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

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

Received SVRT PDCC Sep 29 2005

Silicon Valley
Rapid Transit Project

Tunnel Segment
Geotechnical Data Report
Volume III of VI

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

Prepared by
HMM/Bechtel SVRT,
a Joint Venture

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VOLUME III

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APPENDIX 3

PRESSUREMETER TESTS

Hughes Insitu Engineering performed Pressuremeter Testing. A description of the test equipment, testing procedures and results are presented in Appendix 3.

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

APPENDIX 3

PRESSUREMETER TESTS

For

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

PARIKH CONSULTANTS, INC.
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June 2005

Job No. 204104.10

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

June 3, 2005
Job No.: 204104.10

Attn.: Mr. Ignacio Arango

Sub: Appendix 3 – Pressuremeter 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 3 – Pressuremeter 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

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Project Manager

FW/YDW/GP {\Projects\204104.10\App-3.doc}

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- Exploratory Borehole & In-Situ Test Program (Table A3-1)
- Summary of the Pressuremeter Testing For the Silicon Valley Rapid Transit Project (Hughes Insitu Engineering Inc., May 2005)

APPENDIX 3 – PRESSUREMETER 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 A3-1.

METHODLOGY OF EXPLORATION

Pressuremeter Testing

Pressuremeter tests were performed by Hughes Insitu Engineering, Inc. Both pre-bored pressuremeter tests and self-boring pressuremeter tests were conducted. The Fraste Multidrill XL drill rig (a top-drive rig) was used for the self-boring pressuremeter tests. In hard soils and soils of granular in nature, only the pre-bored pressuremeter tests were conducted. To avoid potential caving of boreholes and damage to the equipment, steel casing was used for pressuremeter tests in and below sandy/gravelly formation. A nitrogen bottle was used for pressure source, and three sensors on the body of the pressuremeter registered displacement data of the borehole during testing.

The pressuremeter tests were performed at the specified boreholes and depths as selected by the design team. The testing procedures are in general accordance with ASTM 4719 modified as per Hughes Insitu Engineering. The pressuremeter test data including undrained shear strength, friction angle, lateral stress, shear modulus, etc. are presented in a report entitled "Summary of the Pressuremeter Testing for the Silicon Valley Rapid Transit Project", dated May 2005, prepared by Hughes Insitu Engineering, Inc. The report is attached with this appendix.

Deploy of Pressuremeter Tests. For pre-bored pressuremeter tests, a pilot was cut using a 3-inch O.D. Shelby tube. One tube cut a hole approximately 2.5 feet in length. To accommodate two pressuremeter tests in the same test pocket, two Shelby tube samples were taken back-to-back (in clay soils). When the material was granular in nature or too hard to push Shelby tube, the pilot hole was drilled with a 2-15/16 inches tricone bit under controlled/limited circulation. The first test was conducted near the bottom of the pilot hole, and the second test was 18 inches higher.

The self-boring pressuremeter is mechanically similar to the pre-bored Pressuremeter, except that it is hollow. Inside the self-boring pressuremeter is a small drill bit that is rotated from the drill rig as the pressuremeter is pushed into undisturbed material. The self-boring pressuremeter drills into undisturbed material approximately three feet for the first test, and the second test is typically an additional 18 to 24 inches deeper.

The self-boring pressuremeter is intended for relatively uniform clays/silts. Granular formation is not suitable for self-boring pressuremeter as the gravel would bind between the cutting bit and the body of the self-boring pressuremeter. This action stops the self-boring process. We noticed that nodules (caliche) within the clay formation tend to have similar effect on the operation of self-boring pressuremeter. More detailed description of the pressuremeter testing operation is provided in the attached summary report by Hughes Insitu Engineering, Inc.

At BH-60 (within the existing Security Contractor Services yard off 28th Street, Honco property), the pressuremeter instrument could not receive signal below 100-foot depth although the equipment was working normally at ground surface. Incidentally, the SCVWD inspector's GPS could not lock-in the borehole location; the equipment indicated "too much noise".

Very Truly Yours,
PARIKH CONSULTANTS, INC.

Y. David Wang

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Senior Engineer

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

REGISTERED PROFESSIONAL ENGINEER
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FW/YDW/GP APP-3 (S:\ON GOING PROJECT\204104.10\APP-3.DOC)

Table A3-1

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)	
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 A3-1

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

Summary of the Pressuremeter Testing For the Silicon Valley Rapid Transit Project

East Santa Clara Street
San Jose, CA

submitted to

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C-290
May 2005

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PHOTOGRAPHS

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TABLES

1.0 INTRODUCTION

This report outlines the results of a pressuremeter study, conducted from October 18 2004 to February 11 2005, in 15 holes along Santa Clara Boulevard in downtown San Jose, CA. The pressuremeter testing was conducted by Hughes Insitu Engineering Inc., Vancouver, B.C. under supervision of Mr. David Wang of Parikh Consultants, Inc. Milpitas, CA. The drilling and the deployment of the pressuremeter was conducted by Greg Drilling, Inc. from Palo Alto, California.

2.0 OBJECT OF THE PRESSUREMETER INVESTIGATION

The object of this study was to obtain the *in-situ* strength and stiffness characteristics of the clay adjacent to the proposed excavation for the Silicon Valley Rapid Transit Rail. The invert of the Rail tunnel is approximately 50 feet below the ground surface. As the walls for the cut and cover tunnel will be required to resist the lateral ground forces and to penetrate sufficiently into the lower clays to prevent failure below the toe of the wall, the aim of the study was to obtain an estimate of the existing lateral stress, and to determine the stability of the lower material into which the wall would be driven.

3.0 PRESSUREMETERS

The pressuremeters used for this study were monocell pressuremeters. At the center of the instrument are three electronic displacement sensors, spaced 120 degrees apart. Over these sensors is the flexible membrane, clamped at each end, which is pressurized to deform the adjacent material. A protective sheet of stainless steel strips covered the membrane. The electronic signals from displacement sensors and the pressure sensor are transmitted by cable to the surface. During the test, the average expansion against pressure curve is displayed on a computer screen. The pressuremeter was expanded by regulating the flow from a gas bottle of compressed nitrogen down the umbilical cable.

In the initial stage (October-December 2004) a conventional type of pressuremeter was deployed. That pressuremeter, a pre-bored type, was placed down a drill hole. The essential details of this type of pressuremeter are shown in Fig. 1 and on the right of Photograph 1. This instrument is a relatively robust instrument capable of applying a pressure to the borehole wall of over 3000 psi. This type of pressuremeter had been used on many occasions with the Failing 1500 drill rigs used by Greg Drilling (Formally Pitcher Drilling) on the BART line to the San Francisco Airport. The drillers were all familiar with its operation and the formation of the test pocket.

At a later stage in the project, a self-boring pressuremeter was deployed in the zones of clay/silty clay as identified from the nearby cone logs. The self-boring pressuremeter, which is similar in design to the pre-bored pressuremeter, but hollow, is “drilled” into the ground. Photograph 1 shows the two instruments with the self-boring instrument on the left. The drill bit and drill rod for the self-boring instrument have been removed from inside the self-boring pressuremeter and are lying between the two pressuremeters.

A close-up view of the cutting shoe and the drill bit is shown in Photograph 2. The bit is smaller than the cutting shoe, and in operation sits inside the shoe as shown in the sketch to the left of Photograph 3. As the pressuremeter is pushed into the ground, the material displaced by the pressuremeter is forced inside the pressuremeter by the sharp tapered edge of the cutting shoe. As the material enters the shoe, it is drilled away and flushed to the surface through the hollow pressuremeter. This system does not work if gravel is present, as the gravel can get wedged between the bit and the cutting shoe. The self-boring operation under way is shown in Photograph 3. The return cuttings can be seen coming out over the top of the upper casing. [a]

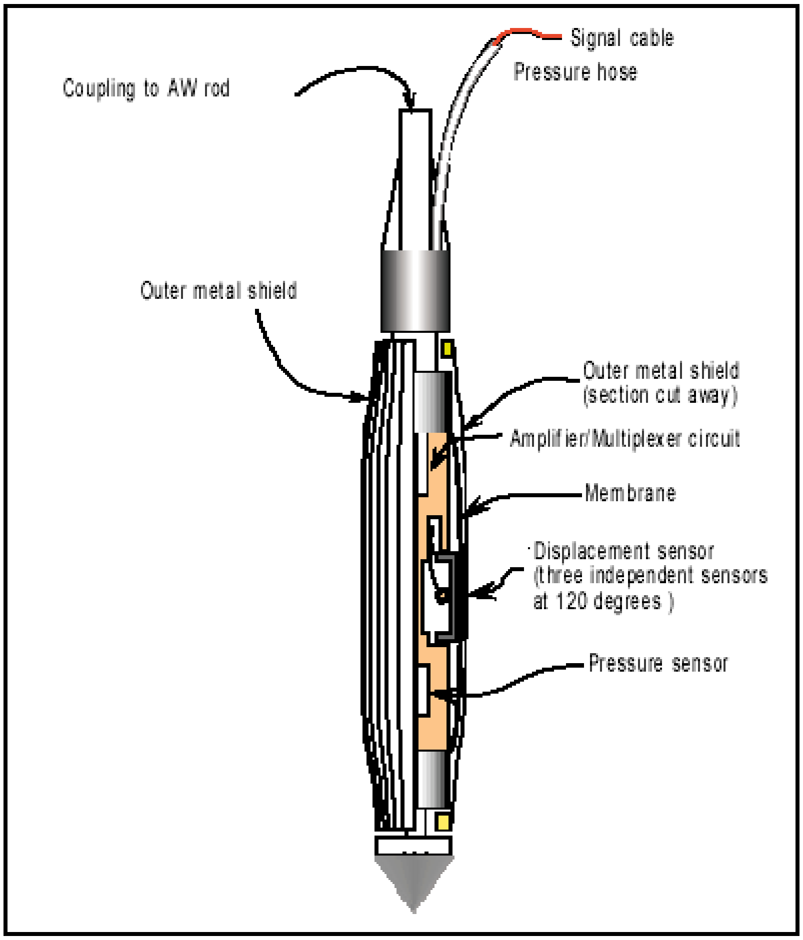

Fig. 1. Schematic details of the pre-bored pressuremeter

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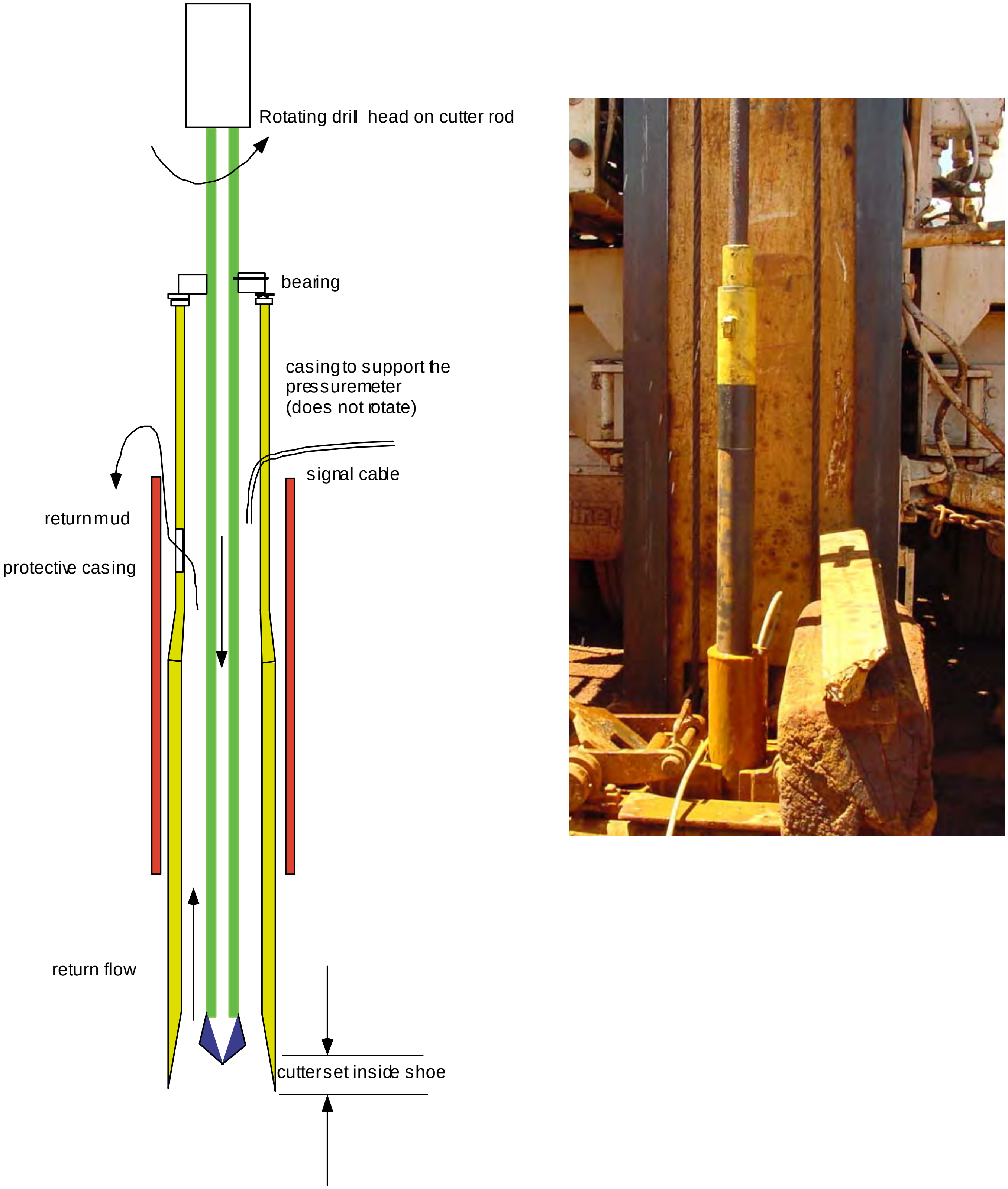
[a] In very soft materials, the soil displaced by the pressuremeter can be removed by jetting action of drill mud alone. In that case a rotating bit is not required and the instrument can penetrate small gravel layers. However, the clay at this site was considered too strong to be able to be cut by jetting action alone.

Photograph 1. Pressuremeters

Photograph 2. Cutting shoe and drill bit on Self-drilled Pressuremeter



Photograph 3. Self-boring pressuremeter in operation

4.0 GROUND CONDITIONS

The ground conditions along the route were complex. They consisted of interlayered clays, silts, and sands with a few gravel lenses. In general, silts and silty clays were near the surface, followed by sand and gravel layers. Some of the sands in this zone were free draining, and would collapse if not held back with casing. Below the sands and gravel was often a further layer of silts and silty clays, with possibly a similar stress history of deposition as the upper silts and clays. Throughout all of the layers, gravel particles existed. The cone traces showed the trend but the detailed layering varied over relatively short distances.

5.0 HOLE FORMATION FOR THE PRE-BORED PRESSUREMETER

In the initial phase of the investigation the pilot hole was cut using a three-inch outside diameter Shelby tube. One tube cut a hole approximately 2.5 ft in length. To accommodate two pressuremeter tests in the test pocket, two Shelby tube samples were taken back-to-back. When the material was too hard to sample with a Shelby tube, the pilot hole was drilled with a $2^{15}/16$-inch tricone bit.

With this approach, two tests can be conducted as close together as possible. The first test is conducted at the bottom of the pilot hole, and the second test 1.5 feet up. If there is little variation in the lithology both tests should be similar. Hence, there is a check on the quality of the data. [b]

6.0 TEST PROCEDURE

After the pressuremeter is inserted to the bottom of the hole, the membrane is expanded by controlling the flow of compressed nitrogen into the pressuremeter. If the pilot hole is larger than the pressuremeter, the membrane will start to expand once the pressure exceeds the water pressure in the hole. (If the drill mud pressure is above the static pressure, this will be the pressure at which expansion is initiated.) This pressure is then increased in small steps until a strain of about 2% was reached. The pressure is then reduced to approximately 50% of the current maximum pressure, then increased again. This will result in a closed unload-reload loop. The slope of this loop will give a measure of the *in-situ* shear modulus for low strain (see Section 7). In most tests, this procedure is conducted several times. If disturbance effects are small, the loops tend to be parallel. Fig. 2 is an illustration of an ideal test.

On reaching the maximum pressure, usually dictated by the strain limit on one of the displacement sensors, the pressure is reduced continuously. If the material is permeable, the membrane will rapidly move inwards when the pressure reduces to the current static water pressure. On the other hand, if the material is impermeable, i.e. a more cohesive material, the membrane will not collapse

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[b] In the first two holes (53 and 55) the second test in the pilot hole, 1.5 above the first test, was always indicative of an oversized hole. This was rather surprising in view of the material. Subsequently, it was noticed that the head to the Shelby tube used in these holes was oversize. Hence, as the second Shelby tube was pushed in to lengthen the hole to 5 feet, the Shelby head widened the top of the hole too much. The head was changed for subsequent tests.

back as the pressure is reduced. It will follow the dotted unloading path shown in Fig. 2. On reloading, cohesive materials will follow a similar curve to the initial loading curve, i.e. the curvature will smoothly decrease as the loading increases. In contrast, frictional materials tend to increase in curvature before decreasing as the pressure nears its maximum. Hence, in a qualitative manner the final unloading curve can be used to give some indication of the material behavior.

If the pilot hole for the pressuremeter is cut undersize or if the hole squeezes in before the pressuremeter can be placed in the pilot hole, the pressuremeter test will have the form shown in Fig. 3. The initial portion of the pressuremeter curve will be truncated. It will not be perfectly truncated. The influence of the squeezing action will change the shape of the initial portion of the pressure-expansion curve, the latter portion of the curves are usually relatively similar.

A typical test with a pre-bored pressuremeter in dense granular material is shown in Fig. 4. In this test the hole is slightly undersize. To obtain a better indication of the initial portion of the pressuremeter curve, the pressuremeter can be inserted by self-drilling it into the ground. In this process the material, displaced by the pressuremeter, is removed up the inside. In this manner there is limited disturbance to the material surrounding the pressuremeter.

The self-drilled pressuremeter is mechanically similar to the pre-bored pressuremeter used at this site (shown in Fig.1). However, it is hollow, as shown in the left of Photograph 1. Inside this pressuremeter is a small drill bit that is rotated from the drill rig as the pressuremeter is pushed into undisturbed material. A close-up view of the cutting shoe and the drill bit is shown in Photograph 2. In operation the drill bit is set back inside the cutting shoe approximately 1 inch. In this manner the material displaced by the pressuremeter is cut and slurried inside the instrument and flushed to the surface with drilling mud. A schematic drawing of the process is shown on the left of Photograph 3. [c]

The process of self-boring is relatively complex, in that a double rod system has to be employed. To add to these difficulties, at this site there were thin layers of gravel throughout the silt and clay layers. On occasions, the gravel would bind between the cutting bit and the body of the self-boring pressuremeter. This action stopped the self-drilling process, as the pressuremeter itself rotated.

The self-boring method used helps to minimize the disturbance to the surrounding soil. It does not eliminate the disturbance. To some extent, the disturbance is a function of the relative cutting bit position. If the cutter is set well back inside the cutting shoe, there will be a tendency to push the material in front of the cutting shoe outwards, whereas if the cutting shoe is set too far forward it will pull material towards the cutting shoe. In general, if the layer being tested is of sufficient depth, the location of the cutter can be adjusted to get the most suitable pressuremeter test with the least disturbance. However, at this site the depth of uniform materials were insufficient to make the necessary adjustments so the cutter was set at approximately one inch back from the edge of the cutting shoe.

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[c] In very soft soils, just the jetting action of mud alone is usually sufficient to remove the material. However, it was considered that the material along the SVRT line would be too strong to jet away with the pumps available on site.

There is one other form of disturbance than cannot be overcome with this method of insertion and that is the effect of vertical friction on the side of the pressuremeter. It is felt that this form of disturbance is why the initial modulus, even on high-quality tests, is always less than the modulus determined from the unload-reload loops. However in the silts, the self-bored approach was particularly useful in establishing limits of the likely behavior of the soft silts and clays. A typical self-bored pressuremeter test is presented in Fig. 5.

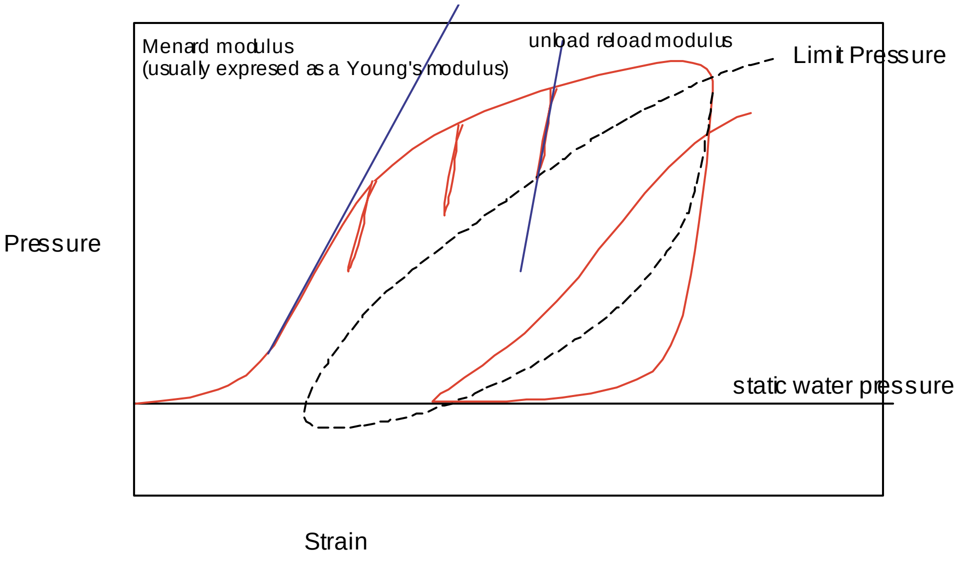


Fig. 2. Ideal pre-bored pressuremeter test

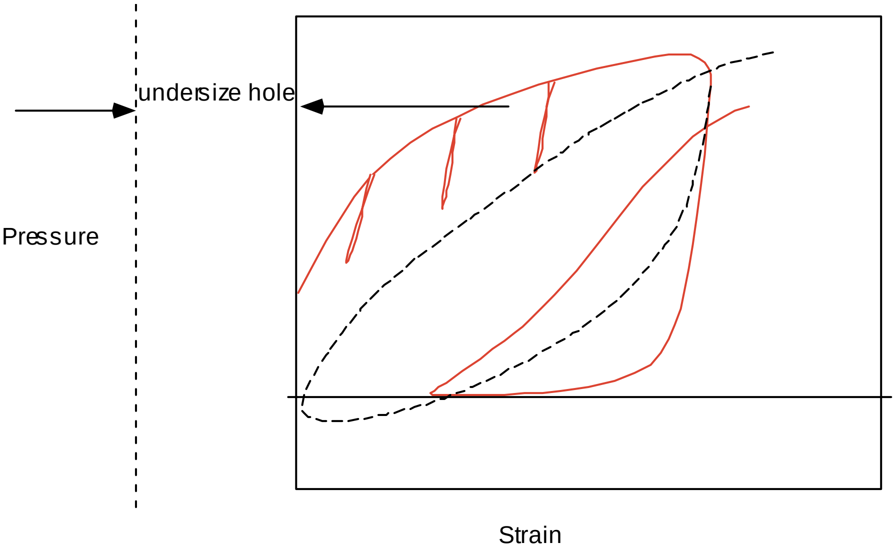
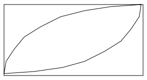


Fig. 3. Ideal pre-bored pressuremeter test in an undersize hole



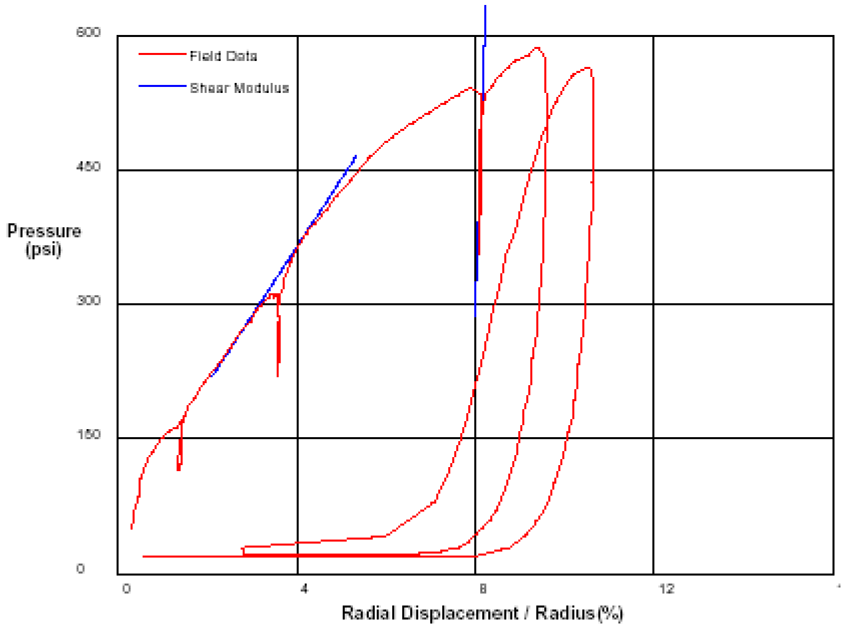


Fig. 4. Pre-bored Pressuremeter Test in Granular Material
(Test 141, Hole 33, at 45 feet)
Note: first unload loop softer than subsequent loops

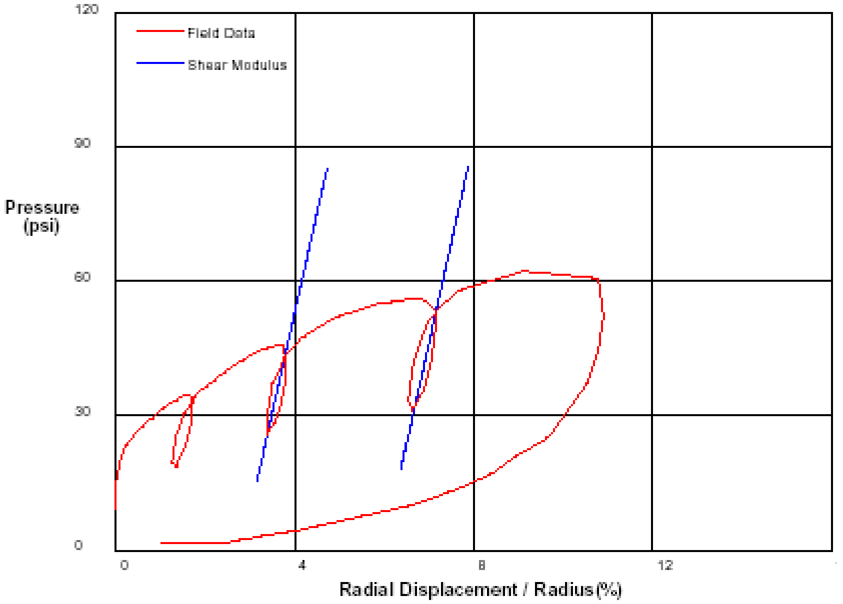


Fig. 5. Self-boring Pressuremeter Test
Test 30, Hole 25 at 21 feet
Unload loops parallel

7.0 STANDARD METHOD OF ANALYSIS OF THE SHEAR MODULUS

If the material surrounding the pressuremeter is assumed to extend to infinity, and to behave in an idealized manner, as a linear elastic, homogeneous material, which does not fail under shear or tension, then the displacement on the boundary of the pressuremeter, u_a, for a given pressure, P, is given by:

$$U_a = P.a\,(1+\mu) / E \tag{1}$$

where E is the Young's Modulus, a the radius of the pressuremeter cavity, and μ the Poisson's ratio.

As the shear modulus, G, and the Young's modulus, E, are related by the following relationship:

$$E=2.G(1+\mu\ ) \tag{2}$$

Equation 1 reduces to:

$$u_a = 0.5P.a / G \tag{3}$$

Hence, the shear modulus G is given by:

$$G = 0.5 * \text{Pressure}/\ (\text{radial displacement}/\text{radius}) \tag{4}$$

The shear modulus values for the average slope of the initial part of the pressuremeter curve of all of the tests are summarized in Table I. The modulus for the average slope of the initial part of the pressuremeter curve expressed as a Young's modulus (assuming a Poisson's ratio of 0.33) is the same as the "pressuremeter modulus" defined in the American Society for Testing and Materials (ASTM) D4719 - 94, Section 9.5.

Also included in this table the modulus determined from any unload-reload loops. This modulus, which is higher that the initial loading modulus probably is more representative of the *in-situ* material.

8.0 DETERMINATION OF THE LIMIT PRESSURE

From a visual inspection of the curve typical pressuremeter curves shown in Fig. 4 and particularly Fig. 5, it is clear that the pressure tends to a limit. For Test 141 (Fig. 4) this limit pressure is in excess of 600 psi, and for Test 30 (Fig. 5) 60 psi. However, to make this limit pressure a more quantitative measurement, the Limit Pressure is defined as that pressure which occurs when the volume of the pressuremeter has doubled. However, few pressuremeter tests ever actually expand this far before reaching the limit of the strain sensing system. The pressuremeters used in this investigation will only expand about 15% before the displacement limit is reached.

If the material being tested is assumed to behave as an elastic cohesive material, then the equation governing the pressure-displacement curve is given by:

$$P = P_L + c.\log_e (u_a/a) \qquad 5)$$

$$P_L = P_o + c + c.\log_e [G/c] \qquad 6)$$

where P_L is the theoretical limit pressure at infinite expansion, c the undrained cohesive strength, P_O the total *in-situ* lateral stress, and G the shear modulus. For typical values of G and c the ratio G/c lies between 50-100. Hence, the limit pressure is approximately 5 times the shear strength (assuming P_o is small relative to c).

From Equation 5, a plot of pressure P against the log of u_a/a will be a straight line, provided the shear strength remains constant with strain. The slope of this line will give a measure of the shear strength c. The limit pressure, as defined by the ASTM code D4719, Section 9.6, is the pressure at which the cavity has doubled in size. This doubling in size occurs when u_a/a is equal to 41%. (The origin of the strain used in the log/normal plots is the assumed origin at the *in-situ* stress state). If any disturbance is present and the hole is oversize, the above method of determining the cohesive strength usually provides an overly optimistic value of the shear strength and the Limit Pressure.

If the data is to be used to determine the ultimate bearing capacity, a more conservative approach is to use the pressure at 10% strain. In general this pressure can be read directly from the field data. The Limit Pressure and the pressure at 10% strain are presented in Table I.

9.0 GENERAL COMMENTS ON THE TESTS

The behavior of the clay surrounding the pressuremeter is rather complex. Unlike a triaxial test, the radial strains in the material surrounding the pressuremeter are not uniform. They decrease with radius. That is, during the test, the greatest strains are on the boundary of the pressuremeter. However, the zone of influence is quite large.

During a typical test in which the pressuremeter expands by 10% radial movement, the zone of influence is approximately twice the diameter of the hole. The problem is the initial disturbance. During the formation of the pilot hole for the pre-bored pressuremeter, the pressure on the borehole wall is reduced to just the water or mud pressure in the hole. As this stress is, in general, below the total *in-situ* lateral stress the borehole walls will move inward. In stiff clays the material will just move elastically towards the hole, but in soft clays such as at the San Jose site, water will be sucked in and the clay or silts will soften. Therefore, at the start of a pre-bored pressuremeter test, the material close to the wall will have softened. With the self-bored pressuremeter, this inward movement and subsequent softening is minimized.

In an ideal cohesive material, during the expansion phase of the pressuremeter test, the material will just return to its initial state, and then continue to shear at constant volume as the pressure increases above the total *in-situ* stress. However, if the walls have softened prior to expansion, then the expansion will not occur at constant volume. The material will start to consolidate and stiffen during the expansion phase. At some point it will tend to regain its initial state. The expansion curve from then on will tend towards the ideal shape. During this expansion phase, the slope of any unload-reload loops will increase as the pressure and strain increases. The slope tends to remain relatively constant once the original condition has been reestablished. Therefore the portion of the pressuremeter curve that is a reflection of the *in-situ* state is that part of the pressure-expansion curve where unload-reload loops are parallel. It is the slope of this relatively constant unload-reload loop, which is used to establish the *in-situ* secant shear modulus.

From a visual inspection of the pressure meter curves three parameters can be established:

1. Limit pressure or pressure at 10% strain.
2. The initial slope, from which the Ménard Modulus is calculated. The slope of the initial section of the pressuremeter curve in many cases is linear. The slope of this line can be used to determine the equivalent Young's modulus, the Ménard Modulus, by assuming a Poisson's ratio. This modulus has been presented in its shear modulus form in Table I.
3. The slope of the unload-reload curves. In general this is a very well defined parameter. The shear modulus G can be directly determined from the slope of the unload-reload curves. In many cases, particularly in stiff material, this modulus corresponds directly to the *in-situ* secant stiffness from zero stress up to the onset of shear failure.

All of the above parameters are listed in Table I.

10.0 FUNDAMENTAL MATERIAL PROPERTIES

Shear strength, Secant modulus, Friction angle, and *In-situ* Stress

10.1 General

If it is assumed that the material then behaves in an ideal manner, in that clays remain at constant volume throughout the test, i.e. do not consolidate during the pressuremeter test, then the data can be interpreted by simple analytical means. The slope of the plot of pressure against the log of the strain can be used to give a direct measure of the shear strength, as described in the ASTM manual. Unfortunately, real materials do not quite behave in this manner. The shear strength determined by this method is often an overestimate, particularly in an oversized pilot hole. (In an undersized hole this method will underestimate the shear strength.)

A more realistic method of determining the shear strength in clays is to compare the field pressuremeter tests with an ideal model pressuremeter curve, based on an assumed set of material parameters. If, for instance, the material is assumed to be cohesive and fail at constant shear strength and at constant volume, then the material parameters required for this model are the shear strength, lateral stress and shear modulus.[d] Adjustments can be made to those three parameters until a mathematical curve can be made to match the field data.

For the San Jose data the shear modulus is assumed to be that measured from the unload-reload loops. Judgment is required to adjust these three parameters to determine the best fit to the data,

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[d] The shear modulus is the secant shear modulus from zero strain to the initiation of failure.

particularly if there is any disturbance present. However, the result of this analysis is to obtain a *set of strength parameters* that match the field data.

It is important to recognize that while the set of parameters matches the field data, no one parameter is necessarily more accurately defined than any other. The better the definition of the field data, (i.e. the less disturbance in the test data), the more accurately the data can be analyzed. The self-boring tests, although of limited number throughout the testing, are particularly helpful in establishing limits on the material parameters. Tests 181-184 (53-64.5 ft) in Hole 8 are very consistent. The pressure at 10% for all of the tests is 140 psi. A detailed analysis of Test 184 suggests the following sets of material parameters, shown in Table 2, would reflect the behavior of the material. The link between the lateral stress and the shear modulus is shown in Fig. 6. The most likely fit, as shown in Fig.7, suggests that a total lateral stress in the range of 45 psi would be reasonable. If for other reasons a different lateral stress is selected, the shear modulus must be adjusted accordingly.

An illustration of the interactive nature of the material parameters is shown in Fig. 8. Here the ideal pressure-expansion curve is based on the assumption that the shear strength and the *in-situ* stress are at point A in Fig. 6, but the shear modulus is increased to 6000 psi. In Figs. 9 and 10, the shear strength and the *in-situ* stress are at point B in Fig. 6, but the shear modulus varies from 3000 psi to 6000 psi.

The above modeling approach, completed on all of the materials that are possibly of a cohesive nature, has been presented in Table 2 and in Fig. 11.

It must be stressed that the parameters used in the clay model are total stress parameters. It is the total lateral stress that is used in the modeling process, and not the effective lateral stress. The effective lateral stress can only be estimated from a knowledge of the *in-situ* water pressure. In ideal materials, without gravel bands, it is possible to measure pore pressures on the boundary of the membrane. However, as with the cone, establishing absolute pore pressures in cohesive materials takes time. With a cone, the absolute static water pressure is usually obtained from the free-draining sand layers, and not the cohesive layers.

Even with the best insertion techniques, there is uncertainty about the amount of initial radial disturbance, whether it is forcing the material radially inwards or outwards. This becomes a significant issue if the lateral stress is assumed to be at the “lift-off” point, the pressure at which expansion initiates. However, it is of much less significance if the whole curve is used in a modeling approach, as the later points on the curve are less influenced by the initial radial disburbance.

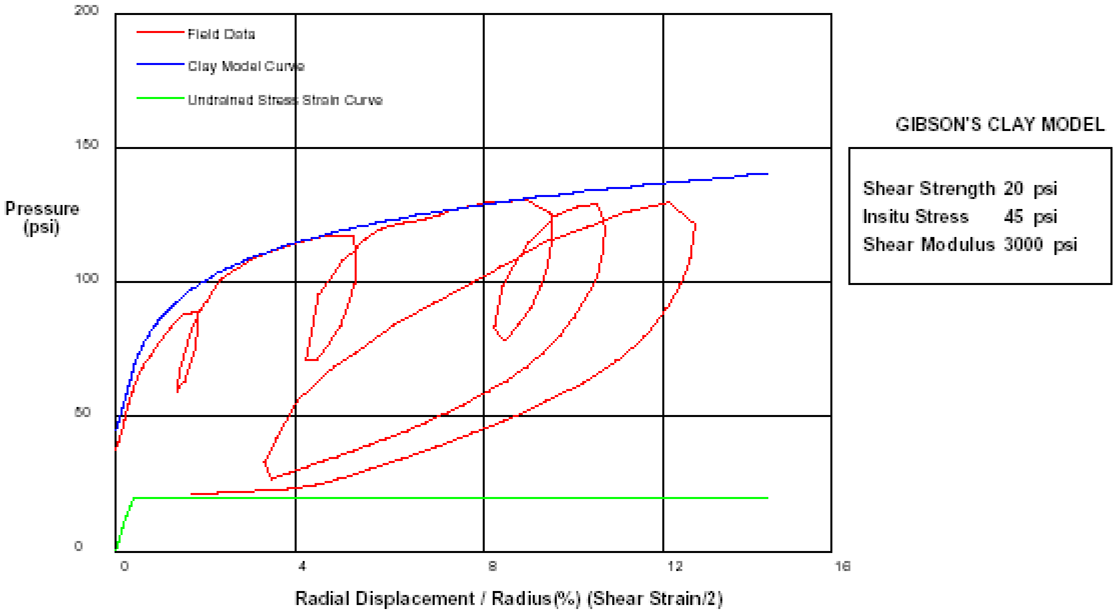


Fig. 6. Total lateral stress/shear strain for ideal model

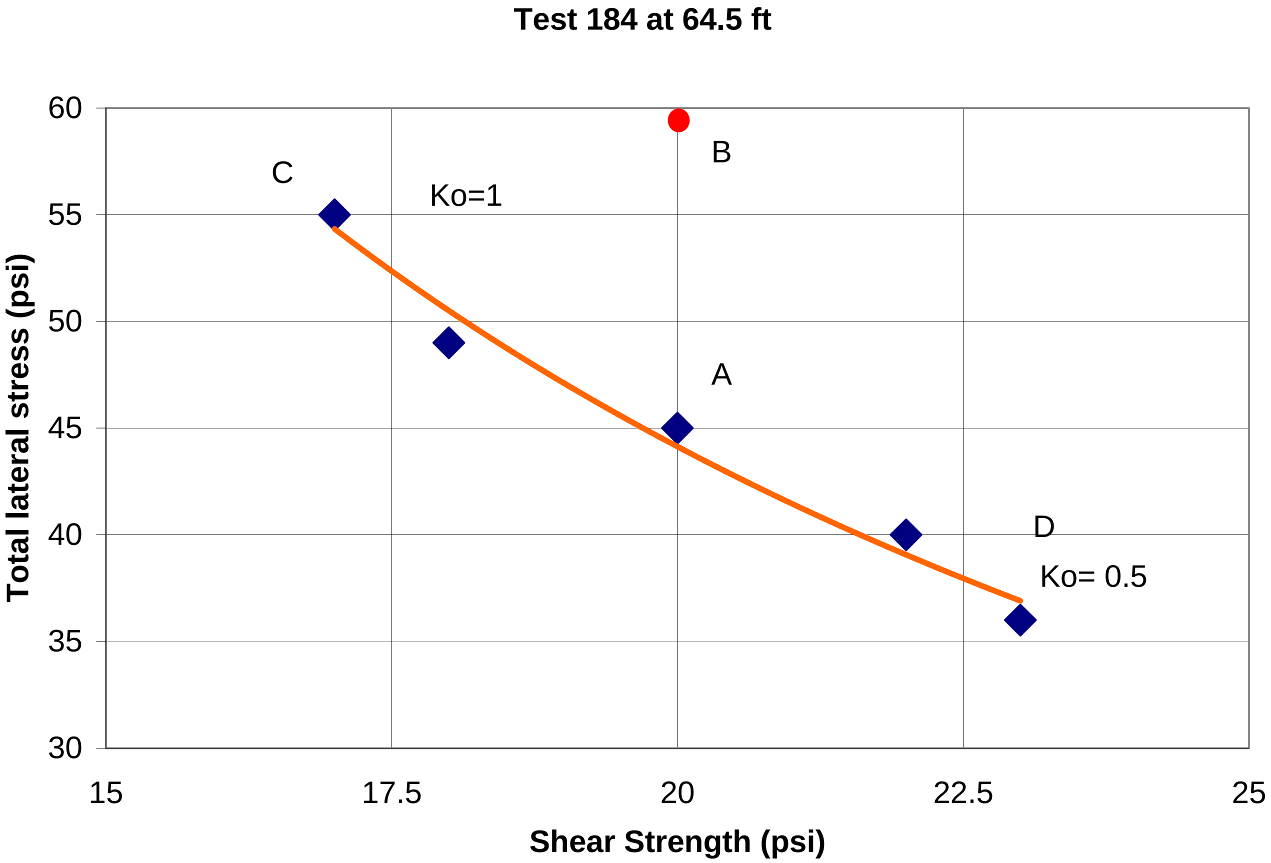


Fig. 7. Test 184 compared to the ideal model at Point A in Fig. 6 (assuming G= 3000 psi)

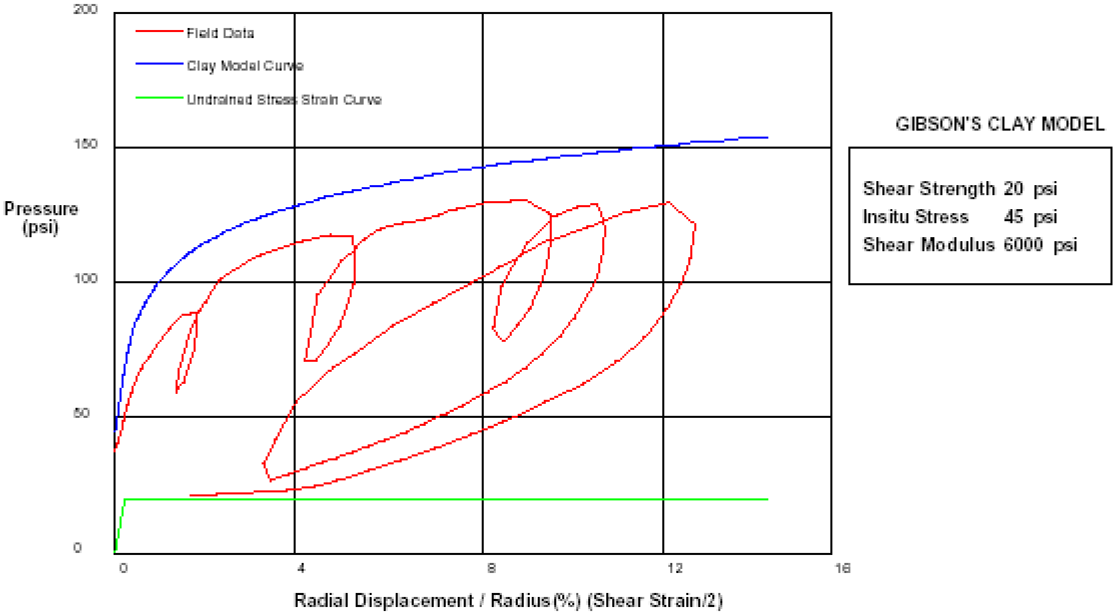


Fig. 8. Test 184 compared to the ideal model at Point A in Fig. 6 (assuming G= 6000 psi)

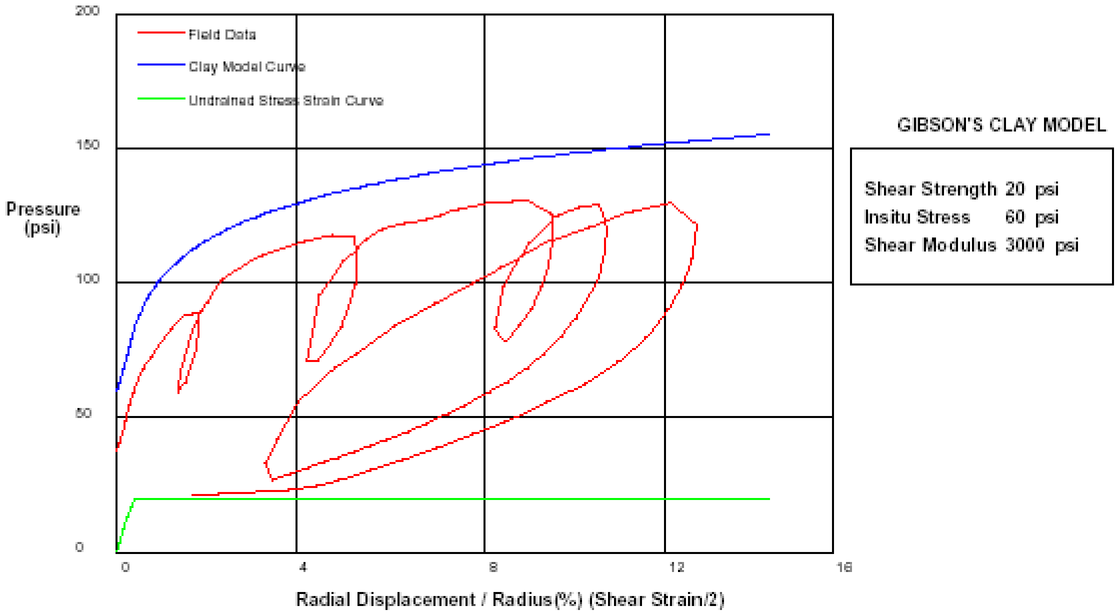


Fig. 9. Test 184 compared to the ideal model at Point B in Fig. 6 (assuming G= 3000 psi)

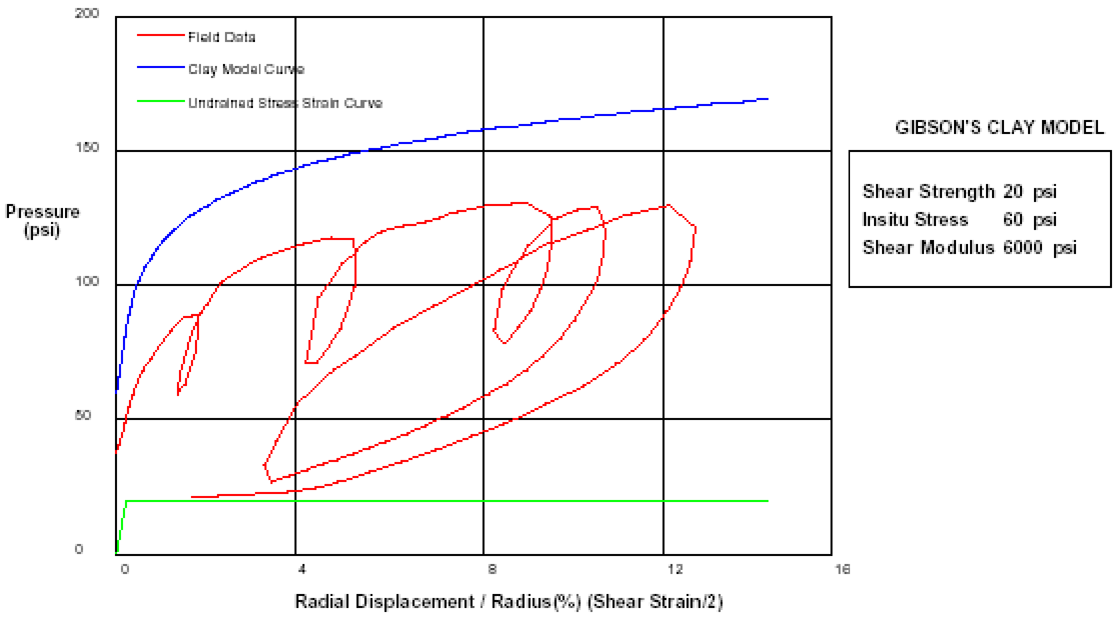


Fig. 10. Test 184 compared to the ideal model at Point B in Fig. 6 (assuming G= 6000 psi)

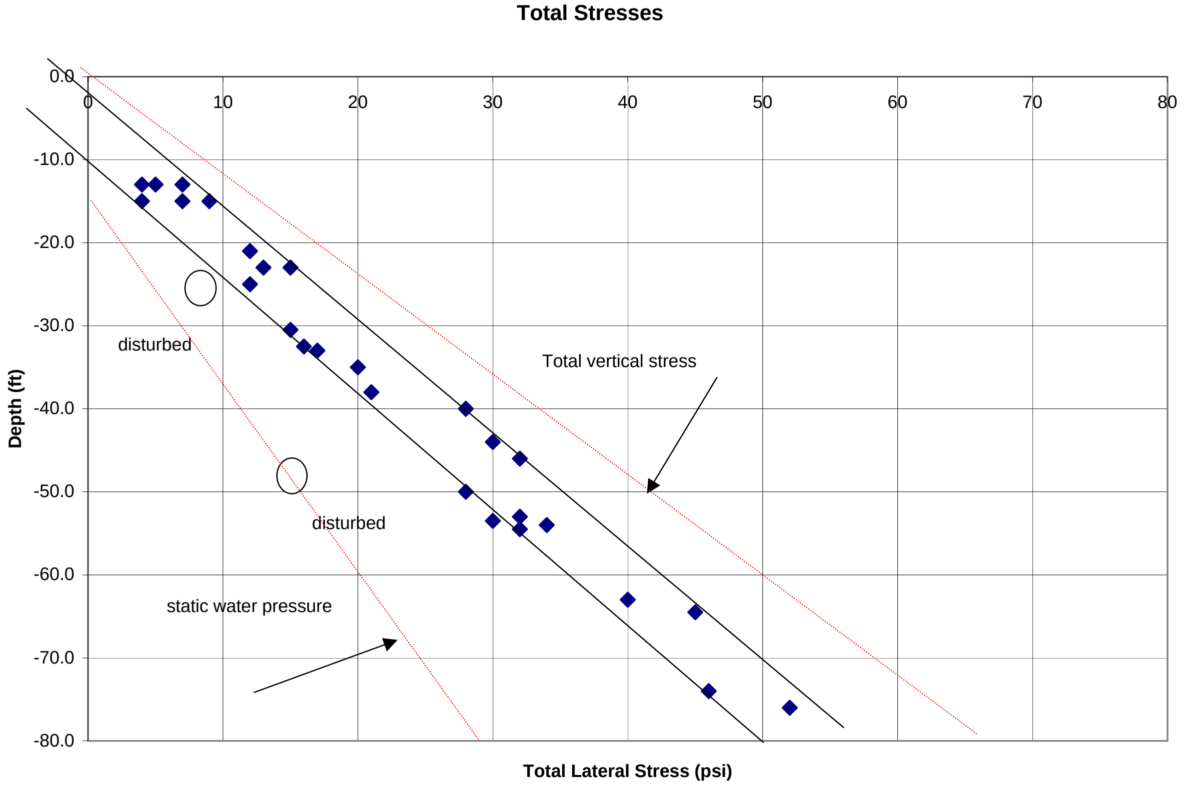
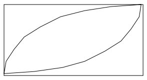


Fig. 11. Total lateral stress from self-boring pressuremeter tests



The simple cohesive model will not work for many of the tests, particularly those that are dominated by sands and silts. With those materials an alternative model, which considers the frictional resistance rather than the cohesive strength of the material, is necessary. A simple friction model has been used to analyze these materials. The results are presented in Table 3. In some instances the test have been analyzed by both methods. In the Table, the method that is least representative is marked with an asterisk.

In the pre-bored pressuremeter tests, this modeling approach requires more judgment, and is therefore less precise, as the initial part of the pressuremeter is masked by disturbance.

The modulus referred to in the model and the Figures is the shear modulus, G. It is the secant shear modulus from zero strain to the initiation of failure. That is the basis for the simple linear model used. It is recognized that the true modulus will follow a non-linear, softening form, in which the initial low-strain shear modulus will be higher than that quoted in the tables.

11.0 PRELIMINARY CONCLUSIONS

The testing covers a large range of materials. The modulus ranges from 600 psi to 60,000 psi, the pressure at 10% ranges from 30 psi to 600 psi, and the shear strength ranges from 3 to >100 psi. Further, in view of the difficult ground conditions, the tests vary in quality. Although all of the tests provide some useful data on the *in-situ* material properties, some tests provide much more than others. A qualitative indication of the tests is presented in the final column of Table 3. This has been based on a review of the tests in conjunction with the adjacent CPT logs.

The clays fall into a relatively narrow band as defined by the self-boring pressuremeter tests. These tests tend to indicate that the total *in-situ* stress at the 60 ft level is in the order of 45 psi, with a shear strength of 20 psi. That is indicative of a material with a small amount of overconsolidation, as the c/p ratio is in the order of 0.6. However, within this material are layers of very stiff material that may have a higher lateral stress, but will almost certainly have a higher shear modulus. Hence, it will be the interaction of these materials, combined with the wall characteristics, that influence the design. It is important to stress that it is probably the combination of parameters that will influence the wall behavior, rather than the lateral stress alone.[e] (Fidler 2002)

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[e] As an illustration of this point, consider an idealized soil model in which the soil consists of a series of horizontal springs acting on a vertical wall. If these springs are fixed at 30 ft back behind the wall, then for a 1 inch change in lateral movement, a soil with a shear modulus of 2,000 psi, (a clay) will require a stress of 14 psi to move it, whereas a soil with a shear modulus of 10,000 psi (a sand) will required a stress of 70 psi to move it. If the total lateral stress at 40 ft depth is in the range of 30 psi, then with a wall movement of, for example, 0.5 inches towards the tunnel, the lateral stress in the clay on the wall will reduce by 7 psi to 23 psi (30-7). In contrast, a similar movement in sand will make the lateral stress tend to zero (i.e. to the active state!). Hence, for inwards movement of the wall towards the tunnel, the lateral loads are dominated by the lower modulus (the modulus in the clay).

12.0 REFERENCES

ASTM D4719. 1994. Standard test method for pressuremeter testing in soils.

Fidler, S. Design and construction monitoring for the Breakfast Creek Tunnel Inner City Bypass Project. Brisbane, Australia. Geotechnical Aspects of Underground Construction in Soft Ground. Specifique/Lyon Toulouse, France. October 2002.

Mair, R.J. and Wood, D.M. 1987. Pressuremeter testing: methods and interpretation. CIRIA Ground Engineering Report. Butterworths, London.

Table 1. Summary of basic data from Pressuremeter Tests

Test	Hole	Date	Depth	G unload/ Reload	G loading	Pressure at 10% strain	Limit Pressure	Material	Instrument
			(Ft)	(psi)	(psi)	(psi)	(psi)		
1	55	10/18/2004	25	1,000	130	35	46	coh	hp
3	55	10/18/2004	45	1,200	320	80	110	?	hp
11	53	10/21/2004	25	5,000	1,500	100	110	coh	hp
14	53	10/21/2004	45	1,700	300	110	118	coh	hp
17	53	10/22/2004	55	2,700	300	120	148	coh	hp
19	64	10/23/2004	25	1,600	300	50	60	coh	hp
20	64	10/23/2004	23.5	2,000	400	70	105	fri	hp
21	64	10/23/2004	54.5	2,500	750	140	185	coh	hp
22	64	10/23/2004	53	4,000	500	110	170	fri	hp
23	64	10/23/2004	74	3,700	550	160	224	fri	hp
24	71	10/25/2004	25	1,000	200	70	98	coh	hp
25	71	10/25/2004	23.5	500	140	40	66	coh	hp
26	71	10/25/2004	45	680	200	90	105	coh	hp
27	71	10/25/2004	43.5	620	140	70	90	coh	hp
28	71	10/25/2004	65	650	180	110	120	coh	hp
29	71	10/25/2004	63.5	550	250	80	115	coh	hp
30	25	11/6/2004	21	2,000	600	65	85	coh	sb
31	25	11/6/2004	23	3,000	1,000	75	108	coh	sb
32	25	11/6/2004	48	550	300	40	60	coh	sb
33	25	11/6/2004	50	2,300	1,400	90	136	coh	sb
34	25	11/7/2004	74	2,000	1,000	125	161	coh	sb
35	25	11/7/2004	76	1,400	550	150	180	coh	sb
36	25	11/7/2004	107	7,000	1,500	250	400	fri	hp
37	25	11/7/2004	105.5	18,000	3,000	350	550	fri	hp
48	25	11/13/2004	114.5	3,000	800	140	210	coh	hp
49	25	11/13/2004	113	3,400	800	200	300	coh	hp
50	25	11/13/2004	129	2,500	660	220	290	coh	hp
51	25	11/13/2004	127.5	4,500	800	200	280	coh	hp
52	25	11/14/2004	150	2,500	950	250	350	coh	hp
53	25	11/14/2004	148.5	2,500	980	230	350	coh	hp
38	65	11/8/2004	13	350	170	17	22	coh	sb
39	65	11/8/2004	15	500	170	17	21	coh	sb
40	65	11/8/2004	38	530	380	40	55	coh	sb
41	65	11/8/2004	40	1,200	700	65	80	coh	sb
42	65	11/8/2004	54	10,000	1,500	140	190	fri	sb
45	65	11/10/2004	113	7,000	1,600	200	330	fri	hp
46	65	11/10/2004	111.3	2,100	800	160	180	coh	hp

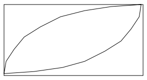


Table 1
Summary of basic data from Pressuremeter Tests

Test	Hole	Date	Depth	G unload/ reload	G loading	Pressure at 10% strain	Limit Pressure	Material	Instrument
			(ft)	(psi)	(psi)	(psi)	(psi)		
101	18	1/11/2005	76	2,600	850	210	290	coh	hp
102	18	1/11/2005	74.5	3,800	1,500	270	320	coh	hp
104	18	1/12/2005	86	5,500	980	180	218	fri	hp
105	13	1/14/2005	93.5	2,000	450	less than 200		fri	hp
107	13	1/14/2005	116	5,000	1,800	250	340	coh	hp
108	13	1/14/2005	114.5	10,000	1,100	270	300	fri	hp
109	42	1/16/2005	23	2,800	350	80	90	coh	sb
110	42	1/16/2005	25		250	80		coh	sb
111	42	1/16/2005	33	2,000	450	80	95	coh	sb
112	42	1/16/2005	35	2,300	650	80	110	coh	sb
113	42	1/17/2005	44.5	11,000	1,000	200	280	fri	hp
114	42	1/17/2005	43	850	250	70	80	fri	hp
116	38	1/18/2005	43.5	12,000	1,100	200	350	fri	hp
117	38	1/18/2005	51	5,000	400	130	150	fri	hp
118	38	1/19/2005	65	34,000	4,000	450	580	fri	hp
119	38	1/19/2005	80	2,000	400	150	180	fri	hp
121	2	1/20/2005	39	1,300	200	80	80	fri	hp
122	2	1/20/2005	50	8,000	1,400	220	300	fri	hp
124	2	1/21/2005	60	5,200	1,500	150	200	fri	hp
125	2	1/21/2005	58.5	7,000	700	150	220	fri	hp
126	45	1/22/2005	50	11,000	800	160	280	fri	hp
128	45	1/22/2005	60	4,000	1,100	150	240	fri	hp
129	45	1/23/2005	58.5	40,000	7,000	500	750	fri	hp
130	45	1/23/2005	70	4,000	1,300	150	230	fri	hp
132	6	1/24/2005	44	700	300	80	110	coh	sb
133	6	1/25/2005	46	750	350	100	110	coh	sb
134	6	1/25/2005	53.5	2,500	500	100	130	coh	sb
135	6	1/25/2005	65	8,000	1,500	230	280	coh	hp
136	6	1/26/2005	63.5	3,200	500	100	120	coh	hp
137	33	1/26/2005	13	4,000	1,100	130	173	coh	sb
138	33	1/26/2005	15	3,200	900	100	130	coh	sb
139	33	1/26/2005	23	3,800	900	100	130	coh	sb
140	33	1/26/2005	25	2,200	900	70	80	coh	sb
141	33	1/26/2005	45	70,000	4,000	600	1,000	coh	hp
142	33	1/27/2005	43.5	50,000	3,600	600	1,000	coh	hp

Table 1
Summary of basic data from Pressuremeter Tests

Test	Hole	Date	Depth	G unload/ reload	G loading	Pressure at 10% strain	Limit Pressure	Material	Instrument
			(ft)	(psi)	(psi)	(psi)	(psi)		
143	33	1/27/2005	76	28,000	18,000	400	570	fri	hp
144	33	1/27/2005	74.5	4,500	500	130	140	fri	hp
145	33	1/27/2005	90	3,200	900	200	250	fri	hp
146	33	1/27/2005	88.5	1,500	400	130	170	fri	hp
147	33	1/27/2005	115	5,000	1500	200	300	fri	hp
148	33	1/27/2005	113.5	3,000	800	170	310	fri	hp
149	76	1/31/2005	13	1,200	500	60	65	coh	sb
150	76	1/31/2005	15	1,500	400	70	80	coh	sb
152	76	1/31/2005	25	1,500	250	60	90	coh	sb
153	76	1/31/2005	45	26,000	1,800	300	500	coh	hp
154	76	1/31/2005	43.5	27,000	1,400	300	500	fri	hp
155	76	2/1/2005	75	7,000	900	170	240	fri	hp
156	76	2/1/2005	73.5	32,000	2,600	500	680	fri	hp
157	76	2/1/2005	95	6,000	1,000	200	250	fri	hp
158	76	2/1/2005	93.5	5,000	1,100	160	210	fri	hp
159	48	2/3/2005	30.5	2,000	400	80	110	coh	sb
160	48	2/3/2005	32.5	1,500	600	80	100	coh	sb
161	48	2/3/2005	50	9,000	800	160	200	fri	hp
162	48	2/3/2005	48.5	5,500	900	160	230	fri	hp
163	48	2/4/2005	60	6,100	500	150	170	fri	hp
164	48	2/4/2005	58.5	11,000	1,100	180	240	fri	hp
165	60	2/5/2005	13	1,500	500	70	80	coh	sb
166	60	2/5/2005	15	1,600	900	80	110	coh	sb
168	60	2/5/2005	28	2,000	220	70	80	coh	hp
170	60	2/5/2005	35	3,200	400	80	95	coh	hp
171	60	2/5/2005	33.5	2,000	800	80		coh	hp
172	60	2/5/2005	45	2,000	1,800	100	110	coh	hp
173	60	2/5/2005	43.5	1,100	500	90	120	coh	hp
174	60	2/5/2005	75	800	500	170	180	coh	hp
175	60	2/5/2005	73.5	1,500	300	130	150	coh	hp
176	60	2/6/2005	99	10,000	3,000	320	420	fri	hp
177	60	2/6/2005	97.5	13,000	1,300	200	300	fri	hp
181	8	2/8/2005	53	5,000	1,300	140	180	coh	sb
182	8	2/8/2005	54.5	4,500	1,400	140	170	coh	sb
183	8	2/8/2005	63	3,200	1,500	140	160	coh	sb
184	8	2/8/2005	64.5	2,800	2,400	140	160	coh	sb

Table 1
Summary of basic data from Pressuremeter Tests

Test	Hole	Date	Depth	G unload/ reload	G loading	Pressure at 10% strain	Limit Pressure	Material	Instrument
			(ft)	(psi)	(psi)	(psi)	(psi)		
185	8	2/8/2005	75	34,000	2,700	400	600	fri	hp
186	8	2/8/2005	73.5	27,000	2,300	500	620	fri	hp
187	31	2/10/2005	74	1,000	600	130	160	coh	hp
188	31	2/10/2005	72.5	7,000	800	200	240	coh	hp
189	31	2/11/2005	84	8,000	800	220	300	fri	hp
190	31	2/11/2005	82.5	1,800	400	160	200	fri	hp

Table 2. Total Lateral Stress/Shear Strength for Test 184

Shear strength (psi)	Total lateral stress (psi)	Secant shear modulus (psi)	ko
17	55	3000	1
18	49	3000	0.9
20	45	3000	0.7
22	40	3000	0.6
23	36	3000	0.5

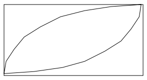


Table 3. Interpretation of Undrained Shear Strength, Lateral Stress, Friction Angle and Secant Shear Modulus

Test	Hole	Instrument	Shear Strength	Friction Angle	Secant Shear Modulus	Effective Vertical Stress	Total Lateral Stress	Effective Lateral Stress – Friction Analysis	Effective Lateral Stress	ko	Quality (1-best)
			(psi)		(psi)	(psi)	(psi)	(psi)	(psi)		
1	55	hp	5		1,000	17	12		8	0.5	1
3	55	hp	14		1,500	25	28		15	0.6	1
11	53	hp	14			17	25		21	1.3	1
14	53	hp	12		4,000	25	40		27	1.1	1
17	53	hp	17		4,000	29	40		23	0.8	1
19	64	hp	8		1,500	17	12		8	0.5	1
20	64	hp	14*	34	2,000	16	15*	9	9	0.6	1
21	64	hp	26*	34	2,500	28	35*	17	17	0.6	1
22	64	hp	16*	34	4,000	28	35*	13	13	0.5	1
23	64	hp	24*	34	4,000	36	50*	18	18	0.5	1
24	71	hp	14		1,000	17	25	20	5	1.3	2
25	71	hp	9*	34	500	16	16*	8	8	0.5	1
26	71	hp	13		1,000	25	45		32	1.3	1
27	71	hp	12		600	24	25		12	0.5	1
28	71	hp	16		700	33	45		18	0.6	1
29	71	hp	17*	35	700	32	34*	22	22	0.7	1
30	25	sb	10		2,200	15	12		9	0.6	1
31	25	sb	15		2,500	16	13		10	0.6	1
32	25	sb	7		800	26	15				3(Disturbed)
33	25	sb	17		2,200	27	28		13	0.5	1
34	25	sb	22		2,000	36	46		20	0.6	1
35	25	sb	25		2,000	37	52		26	0.7	1
36	25	hp	44*	34	6,000	50	69*	30	30	0.6	1

Table 3

Interpretation of Undrained Shear Strength, Lateral Stress, Friction Angle and Secant Shear Modulus

Test	Hole	Instrument	Shear Strength	Friction Angle	Secant Shear Modulus	Effective Vertical Stress	Total Lateral Stress	Effective Lateral Stress – Friction Analysis	Effective Lateral Stress	ko	Quality (1-best)
			(psi)		(psi)	(psi)	(psi)	(psi)	(psi)		
37	25	hp	55*	34	15,000	49	69*	32	32	0.7	1
48	25	hp	25		2,700	52	60		25	0.5	4
49	25	hp	35		3,600	52	70		30	0.6	2
50	25	hp	35*	34	2,100	58	70*	36	36	0.6	2
51	25	hp	25		3,600	58	70		21	0.4	3
52	25	hp	55*	34	2,700	67	75*	37	37	0.6	1
53	25	hp	45*	34	3,000	66	75*	35	35	0.5	2
38	65	sb	3		400	12	4		5	0.4	1
39	65	sb	3		400	13	4		4	0.3	1
40	65	sb	7		500	22	21		11	0.5	1
41	65	sb	9		1,200	23	28		17	0.8	1
42	65	sb	18		9,000	28	34		17	0.6	1
45	65	hp	30*	34	9,000	51	72*	27	27	0.5	1
46	65	hp	27*	34	2,000	52	71*	28	28	0.5	1
101	18	hp	40			37	50		24	0.6	1
102	18	hp	50		3,000	36	50		24	0.7	3
104	18	hp		35	5,000	42		20	20	0.5	4
105	13	hp				44					5
107	13	hp	50		3,000	53	70		26	0.5	1
108	13	hp	30		8,000	52	70		27	0.5	3
109	42	sb	13		5,000	16	15		12	0.7	2
110	42	sb	12		2,500	17	12		8	0.5	2
111	42	sb	12		2,000	20	17		9	0.5	1
112	42	sb	14		1,500	21	20		11	0.6	1

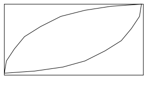


Table 3

Interpretation of Undrained Shear Strength, Lateral Stress, Friction Angle and Secant Shear Modulus

Test	Hole	Instrument	Shear Strength	Friction Angle	Secant Shear Modulus	Effective Vertical Stress	Total Lateral Stress	Effective Lateral Stress – Friction Analysis	Effective Lateral Stress	ko	Quality (1-best)
			(psi)		(psi)	(psi)	(psi)	(psi)	(psi)		
113	42	hp		33		24		20	20	0.8	3
114	42	hp	8		1,500	24	>15				5
116	38	hp	26*	35	20,000	24	>15	10	10	0.6	2
117	38	hp		35	4,000	27		11	11	0.4	2
118	38	hp	70*	35	20,000	33	>30	30	30	0.9	1
119	38	hp	30*	35	2,000	39	>30				5
121	2	hp	16*	35	1,500	22	>20	11	11	0.5	2
122	2	hp	40*	35	8,000	27	25*	17	17	0.6	1
124	2	hp		35	6,000	31		15	15	0.5	4
125	2	hp	30*	33	7,000	30		14	14	0.7	1
126	45	hp		35	8,000	27			16	0.6	1
128	45	hp		35	3,000	31			20	0.7	4
129	45	hp	80*	35	40,000	30	20*	30	30	1.0	1
130	45	hp	25*	35	4,000	35	40*	16	16	0.5	1
132	6	sb	15		800	24	30		17	0.7	2
133	6	sb	16		800	25	32		19	0.7	2
134	6	sb	12		1,800	28	30		13	0.5	2
135	6	hp	45		8,000	33	37		15	0.5	1
136	6	hp	16		3,000	32	30		9	0.3	2
137	33	sb	26		4,000	12	6		7	0.6	2
138	33	sb	20		2,500	13	6		6	0.5	2
139	33	sb	17		4,000	16	12		9	0.5	1
140	33	sb	10		2,500	17	12		8	0.5	1

Table 3

Interpretation of Undrained Shear Strength, Lateral Stress, Friction Angle and Secant Shear Modulus

Test	Hole	Instrument	Shear Strength	Friction Angle	Secant Shear Modulus	Effective Vertical Stress	Total Lateral Stress	Effective Lateral Stress – Friction Analysis	Effective Lateral Stress	ko	Quality (1-best)
			(psi)		(psi)	(psi)	(psi)	(psi)	(psi)		
141	33	hp	100*	35	60,000	25	35*	35	35	1.4	1(cemented)
142	33	hp	100*	40	40,000	24	20*	20	20	0.8	1(cemented)
143	33	hp	65		40,000	37	50		24	0.6	1
144	33	hp	18		4,000	36	40		14	0.4	4
145	33	hp	28*	35	4,000	43	70*	20	20	0.5	2
146	33	hp	16*	35	2,000	42	50*				4
147	33	hp	30*	33	5,000	53	70*	25	25	0.5	2
148	33	hp	30		4,000	52					4
149	76	sb	10		1,500	12	5		5	0.5	1
150	76	sb	12		1,500	13	7		7	0.6	1
152	76	sb	12		1,500	17	8				4
153	76	hp	50*		20,000	25	20*	30	30	1.2	1
154	76	hp		35	20,000	24		20	20	0.8	2
155	76	hp		33	6,000	37		17	17	0.5	3
156	76	hp	70*	35	30,000	36	50*	32	32	0.9	1
157	76	hp	26*	33	6,000	45	50*	20	20	0.4	2
158	76	hp	26*	33	6,000	44	50*	18	18	0.4	3
159	48	sb	12		2,000	19	15		8	0.4	3
160	48	sb	15		7,500	20	16		8	0.4	2
161	48	hp	25	33*	9,000	27	20	12*	12	0.5	2
162	48	hp	25	33*	5,500	26	20	14*	14	0.5	2
163	48	hp	16	33*	6,000	31	40	10*	21	0.7	2
164	48	hp	30	35*	8,000	30	30	16*	16	0.5	2
165	60	sb	12		1,500	12	7		7	0.6	2
166	60	sb	16		1,500	13	9		9	0.7	1

Table 3

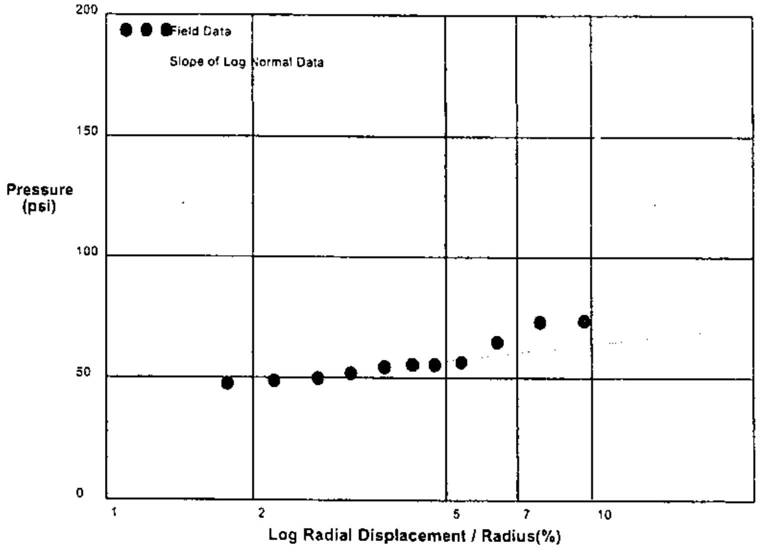
Interpretation of Undrained Shear Strength, Lateral Stress, Friction Angle and Secant Shear Modulus

Test	Hole	Instrument	Shear Strength	Friction Angle	Secant Shear Modulus	Effective Vertical Stress	Total Lateral Stress	Effective Lateral Stress – Friction Analysis	Effective Lateral Stress	ko	Quality (1-best)
			(psi)		(psi)	(psi)	(psi)	(psi)	(psi)		
168	60	hp	10		1,500	18					5
170	60	hp	15		3,000	21	12		3		4
171	60	hp	12		2,000	20	14		6		4
172	60	hp	15		2,000	25	35		22	0.9	3
173	60	hp	14		3,000	24	22		10	0.4	2
174	60	hp	20		3,000	37	85		59	1.6	2 (cemented)
175	60	hp	17		1,500	36	50		25	0.7	3
176	60	hp	60*	35	8,000	46	50*	30	30	0.7	2
177	60	hp	30*	35	8,000	46	50*	20	20	0.4	2
181	8	sb	20		4,000	28	32		16	0.6	1
182	8	sb	20		4,000	28	32		15	0.5	1
183	8	sb	20		4,000	32	40		19	0.6	1
184	8	sb	20		3,000	32	40		19	0.6	1
185	8	hp	50*	35	20,000	37	49*	30	30	0.8	1
186	8	hp	50*	35	20,000	36	40*	30	30	0.8	1
187	31	hp	30		2,000	36	55		29	0.8	1 (cemented)
188	31	hp	30		5,000	36	50		25	0.7	1
189	31	hp	30*	35	5,000	40	40*	20	20	0.5	1
190	31	hp	30		2,000	40					3 (disturbed)

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-20-05

Hole No. BH-2 Depth 39 feet File E:\PC121.P



Shear Strength 9.7 psi
Limit Pressure 77 psi

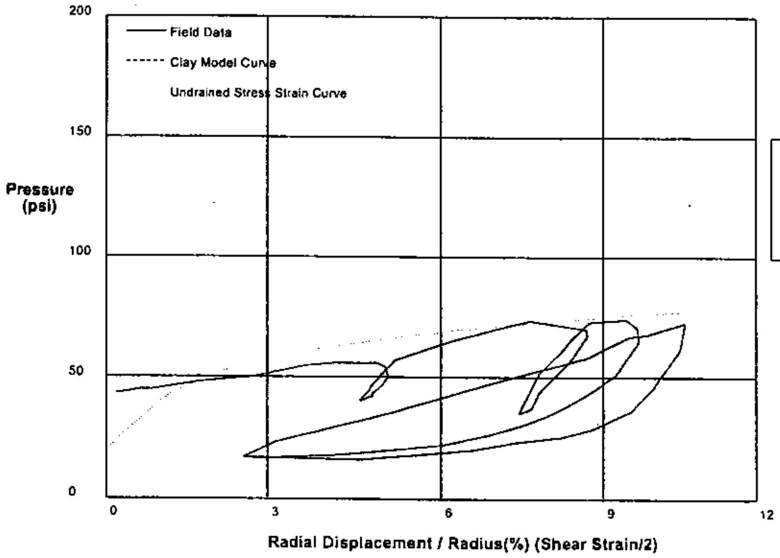
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-20-05

Hole No. BH-2 Depth 39 feet File E:\PC121.P



GIBSON'S CLAY MODEL

Shear Strength 16 psi
Insitu Stress 20 psi
Shear Modulus 1000 psi

shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-20-05

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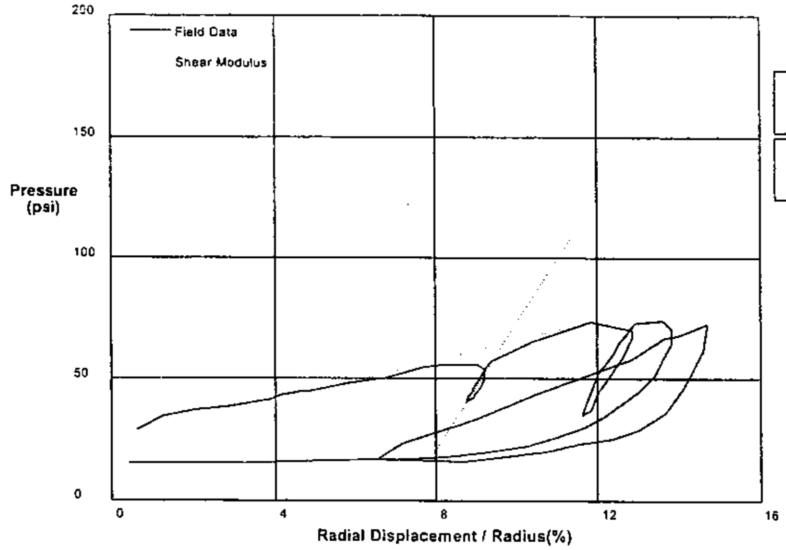

Shear Modulus 207 psi

Shear Modulus 1305 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-20-05

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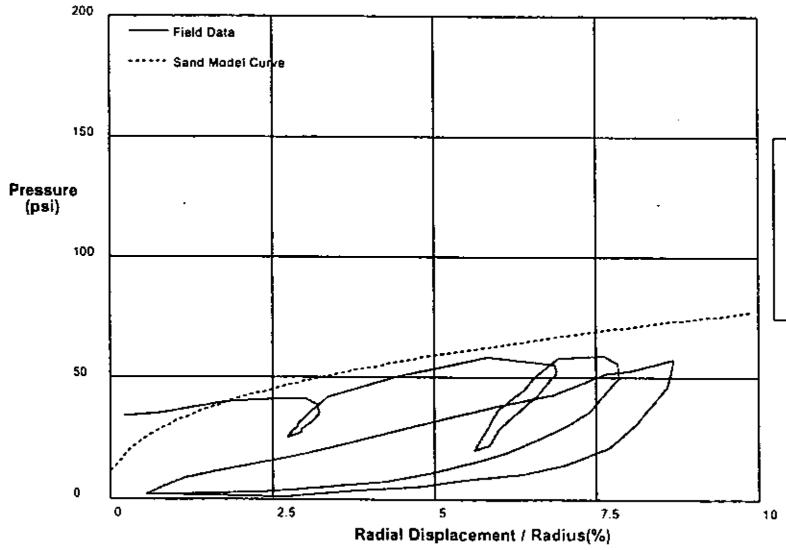


THE HUGHES SAND MODEL

Water Pressure	15 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	11 psi
Shear Modulus	1500 psi

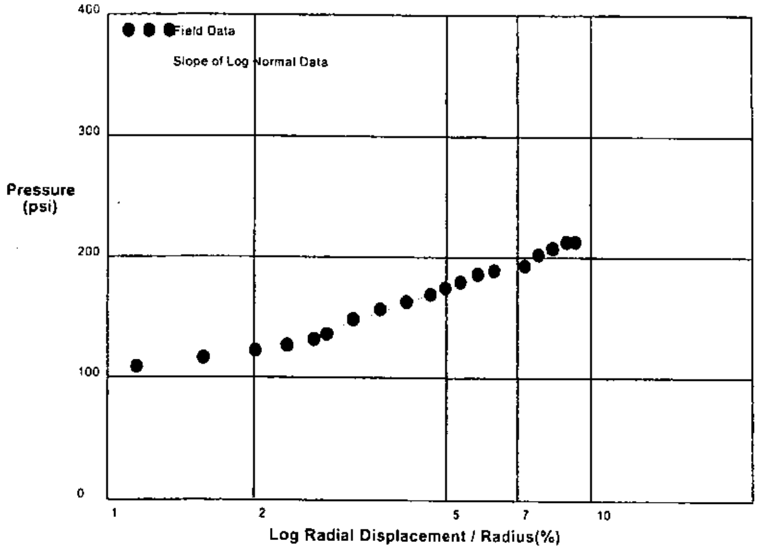
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-20-05

Hole No. BH-2 Depth 50 feet File E:\PC122.P



Shear Strength 62.8 psi
Limit Pressure 306 psi

shift 2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-20-05

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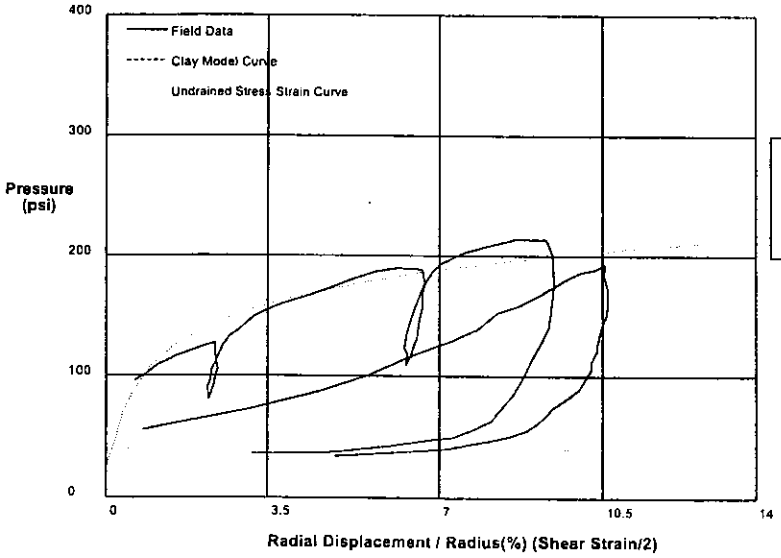


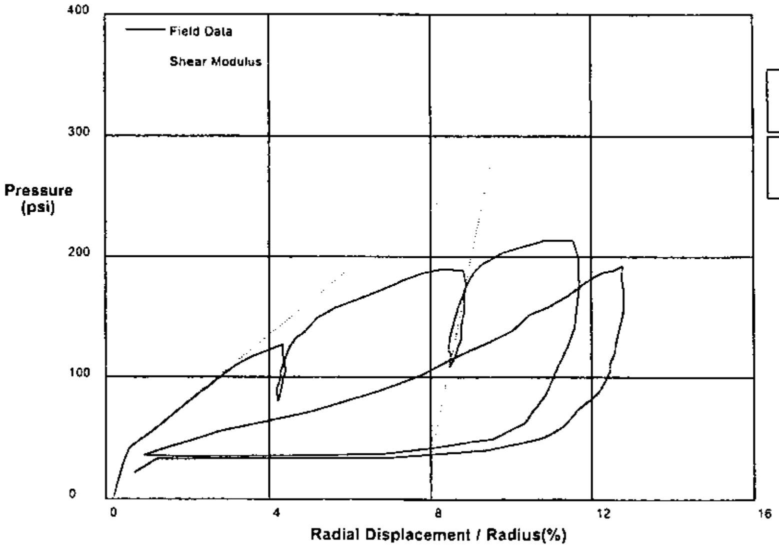
GIBSON'S CLAY MODEL

Shear Strength 40 psi
Insitu Stress 25 psi
Shear Modulus 6000 psi

shift 2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-20-05
Hole No. BH-2 Depth 50 feet File E:\PC122.P



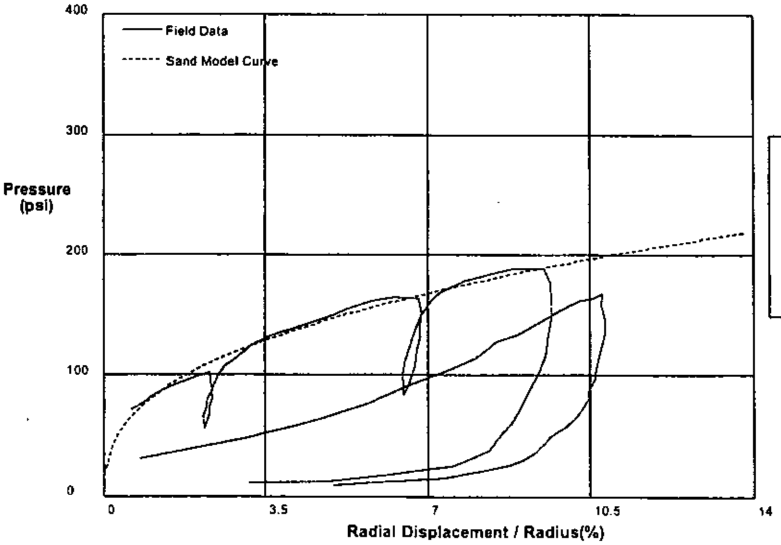
Shear Modulus 1374 psi

Shear Modulus 8188 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-20-05
Hole No. BH-2 Depth 50 feet File E:\PC122.P



