Silicon Valley Rapid Transit Project
Tunnel Segment
Geotechnical Data Report
Volume V of VI

(P0503-D300-RPT-GEO-002, Rev.0)

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Silicon Valley Rapid Transit Project

Tunnel Segment Geotechnical Data Report Volume V of VI

P0503-D300-RPT-GEO-002
Rev. 0

HMM/Bechtel

Prepared by HMM/Bechtel SVRT, a Joint Venture

VTA Silicon Valley Rapid Transit Corridor 2000 Measure A Project
BART to Milpitas San Jose Santa Clara

B0508-C006

VOLUME V

APPENDIX 12: CLASSIFICATION TESTS

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APPENDIX 12

CLASSIFICATION TESTS

Parikh Consultants performed laboratory tests on basic index properties, including moisture content/dry density tests, Atterberg limits tests, gradation analyses, hydrometer tests, unconfined compression tests and laboratory minivane tests. Appendix 12 presents the results of these tests.

TUNNEL SEGMENT OF
SILICON VALLEY RAPID TRANSIT (SVRT) PROJECT
SAN JOSE, SANTA CLARA COUNTY, CALIFORNIA

APPENDIX 12

CLASSIFICATION TESTS

For

SVRT – HMM/BECHTEL
3331 North First Street, Building B
San Jose, CA 95134

PARIKH CONSULTANTS, INC.
356 S. Milpitas Blvd, Milpitas, CA 95035
(408) 945-1011

June 2005

Job No. 204104.10

PARIKH

Practicing in the Geosciences

Geotechnical ■
Environmental ■
Materials Testing ■
Construction Inspection ■

HMM/BECHTEL
3331 North First Street
San Jose, CA 95134

June 3, 2005
Job No.: 204104.10

Attn.: Mr. Ignacio Arango

Sub: Appendix 12 – Classification Tests
Tunnel Segment of Silicon Valley Rapid Transit (SVRT) Project
San Jose, Santa Clara County, California

Dear Mr. Arango:

As requested, we are presenting *Appendix 12 – Classification Tests* for the proposed Silicon Valley Rapid Transit (SVRT) project in San Jose, California.

Please contact us at (408) 945-1011 if you have any questions regarding the data presented in the appendix.

Very truly yours,
PARIKH CONSULTANTS, INC.

Y. David Wang

Y. David Wang, Ph.D., P.E., 52911
Senior Engineer

Gary Parikh

Gary Parikh, P.E., G.E., 666
Project Manager

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APPENDIX 12 – CLASSIFICATION TESTS

TUNNEL SEGMENT OF SILICON VALLEY RAPID TRANSIT (SVRT) PROJECT
SAN JOSE, SANTA CLARA COUNTY, CALIFORNIA

INTRODUCTION

This appendix includes data from our geotechnical exploration performed for the proposed Tunnel Segment of Silicon Valley Rapid Transit (SVRT) project in San Jose, Santa Clara County, California. The fieldwork was performed between October 2004 and April 2005. The work was performed generally in accordance with the project scope and technical specifications prepared by Hatch Mott MacDonald/Bechtel team.

PURPOSE AND SCOPE

The purpose of this exploration was to perform soil borings and in-situ tests and to provide subsurface data for the design team. The scope of work performed for this exploration included drilling 76 rotary wash boreholes (Appendix 1), with majority of them on city streets. In addition, the scope included the following: (1) performing vane shear tests in 23 boreholes (Appendix 2), (2) performing pressuremeter tests in 19 boreholes (Appendix 3), (3) performing P/S wave suspension logging in three boreholes (Appendix 4), and (4) installing vibrating wire piezometer in 17 boreholes (Appendix 5) and standpipe monitoring wells in two boreholes (Appendix 6). The "Exploratory Borehole & In-Situ Test Program" is summarized on Table A12-1.

METHODOLOGY OF EXPLORATION

The geotechnical exploration consisted of 76 boreholes extending to depths between 42.5 feet (portal area) and 217 feet (P/S wave suspension logging boreholes). At the proposed stations, the borehole depths are typically 150 feet. Along the tunnel alignment, the borehole depths cover approximately 20 feet below the planned tunnel invert at the time of drilling. Majority of the exploration program was performed between October 4, 2004 and March 5, 2005; except that BH-78 (in Newhall yard near the west portal) was drilled on April 18, 2005 due to permitting and coordination with Union Pacific Railroad (UPRR).

Laboratory Data

The laboratory tests for basic index properties performed by Parikh Consultants included the following: Moisture/Density (ASTM D2216), Atterberg Limits (ASTM D4318), Gradation Analysis with Hydrometer (ASTM D422), Unconfined Compression Tests (ASTM D2166), and Laboratory Vane Tests (ASTM D 4648). Every sample was examined and identified in the laboratory in accordance with visual-manual procedure as outlined in ASTM D2488. Final soil classification was based on Unified Soil Classification System as outlined in ASTM D2487. The laboratory test data are summarized and tabulated per each boring. Additional laboratory tests performed by Fugro West, Inc. are included in subsequent appendices.

For four boreholes (BH-25, 58, 70 & 74) for four "Cut-and-Cover" structure locations and eight boreholes (BH-3, 11, 15, 20, 35, 40, 43 & 46) for "Tunnel", extrusion of the continuous tube samples were performed in the presence of representatives of Kleinfelder and HMM/Bechtel. The tube samples were extruded and visually classified at every six inches by either HMM/Bechtel or Kleinfelder. Additional laboratory tests were assigned as deemed appropriate. In order to improve legibility of the gINT boring logs, these additional moisture/density data are presented in the summary table.

Very Truly Yours,
PARIKH CONSULTANTS, INC.

Y. David Wang

Y. David Wang, Ph.D., P.E. 52911
Senior Engineer

Gary Parikh

Gary Parikh, P.E., G.E 666
Project Manager

REGISTERED PROFESSIONAL ENGINEER
GAURANG R. PARIKH
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12-31-05
GEOTECHNICAL
STATE OF CALIFORNIA

FW/YDW/GP APP-11 (\PROJECT\204104.10\APP-11.DOC)

Table A12-1

Exploratory Borehole & In-Situ Test Program
Silicon Valley Rapid Transit (SVRT) Project
Tunnel Segment
San Jose, California

7/26/2005

Exploration	Boring Depth	Station (ft)	Offset (ft)	Offset R/L	Structure	In-Situ Tests Type	In-Situ Tests Qty	In-Situ Tests Depth (ft)	Vib. Wire Piezometers & Standpipe Wells
East Portal to Alum Rock Station									
BH-56	42.5	566+11	42	L	Portal	-			-
BH-57	42.5	569+16	18	L	Tunnel	VS	2	9.5 & 29.5	-
BH-01	61.5	574+05	13	L	Tunnel	VS	3	20, 30 & 40	-
BH-02	75.0	578+07	23	R	Tunnel	PM	4	39, 50, 58.5 & 60	25' & 52'
BH-03	90.0	581+81	14	L	Tunnel	Continuous Sampling (30' to 90')			-
BH-04	91.5	590+51	10	L	Tunnel	VS	1	45	20' & 52'
BH-05	92.5	598+17	55	R	Tunnel	-			-
BH-06	82.5	599+61	28	R	Tunnel	PM	5	44, 46, 53.5, 63.5 & 65	-
Alum Rock Station									
BH-58	151.5	600+32	53	R	Station	Continuous Sampling (5' to 70')			30.5'
BH-59	200.5	602+37	146	L	Station	P/S Suspension Logging to 200'			Standpipe Well to 217'
BH-60	152.2	604+20	61	L	Station	PM	11	13, 15, 28, 33.5, 35, 43.5, 45, 73.5, 75, 97.5, 99	
BH-61	151.5	605+84	41	L	Station	VS	12	9, 11, 19.5, 21.5, 30, 32, 39.5, 41.5, 49.5, 51.5, 64.5, 66.5	
BH-62	151.0	607+05	47	L	Station	-			-
BH-63	151.5	607+67	16	R	Station	VS	7	13.5, 15.5, 23.5, 34.5, 36.5, 49.5 & 51.5	81'
Alum Rock Station to Crossover/Downtown Station									
BH-07	86.0	609+41	9	R	Tunnel	VS	2	45 & 54.3	-
BH-08	91.0	615+75	64	R	Tunnel	PM	6	53, 54.5, 63, 64.5, 73.5 & 75	
BH-09	101.5	619+92	26	L	Tunnel	-			30' & 75'
BH-10	105.5	624+91	14	L	Tunnel	VS	1	55	-
BH-11	110.0	627+54	14	L	Tunnel	Continuous Sampling (50' to 110')			-
BH-12	121.5	634+69	13	L	Tunnel	VS	1	50	-
BH-13	131.5	640+81	13	L	Tunnel	PM	3	93.5, 114.5 & 116	30.5' & 100.5'
BH-14	127.0	642+52	15	L	Tunnel	-			-
BH-15	128.0	645+69	97	L	Tunnel	Continuous Sampling (70' to 128')			30' & 90'
BH-16	116.5	650+33	25	L	Tunnel	VS	0	Soil resistance higher than vane shear capacity	
BH-17	107.5	654+44	24	L	Tunnel	-			-
BH-18	100.5	660+03	24	L	Tunnel	PM	3	74.5, 76 & 86	-
BH-19	91.5	666+26	23	L	Tunnel	VS	1	45	30' & 60'
BH-20	91.5	669+80	24	L	Tunnel	Continuous Sampling (30' to 90')			-
BH-21	80.0	675+49	86	R	Tunnel	VS	2	40 & 50	-
BH-50	150.5	681+71	5	L	Tunnel	VS	3	9.5, 34.5 & 40.5	-
BH-52	150.5	684+09	6	L	Tunnel	Continuous Sampling (10' to 70')			-
BH-53	149.0	685+43	17	L	Tunnel	PM	3	25, 45 & 55	-
BH-54	121.5	687+16	10	L	Tunnel	VS	3	24, 34 & 48	-
BH-55	150.0	688+35	11	L	Tunnel	PM	2	25 & 45	-
Crossover/Downtown Station									
BH-23	130.5	690+03	74	R	Crossover	VS	4	14.6, 17.1, 38.5 & 44.6	-
BH-64	141.5	691+93	30	L	Crossover	PM	5	23.5, 25, 53, 54.5 & 74	-
BH-24	151.0	694+52	31	L	Crossover	Continuous Sampling (10' to 70')			-
BH-65	149.0	695+58	16	L	Crossover	PM	7	13, 15, 38, 40, 54, 111.5, & 113	
BH-77	137.5	698+34	16	L	Crossover	VS	4	14.1, 19.1, 24.2 & 39.1	-
BH-25	150.0	701+55	2	R	Station	PM	13	21, 23, 48, 50, 74, 76, 105.5, 107, 113, 114.5, 127.5, 129, 148.5 & 150	
BH-66	130.0	702+51	29	L	Station	VS	3	15.5, 21.5 & 44	-
BH-68	216.0	703+72	69	R	Station	P/S Suspension Logging to 200'			30', 80' & 160' (Piezometer at 30' depth in separate hole)
BH-70	146.5	706+78	47	L	Station	Continuous Sampling (10' to 70')			-
BH-71	148.0	707+62	18	L	Station	PM	6	23.5, 25, 43.5, 45, 63.5 & 65	
BH-72	162.5	709+40	22	L	Station	VS	5	18, 20, 22, 43 & 45	-
BH-26	157.5	710+66	19	L	Station	-			-
Crossover/Downtown Station to Diridon Station									
BH-27	140.5	715+01	131	L	Tunnel	-			-
BH-28	150.0	720+23	48	R	Tunnel	-			-
BH-29	112.5	723+89	29	R	Tunnel	VS	1	88.5	-
BH-30	110.5	728+02	31	R	Tunnel	-			-
BH-31	100.0	731+55	10	L	Tunnel	PM	4	72.5, 74, 82.5 & 84	30' & 60'
BH-32	92.5	733+31	38	L	Tunnel	-			-

Table A12-1

Exploratory Borehole & In-Situ Test Program
Silicon Valley Rapid Transit (SVRT) Project
Tunnel Segment
San Jose, California

7/26/2005

Exploration	Boring Depth	Station (ft)	Offset		Structure	In-Situ Tests			Vib. Wire Piezometers & Standpipe Wells
			(ft)	R/L		Type	Qty	Depth (ft)	
Diridon Station									
BH-33	150.8	735+14	52	L	Station	PM	12	13, 15, 23, 25, 43.5, 45, 74.5, 76, 88.5, 90, 113.5 & 115	
BH-73	150.5	736+58	41	L	Station	VS	5	9.7, 11.5, 19.5, 21.5 & 23.5	
BH-74	150.5	738+28	32	R	Station	Continuous Sampling (10' to 70')			30'
BH-75	200.5	739+52	45	R	Station	-			Standpipe Well to 200'
BH-76	152.5	741+02	70	R	Station	PM	9	13, 15, 25, 43.5, 45, 73.5, 75, 93.5 & 95	105'
BH-34	150.8	744+65	79	R	Station	VS	8	14.5, 16.5, 24.5, 26.5, 34.7, 44.5, 46.5 & 54.5	
Diridon Station to West Portal									
BH-35	78.0	750+49	77	R	Tunnel	Continuous Sampling (20' to 78')			-
BH-36	81.0	755+33	101	R	Tunnel	-			-
BH-37	82.5	760+60	53	L	Tunnel	VS	2	42.5 & 52.5	20.5' & 60.5'
BH-38	95.5	765+24	5	L	Tunnel	PM	4	43.5, 51, 65 & 80	-
BH-39	96.0	768+77	17	R	Tunnel	VS	0	Soil resistance higher than vane shear capacity	
BH-40	68.5	775+76	75	L	Tunnel	Continuous Sampling (10' to 69')			-
BH-41	60.0	781+35	12	L	Tunnel	VS	3	19.5, 29.5 & 34.5	20' & 40'
BH-79	216.0	782+50	17	L	Tunnel/Vent Shaft	P/S Suspension Logging to 200'			35.5', 75.5' & 118.5'
BH-42	62.5	785+37	19	L	Tunnel	PM	6	23, 25, 33, 35, 43 & 44.5	
BH-43	60.0	789+72	20	L	Tunnel	Continuous Sampling (5' to 60')			-
BH-80	100.0	794+39	112	L	Tunnel	-			47'
BH-44	61.5	798+28	20	L	Tunnel	VS	2	20 & 30	-
BH-45	85.5	802+44	26	L	Tunnel	PM	4	50, 58.5, 60 & 70	-
BH-46	60.0	809+36	9	L	Tunnel	Continuous Sampling (5' to 60')			-
BH-47	61.5	813+52	52	L	Tunnel	VS	2	22 & 24.5	20' & 40'
BH-48	86.5	818+34	15	R	Tunnel	PM	6	30.5, 32.5, 48.5, 50, 58.5 & 60	
BH-49	77.5	824+28	66	L	Tunnel	-			
BH-78	80.8	831+41	15	L	Portal	-			

Note: Stations and offsets based on the April 2005, S1 track alignment.

Summary	Borings	Downhole Logging	Continuous Sampling	Pressuremeter Testing	Vane Shear Testing	Piezometer/Well Borings
Stations & Crossover	24	2	4	7	8	7
Tunnel	52	1	9	12	17	12

A. **Sampling Schedule for Tunnel Borings** :
Sampling for tunnel borings focused on the 60' tunnel zone (20' above crown to 20' below invert of the 20' diameter tunnel).

B. **Sampling Schedule for Stations and Crossover** :
Stations and crossover borings were drilled to approx. 150' depth in general. Shelby tubes or Pitcher barrels were taken in cohesive soils, and SPT sampler (2" O.D. & 1.4" I.D.) or Modified California sampler (3" O.D. & 2.43" I.D.) were typically taken in granular soils.

C. **Continuous Sampling** :
Continuous Pitcher Barrel or Shelby Tube samples (in cohesive soils) and driven SPT or MC samples (in granular soils) were taken throughout the 60' tunnel zone at specified tunnel boring locations. Continuous Pitcher Barrel or Shelby Tube samples (in cohesive soils) and driven SPT or MC samples (in granular soils) were taken from 10' to 70' at specified station boring locations.

D. **Vane Shear Borings** :
Vane Shear tests were performed using Geonor H-10 Vane Borer equipment. Vane shear tests were not planned in granular soils and clay soils where the strength exceeded the equipment capacity (2.1 ksf). Along the tunnel alignment, vane shear testing was typically attempted at the tunnel crown, center and invert. Vane Shear tests were performed at specified depths of the station borings.

E. **Pressuremeter Borings**:
Pressuremeter tests were performed by Hughes Insitu Engineering Inc. Both "pre-bored" and "self-boring" pressuremeter tests were conducted. A top-drive drill rig was used for self-boring pressuremeter tests. In hard soils and gravelly soils, only the "pre-bored" type pressuremeter tests could be conducted. Along the tunnel alignment, pressuremeter testing was typically attempted at the tunnel crown, center and invert. Pressuremeter tests were performed at specified depths of the station borings.

F. **Downhole Logging** :
GEOVision Geophysical Services performed P/S suspension logging in borings at BH-59, BH-68 and 79.

G. **Noise and Vibration Testing** :
Noise and vibration tests were performed at BH-03, BH-10, BH-15, BH-19, BH-23, BH-27, BH-35, BH-40 and BH-46

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-01	1	2.4	CL									-	-	
BH-01	2	7.4	CL									-	-	
BH-01	3	12.2	CL									-	-	
BH-01	4	17.5	CL				42	22	20	2.0		92.9	30	
BH-01	5	22.5	CH									-	-	
BH-01	6	27.5	CL				40	23	17	1.2		94.1	29	
BH-01	7	32.5	CL									-	-	
BH-01	8	37.3	CH									-	-	
BH-01	9	42.5	CL									-	-	
BH-01	10	46.8	SC	25	47	28						113.0	16	
BH-01	11	51.3	SC	36	47	17						-	10	
BH-01	12	56.5	CH									-	-	
BH-01	13	60.9	SC	42	43	15						-	11	

SUMMARY OF LABORATORY TEST RESULTS
TUNNEL SEGMENT OF SILICON VALLEY RAPID TRANSIT (SVRT) PROJECT
SAN JOSE, CALIFORNIA

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

Notes:

** USCS - Symbol of Unified Soil Classification System per visual-manual procedures in accordance with ASTM D2488 or classification based on laboratory test results in accordance with ASTM D2487 when laboratory data is available.

Date: 6/2005

Job No.: 204104.10

TABLE A12-2

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	Grain Size Analysis sand (%)	Grain Size Analysis fines (%)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-02	1	16.5	CL									-	-	
BH-02	2	21.3	CL									-	-	
BH-02	3	26.5	CL									-	-	
BH-02	4	31.5	CL									-	-	
BH-02	5	34.7	CL				27	16	11			109.4	21	
BH-02	6	42.7	CL									-	-	
BH-02	7	47.5	CL				26	15	11	1.8		100.1	25	
BH-02	8	51.8	GC	49	36	15						-	10	
BH-02	9	54.8	CL									-	-	
BH-02	10	61.8	CL									-	-	
BH-02	11	65.8	CL									-	-	
BH-02	12	69.5	CL									-	-	
BH-02	13	74.7	CL									-	-	

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TABLE A12-3

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-03	1	32.5	CL									85.0	37	
BH-03	2	34.6	CL									-	-	
BH-03	3	37.5	SC	16	40	43						115.3	18	
BH-03	4	39.9	CL									-	-	
BH-03	5	41.5	CL									-	-	
BH-03	6	45.0	CL							0.9		99.0	26	
BH-03	7	47.5	CL									-	-	
BH-03	8B	49.4	CL			90						-	-	
BH-03	8A	49.9	SM			20						-	-	
BH-03	9C	54.0	CL			83						-	-	
BH-03	9A	55.0	CL									116.8	15	
BH-03	10C	56.3	CL			76								
BH-03	10A	57.3	CL			49						-	-	
BH-03	11E	58.0	CL			93						-	-	
BH-03	11B	59.5	SC	23	32	46						-	-	
BH-03	11A	60.0	SC									-	-	
BH-03	12C	64.0	CL-ML			70						-	-	
BH-03	12B	64.5	SM	20	53	27						-	-	
BH-03	12A	65.0	CL-ML	3	27	70				2.0		105.1	22	
BH-03	13B	66.9	CL-ML			87						-	-	
BH-03	13A	67.4	CL-ML									-	-	
BH-03	14B	69.3	CL-ML			95						-	-	
BH-03	14A	69.8	CL-ML									-	-	
BH-03	15	74.8	SP	18	76	6						110.9	15	
BH-03	16	76.5	CL									-	-	
BH-03	17	80.0	CL									-	-	
BH-03	18	81.0	CL-ML									-	-	

SUMMARY OF LABORATORY TEST RESULTS
TUNNEL SEGMENT OF SILICON VALLEY RAPID TRANSIT (SVRT) PROJECT
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PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

Notes:

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TABLE A12-4

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-03	19	85.0	CL									100.6	24	
BH-03	20	87.5	CL									-	-	
BH-03	21	89.8	ML			61						-	27	

SUMMARY OF LABORATORY TEST RESULTS
TUNNEL SEGMENT OF SILICON VALLEY RAPID TRANSIT (SVRT) PROJECT
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TABLE A12-5

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-04	1	32.2	CL/CH									80.4	40	
BH-04	2	37.3	CH									-	-	
BH-04	3	42.5	CH									-	-	
BH-04	4	47.4	CL				38	16	22	2.3		103.1	22	
BH-04	5	50.5	CH	3	18	79						78.7	41	
BH-04	6	56.0	CL-ML									-	-	
BH-04	7	61.0	CL							1.4		101.6	25	
BH-04	8	67.0	CL									-	-	
BH-04	9	72.3	CL									-	-	
BH-04	10	76.8	CL				28	18	10	3.8		108.0	20	
BH-04	11	81.2	GW-GC	49	40	12							9	
BH-04	12	86.3	CL									-	-	
BH-04	13	91.3	CL									98.8	27	

SUMMARY OF LABORATORY TEST RESULTS
TUNNEL SEGMENT OF SILICON VALLEY RAPID TRANSIT (SVRT) PROJECT
SAN JOSE, CALIFORNIA

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

Notes:

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TABLE A12-6

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-05	1	32.3	CL									-	-	
BH-05	2	37.3	CL									-	38	
BH-05	3	42.5	CL									-	-	
BH-05	4	47.5	CL			79				1.8		102.9	23	
BH-05	5	52.5	CL									-	-	
BH-05	6	57.5	CL									-	35	
BH-05	7	62.5	CL			88				1.5		100.2	24	
BH-05	8	67.3	SC	7	57	37						116.9	16	
BH-05	9	71.5	CL-ML									-	-	
BH-05	10	77.5	CL									-	32	
BH-05	11	82.5	CL									-	-	
BH-05	12	87.0	ML									-	25	
BH-05	13	92.1	ML									-	-	

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TABLE A12-7

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-06	1	22.5	CL									-	-	
BH-06	2	27.0	CL									-	-	
BH-06	3	32.3	CL									-	34	
BH-06	4	37.1	CL									-	-	
BH-06	5	39.5	CH				61	29	32			-	41	
BH-06	6	49.7	CL-ML									-	-	
BH-06	7	52.3	ML	1	45	55						110.0	19	
BH-06	8	54.7	ML				34	28	6			98.5	26	
BH-06	9	62.5	CL									-	-	
BH-06	10	64.0	CL									-	28	
BH-06	11	72.2	CL									-	-	
BH-06	12	77.0	CL-ML	1	4	96						-	30	
BH-06	13	82.5	CL-ML									-	-	

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TABLE A12-8

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-07	1	27.2	CL									-	-	
BH-07	2	32.5	CL									90.7	32	
BH-07	3	37.3	CH									-	-	
BH-07	4	42.3	CH							2.2		87.0	34	
BH-07	5	47.4	CH									-	-	
BH-07	6	52.2	CL									-	-	
BH-07	7	57.2	CL							3.2		96.9	25	
BH-07	8	60.5	SC									-	-	
BH-07	9	65.5	SP-SM	25	65	10						119.0	15	
BH-07	10	70.5	SW-SM	40	54	6						121.1	14	
BH-07	11	75.8	SW-SM									-	-	
BH-07	12	80.8	GW	86	12	2						-	6	
BH-07	13	85.6	SM									-	-	

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TABLE A12-9

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-08	1	32.5	SM									-	-	
BH-08	2	37.5	CL									92.4	31	
BH-08	3	42.5	CL									-	-	
BH-08	4	47.5	CL				39	23	16	2.1		91.0	30	
BH-08	5	50.0	CL									-	-	
BH-08	6	60.0	CL				39	22	17			93.6	29	
BH-08	7	66.0	-									-	-	
BH-08	8	69.5	GW-GM							3.1		-	-	
BH-08	9	76.2	GW-GM	49	43	9							9	
BH-08	10	81.2	GP-GM	50	39	12							7	
BH-08	11	85.8	SW-SM	20	71	9						-	10	
BH-08	12	90.8	SW-SM									-	-	

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TABLE A12-10

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-09	1	42.5	CH									-	-	
BH-09	2	47.5	CH									-	-	
BH-09	3	52.5	CH							4.1		93.0	29	
BH-09	4	57.5	CH									-	-	
BH-09	5	62.5	CL							1.4		94.9	28	
BH-09	6	66.0	SM/ML	0	51	49						100.5	24	
BH-09	7	71.3	SW-SM			8						-	13	
BH-09	8	75.8	SW-SM	26	68	7						-	12	
BH-09	9	81.0	SW-SM			7						-	12	
BH-09	10	86.0	SW-SM			7						-	13	
BH-09	11	90.8	SW-SM	37	53	10						-	9	
BH-09	12	96.0	SW-SM			8						-	12	
BH-09	X	-	-									-	-	
BH-09	13	101.5	CL									-	-	

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TABLE A12-11

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-10	1	47.4	CL									-	-	
BH-10	2	52.3	CL									-	-	
BH-10	3	59.5	CL				36	20	16	3.2		104.9	21	
BH-10	4	62.5	CL									-	-	
BH-10	5	66.5	CL-ML				25	21	4	1.8		113.1	14	
BH-10	6	69.5	GW-GM	57	38	5						-	8	
BH-10	7	74.5	GW-GM	67	26	8						-	-	
BH-10	8	79.5	GP-GM									-	8	
BH-10	9	84.9	SW-SM									-	-	
BH-10	10	89.8	SW-SM	33	61	6						-	12	
BH-10	11	95.5	CL									-	-	
BH-10	12	101.5	CL									-	-	
BH-10	13	105.4	SP									-	-	

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TABLE A12-12

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-11	1	52.0	CH			100						-	-	
BH-11	2	55.0	CH									-	-	
BH-11	3	57.5	CH									-	-	
BH-11	4	60.0	CH									105.4	24	
BH-11	5	62.3	CL			99						-	-	
BH-11	6	64.8	CL									-	-	
BH-11	7	67.5	CL									102.8	24	
BH-11	8	70.0	CL			100						-	-	
BH-11	9	71.8	CL			97						-	-	
BH-11	10	75.0	CL			98						108.0	22	
BH-11	11	76.8	CL			84						-	-	
BH-11	12	78.8	SP-SM	34	57	9						-	9	
BH-11	13	81.1	GW									-	-	
BH-11	14	83.2	GW									-	-	
BH-11	15	86.0	CL			80						-	-	
BH-11	16	88.3	SM	17	71	13						112.2	18	
BH-11	17	91.3	SP									-	-	
BH-11	18	93.5	SP-SM	32	58	10						-	9	
BH-11	19	96.2	CL									-	-	
BH-11	20	99.5	CL			99						109.7	21	
BH-11	21	102.5	CL			99						-	-	
BH-11	22	105.0	ML			92						-	-	
BH-11	23	107.5	CL									-	-	
BH-11	24	110.0	CL									-	-	

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TABLE A12-13

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-12	1	32.5	ML									95.3	29	
BH-12	2	37.4	CL									102.2	13	
BH-12	3	42.4	ML/CL	1	30	70	35	24	11			94.2	31	
BH-12	4	47.5	ML/CL									86.3	37	
BH-12	5	52.5	CL									98.0	27	
BH-12	6	57.5	CL									88.9	32	
BH-12	7	60.7	CH									-	-	
BH-12	8	66.5	ML/CL				34	23	11			94.7	29	
BH-12	9	71.2	ML/CL	0	15	85				1.5		95.7	25	
BH-12	10	75.3	SC									-	-	
BH-12	11	79.8	SW-SM	42	53	5						-	13	
BH-12	12	86.3	CL				33	20	13	3.0		102.8	23	
BH-12	13	90.1	SC									-	-	
BH-12	14	94.8	GW-GM	55	39	6						-	9	
BH-12	15	99.6	GW-GM									-	-	
BH-12	16	104.7	GW-GM	49	46	6						-	11	
BH-12	17	109.3	GW-GM									-	-	
BH-12	18	115.3	CL									86.9	34	
BH-12	19	121.5	CL									-	-	

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TABLE A12-14

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-13	1	71.0	SM									-	-	
BH-13	2	76.0	GW-GM	53	41	6						-	8	
BH-13	3	80.7	SP									-	-	
BH-13	4	86.0	SW									-	-	
BH-13	5	91.3	GW-GM	59	36	6						-	9	
BH-13	6	96.3	SW-SM									-	-	
BH-13	7	101.5	ML/SM	1	48	52						-	29	
BH-13	8	-	-									-	-	
BH-13	9	106.0	SC									-	-	
BH-13	10	111.5	SW	23	73	4						117.7	13	
BH-13	11	117.5	CL							4.0		118.5	16	
BH-13	12	121.0	CL-ML									-	-	
BH-13	13	125.6	SP-SM	33	61	6						126.6	11	
BH-13	14	131.5	SW-SC									-	-	

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TABLE A12-15

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-14	1	71.3	SC			13						-	11	
BH-14	2	75.8	SP									-	-	
BH-14	3	81.0	GW-GM			6						-	11	
BH-14	4	85.7	GW-GM									-	-	
BH-14	5	90.7	GW-GM	57	37	5						-	10	
BH-14	6	95.8	GW-GM			9						-	9	
BH-14	7	100.8	SM	38	45	17						129.6	8	
BH-14	8	105.5	SP-SM			5						-	12	
BH-14	9	110.6	GP-GM	72	23	5						-	13	
BH-14	10	115.3	GP-GM			3						-	11	
BH-14	11	120.3	GP-GM									-	-	
BH-14	12	125.3	GW-GC									-	7	
BH-14	13	126.2	GW-GC									-	-	

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TABLE A12-16

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-15	1	70.8	CH									-	42	
BH-15	2	73.5	SW-SC	27	63	10						-	11	
BH-15	3	75.8	SW-SC									-	-	
BH-15	4	78.8	SW-SC									-	-	
BH-15	5	80.8	SW-SC	44	47	9						-	9	
BH-15	6	83.3	SW-SC									-	-	
BH-15	7	85.8	SW-SC									-	-	
BH-15	8	88.1	SW-SC									-	-	
BH-15	9	90.3	SW-SC									-	-	
BH-15	10	92.7	SW-SC									-	-	
BH-15	11	95.3	GC									-	-	
BH-15	12	98.0	GC									-	-	
BH-15	13	100.8	GC	45	41	14						-	12	
BH-15	14	103.4	GC									-	-	
BH-15	15	-	-									-	-	
BH-15	16C	109.0	ML			90						-	-	
BH-15	16A	110.0	ML			81						-	-	
BH-15	17	-	-									-	-	
BH-15	18	113.6	SM									-	-	
BH-15	19	116.5	SM	0	70	30						-	32	
BH-15	20	117.7	SM									-	-	
BH-15	21	120.3	SW-SM									-	-	
BH-15	22	123.2	SW-SM	37	54	9						-	12	
BH-15	23	125.7	SW-SM									-	-	
BH-15	24	127.9	SW-SM									-	-	

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TABLE A12-17

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-16	1	57.3	CH									90.3	32	
BH-16	2	62.2	CL									-	-	
BH-16	3	65.6	CH				51	26	25			79.5	42	
BH-16	4	70.6	GW									-	-	
BH-16	5	75.8	GW	80	17	3						-	7	
BH-16	6	80.5	GW									-	-	
BH-16	7	86.7	ML									-	-	
BH-16	8	90.7	GC	79	4	17						-	12	
BH-16	9	95.3	GC									-	-	
BH-16	10	101.5	ML/CL				33	24	9			98.0	27	
BH-16	11	106.5	ML									-	-	
BH-16	12	112.3	ML									99.8	26	
BH-16	13	116.5	SM	0	68	32						-	26	

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TABLE A12-18

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-17	1	46.9	CH									-	-	
BH-17	2	52.5	CH							2.7		91.7	32	
BH-17	3	57.5	ML	0	42	58						107.6	20	
BH-17	4	60.7	SW-SC									-	-	
BH-17	5	66.0	SW-SC	43	50	7						-	9	
BH-17	6	-	-									-	-	
BH-17	7	75.3	CL									-	-	
BH-17	8	82.5	CL							3.6		108.0	20	
BH-17	9	87.5	CL									-	-	
BH-17	10	92.2	CL									100.1	24	
BH-17	11	97.5	CL									-	-	
BH-17	12	101.5	CL-ML									-	-	
BH-17	13	107.5	CH									-	-	

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TABLE A12-19

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-18	1	42.5	CH									-	36	
BH-18	2	47.5	CL									-	-	
BH-18	3	52.5	CH				54	27	27	2.0		88.5	31	
BH-18	4	-	-									-	-	
BH-18	5	57.0	SP-SM									-	-	
BH-18	6	67.0	GW-GM	57	37	6						-	7	
BH-18	7	73.5	CL				31	18	13	2.0		105.0	21	
BH-18	8	76.0	CL									-	-	
BH-18	9	82.5	CL									-	22	
BH-18	10	90.0	CL									-	-	
BH-18	11	95.5	CL									-	23	
BH-18	12	100.4	CL									-	-	

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TABLE A12-20

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-19	1	32.1	CH									86.3	36	
BH-19	2	37.2	CH									-	-	
BH-19	3	42.3	CH									-	44	
BH-19	4	47.0	CH							2.9		87.1	34	
BH-19	5	52.0	CH									-	-	
BH-19	6	56.9	CL									-	-	
BH-19	7	61.4	SM	12	72	16						-	12	
BH-19	8	66.0	GW-GC	60	34	6						-	7	
BH-19	9	71.4	CL							4.2		102.1	23	
BH-19	10	81.3	SM									-	-	
BH-19	11	85.8	GW-GC	61	31	8						-	7	
BH-19	12	91.3	CL									-	-	

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TABLE A12-21

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-20	1	32.5	CH									-	-	
BH-20	2	34.8	CH									-	-	
BH-20	3	37.5	CH				66	30	36	1.8		74.7	46	
BH-20	4	40.0	CH									-	-	
BH-20	5	42.4	CH									82.0	39	
BH-20	6	45.0	CH									-	-	
BH-20	7	-	-									-	-	
BH-20	8	50.0	CH							2.7		88.9	31	
BH-20	9	51.2	CH			85						-	-	
BH-20	10	54.4	CL			84						-	-	
BH-20	11	55.3	GW-GC	49	40	11						-	8	
BH-20	12	58.5	GW-GC									-	-	
BH-20	13	60.5	GW-GC									-	-	
BH-20	14	62.9	GW-GC									-	-	
BH-20	15	-	-									-	-	
BH-20	16	67.8	GW	49	47	4						-	15	
BH-20	17C	72.5	SM	29	45	25						-	-	
BH-20	17A	73.5	ML				31	26	5			95.7	28	
BH-20	18	75.8	SP-SM									-	-	
BH-20	19	78.2	SP-SM									-	-	
BH-20	20	81.0	SP-SM	44	49	7						-	11	
BH-20	21	85.5	SP-SM									-	-	
BH-20	22	91.5	SP-SM									-	-	

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TABLE A12-22

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-21	1	22.5	CL									-	-	
BH-21	2	27.5	CL									-	-	
BH-21	3	32.5	CL									-	-	
BH-21	4	37.3	CH									-	-	
BH-21	5	42.2	CL									-	-	
BH-21	6	47.5	CL									-	-	
BH-21	7	52.1	ML									-	-	
BH-21	8	55.9	SW-SC									-	-	
BH-21	9	60.0	SW-SC	46	48	6						-	10	
BH-21	10	65.1	SP	47	49	5						-	9	
BH-21	11	70.0	ML									-	-	
BH-21	12	74.5	SW-SC									-	-	
BH-21	13	79.1	GP									-	-	

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TABLE A12-23

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	Grain Size Analysis sand (%)	Grain Size Analysis fines (%)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-23	1	3.9	CL									-	22	
BH-23	2	7.0	ML									-	-	
BH-23	3	12.0	CL									88.1	34	
BH-23	4	22.5	CL									-	28	
BH-23	5	24.8	CL									-	27	
BH-23	6	28.5	CL				35	21	14			71.2	32	
BH-23	7	33.5	CL									-	31	
BH-23	8	36.0	CL									-	-	
BH-23	9	41.7	CL									-	-	
BH-23	10	47.5	CL				30	22	8			101.8	26	
BH-23	11	51.0	CL									-	20	
BH-23	12	60.0	CL									-	25	
BH-23	13	67.5	ML									104.0	22	
BH-23	14	76.3	SM			14						-	14	
BH-23	15	86.3	GP			5						-	8	
BH-23	16	95.8	CL									-	22	
BH-23	17	106.8	CL									106.6	20	
BH-23	18	117.3	CL			69						100.1	25	
BH-23	19	-	-									-	15	
BH-23	20	121.3	SM			13						-	24	
BH-23	21	125.0	GM									-	9	
BH-23	22	130.5	CL									-	22	

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TABLE A12-24

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-24	1	5.5	CL									-	15	
BH-24	2	12.3	SM									96.9	28	
BH-24	3	15.0	CL	0	10	90	43	19	24	2.1		98.0	25	Hydrometer test
BH-24	4	17.5	CL				35	16	19	0.9		96.3	30	
BH-24	5	20.0	ML	2	17	81				1.1		100.2	24	
BH-24	6	22.5	CL									91.9	32	
BH-24	7	25.0	CL									104.9	23	
BH-24	8	27.5	CL	0	14	86	31	22	9	1.4		94.6	28	Hydrometer test
BH-24	9	30.0	ML									94.6	29	
BH-24	10	32.4	ML	0	29	71	25	24	1	1.5		97.1	26	Hydrometer test
BH-24	11	35.0	CH									78.7	44	
BH-24	12	37.3	CL									99.6	28	
BH-24	13	40.0	SM	0	56	44						110.0	20	
BH-24	14	40.5	SM	18	64	18						-	19	
BH-24	15	43.8	GP-GM	86	5	9						-	12	
BH-24	16	46.3	GW-GM	54	40	6						-	9	
BH-24	17	50.4	CL									-	25	
BH-24	18	53.5	GC									101.6	25	
BH-24	19	55.0	CL-ML	0	23	78	29	22	7	0.9		98.0	26	Hydrometer test
BH-24	20	57.5	CL-ML									106.9	22	
BH-24	21	60.0	CL-ML							1.3		105.3	21	
BH-24	22	62.5	CL-ML									102.0	23	
BH-24	23	65.0	CL	0	12	88				3.5		102.9	23	Hydrometer test
BH-24	24	67.5	CL									99.0	27	
BH-24	25	70.0	CL							3.3		115.3	17	
BH-24	26	81.0	SP	27	69	5						-	21	Hydrometer test
BH-24	27	90.5	SP-SM	24	69	7						-	15	Hydrometer test

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TABLE A12-25

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-24	28	100.9	SM	0	70	29						-	18	Hydrometer test
BH-24	29	111.0	CL			59	27	19	8	2.5		105.0	21	
BH-24	30	121.0	SM	29	50	22						-	13	Hydrometer test
BH-24	31	129.4	SW									-	8	
BH-24	32	141.0	CL-ML	0	44	56	26	21	5	1.4		108.7	19	Hydrometer test
BH-24	33	151.0	SM	0	74	26						98.8	25	Hydrometer test

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TABLE A12-26

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-25	1	6.5	SM									-	7	
BH-25	2	11.5	SP-SM									-	-	
BH-25	3	18.0	CL				38	23	15	1.9		86.2	35	
BH-25	4	32.5	ML									-	27	
BH-25	5	34.0	ML									-	-	
BH-25	6	36.5	OH/MH									-	39	
BH-25	7B	40.7	SC/CL									94.2	30	
BH-25	7A	41.2	SC/CL				47	26	21			-	29	
BH-25	8B	52.3	SP-SM									111.5	9	
BH-25	8A	52.8	SP-SM	36	56	8						-	13	
BH-25	9	56.5	CL				33	21	12			-	28	
BH-25	10	61.7	ML				24	20	4		1.0	-	21	
BH-25	11B	70.5	ML				22	21	1			106.5	21	
BH-25	11A	71.0	CL	0	32	69	33	18	15	3.2		101.3	23	Hydrometer Test
BH-25	12	81.5	SW-SM	36	56	9						-	13	
BH-25	13	91.5	SW-SM									-	-	
BH-25	14	-	-									-	-	
BH-25	15	104.0	CL				34	18	16			-	27	
BH-25	16	112.5	CL									-	-	
BH-25	17	113.5	CL									109.1	17	
BH-25	18	114.0	SC									-	-	
BH-25	19	116.0	SM									-	-	
BH-25	20	121.5	GW-GM	51	42	8						-	8	
BH-25	21	127.5	CL									-	-	
BH-25	22	129.5	CL									95.0	27	
BH-25	23	-	-									-	-	
BH-25	24	139.0	CL									-	-	

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TABLE A12-27

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-25	X	-	-									-	-	
BH-25	25	142.0	SC	39	42	18						-	10	
BH-25	26	147.5	CL									97.6	27	
BH-25	27	150.0	CL									-	-	

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TABLE A12-28

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-26	1	22.5	CL									-	-	
BH-26	2	27.5	CL									92.1	31	
BH-26	3	32.3	SC/CL	0	52	49						-	25	
BH-26	4	36.2	SM									-	-	
BH-26	5	42.2	CL									-	-	
BH-26	6	47.0	SC									-	-	
BH-26	7	50.3	CL									-	-	
BH-26	8	56.3	SP-SC	33	60	7						-	13	
BH-26	9	61.5	ML									-	-	
BH-26	10	67.5	CL									105.1	22	
BH-26	11	72.5	CL									-	-	
BH-26	12	77.5	CL									99.1	25	
BH-26	13	81.5	CL									-	-	
BH-26	14	91.0	CL	2	33	66						-	26	
BH-26	15	102.5	CL									-	-	
BH-26	16	111.5	CL	1	30	69						-	21	Hydrometer Test
BH-26	17	-	-									-	-	
BH-26	18	117.3	SM									-	-	
BH-26	19	121.5	CL									-	-	
BH-26	20	125.7	GW-GC	50	41	9						-	10	
BH-26	21	131.5	CL									-	-	
BH-26	22	-	-									-	-	
BH-26	22A	137.0	CL									-	-	
BH-26	23	141.5	CL									-	-	
BH-26	24	147.5	CL									103.2	23	
BH-26	25	152.5	CL									-	-	
BH-26	26	155.0	CL									-	-	

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TABLE A12-29

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-26	27	157.1	SW									-	-	

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TABLE A12-30

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-27	1	22.5	SM	0	61	39						108.6	21	
BH-27	2	27.5	SM									-	-	
BH-27	3	32.5	CL/CH				49	25	24			90.9	33	
BH-27	4	-	-									-	-	
BH-27	5	39.5	GW-GC									-	-	
BH-27	6	41.1	GW-GC	53	35	12						-	9	Hydrometer Test
BH-27	7	46.1	GW-GC									-	-	
BH-27	8	51.1	SW-SC	36	57	7						-	12	Hydrometer Test
BH-27	9	56.1	CL									-	-	
BH-27	10	59.7	SM									-	-	
BH-27	11	66.0	SW-SM									-	-	
BH-27	12	68.0	SW-SM	44	48	9						-	7	Hydrometer Test
BH-27	13	74.7	SP-SM	11	80	9						-	18	
BH-27	14	81.0	SM									-	-	
BH-27	15	85.0	SW-SM									-	-	
BH-27	16	90.3	CL									-	-	
BH-27	17	95.3	ML									-	-	
BH-27	18	100.0	GW-GC									-	-	
BH-27	19	109.4	SC									-	-	
BH-27	20	120.5	CL									-	-	
BH-27	21	131.5	CL				33	20	13			98.4	24	
BH-27	22	140.5	CL									-	-	

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TABLE A12-31

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-28	1	21.8	GC									-	-	
BH-28	2	26.5	CL-ML	0	13	87						-	32	
BH-28	3	32.5	CL									-	-	
BH-28	4	37.4	SM									-	-	
BH-28	5	40.7	GP-GM	56	34	11						-	10	
BH-28	6	45.7	SM									-	-	
BH-28	7	52.2	CL									-	-	
BH-28	8	55.0	CL									-	-	
BH-28	9	57.3	CL									-	-	
BH-28	10	61.8	SM									-	-	
BH-28	11	65.8	CL									-	-	
BH-28	12	71.9	SC									-	-	
BH-28	13	77.0	CL	0	41	59						-	21	
BH-28	14	82.0	CL									-	-	
BH-28	15	91.3	CL									-	-	
BH-28	16	101.4	SM									-	-	
BH-28	17	112.5	CL									-	-	
BH-28	18	115.7	CL									-	-	
BH-28	19	121.3	ML									-	-	
BH-28	20	125.7	CL									-	-	
BH-28	21	132.5	CL									-	-	
BH-28	22	135.0	CL									-	-	
BH-28	23	137.5	CL									-	-	
BH-28	24	139.1	CL									-	-	
BH-28	25	141.8	CL									-	-	
BH-28	26	145.0	CL									-	-	
BH-28	27	150.0	CL									-	-	

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TABLE A12-32

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-29	1	51.8	CL									-	-	
BH-29	2	55.3	CL									-	-	
BH-29	3	61.5	SW-SM			8						-	9	
BH-29	4	65.5	CL	23	23	54						-	28	
BH-29	5	70.7	CL				32	17	15			-	24	
BH-29	6	76.5	CL	0	17	83						107.4	21	
BH-29	7	80.0	CL-ML				24	19	5			-	24	
BH-29	8	86.5	CL	0	31	69						104.2	24	
BH-29	9	92.5	CL									-	-	
BH-29	10	95.8	SC	12	54	35						119.3	17	
BH-29	11	102.0	SM			40						-	19	
BH-29	12	107.5	CL									-	-	
BH-29	13	112.5	CL									-	-	

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TABLE A12-33

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-30	1	51.4	CL									-	-	
BH-30	2	56.5	ML	0	23	77						103.0	20	Hydrometer Test
BH-30	3	59.3	GW-GC	88	7	6						-	6	
BH-30	X	-	-									-	-	
BH-30	4	69.6	GP-GC	55	37	9						-	8	
BH-30	5	75.5	CL				37	15	22			103.9	22	
BH-30	6	81.4	CL									-	-	
BH-30	7	84.4	GC	64	23	13						-	8	
BH-30	8	89.8	GP-GM	57	32	11						-	7	Hydrometer Test
BH-30	9	94.5	ML	8	27	65						111.8	17	
BH-30	10	99.8	CL									-	-	
BH-30	11	105.0	GM	42	39	19						124.2	10	
BH-30	12	110.5	CL									-	-	

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PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

Notes:

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TABLE A12-34

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-31	1	40.7	CL	0	24	75						-	21	
BH-31	2	44.3	CL									-	-	
BH-31	3	50.5	CL			61						-	21	
BH-31	4	55.3	SC	0	68	32						89.3	22	
BH-31	5	58.3	GP-GM	48	43	9						122.0	11	
BH-31	6	70.2	CL							2.1		102.3	23	
BH-31	7	76.5	CL			91						-	22	
BH-31	8	80.0	CL							2.6		108.4	22	
BH-31	9	86.0	SC			20						-	9	
BH-31	10	88.8	SC	36	52	13						117.4	14	
BH-31	11	94.4	SC			22						-	5	
BH-31	12	99.7	CL									-	-	

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TABLE A12-35

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-32	1	32.4	CL									-	-	
BH-32	2	37.4	CL									-	-	
BH-32	3	42.0	SM	0	74	26						93.3	25	
BH-32	4	47.2	CL									-	-	
BH-32	5	52.3	CL			81	27	18	9			101.5	23	
BH-32	6	57.1	CL									-	-	
BH-32	7	60.8	GW-GM	52	39	9							8	
BH-32	8	66.8	CL			94	36	18	18			-	23	
BH-32	9	71.5	CL	9	28	63						111.7	17	
BH-32	10	77.0	CL									102.0	23	
BH-32	11	80.5	GC	64	17	20						123.3	12	
BH-32	12	87.2	CL									-	-	
BH-32	13	92.5	ML	1	34	64						104.0	21	

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TABLE A12-36

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-33	1	9.8	CL									97.6	22	
BH-33	2	20.0	CL	0	48	52						-	20	
BH-33	3	32.5	CL									-	-	
BH-33	4	41.3	SW-SM	38	54	8						-	9	
BH-33	5	-	-									-	-	
BH-33	6	54.4	ML				31	24	7			97.6	25	
BH-33	7	62.5	CL									-	-	
BH-33	8	71.0	CL	0	28	72						106.1	21	Hydrometer Test
BH-33	9	82.5	CL	0	12	88						-	-	Hydrometer Test
BH-33	10	91.0	SP-SM	45	48	8						128.8	9	
BH-33	11	100.8	ML									-	-	
BH-33	12	110.0	CL				33	19	14			99.9	25	
BH-33	13	116.1	SP-SM	16	73	11						-	16	
BH-33	14	121.5	CL									-	-	
BH-33	15	127.2	CL									108.2	21	
BH-33	16	131.5	CL									-	-	
BH-33	17	137.0	CL									-	-	
BH-33	18	141.7	CL									-	-	
BH-33	19	-	-									-	-	
BH-33	20	148.3	CL	11	36	53						-	22	
BH-33	21	150.8	SW-SM									-	-	

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TABLE A12-37

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-34	1	7.8	CL									-	-	
BH-34	2	12.3	CL									91.8	30	
BH-34	3	22.4	CL-ML									-	-	
BH-34	4	32.5	CL									100.7	21	
BH-34	5	42.5	SM									-	-	
BH-34	6	52.5	CL									105.9	22	
BH-34	7	61.7	CL									-	-	
BH-34	8	71.1	CL									-	-	
BH-34	9	80.8	SW-SM	10	78	12						116.7	16	
BH-34	10	90.8	GW-GM	67	26	7						-	-	
BH-34	11	100.8	SP-SM	0	90	10						105.5	20	
BH-34	12	111.3	ML	0	10	90						-	-	Hydrometer Test
BH-34	13	117.5	CL									-	-	
BH-34	14	122.5	CL									-	-	
BH-34	15	127.2	CL	0	4	97						94.3	28	Hydrometer Test
BH-34	16	131.8	CH									-	-	
BH-34	17	136.9	CL									-	-	
BH-34	18	142.4	CL									101.3	24	
BH-34	19	147.1	CL									-	-	
BH-34	20	150.8	ML	0	38	62						-	23	

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TABLE A12-38

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-35	1	22.1	CL									-	-	
BH-35	2	25.0	CL									93.1	28	
BH-35	3	27.0	CL									-	-	
BH-35	4	30.0	CL									-	-	
BH-35	5	32.3	CL									-	-	
BH-35	6	34.8	CL									-	-	
BH-35	7	37.5	CL									102.5	22	
BH-35	8	39.9	CL									-	-	
BH-35	9	42.5	CL							1.8		101.4	25	
BH-35	10	47.2	CL									-	-	
BH-35	11B	49.2	CL			94						-	-	
BH-35	11A	49.7	SM/ML	0	53	47						100.2	25	
BH-35	12	52.5	CL			94						-	-	
BH-35	13	54.3	CL			86						-	-	
BH-35	14B	59.4	CL			96								
BH-35	14A	59.9	CL	0	28	72				3.6		100.5	25	
BH-35	15D	61.0	CL			79						-	-	
BH-35	15C	61.5	CL			71						-	-	
BH-35	15A	62.5	CL									-	-	
BH-35	16	64.8	CL			88						-	-	
BH-35	17	67.5	CL	18	24	59						107.7	20	
BH-35	18	72.2	CL									-	-	
BH-35	19	73.0	GW-GM	47	46	8						-	10	
BH-35	20	75.5	GW-GM									-	-	
BH-35	21	78.0	GW-GM									-	-	

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TABLE A12-39

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-36	1	22.5	CH									-	-	
BH-36	2	27.5	SC									-	-	
BH-36	3	32.5	CL/CH				50	19	31	2.4		93.1	28	
BH-36	4	37.5	CL									-	-	
BH-36	5	42.5	CL				32	19	13			98.8	26	
BH-36	6	47.0	CL									-	-	
BH-36	7	51.0	SW-SM	43	50	7						-	9	
BH-36	8	55.3	SW-SM									-	-	
BH-36	9	62.4	CL									112.0	17	
BH-36	10	67.5	CL				37	19	18	3.5		99.5	24	
BH-36	11	72.5	CL									-	-	
BH-36	12	75.3	SC									-	-	
BH-36	13	81.0	GW-GM	47	46	7						-	10	

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TABLE A12-40

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-37	1	22.5	CH									-	-	
BH-37	2	26.6	CL									-	-	
BH-37	3	32.0	CL									103.1	23	
BH-37	4	35.9	SC/CL	2	52	46						-	8	
BH-37	5	42.3	CL							2.5		119.7	25	
BH-37	6	47.1	CL									-	-	
BH-37	7	52.3	CL							2.4		99.9	25	
BH-37	8	56.4	SM	1	72	27						-	24	
BH-37	9	60.5	SW									-	-	
BH-37	10	66.2	SM	0	61	39						-	22	
BH-37	11	71.1	SM									-	-	
BH-37	12	77.5	CL									102.1	23	
BH-37	13	82.5	CL									-	-	

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TABLE A12-41

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-38	1	21.5	CL									-	-	
BH-38	2	26.5	CL									-	-	
BH-38	3	31.3	CL				45	18	27	2.5		94.2	28	
BH-38	4	35.0	ML									-	-	
BH-38	5	40.0	GM	36	35	29						-	15	
BH-38	6	-	-									-	-	
BH-38	7	49.9	SM									-	-	
BH-38	8	51.0	SM									-	-	
BH-38	9	52.0	SM									-	-	
BH-38	10	55.3	SM	0	86	14						-	22	
BH-38	11	60.2	ML									-	-	
BH-38	12	65.3	SW-SC									-	-	
BH-38	13	71.0	CL				33	17	16	3.1		105.8	21	
BH-38	14	76.3	CL									-	-	
BH-38	15	78.8	CL	0	14	86						98.7	24	
BH-38	16	82.0	SM									-	-	
BH-38	17	86.0	CL									-	-	
BH-38	18	90.5	SP-SM									-	-	
BH-38	19	95.0	CL-ML				27	21	6	2.6		109.2	20	

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TABLE A12-42

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-39	1	36.0	SM									-	-	
BH-39	2	39.3	SM	2	67	31						-	21	
BH-39	3	44.3	CH									-	-	
BH-39	4	49.0	GW									-	-	
BH-39	5	54.3	GP	99	1	1						-	2	
BH-39	6	59.8	GP-GM									-	-	
BH-39	7	64.5	GP-GM	67	26	8						-	7	
BH-39	8	69.8	ML									-	-	
BH-39	9	75.8	CL									-	-	
BH-39	10	81.0	CL							3.5		99.0	25	
BH-39	11	86.0	CL									-	-	
BH-39	12	91.0	CL									101.6	25	
BH-39	13	95.8	CL									-	.	

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TABLE A12-43

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	Grain Size Analysis sand (%)	Grain Size Analysis fines (%)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-40	1	12.5	CH									-	-	
BH-40	2	14.6	CH									81.1	39	
BH-40	3	16.7	CH									-	-	
BH-40	4	19.8	CH									-	-	
BH-40	5	-	-									-	-	
BH-40	6	24.3	CH				54	22	32	2.0		83.0	38	
BH-40	7	27.5	CH									-	-	
BH-40	8	30.0	CL									-	-	
BH-40	9	32.5	CL									93.7	29	
BH-40	10	37.5	CL-ML									-	-	
BH-40	11	39.5	CL-ML									-	-	
BH-40	12	42.5	CL-ML				27	21	6	2.2		97.8	26	
BH-40	13	47.2	CL									-	-	
BH-40	14	50.0	CL									-	-	
BH-40	15	52.5	CL			94						94.5	27	
BH-40	16C	56.5	CL			58						-	-	
BH-40	16A	57.5	CL			94						-	-	
BH-40	17	60.0	CL			89						-	-	
BH-40	18	62.4	CL			90						99.1	24	
BH-40	19	64.0	SM	5	62	33						-	-	
BH-40	20	65.8	SM	22	60	18						-	16	
BH-40	21	68.3	SM									-	-	

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TABLE A12-44

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-41	1	5.2	CH									-	-	
BH-41	2	12.3	ML									-	-	
BH-41	3	17.3	CH							1.5		81.4	40	
BH-41	4	21.5	CH									-	-	
BH-41	5	27.4	CH									-	-	
BH-41	6	32.3	CL	0	41	59				1.4		103.1	23	
BH-41	7	36.8	CL									-	-	
BH-41	8	41.5	SC/CL	0	52	48						104.8	21	
BH-41	9	46.3	SP-SM	21	72	7						-	15	
BH-41	10	51.1	SM									-	-	
BH-41	11	56.0	SW									-	-	
BH-41	12	59.5	SW									-	9	

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TABLE A12-45

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-42	1	4.0	CL									-	-	
BH-42	2	6.0	SM	2	57	41						114.6	16	
BH-42	3	12.3	CL									-	-	
BH-42	4	17.0	CL									-	-	
BH-42	5	27.5	CL									-	29	
BH-42	6	29.9	CL									-	-	
BH-42	7	37.5	CL									93.8	28	
BH-42	8	42.3	CL/SC	1	48	50						109.4	18	
BH-42	9	45.8	GW-GM	47	44	10						-	11	
BH-42	10	50.9	CL				38	18	20	2.0		92.8	27	
BH-42	11	57.4	CL									-	-	
BH-42	12	62.5	CL				31	16	15	3.9		107.1	20	

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TABLE A12-46

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-43	1	6.3	ML									-	-	
BH-43	2	8.8	ML									-	-	
BH-43	3	10.4	SM									-	-	
BH-43	4	15.0	CH									-	-	
BH-43	5	17.3	CL							0.9		83.5	36	
BH-43	6	19.8	CH									-	-	
BH-43	7	22.5	CL									99.6	24	
BH-43	8	25.0	CL									-	-	
BH-43	9	27.5	CH									83.5	38	
BH-43	10	30.0	CL							2.0		100.9	22	
BH-43	11	31.0	GP-GM									-	-	
BH-43	12	33.7	GP-GM	62	32	6						-	8	
BH-43	13	35.8	GP-GM									-	-	
BH-43	14	38.2	GP-GM									-	-	
BH-43	15	40.4	GW-GM	55	39	6						-	10	
BH-43	16	43.0	GW-GM									-	-	
BH-43	17	45.7	GW-GM									-	-	
BH-43	18	48.0	SW-SM	31	60	10						-	12	
BH-43	19	50.2	SW-SM									-	-	
BH-43	20	52.7	CL									-	-	
BH-43	21	-	-									-	-	
BH-43	22	60.0	CL							1.9		94.6	28	

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SAN JOSE, CALIFORNIA

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

Notes:

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TABLE A12-47

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-44	1	2.8	CH									-	-	
BH-44	2	6.2	CL									-	-	
BH-44	3	11.2	SC/CL	3	49	48						-	23	
BH-44	4	17.3	CL/CH							0.8		90.5	32	
BH-44	5	22.5	CL									-	-	
BH-44	6	27.5	CL									-	-	
BH-44	7	32.5	CL							1.8		94.7	26	
BH-44	8	37.4	CL									-	-	
BH-44	9	39.9	CL									-	-	
BH-44	10	44.3	GW	62	35	4						101.9	24	
BH-44	11	45.7	GW									-	8	
BH-44	12	50.8	GW-GC	53	40	6						-	-	
BH-44	13	58.9	SW-SC									-	9	
BH-44	14	60.5	SW-SC									-	-	

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TABLE A12-48

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-45	1	26.5	CL									-	-	
BH-45	2	31.5	CL-ML									-	26	
BH-45	3	35.1	ML									-	-	
BH-45	4	41.5	CL							1.9		97.1	26	
BH-45	5	45.2	CL									-	-	
BH-45	6	51.6	SW-SM									-	-	
BH-45	7	54.2	SW-SM	19	73	8						113.8	15	
BH-45	8	61.8	CL									-	-	
BH-45	9	65.5	CL									-	-	
BH-45	10	73.0	SM									-	-	
BH-45	11	76.2	SM	0	80	20						99.8	21	
BH-45	12	80.3	SM	3	54	43						114.4	17	
BH-45	13	85.5	CL									-	-	

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TABLE A12-49

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-46	1	6.0	CL									-	-	
BH-46	2	10.0	SC									-	-	
BH-46	3	11.1	SM									-	-	
BH-46	4	14.5	CL									91.5	29	
BH-46	5	15.7	SP									-	-	
BH-46	6	20.0	CL									-	-	
BH-46	7	22.5	CL				42	22	20	0.9		91.1	30	
BH-46	8	25.0	CL									-	-	
BH-46	9	27.5	CH									80.9	41	
BH-46	10	29.8	SC									-	-	
BH-46	11	31.0	SW-SM	35	54	11						-	13	
BH-46	12	-	-									-	-	
BH-46	13	38.5	SW-SM									-	-	
BH-46	14	41.1	SP-SM	47	47	6						-	11	
BH-46	15	43.8	GP-GM									-	-	
BH-46	16	46.0	GP-GM	49	46	6						-	12	
BH-46	17	48.8	ML/CL									-	-	
BH-46	18B	52.0	ML/CL			96						-	-	
BH-46	18A	52.5	ML/CL			92	36	25	11	3.1		91.8	30	
BH-46	19D	56.0	ML/CL			89								
BH-46	19B	57.0	CL			83						-	-	
BH-46	20	60.0	CL-ML			97						99.3	25	

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TABLE A12-50

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-47	1	3.2	CL									115.4	15	
BH-47	2	6.0	SM	24	64	12						115.0	8	
BH-47	3	11.1	CL-ML									-	-	
BH-47	4	15.8	CL-ML									-	-	
BH-47	5	20.0	CL							0.9		93.2	30	
BH-47	6	27.5	CL									-	-	
BH-47	7	30.3	GW-GC									-	-	
BH-47	8	35.8	SP	40	55	5						119.5	13	
BH-47	9	41.1	SW-SM									-	-	
BH-47	10	45.8	SW-SM	38	56	6						128.4	11	
BH-47	11	50.8	CL									-	-	
BH-47	12	57.5	CL							2.6		106.4	29	
BH-47	13	61.5	CL									-	-	

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TABLE A12-51

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-48	1	15.5	SM									-	-	
BH-48	2	22.2	CL									-	-	
BH-48	3	27.4	CL									-	-	
BH-48	4	34.9	ML									-	-	
BH-48	5	40.0	CL				29	18	11	3.7		109.0	19	
BH-48	6	44.0	SM	0	73	27						-	24	
BH-48	7	54.0	CL	0	27	73						-	23	
BH-48	8	61.7	CL									-	-	
BH-48	9	66.5	SW-SM	33	60	7						-	10	
BH-48	10	70.7	SP-SM	42	49	9						-	12	
BH-48	11	77.5	CL				38	18	20	3.7		100.5	24	
BH-48	12	82.5	CL									-	-	
BH-48	13	86.0	SM									-	-	

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TABLE A12-52

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-49	1	17.5	CL									-	-	
BH-49	2	22.5	CL									-	-	
BH-49	3	26.5	CL									99.1	24	
BH-49	4	30.4	GW-GM	52	40	9						-	8	
BH-49	5	35.5	ML			60						-	-	
BH-49	6	41.1	ML									-	-	
BH-49	7	47.1	ML	0	33	67						113.3	17	
BH-49	8	52.0	SM	1	68	31						95.0	22	
BH-49	9	56.5	CL							2.1		100.6	26	
BH-49	10	62.1	CL									-	-	
BH-49	11	67.3	CL									-	-	
BH-49	12	72.0	SP-SC									-	-	
BH-49	13	77.5	CL									-	-	

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TABLE A12-53

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-50	1	3.1	CH									-	23	
BH-50	2	6.8	CL				37	22	15	3.1		104.1	22	
BH-50	3	12.2	CL				38	22	16	1.4		91.9	31	
BH-50	4	16.4	CL				43	21	22	3.4		104.9	23	
BH-50	5	25.0	CL									89.0	32	
BH-50	6	27.3	ML									91.0	32	
BH-50	7	32.5	CL				35	20	15	1.2		90.1	31	
BH-50	8	37.2	CH				56	27	29	1.4		79.7	41	
BH-50	9	45.0	CL									102.0	25	
BH-50	10	47.5	CL									98.8	27	
BH-50	11	52.5	CL				36	23	13	2.2		90.2	32	
BH-50	12	56.3	CL									-	29	
BH-50	13	61.1	SP-SM	35	59	6						-	24	
BH-50	14	70.4	ML									-	23	
BH-50	15	80.5	GP-GM	49	45	6						-	9	
BH-50	16	90.0	GW-GM	48	42	9						-	8	
BH-50	17	101.2	CL				33	22	11			104.8	23	
BH-50	18	111.4	CL				27	19	8	2.4		101.9	22	
BH-50	19	120.5	CL	0	9	91	36	19	17			-	25	
BH-50	X	-	-									-	-	
BH-50	20	130.5	SM	1	83	17						-	25	
BH-50	21	140.5	CL	0	6	94	35	21	14			-	26	
BH-50	22	150.5	ML	0	20	80	31	24	7			-	23	

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TABLE A12-54

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-52	1	3.5	CL									-	22	
BH-52	2	7.5	ML									-	21	
BH-52	3	12.4	CL									93.7	30	
BH-52	4	15.0	CL									108.6	21	
BH-52	5	16.3	CL									110.0	19	
BH-52	6	19.5	CL				26	17	9			111.9	18	
BH-52	7	22.0	ML									102.9	32	
BH-52	8	24.2	CL									98.3	26	
BH-52	9	26.9	CL			55						98.2	28	
BH-52	10	29.4	CL									99.6	24	
BH-52	11	31.9	CL				38	20	18	1.6		91.7	30	
BH-52	12	34.5	CL									86.3	37	
BH-52	13	36.6	CH				51	25	26	1.5		78.7	43	
BH-52	14	39.1	CH				72	28	44	2.0		80.5	40	
BH-52	15	41.4	CL				46	19	27			101.0	26	
BH-52	16	44.5	CL									95.4	29	
BH-52	17	46.7	CL				36	21	15			93.3	25	
BH-52	18	49.3	CL									89.5	33	
BH-52	19	52.0	CL									100.1	26	
BH-52	20	54.5	ML	0	44	56						107.8	21	
BH-52	21	56.7	CL/SC	0	48	53	33	22	11	1.7		91.6	28	
BH-52	22	58.8	CL									102.4	26	
BH-52	23	61.0	SM	0	77	23						-	28	
BH-52	24	63.6	GW									-	8	
BH-52	25	65.8	SP-SM	45	49	6						-	10	
BH-52	26	68.7	ML									-	19	
BH-52	27	70.8	SM									-	25	

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TABLE A12-55

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-52	28	75.2	SP-SM	32	58	10						-	12	
BH-52	29	81.0	SP-SM									-	28	
BH-52	30	84.9	SW-SM	40	55	6						-	10	
BH-52	31	90.1	SW-SM	25	68	8						-	12	
BH-52	32	94.3	SW-SM									-	18	
BH-52	33	101.5	CL									-	19	
BH-52	34	106.5	CL									108.9	23	
BH-52	35	111.5	CL									108.3	22	
BH-52	36	116.5	CL	0	27	73	33	21	12	5.3		103.9	21	
BH-52	37	121.5	SC/CL	3	50	48						112.4	18	
BH-52	38	130.3	SM	0	83	17						-	22	
BH-52	39	141.5	CL									103.5	23	
BH-52	40	150.3	SM/ML	0	56	45						-	25	

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TABLE A12-56

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-53	1	4.9	CL				41	23	18			103.2	21	
BH-53	2	7.1	CL									-	27	
BH-53	3	12.2	CL				32	21	11			99.1	27	
BH-53	4	17.0	CL				36	19	17			106.7	21	
BH-53	5	22.5	CL									-	32	
BH-53	6	25.0	ML				32	26	6	1.3		88.1	33	
BH-53	7	27.2	CL				31	22	9			99.8	25	
BH-53	8	31.5	CL									-	32	
BH-53	9	37.5	MH/CH				73	35	38			66.0	59	
BH-53	10	42.2	CL				44	20	24	3.6		100.6	24	
BH-53	11	45.0	CL									-	24	
BH-53	12	47.5	CL				33	23	10	2.6		93.4	29	
BH-53	13	52.5	CL									-	25	
BH-53	14	54.2	ML			78	30	24	6			-	24	
BH-53	15	57.3	ML				34	30	4			93.7	29	
BH-53	16	62.4	CL									98.7	24	
BH-53	17	66.5	SM/ML	0	54	46						-	28	
BH-53	18	71.5	CL									-	19	
BH-53	19	76.3	SM	0	86	14						-	27	
BH-53	20	81.0	SW-SM	41	53	6						-	8	
BH-53	21	91.0	SW-SM									-	11	
BH-53	22	100.5	CL				46	22	24			-	29	
BH-53	23	110.5	CL/SC	0	48	52						-	22	
BH-53	24	116.5	SC			45	27	15	12			110.7	20	
BH-53	25	120.2	SP-SM	9	82	10						-	19	
BH-53	26	125.2	ML				37	25	12			-	32	
BH-53	27	131.5	ML									-	33	

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TABLE A12-57

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-53	28	136.5	CL				41	24	17			-	24	
BH-53	29	141.4	ML			79	23	21	2			106.2	24	
BH-53	30	146.5	ML									-	23	
BH-53	31	149.0	CL				44	25	19			90.2	32	

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Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-54	1	3.5	CL									-	25	
BH-54	2	6.0	CL									-	29	
BH-54	3	11.6	CL	0	4	97	29	20	9			95.0	31	Hydrometer Test
BH-54	4	17.0	CL				30	18	12	2.9		108.4	22	
BH-54	5	22.5	CL-ML	0	31	69	28	21	7	0.9		96.2	28	Hydrometer Test
BH-54	6	27.4	CH									103.9	22	
BH-54	7	32.0	CL	0	15	85	32	20	12	0.9		95.0	28	Hydrometer Test
BH-54	8	37.5	CH							1.7		75.3	46	
BH-54	9	42.5	CL	0	24	76	37	16	21	2.4		103.1	22	Hydrometer Test
BH-54	10	47.5	CL									95.3	28	
BH-54	11	52.5	CL	1	11	88	39	20	19	1.8		100.5	23	Hydrometer Test
BH-54	12	57.5	CL									-	25	
BH-54	13	62.5	CL				27	16	11			107.8	20	
BH-54	14	71.4	ML	0	35	65						100.2	21	Hydrometer Test
BH-54	15	81.0	SW-SM	42	53	6						-	8	
BH-54	16	91.0	CL	0	15	85	34	19	15			-	26	
BH-54	17	101.2	SM			40						-	24	
BH-54	18	111.0	SW-SM	44	48	9						-	9	
BH-54	19	120.8	SM/ML	0	55	45						-	19	

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TABLE A12-59

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-55	1	3.1	CL									-	19	
BH-55	2	7.5	ML									-	14	
BH-55	3	12.4	CL				35	23	12	4.7		107.5	16	
BH-55	4	16.9	CL			60	32	18	14			108.0	22	
BH-55	5	21.5	CL	0	13	87						-	24	
BH-55	6	26.7	CL				31	20	11			96.1	27	
BH-55	7	32.3	CL									-	35	
BH-55	8	37.5	MH/CH				69	34	35			77.0	47	
BH-55	9	42.5	CL									-	22	
BH-55	10	45.0	CL				37	17	20	2.2		101.4	24	
BH-55	11	47.5	CL				35	23	12			93.4	30	
BH-55	12	52.5	CL									-	30	
BH-55	13	57.5	CL-ML			79						-	26	
BH-55	14	62.5	CL-ML				24	17	7			111.5	19	
BH-55	15	67.3	CL-ML									-	23	
BH-55	16	71.6	ML			67	23	21	2	1.2		103.4	23	
BH-55	17	82.5	GW-GM	52	38	10						-	10	
BH-55	18	86.7	SW-SM	40	52	8						-	10	
BH-55	19	90.7	SW-SM									-	13	
BH-55	20	94.5	GP-GM	55	33	12						-	9	
BH-55	21	100.3	ML	0	42	59						-	24	Hydrometer Test
BH-55	22	110.8	CL									102.0	23	
BH-55	23	115.8	ML									102.0	23	
BH-55	24	120.5	SM									-	24	
BH-55	25	125.3	ML									-	26	
BH-55	26	131.5	CL									107.5	21	
BH-55	27	136.5	CL				39	21	18			103.9	23	

Notes:

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TABLE A12-60

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-55	28	141.5	CL									102.4	23	
BH-55	29	147.4	CL	0	29	71						-	19	
BH-55	30	149.2	CL									-	-	

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Geotechnical & Materials Engineering

Notes:

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TABLE A12-61

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-56	1	3.3	FILL									-	-	
BH-56	2	6.9	CL									-	-	
BH-56	3	11.2	CL									-	-	
BH-56	4	17.3	CL				45	24	21	1.6		95.0	28	
BH-56	5	22.4	CH									-	-	
BH-56	6	27.2	CH									-	-	
BH-56	7	32.3	CL				45	26	19	1.6		86.8	34	
BH-56	8	37.2	CL									-	-	
BH-56	9	42.3	CL									-	-	

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TABLE A12-62

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-57	1	3.3	FILL									-	-	
BH-57	2	7.3	CL									-	-	
BH-57	3	11.3	CL							1.1		95.4	27	
BH-57	4	17.4	CH									-	-	
BH-57	5	22.2	CH							2.0		94.1	28	
BH-57	6	27.4	CL									-	-	
BH-57	7	32.3	CH									86.1	36	
BH-57	8	37.3	CL									-	-	
BH-57	9	42.4	CL									101.5	24	

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TABLE A12-63

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-58	1	3.3	CL									-	-	
BH-58	2C	6.4	CL									-	22	
BH-58	2A	7.4	CL				29	18	11		1.5	99.5	22	
BH-58	3C	9.0	CL-ML									99.7	24	
BH-58	3B	9.5	CL-ML				24	18	6			-	27	
BH-58	3A	10.0	CL-ML								0.4	-	-	
BH-58	4D	10.6	CL-ML									97.0	28	
BH-58	4B	11.6	CL								1.7	-	-	
BH-58	4A	12.1	ML/CL				44	26	18			96.0	28	
BH-58	X	-	-									-	-	
BH-58	5C	16.5	CL-ML									-	23	
BH-58	5B	17.0	CL-ML								0.5	-	-	
BH-58	5A	17.5	CL-ML				21	15	6			109.4	22	
BH-58	6C	19.0	SP-SC									-	19	
BH-58	6A	20.0	ML/CL				35	24	11		0.8	99.8	31	
BH-58	7C	21.5	ML				31	24	7			97.3	30	
BH-58	7A	22.5	ML								0.6	98.2	25	
BH-58	8C	23.3	CL									95.3	26	
BH-58	8B	23.8	CL								0.8	-	-	
BH-58	8A	24.3	CL				39	24	15			94.5	31	
BH-58	9C	26.2	ML				35	26	9			88.8	32	
BH-58	9B	26.7	ML								0.7	-	-	
BH-58	9A	27.2	ML				30	22	8			100.1	27	
BH-58	10C	28.7	ML									-	30	
BH-58	10B	29.2	CL/CH								0.9	-	-	
BH-58	10A	29.7	CL/CH				50	26	24			90.2	34	
BH-58	11D	30.6	CL/CH									-	25	

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TABLE A12-64

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-58	11B	31.6	ML				39	27	12		0.7	98.1	27	
BH-58	11A	32.1	ML									-	-	
BH-58	12C	33.7	ML									-	30	
BH-58	12B	34.2	ML								0.9	-	-	
BH-58	12A	34.7	ML				38	29	9			94.2	30	
BH-58	13C	36.1	ML									-	33	
BH-58	13B	36.6	ML								0.8			
BH-58	13A	37.1	ML				37	27	10			93.3	32	
BH-58	14C	38.6	MH/CH									-	34	
BH-58	14B	39.1	MH/CH								1.4	-	-	
BH-58	14A	39.6	MH/CH				63	32	31			86.3	36	
BH-58	15C	41.0	ML/CL									-	40	
BH-58	15B	41.5	ML/CL								1.0	-	-	
BH-58	15A	42.0	ML/CL				48	27	21			92.7	31	
BH-58	16C	43.4	CH									-	33	
BH-58	16B	43.9	CH								1.6	-	-	
BH-58	16A	44.4	CH				51	25	26			90.7	31	
BH-58	17C	46.2	CL									-	29	
BH-58	17B	46.7	CL								1.4	-	-	
BH-58	17A	47.2	CL				47	24	23			92.9	30	
BH-58	18C	48.4	CL				45	17	28			102.0	22	
BH-58	18B	48.9	CL								1.8	-	-	
BH-58	18A	49.4	CL				32	14	18			109.4	18	
BH-58	19B	51.8	CL				31	20	11			102.2	26	
BH-58	19A	52.3	CL								0.8	-	-	
BH-58	20C	53.8	CL									97.2	25	
BH-58	20B	54.3	ML				35	25	10			-	-	

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TABLE A12-65

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-58	20A	54.8	ML								0.9	96.5	27	
BH-58	21C	56.5	CL									-	23	
BH-58	21B	57.0	CL								1.0	-	-	
BH-58	21A	57.5	CL				46	26	20			91.8	32	
BH-58	22C	59.0	ML									-	26	
BH-58	22B	59.5	ML								1.3	-	-	
BH-58	22A	60.0	ML				42	27	15			93.4	30	
BH-58	23C	61.4	CL									-	26	
BH-58	23B	61.9	CL								1.2	-	-	
BH-58	23A	62.4	CL				33	21	12			96.2	29	
BH-58	24C	64.0	ML									-	20	
BH-58	24B	64.5	ML								1.4	-	-	
BH-58	24A	65.0	ML				25	23	2			99.7	26	
BH-58	25C	66.5	CL									-	23	
BH-58	25B	67.0	CL								1.1	-	-	
BH-58	25A	67.5	CL				35	19	16			98.3	26	
BH-58	26C	69.0	CL									-	28	
BH-58	26B	69.5	CL								1.8	-	-	
BH-58	26A	70.0	CL				27	19	8			104.4	22	
BH-58	27	82.0	CL									-	-	
BH-58	28	91.3	CL									-	-	
BH-58	29	101.2	SP-SM									-	-	
BH-58	30	110.8	SW-SM									-	-	
BH-58	31	116.3	CL				37	23	14			-	24	Hydrometer Test
BH-58	32	122.4	CL-ML									-	-	
BH-58	33	127.0	SP									-	-	
BH-58	34	130.5	GP-GM	66	27	7						-	-	

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TABLE A12-66

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-58	35	135.4	SW									-	-	
BH-58	36	141.0	GW-GM	61	32	7						-	-	
BH-58	37	145.8	CH									-	-	
BH-58	38	151.5	CL									-	-	

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TABLE A12-67

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-59	1	11.0	CH									-	-	
BH-59	2	19.7	CL									-	-	
BH-59	3	30.5	CL				44	20	24			-	28	
BH-59	4	38.9	CL									-	-	
BH-59	5	51.0	CL									-	-	
BH-59	6	60.5	CL				30	19	11			-	22	
BH-59	7	68.8	GW-GC	51	37	12						-	9	
BH-59	8	79.7	CL	0	7	93						105.0	20	
BH-59	9	89.9	ML	0	3	97						98.8	25	Hydrometer Test
BH-59	10	99.7	SM	0	72	28						101.2	21	
BH-59	11	108.7	GC	59	29	12						-	11	
BH-59	12	119.7	ML	0	24	76						100.5	24	Hydrometer Test
BH-59	13	129.5	SM	26	55	20						-	14	
BH-59	14	138.3	GW-GM									-	-	
BH-59	15	148.8	GW-GM									-	-	
BH-59	16	160.5	CL				32	21	11			105.1	22	
BH-59	17	170.5	CL									-	-	
BH-59	18	180.5	CH									103.5	24	
BH-59	19	190.5	CH									-	-	
BH-59	20	200.5	CH									109.4	21	

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TABLE A12-68

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-60	1	3.1	CL									-	-	
BH-60	2	10.0	CL				28	20	8			93.2	31	
BH-60	3	20.0	ML/CL									-	-	
BH-60	4	32.5	ML/CL				33	23	10			99.8	24	
BH-60	5	34.9	ML/CL									-	-	
BH-60	6	42.4	CH				63	30	33			87.0	34	
BH-60	7	44.8	CH									-	-	
BH-60	8	52.5	CL									-	-	
BH-60	9	62.5	CL	0	6	94	35	20	15			100.0	24	Hydometer Test
BH-60	10	72.5	CL									-	-	
BH-60	11	75.0	CL	0	8	92	30	19	11			-	24	Hydometer Test
BH-60	12B	80.3	ML	0	23	77						-	-	Hydometer Test
BH-60	12A	80.8	ML	0	18	82						101.0	23	
BH-60	13	92.0	ML	0	1	99	36	25	11			-	26	Hydometer Test
BH-60	X	-	-									-	-	
BH-60	14	101.2	ML	0	4	96						104.5	23	
BH-60	15	109.5	GW-GM	64	29	8						125.7	9	
BH-60	16	119.0	SP									-	-	
BH-60	17	125.6	ML	0	10	90						106.2	21	
BH-60	18	132.4	CL									-	-	
BH-60	19	137.3	CL									-	-	
BH-60	20	141.5	CL									-	-	
BH-60	21	147.0	CL									-	-	
BH-60	22	152.2	CL									-	-	

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TABLE A12-69

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-61	1	7.0	CL									-	-	
BH-61	2	17.3	CL									102.6	23	
BH-61	3	27.1	CL-ML									-	-	
BH-61	4	37.3	CL									95.6	29	
BH-61	5	47.3	CH									-	-	
BH-61	6	57.3	CL									97.6	25	
BH-61	7	62.5	CL									-	-	
BH-61	8	72.4	CL	2	6	92	34	21	13			104.5	23	Hydrometer Test
BH-61	9	81.9	CH									-	-	
BH-61	10	91.9	CL	0	4	95	43	25	18			97.8	27	Hydrometer Test
BH-61	11	101.4	ML	0	22	78						103.2	22	
BH-61	12	110.3	SW-SM	31	58	12						-	9	
BH-61	13	115.4	SP-SM	18	71	11						-	9	
BH-61	14	121.2	CH									95.1	30	
BH-61	15	127.5	CH									-	-	
BH-61	16	132.4	CH									94.8	29	
BH-61	17	137.4	CH									-	-	
BH-61	18	142.0	CL									103.5	23	
BH-61	19	146.0	CL									-	-	
BH-61	20	151.5	ML	0	20	80						108.3	21	

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TABLE A12-70

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-62	1	2.8	CL									-	-	
BH-62	2	7.2	CL									103.9	19	
BH-62	3	11.0	CL									-	-	
BH-62	4	17.5	CL									-	-	
BH-62	5	22.4	ML	0	9	91						98.8	25	
BH-62	6	27.5	CL									-	-	
BH-62	7	32.5	CL									-	-	
BH-62	8	37.5	CL									90.4	32	
BH-62	9	42.4	CL									-	-	
BH-62	10	47.5	CL									-	-	
BH-62	11	52.3	CL									102.8	22	
BH-62	12	55.5	CL									-	-	
BH-62	13	62.5	CL	0	9	91						100.1	24	
BH-62	14	65.3	SC									-	-	
BH-62	15	70.9	SP-SM	14	79	7						-	5	
BH-62	16	82.2	CL	0	2	98	40	24	16			-	29	Hydrometer Test
BH-62	17	92.3	CL									96.5	27	
BH-62	18	100.6	CL									-	-	
BH-62	19	110.4	GC	53	29	18						-	10	
BH-62	20	114.9	GP									-	-	
BH-62	21	119.8	GP-GC	70	22	8						-	10	
BH-62	22	125.0	GP									-	-	
BH-62	23	130.0	GC	71	6	23						118.8	14	
BH-62	24	136.5	CL									-	-	
BH-62	25	139.8	CL									-	-	
BH-62	26	144.5	CL									-	-	
BH-62	27	149.8	CL									103.1	23	

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TABLE A12-71

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-63	1	11.3	CL									-	-	
BH-63	2	21.3	ML									99.7	26	
BH-63	3	27.4	ML									-	-	
BH-63	4	32.5	CL									-	-	
BH-63	5	42.5	CH									92.7	30	
BH-63	6	47.5	CL									-	-	
BH-63	7	57.0	CL									-	-	
BH-63	8	66.2	SW-SM	29	62	9						-	12	
BH-63	9	70.5	SW-SM									-	-	
BH-63	10	75.0	SW-SM	31	59	10						-	9	
BH-63	11	80.1	SP-SM									-	-	
BH-63	X	-	-									-	-	
BH-63	12	91.3	CL-ML				29	21	8			112.2	19	
BH-63	13	92.8	CL-ML	0	30	70						-	25	Hydrometer Test
BH-63	14	100.3	ML	0	2	98						-	25	Hydrometer Test
BH-63	15	109.1	SM									-	-	
BH-63	16	110.3	SM	0	56	44						-	23	
BH-63	17	114.3	SM									-	-	
BH-63	18	119.5	GM	45	43	13						-	11	
BH-63	19	124.5	SC	31	48	21						-	12	
BH-63	20	131.0	CL									-	-	
BH-63	21	136.5	CL									-	23	
BH-63	22	142.5	CL									-	-	
BH-63	23	147.4	CH									-	-	
BH-63	24	151.5	CH									-	-	

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PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

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TABLE A12-72

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-64	1	3.8	CL				26	14	12			-	13	
BH-64	2	12.3	ML				31	29	2			92.4	32	
BH-64	3	22.5	ML									-	27	
BH-64	4	24.8	CL				33	18	15	1.1		97.6	27	
BH-64	5	32.5	CL				40	25	15			87.8	38	
BH-64	6	42.4	CL									-	23	
BH-64	7	45.7	SP-SM	28	65	7						-	10	
BH-64	8	52.4	ML				23	22	1			108.1	21	
BH-64	9	54.7	CL									-	21	
BH-64	10	61.0	SP-SM	4	86	10						-	26	
BH-64	11	72.5	CL				35	21	14			102.4	24	
BH-64	12	74.0	ML									98.1	9	
BH-64	13	80.1	GW									-	4	
BH-64	14	84.3	SW-SM	44	50	7						-	10	
BH-64	15	90.9	SW-SM	38	53	10						-	10	
BH-64	16	100.7	ML/SM									-	-	
BH-64	17	102.4	ML/SM	0	47	53						-	27	
BH-64	18	107.1	CL				37	21	16			100.4	25	
BH-64	X	-	-									-	-	
BH-64	19	117.4	CL				38	21	17	1.8		93.2	27	
BH-64	20	122.0	SP-SM	3	86	11						-	24	
BH-64	21	126.0	GW-GM	50	40	11						-	9	
BH-64	22	131.0	GW-GM									-	13	
BH-64	23	136.9	CL				35	20	15	3.3		102.0	23	
BH-64	X	-	-									-	-	

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TABLE A12-73

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-65	1	3.9	CL									-	-	
BH-65	2	9.5	ML				31	24	7			93.3	29	
BH-65	3	22.5	CL									120.6	25	
BH-65	4	32.5	CL				30	20	10			97.7	27	
BH-65	5	46.0	GW-GM	51	42	7						-	9	
BH-65	6	58.5	CL									103.0	23	
BH-65	7	67.5	CL									104.5	21	
BH-65	8	76.0	SM	45	48	7						-	11	
BH-65	9	86.0	SW-SM	32	60	8						-	11	
BH-65	10	96.3	CL									-	20	
BH-65	11	109.0	SM				21	20	1			107.1	19	
BH-65	12	114.0	SM									-	16	
BH-65	13	121.6	CL									104.0	23	
BH-65	14	126.2	SP-SM	24	70	6						-	14	
BH-65	15	130.5	CL									-	-	
BH-65	16	135.5	CL									103.7	23	
BH-65	17	142.5	CL									-	-	
BH-65	18	147.5	ML									99.8	22	
BH-65	19	148.8	SM									-	-	

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TABLE A12-74

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-66	1	3.7	ML									-	19	
BH-66	2	6.3	ML									-	29	
BH-66	3	11.1	ML									-	10	
BH-66	4	19.0	CH									-	37	
BH-66	5	24.5	CL									94.1	27	
BH-66	6	27.4	CL									101.2	24	
BH-66	7	32.5	SM									99.7	25	
BH-66	8	35.7	SP-SM			9						-	17	
BH-66	9	41.5	ML/SM									-	37	
BH-66	10	47.5	CL									-	26	
BH-66	11	52.4	SP-SM									-	26	
BH-66	12	62.5	CL				35	16	19			99.1	25	
BH-66	13	72.5	CL-ML				22	16	6			107.0	20	
BH-66	14	81.1	GW-GC			9						-	10	
BH-66	15	90.7	SW-SM									-	13	
BH-66	16	101.5	CL			69						-	27	
BH-66	17	112.5	CL				37	19	18			101.0	24	
BH-66	18	116.3	GP			5						-	20	
BH-66	19	120.5	SM			13						-	12	
BH-66	20	-	-									-	-	
BH-66	21	128.4	CL-ML				25	18	7			110.0	19	

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TABLE A12-75

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-68	1	3.1	CL									-	-	
BH-68	2	-	-									-	-	
BH-68	3	13.1	CH									-	-	
BH-68	4	20.7	CH									80.8	40	
BH-68	5	29.3	SM	23	53	24						116.2	18	
BH-68	6	39.6	SM									-	-	
BH-68	7	51.0	SC	1	56	43						-	-	
BH-68	8	-	-									-	-	
BH-68	9	62.5	CL									-	-	
BH-68	10	70.5	CL	0	8	92						103.6	22	Hydrometer Test
BH-68	11	79.0	SW-SM	47	48	5						-	9	
BH-68	12	90.5	GP-GC									-	-	
BH-68	13	100.0	CL									101.0	25	
BH-68	14	111.0	CL									-	-	
BH-68	15	119.0	GP-GC	48	43	9						-	10	
BH-68	16	130.0	CH									-	-	
BH-68	17	141.0	CL-ML									-	-	
BH-68	18	151.0	CL									97.5	26	
BH-68	19	158.8	SM	0	79	21						112.5	22	Hydrometer Test
BH-68	20	169.3	GP-GC	65	31	5						-	8	
BH-68	21	180.5	CH	0	1	99						98.9	26	
BH-68	22	190.5	GW-GC									-	-	
BH-68	23	199.0	CL									-	-	

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TABLE A12-76

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-70	1	8.3	SP-SM									101.8	16	
BH-70	2	10.9	SW-SM									-	-	
BH-70	3	13.7	CL									-	-	
BH-70	4	-	-									-	-	
BH-70	5	19.0	CL									-	36	
BH-70	6B	21.6	ML				34	28	6			87.0	33	
BH-70	6A	22.1	CL								1.4	91.6	18	
BH-70	7C	24.0	CL									-	27	
BH-70	7B	24.5	CL								1.5	100.1	21	
BH-70	7A	25.0	CL				32	19	13			102.1	21	
BH-70	8C	26.3	CL-ML				28	21	7			99.6	23	
BH-70	8A	27.3	SP-SM									-	19	
BH-70	9	29.0	SP-SM									-	-	
BH-70	10	31.5	SW									-	-	
BH-70	11	34.0	SP-SM	30	61	10						-	15	
BH-70	12	35.5	SP-SM									-	-	
BH-70	13	39.0	SM	0	58	42						-	19	Hydometer Test
BH-70	14	40.9	CL									-	-	
BH-70	15C	44.0	CL				45	25	20			-	27	
BH-70	15B	44.5	CL								1.0	102.1	25	
BH-70	15A	45.0	CL				30	19	11			100.2	23	
BH-70	16C	46.5	CL									94.7	44	
BH-70	16B	47.0	CL								0.9	-	-	
BH-70	16A	47.5	CL				32	18	14	0.3		99.5	26	
BH-70	17	49.3	SP-SM									94.0	25	
BH-70	18	51.5	SP-SM	7	82	11						-	23	
BH-70	19	53.3	SW-SM									-	-	

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TABLE A12-77

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-70	20	55.3	CL									-	-	
BH-70	21C	59.0	CL									102.5	28	
BH-70	21B	59.5	CL								2.2	-	-	
BH-70	21A	60.0	CL				33	21	12			107.0	20	
BH-70	22	62.5	CL									99.2	25	
BH-70	23	65.0	CL									-	-	
BH-70	24	67.1	CL-ML								1.2	-	-	
BH-70	25B	68.8	CL-ML									111.4	19	
BH-70	25A	69.3	CL-ML				22	17	5			108.0	19	
BH-70	26	80.1	GP-GC	51	42	6						-	11	
BH-70	27	90.5	GP-GC									-	-	
BH-70	28	-	-									-	-	
BH-70	29	105.8	CL									-	-	
BH-70	30	110.9	SM	0	67	33						-	25	Hydrometer Test
BH-70	31	116.4	CL									97.9	27	
BH-70	32	120.3	SW									-	-	
BH-70	33	126.5	ML									-	-	
BH-70	34	132.3	ML									-	-	
BH-70	35	137.3	CH									-	-	
BH-70	36	140.5	CH	0	16	84						81.3	40	Hydrometer Test
BH-70	37	145.5	SC									-	-	
BH-70	38	146.4	SC									-	-	

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TABLE A12-78

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-71	1	2.5	CL									-	-	
BH-71	2	5.5	SP-SM									-	-	
BH-71	3	10.8	SP-SM	40	54	6						-	9	
BH-71	4	16.9	ML									-	-	
BH-71	5	21.0	OH				70	28	42			82.3	39	
BH-71	6	25.0	OH									-	-	
BH-71	7	31.5	ML									-	-	
BH-71	8	42.0	CH				51	26	25			86.4	36	
BH-71	9	45.1	CH									-	-	
BH-71	10	50.3	SP-SM									-	-	
BH-71	11	51.6	SP-SM	39	52	9						-	9	
BH-71	12	62.5	CL				36	20	16	2.9		98.0	26	
BH-71	13	64.9	CL									-	-	
BH-71	14	71.9	CL	0	39	61						108.7	19	
BH-71	15	79.7	SP-SM	40	54	6						-	10	
BH-71	16	89.7	SP-SM									-	-	
BH-71	17	99.7	CL				33	16	17			-	18	
BH-71	X	-	-									-	-	
BH-71	18	111.3	SP-SM									-	-	
BH-71	19	115.3	SP-SM	14	76	10						-	20	
BH-71	20	119.9	SP-SM									-	-	
BH-71	21	125.5	CL				28	20	8	3.6		102.5	22	
BH-71	22	130.1	CL									-	-	
BH-71	23	135.2	ML				25	24	1			-	35	
BH-71	24	142.2	CL									-	-	
BH-71	25	147.9	SP-SC	29	59	12						-	14	

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TABLE A12-79

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-72	1	72.4	CL									98.0	25	
BH-72	2	81.2	GW-GC	47	46	6						-	10	
BH-72	3	91.5	CL	0	20	80						-	-	Hydrometer Test
BH-72	4	100.3	CL									-	24	
BH-72	5	111.2	SP-SC	39	51	10						-	11	
BH-72	6	114.8	SP-SC									-	-	
BH-72	7	121.2	CL-ML									103.1	20	
BH-72	8	125.1	SW-SC									-	-	
BH-72	9	129.9	SM/ML	0	52	48						-	-	Hydrometer Test
BH-72	10	135.2	SM/ML									-	-	
BH-72	11	140.5	ML									-	-	
BH-72	12	146.5	CL									109.8	20	
BH-72	13	151.5	CL-ML									-	-	
BH-72	14	156.5	ML	0	8	92						100.2	24	Hydrometer Test
BH-72	15	162.0	SM									-	-	

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TABLE A12-80

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-73	1	3.1	FILL									-	-	
BH-73	2	7.3	CL									89.7	26	
BH-73	3	17.2	CL									-	-	
BH-73	4	27.1	CL									88.7	32	
BH-73	5	30.7	CL									-	-	
BH-73	6	32.3	GC	43	33	24						-	11	
BH-73	7	36.1	GC									-	-	
BH-73	8	41.2	SW-SC	39	50	11						-	10	
BH-73	X	-	-									-	-	
BH-73	9	50.8	GC									-	-	
BH-73	10	56.1	GC	44	36	20						-	11	
BH-73	11	62.5	CL									-	-	
BH-73	12	66.5	CL									-	-	
BH-73	X	-	-									-	-	
BH-73	13	81.7	ML	0	8	91	29	25	4			89.7	34	Hydrometer Test
BH-73	14	92.2	CL	5	30	64						-	23	
BH-73	15	101.5	CL									-	-	
BH-73	16	112.3	ML	0	10	90	22	21	1			103.5	21	Hydrometer Test
BH-73	17	116.2	SM	7	51	43						-	19	
BH-73	18	121.9	CL									-	-	
BH-73	19	126.3	CL	23	31	47						-	15	
BH-73	20	131.5	CH									-	-	
BH-73	21	137.3	CL									-	-	
BH-73	22	141.8	CL-ML									-	-	
BH-73	23	146.5	CH									-	-	
BH-73	24	150.5	SC	38	45	17						-	12	

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TABLE A12-81

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-74	1	3.3	FILL									-	-	
BH-74	2	6.3	CL								0.1	-	28.0	
BH-74	3B	9.4	CL				40	19	21			95.5	26	
BH-74	3A	9.9	CL								1.6		24	
BH-74	4	11.9	CL				28	20	8		2.1	104.5	19.0	
BH-74	5	15.0	ML/CL				34	24	10		1.0	100.0	25.1	
BH-74	6	17.0	ML				24	21	3		1.8	105.2	21.0	
BH-74	7	19.8	CL				30	18	12		0.8	101.2	24.0	
BH-74	8	22.4	ML				28	24	4		1.2	100.6	24.0	
BH-74	9C	23.8	CL									97.5	26	
BH-74	9A	24.8	CL				43	23	20		1.3	99.4	27	
BH-74	10C	26.5	MH				57	32	25			87.4	34	
BH-74	10A	27.5	CH				57	27	30		0.8	87.4	33	
BH-74	11	29.3	CL				36	19	17		1.0	87.1	33.0	
BH-74	12C	31.0	CL				37	20	17			100.3	25	
BH-74	12A	32.0	CL								1.8	112.3	12	
BH-74	13	34.4	CL-ML				27	22	5			102.1	21.0	
BH-74	14	37.2	CL				36	22	14		0.5	93.0	28.0	
BH-74	15	39.8	ML				27	23	4		0.5	107.5	21.0	
BH-74	16C	41.2	ML									-	22	
BH-74	16A	42.2	ML				11	11	0		0.3	96.2	26	
BH-74	17D	43.2	SP-SM									-	24	
BH-74	17B	44.2	CL									-	22	
BH-74	17A	44.7	CL				27	15	12		1.4	105.9	21	
BH-74	18C	46.5	CL									-	20	
BH-74	18A	47.5	CL				30	20	10		0.8	97.1	25	
BH-74	19C	49.0	CL-ML				24	19	5			-	7	

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PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

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TABLE A12-82

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-74	19A	50.0	CL-ML				20	13	7		0.8	108.9	20	
BH-74	20C	51.5	ML				30	25	5			-	25	
BH-74	20A	52.5	CL				34	19	15		1.4	100.5	25	
BH-74	21E	53.0	CL									-	28	
BH-74	21C	54.0	CL									-	17	
BH-74	21A	55.0	ML				29	23	6		0.9	96.6	27	
BH-74	22C	56.5	CL									-	19	
BH-74	22A	57.5	CL				34	18	16		1.7	107.9	20	
BH-74	23C	59.0	CL									-	25	
BH-74	23A	60.0	CL				35	20	15		1.3	98.6	25	
BH-74	24C	61.4	ML									-	23	
BH-74	24A	62.4	ML				30	24	6			107.8	19	
BH-74	25C	63.6	ML				32	28	4			-	31	
BH-74	25A	64.6	ML								0.9	103.5	20	
BH-74	26	66.8	SM	3	50	47						-	17.0	
BH-74	27	71.3	GM	52	35	14						-	8.7	
BH-74	28	77.4	CL	52	40	8	30	17	13			103.9	23	Hydrometer Test
BH-74	29	82.3	CL									-	-	
BH-74	30	87.3	CL									-	-	
BH-74	31	91.8	CL									99.6	23	
BH-74	32	95.7	GW	67	29	4						-	11	
BH-74	X	-	-									-	-	
BH-74	33	107.5	CL									97.3	24	
BH-74	34	110.5	GW-GC	52	40	8						-	9	Hydrometer Test
BH-74	35	115.3	SW									-	-	
BH-74	36	120.5	SW-SM	26	63	11						-	11	
BH-74	37	126.5	CL									-	-	

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TABLE A12-83

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-74	38	131.3	SM									97.1	20.8	
BH-74	39	136.5	CH									-	-	
BH-74	40	140.3	GC									-	-	
BH-74	41	146.0	CL									113.0	18.7	
BH-74	42	150.3	GM	41	43	16						-	9.3	

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TABLE A12-84

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-75	1	9.9	CL									-	-	
BH-75	2	21.0	CL									104.7	23	
BH-75	3	30.9	CL									-	-	
BH-75	4	41.0	CL									102.8	21	
BH-75	5	51.0	CL			91						-	23	
BH-75	6	61.0	SM									-	-	
BH-75	7	70.5	SC	20	65	15						-	18	
BH-75	8	81.0	ML									-	-	
BH-75	9	89.3	CL	0	38	62						103.6	23	Hydrometer Test
BH-75	10	99.0	GW-GC	56	37	7						123.2	9	
BH-75	11	110.5	CL									-	-	
BH-75	12	121.0	CL									107.1	20	
BH-75	13	128.8	SP-SC	30	62	8						-	12	
BH-75	14	141.0	CL	0	22	78						104.4	20	Hydrometer Test
BH-75	15	151.0	CL									-	-	
BH-75	16	160.0	CL									106.1	21	
BH-75	17	169.8	CL									-	-	
BH-75	18	178.9	SP-SC	24	68	8						-	13	
BH-75	19	190.8	CL									-	-	
BH-75	20	200.3	SM	4	68	28						-	15	

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TABLE A12-85

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-76	1	9.8	CL									-	-	
BH-76	2	20.0	CL									99.6	26	
BH-76	3	32.5	CL									-	-	
BH-76	4	39.5	SP-SM	28	60	12						121.8	8	
BH-76	5	-	-									-	-	
BH-76	6	55.5	CL									103.1	23	
BH-76	7	62.5	CL									-	-	
BH-76	8	69.3	GP-GC	46	42	13						126.4	10	
BH-76	9	-	-									-	-	
BH-76	X	-	-									-	-	
BH-76	10	87.5	CL	0	19	82	28	20	8			106.8	21	Hydrometer Test
BH-76	11	90.0	CL									-	-	
BH-76	12	101.2	CL									-	-	
BH-76	13	111.0	GP-GM	52	41	7						120.9	8	Hydrometer Test
BH-76	14	117.5	CL	1	37	62						-	17	
BH-76	15	121.2	CL									-	-	
BH-76	16	127.5	CL									-	-	
BH-76	17	-	-									-	-	
BH-76	18	132.5	SM	0	63	37						-	20	
BH-76	19	136.0	CL									-	-	
BH-76	20	141.0	CL	0	25	75						-	23	
BH-76	21	146.3	CL									-	-	
BH-76	22	152.5	CL									-	-	

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TABLE A12-86

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-77	1	2.3	FILL									-	7	
BH-77	2	7.5	SM	0	66	34						100.9	18	
BH-77	3	11.0	CL				47	24	23			-	41	
BH-77	4	16.5	ML				23	23	0	0.4		93.3	26	
BH-77	5	21.3	CL									91.7	31	
BH-77	6	28.0	CL				28	18	10	0.9		105.7	21	
BH-77	7	33.0	CL				41	22	19			91.3	31	
BH-77	8	35.5	SM									-	23	
BH-77	9	36.6	CL-ML									-	27	
BH-77	10	40.5	CL				28	15	13	2.1		111.0	18	
BH-77	11	50.8	SW-SM	28	62	11						-	11	
BH-77	12	61.7	CL									-	25	
BH-77	13	71.6	CL				30	20	10			109.9	20	
BH-77	14	81.1	GM									-	8	
BH-77	15	91.3	SP-SM	28	65	7						-	12	
BH-77	16	102.0	CL				30	21	9			96.8	27	
BH-77	17	110.4	CL									-	21	
BH-77	18	116.0	SW-SM	34	56	10						-	10	
BH-77	19	121.1	CL-ML	1	47	52						-	21	
BH-77	20	125.8	CL	1	14	85						100.8	24	
BH-77	21	132.5	ML				29	23	6	3.8		112.3	16	
BH-77	22	137.5	CL									-	-	

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TABLE A12-87

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis			Atterberg Limits			Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
				gravel (%)	sand (%)	fines (%)	LL	PL	PI					
BH-78	1	2.3	FILL									-	-	
BH-78	2	6.5	CH									73.5	43	
BH-78	3	12.3	CH									-	-	
BH-78	4	17.5	CH									85.9	35	
BH-78	5	22.5	SC									-	-	
BH-78	6	25.8	GW									-	-	
BH-78	7	31.2	GM	46	38	16						126.1	9	
BH-78	8	36.8	GM									-	-	
BH-78	9	41.3	SM									107.1	20	
BH-78	10	46.2	CL									-	-	
BH-78	11	51.2	ML	8	31	61						-	21	
BH-78	12	56.0	GW									-	-	
BH-78	13	61.1	SW-SM	27	64	9						121.2	12	
BH-78	14	65.7	CL									-	-	
BH-78	15	72.4	CL									99.3	25	
BH-78	16	75.8	GP-GM	52	38	10						-	10	
BH-78	17	80.8	SM									-	-	

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TABLE A12-88

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-79	1	12.5	CL									-	-	
BH-79	2	22.5	CH				65	27	38			83.1	38	
BH-79	3	32.4	ML									-	-	
BH-79	4	41.8	ML	7	40	53						106.6	19	
BH-79	5	51.3	SW									-	-	
BH-79	6	62.4	CL				33	17	16	2.5		99.7	25	
BH-79	7	72.4	CL									-	-	
BH-79	8	82.5	CL				35	17	18			102.8	23	
BH-79	9	91.5	CL									-	-	
BH-79	10	100.5	SW									-	-	
BH-79	11	112.1	ML	0	20	80						106.1	21	
BH-79	12	121.3	ML/CL									-	-	
BH-79	13	132.3	ML/CL				32	23	9			100.1	25	
BH-79	14	140.3	ML/CL									-	-	
BH-79	15	150.5	SM/ML	0	66	34						-	22	
BH-79	16	151.2	SM/ML									-	-	
BH-79	17	160.4	GM	48	36	15						-	9	
BH-79	18	171.0	ML									-	-	
BH-79	19	180.3	SP-SM	36	56	8						-	12	
BH-79	20	191.1	ML									-	-	
BH-79	21	200.4	SC	35	43	23						-	11	

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TABLE A12-89

Boring No.	Sample No.	Depth (ft)	USCS**	Grain Size Analysis gravel (%)	sand (%)	fines (%)	Atterberg Limits LL	PL	PI	Unconfined Comp. (q_u, ksf)	Lab Vane (S_u, ksf)	Dry Density (pcf)	Moisture Content (%)	Remarks
BH-80	1	5.8	SM									-	-	
BH-80	2	9.8	GM									-	-	
BH-80	3	-	-									-	-	
BH-80	4	20.0	CL									-	-	
BH-80	5	26.5	CL									-	-	
BH-80	6	31.5	CL									-	-	
BH-80	7	36.5	CL									-	-	
BH-80	8	40.0	ML	0	34	66						105.1	20	
BH-80	9	45.0	GW-GM	52	42	6						-	9	
BH-80	10	50.2	CL				29	21	8			101.5	24	
BH-80	11	55.0	CL	1	35	64						96.2	28	
BH-80	12	59.9	SM									-	-	
BH-80	13	-	-									-	-	
BH-80	14	68.5	CL				29	20	9			103.6	23	
BH-80	15	74.3	SM	0	59	41						-	26	
BH-80	16	81.3	SM									-	-	
BH-80	17	86.3	SP-SM	41	48	11						132.2	9	
BH-80	18	90.8	SP-SM									-	-	
BH-80	19	-	-									-	-	
BH-80	20	99.5	CL									-	-	

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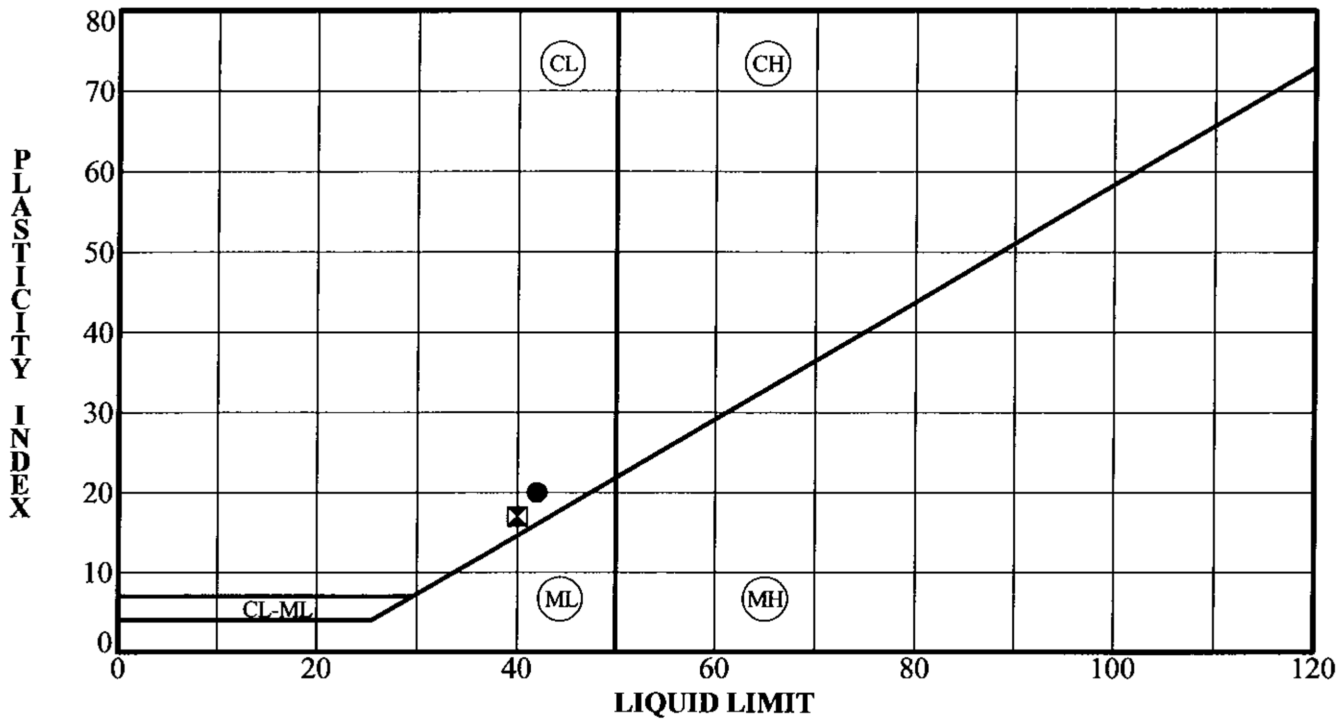
TABLE A12-90



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-01	17.5	42	20	0.405	30		CL
⊠	BH-01	27.5	40	17	0.341	29		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

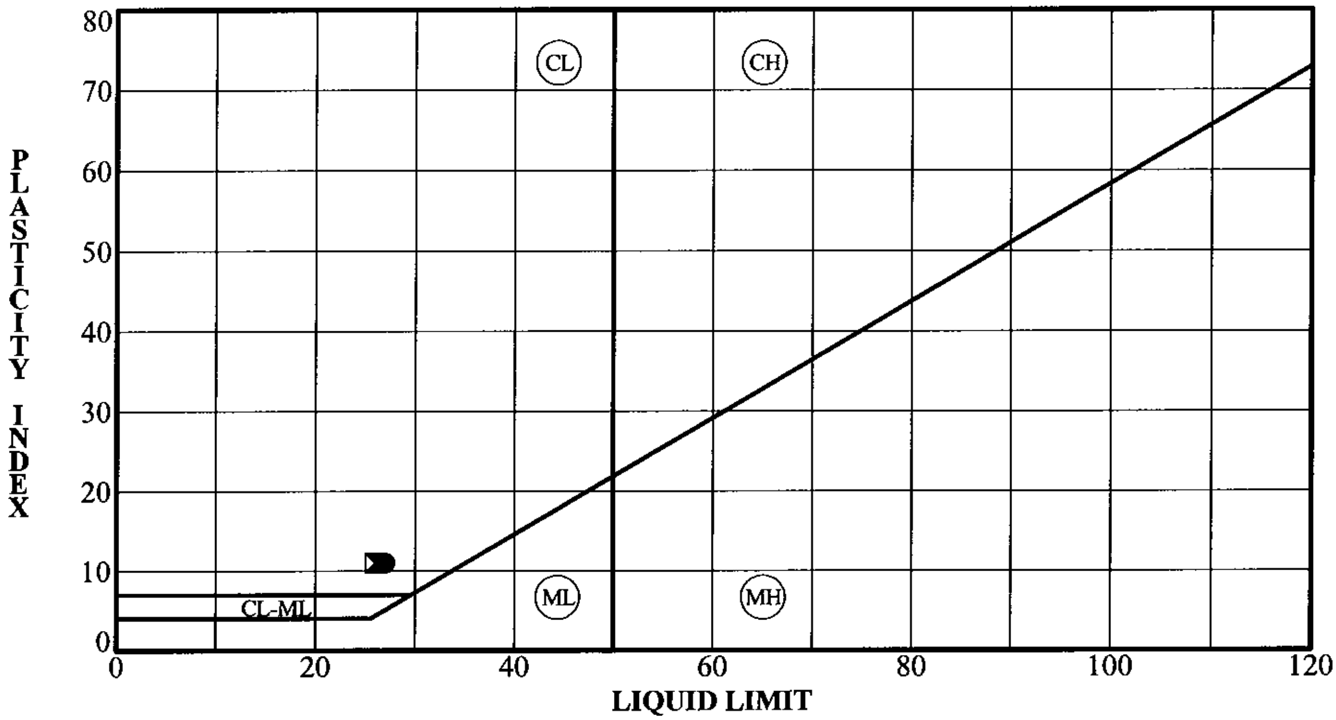
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-1**

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-02	34.7	27	11	0.482	21		CL
⊠	BH-02	47.5	26	11	0.909	25		CL

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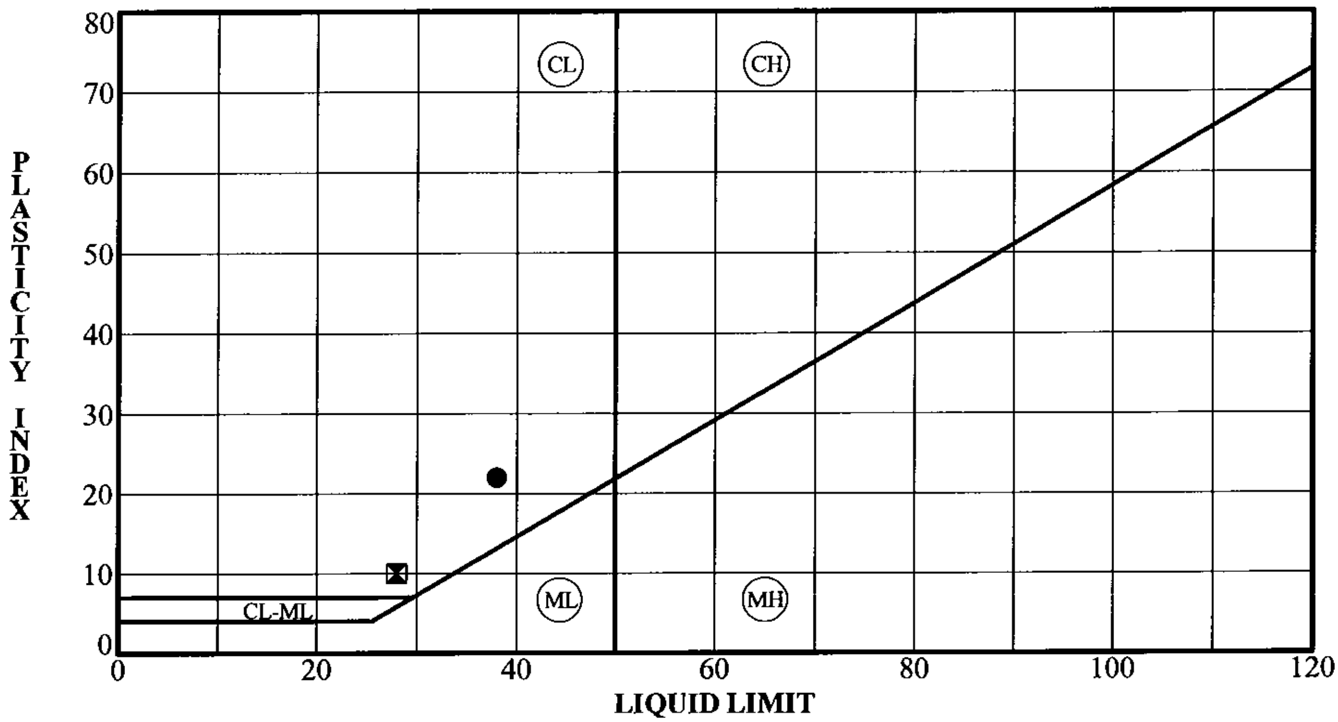
PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE	
APP'D BY: Y. D. Wang		A12-2	
DATE: 17/6/05	**SVRT DOWNTOWN**	PROJECT No.	
DWG FILE:	**San Jose, California**	204104.10	



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-04	47.4	38	22	0.273	22		CL
⊠	BH-04	76.8	28	10	0.200	20		CL

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PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

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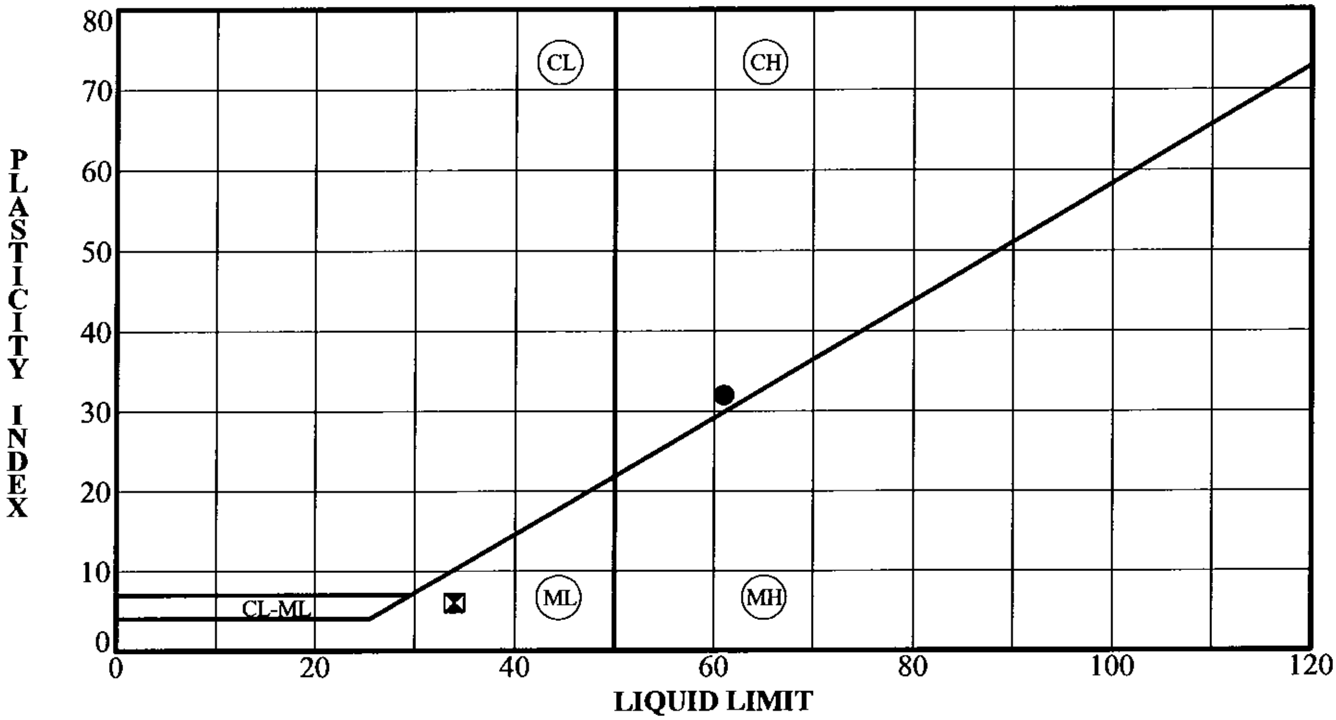
San Jose, California

FIGURE A12-3

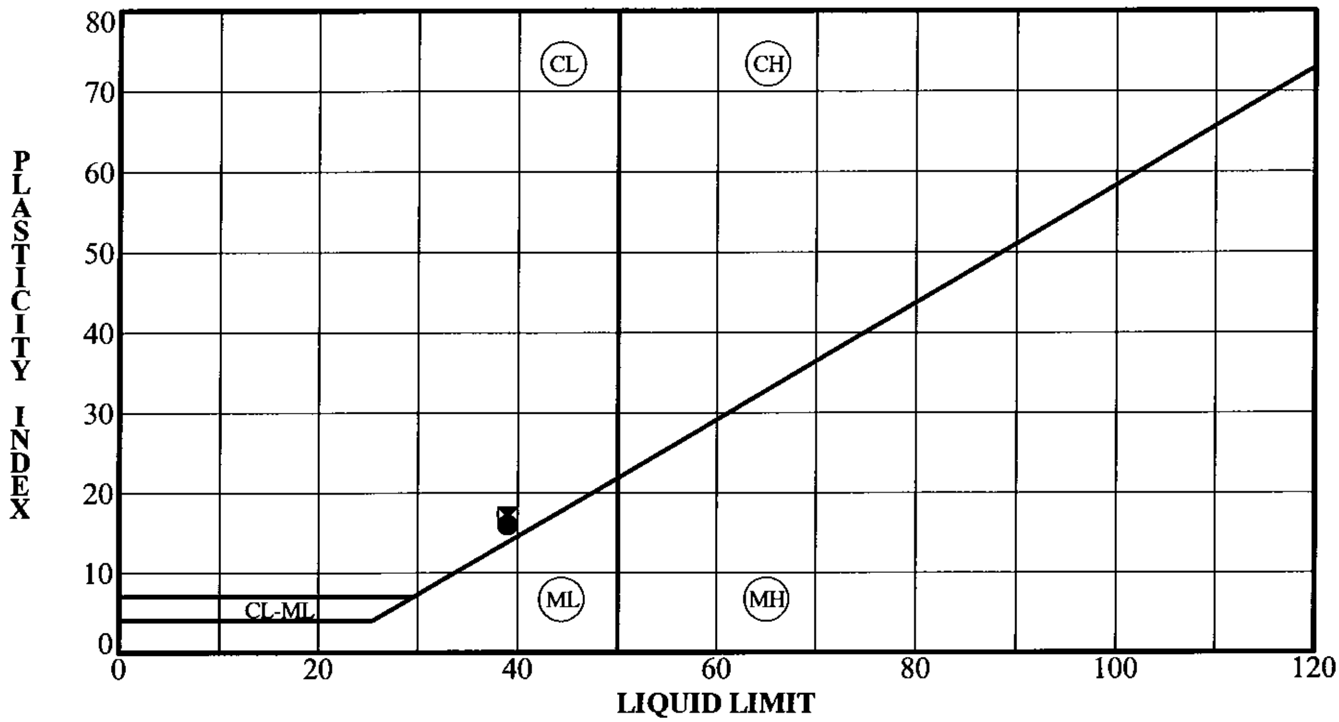
PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-06	39.5	61	32	0.375	41		CH
⊠	BH-06	54.7	34	6	-0.333	26		ML

PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE	
APP'D BY: Y. D. Wang		A12-4	
DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.	
DWG FILE:		204104.10	

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-08	47.5	39	16	0.438	30		CL
⊠	BH-08	60.0	39	17	0.412	29		CL

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APP'D BY: Y. D. Wang

DATE: 17/6/05

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PLASTICITY CHART AND DATA

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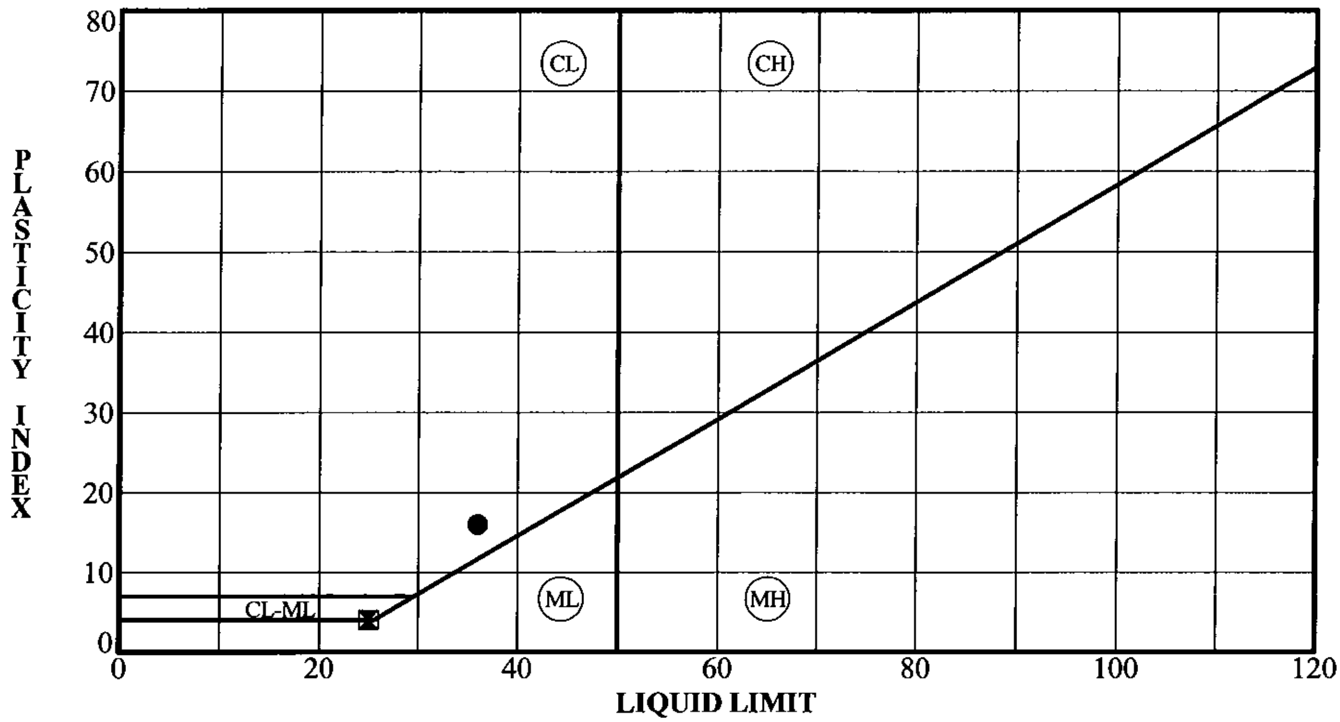
San Jose, California

FIGURE **A12-5**

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-10	59.5	36	16	0.063	21		CL
⊠	BH-10	66.5	25	4	-1.750	14		CL-ML

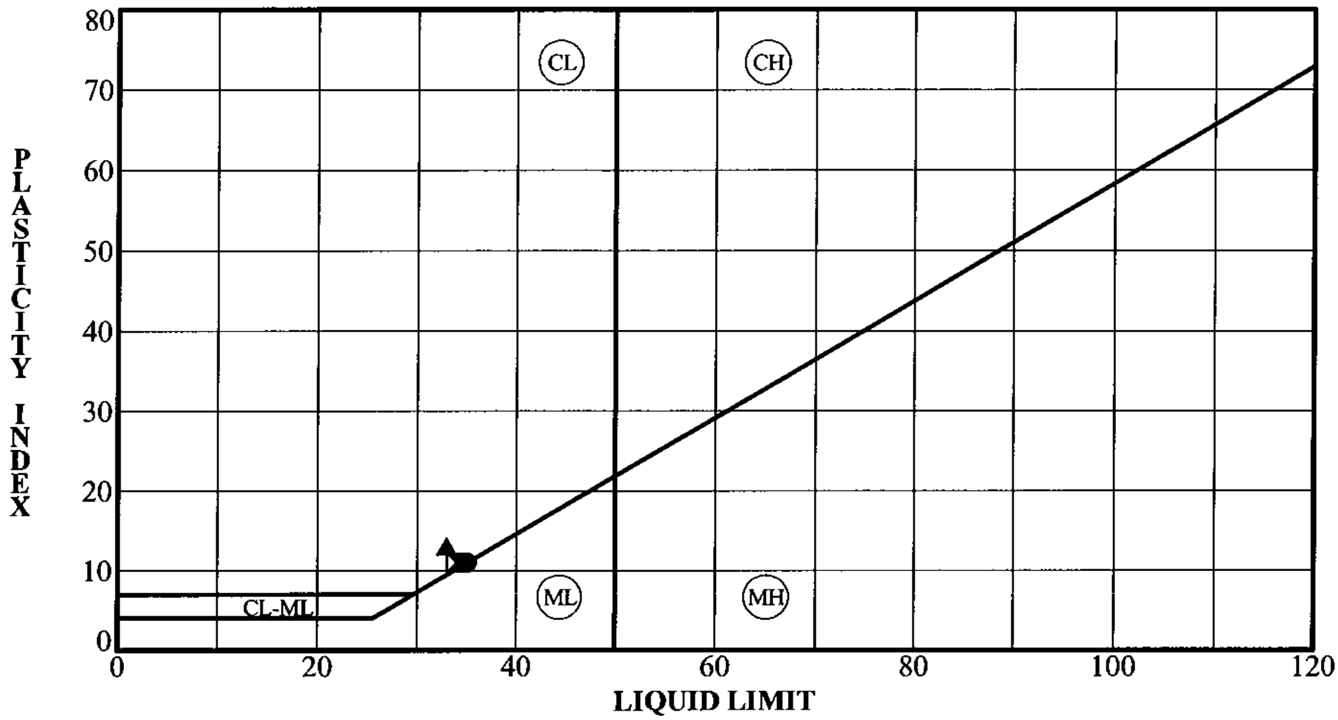
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-6

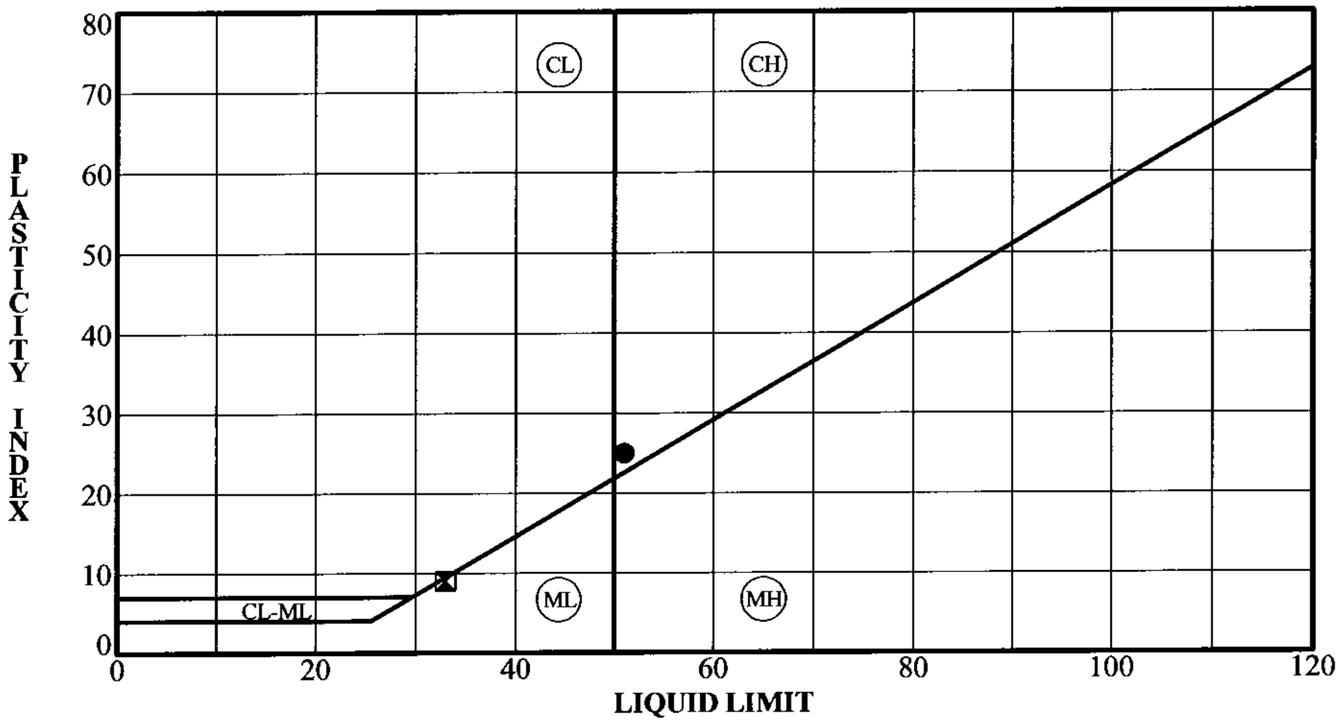
PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-12	42.4	35	11	0.609	31	70	ML/CL
⊠	BH-12	66.0	34	11	0.545	29		ML/CL
▲	BH-12	86.3	33	13	0.200	23		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE
APP'D BY: Y. D. Wang		A12-7
DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
DWG FILE:		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-16	65.6	51	25	0.624	42		CH
⊠	BH-16	101.5	33	9	0.289	27		ML/CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

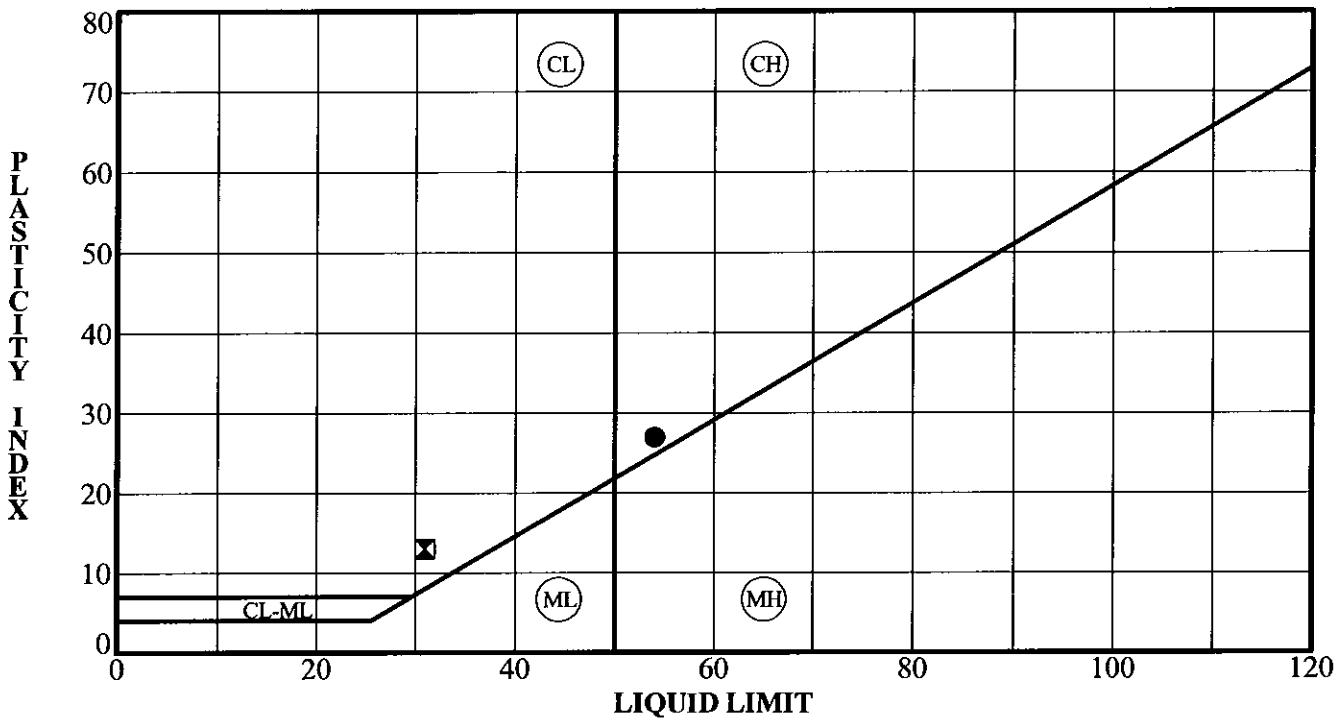
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-8

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-18	52.5	54	27	0.148	31		CH
⊠	BH-18	73.5	31	13	0.231	21		CL

ATTERBERG 204104_06_20_2005.GPJ VERSION-042904.GDT 17/6/05

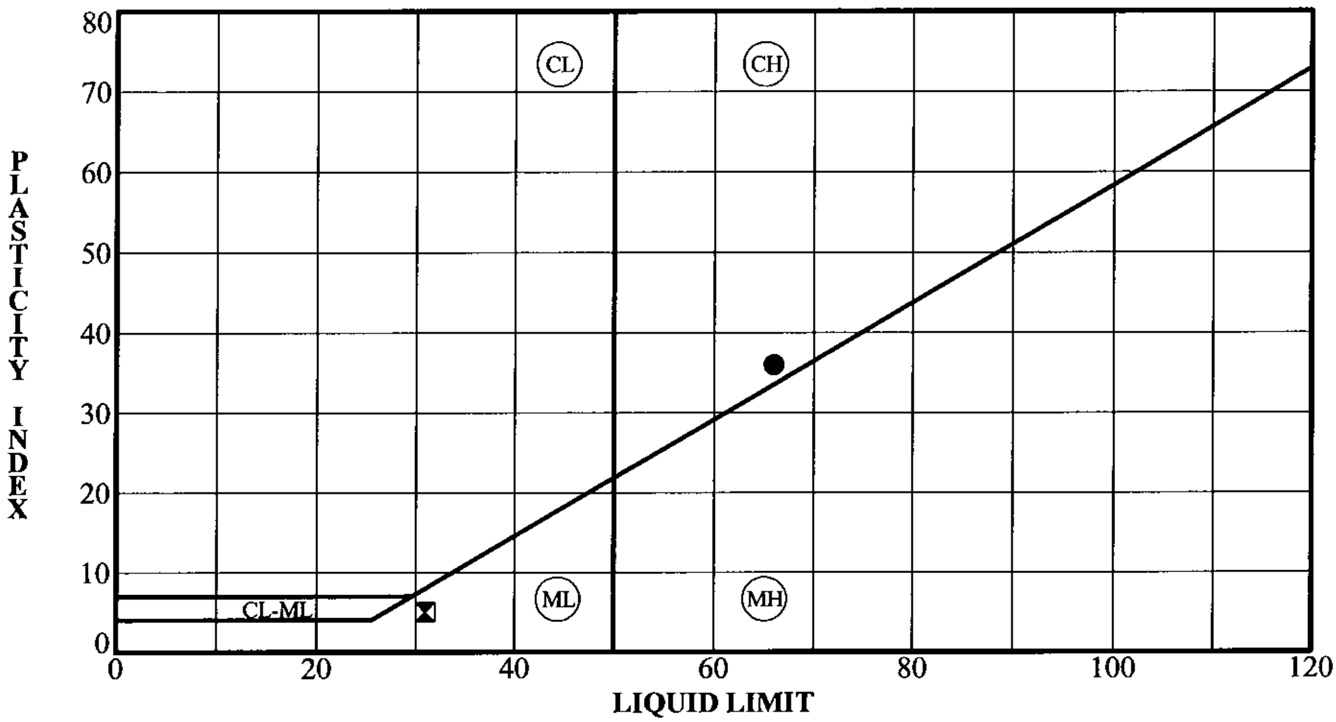
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-9

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-20	37.5	66	36	0.442	46		CH
⊠	BH-20	73.5	31	5	0.400	28		ML

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

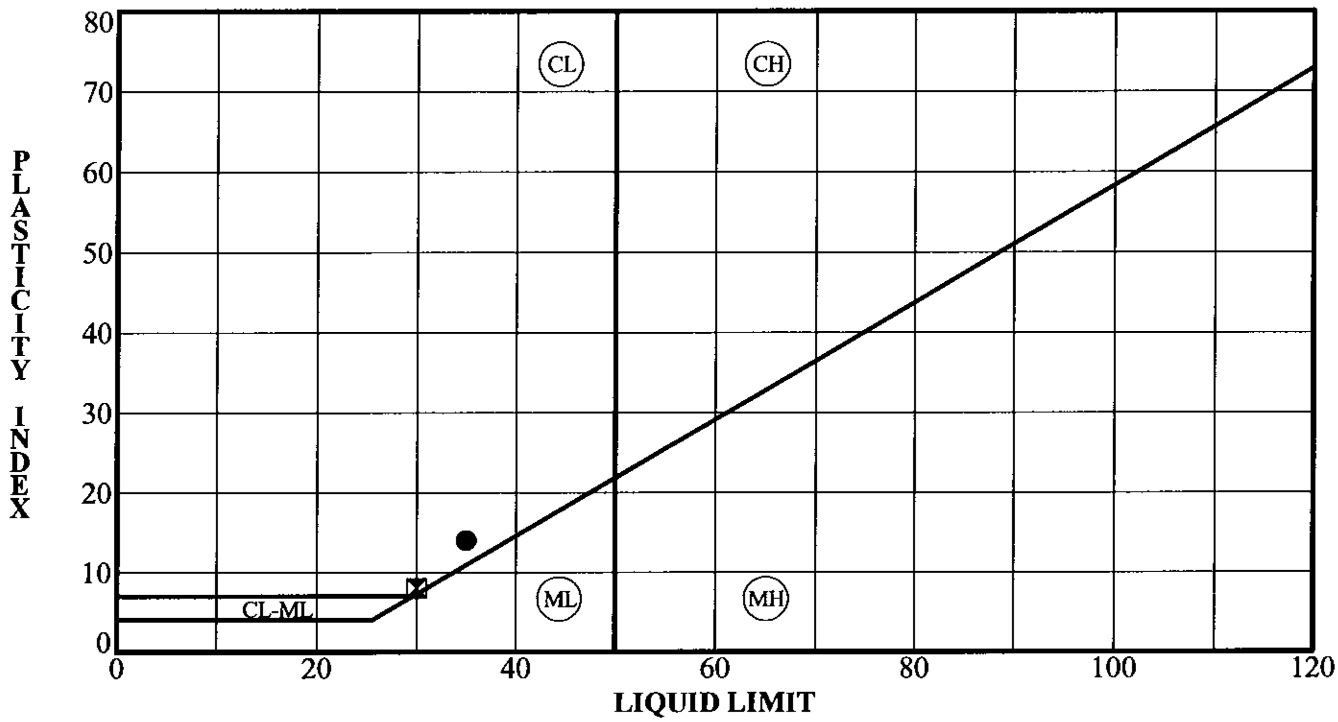
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-10

PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-23	28.5	35	14	0.793	32		CL
⊠	BH-23	47.5	30	8	0.463	26		CL

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

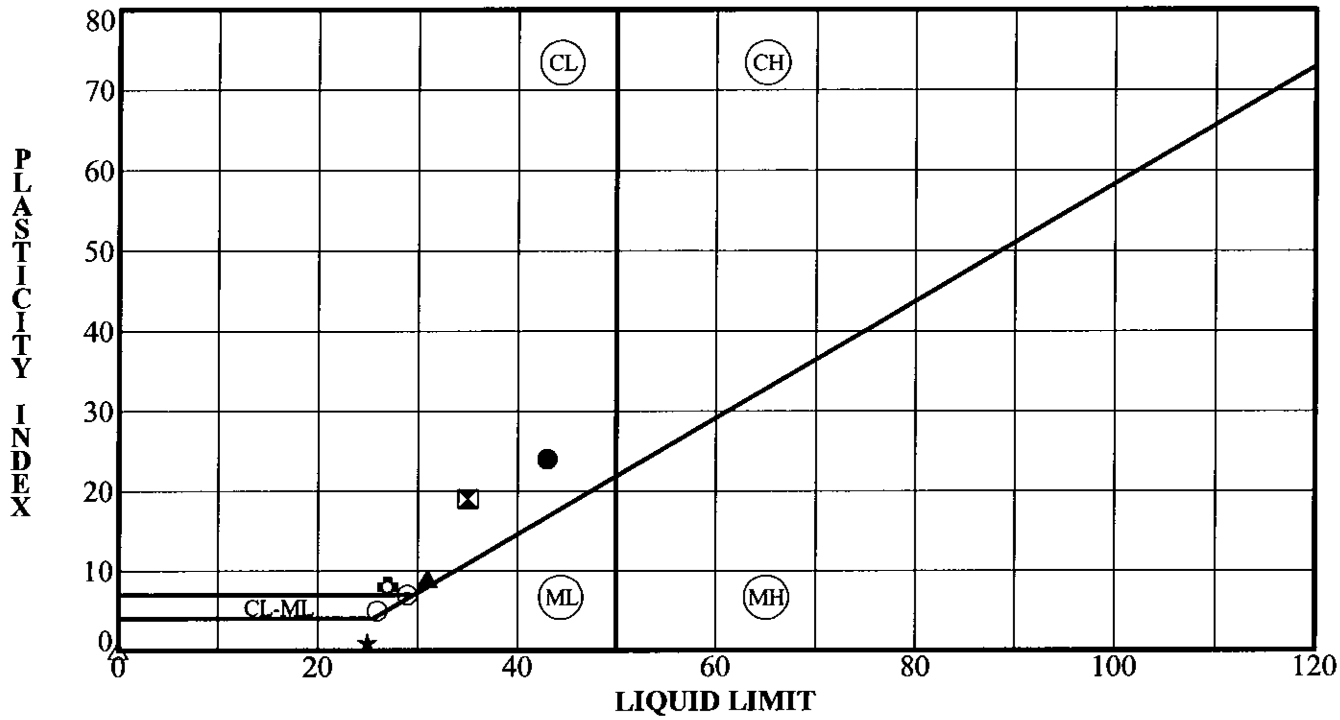
PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-11

PROJECT No.
204104.10

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-24	15.0	43	24	0.229	25	90	CL
⊠	BH-24	17.5	35	19	0.732	30		CL
▲	BH-24	27.5	31	9	0.678	28	86	CL
★	BH-24	32.4	25	1	2.300	26	71	ML
⊙	BH-24	55.0	29	7	0.514	26	78	CL-ML
✿	BH-24	111.0	27	8	0.225	21	59	CL
○	BH-24	141.0	26	5	-0.500	19	56	CL-ML
△	BH-24	151.0	NP	NP		25	26	SM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

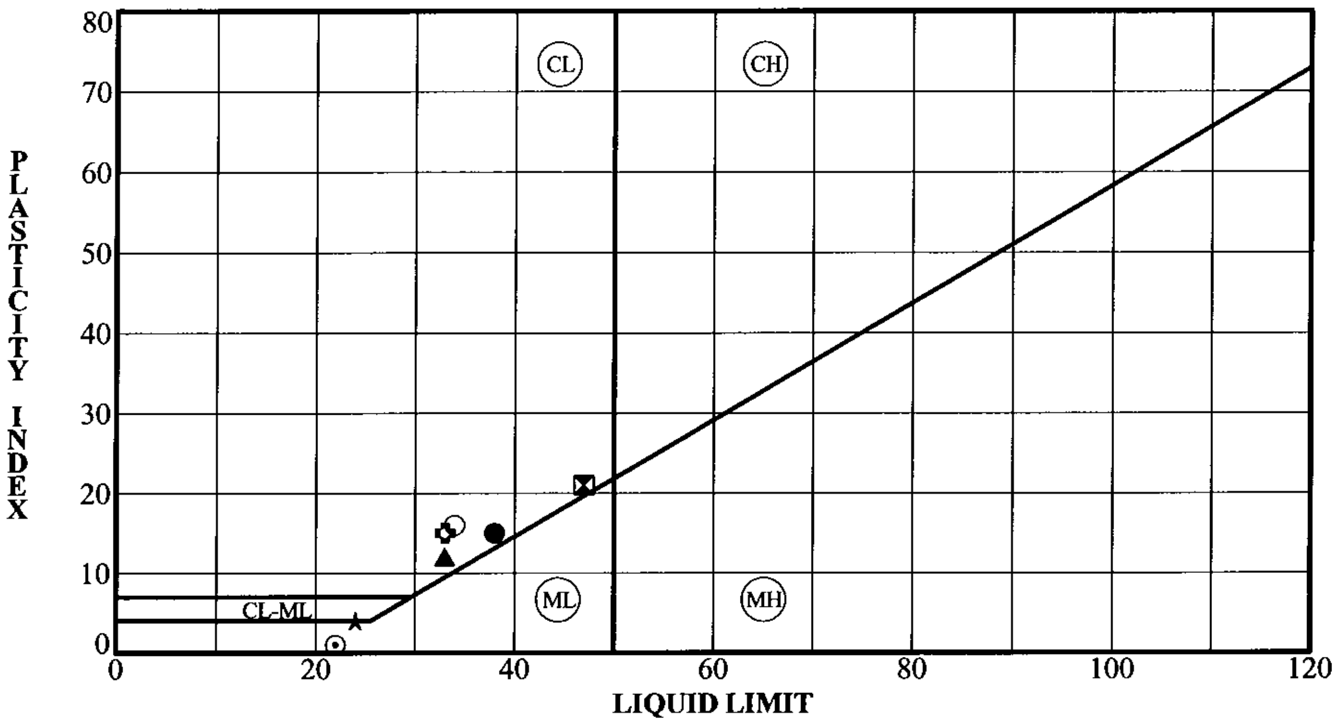
PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-12

PROJECT No.
204104.10

ATTERBERG 204104_06_20_2005.GPJ VERSION-042904.GDT 17/6/05



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-25	18.0	38	15	0.813	35		CL
⊠	BH-25	41.2	47	21	0.119	29		SC/CL
▲	BH-25	56.5	33	12	0.542	28		CL
★	BH-25	61.5	24	4	---	---		ML
⊙	BH-25	70.5	22	1	0.000	21		ML
✿	BH-25	71.0	33	15	0.340	23		CL
○	BH-25	104.0	34	16	0.569	27		CL

ATTERBERG 204104_06_20_2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

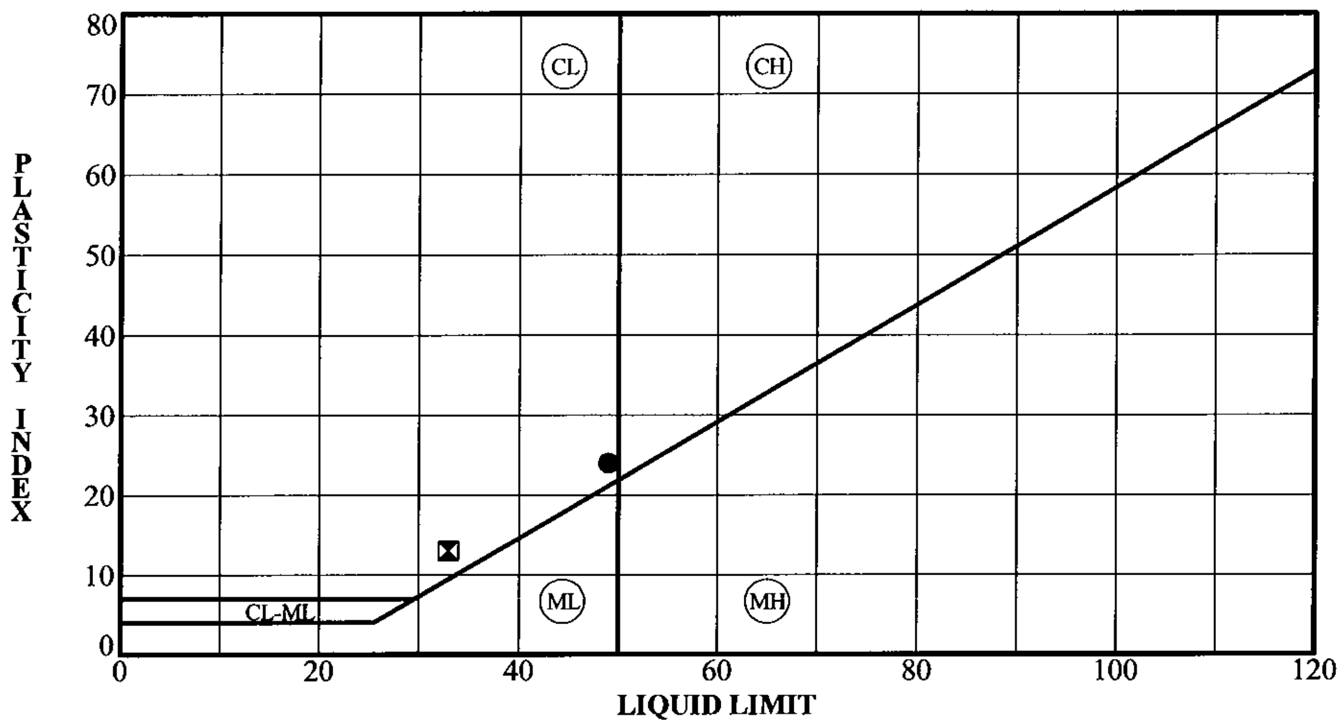
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-13**

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-27	32.5	49	24	0.342	33		CL/CH
⊠	BH-27	131.5	33	13	0.331	24		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN

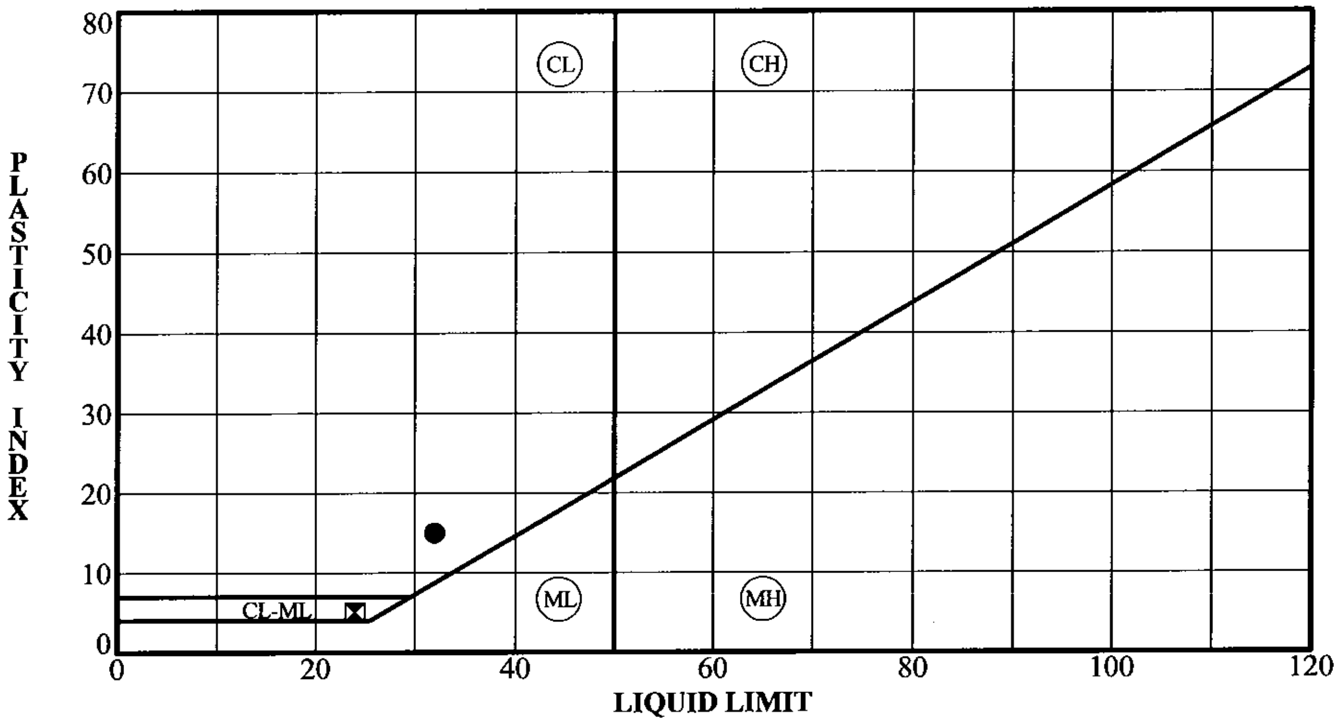
San Jose, California

FIGURE

A12-14

PROJECT No.

204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-29	70.7	32	15	0.467	24		CL
⊠	BH-29	80.0	24	5	1.000	24		CL-ML

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

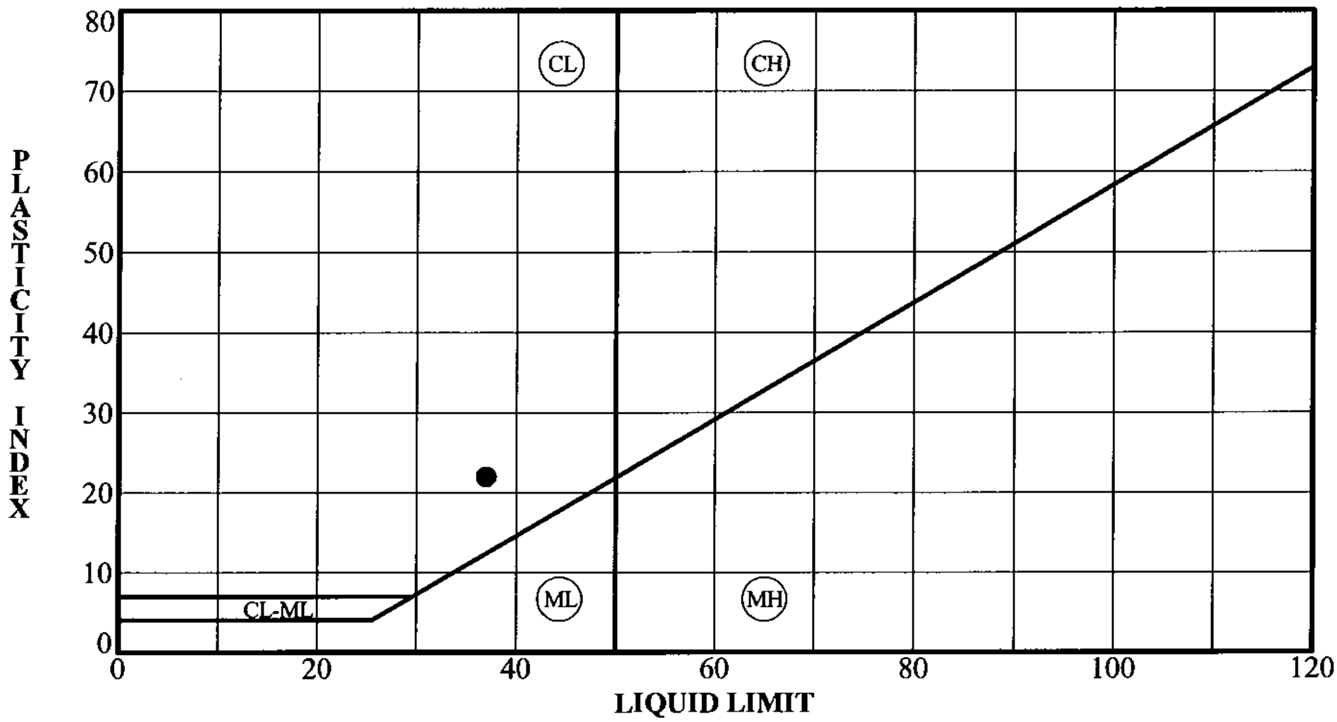
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-15

PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-30	75.5	37	22	0.295	22		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

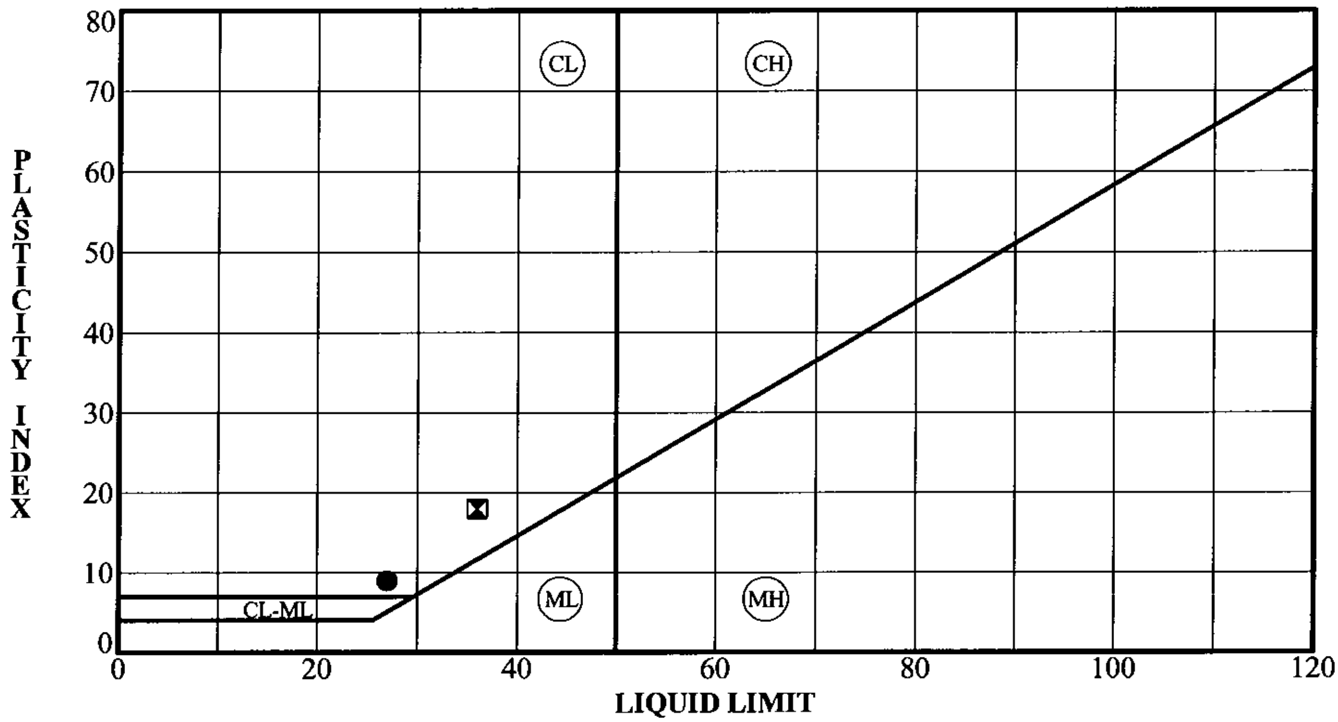
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-16

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-32	52.3	27	9	0.578	23		CL
⊠	BH-32	66.8	36	18	0.300	23		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

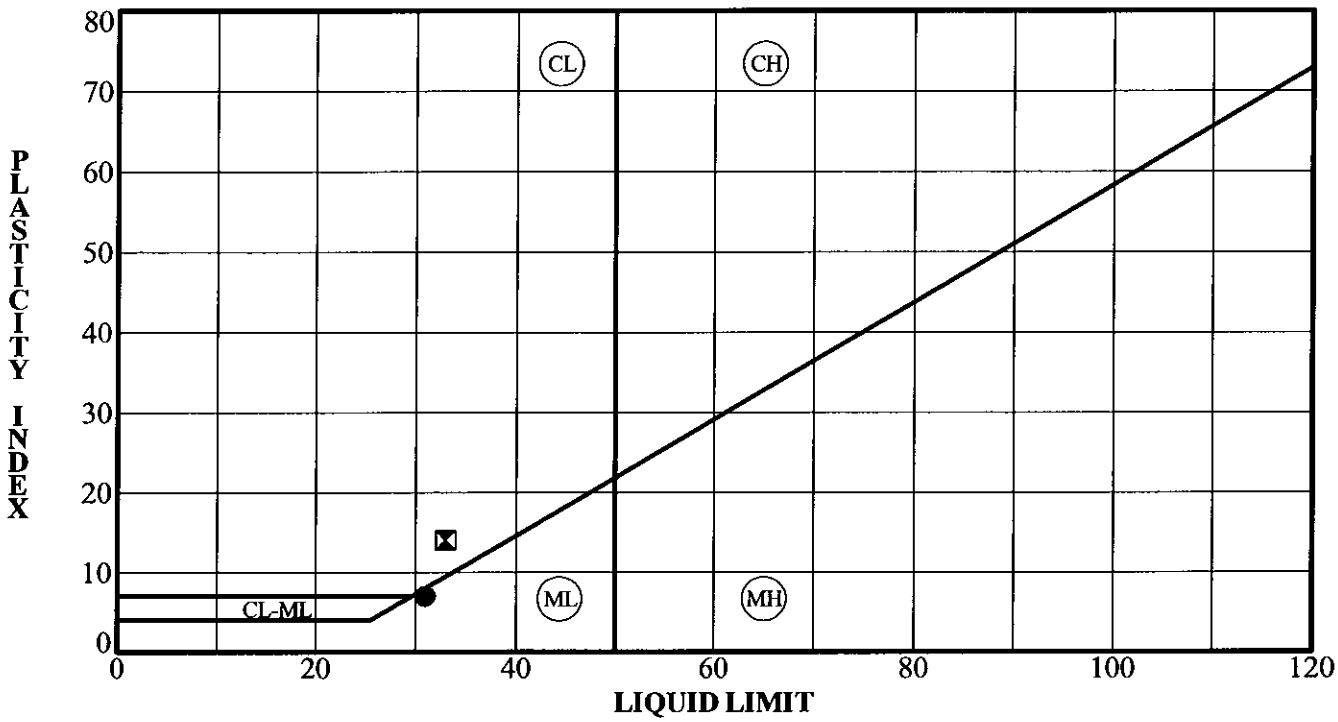
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-17**

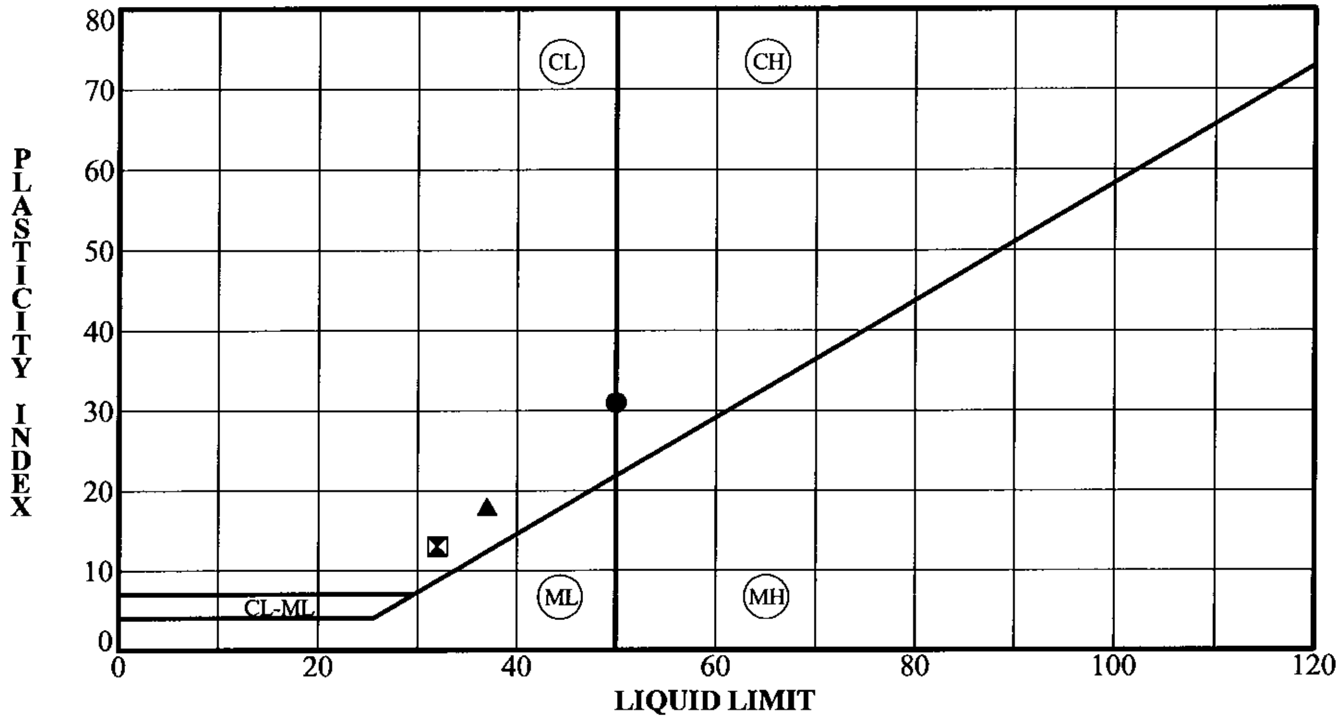
PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-33	54.4	31	7	0.100	25		ML
⊠	BH-33	110.0	33	14	0.393	25		CL

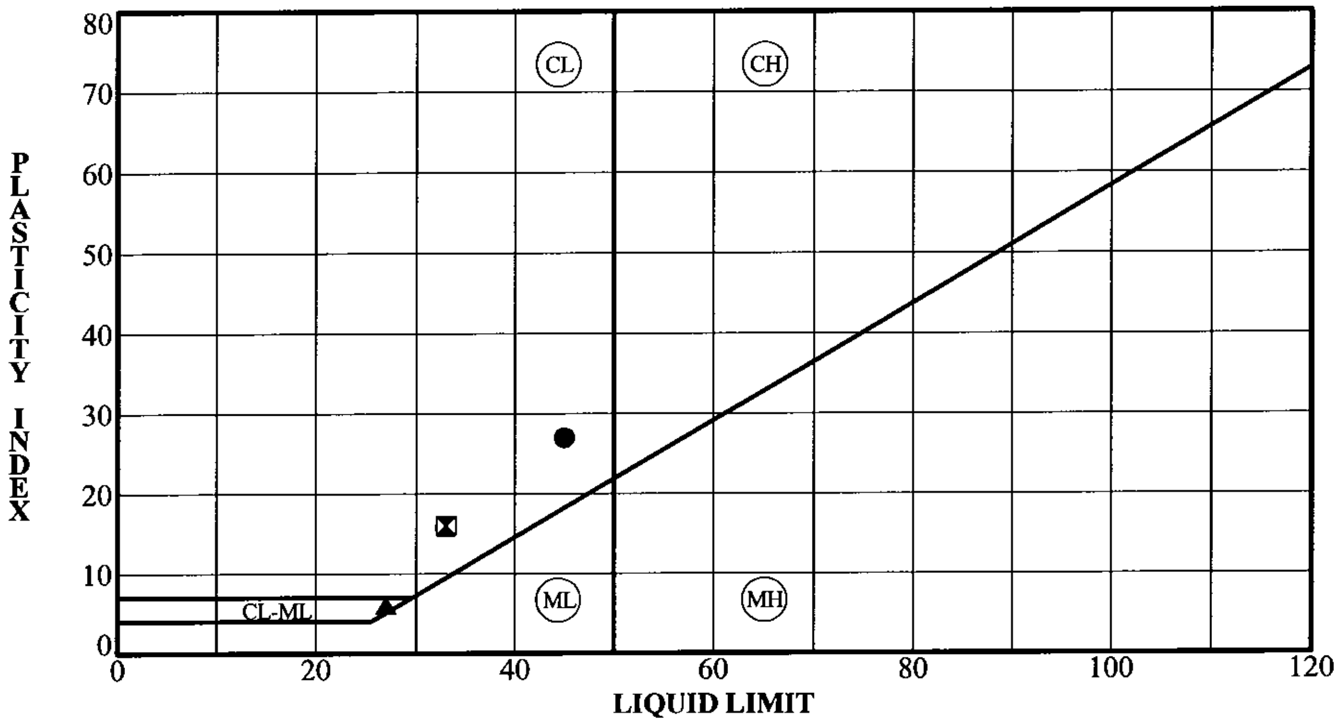
ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE	A12-18
APP'D BY: Y. D. Wang	SVRT DOWNTOWN San Jose, California	PROJECT No.	204104.10
DATE: 17/6/05			
DWG FILE:			



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-36	32.5	50	31	0.297	28		CL/CH
⊠	BH-36	42.5	32	13	0.515	26		CL
▲	BH-36	67.5	37	18	0.278	24		CL

PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE
APP'D BY: Y. D. Wang		A12-19
DATE: 17/6/05	**SVRT DOWNTOWN**	PROJECT No.
DWG FILE:	**San Jose, California**	204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-38	31.3	45	27	0.370	28		CL
⊠	BH-38	71.0	33	16	0.225	21		CL
▲	BH-38	95.0	27	6	-0.150	20		CL-ML

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

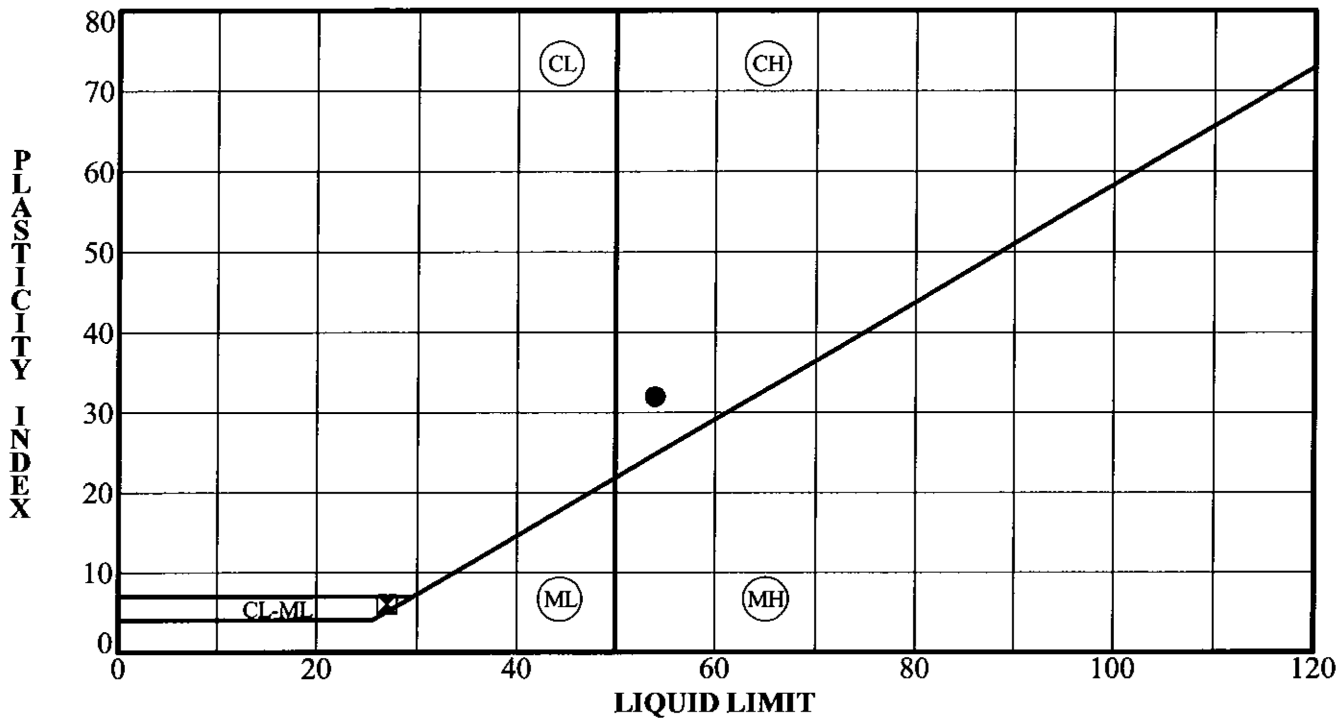
PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-20**

PROJECT No. 204104.10

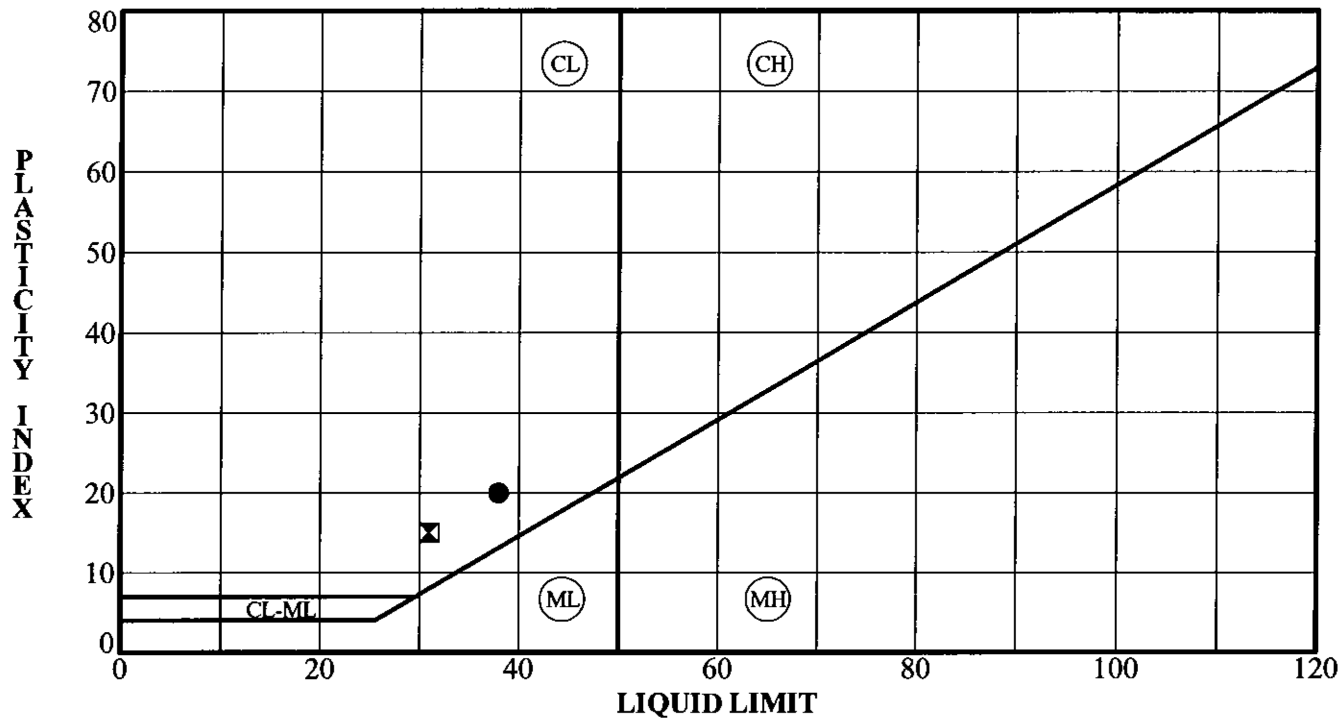
ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-40	24.3	54	32	0.488	38		CH
⊠	BH-40	42.5	27	6	0.750	26		CL-ML

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

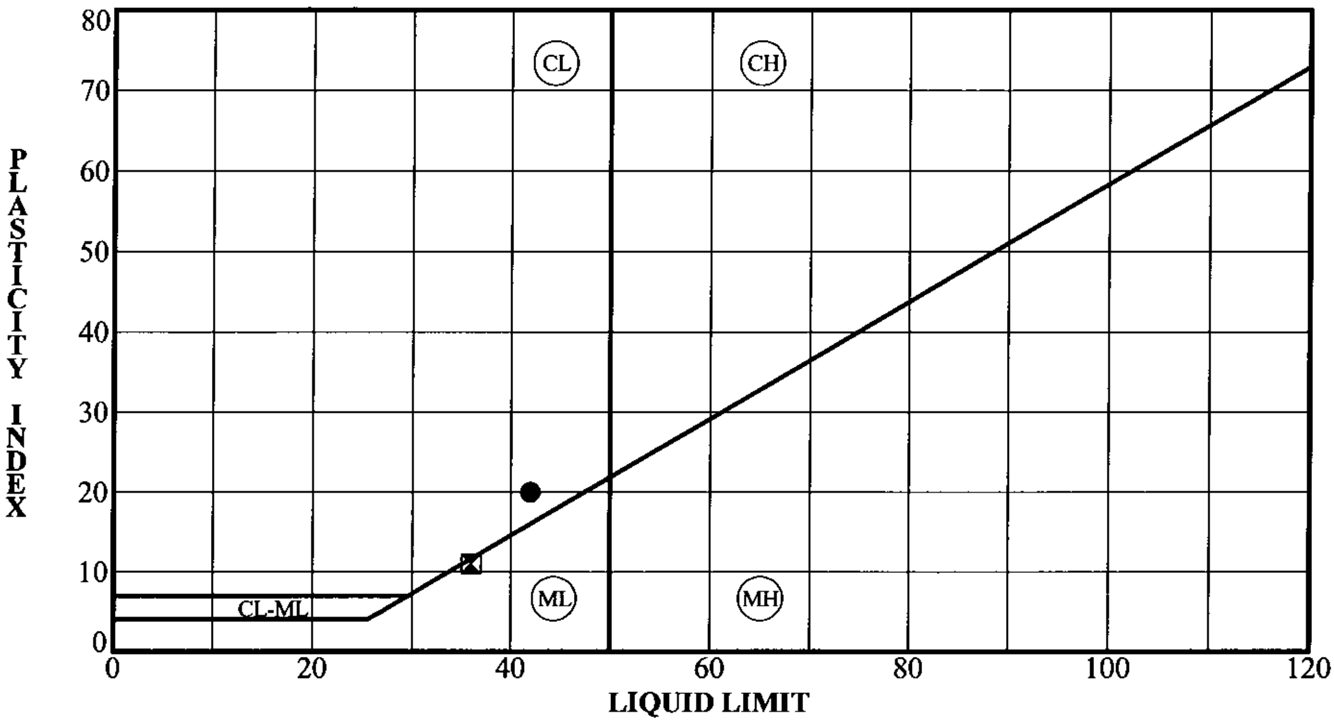
PREP'D BY:	PLASTICITY CHART AND DATA		FIGURE
APP'D BY: Y. D. Wang			A12-21
DATE: 17/6/05	SVRT DOWNTOWN		PROJECT No.
DWG FILE:	San Jose, California		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-42	50.9	38	20	0.425	27		CL
⧗	BH-42	62.5	31	15	0.267	20		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

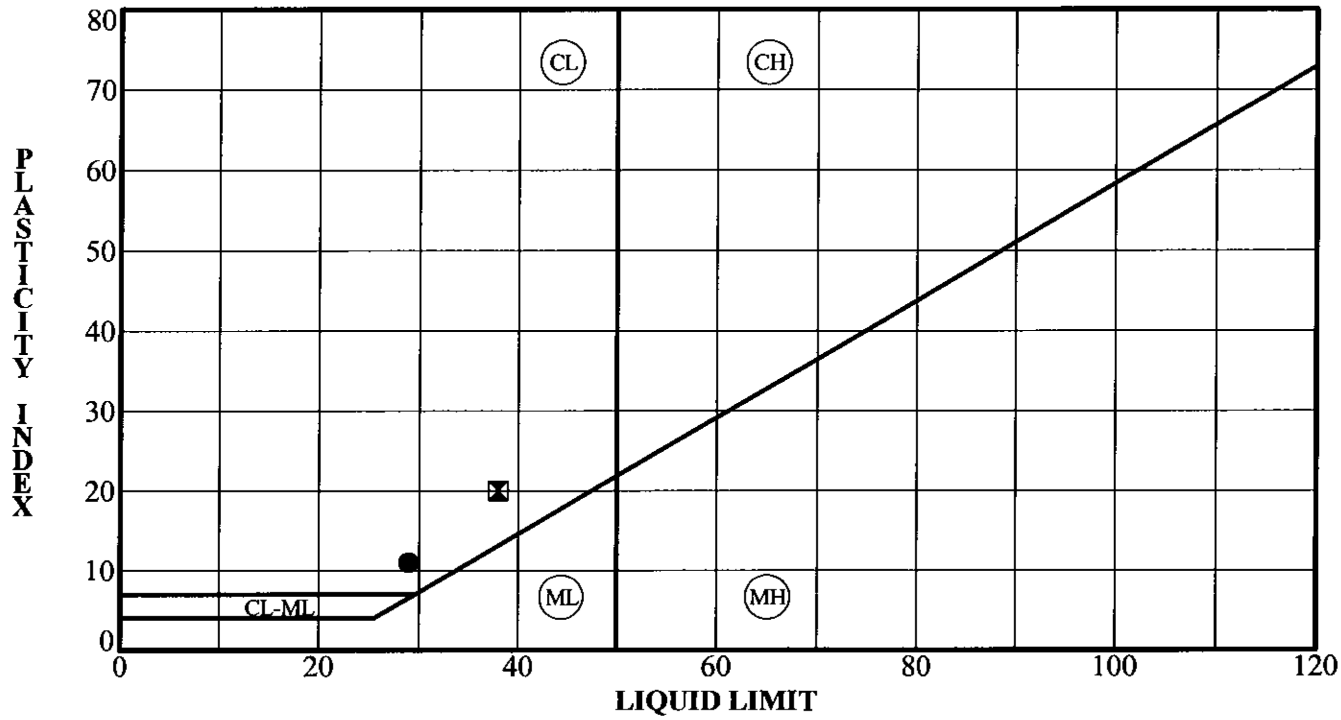
	PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE
	APP'D BY: Y. D. Wang		A12-22
	DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
	DWG FILE:		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-46	22.5	42	20	0.395	30		CL
⊠	BH-46	52.5	36	11	0.418	30		ML/CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

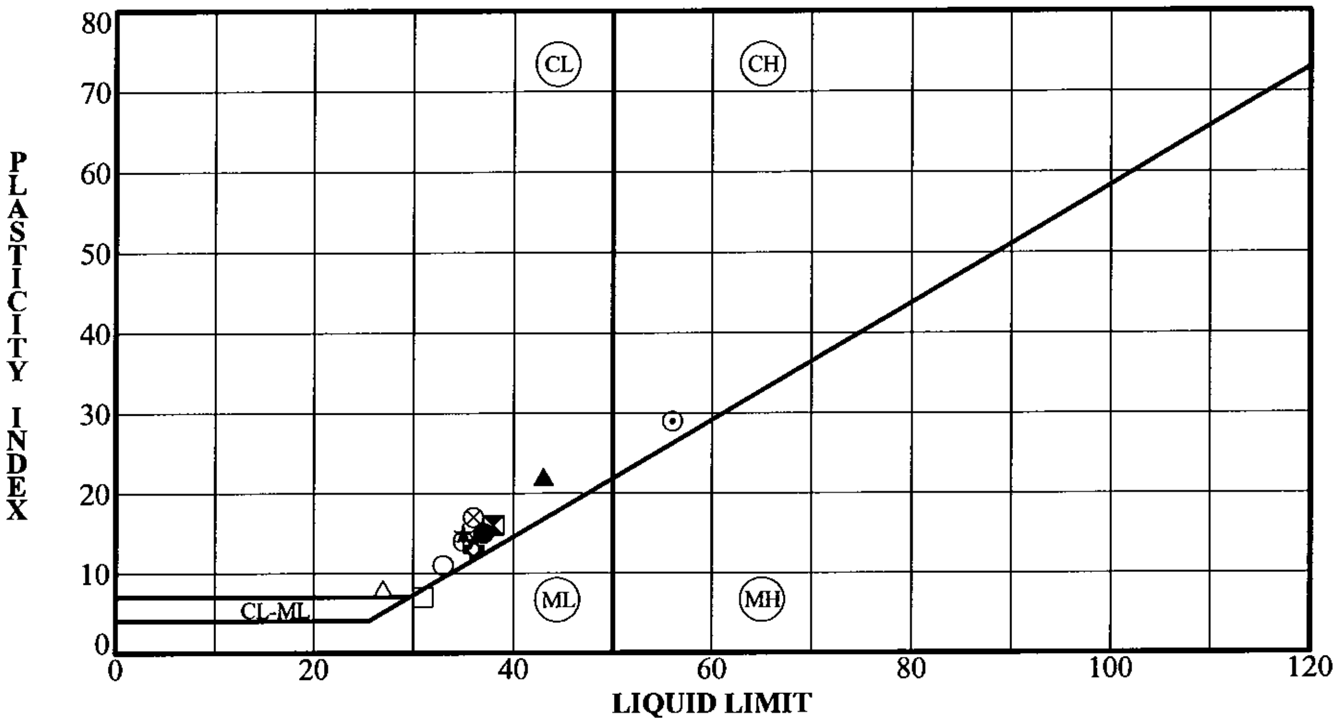
PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE
APP'D BY: Y. D. Wang		A12-23
DATE: 17/6/05	SVRT DOWNTOWN	PROJECT No.
DWG FILE:	San Jose, California	204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-48	40.0	29	11	0.109	19		CL
⊠	BH-48	77.5	38	20	0.295	24		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:	PLASTICITY CHART AND DATA		FIGURE
APP'D BY: Y. D. Wang			A12-24
DATE: 17/6/05	SVRT DOWNTOWN		PROJECT No.
DWG FILE:	San Jose, California		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-50	6.8	37	15	0.027	22		CL
⊠	BH-50	12.2	38	16	0.556	31		CL
▲	BH-50	16.4	43	22	0.100	23		CL
★	BH-50	32.5	35	15	0.740	31		CL
⊙	BH-50	37.2	56	29	0.490	41		CH
✪	BH-50	52.5	36	13	0.654	32		CL
○	BH-50	101.2	33	11	0.118	23		CL
△	BH-50	111.4	27	8	0.388	22		CL
⊗	BH-50	120.5	36	17	0.359	25	91	CL
⊕	BH-50	140.5	35	14	0.357	26	94	CL
□	BH-50	150.5	31	7	-0.086	23	80	ML

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

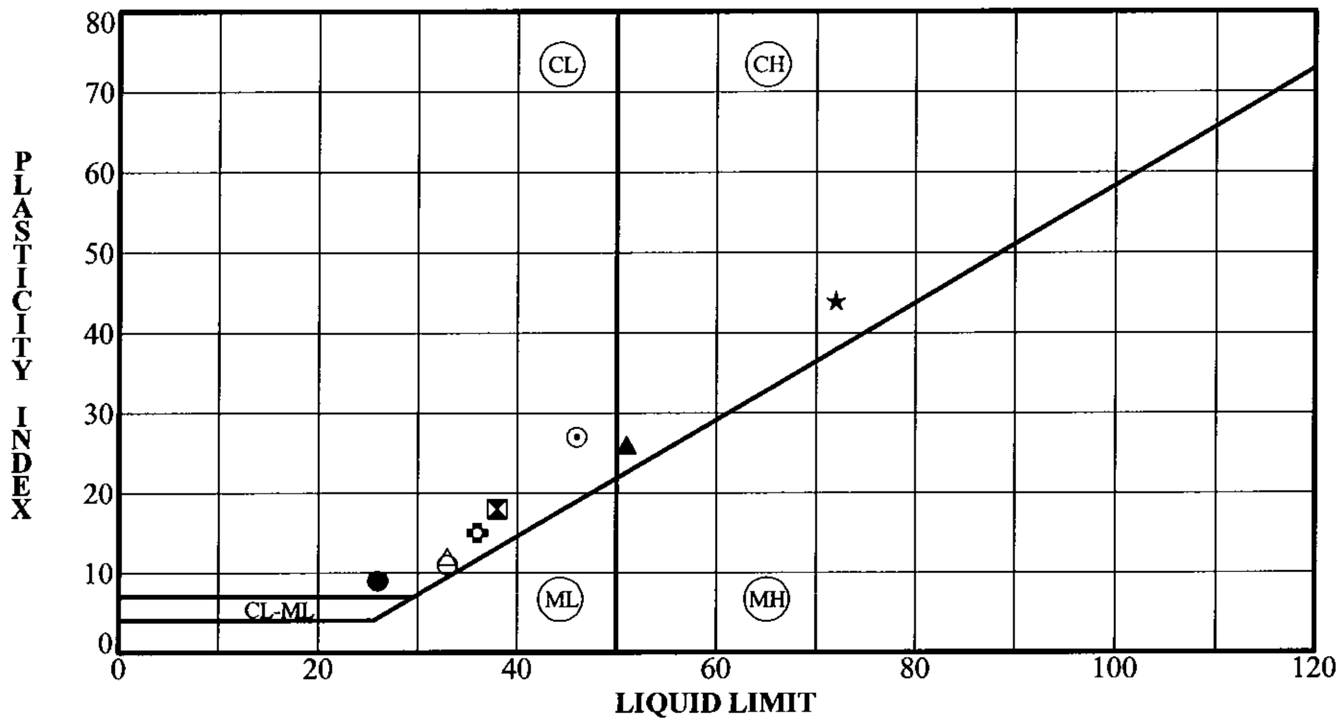
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-25**

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-52	19.5	26	9	0.111	18		CL
⊠	BH-52	31.9	38	18	0.572	30		CL
▲	BH-52	36.6	51	26	0.681	43		CH
★	BH-52	39.1	72	44	0.266	40		CH
⊙	BH-52	41.4	46	27	0.241	26		CL
✿	BH-52	46.7	36	15	0.493	28		CL
○	BH-52	56.7	33	11	0.527	28	53	CL/SC
△	BH-52	116.5	33	12	0.025	21	73	CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

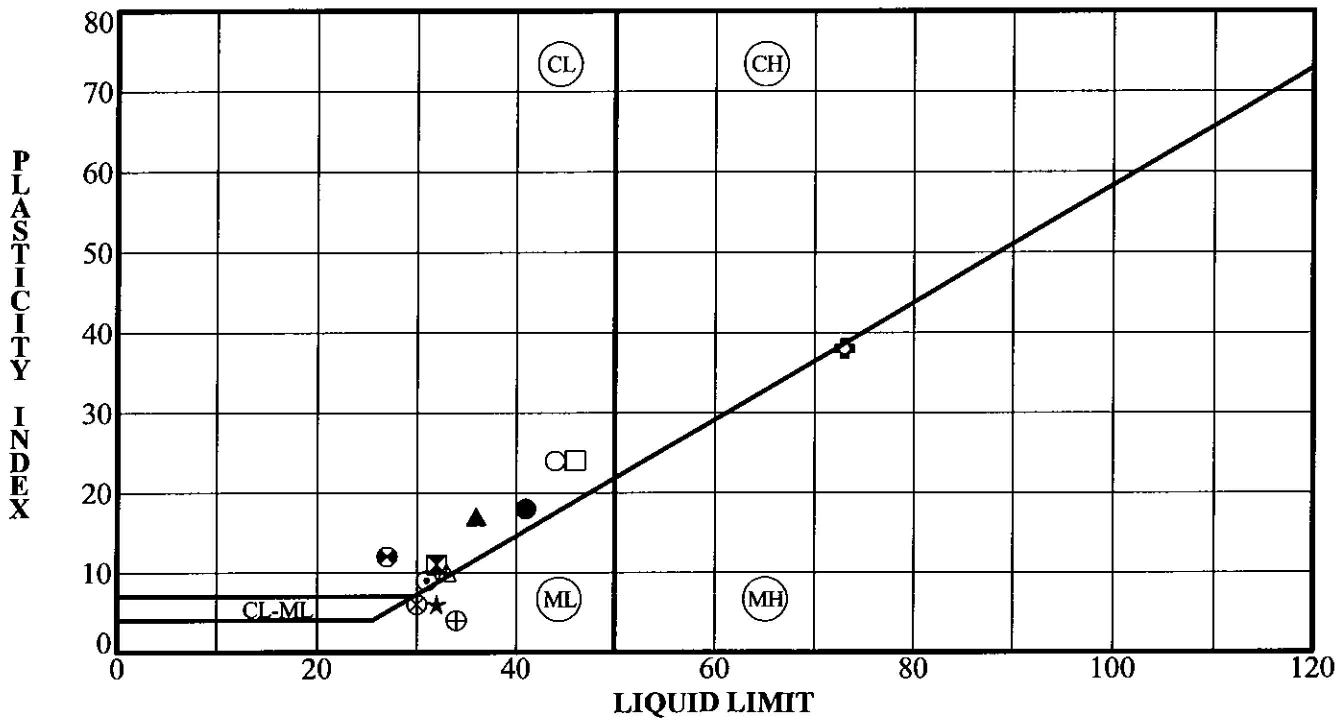
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-26**

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-53	4.9	41	18	-0.106	21		CL
⊠	BH-53	12.2	32	11	0.518	27		CL
▲	BH-53	17.0	36	17	0.118	21		CL
★	BH-53	25.0	32	6	1.200	33		ML
⊙	BH-53	27.2	31	9	0.300	25		CL
✪	BH-53	37.5	73	38	0.624	59		MH/CH
○	BH-53	42.2	44	24	0.150	24		CL
△	BH-53	47.5	33	10	0.570	29		CL
⊗	BH-53	54.2	30	6	-0.050	24	78	ML
⊕	BH-53	57.3	34	4	-0.175	29		ML
□	BH-53	100.5	46	24	0.308	29		CL
⊛	BH-53	116.5	27	12	0.442	20	45	SC

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

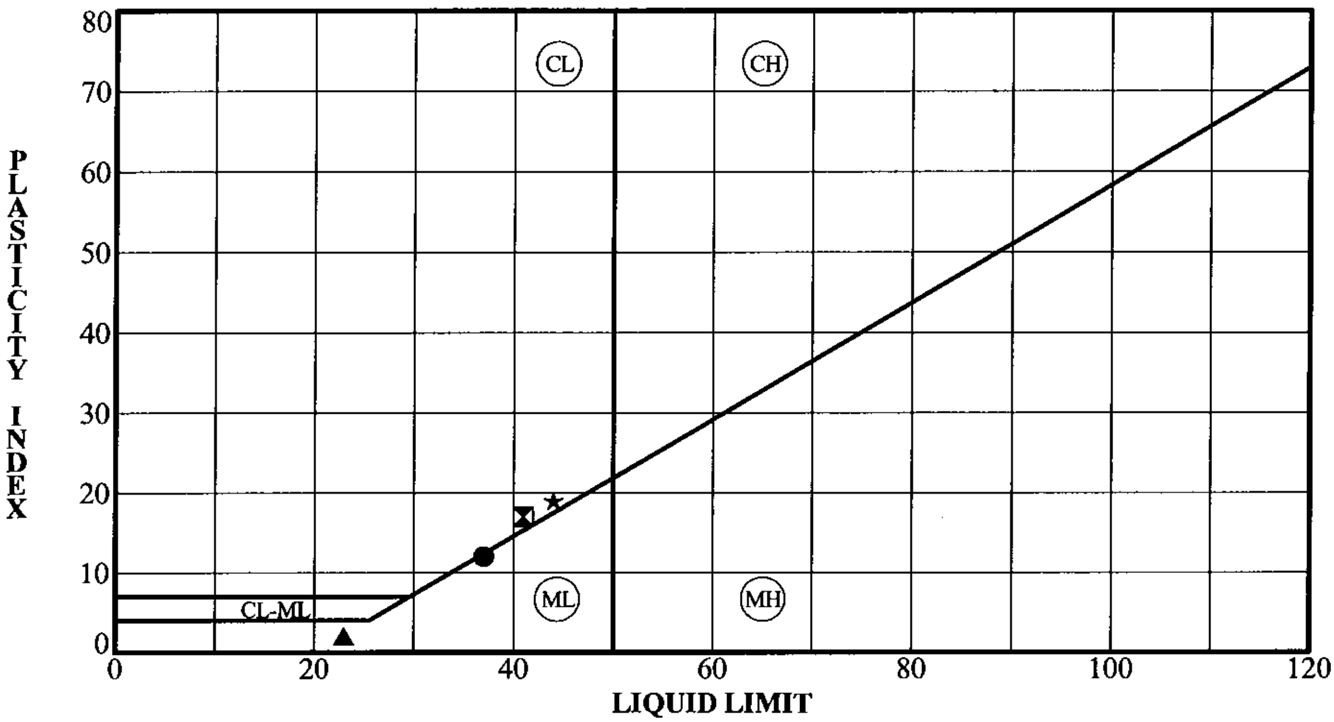
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-27-1

PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-53	125.2	37	12	0.542	32		ML
⊠	BH-53	136.5	41	17	0.018	24		CL
▲	BH-53	141.4	23	2	1.300	24	79	ML
★	BH-53	149.0	44	19	0.374	32		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

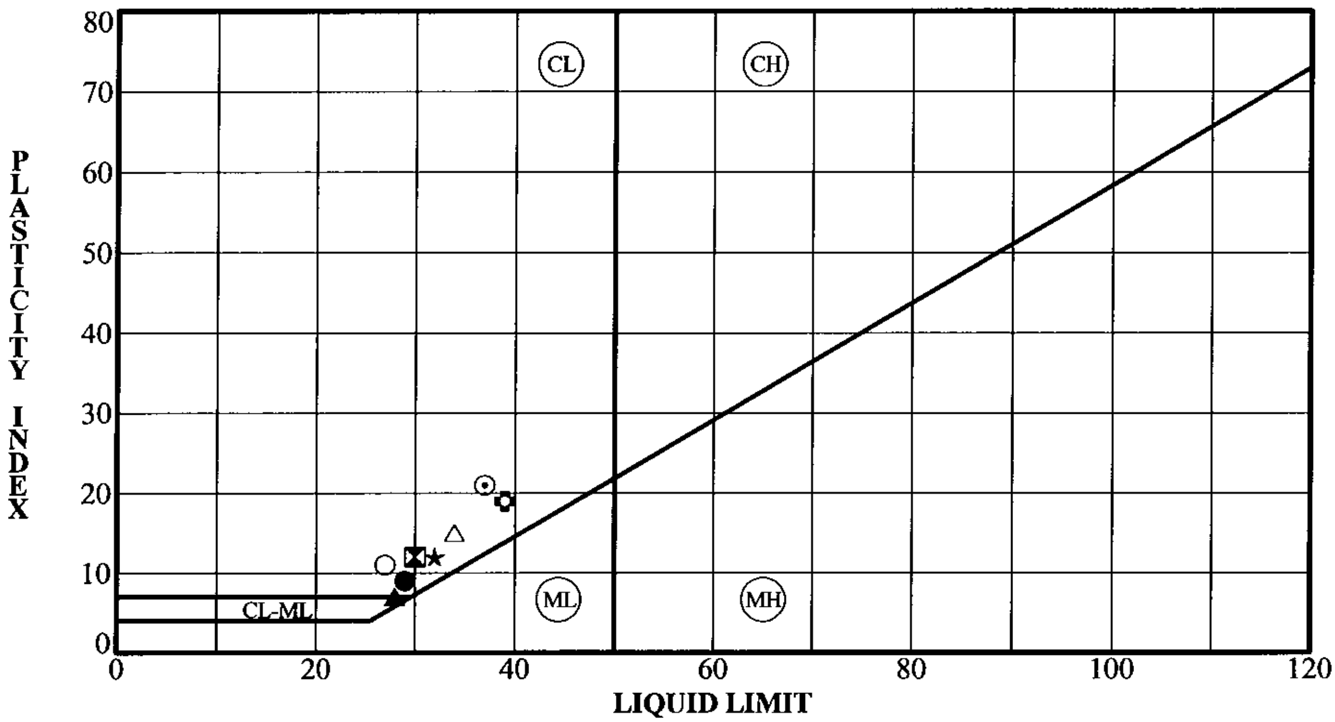
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-27-2

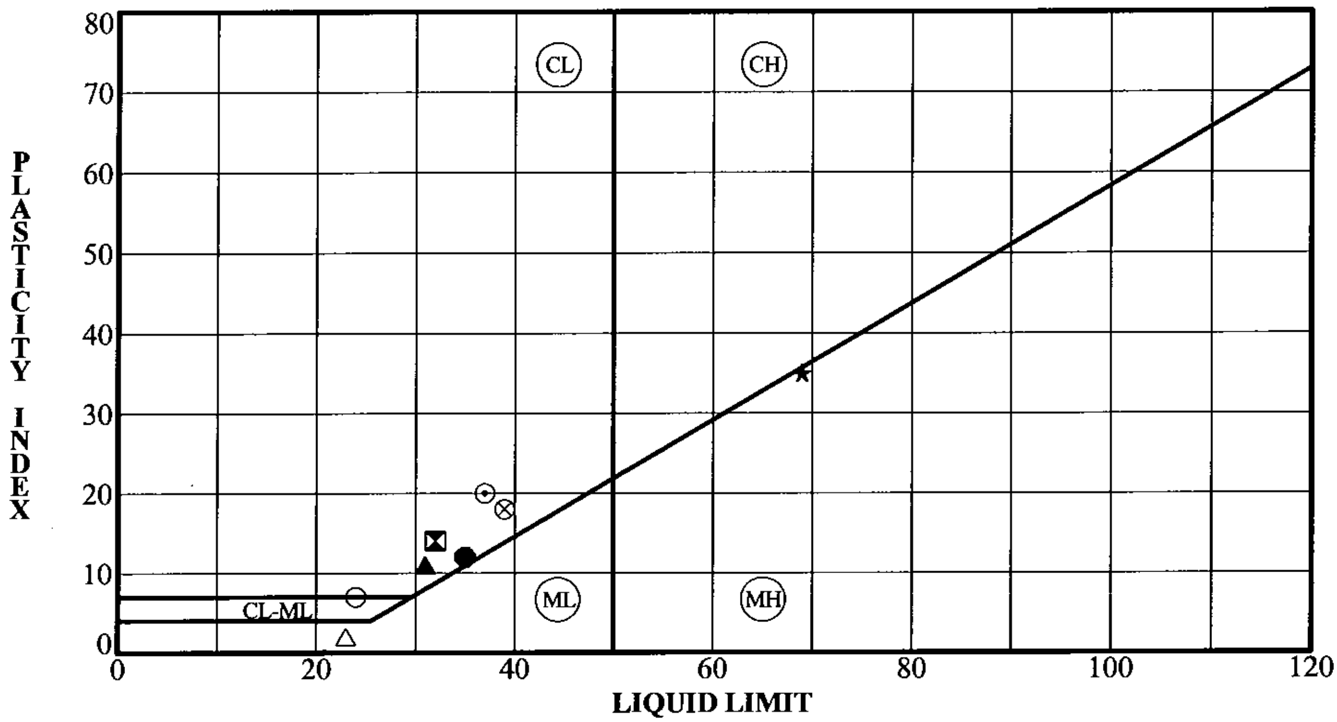
PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-54	11.6	29	9	1.267	31	97	CL
⊠	BH-54	17.0	30	12	0.300	22		CL
▲	BH-54	22.5	28	7	0.971	28	69	CL-ML
★	BH-54	32.0	32	12	0.625	28	85	CL
⊙	BH-54	42.5	37	21	0.300	22	76	CL
✿	BH-54	52.5	39	19	0.163	23	88	CL
○	BH-54	62.5	27	11	0.327	20		CL
△	BH-54	91.0	34	15	0.440	26	85	CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

	PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE
	APP'D BY: Y. D. Wang		A12-28
	DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
	DWG FILE:		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-55	12.4	35	12	-0.617	16		CL
⊠	BH-55	16.9	32	14	0.257	22	60	CL
▲	BH-55	26.7	31	11	0.655	27		CL
★	BH-55	37.5	69	35	0.357	47		MH/CH
⊙	BH-55	45.0	37	20	0.340	24		CL
✿	BH-55	47.5	35	12	0.542	30		CL
○	BH-55	62.5	24	7	0.314	19		CL-ML
△	BH-55	71.6	23	2	1.100	23	67	ML
⊗	BH-55	136.5	39	18	0.100	23		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

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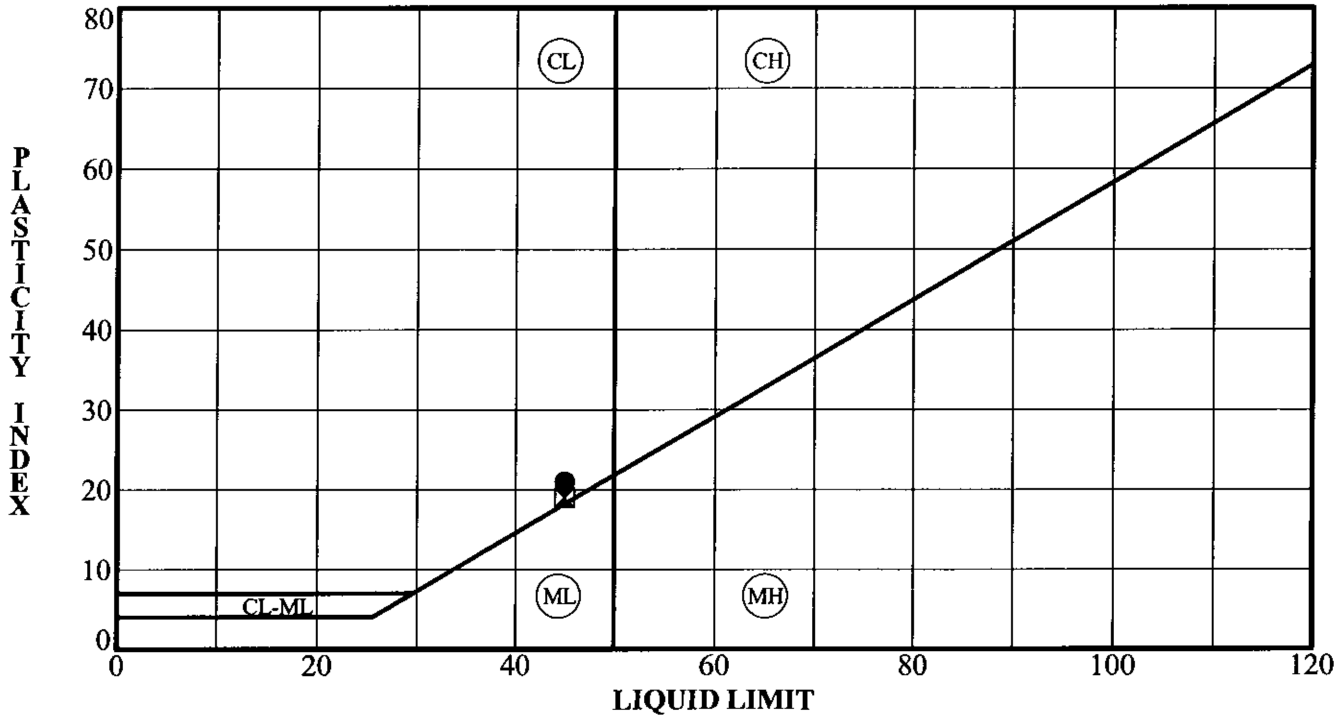
PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-29

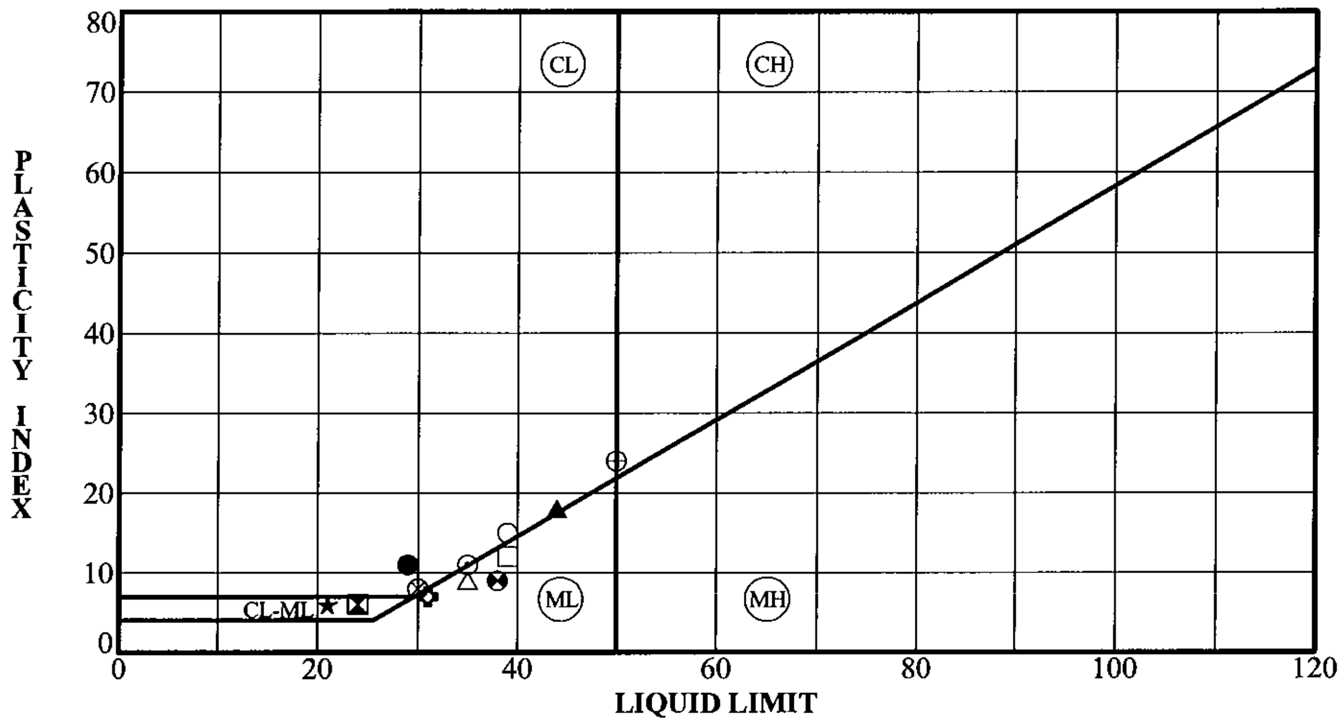
PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-56	17.3	45	21	0.195	28		CL
⊠	BH-56	32.3	45	19	0.395	34		CL

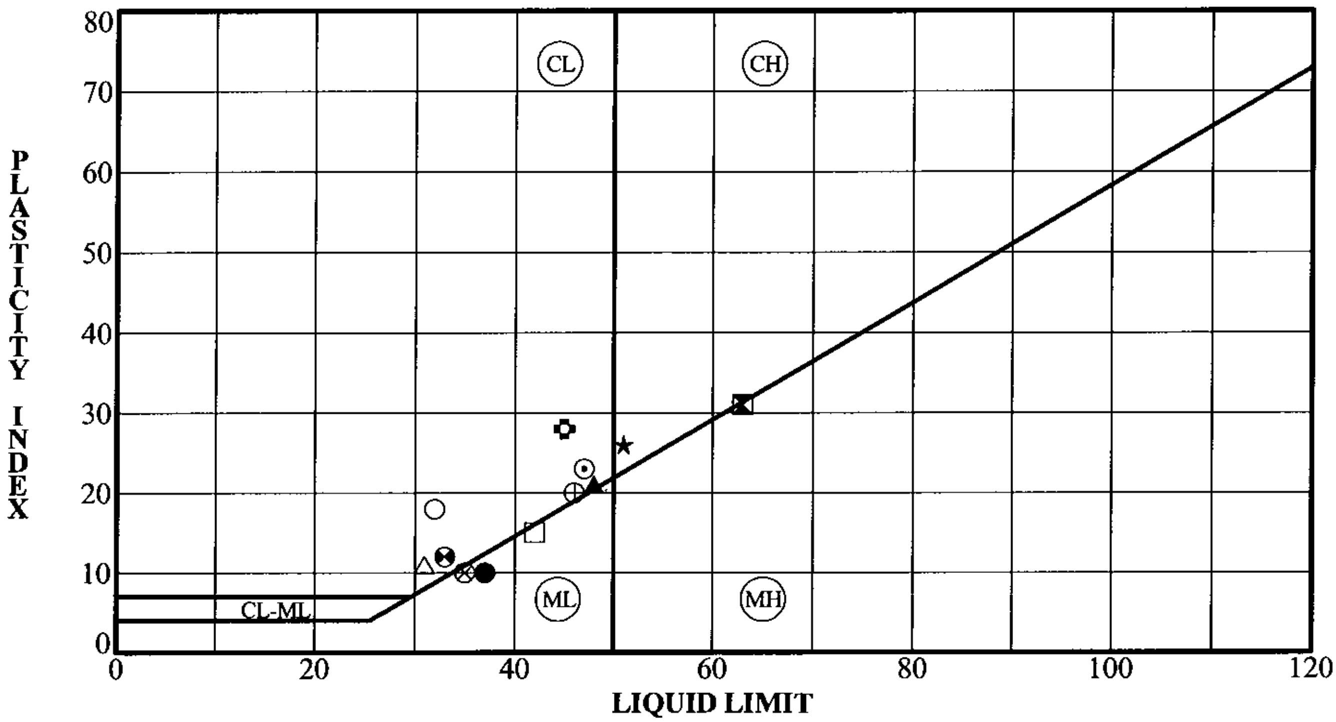
ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE
APP'D BY: Y. D. Wang		A12-30
DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
DWG FILE:		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-58	7.4	29	11	0.382	22		CL
⊠	BH-58	9.5	24	6	1.433	27		CL-ML
▲	BH-58	12.1	44	18	0.122	28		ML/CL
★	BH-58	17.5	21	6	1.083	22		CL-ML
⊙	BH-58	20.0	35	11	0.627	31		ML/CL
✪	BH-58	21.5	31	7	0.786	30		ML
○	BH-58	24.3	39	15	0.473	31		CL
△	BH-58	26.7	35	9	---	---		ML
⊗	BH-58	27.2	30	8	0.563	27		ML
⊕	BH-58	29.7	50	24	0.350	34		CL/CH
□	BH-58	31.6	39	12	-0.017	27		ML
⊗	BH-58	34.7	38	9	0.111	30		ML

PREP'D BY: APP'D BY: Y. D. Wang DATE: 17/6/05 DWG FILE:	PLASTICITY CHART AND DATA SVRT DOWNTOWN San Jose, California	FIGURE A12-31-1 PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-58	37.1	37	10	0.470	32		ML
⊠	BH-58	39.6	63	31	0.113	36		MH/CH
▲	BH-58	42.0	48	21	0.205	31		ML/CL
★	BH-58	44.4	51	26	0.242	31		CH
⊙	BH-58	47.2	47	23	0.248	30		CL
✿	BH-58	48.4	45	28	0.179	22		CL
○	BH-58	49.4	32	18	0.233	18		CL
△	BH-58	51.8	31	11	0.500	26		CL
⊗	BH-58	54.3	35	10	---	---		ML
⊕	BH-58	57.5	46	20	0.320	32		CL
□	BH-58	60.0	42	15	0.173	30		ML
⨂	BH-58	62.4	33	12	0.650	29		CL

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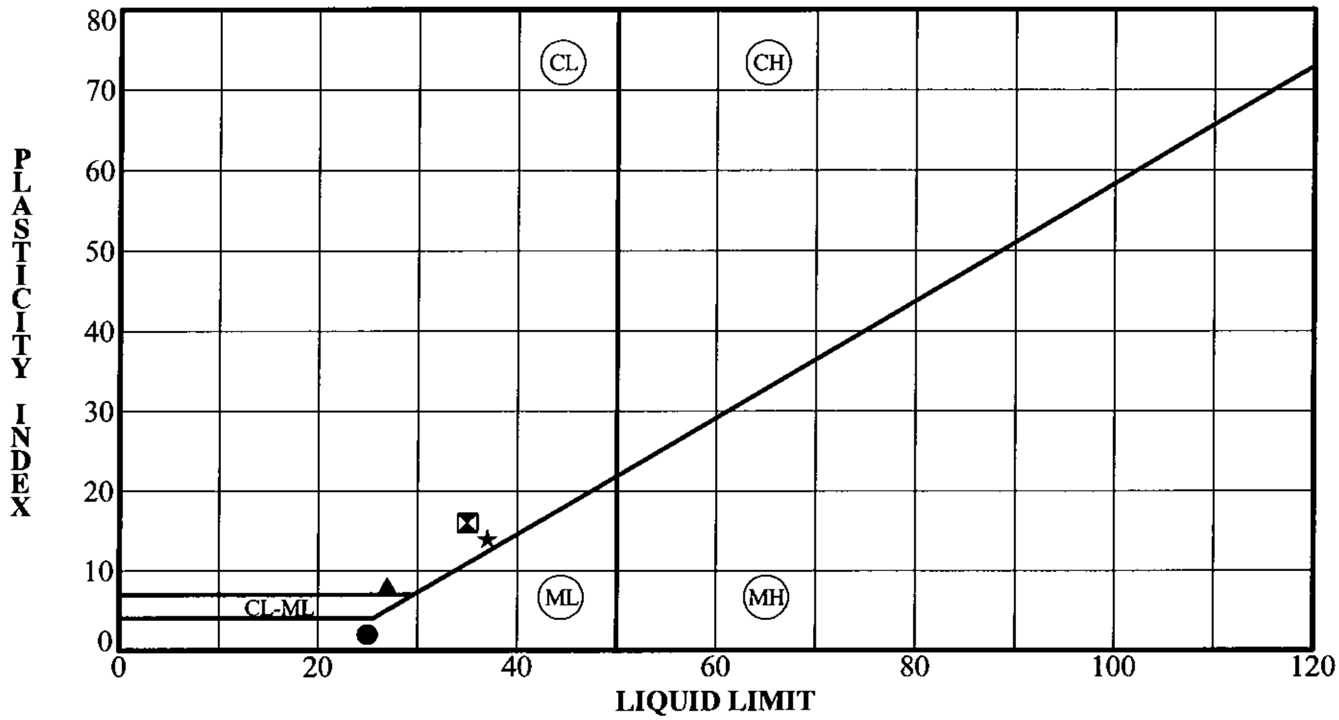
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-31-2
PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-58	64.5	25	2	1.450	26		ML
⊠	BH-58	67.5	35	16	0.463	26		CL
▲	BH-58	70.0	27	8	0.350	22		CL
★	BH-58	116.3	37	14	0.071	24		CL

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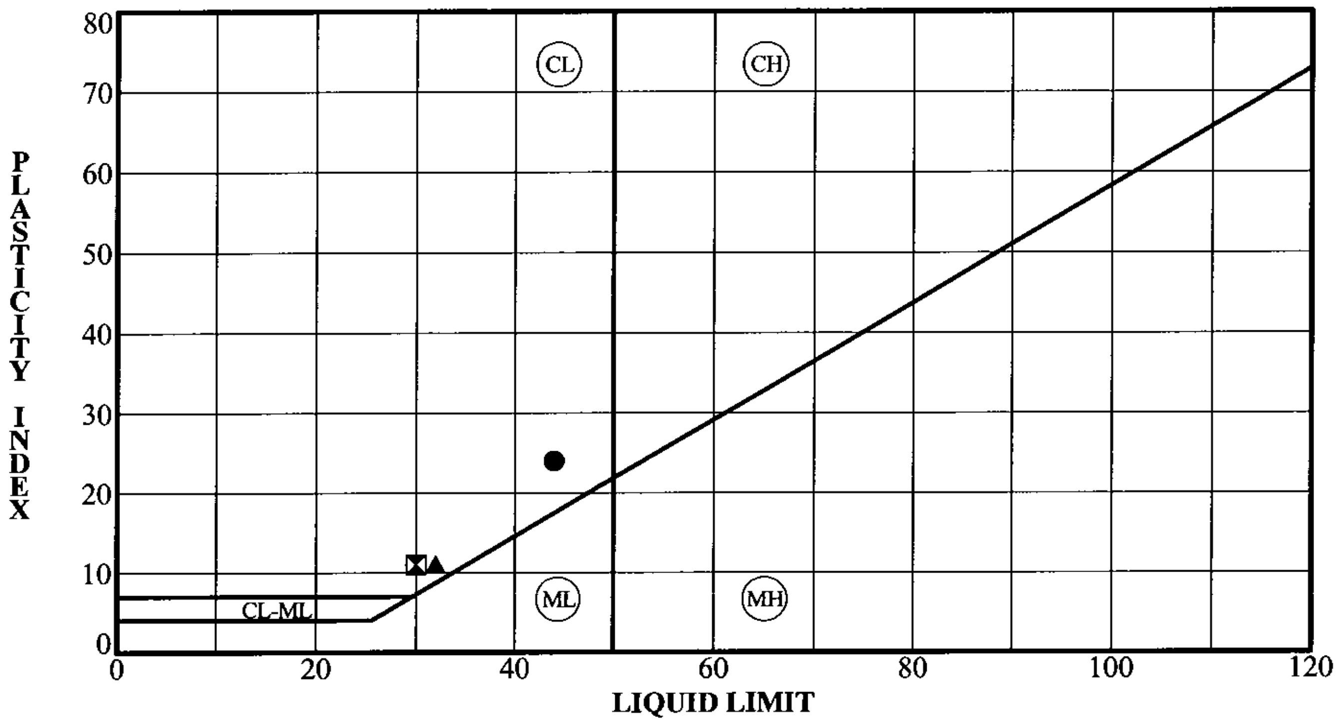
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-31-3

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-59	30.5	44	24	0.333	28		CL
⊠	BH-59	60.5	30	11	0.273	22		CL
▲	BH-59	160.5	32	11	0.091	22		CL

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APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

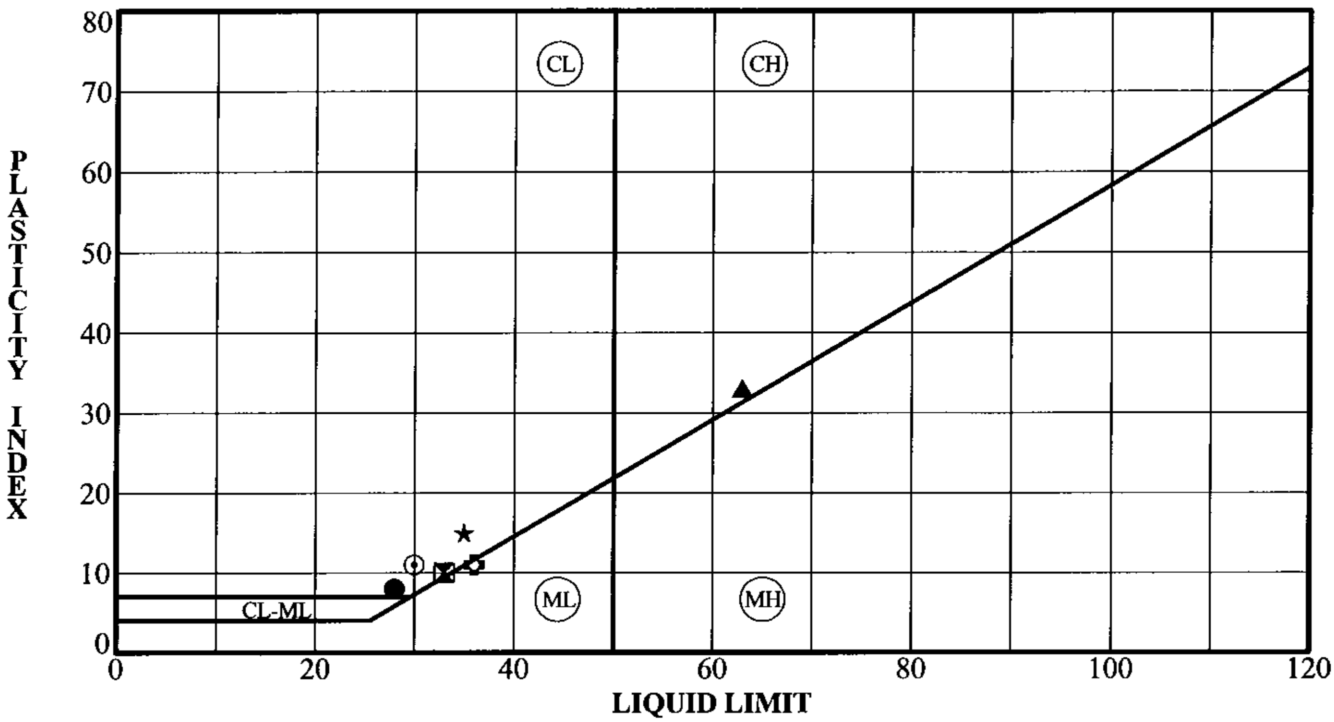
PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-32

PROJECT No.
204104.10

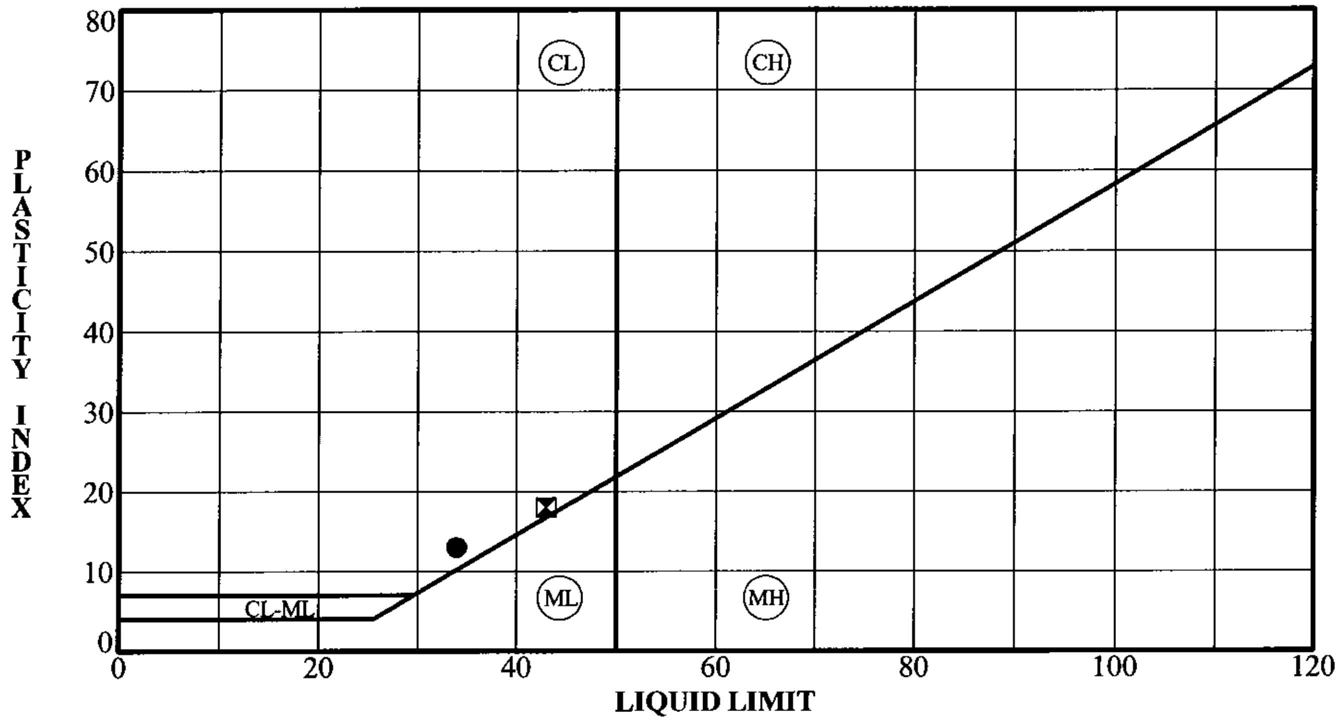
ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-60	10.0	28	8	1.413	31		CL
⊠	BH-60	32.5	33	10	0.110	24		ML/CL
▲	BH-60	42.4	63	33	0.121	34		CH
★	BH-60	62.5	35	15	0.267	24		CL
⊙	BH-60	75.0	30	11	0.409	24		CL
✪	BH-60	92.0	36	11	0.118	26		ML

