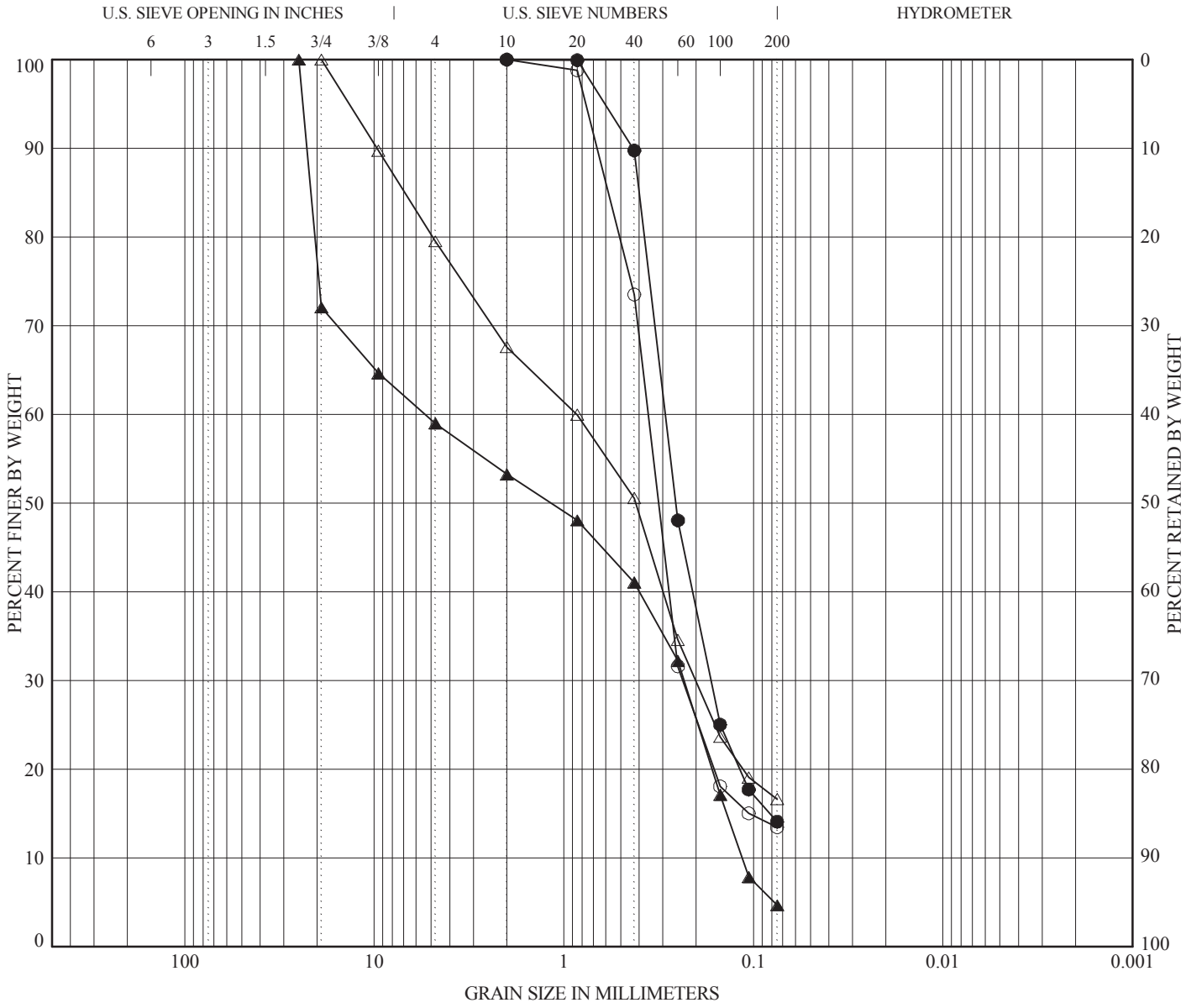

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-413	45.5	SILTY SAND (SM)	--	--	--	--	--
●	G-413	65.5	SILTY SAND (SM)	--	--	--	--	--
△	G-413	85.5	SILTY SAND with GRAVEL (SM)	--	--	--	--	--
▲	G-413	105.5	POORLY GRADED SAND w/ SILT & GRAVEL (SP-SM)	--	--	--	0.1	46.8

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-413	45.5	2.00	0.358	0.235	--	0.0	86.5	13.5
●	G-413	65.5	2.00	0.291	0.167	--	0.0	85.9	14.1
△	G-413	85.5	19.00	0.855	0.202	--	20.5	62.9	16.6
▲	G-413	105.5	25.00	5.375	0.232	0.115	41.0	54.3	4.7

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.5b

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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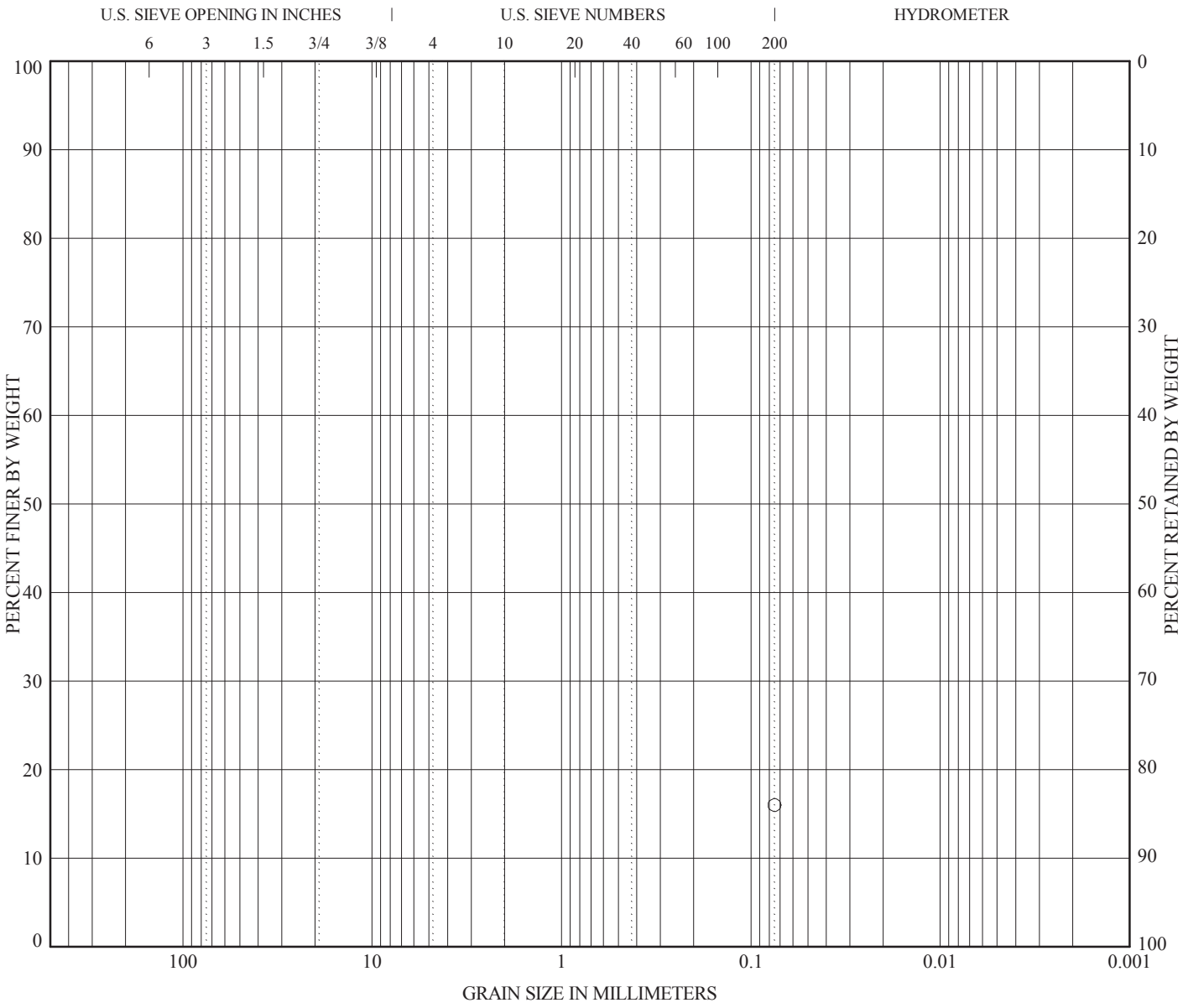

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-413	115.5	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-413	115.5	0.08	--	--	--	0.0	0.0	16.0

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.5c

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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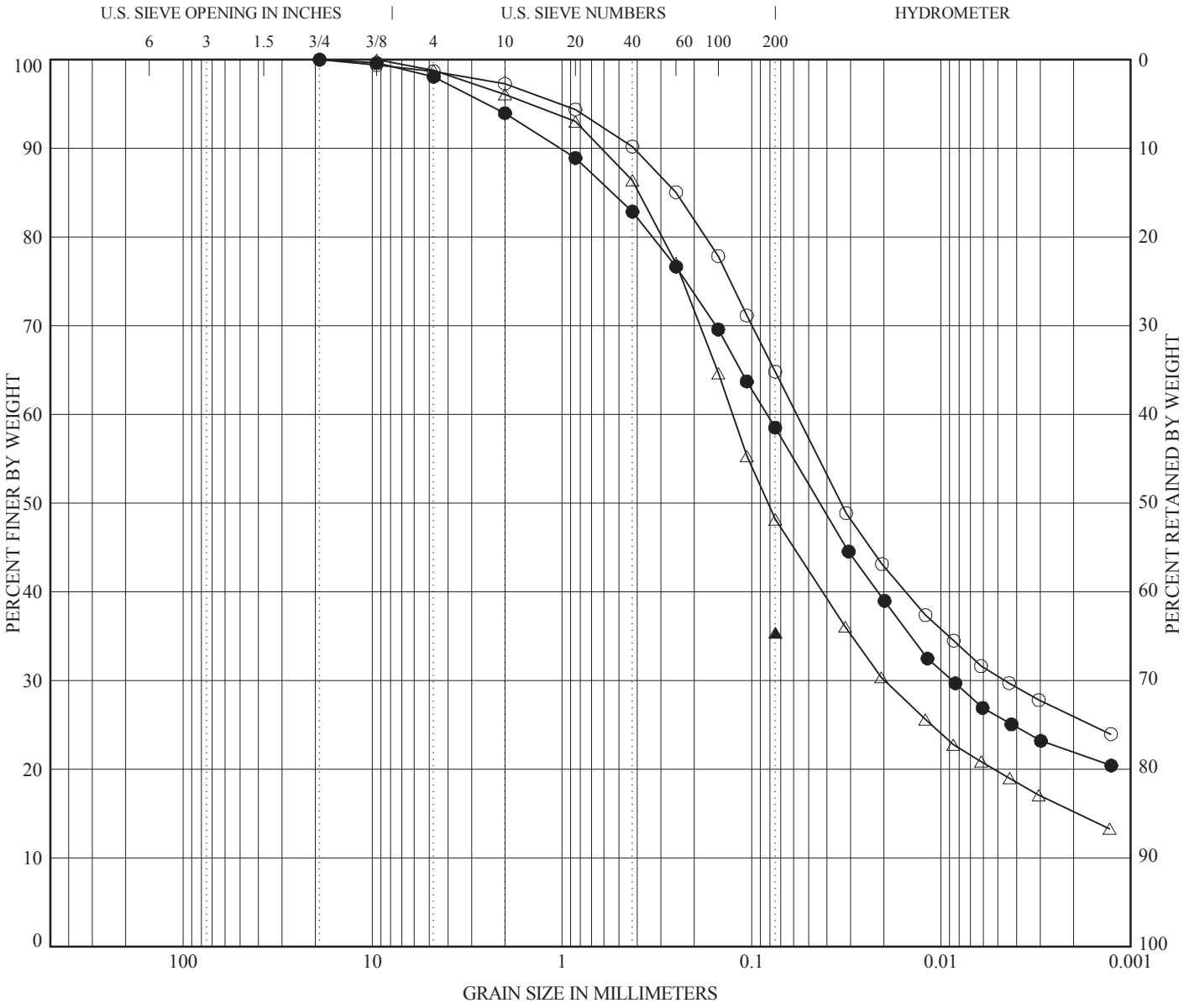

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-414/M-410	15.5	Sandy LEAN CLAY (CL)	37	12	25	--	--
●	G-414/M-410	25.5	Sandy LEAN CLAY (CL)	37	12	25	--	--
△	G-414/M-410	35.5	CLAYEY SAND (SC)	27	13	14	--	--
▲	G-414/M-410	45.5	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-414/M-410	15.5	19.00	0.058	0.005	--	1.3	33.9	64.8
●	G-414/M-410	25.5	19.00	0.083	0.009	--	1.9	39.6	58.5
△	G-414/M-410	35.5	9.50	0.126	0.020	--	1.2	50.7	48.2
▲	G-414/M-410	45.5	0.08	--	--	--	0.0	0.0	35.4

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.6a

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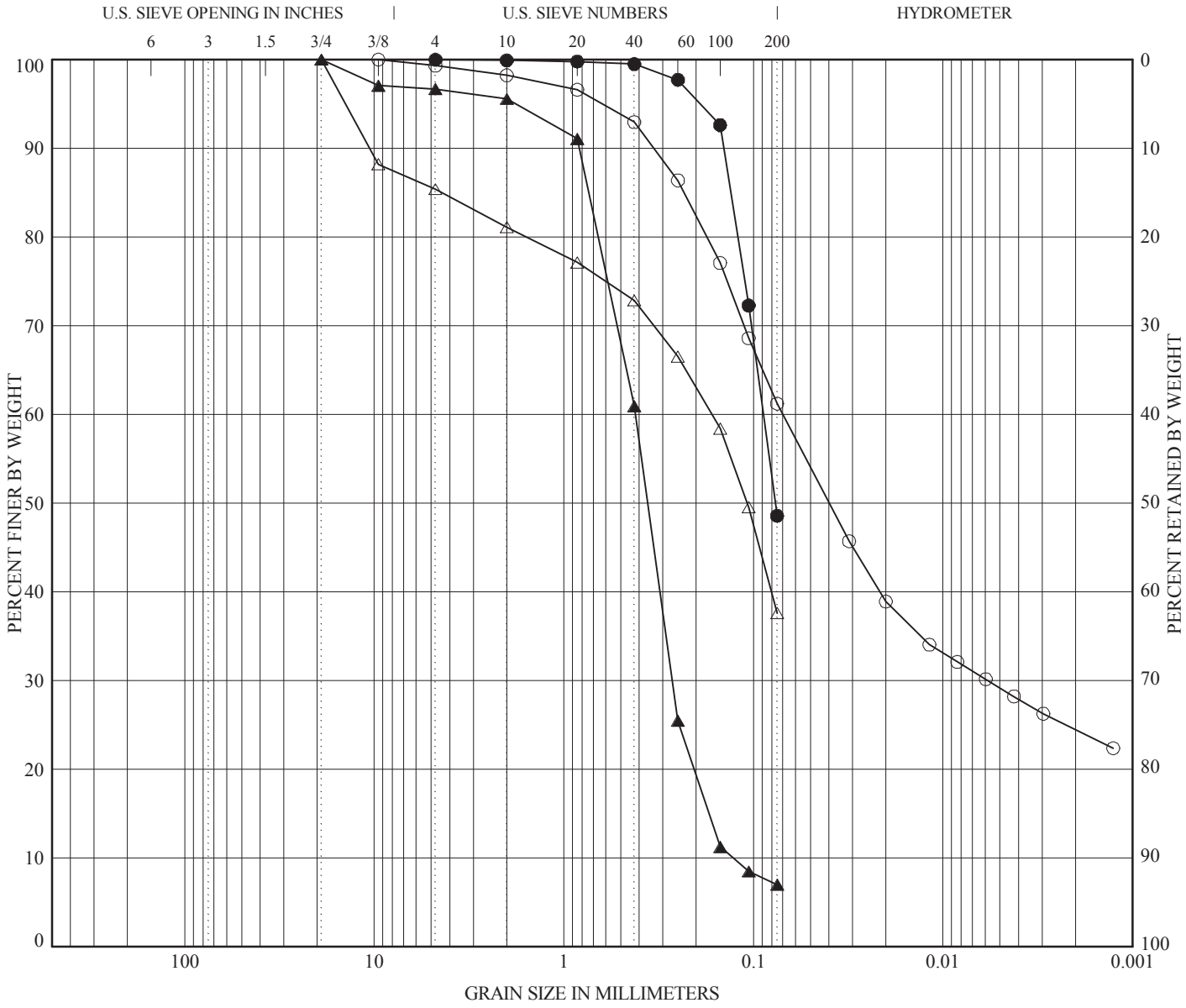

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-414/M-410	51.5	Sandy LEAN CLAY (CL)	34	12	22	--	--
●	G-414/M-410	60.5	SILTY SAND (SM)	--	--	--	--	--
△	G-414/M-410	72.5	SILTY SAND with GRAVEL (SM)	--	--	--	--	--
▲	G-414/M-410	90.5	POORLY GRADED SAND with SILT (SP-SM)	--	--	--	1.3	3.3

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-414/M-410	51.5	9.50	0.070	0.006	--	0.7	38.1	61.2
●	G-414/M-410	60.5	4.75	0.089	--	--	0.0	51.4	48.6
△	G-414/M-410	72.5	19.00	0.166	--	--	14.6	47.8	37.6
▲	G-414/M-410	90.5	19.00	0.419	0.267	0.128	3.3	89.7	7.0

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

MTA Westside Subway Extension
Los Angeles, California

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.6b

MACTEC LA GRAIN SIZE C:\USERS\KYLE CRONIN\GOOGLE DRIVE\2015-105-010 PURPLE LINE EXTENSION\GINT\LIBRARY AMEC JUNE2012.GLB
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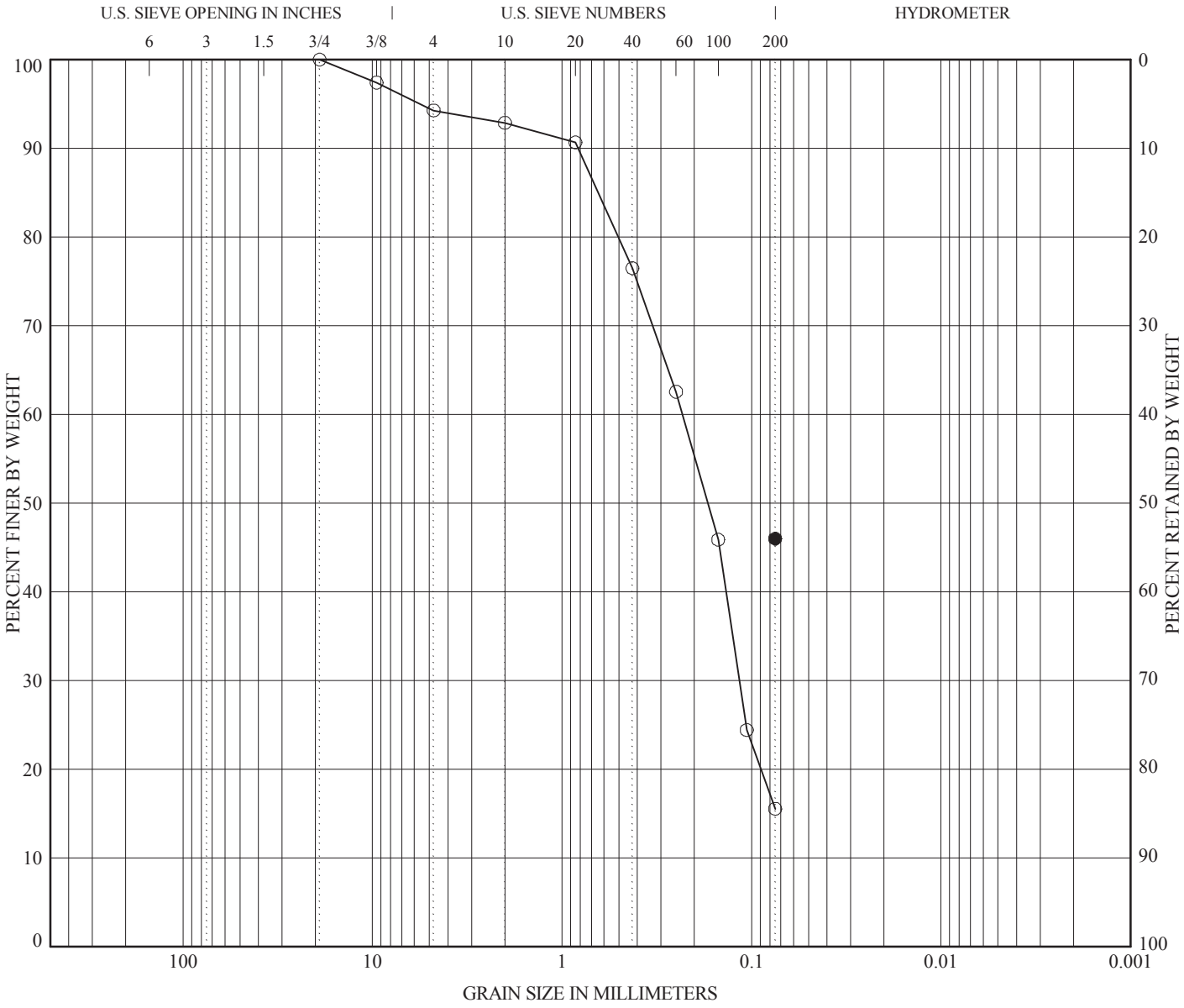

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-414/M-410	99.5	SILTY SAND (SM)	--	--	--	--	--
●	G-414/M-410	114.5	SILTY SAND (SM)	--	--	--	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-414/M-410	99.5	19.00	0.231	0.116	--	5.7	78.7	15.5
●	G-414/M-410	114.5	0.08	--	--	--	0.0	0.0	46.0

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

MTA Westside Subway Extension
Los Angeles, California

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.6c

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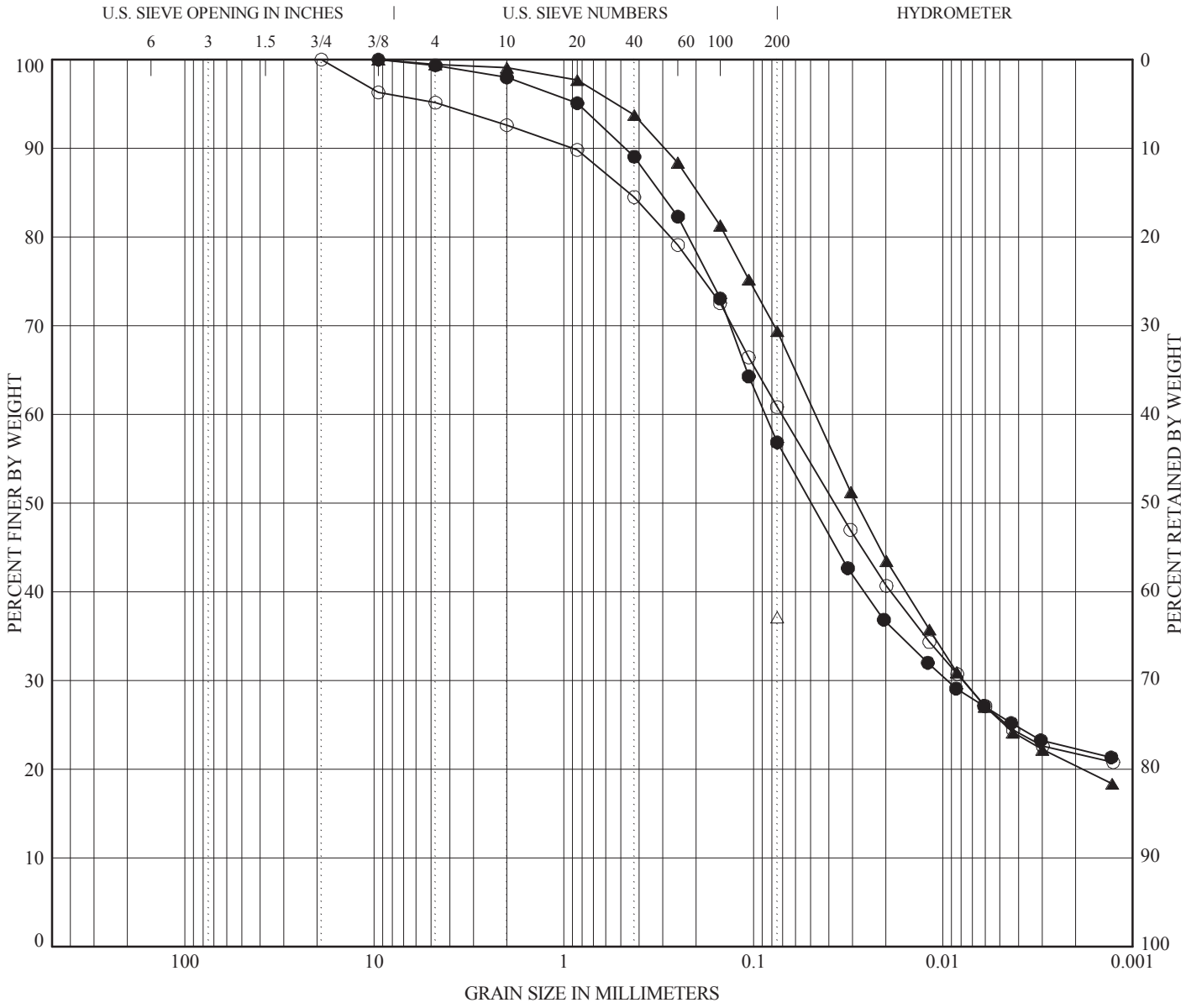

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-415	9.5	Sandy LEAN CLAY (CL)	38	12	26	--	--
●	G-415	25.5	Sandy LEAN CLAY (CL)	35	11	24	--	--
△	G-415	34.5	CLAYEY SAND (SC)	--	--	--	--	--
▲	G-415	37.5	Sandy LEAN CLAY (CL)	36	14	22	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-415	9.5	19.00	0.071	0.008	--	4.9	34.3	60.8
●	G-415	25.5	9.50	0.087	0.009	--	0.6	42.5	56.8
△	G-415	34.5	0.08	--	--	--	0.0	0.0	37.1
▲	G-415	37.5	9.50	0.047	0.008	--	0.5	30.1	69.4

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
Checked/Date: HP/DP

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.7a

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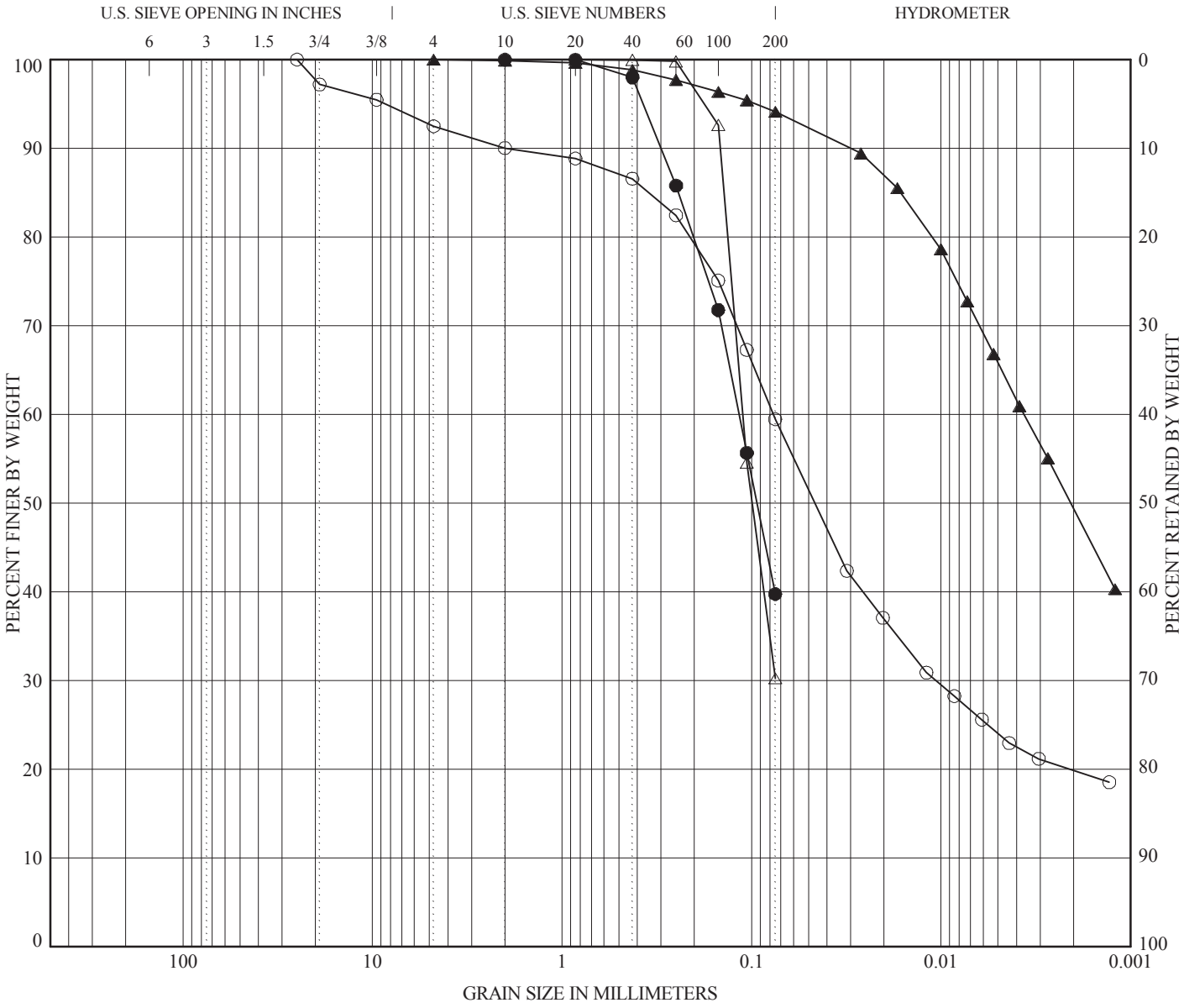