THE HUGHES SAND MODEL

Water Pressure	25 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	17 psi
Shear Modulus	8000 psi

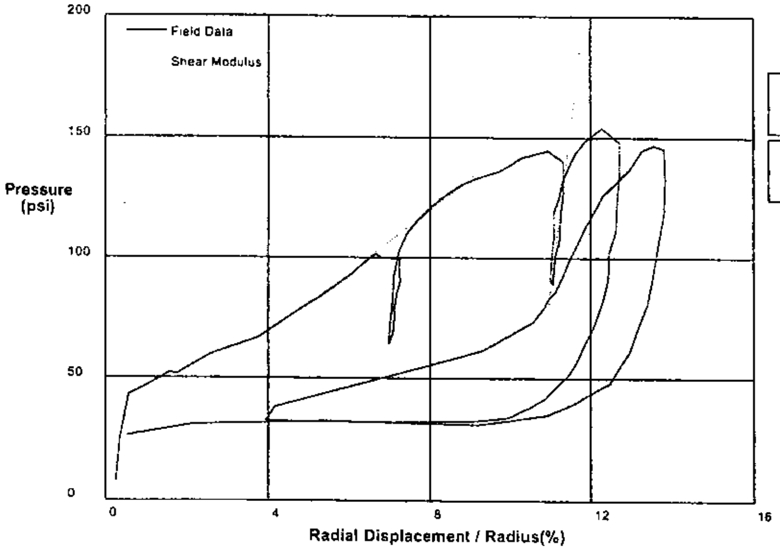
shift 2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-21-05

Hole No. BH-2 Depth 58.5 feet File E:\PC125.P



Shear Modulus 653 psi

Shear Modulus 6893 psi

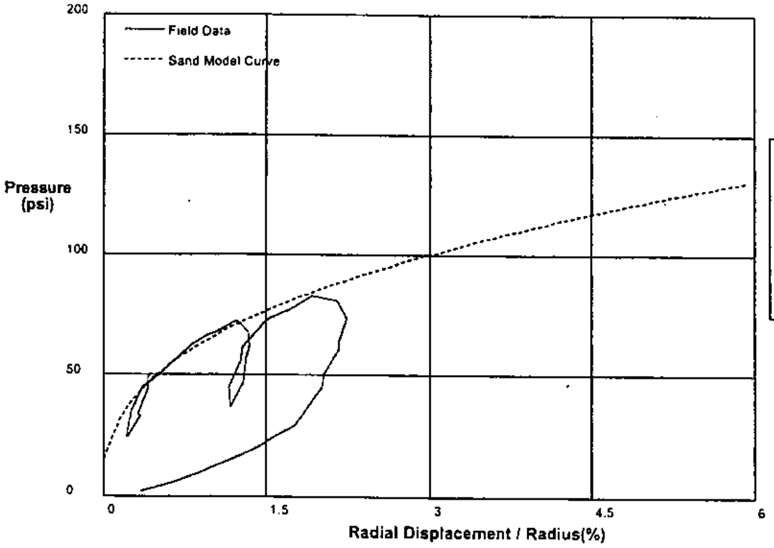
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-21-05

Hole No. BH-2 Depth 60 feet File E:\PC124.P



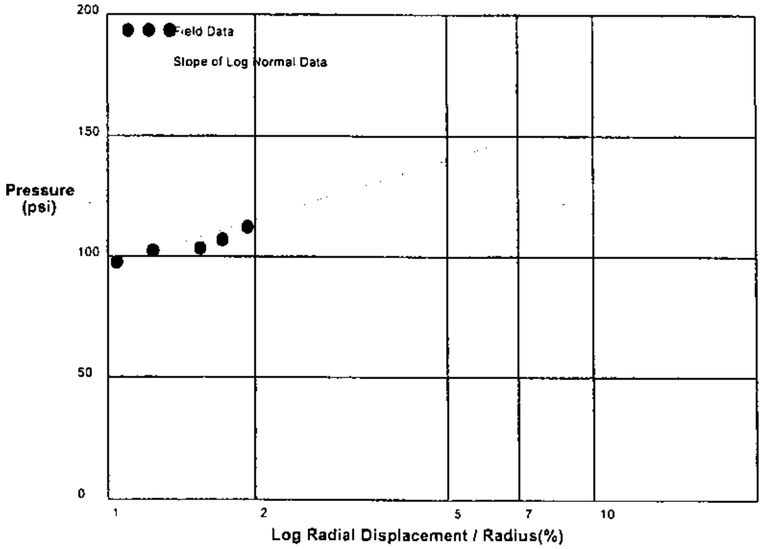
THE HUGHES SAND MODEL

Water Pressure	30 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	15 psi
Shear Modulus	6000 psi

shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-21-05
Hole No. BH-2 Depth 60 feet File E:\PC124.P

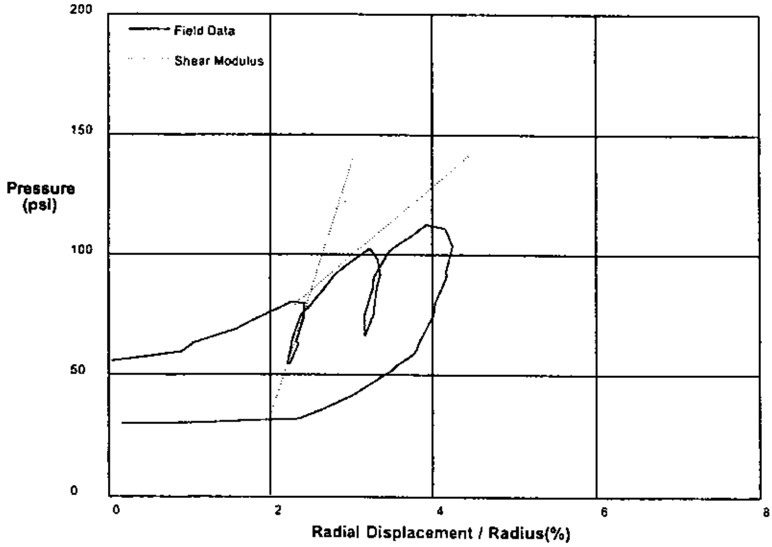


Shear Strength 27.3 psi
Limit Pressure 198 psi

shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-21-05
Hole No. BH-2 Depth 60 feet File E:\PC124.P



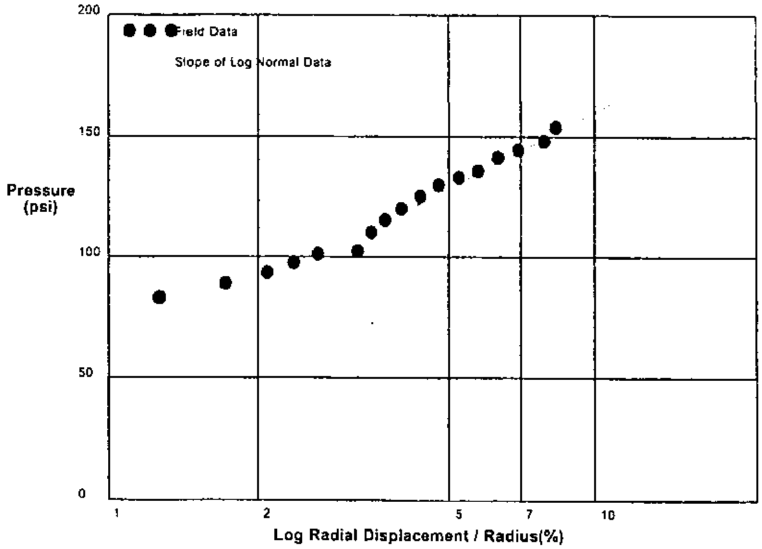
Shear Modulus 1446 psi

Shear Modulus 5202 psi

shift 4

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-21-05
Hole No. BH-2 Depth 58.5 feet File E:\PC125.P

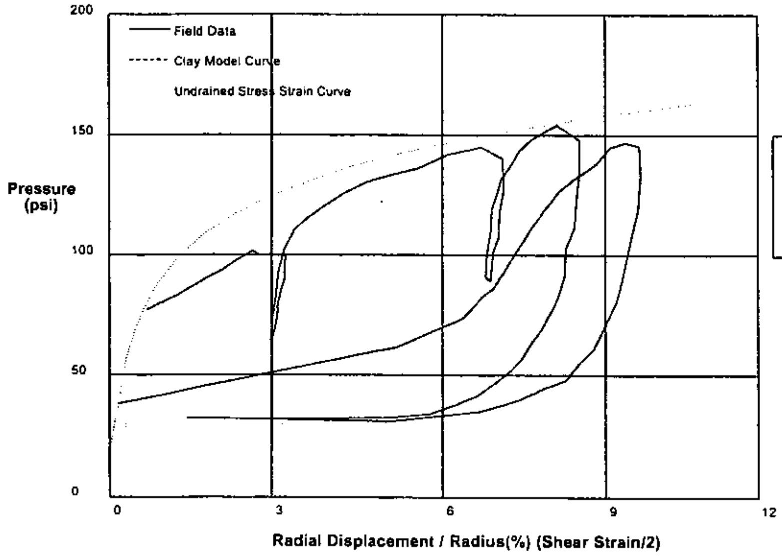


Shear Strength 45.4 psi
Limit Pressure 224 psi

shift 4

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-21-05
Hole No. BH-2 Depth 58.5 feet File E:\PC125.P



GIBSON'S CLAY MODEL

Shear Strength 30 psi
Insitu Stress 20 psi
Shear Modulus 6000 psi

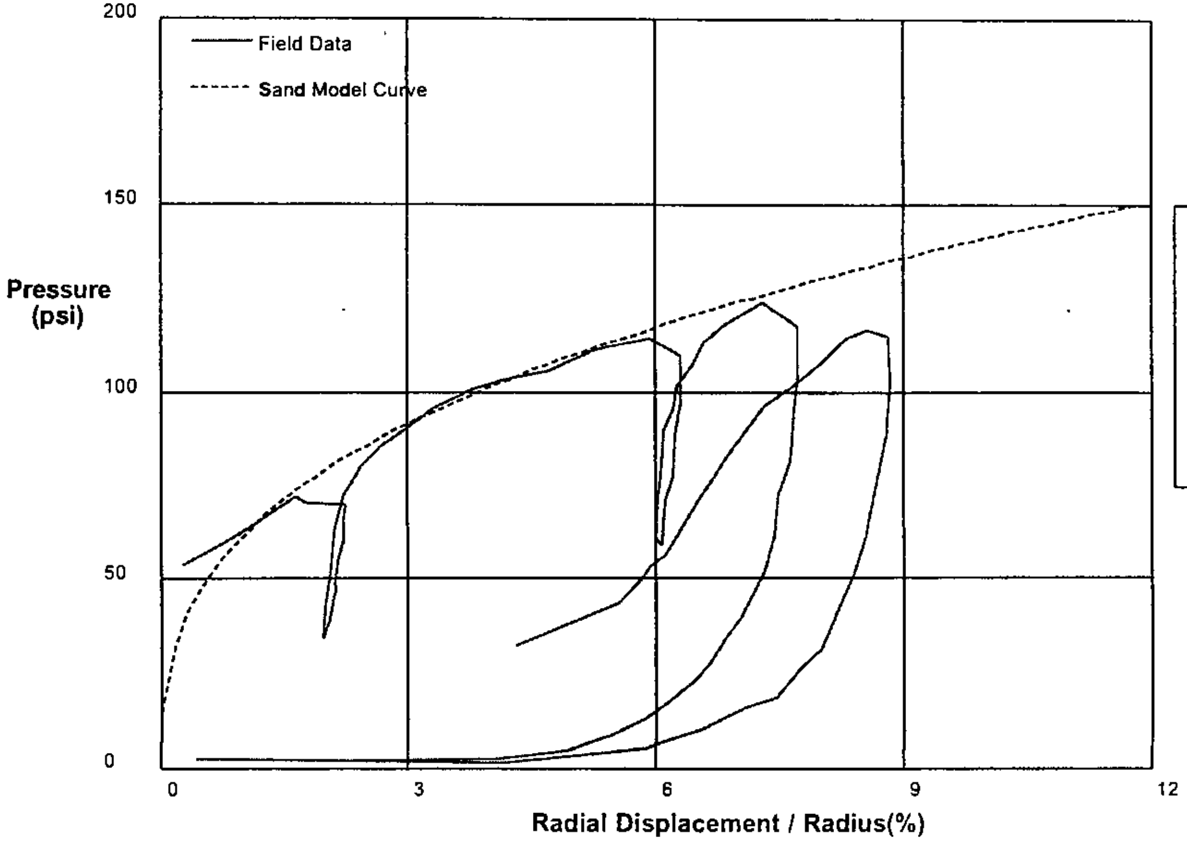
shift 4

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-21-05

Hole No. bh2 Depth 58.5feet File C:\DATA\C-290\C-29005\PC125.P



THE HUGHES SAND MODEL

Water Pressure	30 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	14 psi
Shear Modulus	7000 psi

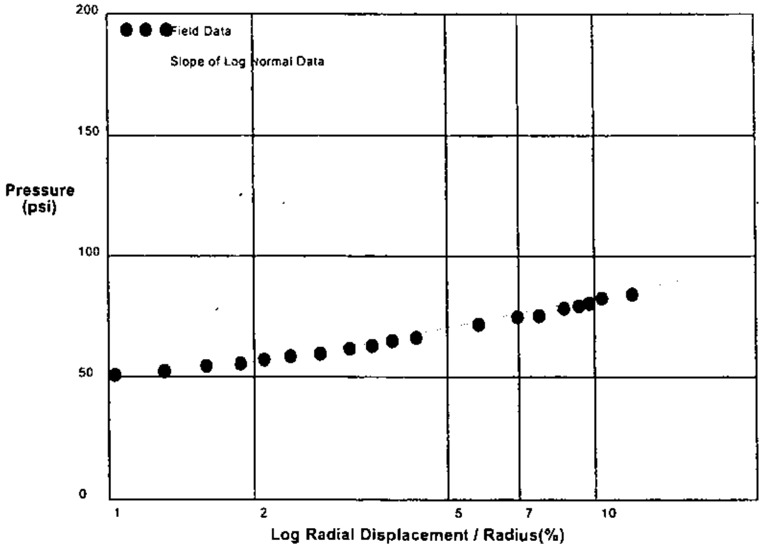
shift 5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-24-05

Hole No. BH-6 Depth 44 feet File E:\PC132.P



Shear Strength 17.8 psi
Limit Pressure 108 psi

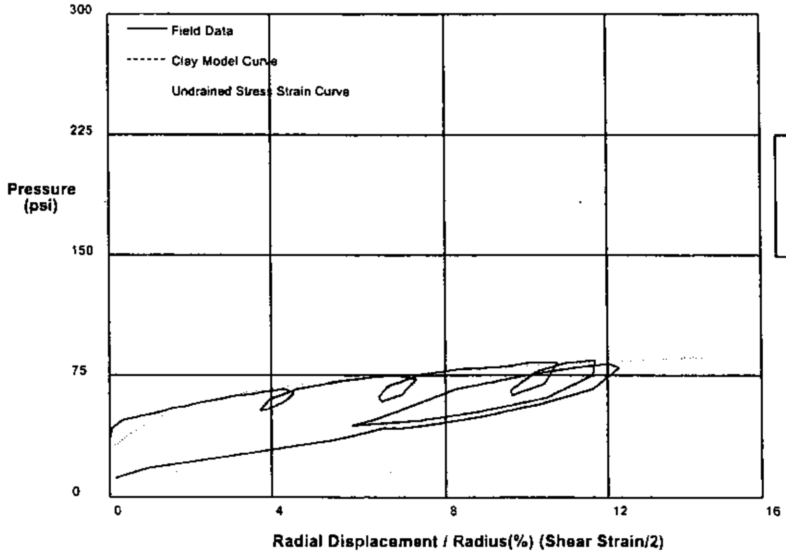
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-24-05

Hole No. bh6 Depth 44feet File C:\DATA\C-290\C-29005\PC132.P



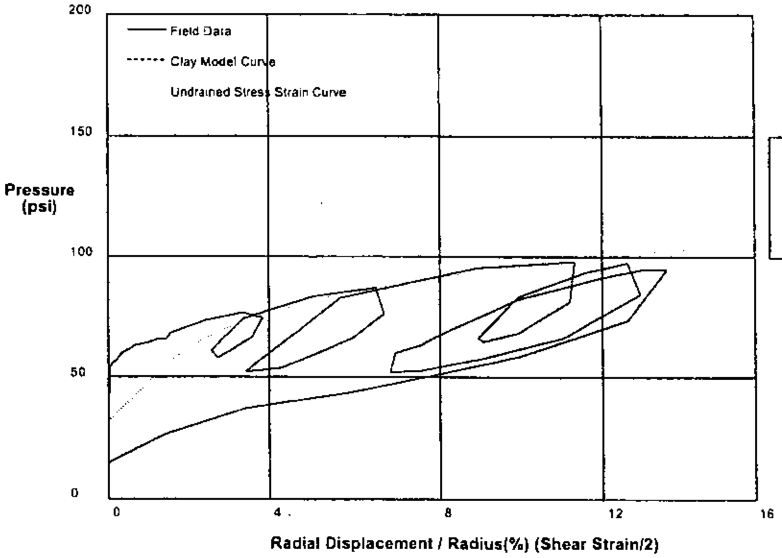
GIBSON'S CLAY MODEL

Shear Strength 15 psi
Insitu Stress 30 psi
Shear Modulus 800 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-24-05
Hole No. BH-6 Depth 46 feet File C:\DATA\C-290\C-29005\PC133.P



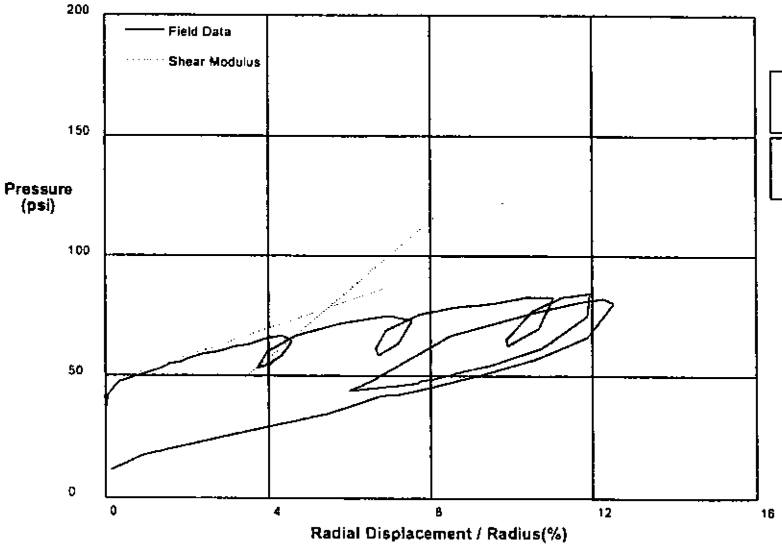
GIBSON'S CLAY MODEL

Shear Strength 21 psi
Insitu Stress 32 psi
Shear Modulus 800 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-24-05
Hole No. BH-6 Depth 44 feet File E:\PC132.P



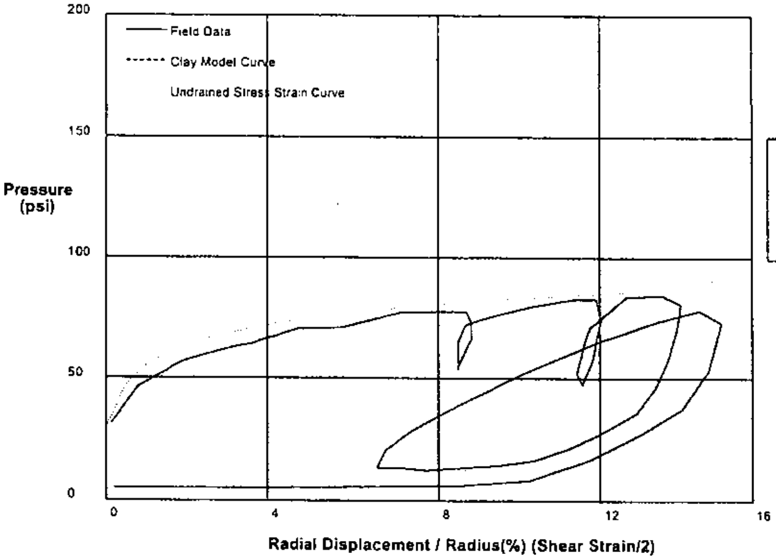
Shear Modulus 296 psi

Shear Modulus 719 psi

shift 0

HUGHES

PRESSUREMETER DATA	**Parikh Consultants, Inc.**	
Silicon Valley Rapid Transit (Downtown)		1-25-05
Hole No. BH-6	Depth 53.5 feet	File C:\DATA\C-290\C-29005\PC134.P



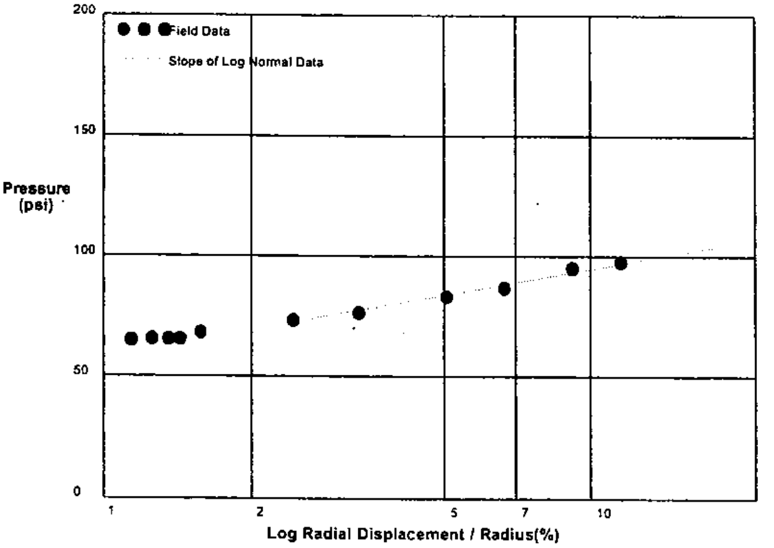
GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 30 psi
Shear Modulus 1800 psi

shift .2

HUGHES

PRESSUREMETER DATA	**Parikh Consultants, Inc.**	
Silicon Valley Rapid Transit (Downtown)		1-24-05
Hole No. BH-6	Depth 46 feet	File E:\PC133.P

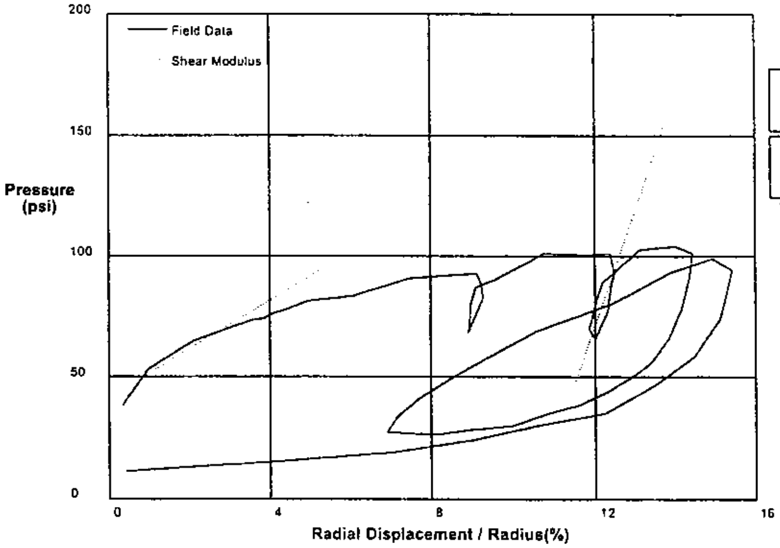


Shear Strength 15.6 psi
Limit Pressure 116 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-25-05
Hole No. bh6 Depth 53.5feet File E:\PC134.P



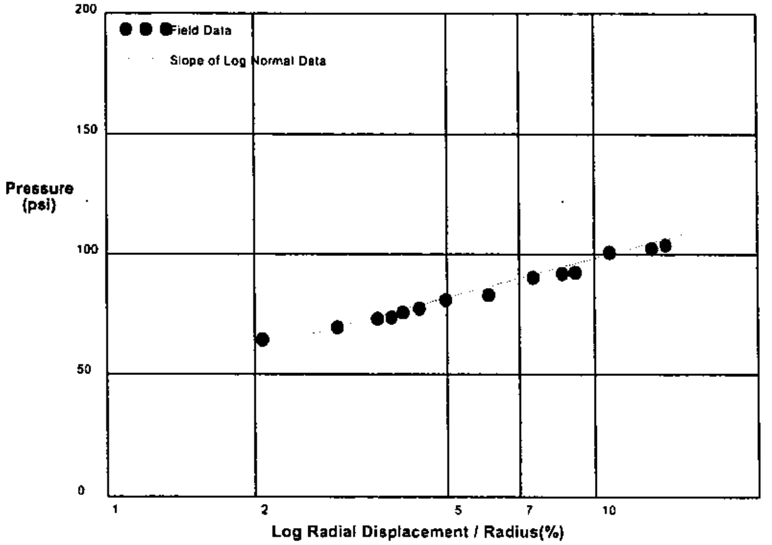
Shear Modulus 502 psi

Shear Modulus 2435 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-25-05
Hole No. bh6 Depth 53.5feet File E:\PC134.P

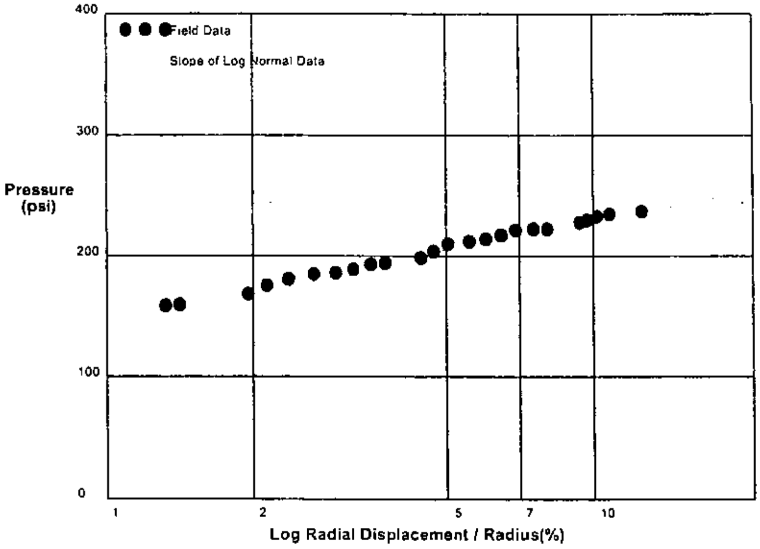


Shear Strength 23.5 psi
Limit Pressure 131 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-25-05
Hole No. BH-6 Depth 65 feet File E:\PC135.P

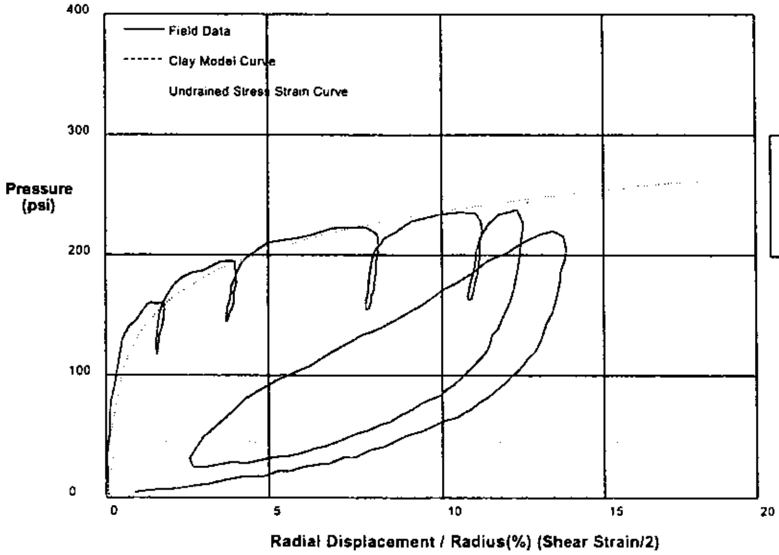


Shear Strength 33.4 psi
Limit Pressure 275 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-25-05
Hole No. BH-6 Depth 65 feet File E:\PC135.P



GIBSON'S CLAY MODEL

Shear Strength 45 psi
Insitu Stress 30 psi
Shear Modulus 7887 psi

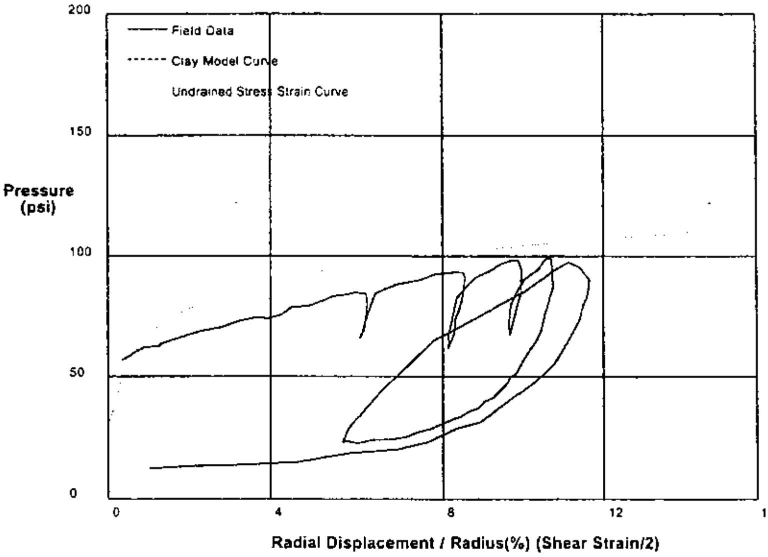
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-25-05

Hole No. bh6 Depth 63.5feet File C:\DATA\C-290\C-29005\PC136.P



GIBSON'S CLAY MODEL

Shear Strength 16 psi
Insitu Stress 30 psi
Shear Modulus 3000 psi

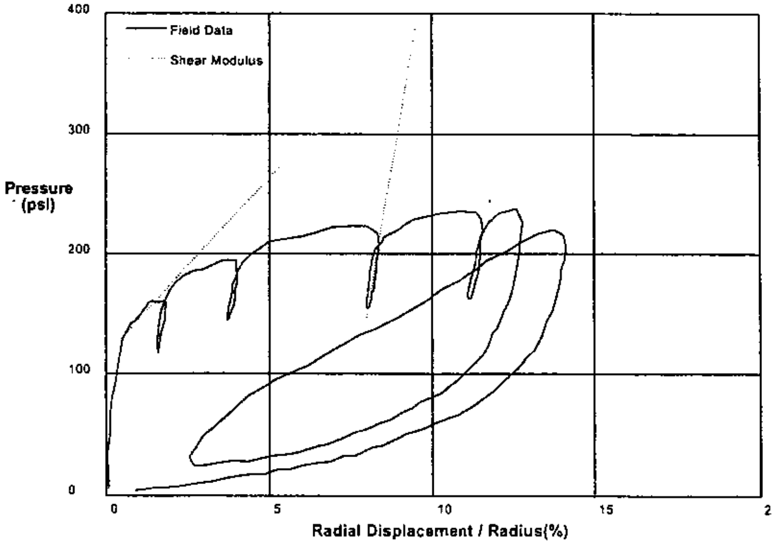
shift 1

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-25-05

Hole No. BH-6 Depth 65 feet File E:\PC135.P



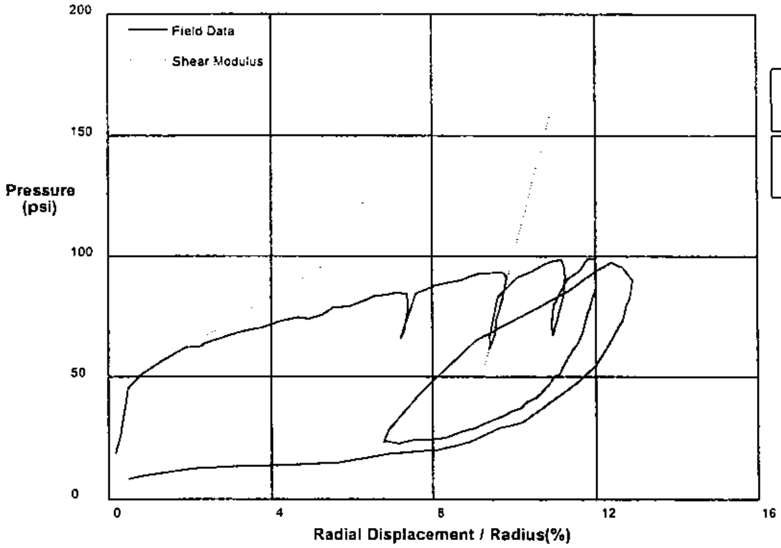
Shear Modulus 1490 psi

Shear Modulus 7887 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-25-05
Hole No. BH-6 Depth 63.5 feet File E:\PC136.P



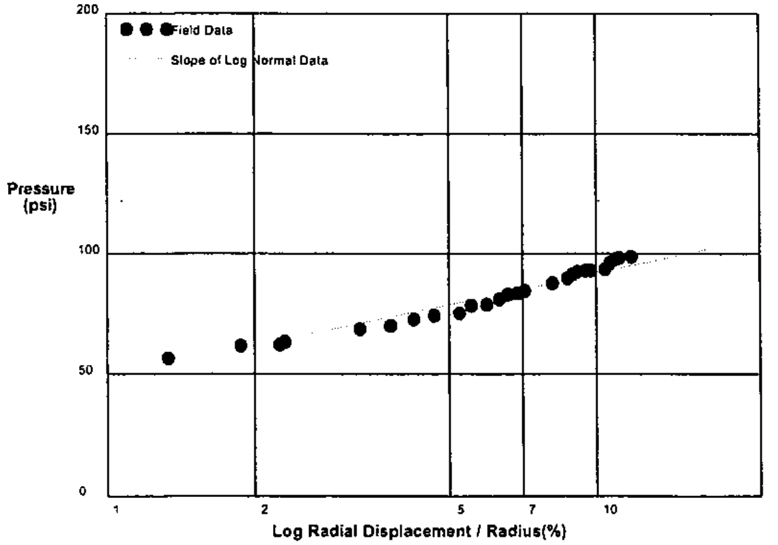
Shear Modulus 502 psi

Shear Modulus 3214 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-25-05
Hole No. BH-6 Depth 63.5 feet File E:\PC136.P



Shear Strength 18.9 psi
Limit Pressure 118 psi

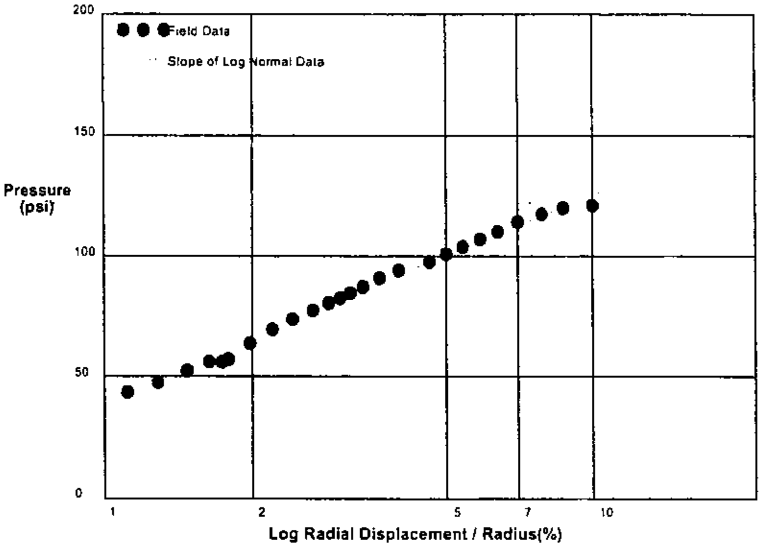
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-8-05

Hole No. bh-8 Depth 53 feet File E:\PC181.P



Shear Strength 35.7 psi
Limit Pressure 175 psi

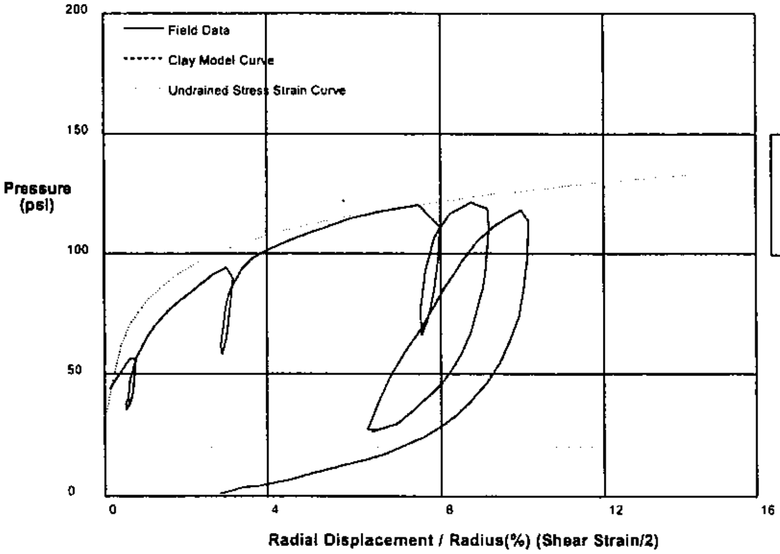
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-8-05

Hole No. BH-8 Depth 53 feet File C:\DATA\C-290\C-29005\PC181.P



GIBSON'S CLAY MODEL

Shear Strength 20 psi
Insitu Stress 32 psi
Shear Modulus 4000 psi

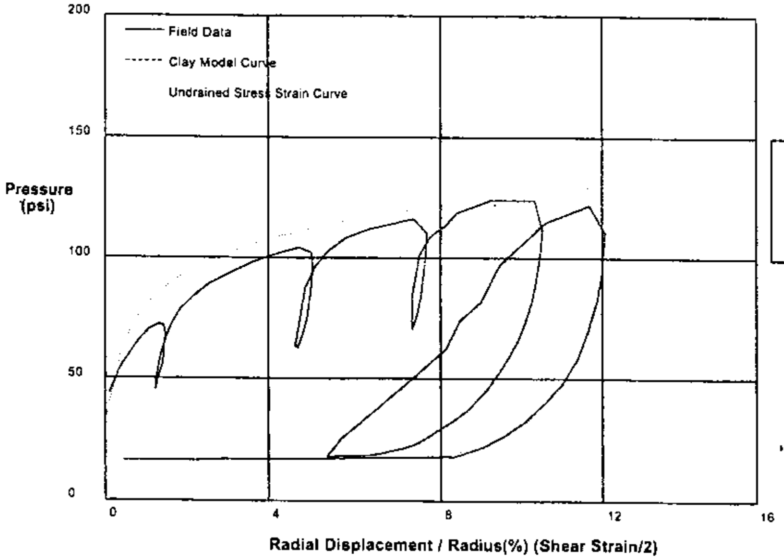
shift 1

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-8-05

Hole No. BH-8 Depth 54.5 feet File C:\DATA\C-290\C-29005\PC182.P



GIBSON'S CLAY MODEL

Shear Strength 20 psi
Insitu Stress 32 psi
Shear Modulus 4000 psi

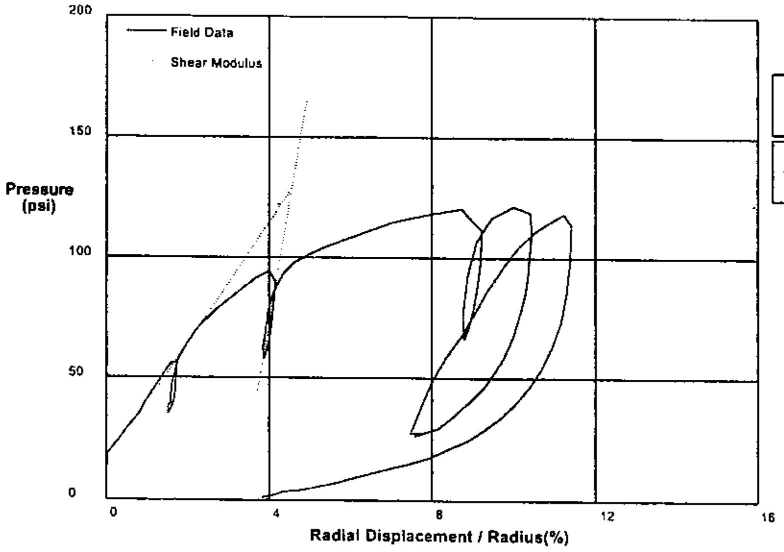
shift 1

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-8-05

Hole No. bh-8 Depth 53 feet File E:\PC181.P



Shear Modulus 1268 psi

Shear Modulus 4929 psi

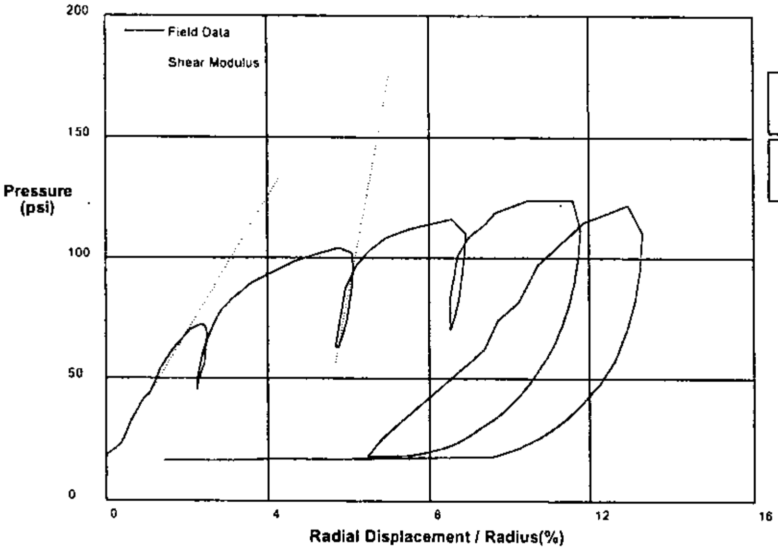
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-8-05

Hole No. BH-8 Depth 54.5 feet File E:\PC182.P



Shear Modulus 1411 psi

Shear Modulus 4479 psi

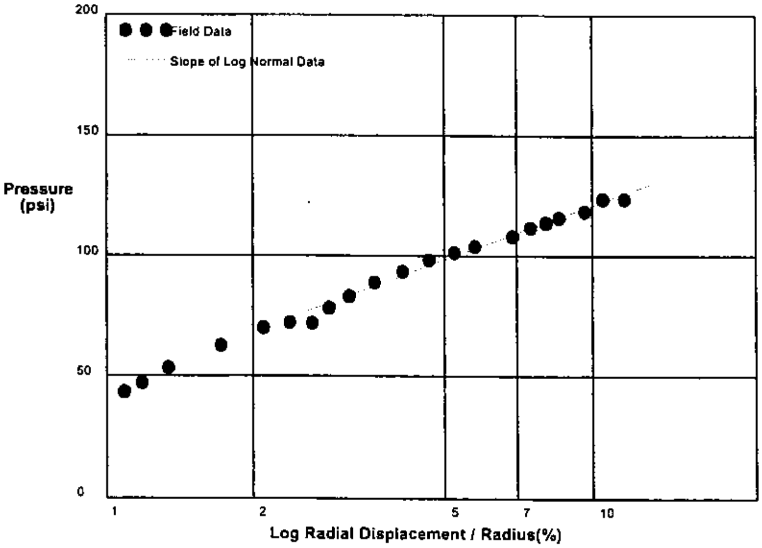
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-8-05

Hole No. BH-8 Depth 54.5 feet File E:\PC182.P



Shear Strength 32.8 psi
Limit Pressure 167 psi

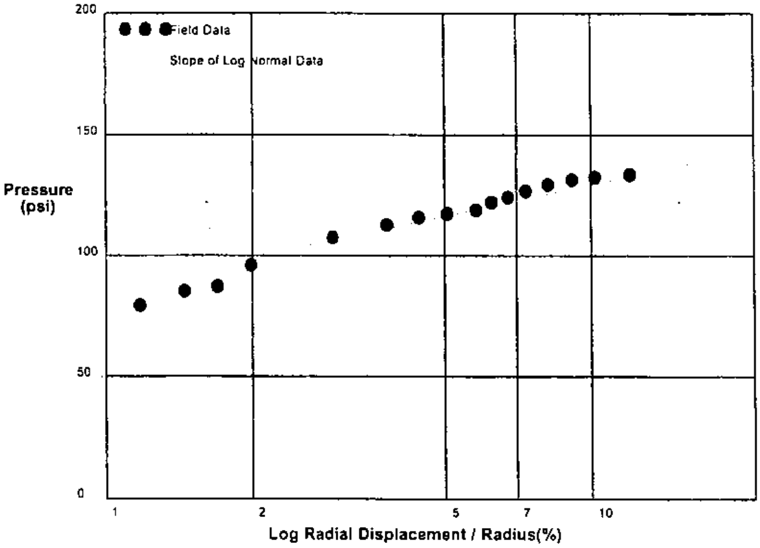
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-8-05

Hole No. BH-8 Depth 63 feet File E:\PC183.P



Shear Strength 18.9 psi
Limit Pressure 156 psi

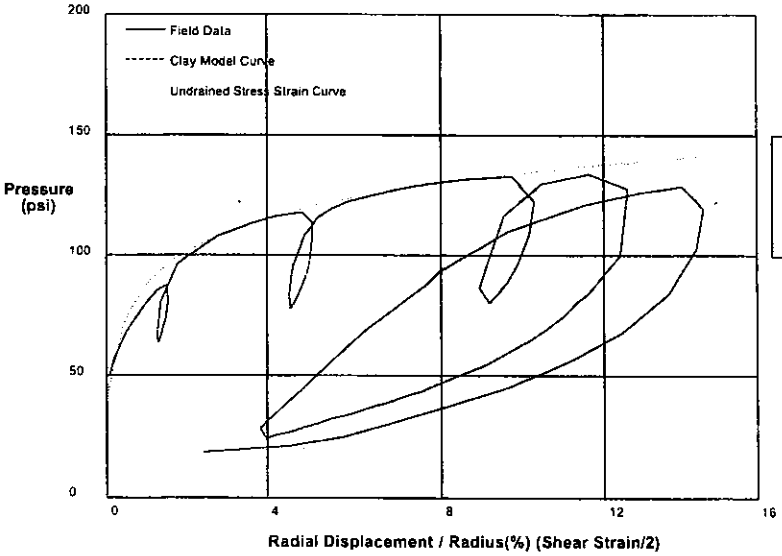
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-8-05

Hole No. BH-8 Depth 63 feet File C:\DATA\C-290\C-29005\PC183.P



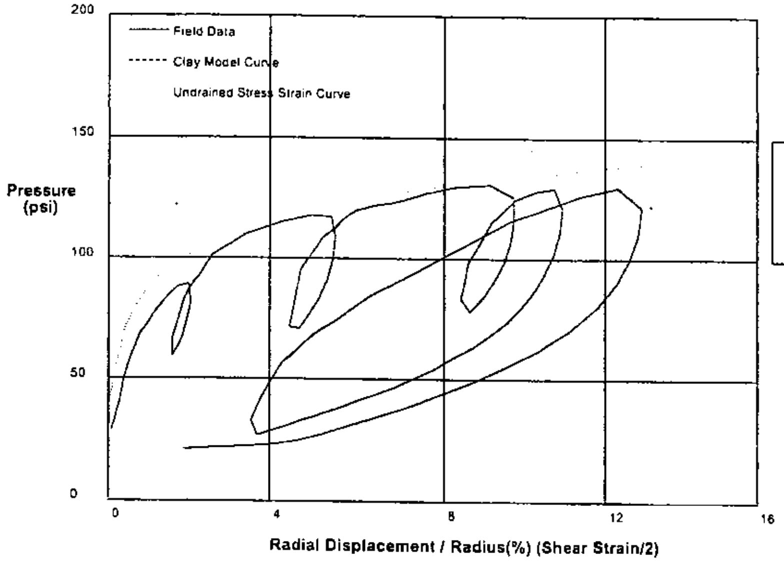
GIBSON'S CLAY MODEL

Shear Strength 20 psi
Insitu Stress 40 psi
Shear Modulus 4000 psi

shift .2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-8-05
Hole No. BH-8 Depth 64.5 feet File C:\DATA\C-290\C-29005\PC184.P



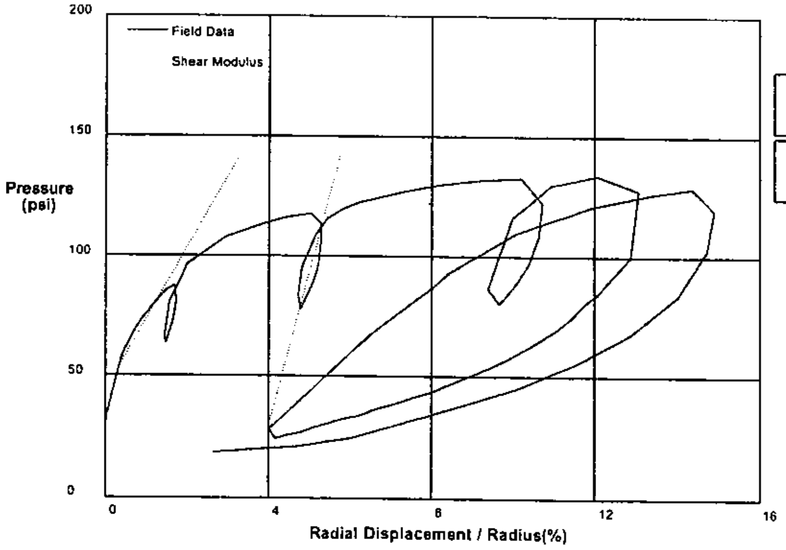
GIBSON'S CLAY MODEL

Shear Strength 20 psi
Insitu Stress 40 psi
Shear Modulus 4000 psi

shift .2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-8-05
Hole No. BH-8 Depth 63 feet File E:\PC183.P



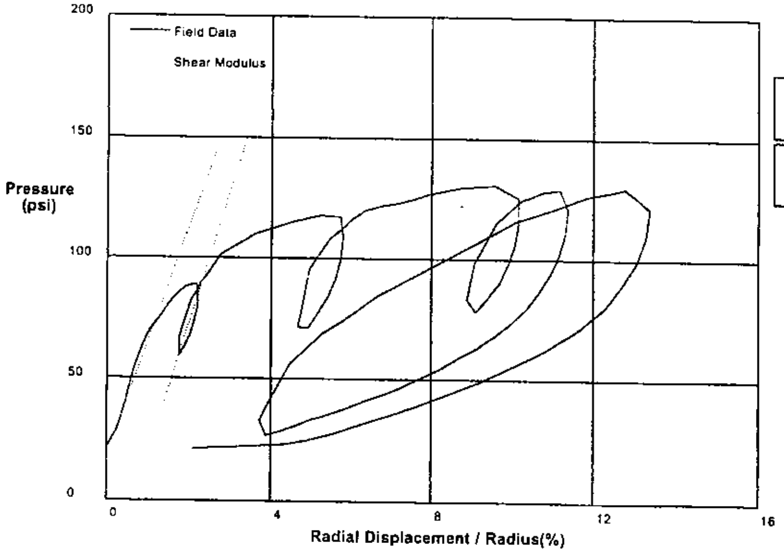
Shear Modulus 1490 psi

Shear Modulus 3214 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-8-05
Hole No. BH-8 Depth 64.5 feet File E:\PC184.P



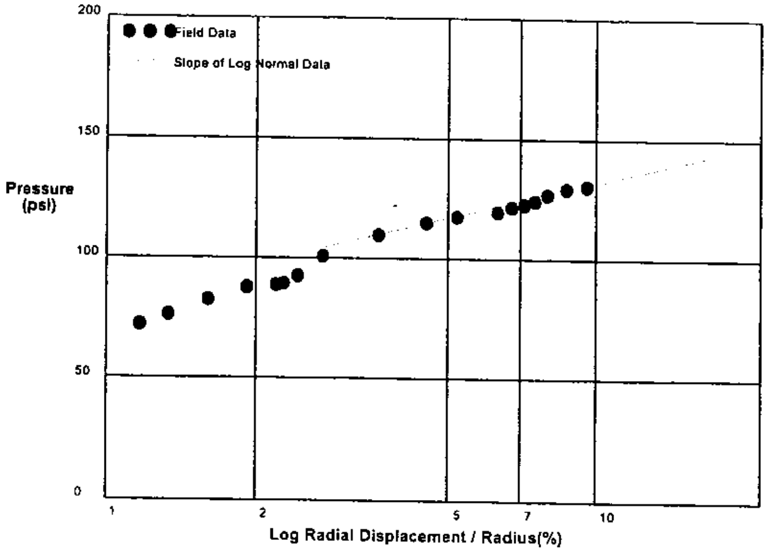
Shear Modulus 2401 psi

Shear Modulus 2783 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-8-05
Hole No. BH-8 Depth 64.5 feet File E:\PC184.P

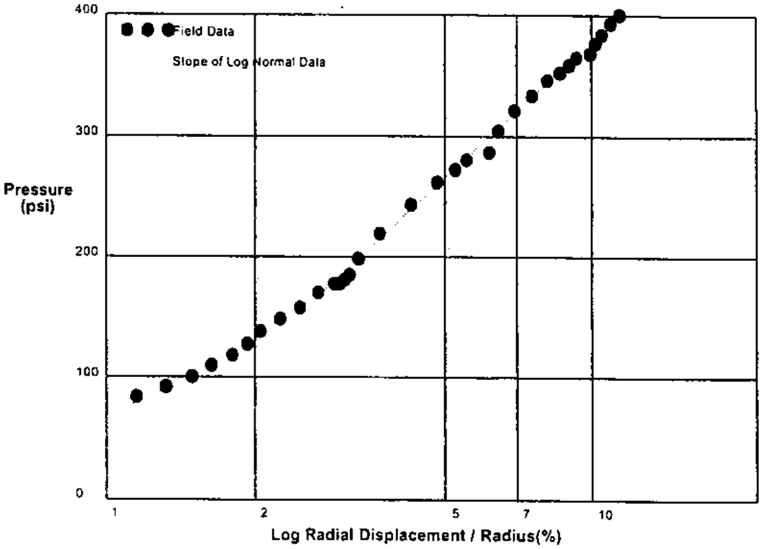


Shear Strength 21.1 psi
Limit Pressure 161 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-9-05
Hole No. BH-8 Depth 75 feet File E:\PC185.P

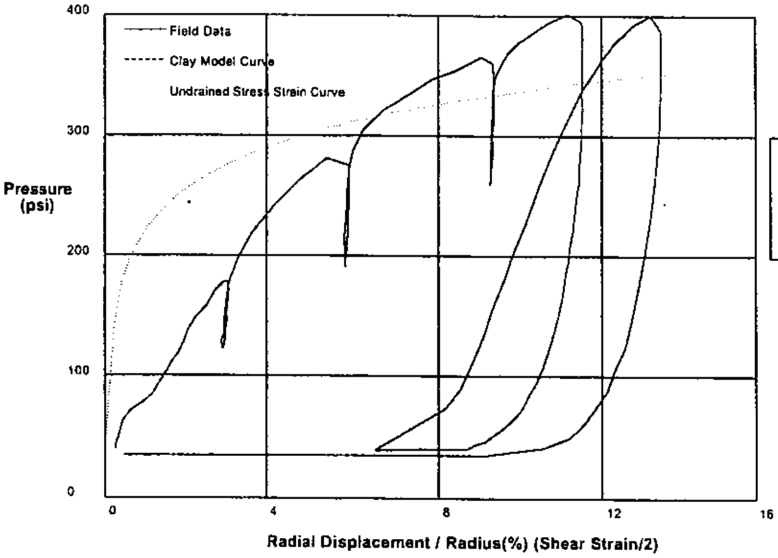


Shear Strength 162 psi
Limit Pressure 607 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-9-05
Hole No. BH-8 Depth 75 feet File E:\PC185.P



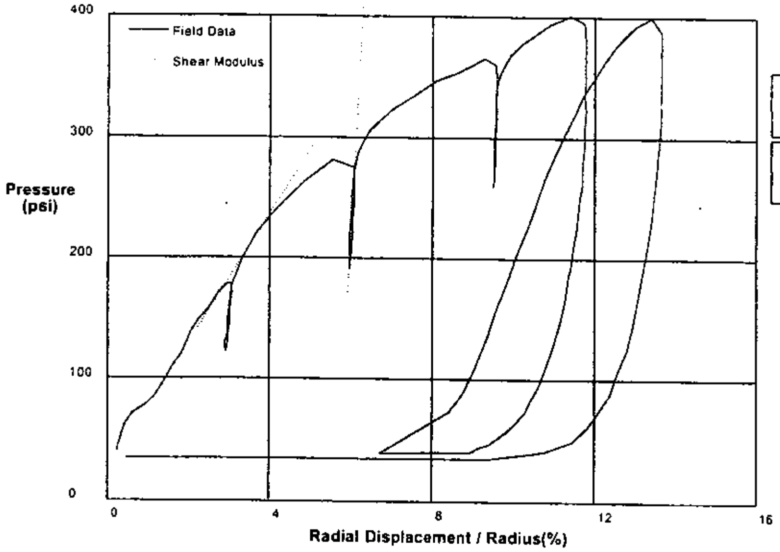
GIBSON'S CLAY MODEL

Shear Strength 50 psi
Insitu Stress 40 psi
Shear Modulus 34122 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-9-05
Hole No. BH-8 Depth 75 feet File E:\PC185.P



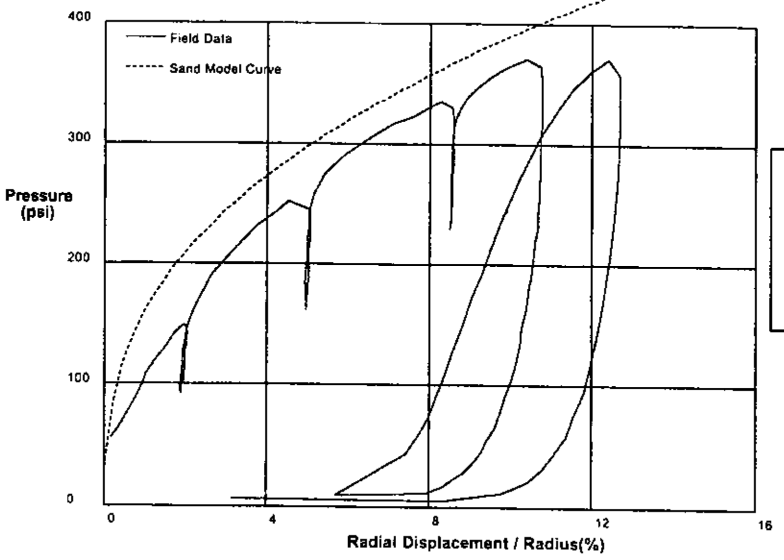
Shear Modulus 2675 psi

Shear Modulus 34122 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-9-05
Hole No. BH-8 Depth 75 feet File E:\PC185.P



THE HUGHES SAND MODEL

Water Pressure	30 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	30 psi
Shear Modulus	20000 psi

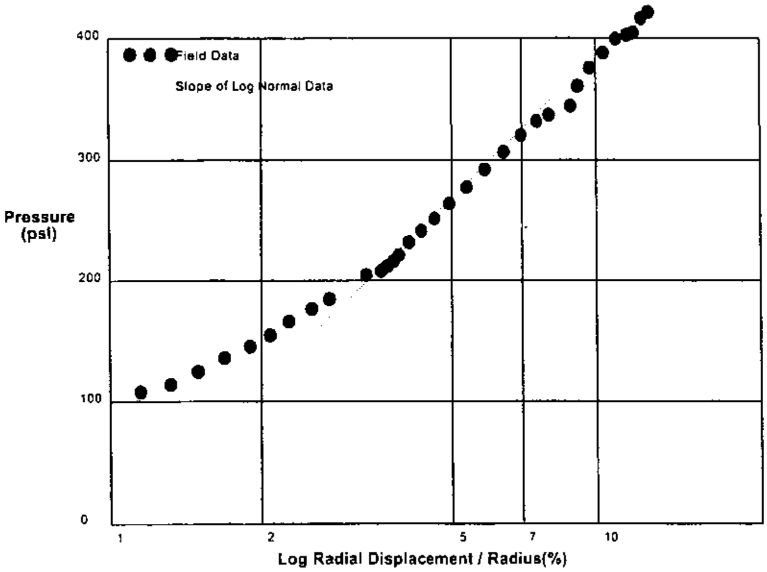
shift 1

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-9-05

Hole No. BH-8 Depth 73.5 feet File E:\PC186.P



Shear Strength 167.7 psi
Limit Pressure 621 psi

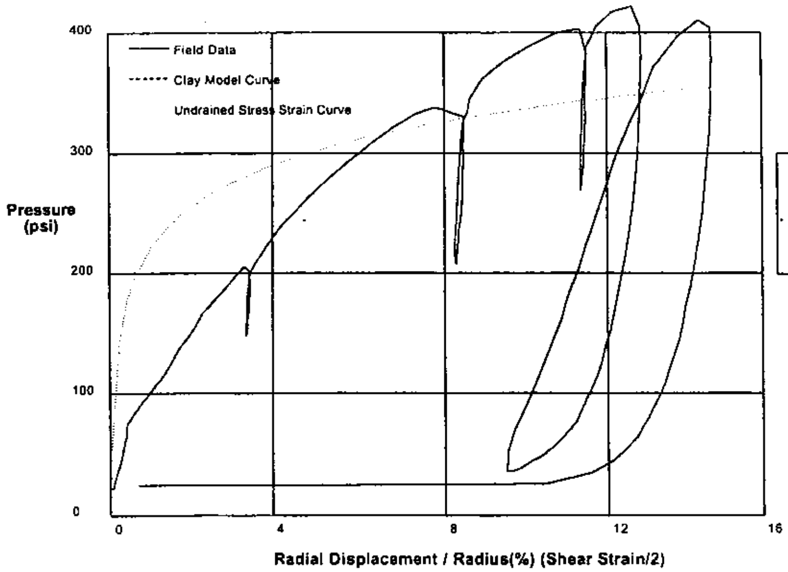
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-9-05

Hole No. BH-8 Depth 73.5 feet File E:\PC186.P



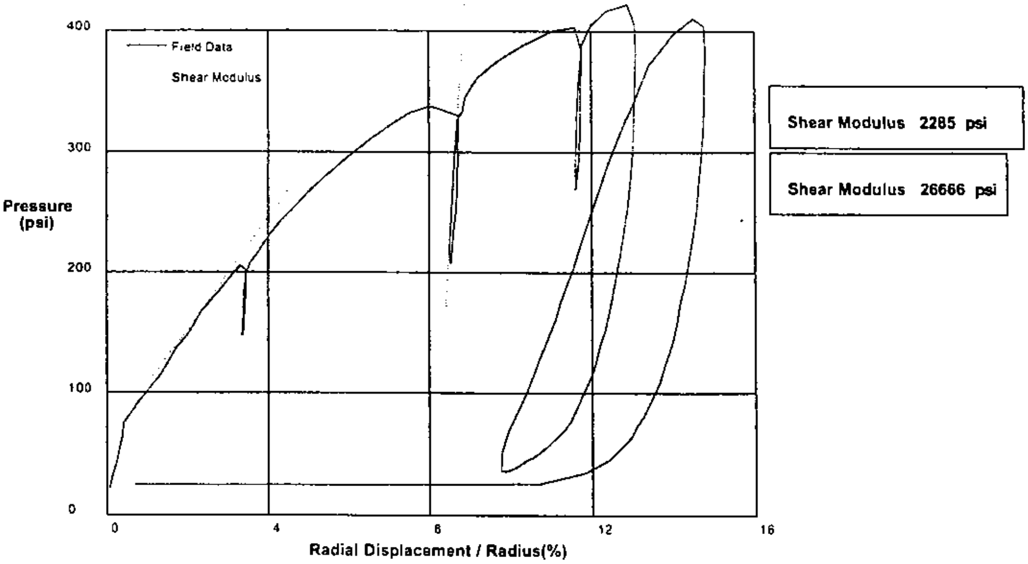
GIBSON'S CLAY MODEL

Shear Strength 50 psi
Insitu Stress 40 psi
Shear Modulus 34122 psi

shift 0

HUGHES

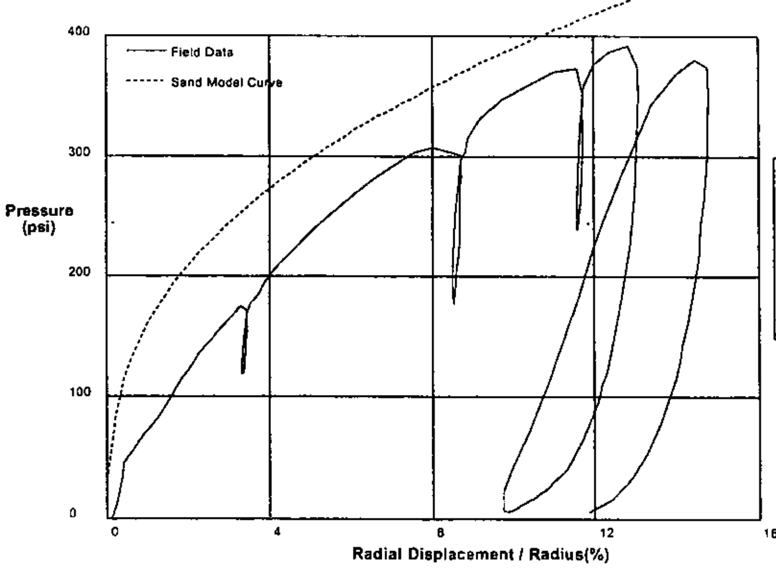
PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-9-05
Hole No. BH-8 Depth 73.5 feet File E:\PC186.P



shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-9-05
Hole No. BH-8 Depth 73.5 feet File E:\PC186.P



THE HUGHES SAND MODEL

Water Pressure	30 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	30 psi
Shear Modulus	20000 psi

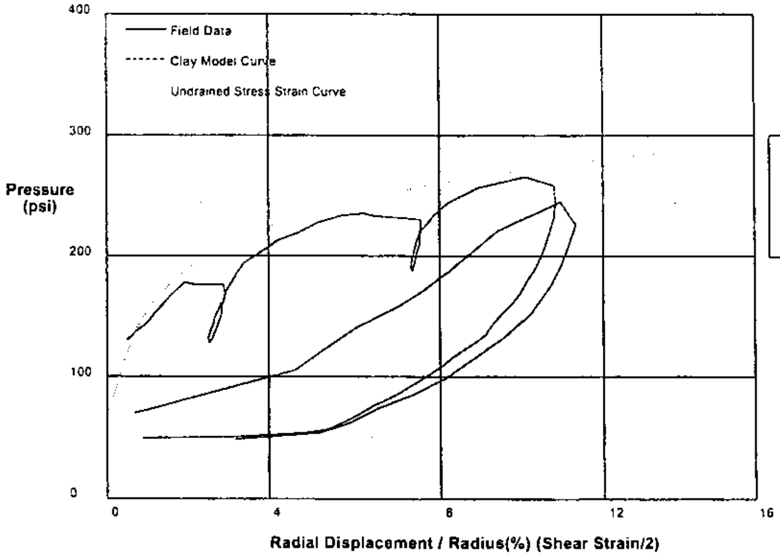
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-15-05

Hole No. BH-13 Depth 116 feet File C:\DATA\C-290\C-29005\PC107.P



GIBSON'S CLAY MODEL

Shear Strength 50 psi
Insitu Stress 70 psi
Shear Modulus 5000 psi

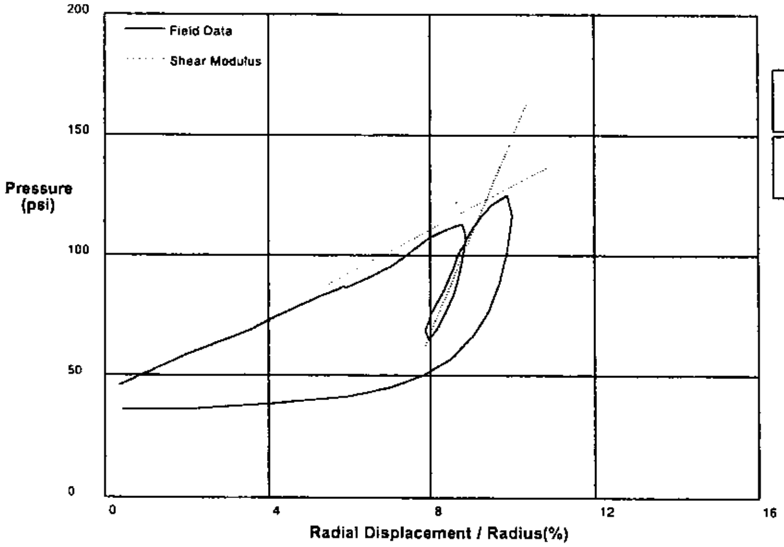
shift 2.5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-14-05

Hole No. BH-13 Depth 93.5 feet File E:\PC105.P



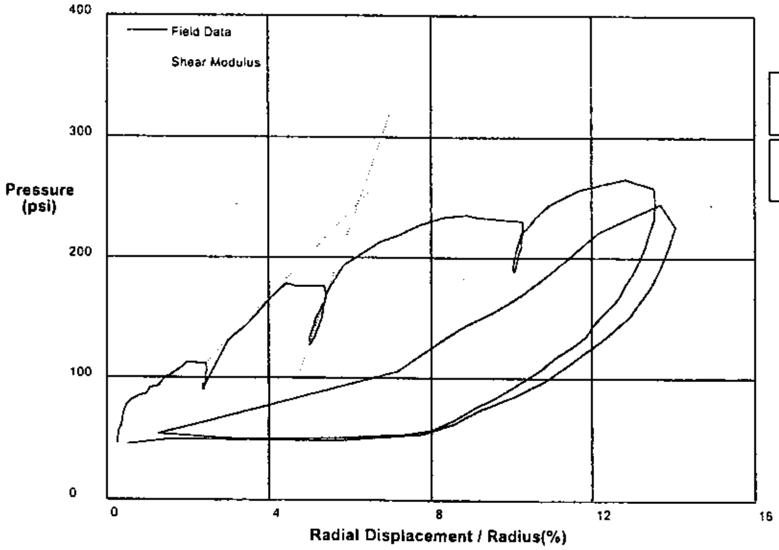
Shear Modulus 450 psi

Shear Modulus 2023 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-15-05
Hole No. BH-13 Depth 116 feet File E:\PC107.P



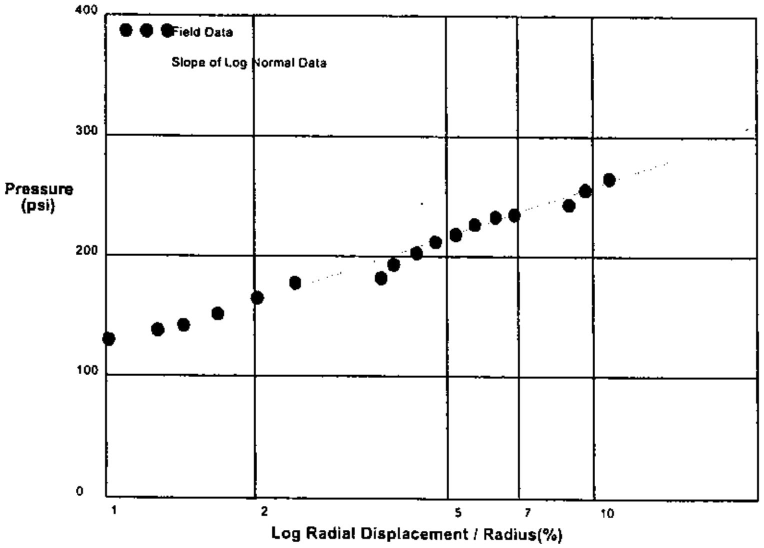
Shear Modulus 1770 psi

Shear Modulus 4871 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-15-05
Hole No. BH-13 Depth 116 feet File E:\PC107.P

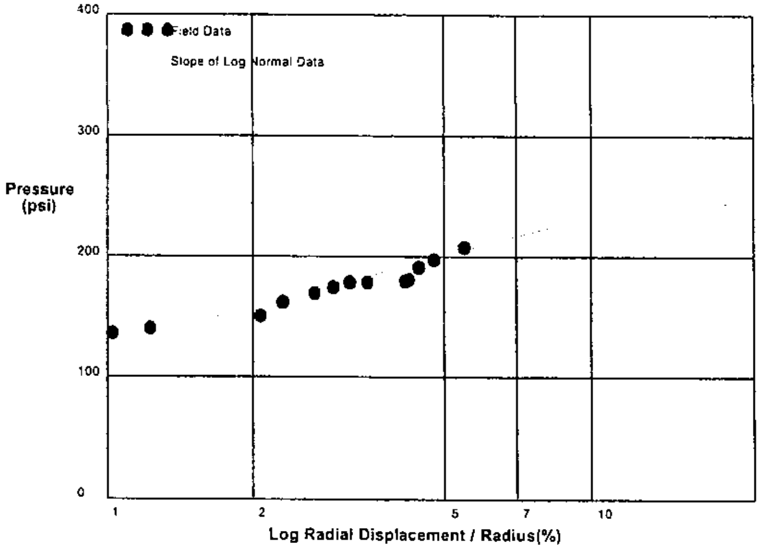


Shear Strength 60 psi
Limit Pressure 343 psi

shift 2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-15-04
Hole No. bh13 Depth 114.5feet File E:\PC108.P

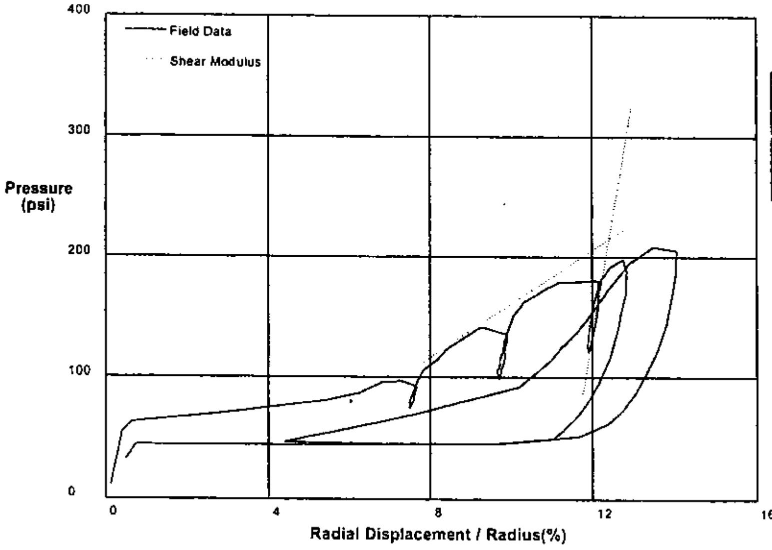


Shear Strength 47.1 psi
Limit Pressure 300 psi

shift 8

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-15-04
Hole No. BH-13 Depth 114.5 feet File E:\PC108.P



Shear Modulus 1118 psi

Shear Modulus 9858 psi

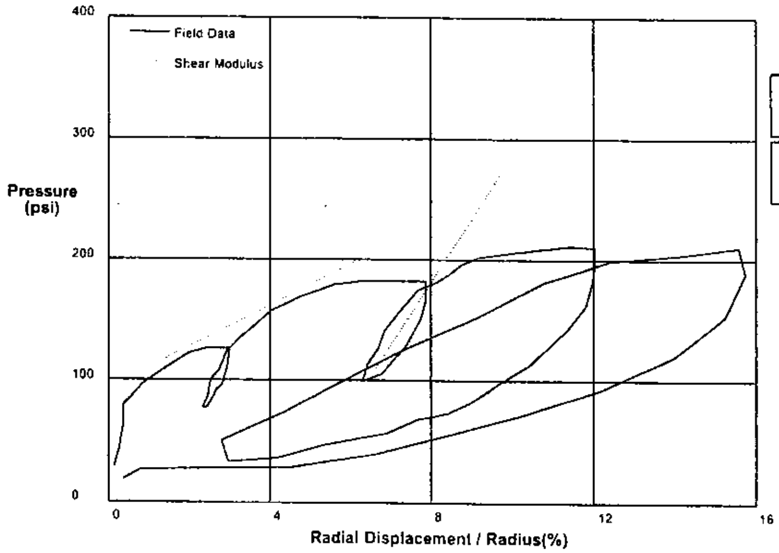
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-11-05

Hole No. BH-18 Depth 76feet File E:\PC101.P



Shear Modulus 852 psi

Shear Modulus 2610 psi

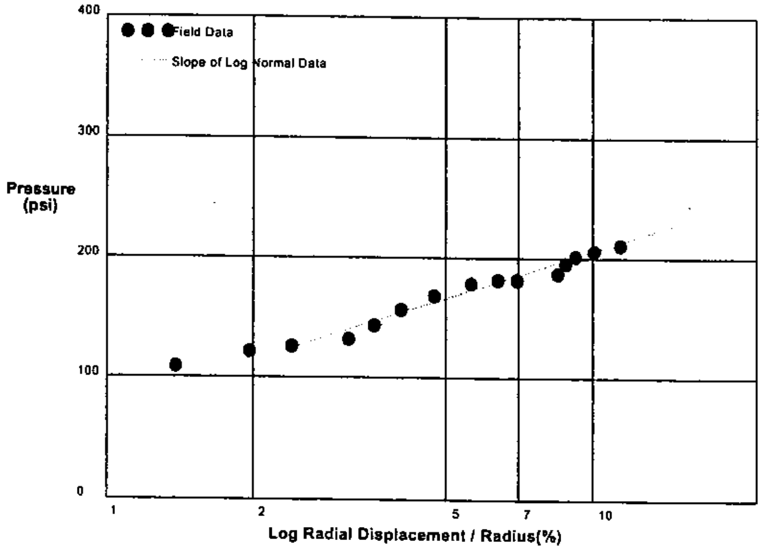
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-11-05

Hole No. BH-18 Depth 76feet File E:\PC101.P



Shear Strength 57.3 psi
Limit Pressure 287 psi

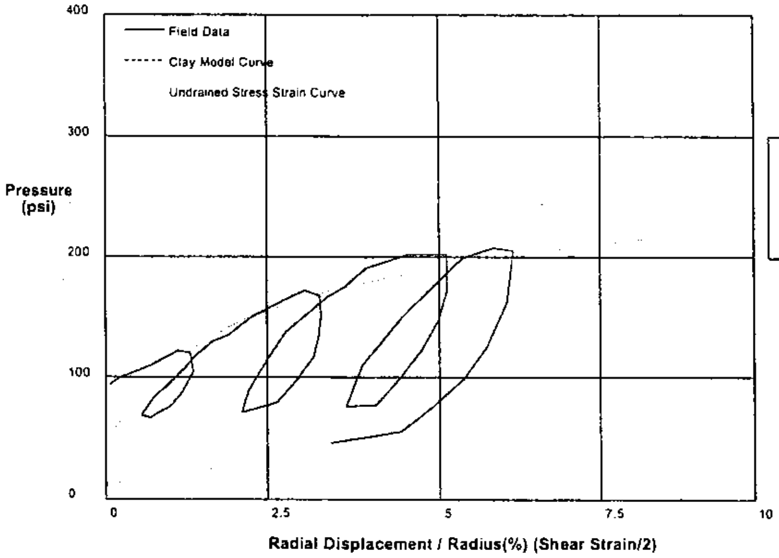
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-11-05

Hole No. BH-18 Depth 74.5 feet File E:\PC102.P



GIBSON'S CLAY MODEL

Shear Strength 50 psi
Insitu Stress 50 psi
Shear Modulus 3000 psi

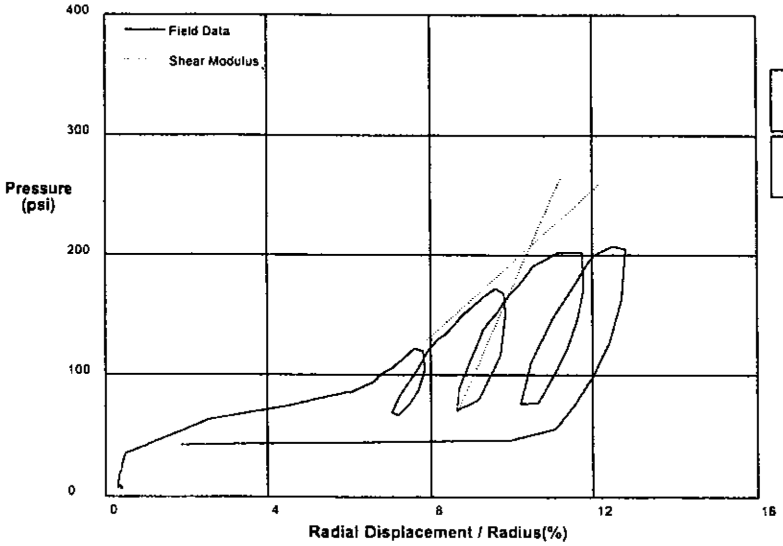
shift 6.5

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-11-05

Hole No. BH-18 Depth 74.5 feet File E:\PC102.P



Shear Modulus 1521 psi

Shear Modulus 3817 psi

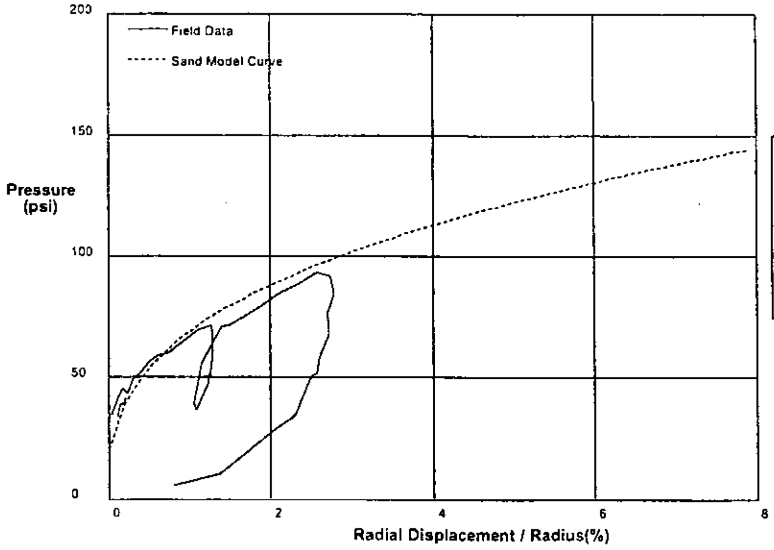
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-12-05

Hole No. BH-18 Depth 86 feet File E:\PC104.P



THE HUGHES SAND MODEL

Water Pressure	35 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	20 psi
Shear Modulus	5000 psi

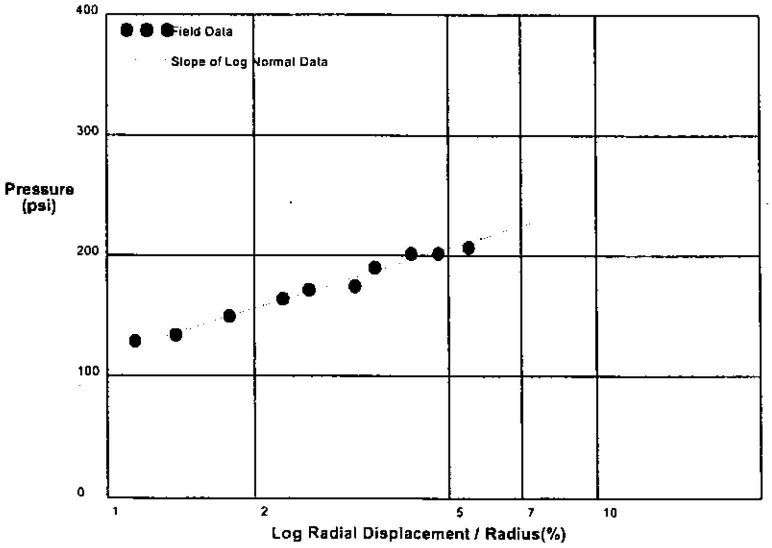
shift 9.5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-11-05

Hole No. BH-18 Depth 74.5 feet File E:\PC102.P



Shear Strength 54.7 psi
Limit Pressure 321 psi

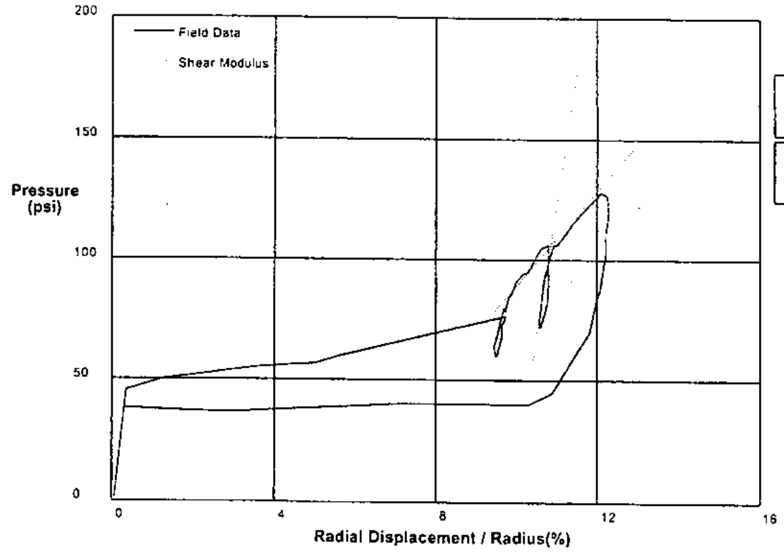
shift 7

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-12-05

Hole No. BH-18 Depth 86 feet File E:\PC104.P



Shear Modulus 979 psi

Shear Modulus 5462 psi

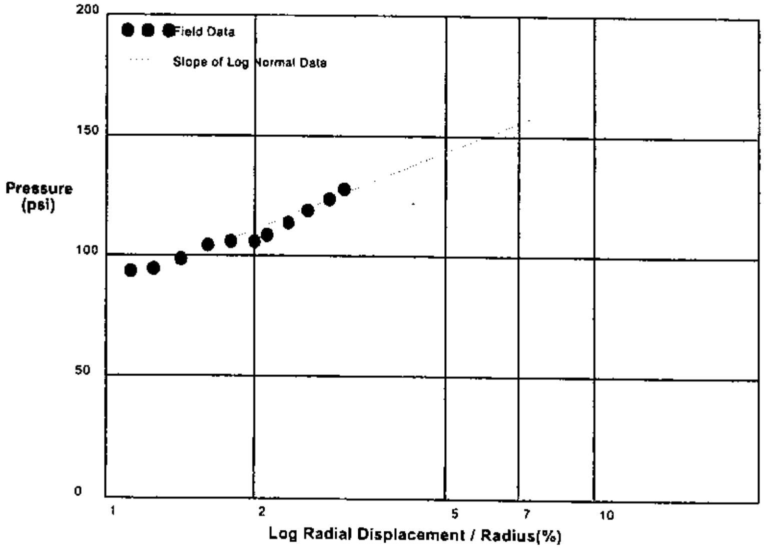
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-12-05