ATTERBERG 204104_06_20_2005.GPJ VERSION-042904.GDT 17/6/05

	PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE
	APP'D BY: Y. D. Wang		A12-33
	DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
	DWG FILE:		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-61	72.4	34	13	0.131	23		CL
⊠	BH-61	91.9	43	18	0.133	27		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

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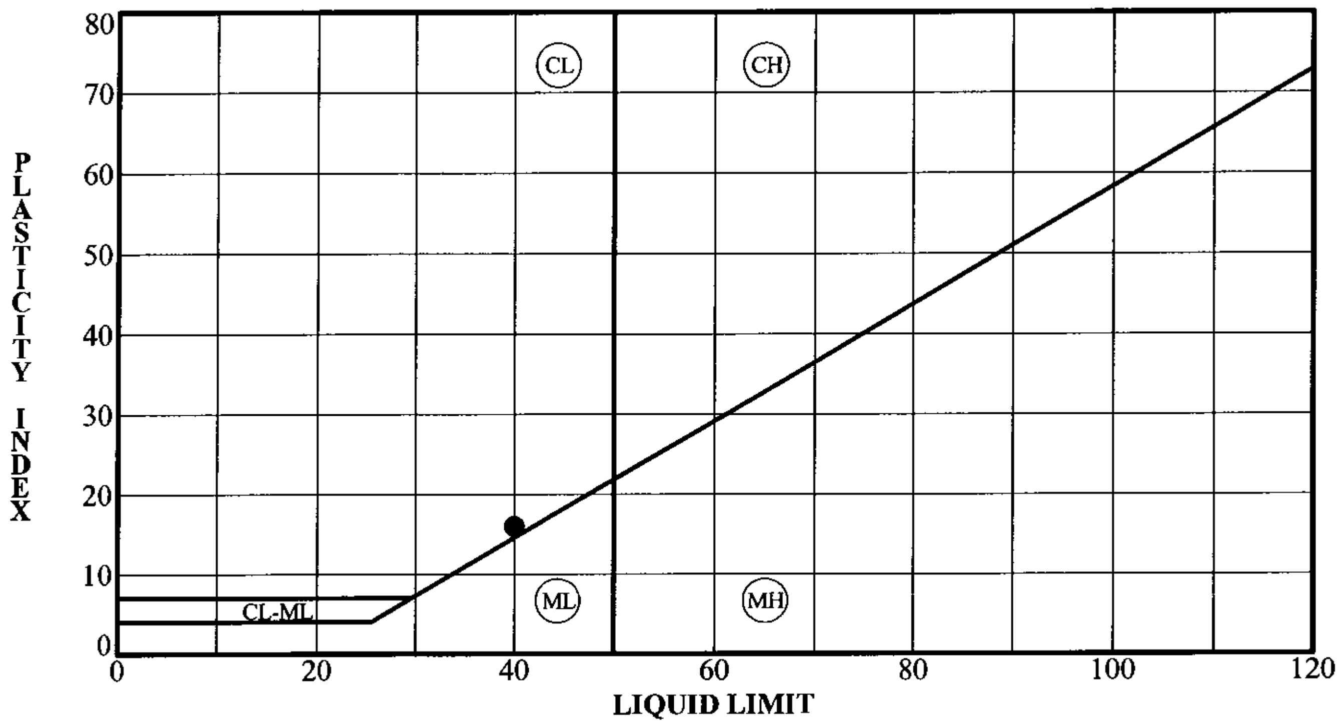
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-34

PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-62	82.2	40	16	0.294	29	98	CL

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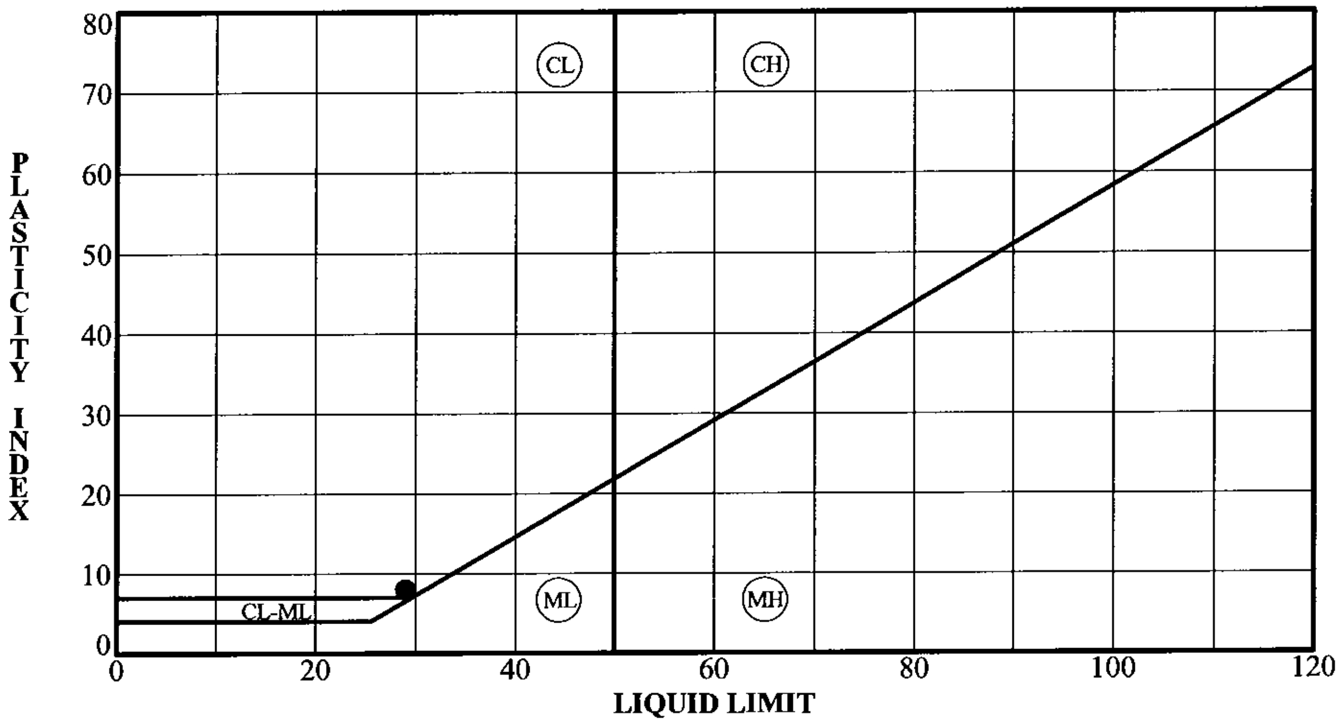
APP'D BY: Y. D. Wang	SVRT DOWNTOWN San Jose, California	A12-35
DATE: 17/6/05		PROJECT No.
DWG FILE:		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-63	91.3	29	8	-0.288	19		CL-ML

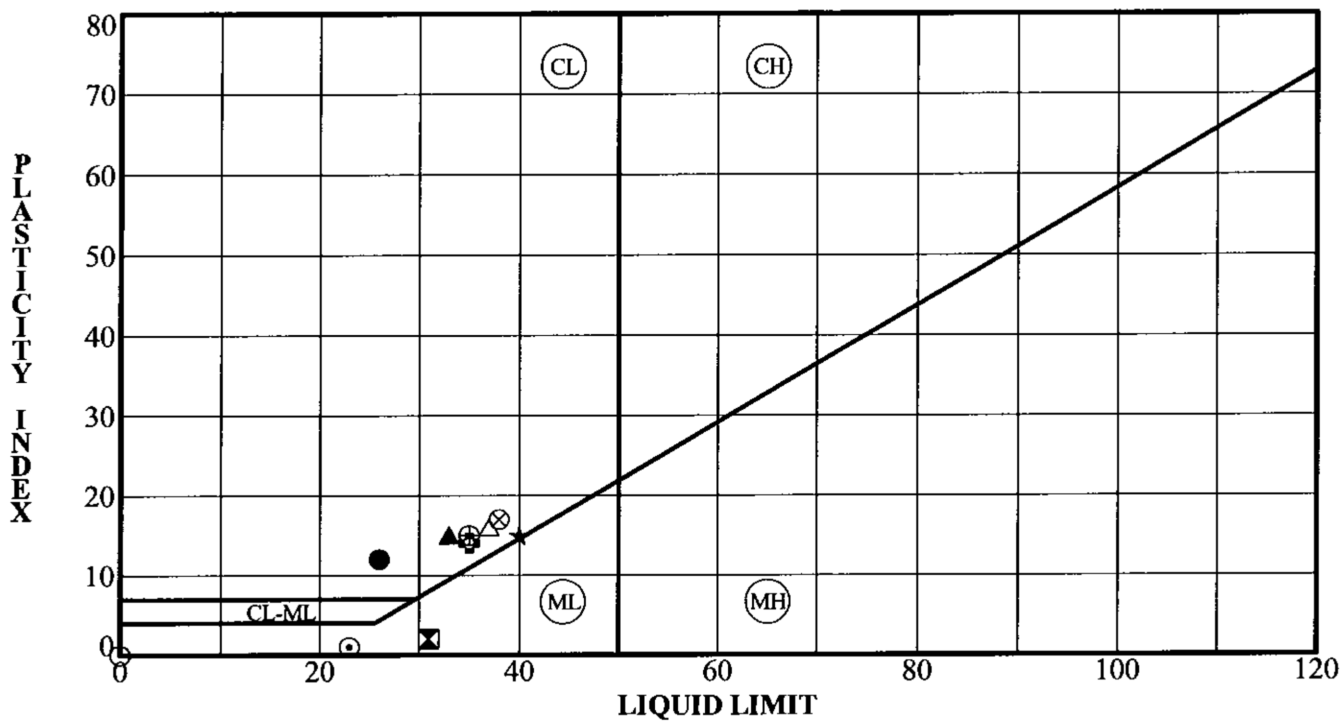
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-36

PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-64	3.8	26	12	-0.092	13		CL
⊠	BH-64	12.3	31	2	1.250	32		ML
▲	BH-64	24.8	33	15	0.567	27		CL
★	BH-64	32.5	40	15	0.840	38		CL
⊙	BH-64	52.4	23	1	-1.300	21		ML
✿	BH-64	72.5	35	14	0.229	24		CL
○	BH-64	74.0	NP	NP		9		ML
△	BH-64	107.1	37	16	0.238	25		CL
⊗	BH-64	117.4	38	17	0.371	27		CL
⊕	BH-64	136.9	35	15	0.200	23		CL

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APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

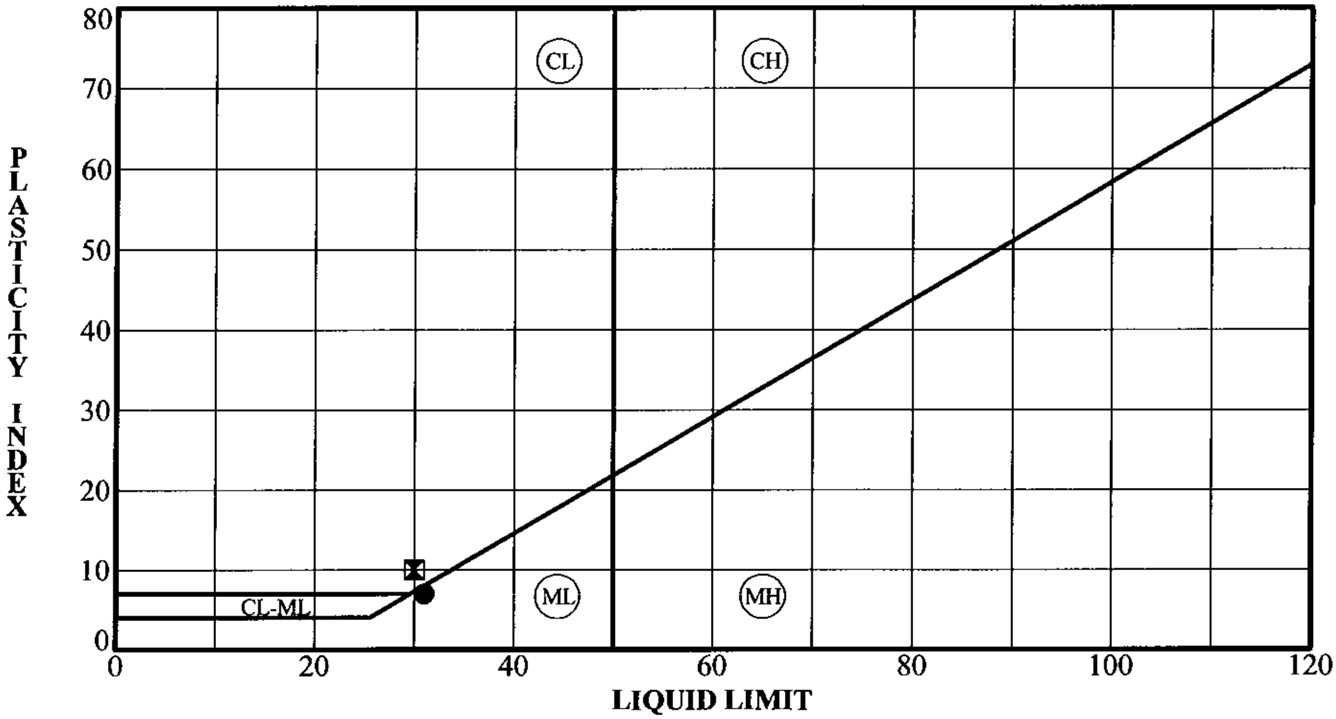
PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-37

PROJECT No.
204104.10

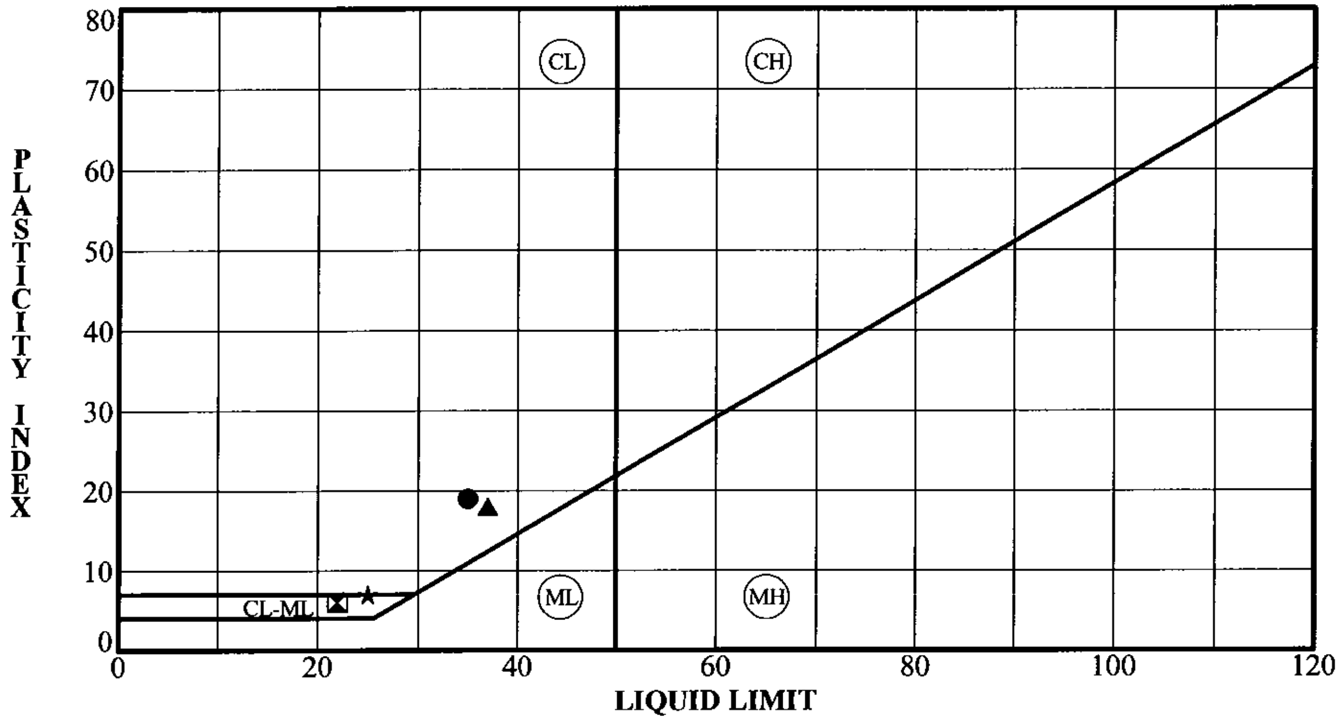
ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-65	9.5	31	7	0.729	29		ML
⊠	BH-65	32.0	30	10	0.710	27		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY: APP'D BY: Y. D. Wang DATE: 17/6/05 DWG FILE:	PLASTICITY CHART AND DATA **SVRT DOWNTOWN** **San Jose, California**	FIGURE **A12-38** PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-66	62.5	35	19	0.479	25		CL
⊠	BH-66	72.5	22	6	0.700	20		CL-ML
▲	BH-66	112.5	37	18	0.289	24		CL
★	BH-66	128.4	25	7	0.143	19		CL-ML

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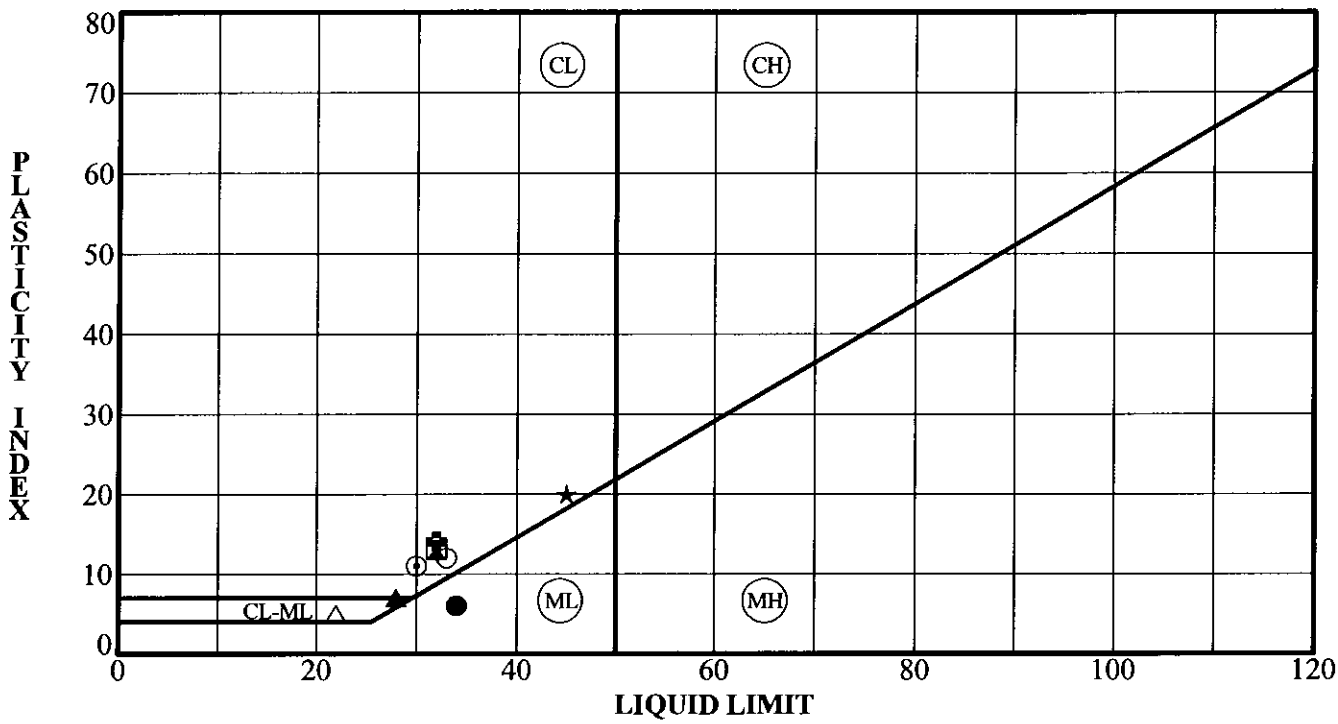
PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE
APP'D BY: Y. D. Wang	SVRT DOWNTOWN	A12-39
DATE: 17/6/05	San Jose, California	PROJECT No.
DWG FILE:		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-70	21.6	34	6	0.850	33		ML
⊠	BH-70	25.0	32	13	0.115	21		CL
▲	BH-70	26.3	28	7	0.286	23		CL-ML
★	BH-70	44.0	45	20	0.085	27		CL
⊙	BH-70	45.0	30	11	0.364	23		CL
✿	BH-70	47.5	32	14	0.571	26		CL
○	BH-70	60.0	33	12	-0.083	20		CL
△	BH-70	69.3	22	5	0.460	19		CL-ML

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DATE: 17/6/05
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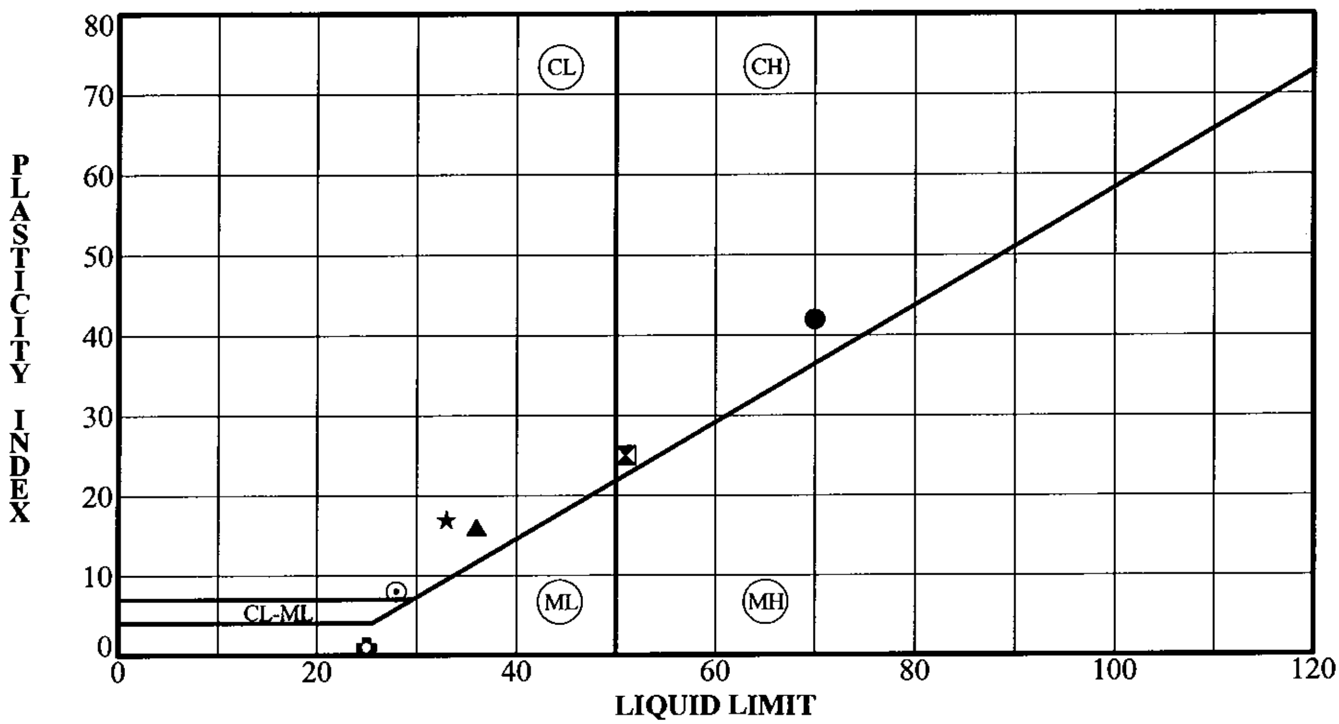
PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-40

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-71	21.0	70	42	0.269	39		OH
⊠	BH-71	42.0	51	25	0.408	36		CH
▲	BH-71	62.5	36	16	0.369	26		CL
★	BH-71	99.5	33	17	---	---		CL
⊙	BH-71	125.5	28	8	0.263	22		CL
✿	BH-71	135.2	25	1	11.200	35		ML

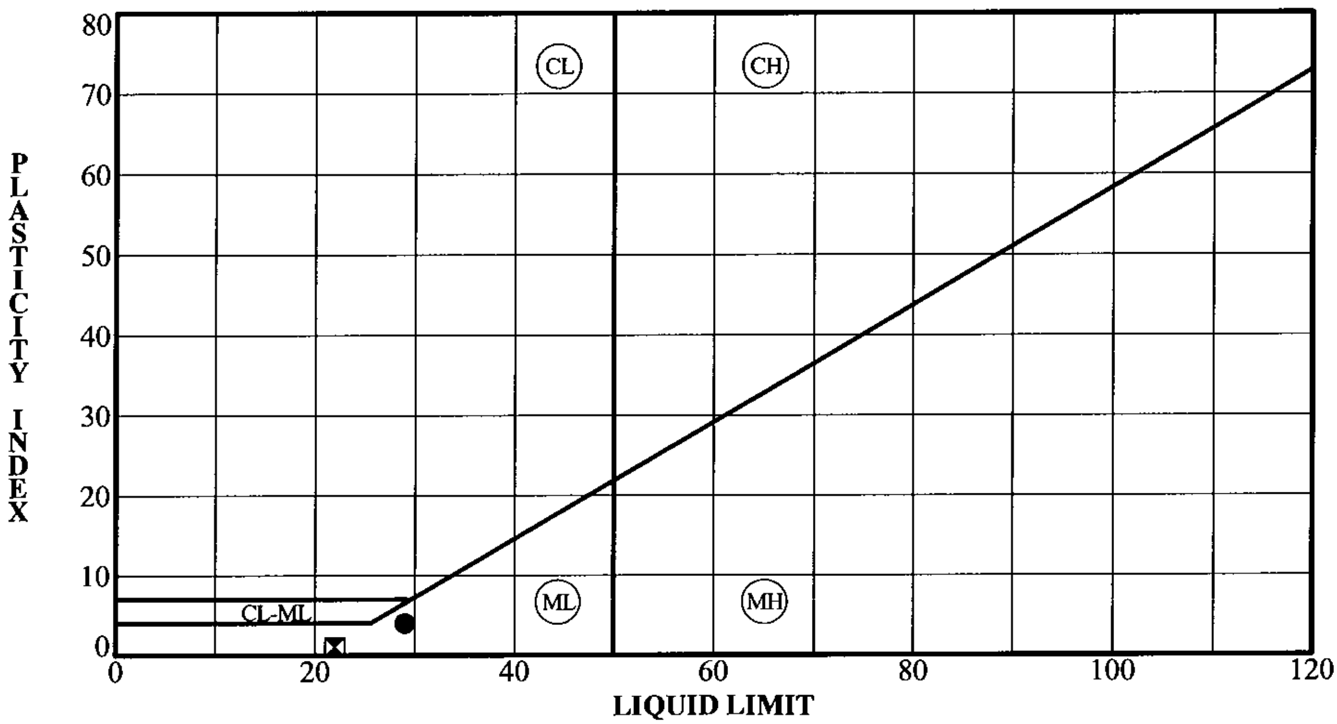
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-41

PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-73	81.7	29	4	2.200	34		ML
⊠	BH-73	112.3	22	1	0.100	21		ML

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PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

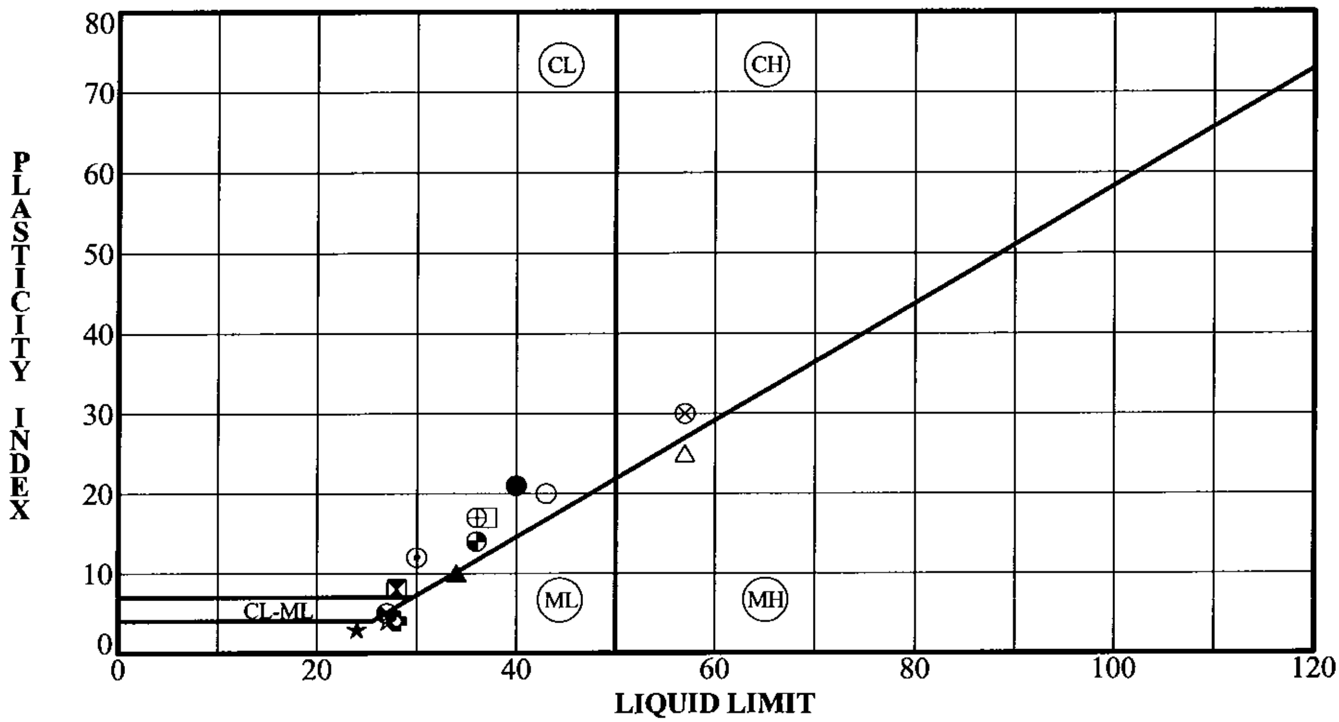
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-42

PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-74	9.4	40	21	0.333	26		CL
⊠	BH-74	11.9	28	8	-0.125	19		CL
▲	BH-74	15.0	34	10	0.110	25		ML/CL
★	BH-74	17.0	24	3	0.000	21		ML
⊙	BH-74	19.8	30	12	0.500	24		CL
✪	BH-74	22.4	28	4	0.000	24		ML
○	BH-74	24.8	43	20	0.200	27		CL
△	BH-74	26.5	57	25	0.068	34		MH
⊗	BH-74	27.5	57	30	0.200	33		CH
⊕	BH-74	29.3	36	17	0.353	25		CL
□	BH-74	31.5	37	17	0.265	25		CL
◉	BH-74	34.4	27	5	-0.200	21		CL-ML

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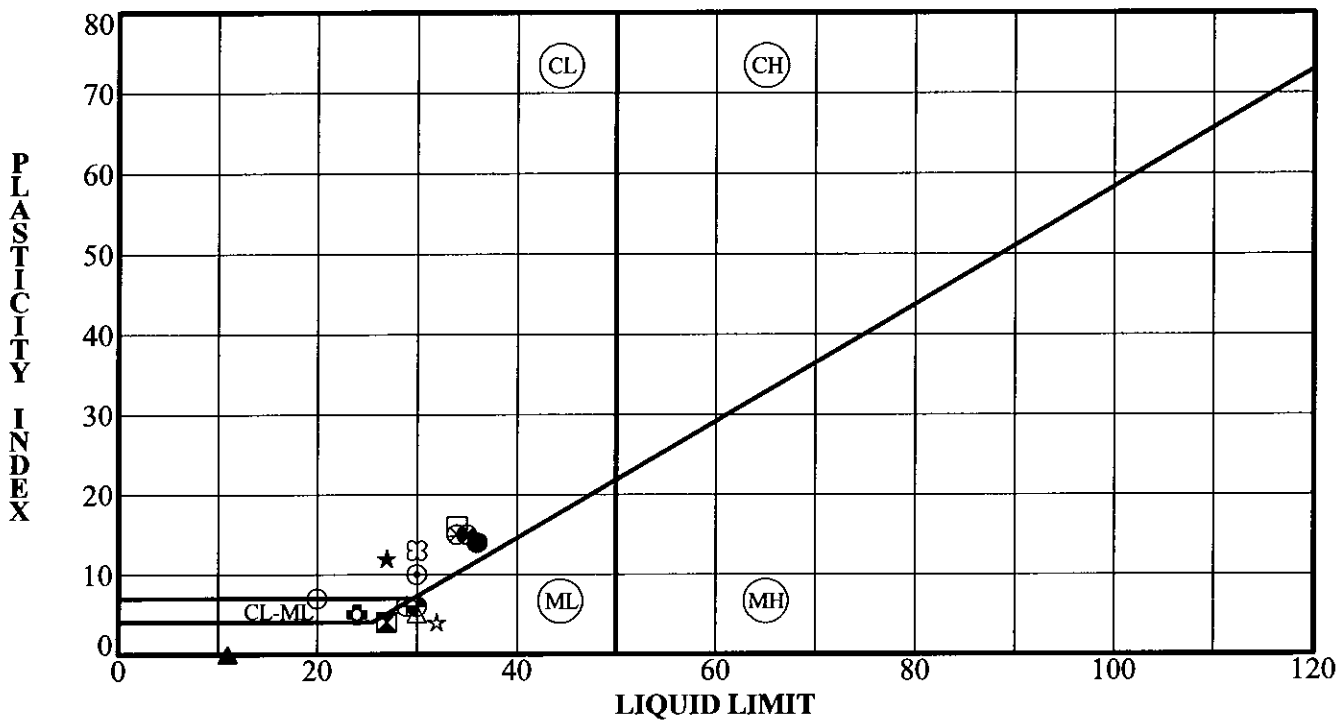
PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

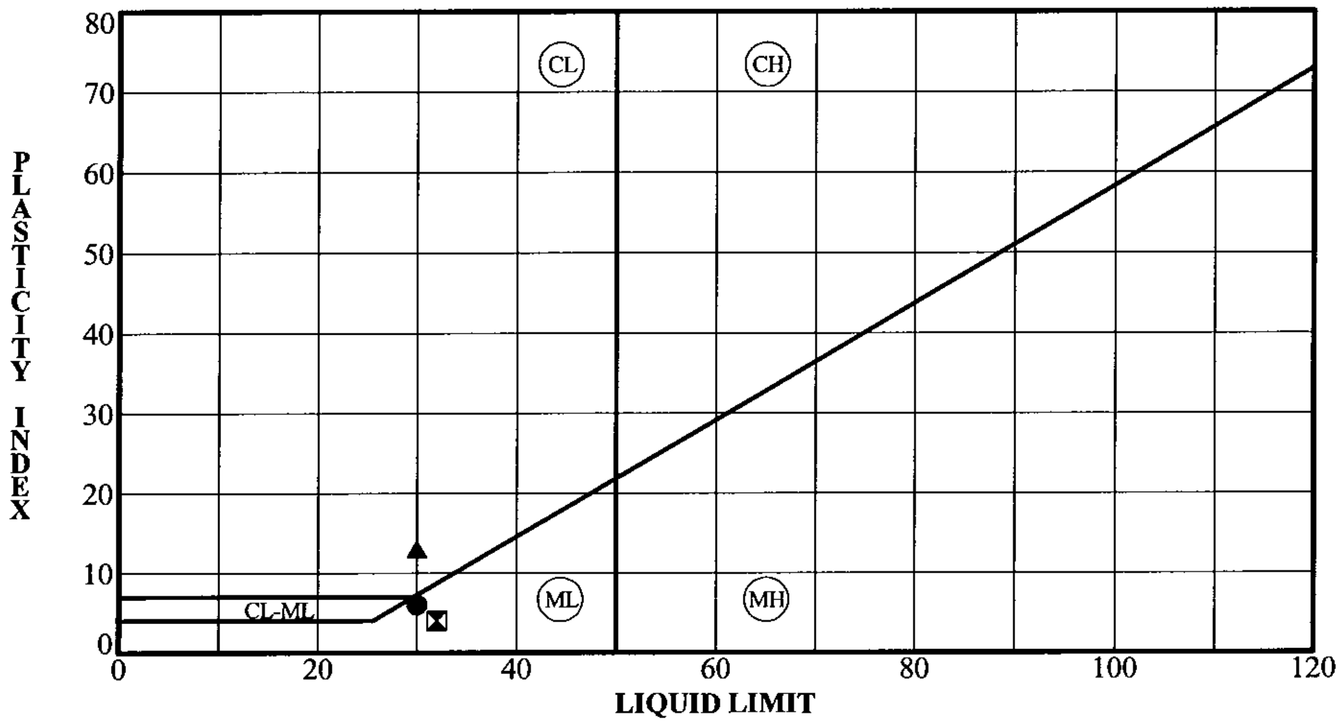
FIGURE A12-43-1

PROJECT No. 204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-74	37.2	36	14	0.429	28		CL
⊠	BH-74	39.8	27	4	-0.575	21		ML
▲	BH-74	42.2	11	NP		26		ML
★	BH-74	44.7	27	12	0.500	21		CL
⊙	BH-74	47.5	30	10	0.500	25		CL
✿	BH-74	49.0	24	5	-2.400	7		CL-ML
○	BH-74	50.0	20	7	1.000	20		CL-ML
△	BH-74	51.5	30	5	0.000	25		ML
⊗	BH-74	52.5	34	15	0.400	25		CL
⊕	BH-74	55.0	29	6	0.667	27		ML
□	BH-74	57.3	34	16	0.125	20		CL
⊛	BH-74	60.0	35	15	0.333	25		CL

PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE	
APP'D BY: Y. D. Wang		A12-43-2	
DATE: 17/6/05	SVRT DOWNTOWN	PROJECT No.	
DWG FILE:	San Jose, California	204104.10	



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-74	62.4	30	6	-0.833	19		ML
⊠	BH-74	63.6	32	4	0.825	31		ML
▲	BH-74	77.4	30	13	0.462	23		CL

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DATE: 17/6/05
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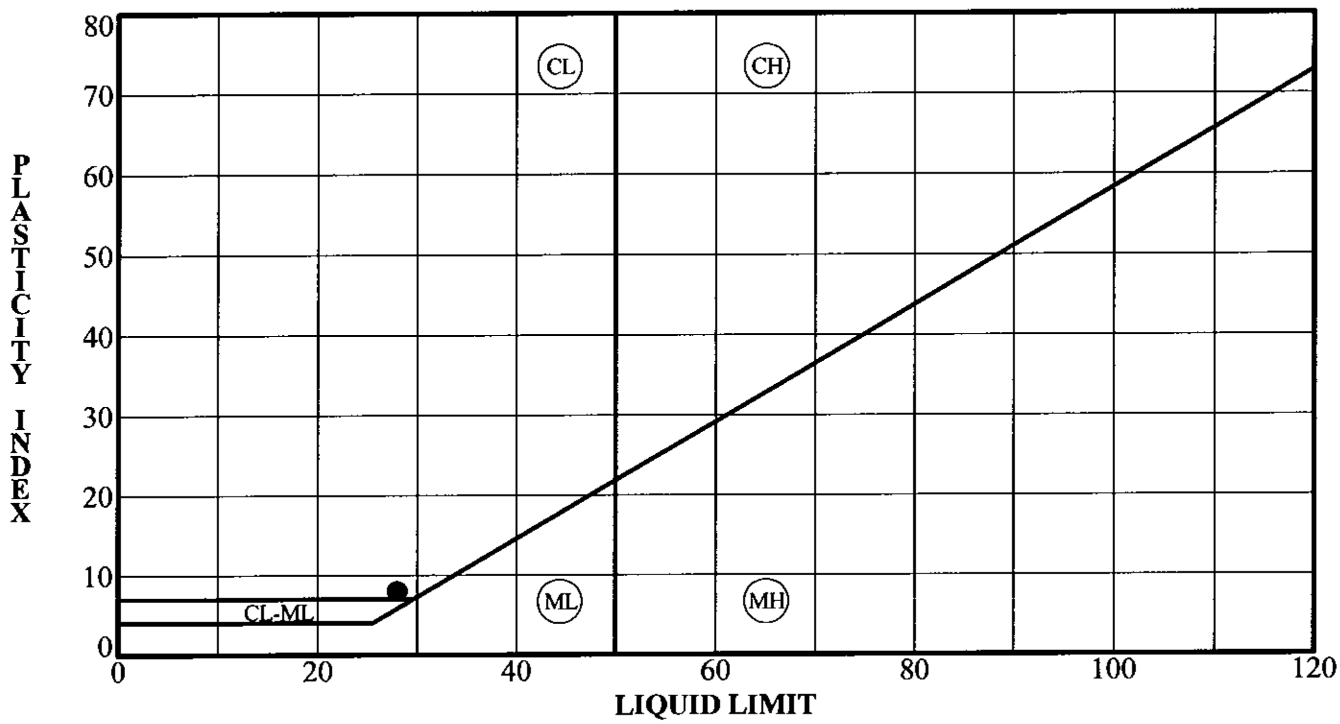
PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-43-3
PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-76	87.5	28	8	0.100	21		CL

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PREP'D BY:
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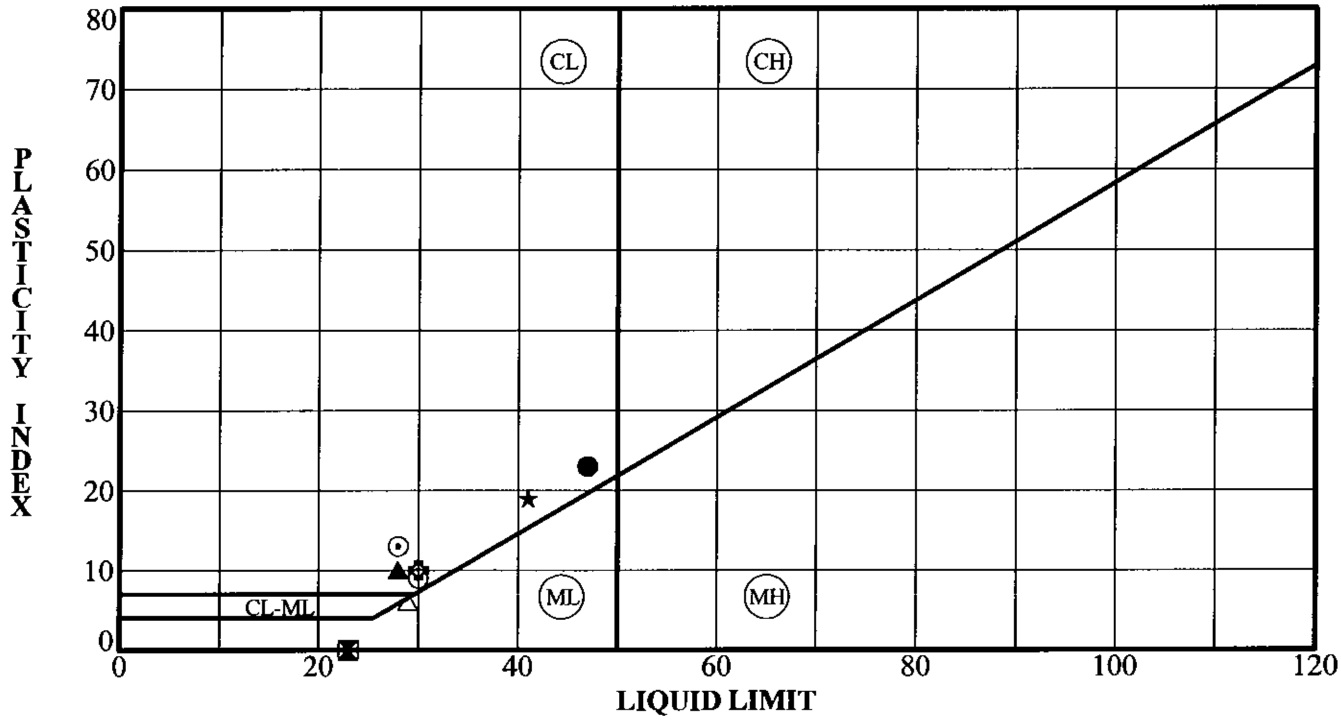
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-44

PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-77	11.0	47	23	0.730	41		CL
⊠	BH-77	16.5	23	NP		26		ML
▲	BH-77	28.0	28	10	0.310	21		CL
★	BH-77	33.0	41	19	0.484	31		CL
⊙	BH-77	40.5	28	13	0.215	18		CL
✿	BH-77	71.6	30	10	-0.030	20		CL
○	BH-77	102.0	30	9	0.667	27		CL
△	BH-77	132.5	29	6	-1.250	16		ML

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

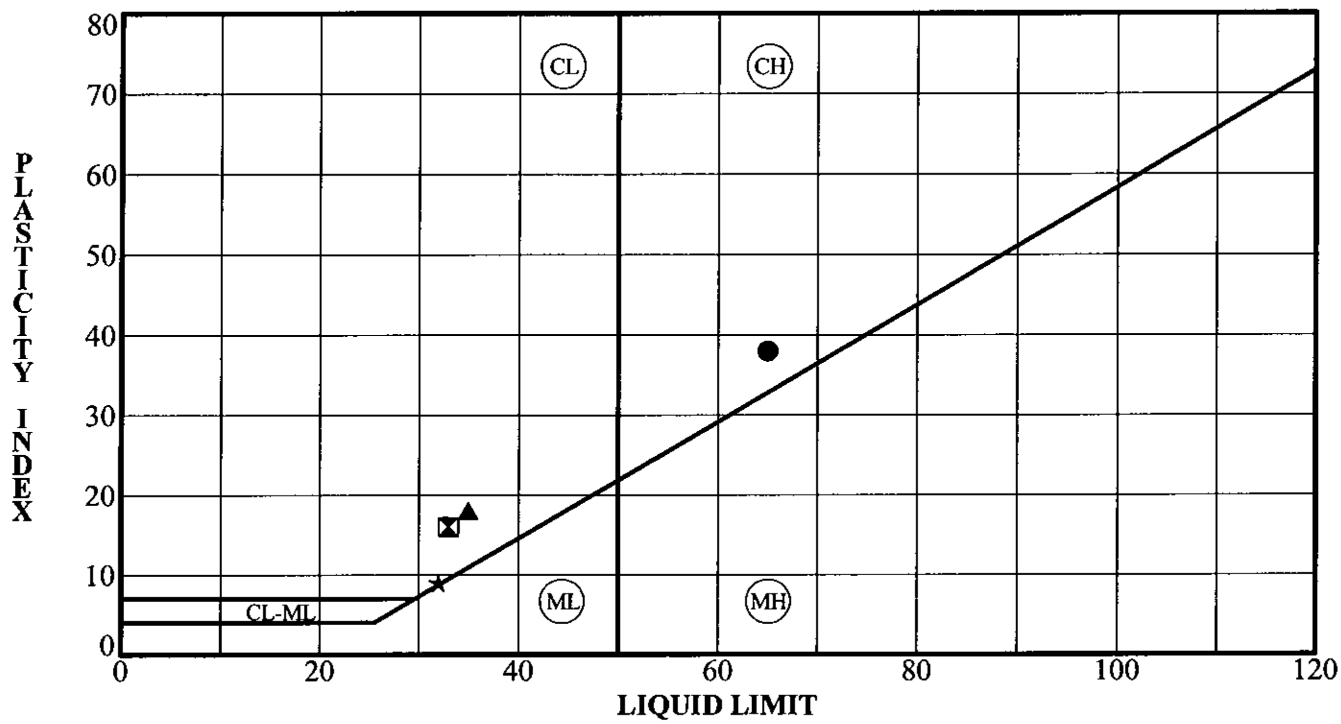
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-45

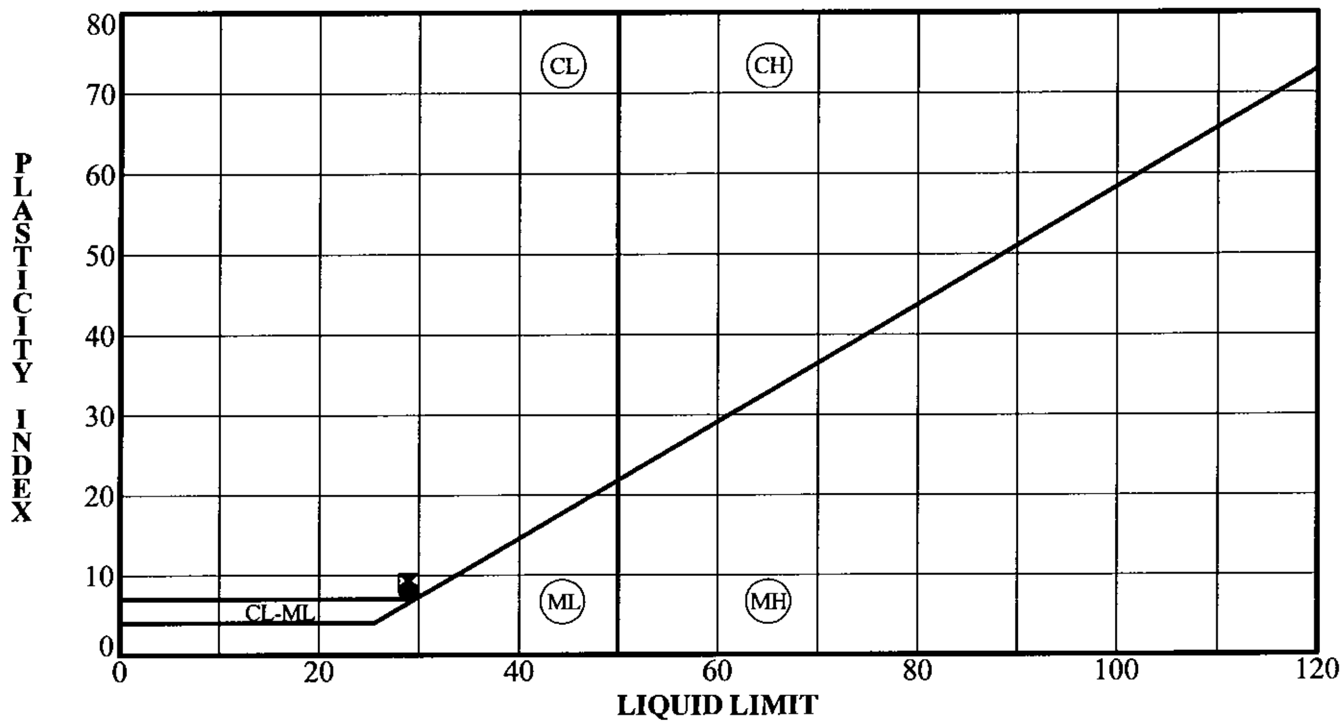
PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-79	22.5	65	38	0.282	38		CH
⊠	BH-79	62.4	33	16	0.519	25		CL
▲	BH-79	82.5	35	18	0.344	23		CL
★	BH-79	132.3	32	9	0.200	25		ML/CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:	PLASTICITY CHART AND DATA	FIGURE
APP'D BY: Y. D. Wang	SVRT DOWNTOWN San Jose, California	A12-46
DATE: 17/6/05		PROJECT No.
DWG FILE:		204104.10



Key Symbol	Boring No.	Depth (Feet)	Liquid Limit	Plasticity Index	Liquidity Index	Water Content (%)	% Passing #200 Sieve	USCS
●	BH-80	50.2	29	8	0.400	24		CL
⊠	BH-80	68.5	29	9	0.300	23		CL

ATTERBERG 204104 06 20 2005.GPJ VERSION-042904.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

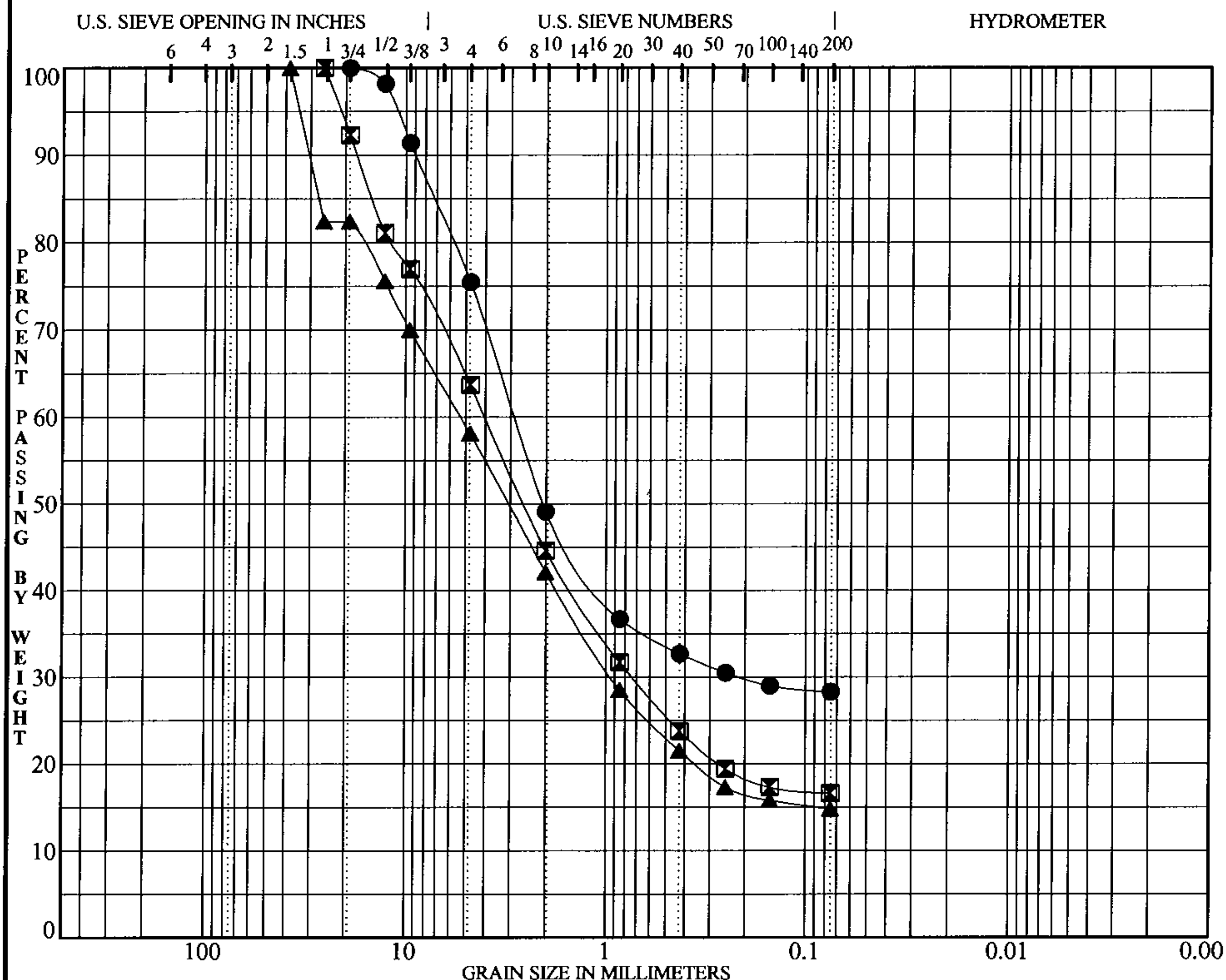
DWG FILE:

PLASTICITY CHART AND DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-47**

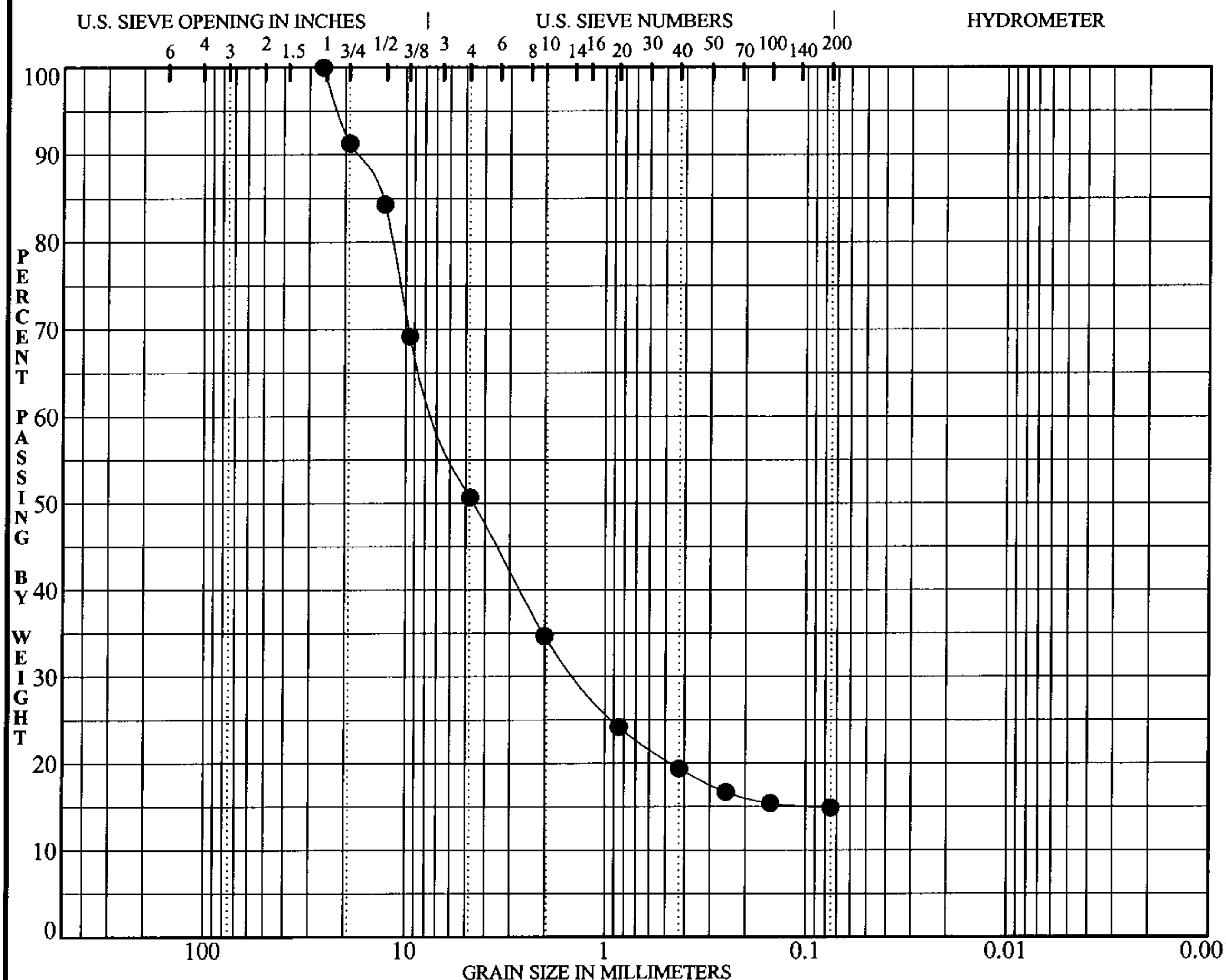
PROJECT No. 204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-01	46.8	28	76	Clayey SAND with gravel (SC)	SC
⊠	BH-01	51.3	17	64	Clayey SAND with gravel (SC)	SC
▲	BH-01	60.9	15	58	Clayey SAND with gravel (SC)	SC

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-48
DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
DWG FILE:		204104.10

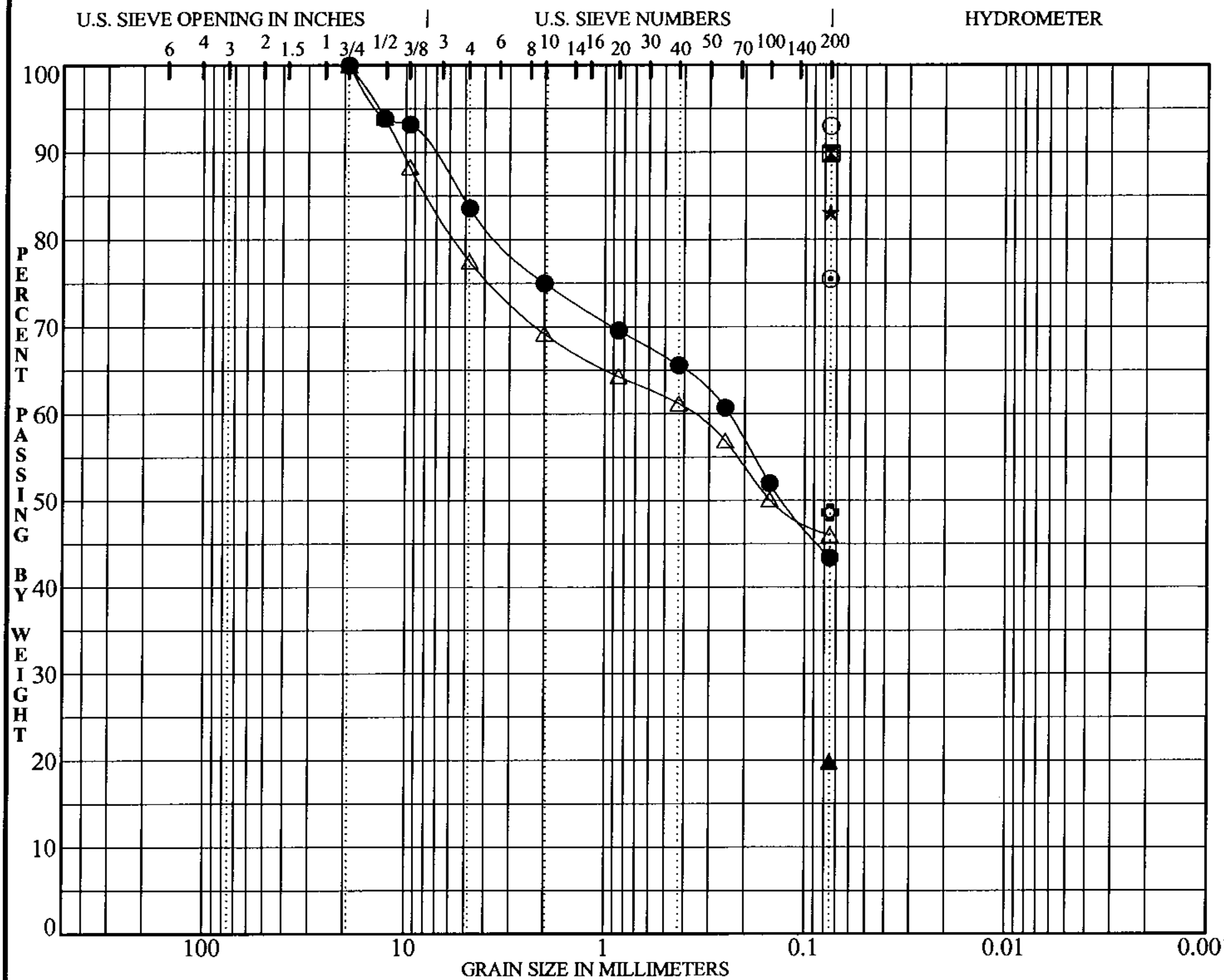


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-02	51.8	15	51	Clayey GRAVEL with sand (GC)	GC

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-49
DATE: 17/6/05	SVRT DOWNTOWN	PROJECT No.
DWG FILE:	San Jose, California	204104.10

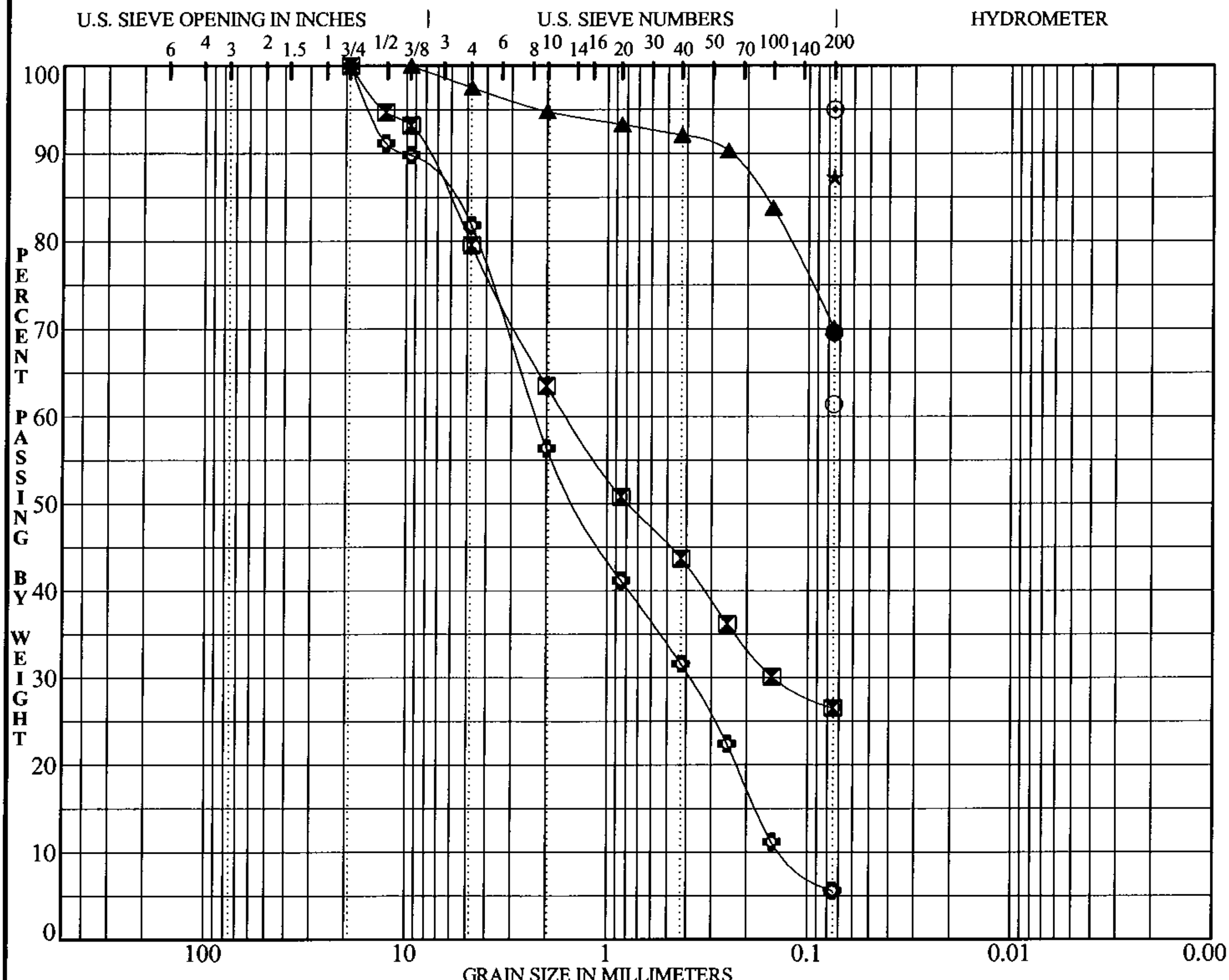


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-03	37.5	43	84	Clayey SAND with gravel (SC)	SC
⊠	BH-03	49.4	90		Lean CLAY (CL)	CL
▲	BH-03	49.9	20		Silty SAND with gravel (SM)	SM
★	BH-03	54.0	83		Lean CLAY with sand (CL)	CL
⊙	BH-03	56.3	76		Lean CLAY with sand (CL)	CL
⊕	BH-03	57.0	49		Clayey SAND to Sandy Lean CLAY (SC/CL)	SC/CL
○	BH-03	58.0	93		Lean CLAY (CL)	CL
△	BH-03	59.5	46	78	Clayey SAND with gravel (SC)	SC

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA		FIGURE
APP'D BY: Y. D. Wang			A12-50-1
DATE: 17/6/05	SVRT DOWNTOWN	San Jose, California	PROJECT No.
DWG FILE:			204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-03	64.0	70		Silty CLAY with sand (CL-ML)	CL-ML
⧗	BH-03	64.5	27	80	Silty SAND with gravel (SM)	SM
▲	BH-03	65.0	70	98	Silty CLAY with sand (CL-ML)	CL-ML
★	BH-03	66.9	87		Silty CLAY (CL-ML)	CL-ML
⊙	BH-03	69.3	95		Silty CLAY (CL-ML)	CL-ML
✿	BH-03	74.8	6	82	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
○	BH-03	89.8	61		Sandy SILT (ML)	ML

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

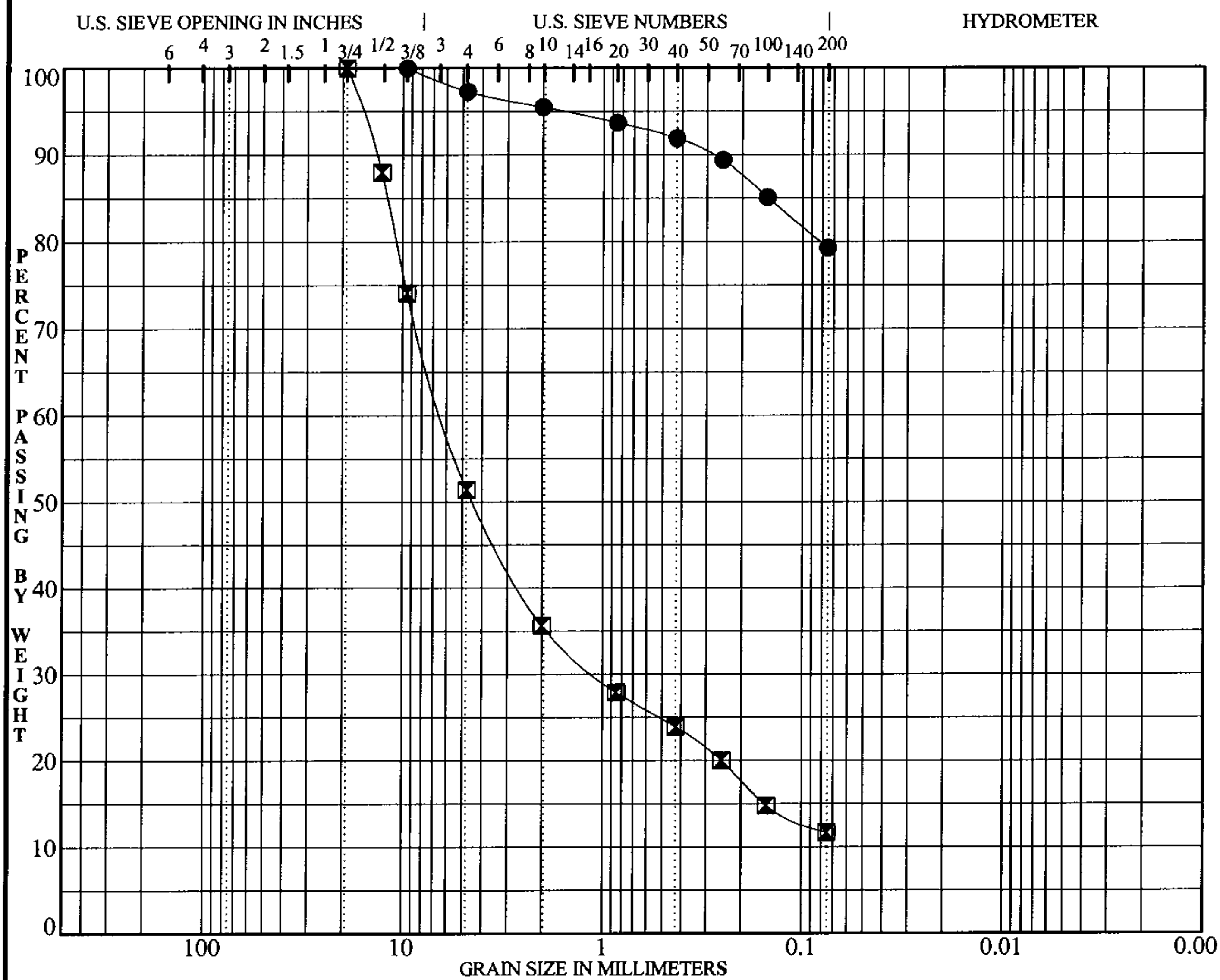
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-50-2**

PROJECT No. 204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

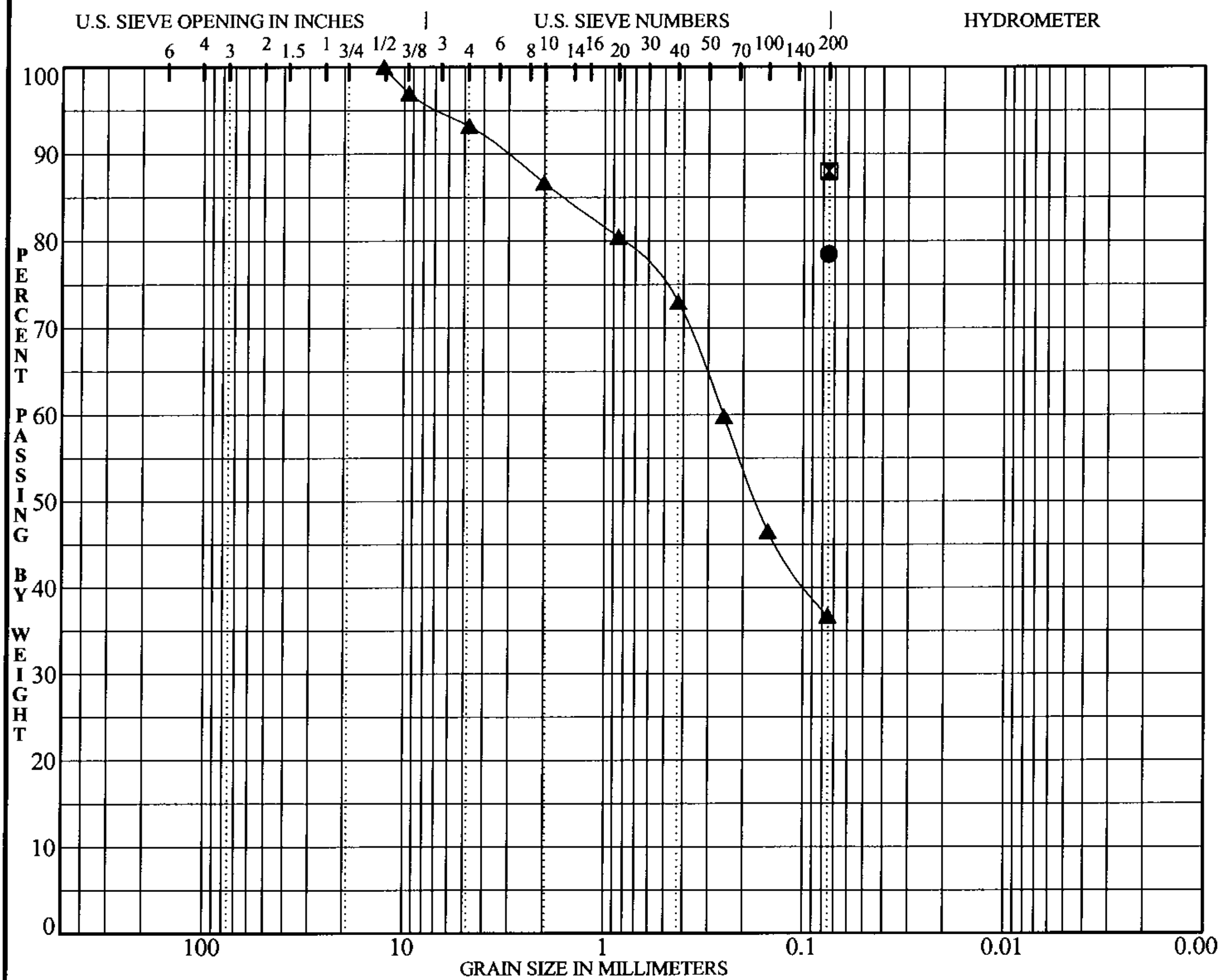


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-04	50.5	79	97	Fat CLAY with sand (CH)	CH
⊠	BH-04	81.2	12	51	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-51
DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
DWG FILE:		204104.10

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-05	47.5	79		Lean CLAY with sand (CL)	CL
⊠	BH-05	62.5	88		Lean CLAY (CL)	CL
▲	BH-05	67.3	37	93	Clayey SAND (SC)	SC

GRADATION_B 204104_06_20 2005.GPJ STD.GDT 17/6/05

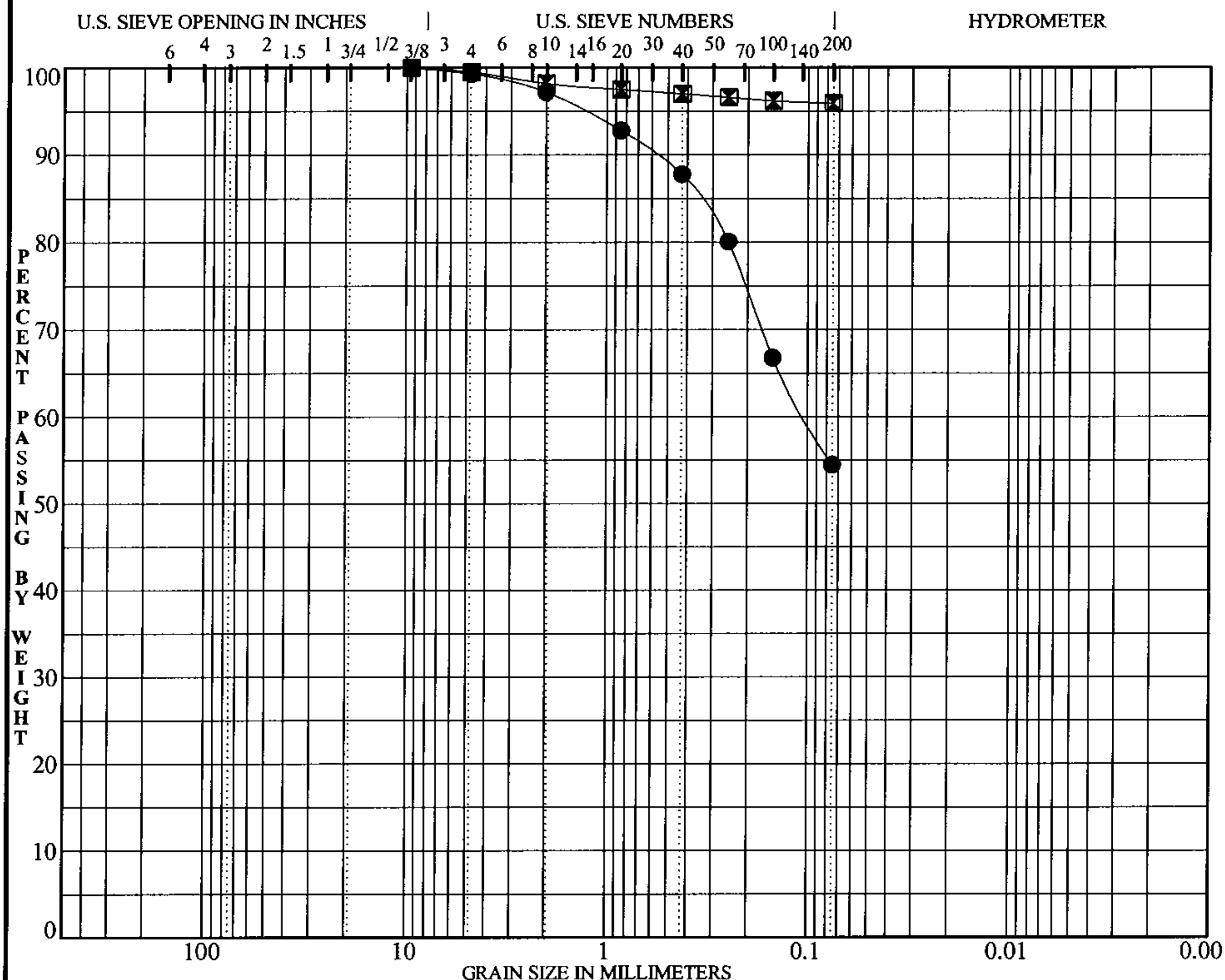
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-52

PROJECT No. 204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-06	52.3	55	99	Sandy SILT (ML)	ML
⊠	BH-06	77.0	96	100	Silty CLAY (CL-ML)	CL-ML

GRADATION_B 204104 06 20 2005.GPJ STD.GDT 17/6/05

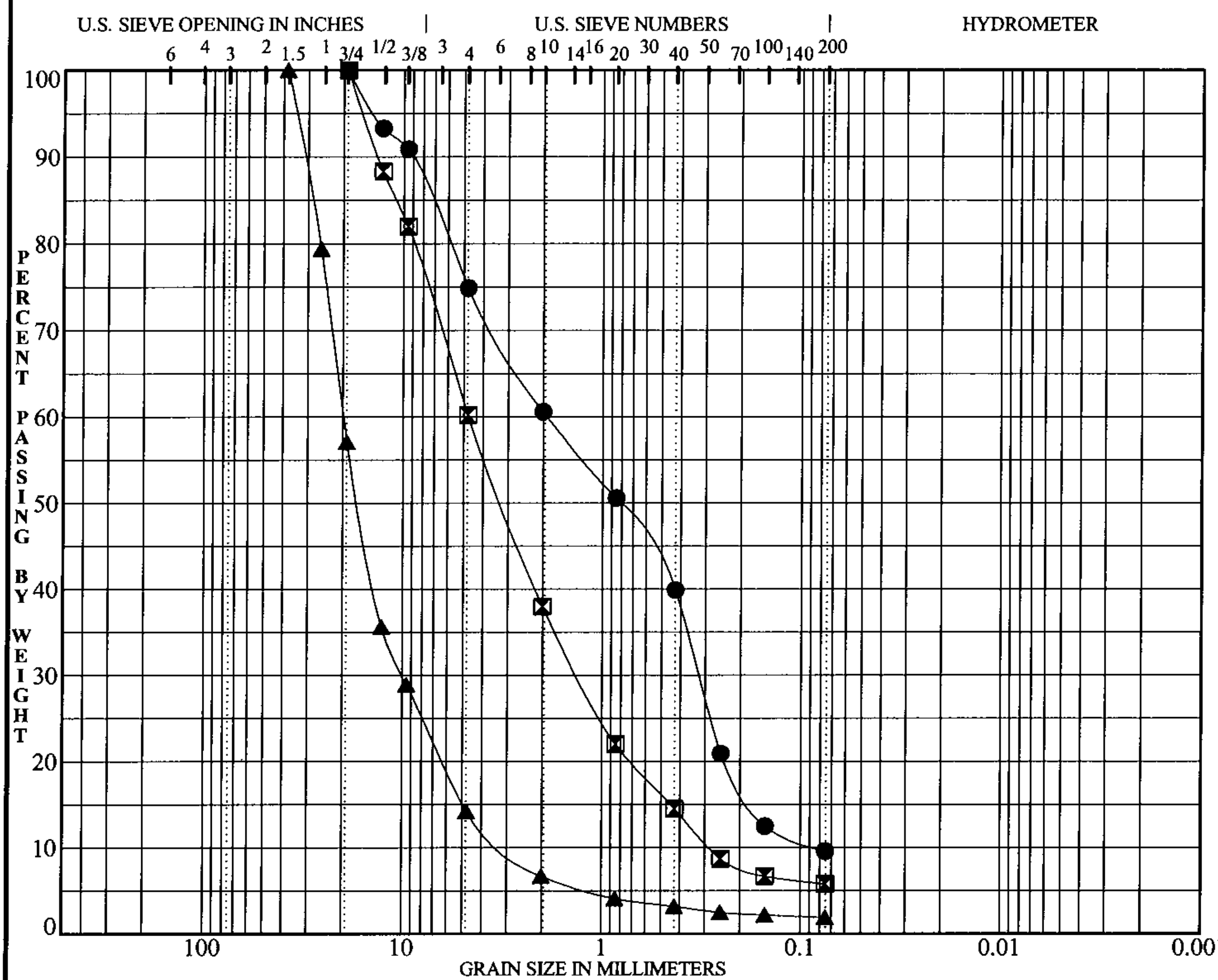
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-53

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-07	65.5	10	75	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
⊠	BH-07	70.5	6	60	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
▲	BH-07	80.8	2	14	Well-graded GRAVEL (GW)	GW

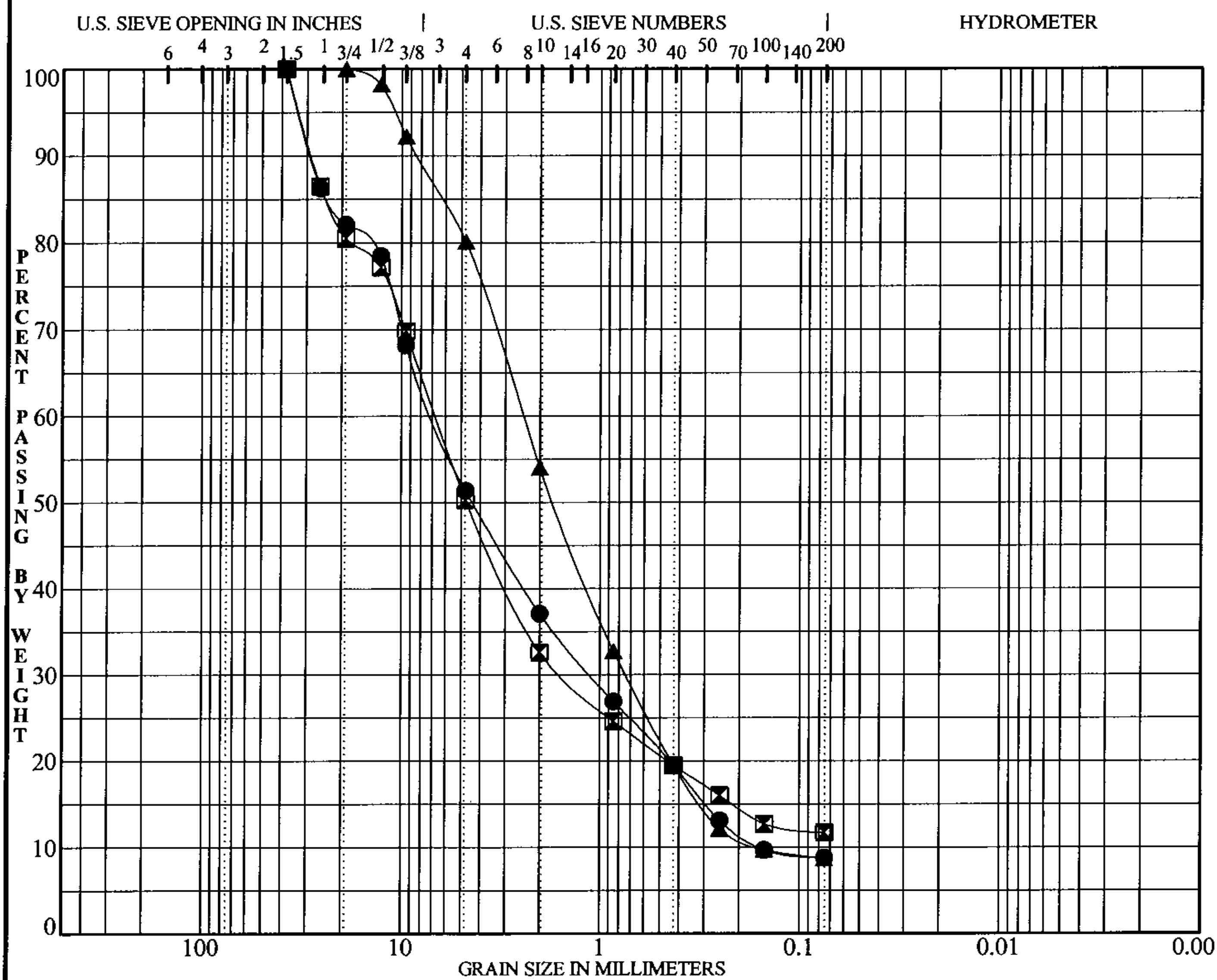
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-54**

PROJECT No. 204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-08	76.2	9	51	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
⊠	BH-08	81.2	12	50	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
▲	BH-08	85.8	9	80	Well-graded SAND with silt and gravel (SW-SM)	SW-SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

DWG FILE:

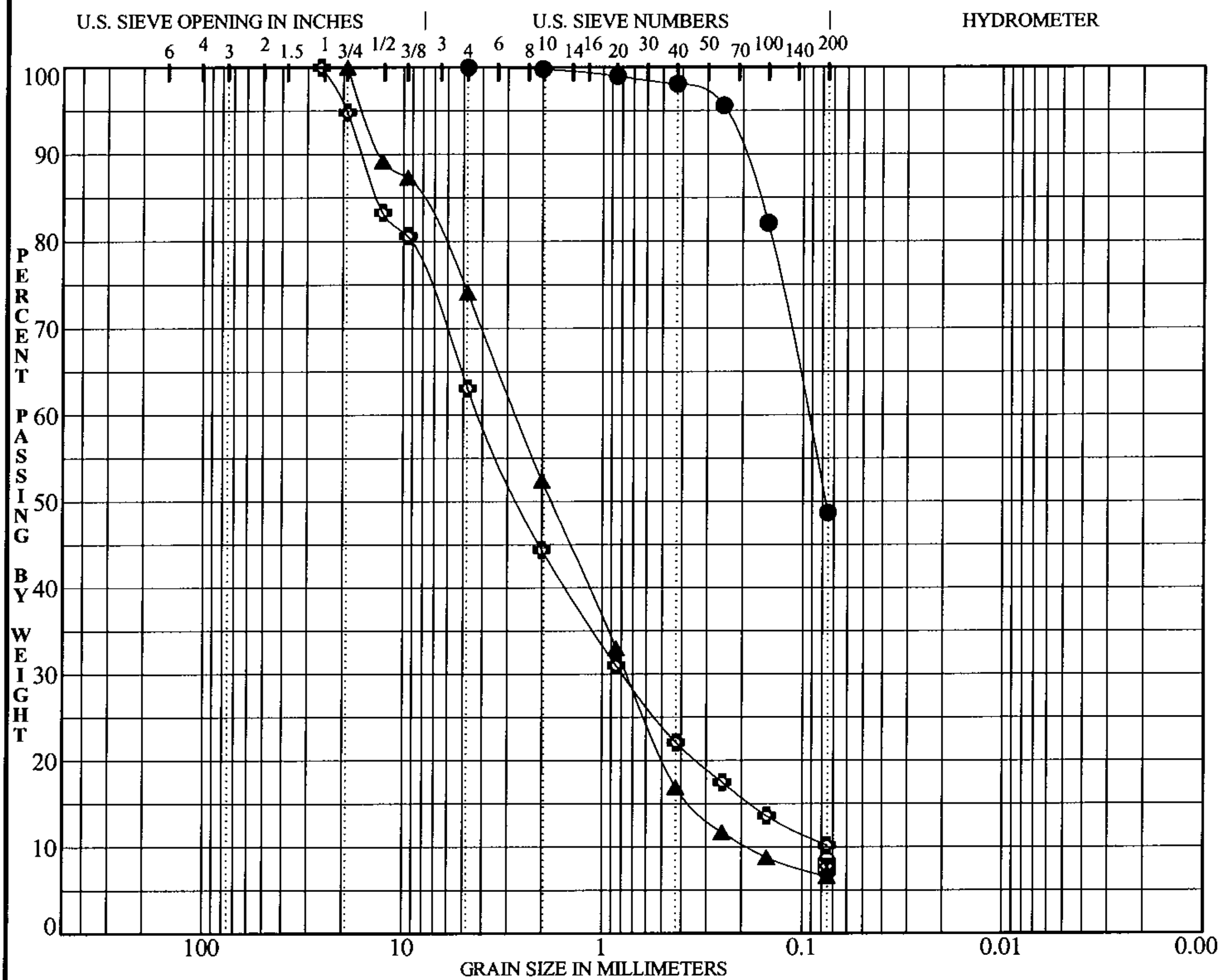
GRADATION TEST DATA

SVRT DOWNTOWN

San Jose, California

FIGURE **A12-55**

PROJECT No. 204104.10

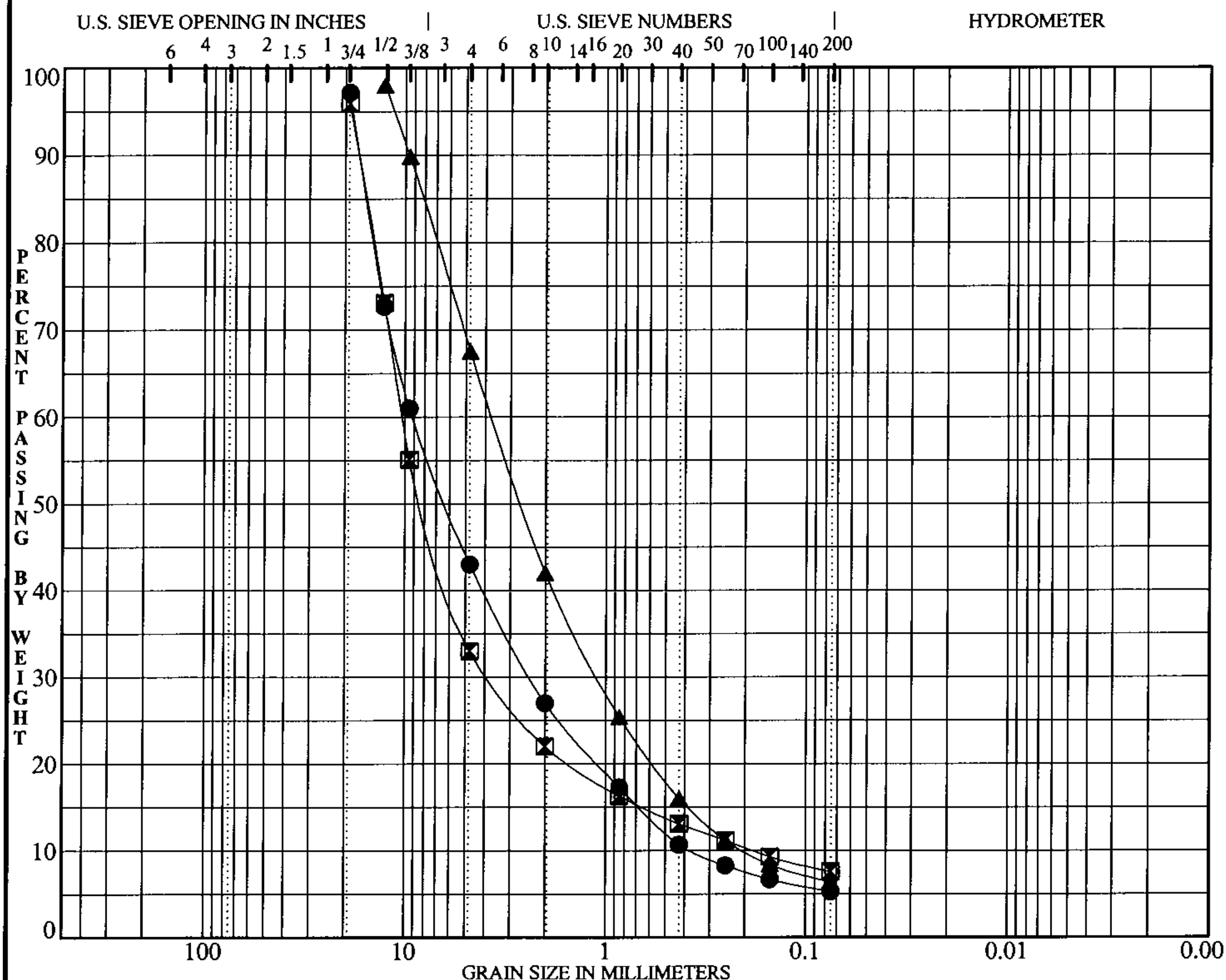


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-09	66.0	49	100	Silty SAND to Sandy SILT (SM/ML)	SM/ML
⧗	BH-09	71.3	8		Well-graded SAND with silt and gravel (SW-SM)	SW-SM
▲	BH-09	75.8	7	74	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
★	BH-09	81.0	7		Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊙	BH-09	86.0	7		Well-graded SAND with silt and gravel (SW-SM)	SW-SM
✿	BH-09	90.8	10	63	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
○	BH-09	96.0	8		Well-graded SAND with silt and gravel (SW-SM)	SW-SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang	SVRT DOWNTOWN San Jose, California	A12-56
DATE: 17/6/05		PROJECT No.
DWG FILE:		204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-10	69.5	5	43	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
⊠	BH-10	79.5	8	33	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
▲	BH-10	89.8	6	68	Well-graded SAND with silt and gravel (SW-SM)	SW-SM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

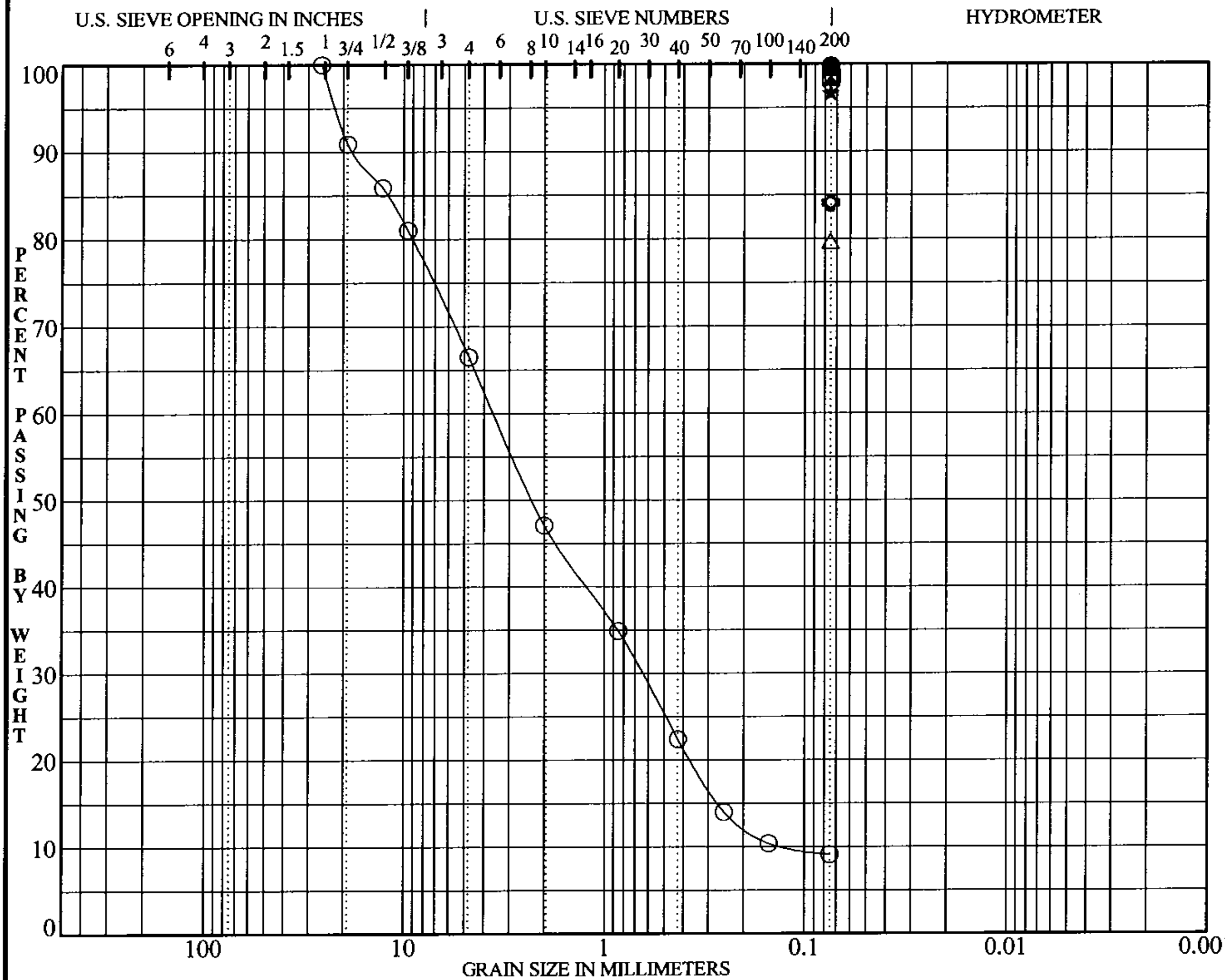
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-57

PROJECT No.
204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-11	52.0	100		Fat CLAY (CH)	CH
⊠	BH-11	62.0	99		Lean CLAY (CL)	CL
▲	BH-11	69.5	100		Lean CLAY (CL)	CL
★	BH-11	71.5	97		Lean CLAY (CL)	CL
⊙	BH-11	74.5	98		Lean CLAY (CL)	CL
✿	BH-11	76.5	84		Lean CLAY with sand (CL)	CL
○	BH-11	78.8	9	67	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
△	BH-11	86.0	80		Sandy Lean CLAY (CL)	CL

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

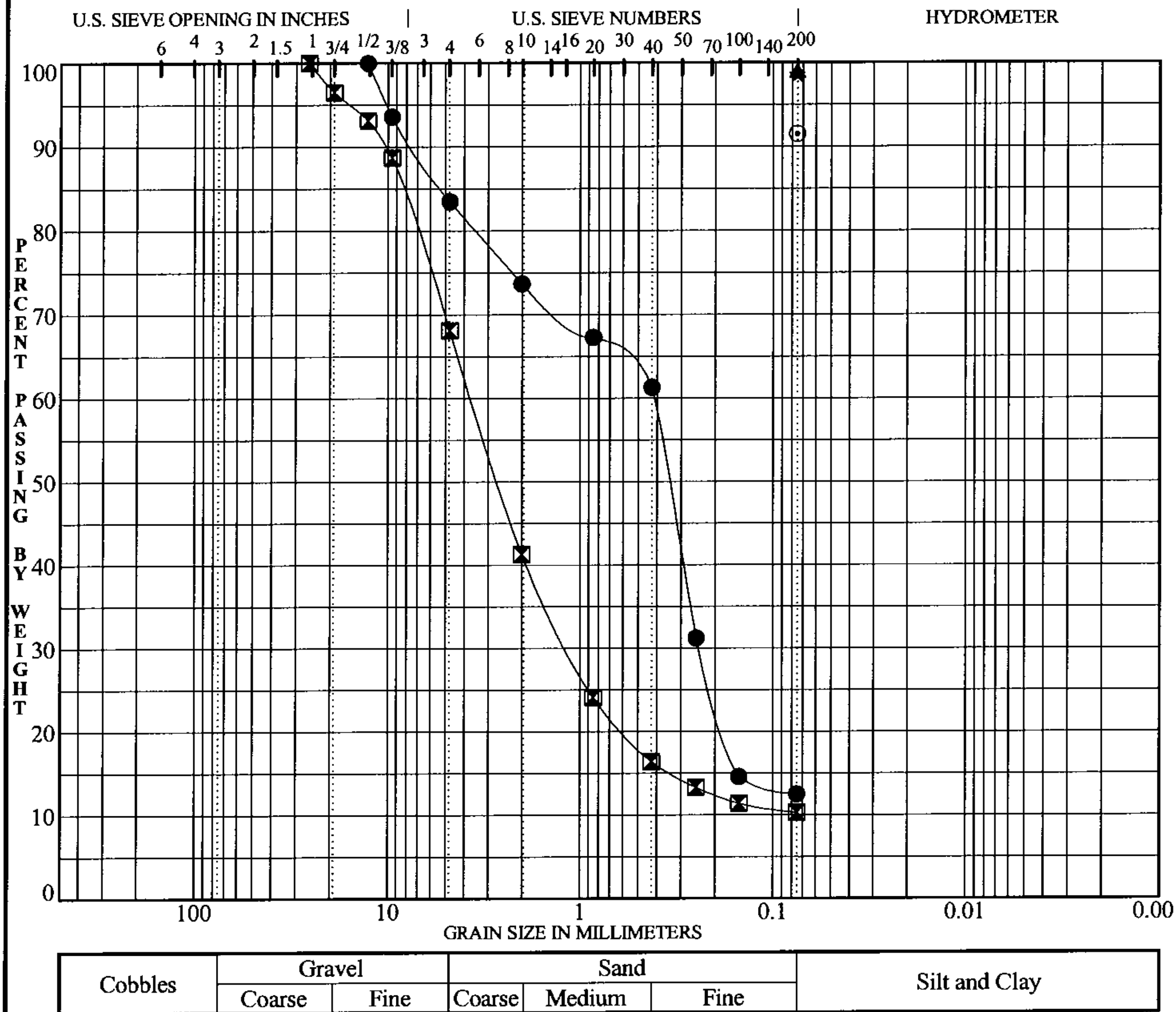
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-58-1

PROJECT No.
204104.10



Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-11	88.3	13	84	Silty SAND with gravel (SM)	SM
⊠	BH-11	93.5	10	68	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
▲	BH-11	99.5	99		Lean CLAY (CL)	CL
★	BH-11	102.0	99		Lean CLAY (CL)	CL
⊙	BH-11	105.0	92		SILT (ML)	ML

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

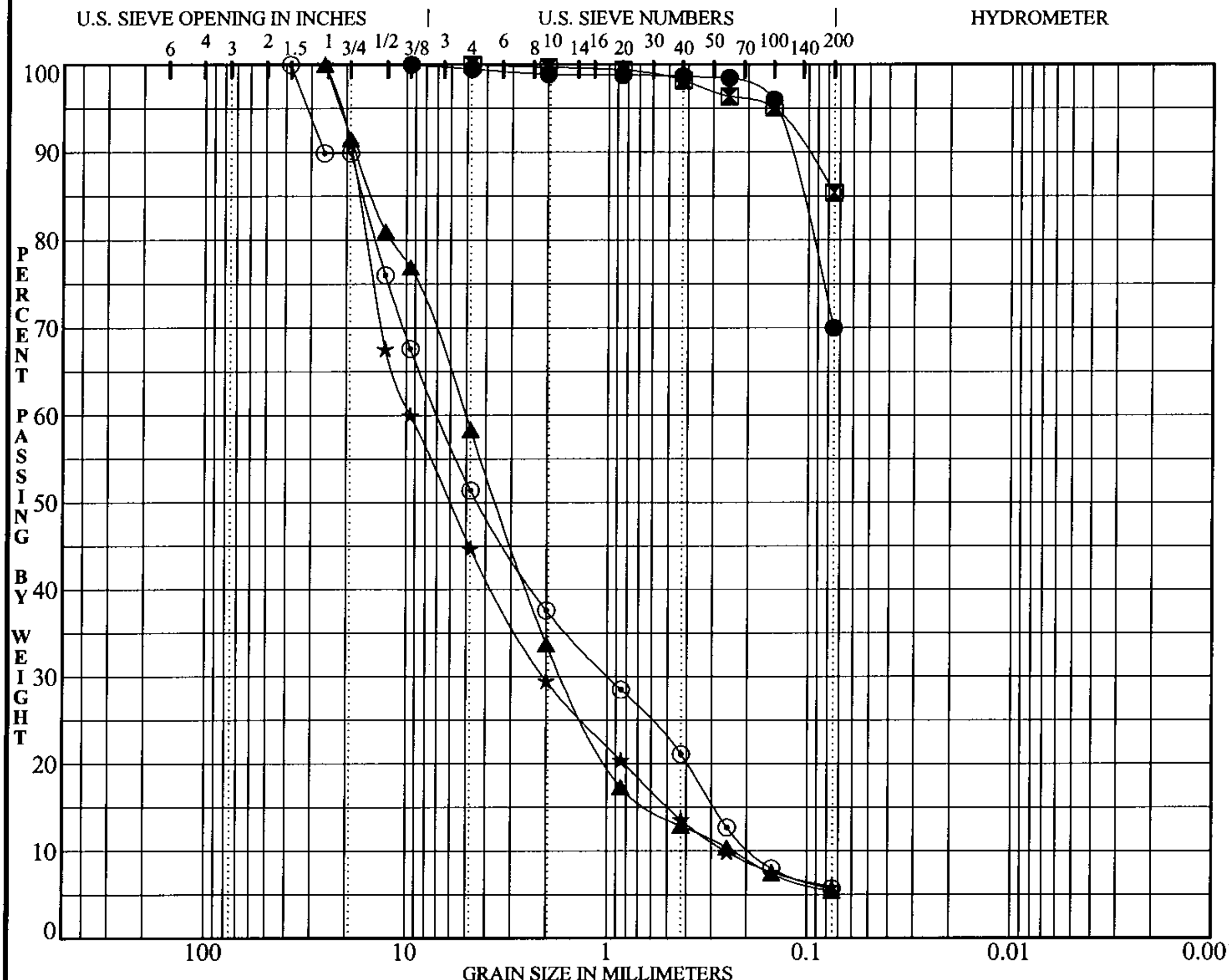
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-58-2

PROJECT No.
204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-12	42.4	70	100	Sandy SILT to Sandy Lean CLAY (ML/CL)	ML/CL
⧗	BH-12	71.2	85	100	SILT with sand to Lean CLAY with sand (ML/CL)	ML/CL
▲	BH-12	79.8	5	58	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
★	BH-12	94.8	6	45	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
⊙	BH-12	104.7	6	51	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

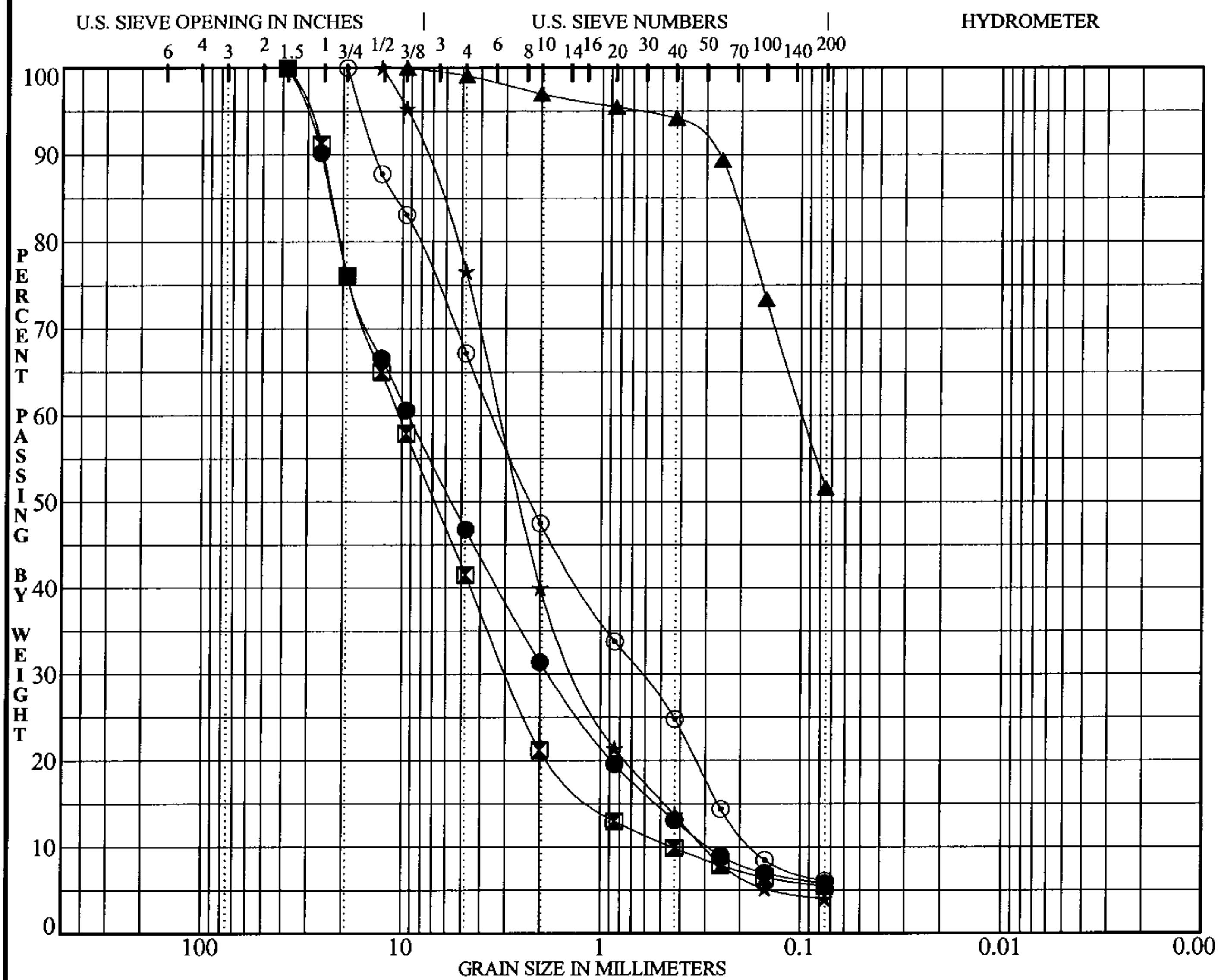
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-59

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-13	76.0	6	47	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
⊠	BH-13	91.3	6	42	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
▲	BH-13	101.5	52	99	Sandy SILT to Silty SAND (ML/SM)	ML/SM
★	BH-13	111.5	4	77	Well-graded SAND with gravel (SW)	SW
⊙	BH-13	125.6	6	67	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

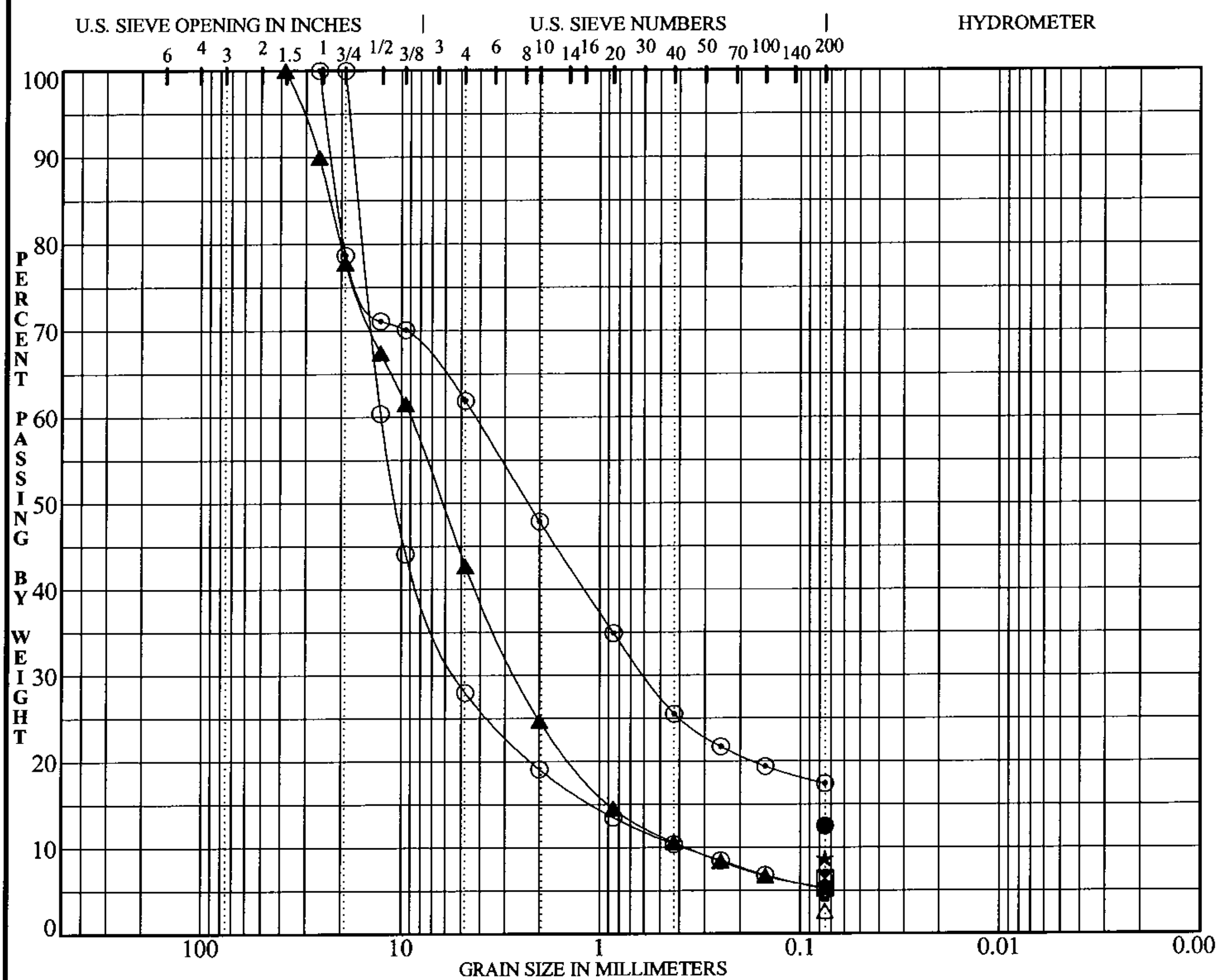
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-60**

PROJECT No. 204104.10

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-14	71.3	13		Clayey SAND (SC)	SC
⊠	BH-14	81.0	6		Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
▲	BH-14	90.7	5	43	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
★	BH-14	95.8	9		Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
⊙	BH-14	100.8	17	62	Silty SAND with gravel (SM)	SM
✿	BH-14	105.5	5		Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
○	BH-14	110.6	5	28	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
△	BH-14	115.3	3		Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

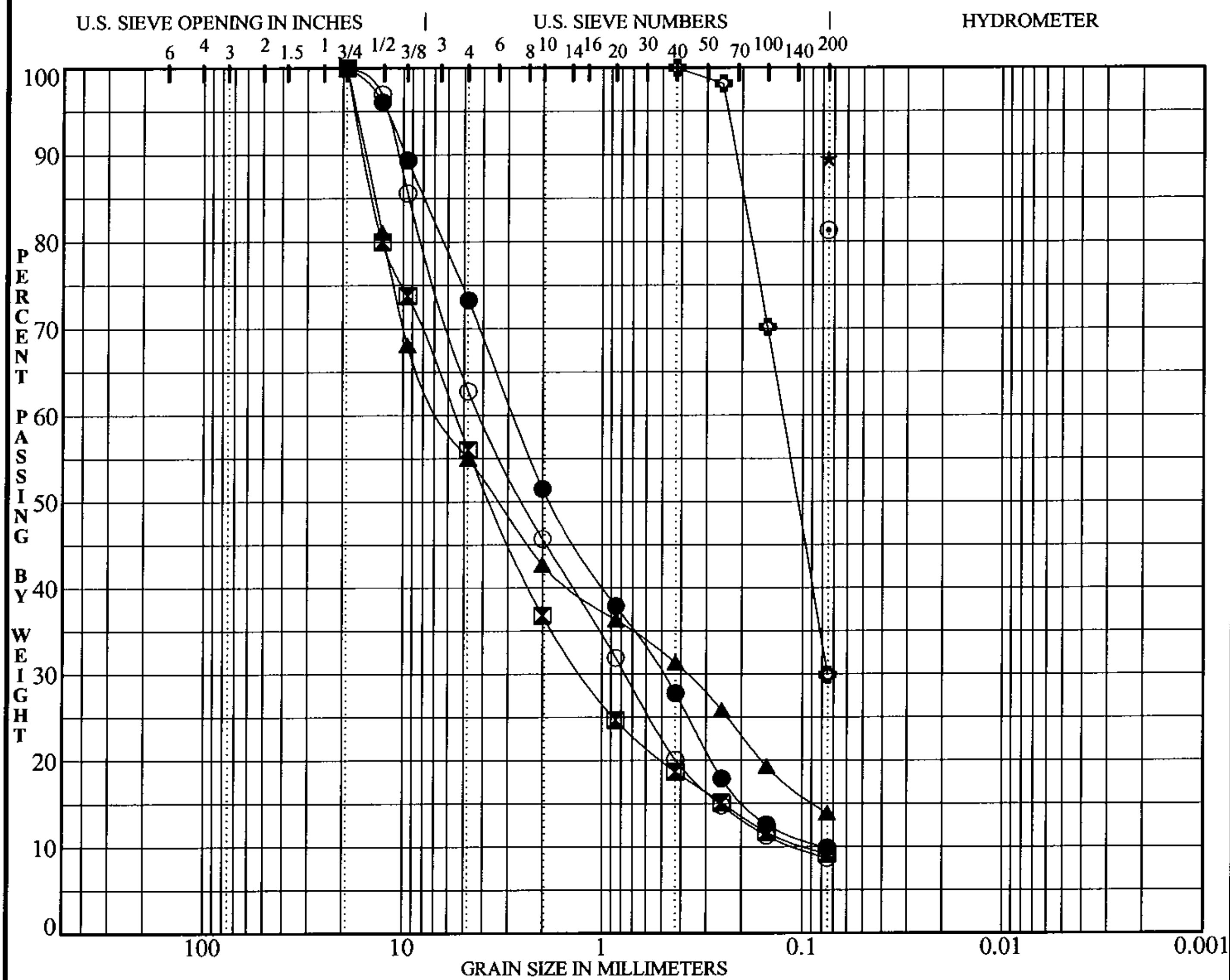
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-61

PROJECT No.
204104.10

GRADATION_B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-15	73.5	10	73	Well-graded SAND with clay and gravel (SW-SC)	SW-SC
⊠	BH-15	80.8	9	56	Well-graded SAND with clay and gravel (SW-SC)	SW-SC
▲	BH-15	100.8	14	55	Clayey GRAVEL with sand (GC)	GC
★	BH-15	108.0	90		SILT (ML)	ML
⊙	BH-15	109.0	81		SILT with sand (ML)	ML
✿	BH-15	116.5	30		Silty SAND (SM)	SM
○	BH-15	123.2	9	63	Well-graded SAND with silt and gravel (SW-SM)	SW-SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

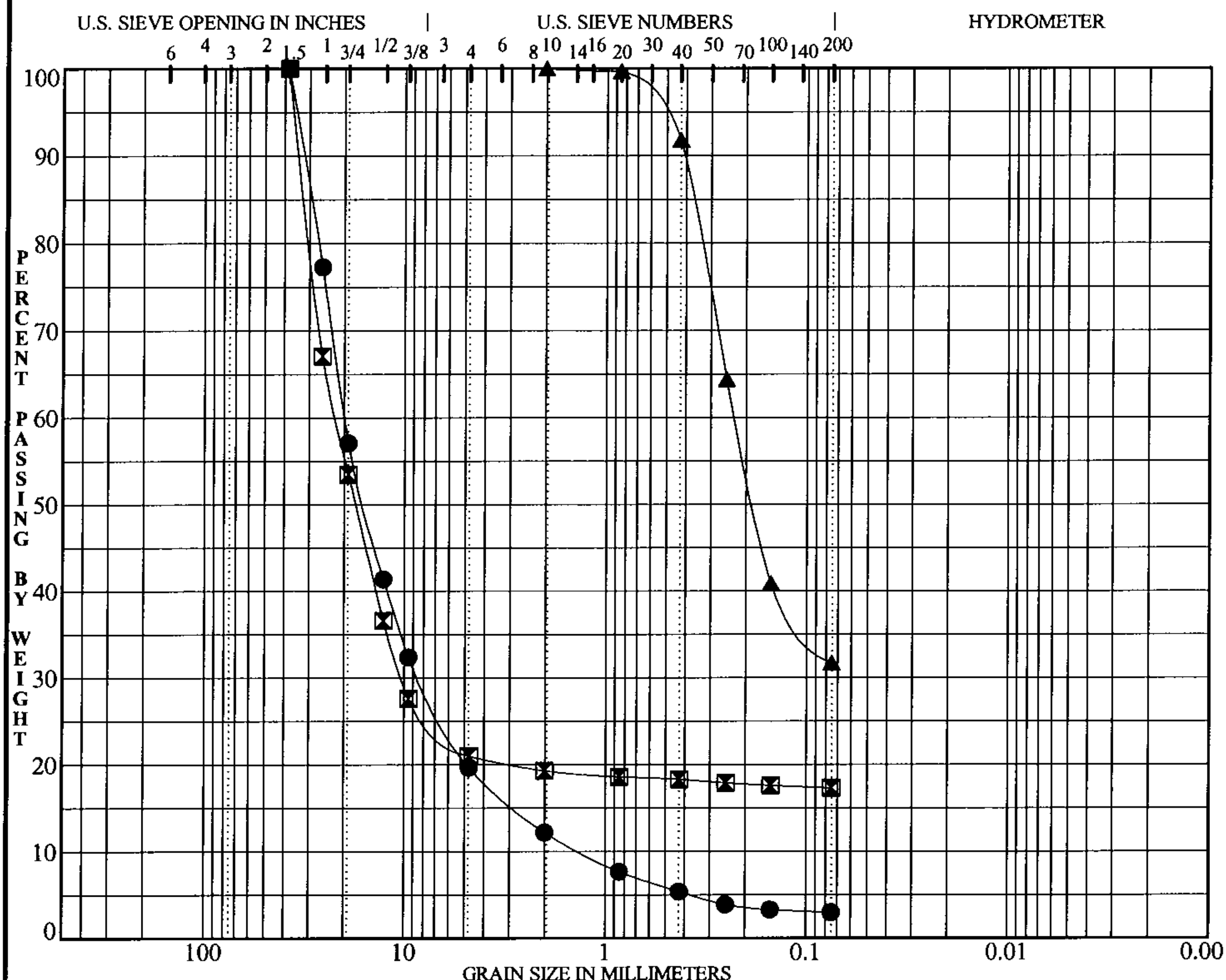
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-62

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-16	75.8	3	20	Well-graded GRAVEL with sand (GW)	GW
⊠	BH-16	90.7	17	21	Clayey GRAVEL (GC)	GC
▲	BH-16	116.5	32		Silty SAND (SM)	SM

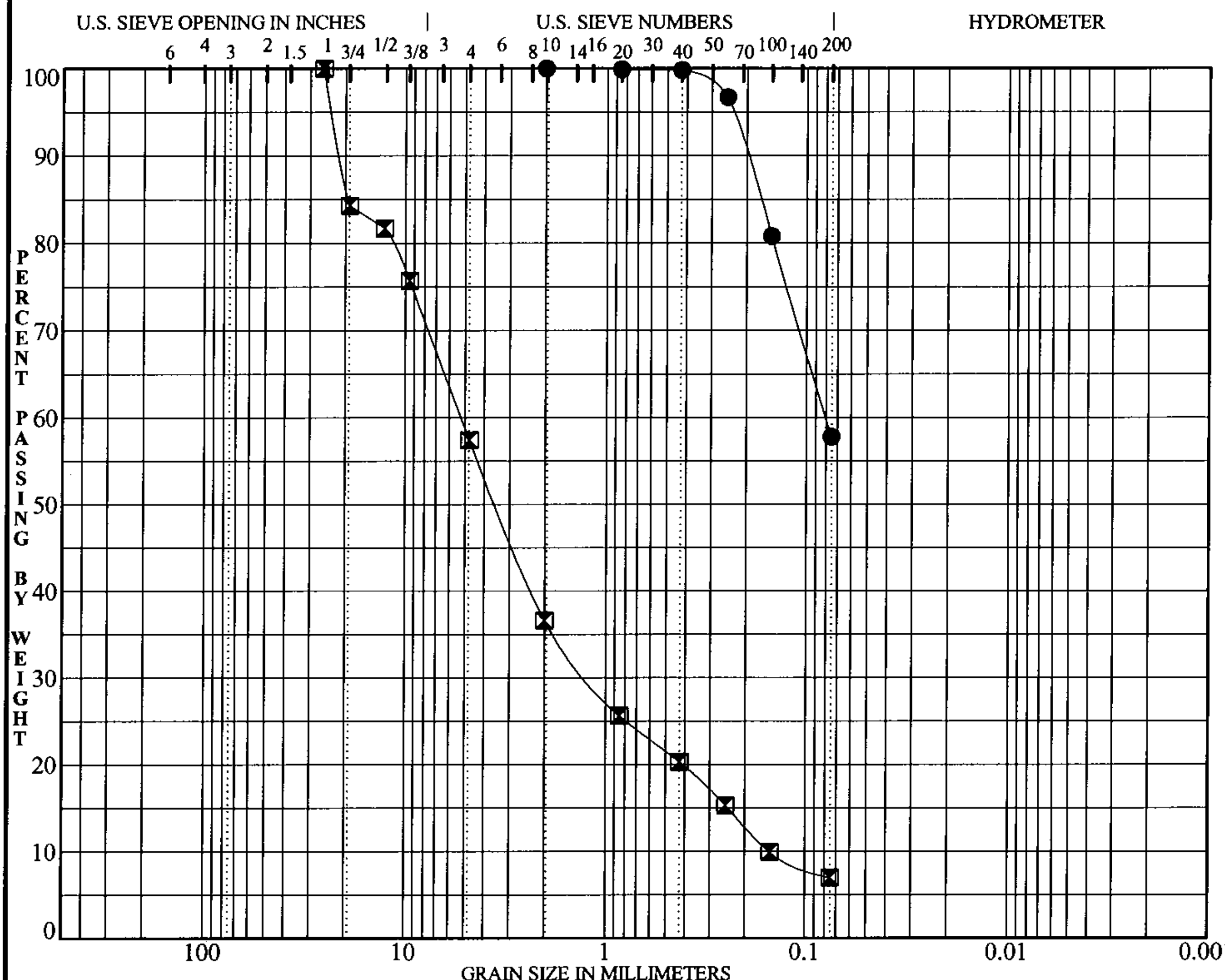
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-63

PROJECT No.
204104.10

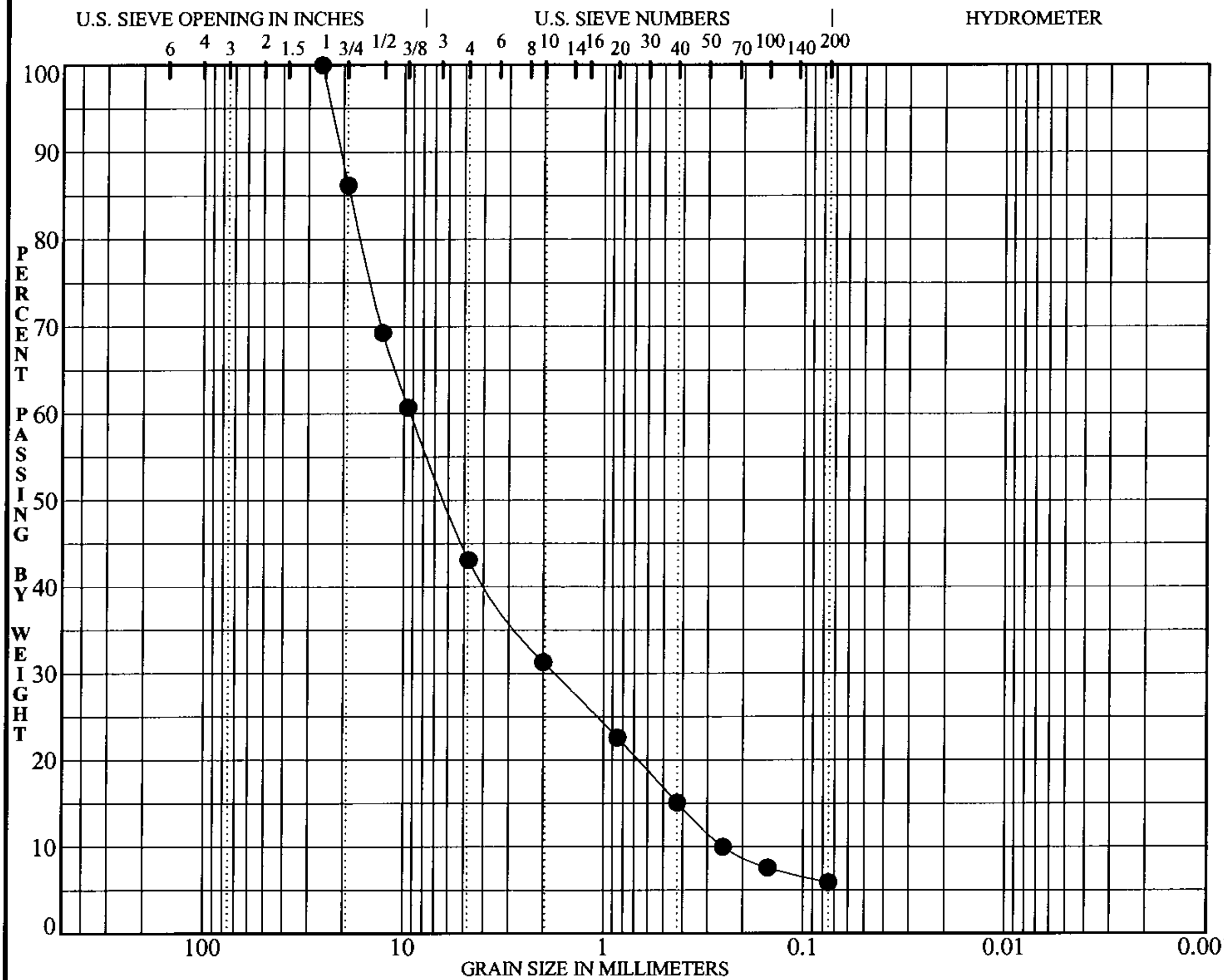


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-17	57.5	58		Sandy SILT (ML)	ML
⊠	BH-17	66.0	7	57	Well-graded SAND with clay and gravel (SW-SC)	SW-SC

PREP'D BY:	GRADATION TEST DATA	FIGURE	A12-64
APP'D BY: Y. D. Wang	SVRT DOWNTOWN	PROJECT No.	204104.10
DATE: 17/6/05	San Jose, California		
DWG FILE:			

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-18	67.0	6	43	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

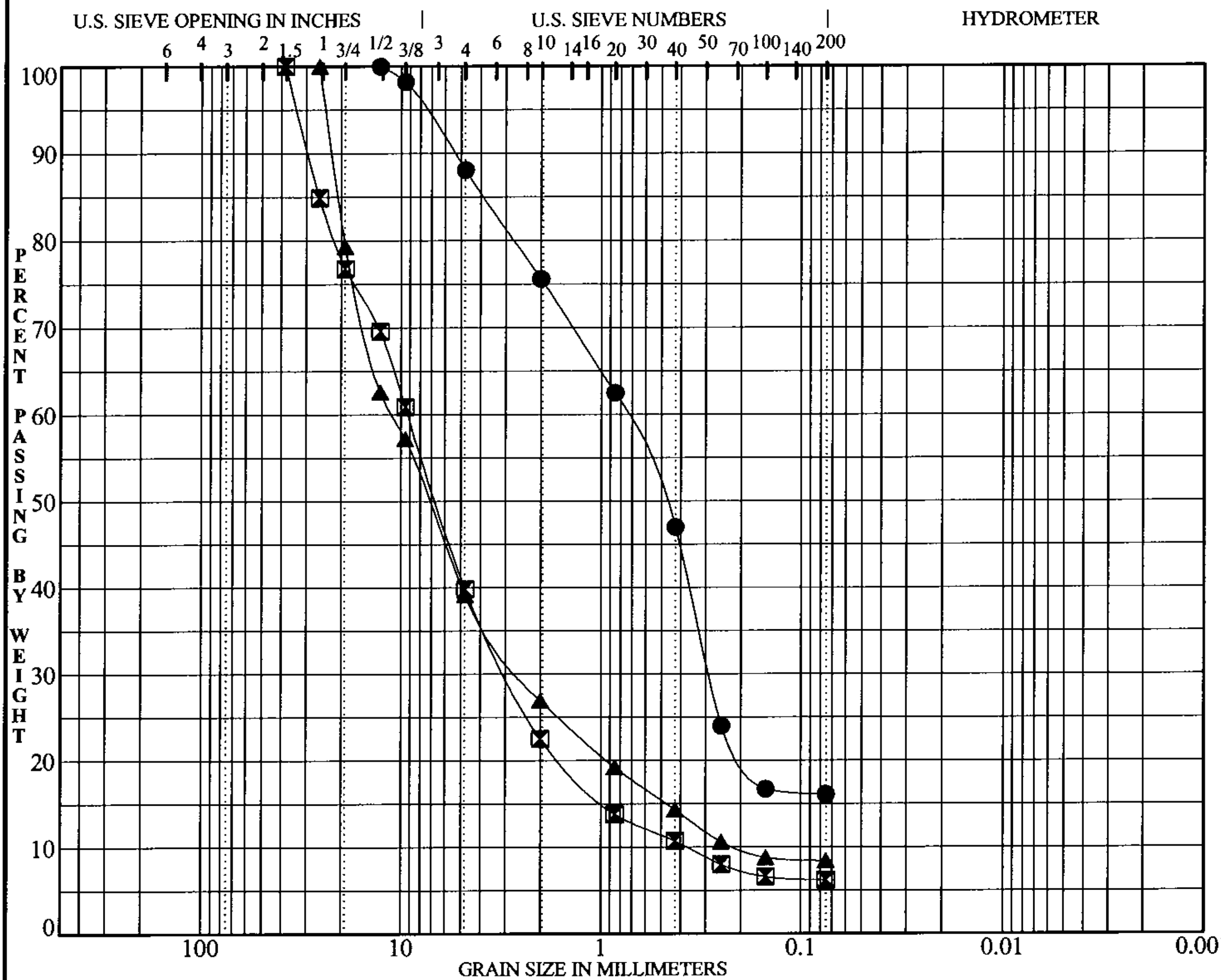
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-65**

PROJECT No. 204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-19	61.4	16	88	Silty SAND (SM)	SM
⊠	BH-19	66.0	6	40	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC
▲	BH-19	85.8	8	39	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

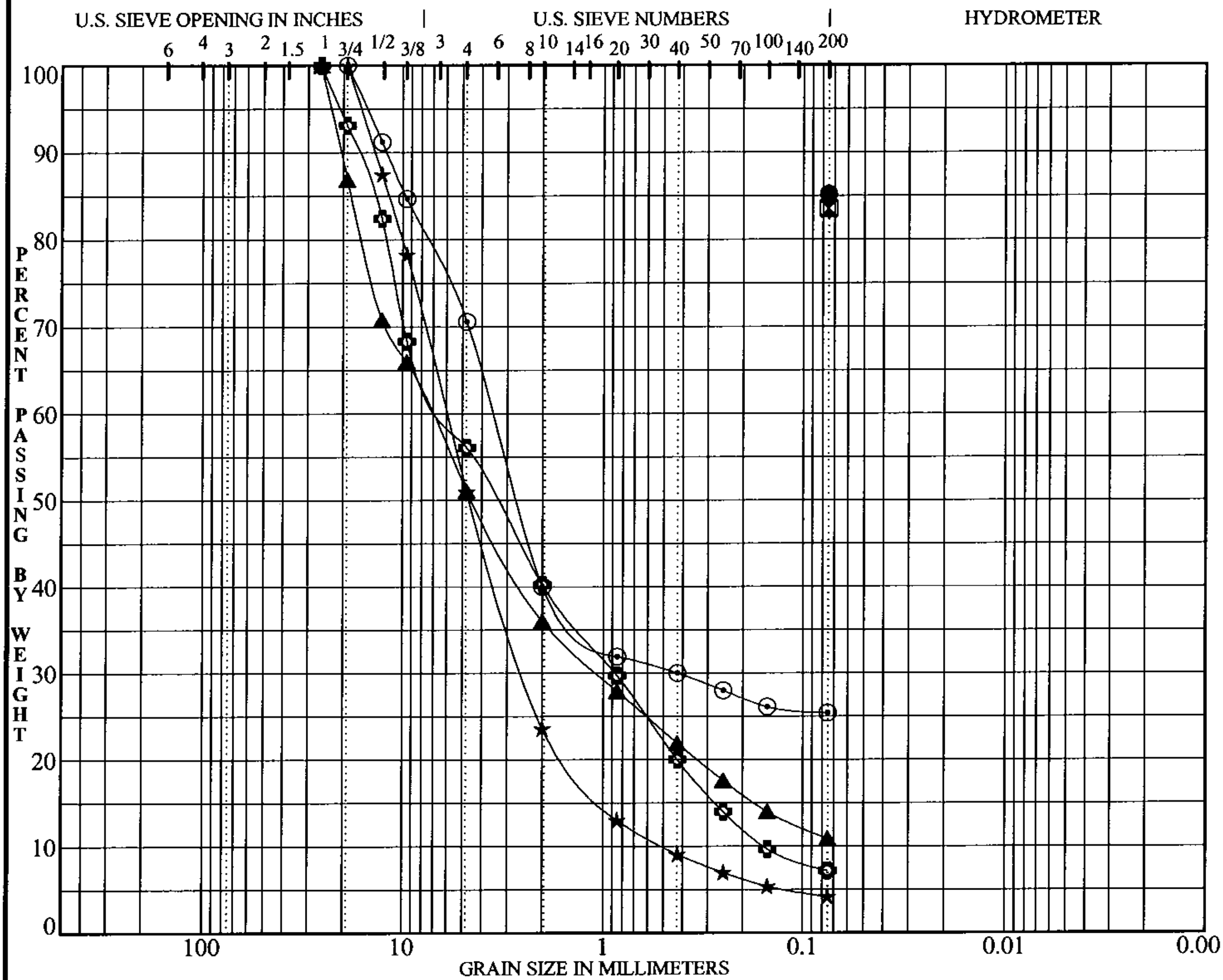
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-66

PROJECT No.
204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-20	51.2	85		Fat CLAY with sand (CH)	CH
⊠	BH-20	54.4	84		Lean CLAY with sand (CL)	CL
▲	BH-20	55.3	11	51	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC
★	BH-20	67.8	4	51	Well-graded GRAVEL with sand (GW)	GW
⊙	BH-20	72.5	25	71	Silty SAND with gravel (SM)	SM
✪	BH-20	81.0	7	56	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

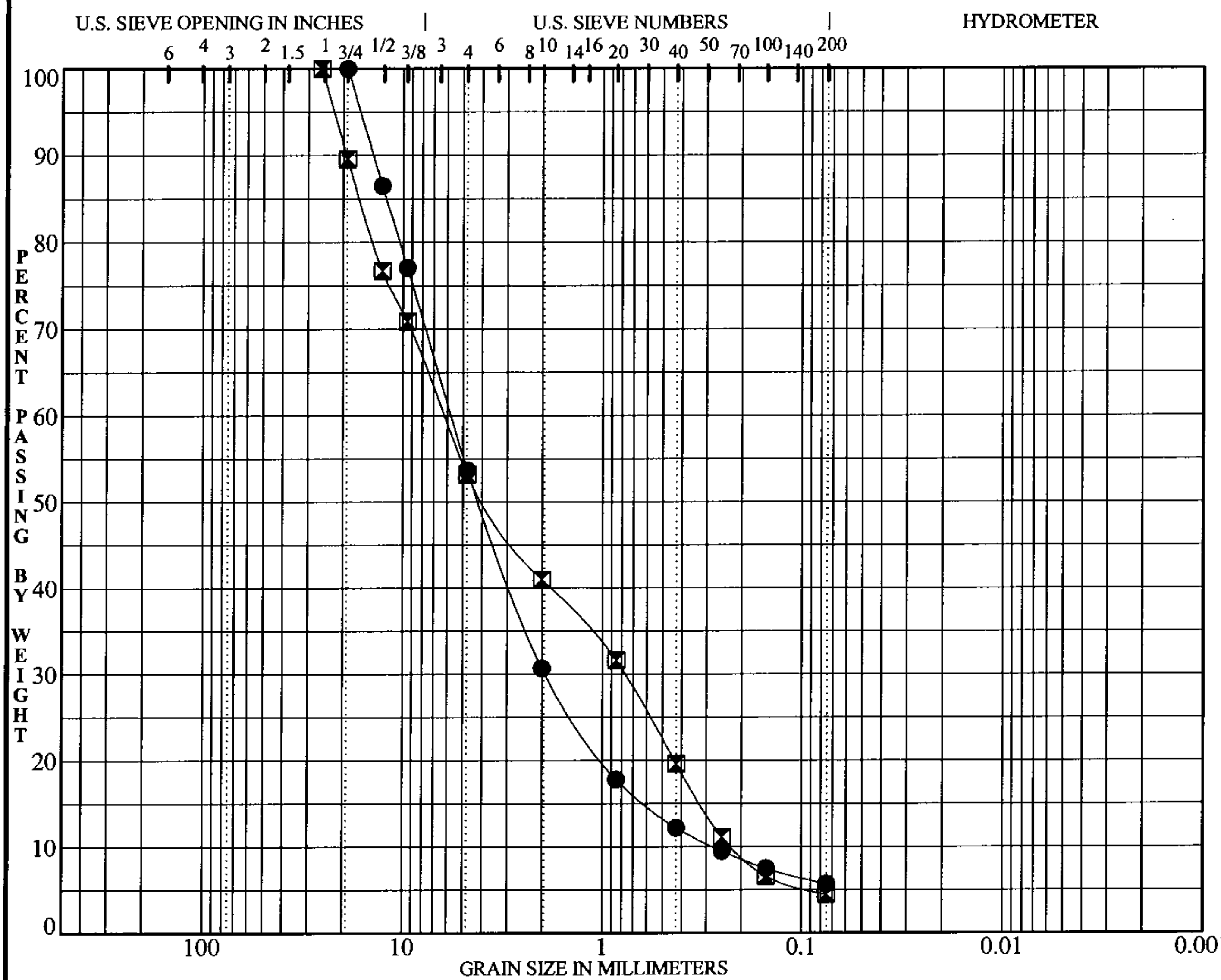
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-67

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-21	60.0	6	54	Well-graded SAND with clay and gravel (SW-SC)	SW-SC
⊠	BH-21	65.1	5	53	Poorly-graded SAND with gravel (SP)	SP

GRADATION_B 204104 06 20 2005.GPJ STD.GDT 17/6/05

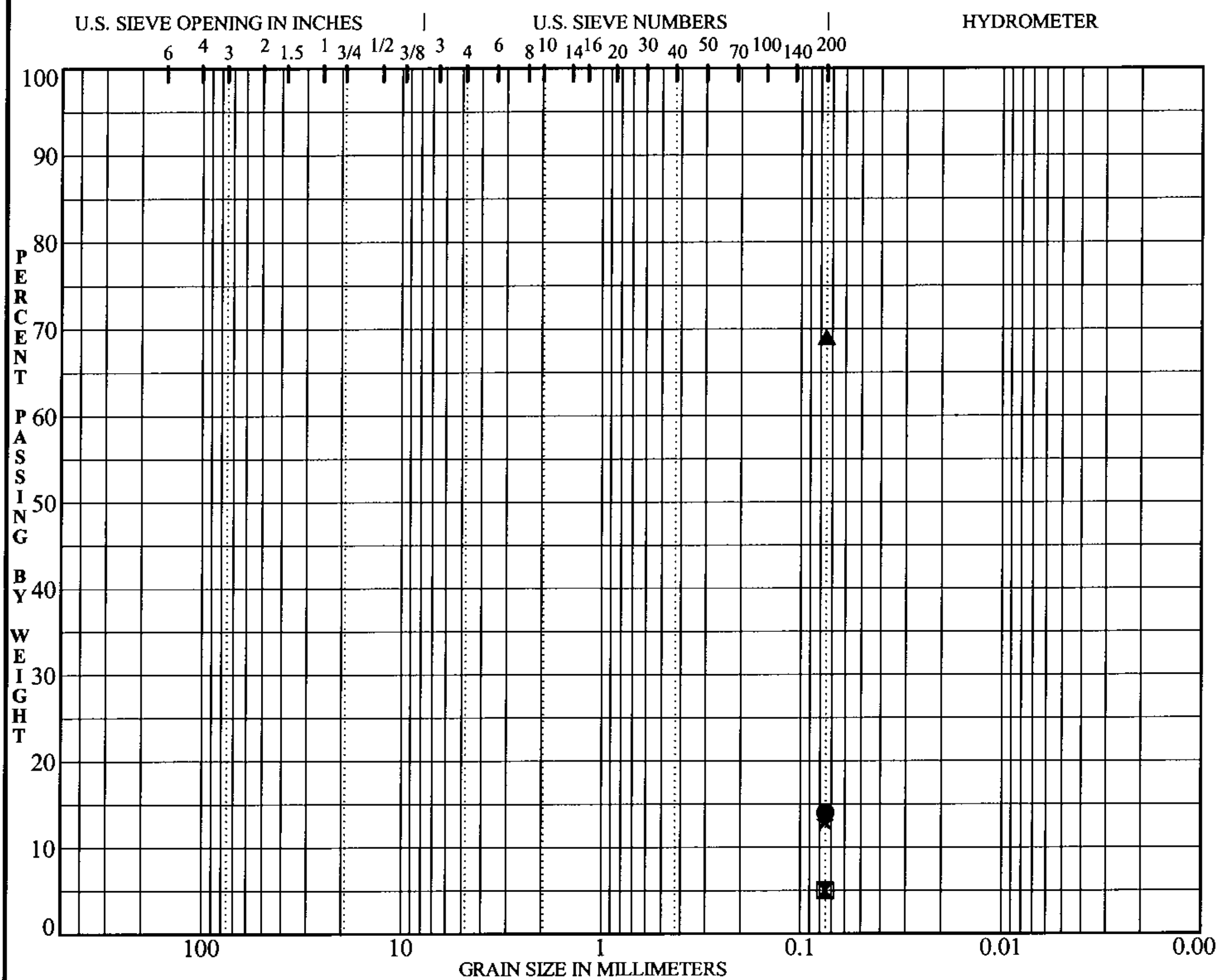
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-68

PROJECT No. 204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-23	76.3	14		Silty SAND with gravel (SM)	SM
☒	BH-23	86.3	5		Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
▲	BH-23	117.3	69		Sandy Lean CLAY (CL)	CL
★	BH-23	121.3	13		Silty SAND (SM)	SM

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

DWG FILE:

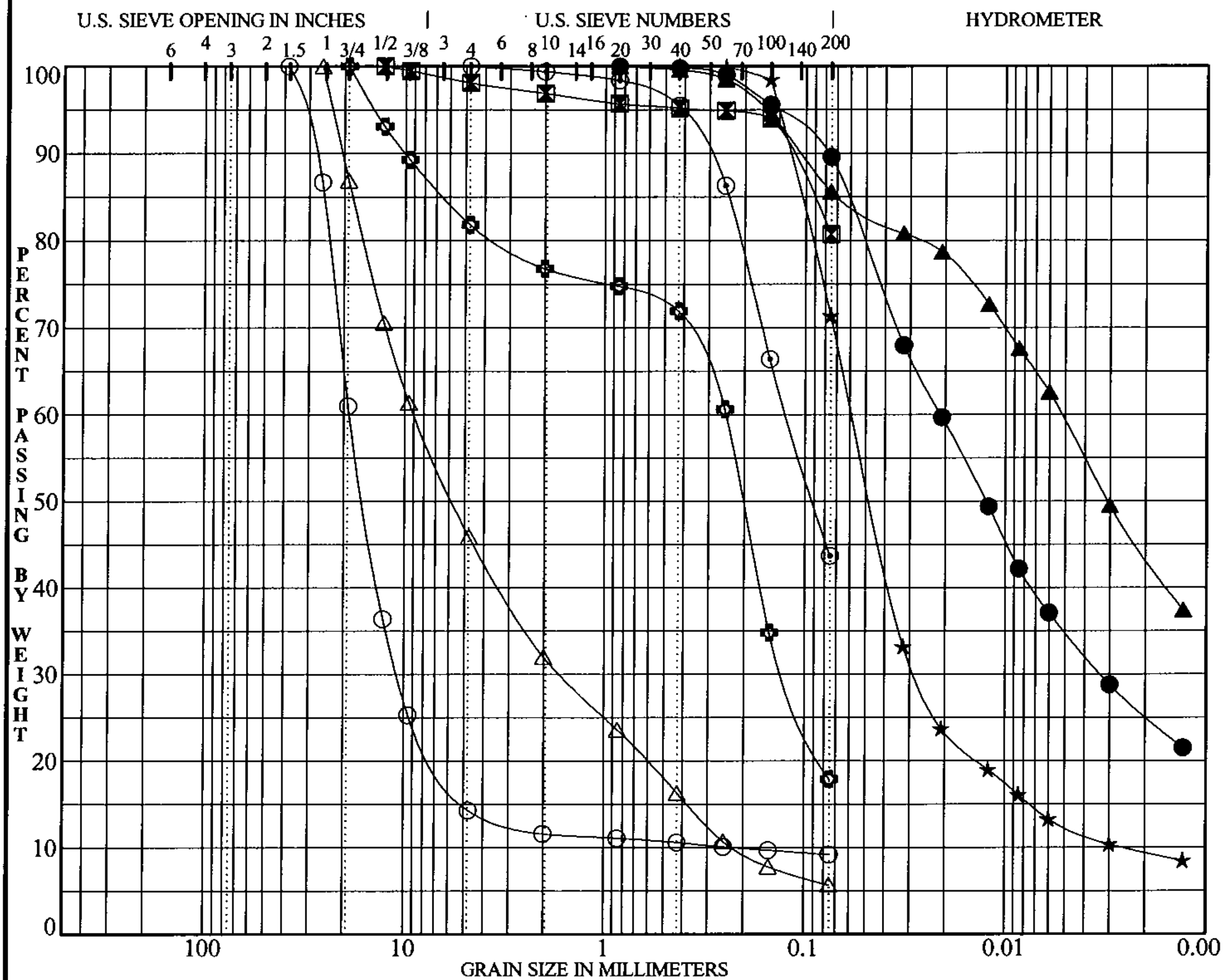
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-69**

PROJECT No. 204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-24	15.0	90		Lean CLAY (CL)	CL
⧗	BH-24	20.0	81	98	SILT with sand (ML)	ML
▲	BH-24	27.5	86		Lean CLAY (CL)	CL
★	BH-24	32.4	71		Sandy SILT (ML)	ML
⊙	BH-24	40.0	44	100	Silty SAND (SM)	SM
✪	BH-24	40.5	18	82	Silty SAND with gravel (SM)	SM
○	BH-24	43.8	9	14	Poorly-graded GRAVEL with silt (GP-GM)	GP-GM
△	BH-24	46.3	6	46	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

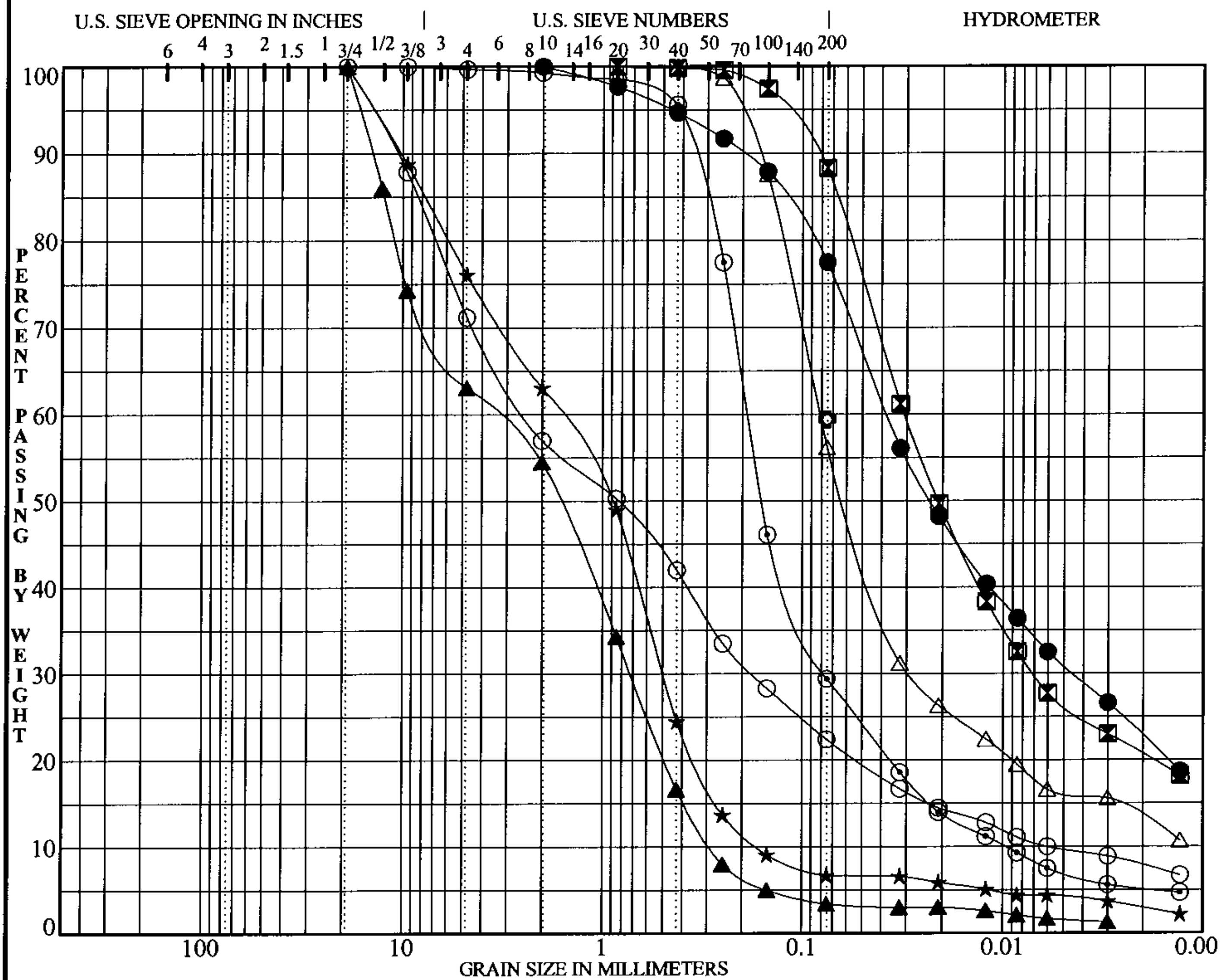
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-70-1**

PROJECT No. 204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

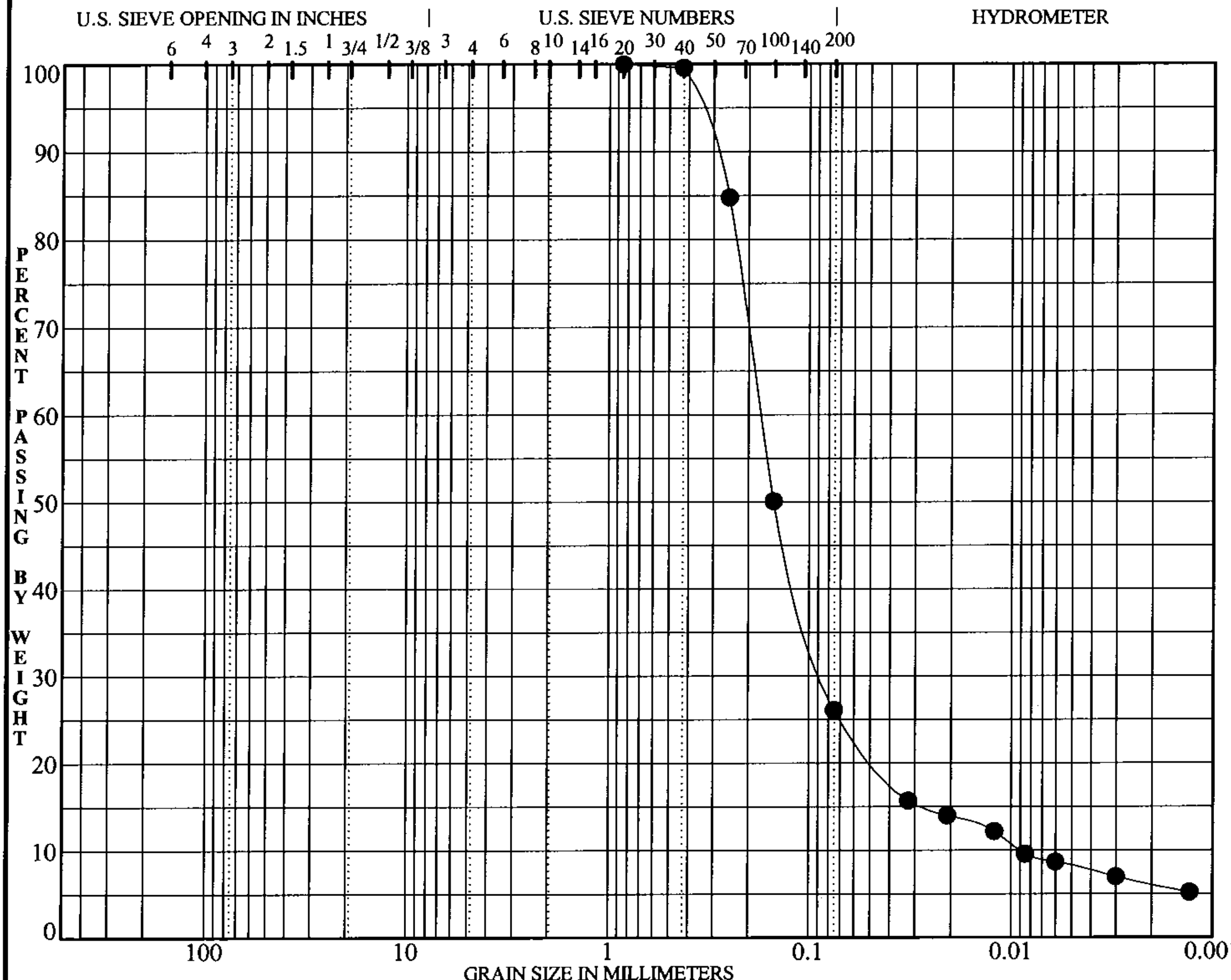


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-24	55.0	78		Silty CLAY with sand (CL-ML)	CL-ML
⊠	BH-24	65.0	88		Lean CLAY (CL)	CL
▲	BH-24	81.0	3	63	Poorly-graded SAND with gravel (SP)	SP
★	BH-24	90.5	7	76	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
⊙	BH-24	100.9	29	100	Silty SAND (SM)	SM
✪	BH-24	111.0	59		Sandy Lean CLAY (CL)	CL
○	BH-24	121.0	22	71	Silty SAND with gravel (SM)	SM
△	BH-24	141.0	56		Sandy, Silty CLAY (CL-ML)	CL-ML

PREP'D BY:	GRADATION TEST DATA		FIGURE
APP'D BY: Y. D. Wang	SVRT DOWNTOWN	San Jose, California	A12-70-2
DATE: 17/6/05			PROJECT No.
DWG FILE:			204104.10

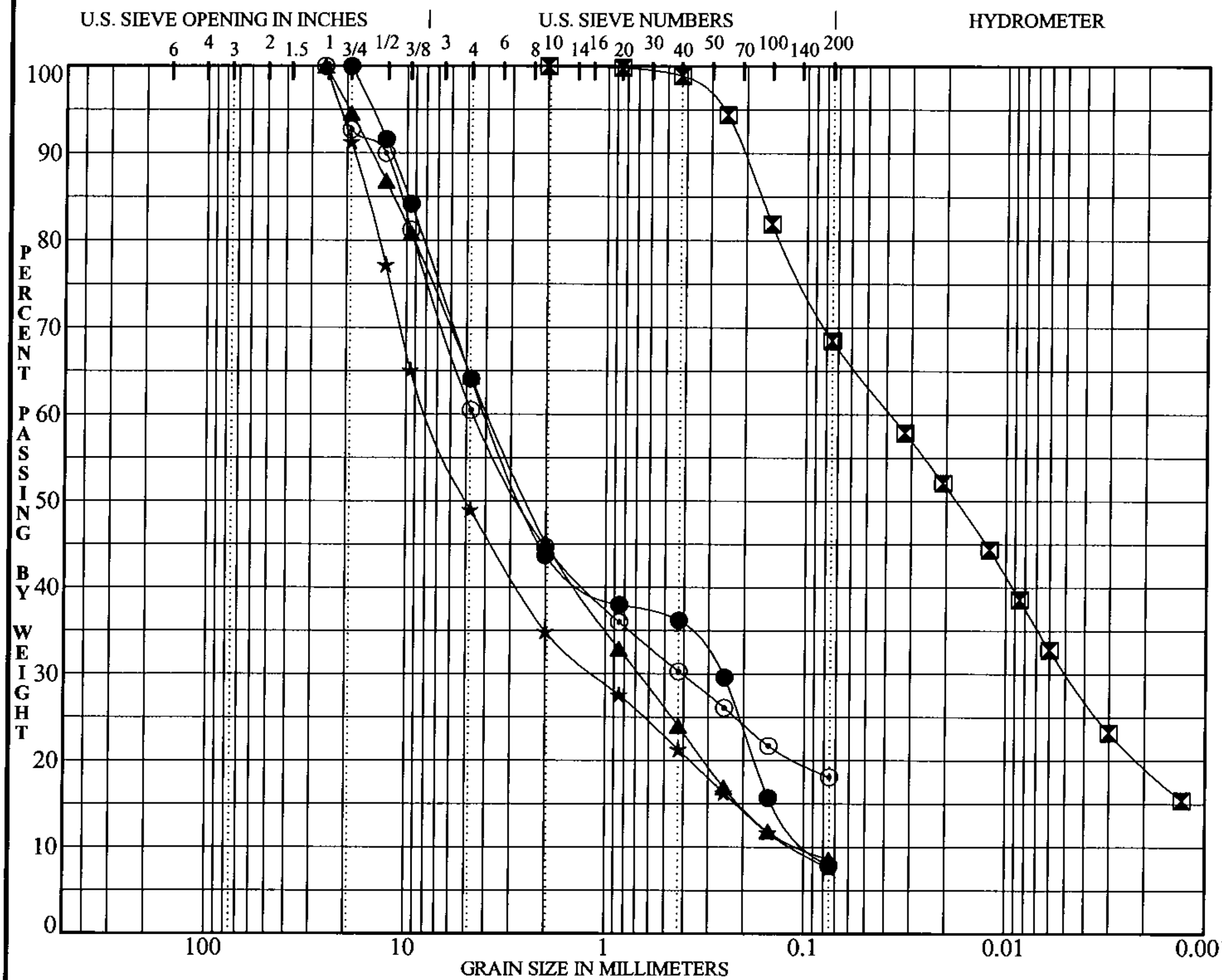
GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-24	151.0	26		Silty SAND (SM)	SM

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang	SVRT DOWNTOWN San Jose, California	A12-70-3
DATE: 17/6/05		PROJECT No.
DWG FILE:		204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-25	52.8	8	64	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
⊠	BH-25	71.0	69		Sandy Lean CLAY (CL)	CL
▲	BH-25	81.5	9	64	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
★	BH-25	121.5	8	49	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
⊙	BH-25	142.0	18	61	Clayey SAND with gravel (SC)	SC

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

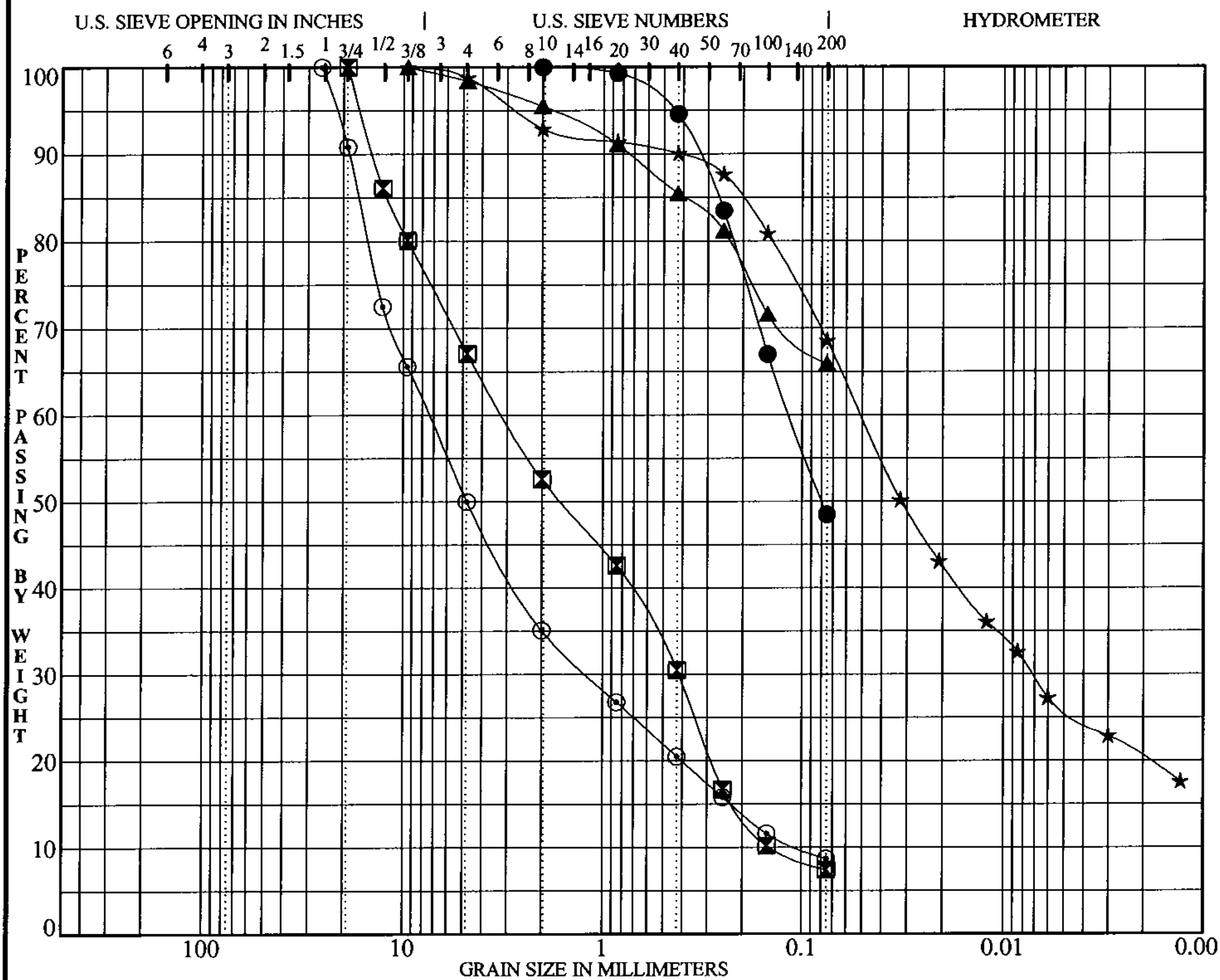
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-71

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-26	32.3	49		Clayey SAND to Sandy Lean CLAY (SC/CL)	SC/CL
⊠	BH-26	56.3	7	67	Poorly-graded SAND with clay and gravel (SP-SC)	SP-SC
▲	BH-26	91.0	66	98	Sandy Lean CLAY (CL)	CL
★	BH-26	111.5	69	99	Sandy Lean CLAY (CL)	CL
⊙	BH-26	125.7	9	50	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

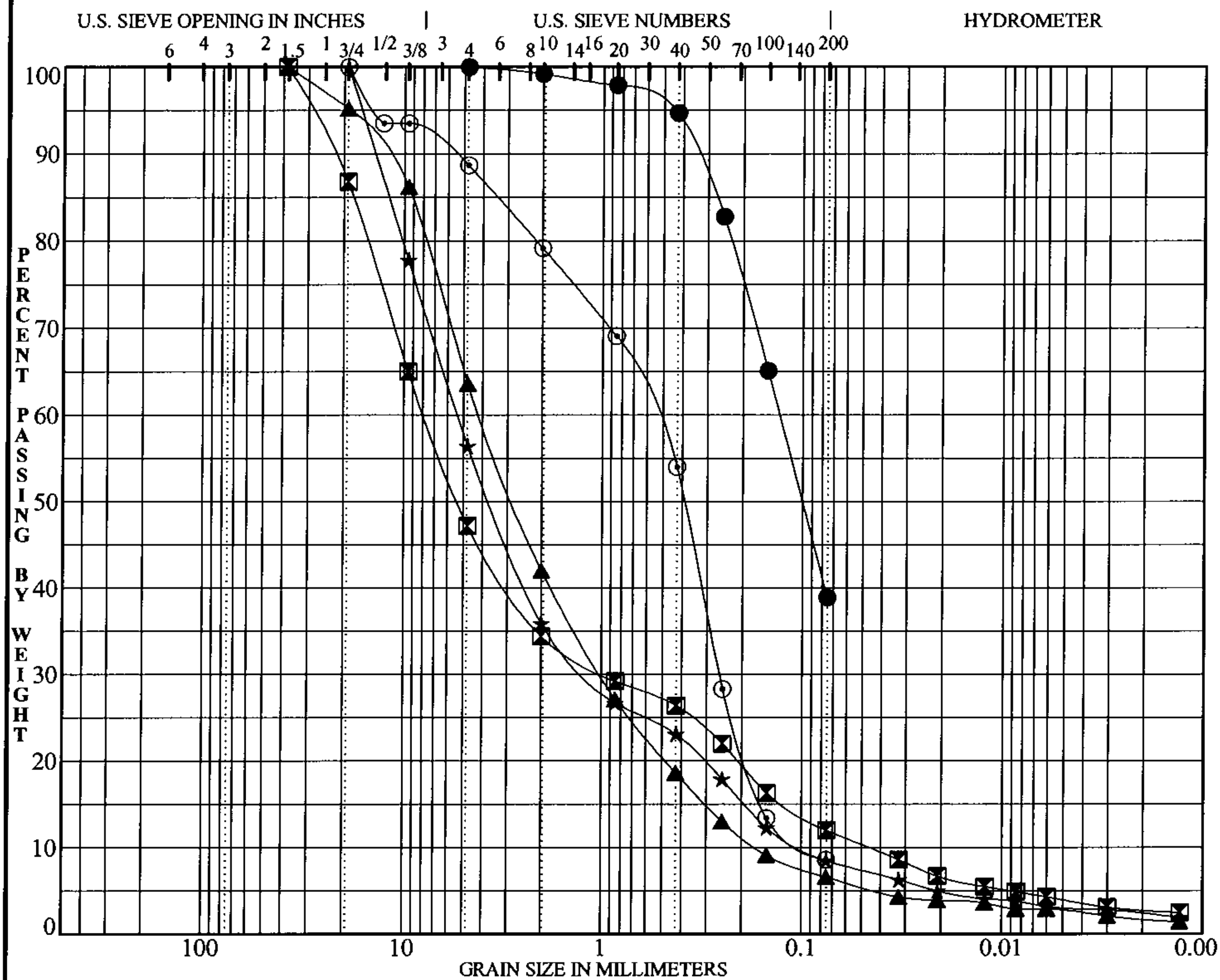
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-72

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-27	22.5	39	100	Silty SAND (SM)	SM
⊠	BH-27	41.1	12	47	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC
▲	BH-27	51.1	7	64	Well-graded SAND with clay and gravel (SW-SC)	SW-SC
★	BH-27	68.0	9	56	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊙	BH-27	74.7	9	89	Poorly-graded SAND with silt (SP-SM)	SP-SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

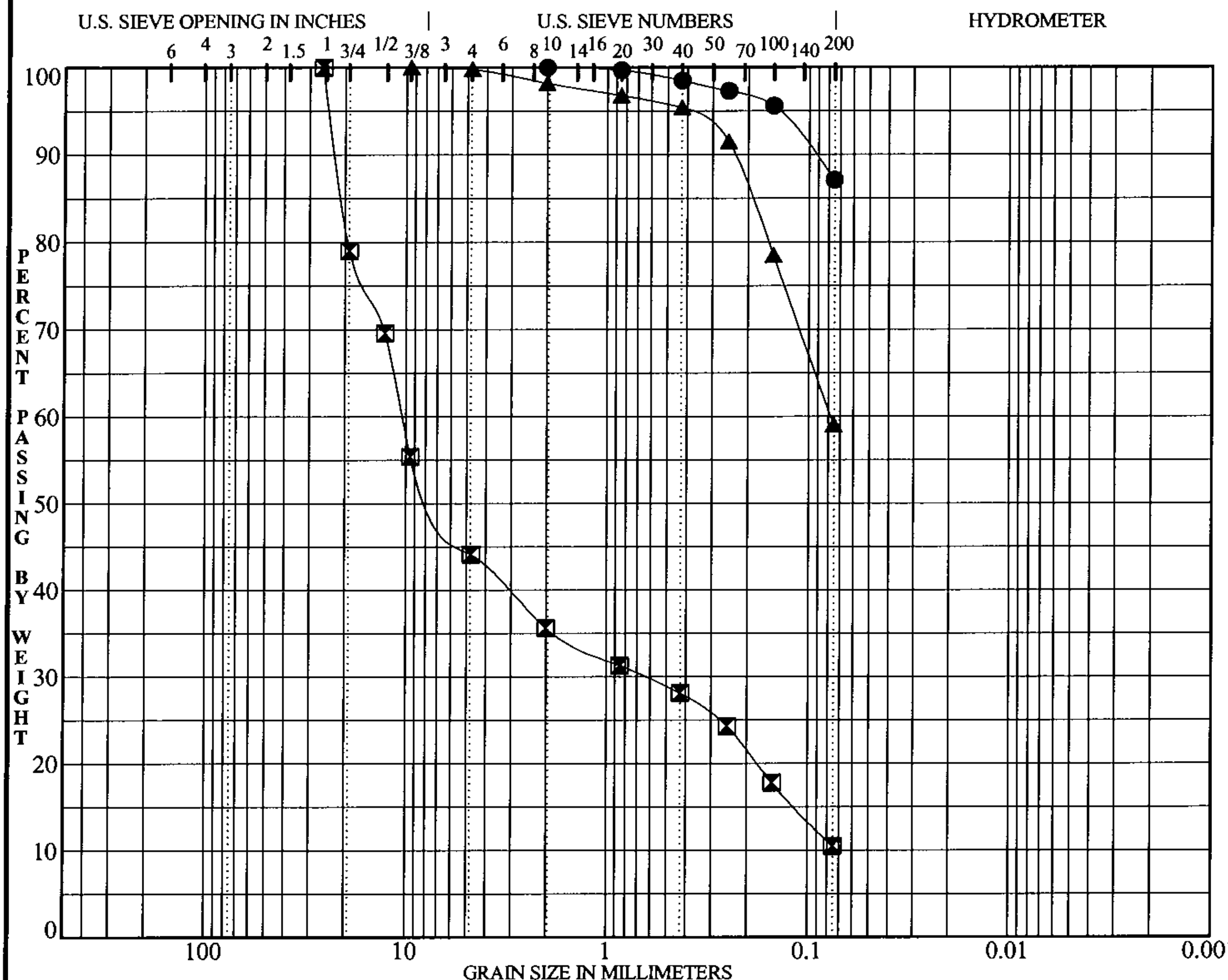
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-73**

PROJECT No. 204104.10

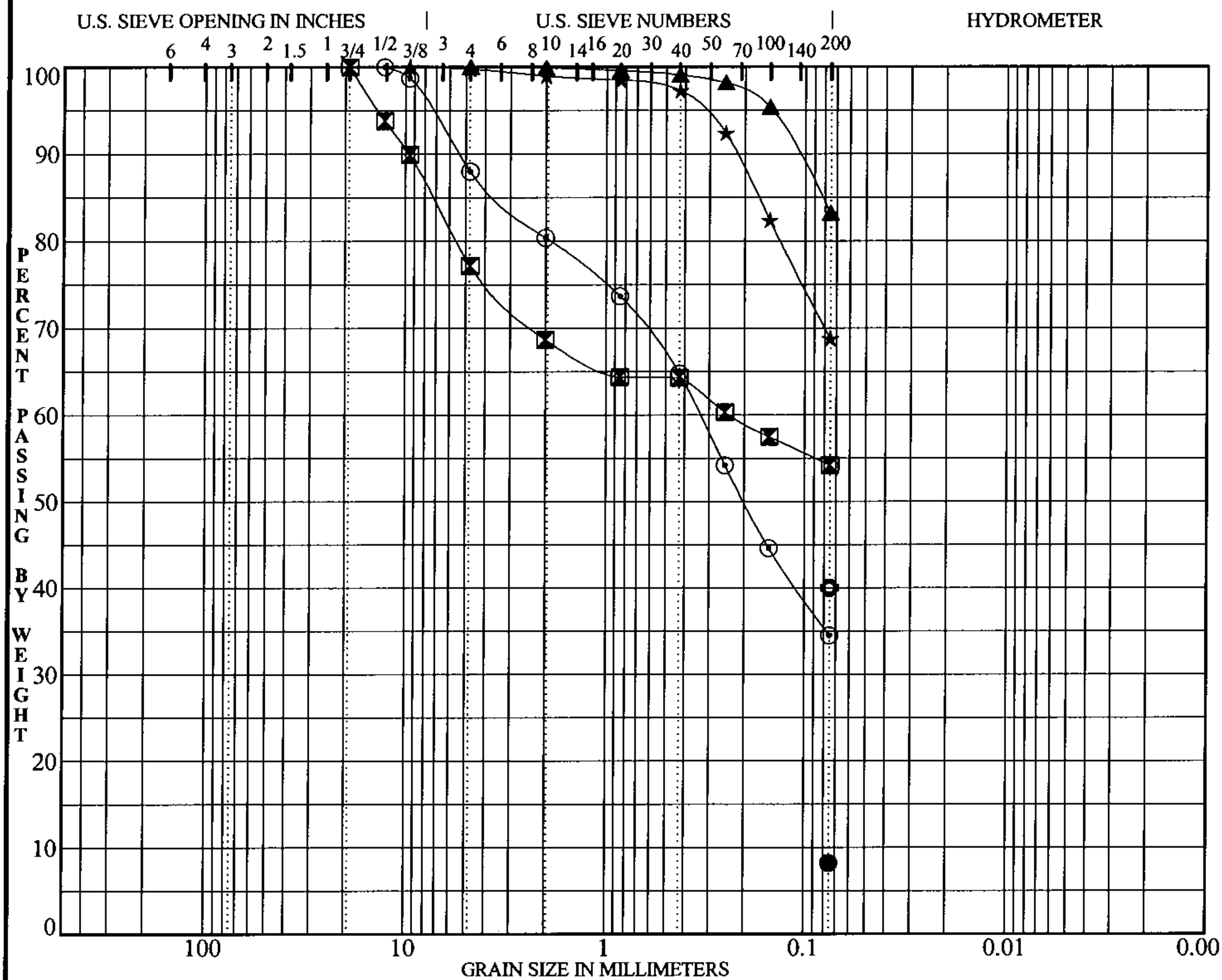


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-28	26.5	87		Silty CLAY (CL-ML)	CL-ML
⊠	BH-28	40.7	11	44	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
▲	BH-28	77.0	59	100	Sandy Lean CLAY (CL)	CL

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-74
DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
DWG FILE:		204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-29	61.5	8		Well-graded SAND with Silt (SW-SM)	SW-SM
⊠	BH-29	65.5	54	77	Sandy Lean CLAY with gravel (CL)	CL
▲	BH-29	76.5	83	100	Lean CLAY with sand (CL)	CL
★	BH-29	86.5	69	100	Sandy Lean CLAY (CL)	CL
⊙	BH-29	95.8	35	88	Clayey SAND (SC)	SC
✿	BH-29	102.0	40		Silty SAND (SM)	SM

GRADATION_B 204104 06 20 2005.GPJ STD.GDT 17/6/05

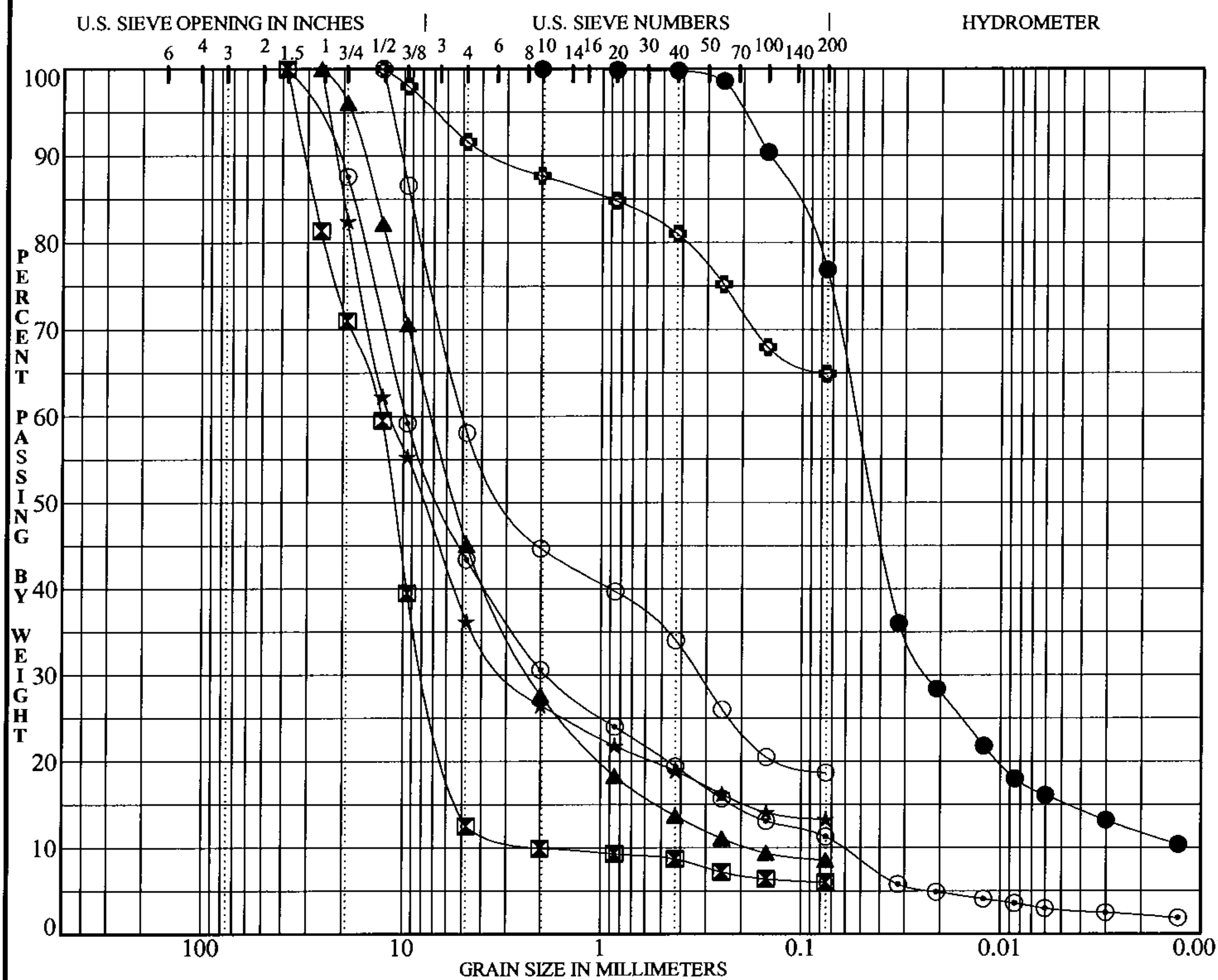
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-75

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-30	56.5	77		SILT with sand (ML)	ML
⊠	BH-30	59.3	6	13	Well-graded GRAVEL with clay (GW-GC)	GW-GC
▲	BH-30	69.5	9	45	Poorly-graded GRAVEL with clay and sand (GP-GC)	GP-GC
★	BH-30	84.4	13	36	Clayey GRAVEL with sand (GC)	GC
⊙	BH-30	89.8	11	43	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
✪	BH-30	94.5	65	92	Sandy SILT (ML)	ML
○	BH-30	105.0	19	58	Silty GRAVEL with sand (GM)	GM

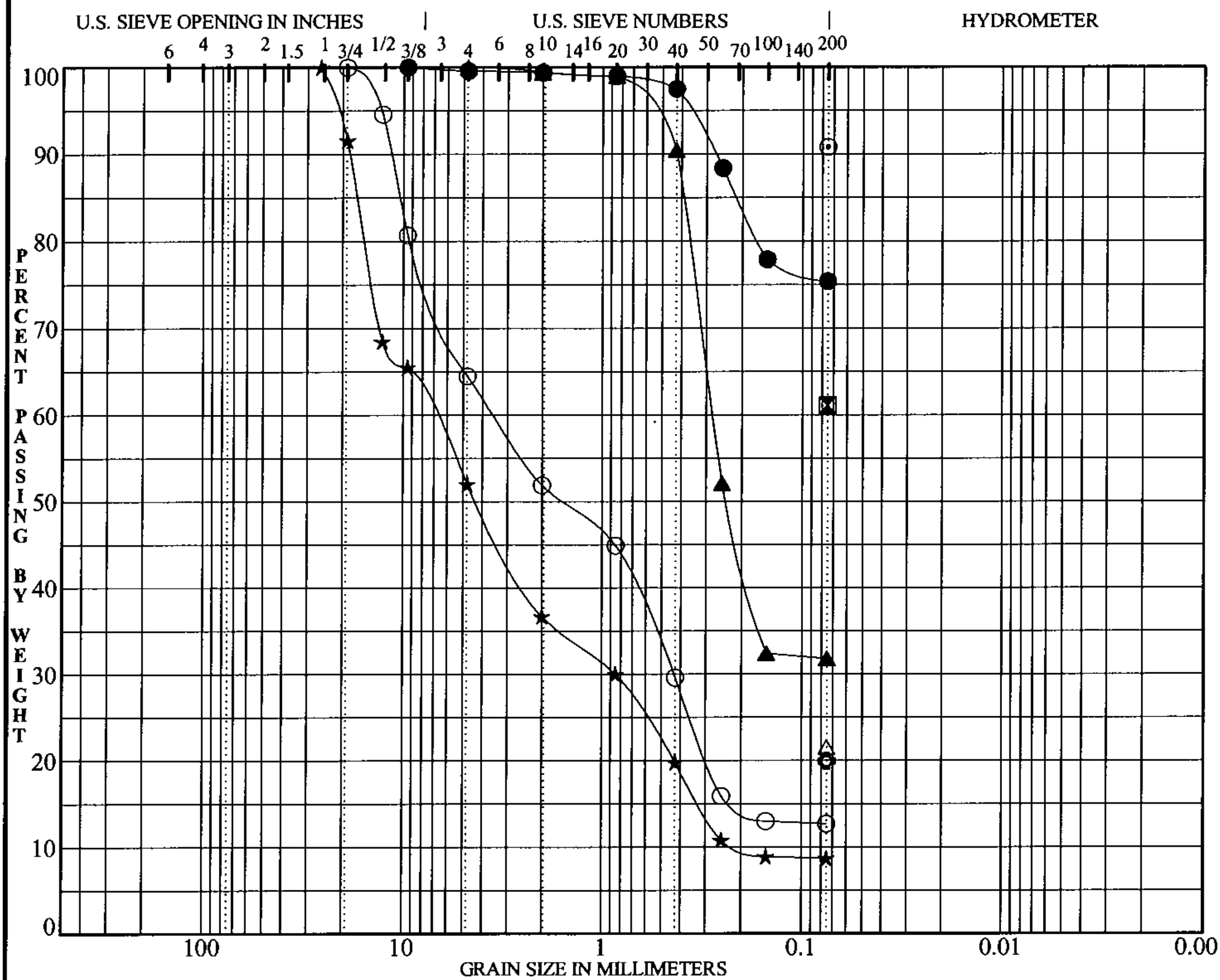
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-76

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-31	40.7	75	100	Lean CLAY with sand (CL)	CL
⊠	BH-31	50.5	61		Sandy Lean CLAY (CL)	CL
▲	BH-31	55.3	32	100	Clayey SAND (SC)	SC
★	BH-31	58.3	9	52	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
⊙	BH-31	76.5	91		Lean CLAY with sand (CL)	CL
✿	BH-31	86.0	20		Clayey SAND with gravel (SC)	SC
○	BH-31	88.8	13	65	Clayey SAND with gravel (SC)	SC
△	BH-31	94.4	22		Clayey SAND with gravel (SC)	SC

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

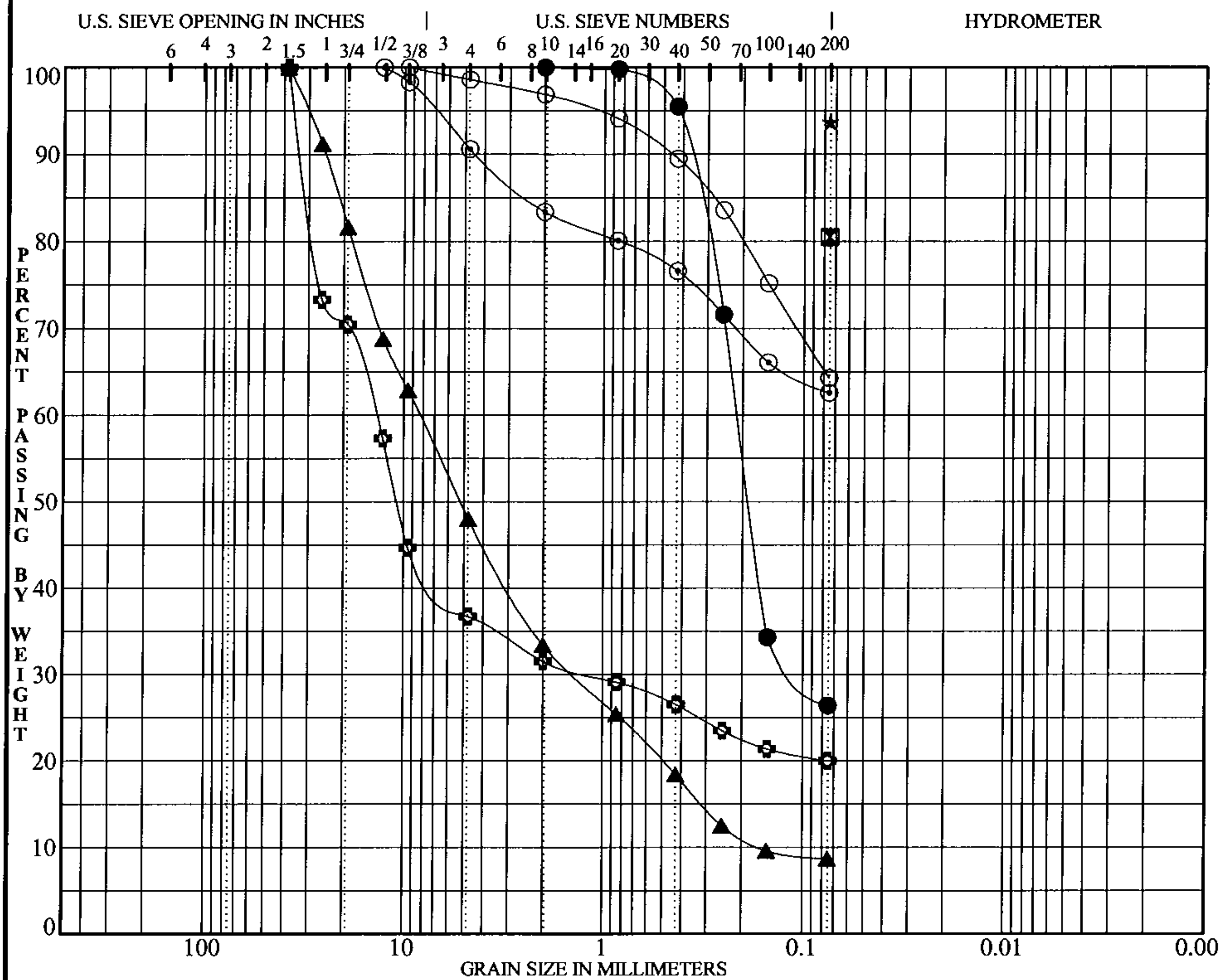
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-77**

PROJECT No. 204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-32	42.0	26		Silty SAND (SM)	SM
⊠	BH-32	52.3	81		Lean CLAY with sand (CL)	CL
▲	BH-32	60.8	9	48	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
★	BH-32	66.8	94		Lean CLAY (CL)	CL
⊙	BH-32	71.5	63	91	Sandy Lean CLAY (CL)	CL
✿	BH-32	80.5	20	37	Clayey GRAVEL with sand (GC)	GC
○	BH-32	92.5	64	99	Sandy SILT (ML)	ML

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

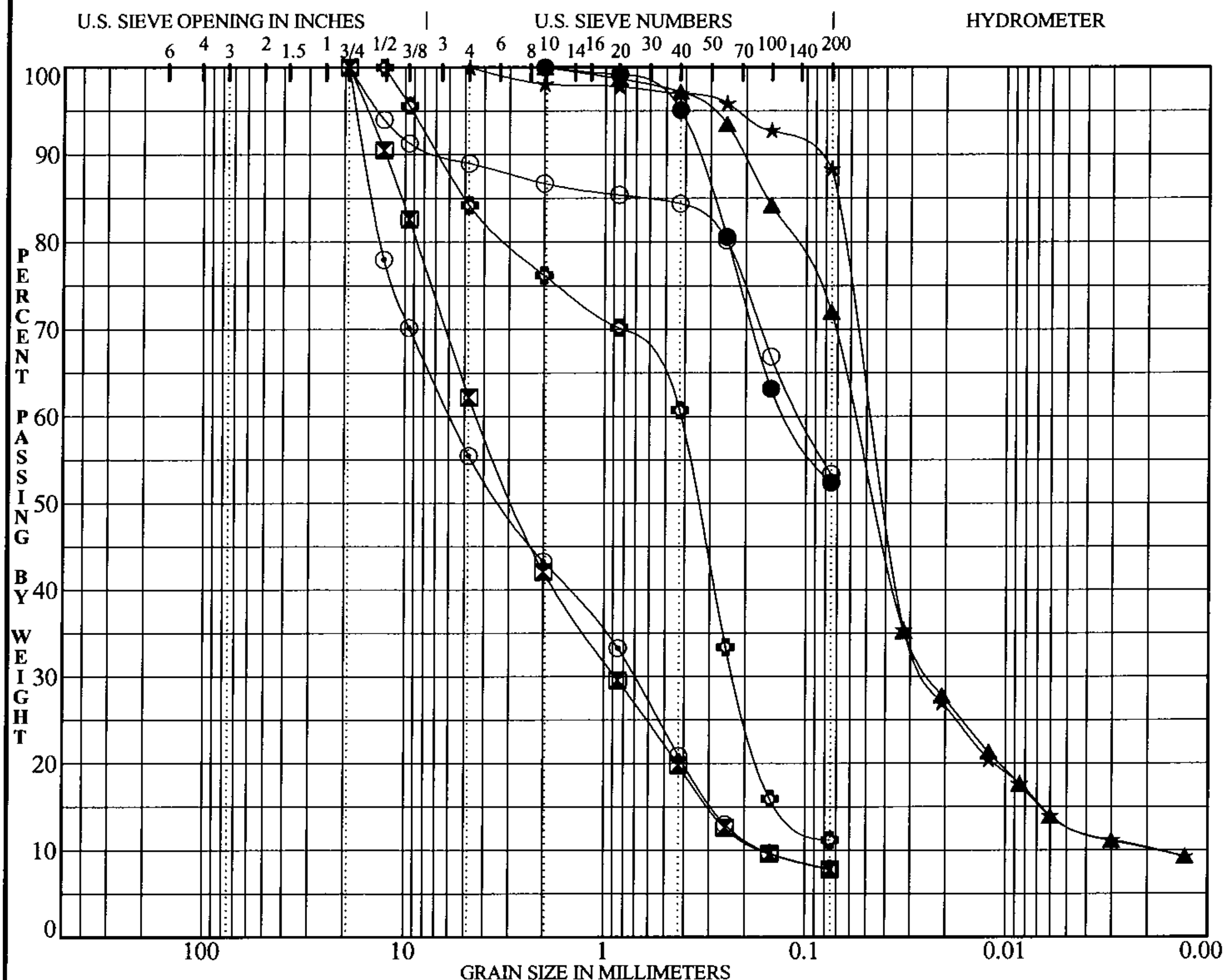
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-78**

PROJECT No. 204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-33	20.0	52		Sandy Lean CLAY (CL)	CL
⊠	BH-33	41.3	8	62	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
▲	BH-33	71.0	72		Sandy Lean CLAY (CL)	CL
★	BH-33	82.5	88	100	Lean CLAY (CL)	CL
⊙	BH-33	91.0	8	56	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
✪	BH-33	116.1	11	84	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
○	BH-33	148.3	53	89	Sandy Lean CLAY (CL)	CL

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

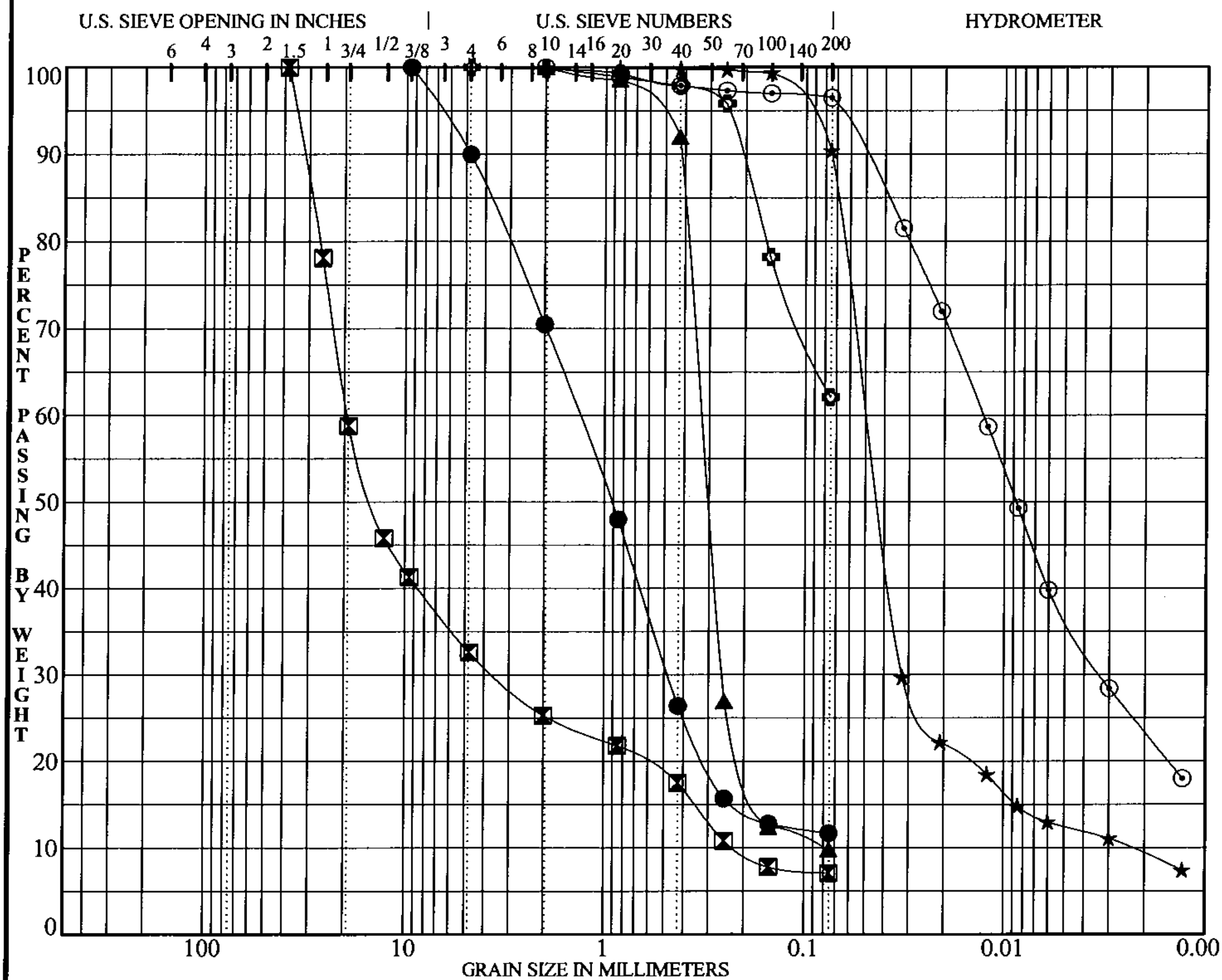
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-79

PROJECT No.
204104.10



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-34	80.8	12	90	Well-graded SAND with silt (SW-SM)	SW-SM
⊠	BH-34	90.8	7	33	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
▲	BH-34	100.8	10		Poorly-graded SAND with silt (SP-SM)	SP-SM
★	BH-34	111.3	90		SILT (ML)	ML
⊙	BH-34	127.2	97		Lean CLAY (CL)	CL
✿	BH-34	150.8	62	100	Sandy SILT (ML)	ML

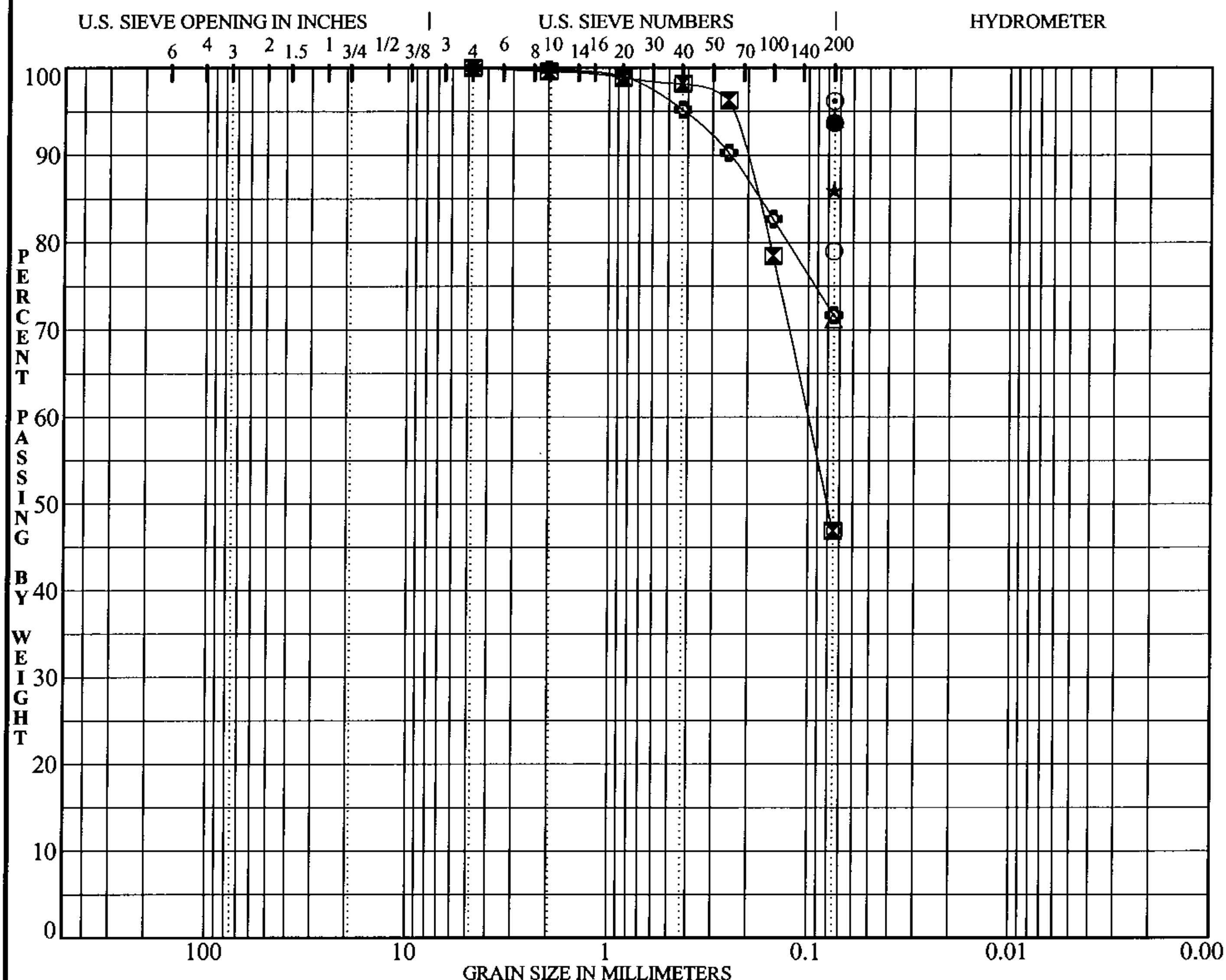
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-80

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-35	49.2	94		Lean CLAY (CL)	CL
⊠	BH-35	49.7	47	100	Silty SAND to Sandy SILT (SM/ML)	SM/ML
▲	BH-35	51.5	94		Lean CLAY (CL)	CL
★	BH-35	54.3	86		Lean CLAY (CL)	CL
⊙	BH-35	59.4	96		Lean CLAY (CL)	CL
✿	BH-35	59.9	72	100	Sandy Lean CLAY (CL)	CL
○	BH-35	61.0	79		Lean CLAY with sand (CL)	CL
△	BH-35	61.5	71		Sandy Lean CLAY (CL)	CL

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

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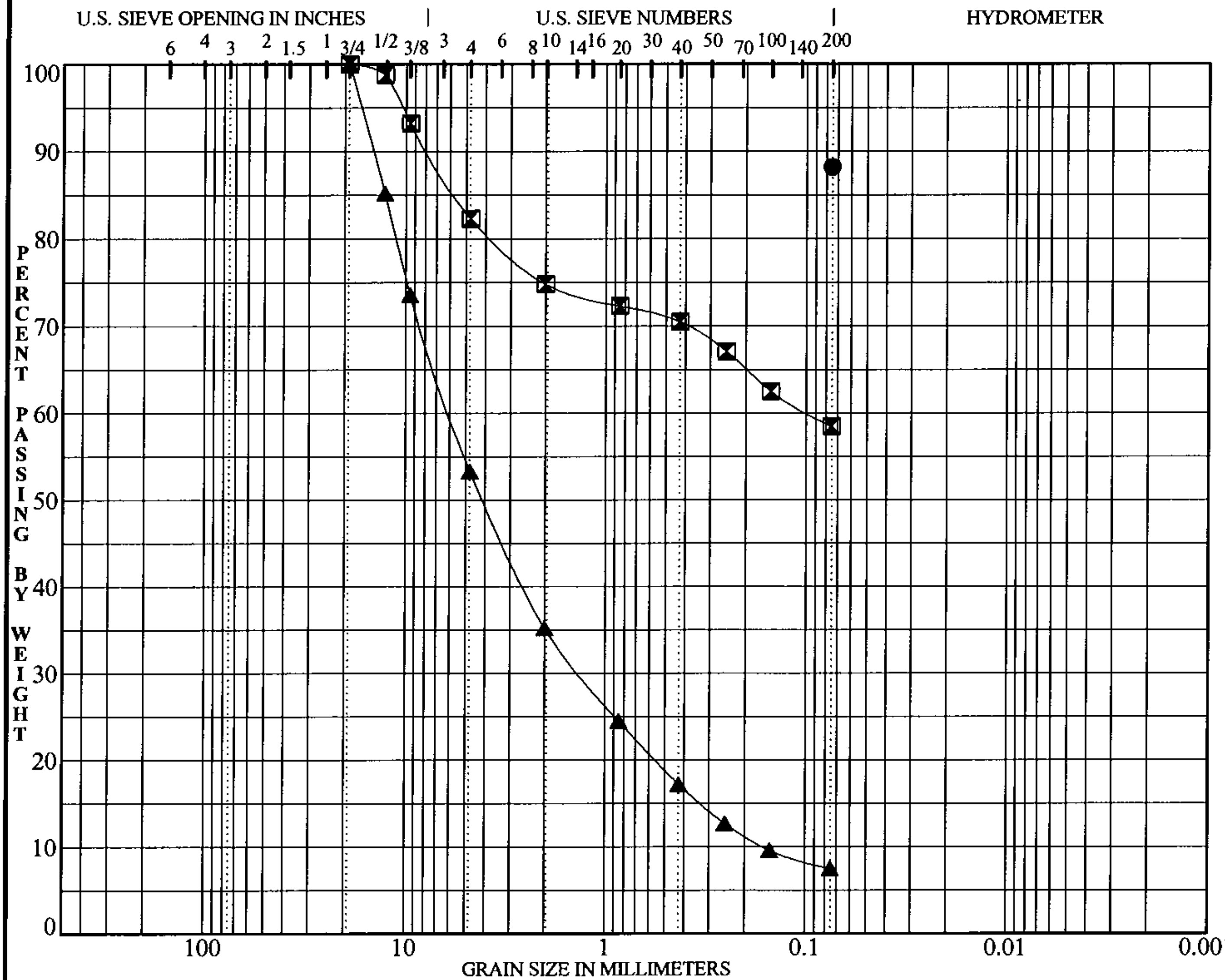
SVRT DOWNTOWN
San Jose, California

FIGURE
A12-81-1

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-35	64.8	88		Lean CLAY (CL)	CL
⊠	BH-35	67.5	59	82	Sandy Lean CLAY with gravel (CL)	CL
▲	BH-35	72.5	8	53	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:
APP'D BY: Y. D. Wang
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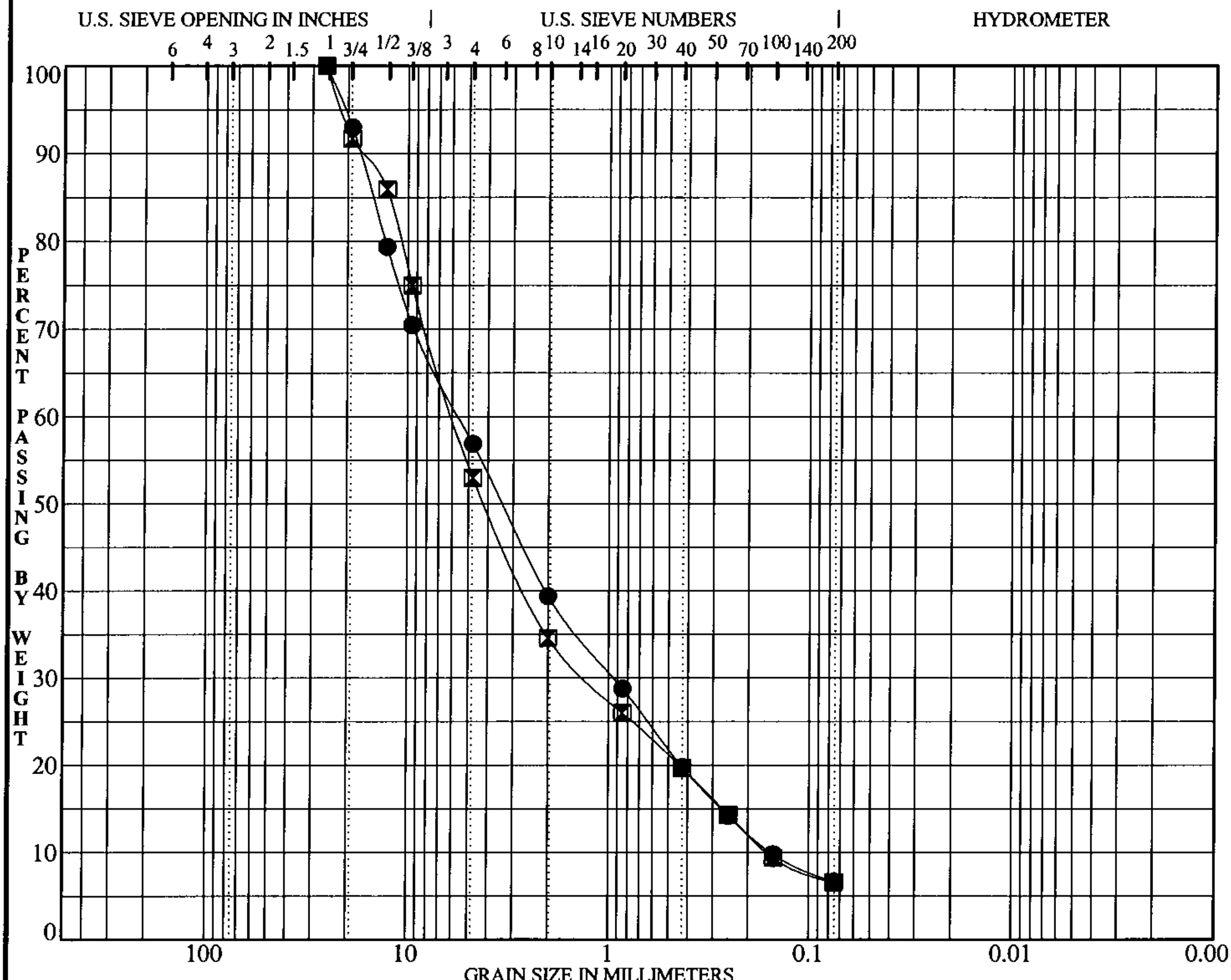
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-81-2**

PROJECT No. 204104.10

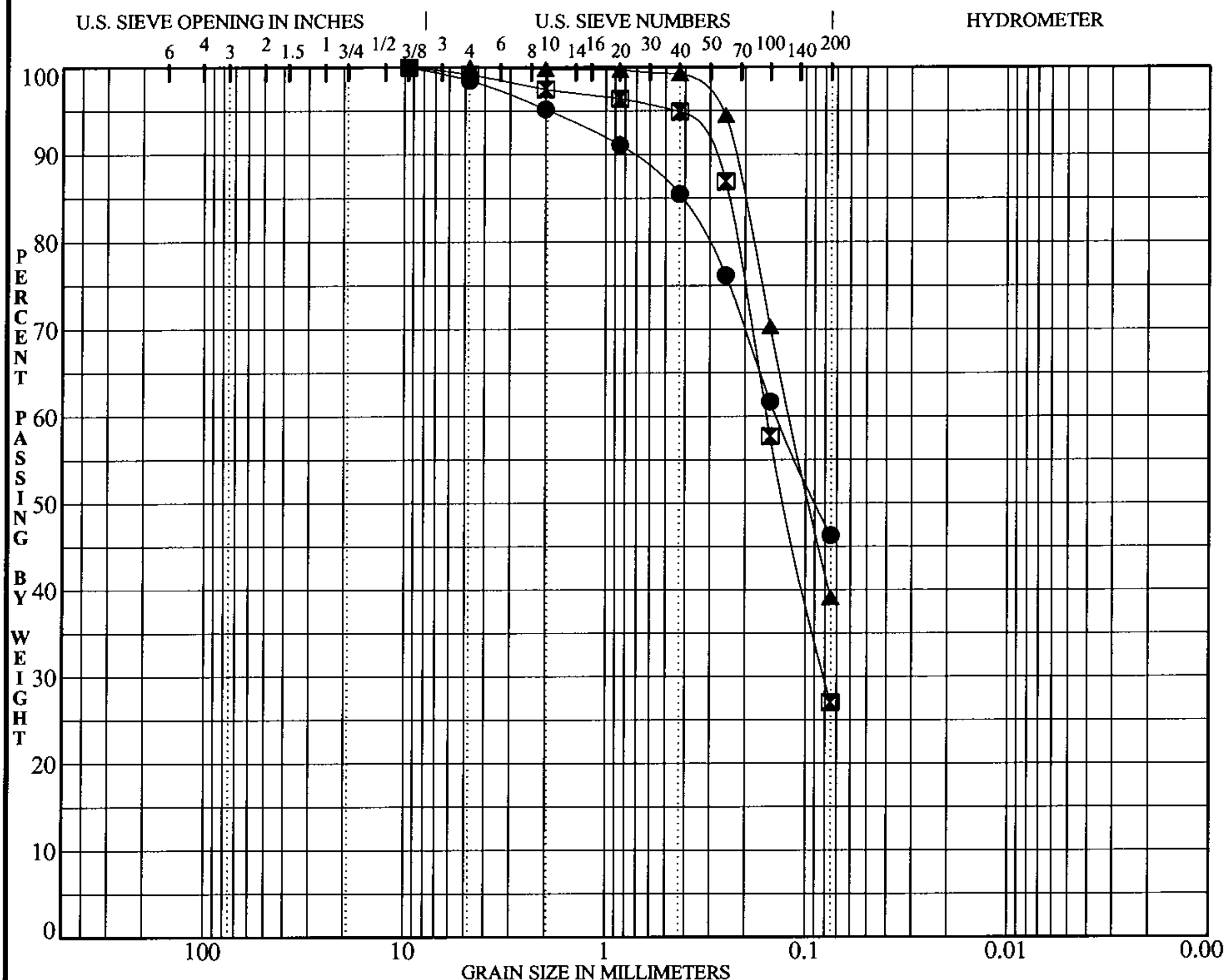


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-36	51.0	7	57	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊠	BH-36	81.0	7	53	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-82
DATE: 17/6/05	SVRT DOWNTOWN	PROJECT No.
DWG FILE:	San Jose, California	204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-37	35.9	46	99	Clayey SAND to Sandy Lean CLAY (SC/CL)	SC/CL
⊠	BH-37	56.4	27	99	Silty SAND (SM)	SM
▲	BH-37	66.2	39	100	Silty SAND (SM)	SM

GRADATION_B 204104 06 20 2005.GPJ STD.GDT 17/6/05

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APP'D BY: Y. D. Wang
DATE: 17/6/05
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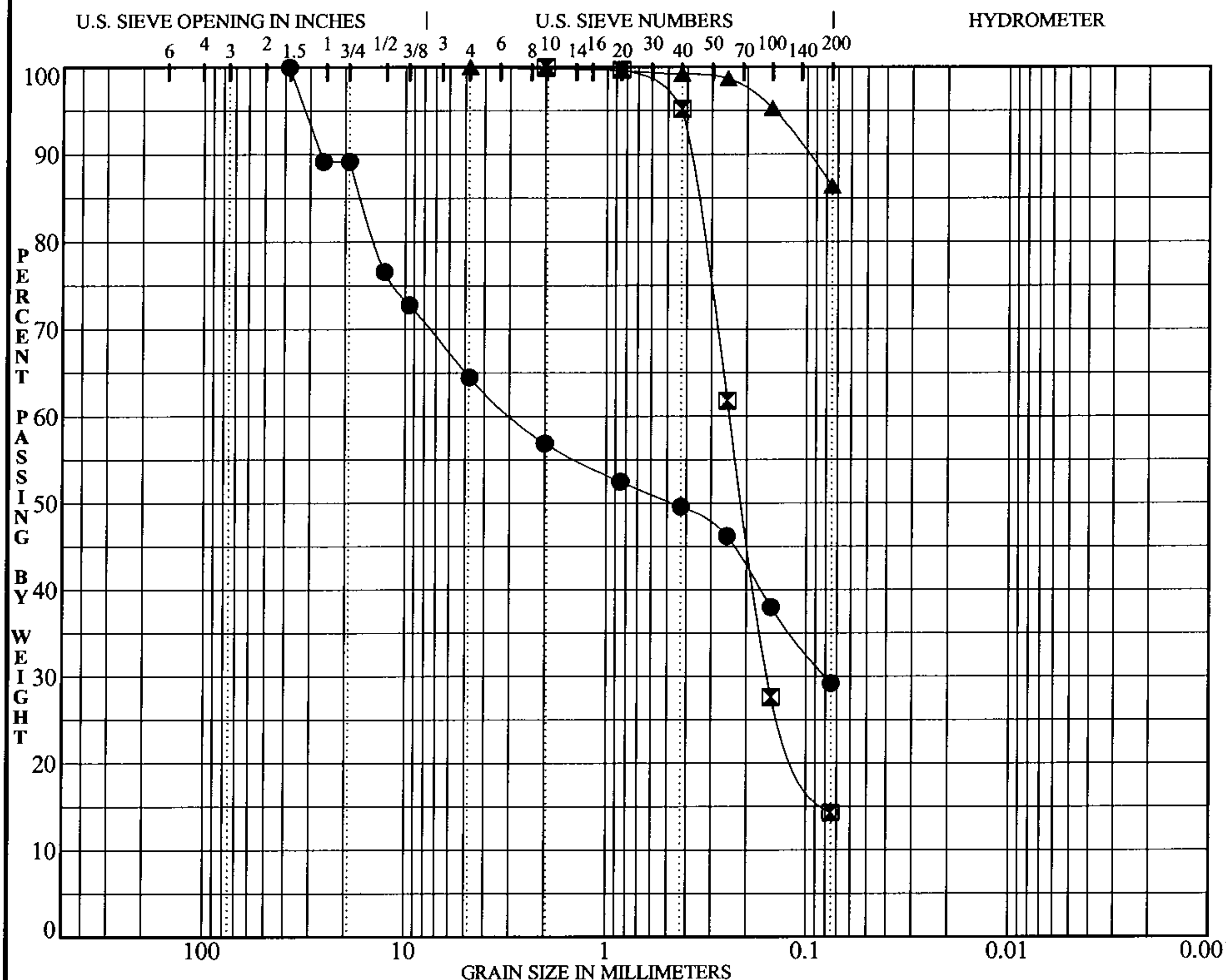
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-83

PROJECT No. 204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-38	40.0	29	65	Silty GRAVEL with sand (GM)	GM
⊠	BH-38	55.3	14		Silty SAND (SM)	SM
▲	BH-38	78.8	86	100	Lean CLAY with sand (CL)	CL

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05

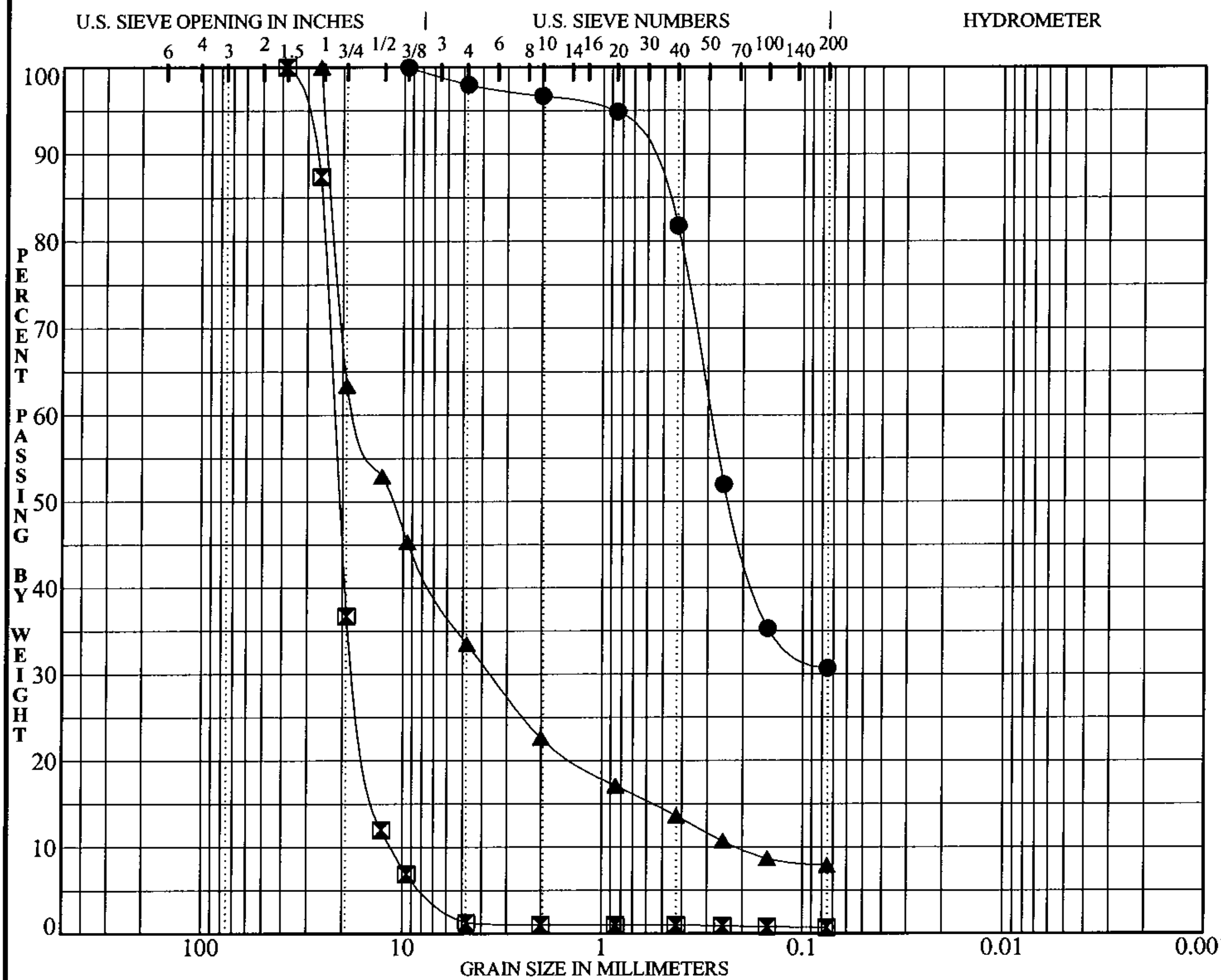
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-84

PROJECT No.
204104.10

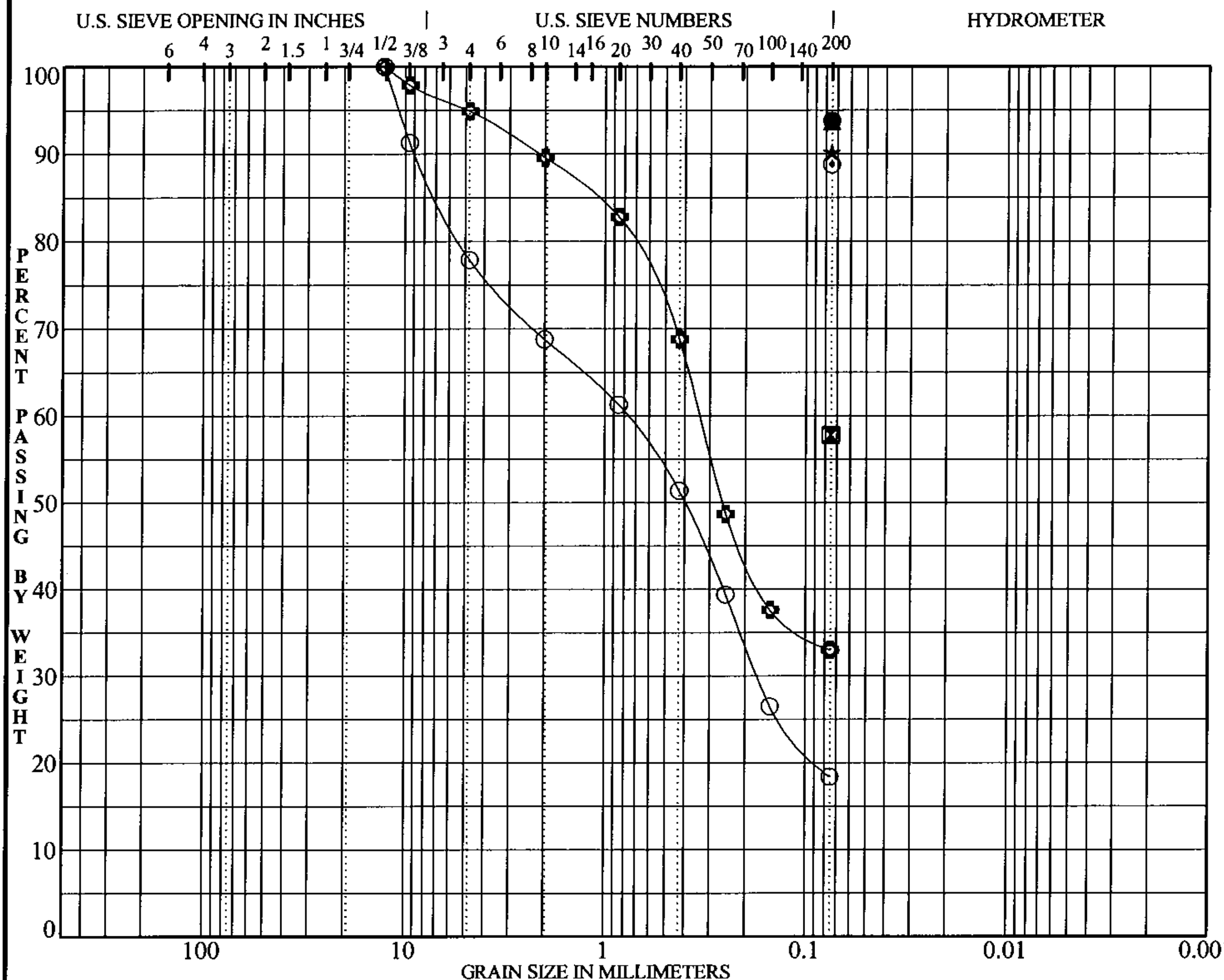


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-39	39.3	31	98	Silty SAND (SM)	SM
⊠	BH-39	54.3	1	1	Poorly-graded GRAVEL (GP)	GP
▲	BH-39	64.5	8	34	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang	SVRT DOWNTOWN	A12-85
DATE: 17/6/05	San Jose, California	PROJECT No.
DWG FILE:		204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-40	52.5	94		Lean CLAY (CL)	CL
⊠	BH-40	56.5	58		Sandy Lean CLAY (CL)	CL
▲	BH-40	57.5	94		Lean CLAY (CL)	CL
★	BH-40	60.0	90		Lean CLAY (CL)	CL
⊙	BH-40	62.4	89		Lean CLAY (CL)	CL
✪	BH-40	64.0	33	95	Silty SAND (SM)	SM
○	BH-40	65.8	18	78	Silty SAND with gravel (SM)	SM