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-415	60.5	Sandy LEAN CLAY (CL)	30	12	18	--	--
●	G-415	65.5	SILTY SAND (SM)	--	--	--	--	--
△	G-415	80.5	SILTY SAND (SM)	--	--	--	--	--
▲	G-415	90.5	FAT CLAY (CH)	75	21	54	--	--

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-415	60.5	25.00	0.077	0.011	--	7.5	33.0	59.5
●	G-415	65.5	2.00	0.116	--	--	0.0	60.2	39.8
△	G-415	80.5	0.85	0.111	--	--	0.0	69.8	30.2
▲	G-415	90.5	4.75	0.004	--	--	0.0	5.9	94.1

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

Prepared/Date: KC
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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.7b

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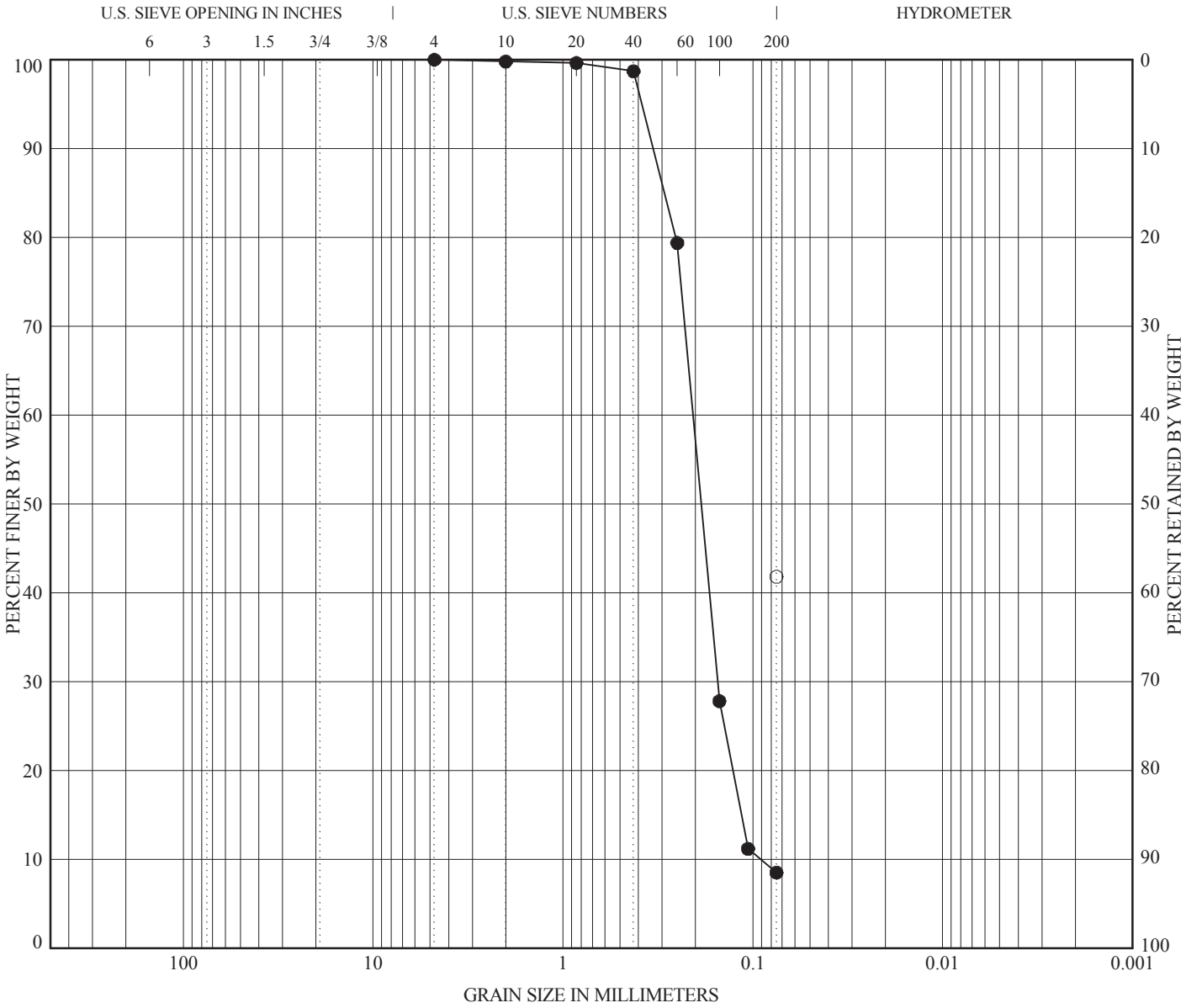

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION	LL (%)*	PL (%)*	PI (%)*	C_c	C_u
○	G-415	95.5	SILTY SAND (SM)	--	--	--	--	--
●	G-415	100.5	POORLY GRADED SAND with SILT (SP-SM)	--	--	--	1.3	2.3

SYMBOL	BORING	DEPTH (ft)	D_{100} (mm)	D_{60} (mm)	D_{30} (mm)	D_{10} (mm)	% Gravel	% Sand	% Silt or % Clay
○	G-415	95.5	0.08	--	--	--	0.0	0.0	41.8
●	G-415	100.5	4.75	0.206	0.153	0.091	0.0	91.5	8.5

Laboratory Test Method: ASTM D 422

*As determined by ASTM D 4318; see attached Atterberg Limits Test Results.

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PARTICLE SIZE DISTRIBUTION
Project No.: 4953-11-1423
Figure: D-5.2.7c

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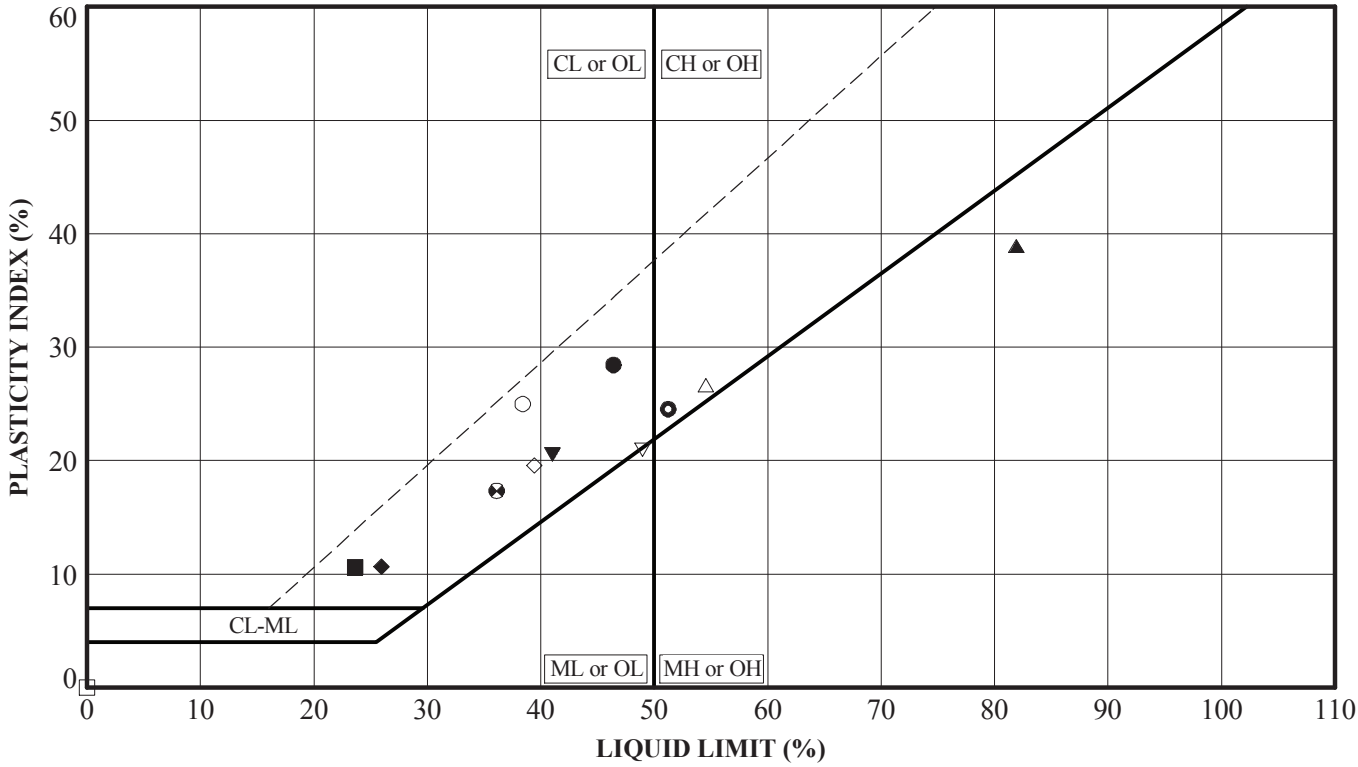

SYMBOL	BORING	DEPTH (ft)	LL (%)	PL (%)	PI (%)	CLASSIFICATION
○	G-166A/B	31.5	38	13	25	SANDY LEAN CLAY (CL)
●	G-166A/B	52.5	46	18	28	LEAN CLAY (CL)
△	G-166A/B	62.5	55	28	27	FAT CLAY with SAND (CH)
▲	G-166A/B	68.5	82	43	39	ELASTIC SILT (MH)
□	G-166A/B	105.5	NP	NP	NP	SILTY SAND (SM)
■	G-166A/B	115.5	24	13	11	CLAYEY SAND (SC)
▽	G-168	17.5	49	28	21	LEAN CLAY (CL)
▼	G-168	26.5	41	20	21	LEAN CLAY (CL)
⊙	G-168	97.5	51	27	24	FAT CLAY with SAND (CH)
◇	G-169	14.5	39	20	19	LEAN CLAY (CL)
◆	G-169	29.5	26	15	11	CLAYEY SAND (SC)
⊗	G-169	95.5	36	19	17	SANDY LEAN CLAY (CL)

Laboratory Test Method: ASTM D 4318 "NP" indicates Non-Plastic

Prepared/Date: JF 7/17/2011
Checked/Date: LT 8/3/2011

MTA Westside Subway Extension
Los Angeles, California

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ATTERBERG LIMITS TEST RESULTS
Project No.: 4953-11-1423
Figure: D-6.1

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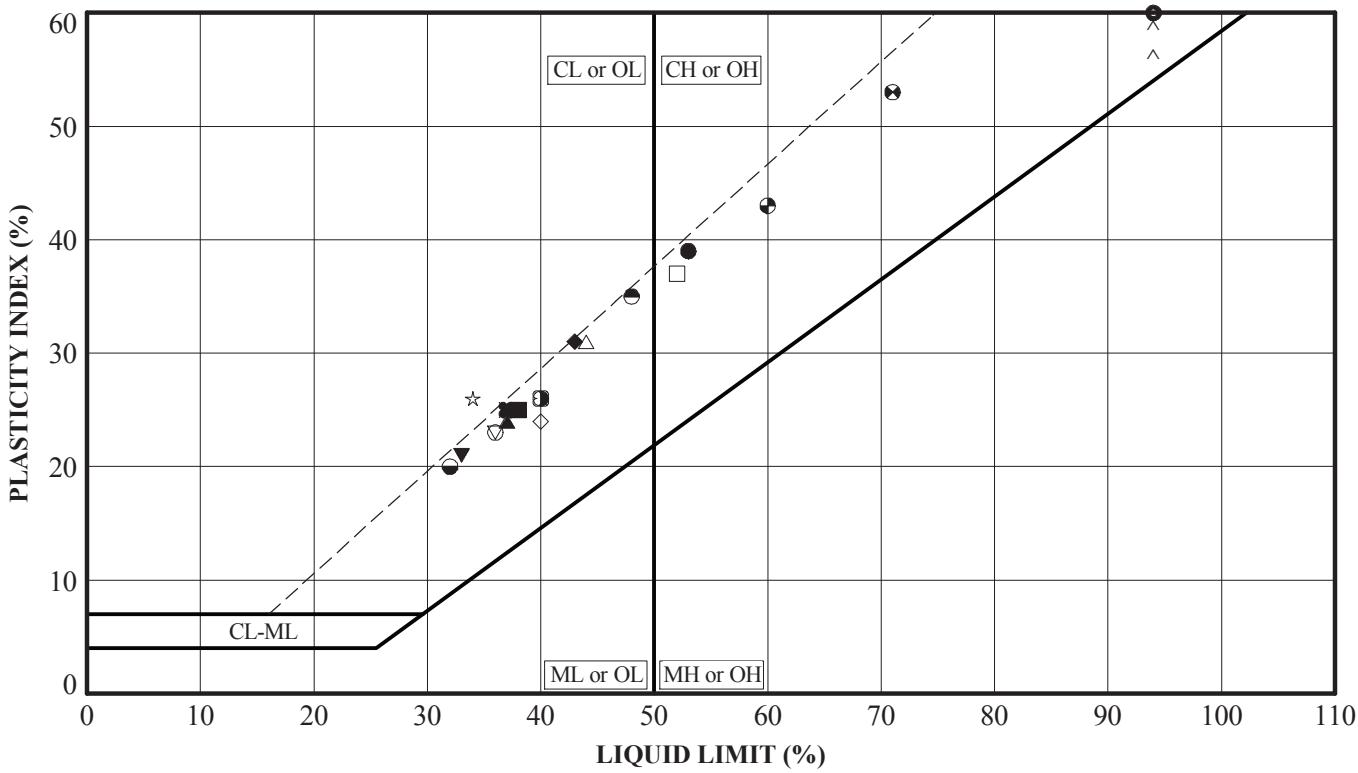

SYMBOL	BORING	DEPTH (ft)	LL (%)	PL (%)	PI (%)	CLASSIFICATION
○	E-132B	10.5	36	13	23	Sandy LEAN CLAY (CL)
●	E-132B	20.5	53	14	39	FAY CLAY with SAND (CH)
△	E-132B	30.5	44	13	31	Sandy LEAN CLAY (CL)
▲	E-132C/M-408	10.5	37	13	24	CLAYEY SAND (SC)
□	E-132C/M-408	30.5	52	15	37	FAT CLAY (CH)
■	E-133A/M-409	10.5	38	13	25	Sandy LEAN CLAY (CL)
▽	E-133A/M-409	20.5	36	13	23	Sandy LEAN CLAY (CL)
▼	E-133A/M-409	30.5	33	12	21	CLAYEY SAND (SC)
⊙	E-133A/M-409	45.0	94	21	73	FAT CLAY (CH)
◇	E-133A/M-409	110.0	40	16	24	Sandy LEAN CLAY (CL)
◆	G-412/M-407/E-132A	15.5	43	12	31	Sandy LEAN CLAY (CL)
⊗	G-412/M-407/E-132A	25.5	71	18	53	FAT CLAY (CH)
⊕	G-412/M-407/E-132A	43.0	60	17	43	FAT CLAY (CH)
☆	G-412/M-407/E-132A	48.0	34	8	26	Sandy LEAN CLAY (CL)
⊠	G-413	9.5	40	14	26	Sandy LEAN CLAY (CL)
◓	G-413	18.5	48	13	35	LEAN CLAY with SAND (CL)
◒	G-413	24.5	32	12	20	Sandy LEAN CLAY (CL)
◑	G-413	30.5	40	14	26	Sandy LEAN CLAY (CL)
×	G-414/M-410	15.5	37	12	25	Sandy LEAN CLAY (CL)
✖	G-414/M-410	25.5	37	12	25	Sandy LEAN CLAY (CL)

Laboratory Test Method: ASTM D 4318 "NP" indicates Non-Plastic

Prepared/Date: KC
Checked/Date: HP/DP

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Los Angeles, California

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ATTERBERG LIMITS TEST RESULTS
Project No.: 4953-11-1423
Figure: D-6.2.1

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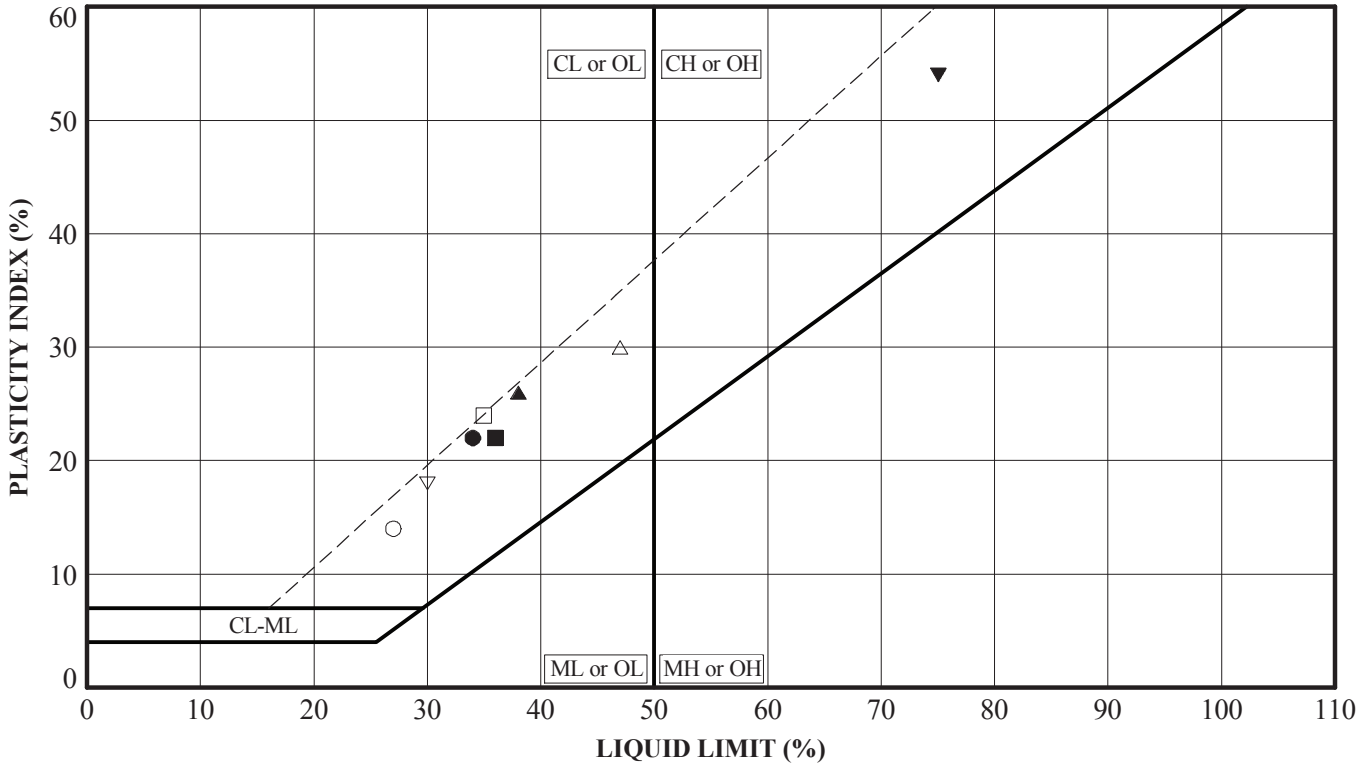

SYMBOL	BORING	DEPTH (ft)	LL (%)	PL (%)	PI (%)	CLASSIFICATION
○	G-414/M-410	35.5	27	13	14	CLAYEY SAND (SC)
●	G-414/M-410	51.5	34	12	22	Sandy LEAN CLAY (CL)
△	G-414/M-410	109.0	47	17	30	Sandy LEAN CLAY (CL)
▲	G-415	9.5	38	12	26	Sandy LEAN CLAY (CL)
□	G-415	25.5	35	11	24	Sandy LEAN CLAY (CL)
■	G-415	37.5	36	14	22	Sandy LEAN CLAY (CL)
▽	G-415	60.5	30	12	18	Sandy LEAN CLAY (CL)
▼	G-415	90.5	75	21	54	FAT CLAY (CH)

Laboratory Test Method: ASTM D 4318 "NP" indicates Non-Plastic

Prepared/Date: KC
Checked/Date: HP/DP

MTA Westside Subway Extension
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ATTERBERG LIMITS TEST RESULTS
Project No.: 4953-11-1423
Figure: 6.2.2

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SOIL CORROSIVITY EVALUATION

for the

WESTSIDE SUBWAY EXTENSION

CENTURY CITY CONSTELLATION STATION

in

LOS ANGELES, CA

prepared for

AMEC E&I
5628 East Slauson Avenue
Los Angeles, CA 90040

Project No.: 4953-10-1561

PROJECT MANAGER: MR. MARTY HUDSON

prepared by

HDR ENGINEERING, INC.
Consulting Corrosion Engineers
431 West Baseline Road
Claremont, California 91711

HDR|SCHIFF #172549

October 18, 2011

Figure D-7.1.1

EXECUTIVE SUMMARY

The Westside Subway Extension is a proposed extension of the Metro Purple Line subway westward from the Wilshire/Western Station to the Veterans Administration West Los Angeles Hospital. Century City Constellation station is one of the eight stations planned for the project. The station will be approximately 980 feet long and about 85 to 95 feet below ground surface.

Laboratory tests on the soil samples provided by AMEC E&I have been completed. Six of the samples were selected for analysis. This soil is classified as severely corrosive to ferrous metals and aggressive to copper.

A dielectric coated steel pipeline for this route should also have bonded joints and test stations. In addition, cathodic protection should be installed and applied concurrently with the pipeline.

Cathodically protect and provide corrosion monitoring for hydraulic elevators and associated components as required for compliance with Title 23.

A dielectric coated ductile iron pipe would also be a suitable choice. In addition, cathodic protection should be installed and applied concurrently with the pipeline. A polyethylene wrap may be used on non-pressurized iron pipe due to corrosive soils along portions of the route.

A polyvinyl chloride (PVC) pipe would also be a suitable choice. Coat any iron parts, such as fittings and valves, with a high quality dielectric coating.

Type II cement may be used for concrete structures. Standard concrete cover over reinforcing steel may be used. Any contact between concrete structures and ground water should be prevented. Contact can be prevented with an impermeable waterproofing system.

Due to the soils at this site, post-tensioned slabs should be protected in accordance with soil considered aggressive (corrosive).

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APPENDIX: Table 1 – Laboratory Test on Soil Samples

INTRODUCTION

The existing subway system is owned and operated by Los Angeles County Metropolitan Transportation Authority (MTA) and provides public transportation throughout the City of Los Angeles, and surrounding areas.

The Westside Subway Extension is a proposed extension of the Metro Purple Line subway westward from the Wilshire/Western Station to the Veterans Administration West Los Angeles Hospital. In the Century City area, two alternative alignments are considered; one with a station along Santa Monica Boulevard, and one with a station along Constellation Boulevard. The proposed subway alignment is about 9 miles long. The depth to tunnel invert varies along the alignment from 40 to 160 feet below grade. The subway will consist of heavy rail transit operated in a twin tunnel configuration with eight new passenger stations, with two options in Century City.

Century City Constellation station is one of the eight stations planned for the project. The station will be approximately 980 feet long and about 85 to 95 feet below ground surface. Ground water was encountered at depths of about 35 to 50 feet below ground surface. The station will include walls below grade, utility piping, hydraulic elevator systems, concrete structures, and post-tensioning systems.

An analysis of soil corrosivity along the route of the Metro rail alignment was requested. Laboratory tests on the soil samples provided by AMEC E&I have been completed. Six of the samples were selected for analysis. HDR Engineering, Inc. (HDR|Schiff) assumes that the samples selected are representative of the most corrosive soils at the site.

The scope of this study is limited to a determination of soil corrosivity and general corrosion control recommendations for materials planned for construction. HDR|Schiff understands shoring piles will be used only temporarily during construction and will not be considered in this study. If steel piles are considered for use as permanent structures in the future, HDR|Schiff will be glad to perform Romanoff similitude analysis for metal loss and determine estimated corrosion rates.

LABORATORY TESTS ON SOIL SAMPLES

The electrical resistivity of each of the six samples was measured in a soil box per ASTM G187 in its as-received condition and again after saturation with distilled water. Resistivities are at about their lowest value when the soil is saturated. The pH of the saturated samples was measured per ASTM G51. A 5:1 water:soil extract from each sample was chemically analyzed for the major soluble salts commonly found in soil per ASTM D4327, D6919, and D513. Test results are shown in Table 1 in the Appendix to this report.

SOIL CORROSIVITY

A major factor in determining soil corrosivity is electrical resistivity. The electrical resistivity of a soil is a measure of its resistance to the flow of electrical current. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of electrical current (DC) from the metal into the soil. Corrosion currents, following Ohm's Law, are inversely proportional to soil resistivity. Lower electrical resistivities result from higher moisture and soluble salt contents and indicate corrosive soil.

A correlation between electrical resistivity and corrosivity toward ferrous metals is (Romanoff, 1989):

Soil Resistivity in ohm-centimeters	Corrosivity Category
Greater than 10,000	Mildly Corrosive
2,001 to 10,000	Moderately Corrosive
1,001 to 2,000	Corrosive
0 to 1,000	Severely Corrosive

Other soil characteristics that may influence corrosivity towards metals are pH, soluble salt content, soil types, aeration, anaerobic conditions, and site drainage.

Electrical resistivities were in the moderately corrosive and corrosive categories with as-received moisture. When saturated, the resistivities were in the moderately to severely corrosive categories. The resistivities dropped considerably with added moisture because the samples were dry as-received.

Soil pH values varied from 7.3 to 8.2. This range is neutral to moderately alkaline (Romanoff, 1989). These values do not particularly increase soil corrosivity.

The soluble salt content of the samples ranged from low to high.

Nitrate was detected in low concentrations. The ammonium concentration was high enough to be deleterious to copper.

Tests were not made for sulfide and negative oxidation-reduction (redox) potential because these samples did not exhibit characteristics typically associated with anaerobic conditions.

The variation in soil types can create differential-aeration corrosion cells that would affect all metals.

This soil is classified as severely corrosive to ferrous metals and aggressive to copper.

Heavy rail transit systems can present a multitude of DC stray current issues. These issues can affect not only the system of concern, but also other metallic utilities or structures proximal to rails, and DC substations if the proper mitigation practices are not followed. Stray current can increase corrosion

CONCLUSIONS

This soil is classified as severely corrosive to ferrous metals and aggressive to copper.

A dielectrically coated steel pipeline for this route should also have bonded joints and test stations. In addition, cathodic protection should be installed and applied concurrently with the pipeline.

Cathodically protect and provide corrosion monitoring for hydraulic elevators and associated components as required for compliance with Title 23.

A dielectrically coated ductile iron pipe would also be a suitable choice. In addition, cathodic protection should be installed and applied concurrently with the pipeline. A polyethylene wrap may be used on non-pressurized iron pipe due to corrosive soils along portions of the route.

A polyvinyl chloride (PVC) pipe would also be a suitable choice. Coat any iron parts, such as fittings and valves, with a high quality dielectric coating.

Type II cement may be used for concrete structures. Standard concrete cover over reinforcing steel may be used. Any contact between concrete structures and ground water should be prevented. Contact can be prevented with an impermeable waterproofing system.

Due to the soils at this site, post-tensioned slabs should be protected in accordance with soil considered aggressive (corrosive).

Due to the nature and magnitude of the project and the long design service life requirements, tolerance for corrosion on all project components is low. Based on the need for high reliability and the corrosivity considerations discussed above, it is clear that corrosion protection must be provided for the components exposed to the environment discussed with consideration given to the level of risk and practicality.

RECOMMENDATIONS

DC Stray Current

A study of the impact of the DC powered heavy rail system was not detailed as part of the scope work in this project. It is recommended that the client pursue such a study in order to take the necessary precautions to avoid the deleterious effects known to result from DC stray current.

Steel Pipe

Implement *all* the following measures.

1. Underground steel pipe with rubber gasketed, mechanical, grooved end, or other nonconductive type joints should be bonded for electrical continuity. For pipe diameters less 18 inches use two joint bonds. For pipe diameters greater than or equal to 18 inches use three joint bonds. Electrical continuity is necessary for corrosion monitoring and cathodic protection.

2. Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:
    a. Two or four-wire test stations at each end of the pipeline depending on how the pipe terminates.
    b. Four-wire test stations at all buried insulating joints.
    c. Four-wire test stations at each end of all casings.
    d. Two-wire test stations at other locations as necessary so the interval between test stations does not exceed 1,200 feet.

    Where 4-wire test stations are required, use wires of difference size or insulation color for identification. Each wire should be independently welded or pin-brazed to the pipe.

3. To prevent dissimilar metal corrosion cells and to facilitate the application of cathodic protection, electrically isolate each buried steel pipeline per NACE Standard SP0286 from:
    a. Pumping plants.
    b. Reservoirs.
    c. Flow meters.
    d. Motorized operated valves.
    e. Dissimilar metals.
    f. Dissimilarly coated piping (cement-mortar vs. dielectric).
    g. Above ground steel pipe.
    h. All existing piping.

    Insulated joints should be placed above grade or in vaults where possible. Wrap all buried insulators with wax tape per AWWA C217.

4. Prevent contact between the steel pipe and concrete and/or reinforcing steel, such as at wall penetrations and thrust blocks, with such items as plastic sleeves, rubber seals, or 20 mil plastic tape.

5. Apply a suitable dielectric coating intended for underground use such as:
    a. Polyurethane per AWWA C222 *or*
    b. Extruded polyethylene per AWWA C215 *or*
    c. A tape coating system per AWWA C214 *or*

d. Hot applied coal tar enamel per AWWA C203 *or*
e. Fusion bonded epoxy per AWWA C213.

6. Buried steel and iron pipe, fittings, and valves in appurtenances, such as air valves and blowoffs, should be coated with a material listed above or with coal-tar epoxy, wax tape, moldable sealant, or equivalent. If copper is used, electrically insulate it from the steel with an insulating joint or with a dielectric union.