Hole No. BH-18 Depth 86 feet File E:\PC104.P

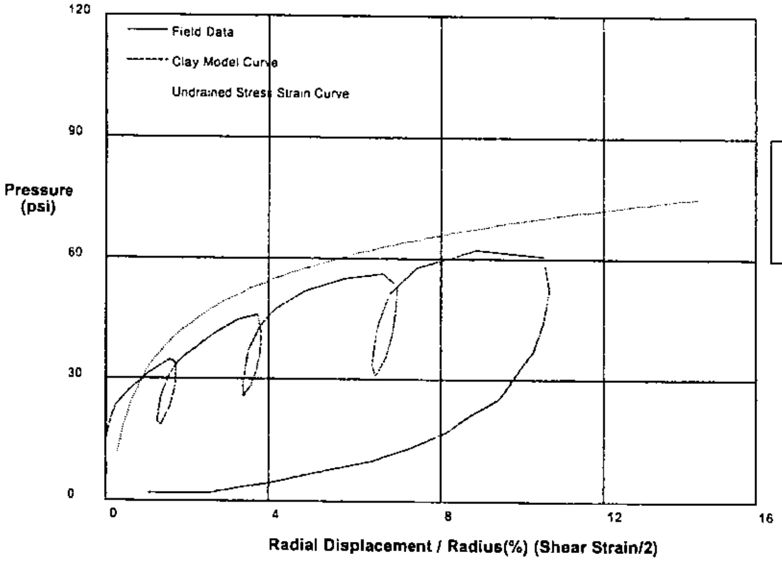


Shear Strength 35.7 psi
Limit Pressure 218 psi

shift 9

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 6, 2004
Hole No. 25 Depth 21 File C:\DATA\C-290\PC30.P



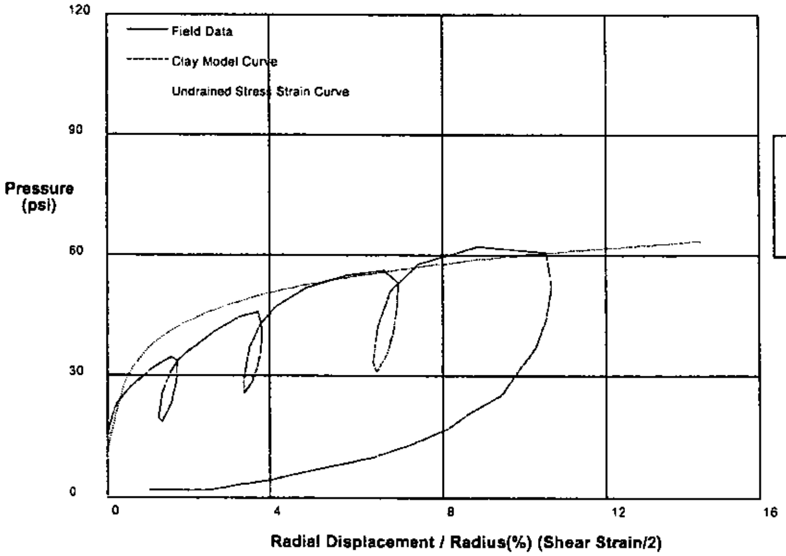
GIBSON'S CLAY MODEL

Shear Strength 16 psi
Insitu Stress 0 psi
Shear Modulus 2200 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 6, 2004
Hole No. 25 Depth 21 File C:\DATA\C-290\PC30.P



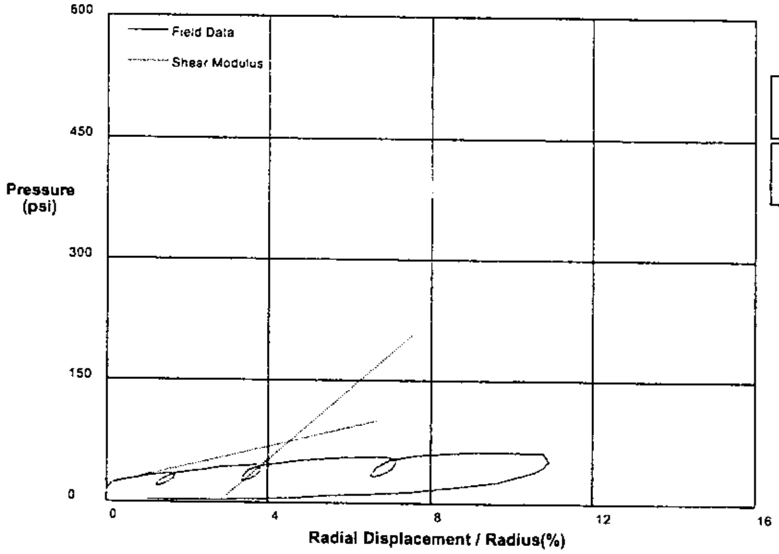
GIBSON'S CLAY MODEL

Shear Strength 10 psi
Insitu Stress 12 psi
Shear Modulus 2200 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) Nov 6, 2004
Hole No. 25 Depth 21 File C:\DATA\C-290\PC30.P



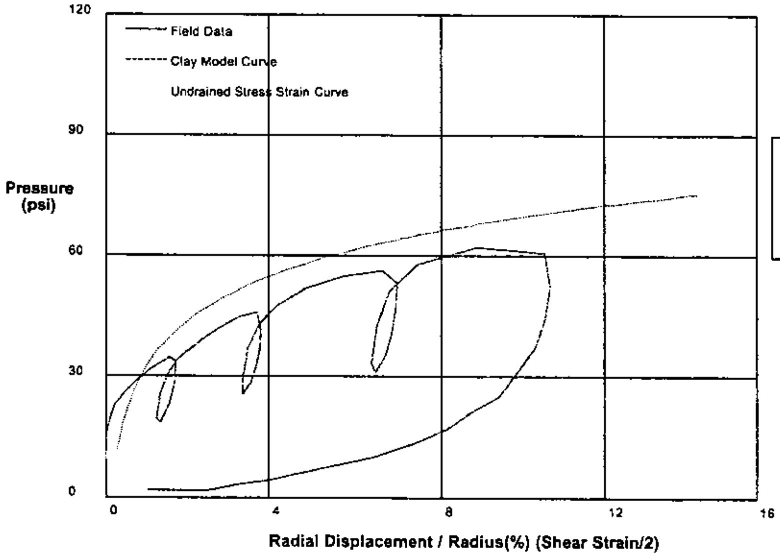
Shear Modulus 603 psi

Shear Modulus 2200 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) November 6, 2004
Hole No. 25 Depth 21 File C:\DATA\C-290\PC30.P



GIBSON'S CLAY MODEL

Shear Strength 16 psi
Insitu Stress 0 psi
Shear Modulus 2256 psi

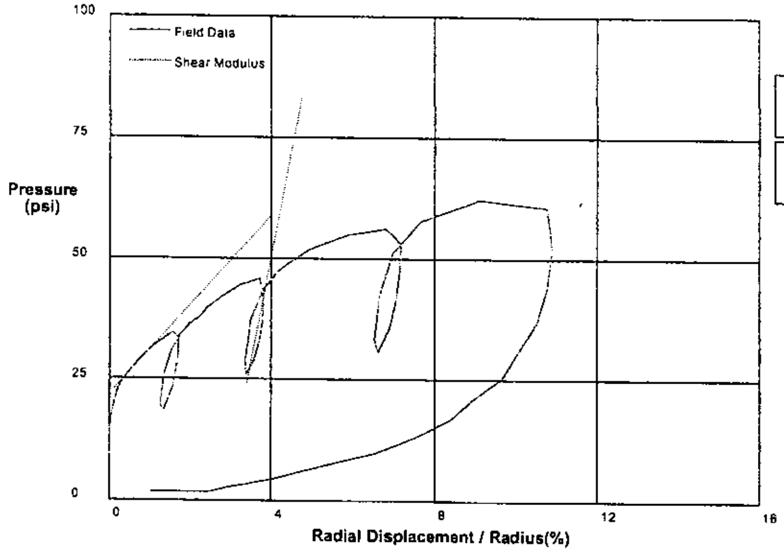
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 21 File C:\DATA\C-290\PC30.P



Shear Modulus 465 psi

Shear Modulus 2239 psi

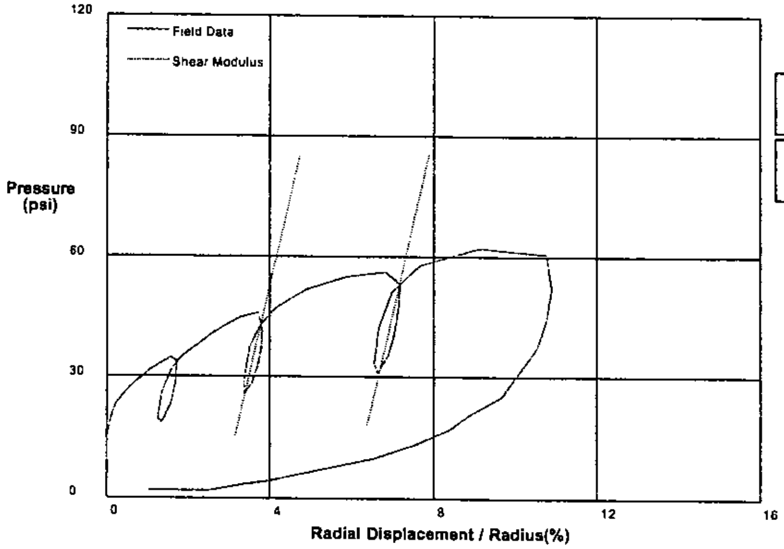
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 21 File C:\DATA\C-290\PC30.P



Shear Modulus 2250 psi

Shear Modulus 2256 psi

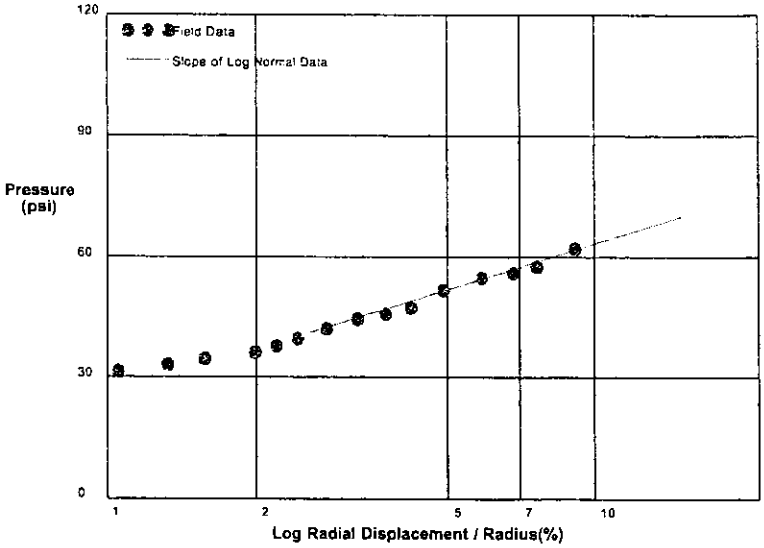
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 21 File C:\DATA\C-290\PC30.P



Shear Strength 16.4 psi
Limit Pressure 86 psi

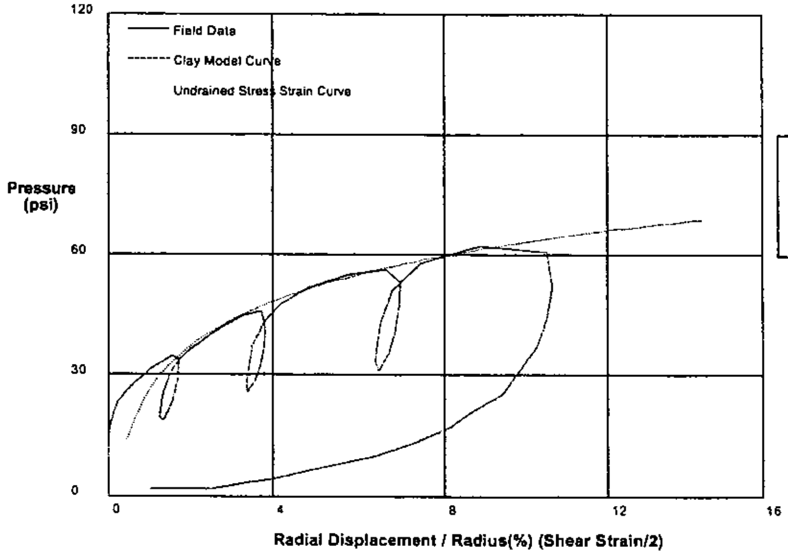
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 21 File C:\DATA\C-290\PC30.P



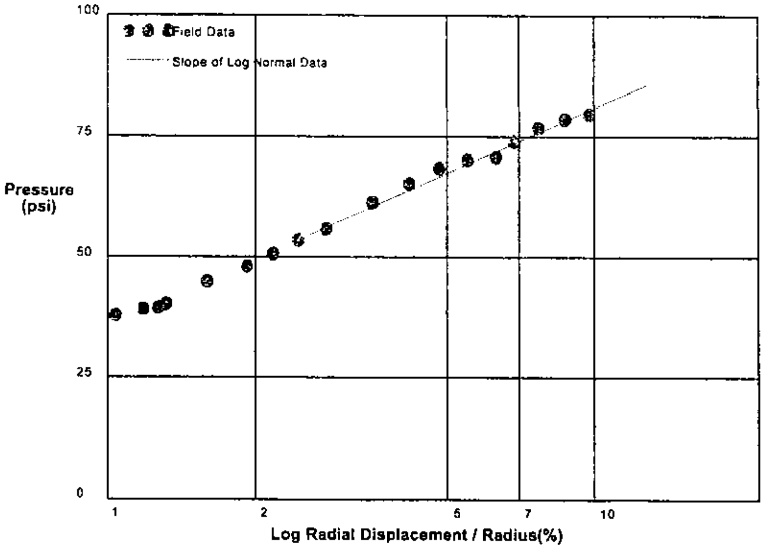
GIBSON'S CLAY MODEL

Shear Strength 16 psi
Insitu Stress 0 psi
Shear Modulus 1500 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 6, 2004
Hole No. 25 Depth 23 ft File C:\DATA\C-290\PC31.P

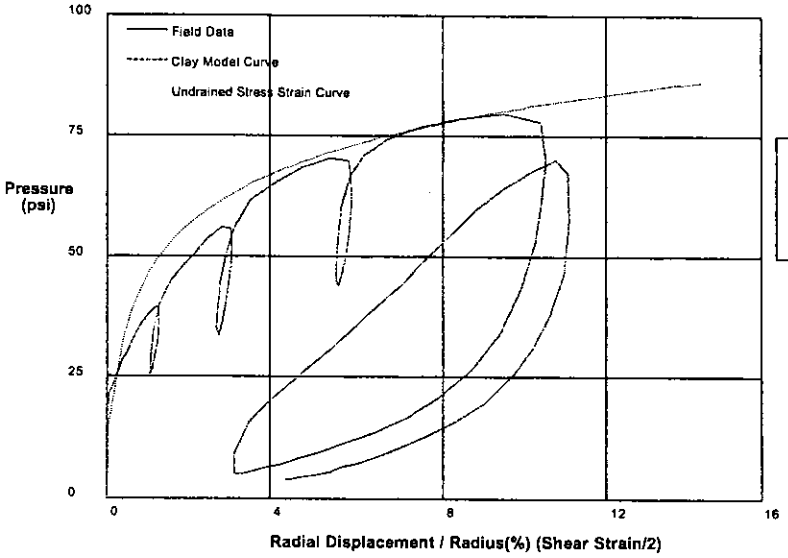


Shear Strength 19.4 psi
Limit Pressure 108 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 6, 2004
Hole No. 25 Depth 23 ft File C:\DATA\C-290\PC31.P



GIBSON'S CLAY MODEL

Shear Strength 15 psi
Insitu Stress 13 psi
Shear Modulus 2500 psi

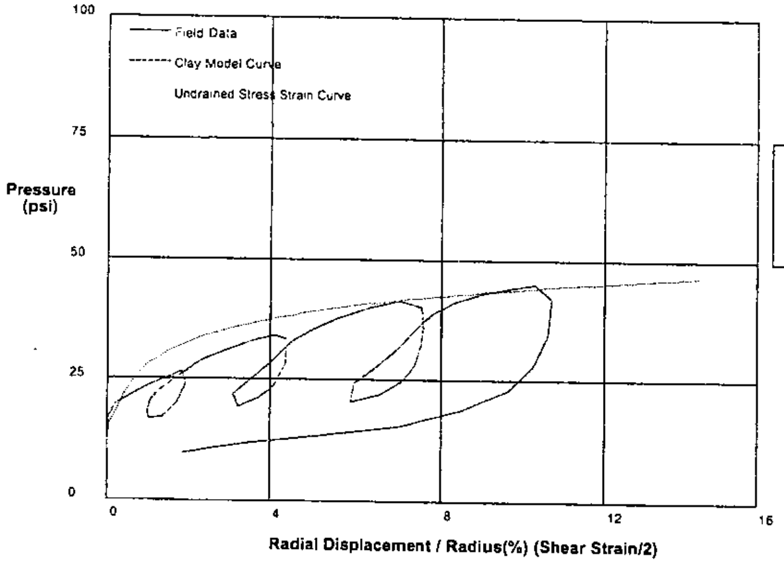
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 48 ft File C:\DATA\C-290\PC32.P



GIBSON'S CLAY MODEL

Shear Strength 7 psi
Insitu Stress 15 psi
Shear Modulus 800 psi

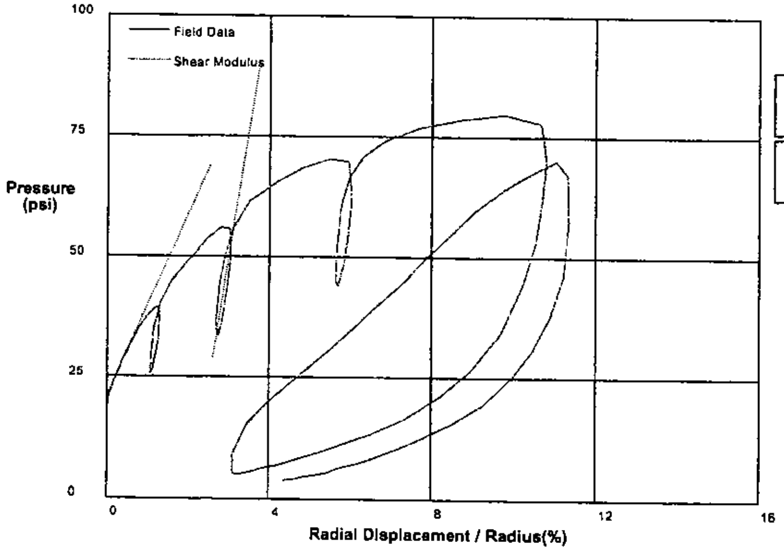
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 23 ft File C:\DATA\C-290\PC31.P



Shear Modulus 935 psi

Shear Modulus 2731 psi

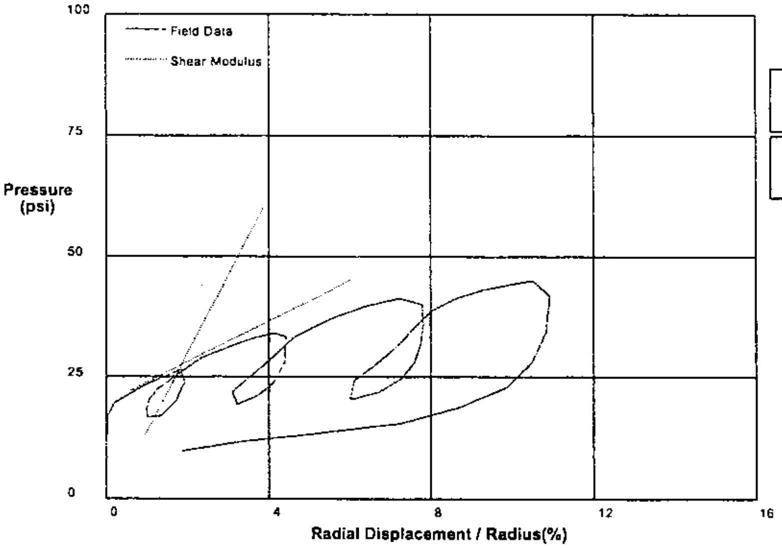
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 48 ft File C:\DATA\C-290\PC32.P



Shear Modulus 213 psi

Shear Modulus 806 psi

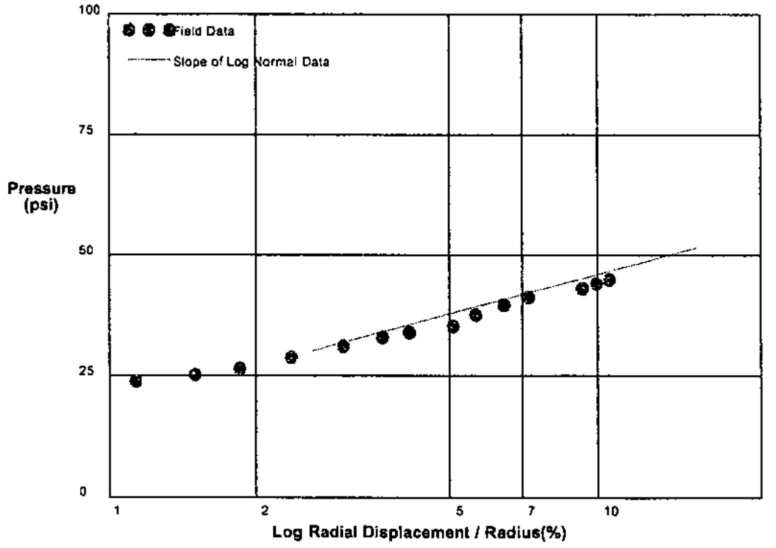
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 48 ft File C:\DATA\C-290\PC32.P



Shear Strength 11.7 psi
Limit Pressure 62 psi

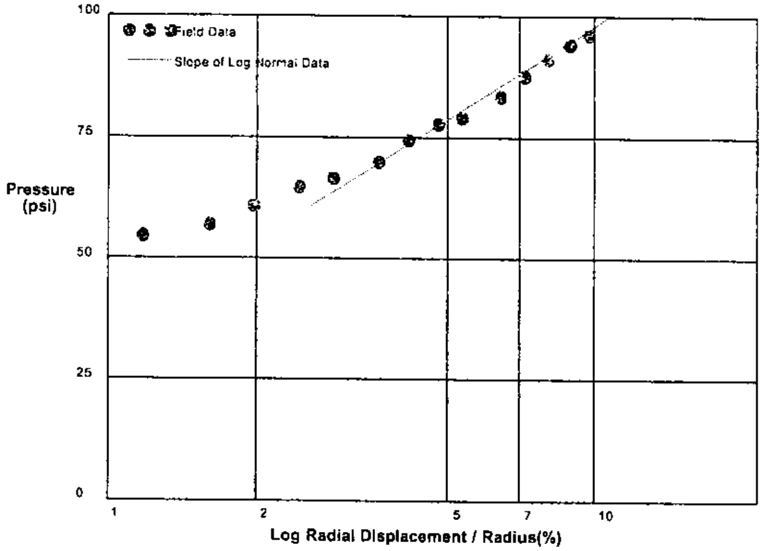
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 50 ft File C:\DATA\C-290\PC33.P



Shear Strength 27.4 psi
Limit Pressure 136 psi

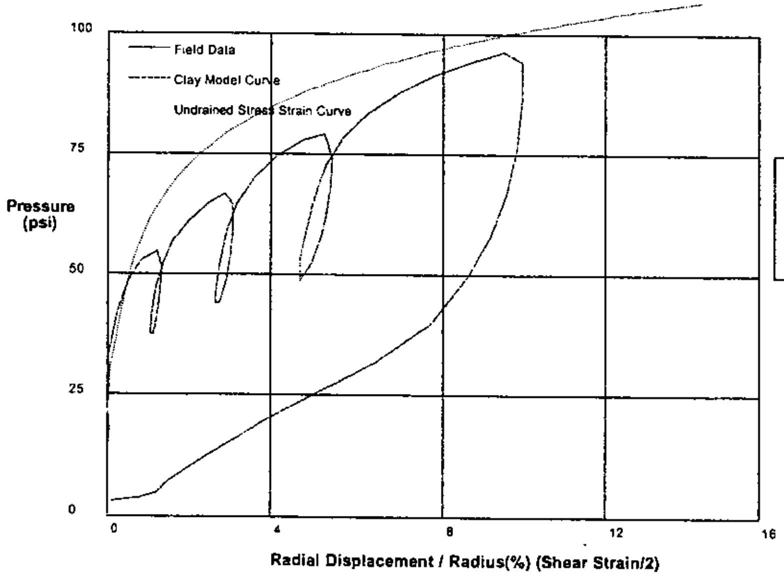
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 50 ft File C:\DATA\C-290\PC33.P



GIBSON'S CLAY MODEL

Shear Strength 17 psi
Insitu Stress 28 psi
Shear Modulus 2200 psi

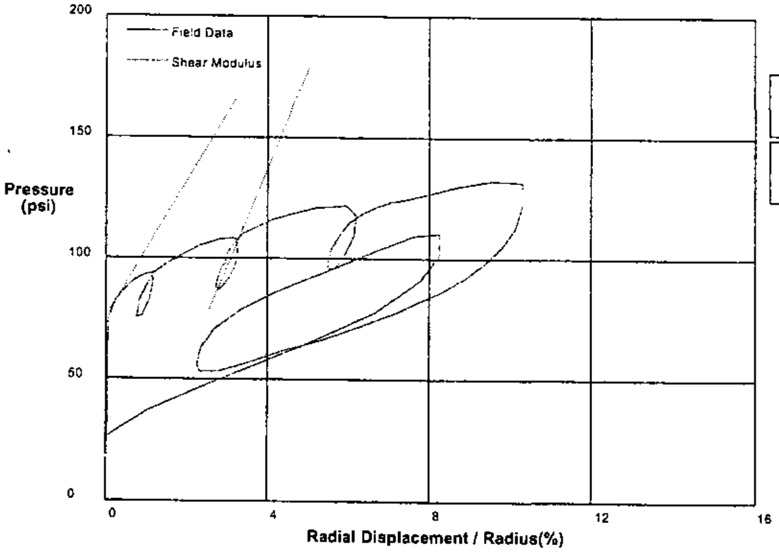
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) November 7, 2004

Hole No. 25 Depth 74 ft File C:\DATA\C-290\PC34.P



Shear Modulus 1411 psi

Shear Modulus 2023 psi

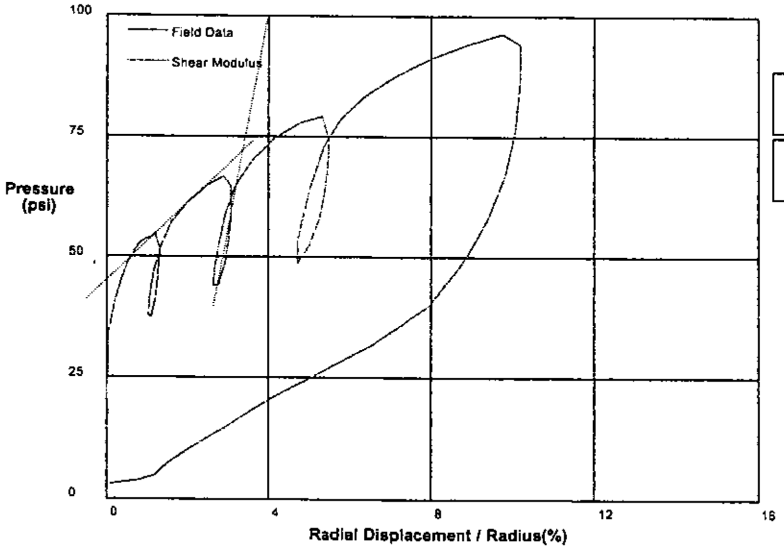
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) November 6, 2004

Hole No. 25 Depth 50 ft File C:\DATA\C-290\PC33.P



Shear Modulus 400 psi

Shear Modulus 2239 psi

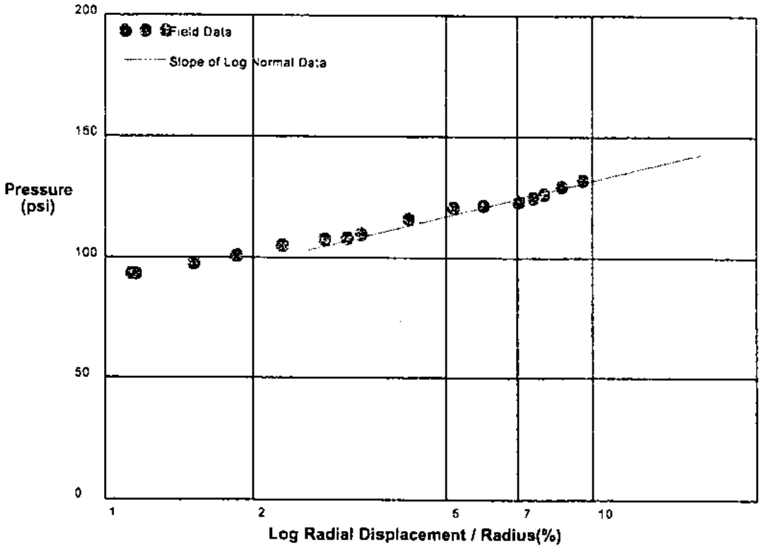
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 7, 2004

Hole No. 25 Depth 74 ft File C:\DATA\C-290\PC34.P



Shear Strength 21.1 psi
Limit Pressure 161 psi

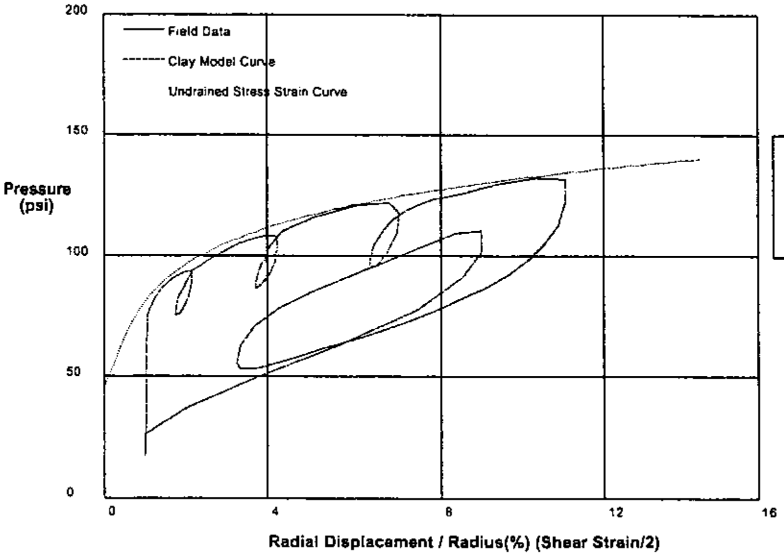
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 7, 2004

Hole No. 25 Depth 74 ft File C:\DATA\C-290\PC34.P



GIBSON'S CLAY MODEL

Shear Strength 22 psi
Insitu Stress 46 psi
Shear Modulus 2000 psi

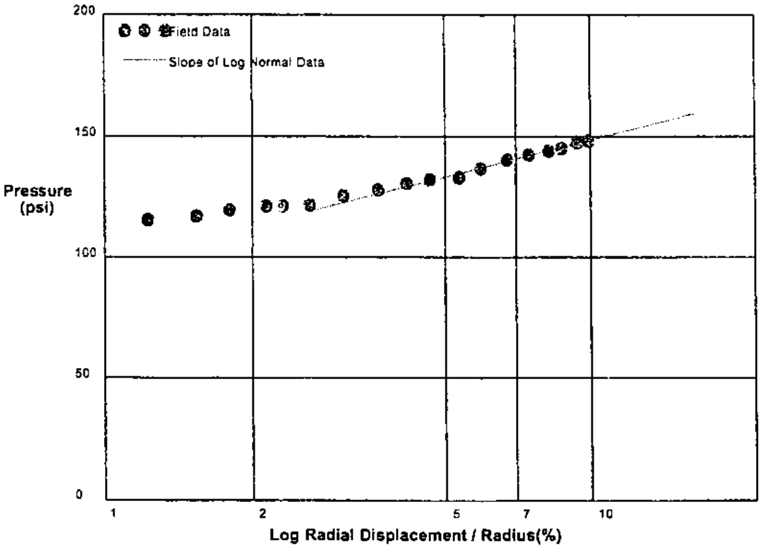
shift-1

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 7, 2004

Hole No. 25 Depth 76 ft File C:\DATA\C-290\PC35.P



Shear Strength 22.3 psi
Limit Pressure 180 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 7, 2004

Hole No. 25 Depth 76 ft File C:\DATA\C-290\PC35.P

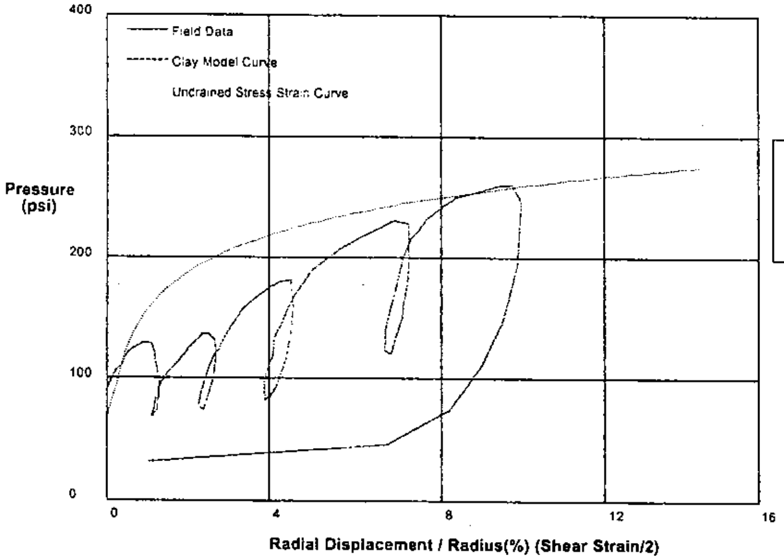
Shear Modulus 402 psi

Shear Modulus 2023 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 7, 2004
Hole No. 25 Depth 107 ft File C:\DATA\C-290\PC36.P



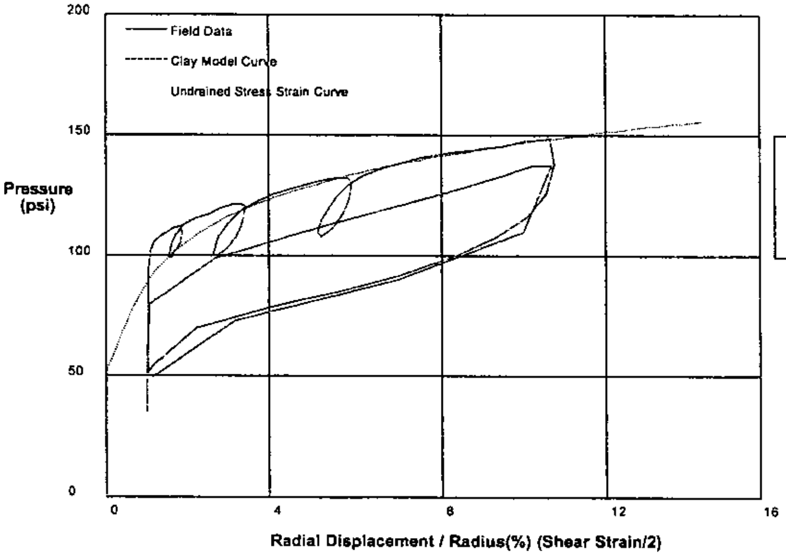
GIBSON'S CLAY MODEL

Shear Strength 44 psi
Insitu Stress 69 psi
Shear Modulus 6000 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 7, 2004
Hole No. 25 Depth 76 ft File C:\DATA\C-290\PC35.P



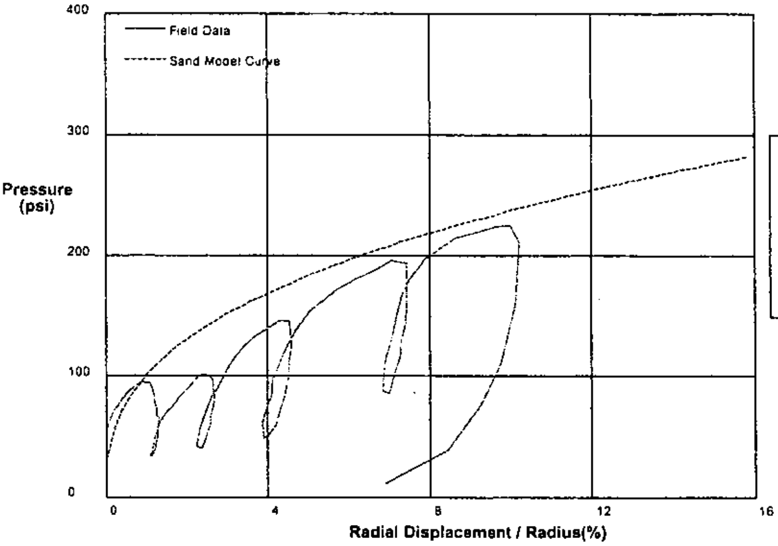
GIBSON'S CLAY MODEL

Shear Strength 25 psi
Insitu Stress 52 psi
Shear Modulus 2000 psi

shift-1

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 7, 2004
Hole No. 25 Depth 107 ft File C:\DATA\C-290\PC36.P



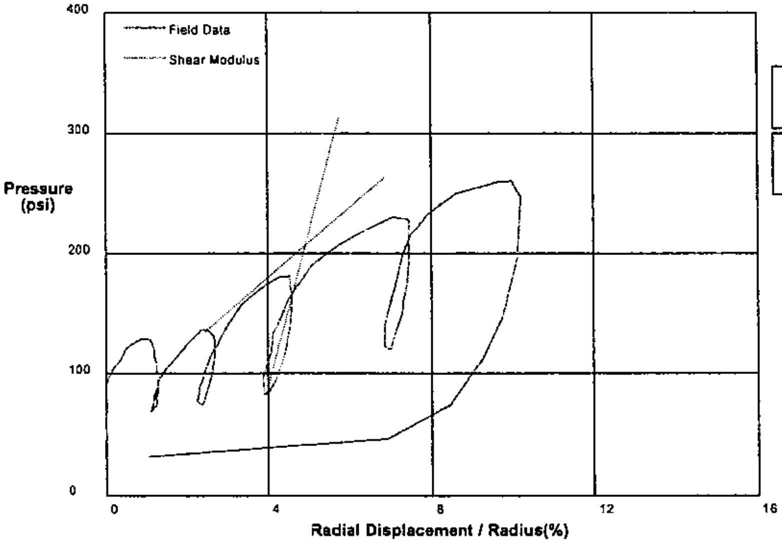
THE HUGHES SAND MODEL

Water Pressure	35 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	30 psi
Shear Modulus	6500 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 7, 2004
Hole No. 25 Depth 107 ft File C:\DATA\C-290\PC36.P



Shear Modulus 1446 psi

Shear Modulus 6428 psi

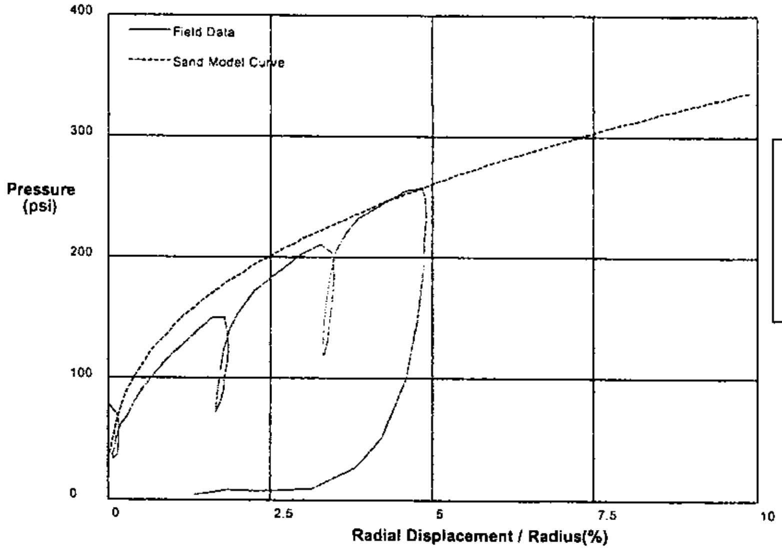
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) nov 7 2004

Hole No. ~~35~~25 Depth 107 File C:\DATA\C-290\PC37 P



THE HUGHES SAND MODEL

Water Pressure	45 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	32 psi
Shear Modulus	15000 psi

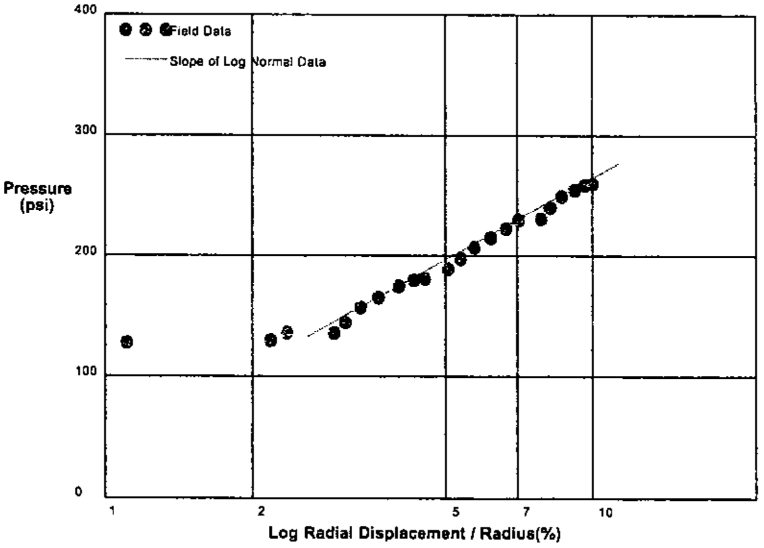
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 7, 2004

Hole No. 25 Depth 107 ft File C:\DATA\C-290\PC36.P

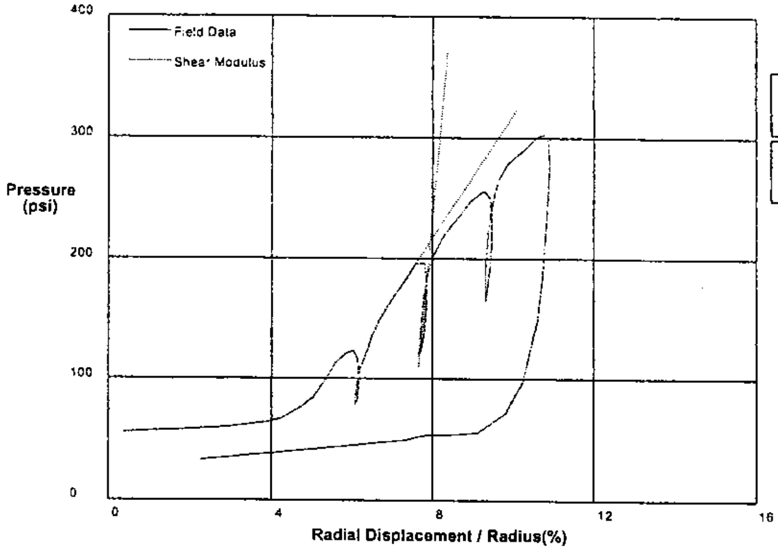


Shear Strength 98.1 psi
Limit Pressure 403 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 7, 2004
Hole No. 3525 Depth 107 ft File C:\DATA\C-290\PC37.P



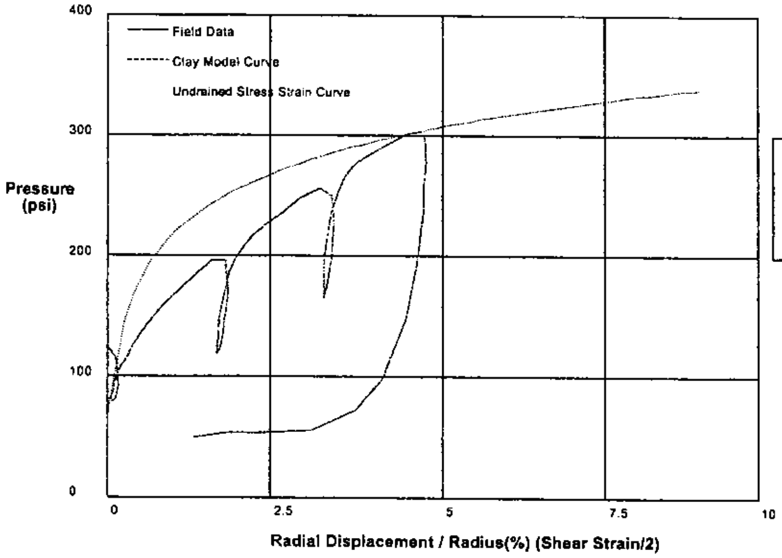
Shear Modulus 2537 psi

Shear Modulus 18333 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) November 7, 2004
Hole No. 3525 Depth 107 ft File C:\DATA\C-290\PC37.P



GIBSON'S CLAY MODEL

Shear Strength 55 psi
Insitu Stress 69 psi
Shear Modulus 15000 psi

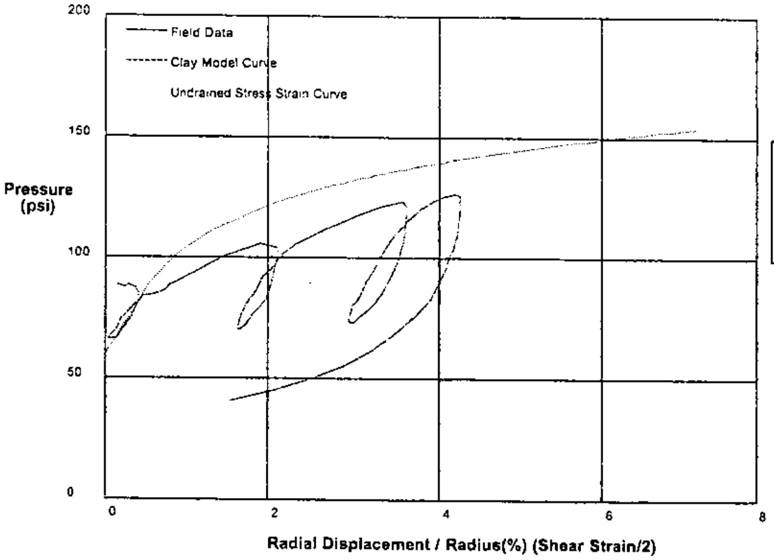
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 114.5 feet File C:\DATA\C-290\PC48.P



GIBSON'S CLAY MODEL

Shear Strength	25	psi
Insitu Stress	60	psi
Shear Modulus	2700	psi

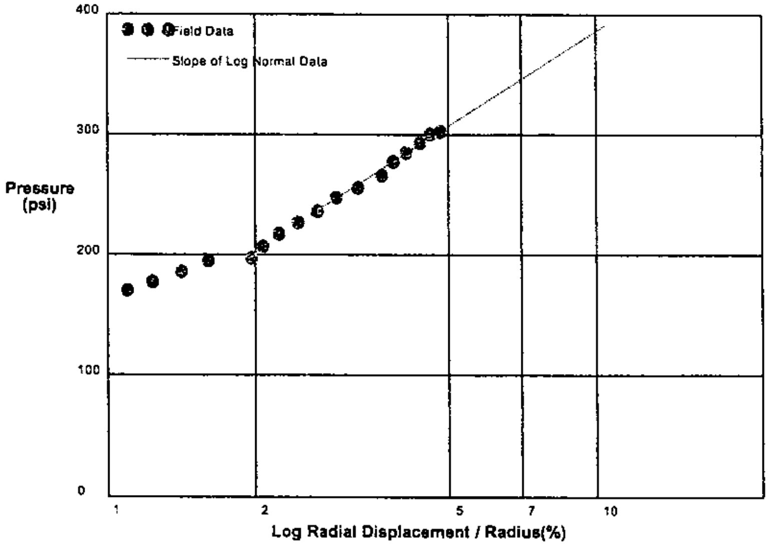
shift 8

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) November 7, 2004

Hole No. ~~35~~ 25 Depth 107 ft File C:\DATA\C-290\PC37.P

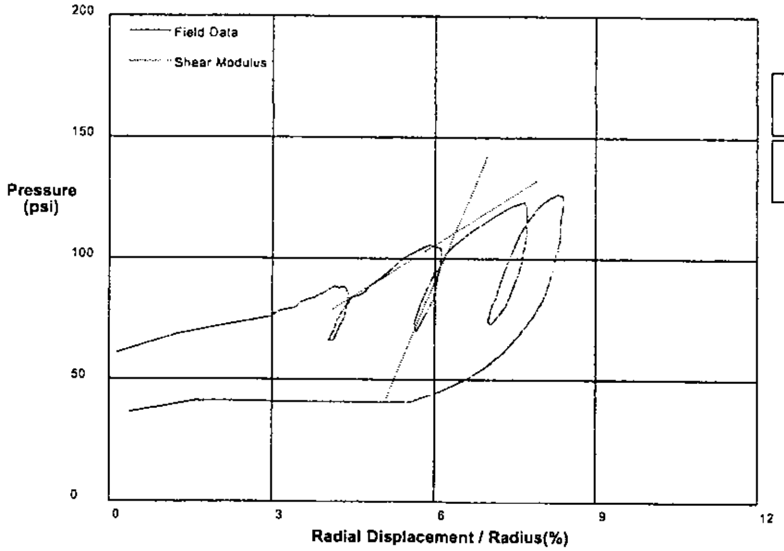


Shear Strength	113.8	psi
Limit Pressure	546	psi

shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 11-13-04
Hole No. 25 Depth 114.5 feet File C:\DATA\C-290\PC48.P



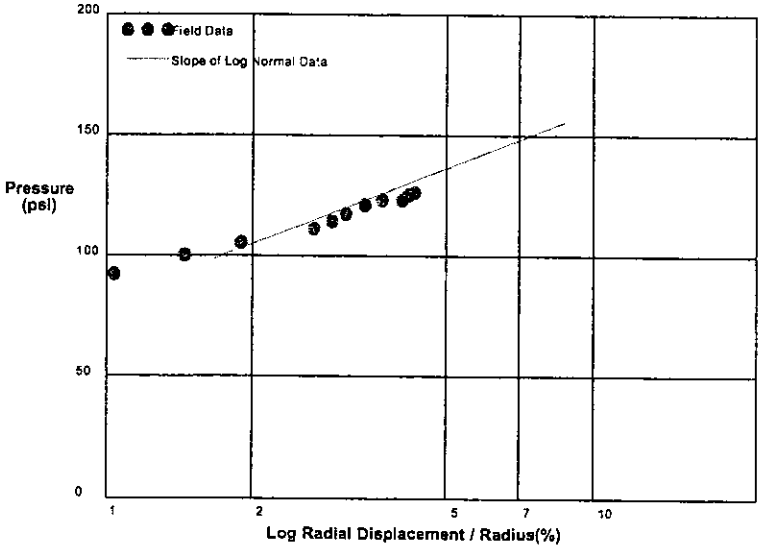
Shear Modulus 707 psi

Shear Modulus 2698 psi

shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 11-13-04
Hole No. 25 Depth 114.5 feet File C:\DATA\C-290\PC48.P



Shear Strength 34.2 psi
Limit Pressure 208 psi

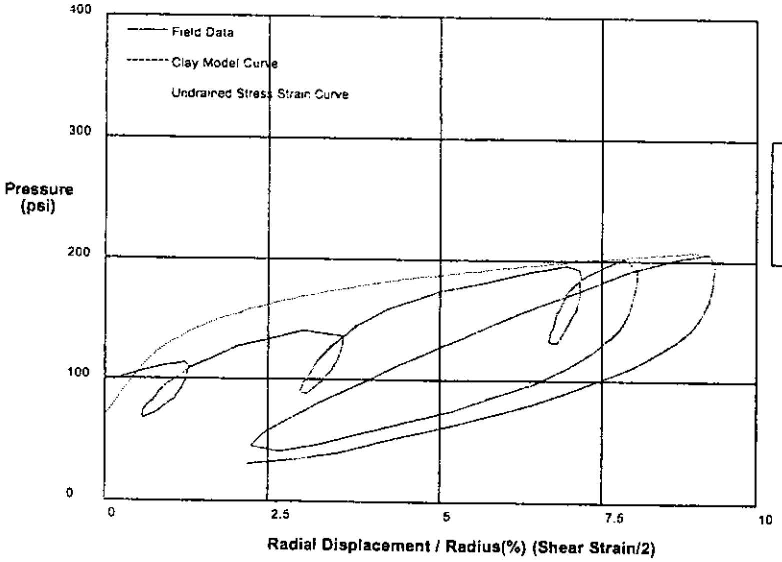
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 113 feet File C:\DATA\C-290\PC49.P



GIBSON'S CLAY MODEL

Shear Strength	35	psi
Insitu Stress	70	psi
Shear Modulus	3600	psi

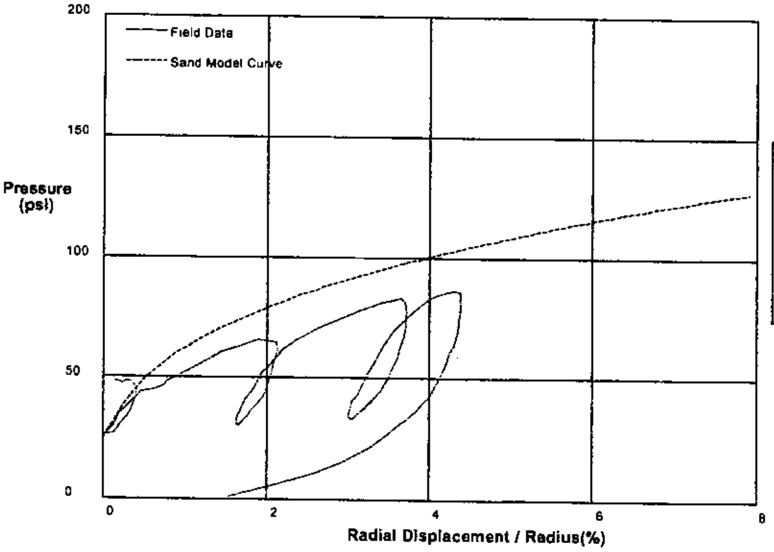
shift 5

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 114.5 feet File C:\DATA\C-290\PC48.P



THE HUGHES SAND MODEL

Water Pressure	40 psi
Friction Angle	32 deg
Critical Friction Angle	32 deg
Lateral Stress	25 psi
Shear Modulus	2700 psi

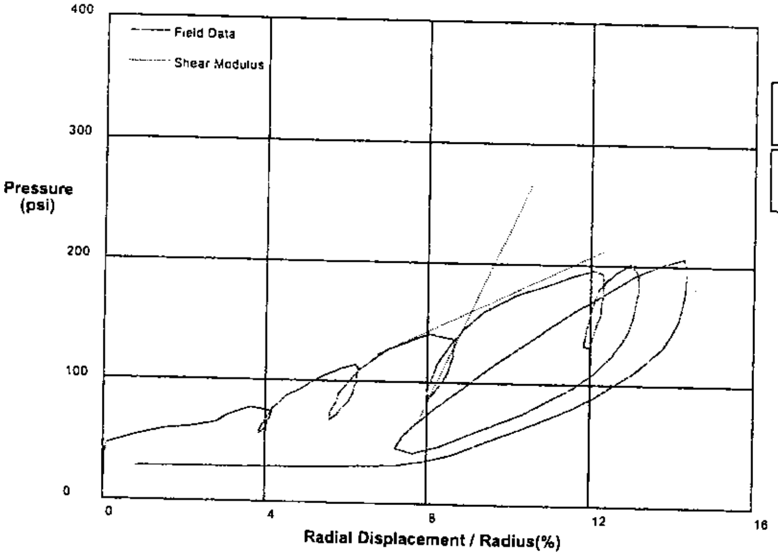
shift 8

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 113 feet File C:\DATA\C-290\PC49.P



Shear Modulus 805 psi

Shear Modulus 3604 psi

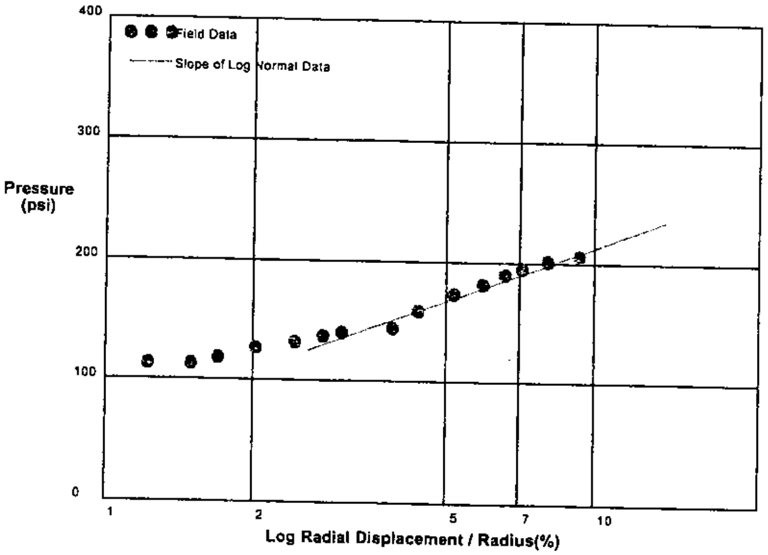
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 113 feet File C:\DATA\C-290\PC49.P



Shear Strength 65.6 psi
Limit Pressure 305 psi

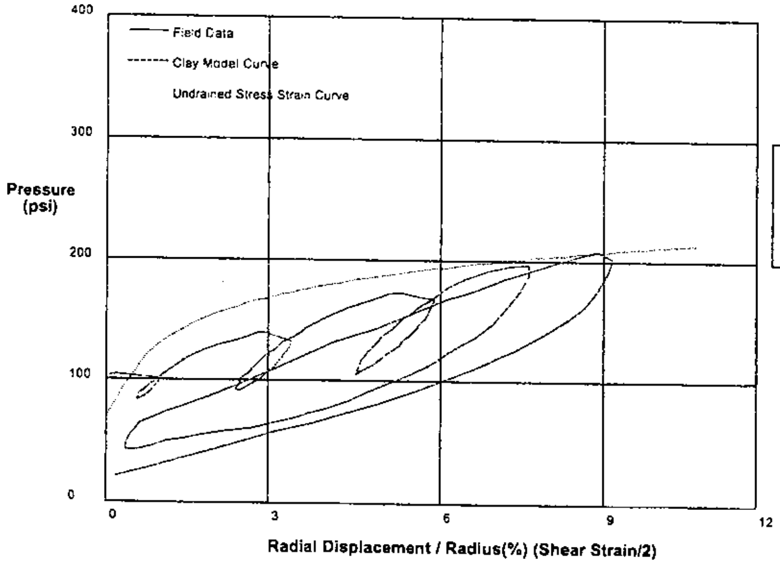
shift 5

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 129 feet File C:\DATA\C-290\PC50.P



GIBSON'S CLAY MODEL

Shear Strength	35 psi
Insitu Stress	70 psi
Shear Modulus	3600 psi

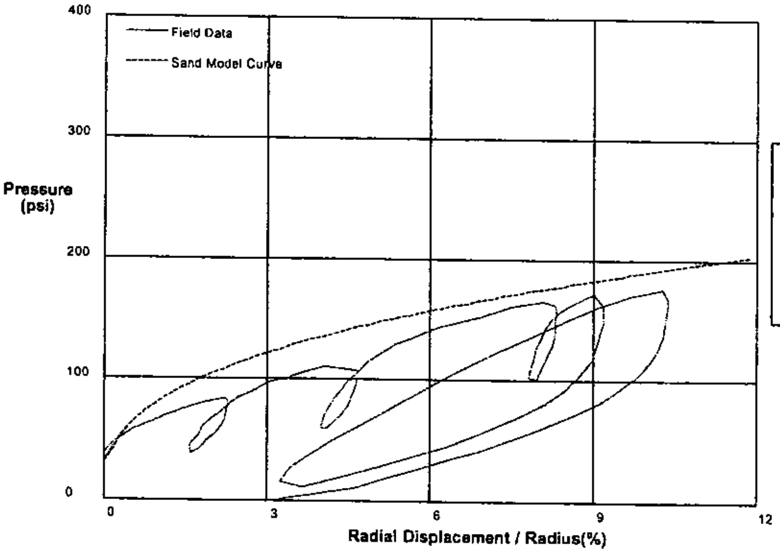
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 113feet File C:\DATA\C-290\PC49.P



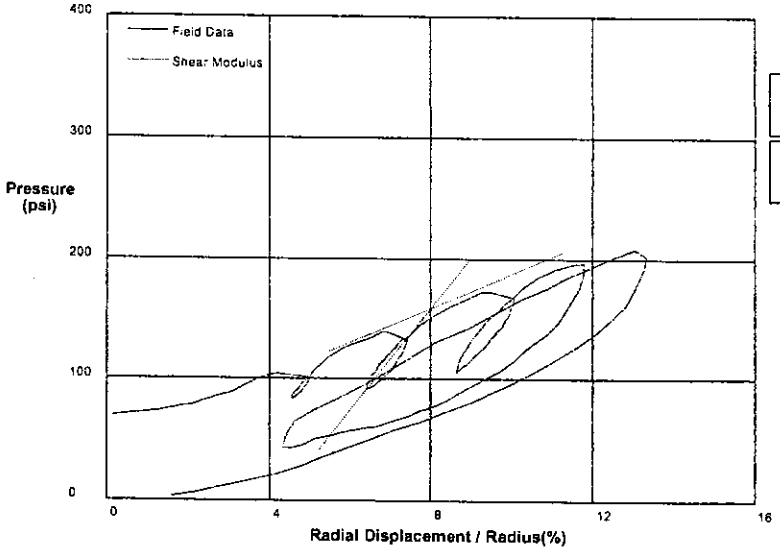
THE HUGHES SAND MODEL

Water Pressure	40 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	30 psi
Shear Modulus	3600 psi

shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 11-13-04
Hole No. 25 Depth 129 feet File C:\DATA\C-290\PC50.P



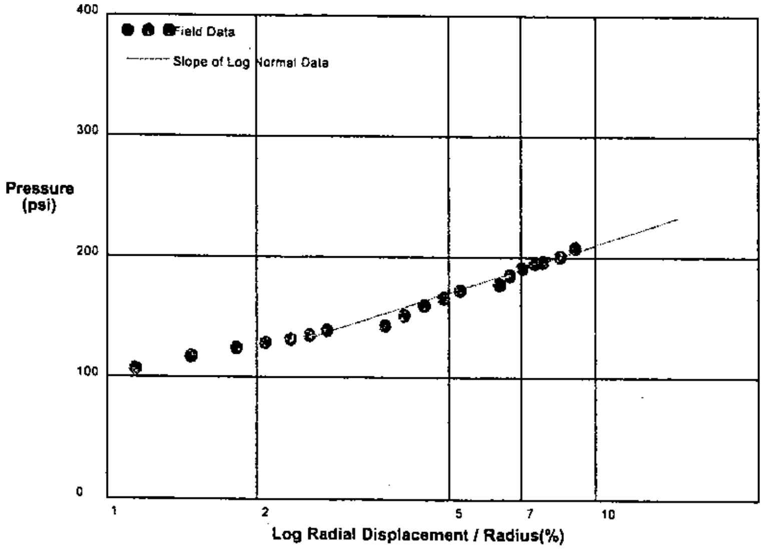
Shear Modulus 716 psi

Shear Modulus 2132 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 11-13-04
Hole No. 25 Depth 129 feet File C:\DATA\C-290\PC50.P



Shear Strength 57.3 psi
Limit Pressure 291 psi

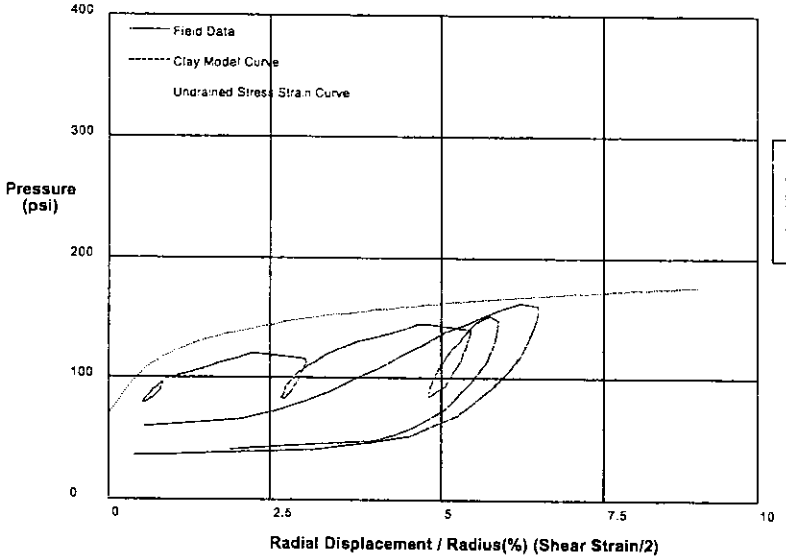
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 127.5 feet File C:\DATA\C-290\PC51.P



GIBSON'S CLAY MODEL

Shear Strength	25	psi
Insitu Stress	70	psi
Shear Modulus	3600	psi

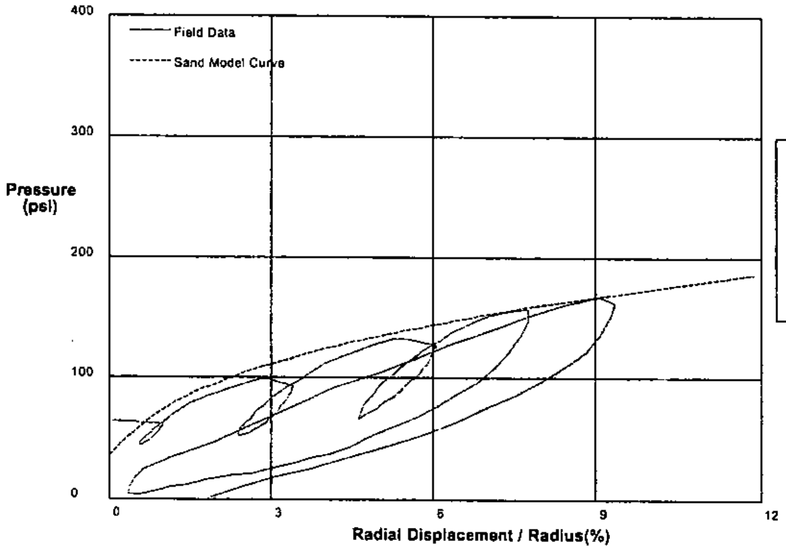
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 129 feet File C:\DATA\C-290\PC50.P



THE HUGHES SAND MODEL

Water Pressure	40 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	36 psi
Shear Modulus	2100 psi

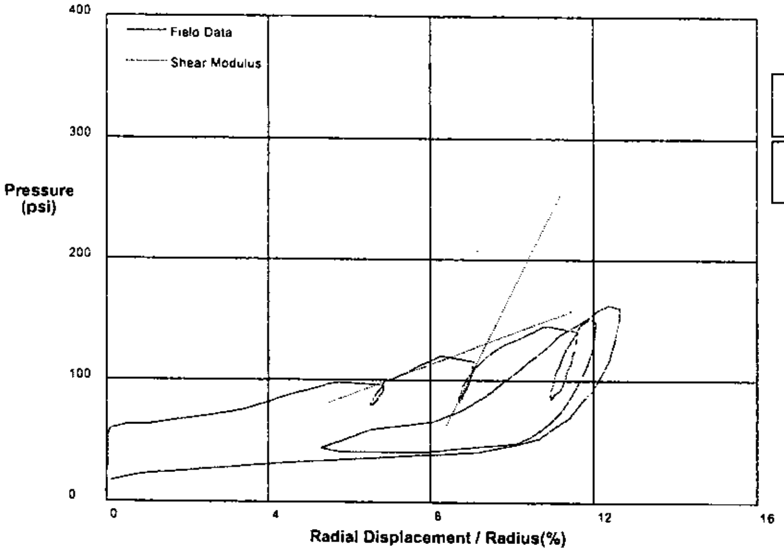
shift 4

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 127.5 feet File C:\DATA\C-290\PC51.P



Shear Modulus 632 psi

Shear Modulus 3407 psi

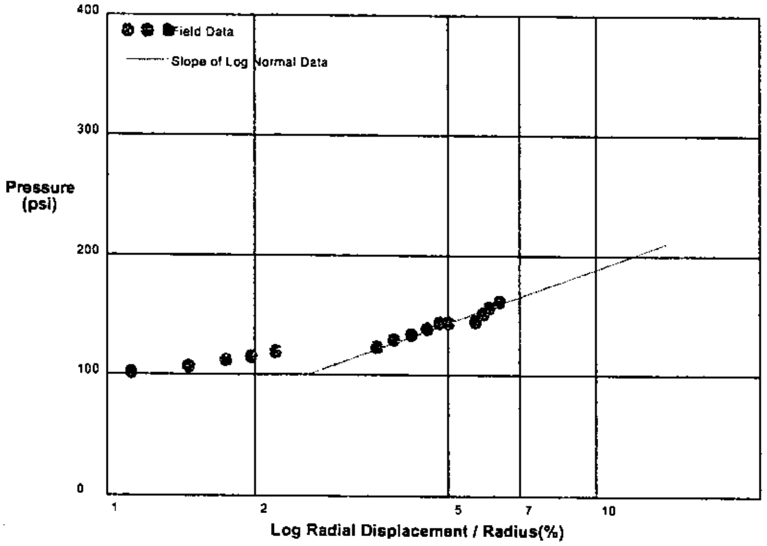
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-13-04

Hole No. 25 Depth 127.5 feet File C:\DATA\C-290\PC51.P

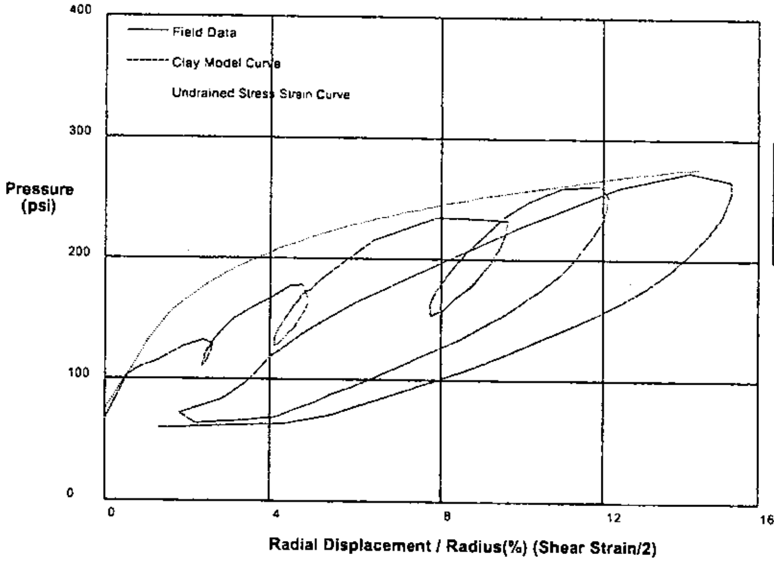


Shear Strength 65.6 psi
Limit Pressure 282 psi

shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 11-14-04
Hole No. 25 Depth 150 feet File C:\DATA\C-290\PC52.P



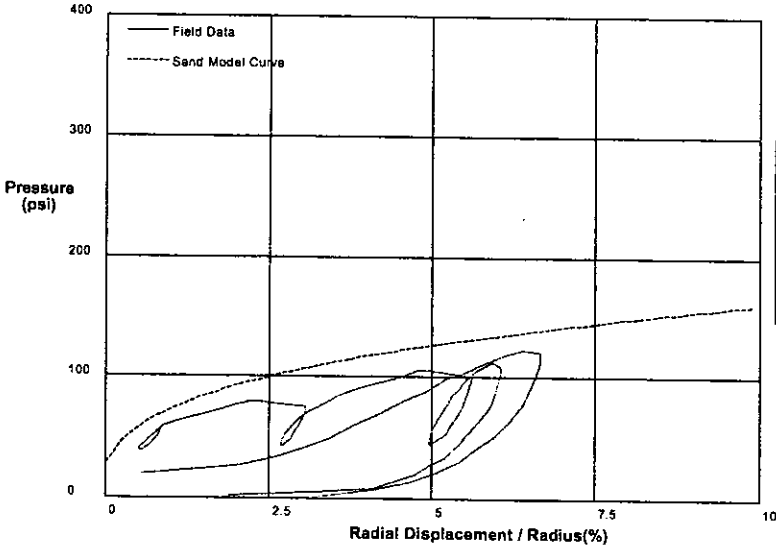
GIBSON'S CLAY MODEL

Shear Strength	55	psi
Insitu Stress	75	psi
Shear Modulus	2700	psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 11-13-04
Hole No. 25 Depth 127.5 feet File C:\DATA\C-290\PC51.P



THE HUGHES SAND MODEL

Water Pressure	50	psi
Friction Angle	32	deg
Critical Friction Angle	32	deg
Lateral Stress	28	psi
Shear Modulus	3400	psi

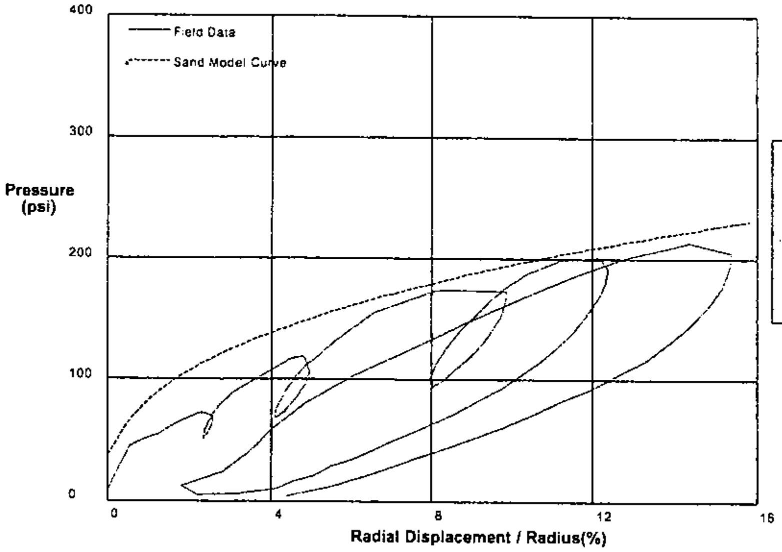
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 11-14-04

Hole No. 25 Depth 150 feet File C:\DATA\C-290\PC52.P



THE HUGHES SAND MODEL

Water Pressure	60 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	37 psi
Shear Modulus	2700 psi

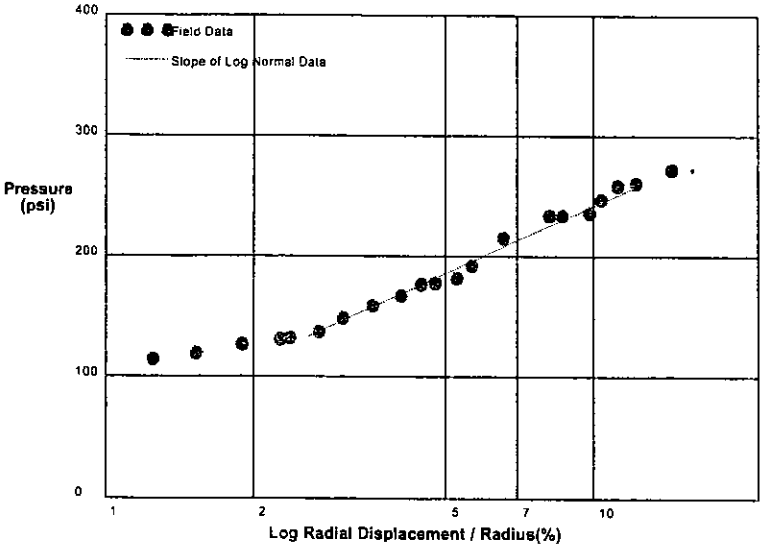
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 11-14-04

Hole No. 25 Depth 150 feet File C:\DATA\C-290\PC52.P

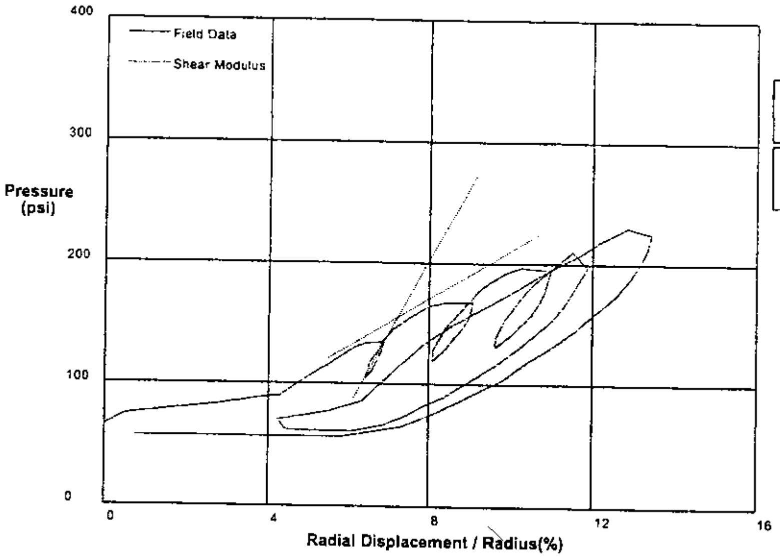


Shear Strength 80.8 psi
Limit Pressure 356 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 11-14-04
Hole No. 25 Depth 148.5 feet File C:\DATA\C-290\PC53.P



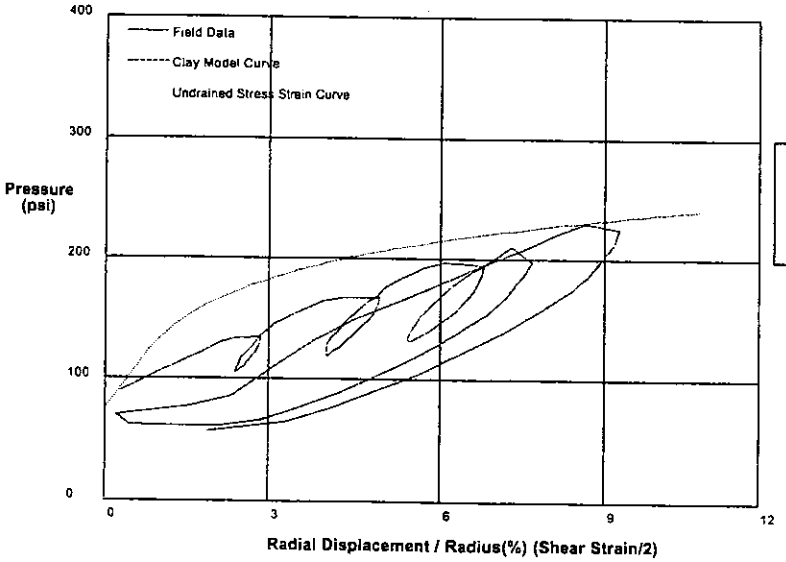
Shear Modulus 1005 psi

Shear Modulus 3055 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 11-14-04
Hole No. 25 Depth 148.5 feet File C:\DATA\C-290\PC53.P



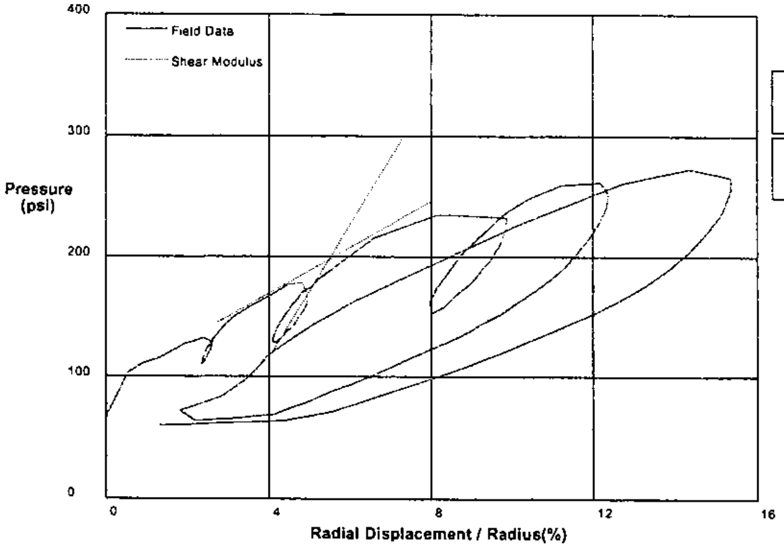
GIBSON'S CLAY MODEL

Shear Strength 45 psi
Insitu Stress 75 psi
Shear Modulus 3000 psi

shift 4

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 11-14-04
Hole No. 25 Depth 150 feet File C:\DATA\C-290\PC52.P



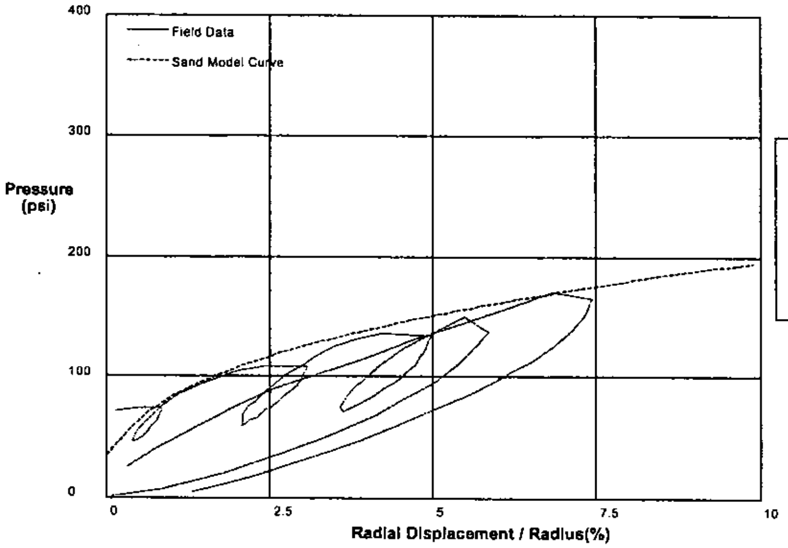
Shear Modulus 952 psi

Shear Modulus 2748 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 11-14-04
Hole No. 25 Depth 148.5 feet File C:\DATA\C-290\PC53.P



THE HUGHES SAND MODEL

Water Pressure	60 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	35 psi
Shear Modulus	3000 psi

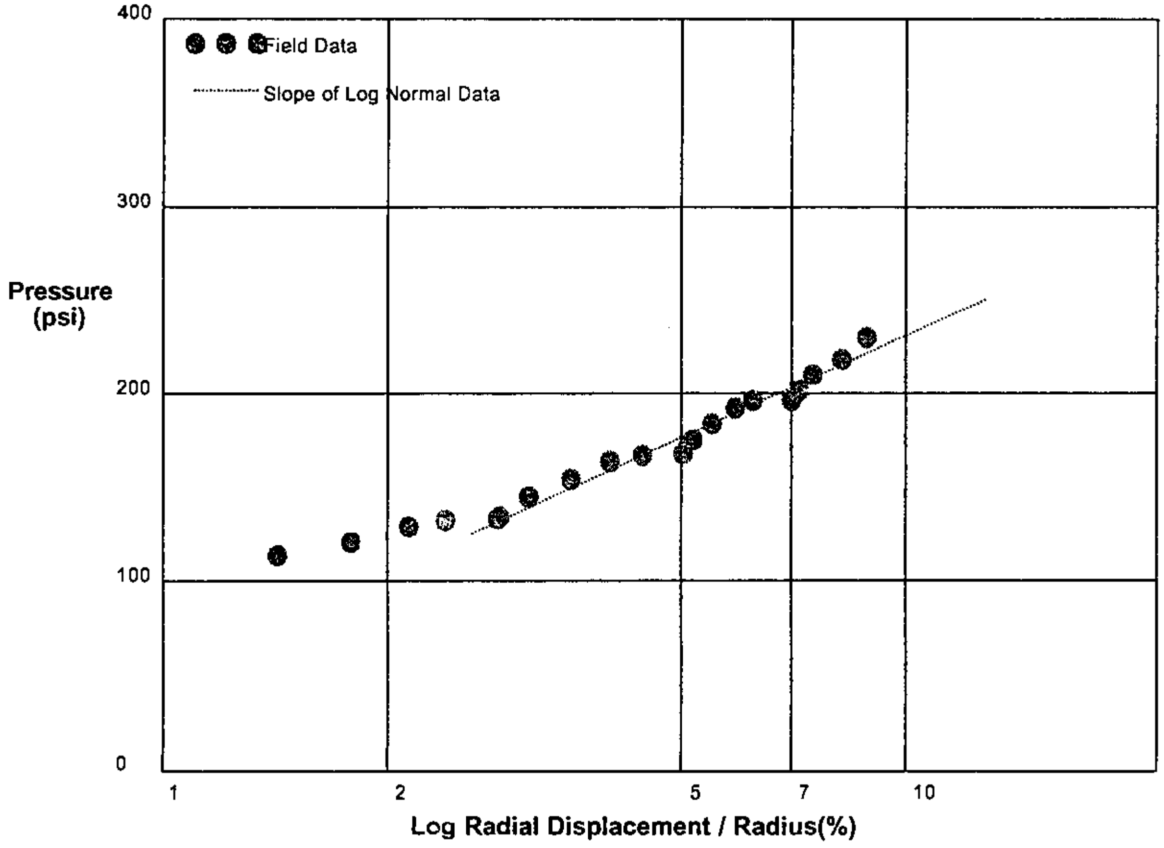
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-14-04