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
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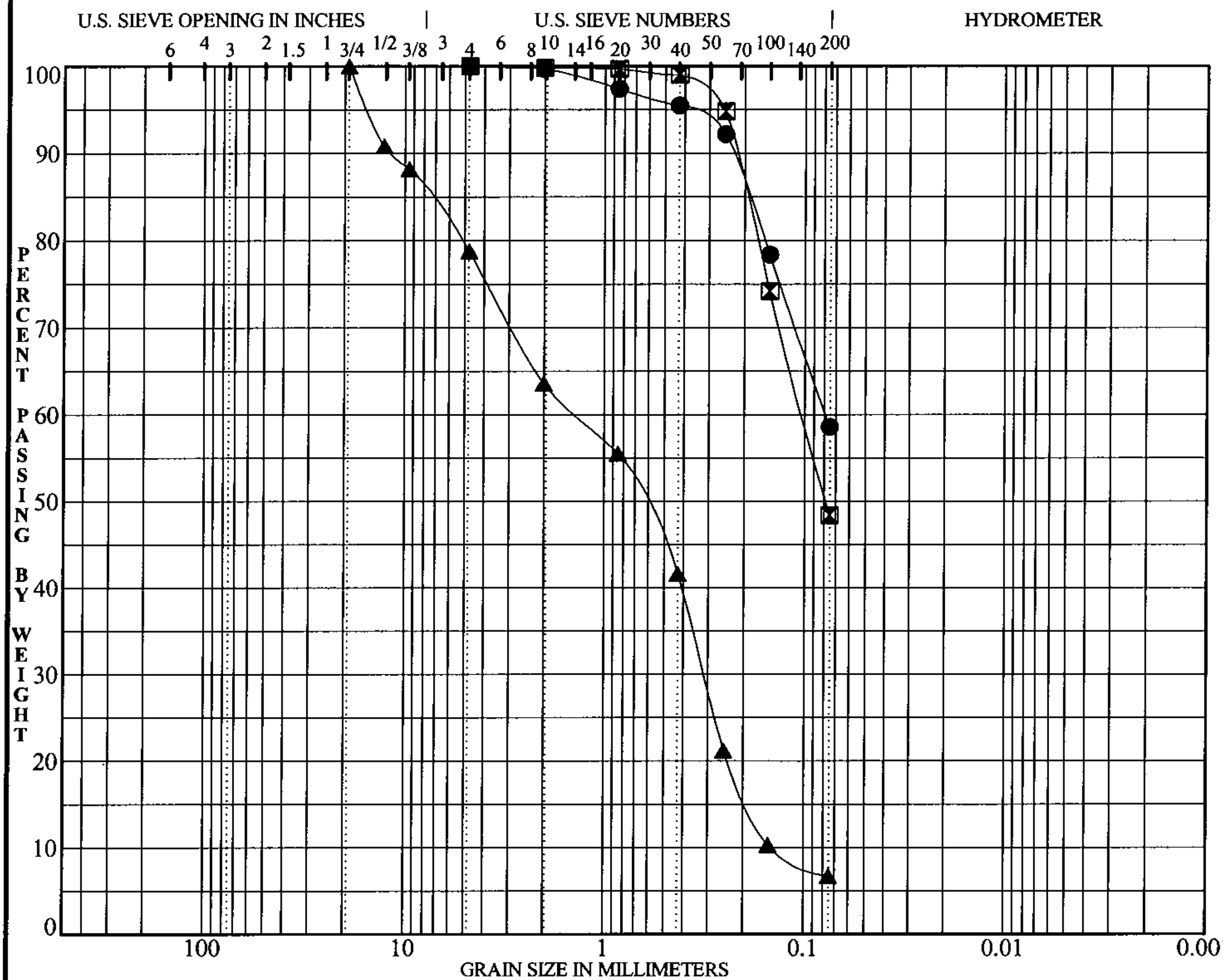
SVRT DOWNTOWN
San Jose, California

FIGURE
A12-86

PROJECT No.
204104.10



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-41	32.3	59	100	Sandy Lean CLAY (CL)	CL
⊠	BH-41	41.5	48	100	Clayey SAND to Sandy Lean CLAY (SC/CL)	SC/CL
▲	BH-41	46.3	7	79	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05

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APP'D BY: Y. D. Wang
DATE: 17/6/05
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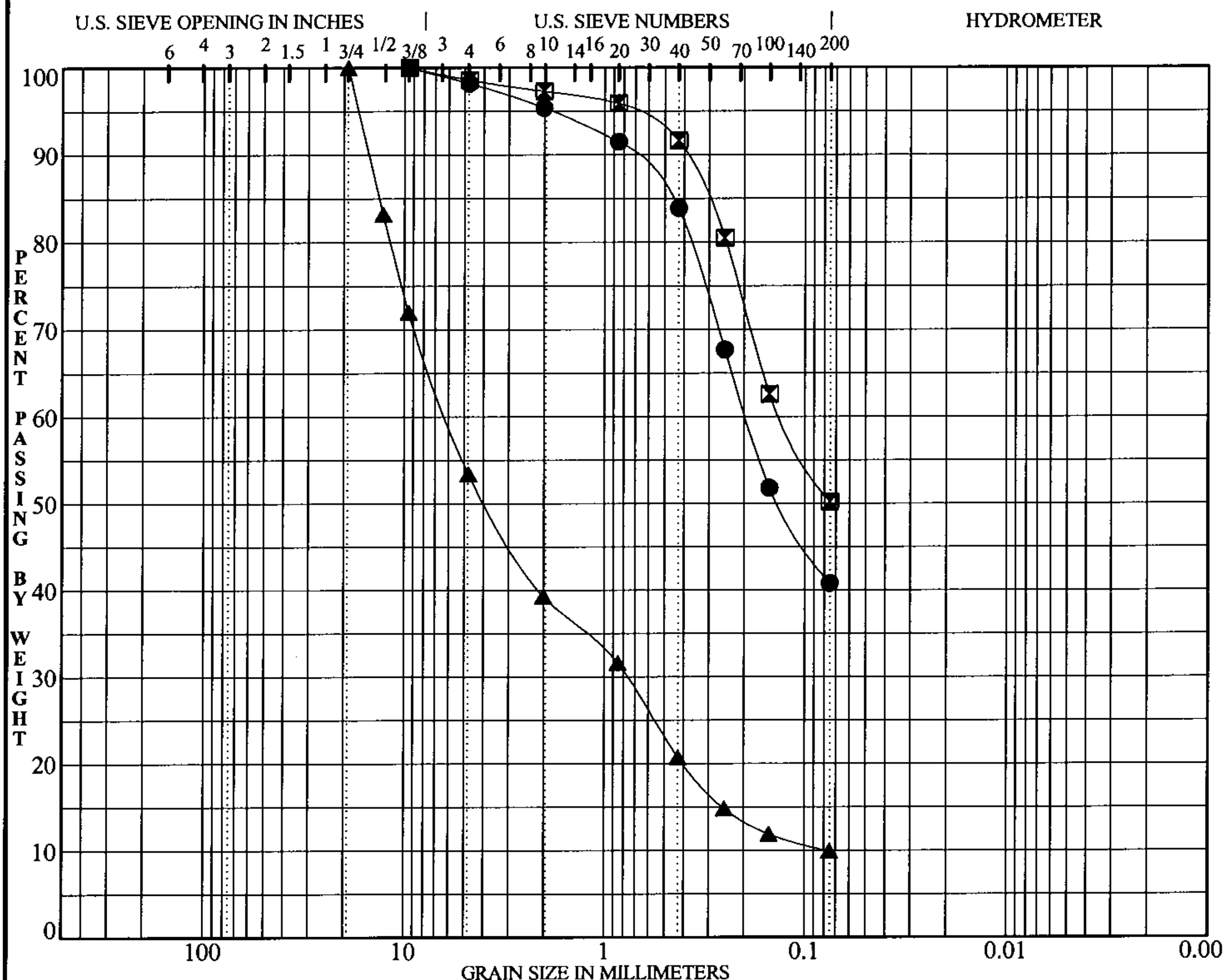
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-87**

PROJECT No. 204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-42	6.0	41	98	Silty SAND (SM)	SM
⊠	BH-42	42.3	50	99	Sandy Lean CLAY to Clayey SAND (CL/SC)	CL/SC
▲	BH-42	45.8	10	53	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

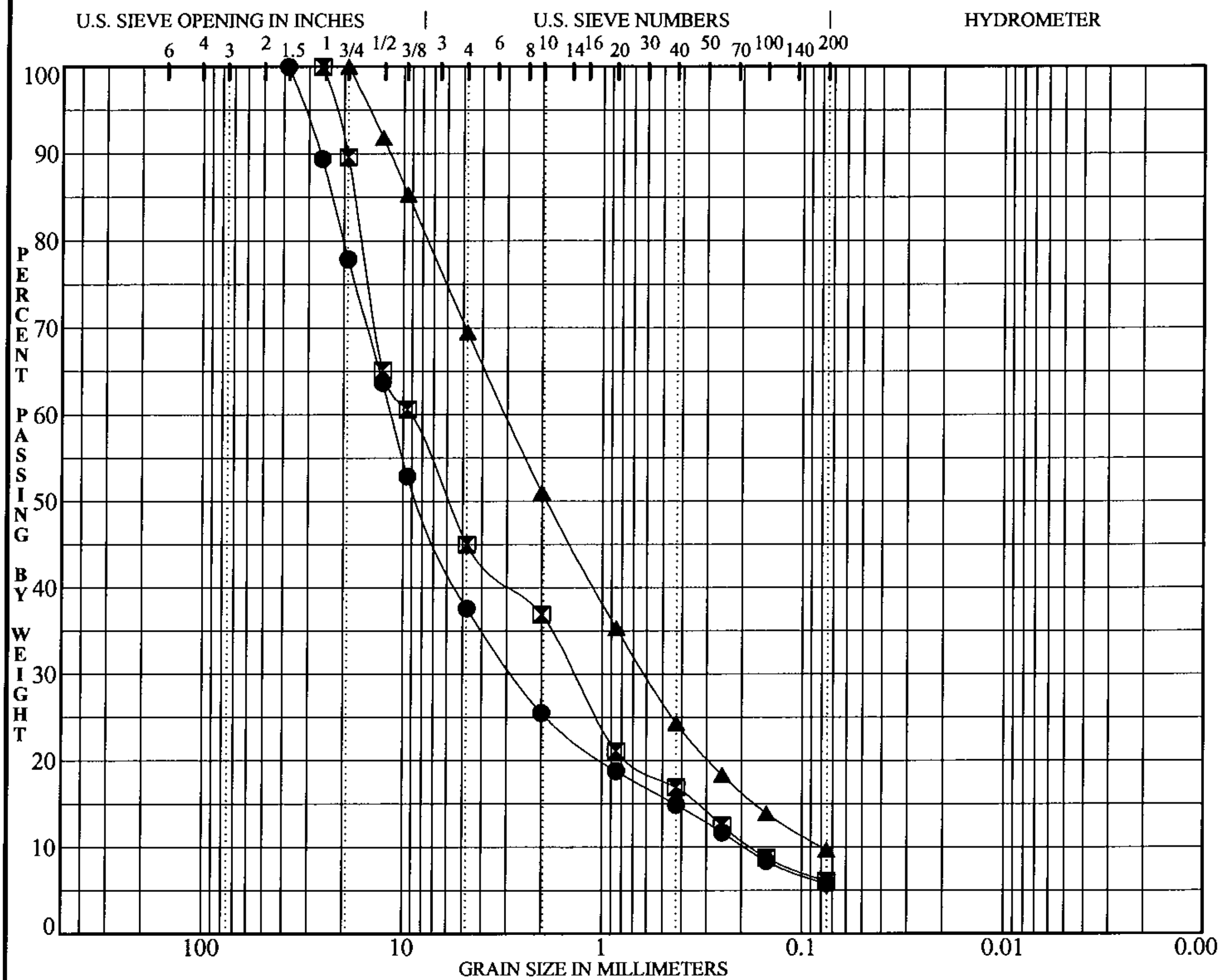
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-88

PROJECT No.
204104.10



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-43	33.7	6	38	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
⊠	BH-43	40.4	6	45	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
▲	BH-43	48.0	10	70	Well-graded SAND with silt and gravel (SW-SM)	SW-SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

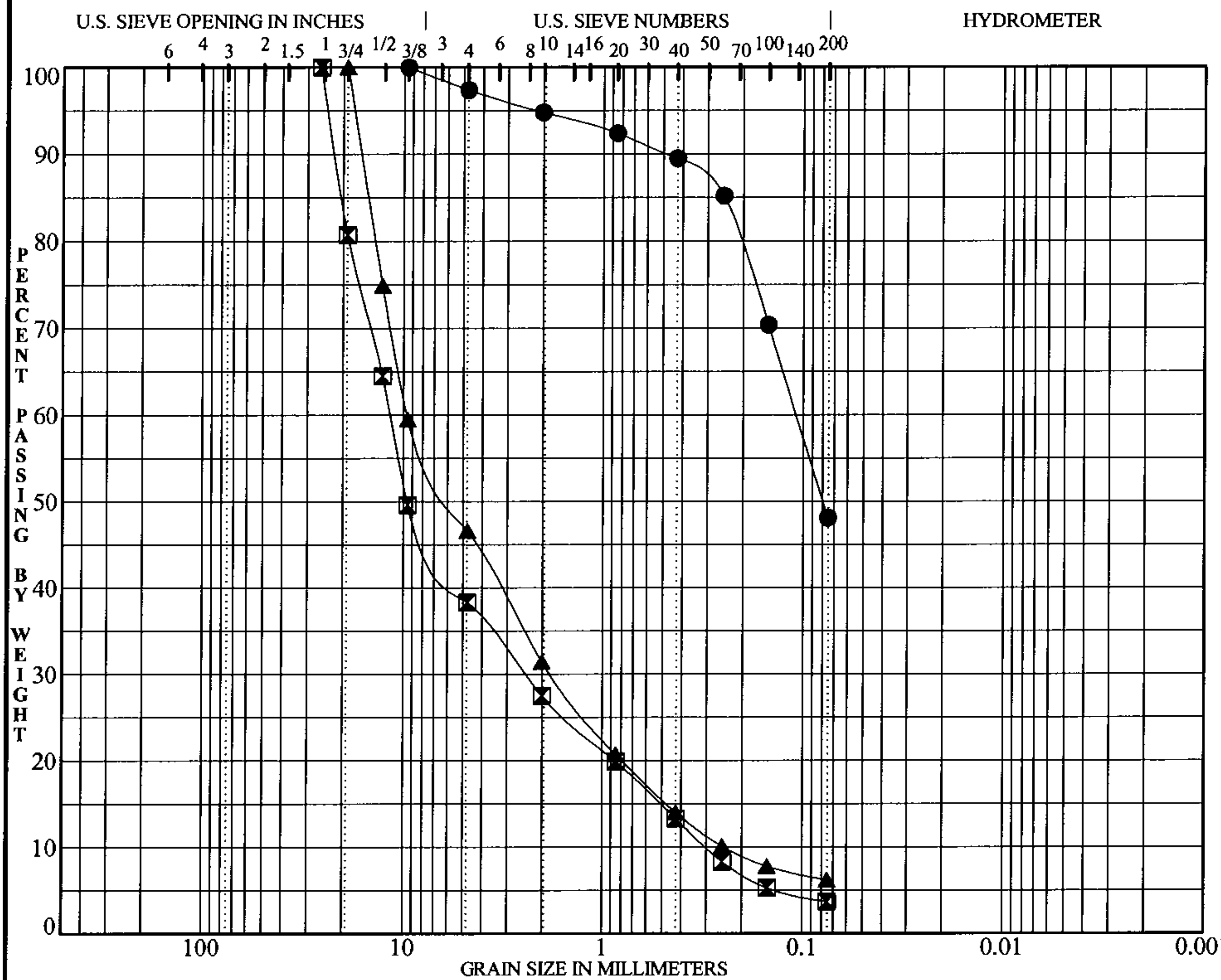
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-89

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-44	11.2	48	97	Clayey SAND to Sandy Lean CLAY (SC/CL)	SC/CL
⊠	BH-44	44.3	4	38	Well-graded GRAVEL with sand (GW)	GW
▲	BH-44	50.8	6	47	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05

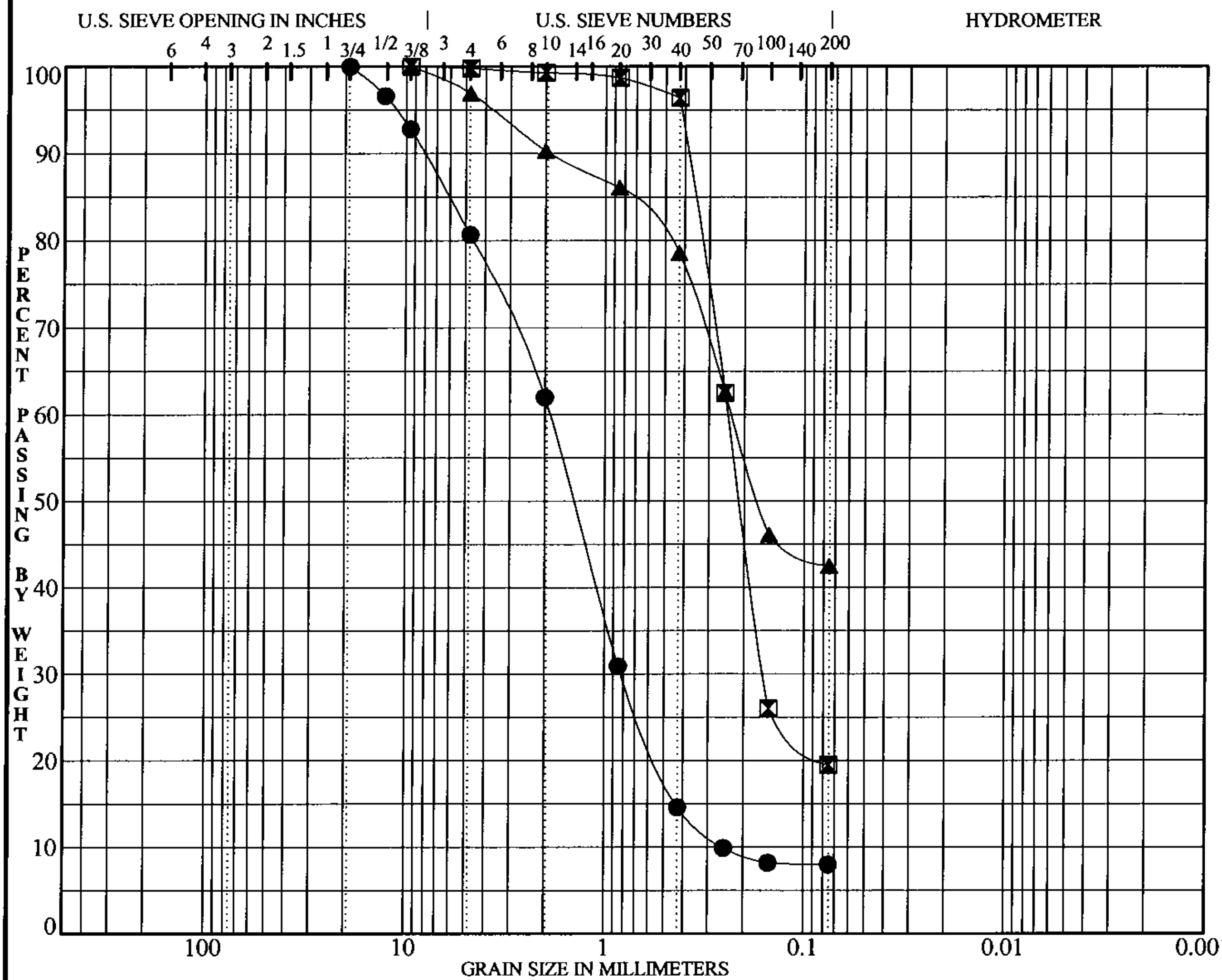
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-90**

PROJECT No. 204104.10

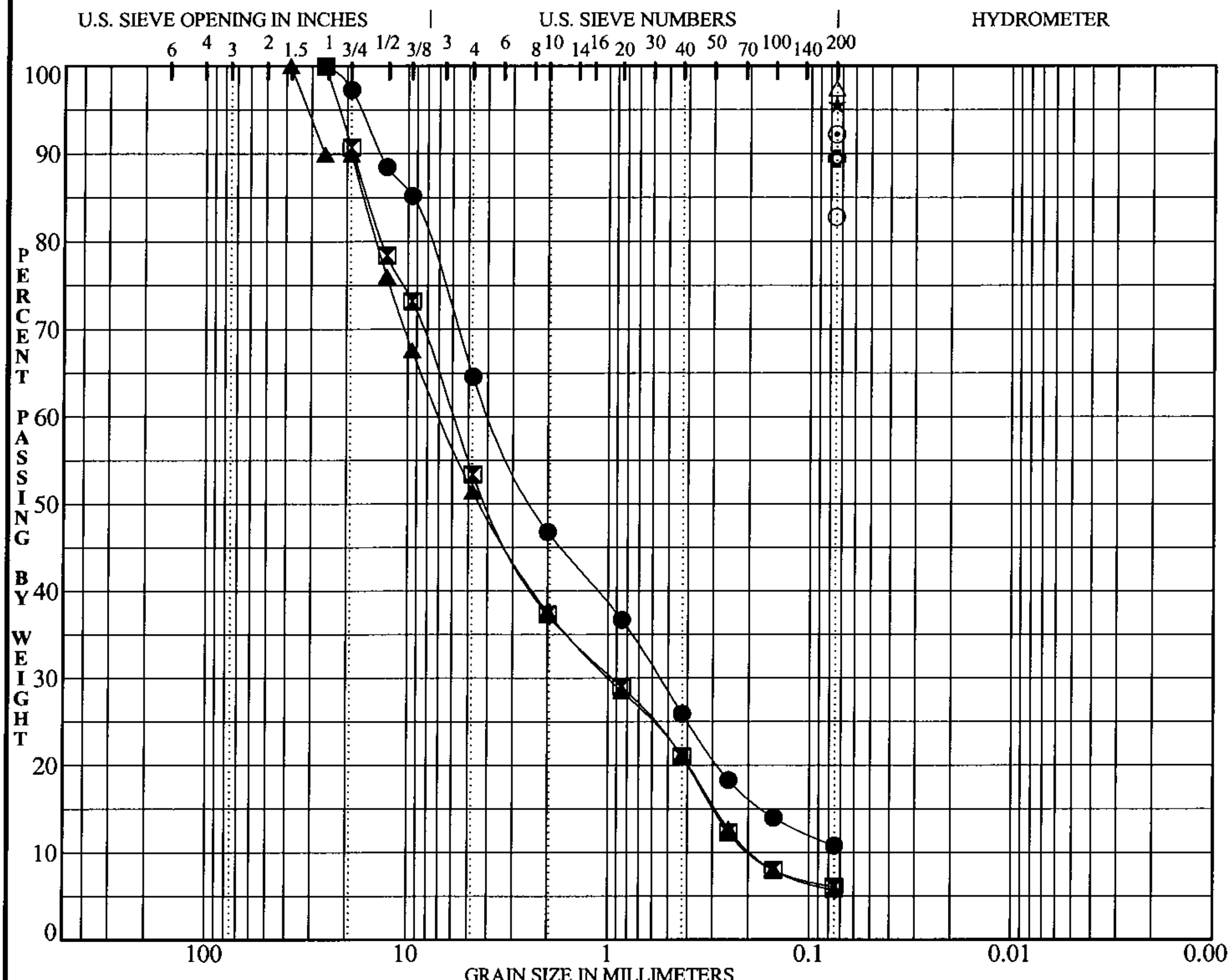


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-45	54.2	8	81	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊠	BH-45	76.2	20	100	Silty SAND (SM)	SM
▲	BH-45	80.3	43	97	Silty SAND (SM)	SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-91
DATE: 17/6/05	SVRT DOWNTOWN	PROJECT No.
DWG FILE:	San Jose, California	204104.10



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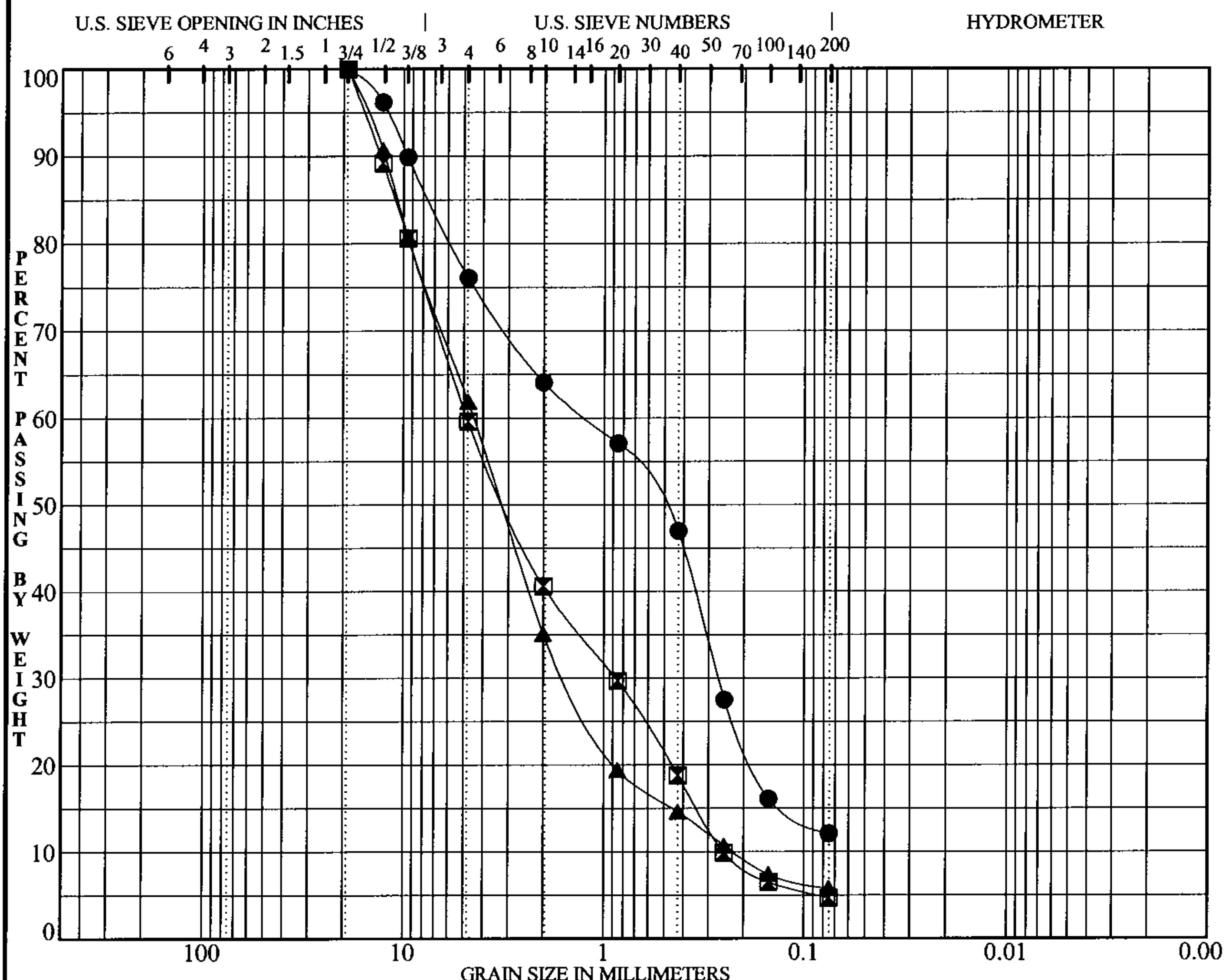
<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-46	31.0	11	65	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊠	BH-46	41.1	6	53	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
▲	BH-46	46.0	6	51	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
★	BH-46	52.0	96		SILT to Lean CLAY (ML/CL)	ML/CL
⊙	BH-46	52.5	92		SILT to Lean CLAY (ML/CL)	ML/CL
✿	BH-46	56.0	89		SILT to Lean CLAY (ML/CL)	ML/CL
○	BH-46	57.0	83		Lean CLAY with sand (CL)	CL
△	BH-46	60.0	97		Silty CLAY (CL-ML)	CL-ML

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-92
DATE: 17/6/05	SVRT DOWNTOWN	PROJECT No.
DWG FILE:	San Jose, California	204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-47	6.0	12	76	Silty SAND with gravel (SM)	SM
⊠	BH-47	35.8	5	60	Poorly-graded SAND with gravel (SP)	SP
▲	BH-47	45.8	6	62	Well-graded SAND with silt and gravel (SW-SM)	SW-SM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

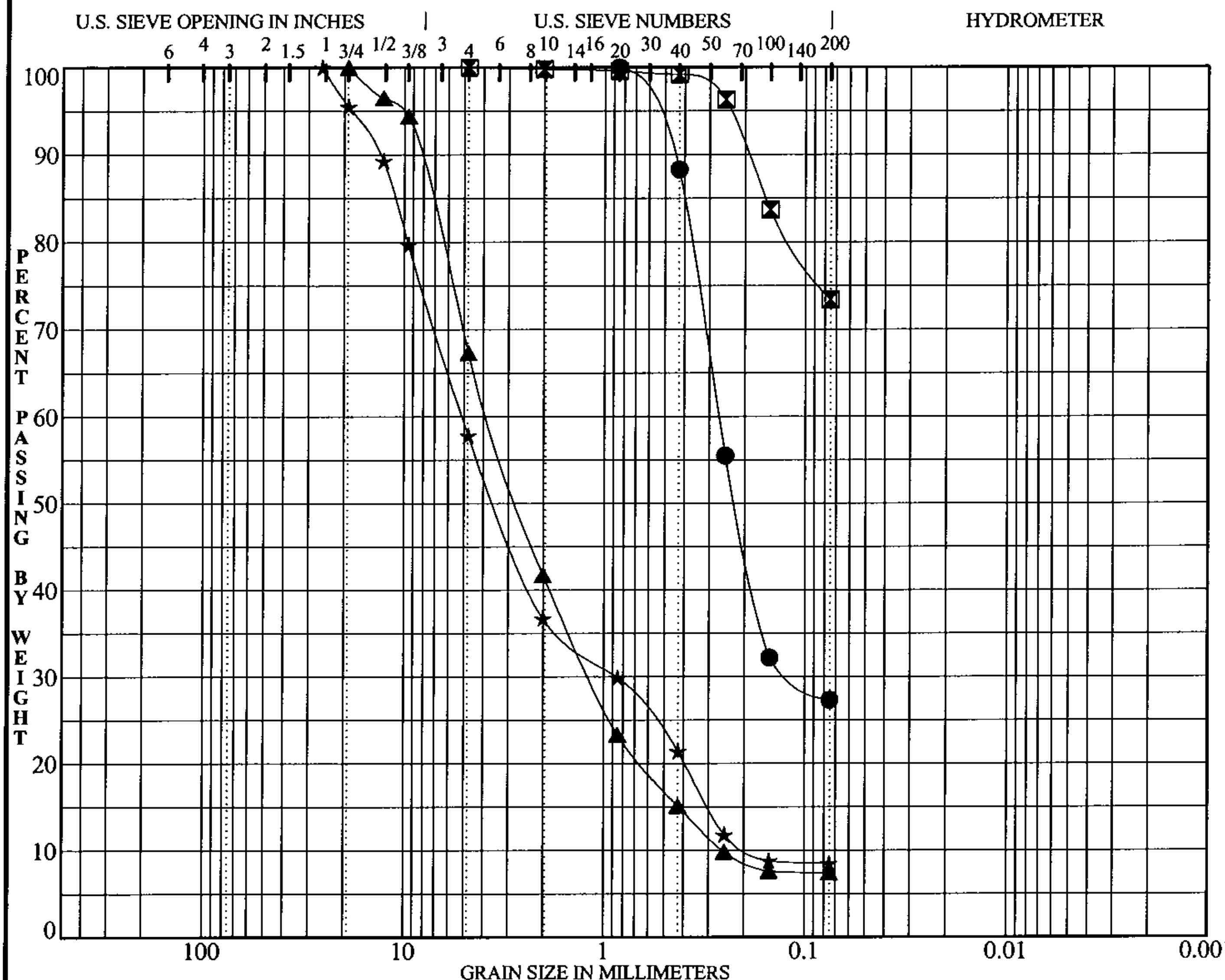
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-93

PROJECT No.
204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-48	44.0	27		Silty SAND (SM)	SM
⊠	BH-48	54.0	73	100	Sandy Lean CLAY (CL)	CL
▲	BH-48	66.5	7	67	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
★	BH-48	70.7	9	58	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

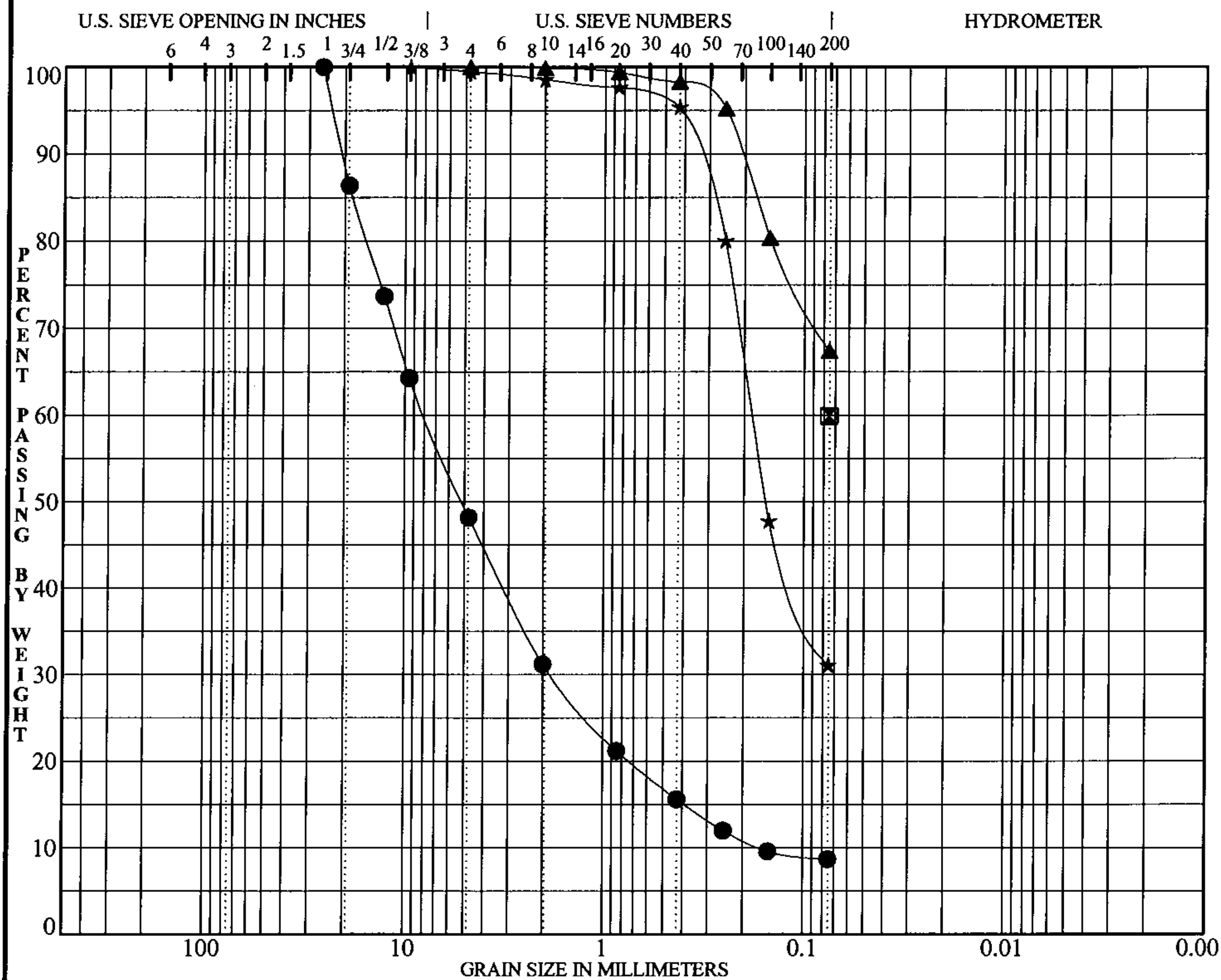
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-94

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-49	30.4	9	48	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
⊠	BH-49	35.5	60		Sandy SILT (ML)	ML
▲	BH-49	47.1	67	100	Sandy SILT (ML)	ML
★	BH-49	52.0	31	100	Silty SAND (SM)	SM

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05

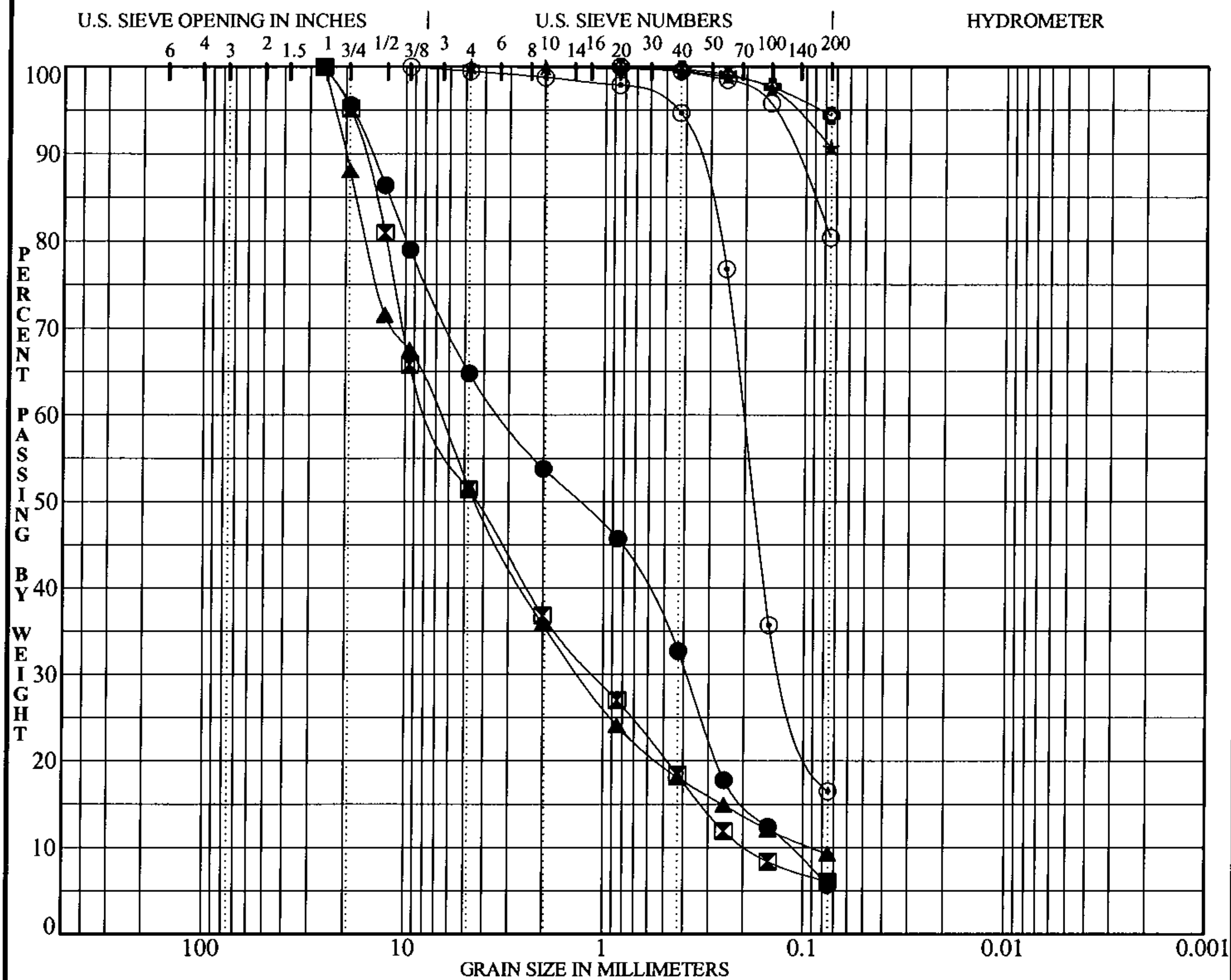
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-95

PROJECT No.
204104.10



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
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Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-50	61.1	6	65	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
⊠	BH-50	80.5	6	51	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
▲	BH-50	90.0	9	52	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
★	BH-50	120.5	91	100	Lean CLAY (CL)	CL
⊙	BH-50	130.5	17	100	Silty SAND (SM)	SM
✪	BH-50	140.5	94		Lean CLAY (CL)	CL
○	BH-50	150.5	80		SILT with sand (ML)	ML

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

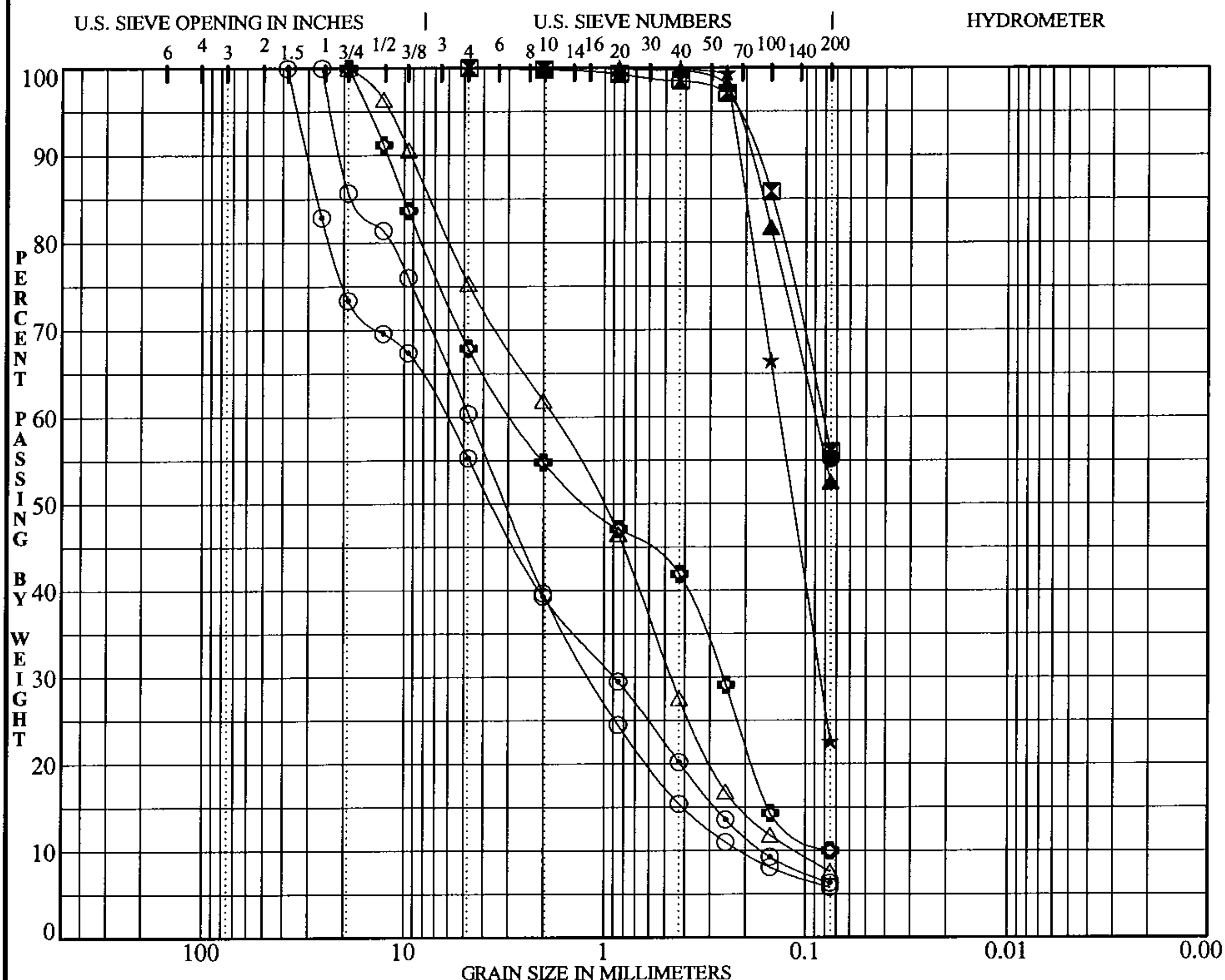
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-96

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-52	26.9	55		Sandy Lean CLAY (CL)	CL
⊠	BH-52	54.5	56	100	Sandy SILT (ML)	ML
▲	BH-52	56.7	53		Sandy Lean CLAY to Clayey SAND (CL/SC)	CL/SC
★	BH-52	61.0	23		Silty SAND (SM)	SM
⊙	BH-52	65.8	6	55	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
✪	BH-52	75.2	10	68	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
○	BH-52	84.9	6	60	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
△	BH-52	90.1	8	75	Well-graded SAND with silt and gravel (SW-SM)	SW-SM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

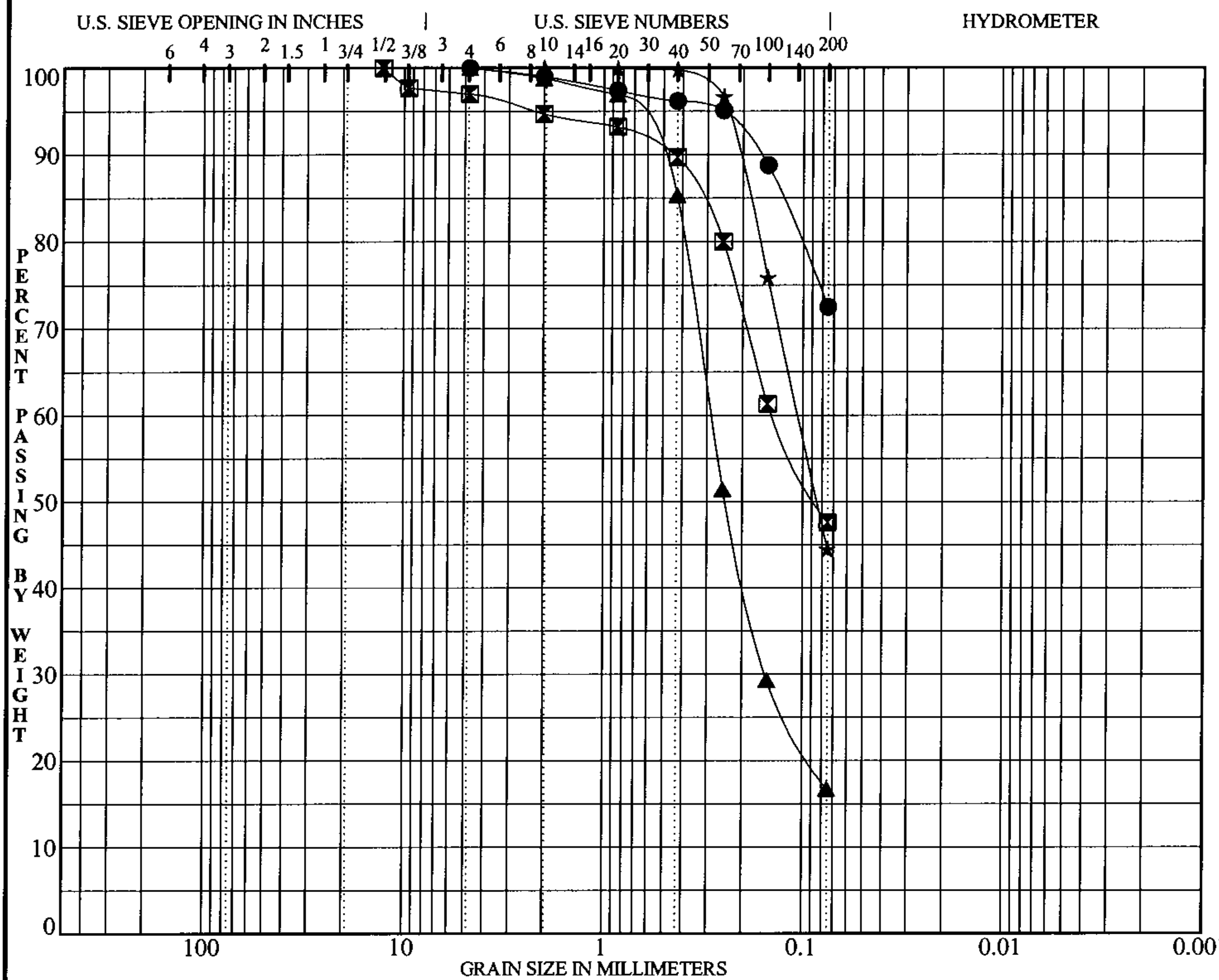
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-97-1

PROJECT No.
204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-52	116.5	73	100	Sandy Lean CLAY (CL)	CL
⊠	BH-52	121.5	48	97	Clayey SAND to Sandy Lean Clay (SC/CL)	SC/CL
▲	BH-52	130.3	17	100	Silty SAND (SM)	SM
★	BH-52	150.3	45		Silty SAND to Sandy SILT (SM/ML)	SM/ML

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

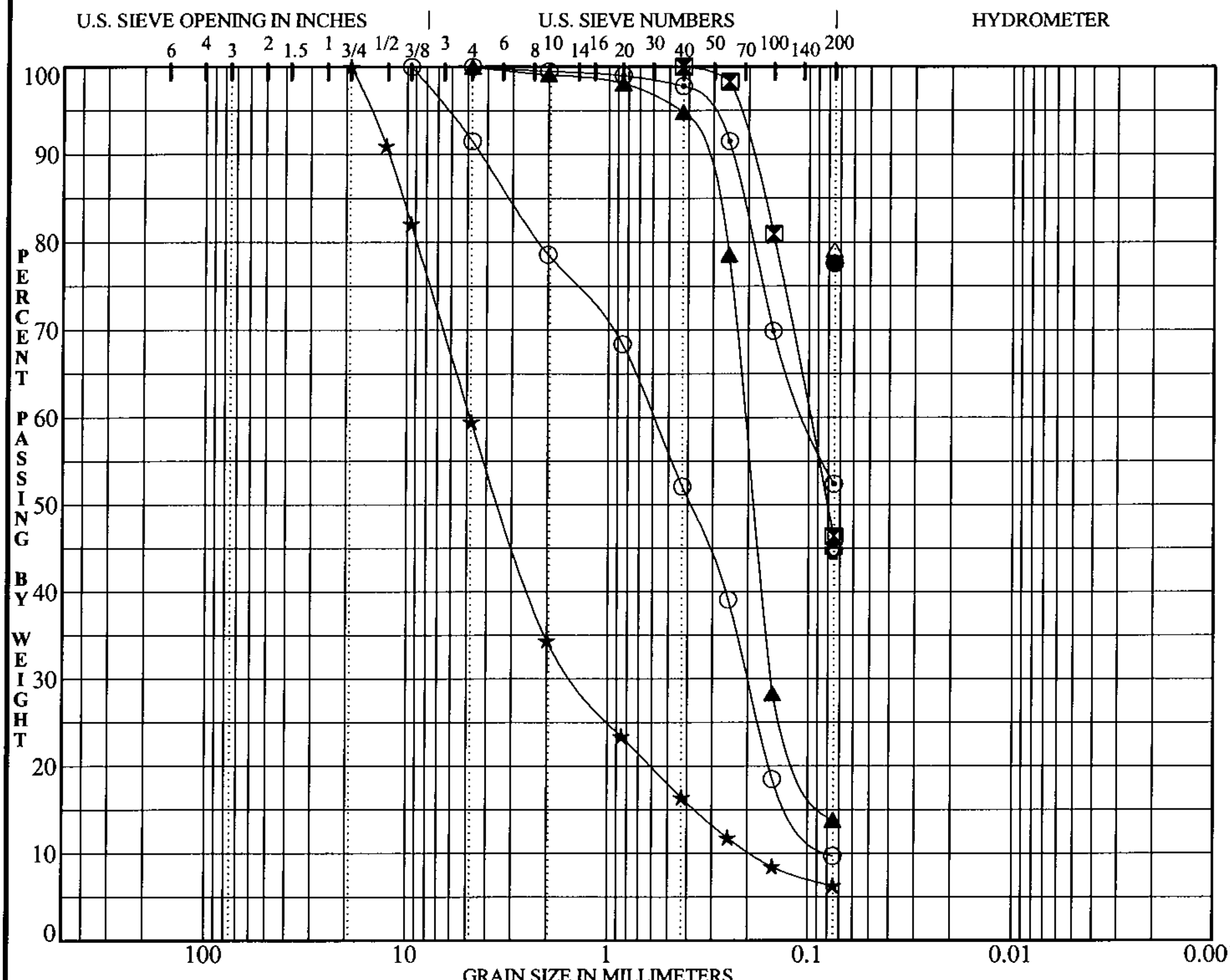
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-97-2

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-53	54.2	78		SILT with sand (ML)	ML
⊠	BH-53	66.5	46		Silty SAND to Sandy SILT (SM/ML)	SM/ML
▲	BH-53	76.3	14	100	Silty SAND (SM)	SM
★	BH-53	81.0	6	60	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊙	BH-53	110.5	52	100	Sandy Lean CLAY to Clayey SAND (CL/SC)	CL/SC
✪	BH-53	116.5	45		Clayey SAND (SC)	SC
○	BH-53	120.2	10	92	Poorly-graded SAND with silt (SP-SM)	SP-SM
△	BH-53	141.4	79		SILT with sand (ML)	ML

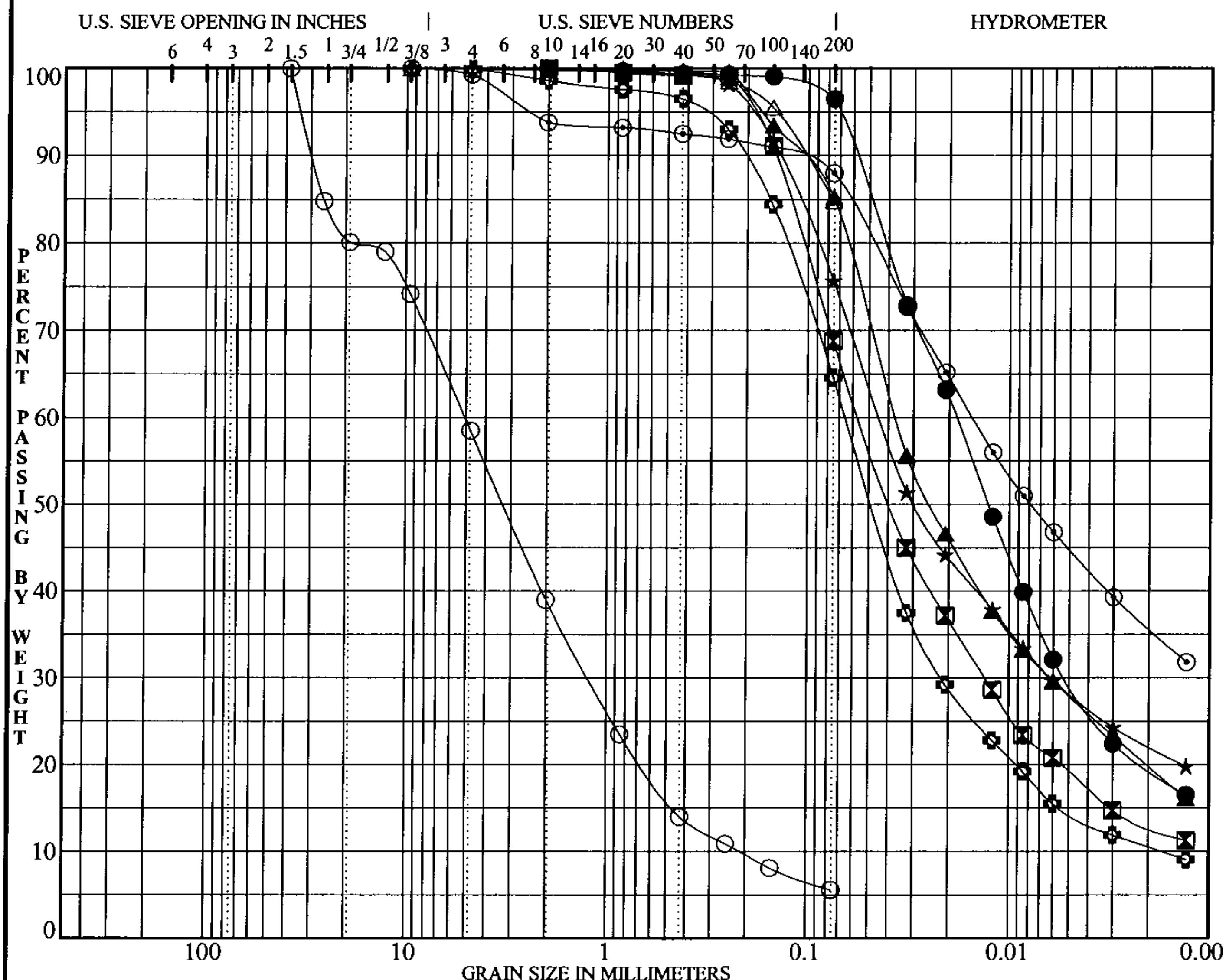
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-98

PROJECT No.
204104.10

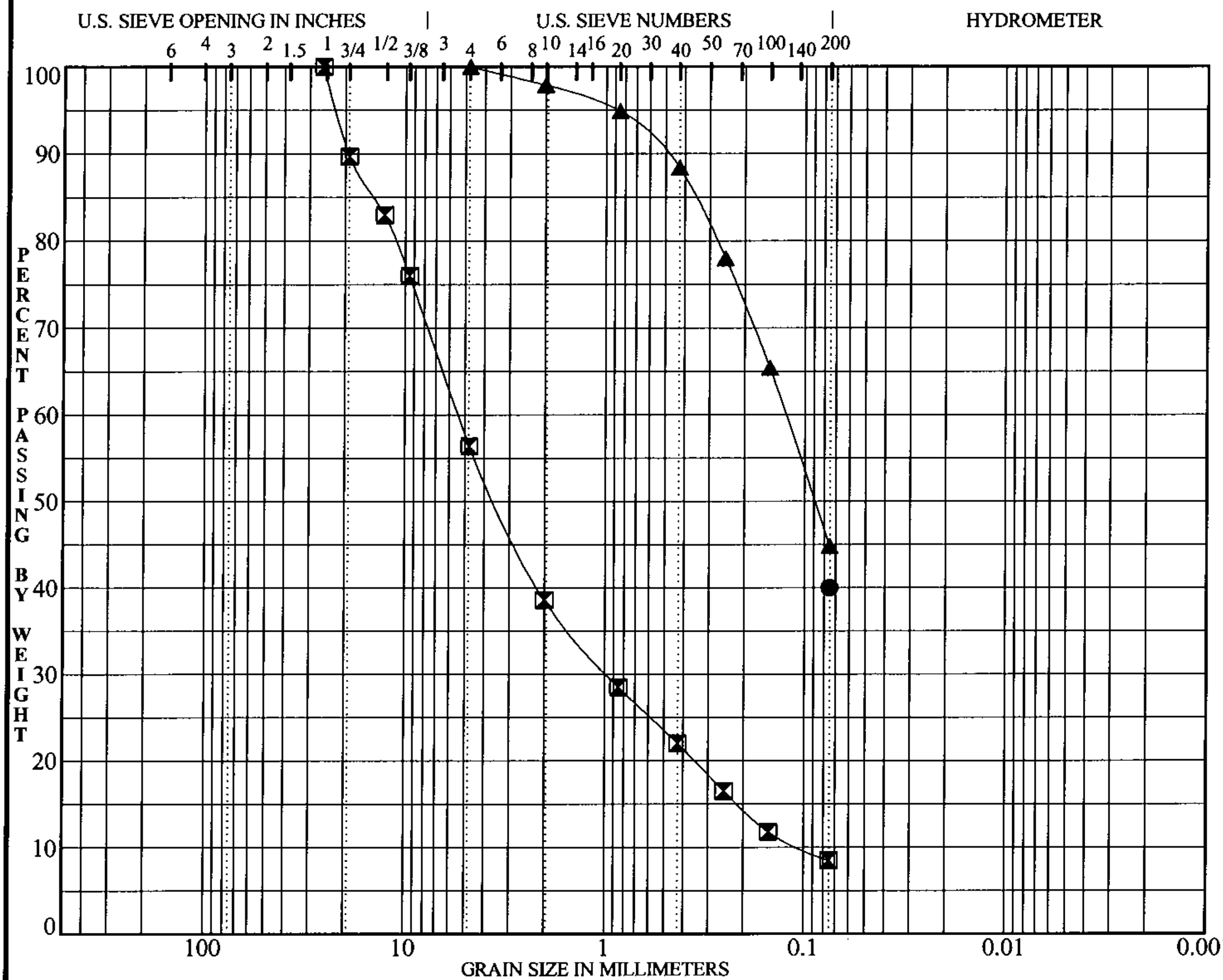


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-54	11.6	97		Lean CLAY (CL)	CL
⊠	BH-54	22.5	69		Sandy, Silty CLAY (CL-ML)	CL-ML
▲	BH-54	32.0	85		Lean CLAY with sand (CL)	CL
★	BH-54	42.5	76		Lean CLAY with sand (CL)	CL
⊙	BH-54	52.5	88	99	Lean CLAY (CL)	CL
✪	BH-54	71.4	65	100	Sandy SILT (ML)	ML
○	BH-54	81.0	6	59	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
△	BH-54	91.0	85	100	Lean CLAY with sand (CL)	CL

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-99-1
DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
DWG FILE:		204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-54	101.2	40		Silty SAND (SM)	SM
⊠	BH-54	111.0	9	56	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
▲	BH-54	120.8	45	100	Silty SAND to Sandy SILT (SM/ML)	SM/ML

GRADATION_B 204104 06 20 2005.GPJ STD.GDT 17/6/05

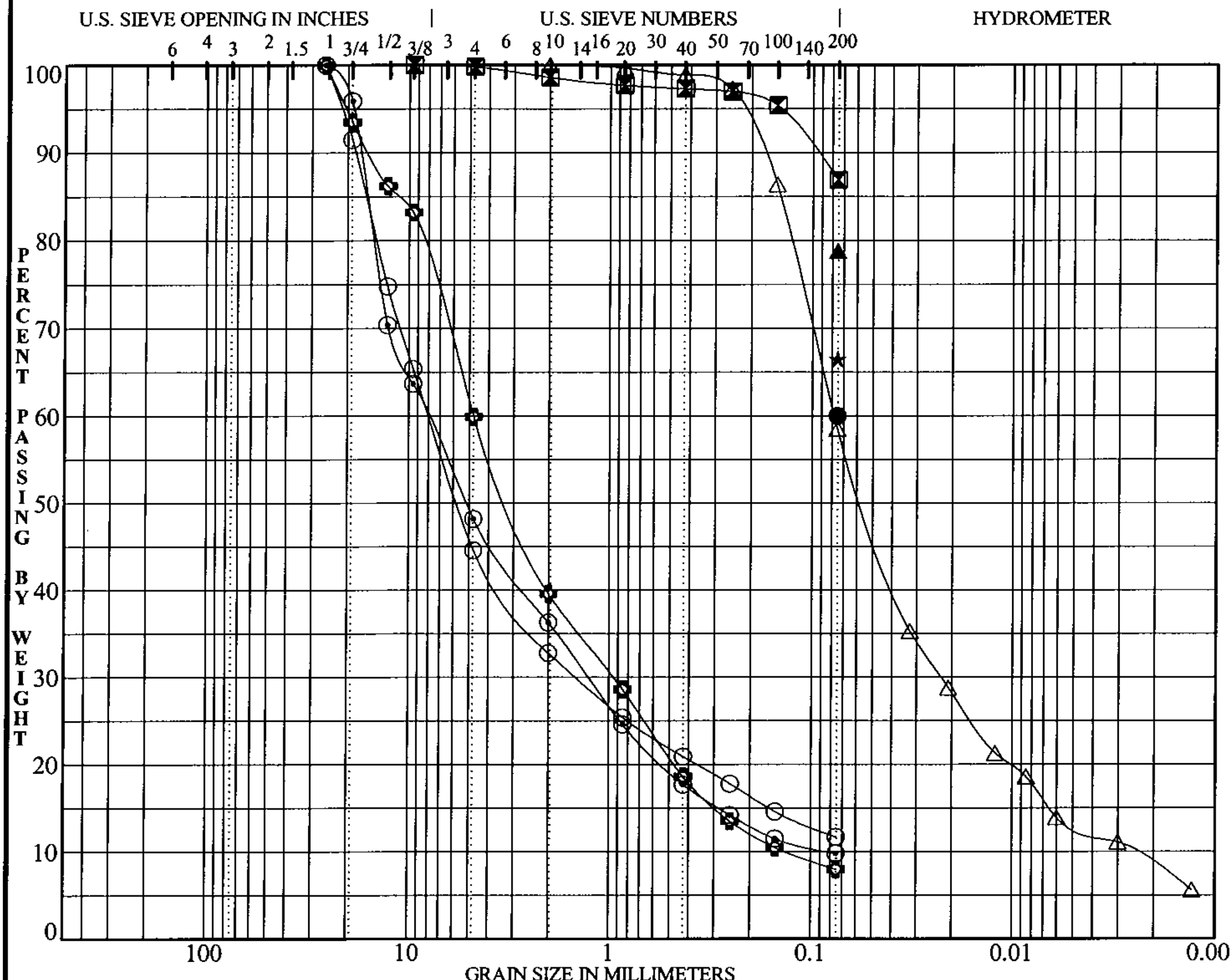
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-99-2

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-55	16.9	60		Sandy Lean CLAY (CL)	CL
⊠	BH-55	21.5	87	100	Lean CLAY (CL)	CL
▲	BH-55	57.5	79		Silty CLAY with sand (CL-ML)	CL-ML
★	BH-55	71.6	67		Sandy SILT (ML)	ML
⊙	BH-55	82.5	10	48	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
✿	BH-55	86.7	8	60	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
○	BH-55	94.5	12	45	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
△	BH-55	100.3	59		Sandy SILT (ML)	ML

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

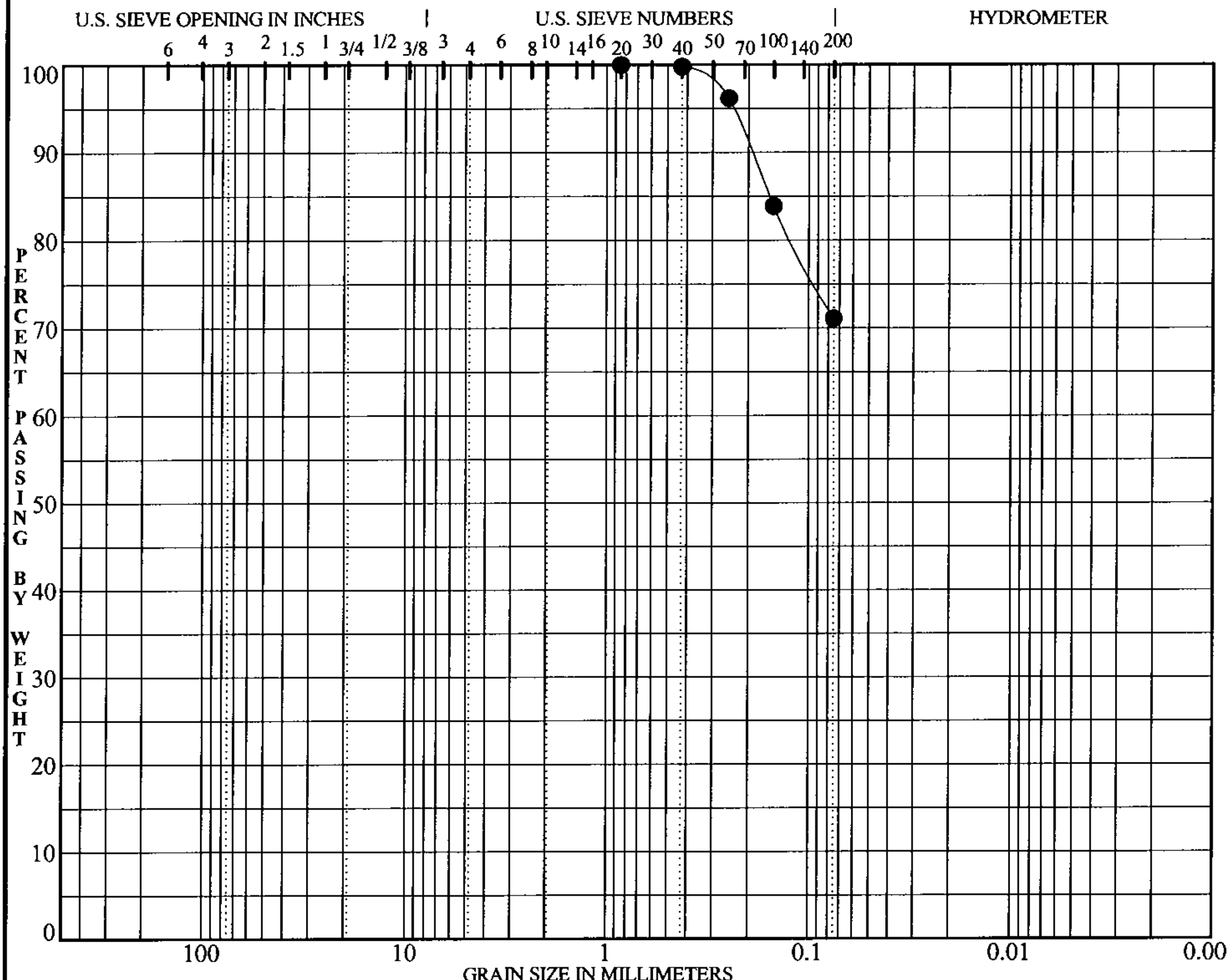
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-100-1

PROJECT No.
204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-55	147.4	71		Sandy Lean CLAY (CL)	CL

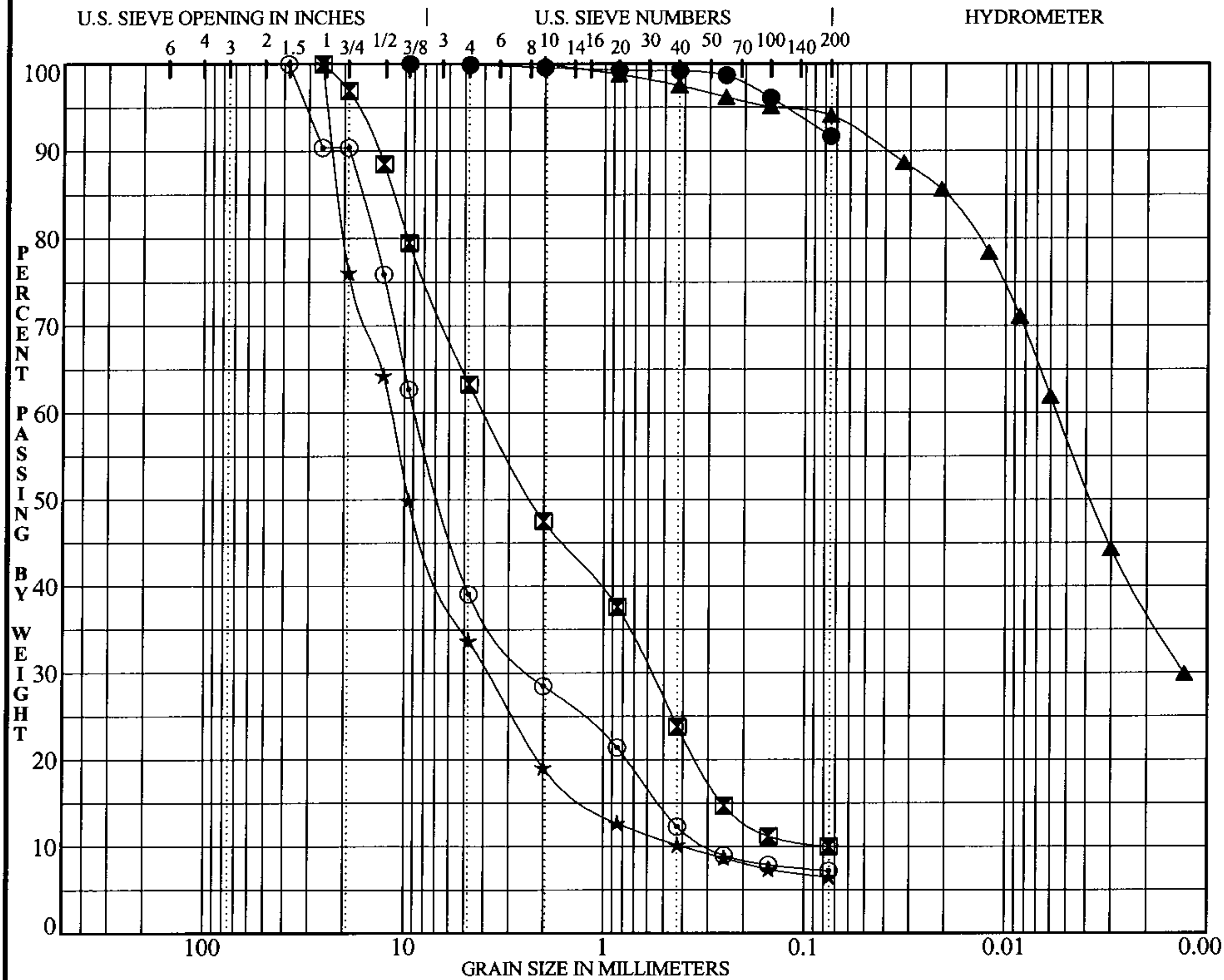
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-100-2
PROJECT No.
204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-58	91.3	92	100	Lean CLAY (CL)	CL
⊠	BH-58	110.8	10	63	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
▲	BH-58	116.3	94		Lean CLAY (CL)	CL
★	BH-58	130.5	7	34	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
⊙	BH-58	141.0	7	39	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

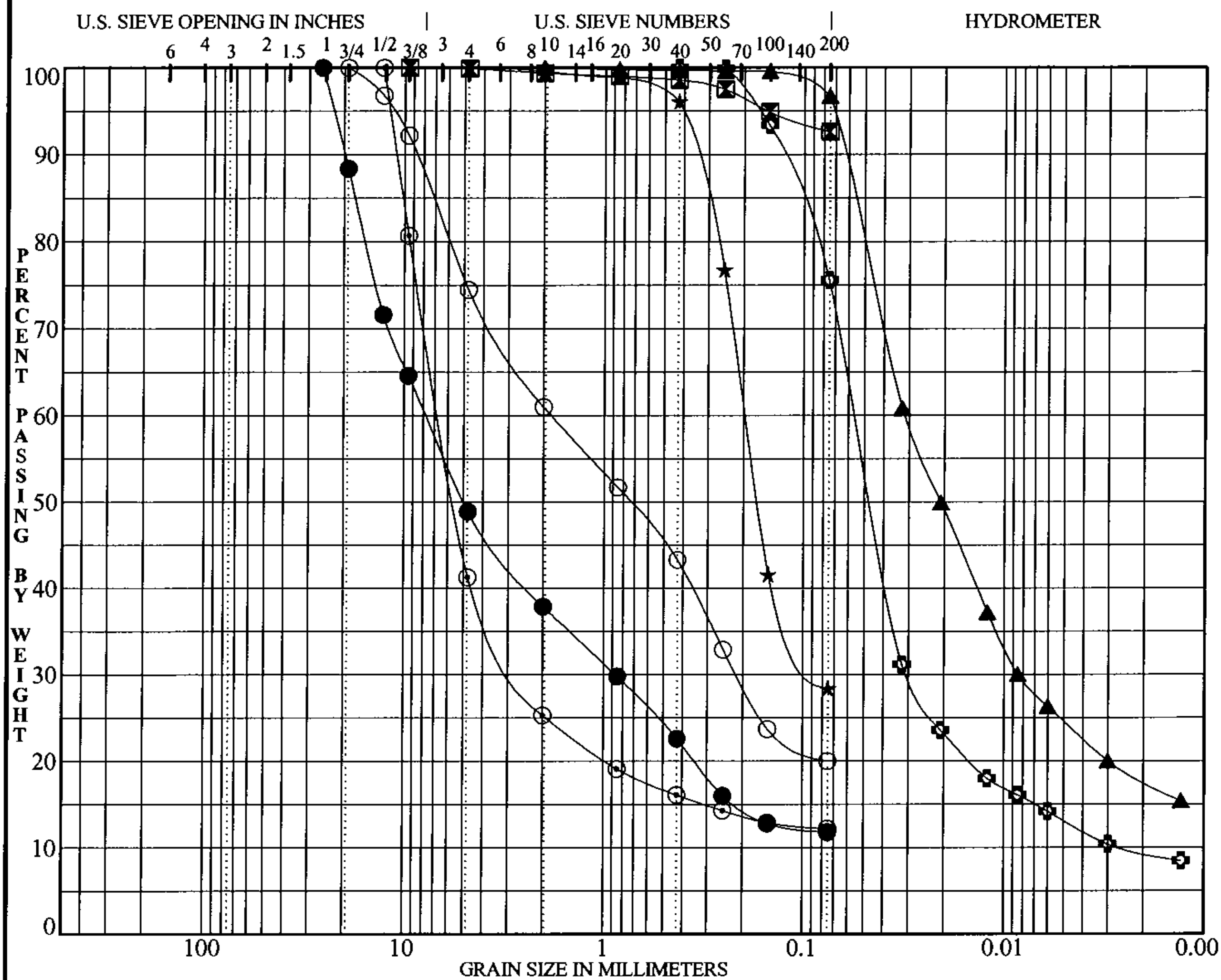
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-101

PROJECT No.
204104.10

GRADATION_B 204104_06_20_2005.GPJ STD.GDT 17/6/05

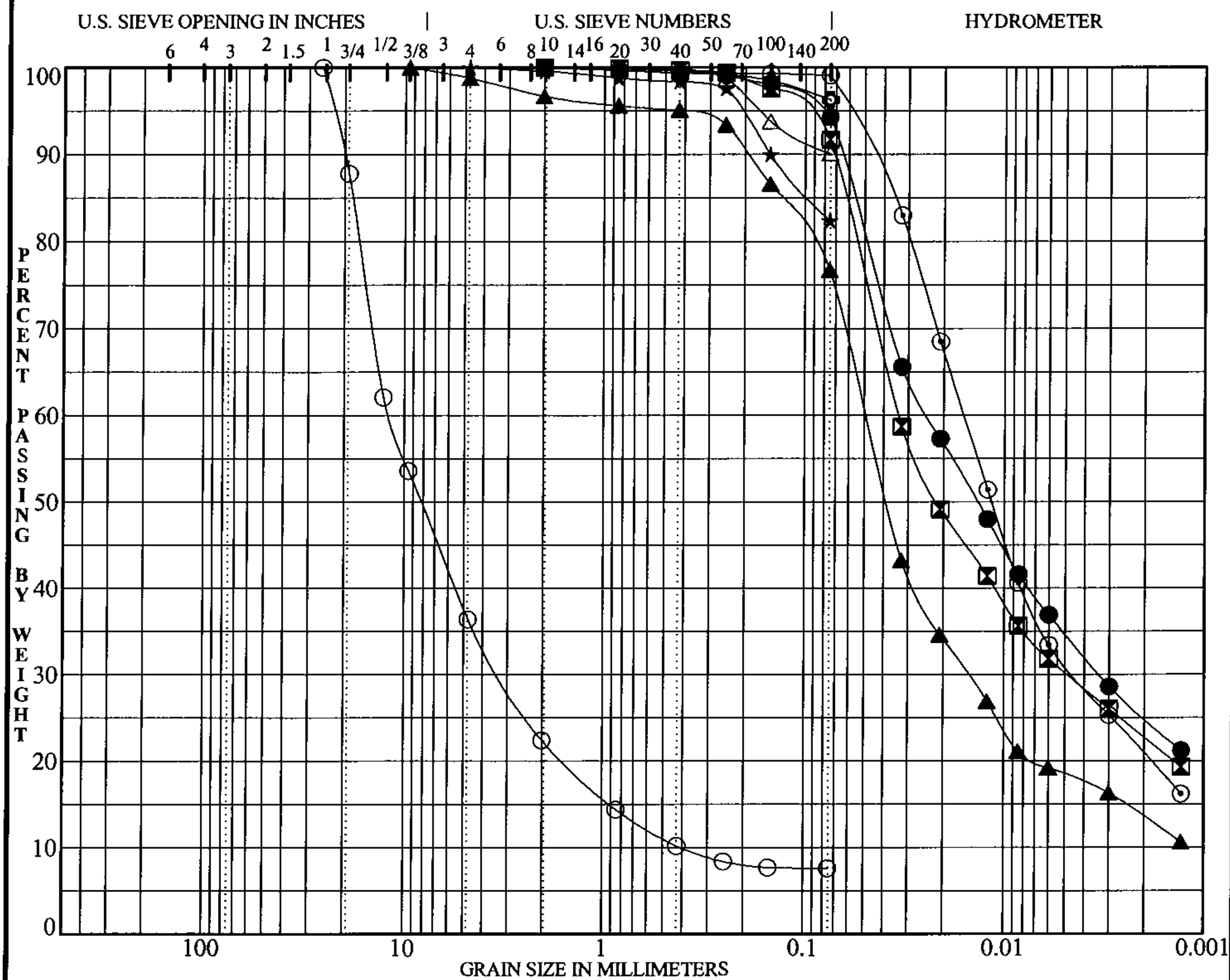


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-59	68.8	12	49	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC
⧗	BH-59	79.7	93	100	Lean CLAY (CL)	CL
▲	BH-59	89.9	97		SILT (ML)	ML
★	BH-59	99.7	28	100	Silty SAND (SM)	SM
⊙	BH-59	108.7	12	41	Clayey GRAVEL with sand (GC)	GC
✿	BH-59	119.7	76		SILT with sand (ML)	ML
○	BH-59	129.5	20	75	Silty SAND with gravel (SM)	SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-102
DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
DWG FILE:		204104.10



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<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

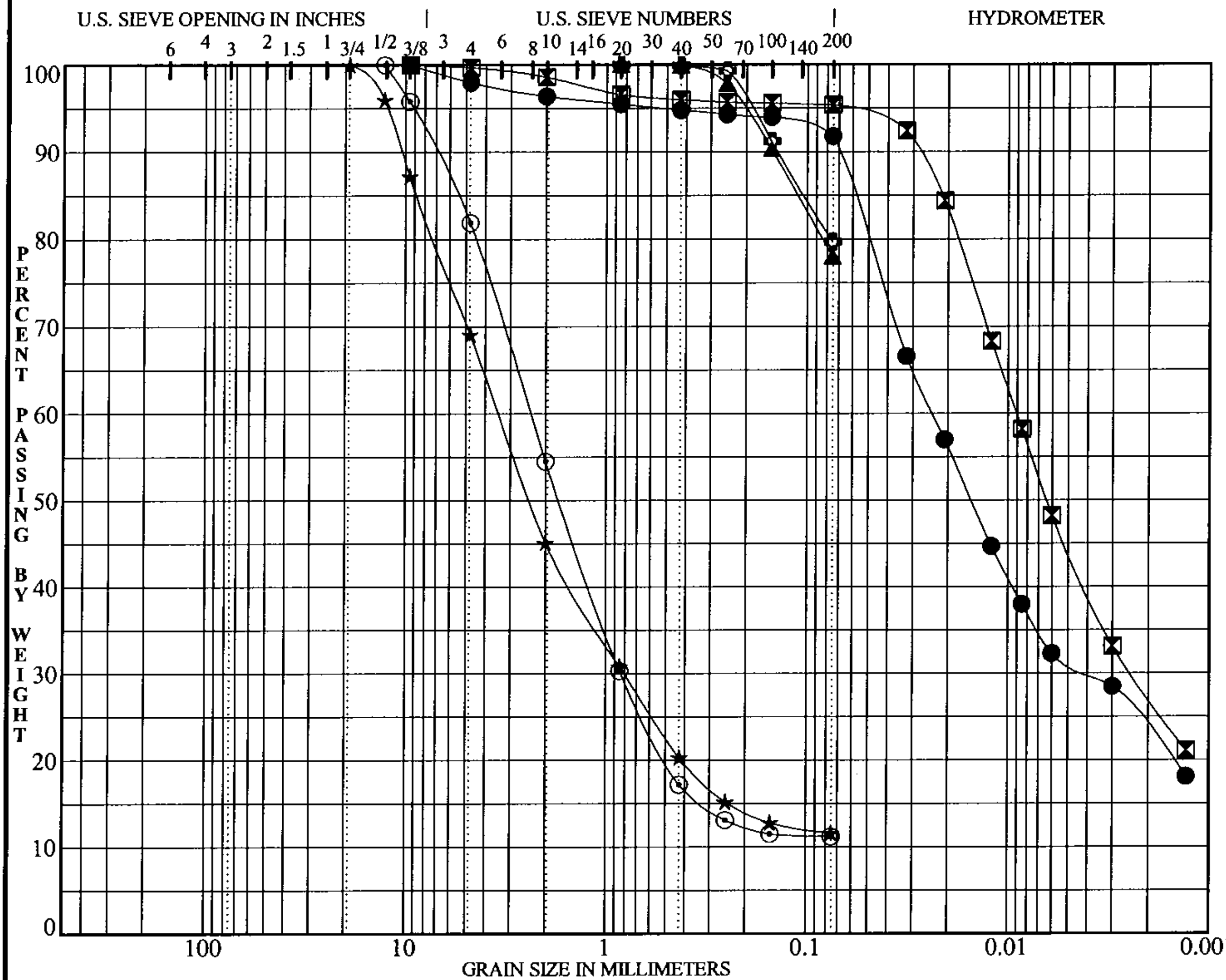
Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-60	62.5	94		Lean CLAY (CL)	CL
⊠	BH-60	75.0	92		Lean CLAY (CL)	CL
▲	BH-60	80.3	77	99	SILT with sand (ML)	ML
★	BH-60	80.8	82	100	SILT with sand (ML)	ML
⊙	BH-60	92.0	99		SILT (ML)	ML
✿	BH-60	101.2	96		SILT (ML)	ML
○	BH-60	109.5	8	36	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
△	BH-60	125.6	90		SILT (ML)	ML

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-103
PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-61	72.4	92	98	Lean CLAY (CL)	CL
⊠	BH-61	91.5	95	100	Lean CLAY (CL)	CL
▲	BH-61	101.4	78		SILT with sand (ML)	ML
★	BH-61	110.3	12	69	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊙	BH-61	115.4	11	82	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
✪	BH-61	151.5	80		SILT with sand (ML)	ML

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

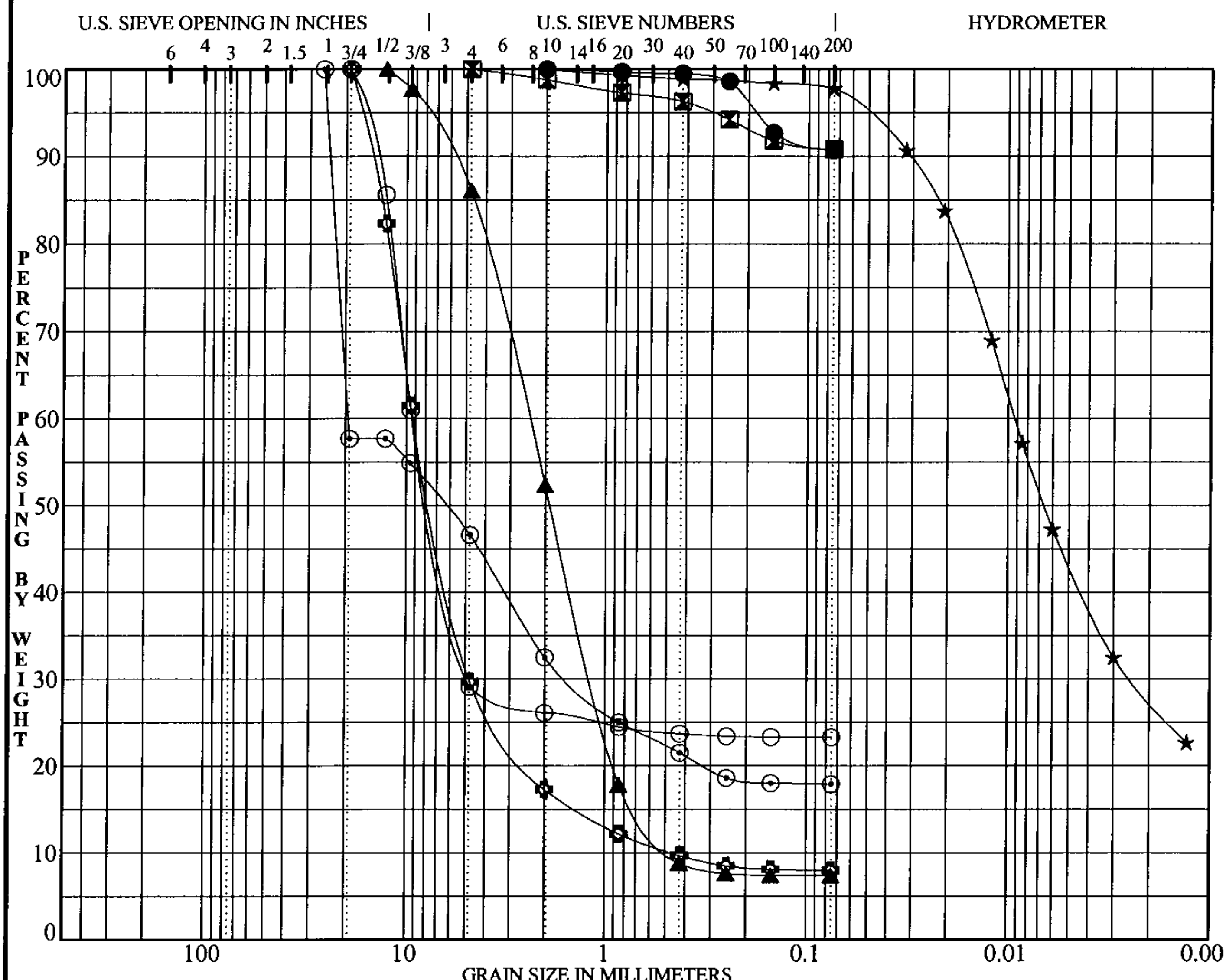
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-104

PROJECT No.
204104.10

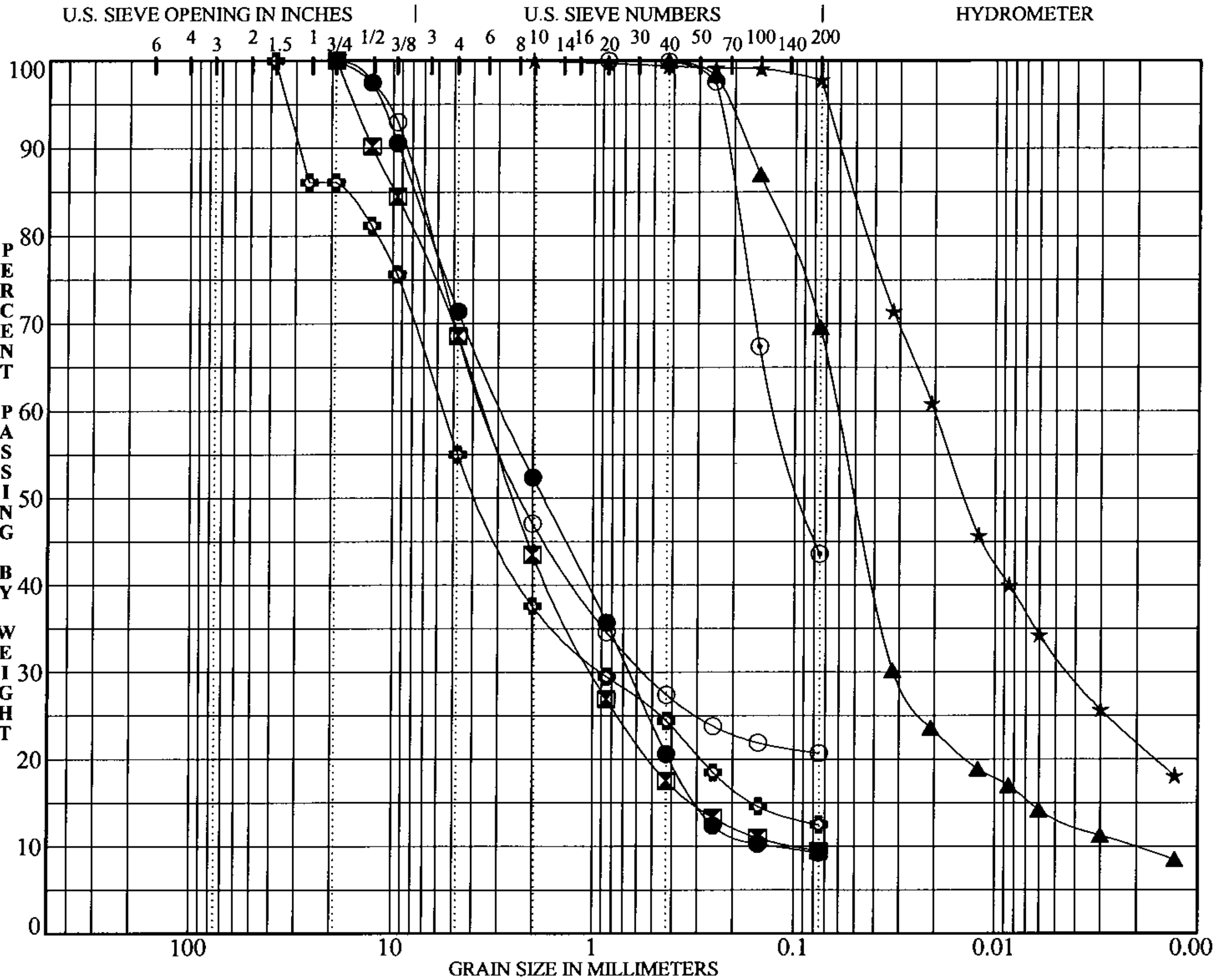


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-62	22.4	91		SILT (ML)	ML
⧗	BH-62	62.5	91	100	Lean CLAY (CL)	CL
▲	BH-62	70.9	7	86	Poorly-graded SAND with silt (SP-SM)	SP-SM
★	BH-62	82.2	98		Lean CLAY (CL)	CL
⊙	BH-62	110.4	18	47	Clayey GRAVEL with sand (GC)	GC
✿	BH-62	119.8	8	30	Poorly-graded GRAVEL with clay and sand (GP-GC)	GP-GC
○	BH-62	130.0	23	29	Clayey GRAVEL (GC)	GC

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-105
DATE: 17/6/05	SVRT DOWNTOWN San Jose, California	PROJECT No.
DWG FILE:		204104.10



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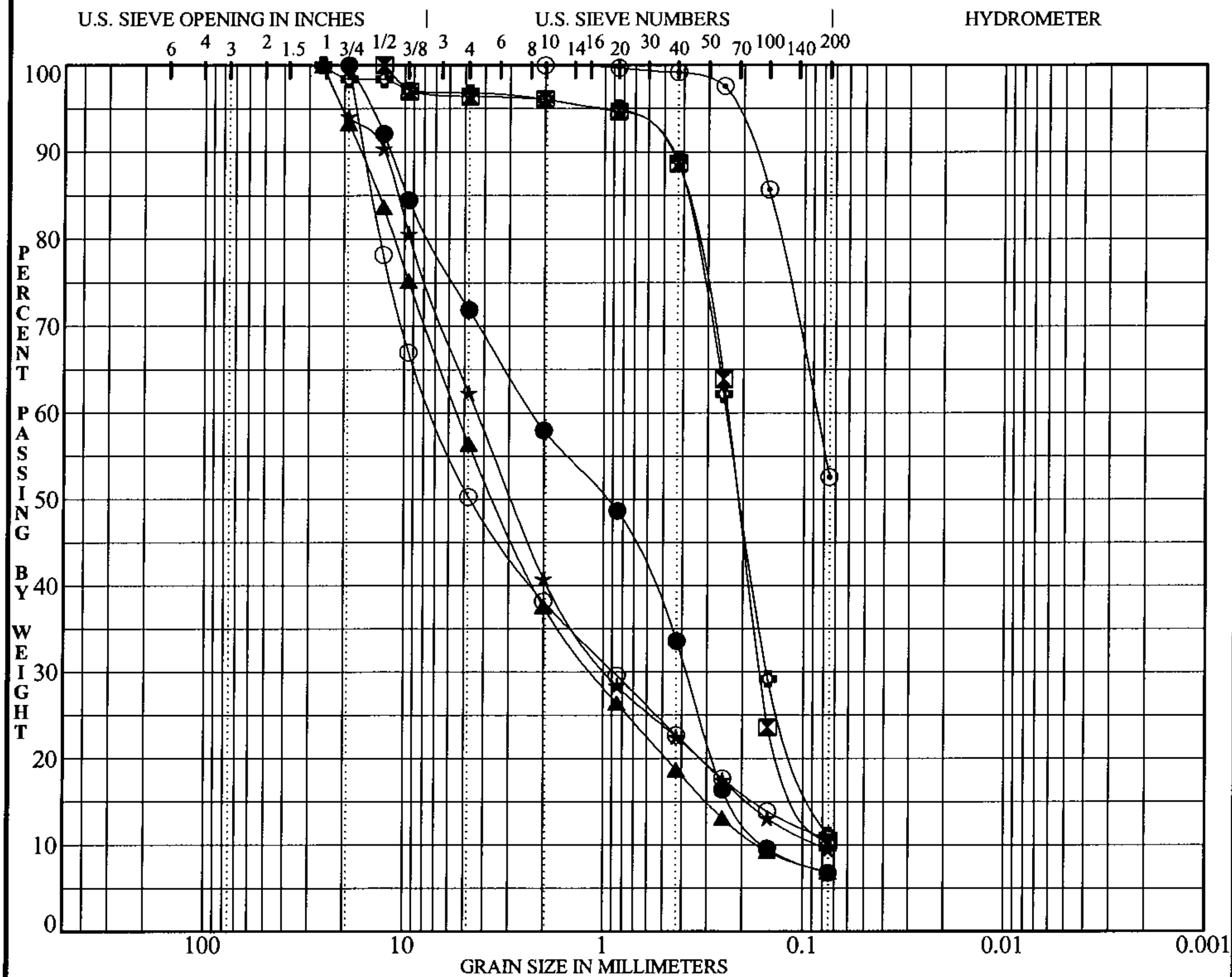
<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-63	66.2	9	71	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊠	BH-63	75.0	10	69	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
▲	BH-63	92.8	70		Sandy Silty CLAY (CL-ML)	CL-ML
★	BH-63	100.3	98		SILT (ML)	ML
⊙	BH-63	110.3	44		Silty SAND (SM)	SM
✪	BH-63	119.5	13	55	Silty GRAVEL with sand (GM)	GM
○	BH-63	124.5	21	69	Clayey SAND with gravel (SC)	SC

	PREP'D BY:	GRADATION TEST DATA	FIGURE
	APP'D BY: Y. D. Wang	SVRT DOWNTOWN San Jose, California	A12-106
	DATE: 17/6/05		PROJECT No.
	DWG FILE:		204104.10

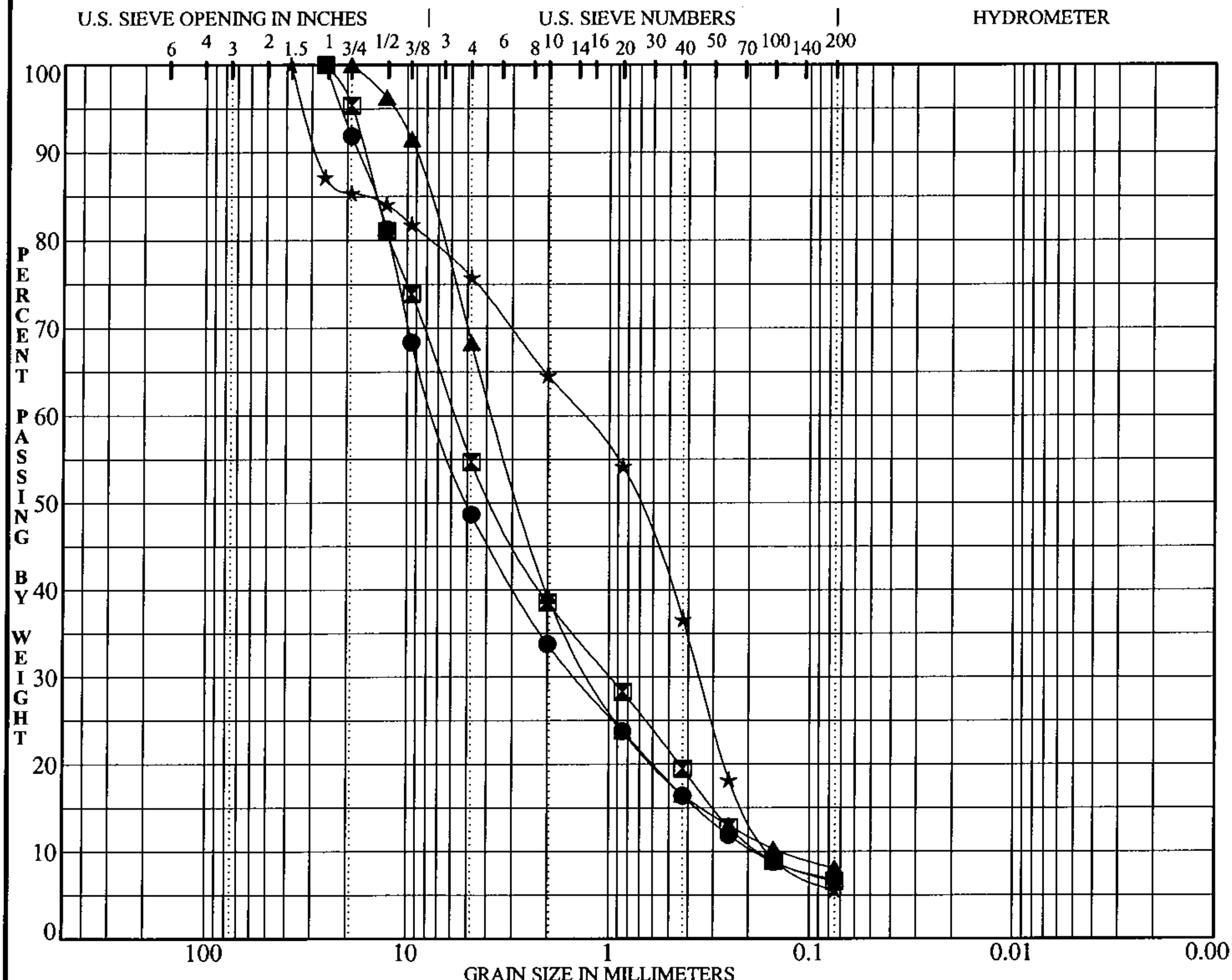


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-64	45.7	7	72	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
⊠	BH-64	61.0	10	96	Poorly-graded SAND with silt (SP-SM)	SP-SM
▲	BH-64	84.3	7	56	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
★	BH-64	90.9	10	62	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊙	BH-64	102.4	53		Sandy SILT to Silty SAND (ML/SM)	ML/SM
✿	BH-64	122.0	11	97	Poorly-graded SAND with silt (SP-SM)	SP-SM
○	BH-64	126.0	11	50	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM

PREP'D BY:	GRADATION TEST DATA		FIGURE
APP'D BY: Y. D. Wang			A12-107
DATE: 17/6/05	SVRT DOWNTOWN		PROJECT No.
DWG FILE:	San Jose, California		204104.10

GRADATION_B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-65	46.0	7	49	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
⊠	BH-65	76.0	7	55	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
▲	BH-65	86.0	8	68	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
★	BH-65	126.2	6	76	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

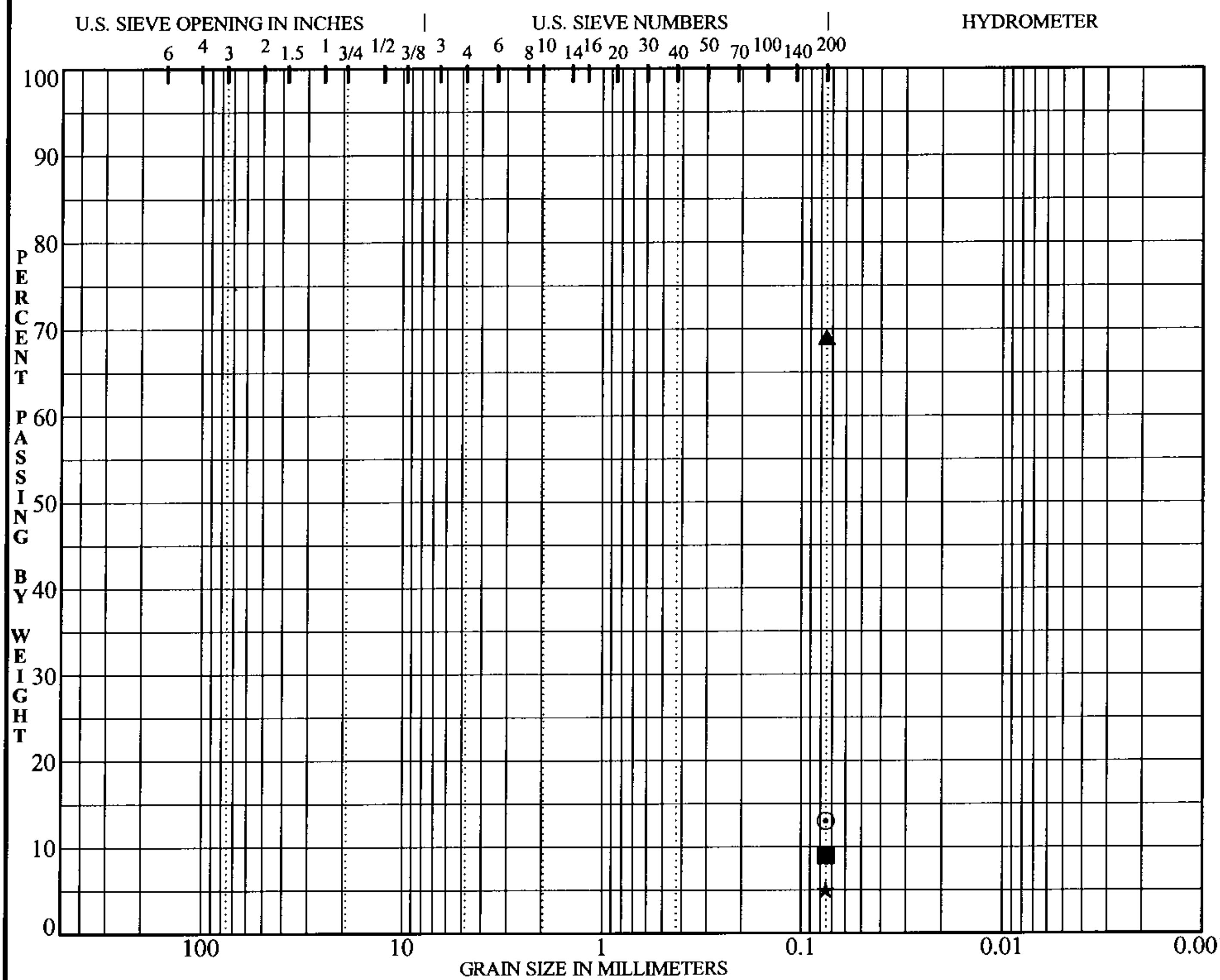
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-108

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-66	35.7	9		Poorly-graded SAND with silt (SP-SM)	SP-SM
⊠	BH-66	81.1	9		Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC
▲	BH-66	101.5	69		Sandy Lean CLAY (CL)	CL
★	BH-66	116.3	5		Poorly-graded GRAVEL (GP)	GP
⊙	BH-66	120.5	13		Silty SAND with gravel (SM)	SM

PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

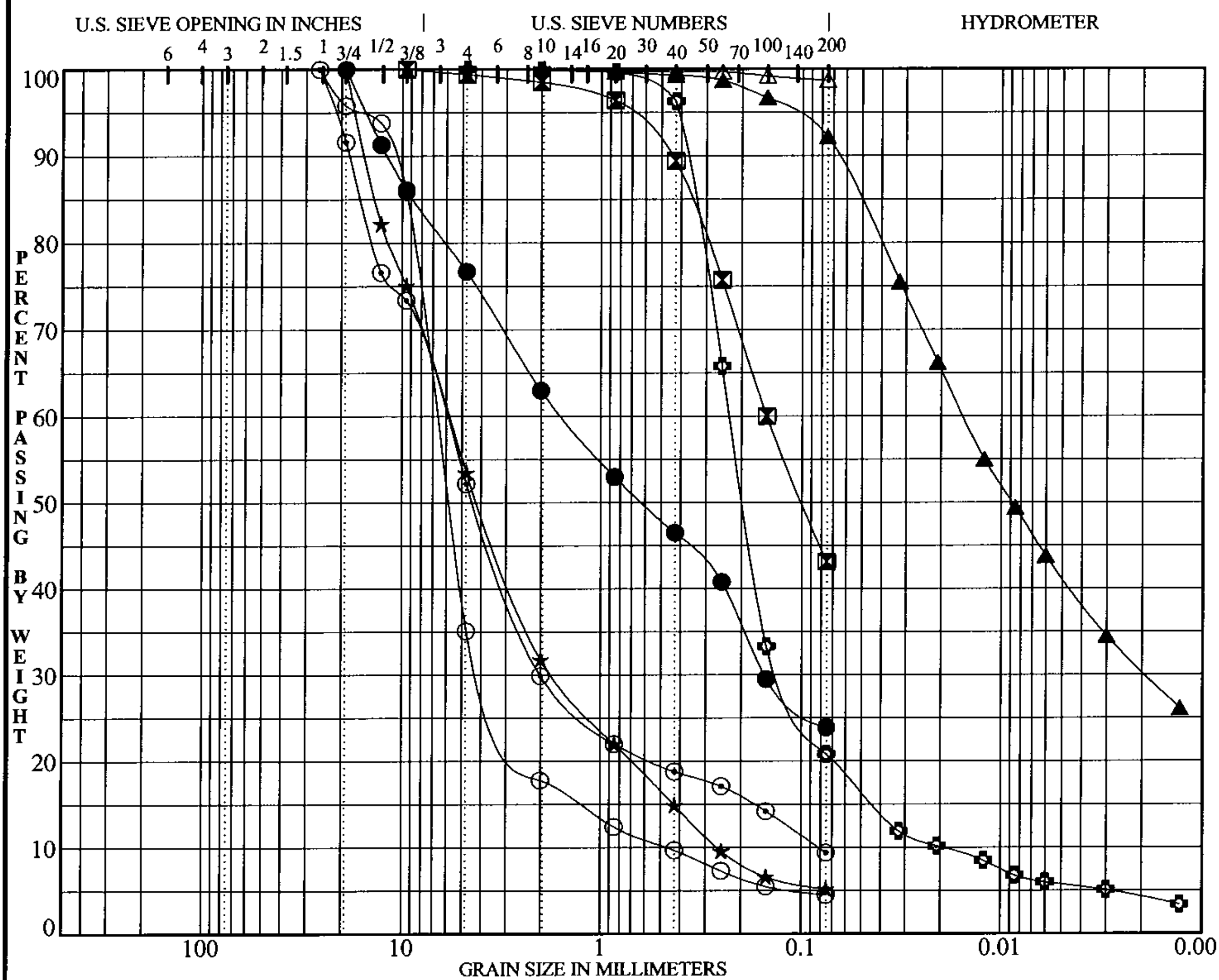
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-109

PROJECT No.
204104.10

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-68	29.3	24	77	Silty SAND with gravel (SM)	SM
⊠	BH-68	51.0	43	99	Clayey SAND (SC)	SC
▲	BH-68	70.5	92		Lean CLAY (CL)	CL
★	BH-68	79.0	5	54	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊙	BH-68	119.0	9	52	Poorly-graded GRAVEL with clay and sand (GP-GC)	GP-GC
✪	BH-68	158.8	21	100	Silty SAND (SM)	SM
○	BH-68	169.3	5	35	Poorly-graded GRAVEL with sand (GP)	GP
△	BH-68	180.5	99		Fat CLAY (CH)	CH

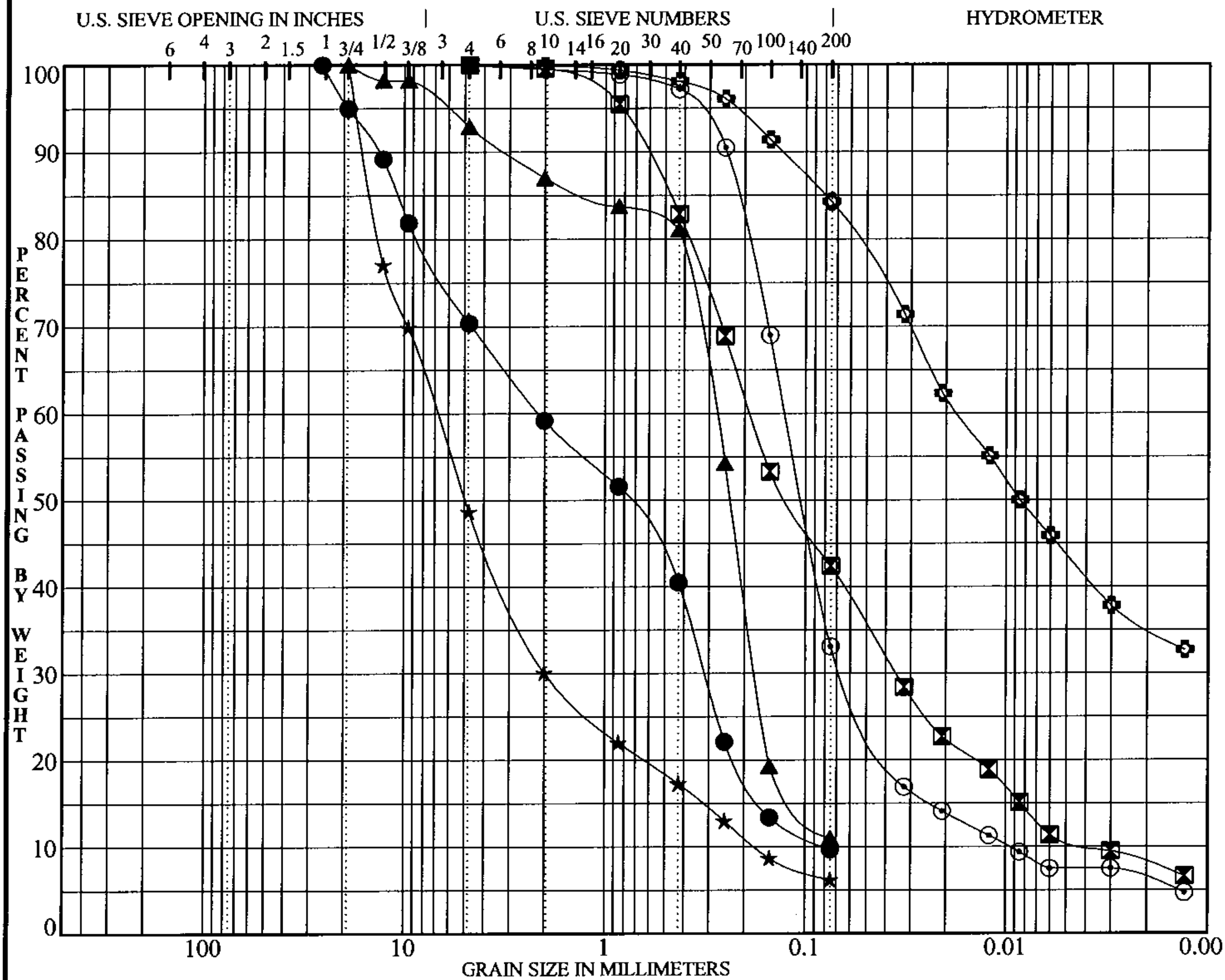
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-110

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-70	34.0	10	70	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
⊠	BH-70	39.0	42	100	Silty SAND (SM)	SM
▲	BH-70	51.5	11	93	Poorly-graded SAND with silt (SP-SM)	SP-SM
★	BH-70	80.1	6	49	Poorly-graded GRAVEL with clay and sand (GP-GC)	GP-GC
⊙	BH-70	110.9	33	100	Silty SAND (SM)	SM
✪	BH-70	140.5	84	100	Fat CLAY (CH)	CH

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

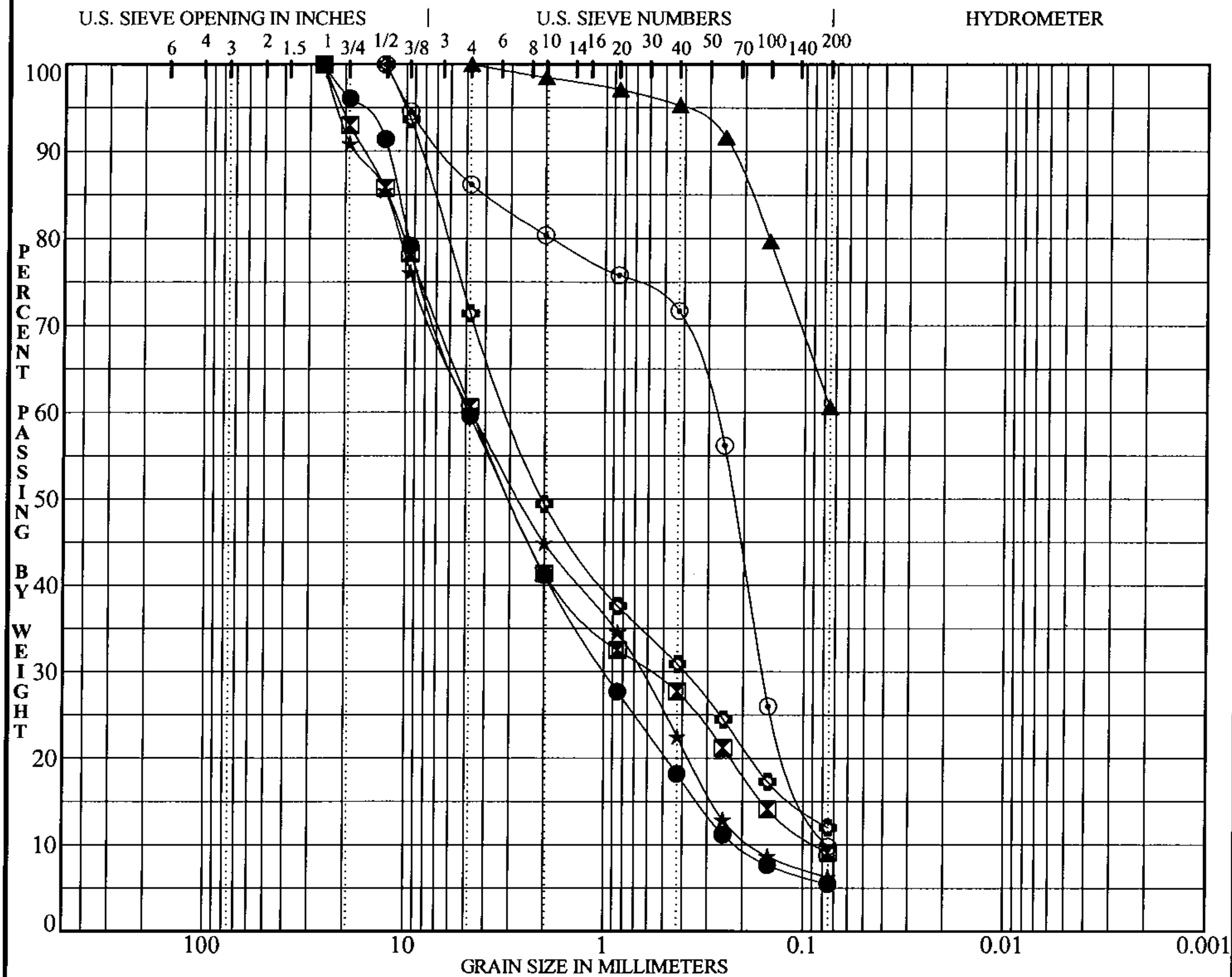
PREP'D BY:
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE A12-111

PROJECT No. 204104.10

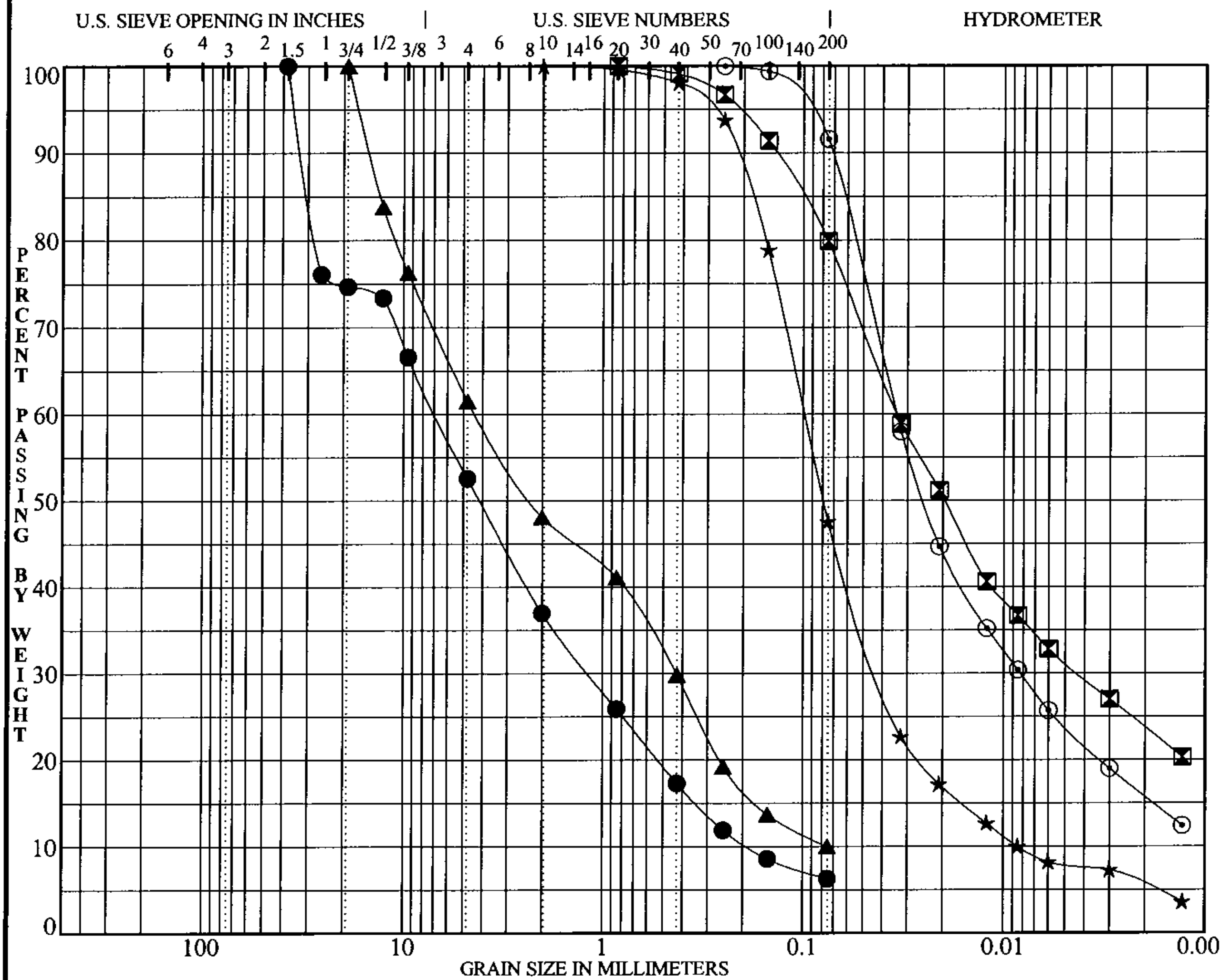


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-71	10.8	6	60	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
⊠	BH-71	51.6	9	61	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
▲	BH-71	71.9	61	100	Sandy Lean CLAY (CL)	CL
★	BH-71	79.7	6	60	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
⊙	BH-71	115.3	10	86	Poorly-graded SAND with silt (SP-SM)	SP-SM
✪	BH-71	147.9	12	71	Poorly-graded SAND with clay and gravel (SP-SC)	SP-SC

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE
APP'D BY: Y. D. Wang		A12-112
DATE: 17/6/05	SVRT DOWNTOWN	PROJECT No.
DWG FILE:	San Jose, California	204104.10

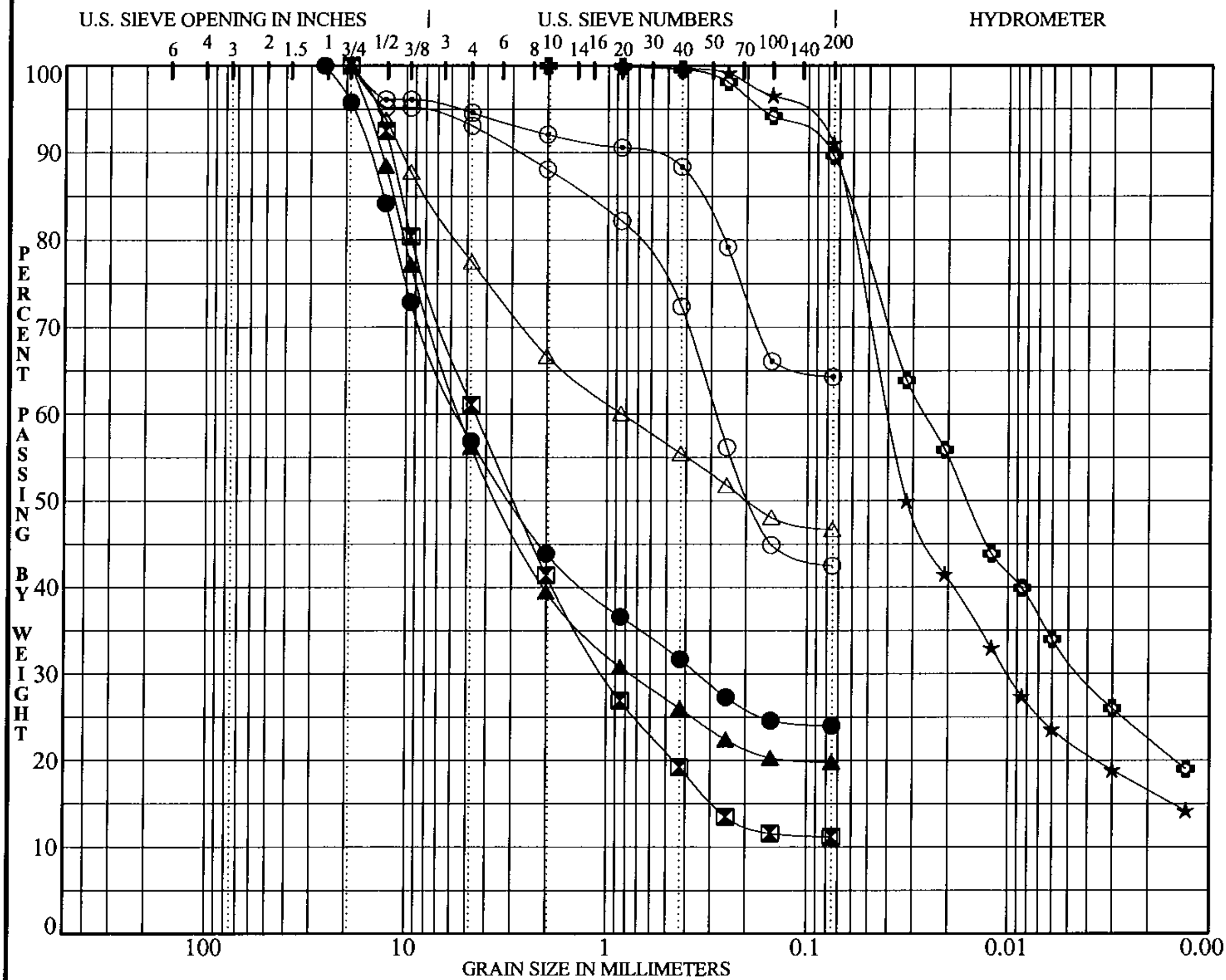


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-72	81.2	6	53	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC
⊠	BH-72	91.5	80		Lean CLAY with sand (CL)	CL
▲	BH-72	111.2	10	62	Poorly-graded SAND with clay and gravel (SP-SC)	SP-SC
★	BH-72	129.9	48		Silty SAND to Sandy SILT (SM/ML)	SM/ML
⊙	BH-72	156.5	92		SILT (ML)	ML

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:	GRADATION TEST DATA	FIGURE	
APP'D BY: Y. D. Wang	SVRT DOWNTOWN San Jose, California	A12-113	
DATE: 17/6/05		PROJECT No.	
DWG FILE:		204104.10	



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-73	32.3	24	57	Clayey GRAVEL with sand (GC)	GC
⧓	BH-73	41.2	11	61	Well-graded SAND with clay and gravel (SW-SC)	SW-SC
▲	BH-73	56.1	20	56	Clayey GRAVEL with sand (GC)	GC
★	BH-73	81.7	91		SILT (ML)	ML
⊙	BH-73	92.2	64	95	Sandy Lean CLAY (CL)	CL
✪	BH-73	112.3	90		SILT (ML)	ML
○	BH-73	116.2	43	93	Silty SAND (SM)	SM
△	BH-73	126.3	47	78	Sandy Lean CLAY with gravel (CL)	CL

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

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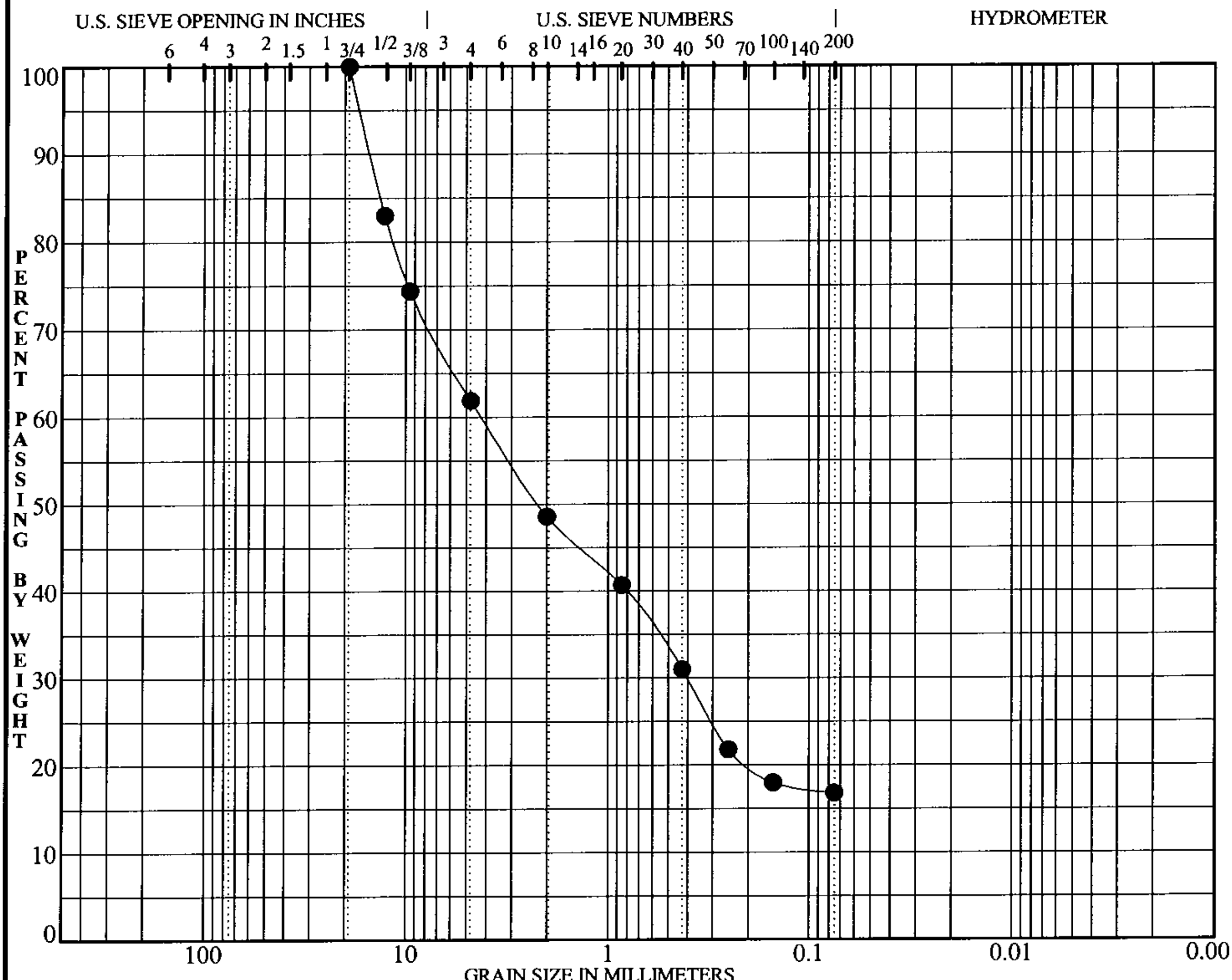
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-114-1

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-73	150.5	17	62	Clayey SAND with gravel (SC)	SC

PREP'D BY:

APP'D BY: Y. D. Wang

DATE: 17/6/05

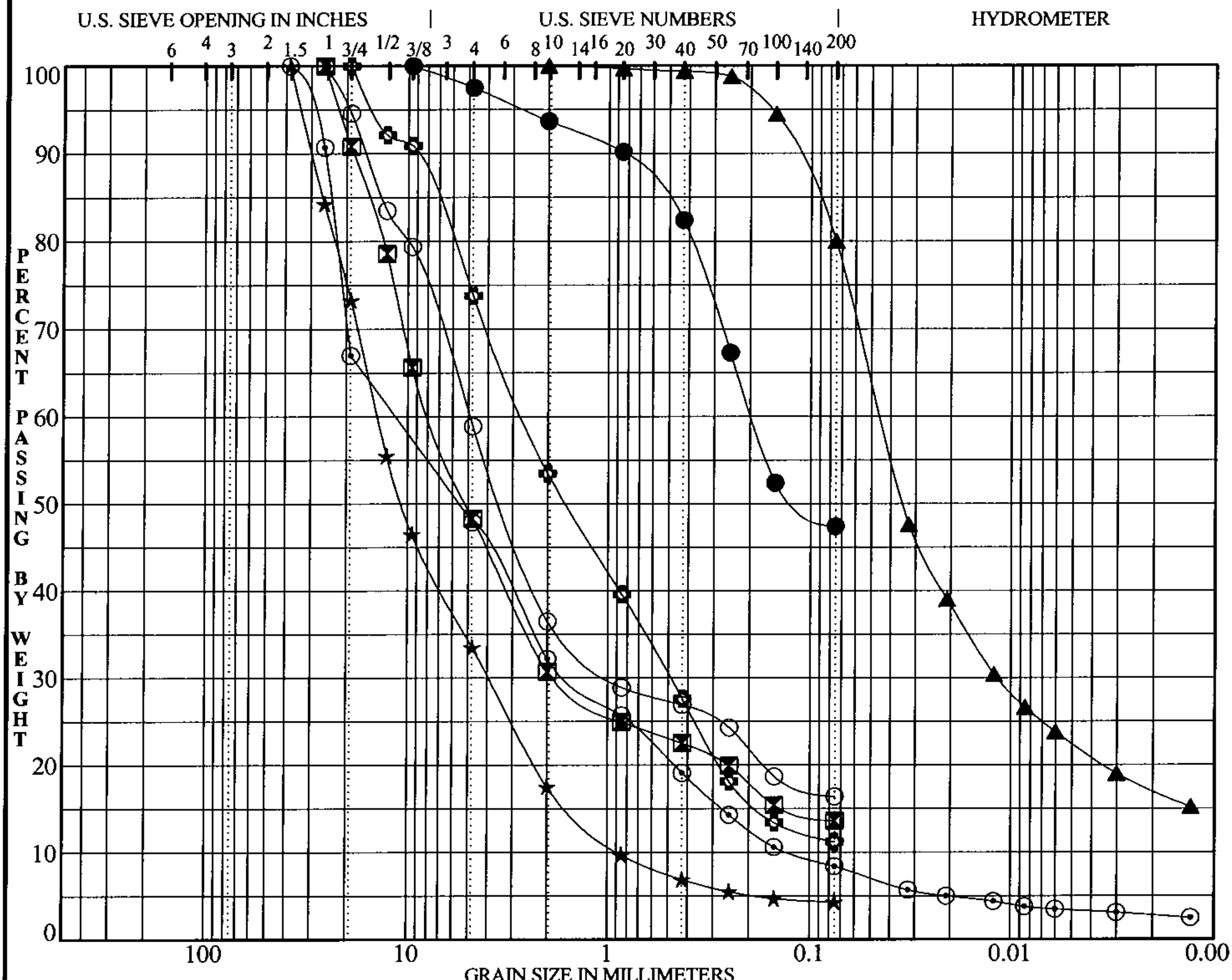
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-114-2

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-74	66.8	47	98	Silty SAND (SM)	SM
⊠	BH-74	71.3	14	48	Silty GRAVEL with sand (GM)	GM
▲	BH-74	77.4	80		Lean CLAY with sand (CL)	CL
★	BH-74	95.7	4	34	Well-graded GRAVEL (GW)	GW
⊙	BH-74	110.5	8	48	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC
✿	BH-74	120.5	11	74	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
○	BH-74	150.3	16	59	Silty GRAVEL with sand (GM)	GM

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APP'D BY: Y. D. Wang

DATE: 17/6/05

DWG FILE:

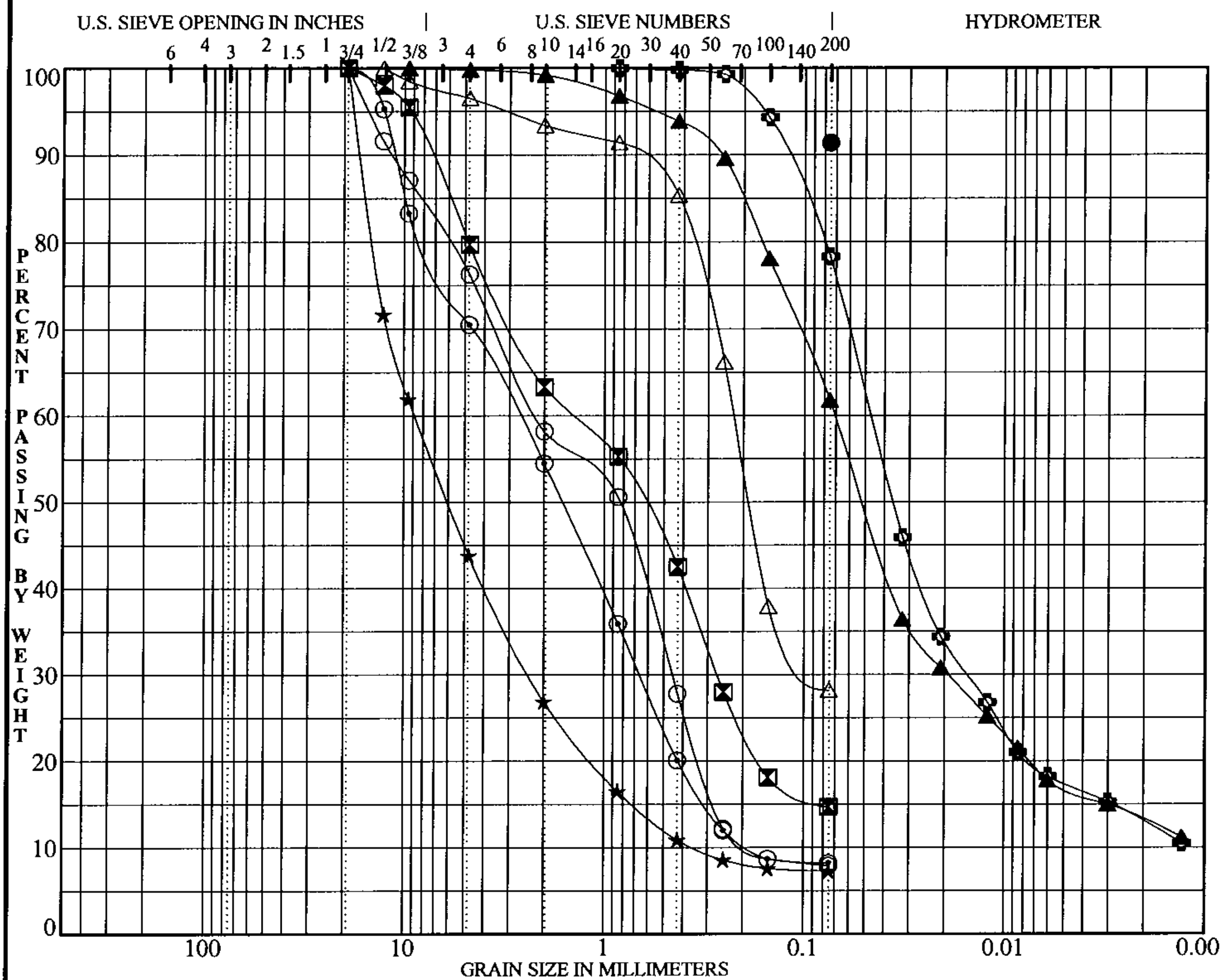
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-115**

PROJECT No. 204104.10

GRADATION_B 204104 06 20 2005.GPJ STD.GDT 17/6/05



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-75	51.0	91		Lean CLAY (CL)	CL
⊠	BH-75	70.5	15	80	Clayey SAND with gravel (SC)	SC
▲	BH-75	89.3	62	100	Sandy Lean CLAY (CL)	CL
★	BH-75	99.0	7	44	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC
⊙	BH-75	128.8	8	71	Poorly-graded SAND with clay and gravel (SP-SC)	SP-SC
✿	BH-75	141.0	78		Sandy Lean CLAY (CL)	CL
○	BH-75	178.9	8	76	Poorly-graded SAND with clay and gravel (SP-SC)	SP-SC
△	BH-75	200.3	28	97	Silty SAND (SM)	SM

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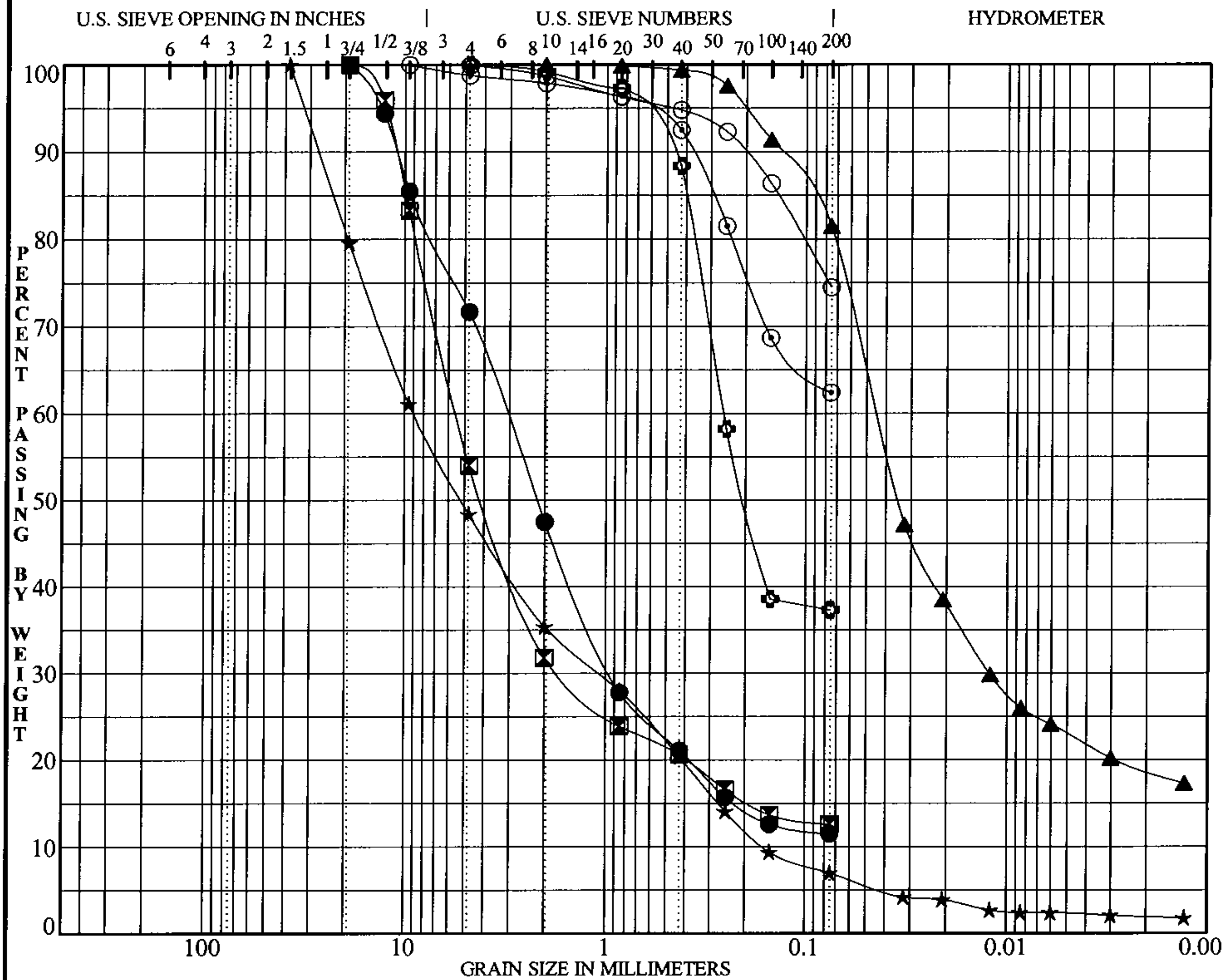
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-116

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-76	39.5	12	72	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
⊠	BH-76	69.3	13	54	Poorly-graded GRAVEL with clay and sand (GP-GC)	GP-GC
▲	BH-76	87.5	82		Lean CLAY with sand (CL)	CL
★	BH-76	111.0	7	48	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM
⊙	BH-76	117.5	62	99	Sandy Lean CLAY (CL)	CL
✪	BH-76	132.5	37	100	Silty SAND (SM)	SM
○	BH-76	141.0	75	100	Sandy Lean CLAY (CL)	CL

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APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE **A12-117**

PROJECT No. 204104.10

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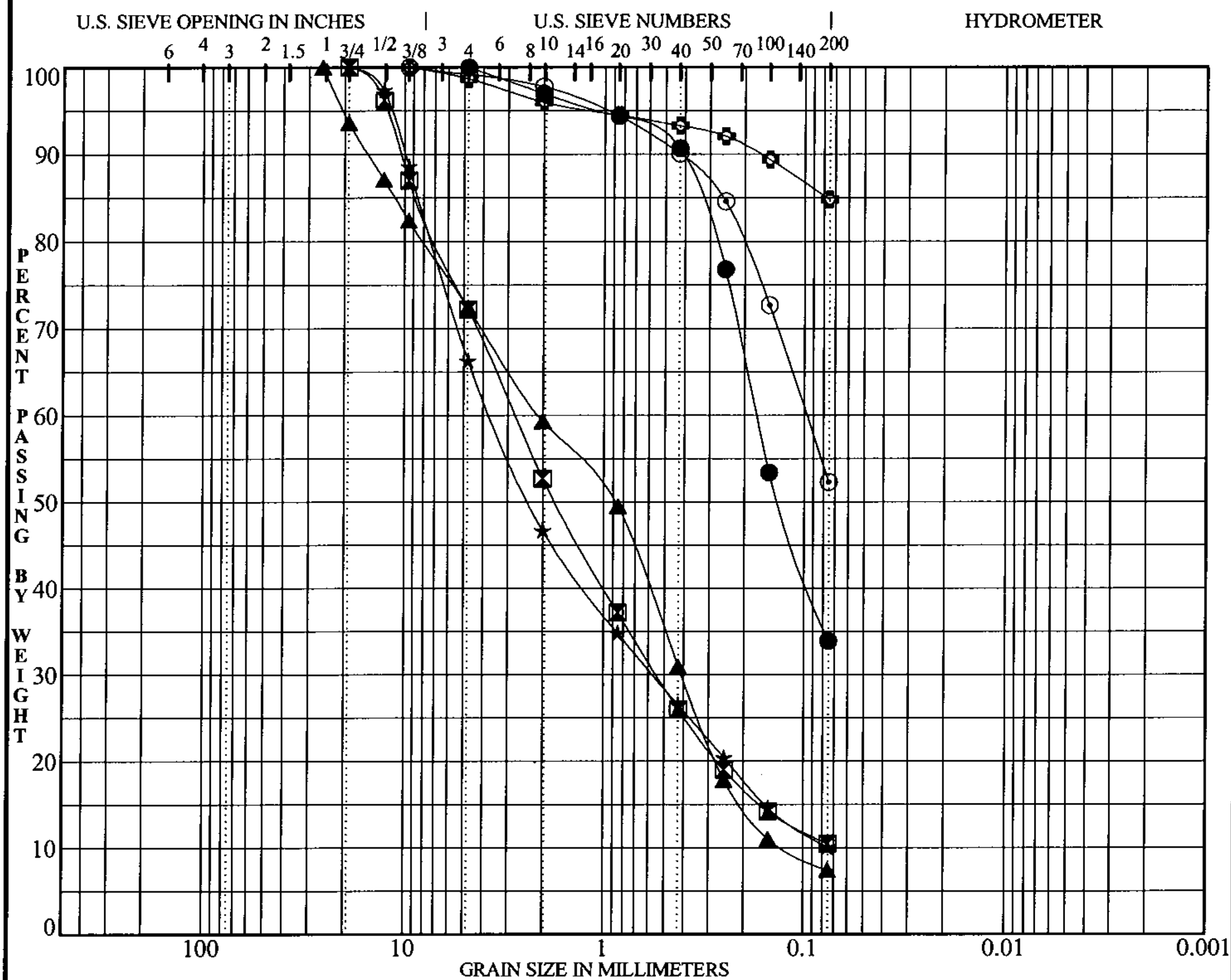

Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-77	7.5	34	100	Silty SAND (SM)	SM
⊠	BH-77	50.8	11	72	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
▲	BH-77	91.3	7	72	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
★	BH-77	116.0	10	66	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
⊙	BH-77	121.1	52	99	Sandy, Silty CLAY (CL-ML)	CL-ML
✪	BH-77	125.8	85	99	Lean CLAY with sand (CL)	CL

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

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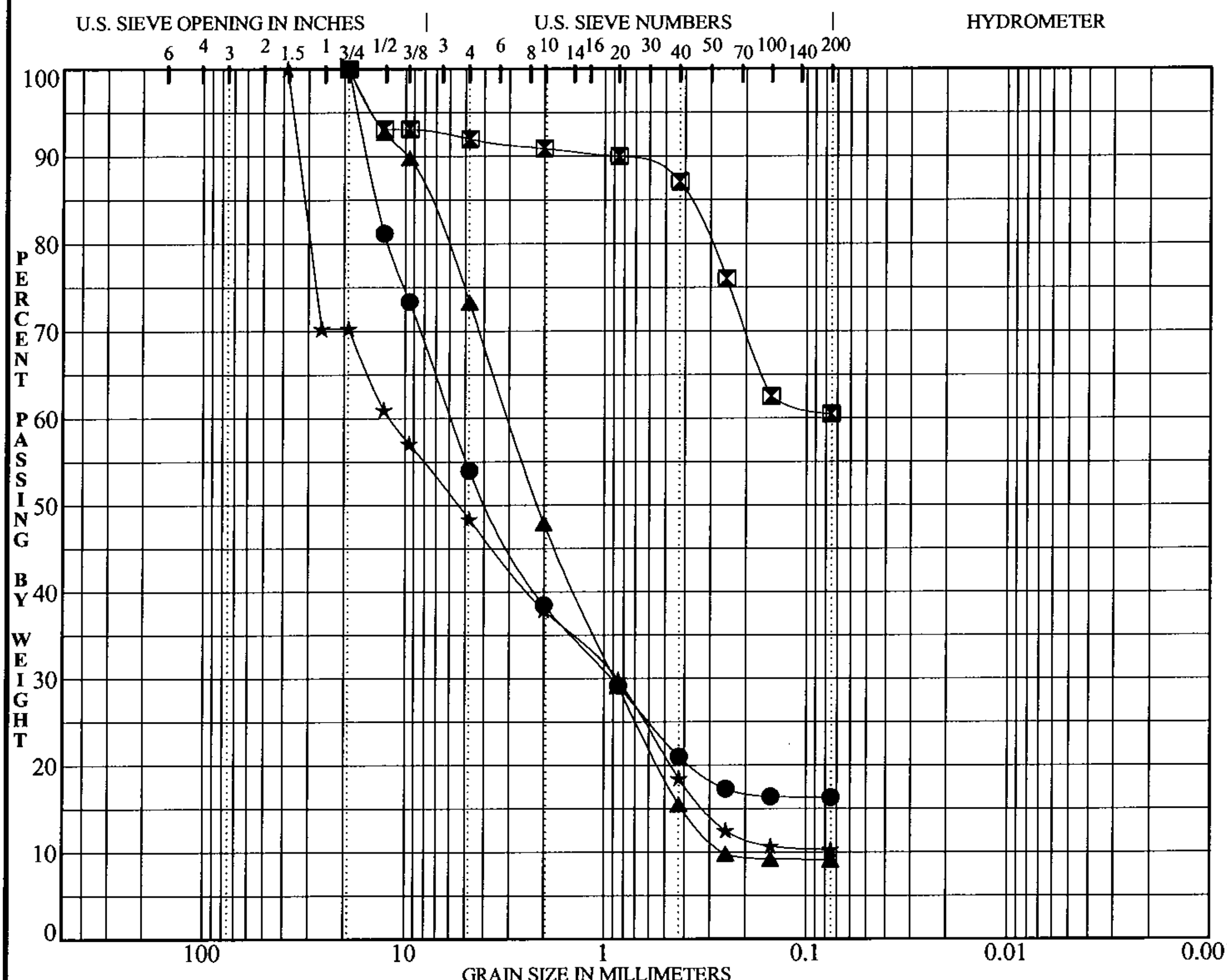
APP'D BY: Y. D. Wang
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-118

PROJECT No.
204104.10



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-78	31.2	16	54	Silty GRAVEL with sand (GM)	GM
⊠	BH-78	51.2	61	92	Sandy SILT (ML)	ML
▲	BH-78	61.1	9	73	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
★	BH-78	75.8	10	48	Poorly-graded GRAVEL with silt and sand (GP-GM)	GP-GM

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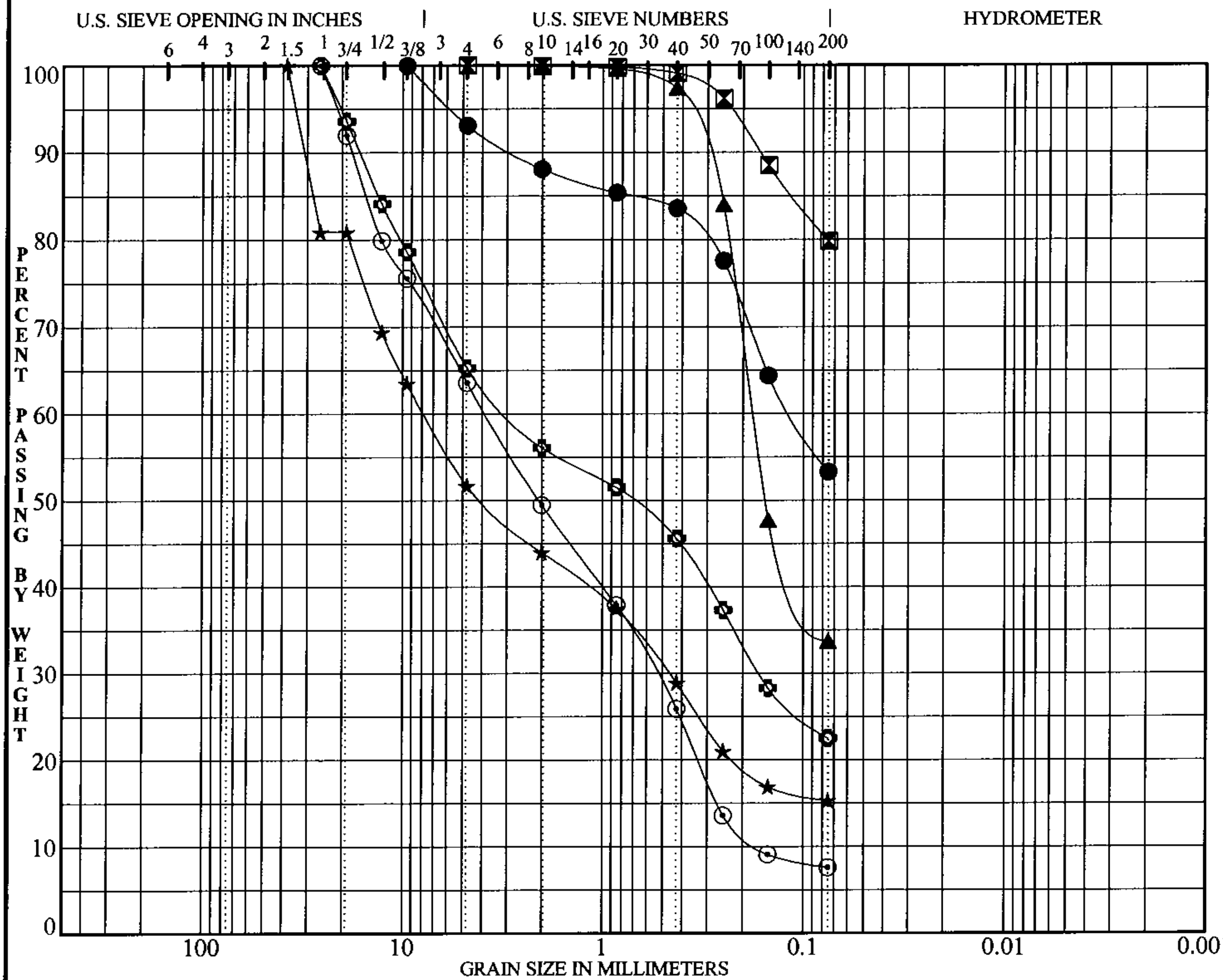
DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-119

PROJECT No.
204104.10

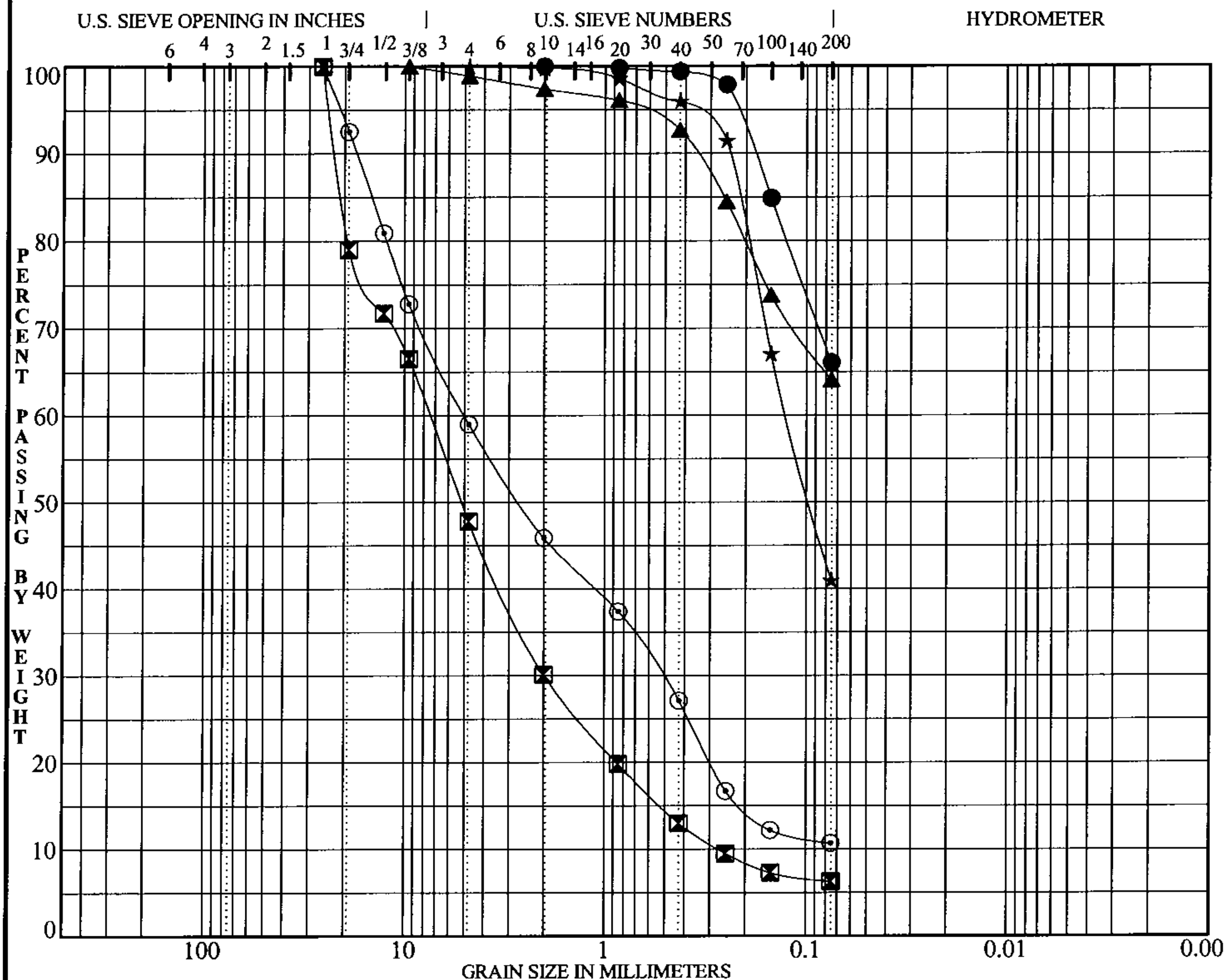


Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-79	41.8	53	93	Sandy SILT (ML)	ML
⊠	BH-79	112.1	80	100	SILT with sand (ML)	ML
▲	BH-79	150.5	34		Silty SAND to Sandy SILT (SM/ML)	SM/ML
★	BH-79	160.4	15	52	Silty GRAVEL with sand (GM)	GM
⊙	BH-79	180.3	8	64	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM
✿	BH-79	200.4	23	65	Clayey SAND with gravel (SC)	SC

GRADATION_B 204104 06 20 2005.GPJ STD.GDT 17/6/05

PREPD BY:	GRADATION TEST DATA	FIGURE	
APPD BY: Y. D. Wang		A12-120	
DATE: 17/6/05	SVRT DOWNTOWN	PROJECT No.	
DWG FILE:	San Jose, California	204104.10	



Cobbles	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	

Key Symbol	Boring No.	Depth (Feet)	% Passing No. 200 Sieve	% Passing No. 4 Sieve	Sample Descsription	USCS
●	BH-80	40.0	66		Sandy SILT (ML)	ML
⊠	BH-80	45.0	6	48	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
▲	BH-80	55.0	64	99	Sandy Lean CLAY (CL)	CL
★	BH-80	74.3	41	100	Silty SAND (SM)	SM
⊙	BH-80	86.3	11	59	Poorly-graded SAND with silt and gravel (SP-SM)	SP-SM

GRADATION B 204104 06 20 2005.GPJ STD.GDT 17/6/05

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DATE: 17/6/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A12-121

PROJECT No.
204104.10

APPENDIX 13

CONSTANT RATE OF STRAIN (CRS) CONSOLIDATION TEST RESULTS

Appendix 13 presents the laboratory results of the Constant Rate of Strain (CRS) Consolidation tests performed by Fugro.

FUGRO WEST, INC.

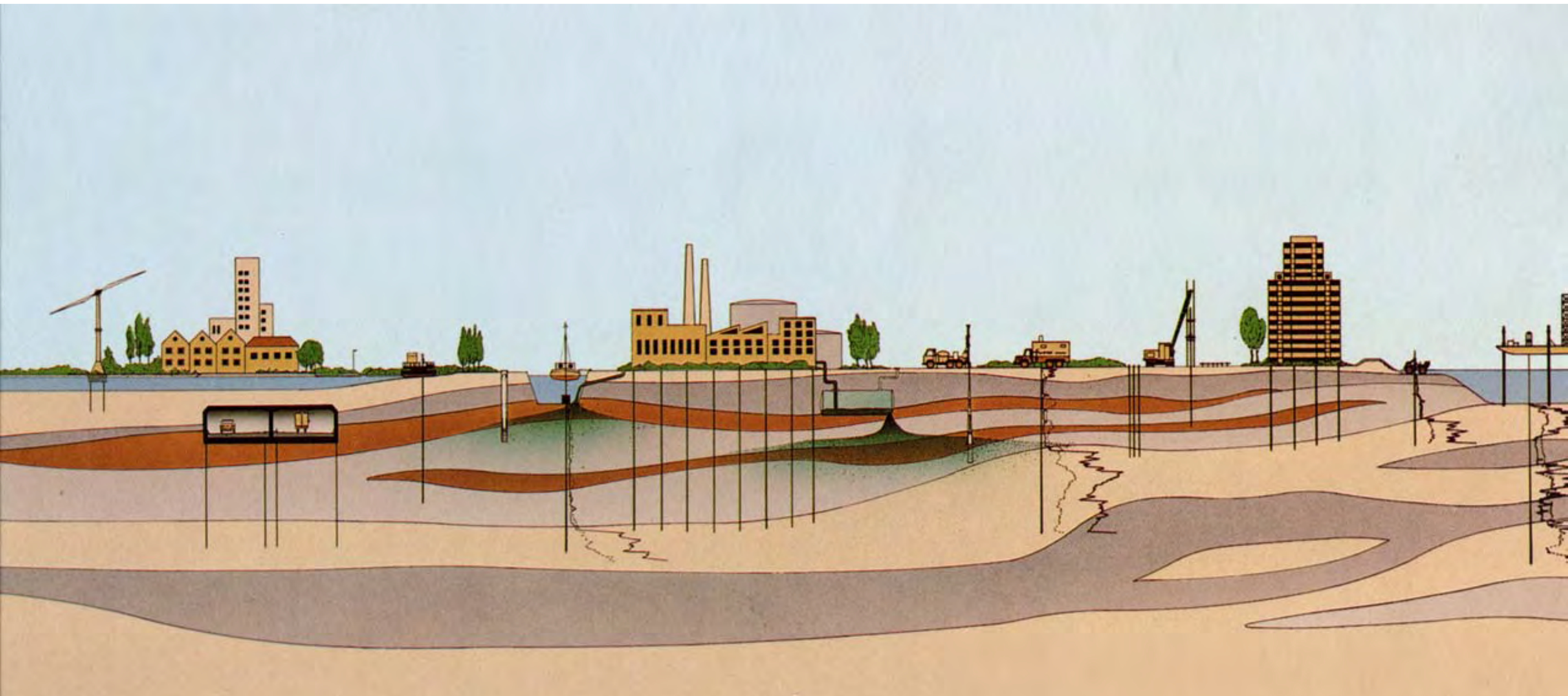
APPENDIX 13
CONSTANT RATE OF STRAIN (CRS) CONSOLIDATION TEST RESULTS

GEOTECHNICAL EXPLORATION PROGRAM
TUNNEL SEGMENT OF SILICON VALLEY
RAPID TRANSIT (SVRT) PROJECT
SAN JOSE, CALIFORNIA

Prepared for:
HMM/BECHTEL

JULY 2005

Project No. 1637.001



REPORT DOCKET

APPROVAL

This document is approved by the following:

Name	Title	Signature	Issue Date
Jon W. Mitchell	Project Manager	Jon W Mitchell	July 20, 2005

REVISION HISTORY

Revision	Date	Change	Approval
0	June 3, 2005	Draft Report: Appendix 13 Constant Rate of Strain (CRS) Consolidation Test Results	JM
1	July 20, 2005	Final Report: Appendix 13 Constant Rate of Strain (CRS) Consolidation Test Results with Bechtel comments from 6/10/05 & 7/13/05	JM

FUGRO WEST, INC.

1000 Broadway, Suite 200
Oakland, California 94607
Tel: (510) 268-0461
Fax: (510) 268-0137

July 20, 2005
Project No. 1637.001

HMM/Bechtel
3103 North First Street
San Jose, California 95134

Attention: Mr. Ignacio Arango

Subject: Appendix 13 – Constant Rate of Strain Consolidation Test Results
Tunnel Segment of SVRT Project
San Jose, California

Dear Mr. Arango:

Fugro West, Inc., is pleased to submit this copy of "Appendix 13 - Constant Rate of Strain Consolidation Test Results," presenting the results of the Constant Rate of Strain consolidation tests, conducted by the geotechnical laboratory of Fugro Consultants LP in Houston, Texas, for the Tunnel Segment of SVRT Project in San Jose, California.

We appreciate this opportunity to be of continued service to HMM/Bechtel. Please contact Jon Mitchell at (510) 267-4430 if you have any questions regarding the information presented in this appendix.

Sincerely,
FUGRO WEST, INC.

Linda Al Atik
Staff Engineer

Jon W. Mitchell
Staff Engineer

Ronald L. Bajuniemi, P.E., G.E.
Principal Consultant

LAA/JWM/RLB:rp

Copies Submitted: (pdf) Addressee

CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This appendix presents the results of the Constant Rate of Strain (CRS) consolidation tests conducted by the geotechnical laboratory of Fugro Consultants LP, of Houston, Texas, (Fugro Consultants) as a part of the advanced laboratory testing program for the Tunnel Segment of SVRT Project. The CRS consolidation tests were conducted on soil samples from boring locations situated along the tunnel segment alignment of the Silicon Valley Rapid Transit (SVRT) Project, as shown on the Boring Location Map, Figure A13-1.

1.1 PROJECT DESCRIPTION

The Santa Clara Valley Transportation Authority (VTA) intends to construct the SVRT Project in San Jose, California. This will be a 26.2-km (16.3-mile) extension of the Bay Area Rapid Transit (BART) heavy rail rapid transit system from its planned terminus at the end of the Warms Springs Extension in Fremont, to San Jose. The proposed alignment currently includes six stations (three above-grade and three below-grade), a proposed future station, and vehicle storage and maintenance facilities. The alignment is composed of two major segments:

1) A line segment that will be approximately 11.5 miles of at-grade, elevated and cut-and-cover track from Warm Springs to San Jose; and
2) A 5.1-mile-long tunnel segment, consisting of twin bored tunnels and cut-and-cover structures through downtown San Jose (see Figure A13-1).

As currently planned, the tunnel segment includes at-grade and open cut track, three cut-and-cover stations, and a cut-and-cover track crossover structure. The cut-and-cover stations and the crossover structures have a cumulative length of approximately 4,970 feet. The remaining 4.14 miles of the alignment will be twin 19.5-foot-diameter tunnels.

This investigation and report cover the 5.1-mile-long tunnel segment section only.

1.2 GEOTECHNICAL EXPLORATION PROGRAM OVERVIEW

The joint venture of Hatch Mott MacDonald T & T, Inc., and Bechtel Infrastructure Corporation (HMM/Bechtel) is providing engineering design services for the tunnel segments (Segments 3 and 4) of the SVRT Project to the VTA. HMM/Bechtel has subcontracted with a number of companies to conduct the geotechnical field exploration program for the project. HMM/Bechtel's primary subcontractors for the geotechnical exploration program included: Fugro West, Inc., (Fugro), Parikh Consultants (Parikh) and Pitcher Drilling Company (Pitcher).

The three companies, Fugro, Parikh, and Pitcher, conducted the majority of the geotechnical field exploration program for the tunnel segments of the SVRT Project from October 15, 2004, to March 5, 2005. The intent of the geotechnical field investigation program was to obtain geotechnical data that will aid in the design and construction of the proposed tunnel and cut-and-cover structures.

In general, the geotechnical field investigations explored subsurface conditions along the proposed tunnel alignment, within the vicinity of the proposed Eastern and Western Portals, at the two proposed ventilation structures, and at the proposed stations including Alum Rock Station, Downtown San Jose Station, and Diridon/Arena Station. The geotechnical exploration program included:

- 76 rotary wash borings, and
- 146 cone penetration tests (CPTS).

Figure A13-1 provides a map of the exploration locations. These locations were selected by HMM/Bechtel based on the following considerations: 1) data requirements of the tunnel designer, 2) location of existing geotechnical data, 3) avoidance of private property, and 4) avoidance of existing underground and overhead utilities. For CPT correlation purposes, approximately 16 sets of borings and CPTs were conducted within 15 feet of each other.

The boring investigation program was conducted by the two companies, Parikh and Pitcher. The investigation included soil sampling and in situ testing. Soil sampling consisted of Pitcher Barrel sampling, Shelby tube sampling, SPT sampling and California sampling. The in situ testing conducted in the borings consisted of field vane shear testing, pressuremeter testing, downhole geophysical logging, and piezometer installation. For further details regarding the boring investigation program and results, please refer to the main report.

1.3 LABORATORY TESTING PROGRAM OVERVIEW

1.3.1 Testing Overview

The geotechnical laboratory of Fugro Consultants conducted the advanced laboratory testing program for the Tunnel Segment of SVRT Project. This program was conducted on samples provided by Parikh from soil borings located along the tunnel segment. Table A13-1, below, summarizes the numbers and types of different tests conducted. The purpose of this advanced laboratory testing program was to determine selected index and engineering properties of the sampled soils. This appendix provides a detailed description for the constant rate of strain CRS consolidation tests along with a summary of the interpreted parameters.

Table A13-1. Summary of Advanced Laboratory Testing Program

Test Description	Number of Tests
Constant Rate of Strain (CRS) Consolidation	37
Static Direct Simple Shear	15
K_0-Consolidated Undrained Triaxial Compression	20
K_0-Consolidated Undrained Triaxial Extension	16
K_0-Consolidated Bishop's Procedure	12
Isotropically-Consolidated Drained Triaxial Compression	30

1.3.2 Program Description

The physical properties of the soils tested during the advanced laboratory testing program are separated into two categories - index and engineering. The index properties include items such as water content, specific gravity, unit weight, void ratio, and degree of saturation. The engineering properties would include items such as compressibility (consolidation), strength, and hydraulic conductivity (permeability). The advanced tests conducted as part of this laboratory testing program are discussed in more detail below.

- **Constant Rate of Strain (CRS) Consolidation** tests were conducted to determine the rate and magnitude of soil consolidation as well as stress history for a soil sample that is restrained laterally and drained axially. The one-dimensional consolidation tests typically involved constant rate-of-loading, one unload-reload cycle, and one rebound stage from the maximum applied stress. Detailed discussion of the CRS consolidation tests is provided in Appendix 13 (this appendix).
- **Static Direct Simple Shear (DSS)** tests were conducted to measure constant volume (undrained) shear strength and stress-strain characteristics of cohesive soils after one-dimensional consolidation using a constant rate of simple shear deformation. Detailed discussion of the DSS tests is provided in Appendix 14.
- **Isotropically Consolidated Drained Triaxial (CDTX**) tests were conducted to evaluate the drained strength characteristics, such as friction angle and stress-strain relationship of the soils encountered in the borings. For detailed discussion of the consolidated drained triaxial tests, refer to Appendix 15.
- **K_0-Consolidated Undrained Triaxial Compression and Extension (CK_0UC & CK_0UE)** tests were conducted to estimate the static strength parameters and stress-strain characteristics of fine-grained soils under a range of confining stresses and overconsolidation ratios (OCRs). In K_0-consolidated test, the sample was consolidated under drained conditions to the assigned vertical stress while maintaining a constant diameter of the cylindrical specimen (the horizontal confining stress was automatically adjusted to maintain the constant diameter). For detailed discussion of the K_0 triaxial compression and extension tests, refer to Appendix 16.
- **K_0 Bishop's Procedure Triaxial** tests were conducted to determine the at-rest lateral earth pressure coefficient (K_0) as a function of the overconsolidation ratio (OCR). For detailed discussion of the K_0 Bishop's tests, refer to Appendix 17.

The scope of the advanced laboratory testing program also included the x-raying of assigned soil samples. Discussion of the x-ray testing procedures and a summary of results are provided in Section 2.0 of Appendix 13 (this appendix), with x-ray images shown in Appendix 20.

1.3.3 Sample Recovery and Handling

Soil sampling was conducted by Parikh at intervals typically ranging from 5 to 10 feet, in accordance with the project specifications. Upon sample recovery, undisturbed portions of the soil sample tubes were sealed and transported to Parikh's lab. For further details regarding sample recovery and handling, refer to the main report.

Soil samples assigned for advanced laboratory testing were transported in wooden Shelby tube holders, designed to maintain the tubes' vertical orientation during transit to Fugro's laboratory in Oakland. The samples where then packed in specially-fabricated, padded containers designed to minimize disturbance and maintain an upright (vertical) orientation of the samples during shipping. The samples were finally shipped to the Fugro Consultants' geotechnical laboratory for testing.

1.3.4 Constant Rate of Strain Consolidation Test Overview

The Fugro Consultants' geotechnical laboratory conducted CRS consolidation tests on 37 soil samples, as assigned by HMM/Bechtel. These tests involved constant rate-of-strain loading and, typically, one unload-reload cycle and one rebound stage of the soil samples. The CRS consolidation tests are conducted to determine the rate and magnitude of soil consolidation, as well as stress history for a soil sample that is restrained laterally, and drained and loaded axially. The primary output of the CRS consolidation tests includes load versus strain and coefficient of consolidation data. The compressibility-related parameters of interest that are typically obtained from CRS consolidation tests are the compression ($Cc\varepsilon$), recompression ($Cr\varepsilon$) and swelling ratios ($Cs\varepsilon$). These ratios are used to estimate the magnitude of consolidation settlements, and are determined from the plots of strain versus log of pressure. The rate of consolidation is characterized by the coefficient of consolidation (c_v), which is estimated from the time rate of consolidation data. In addition, consolidation test data can be used to estimate the preconsolidation stress. The preconsolidation stress is a measure of the maximum past consolidation pressure that the soil was subjected to. The results of the CRS consolidation tests may be used to estimate one-dimensional consolidation settlement and rates.

2.0 X-RAY TEST PROCEDURES AND RESULTS

2.1 OVERVIEW

Fugro Consultants conducted 68 x-ray tests on soil samples assigned by HMM/Bechtel, in general accordance with ASTM D4452, Standard Test Methods for X-Ray Radiography of Soil Samples. X-ray radiography provides a qualitative measure of the internal structure of the sample's content, as displayed by the varying shades of gray resulting from variations in the soil sample. These varying shades of gray enable one to evaluate items such as the following:

- Sample quality as noted by signs of voids, drilling wash, separations in the soil caused by gas expansion, unusual changes in bedding planes or layering;
- The presence of inclusions in the sample, such as shells and/or calcareous nodules; and
- The presence of naturally occurring fissures, bedding planes, voids, layering, gravel, and silts seams.

Results of the x-ray tests are used to help select appropriate and relatively undisturbed soil specimen for the different types of laboratory testing.

2.2 PROCEDURE

In accordance with ASTM D4452, x-rayed soil samples were viewed in a slightly darkened room. Information regarding the tested sample was recorded on the laboratory's tube log sheet.

All pertinent project information, including project number, boring, sample, and depth, was recorded on the tube log sheet along with the technician's interpretation of the test. The location of the sub samples, also known as "specimen," was marked on the tube log sheet. Subsequent technicians making tube cuts used the tube log sheet to pick up their specimen for advanced testing.

2.3 RESULTS AND LIMITATIONS

Results obtained from the x-ray tests performed are summarized in Table A13-2. Table A13-2 displays information related to the sample and boring numbers, the depth of the soil sample, the length of the material tested, the available testing material and a soil description.

X-ray tests involve some degree of uncertainty. The interpretation of the radiographs is dependent upon the quality of the radiograph and the amount of experience the technician has in performing these interpretations.

3.0 CRS CONSOLIDATION TEST PROCEDURES

3.1 INTRODUCTION

Thirty-seven CRS consolidation tests were performed in general accordance with ASTM Test Method D 4186 – 89 (1998) using an updated consolidometer and testing methodology. CRS consolidation tests include loading at a constant rate-of-deformation while monitoring axial deformation, axial force, and pore water pressure transducers using a data acquisition-control loading system. One unload-reload cycle was achieved for each soil sample and then a rebound stage from the maximum applied stress was performed.

3.2 TEST STANDARDS AND PROCEDURES

CRS consolidation tests were performed in general accordance with ASTM D4186-89, using an updated consolidometer and testing methodology. CRS consolidation specimens were taken from Shelby tubes that had been x-rayed to determine the least disturbed portion of the sample. Each test specimen had a diameter of 2.50 inches and a height of about 0.75 inches. The tests were run on consolidometers manufactured by Trautwein Soil Testing Equipment, using specifications based on research sponsored by Fugro at the Massachusetts Institute of Technology, and reported by Force and Germaine (1998).

The key components in the updated testing methodology may be summarized as follows:

- *Specimen Preparation:* The selected portions of the tubes were cut into segments with a mechanical hacksaw (18 teeth per inch). A wire saw was used to separate the soil from the surrounding tube in an effort to reduce potential disturbance upon extrusion. In addition, each tube is marked such that all test specimens, will have the same orientation when sheared. The sample is then extruded from the cut portion of the tube using a hydraulically actuated ram.

  The placement of the specimen into the consolidometer is done in a manner to prevent any swelling of the specimen or entrapment of air between the specimen and the consolidometer's base and porous stone in the pore-water pressure (PWP) measurement system.

- *Seating and Back Pressure Saturation:* A seating stress of about 0.1 ksf is applied to enable the initialization of the deformation indicator. Next, the specimen is consolidated to an axial strain of about 0.2 percent, and back-pressure saturation is initiated without allowing the specimen to swell and at a rate that minimizes soil compression. The applied bask pressure is typically 70 psi.

- *Loading (Consolidation):* Loading is initiated at a constant rate-of-deformation while monitoring axial deformation, axial force, and PWP transducers using a data acquisition-control loading system. This system can display the stress-strain curve, pore pressure-stress ratio (R_u = ratio of excess PWP to total axial/vertical stress), etc. and control the applied rate-of-deformation (constant rate-of-strain). If required, the constant rate-of-strain is adjusted to keep R_u between about 3 and 15 percent (in lieu of the 30 percent allowed in D 4186). As presented by Force and Germaine (1998) usage of a smaller range for R_u obtains compressibility and rate-of-consolidation coefficients that are more reliable.

  Loading is continued until the virgin compression curve is well defined or the stress limit of the apparatus is reached, 120 ksf. When an unload-reload curve is required, as in this program, it is initiated when it appears that the consolidation curve is well into the virgin consolidation region (axial strain of about 10 to 15 percent for plastic clays). The unload-reload cycle covers about one log cycle of effective vertical stress. The applicable data are corrected for the piston uplift force applied by the back pressure and apparatus compressibility.

4.0 CRS CONSOLIDATION TEST RESULTS

4.1 CRS CONSOLIDATION TEST RESULTS

During consolidation, the necessary data (time, vertical forces, strain, pore pressure, and transducer excitation voltage) were recorded using an automated data-acquisition system and electronically filed. Specialized Excel worksheets, along with a Visual Basic code (VBA) were used to reduce the data files into engineering units in tabular and graphical format. Figures A13-2a through A13-38b present the CRS consolidation test results. For each test performed, the laboratory axial strain versus the log of effective vertical stress curve is displayed showing a recompression phase, a virgin compression stage, an unload-reload cycle and a final rebound stage. The coefficient of consolidation (c_v) versus the average effective vertical stress and the void ratio at 50 percent consolidation versus the hydraulic conductivity k curves were also plotted. Results such as moisture content, Atterberg limits, initial unit weight, initial and final void ratios, interpreted preconsolidation pressure, estimated in situ vertical stress and overconsolidation ratio, and compression, recompression and swelling ratios are summarized in Table A13-3 for all the CRS consolidation tests performed. The in situ vertical effective stress was estimated by developing a unit weight profile from the boring data and either measured or estimated ground water levels. The interpretation of the parameters from the CRS test data (e.g., preconsolidation pressure and compression/recompression ratios) is discussed in more detail in the sections below.

4.2 DISCUSSION AND INTERPRETATION OF CRS CONSOLIDATION TEST DATA

4.2.1 Coefficients of Consolidation and Permeability

After recording the stress-strain behavior of the tested soil specimens under loading, unloading-reloading and rebound, the applicable data were corrected for the piston uplift force applied by the back pressure and apparatus compressibility.

Consolidation parameters, such as coefficient of consolidation (c_v), and hydraulic conductivity (k), were calculated using the “non-linear” approach, as presented by Wissa, et al. (1971) and Sheahan and Watters (1996), instead of using a combination of the “non-linear” and “linear” approaches as presented in D4186. In addition, values of c_v and k were only determined when steady-state conditions were achieved, as defined by Wissa et al. (1971).

4.2.2 Preconsolidation Pressure

Casagrande’s method (1936), and Becker’s method (Becker et al. 1987) were employed to estimate the preconsolidation pressure (σ'_p) from the CRS consolidation test data. These methods are discussed in more detail below.

4.2.2.1 *Casagrande Method*

The most common method for determining the preconsolidation pressure is the graphical construction, where a void ratio (or axial strain) versus log pressure curve is plotted for the clayey soil. Preconsolidation pressure is difficult to define when sample disturbance has occurred. The Casagrande procedure is illustrated on Figure A13-39 and described as follows:

1. Choose by eye, the point of minimum radius or maximum curvature on the consolidation curve (Point A).
2. Draw a horizontal line from point A (Line 1).
3. Draw a line tangent to the curve at point A (Line 2).
4. Bisect the angle made by steps 2 and 3 (Line 3).

5. Extend the straight-line portion of the virgin compression curve up to where it meets the bisector line obtained in step 4 (Line 4). The point of intersection of these two lines is the preconsolidation stress (Pp).

4.2.2.2 *Becker Method*

Becker et al. (1987) proposed a method of interpreting conventional consolidation test data using work per unit volume as a criterion for determining both the in situ effective and preconsolidation stresses in clayey soils. The work per unit volume – effective stress relationship, using arithmetic scales, can be approximated using linear relationships. The total work (defined as the average vertical stress between two load increments multiplied by the strain between load increments) is plotted versus vertical effective stress. The preconsolidation stress is simply defined as the intersection of the pre-yield line (initial loading points) and the post-yield line (at higher stresses) on the work versus vertical stress plot, as illustrated on Figure A13-40.

The Becker method applies for both horizontally and vertically trimmed samples. According to Becker et al. (1987), the accuracy with which in situ effective and preconsolidation stresses are determined was demonstrated to be within 10 percent of known stresses.

4.2.3 Compression, Recompression, and Swelling Ratios

The compression, recompression and swelling ratios are determined from the axial strain versus the effective vertical stress curve plotted using a semi-logarithmic scale. The compression ratio is the slope of the virgin compression line beyond the determined preconsolidation pressure. The swelling and recompression ratios are the slopes of the fitted lines of the unloading and reloading curves respectively.

5.0 LIMITATIONS

Our services consist of laboratory testing and data evaluations that are made in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The test data provided in this appendix is from laboratory testing of samples obtained from subsurface explorations conducted by others. These explorations indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. Variations may exist and conditions not observed or described in this report could be encountered during construction. Our laboratory tests results presented in this appendix are based on the standards and procedures indicated herein. The laboratory assignments were provided by HMM/Bechtel.

This appendix has been prepared for the exclusive use of HMM/Bechtel and their consultants for specific application to the SVRT project as described herein. In the event that there are any changes in the ownership, nature, design, or location of the proposed project, or if any future additions are planned, the results contained in this appendix should not be considered valid unless 1) the project changes are reviewed by Fugro, and 2) results presented in this appendix are modified or verified in writing. Reliance on this report by others must be at their risk unless we are consulted on the use or limitations. We cannot be responsible for the impacts of any changes in geotechnical standards, practices, or regulations subsequent to performance of services without our further consultation. We can neither vouch for the accuracy of information supplied by others, nor accept consequences for unconsulted use of segregated portions of this report.

6.0 REFERENCES

ASTM D2435, "Standard Test Methods for One-Dimensional Properties of Soils Using Incremental Loading," ASTM International.

ASTM D4452, "Standard Test Methods for X-Ray Radiography of Soil Samples," ASTM International.

ASTM D4186, "Standard Test Methods for One-Dimensional Properties of Soils Using Controlled-Strain Loading," ASTM International.

Becker, D. E., Crooks, J. H. A. and Been, K. (1987). "Interpretation of the Field Vane Test in Terms of In Situ and Yield Stresses." American Society for Testing and Materials. International Symposium on Laboratory and Field Vane Shear Strength Testing, Tampa, Florida.

Becker, D. E., Crooks, J. H. A., Been, K., and Jefferies, M. G. (1987). "Work as a Criterion for Determining In Situ and Yield Stresses in Clays," *Canada Geotechnique Journal 24*, pp. 549-564.

Casagrande, A. (1936). "Determination of the Preconsolidation Load and Its Practical Significance," *Proceedings, 1st International Conference on Soil Mechanics and Foundation Engineering,* Cambridge, Mass., Vol. 3, pp. 60-64.

Force, E. A. and Germaine, J. T. (1998), "Technology Advances in Testing Gulf Sediments," Progress Report No. 1, Department of Civil and Environmental Engineering, MIT, March 14, 1998.

Sheahan, T. C. and Watters, P. J. (1996), "Using an Automated Rowe Cell for Constant Rate of Strain Consolidation Testing," *Geotechnical Testing Journal*, ASTM, GTJODJ, Vol. 19, No. 4, pp. 345-363.

Wissa A. E. Z., Christian J. T., Davis E. H. and Heiberg S. (1971). " Consolidation at Constant Rate of Strain". *Journal of Soil Mechanics and Foundation Engineering*, ASCE, Vol. 97, No. SM10, October.

TABLES

Boring #	Sample #	Test Depth (feet)	Total Length of Material (inches)	Available Testing Material (inches)	Description
B-9	3	52.5	21	20.5	
	4	57.5	35	24	Variable material with a clean portion of 8 inches at the bottom of the sample
	5	68	22	18	
B-18	9	82.5	30	29	
B-21	6	47.5	31.5	31	
B-23	9	41.75	23	19	Stress relief cracks towards the bottom of the sample, and sample disturbance at its top
	17	106.8	22.5	20	Sample disturbance at the top of the sample
	18	117.3	26.5	25	Sample disturbance at the top of the sample
B-24	3	15	22	21	Few stress relief cracks at the top of the sample
	4	15	25	23	Expansions throughout the sample
	5	17.5	27	23	Expansions and voids towards the top and the middle of the sample
	6	22.5	25	22	Stress relief cracks towards the top of the sample
	7	25	31	28	Stress relief crack at the top of the sample
	8	27.5	25.5	23	Sample disturbance at the top of the sample
	29	111	26	24.5	Sample disturbance at the top of the sample
B-25	3	18	22	20	Bottom 12 inches of the sample may be sandy
	4	32.5	34	33	Highly variable material and heavily interlayered
	16	112.5	33	29	Numerous sand and gravel pockets thoughout the sample
	21	127.5	36	31	Slightly interlayered sample
	22	129.5	21	19	Few sand or silt pockets observed throughout the sample
B-26	2	25	33	28	Expansion cracks near the top of the sample, possibly sandy material
	5	40	25	24	Material may change plasticity 20 inches from the bottom of the sample
B-33	1	9.75	23	23	Material may be may be sandy with gravels
	3	30	31	28	
	6	54.4	25	-	
	7	62.5	31	31	
	9	82.5	31.5	31	
	17	137	25	24	Bottom 12 inches of the sample may be clayey
B-37	5	42.3	18	17	
B-38	14	76.25	26	25	
B-42	7	37.5	21	21	
B-45	4	41.5	25	24	
B-50	10	47.5	30	28	Some stress relief cracks towards the top of the sample
	17	101.2	15.5	15.5	Clean Sample

Notes: - No available testing material

SUMMARY OF X-RAY TEST RESULTS
Tunnel Segment of SVRT Project
San Jose, California

TABLE A13-2a

Boring #	Sample #	Test Depth (feet)	Total Length of Material (inches)	Available Testing Material (inches)	Description
B-52	8	24.2	21.5	20.5	Few seams at the bottom of the sample
	9	24.5	29.5	-	Stress relief cracks throughout the sample
	10	27	27.5	26.5	Sample disturbance at the top of the sample
	11	31.9	23.5	23.5	Clean Sample
	12	34.5	29.5	29.5	Clean Sample
	34	106.5	22	22	Few seams towards the middle of the sample
	35	111.5	32	27	Sample disturbance at the top of the sample
	36	116.5	16	16	Clean Sample
B-53	11	42.5	34.5	7	Sample disturbance throughout except for the bottom 7 inches
	28	134	34	29	Sample disturbance at the top and the bottom of the sample
B-54	4	15	11.75	11.75	Clean Sample
	13	60	32	32	Few stress relief cracks in the middle of the sample
B-55	7	32.5	29.5	25.5	Sample disturbance and expansions at the top and the bottom
	22	110.8	16.75	16.75	Clean Sample
	26	131.5	32.25	30.75	Sample disturbance at the top
B-64	5	32.5	30.5	30.5	Clean Sample
	18	107.1	23	22	Sample disturbance at the top
	19	117.4	17	15	Sample disturbance at the top and a few expansions towards the bottom
B-65	3	20	27.5	22.5	Voids at the top and middle portions of the sample
	13	121.6	16	-	Sample disturbance throughout the sample except for the bottom 2 inches
B-66	5	22.5	20	18	Sample may be sandy
	6	27.4	28	26	Variable material, possibly sandy
B-68	3	13.1	26	21.5	
	4	20.7	24.5	24	
	18	151	29.5	29	
B-70	35	137.3	28	27	
B-71	4	15	25	16	1.5-inches gravel caused large cavity in the top 9 inches of the sample as tube advanced
	8	22.5	24	23	Top 9 inches of the sample may be clayey
	22	129	13	0	Top 6 inches of the sample is gravelly; cutting edge of tube bent in as it was
B-75	14	141	26	26	
	15	151	32	29	
	16	160	17	16	
B-77	4	16.7	24	-	Partings from the middle to the bottom of the sample
	16	102	24.5	23	Sample disturbance at the top

Notes: - No available testing material

SUMMARY OF X-RAY TEST RESULTS
Tunnel Segment of SVRT Project
San Jose, California

Boring Number Sample Number	B-9 3d	B-18 9a	B-23 9a	B-23 17a	B-23 18a	B-24 3a	B-24 6a	B-24 7a	B-24 8a	B-24 29a	B-25 16a	B-33 1a	B-33 9a	B-42 7a	B-45 4a	B-50 10a	B-50 17a	B-52 8a	B-52 11a
Penetration Depth (ft)	52.35	80.15	41.35	106.80	117.30	15.00	22.50	25.00	27.50	110.50	112.50	9.75	82.25	37.50	41.40	47.50	101.10	24.20	31.90
Soil Type	CH	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
Moisture Content (%)																			
Initial, W_0	30.2	23	22.1	17.5	21.3	26.7	24.1	22.9	27.2	21.9	18.5	23.5	25.5	25.2	22.2	26.8	24.6	22.7	27.3
Final, W_f	25.5	17.1	15.2	11.8	15.8	21.4	16.2	16.5	17.9	14.4	13.7	18.5	21.1	17.7	16.2	19	19.2	17.2	17.9
Atterberg Limits																			
Liquid Limit, LL (%)	53	32	32	24	30	37	30	29	35	28	43	35	40	31	27	41	NA	NP	41
Plastic Limit, PL (%)	22	18	15	16	18	18	20	16	18	16	16	16	16	13	17	16	NA	NP	20
Specific Gravity	NA	NA	2.694	2.696	2.670	2.680	2.703	2.676	2.724	2.664	NA	NA	NA	NA	NA	2.699	2.707	2.700	2.703
Initial Total Unit Weight, $\gamma_{t,0}$ (pcf)	122	127	125	130	124	124	126	128	124	126	131	123	124	126	128	124	123	120	122
Void Ratio																			
Initial, e_0	0.83	0.64	0.64	0.52	0.63	0.70	0.66	0.60	0.74	0.61	0.54	0.71	0.71	0.68	0.61	0.73	0.71	0.72	0.77
Final, e_f	0.69	0.45	0.39	0.32	0.42	0.54	0.43	0.40	0.47	0.38	0.37	0.50	0.56	0.48	0.42	0.49	0.52	0.48	0.48
Interpreted Preconsolidation Pressure, σ'_p (ksf)																			
Casagrande (1936) Method	12.8	18.1	10.0	25.0	20.6	9.2	13.2	8.9	10.9	19.6	20.6	6.2	18.6	12.9	17.5	10.8	19.2	26.1	8.9
Becker (1987) Method	12.4	18.6	10.1	25.4	20.8	9.4	13.7	8.5	10.9	19.2	23.7	6.3	18.6	12.5	14.9	10.7	18.4	26.4	8.9
Estimated Effective Vertical Stress, σ'_{vo} (ksf)	3.63	5.47	2.79	6.84	7.48	1.64	2.10	2.25	2.40	8.09	8.24	1.20	5.71	2.84	3.08	3.51	7.36	2.32	2.77
Overconsolidation, OCR																			
OCR - Casagrande Method	3.5	3.3	3.6	3.7	2.8	5.6	6.3	3.9	4.5	2.4	2.5	5.2	3.3	4.5	5.7	3.1	2.6	11.2	3.2
OCR - Becker Method	3.4	3.4	3.6	3.7	2.8	5.7	6.5	3.8	4.5	2.4	2.9	5.2	3.3	4.4	4.9	3.0	2.5	11.4	3.2
Compression Index/Ratio																			
C_c	0.29	0.17	0.16	0.16	0.23	0.21	0.22	0.17	0.22	0.18	0.14	0.19	0.27	0.17	0.17	0.27	0.23	0.27	0.26
$C_{e,c}$	0.16	0.10	0.10	0.11	0.14	0.12	0.13	0.10	0.13	0.11	0.09	0.11	0.16	0.10	0.11	0.16	0.13	0.16	0.15
Recompression Index/Ratio																			
C_r	0.057	0.018	0.020	0.021	0.024	0.041	0.032	0.022	0.026	0.026	0.017	0.024	0.026	0.017	0.016	0.048	0.026	0.017	0.049
$C_{e,r}$	0.031	0.011	0.012	0.014	0.015	0.024	0.019	0.014	0.015	0.016	0.011	0.014	0.015	0.010	0.010	0.028	0.015	0.010	0.028
Swelling Index/Ratio																			
C_s	0.060	0.016	0.011	0.018	0.021	0.036	0.023	0.018	0.028	0.018	0.012	0.020	0.026	0.012	0.014	0.040	0.026	0.012	0.039
$C_{e,s}$	0.033	0.01	0.007	0.012	0.013	0.021	0.014	0.011	0.016	0.011	0.008	0.012	0.015	0.007	0.009	0.023	0.015	0.007	0.022
Coefficient of Consolidation, C_v (ft^2/yr)																			
Min (Typical)	1.6	20.1	9.8	5307.6	600.3	3.6	149.9	13.5	5.7	233.7	1386.7	3.6	3.0	100.7	1252.1	7.5	27.6	10951.0	49.3
At σ'_{vo}	51.7	958.0	32.3	-	699.7	4.3	828.8	21.5	9.7	430.6	-	32.3	215.3	1237.8	-	7.5	699.7	-	107.6
Max (Typical)	91.8	1894.4	3656.1	8221.9	11552.3	42.9	2123.1	189.6	135.2	2701.7	20031.3	204.4	373.7	1638.0	20095.8	98.8	969.7	957990.2	835.2

Notes: Data could not be interpreted from test results
NA = Test not assigned, see Appendix 12
NP = Non plastic soil sample

SUMMARY OF CRS CONSOLIDATION TEST RESULTS
Tunnel Segment of SVRT Project
San Jose, California

TABLE A13-3a

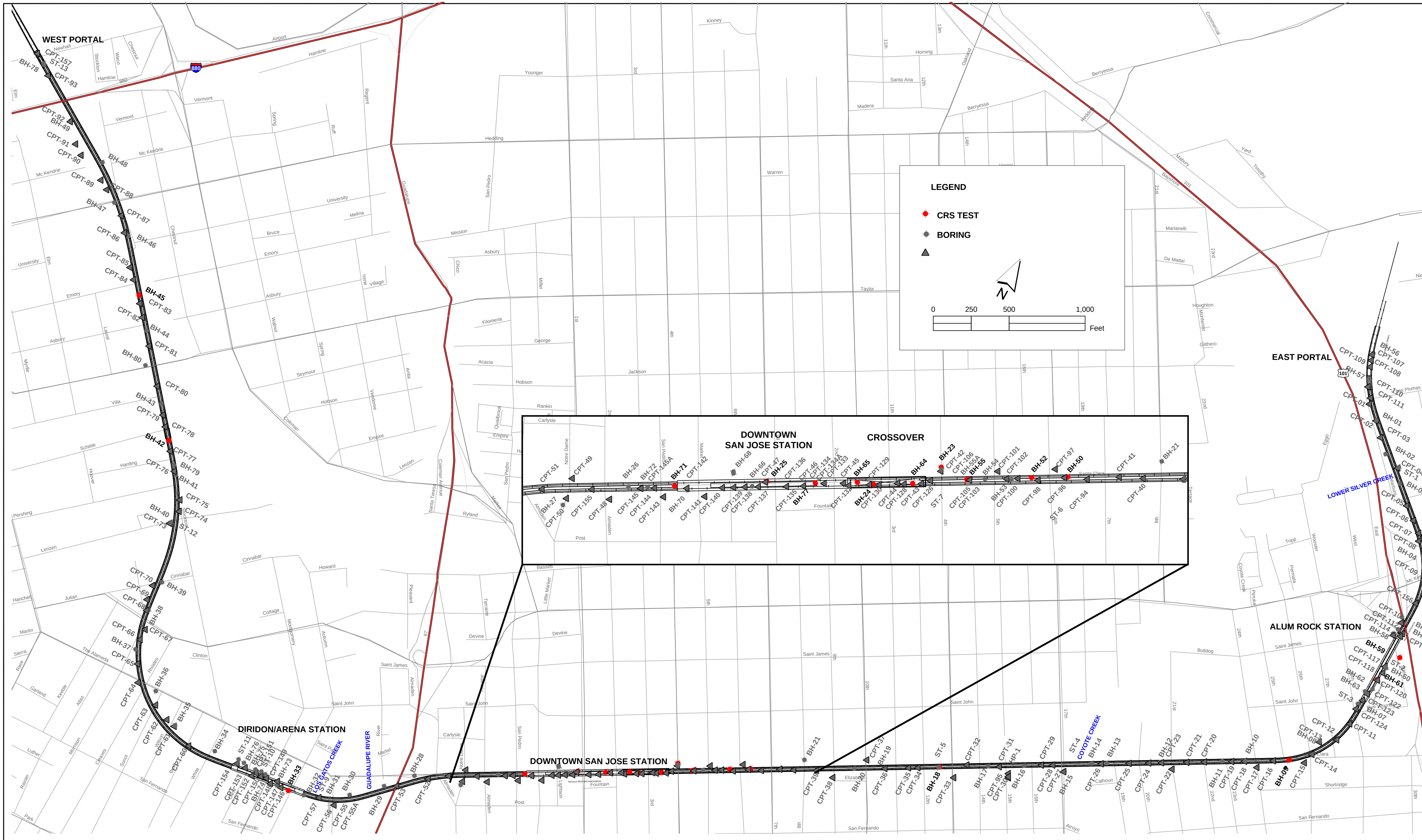
Boring Number	B-52	B-52	B-52	B-52	B-55	B-55	B-55	B-59	B-59	B-61	B-61	B-61	B-64	B-64	B-64	B-65	B-71	B-77
Sample Number	12a	34a	35a	36a	7a	22a	26a	5a	17a	5a	15a	17a	5a	18a	19a	13a	6a	16a
Penetration Depth (ft)	34.50	106.50	111.50	116.50	32.35	110.80	131.50	50.70	170.00	47.20	125.55	135.45	32.50	107.05	117.40	121.60	25.00	102.00
Soil Type	CL	CL	CL	CL	CL	CL	CL	CL	CL	CH	CH	CH	CL	CL	CL	CL	OH	CL
Moisture Content (%)																		
Initial, W_0	31.8	22.7	19.9	19.8	32.1	21.4	20.2	22.6	28.8	33.4	25.4	28.3	31	20.5	30.1	21.3	32	17.2
Final, W_f	20.7	18.6	14.2	15.2	18.5	15.6	16.4	22.3	28.2	25.5	20.6	25.6	19.8	14	22.8	14.5	24.9	12.2
Atterberg Limits																		
Liquid Limit, LL (%)	35	NA	34	NA	39	34	37	42	51	53	41	47	32	NA	NA	36	68	NA
Plastic Limit, PL (%)	19	NA	16	NA	20	14	16	15	25	25	21	20	21	NA	NA	14	20	NA
Specific Gravity	2.768	2.681	2.708	2.667	2.684	2.664	2.705	NA	NA	NA	NA	NA	2.714	2.679	2.679	2.666	NA	2.668
Initial Total Unit Weight, $\gamma_{t,0}$ (pcf)	123	126	129	124	121	127	126	129	122	118	126	124	122	128	119	128	119	128
Void Ratio																		
Initial, e_0	0.85	0.62	0.57	0.60	0.83	0.59	0.60	0.62	0.82	0.93	0.71	0.77	0.82	0.57	0.82	0.58	0.90	0.52
Final, e_f	0.57	0.50	0.38	0.41	0.49	0.41	0.44	0.60	0.75	0.69	0.56	0.69	0.53	0.37	0.61	0.39	0.68	0.32
Interpreted Preconsolidation Pressure, σ'_p (ksf)																		
Casagrande (1936) Method	8.5	30.6	21.4	29.2	7.5	20.2	25.5	10.9	33.5	10.57	25.62	23.42	20.17	24.23	31.26	18.14	9	16.14
Becker (1987) Method	8.5	30.4	22.0	27.7	7.4	19.5	25.4	10.9	33.0	10.42	23.44	22.12	18.23	23.18	31.7	18.32	9.6	15.11
Estimated Effective Vertical Stress, σ'_{vo} (ksf)	2.92	7.76	8.12	8.47	2.80	7.91	9.15	3.48	11.21	3.70	8.72	9.46	2.54	7.39	7.99	8.57	2.77	7.34
Overconsolidation, OCR																		
OCR - Casagrande Method	2.9	3.9	2.6	3.4	2.7	2.5	2.8	3.1	3.0	2.9	2.9	2.5	8.0	3.3	3.9	2.1	3.2	2.2
OCR - Becker Method	2.9	3.9	2.7	3.3	2.6	2.5	2.8	3.1	2.9	2.8	2.7	2.3	7.2	3.1	4.0	2.1	3.5	2.1
Compression Index/Ratio																		
C_c	0.21	0.15	0.20	0.22	0.22	0.18	0.20	0.18	0.34	0.29	0.25	0.30	0.19	0.18	0.28	0.20	0.29	0.19
$C_{e,c}$	0.11	0.09	0.13	0.14	0.12	0.11	0.13	0.11	0.19	0.15	0.15	0.17	0.11	0.12	0.15	0.13	0.15	0.12
Recompression Index/Ratio																		
C_r	0.022	0.029	0.031	0.026	0.035	0.018	0.027	0.039	0.064	0.046	0.034	0.050	0.022	0.030	0.033	0.041	0.084	0.027
$C_{e,r}$	0.012	0.018	0.020	0.016	0.019	0.011	0.017	0.024	0.035	0.024	0.020	0.028	0.012	0.019	0.018	0.026	0.044	0.018
Swelling Index/Ratio																		
C_s	0.022	0.021	0.027	0.021	0.022	0.011	0.021	0.036	0.062	0.052	0.038	0.046	0.009	0.019	0.018	0.027	0.074	0.017
$C_{e,s}$	0.012	0.013	0.017	0.013	0.012	0.007	0.013	0.022	0.034	0.027	0.022	0.026	0.005	0.012	0.01	0.017	0.039	0.011
Coefficient of Consolidation, C_v (ft^2/yr)																		
Min (Typical)	31.4	21.6	88.0	189.3	13.2	37.2	305.1	5.2	4.0	7.4	10.5	5.6	282.9	4472.9	2795.8	423.5	5.7	4292.5
At σ'_{vo}	366.0	118.4	2454.2	193.8	581.3	678.1	968.8	-	344.4	204.5	1216.3	93.6	538.2	-	-	-	12.9	-
Max (Typical)	492.0	567.1	11764.7	12442.4	663.5	691.4	1338.6	38.6	381.3	371.9	1261.3	94.2	114536.1	6763.0	4361.7	60303.4	404.1	5936.0

Notes: Data could not be interpreted from test results
NA = Test not assigned, see Appendix 12
NP = Non plastic soil sample

SUMMARY OF CRS CONSOLIDATION TEST RESULTS
Tunnel Segment of SVRT Project
San Jose, California

TABLE A13-3b

FIGURES



REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY

DRAWN BY

CHECKED BY

IN CHARGE

DATE

HMM / BECHTEL

A Joint Venture of Hatch Mott MacDonald T&T, Inc. and Bechtel Infrastructure Corp.