7. Apply cathodic protection to steel piping as per NACE Standard SP0169.

8. To insure that corrosion control is properly designed, preliminary construction drawings should be reviewed by a qualified corrosion engineer.

9. After the pipeline is backfilled, but before the construction contract is completed, the pipeline should be tested to insure that the joint bonds are intact and test stations properly installed. Also, native pipe-to-soil potentials should be measured and recorded. These data will be useful in determining if pipeline conditions change in the future.

10. Pipe-to-soil potentials should be measured biennially to determine if conditions on the pipeline are changing.

Hydraulic Elevator

Implement *all* the following measures:

1. Coat hydraulic elevator cylinders as described above for steel pipe, item #5 that is resistant to petroleum products (hydraulic fluid).
2. Electrically insulate each cylinder from building metals by installing dielectric material between the piston platen and car, insulating the bolts, and installing an insulated joint in the oil line.
3. Place each cylinder in a non-metallic casing with a plastic watertight seal at the bottom. Fill the annulus with a dry sand with a minimum resistivity of 25,000 ohm-centimeters, a pH of between 6.5 and 7.5 and a maximum chloride content of 200 ppm.
4. A removable moisture-proof sealing lid installed on the top of the casing prior to installation of the cylinder. The top of the casing shall be permanently sealed against moisture intrusion after installation of the cylinder.
5. Provide permanent test facilities and apply cathodic protection to hydraulic cylinders as per NACE Standard SP0169.
6. The elevator oil line should be placed above ground if possible but, if underground, should be protected by one of the following corrosion control options:

OPTION 1

a. Provide a bonded dielectric coating.
b. Electrically isolate the pipeline.
c. Apply cathodic protection to steel piping as per NACE Standard SP0169.

OPTION 2

a. Place the oil line in a PVC casing pipe with solvent-welded joints to prevent contact with soil and soil moisture.

7. If Steel underground storage tanks are used, cathodic protection and corrosion control requirements shall comply with Title 23.

Reinforced Concrete Pipe

Implement *all* the following measures.

1. To prevent dissimilar metal corrosion cells electrically isolate the storm drain per NACE Standard SP0286 from all structures and facilities.

   Insulated joints should be placed above grade or in vaults where possible. Wrap all buried insulators with wax tape per AWWA C217.

2. Prevent contact between the steel pipe and concrete and/or reinforcing steel, such as at wall penetrations and thrust blocks, with such items as plastic sleeves, rubber seals, or 20 mil plastic tape.

3. Buried steel and iron pipe and fittings in appurtenances should be cement-mortar coated or concrete or cement slurry encased where possible. Otherwise, they should be wrapped with wax tape per AWWA Standard C-217

4. To insure that corrosion control is properly designed, preliminary construction drawings should be reviewed by a qualified corrosion engineer.

5. Apply a suitable dielectric waterproofing coating intended for underground use. This coating is to be compatible with and applied over the concrete/cement-mortar.

Iron Pipe

Implement *all* the following measures:

1. To prevent dissimilar metal corrosion cells and to facilitate the application of cathodic protection, electrically isolate each buried iron pipeline per NACE Standard SP0286 from:
   a. Pumping plants.
   b. Reservoirs.
   c. Flow meters.
   d. Motorized operated valves.
   e. Dissimilar metals.
   f. Dissimilarly coated piping (cement-mortar vs. dielectric).
   g. Above ground steel pipe.
   h. All existing piping.

Insulated joints should be placed above grade or in vaults where possible. Wrap all buried insulators with wax tape per AWWA C217.

2. Bond all nonconductive type joints for electrical continuity. Electrical continuity is necessary for corrosion monitoring and cathodic protection. For pipe diameters less 18 inches use two joint bonds. For pipe diameters greater than or equal to 18 inches use three joint bonds. Electrical continuity is necessary for corrosion monitoring and cathodic protection.

3. Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:
    a. Two or four-wire test stations at each end of the pipeline depending on how the pipe terminates.
    b. Four-wire test stations at all buried insulating joints.
    c. Four-wire test stations at each end of all casings.
    d. Two-wire test stations at other locations as necessary so the interval between test stations does not exceed 1,200 feet.

    Where 4-wire test stations are required, use wires of difference size or insulation color for identification. Each wire should be independently welded or pin-brazed to the pipe.

4. Use iron pipe, fittings, and valves in appurtenances to the extent possible to avoid creating dissimilar metal corrosion cells. Steel appurtenances such as bolts should be coated with wax tape. If copper is used, electrically isolate it from the iron.

5. Prevent contact between iron and concrete including reinforcing steel, using such items as plastic sleeves, rubber seals, two layers of 8 mil thick polyethylene plastic, or 20 mil plastic tape.

6. Apply a suitable coating intended for underground use such as:
    a. Polyethylene encasement per AWWA C105; *or*
    b. Epoxy coating; *or*
    c. Polyurethane; *or*
    d. Wax tape.

    NOTE: The thin factory-applied asphaltic coating applied to ductile iron pipe for transportation and aesthetic purposes does not constitute a corrosion control coating.

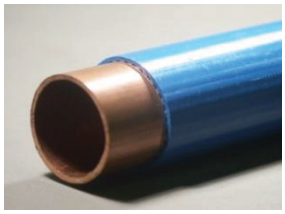
7. Apply cathodic protection to cast and ductile iron piping as per NACE Standard SP0169.

Iron Pipe (Non-Pressurized)

1. Encase iron pipe, fittings, and valves in an 8 mil polyethylene wrap per AWWA Standard C105/ANSI 21.5.

Copper Pipe

Protect buried copper pipe by *one* of the following measures:



1. Installation of a factory-coated copper pipe with a minimum 25-mil thickness such as Kamco's Aqua Shield™, Mueller's Streamline Protec™, or equal. The coating must be continuous with no cuts or defects.

2. Installation of 12-mil polyethylene pipe wrapping tape with butyl rubber mastic over a suitable primer. Protect wrapped copper tubing by applying cathodic protection per NACE Standard SP0169.

Polyvinyl Chloride (PVC) Pipe

1. No special measures are required to protect PVC.

2. Coat any iron parts, such as fittings and valves, with a high quality dielectric coating such as wax tape per AWWA C217, plastic pipe wrapping tape, coal tar epoxy, polyurethane, or equivalent.

3. Install electrically insulated joints in iron riser connections to above grade metallic piping.

4. Use iron pipe, fittings, and valves in appurtenances, such as air valves and blowoffs, to the extent possible to avoid creating dissimilar metal corrosion cells. Steel appurtenances such as bolts should be coated as described above. If copper is used, electrically isolate it from the iron.

All Pipe

1. On all pipes, appurtenances, and fittings not protected by cathodic protection or encased in concrete, coat pipe specials such as valves, bolts, flange joints, joint harnesses, and flexible couplings with wax tape per AWWA C217 after assembly.

2. Where metallic pipelines penetrate concrete structures such as building floors, vault walls, and thrust blocks use plastic sleeves, rubber seals, or other dielectric material to prevent pipe contact with the concrete and reinforcing steel.

Concrete Structures

The concrete mix design should provide the least permeable and mostly crack-free matrix to reduce penetration of aggressive ions and oxygen into the concrete. The concrete mixture should be designed to help protect the steel adequately from corrosion. Factors in concrete mix design that can reduce the permeability of the concrete include lowering the water-to-cement ratio by either increasing the cement content or decreasing water content. Finely divided materials such as fly ash, granulated blast furnace slag, silica fume, and other pozzolons can further reduce permeability of the concrete.

In addition, aggregates having water-soluble chloride ions on their surfaces, or even within their particles, can cause corrosion problems. If enough surface-borne chlorides are present, a portion will not be bound within the solid "paste" phase during hydration of the cement. Most of the chlorides released from the interior of an aggregate particle after the first few hours of hydration will not be bound at all. Unbound chloride ions can cause passivity breakdown of the steel created by the alkaline cement.

The following standards contain important guidelines for the maximum concentration of chloride, sulfate and carbonate ions on the mixing water and admixture:

- Portland Cement Association PCA Publication E B.001, Design and Control of Concrete mixtures
- American Concrete Institute ACI 318, Building Code Requirements for Reinforced Concrete Structures
- American Concrete Institute ACI 222, Corrosion of Metals in Concrete

Nevertheless, there are certain steps that can be taken to enhance the protective properties of the concrete. The most important factor is keeping the cement content high enough to maintain a pH of 12.5 or greater.

1. From a corrosion standpoint, Type II cement may be used for concrete structures and pipe because the sulfate concentration is negligible, 0 to 0.1 percent.

2. Standard concrete cover over reinforcing steel may be used for concrete structures and pipe in contact with these soils due to the low chloride concentration found onsite.

3. Due to the high ground water table encountered at this site, cyclical or continual wetting may be an issue. Any contact between concrete structures and ground water should be prevented. Contact can be prevented with an impermeable waterproofing system.

Post Tensioning Slabs: Unbonded Single-Stranded Tendons and Anchors

1. Soil is considered an aggressive environment for post-tensioning strands and anchors. Therefore, due to the soils found on-site, protect post-tensioning strands and anchors against corrosion in this aggressive (corrosive) environment. Implement *all* the following measures: (ACI 2001)(PTI 2006)(PTI 2000)

    a. Completely encapsulate the tendon and anchor with polyethylene to create a watertight seal.

    b. All components exposed to the job site should be protected within one working day after their exposure during installation.

    c. Ensure the minimum concrete cover over the tendon tail is 1-inch, or greater if required by the applicable building code.

    d. Caps and sleeves should be installed within one working day after the cutting of the tendon tails and acceptance of the elongation records by the engineer.

    e. Inspect the following to ensure the encapsulated system is completely watertight:

i. Sheathing: Verify that all damaged areas, including pin-holes, are repaired.

ii. Stressing tails: After removal, ensure they are cut to a length for proper installation of P/T coating filled end caps.

iii. End caps: Ensure proper installation before patching the pocket former recesses.

iv. Patching: Ensure the patch is of an approved material and mix design, and installed void-free.

f. Limit the access of direct runoff onto the anchorage area by designing proper drainage.

g. Provide at least 2 inches of space between finish grade and the anchorage area, or more if required by applicable building codes.

CLOSURE

Our services have been performed with the usual thoroughness and competence of the engineering profession. No other warranty or representation, either expressed or implied, is included or intended.

Please call if you have any questions.

Respectfully Submitted,
HDR ENGINEERING, INC.

Ian Budner
EIT Corrosion Technician

Steven R. Fox, P.E.
Vice President

11-1050SCS-RPT_Century_City-Constellation_IB_rev01_IB

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ACI 423.6-01: Specification for Unbonded Single Strand Tendons. American Concrete Institute (ACI), 2001

AWWA. (C105-05). "American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems". Denver, CO: www.awwa.org/.

Post-Tensioning Manual, sixth edition. Post-Tensioning Institute (PTI), Phoenix, AZ, 2006.

Romanoff, M. (1989). Underground Corrosion, National Bureau of Standards (NBS) Circular 579. Houston, TX, United States of America: Reprinted by NACE.

Specification for Unbonded Single Strand Tendons. Post-Tensioning Institute (PTI), Phoenix, AZ, 2000.

Table 1 - Laboratory Tests on Soil Sample(s)

AMEC E&I
Westside Subway Extension
Your #4953-10-1561, SA #11-0184LAB
21-Feb-11

Sample ID			168 @ 1-5' CL - Fill	168 @ 38.5' CL with Sand	168 @ 72.5' SP	169 @ 26' CL	169 @ 72' SP-SM / SM
Resistivity		**Units**					
as-received		ohm-cm	8,000	2,640	4,000	6,400	1,480
saturated		ohm-cm	1,680	840	3,040	920	960
pH			8.2	7.3	8.2	7.9	7.8
Electrical Conductivity		mS/cm	0.09	0.07	0.13	0.46	0.29
Chemical Analyses							
Cations							
calcium	Ca^{2+}	mg/kg	21	27	34	73	135
magnesium	Mg^{2+}	mg/kg	10	10	6.6	32	17
sodium	Na^{1+}	mg/kg	115	88	132	377	129
potassium	K^{1+}	mg/kg	3.3	5.6	6.4	11	26
Anions							
carbonate	CO_3^{2-}	mg/kg	ND	ND	45	ND	ND
bicarbonate	HCO_3^{1-}	mg/kg	143	98	142	183	259
fluoride	F^{1-}	mg/kg	24	14	1.9	9.0	1.2
chloride	Cl^{1-}	mg/kg	3.9	21	13	99	58
sulfate	SO_4^{2-}	mg/kg	27	25	51	672	358
phosphate	PO_4^{3-}	mg/kg	16	13	ND	1.5	ND
Other Tests							
ammonium	NH_4^{1+}	mg/kg	ND	ND	ND	ND	3.7
nitrate	NO_3^{1-}	mg/kg	2.8	2.3	4.2	ND	9.0
sulfide	S^{2-}	qual	na	na	na	na	na
Redox		mV	na	na	na	na	na

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

Table 1 - Laboratory Tests on Soil Sample(s)

AMEC E&I
Westside Subway Extension
Your #4953-10-1561, SA #11-0184LAB
21-Feb-11

Sample ID			169 @ 100.5' ML
Resistivity		**Units**	
as-received		ohm-cm	3,920
saturated		ohm-cm	640
pH			7.7
Electrical Conductivity		mS/cm	0.50
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	289
magnesium	Mg^{2+}	mg/kg	55
sodium	Na^{1+}	mg/kg	84
potassium	K^{1+}	mg/kg	76
Anions			
carbonate	CO_3^{2-}	mg/kg	ND
bicarbonate	HCO_3^{1-}	mg/kg	101
fluoride	F^{1-}	mg/kg	0.5
chloride	Cl^{1-}	mg/kg	45
sulfate	SO_4^{2-}	mg/kg	968
phosphate	PO_4^{3-}	mg/kg	ND
Other Tests			
ammonium	NH_4^{1+}	mg/kg	14
nitrate	NO_3^{1-}	mg/kg	ND
sulfide	S^{2-}	qual	na
Redox		mV	na

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: AMEC Foster Wheeler
Project Name: Westside Subway Extension
Project No.: 4953-11-1423

AP Job No.: 15-0361
Date 04/29/15

Boring No.	Sample No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
E-132B	3	15	CL	1186	7.3	78	357
E-132B	5	25	CL	1221	7.2	188	140
E-132B	13	65	SM	5020	7.9	39	85
E-132B	15	75	SM	1524	7.6	1037	65

NOTES:
Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

Figure D-7.2.1

AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: AMEC Foster Wheeler
Project Name: Westside Subway Extension
Project No.: 4953-11-1423

AP Job No.: 15-0361
Date 04/20/15

Boring No.	Sample No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
E-132C	1	6	CL	1328	7.5	107	32
E-132C	9	45	SM	9840	7.1	20	15
E-132C	16	63	SM	3729	7.4	42	18
E-132C	22	78	SM	1316	7.0	1622	28

NOTES:
Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

Figure D-7.2.2

AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: AMEC Foster Wheeler
Project Name: Westside Subway Extension
Project No.: 4953-11-1423

AP Job No.: 15-0361
Date 04/20/15

Boring No.	Sample No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
E-133A	1	6	CL	1576	7.1	214	23
E-133A	7	35	CL	974	7.5	400	305
E-133A	10	50.5	SM	8880	7.8	37	17
E-133A	15	75	SM	4313	7.6	133	101

NOTES:
Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

Figure D-7.2.3

AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: AMEC Foster Wheeler
Project Name: Westside Subway Extension
Project No.: 4953-11-1423

AP Job No.: 15-0361
Date 04/20/15

Boring No.	Sample No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
G-412	14	55	SM	9638	7.7	33	25
G-412	19	68	SM	4270	7.8	143	81
G-412	22 & 23	75-78	ML	2754	7.8	45	42
G-412	24 & 25	80-83	SM	7208	8.0	53	52

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

Figure D-7.2.4

AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: AMEC Foster Wheeler
Project Name: Westside Subway Extension
Project No.: 4953-11-1423

AP Job No.: 15-0361
Date 05/07/15

Boring No.	Sample No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
G-413	2	9.5	CL	1352	8.0	16	35
G-413	5	21.5	CL	911	7.9	34	29
G-413	15	70.5	SM	1550	7.8	195	99
G-413	19	90.5	SM	774	5.8	3823	108

NOTES:
Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

Figure D-7.2.5

AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: AMEC Foster Wheeler
Project Name: Westside Subway Extension
Project No.: 4953-11-1423

AP Job No.: 15-0361
Date 05/07/15

Boring No.	Sample No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
G-414	2	10	CL	1215	7.7	223	23
G-414	4	20	CL	806	7.4	398	66
G-414	10	48	CL	1223	7.6	180	206
G-414	15	63	SM	1936	7.6	128	251

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

Figure D-7.2.6

AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: AMEC Foster Wheeler
Project Name: Westside Subway Extension
Project No.: 4953-11-1423

AP Job No.: 15-0361
Date 05/07/15

Boring No.	Sample No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
G-415	7	28	CL	1002	7.9	494	289
G-415	12	45.5	CL	1838	7.5	136	71
G-415	17	70	SM	2159	7.9	92	50
G-415	19	80.5	SM	1628	7.5	51	44

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

Figure D-7.2.7

AP Engineering & Testing, Inc.

SPECIFIC GRAVITY

ASTM D854

AP Number: 15-0361

Client: Name: Amec Foster Wheeler E&I Tested By: KM Date: 04/26/15

Project Name: Westside Subway Extension Data Input By: NN Date: 04/27/15

Project No. : 4953-11-1423 Checked By: AP Date: 04/28/15

BORING NUMBER	G-412	G-412	G-412			
SAMPLE NUMBER	19	22	24			
DEPTH (FT)	68	75	80			
SOIL CLASSIFICATION	Silty Sand	Silt w/sand	Silty Sand			
METHOD (A OR B)	B	B	B			
FLASK NUMBER	2	1	3			
WT. FLASK+WATER+SOIL, g	380.64	405.10	374.80			
TEMPERATURE, °C	23.0	23.0	23.0			
CORRECTION FACTOR	0.9993	0.9993	0.9993			
WT. DRY SOIL, g	66.65	55.20	60.25			
WT. FLASK + WATER, g	249.74	249.69	249.57			
% RETAINED #4	0.92	0.68	0.00			
% PASSING #4	99.08	99.32	100.00			
MATERIAL EXCLUDED	Retained No. 4	Retained No. 4	None			
SPECIFIC GRAVITY ($G_{S,20°C}$)	**2.65**	**2.77**	**2.66**			

2607 Pomona Boulevard. Pomona, California 91768
Tel. (909) 869-6316, Fax (909) 869-6318

Figure D-8.1

AP Engineering & Testing, Inc.

SPECIFIC GRAVITY

ASTM D854

AP Number: 15-0361

Client: Name: AMEC E&I | Tested By: KM | Date: 05/08/15

Project Name: Westside Subway Extension | Data Input By: KM | Date: 05/10/15

Project No. : 4953-11-1423 | Checked By: AP | Date: 05/11/15

BORING NUMBER	G-415	G-415	G-415	G-415		
SAMPLE NUMBER	14	16	19	21		
DEPTH (FT)	55.5	65.5	80.5	90.5		
SOIL CLASSIFICATION	Clay	Silty Sand	Silty Sand	Fat Clay		
METHOD (A OR B)	B	B	B	B		
FLASK NUMBER	4	3	2	4		
WT. FLASK+WATER+SOIL, g	387.57	357.92	360.95	389.63		
TEMPERATURE, °C	22.9	24.9	24.8	19.7		
CORRECTION FACTOR	0.9994	0.9989	0.9989	1.0001		
WT. DRY SOIL, g	33.12	32.98	34.75	35.43		
WT. FLASK + WATER, g	249.81	249.77	249.80	249.81		
% RETAINED #4	8.32	0.00	0.00	0.00		
% PASSING #4	91.68	100.00	100.00	100.00		
MATERIAL EXCLUDED	Retained No. 4	None	None	None		
SPECIFIC GRAVITY ($G_{S,20°C}$)	**2.63**	**2.69**	**2.66**	**2.72**		

2607 Pomona Boulevard. Pomona, California 91768
Tel. (909) 869-6316, Fax (909) 869-6318

Figure D-8.2

Project Name	WSE SECTION 2
Location	LOS ANGELES, CA
Client	METRO
Client's Project No.	4953-11-1423
Registry No.	2015-29
Report No.	2015-29-1-1
Report Date	5/11/2015
Boring and Depth (ft)	E-132B; 85', 90', 95.5' ft
Soil Type	SP/SP-SM

Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder

Date Received: 5/5/2015	Date Opened: 5/5/2015	Date Tested: 5/11/2015

Test no.	Test 1	Test 2	AVS
Weight Loss (mg)	42	40	**41**

Photograph of the Tested Sample

Tested by: Dr. Fulvio Tonon, P.E., Ph.D.

Checked by: Gloria Tonon-Kozma, P.E.

This report shall not be partially reproduced without the written consent of Tonon USA, LLC.

Figure D-9.1

Project Name	WSE SECTION 2
Location	LOS ANGELES, CA
Client	METRO
Client's Project No.	4953-11-1423
Registry No.	2015-29
Report No.	2015-29-1-2
Report Date	5/11/2015
Boring and Depth (ft)	G-412; 60', 63' ft
Soil Type	SW/SP/SP-SM

Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder

Date Received: 5/5/2015	Date Opened: 5/5/2015	Date Tested: 5/11/2015

Test no.	Test 1	Test 2	AVS
Weight Loss (mg)	42	46	**44**

Photograph of the Tested Sample

Tested by: Dr. Fulvio Tonon, P.E., Ph.D.

Checked by: Gloria Tonon-Kozma, P.E.

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Project Name	WSE SECTION 2
Location	LOS ANGELES, CA
Client	METRO
Client's Project No.	4953-11-1423
Registry No.	2015-29
Report No.	2015-29-1-3
Report Date	5/11/2015
Boring and Depth (ft)	G-412; 65', 70', 73' ft
Soil Type	SP-SM/SM

Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder

Date Received: 5/5/2015	Date Opened: 5/5/2015	Date Tested: 5/11/2015

Test no.	Test 1	Test 2	AVS
Weight Loss (mg)	27	31	**29**

Photograph of the Tested Sample

Tested by: Dr. Fulvio Tonon, P.E., Ph.D.

Checked by: Gloria Tonon-Kozma, P.E.

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Figure D-9.3

Project Name	WSE SECTION 2
Location	LOS ANGELES, CA
Client	METRO
Client's Project No.	4953-11-1423
Registry No.	2015-29
Report No.	2015-29-1-4
Report Date	5/11/2015
Boring and Depth (ft)	G-415; 75', 85' ft
Soil Type	SM/SM w/ Gravel

Sample moisture condition	Dried in ventilated oven at 30°C for 3 days
Steel test piece condition	Ground and polished by bench grinder

Date Received: 5/5/2015	Date Opened: 5/5/2015	Date Tested: 5/11/2015

Test no.	Test 1	Test 2	AVS
Weight Loss (mg)	28	26	**27**

Photograph of the Tested Sample

Tested by: Dr. Fulvio Tonon, P.E., Ph.D.

Checked by: Gloria Tonon-Kozma, P.E.

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Figure D-9.4

APPENDIX E ANALYTICAL LABORATORY TEST RESULTS

Appendix E

Figure E-1: Analytical Laboratory Test Results of Vapor Samples

Figure E-2: Analytical Laboratory Test Results of Groundwater Samples

ADVANCED TECHNOLOGY LABORATORIES

April 21, 2015

Ron Lopez
Amec Foster Wheeler
6001 Rickenbacker Road
Los Angeles, CA 90040
Tel: (323) 889-5300
Fax:(323) 721-6700

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1501260

Client Reference : MTA Westside, 4953-11-1423

Enclosed are the results for sample(s) received on April 08, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez

Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Amec Foster Wheeler		Project Number :	MTA Westside, 4953-11-1423
6001 Rickenbacker Road		Report To :	Ron Lopez
Los Angeles , CA 90040		Reported :	04/21/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
M-407 @ 65' (probe)	1501260-01	Air	4/08/15 10:46	4/08/15 15:35
M-407 @ 70' (probe)	1501260-02	Air	4/08/15 11:02	4/08/15 15:35
M-407 @ 75' (probe)	1501260-03	Air	4/08/15 11:33	4/08/15 15:35
M-407 @ 60'	1501260-04	Air	4/08/15 9:53	4/08/15 15:35
M-407 @ 90'	1501260-05	Air	4/08/15 10:22	4/08/15 15:35
M-408 @ 40' (probe)	1501260-06	Air	4/08/15 13:08	4/08/15 15:35
M-408 @ 70' (probe)	1501260-07	Air	4/08/15 13:24	4/08/15 15:35
M-408 @ 95' (probe)	1501260-08	Air	4/08/15 13:41	4/08/15 15:35
M-408 @ 60'	1501260-09	Air	4/08/15 12:19	4/08/15 15:35
M-408 @ 90'	1501260-10	Air	4/08/15 12:40	4/08/15 15:35

CASE NARRATIVE

The samples for Methane, H2S (15/16) and Fixed Gases (ASTM D1946) were subcontracted to Air Technology Laboratories.

Figure E-1.2

Air TECHNOLOGY Laboratories, Inc.

April 21, 2015

ACCLASS ACCREDITED DoD ELAP
ADE-1461
EPA Methods TO-3, TO14A,TO15 SIM & Scan, ASTM D1946

nelac
LA Cert 04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175
TX Cert T104704450-09-TX
EPA Methods TO14A, TO15
UT Cert CA0133332014-1
EPA Methods TO3, TO14A, TO15, RSK-175

Advanced Technology Laboratories
ATTN: Rachelle Arada
3275 Walnut Ave.
Signal Hill, CA 90755

LABORATORY TEST RESULTS

Project Reference: 1501260
Lab Number: G040901-01/10

Enclosed are results for sample(s) received 4/09/15 by Air Technology Laboratories. Samples were received intact. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the NELAC Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Enclosures

Note: The cover letter is an integral part of this analytical report.

Figure E-1.3

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501260
Date Received: 04/09/15
Matrix: Air
Reporting Units: % v/v

ASTM D1946

Lab No.:	G040901-01		G040901-02		G040901-03		G040901-04	
Client Sample I.D.:	1501260-01 / M-407 @ 65' (probe)		1501260-02 / M-407 @ 70' (probe)		1501260-03 / M-407 @ 75' (probe)		1501260-04 / M-407 @ 60' (probe)	
Date/Time Sampled:	4/8/15 10:46		4/8/15 11:02		4/8/15 11:33		4/8/15 9:53	
Date/Time Analyzed:	4/9/15 12:23		4/9/15 12:38		4/9/15 12:53		4/9/15 13:07	
QC Batch No.:	150409GC8A1		150409GC8A1		150409GC8A1		150409GC8A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	Result % v/v	RL % v/v	Result % v/v	RL % v/v	Result % v/v	RL % v/v	Result % v/v	RL % v/v
Carbon Dioxide	8.4	0.010	8.4	0.010	8.3	0.010	0.45	0.010
Oxygen/Argon	1.7	0.50	1.8	0.50	1.6	0.50	16	0.50
Nitrogen	75	1.0	74	1.0	67	1.0	81	1.0
Methane	14	0.0010	15	0.0010	23	0.0010	3.2	0.0010

Results normalized including non-methane hydrocarbons
ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 4/21/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client:	**Advanced Technology Laboratories**
Attn:	**Rachelle Arada**
Project Name:	**NA**
Project No.:	**1501260**
Date Received:	**04/09/15**
Matrix:	**Air**
Reporting Units:	**% v/v**

ASTM D1946

Lab No.:	G040901-05		G040901-06		G040901-07		G040901-08	
Client Sample I.D.:	1501260-05 / M-407 @ 90' (probe)		1501260-06 / M-408 @ 40' (probe)		1501260-07 / M-408 @ 70' (probe)		1501260-08 / M-408 @ 95' (probe)	
Date/Time Sampled:	4/8/15 10:22		4/8/15 13:08		4/8/15 13:24		4/8/15 13:41	
Date/Time Analyzed:	4/9/15 13:22		4/9/15 13:37		4/9/15 15:20		4/9/15 14:06	
QC Batch No.:	150409GC8A1		150409GC8A1		150409GC8A1		150409GC8A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	**Result % v/v**	**RL % v/v**	**Result % v/v**	**RL % v/v**	**Result % v/v**	**RL % v/v**	**Result % v/v**	**RL % v/v**
Carbon Dioxide	2.9	0.010	3.1	0.010	5.9	0.010	1.5	0.010
Oxygen/Argon	12	0.50	9.2	0.50	3.9	0.50	0.61	0.50
Nitrogen	62	1.0	88	1.0	90	1.0	4.1	1.0
Methane	22	0.0010	0.0038	0.0010	0.52	0.0010	92	0.0010

Results normalized including non-methane hydrocarbons
ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 4/11/15

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501260
Date Received: 04/09/15
Matrix: Air
Reporting Units: % v/v

ASTM D1946

Lab No.:	G040901-09		G040901-10					
Client Sample I.D.:	1501260-09 / M-408 @ 60' (probe)		1501260-10 / M-408 @ 90' (probe)					
Date/Time Sampled:	4/8/15 12:19		4/8/15 12:40					
Date/Time Analyzed:	4/9/15 14:20		4/9/15 15:06					
QC Batch No.:	150409GC8A1		150409GC8A1					
Analyst Initials:	AS		AS					
Dilution Factor:	1.0		1.0					
ANALYTE	Result % v/v	RL % v/v	Result % v/v	RL % v/v				
Carbon Dioxide	1.1	0.010	0.32	0.010				
Oxygen/Argon	17	0.50	16	0.50				
Nitrogen	81	1.0	83	1.0				
Methane	0.026	0.0010	0.22	0.0010				

Results normalized including non-methane hydrocarbons
ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 4/21/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

QC Batch No.: 150409GC8A1
Matrix: Air
Units: % v/v

QC for ASTM D1946

Lab No.:	Method Blank		LCS		LCSD			
Date/Time Analyzed:	4/9/15 10:36		4/9/15 9:37		4/9/15 10:07			
Analyst Initials:	AS		AS		AS			
Datafile:	09apr010		09apr006		09apr008			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	Results	RL	% Rec.	Criteria	% Rec.	Criteria	%RPD	Criteria
Carbon Dioxide	ND	0.010	96	70-130%	96	70-130%	0.0	<30
Oxygen/Argon	ND	0.50	98	70-130%	98	70-130%	0.0	<30
Nitrogen	ND	1.0	99	70-130%	99	70-130%	0.2	<30
Methane	ND	0.0010	105	70-130%	104	70-130%	0.5	<30

ND = Not Detected (Below RL)

Reviewed/Approved By: _____ Date: 4/14/15

Mark J. Johnson
Operations Manager

The cover letter is an integral part of this analytical report.