Hole No. 25 Depth 148.5 feet File C:\DATA\C-290\PC53.P



Shear Strength 77.6 psi
Limit Pressure 340 psi

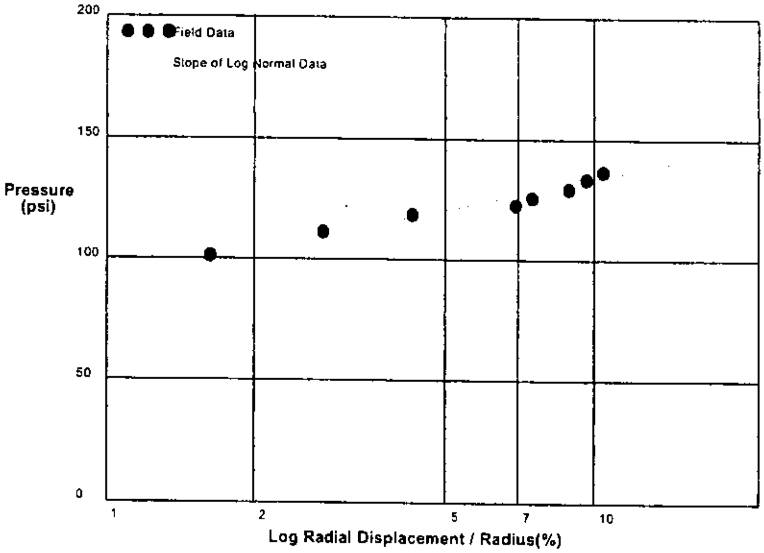
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-10-05

Hole No. BH-31 Depth 74 feet File E:\PC187.P



Shear Strength 18.9 psi
Limit Pressure 160 psi

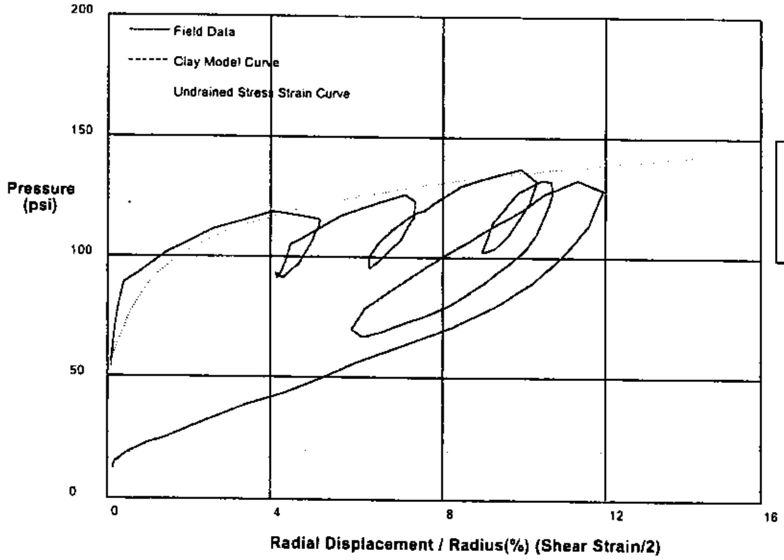
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-10-05

Hole No. BH-31 Depth 74 feet File C:\DATA\C-290\C-29005\PC187.P



GIBSON'S CLAY MODEL

Shear Strength 20 psi
Insitu Stress 55 psi
Shear Modulus 2000 psi

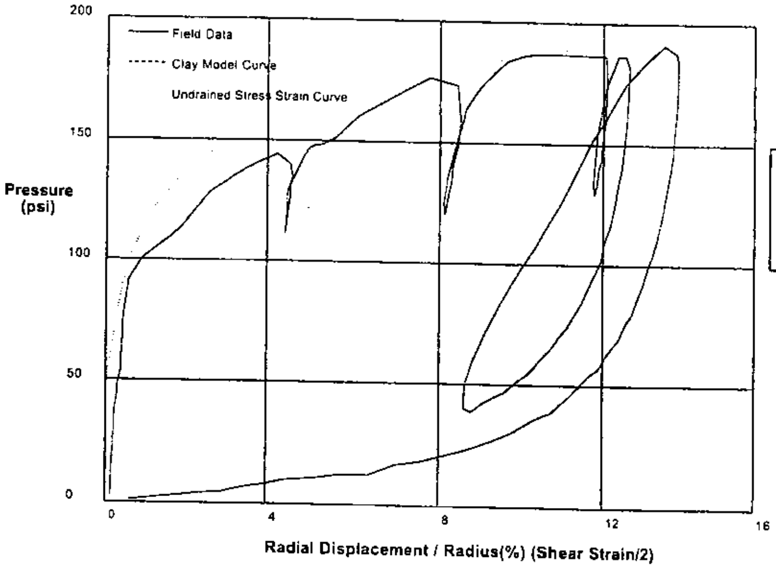
shift 2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-10-05

Hole No. BH-31 Depth 72.5 feet File C:\DATA\C-290\C-29005\PC188.P



GIBSON'S CLAY MODEL

Shear Strength 30 psi
Insitu Stress 50 psi
Shear Modulus 5000 psi

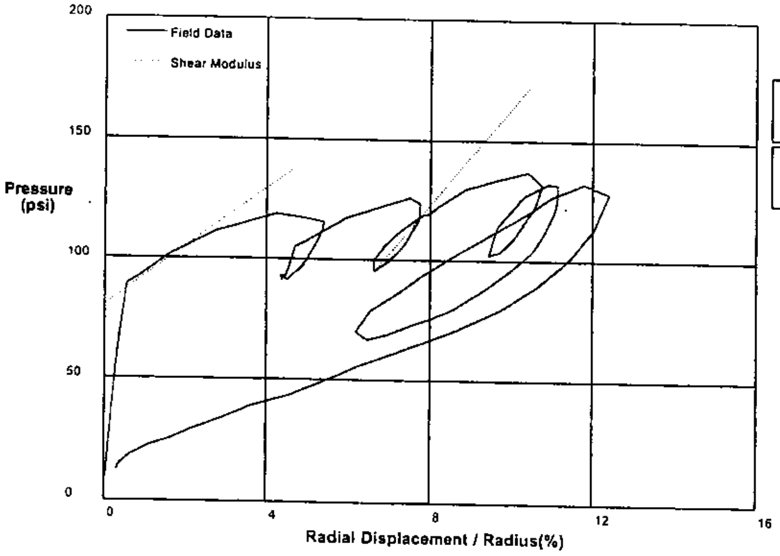
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-10-05

Hole No. BH-31 Depth 74 feet File E:\PC187.P



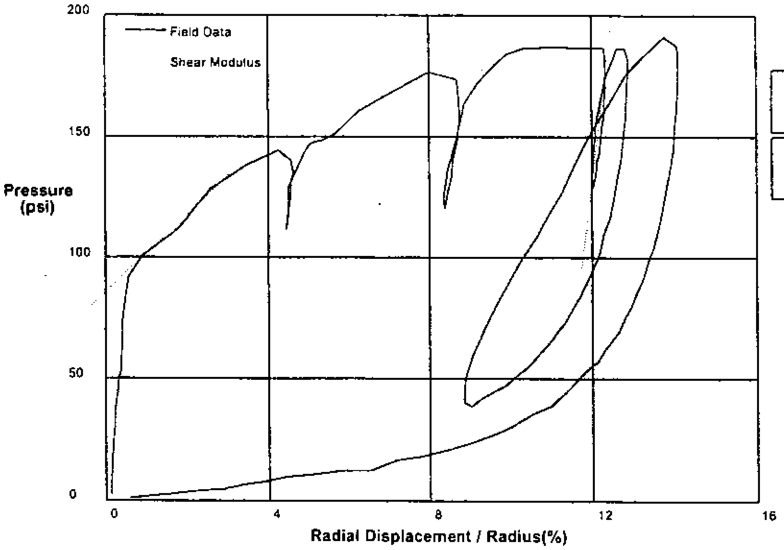
Shear Modulus 620 psi

Shear Modulus 1014 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-10-05
Hole No. BH-31 Depth 72.5 feet File E:\PC188.P



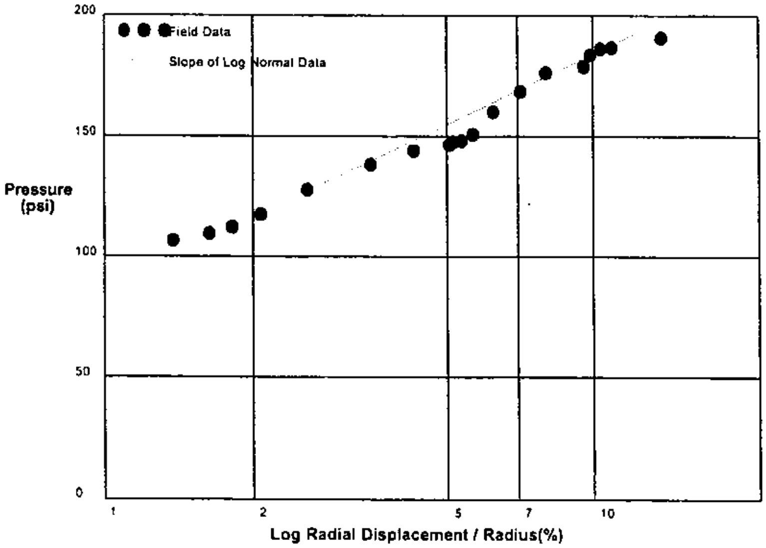
Shear Modulus 800 psi

Shear Modulus 6893 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-10-05
Hole No. BH-31 Depth 72.5 feet File E:\PC188.P



Shear Strength 42 psi
Limit Pressure 243 psi

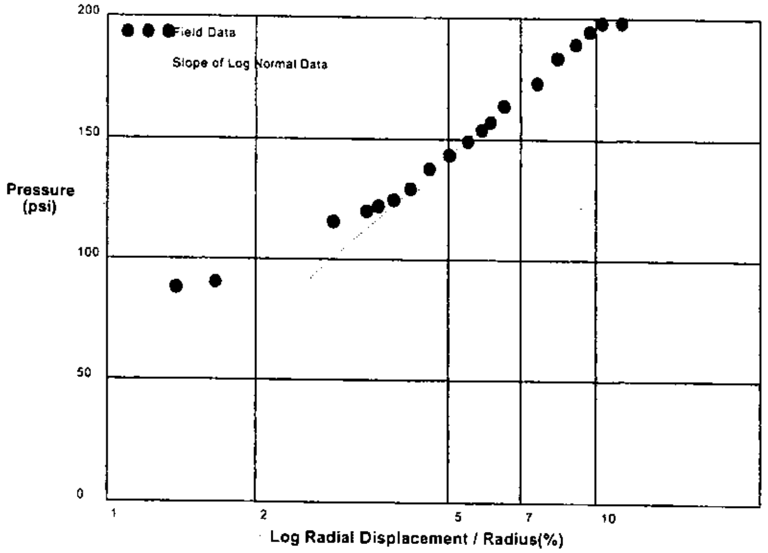
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-11-05

Hole No. BH-31 Depth 84 feet File E:\PC189.P



Shear Strength 78.2 psi
Limit Pressure 307 psi

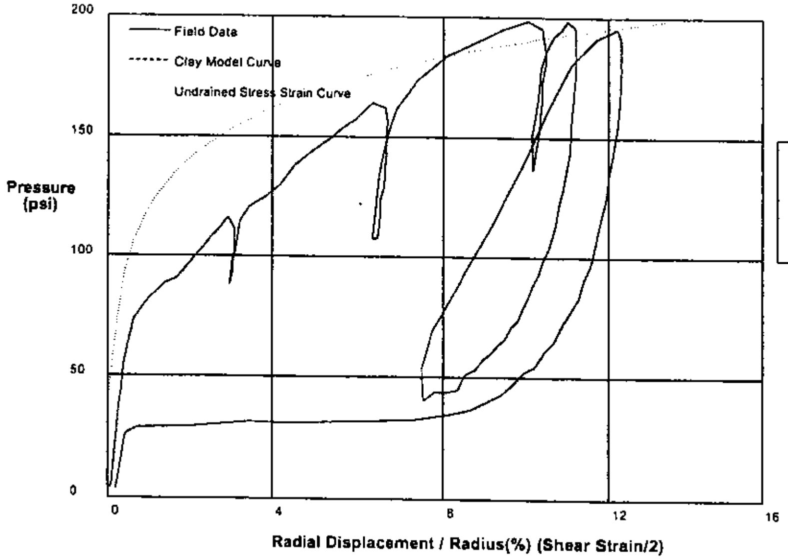
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-11-05

Hole No. BH-31 Depth 84 feet File E:\PC189.P



GIBSON'S CLAY MODEL

Shear Strength 30 psi
Insitu Stress 40 psi
Shear Modulus 8000 psi

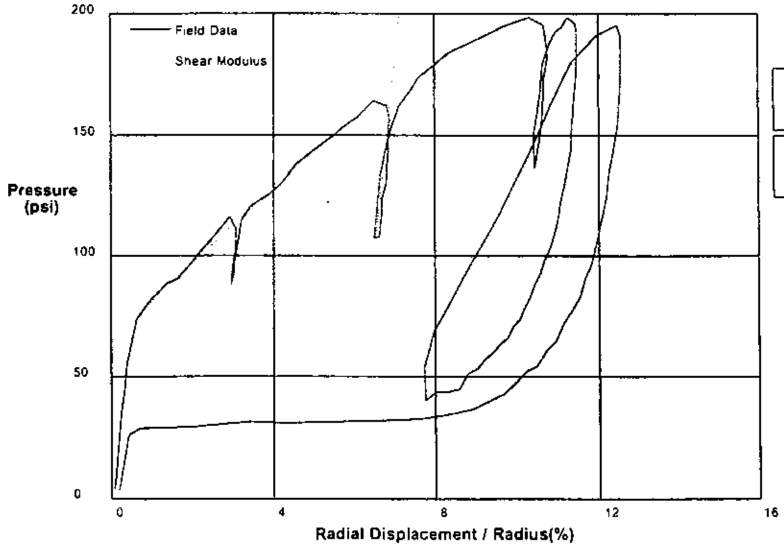
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-11-05

Hole No. BH-31 Depth 84 feet File E:\PC189.P



Shear Modulus 800 psi

Shear Modulus 7884 psi

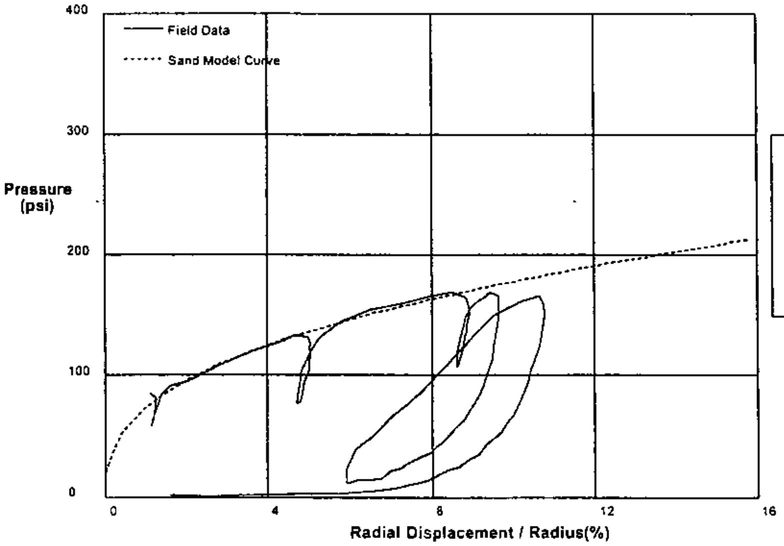
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-11-05

Hole No. BH-31 Depth 84feet File C:\DATA\C-290\C-29005\PC189.P



THE HUGHES SAND MODEL

Water Pressure	30 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	20 psi
Shear Modulus	5000 psi

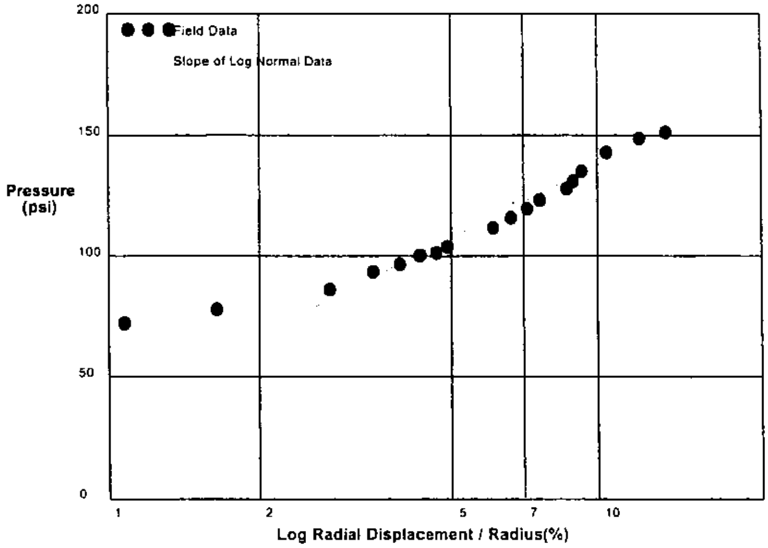
shift 1.8

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-11-05

Hole No. BH-31 Depth 82.5 feet File E:\PC190.P



Shear Strength 43.7 psi
Limit Pressure 199 psi

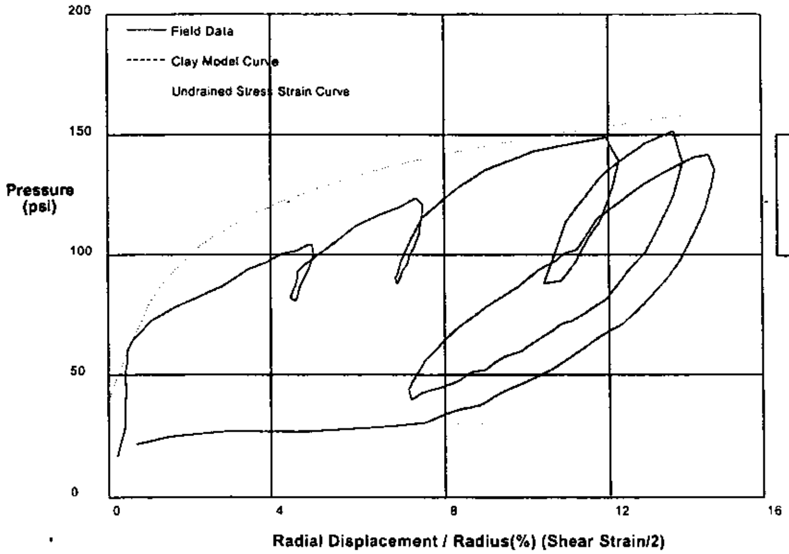
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-11-05

Hole No. BH-31 Depth 82.5 feet File E:\PC190.P



GIBSON'S CLAY MODEL

Shear Strength 30 psi
Insitu Stress 40 psi
Shear Modulus 2000 psi

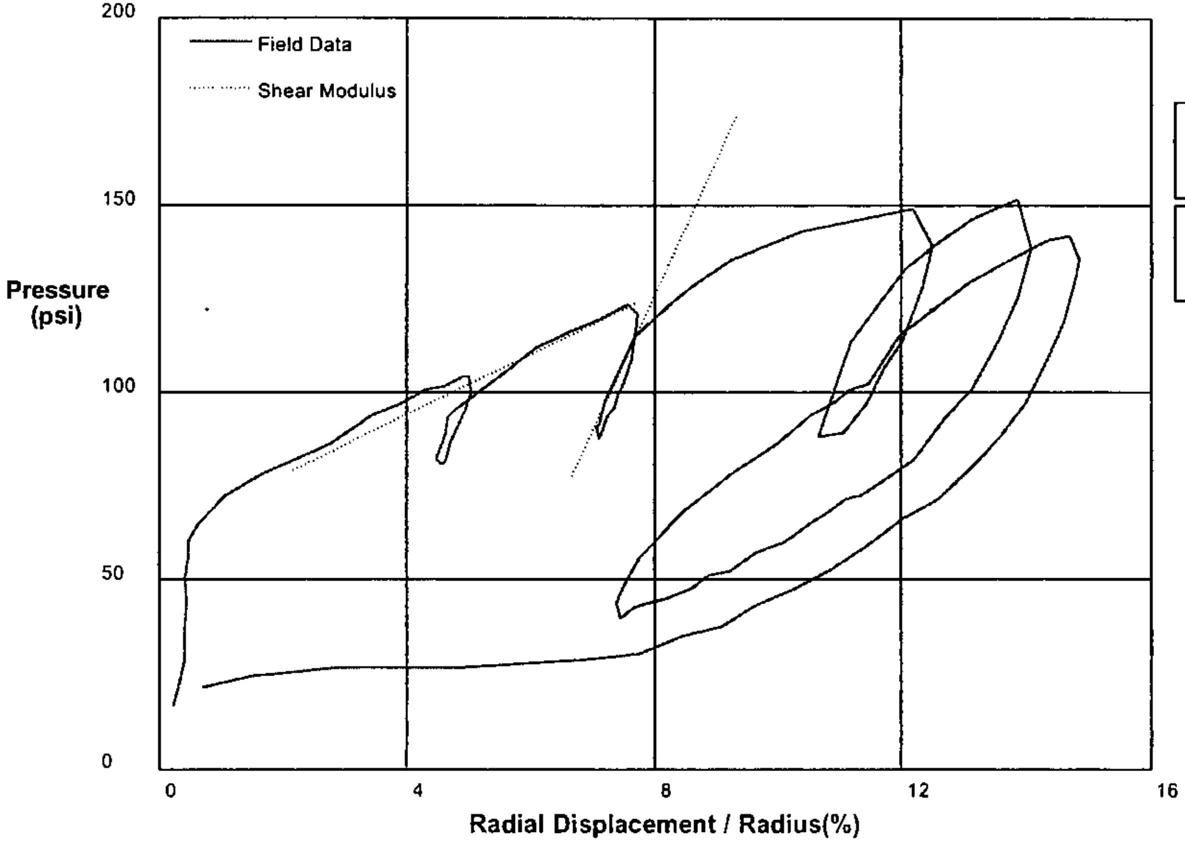
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-11-05

Hole No. BH-31 Depth 82.5 feet File E:\PC190.P



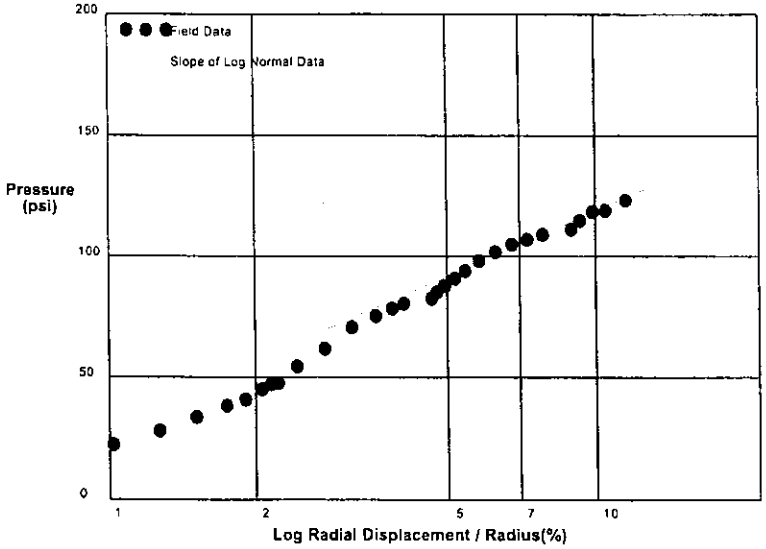
Shear Modulus 402 psi

Shear Modulus 1802 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-26-05
Hole No. BH-33 Depth 13 feet File E:\PC137.P

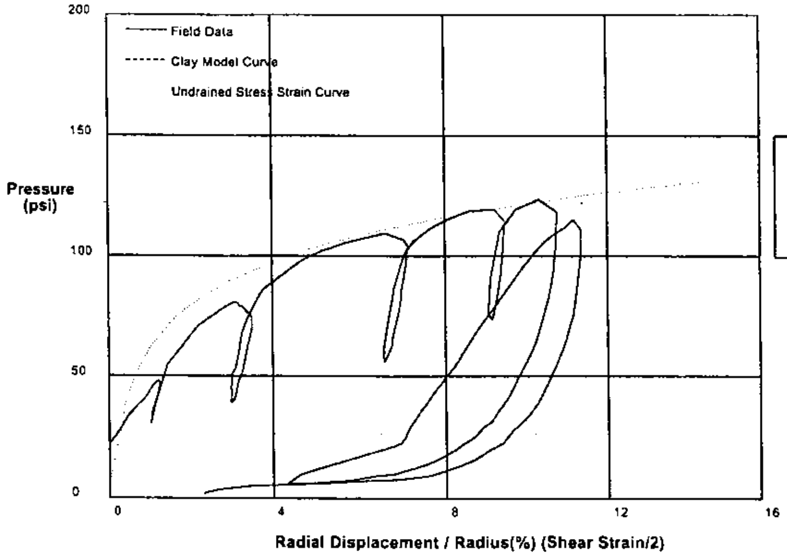


Shear Strength 38.8 psi
Limit Pressure 173 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-26-05
Hole No. BH-33 Depth 13 feet File C:\DATA\C-290\C-29005\PC137.P



GIBSON'S CLAY MODEL

Shear Strength 26 psi
Insitu Stress 6 psi
Shear Modulus 4000 psi

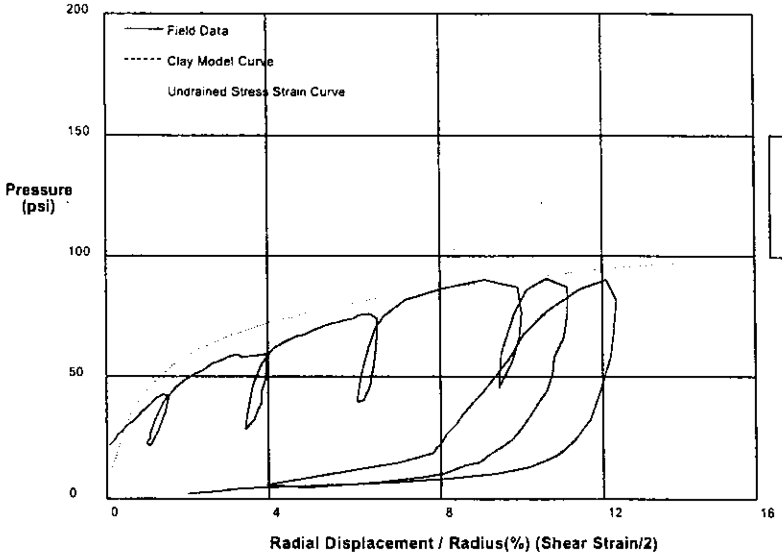
shift 1

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. bh33 Depth 15feet File C:\DATA\C-290\C-29005\PC138.P



GIBSON'S CLAY MODEL

Shear Strength 20 psi
Insitu Stress 6 psi
Shear Modulus 2500 psi

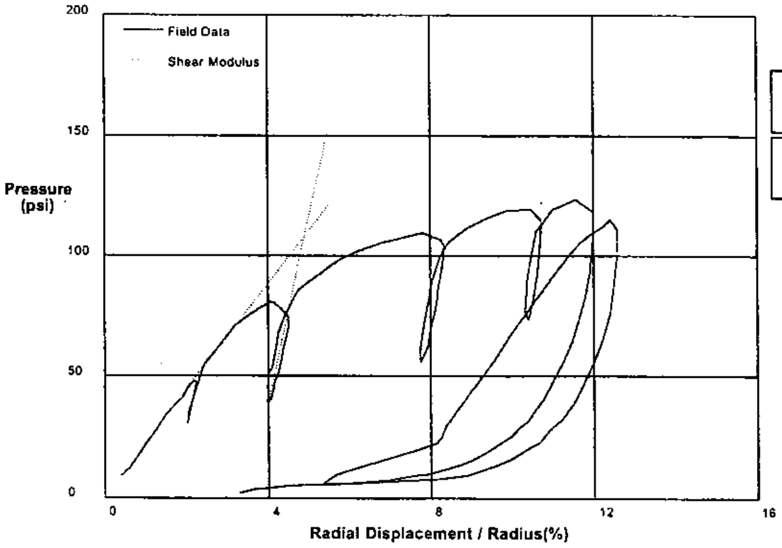
shift 1

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 13 feet File E:\PC137.P



Shear Modulus 1085 psi

Shear Modulus 3761 psi

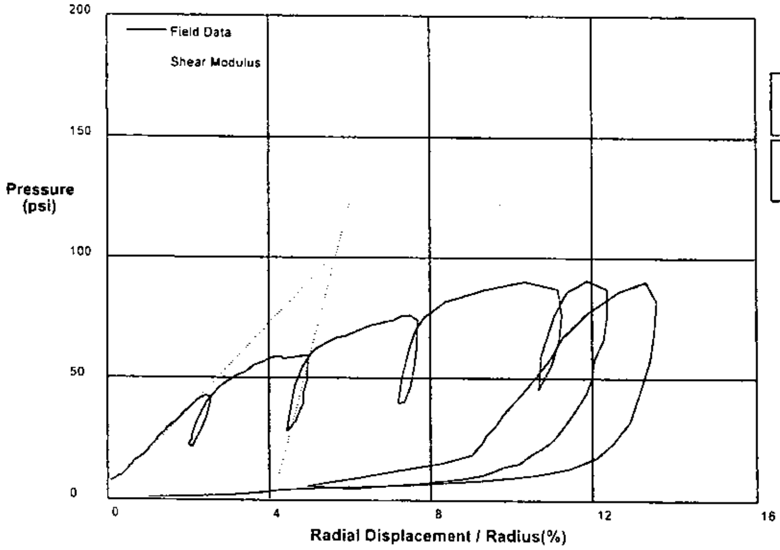
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 15 feet File E:\PC138.P



Shear Modulus 885 psi

Shear Modulus 3214 psi

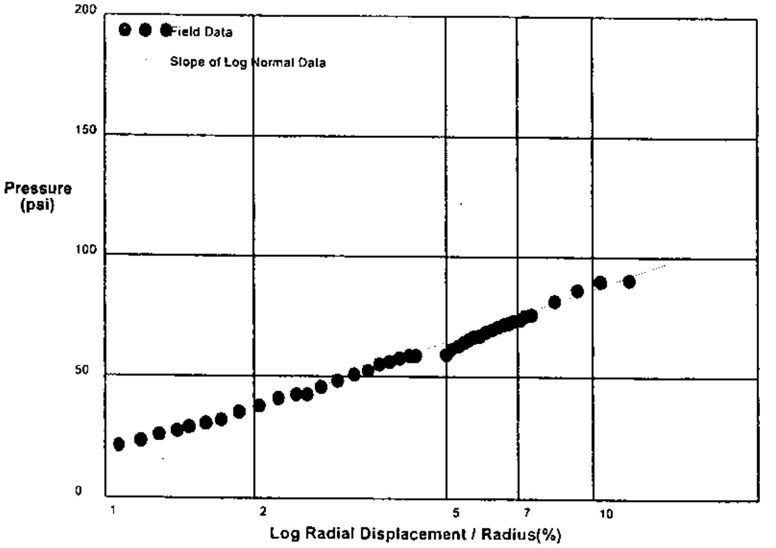
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 15 feet File E:\PC138.P



Shear Strength 31.4 psi
Limit Pressure 130 psi

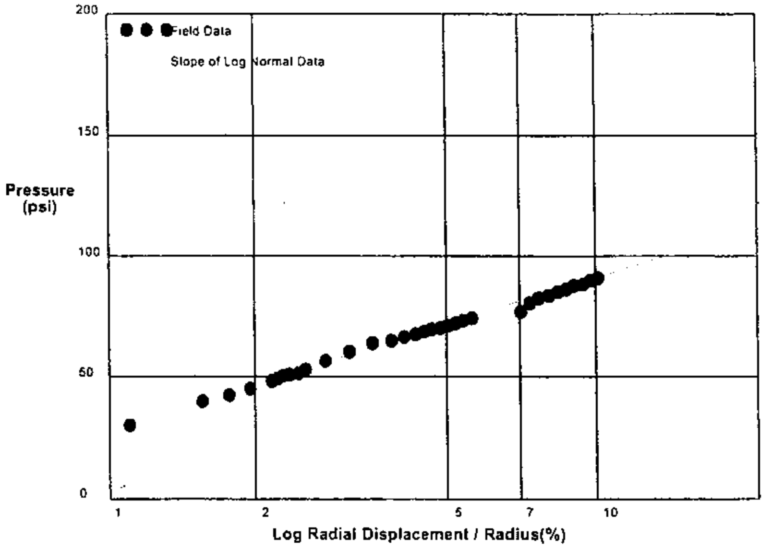
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 23 feet File E:\PC139.P



Shear Strength 27.3 psi
Limit Pressure 129 psi

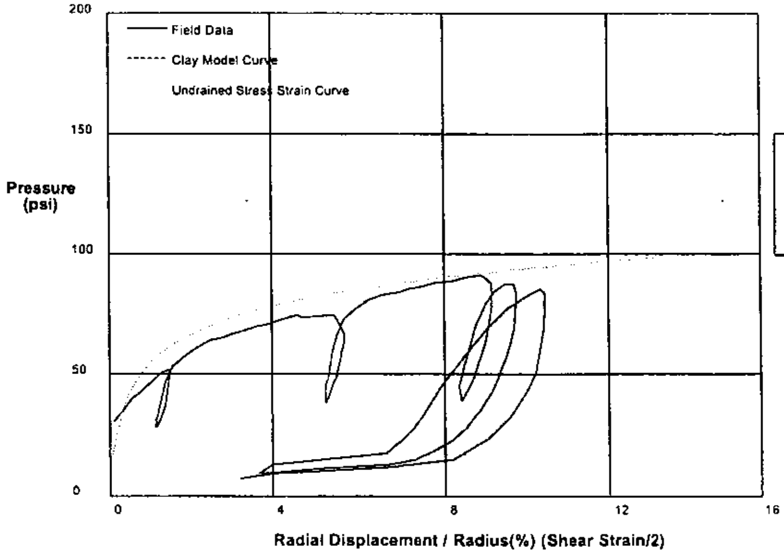
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 23 feet File C:\DATA\C-290\C-29005\PC139.P



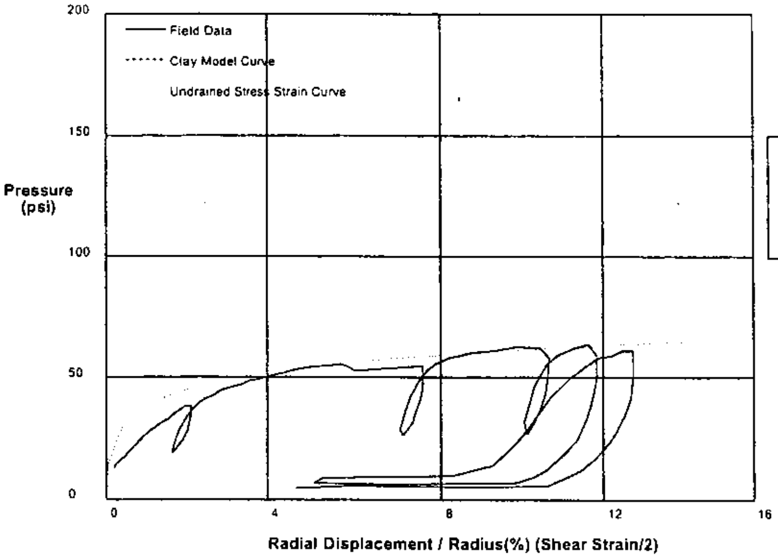
GIBSON'S CLAY MODEL

Shear Strength 17 psi
Insitu Stress 12 psi
Shear Modulus 3800 psi

shift 1

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-26-05
Hole No. BH-33 Depth 25 feet File C:\DATA\C-290\C-29005\PC140.P



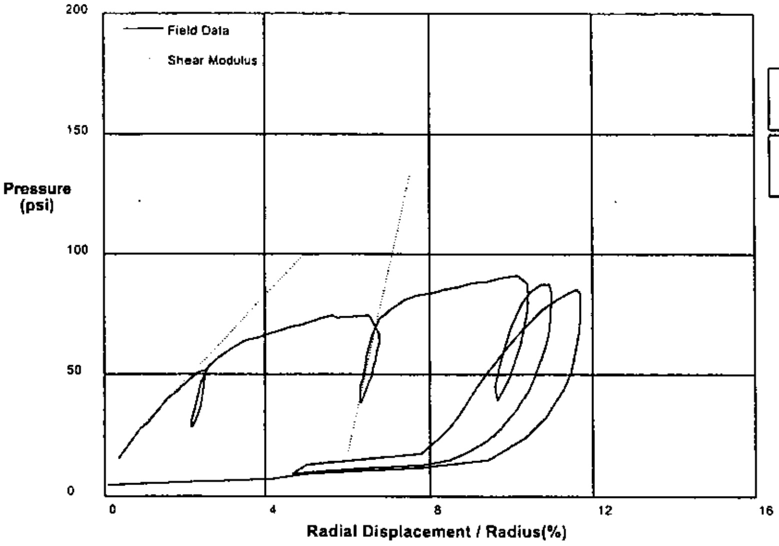
GIBSON'S CLAY MODEL

Shear Strength 10 psi
Insitu Stress 12 psi
Shear Modulus 2500 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-26-05
Hole No. BH-33 Depth 23 feet File E:\PC139.P



Shear Modulus 885 psi

Shear Modulus 3761 psi

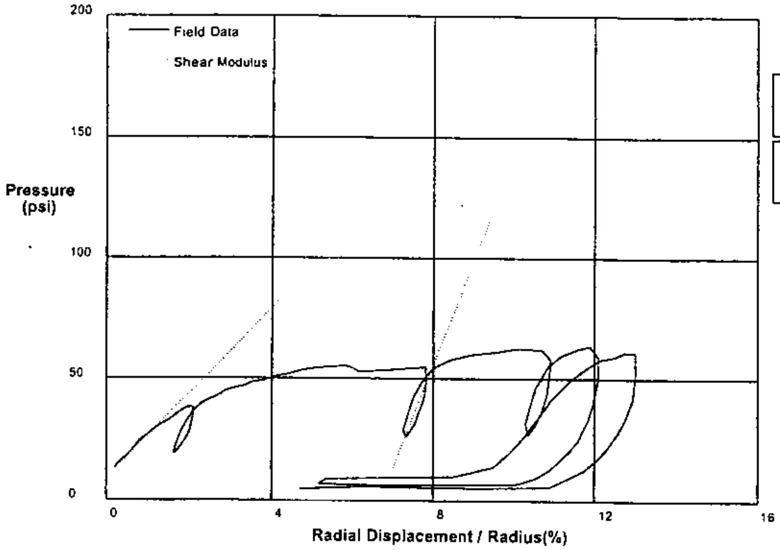
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 25 feet File E:\PC140.P



Shear Modulus 885 psi

Shear Modulus 2149 psi

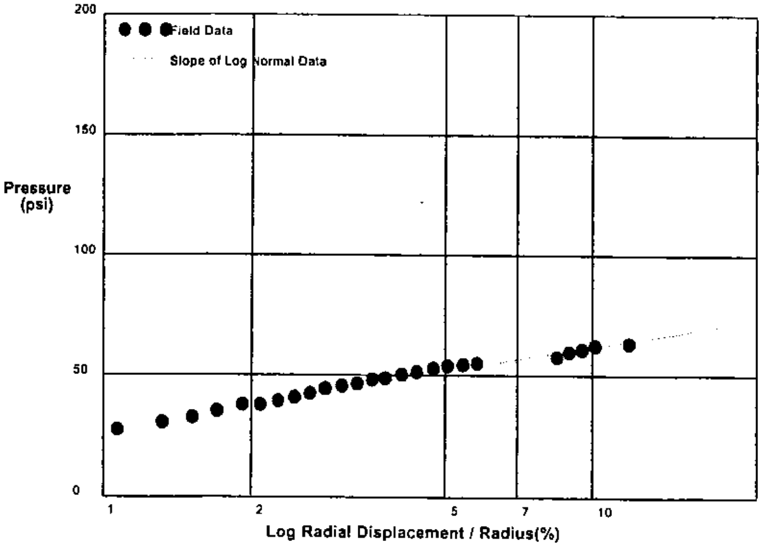
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 25 feet File E:\PC140.P



Shear Strength 14.6 psi
Limit Pressure 82 psi

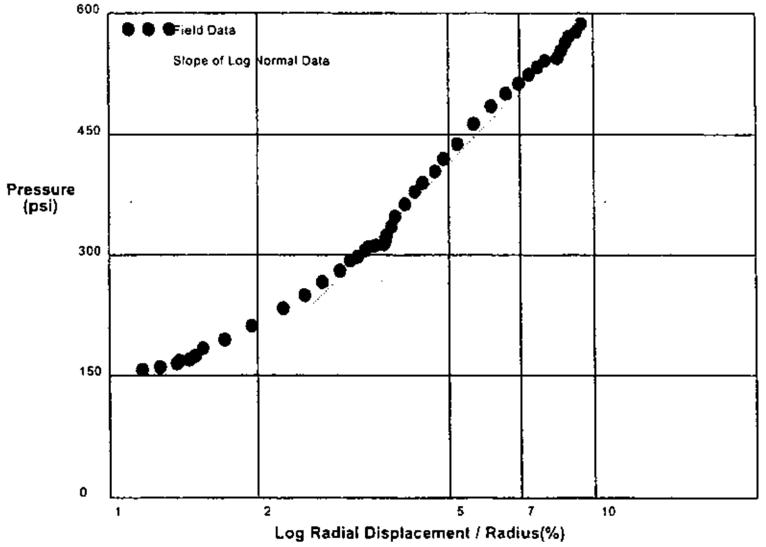
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 45 feet File E:\PC141.P



Shear Strength 269.7 psi
Limit Pressure 982 psi

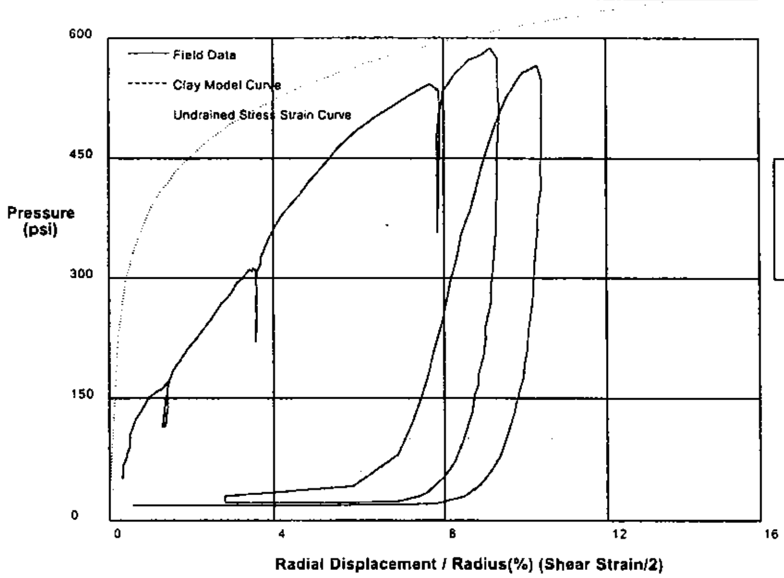
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 45 feet File C:\DATA\C-290\C-29005\PC141.P



GIBSON'S CLAY MODEL

Shear Strength 100 psi
Insitu Stress 35 psi
Shear Modulus 60000 psi

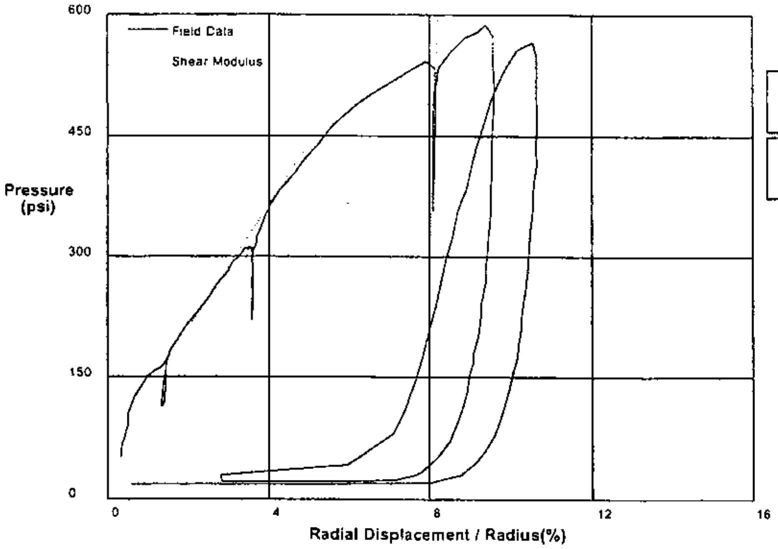
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 45 feet File E:\PC141.P



Shear Modulus 3805 psi

Shear Modulus 70357 psi

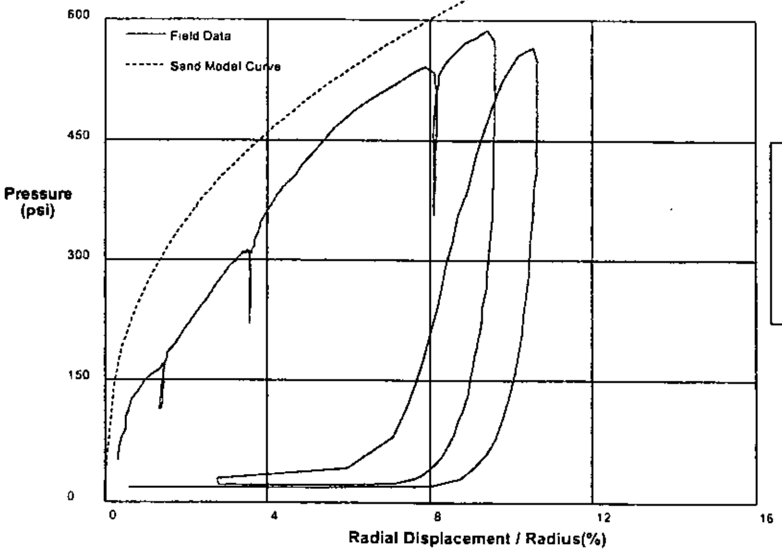
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 45 feet File C:\DATA\C-290\C-29005\PC141.P



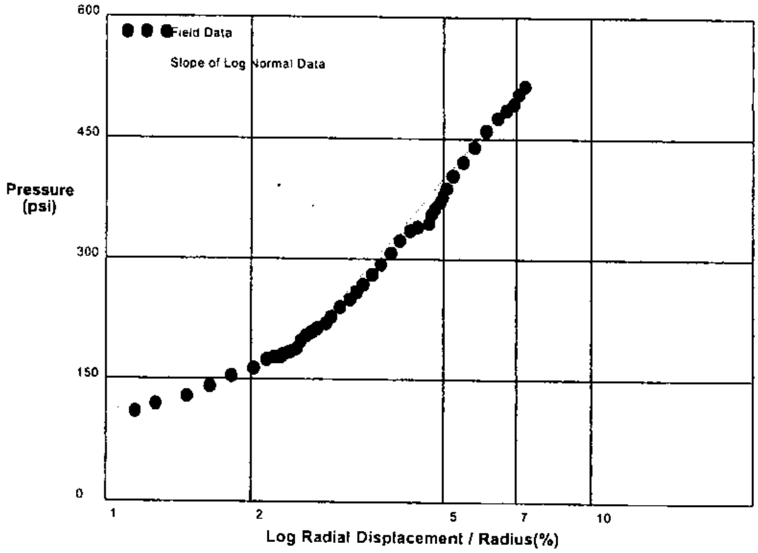
THE HUGHES SAND MODEL

Water Pressure	0 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	35 psi
Shear Modulus	60000 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-26-05
Hole No. BH-33 Depth 43.5 feet File E:\PC142.P

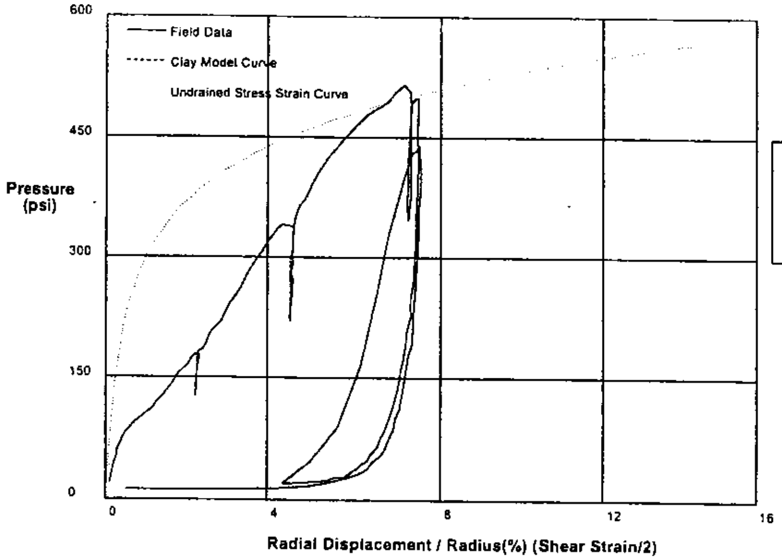


Shear Strength 310.1 psi
Limit Pressure 1054 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-26-05
Hole No. BH-33 Depth 43.5 feet File E:\PC142.P



GIBSON'S CLAY MODEL

Shear Strength 100 psi
Insitu Stress 20 psi
Shear Modulus 30000 psi

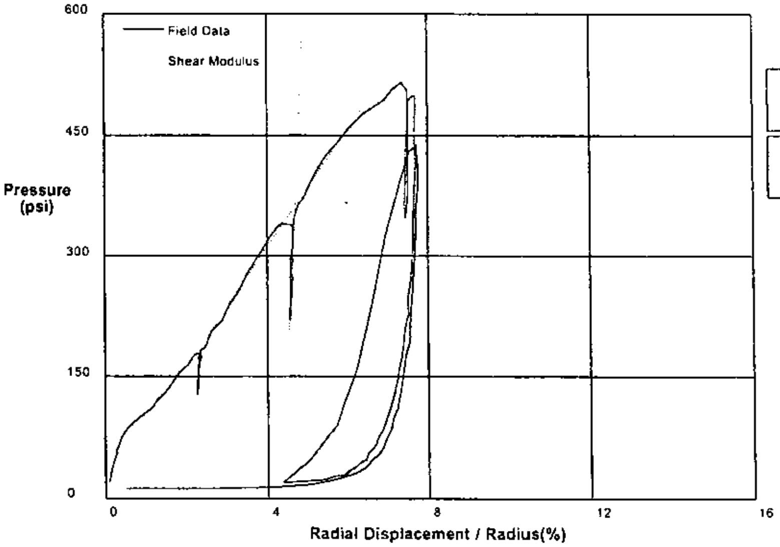
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 43.5 feet File E:\PC142.P



Shear Modulus 3611 psi

Shear Modulus 51184 psi

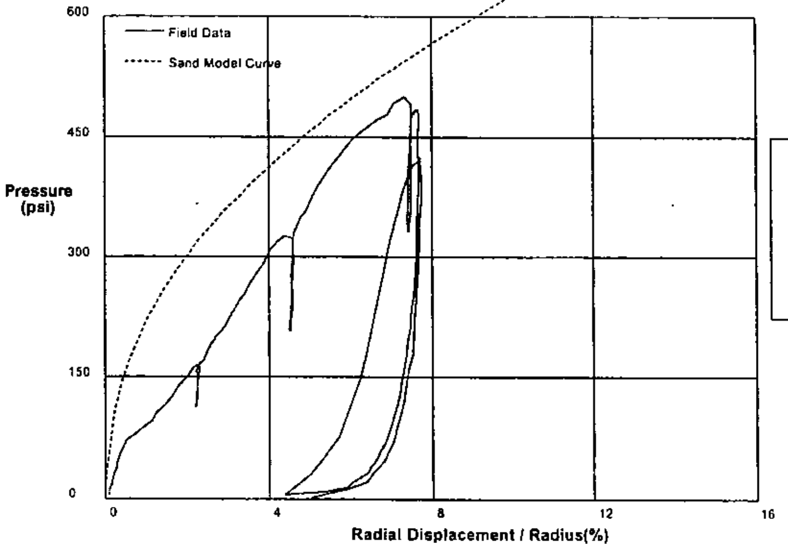
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-26-05

Hole No. BH-33 Depth 43.5 feet File E:\PC142.P



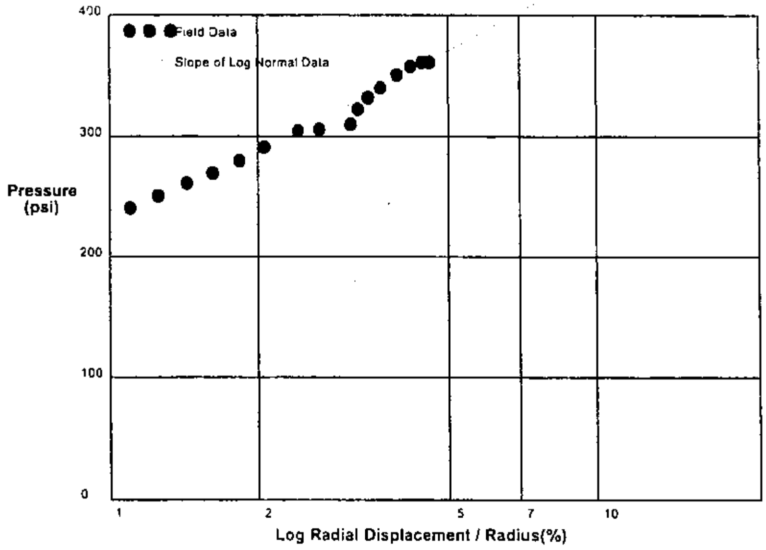
THE HUGHES SAND MODEL

Water Pressure	15 psi
Friction Angle	40 deg
Critical Friction Angle	32 deg
Lateral Stress	20 psi
Shear Modulus	40000 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 76 feet File E:\PC143.P

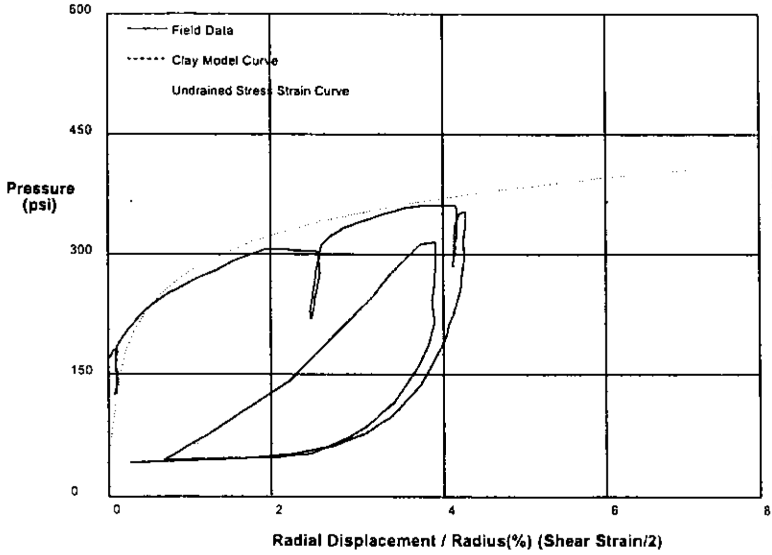


Shear Strength 94.5 psi
Limit Pressure 570 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 76 feet File C:\DATA\C-290\C-29005\PC143.P



GIBSON'S CLAY MODEL

Shear Strength 65 psi
Insitu Stress 50 psi
Shear Modulus 40000 psi

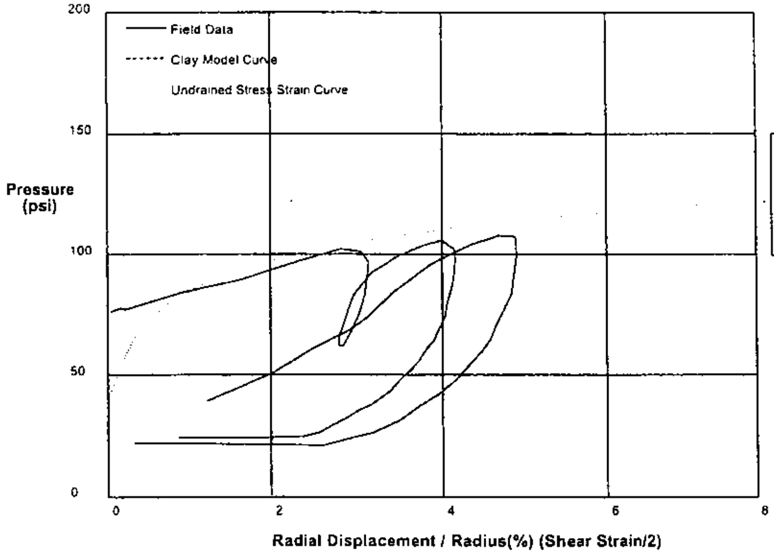
shift .5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 74.5 feet File E:\PC144.P



GIBSON'S CLAY MODEL

Shear Strength 18 psi
Insitu Stress 40 psi
Shear Modulus 4000 psi

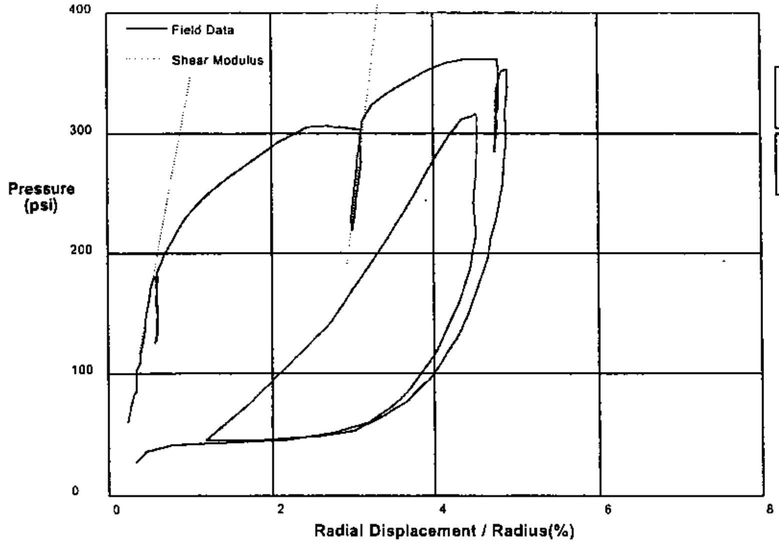
shift 8

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 76 feet File E:\PC143.P



Shear Modulus 17956 psi

Shear Modulus 27575 psi

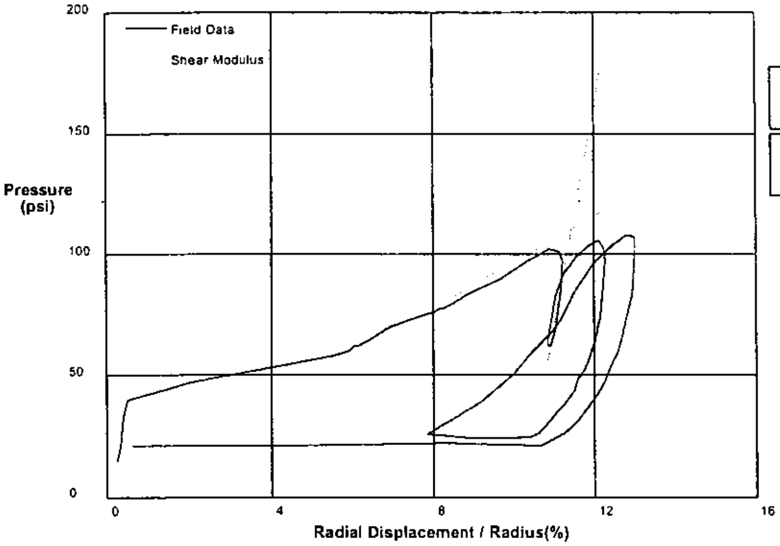
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 74.5 feet File E:\PC144.P



Shear Modulus 476 psi

Shear Modulus 4479 psi

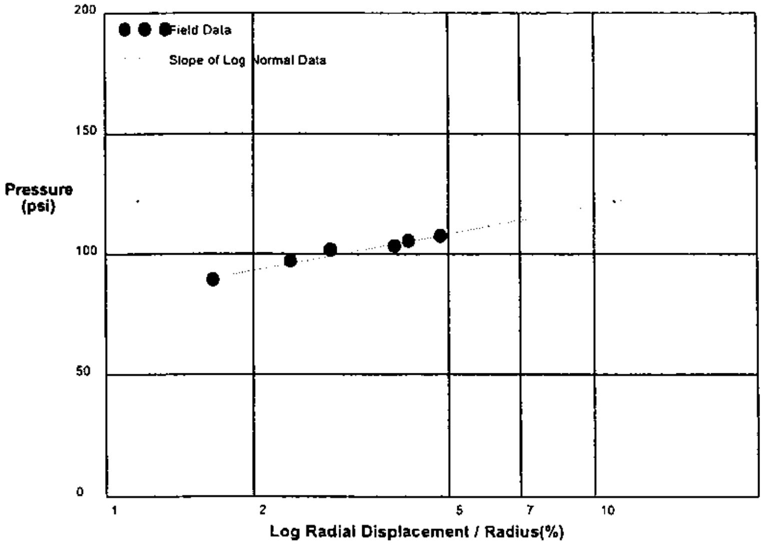
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 74.5 feet File E:\PC144.P



Shear Strength 16.7 psi
Limit Pressure 143 psi

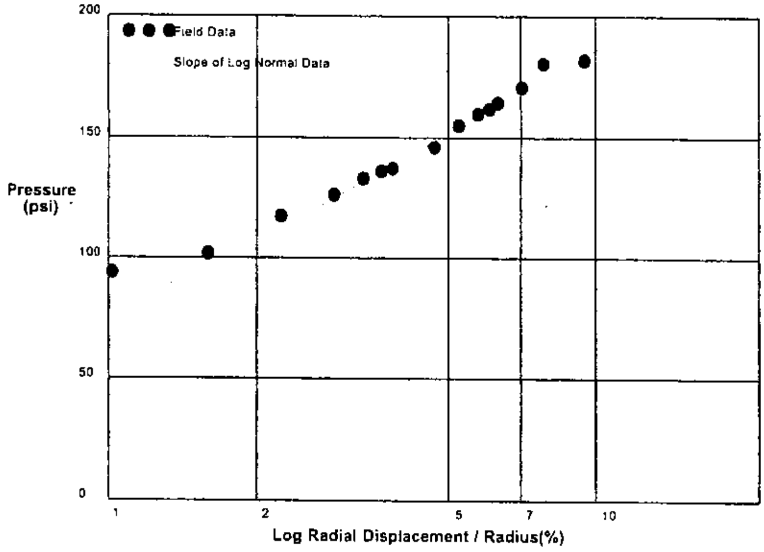
shift 8

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 9 0feet File E:\PC145.P



Shear Strength 49 psi
Limit Pressure 255 psi

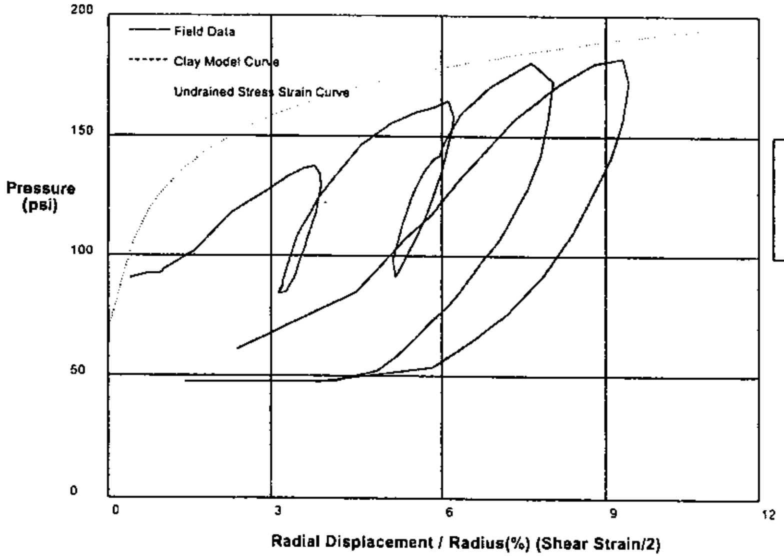
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 90 feet File E:\PC145.P



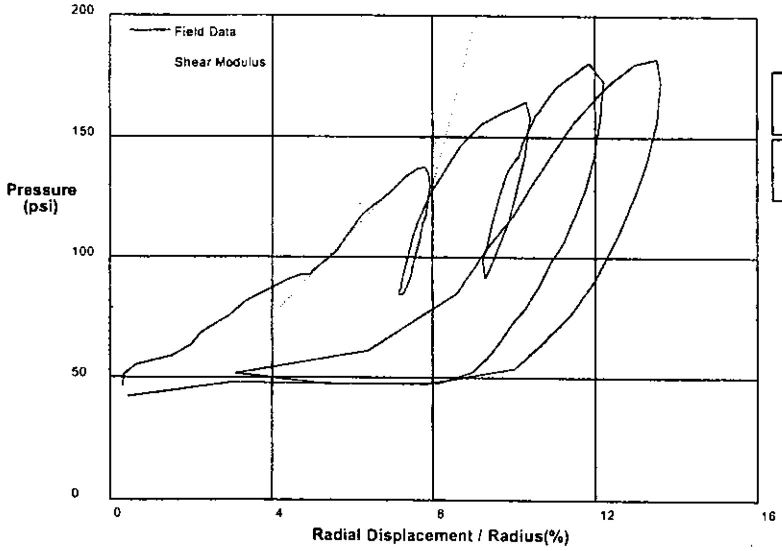
GIBSON'S CLAY MODEL

Shear Strength 28 psi
Insitu Stress 70 psi
Shear Modulus 4000 psi

shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 9 0feet File E:\PC145.P



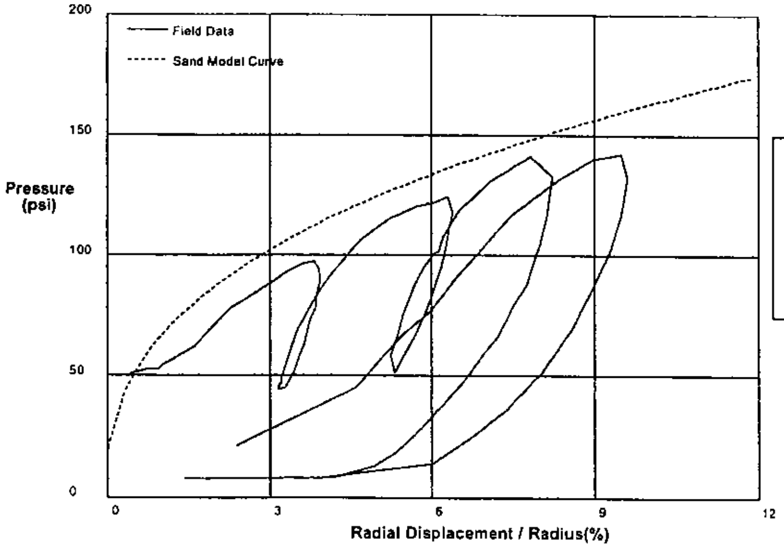
Shear Modulus 885 psi

Shear Modulus 3214 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 90 feet File E:\PC145.P



THE HUGHES SAND MODEL

Water Pressure	40 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	20 psi
Shear Modulus	4000 psi

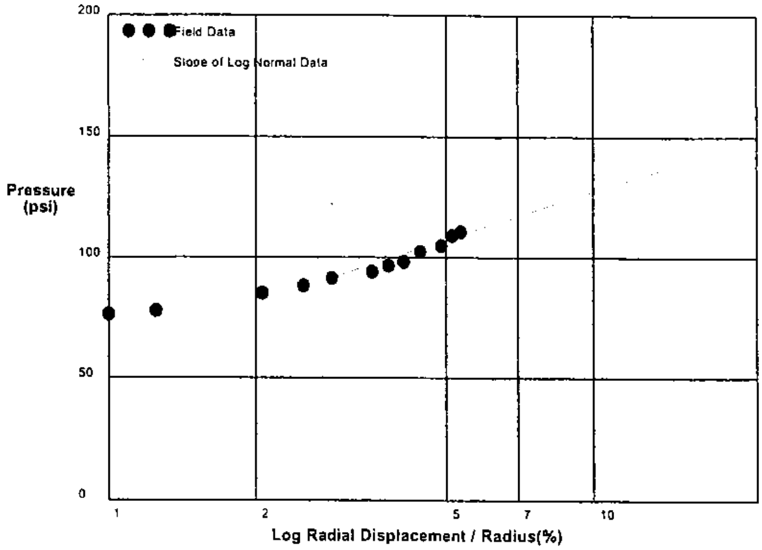
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 88.5 feet File E:\PC146.P



Shear Strength 28.6 psi
Limit Pressure 167 psi

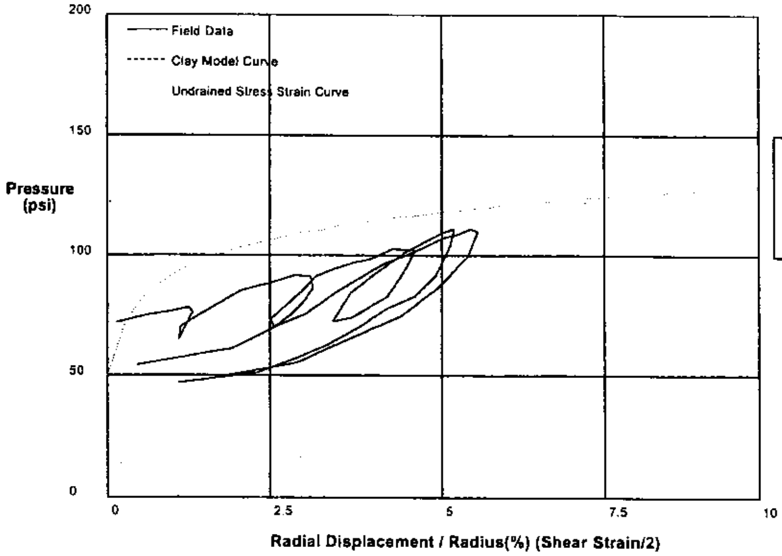
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 88.5 feet File E:\PC146.P



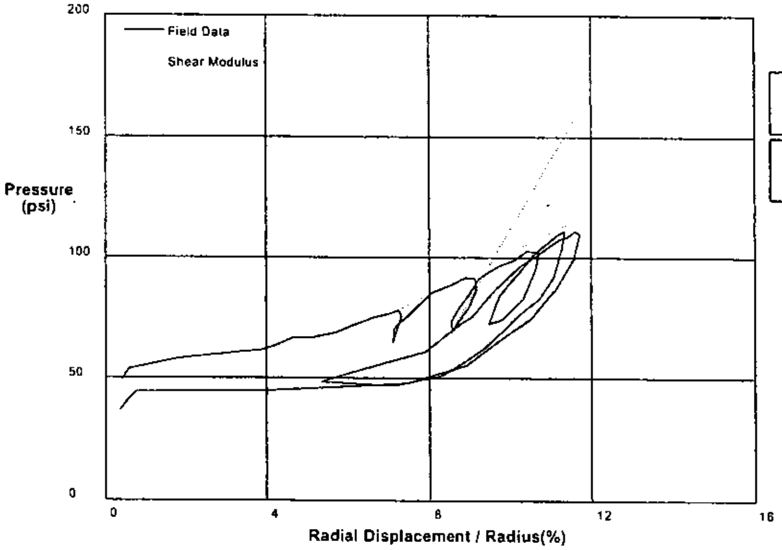
GIBSON'S CLAY MODEL

Shear Strength 16 psi
Insitu Stress 50 psi
Shear Modulus 4000 psi

shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 88.5 feet File E:\PC146.P



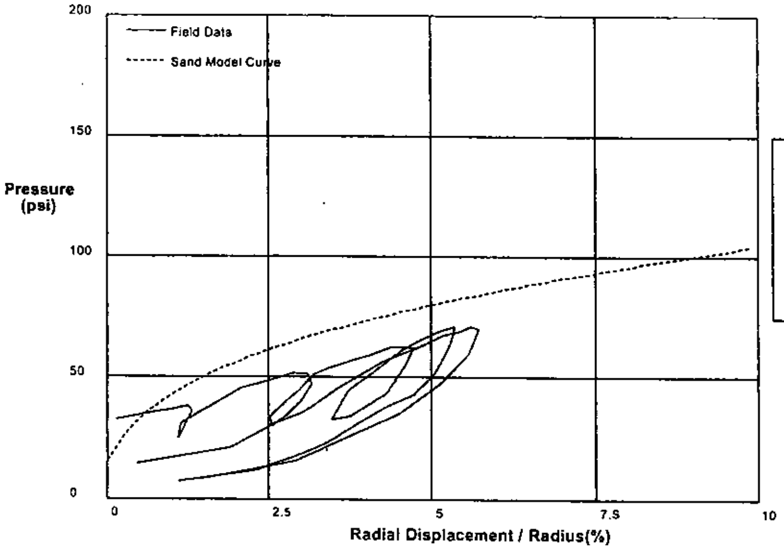
Shear Modulus 426 psi

Shear Modulus 1448 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 88.5 feet File E:\PC146.P



THE HUGHES SAND MODEL

Water Pressure	40 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	15 psi
Shear Modulus	2000 psi

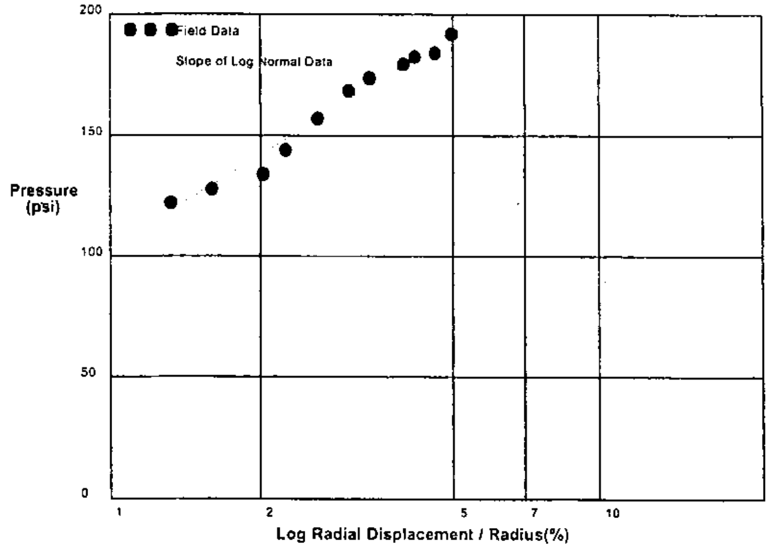
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 115 feet File E:\PC147.P



Shear Strength 54.8 psi
Limit Pressure 307 psi

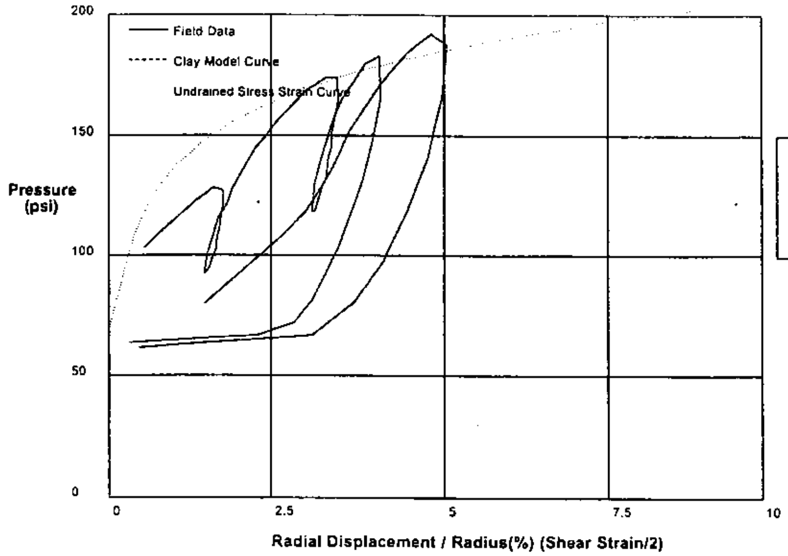
shift 5

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-27-05

Hole No. BH-33 Depth 115 feet File E:\PC147.P



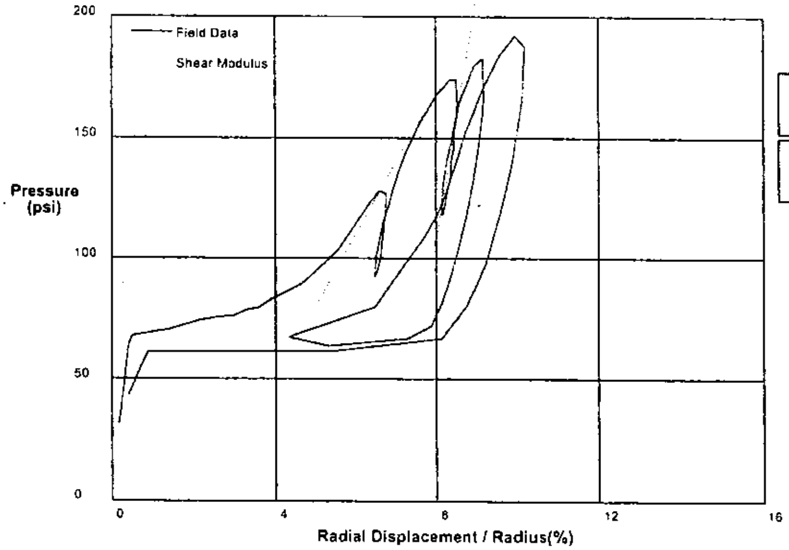
GIBSON'S CLAY MODEL

Shear Strength 30 psi
Insitu Stress 70 psi
Shear Modulus 5000 psi

shift 5

HUGHES

PRESSUREMETER DATA Parikh Consultants. Inc.
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 115 feet File E:\PC147.P



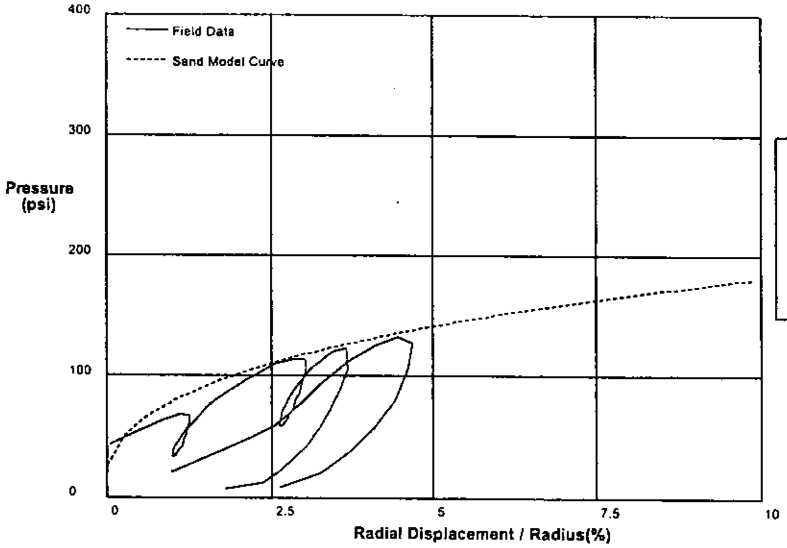
Shear Modulus 1490 psi

Shear Modulus 4929 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 115 feet File C:\DATA\C-290\C-29005\PC147.P



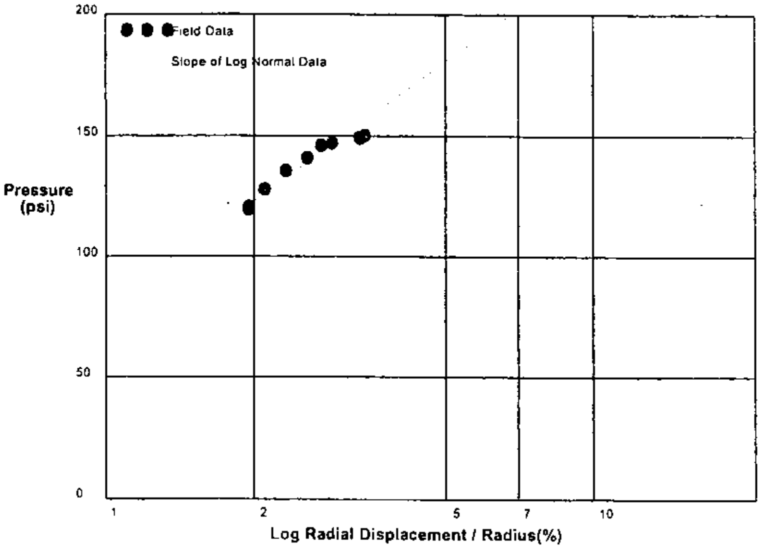
THE HUGHES SAND MODEL

Water Pressure	60 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	25 psi
Shear Modulus	5000 psi

shift 5.5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 113.5 feet File E:\PC148.P

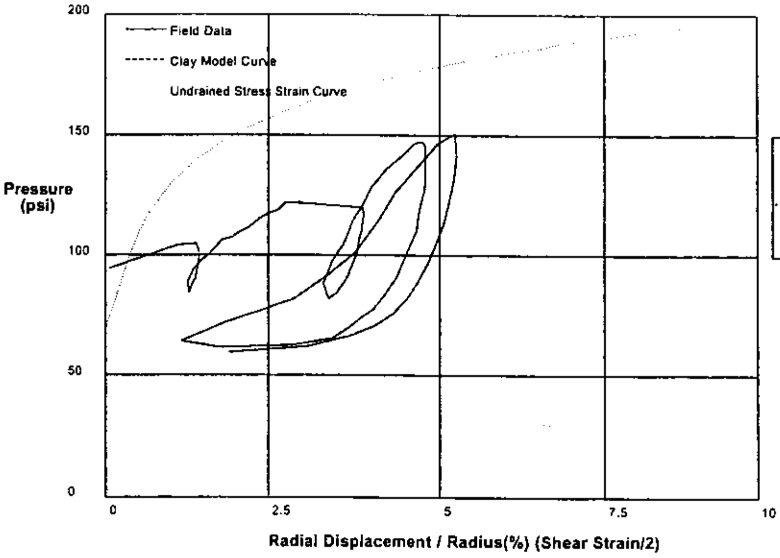


Shear Strength 63.3 psi
Limit Pressure 314 psi

shift 8

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-27-05
Hole No. BH-33 Depth 113.5 feet File E:\PC148.P



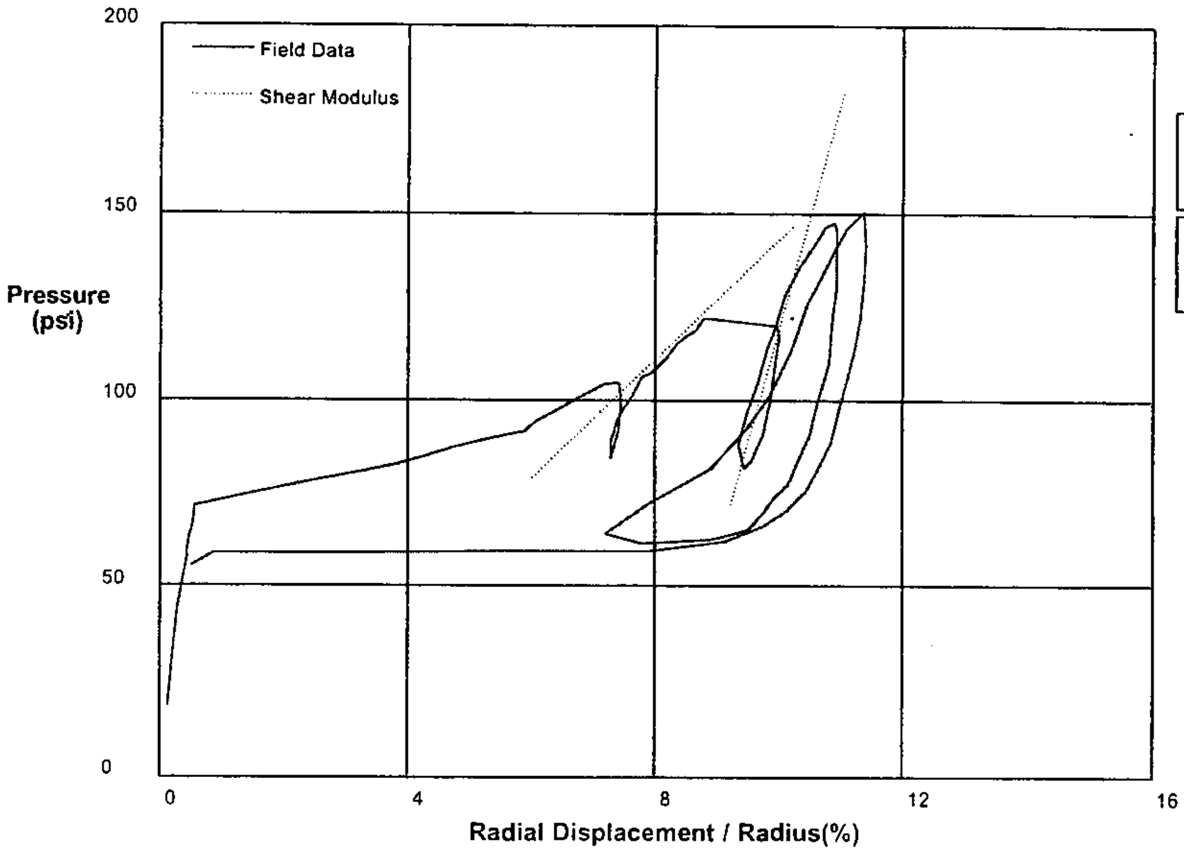
GIBSON'S CLAY MODEL

Shear Strength 30 psi
Insitu Stress 70 psi
Shear Modulus 4000 psi

shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) **1-27-05**
Hole No. BH-33 **Depth 113.5 feet** **File E:\PC148.P**