DESIGNER/SUBCONSULTANT FUGRO

SUBMITTED

HMM/BECHTEL

APPROVED

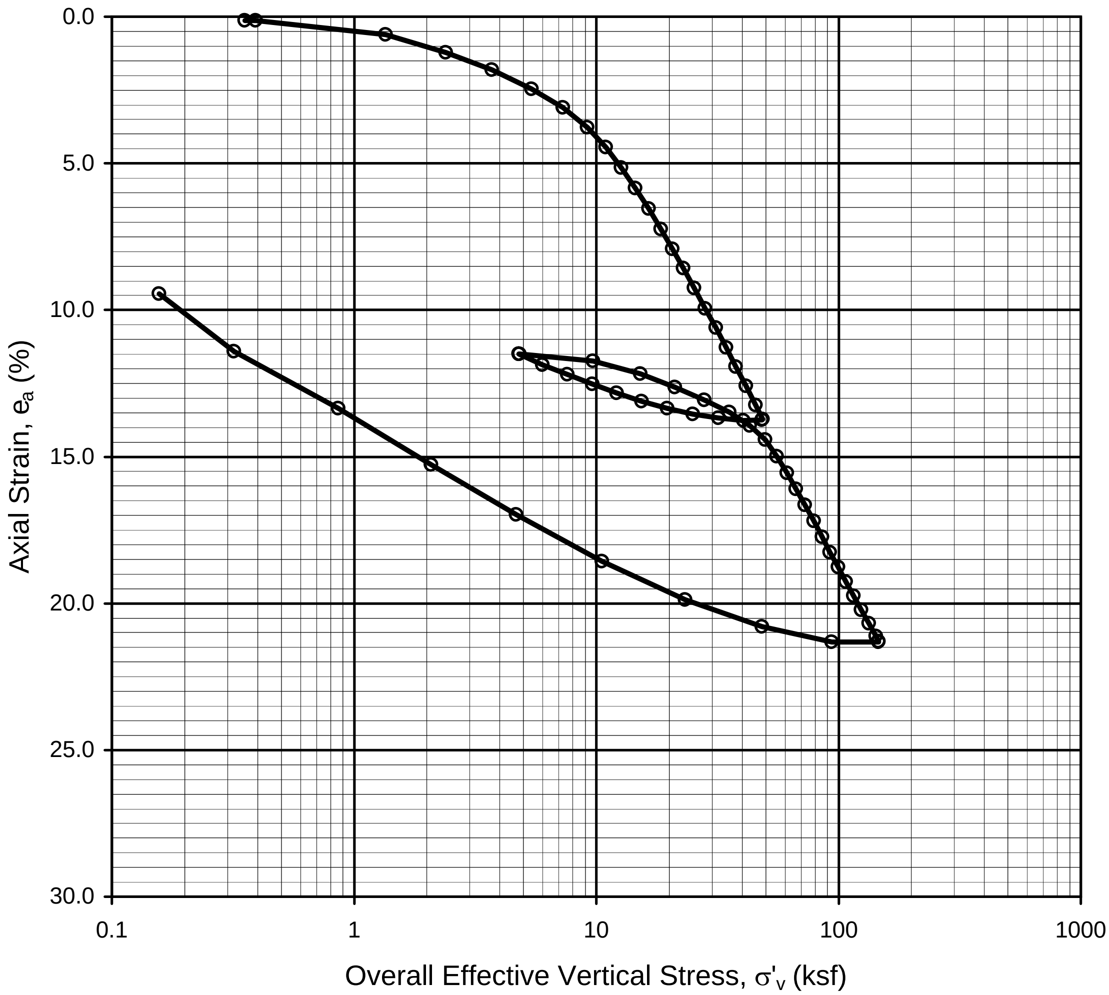
BART

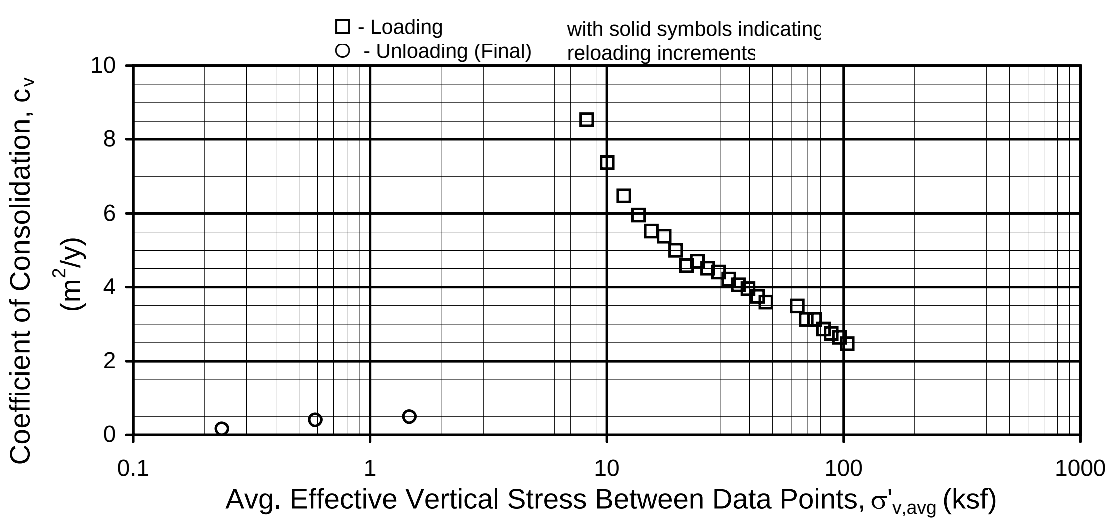
SILICON VALLEY RAPID TRANSIT PROJECT

VTA SANTA CLARA Valley Transportation Authority

CRS LOCATION MAP
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-1





CRS CONSOLIDATION TEST RESULTS

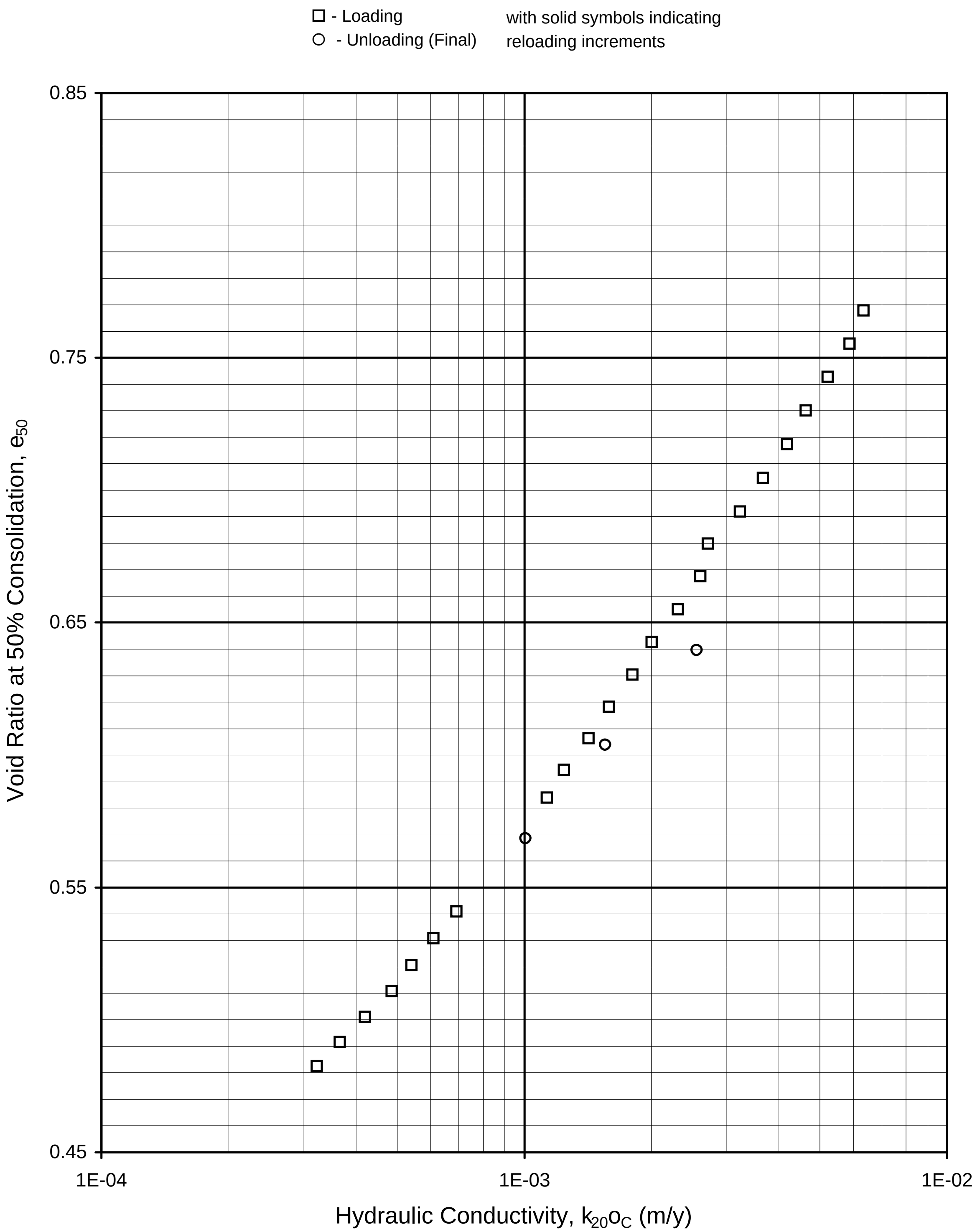
Sample No. 3d - Depth 52.35 ft

Boring B-9

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-2a



CRS CONSOLIDATION TEST RESULTS

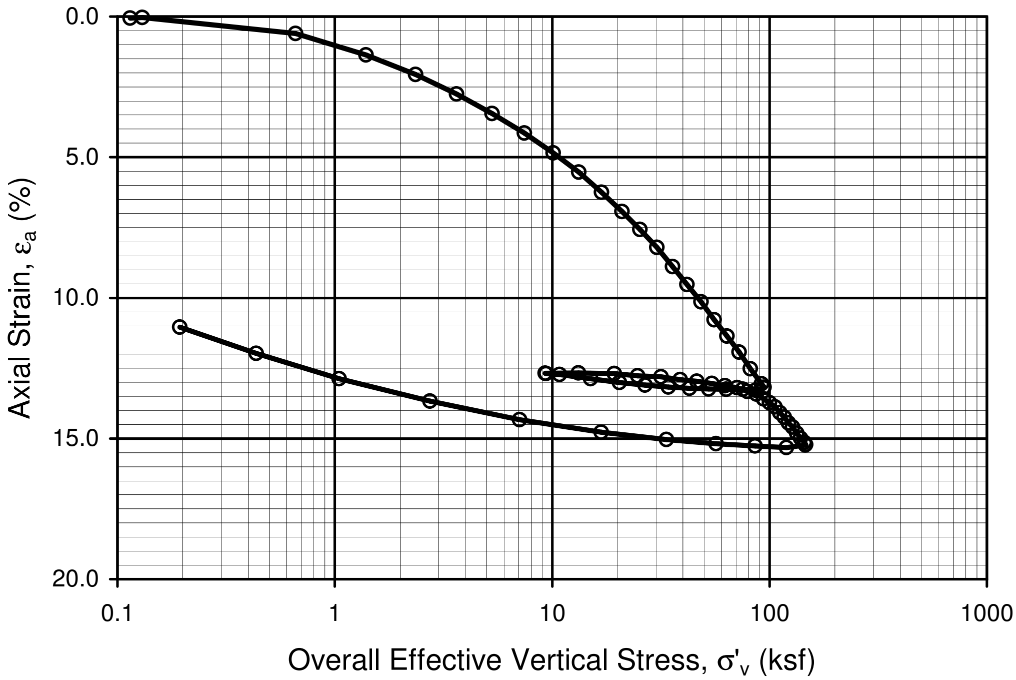
Sample No. 3d - Depth 52.35 ft

Boring B-9

Tunnel Segment of SVRT Project

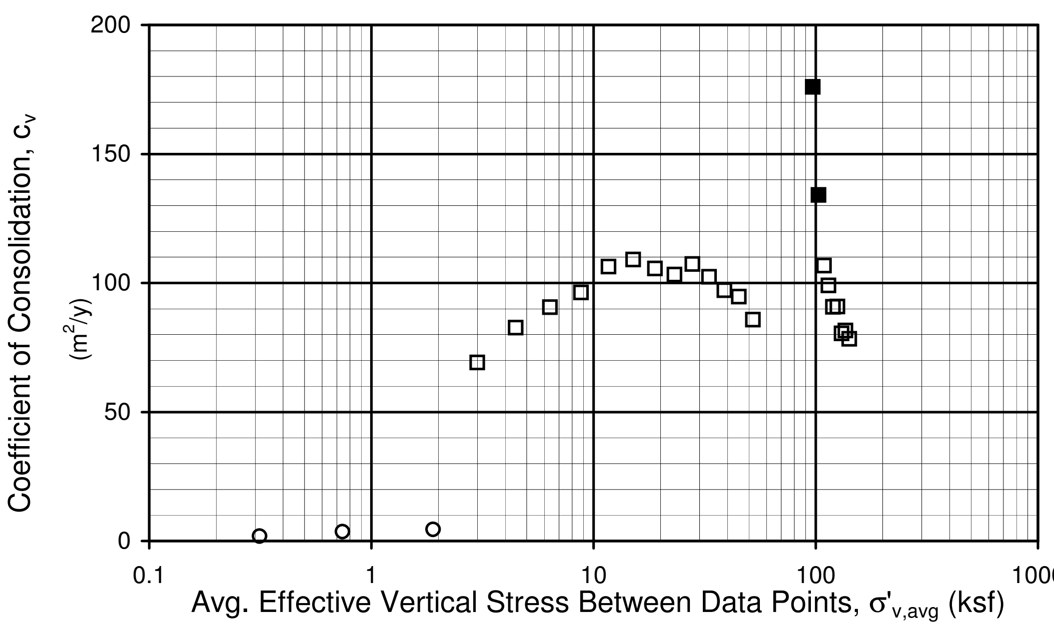
San Jose, California

FIGURE A13-2b



□ - Loading
○ - Unloading (Final)

with solid symbols indicating reloading increments



CRS CONSOLIDATION TEST RESULTS

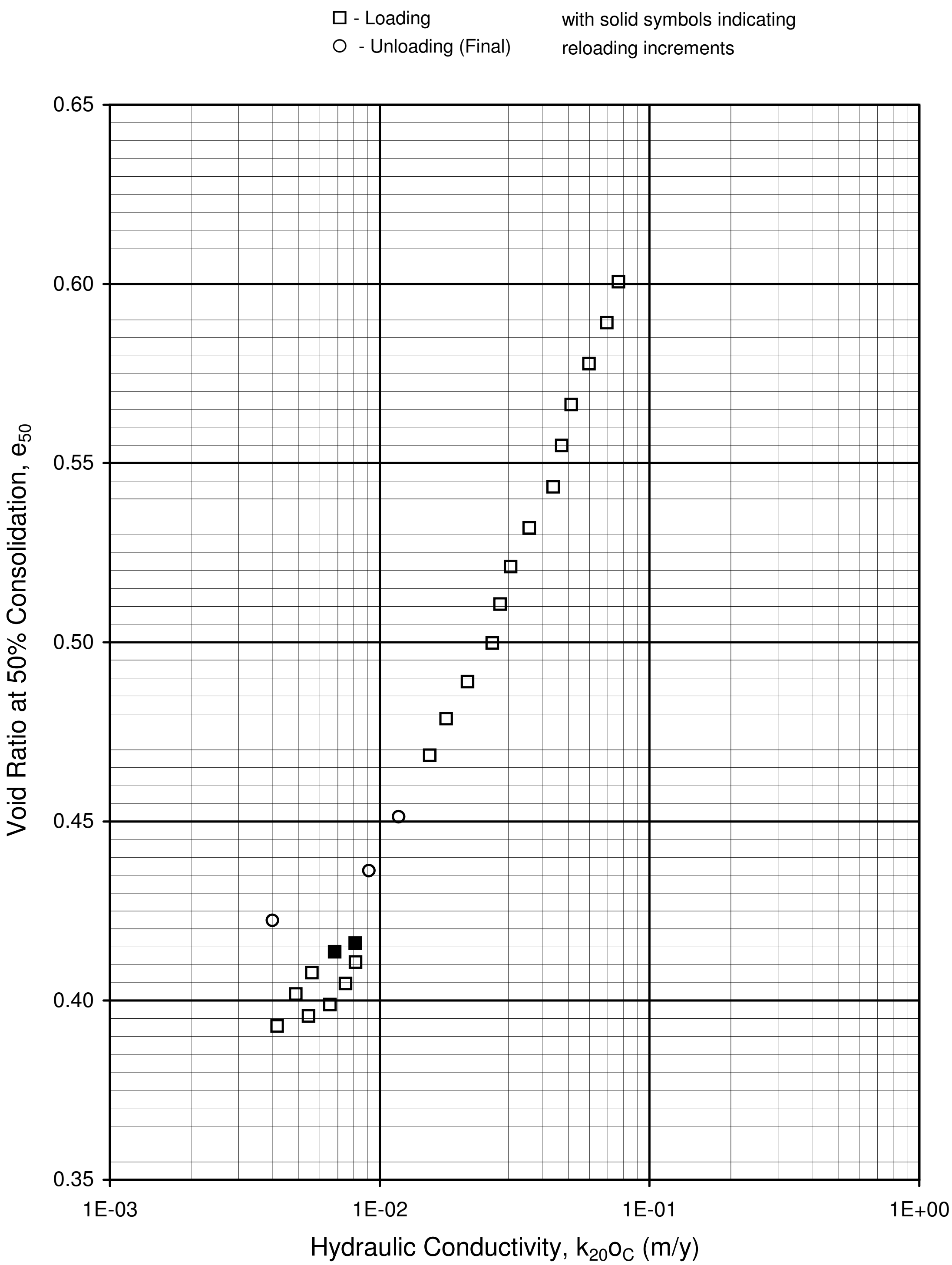
Sample No. 9a - Depth 80.15 ft

Boring B-18

Tunnel Segment of SVRT Project

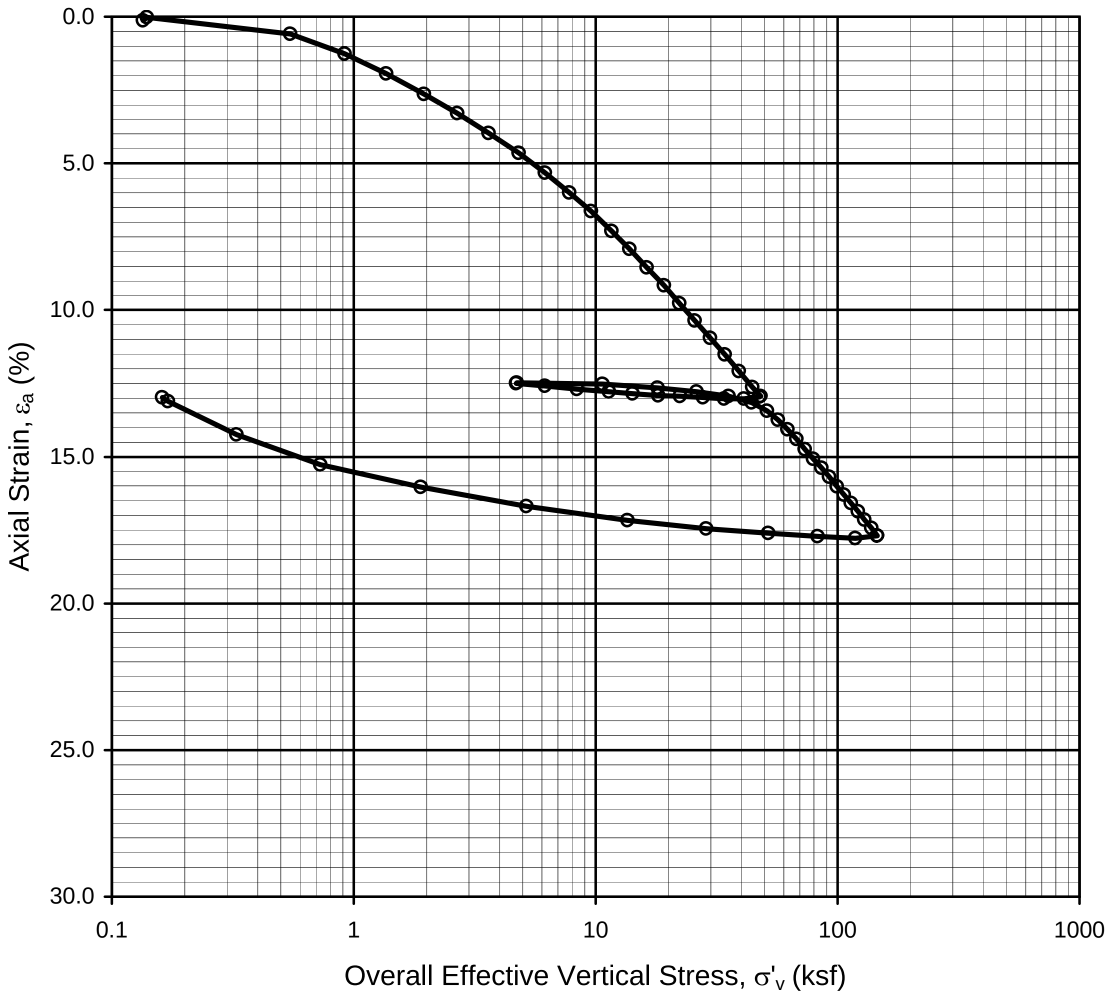
San Jose, California

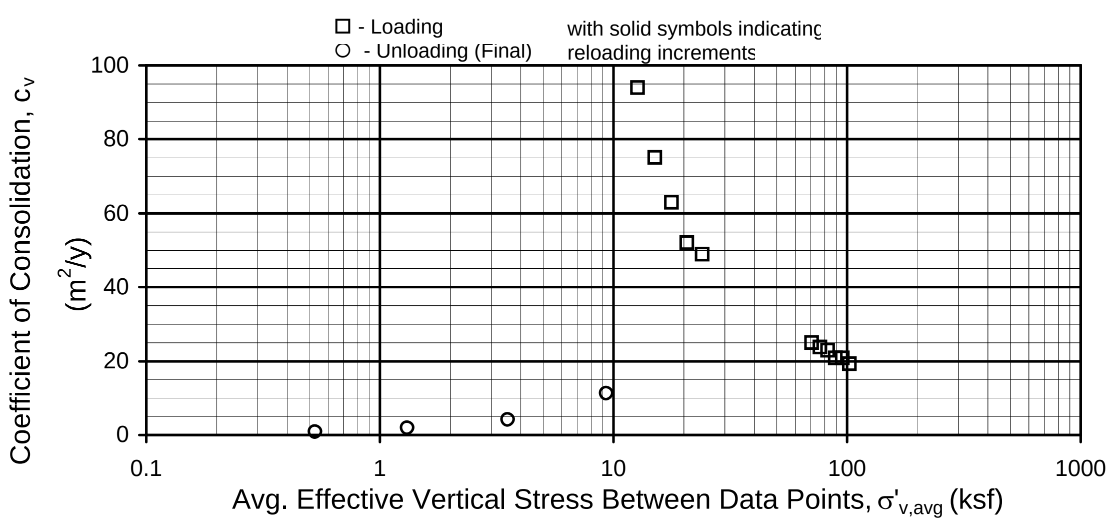
FIGURE A13-3a



CRS CONSOLIDATION TEST RESULTS
Sample No. 9a - Depth 80.15 ft
Boring B-18
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-3b





CRS CONSOLIDATION TEST RESULTS

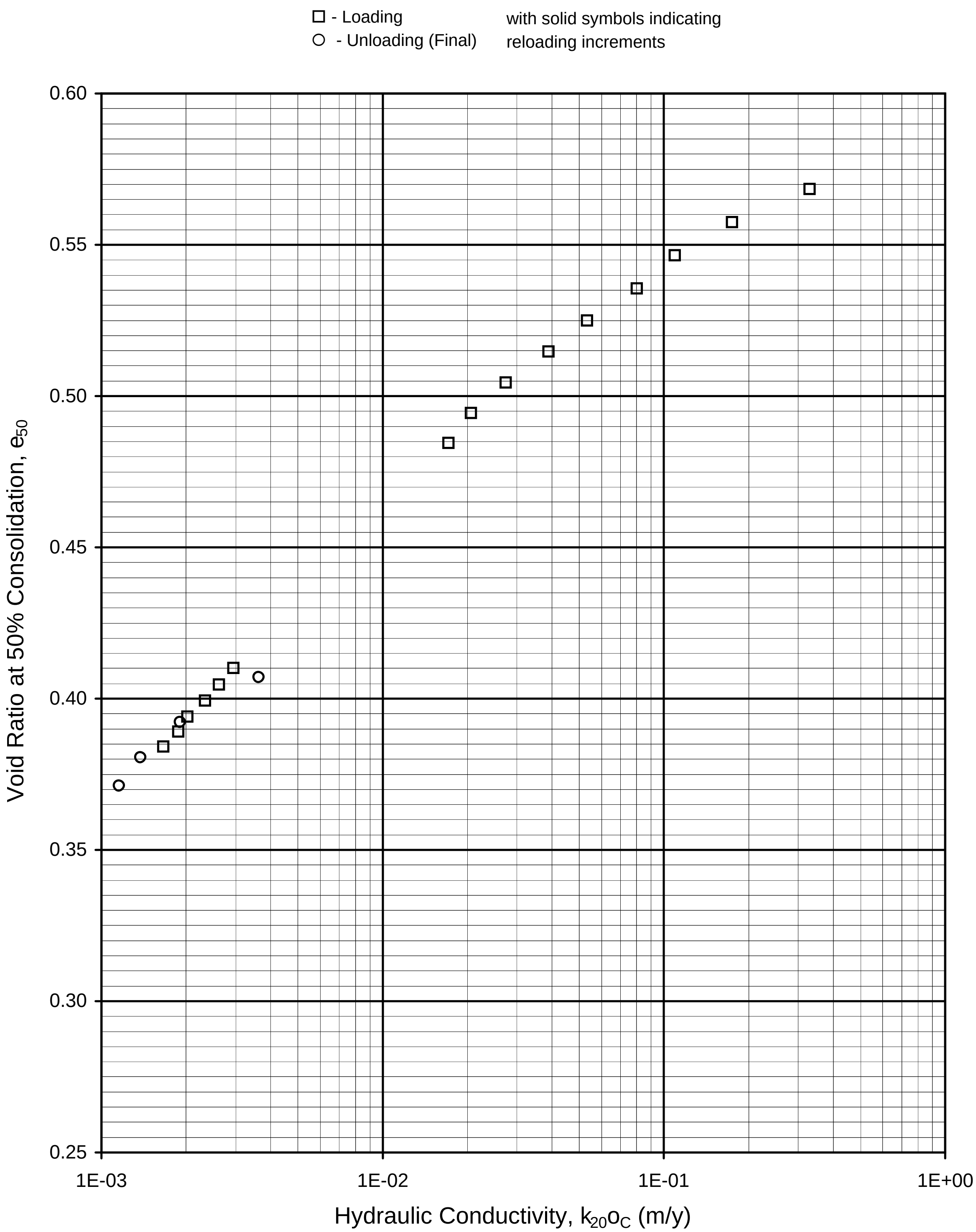
Sample No. 9a - Depth 41.35 ft

Boring B-23

Tunnel Segment of SVRT Project

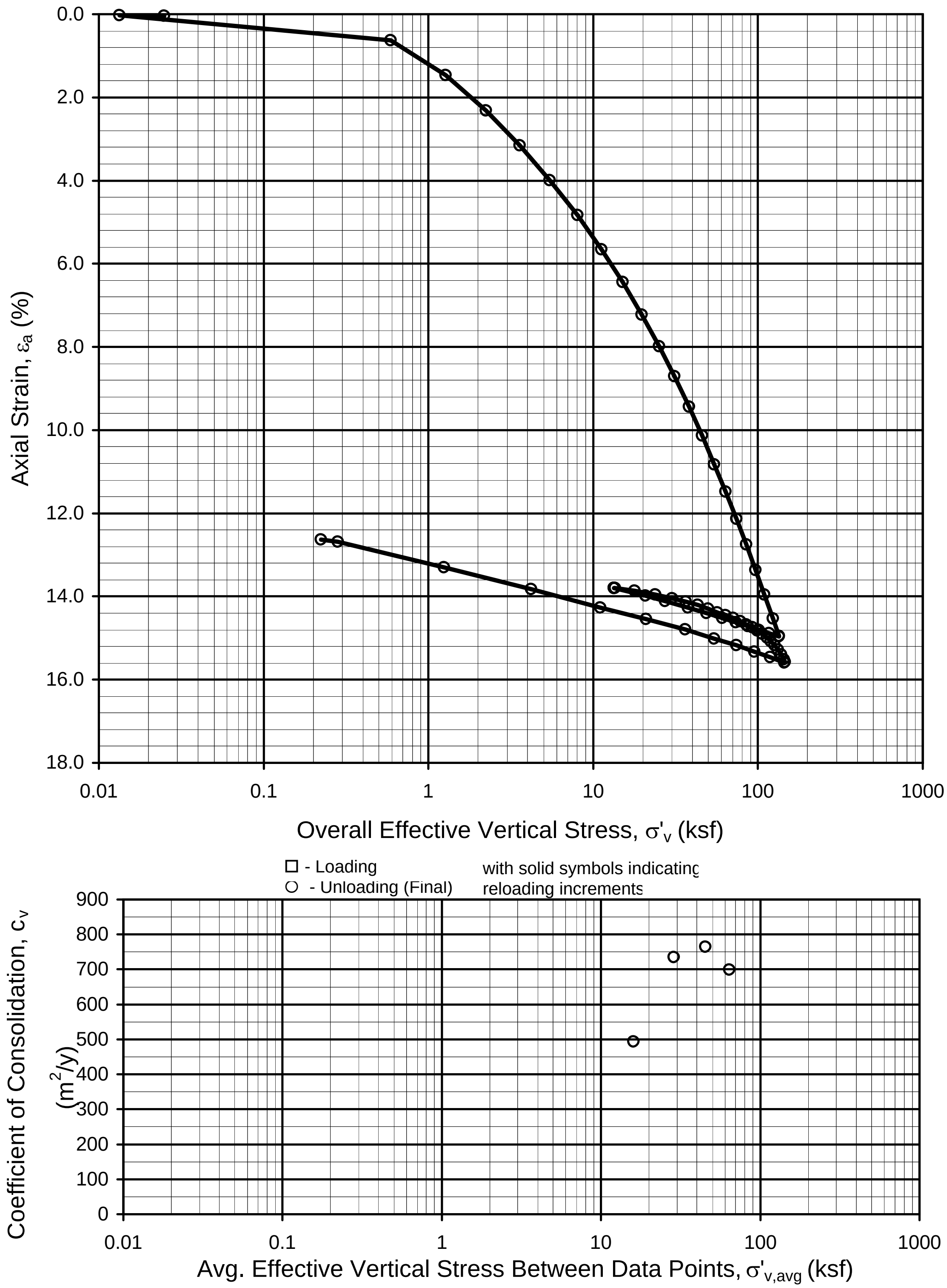
San Jose, California

FIGURE A13-4a



CRS CONSOLIDATION TEST RESULTS
Sample No. 9a - Depth 41.35 ft
Boring B-23
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-4b



CRS CONSOLIDATION TEST RESULTS

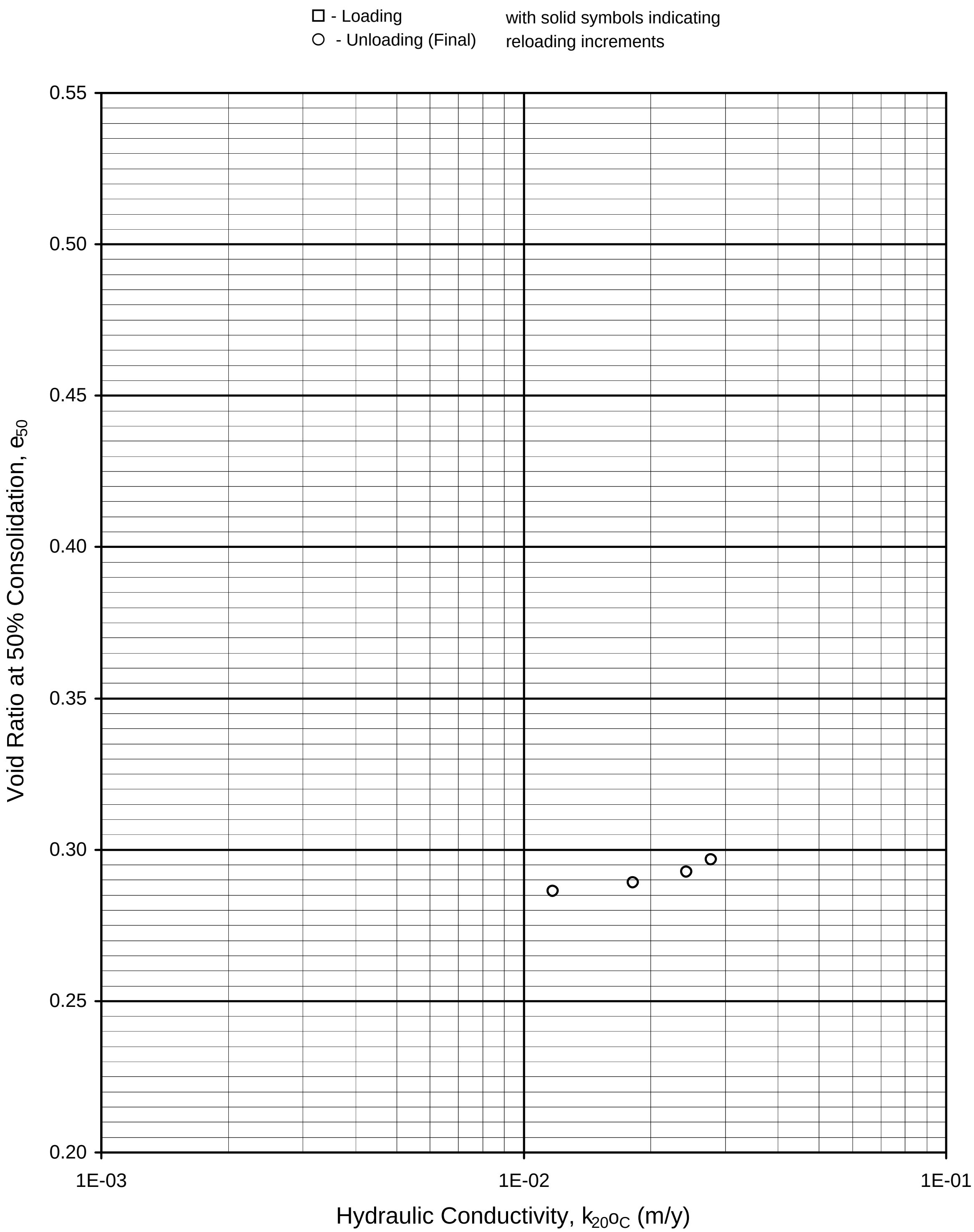
Sample No. 17 - Depth 106.80 ft

Boring B-23

Tunnel Segment of SVRT Project

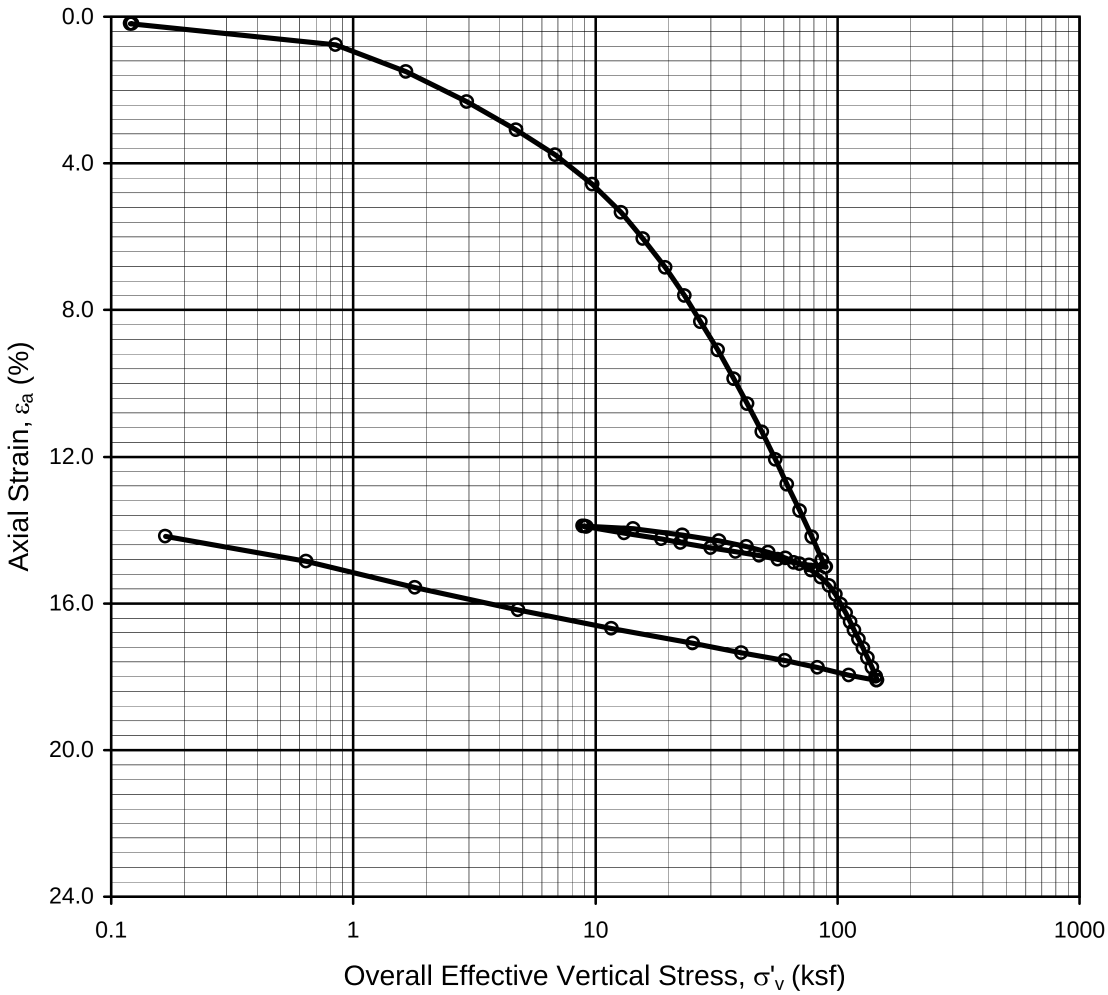
San Jose, California

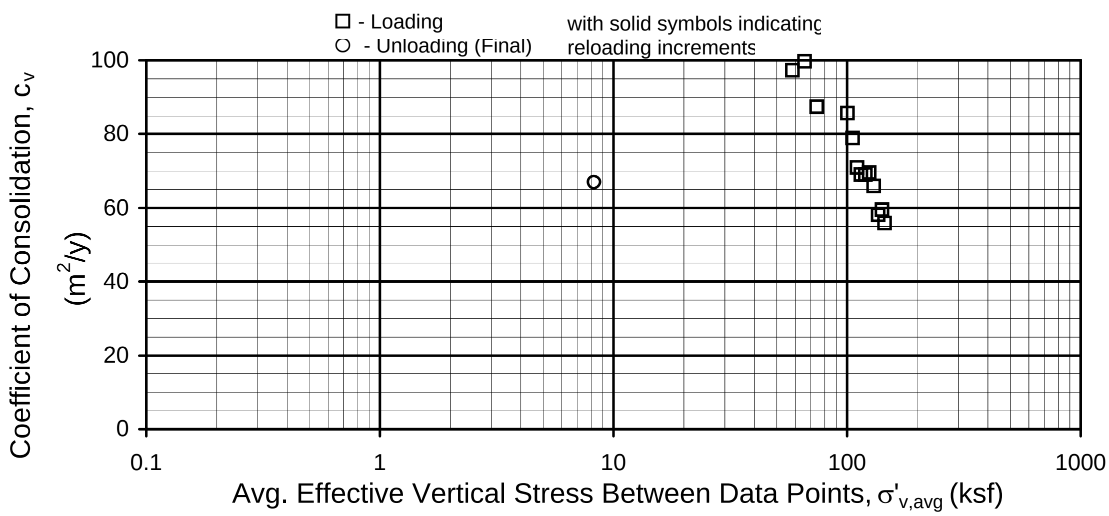
FIGURE A13-5a



CRS CONSOLIDATION TEST RESULTS
Sample No. 17 - Depth 106.80 ft
Boring B-23
Tunnel Segment of SVRT Project
San Jose, California

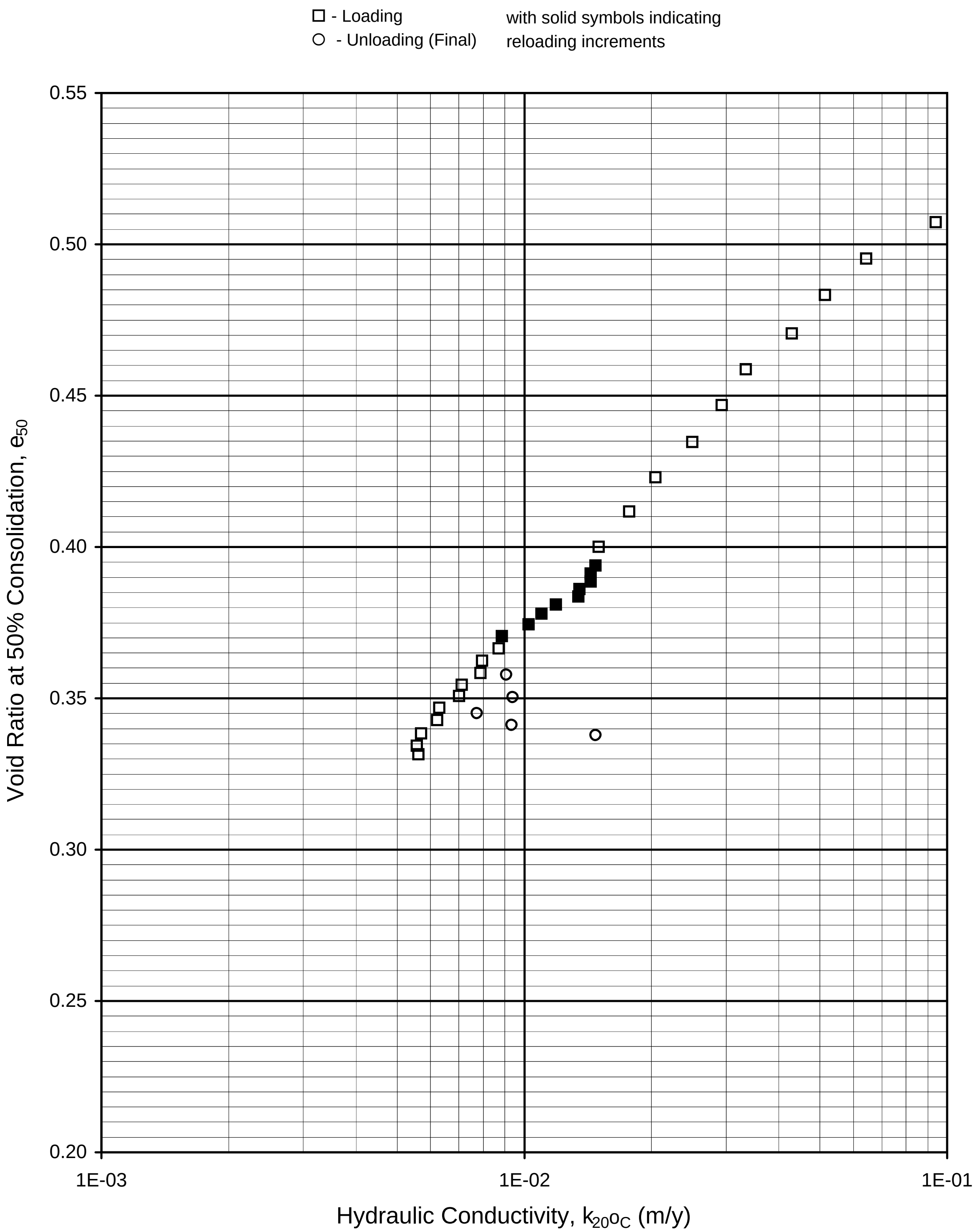
FIGURE A13-5b





CRS CONSOLIDATION TEST RESULTS
Sample No. 18a - Depth 117.30 ft
Boring B-23
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-6a



CRS CONSOLIDATION TEST RESULTS

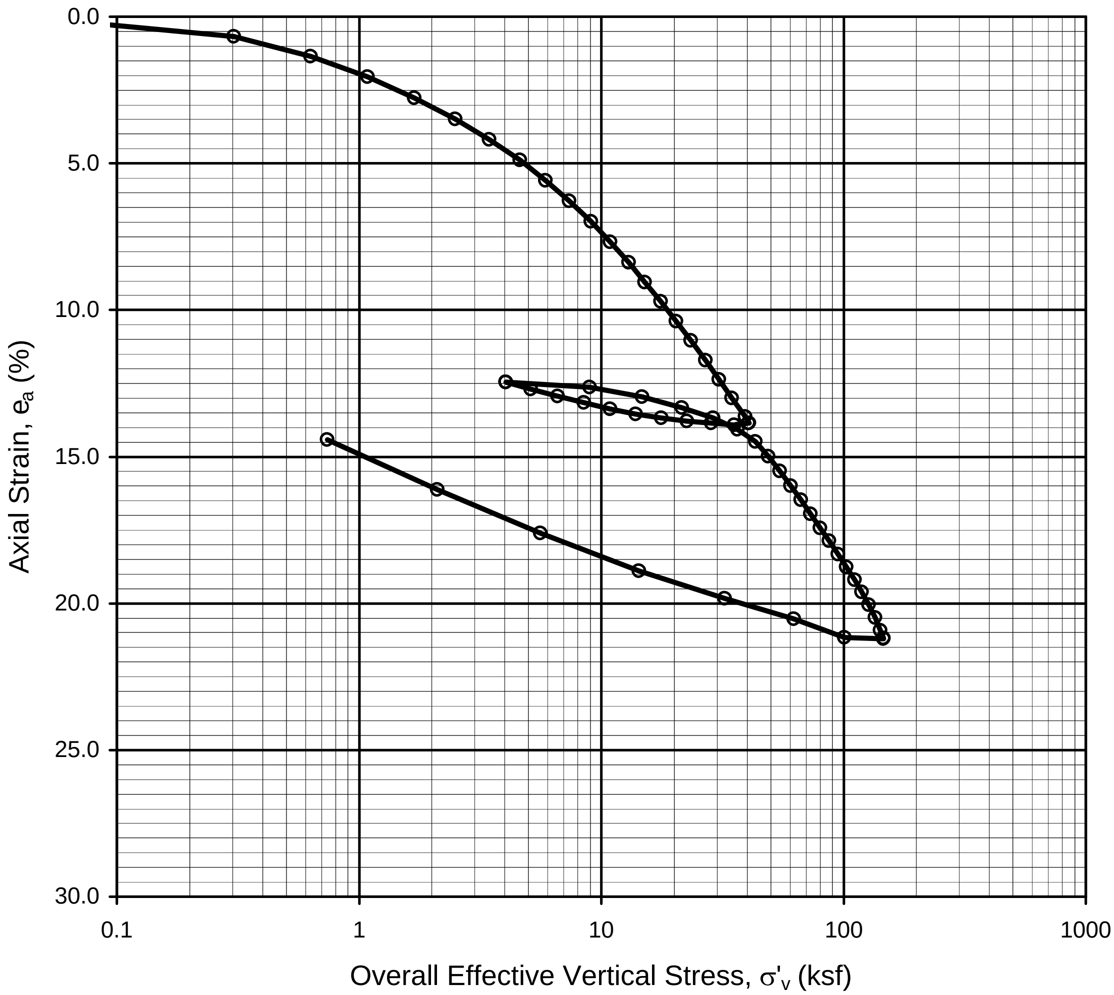
Sample No. 18a - Depth 117.30 ft

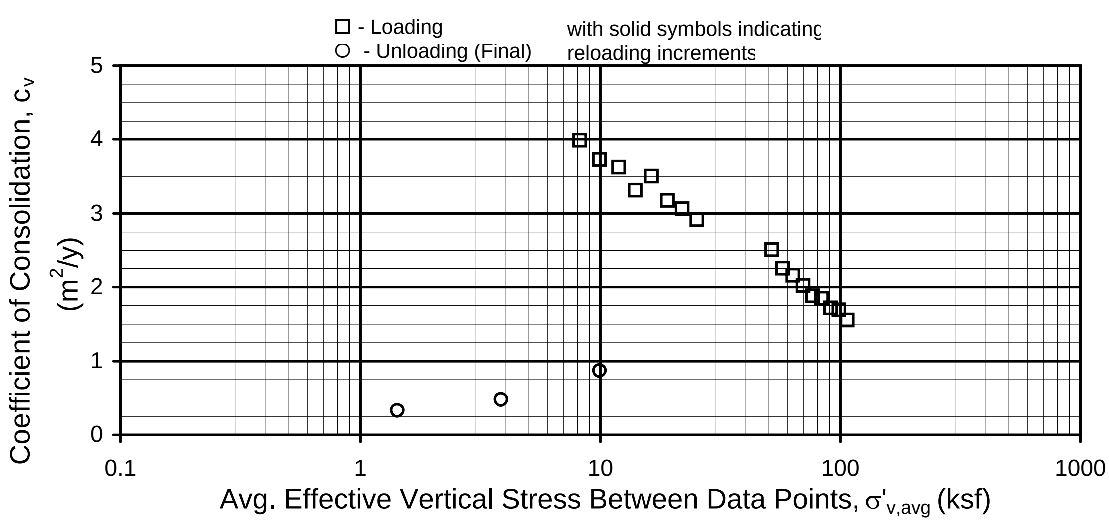
Boring B-23

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-6b





CRS CONSOLIDATION TEST RESULTS

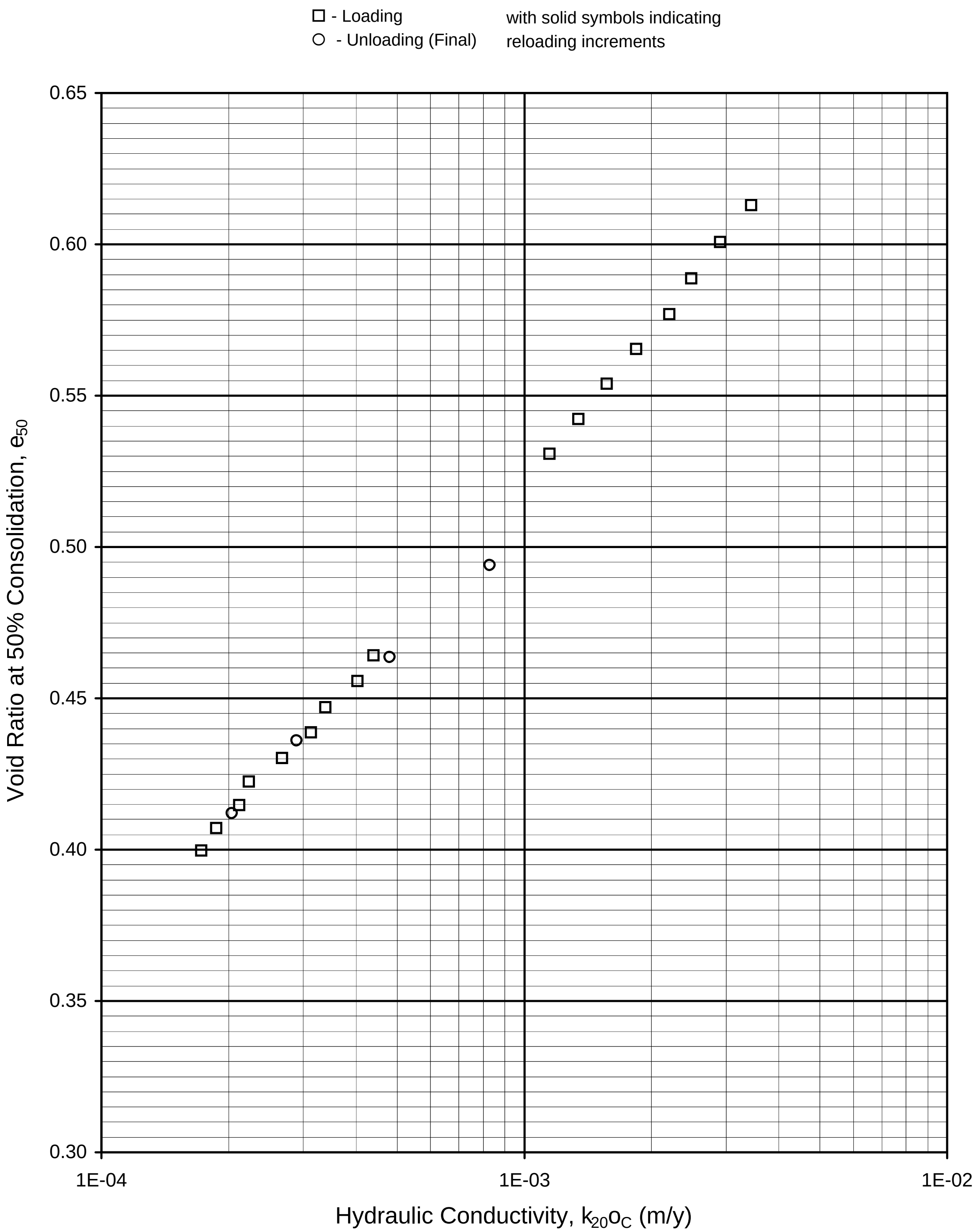
Sample No. 3a - Depth 15.00 ft

Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-7a



CRS CONSOLIDATION TEST RESULTS

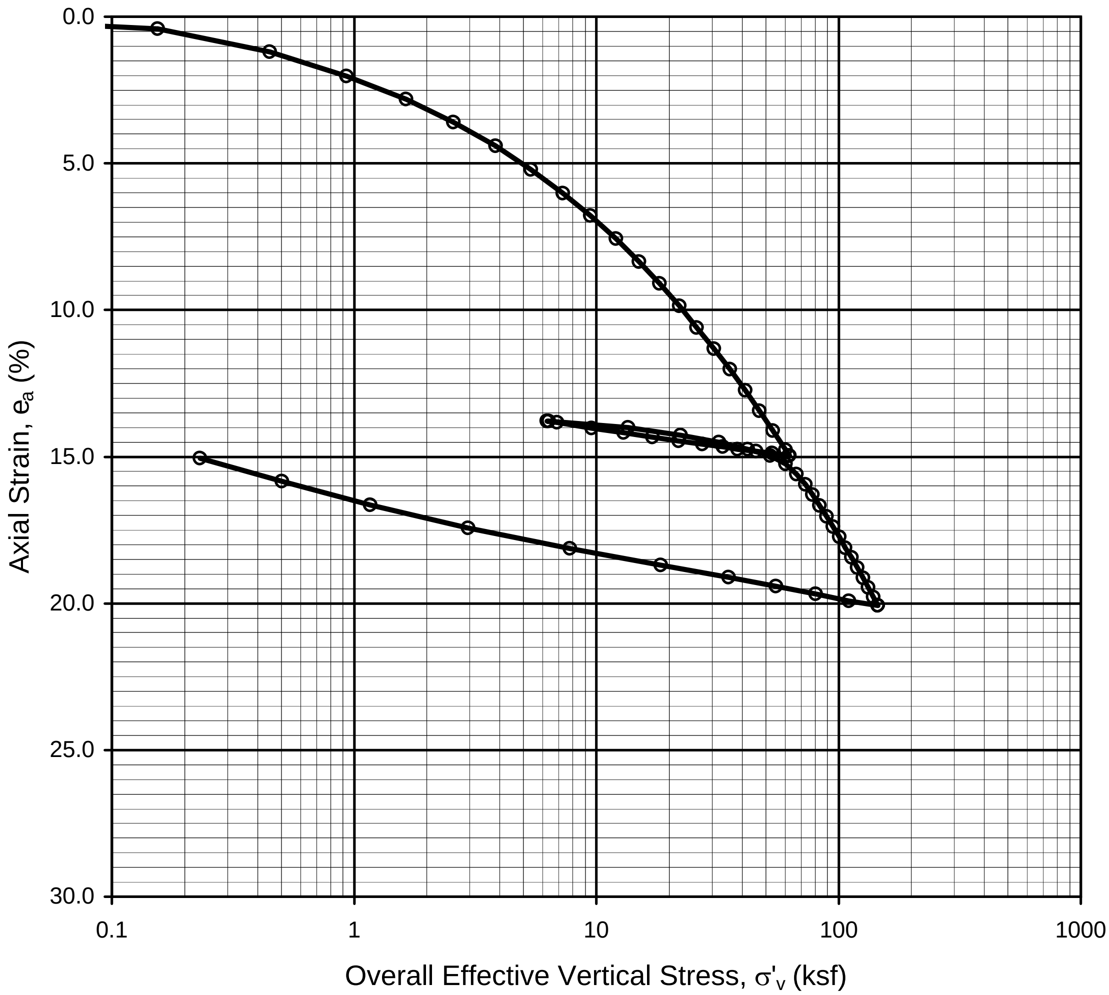
Sample No. 3a - Depth 15.00 ft

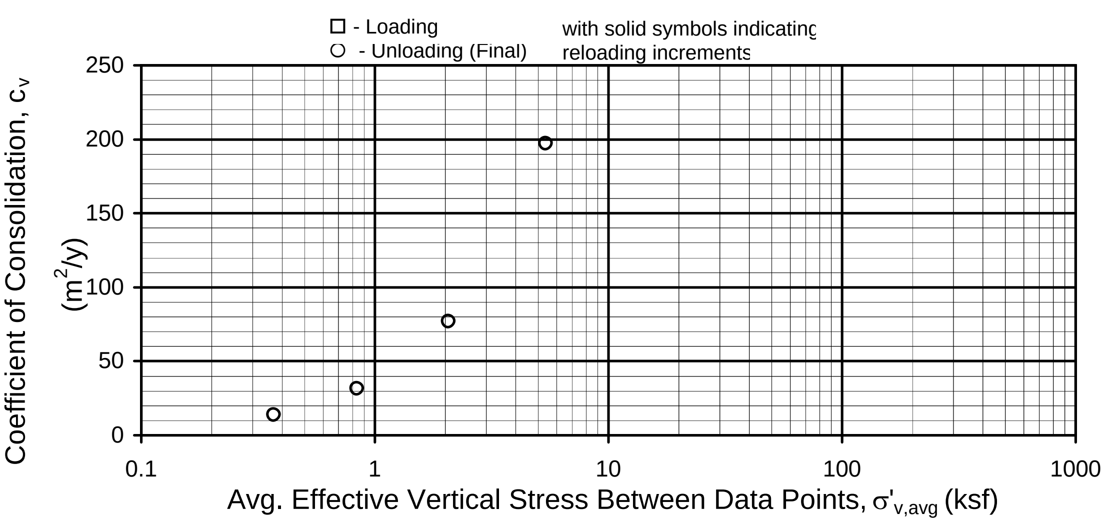
Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-7b





CRS CONSOLIDATION TEST RESULTS

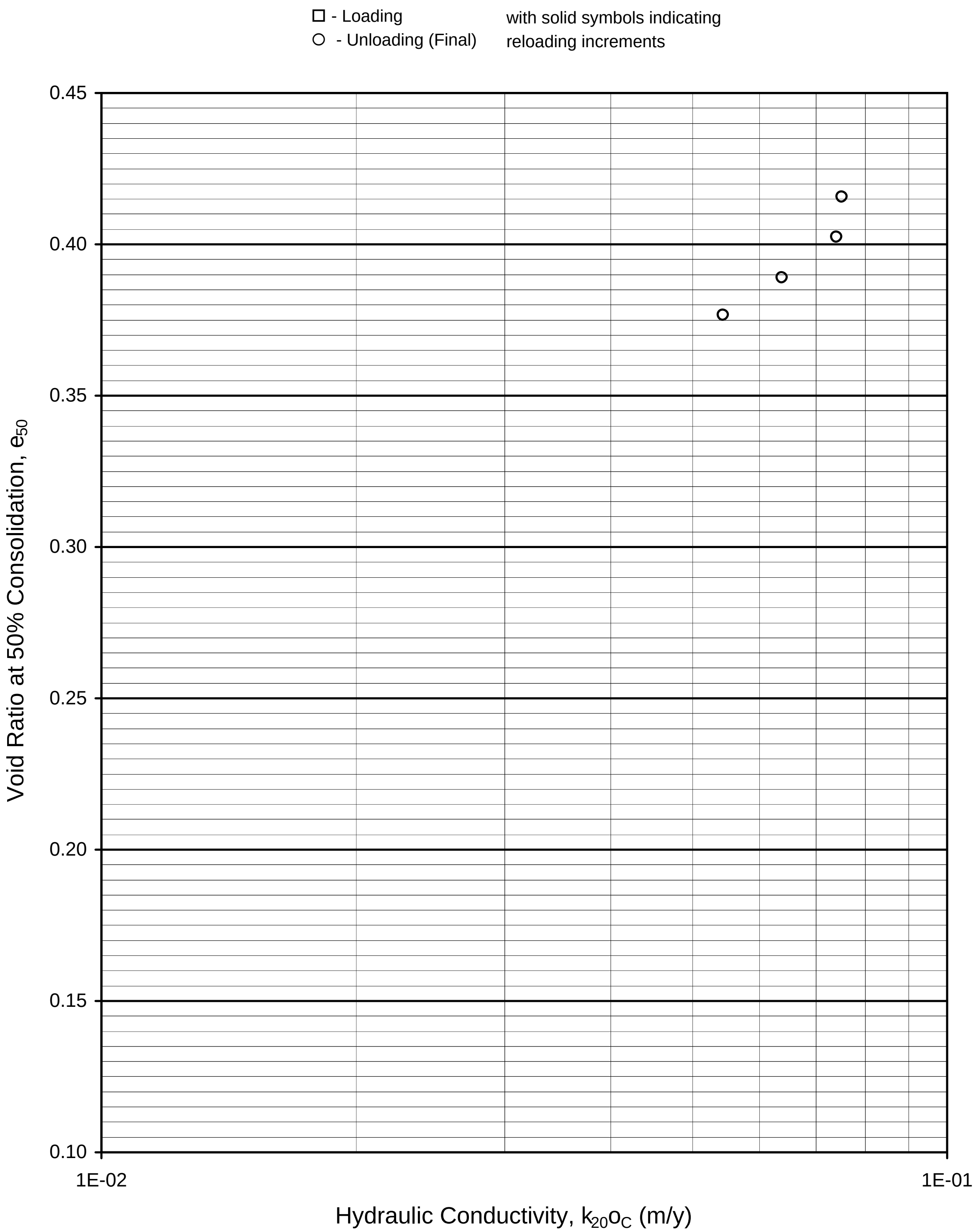
Sample No. 6a - Depth 22.50 ft

Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-8a



CRS CONSOLIDATION TEST RESULTS

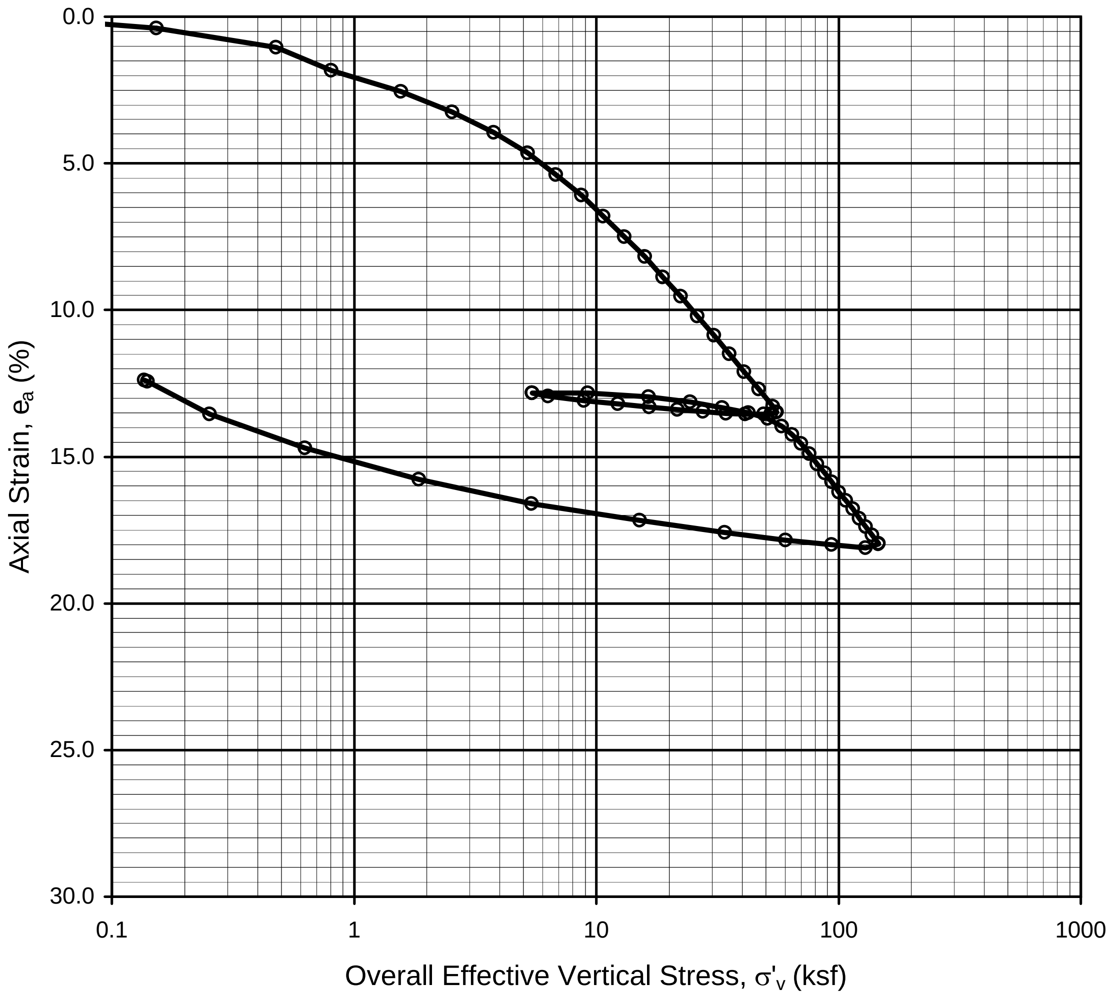
Sample No. 6a - Depth 22.50 ft

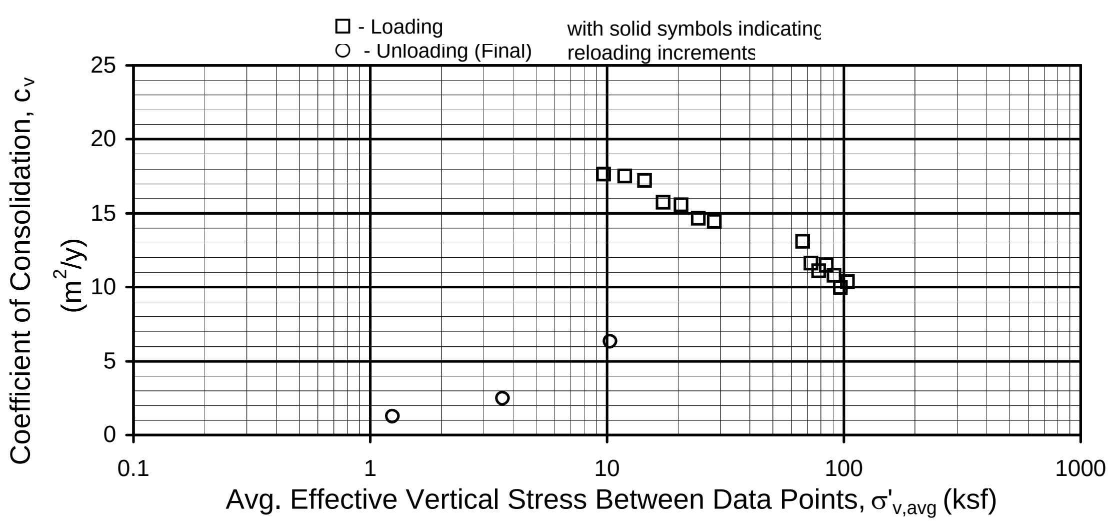
Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-8b





CRS CONSOLIDATION TEST RESULTS

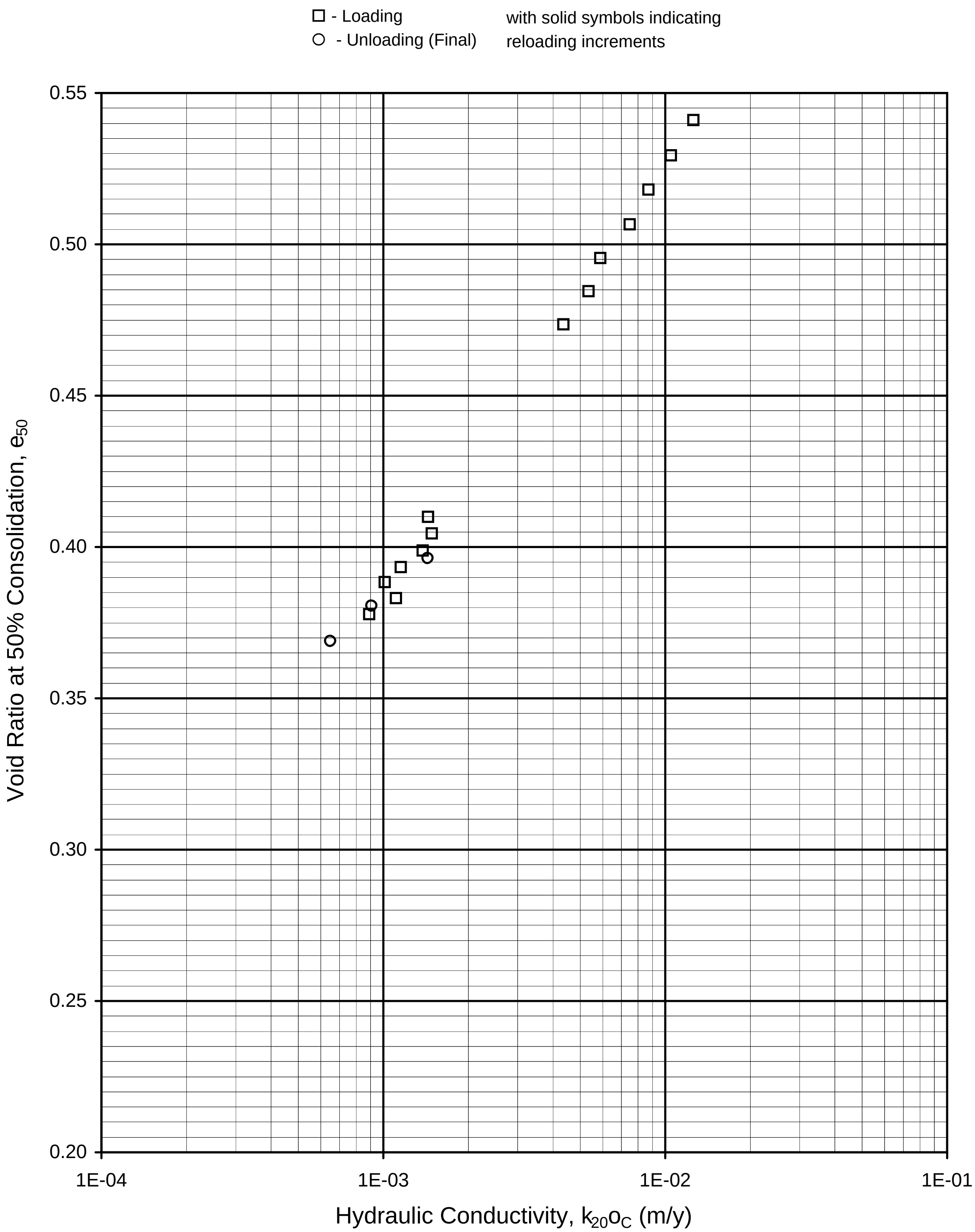
Sample No. 7a - Depth 25.00 ft

Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-9a



CRS CONSOLIDATION TEST RESULTS

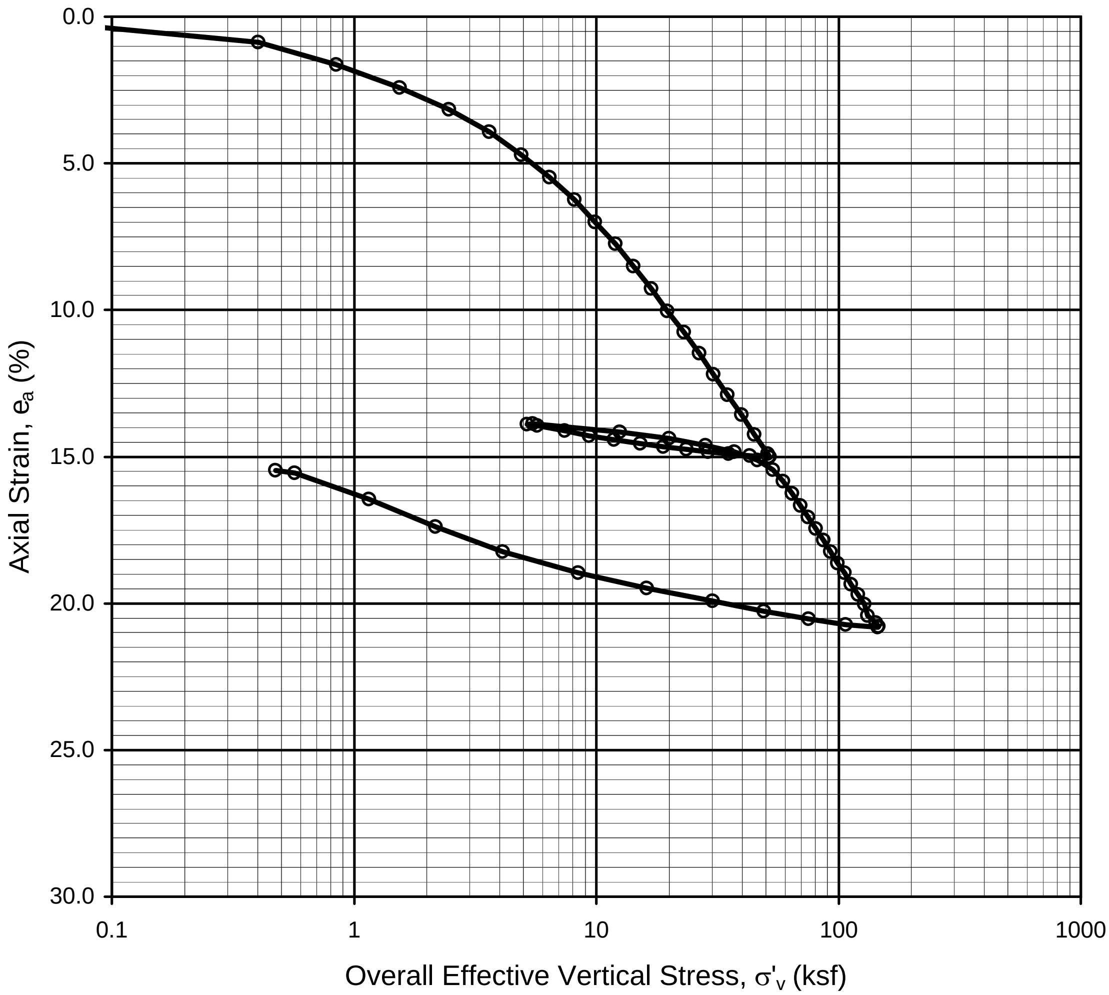
Sample No. 7a - Depth 25.00 ft

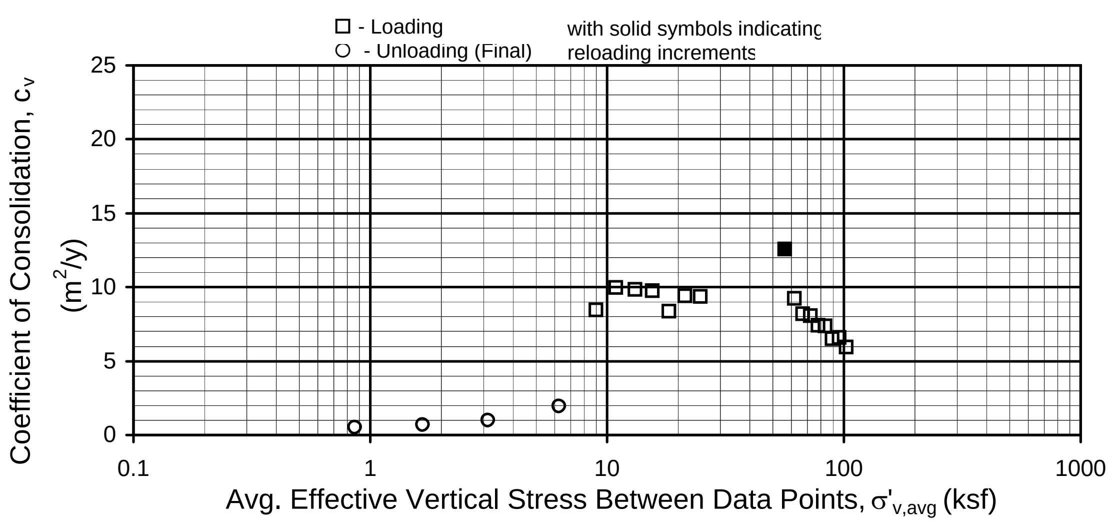
Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-9b





CRS CONSOLIDATION TEST RESULTS

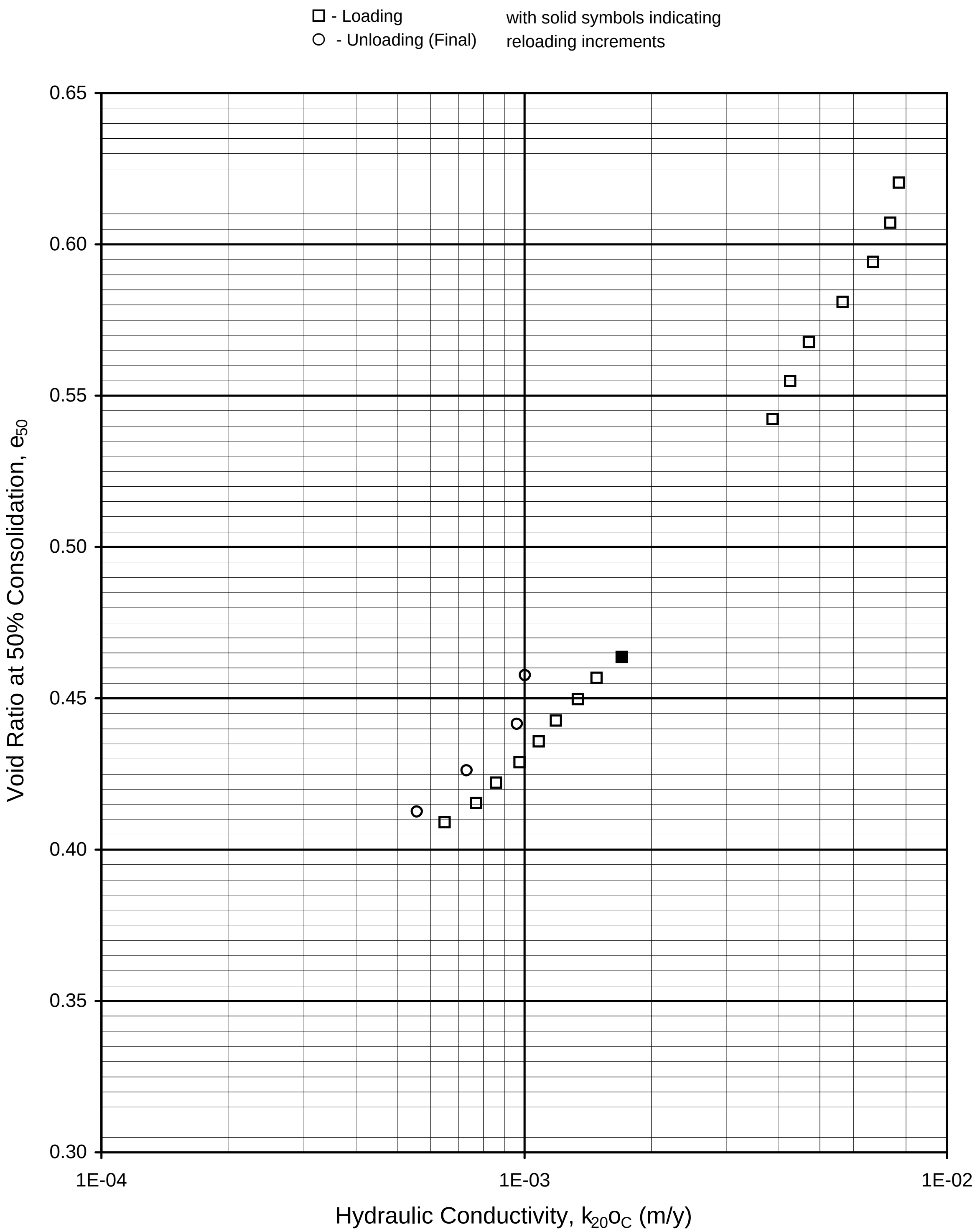
Sample No. 8a - Depth 27.50 ft

Boring B-24

Tunnel Segment of SVRT Project

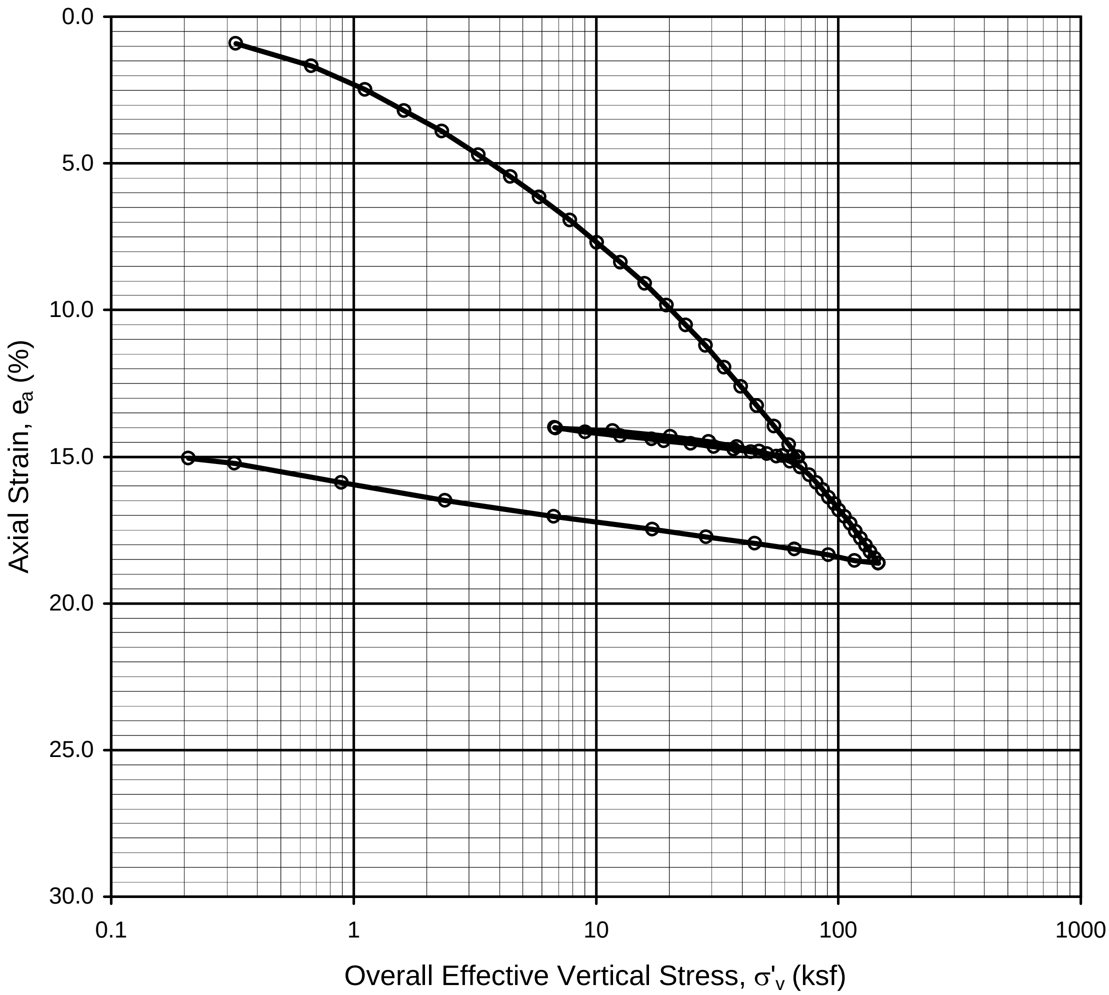
San Jose, California

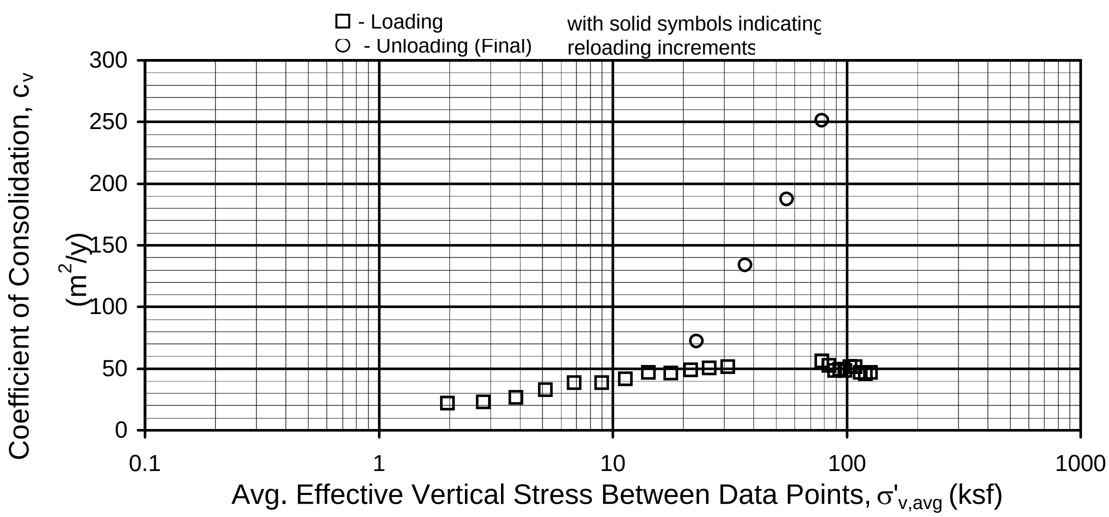
FIGURE A13-10a



CRS CONSOLIDATION TEST RESULTS
Sample No. 8a - Depth 27.50 ft
Boring B-24
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-10b





CRS CONSOLIDATION TEST RESULTS

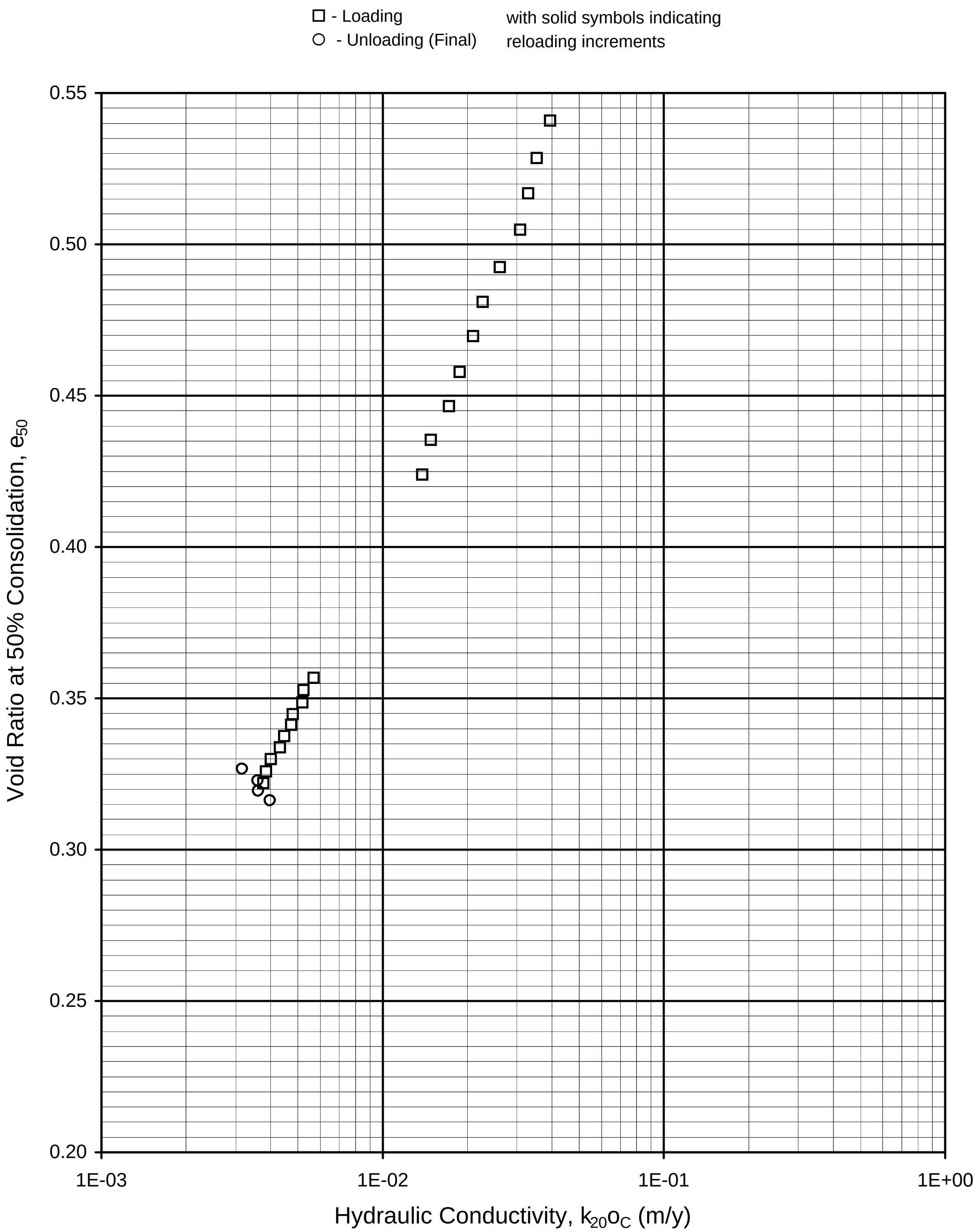
Sample No. 29 - Depth 110.50 ft

Boring B-24

Tunnel Segment of SVRT Project

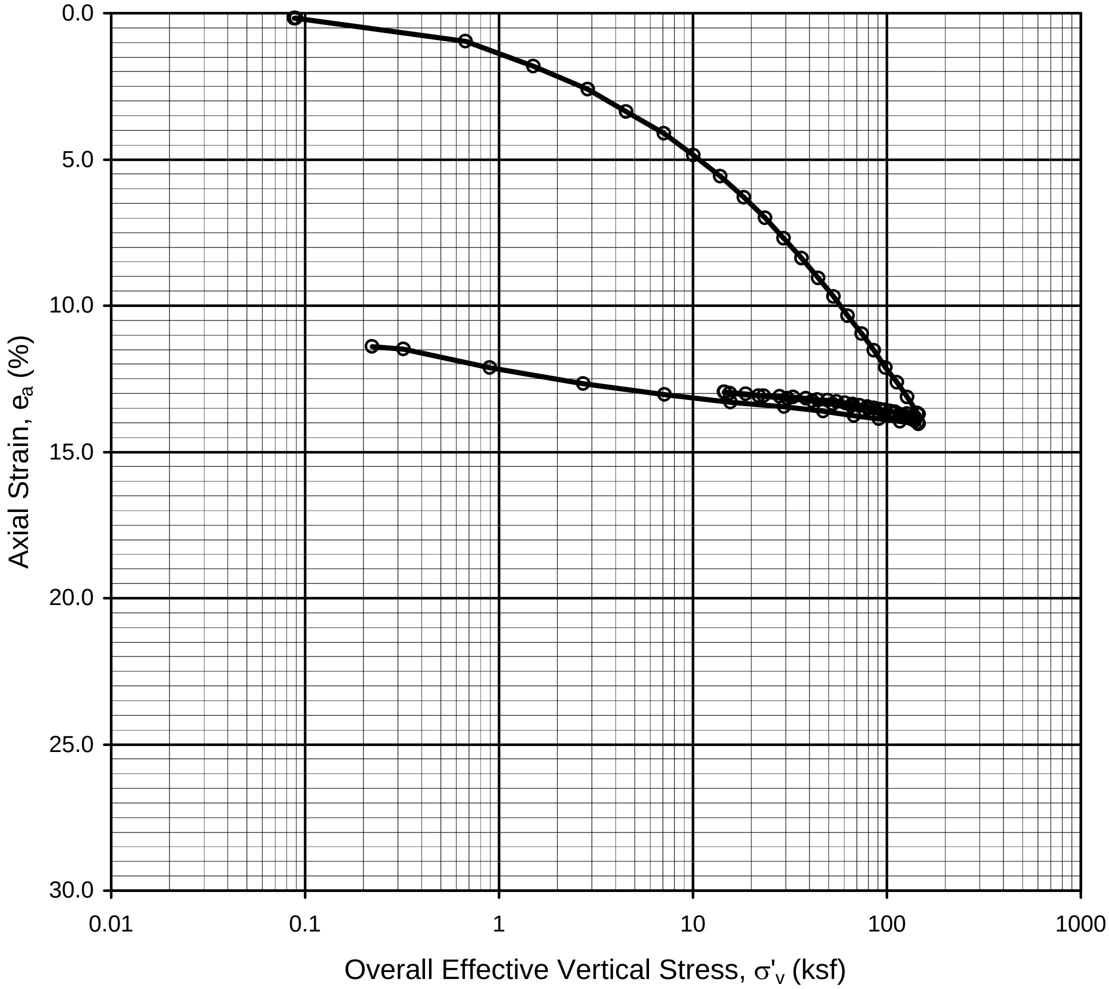
San Jose, California

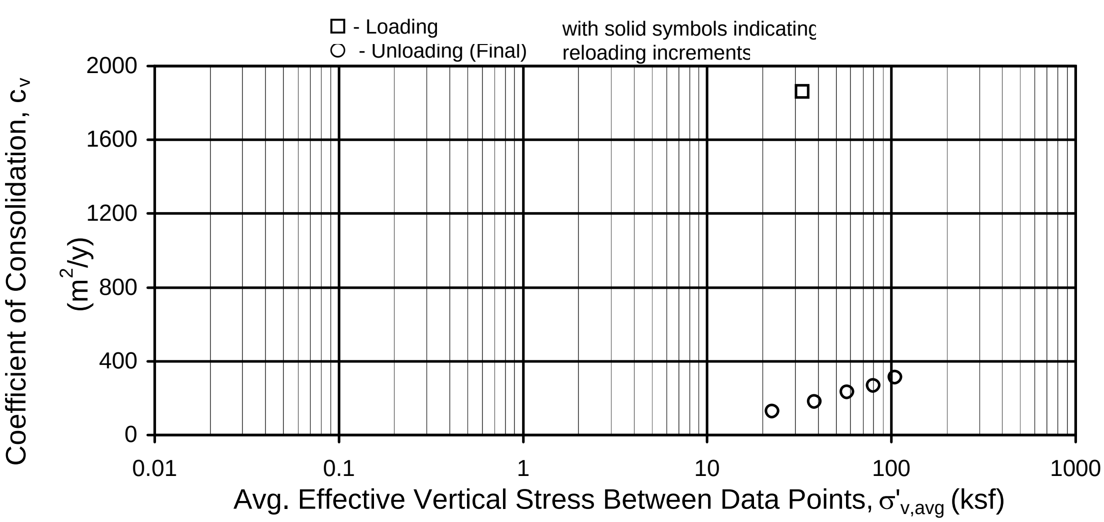
FIGURE A13-11a



CRS CONSOLIDATION TEST RESULTS
Sample No. 29 - Depth 110.50 ft
Boring B-24
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-11b





CRS CONSOLIDATION TEST RESULTS

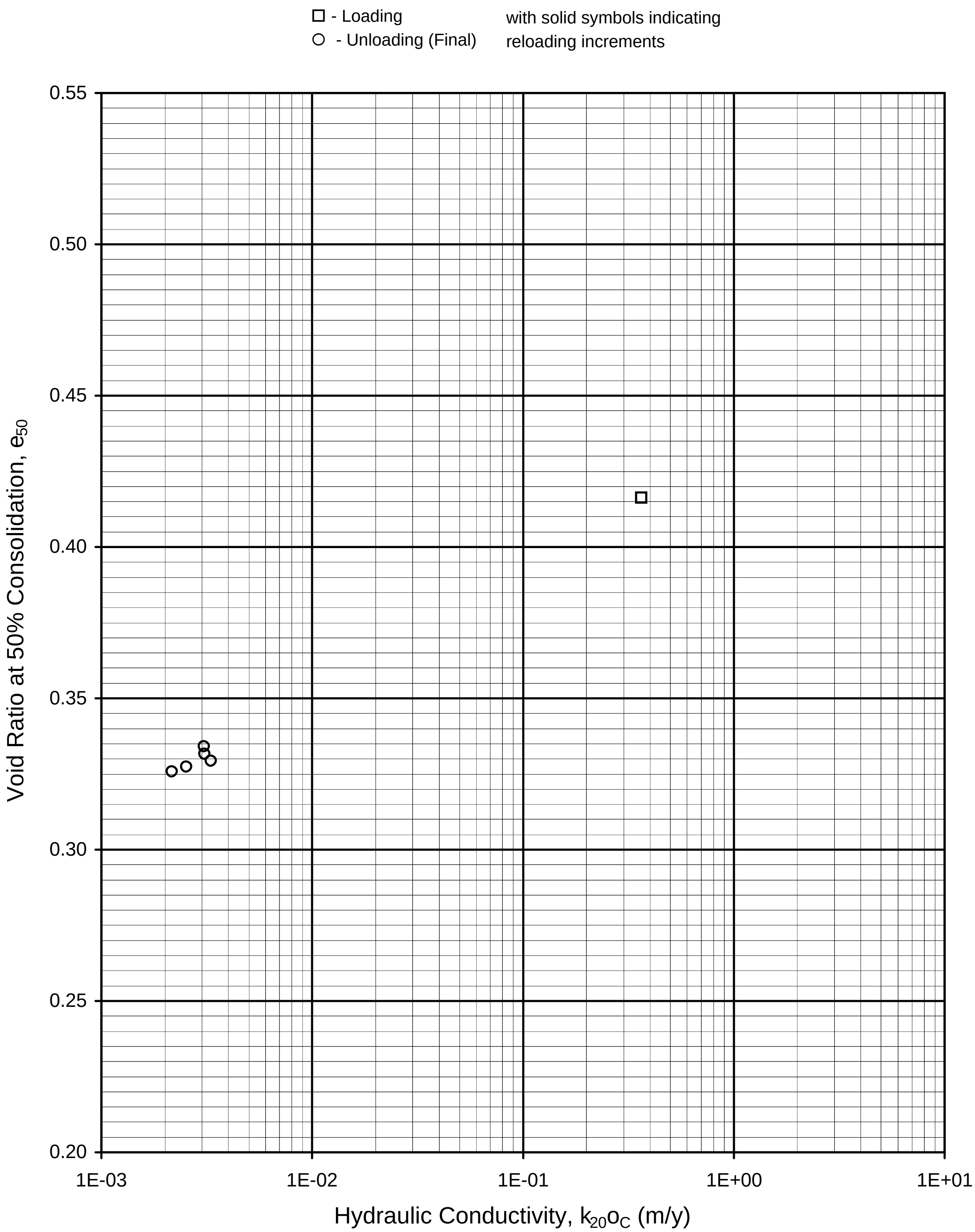
Sample No. 16a - Depth 112.50 ft

Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-12a



CRS CONSOLIDATION TEST RESULTS

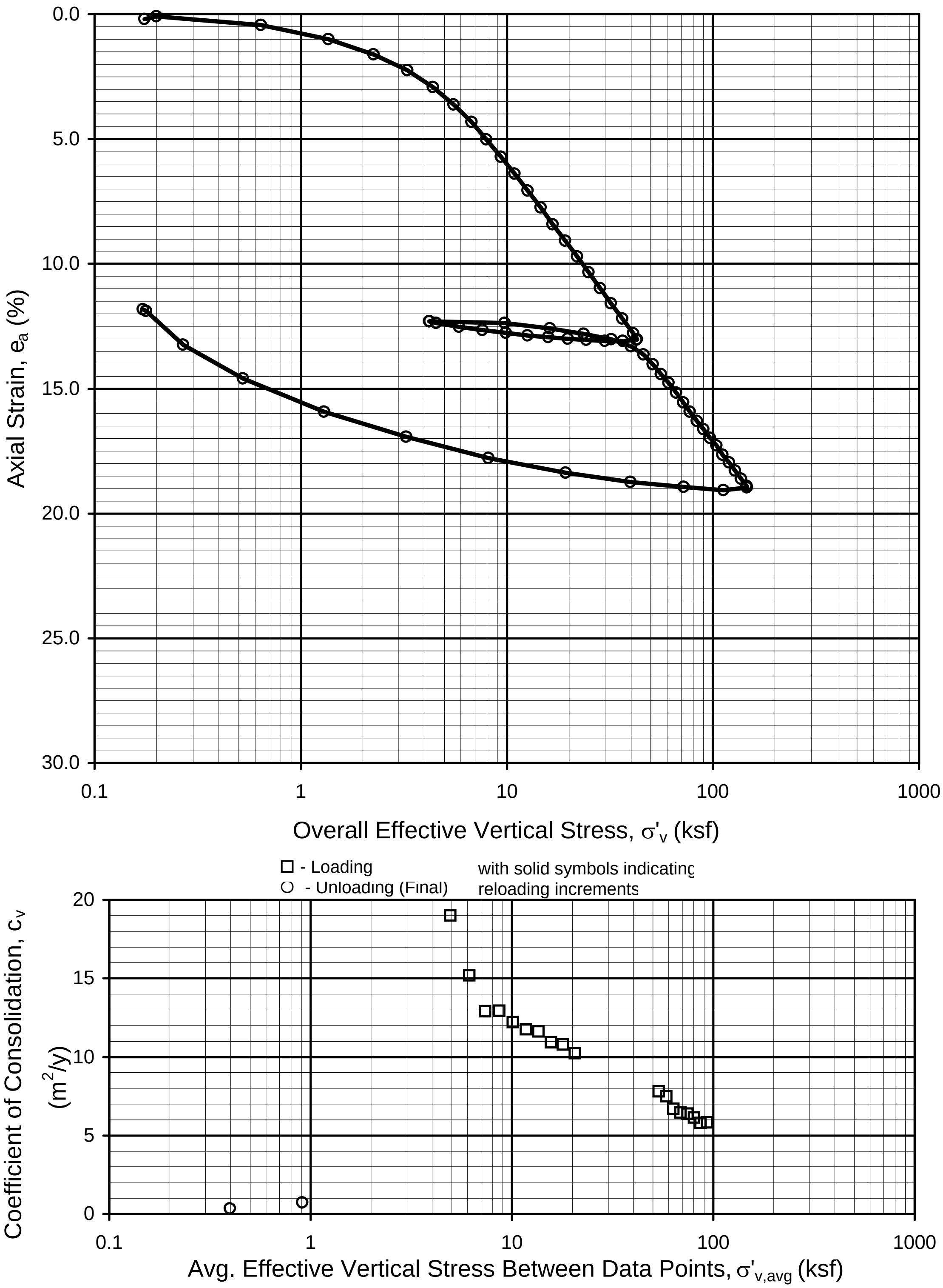
Sample No. 16a - Depth 112.50 ft

Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-12b



CRS CONSOLIDATION TEST RESULTS

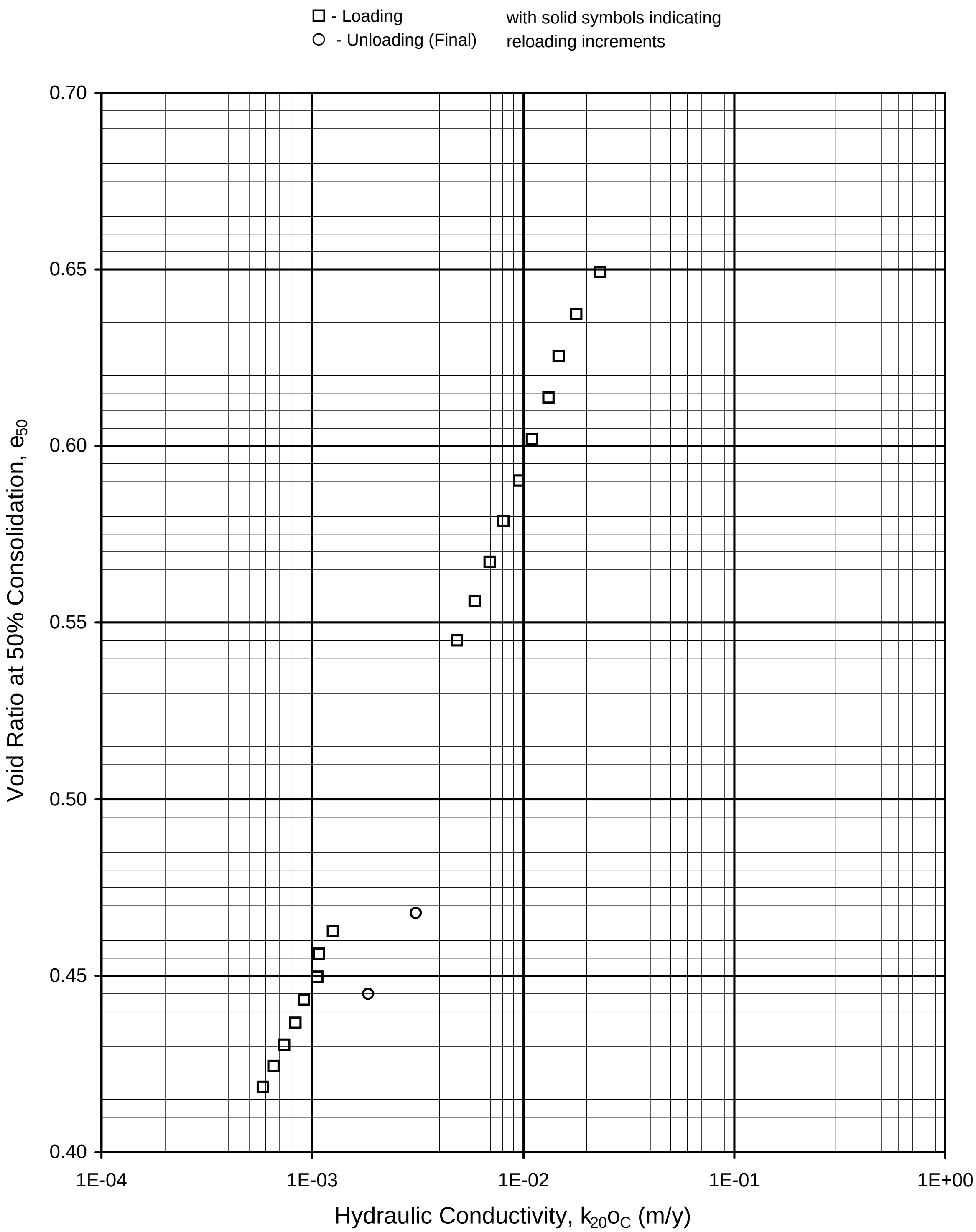
Sample No. 1a - Depth 9.75 ft

Boring B-33

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-13a



CRS CONSOLIDATION TEST RESULTS

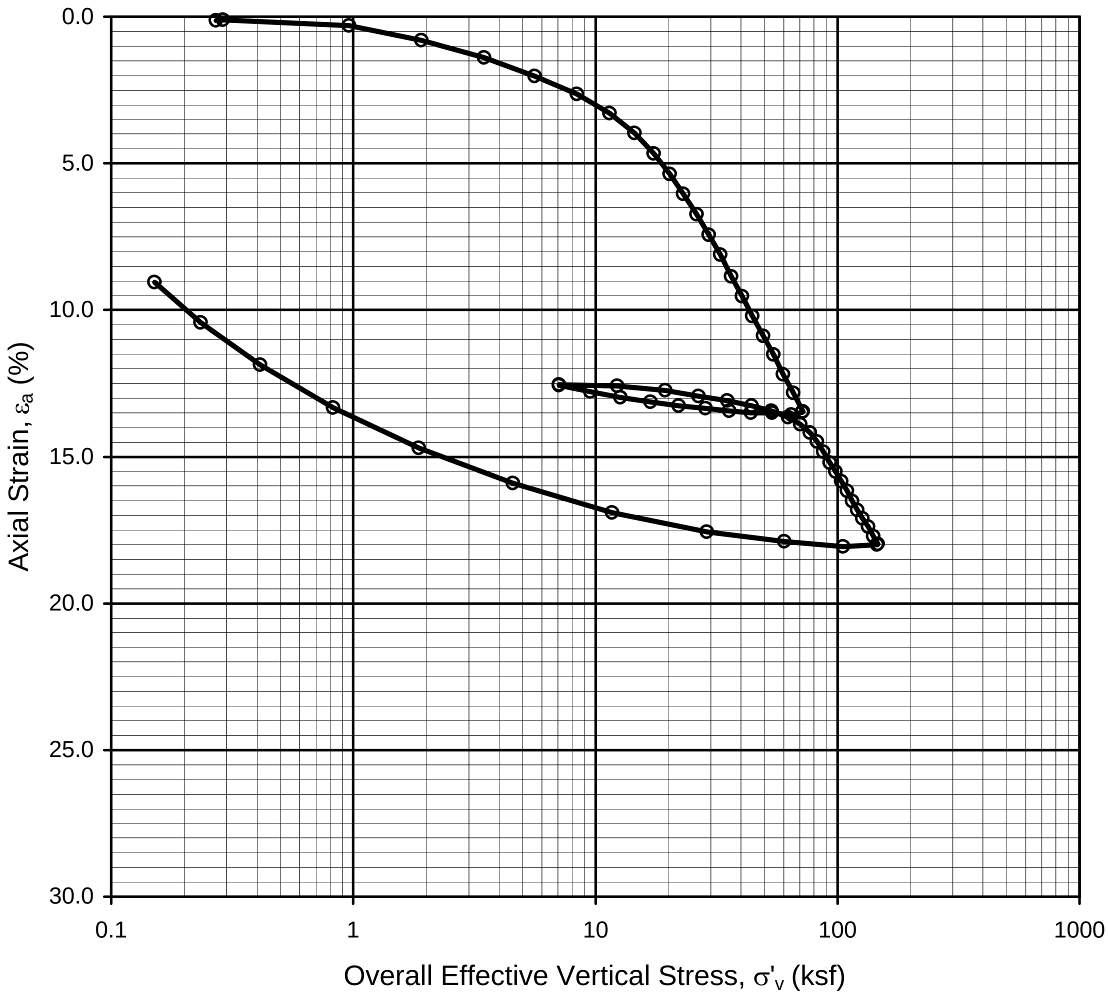
Sample No. 1a - Depth 9.75 ft

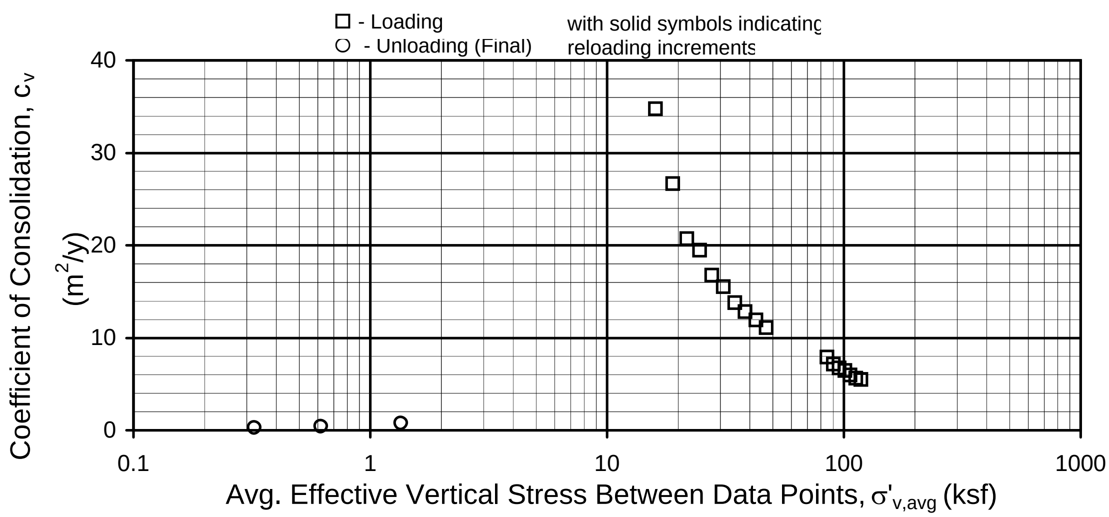
Boring B-33

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-13b





CRS CONSOLIDATION TEST RESULTS

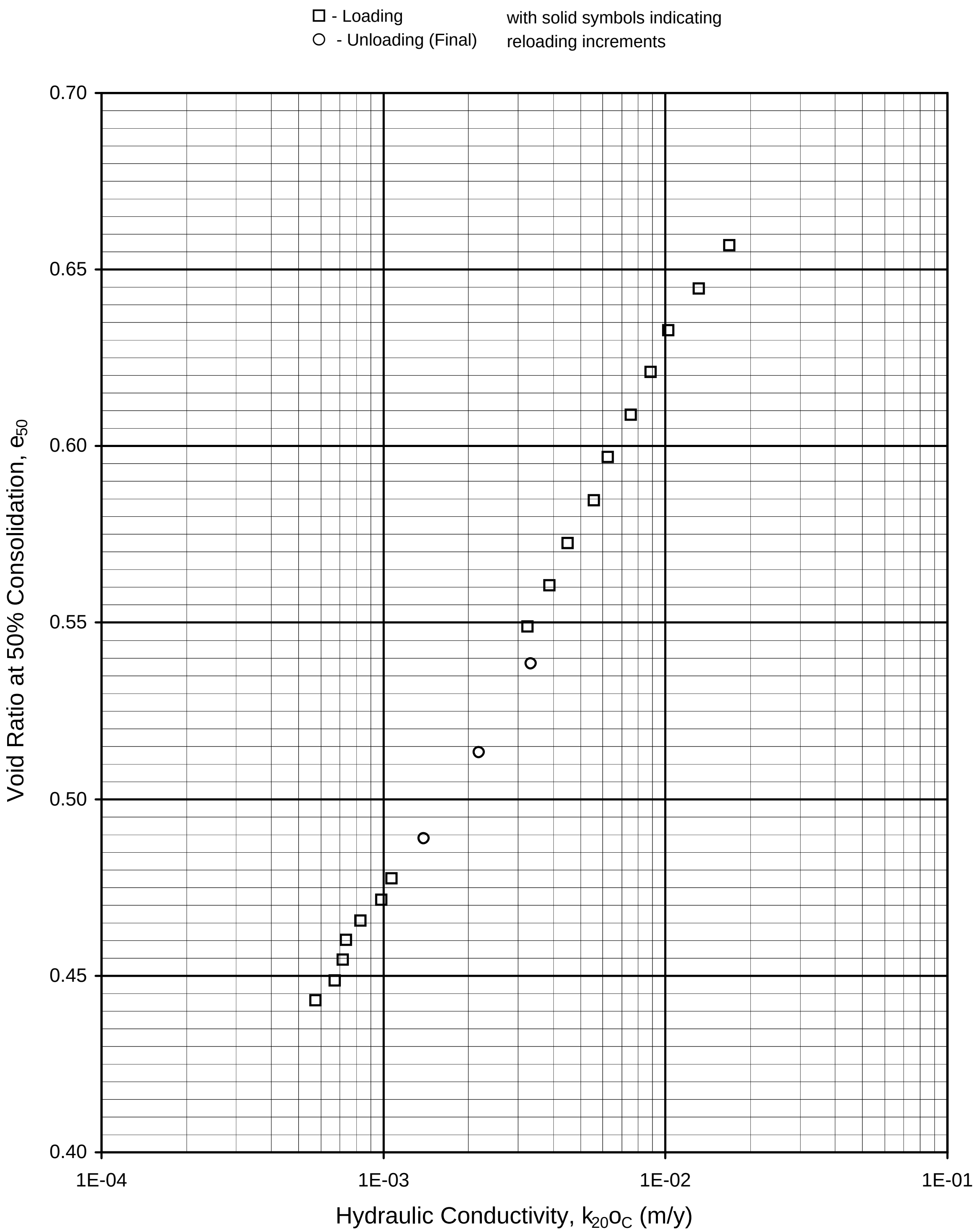
Sample No. 9a - Depth 82.25 ft

Boring B-33

Tunnel Segment of SVRT Project

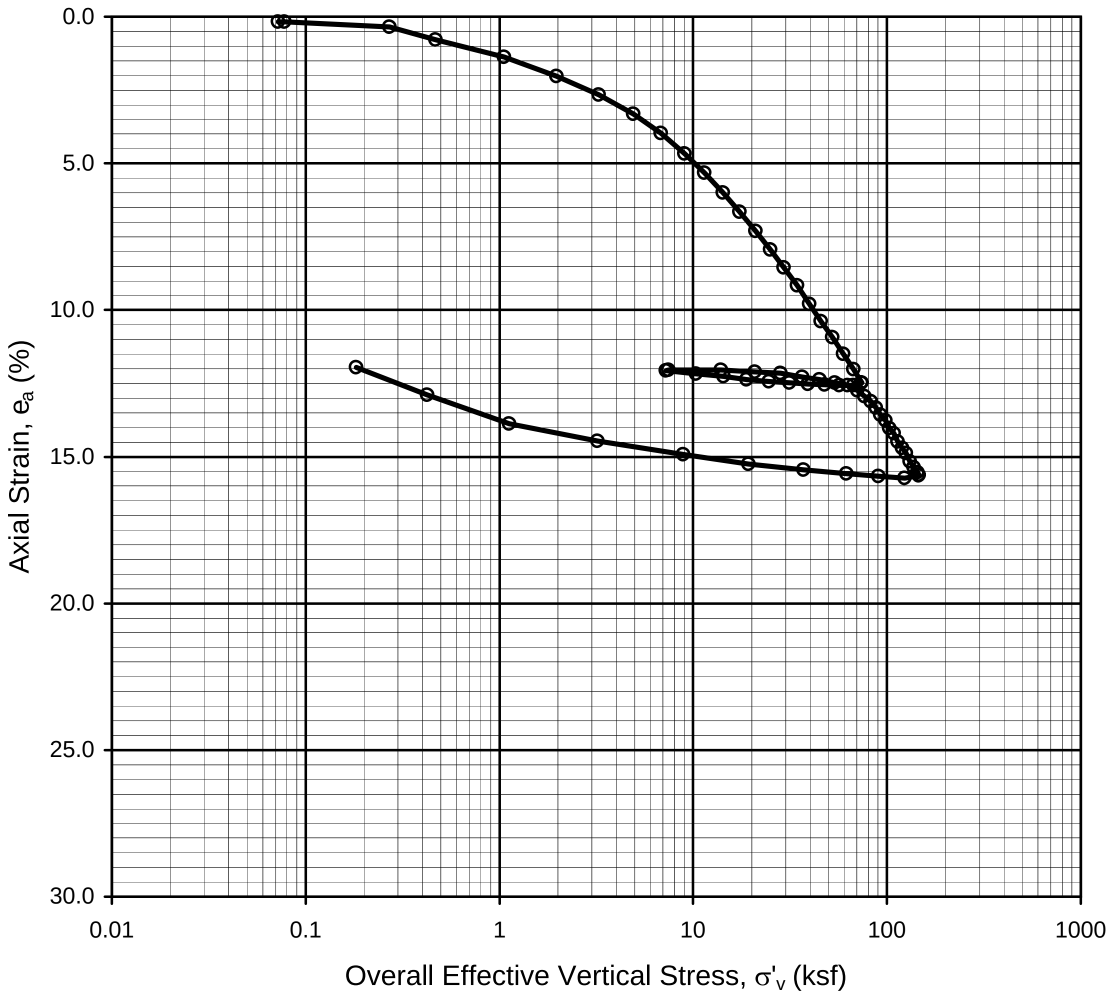
San Jose, California

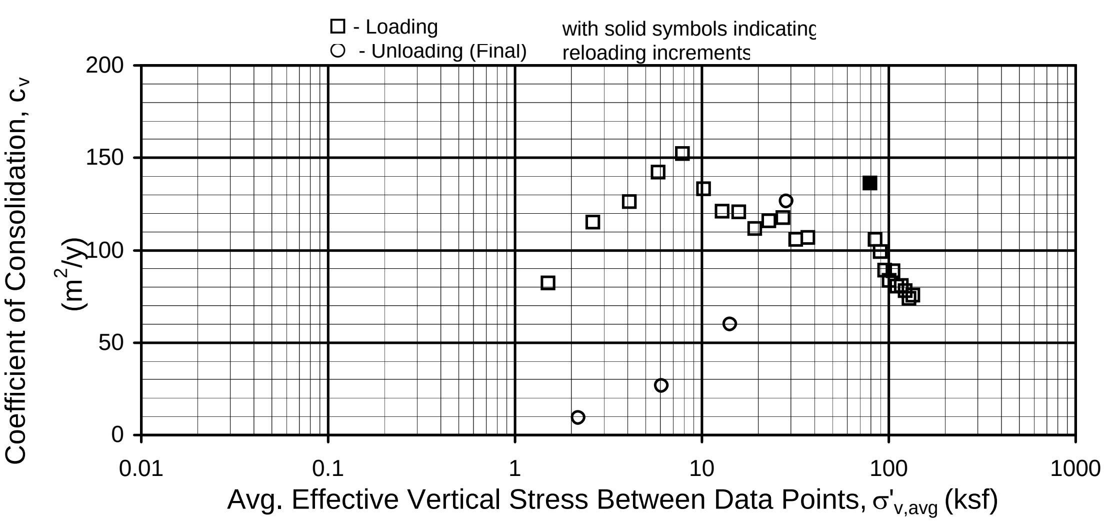
FIGURE A13-14a



CRS CONSOLIDATION TEST RESULTS
Sample No. 9a - Depth 82.25 ft
Boring B-33
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-14b





CRS CONSOLIDATION TEST RESULTS

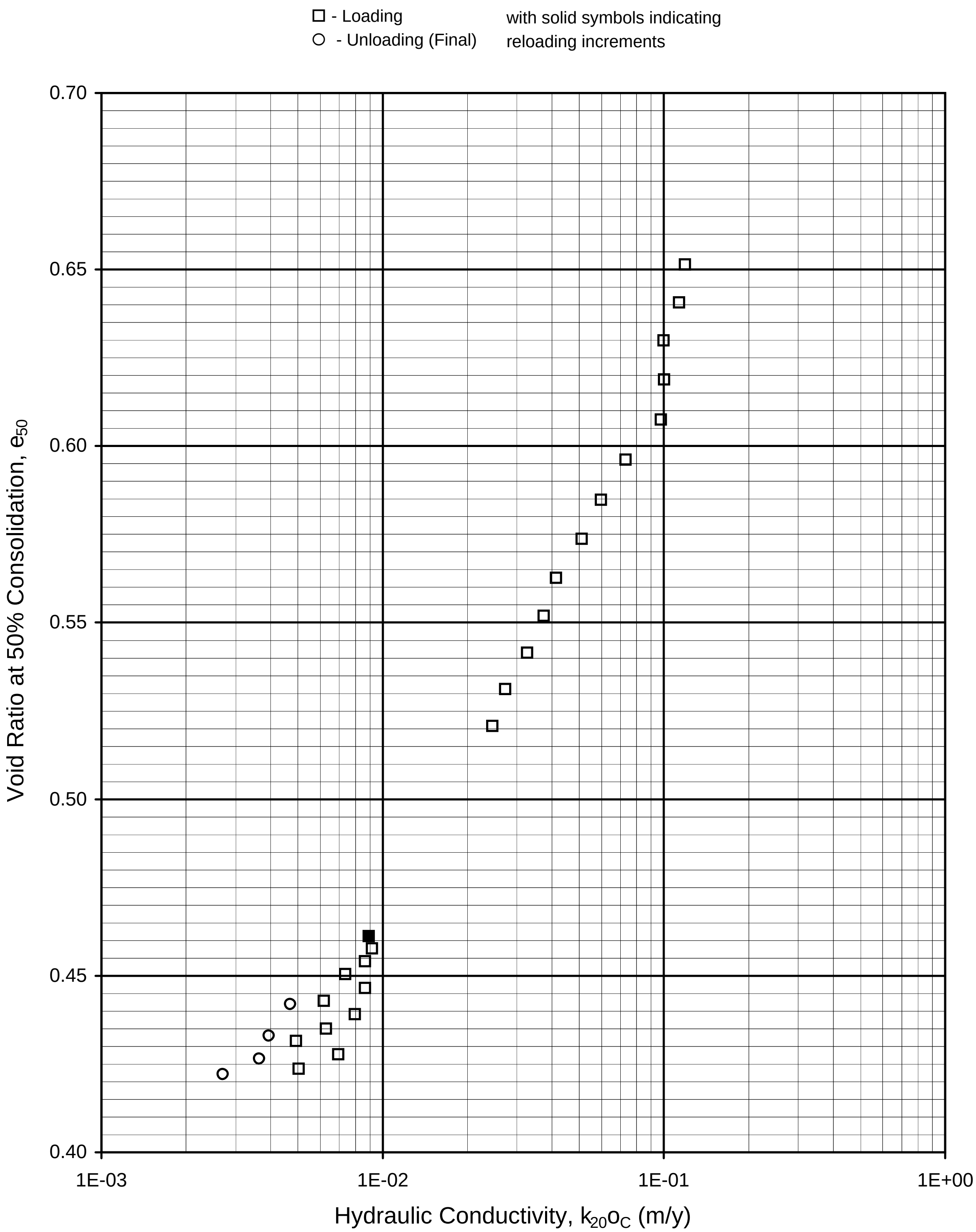
Sample No. 7a - Depth 37.50 ft

Boring B-42

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-15a



CRS CONSOLIDATION TEST RESULTS

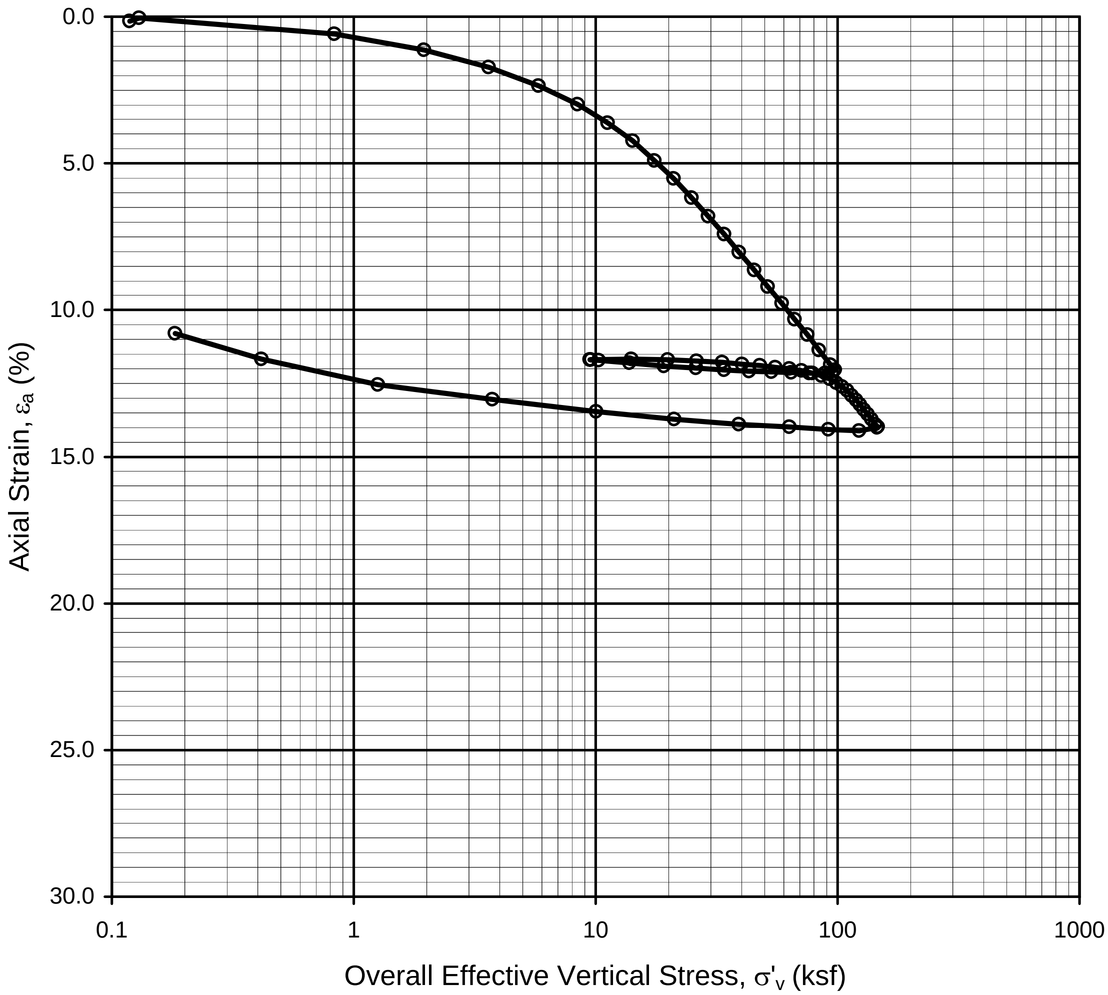
Sample No. 7a - Depth 37.50 ft

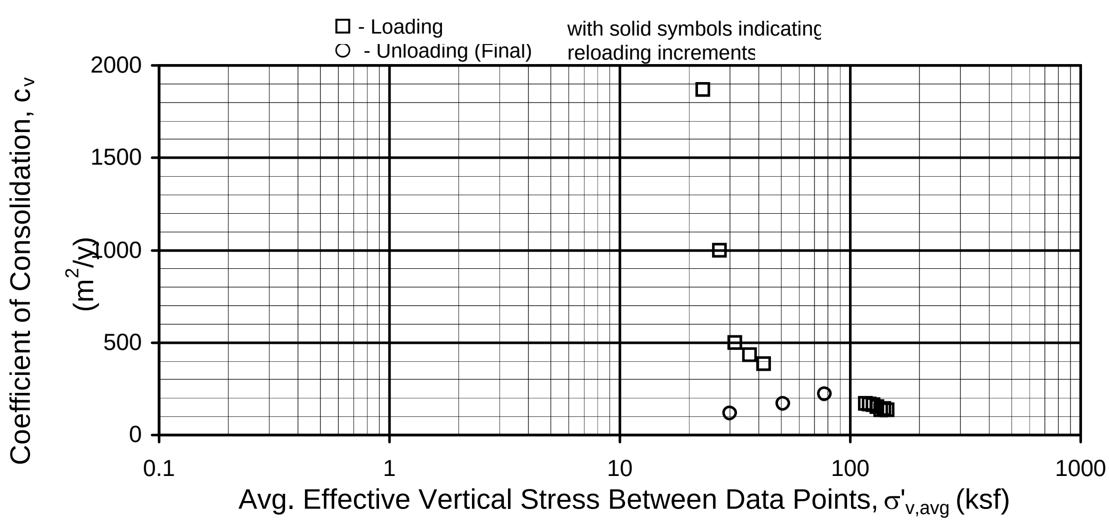
Boring B-42

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-15b





CRS CONSOLIDATION TEST RESULTS

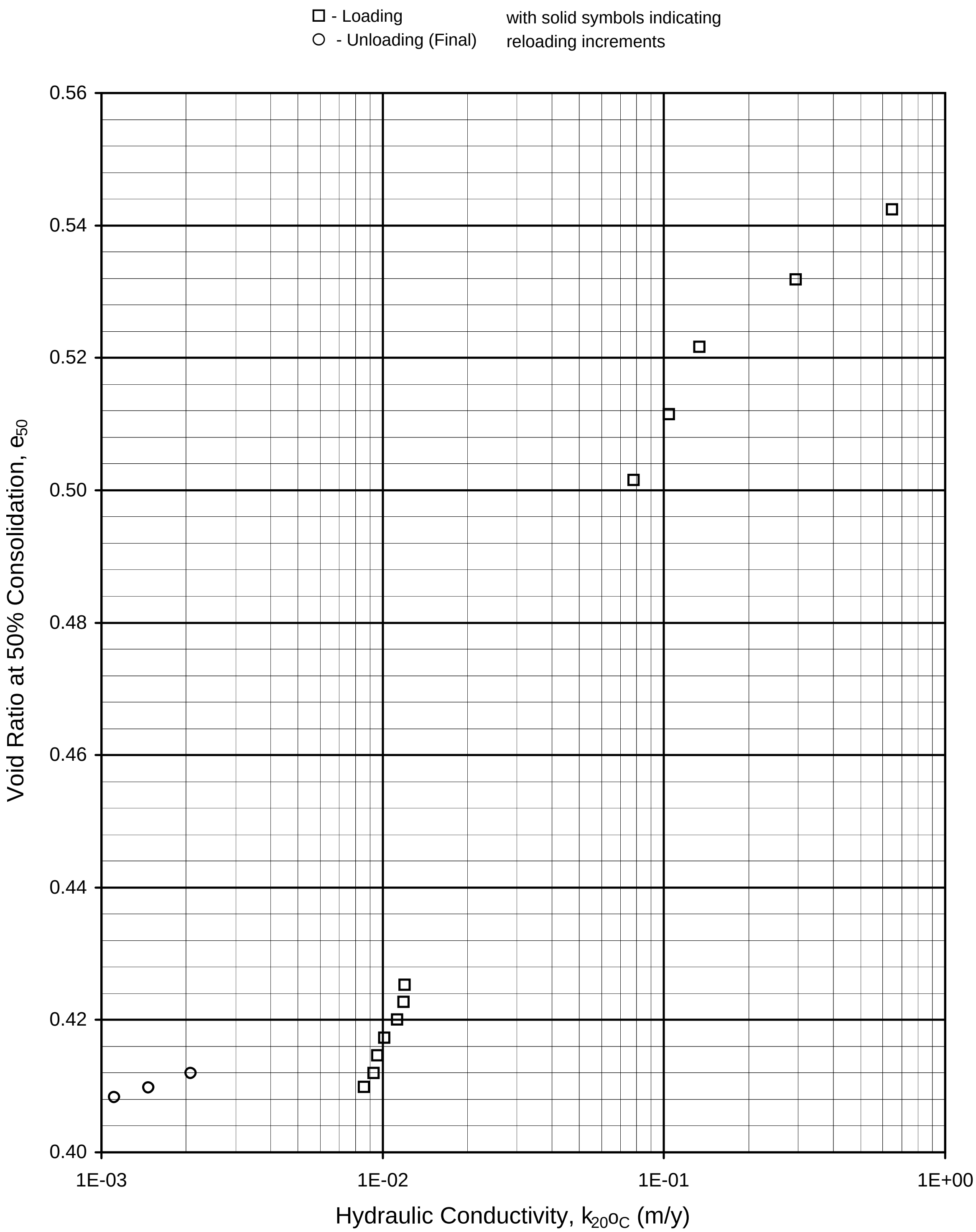
Sample No. 4a - Depth 41.40 ft

Boring B-45

Tunnel Segment of SVRT Project

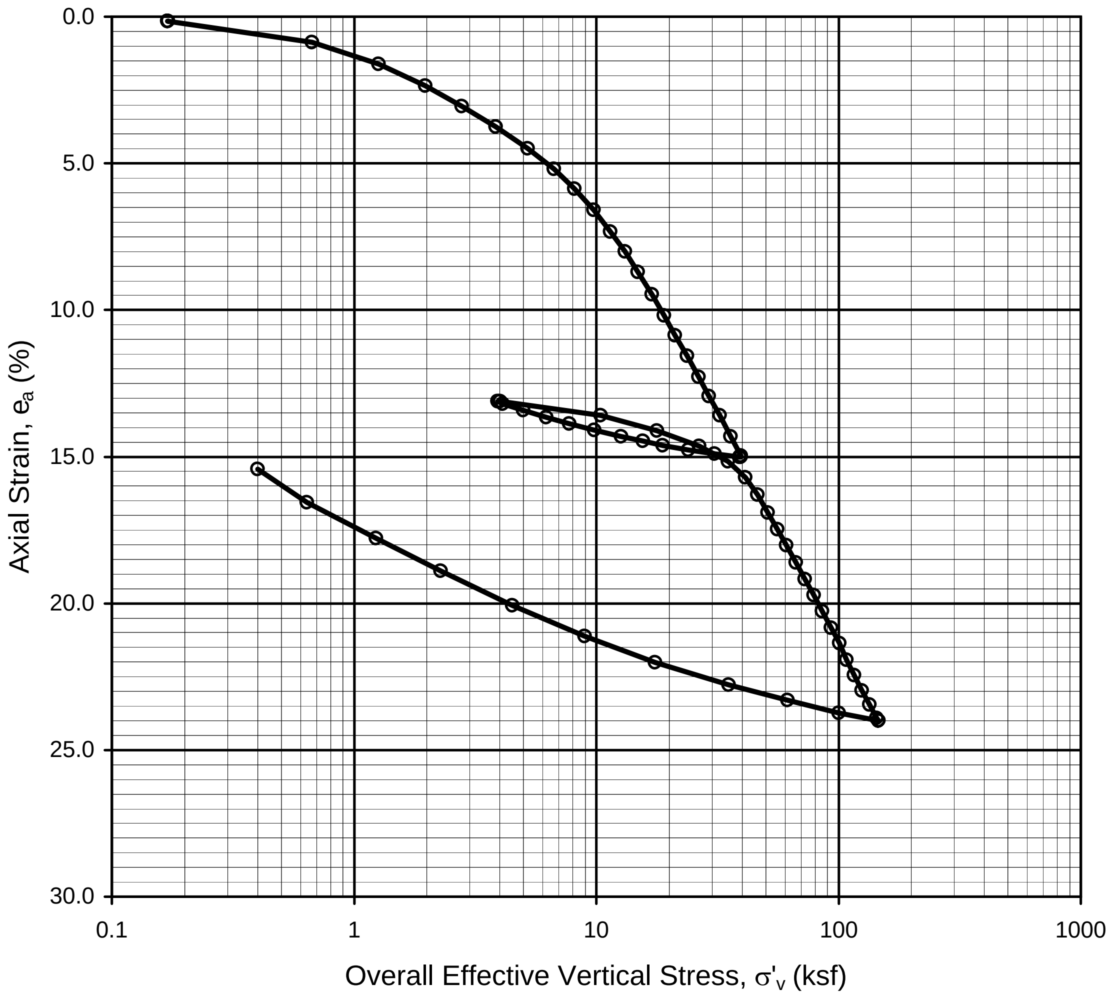
San Jose, California

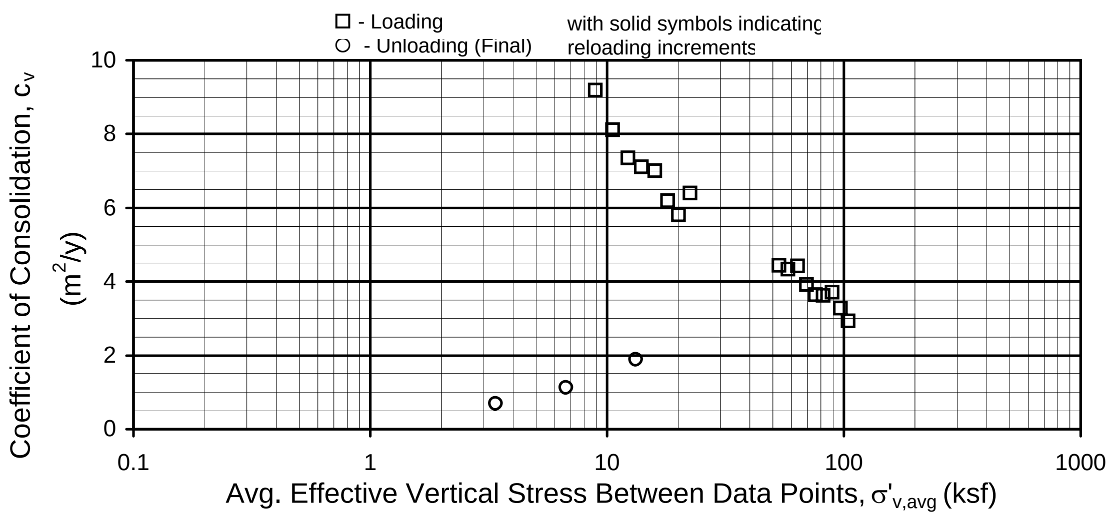
FIGURE A13-16a



CRS CONSOLIDATION TEST RESULTS
Sample No. 4a - Depth 41.40 ft
Boring B-45
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-16b





CRS CONSOLIDATION TEST RESULTS

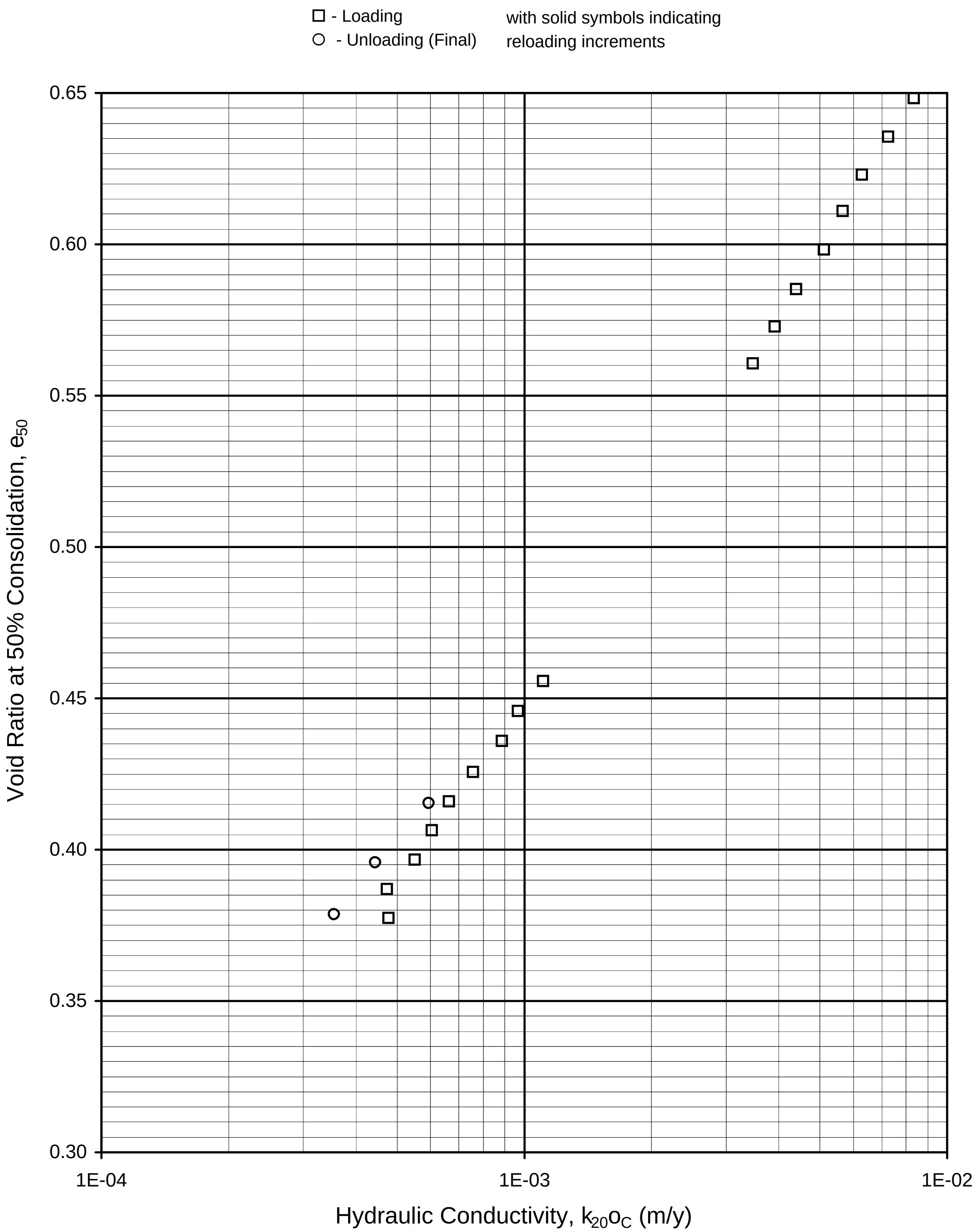
Sample No. 10a - Depth 47.50 ft

Boring B-50

Tunnel Segment of SVRT Project

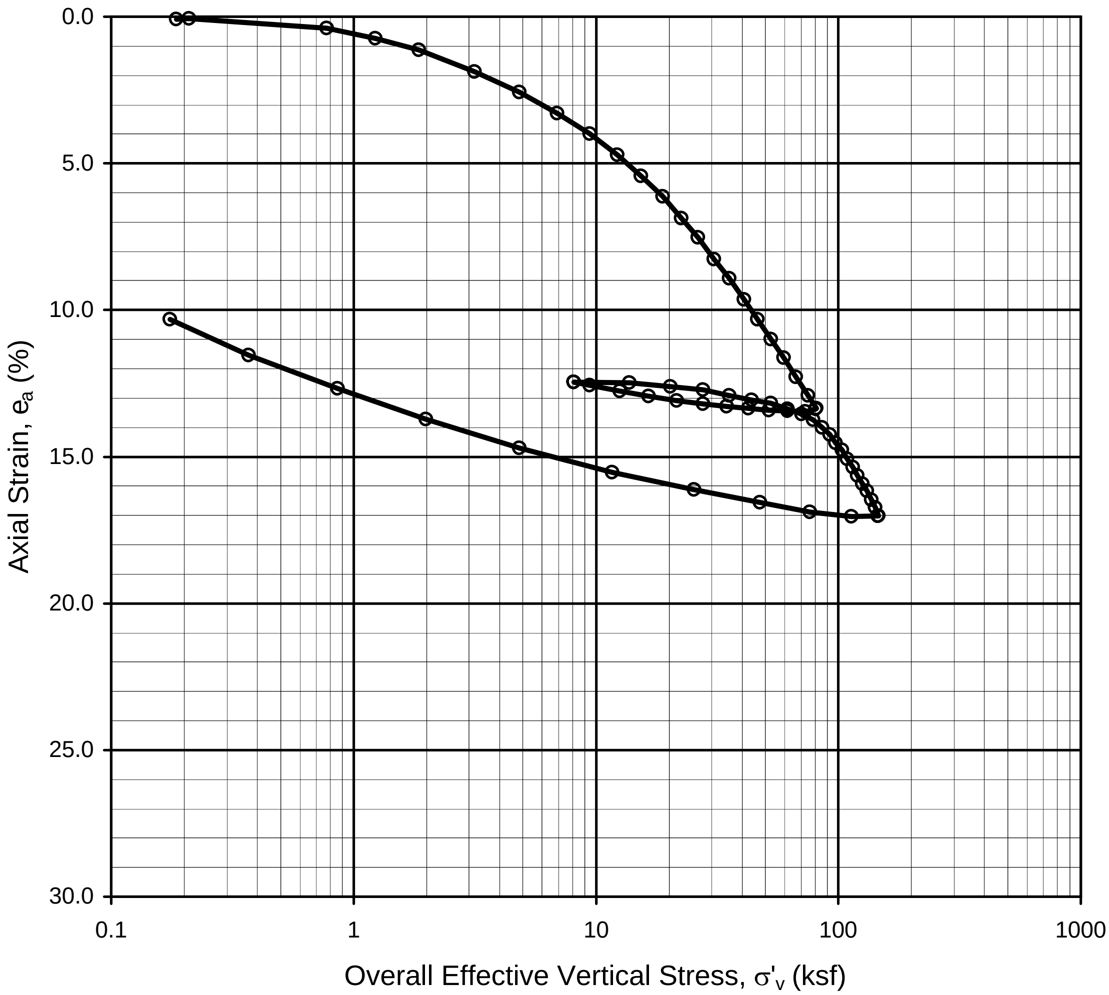
San Jose, California

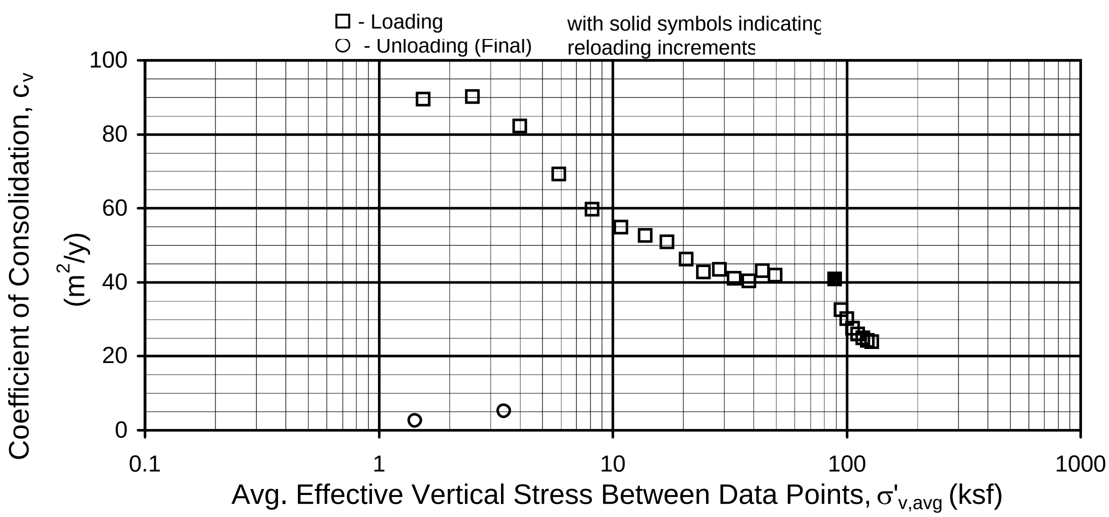
FIGURE A13-17a



CRS CONSOLIDATION TEST RESULTS
Sample No. 10a - Depth 47.50 ft
Boring B-50
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-17b





CRS CONSOLIDATION TEST RESULTS

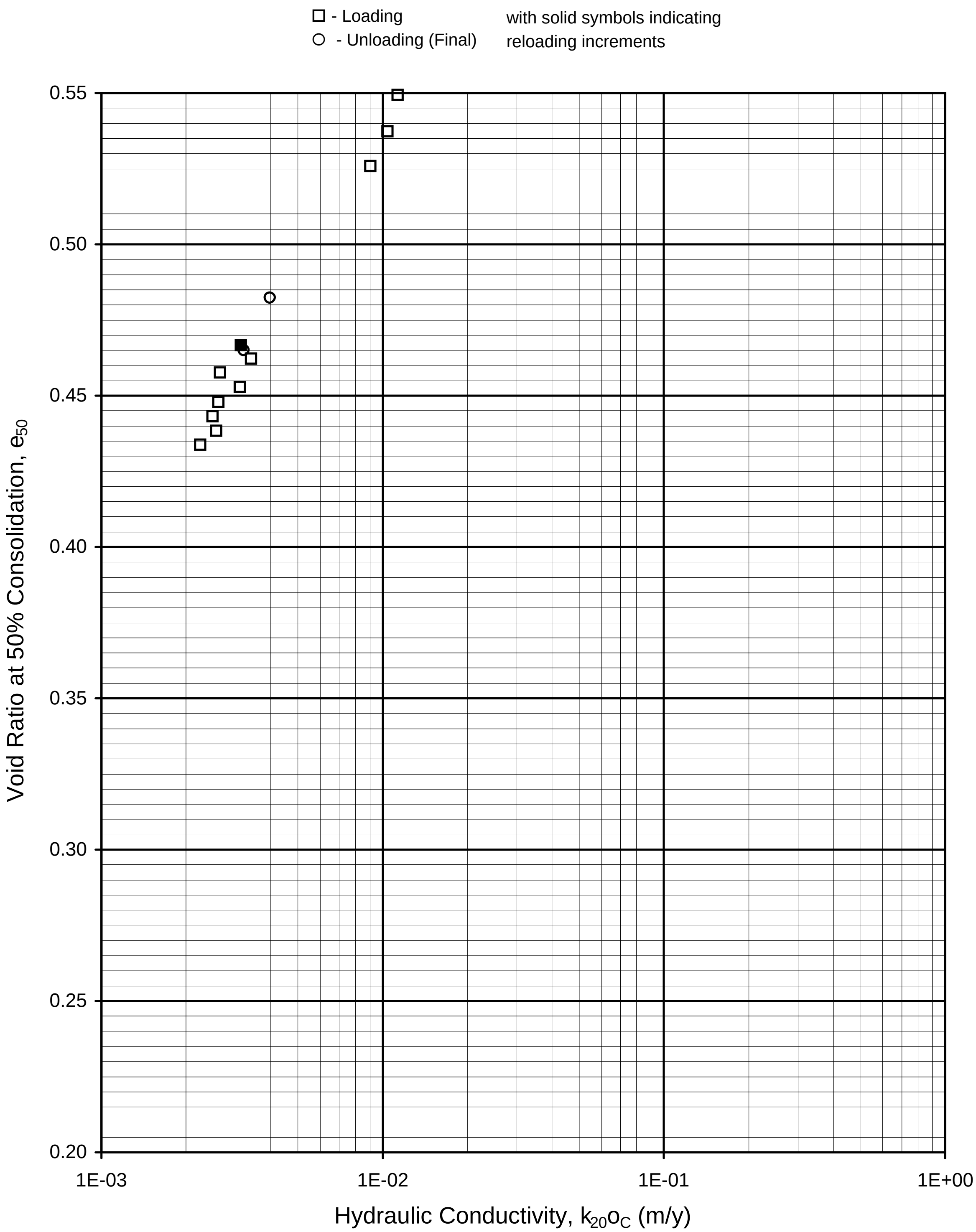
Sample No. 17 - Depth 101.10 ft

Boring B-50

Tunnel Segment of SVRT Project

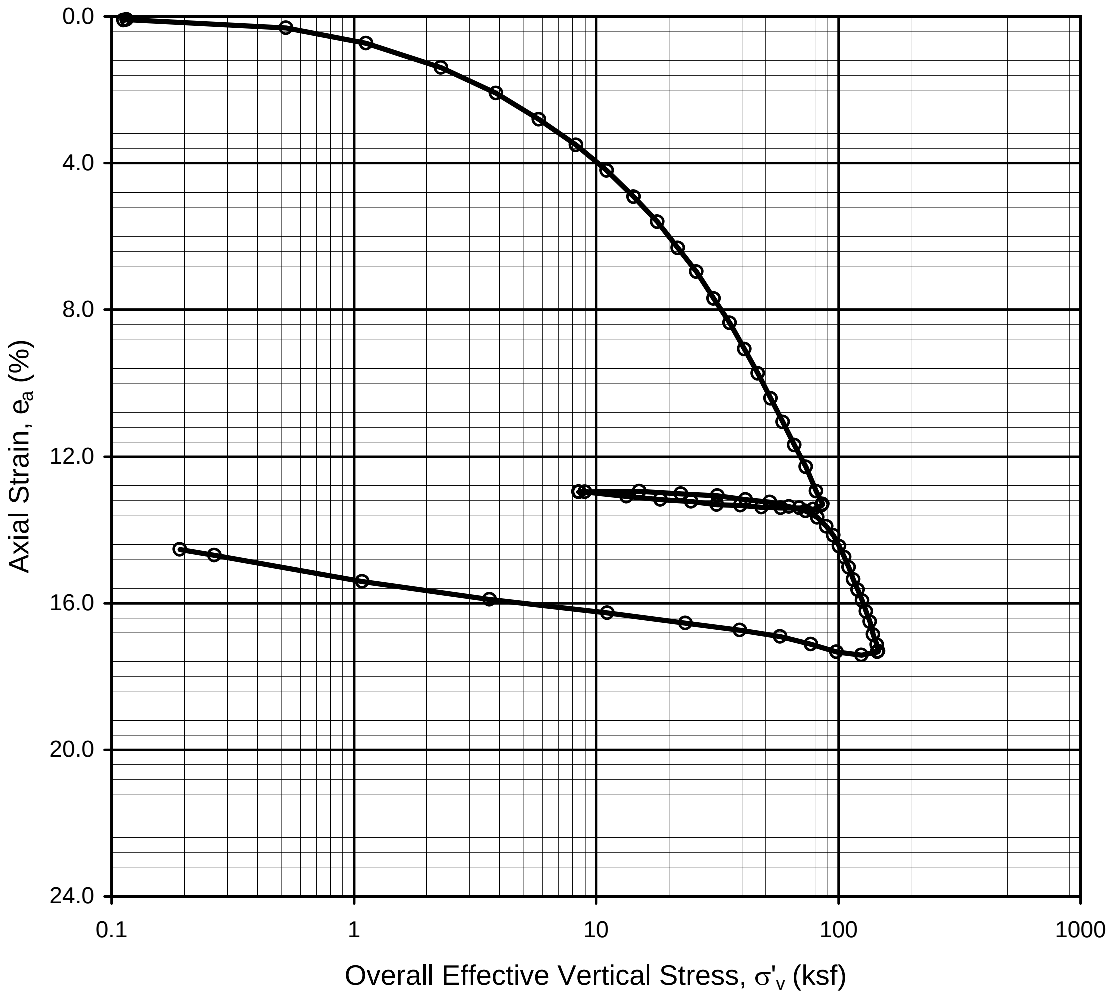
San Jose, California

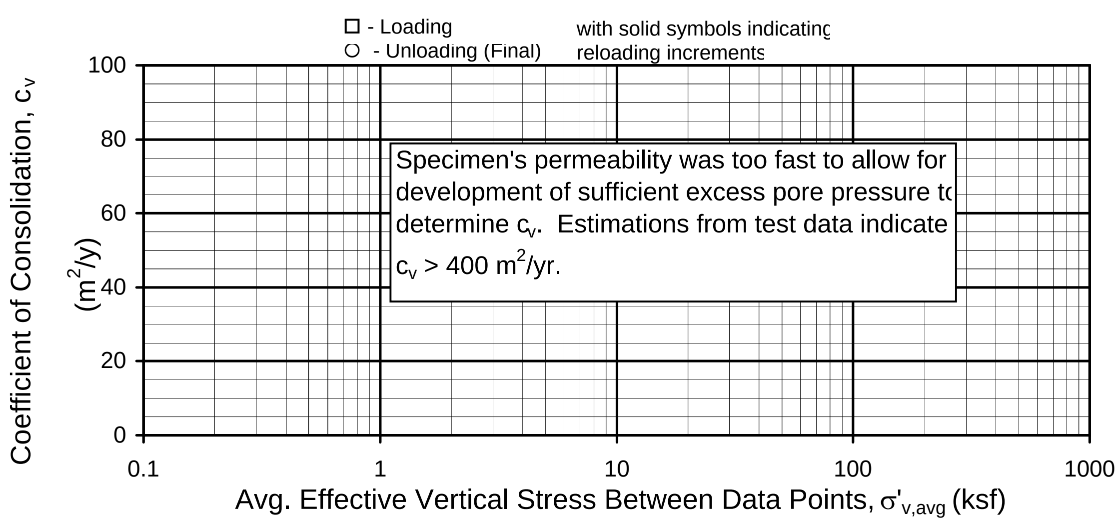
FIGURE A13-18a



CRS CONSOLIDATION TEST RESULTS
Sample No. 17 - Depth 101.10 ft
Boring B-50
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-18b





CRS CONSOLIDATION TEST RESULTS

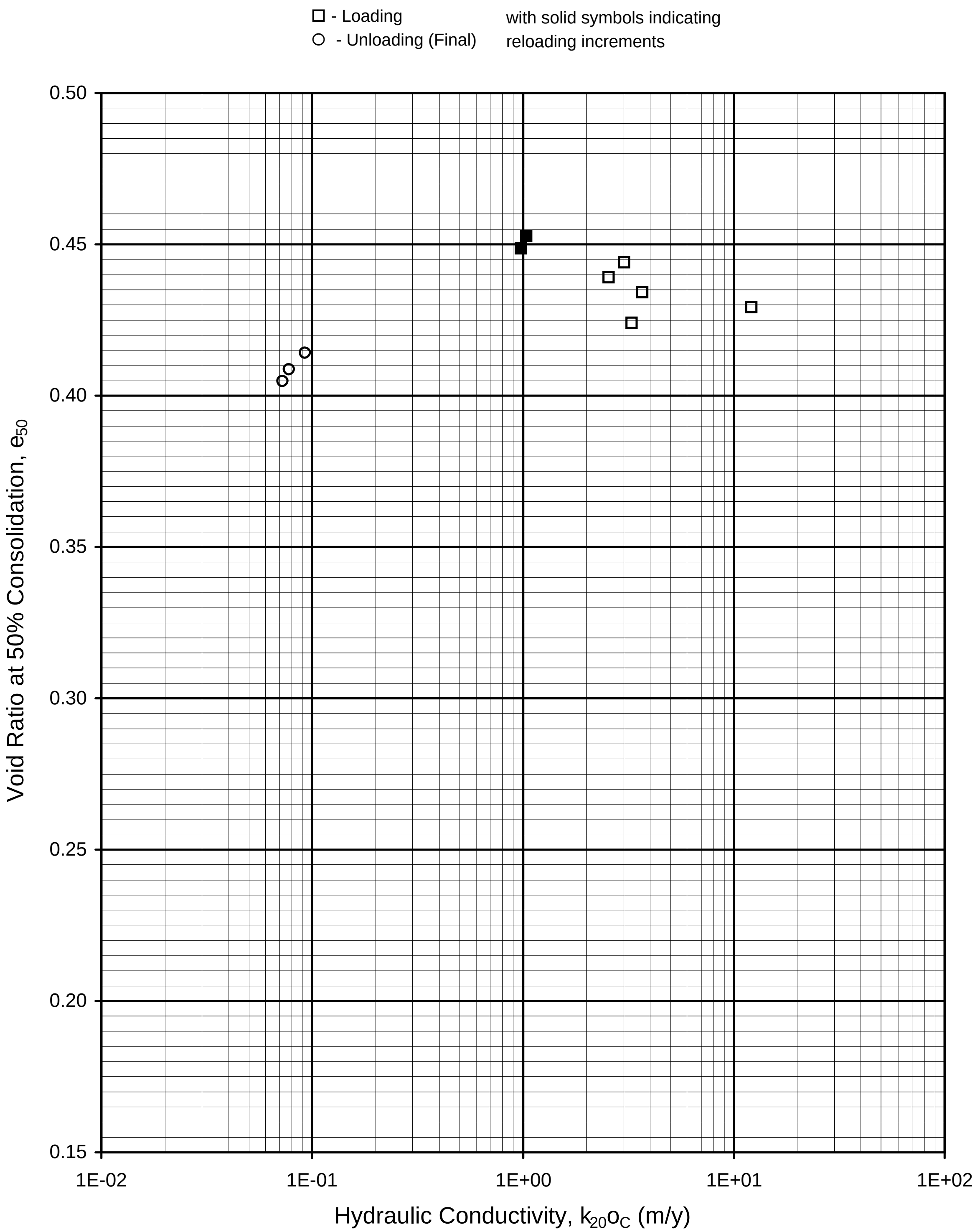
Sample No. 8a - Depth 24.20 ft

Boring B-52

Tunnel Segment of SVRT Project

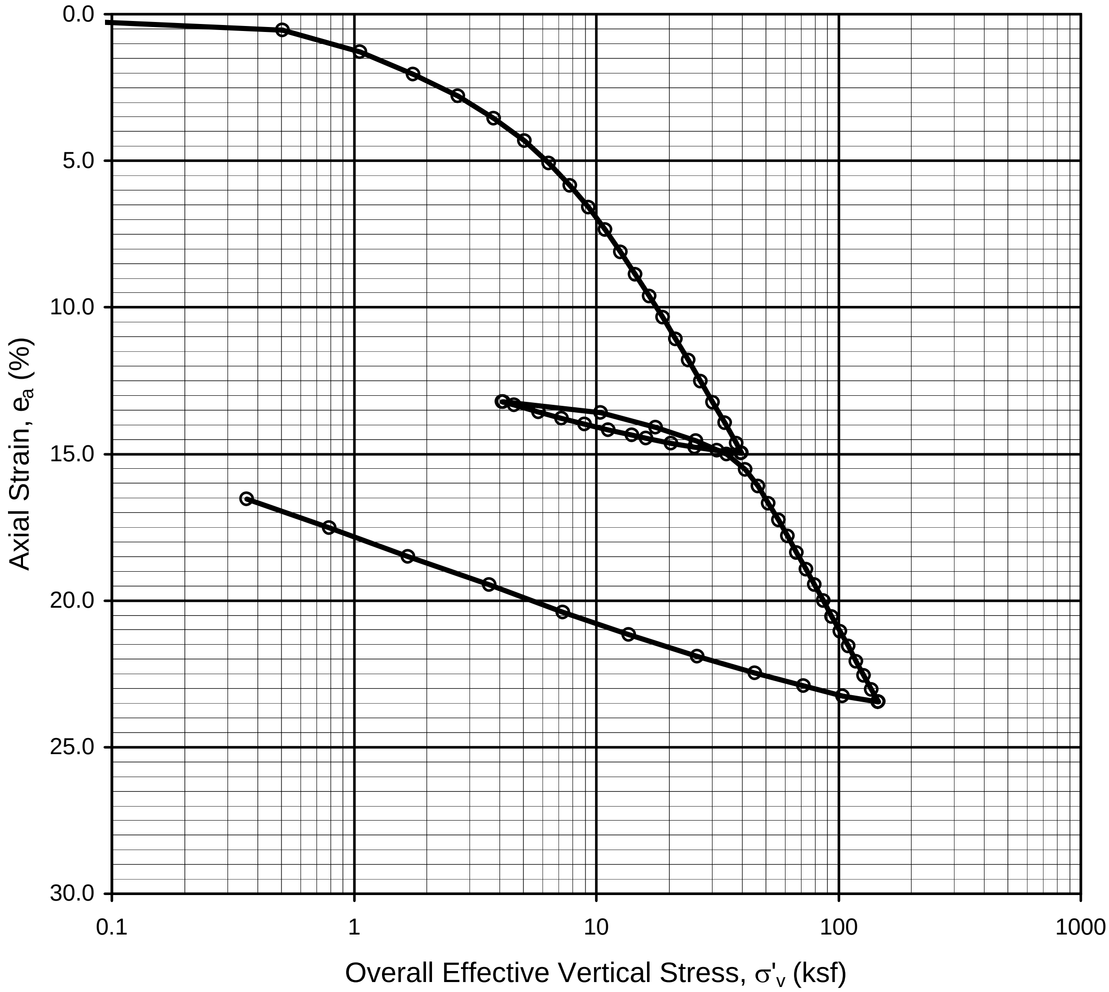
San Jose, California

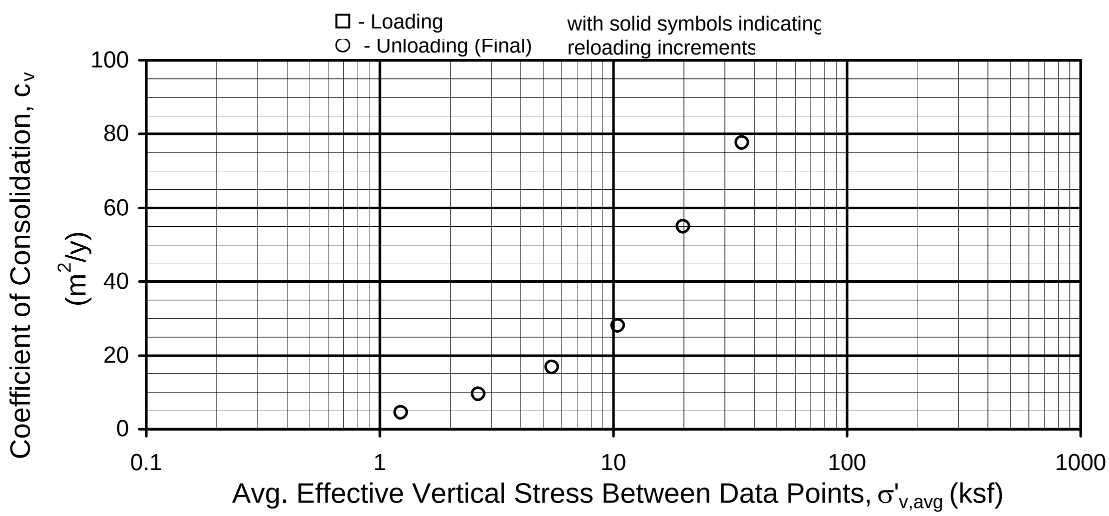
FIGURE A13-19a



CRS CONSOLIDATION TEST RESULTS
Sample No. 8a - Depth 24.20 ft
Boring B-52
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-19b





CRS CONSOLIDATION TEST RESULTS

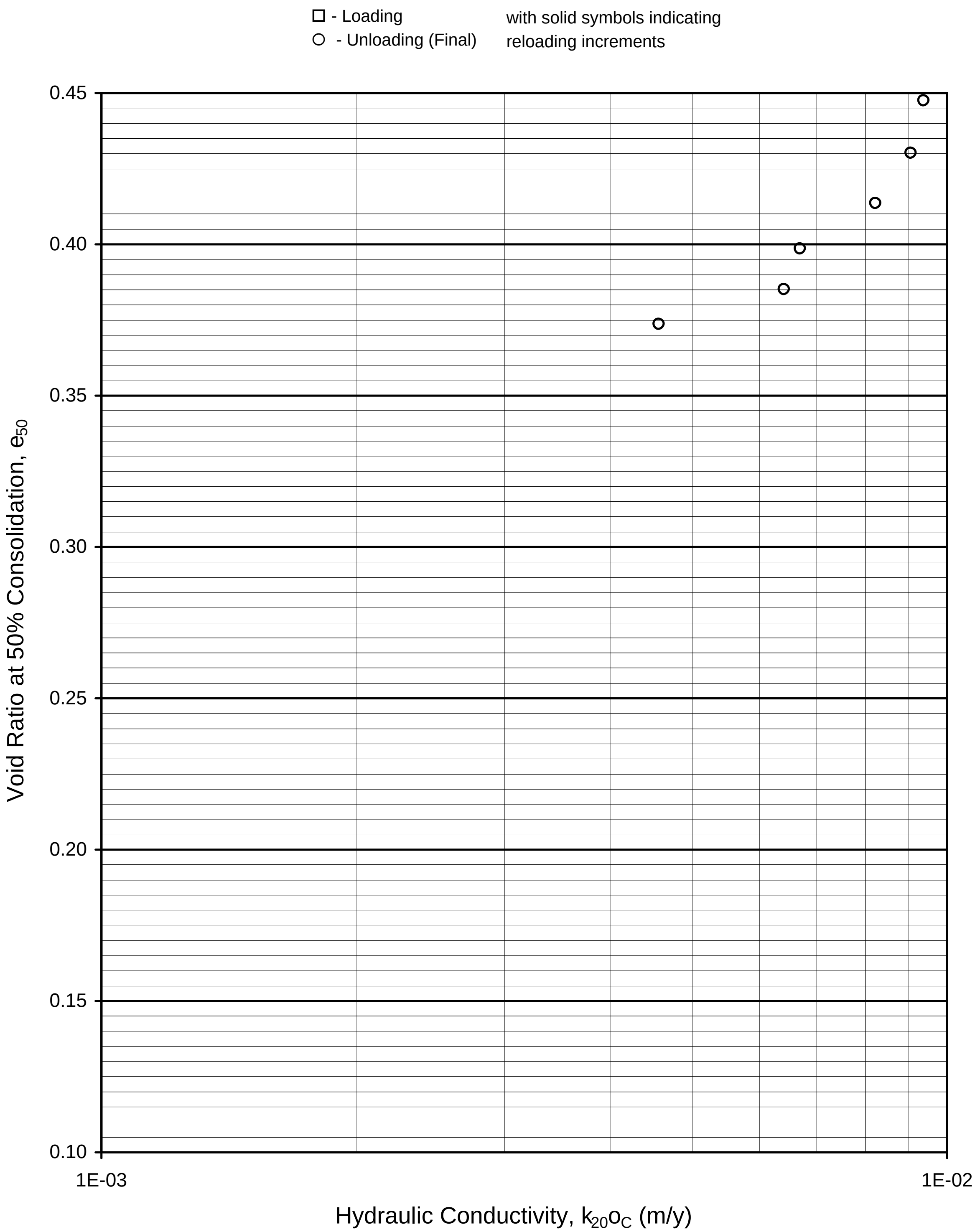
Sample No. 11a - Depth 31.90 ft

Boring B-52

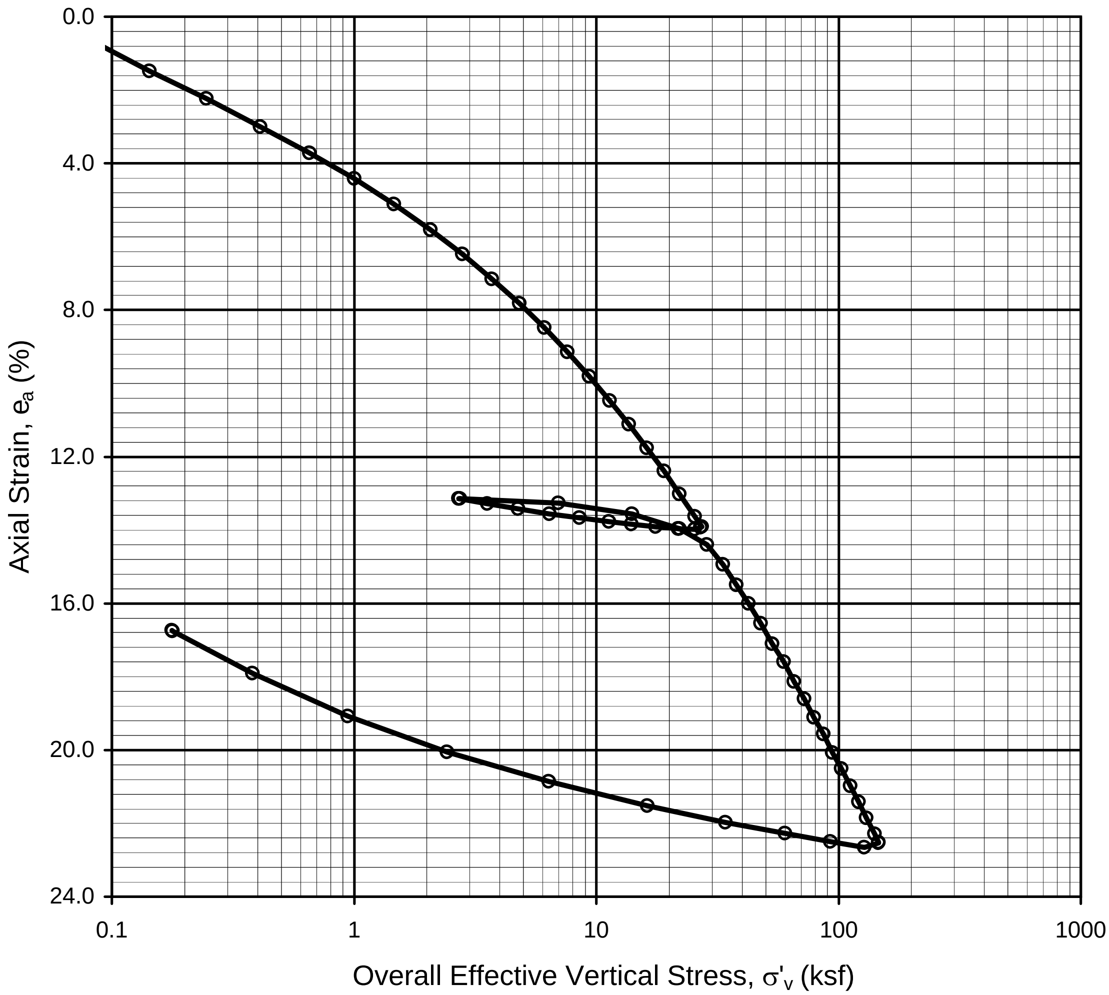
Tunnel Segment of SVRT Project

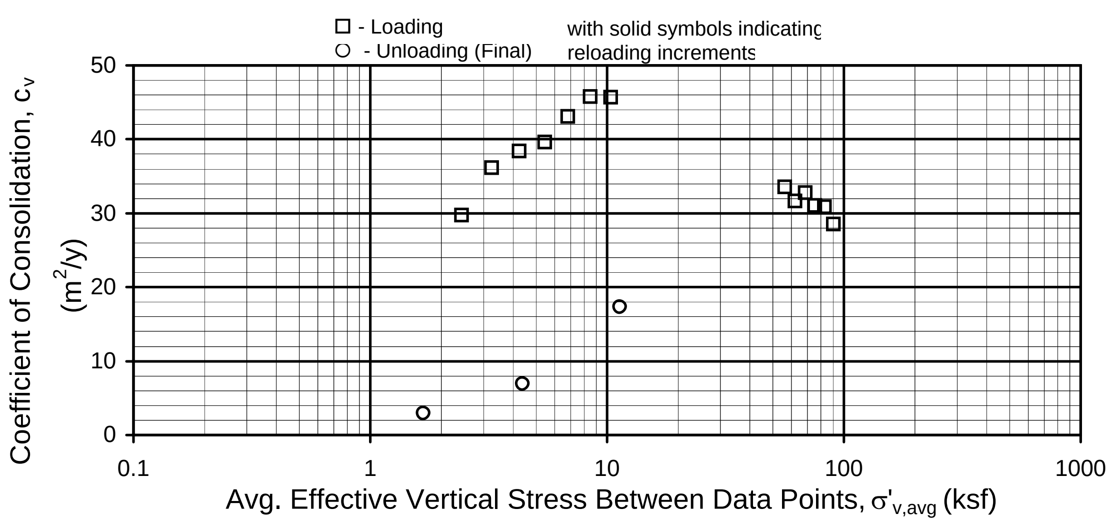
San Jose, California

FIGURE A13-20a



CRS CONSOLIDATION TEST RESULTS
Sample No. 11a - Depth 31.90 ft
Boring B-52
Tunnel Segment of SVRT Project
San Jose, California





CRS CONSOLIDATION TEST RESULTS

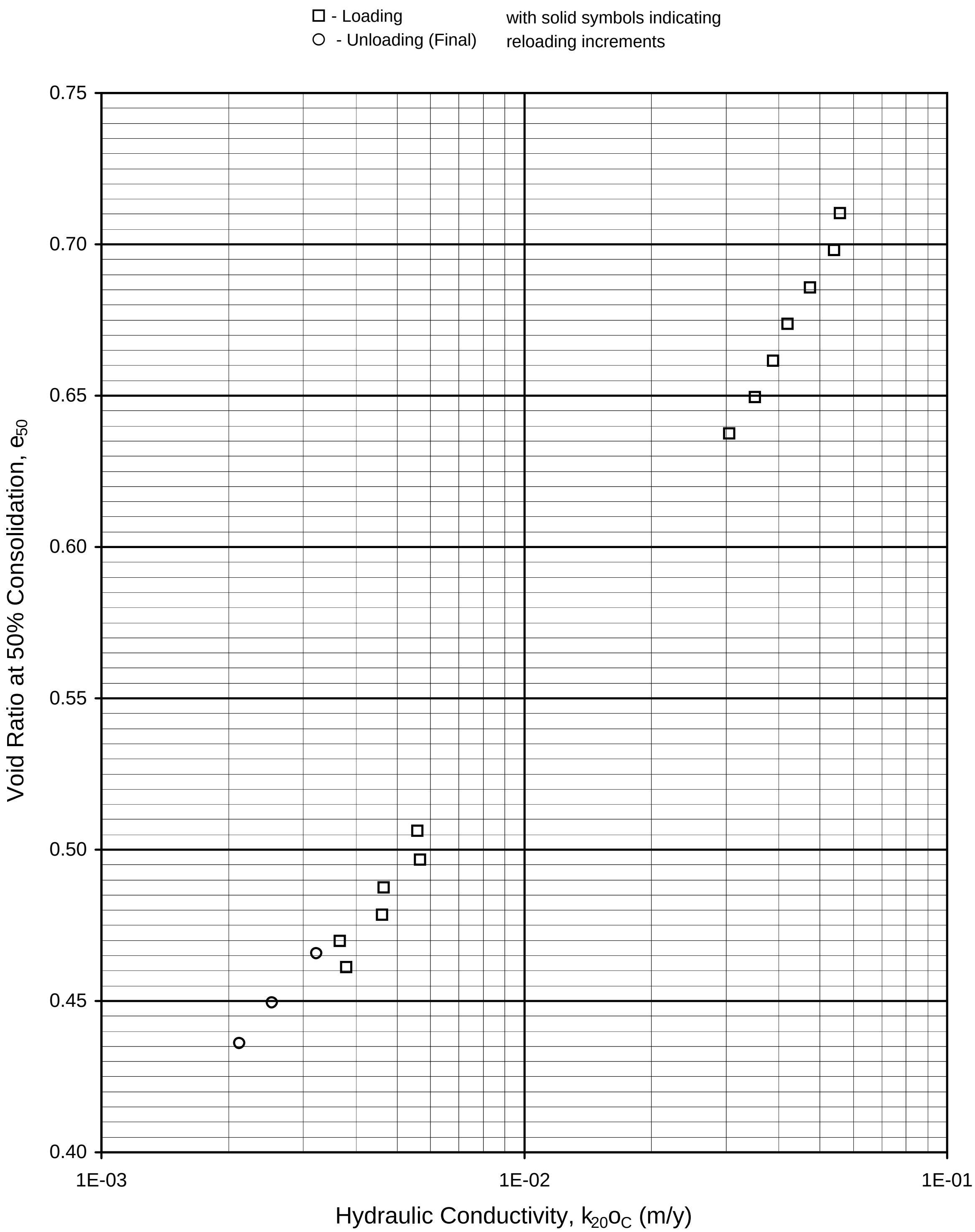
Sample No. 12a - Depth 34.50 ft

Boring B-52

Tunnel Segment of SVRT Project

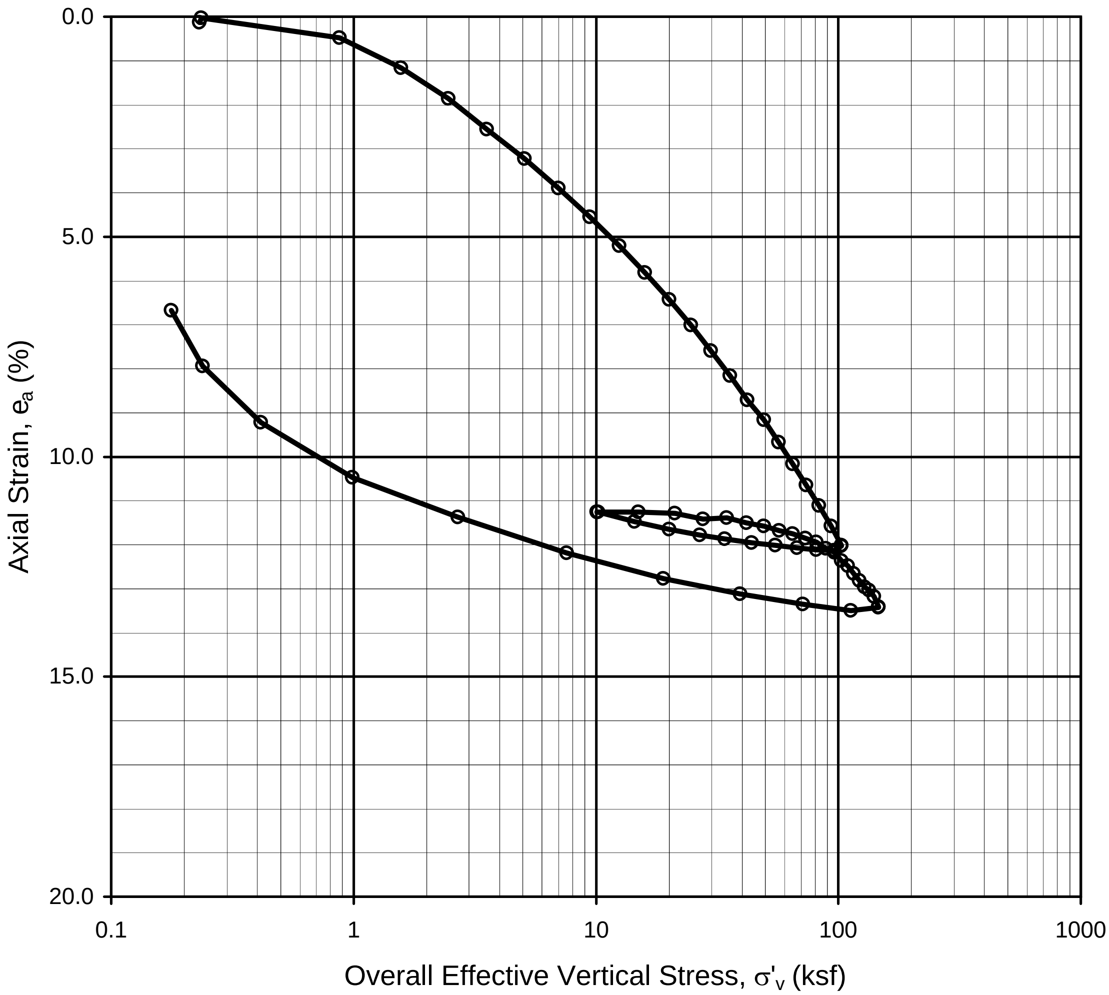
San Jose, California

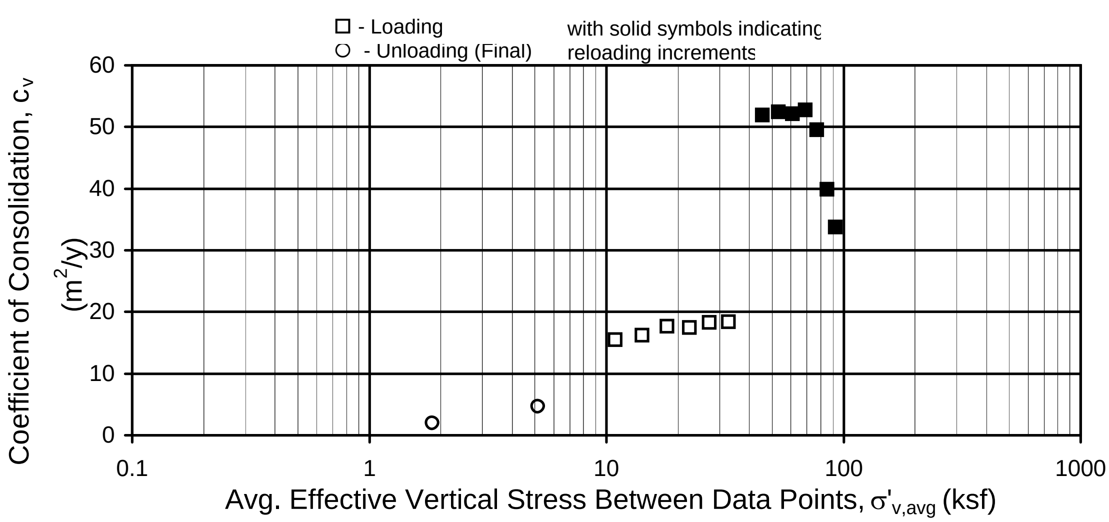
FIGURE A13-21a



CRS CONSOLIDATION TEST RESULTS
Sample No. 12a - Depth 34.50 ft
Boring B-52
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-21b





CRS CONSOLIDATION TEST RESULTS

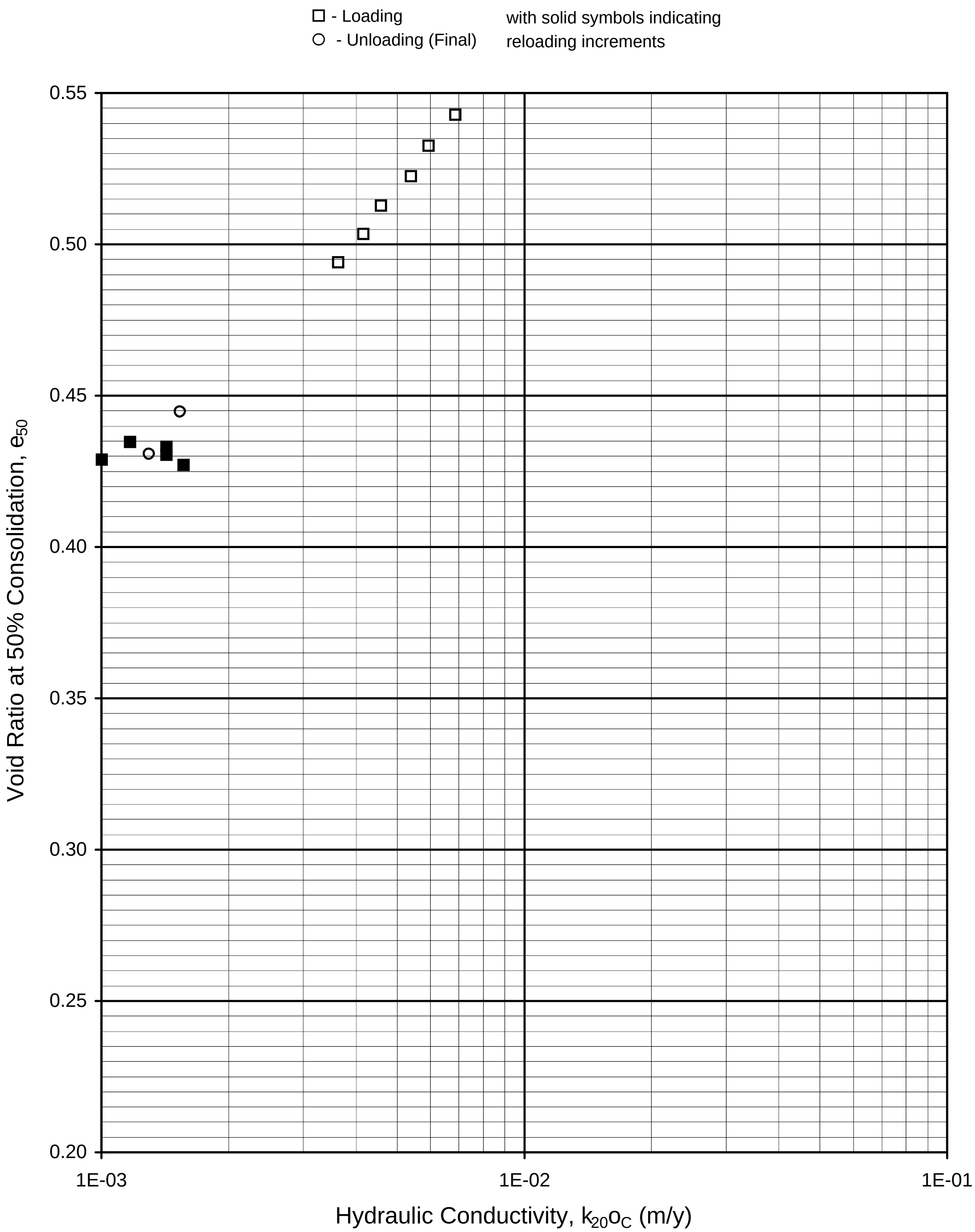
Sample No. 34a - Depth 106.50 ft

Boring B-52

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-22a



CRS CONSOLIDATION TEST RESULTS

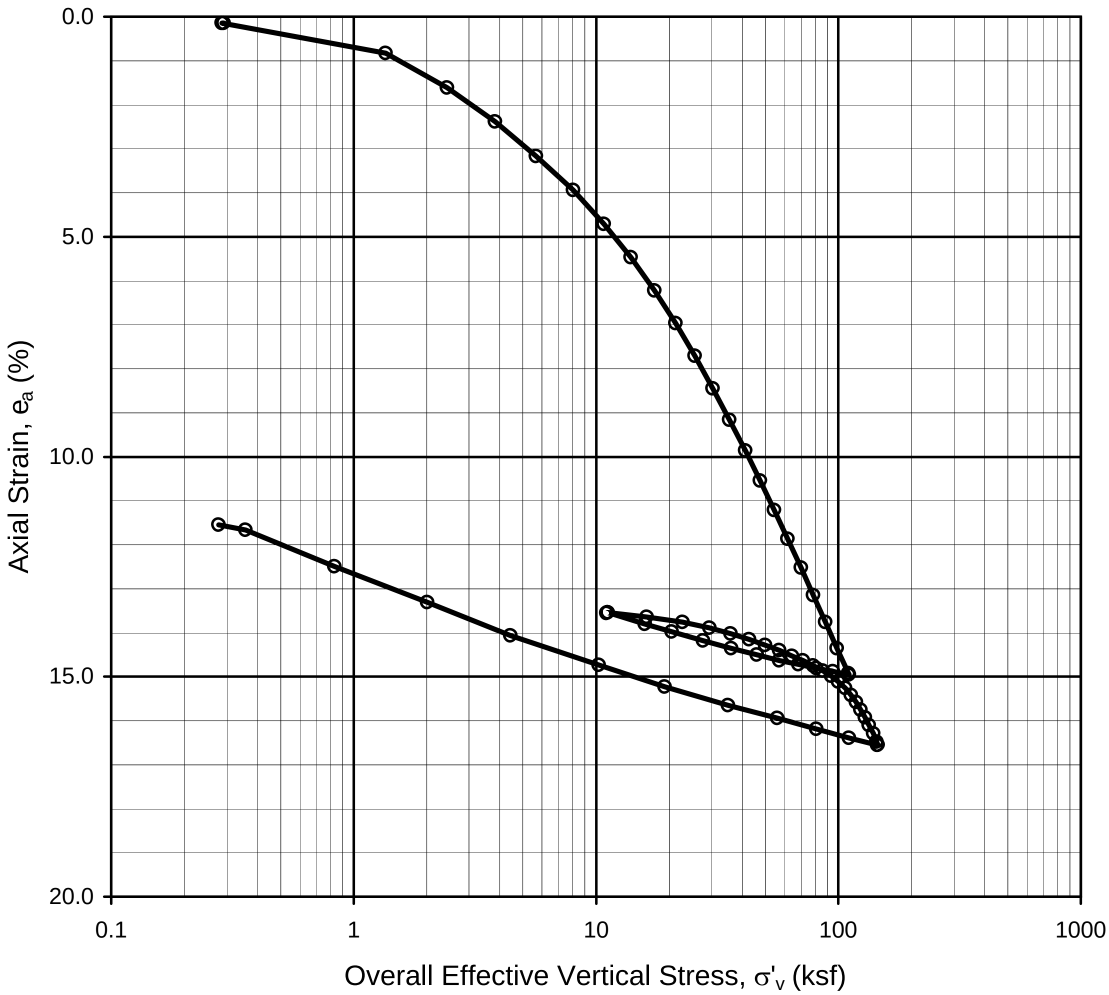
Sample No. 34a - Depth 106.50 ft

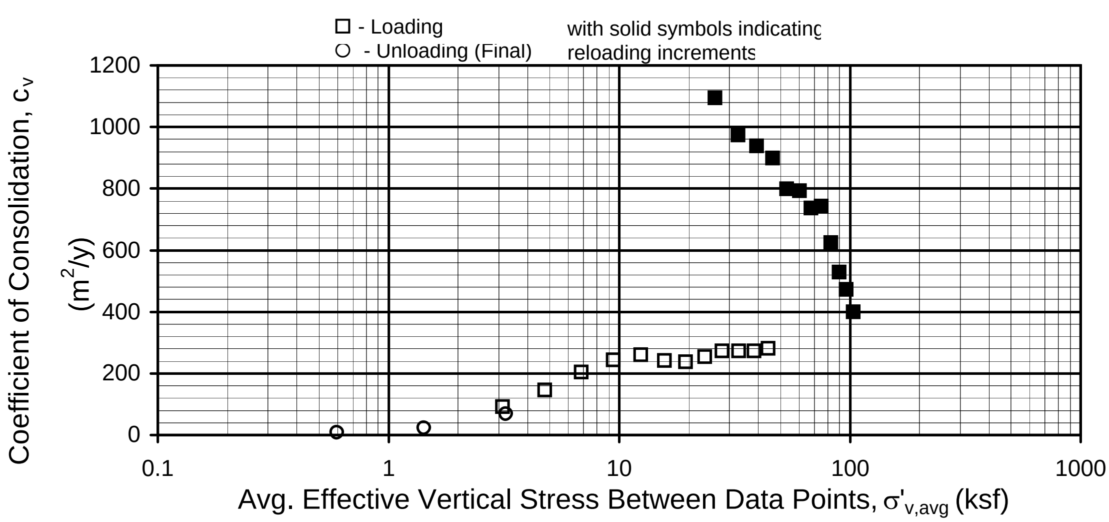
Boring B-52

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-22b





CRS CONSOLIDATION TEST RESULTS

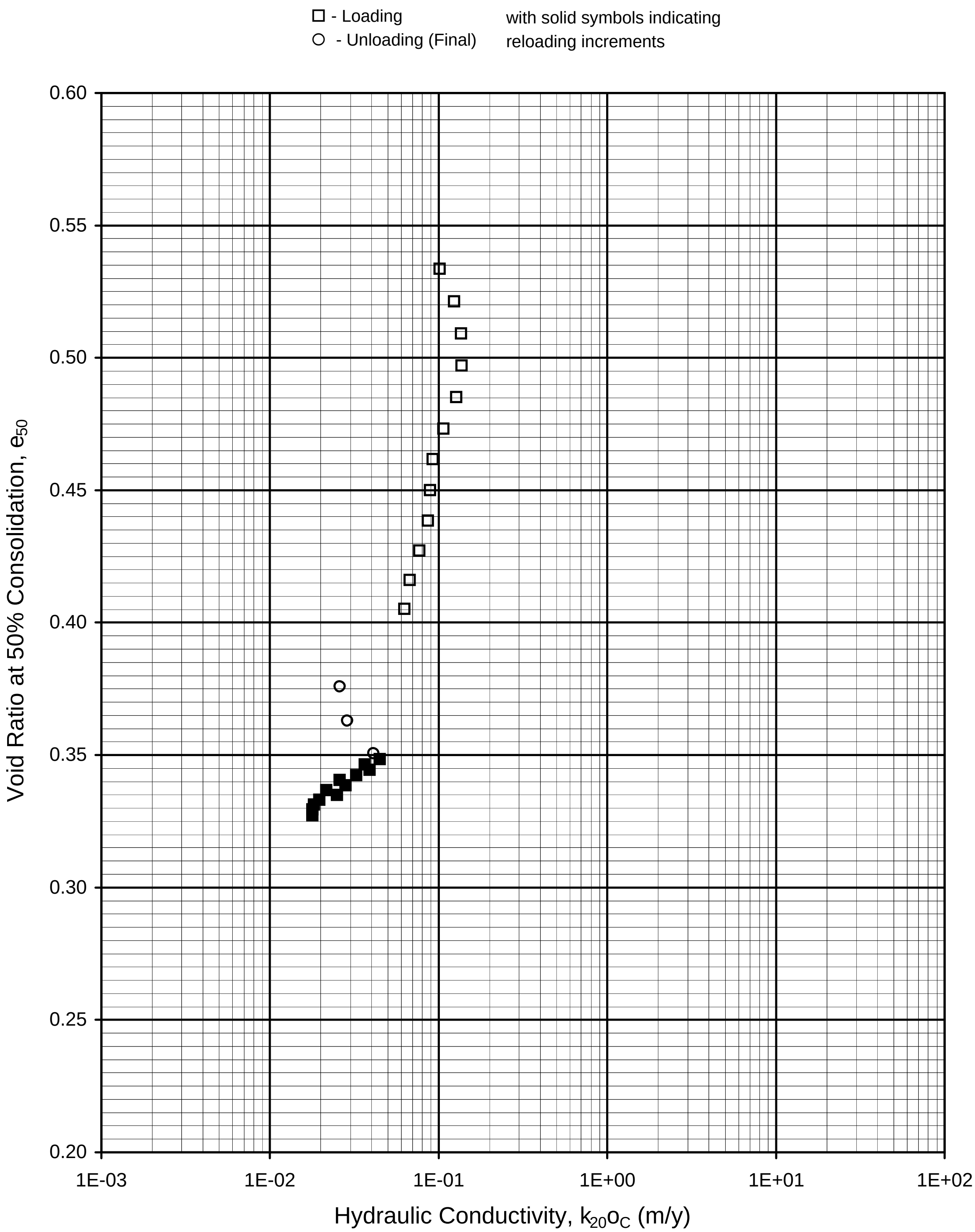
Sample No. 35a - Depth 111.50 ft

Boring B-52

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-23a



CRS CONSOLIDATION TEST RESULTS

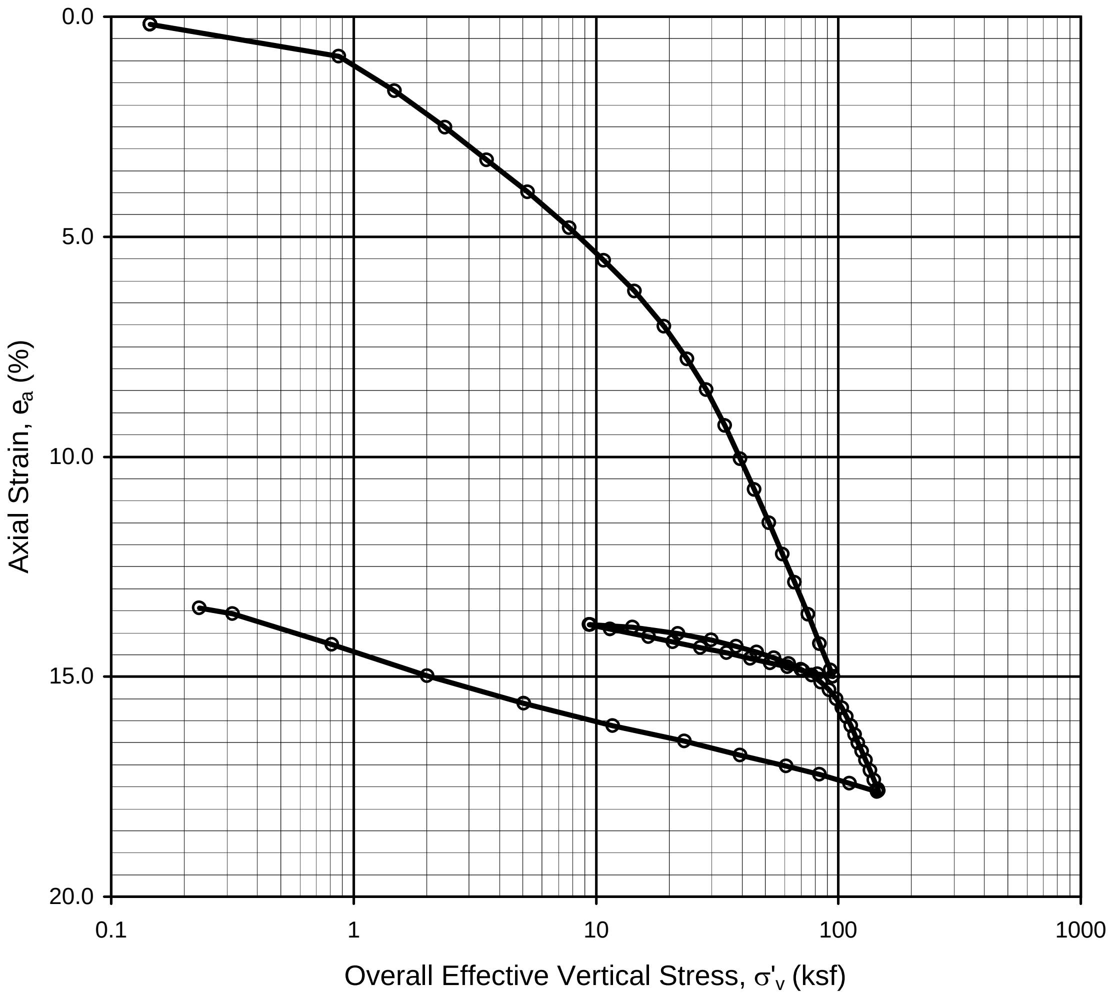
Sample No. 35a - Depth 111.50 ft

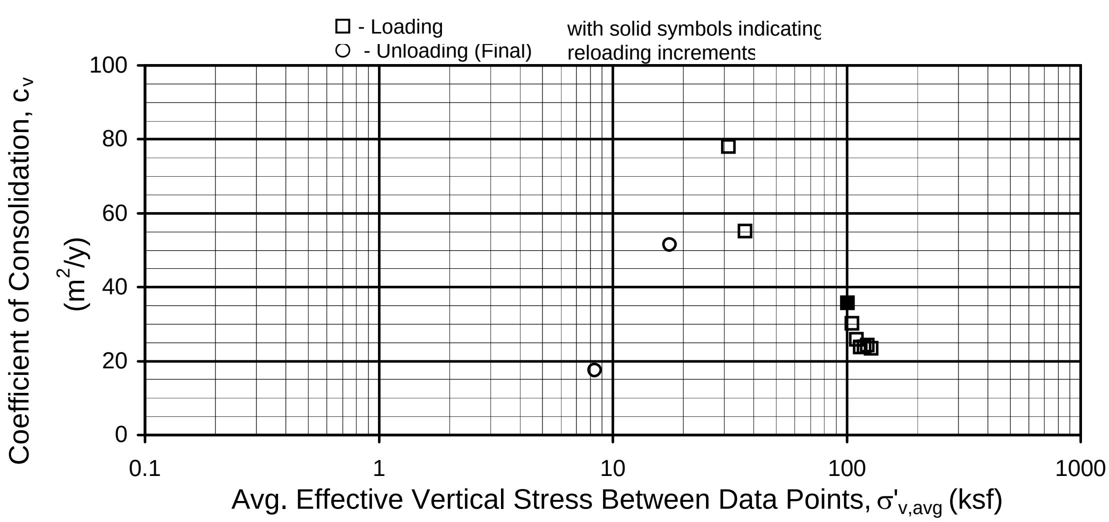
Boring B-52

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-23b





CRS CONSOLIDATION TEST RESULTS

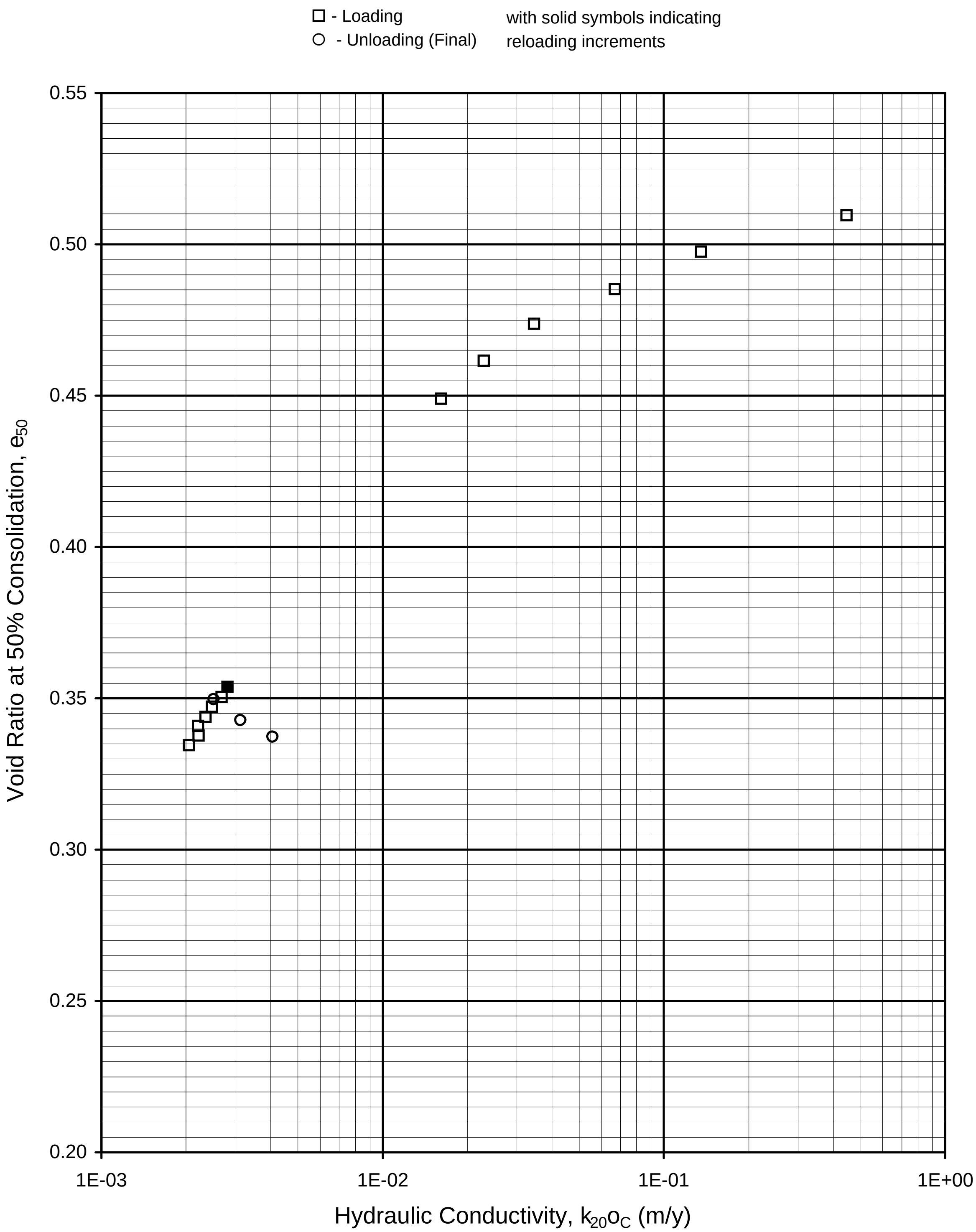
Sample No. 36a - Depth 116.50 ft

Boring B-52

Tunnel Segment of SVRT Project

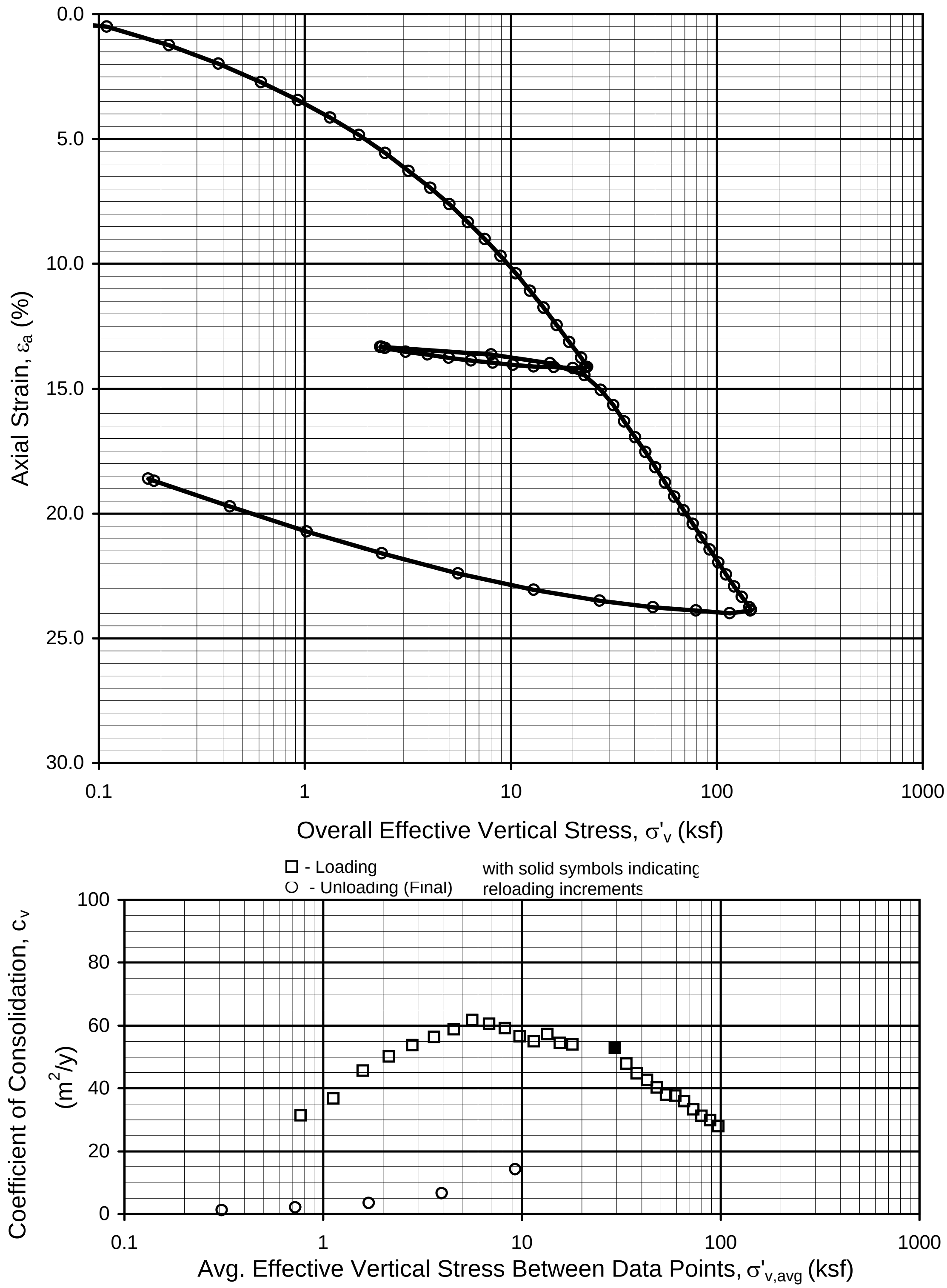
San Jose, California

FIGURE A13-24a



CRS CONSOLIDATION TEST RESULTS
Sample No. 36a - Depth 116.50 ft
Boring B-52
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-24b



CRS CONSOLIDATION TEST RESULTS

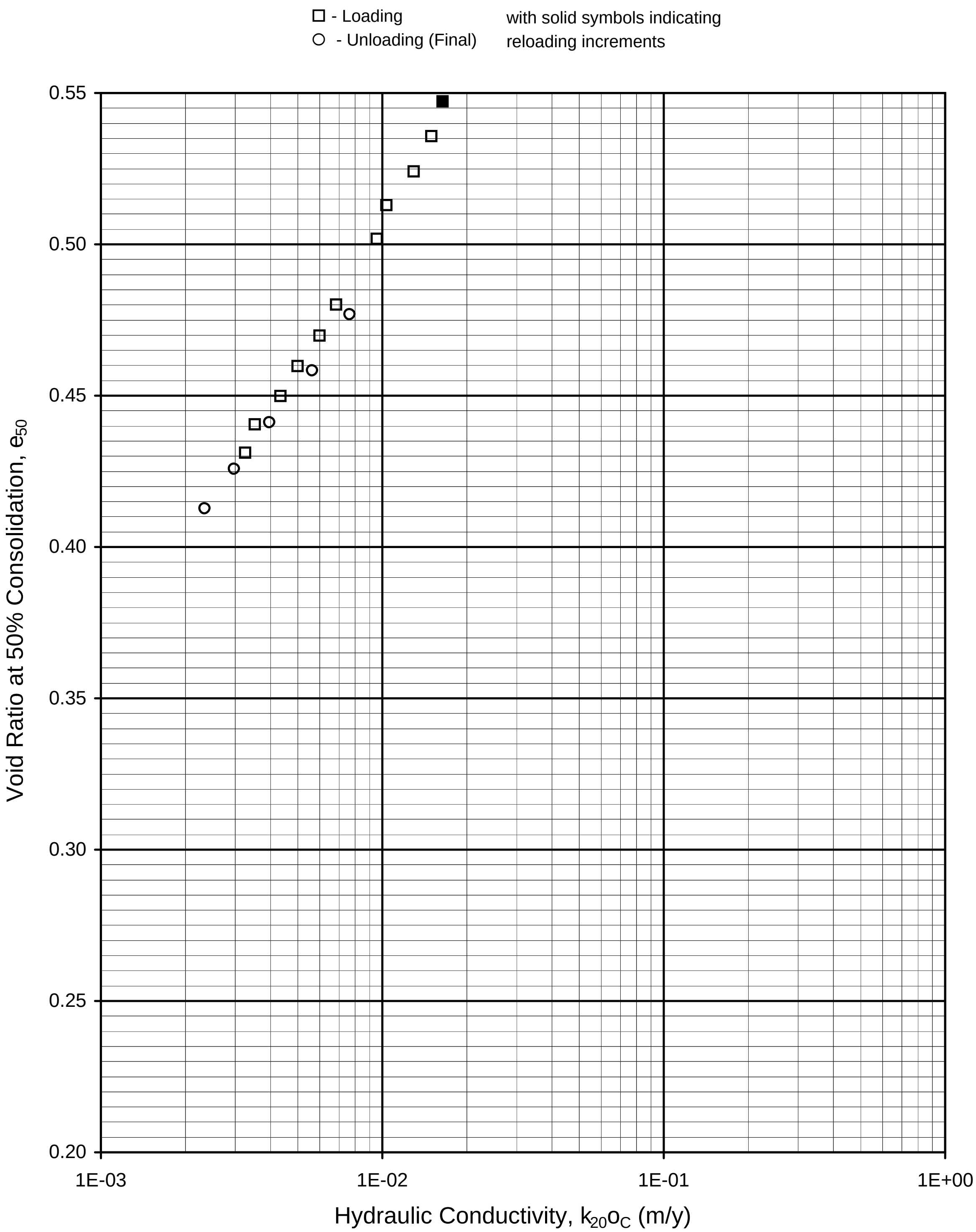
Sample No. 7a - Depth 32.35 ft

Boring B-55

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-25a



CRS CONSOLIDATION TEST RESULTS

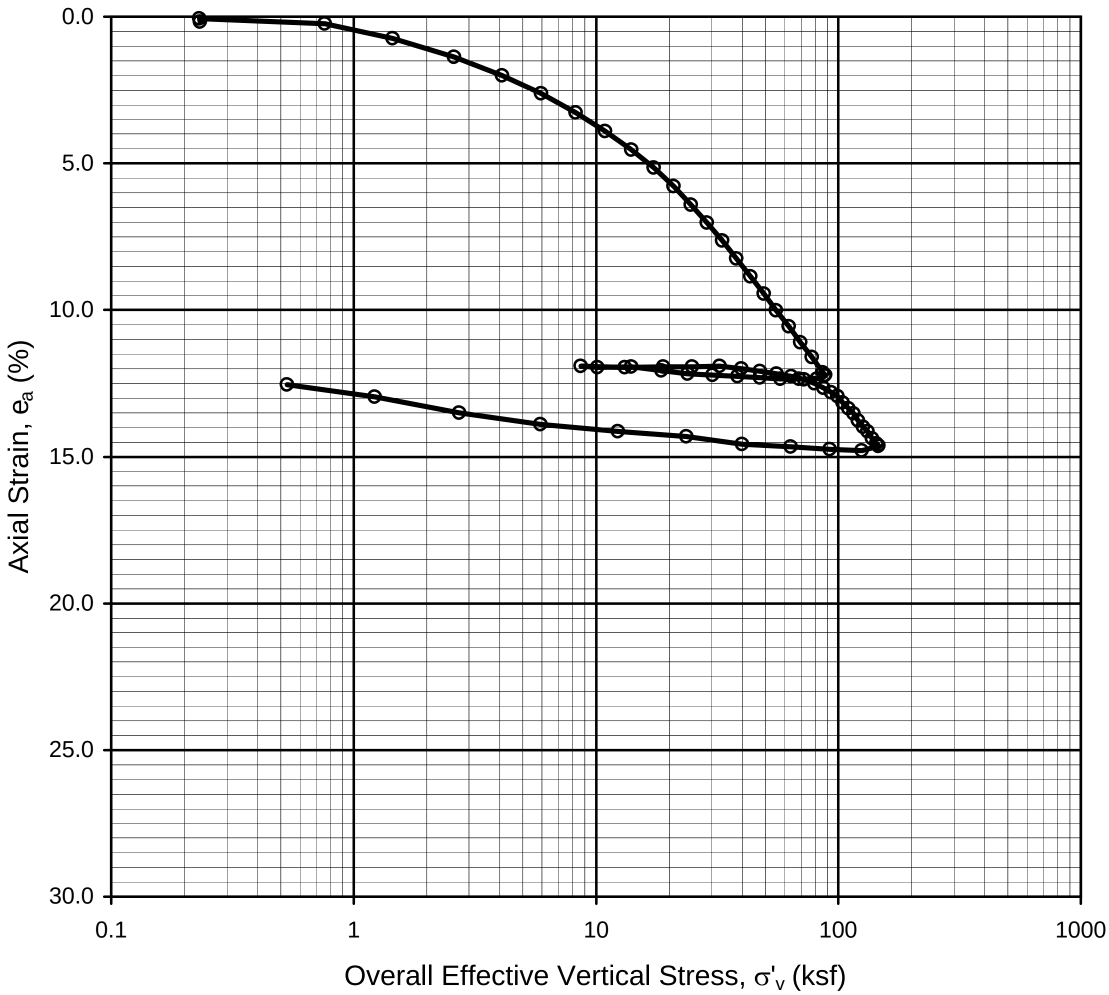
Sample No. 7a - Depth 32.35 ft

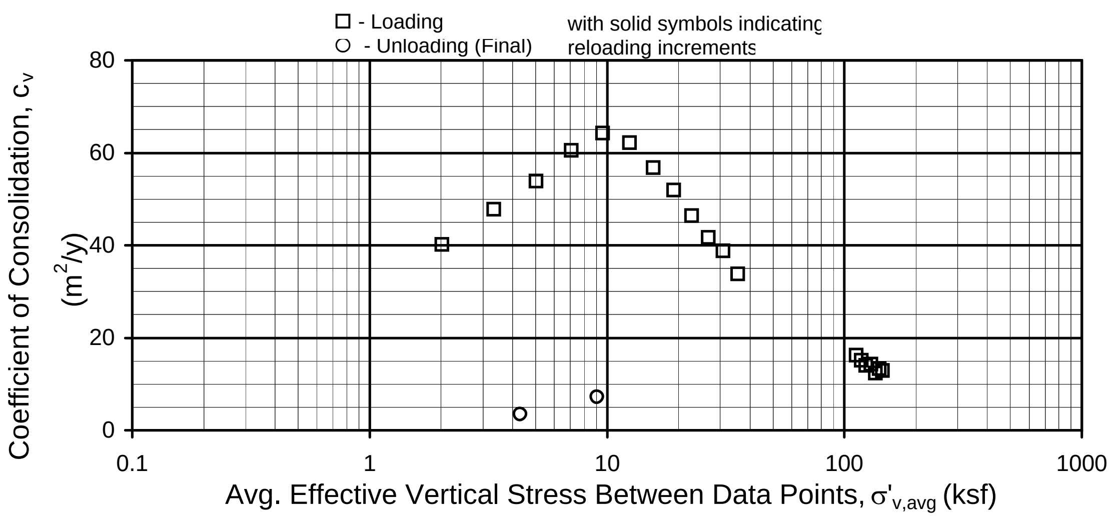
Boring B-55

Tunnel Segment of SVRT Project

San Jose, California

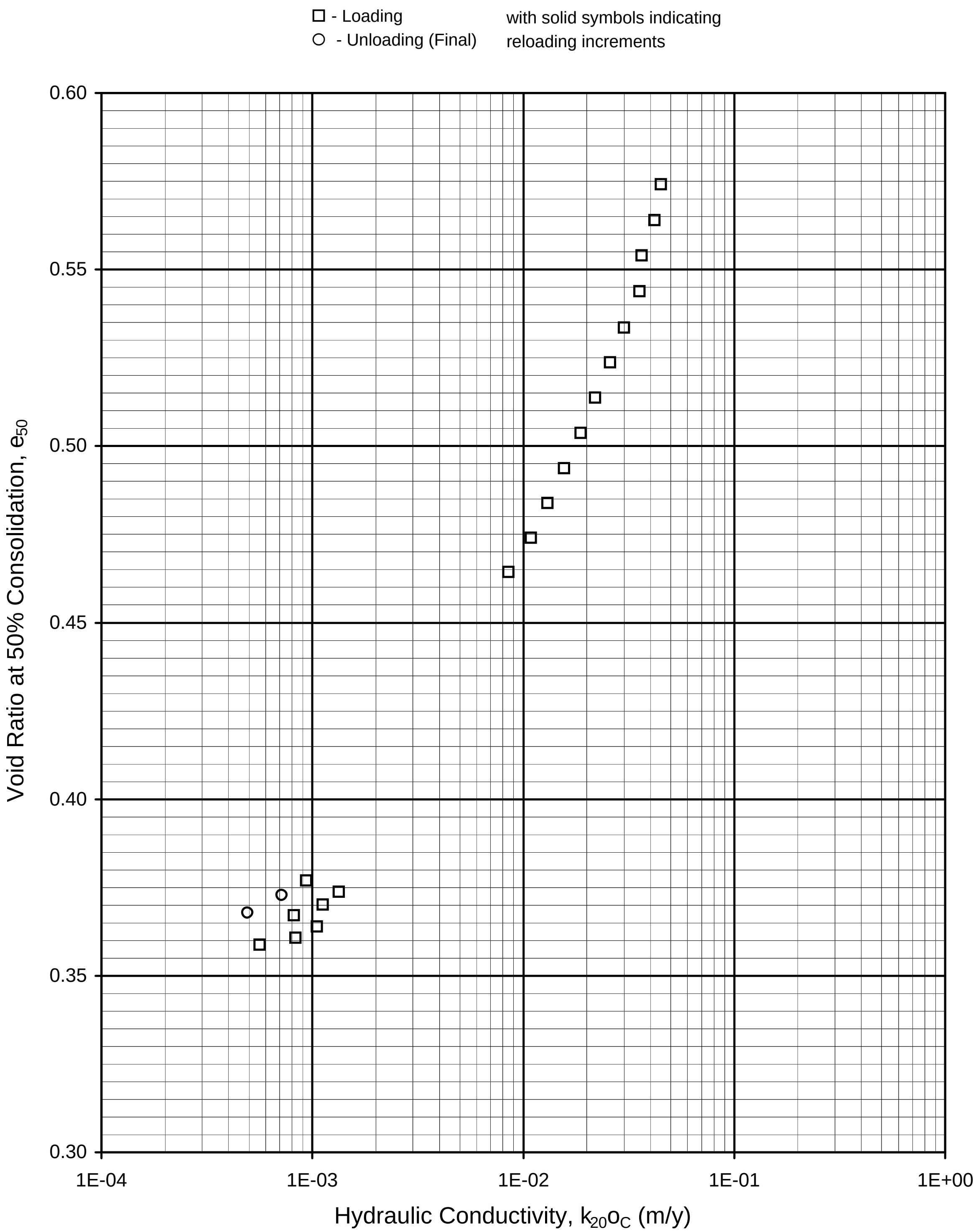
FIGURE A13-25b





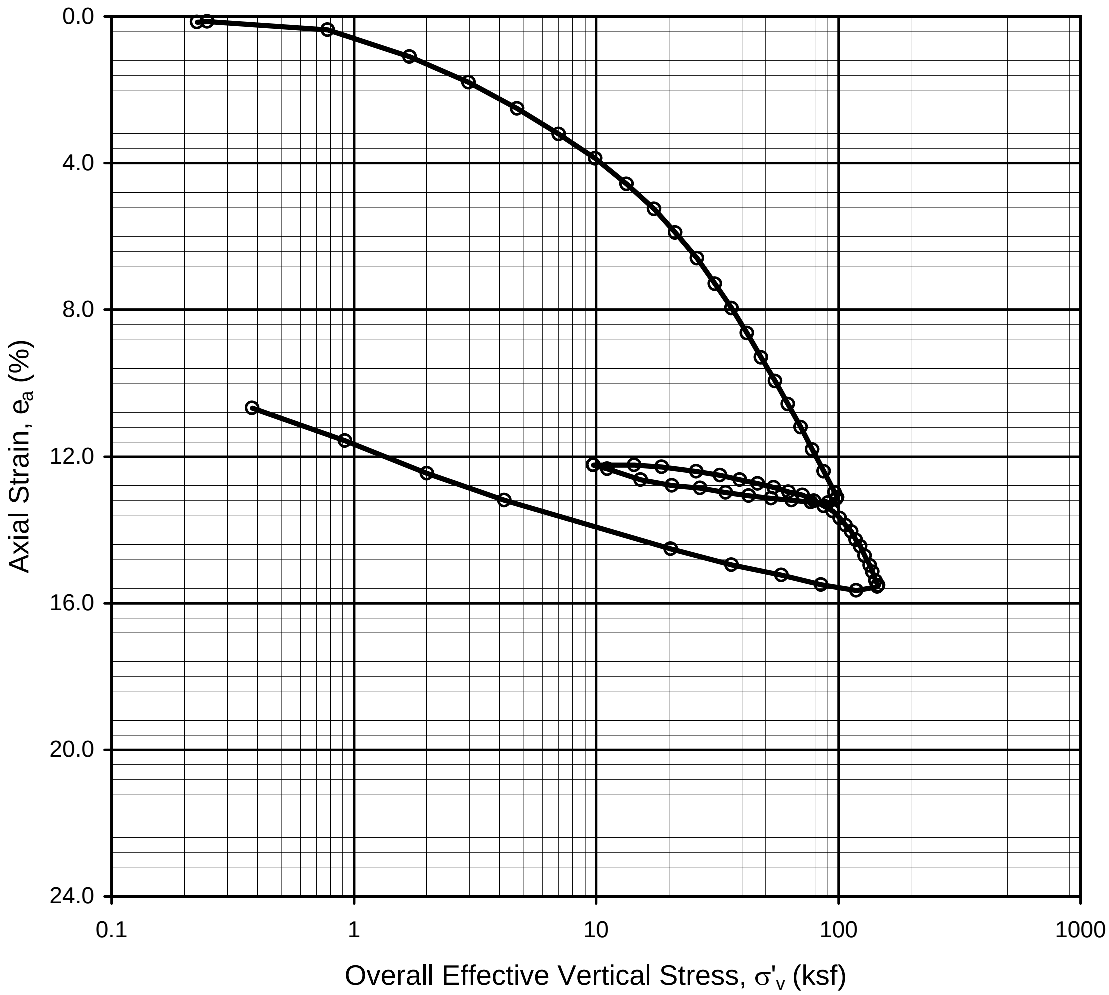
CRS CONSOLIDATION TEST RESULTS
Sample No. 22a - Depth 110.80 ft
Boring B-55
Tunnel Segment of SVRT Project
San Jose, California

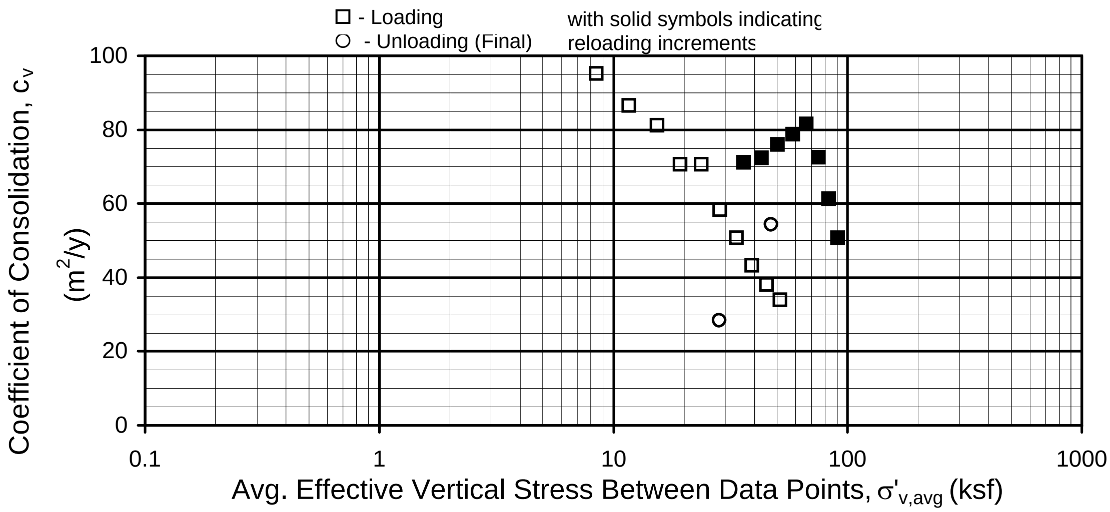
FIGURE A13-26a



CRS CONSOLIDATION TEST RESULTS
Sample No. 22a - Depth 110.80 ft
Boring B-55
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-26b





CRS CONSOLIDATION TEST RESULTS

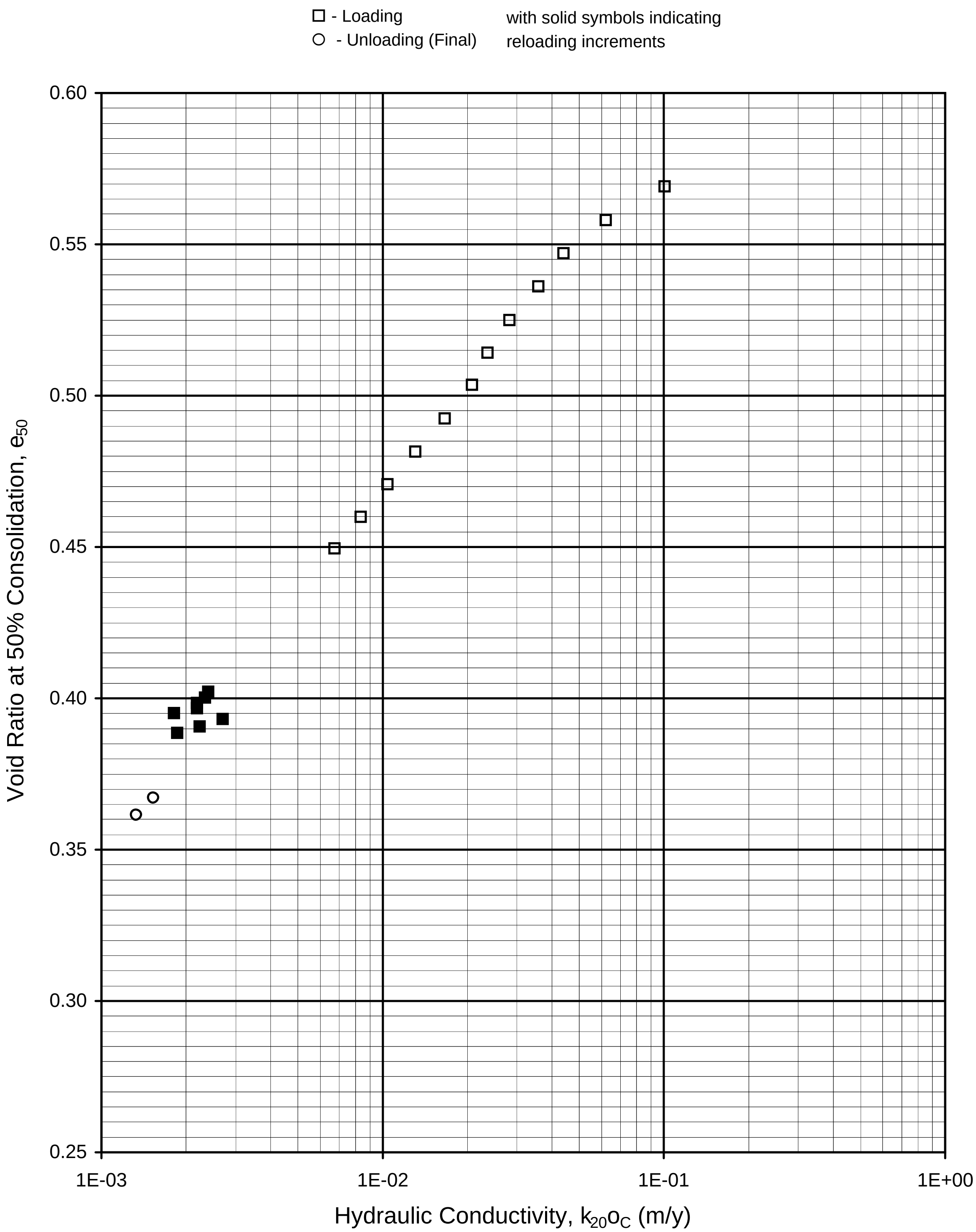
Sample No. 26a - Depth 131.50 ft

Boring B-55

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-27a



CRS CONSOLIDATION TEST RESULTS

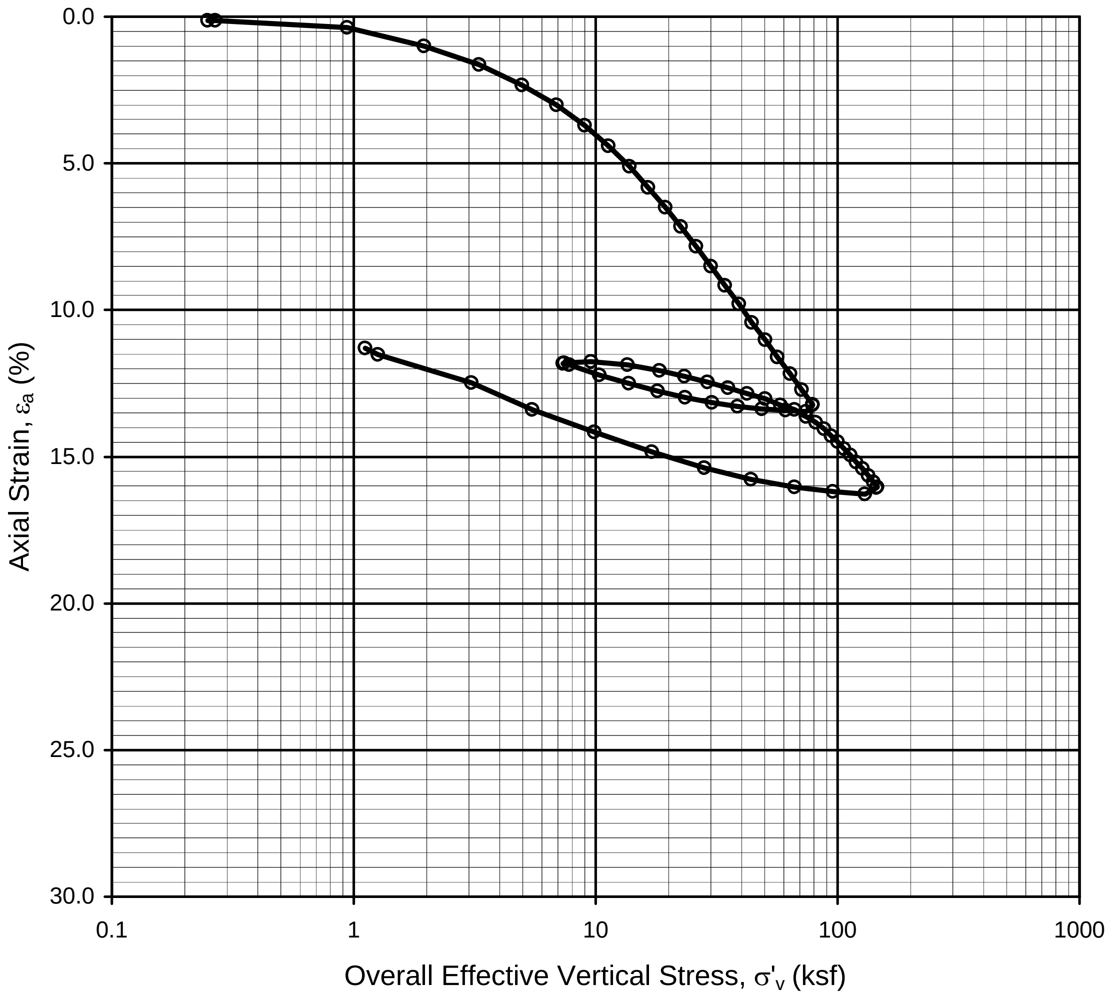
Sample No. 26a - Depth 131.50 ft

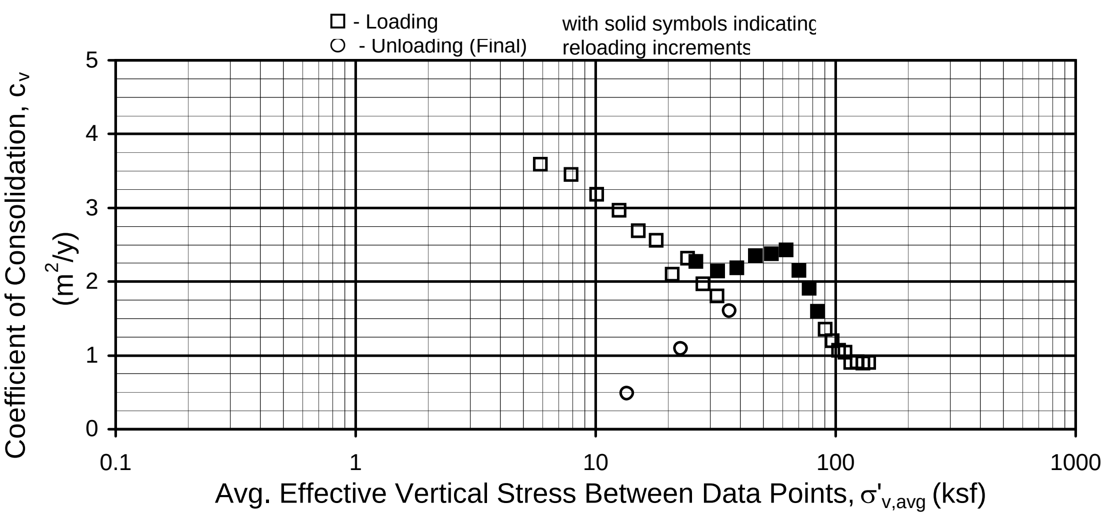
Boring B-55

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-27b





CRS CONSOLIDATION TEST RESULTS

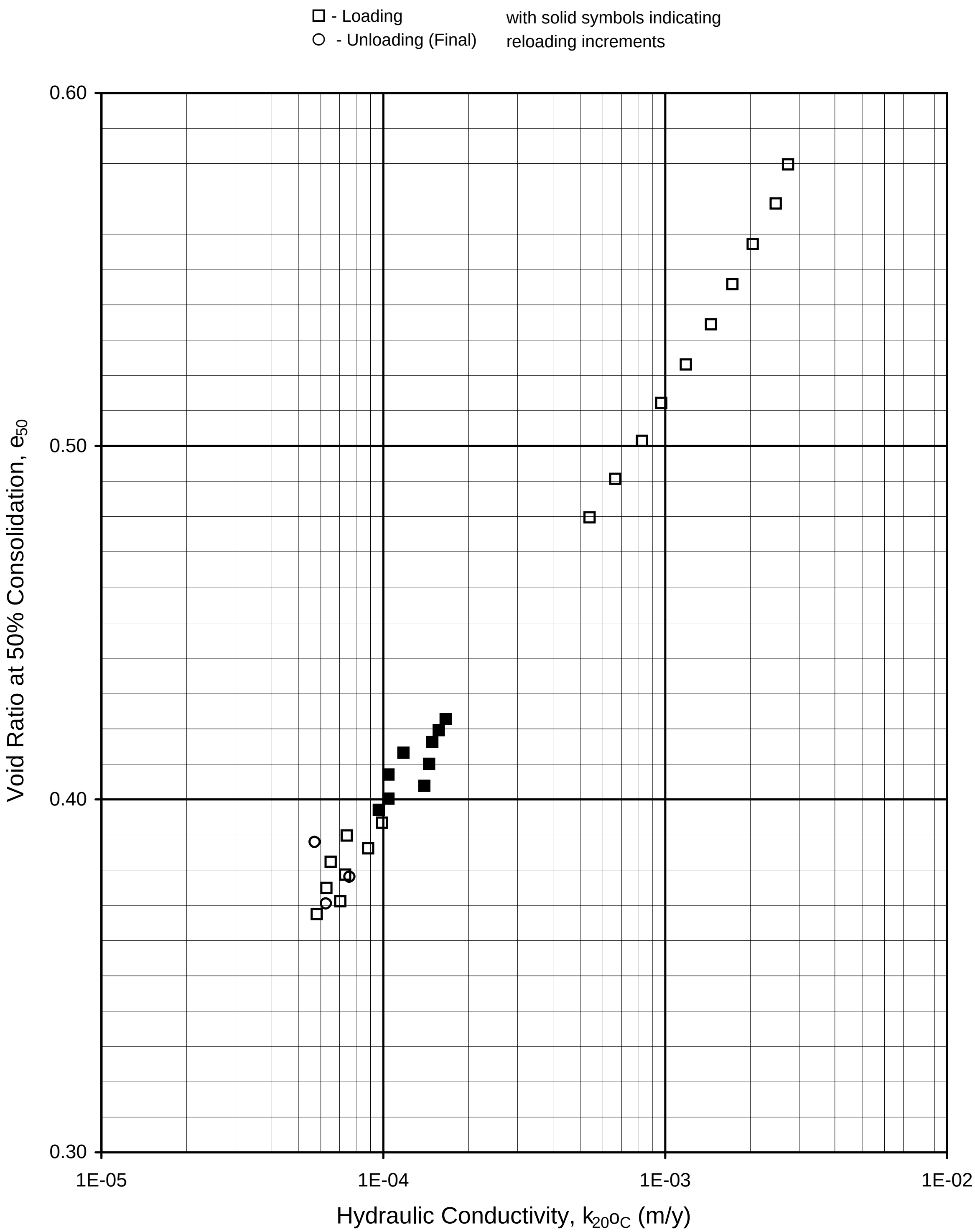
Sample No. 5a - Depth 50.70 ft

Boring B-59

Tunnel Segment of SVRT Project

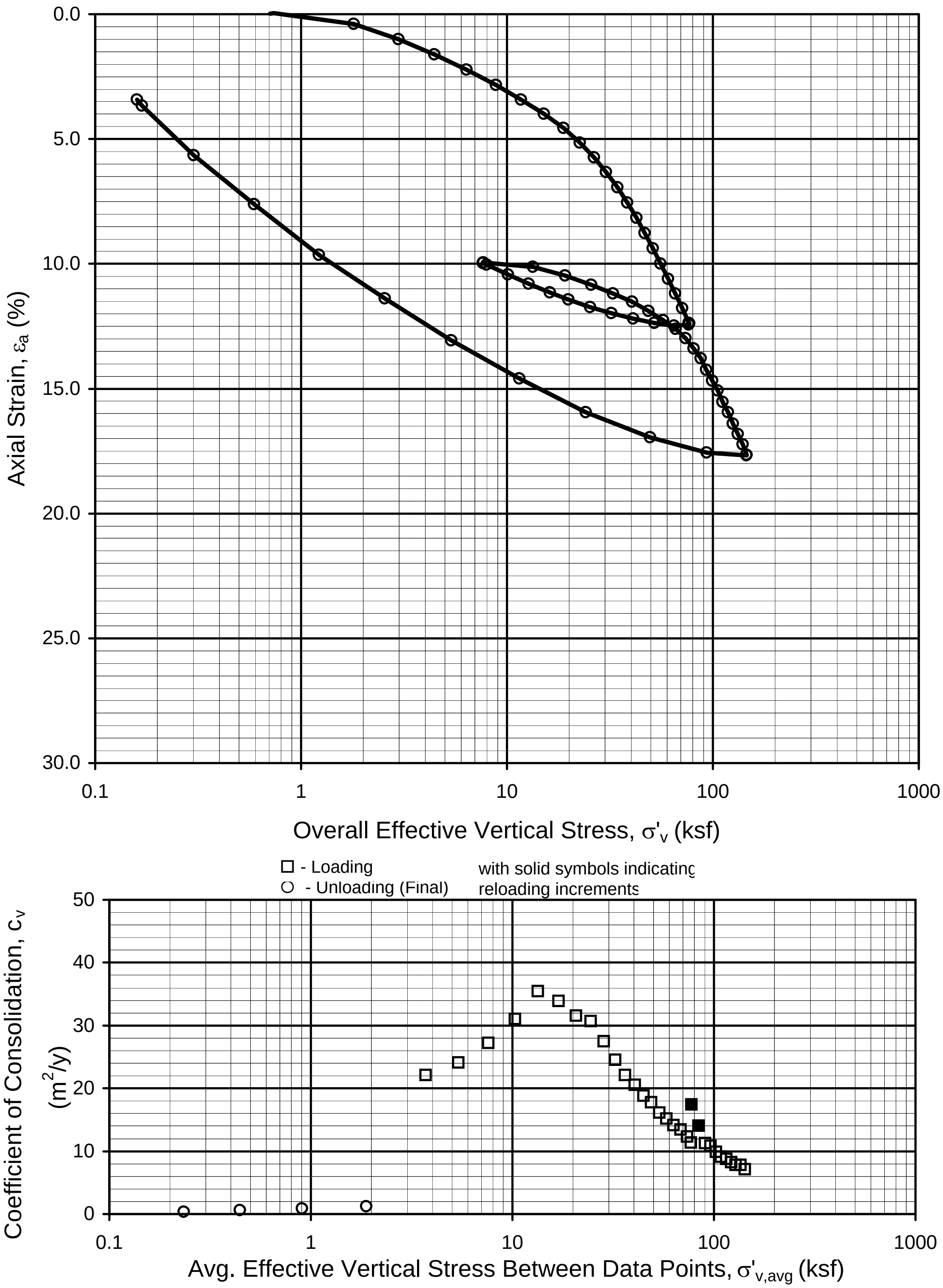
San Jose, California

FIGURE A13-28a



CRS CONSOLIDATION TEST RESULTS
Sample No. 5a - Depth 50.70 ft
Boring B-59
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-28b