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501260
Date Received: 04/09/15
Matrix: Air
Reporting Units: ppmv

EPA 15/16

Lab No.:	G040901-01		G040901-02		G040901-03		G040901-04	
Client Sample I.D.:	1501260-01 / M-407 @ 65' (probe)		1501260-02 / M-407 @ 70' (probe)		1501260-03 / M-407 @ 75' (probe)		1501260-04 / M-407 @ 60' (probe)	
Date/Time Sampled:	4/8/15 10:46		4/8/15 11:02		4/8/15 11:33		4/8/15 9:53	
Date/Time Analyzed:	4/9/15 11:15		4/9/15 11:27		4/9/15 11:38		4/9/15 11:54	
QC Batch No.:	150409GC3A1		150409GC3A1		150409GC3A1		150409GC3A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv
Hydrogen Sulfide	ND	0.20	ND	0.20	ND	0.20	ND	0.20

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 4/20/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501260
Date Received: 04/09/15
Matrix: Air
Reporting Units: ppmv

EPA 15/16

Lab No.:	G040901-05		G040901-06		G040901-07		G040901-08	
Client Sample I.D.:	1501260-05 / M-407 @ 90' (probe)		1501260-06 / M-408 @ 40' (probe)		1501260-07 / M-408 @ 70' (probe)		1501260-08 / M-408 @ 95' (probe)	
Date/Time Sampled:	4/8/15 10:22		4/8/15 13:08		4/8/15 13:24		4/8/15 13:41	
Date/Time Analyzed:	4/9/15 12:05		4/9/15 12:18		4/9/15 12:30		4/9/15 13:12	
QC Batch No.:	150409GC3A1		150409GC3A1		150409GC3A1		150409GC3A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		10	
ANALYTE	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv
Hydrogen Sulfide	ND	0.20	ND	0.20	ND	0.20	11	2.0

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 4/20/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client:	**Advanced Technology Laboratories**
Attn:	**Rachelle Arada**
Project Name:	**NA**
Project No.:	**1501260**
Date Received:	**04/09/15**
Matrix:	**Air**
Reporting Units:	**ppmv**

EPA 15/16

Lab No.:	G040901-09		G040901-10					
Client Sample I.D.:	1501260-09 / M-408 @ 60' (probe)		1501260-10 / M-408 @ 90' (probe)					
Date/Time Sampled:	4/8/15 12:19		4/8/15 12:40					
Date/Time Analyzed:	4/9/15 13:24		4/9/15 13:35					
QC Batch No.:	150409GC3A1		150409GC3A1					
Analyst Initials:	AS		AS					
Dilution Factor:	1.0		1.0					
ANALYTE	**Result ppmv**	**RL ppmv**	**Result ppmv**	**RL ppmv**				
Hydrogen Sulfide	ND	0.20	ND	0.20				

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 4/20/15

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

QC Batch No.: 150409GC3A1
Matrix: Air
Units: ppmv

QC for Sulfur Compounds by EPA 15/16

Lab No.:	Method Blank		LCS		LCSD			
Date/Time Analyzed:	4/9/15 9:00		4/9/15 9:45		4/9/15 9:57			
Analyst Initials:	AS		AS		AS			
Datafile:	09apr001		09apr004		09apr005			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	Results	RL	% Rec.	Criteria	% Rec.	Criteria	%RPD	Criteria
Hydrogen Sulfide	ND	0.20	103	70-130%	103	70-130%	0.1	<30

ND = Not Detected (Below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date: 4/10/15
Mark J. Johnson
Operations Manager

The cover letter is an integral part of this analytical report.

Figure E-1.11

ADVANCED TECHNOLOGY LABORATORIES

SUBCONTRACT ORDER

Work Order: 1501260

GA40901-01/60

SENDING LABORATORY:

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Phone: 562.989.4045
Fax: 562.989.6348
Project Manager: Rachelle Arada (Rachelle@atlglobal.com)

RECEIVING LABORATORY:

Air Technology Laboratories, Inc.
18501 E. Gale Ave, Suite 130
City of Industry, CA 91748
Phone :(626) 964-4032
Fax: (626) 964-5832
PO#: SC09501-STANDARD TAT

IMPORTANT : Please include Work Order # and PO # in your invoice.

Analysis	Due	Expires	Sampled	Comments
01 **ATL Lab#: 1501260-01** / **M-407 @ 65' (probe)**		**Air**	**04/08/15 10:46**	**Pls. report fixed gases - Nitrogen, Oxygen,Carbon Dioxide and Methane**
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 10:46		
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 10:46		
2-Tedlar Bag				
02 **ATL Lab#: 1501260-02** / **M-407 @ 70' (probe)**		**Air**	**04/08/15 11:02**	
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 11:02		
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 11:02		
03 **ATL Lab#: 1501260-03** / **M-407 @ 75' (probe)**		**Air**	**04/08/15 11:33**	
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 11:33		
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 11:33		

Released By	Date	Received By	Date
	4/9/15	907	4/9/15
Released By	Date	Received By	Date

Figure L-1.12

4/8/15

ADVANCED TECHNOLOGY LABORATORIES

SUBCONTRACT ORDER

Work Order: 1501260

G0409001-01/10

Analysis	Due	Expires	Sampled	Comments
04 **ATL Lab#: 1501260-04**	**/ M-407 @ 60'**	**Air**	**04/08/15 09:53**	
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 09:53		
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 09:53		
05 **ATL Lab#: 1501260-05**	**/ M-407 @ 90'**	**Air**	**04/08/15 10:22**	
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 10:22		
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 10:22		
06 **ATL Lab#: 1501260-06**	**/ M-408 @ 40' (probe)**	**Air**	**04/08/15 13:08**	
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 13:08		
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 13:08		
07 **ATL Lab#: 1501260-07**	**/ M-408 @ 70' (probe)**	**Air**	**04/08/15 13:24**	
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 13:24		
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 13:24		
08 **ATL Lab#: 1501260-08**	**/ M-408 @ 95' (probe)**	**Air**	**04/08/15 13:41**	
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 13:41		
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 13:41		

Released By	Date	Received By	Date
	4/9/15		4/9/15
Released By	Date	Received By	Date

Figure E-1.13

ADVANCED TECHNOLOGY LABORATORIES

SUBCONTRACT ORDER

Work Order: 1501260

G040901-01/10

Analysis	Due	Expires	Sampled	Comments
ATL Lab#: 1501260-09 **/ M-408 @ 60'**		**Air**	**04/08/15 12:19**	
09 15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 12:19		
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 12:19		
ATL Lab#: 1501260-10 **/ M-408 @ 90'**		**Air**	**04/08/15 12:40**	
10 D1946_T [Fixed Gases]	**04/15/15 17:00**	04/11/15 12:40		
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/11/15 12:40		

Released By	Date	Received By	Date
[signature]	4/9/15	907 [signature]	4/9/15
Released By	Date	Received By	Date

Figure E-1.14

ADVANCED TECHNOLOGY LABORATORIES

3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 1

Instruction: Complete all shaded areas.

For Laboratory Use Only				ATLCOC Ver: 20130715
Method of Transport	Sample Conditions Upon Receipt			
	Condition	Y	N	Condition Y N
☐ Client ☐ ATL	1. CHILLED	☐	☐	5. # OF SAMPLES MATCH COC ☐ ☐
☐ FedEx ☐ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED ☐ ☐
☐ GSO	3. CONTAINER INTACT	☐	☐	7. COOLER TEMP, deg C:
☐ Other: _____	4. SEALED	☐	☐	

CUSTOMER

Company: Amec Foster Wheeler | Address: 6001 Rickenbacker Rd | Tel: 323-889-5300
City: Los Angeles | State: CA | Zip: | Fax:

SEND REPORT TO:
Attn: Ron Lopez | Email: RON.R.LOPEZ@AMEC.COM
Company: Amec Foster Wheeler
Address: 6001 Rickenbacker Rd.
City: Los Angeles | State: CA | Zip:

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Marty Hudson | Email:
Company: Amec Foster Wheeler
Address: 6001 Rickenbacker Rd
City: Los Angeles 1946 | State: CA | Zip:

PROJECT

Project Name: MTA Westside
Project No.: 4953-11-1423
Sampler: Diego Scapillato
Quote No:
PO #:
Special Instructions/Comments: Fixed gases to be Nitrogen, Oxygen & CO_2

ITEM	Lab No.	Sample Description: Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 / 7000(Title 22 Metals)	TO-15	Methane, H_2S, EPA 15 $1/_{16}$ Fixed gases ASTM	SOIL / SEDIMENT / SLUDGE	SOLIDS / WIPE / FILTER	WATER - DRINKING / GROUND	WATER - STORM / WASTE	AQUEOUS / LAYERED - OIL	TAT	Container #	Container Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Container Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (AcO); 6=NaOH; 7=NA2S2O3	REMARKS
1	1501240-1	M-407 @ 65' (probe)	4/8/15	10:46a									X							6	2		
2	2	M-407 @ 70' (probe)	4/8/15	11:02a									X							6	2		
3	3	M-407 @ 75' (probe)	4/8/15	11:33a									X							6	2		
4	4	M-407 @ 60'	4/8/15	9:53a									X							6	2		
5	5	M-407 @ 90'	4/8/15	10:22a									X							6	2		
6	6	M-408 @ 40' (probe)	4/8/15	1:08p									X							6	2		
7	7	M-408 @ 70' (probe)	4/8/15	1:24p									X							6	2		
8	8	M-408 @ 95' (probe)	4/8/15	1:41p									X							6	2		
9	9	M-408 @ 60'	4/8/15	12:19p									X							6	2		
10	10	M-408 @ 90'	4/8/15	12:40p									X							6	2		

Encircle or Write Requested Analysis | Encircle Sample Matrix | Container | QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Diego Scapillato — Submitter Print Name | Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Diego Scapillato	4/8/15	3:35p.		4/8/15	15:35
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

Figure E1.15

ADVANCED TECHNOLOGY LABORATORIES

April 21, 2015

Ron Lopez
Amec Foster Wheeler
6001 Rickenbacker Road
Los Angeles, CA 90040
Tel: (323) 889-5300
Fax:(323) 721-6700

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1501279
Client Reference : MTA Westside, 4953-11-1423

Enclosed are the results for sample(s) received on April 09, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Amec Foster Wheeler	Project Number : MTA Westside, 4953-11-1423
6001 Rickenbacker Road	Report To : Ron Lopez
Los Angeles , CA 90040	Reported : 04/21/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
M-410 @ 75'	1501279-01	Air	4/09/15 9:53	4/09/15 14:55
M-410 @ 90'	1501279-02	Air	4/09/15 10:26	4/09/15 14:55
M-410 @ 40' (probe)	1501279-03	Air	4/09/15 10:48	4/09/15 14:55
M-410 @ 60' (probe)	1501279-04	Air	4/09/15 11:13	4/09/15 14:55
M-410 @ 95' (probe)	1501279-05	Air	4/09/15 11:58	4/09/15 14:55
M-409 @ 40' (probe)	1501279-06	Air	4/09/15 12:48	4/09/15 14:55
M-409 @ 85'	1501279-07	Air	4/09/15 12:54	4/09/15 14:55
M-409 @ 70' (probe)	1501279-08	Air	4/09/15 13:11	4/09/15 14:55
M-409 @ 100'	1501279-09	Air	4/09/15 13:29	4/09/15 14:55

CASE NARRATIVE

The samples for Methane, H2S (15/16) and Fixed Gases (ASTM D1946) were subcontracted to Air Technology Laboratories.

Figure E-1.17

Air TECHNOLOGY Laboratories, Inc.

April 21, 2015

ACCLASS ACCREDITED DoD ELAP
ADE-1461
EPA Methods TO-3, TO14A,TO15 SIM & Scan, ASTM D1946

nelac
LA Cert 04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175
TX Cert T104704450-09-TX
EPA Methods TO14A, TO15
UT Cert CA0133332014-1
EPA Methods TO3, TO14A, TO15, RSK-175

Advanced Technology Laboratories
ATTN: Rachelle Arada
3275 Walnut Ave.
Signal Hill, CA 90755

LABORATORY TEST RESULTS

Project Reference: 1501279
Lab Number: G041002-01/09

Enclosed are results for sample(s) received 4/10/15 by Air Technology Laboratories. Samples were received intact. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the NELAC Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Enclosures

Note: The cover letter is an integral part of this analytical report.

Figure E-1.18

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501279
Date Received: 04/10/15
Matrix: Air
Reporting Units: % v/v

ASTM D1946

Lab No.:	G041002-01		G041002-02		G041002-03		G041002-04	
Client Sample I.D.:	1501279-01 / M-410 @ 75'		1501279-02 / M-410 @ 90'		1501279-03 / M-410 @ 40' (probe)		1501279-04 / M-410 @ 60' (probe)	
Date/Time Sampled:	4/9/15 9:53		4/9/15 10:26		4/9/15 10:48		4/9/15 11:13	
Date/Time Analyzed:	4/10/15 10:35		4/10/15 10:49		4/10/15 11:04		4/10/15 11:19	
QC Batch No.:	150410GC8A1		150410GC8A1		150410GC8A1		150410GC8A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	Result % v/v	RL % v/v	Result % v/v	RL % v/v	Result % v/v	RL % v/v	Result % v/v	RL % v/v
Carbon Dioxide	1.2	0.010	1.4	0.010	12	0.010	15	0.010
Oxygen/Argon	17	0.50	17	0.50	1.7	0.50	1.5	0.50
Nitrogen	80	1.0	77	1.0	79	1.0	76	1.0
Methane	1.5	0.0010	4.0	0.0010	6.8	0.0010	7.6	0.0010

Results normalized including non-methane hydrocarbons
ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 4/21/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client:	**Advanced Technology Laboratories**
Attn:	**Rachelle Arada**
Project Name:	**NA**
Project No.:	**1501279**
Date Received:	**04/10/15**
Matrix:	**Air**
Reporting Units:	**% v/v**

ASTM D1946

Lab No.:	G041002-05		G041002-06		G041002-07		G041002-08	
Client Sample I.D.:	1501279-05 / M-410 @ 95' (probe)		1501279-06 / M-409 @ 40' (probe)		1501279-07 / M-409 @ 85'		1501279-08 / M-409 @ 70' (probe)	
Date/Time Sampled:	4/9/15 11:58		4/9/15 12:48		4/9/15 12:54		4/9/15 13:11	
Date/Time Analyzed:	4/10/15 11:33		4/10/15 12:03		4/10/15 12:18		4/10/15 12:47	
QC Batch No.:	150410GC8A1		150410GC8A1		150410GC8A1		150410GC8A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	**Result % v/v**	**RL % v/v**	**Result % v/v**	**RL % v/v**	**Result % v/v**	**RL % v/v**	**Result % v/v**	**RL % v/v**
Carbon Dioxide	0.12	0.010	13	0.010	1.9	0.010	12	0.010
Oxygen/Argon	19	0.50	4.6	0.50	13	0.50	1.5	0.50
Nitrogen	81	1.0	82	1.0	84	1.0	74	1.0
Methane	0.020	0.0010	0.21	0.0010	1.8	0.0010	12	0.0010

Results normalized including non-methane hydrocarbons
ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 4/21/15

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501279
Date Received: 04/10/15
Matrix: Air
Reporting Units: % v/v

ASTM D1946

Lab No.:	G041002-09							
Client Sample I.D.:	1501279-09 / M-409 @ 100'							
Date/Time Sampled:	4/9/15 13:29							
Date/Time Analyzed:	4/10/15 12:32							
QC Batch No.:	150410GC8A1							
Analyst Initials:	AS							
Dilution Factor:	1.0							
ANALYTE	**Result % v/v**	**RL % v/v**						
Carbon Dioxide	0.070	0.010						
Oxygen/Argon	22	0.50						
Nitrogen	78	1.0						
Methane	0.064	0.0010						

Results normalized including non-methane hydrocarbons
ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 4/11/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

QC Batch No.: 150410GC8A1
Matrix: Air
Units: % v/v

QC for ASTM D1946

Lab No.:	Method Blank		LCS		LCSD			
Date/Time Analyzed:	4/10/15 8:27		4/10/15 7:44		4/10/15 7:58			
Analyst Initials:	AS		AS		AS			
Datafile:	10apr004		10apr001		10apr002			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	Results	RL	% Rec.	Criteria	% Rec.	Criteria	%RPD	Criteria
Carbon Dioxide	ND	0.010	94	70-130%	94	70-130%	0.4	<30
Oxygen/Argon	ND	0.50	98	70-130%	98	70-130%	0.4	<30
Nitrogen	ND	1.0	99	70-130%	99	70-130%	0.2	<30
Methane	ND	0.0010	110	70-130%	109	70-130%	0.9	<30

ND = Not Detected (Below RL)

Reviewed/Approved By: _____ Date: 4/21/15

Mark J. Johnson
Operations Manager

The cover letter is an integral part of this analytical report.

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501279
Date Received: 04/10/15
Matrix: Air
Reporting Units: ppmv

EPA 15/16

Lab No.:	G041002-01		G041002-02		G041002-03		G041002-04	
Client Sample I.D.:	1501279-01 / M-410 @ 75'		1501279-02 / M-410 @ 90'		1501279-03 / M-410 @ 40' (probe)		1501279-04 / M-410 @ 60' (probe)	
Date/Time Sampled:	4/9/15 9:53		4/9/15 10:26		4/9/15 10:48		4/9/15 11:13	
Date/Time Analyzed:	4/10/15 10:47		4/10/15 10:58		4/10/15 11:11		4/10/15 11:33	
QC Batch No.:	150410GC3A1		150410GC3A1		150410GC3A1		150410GC3A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv
Hydrogen Sulfide	ND	0.20	0.66	0.20	ND	0.20	ND	0.20

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 4/21/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

Figure E-1.23

18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client:	**Advanced Technology Laboratories**
Attn:	**Rachelle Arada**
Project Name:	**NA**
Project No.:	**1501279**
Date Received:	**04/10/15**
Matrix:	**Air**
Reporting Units:	**ppmv**

EPA 15/16

Lab No.:	G041002-05		G041002-06		G041002-07		G041002-08	
Client Sample I.D.:	1501279-05 / M-410 @ 95' (probe)		1501279-06 / M-409 @ 40' (probe)		1501279-07 / M-409 @ 85'		1501279-08 / M-409 @ 70' (probe)	
Date/Time Sampled:	4/9/15 11:58		4/9/15 12:48		4/9/15 12:54		4/9/15 13:11	
Date/Time Analyzed:	4/10/15 11:47		4/10/15 12:14		4/10/15 13:07		4/10/15 13:19	
QC Batch No.:	150410GC3A1		150410GC3A1		150410GC3A1		150410GC3A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv
Hydrogen Sulfide	ND	0.20	ND	0.20	ND	0.20	ND	0.20

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 4/21/15

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

Figure E-1.24

18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client:	**Advanced Technology Laboratories**
Attn:	**Rachelle Arada**
Project Name:	**NA**
Project No.:	**1501279**
Date Received:	**04/10/15**
Matrix:	**Air**
Reporting Units:	**ppmv**

EPA 15/16

Lab No.:	**G041002-09**							
Client Sample I.D.:	**1501279-09 / M-409 @ 100'**							
Date/Time Sampled:	**4/9/15 13:29**							
Date/Time Analyzed:	**4/10/15 13:32**							
QC Batch No.:	**150410GC3A1**							
Analyst Initials:	**AS**							
Dilution Factor:	**1.0**							
ANALYTE	**Result ppmv**	**RL ppmv**						
Hydrogen Sulfide	ND	0.20						

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 4/21/15

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

Figure E-1.25

18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

QC Batch No.: 150410GC3A1
Matrix: Air
Units: ppmv

QC for Sulfur Compounds by EPA 15/16

Lab No.:	Method Blank		LCS		LCSD			
Date/Time Analyzed:	4/10/15 8:11		4/10/15 7:47		4/10/15 8:00			
Analyst Initials:	AS		AS		AS			
Datafile:	10apr003		10apr001		10apr002			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	Results	RL	% Rec.	Criteria	% Rec.	Criteria	%RPD	Criteria
Hydrogen Sulfide	ND	0.20	95	70-130%	98	70-130%	3.4	<30

ND = Not Detected (Below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date: 4/21/15
Mark J. Johnson
Operations Manager

The cover letter is an integral part of this analytical report.

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

ADVANCED TECHNOLOGY LABORATORIES

SUBCONTRACT ORDER

Work Order: 1501279

G041002-01/09

SENDING LABORATORY:

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Phone: 562.989.4045
Fax: 562.989.6348
Project Manager: Rachelle Arada (Rachelle@atlglobal.com)

RECEIVING LABORATORY:

Air Technology Laboratories, Inc.
18501 E. Gale Ave, Suite 130
City of Industry, CA 91748
Phone :(626) 964-4032
Fax: (626) 964-5832
PO#: SC09504-STANDARD TAT

IMPORTANT : Please include Work Order # and PO # in your invoice.

Analysis	Due	Expires	Sampled	Comments
01 **ATL Lab#: 1501279-01** / M-410 @ 75'		Air	04/09/15 09:53	**Fixed gases -Carbon Dioxide, Oxygen, Nitrogen, Methane**
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/12/15 09:53		
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/12/15 09:53		
2-Tedlar Bag				
02 **ATL Lab#: 1501279-02** / M-410 @ 90'		Air	04/09/15 10:26	
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/12/15 10:26		
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/12/15 10:26		
2-Tedlar Bag				
03 **ATL Lab#: 1501279-03** / M-410 @ 40' (probe)		Air	04/09/15 10:48	
15_16_H2S_T_SUB [Hydrogen Sulfide]	**04/15/15 17:00**	04/12/15 10:48		
D1946_T [Fixed Gases]	**04/15/15 17:00**	04/12/15 10:48		
2-Tedlar Bag				

Released By	Date	Received By	Date
ADNOR MANGAHAS	4/10/15		4/10/15 853
Released By	Date	Received By	Date

ADVANCED TECHNOLOGY LABORATORIES

SUBCONTRACT ORDER

Work Order: 1501279

G041002-01/09

Analysis	Due	Expires	Sampled	Comments
ATL Lab#: 1501279-04 / **M-410 @ 60' (probe)**		**Air**	**04/09/15 11:13**	
D1946_T	**04/15/15 17:00**	04/12/15 11:13		
[Fixed Gases]				
15_16_H2S_T_SUB	**04/15/15 17:00**	04/12/15 11:13		
[Hydrogen Sulfide]				
2-Tedlar Bag				
ATL Lab#: 1501279-05 / **M-410 @ 95' (probe)**		**Air**	**04/09/15 11:58**	
D1946_T	**04/15/15 17:00**	04/12/15 11:58		
[Fixed Gases]				
15_16_H2S_T_SUB	**04/15/15 17:00**	04/12/15 11:58		
[Hydrogen Sulfide]				
1-Tedlar Bag				
ATL Lab#: 1501279-06 / **M-409 @ 40' (probe)**		**Air**	**04/09/15 12:48**	
15_16_H2S_T_SUB	**04/15/15 17:00**	04/12/15 12:48		
[Hydrogen Sulfide]				
D1946_T	**04/15/15 17:00**	04/12/15 12:48		
[Fixed Gases]				
2-Tedlar Bag				
ATL Lab#: 1501279-07 / **M-409 @ 85'**		**Air**	**04/09/15 12:54**	
15_16_H2S_T_SUB	**04/15/15 17:00**	04/12/15 12:54		
[Hydrogen Sulfide]				
D1946_T	**04/15/15 17:00**	04/12/15 12:54		
[Fixed Gases]				
2-Tedlar Bag				
ATL Lab#: 1501279-08 / **M-409 @ 70' (probe)**		**Air**	**04/09/15 13:11**	
15_16_H2S_T_SUB	**04/15/15 17:00**	04/12/15 13:11		
[Hydrogen Sulfide]				
D1946_T	**04/15/15 17:00**	04/12/15 13:11		
[Fixed Gases]				
2-Tedlar Bag				

Released By	Date	Received By	Date
MISTER MANGANAS	4/10/15		4/10/15 853
Released By	Date	Received By	Date

ADVANCED TECHNOLOGY LABORATORIES

SUBCONTRACT ORDER

Work Order: 1501279

G041002-09

Analysis	Due	Expires	Sampled	Comments
ATL Lab#: 1501279-09 / M-409 @ 100'		**Air**	**04/09/15 13:29**	
09 D1946_T [Fixed Gases]	**04/15/15 17:00**	04/12/15 13:29		
15_16_H2S_T_SUB [Hydrogen Sulfide] 2-Tedlar Bag	**04/15/15 17:00**	04/12/15 13:29		

ABNER MANGOBAS 4/10/15 — 4/10/15 853

Released By / Date / Received By / Date

Released By / Date / Received By / Date

Figure E-1.29

ADVANCED TECHNOLOGY LABORATORIES

3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 1

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport	Sample Conditions Upon Receipt					
	Condition	Y	N	Condition	Y	N
☑ Client ☐ ATL	1. CHILLED	☐	☐	5. # OF SAMPLES MATCH COC	☐	☐
☐ FedEx ☐ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☐
☐ GSO	3. CONTAINER INTACT	☐	☐	7. COOLER TEMP, deg C:		
☐ Other:	4. SEALED	☐	☐			

CUSTOMER

Company: Amec Foster Wheeler
Address: 6001 Rickenbacker Rd
City: Los Angeles State: CA Zip:
Tel:
Fax: 323-889-5300

SEND REPORT TO:
Attn: Ron Lopez
Email: RON.R.LOPEZ@AMEC.COM
Company: Amec Foster Wheeler
Address: 6001 Rickenbacker Rd
City: Los Angeles State: CA Zip:

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Marty Hudson
Email:
Company: Amec Foster Wheeler
Address: 6001 Rickenbacker Rd
City: Los Angeles → D1946 State: CA Zip:

PROJECT

Project Name: MTA Westside
Project No.: 4953-11-1423
Sampler: Diego Scapillato
Quote No:
PO #:
Special Instructions/Comments: Fixed gases to be Nitrogen, Oxygen & CO_2

ITEM	Lab No.	Sample Description: Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 / 7000(Title 22 Metals)	TO-15	Methane	H_2S EPA 15/16	Fixed gases ASTM	SOIL / SEDIMENT / SLUDGE	SOLIDS / WIPE / FILTER	WATER - DRINKING / GROUND	WATER - STORM / WASTE	AQUEOUS / LAYERED - OIL	AIR	TAT	#	Container Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Ziplock; 7=Canister	Container Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn (Ac)2; 6=NaOH; 7=NA2S2O3	REMARKS
1	1504279-1	M-410 @ 75'	4/9/15	9:53a									X	X	X						X		6	2		
2	2	M-410 @ 90'	4/9/15	10:26									X	X	X						X		6	2		
3	3	M-410 @ 40' (probe)	4/9/15	10:48									X	X	X						X		6	2		
4	4	M-410 @ 60' (probe)	4/9/15	11:13									X	X	X						X		6	2		
5	5	M-410 @ 95' (probe) (1 bag)	4/9/15	11:58									X	X	X						X		6	1		
6	6	M-409 @ 40' (probe)	4/9/15	12:48									X	X	X						X		6	2		
7	7	M-409 @ 85'	4/9/15	12:54									X	X	X						X		6	2		
8	8	M-409 @ 70' (probe)	4/9/15	1:11									X	X	X						X		6	2		
9	9	M-409 @ 100'	4/9/15	1:29									X	X	X						X		6	2		
10																										

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday after-hours work - ask for quote.
5. Subcontract TAT = 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Diego Scapillato — Submitter Print Name

Signature

CUSTODY

Relinquished by: (Signature and Printed Name) Diego Scapillato	Date: 4/9/15	Time: 2:54p	Received by: (Signature and Printed Name) FEDEX	Date: 4/9/15	Time: 1455
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES

May 29, 2015

Ron Lopez
Amec Foster Wheeler
6001 Rickenbacker Road
Los Angeles, CA 90040
Tel: (323) 889-5300
Fax:(323) 721-6700

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1501682
Client Reference : MTA Westside, 4953-11-1423

Enclosed are the results for sample(s) received on May 12, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Amec Foster Wheeler		Project Number :	MTA Westside, 4953-11-1423
6001 Rickenbacker Road		Report To :	Ron Lopez
Los Angeles , CA 90040		Reported :	05/29/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
M409-90'	1501682-01	Water	5/12/15 14:55	5/12/15 17:20
M410 -80'	1501682-02	Water	5/12/15 12:20	5/12/15 17:20
M409 probe @70'	1501682-03	Air	5/12/15 13:55	5/12/15 17:20
M409 stand pipe@ 85'	1501682-04	Air	5/12/15 14:08	5/12/15 17:20
M410 probe @ 60'	1501682-05	Air	5/12/15 11:00	5/12/15 17:20

CASE NARRATIVE

The air samples for Methane, H2S (15/16) and Fixed Gases (ASTM D1946) were subcontracted to Air Technology Laboratories.