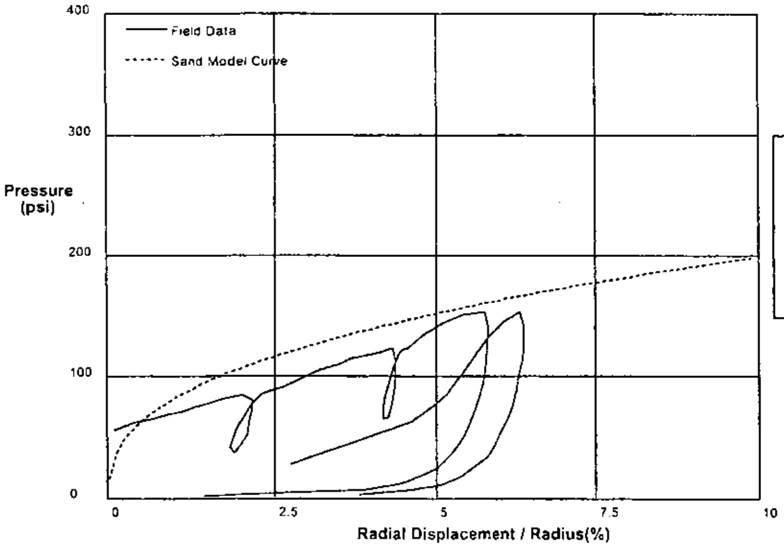
Shear Modulus 800 psi

Shear Modulus 2986 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-18-05
Hole No. BH-38 Depth 43.5 feet File E:\PC116.P



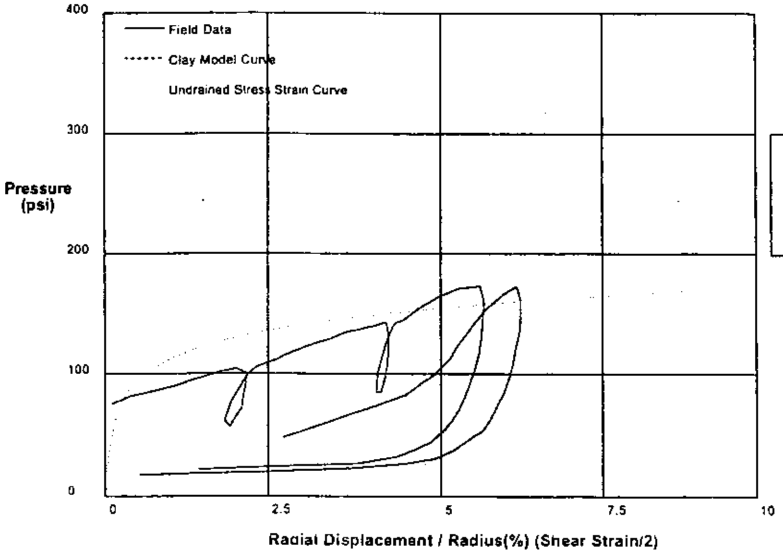
THE HUGHES SAND MODEL

Water Pressure	20 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	10 psi
Shear Modulus	20000 psi

shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-18-05
Hole No. BH-38 Depth 43.5 feet File E:\PC116.P



GIBSON'S CLAY MODEL

Shear Strength	**26 psi**
Insitu Stress	**15 psi**
Shear Modulus	**20000 psi**

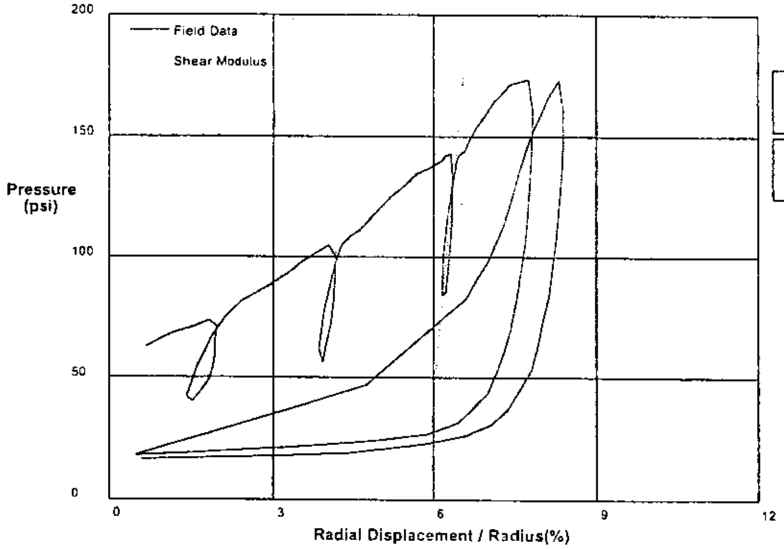
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-18-05

Hole No. BH-38 Depth 43.5 feet File E:\PC116.P



Shear Modulus 1088 psi

Shear Modulus 12222 psi

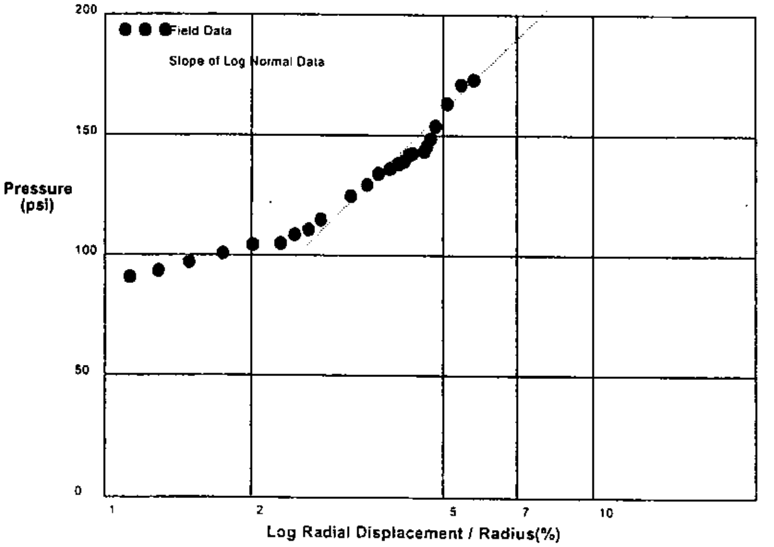
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-18-05

Hole No. BH-38 Depth 43.5 feet File E:\PC116.P



Shear Strength 86.8 psi
Limit Pressure 343 psi

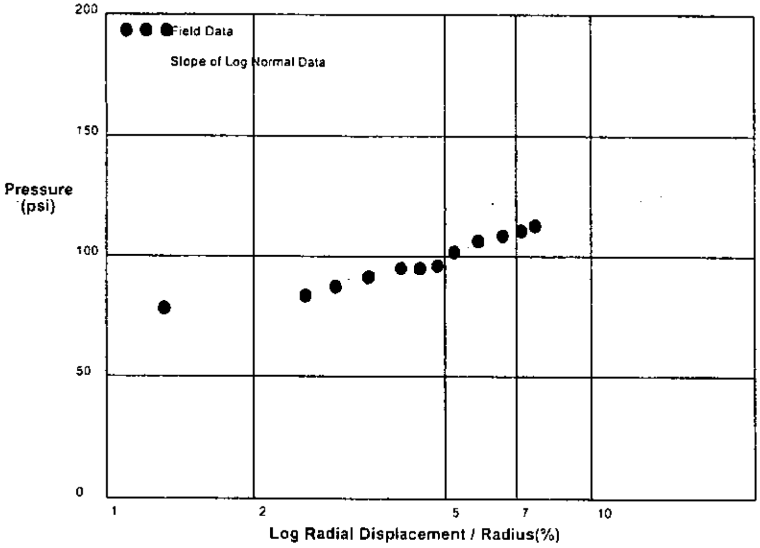
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-18-05

Hole No. BH-38 Depth 51 feet File E:\PC117.P



Shear Strength 23.5 psi
Limit Pressure 151 psi

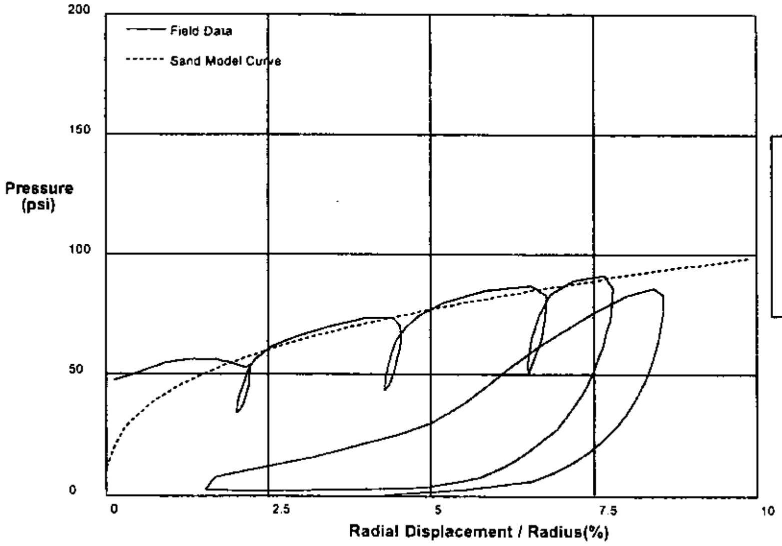
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-18-05

Hole No. BH-38 Depth 51 feet File C:\DATA\C-290\C-29005\PC117.P



THE HUGHES SAND MODEL

Water Pressure	22 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	11 psi
Shear Modulus	4000 psi

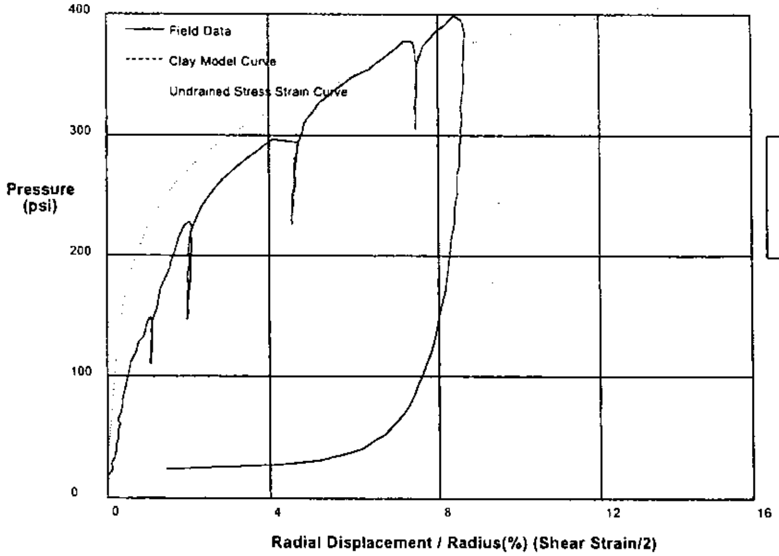
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-19-05

Hole No. BH-38 Depth 65 feet File E:\PC118.P



GIBSON'S CLAY MODEL

Shear Strength 70 psi
Insitu Stress 30 psi
Shear Modulus 20000 psi

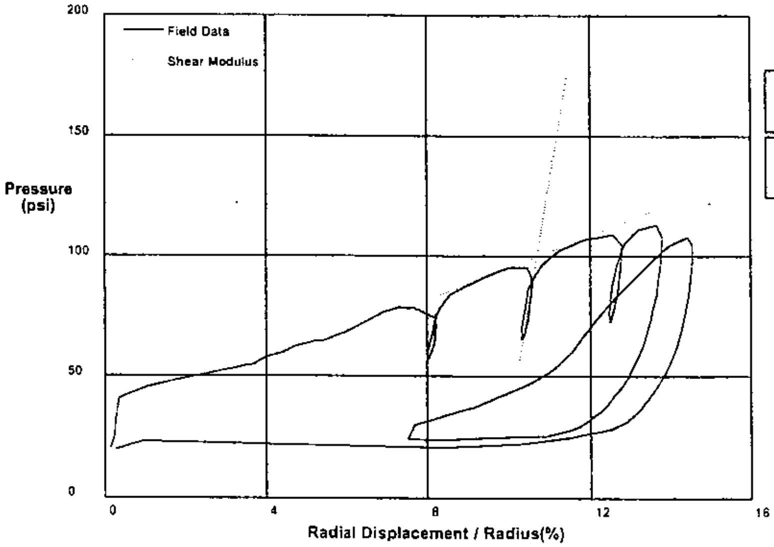
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-18-05

Hole No. BH-38 Depth 51 feet File E:\PC117.P



Shear Modulus 336 psi

Shear Modulus 4929 psi

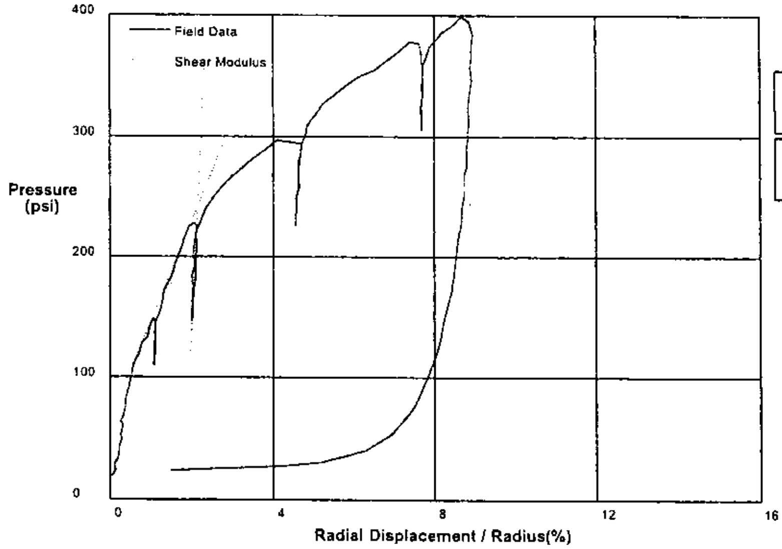
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-19-05

Hole No. BH-38 Depth 65 feet File E:\PC118.P



Shear Modulus 4226 psi

Shear Modulus 34122 psi

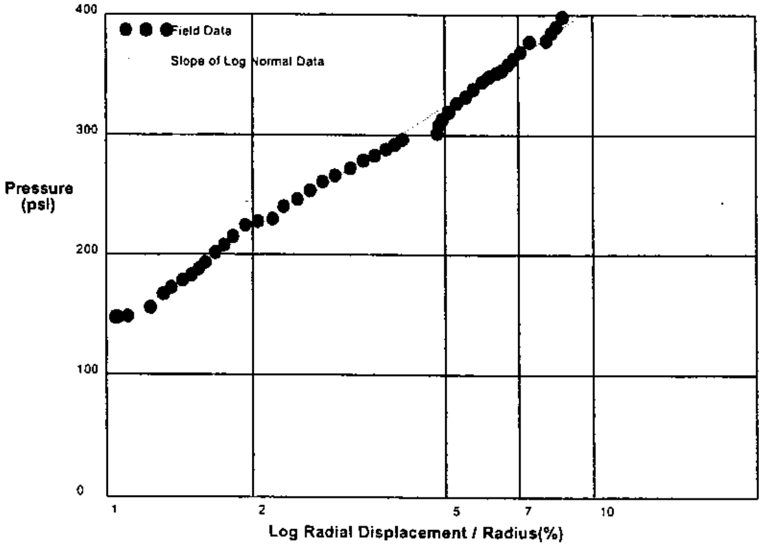
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-19-05

Hole No. BH-38 Depth 65 feet File E:\PC118.P



Shear Strength 118 psi
Limit Pressure 573 psi

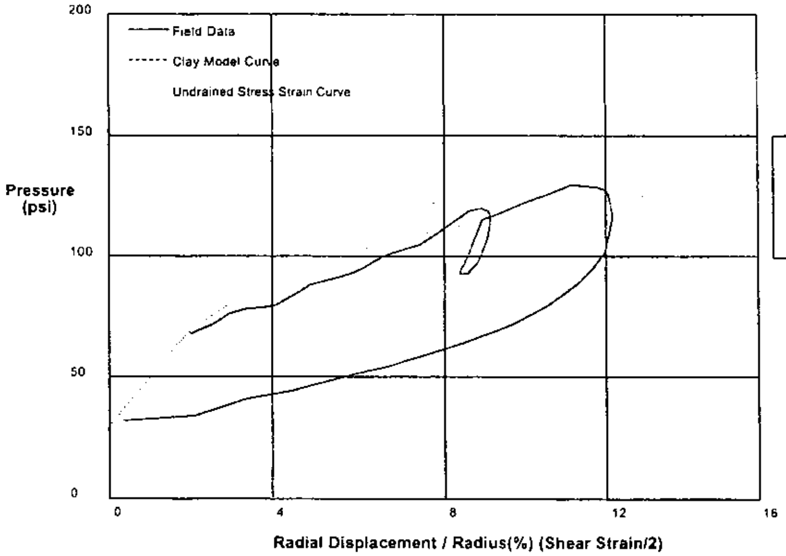
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-19-05

Hole No. bh38 Depth 80feet File E:\PC119.P



GIBSON'S CLAY MODEL

Shear Strength	30 psi
Insitu Stress	30 psi
Shear Modulus	1000 psi

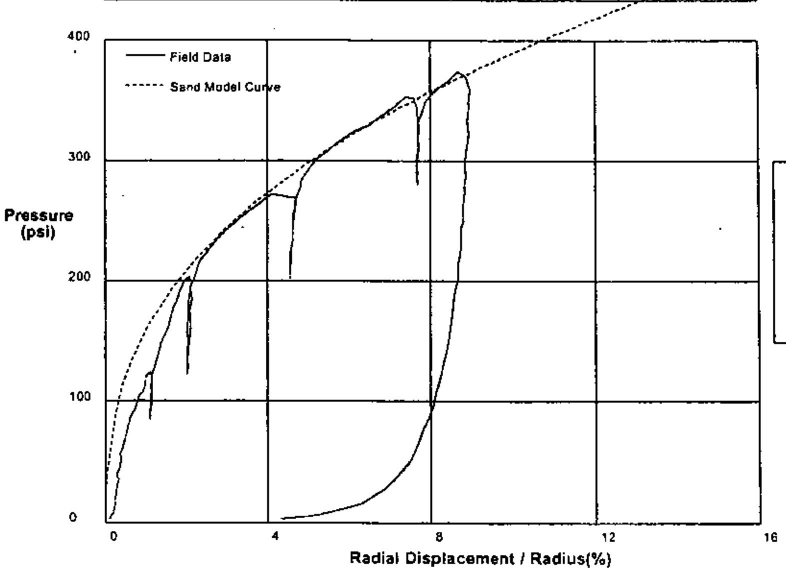
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-19-05

Hole No. BH-38 Depth 65 feet File E:\PC118.P



THE HUGHES SAND MODEL

Water Pressure	25 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	30 psi
Shear Modulus	20000 psi

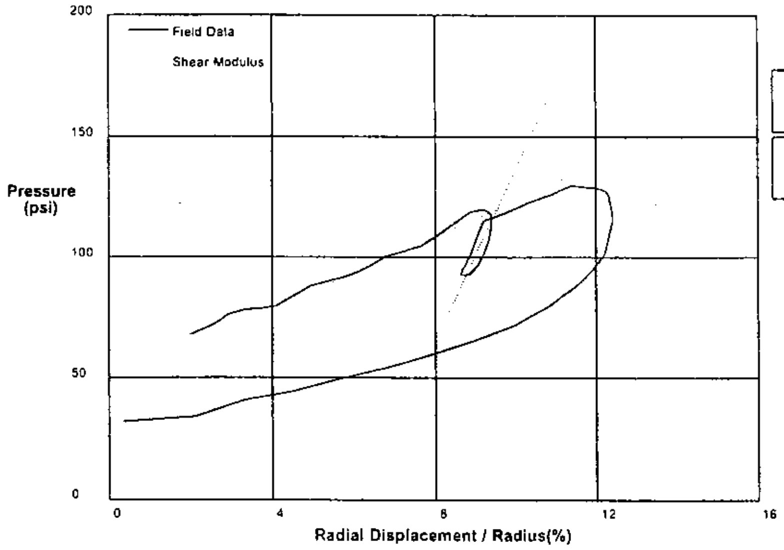
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-19-05

Hole No. bh38 Depth 80feet File E:\PC119.P



Shear Modulus 379 psi

Shear Modulus 1802 psi

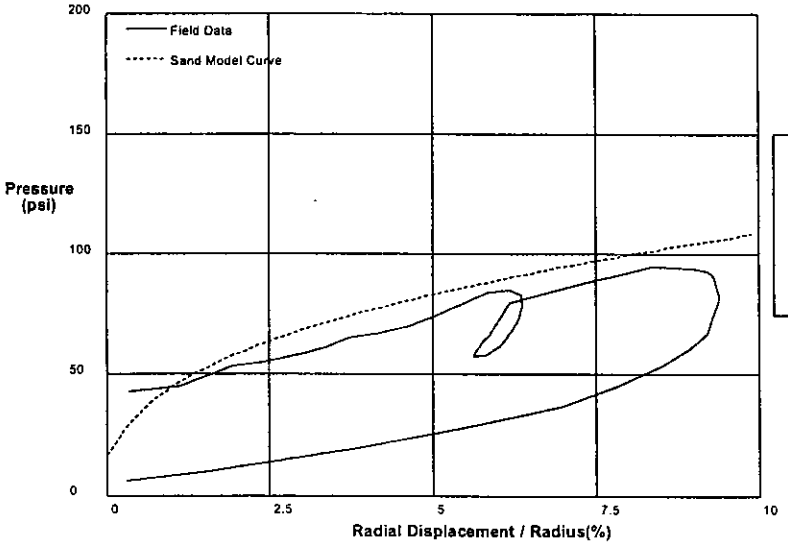
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-19-05

Hole No. bh38 Depth 80feet File E:\PC119.P



THE HUGHES SAND MODEL

Water Pressure	35 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	16 psi
Shear Modulus	2000 psi

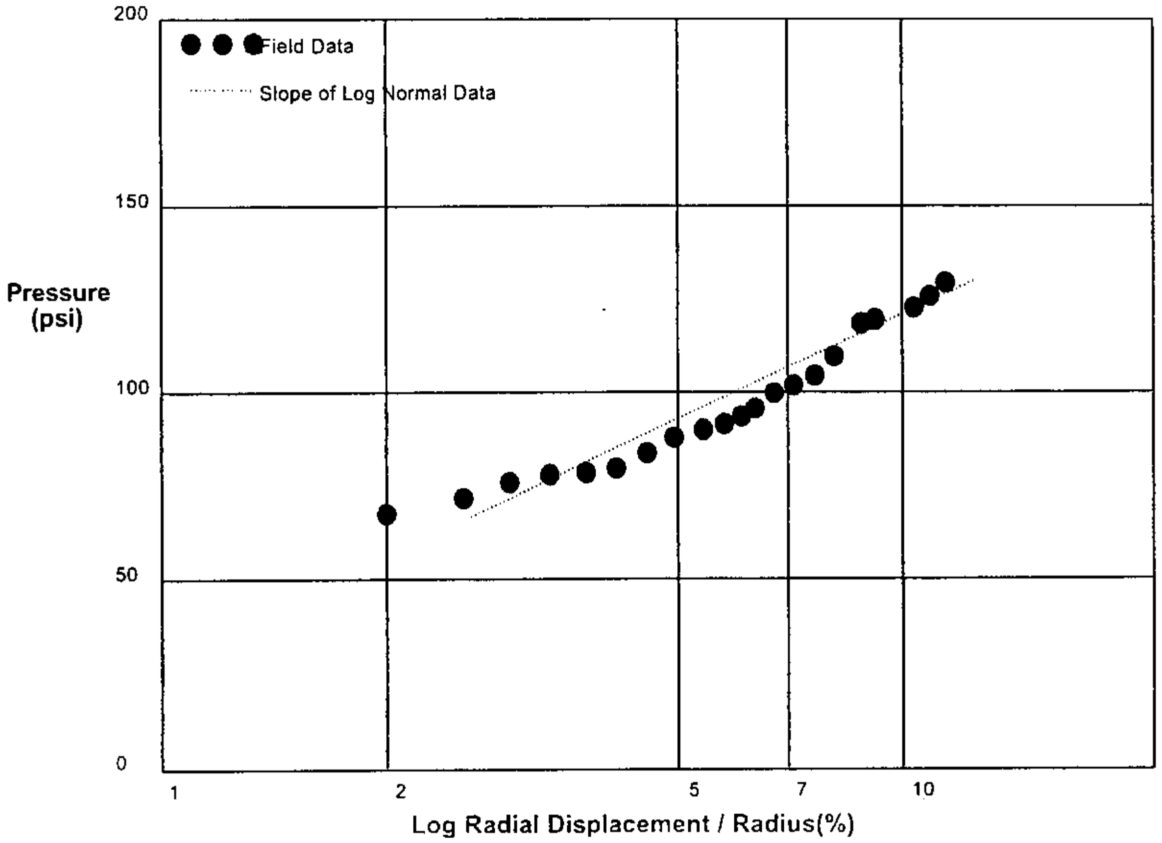
shift 3

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-19-05

Hole No. bh38 Depth 80feet File E:\PC119.P



Shear Strength 40.4 psi
Limit Pressure 178 psi

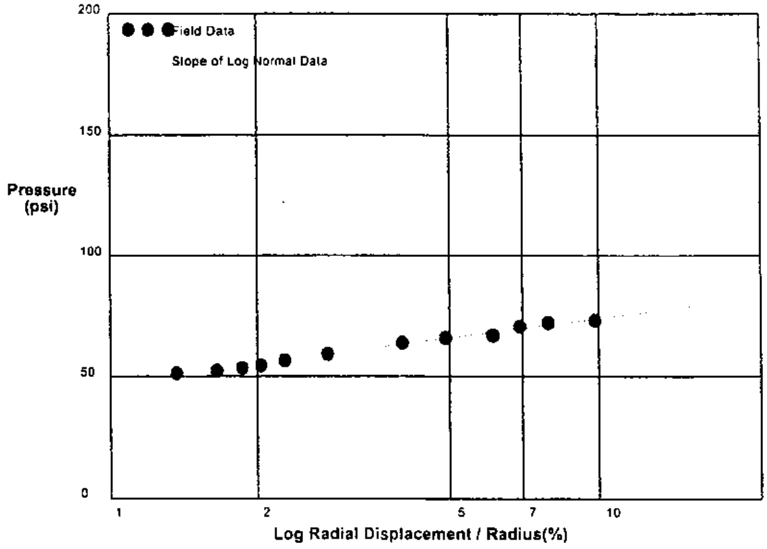
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-16-05

Hole No. BH-42 Depth 23 feet File E:\PC109.P



Shear Strength 11.6 psi
Limit Pressure 90 psi

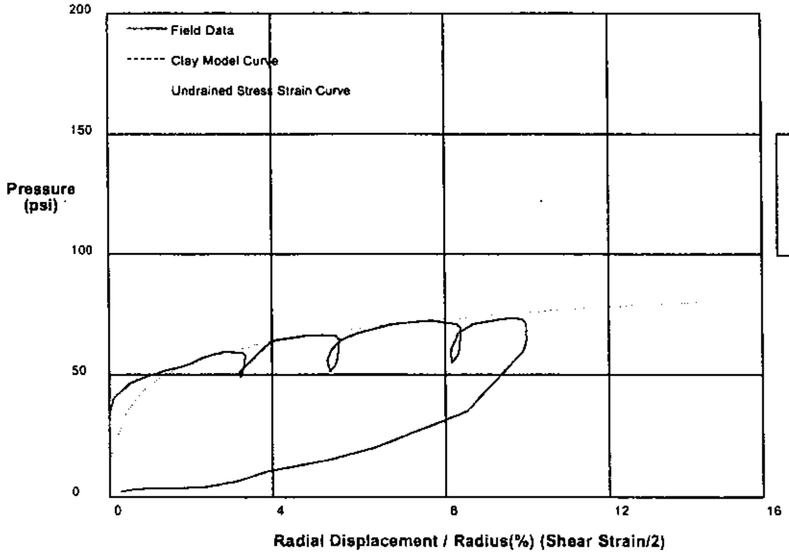
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-16-05

Hole No. BH-42 Depth 23 feet File C:\DATA\C-290\C-29005\PC109.P



GIBSON'S CLAY MODEL

Shear Strength 13 psi
Insitu Stress 15 psi
Shear Modulus 2500 psi

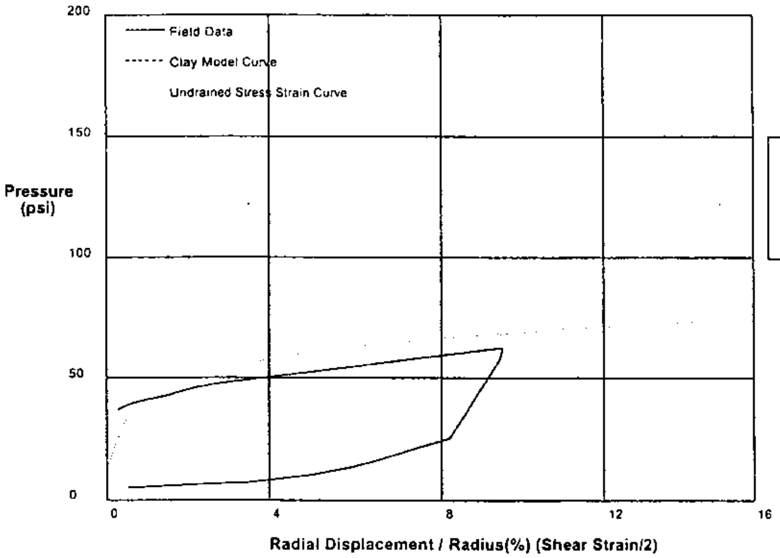
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-16-05

Hole No. bh42 Depth 25feet File C:\DATA\C-290\C-29005\PC110.P



GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 12 psi
Shear Modulus 2500 psi

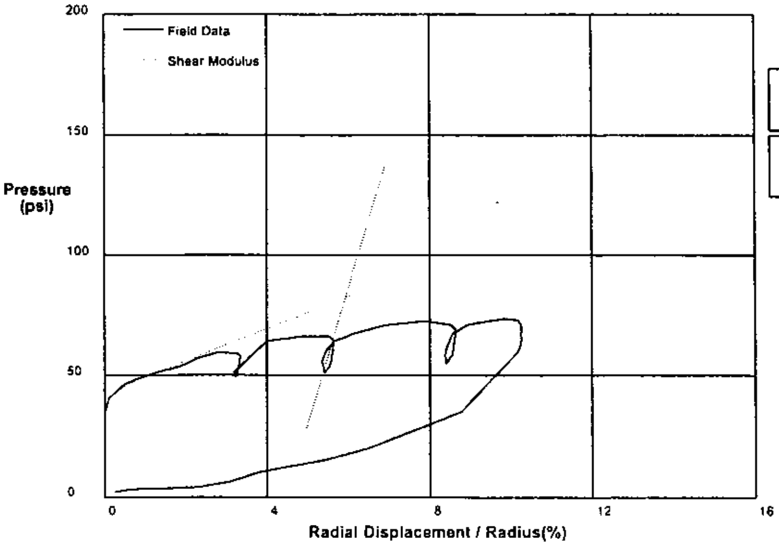
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-16-05

Hole No. BH-42 Depth 23 feet File E:\PC109.P



Shear Modulus 336 psi

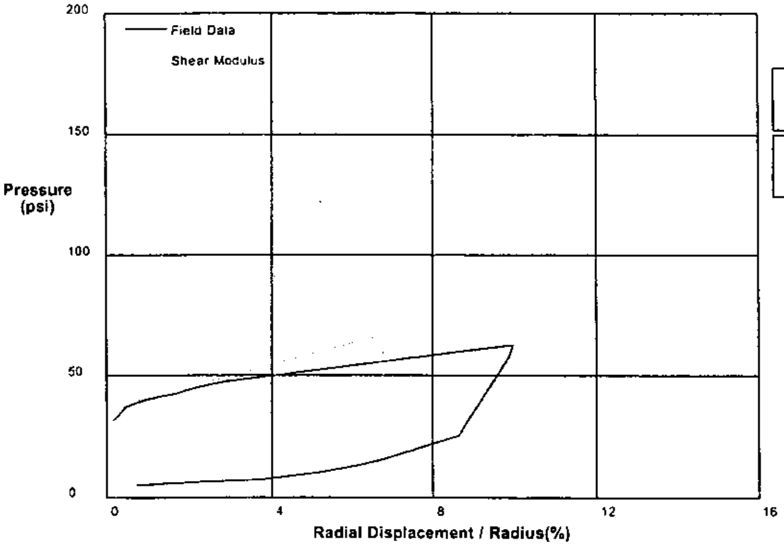
Shear Modulus 2783 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-16-05
Hole No. BH-42 Depth 25 feet File E:\PC110.P



Shear Modulus 224 psi

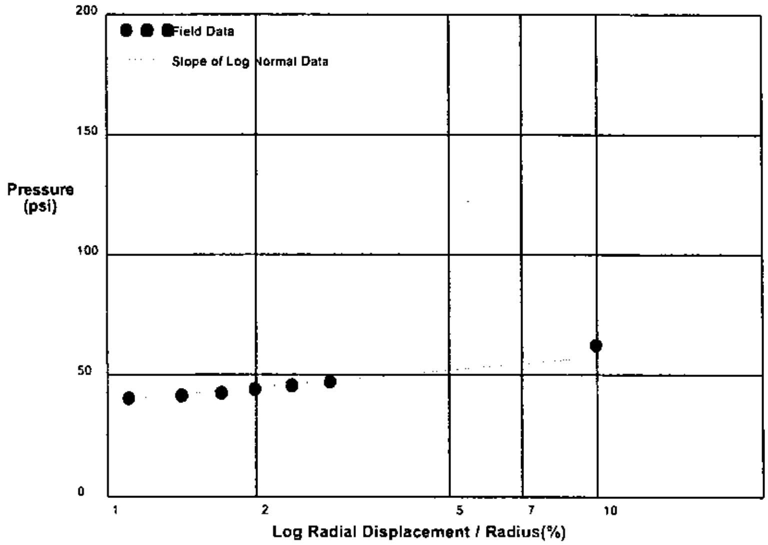
Shear Modulus 0 psi

shift- 2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-16-05
Hole No. BH-42 Depth 25 feet File E:\PC110.P



Shear Strength 7.8 psi
Limit Pressure 68 psi

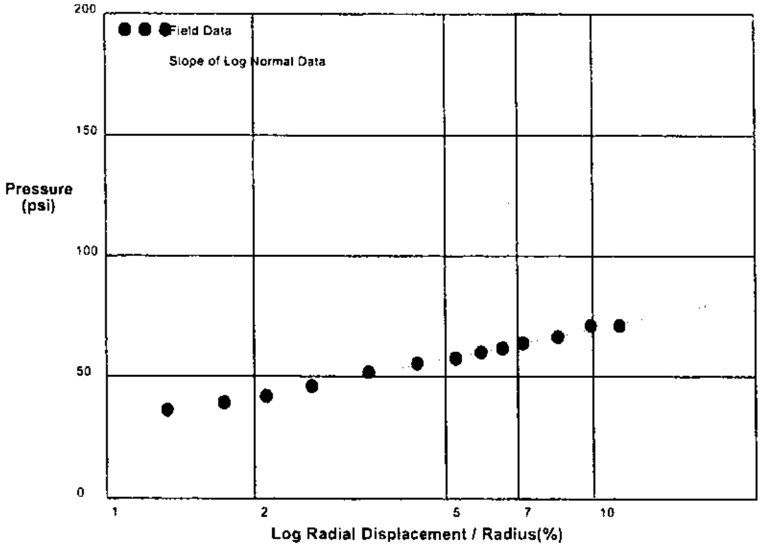
shift-.2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-16-05

Hole No. BH-42 Depth 33 feet File E:\PC111.P



Shear Strength 17.8 psi
Limit Pressure 94 psi

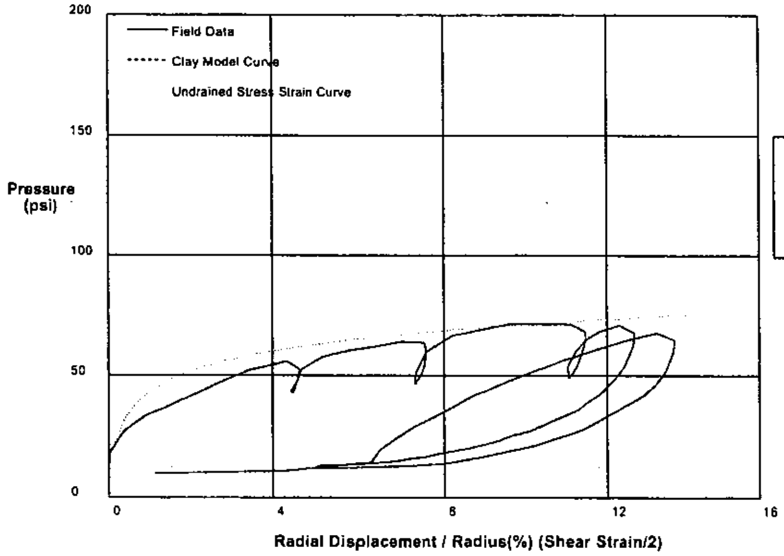
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-16-05

Hole No. BH-42 Depth 33 feet File C:\DATA\C-290\C-29005\PC111.P



GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 17 psi
Shear Modulus 2000 psi

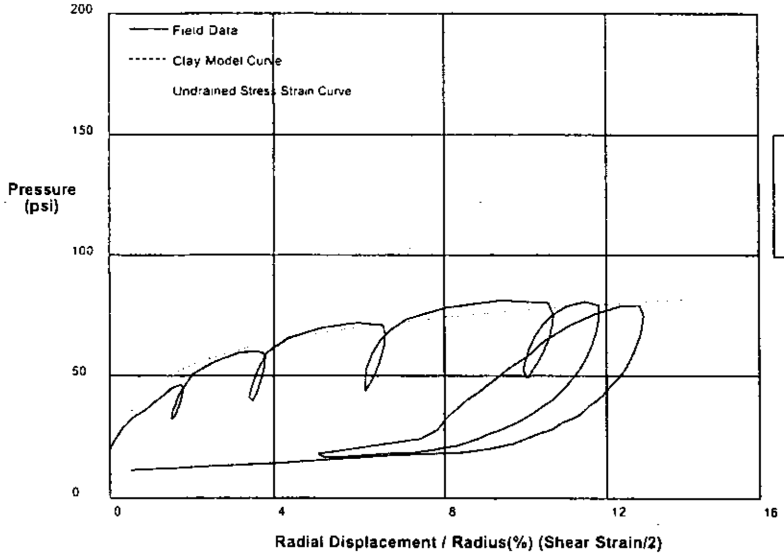
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-16-05

Hole No. BH-42 Depth 35 feet File E:\PC112.P



GIBSON'S CLAY MODEL

Shear Strength 14 psi
Insitu Stress 20 psi
Shear Modulus 1500 psi

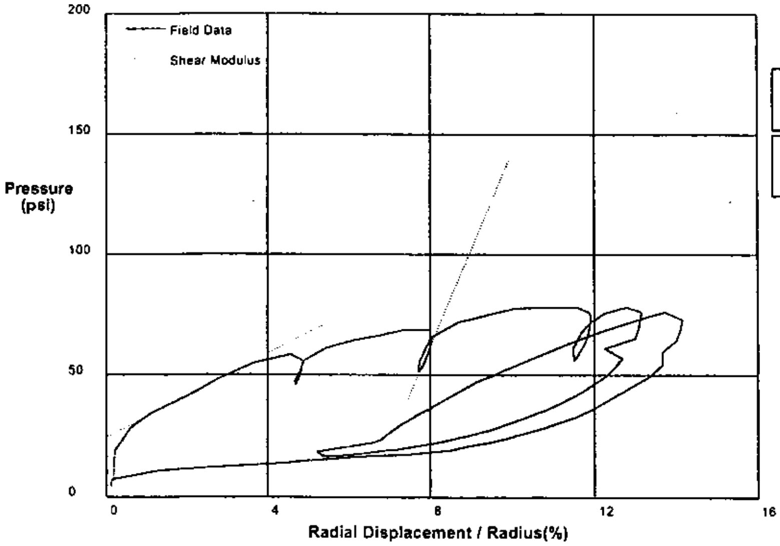
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-16-05

Hole No. BH-42 Depth 33 feet File C:\DATA\C-290\C-29005\PC111.P



Shear Modulus 426 psi

Shear Modulus 2023 psi

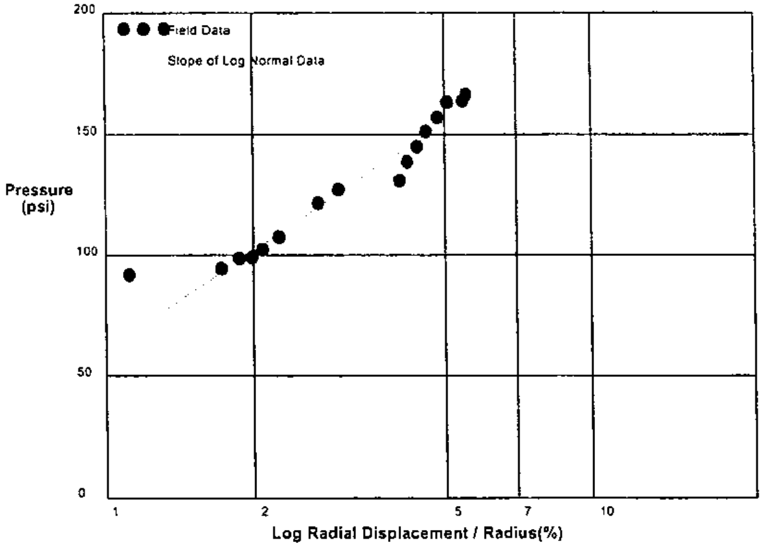
shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-17-05

Hole No. BH-42 Depth 44.5 feet File C:\DATA\C-290\C-29005\PC113.P



Shear Strength 59 psi
Limit Pressure 279 psi

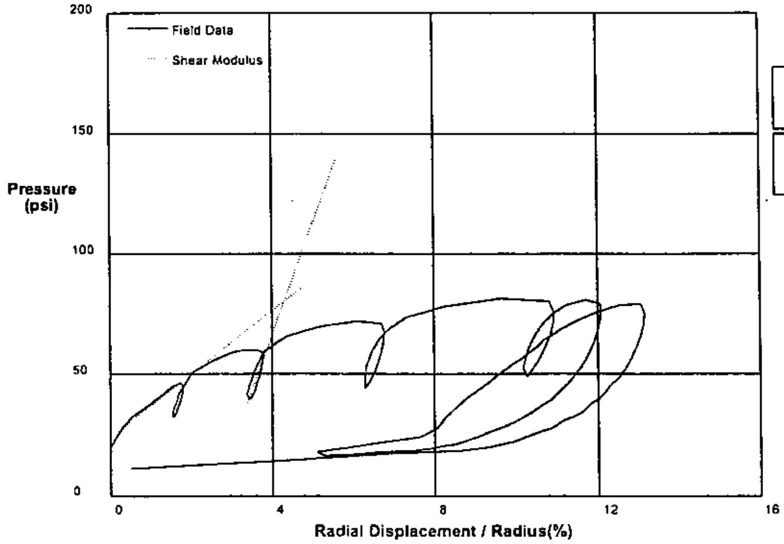
shift 4

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-16-05

Hole No. BH-42 Depth 35 feet File E:\PC112.P



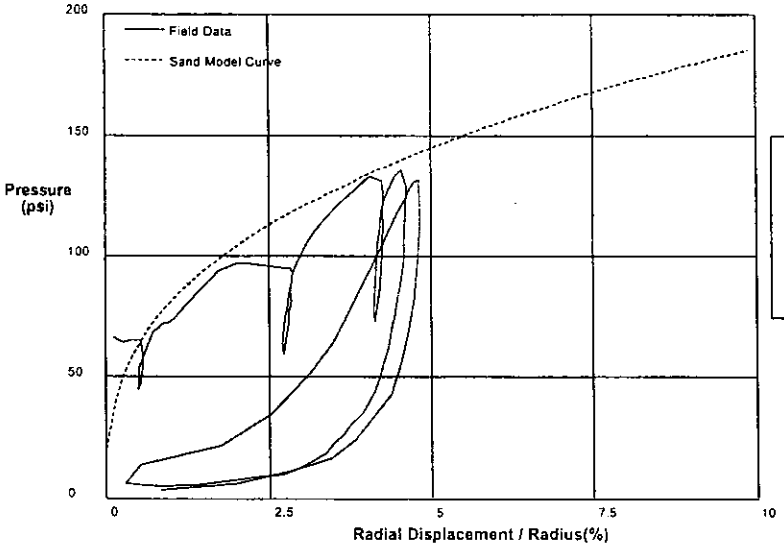
Shear Modulus 653 psi

Shear Modulus 2285 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-17-05
Hole No. BH-42 Depth 44.5 feet File C:\DATA\C-290\C-29005\PC113.P



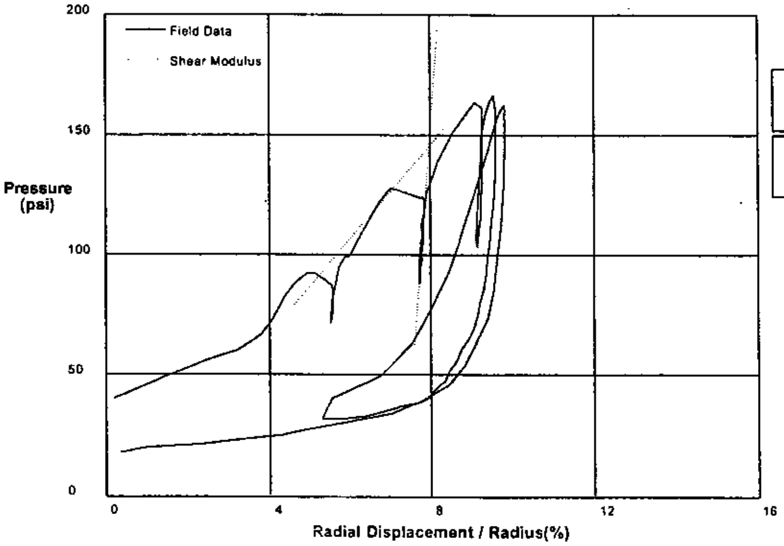
THE HUGHES SAND MODEL

Water Pressure	15 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	20 psi
Shear Modulus	8000 psi

shift 5

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-17-05
Hole No. BH-42 Depth 44.5 feet File C:\DATA\C-290\C-29005\PC113.P



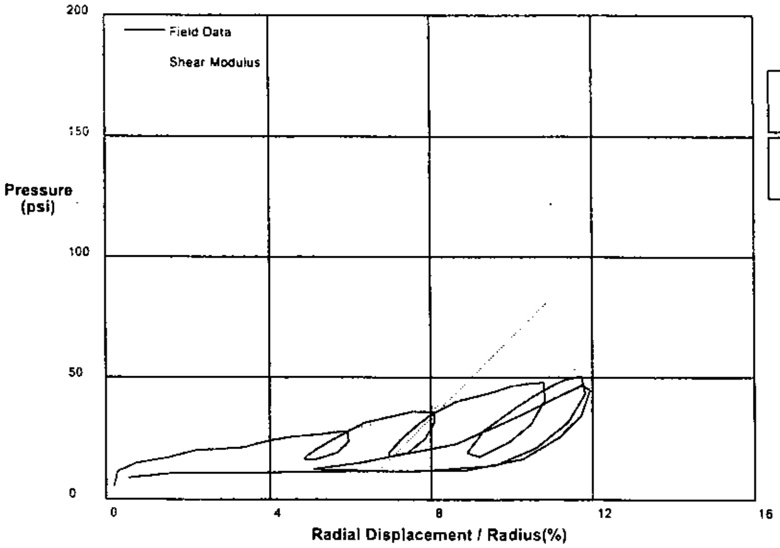
Shear Modulus 979 psi

Shear Modulus 10890 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-17-05
Hole No. BH-42 Depth 43 feet File E:\PC114.P



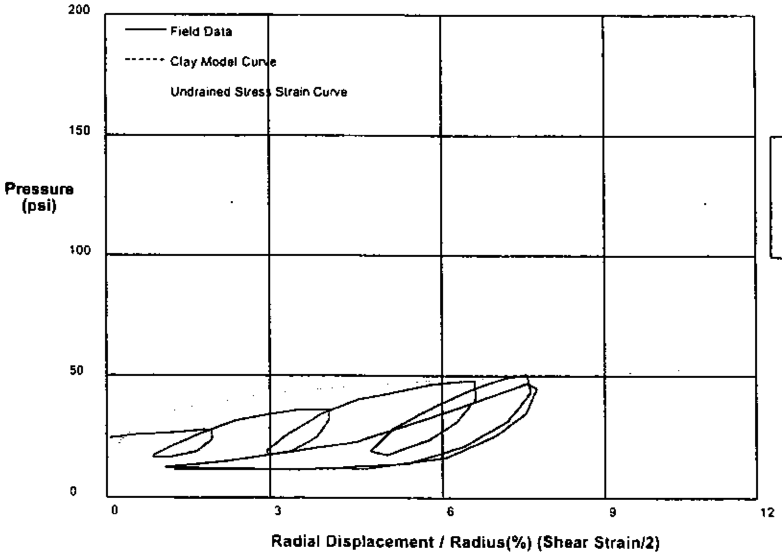
Shear Modulus 224 psi

Shear Modulus 833 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-17-05
Hole No. BH-42 Depth 43 feet File E:\PC114.P



GIBSON'S CLAY MODEL

Shear Strength 8 psi
Insitu Stress 15 psi
Shear Modulus 1500 psi

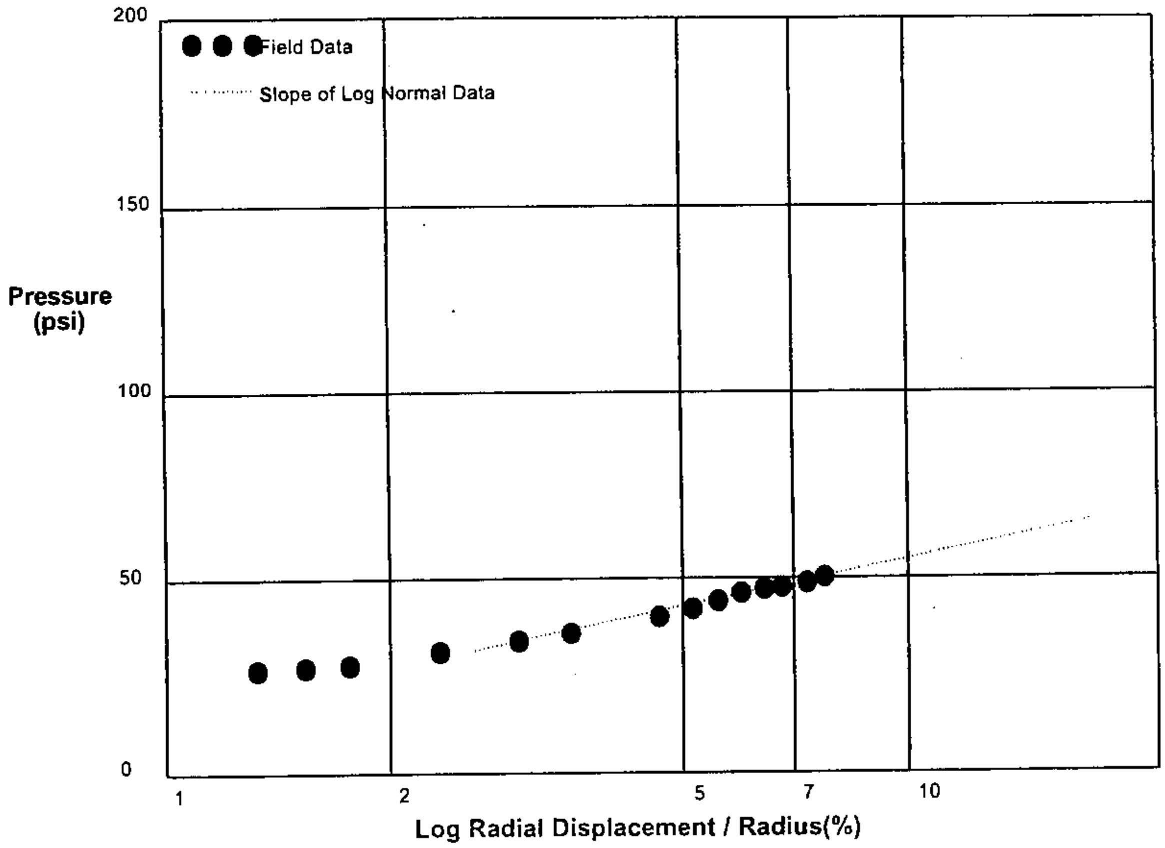
shift 4

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) **1-17-05**

Hole No. BH-42 **Depth 43 feet** **File E:\PC114.P**



Shear Strength 17.8 psi
Limit Pressure 80 psi

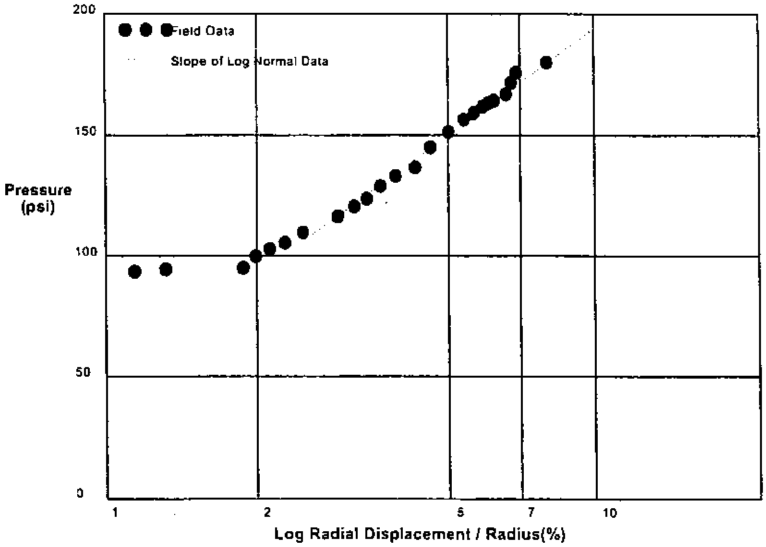
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-22-05

Hole No. BH-45 Depth 50 feet File E:\PC126.P



Shear Strength 63.3 psi
Limit Pressure 283 psi

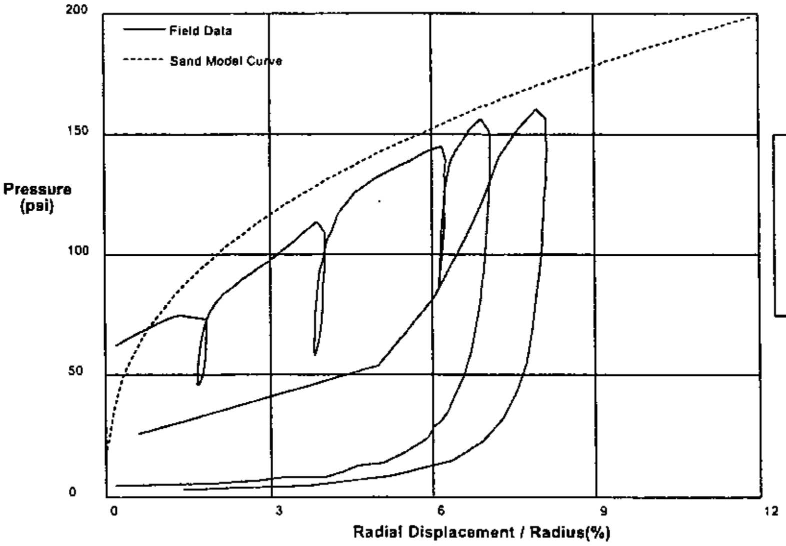
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-22-05

Hole No. BH-45 Depth 50 feet File E:\PC126.P



THE HUGHES SAND MODEL

Water Pressure	20 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	16 psi
Shear Modulus	8000 psi

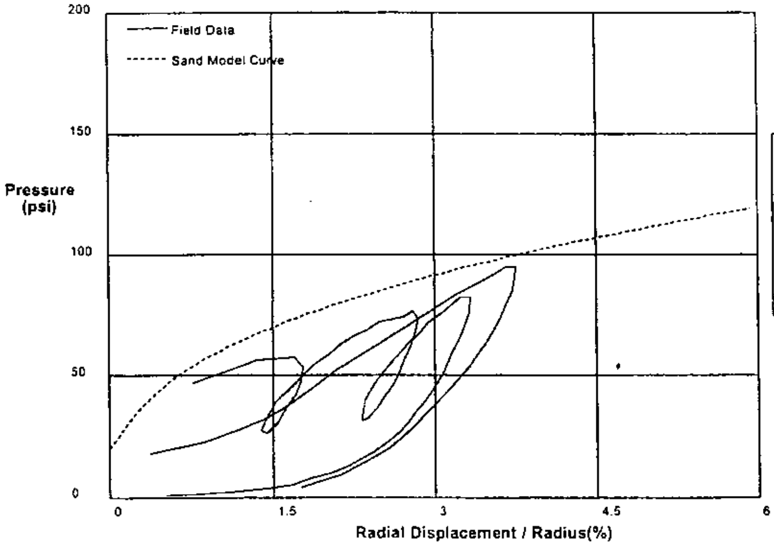
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-22-05

Hole No. BH-45 Depth 60 feet File E:\PC128.P



THE HUGHES SAND MODEL

Water Pressure	25 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	20 psi
Shear Modulus	3000 psi

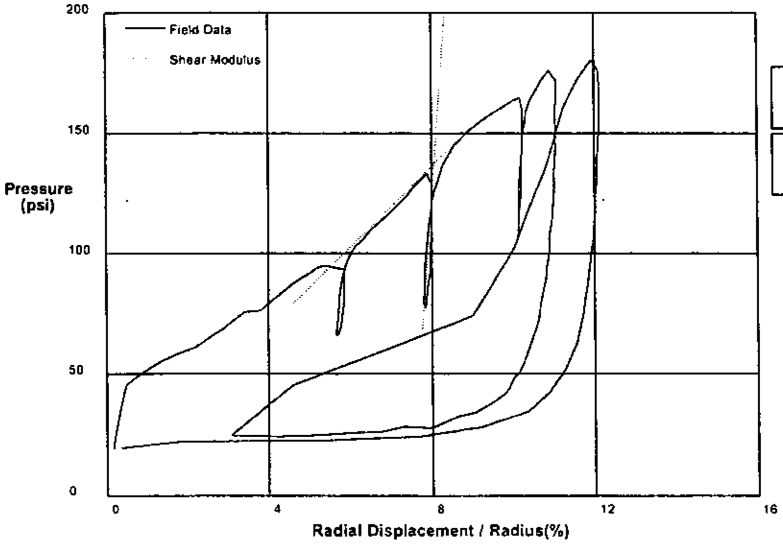
shift 10

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-22-05

Hole No. BH-45 Depth 50 feet File E:\PC126.P



Shear Modulus 841 psi

Shear Modulus 10890 psi

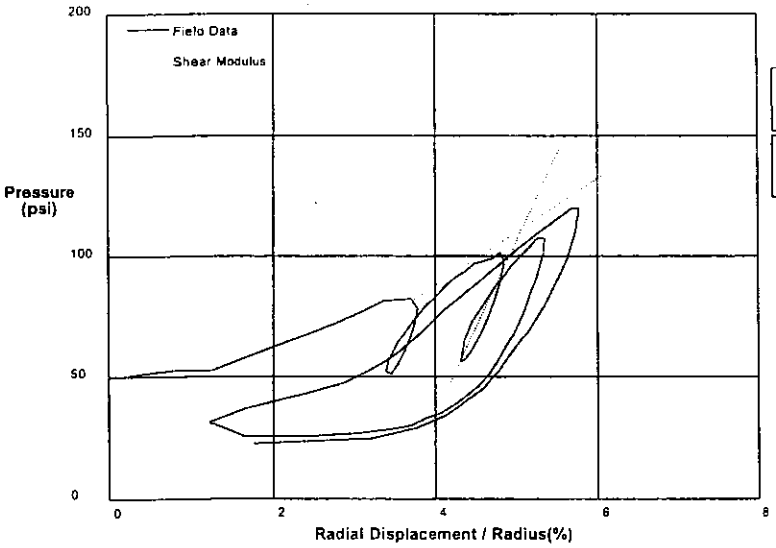
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-22-05

Hole No. BH-45 Depth 60 feet File E:\PC128.P



Shear Modulus 1118 psi

Shear Modulus 3604 psi

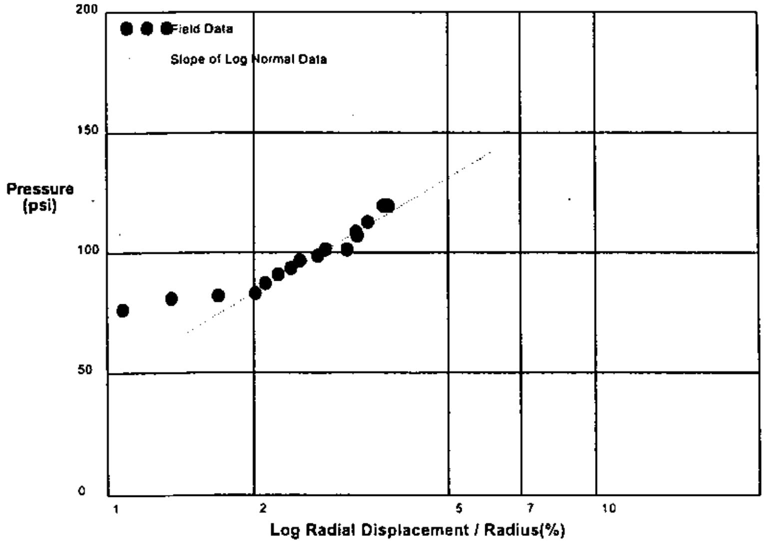
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-22-05

Hole No. BH-45 Depth 60 feet File E:\PC128.P



Shear Strength 52.8 psi
Limit Pressure 242 psi

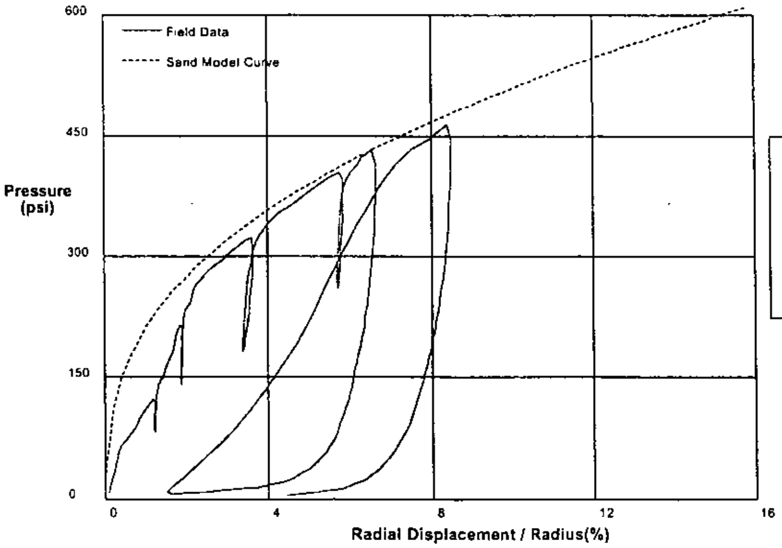
shift 10

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-22-05

Hole No. BH-45 Depth 58.5 feet File E:\PC129.P



THE HUGHES SAND MODEL

Water Pressure	20 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	30 psi
Shear Modulus	40000 psi

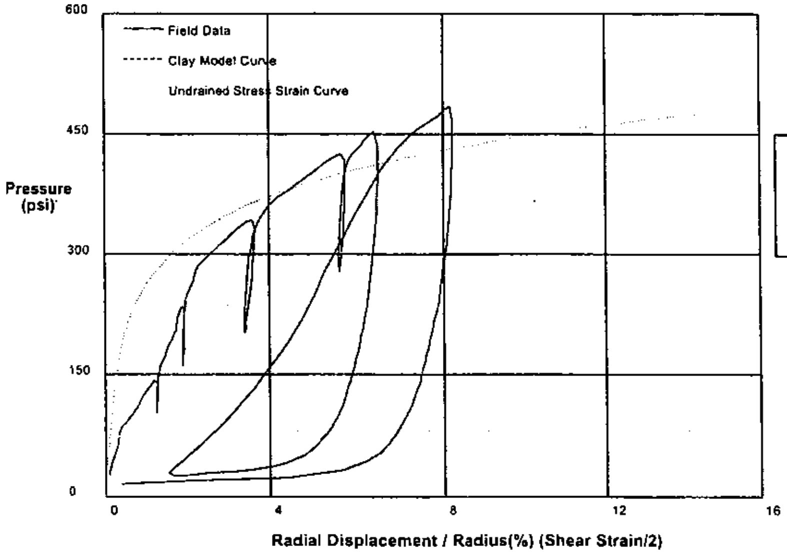
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-22-05

Hole No. BH-45 Depth 58.5 feet File E:\PC129.P



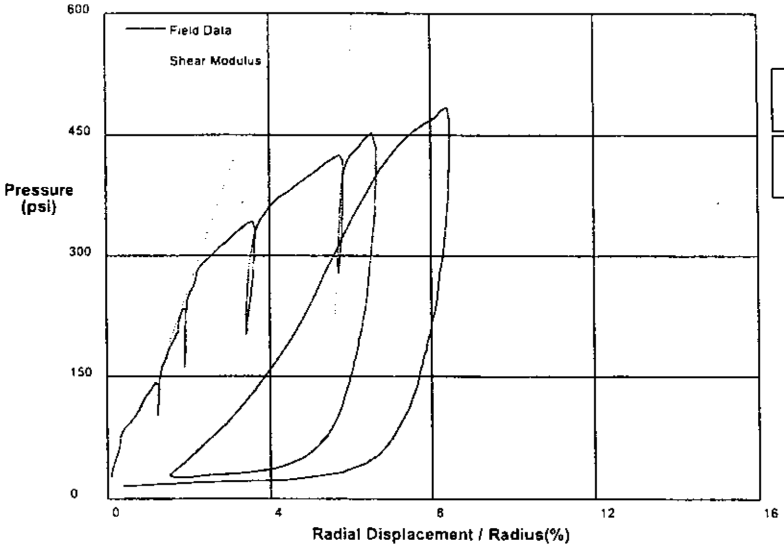
GIBSON'S CLAY MODEL

Shear Strength	80 psi
Insitu Stress	20 psi
Shear Modulus	30000 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-22-05
Hole No. BH-45 Depth 58.5 feet File E:\PC129.P



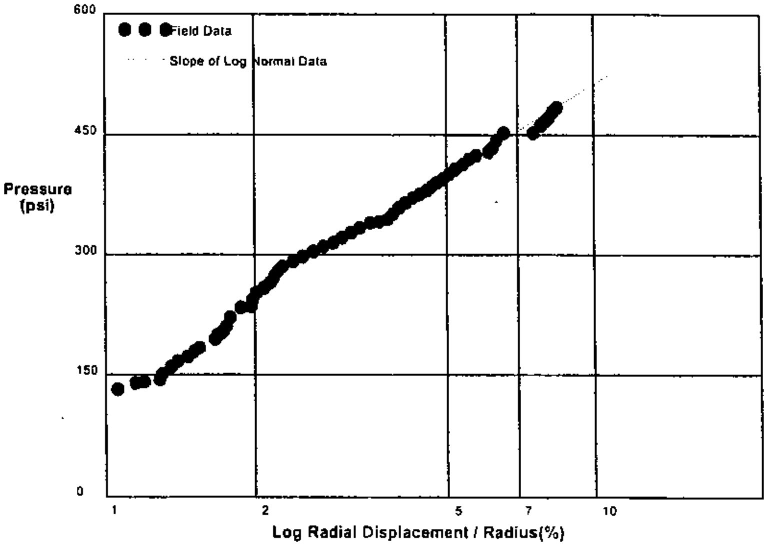
Shear Modulus 7205 psi

Shear Modulus 40000 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-22-05
Hole No. BH-45 Depth 58.5 feet File E:\PC129.P



Shear Strength 164.6 psi
Limit Pressure 745 psi

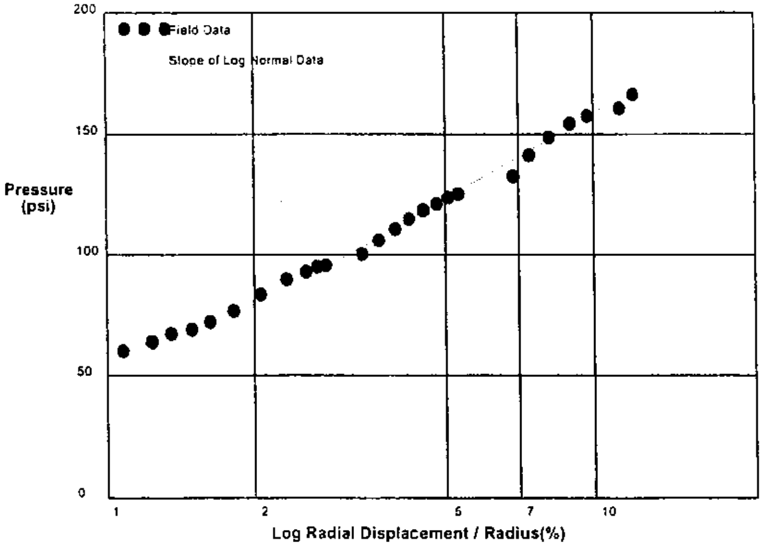
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-23-05

Hole No. BH-45 Depth 70 feet File E:\PC130.P



Shear Strength 50.9 psi
Limit Pressure 230 psi

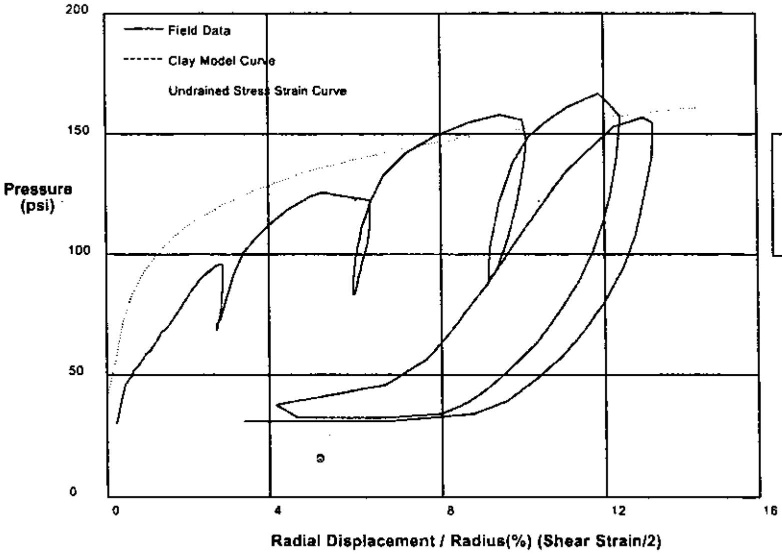
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-23-05

Hole No. BH-45 Depth 70 feet File E:\PC130.P



GIBSON'S CLAY MODEL

Shear Strength 25 psi
Insitu Stress 40 psi
Shear Modulus 4000 psi

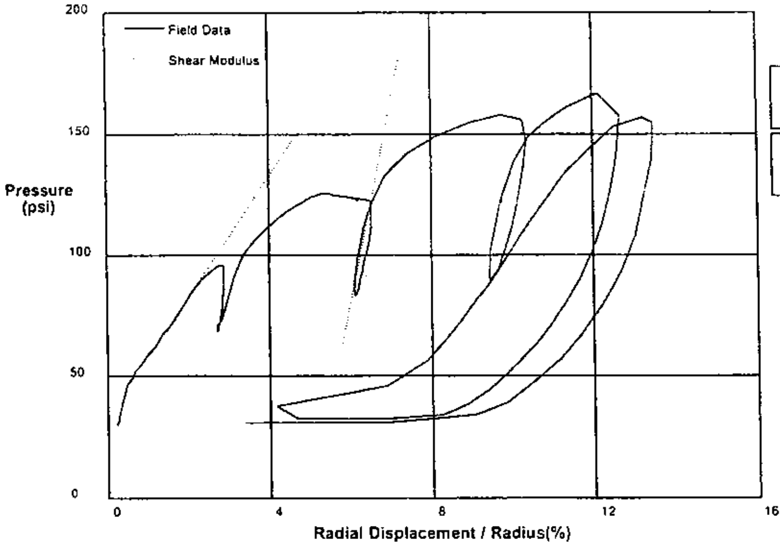
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-23-05

Hole No. BH-45 Depth 70 feet File E:\PC130.P



Shear Modulus 1268 psi

Shear Modulus 4094 psi

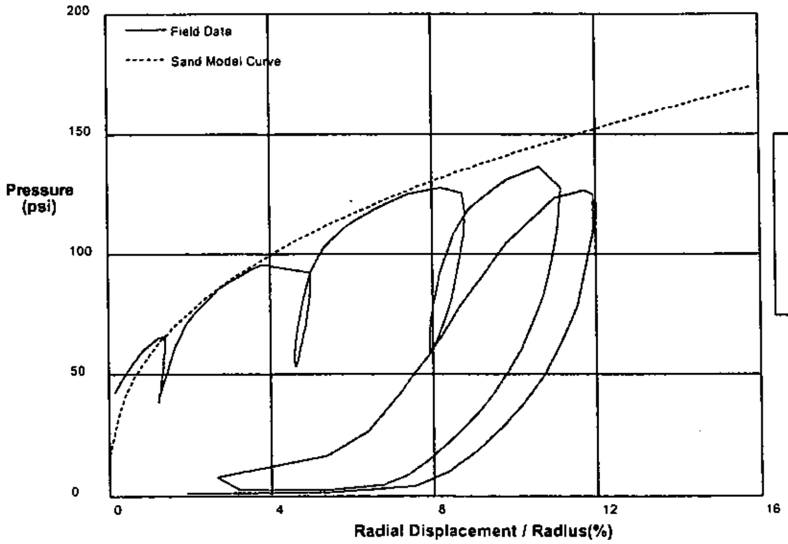
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 1-23-05

Hole No. BH-45 Depth 70 feet File C:\DATA\C-290\C-29005\PC130.P



THE HUGHES SAND MODEL

Water Pressure	30 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	16 psi
Shear Modulus	4000 psi

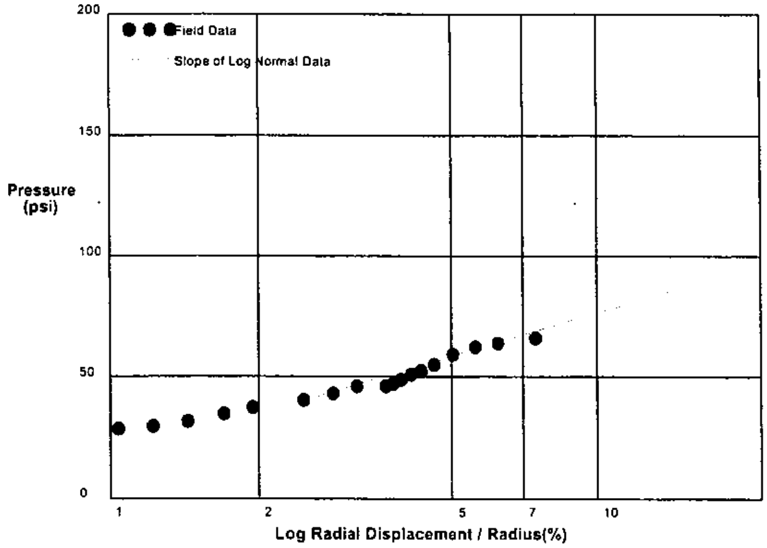
shift 1.5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 30.5 feet File E:\PC159.P



Shear Strength 26 psi
Limit Pressure 113 psi

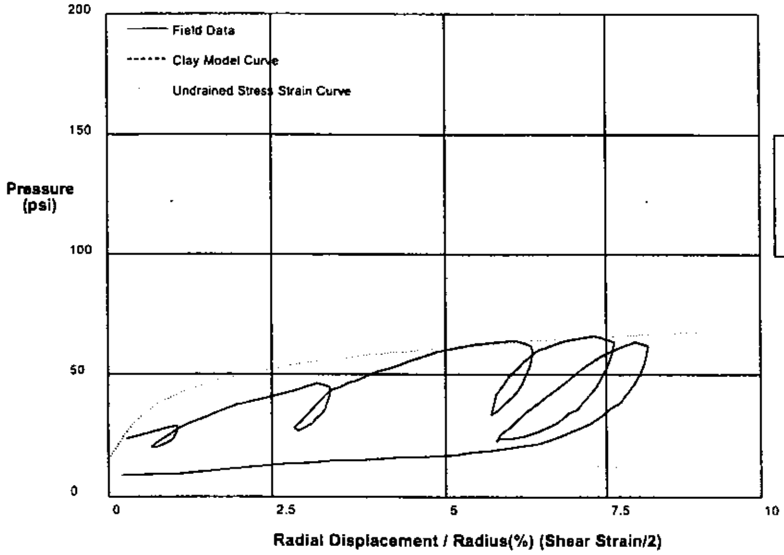
shift 5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 30.5 feet File E:\PC159.P



GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 15 psi
Shear Modulus 2000 psi

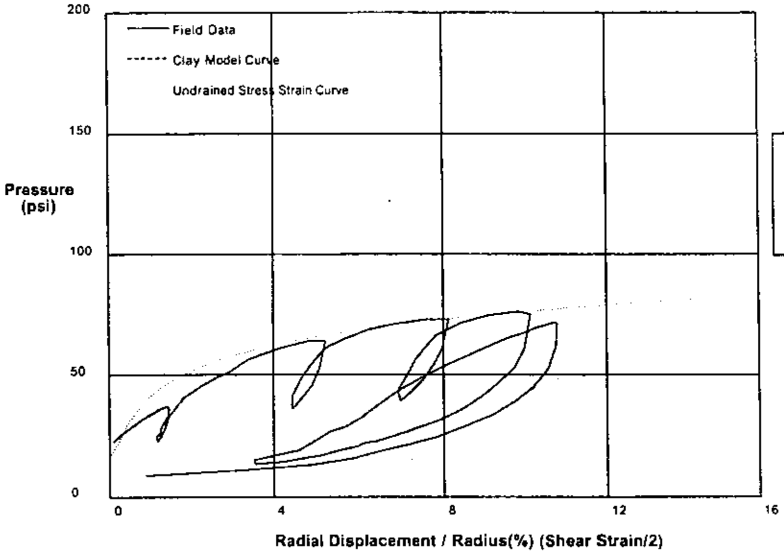
shift 5

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 32.5 feet File C:\DATA\C-290\C-29005\PC160.P



GIBSON'S CLAY MODEL

Shear Strength 15 psi
Insitu Stress 16 psi
Shear Modulus 1500 psi

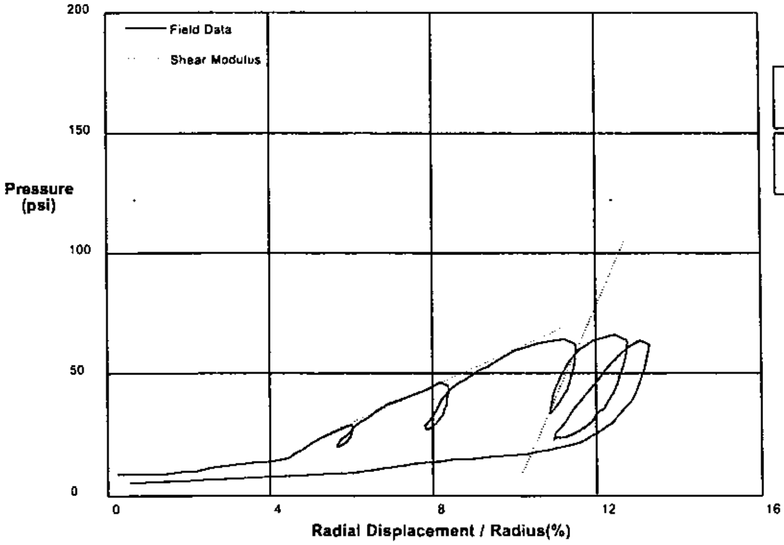
shift 1

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 30.5 feet File E:\PC159.P



Shear Modulus 379 psi

Shear Modulus 1908 psi

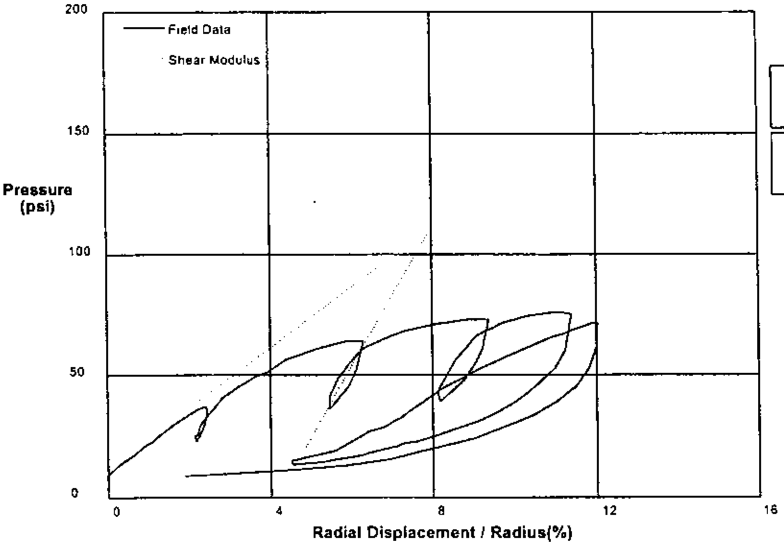
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 32.5feet File E:\PC160.P



Shear Modulus 620 psi

Shear Modulus 1448 psi

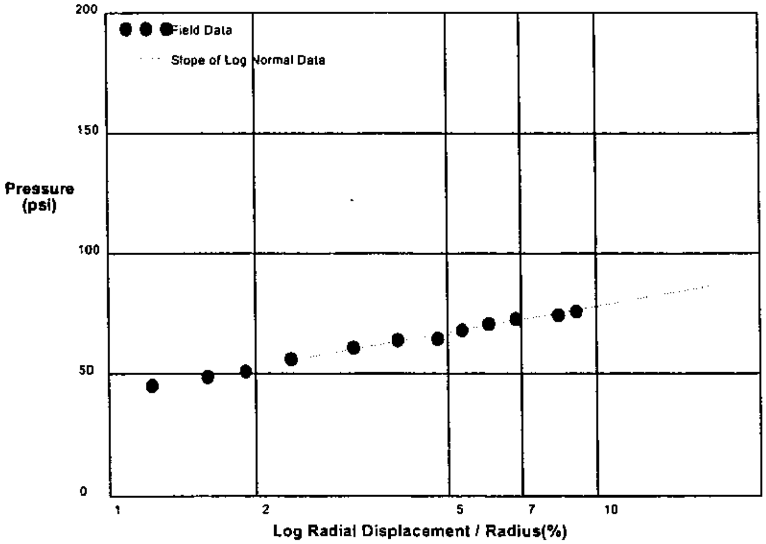
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 32.5feet File E:\PC160.P



Shear Strength 15.6 psi
Limit Pressure 100 psi

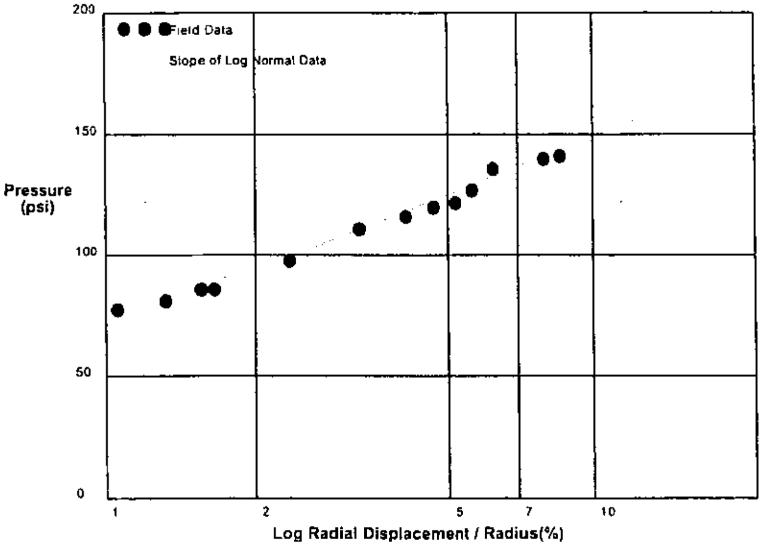
shift 2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 50 feet File E:\PC161.P



Shear Strength 34.2 psi
Limit Pressure 197 psi

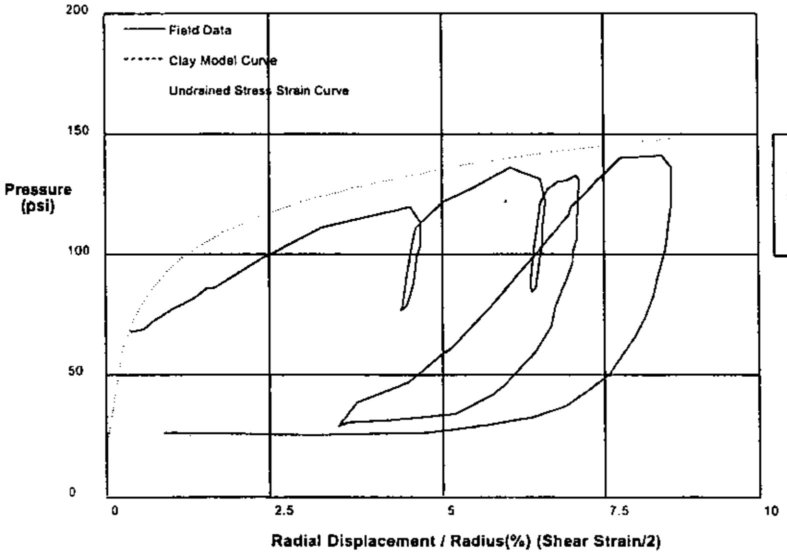
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 50 feet File E:\PC161.P