CRS CONSOLIDATION TEST RESULTS

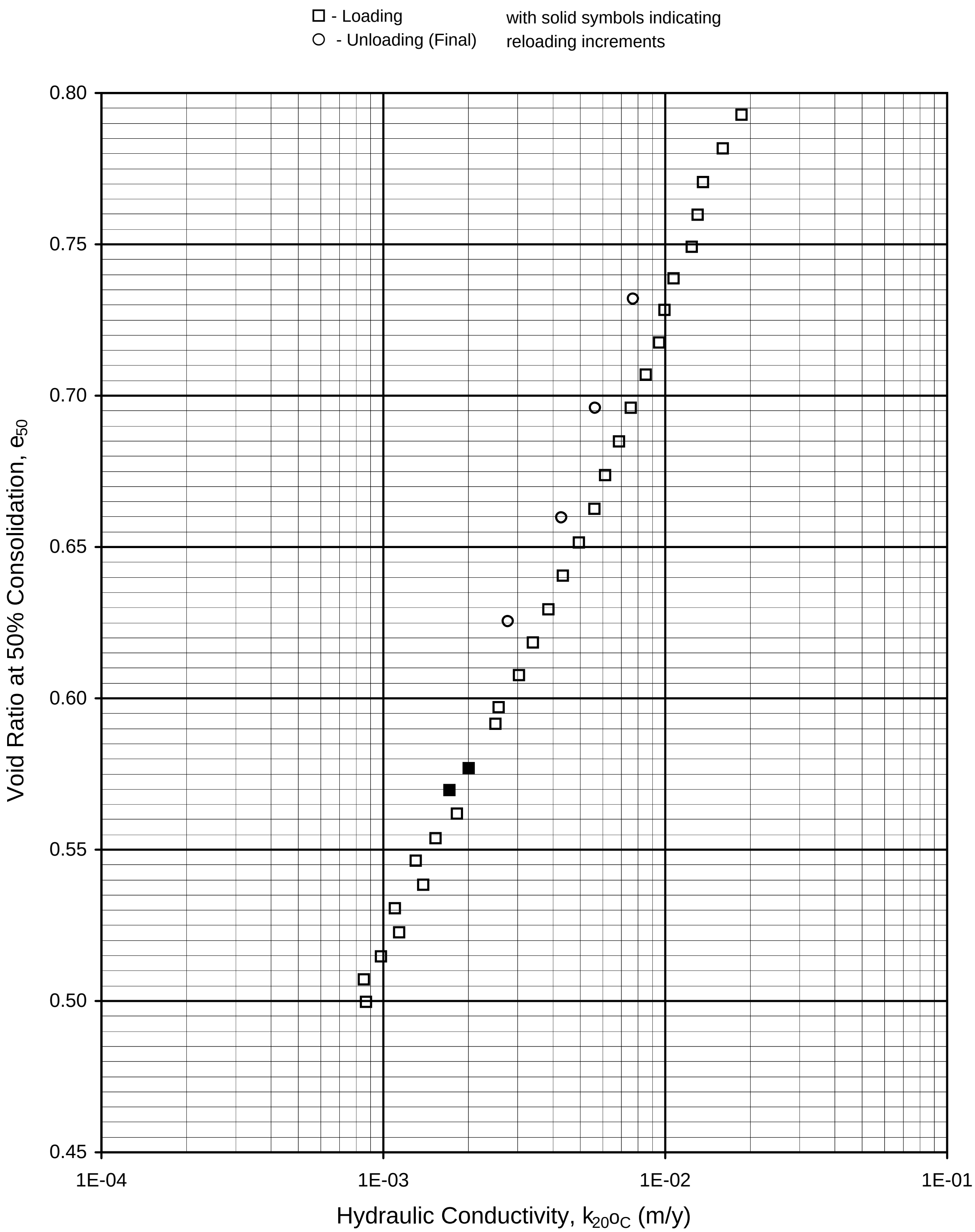
Sample No. 17a - Depth 170.00 ft

Boring B-59

Tunnel Segment of SVRT Project

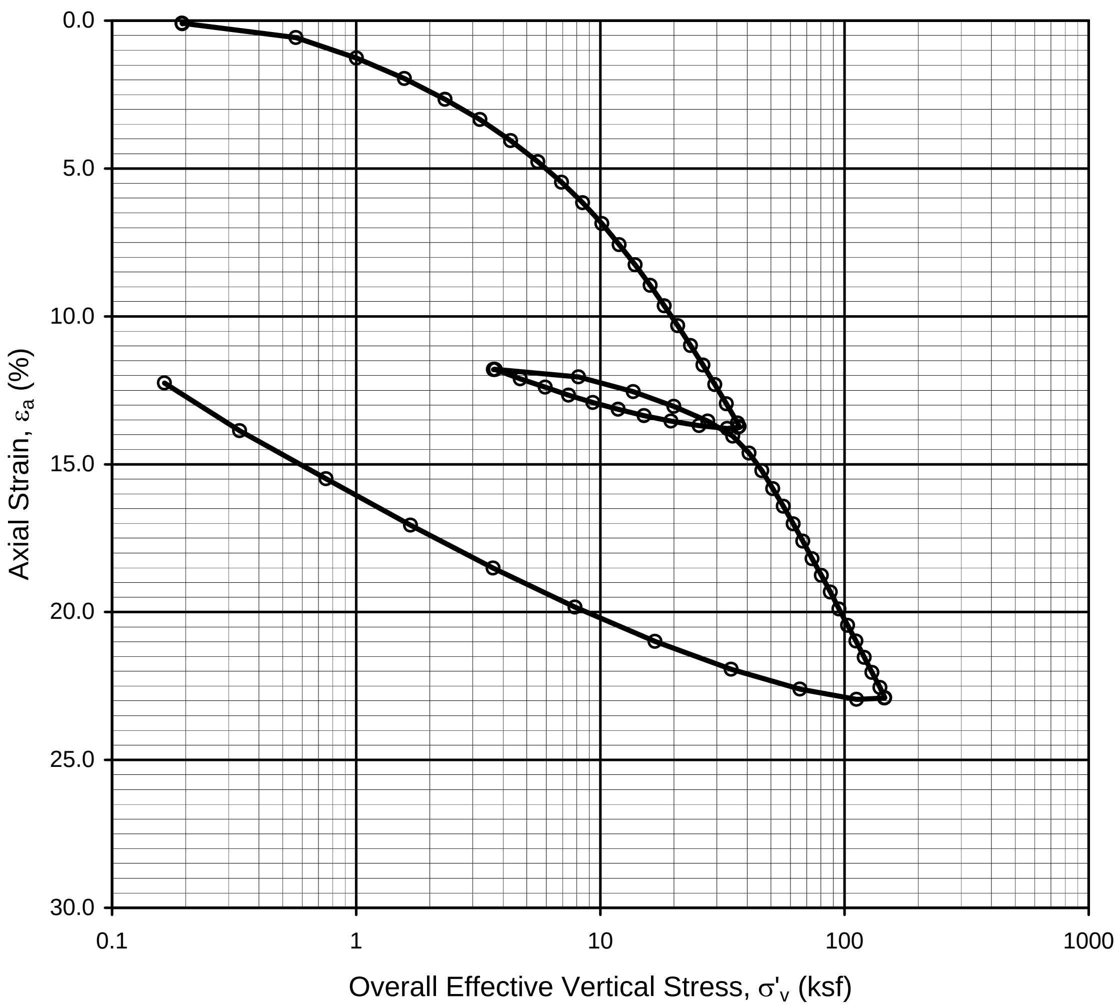
San Jose, California

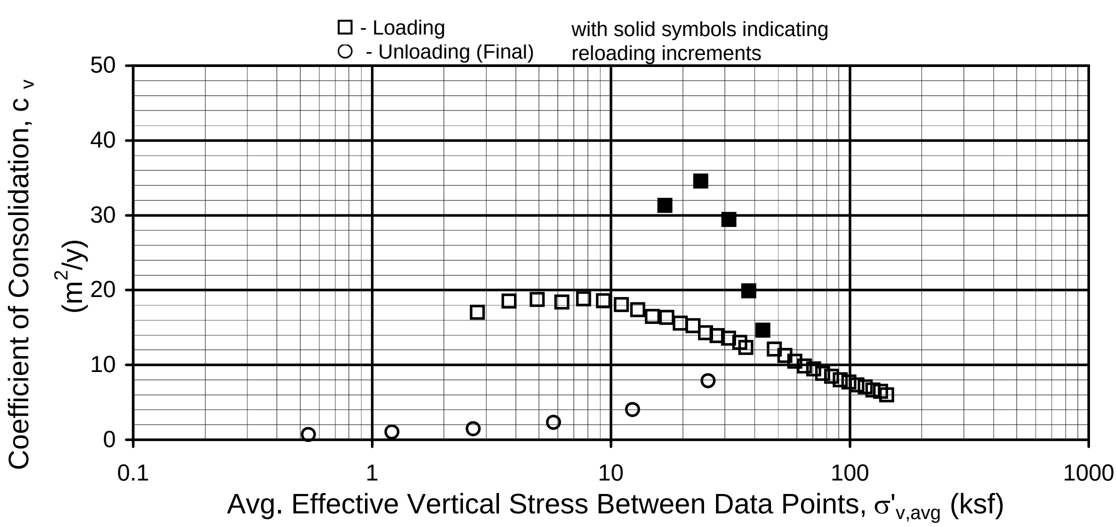
FIGURE A13-29a



CRS CONSOLIDATION TEST RESULTS
Sample No. 17a - Depth 170.00 ft
Boring B-59
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-29b

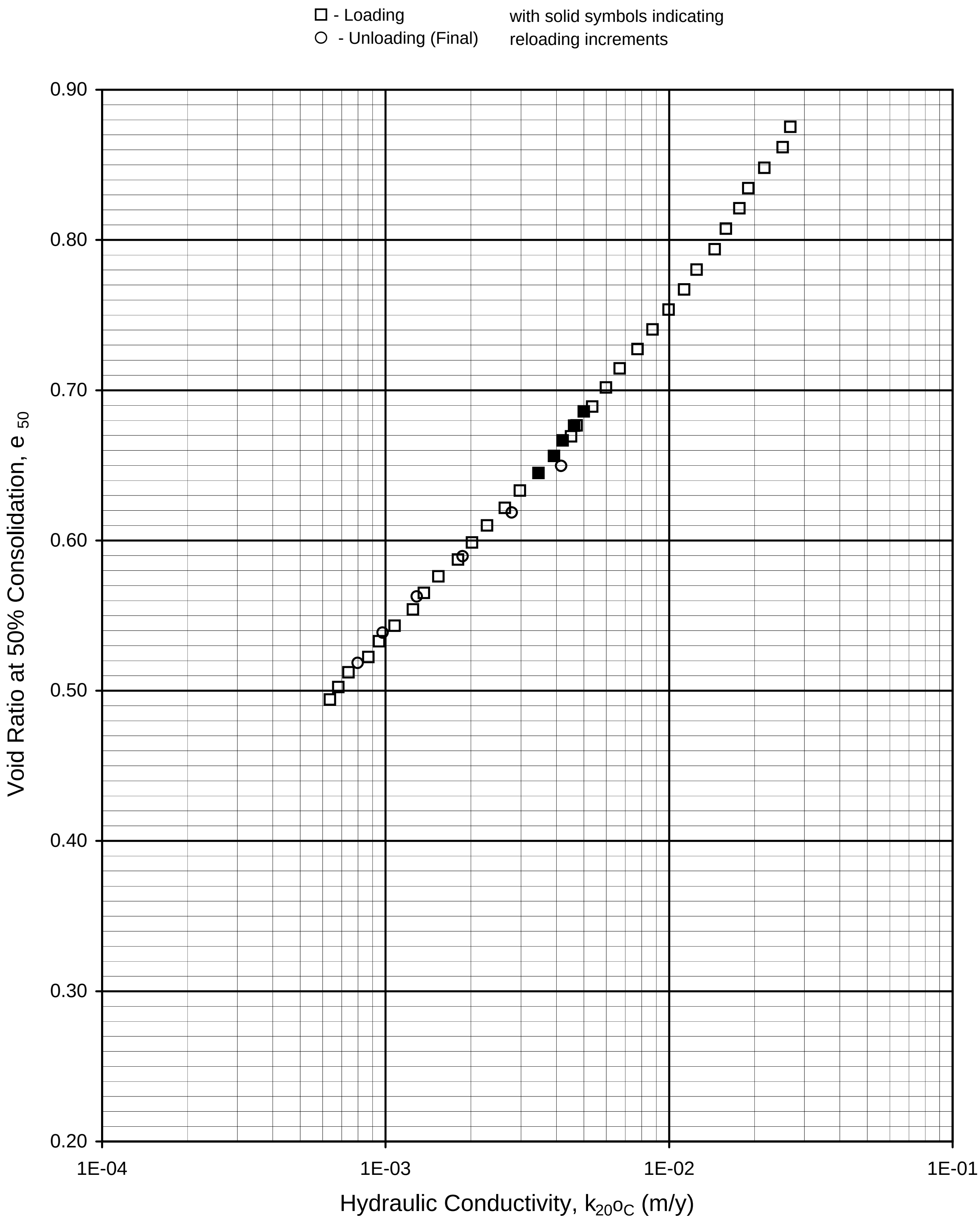




CRS CONSOLIDATION TEST RESULTS

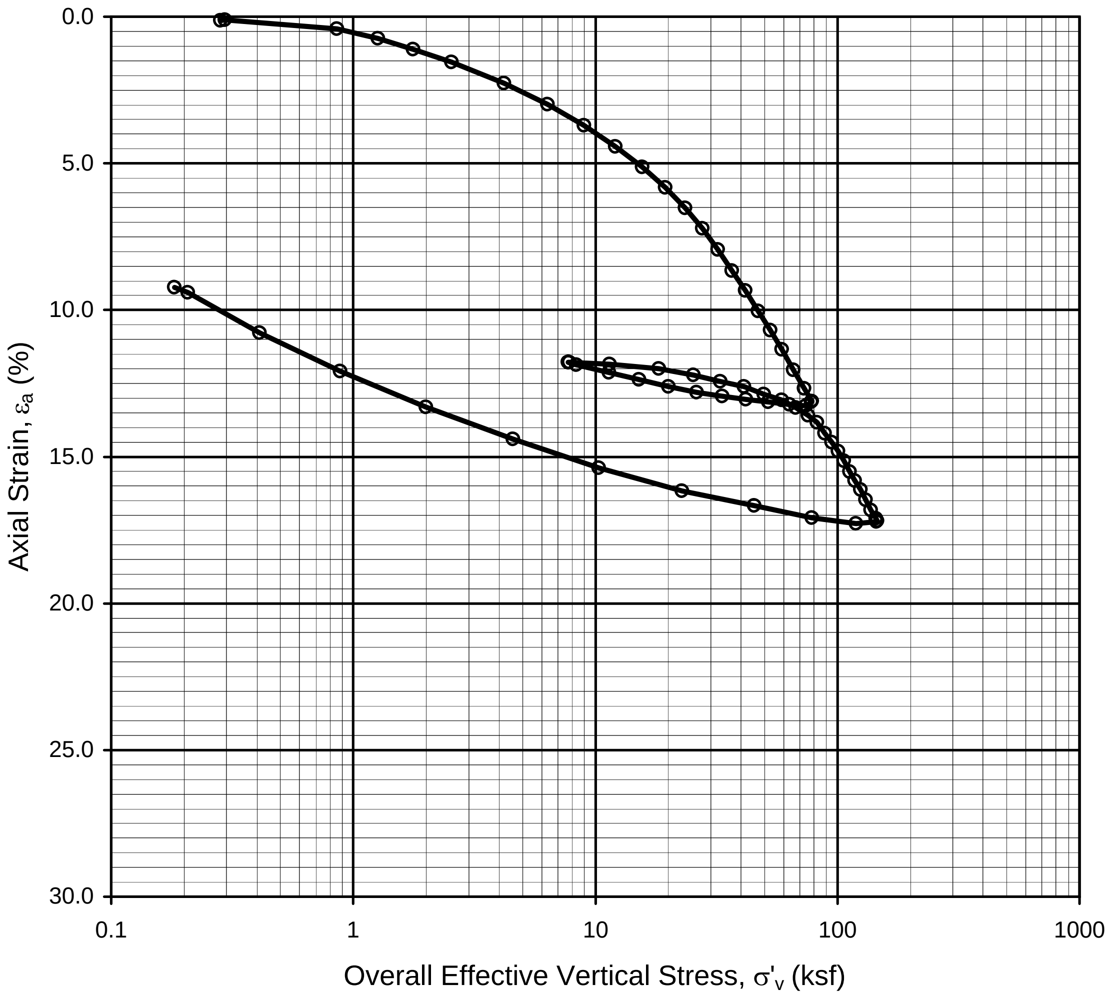
Sample No. 5a - Depth 47.20 ft
Boring B-61
Tunnel Segment of SVRT Project
San Jose, California

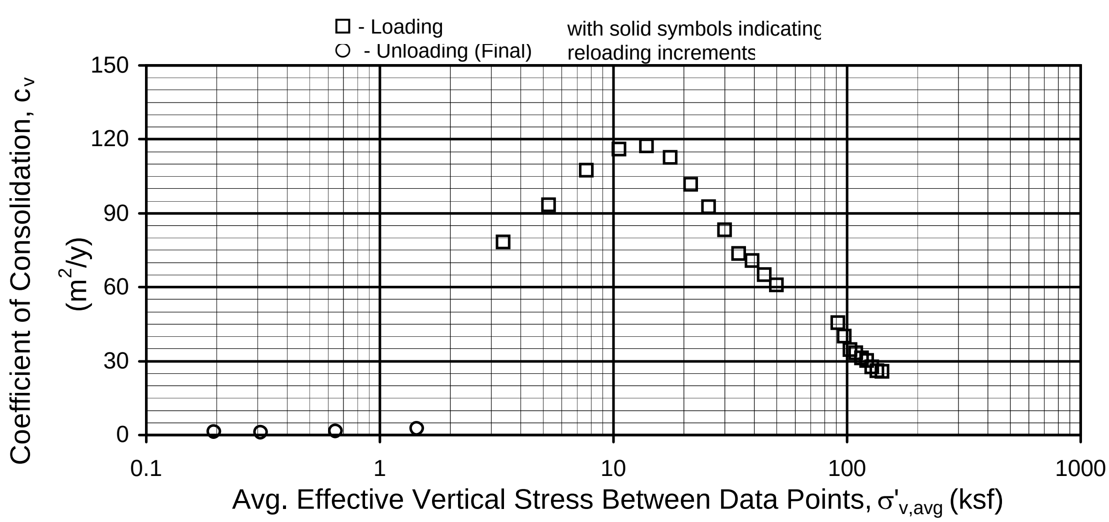
FIGURE A13-30a



CRS CONSOLIDATION TEST RESULTS
Sample No. 5a - Depth 47.20 ft
Boring B-61
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-30b





CRS CONSOLIDATION TEST RESULTS

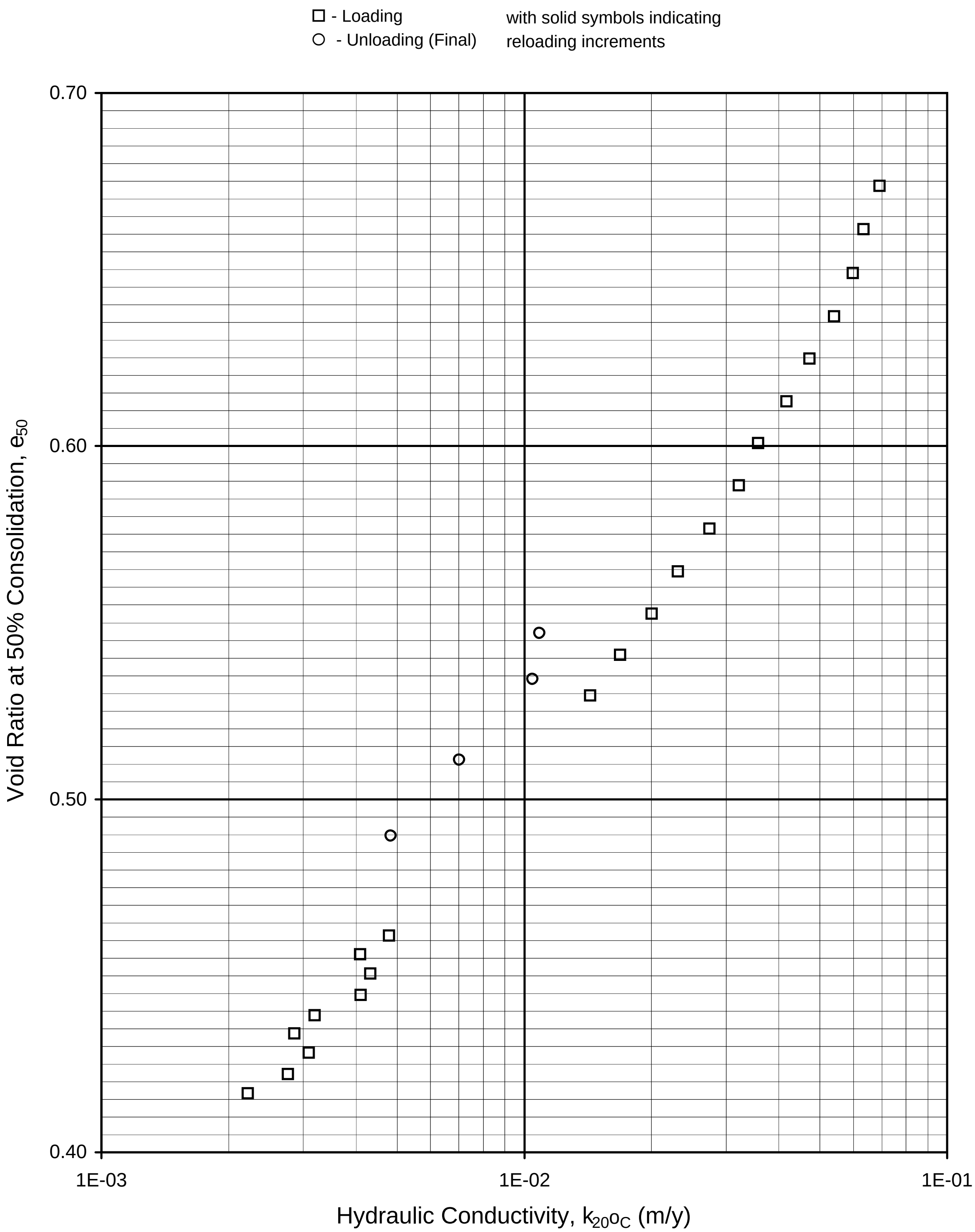
Sample No. 15a - Depth 136.00 ft

Boring B-61

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-31a



CRS CONSOLIDATION TEST RESULTS

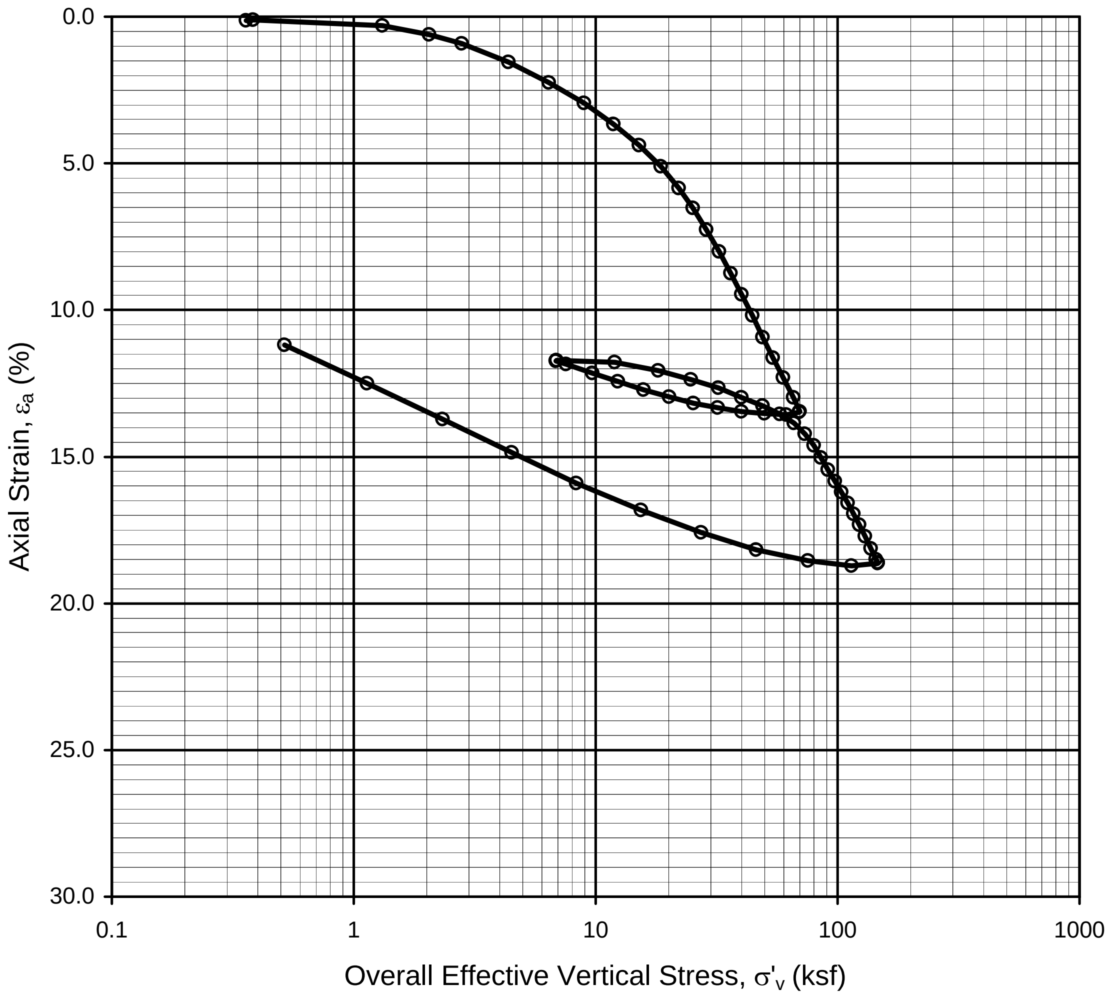
Sample No. 15a - Depth 136.00 ft

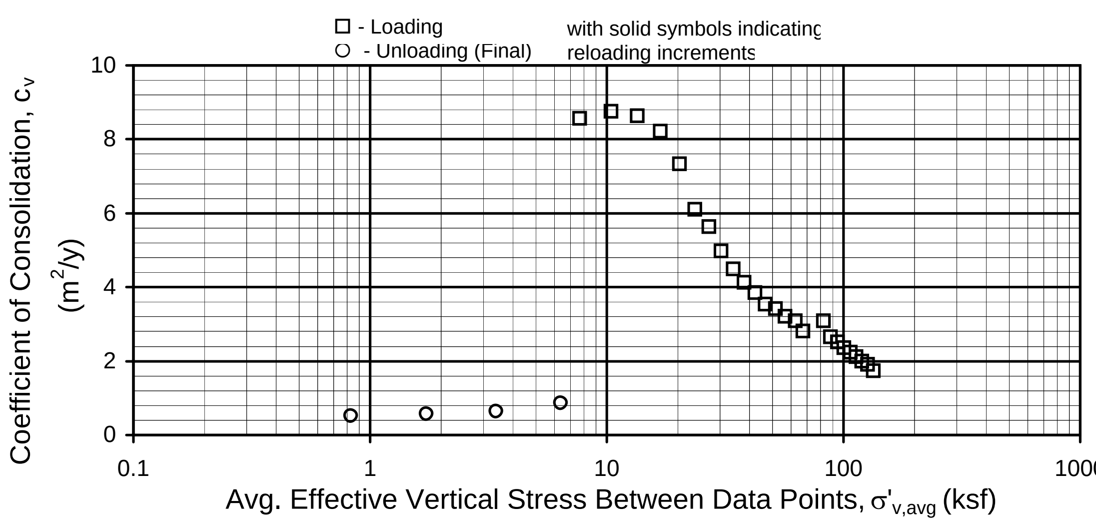
Boring B-61

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-31b





CRS CONSOLIDATION TEST RESULTS

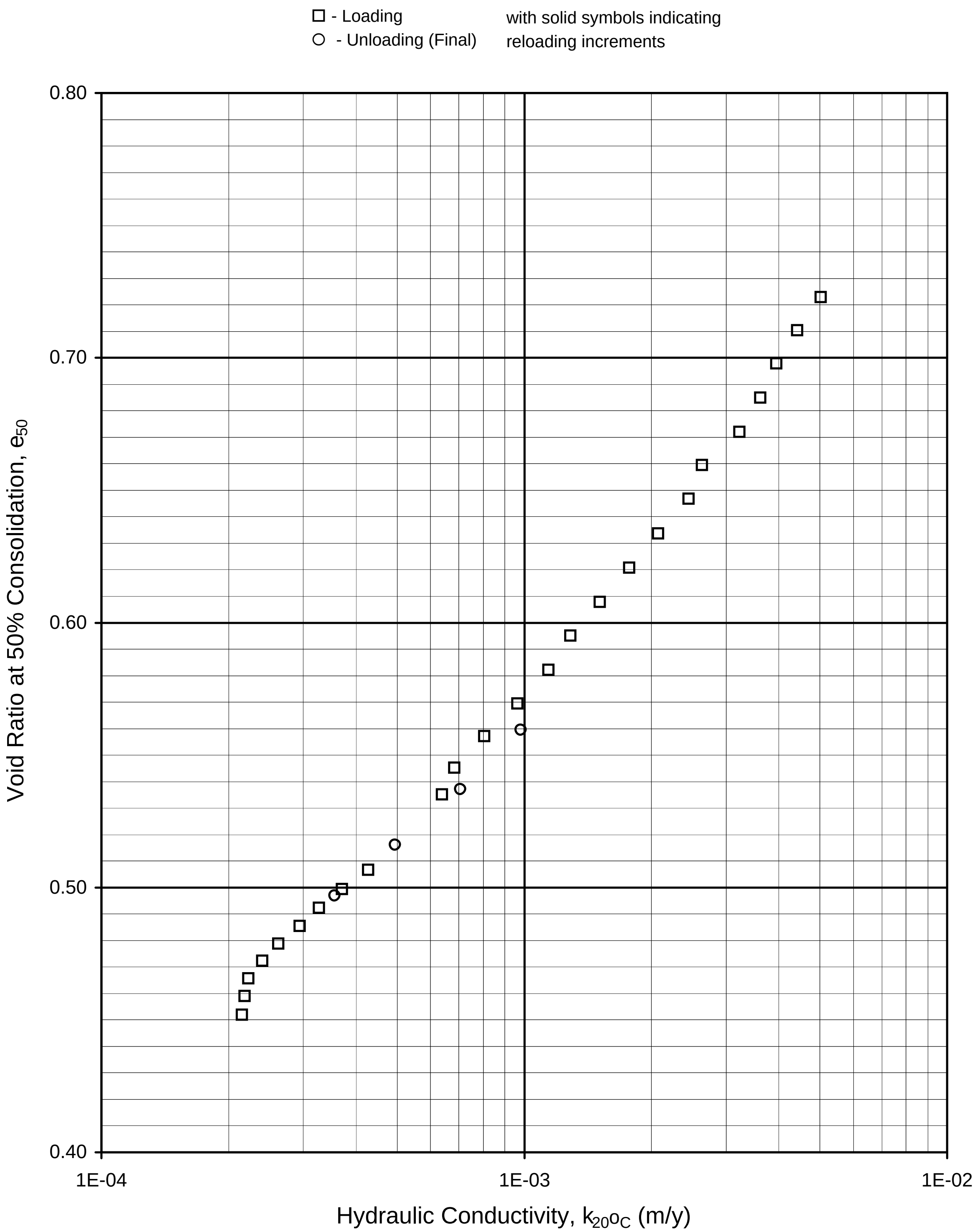
Sample No. 17a - Depth 135.45 ft

Boring B-61

Tunnel Segment of SVRT Project

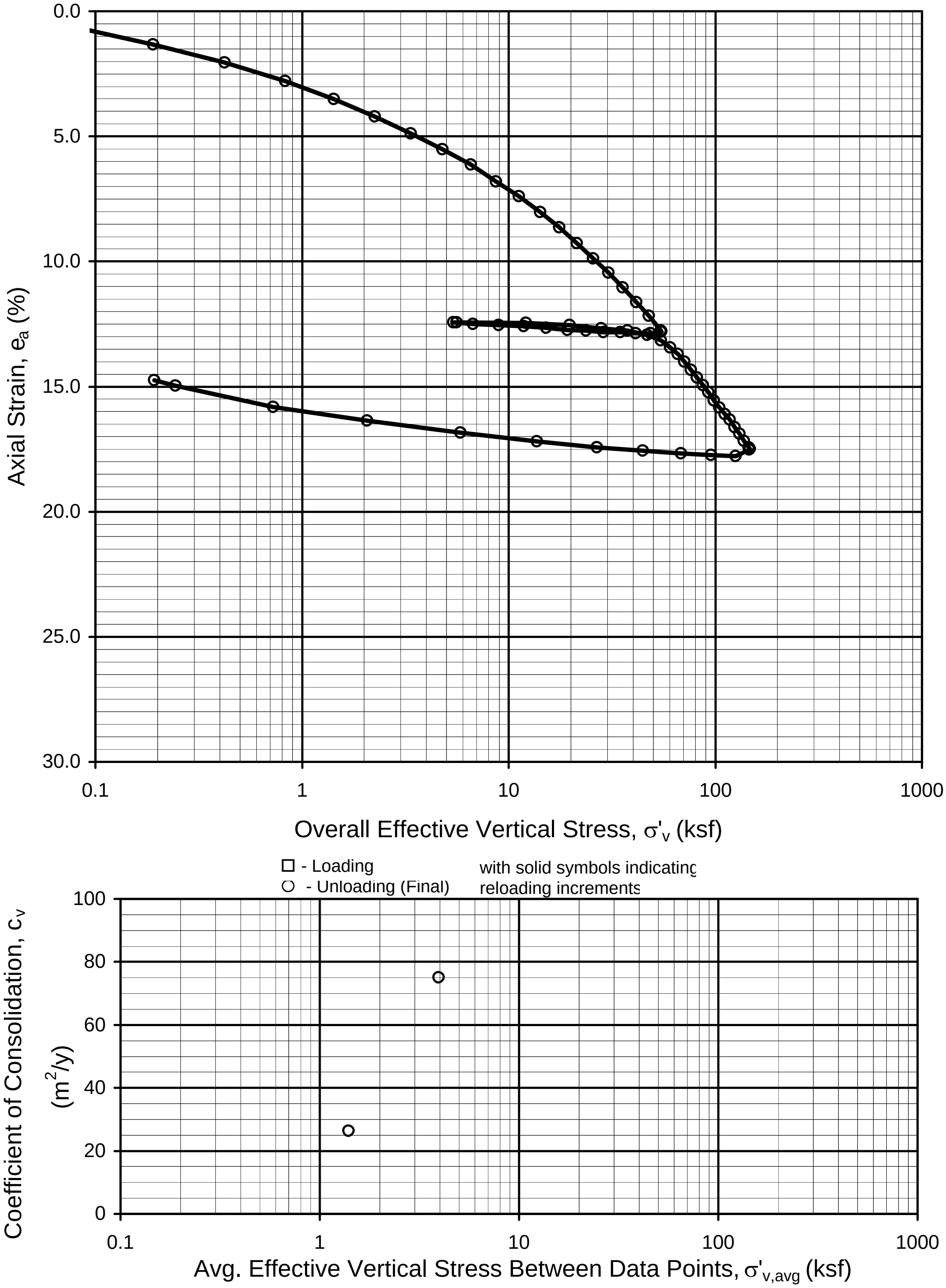
San Jose, California

FIGURE A13-32a



CRS CONSOLIDATION TEST RESULTS
Sample No. 17a - Depth 135.45 ft
Boring B-61
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-32b



CRS CONSOLIDATION TEST RESULTS

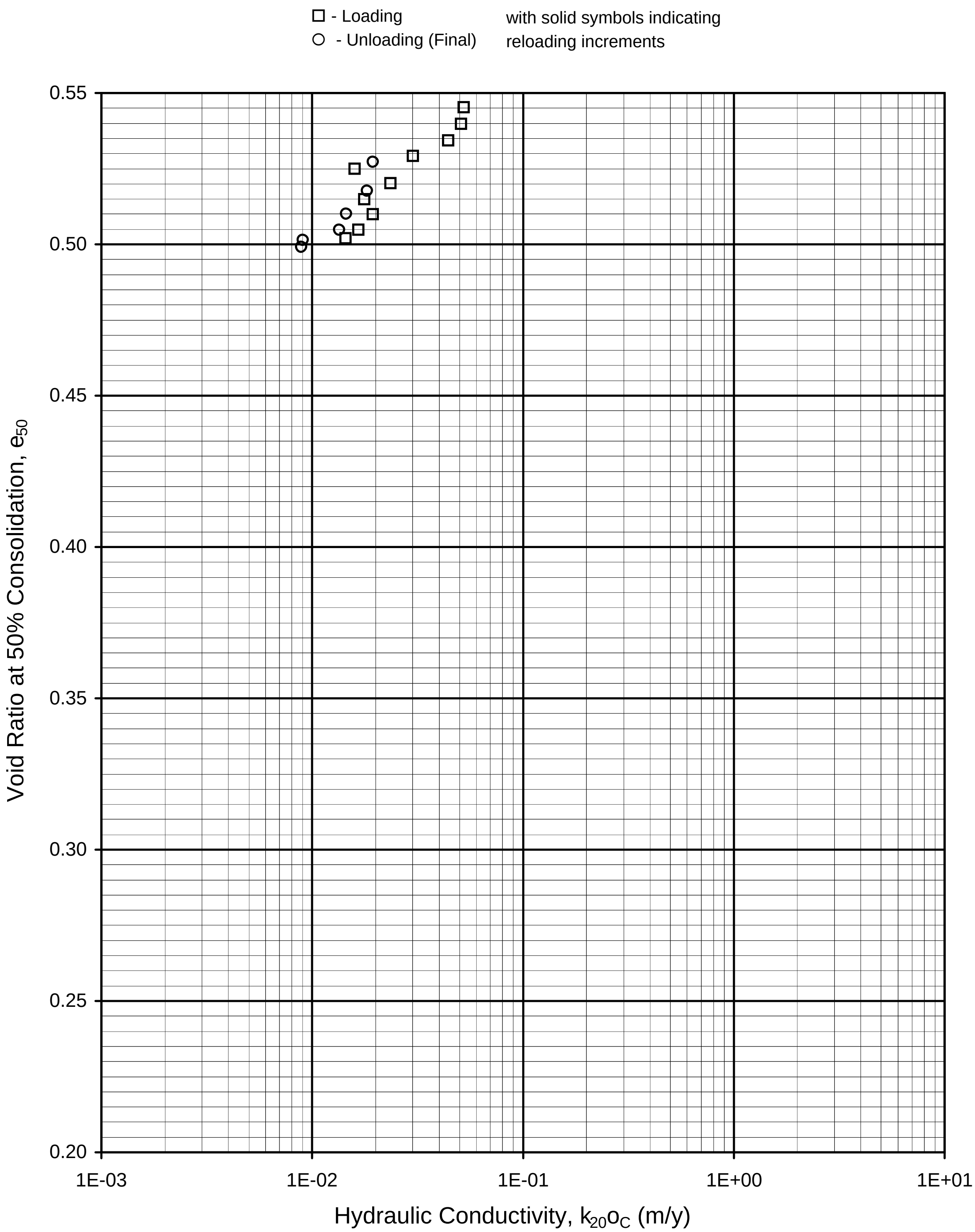
Sample No. 5a - Depth 32.50 ft

Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-33a



CRS CONSOLIDATION TEST RESULTS

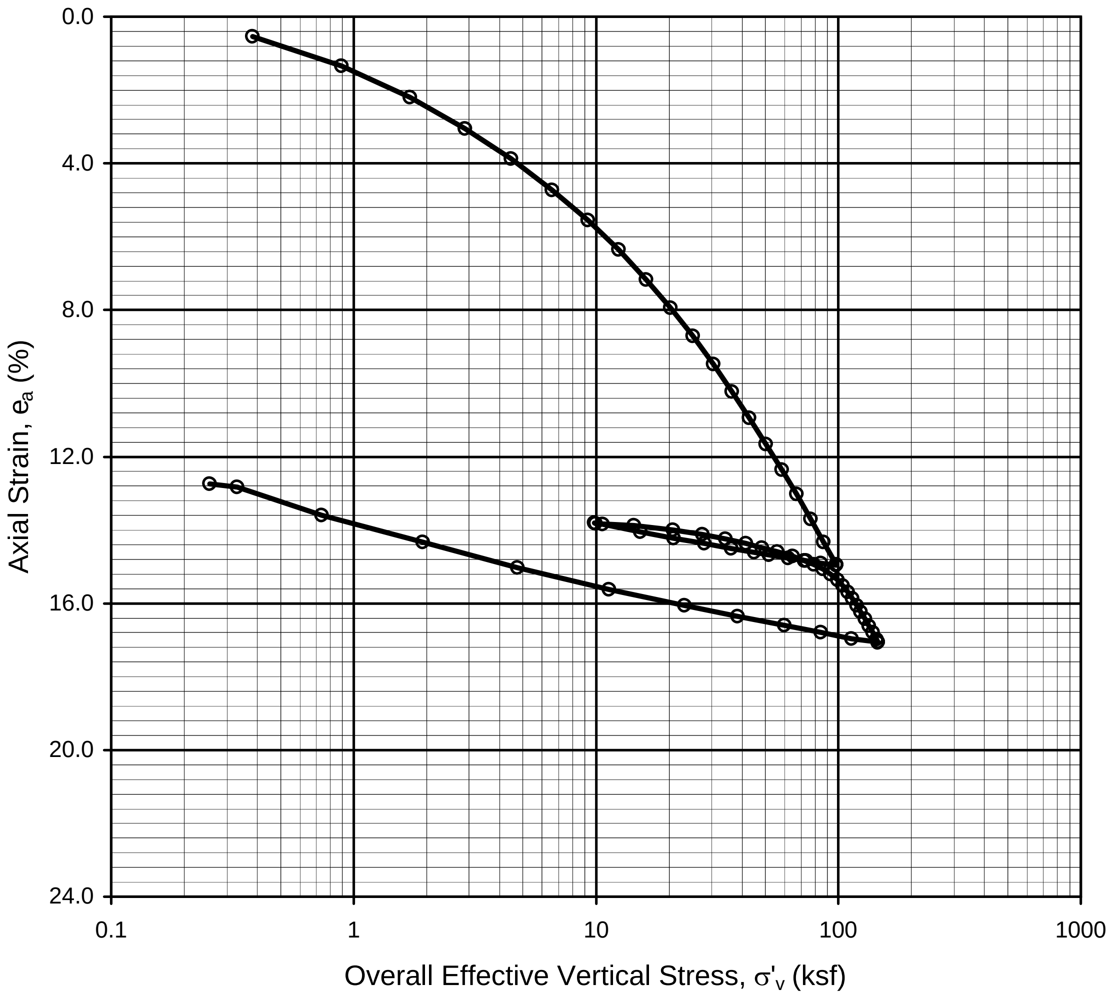
Sample No. 5a - Depth 32.50 ft

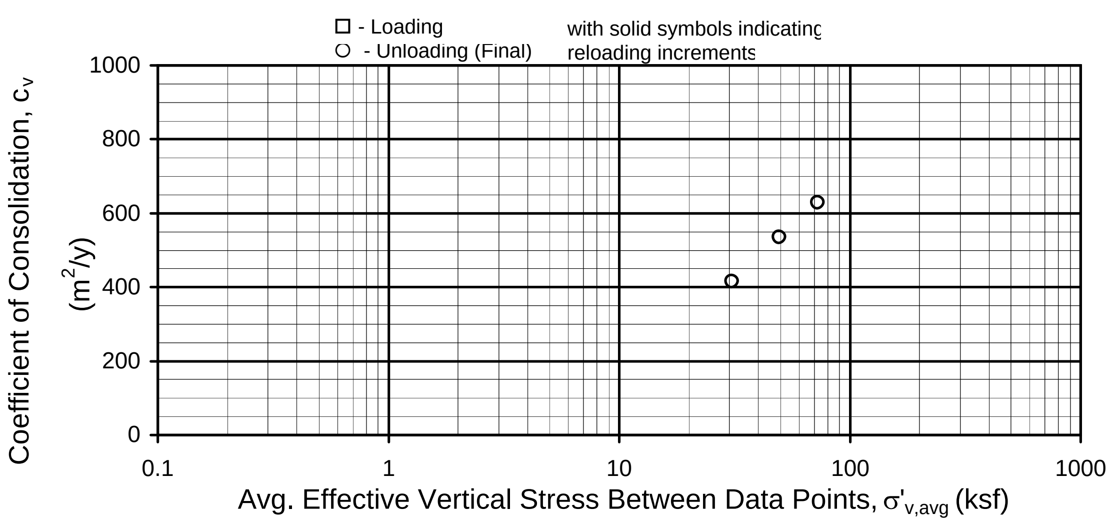
Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-33b





CRS CONSOLIDATION TEST RESULTS

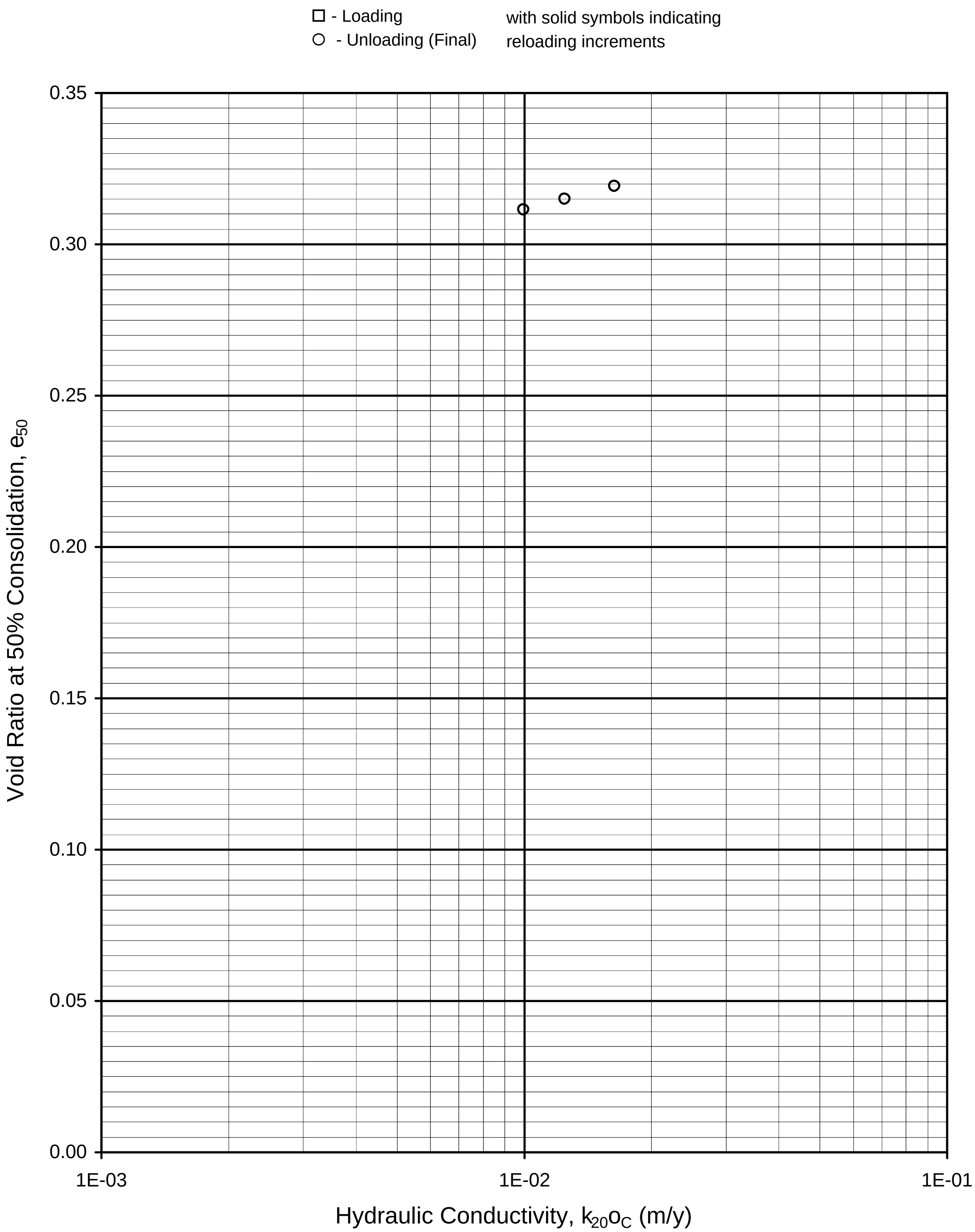
Sample No. 18a - Depth 107.05 ft

Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-34a



CRS CONSOLIDATION TEST RESULTS

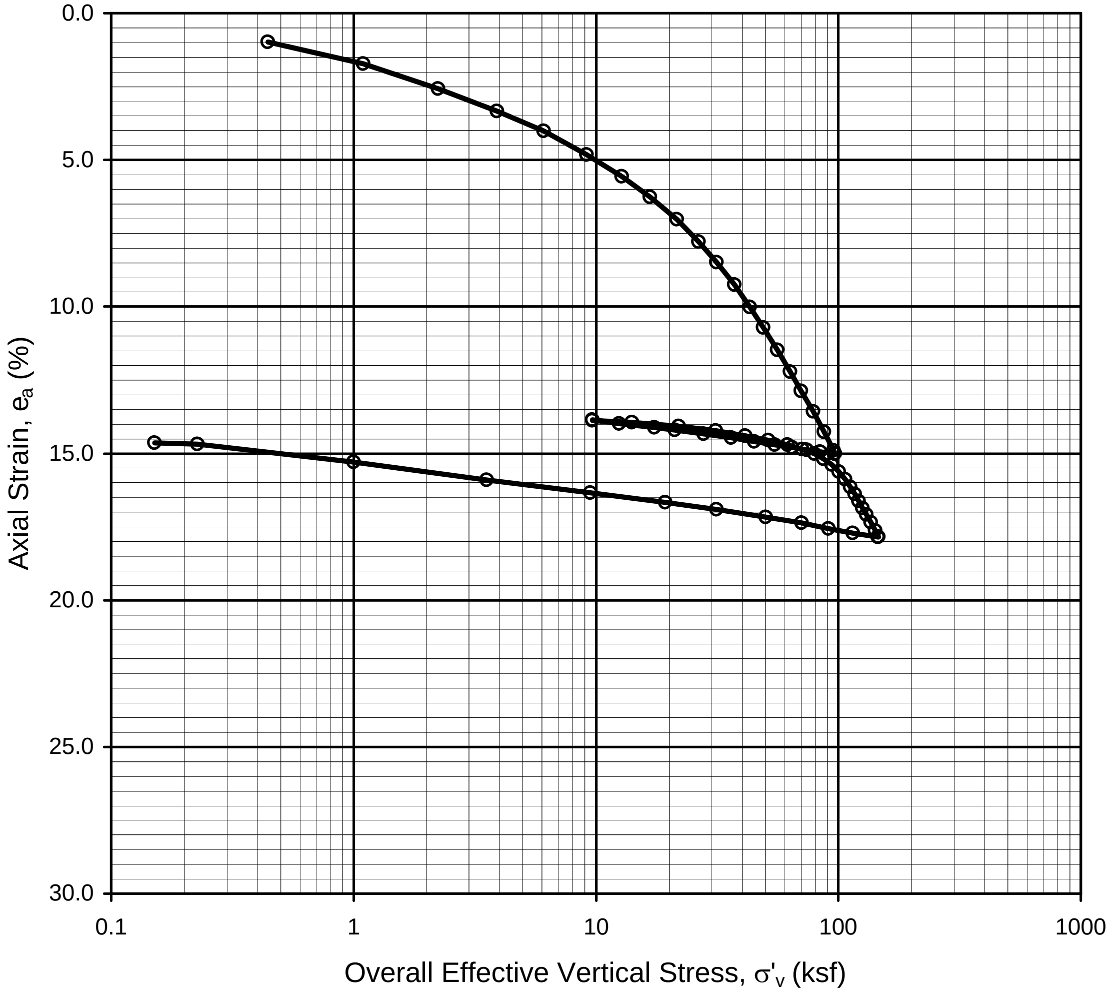
Sample No. 18a - Depth 107.05 ft

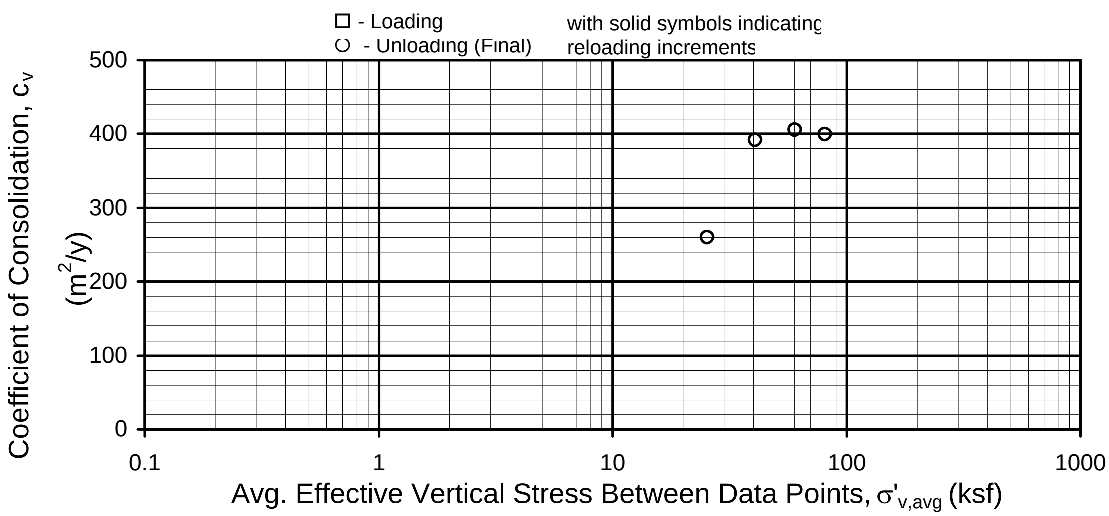
Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-34b





CRS CONSOLIDATION TEST RESULTS

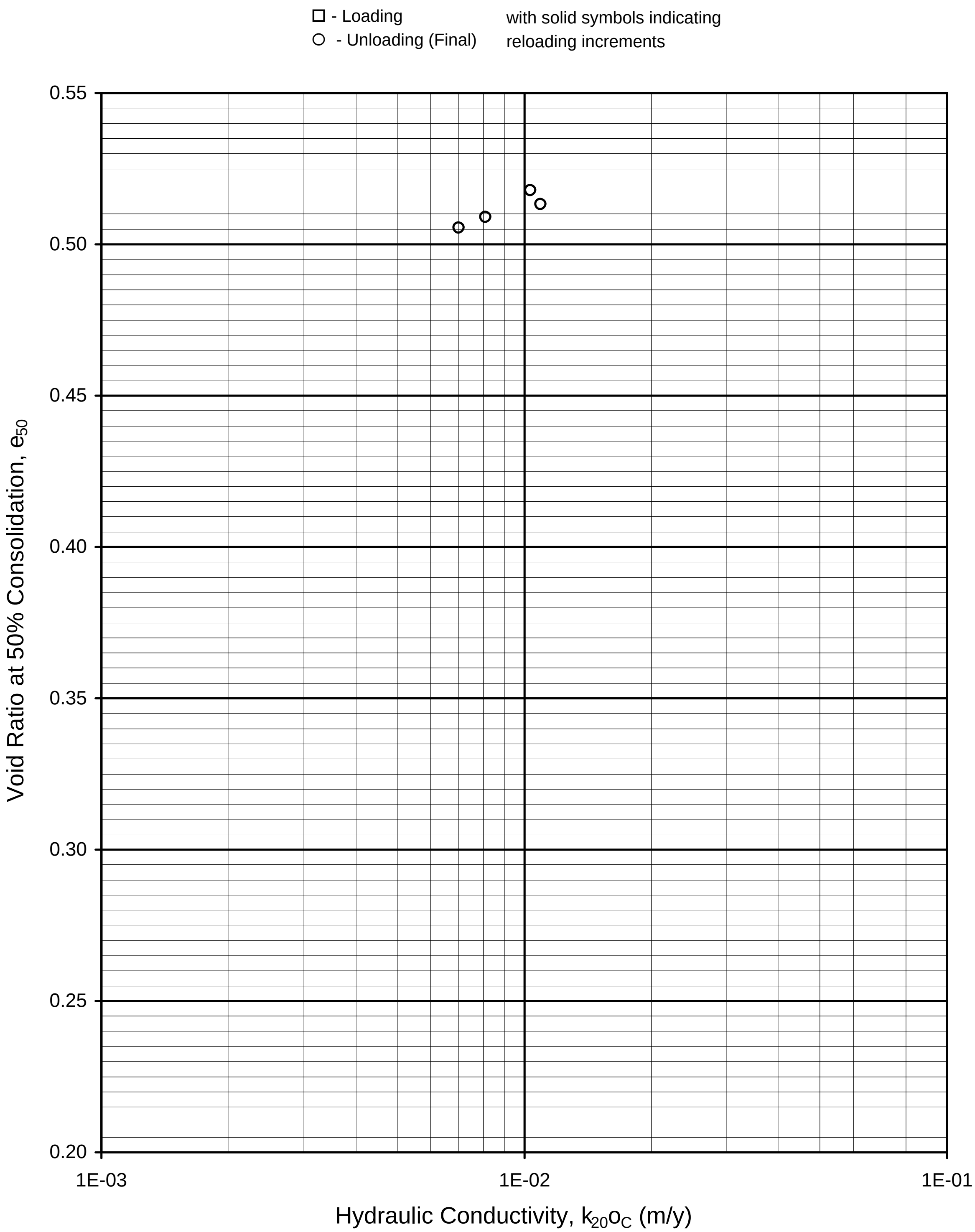
Sample No. 19a - Depth 117.40 ft

Boring B-64

Tunnel Segment of SVRT Project

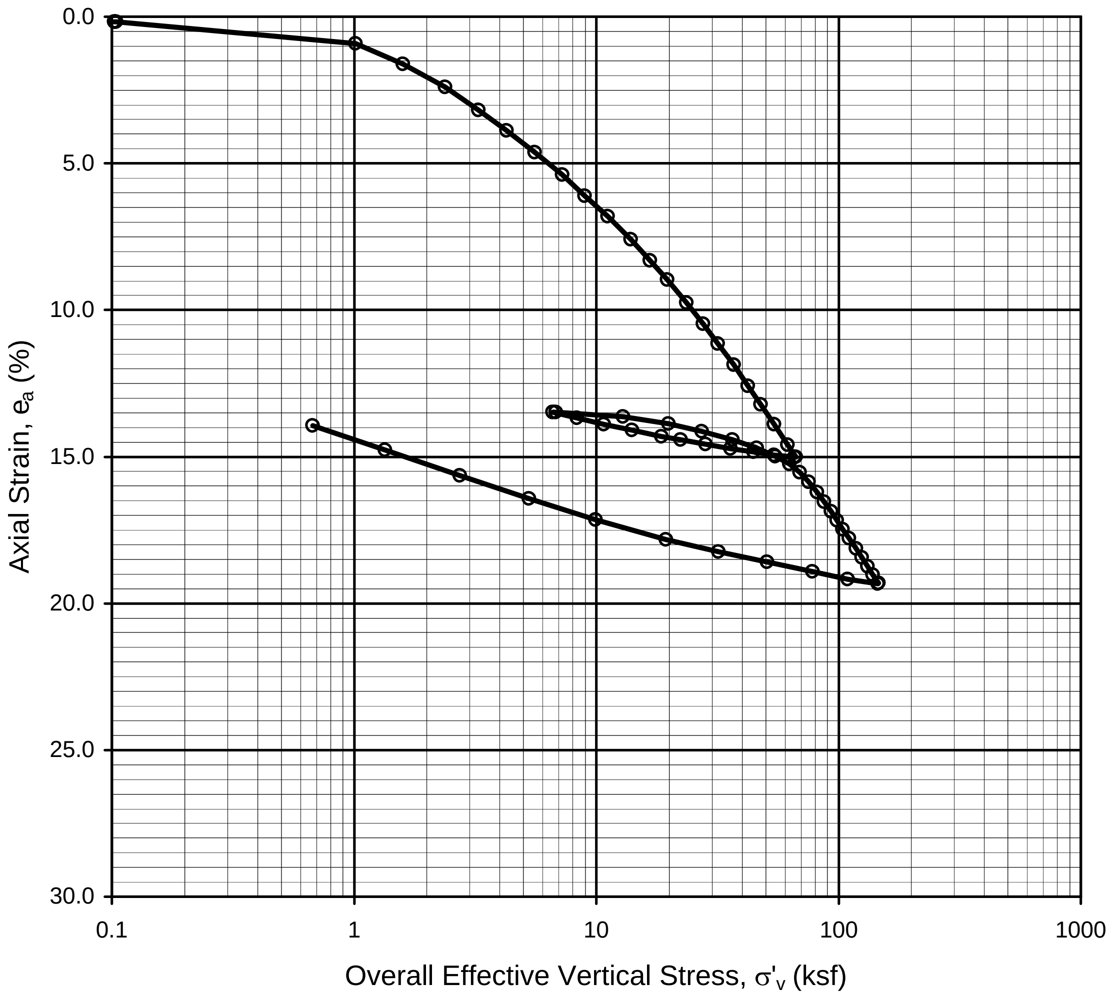
San Jose, California

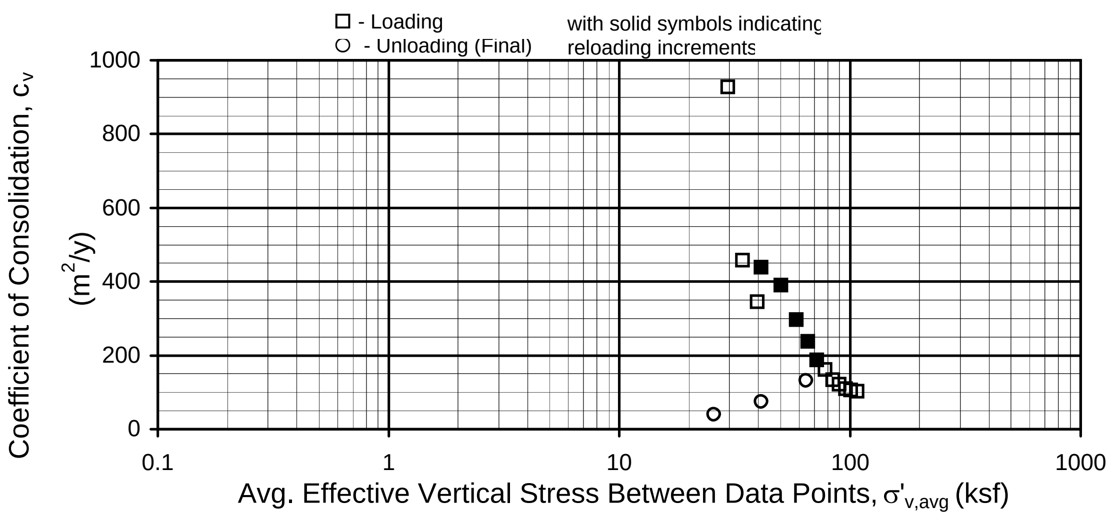
FIGURE A13-35a



CRS CONSOLIDATION TEST RESULTS
Sample No. 19a - Depth 117.40 ft
Boring B-64
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-35b

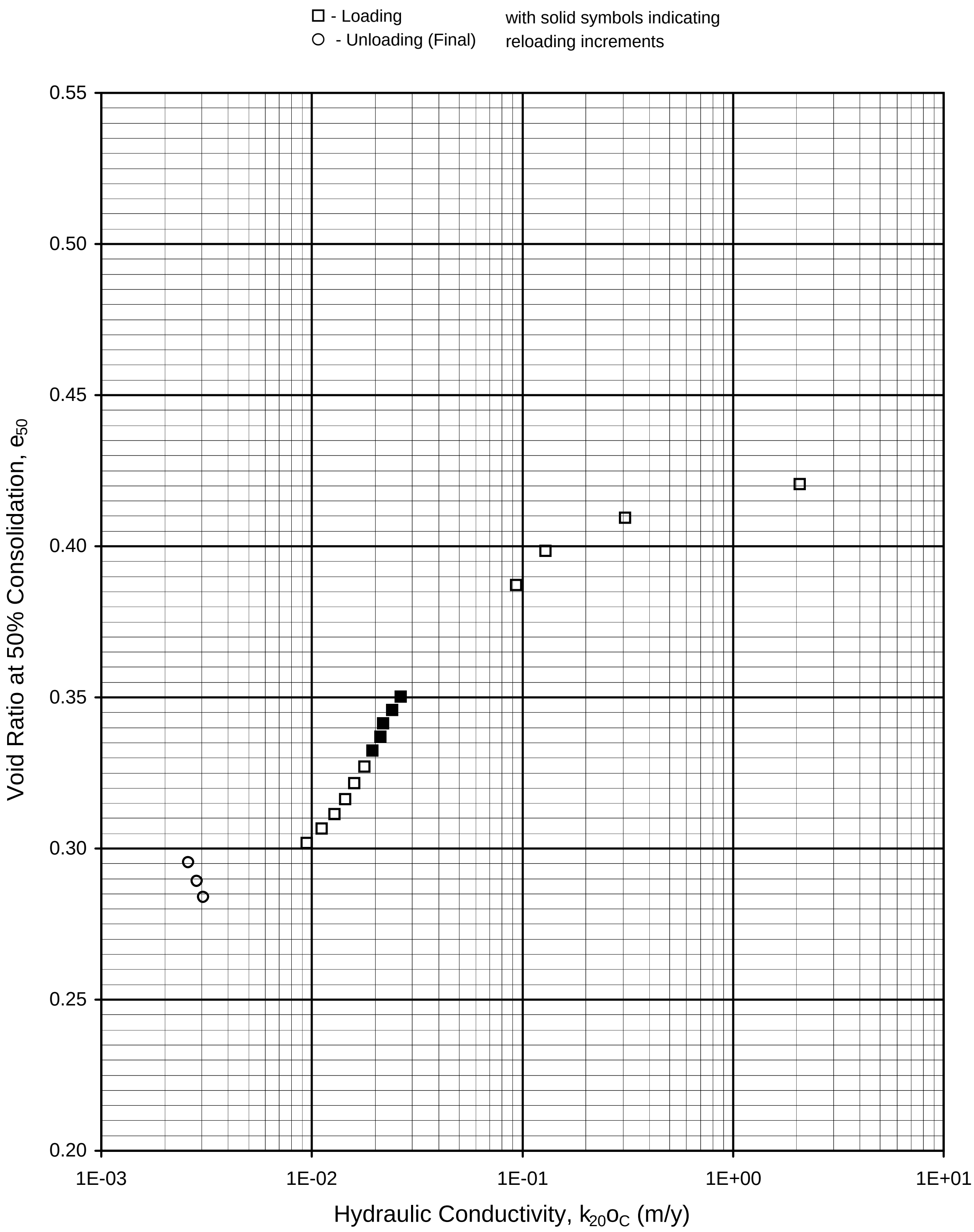




CRS CONSOLIDATION TEST RESULTS

Sample No. 13a - Depth 121.60 ft
Boring B-65
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-36a



CRS CONSOLIDATION TEST RESULTS

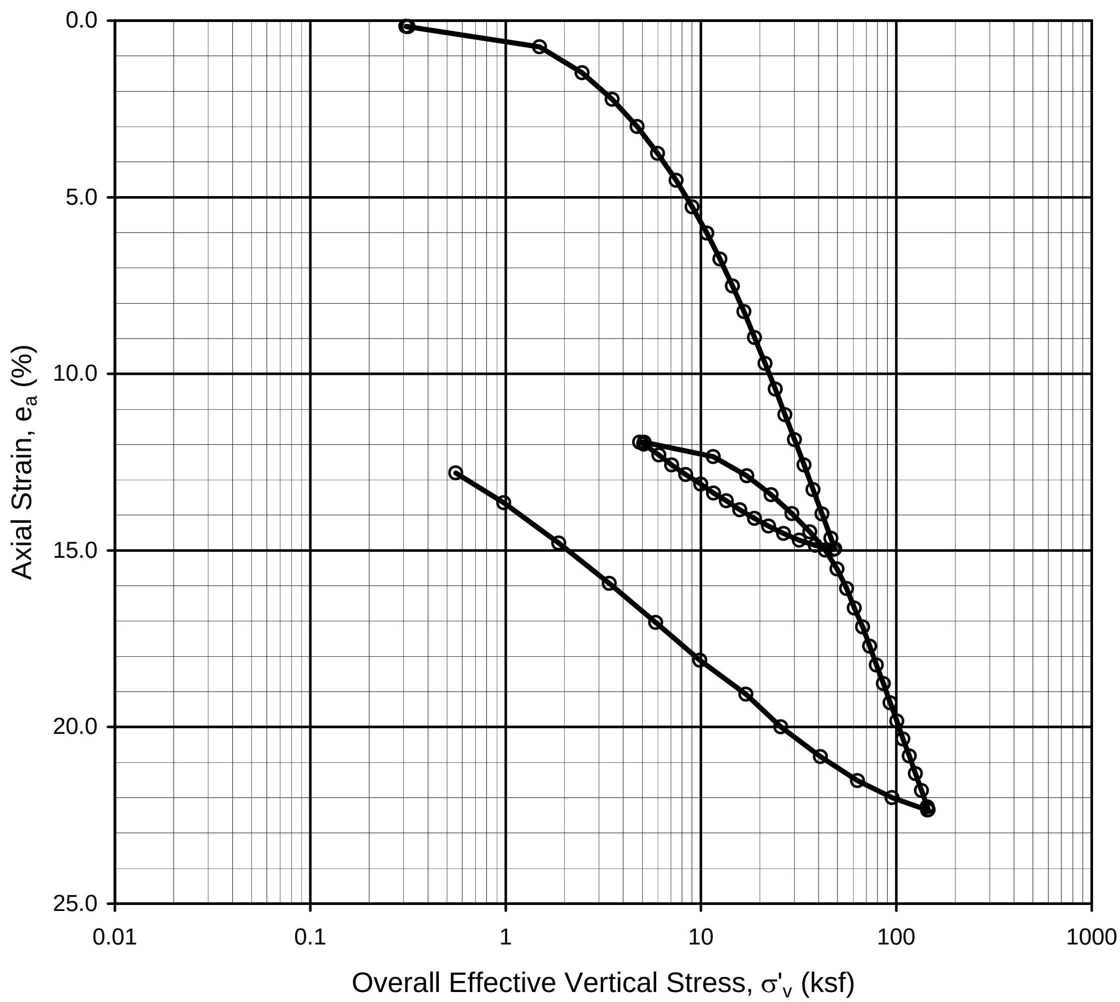
Sample No. 13a - Depth 121.60 ft

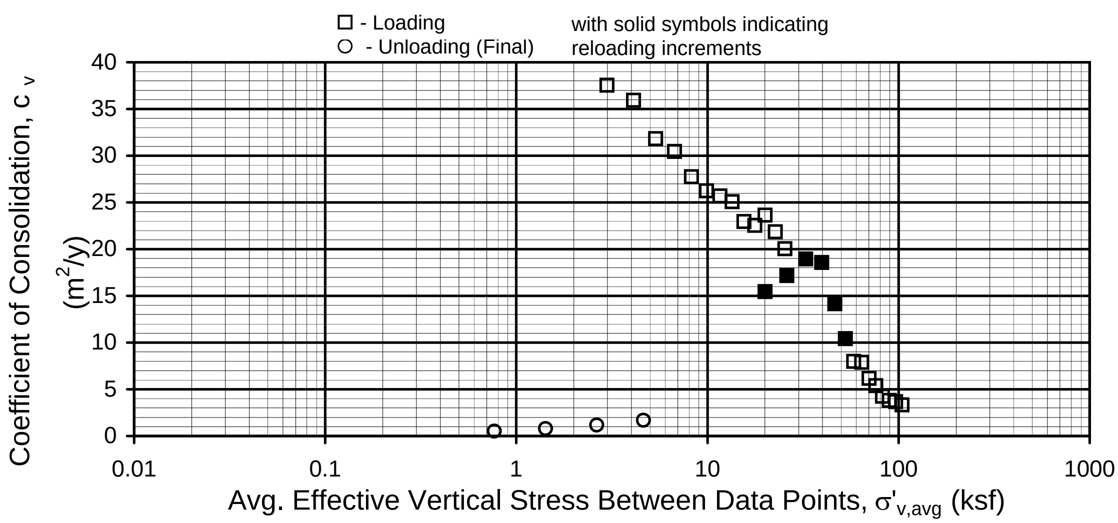
Boring B-65

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A13-36b





CRS CONSOLIDATION TEST RESULTS

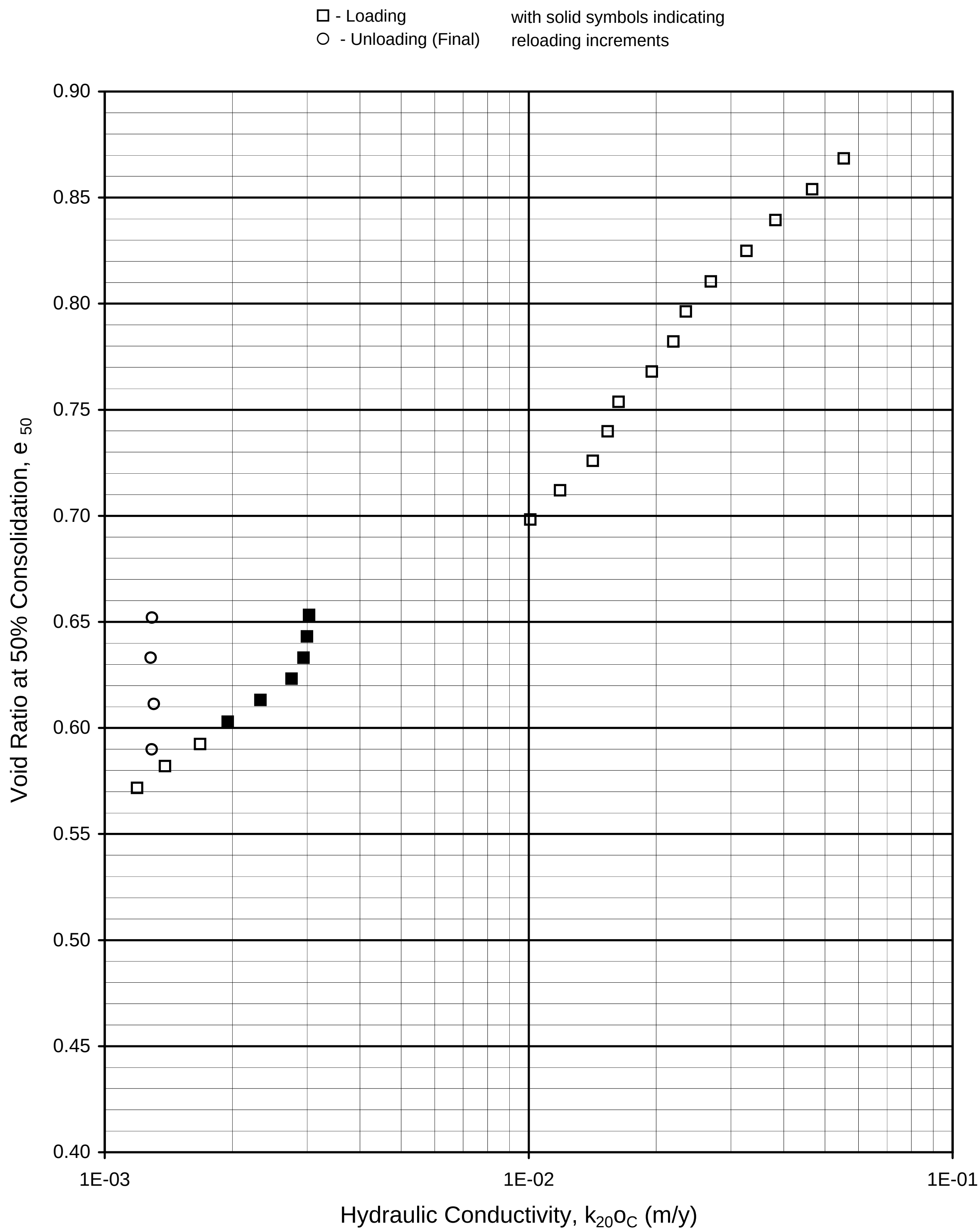
Sample No. 6 - Depth 25.00 ft

Boring B-71

Tunnel Segment of SVRT Project

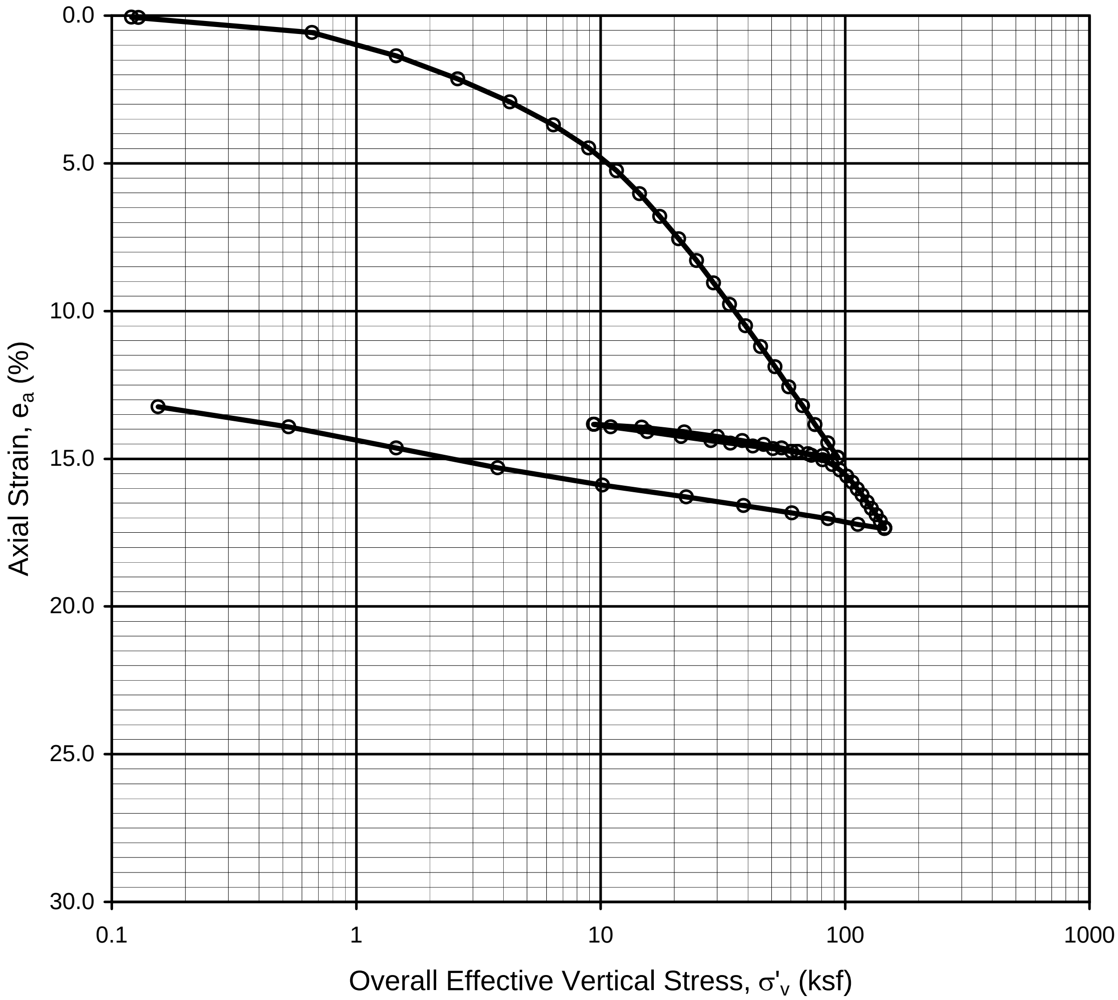
San Jose, California

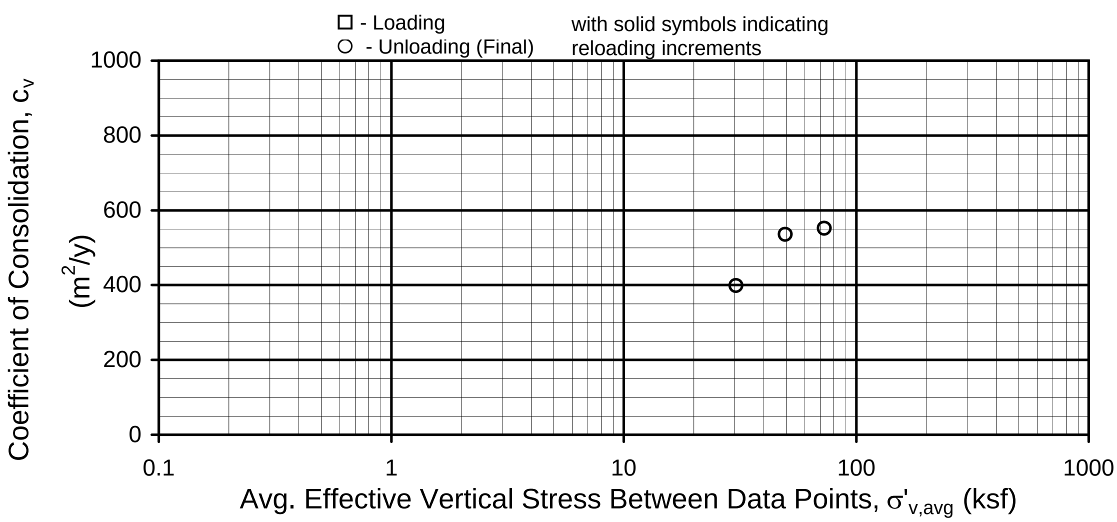
FIGURE A13-37a



CRS CONSOLIDATION TEST RESULTS
Sample No. 6 - Depth 25.00 ft
Boring B-71
Tunnel Segment of SVRT Project
San Jose, California

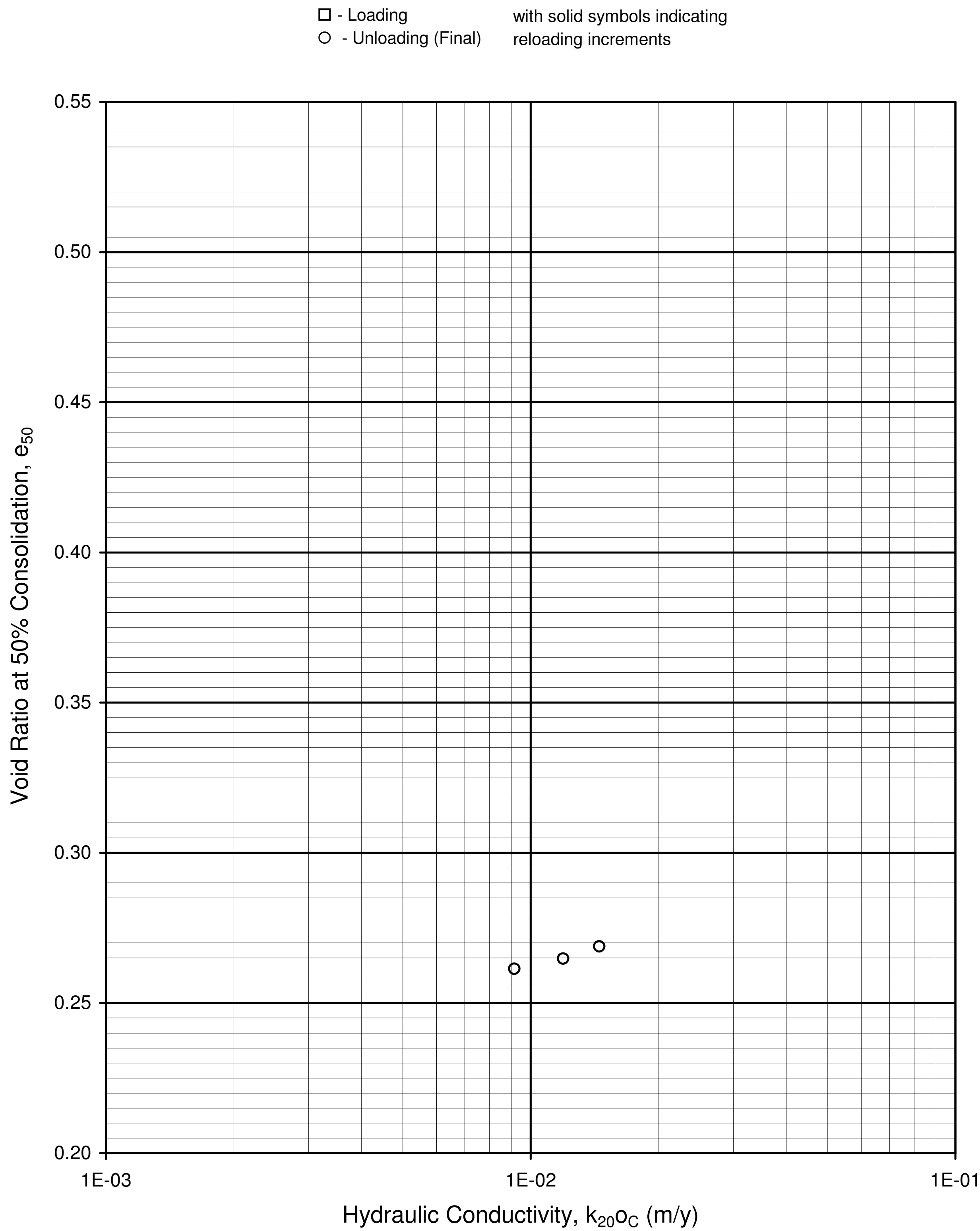
FIGURE A13-37b





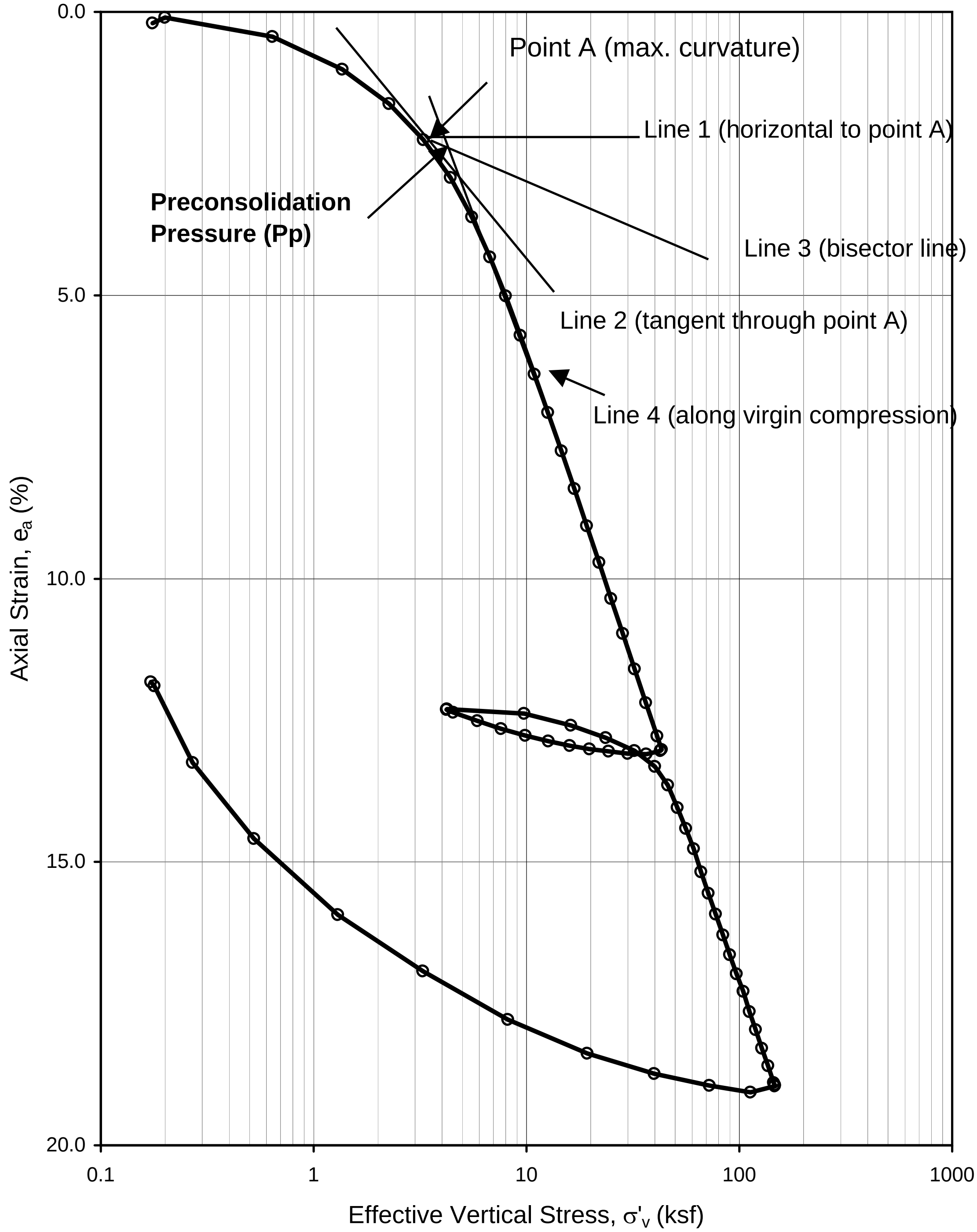
CRS CONSOLIDATION TEST RESULTS
Sample No. 16a - Depth 102.00 ft
Boring B-77
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-38a



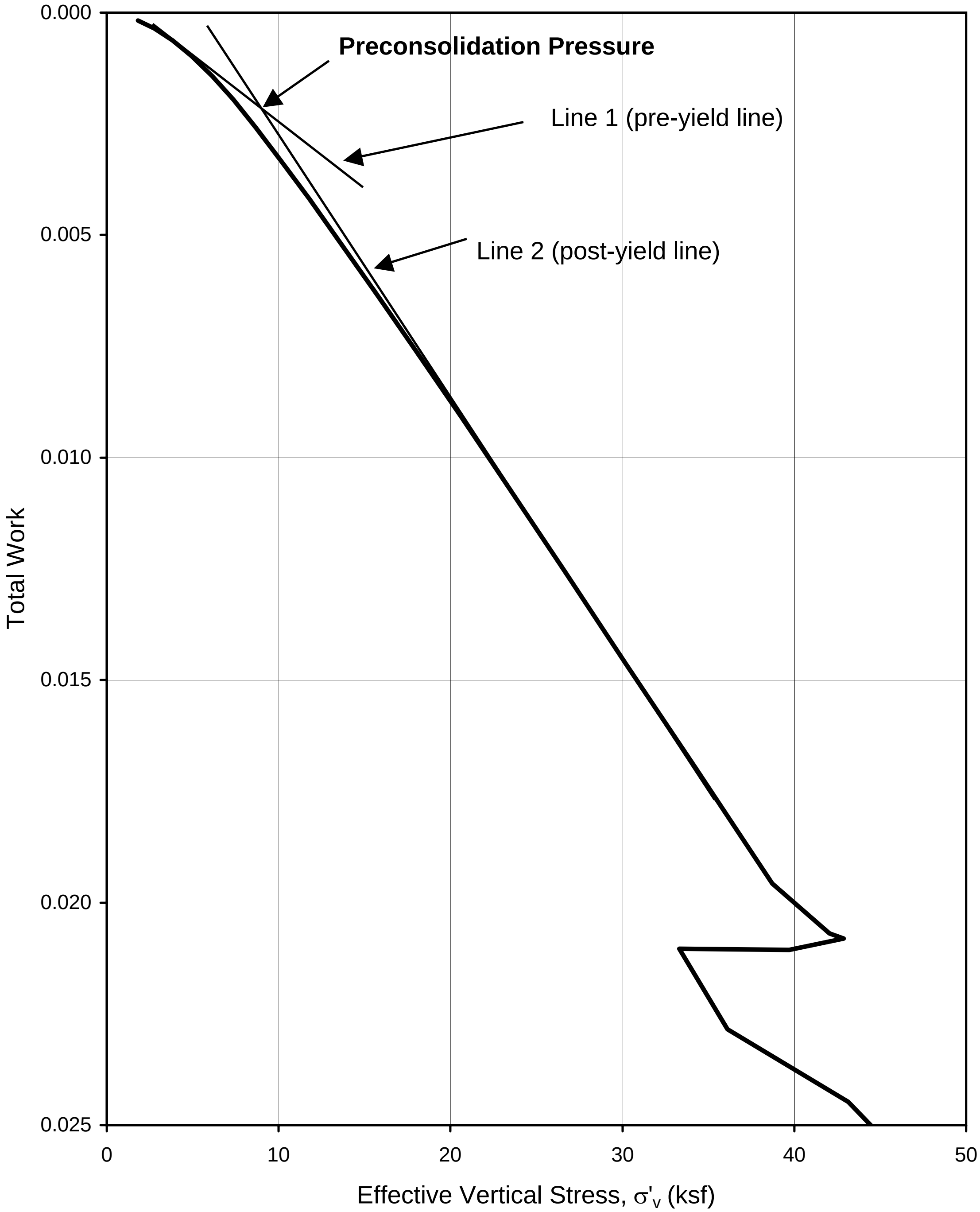
CRS CONSOLIDATION TEST RESULTS
Sample No. 16a - Depth 102.00 ft
Boring B-77
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-38b



EXAMPLE OF CASAGRANDE CONSTRUCTION
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-39



EXAMPLE OF BECKER CONSTRUCTION
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A13-40

APPENDIX 14

STATIC DIRECT SIMPLE SHEAR TEST RESULTS

Appendix 14 presents the laboratory results of the Static Direct Simple Shear tests performed by Fugro.

FUGRO WEST, INC.

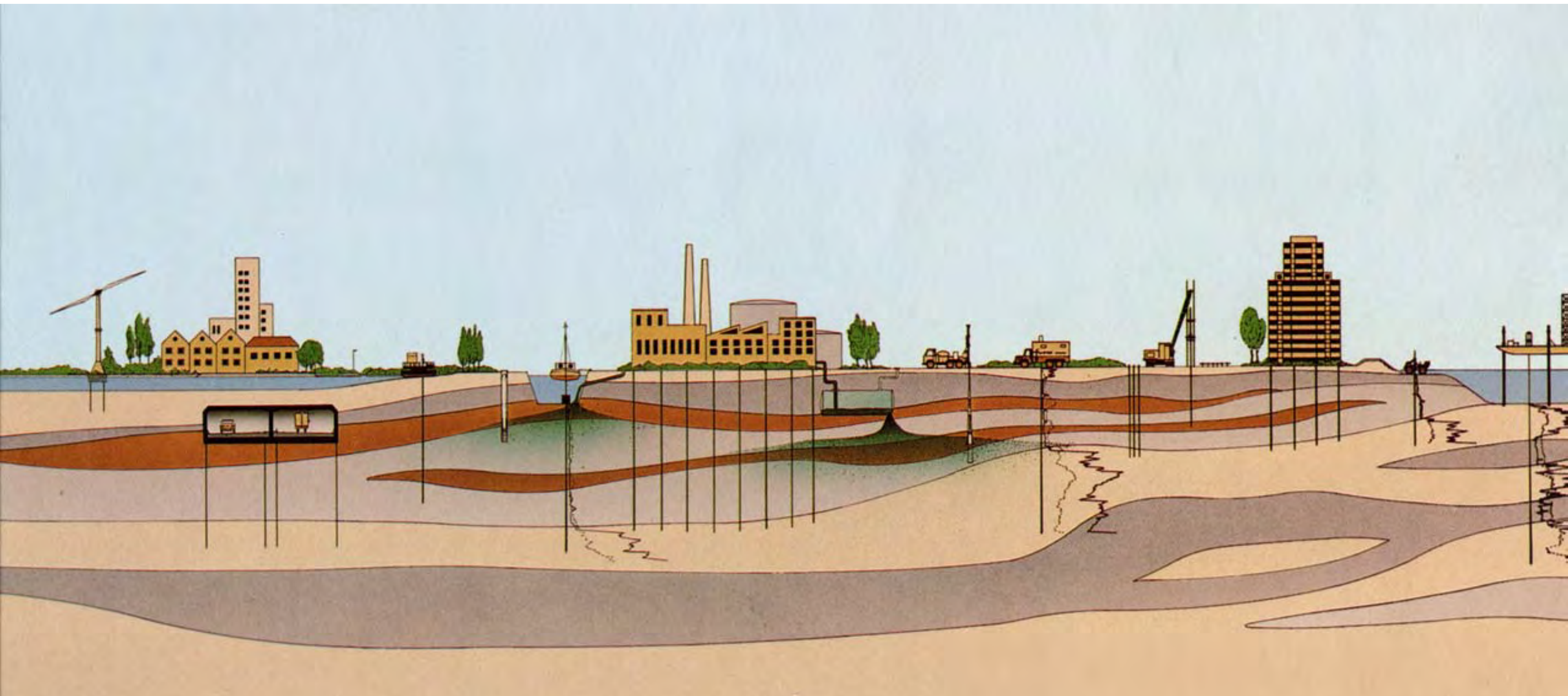
APPENDIX 14
STATIC DIRECT SIMPLE SHEAR TEST RESULTS

GEOTECHNICAL EXPLORATION PROGRAM
TUNNEL SEGMENT OF SILICON VALLEY
RAPID TRANSIT (SVRT) PROJECT
SAN JOSE, CALIFORNIA

Prepared for:
HMM/BECHTEL

JULY 2005

Project No. 1637.001



REPORT DOCKET

APPROVAL

This document is approved by the following:

Name	Title	Signature	Issue Date
Jon W. Mitchell	Project Manager	Jon W. Mitchell	July 20, 2005

REVISION HISTORY

Revision	Date	Change	Approval
0	June 3, 2005	Draft Report: Appendix 14 Static Direct Simple Shear Test Results	Jm
1	July 20, 2005	Final Report: Appendix 14 Static Direct Simple Shear Test Results with Bechtel comments from 6/10/05 & 7/13/05	Jm

FUGRO WEST, INC.

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Tel: (510) 268-0461
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July 20, 2005
Project No. 1637.001

HMM/Bechtel
3103 North First Street
San Jose, California 95134

Attention: Mr. Ignacio Arango

Subject: Appendix 14 – Static Direct Simple Shear
Tunnel Segment of SVRT Project
San Jose, California

Dear Mr. Arango:

Fugro West, Inc., is pleased to submit this copy of "Appendix 14 – Static Direct Simple Shear" presenting the results of the Static Direct Simple Shear (DSS) tests performed by the geotechnical laboratory of Fugro Consultants LP in Houston, Texas, for the Tunnel Segment of SVRT Project in San Jose, California.

We appreciate this opportunity to be of continued service to HMM/Bechtel. Please contact Jon Mitchell at (510) 267-4430 if you have any questions regarding the information presented in this appendix.

Sincerely,

FUGRO WEST, INC.

Linda Al Atik
Staff Engineer

Jon W. Mitchell
Staff Engineer

REGISTERED PROFESSIONAL ENGINEER
RONALD L. BAJUNIEMI
No. 112
Exp. 12-31-05
GEOTECHNICAL
STATE OF CALIFORNIA

Ronald L. Bajuniemi, P.E., G.E.
Principal Consultant

LAA/JWM/RLB:rp
Copies Submitted: (pdf) Addressee

CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This appendix presents the results of the Static Direct Simple Shear (DSS) tests conducted by the geotechnical laboratory of Fugro Consultants LP, in Houston, Texas, (Fugro Consultants) as a part of the advanced laboratory testing program for the Tunnel Segment of Silicon Valley Rapid Transit (SVRT) Project. The DSS tests were performed on soil samples from boring locations situated along the tunnel segment alignment of SVRT Project, as shown on the Boring Location Map, Figure A14-1.

1.1 PROJECT DESCRIPTION

The Santa Clara Valley Transportation Authority (VTA) intends to construct the SVRT Project in San Jose, California. This will be a 26.2-km (16.3-mile) extension of the Bay Area Rapid Transit (BART) heavy rail rapid transit system from its planned terminus at the end of the Warms Springs Extension in Fremont, to San Jose. The proposed alignment currently includes six stations (three above-grade and three below-grade), a proposed future station, and vehicle storage and maintenance facilities. The alignment is composed of two major segments:

1) A line segment which will be approximately 11.5 miles of at grade, elevated and cut-and-cover track from Warm Springs to San Jose; and

2) A 5.1-mile-long tunnel segment, consisting of twin bored tunnels and cut-and-cover structures through downtown San Jose (See Figure A14-1.).

As currently planned, the tunnel segment includes at-grade and open cut track, three cut-and-cover stations, and a cut-and-cover track crossover structure. The cut-and-cover stations and the crossover structures have a cumulative length of approximately 4,970 feet. The remaining 4.14 miles of the alignment will be twin 19.5-foot-diameter tunnels.

This investigation and report cover the 5.1-mile-long tunnel segment section only.

1.2 GEOTECHNICAL EXPLORATION PROGRAM OVERVIEW

The joint venture of Hatch Mott MacDonald T & T, Inc., and Bechtel Infrastructure Corporation (HMM/Bechtel) is providing engineering design services for the tunnel segments (Segments 3 and 4) of the SVRT project to the VTA. HMM/Bechtel has subcontracted with a number of companies to conduct the geotechnical field exploration program for the project. HMM/Bechtel’s primary subcontractors for the geotechnical exploration program included Fugro West, Inc., (Fugro); Parikh Consultants (Parikh); and Pitcher Drilling Company (Pitcher).

The three companies, Fugro, Parikh, and Pitcher, conducted the majority of the geotechnical field exploration program for the tunnel segments of the SVRT Project from October 15, 2004, to March 5, 2005. The intent of the geotechnical field investigation program was to obtain geotechnical data that will aid in the design and construction of the proposed tunnel and cut-and-cover structures.

In general, the geotechnical field investigations explored subsurface conditions along the proposed tunnel alignment, within the vicinity of the proposed Eastern and Western Portals, at the two proposed ventilation structures, and at the proposed stations including Alum Rock Station, Downtown San Jose Station, and Diridon/Arena Station. The geotechnical exploration program included:

- 76 rotary wash borings, and
- 146 cone penetration tests (CPTs).

Figure A14-1 provides a map of the exploration locations. These locations were selected by HMM/Bechtel based on the following considerations: 1) the data requirements of the tunnel designer; 2) the location of existing geotechnical data; 3) the avoidance of private property; and 4) the avoidance of existing underground and overhead utilities. For CPT correlation purposes approximately 16 sets of borings and CPTs were conducted within 15 feet of each other.

The boring investigation program was conducted by the two companies, Parikh and Pitcher. The investigation included soil sampling and in situ testing. Soil sampling consisted of Pitcher Barrel sampling, Shelby tube sampling, SPT sampling and California sampling. The in situ testing conducted in the borings consisted of field vane shear testing, pressuremeter testing, downhole geophysical logging, and piezometer installation. For further details regarding the boring investigation program and results, please refer to the main report.

1.3 LABORATORY TESTING PROGRAM OVERVIEW

1.3.1 Testing Overview

Fugro Consultants' geotechnical laboratory conducted the advanced laboratory testing program for the Tunnel Segment of SVRT Project. This program was conducted on samples provided by Parikh from soil borings located along the tunnel segment. Table A14-1, below, summarizes the numbers and types of different tests conducted. The purpose of this advanced laboratory testing program was to determine selected index and engineering properties of the sampled soils. This appendix provides a detailed description for the constant rate of strain CRS consolidation tests, along with a summary of the interpreted parameters.

Table A14-1. Summary of Advanced Laboratory Testing Program

Test Description	Number of Tests
Constant Rate of Strain (CRS) Consolidation	37
Static Direct Simple Shear	15
K_0-Consolidated Undrained Triaxial Compression	20
K_0-Consolidated Undrained Triaxial Extension	16
K_0-Consolidated Bishop's Procedure	12
Isotropically-Consolidated Drained Triaxial Compression	30

1.3.2 Program Description

The physical properties of the soils tested during the advanced laboratory testing program are separated into two categories - index and engineering. The index properties include items such as water content, specific gravity, unit weight, void ratio, and degree of saturation. The engineering properties would include items such as compressibility (consolidation), strength, and hydraulic conductivity (permeability). The advanced tests conducted as part of this laboratory testing program are discussed in more detail below.

- **Constant Rate of Strain Consolidation (CRS)** tests were conducted to determine the rate and magnitude of soil consolidation as well as stress history for a soil sample that is restrained laterally and drained axially. The one-dimensional consolidation tests typically involved constant rate-of-loading, one unload-reload cycle, and one rebound stage from the maximum applied stress. Detailed discussion of the CRS consolidation tests is provided in Appendix 13.
- **Static Direct Simple Shear (DSS)** tests were conducted to measure constant volume (undrained) shear strength and stress-strain characteristics of cohesive soils after one-dimensional consolidation using a constant rate of simple shear deformation. Detailed discussion of the DSS tests is provided in Appendix 14 (this appendix).
- **Isotropically Consolidated Drained Triaxial (CDTX)** tests were conducted to evaluate the drained strength characteristics, such as friction angle and stress-strain relationship of the soils encountered in the borings. For detailed discussion of the consolidated drained triaxial tests, refer to Appendix 15.
- **K_0-Consolidated Undrained Triaxial Compression and Extension (CK_0UE & CK_0UC)** tests were conducted to estimate the static strength parameters and stress-strain characteristics of fine-grained soils under a range of confining stresses and overconsolidation ratios (OCRs). In K_0-consolidated testing, the sample was consolidated under drained conditions to the assigned vertical stress while maintaining a constant diameter of the cylindrical specimen (the horizontal confining stress was automatically adjusted to maintain the constant diameter). For detailed discussion of the K_0 triaxial compression and extension tests, refer to Appendix 16.
- **K_0 Bishop's Procedure Triaxial** tests were conducted to determine the at-rest lateral earth pressure coefficient (K_0) as a function of the overconsolidation ratio (OCR). For detailed discussion of the K_0 Bishop's tests, refer to Appendix 17.

The scope of the advanced laboratory testing program also included the x-raying of assigned soil samples. Discussion of the x-ray testing procedures and a summary of results are provided in Section 2.0 of Appendix 13, with x-ray images shown in Appendix 20.

1.3.3 Sample Recovery and Handling

Soil sampling was conducted by Parikh at intervals typically ranging from 5 to 10 feet in accordance with the project specifications. Upon sample recovery, undisturbed portions of the

soil sample tubes were sealed and transported to Parikh's lab. For further details regarding sample recovery and handling, please refer to the main report.

Soil samples assigned for advanced laboratory testing were transported in wooden Shelby tube holders, which are designed to maintain the tubes vertical orientation during transit to Fugro's laboratory in Oakland. The samples where then packed in specially fabricated padded containers designed to minimize disturbance and maintain an upright (vertical) orientation of the samples during shipping. The samples were finally shipped to Fugro Consultants' geotechnical laboratory for testing.

1.3.4 Overview of Static Direct Simple Shear Test Program

Fugro Consultants' geotechnical laboratory conducted 15 DSS tests as assigned by HMM/Bechtel. The DSS test measures constant volume (undrained) shear strength and stress strain-characteristics of cohesive soils after K_0-consolidation using a constant rate of simple shear deformation. The test is applicable to field conditions where the soils have fully consolidated under one set of stresses, and then subjected to changes in stress without time for further drainage to take place. In the DSS test, the shear strength is measured under plane strain conditions, which is indicative of field loading conditions such as beneath long embankments and around axially loaded piles.

2.0 DSS TEST PROCEDURES

2.1 INTRODUCTION

The DSS tests were conducted in general accordance with ASTM Test Method D 6528 using an NGI-type simple shear device. In static DSS tests, a sample is consolidated under K_0 conditions, and subjected to horizontal displacement. Horizontal displacement is applied at a constant rate and the constant volume condition simulates the undrained condition for saturated specimens. Constant volume is achieved by changing the normal load applied to the specimen to maintain constant specimen height.

During the DSS test, horizontal and vertical loads and displacements are recorded and then analyzed to determine strength and stress-strain characteristics of the soil specimen. These soil characteristics are presented in the normalized shear stress versus strain and normalized shear stress versus normalized effective stress plots.

2.2 DSS TEST STANDARDS AND PROCEDURES

In accordance with ASTM D6528, the DSS test involves four steps:

1. *Specimen Preparation*: The selected portions of the tubes were cut into segments with a mechanical hacksaw (18 teeth per inch). A wire saw was used to separate the soil from the surrounding tube in an effort to reduce potential disturbance upon extrusion. In addition, each tube is marked such that all test specimens, will have the same

orientation when sheared. The sample is then extruded from the cut portion of the tube using a hydraulically actuated ram.

After the cohesive soil sample is trimmed to the required diameter (47.6, 63.5 or 71 mm) and height (19.5 mm), the specimen is placed between two parallel rigid platens constrained axially and laterally, such that its cross-sectional area remains constant.

2. *Specimen Consolidation*: The specimen is loaded axially and allowed to consolidate one-dimensionally to reach the stress level specified by the client. Each normal load increment is maintained until excess pore water pressures are essentially dissipated to reach at least 90 percent consolidation. The maximum normal load is maintained until the completion of one cycle of secondary compression. If a test requires the specimen to have an OCR greater than one, as in this program, the specimen is first consolidated to an induced OCR = 1, and cured (as mentioned above, but with $\sigma'_{v,c} = \sigma'_{vc,max}$); then rebounded in increments to $\sigma'_{v,c}$ and cured (thereby obtaining the appropriate OCR > 1); and, finally, sheared.
3. *Equipment Preparation:* Equipment is prepared by setting a suitable rate of displacement on the shear motor, setting the displacement gauge to a desired starting position and locking the vertical loading assembly to prevent any vertical deformation of specimen during simple shear.
4. *Simple Shearing*: The specimen is sheared by displacing one platen tangentially relative to the other at a constant rate of displacement and measuring the resulting shear force. The platens are constrained against rotation and axial movement throughout shear. The specimen volume is held constant during shear to simulate undrained conditions. The specimen must be sheared at a rate that is slow enough to allow dissipation of excess pore pressure generated during shearing. For this program the specimen were typically sheared at a strain rate of about 5 percent per hour.

3.0 DSS TEST RESULTS

3.1 DSS TEST RESULTS

During shearing, the necessary data (time, vertical and horizontal forces, shear deformations, and transducer excitation voltage) were recorded using an automated data-acquisition system and electronically filed. Specialized Excel worksheets, along with a Visual Basic code (VBA) were used to reduce the data files into engineering units in tabular and graphical format. Figures A14-2 through A14-16 present the DSS test results. For each test performed, normalized shear stress (the ratio of the horizontal shear stress to the pre-shear effective vertical stress [$\tau_h/\sigma'_{v,c}$]) versus shear strain (γ %) and normalized shear stress ($\tau_h/\sigma'_{v,c}$) versus normalized effective vertical stress ($\sigma'_v/\sigma'_{v,c}$) were displayed.

In addition, a plot of the Normalized Undrained Shear Strength, $S_u/\sigma'_{v,c}$ versus Overconsolidation Ratio (OCR), for test series run at various test-induced OCRs is presented on

Plate A14-17. The data presented in that plot can be expressed by the following empirical relationship:

$$(S_u/\sigma'_v) = (S_u/\sigma'_{v,c})_{NC} \times OCR^m$$

where:

- (S_u/σ'_v) is the in situ, normalized undrained shear strength for a given node of shearing and OCR;
- $(S_u/\sigma'_{v,c})_{NC}$ is the normalized undrained shear strength at an induced OCR = 1 and for a given node of shearing;
- OCR is the over consolidation ratio; and m is the OCR exponent.

The above empirical relationship implies a linear relationship between the increase in normalized undrained shear strength and increase in OCR, when plotted on a log-log scale. The data presented on the on Figure A14-17 include data from: 1) tests with induced OCRs of greater than 1, and 2) tests which had a test induced OCR of 1, and where it could be confirmed that the in situ preconsolidation stress (from CRS consolidation tests) was significantly less than the preshear vertical effective consolidation stress. This second condition helps to ensure that there is minimal effect of sample disturbance for the OCR =1 data points. Based on the data plotted on Figure A14-17, the $(S_u/\sigma'_{v,c})_{NC}$ = 0.27 and m = 0.68. The value of m typically ranges between about 0.70 and 0.85 (Ladd et al. 1977).

Results such as moisture content, Atterberg limits, initial unit weight, soil type, interpreted preconsolidation pressure, estimated in situ vertical stress, overconsolidation ratio, undrained shear strength and maximum shear strain are summarized in Table A14-2 – Summary of DSS Test Results for all the DSS tests performed. The estimated in situ vertical effective stress was estimated by developing a unit weight profile from the boring data with either measured or estimated ground water levels. The interpretation of the parameters from the DSS test data (e.g., undrained shear strength and stress-strain curves) is discussed in more detail below.

3.2 DISCUSSION AND INTERPRETATION OF DSS TEST DATA

Interpretation of the DSS test results is subject to the following assumptions and limitations:

- The interpreted shear strength of a specimen is a function of the soil type, normal consolidation stress, time of consolidation, rate of strain applied and prior stress history of the soil.
- The interpreted undrained strength of a specimen is a function of stress conditions. In this test method, undrained shear strength is measured under plane strain conditions and the principle stresses continuously rotate due to the application of shear stress.
- The constant volume conditions applied during the DSS tests are equivalent to the undrained conditions for a saturated specimen; hence, the DSS test results are applicable to field conditions wherein soils have fully consolidated under one set of

field conditions, and then are subjected to changes in stress without enough time for further drainage to take place.

- The state of stress within the soil specimen under the DSS test is usually neither sufficiently defined nor uniform enough to allow rigorous interpretation of the results. Therefore, interpreted results herein should not be confused with the effective stress parameters derived from other shear tests having better defined states of stress.
- Values of the secant shear modulus can be used to estimate the initial settlements of saturated cohesive soils due to undrained shear deformations.

4.0 LIMITATIONS

Our services consist of laboratory testing and data evaluations that are made in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The test data provided in this appendix is from the laboratory testing of samples obtained from subsurface explorations conducted by others. These explorations indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. Variations may exist and conditions not observed or described in this report could be encountered during construction. Our laboratory tests results presented in this appendix are based on the standards and procedures indicated herein. The laboratory assignments were provided by HMM/Bechtel.

This appendix has been prepared for the exclusive use of HMM/Bechtel and their consultants for specific application to the SVRT project as described herein. In the event that there are any changes in the ownership, nature, design, or location of the proposed project, or if any future additions are planned, the results contained in this appendix should not be considered valid unless 1) the project changes are reviewed by Fugro, and 2) results presented in this appendix are modified or verified in writing. Reliance on this report by others must be at their risk unless we are consulted on the use or limitations. We cannot be responsible for the impacts of any changes in geotechnical standards, practices, or regulations subsequent to performance of services without our further consultation. We can neither vouch for the accuracy of information supplied by others nor accept consequences for unconsulted use of segregated portions of this report.

5.0 REFERENCES

ASTM D6528, "Standard Test Method for Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils," ASTM International.

Ladd, C.C., et al. 1977. "Stress Deformation and Strength Characteristics," *Proceedings, 9th International Conference on Soil Mechanics, 2,* Tokyo, Japan, pp. 421-494.

TABLE

Boring Number	B-23	B-23	B-24	B-25	B-25	B-25	B-33	B-55	B-59
Sample Number	17b	18b	29b	16b	21a	21b	17a	26b	17b
Penetration Depth (ft)	106.65	117.15	110.35	110.65	127.50	127.35	137.00	131.35	169.85
Soil Type[1]	CL	CL	CL	CL	CL	CL	CL	CL	CL
Moisture Content (%)									
In Situ, W_o	18.6	20.4	21.8	25.7	28.3	28.6	28.8	20.0	26.1
Initial Before Consolidation, W_i	19.4	20.8	22.6	26.7	28.9	29.3	29.5	22	27.6
Final W_f	11.7	17.3	17.2	15.7	25.4	18.4	26.2	14.4	24.9
Atterberg Limits (%)									
Liquid Limit, LL	24	30	28	43	54	NA	57	37	51
Plastic Limit, PL	16	18	16	16	18	NA	19	16	25
Initial Total Unit Weight (pcf)	131.1	126.7	126.5	123.9	121	119.3	121.8	125.4	121.3
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	6.8	7.5	8.1	8.1	9.2	9.3	9.6	9.1	11.2
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	50.6	18.9	20.2	51.6	8.3	13.0	8.7	22.9	10.6
Interpreted Preconsolidation Pressure, σ'_p (ksf)[2]	25.0	20.7	19.4	21.0	-	-	-	25.5	33.0
Overconsolidation, OCR									
In Situ[2]	3.7	2.8	2.4	2.5	-	-	-	2.8	3.0
Test Induced	1	1	1	1	1	4.99	1	3.5	1
Maximum Shear Strain (%)	29.1	28.1	29.4	29.1	28.6	28.7	29.2	29.5	28.1
Undrained Shear Strength, S_u (ksf)	14.48	7.36	6.13	13.62	3.80	10.75	3.23	14.32	4.20
Undrained Shear Strength Ratio, S_u/σ'_{vc}	0.29	0.39	0.30	0.26	0.46	0.82	0.37	0.62	0.39

Notes: NA = Test Not Assigned
1. Soil type is based on visual soil classification
2. Parameters interpreted from CRS consolidation tests
- : Test data not measured

Summary of Static Direct Simple Shear Test Results
Tunnel Segment of SVRT Project
San Jose, California

TABLE A14-2a

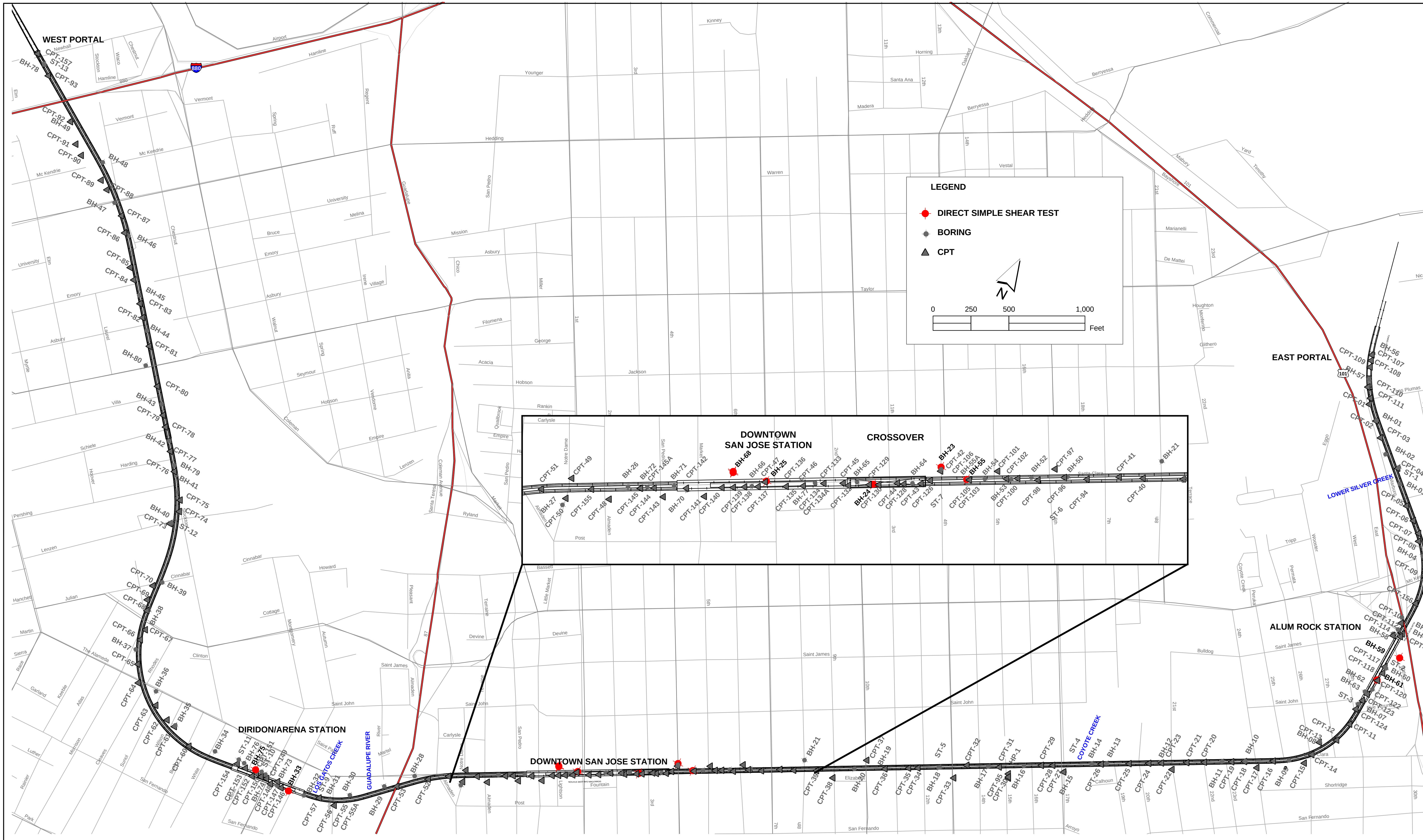
Boring Number Sample Number	B-61 15b	B-61 15f	B-61 17c	B-68 18a	B-75 15a	B-75 15d
Penetration Depth (ft)	125.70	127.10	136.10	148.90	151.00	150.05
Soil Type[1]	CH	CH	CH	CL	CL	CL
Moisture Content (%)						
In Situ, W_o	24.7	29.8	23.1	24.3	18.4	27.1
Initial Before Consolidation, W_i	24.6	29.8	23.9	25.3	18.9	28.1
Final W_f	21.3	17.5	15.4	22.4	17.1	19.1
Atterberg Limits (%)						
Liquid Limit, LL	41	41	41	38	29	29
Plastic Limit, PL	21	21	21	18	16	16
Initial Total Unit Weight (pcf)	129	121	126.1	125.8	131.2	123.7
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	8.9	8.7	9.4	10.3	10.5	10.5
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	8.2	17.5	16.9	5.1	5.1	25.1
Interpreted Preconsolidation Pressure, σ'_p (ksf)[2]	24.0	24.0	23.0	-	-	-
Overconsolidation, OCR						
In Situ[2]	2.8	2.8	2.4	-	-	-
Test Induced	1	4	2.99	1	1	2
Maximum Shear Strain (%)	28.2	31.9	30.5	27.8	28.2	29.2
Undrained Shear Strength, S_u (ksf)	3.33	11.98	9.44	2.10	2.34	10.39
Undrained Shear Strength Ratio, $S_u/\sigma'vc$	0.41	0.68	0.56	0.41	0.46	0.41

Notes: NA = Test Not Assigned
1. Soil unit is based on visual soil classification
2. Parameters interpreted from CRS consolidation tests
- : Test data not measured

Summary of Static Direct Simple Shear Test Results
Tunnel Segment of SVRT Project
San Jose, California

TABLE A14-2a

FIGURES



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DRAWN BY
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DATE

HMM / BECHTEL
A Joint Venture of Hatch Mott MacDonald T&T, Inc. and Bechtel Infrastructure Corp.

DESIGNER/SUBCONSULTANT FUGRO
SUBMITTED

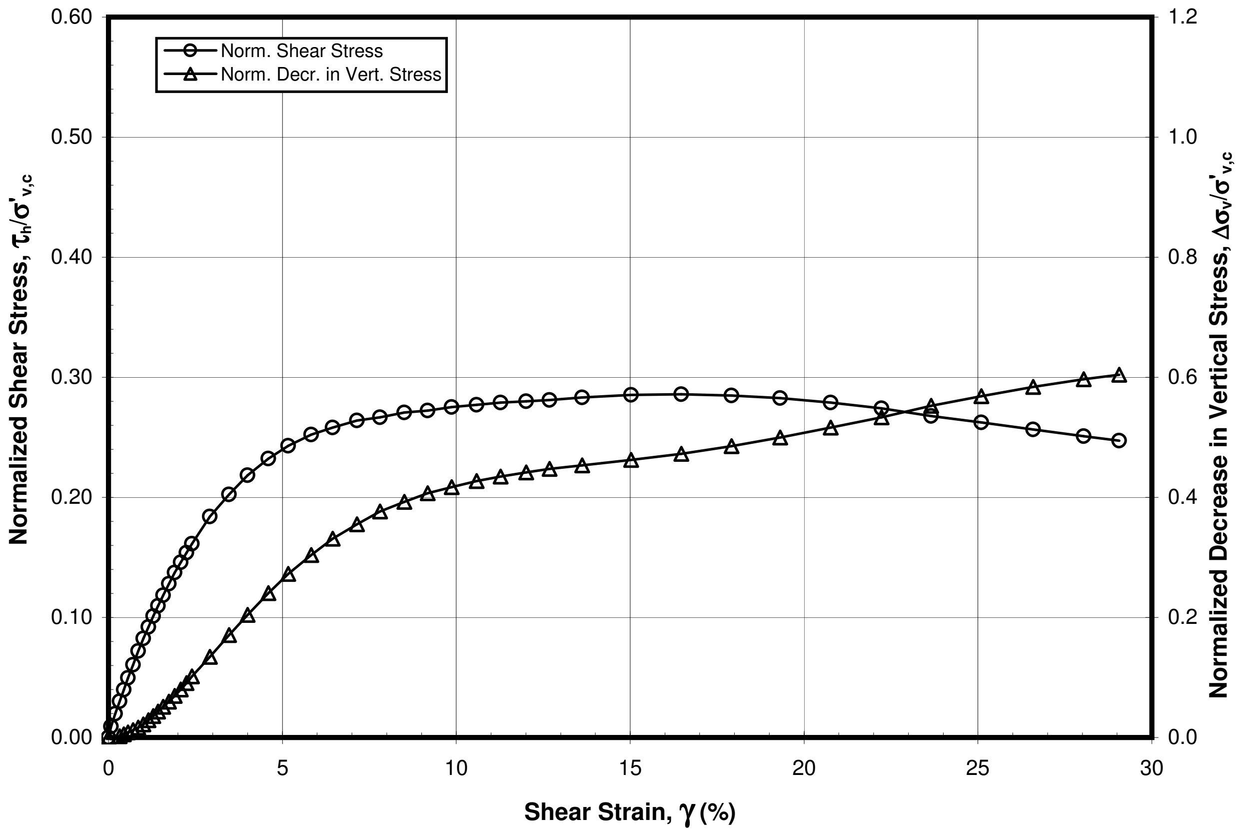
HMM/BECHTEL
APPROVED

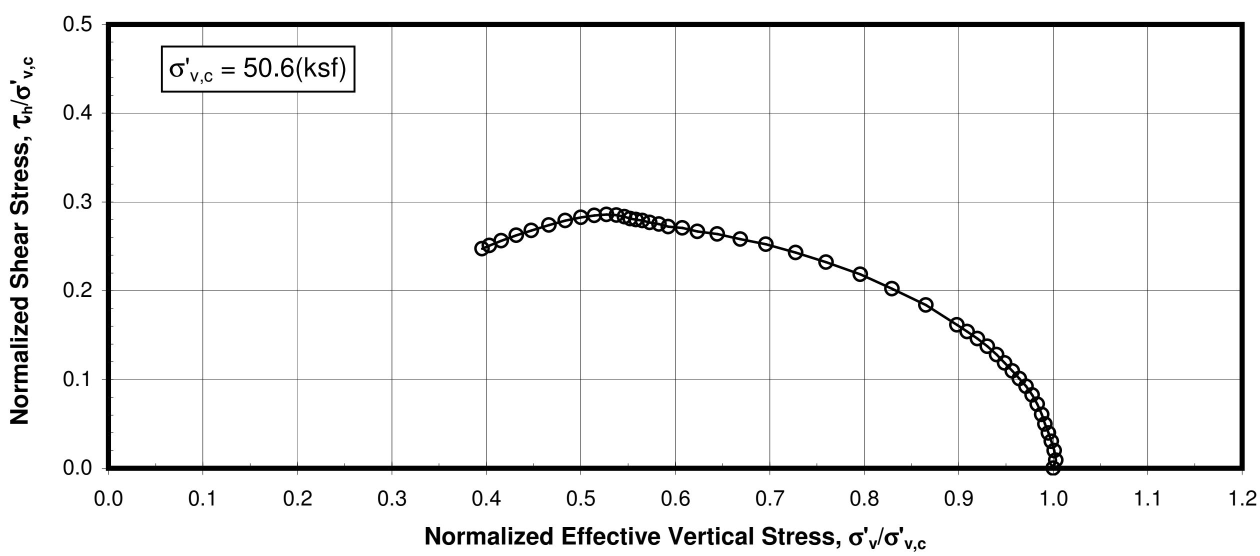
BART

SILICON VALLEY RAPID TRANSIT PROJECT
VTA SANTA CLARA Valley Transportation Authority

DIRECT SIMPLE SHEAR LOCATION MAP
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A14-1





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

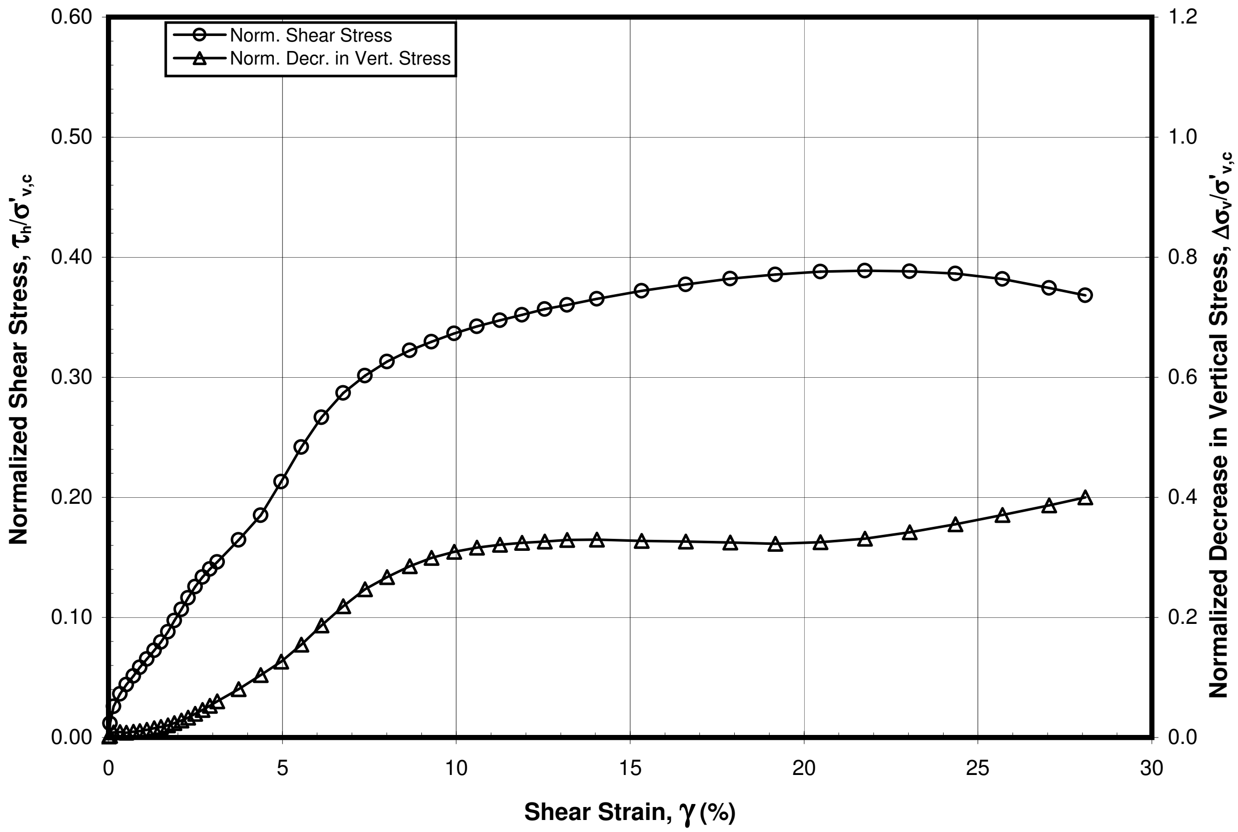
Sample: 17b - Depth: 106.65 ft. Induced OCR = 1

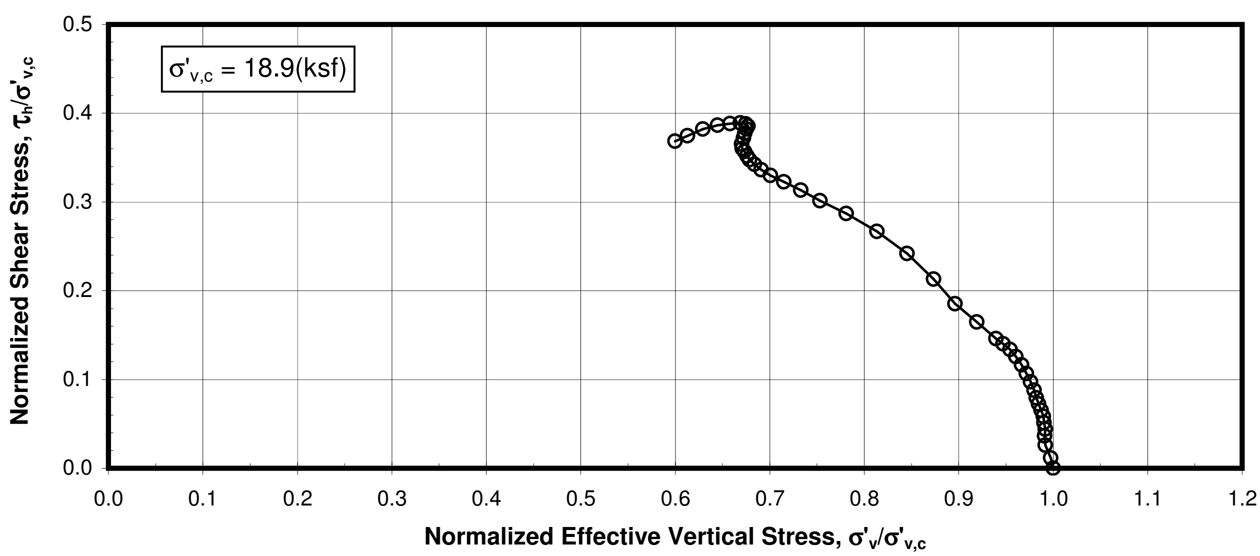
Boring B-23

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A14-2





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

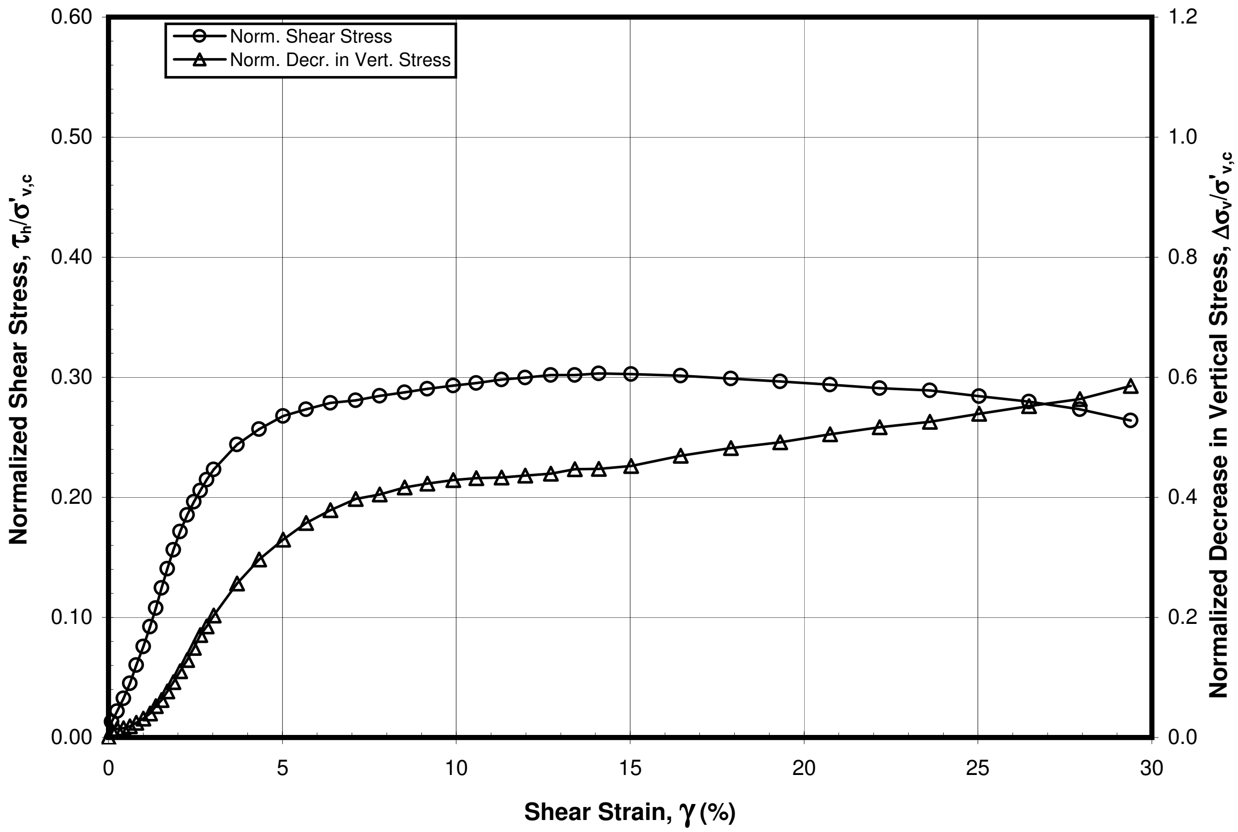
Sample: 18b - Depth: 117.15 ft. Induced OCR = 1

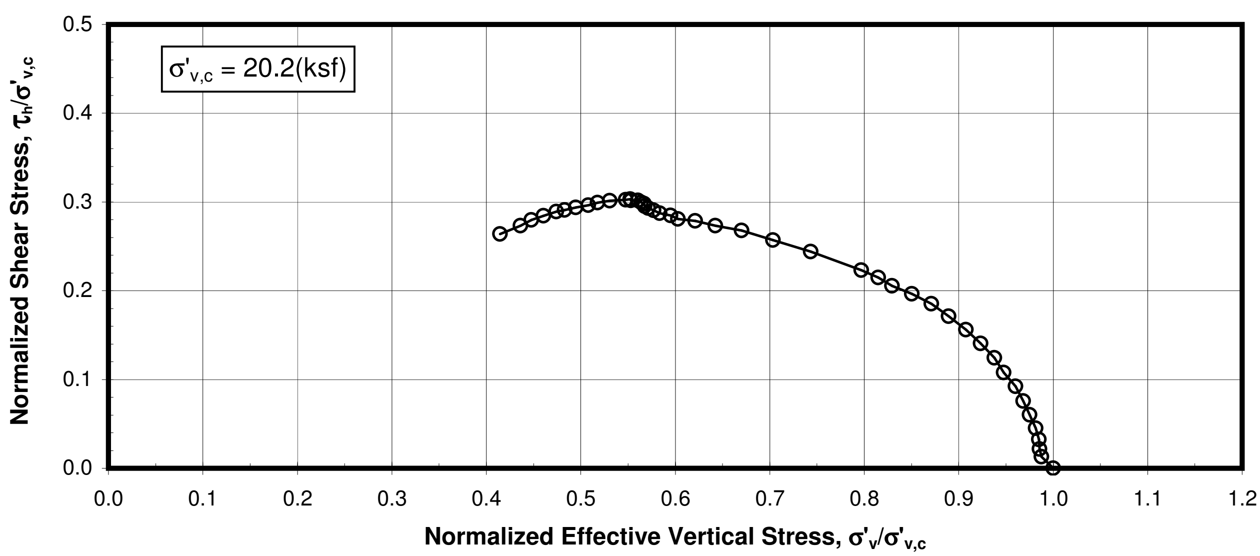
Boring B-23

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A14-3





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

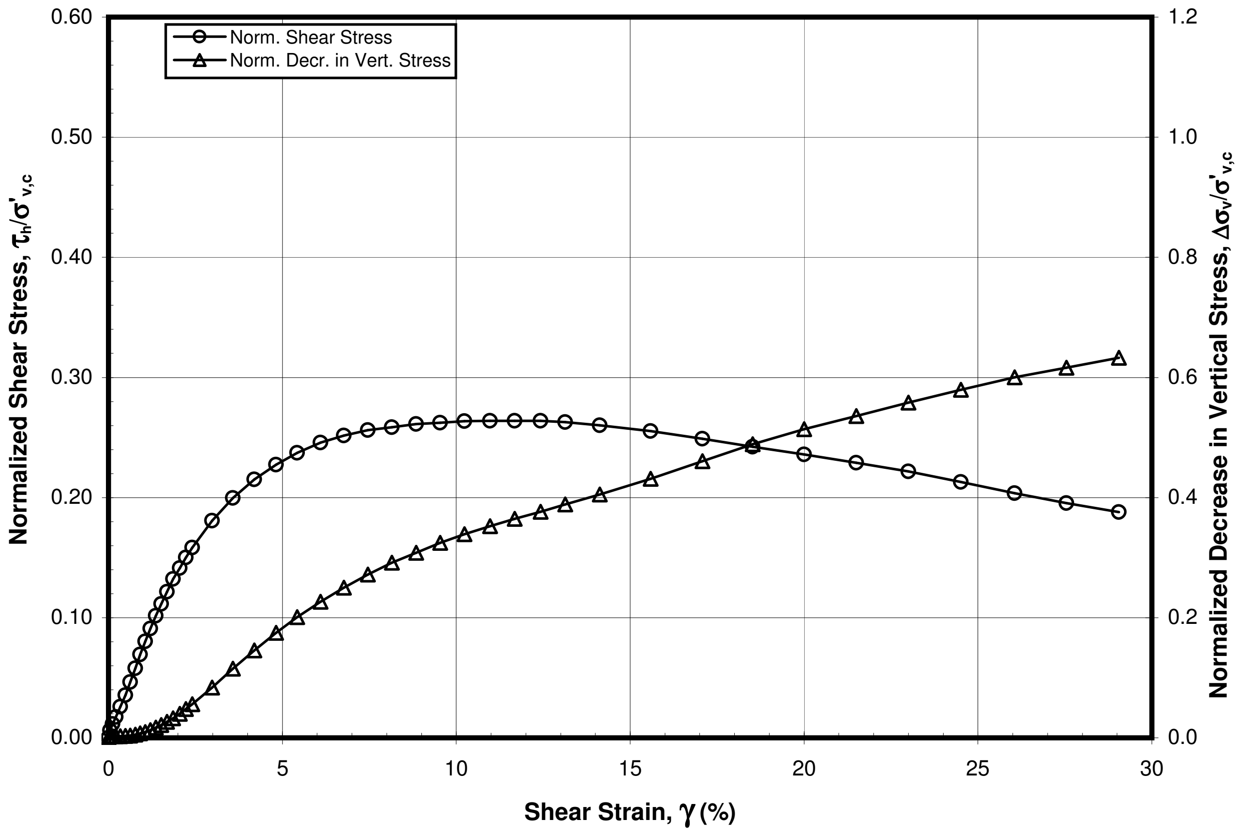
Sample: 29b - Depth: 110.35 ft. Induced OCR = 1

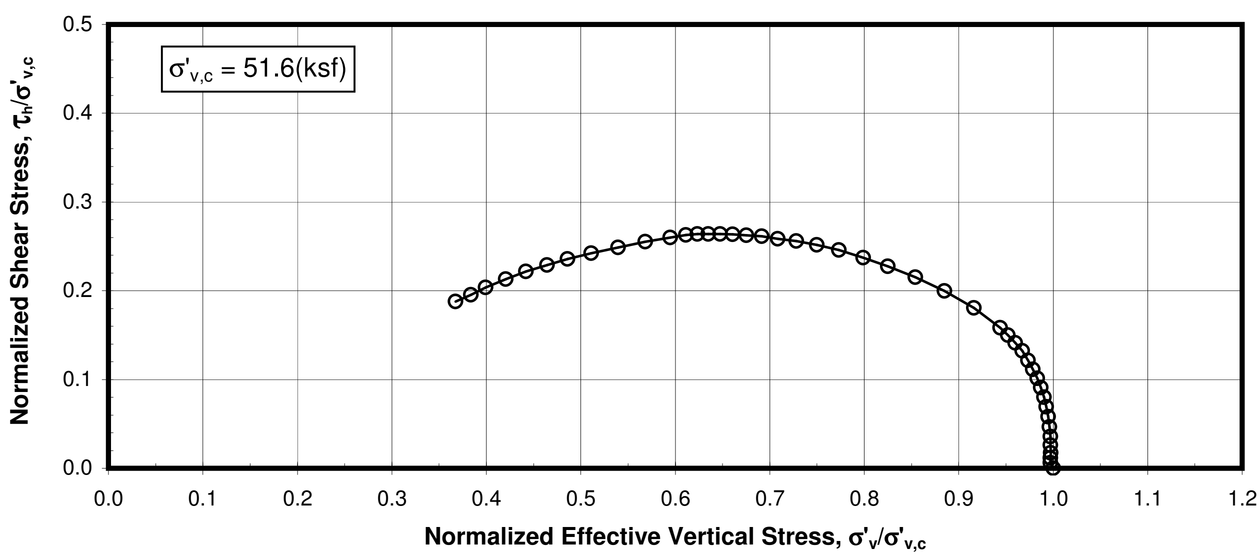
Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A14-4





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

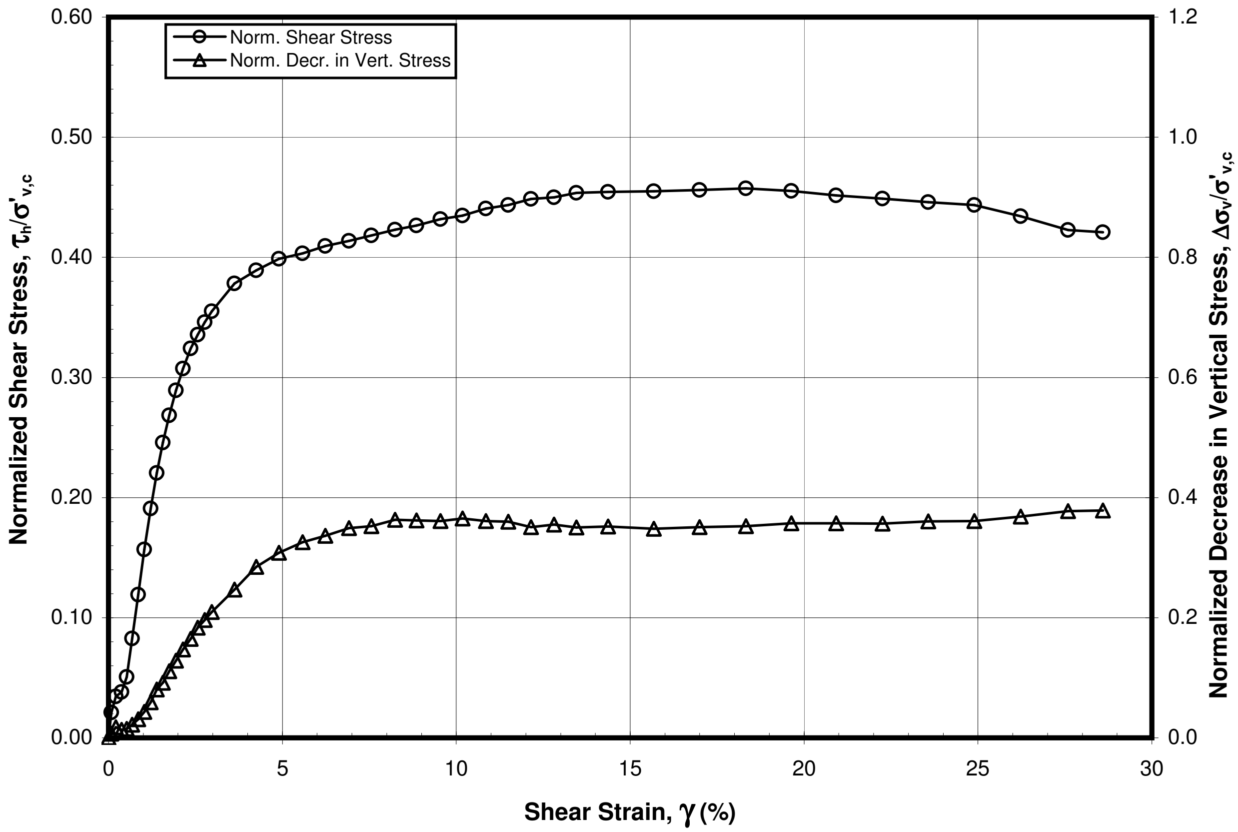
Sample: 16b - Depth: 110.65 ft. Induced OCR = 1

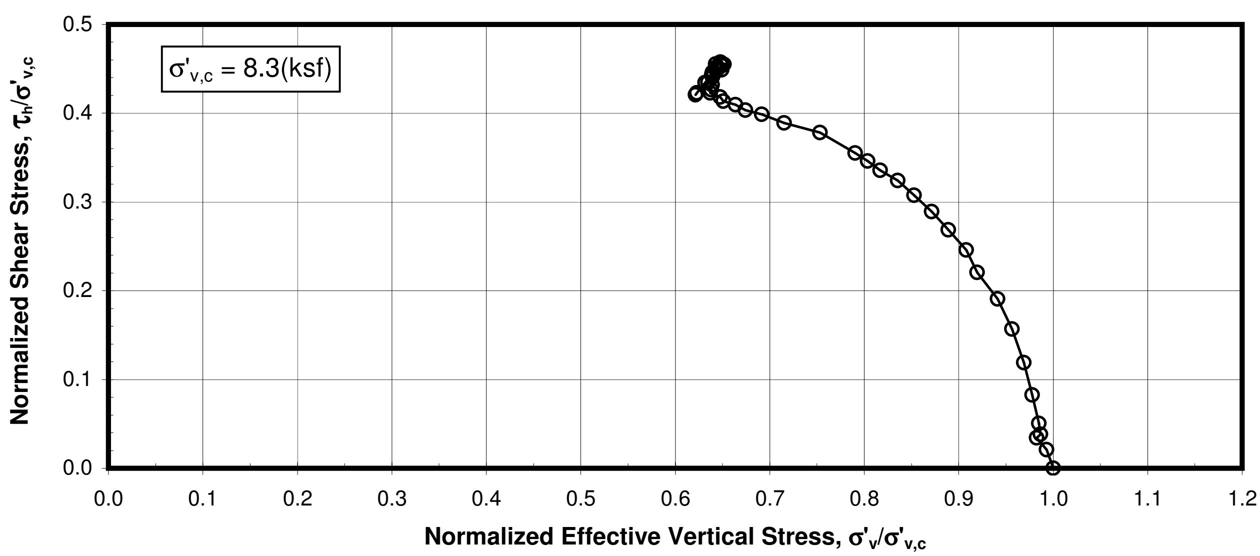
Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A14-5





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

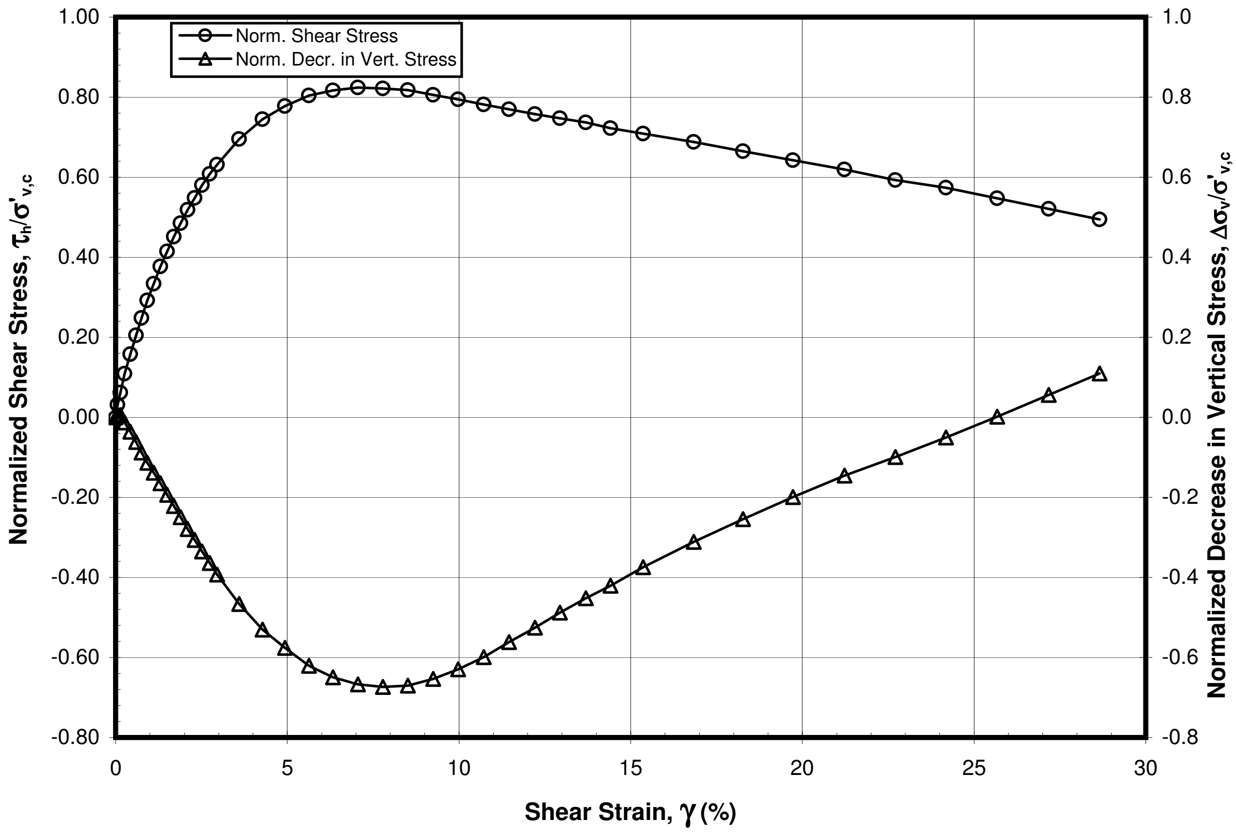
Sample: 21a - Depth: 127.50 ft. Induced OCR = 1

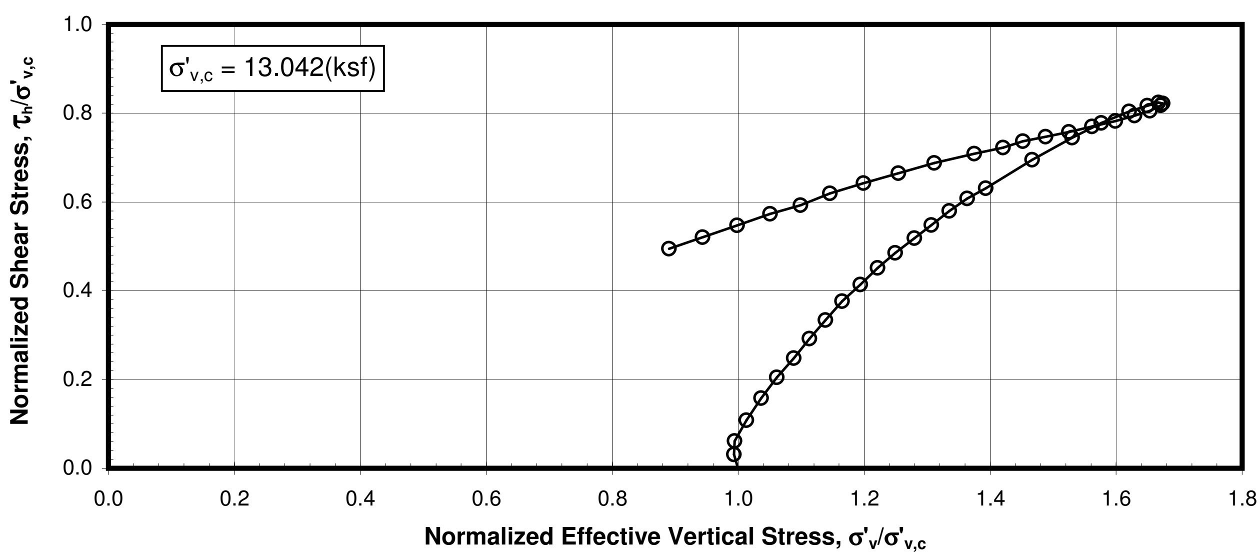
Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A14-6





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

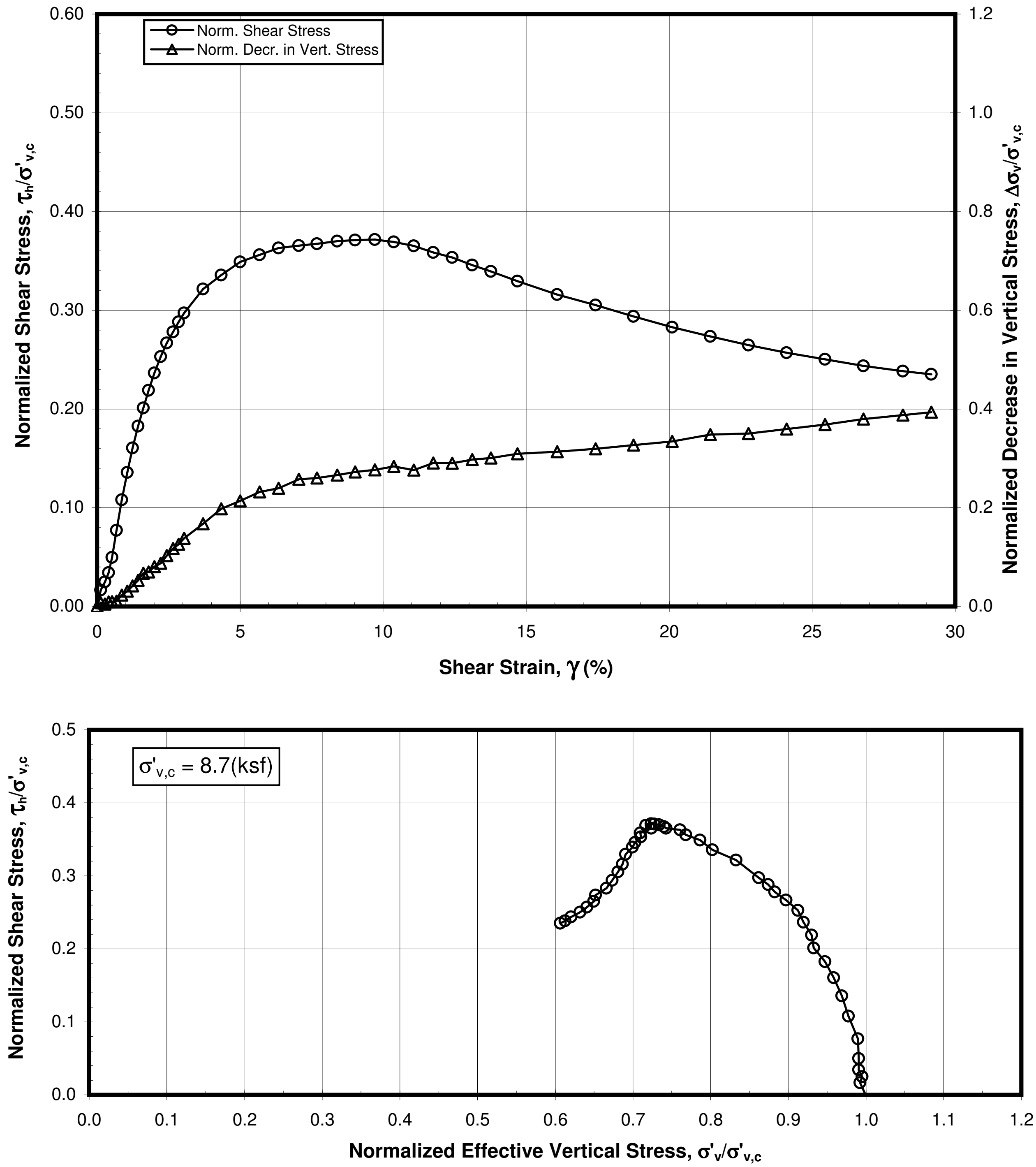
Sample: 21b - Depth: 127.35 ft. Induced OCR = 4.99

Boring B-25

Tunnel Segment of SVRT Project

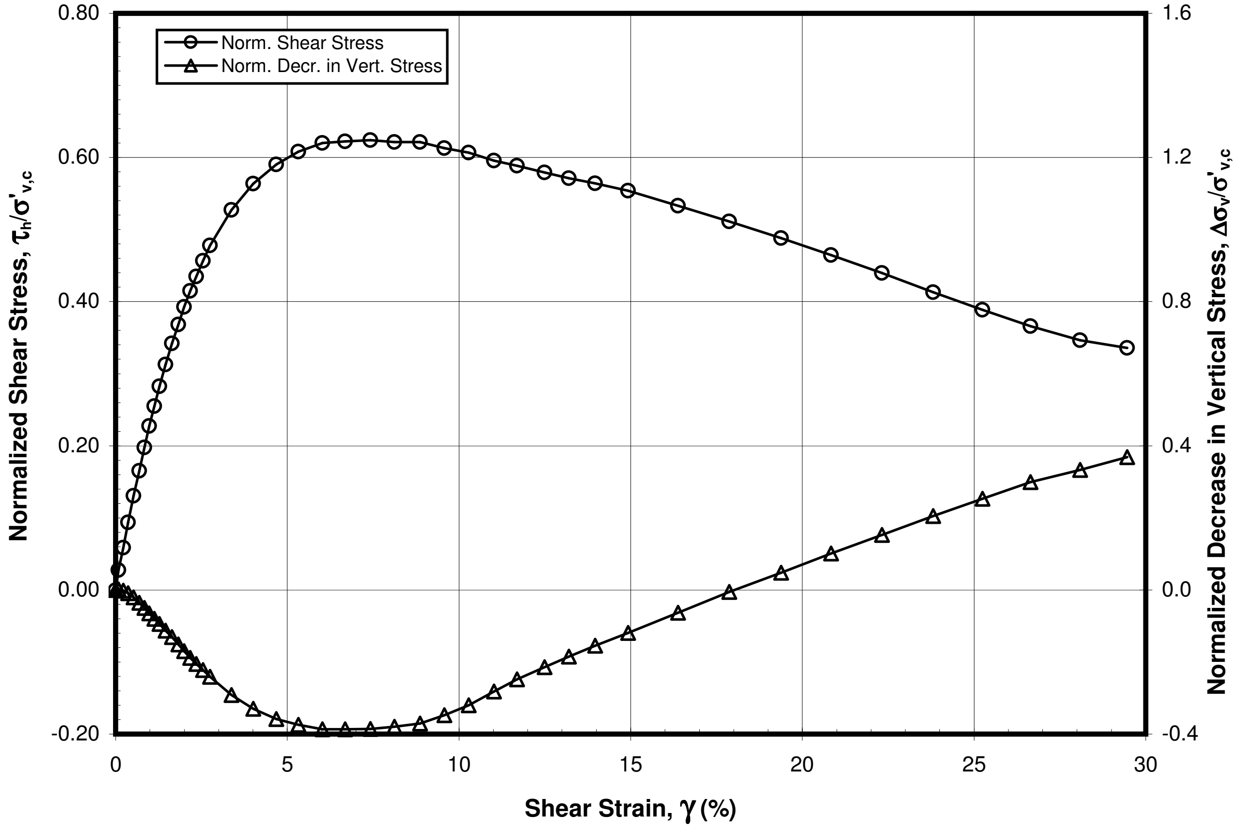
San Jose, California

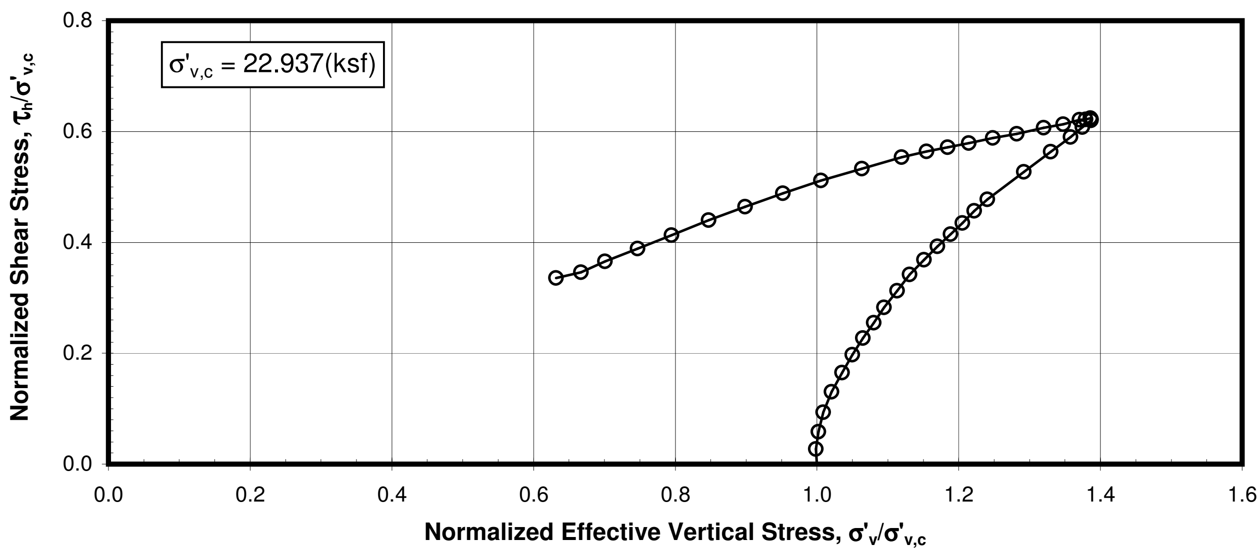
FIGURE A14-7



STATIC DIRECT SIMPLE SHEAR TEST RESULTS
Sample: 17a - Depth: 137.00 ft. Induced OCR = 1
Boring B-33
Tunnel Segment of SVRT Project
San Jose, California

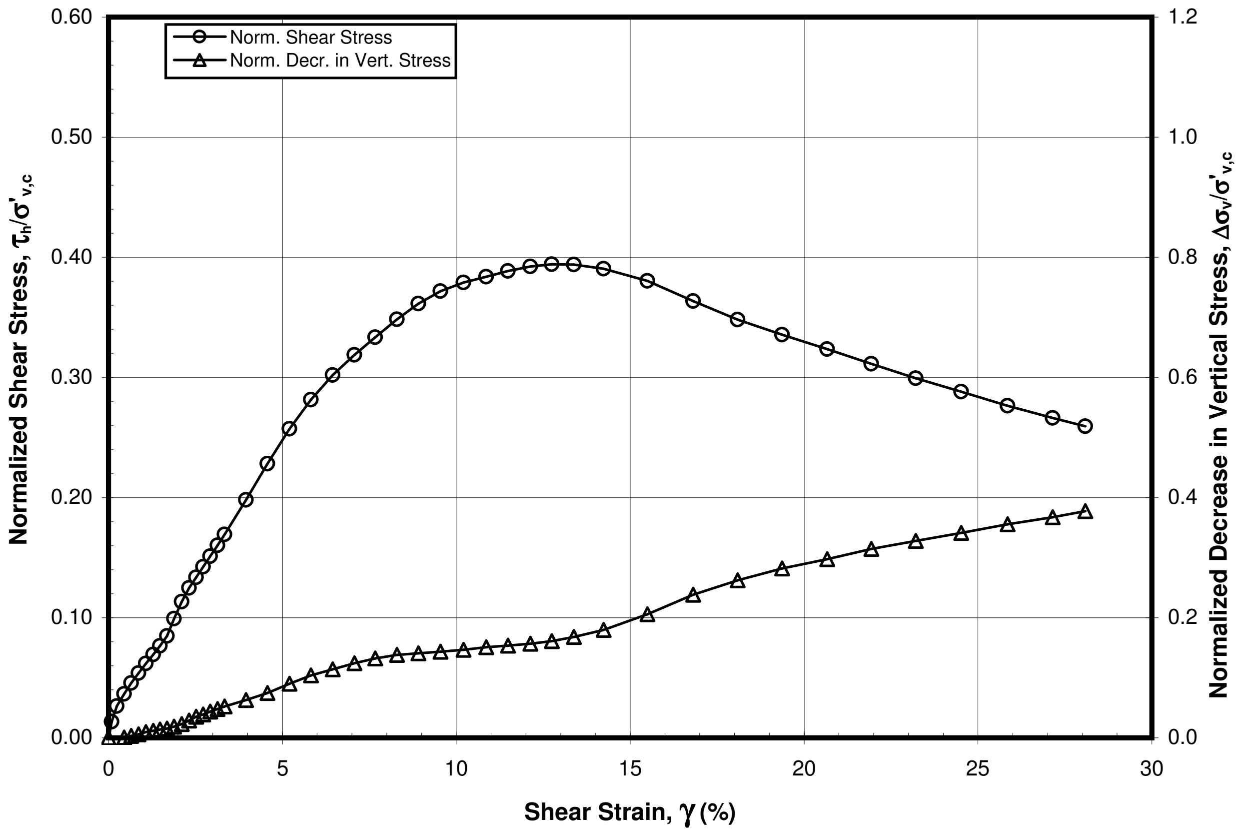
FIGURE A14-8

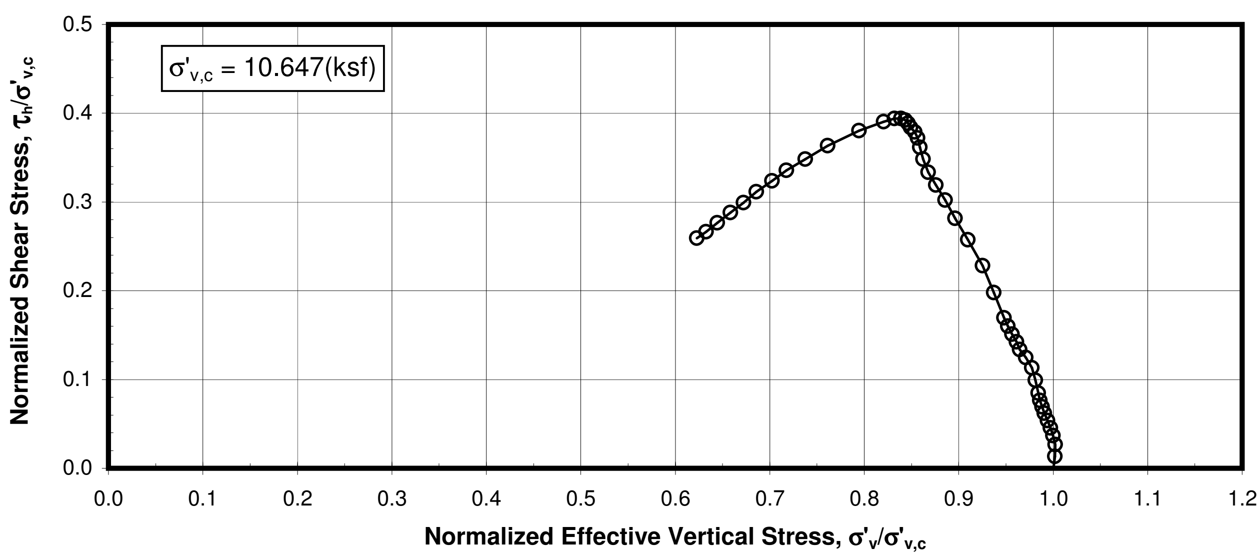




STATIC DIRECT SIMPLE SHEAR TEST RESULTS
Sample: 26b - Depth: 131.35 ft. Induced OCR = 3.5
Boring B-55
Tunnel Segment of SVRT Project
San Jose, California

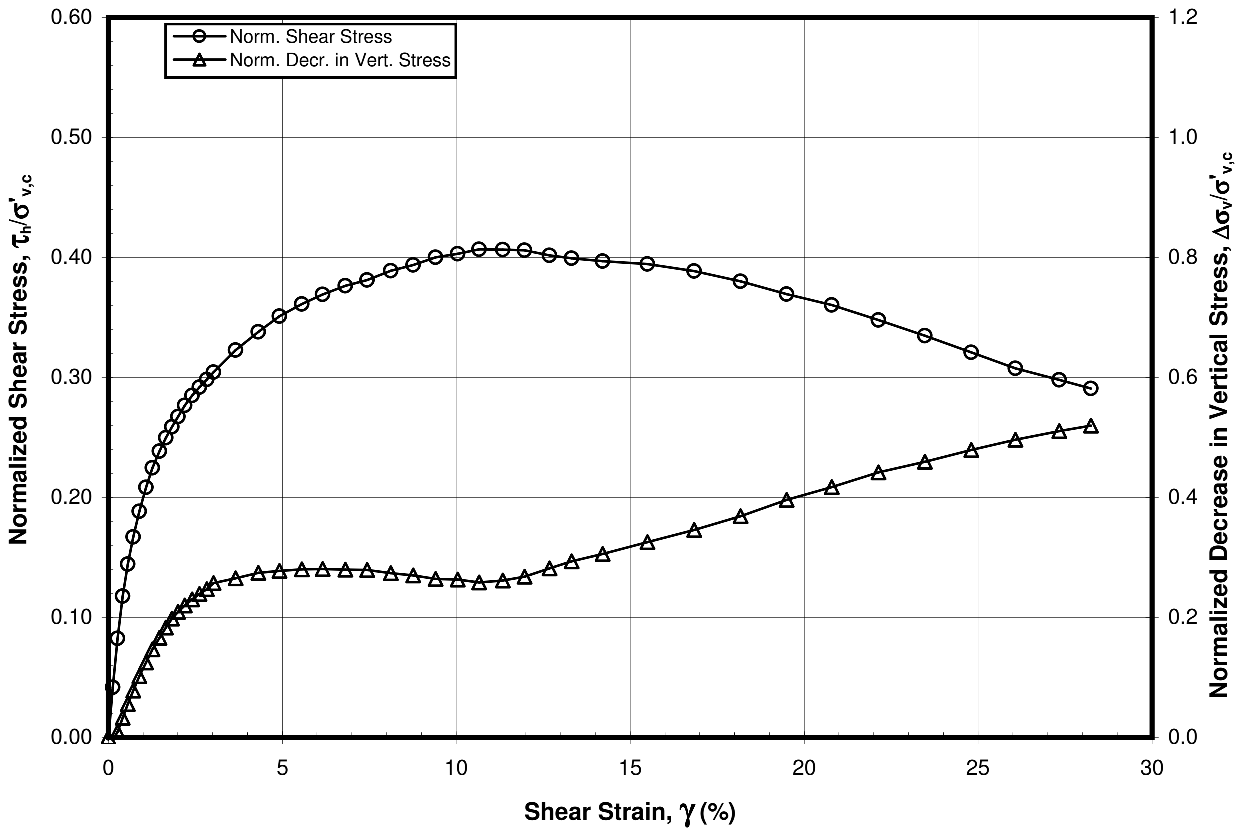
FIGURE A14-9

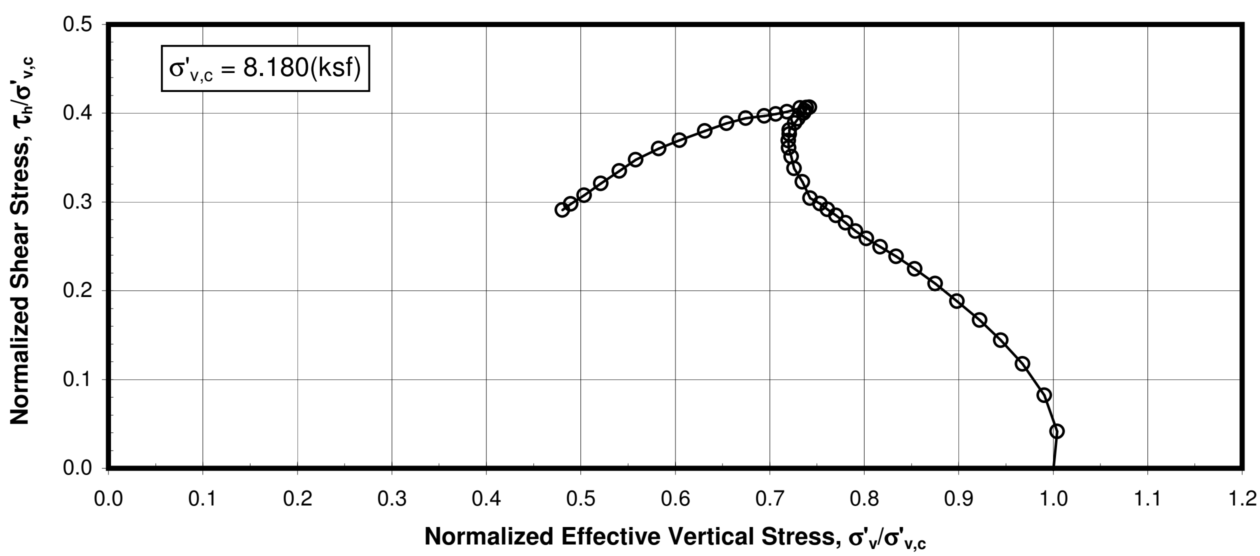




STATIC DIRECT SIMPLE SHEAR TEST RESULTS
Sample: 17b - Depth: 169.85 ft. Induced OCR = 1
Boring B-59
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A14-10





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

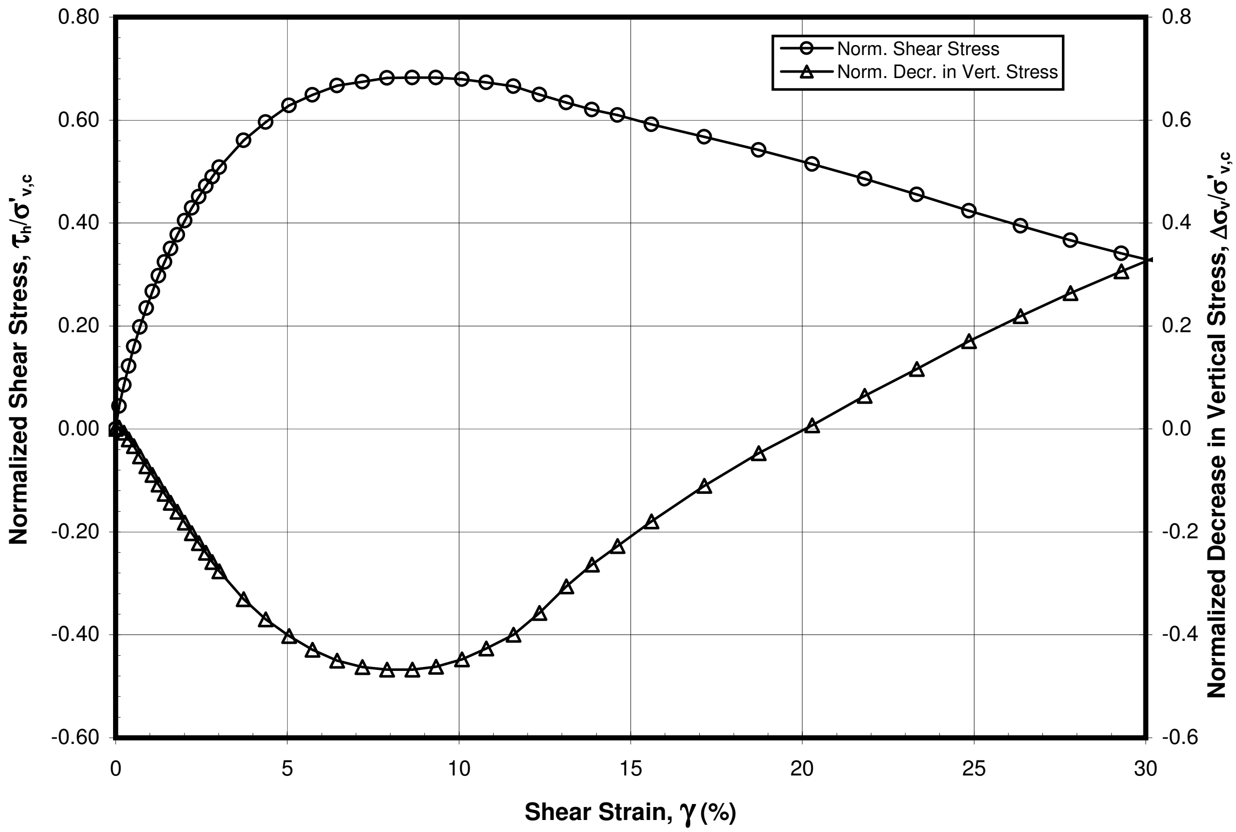
Sample: 15b - Depth: 125.70 ft. Induced OCR = 1

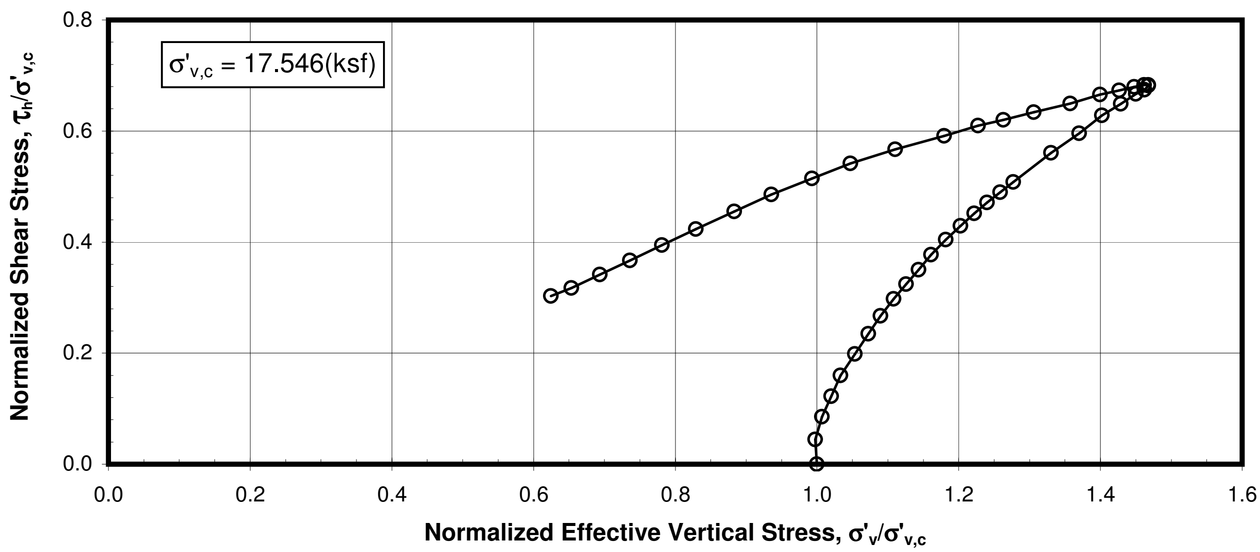
Boring B-61

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A14-11





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

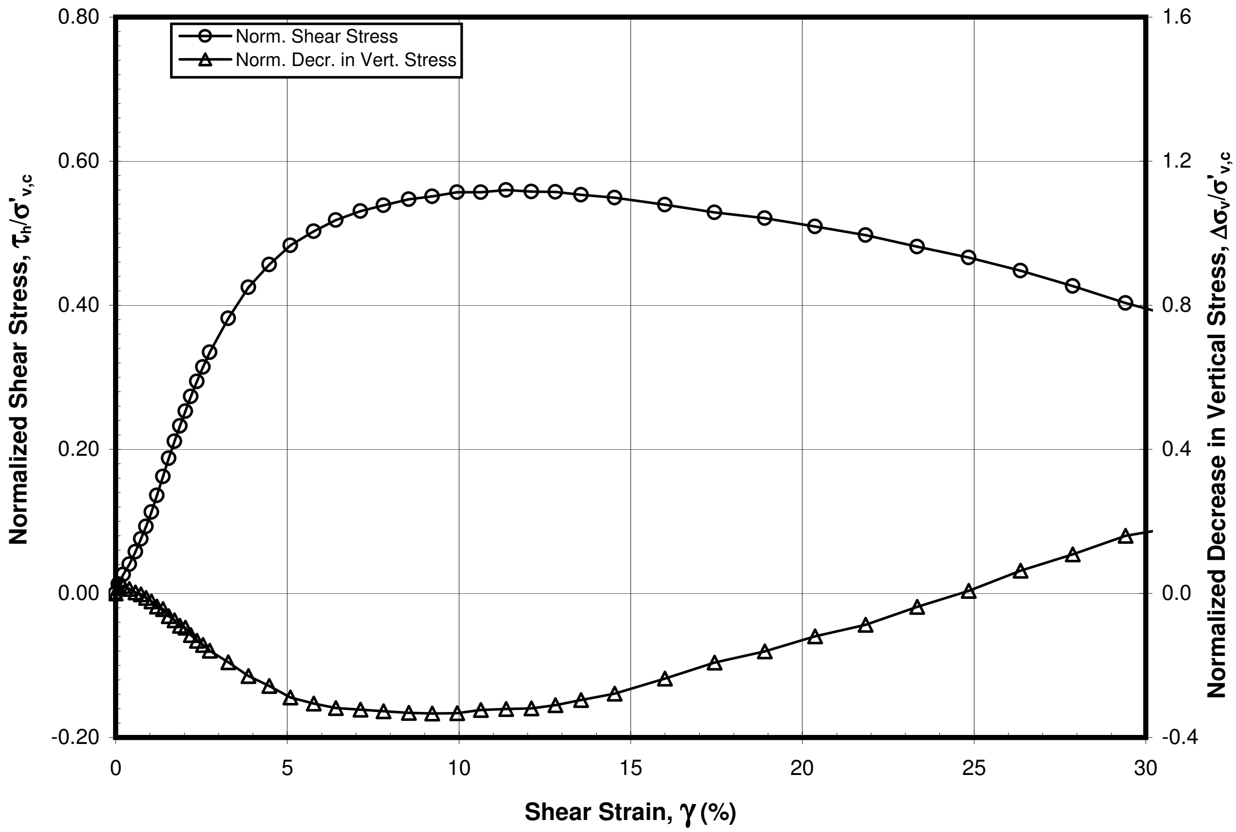
Sample: 15f - Depth: 127.10 ft. Induced OCR = 4

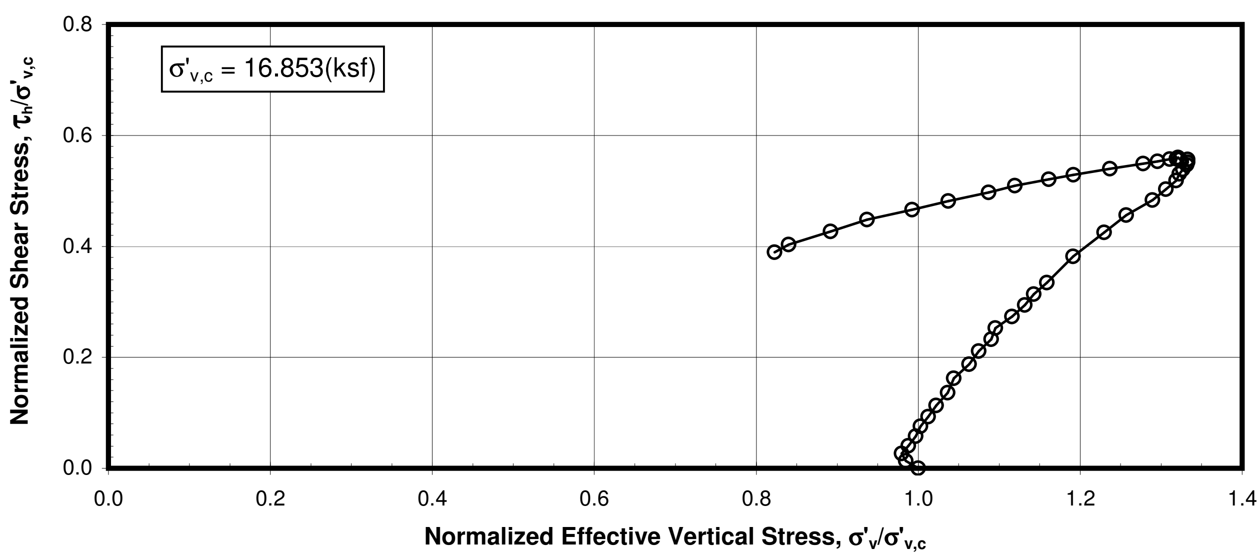
Boring B-61

Tunnel Segment of SVRT Project

San Jose, California

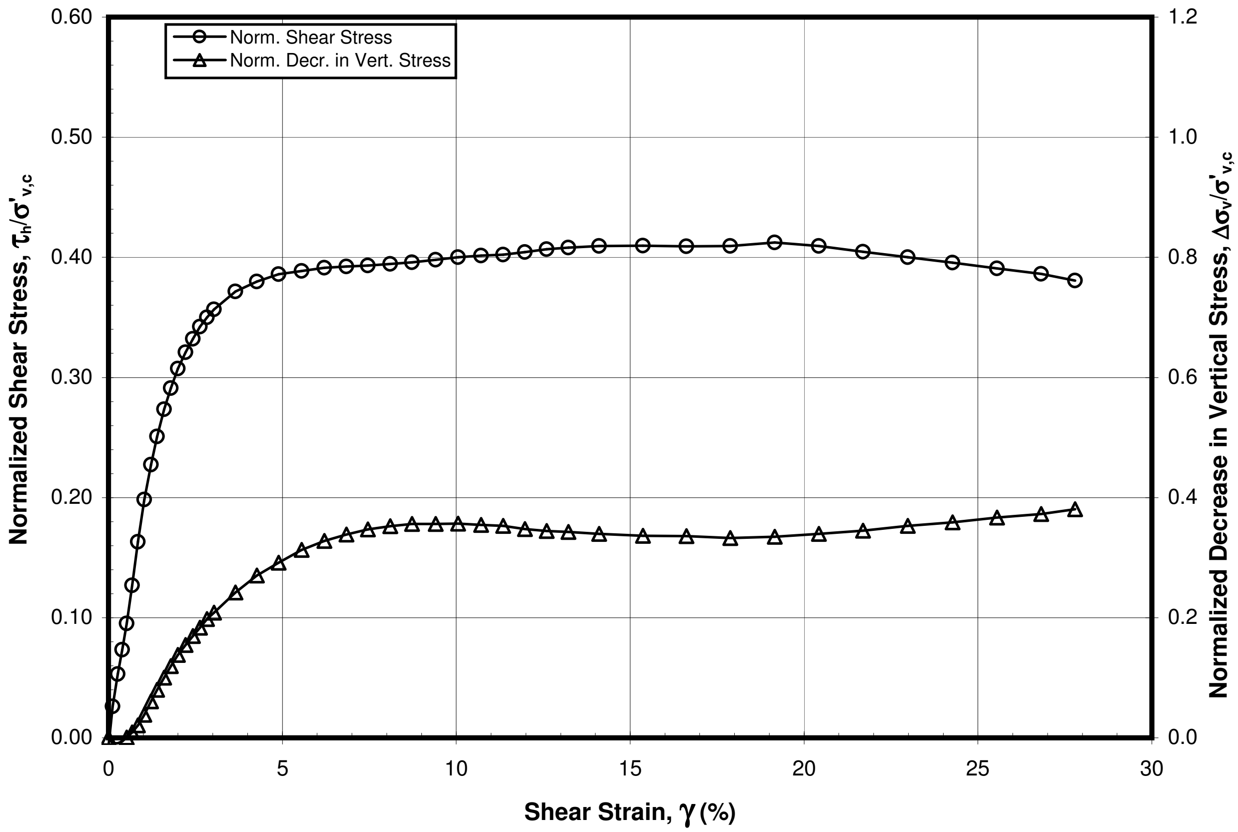
FIGURE A14-12

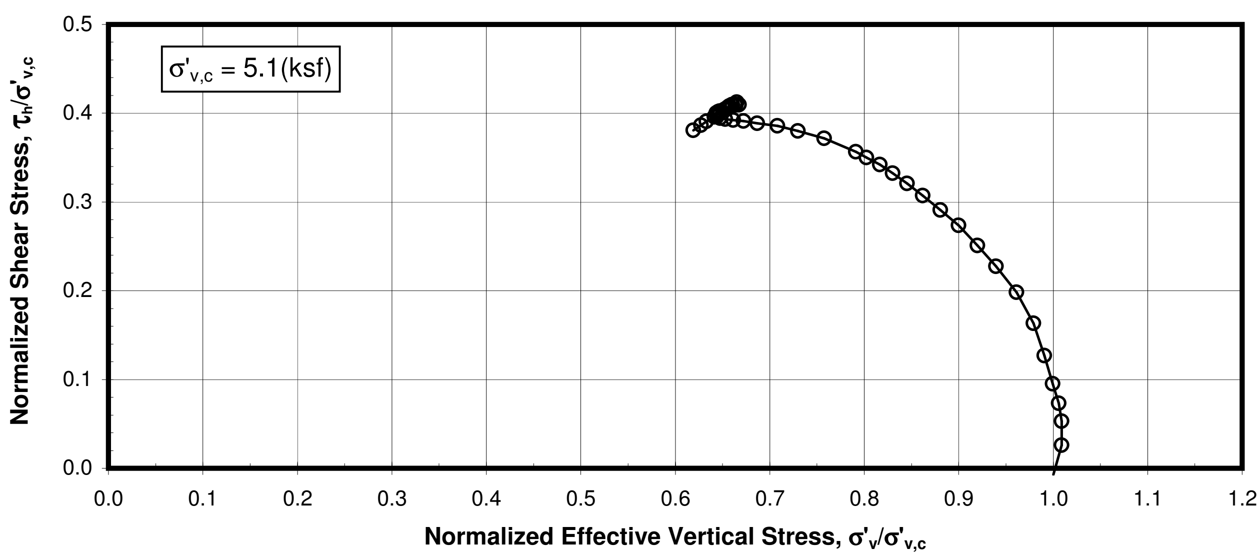




STATIC DIRECT SIMPLE SHEAR TEST RESULTS
Sample: 17c - Depth: 136.00 ft. Induced OCR = 2.99
Boring B-61
Tunnel Segment of SVRT Project
San Jose, California

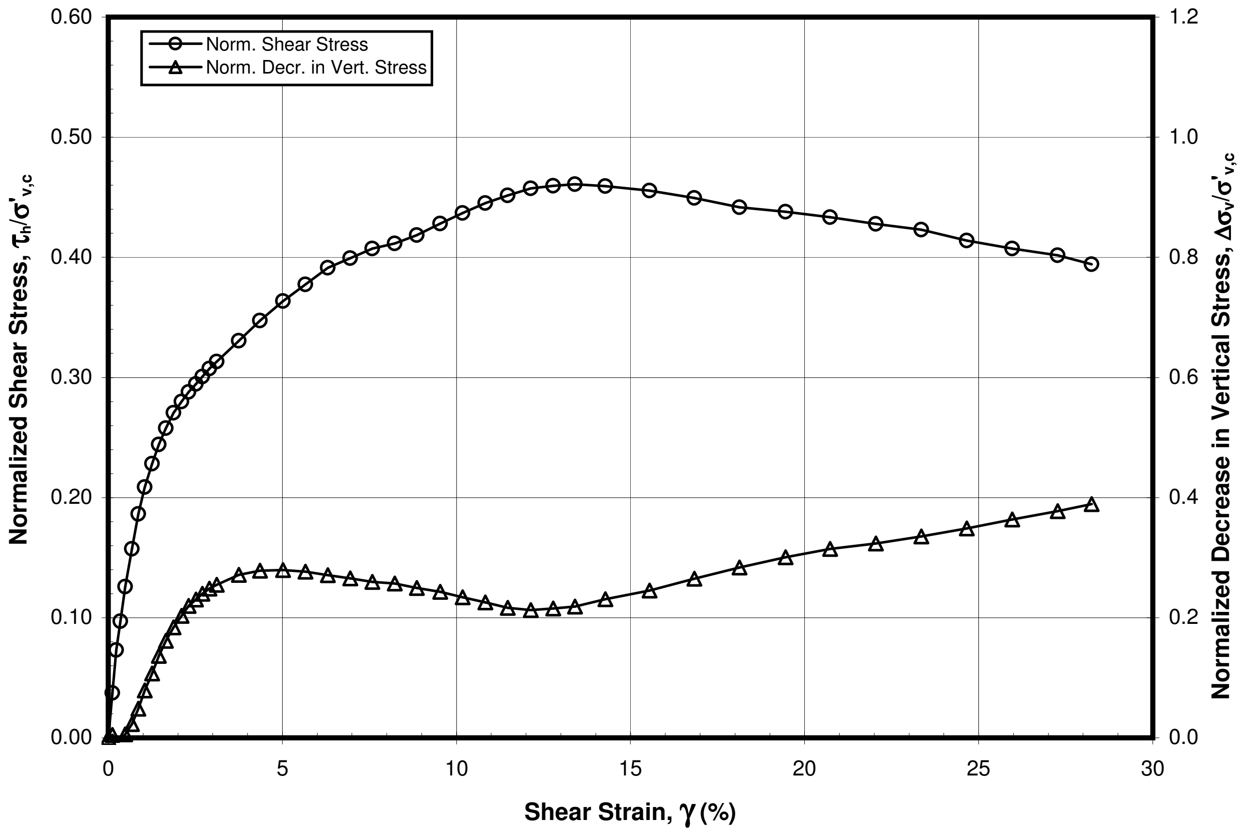
FIGURE A14-13

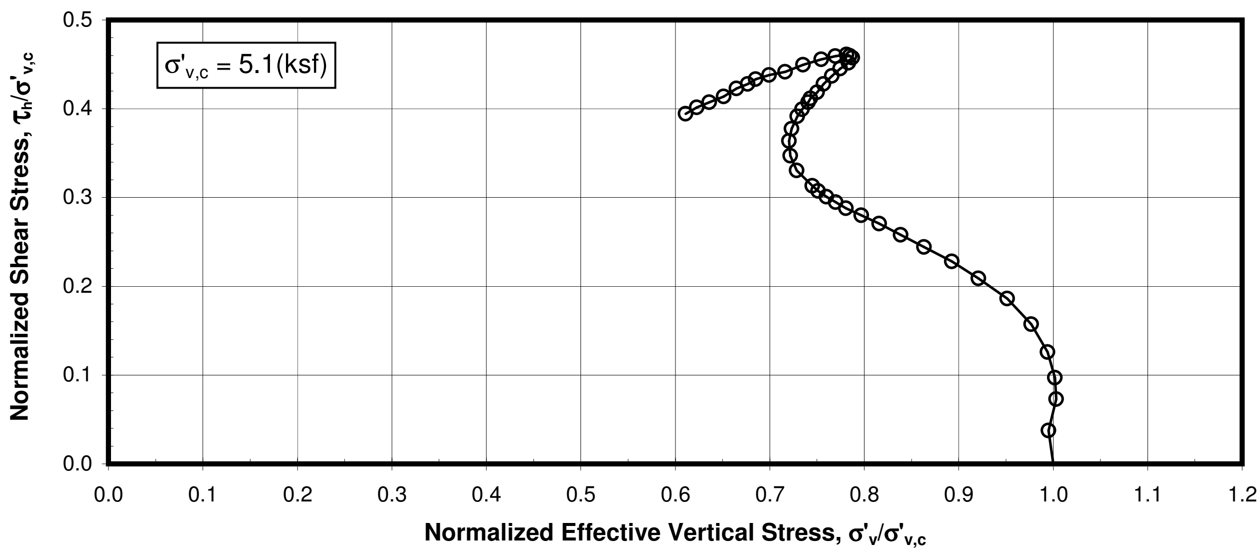




STATIC DIRECT SIMPLE SHEAR TEST RESULTS
Sample: 18a - Depth: 148.90 ft. Induced OCR = 1
Boring B-68
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A14-14





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

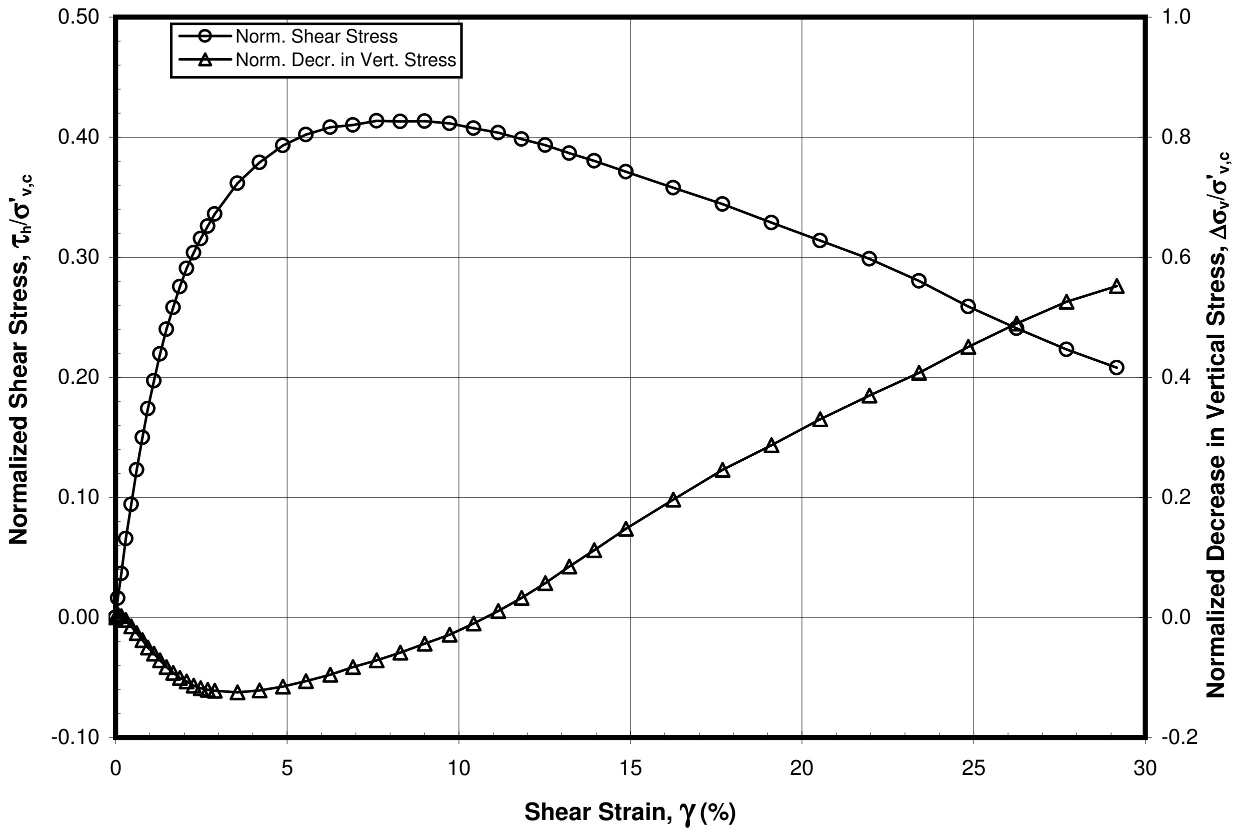
Sample: 15a- Depth: 151.00 ft. Induced OCR = 1

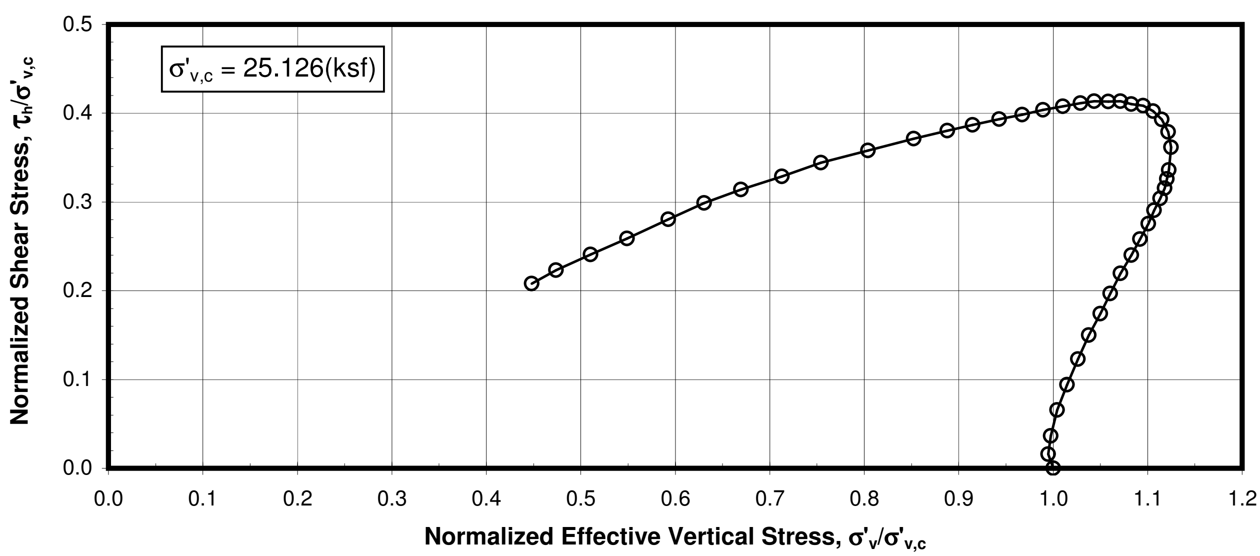
Boring B-75

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A14-15





STATIC DIRECT SIMPLE SHEAR TEST RESULTS

Sample: 15d - Depth: 150.05 ft. Induced OCR = 2

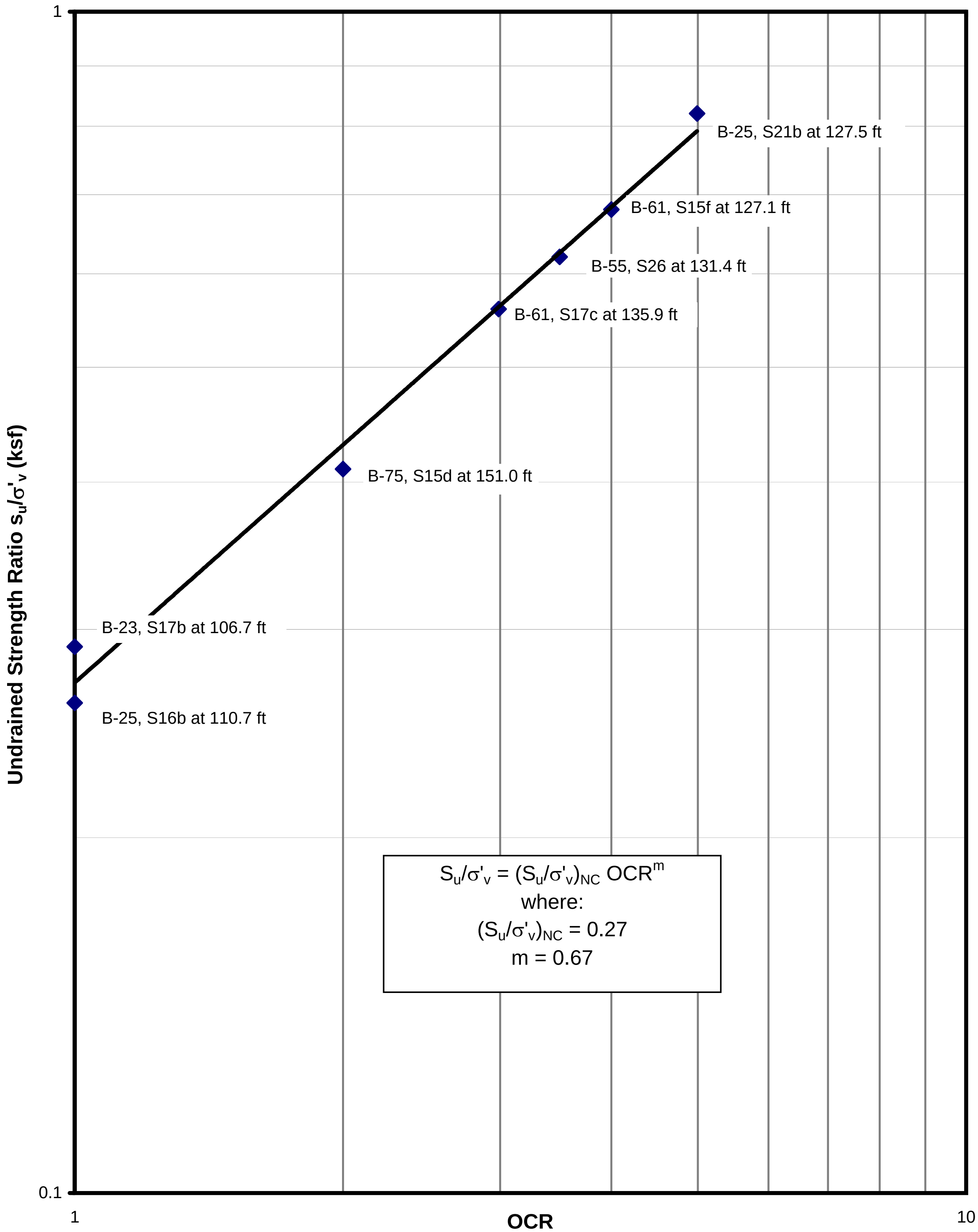
Boring B-75

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A14-16

HMM/Bechtel
Project No. 1637.001



INFLUENCE OF OCR ON UNDRAINED SHEAR STRENGTH
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A14-17

APPENDIX 15

CONSOLIDATED DRAINED TRIAXIAL COMPRESSION TEST RESULTS

Appendix 15 presents the laboratory results of the Consolidated Drained Triaxial Compression tests performed by Fugro.

FUGRO WEST, INC.

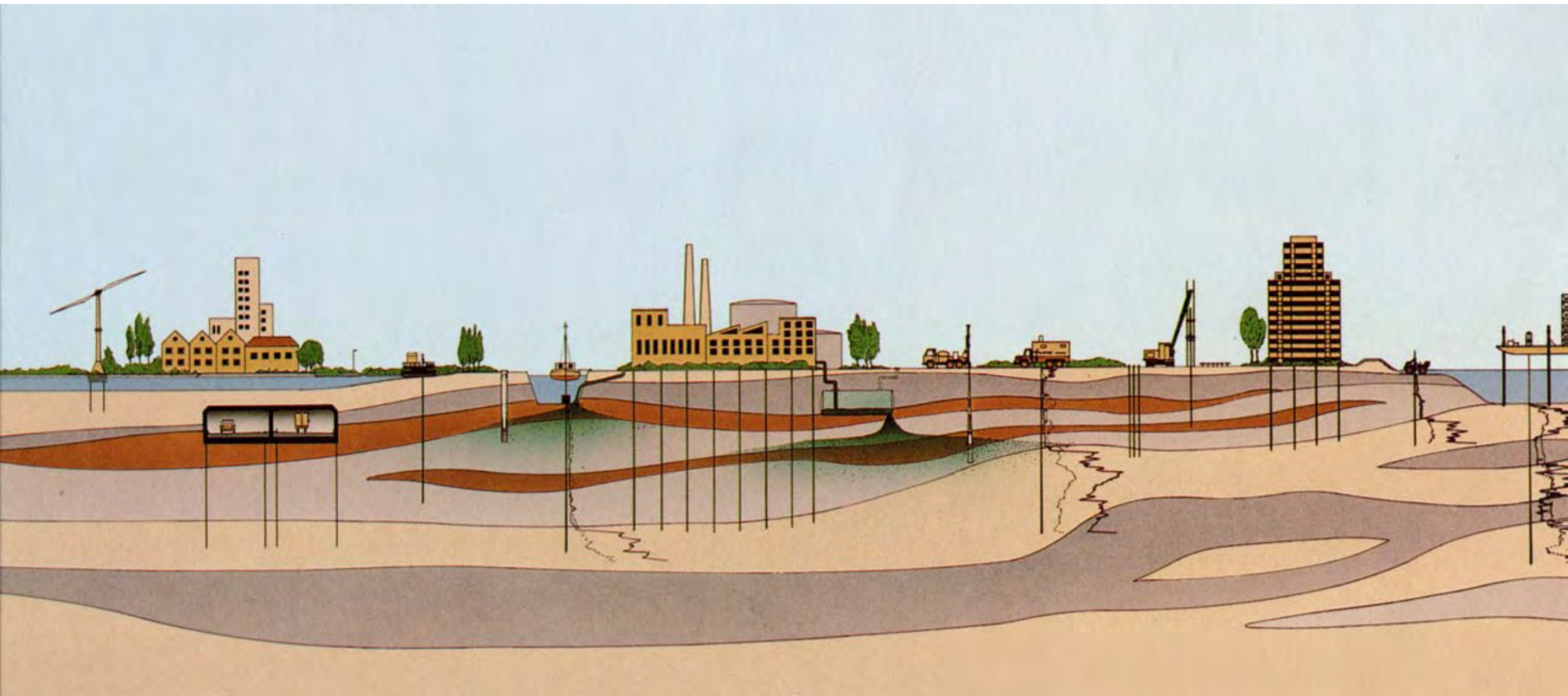
APPENDIX 15
CONSOLIDATED DRAINED TRIAXIAL COMPRESSION TEST RESULTS

GEOTECHNICAL EXPLORATION PROGRAM
TUNNEL SEGMENT OF SILICON VALLEY RAPID TRANSIT (SVRT) PROJECT
SAN JOSE, CALIFORNIA

Prepared for:
HMM/BECHTEL

JULY 2005

Project No. 1637.001



REPORT DOCKET

APPROVAL

This document is approved by the following:

Name	Title	Signature	Issue Date
Jon W. Mitchell	Project Manager	Jon W. Mitchell	July 20, 2005

REVISION HISTORY

Revision	Date	Change	Approval
0	June 3, 2005	Draft Report: Appendix 15 Consolidated Drained Triaxial Compression Test Results	Jon
1	July 20, 2005	Final Report: Appendix 15 Consolidated Drained Triaxial Compression Test Results with Bechtel comments from 6/10/05 & 7/13/05	Jon

FUGRO WEST, INC.

FUGRO

1000 Broadway, Suite 200
Oakland, California 94607
Tel: (510) 268-0461
Fax: (510) 268-0137

July 20, 2005
Project No. 1637.001

HMM/Bechtel
3103 North First Street
San Jose, California 95134

Attention: Mr. Ignacio Arango

Subject: Appendix 15 – Consolidated Drained Triaxial Compression Test Results
Tunnel Segment of SVRT Project
San Jose, California

Dear Mr. Arango:

Fugro West, Inc., is pleased to submit this copy of "Appendix 15 – Consolidated Drained Triaxial Compression Test Results," presenting the results of the Consolidated Drained Triaxial Compression tests performed by geotechnical laboratory of Fugro Consultants LP in Houston, Texas, for the tunnel segment of the SVRT Project in San Jose, California.

We appreciate this opportunity to be of continued service to HMM/Bechtel. Please contact Jon Mitchell at (510) 267-4430 if you have any questions regarding the information presented in this appendix.

Sincerely,

FUGRO WEST, INC.

Linda Al Atik
Staff Engineer

Jon W. Mitchell
Staff Engineer

REGISTERED PROFESSIONAL ENGINEER · RONALD L. BAJUNIEMI · No. 112 · Exp. 12-31-05 · GEOTECHNICAL · STATE OF CALIFORNIA

Ronald L. Bajuniemi, P.E., G.E.
Principal Consultant

LAA/JWM/RLB:rp

Copies Submitted: (pdf) Addressee

CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This appendix presents the results of the Consolidated Drained Triaxial Compression (CDTX) tests conducted by the geotechnical laboratory of Fugro Consultants LP in Houston, Texas, (Fugro Consultants) as a part of the advanced laboratory testing program for the Tunnel Segment of the SVRT Project. The CDTX compression tests were performed on soil samples from boring locations situated along the tunnel segment alignment of the Silicon Valley Rapid Transit (SVRT) Project, as shown on the Test Sample Location Map, Figure A15-1.

1.1 PROJECT DESCRIPTION

The Santa Clara Valley Transportation Authority (VTA) intends to construct the SVRT Project in San Jose, California. This will be a 26.2-km (16.3-mile) extension of the Bay Area Rapid Transit (BART) heavy rail rapid transit system from its planned terminus at the end of the Warms Springs Extension in Fremont, to San Jose. The proposed alignment currently includes six stations (three above-grade and three below-grade), a proposed future station, and vehicle storage and maintenance facilities. The alignment is composed of two major segments;

1. A line segment which will be approximately 11.5 miles of at-grade, elevated and cut-and-cover track from Warm Springs to San Jose; and
2. A 5.1-mile-long tunnel segment, consisting of twin bored tunnels and cut-and-cover structures through downtown San Jose (see Figure A15-1).

As currently planned, the tunnel segment includes at-grade and open cut track, three cut-and-cover stations, and a cut-and-cover track crossover structure. The cut-and-cover stations and the crossover structures have a cumulative length of approximately 4,970 feet. The remaining 4.14 miles of the alignment will be twin 19.5-foot-diameter tunnels.

This investigation and report cover the 5.1-mile-long tunnel segment section only.

1.2 GEOTECHNICAL EXPLORATION PROGRAM OVERVIEW

The joint venture of Hatch Mott MacDonald T & T, Inc., and Bechtel Infrastructure Corporation (HMM/Bechtel) is providing engineering design services for the tunnel segments (Segments 3 and 4) of the SVRT Project to the VTA. HMM/Bechtel has subcontracted with a number of companies to conduct the geotechnical field exploration program for the project. HMM/Bechtel's primary subcontractors for the geotechnical exploration program included Fugro West, Inc., (Fugro), Parikh Consultants (Parikh), and Pitcher Drilling Company (Pitcher).

The three companies, Fugro, Parikh, and Pitcher, conducted the majority of the geotechnical field exploration program for the tunnel segments of the SVRT Project from October 15, 2004, to March 5, 2005. The intent of the geotechnical field investigation program was to obtain geotechnical data that would aid in the design and construction of the proposed tunnel and cut-and-cover structures.

In general, the geotechnical field investigations explored subsurface conditions along the proposed tunnel alignment within the vicinity of the proposed Eastern and Western Portals, at the two proposed ventilation structures, and at the proposed stations including Alum Rock Station, Downtown San Jose Station, and Diridon/Arena Station. The geotechnical exploration program included:

- 76 rotary wash borings, and
- 146 cone penetration tests (CPTs).

Figure A15-1 provides a map of the exploration locations. These locations were selected by HMM/Bechtel based on the following considerations: 1) the data requirements of the tunnel designer; 2) the location of existing geotechnical data; 3) the avoidance of private property; and 4) the avoidance of existing underground and overhead utilities. For CPT correlation purposes approximately 16 sets of borings and CPTs were conducted within 15 feet of each other.

The boring investigation program was conducted by the two companies, Parikh and Pitcher. The investigation included soil sampling and in situ testing. Soil sampling consisted of Pitcher Barrel sampling, Shelby tube sampling, SPT sampling and California sampling. The in situ testing conducted in the borings consisted of field vane shear testing, pressuremeter testing, downhole geophysical logging, and piezometer installation. For further details regarding the boring investigation program and results, please refer to the main report.

1.3 LABORATORY TESTING PROGRAM OVERVIEW

1.3.1 Testing Overview

Fugro Consultants' geotechnical laboratory conducted the advanced laboratory testing program for the Tunnel Segment of the SVRT Project. This program was conducted on samples provided by Parikh from soil borings located along the tunnel segment. Table A15-1, below, summarizes the numbers and types of different tests conducted. The purpose of this advanced laboratory testing program was to determine selected index and engineering properties of the sampled soils. This appendix provides a detailed description for the consolidated drained triaxial compression tests along with a summary of the interpreted parameters.

Table A15-1. Summary of Advanced Laboratory Testing Program

Test Description	Number of Tests
Constant Rate of Strain (CRS) Consolidation	37
Static Direct Simple Shear	15
K_0-Consolidated Undrained Triaxial Compression	20
K_0-Consolidated Undrained Triaxial Extension	16
K_0-Consolidated Bishop's Procedure	12
Consolidated Drained Triaxial Compression	30

1.3.2 Program Description

The physical properties of the soils tested during the advanced laboratory testing program are separated into two categories, i.e., index and engineering. The index properties include items such as water content, specific gravity, unit weight, void ratio, and degree of saturation. The engineering properties include items such as compressibility (consolidation), strength, and hydraulic conductivity (permeability). The advanced tests conducted as part of this laboratory testing program are discussed in more detail below.

- **Constant Rate of Strain Consolidation (CRS)** tests were conducted to determine the rate and magnitude of soil consolidation as well as stress history for a soil sample that is restrained laterally and drained axially. The one-dimensional consolidation tests typically involved constant rate-of-loading, one unload-reload cycle, and one rebound stage from the maximum applied stress. Detailed discussion of the CRS consolidation tests is provided in Appendix 13.
- **Static Direct Simple Shear (DSS)** tests were conducted to measure constant volume (undrained) shear strength and stress strain-characteristics of cohesive soils after one-dimensional consolidation using a constant rate of simple shear deformation. Detailed discussion of the DSS tests is provided in Appendix 14.
- **Isotropically Consolidated Drained Triaxial Drained** tests were conducted to evaluate the drained strength characteristics, such as friction angle and stress-strain relationship of the soils encountered in the borings. A detailed discussion of the consolidated drained triaxial tests is provided in this appendix.
- **K_0-Consolidated Undrained Triaxial Compression and Extension (CK_0UC & CK_0UE)** tests were conducted to estimate the static strength parameters and stress-strain characteristics of fine-grained soils under a range of confining stresses and overconsolidation ratios (OCRs). In the K_0-consolidated test, the sample was consolidated under drained conditions to the assigned vertical stress while maintaining a constant diameter of the cylindrical specimen (the horizontal confining stress was automatically adjusted to maintain the constant diameter). For detailed discussion of the K_0 triaxial compression and extension tests, refer to Appendix 16.
- **K_0 Bishop's Procedure Triaxial** tests were conducted to determine the at-rest lateral earth pressure coefficient (K_0) as a function of the overconsolidation ratio (OCR). For detailed discussion of the K_0 Bishop's tests, refer to Appendix 17.

The scope of the advanced laboratory testing program also included the x-raying of assigned soil samples. Discussion of the x-ray testing procedures and a summary of results are provided in Section 2.0 of Appendix 13, with x-ray images shown in Appendix 20.

1.3.3 Sample Recovery and Handling

Soil sampling was conducted by Parikh at intervals typically ranging from 5 to 10 feet in accordance with the project specifications. Upon sample recovery, undisturbed portions of the

soil sample tubes were sealed and transported to Parikh's lab. For further details regarding sample recovery and handling, refer to the main report.

Soil samples assigned for advanced laboratory testing were transported in wooden Shelby tube holders designed to maintain the tubes vertical orientation during transit to Fugro's laboratory in Oakland, California. The samples where then packed in specially fabricated, padded containers designed to minimize disturbance, and maintain an upright (vertical) orientation of the samples during shipping. The samples were finally shipped to Fugro Consultants' geotechnical laboratory for testing.

1.3.4 Overview of Consolidated Drained Triaxial Compression Test Program

Fugro Consultants' geotechnical laboratory conducted CDTX compression tests on 32 samples, as assigned by HMM/Bechtel. CDTX compression tests are performed to evaluate the drained strength characteristics (e.g., friction angle and stress-strain relationship) of the soils encountered in the borings. The samples were consolidated to the assigned test stresses under isotropic stress conditions (i.e., the same vertical and horizontal effective confining stresses).

In the CDTX compression test method, the shear characteristics are measured under drained conditions. This test method is applicable to field conditions where soils have been consolidated under the existing normal stresses, and are then sheared under drained conditions. The CDTX compression test may be used to determine strength and stress-strain relationships of a cylindrical specimen of either an undisturbed or remolded non-cohesive soils or sands. This test provides data useful in determining strength and deformation properties such as Mohr strength envelopes. Often, two to three specimens from each sample tube are tested at different effective consolidation stresses to define a strength envelope.

2.0 CONSOLIDATED DRAINED TRIAXIAL TEST COMPRESSION PROCEDURES

2.1 INTRODUCTION

The CDTX compression tests were conducted in general accordance with the U.S. Army Corps of Engineers' tests standard EM 1110 (1986), as well as the proposed ASTM test method that is currently in development. In the CDTX compression test, the sample is consolidated under drained conditions to the assigned vertical stress. The sample is then sheared to failure under drained conditions. This test method provides for the calculation of effective stresses, and axial compression by measurement of axial load, axial deformation, and pore water pressure.

2.2 CONSOLIDATED DRAINED TRIAXIAL COMPRESSION TEST STANDARDS AND PROCEDURES

CDTX compression tests were performed using the same system used to conduct the K_0-Consolidated Undrained Triaxial test, which is an automated system developed by Fugro Consultants and Trautwein and Germaine (at the Massachusetts Institute of Technology). The test procedure followed the technical requirements of the ASTM Test Method for Consolidated

Drained Triaxial Compression Tests for Soils that is currently under development. The procedure for the Consolidated Drained Triaxial tests typically consists of five steps:

1. *Cell Preparation*: Using the assigned confining pressure, strength estimates and specimen area, the proper load cell and pressure transducers are selected.
2. *Specimen Preparation*: The selected portions of the tubes were cut into segments with a mechanical hacksaw (18 teeth per inch). A wire saw was used to separate the soil from the surrounding tube in an effort to reduce potential disturbance upon extrusion. In addition, each tube is marked such that all test specimens, will have the same orientation when sheared. The sample is then extruded from the cut portion of the tube using a hydraulically actuated ram.
3. Test specimens are typically trimmed to a 2.0-inch diameter by 4-inch height. After specimens are trimmed, they are mounted in the triaxial testing apparatus and aligned with the cell base with porous stones at each end. Each specimen had top, bottom and radial drainage boundaries during consolidation. The radial drainage was provided by spirally oriented ¼ inch wide, Whatman No. 1 filter strips placed at about ¼-inch spacing.
4. *Back Pressure Saturation:* Specimen saturation is usually achieved through back pressuring at either, an effective isotropic-confining stress of 3 to 7 psi (21 to 48 Kpa), a stress that prevents swelling or the assigned stress, whichever was smaller.
5. *Consolidation:* The soil specimen is isotropically-consolidated, to the assigned vertical stress. The samples are typically consolidated at a controlled rate of strain of about 0.1 to 0.5 percent/hr, depending upon its liquid limit. The duration of all consolidation increments is such that at least 95 percent consolidation is achieved. The assigned confining stresses ranged from below the present overburden to above the past maximum pressure as determined in the consolidation tests.
6. *Drained Axial Shearing:* During shearing, the chamber pressure is kept constant and specimen drainage is permitted. An axial loading piston is advanced into (shearing compression) the cell at a specific rate of strain. The applied rate of strain is slow enough to produce approximate equalization of excess pore water pressures throughout the specimen at failure. For this program the specimens were sheared at strain rates between 0.007 and 1 percent/hour depending on the drainage rate determined from the consolidation portion of the test.

3.0 CONSOLIDATED DRAINED TRIAXIAL COMPRESSION TEST RESULTS

During consolidation and shearing the necessary data (time, vertical and horizontal forces, shear deformations, pore pressures and transducer excitation voltage) were recorded using an automated data-acquisition system and electronically filed. Specialized Excel worksheets, along with a Visual Basic code (VBA) were used to reduce the data files into engineering units in tabular and graphical format. Figures A15-2a through A15-12c present the CDTX compression test results.

For each test performed, the shear stress (q) and the volume change are plotted versus axial strain on one page while obliquity (σ_1'/σ_3') is plotted versus axial strain on a second page of plots. In addition, where two or more CDTX compression tests were conducted at various confining pressures from a single sample tube, a Mohr's circle is plotted for each specimen. The Mohr's circle is a plot of the shear stress at failure versus the effective normal (vertical) stress.

Results such as moisture content, Atterberg limits, initial unit weight, soil type, void ratio, initial total unit weight, estimated in situ vertical stress, vertical effective consolidation stress, the confinement pressure, axial strain at the maximum shear stress, the maximum shear stress, maximum obliquity, and the coefficient of cohesion and effective friction angle determined from the Mohr's circles plots are summarized in "Table A15-2 – Summary of CDTX Test Results." The estimated in situ vertical effective stress was estimated by developing a unit weight profile from the boring data with either measured or estimated ground water levels.

4.0 LIMITATIONS

Our services consist of laboratory testing, and data evaluations that are made in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The laboratory data provided in this appendix is from the laboratory testing of subsurface explorations conducted by others. These explorations indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. Variations may exist and conditions not observed or described in this report could be encountered during construction. Our laboratory tests results presented in this appendix are based on the standards and procedures indicated herein. The laboratory assignments were provided by HMM/Bechtel.

This appendix has been prepared for the exclusive use of HMM/Bechtel and their consultants for specific application to the SVRT project as described herein. In the event that there are any changes in the ownership, nature, design, or location of the proposed project, or if any future additions are planned, the results contained in this appendix should not be considered valid unless 1) the project changes are reviewed by Fugro, and 2) results presented in this appendix are modified or verified in writing. Reliance on this report by others must be at their risk unless we are consulted on the use or limitations. We cannot be responsible for the impacts of any changes in geotechnical standards, practices, or regulations subsequent to performance of services without our further consultation. We can neither vouch for the accuracy of information supplied by others, nor accept consequences for unconsulted use of segregated portions of this report.

5.0 REFERENCES

U.S. Army Corps of Engineers. "Laboratory Soils Testing," U.S. Army Corps of Engineers Engineering Manual, EM 1110-2-1906, November 30, 1970. Change 2, dated 20 August 1986.