Figure E-1.32

Certificate of Analysis

Amec Foster Wheeler	Project Number : MTA Westside, 4953-11-1423
6001 Rickenbacker Road	Report To : Ron Lopez
Los Angeles , CA 90040	Reported : 05/29/2015

Client Sample ID M409-90'

Lab ID: 1501682-01

Dissolved Gases in Water — **Analyst: MFR**

Analyte	Result (ug/L)	PQL (ug/L)	MDL (ug/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Methane	**600**	5.0	3.7	5	B5E0426	05/18/2015	05/18/15 12:26	

Sulfide, Total by SM 4500-S=D — **Analyst: LA**

Analyte	Result (mg/L)	PQL (mg/L)	MDL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Sulfide, Total	**0.027**	0.010	0.004	1	B5E0520	05/19/2015	05/19/15 18:51	
Hydrogen sulfide	**0.029**	0.011	0.005	1	B5E0520	05/19/2015	05/19/15 18:51	

Figure E-1.33

Certificate of Analysis

Amec Foster Wheeler	Project Number : MTA Westside, 4953-11-1423
6001 Rickenbacker Road	Report To : Ron Lopez
Los Angeles , CA 90040	Reported : 05/29/2015

Client Sample ID M410 -80'

Lab ID: 1501682-02

Dissolved Gases in Water — **Analyst: MFR**

Analyte	Result (ug/L)	PQL (ug/L)	MDL (ug/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Methane	**400**	5.0	3.7	5	B5E0426	05/18/2015	05/18/15 13:43	

Sulfide, Total by SM 4500-S=D — **Analyst: LA**

Analyte	Result (mg/L)	PQL (mg/L)	MDL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Sulfide, Total	**82**	4.0	1.8	400	B5E0520	05/19/2015	05/19/15 18:51	
Hydrogen sulfide	**87**	4.4	1.9	400	B5E0520	05/19/2015	05/19/15 18:51	

Figure E-1.34

Certificate of Analysis

Amec Foster Wheeler	Project Number : MTA Westside, 4953-11-1423
6001 Rickenbacker Road	Report To : Ron Lopez
Los Angeles , CA 90040	Reported : 05/29/2015

QUALITY CONTROL SECTION

Dissolved Gases in Water - Quality Control

Analyte	Result (ug/L)	PQL (ug/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5E0426 - No_Prep_RSK_W									
Blank (B5E0426-BLK1)				Prepared: 5/18/2015 Analyzed: 5/18/2015					
Methane	ND	1.0			NR				
LCS (B5E0426-BS1)				Prepared: 5/18/2015 Analyzed: 5/18/2015					
Methane	33.9200	1.0	48.1000		70.5	70 - 130			
LCS Dup (B5E0426-BSD1)				Prepared: 5/18/2015 Analyzed: 5/18/2015					
Methane	33.9200	1.0	48.1000		70.5	70 - 130	0.00	20	
Duplicate (B5E0426-DUP1)		**Source: 1501682-02**		Prepared: 5/18/2015 Analyzed: 5/18/2015					
Methane	479.750	5.0		400.100	NR		18.1	20	

Figure E-1.35

Certificate of Analysis

Amec Foster Wheeler	Project Number : MTA Westside, 4953-11-1423
6001 Rickenbacker Road	Report To : Ron Lopez
Los Angeles , CA 90040	Reported : 05/29/2015

Sulfide, Total by SM 4500-S=D - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5E0520 - Prep_WC3_W									
Blank (B5E0520-BLK1)					Prepared: 5/19/2015 Analyzed: 5/19/2015				
Sulfide, Total	ND	0.010			NR				
Hydrogen sulfide	ND	0.011			NR				
LCS (B5E0520-BS1)					Prepared: 5/19/2015 Analyzed: 5/19/2015				
Sulfide, Total	0.107700	0.010	0.100000		108	80 - 120			
Hydrogen sulfide	0.114468	0.011	0.106284		108	80 - 120			
Matrix Spike (B5E0520-MS1)		**Source: 1501682-01**			Prepared: 5/19/2015 Analyzed: 5/19/2015				
Sulfide, Total	0.142100	0.010	0.100000	0.0272	115	70 - 120			
Hydrogen sulfide	0.151030	0.011	0.106284	0.028909	115	70 - 120			
Matrix Spike Dup (B5E0520-MSD1)		**Source: 1501682-01**			Prepared: 5/19/2015 Analyzed: 5/19/2015				
Sulfide, Total	0.142000	0.010	0.100000	0.0272	115	70 - 120	0.0704	20	
Hydrogen sulfide	0.150923	0.011	0.106284	0.028909	115	70 - 120	0.0709	20	

Figure E-1.36

Certificate of Analysis

Amec Foster Wheeler		Project Number :	MTA Westside, 4953-11-1423
6001 Rickenbacker Road		Report To :	Ron Lopez
Los Angeles , CA 90040		Reported :	05/29/2015

Notes and Definitions

ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

Figure E-1.37

AirTECHNOLOGY
Laboratories, Inc.

May 28, 2015

ADE-1461
EPA Methods TO-3, TO14A,TO15 SIM & Scan, ASTM D1946

LA Cert 04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175
TX Cert T104704450-09-TX
EPA Methods TO14A, TO15
UT Cert CA0133332014-1
EPA Methods TO3, TO14A, TO15, RSK-175

Advanced Technology Laboratories
ATTN: Rachelle Arada
3275 Walnut Ave.
Signal Hill, CA 90755

LABORATORY TEST RESULTS

Project Reference: 1501682
Lab Number: G051303-01/03

Enclosed are results for sample(s) received 5/13/15 by Air Technology Laboratories. Samples were received intact. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the NELAC Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Enclosures

Note: The cover letter is an integral part of this analytical report.

Figure E-1.38

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501682
Date Received: 05/13/15
Matrix: Air
Reporting Units: % v/v

ASTM D1946

Lab No.:	G051303-01		G051303-02		G051303-03			
Client Sample I.D.:	1501682-03 / M409 probe @70'		1501682-04 / M409 stand pipe @85'		1501682-05 / M410 probe @60'			
Date/Time Sampled:	5/12/15 13:55		5/12/15 14:08		5/12/15 11:00			
Date/Time Analyzed:	5/14/15 12:47		5/14/15 12:17		5/14/15 12:31			
QC Batch No.:	150514GC8A1		150514GC8A1		150514GC8A1			
Analyst Initials:	AS		AS		AS			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	**Result % v/v**	**RL % v/v**	**Result % v/v**	**RL % v/v**	**Result % v/v**	**RL % v/v**		
Carbon Dioxide	13	0.010	7.4	0.010	17	0.010		
Oxygen/Argon	3.7	0.50	4.1	0.50	2.2	0.50		
Nitrogen	83	1.0	79	1.0	76	1.0		
Methane	0.21	0.0010	8.9	0.0010	4.4	0.0010		

Results normalized including non-methane hydrocarbons
ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ **Date** 5-28-15

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

QC Batch No.: 150514GC8A1
Matrix: Air
Units: % v/v

QC for ASTM D1946

Lab No.:	Method Blank		LCS		LCSD			
Date/Time Analyzed:	5/14/15 11:31		5/14/15 9:51		5/14/15 10:06			
Analyst Initials:	AS		AS		AS			
Datafile:	14may010		14may003		14may004			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	**Results**	**RL**	**% Rec.**	**Criteria**	**% Rec.**	**Criteria**	**%RPD**	**Criteria**
Carbon Dioxide	ND	0.010	91	70-130%	79	70-130%	13.4	<30
Oxygen/Argon	ND	0.50	101	70-130%	88	70-130%	13.8	<30
Nitrogen	ND	1.0	101	70-130%	88	70-130%	13.6	<30
Methane	ND	0.0010	103	70-130%	103	70-130%	0.1	<30

ND = Not Detected (Below RL)

Reviewed/Approved By: _____ **Date:** 5-27-15

Mark J. Johnson
Operations Manager

The cover letter is an integral part of this analytical report.

Figure E-1.40

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501682
Date Received: 05/13/15
Matrix: Air
Reporting Units: ppmv

EPA 15/16

Lab No.:	G051303-01		G051303-02		G051303-03			
Client Sample I.D.:	1501682-03 / M409 probe @70'		1501682-04 / M409 stand pipe @85'		1501682-05 / M410 probe @60'			
Date/Time Sampled:	5/12/15 13:55		5/12/15 14:08		5/12/15 11:00			
Date/Time Analyzed:	5/14/15 10:02		5/14/15 10:14		5/14/15 10:25			
QC Batch No.:	150514GC3A1		150514GC3A1		150514GC3A1			
Analyst Initials:	AS		AS		AS			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv		
Hydrogen Sulfide	ND	0.20	ND	0.20	ND	0.20		

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 5-28-15

Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

Figure E-1.41

QC Batch No.: 150514GC3A1
Matrix: Air
Units: ppmv

QC for Sulfur Compounds by EPA 15/16

Lab No.:	Method Blank		LCS		LCSD			
Date/Time Analyzed:	5/14/15 9:49		5/14/15 9:20		5/14/15 9:31			
Analyst Initials:	AS		AS		AS			
Datafile:	14may003		14may001		14may002			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	Results	RL	% Rec.	Criteria	% Rec.	Criteria	%RPD	Criteria
Hydrogen Sulfide	ND	0.20	92	70-130%	91	70-130%	1.2	<30

ND = Not Detected (Below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date: 5-28-15
Mark J. Johnson
Operations Manager

The cover letter is an integral part of this analytical report.

Air TECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

ADVANCED TECHNOLOGY LABORATORIES

SUBCONTRACT ORDER

Work Order: 1501682

C051303-01/03

SENDING LABORATORY:

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90755
Phone: 562.989.4045
Fax: 562.989.6348
Project Manager: Rachelle Arada (Rachelle@atlglobal.com)

RECEIVING LABORATORY:

Air Technology Laboratories, Inc.
18501 E. Gale Ave, Suite 130
City of Industry, CA 91748
Phone :(626) 964-4032
Fax: (626) 964-5832
PO#: SC09583-STANDARD TAT

IMPORTANT : Please include Work Order # and PO # in your invoice.

Analysis	Due	Expires	Sampled	Comments
ATL Lab#: 1501682-03 / M409 probe @70'		**Air**	**05/12/15 13:55**	**D1946- please report Carbon Dioxide, Oxygen, Nitrogen and Methane**
D1946_T [Fixed Gases]	**05/27/15 17:00**	05/15/15 13:55		
15_16_H2S_T_SUB [Hydrogen Sulfide] 2-Tedlar Bag	**05/27/15 17:00**	05/15/15 13:55		
ATL Lab#: 1501682-04 / M409 stand pipe @85'		**Air**	**05/12/15 14:08**	
D1946_T [Fixed Gases]	**05/27/15 17:00**	05/15/15 14:08		
15_16_H2S_T_SUB [Hydrogen Sulfide] 2-Tedlar Bag	**05/27/15 17:00**	05/15/15 14:08		
ATL Lab#: 1501682-05 / M410 probe @60'		**Air**	**05/12/15 11:00**	
D1946_T [Fixed Gases]	**05/27/15 17:00**	05/15/15 11:00		
15_16_H2S_T_SUB [Hydrogen Sulfide] 2-Tedlar Bag	**05/27/15 17:00**	05/15/15 11:00		

Released By	Date	Received By	Date
	5/13/15		5-13-15 9:00
	5-13-15 11:06		5/13/15 1106

Figure E-1.43

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page ____ of ____

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport	Sample Conditions Upon Receipt					
	Condition	Y	N	Condition	Y	N
☑ Client ☐ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐ FedEx ☐ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☑	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:	5.7	
☐ Other: _____	4. SEALED	☐	☑			

CUSTOMER

Company: Amec Foster Wheeler
Address: 6001 Rickenbacker Rd
City: Los Angeles State: CA Zip: 90040
Tel: 323 889 5300 Fax: 323 889 6700

SEND REPORT TO:
Attn: Ron Lopez Email: RON.R.LOPEZ@AMEC.COM
Company: Amec Foster Wheeler
Address: Same
City: State: Zip:

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Email:
Company: Amec
Address: Same
City: State: Zip:

PROJECT SAMPLE (Figure 4 Wave)

Project Name: MTA Westside
Project No.: 4953-11-1423
Sampler: Diego Scapillato / Ron Lopez
Quote No:
PO #:
Special Instructions/Comments: * fixed gases (O2, O2, Nitrogen

ITEM	Lab No.	Sample Description: Sample ID / Location	Date	Time
1	1701662 - 1	M409 - 90'	5/12/15	2:55
2	2	M410 - 80'	5/12/15	12:20
3	3	M 409 probe @ 70'	5/12/15	1:55
4	4	M 409 standpipe @ 85'	5/12/15	2:08
5	5	M 410 probe @ 60'	5/12/15	11:00
6				
7				
8				
9				
10				

Encircle or Write Requested Analysis

| 8260 / 624 (Volatiles) | 8015(GRO) | 8015(DRO) | 8270(Semi-volatiles) | 8081(Organochlorine Pesticides) | 8082(PCBs) | 6010 / 7000(Title 22 Metals) | TO-15 | EPA RSK-175 | SM 4500-S=D | ASTM D1946 Methane | EPA 1s/1g | ASTM D1946* | | | | |

Rachelle Arada

From: Lopez, Ron R (Los Angeles) [ron.lopez@amecfw.com]
Sent: Thursday, May 21, 2015 8:32 AM
To: Rachelle Arada
Subject: RE: Results - MTA Westside, 4953-11-1423 (ATL# 1501682)

Hi Rachelle,

Can you please had H_2S to the results of the lab report.
Thanks,

Ronald Lopez
Senior Engineer
Amec Foster Wheeler
Environment & Infrastructure
6001 Rickenbacker Road | Los Angeles, CA 90040
Office (323) 889-5300 x286 | **Cell** (818) 472-1875 | **Fax** (323) 721-6700
Email: ron.r.lopez@amecfw.com | **Web:** www.amecfw.com

From: Rachelle Arada [mailto:Rachelle@atlglobal.com]
Sent: Wednesday, May 20, 2015 3:58 PM
To: Lopez, Ron R (Los Angeles)
Subject: Results - MTA Westside, 4953-11-1423 (ATL# 1501682)

Hi Ron,

Attached are the results for the above project. Subcontract analysis results to follow.

Rachelle Arada
Project Manager

Advanced Technology Laboratories
www.atlglobal.com
Tel: (562) 989-4045 ext. 237
Fax: (562) 989-4040

Advanced Technology Laboratories is a full-service environmental lab providing organic and inorganic analyses of soil, water, wastewater, storm water and hazardous waste samples. ATL is accredited by the State of California, NELAP and State of Oregon (Air) and holds various SBE, DBE and MBE certificates and a USDA soil permit. ATL takes pride in providing our customers with quick turnaround time, excellent customer service and defensible data while offering very competitive rates. *Advanced Technology Labs - Your Partner for Quality Environmental Testing*

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amec
foster
wheeler

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ADVANCED TECHNOLOGY LABORATORIES

June 01, 2015

Ron Lopez
Amec Foster Wheeler
6001 Rickenbacker Road
Los Angeles, CA 90040
Tel: (323) 889-5300
Fax:(323) 721-6700

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1501690

Client Reference : MTA WESTSIDE, 4953-11-1423

Enclosed are the results for sample(s) received on May 13, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Amec Foster Wheeler	Project Number : MTA WESTSIDE, 4953-11-1423
6001 Rickenbacker Road	Report To : Ron Lopez
Los Angeles , CA 90040	Reported : 06/01/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
M-407 Standpipe @ 60'	1501690-01	Air	5/13/15 9:57	5/13/15 14:56
M-407 Probe @75'	1501690-02	Air	5/13/15 10:18	5/13/15 14:56
M-408 Standpipe @90'	1501690-03	Air	5/13/15 11:00	5/13/15 14:56
M-408 Probe @ 95'	1501690-04	Air	5/13/15 11:25	5/13/15 14:56
M-119 Standpipe @ 50'	1501690-05	Air	5/13/15 12:10	5/13/15 14:56
M-119 Standpipe @ 75'	1501690-06	Air	5/13/15 12:55	5/13/15 14:56
M-119 Probe @ 25'	1501690-07	Air	5/13/15 12:45	5/13/15 14:56

CASE NARRATIVE

The samples for Methane, H2S (15/16) and Fixed Gases (ASTM D1946) were subcontracted to Air Technology Laboratories.

Figure E-1.47

Air TECHNOLOGY Laboratories, Inc.

June 1, 2015

ADE-1461
EPA Methods TO-3, TO14A,TO15 SIM & Scan, ASTM D1946

LA Cert 04140
EPA Methods TO3, TO14A, TO15, 25C/3C, RSK-175

TX Cert T104704450-09-TX
EPA Methods TO14A, TO15

UT Cert CA0133332014-1
EPA Methods TO3, TO14A, TO15, RSK-175

Advanced Technology Laboratories
ATTN: Rachelle Arada
3275 Walnut Ave.
Signal Hill, CA 90755

LABORATORY TEST RESULTS

Project Reference: 1501690
Lab Number: G051402-01/07

Enclosed are results for sample(s) received 5/14/15 by Air Technology Laboratories. Samples were received intact. Analyses were performed according to specifications on the chain of custody provided with the sample(s).

Report Narrative:

- Unless otherwise noted in the report, sample analyses were performed within method performance criteria and meet all requirements of the NELAC Standards.
- The enclosed results relate only to the sample(s).

ATL appreciates the opportunity to provide testing services to your company. If you have any questions regarding these results, please call me at (626) 964-4032.

Sincerely,

Mark Johnson
Operations Manager
MJohnson@AirTechLabs.com

Enclosures

Note: The cover letter is an integral part of this analytical report.

Figure E-1.48

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501690
Date Received: 05/14/15
Matrix: Air
Reporting Units: % v/v

ASTM D1946

Lab No.:	G051402-01		G051402-02		G051402-03		G051402-04	
Client Sample I.D.:	1501690-01 / M-407 Standpipe @60'		1501690-02 / M-407 probe @75'		1501690-03 / M-408 Standpipe @90'		1501690-04 / M-408 probe @95'	
Date/Time Sampled:	5/13/15 9:57		5/13/15 10:18		5/13/15 11:00		5/13/15 11:25	
Date/Time Analyzed:	5/15/15 10:36		5/15/15 10:51		5/15/15 11:05		5/15/15 11:20	
QC Batch No.:	150515GC8A1		150515GC8A1		150515GC8A1		150515GC8A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		1.0	
ANALYTE	Result % v/v	RL % v/v	Result % v/v	RL % v/v	Result % v/v	RL % v/v	Result % v/v	RL % v/v
Carbon Dioxide	6.9	0.010	7.8	0.010	5.6	0.010	1.4	0.010
Oxygen/Argon	2.9	0.50	1.9	0.50	5.8	0.50	0.59	0.50
Nitrogen	53	1.0	46	1.0	83	1.0	2.3	1.0
Methane	36	0.0010	43	0.0010	5.3	0.0010	94	0.0010

Results normalized including non-methane hydrocarbons
ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 5/21/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501690
Date Received: 05/14/15
Matrix: Air
Reporting Units: % v/v

ASTM D1946

Lab No.:	G051402-05		G051402-06		G051402-07			
Client Sample I.D.:	1501690-05 / M-119 Standpipe @50'		1501690-06 / M-119 Standpipe @75'		1501690-07 / M-119 probe @25'			
Date/Time Sampled:	5/13/15 12:10		5/13/15 12:55		5/13/15 12:45			
Date/Time Analyzed:	5/15/15 11:34		5/15/15 12:04		5/15/15 12:19			
QC Batch No.:	150515GC8A1		150515GC8A1		150515GC8A1			
Analyst Initials:	AS		AS		AS			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	Result % v/v	RL % v/v	Result % v/v	RL % v/v	Result % v/v	RL % v/v		
Carbon Dioxide	1.9	0.010	6.7	0.010	3.1	0.010		
Oxygen/Argon	14	0.50	4.8	0.50	2.6	0.50		
Nitrogen	84	1.0	83	1.0	94	1.0		
Methane	0.24	0.0010	5.2	0.0010	0.043	0.0010		

Results normalized including non-methane hydrocarbons
ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 5/31/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

QC Batch No.: 150515GC8A1
Matrix: Air
Units: % v/v

QC for ASTM D1946

Lab No.:	Method Blank		LCS		LCSD			
Date/Time Analyzed:	5/15/15 10:21		5/15/15 9:37		5/15/15 9:52			
Analyst Initials:	AS		AS		AS			
Datafile:	15may007		15may004		15may005			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	**Results**	**RL**	**% Rec.**	**Criteria**	**% Rec.**	**Criteria**	**%RPD**	**Criteria**
Carbon Dioxide	ND	0.010	97	70-130%	96	70-130%	1.0	<30
Oxygen/Argon	ND	0.50	97	70-130%	96	70-130%	0.9	<30
Nitrogen	ND	1.0	99	70-130%	98	70-130%	0.9	<30
Methane	ND	0.0010	116	70-130%	113	70-130%	2.6	<30

ND = Not Detected (Below RL)

Reviewed/Approved By: _____ Date: 5/31/15

Mark J. Johnson
Operations Manager

The cover letter is an integral part of this analytical report.

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501690
Date Received: 05/14/15
Matrix: Air
Reporting Units: ppmv

EPA 15/16

Lab No.:	G051402-01		G051402-02		G051402-03		G051402-04	
Client Sample I.D.:	1501690-01 / M-407 Standpipe @60'		1501690-02 / M-407 probe @75'		1501690-03 / M-408 Standpipe @90'		1501690-04 / M-408 probe @95'	
Date/Time Sampled:	5/13/15 9:57		5/13/15 10:18		5/13/15 11:00		5/13/15 11:25	
Date/Time Analyzed:	5/14/15 13:37		5/14/15 13:50		5/14/15 14:02		5/14/15 14:25	
QC Batch No.:	150514GC3A1		150514GC3A1		150514GC3A1		150514GC3A1	
Analyst Initials:	AS		AS		AS		AS	
Dilution Factor:	1.0		1.0		1.0		100	
ANALYTE	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv
Hydrogen Sulfide	ND	0.20	ND	0.20	ND	0.20	290	20

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 5/31/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

Figure E-1.52

Client: Advanced Technology Laboratories
Attn: Rachelle Arada
Project Name: NA
Project No.: 1501690
Date Received: 05/14/15
Matrix: Air
Reporting Units: ppmv

EPA 15/16

Lab No.:	G051402-05		G051402-06		G051402-07			
Client Sample I.D.:	1501690-05 / M-119 Standpipe @50'		1501690-06 / M-119 Standpipe @75'		1501690-07 / M-119 probe @25'			
Date/Time Sampled:	5/13/15 12:10		5/13/15 12:55		5/13/15 12:45			
Date/Time Analyzed:	5/14/15 14:36		5/14/15 14:47		5/14/15 14:58			
QC Batch No.:	150514GC3A1		150514GC3A1		150514GC3A1			
Analyst Initials:	AS		AS		AS			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	Result ppmv	RL ppmv	Result ppmv	RL ppmv	Result ppmv	RL ppmv		
Hydrogen Sulfide	ND	0.20	0.52	0.20	ND	0.20		

ND = Not Detected (below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date 5/31/15
Mark Johnson
Operations Manager

The cover letter is an integral part of this analytical report

QC Batch No.: 150514GC3A1
Matrix: Air
Units: ppmv

QC for Sulfur Compounds by EPA 15/16

Lab No.:	Method Blank		LCS		LCSD			
Date/Time Analyzed:	5/14/15 9:49		5/14/15 9:20		5/14/15 9:31			
Analyst Initials:	AS		AS		AS			
Datafile:	14may003		14may001		14may002			
Dilution Factor:	1.0		1.0		1.0			
ANALYTE	Results	RL	% Rec.	Criteria	% Rec.	Criteria	%RPD	Criteria
Hydrogen Sulfide	ND	0.20	92	70-130%	91	70-130%	1.2	<30

ND = Not Detected (Below RL)
RL = Reporting Limit

Reviewed/Approved By: _____ Date: 5/31/15
Mark J. Johnson
Operations Manager

The cover letter is an integral part of this analytical report.

AirTECHNOLOGY Laboratories, Inc.
18501 E. Gale Avenue, Suite 130 ♦ City of Industry, CA 91748 ♦ Ph: (626) 964-4032 ♦ Fx: (626) 964-5832

ADVANCED TECHNOLOGY LABORATORIES

SUBCONTRACT ORDER

Work Order: 1501690

G09K02-01/07

SENDING LABORATORY:	RECEIVING LABORATORY:
Advanced Technology Laboratories	Air Technology Laboratories, Inc.
3275 Walnut Avenue	18501 E. Gale Ave, Suite 130
Signal Hill, CA 90755	City of Industry, CA 91748
Phone: 562.989.4045	Phone :(626) 964-4032
Fax: 562.989.6348	Fax: (626) 964-5832
Project Manager: Rachelle Arada (Rachelle@atlglobal.com)	PO#: SC09584-STANDARD TAT (RA)

IMPORTANT : Please include Work Order # and PO # in your invoice.

Analysis	Due	Expires	Sampled	Comments
01 **ATL Lab#: 1501690-01**	**/ M-407 Standpipe @60'**	**Air**	**05/13/15 09:57**	**D1946-Carbon Dioxide, Oxygen, Nitrogen, Methane**
D1946_T [Fixed Gases]	**05/29/15 17:00**	05/16/15 09:57		
15_16_H2S_T_SUB [Hydrogen Sulfide]	**05/29/15 17:00**	05/16/15 09:57		
2-Tedlar Bag				
02 **ATL Lab#: 1501690-02**	**/ M-407 probe @75'**	**Air**	**05/13/15 10:18**	
D1946_T [Fixed Gases]	**05/29/15 17:00**	05/16/15 10:18		
15_16_H2S_T_SUB [Hydrogen Sulfide]	**05/29/15 17:00**	05/16/15 10:18		
2-Tedlar Bag				
03 **ATL Lab#: 1501690-03**	**/ M-408 Standpipe @90'**	**Air**	**05/13/15 11:00**	
D1946_T [Fixed Gases]	**05/29/15 17:00**	05/16/15 11:00		
15_16_H2S_T_SUB [Hydrogen Sulfide]	**05/29/15 17:00**	05/16/15 11:00		
2-Tedlar Bag				

Released By	Date	Received By	Date
[signature]	5/14/15 1224	Don Tiang -	5/14/15 1624
Released By	Date	Received By	Date

Page 1 of 2

Figure E-1.55

ADVANCED TECHNOLOGY LABORATORIES

SUBCONTRACT ORDER

Work Order: 1501690

G091402-01/07

Analysis	Due	Expires	Sampled	Comments
ATL Lab#: 1501690-04	**/ M-408 probe @95'**	**Air**	**05/13/15 11:25**	
04 D1946_T [Fixed Gases]	05/29/15 17:00	05/16/15 11:25		
15_16_H2S_T_SUB [Hydrogen Sulfide] 2-Tedlar Bag	05/29/15 17:00	05/16/15 11:25		
ATL Lab#: 1501690-05	**/ M-119 Standpipe @50'**	**Air**	**05/13/15 12:10**	
05 D1946_T [Fixed Gases]	05/29/15 17:00	05/16/15 12:10		
15_16_H2S_T_SUB [Hydrogen Sulfide] 2-Tedlar Bag	05/29/15 17:00	05/16/15 12:10		
ATL Lab#: 1501690-06	**/ M-119 Standpipe @75'**	**Air**	**05/13/15 12:55**	
06 D1946_T [Fixed Gases]	05/29/15 17:00	05/16/15 12:55		
15_16_H2S_T_SUB [Hydrogen Sulfide] 2-Tedlar Bag	05/29/15 17:00	05/16/15 12:55		
ATL Lab#: 1501690-07	**/ M-119 probe @25'**	**Air**	**05/13/15 12:45**	
07 D1946_T [Fixed Gases]	05/29/15 17:00	05/16/15 12:45		
15_16_H2S_T_SUB [Hydrogen Sulfide] 2-Tedlar Bag	05/29/15 17:00	05/16/15 12:45		

Released By	Date	Received By	Date
[signature]	5/14/15 1226	Don Tiongson	5/14/15 1226
Released By	Date	Received By	Date

Figure E-1.56

ADVANCED TECHNOLOGY LABORATORIES

3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page ____ of ____

Instruction: Complete all shaded areas.