GIBSON'S CLAY MODEL

Shear Strength 25 psi
Insitu Stress 20 psi
Shear Modulus 9000 psi

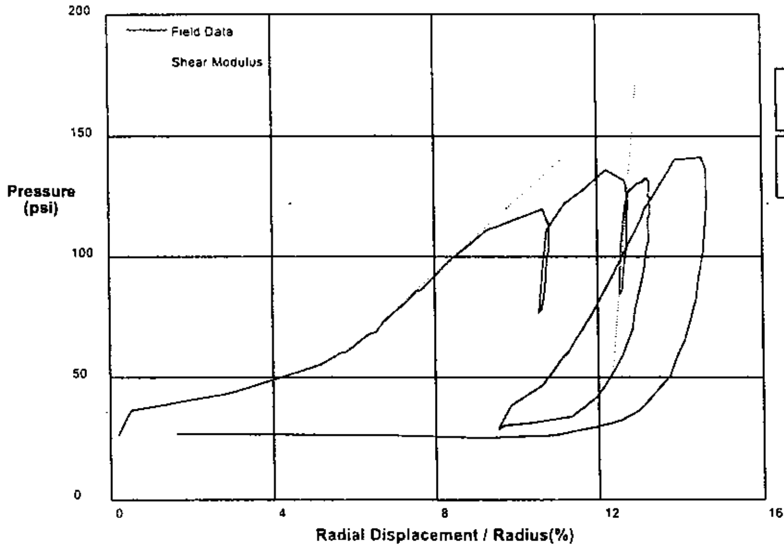
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 50 feet File E:\PC161.P



Shear Modulus 760 psi

Shear Modulus 9166 psi

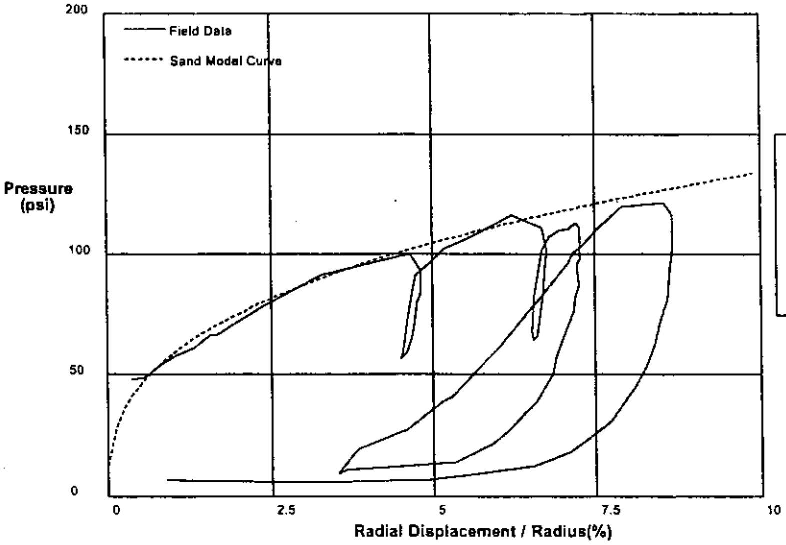
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 50 feet File E:\PC161.P



THE HUGHES SAND MODEL

Water Pressure	20 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	12 psi
Shear Modulus	6000 psi

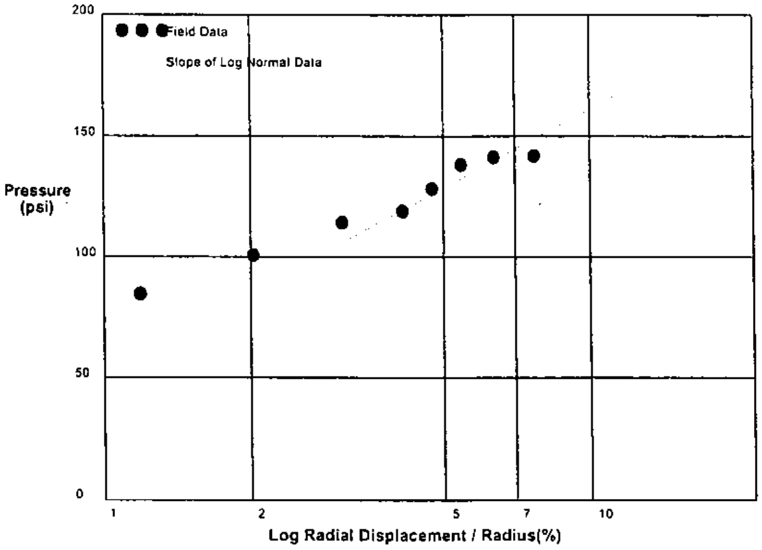
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 48.5feet File E:\PC162.P



Shear Strength 47.2 psi
Limit Pressure 228 psi

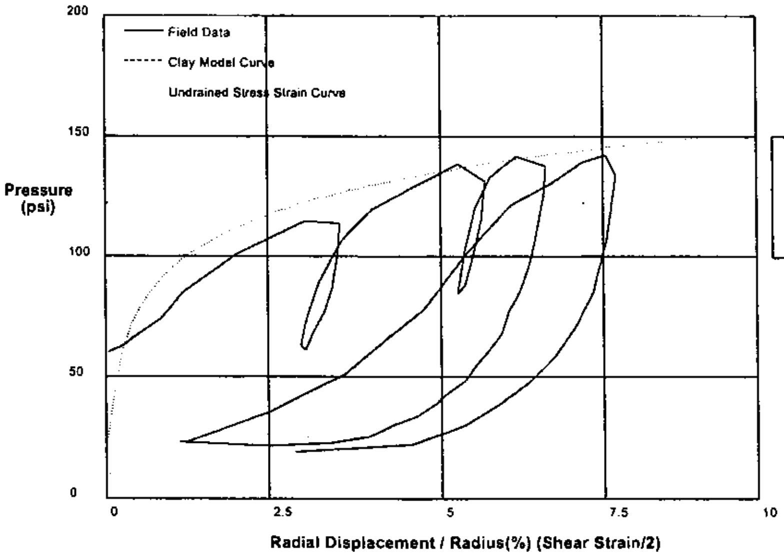
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-3-05

Hole No. BH-48 Depth 48.5feet File E:\PC162.P



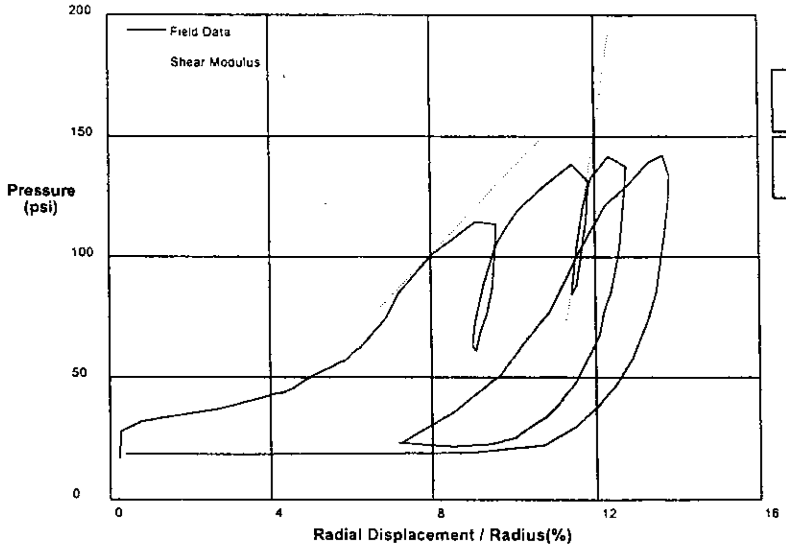
GIBSON'S CLAY MODEL

Shear Strength 25 psi
Insitu Stress 20 psi
Shear Modulus 9000 psi

shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-3-05
Hole No. BH-48 Depth 48.5feet File E:\PC162.P



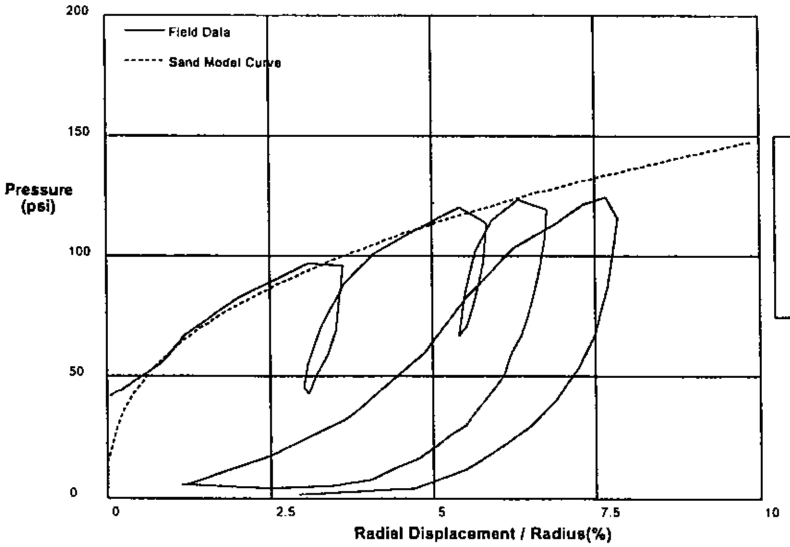
Shear Modulus 885 psi

Shear Modulus 5462 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-3-05
Hole No. BH-48 Depth 48.5 feet File C:\DATA\C-290\C-29005\PC162.P



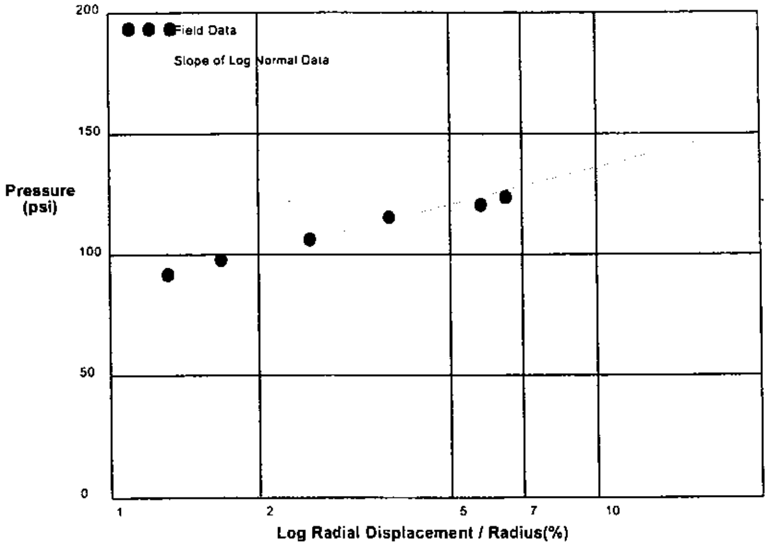
THE HUGHES SAND MODEL

Water Pressure	18 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	14 psi
Shear Modulus	5500 psi

shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-4-05
Hole No. BH-48 Depth 60 feet File E:\PC163.P

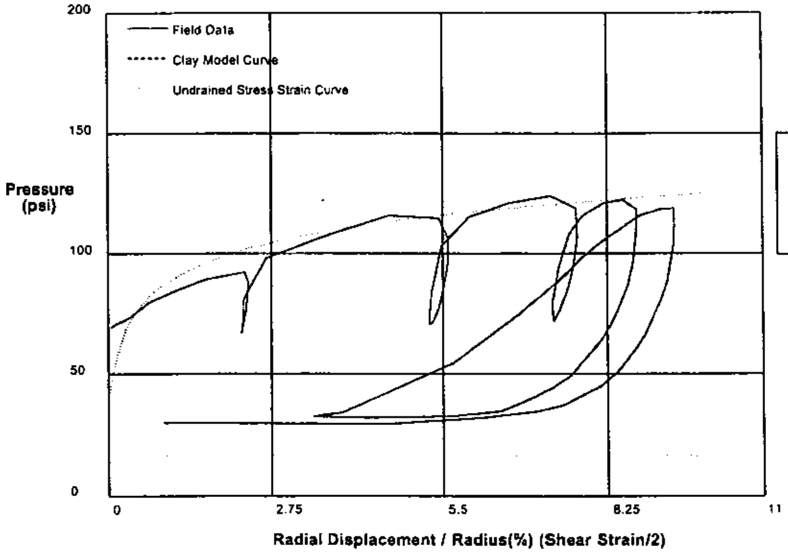


Shear Strength 22.3 psi
Limit Pressure 167 psi

shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-4-05
Hole No. BH-48 Depth 60 feet File C:\DATA\C-290\C-29005\PC163.P



GIBSON'S CLAY MODEL

Shear Strength 16 psi
Insitu Stress 40 psi
Shear Modulus 6000 psi

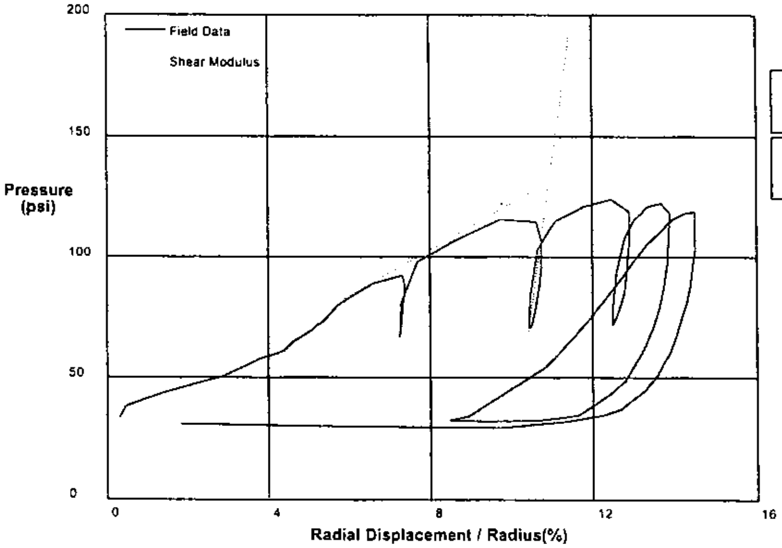
shift 5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-4-05

Hole No. BH-48 Depth 60 feet File E:\PC163.P



Shear Modulus 476 psi

Shear Modulus 6105 psi

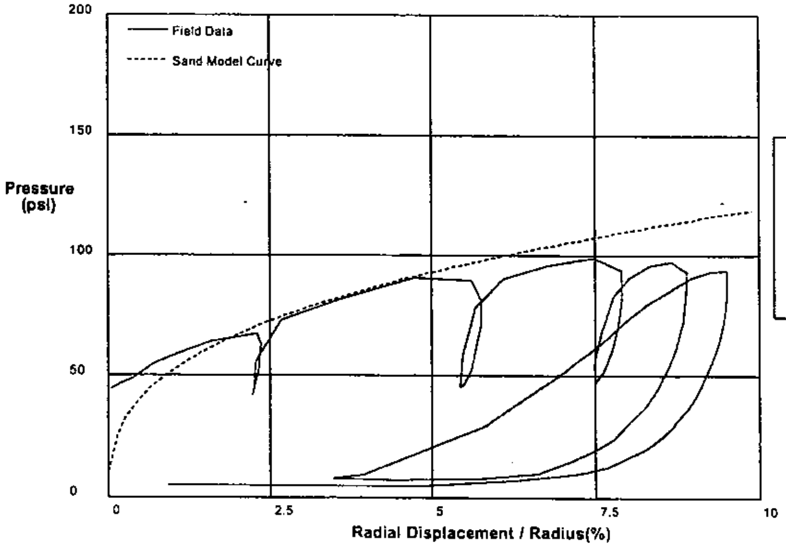
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-4-05

Hole No. BH-48 Depth 60 feet File E:\PC163.P



THE HUGHES SAND MODEL

Water Pressure	25 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	10 psi
Shear Modulus	8000 psi

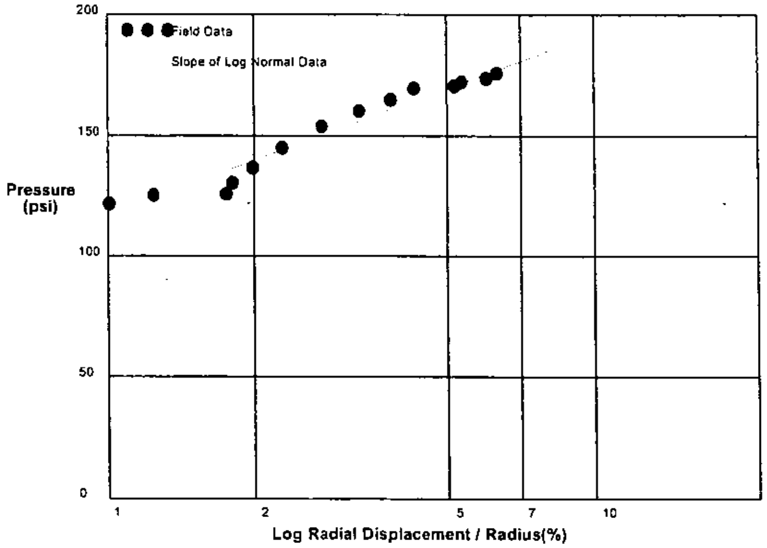
shift 5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-4-05

Hole No. BH-48 Depth 58.5 feet File E:\PC164.P



Shear Strength 32.8 psi

Limit Pressure 238 psi

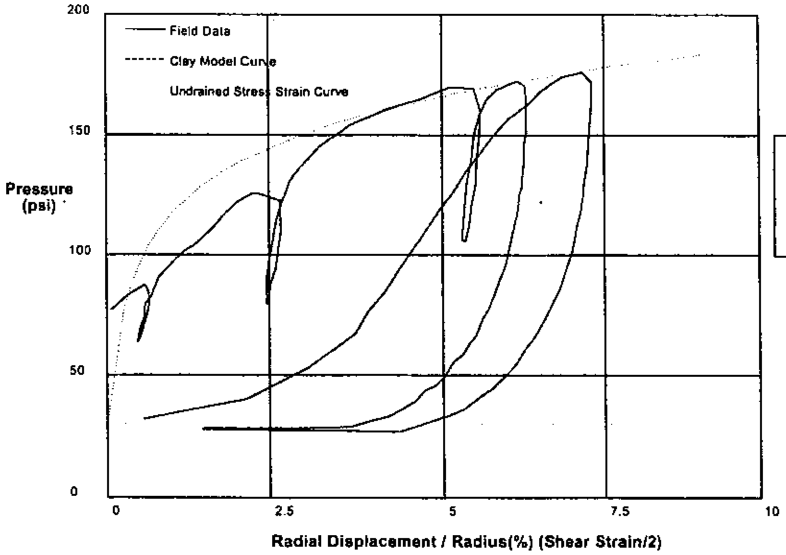
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-4-05

Hole No. BH-48 Depth 58.5 feet File E:\PC164.P



GIBSON'S CLAY MODEL

Shear Strength 30 psi

Insitu Stress 30 psi

Shear Modulus 10000 psi

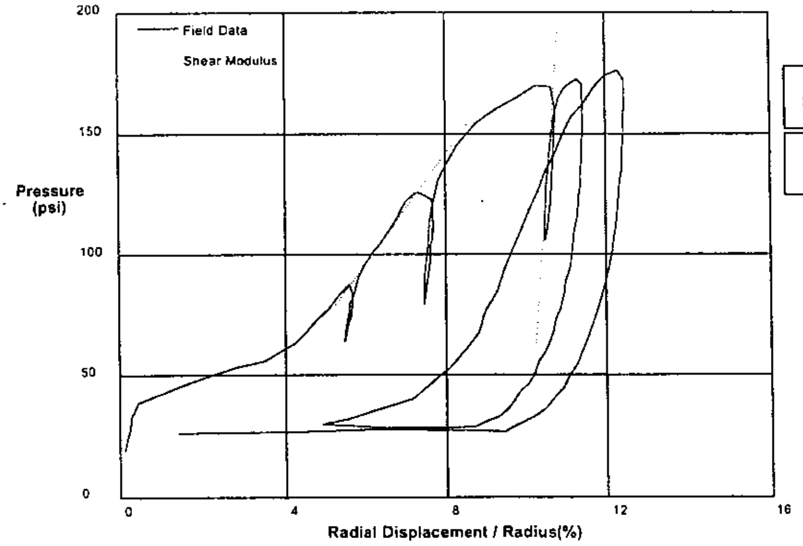
shift 5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-4-05

Hole No. BH-48 Depth 58.5 feet File E:\PC164.P



Shear Modulus 1142 psi

Shear Modulus 10890 psi

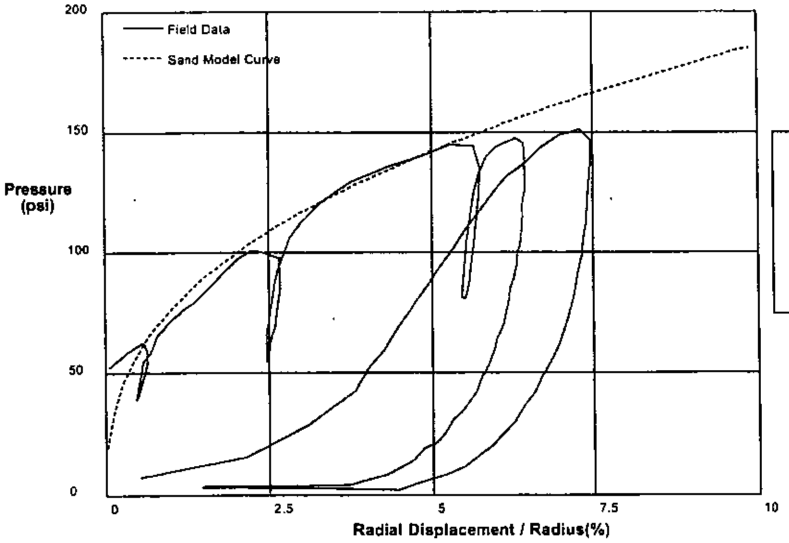
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-4-05

Hole No. BH-48 Depth 58.5 feet File E:\PC164.P



THE HUGHES SAND MODEL

Water Pressure	25 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	16 psi
Shear Modulus	6000 psi

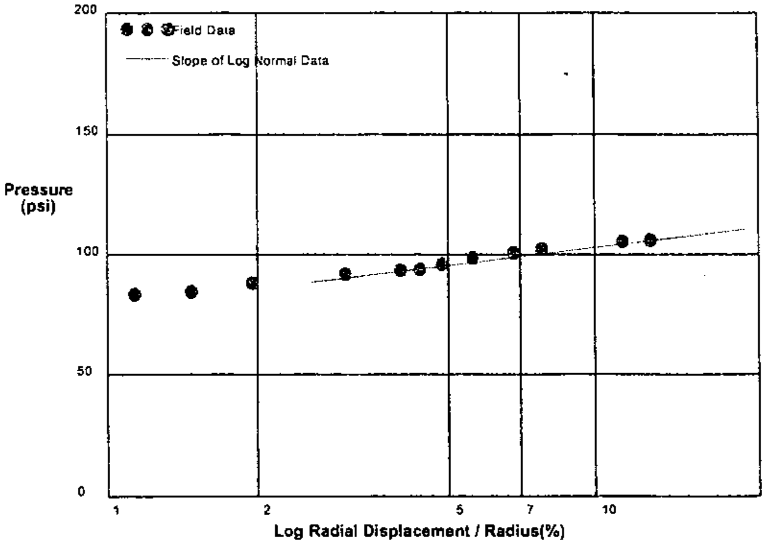
shift 5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 21, 2004

Hole No. 53 Depth 45 ft File C:\DATA\C-290\PC14.P



Shear Strength 10.6 psi
Limit Pressure 118 psi

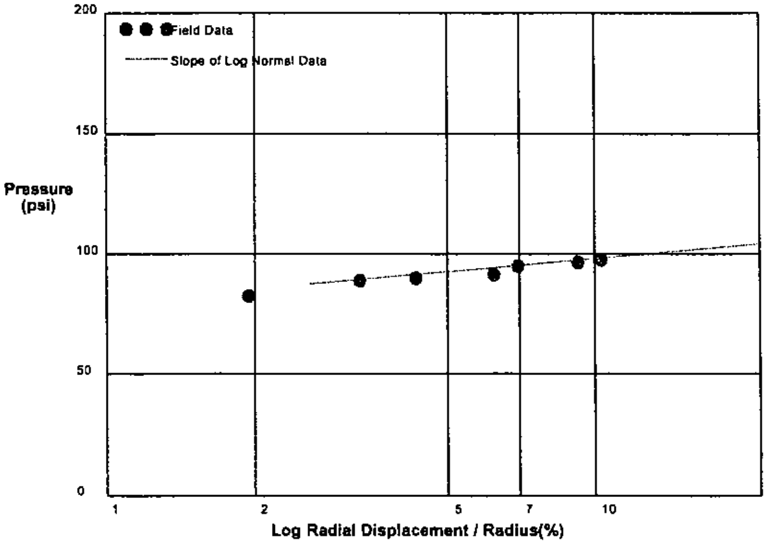
shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 21, 2004

Hole No. 53 Depth 25 ft File C:\DATA\C-290\PC11.P

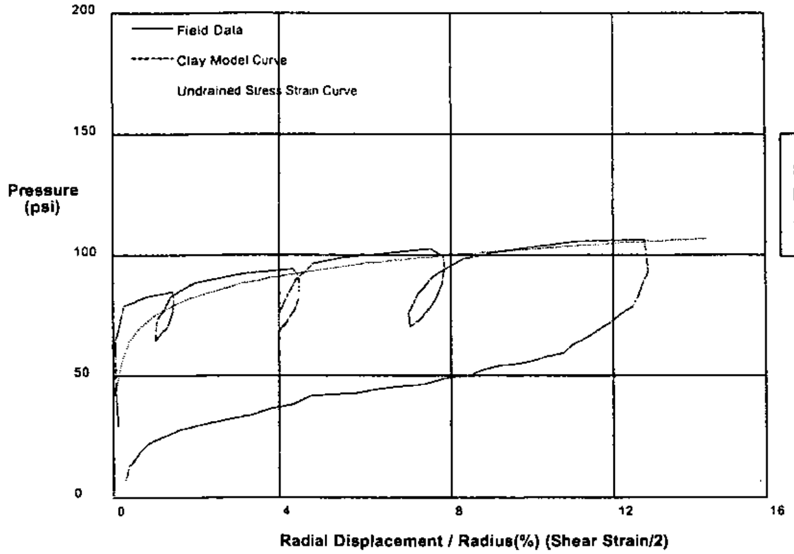


Shear Strength 7.8 psi
Limit Pressure 109 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) October 21, 2004
Hole No. 53 Depth 45 ft File C:\DATA\C-290\PC14.P



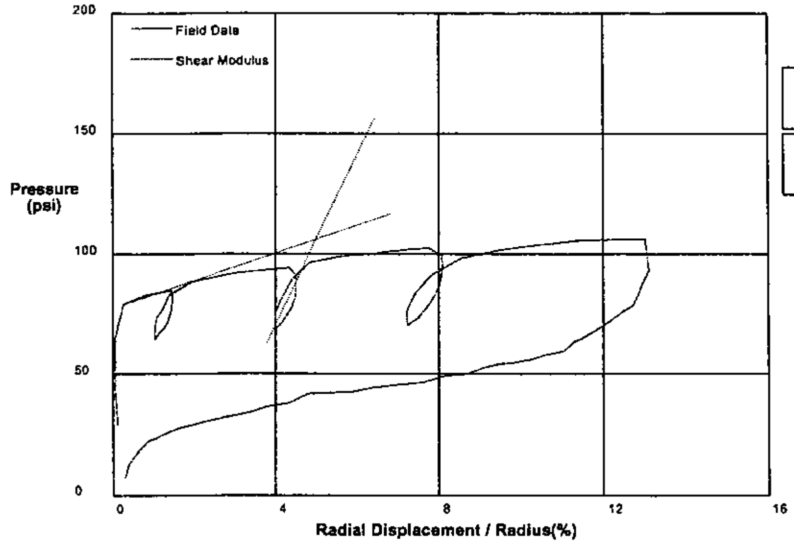
GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 40 psi
Shear Modulus 4000 psi

shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Rail (Downtown) October 21, 2004
Hole No. 53 Depth 45 ft File C:\DATA\C-290\PC14.P



Shear Modulus 1765 psi

Shear Modulus 285 psi

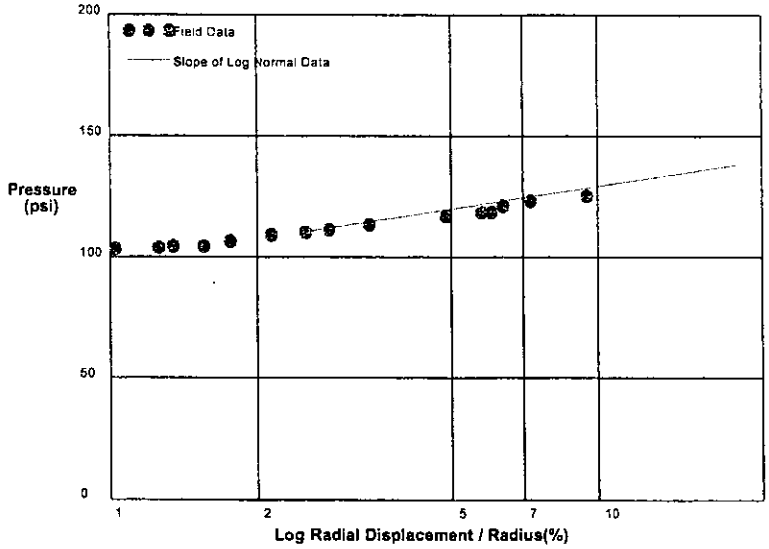
shift-.2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) October 22, 2004

Hole No. 53 Depth 55 ft File C:\DATA\C-290\PC17.P



Shear Strength 13.6 psi
Limit Pressure 148 psi

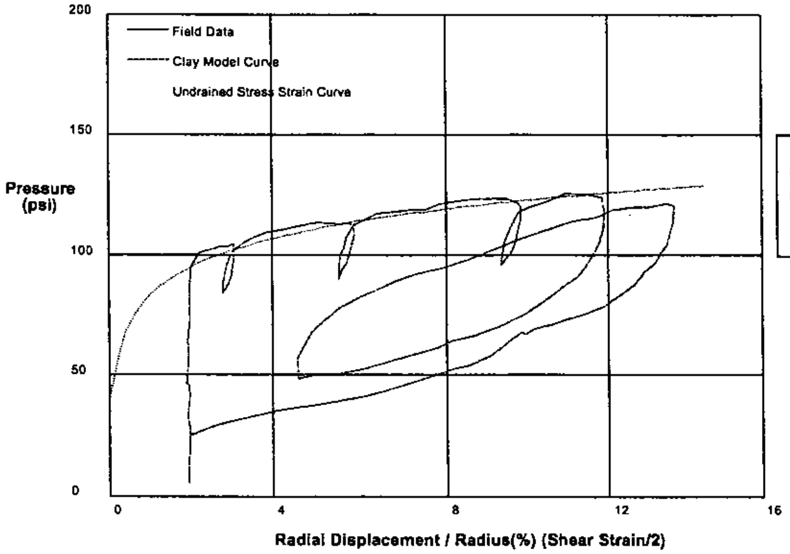
shift-.3

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) October 22, 2004

Hole No. 53 Depth 55 ft File C:\DATA\C-290\PC17.P



GIBSON'S CLAY MODEL

Shear Strength 17 psi
Insitu Stress 40 psi
Shear Modulus 4000 psi

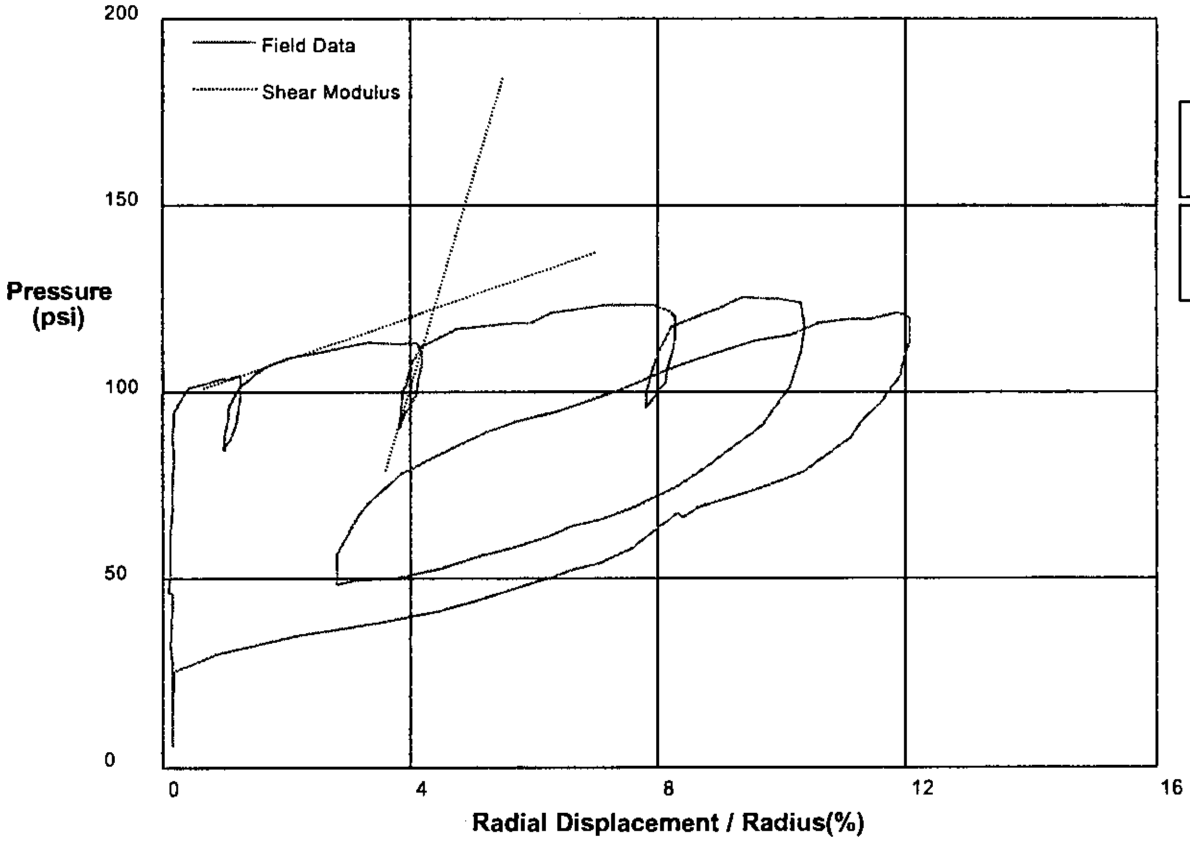
shift-2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) October 22, 2004

Hole No. 53 Depth 55 ft File C:\DATA\C-290\PC17.P



Shear Modulus 2753 psi

Shear Modulus 285 psi

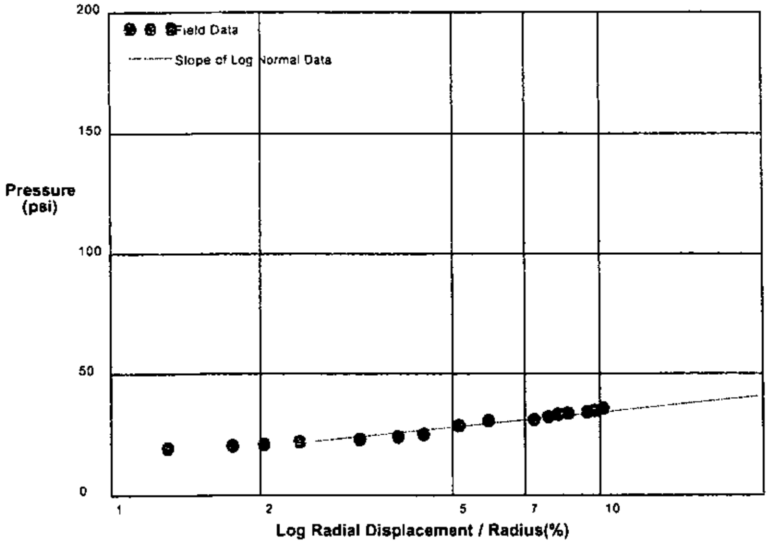
shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) October 18, 2004

Hole No. 55 Depth 25 File C:\DATA\C-290\PC1.P



Shear Strength 8.8 psi
Limit Pressure 46 psi

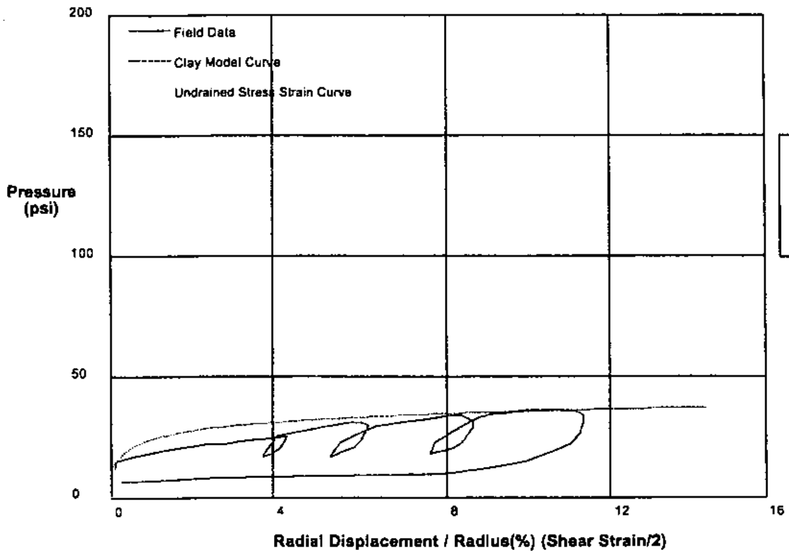
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) October 18, 2004

Hole No. 55 Depth 25 ft File C:\DATA\C-290\PC1.P



GIBSON'S CLAY MODEL

Shear Strength 5 psi
Insitu Stress 12 psi
Shear Modulus 1000 psi

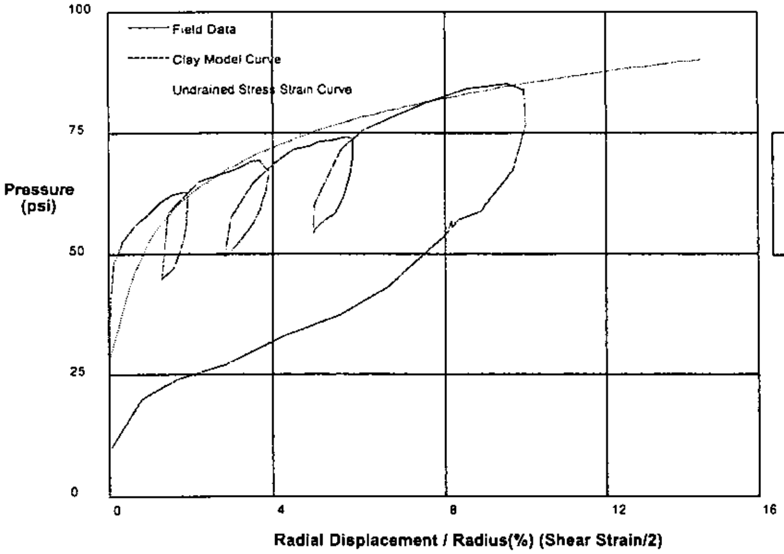
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 18, 2004

Hole No. 55 Depth 45 ft File C:\DATA\C-290\PC3.P



GIBSON'S CLAY MODEL

Shear Strength 14 psi
Insitu Stress 28 psi
Shear Modulus 1500 psi

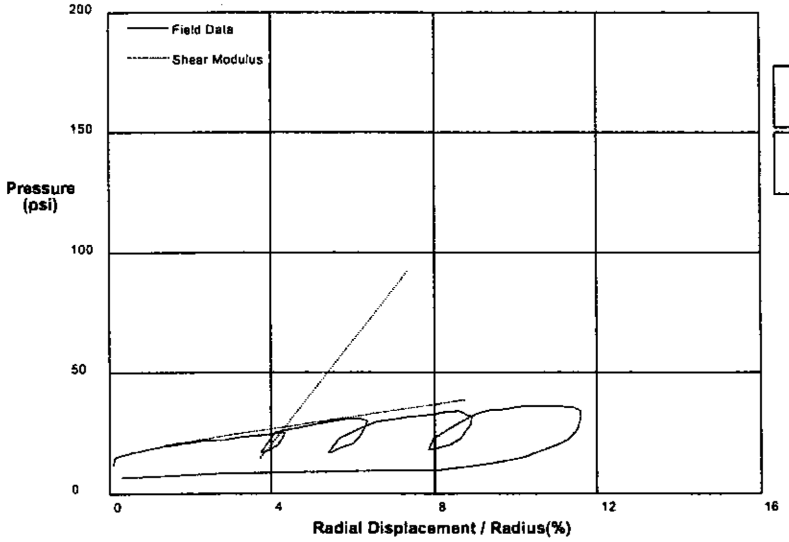
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) Ooctober 18, 2004

Hole No. 55 Depth 25 ft File C:\DATA\C-290\PC1.P



Shear Modulus 1085 psi

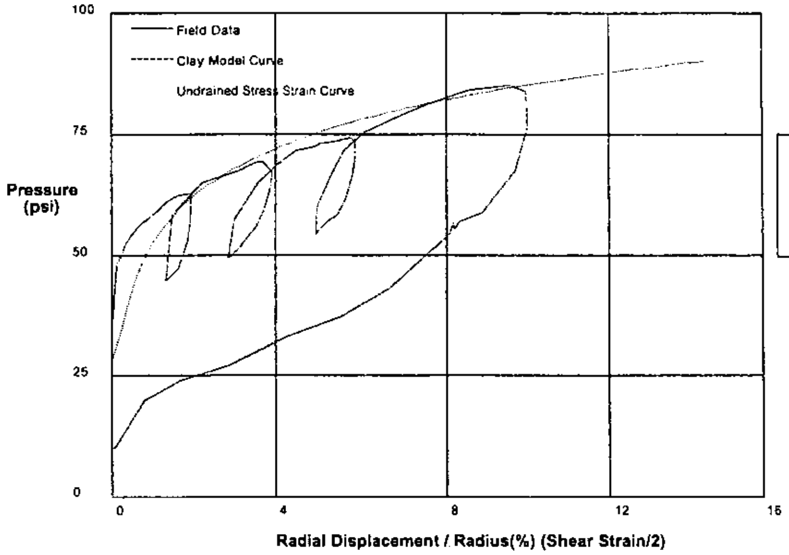
Shear Modulus 127 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown)	October 18, 2004
Hole No. 55 Depth 45 ft	File C:\DATA\C-290\PC3.P



GIBSON'S CLAY MODEL

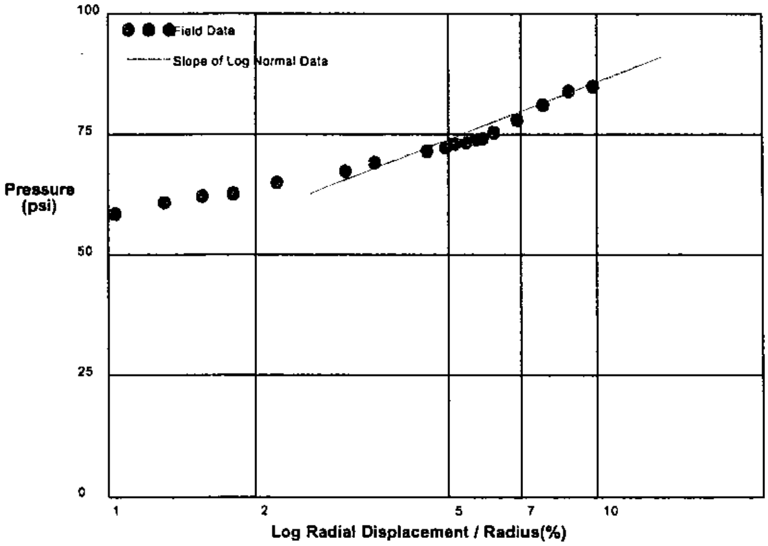
Shear Strength 14 psi
Insitu Stress 28 psi
Shear Modulus 1500 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown)	October 18, 2004
Hole No. 55 Depth 45 ft	File C:\DATA\C-290\PC3.P



Shear Strength 17.1 psi
Limit Pressure 110 psi

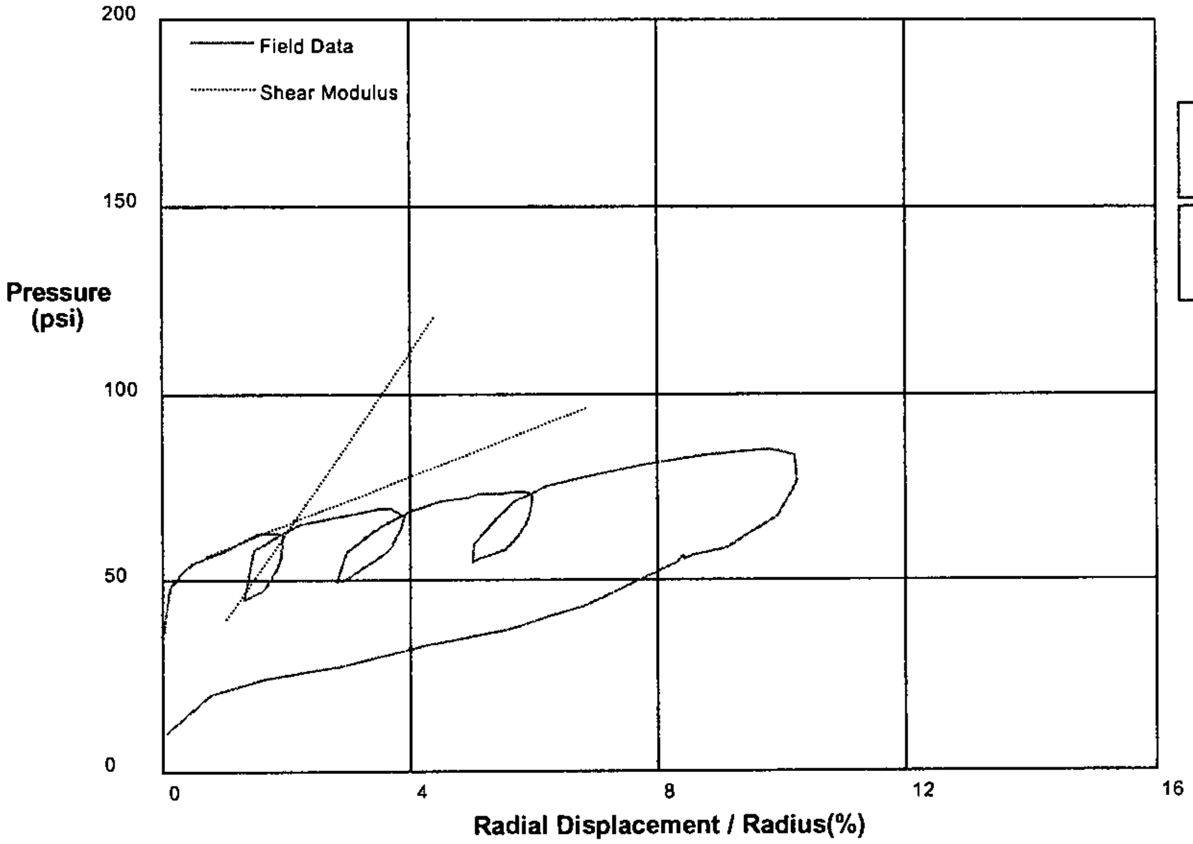
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) **October 18, 2004**

Hole No. 55 **Depth 45 ft** **File C:\DATA\C-290\PC3.P**



Shear Modulus 1203 psi

Shear Modulus 323 psi

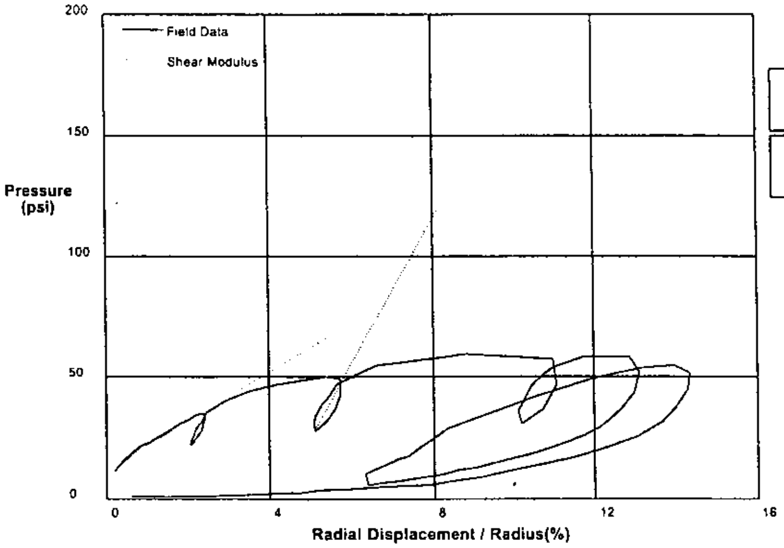
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH 60 Depth 13 feet File E:\PC165.P



Shear Modulus 502 psi

Shear Modulus 1527 psi

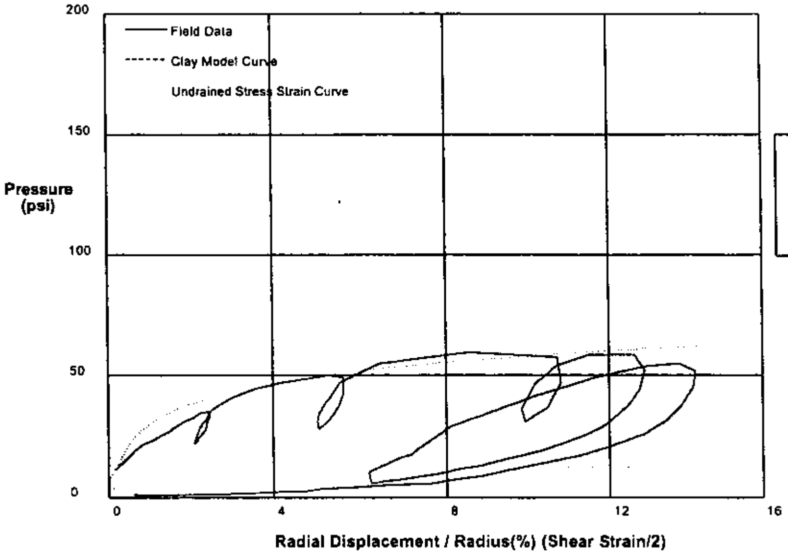
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 13 feet File C:\DATA\C-290\C-29005\PC165.P



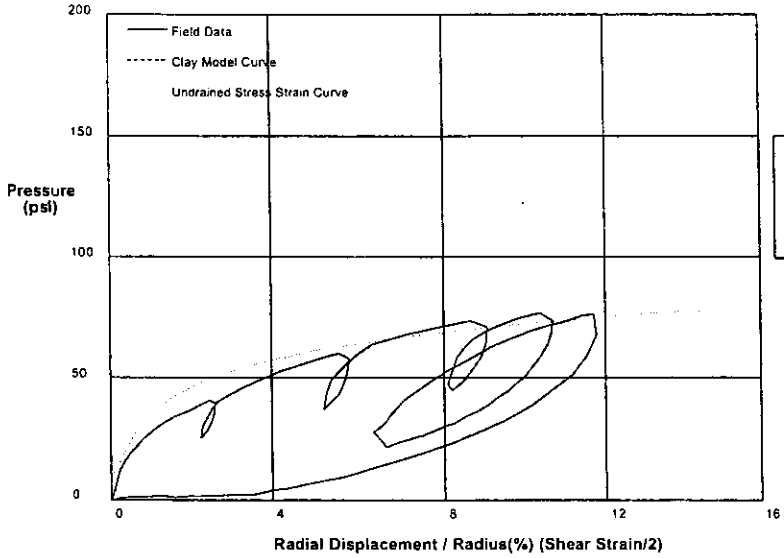
GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 7 psi
Shear Modulus 1500 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 15 feet File C:\DATA\C-290\C-29005\PC166.P



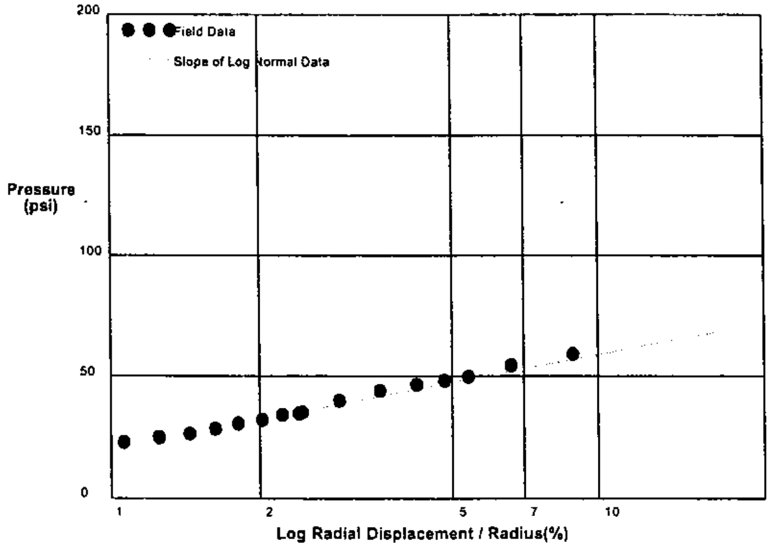
GIBSON'S CLAY MODEL

Shear Strength 16 psi
Insitu Stress 9 psi
Shear Modulus 1500 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH 60 Depth 13 feet File E:\PC165.P



Shear Strength 16.7 psi
Limit Pressure 62 psi

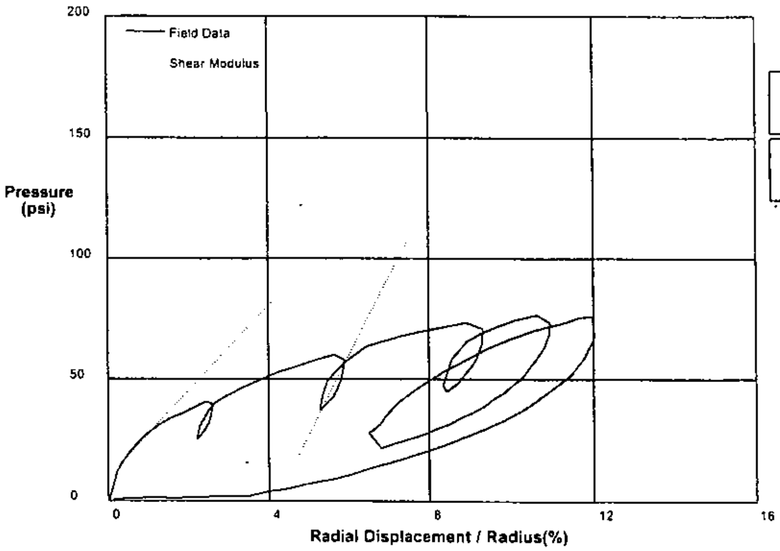
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 15 feet File E:\PC166.P



Shear Modulus 885 psi

Shear Modulus 1612 psi

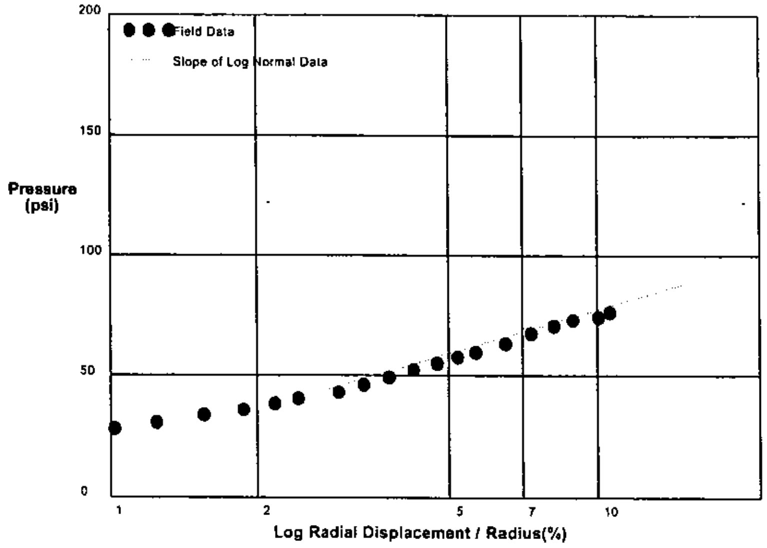
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 15 feet File E:\PC166.P



Shear Strength 26 psi
Limit Pressure 114 psi

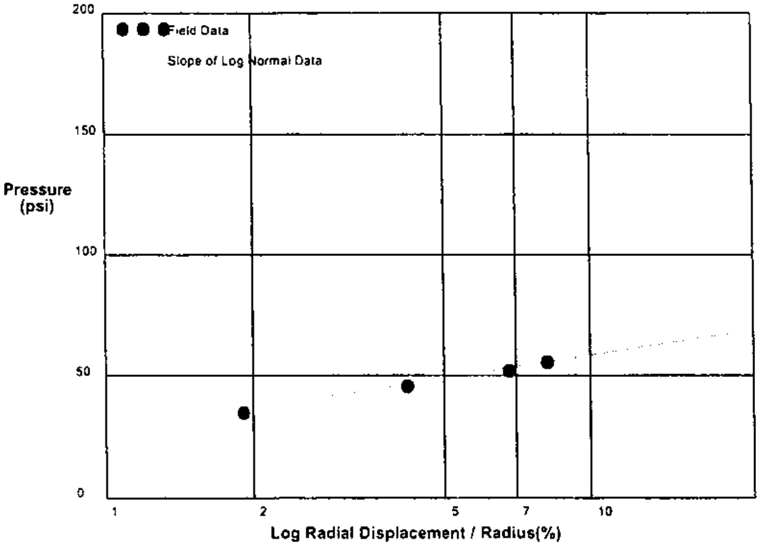
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 28 feet File E:\PC168.P



Shear Strength 13.6 psi
Limit Pressure 77 psi

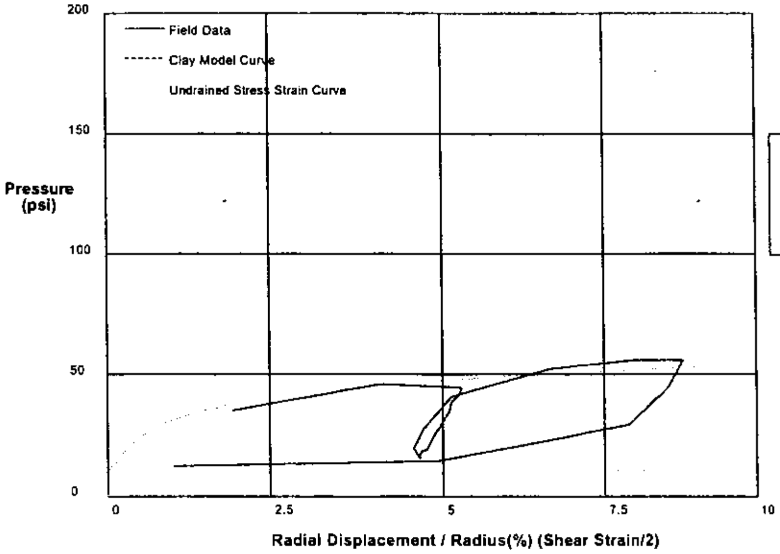
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 28 feet File E:\PC168.P



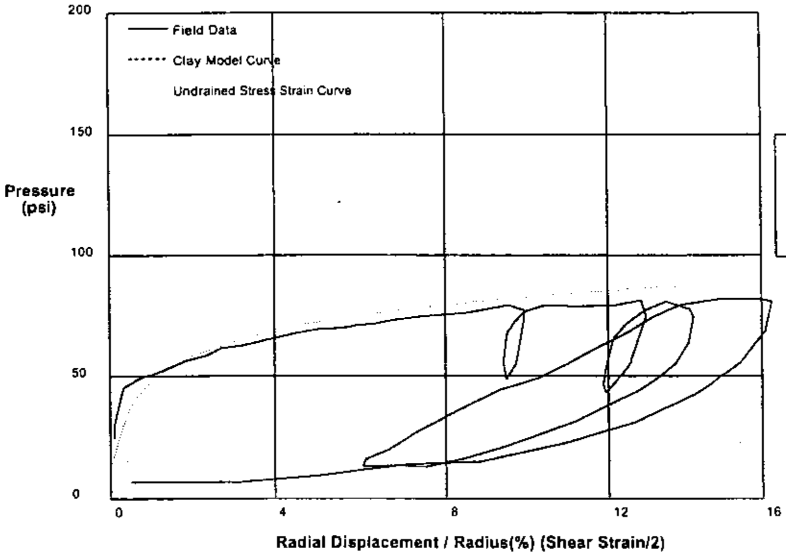
GIBSON'S CLAY MODEL

Shear Strength 10 psi
Insitu Stress 10 psi
Shear Modulus 1500 psi

shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 35 feet File E:\PC170.P



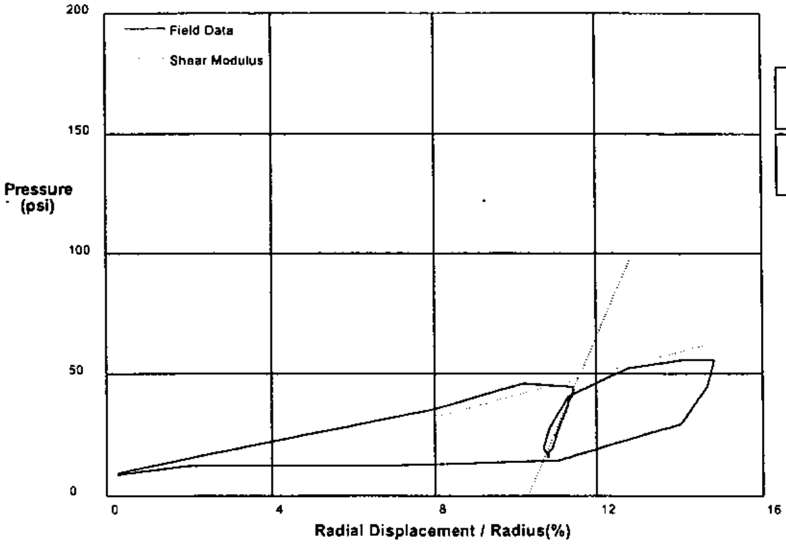
GIBSON'S CLAY MODEL

Shear Strength 15 psi
Insitu Stress 12 psi
Shear Modulus 3000 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 28 feet File E:\PC168.P



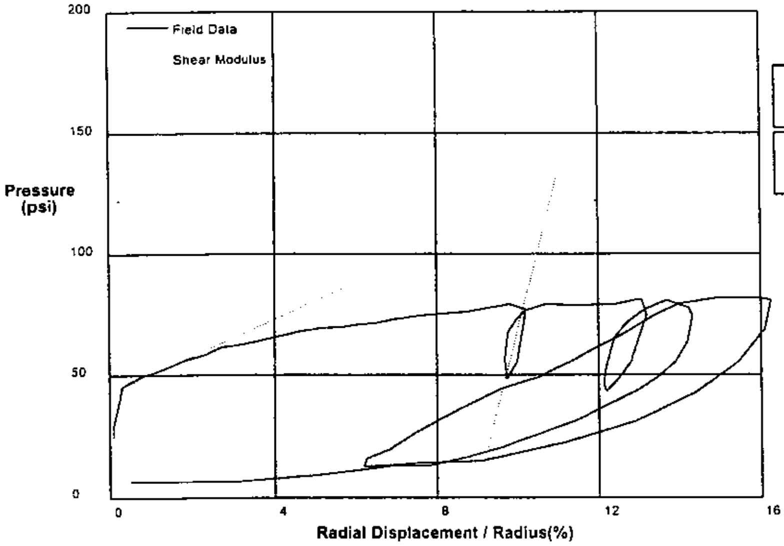
Shear Modulus 224 psi

Shear Modulus 1908 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 35 feet File E:\PC170.P



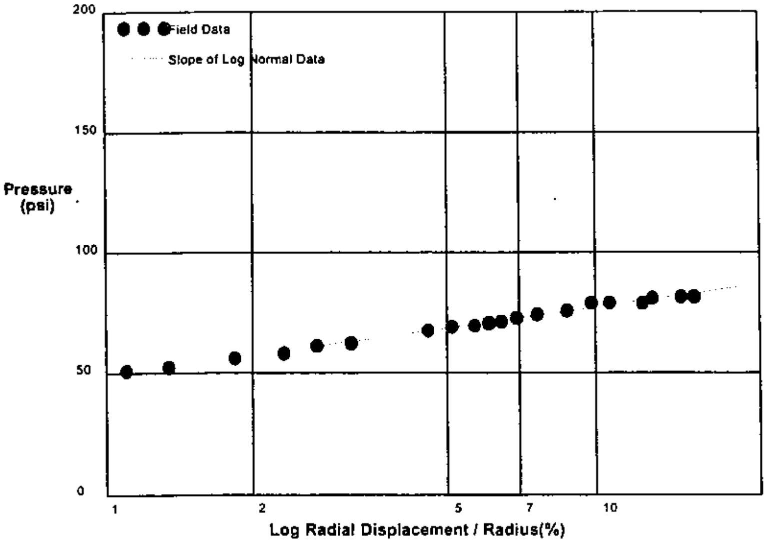
Shear Modulus 379 psi

Shear Modulus 3214 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 35 feet File E:\PC170.P



Shear Strength 12.6 psi
Limit Pressure 95 psi

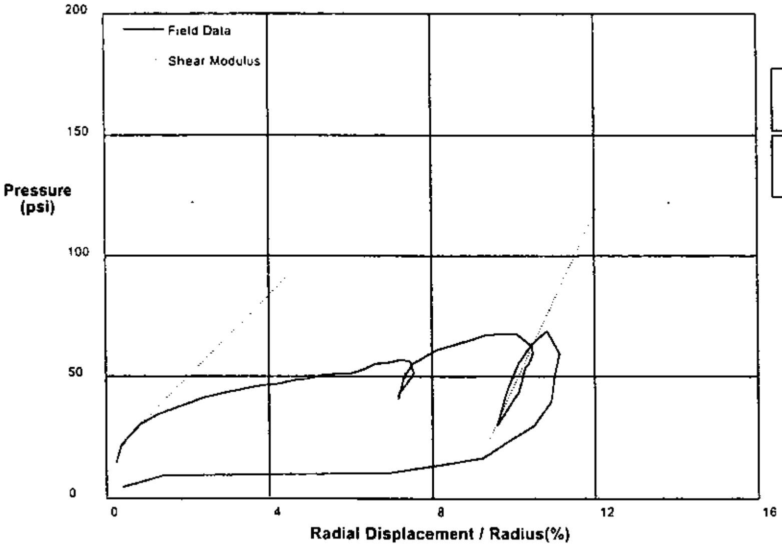
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 33.5 feet File E:\PC171.P



Shear Modulus 841 psi

Shear Modulus 1802 psi

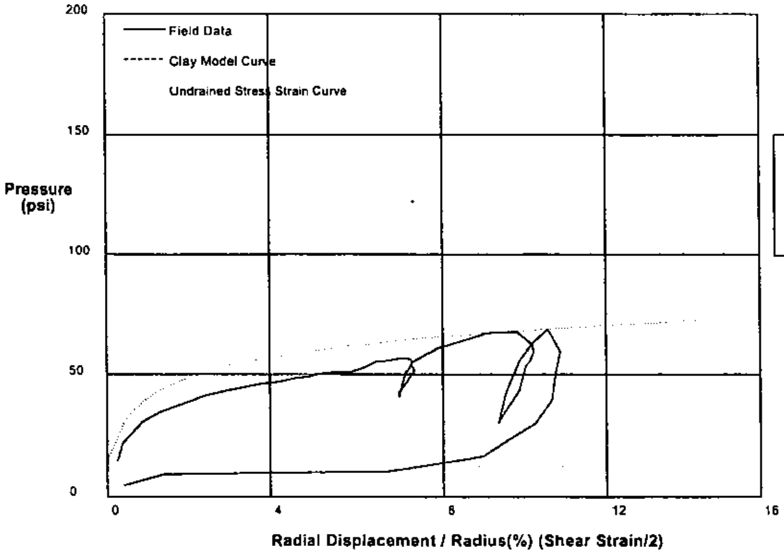
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 33.5 feet File C:\DATA\C-290\C-29005\PC171.P



GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 14 psi
Shear Modulus 2000 psi

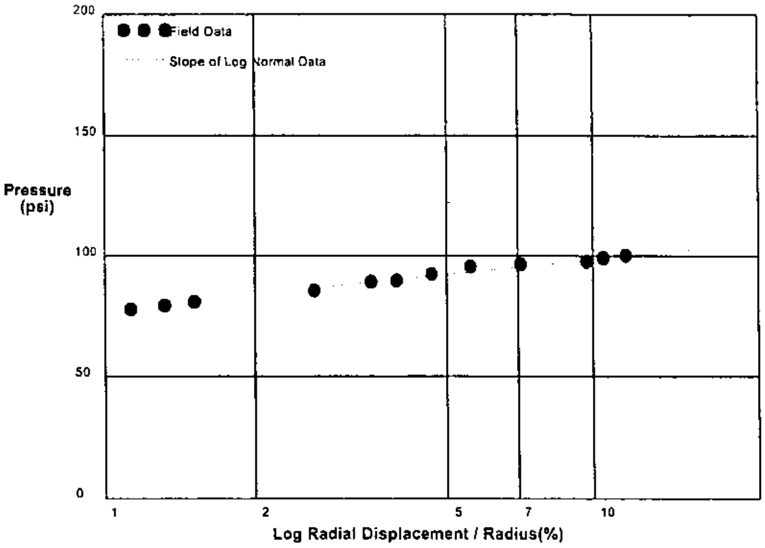
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 45 feet File E:\PC172.P



Shear Strength 8.8 psi
Limit Pressure 111 psi

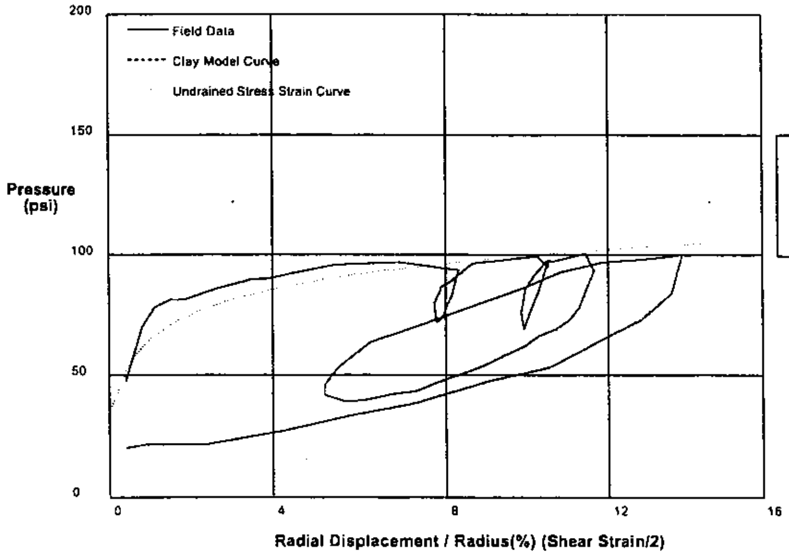
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 45 feet File C:\DATA\C-290\C-29005\PC172.P



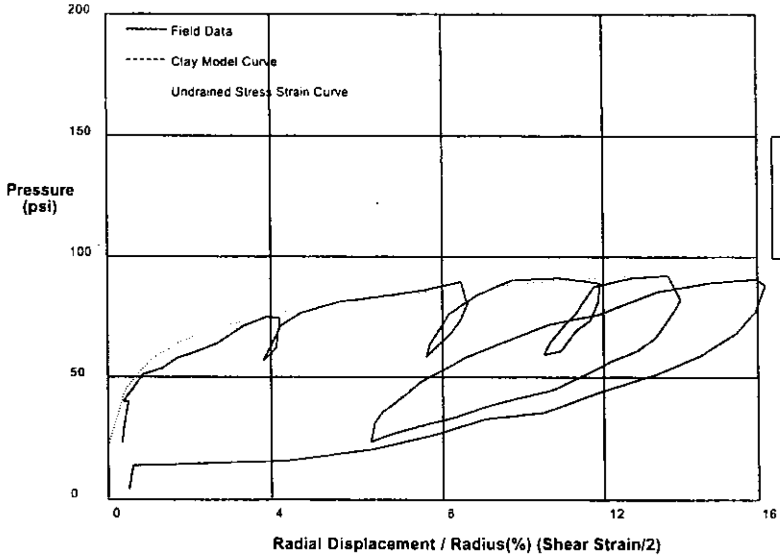
GIBSON'S CLAY MODEL

Shear Strength 15 psi
Insitu Stress 35 psi
Shear Modulus 2000 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 43.5 feet File E:\PC173.P



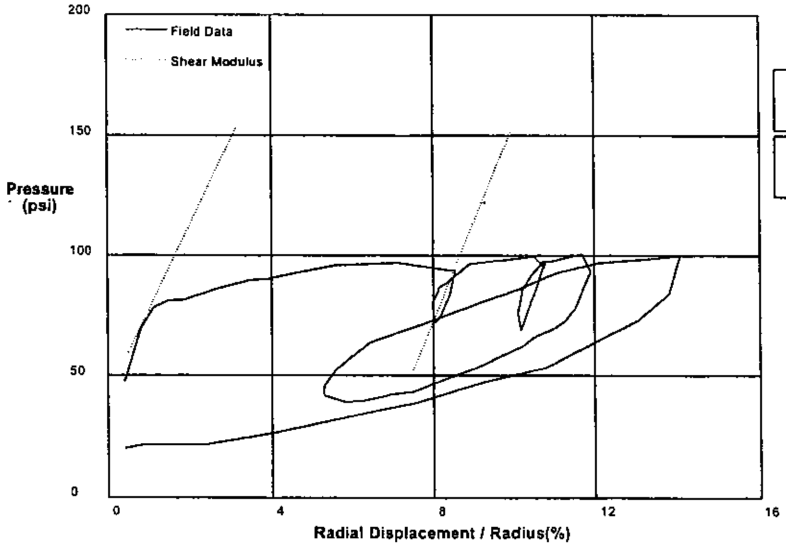
GIBSON'S CLAY MODEL

Shear Strength 14 psi
Insitu Stress 22 psi
Shear Modulus 3000 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 45 feet File E:\PC172.P



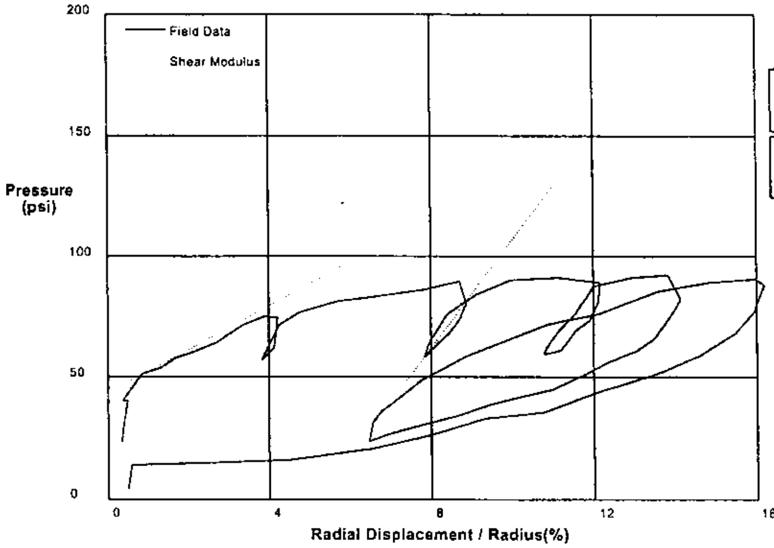
Shear Modulus 1765 psi

Shear Modulus 2023 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 43.5 feet File E:\PC173.P



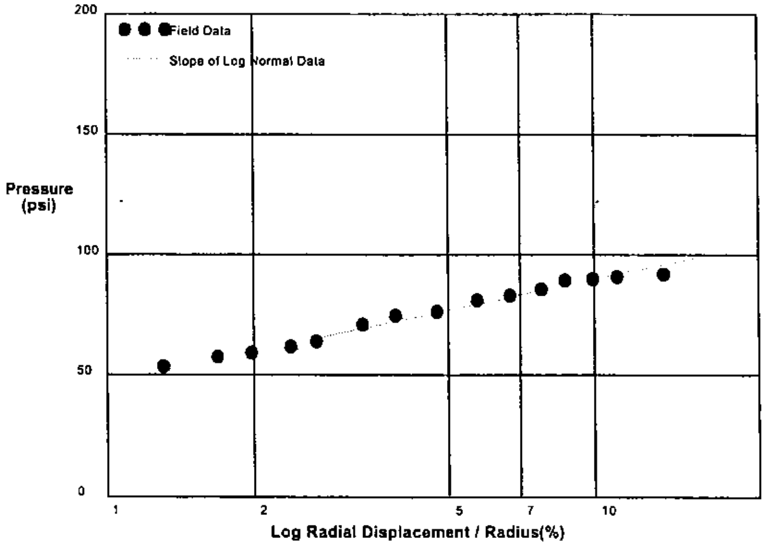
Shear Modulus 450 psi

Shear Modulus 1120 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 43.5 feet File E:\PC173.P

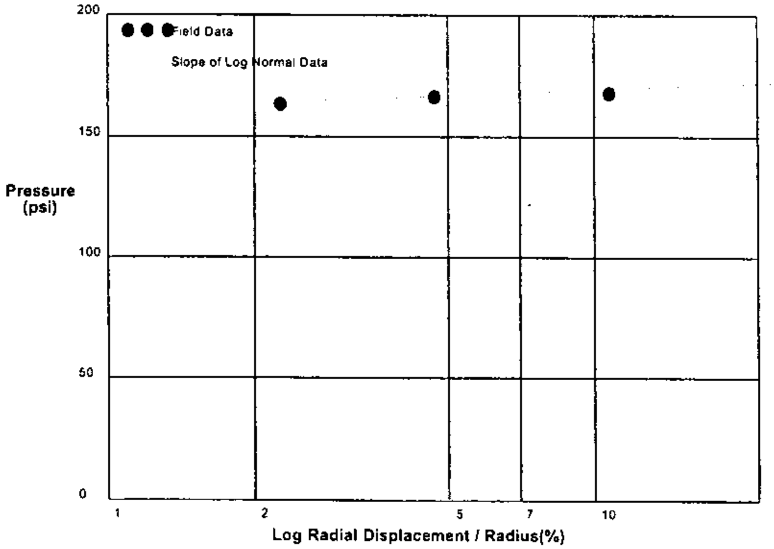


Shear Strength 18.9 psi
Limit Pressure 116 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 75 feet File E:\PC174.P

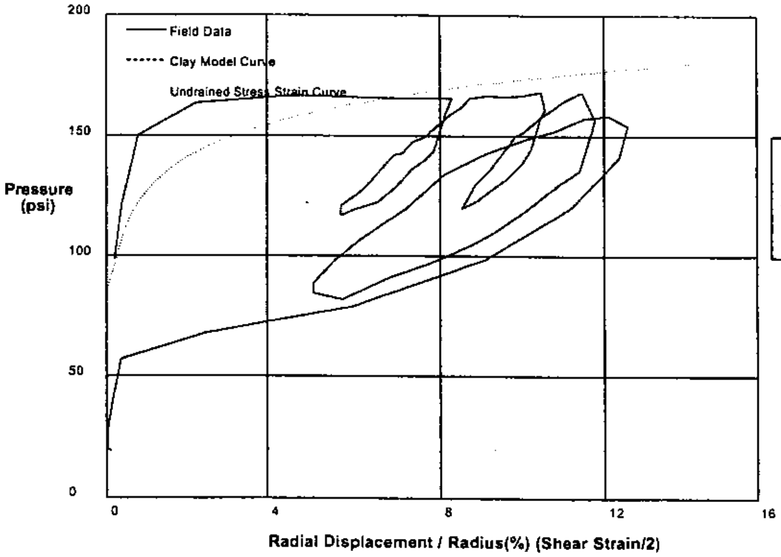


Shear Strength 3.6 psi
Limit Pressure 174 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 75 feet File C:\DATA\C-290\C-29005\PC174.P



GIBSON'S CLAY MODEL

Shear Strength 20 psi
Insitu Stress 85 psi
Shear Modulus 3000 psi

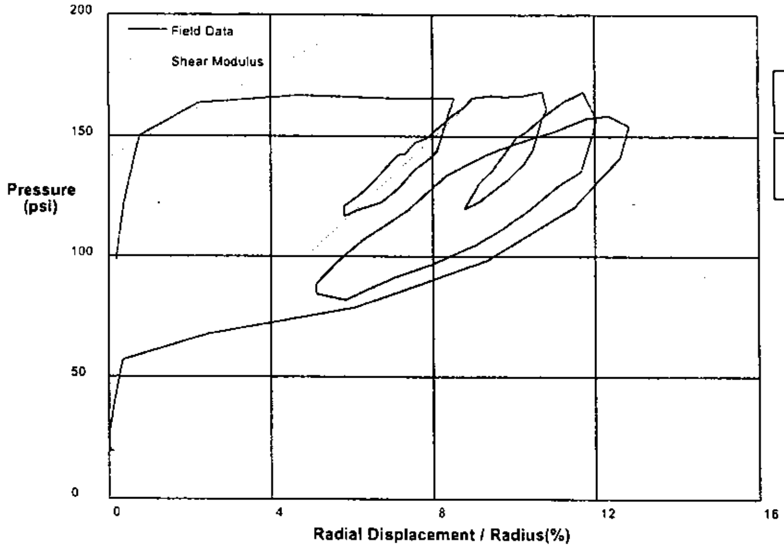
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 75 feet File E:\PC174.P



Shear Modulus 450 psi

Shear Modulus 793 psi

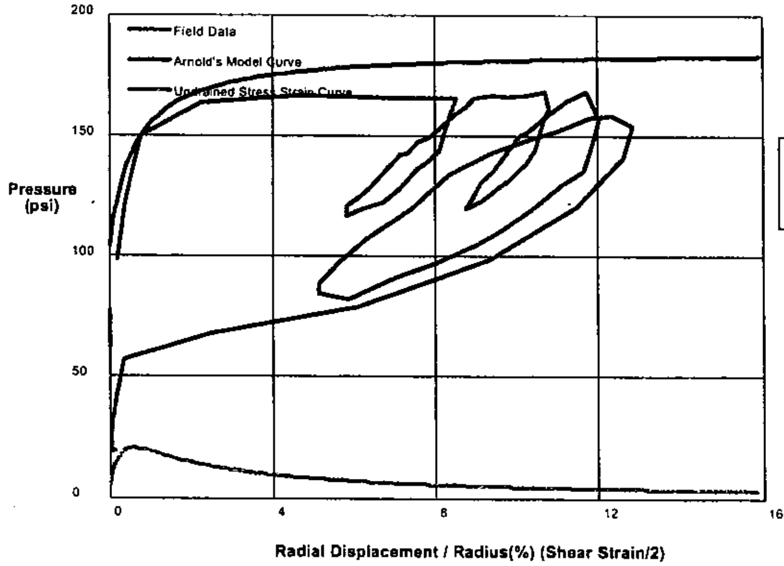
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 75 feet File E:\PC174.P



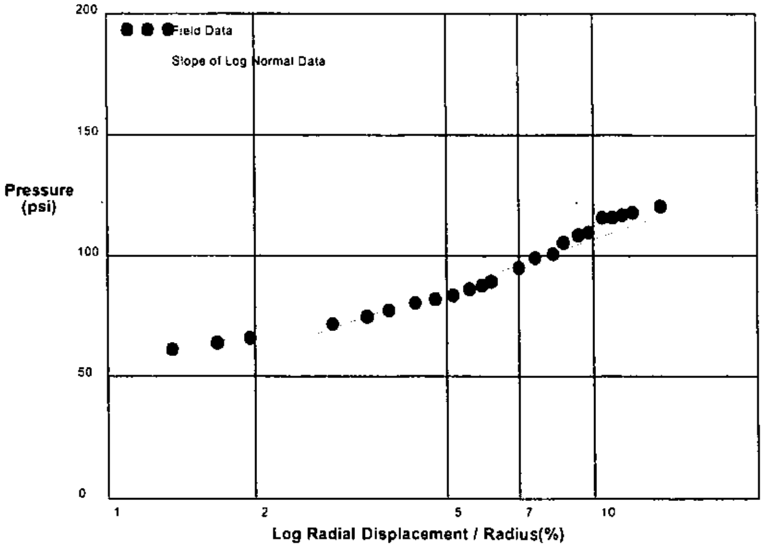
ARNOLD'S CLAY MODEL

Shear Strength at
10 % Shear Strain = 4 psi

155 170 180 shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 73.5 feet File E:\PC175.P

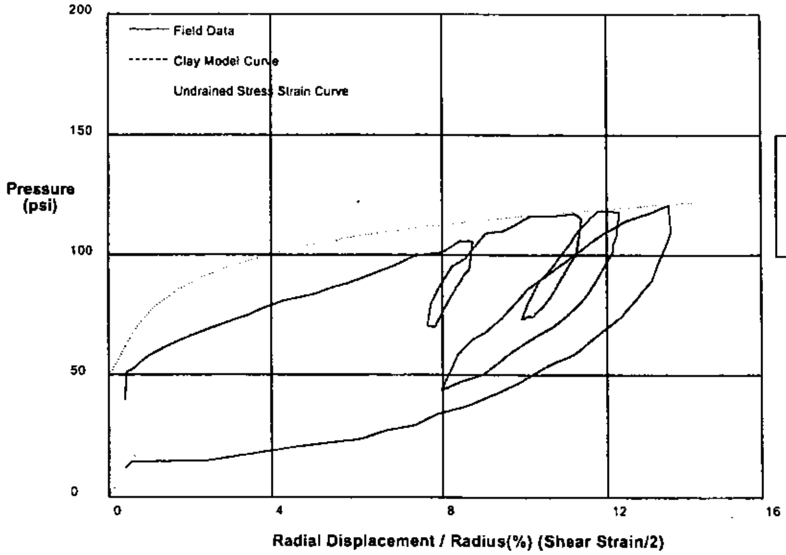


Shear Strength 30 psi
Limit Pressure 149 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-5-05
Hole No. BH-60 Depth 73.5 feet File C:\DATA\C-290\C-29005\PC175.P