TABLE

Boring Number / Sample Number	B-9 4a	B-9 4b	B-21 6a	B-21 6b	B-21 6c	B-24 6b	B-24 6c	B-24 6d	B-25 22a	B-25 22b
Penetration Depth (ft)	57.20	56.80	45.50	46.30	45.90	22.35	21.95	21.55	129.50	129.10
Soil Type	CH	CH	CL	CL	CL	CL	CL	CL	CL	CL
Atterberg Limits (%)										
Liquid Limit, LL	50	50	69	69	69	30	30	30	48	48
Plastic Limit, PL	18	18	23	23	23	20	20	20	21	21
Water Content (%)										
In Situ Water Content, W_o	21.8	21.6	35.4	33.3	33.6	26.1	27.1	25.6	25.1	24.5
Initial Water Content Before Consolidation, W_i	21.8	20.6	34.2	33.0	33.9	27.0	25.6	26.7	24.9	24.9
Final Water Content After Consolidation, W_f	18.2	17.1	40.1	28.0	25.7	22.7	22.4	21.1	24.7	25.6
Void Ratio										
Initial Void Ratio, e_0	0.63	0.62	0.95	0.91	0.93	0.74	0.66	0.72	0.75	0.73
Final Void Ratio, e_f	0.51	0.47	0.92	0.75	0.68	0.60	0.60	0.57	0.40	0.70
Initial Total Unit Weight, $\gamma_{t,0}$ (pcf)	128	128	118	119	119	123	127	124	123	124
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	4.03	4.00	3.15	3.18	3.20	1.96	1.93	1.91	9.56	9.52
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	18.96	27.89	1.63	16.61	24.86	0.95	1.80	6.06	50.15	4.30
Test Induced Overconsolidation, OCR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Axial Strain at Max Shear Stress, ε_a (%)	11.5	14.7	5.5	18.4	18.7	8.3	9.8	15.7	16.4	10.5
Axial Strain at Max Obliquity, ε_a (%)	10.4	14.7	6.0	18.7	18.7	9.0	9.3	11.6	16.1	10.5
Maximum Shear Stress (ksf)	12.50	16.98	2.00	10.42	15.07	1.62	2.61	8.18	41.88	4.62
Maximum Obliquity (σ'_1/σ'_3)	2.33	2.22	3.35	2.27	2.22	4.51	3.97	3.73	2.68	3.2
Friction Angle, ϕ' (degrees)										
At Max. Shear Stress, c' = 0	23.6	22.2	33	22.6	22.2	39.2	36.2	34.4	26.6	31.6
From Multi-Specimen Mohr Circle Plot	19.8		21.1			33.4			26.6	
Coefficient of Cohesion*, C' (ksf)	2		0.8			0.3			0.9	

Notes: NA = Test Not Assigned
* Interpreted from Mutli-Specimen Mohr's circle plot

SUMMARY OF CONSOLIDATED DRAINED TRIAXIAL TEST RESULTS
Tunnel Segment of SVRT Project
San Jose, California

Boring Number Sample Number	B-33 7a	B-33 7b	B-33 7c	B-38 14b	B-38 14c	B-60 3a	B-60 3b	B-60 3c
Penetration Depth (ft)	62.50	62.05	61.65	75.85	75.45	17.50	17.05	16.65
Soil Type	CL	CL	CL	CL	CL	ML/CL	ML/CL	ML/CL
Atterberg Limits (%)								
Liquid Limit, LL	39	39	39	37	37	27	27	27
Plastic Limit, PL	19	19	19	18	18	20	20	20
Water Content (%)								
In Situ Water Content, W_o	24.3	24.3	22.8	23.3	23.2	26.1	22.2	16.3
Initial Water Content Before Consolidation, W_i	24.7	25.1	22.9	23.7	23.2	26.0	22.6	16.3
Final Water Content After Consolidation, W_f	23.7	20.4	18.1	22.2	24.0	24.3	21.3	15.0
Void Ratio								
Initial Void Ratio, e_0	0.72	0.73	0.67	0.69	0.68	0.70	0.63	0.46
Final Void Ratio, e_f	0.65	0.59	0.51	0.63	0.66	0.68	0.59	0.44
Initial Total Unit Weight, $\gamma_{t,0}$ (pcf)	124	124	126	126	126	127	129	137
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	4.40	4.37	4.34	5.37	5.35	1.49	1.46	1.44
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	4.35	12.23	20.89	5.22	2.84	0.97	1.84	6.86
Test Induced Overconsolidation, OCR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Axial Strain at Max Shear Stress, ε_a (%)	18.4	19.0	19.5	10.8	3.2	4.8	4.8	7.3
Axial Strain at Max Obliquity, ε_a (%)	16.0	19.0	19.5	10.5	3.7	4.8	5.1	7.0
Maximum Shear Stress (ksf)	5.02	13.23	25.11	6.47	3.84	1.44	3.09	11.98
Maximum Obliquity (σ'_1/σ'_3)	3.38	3.22	3.42	3.5	3.82	4.22	4.63	4.52
Friction Angle, ϕ' (degrees)								
At Max. Shear Stress, c' = 0	32.8	21.6	33	34.3	35.6	38.5	40	39.2
From Multi-Specimen Mohr Circle Plot		33		31.5			39.7	
Coefficient of Cohesion*, C' (ksf)		0		0.5			0	

Notes: NA = Test Not Assigned

* Interpreted from Mutli-Specimen Mohr's circle plot

SUMMARY OF CONSOLIDATED DRAINED TRIAXIAL TEST RESULTS

Tunnel Segment of SVRT Project

San Jose, California

TABLE A15-2b

Boring Number Sample Number	B-61 15c	B-61 15d	B-61 15e	B-64 18b	B-64 18c	B-64 18d	B-66 6a	B-66 6b	B-66 6d
Penetration Depth (ft)	126.00	126.50	126.90	106.90	106.50	106.10	27.40	27.00	25.80
Soil Type	CH	CH	CH	CL	CL	CL	CL	CL	CL
Atterberg Limits (%)									
Liquid Limit, LL	41	41	41	NA	NA	NA	36	36	36
Plastic Limit, PL	21	21	21	NA	NA	NA	17	17	17
Water Content (%)									
In Situ Water Content, W_o	23.5	24.1	26.6	22.0	20.3	19.9	22.2	22.2	23.3
Initial Water Content Before Consolidation, W_i	24.2	23.8	27.0	21.9	20.6	20.6	22.7	21.9	22.5
Final Water Content After Consolidation, W_f	26.0	27.8	25.5	20.0	17.9	16.3	20.6	21.5	20.6
Void Ratio									
Initial Void Ratio, e_0	0.75	0.77	0.78	0.58	0.55	0.54	0.66	0.72	0.77
Final Void Ratio, e_f	0.74	0.76	0.69	0.54	0.49	0.43	0.56	0.62	0.58
Initial Total Unit Weight, $\gamma_{t,0}$ (pcf)	122	120	123	129	130	130	127	121	119
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	8.65	8.68	8.70	7.14	7.17	7.14	2.06	2.00	1.95
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	4.15	8.27	16.11	3.74	6.91	18.73	7.03	11.74	18.15
Test Induced Overconsolidation, OCR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Axial Strain at Max Shear Stress, ε_a (%)	10.3	17.4	19.4	5.9	11.7	11.8	17.8	20.5	19.1
Axial Strain at Max Obliquity, ε_a (%)	10.3	18.0	19.7	5.9	11.7	11.8	19.7	20.1	19.1
Maximum Shear Stress (ksf)	5.07	8.72	14.18	6.04	11.31	27.22	7.49	11.53	16.95
Maximum Obliquity (σ'_1/σ'_3)	3.53	3.13	2.77	4.32	4.29	3.92	3.14	2.98	2.87
Friction Angle, ϕ' (degrees)									
At Max. Shear Stress, c' = 0	34.3	30.8	28.1	39.1	38.4	36.2	30.7	30.1	29
From Multi-Specimen Mohr Circle Plot		24.7			35.8			27.5	
Coefficient of Cohesion*, C' (ksf)		1.8			0.5			0.9	

Notes: NA = Test Not Assigned
* Interpreted from Mutli-Specimen Mohr's circle plot

SUMMARY OF CONSOLIDATED DRAINED TRIAXIAL TEST RESULTS
Tunnel Segment of SVRT Project
San Jose, California

Boring Number Sample Number	B-75 14a	B-75 14b	B-75 14c
Penetration Depth (ft)	141.00	140.60	140.20
Soil Type	CL	CL	CL
Atterberg Limits (%)			
Liquid Limit, LL	29	29	29
Plastic Limit, PL	21	21	21
Water Content (%)			
In Situ Water Content, W_o	18.6	19.8	18.9
Initial Water Content Before Consolidation, W_i	19.0	20.6	18.2
Final Water Content After Consolidation, W_f	22.2	18.7	16.8
Void Ratio			
Initial Void Ratio, e_0	0.59	0.62	0.53
Final Void Ratio, e_f	0.58	0.54	0.45
Initial Total Unit Weight, $\gamma_{t,0}$ (pcf)	126	125	130
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	9.59	9.56	9.54
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	8.96	23.09	38.13
Test Induced Overconsolidation, OCR	1.00	1.00	1.00
Axial Strain at Max Shear Stress, ε_a (%)	19.7	14.9	14.8
Axial Strain at Max Obliquity, ε_a (%)	20.2	14.9	14.8
Maximum Shear Stress (ksf)	12.66	30.88	39.87
Maximum Obliquity (σ'_1/σ'_3)	3.84	3.68	3.1
Friction Angle, ϕ' (degrees)			
At Max. Shear Stress, c' = 0	35.8	35.1	30.5
From Multi-Specimen Mohr Circle Plot		28.8	
Coefficient of Cohesion*, C' (ksf)		3	

Notes: NA = Test Not Assigned

* Interpreted from Mutli-Specimen Mohr's circle plot

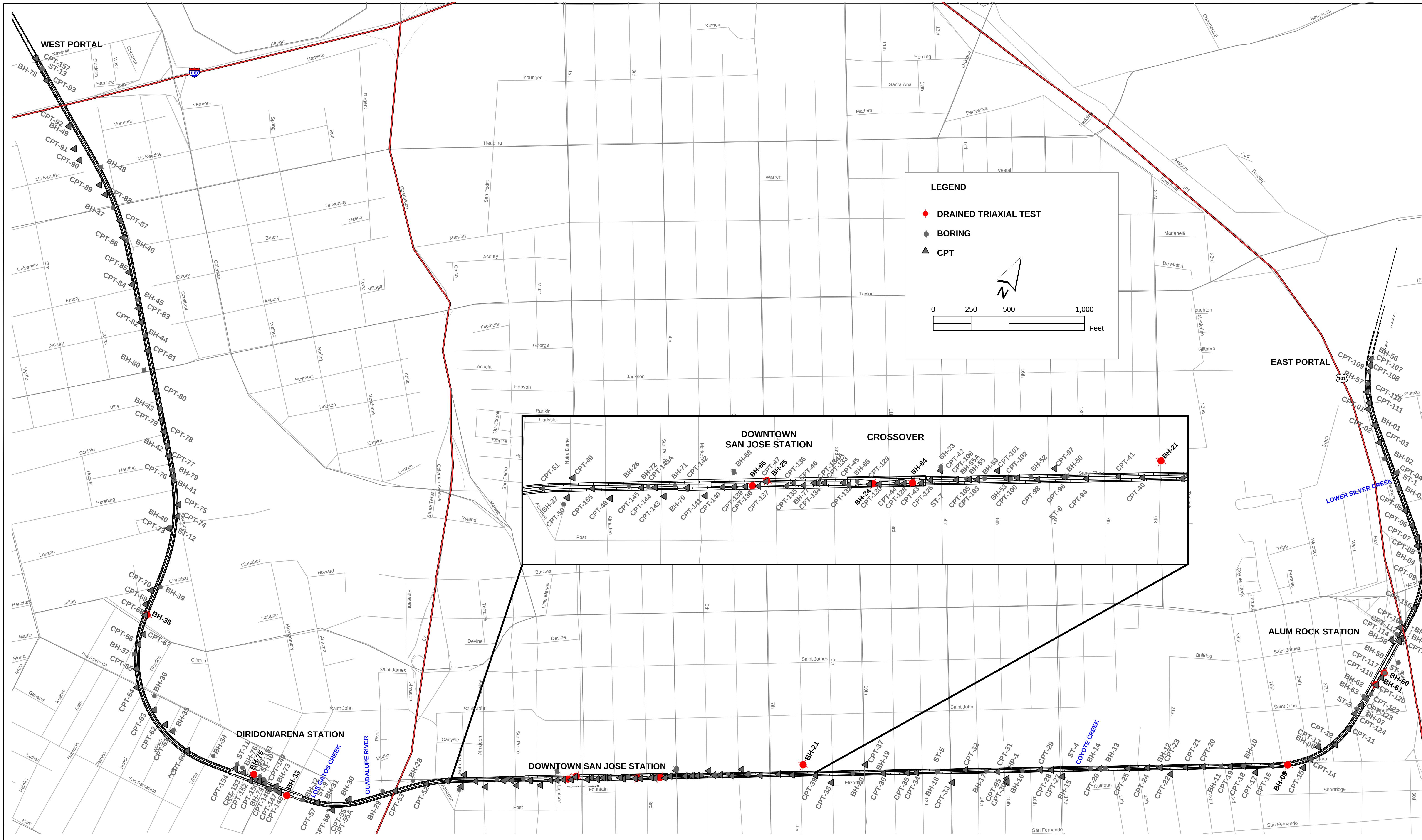
SUMMARY OF CONSOLIDATED DRAINED TRIAXIAL TEST RESULTS

Tunnel Segment of SVRT Project

San Jose, California

TABLE A15-2d

FIGURES



REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY

DRAWN BY

CHECKED BY

IN CHARGE

DATE

HMM / BECHTEL

A Joint Venture of Hatch Mott MacDonald T&T, Inc. and Bechtel Infrastructure Corp.

DESIGNER/SUBCONSULTANT FUGRO

SUBMITTED

HMM/BECHTEL

APPROVED

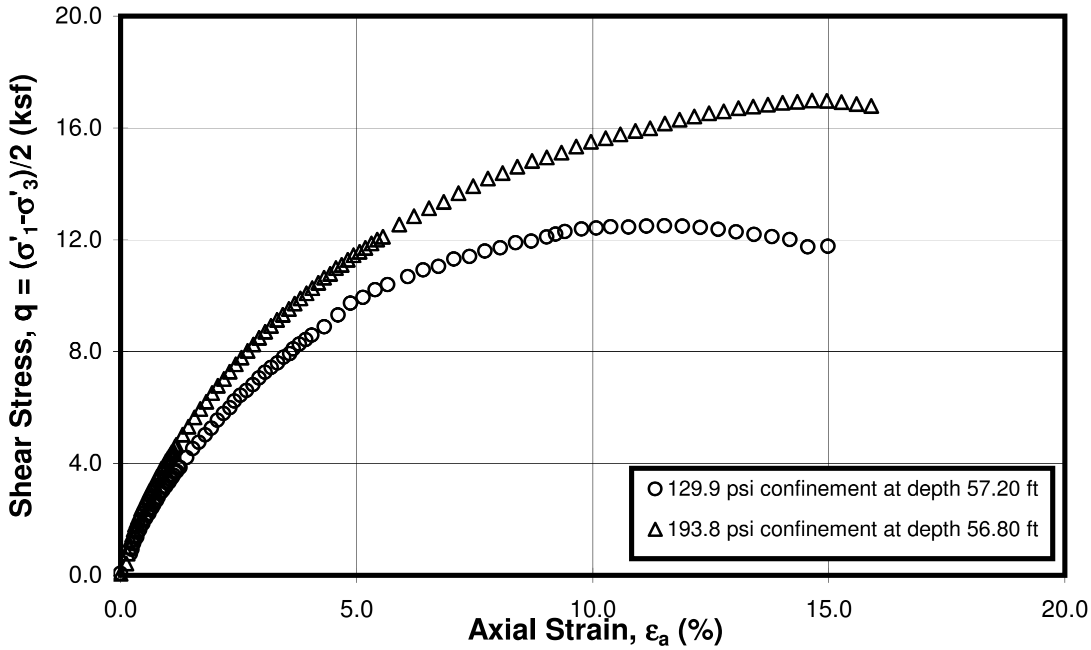
BART

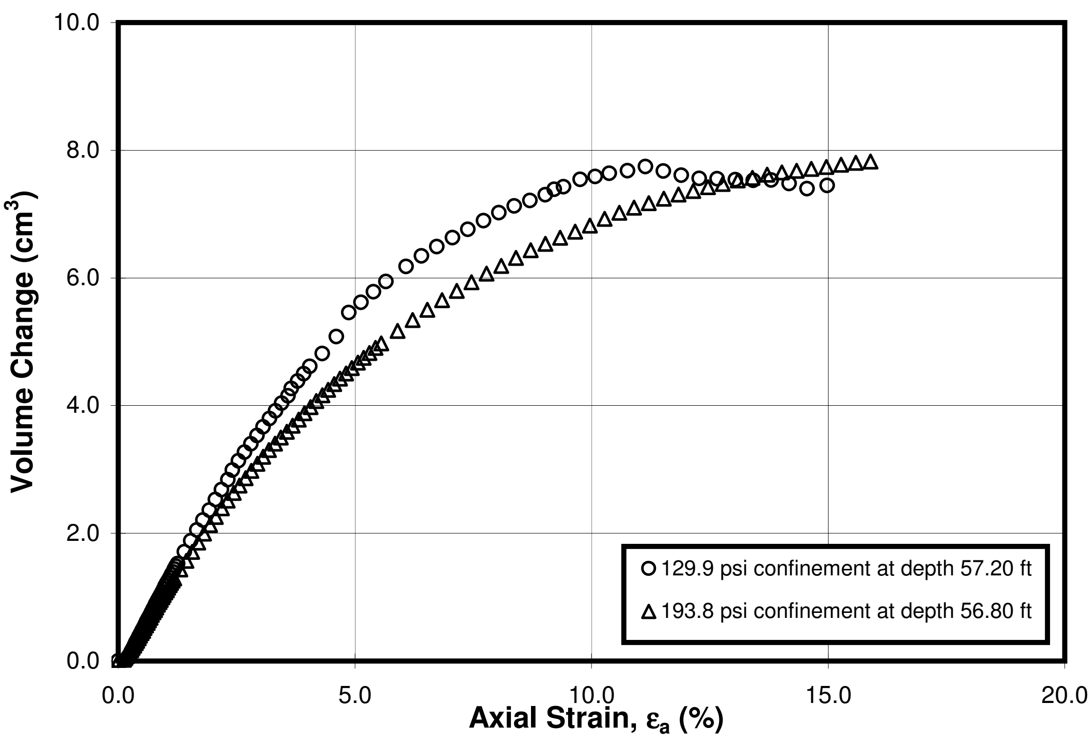
SILICON VALLEY RAPID TRANSIT PROJECT

VTA SANTA CLARA Valley Transportation Authority

DRAINED TRIAXIAL TEST LOCATION MAP
Tunnel Segment of SVRT Project
San Jose, California

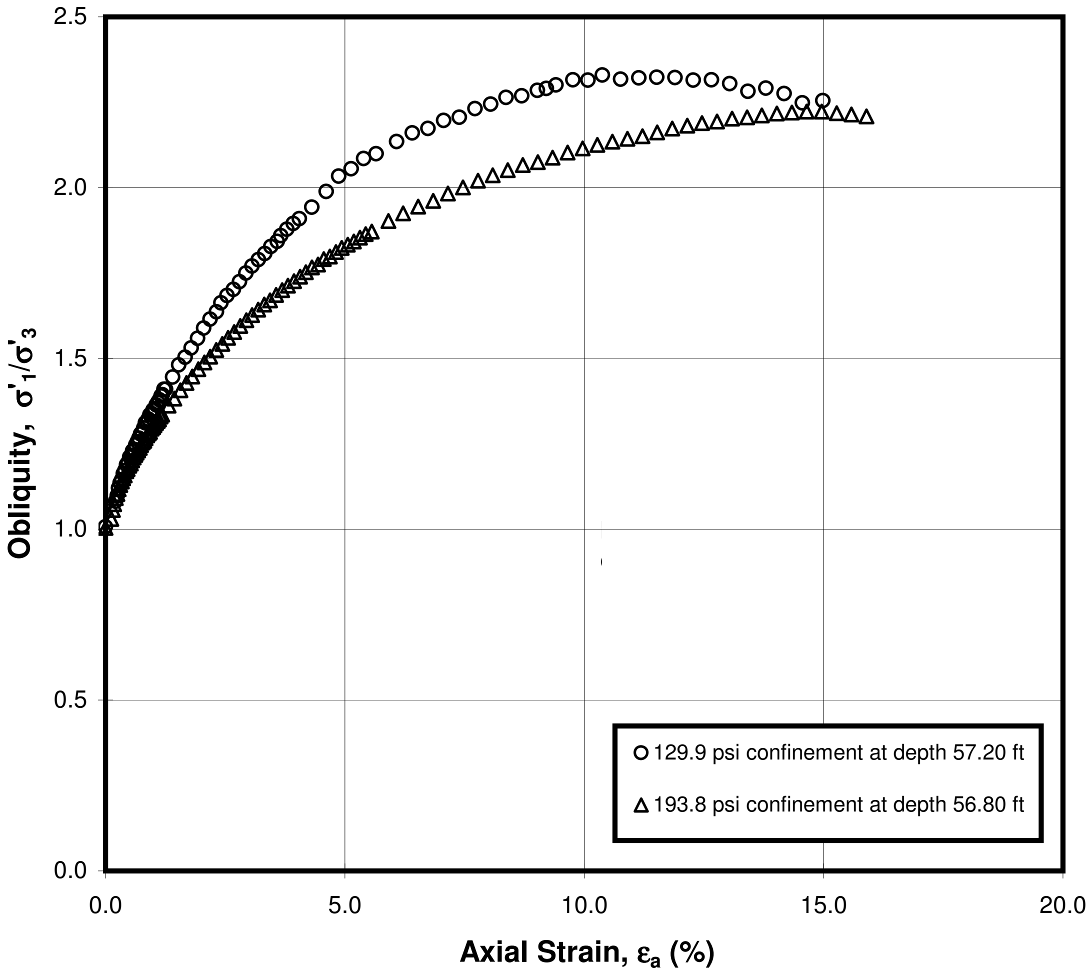
FIGURE A15-1





MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 4a and b - Depth: 57.20 and 56.80 ft
Boring B-9
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-2a



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

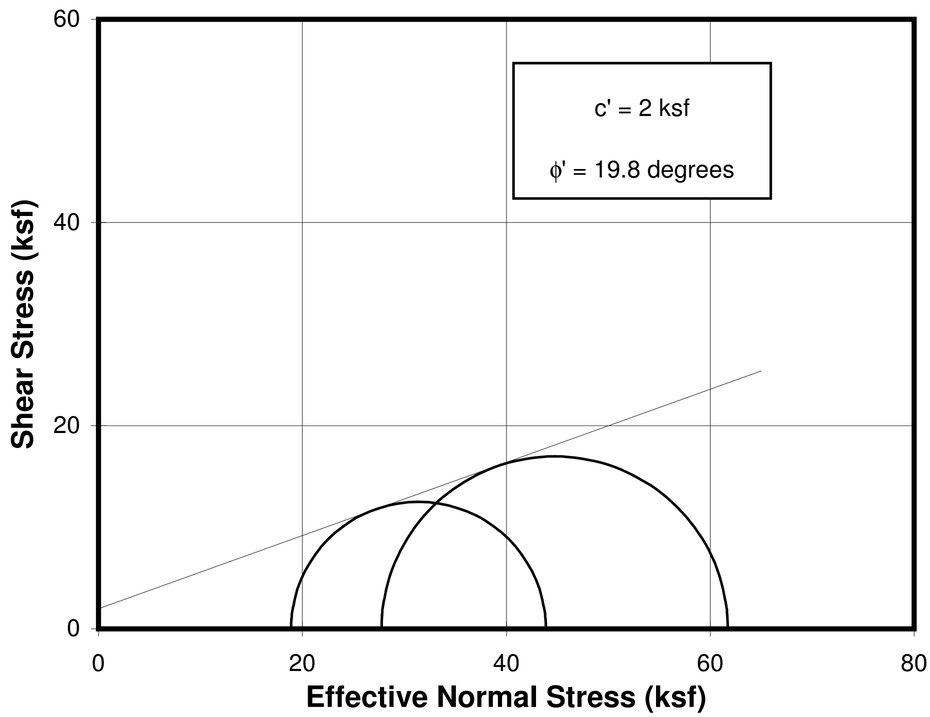
Sample: 4a and b - Depth: 57.20 and 56.80 ft

Boring B-9

Tunnel Segment of SVRT Project

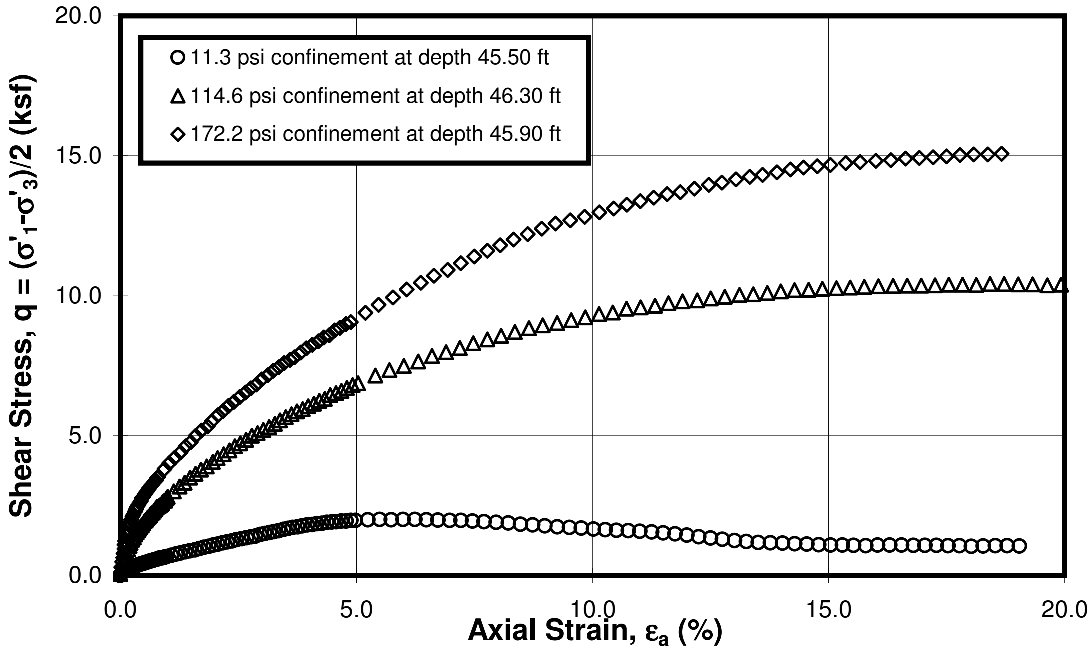
San Jose, California

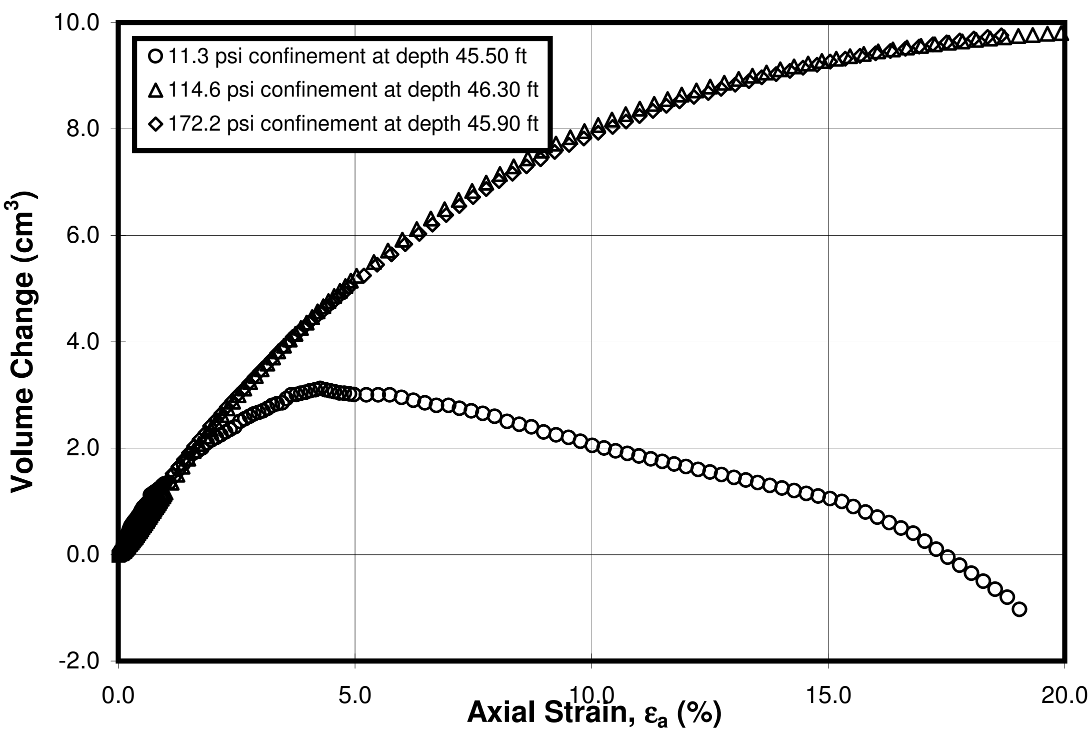
FIGURE A15-2b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 4a and b - Depth: 57.20 and 56.80 ft
Boring B-9
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-2c





MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

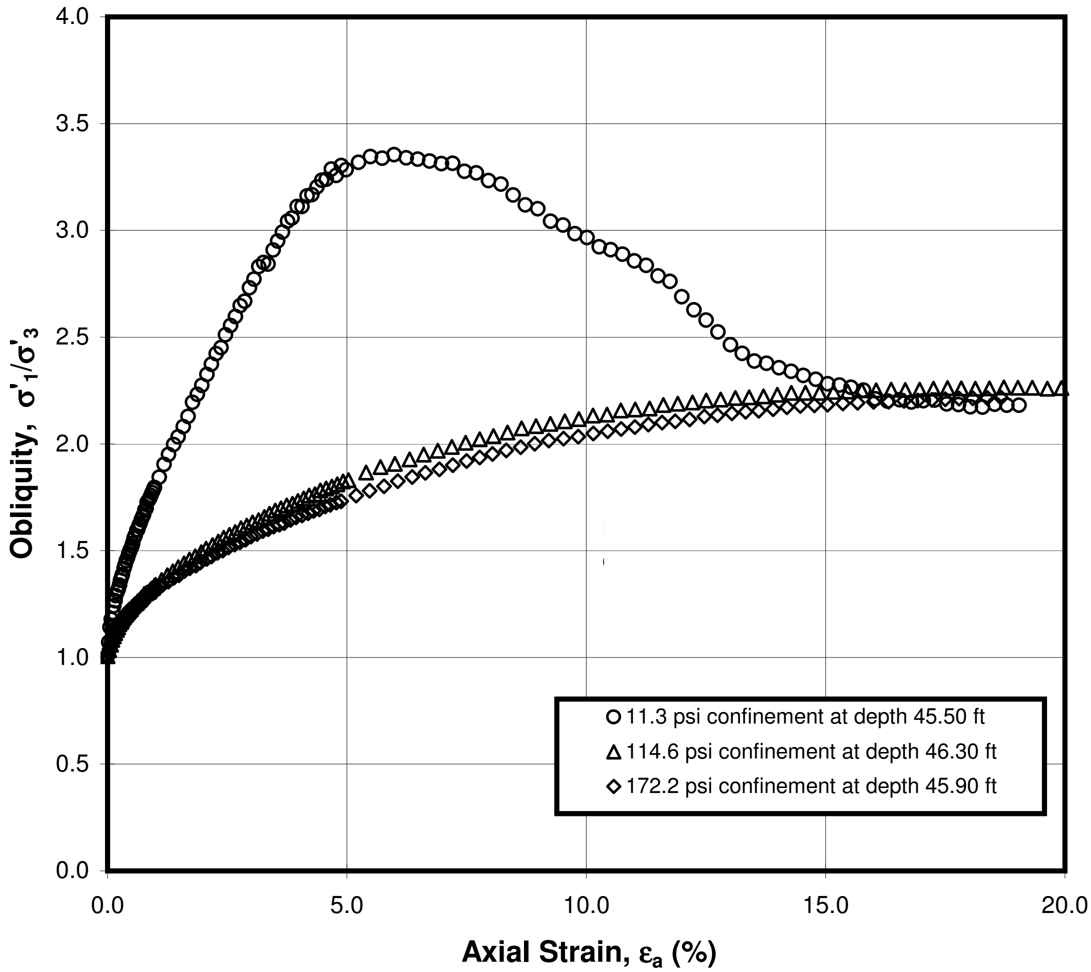
Sample: 6a, b, and c - Depth: 45.50, 46.30, and 45.90 ft

Boring B-21

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A15-3a



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

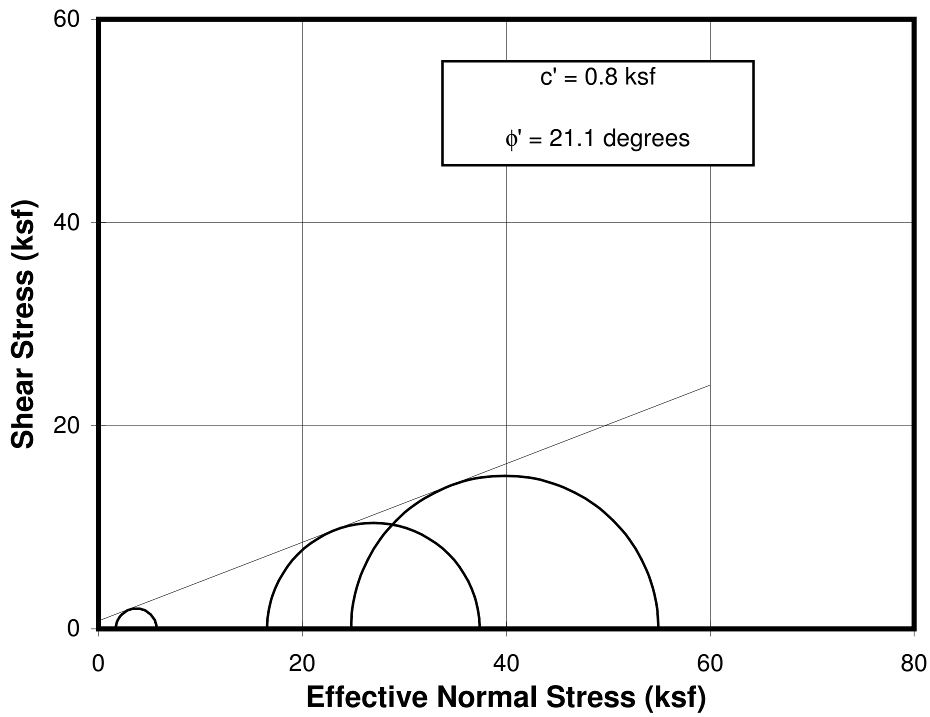
Sample: 6a, b, and c - Depth: 45.50, 46.30, and 45.90 ft

Boring B-21

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A15-3b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

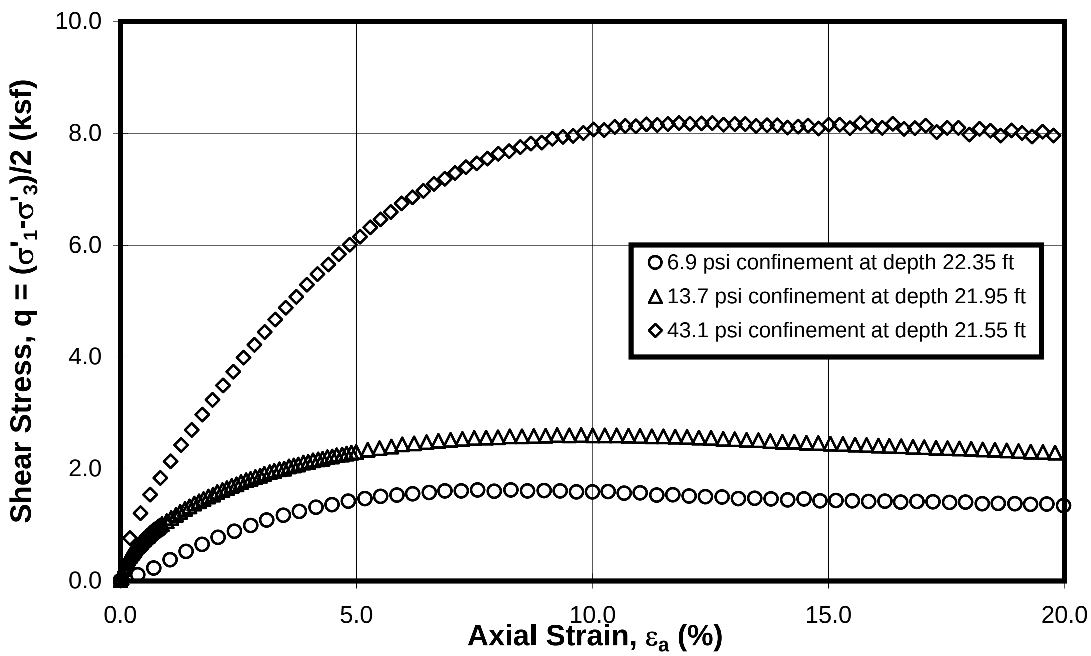
Sample: 6a, b, and c - Depth: 45.50, 46.30, and 45.90 ft

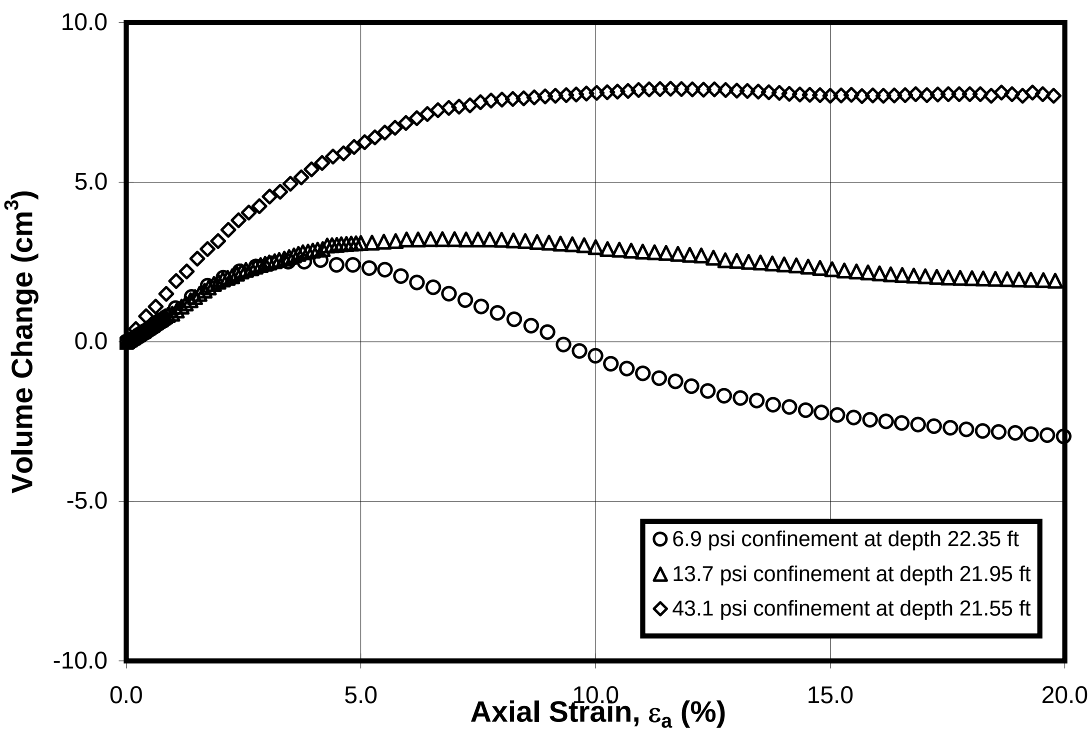
Boring B-21

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A15-3c





MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

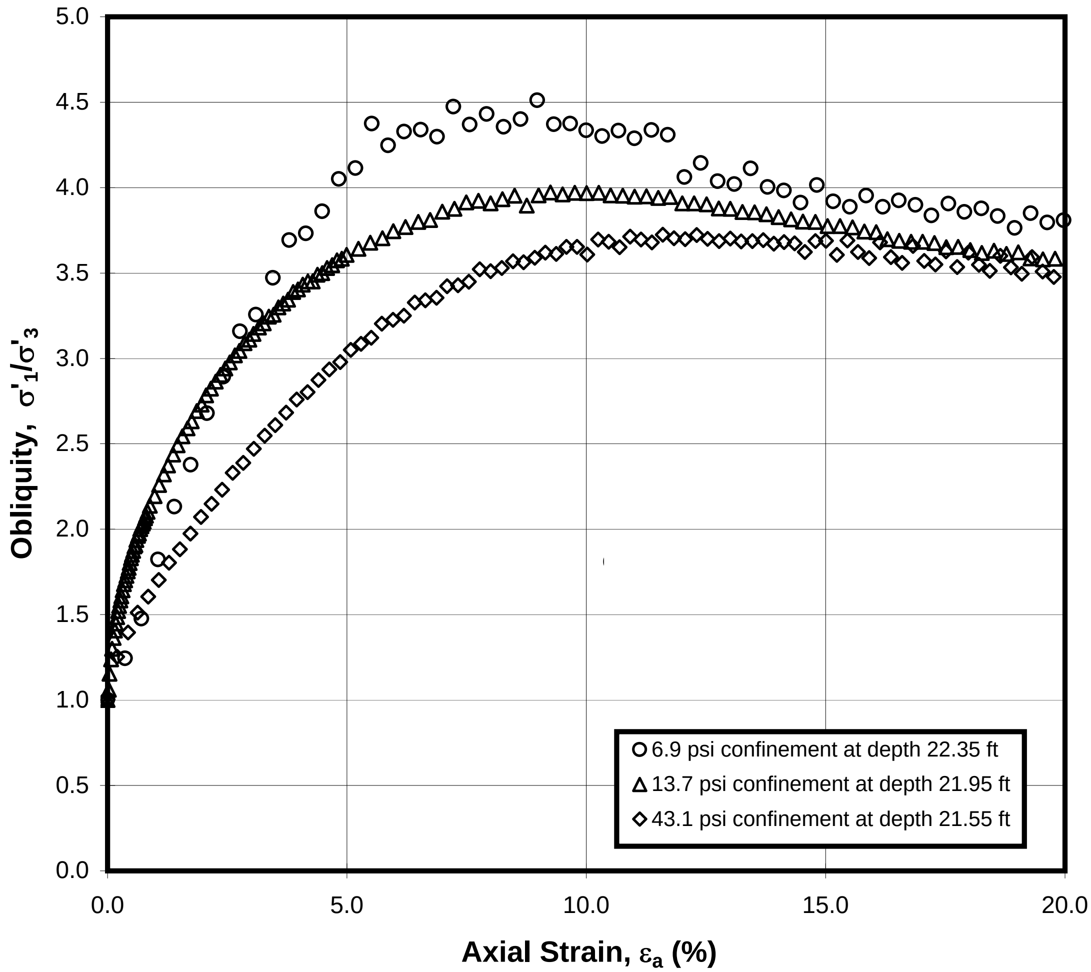
Sample: 6b, c, and d - Depth 22.35, 21.95 and 21.55 ft

Boring B-24

Tunnel Segment of SVRT Project

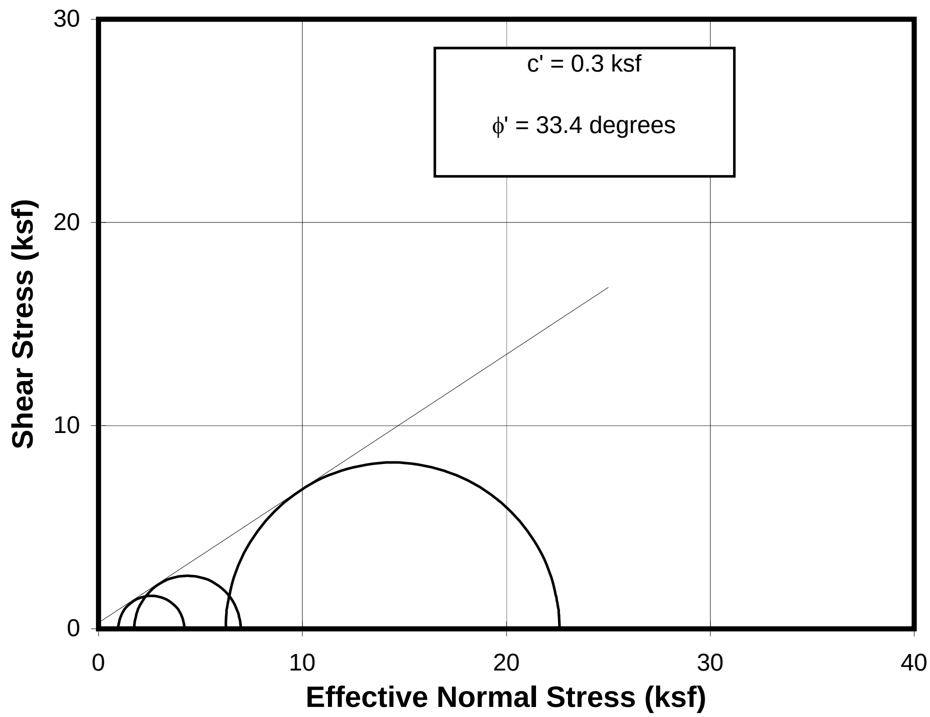
San Jose, California

FIGURE A15-4a



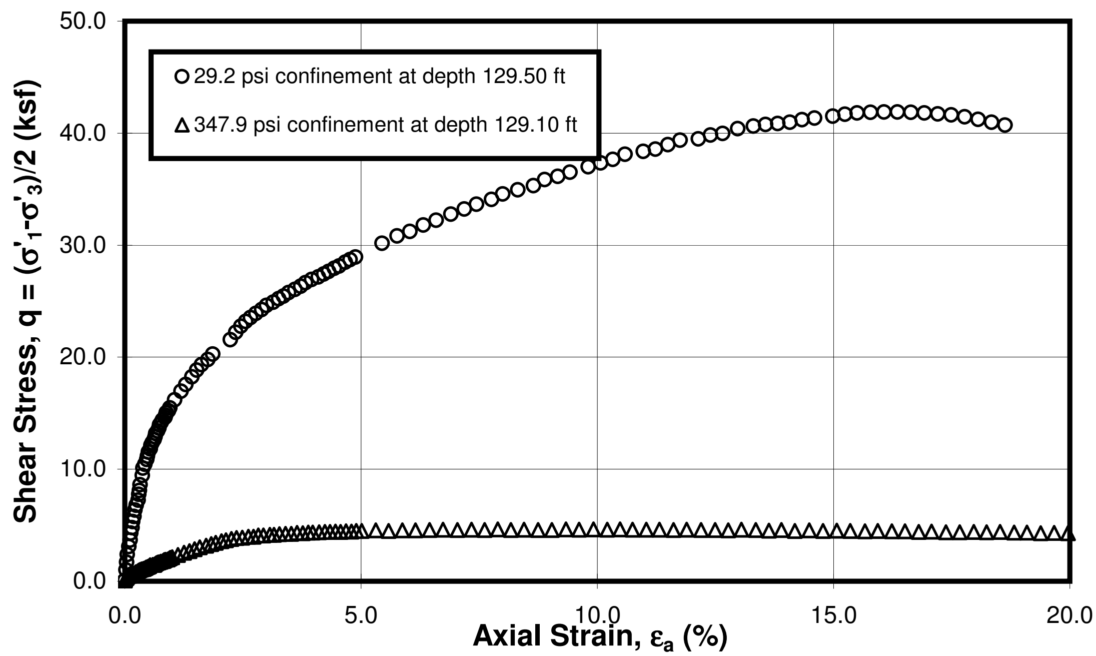
MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 6 b, c, and d - Depth 22.35, 21.95 and 21.55 ft
Boring B-24
Tunnel Segment of SVRT Project
San Jose, California

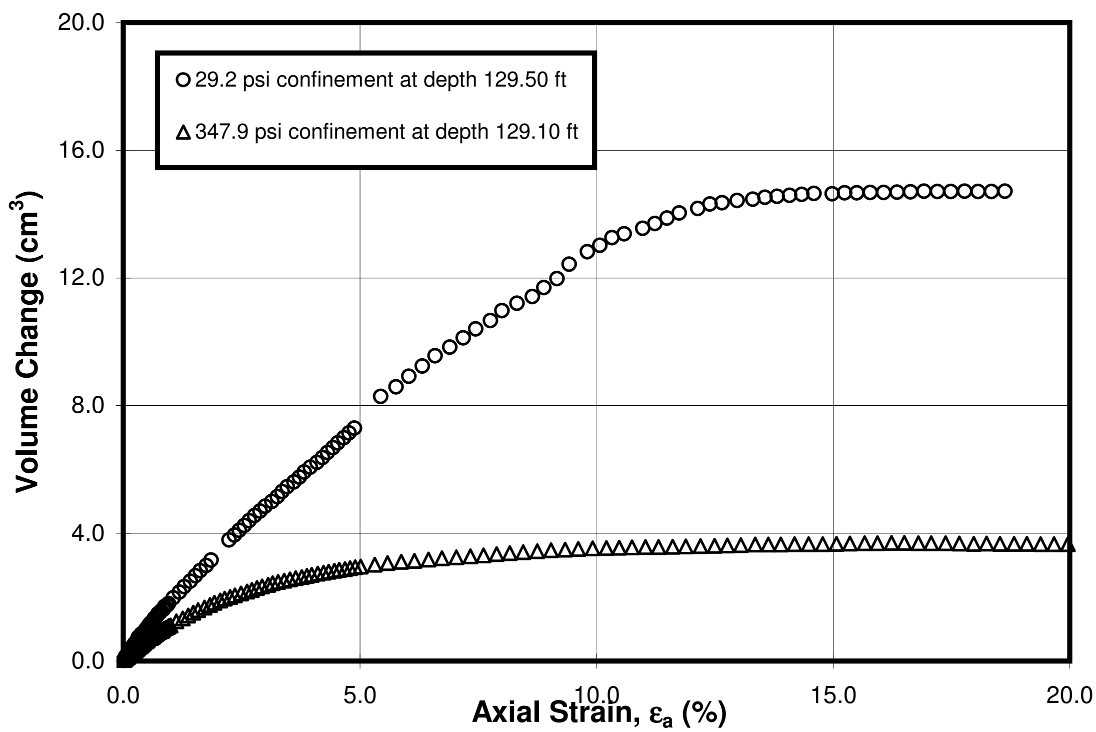
FIGURE A15-4b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 6b, c and d - Depth 22.35, 21.95 and 21.55 ft
Boring B-24
Tunnel Segment of SVRT Project
San Jose, California

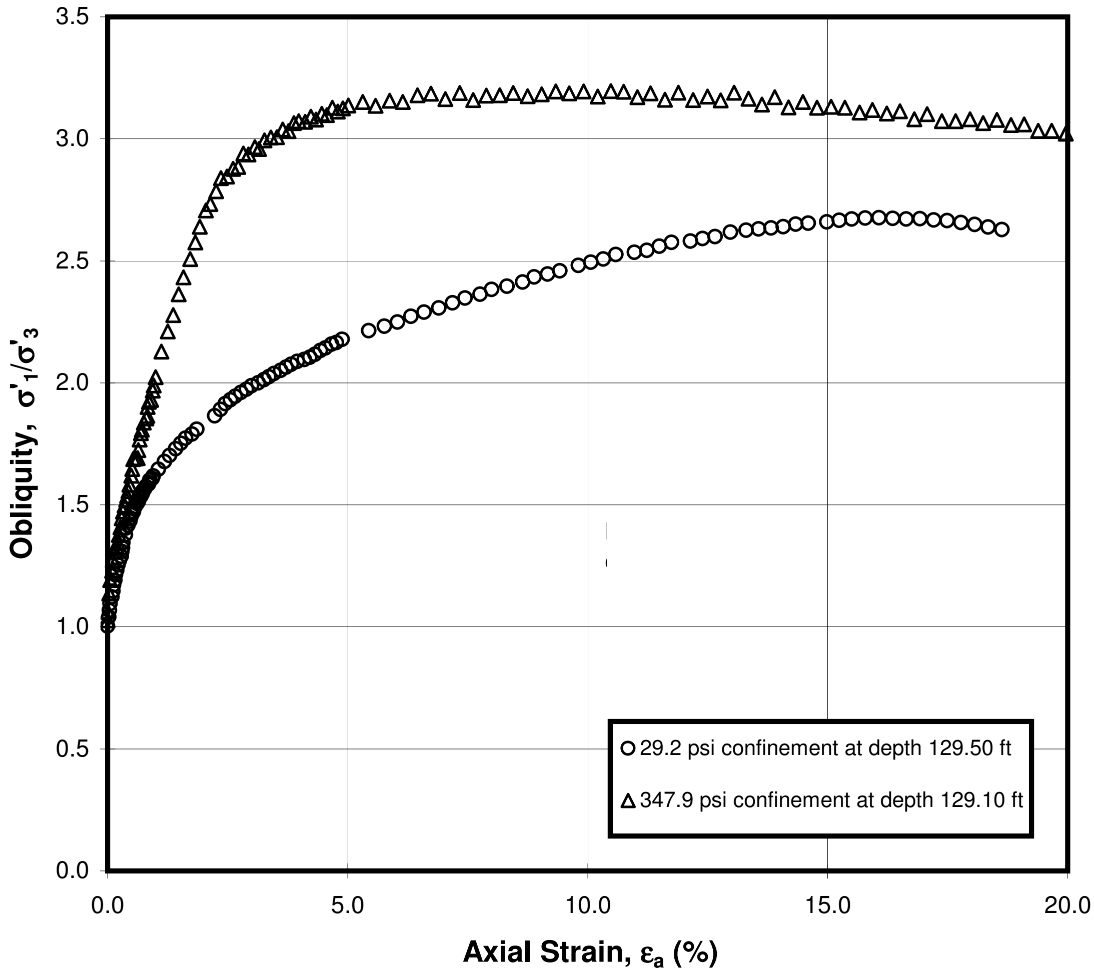
FIGURE A15-4c





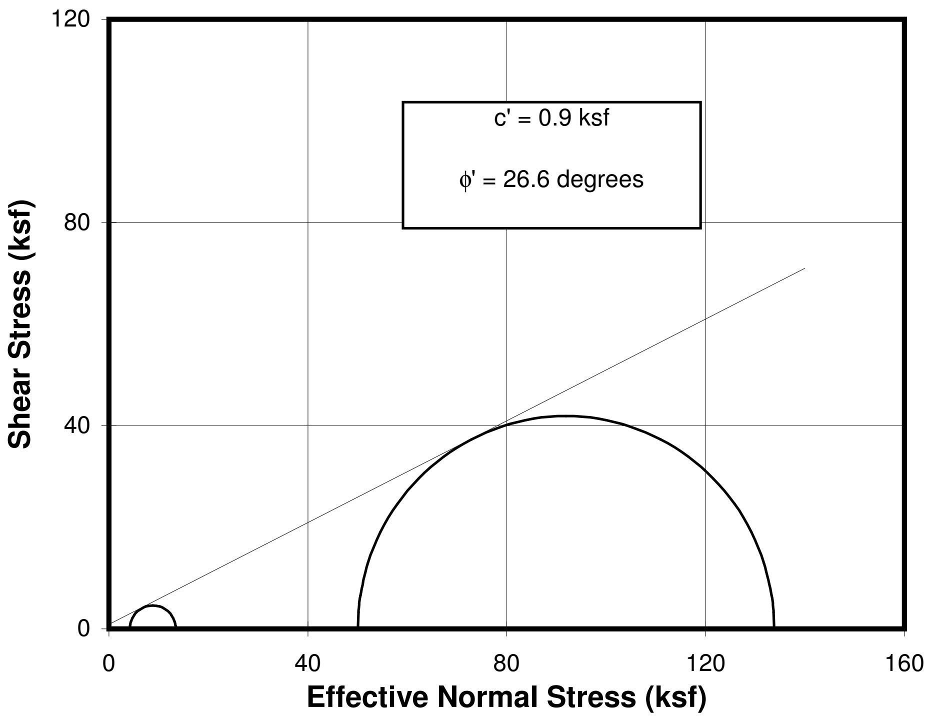
MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 22a and b - Depth 129.50 and 129.10 ft
Boring B-25
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-5a



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 22a and b - Depth 129.50 and 129.10 ft
Boring B-25
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-5b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

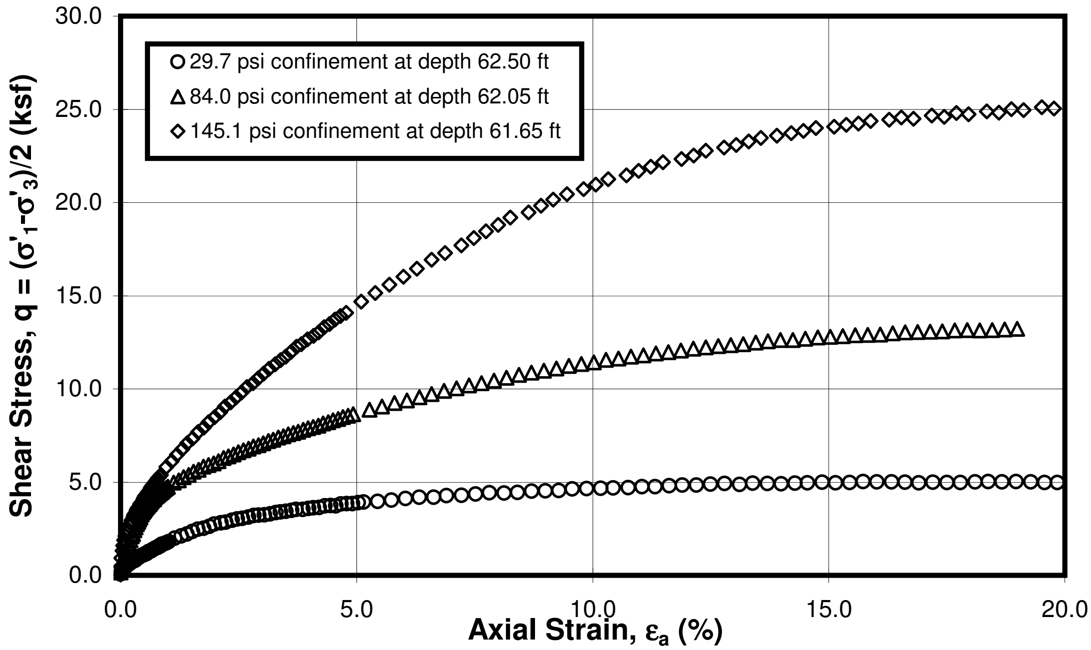
Sample: 22a and b - Depth 129.50 and 129.10 ft

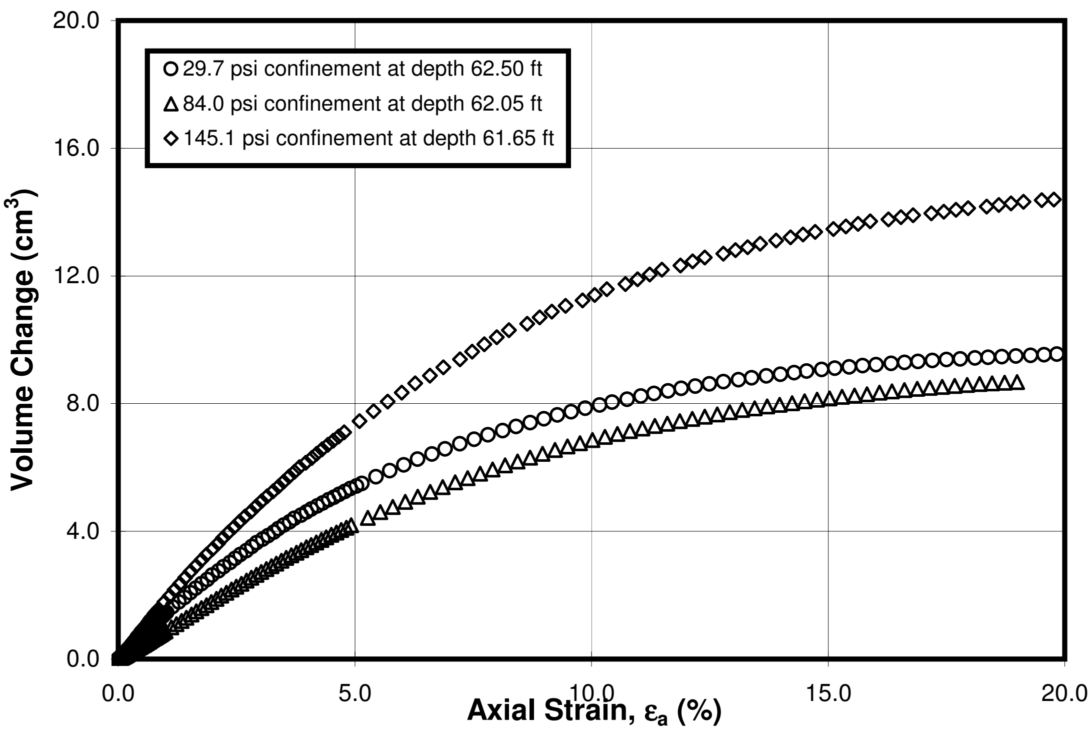
Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

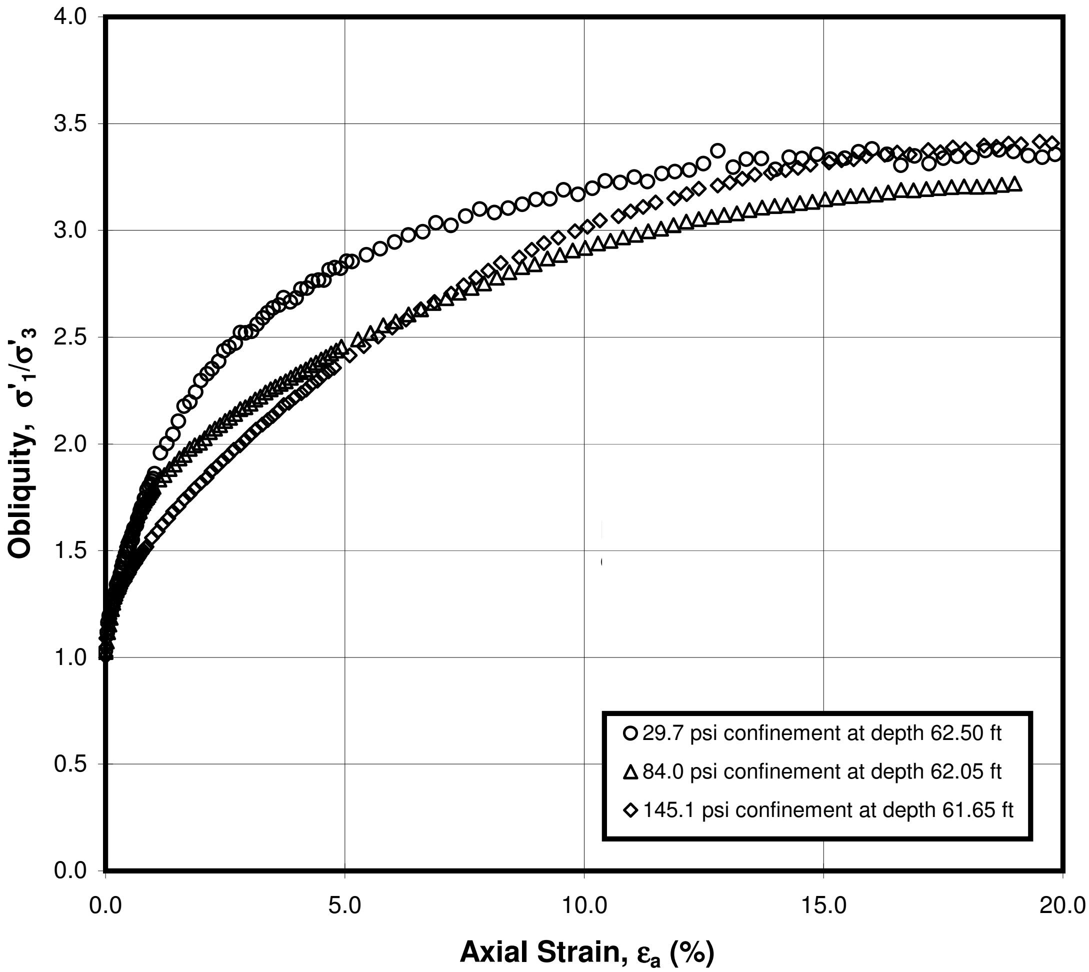
FIGURE A15-5c





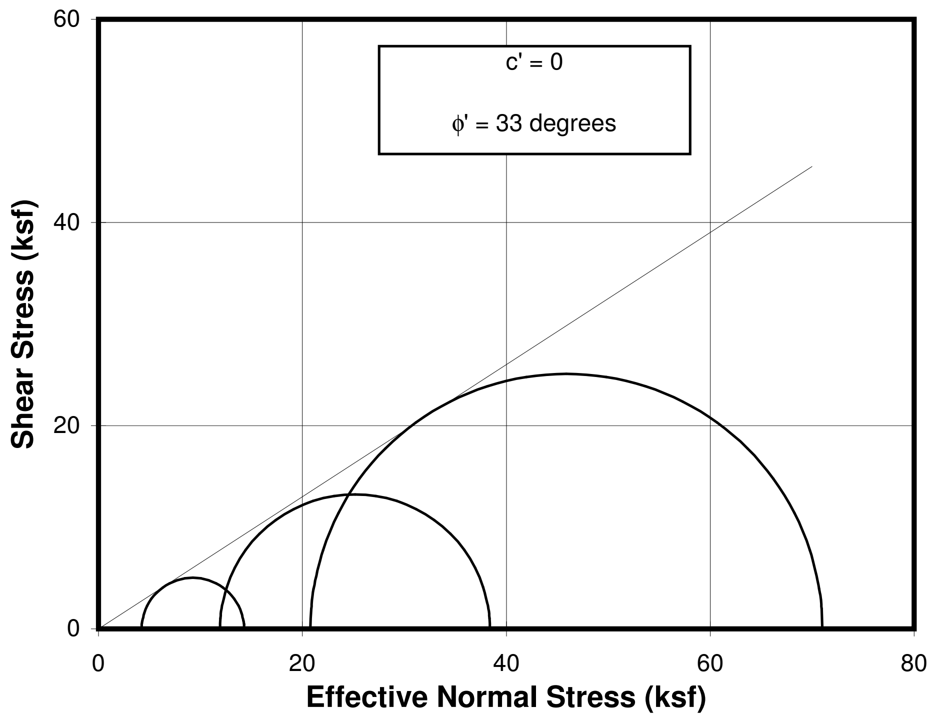
MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 7a, b and c - Depth 62.50, 62.05 and 61.65 ft
Boring B-33
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-6a



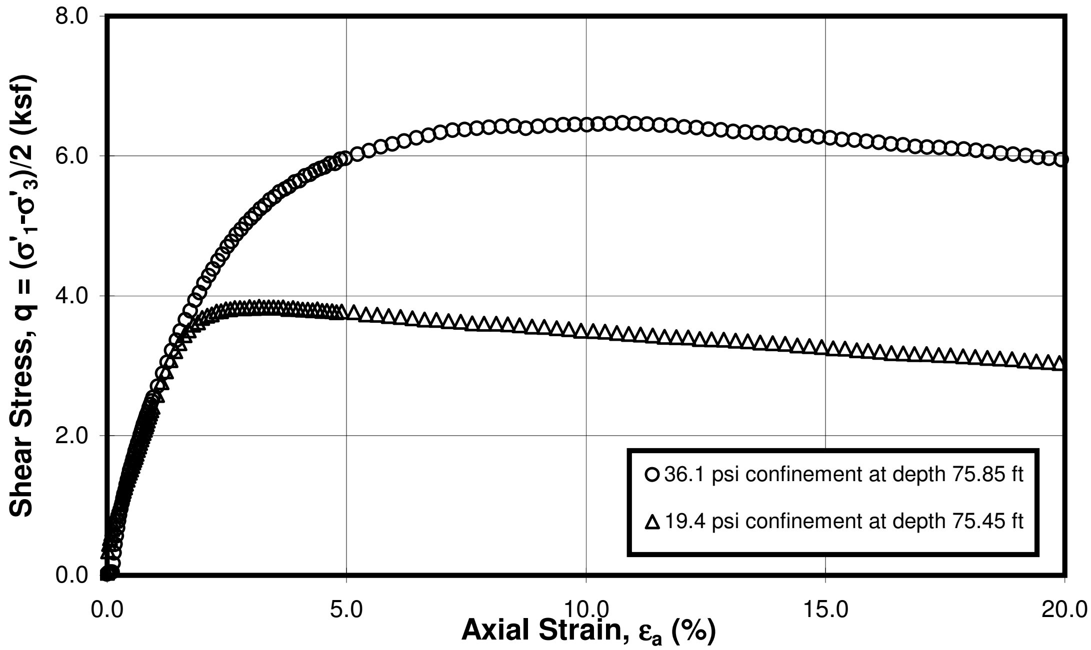
MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated-
Sample: 7a, b and c - Depth 62.50, 62.05 and 61.65 ft
Boring B-33
Tunnel Segment of SVRT Project
San Jose, California

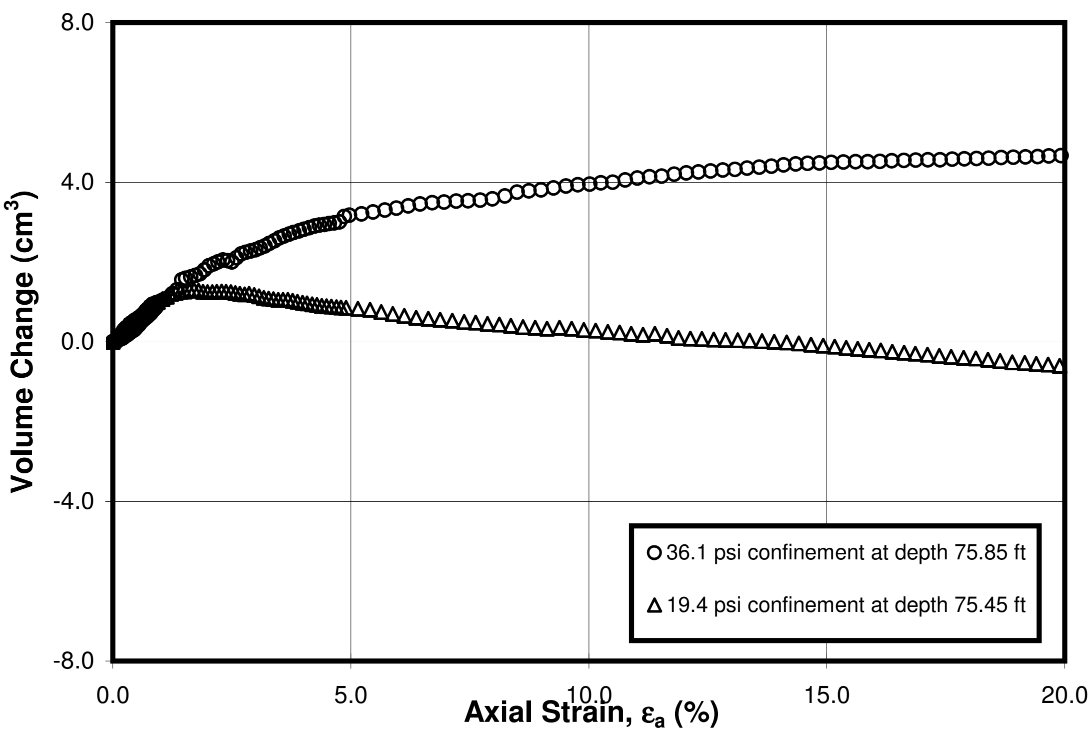
FIGURE A15-6b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 7a, b and c - Depth 62.50, 62.05 and 61.65 ft
Boring B-33
Tunnel Segment of SVRT Project
San Jose, California

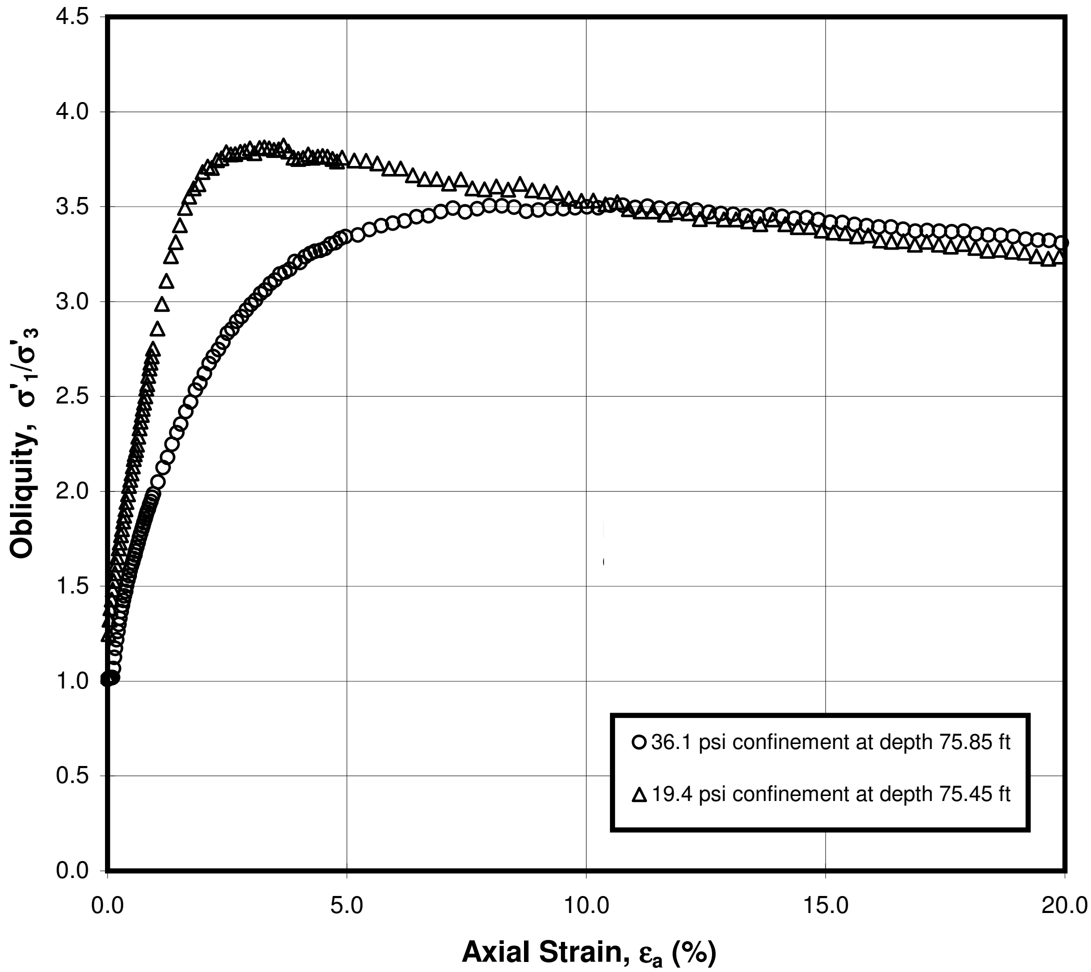
FIGURE A15-6c





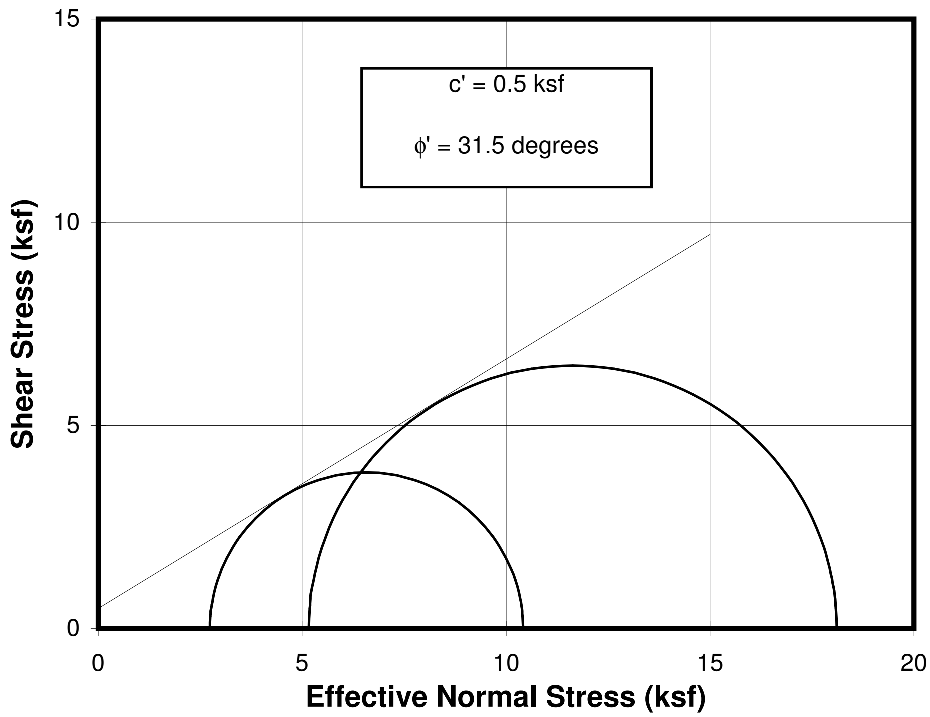
MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 14b and c - Depth: 75.85 and 75.45 ft
Boring B-38
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-7a



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 14b and c - Depth: 75.85 and 75.45 ft
Boring B-38
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-7b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

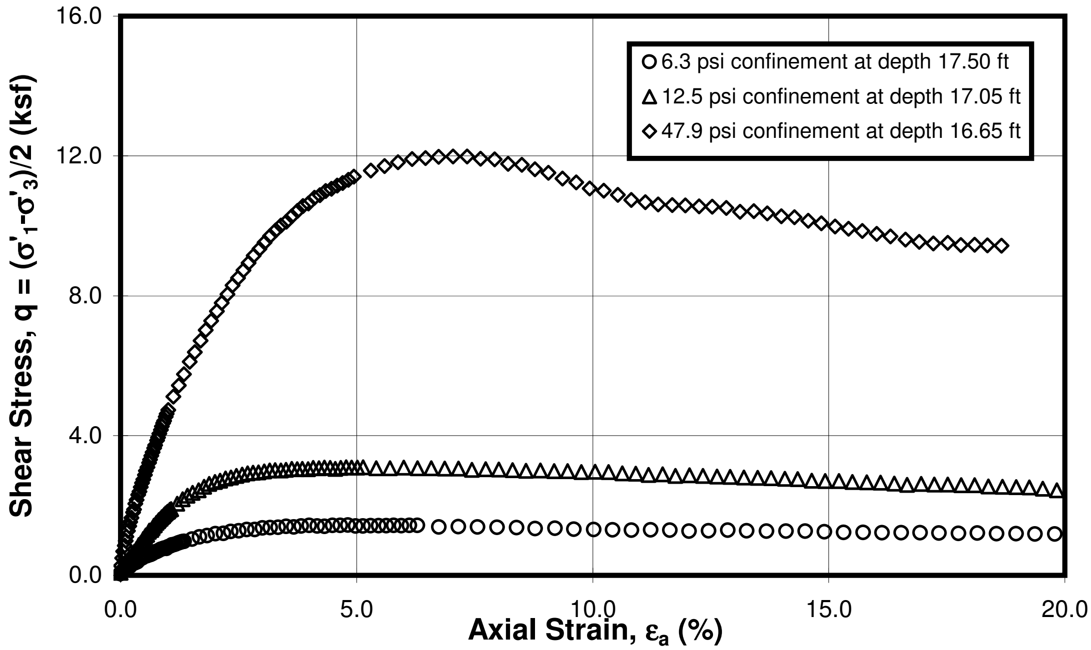
Sample: 14b and c - Depth: 75.85 and 75.45 ft

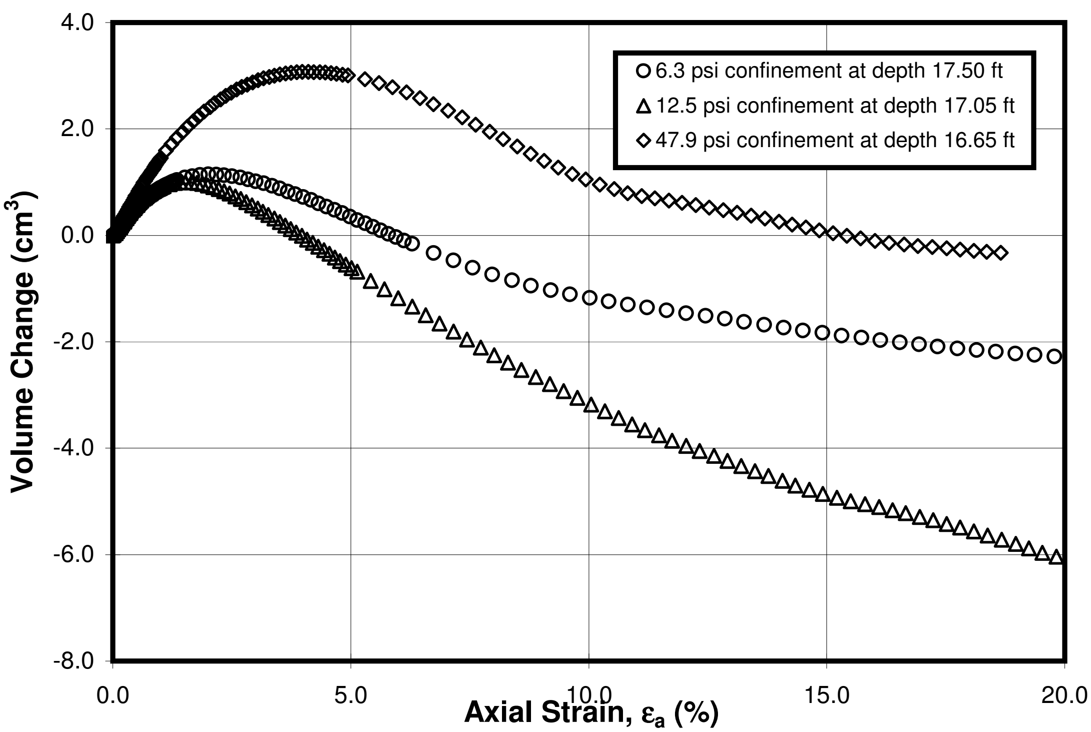
Boring B-38

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A15-7c





MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

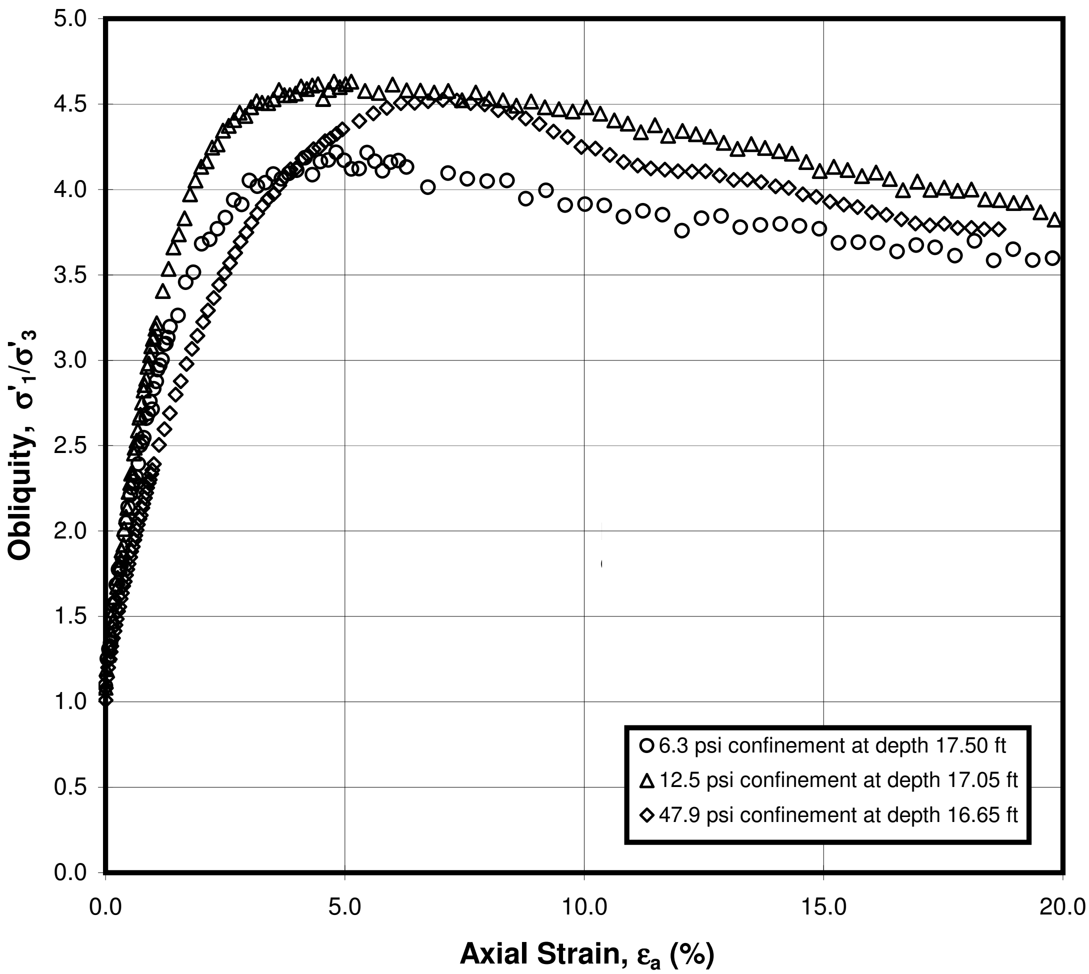
Sample: 3a, b and c - Depth: 17.50, 17.05 and 16.65 ft

Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A15-8a



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

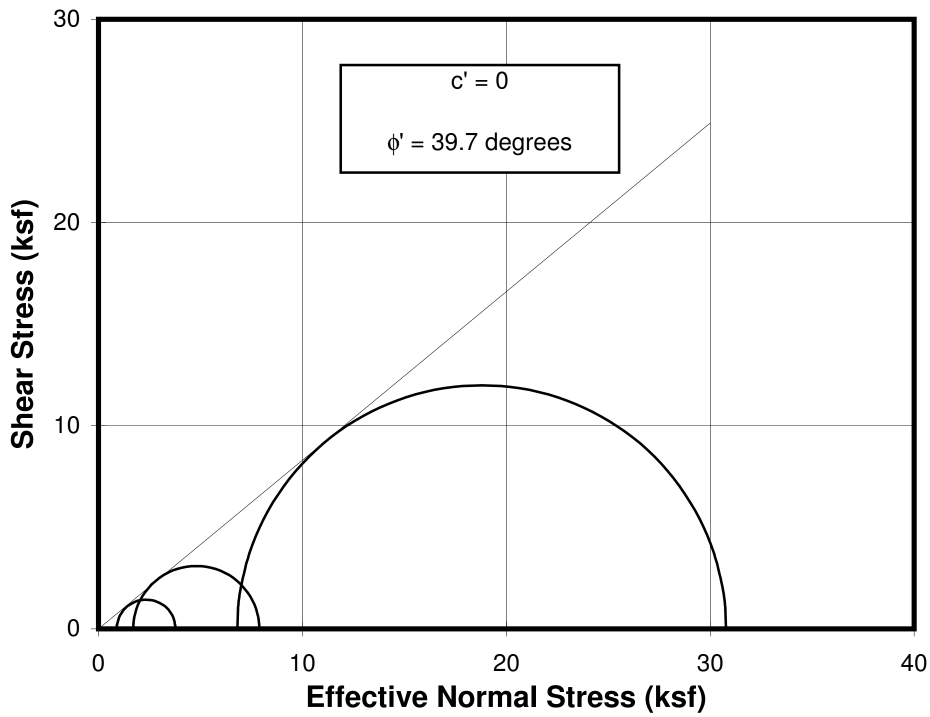
Sample: 3a, b and c - Depth: 17.50, 17.05 and 16.65 ft

Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A15-8b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

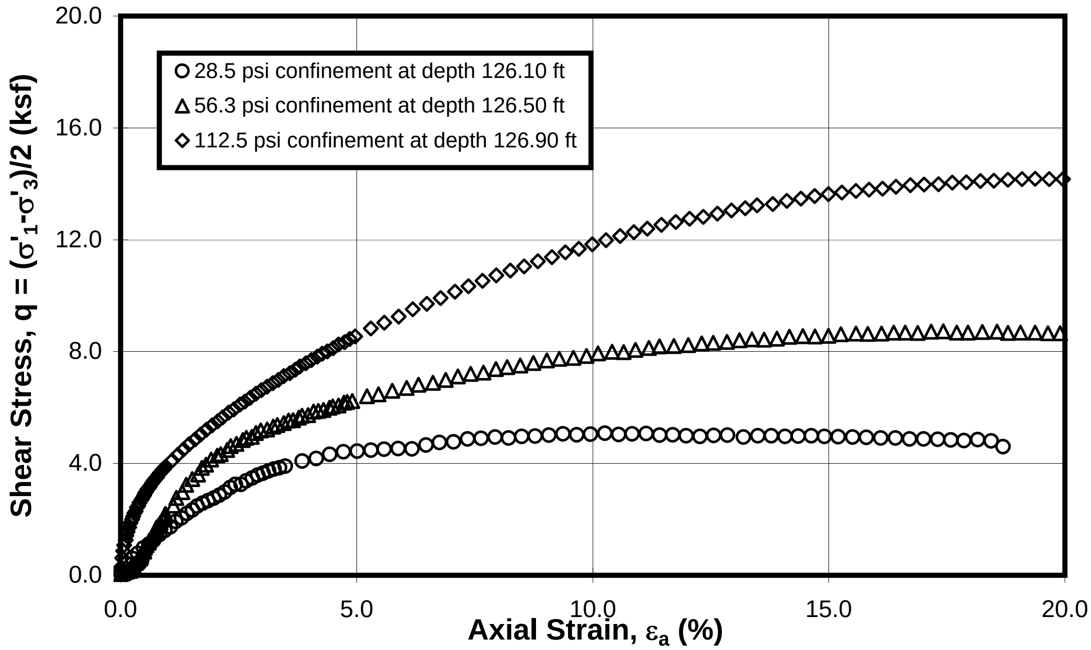
Sample: 3a, b and c - Depth: 17.50, 17.05 and16.65 ft

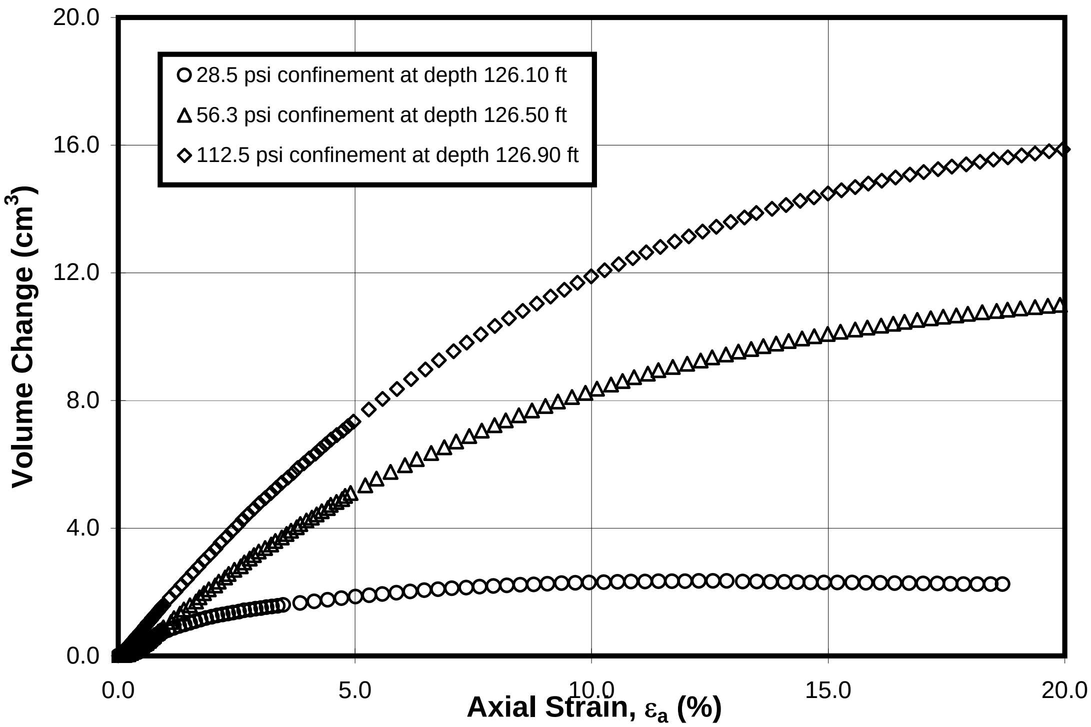
Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

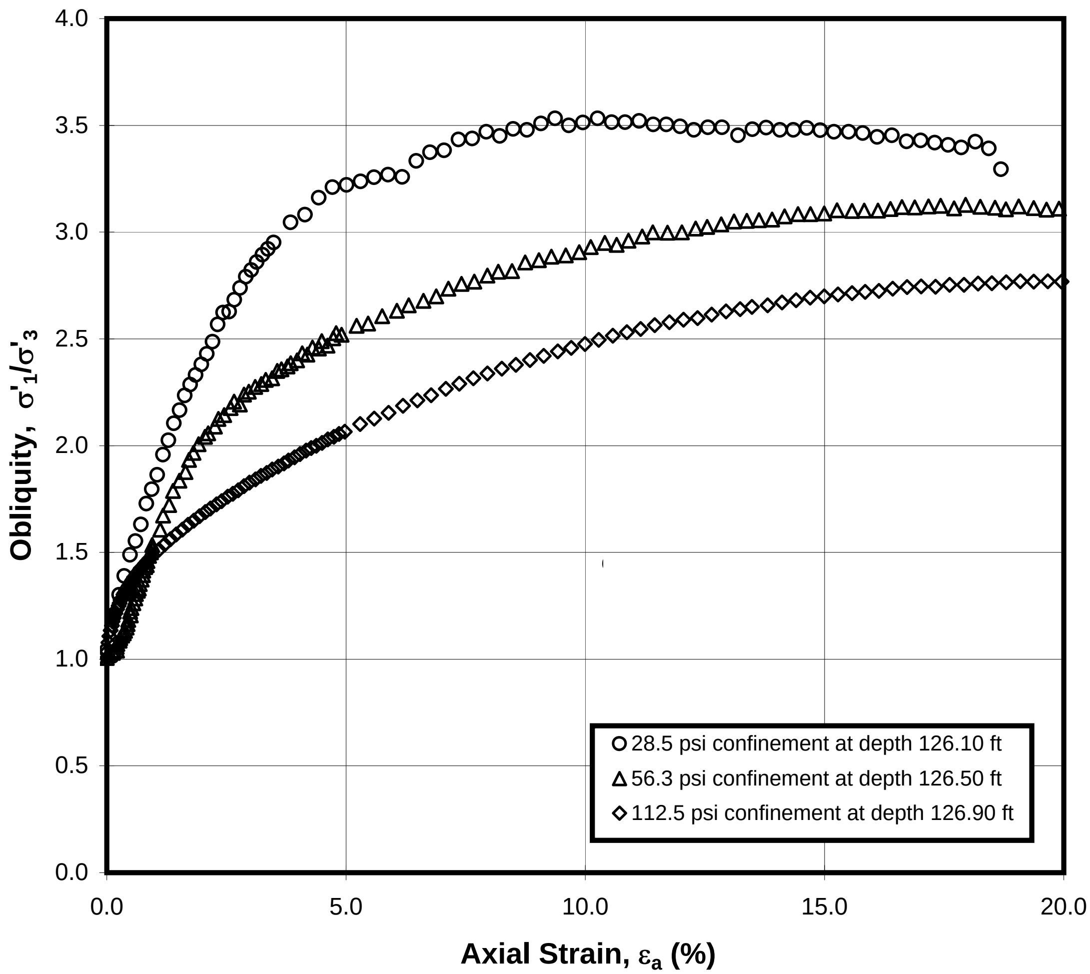
FIGURE A15-8c





MULTISTAGE DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 15c, d and e - Depth: 126.10, 126.50 and 126.90 ft
Boring B-61
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-9a



MULTISTAGE DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

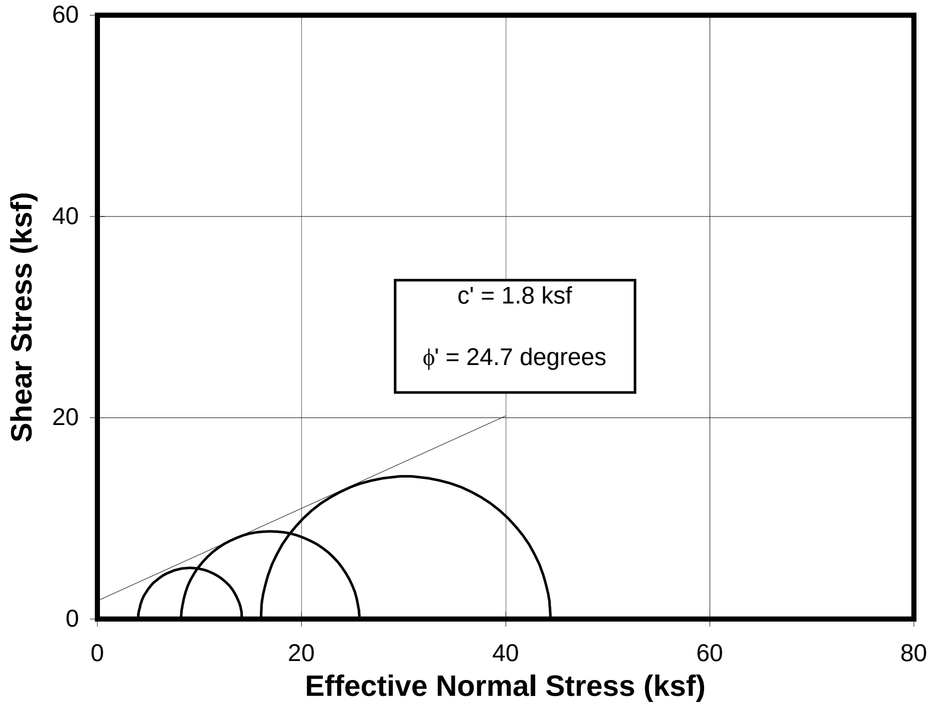
Sample:15- Depth: 126.10, 126.50 and 126.90 ft

Boring B-61

Tunnel Segment of SVRT Project

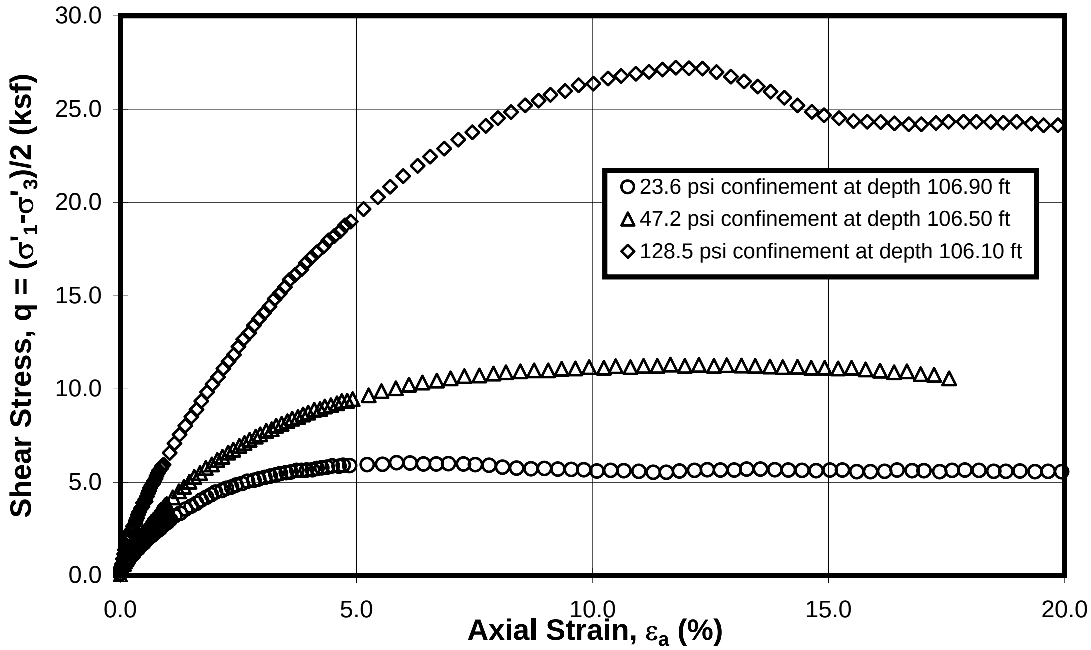
San Jose, California

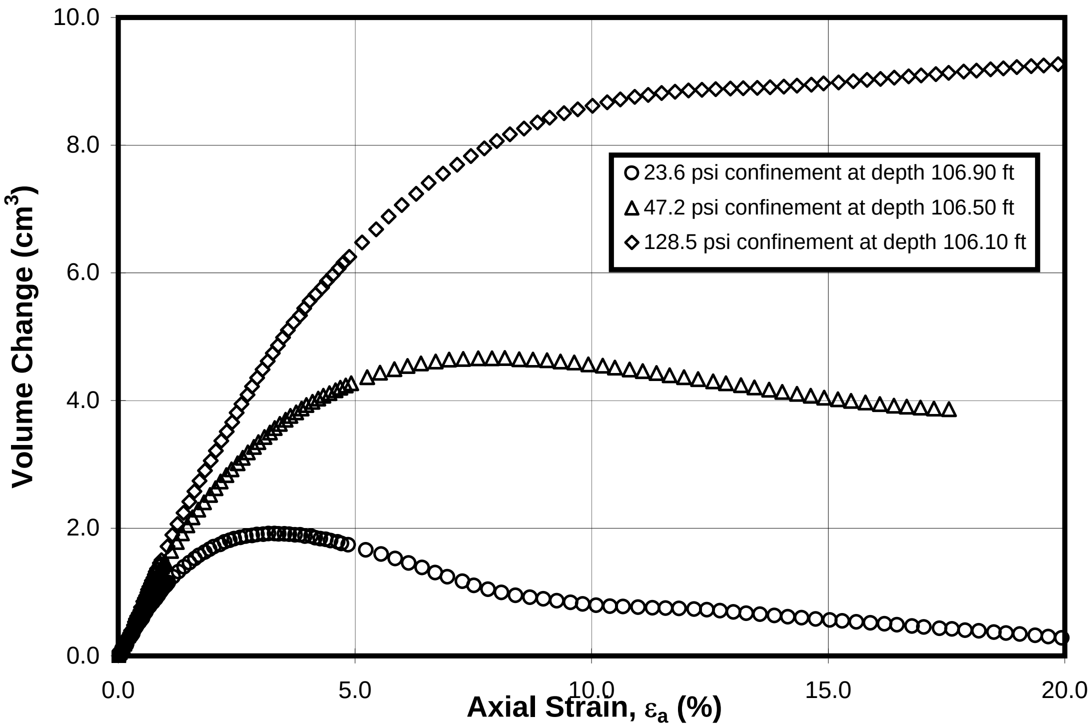
FIGURE A15-9b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 15c, d and e - Depth: 126.10, 126.50 and 126.90 ft
Boring B-61
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-9c





MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

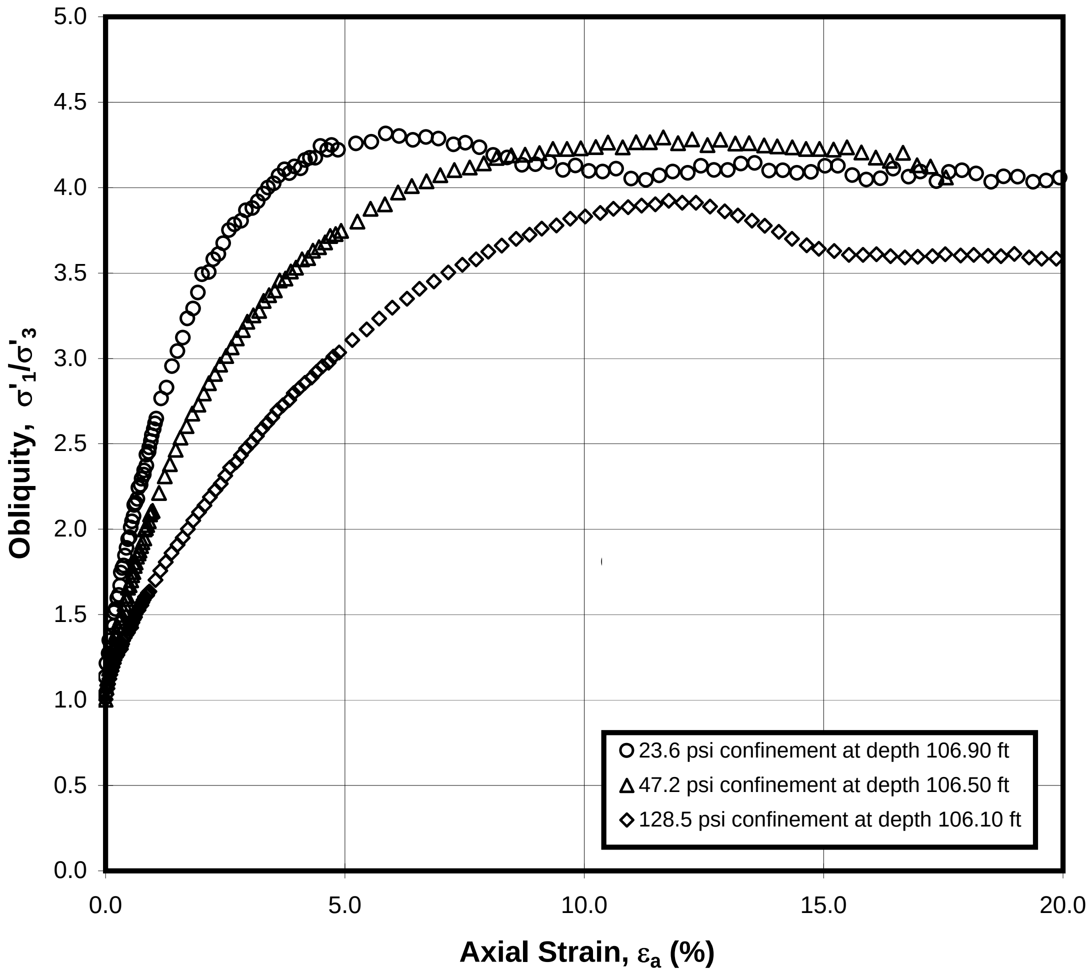
Sample: 18b, c, and d - Depth: 106.90, 106.50, 106.10 ft

Boring B-64

Tunnel Segment of SVRT Project

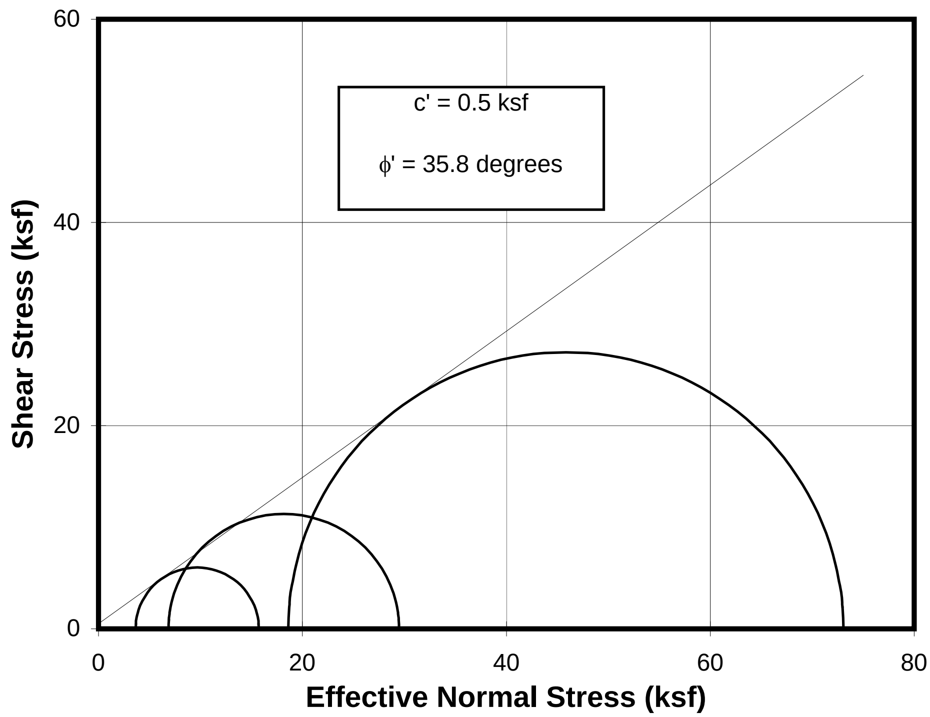
San Jose, California

FIGURE A15-10a



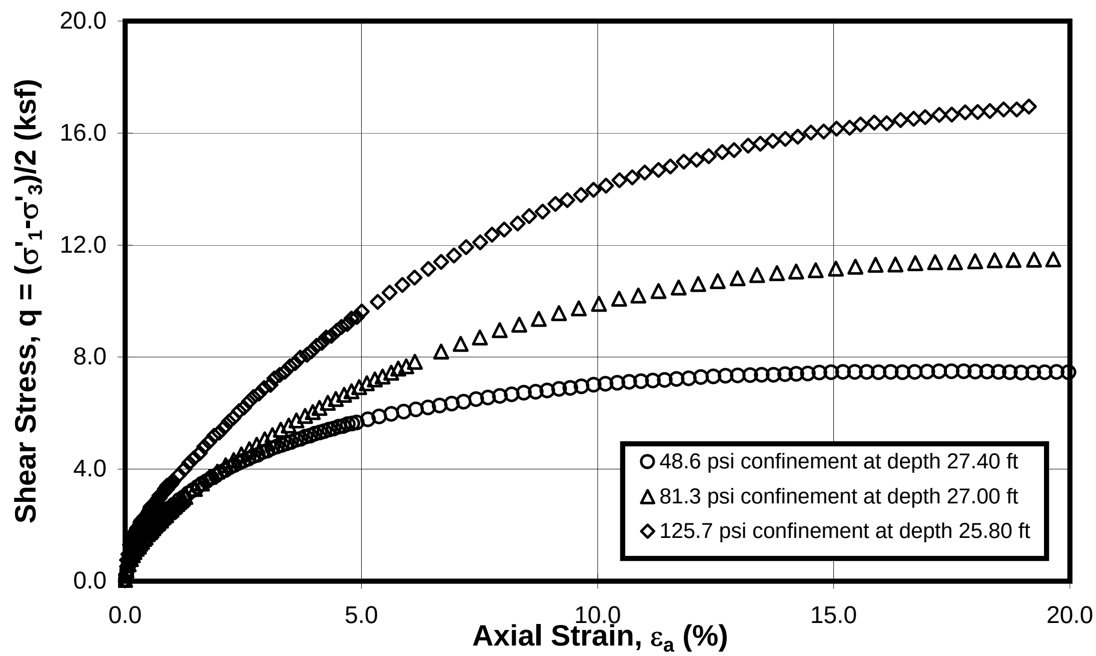
MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 18b, c, and d - Depth: 106.90, 106.50, 106.10 ft
Boring B-64
Tunnel Segment of SVRT Project
San Jose, California

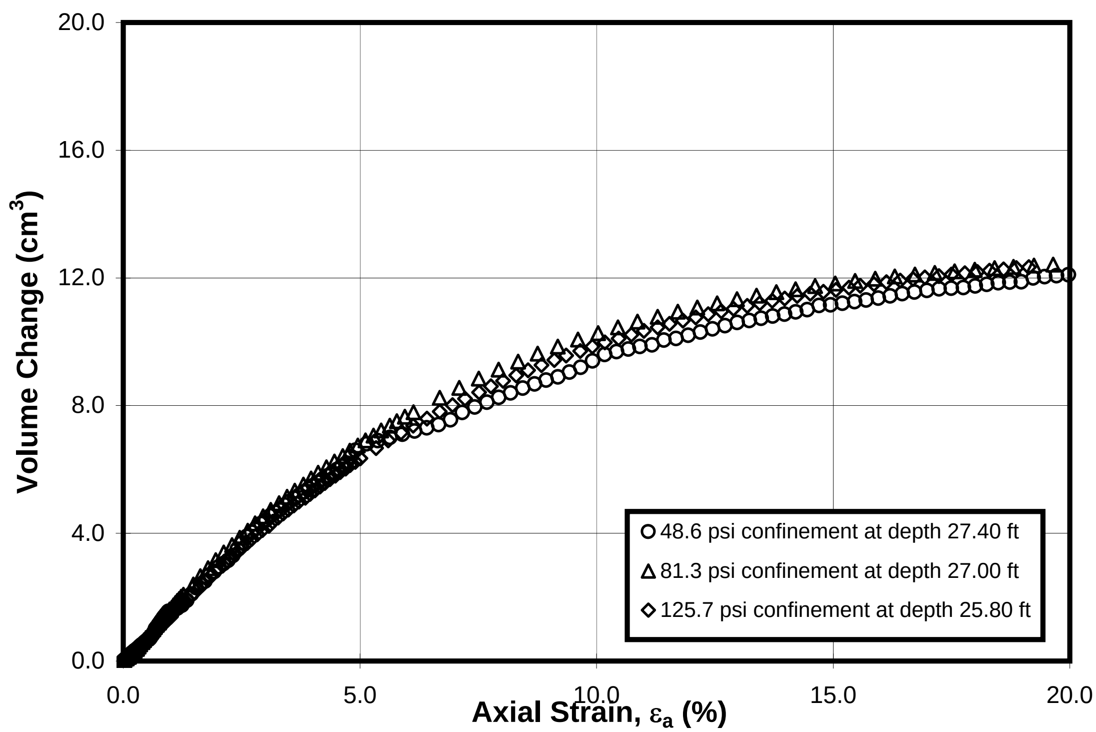
FIGURE A15-10b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample:18b, c and d - Depth: 106.90, 106.50 and 106.10 ft
Boring B-64
Tunnel Segment of SVRT Project
San Jose, California

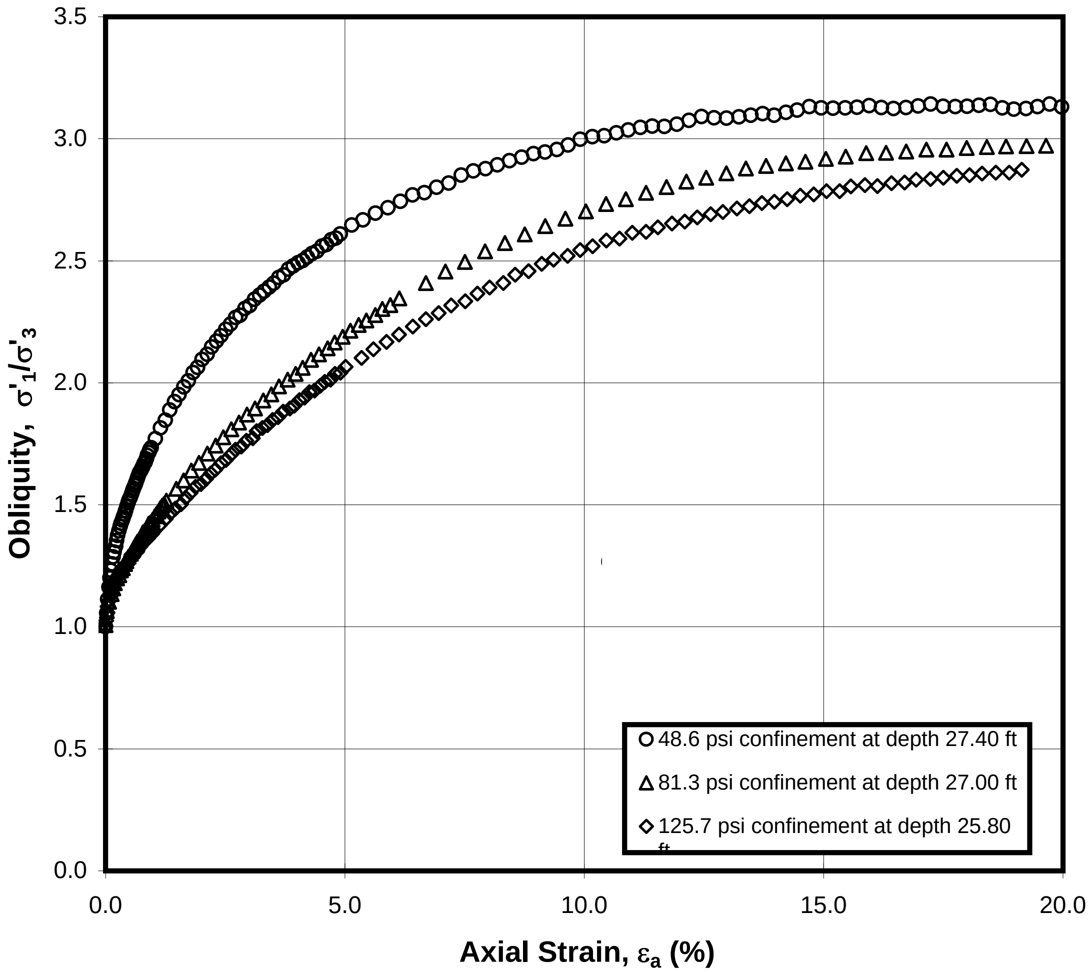
FIGURE A15-10c





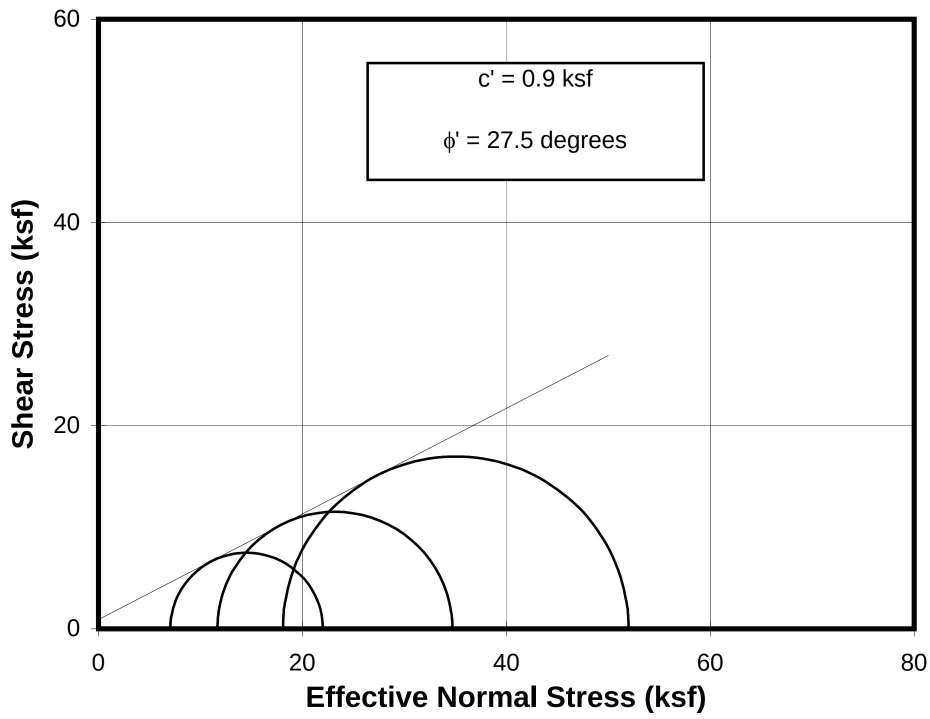
MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 6a, b and d - Depth: 27.40, 27.00 and 25.80 ft
Boring B-66
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-11a



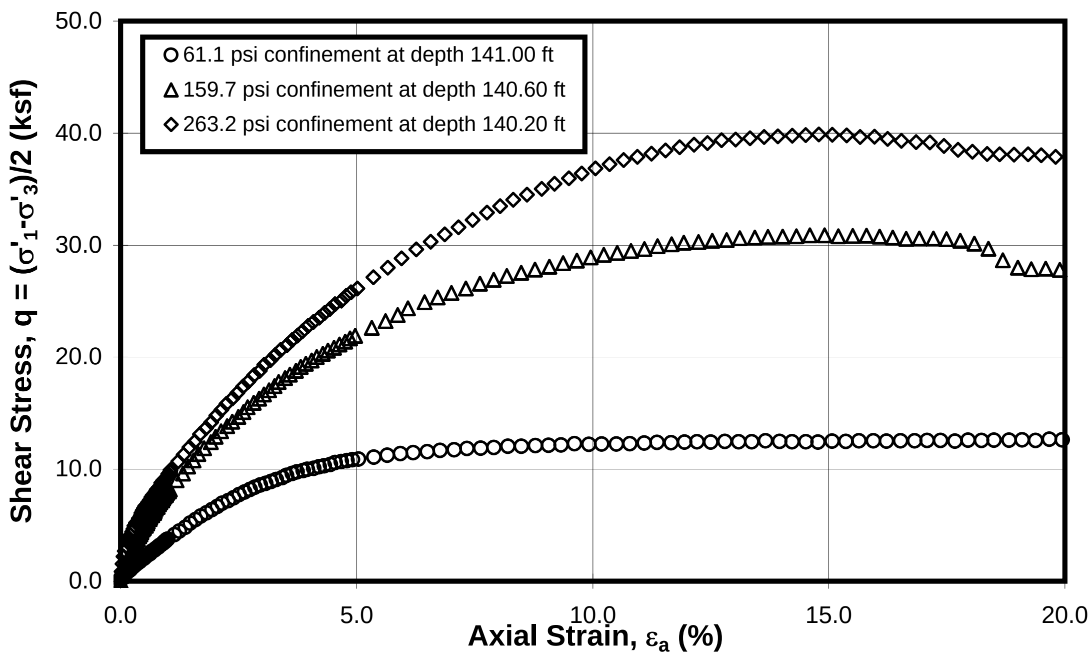
MULTI-STAGE DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 6a, b and d - Depth: 27.40, 27.00 and 25.80 ft
Boring B-66
Tunnel Segment of SVRT Project
San Jose, California

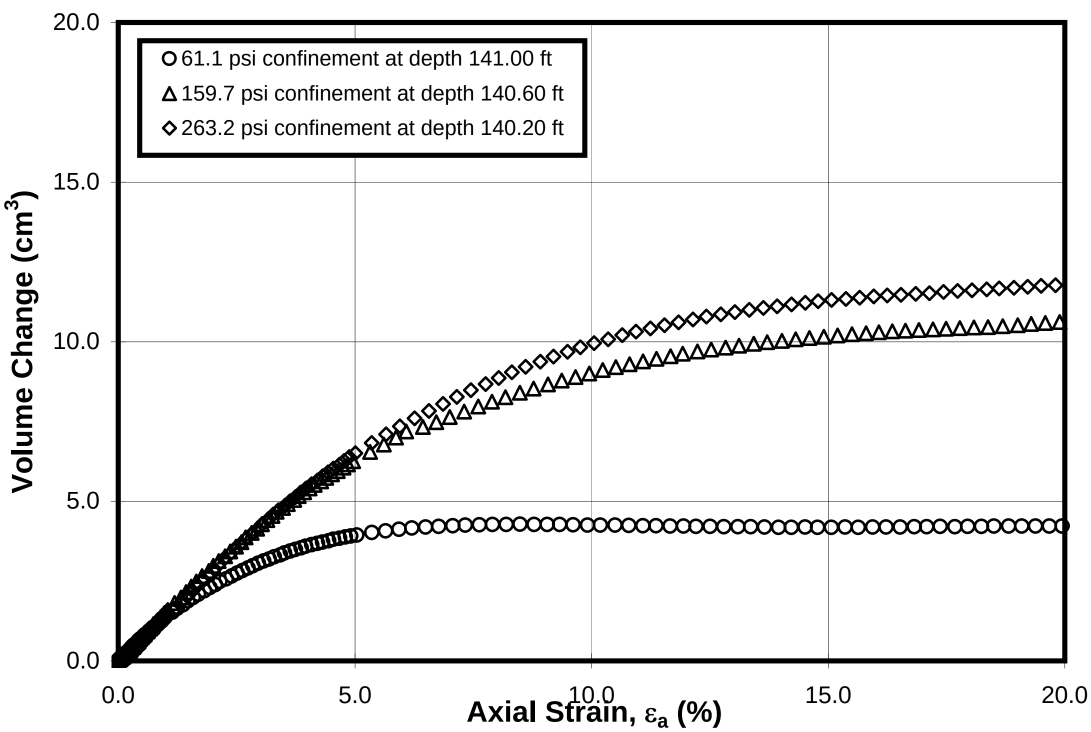
FIGURE A15-11b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST
Isotropically Consolidated
Sample: 6a, b and d - Depth: 27.40, 27.00 and 25.80 ft
Boring B-66
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A15-11c





MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

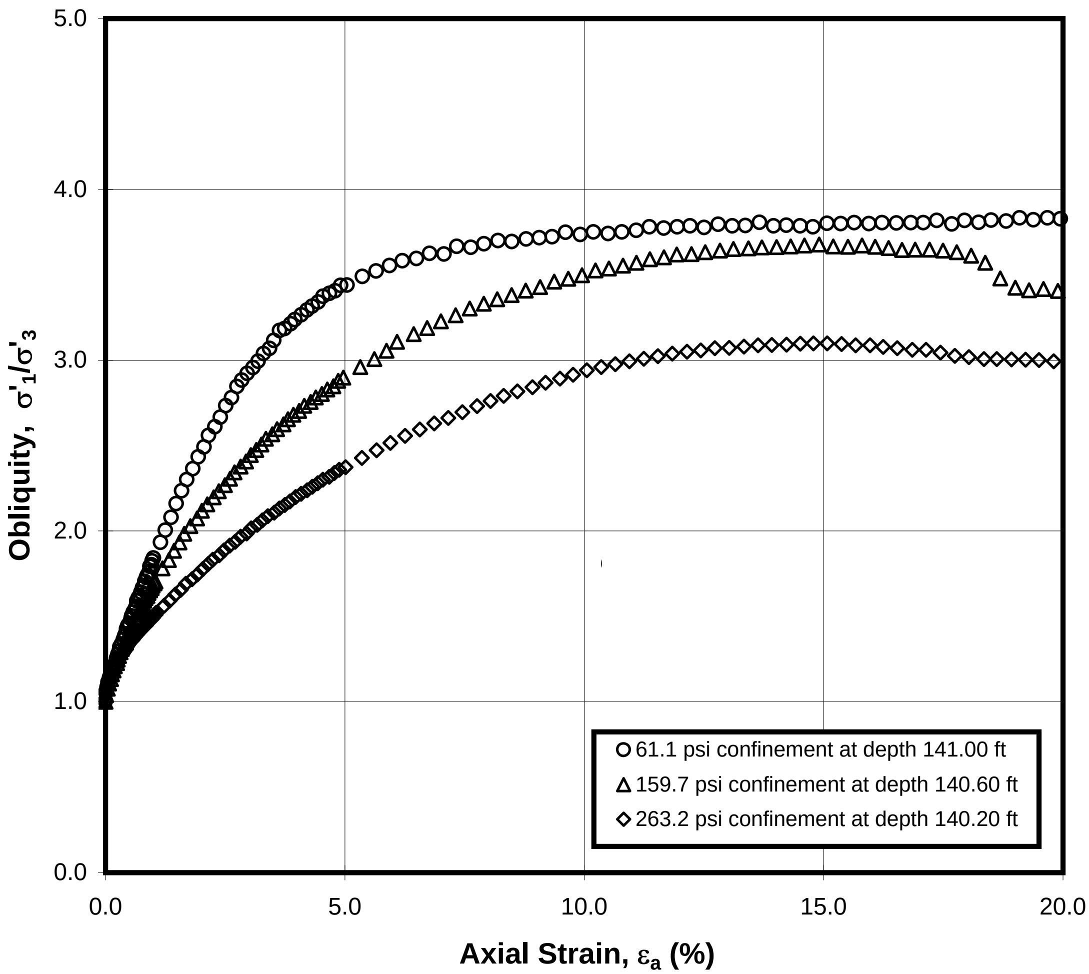
Samples: 14a, b, and c - Depth: 141.00, 140.60 and 140.20 ft

Boring B-75

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A15-12a



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

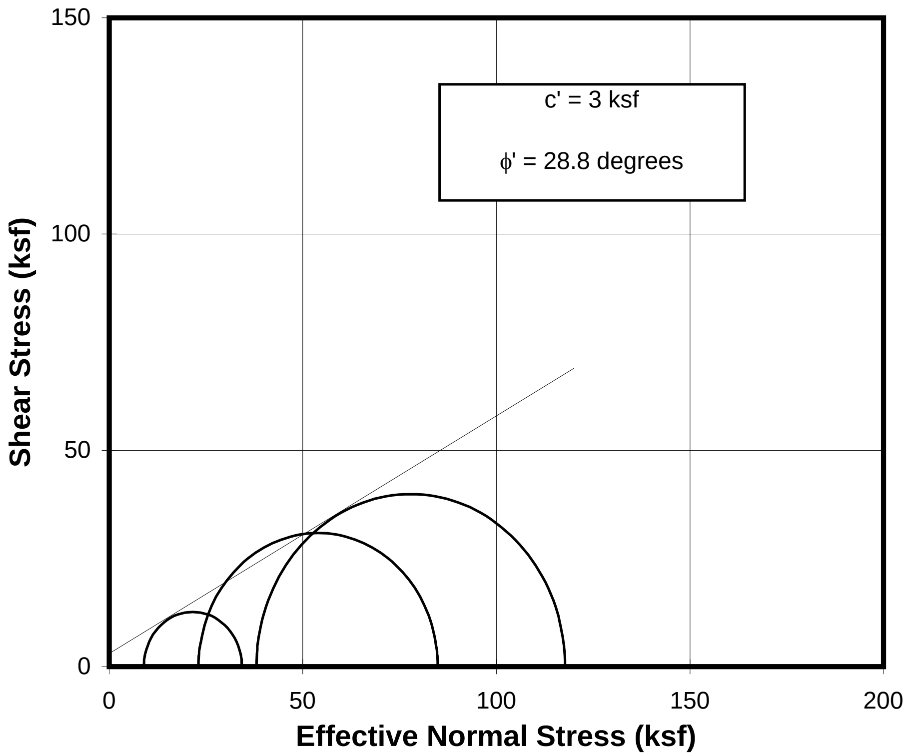
Samples: 14a, b, and c - Depth: 141.00, 140.60 and 140.20 ft

Boring B-75

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A15-12b



MULTI-SPECIMEN DRAINED TRIAXIAL COMPRESSION TEST

Isotropically Consolidated

Samples: 14a, b, and c - Depth: 141.00, 140.60 and 140.20 ft

Boring B-75

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A15-12c

APPENDIX 16

K_0-CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Appendix 16 presents the laboratory results of the K_0-Consolidated Undrained Triaxial tests performed by Fugro.

FUGRO WEST, INC.

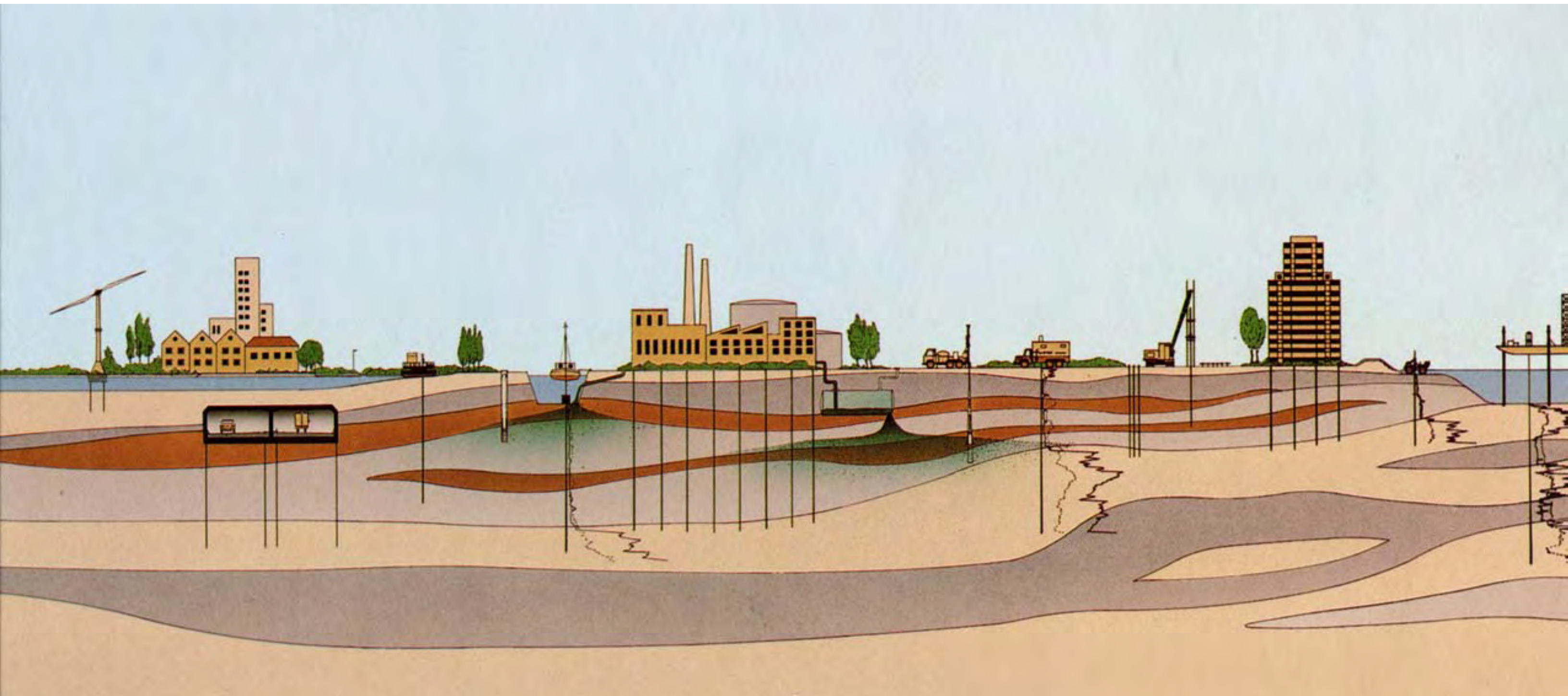
APPENDIX 16
K_0-CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

GEOTECHNICAL EXPLORATION PROGRAM
TUNNEL SEGMENT OF SILICON VALLEY RAPID TRANSIT (SVRT) PROJECT
SAN JOSE, CALIFORNIA

Prepared for:
HMM/BECHTEL

JULY 2005

Project No. 1637.001



REPORT DOCKET

APPROVAL

This document is approved by the following:

Name	Title	Signature	Issue Date
Jon W. Mitchell	Project Manager	Jon W. Mitchell	July 20, 2005

REVISION HISTORY

Revision	Date	Change	Approval
0	June 3, 2005	Draft Report: Appendix 16 K_0-Consolidated Undrained Triaxial Test Results	Jon
1	July 20, 2005	Draft Report: Appendix 16 K_0-Consolidated Undrained Triaxial Test Results with Bechtel comments from 6/10/05 & 7/13/05	Jon

FUGRO WEST, INC.

1000 Broadway, Suite 200
Oakland, California 94607
Tel: (510) 268-0461
Fax: (510) 268-0137

July 20, 2005
Project No. 1637.001

HMM/Bechtel
3103 North First Street
San Jose, California 95134

Attention: Mr. Ignacio Arango

Subject: Appendix 16 – K_0-Consolidated Undrained Triaxial Compression and Extension Test Results
Tunnel Segment of SVRT Project
San Jose, California

Dear Mr. Arango:

Fugro West, Inc., is pleased to submit this draft copy of "Appendix 16 - K_0-Consolidated Undrained Triaxial Compression and Extension Test Results," presenting the results of the K_0-Consolidated Undrained Triaxial Compression and Extension tests conducted by the geotechnical laboratory of Fugro Consultants LP in Houston, Texas, for the Tunnel Segment of SVRT Project in San Jose, California.

We appreciate this opportunity to be of continued service to HMM/Bechtel. Please contact Jon Mitchell at (510) 267-4430 if you have any questions regarding the information presented in this appendix.

Sincerely,
FUGRO WEST, INC.

Linda Al Atik
Staff Engineer

Jon W. Mitchell
Senior Engineer

Ronald L. Bajuniemi, P.E., G.E.
Principal Consultant

LAA/JWM/RLB:rp
Copies Submitted: (pdf) Addressee

CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This appendix presents the results of the K_0-Consolidated Undrained Triaxial Compression and Extension (CK_0UC & CK_0UE) Tests conducted by the Houston geotechnical laboratory of Fugro Consultants LP (Fugro Consultants) as a part of the advanced laboratory testing program for the Tunnel Segment of Silicon Valley Rapid Transit (SVRT) Project. The K_0-consolidated tests were performed on soil samples from boring locations situated along the tunnel segment alignment of SVRT Project, as shown on the Test Sample Location Map, Figure A16-1.

1.1 PROJECT DESCRIPTION

The Santa Clara Valley Transportation Authority (VTA) intends to construct the SVRT Project in San Jose, California. This will be a 26.2-km (16.3-mile) extension of the Bay Area Rapid Transit (BART) heavy rail rapid transit system from its planned terminus at the end of the Warms Springs Extension in Fremont, to San Jose. The proposed alignment currently includes six stations (three above-grade and three below-grade), a proposed future station, and vehicle storage and maintenance facilities. The alignment is composed of two major segments;

1) A line segment which will be approximately 11.5 miles of at-grade, elevated and cut-and-cover track from Warm Springs to San Jose; and
2) A 5.1-mile-long Tunnel Segment, consisting of twin bored tunnels and cut-and-cover structures through downtown San Jose (see Figure A16-1).

As currently planned, the tunnel segment includes an at-grade and open cut track, three cut-and-cover stations, and a cut-and-cover track crossover structure. The cut-and cover stations and the crossover structures have a cumulative length of approximately 4,970 feet. The remaining 4.14 miles of the alignment will be twin 19.5-foot-diameter tunnels.

This investigation and report cover the 5.1-mile-long tunnel segment section only.

1.2 GEOTECHNICAL EXPLORATION PROGRAM OVERVIEW

The joint venture of Hatch Mott MacDonald T & T, Inc., and Bechtel Infrastructure Corporation (HMM/Bechtel) is providing engineering design services for the tunnel segments (Segments 3 and 4) of the SVRT Project to the VTA. HMM/Bechtel has subcontracted with a number of companies to conduct the geotechnical field exploration program for the project. HMM/Bechtel's primary subcontractors for the geotechnical exploration program included Fugro West, Inc., (Fugro), Parikh Consultants (Parikh) and Pitcher Drilling Company (Pitcher).

The three companies, Fugro, Parikh, and Pitcher, conducted the majority of the geotechnical field exploration program for the tunnel segments of the SVRT Project from October 15, 2004, to March 5, 2005. The intent of the geotechnical field investigation program was to obtain geotechnical data that will aid in the design and construction of the proposed tunnel and cut-and-cover structures.

In general, the geotechnical field investigations explored subsurface conditions along the proposed tunnel alignment, within the vicinity of the proposed Eastern and Western Portals, at the two proposed ventilation structures, and at the proposed stations including Alum Rock Station, Downtown San Jose Station, and Diridon/Arena Station. The geotechnical exploration program included:

- 76 rotary wash borings, and
- 146 cone penetration tests (CPTs).

Figure A16-1 provides a map of the exploration locations. These locations were selected by HMM/Bechtel based on the following considerations: 1) the data requirements of the tunnel designer, 2) the location of existing geotechnical data, 3) the avoidance of private property, and 4) the avoidance of existing underground and overhead utilities. For CPT correlation purposes, approximately 16 sets of borings and CPTs were conducted within 15 feet of each other.

The boring investigation program was conducted by the two companies, Parikh and Pitcher. The investigation included soil sampling and in situ testing. Soil sampling consisted of Pitcher Barrel sampling, Shelby tube sampling, SPT sampling and California sampling. The in situ testing conducted in the borings consisted of field vane shear testing, pressuremeter testing, downhole geophysical logging, and piezometer installation. For further details regarding the boring investigation program and results refer to the main report.

1.3 LABORATORY TESTING PROGRAM OVERVIEW

1.3.1 Testing Overview

Fugro Consultants' geotechnical laboratory conducted the advanced laboratory testing program for the Tunnel Segment of SVRT Project. This program was conducted on samples provided by Parikh from soil borings located along the tunnel segment. Table A16-1, below, summarizes the numbers and types of different tests conducted. The purpose of this advanced laboratory testing program was to determine selected index and engineering properties of the sampled soils. This appendix provides a detailed description for the K_0-Consolidated Undrained Triaxial tests along with a summary of the interpreted parameters.

Table A16-1. Summary of Advanced Laboratory Testing Program

Test Description	Number of Tests
Constant Rate of Strain (CRS) Consolidation	37
Static Direct Simple Shear	15
K_0-Consolidated Undrained Triaxial Compression	20
K_0-Consolidated Undrained Triaxial Extension	16
K_0-Consolidated Bishop's Procedure	12
Isotropically-Consolidated Drained Triaxial Compression	30

1.3.2 Program Description

The physical properties of the soils tested during the advanced laboratory testing program are separated into two categories, index and engineering. The index properties include items such as water content, specific gravity, unit weight, void ratio, and degree of saturation. The engineering properties would include items such as compressibility (consolidation), strength, and hydraulic conductivity (permeability). The advanced tests conducted as part of this laboratory testing program are discussed in more detail below.

- **Constant Rate of Strain Consolidation (CRS)** tests were conducted to determine the rate and magnitude of soil consolidation as well as stress history for a soil sample that is restrained laterally and drained axially. The one-dimensional consolidation tests typically involved constant rate-of-loading, one unload-reload cycle, and one rebound stage from the maximum applied stress. Detailed discussion of the CRS consolidation tests is provided in Appendix 13.

- **Static Direct Simple Shear (DSS)** tests were conducted to measure constant volume (undrained) shear strength and stress strain-characteristics of cohesive soils after one-dimensional consolidation using a constant rate of simple shear deformation. Detailed discussion of the DSS tests is provided in Appendix 14.

- **Isotropically Consolidated Triaxial Drained (CDTX**) tests were conducted to evaluate the drained strength characteristics, such as friction angle and stress-strain relationship of the soils encountered in the borings. For detailed discussion of the consolidated drained triaxial tests, refer to Appendix 15.

- **K_0-Consolidated Undrained Triaxial Compression and Extension (CK_0UC & CK_0UE)** tests were conducted to estimate the static strength parameters and stress-strain characteristics of fine-grained soils under a range of confining stresses and overconsolidation ratios (OCRs). In a K_0-consolidated test, the sample is consolidated under drained conditions to the assigned vertical stress while maintaining a constant diameter of the cylindrical specimen (the horizontal confining stress was automatically adjusted to maintain the constant diameter). A detailed discussion of the K_0 triaxial compression and extension tests is provided in Appendix 16 (this appendix).

- **K_0 Bishop's Procedure Triaxial** tests were conducted to determine the at-rest lateral earth pressure coefficient (K_0) as a function of the overconsolidation ratio (OCR). For detailed discussion of the K_0 Bishop's tests, refer to Appendix 17.

The scope of the advanced laboratory testing program also included x-raying of assigned soil samples. Discussion of the x-ray testing procedures and a summary of results are provided in Section 2.0 of Appendix 13, with x-ray images shown in Appendix 20.

1.3.3 Sample Recovery and Handling

Soil sampling was conducted by Parikh at intervals typically ranging from 5 to 10 feet in accordance with the project specifications. Upon sample recovery, undisturbed portions of the

soil sample tubes were sealed and transported to Parikh's laboratory. For further details regarding sample recovery and handling, refer to the main report.

Soil samples assigned for advanced laboratory testing were transported in wooden Shelby tube holders designed to maintain the tubes vertical orientation during transit to Fugro's Laboratory in Oakland. The samples were then packed in specially fabricated, padded containers designed to minimize disturbance and maintain an upright (vertical) orientation of the samples during shipping. The samples were finally shipped to Fugro Consultants' geotechnical laboratory for testing.

1.3.4 Overview of K_0-Consolidated Undrained Triaxial Compression and Extension Test Program

Fugro Consultants' geotechnical laboratory conducted K_0-Consolidated Undrained Triaxial Compression tests on 19 samples and Extension tests on 16 samples, as assigned by HMM/Bechtel. K_0-consolidated tests are conducted to estimate the static strength parameters and stress-strain characteristics of fine-grained soils under a range of confining stresses and overconsolidation ratios (OCR). The K_0 method of consolidation is used to better model the in situ stress conditions of the soil. The test is applicable to field conditions where soils that have been fully consolidated under a set of stresses, are subjected to a change in stress without time for further consolidation to take place (undrained conditions).

The shear strength determined from the K_0-consolidated tests, expressed in terms of total stresses (undrained conditions) or effective stresses (drained conditions), are commonly used in stability analyses, earth pressure calculations and foundation design.

CK_0UE (extension) tests are conducted by consolidating the test specimen under K_0 conditions as per the CK_0UC tests and then sheared to failure by maintaining a constant horizontal stress and decreasing the total vertical stress. Extension loading simulates loading under passive failure conditions as may be encountered at the bottom of a supported excavation.

The normalized undrained shear strength (S_u/σ'_{vc}) can be estimated as the ratio of the maximum observed shear stress (q) to the effective vertical consolidation stress (σ'_{vc}) prior to undrained loading. The in situ undrained shear strength may then be estimated by multiplying the normalized undrained shear strength with the estimated in situ effective overburden pressure (for normally consolidated samples).

2.0 K_0-CONSOLIDATED UNDRAINED TRIAXIAL TEST PROCEDURES

2.1 INTRODUCTION

The K_0-Consolidated Undrained Triaxial tests were conducted in general accordance with ASTM Test Method D 4767. In a K_0-consolidated test the sample is consolidated under drained conditions to the assigned vertical stress while maintaining a constant diameter of the cylindrical specimen (the horizontal confining stress is automatically adjusted to maintain the constant diameter). The sample is then sheared to failure under undrained conditions with pore water pressure measurements. By measuring the pore-water pressures generated during the test, the shear strength determined from the test can be expressed in terms of effective stress. This test method provides for the calculation of total and effective stresses, and axial compression or extension by measurement of axial load, axial deformation, and pore water pressure.

2.2 K_0-CONSOLIDATED UNDRAINED TRIAXIAL TEST STANDARDS AND PROCEDURES

K_0-Consolidated Undrained Triaxial tests were performed using an automated system (TruePath) developed by Fugro Consultants, Trautwein and Germaine (of the Massachusetts Institute of Technology). The test procedure followed the technical requirements of ASTM Test Method D4767-95 except for the following: a) TruePath K_0 consolidation; b) some minor calculation methodologies (volume of specimen before shearing, membrane correction, and area correction during shearing); and c) shearing in extension, when performed. The procedure for K_0-Consolidated Undrained Triaxial tests typically consists of five steps:

1. *Cell Preparation*: Using the assigned confining pressure, strength estimates and specimen area, the proper load cell and pressure transducers are selected.

2. *Specimen Preparation*: The selected portions of the tubes were cut into segments with a mechanical hacksaw (18 teeth per inch). A wire saw was used to separate the soil from the surrounding tube in an effort to reduce potential disturbance upon extrusion. In addition, each tube is marked such that all test specimens, will have the same orientation when sheared. The sample is then extruded from the cut portion of the tube using a hydraulically actuated ram.

   Test specimens are typically trimmed to a 2.0-inch diameter by 4-inch height. After specimens are trimmed, they are mounted in the triaxial testing apparatus and aligned with the cell base with porous stones at each end. Each specimen had top, bottom and radial drainage boundaries during consolidation. The radial drainage was provided by spirally oriented ¼-inch-wide Whatman No. 1 filter strips placed at about ¼-inch spacing.

3. *Back Pressure Saturation:* Specimen saturation is usually achieved through back pressuring at either, an effective isotropic-confining stress of 3 to 7 psi (21 to 48 Kpa), a stress which prevents swelling or the assigned stress, whichever was smaller.

4. *Consolidation:* Using the SHANSEP methodology, the soil specimen is K_0-consolidated, in which the sample is consolidated, under drained conditions, to the assigned vertical stress while maintaining a constant diameter of the cylindrical specimen (the horizontal confining stress is automatically adjusted to maintain the constant diameter). The samples are typically consolidated at a controlled rate of strain of about 0.1 to 0.5 percent/hr, depending upon its liquid limit. The duration of all consolidation increments shall be such that at least 95 percent consolidation is

achieved. If a test required the specimen to have an OCR greater than one, as in this program, the specimen was first consolidated to an induced OCR = 1 and cured (as mentioned above, but with $\sigma'_{v,c} = \sigma'_{vc,max}$); then rebounded in increments to $\sigma'_{v,c}$ and cured (thereby obtaining the appropriate OCR > 1); and, finally, sheared.

5. *Undrained Axial Shearing:* During shearing, the chamber pressure is kept constant and specimen drainage is not permitted. An axial loading piston is advanced into (shearing compression), or retracted from (shearing in extension) the cell at a specific rate of strain. The applied rate-of-strain was slow enough (about 0.1 to 0.5 percent/h, depending upon the specimen's liquid limit) to produce approximate equalization of excess pore-water pressures (PWP) throughout the specimen at failure. The static stresses and excess PWPs (ΔU) were used to express the measured stress parameters in terms of effective stresses.

3.0 K_0-CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

During consolidation and shearing the necessary data (time, vertical and horizontal forces, shear deformations, pore pressures and transducer excitation voltage) were recorded using an automated data-acquisition system and electronically filed. Specialized Excel worksheets, along with a Visual Basic code (VBA) were used to reduce the data files into engineering units in tabular and graphical format. Figures A16-2 through A16-17 present the CK_0UE test results, and Figures A16-18 through A16-37 present the CK_0UC test results. For each test performed, normalized shear stress (ratio of the horizontal shear stress to the pre shear effective vertical stress [$\tau_h/\sigma'_{v,c}$]), the normalized excess pore water pressure and obliquity versus shear strain (γ %) are plotted on three separate plots on one page while the K_0 and axial strain are plotted versus effective vertical stress, and normalized shear stress ($\tau_h/\sigma'_{v,c}$) versus normalized average effective vertical stress ($p/\sigma'_{v,c}$) are shown on a second page of plots.

Results such as moisture content, Atterberg limits, initial unit weight, soil type, interpreted preconsolidation pressure, estimated in situ vertical stress, overconsolidation ratio, undrained shear strength and maximum shear strain are summarized in "Table A16-2 – Summary of CK_0U Test Results." The estimated in situ vertical effective stress was estimated by developing a unit weight profile from the boring data with either measured or estimated ground water levels.

4.0 LIMITATIONS

Our services consist of laboratory testing, and data evaluations that are made in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The test data provided in this appendix is from the laboratory testing of samples obtained from subsurface explorations conducted by others. These explorations indicate subsurface conditions only at specific locations and times, and only to the depths penetrated.

Variations may exist and conditions not observed or described in this report could be encountered during construction. Our laboratory tests results presented in this appendix are based on the standards and procedures indicated herein. The laboratory assignments were provided by HMM/Bechtel.

This appendix has been prepared for the exclusive use of HMM/Bechtel and their consultants for specific application to the SVRT project as described herein. In the event that there are any changes in the ownership, nature, design, or location of the proposed project, or if any future additions are planned, the results contained in this appendix should not be considered valid unless 1) the project changes are reviewed by Fugro, and 2) results presented in this appendix are modified or verified in writing. Reliance on this report by others must be at their risk unless we are consulted on the use or limitations. We cannot be responsible for the impacts of any changes in geotechnical standards, practices, or regulations subsequent to performance of services without our further consultation. We can neither vouch for the accuracy of information supplied by others, nor accept consequences for unconsulted use of segregated portions of this report.

5.0 REFERENCES

ASTM D4767, “Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils, “ASTM International.

TABLE

Boring Number Sample Number Test Type	B-23 9c CKUE	B-23 18c CKUE	B-24 7c CKUE	B-25 4a CKUE	B-33 6a CKUE	B-42 7c CKUE	B-60 11b CKUE
Penetration Depth (ft)	40.00	117.00	24.85	32.50	54.40	37.35	73.95
Soil Type	CL	CL	CL	ML	CL-ML	CL	CL
Atterberg Limits (%)							
Liquid Limit, LL	32	30	29	36	35	31	28
Plastic Limit, PL	15	18	16	24	19	13	17
Water Content (%)							
In Situ Water Content, W_o	22.6	20.1	22.6	30.8	26.7	22.9	21.5
Initial Water Content Before Consolidation, W_i	21.6	20.1	23.4	30.4	27.4	23.4	22.0
Final Water Content, W_f	15.6	15.7	18.6	25.2	21.6	16.7	15.6
Initial Total Unit Weight, γt,0 (pcf)	126	128	123	117	120	127	129
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	2.95	7.93	1.94	3.10	3.88	2.76	4.74
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	65.85	14.17	14.23	7.81	10.84	11.22	49.89
Horizontal Effective Consolidation Stress (Pre-Shear), σ'_{hc} (ksf)	31.80	9.50	7.30	4.95	9.16	7.91	24.28
Lateral Earth Pressure Coefficient After Consolidation, K	0.48	0.67	0.51	0.63	0.85	0.71	0.49
Preconsolidation Pressure (Casagrande), σ'_p (ksf)	9.2	25.6	5.2	8.6	11.6	13.1	16.2
Overconsolidation, OCR							
In Situ	3.1	3.2	2.7	2.8	3.0	4.7	3.4
Test Induced	1.0	4.9	1.0	3.1	4.4	5.1	1.0
Compression Index, $C_{e,c}$	0.11	0.12	0.12	0.13	0.14	0.11	0.10
Axial Strain at Max Shear Stress, ε_a (%):	6.8	1.5	9.5	9.4	9.0	10.3	6.6
Axial Strain at Max Obliquity, ε_a (%):	6.1	5.8	8.8	8.4	8.5	10.5	5.6
Undrained Shear Strength, S_u (ksf)	9.14	4.82	2.99	3.97	7.69	7.76	8.05
Undrained Shear Strength Ratio, S_u/σ'_{vc}	0.14	0.34	0.21	0.51	0.71	0.69	0.16
Estimated Friction Angle at Maximum Obliquity, ϕ' (degrees)	33	36	39	43	41	42	33

Notes: CKUE = K_0 Consolidated Undrained Triaxial Extension test
CKUC = K_0 Consolidated Undrained Triaxial Compression test
NA = Test Not Assigned

SUMMARY OF K_0 TRIAXIAL COMPRESSION AND EXTENSION TEST RESULTS
Tunnel Segment of SVRT Project
San Jose, California

TABLE A16-2a

Boring Number Sample Number Test Type	B-60 18b CKUE	B-64 5c CKUE	B-64 19c CKUE	B-68 3b CKUE	B-68 4a CKUE	B-68 18c CKUE	B-70 35a CKUE
Penetration Depth (ft)	131.85	31.90	117.25	12.65	20.70	149.80	137.30
Soil Type	CL	CL	CL	CL	CH	CL	CH
Atterberg Limits							
Liquid Limit, LL	49	32	NA	51	44	38	52
Plastic Limit, PL	22	21	NA	24	24	18	16
Water Content (%)							
In Situ Water Content, W_o	26.4	30.0	23.2	36.8	36.1	26.9	24.9
Initial Water Content Before Consolidation, W_i	26.9	30.6	23.2	38.1	37.0	27.1	25.0
Final Water Content, W_f	20.8	23.7	21.6	30.0	28.7	22.4	19.3
Initial Total Unit Weight, $\gamma t,0$ (pcf)	123	120	119	115	115	123	124
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	8.66	2.20	7.78	1.29	1.68	9.92	9.74
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	48.46	18.80	74.77	14.10	1.63	56.78	14.33
Horizontal Effective Consolidation Stress (Pre-Shear), σ'_{hc} (ksf)	28.44	9.24	35.79	7.37	2.06	33.96	11.04
Lateral Earth Pressure Coefficient After Consolidation, K	0.59	0.49	0.48	0.52	1.26	0.60	0.77
Preconsolidation Pressure (Casagrande), σ'_p (ksf)	17.9	6.8	28.3	4.9	3.6	30.8	22.5
Overconsolidation, OCR							
In Situ	2.1	3.1	3.6	3.8	2.2	3.1	2.3
Test Induced	1.0	1.0	1.0	1.0	7.0	1.0	4.3
Compression Index, $C_{e,c}$	0.17	0.13	0.11	0.16	0.15	0.16	0.18
Axial Strain at Max Shear Stress, ε_a (%):	12.9	11.3	2.4	13.7	3.9	9.9	6.9
Axial Strain at Max Obliquity, ε_a (%):	11.8	6.0	2.4	12.9	3.9	9.4	6.9
Undrained Shear Strength, S_u (ksf)	9.80	2.97	9.25	3.24	1.40	12.09	7.44
Undrained Shear Strength Ratio, S_u/σ'_{vc}	0.20	0.16	0.12	0.23	0.85	0.21	0.52
Estimated Friction Angle at Maximum Obliquity, ϕ' (degrees)	32	30	44	42	45	31	31

Notes: CKUE = K_0 Consolidated Undrained Triaxial Extension test
CKUC = K_0 Consolidated Undrained Triaxial Compression test
NA = Test Not Assigned

SUMMARY OF K_0 TRIAXIAL COMPRESSION AND EXTENSION TEST RESULTS
Tunnel Segment of SVRT Project
San Jose, California

Boring Number / Sample Number / Test Type	B-75 15c CKUE	B-77 16c CKUE	B-9 3c CKUC	B-18 9c CKUC	B-23 9b CKUC	B-23 17c CKUC	B-24 3b CKUC	B-24 7b CKUC
Penetration Depth (ft)	150.45	101.85	51.80	80.95	41.20	106.50	14.85	24.45
Soil Type	CL	CL	CH	CL	CL	CL	CL	CL
Atterberg Limits								
Liquid Limit, LL	29	NA	53	32	32	24	37	29
Plastic Limit, PL	16	NA	22	18	15	16	18	16
Water Content (%)								
In Situ Water Content, W_o	20.1	20.1	29.0	21.9	22.5	19.0	28.8	22.3
Initial Water Content Before Consolidation, W_i	20.1	20.1	29.2	22.5	21.8	19.4	29.5	22.3
Final Water Content, W_f	16.0	15.7	24.0	17.2	15.5	14.3	22.1	17.8
Initial Total Unit Weight, $\gamma_{t,0}$ (pcf)	128	128	120	127	126	132	121	124
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	10.21	7.02	3.50	5.40	2.95	7.27	1.52	1.94
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	26.81	43.09	4.70	24.89	64.68	18.81	15.68	14.69
Horizontal Effective Consolidation Stress (Pre-Shear), σ'_{hc} (ksf)	15.26	22.02	5.03	16.31	32.48	9.89	8.39	7.00
Lateral Earth Pressure Coefficient After Consolidation, K	0.57	0.51	1.07	0.66	0.50	0.53	0.54	0.48
Preconsolidation Pressure (Casagrande), σ'_p (ksf)	26.1	15.7	11.5	17.3	9.4	25.6	4.1	5.0
Overconsolidation, OCR								
In Situ	2.6	2.2	3.3	3.2	3.2	3.5	2.7	2.6
Test Induced	2.7	1.0	6.1	2.0	1.0	3.8	1.0	1.0
Compression Index, $C_{e,c}$	0.12	0.15	0.15	0.13	0.11	0.10	0.12	0.12
Axial Strain at Max Shear Stress, ε_a (%):	12.1	2.6	7.6	1.9	0.8	6.5	0.9	0.4
Axial Strain at Max Obliquity, ε_a (%):	8.5	10.2	1.9	7.7	8.2	0.7	7.7	7.9
Undrained Shear Strength, S_u (ksf)	9.41	5.63	5.86	14.04	20.34	17.56	4.58	4.66
Undrained Shear Strength Ratio, S_u/σ'_{vc}	0.35	0.13	1.58	0.56	0.31	0.93	0.29	0.32
Estimated Friction Angle at Maximum Obliquity, ϕ' (degrees)	35	24	35	32	32	35	29	33

Notes: CKUE = K_0 Consolidated Undrained Triaxial Extension test
CKUC = K_0 Consolidated Undrained Triaxial Compression test
NA = Test Not Assigned

SUMMARY OF K_0 TRIAXIAL COMPRESSION AND EXTENSION TEST RESULTS

Tunnel Segment of SVRT Project
San Jose, California

TABLE A16-2c

Boring Number Sample Number Test Type	B-25 4b CKUC	B-33 6b CKUC	B-37 5a CKUC	B-42 7d CKUC	B-60 11a CKUC	B-60 18a CKUC	B-64 5d CKUC
Penetration Depth (ft)	32.05	54.00	42.30	36.95	74.35	132.40	31.50
Soil Type	ML	CL-ML	CL	CL	CL	CL	CL
Atterberg Limits							
Liquid Limit, LL	36	35	29	31	28	49	32
Plastic Limit, PL	24	19	20	13	17	22	21
Water Content (%)							
In Situ Water Content, W_o	36.1	23.8	24.1	21.5	20.1	24.4	30.4
Initial Water Content Before Consolidation, W_i	37.0	24.6	24.5	22.2	20.7	24.8	31.3
Final Water Content, W_f	28.8	18.0	18.7	16.9	15.5	18.8	23.6
Initial Total Unit Weight, $\gamma t,0$ (pcf)	106	124	125	127	130	126	117
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	3.10	3.88	3.01	2.76	4.74	8.66	2.20
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	8.04	11.08	47.59	11.42	50.85	48.87	25.91
Horizontal Effective Consolidation Stress (Pre-Shear), σ'_{hc} (ksf)	5.42	8.51	22.20	6.43	23.46	27.89	13.54
Lateral Earth Pressure Coefficient After Consolidation, K	0.67	0.77	0.47	0.56	0.46	0.57	0.52
Preconsolidation Pressure (Casagrande), σ'_p (ksf)	8.7	12.5	12.2	14.3	15.8	18.0	6.1
Overconsolidation, OCR							
In Situ	2.8	3.2	4.0	5.2	3.3	2.1	2.8
Test Induced	3.1	4.3	1.0	5.1	1.0	1.0	1.0
Compression Index, $C_{e,c}$	0.15	0.13	0.12	0.10	0.11	0.15	0.15
Axial Strain at Max Shear Stress, ε_a (%):	2.5	6.7	0.4	10.9	0.6	1.2	0.9
Axial Strain at Max Obliquity, ε_a (%):	8.7	6.7	7.7	0.6	7.8	7.0	8.8
Undrained Shear Strength, S_u (ksf)	6.51	12.36	15.34	15.08	16.58	14.15	7.58
Undrained Shear Strength Ratio, S_u/σ'_{vc}	0.81	1.12	0.32	1.32	0.33	0.29	0.29
Estimated Friction Angle at Maximum Obliquity, ϕ' (degrees)	36	34	34	36	34	28	32

Notes: CKUE = K_0 Consolidated Undrained Triaxial Extension test
CKUC = K_0 Consolidated Undrained Triaxial Compression test
NA = Test Not Assigned

SUMMARY OF K_0 TRIAXIAL COMPRESSION AND EXTENSION TEST RESULTS
Tunnel Segment of SVRT Project
San Jose, California

TABLE A16-2d

Boring Number Sample Number Test Type	B-64 19b CKUC	B-68 3a CKUC	B-68 18b CKUC	B-70 35b CKUC	B-75 15b CKUC	B-75 16a CKUC	B-77 16b CKUC
Penetration Depth (ft)	116.90	13.10	149.40	136.80	150.85	160.00	101.45
Soil Type	CL	CL	CL	CH	CL	CL	CL
Atterberg Limits							
Liquid Limit, LL	NA	51	38	52	29	23	NA
Plastic Limit, PL	NA	24	18	16	16	19	NA
Water Content (%)							
In Situ Water Content, W_o	24.6	37.6	23.2	24.7	18.4	21.0	21.3
Initial Water Content Before Consolidation, W_i	24.9	37.3	23.9	25.1	18.7	21.7	20.8
Final Water Content, W_f	20.4	30.4	18.7	18.8	14.6	18.6	16.3
Initial Total Unit Weight, $\gamma t,0$ (pcf)	123	117	127	123	131	123	128
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	7.78	1.29	9.92	9.74	10.21	10.87	7.02
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	75.11	14.30	57.22	13.39	26.96	116.39	43.26
Horizontal Effective Consolidation Stress (Pre-Shear), σ'_{hc} (ksf)	38.43	7.46	32.41	9.54	14.96	59.71	23.36
Lateral Earth Pressure Coefficient After Consolidation, K	0.51	0.52	0.57	0.71	0.56	0.49	0.54
Preconsolidation Pressure (Casagrande), σ'_p (ksf)	27.1	5.6	29.2	21.1	32.0	46.9	18.5
Overconsolidation, OCR							
In Situ	3.5	4.3	2.9	2.2	3.1	4.3	2.6
Test Induced	1.0	1.0	1.0	4.3	3.0	1.0	1.0
Compression Index, $C_{e,c}$	0.13	0.14	0.14	0.18	0.11	0.10	0.14
Axial Strain at Max Shear Stress, ε_a (%):	0.9	1.9	1.3	3.3	9.2	0.4	0.8
Axial Strain at Max Obliquity, ε_a (%):	6.2	7.7	4.9	1.9	0.9	6.8	8.5
Undrained Shear Strength, S_u (ksf)	22.62	4.39	16.54	14.28	20.65	36.78	13.08
Undrained Shear Strength Ratio, S_u/σ'_{vc}	0.30	0.31	0.29	1.07	0.77	0.32	0.30
Estimated Friction Angle at Maximum Obliquity, ϕ' (degrees)	30	28	28	36	32	36	30

Notes: CKUE = K_0 Consolidated Undrained Triaxial Extension test
CKUC = K_0 Consolidated Undrained Triaxial Compression test
NA = Test Not Assigned

SUMMARY OF K_0 TRIAXIAL COMPRESSION AND EXTENSION TEST RESULTS

Tunnel Segment of SVRT Project
San Jose, California

FIGURES

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE

HMM / BECHTEL

A Joint Venture of Hatch Mott MacDonald T&T, Inc. and Bechtel Infrastructure Corp.

DESIGNER/SUBCONSULTANT

FUGRO

SUBMITTED

HMM/BECHTEL

APPROVED

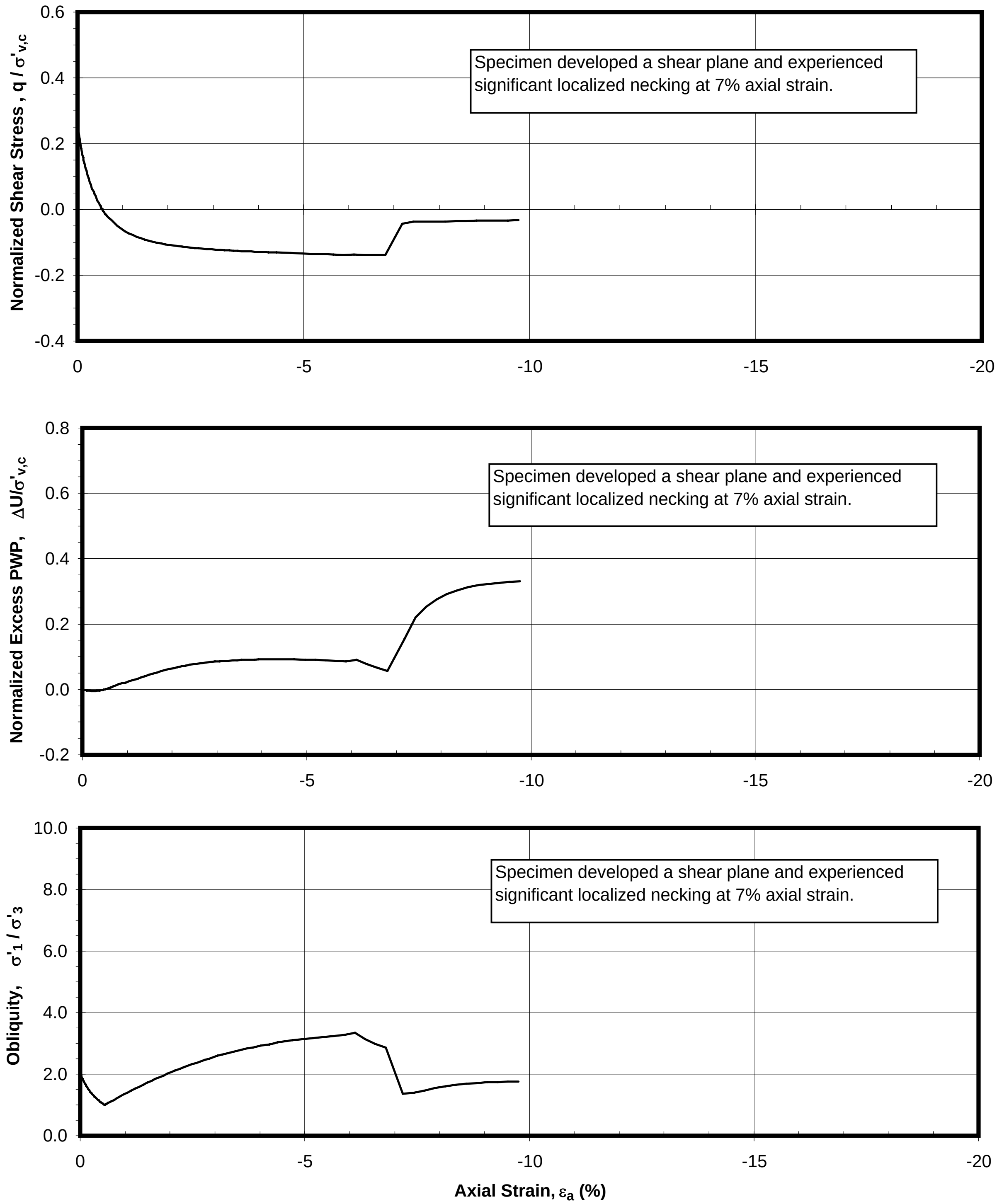
BART

SILICON VALLEY RAPID TRANSIT PROJECT

VTA SANTA CLARA Valley Transportation Authority

Ko TRIAXIAL COMPRESSION AND EXTENSION TEST LOCATION MAP
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A16-1



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

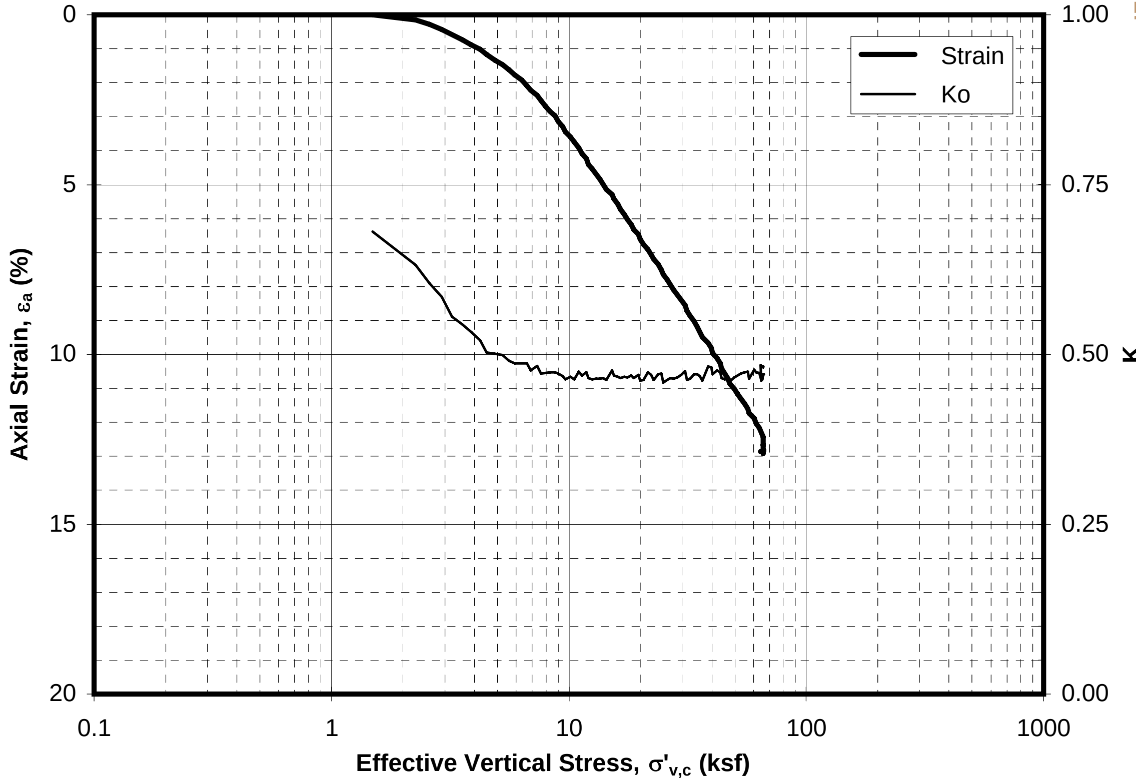
Sample: 9c - Depth: 41.75 ft

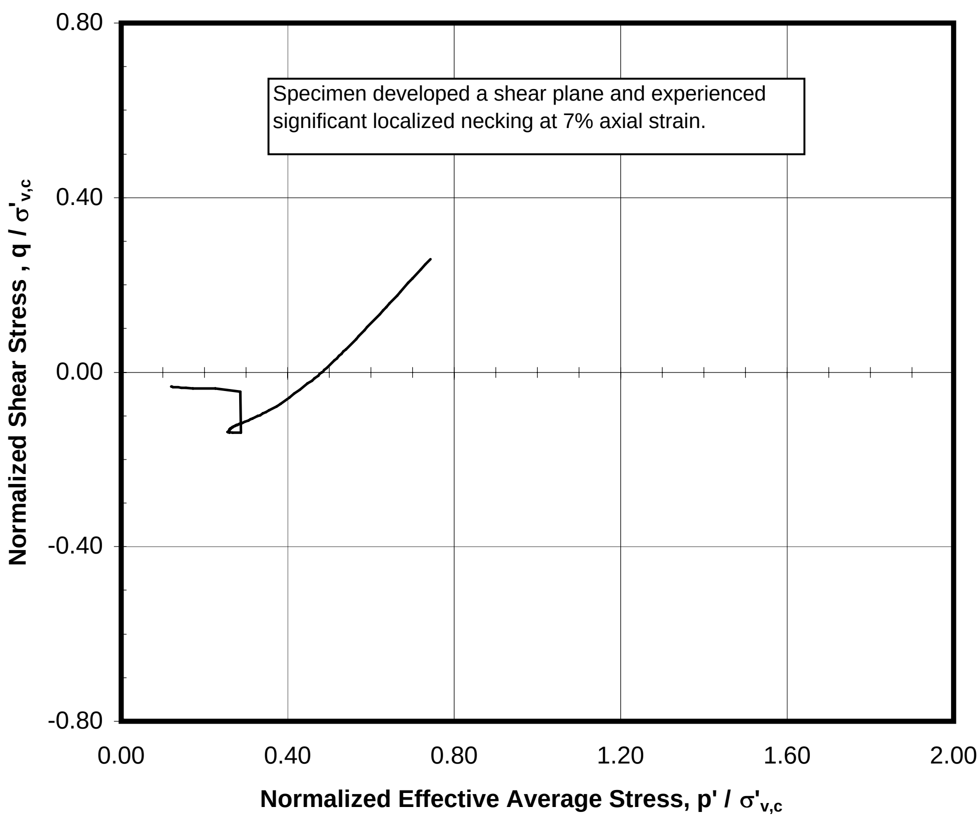
Boring B-23

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-2a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

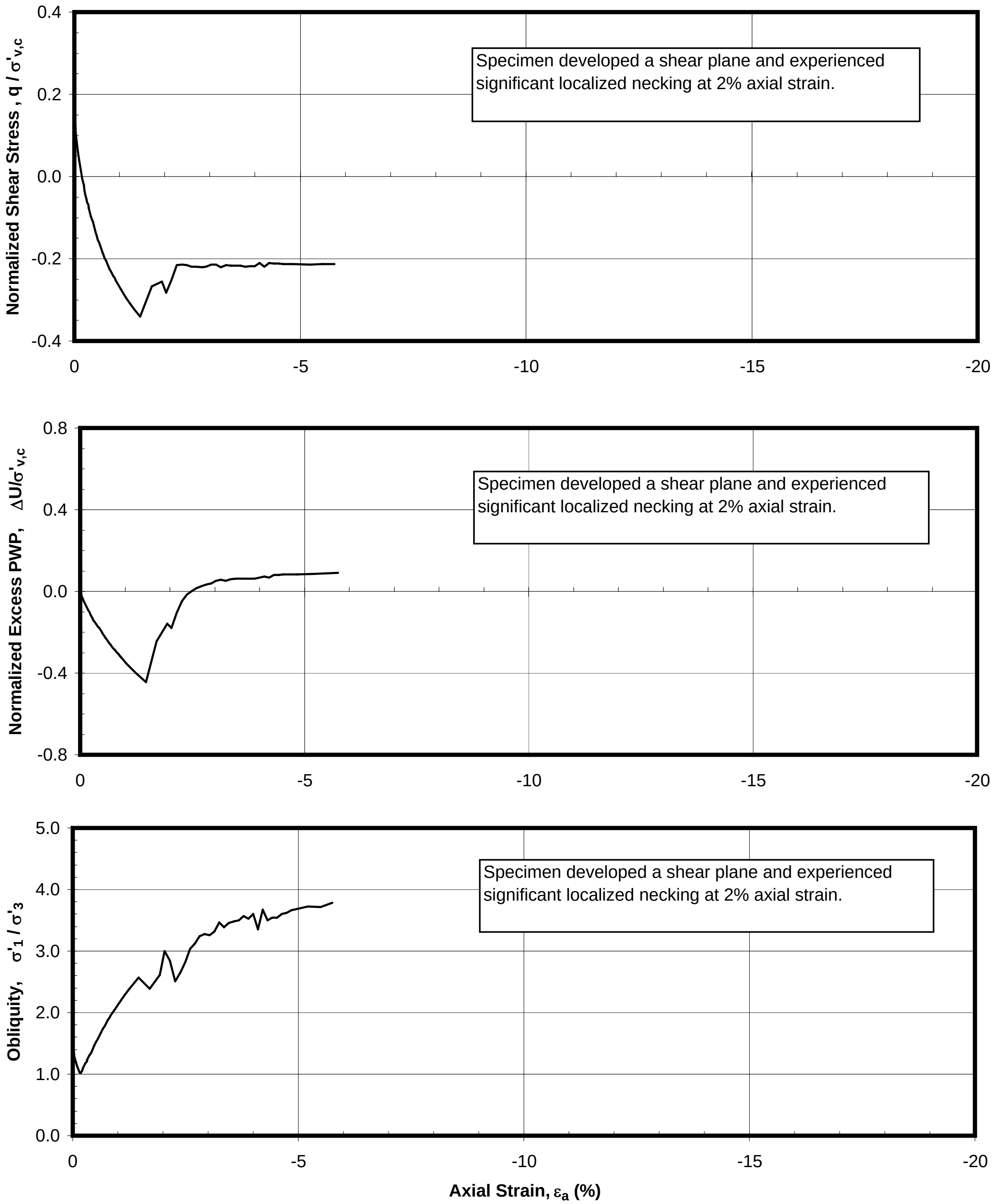
Sample: 9c - Depth: 41.75 ft

Boring B-23

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-2b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 4.94

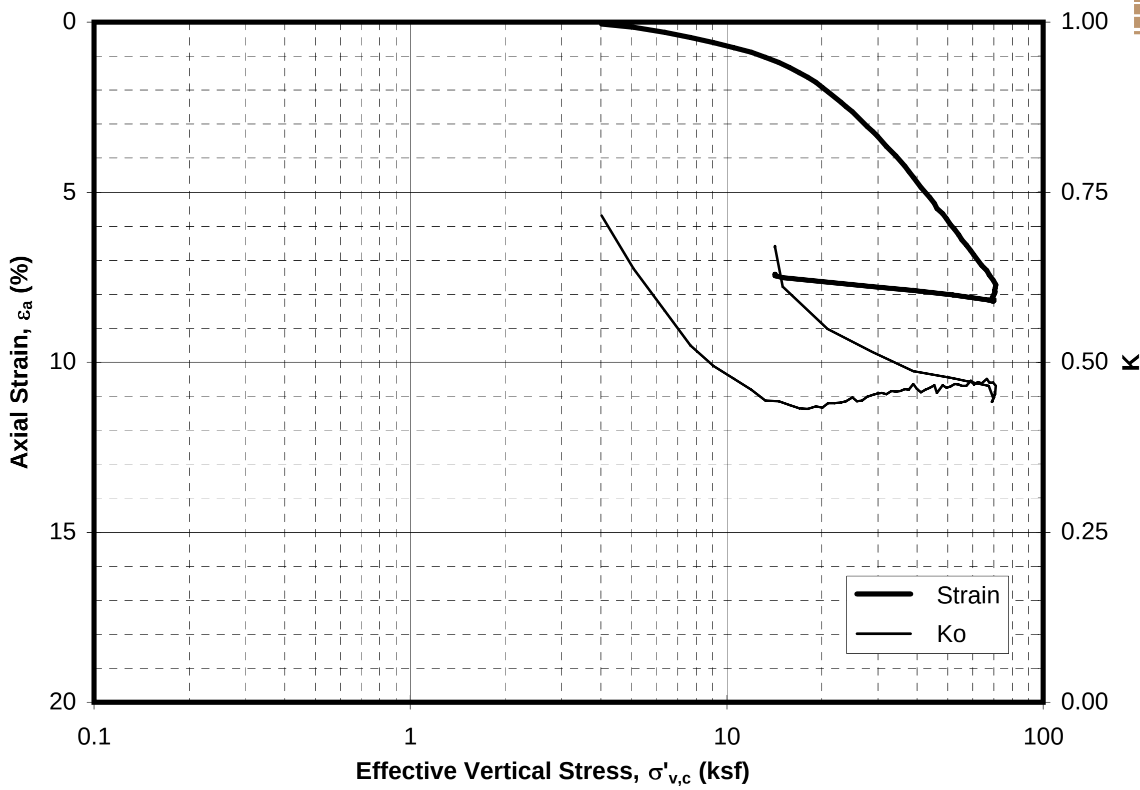
Sample: 18c - Depth: 114.7ft

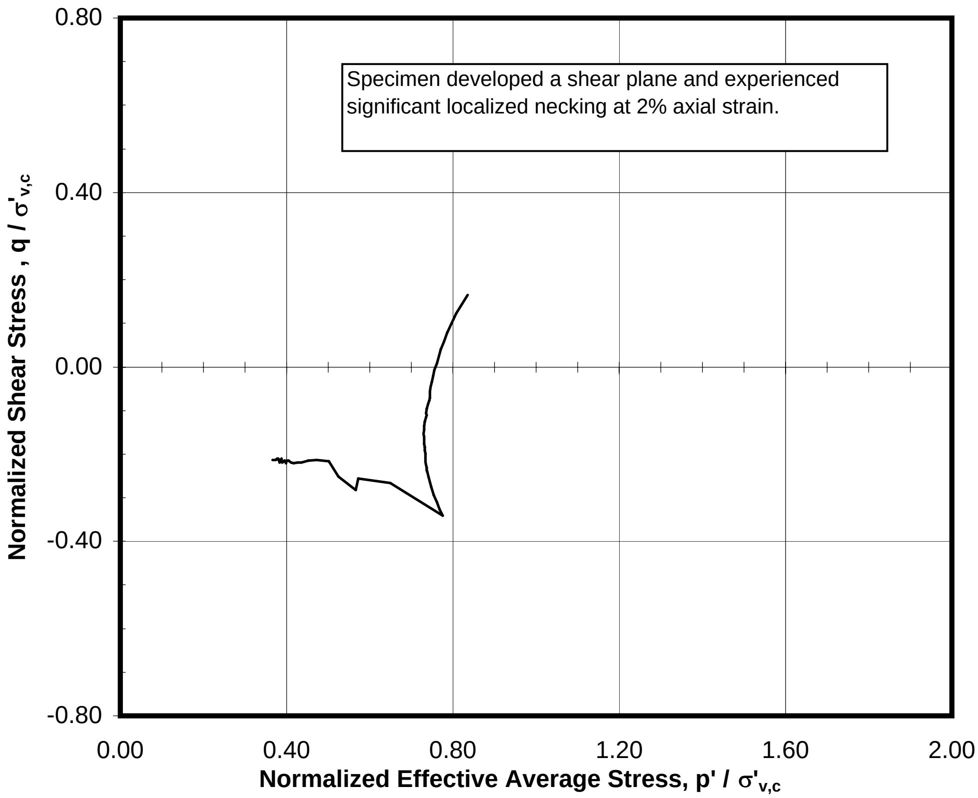
Boring B-23

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-3a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 4.94

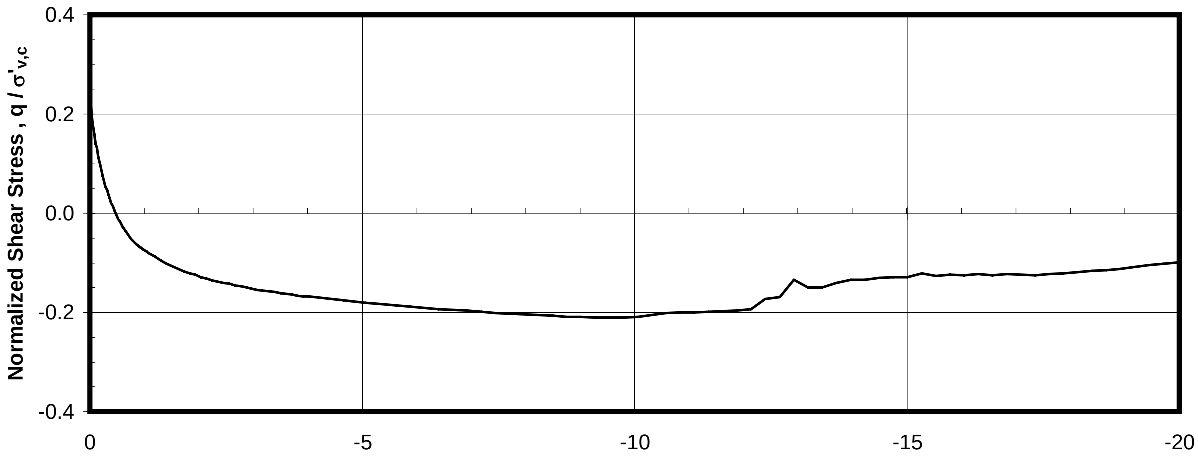
Sample: 18c - Depth: 114.7ft

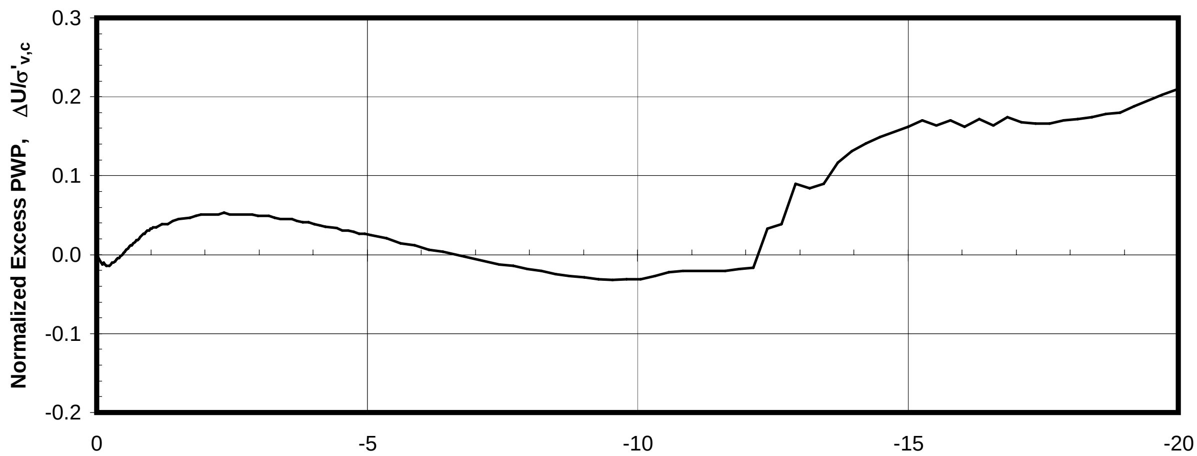
Boring B-23

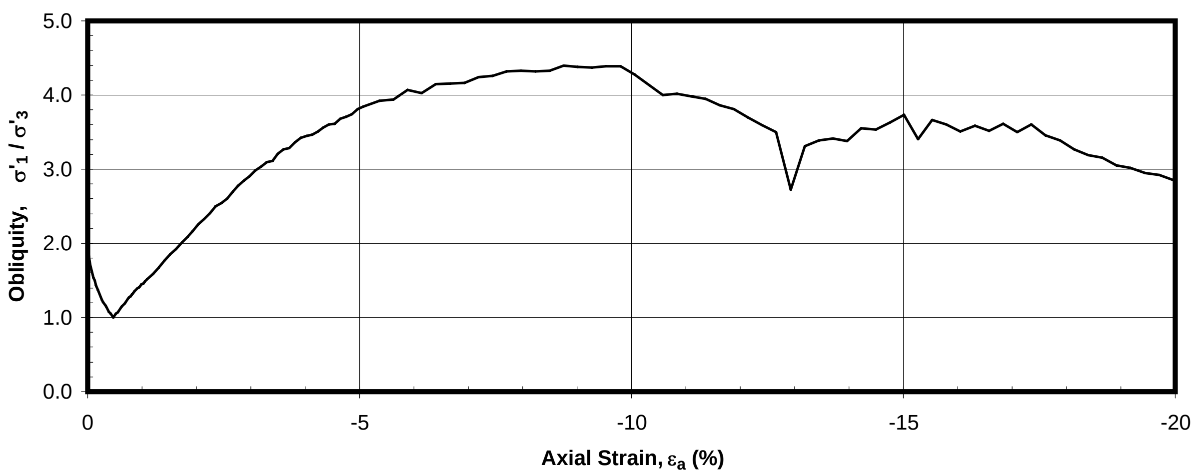
Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-3b







Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

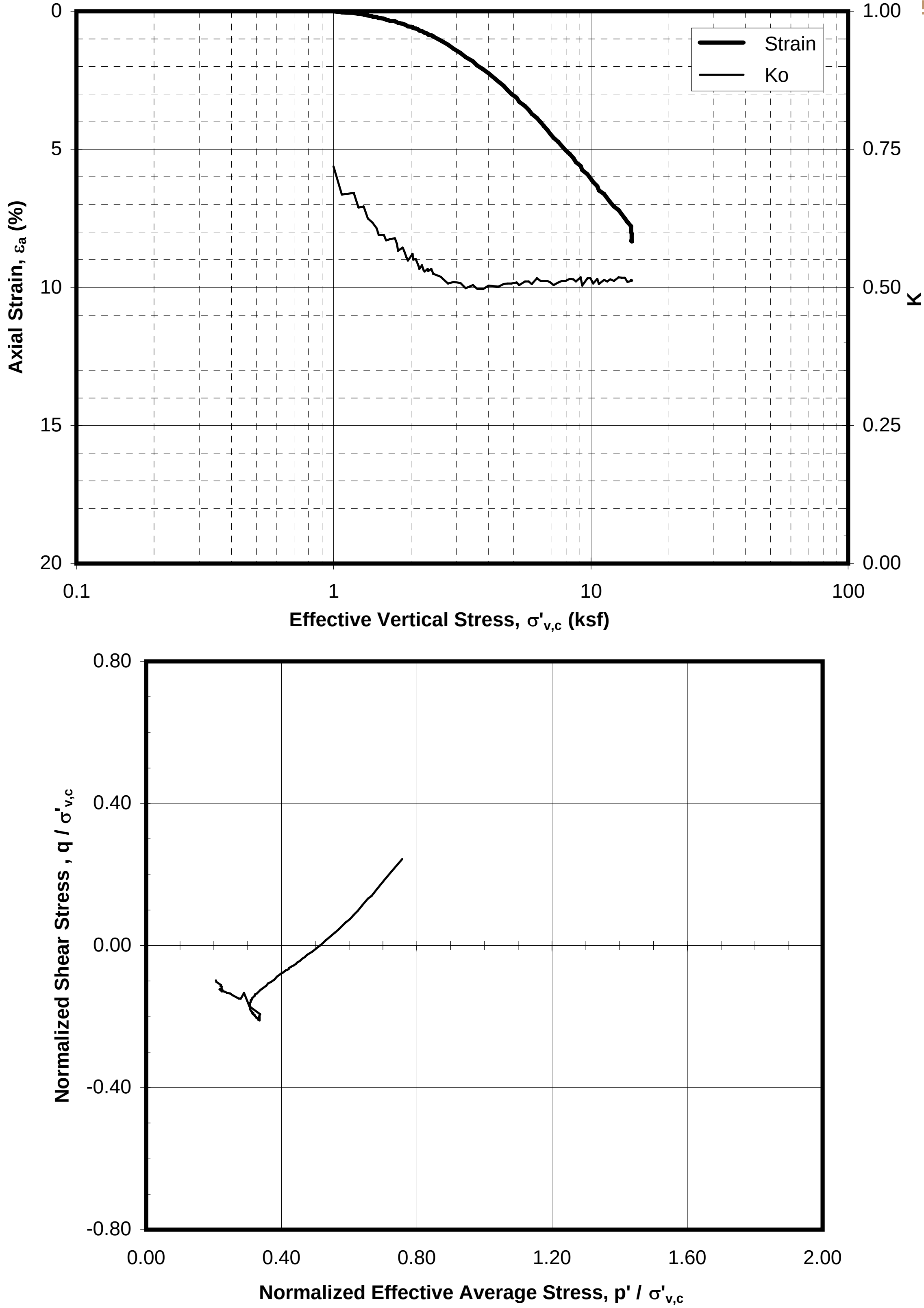
Sample: 7c - Depth: 24.85 ft

Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-4a



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

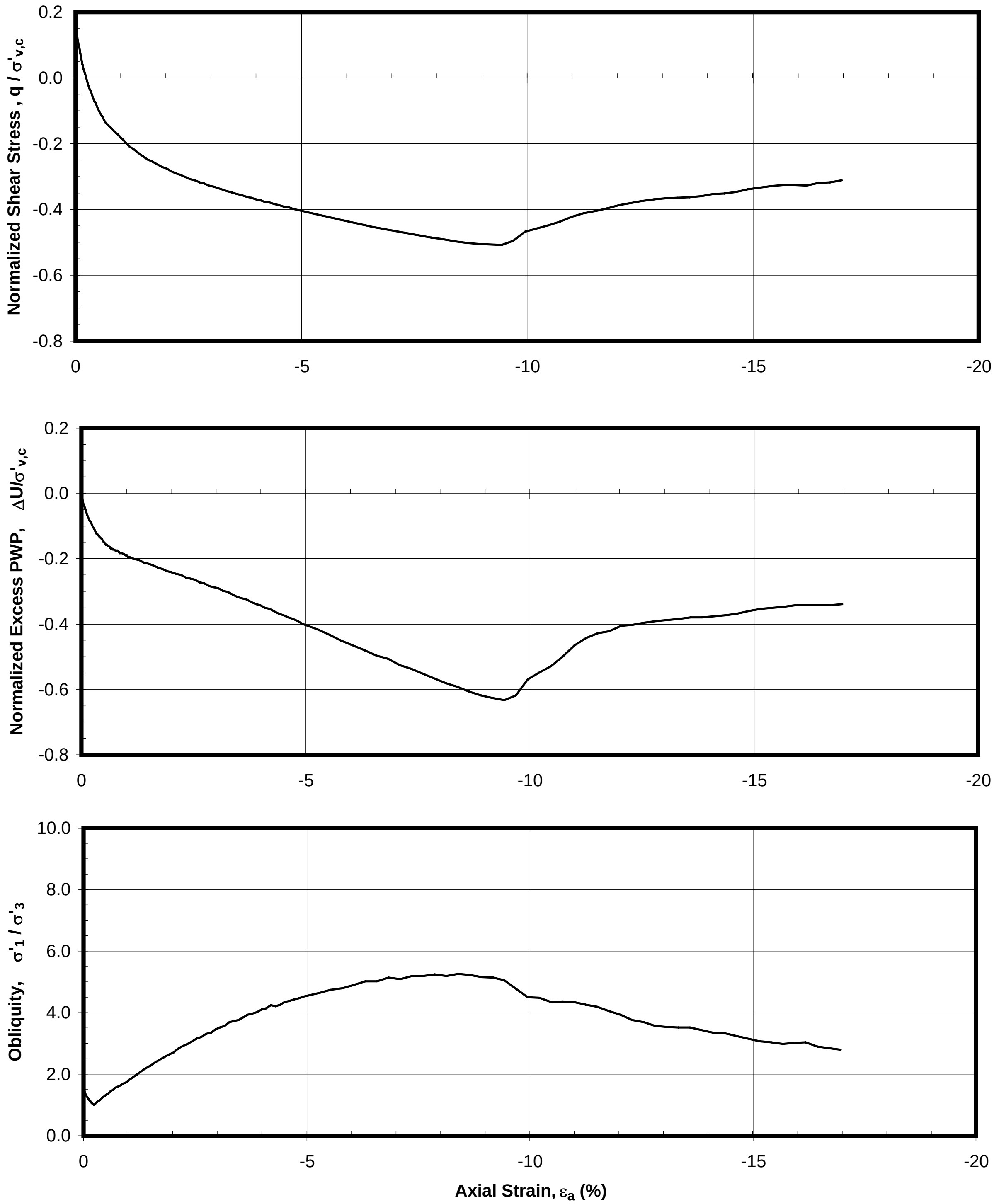
Sample: 7c - Depth: 24.85 ft

Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-4b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 3.13

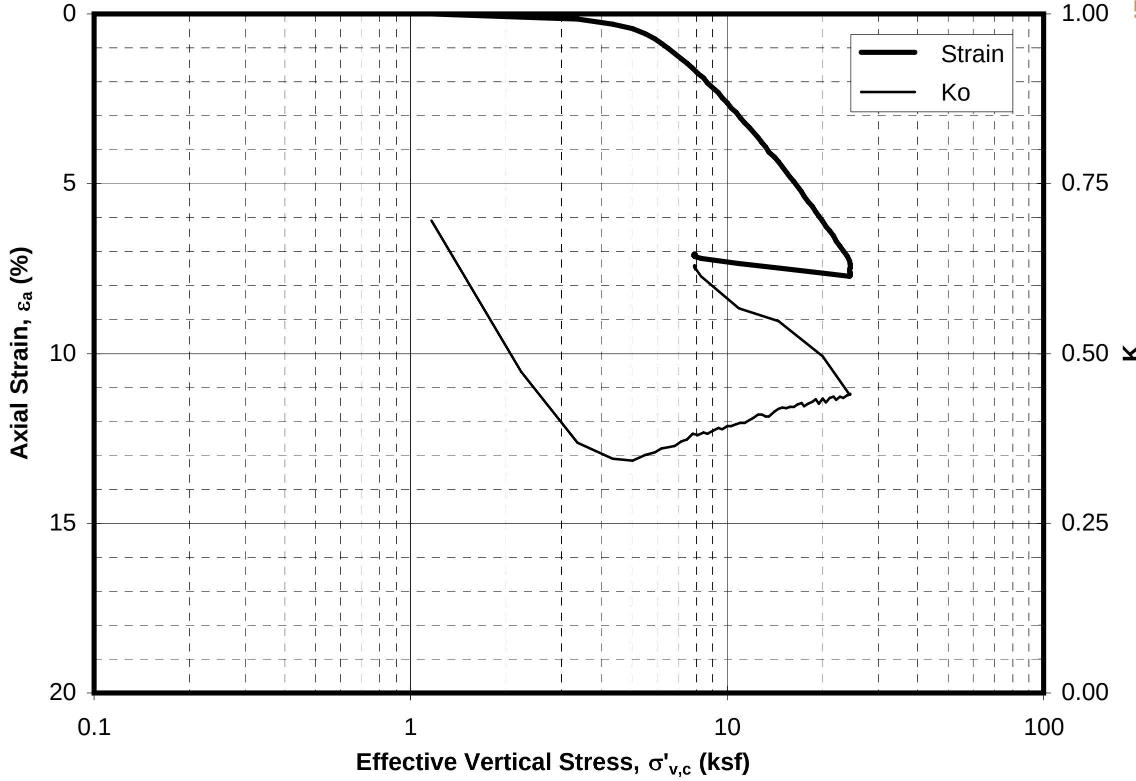
Sample: 4a - Depth: 32.50 ft

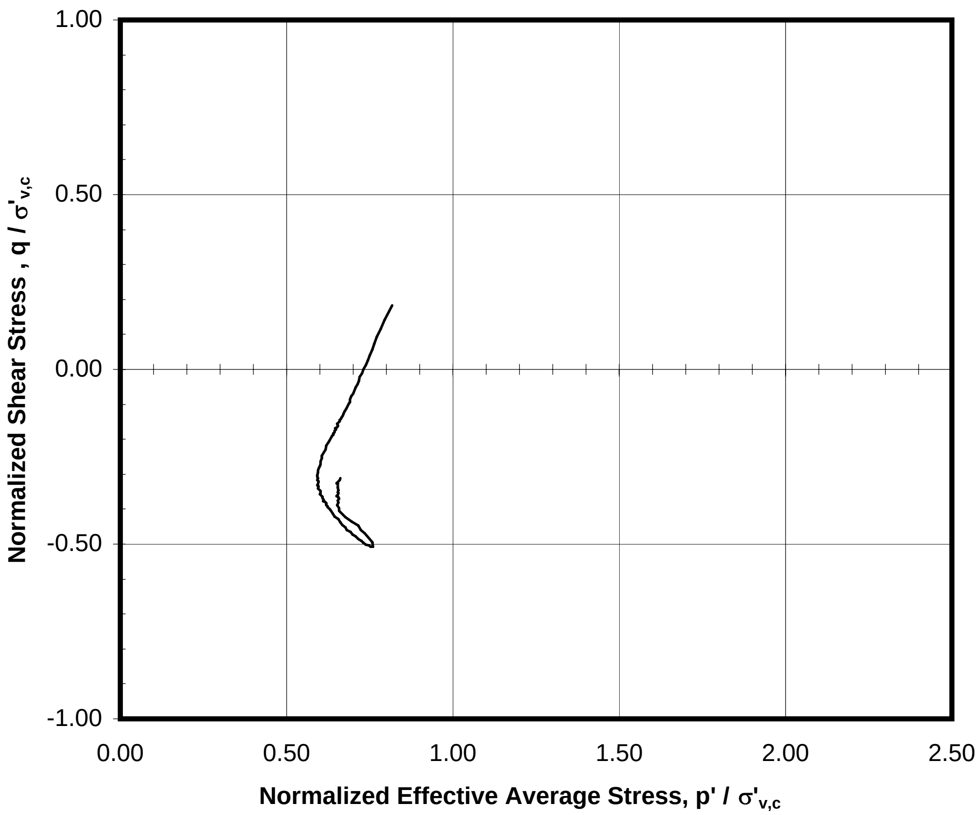
Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-5a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 3.13

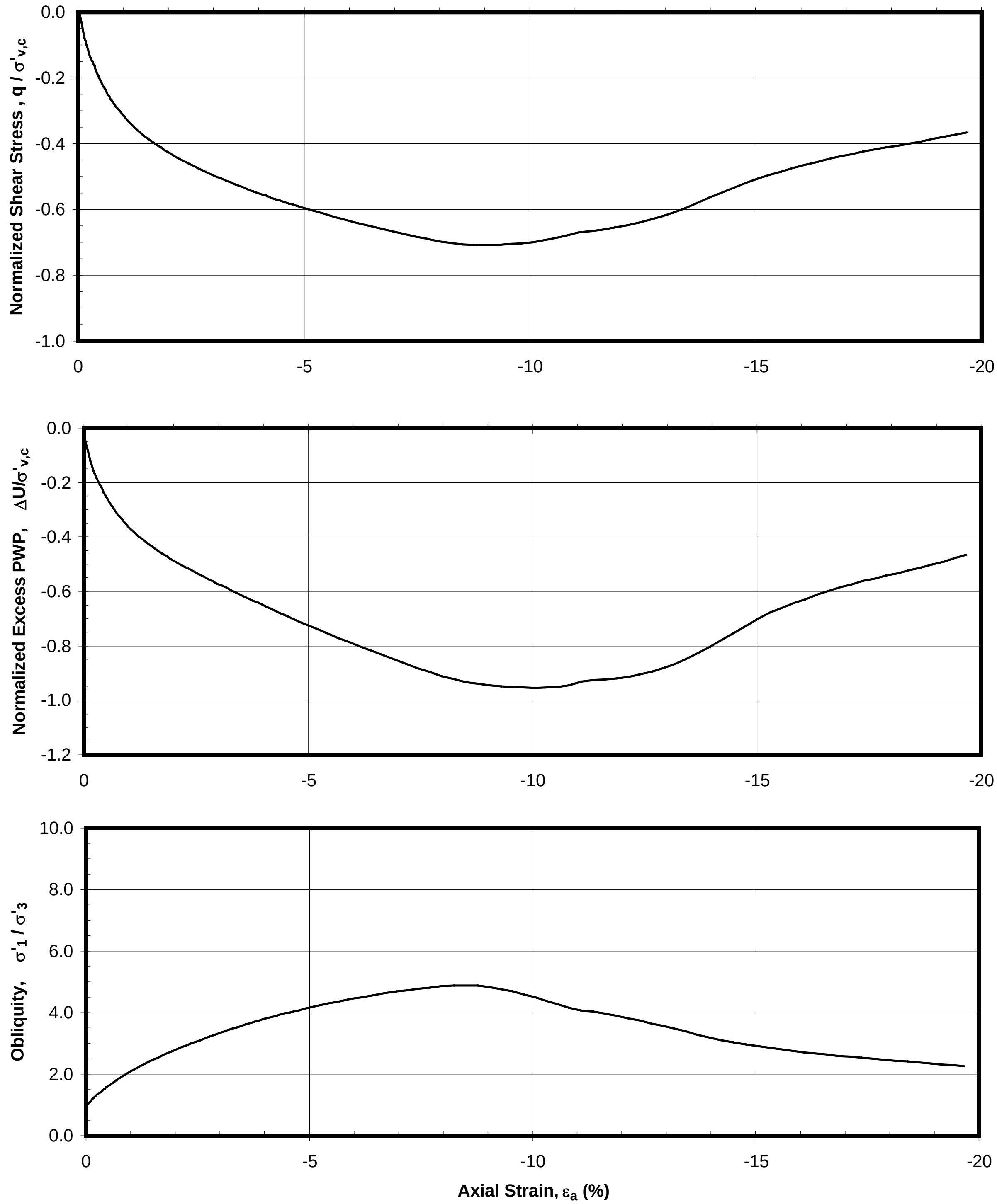
Sample: 4a - Depth: 32.50 ft

Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-5b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 4.37

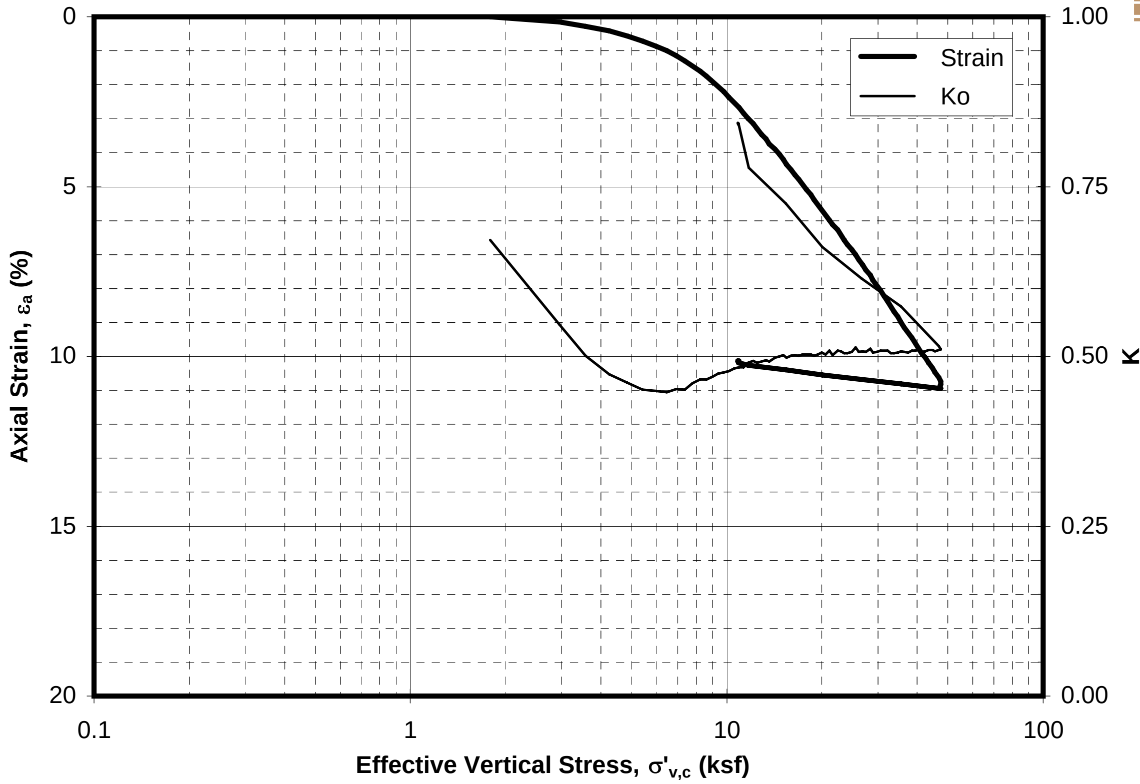
Sample: 6a - Depth: 54.40 ft

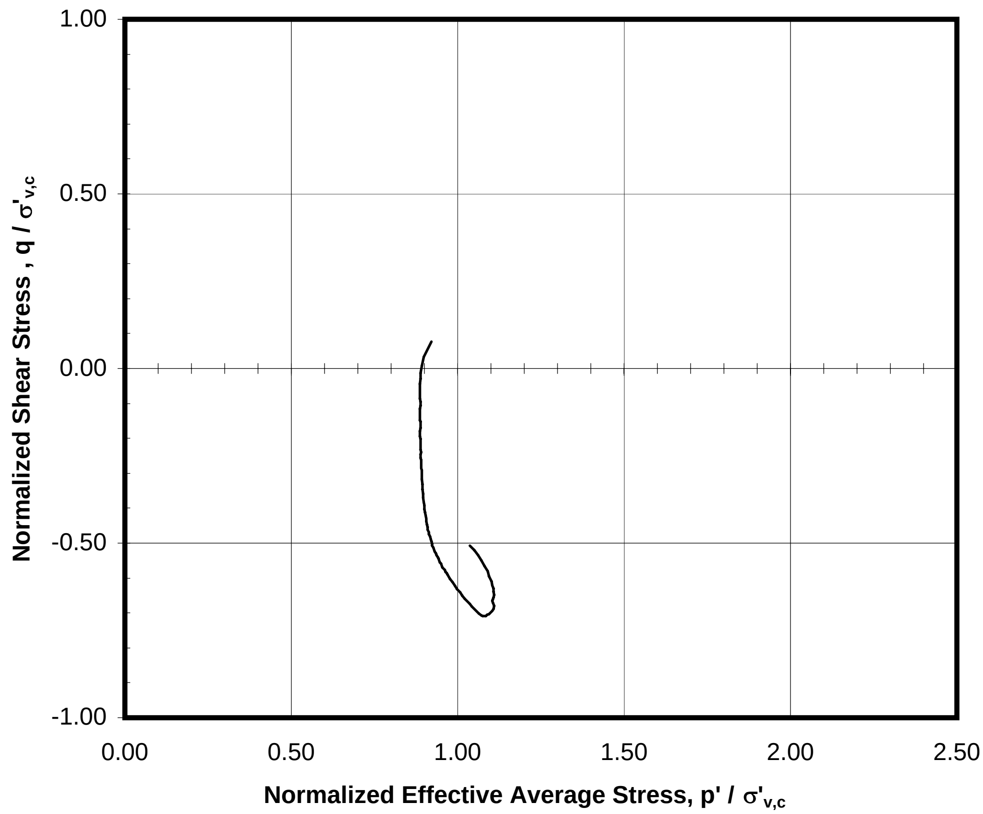
Boring B-33

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-6a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 4.37

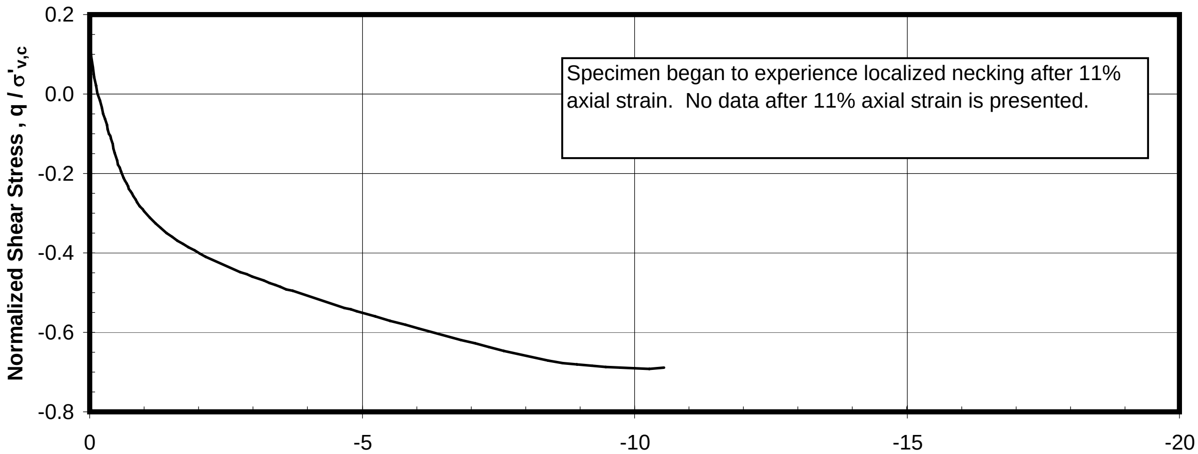
Sample: 6a - Depth: 54.40 ft

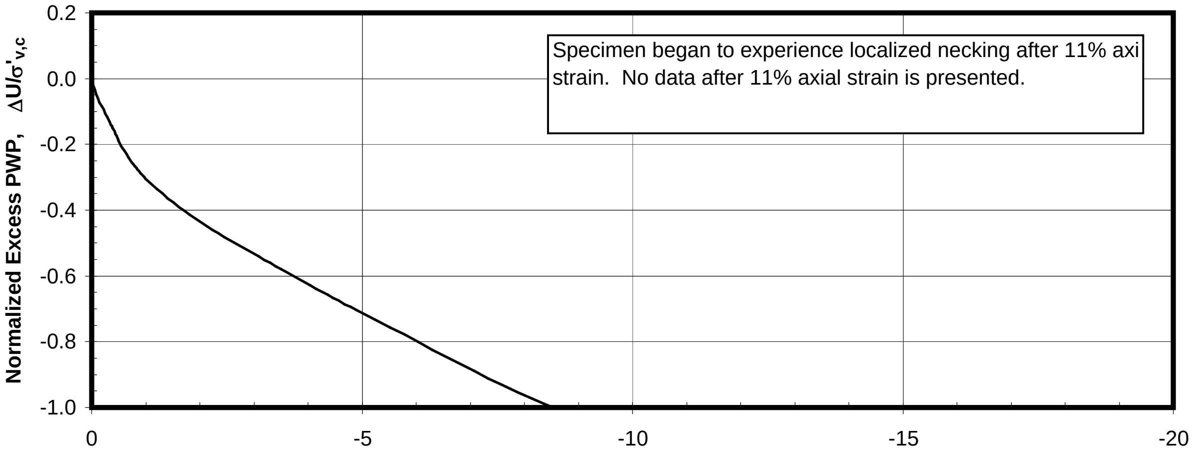
Boring B-33

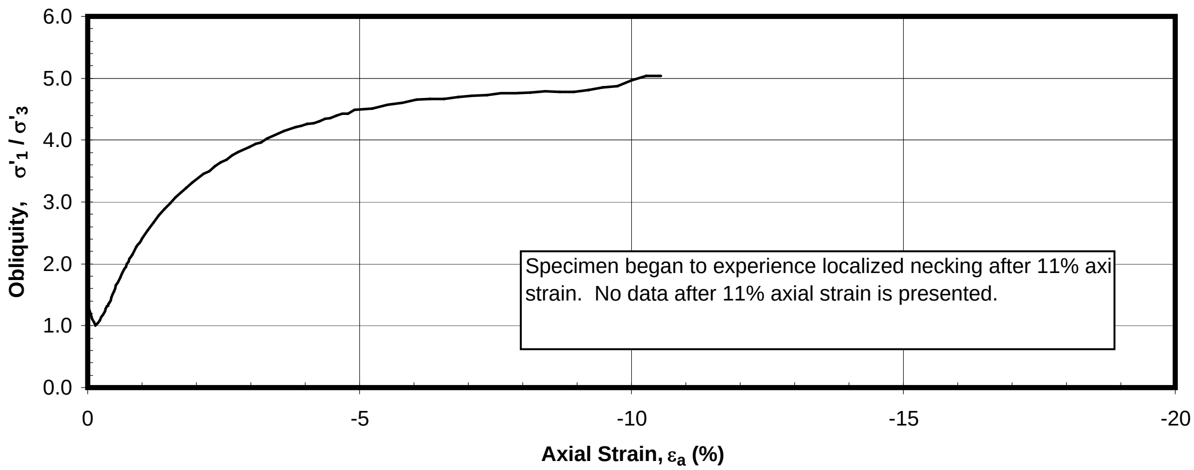
Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-6b







Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 5.14

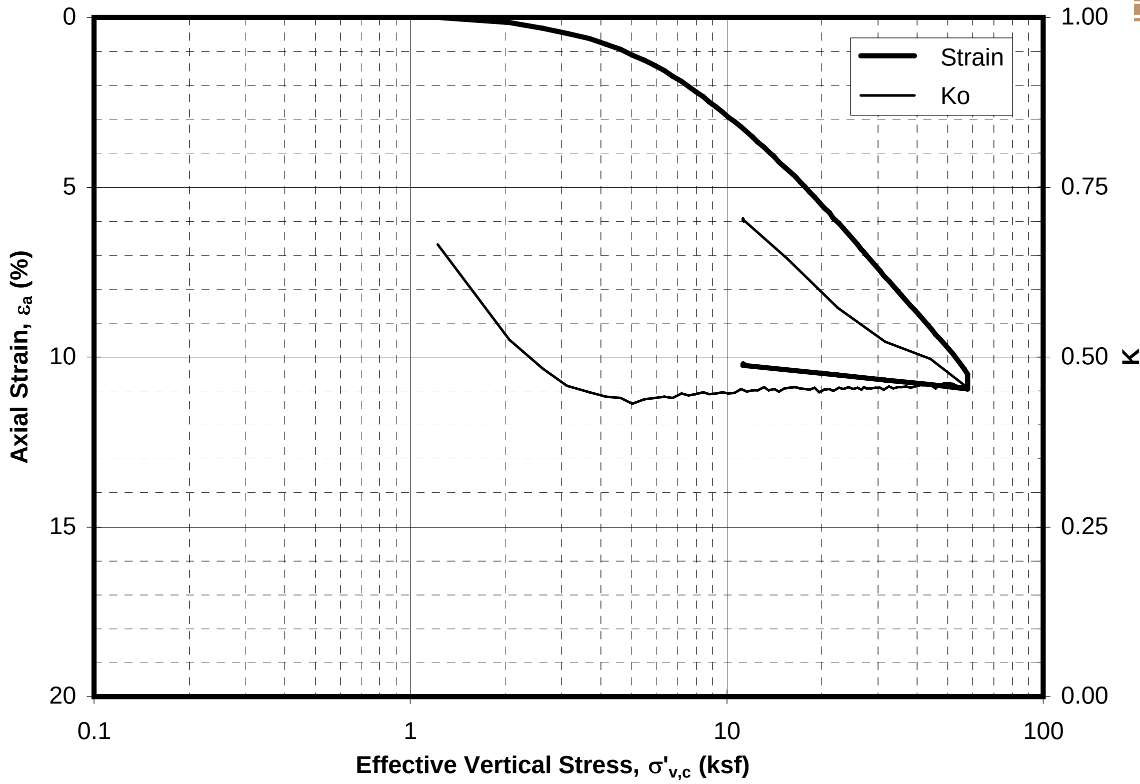
Sample: 7c - Depth: 34.45ft

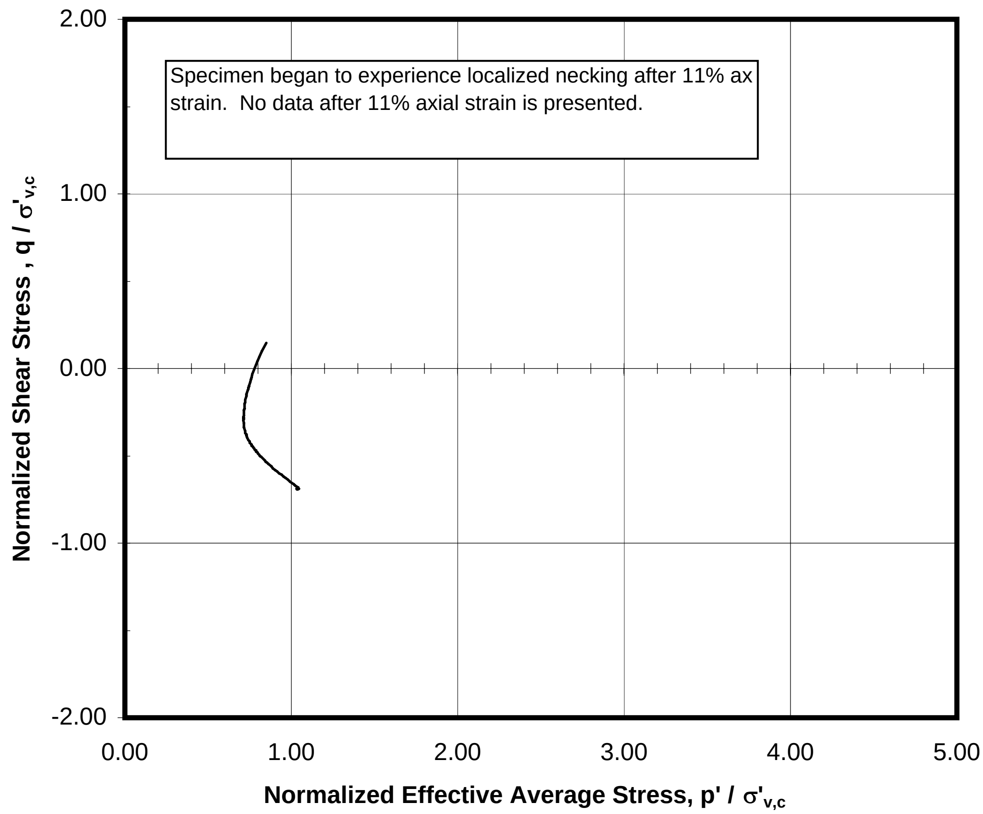
Boring B-42

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-7a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 5.14

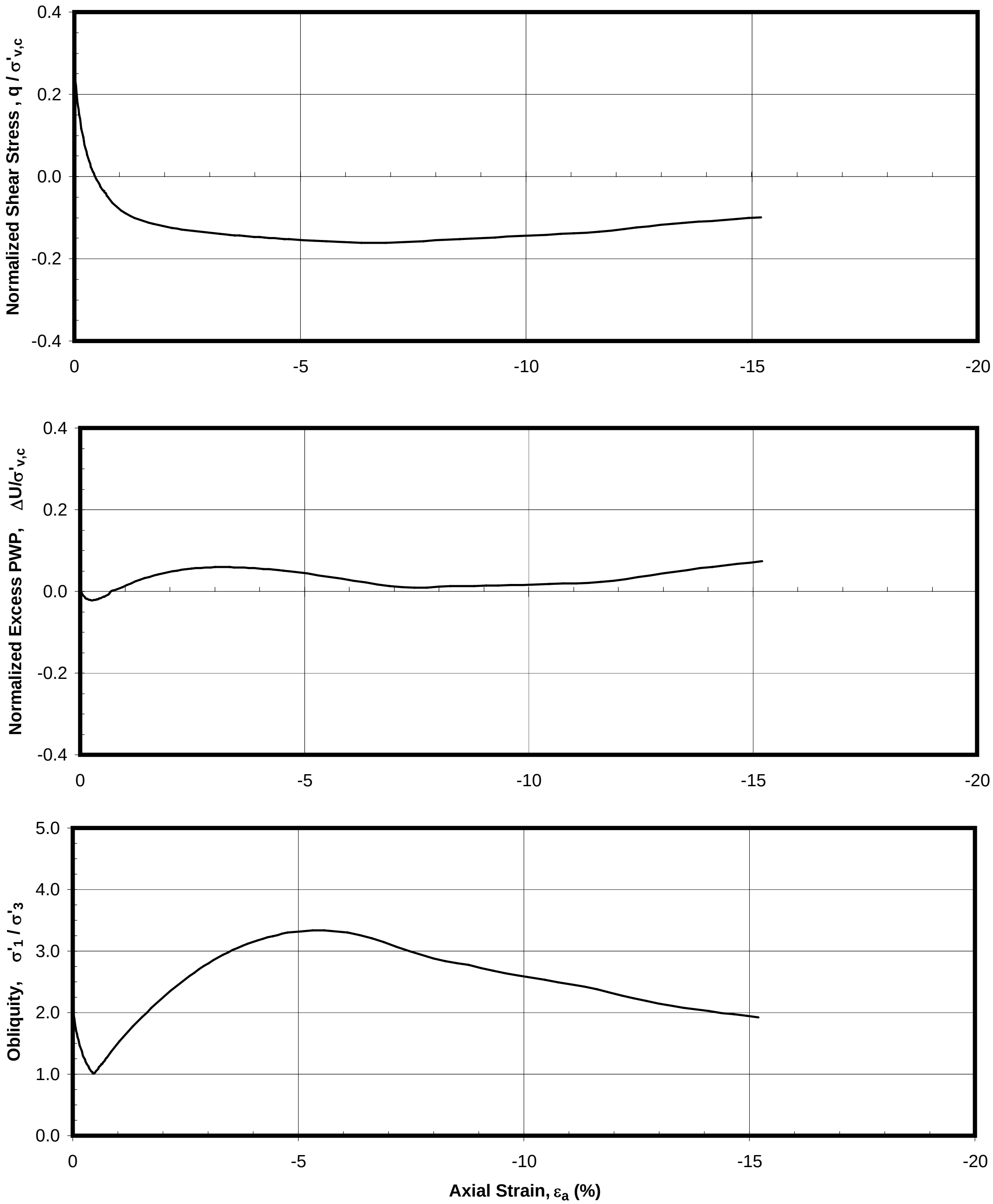
Sample: 7c - Depth: 34.45ft

Boring B-42

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-7b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

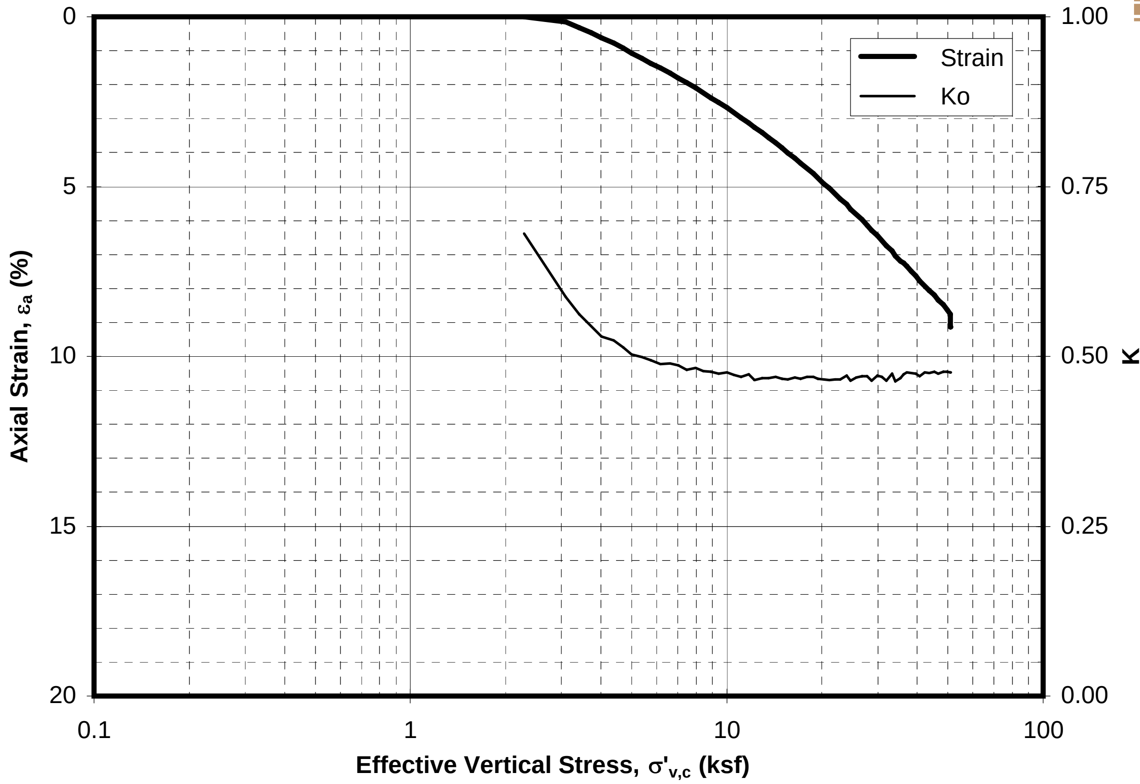
Sample: 11b - Depth: 73.95 ft

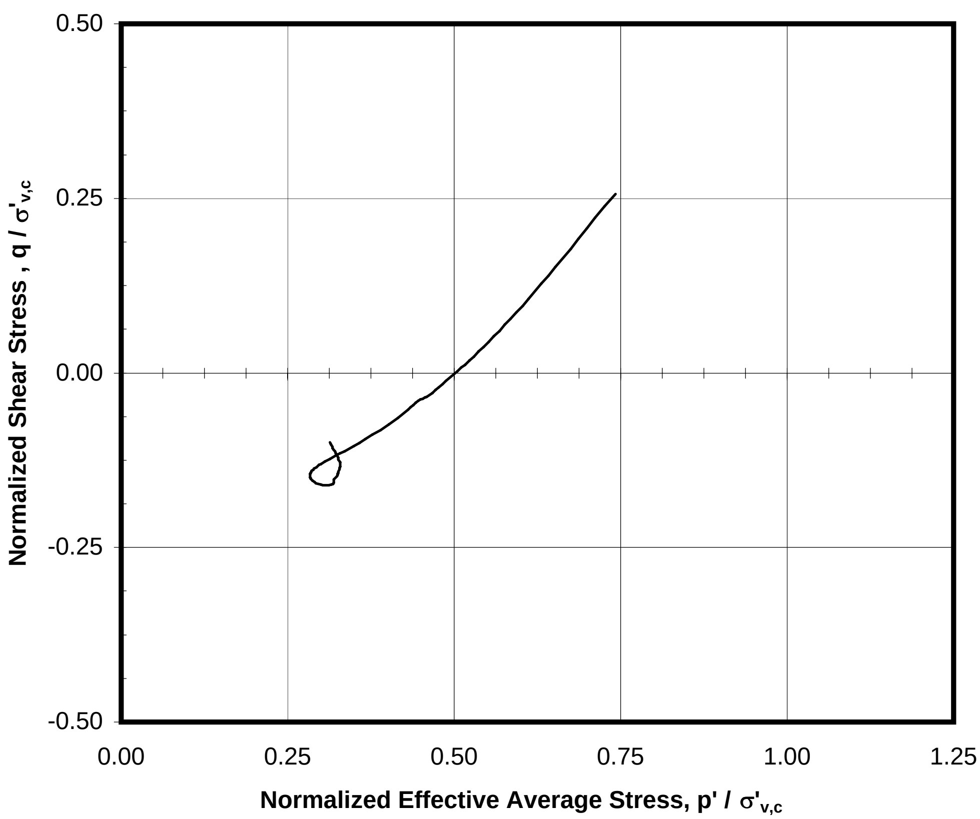
Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-8a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