For Laboratory Use Only				ATLCOC Ver: 20130715
Method of Transport	Sample Conditions Upon Receipt			
	Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL	1. CHILLED	☐	☐	5. # OF SAMPLES MATCH COC	☐	☐
☐ FedEx ☐ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☐
☐ GSO	3. CONTAINER INTACT	☐	☐	7. COOLER TEMP, deg C:		
☐ Other: _____	4. SEALED	☐	☐			

CUSTOMER

Company: Amec Foster Wheeler
Address: 6001 Rickenbacker Rd
City: Los Angeles State: CA Zip: 90040
Tel: 323 889 5300 Fax: 323 889 6700

SEND REPORT TO:
Attn: Ron Lopez Email: Ron.R.Lopez@AMEC.com
Company: Amec Foster Wheeler
Address: Same
City: State: Zip:

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Email:
Company: Amec
Address: Same
City: State: Zip:

PROJECT SAMPLES

Project Name: MTA Westside
Project No.: 4953-11-1423
Sampler: Diego Scapillato
Quote No:
PO #:
Special Instructions/Comments: * Fixed gases O_2, O_2 Nitrogen

Encircle or Write Requested Analysis

ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 / 7000(Title 22 Metals)	TO-15	ASTM D1946 Methane	EPA 15/16	ASTM D1946 *	TAT	Container #	Container Type	Container Material	QA/QC	REMARKS
1	1501680-1	M-407 Standpipe @ 60'	5/13/15	9:57									X	X	X		2	6	2		
2	2	M-407 Probe @ 75'	5/13/15	10:18									X	X	X		2	6	2		
3	3	M-408 Standpipe @ 90'	5/13/15	11:00									X	X	X		2	6	2		
4	4	M-408 Probe @ 95'	5/13/15	11:25									X	X	X		2	6	2		
5	5	M-119 Standpipe @ 50'	5/13/15	12:10									X	X	X		2	6	2		
6	6	M-119 Standpipe @ 75'	5/13/15	12:55									X	X	X		2	6	2		
7	7	M-119 Probe @ 25'	5/13/15	12:45									X	X	X		2	6	2		
8																					
9																					
10																					

Encircle Sample Matrix: SOIL / SEDIMENT / SLUDGE; SOLIDS / WIPE / FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL; AIR

Container Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister
Container Material: 1=Glass; 2=Plastic; 3=Metal
Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn (Ac)2; 6=NaOH; 7=NA2S2O3

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

Page 157 of 195

CUSTODY TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for fi ve (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-fi ve (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Diego Scapillato — Submitter Print Name
Signature

Relinquished by: (Signature and Printed Name) Diego Scapillato	Date: 5/13/15	Time: 2:56pm	Received by: (Signature and Printed Name)	Date: 5/13/15	Time: 1456
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

CUSTODY

Page 12 of 12

Metro-Rail Westside Extension
Groundwater Dissolved Gas Sampling Results

Sample:	M-409 @ 100'	M-410 @ 90'
Water Volume	3,006 cm^3	2,236 cm^3
Gas Volume Extracted	20 cm^3	40 cm^3
Methane Gas Concentration	0.4%	10.6%
Methane Volume Extracted	0.08 cm^3	4.2 cm^3
Methane Mass Extracted	0.006 mg	3.0 mg
Methane Dissolved Concentration	0.002 mg/L	1.34 mg/L
Relative Methane Saturation	<0.01%	5.9%
H_2S Gas Concentration	0 ppm	850 ppm
H_2S Volume Extracted	0.00 cm^3	0.034 cm^3
H_2S Dissolved Concentration	0 mg/L	0.0006 mg/L
Relative H_2S Saturation	0%	<0.001%
CO_2 Gas Concentration	1.3%	2.1%
$C0_2$ Volume Extracted	0.26 cm^3	0.84 cm^3
$C0_2$ Mass Extracted	0.51 mg	1.6 mg
$C0_2$ Dissolved Concentration	0.17 mg/L	0.74 mg/L
Relative CO_2 Saturation	<0.01%	0.04%
O_2 Gas Concentration	18.7%	15.1%
O_2 Dissolved Concentration	1.8 mg/L	3.8 mg/L
Relative O_2 Saturation	20%	43%

Note: Samples collected on May 12, 2015

APPENDIX F PRESSUREMETER TEST REPORTS

Appendix F

Figure F-1: Pressuremeter Test Reports (Adv. PE Phase)

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-413	Test depth:	27.50 ft
Test date:	04/02/2015	Manometer height above ground:	1.64 ft
Test number:	2	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	13	0.0	0.00	
1	2.4	12	2.4	1.13	
1	4.9	12	4.9	2.24	
2	7.3	12	7.3	3.34	
2	9.8	12	9.8	4.42	
3	12.2	12	12.2	5.49	
4	14.6	13	14.6	6.56	
5	17.3	14	17.3	7.70	
7	19.5	15	19.5	8.66	
10	22.0	18	21.9	9.68	
13	24.4	21	24.3	10.70	
19	26.9	27	26.8	11.70	
30	29.3	37	29.1	12.69	◄
47	31.7	54	31.5	13.65	◄
15	29.3	22	29.2	12.72	
44	31.7	51	31.5	13.65	
72	34.2	78	33.8	14.59	
86	36.6	93	36.2	15.54	

Test Results

Pressiometric modulus E:	2,652	psi
Ultimate pressure P_L:	147	psi
Ratio E / P_L:	18.08	
Yield pressure P_F:	54	psi
Ratio P_L / P_F:	2.70	

Calibration Sheet Reference

Remarks

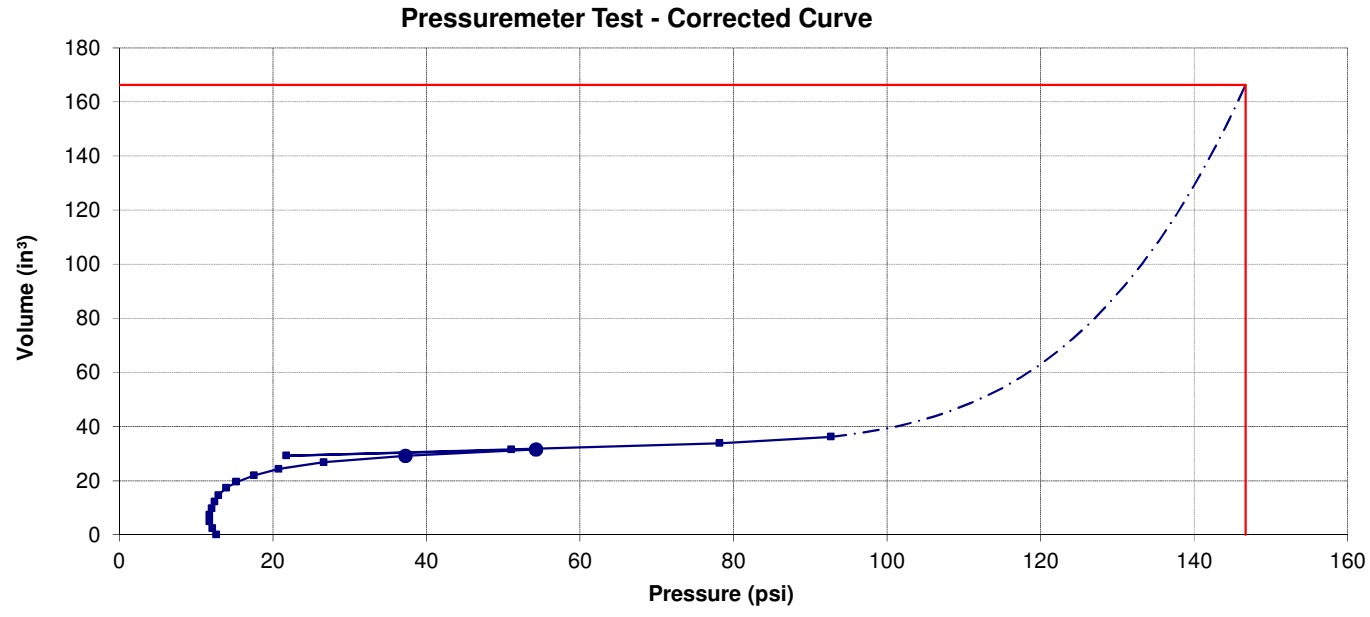


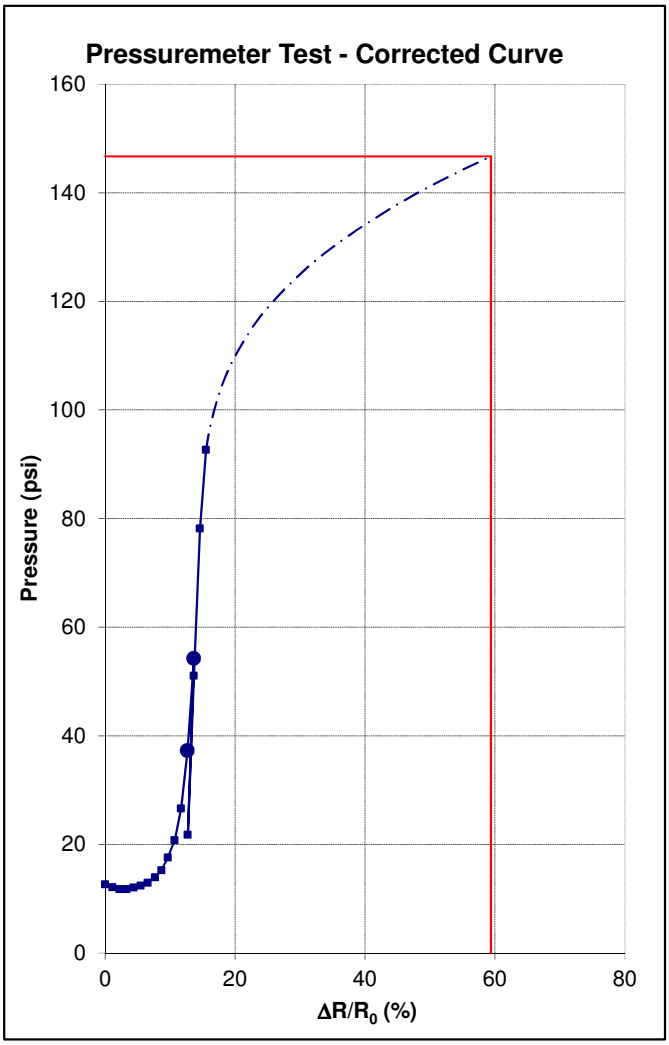
Figure F-1a

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-413	Test depth:	27.50 ft
Test date: (mm/dd/yyyy)	04/02/2015	Manometer height above ground:	1.64 ft
Test number:	2	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %
0	0.0	13	0.0	0.00
1	2.4	12	2.4	1.13
1	4.9	12	4.9	2.24
2	7.3	12	7.3	3.34
2	9.8	12	9.8	4.42
3	12.2	12	12.2	5.49
4	14.6	13	14.6	6.56
5	17.3	14	17.3	7.70
7	19.5	15	19.5	8.66
10	22.0	18	21.9	9.68
13	24.4	21	24.3	10.70
19	26.9	27	26.8	11.70
30	29.3	37	29.1	12.69 ◄
47	31.7	54	31.5	13.65 ◄
15	29.3	22	29.2	12.72
44	31.7	51	31.5	13.65
72	34.2	78	33.8	14.59
86	36.6	93	36.2	15.54



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E:	2,652 psi
Ultimate pressure P_L:	147 psi
Ratio E / P_L:	18.08
Yield pressure P_F:	54 psi
Ratio P_L / P_F:	2.70

Figure F-1b

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-413	Test depth:	47.50 ft
Test date:	04/02/2015	Manometer height above ground:	1.64 ft
Test number:	1	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	21	0.0	0.00	
1	2.6	21	2.6	1.21	
1	4.9	21	4.9	2.23	
2	7.4	21	7.4	3.37	
3	9.8	22	9.7	4.42	
4	12.2	21	12.2	5.49	
6	14.7	22	14.7	6.57	
7	17.1	24	17.1	7.61	
10	19.5	26	19.5	8.64	
13	22.0	30	21.9	9.67	
17	24.5	33	24.5	10.75	
22	26.9	39	26.7	11.70	
28	29.3	45	29.2	12.70	
37	31.8	53	31.6	13.69	
17	29.3	33	29.2	12.72	
35	31.7	51	31.6	13.68	
48	34.2	65	33.9	14.64	
65	36.6	81	36.3	15.59	
110	41.5	126	41.0	17.44	◄
138	43.9	155	43.3	18.35	
172	46.4	188	45.5	19.23	
206	48.8	223	47.8	20.11	◄
246	51.3	262	50.1	20.98	
281	53.7	297	52.3	21.85	
312	56.2	328	54.6	22.72	

Test Results

Pressiometric modulus E:	5,701	psi
Ultimate pressure P_L:	707	psi
Ratio E / P_L:	8.06	
Yield pressure P_F:	223	psi
Ratio P_L / P_F:	3.17	

Calibration Sheet Reference

Remarks

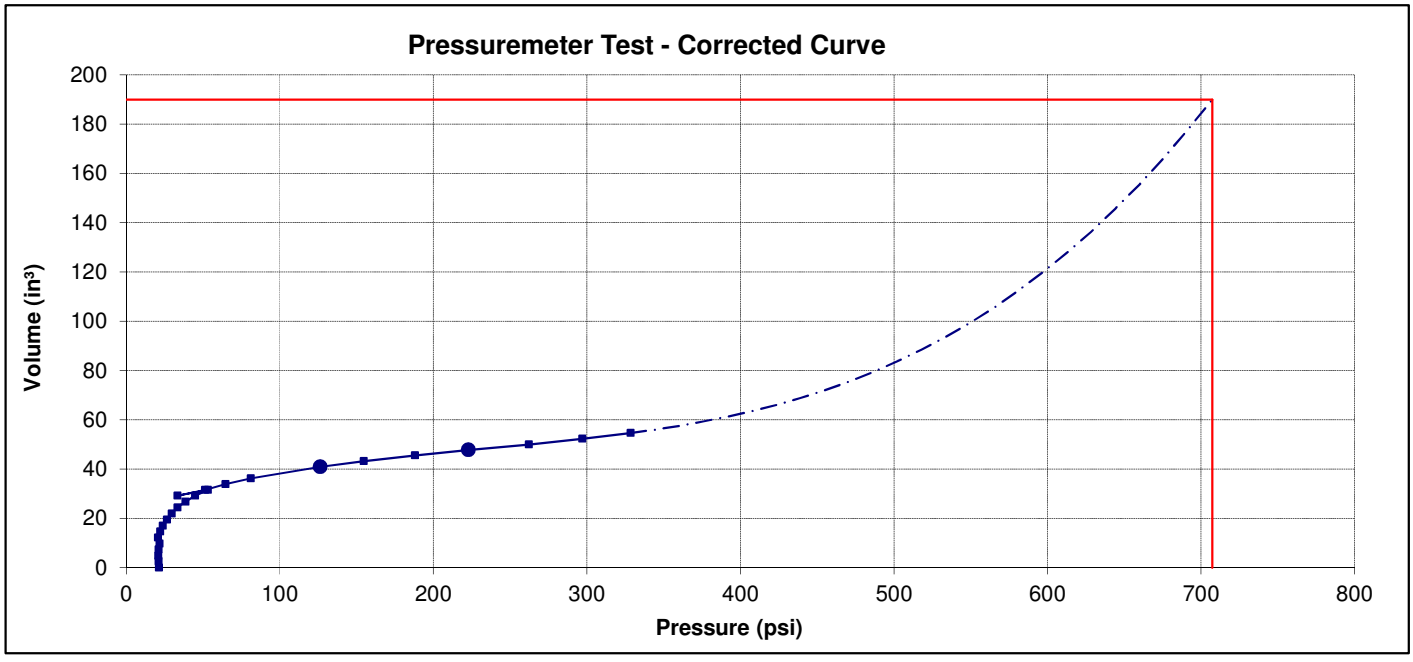


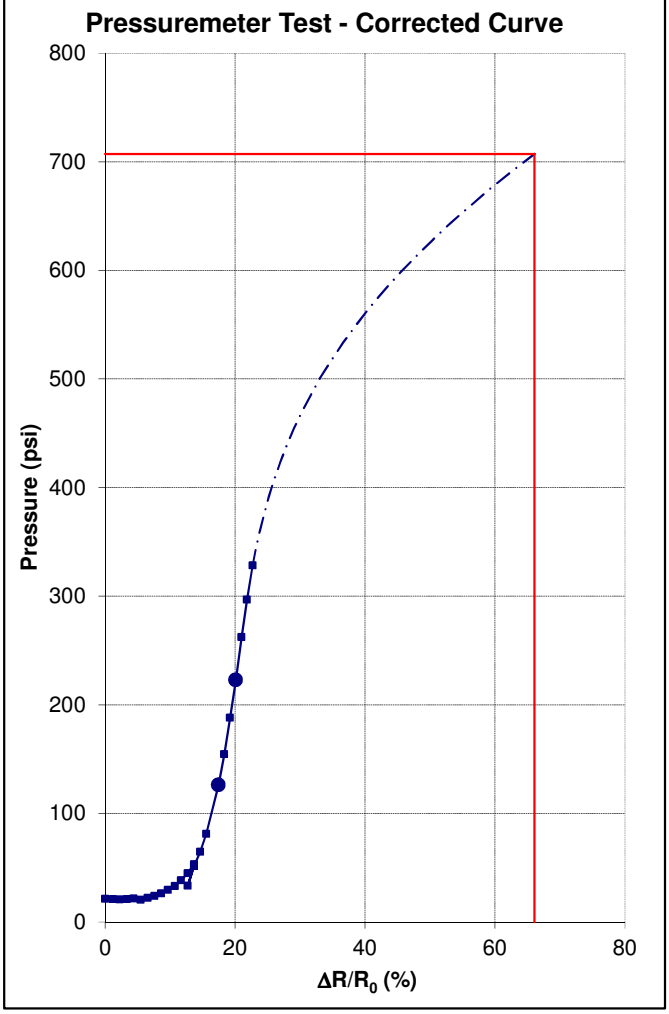
Figure F-2a

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-413	Test depth:	47.50 ft
Test date: (mm/dd/yyyy)	04/02/2015	Manometer height above ground:	1.64 ft
Test number:	1	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %
0	0.0	21	0.0	0.00
1	2.6	21	2.6	1.21
1	4.9	21	4.9	2.23
2	7.4	21	7.4	3.37
3	9.8	22	9.7	4.42
4	12.2	21	12.2	5.49
6	14.7	22	14.7	6.57
7	17.1	24	17.1	7.61
10	19.5	26	19.5	8.64
13	22.0	30	21.9	9.67
17	24.5	33	24.5	10.75
22	26.9	39	26.7	11.70
28	29.3	45	29.2	12.70
37	31.8	53	31.6	13.69
17	29.3	33	29.2	12.72
35	31.7	51	31.6	13.68
48	34.2	65	33.9	14.64
65	36.6	81	36.3	15.59
110	41.5	126	41.0	17.44 ◄
138	43.9	155	43.3	18.35
172	46.4	188	45.5	19.23
206	48.8	223	47.8	20.11 ◄
246	51.3	262	50.1	20.98
281	53.7	297	52.3	21.85
312	56.2	328	54.6	22.72



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E:	5,701 psi
Ultimate pressure P_L:	707 psi
Ratio E / P_L:	8.06
Yield pressure P_F:	223 psi
Ratio P_L / P_F:	3.17

Figure F-2b

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-413	Test depth:	67.50 ft
Test date:	04/02/2015	Manometer height above ground:	1.64 ft
Test number:	1	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	30	0.0	0.00	
1	2.5	30	2.5	1.16	
2	4.9	30	4.9	2.23	
3	7.3	30	7.3	3.33	
4	9.8	31	9.7	4.41	
5	12.2	32	12.2	5.49	
8	14.6	35	14.6	6.55	
12	17.1	39	17.1	7.62	
20	19.7	47	19.6	8.69	
64	22.1	91	21.8	9.62	
8	19.5	34	19.5	8.65	
50	22.0	76	21.8	9.63	◄
102	24.4	128	23.9	10.52	
144	26.9	170	26.2	11.45	
185	29.3	211	28.4	12.38	◄
222	31.7	247	30.7	13.31	
254	34.3	280	33.0	14.27	
280	36.6	305	35.3	15.17	

Test Results

Pressiometric modulus E:	7,252 psi
Ultimate pressure P_L:	674 psi
Ratio E / P_L:	10.76
Yield pressure P_F:	211 psi
Ratio P_L / P_F:	3.19

Calibration Sheet Reference

Remarks

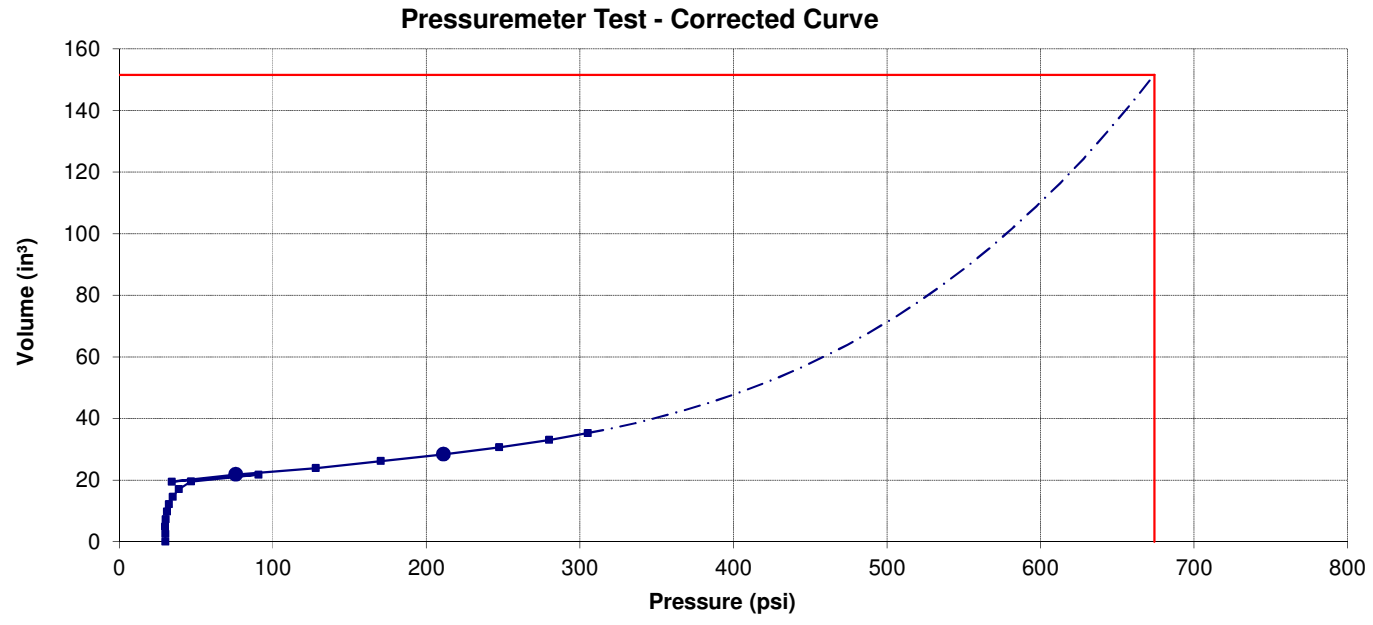


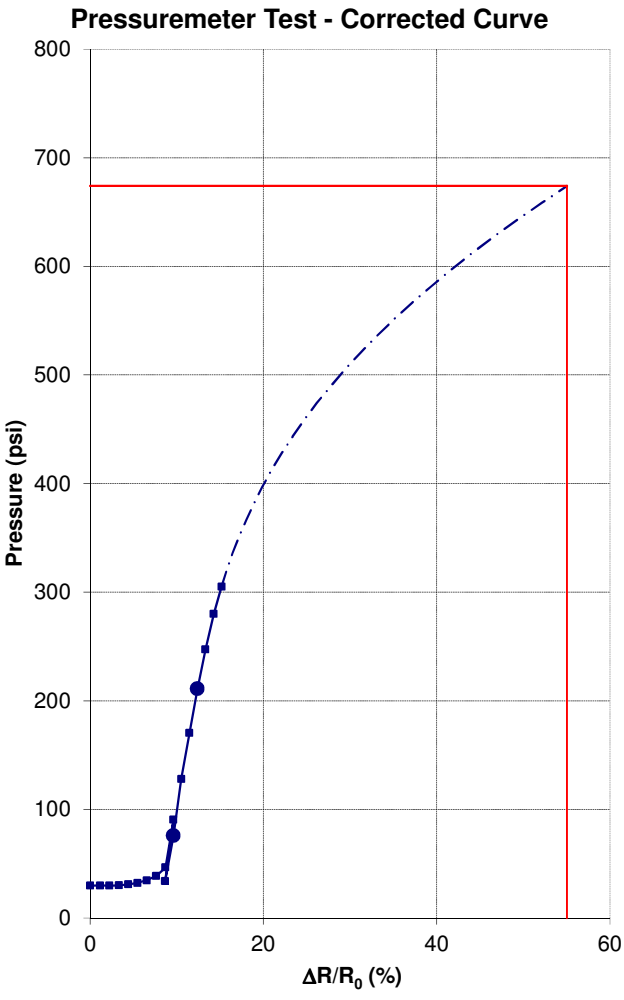
Figure F-3a

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-413	Test depth:	67.50 ft
Test date: (mm/dd/yyyy)	04/02/2015	Manometer height above ground:	1.64 ft
Test number:	1	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	30	0.0	0.00	
1	2.5	30	2.5	1.16	
2	4.9	30	4.9	2.23	
3	7.3	30	7.3	3.33	
4	9.8	31	9.7	4.41	
5	12.2	32	12.2	5.49	
8	14.6	35	14.6	6.55	
12	17.1	39	17.1	7.62	
20	19.7	47	19.6	8.69	
64	22.1	91	21.8	9.62	
8	19.5	34	19.5	8.65	
50	22.0	76	21.8	9.63	◄
102	24.4	128	23.9	10.52	
144	26.9	170	26.2	11.45	
185	29.3	211	28.4	12.38	◄
222	31.7	247	30.7	13.31	
254	34.3	280	33.0	14.27	
280	36.6	305	35.3	15.17	



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E:	7,252	psi
Ultimate pressure P_L:	674	psi
Ratio E / P_L:	10.76	
Yield pressure P_F:	211	psi
Ratio P_L / P_F:	3.19	

Figure F-3b

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-413	Test depth:	83.00 ft
Test date:	04/03/2015	Manometer height above ground:	1.64 ft
Test number:	1	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	37	0.0	0.00	
1	2.5	37	2.4	1.13	
2	4.9	37	4.9	2.25	
3	7.3	38	7.3	3.33	
6	9.8	40	9.8	4.43	
9	12.2	41	12.2	5.49	
14	14.7	46	14.6	6.54	
21	17.1	53	17.0	7.57	
7	14.6	39	14.6	6.55	
20	17.1	52	17.0	7.58	
35	19.5	67	19.4	8.59	
60	22.0	92	21.7	9.58	
99	24.4	131	23.9	10.53	◄
167	26.9	199	26.1	11.42	◄
234	29.3	266	28.2	12.28	
299	31.7	331	30.3	13.15	
356	34.2	388	32.5	14.04	
410	36.6	442	34.6	14.92	

Test Results

Pressiometric modulus E:	11,182	psi
Ultimate pressure P_L:	1,279	psi
Ratio E / P_L:	8.74	
Yield pressure P_F:	199	psi
Ratio P_L / P_F:	6.43	

Calibration Sheet Reference

Remarks

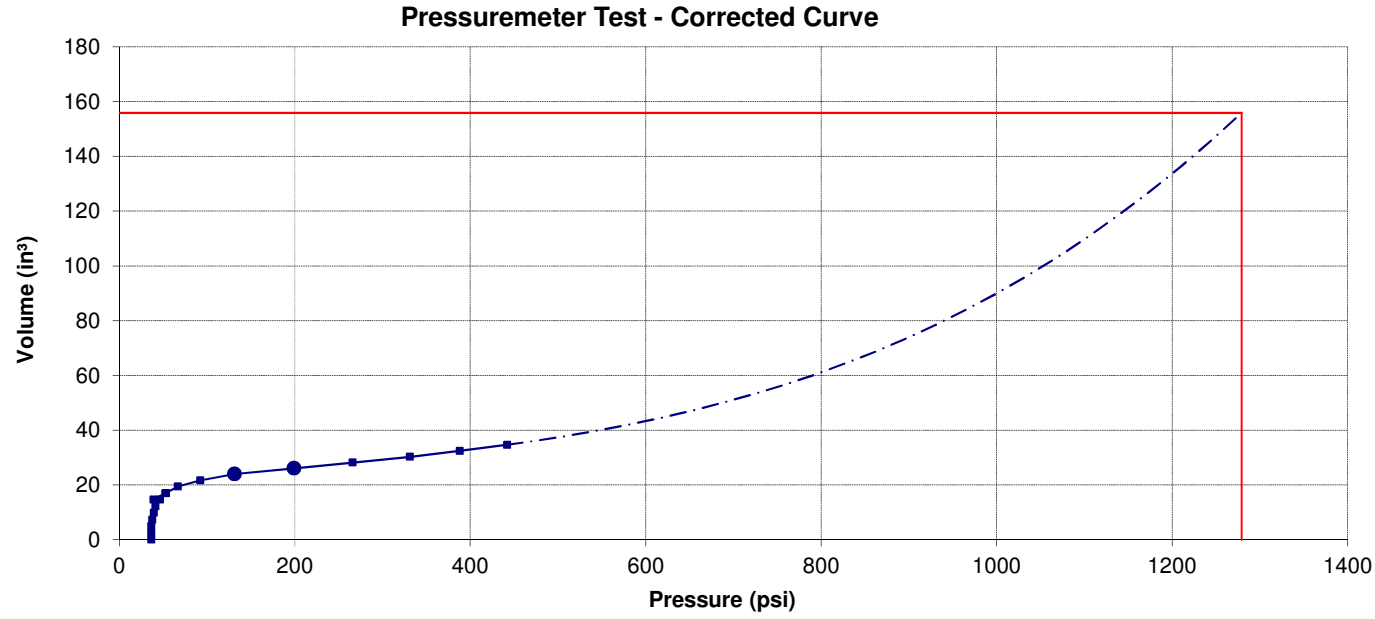


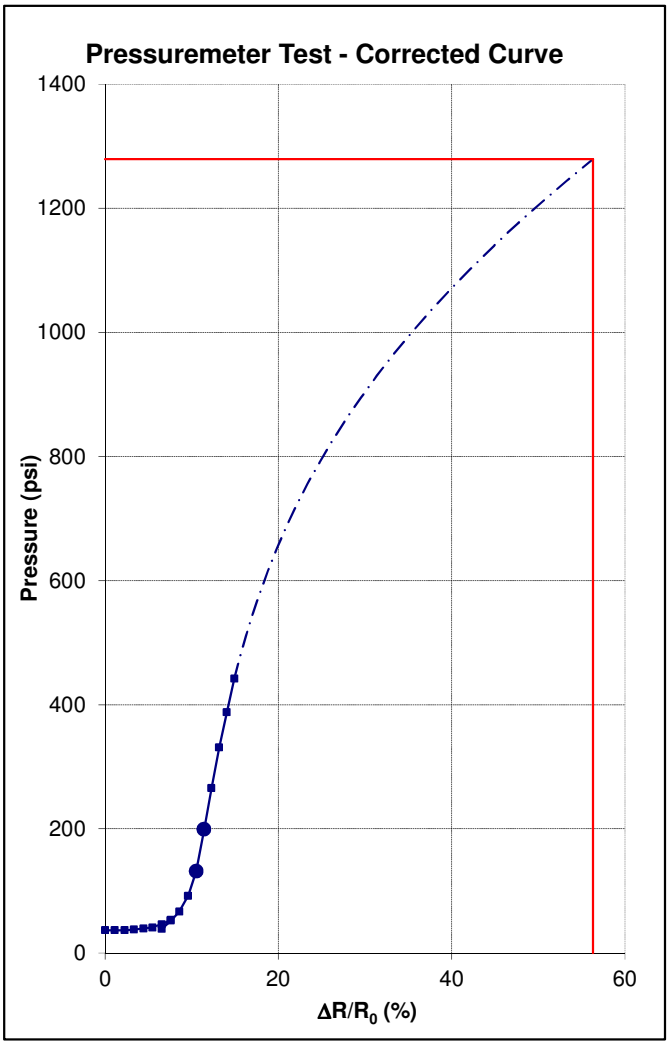
Figure F-4a

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-413	Test depth:	83.00 ft
Test date: (mm/dd/yyyy)	04/03/2015	Manometer height above ground:	1.64 ft
Test number:	1	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %
0	0.0	37	0.0	0.00
1	2.5	37	2.4	1.13
2	4.9	37	4.9	2.25
3	7.3	38	7.3	3.33
6	9.8	40	9.8	4.43
9	12.2	41	12.2	5.49
14	14.7	46	14.6	6.54
21	17.1	53	17.0	7.57
7	14.6	39	14.6	6.55
20	17.1	52	17.0	7.58
35	19.5	67	19.4	8.59
60	22.0	92	21.7	9.58
99	24.4	131	23.9	10.53 ◄
167	26.9	199	26.1	11.42 ◄
234	29.3	266	28.2	12.28
299	31.7	331	30.3	13.15
356	34.2	388	32.5	14.04
410	36.6	442	34.6	14.92