GIBSON'S CLAY MODEL

Shear Strength 17 psi
Insitu Stress 50 psi
Shear Modulus 1500 psi

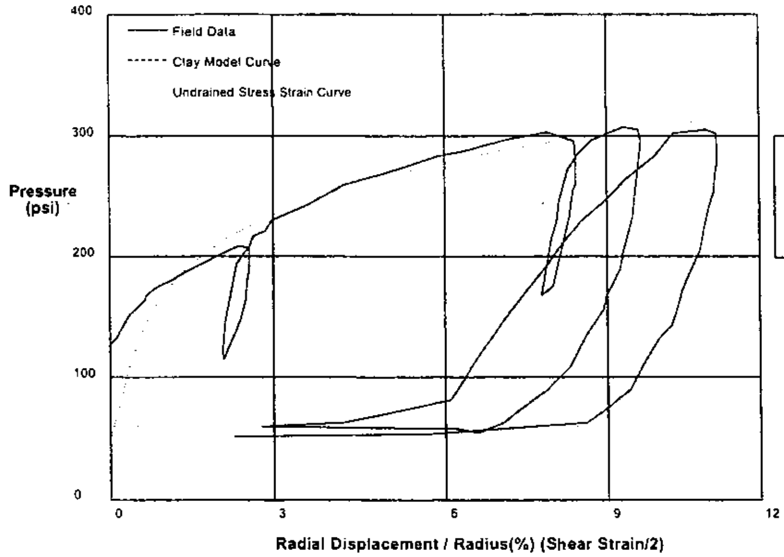
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-6-05

Hole No. BH-60 Depth 99 feet File E:\PC176.P



GIBSON'S CLAY MODEL

Shear Strength 60 psi
Insitu Stress 50 psi
Shear Modulus 8000 psi

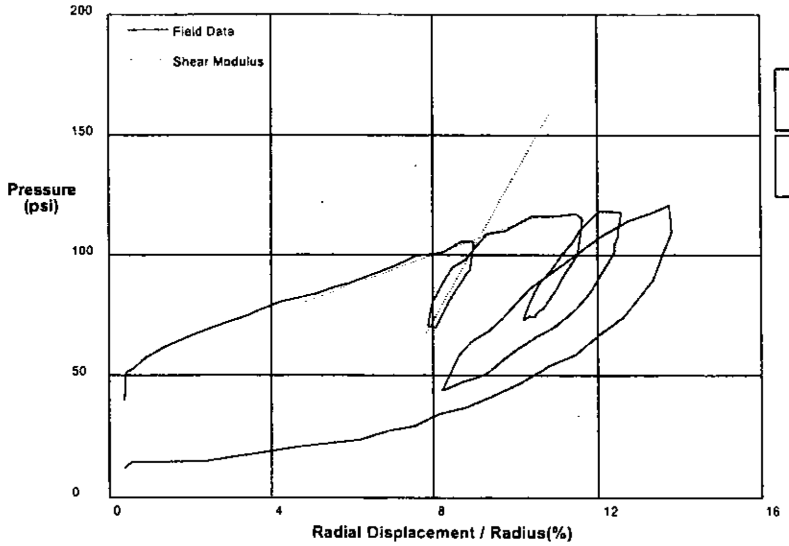
shift 3

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-5-05

Hole No. BH-60 Depth 73.5 feet File E:\PC175.P



Shear Modulus 316 psi

Shear Modulus 1527 psi

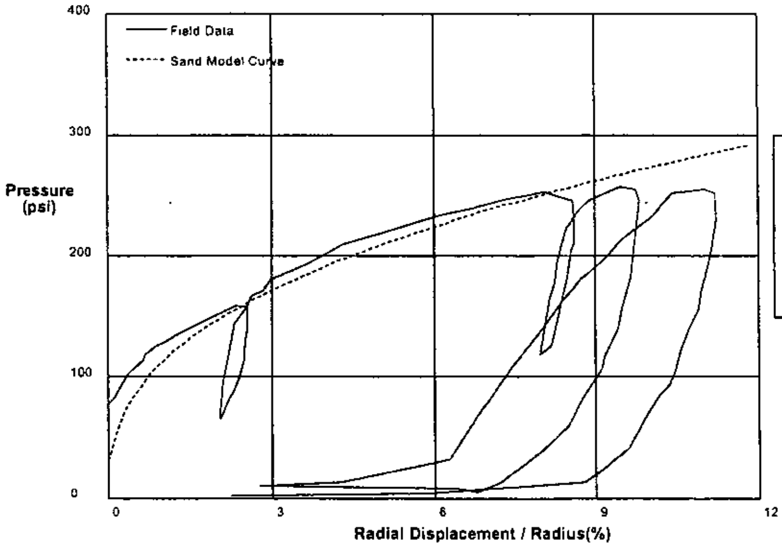
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-6-05

Hole No. BH-60 Depth 99 feet File E:\PC176.P



THE HUGHES SAND MODEL

Water Pressure	50 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	30 psi
Shear Modulus	8000 psi

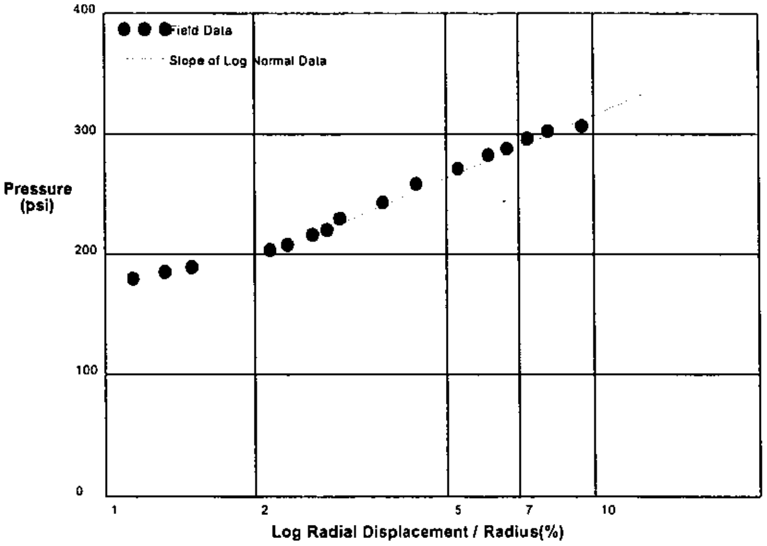
shift 3

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-6-05

Hole No. BH-60 Depth 99 feet File E:\PC176.P



Shear Strength 74.5 psi
Limit Pressure 420 psi

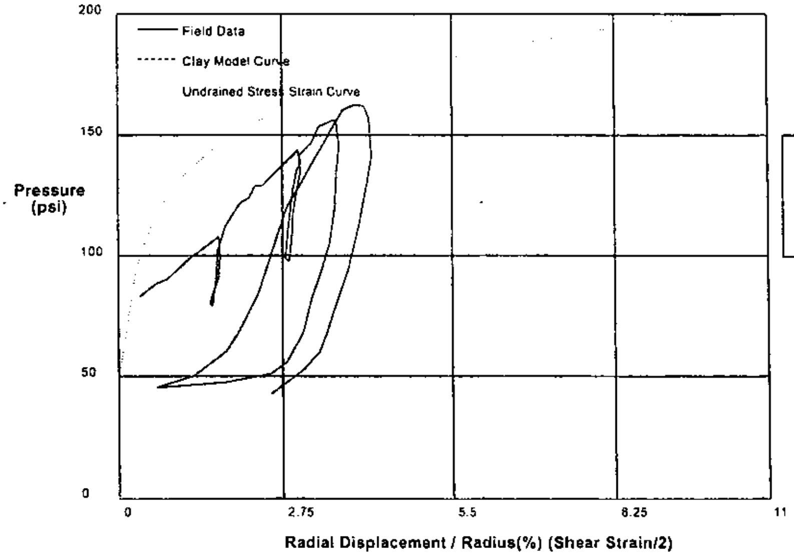
shift 3

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-6-05

Hole No. BH-60 Depth 97.5 feet File E:\PC177.P



GIBSON'S CLAY MODEL

Shear Strength 30 psi
Insitu Stress 50 psi
Shear Modulus 8000 psi

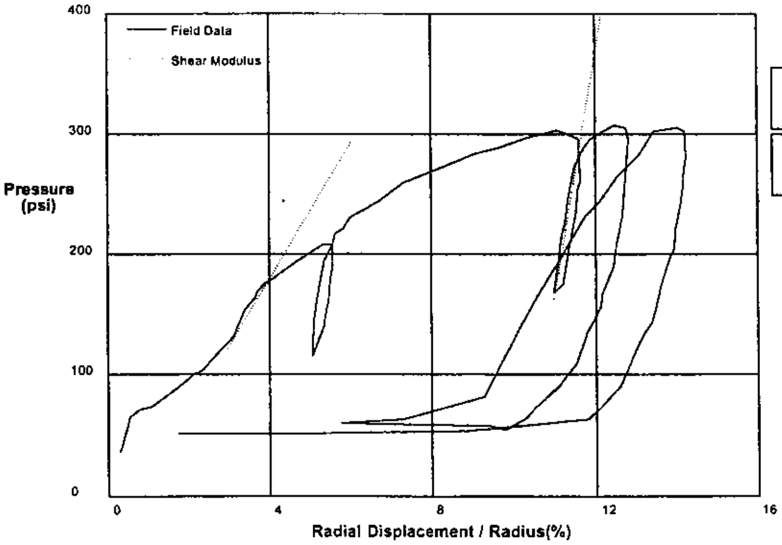
shift 4.5

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-6-05

Hole No. BH-60 Depth 99 feet File E:\PC176.P



Shear Modulus 2823 psi

Shear Modulus 9858 psi

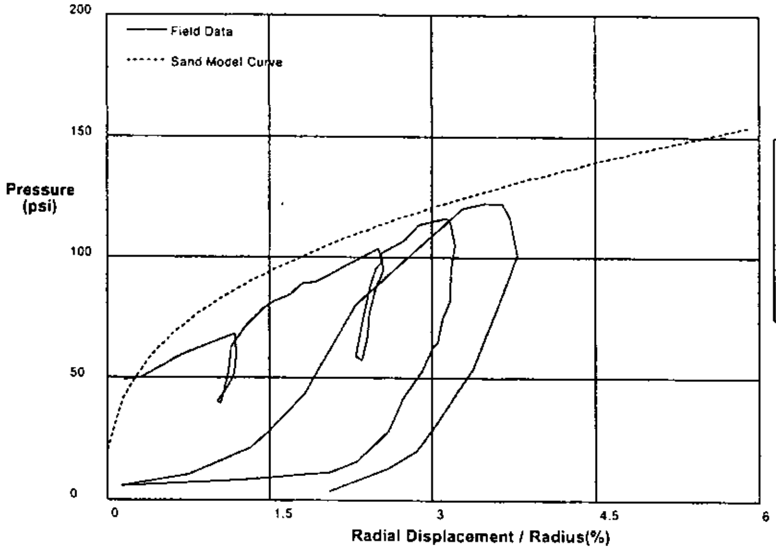
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-6-05

Hole No. BH-60 Depth 97.5 feet File C:\DATA\C-290\C-29005\PC177.P



THE HUGHES SAND MODEL

Water Pressure	40 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	20 psi
Shear Modulus	8000 psi

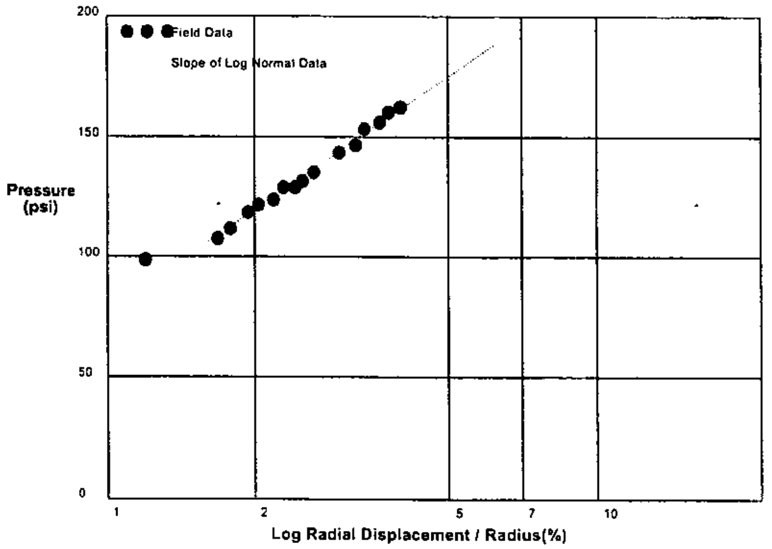
shift 5

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-6-05

Hole No. BH-60 Depth 97.5 feet File E:\PC177.P



Shear Strength 61.1 psi
Limit Pressure 304 psi

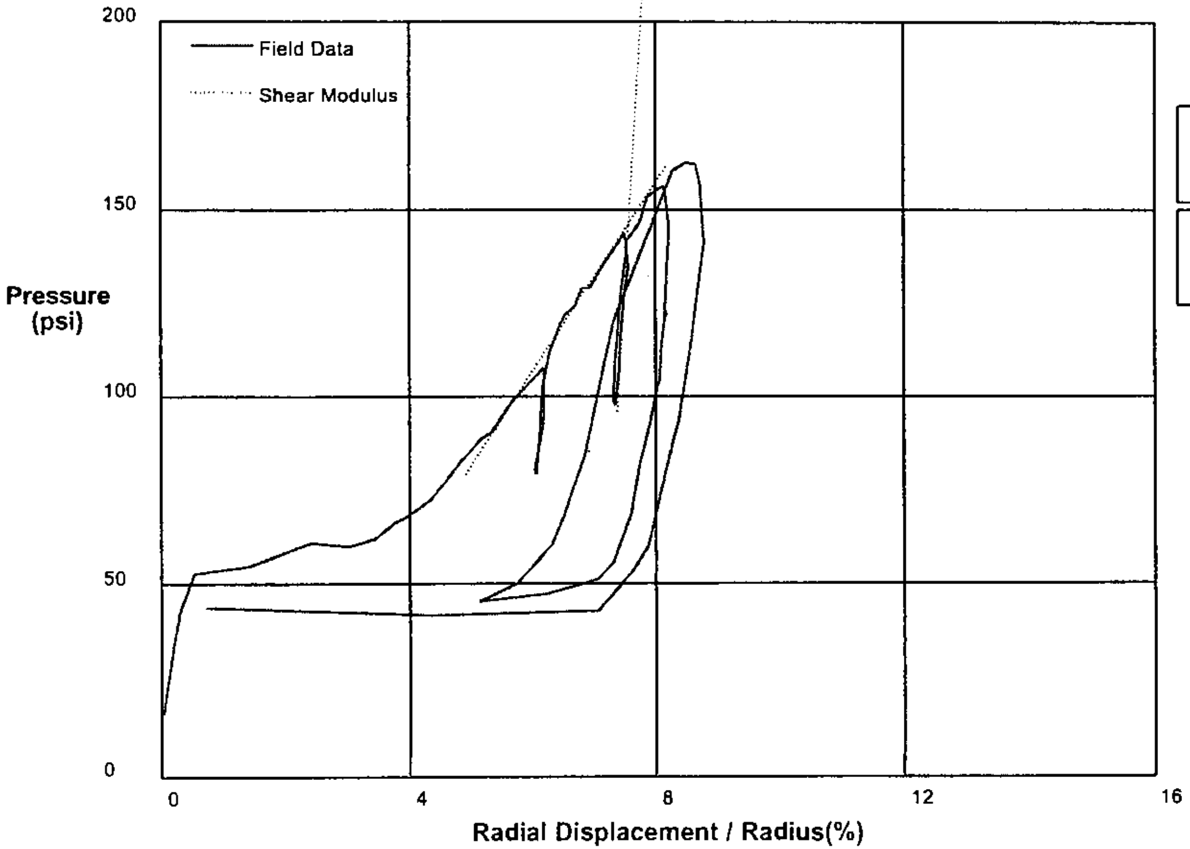
shift 4.5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-6-05

Hole No. BH-60 Depth 97.5 feet File E:\PC177.P



Shear Modulus 1268 psi

Shear Modulus 13333 psi

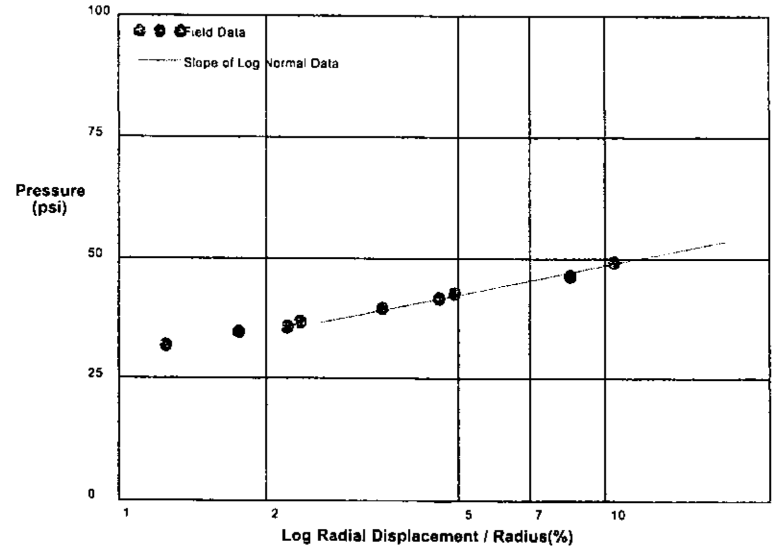
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 23, 2004

Hole No. 64 Depth 25 ft File C:\DATA\C-290\PC19.P



Shear Strength 8.9 psi
Limit Pressure 61 psi

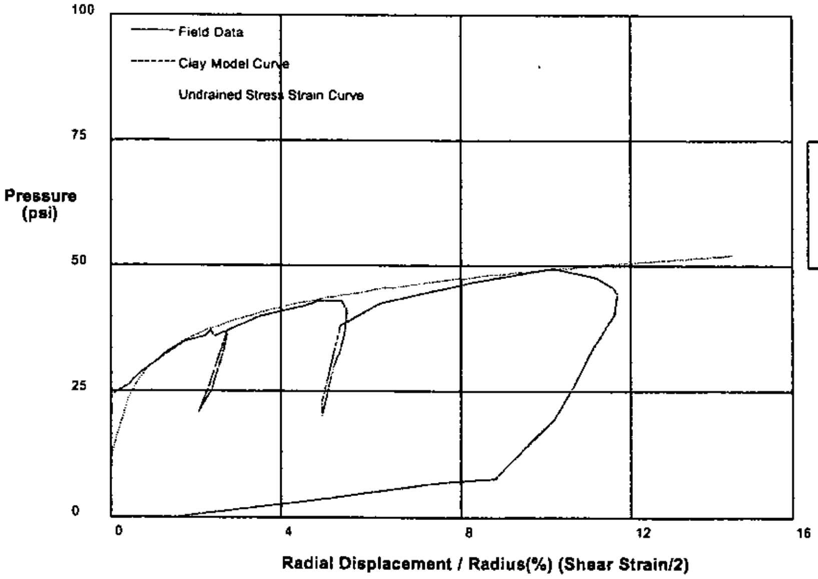
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 23, 2004

Hole No. 64 Depth 25 ft File C:\DATA\C-290\PC19.P



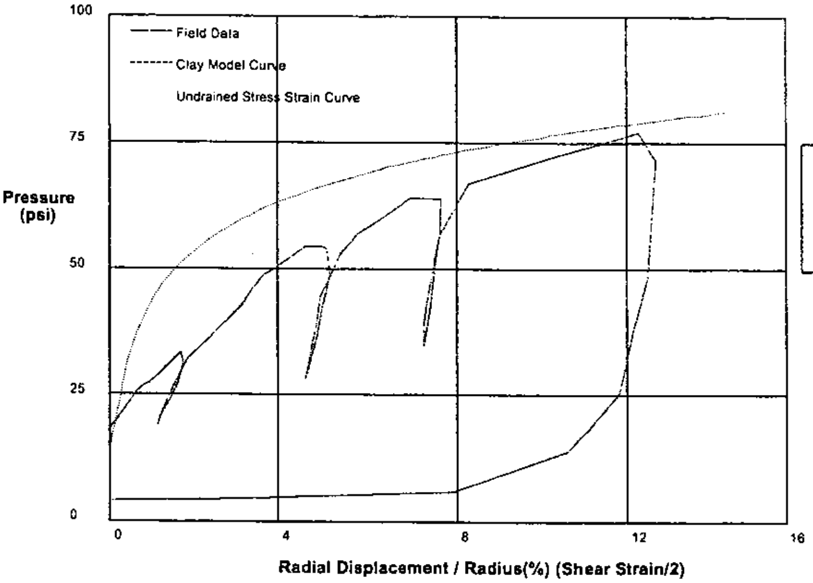
GIBSON'S CLAY MODEL

Shear Strength 8 psi
Insitu Stress 12 psi
Shear Modulus 1500 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) October 23, 2004
Hole No. 64 Depth 23.5 ft File C:\DATA\C-290\PC20.P



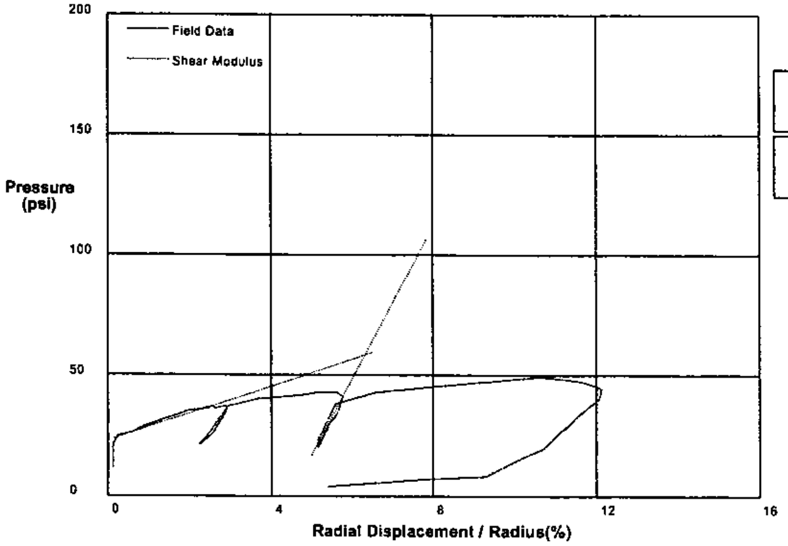
GIBSON'S CLAY MODEL

Shear Strength 14 psi
Insitu Stress 15 psi
Shear Modulus 2000 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Rail (Downtown) October 23 2004
Hole No. 64 Depth 25 File C:\DATA\C-290\PC19.P



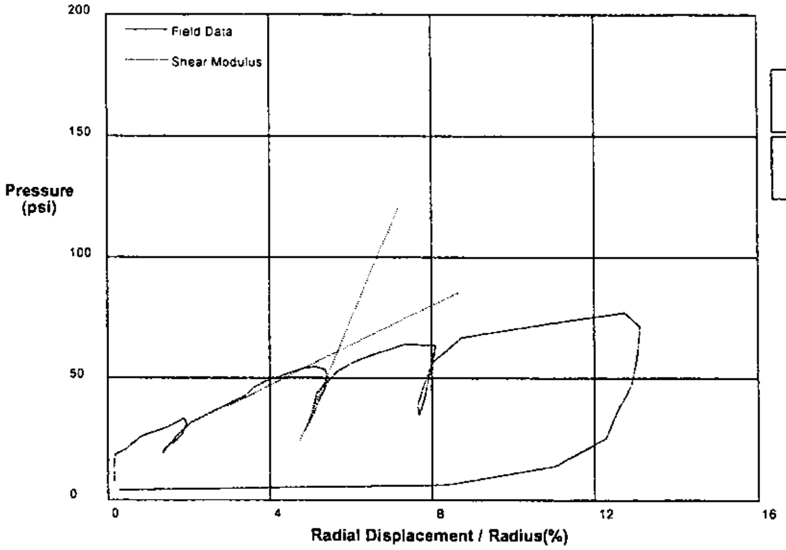
Shear Modulus 1575 psi

Shear Modulus 285 psi

shift-.2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Rail (Downtown) October 23, 2004
Hole No. 64 Depth 23.5 ft File C:\DATA\C-290\PC20.P



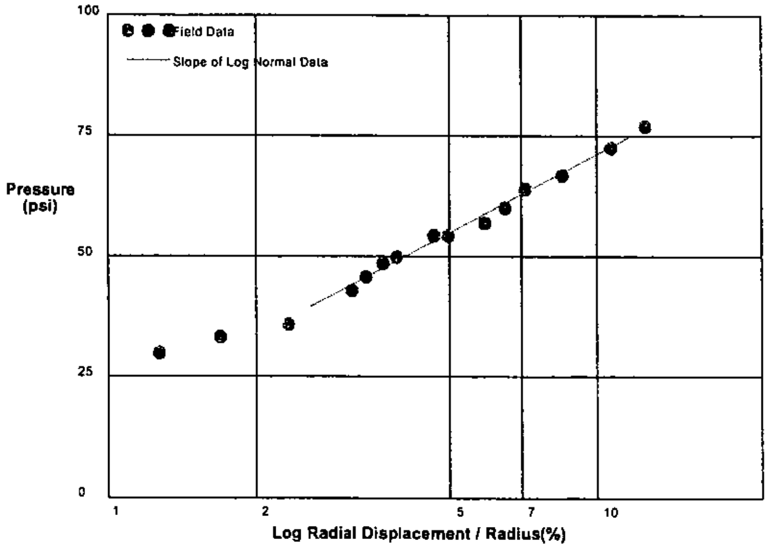
Shear Modulus 1987 psi

Shear Modulus 407 psi

shift-.2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) October 23, 2004
Hole No. 64 Depth 23.5 ft File C:\DATA\C-290\PC20.P



Shear Strength 23.6 psi
Limit Pressure 104 psi

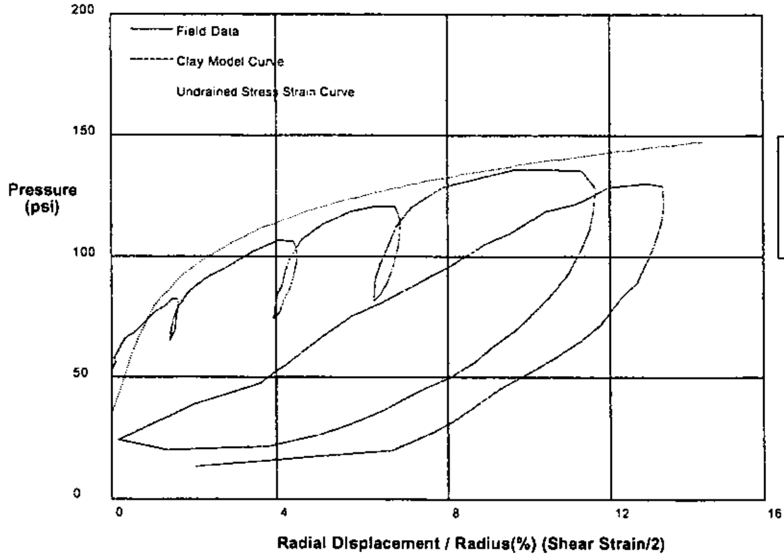
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 23, 2004

Hole No. 64 Depth 54.5 ft File C:\DATA\C-290\PC21.P



GIBSON'S CLAY MODEL

Shear Strength	26 psi
Insitu Stress	35 psi
Shear Modulus	2500 psi

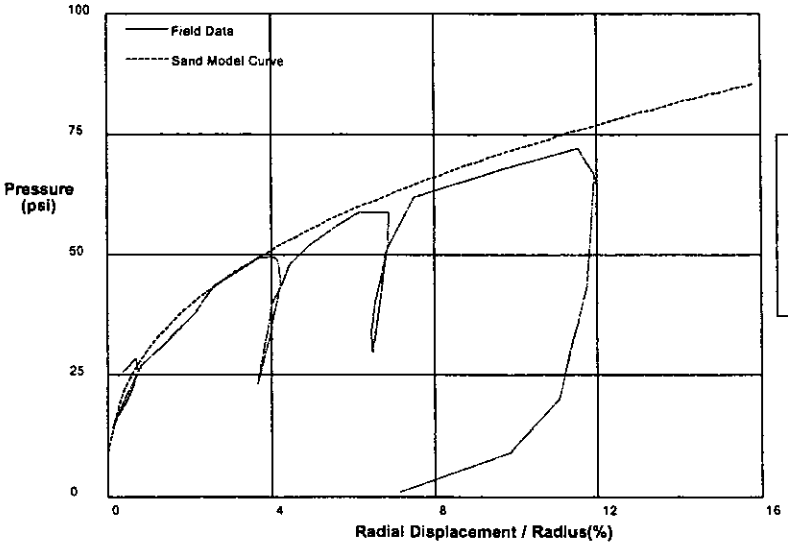
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 23, 2004

Hole No. 64 Depth 23.5 ft File C:\DATA\C-290\PC20.P



THE HUGHES SAND MODEL

Water Pressure	5 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	9 psi
Shear Modulus	2000 psi

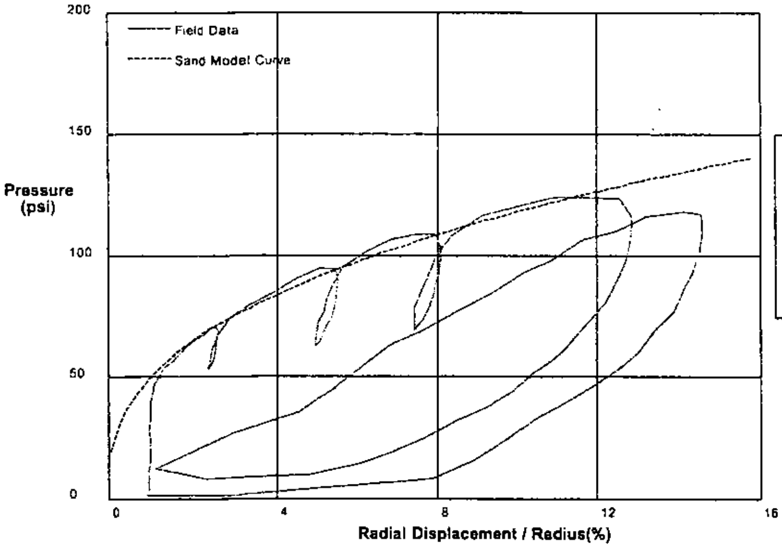
shift 1

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 23, 2004

Hole No. 64 Depth 54.5 ft File C:\DATA\C-290\PC21.P



THE HUGHES SAND MODEL

Water Pressure	12 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	17 psi
Shear Modulus	2600 psi

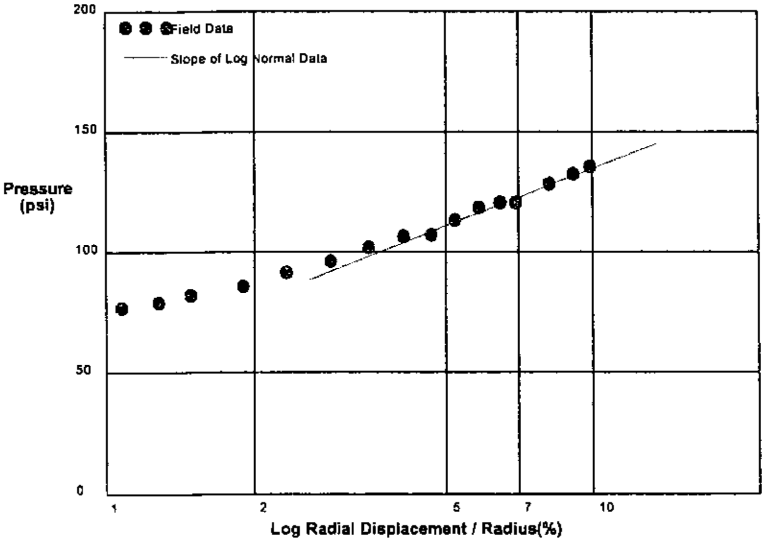
shift-1

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 23, 2004

Hole No. 64 Depth 54.5 ft File C:\DATA\C-290\PC21.P

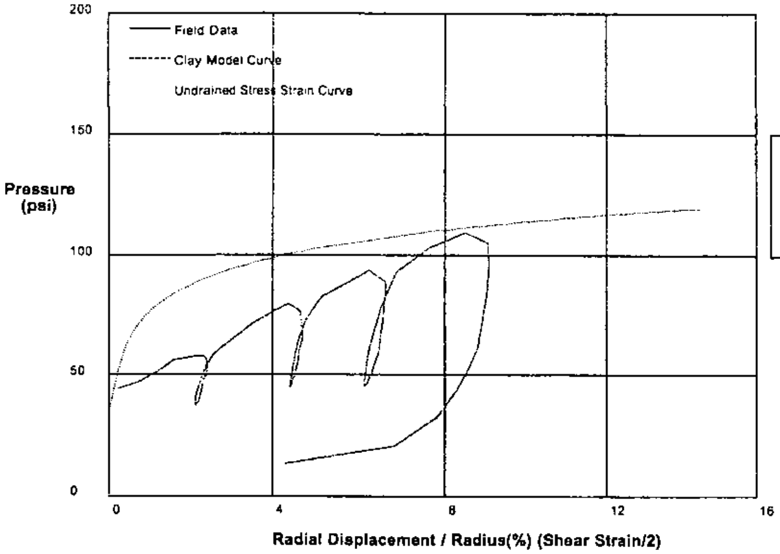


Shear Strength 34.2 psi
Limit Pressure 183 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) October 23, 2004
Hole No. 64 Depth 53 ft File C:\DATA\C-290\PC22.P



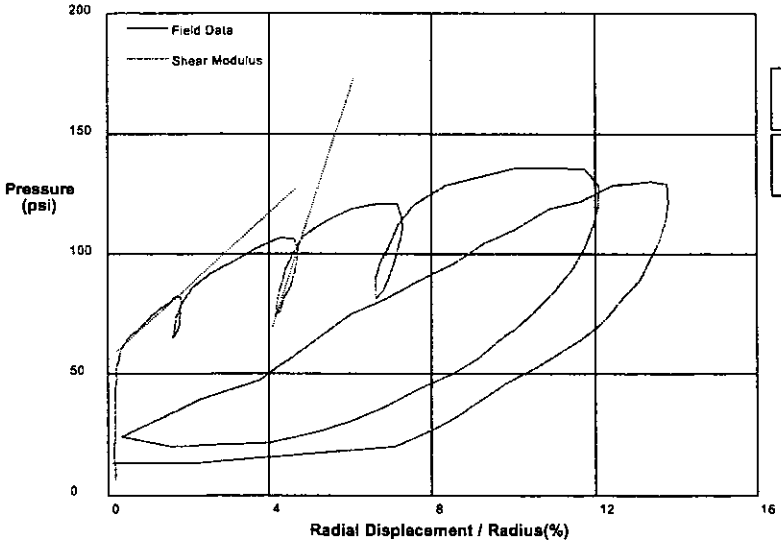
GIBSON'S CLAY MODEL

Shear Strength 16 psi
Insitu Stress 35 psi
Shear Modulus 4000 psi

shift 2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Rail (Downtown) October 23, 2004
Hole No. 64 Depth 54.5 ft File C:\DATA\C-290\PC21.P



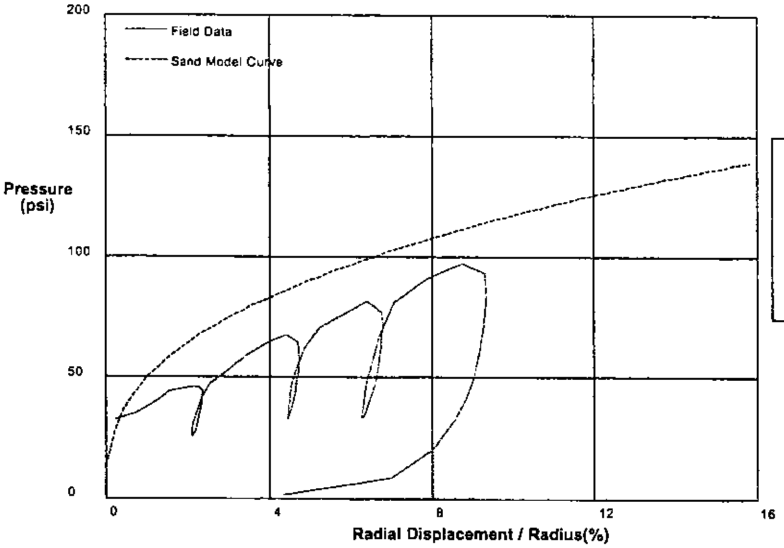
Shear Modulus 2568 psi

Shear Modulus 755 psi

shift-.2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) October 23, 2004
Hole No. 54 Depth 53 ft File C:\DATA\C-290\PC22.P



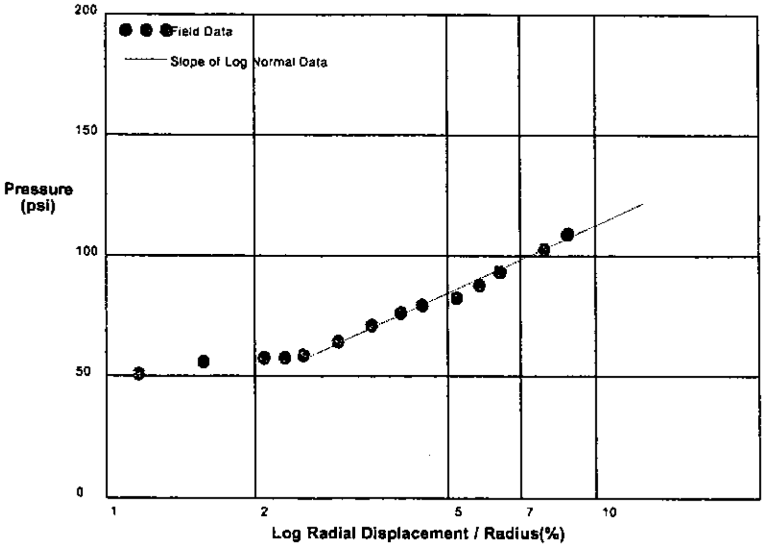
THE HUGHES SAND MODEL

Water Pressure	12 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	13 psi
Shear Modulus	4000 psi

shift 2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) October 23, 2004
Hole No. 64 Depth 53 ft File C:\DATA\C-290\PC22.P

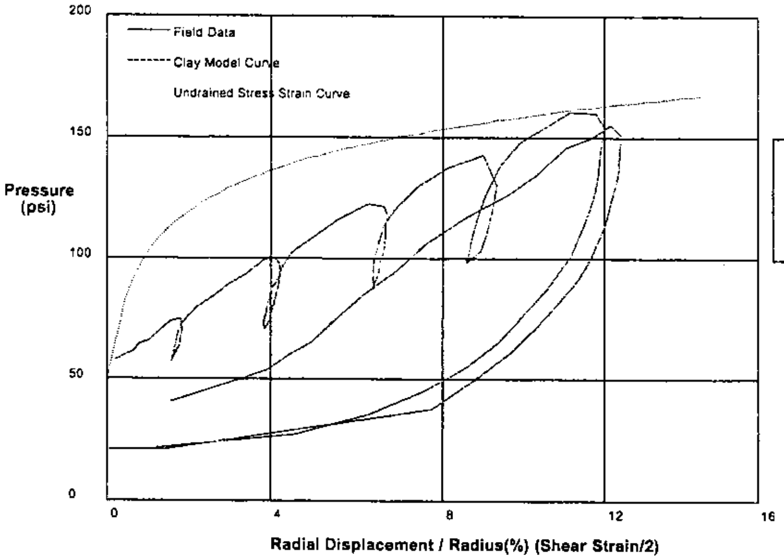


Shear Strength 40.4 psi
Limit Pressure 169 psi

shift 2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) October 23, 2004
Hole No. 64 Depth 74 ft File C:\DATA\C-290\PC23.P



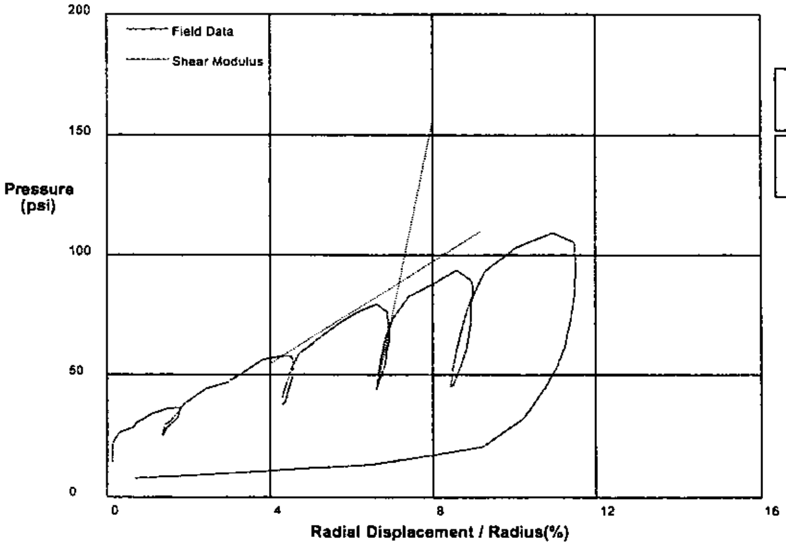
GIBSON'S CLAY MODEL

Shear Strength 24 psi
Insitu Stress 50 psi
Shear Modulus 4000 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Rail (Downtown) October 23, 2004
Hole No. 64 Depth 53 ft File C:\DATA\C-290\PC22.P



Shear Modulus 4092 psi

Shear Modulus 532 psi

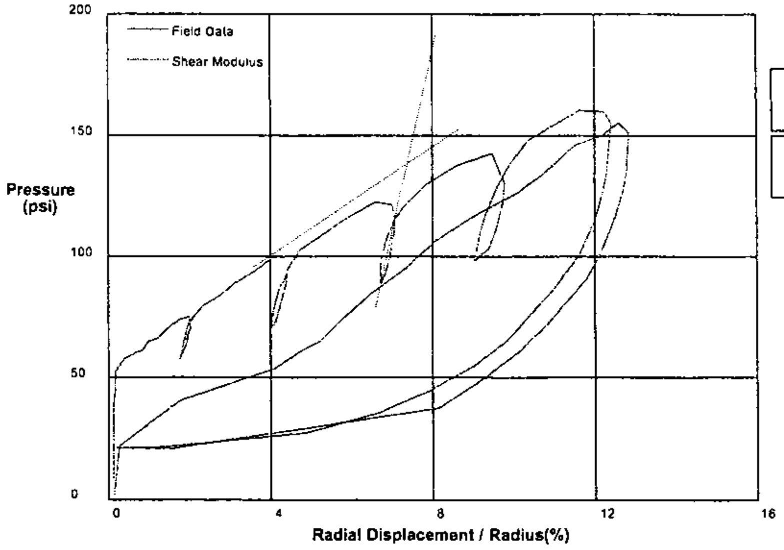
shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) October 23, 2004

Hole No. 64 Depth 74 ft File C:\DATA\C-290\PC23.P



Shear Modulus 3750 psi

Shear Modulus 560 psi

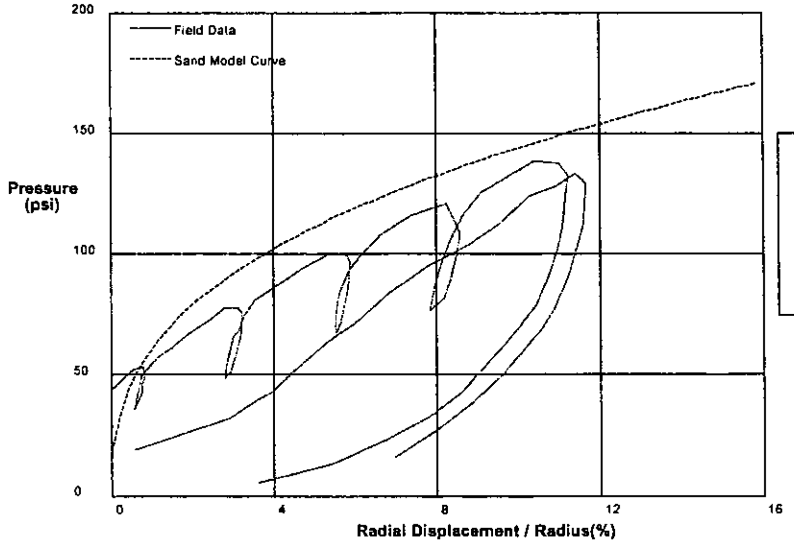
shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) October 23, 2004

Hole No. 64 Depth 74 ft File C:\DATA\C-290\PC23.P



THE HUGHES SAND MODEL

Water Pressure	22 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	18 psi
Shear Modulus	4000 psi

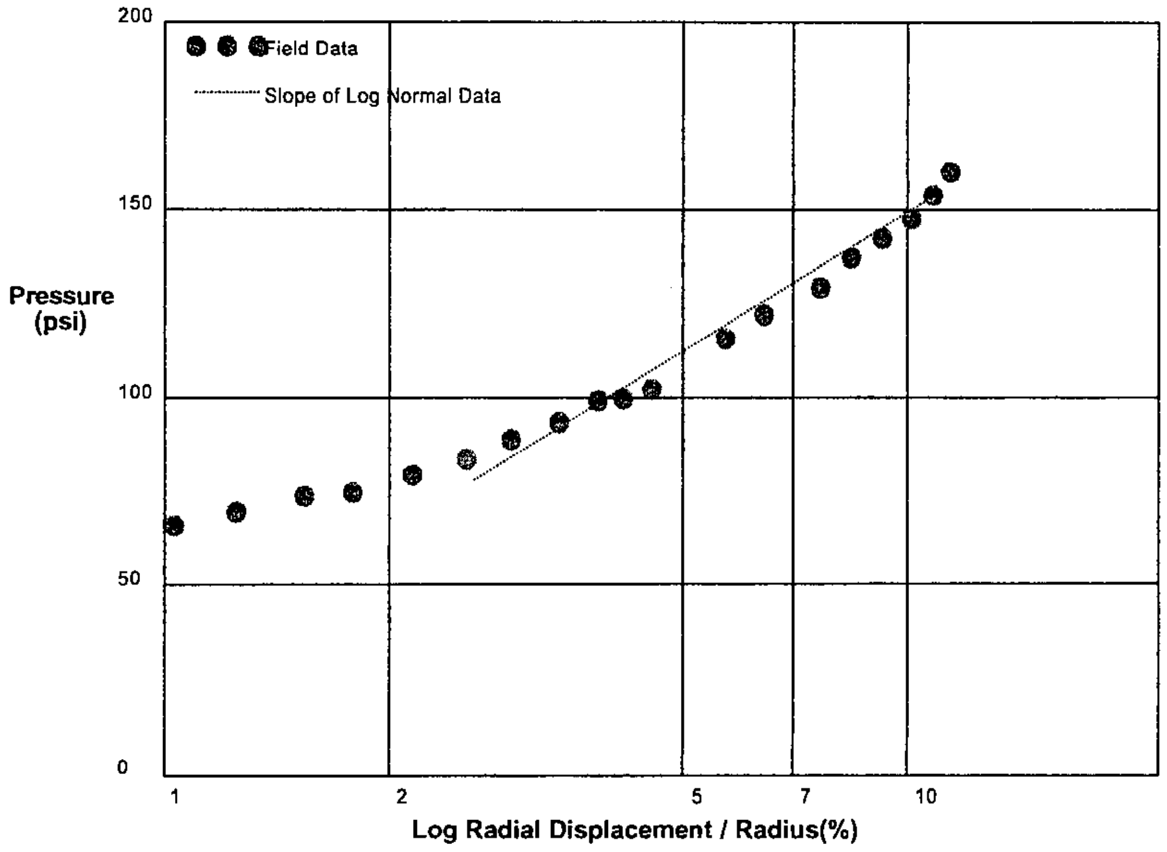
shift 1

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) **October 23, 2004**

Hole No. 64 **Depth 74 ft** **File C:\DATA\C-290\PC23.P**



Shear Strength 52.8 psi
Limit Pressure 224 psi

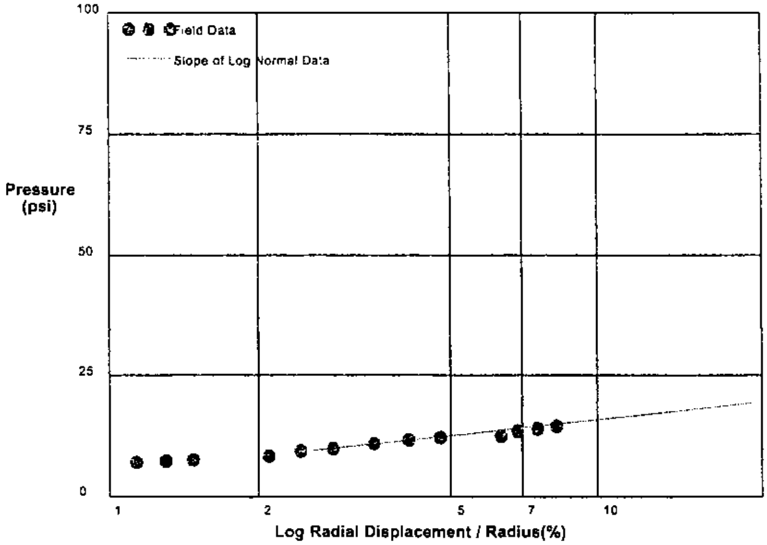
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 13 feet File C:\DATA\C-290\PC38.P



Shear Strength 4.8 psi
Limit Pressure 22 psi

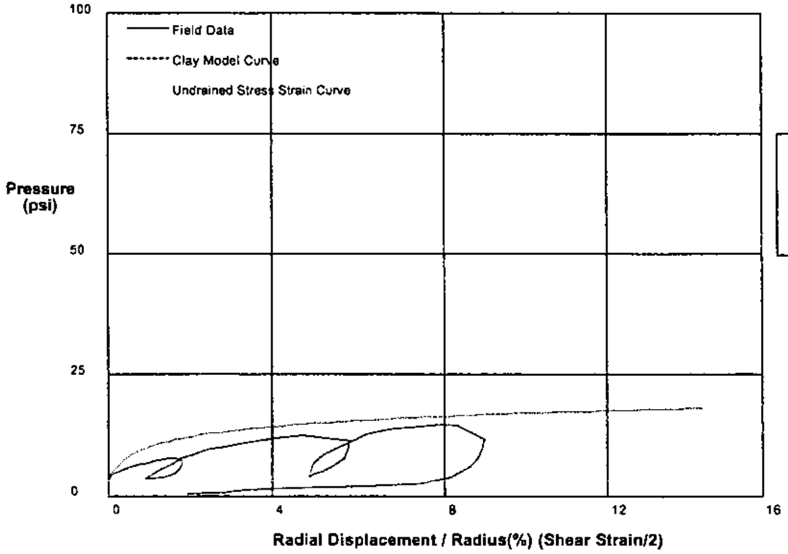
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 13 feet File C:\DATA\C-290\PC38.P



GIBSON'S CLAY MODEL

Shear Strength 3 psi
Insitu Stress 4 psi
Shear Modulus 400 psi

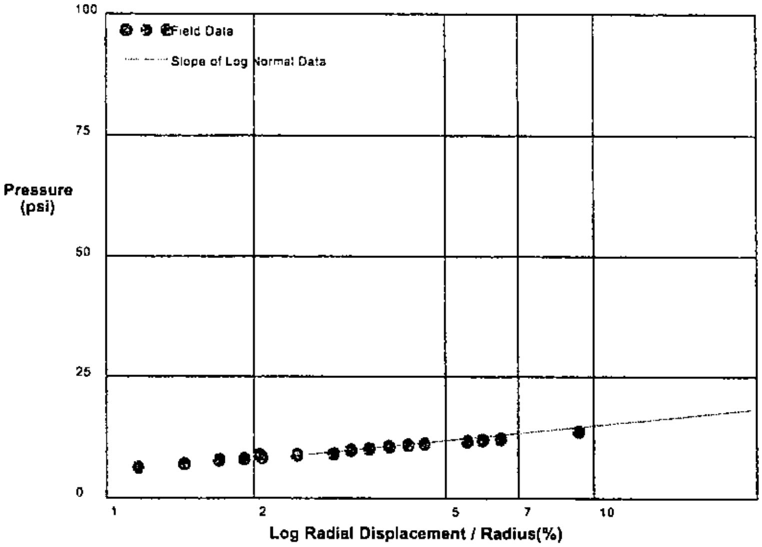
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 15 feet File C:\DATA\C-290\PC39.P



Shear Strength 4.4 psi
Limit Pressure 21 psi

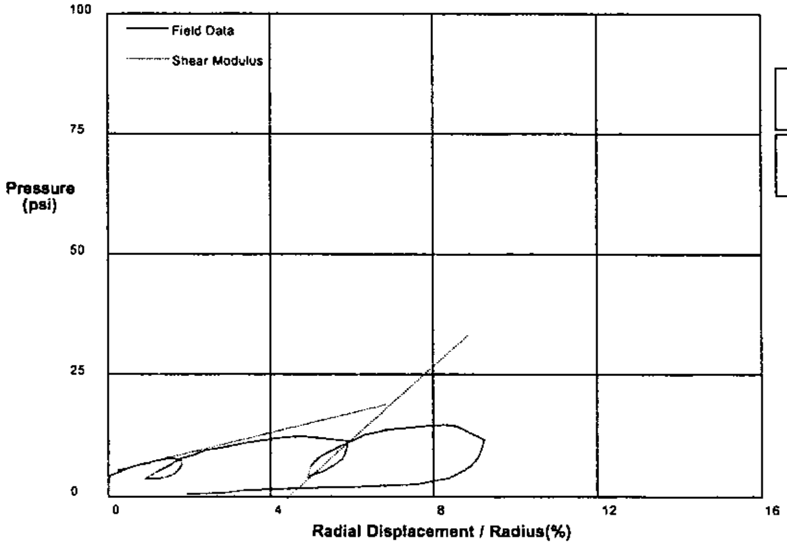
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 13 feet File C:\DATA\C-290\PC38.P



Shear Modulus 103 psi

Shear Modulus 377 psi

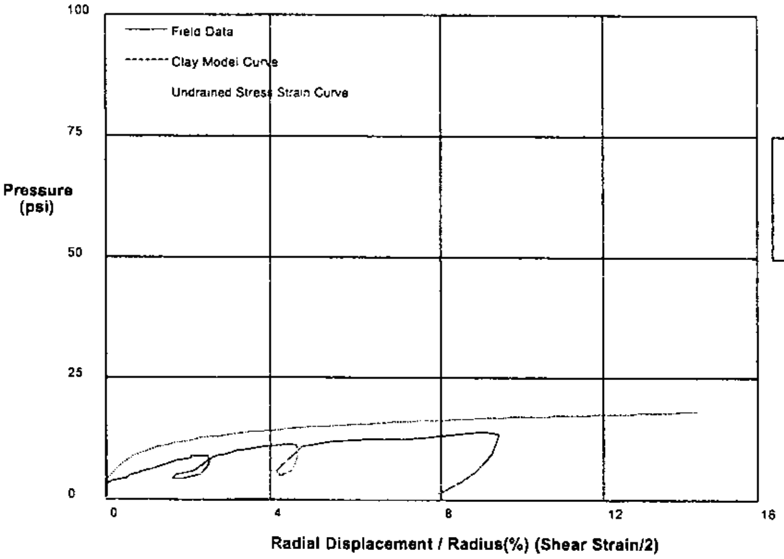
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 15 feet File C:\DATA\C-290\PC39.P



GIBSON'S CLAY MODEL

Shear Strength 3 psi
Insitu Stress 4 psi
Shear Modulus 400 psi

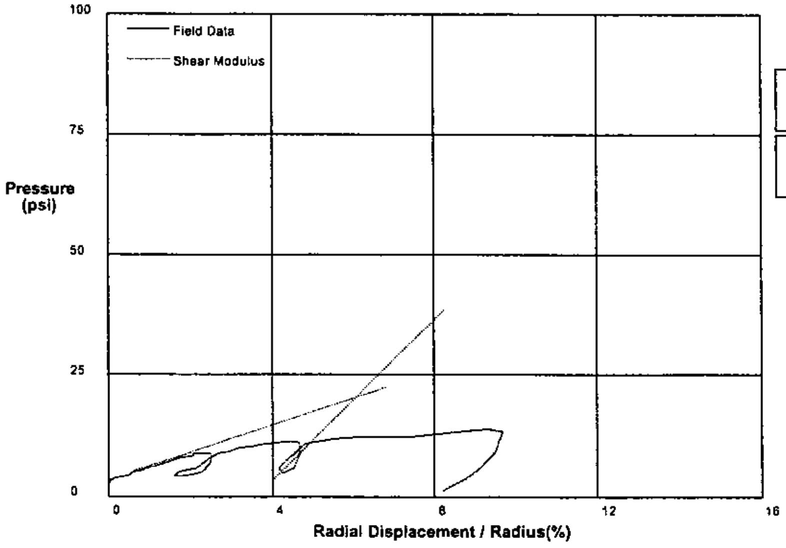
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 15 feet File C:\DATA\C-290\PC39.P



Shear Modulus 138 psi

Shear Modulus 416 psi

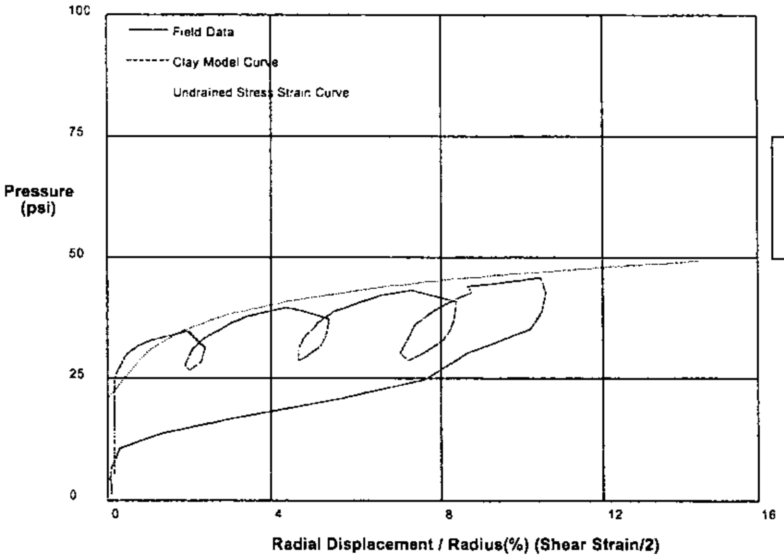
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 38 feet File C:\DATA\C-290\PC40.P



GIBSON'S CLAY MODEL

Shear Strength 7 psi
Insitu Stress 21 psi
Shear Modulus 500 psi

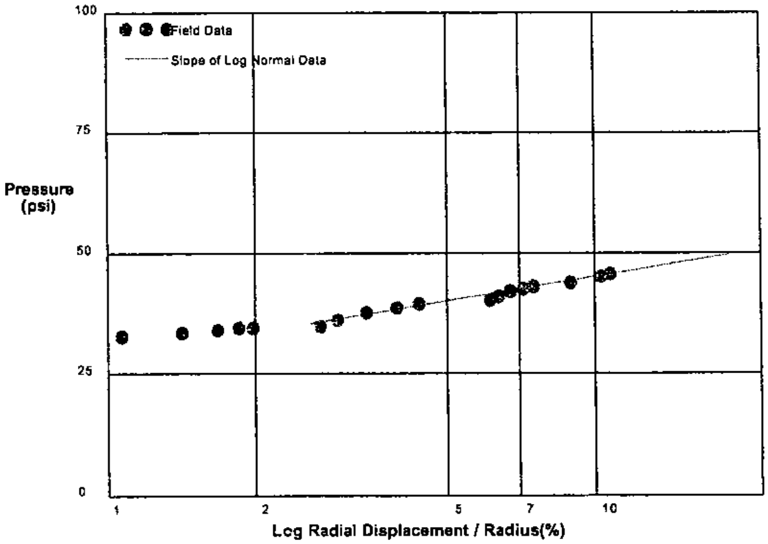
shift .5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 38 feet File C:\DATA\C-290\PC40.P



Shear Strength 7.3 psi
Limit Pressure 55 psi

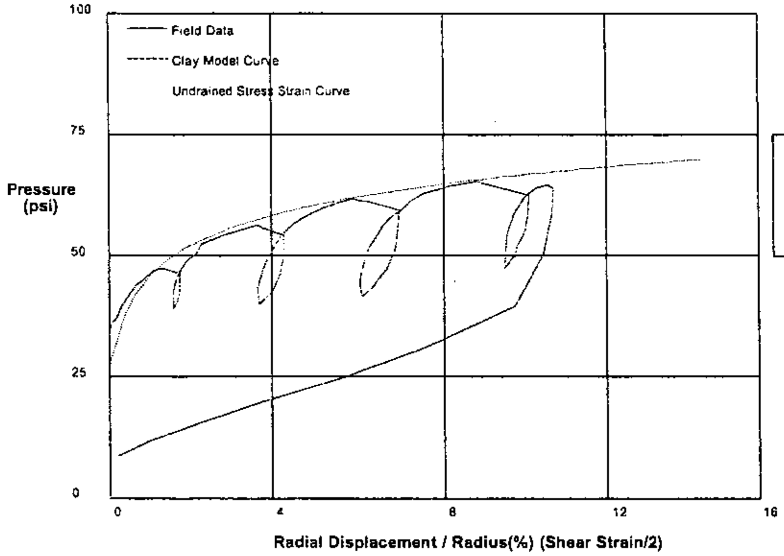
shift .5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 40 feet File C:\DATA\C-290\PC41.P



GIBSON'S CLAY MODEL

Shear Strength 9 psi
Insitu Stress 28 psi
Shear Modulus 1200 psi

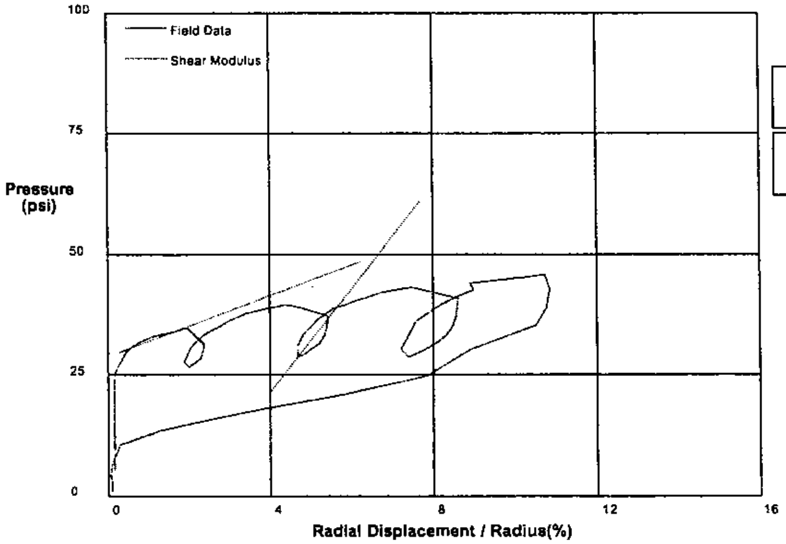
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 38 feet File C:\DATA\C-290\PC40.P



Shear Modulus 158 psi

Shear Modulus 533 psi

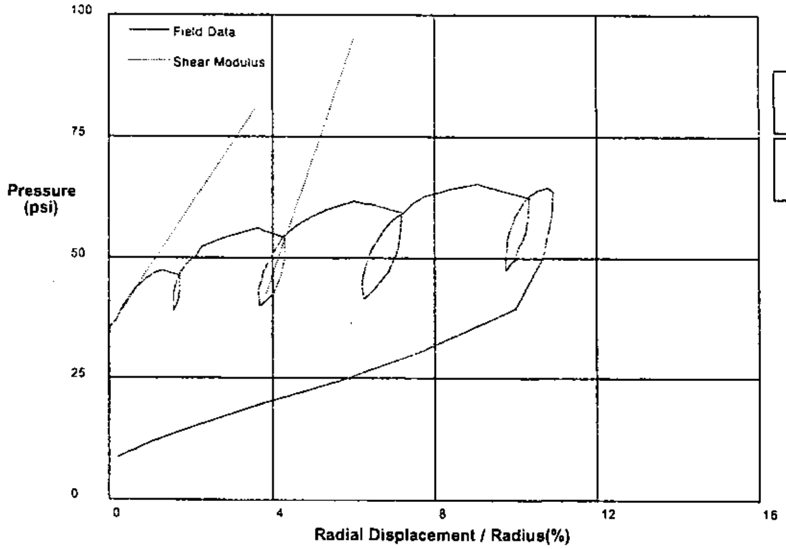
shift .5

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 40 feet File C:\DATA\C-290\PC41.P



Shear Modulus 634 psi

Shear Modulus 1217 psi

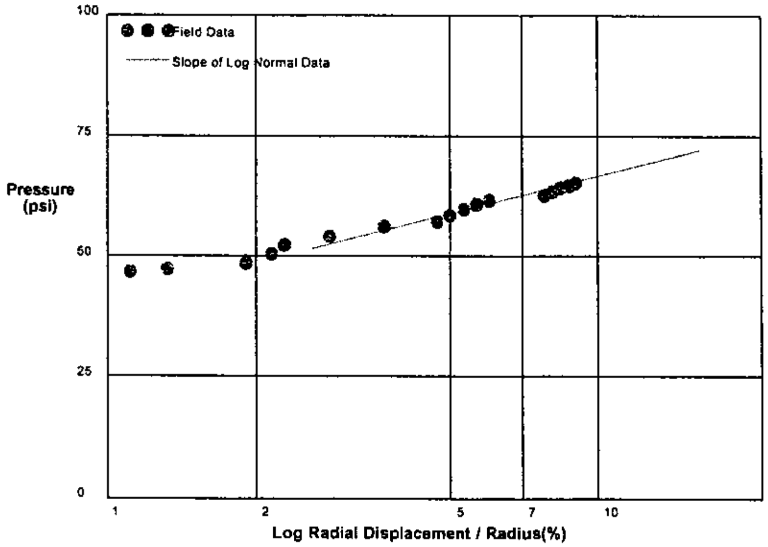
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 40 feet File C:\DATA\C-290\PC41.P



Shear Strength 11.1 psi
Limit Pressure 82 psi

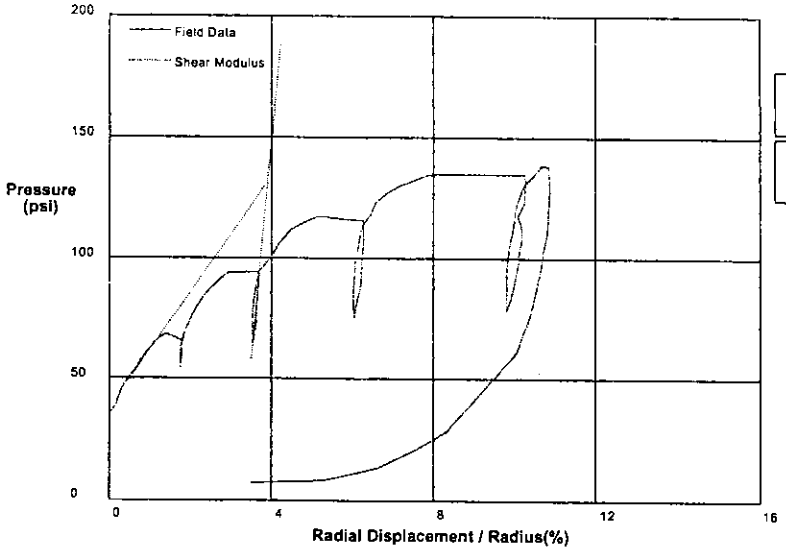
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 54 feet File C:\DATA\C-290\PC423.P



Shear Modulus 1203 psi

Shear Modulus 9166 psi

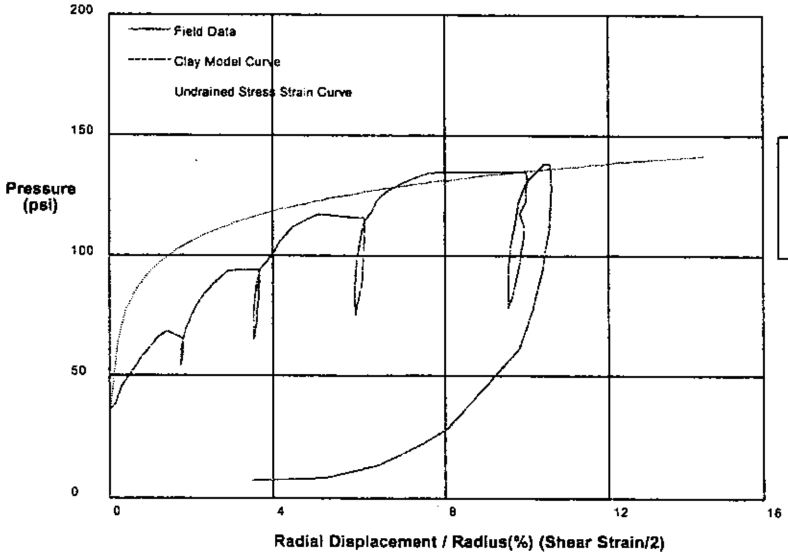
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-8-04

Hole No. 65 Depth 54 feet File C:\DATA\C-290\PC423.P



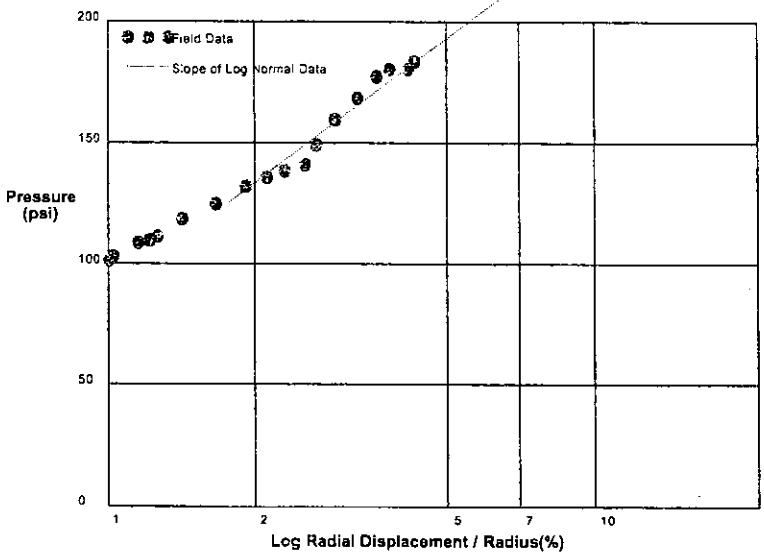
GIBSON'S CLAY MODEL

Shear Strength 18 psi
Insitu Stress 34 psi
Shear Modulus 9000 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 11-10-04
Hole No. 65 Depth 113 feet File C:\DATA\C-290\PC45.P

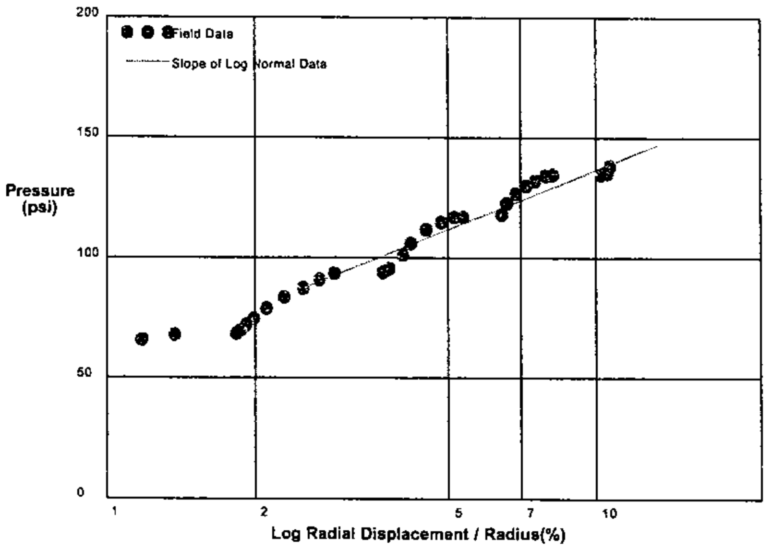


Shear Strength 65.6 psi
Limit Pressure 331 psi

shift 9

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 11-8-04
Hole No. 65 Depth 54 feet File C:\DATA\C-290\PC423.P



Shear Strength 35.7 psi
Limit Pressure 187 psi

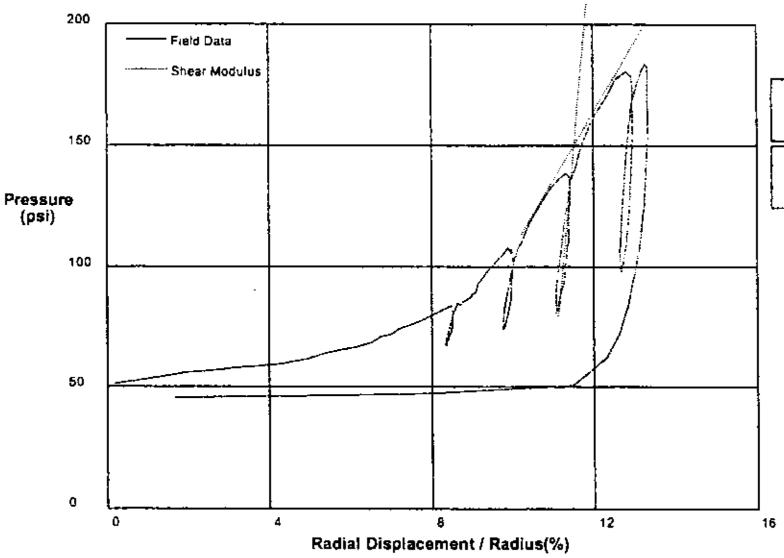
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-10-04

Hole No. 65 Depth 113 feet File C:\DATA\C-290\PC45.P



Shear Modulus 1411 psi

Shear Modulus 9166 psi

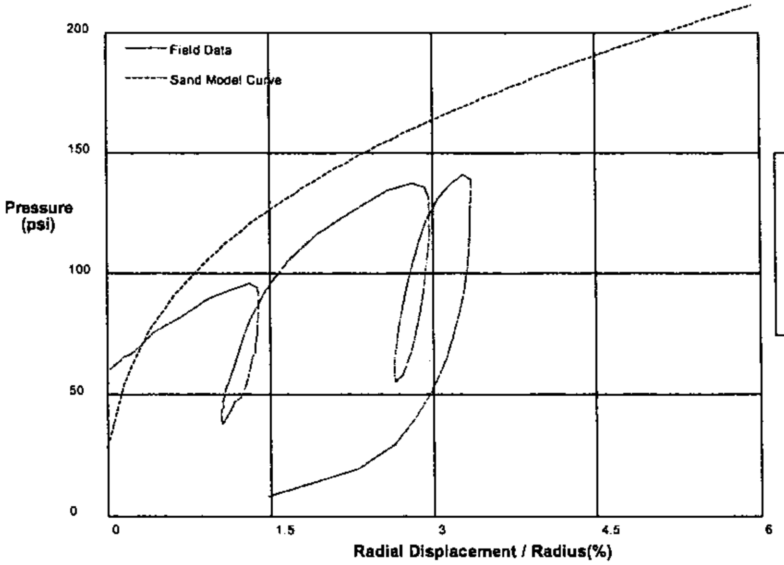
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-10-04

Hole No. 65 Depth 113 feet File C:\DATA\C-290\PC45.P



THE HUGHES SAND MODEL

Water Pressure	43 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	28 psi
Shear Modulus	9000 psi

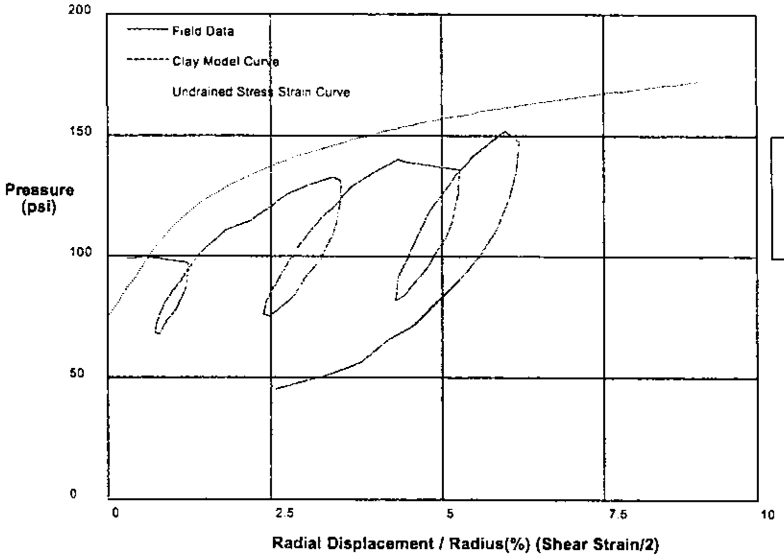
shift 10

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-10-04

Hole No. 65 Depth 111.5 feet File C:\DATA\C-290\PC45.P



GIBSON'S CLAY MODEL

Shear Strength 27 psi
Insitu Stress 75 psi
Shear Modulus 2000 psi

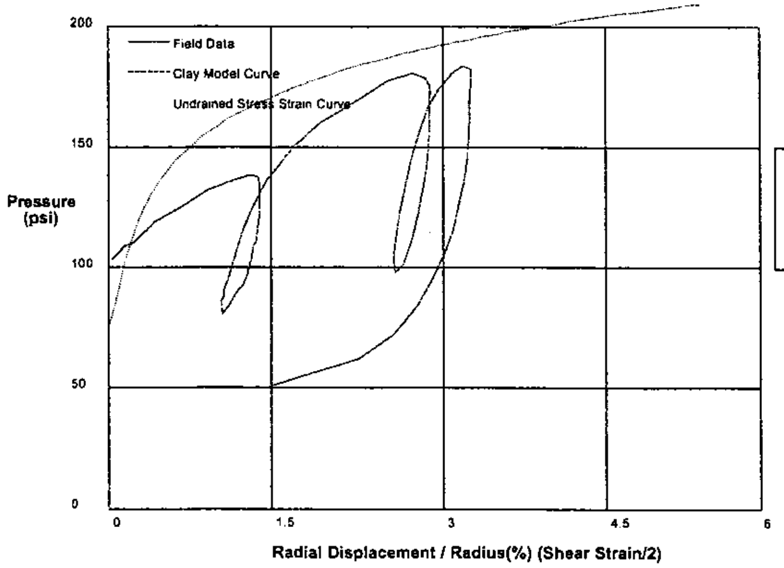
shift 7

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-10-04

Hole No. 65 Depth 113 feet File C:\DATA\C-290\PC45.P



GIBSON'S CLAY MODEL

Shear Strength 30 psi
Insitu Stress 75 psi
Shear Modulus 9000 psi

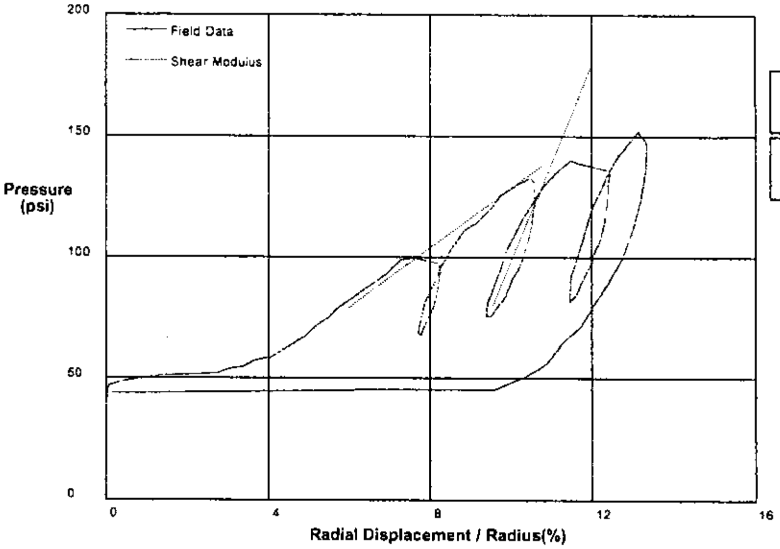
shift 10

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-10-04

Hole No. 65 Depth 111.5 feet File C:\DATA\C-290\PC46.P



Shear Modulus 620 psi

Shear Modulus 2023 psi

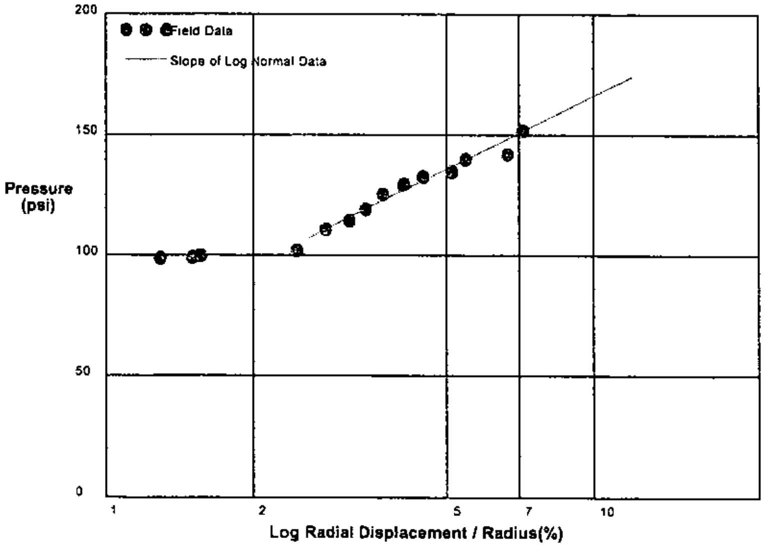
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-10-04

Hole No. 65 Depth 111.5 feet File C:\DATA\C-290\PC46.P



Shear Strength 43.7 psi
Limit Pressure 228 psi

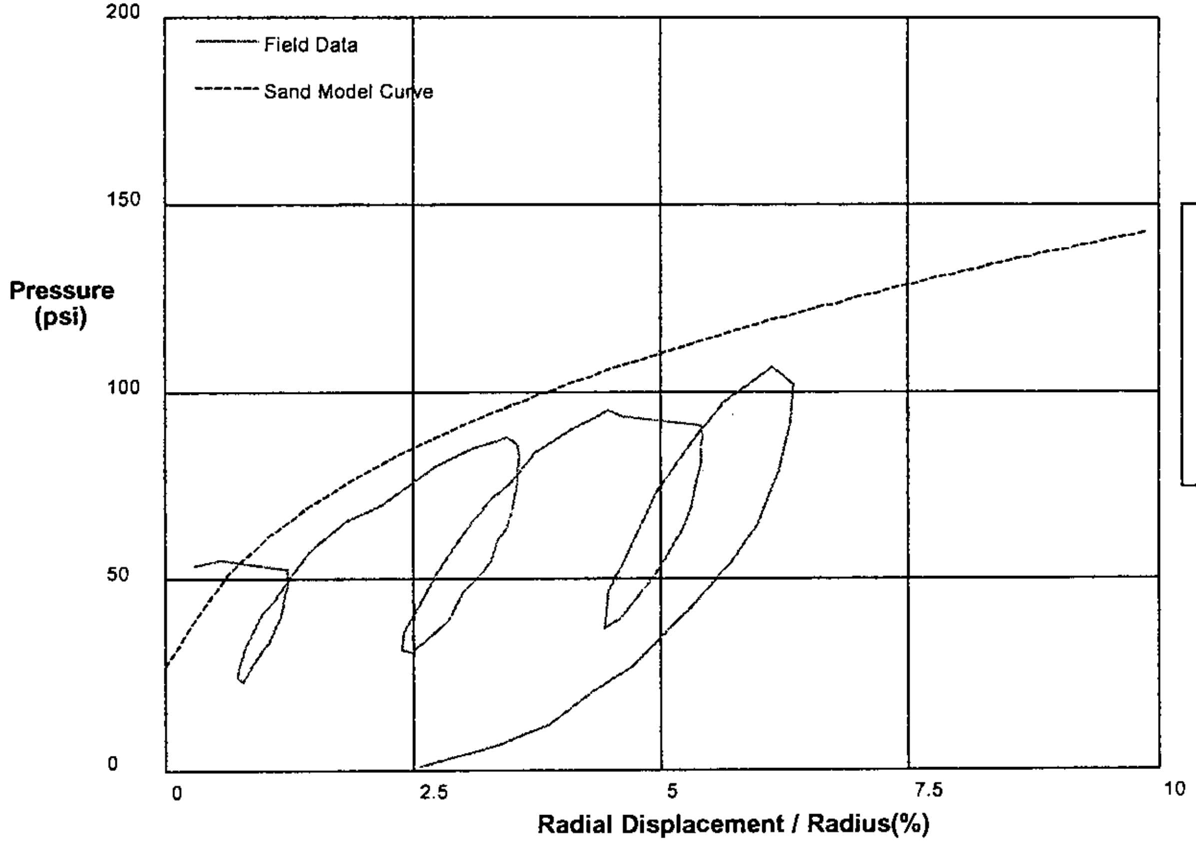
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 11-10-04

Hole No. 65 Depth 111.5 feet File C:\DATA\C-290\PC46.P



THE HUGHES SAND MODEL

Water Pressure	45 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	27 psi
Shear Modulus	2000 psi