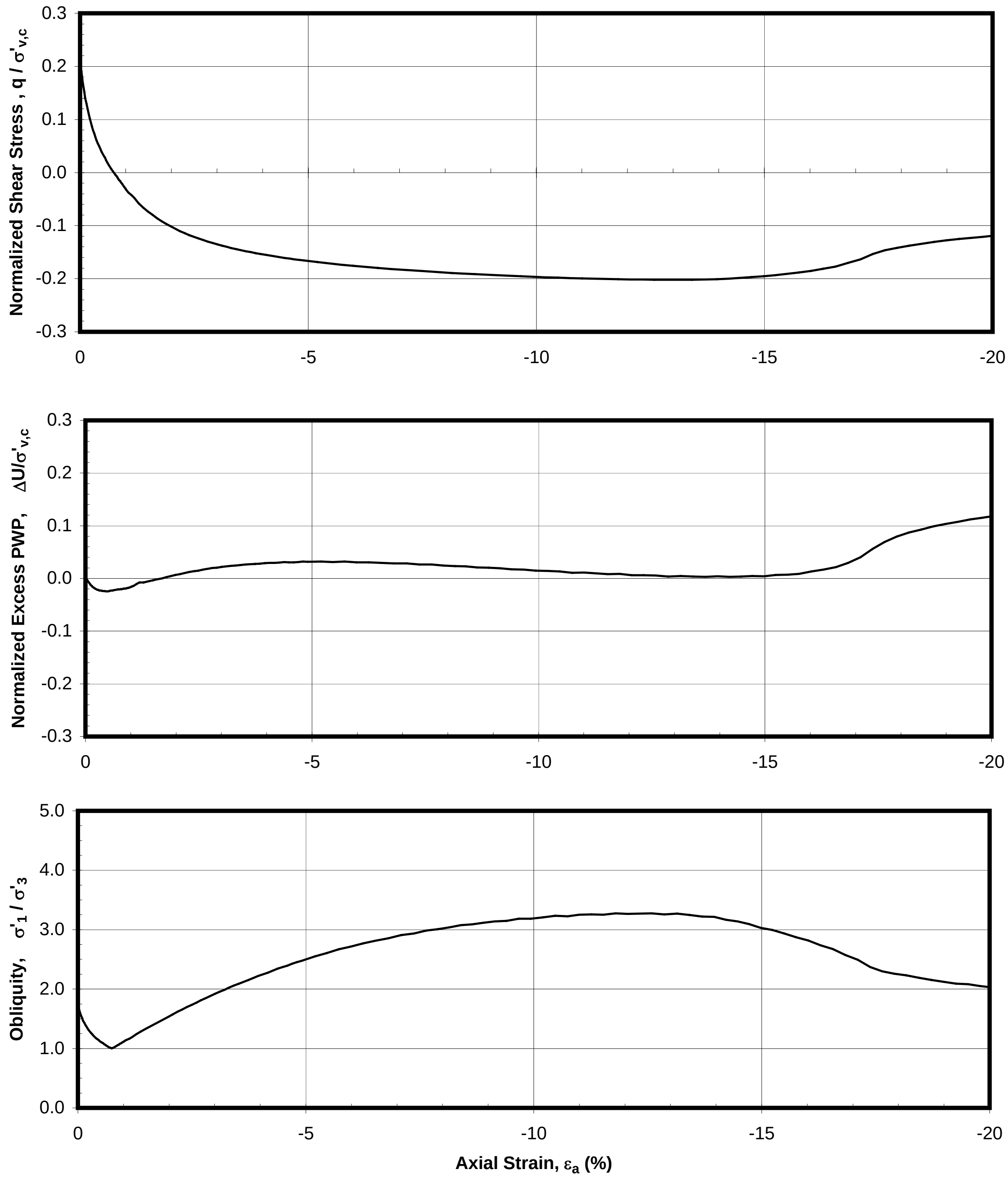
Sample: 11b - Depth: 73.95 ft

Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-8b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

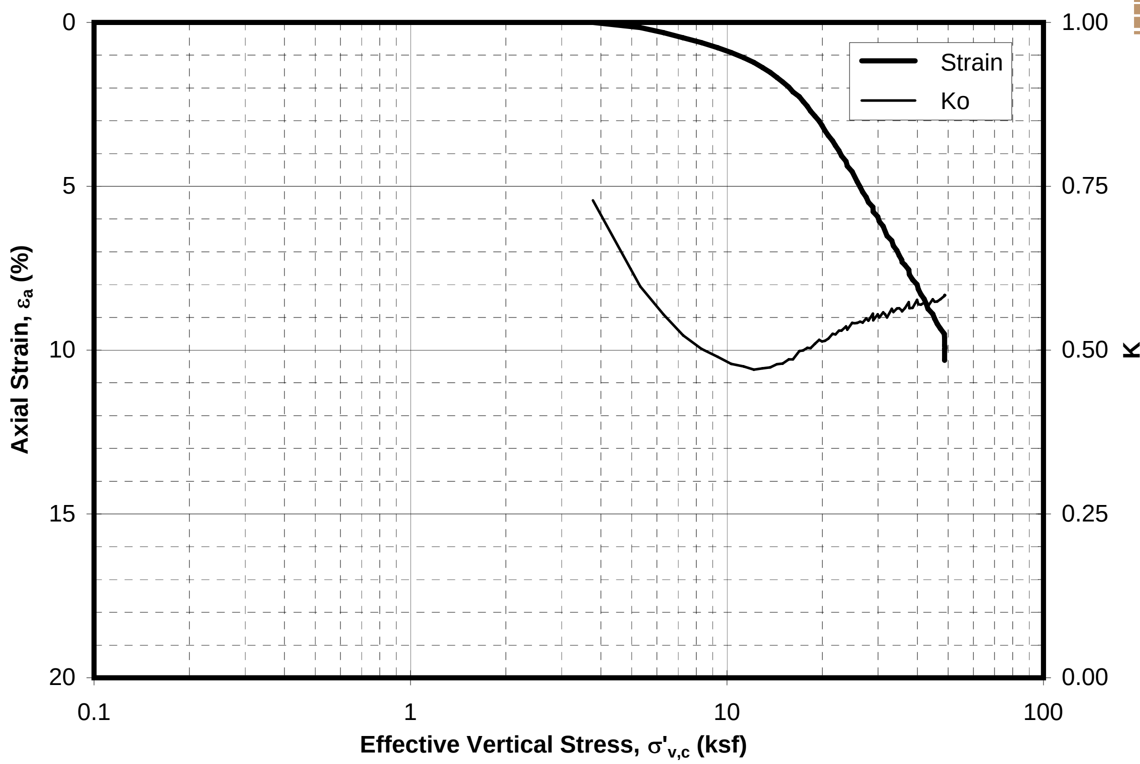
Sample: 18b - Depth: 131.85 ft

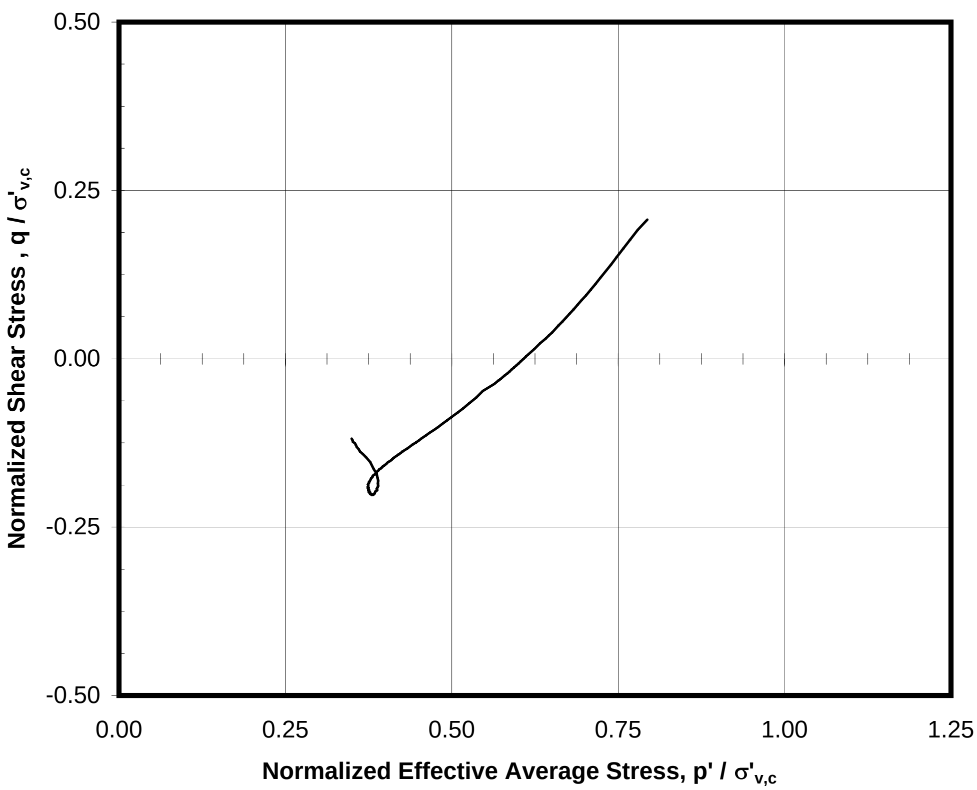
Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

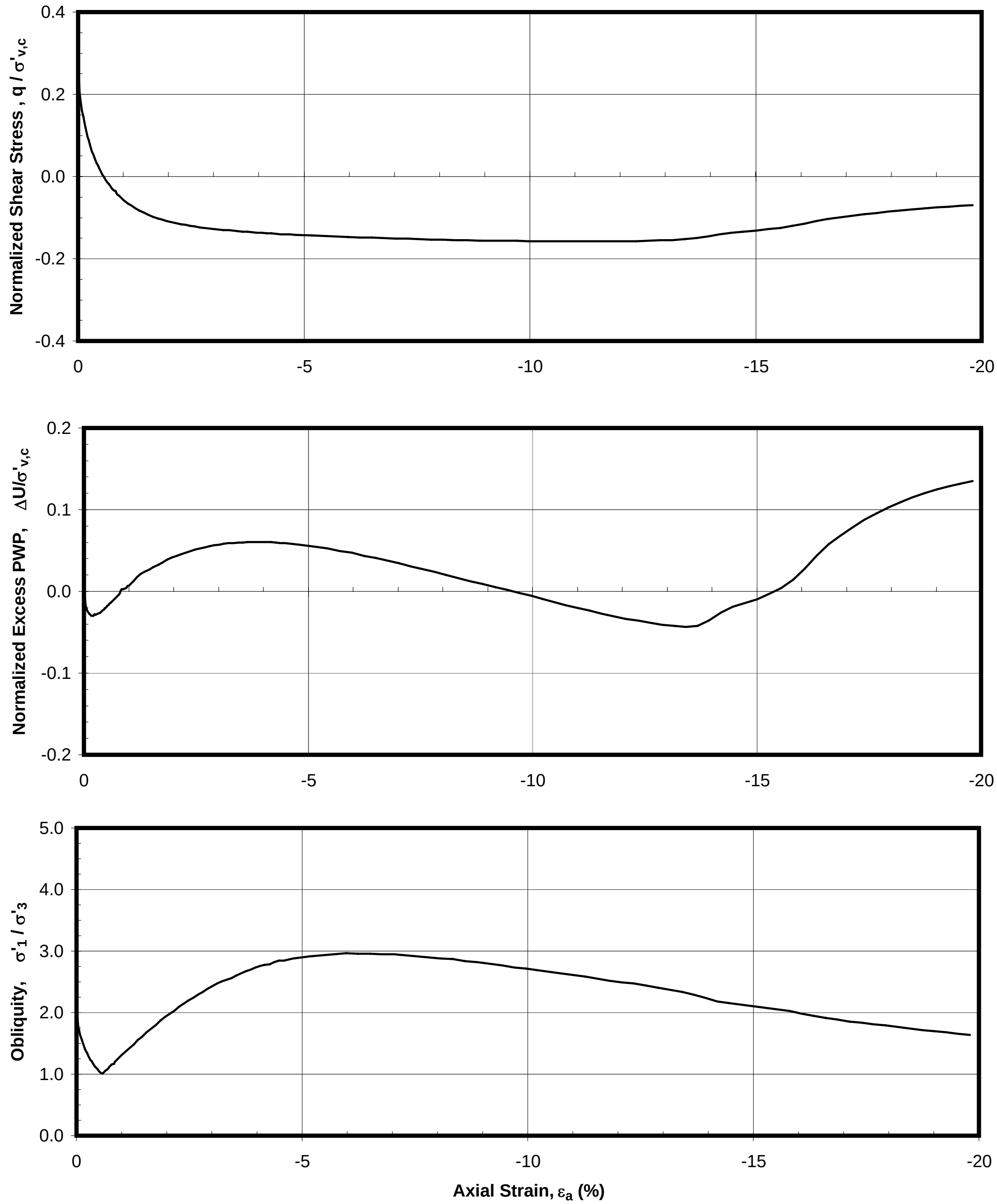
FIGURE A16-9a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS
Test Induced OCR = 1
Sample: 18b - Depth: 131.85 ft
Boring B-60
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A16-9b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

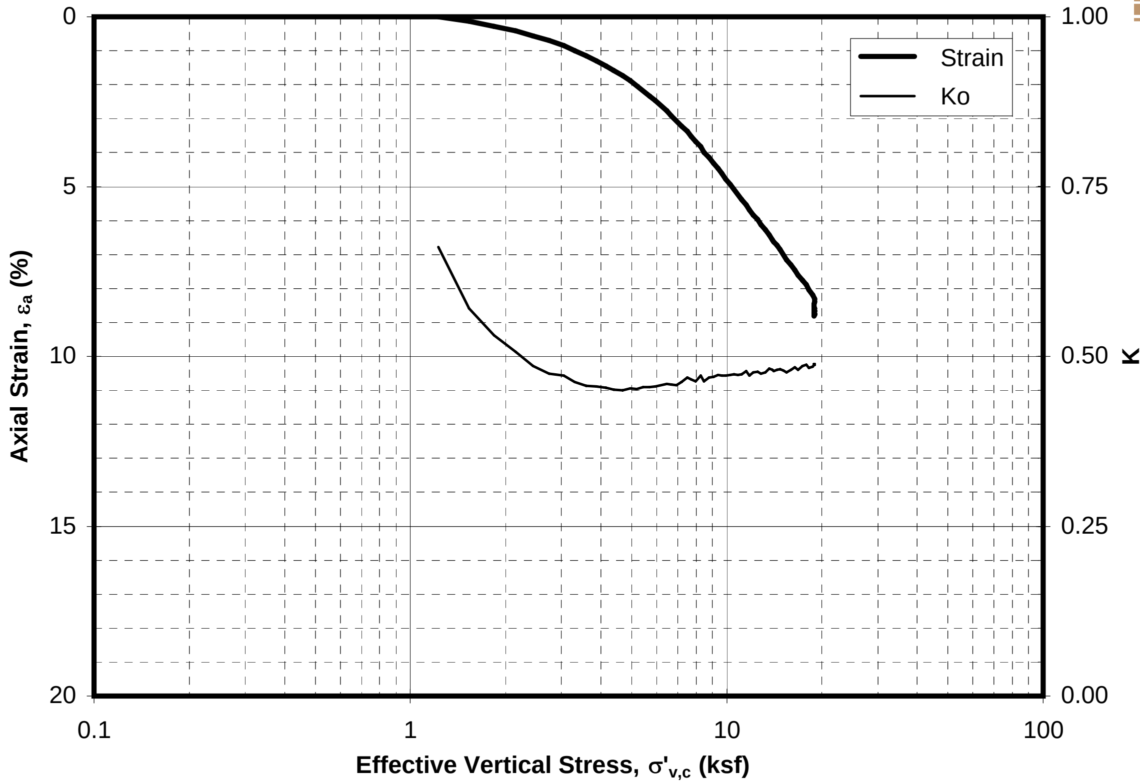
Sample: 5c - Depth: 31.90 ft

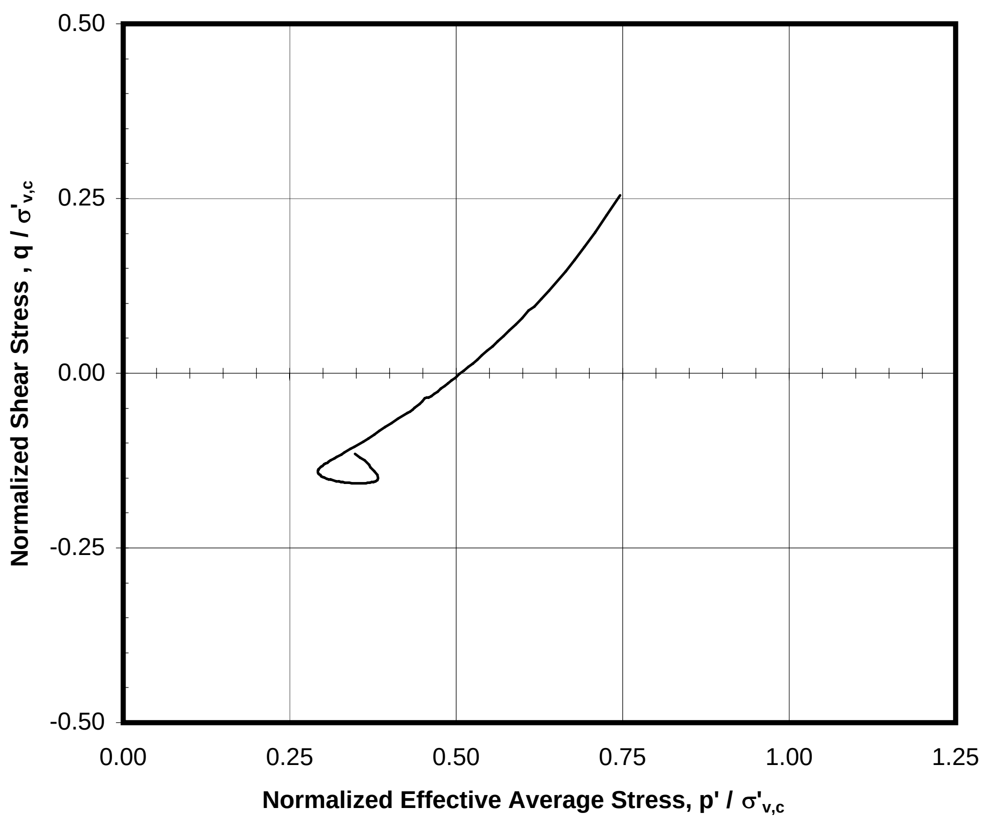
Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-10a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

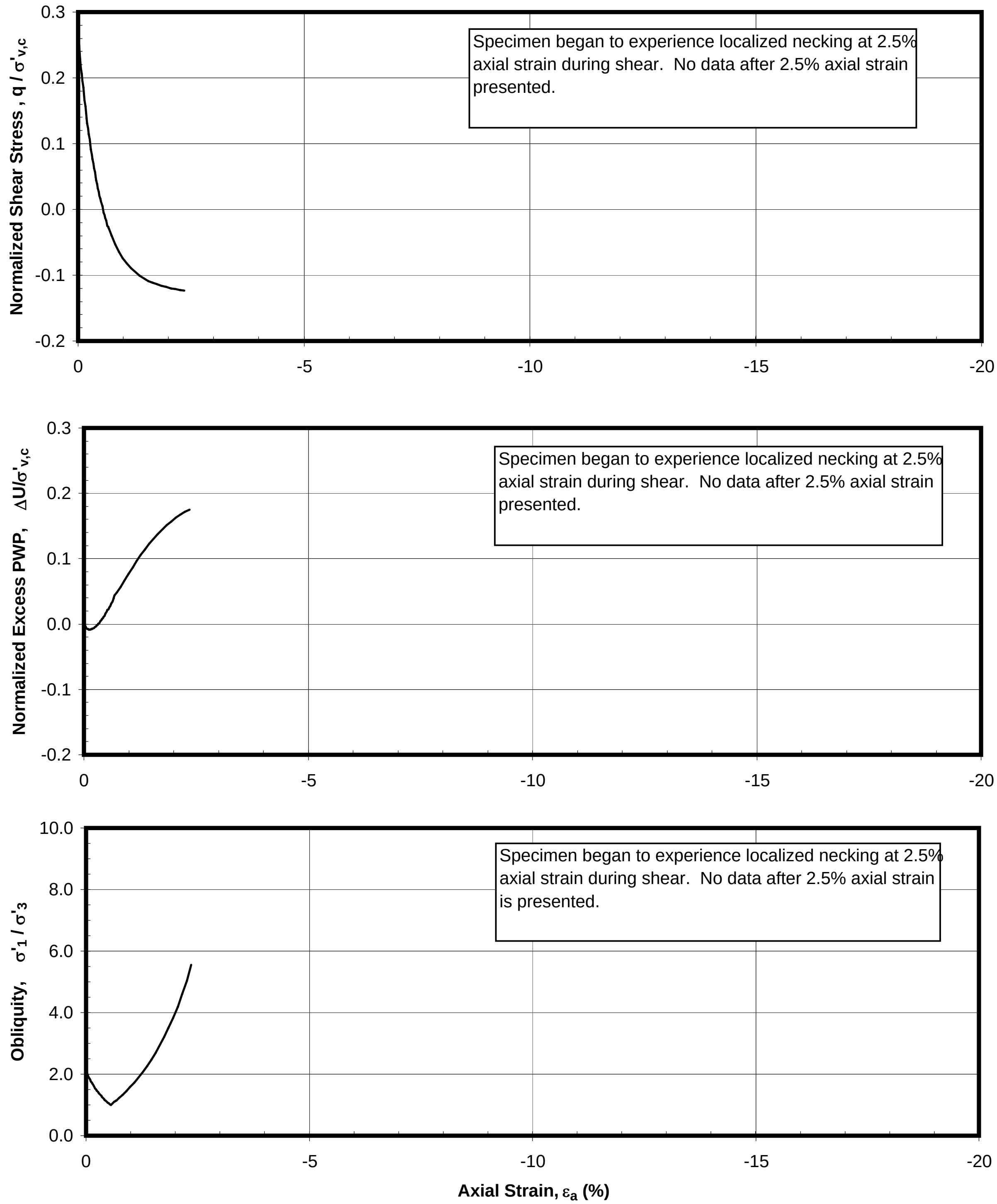
Sample: 5c - Depth: 31.90 ft

Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-10b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

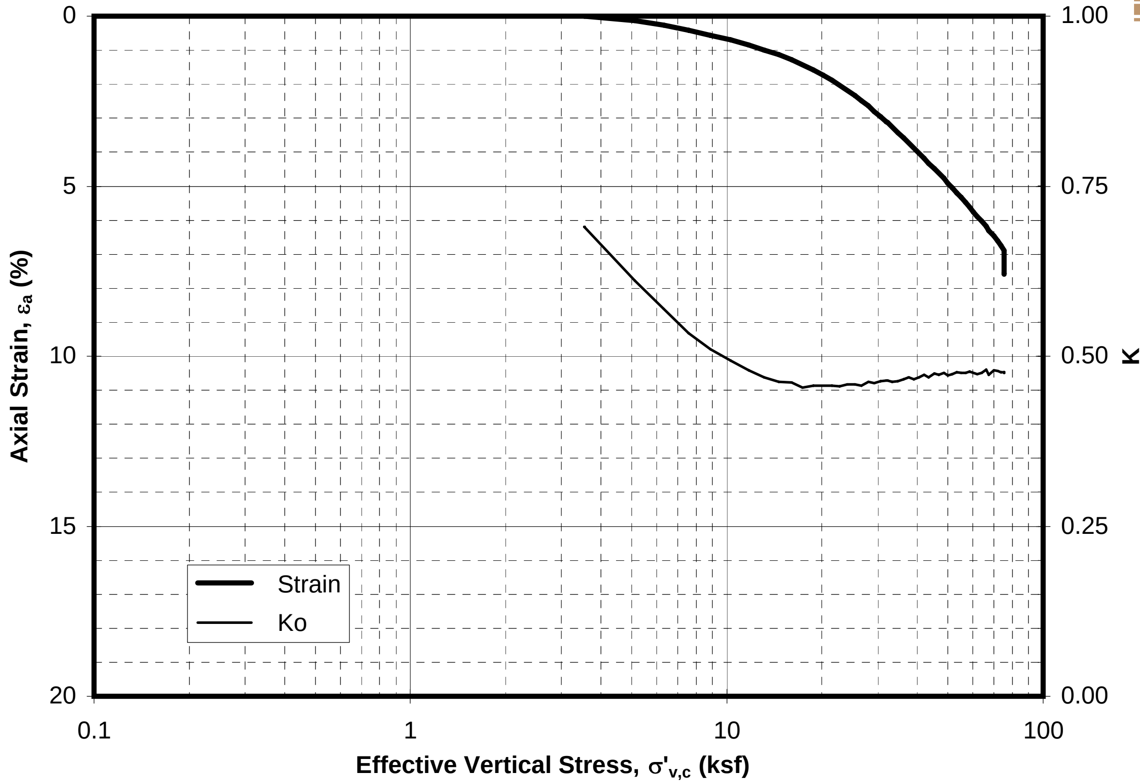
Sample: 19c - Depth: 117.25 ft

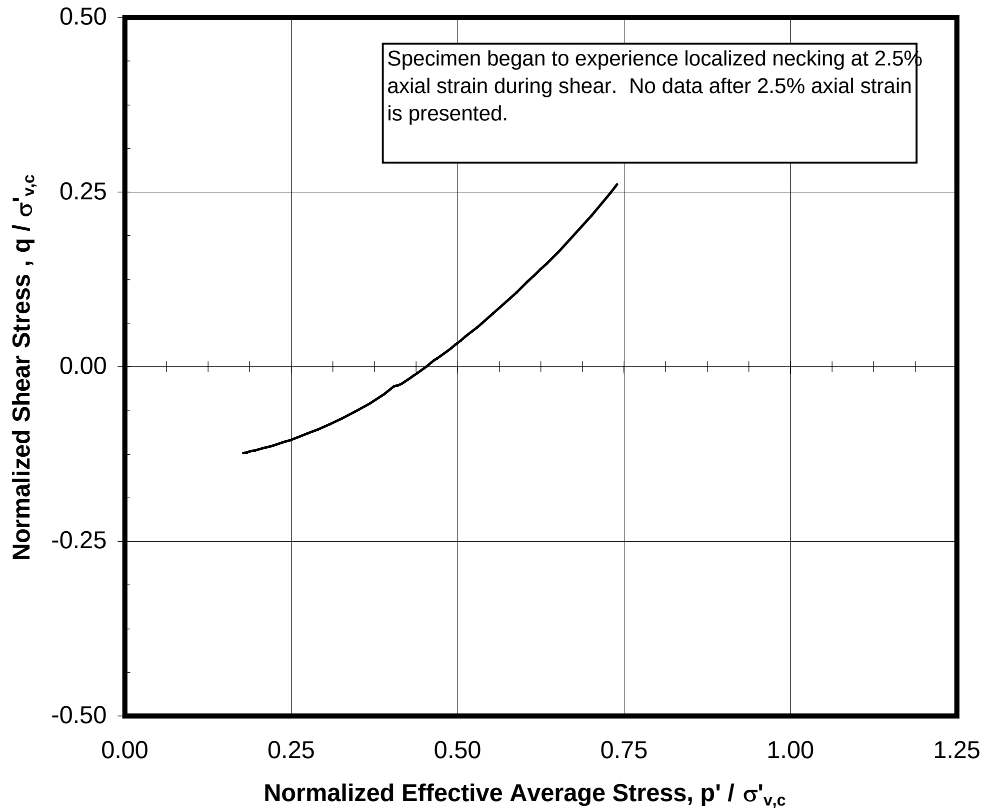
Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-11a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

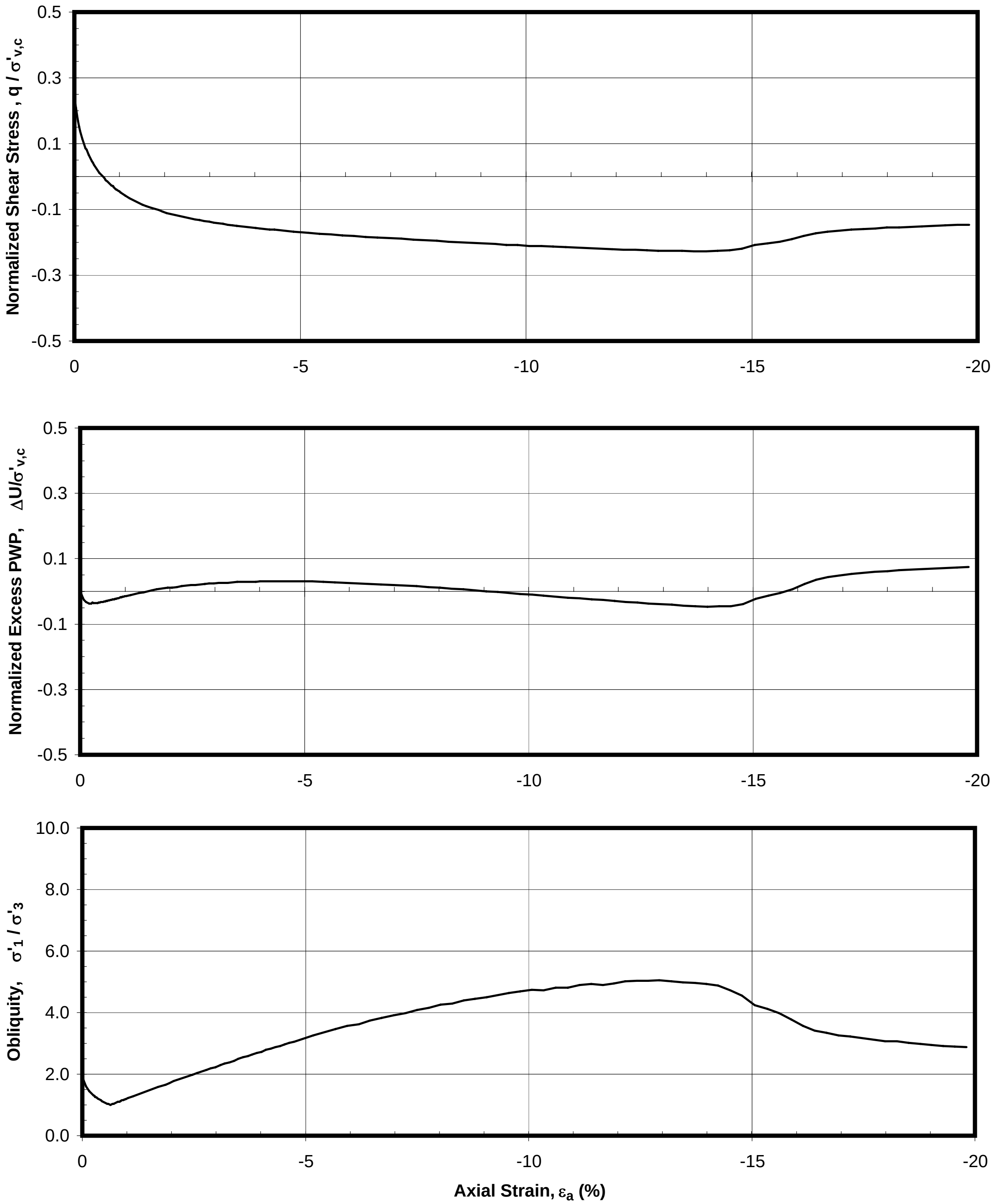
Sample: 19c - Depth 117.25 ft

Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-11b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

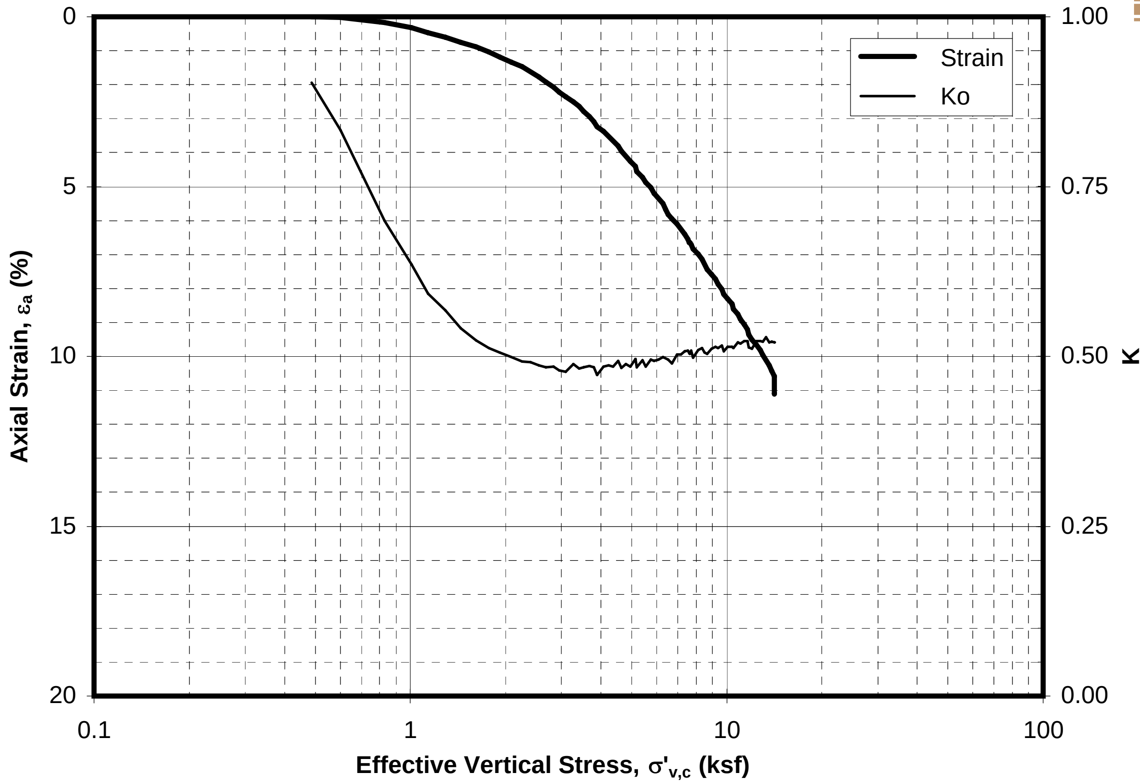
Sample: 3b - Depth: 12.65 ft

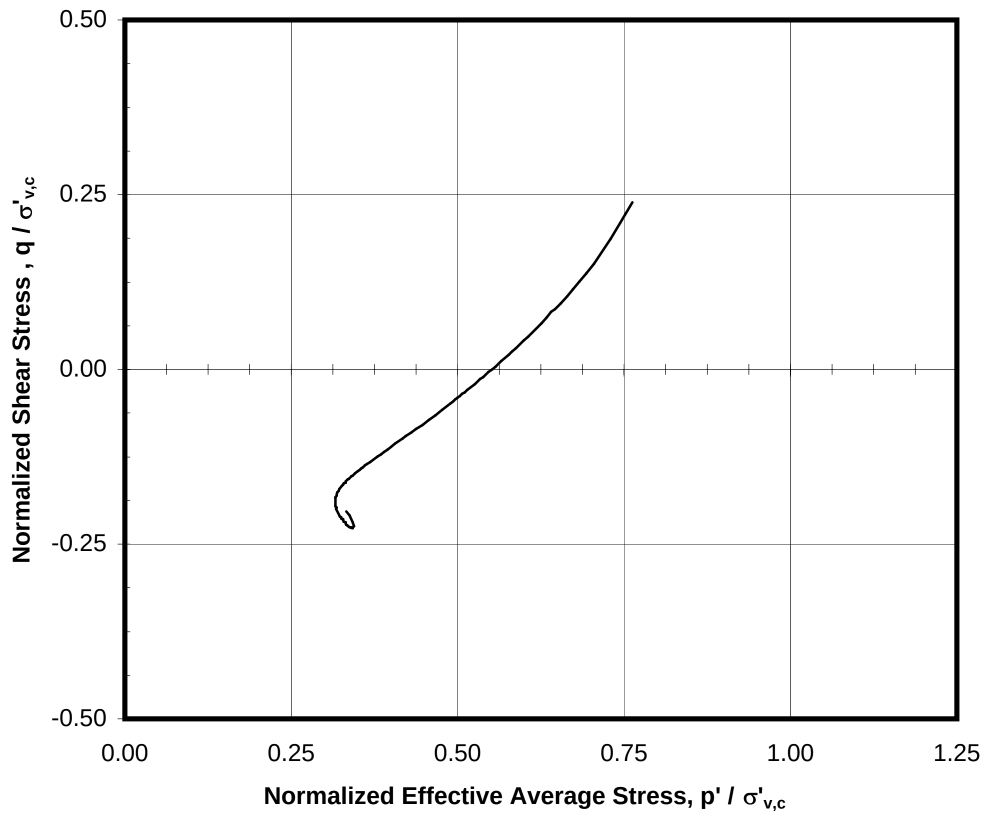
Boring B-68

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-12a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

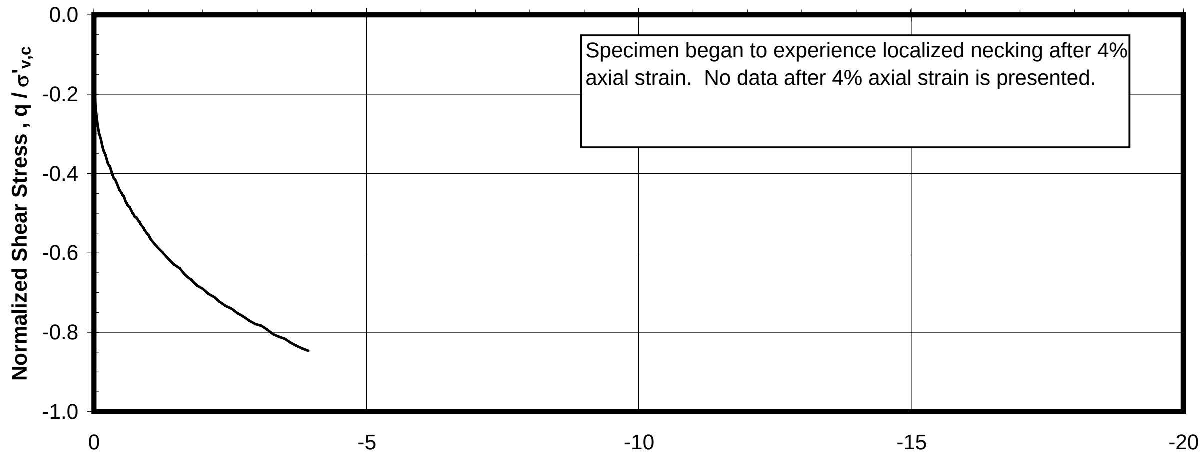
Sample: 3b - Depth: 12.65 ft

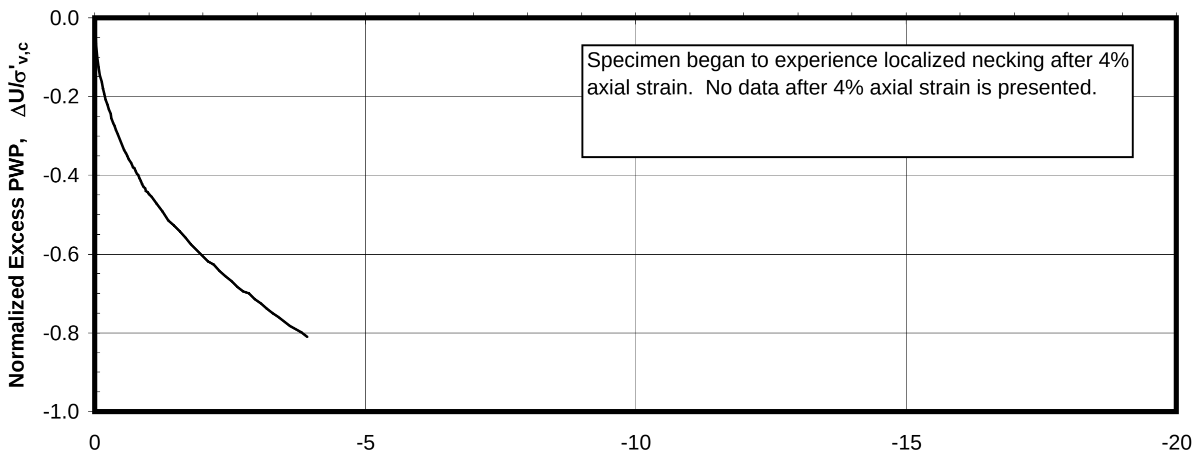
Boring B-68

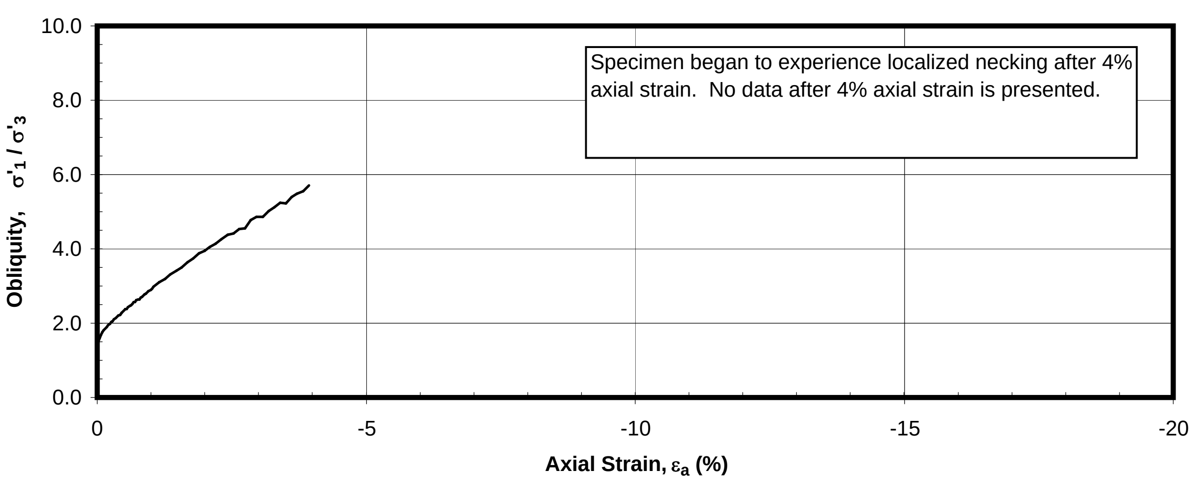
Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-12b







Ko-CONSOLDIATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 6.95

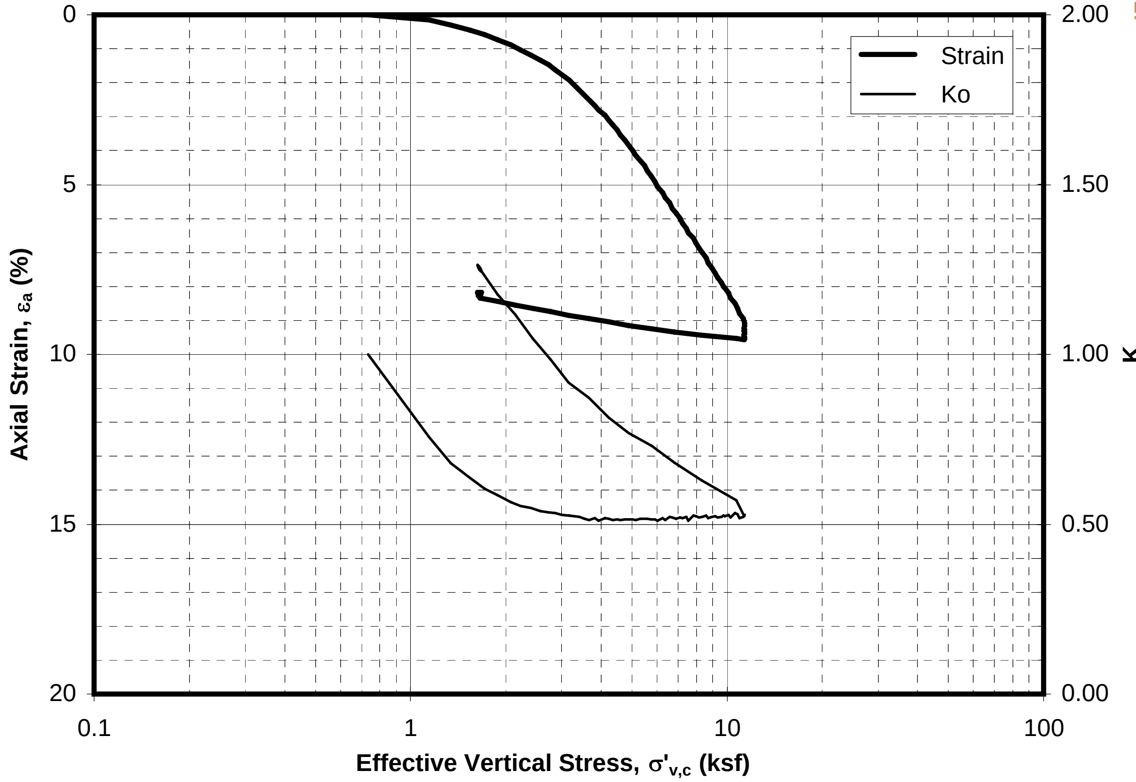
Sample: 4a - Depth: 20.70 ft

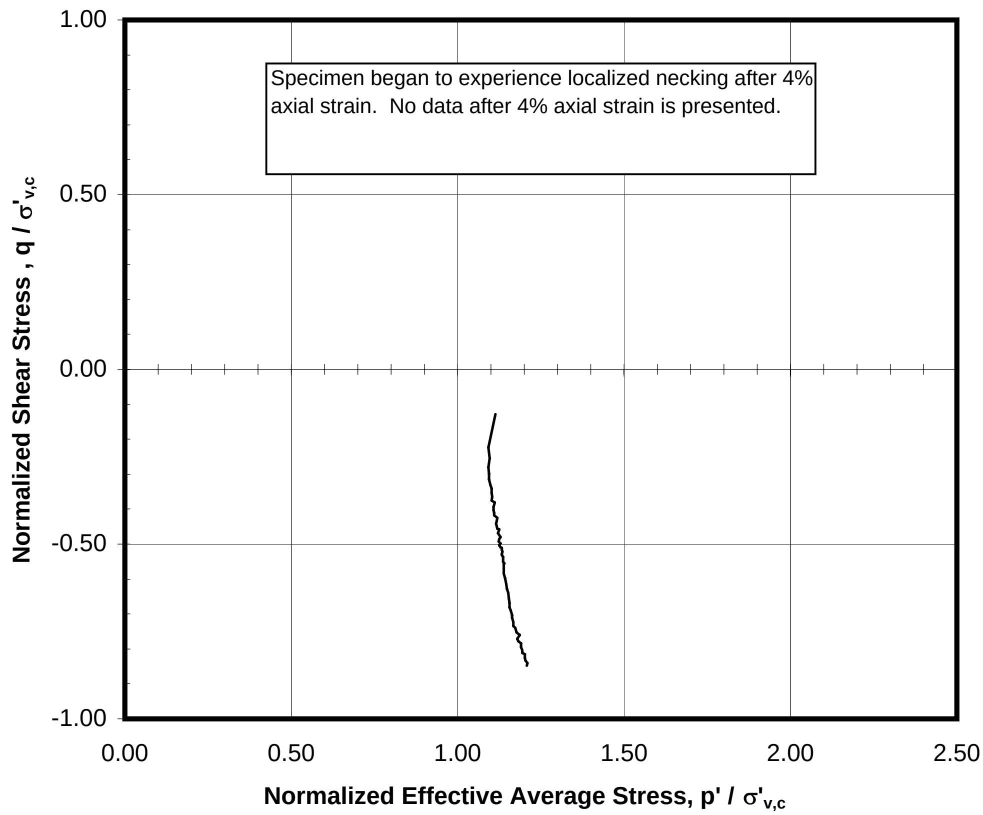
Boring B-68

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-13a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

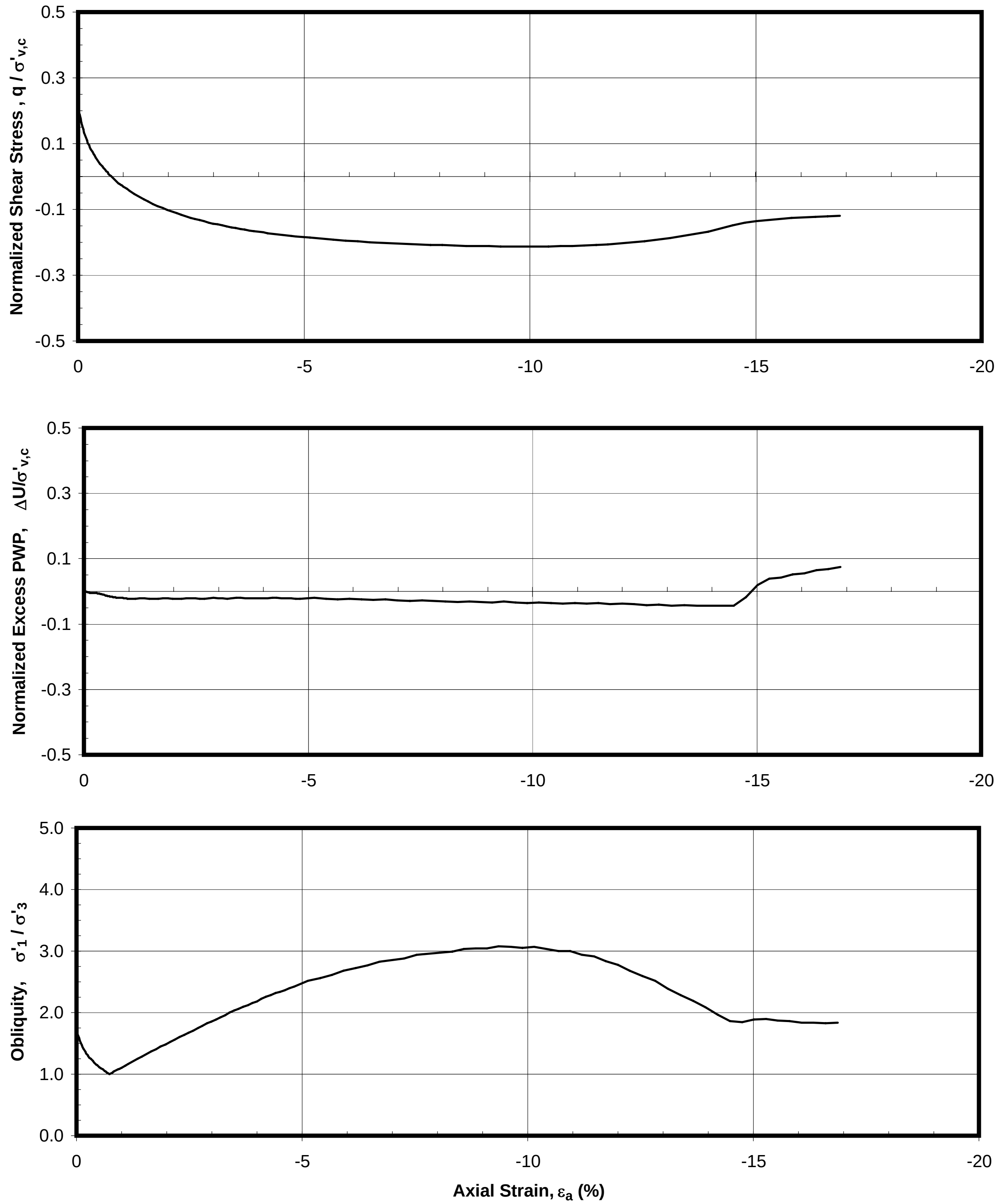
Test Induced OCR = 6.95

Sample: 4a - Depth: 20.70 ft

Boring B-68

Tunnel Segment of SVRT Project

San Jose, California



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

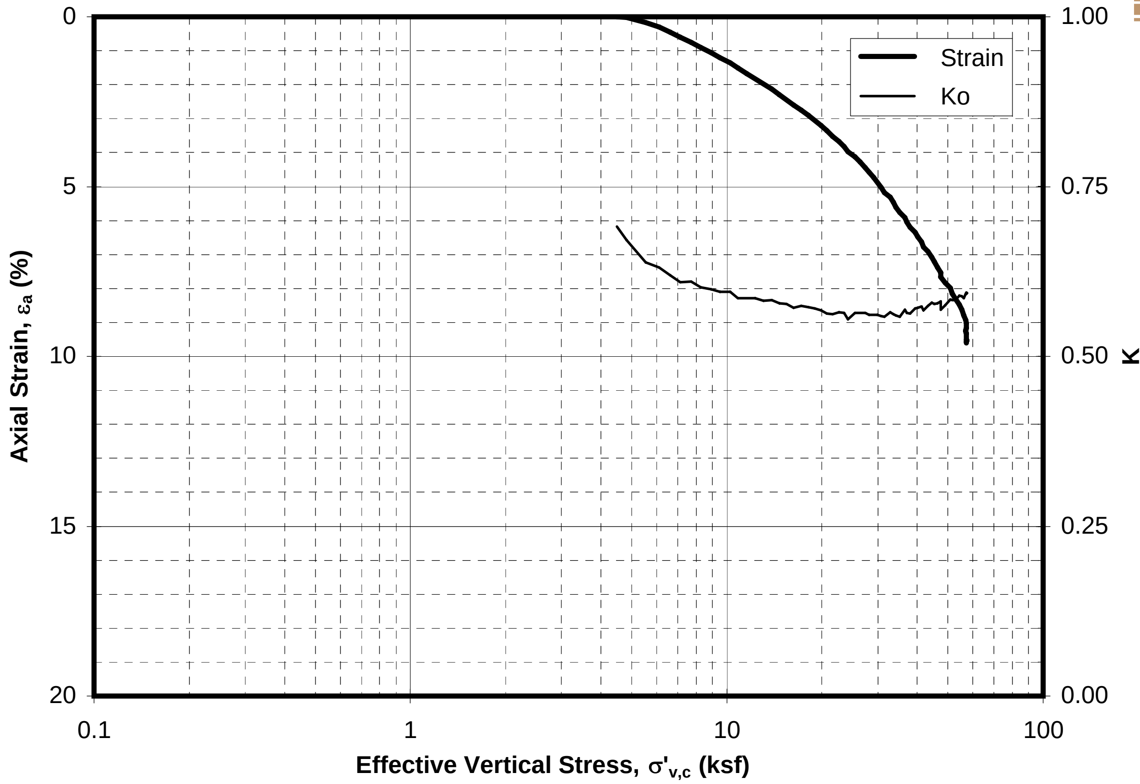
Sample: 18c - Depth: 149.80 ft

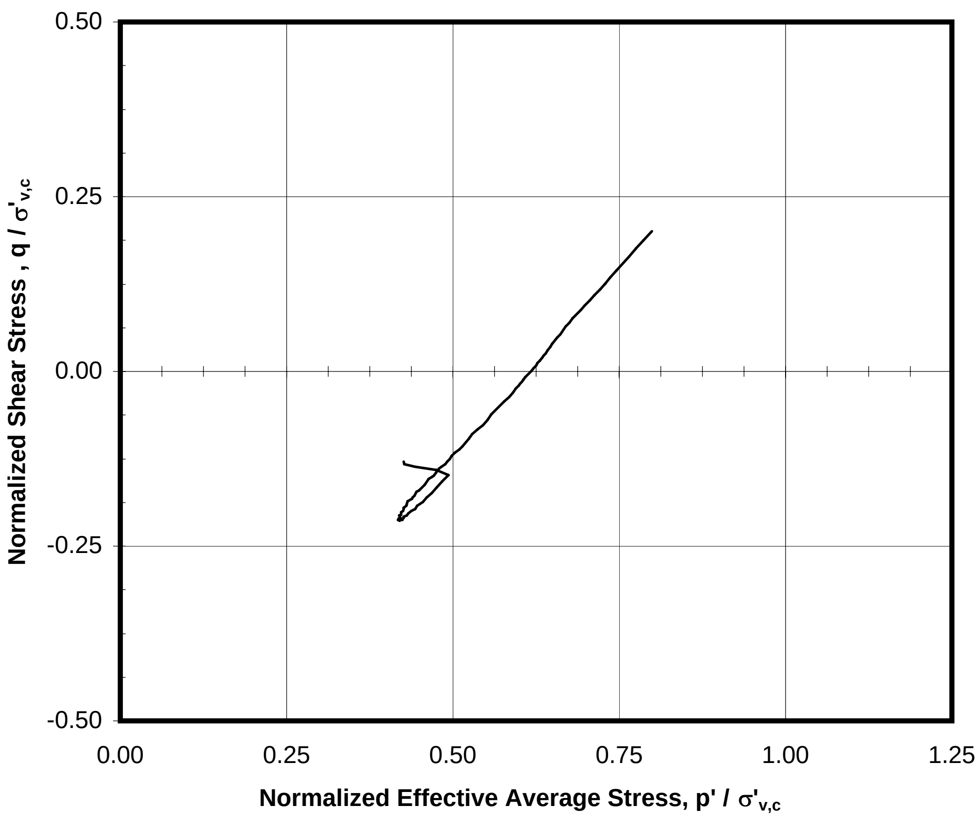
Boring B-68

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-14a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

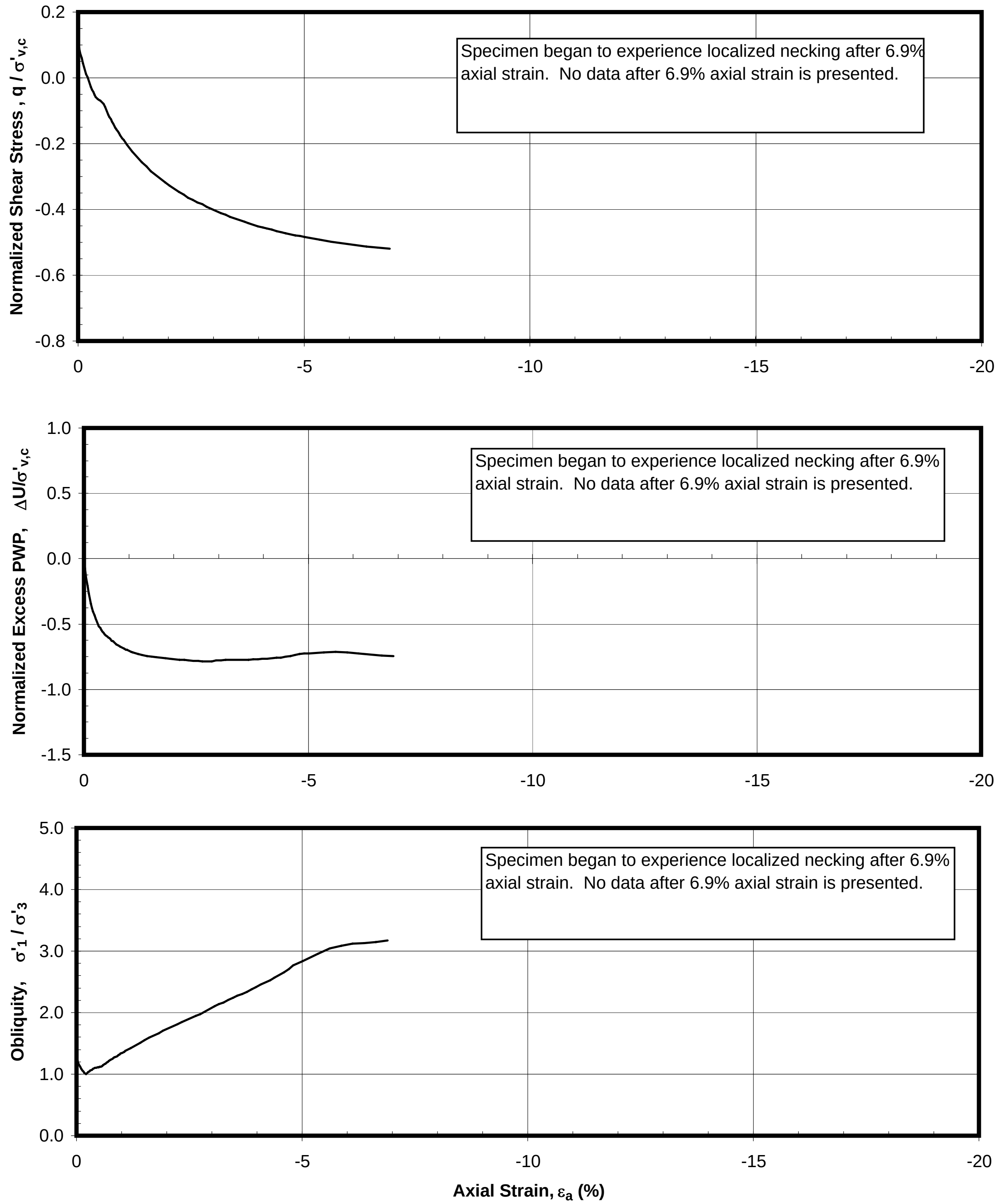
Sample: 18c - Depth: 149.80 ft

Boring B-68

Tunnel Segment of SVRT Project

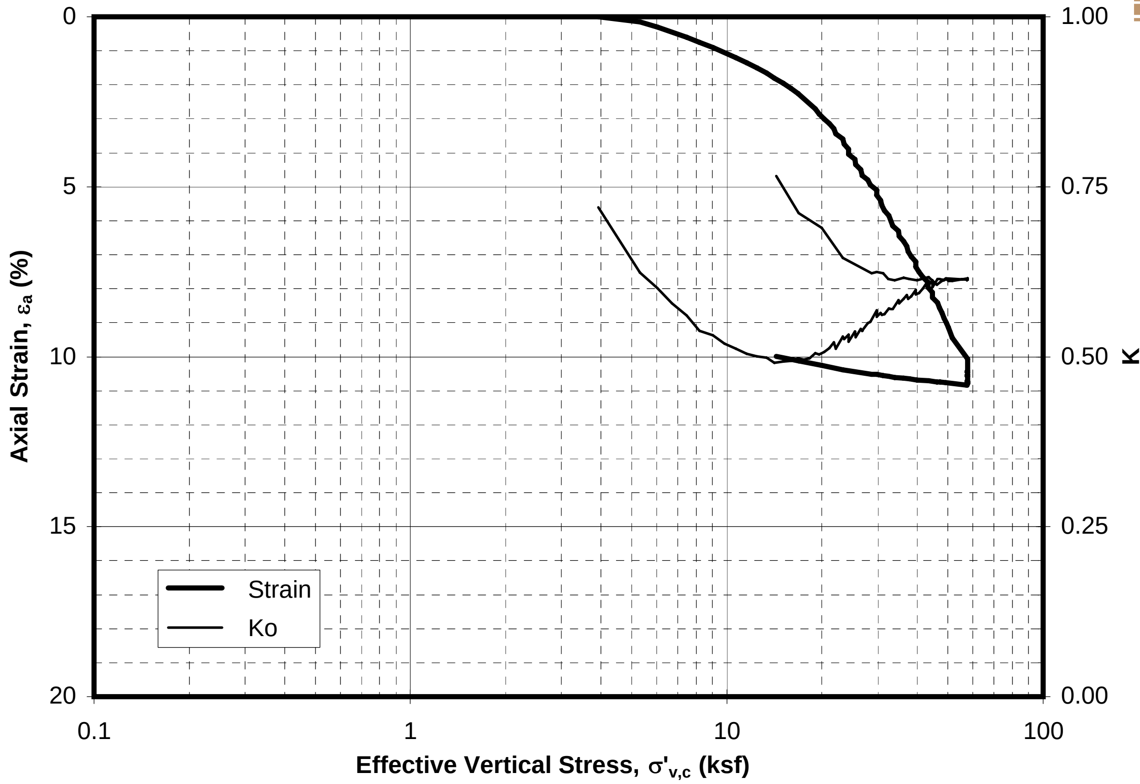
San Jose, California

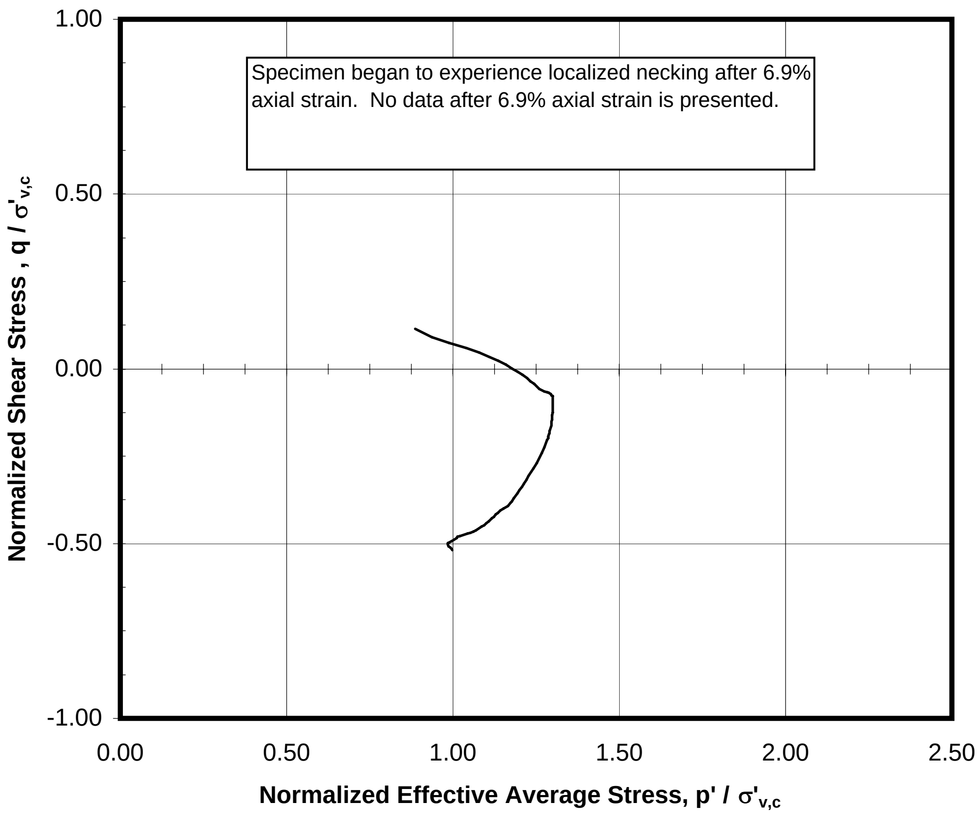
FIGURE A16-14b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS
Test Induced OCR = 4.04
Sample: 35a - Depth: 135.0ft
Boring B-70
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A16-15a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULT

Test Induced OCR = 4.04

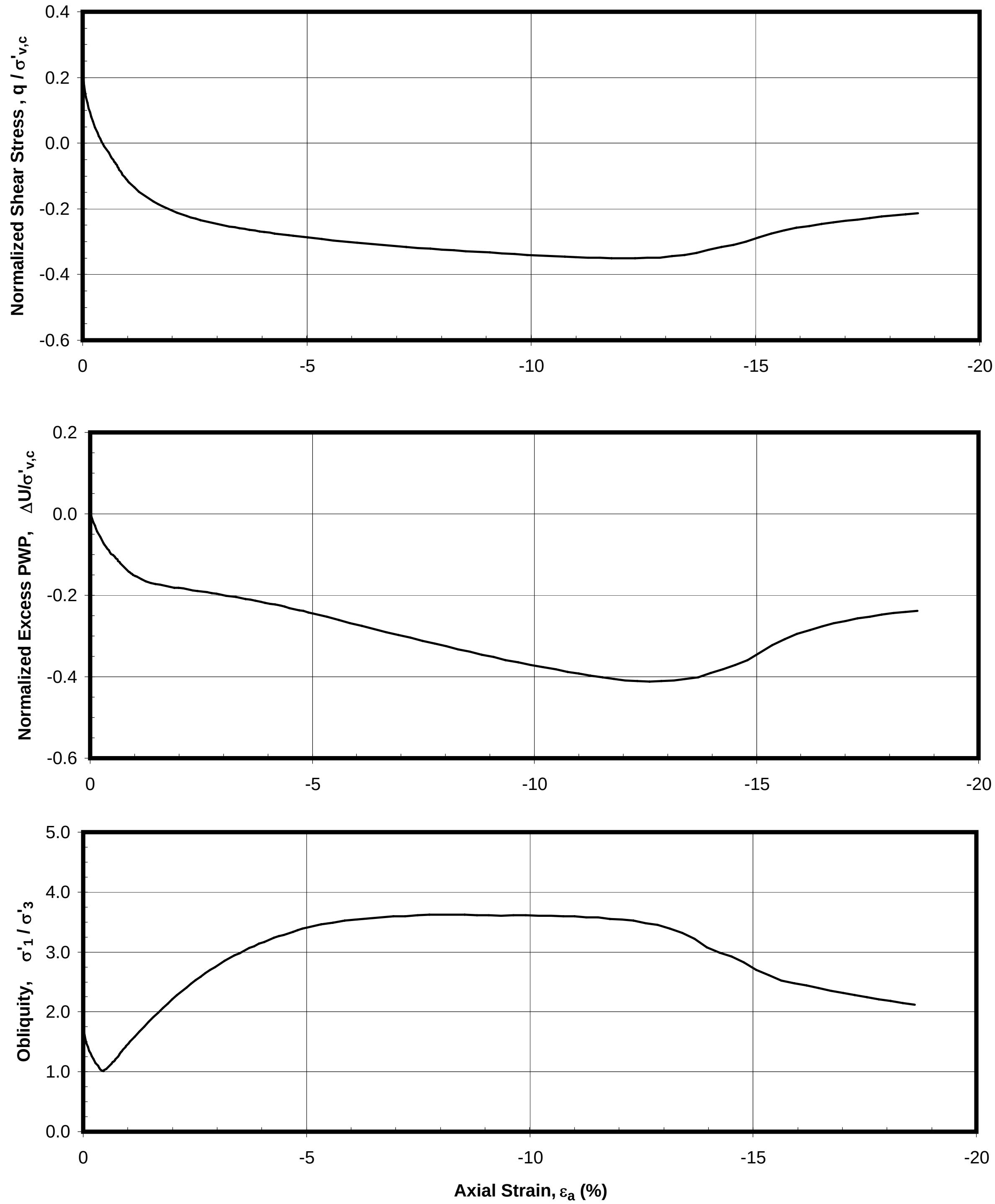
Sample: 35a - Depth: 135.0ft

Boring B-70

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-15b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 2.66

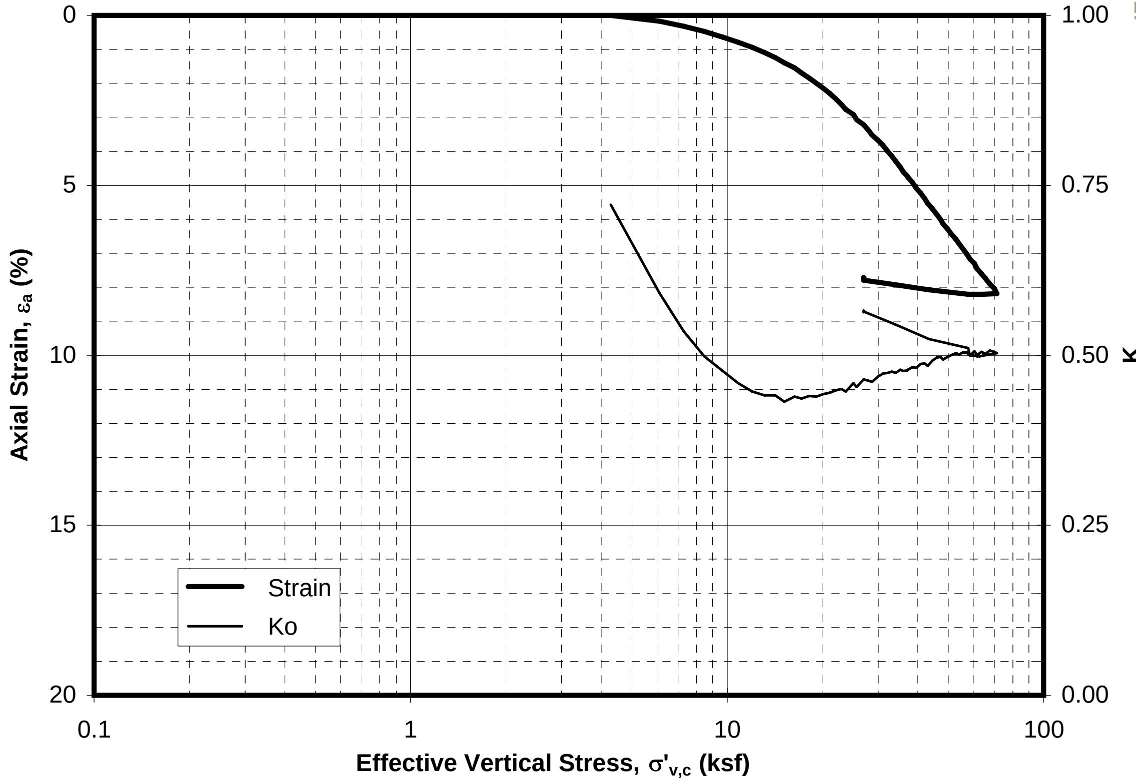
Sample: 15c - Depth: 150.45 ft

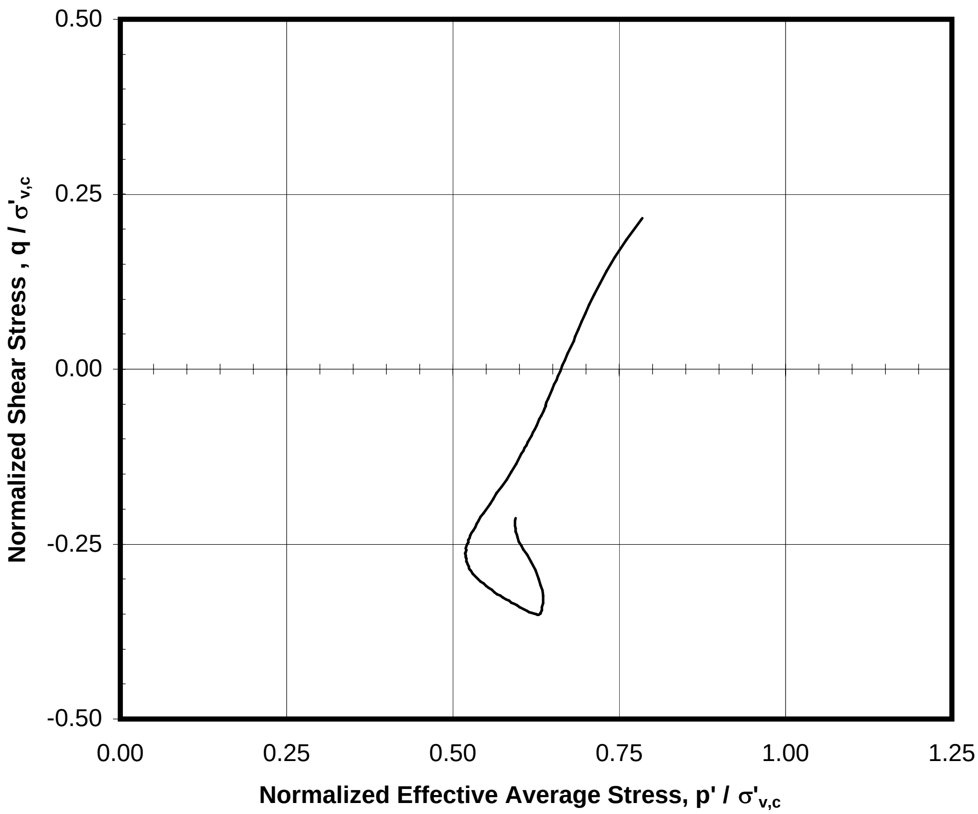
Boring B-75

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-16a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 2.66

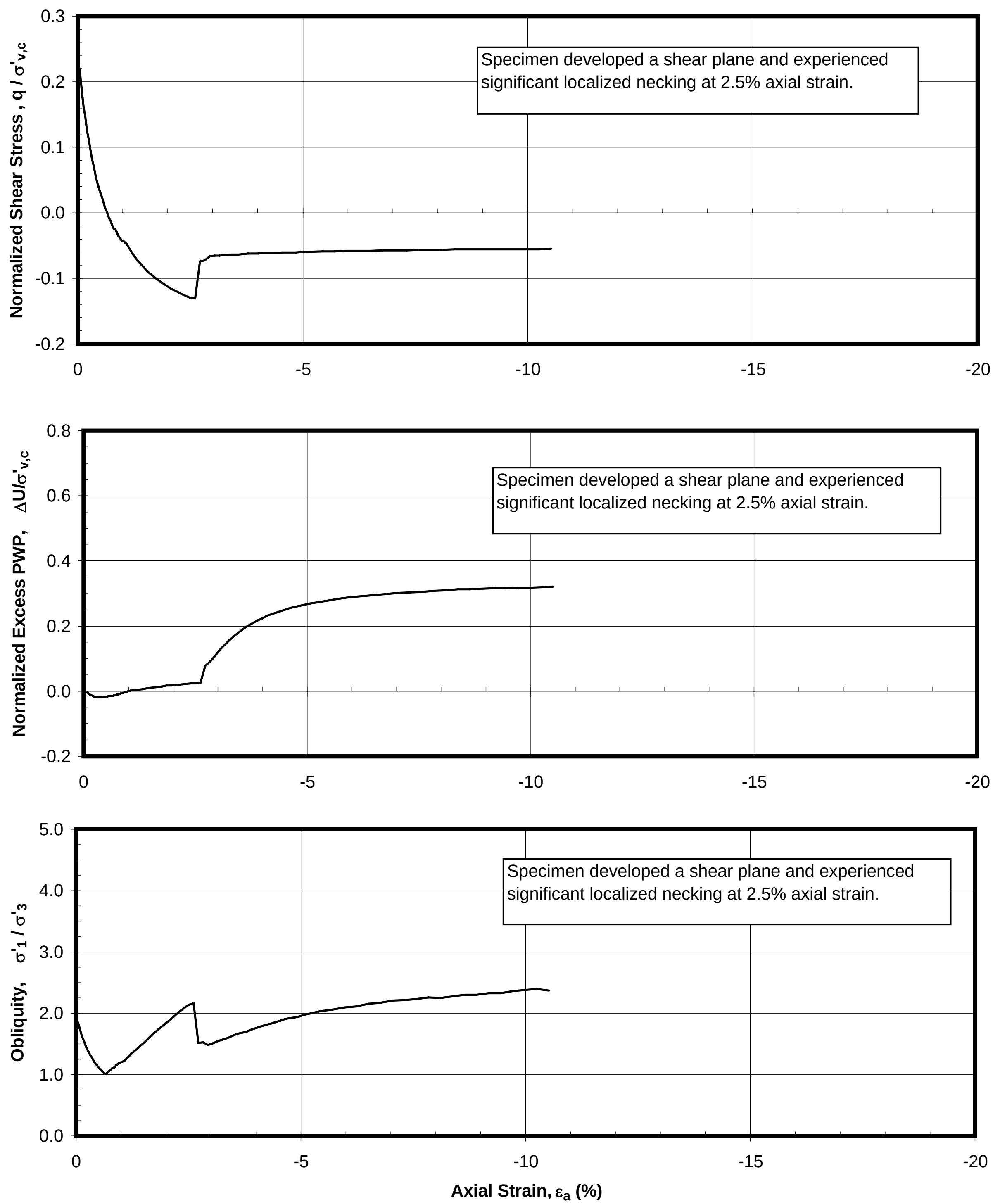
Sample: 15c - Depth: 150.45 ft

Boring B-75

Tunnel Segment of SVRT Project

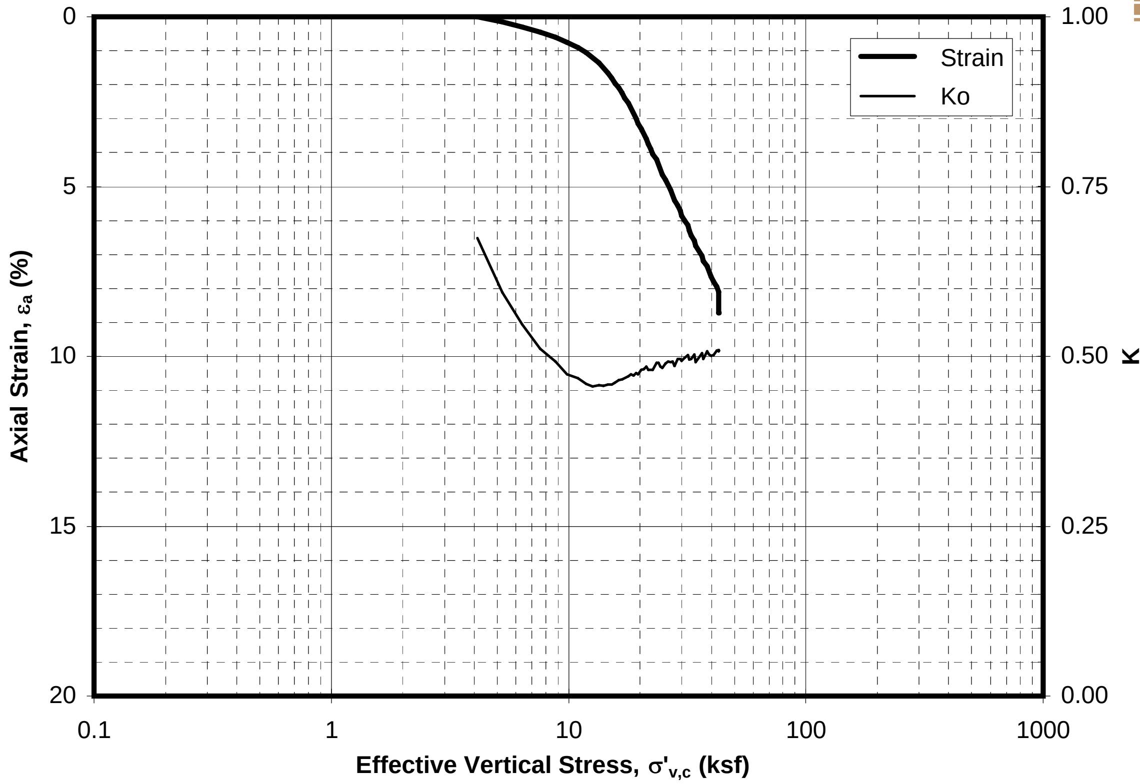
San Jose, California

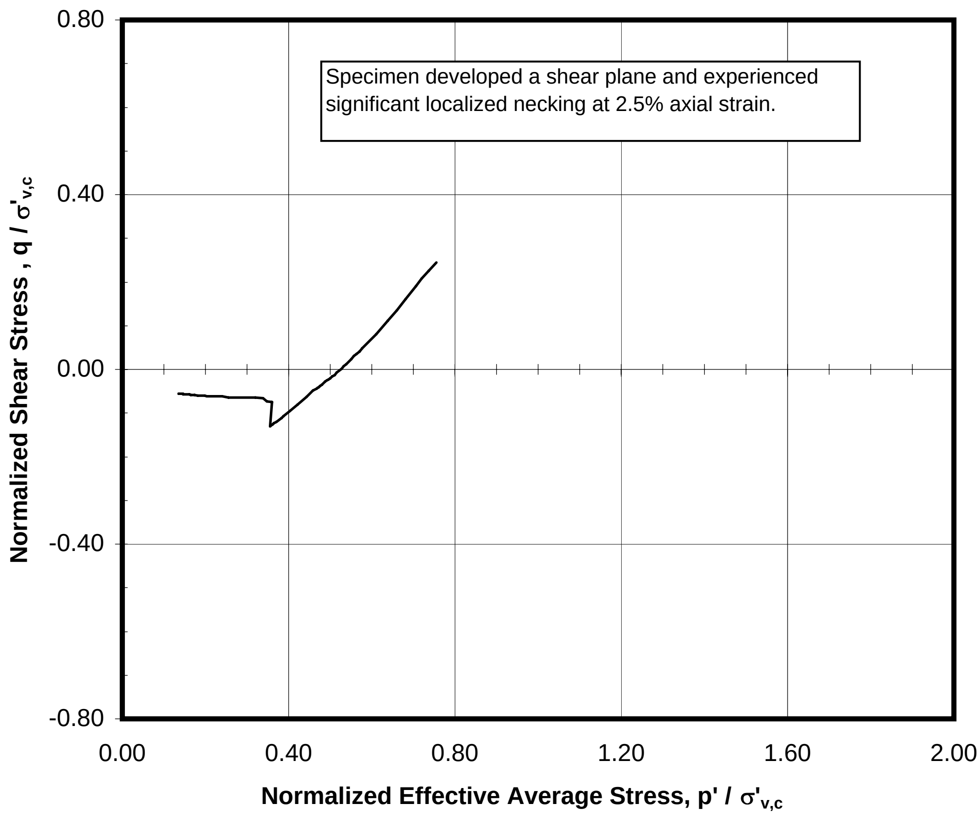
FIGURE A16-16b



Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS
Test Induced OCR = 1
Sample: 16c - Depth: 101.85 ft
Boring B-77
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A16-17a





Ko-CONSOLIDATED TRIAXIAL EXTENSION TEST RESULTS

Test Induced OCR = 1

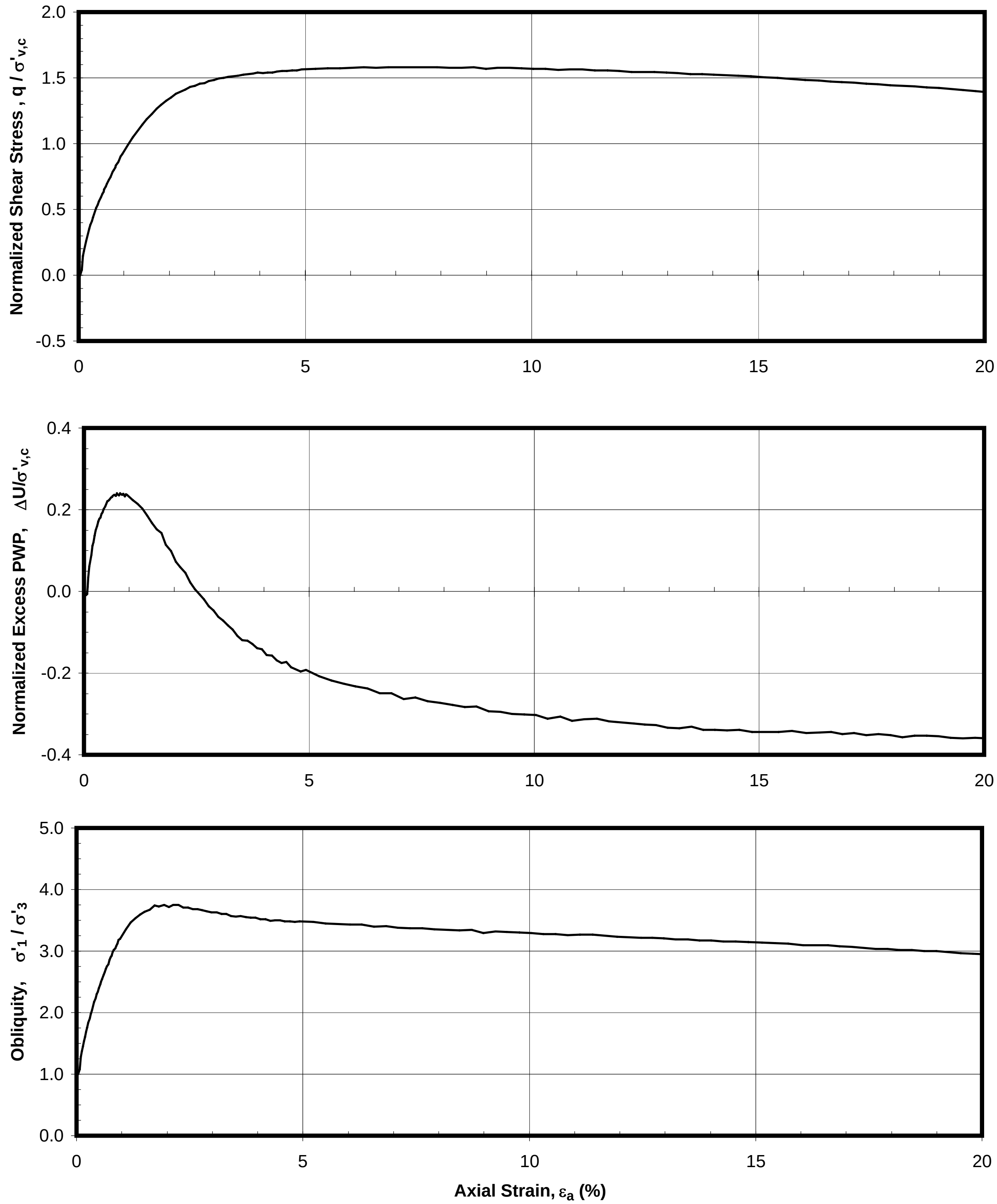
Sample: 16c - Depth: 101.85 ft

Boring B-77

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-17b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 6.14

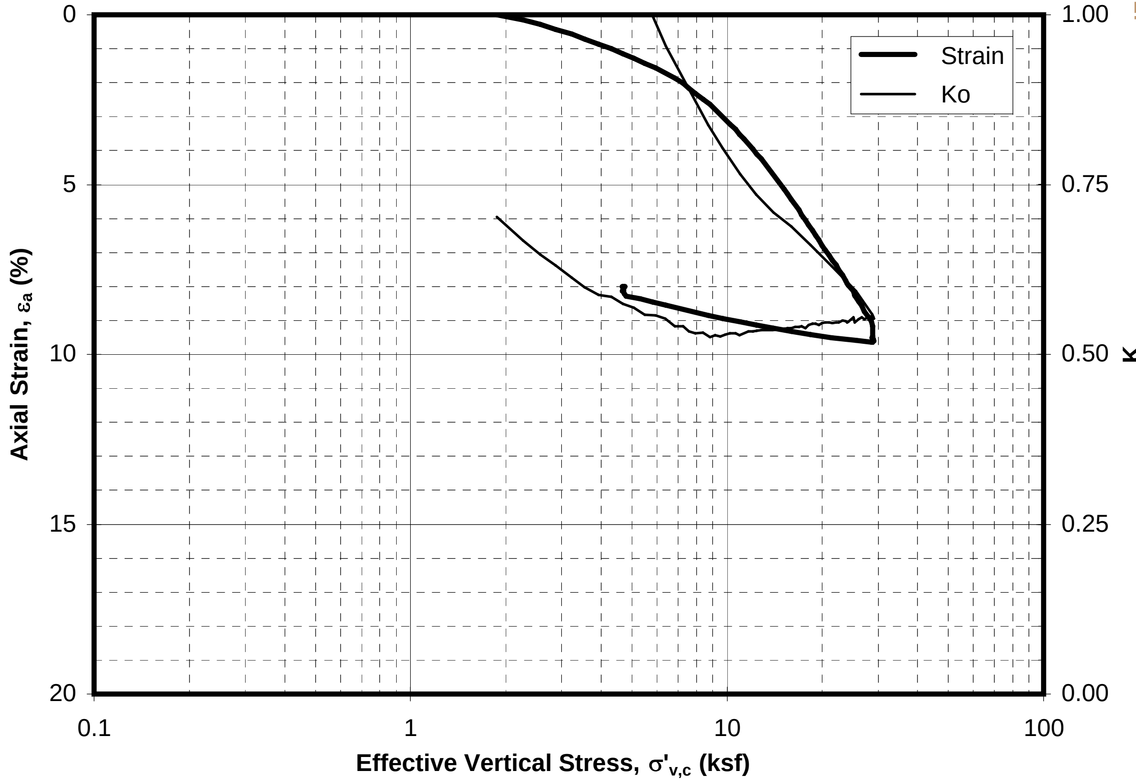
Sample: 3c - Depth: 51.80 ft

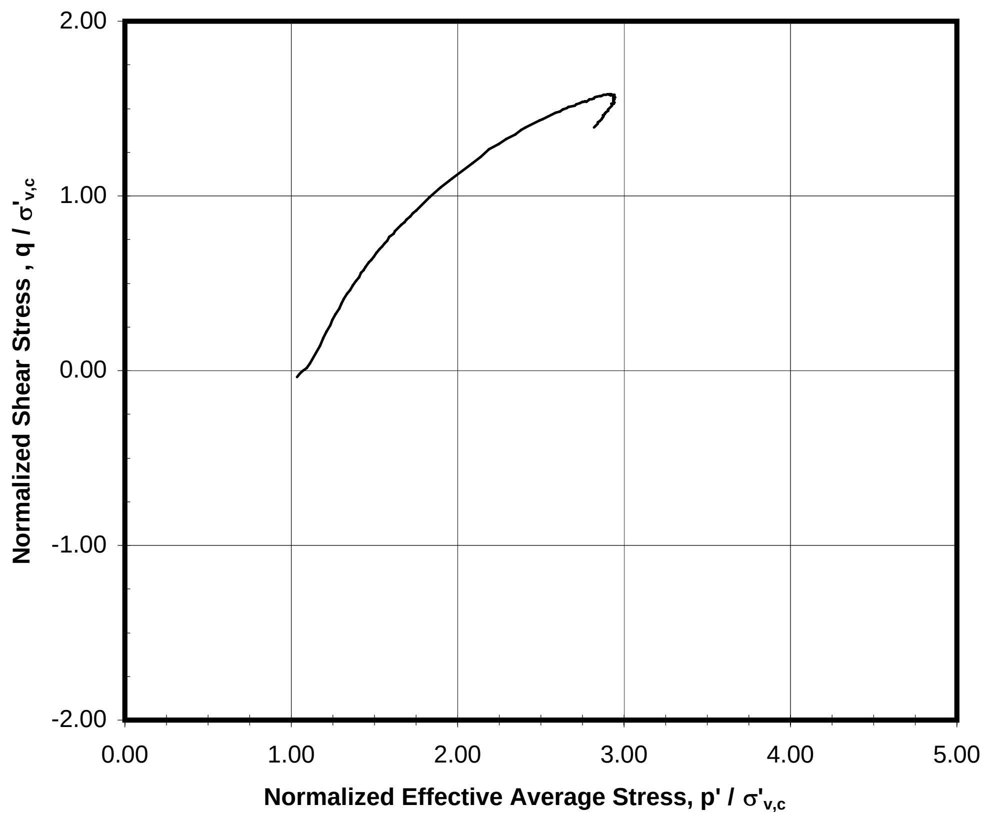
Boring B-9

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-18a





Ko-CONSOLDIATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 6.14

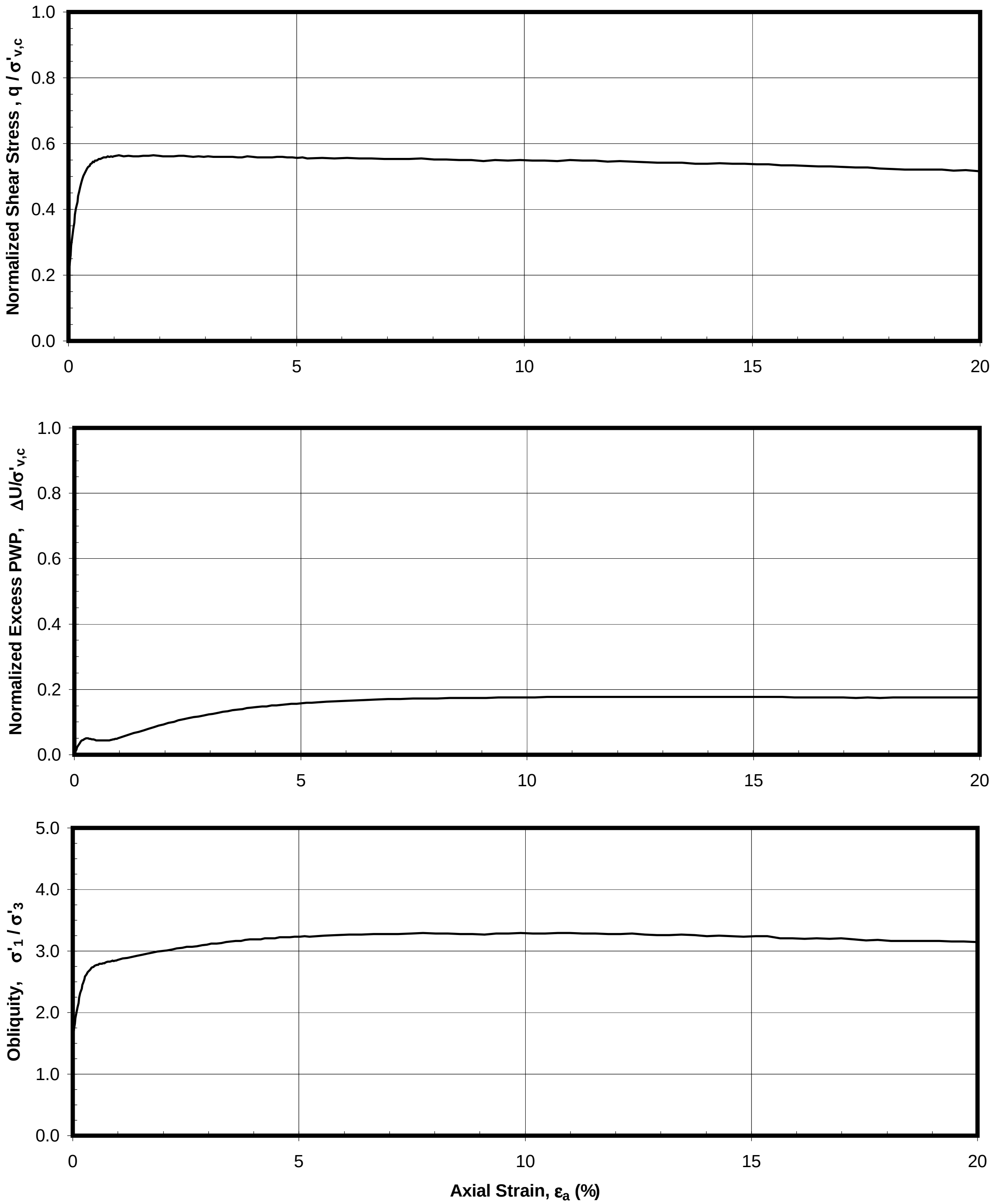
Sample: 3c - Depth: 51.80 ft

Boring B-9

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-18b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 2.03

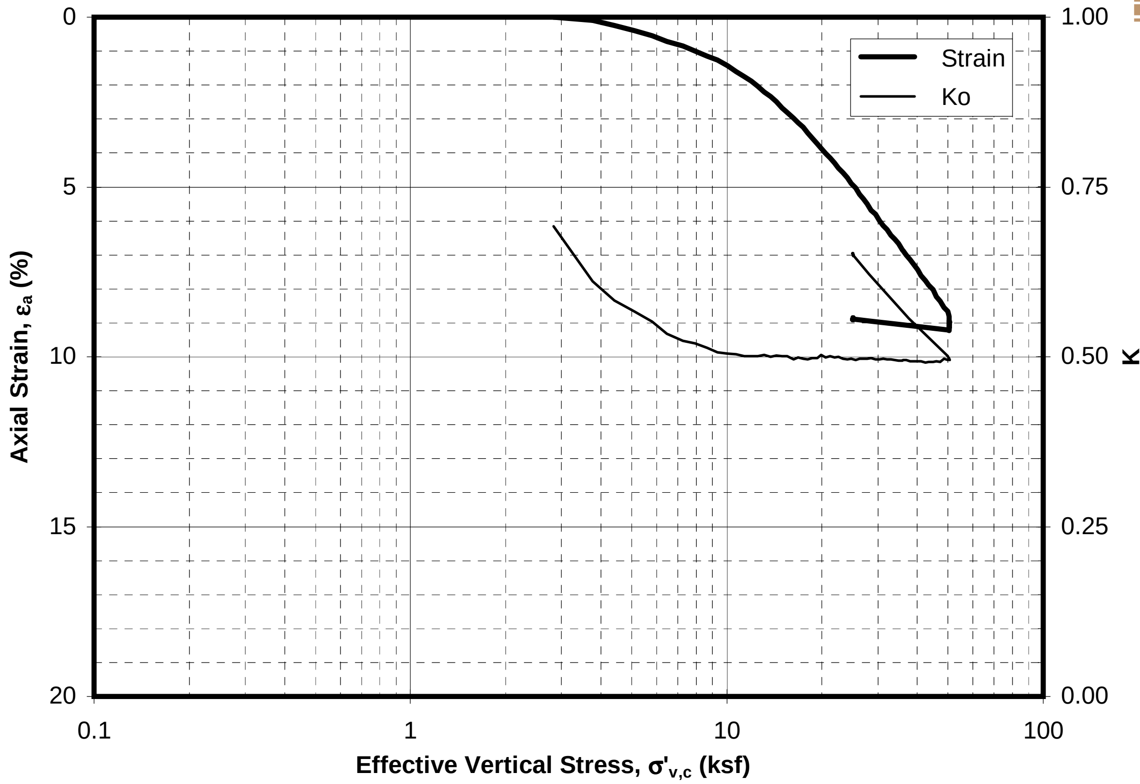
Sample: 9c - Depth: 80.95 ft

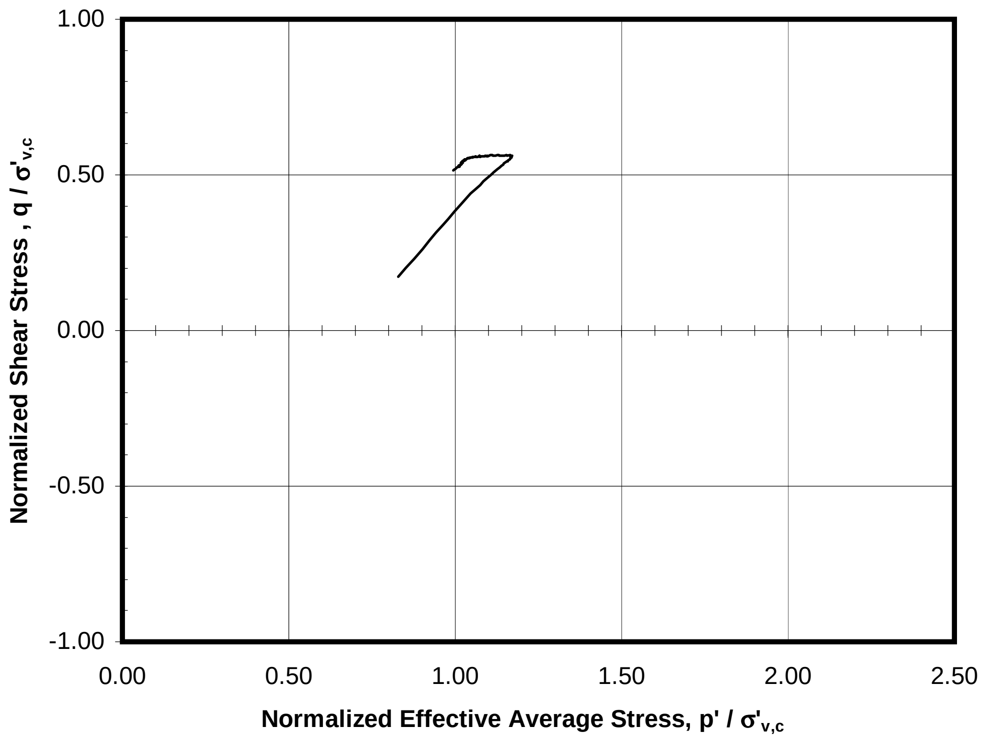
Boring B-18

Tunnel Segment of SVRT Project

San Jose, California

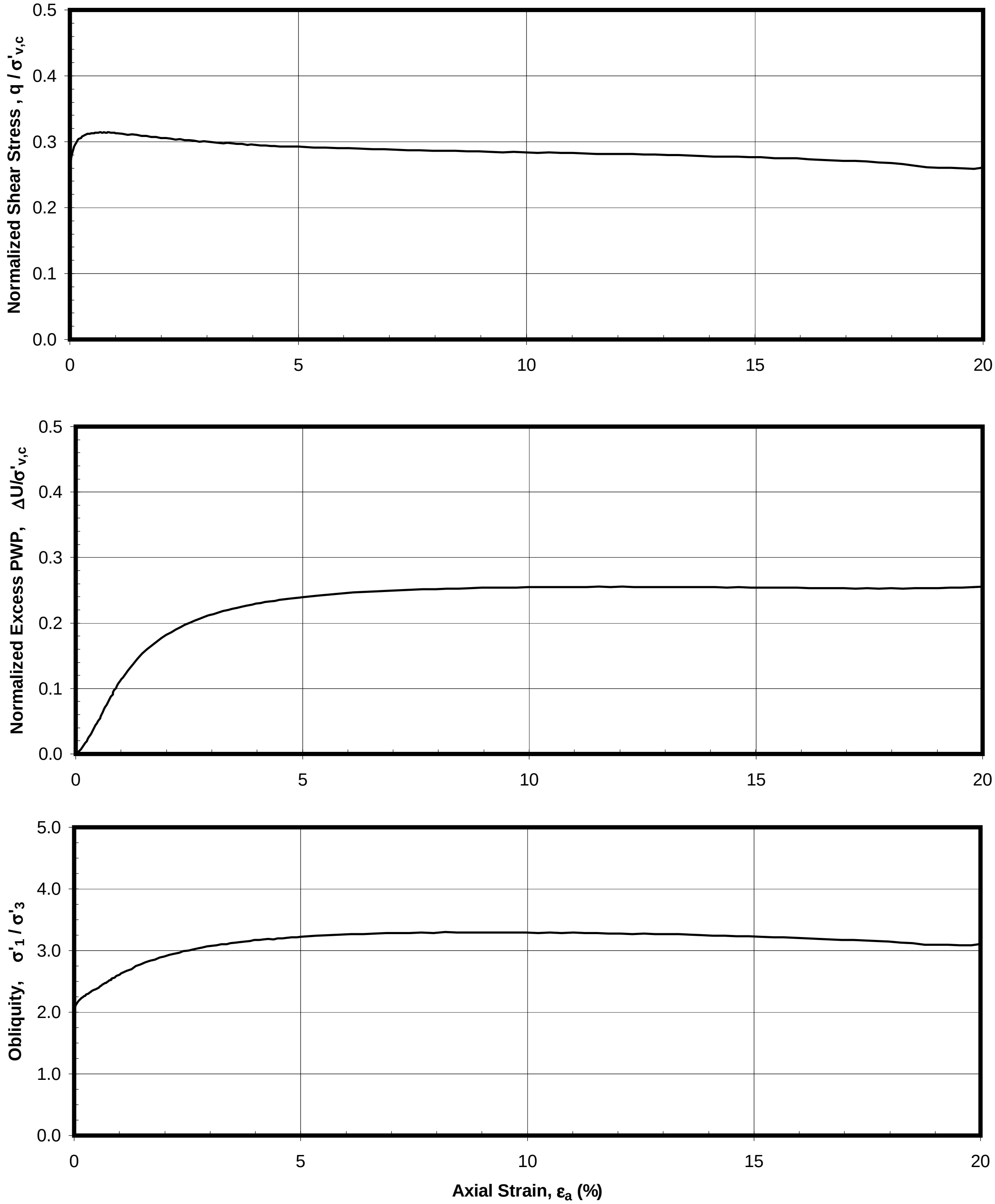
FIGURE A16-19a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Test Induced OCR = 2.03
Sample: 9c - Depth: 80.95 ft
Boring B-18
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A16-19b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

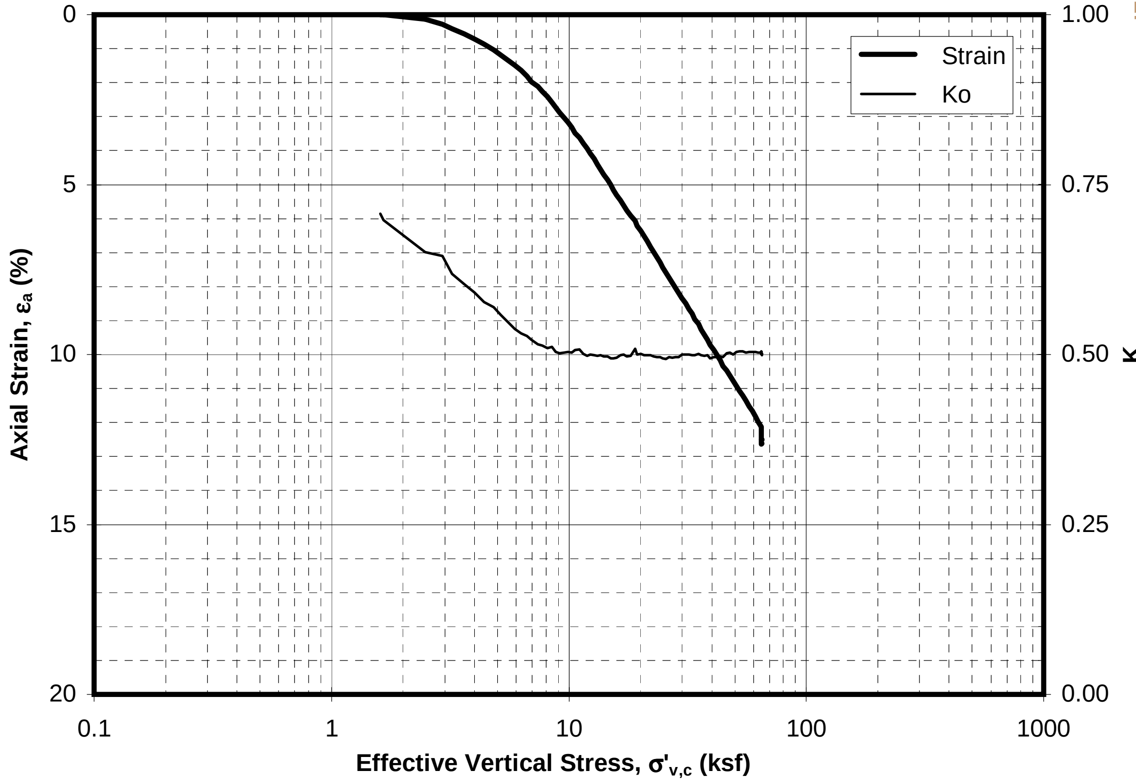
Sample: 9b - Depth: 41.20 ft

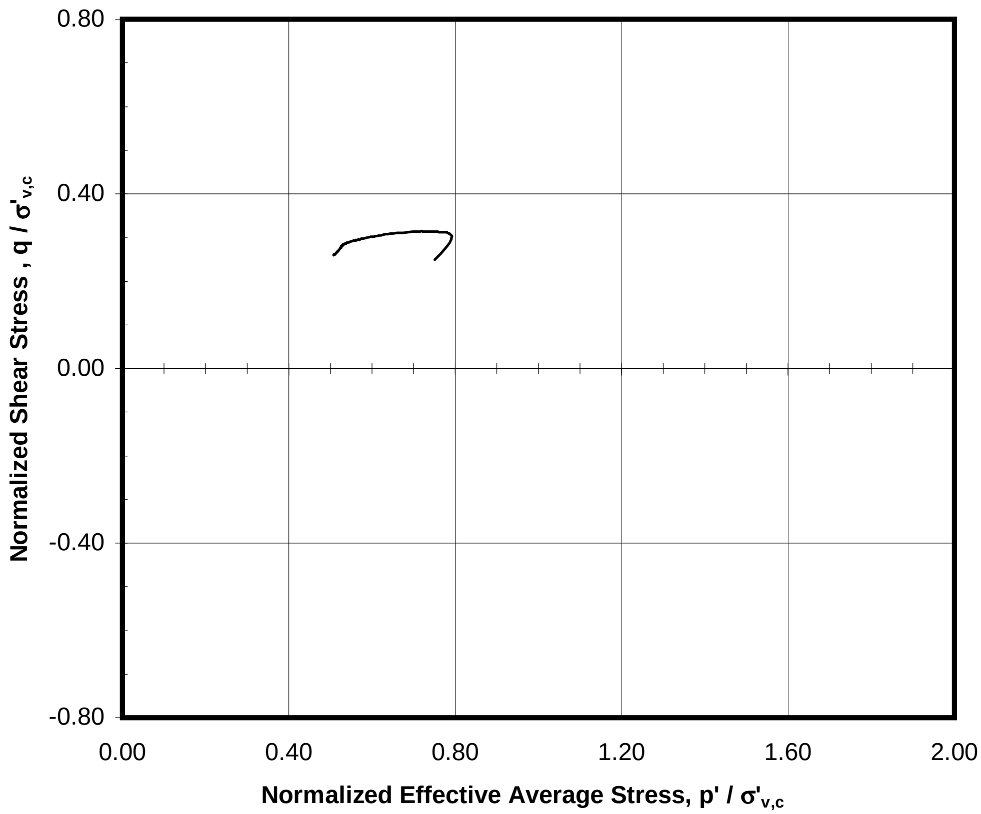
Boring B-23

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-20a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

Sample: 9b - Depth: 41.20 ft

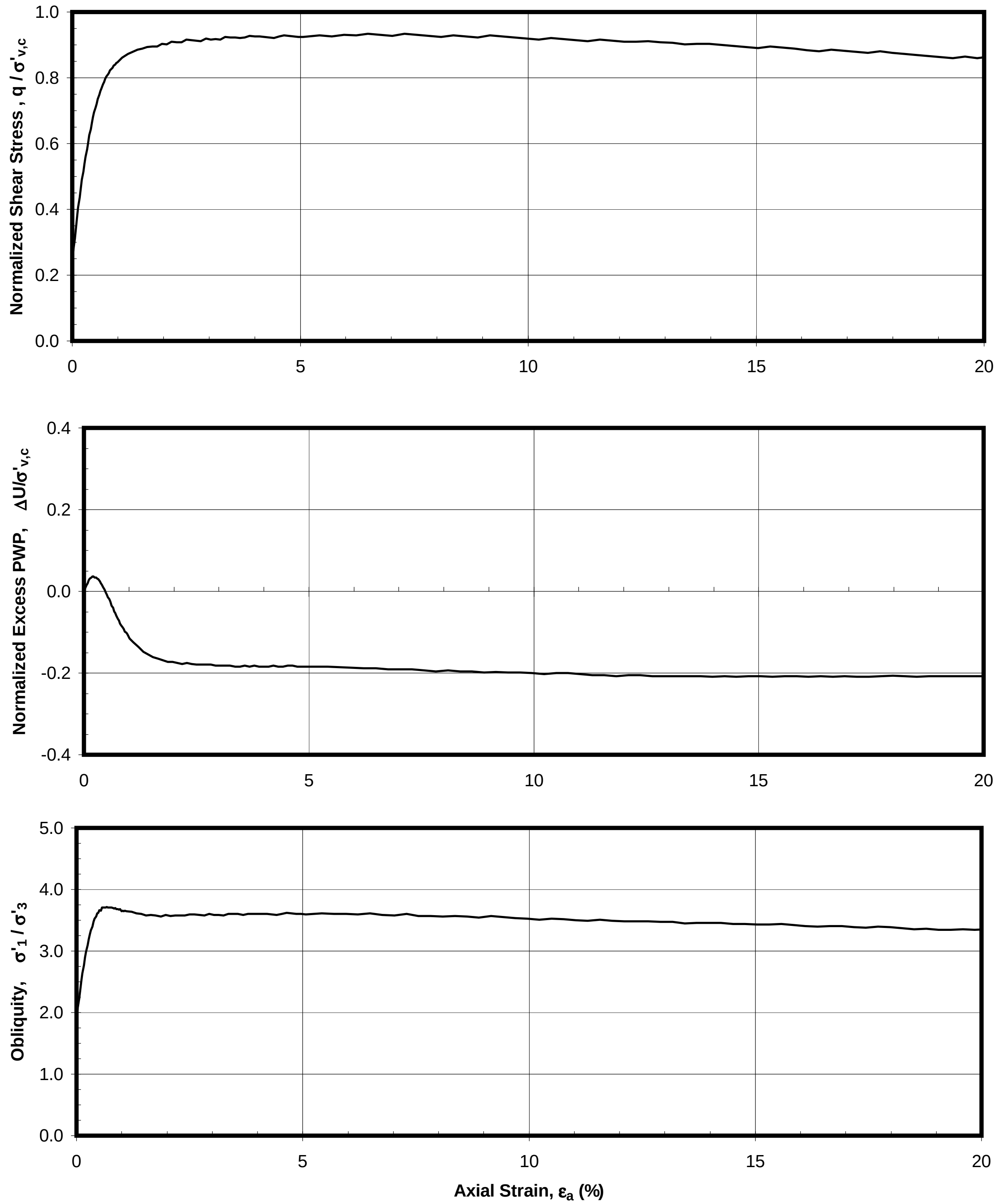
Boring B-23

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-20b

HMM/Bechtel
Project No. 1637.001



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 3.84

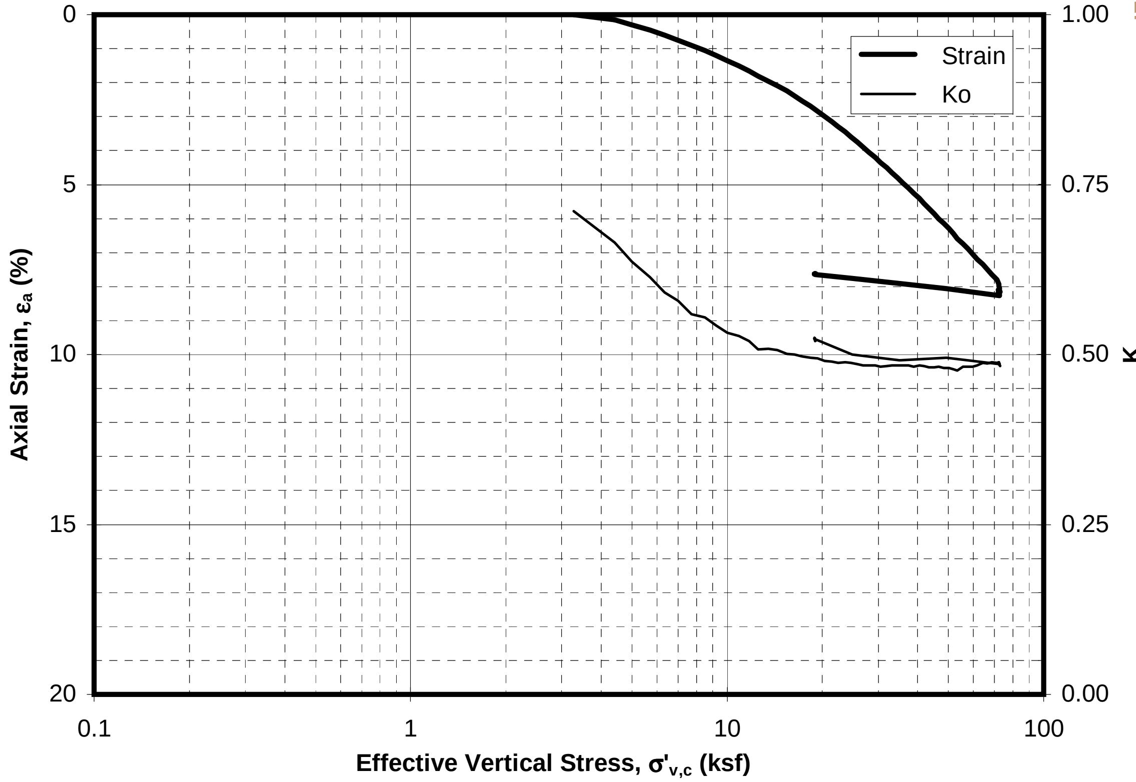
Sample: 17c - Depth: 106.50 ft

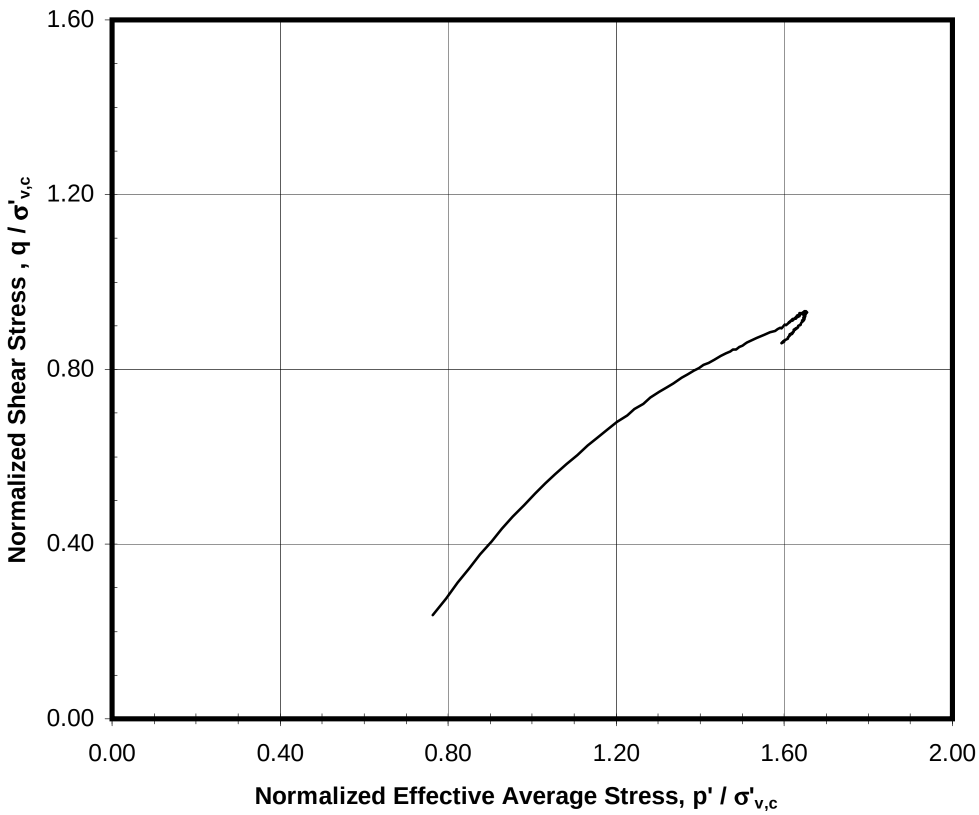
Boring B-23

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-21a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 3.84

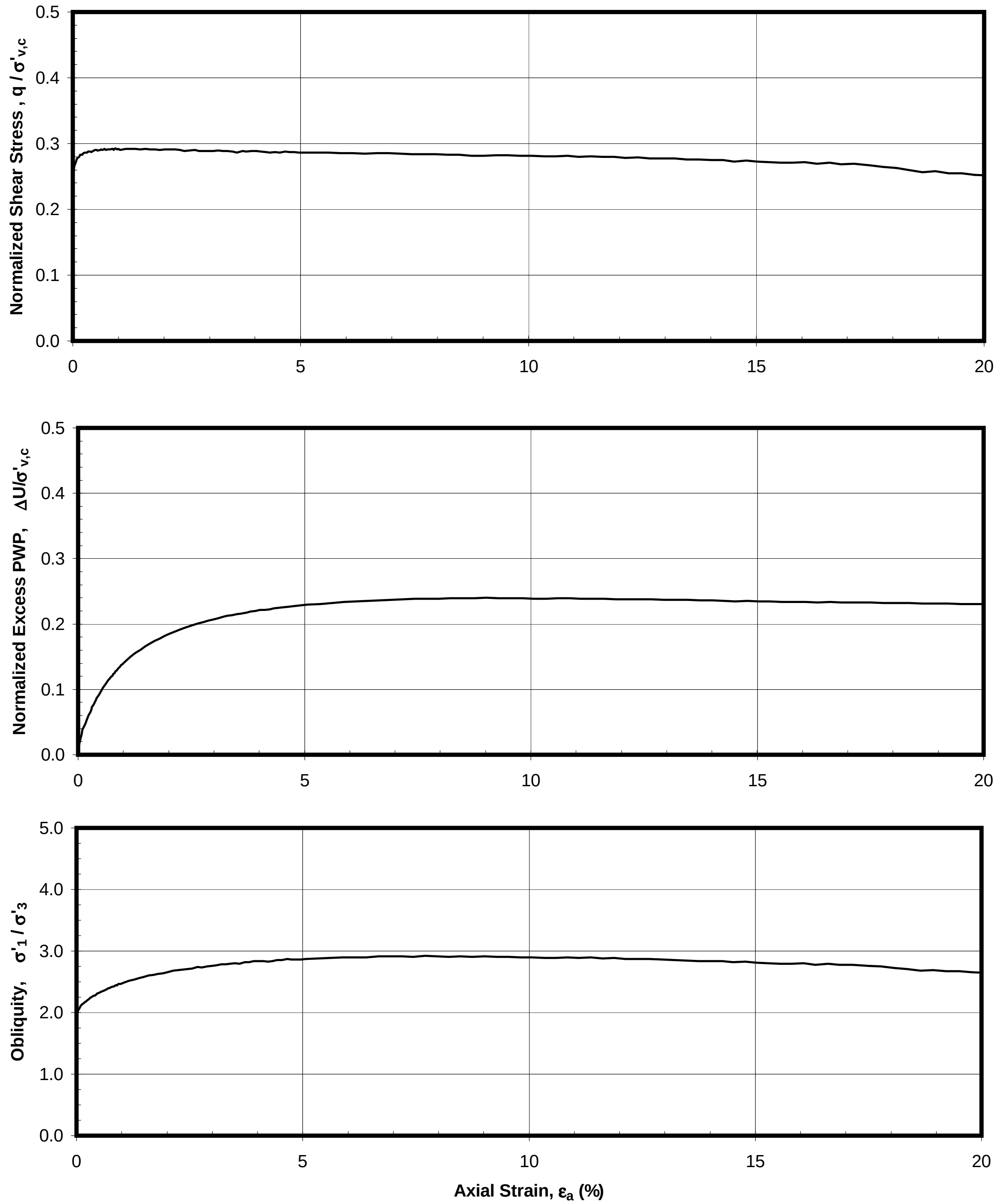
Sample: 17c - Depth: 106.50 ft

Boring B-23

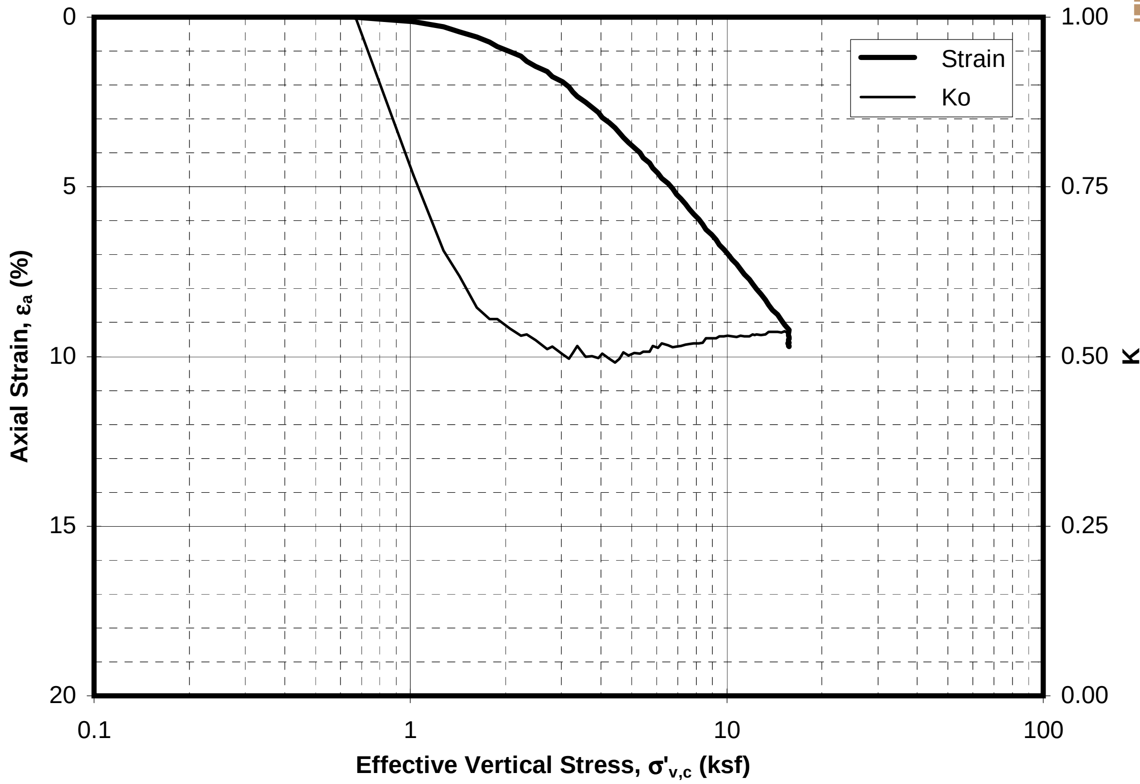
Tunnel Segment of SVRT Project

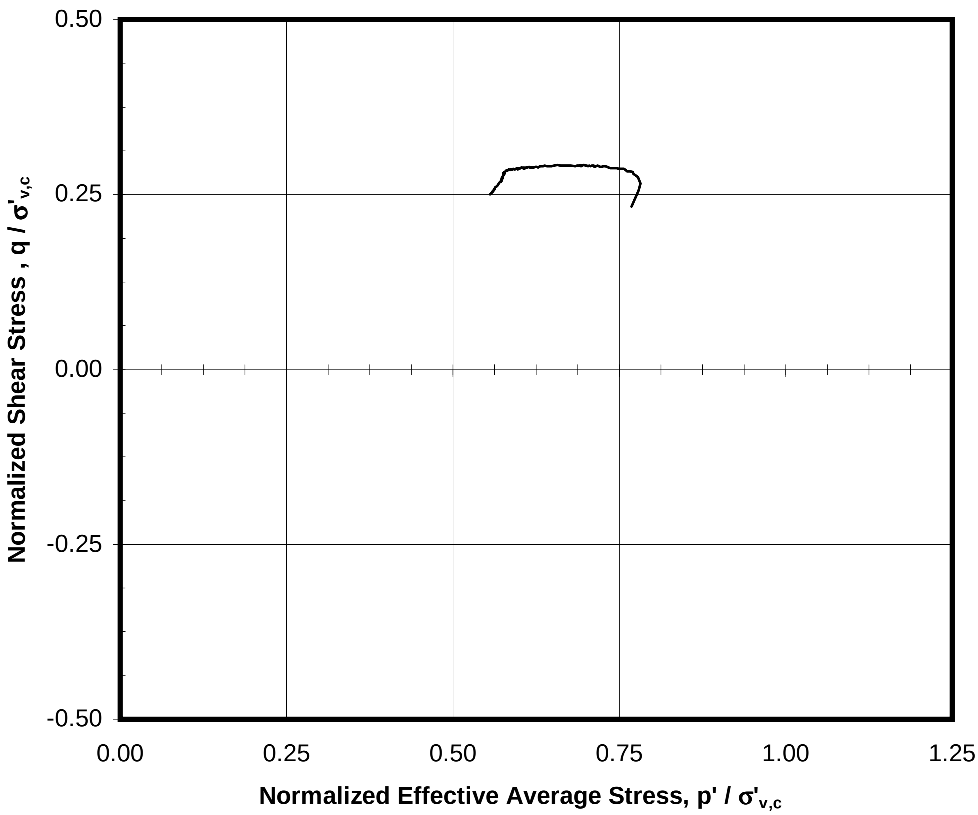
San Jose, California

FIGURE A16-21b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Test Induced OCR = 1
Sample: 3b - Depth: 14.85 ft
Boring B-24
Tunnel Segment of SVRT Project
San Jose, California





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

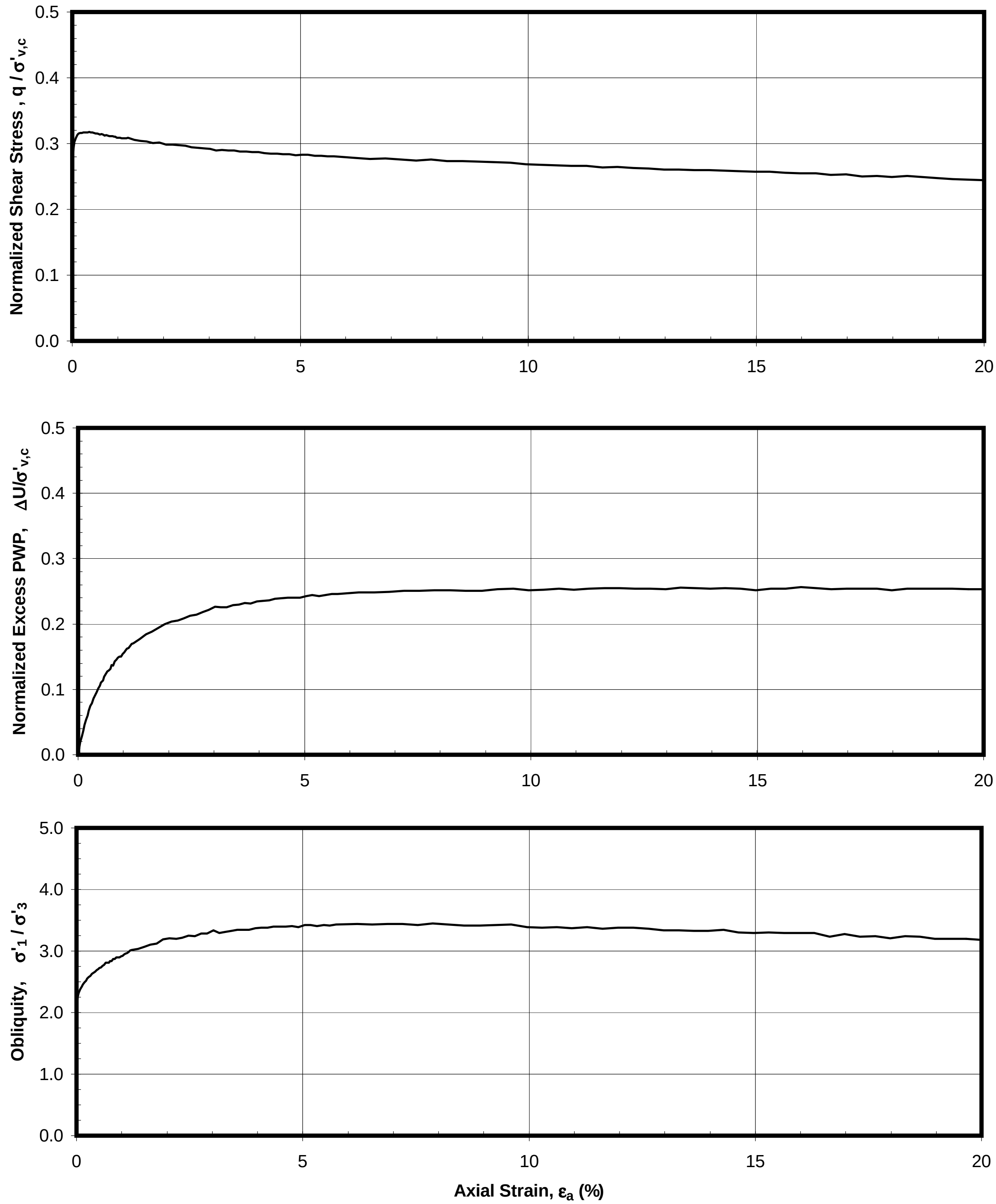
Sample: 3b - Depth: 14.85 ft

Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-22b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

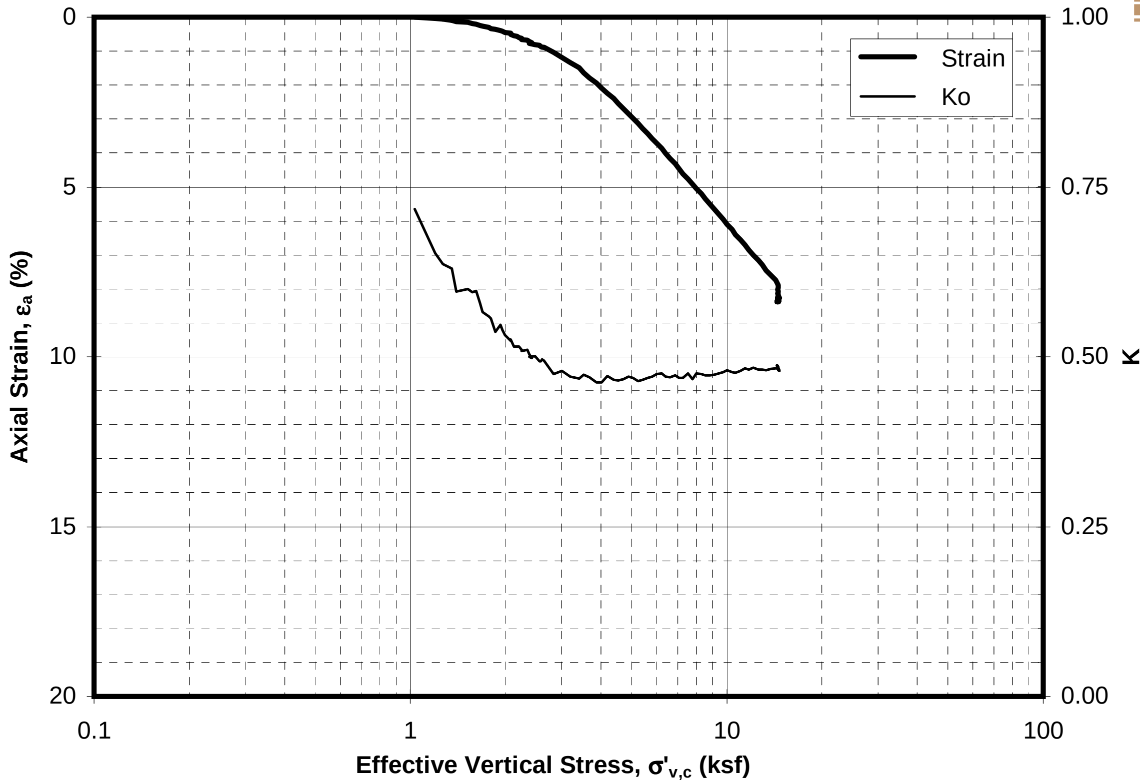
Sample: 7b - Depth: 24.45 ft

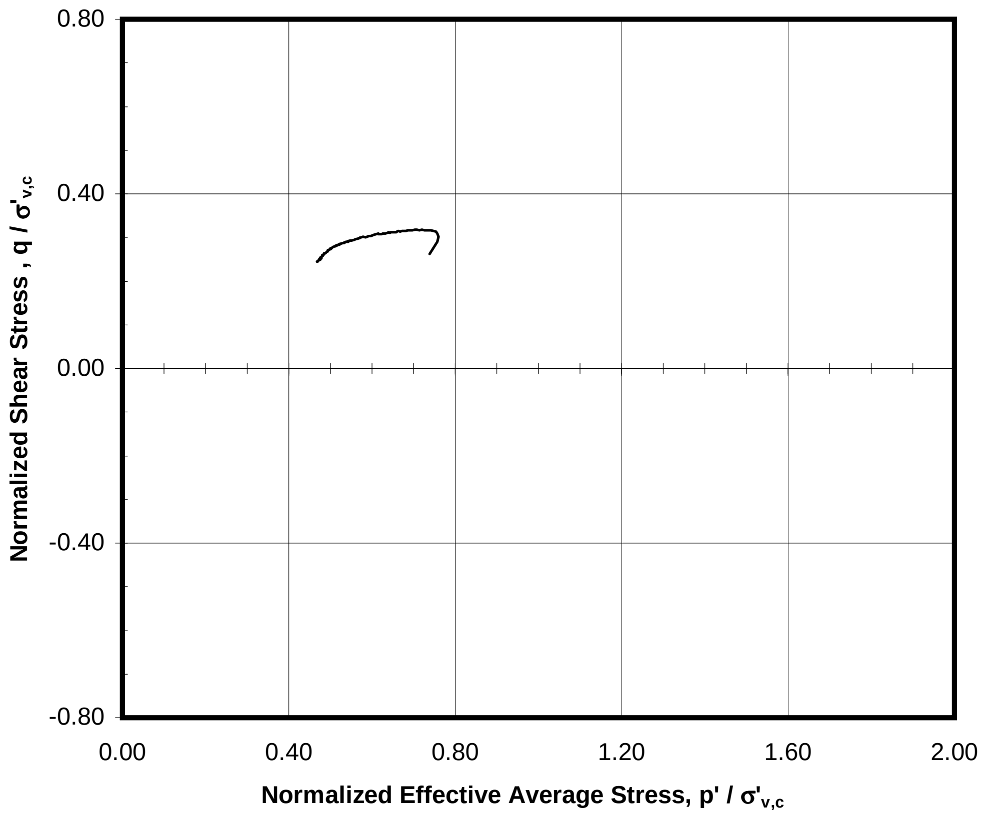
Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-23a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

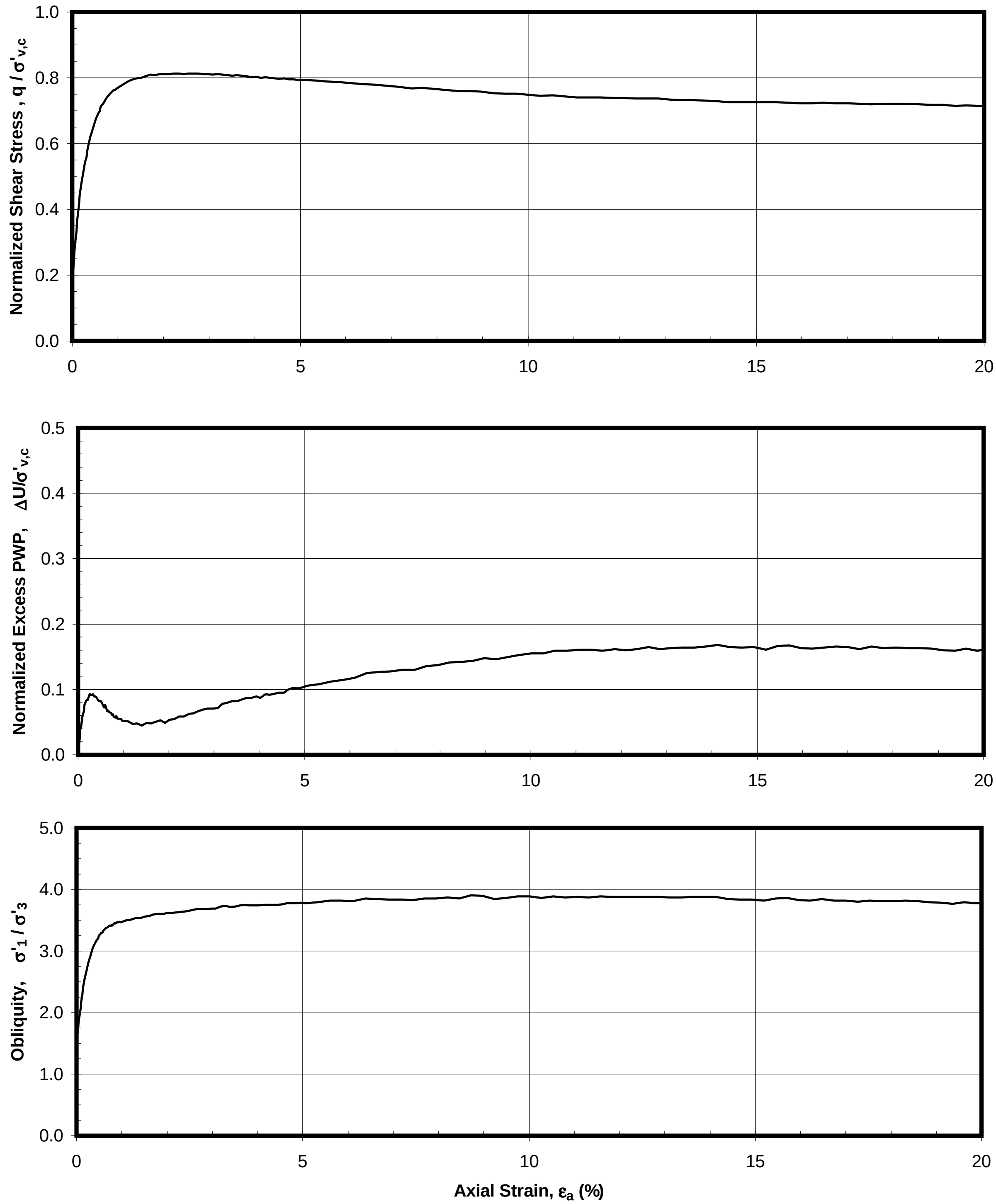
Sample: 7b - Depth: 24.45 ft

Boring B-24

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-23b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 3.14

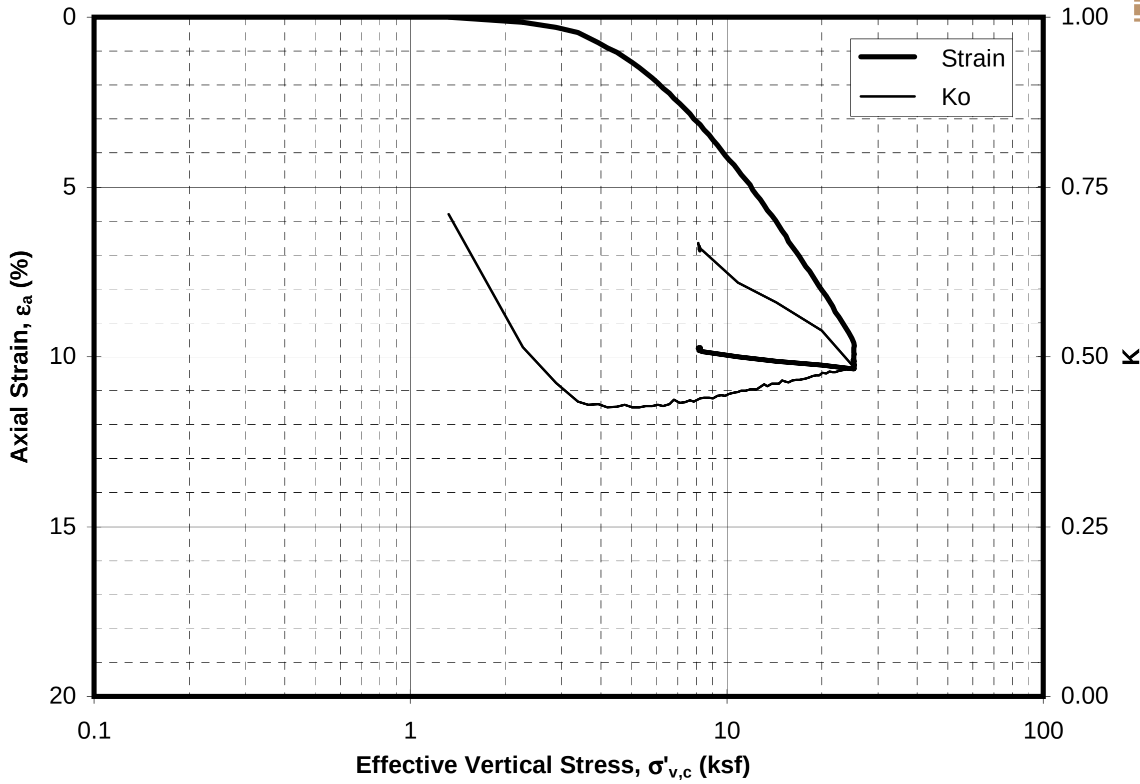
Sample: 4b - Depth: 32.05 ft

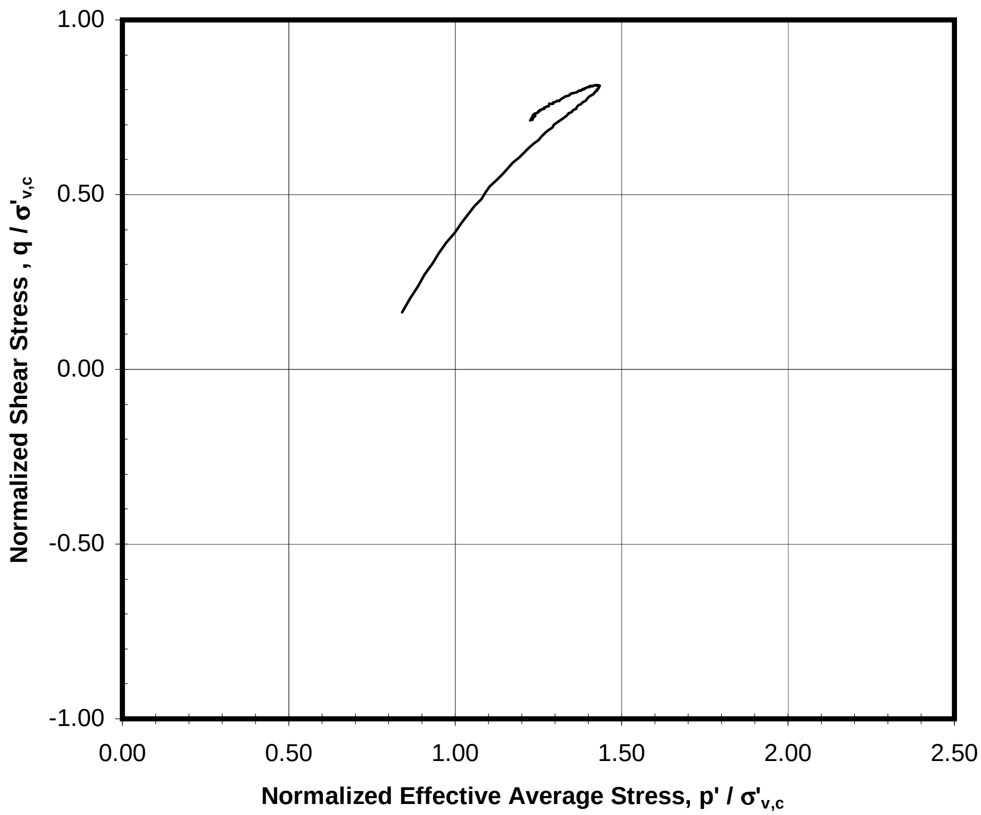
Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-24a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 3.14

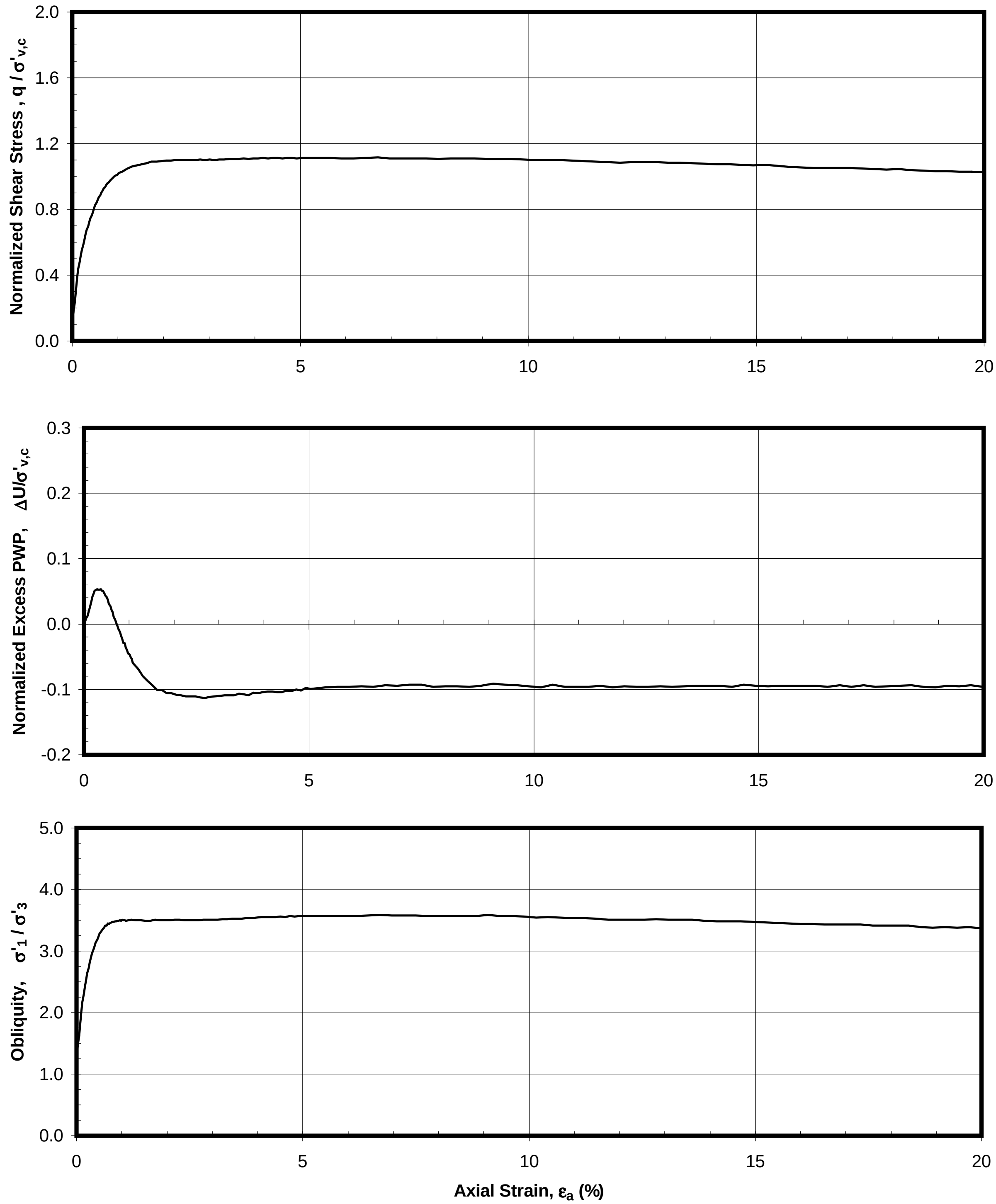
Sample: 4b - Depth: 32.05 ft

Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-24b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 4.29

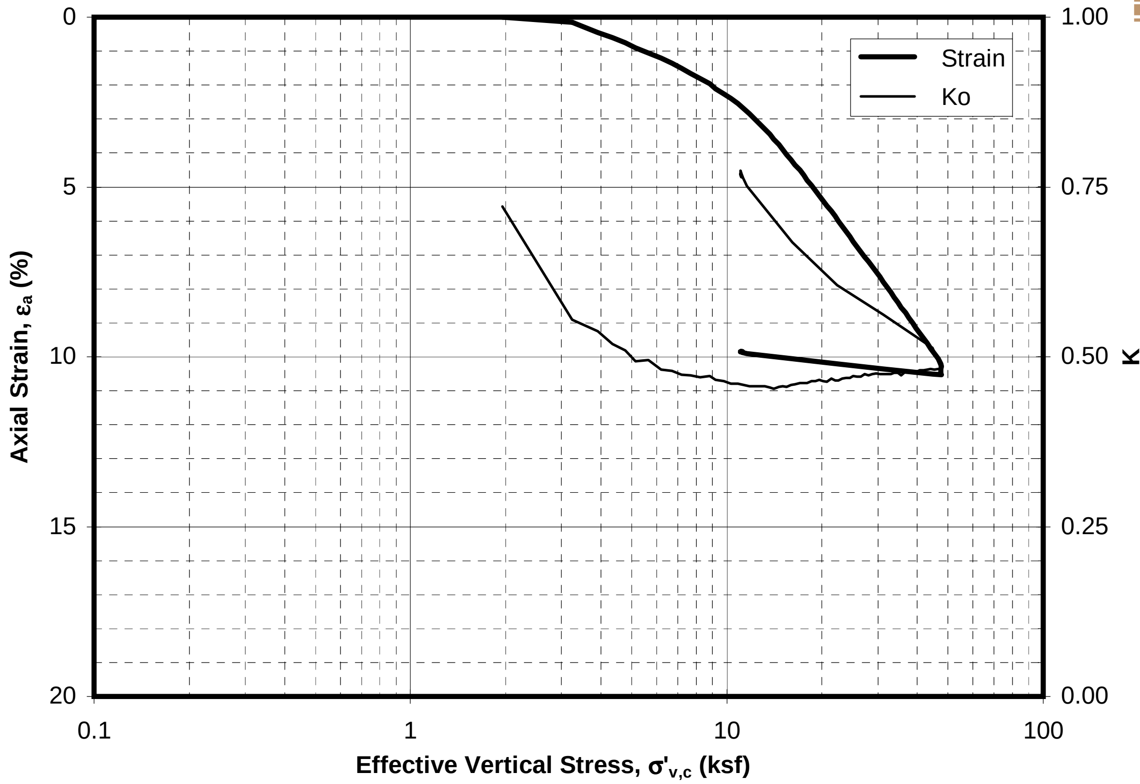
Sample: 6b - Depth: 54.00 ft

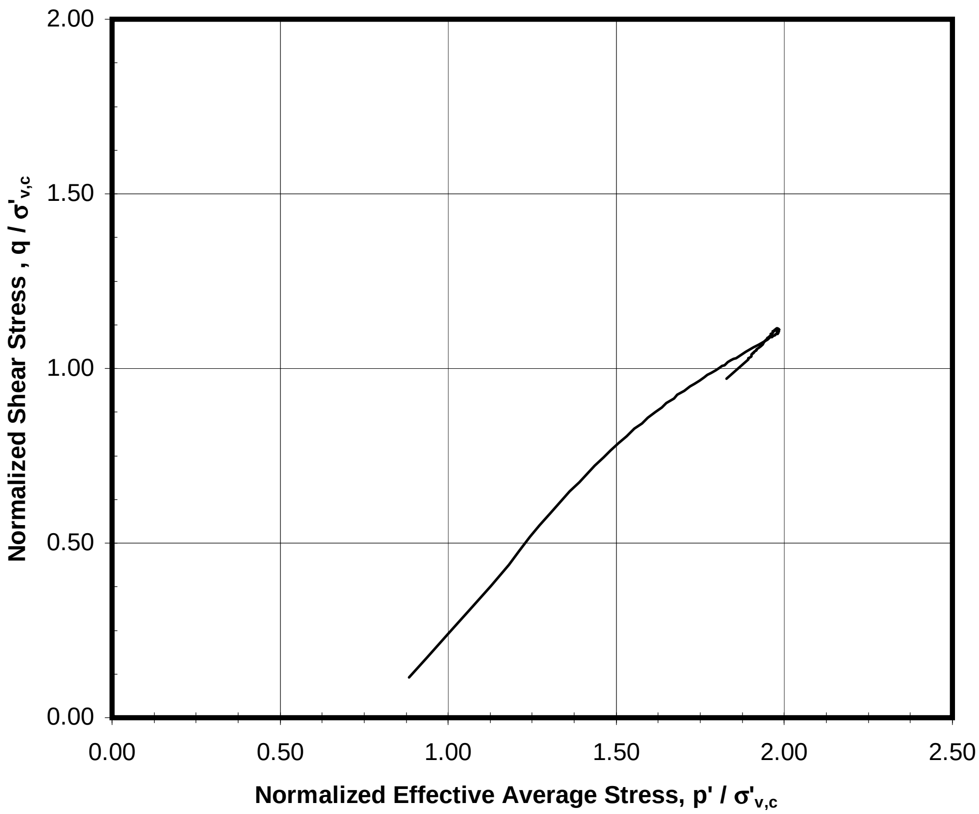
Boring B-33

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-25a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 4.29

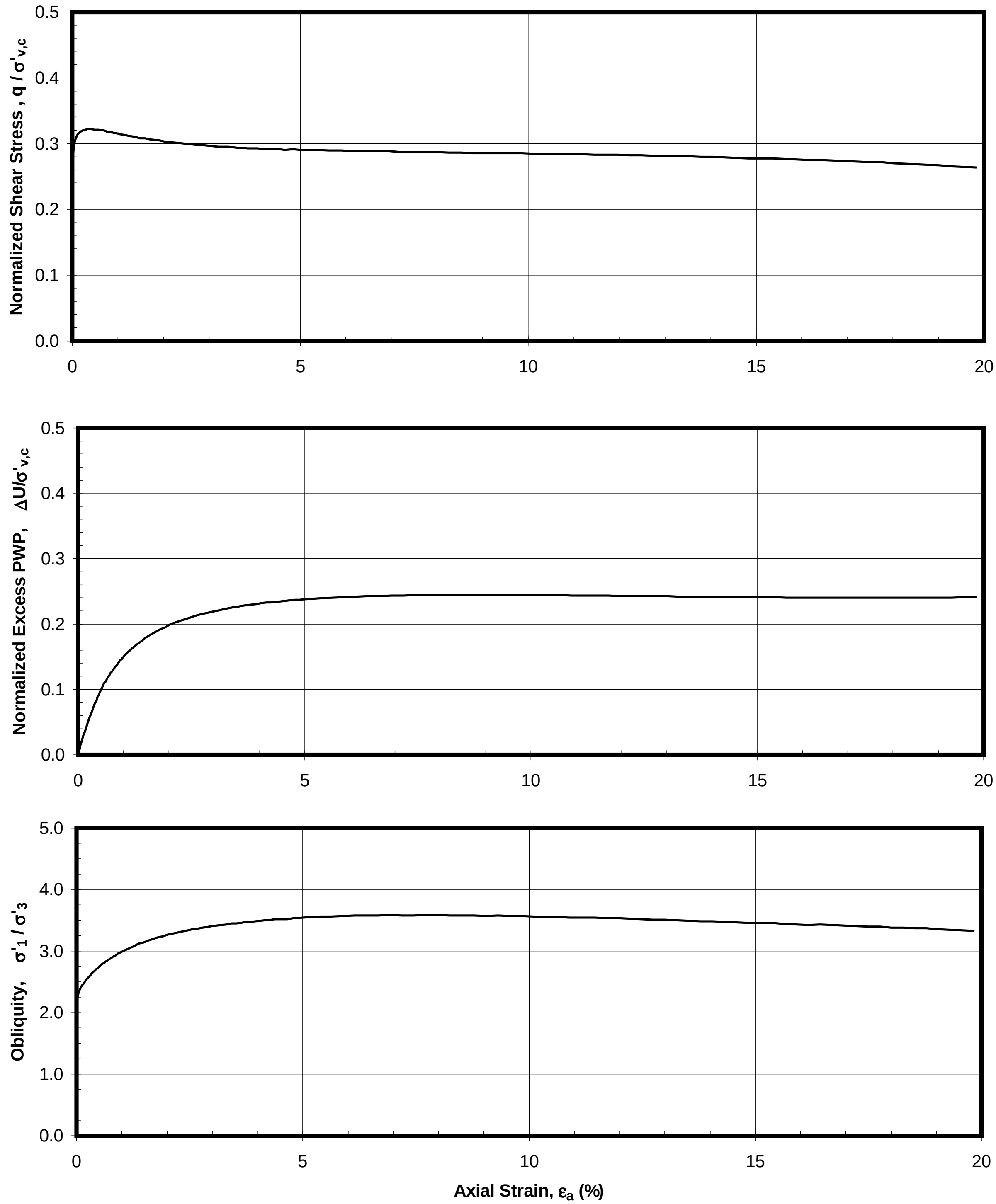
Sample: 6b - Depth: 54.00 ft

Boring B-33

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-25b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

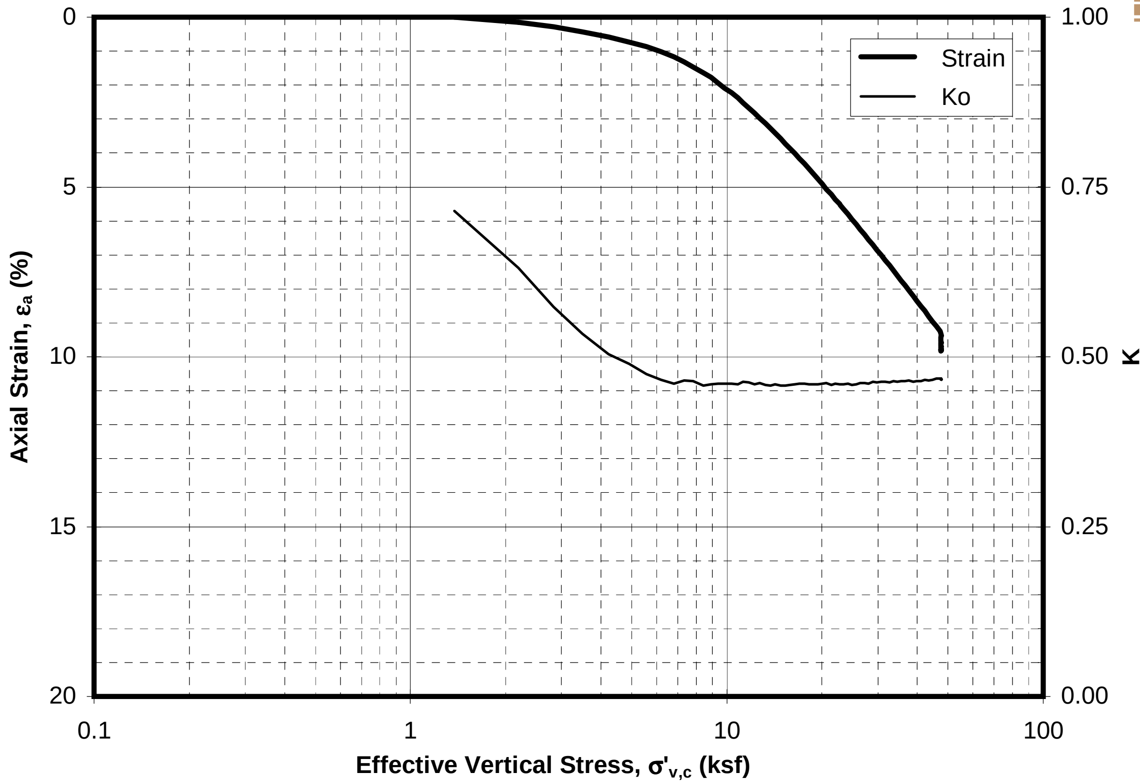
Sample: 5a - Depth: 42.30 ft

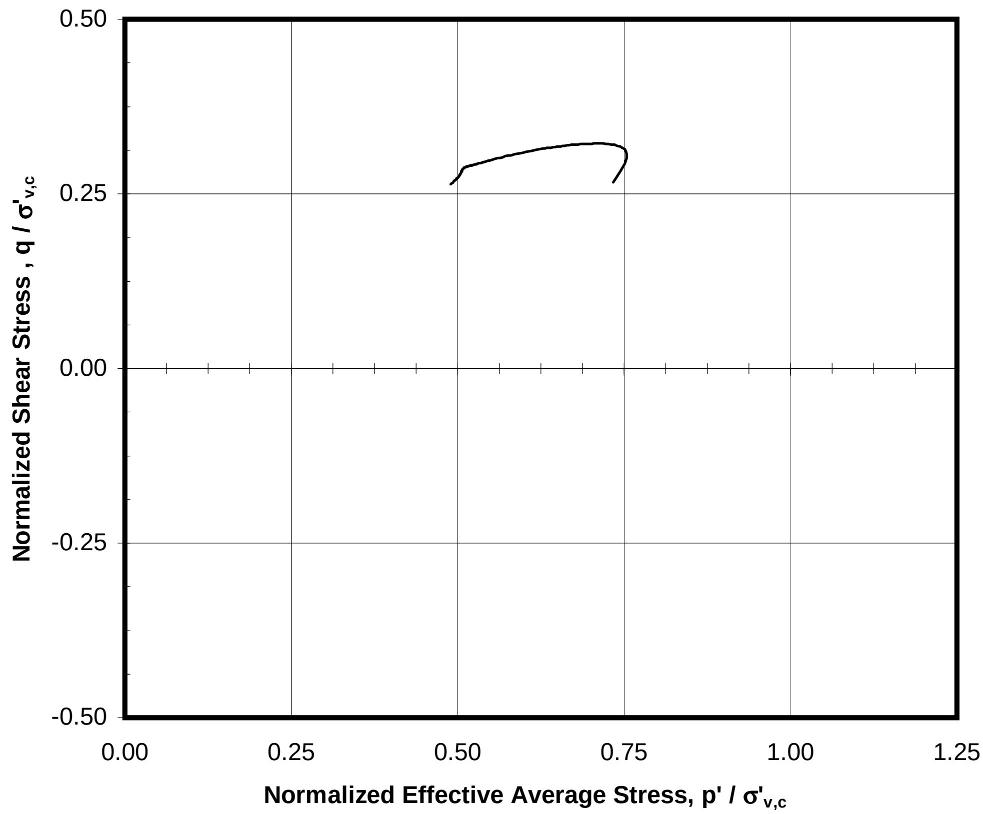
Boring B-37

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-26a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

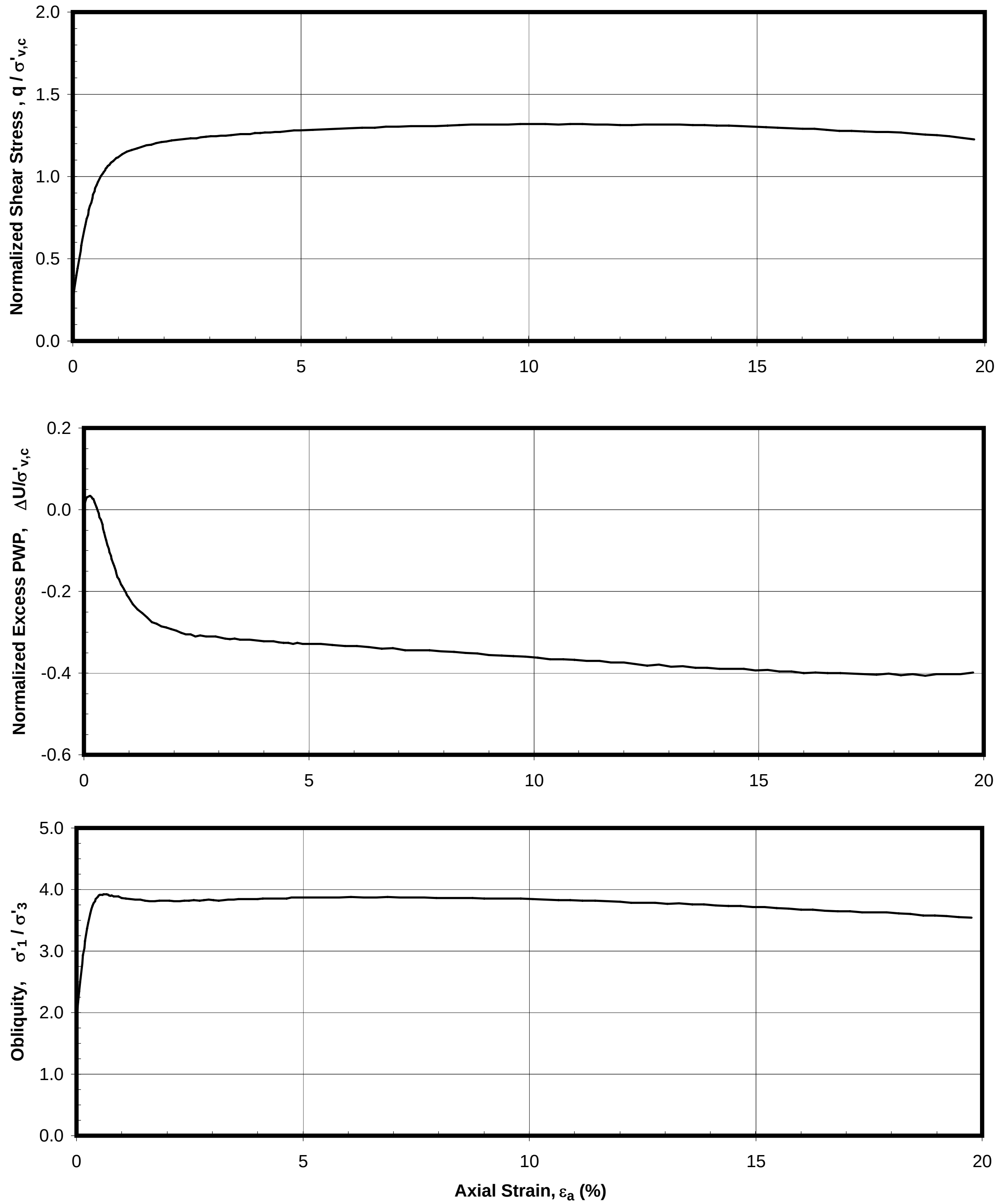
Sample: 5a - Depth: 42.30 ft

Boring B-37

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-26b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 5.06

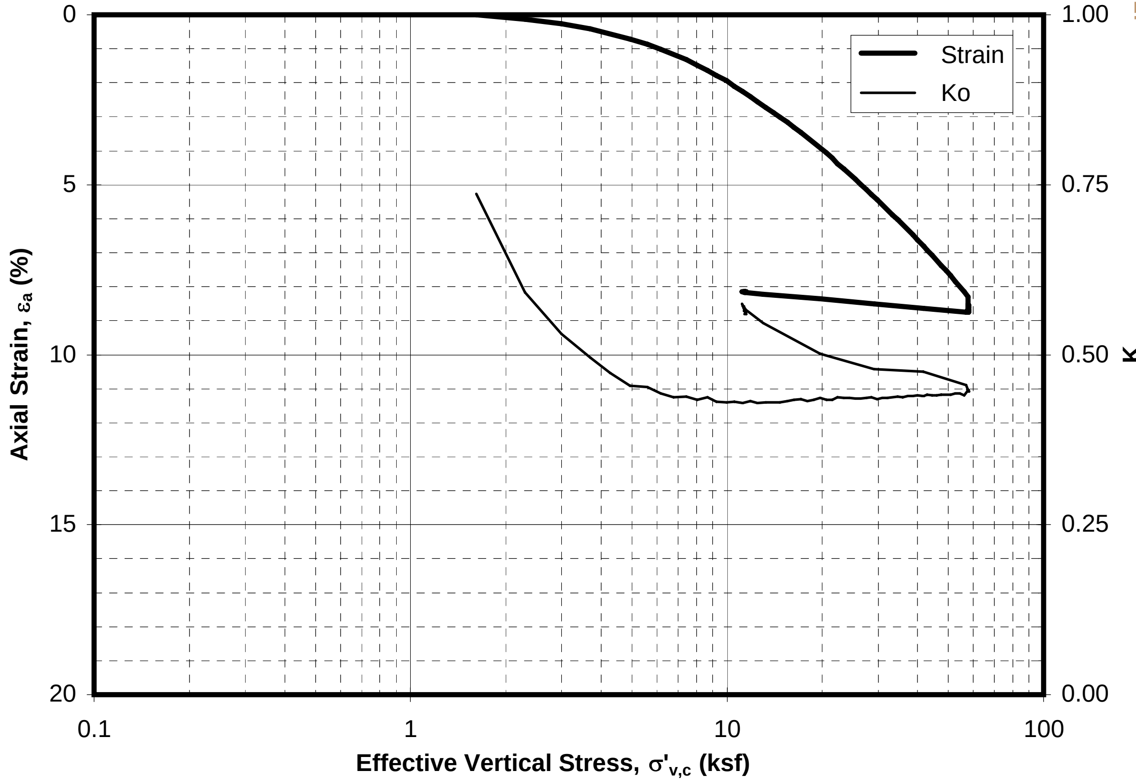
Sample: 7d - Depth: 36.95 ft

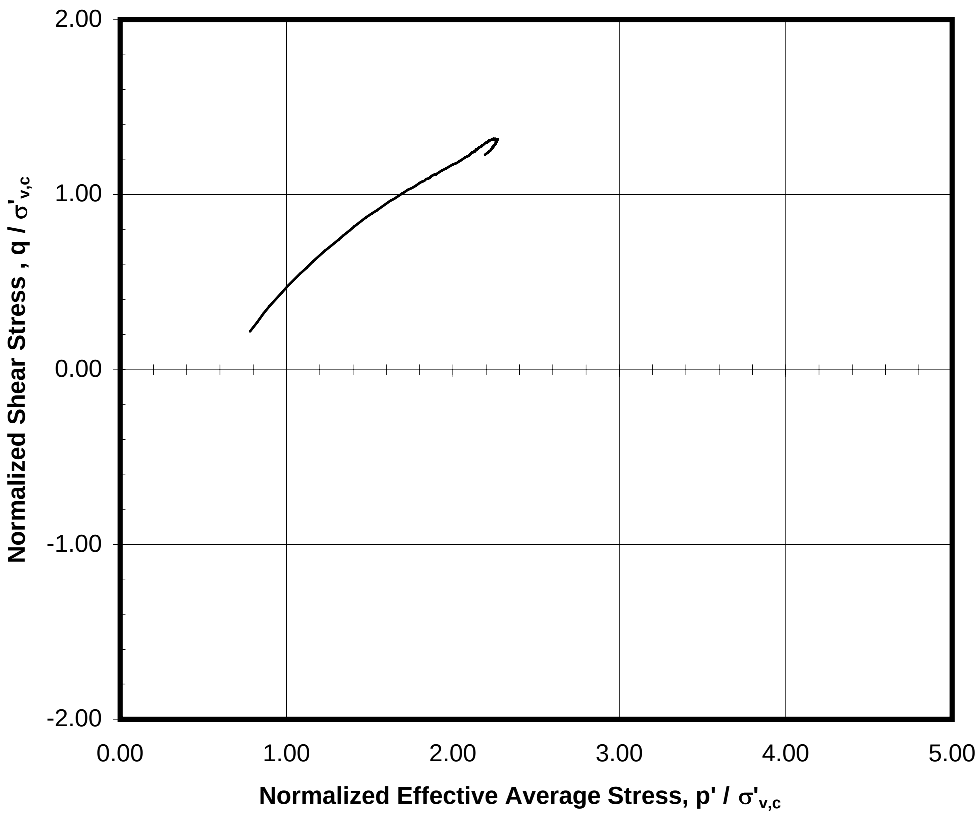
Boring B-42

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-27a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 5.06

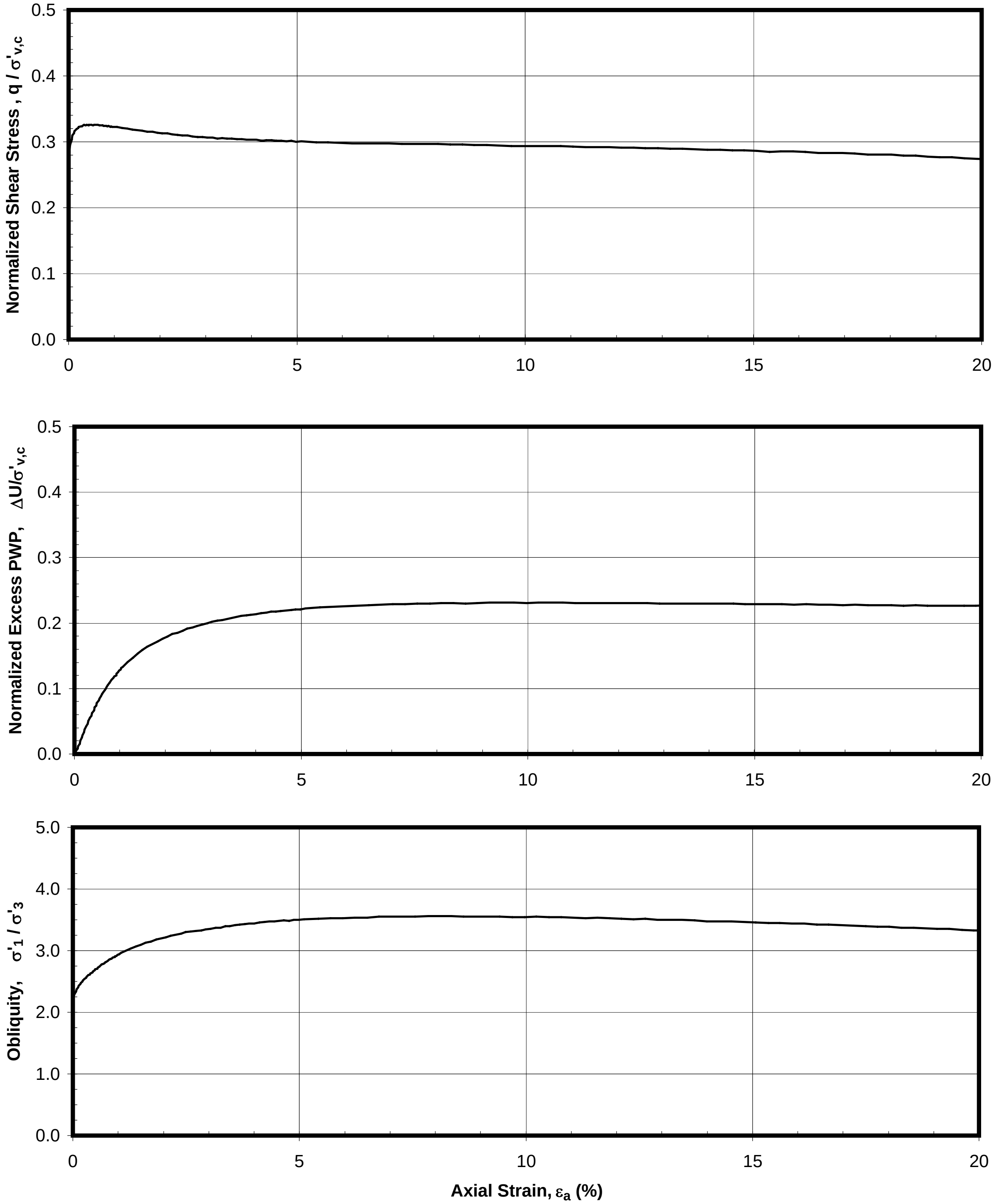
Sample: 7d - Depth: 36.95 ft

Boring B-42

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-27b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

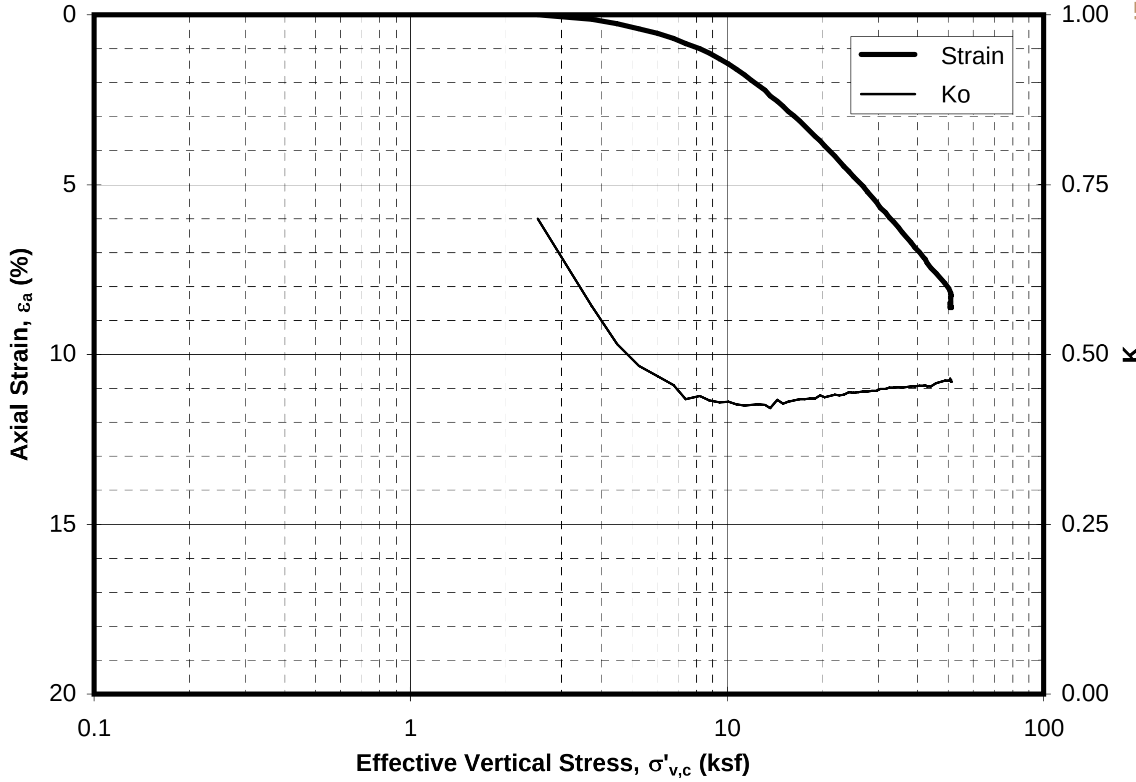
Sample: 11a - Depth: 74.35 ft

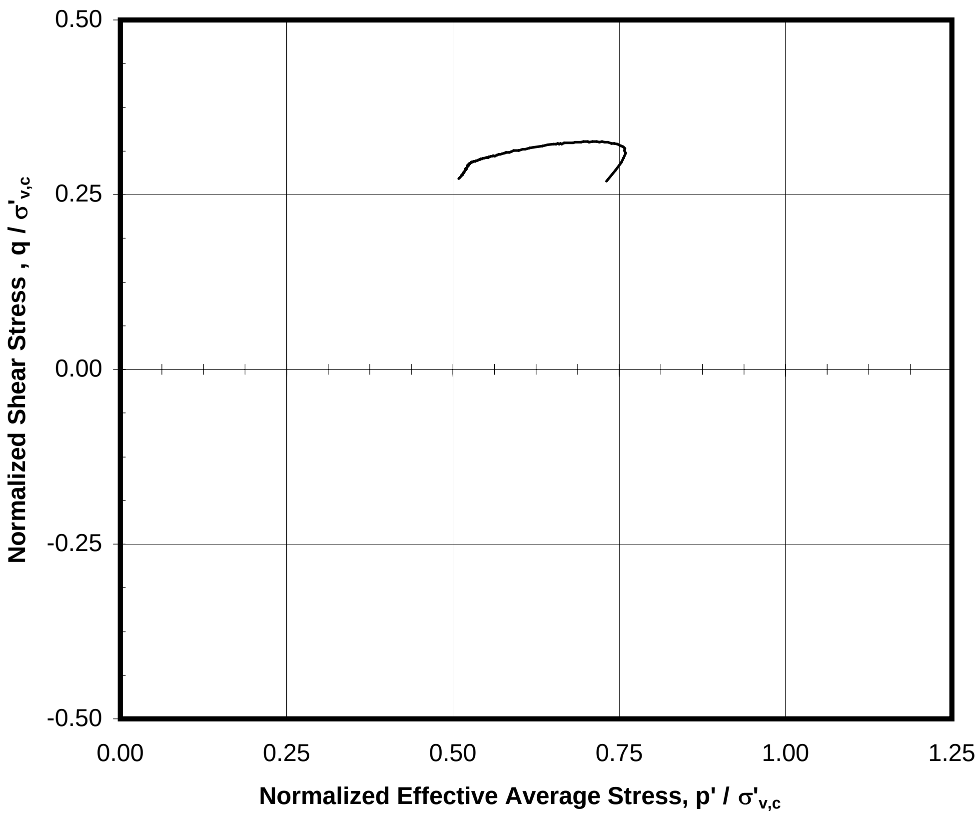
Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-28a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

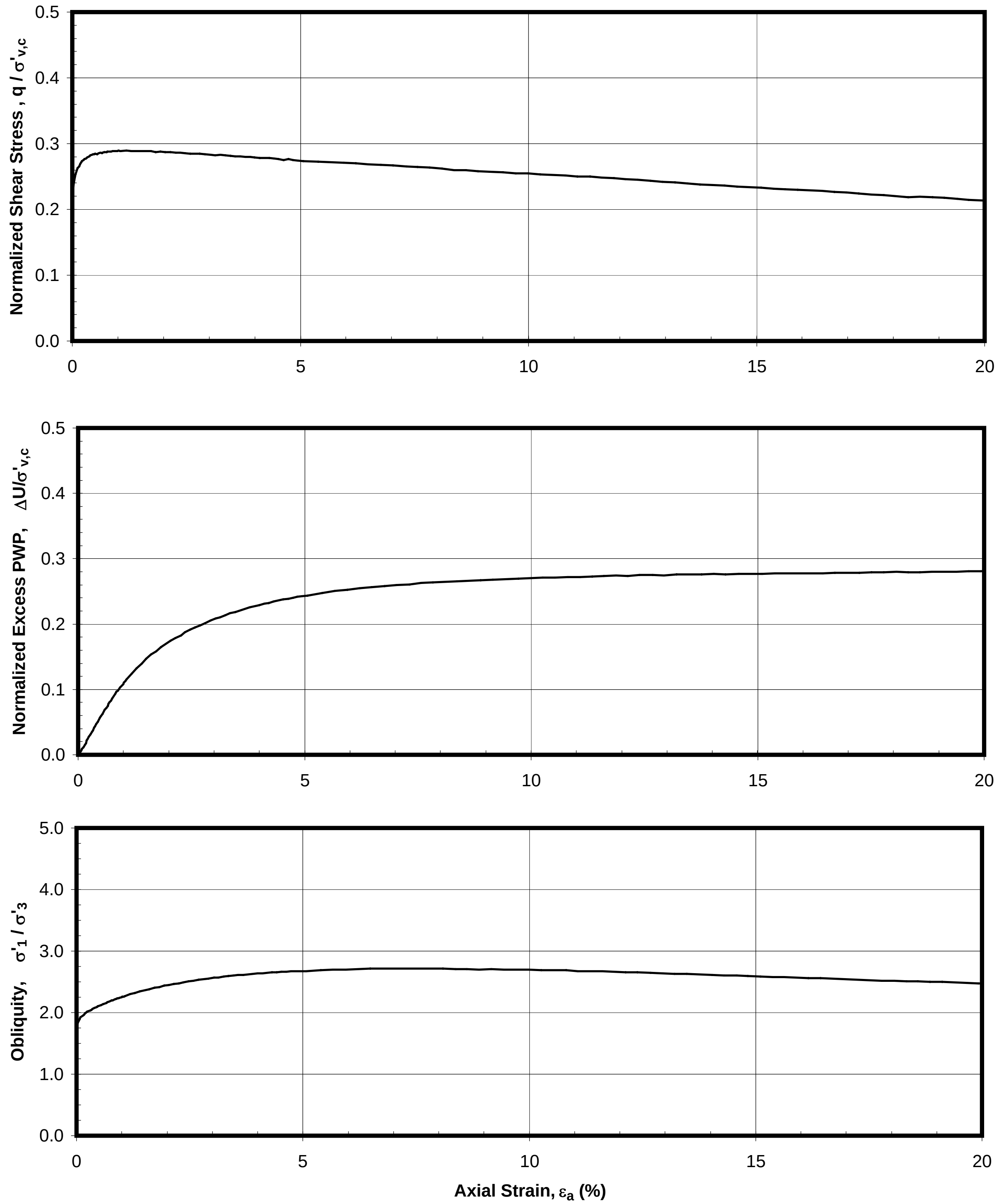
Sample: 11a - Depth: 74.35 ft

Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-28b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

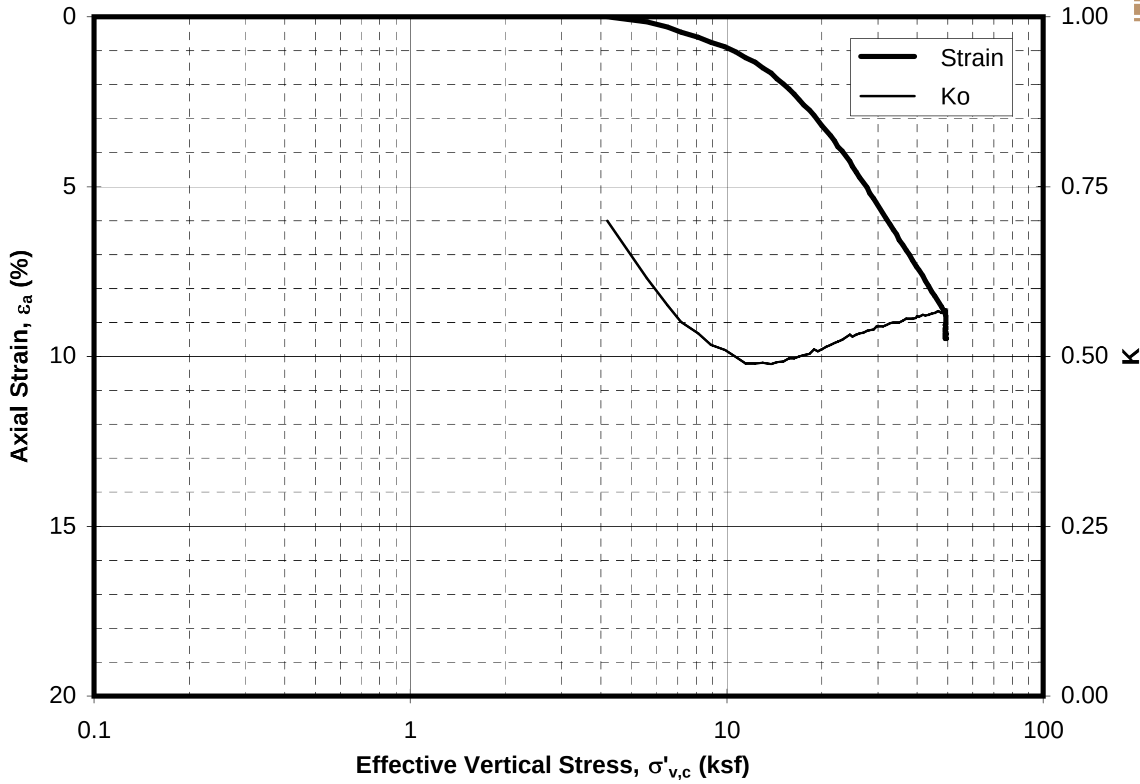
Sample: 18a - Depth: 132.40 ft

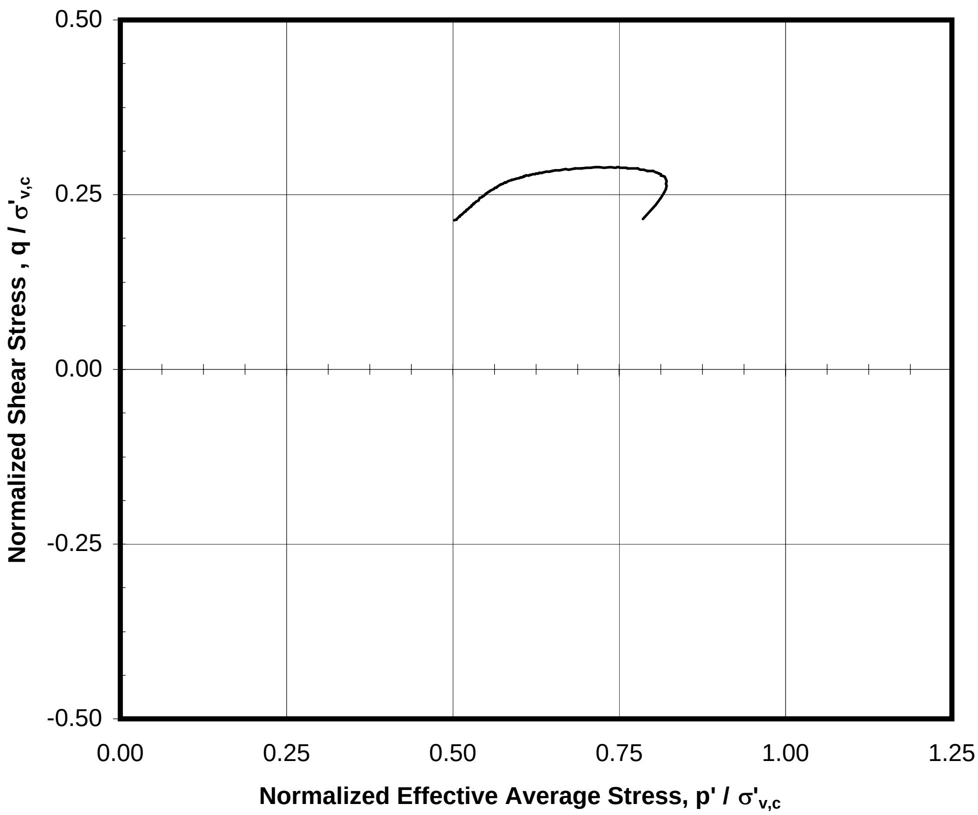
Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-29a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

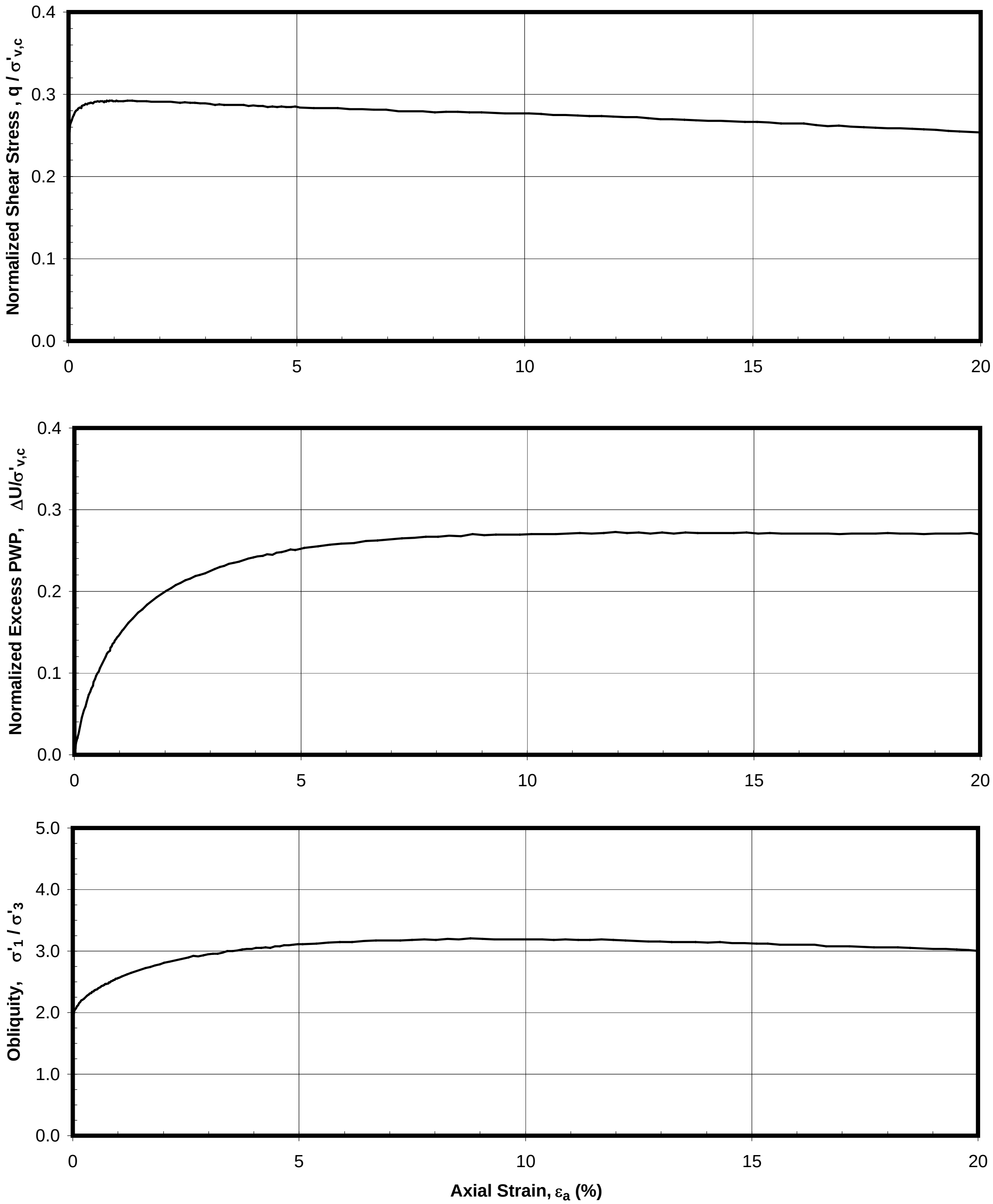
Sample: 18a - Depth: 132.40 ft

Boring B-60

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-29b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

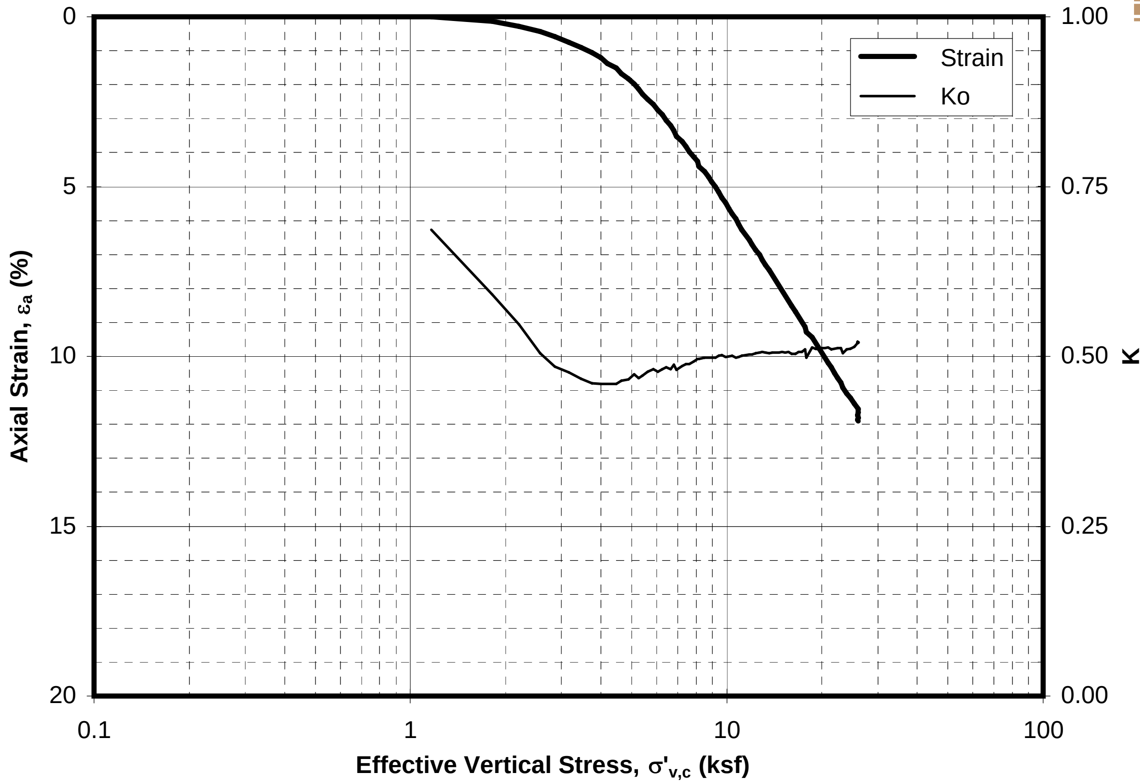
Sample: 5d - Depth: 31.50 ft

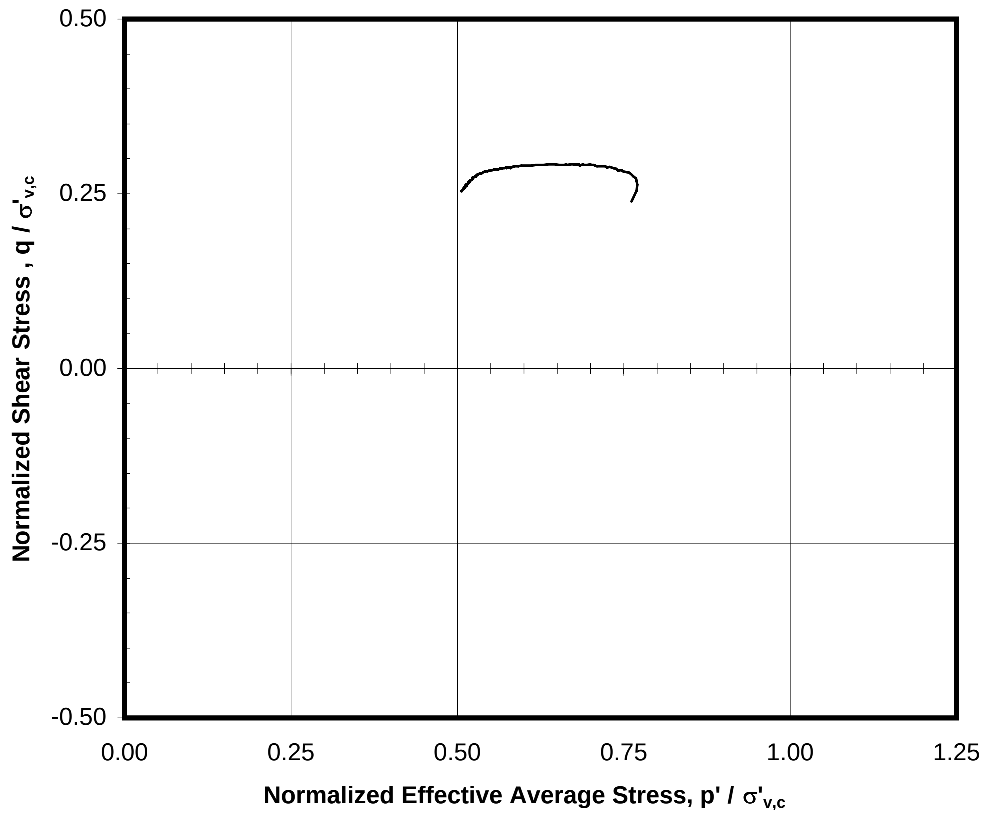
Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-30a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

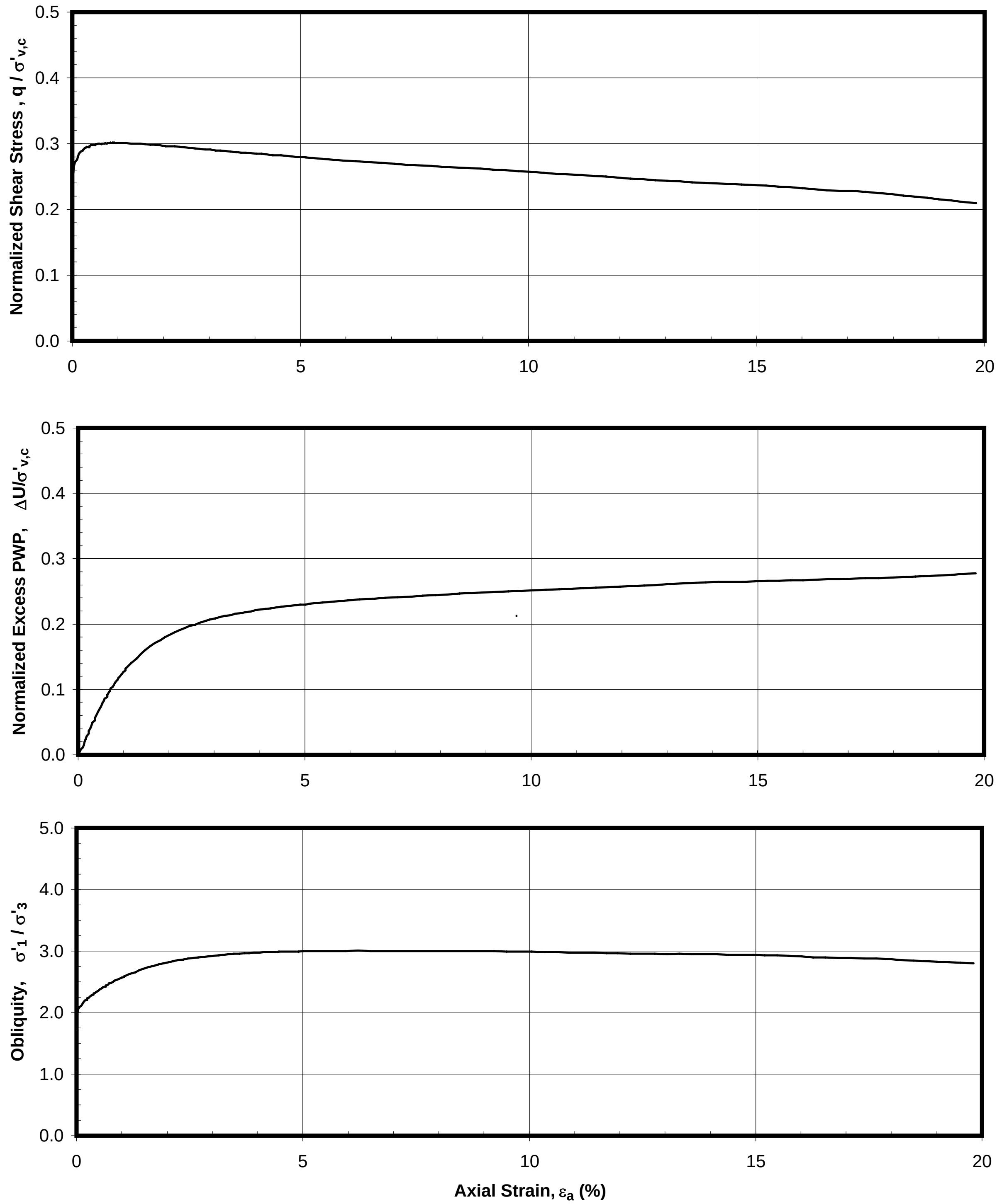
Sample: 5d - Depth: 31.50 ft

Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-30b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

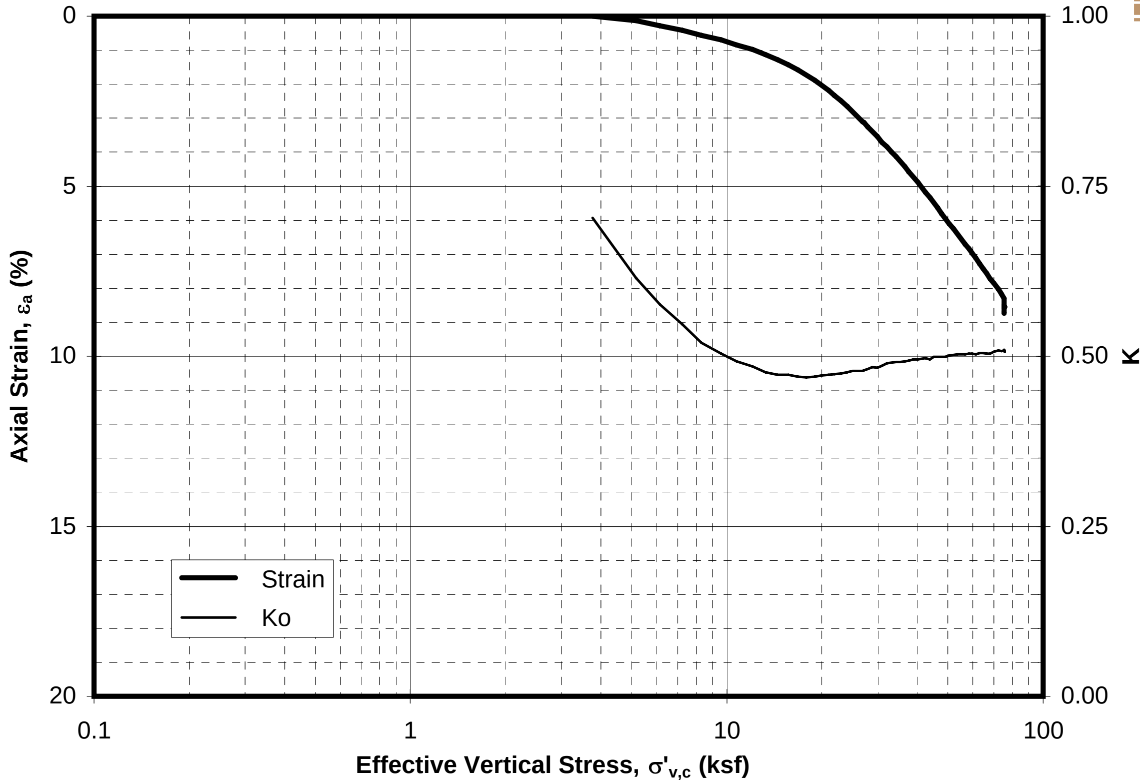
Sample: 19b - Depth: 116.90 ft

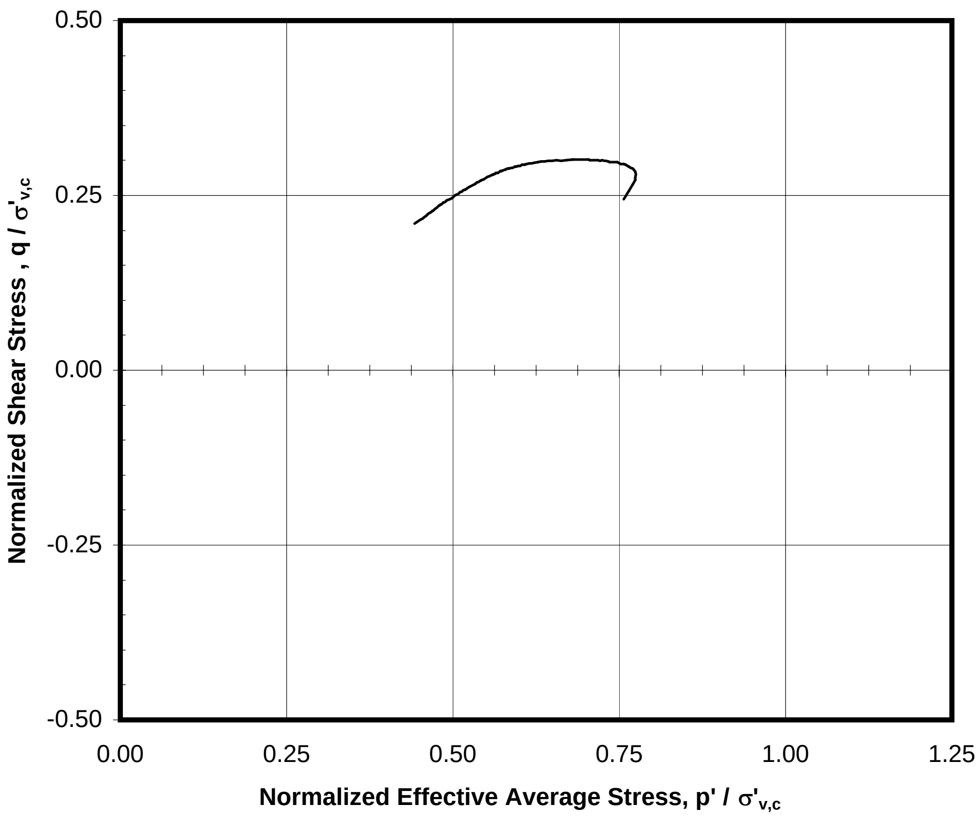
Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-31a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

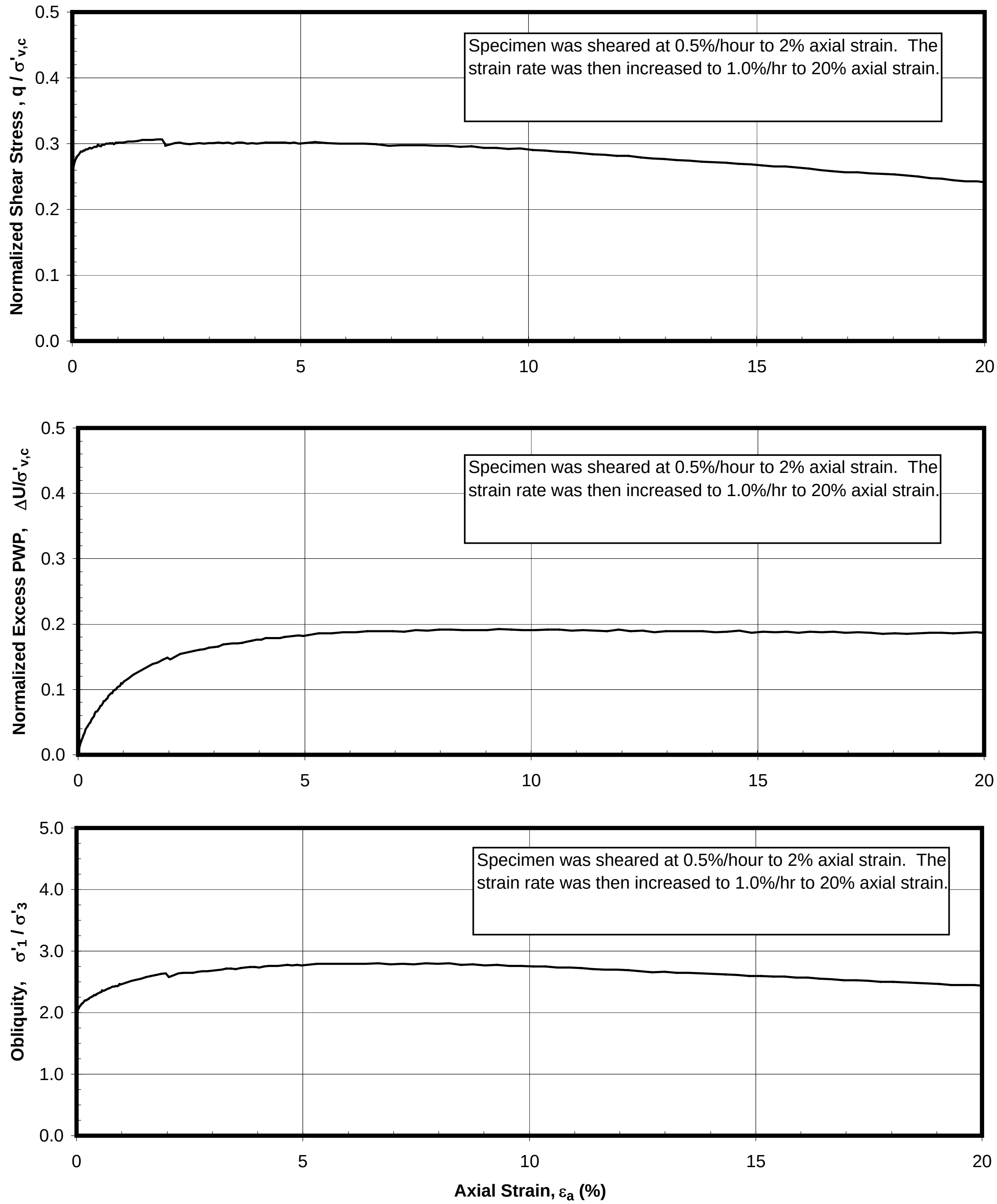
Sample: 19b - Depth: 116.90 ft

Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-31b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

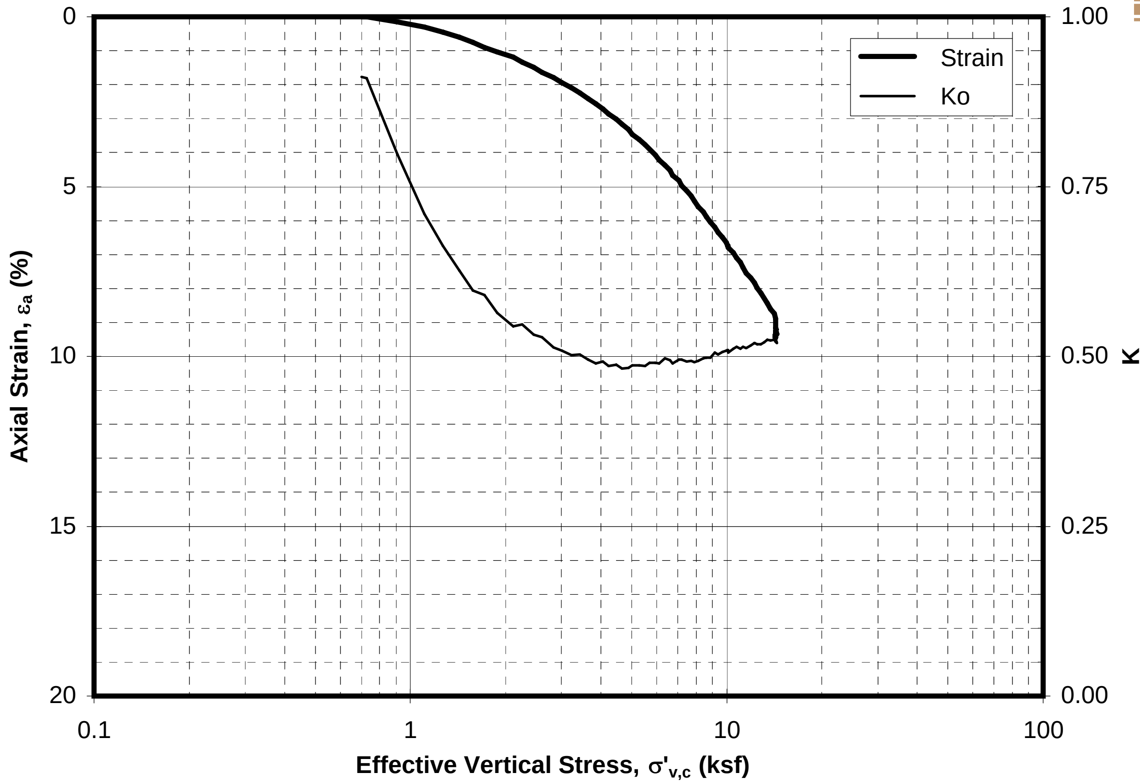
Sample: 3a - Depth: 13.10 ft

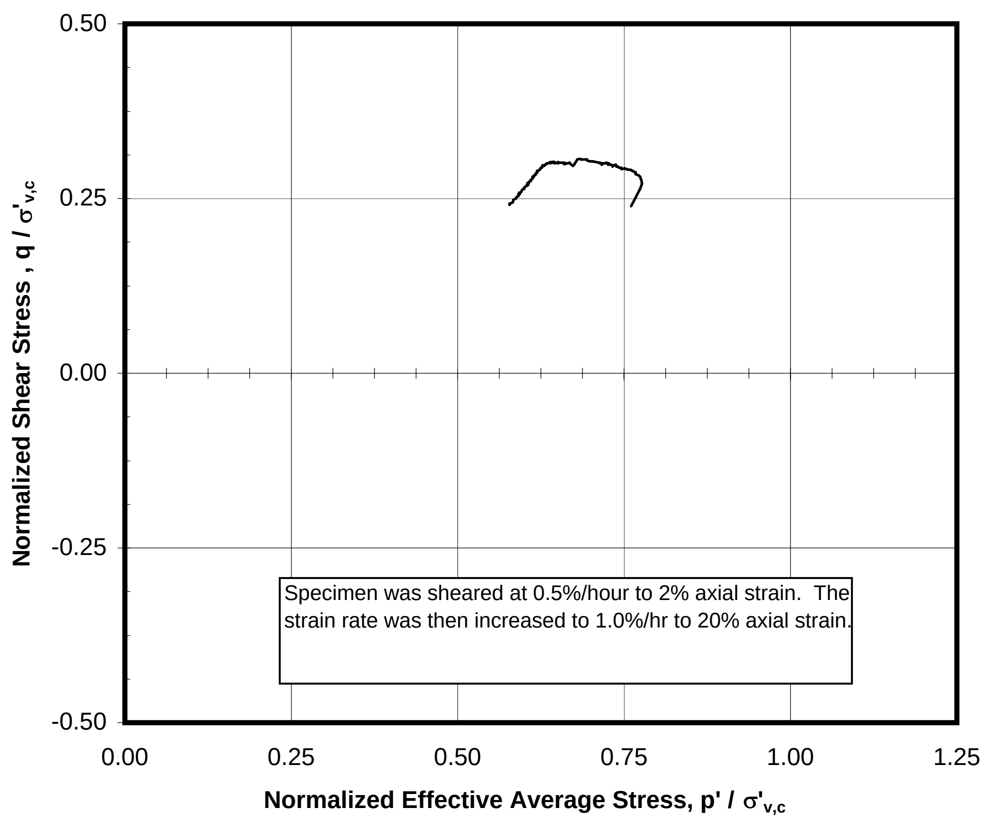
Boring B-68

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-32a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

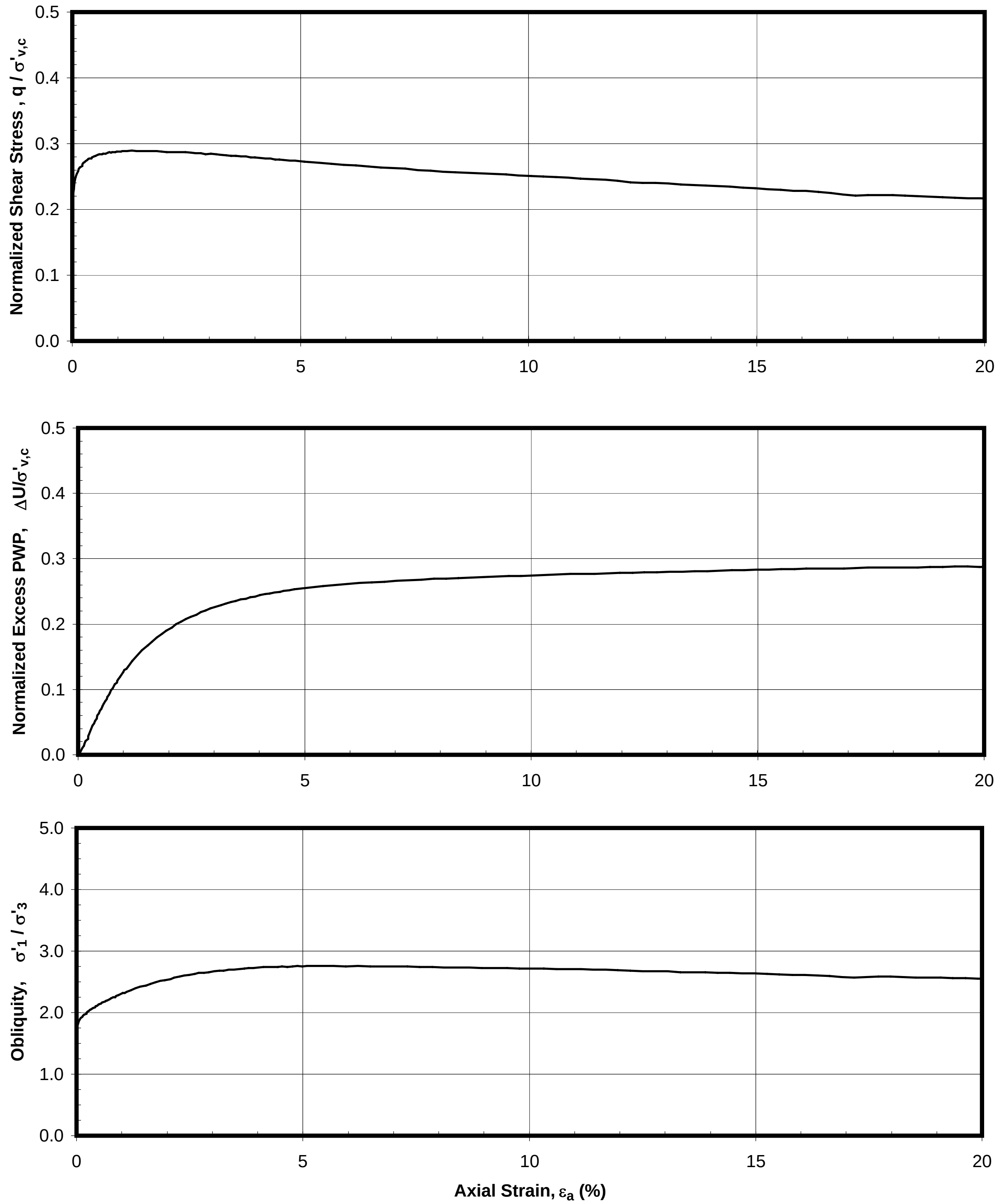
Sample: 3a - Depth: 13.10 ft

Boring B-68

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-32b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

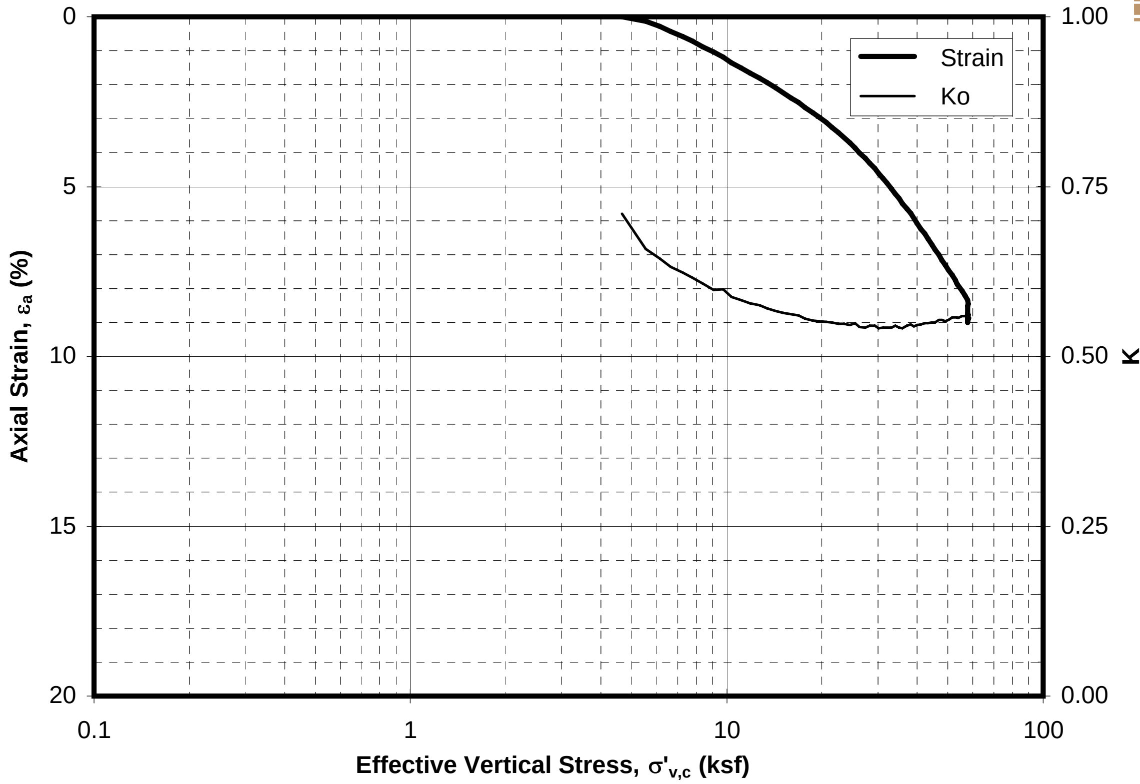
Sample: 18b - Depth: 149.40 ft

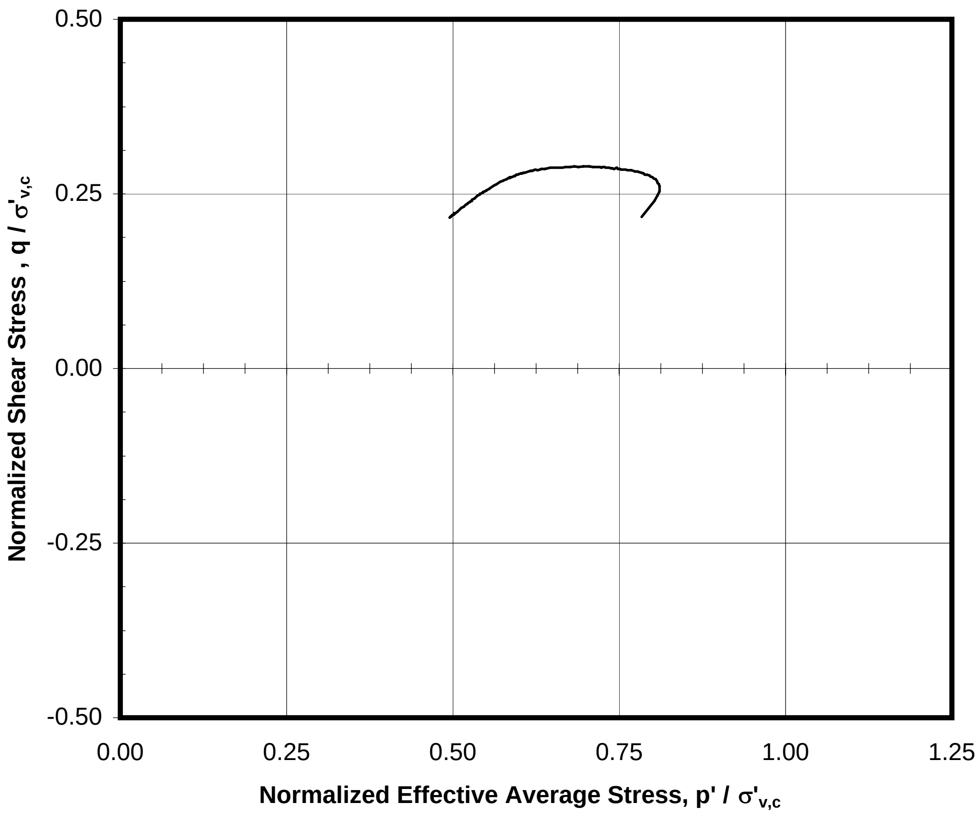
Boring B-68

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-33a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