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E:	11,182 psi
Ultimate pressure P_L:	1,279 psi
Ratio E / P_L:	8.74
Yield pressure P_F:	199 psi
Ratio P_L / P_F:	6.43

Figure F-4b

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-415	Test depth:	23.00 ft
Test date:	03/30/2015	Manometer height above ground:	1.64 ft
Test number:	2	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	11	0.0	0.00	
1	2.4	10	2.4	1.12	
1	4.9	10	4.9	2.23	
2	7.3	10	7.3	3.33	
3	9.8	11	9.8	4.45	
4	12.2	11	12.2	5.49	
5	14.7	13	14.6	6.56	
8	17.1	15	17.1	7.61	
11	19.5	18	19.5	8.64	
16	22.0	23	21.9	9.67	◄
23	24.4	29	24.3	10.68	
34	26.9	40	26.7	11.67	
46	29.3	51	29.1	12.65	◄
54	31.7	59	31.5	13.64	
59	34.2	65	33.9	14.62	
64	36.6	69	36.3	15.59	
67	39.1	72	38.8	16.59	

Test Results

Pressiometric modulus E:	1,433	psi
Ultimate pressure P_L:	99	psi
Ratio E / P_L:	14.50	
Yield pressure P_F:	51	psi
Ratio P_L / P_F:	1.92	

Calibration Sheet Reference

Remarks

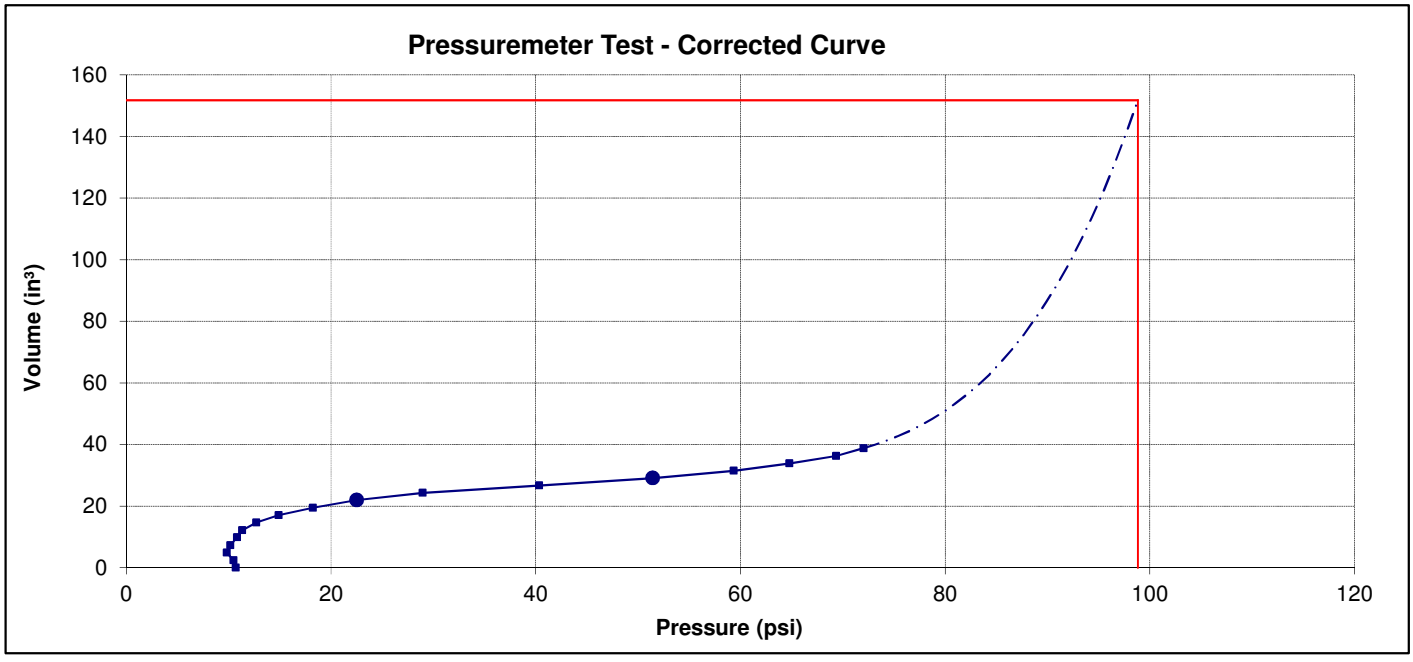


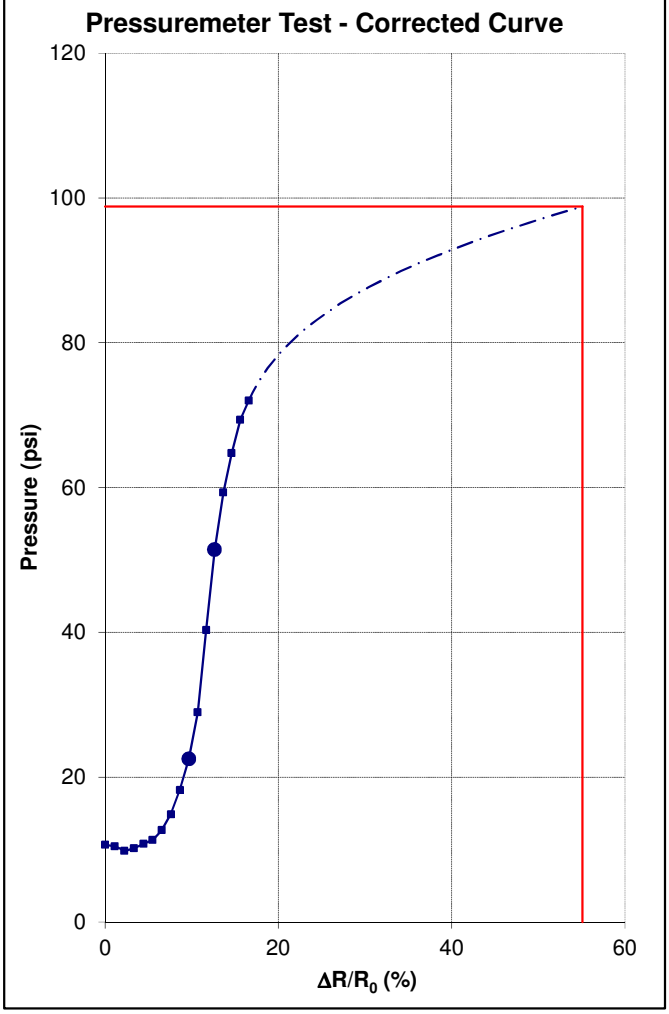
Figure F-5a

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-415	Test depth:	23.00 ft
Test date: (mm/dd/yyyy)	03/30/2015	Manometer height above ground:	1.64 ft
Test number:	2	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	11	0.0	0.00	
1	2.4	10	2.4	1.12	
1	4.9	10	4.9	2.23	
2	7.3	10	7.3	3.33	
3	9.8	11	9.8	4.45	
4	12.2	11	12.2	5.49	
5	14.7	13	14.6	6.56	
8	17.1	15	17.1	7.61	
11	19.5	18	19.5	8.64	
16	22.0	23	21.9	9.67	◄
23	24.4	29	24.3	10.68	
34	26.9	40	26.7	11.67	
46	29.3	51	29.1	12.65	◄
54	31.7	59	31.5	13.64	
59	34.2	65	33.9	14.62	
64	36.6	69	36.3	15.59	
67	39.1	72	38.8	16.59	



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E:	1,433	psi
Ultimate pressure P_L:	99	psi
Ratio E / P_L:	14.50	
Yield pressure P_F:	51	psi
Ratio P_L / P_F:	1.92	

Figure F-5b

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-415	Test depth:	43.00 ft
Test date:	03/30/2015	Manometer height above ground:	1.64 ft
Test number:	3	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	19	0.0	0.00	
2	1.9	21	1.9	0.86	
3	4.1	20	4.1	1.90	
3	6.6	21	6.6	3.01	
4	9.1	21	9.1	4.11	
5	11.5	22	11.4	5.17	
6	13.9	22	13.9	6.23	
8	16.6	23	16.6	7.39	
10	18.8	25	18.8	8.35	
12	21.2	27	21.2	9.36	
16	23.7	31	23.6	10.39	◄
21	26.1	36	26.0	11.39	
10	23.7	25	23.6	10.40	
20	26.1	35	26.0	11.40	
29	28.9	43	28.7	12.51	◄
36	31.0	50	30.8	13.37	
42	33.4	57	33.2	14.36	
48	35.9	62	35.6	15.33	
0					

Test Results

Pressiometric modulus E:	862	psi
Ultimate pressure P_L:	124	psi
Ratio E / P_L:	6.96	
Yield pressure P_F:	43	psi
Ratio P_L / P_F:	2.86	

Calibration Sheet Reference

Remarks

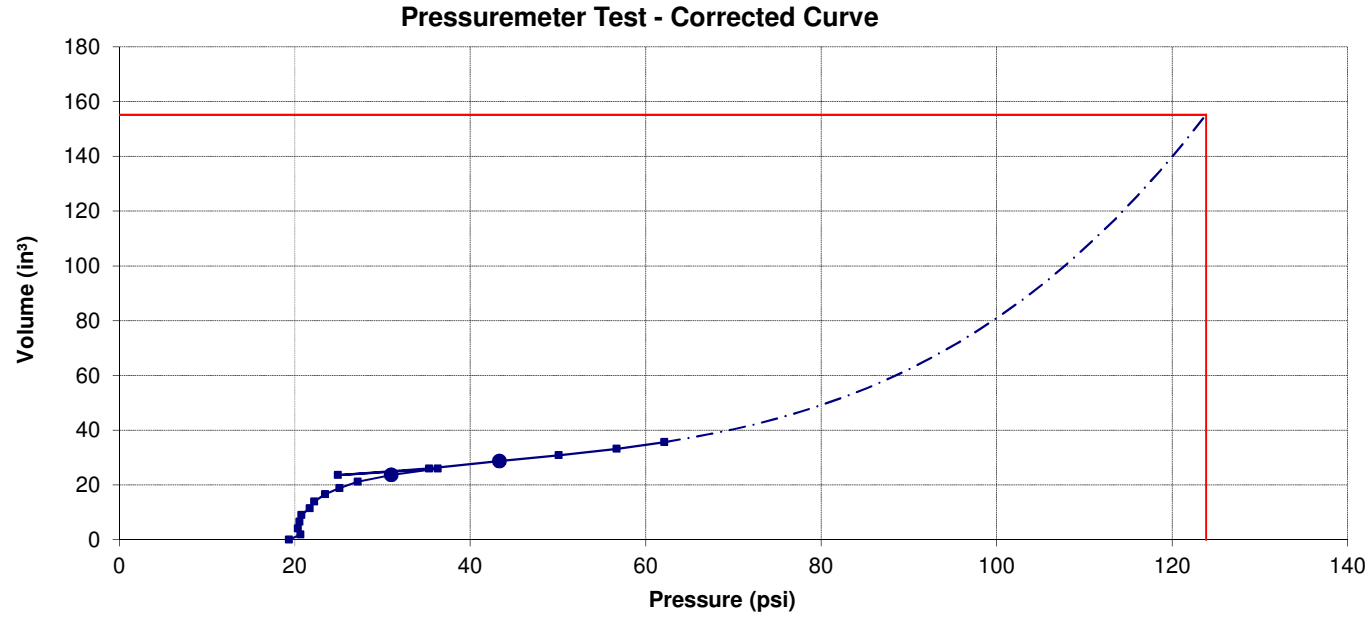


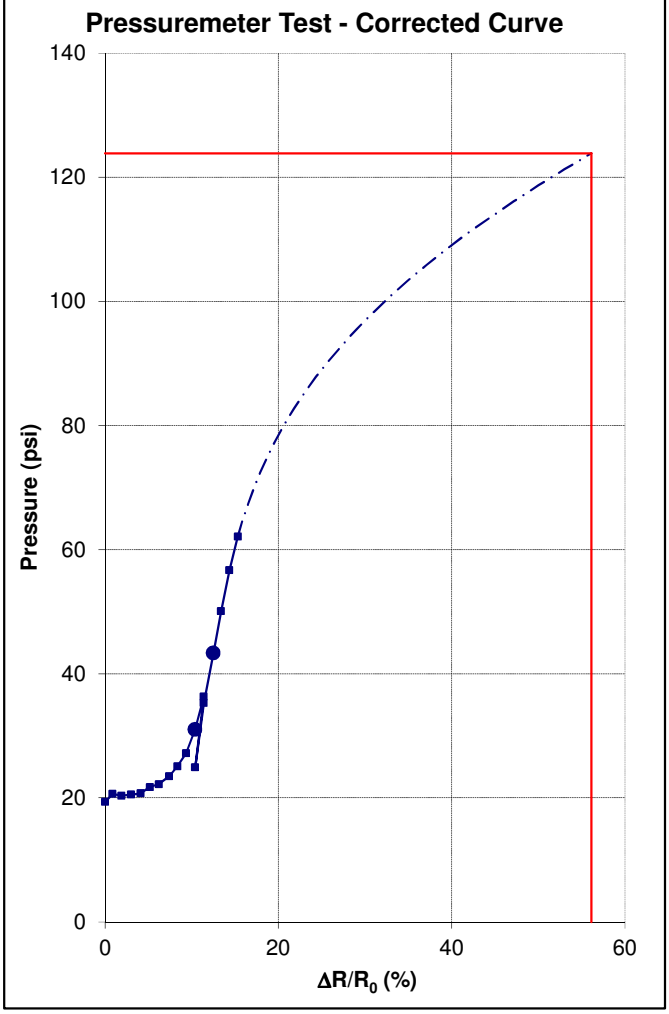
Figure F-6a

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-415	Test depth:	43.00 ft
Test date: (mm/dd/yyyy)	03/30/2015	Manometer height above ground:	1.64 ft
Test number:	3	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	19	0.0	0.00	
2	1.9	21	1.9	0.86	
3	4.1	20	4.1	1.90	
3	6.6	21	6.6	3.01	
4	9.1	21	9.1	4.11	
5	11.5	22	11.4	5.17	
6	13.9	22	13.9	6.23	
8	16.6	23	16.6	7.39	
10	18.8	25	18.8	8.35	
12	21.2	27	21.2	9.36	
16	23.7	31	23.6	10.39	◄
21	26.1	36	26.0	11.39	
10	23.7	25	23.6	10.40	
20	26.1	35	26.0	11.40	
29	28.9	43	28.7	12.51	◄
36	31.0	50	30.8	13.37	
42	33.4	57	33.2	14.36	
48	35.9	62	35.6	15.33	
0					



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E:	862 psi
Ultimate pressure P_L:	124 psi
Ratio E / P_L:	6.96
Yield pressure P_F:	43 psi
Ratio P_L / P_F:	2.86

Figure F-6b

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-415	Test depth:	63.00 ft
Test date:	03/30/2015	Manometer height above ground:	1.64 ft
Test number:	4	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	28	0.0	0.00	
1	2.6	28	2.5	1.17	
2	4.9	28	4.9	2.23	
2	7.4	28	7.3	3.34	
3	9.8	29	9.7	4.42	
5	12.3	30	12.3	5.53	
6	14.6	31	14.6	6.55	
8	17.1	33	17.0	7.60	
11	19.5	35	19.5	8.64	
16	22.0	39	21.9	9.67	
22	24.4	45	24.3	10.68	
33	26.9	56	26.7	11.67	
48	29.3	71	29.1	12.67	◄
68	31.7	91	31.4	13.61	◄
89	34.2	112	33.7	14.56	
30	31.7	53	31.6	13.68	
85	34.2	108	33.8	14.57	
109	36.6	132	36.1	15.50	
163	46.4	185	45.6	19.25	
172	48.8	194	48.0	20.17	
181	51.4	203	50.5	21.14	

Test Results

Pressiometric modulus E:	3,134	psi
Ultimate pressure P_L:	292	psi
Ratio E / P_L:	10.73	
Yield pressure P_F:	91	psi
Ratio P_L / P_F:	3.22	

Calibration Sheet Reference

Remarks

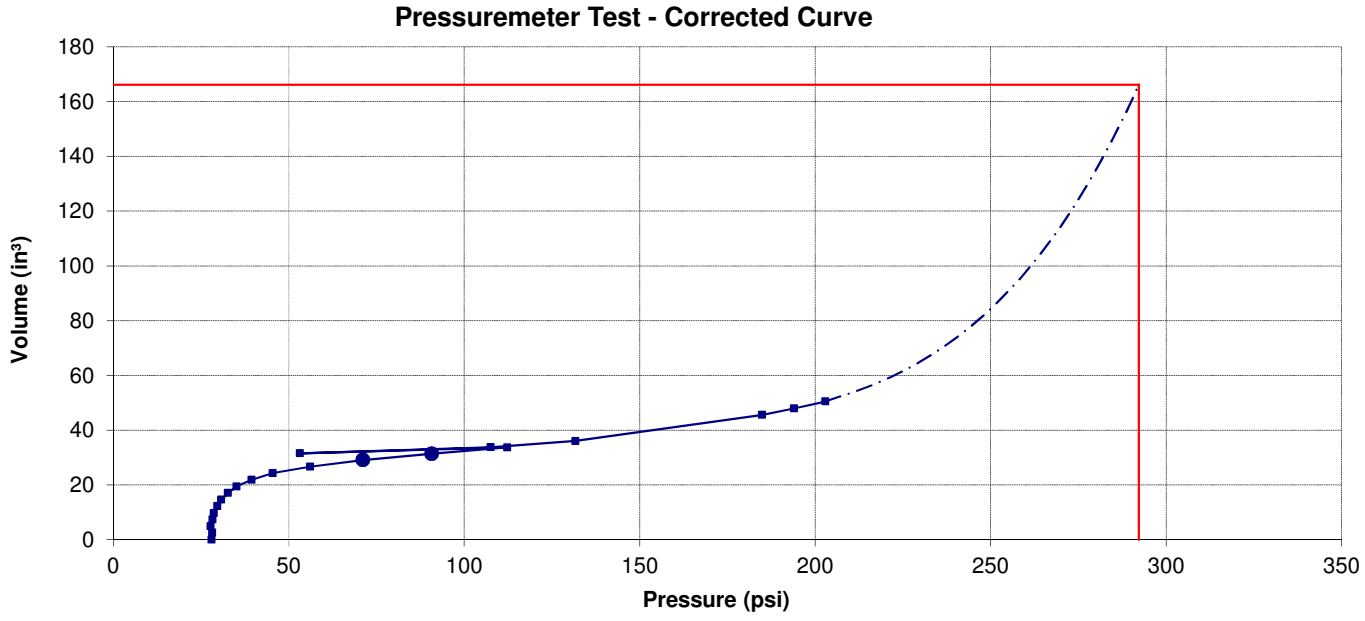


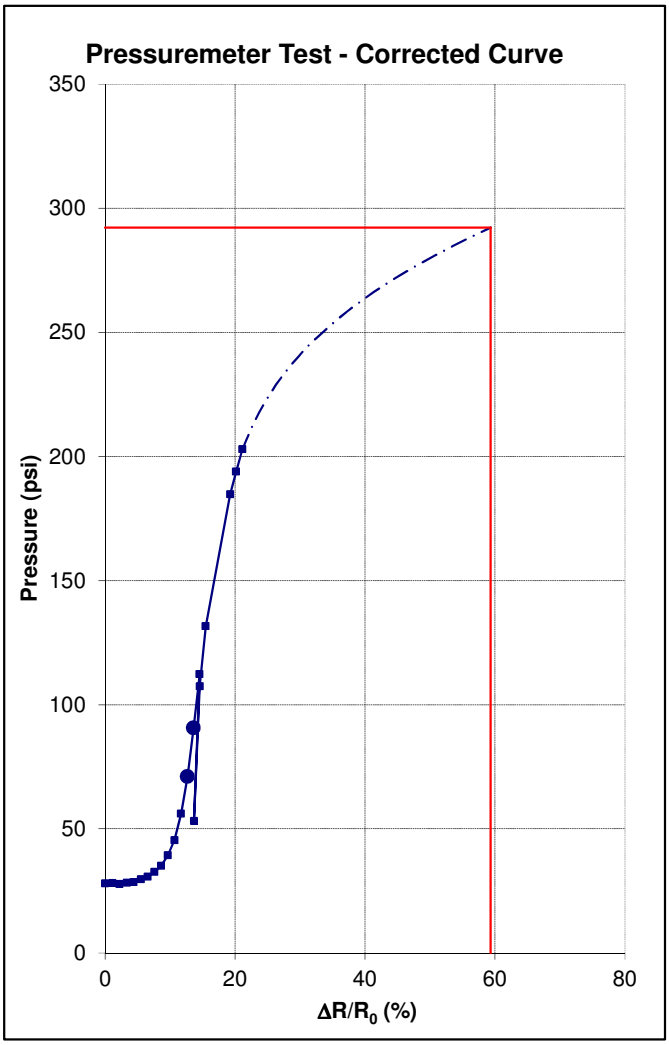
Figure F-7a

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-415	Test depth:	63.00 ft
Test date: (mm/dd/yyyy)	03/30/2015	Manometer height above ground:	1.64 ft
Test number:	4	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %
0	0.0	28	0.0	0.00
1	2.6	28	2.5	1.17
2	4.9	28	4.9	2.23
2	7.4	28	7.3	3.34
3	9.8	29	9.7	4.42
5	12.3	30	12.3	5.53
6	14.6	31	14.6	6.55
8	17.1	33	17.0	7.60
11	19.5	35	19.5	8.64
16	22.0	39	21.9	9.67
22	24.4	45	24.3	10.68
33	26.9	56	26.7	11.67
48	29.3	71	29.1	12.67 ◄
68	31.7	91	31.4	13.61 ◄
89	34.2	112	33.7	14.56
30	31.7	53	31.6	13.68
85	34.2	108	33.8	14.57
109	36.6	132	36.1	15.50
163	46.4	185	45.6	19.25
172	48.8	194	48.0	20.17
181	51.4	203	50.5	21.14



Calibration Sheet Reference

Remarks

Test Results

Pressiometric modulus E:	3,134	psi
Ultimate pressure P_L:	292	psi
Ratio E / P_L:	10.73	
Yield pressure P_F:	91	psi
Ratio P_L / P_F:	3.22	

Figure F-7b

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-415	Test depth:	78.00 ft
Test date:	03/31/2015	Manometer height above ground:	1.64 ft
Test number:	5	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings			
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %	
0	0.0	35	0.0	0.00	
1	2.4	34	2.4	1.12	
6	4.9	38	4.9	2.22	
6	7.3	38	7.3	3.32	
7	9.8	38	9.7	4.41	
8	12.2	39	12.2	5.48	
8	14.6	39	14.6	6.55	
12	17.2	42	17.2	7.65	
15	19.6	45	19.5	8.66	
22	22.0	52	21.9	9.65	
51	24.5	81	24.3	10.67	
100	26.9	129	26.4	11.53	◄
19	24.4	48	24.3	10.69	◄
92	26.9	121	26.4	11.55	
155	29.3	184	28.5	12.43	
199	31.7	227	30.7	13.34	
232	34.2	260	33.0	14.27	
258	36.6	286	35.3	15.20	
327	46.4	356	44.7	18.92	
339	48.8	368	47.1	19.84	

Test Results

Pressiometric modulus E:	14,132 psi
Ultimate pressure P_L:	544 psi
Ratio E / P_L:	25.98
Yield pressure P_F:	48 psi
Ratio P_L / P_F:	11.30

Calibration Sheet Reference

Remarks

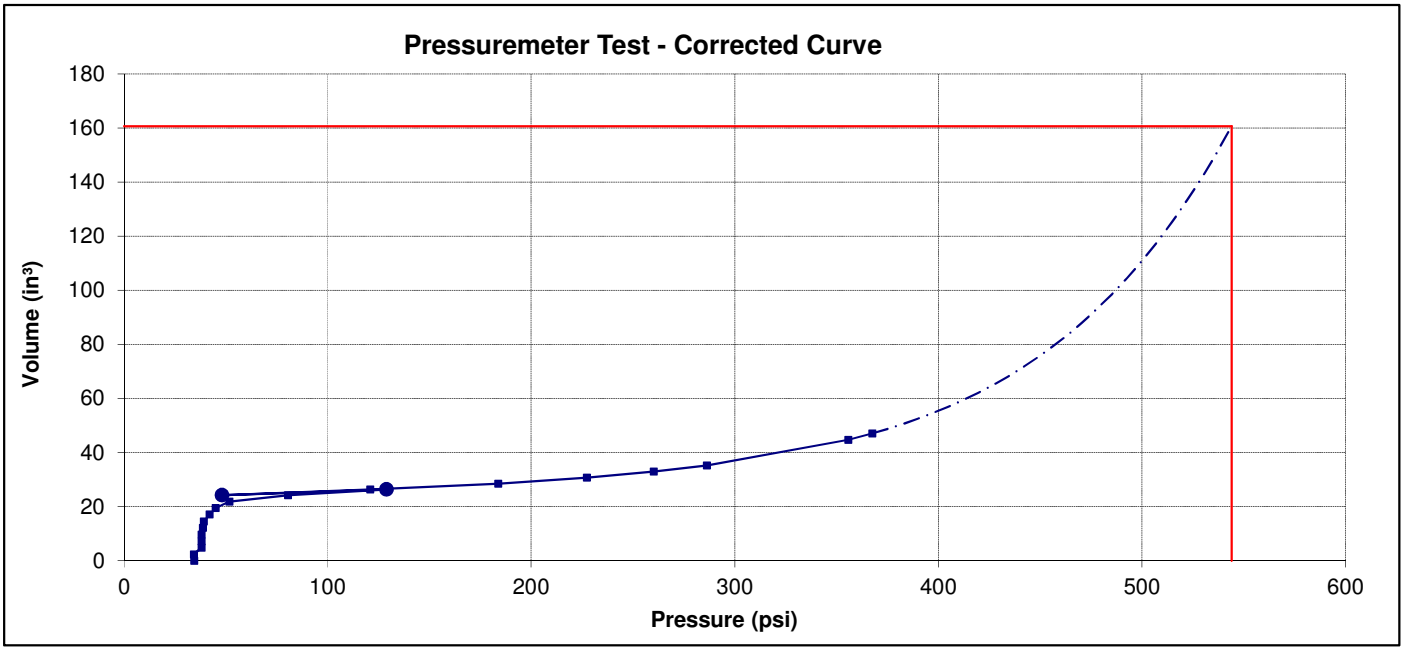


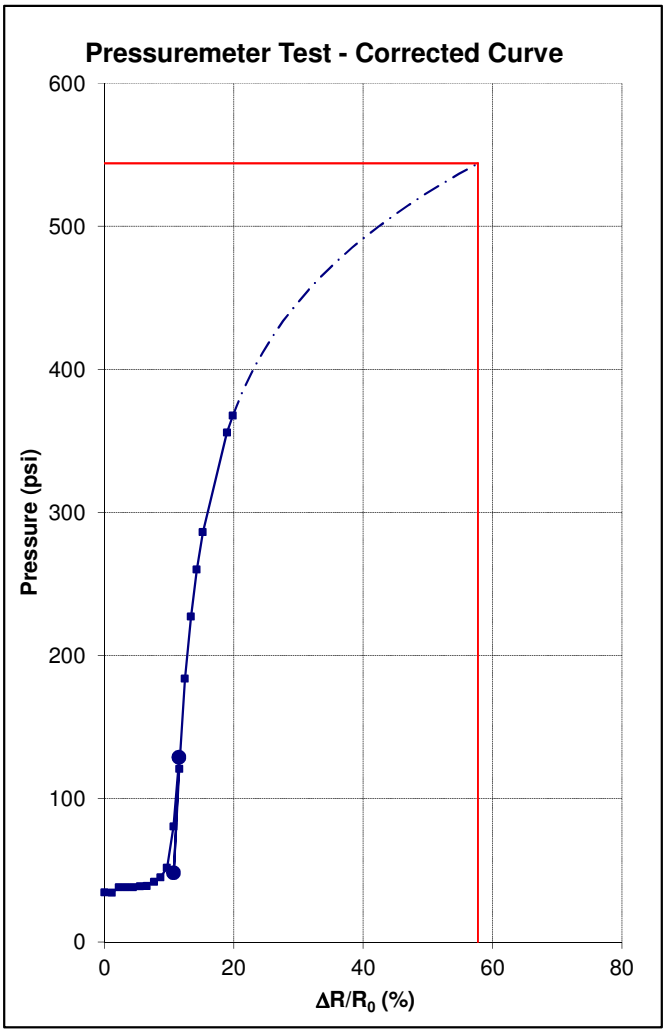
Figure A-8a

amec foster wheeler

TEXAM Pressuremeter Test

Project name:	MTA WESTSIDE EXTENSION	Use of a slotted casing:	No
Borehole name:	G-415	Test depth:	78.00 ft
Test date: (mm/dd/yyyy)	03/31/2015	Manometer height above ground:	1.64 ft
Test number:	5	Poisson's coefficient:	0.33
Probe size:	N	Fluid density:	1.000