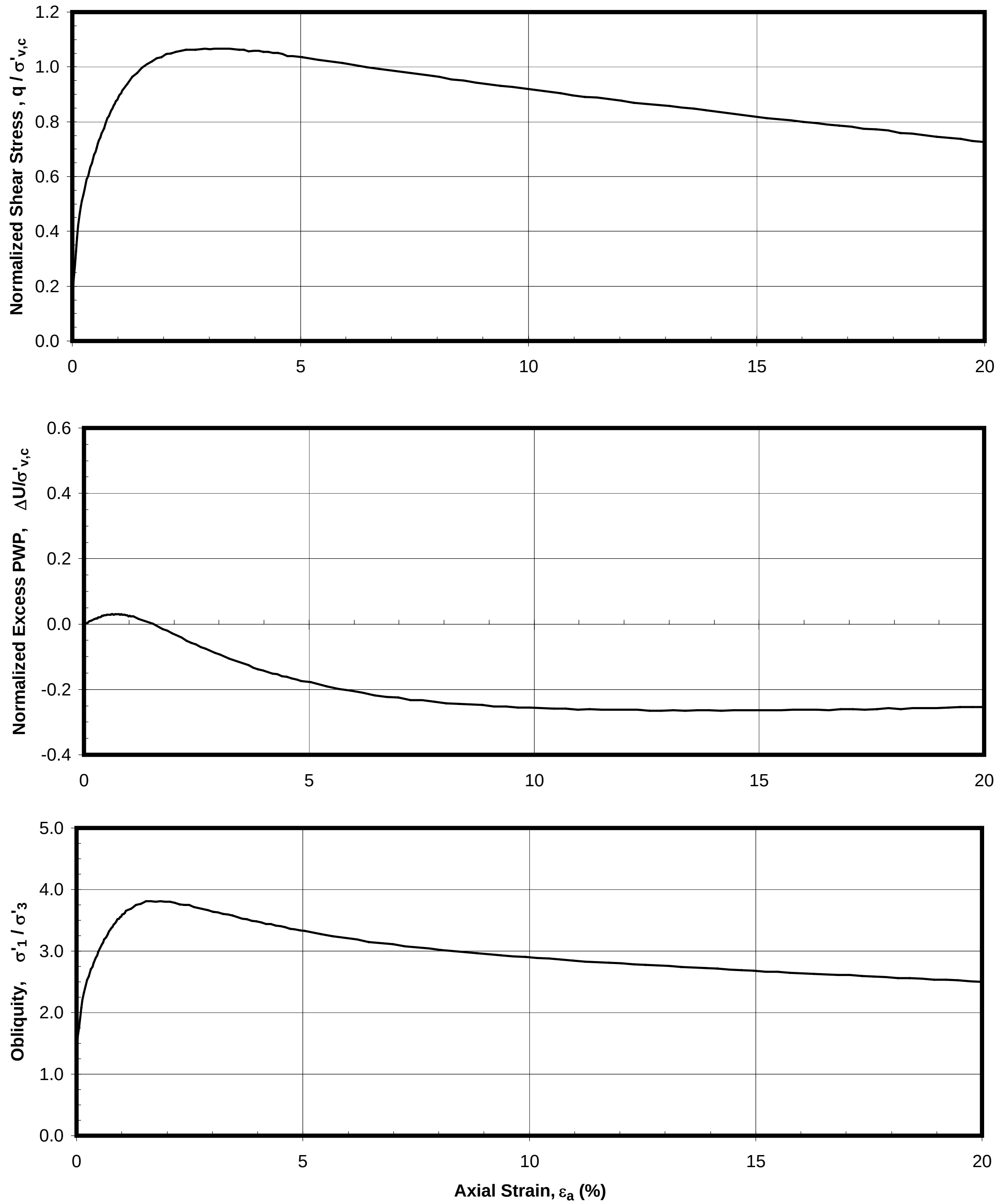
Sample: 18b - Depth: 149.40 ft

Boring B-68

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-33b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 4.25

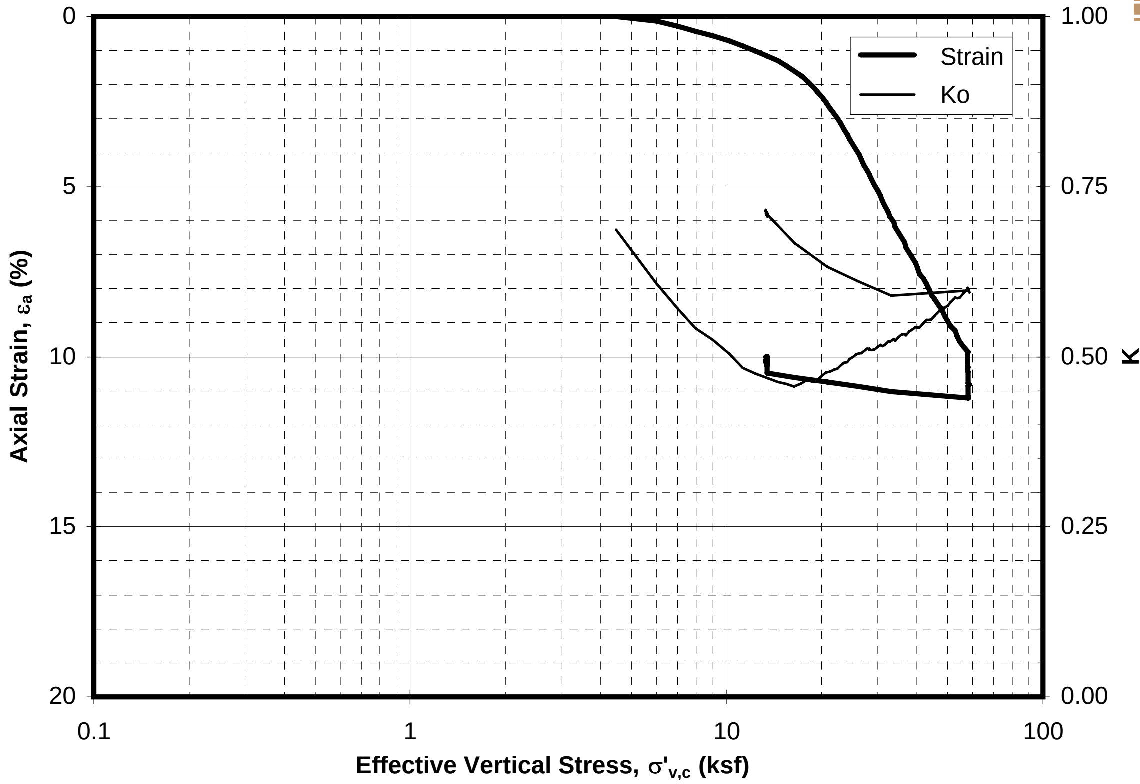
Sample: 35b - Depth: 136.80 ft

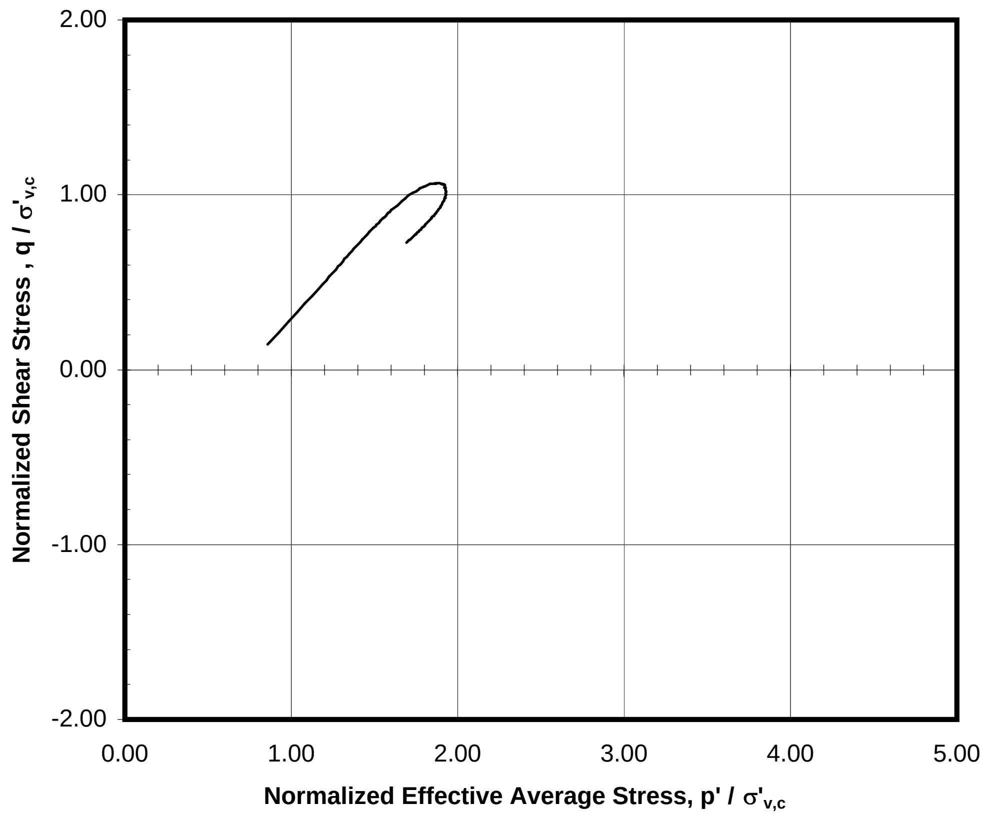
Boring B-70

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-34a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 4.25

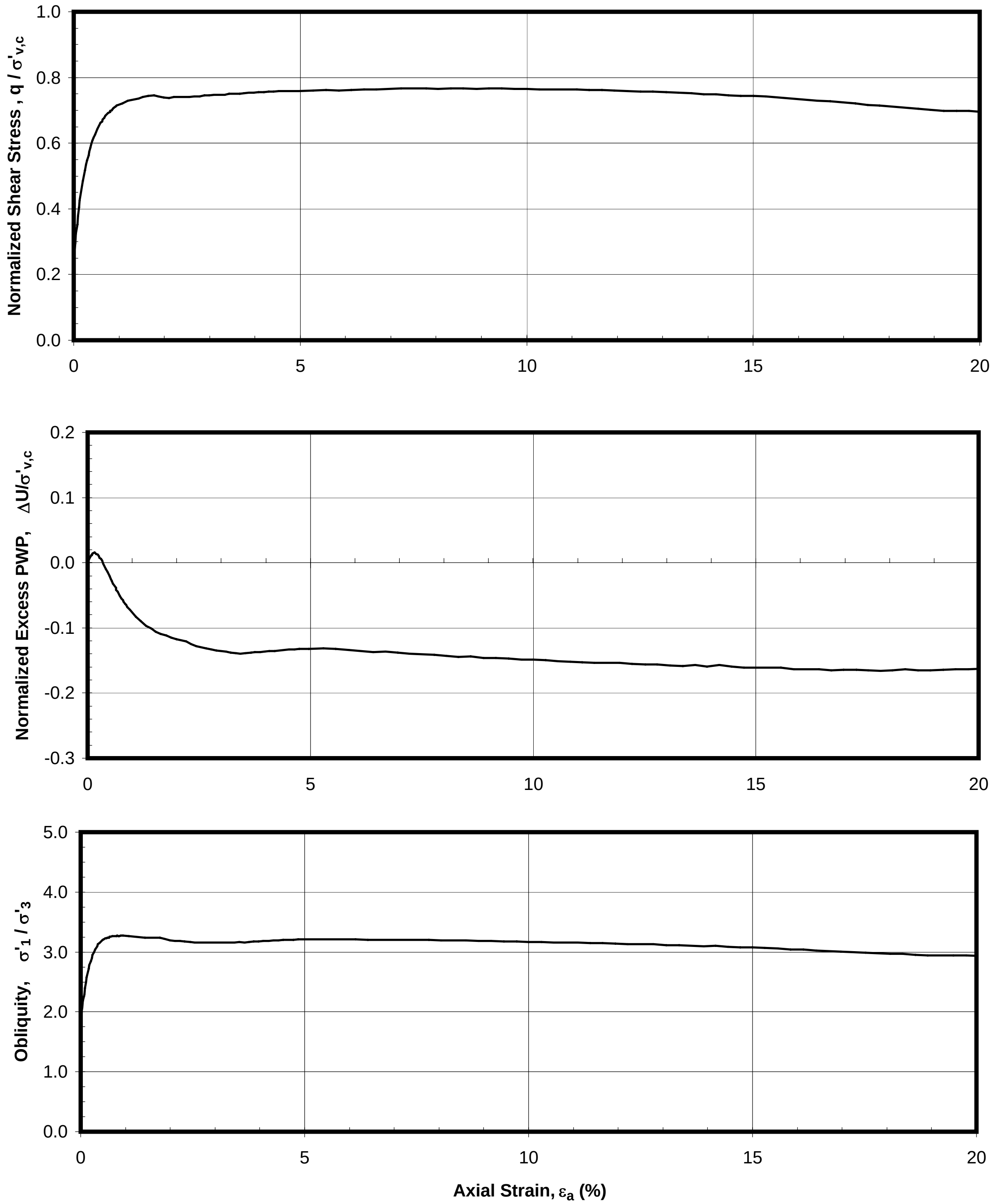
Sample: 35b - Depth: 136.80 ft

Boring B-70

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-34b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 2.96

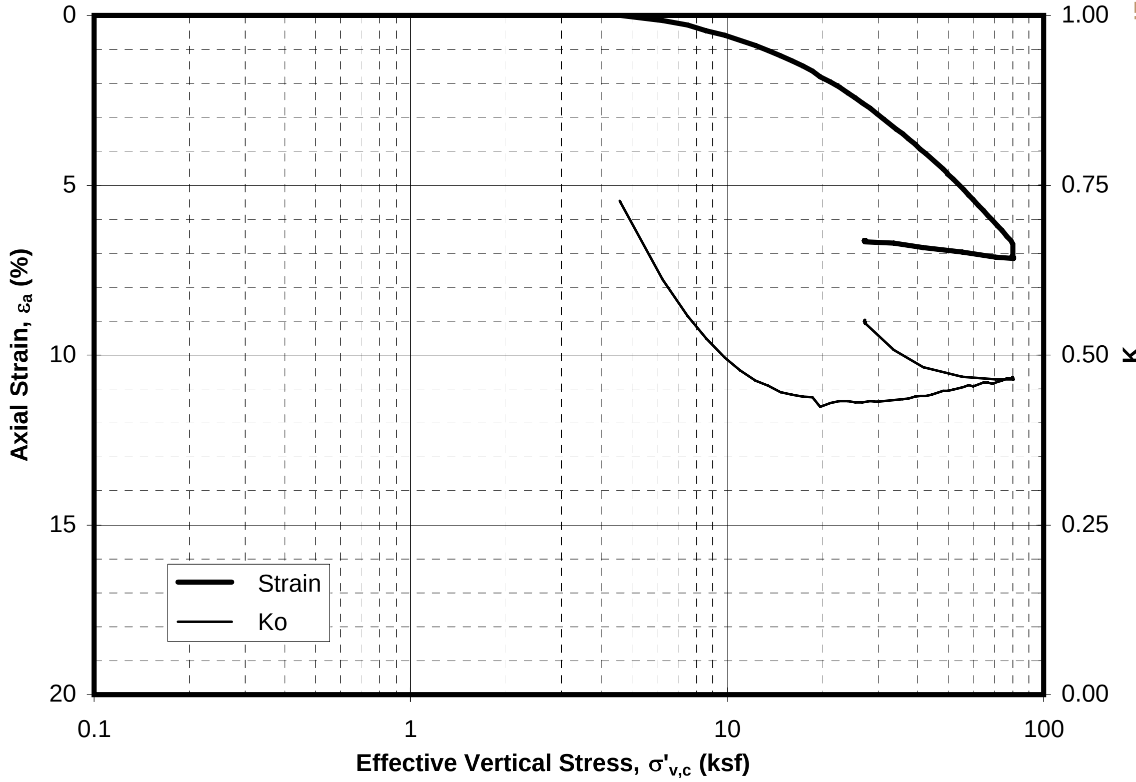
Sample: 15b - Depth: 150.85 ft

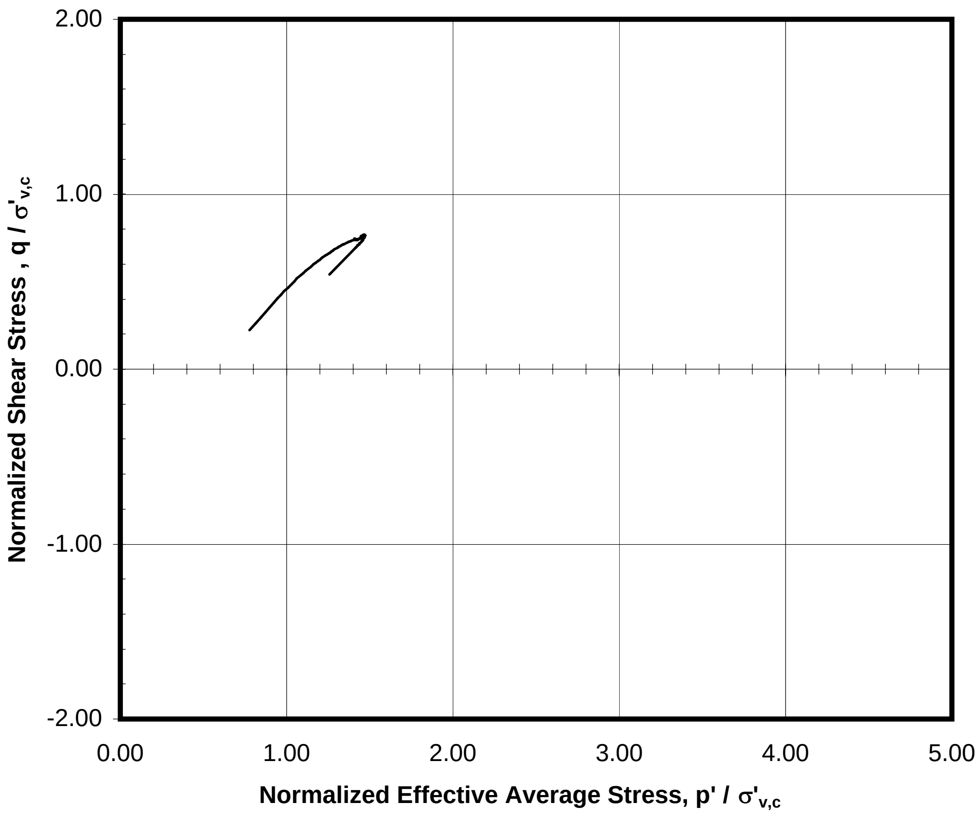
Boring B-75

Tunnel Segmen of SVRT Project

San Jose, California

FIGURE A16-35a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 2.96

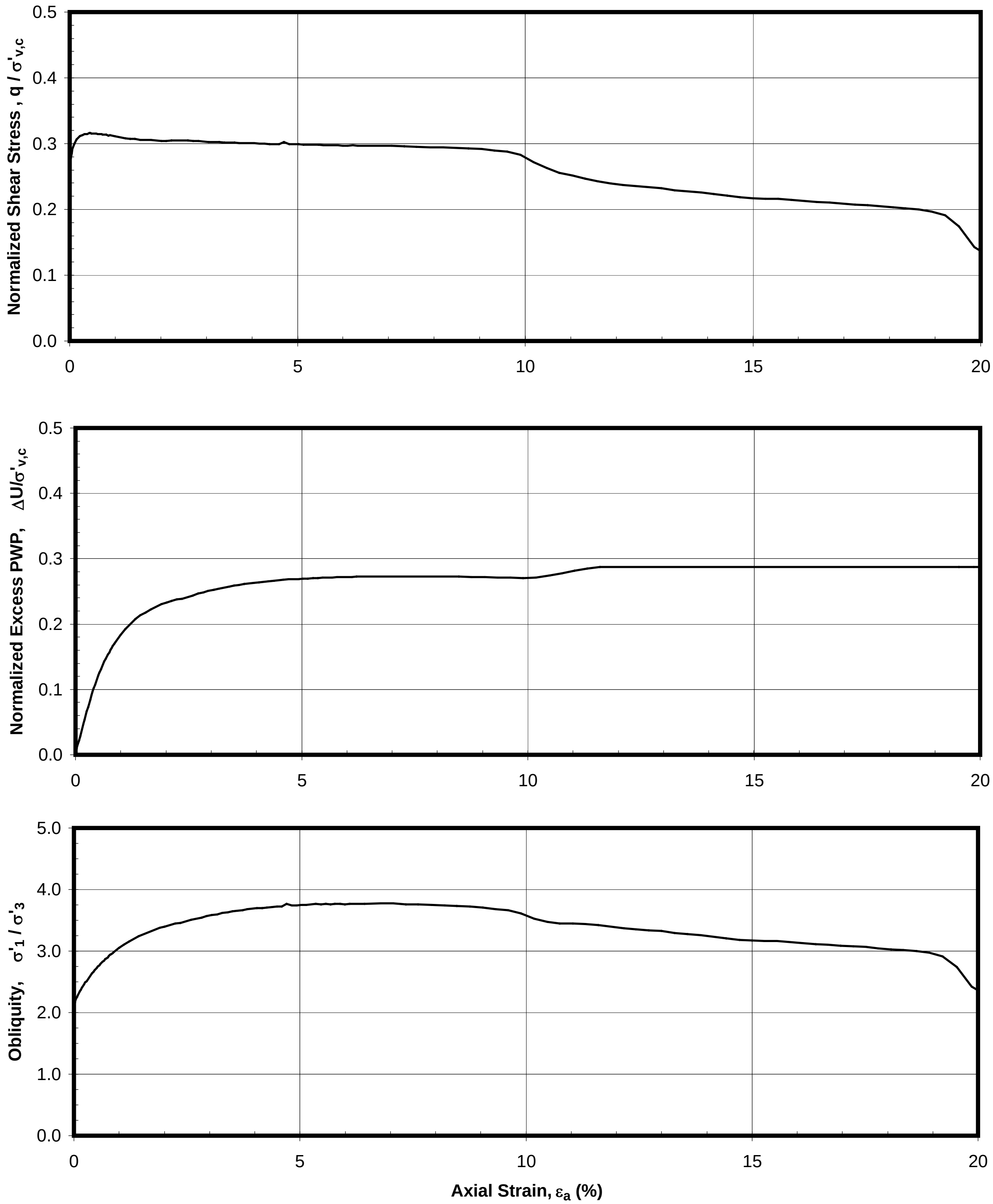
Sample: 15b - Depth: 150.85 ft

Boring B-75

Tunnel Segmen of SVRT Project

San Jose, California

FIGURE A16-35b



Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

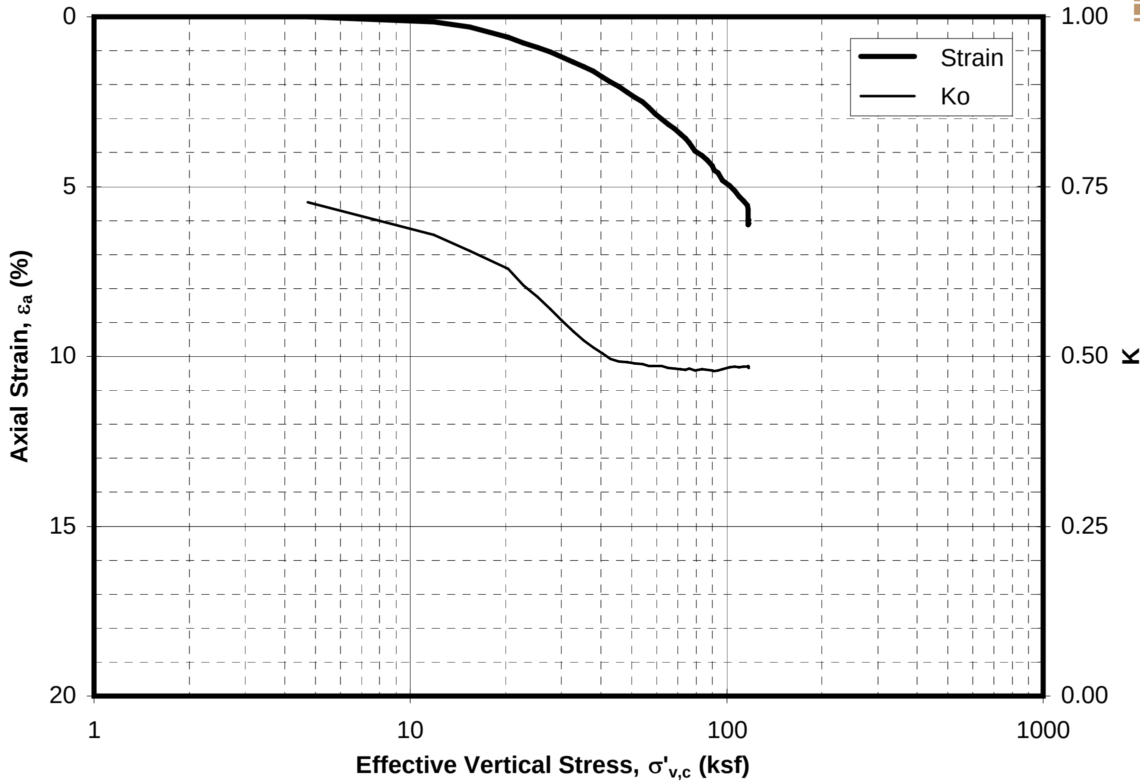
Sample: 16a - Depth: 160.00 ft

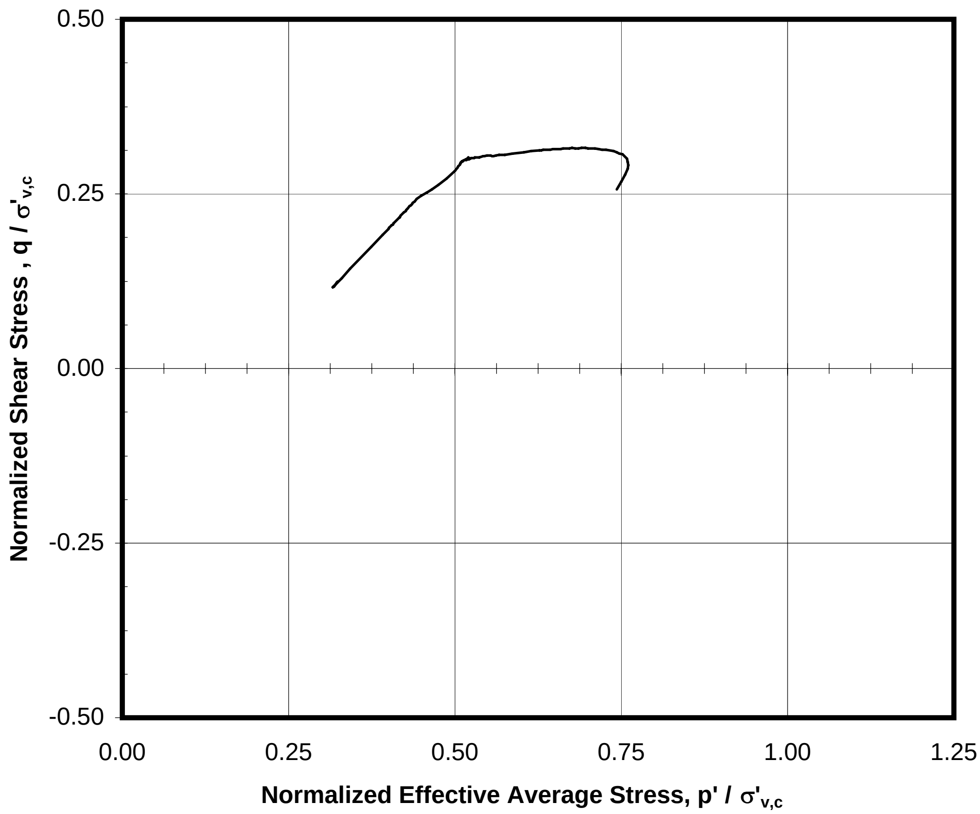
Boring B-75

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-36a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

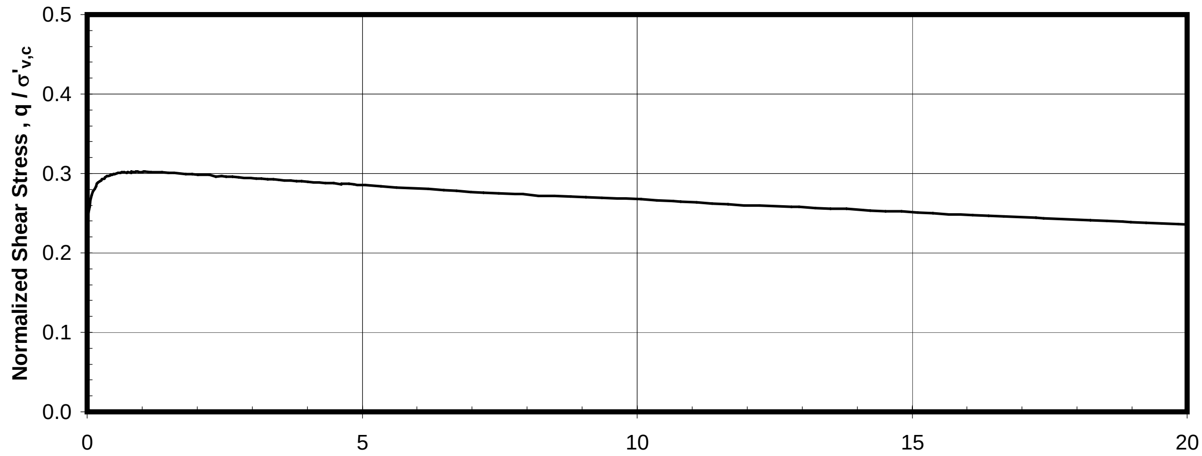
Sample: 16a - Depth: 160.00 ft

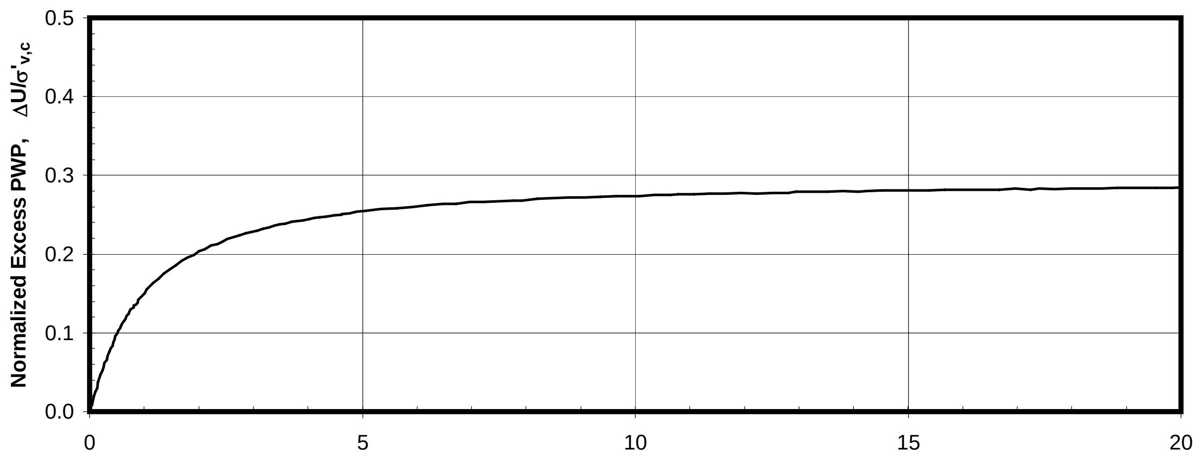
Boring B-75

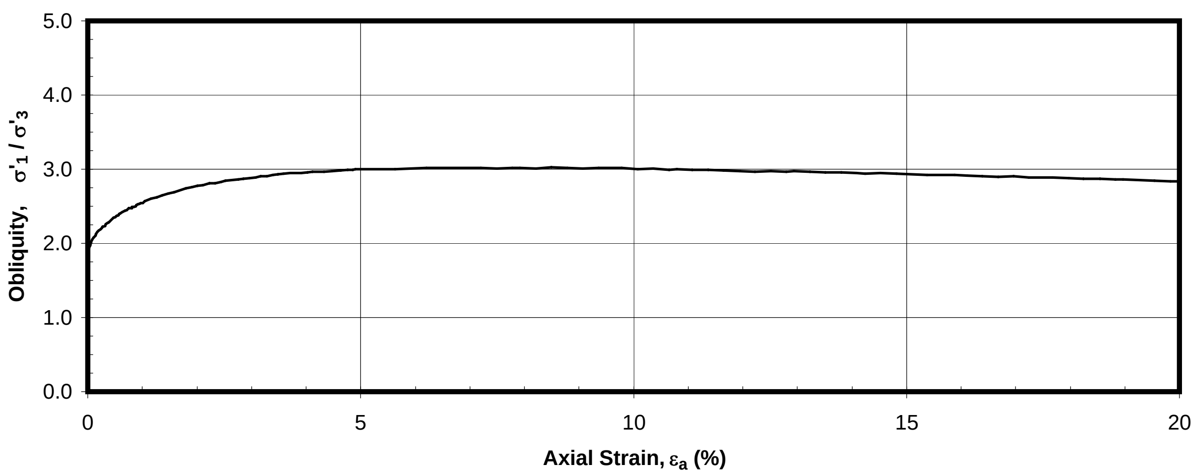
Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-36b







Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

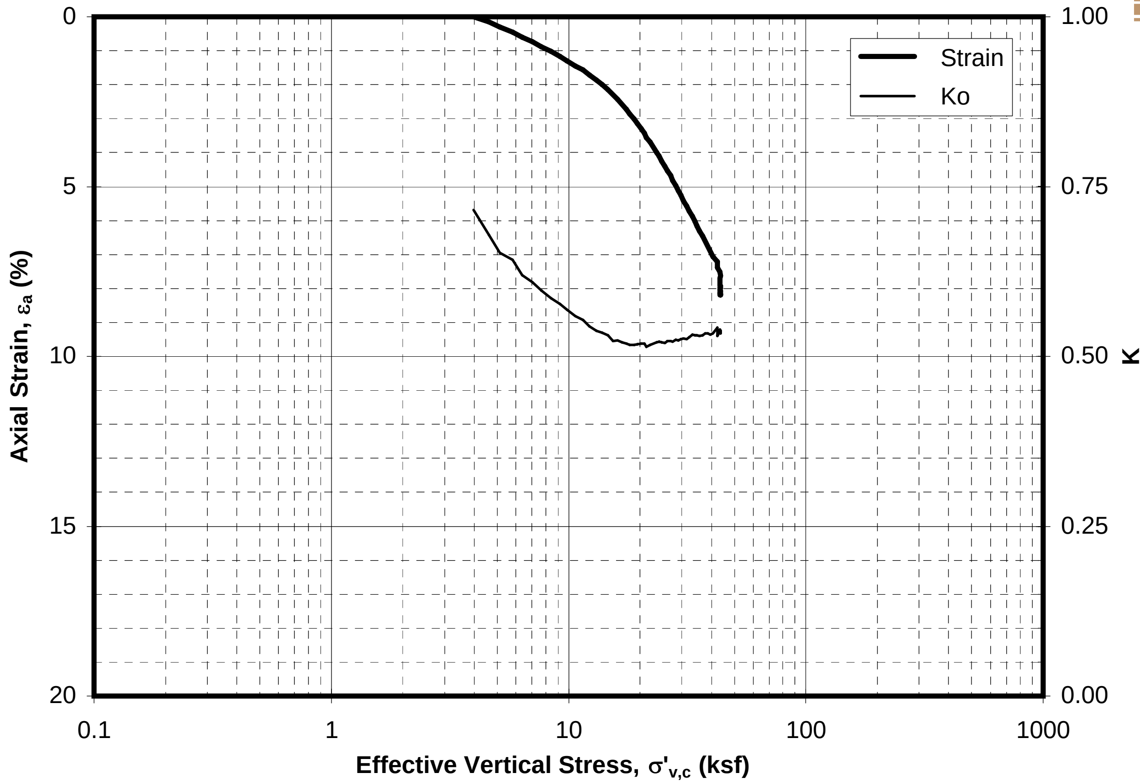
Sample: 16b - Depth: 101.45 ft

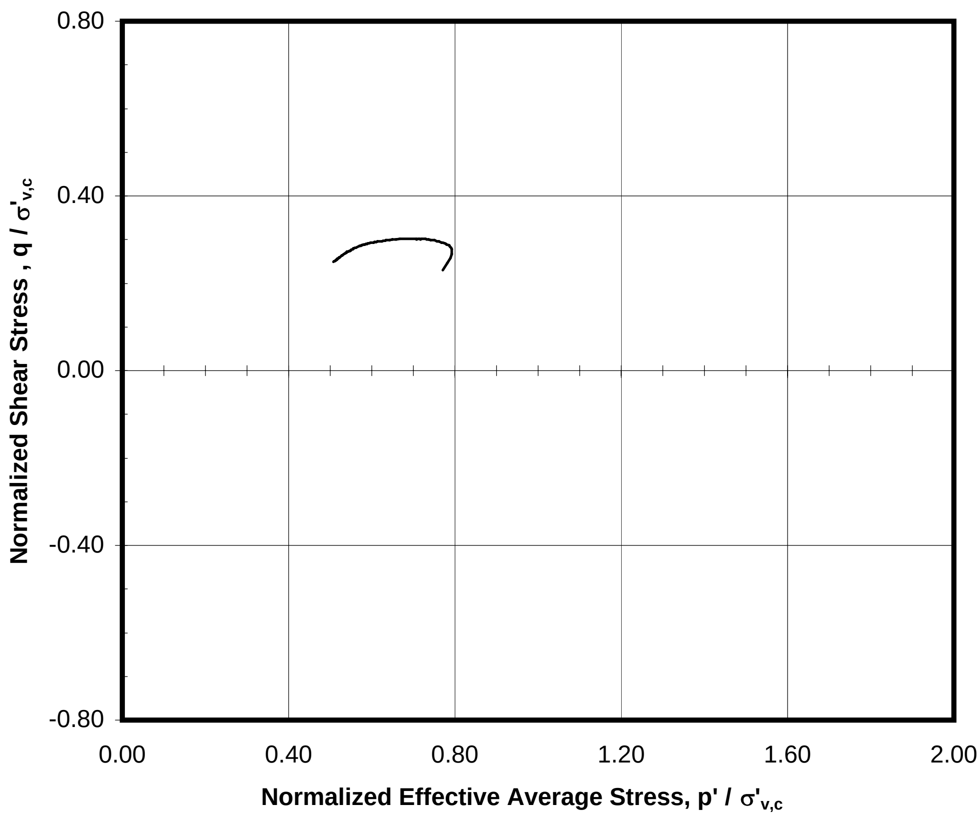
Boring B-77

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-37a





Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Test Induced OCR = 1

Sample: 16b - Depth: 101.45 ft

Boring B-77

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A16-37b

APPENDIX 17

K_0-CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS (BISHOP METHOD)

Appendix 17 presents the laboratory results of the K_0-Consolidated Undrained Triaxial tests (Bishop method) performed by Fugro.

FUGRO WEST, INC.

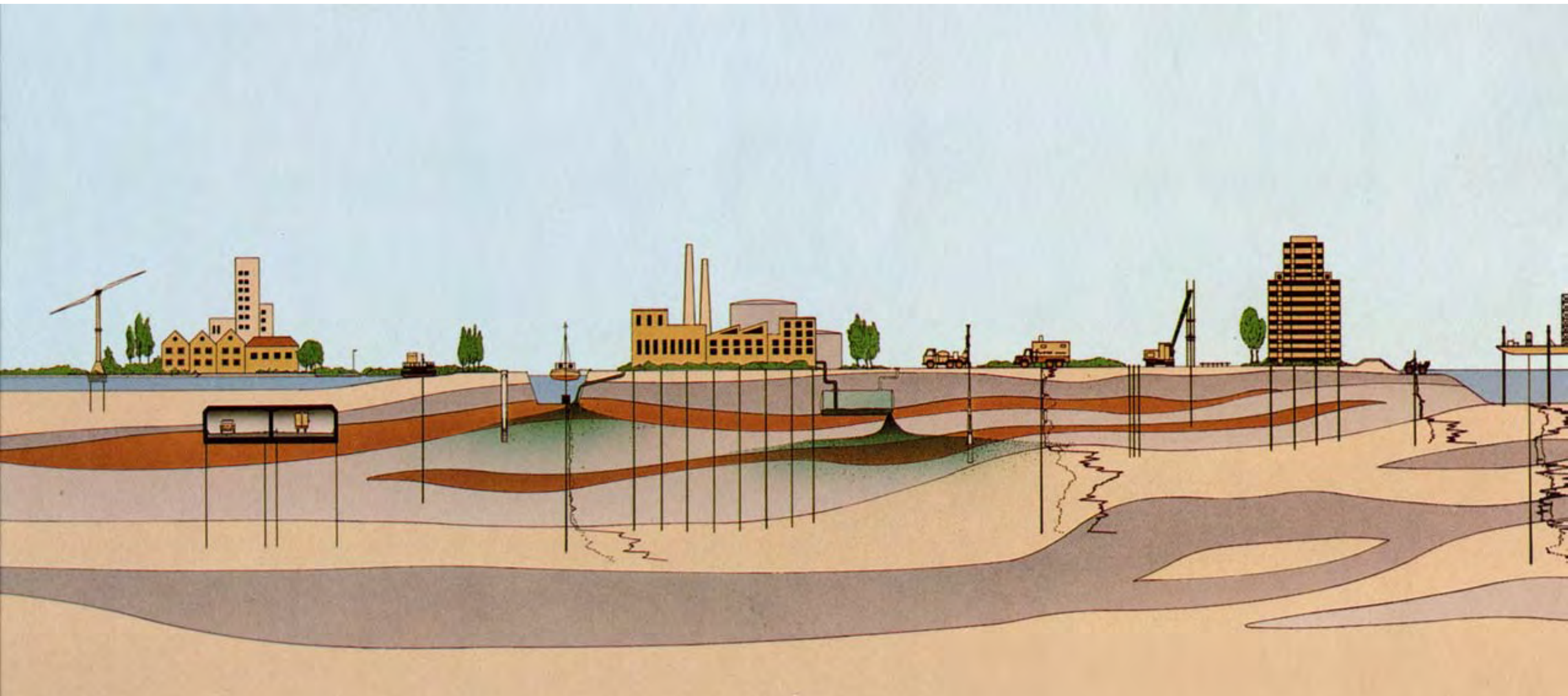
APPENDIX 17
K_0-CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS (BISHOP METHOD)

GEOTECHNICAL EXPLORATION PROGRAM TUNNEL SEGMENT OF SILICON VALLEY RAPID TRANSIT (SVRT) PROJECT SAN JOSE, CALIFORNIA

Prepared for:
HMM/BECHTEL

JULY 2005

Project No. 1637.001



REPORT DOCKET

APPROVAL

This document is approved by the following:

Name	Title	Signature	Issue Date
Jon W. Mitchell	Project Manager	[signature]	July 20, 2005

REVISION HISTORY

Revision	Date	Change	Approval
0	June 3, 2005	Draft Report: Appendix 17 K_0-Consolidated Undrained Triaxial Compression Test Results (Bishop Method)	[signature]
1	July 20, 2005	Final Report: Appendix 17 K_0-Consolidated Undrained Triaxial Compression Test Results (Bishop Method) with Bechtel comments from 6/10/05 & 7/13/05	[signature]

FUGRO WEST, INC.

1000 Broadway, Suite 200
Oakland, California 94607
Tel: (510) 268-0461
Fax: (510) 268-0137

July 20, 2005
Project No. 1637.001

HMM/Bechtel
3103 North First Street
San Jose, California 95134

Attention: Mr. Ignacio Arango

Subject: Appendix 17 – K_0-Consolidated Undrained Triaxial Test Results (Bishop Method)
Tunnel Segment of SVRT Project
San Jose, California

Dear Mr. Arango:

Fugro West, Inc., is pleased to submit this draft copy of Appendix 17, presenting the results of the K_0-Consolidated Undrained Triaxial Compression Tests (Bishop Method) conducted by the geotechnical laboratory of Fugro Consultants LP in Houston, Texas, for the Tunnel Segment of SVRT Project in San Jose, California.

We appreciate this opportunity to be of continued service to HMM/Bechtel. Contact Jon Mitchell at (510) 267-4430 if you have any questions regarding the information presented in this appendix.

Sincerely,

FUGRO WEST, INC.

Linda Al Atik
Staff Engineer

Jon Mitchell
Staff Engineer

REGISTERED PROFESSIONAL ENGINEER
RONALD L. BAJUNIEMI
No. 112
Exp. 12-31-05
GEOTECHNICAL
STATE OF CALIFORNIA

Ronald L. Bajuniemi, P.E., G.E.
Principal Consultant

LAA/JWM/RLB:rp

Copies Submitted: (pdf) Addressee

CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This appendix presents the results of the K_0-Consolidated Undrained Triaxial Compression (K_0-Bishop) tests conducted using Bishop's procedure, by the Houston geotechnical laboratory of Fugro Consultants LP (Fugro Consultants) as a part of the advanced laboratory testing program for the Tunnel Segment of the Silicon Valley Rapid Transit (SVRT) Project. The K_0-Bishop's tests were conducted on soil samples from boring locations situated along the tunnel segment alignment of SVRT Project, as shown on the Test Sample Location Map, Figure A17-1.

1.1 PROJECT DESCRIPTION

The Santa Clara Valley Transportation Authority (VTA) intends to construct the SVRT Project in San Jose, California. This will be a 26.2-km (16.3-mile) extension of the Bay Area Rapid Transit (BART) heavy rail rapid transit system from its planned terminus at the end of the Warms Springs Extension in Fremont, to San Jose. The proposed alignment currently includes six stations (three above-grade and three below-grade), a proposed future station, and vehicle storage and maintenance facilities. The alignment is composed of two major segments;

1. A line segment, which will be approximately 11.5 miles of at-grade, elevated and cut-and-cover track from Warm Springs to San Jose; and
2. A 5.1-mile-long tunnel segment, consisting of twin bored tunnels and cut-and-cover structures through downtown San Jose (see Figure A17-1).

As currently planned, the tunnel segment includes at-grade and open cut track, three cut-and-cover stations, and a cut-and-cover track crossover structure. The cut-and-cover stations and the crossover structures have a cumulative length of approximately 4,970 feet. The remaining 4.14 miles of the alignment will be twin 19.5-foot-diameter tunnels.

This investigation and report cover the 5.1-mile-long tunnel segment section only.

1.2 GEOTECHNICAL EXPLORATION PROGRAM OVERVIEW

The joint venture of Hatch Mott MacDonald T & T, Inc., and Bechtel Infrastructure Corporation (HMM/Bechtel) is providing engineering design services for the tunnel segments (Segments 3 and 4) of the SVRT Project to the VTA. HMM/Bechtel has subcontracted with a number of companies to conduct the geotechnical field exploration program for the project. HMM/Bechtel's primary subcontractors for the geotechnical exploration program included Fugro West, Inc., (Fugro), Parikh Consultants (Parikh) and Pitcher Drilling Company (Pitcher).

The three companies, Fugro, Parikh, and Pitcher, conducted the majority of the geotechnical field exploration program for the tunnel segments of the SVRT Project from October 15, 2004, to March 5, 2005. The intent of the geotechnical field investigation program was to obtain geotechnical data that would aid in the design and construction of the proposed tunnel and cut-and-cover structures.

In general, the geotechnical field investigations explored subsurface conditions along the proposed tunnel alignment, within the vicinity of the proposed Eastern and Western Portals, at the two proposed ventilation structures, and at the proposed stations including: Alum Rock Station, Downtown San Jose Station, and Diridon/Arena Station. The geotechnical exploration program included:

- 76 rotary wash borings, and
- 146 cone penetration tests (CPTs).

Figure A17-1 provides a map of the exploration locations. These locations were selected by HMM/Bechtel based on the following considerations: 1) the data requirements of the tunnel designer; 2) the location of existing geotechnical data; 3) the avoidance of private property; and 4) the avoidance of existing underground and overhead utilities. For CPT correlation purposes approximately 16 sets of borings and CPTs were conducted within 15 feet of each other.

The boring investigation program was conducted by the two companies, Parikh and Pitcher. The investigation included soil sampling and in situ testing. Soil sampling consisted of Pitcher Barrel sampling, Shelby tube sampling, SPT sampling and California sampling. The in situ testing conducted in the borings consisted of field vane shear testing, pressuremeter testing, downhole geophysical logging, and piezometer installation. For further details regarding the boring investigation program and results refer to the main report.

1.3 LABORATORY TESTING PROGRAM OVERVIEW

1.3.1 Testing Overview

Fugro Consultants' geotechnical laboratory conducted the advanced laboratory testing program for the Tunnel Segment of SVRT Project. This program was conducted on samples provided by Parikh from soil borings located along the tunnel segment. Table A17-1, below, summarizes the numbers and types of different tests conducted. The purpose of this advanced laboratory testing program was to determine selected index and engineering properties of the sampled soils. This appendix provides a detailed description for K_0-Bishop Consolidated Undrained Triaxial Compression tests along with a summary of the interpreted parameters.

Table A17-1. Summary of Advanced Laboratory Testing Program

Test Description	Number of Tests
Constant Rate of Strain (CRS) Consolidation	37
Static Direct Simple Shear	15
K_0-Consolidated Undrained Triaxial Compression	20
K_0-Consolidated Undrained Triaxial Extension	16
K_0-Consolidated Bishop's Procedure	12
Isotropically-Consolidated Drained Triaxial Compression	30

1.3.2 Program Description

The physical properties of the soils tested during the advanced laboratory testing program are separated into two categories, index and engineering. The index properties include items such as water content, specific gravity, unit weight, void ratio, and degree of saturation. The engineering properties include items such as compressibility (consolidation), strength, and hydraulic conductivity (permeability). The advanced tests conducted as part of this laboratory testing program are discussed in more detail below.

- **Constant Rate of Strain (CRS) Consolidation** tests were conducted to determine the rate and magnitude of soil consolidation as well as stress history for a soil sample that is restrained laterally and drained axially. The one-dimensional consolidation tests typically involved constant rate-of-loading, one unload-reload cycle, and one rebound stage from the maximum applied stress. Detailed discussion of the CRS consolidation tests is provided in Appendix 13.
- **Static Direct Simple Shear (DSS)** tests were conducted to measure constant volume (undrained) shear strength and stress-strain characteristics of cohesive soils after one-dimensional consolidation using a constant rate of simple shear deformation. Detailed discussion of the DSS tests is provided in Appendix 14.
- **Isotropically Consolidated Drained Triaxial (CDTX**) tests were conducted to evaluate the drained strength characteristics, such as friction angle and stress-strain relationship of the soils encountered in the borings. For a detailed discussion of the CDTX tests, refer to Appendix 15.
- **K_0-Consolidated Undrained Triaxial Compression and Extension (CK_0UC & CK_0UE)** tests were conducted to estimate the static strength parameters and stress-strain characteristics of fine-grained soils under a range of confining stresses and overconsolidation ratios (OCRs). In a K_0-consolidated test, the sample is consolidated under drained conditions to the assigned vertical stress while maintaining a constant diameter of the cylindrical specimen (the horizontal confining stress was automatically adjusted to maintain the constant diameter). For detailed discussion of the K_0 triaxial compression and extension tests, refer to Appendix 16.
- **K_0-Bishop's Procedure Triaxial** tests were conducted to determine the at-rest lateral earth pressure coefficient (K_0) as a function of the overconsolidation ratio (OCR). A detailed discussion of the K_0-Bishop tests is provided in this appendix.

The scope of the advanced laboratory testing program also included x-raying of assigned soil samples. Discussion of the x-ray testing procedures and a summary of results are provided in Section 2.0 of Appendix 13, with x-ray images shown in Appendix 20.

1.3.3 Sample Recovery and Handling

Soil sampling was conducted by Parikh at intervals typically ranging from 5 to 10 feet in accordance with the project specifications. Upon sample recovery, undisturbed portions of the soil sample tubes were sealed and transported to Parikh's lab. For further details regarding sample recovery and handling, refer to the main report.

Soil samples assigned for advanced laboratory testing were transported in wooden Shelby tube holders, designed to maintain the tubes' vertical orientation during transit, to Fugro's laboratory in Oakland. The samples were then packed in specially fabricated, padded containers designed to minimize disturbance, and maintain an upright (vertical) orientation of the samples during shipping. The samples were finally shipped to Fugro Consultants' geotechnical laboratory for testing.

1.3.4 Overview of K_0-Bishop Consolidated Undrained Triaxial Test Program

Fugro Consultants' geotechnical laboratory conducted K_0 consolidated triaxial tests using Bishop's procedure on 12 soil samples, as assigned by HMM/Bechtel. These tests were conducted to estimate the static strength parameters, stress-strain characteristics and K_0 as a function of overconsolidation ratio (OCR) for fine-grained soils. The K_0 method of consolidation is used to better model the in situ stress condition of the soil. This test is applicable to field conditions where soils that have been fully consolidated under a set of stresses, are subjected to a change in stress without time for further consolidation to take place (undrained conditions).

The shear strength determined from the K_o Bishop's tests, expressed in terms of total stresses (undrained conditions) or effective stresses (drained conditions) are commonly used in stability analyses, earth pressure calculations and foundation design.

The normalized undrained shear strength (S_u/σ'_{vc}) can be estimated as the ratio of the maximum observed shear stress (q) to the effective vertical consolidation stress (σ'_{vc}) prior to undrained loading. The in situ undrained shear strength may then be estimated by multiplying the normalized undrained shear strength with the estimated in situ effective overburden pressure (for normally consolidated samples).

2.0 K_0- CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST (BISHOP METHOD) PROCEDURES

2.1 INTRODUCTION

The K_0-Consolidated Undrained Triaxial Compression (Bishop Method) tests were conducted in general accordance with ASTM Test Method D 4767. The K_0-Bishop's procedure is generally the same as the one used for the standard K_0-Consolidated Undrained Triaxial Compression tests, discussed in Appendix 16, with one significant variation. In the K_0-Bishop procedure, the sample is K_0-consolidated under drained conditions until the sample is well into the normally consolidated range. An unload-reload cycle is then performed in order to obtain K_0 for various values of OCR. The K_0-Bishop tests are conducted to estimate the static strength parameters and stress-strain characteristics of fine-grained soils under a range of confining stresses and overconsolidation ratios (OCR). The sample is then sheared to failure under undrained conditions with pore-water pressure measurements. By measuring the pore-water pressures generated during the test, the shear strength determined from the test can be expressed in terms of effective stress. This test method provides for the calculation of total and effective stresses, and axial compression by measurement of axial load, axial deformation, and pore water pressure.

2.2 K_0-CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST (BISHOP METHOD) STANDARDS AND PROCEDURES

K_0-Consolidated Undrained Triaxial Compression (Bishop Method) tests were conducted using an automated system (TruePath) developed by Fugro Consultants, and Trautwein and Germaine (of the Massachusetts Institute of Technology). The test procedure followed the technical requirements of ASTM Test Method D4767-95 using Bishop's procedure in a triaxial cell. The procedure for K_0-Bishop's tests typically consists of the following steps:

- *Cell Preparation*: Using the assigned confining pressure, strength estimates and specimen area, the proper load cell and pressure transducers are selected.
- *Specimen Preparation*: The selected portions of the tubes were cut into segments with a mechanical hacksaw (18 teeth per inch). A wire saw was used to separate the soil from the surrounding tube in an effort to reduce potential disturbance upon extrusion. In addition, each tube is marked such that all test specimens, will have the same orientation when sheared. The sample is then extruded from the cut portion of the tube using a hydraulically actuated ram.

  Test specimens are typically trimmed to a 2.0-inch diameter by 4-inch height. After specimens are trimmed, they are mounted in the triaxial testing apparatus and aligned with the cell base with porous stones at each end. Each specimen had top, bottom and radial drainage boundaries during consolidation. The radial drainage was provided by spirally oriented ¼ -inch-wide Whatman No. 1 filter strips placed at about ¼-inch spacing.
- *Back Pressure Saturation:* Specimen saturation is usually achieved through back pressuring at either, an effective isotropic-confining stress of 3 to 7 psi (21 to 48 Kpa), a stress which prevents swelling or the assigned stress, whichever was smaller.
- *Consolidation:* Using the SHANSEP methodology, the soil specimen is K_0-consolidated, in which the sample is consolidated, under drained conditions, to the assigned vertical stress while maintaining a constant diameter of the cylindrical specimen (the horizontal confining stress is automatically adjusted to maintain the constant diameter). The samples are typically consolidated at a controlled rate of strain of about 0.1 to 0.5 percent/hr, depending upon its liquid limit. The duration of all consolidation increments was such that at least 95 percent consolidation is achieved. For the K_0-Bishop tests, an unload-reload cycle is then performed in order to obtain K_0 for various values of OCR. Following the unload/reload cycle the sample is consolidated back to the normally consolidated range and then sheared to failure.
- *Undrained Axial Shearing:* During shearing, the chamber pressure is kept constant and specimen drainage is not permitted. An axial loading piston is advanced into (shearing compression), or retracted from (shearing in extension) the cell at a specific rate of strain. The applied rate-of-strain was slow enough (about 0.1 to 0.5 percent/hr), depending upon the specimen's liquid limit) to produce approximate

equalization of excess pore-water pressures (PWP) throughout the specimen at failure. The static stresses and excess PWPs (ΔU) were used to express the measured stress parameters in terms of effective stresses.

3.0 K_0-CONSOLIDATED UNDRAINED TRIAXIAL TEST RESULTS

Raw data recorded during the K_0-Bishop tests were interpreted to determine the strength parameters and the stress-strain characteristics of the tested soil. Figures 2a through 13c present the K_0-Bishop's test results. For each test performed, normalized shear stress ($\tau_h/\sigma'_{v,c}$), the normalized excess pore-water pressure and obliquity versus shear strain (γ %) are plotted on three separate plots on one page while the K_0 and axial strain are plotted versus effective vertical stress, and normalized shear stress ($\tau_h/\sigma'_{v,c}$) versus normalized average effective vertical stress ($p/\sigma'_{v,c}$) are shown on a second page of plots. The K_0 versus overconsolidation ratio (OCR) graph is shown on a third page of plots.

Results such as moisture content, Atterberg limits, initial unit weight, soil type, interpreted preconsolidation pressure, estimated in situ vertical stress, overconsolidation ratio, undrained shear strength, maximum shear strain and K_0-overconsoldiation ratio relationships are summarized in "Tables A17-2a through A17-2c – Summary of C K_0U Test Results." The estimated in situ vertical effective stress was estimated by developing a unit weight profile from the boring data with either measured or estimated ground water levels.

4.0 LIMITATIONS

Our services consist of laboratory testing, and data evaluations that are made in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

The test data provided in this appendix is from the laboratory testing of samples obtained from subsurface explorations conducted by others. These explorations indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. Variations may exist and conditions not observed or described in this report could be encountered during construction. Our laboratory tests results presented in this appendix are based on the standards and procedures indicated herein. The laboratory assignments were provided by HMM/Bechtel.

This appendix has been prepared for the exclusive use of HMM/Bechtel and their consultants for specific application to the SVRT project as described herein. In the event that there are any changes in the ownership, nature, design, or location of the proposed project, or if any future additions are planned, the results contained in this appendix should not be considered valid unless 1) the project changes are reviewed by Fugro, and 2) results presented in this appendix are modified or verified in writing. Reliance on this report by others must be at their risk unless we are consulted on the use or limitations. We cannot be responsible for the impacts of any changes in geotechnical standards, practices, or regulations subsequent to performance of services without our further consultation. We can neither vouch for the accuracy of information supplied by others, nor accept consequences for unconsulted use of segregated portions of this report.

5.0 REFERENCES

ASTM D 4767, “Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils”, ASTM International.

TABLE

Boring Number / Sample Number	B-9 / 3b	B-18 / 9b	B-25 / 3a	B-25 / 16c	B-33 / 1b
Penetration Depth (ft)	52.20	80.55	18.00	111.20	9.60
Soil Type	CH	CL	CL	CL	CL
Atterberg Limits (%)					
Liquid Limit, LL	53	32	52	43	35
Plastic Limit, PL	22	18	25	16	16
Water Content (%)					
In Situ Water Content, W_o	29.5	21.6	35.7	25.6	24.2
Initial Water Content Before Consolidation, W_i	29.7	22.2	35.7	26.3	23.5
Final Water Content, W_f	21.0	16.0	25.8	19.9	18.7
Initial Total Unit Weight, γt,0 (pcf)	121	127	116	123	117
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	2.95	5.37	1.82	7.90	0.84
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	52.33	68.87	40.37	45.91	35.96
Horizontal Effective Consolidation Stress (Pre-Shear), σ'_{hc} (ksf)	30.98	35.22	21.38	25.24	19.64
Preconsolidation Pressure (Casagrande), σ'_p (ksf)	12.3	18.2	8.6	18.2	4.1
Overconsolidation, OCR					
In Situ	4.2	3.4	4.7	2.3	4.8
Test Induced	1.0	1.0	1.0	1.0	1.0
Compression Index, $C_{e,c}$	0.15	0.12	0.16	0.18	0.14
Recompression Index, $C_{e,r}$	0.032	0.022	0.026	0.022	0.019
Swelling Index, $C_{e,s}$	0.026	0.013	0.019	0.016	0.014
Axial Strain at Max Shear Stress, ε_a (%):	3.5	0.9	2.5	0.5	1.0
Axial Strain at Max Obliquity, ε_a (%):	7.7	8.6	4.9	20.1	7.4
Undrained Shear Strength, S_u (ksf)	14.82	21.27	11.38	13.31	10.64
Undrained Shear Strength Ratio, S_u/σ'_{vc}	0.28	0.31	0.28	0.29	0.30
Estimated Friction Angle at Maximum Obliquity, ϕ' (degrees)	26	31	29	29	29
K_0 - OCR Relationship	$K_0 = 0.569OCR^{0.283}$	$K_0 = 0.492OCR^{0.290}$	$K_0 = 0.505OCR^{0.329}$	$K_0 = 0.530OCR^{0.127}$	$K_0 = 0.540OCR^{0.493}$

K_0-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Tunnel Segment of SVRT Project
San Jose, California

Boring Number Sample Number	B-33 9b	B-42 7b	B-45 4b	B-59 5b	B-61 17b
Penetration Depth (ft)	82.10	36.55	41.25	50.55	135.85
Soil Type	CL	CL	CL	CL	CH
Atterberg Limits (%) Liquid Limit, LL Plastic Limit, PL	 40 16	 31 13	 27 17	 42 15	 47 20
Water Content (%) In Situ Water Content, W_o Initial Water Content Before Consolidation, W_i Final Water Content, W_f	 24.8 25.0 19.1	 20.5 21.4 15.4	 21.3 21.2 16.2	 21.0 20.8 16.5	 23.0 23.0 16.6
Initial Total Unit Weight, $\gamma t,0$ (pcf)	123	129	127	127	125
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	5.75	2.76	2.94	3.62	9.30
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	63.03	74.87	86.63	54.46	71.93
Horizontal Effective Consolidation Stress (Pre-Shear), σ'_{hc} (ksf)	30.90	33.08	42.76	29.66	39.79
Preconsolidation Pressure (Casagrande), σ'_p (ksf)	18.2	13.6	19.0	11.5	23.1
Overconsolidation, OCR In Situ Test Induced	 3.2 1.0	 4.9 1.0	 6.4 1.0	 3.2 1.0	 2.5 1.0
Compression Index, $C_{e,c}$	0.16	0.10	0.12	0.13	0.15
Recompression Index, $C_{e,r}$	0.022	0.012	0.018	0.027	0.024
Swelling Index, $C_{e,s}$	0.013	0.01	0.014	0.018	0.016
Axial Strain at Max Shear Stress, ε_a (%):	0.7	0.5	0.7	1.7	1.2
Axial Strain at Max Obliquity, ε_a (%):	5.9	8.0	7.9	8.2	11.8
Undrained Shear Strength, S_u (ksf)	20.61	24.87	27.37	15.71	22.28
Undrained Shear Strength Ratio, S_u/σ'_{vc}	0.33	0.33	0.32	0.29	0.31
Estimated Friction Angle at Maximum Obliquity, ϕ' (degrees)	30	36	33	26	27
K_0 - OCR Relationship	$K_0 = 0.473OCR^{0.259}$	$K_0 = 0.426OCR^{0.206}$	$K_0 = 0.461OCR^{0.175}$	$K_0 = 0.518OCR^{0.309}$	$K_0 = 0.547OCR^{0.179}$

K_0-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Tunnel Segment of SVRT Project

San Jose, California

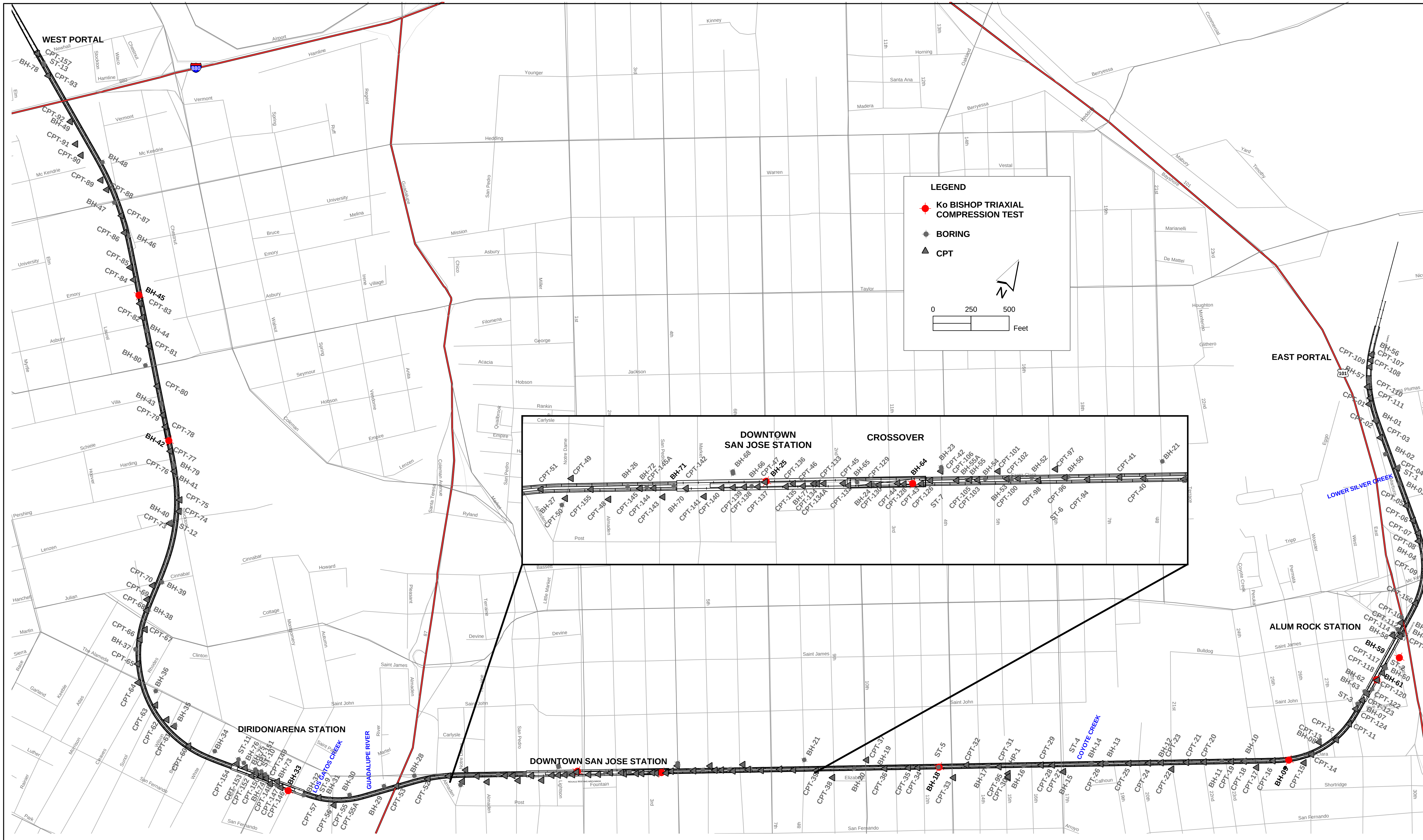
Boring Number **Sample Number**	B-64 5b	B-64 19a
Penetration Depth (ft)	32.35	117.40
Soil Type	CL	CL
Atterberg Limits (%) Liquid Limit, LL Plastic Limit, PL	 32 21	 36 14
Water Content (%) In Situ Water Content, W_o Initial Water Content Before Consolidation, W_i Final Water Content, W_f	 30.5 32.1 21.2	 23.6 24.9 17.4
Initial Total Unit Weight, $\gamma t,0$ (pcf)	119	125
In Situ Vertical Effective Stress, σ'_{vo} (ksf)	2.20	7.75
Vertical Effective Consolidation Stress (Pre-Shear), σ'_{vc} (ksf)	50.47	79.43
Horizontal Effective Consolidation Stress (Pre-Shear), σ'_{hc} (ksf)	24.89	35.56
Preconsolidation Pressure (Casagrande), σ'_p (ksf)	8.6	27.1
Overconsolidation, OCR In Situ Test Induced	 3.9 1.0	 3.5 1.0
Compression Index, $C_{e,c}$	0.14	0.14
Recompression Index, $C_{e,r}$	0.021	0.017
Swelling Index, $C_{e,s}$	0.013	0.011
Axial Strain at Max Shear Stress, ε_a (%):	1.0	0.4
Axial Strain at Max Obliquity, ε_a (%):	6.3	6.3
Undrained Shear Strength, S_u (ksf)	15.92	25.74
Undrained Shear Strength Ratio, S_u/σ'_{vc}	0.32	0.32
Estimated Friction Angle at Maximum Obliquity, ϕ' (degrees)	31	33
K_0 - OCR Relationship	$K_0 = 0.470OCR^{0.302}$	$K_0 = 0.424OCR^{0.340}$

K_0-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Tunnel Segment of SVRT Project

San Jose, California

FIGURES



REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE

HMM / BECHTEL

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DESIGNER/SUBCONSULTANT FUGRO HMM/BECHTEL

SUBMITTED ________ APPROVED ________

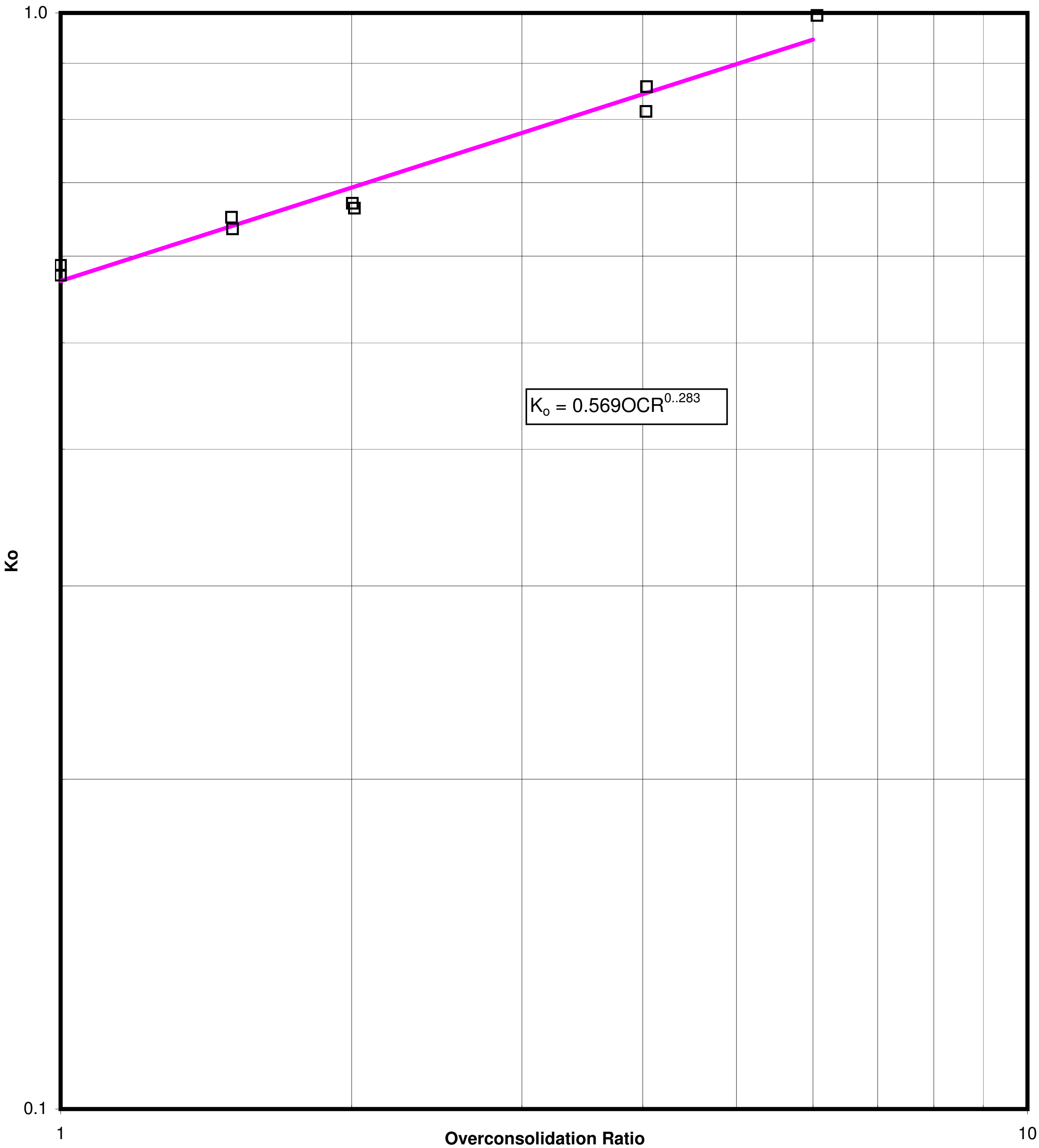
BART

SILICON VALLEY RAPID TRANSIT PROJECT

VTA SANTA CLARA Valley Transportation Authority

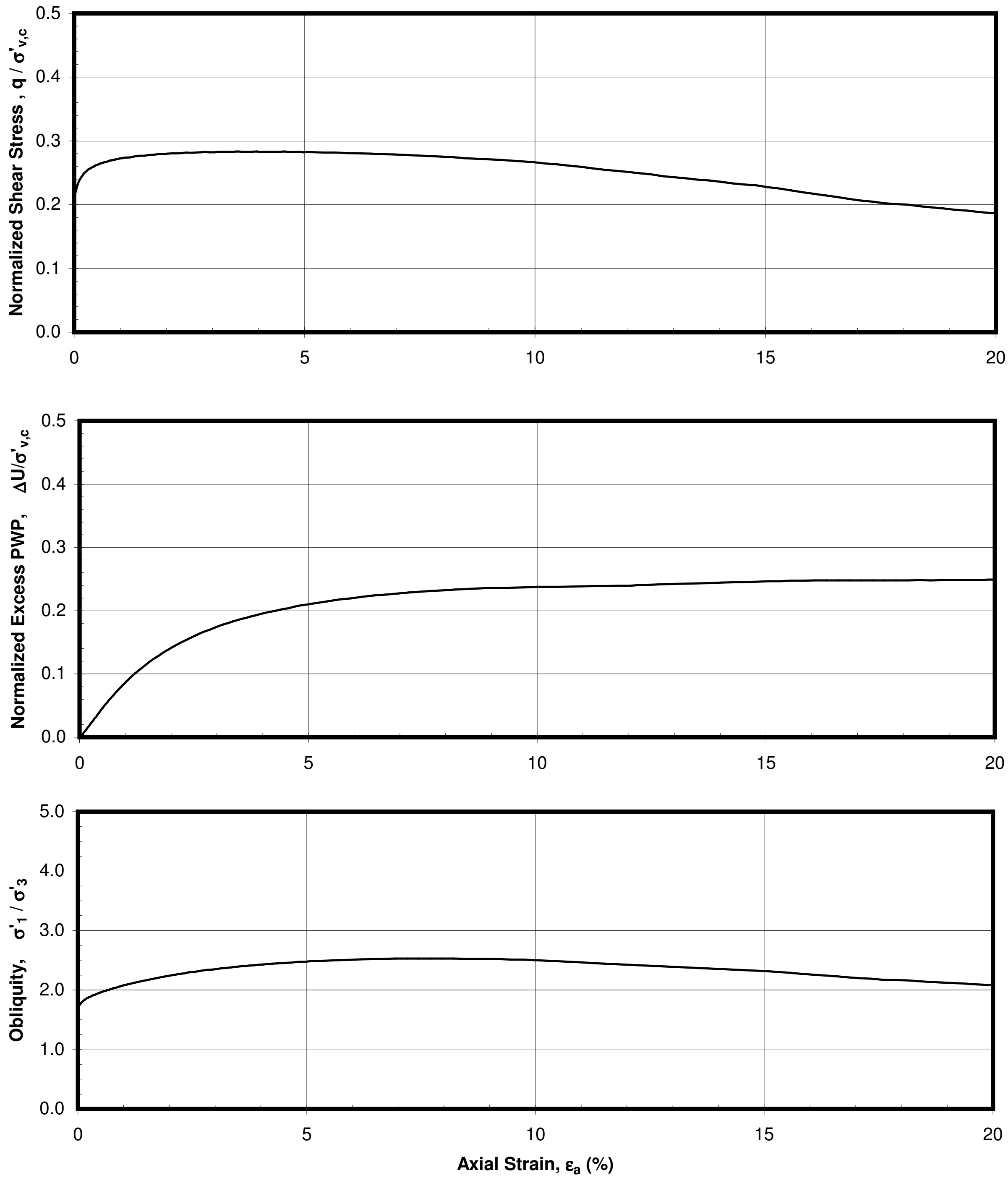
Ko BISHOP TEST LOCATION MAP
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-1



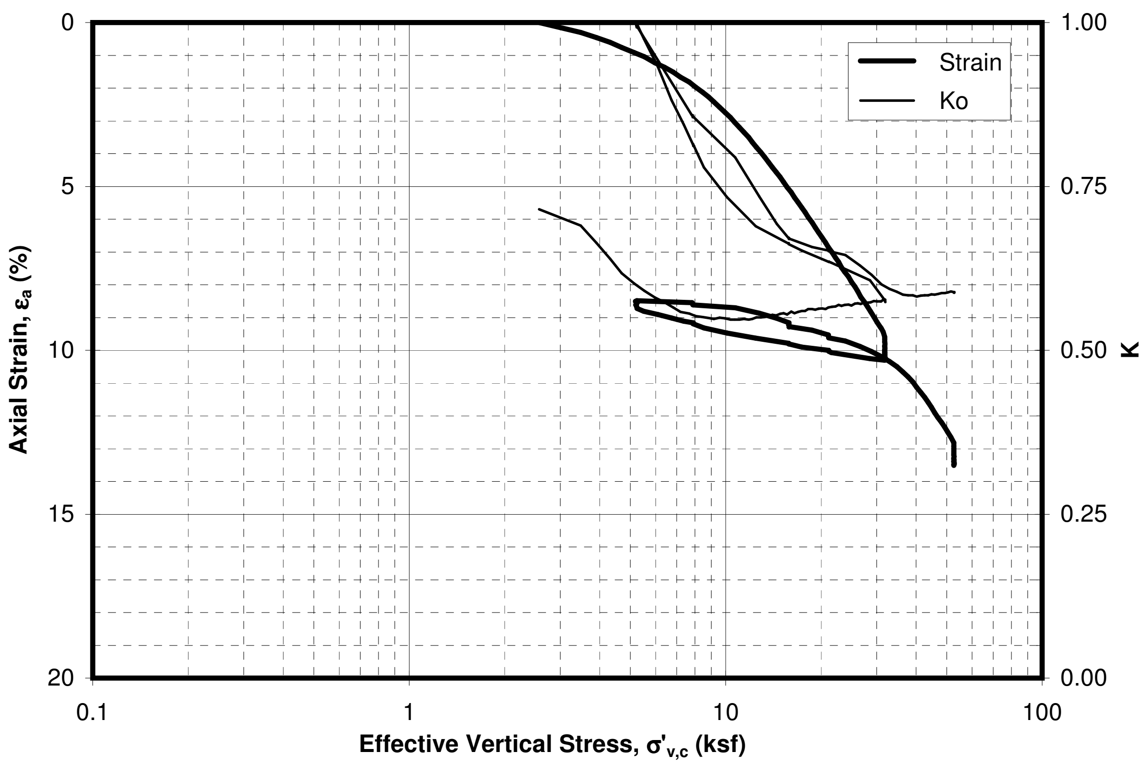
Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 3b - Depth: 52.20 ft
Boring B-9
Tunnel Segment of SVRT Project
San Jose, California

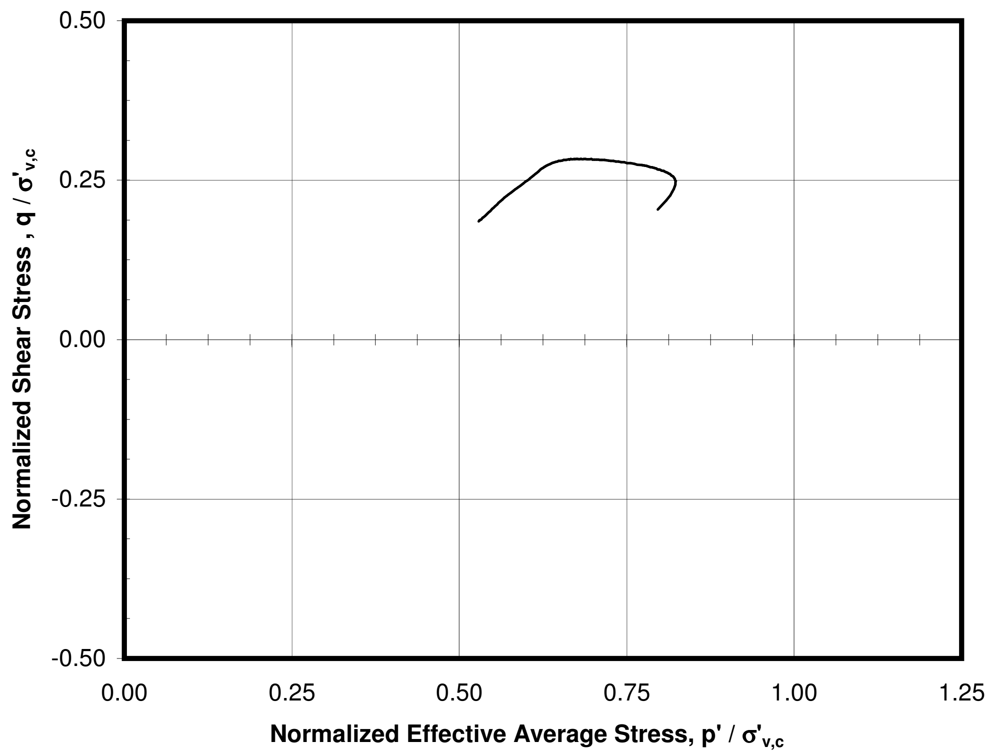
FIGURE A17-2a



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Shearing Phase - Test Induced OCR = 1
Sample: 3b - Depth: 52.20 ft
Boring B-9
Tunnel Segment of SVRT Project
San Jose, California

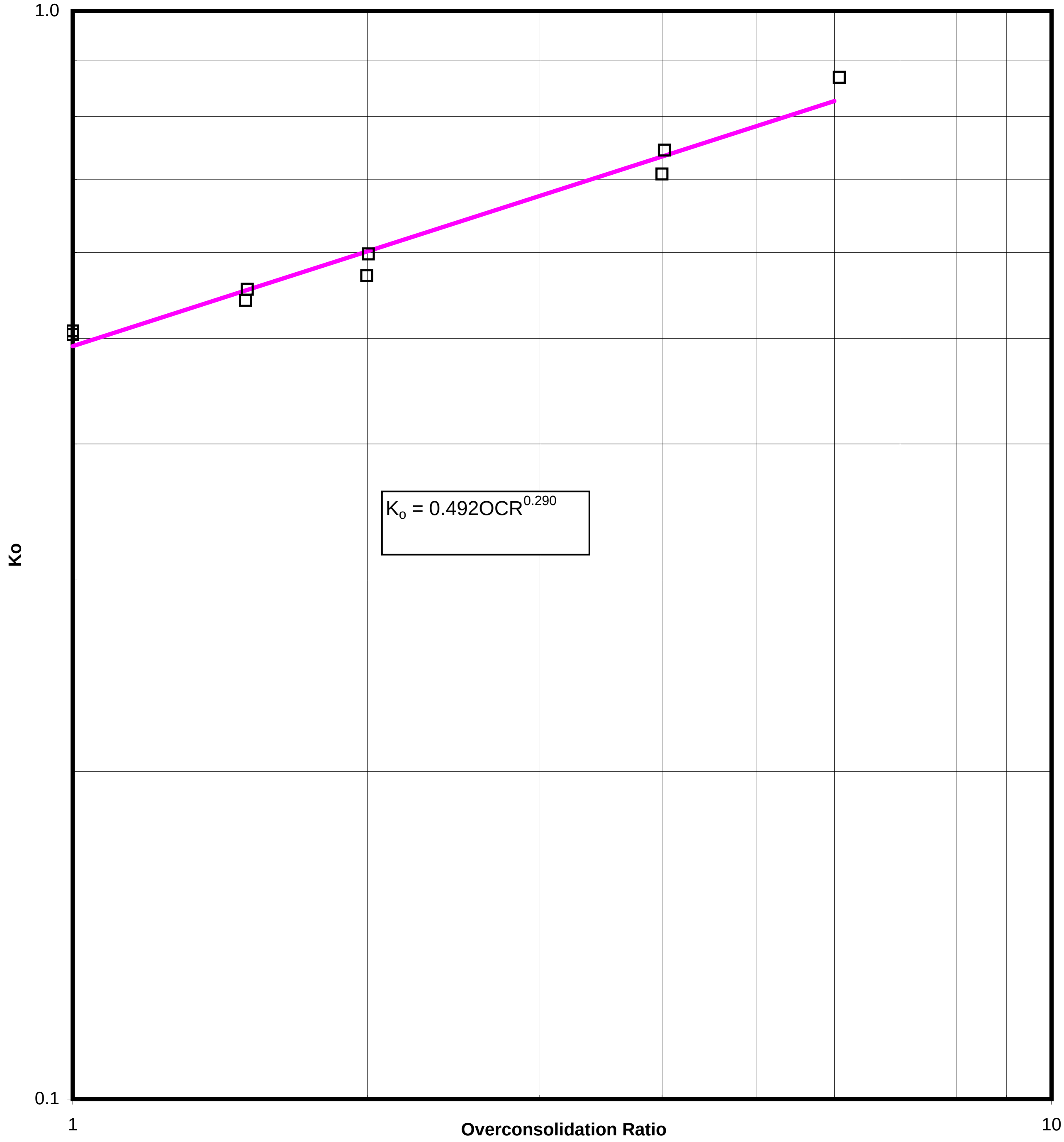
FIGURE A17-2b





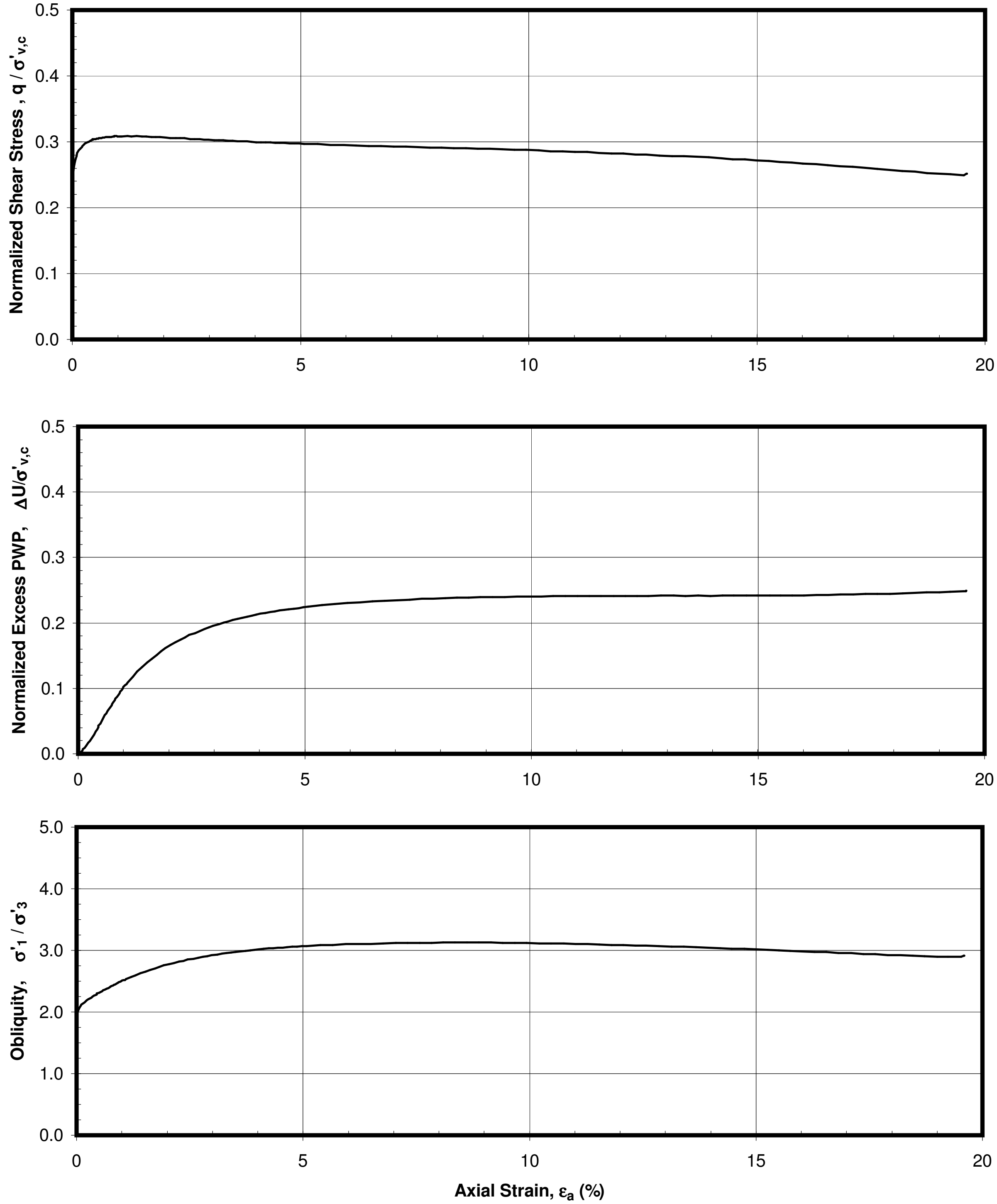
Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Shearing Phase - Test Induced OCR = 1
Sample: 3b - Depth: 52.20 ft
Boring B-9
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-2c



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 9b - Depth: 80.55 ft
Boring B-18
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-3a



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

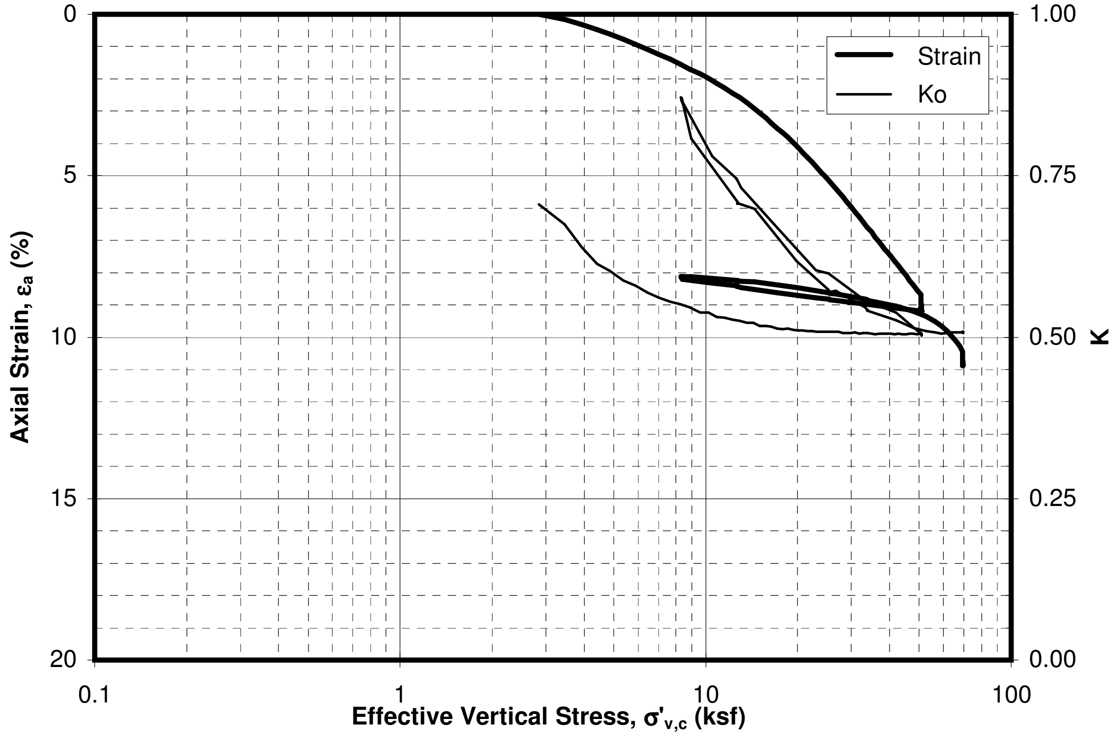
Sample: 9b - Depth: 80.55 ft

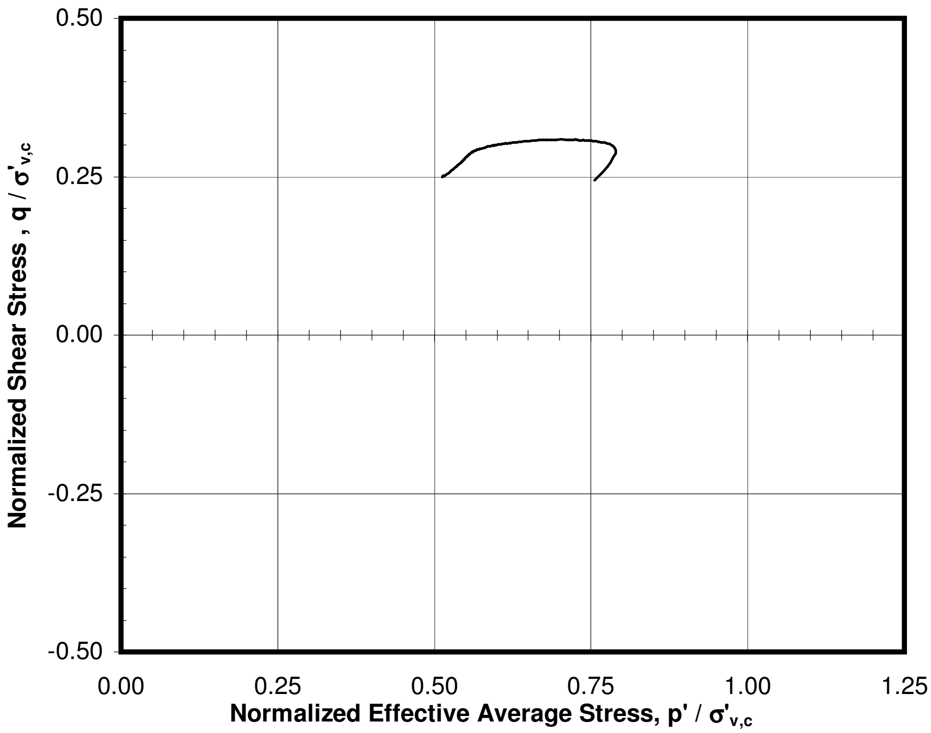
Boring B-18

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-3b





Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

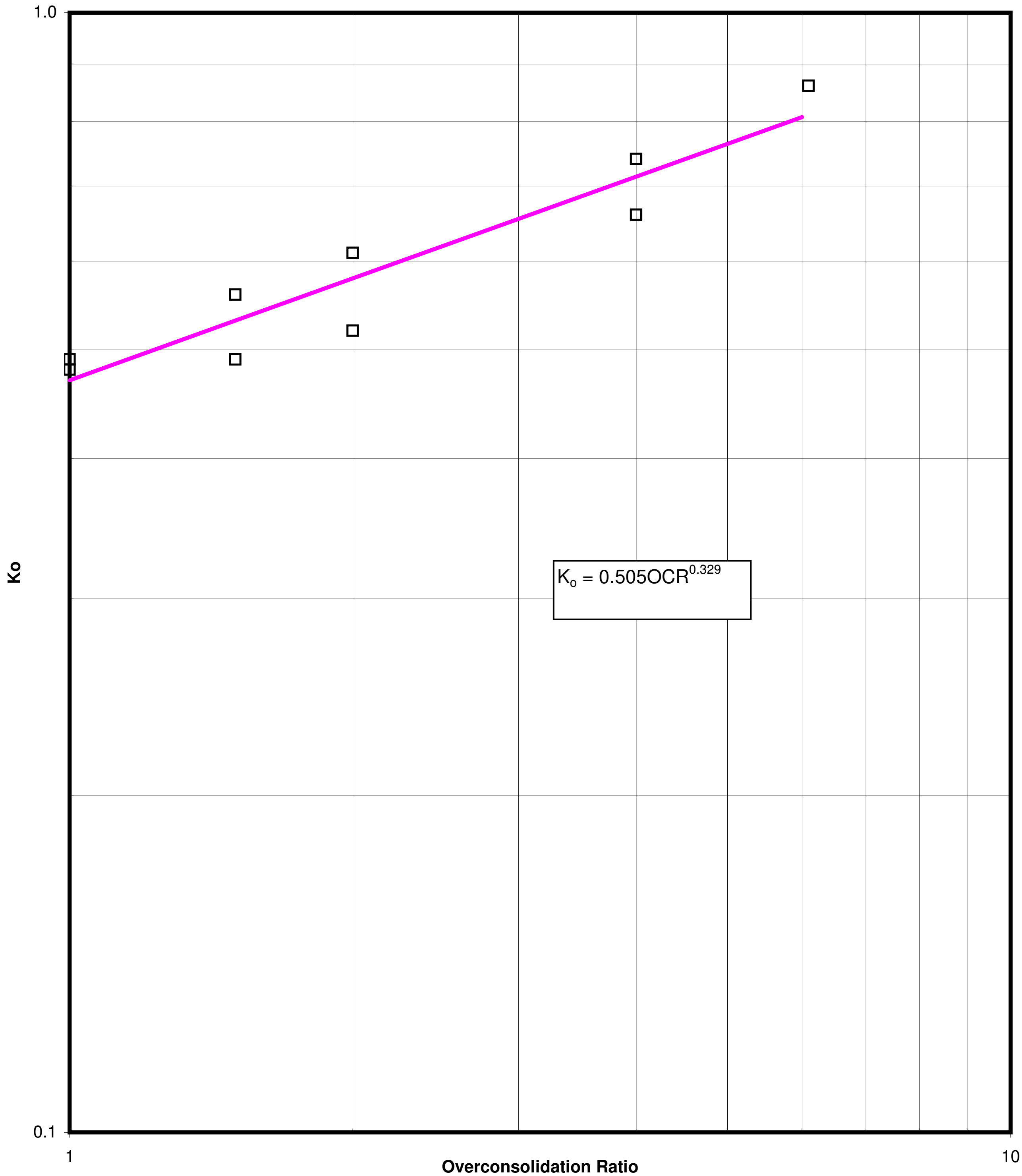
Sample: 9b - Depth: 80.55 ft

Boring B-18

Tunnel Segment of SVRT Project

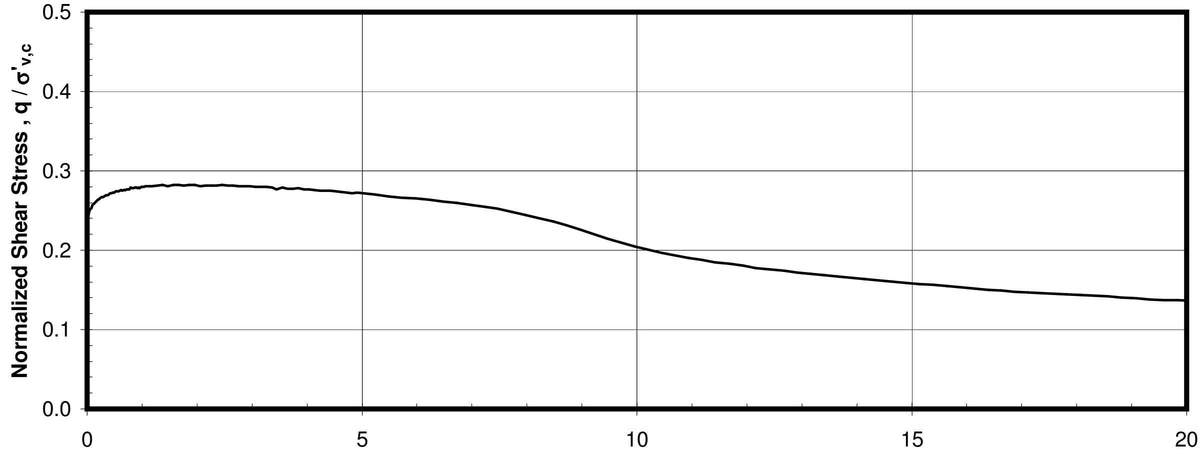
San Jose, California

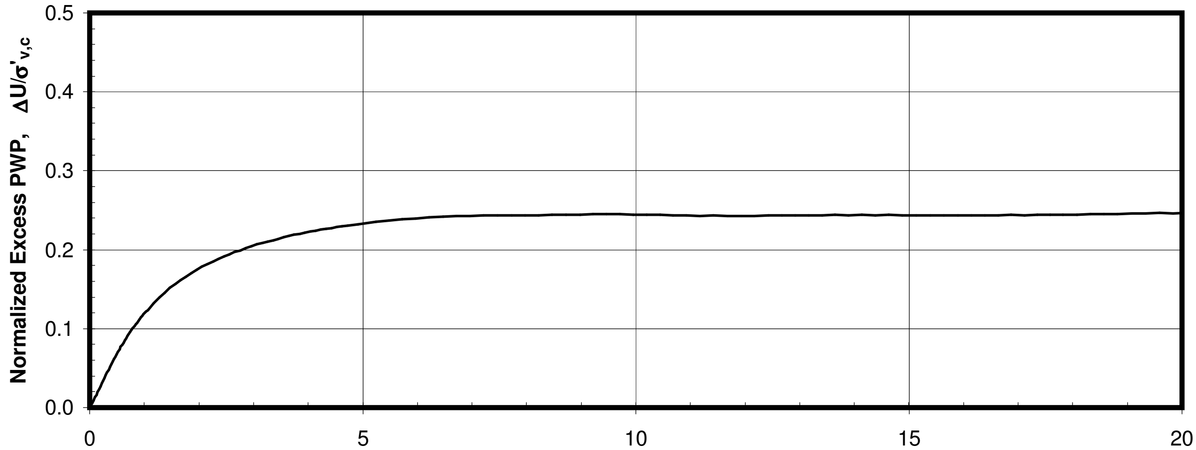
FIGURE A17-3c

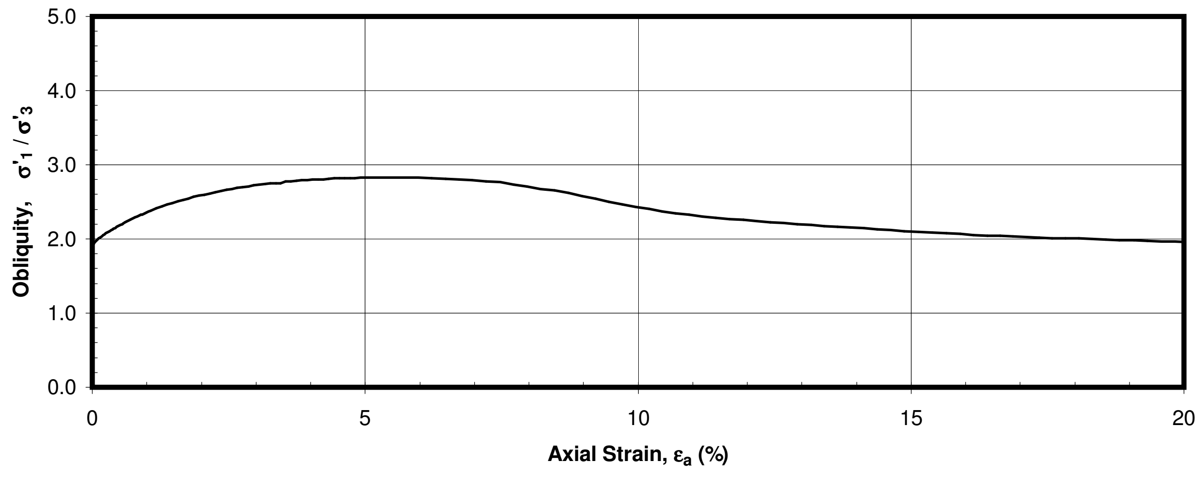


Ko-CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 3a - Depth: 18.00 ft
Boring B-25
Tunnel Segment of SVRT Project (BART to San Jose)
San Jose, California

FIGURE A17-4a







Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

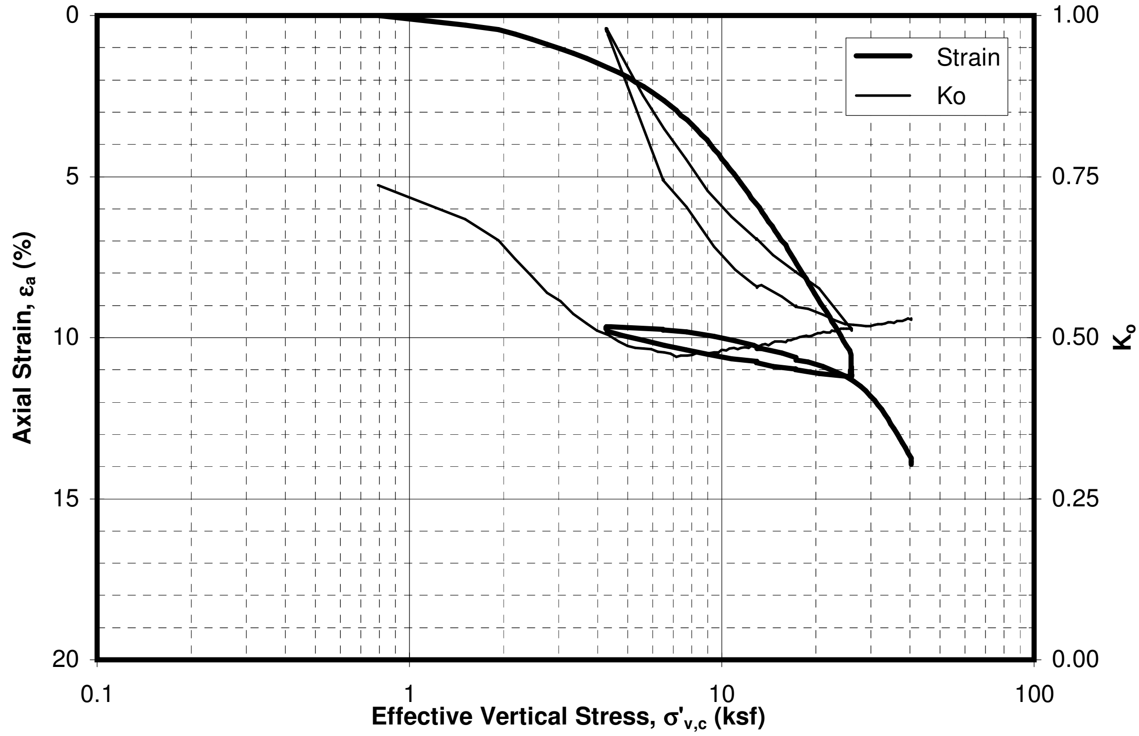
Sample: 3a - Depth: 18.00 ft

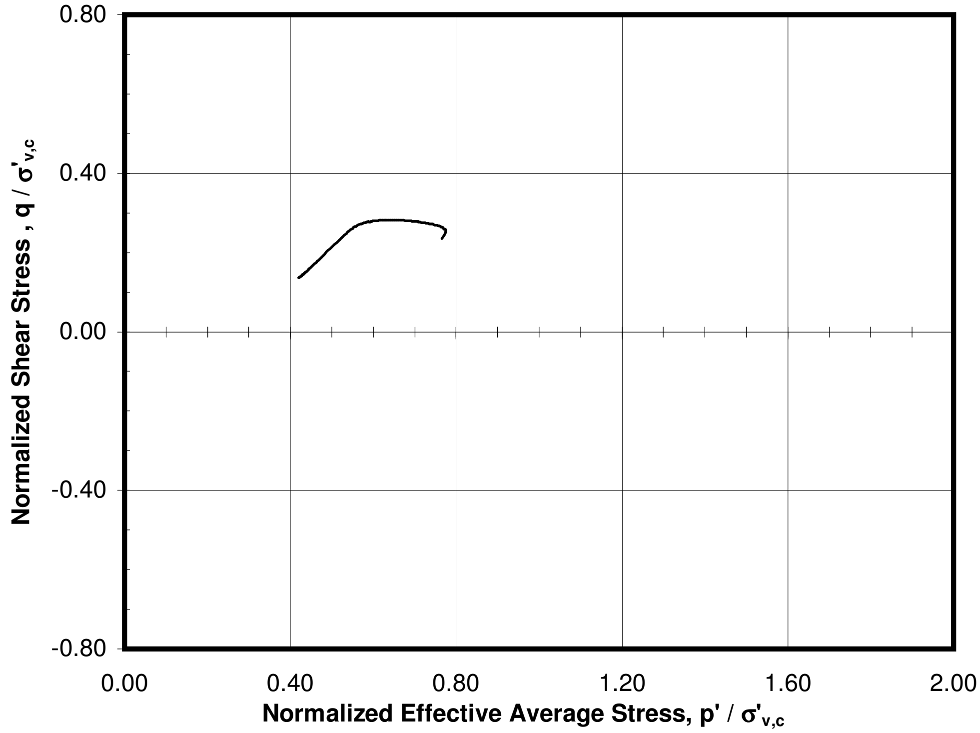
Boring B-25

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-4b

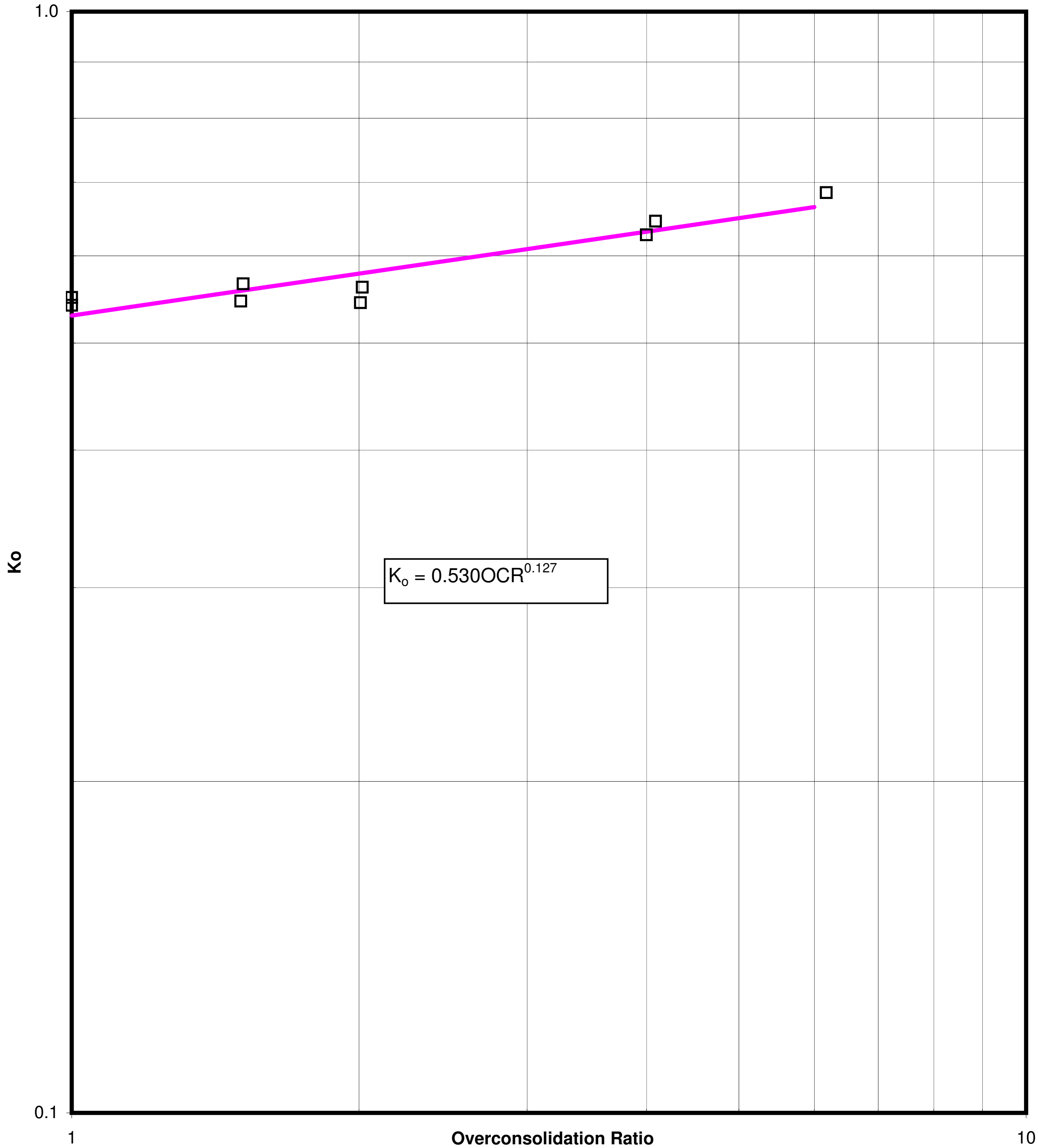




Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Shearing Phase - Test Induced OCR = 1

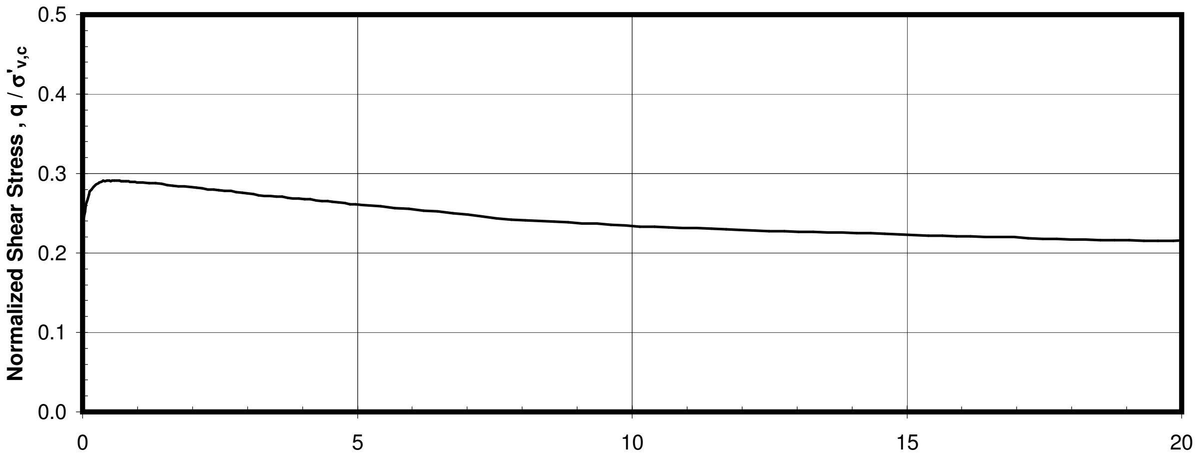
Sample: 3a - Depth: 18.00 ft
Boring B-25
Tunnel Segment of SVRT Project
San Jose, California

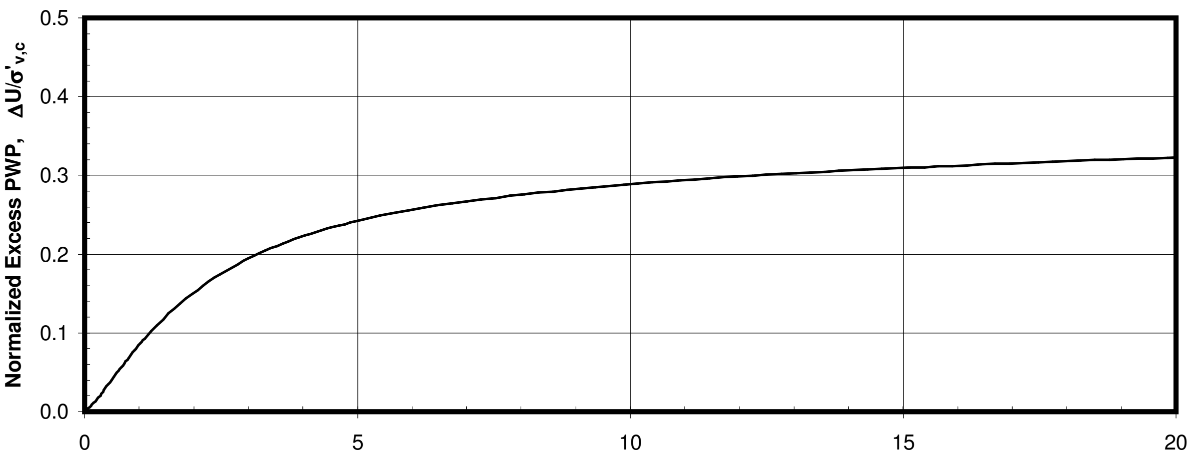
FIGURE A17-4c

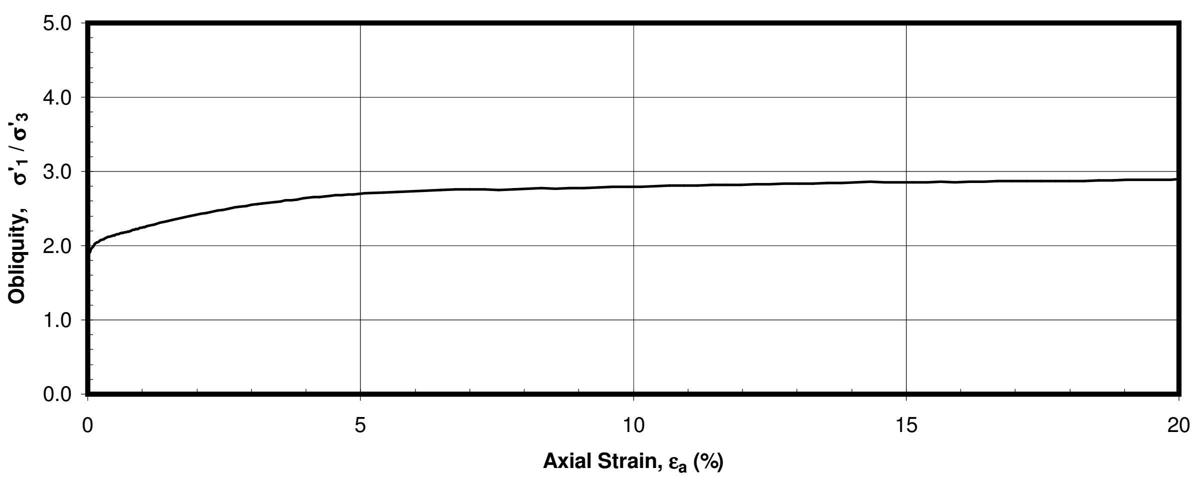


Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 16c - Depth: 111.20 ft
Boring B-25
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-5a

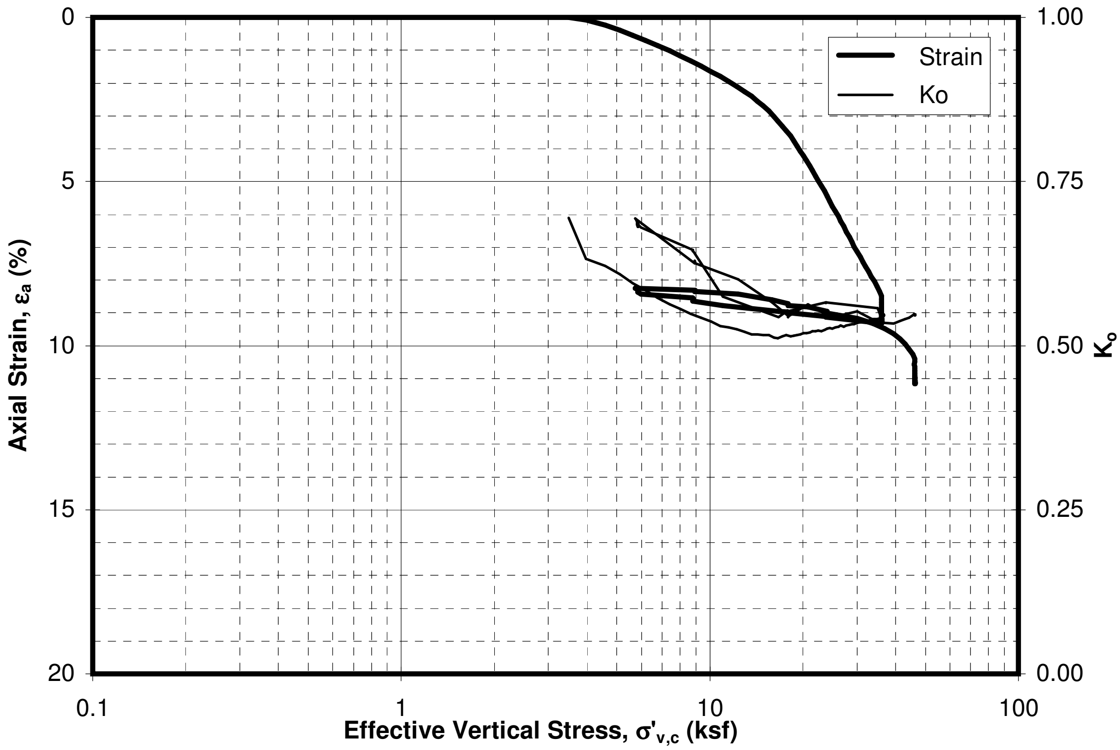


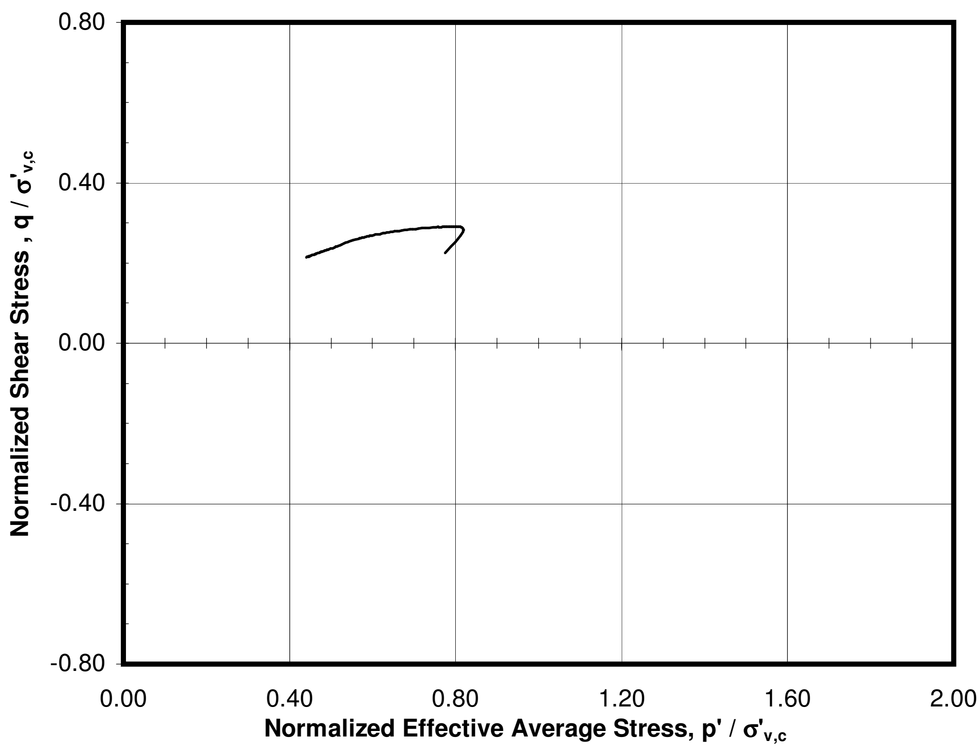




Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Shearing Phase - Test Induced OCR = 1
Sample: 16c - Depth: 111.20 ft
Boring B-25
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-5b





Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

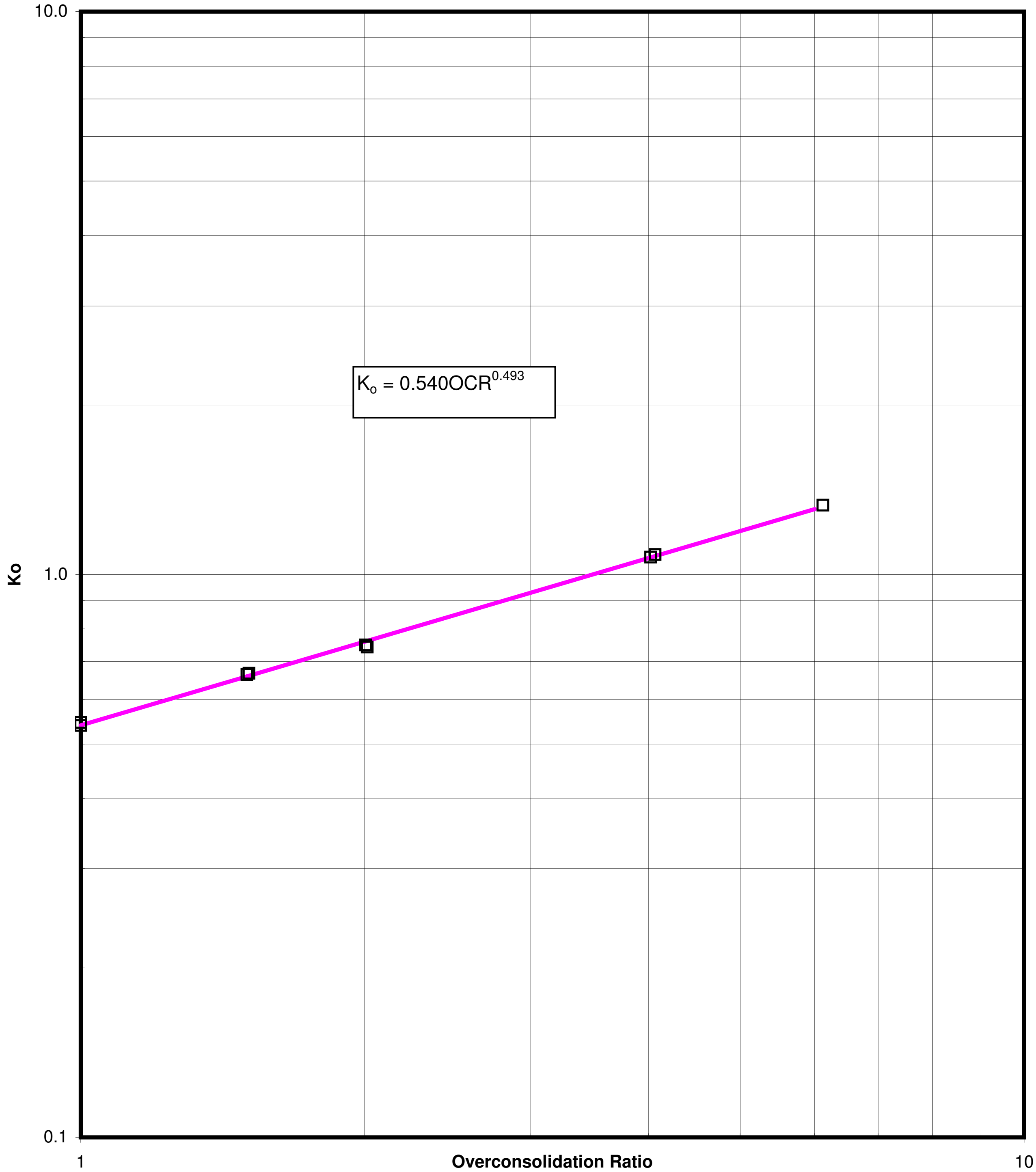
Sample: 16c - Depth: 111.20 ft

Boring B-25

Tunnel Segment of SVRT Project

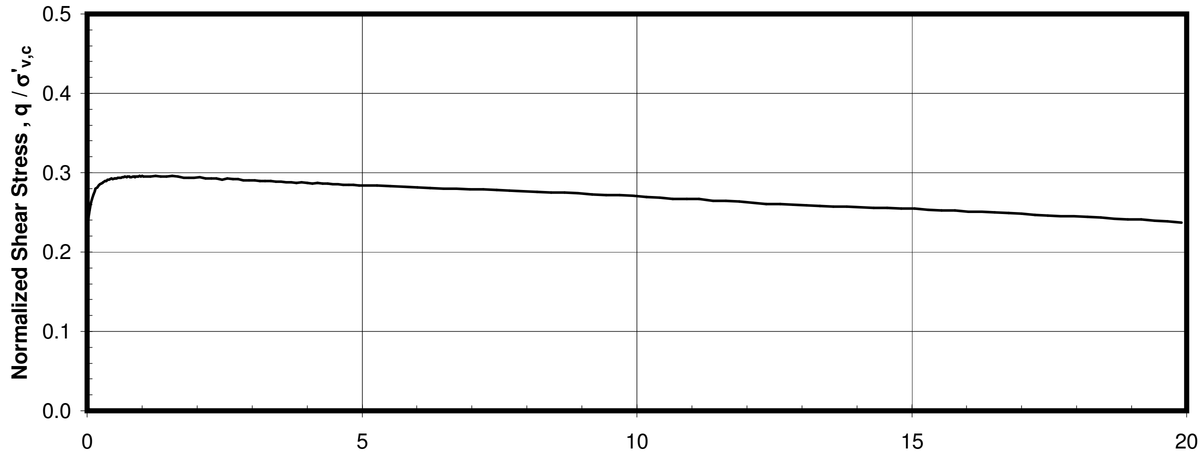
San Jose, California

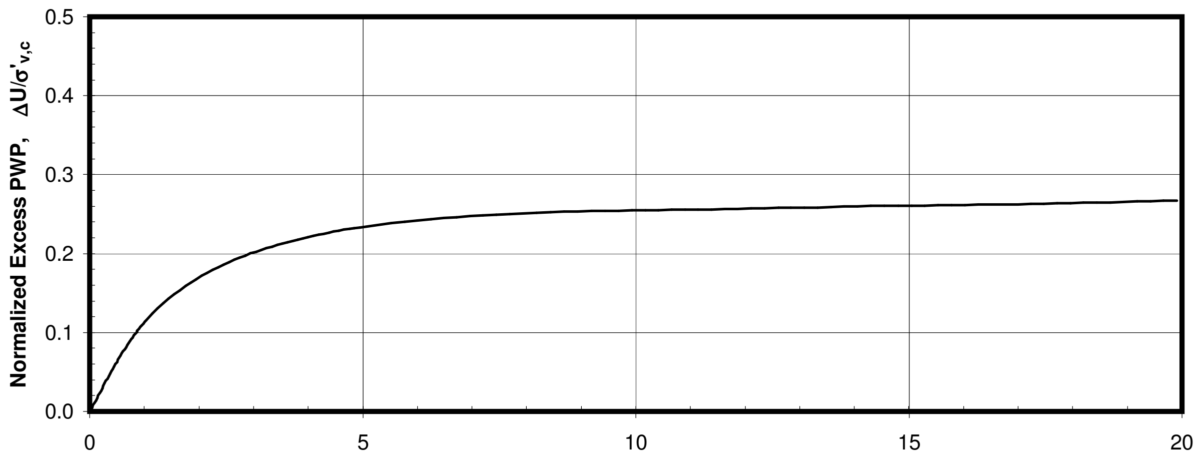
FIGURE A17-5c

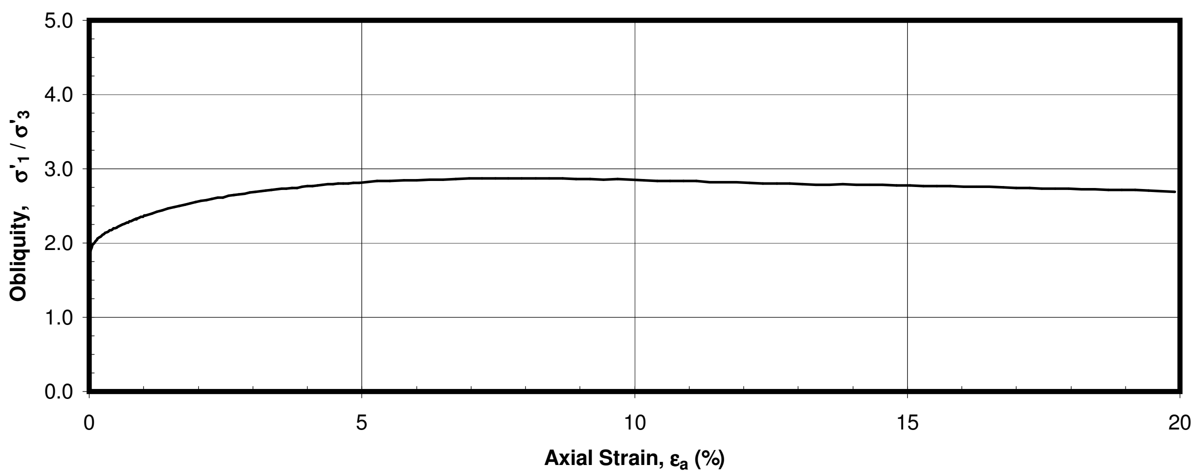


Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 1b - Depth: 9.60 ft
Boring B-33
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-6a







Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

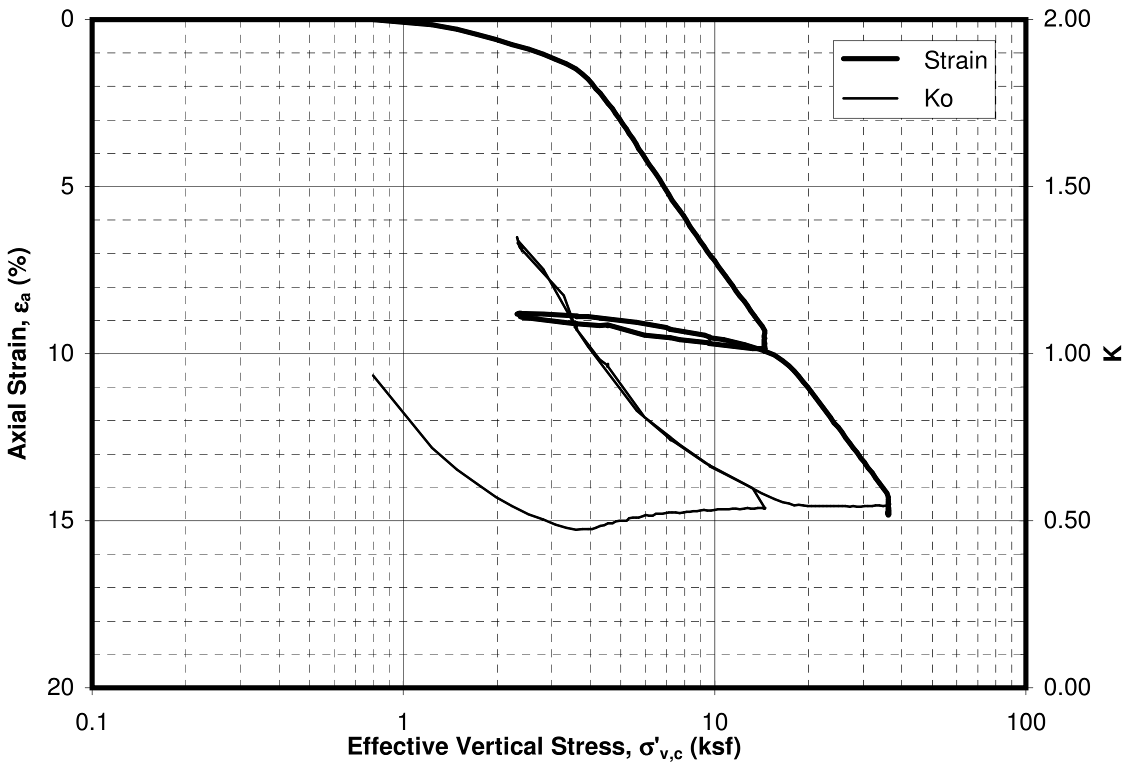
Sample: 1b - Depth: 9.60 ft

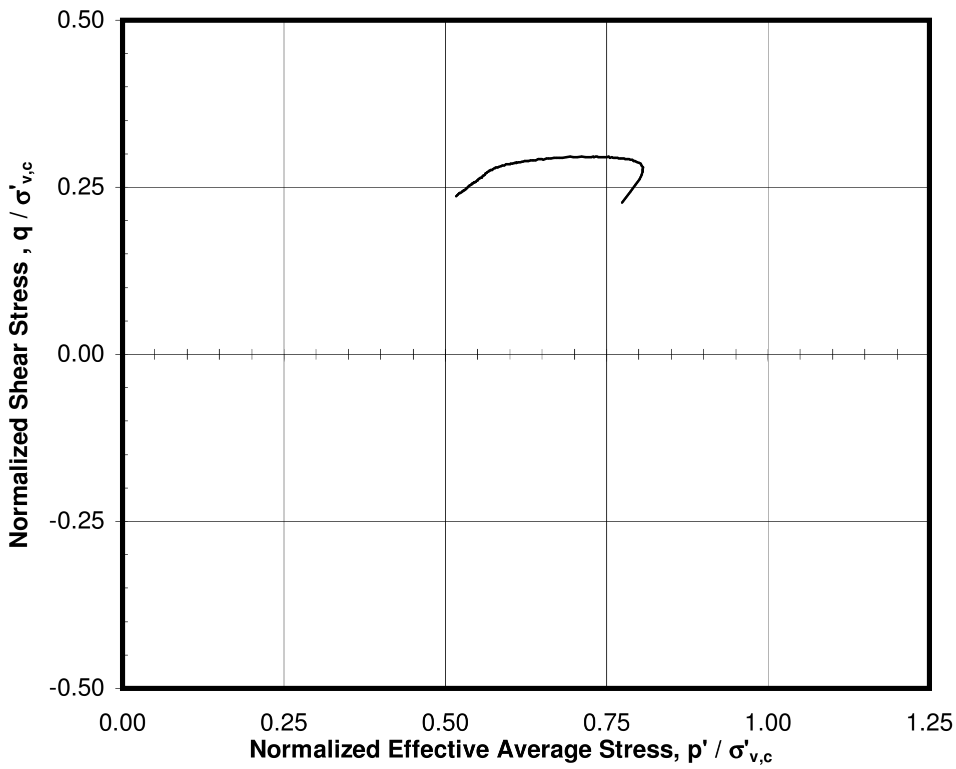
Boring B-33

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-6b





Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

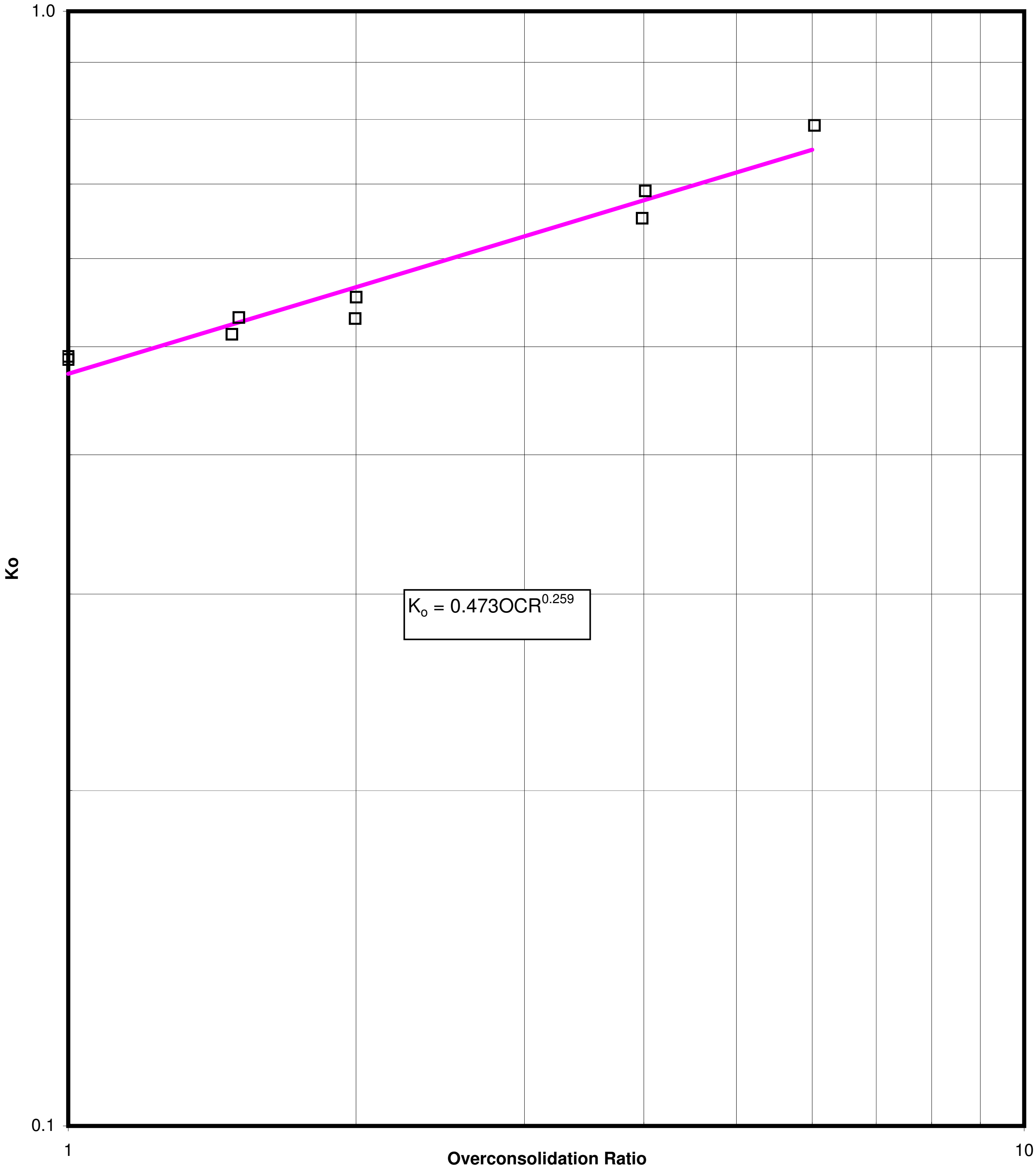
Sample: 1b - Depth: 9.60 ft

Boring B-33

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-6c



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Consolidation Phase

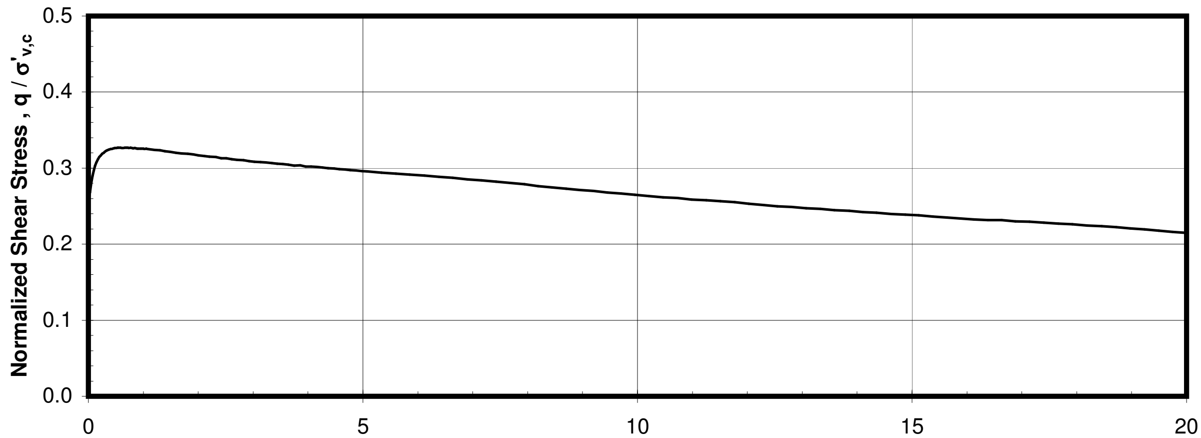
Sample: 9b - Depth: 82.10 ft

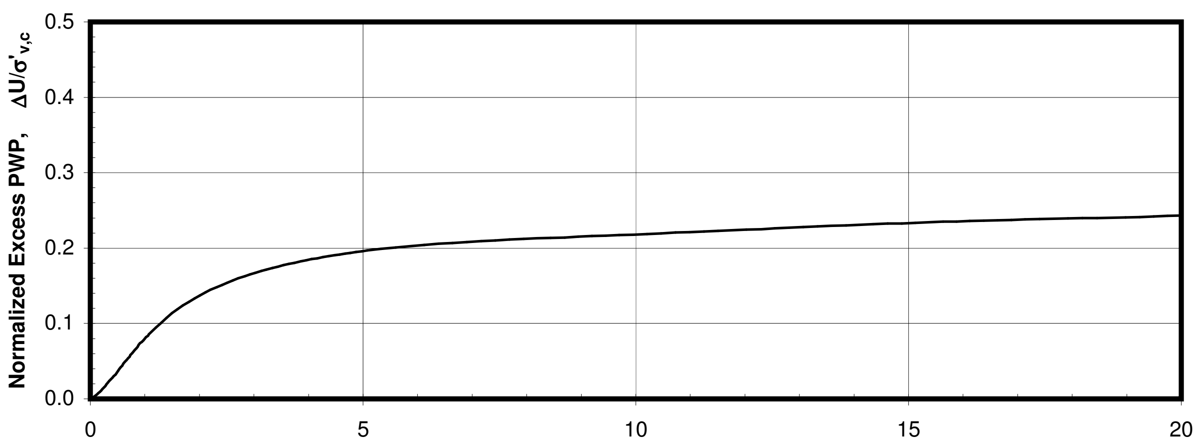
Boring B-33

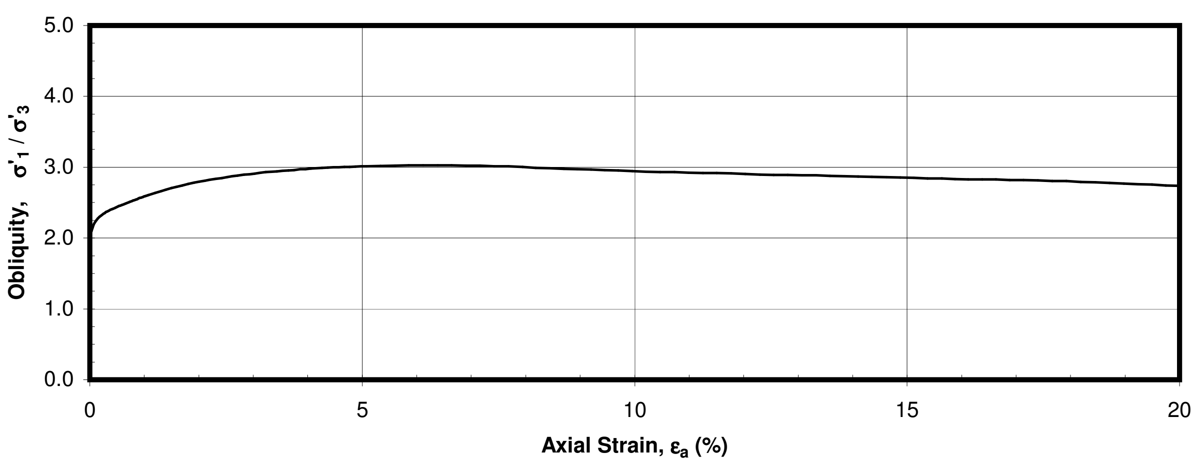
Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-7a

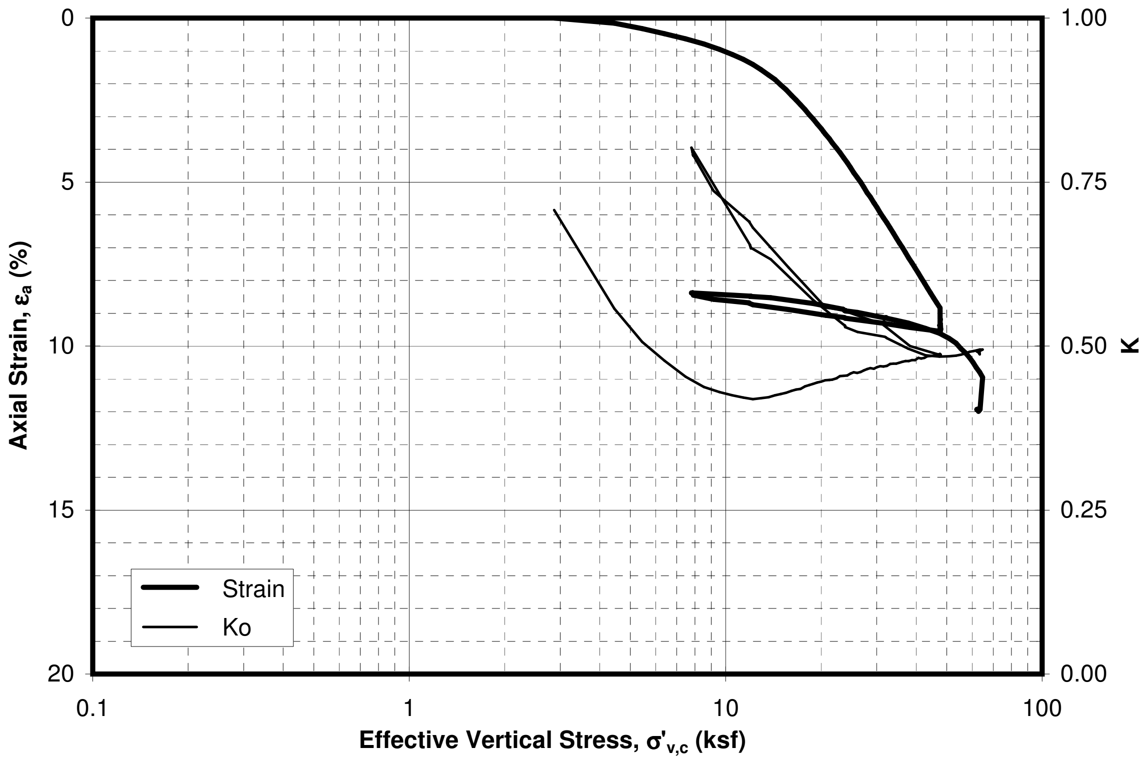


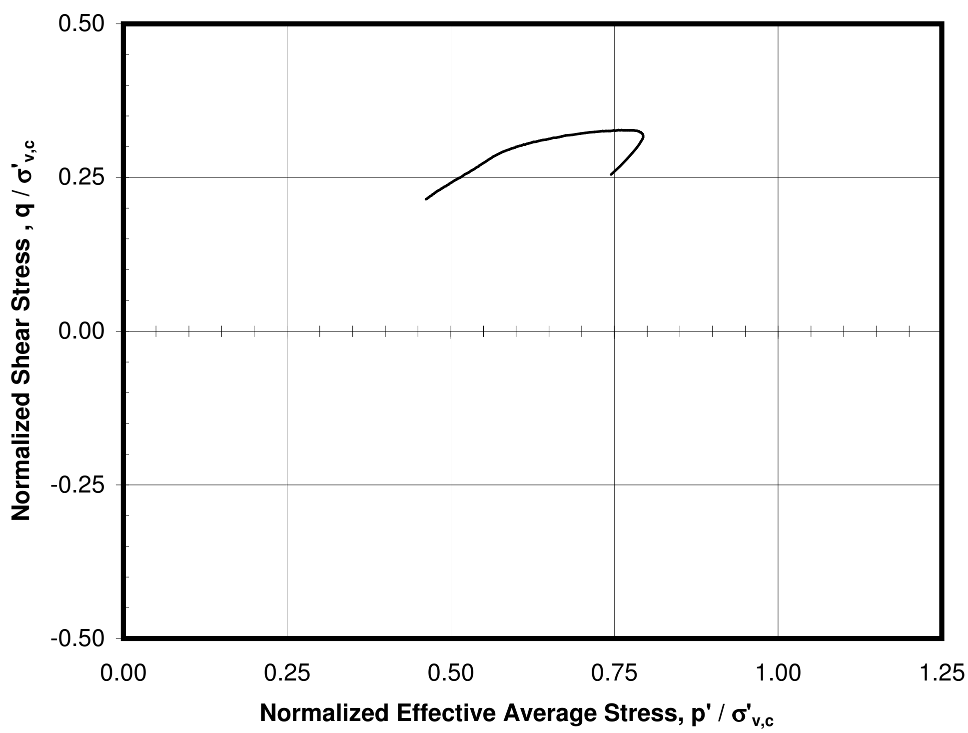




Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Shearing Phase - Test Induced OCR = 1
Sample: 9b - Depth: 82.10 ft
Boring B-33
Tunnel Segment of SVRT Project
San Jose, California

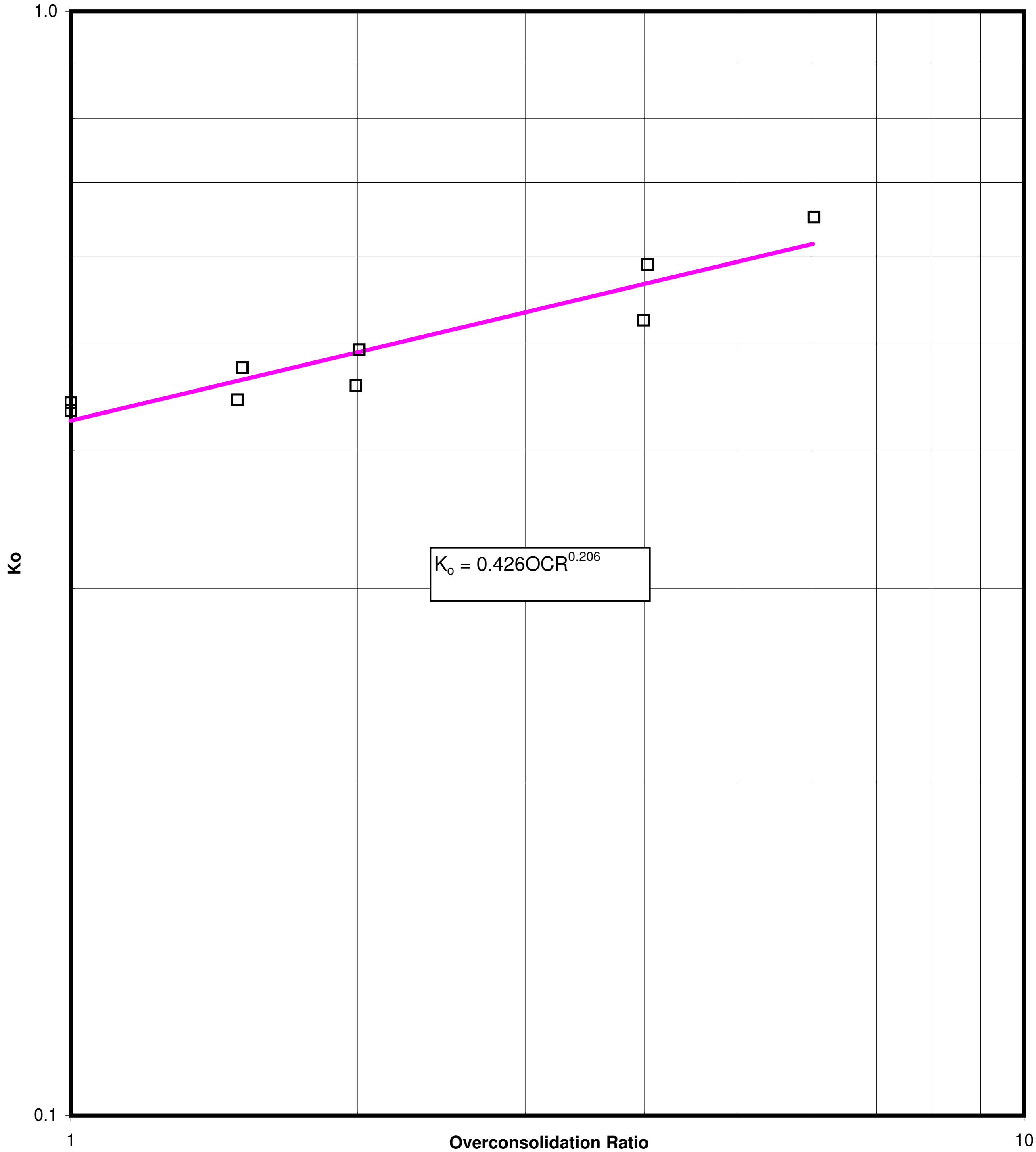
FIGURE A17-7b





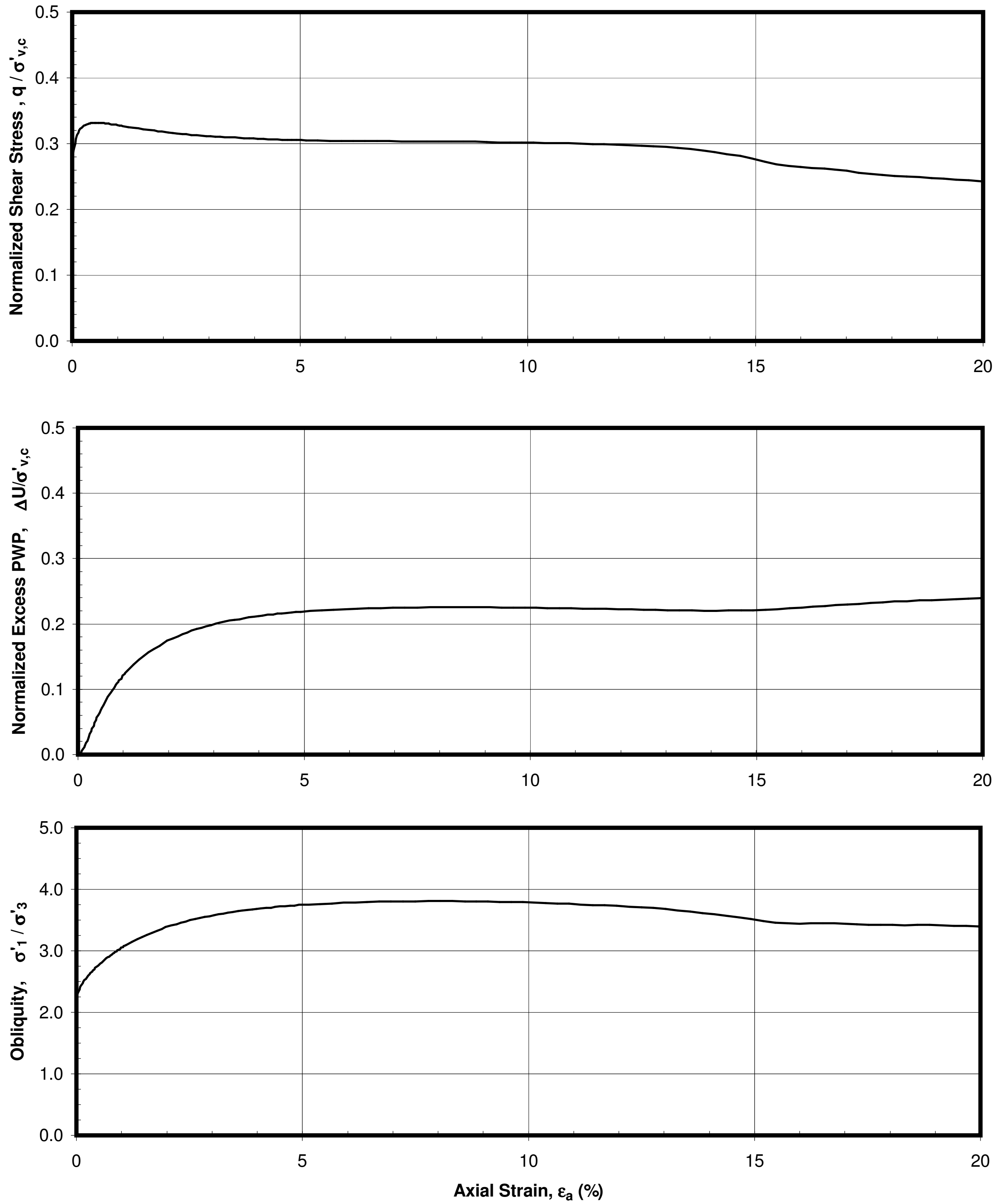
Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Shearing Phase - Test Induced OCR = 1
Sample: 9b - Depth: 82.10 ft
Boring B-33
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-7c



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 7b - Depth: 36.55 ft
Boring B-42
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-8a



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

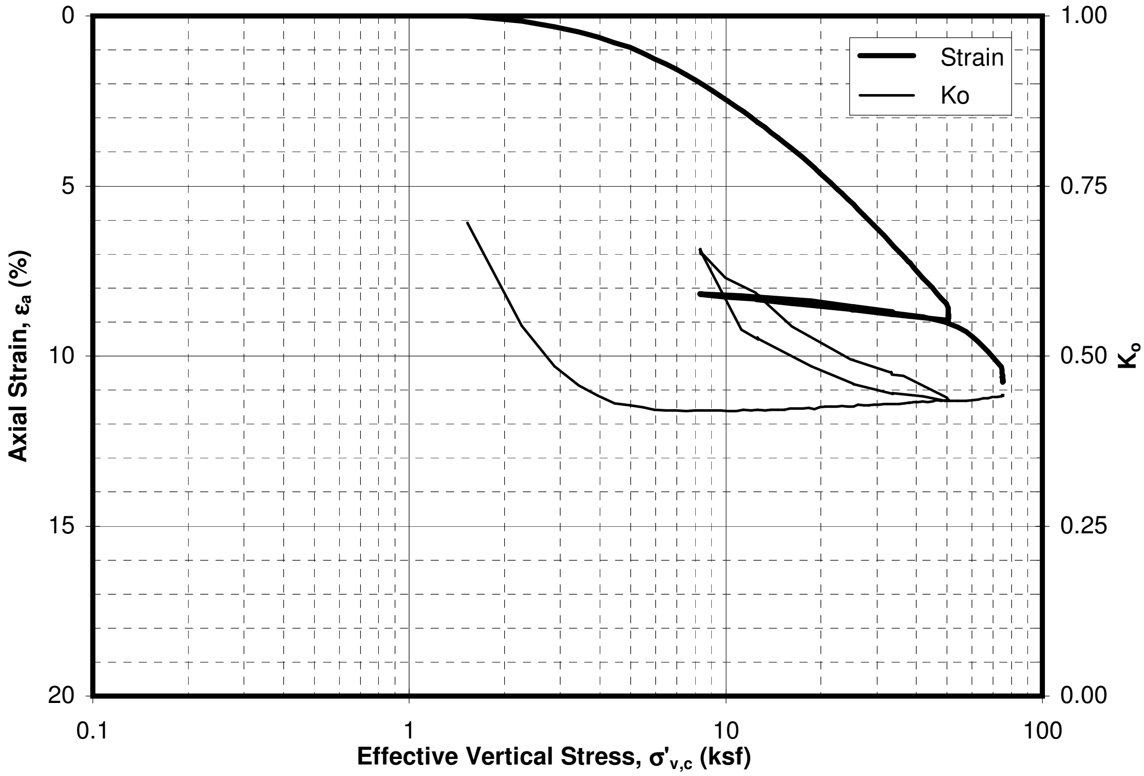
Sample: 7b - Depth: 36.55 ft

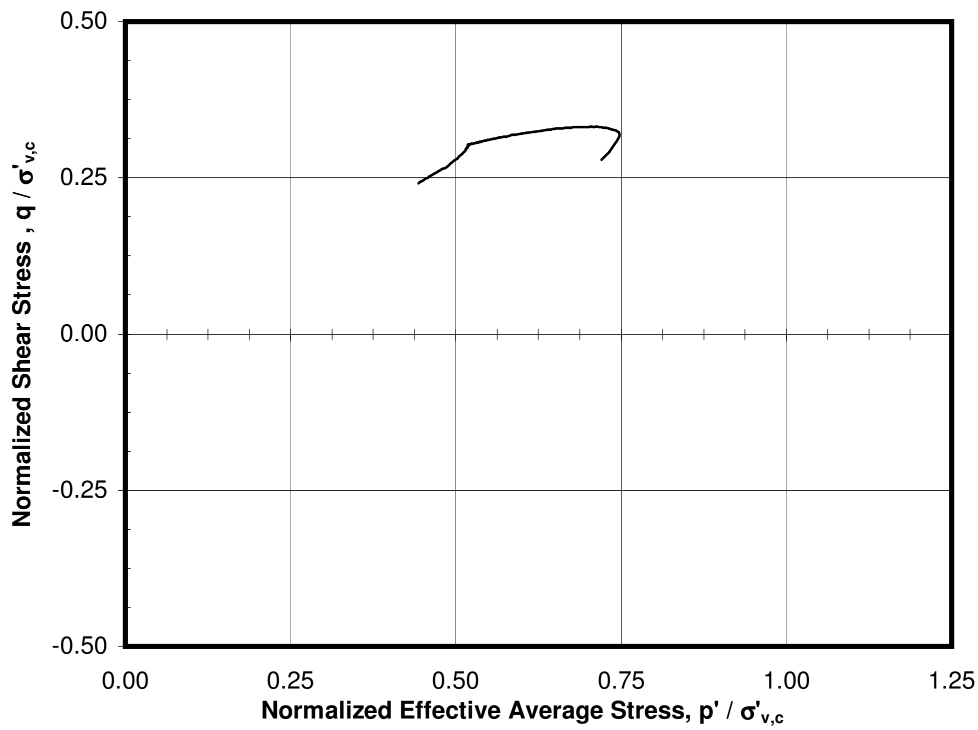
Boring B-42

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-8b





Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

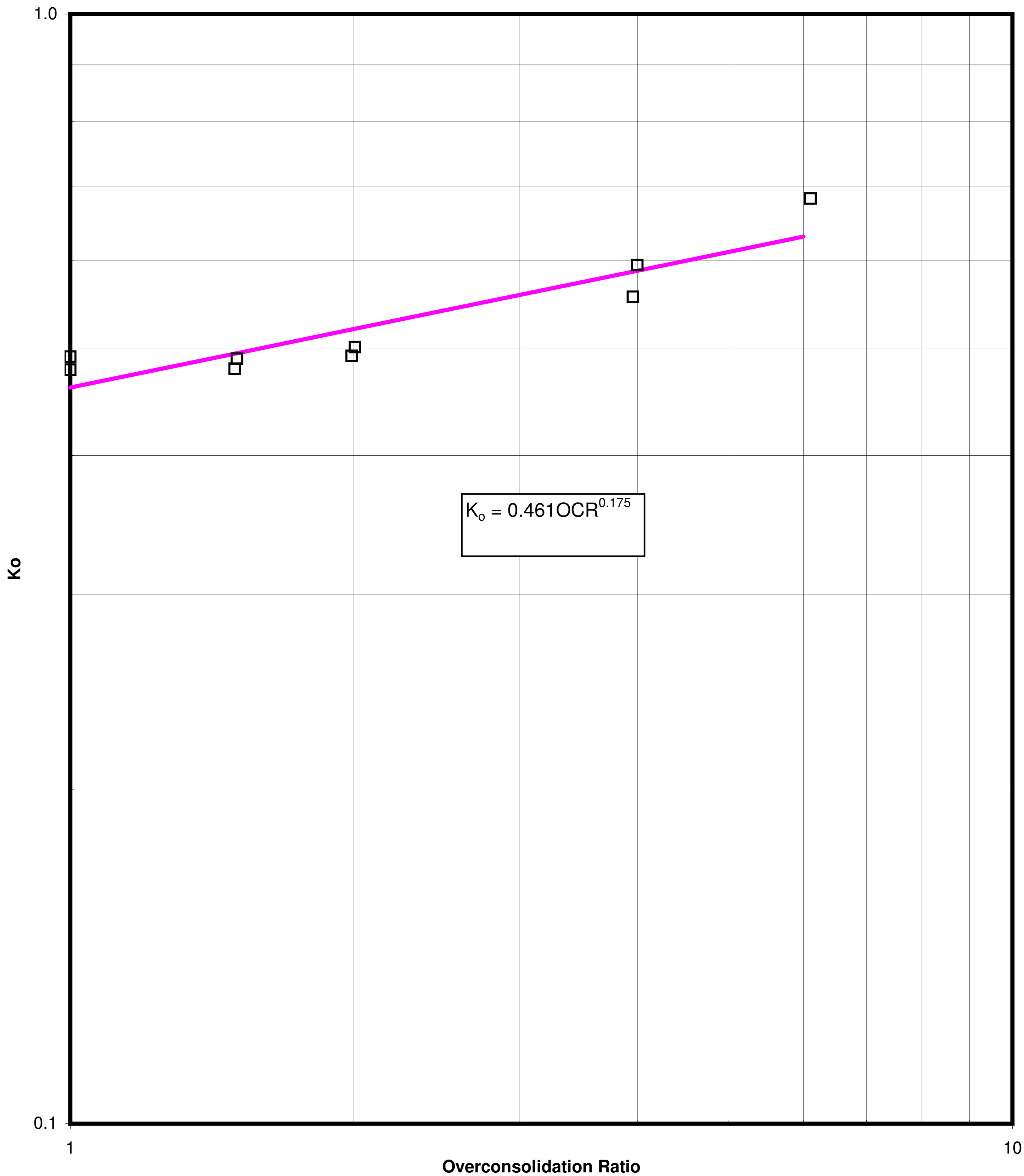
Sample: 7b - Depth: 36.55 ft

Boring B-42

Tunnel Segment of SVRT Project

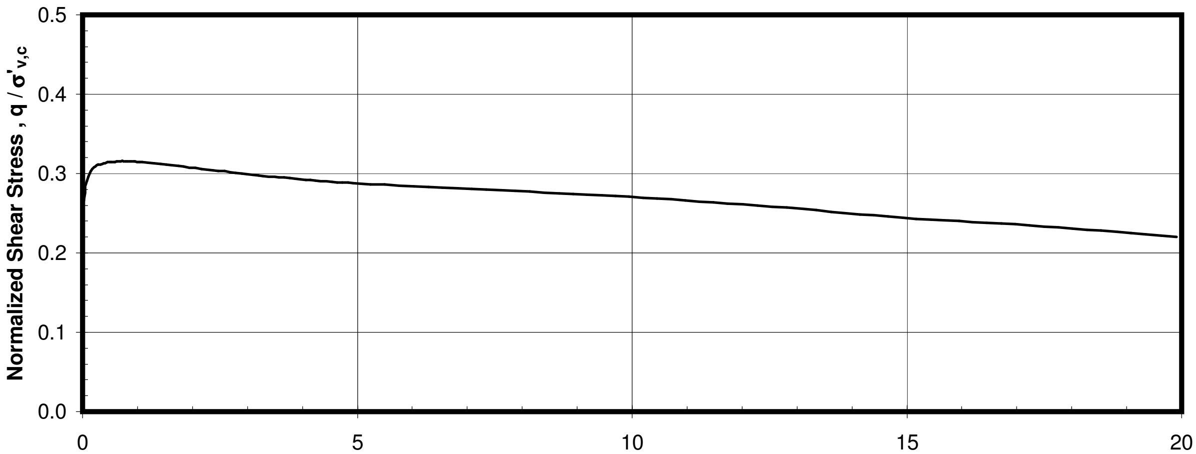
San Jose, California

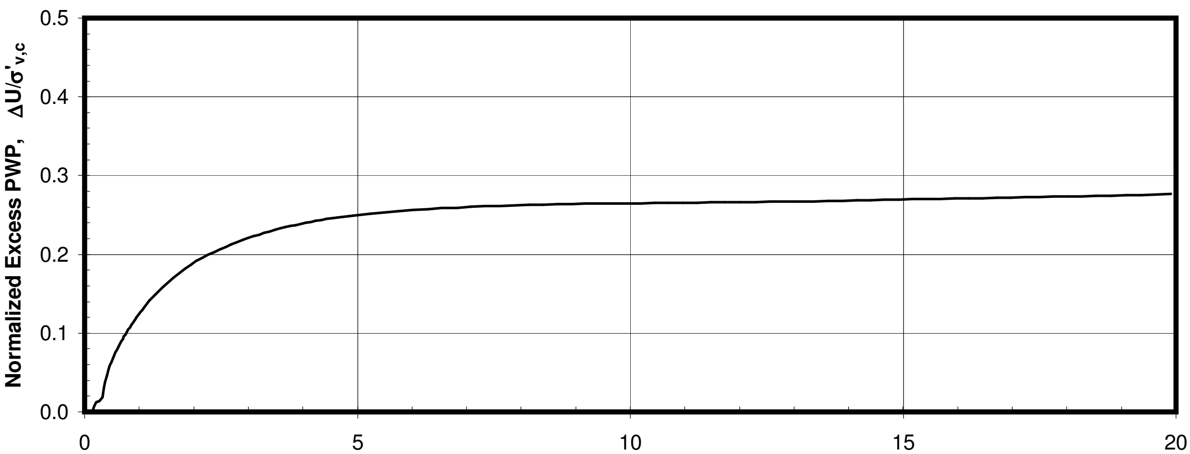
FIGURE A17-8c

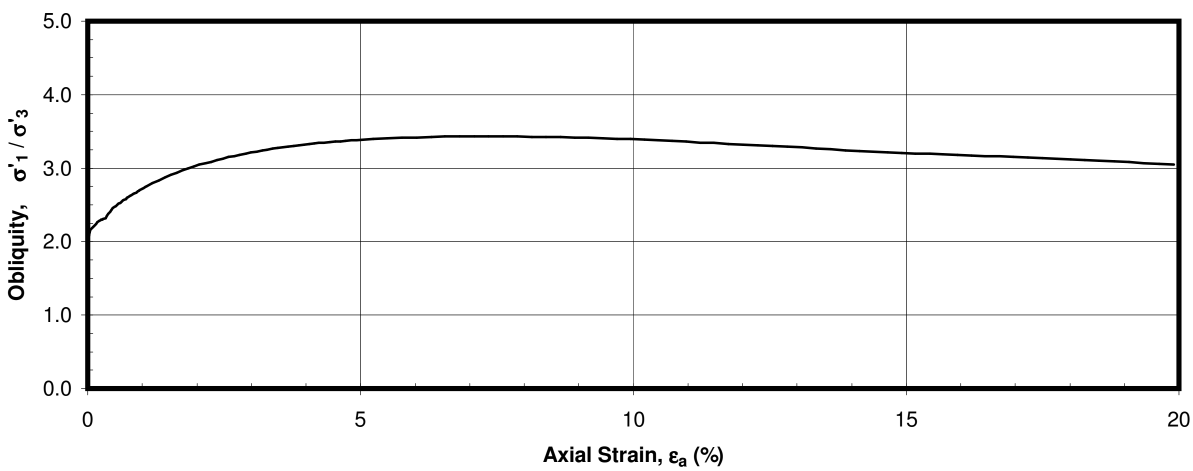


Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 4b- Depth: 41.25 ft
Boring B-45
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-9a







Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

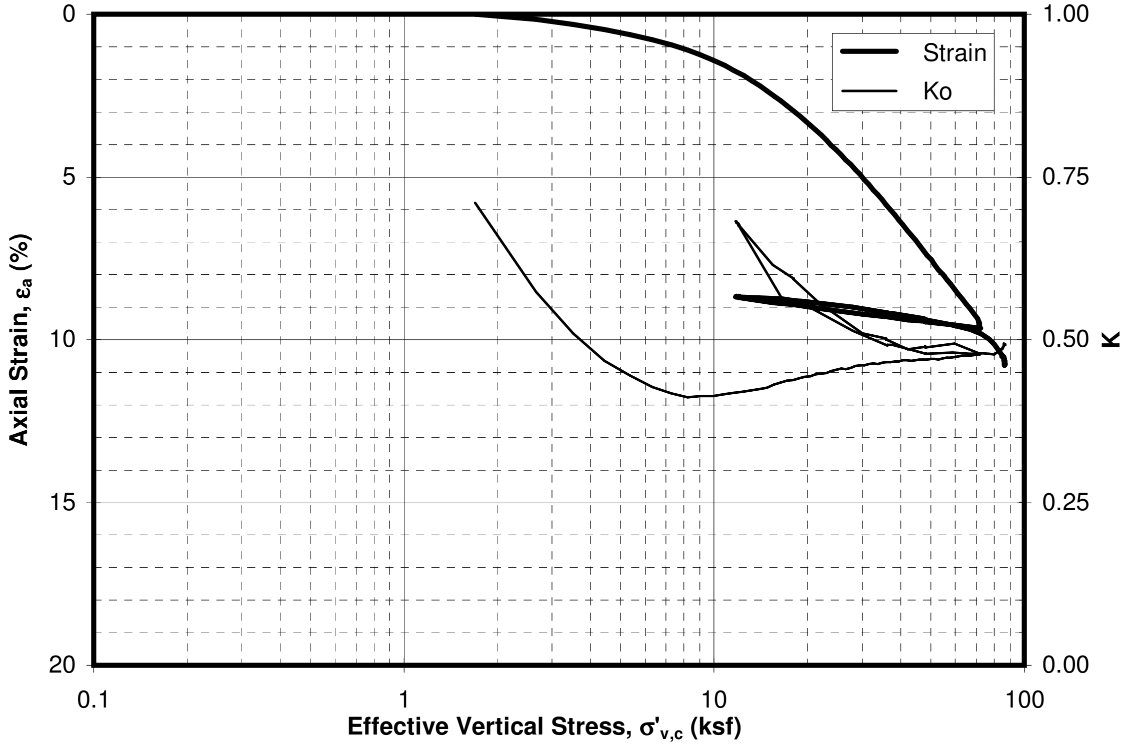
Sample: 4b- Depth: 41.25 ft

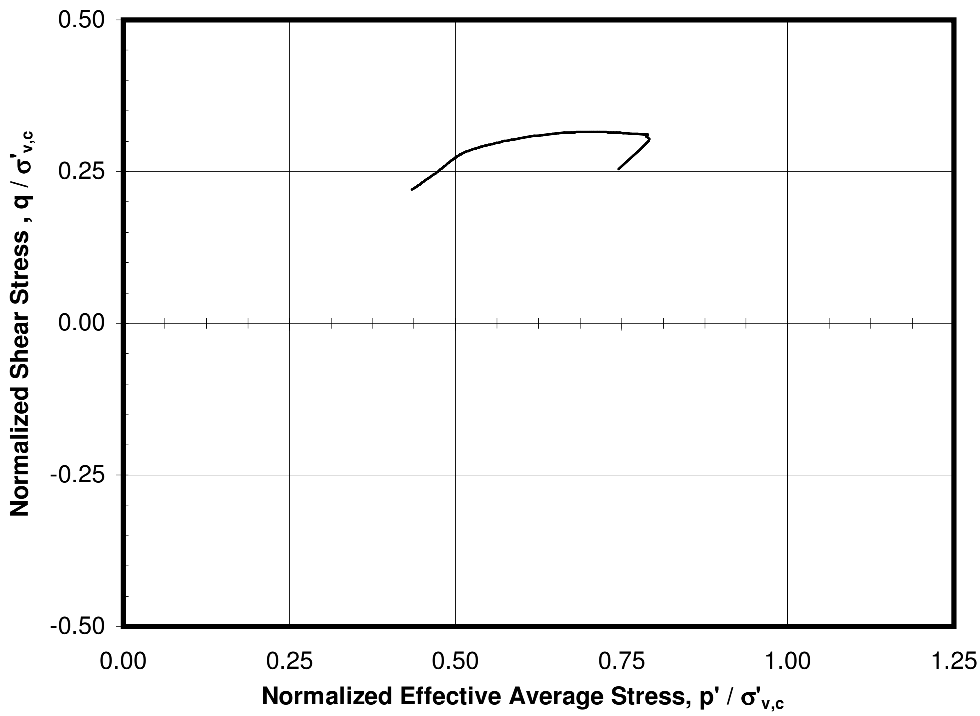
Boring B-45

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-9b





Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

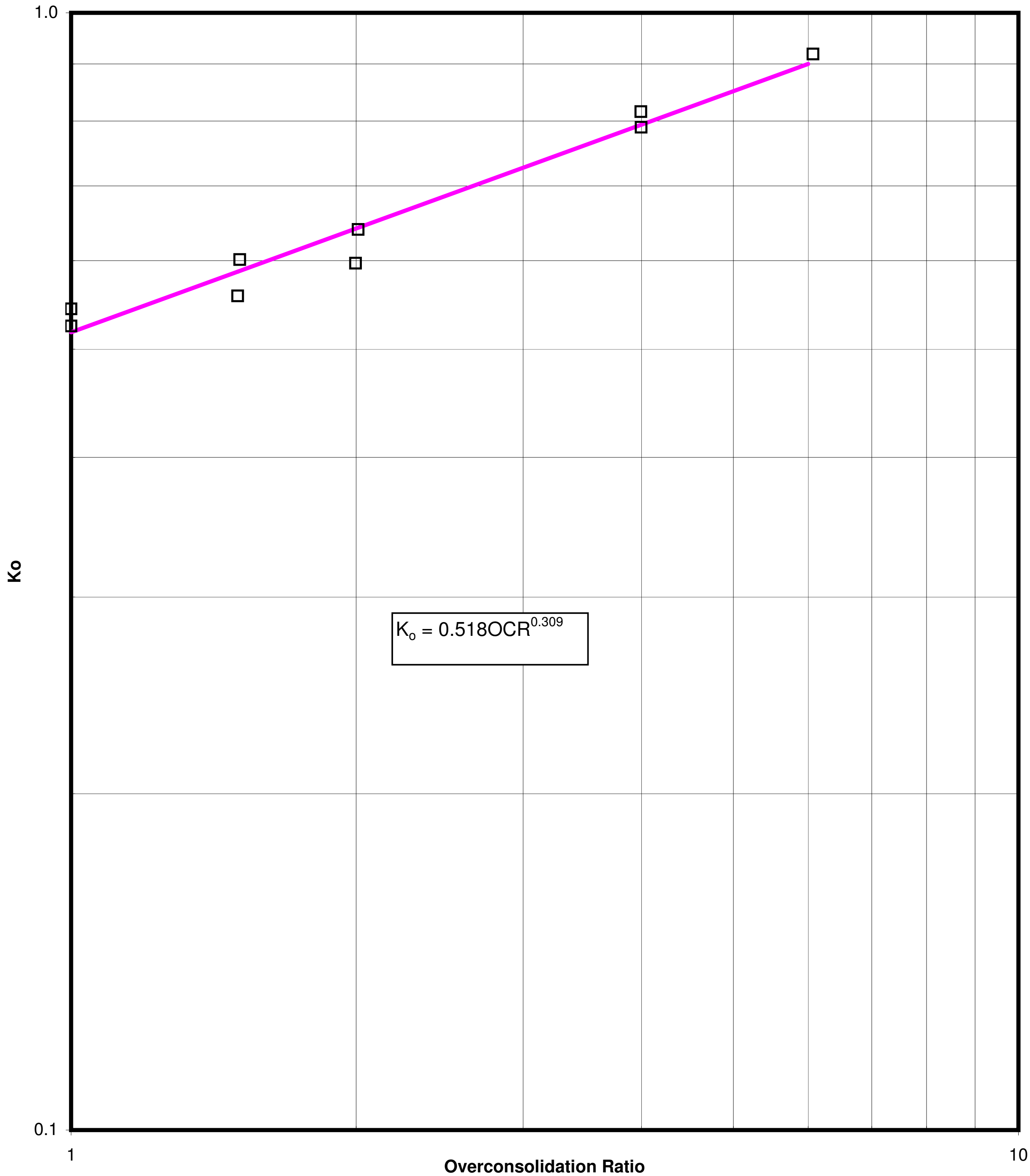
Sample: 4b- Depth: 41.25 ft

Boring B-45

Tunnel Segment of SVRT Project

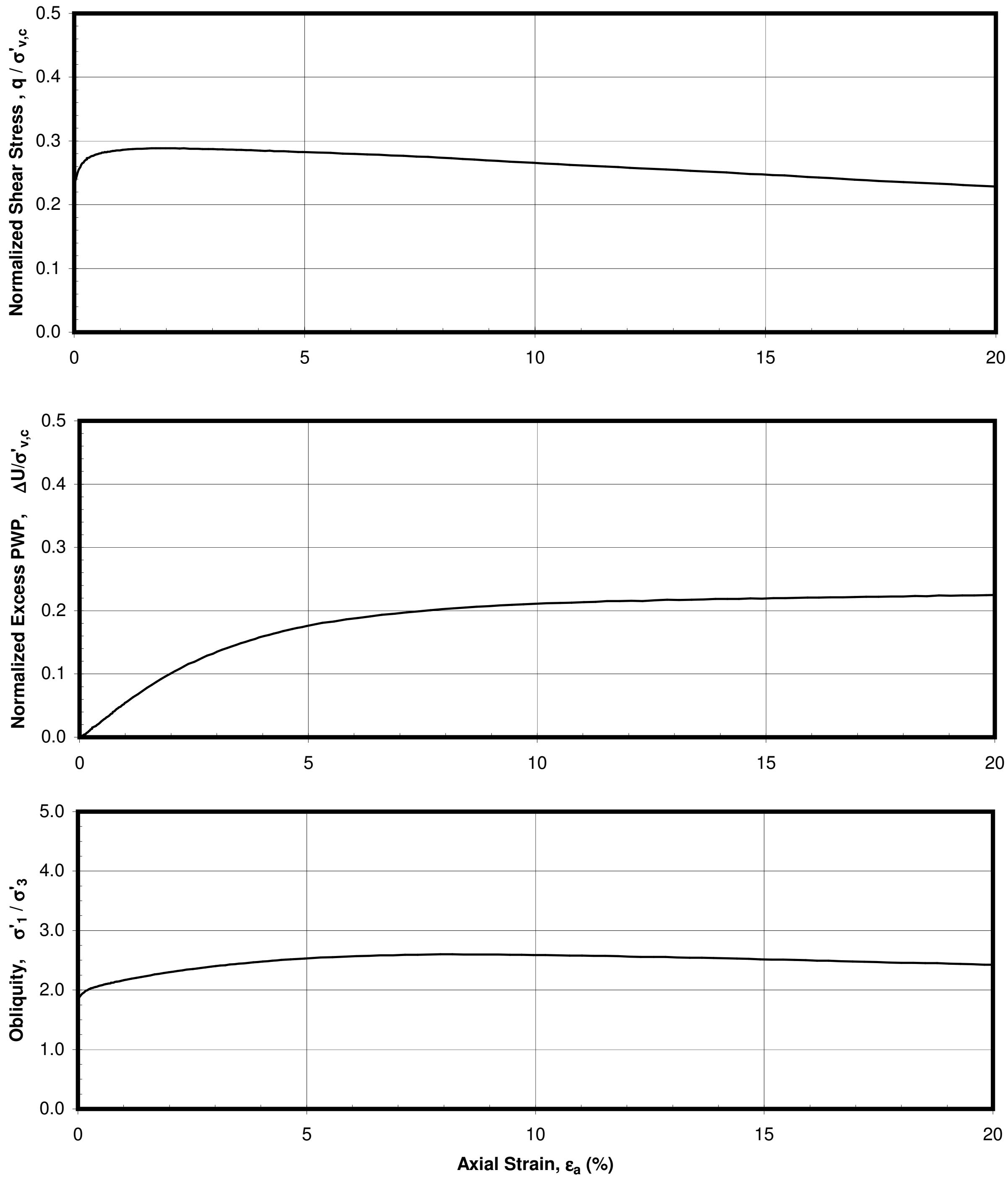
San Jose, California

FIGURE A17-9c



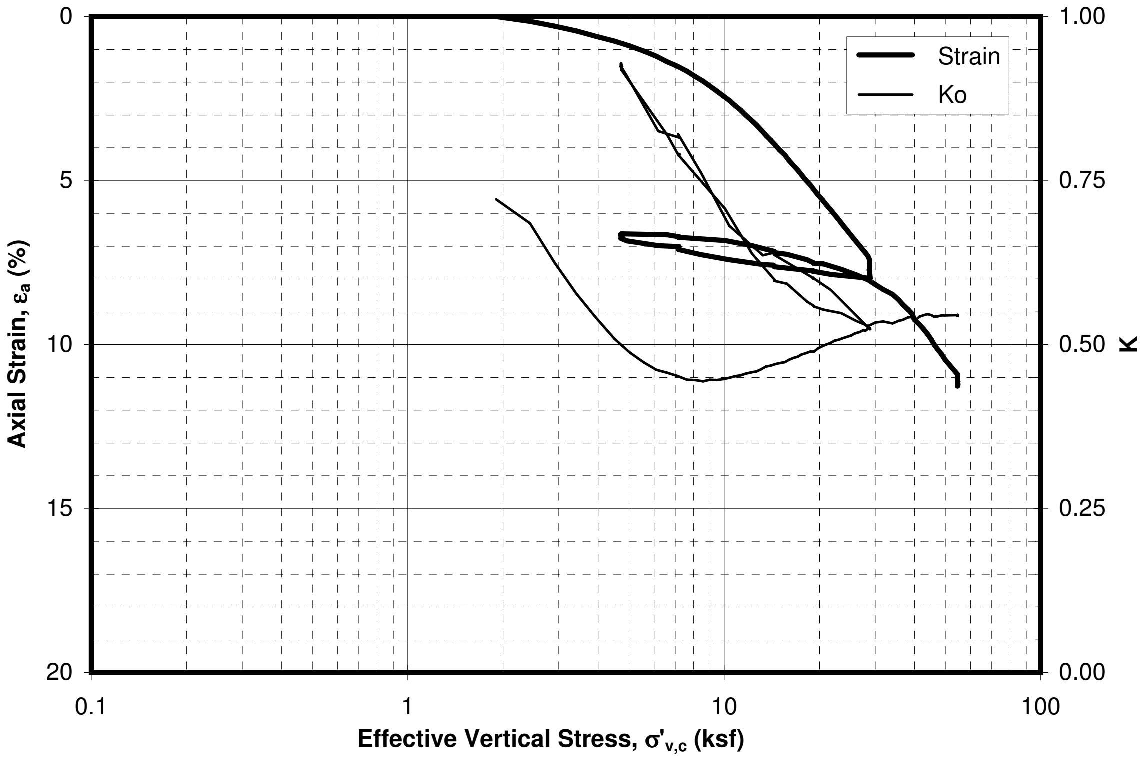
Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 5b - Depth: 50.55 ft
Boring B-59
Tunnel Segment of SVRT Project
San Jose, California

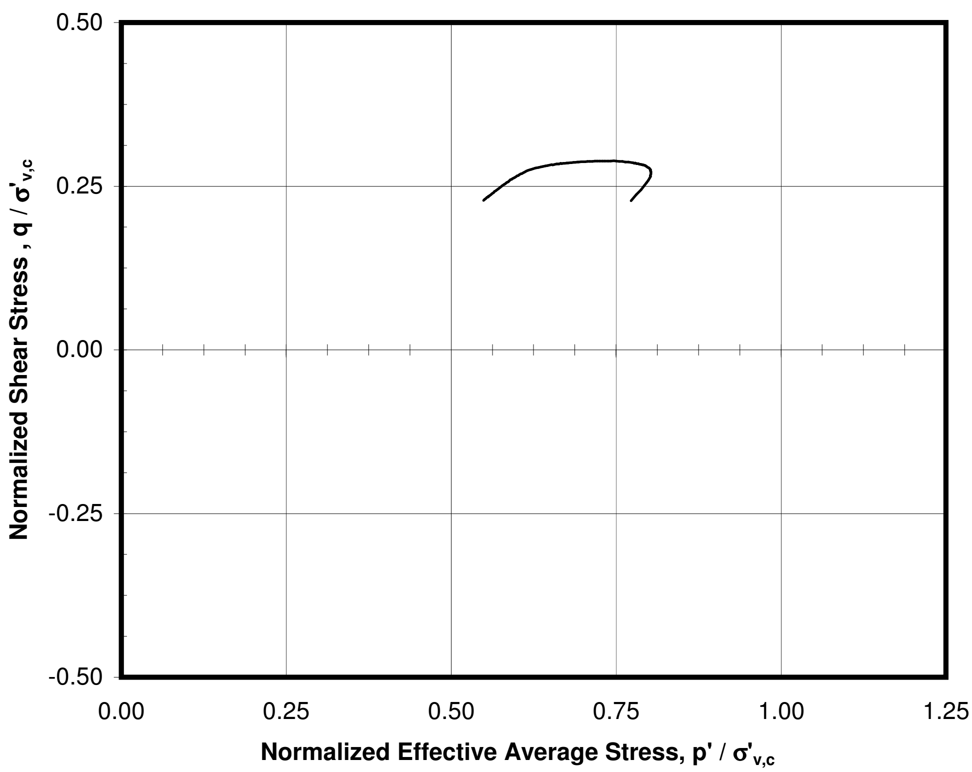
FIGURE A17-10a



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Shearing Phase - Test Induced OCR = 1
Sample: 5b - Depth: 50.55 ft
Boring B-59
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-10b





Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

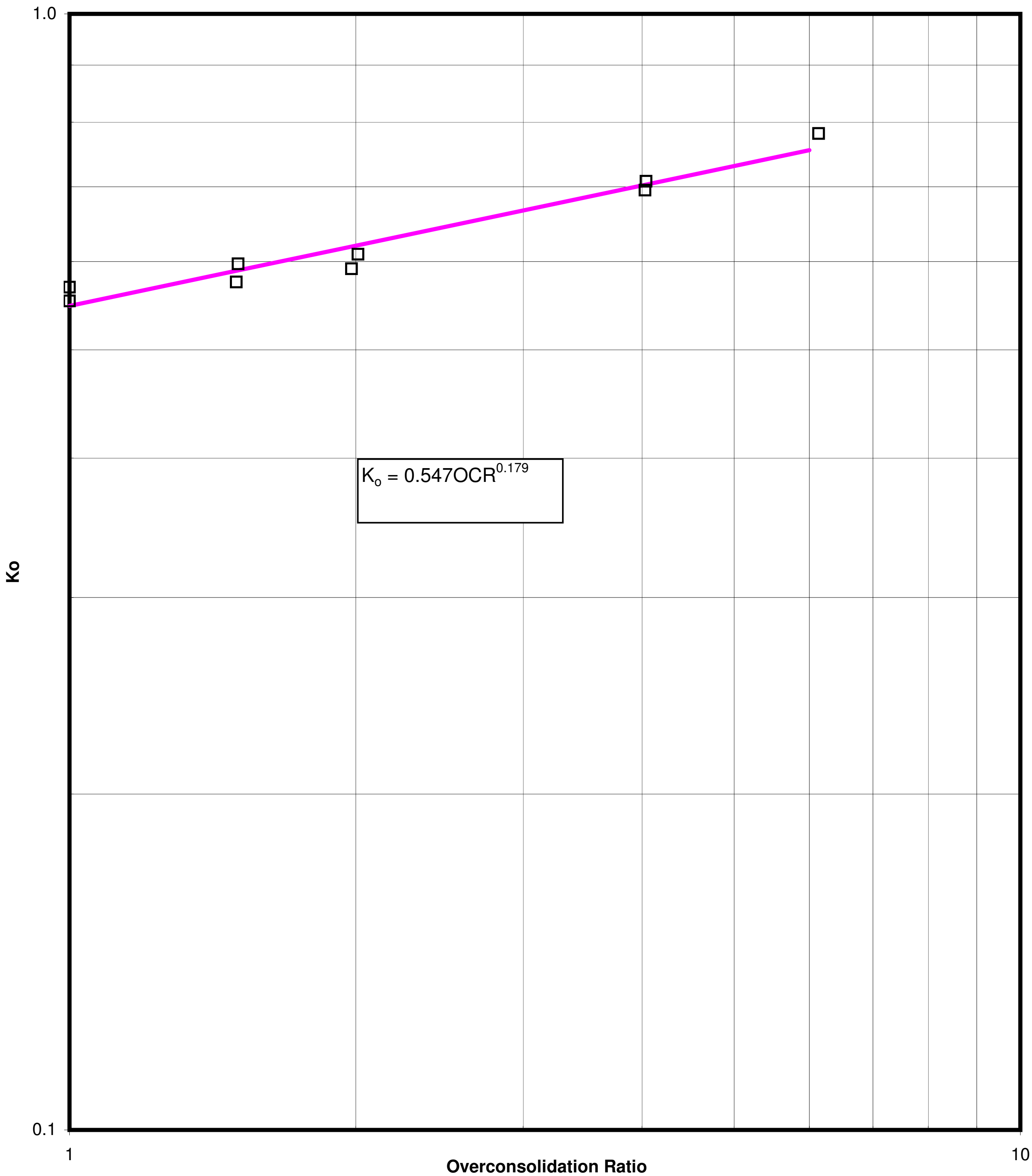
Sample: 5b - Depth: 50.55 ft

Boring B-59

Tunnel Segment of SVRT Project

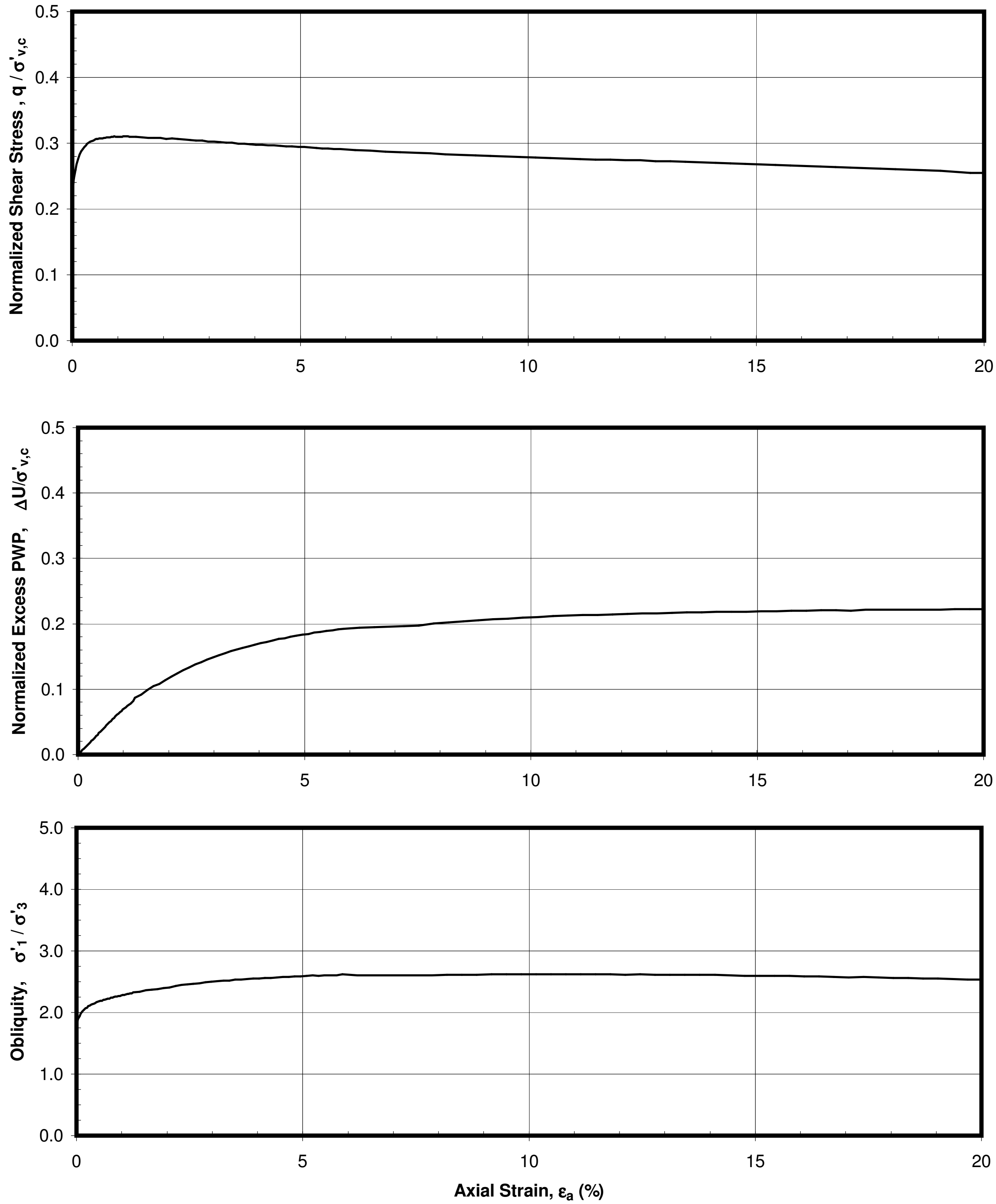
San Jose, California

FIGURE A17-10c



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 17b - Depth: 135.85 ft
Boring B-61
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-11a



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

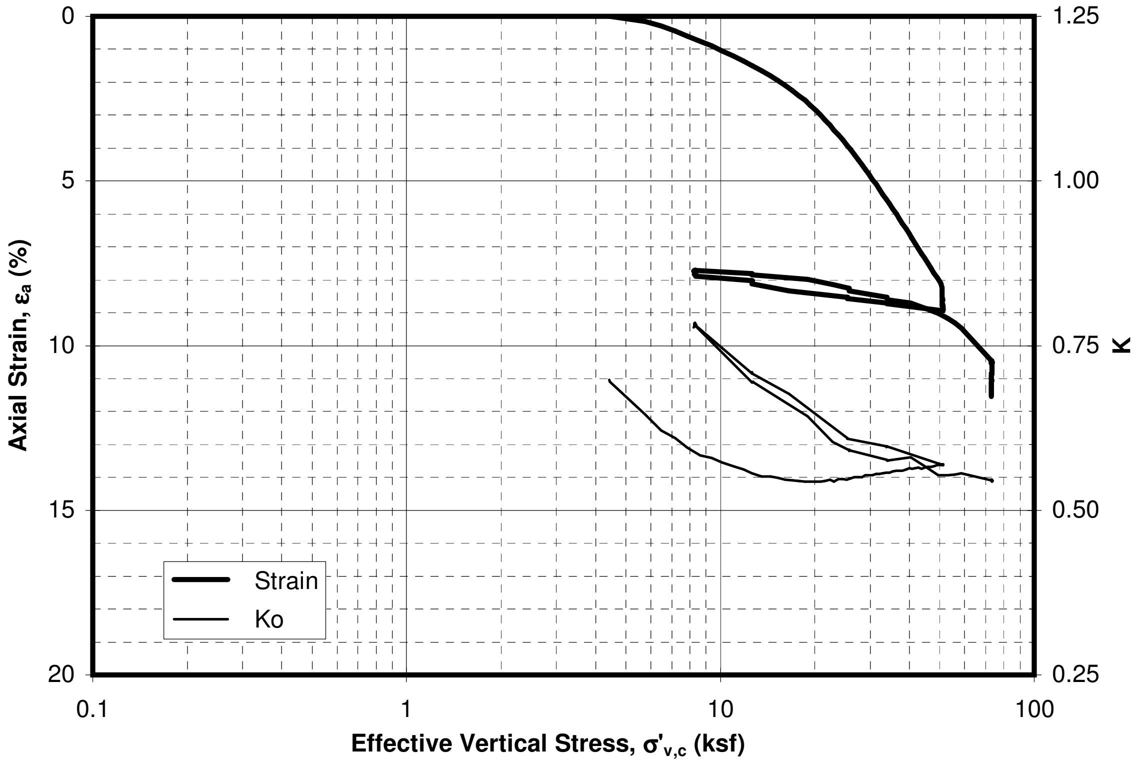
Sample: 17b - Depth: 135.85 ft

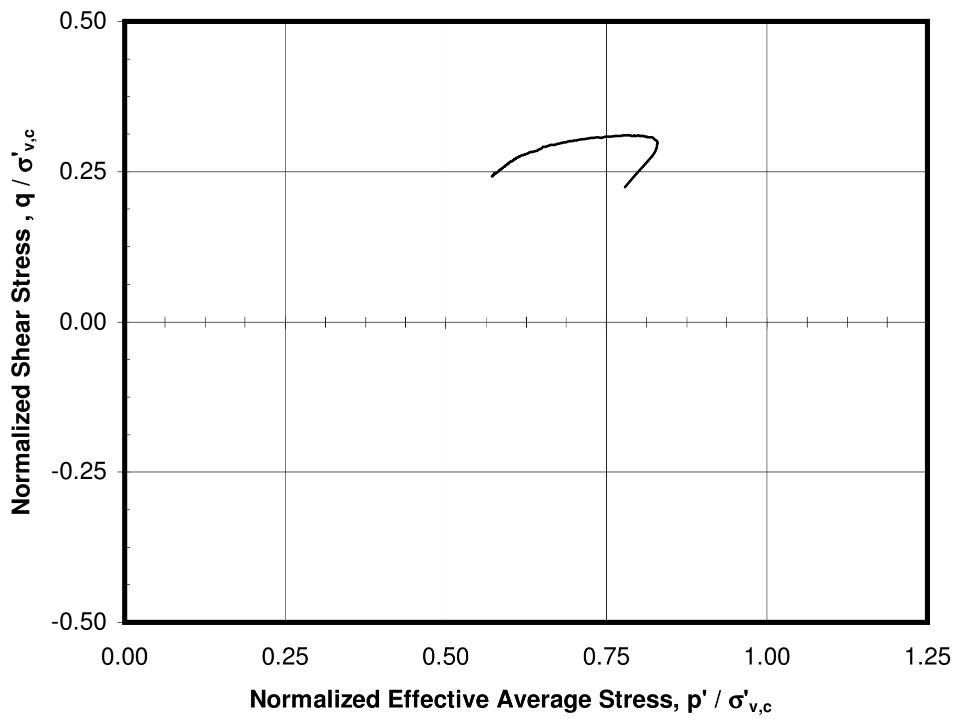
Boring B-61

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-11b





Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

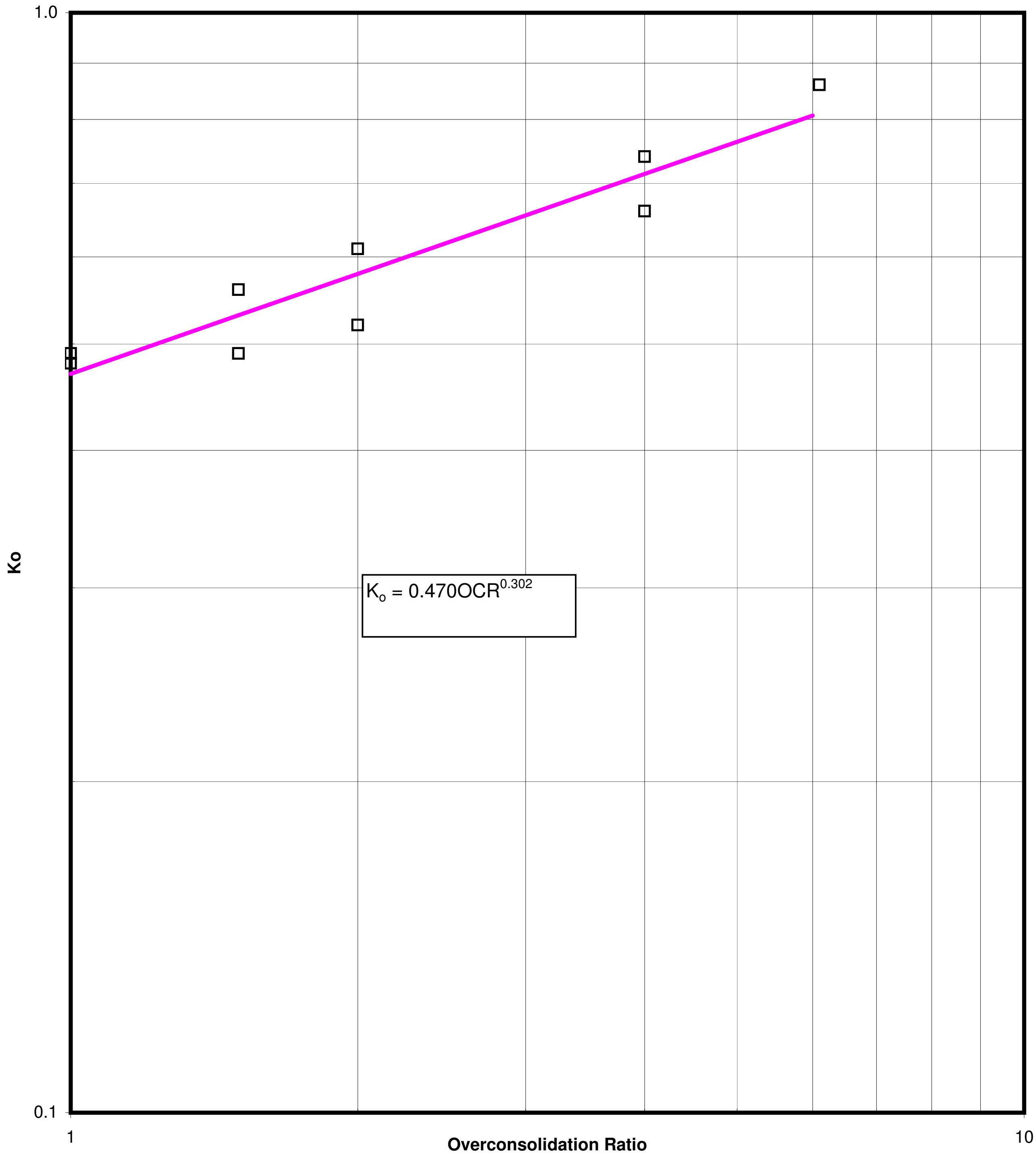
Sample: 17b - Depth: 135.85 ft

Boring B-61

Tunnel Segment of SVRT Project

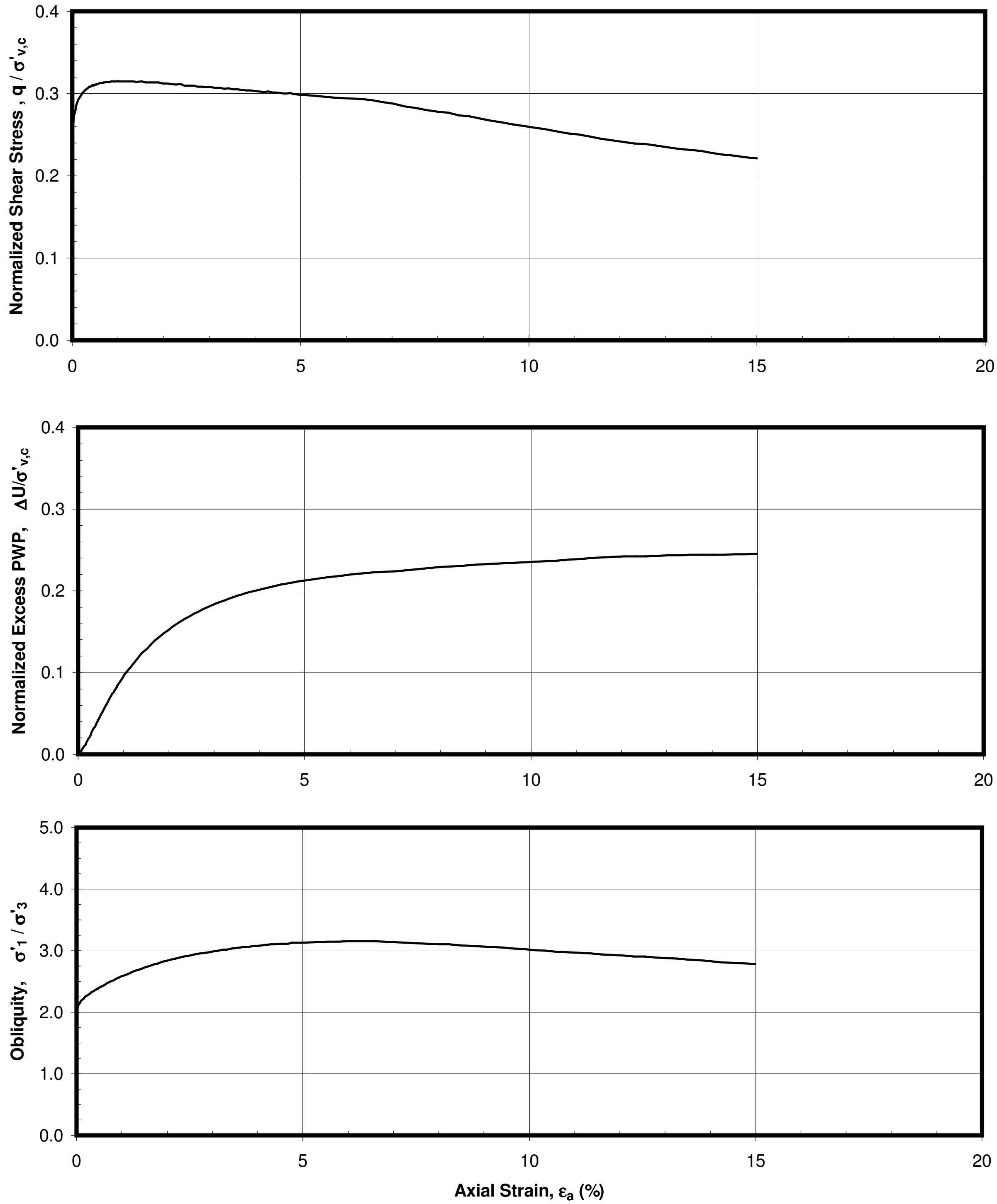
San Jose, California

Figure A17-11c



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 5b - Depth: 32.35 ft
Boring B-64
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-12a



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

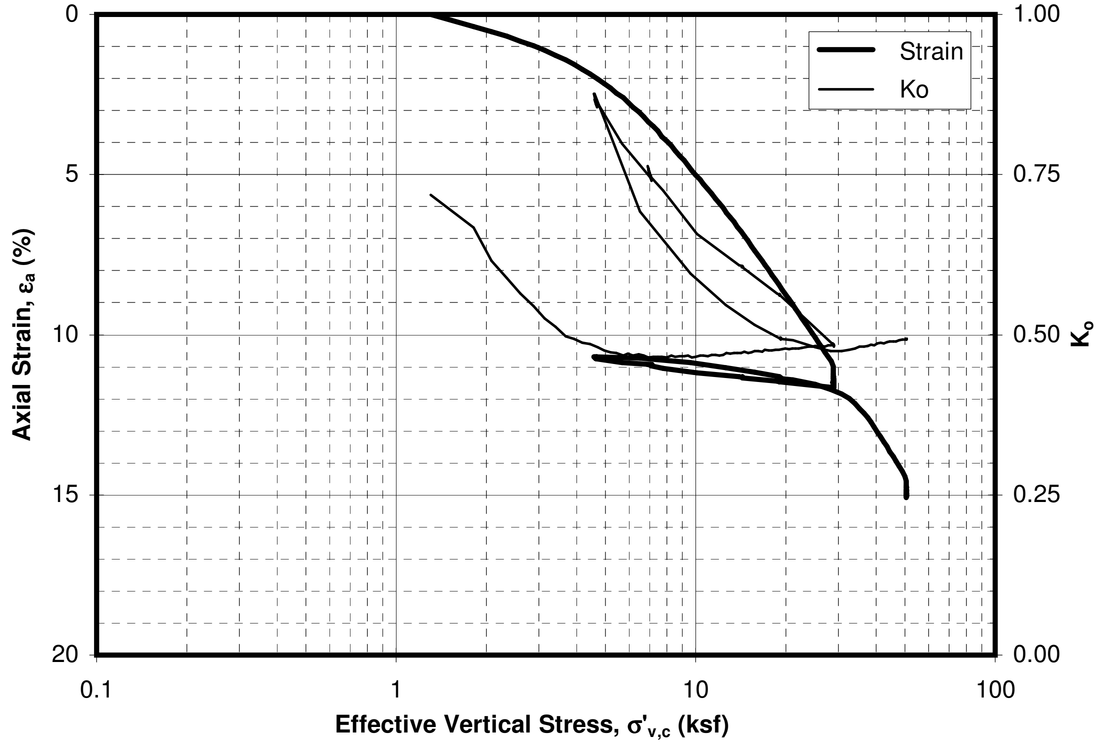
Sample: 5b - Depth: 32.35 ft

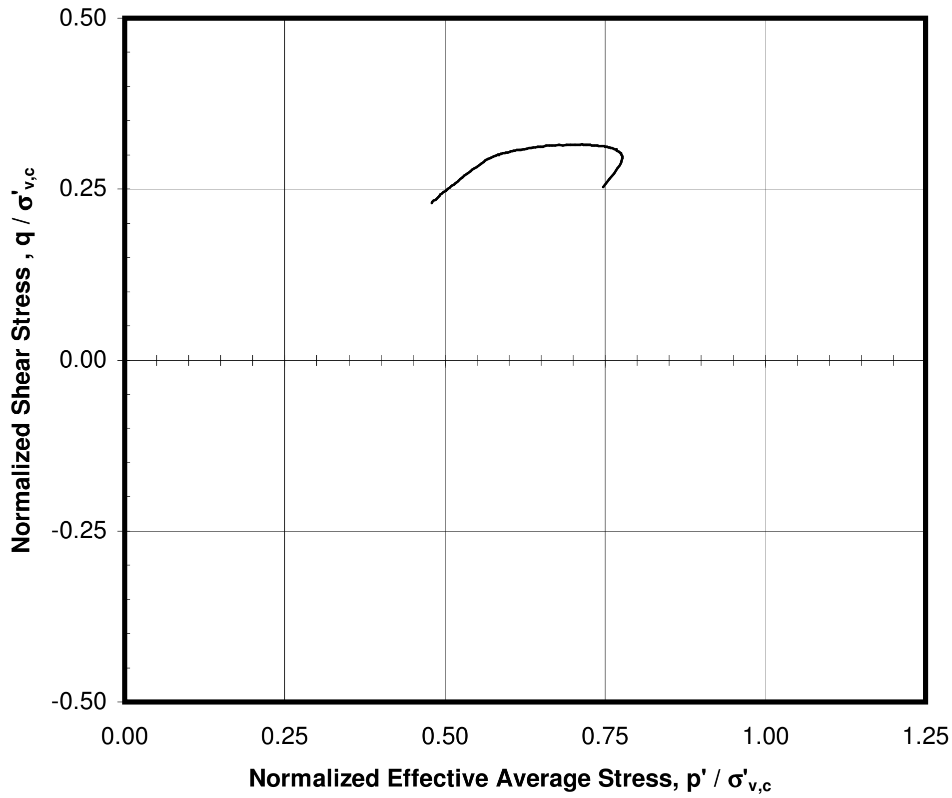
Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-12b





Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR = 1

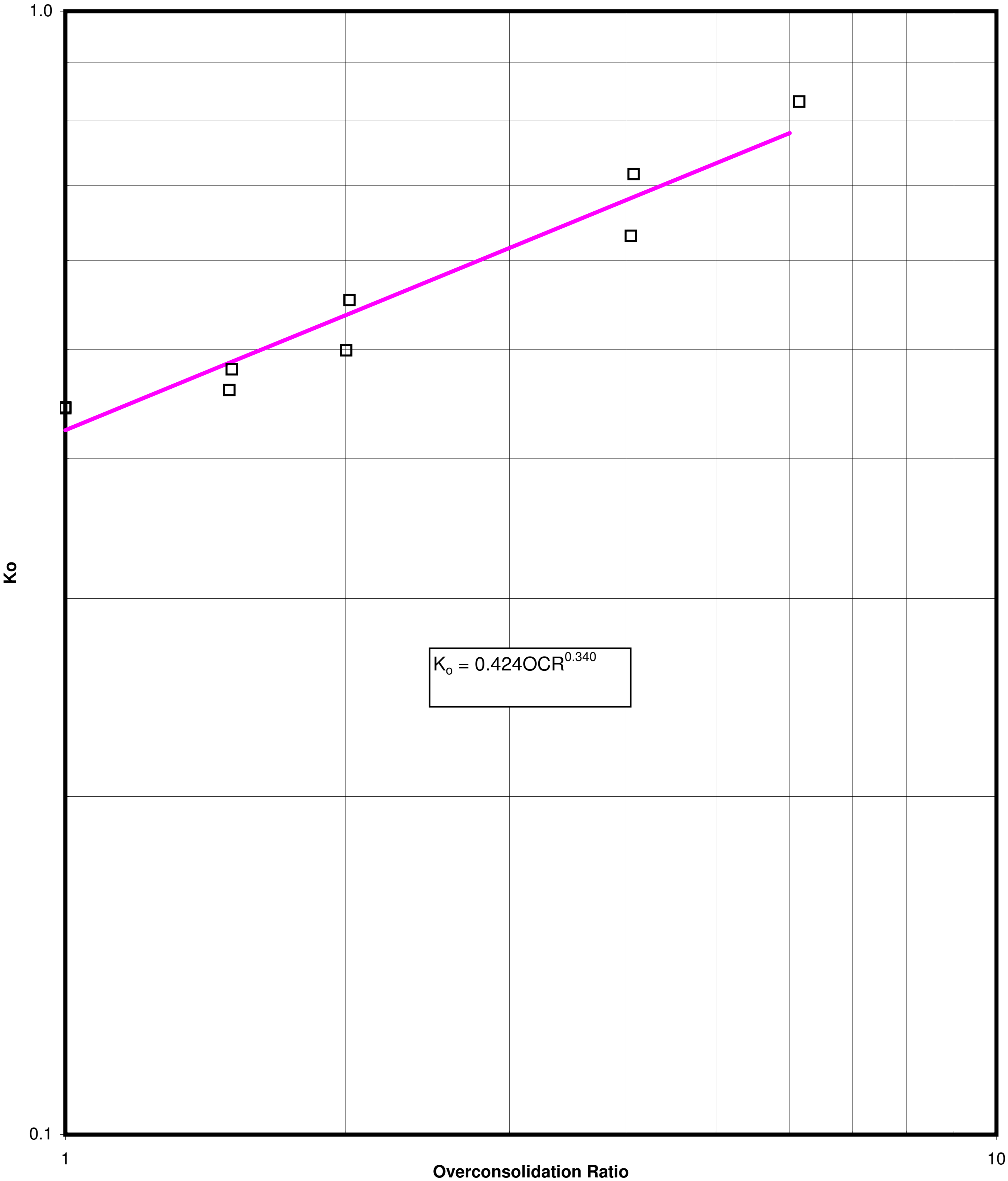
Sample: 5b - Depth: 32.35 ft

Boring B-64

Tunnel Segment of SVRT Project

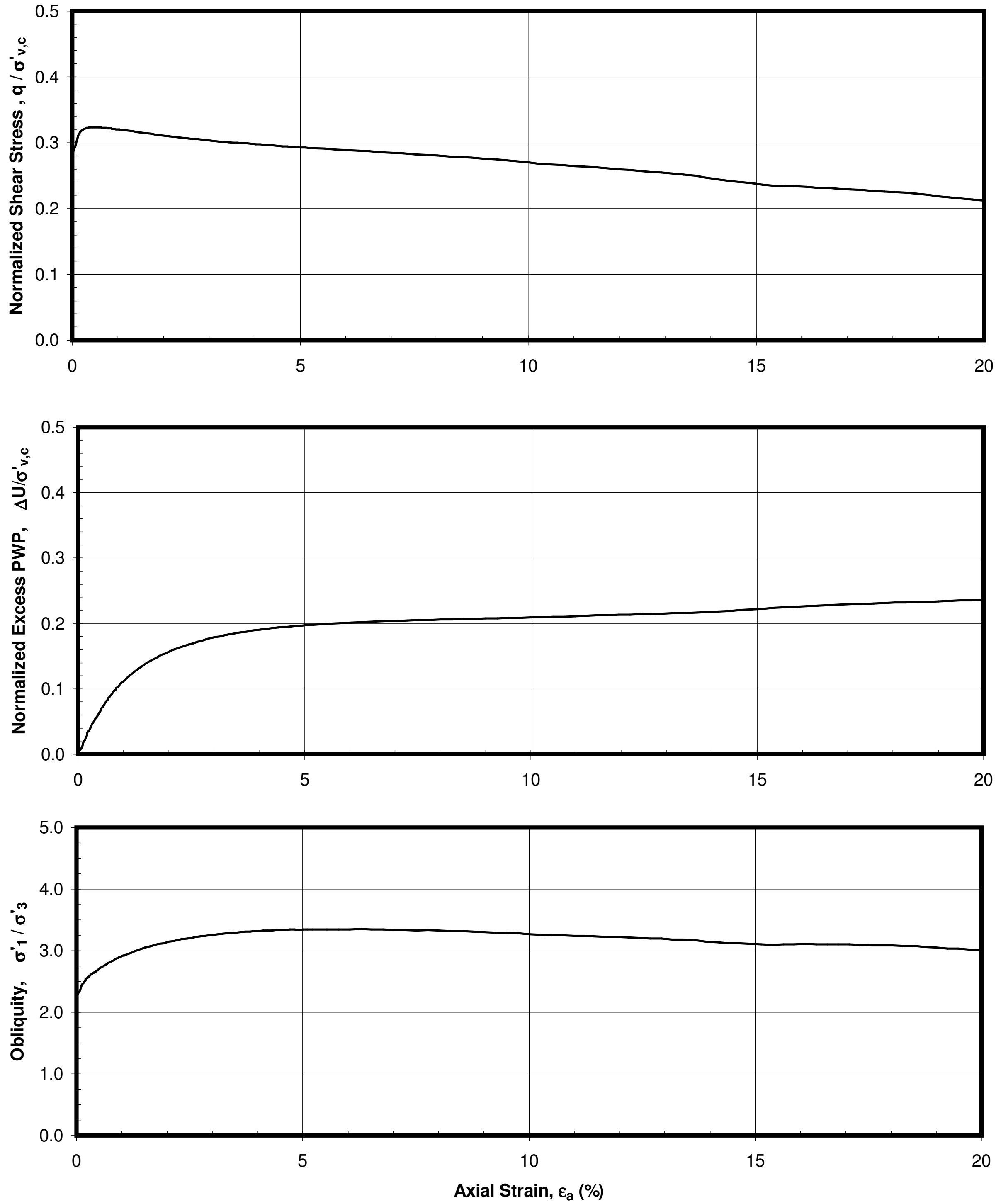
San Jose, California

FIGURE A17-12c



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS
Consolidation Phase
Sample: 19a - Depth: 117.40 ft
Boring B-64
Tunnel Segment of SVRT Project
San Jose, California

FIGURE A17-13a



Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR=1

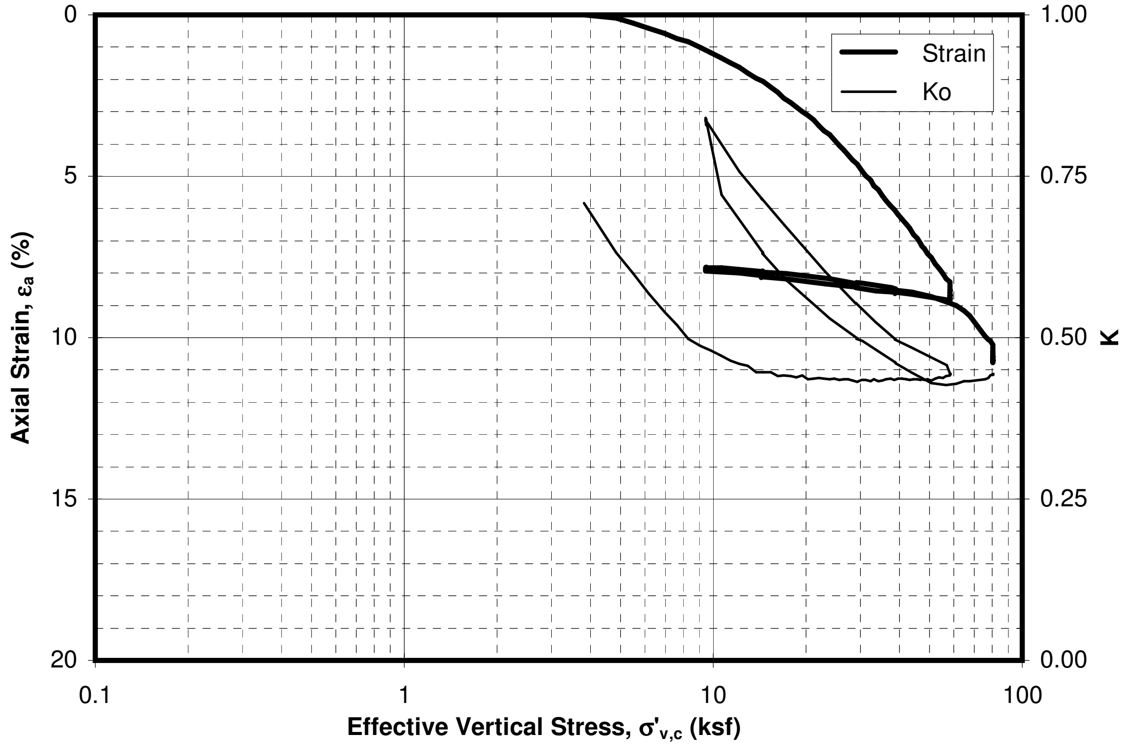
Sample: 19a - Depth: 117.40 ft

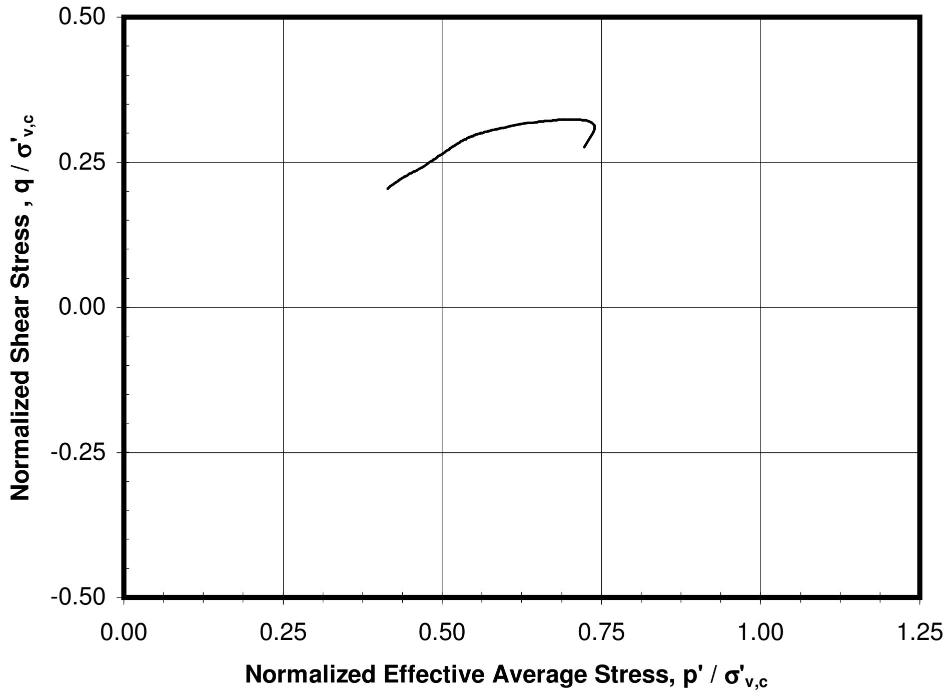
Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-13b





Ko-BISHOP CONSOLIDATED TRIAXIAL COMPRESSION TEST RESULTS

Shearing Phase - Test Induced OCR=1

Sample: 19a - Depth: 117.40 ft

Boring B-64

Tunnel Segment of SVRT Project

San Jose, California

FIGURE A17-13c