Raw Readings		Corrected Readings		
Pressure psi	Volume in³	Pressure psi	Volume in³	$\Delta R/R_0$ %
0	0.0	35	0.0	0.00
1	2.4	34	2.4	1.12
6	4.9	38	4.9	2.22
6	7.3	38	7.3	3.32
7	9.8	38	9.7	4.41
8	12.2	39	12.2	5.48
8	14.6	39	14.6	6.55
12	17.2	42	17.2	7.65
15	19.6	45	19.5	8.66
22	22.0	52	21.9	9.65
51	24.5	81	24.3	10.67
100	26.9	129	26.4	11.53 ◄
19	24.4	48	24.3	10.69 ◄
92	26.9	121	26.4	11.55
155	29.3	184	28.5	12.43
199	31.7	227	30.7	13.34
232	34.2	260	33.0	14.27
258	36.6	286	35.3	15.20
327	46.4	356	44.7	18.92
339	48.8	368	47.1	19.84



Calibration Sheet Reference

Remarks

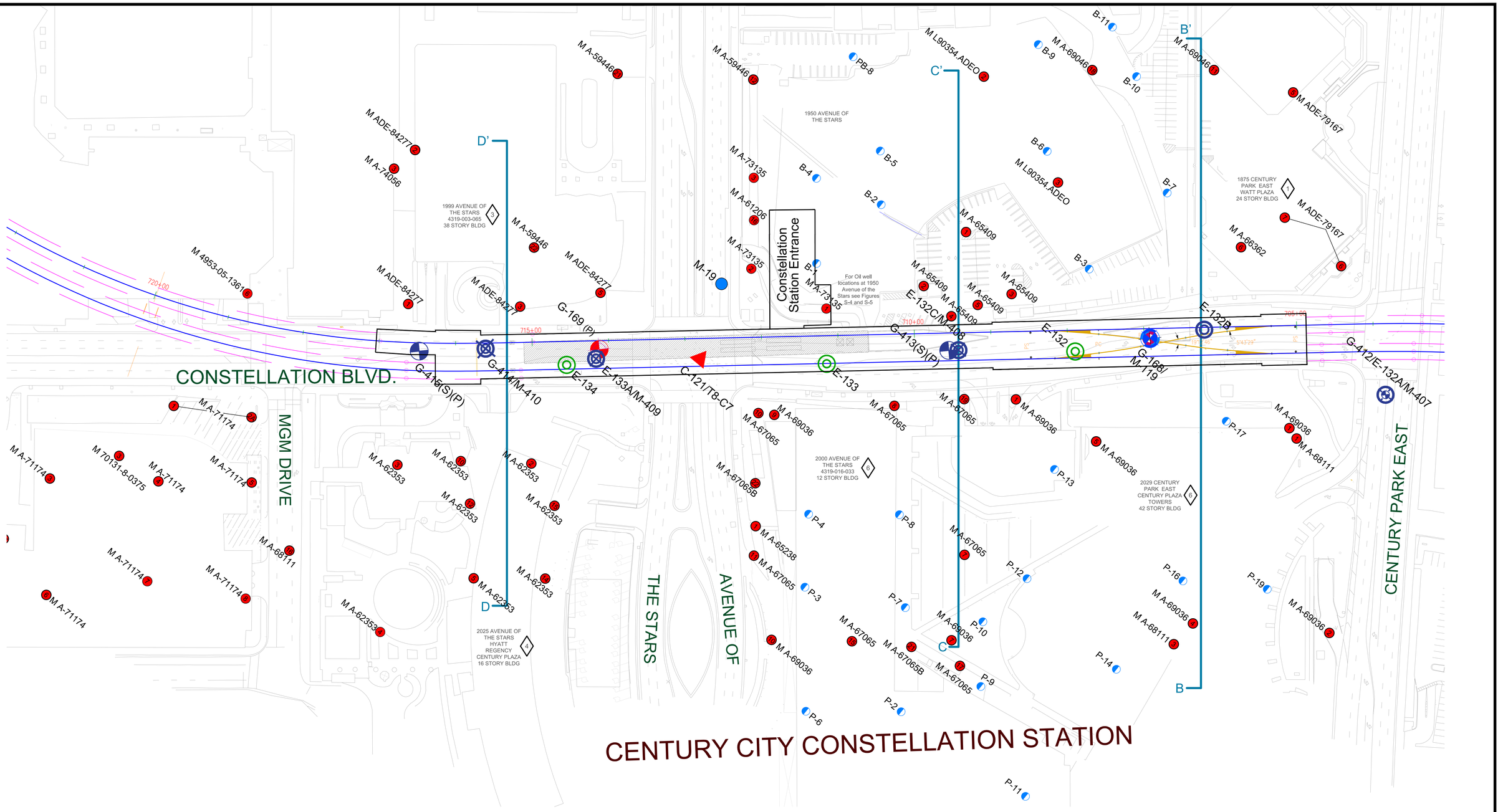
Test Results

Pressiometric modulus E:	14,132 psi
Ultimate pressure P_L:	544 psi
Ratio E / P_L:	25.98
Yield pressure P_F:	48 psi
Ratio P_L / P_F:	11.30

Figure A-8b

PLATES

Plate 1: Exploration Plan
Plates 2-1 and 2-2: Geologic Cross-sections
Plate 3: Plot of Maximum Recorded Subsurface Gas Data



EXPLANATION

Investigations for Adv. PE Phase:

- G-415(S)(P) — Geotechnical Rotary-Wash Boring
- E-133A/M-409 — Enviromental Exploration / Gas Monitoring Well
- G-412/E-132A/M-407 — Geotechnical Boring / Enviromental Exploration / Gas Monitoring Well
- E-132B(MW) — Enviromental Exploration

Investigations for PE Phase:

- G-412 — Geotechnical Rotary-Wash Boring
- C-121/T8-C7 — Geotechnical CPT
- CB-101 — COPT [Geotechnical + Gas - BAT]
- M-19 — Subsurface Gas Exploration
- E-132 — Environmental Exploration
- G-168/M119 — Dual Geotechnical Boring / Gas Monitoring Well

Prior Investigations: = Geotechnical = Gas Well = Geotechnical / Gas Reading

- A 4953-05-1361 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M L90354.ADEO — AMEC Geotechnical Exploration and Exploration Number Indicated
- M ADS-84277 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M ADE-79167 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-74056 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-73135 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-71174 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M 70131-8-0375 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-69046 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-69036 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-68111 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-67065B — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-67065 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-66362 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-65409 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-65238 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-62353 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-61206 — AMEC Geotechnical Exploration and Exploration Number Indicated
- M A-59446 — AMEC Geotechnical Exploration and Exploration Number Indicated
- P-17 — Engineering Science (1992)
- B-11 — GeoKinetics (2006)

Symbol Labels:

- G-413(S)(P) — Noise and Vibration Point of Interest
- (MW) — Groundwater monitoring (observation) well
- (NV) — Boring with noise and vibration testing
- (P) — Boring with pressuremeter testing
- (S-Wave) — Boring / CPT with shear wave velocity measurements
- 4 — Number of basement levels for the subject building
- Cross-Section (See Plates 2-1 and 2-2)
- Site view of station. Alignment based on plans dated June, 2015
- No. 10 Double Crossover Tracks

For Oil well locations per DOGGR see Figures 5-4 and 5-5.

0 25' 50' 100'

SCALE: 1" = 50'

Reference: Proposed Tunnel Alignment and Station Plan and Profile dated June, 2015

REV	DATE	BY	APP	DESCRIPTION

DESIGNED BY: FYW
DRAWN BY: KO
CHECKED BY: WL/DLP
IN CHARGE: FYW/HP
DATE: 8/17/2015

LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY

Metro

PB 125 YEARS

PROJECT MANAGER

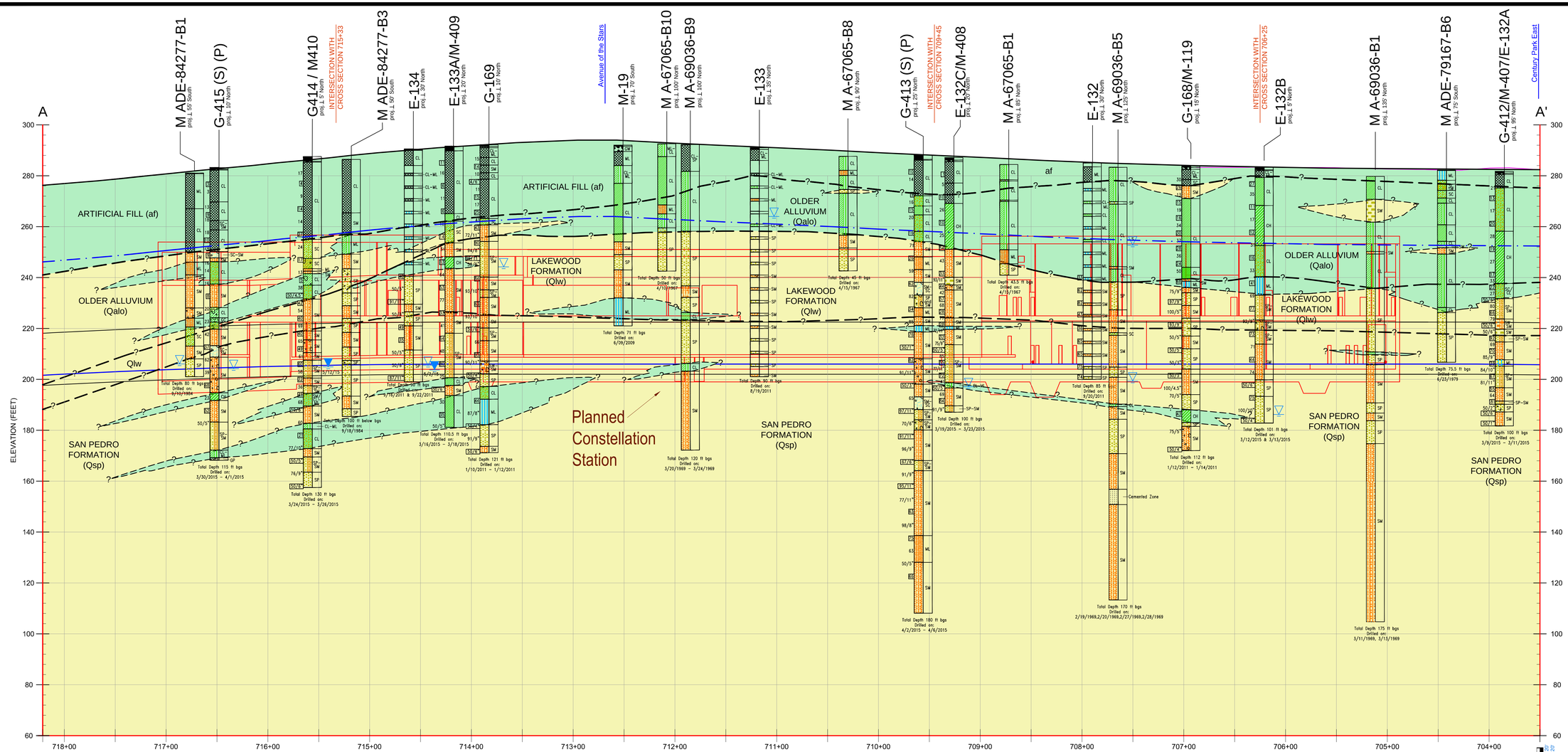
WESTSIDE PURPLE LINE EXTENSION ADVANCED PRELIMINARY ENGINEERING

BORING LOCATION PLAN
CENTURY CITY CONSTELLATION STATION

CONTRACT NO:
DRAWING NO: PLATE 1
REV:
SCALE: 1" = 50'
SHEET NO:

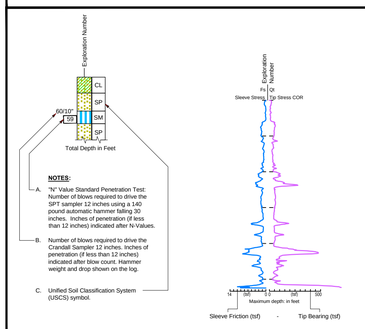
UserName: ogauthier Aug 17, 2015 @ 5:33pm FileName=> C:\Users\Ogauthier\Google Drive\2015-16\5 WSE Purple Line\4953-11-1423_Permit(Beverly-Hills_Century-City-Area) - Standard\4953-11-1423_Constellation_Boring Location Plan.dwg [Plate 1]

User Name: ogputher Aug 17, 2015 @ 5:22pm FileName=> C:\Users\Ogputher\Google Drive\2015-105 WSE Purple Line\49533-11-1423_ConstellationStation_Plate-2-1_Longitudinal Sections (1).dwg [Plate 2-1]
Options - Standard\49533-11-1423_FairfaxStation_Plate-2_Sections - Standard.dwg [Plate 2-1]



STATIONING IS ALONG NORTH (WEST BOUND) CENTER LINE OF RACK

Legend & Explanation



(P) : Pressuremeter

(S) : Shear Wave Velocity Survey

ft bgs : depth of boring in feet below ground surface elevation at time of drilling

Borings projected perpendicular to center line of north/west bound track

GROUP SYMBOLS AND NAMES		
Graphic/Symbol	Group Names	
FILL	CLAYEY Artificial FILL	
	SILTY SAND Artificial FILL	
	SANDY Artificial FILL	
CL	Lean CLAY	
	SANDY lean CLAY	
	Lean CLAY with GRAVEL	
CL-ML	SILTY CLAY	
	SILTY CLAY with GRAVEL	
CL-CH	Lean to fat CLAY	
	Lean to fat CLAY with GRAVEL	
CH	Fat CLAY	
	Fat CLAY with SAND	
	Fat CLAY with GRAVEL	
ML	SILT	
	SILT with SAND	
	SANDY SILT	
MH	Elastic SILT	
	Elastic SILT with GRAVEL	
SM	SILTY SAND	
	SILTY SAND with GRAVEL	
SP-SM	Poorly graded SAND with SILT	
	Poorly graded SAND with SILT and GRAVEL	

GROUP SYMBOLS AND NAMES		
Graphic/Symbol	Group Names	
SC-SM	SILTY, CLAYEY SAND	
	SILTY, CLAYEY SAND with GRAVEL	
SC	CLAYEY SAND	
	CLAYEY SAND with GRAVEL	
SP	Poorly graded SAND	
	Poorly graded SAND with GRAVEL	
SW	Well-graded SAND	
	Well-graded SAND with GRAVEL	
SW-SM	Well-graded SAND to SILT SAND	
GW	Well-graded GRAVEL	
GP	POORLY graded GRAVEL	
SILT-STONE	BEDROCK	
TAR	Tar Impacted Soil	

Geologic Units:

af	ARTIFICIAL FILL, projection of fill along profile is poorly confined due to lack of local boring data.
Qalo	OLDER ALLUVIUM
Qlw	LAKEWOOD FORMATION
Qsp	SAN PEDRO FORMATION
— — —	Geologic contact line, dashed where approximate, queried where poorly constrained
- - - -	Fine / Coarse grained contact line, dashed where approximate, queried where poorly constrained
	Coarse - grained Soils - Sands, fine to coarse grained, variable clay, silt, and gravel; horizontal correlation inferred
	Fine - grained Soils - Clays and Silts, variable sand and gravel; horizontal correlation inferred

Symbols Legend:

- Profile view of station (red) with tunnel outline (black) and track (blue) Based on plans dated May, 2015
- Cross passage (profile view)
- 5/6/13 — Groundwater depth measured in an observation well, and date of measurement
- Groundwater depth measured during drilling of a boring
- Groundwater seepage
- Historically highest Groundwater Depth based on CDMG (1998) groundwater contour map

Notes:

1. Cross-sections are based on current and prior boring data.
2. Depth to fill may not reflect current conditions. Geologic and soil units are interpreted along section from explorations of different types, vintages, projected distances, and material descriptions.
3. Geologic contacts are based on current interpretation of subsurface data.
4. Some of the prior geotechnical explorations are not projected on profile for clarity. Geologic units and contacts shown in profile are based on all the explorations shown on Plate 1.

REV	DATE	BY	APP	DESCRIPTION

DESIGNED BY: DLP
DRAWN BY: KO
CHECKED BY: LH/DLP/PE
IN CHARGE: MBH / PM
DATE: 8/17/2015

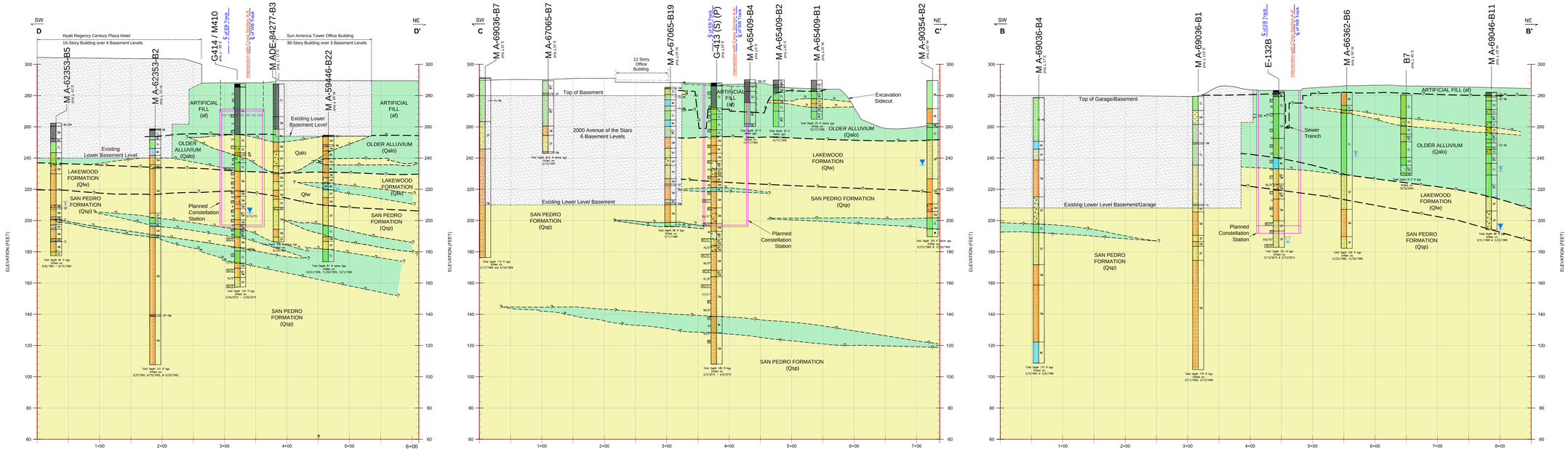
Metro
LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY

PB 125 YEARS
PROJECT MANAGER _____

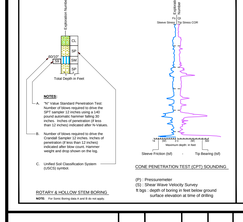
WESTSIDE PURPLE LINE EXTENSION ADVANCED PRELIMINARY ENGINEERING

GEOLOGIC CROSS SECTION (LONGITUDINAL) CONSTELLATION STATION AND NO. 10 DOUBLE CROSSOVER

CONTRACT NO
DRAWING NO: PLATE 2-1
REV
SCALE: AS NOTED
SHEET NO



Legend & Explanation



Geologic Units:

- af — ARTIFICIAL FILL, projection of fill along profile is poorly confined due to lack of local boring data.
- Qalo — OLDER ALLUVIUM
- Qlw — LAKEWOOD FORMATION
- Qsp — SAN PEDRO FORMATION
- Geologic contact line, dashed where approximate, queried where poorly constrained
- Fine / Coarse grained contact line, dashed where approximate, queried where poorly constrained
- Coarse - grained Soils - Sands: ranges from fine-grcined sand fine to coarse grained, variable clay, silt, and gravel; horizontal correlation inferred
- Fine - grained Soils - Clays and Silts, variable sand and gravel; horizontal correlation inferred
- Existing Basement

Symbols Legend:

- Profile view of station (red) with tunnel outline (black) and track (blue) Based on plans dated May 2015
- Cross passage (profile view)
- 5/6/13 — Groundwater depth measured in an observation well, and date of measurement
- Groundwater depth measured during drilling of a boring
- Groundwater Seepage

Notes:

1. Cross-sections are based on current and prior boring data.
2. Depth to fill may not reflect current conditions. Geologic and soil units are interpreted along section from explorations of different types, vintages, projected distances, and material descriptions.
3. Geologic contacts are based on current interpretation of subsurface data.
4. Some of the prior geotechnical explorations are not shown on profile. Geologic units and contacts shown in profile are based on projection of the explorations within 50 ft shown on Plate 1, except for boring MA - 69036-B1.
5. Intersection of longitudinal cross section A-A' coincides with the centerline of the westbound track alignment.

HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 1" = 60'

REV	DATE	BY	APP	DESCRIPTION

DESIGNED BY: DLP
DRAWN BY: KO
CHECKED BY: LH/DLP/PE
IN CHARGE: MBH / PM
DATE: 8/20/2015

LOS ANGELES COUNTY
METROPOLITAN TRANSPORTATION AUTHORITY

Metro

PB AECOM — PROJECT MANAGER

WESTSIDE PURPLE LINE EXTENSION ADVANCED PRELIMINARY ENGINEERING

GEOLOGIC CROSS SECTIONS (TRANSVERSE)
CONSTELLATION STATION AND
NO. 10 DOUBLE CROSSOVER

CONTRACT NO
DRAWING NO: PLATE 2-2
REV
SCALE: AS NOTED
SHEET NO

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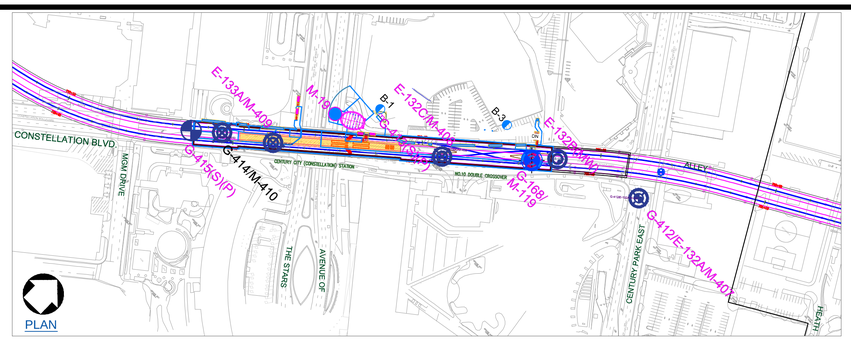

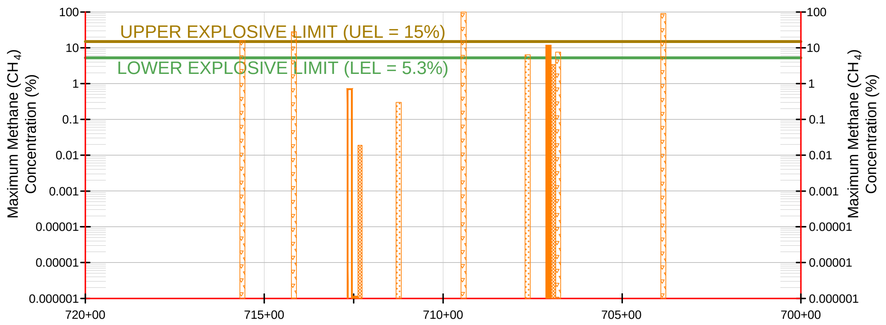

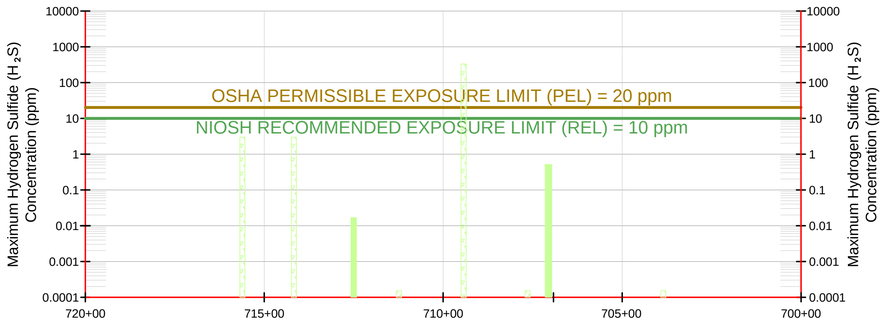

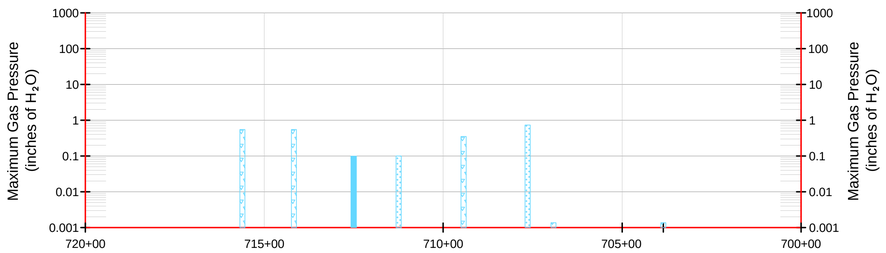

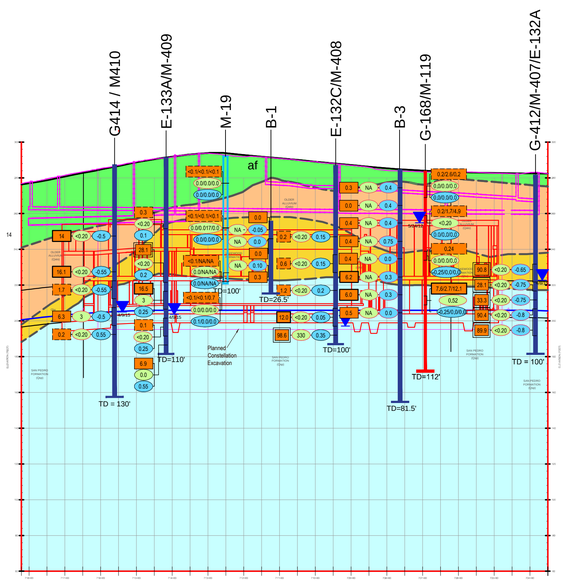

Reference: Proposed Tunnel Alignment and Station Plan and Profile dated June, 2015

EXPLANATION

- ACE phase investigations
- PE phase
- Adv. PE phase

EXPLANATION

Methane (CH_4)

2015 DATA | 2012 DATA | 2011 DATA | 2009 DATA | HISTORIC HIGHEST RECORDED (2003 TO 2004)

Hydrogen Sulfide (H_2S)

2015 DATA | 2012 DATA | 2011 DATA | 2009 DATA | HISTORIC HIGHEST RECORDED (2003 TO 2004)

Gas Pressure (inches of H_2O)

2015 DATA | 2012 DATA | 2011 DATA | 2009 DATA | HISTORIC HIGHEST RECORDED (2003 TO 2004)

GAS SYMBOLS

MAXIMUM RECORDED VALUES

During 2009 to 2015

Methane (CH_4):
- 5 < 5% by Volume
- 25 5 - 25% by Volume
- 100 26 - 100% by Volume

Hydrogen Sulfide (H_2S):
- 0.7 0.7 ppm (Parts Per Million by Volume)

Pressure (H_2O):
- 0.7 0.7 inches of Water

NOTES:

1. Frequency of monitoring events in the ACE, PE, Adv. PE, and prior wells:
   - 1.a. For prior wells, 1 event (2003 or 2004)
   - 1.b. For ACE phase wells, 4 events (2012 / 2011 / 2009)
   - 1.c. For PE phase wells, 5 events (2015 / 2012 / 2011)
   - 1.d. For Adv. PE phase wells, 2 to 3 events (2015)
2. NA = Not analyzed or measured
3. 5/2015 Groundwater Level and Date Measured (AMEC 2009 - 2015)
4. The borings and wells indicated on this figure are part of the Soil-Gas Investigation Program. Additional borings (i.e. for geotechnical purposes) have been completed but are not shown on this figure for clarity purposes. The subsurface geology is compiled from geotechnical, soil-gas and environmental borings previously completed.

HORIZ: 100' 0 200' 400'

VERT: 40' 20' 0 40' 80'

REV	DATE	BY	APP	DESCRIPTION

DESIGNED BY FYW
DRAWN BY KO
CHECKED BY FYW/LH
IN CHARGE MBH / PM
DATE 8/18/2015

LOS ANGELES COUNTY
METROPOLITAN TRANSPORTATION AUTHORITY

Metro

PB

PROJECT MANAGER _____

WESTSIDE SUBWAY EXTENSION
ADVANCED PRELIMINARY ENGINEERING

PLOT OF SUBSURFACE GAS DATA
CONSTELLATION STATION

CONTRACT NO
DRAWING NO PLATE 3
REV
SCALE AS NOTED
SHEET NO

UserName: ogouthier Aug 18, 2015 @ 11:35am FileName=> C:\Users\Ogouthier\Google Drive\2015-105 WSE Purple Line\From AMEC\4953-11-1423_Fairfax Station_Plate-3_Gas-Data-Log - Standard\4953-11-1423_Constellation_Plate-3_Gas-Data-Log.dwg [Plate-3]