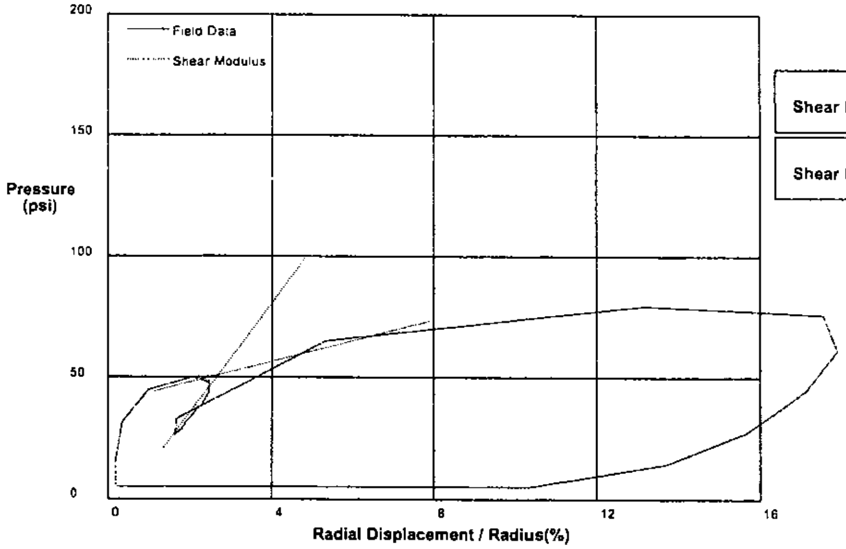
shift 7

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) October 25, 2004

Hole No. 71 Depth 25 ft File C:\DATA\C-290\PC24.P



Shear Modulus 1142 psi

Shear Modulus 216 psi

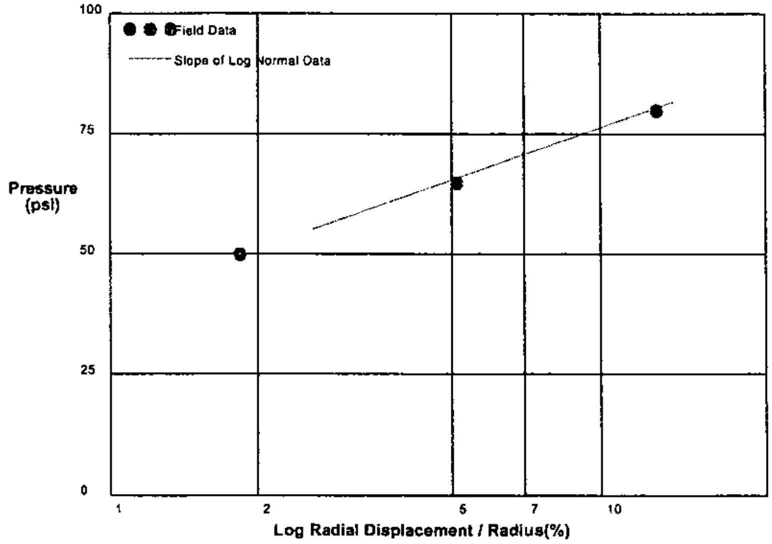
shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-25-04

Hole No. 71 Depth 25feet File C:\DATA\C-290\PC24.P



Shear Strength 15.7 psi
Limit Pressure 98 psi

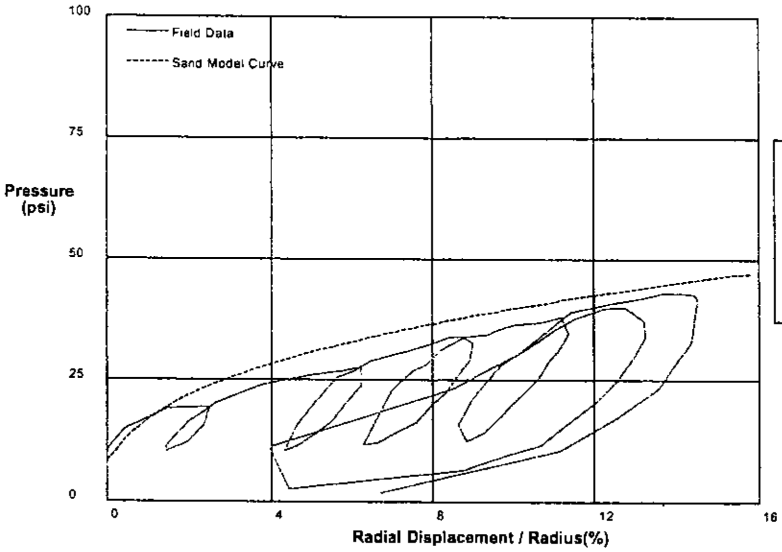
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-25-04

Hole No. 71 Depth 23.5 feet File C:\DATA\C-290\PC25.P



THE HUGHES SAND MODEL

Water Pressure	4 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	8 psi
Shear Modulus	500 psi

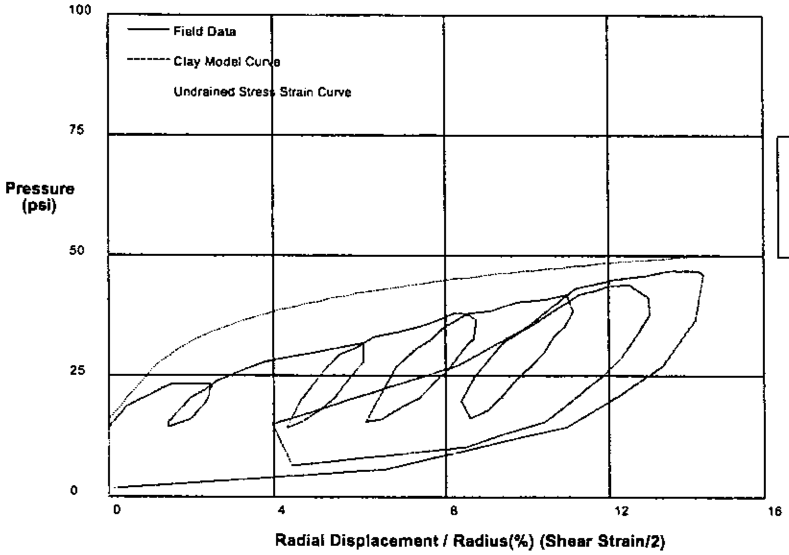
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-25-04

Hole No. 71 Depth 23.5 feet File C:\DATA\C-290\PC25.P



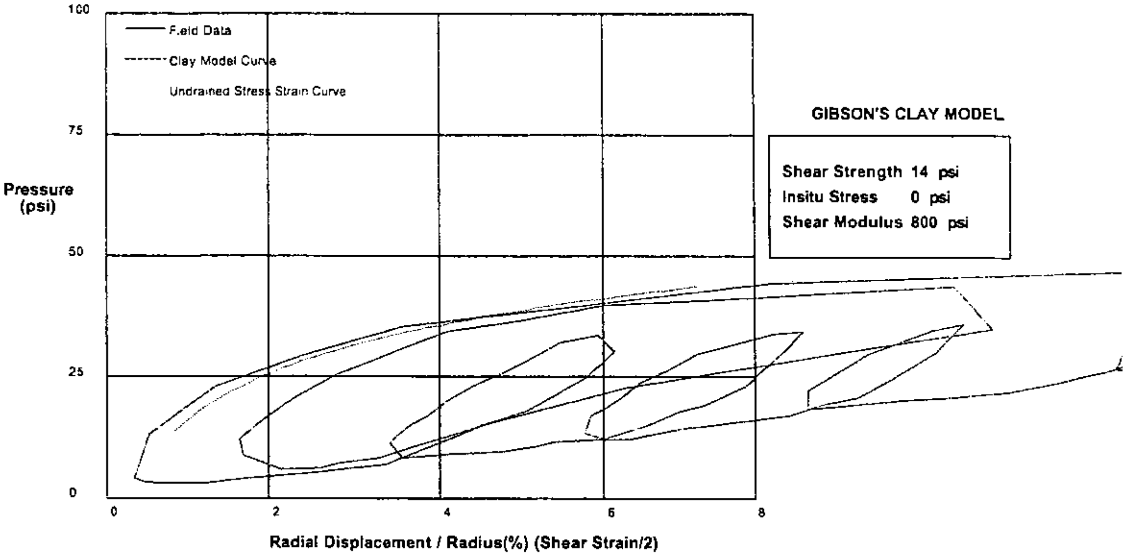
GIBSON'S CLAY MODEL

Shear Strength	9 psi
Insitu Stress	16 psi
Shear Modulus	500 psi

shift 0

HUGHES

PRESSUREMETER DATA	**Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown)	10-25-04
Hole No. 71 Depth 23.5	File C:\DATA\C-290\PC25.P



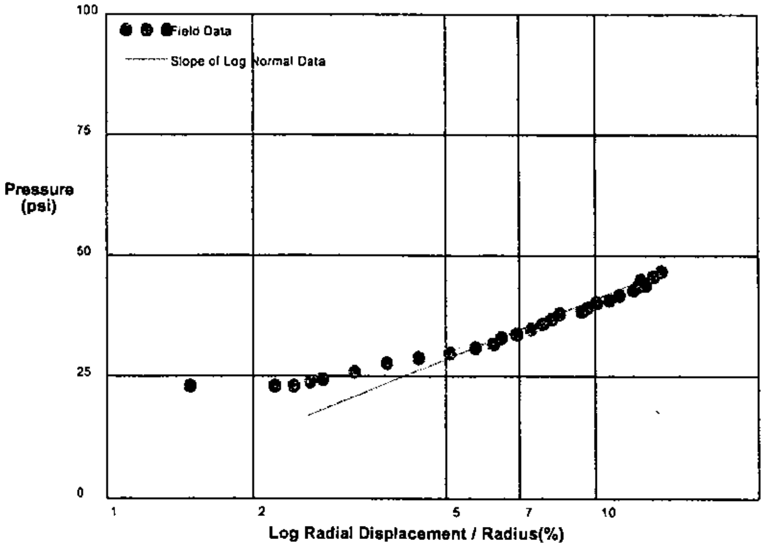
GIBSON'S CLAY MODEL

Shear Strength 14 psi
Insitu Stress 0 psi
Shear Modulus 800 psi

shift 5.1

HUGHES

PRESSUREMETER DATA	**Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown)	10-25-04
Hole No. 71 Depth 23.5 feet	File C:\DATA\C-290\PC25.P



Shear Strength 17.8 psi
Limit Pressure 66 psi

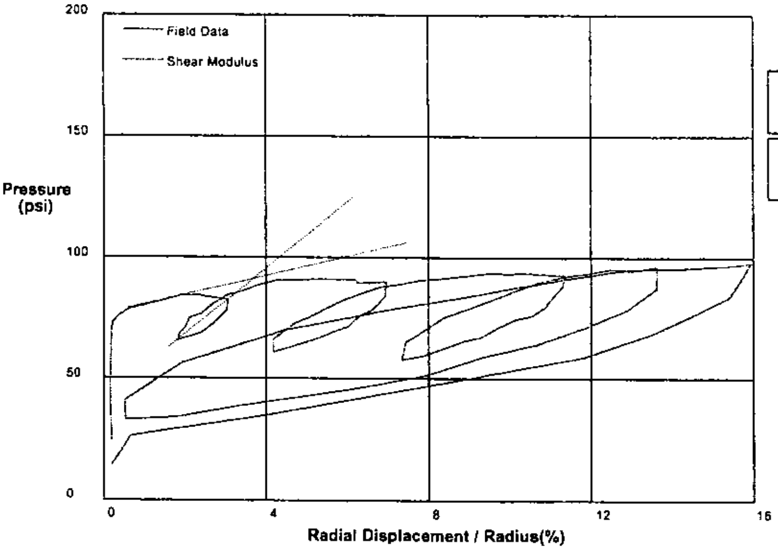
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) October 25, 2004

Hole No. 71 Depth 45 ft File C:\DATA\C-290\PC26.P



Shear Modulus 687 psi

Shear Modulus 200 psi

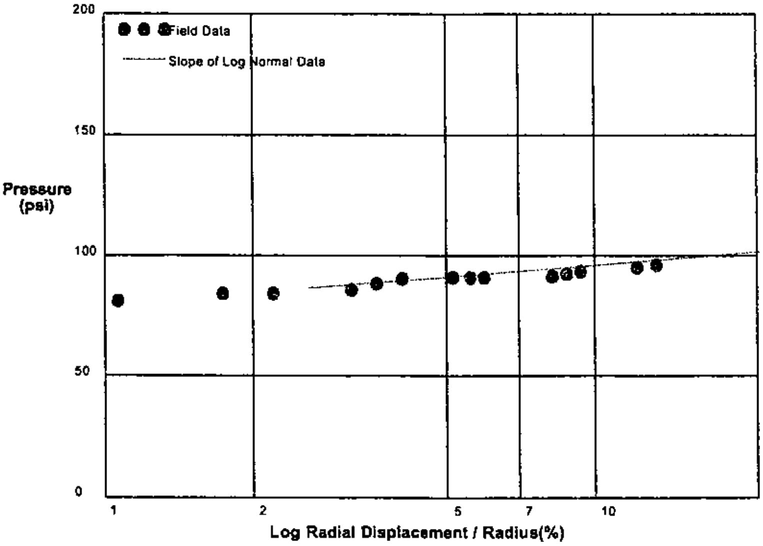
shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-25-04

Hole No. 71 Depth 45 feet File C:\DATA\C-290\PC26.P

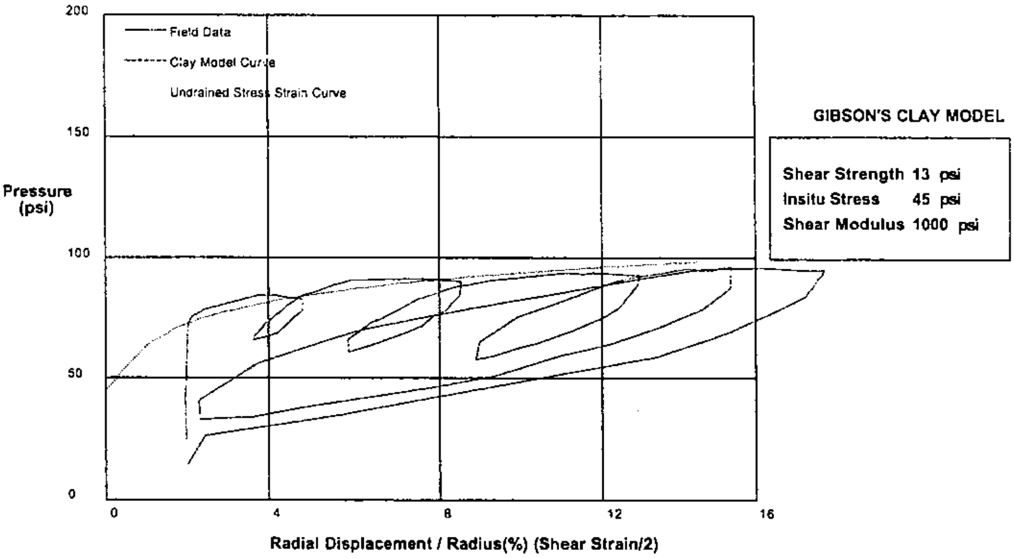


Shear Strength 7 psi
Limit Pressure 106 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 10-25-04
Hole No. 71 Depth 45 feet File C:\DATA\C-290\PC26.P



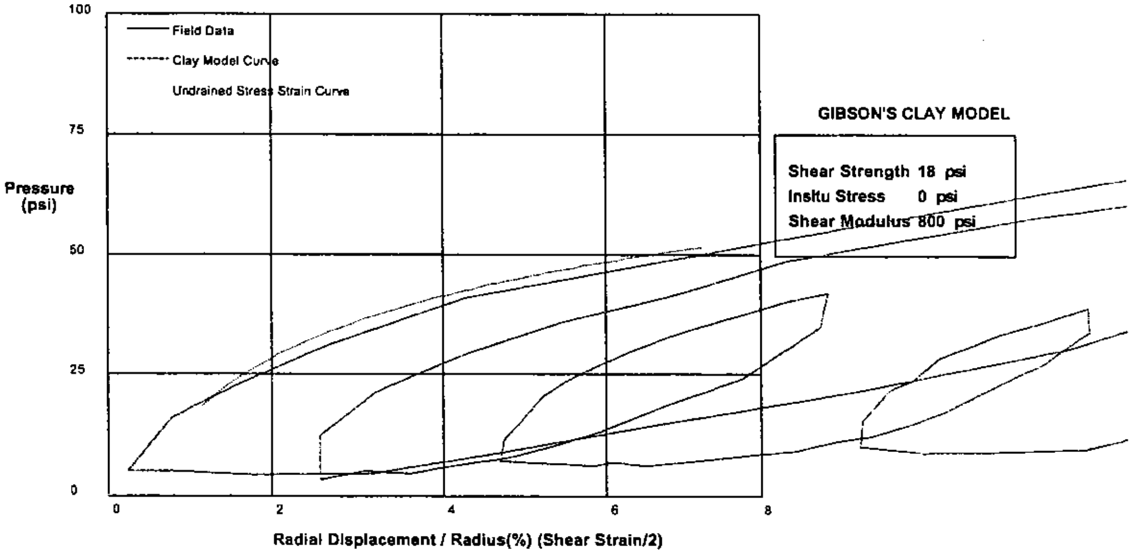
GIBSON'S CLAY MODEL

Shear Strength 13 psi
Insitu Stress 45 psi
Shear Modulus 1000 psi

shift-2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 10-25-04
Hole No. 71 Depth 45 ft File C:\DATA\C-290\PC26.P



GIBSON'S CLAY MODEL

Shear Strength 18 psi
Insitu Stress 0 psi
Shear Modulus 800 psi

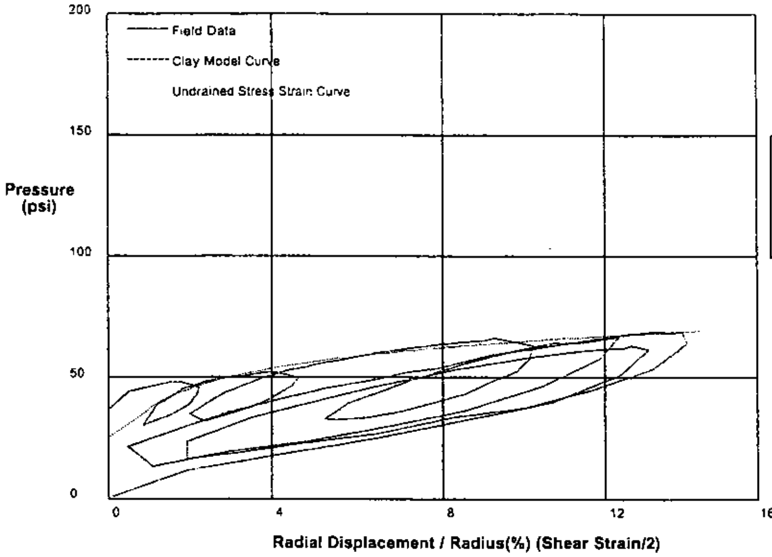
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 10-25-04

Hole No. 71 Depth 43.5 feet File C:\DATA\C-290\PC27.P



GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 25 psi
Shear Modulus 600 psi

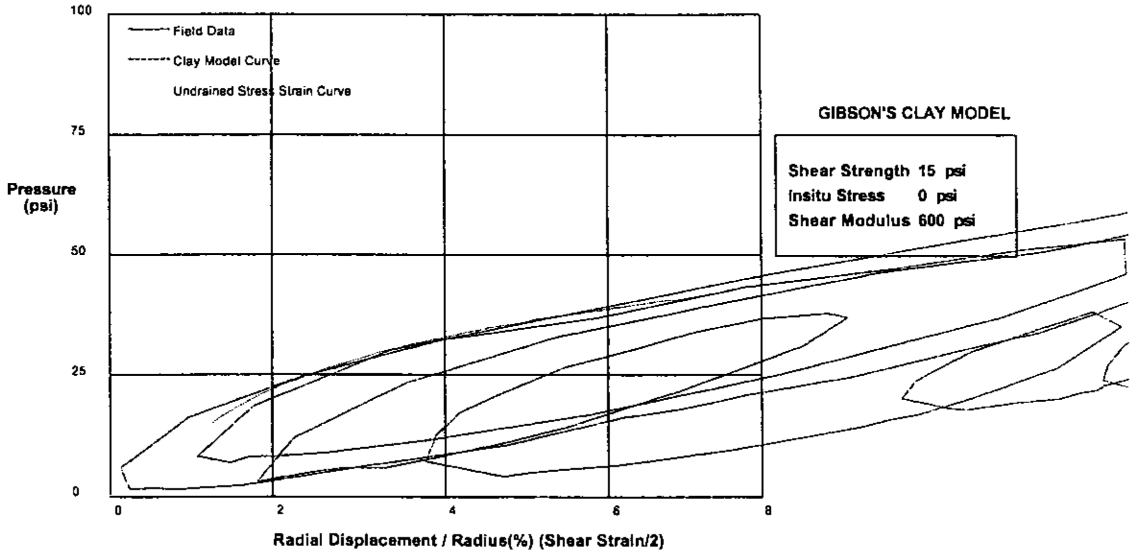
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 10-25-04

Hole No. 71 Depth 43.5 File C:\DATA\C-290\PC27.P



GIBSON'S CLAY MODEL

Shear Strength 15 psi
Insitu Stress 0 psi
Shear Modulus 600 psi

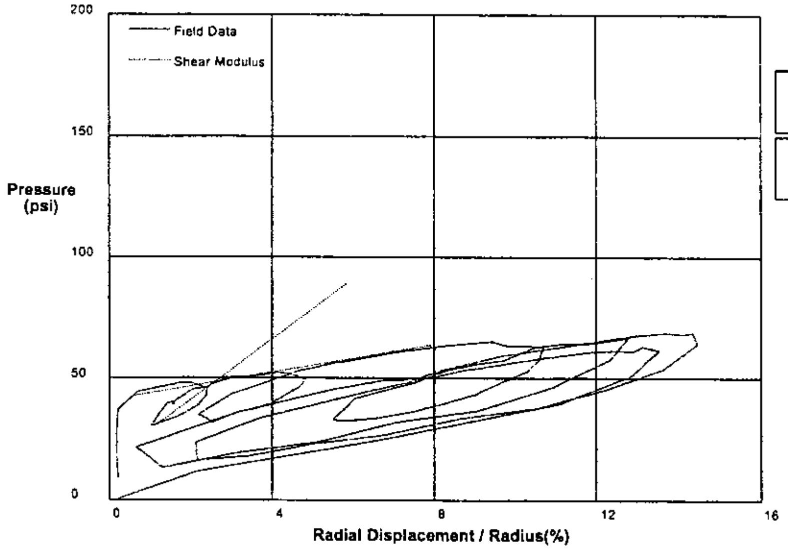
shift 5.6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) October 25, 2004

Hole No. 71 Depth 43.5 ft File C:\DATA\C-290\PC27.P



Shear Modulus 620 psi

Shear Modulus 140 psi

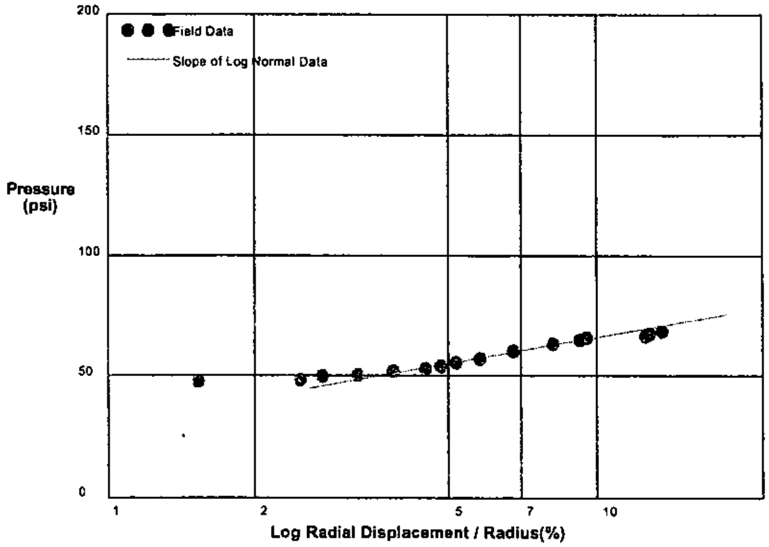
shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-25-04

Hole No. 71 Depth 43.5 feet File C:\DATA\C-290\PC27.P



Shear Strength 15.6 psi
Limit Pressure 88 psi

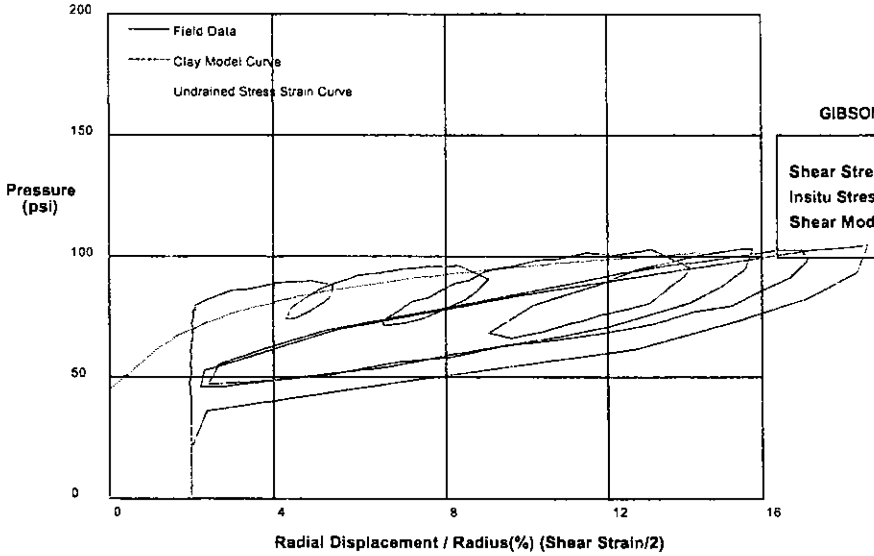
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-26-04

Hole No. 71 Depth 65 feet File C:\DATA\C-290\PC28.P



GIBSON'S CLAY MODEL

Shear Strength	16 psi
Insitu Stress	45 psi
Shear Modulus	700 psi

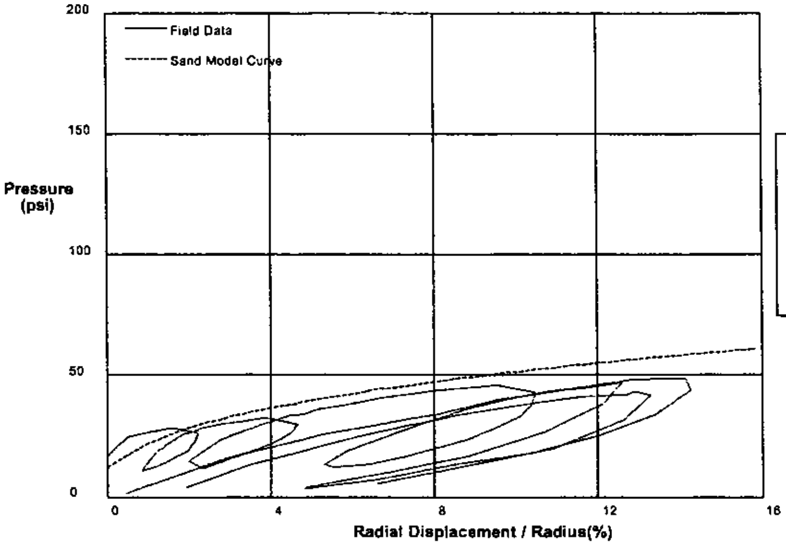
shift-2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-25-04

Hole No. 71 Depth 43.5 feet File C:\DATA\C-290\PC27.P



THE HUGHES SAND MODEL

Water Pressure	20 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	12 psi
Shear Modulus	500 psi

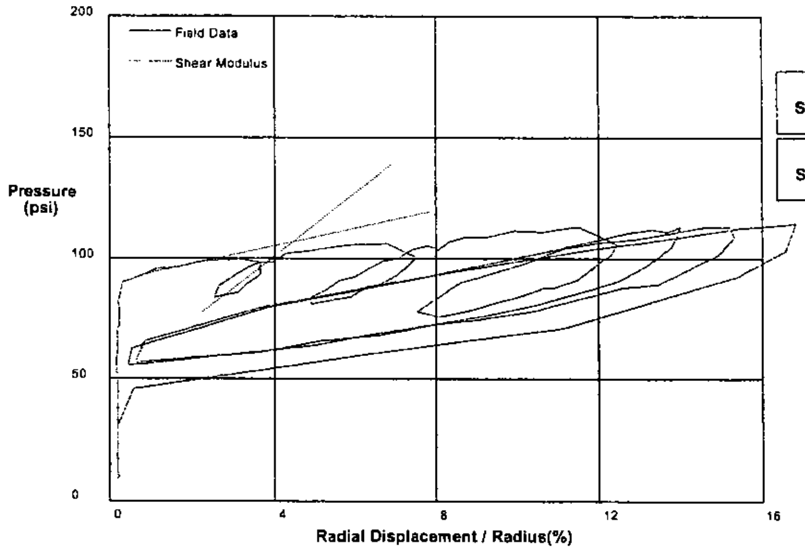
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Rail (Downtown) October 26, 2004

Hole No. 71 Depth 65 ft File C:\DATA\C-290\PC28.P



Shear Modulus 653 psi

Shear Modulus 184 psi

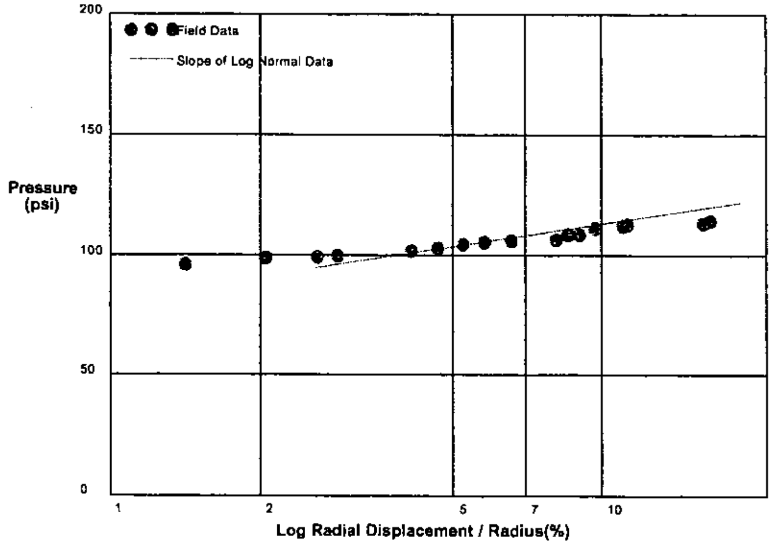
shift-.2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 10-26-04

Hole No. 71 Depth 65 feet File C:\DATA\C-290\PC28.P



Shear Strength 13.6 psi
Limit Pressure 132 psi

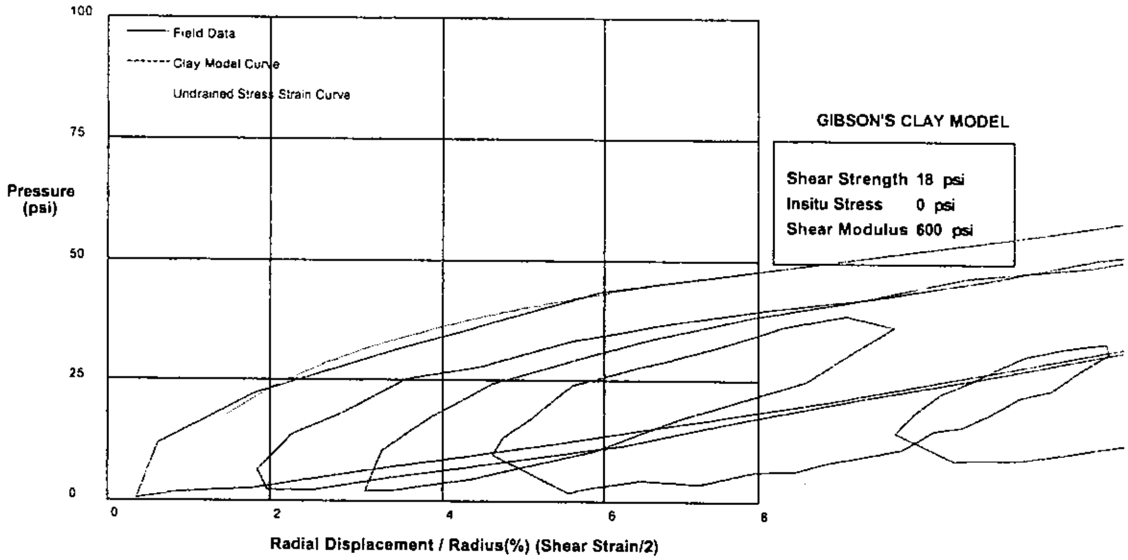
shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-26-04

Hole No. 71 Depth 55 ft File C:\DATA\C-290\PC28.P



GIBSON'S CLAY MODEL

Shear Strength 18 psi
Insitu Stress 0 psi
Shear Modulus 600 psi

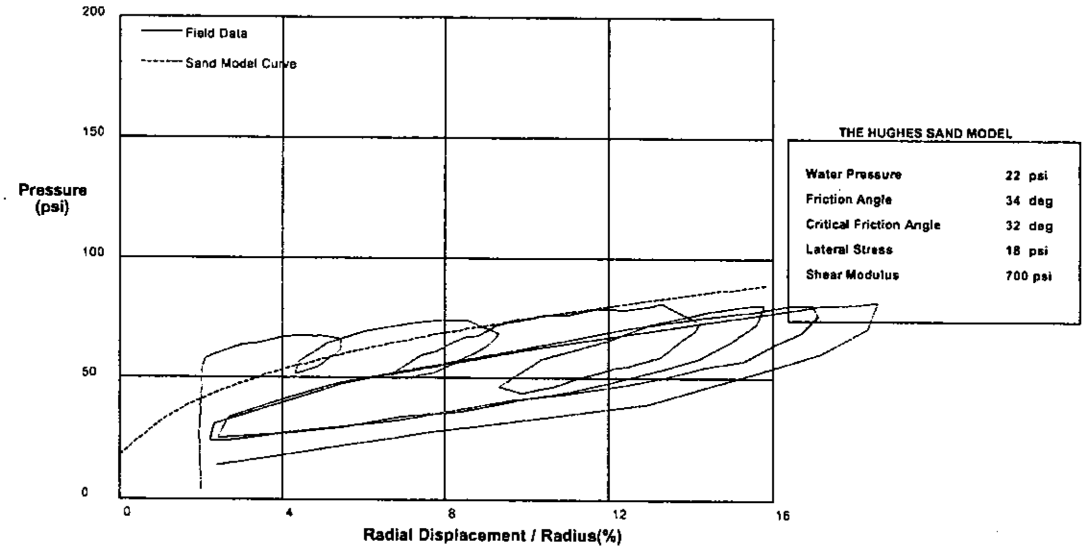
shift 3

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-26-04

Hole No. 71 Depth 65 feet File C:\DATA\C-290\PC28.P



THE HUGHES SAND MODEL

Water Pressure	22 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	18 psi
Shear Modulus	700 psi

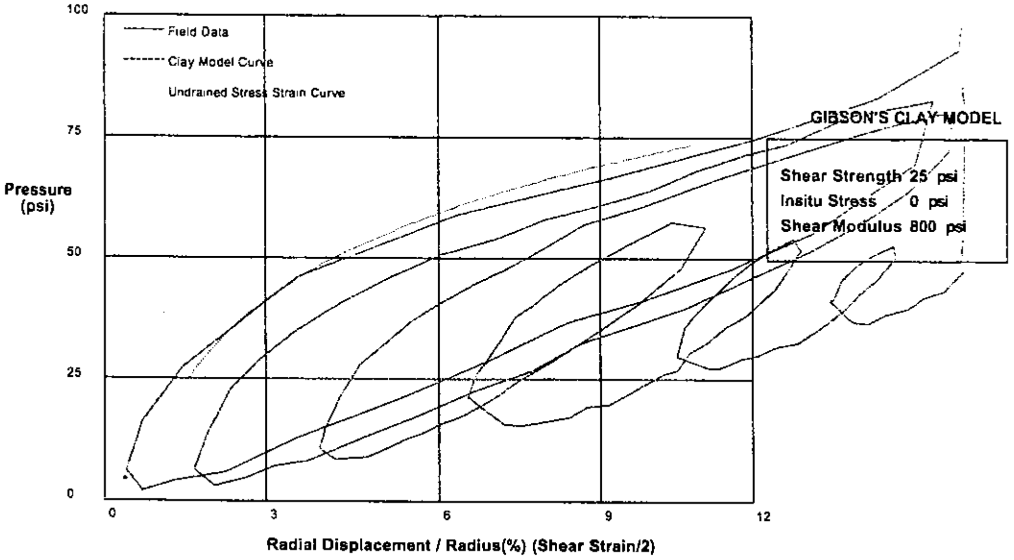
shift-2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 10-26-04

Hole No. 71 Depth 63.5 File C:\DATA\C-290\PC29.P



GIBSON'S CLAY MODEL

Shear Strength	25 psi
Insitu Stress	0 psi
Shear Modulus	800 psi

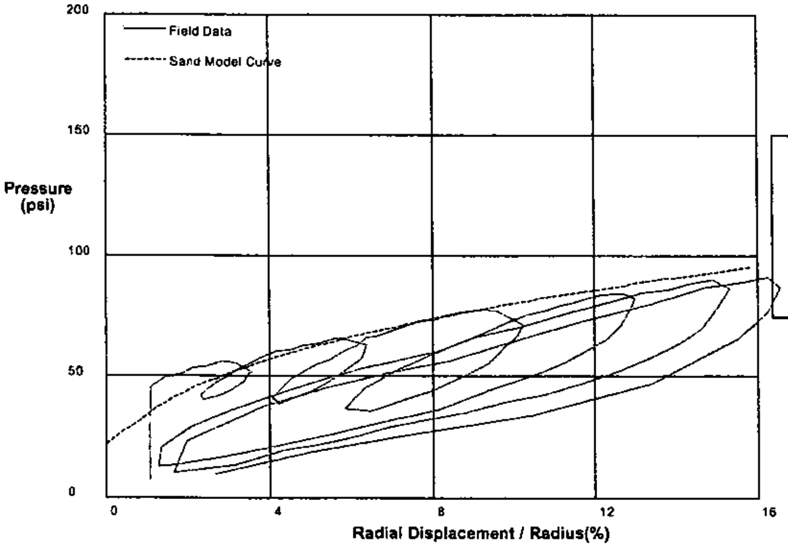
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 10-26-04

Hole No. 71 Depth 63.5 feet File C:\DATA\C-290\PC29.P



THE HUGHES SAND MODEL

Water Pressure	22 psi
Friction Angle	34 deg
Critical Friction Angle	32 deg
Lateral Stress	22 psi
Shear Modulus	600 psi

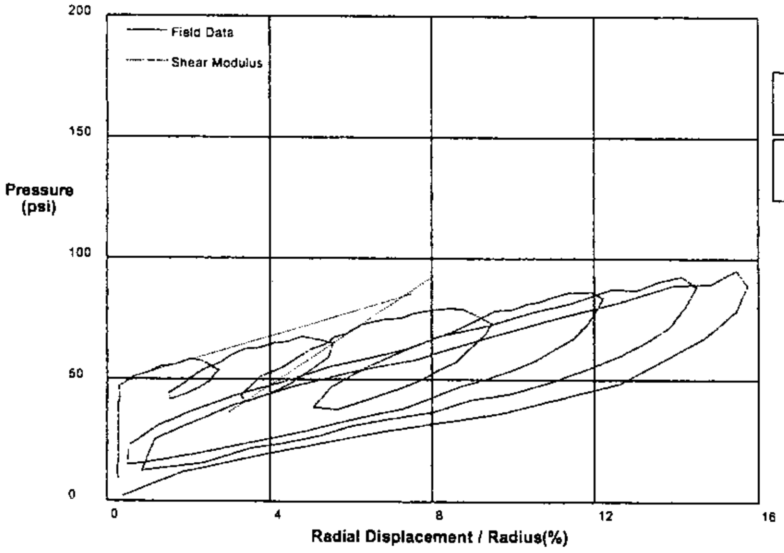
shift-1

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Rail (Downtown) October 26, 2004

Hole No. 71 Depth 63.5 ft File C:\DATA\C-290\PC29.P



Shear Modulus 559 psi

Shear Modulus 249 psi

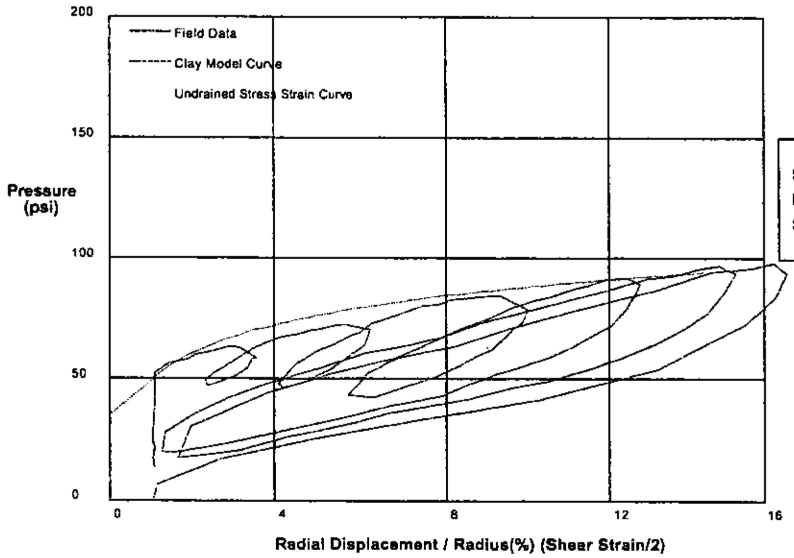
shift-.2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-26-04

Hole No. 71 Depth 63.5 feet File C:\DATA\C-290\PC29.P



GIBSON'S CLAY MODEL

Shear Strength 17 psi
Insitu Stress 35 psi
Shear Modulus 700 psi

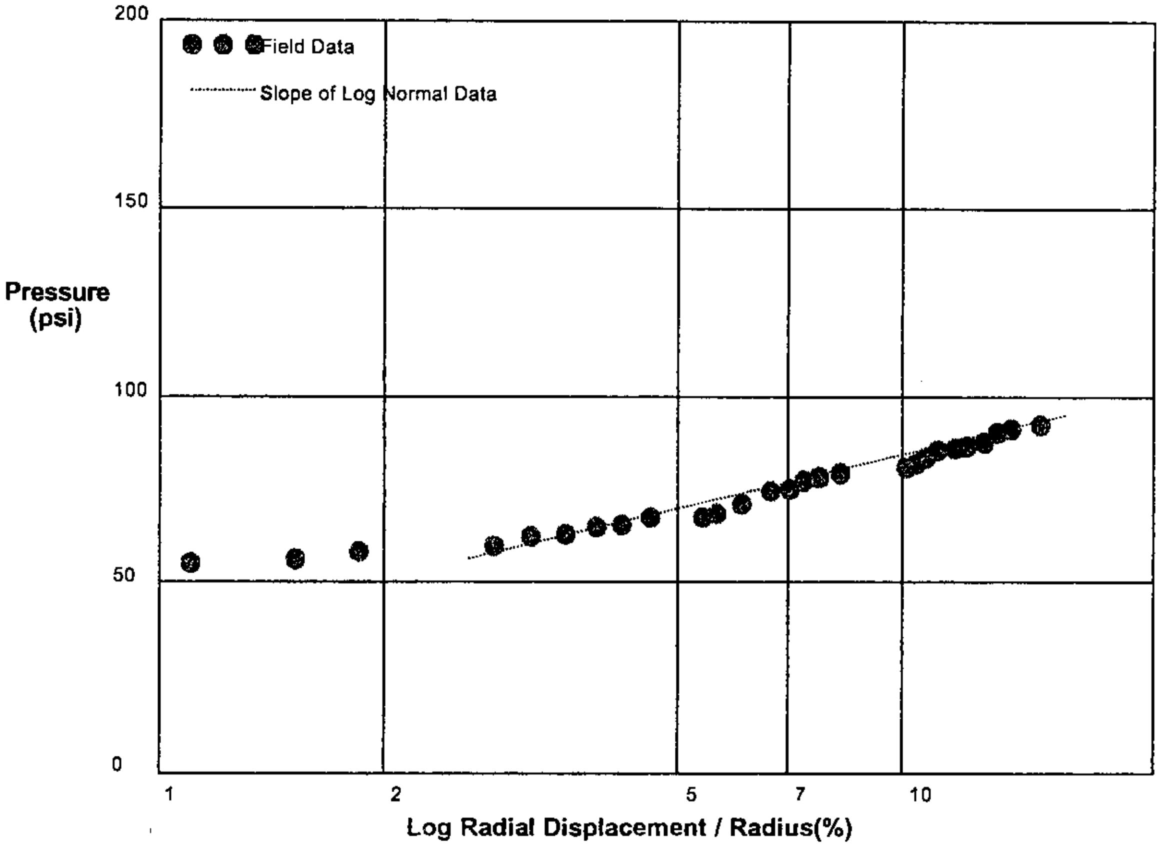
shift-1

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 10-26-04

Hole No. 71 Depth 63.5 feet File C:\DATA\C-290\PC29.P

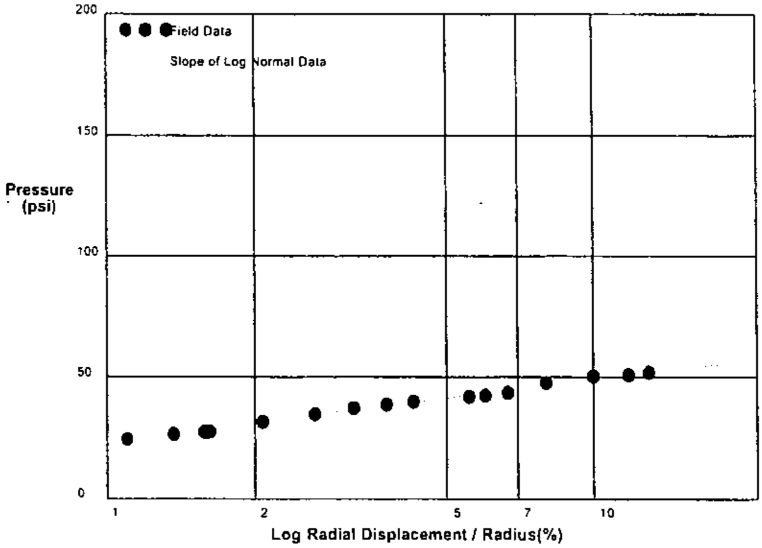


Shear Strength 21.1 psi
Limit Pressure 114 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 13 feet File E:\PC149.P

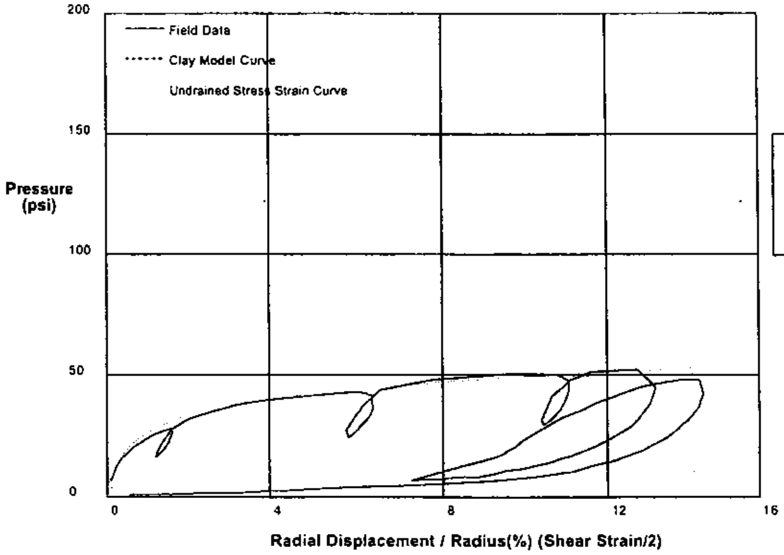


Shear Strength 10.6 psi
Limit Pressure 64 psi

shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 13 feet File E:\PC149.P



GIBSON'S CLAY MODEL

Shear Strength 10 psi
Insitu Stress 5 psi
Shear Modulus 1500 psi

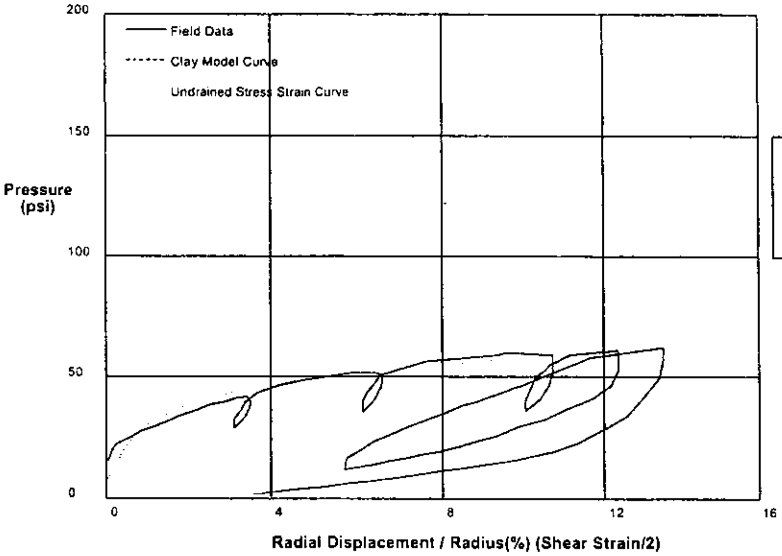
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-31-05

Hole No. BH-76 Depth 15 feet File C:\DATA\C-290\C-29005\PC150.P



GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 7 psi
Shear Modulus 1500 psi

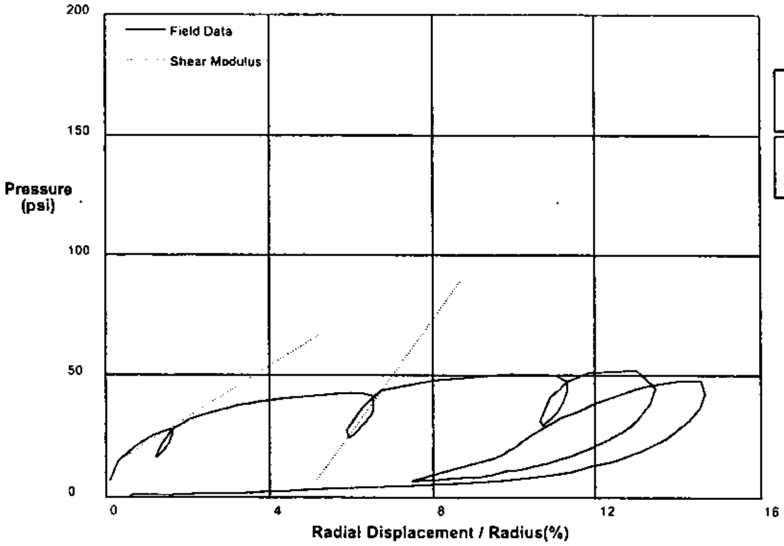
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-31-05

Hole No. BH-76 Depth 13 feet File E:\PC149.P



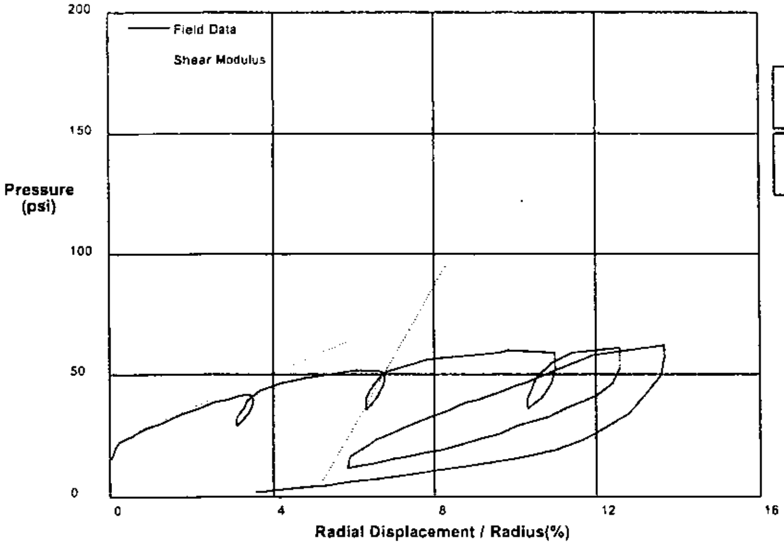
Shear Modulus 530 psi

Shear Modulus 1178 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 15 feet File E:\PC150.P



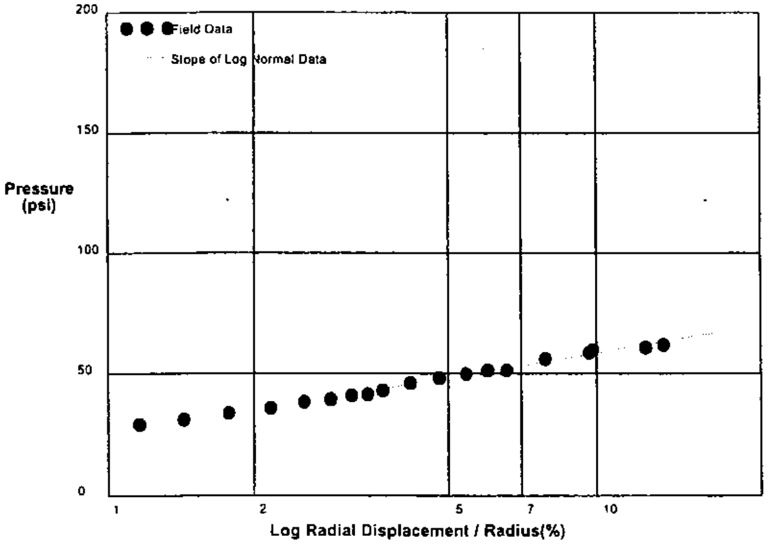
Shear Modulus 358 psi

Shear Modulus 1448 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 15 feet File E:\PC150.P

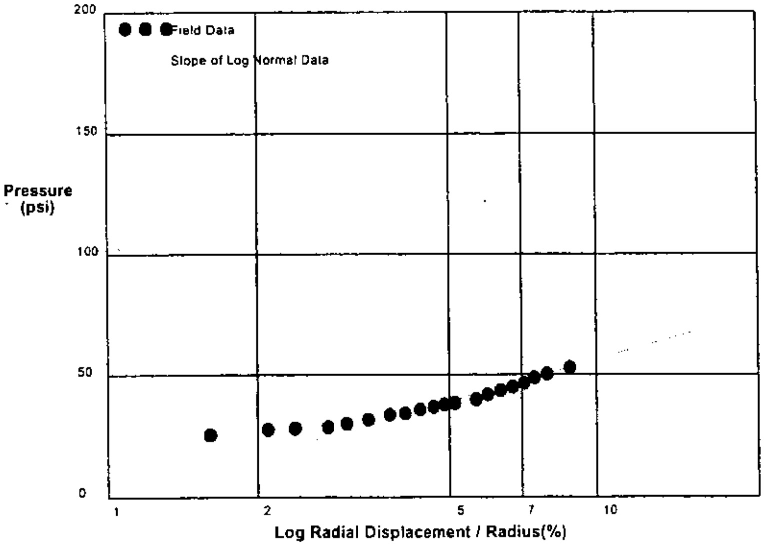


Shear Strength 14.6 psi
Limit Pressure 79 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 25 feet File E:\PC152.P

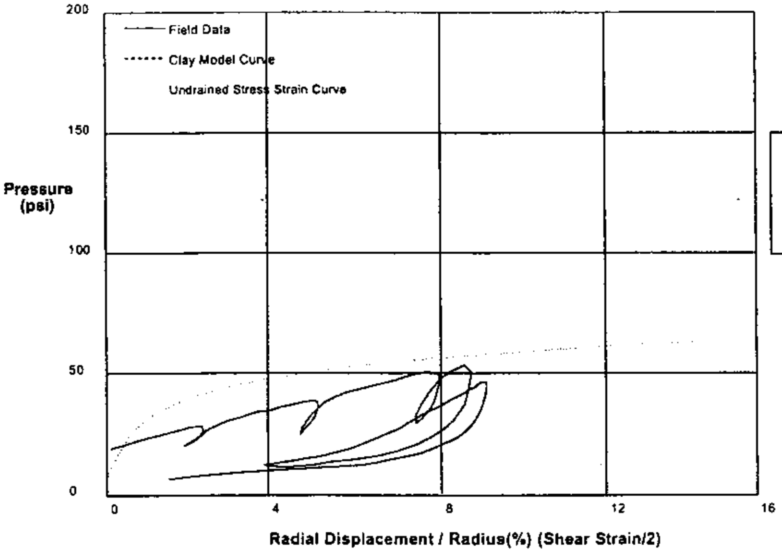


Shear Strength 24.8 psi
Limit Pressure 91 psi

shift 2

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 25 feet File C:\DATA\C-290\C-29005\PC152.P



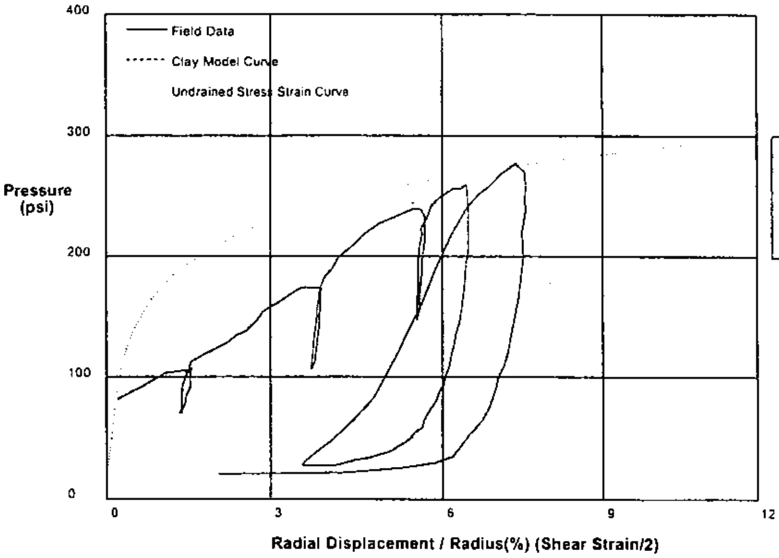
GIBSON'S CLAY MODEL

Shear Strength 12 psi
Insitu Stress 8 psi
Shear Modulus 1500 psi

shift 2

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 45 feet File E:\PC153.P



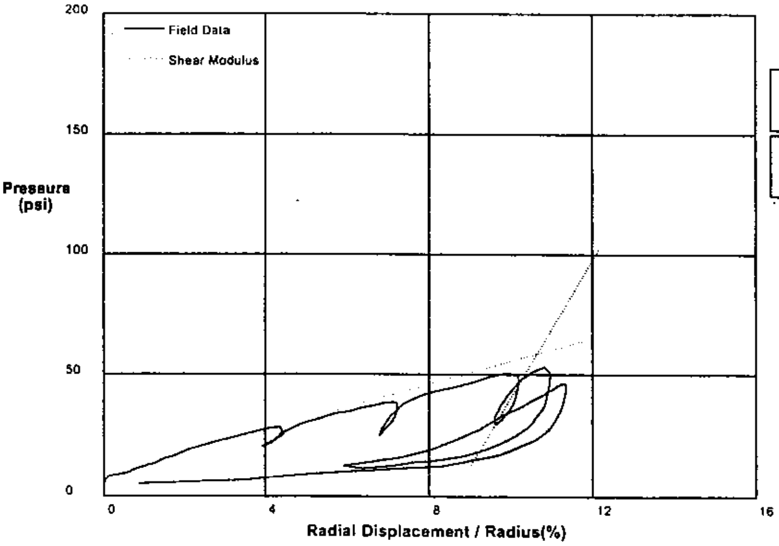
GIBSON'S CLAY MODEL

Shear Strength 50 psi
Insitu Stress 20 psi
Shear Modulus 20000 psi

shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 25 feet File E:\PC152.P



Shear Modulus 241 psi

Shear Modulus 1448 psi

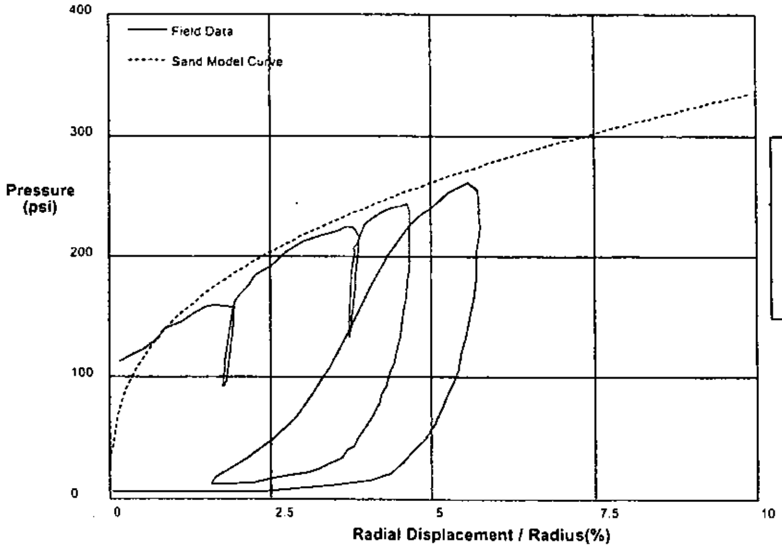
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-31-05

Hole No. bh76 Depth 45feet File C:\DATA\C-290\C-29005\PC153.P



THE HUGHES SAND MODEL

Water Pressure	15 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	30 psi
Shear Modulus	20000 psi

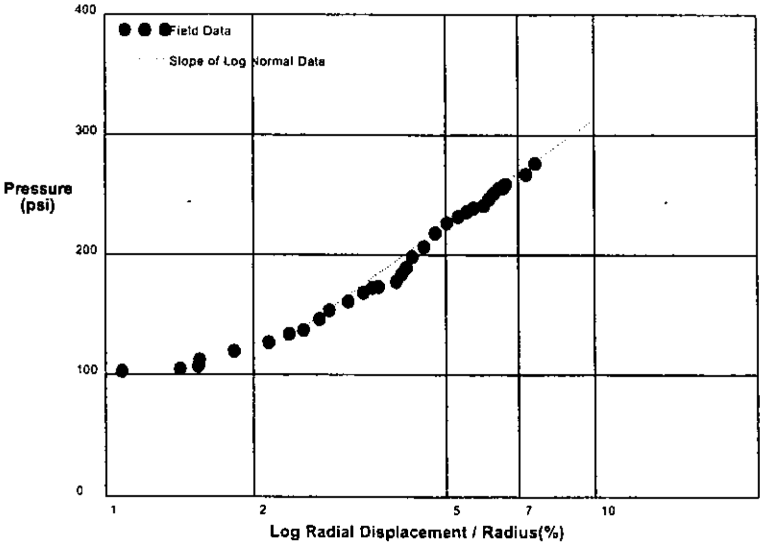
shift 6

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-31-05

Hole No. BH-76 Depth 45 feet File E:\PC153.P



Shear Strength 126.7 psi
Limit Pressure 492 psi

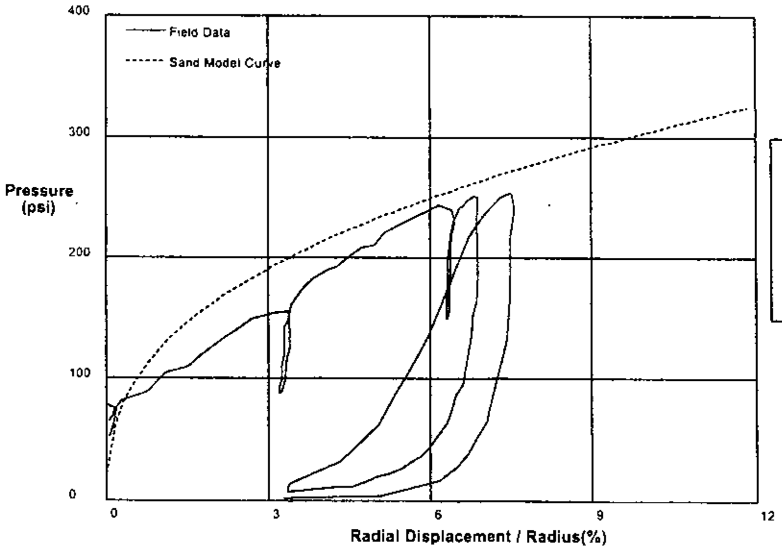
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-31-05

Hole No. BH-76 Depth 43.5 feet File E:\PC154.P



THE HUGHES SAND MODEL

Water Pressure	15 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	20 psi
Shear Modulus	20000 psi

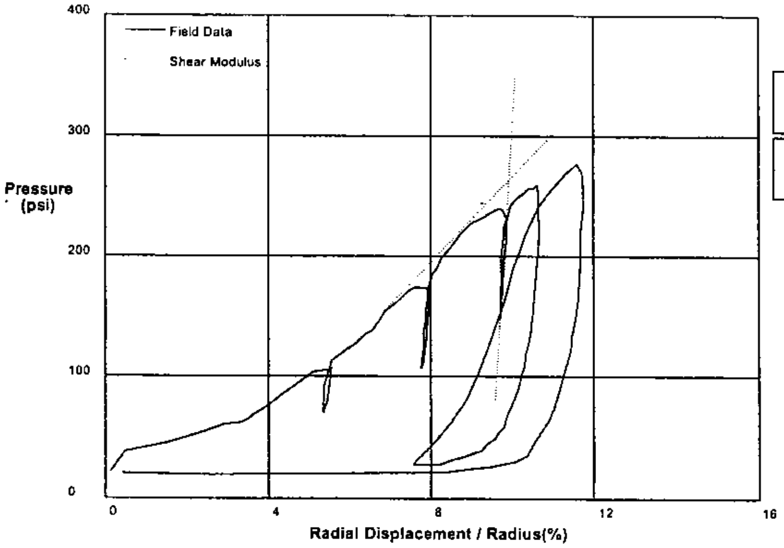
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 1-31-05

Hole No. BH-76 Depth 45 feet File E:\PC153.P



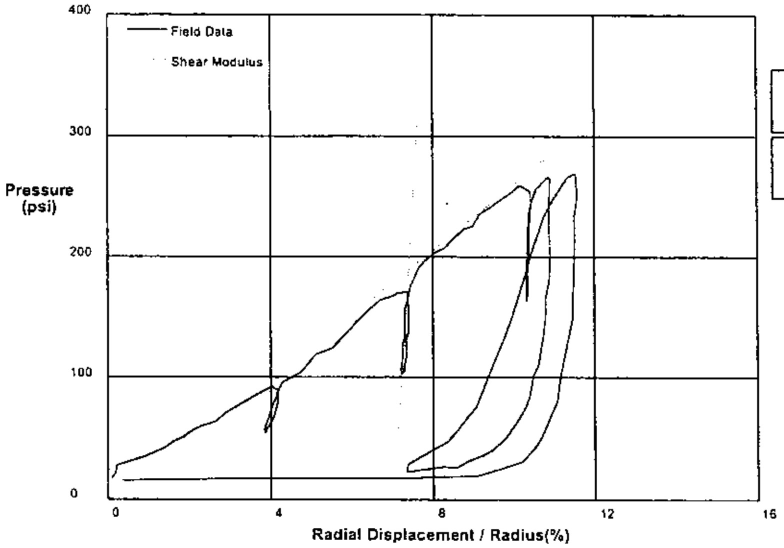
Shear Modulus 1770 psi

Shear Modulus 26666 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 43.5 feet File E:\PC154.P



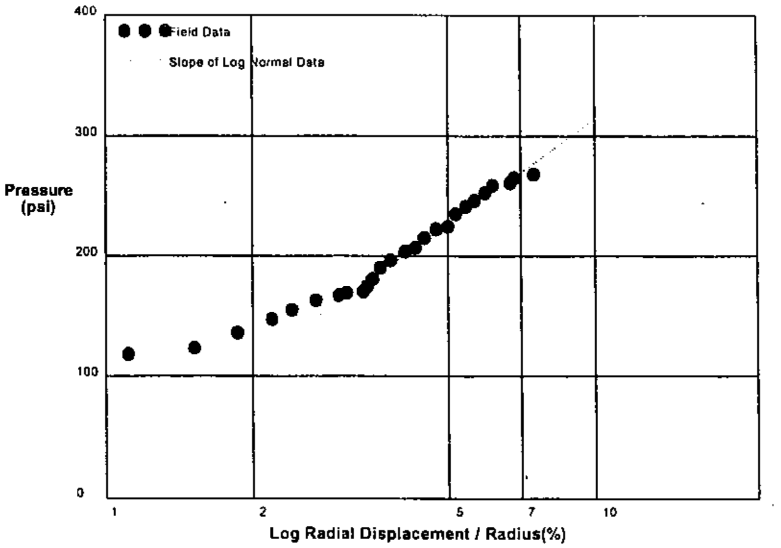
Shear Modulus 1374 psi

Shear Modulus 26666 psi

shift 0

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**
Silicon Valley Rapid Transit (Downtown) 1-31-05
Hole No. BH-76 Depth 43.5 feet File E:\PC154.P



Shear Strength 126.7 psi
Limit Pressure 493 psi

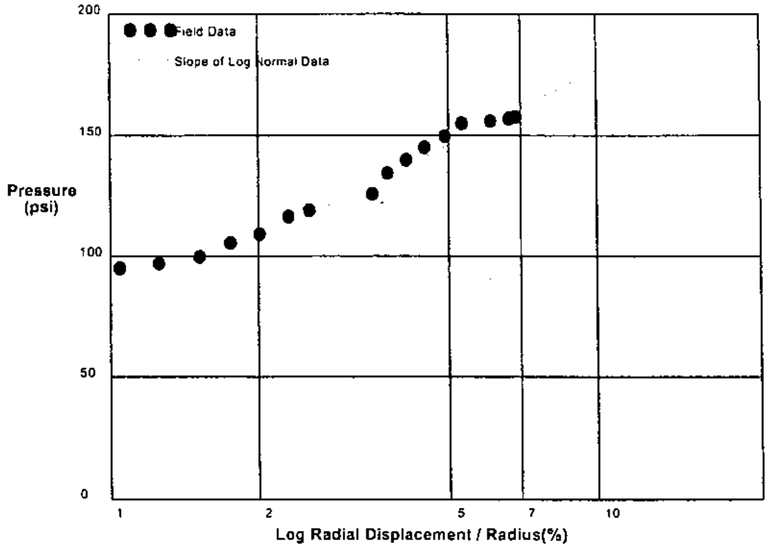
shift 4

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. bh76 Depth 75feet File E:\PC155.P



Shear Strength 43.7 psi
Limit Pressure 238 psi

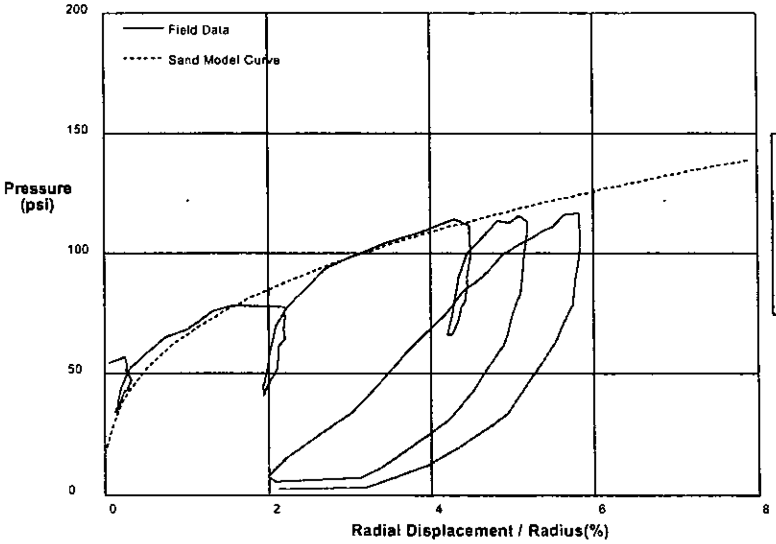
shift 6

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 75 feet File C:\DATA\C-290\C-29005\PC155.P



THE HUGHES SAND MODEL

Water Pressure	41 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	17 psi
Shear Modulus	6000 psi

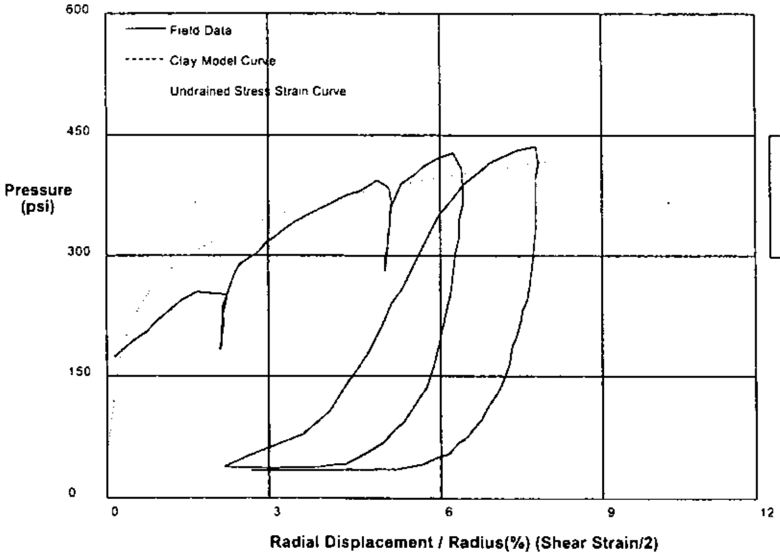
shift 7

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 73.5 feet File E:\PC156.P



GIBSON'S CLAY MODEL

Shear Strength 70 psi
Insitu Stress 50 psi
Shear Modulus 30000 psi

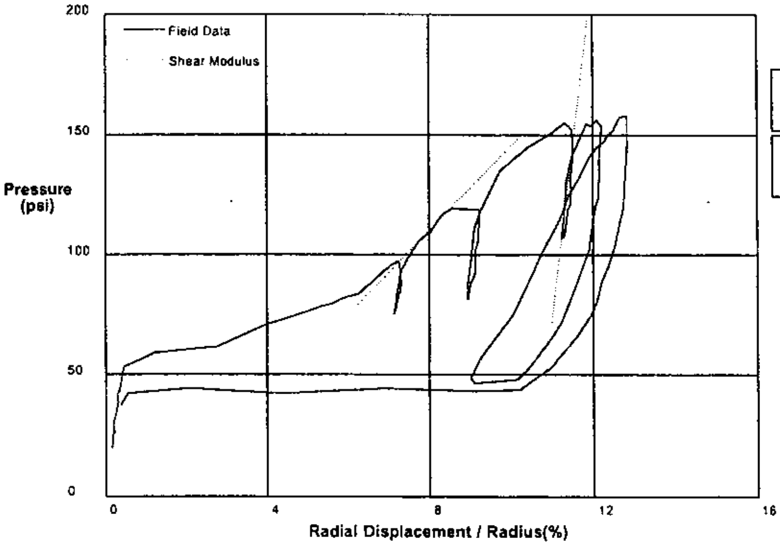
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 75 feet File E:\PC155.P



Shear Modulus 885 psi

Shear Modulus 6893 psi

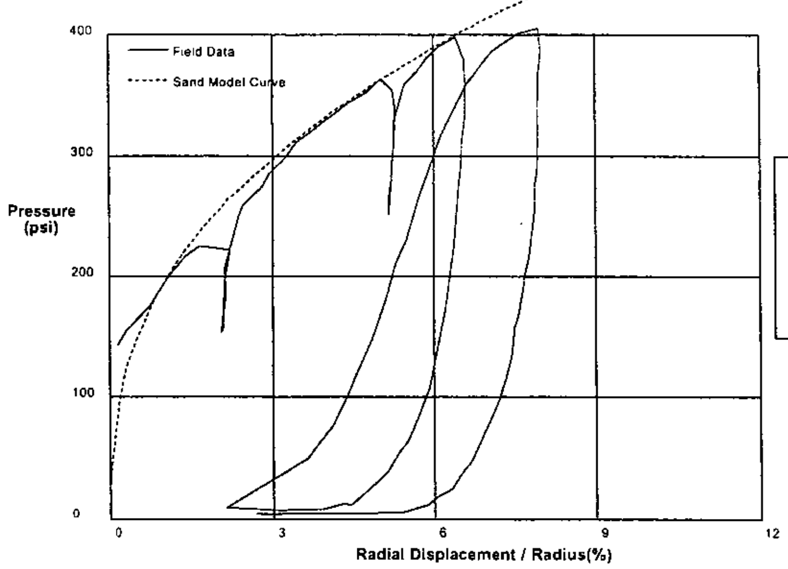
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. bh76 Depth 73.5feet File C:\DATA\C-290\C-29005\PC156.P



THE HUGHES SAND MODEL

Water Pressure	30 psi
Friction Angle	35 deg
Critical Friction Angle	32 deg
Lateral Stress	32 psi
Shear Modulus	30000 psi

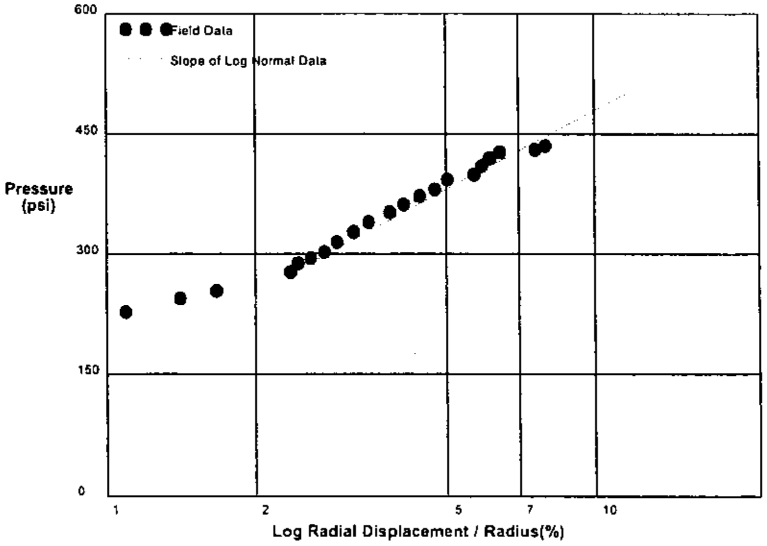
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 73.5 feet File E:\PC156.P

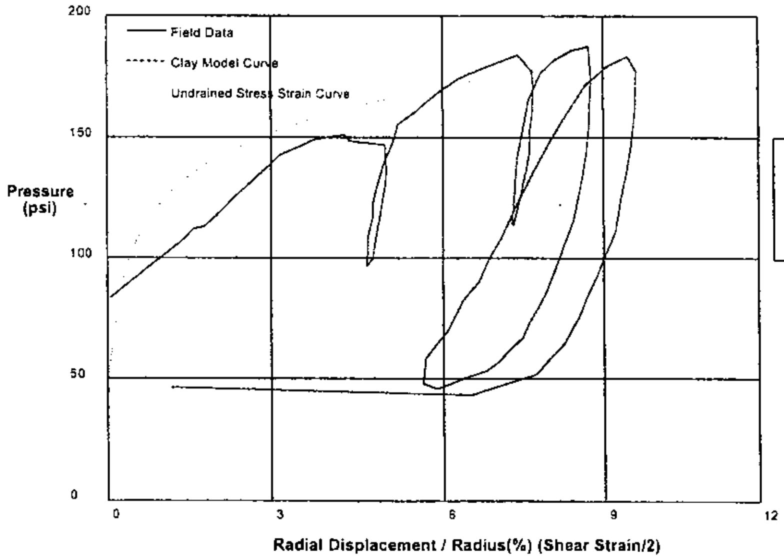


Shear Strength 141.8 psi
Limit Pressure 680 psi

shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-1-05
Hole No. BH-76 Depth 95 feet File E:\PC157.P



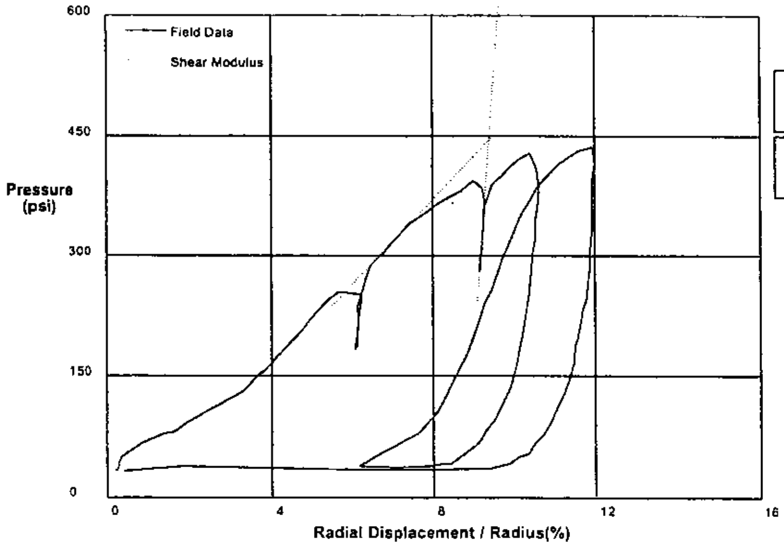
GIBSON'S CLAY MODEL

Shear Strength 26 psi
Insitu Stress 50 psi
Shear Modulus 8000 psi

shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.
Silicon Valley Rapid Transit (Downtown) 2-1-05
Hole No. BH-76 Depth 73.5 feet File E:\PC156.P



Shear Modulus 2656 psi

Shear Modulus 32672 psi

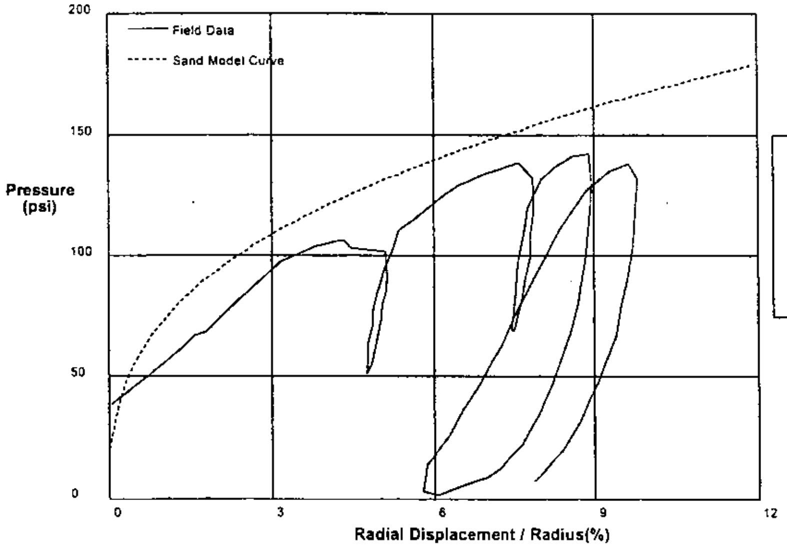
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 95 feet File E:\PC157.P



THE HUGHES SAND MODEL

Water Pressure	45 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	20 psi
Shear Modulus	6000 psi

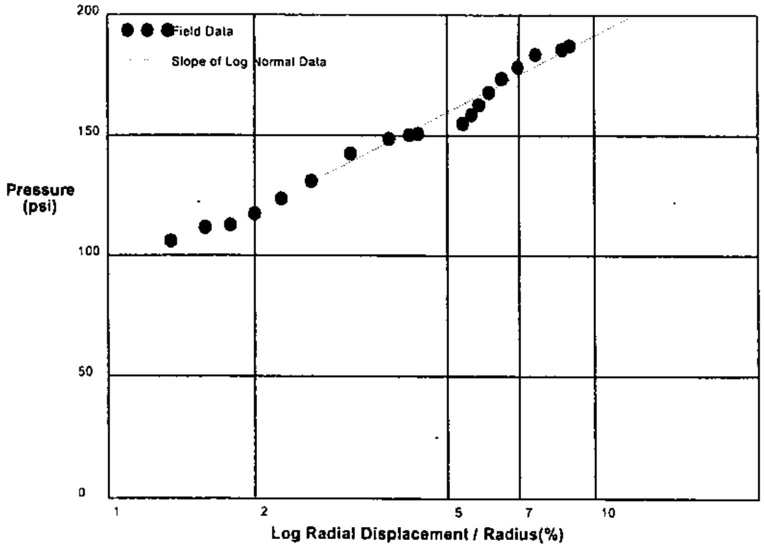
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 95 feet File E:\PC157.P



Shear Strength	**45.4 psi**
Limit Pressure	**255 psi**

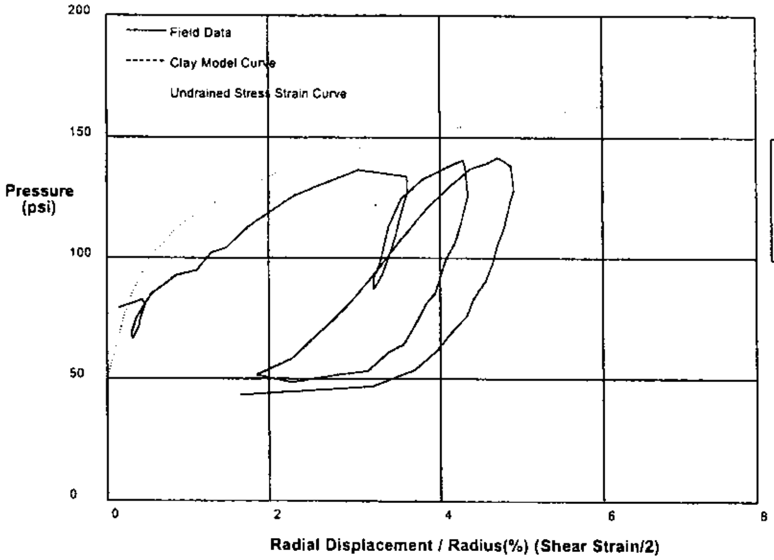
shift 4

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 93.5 feet File E:\PC158.P



GIBSON'S CLAY MODEL

Shear Strength 26 psi
Insitu Stress 50 psi
Shear Modulus 6000 psi

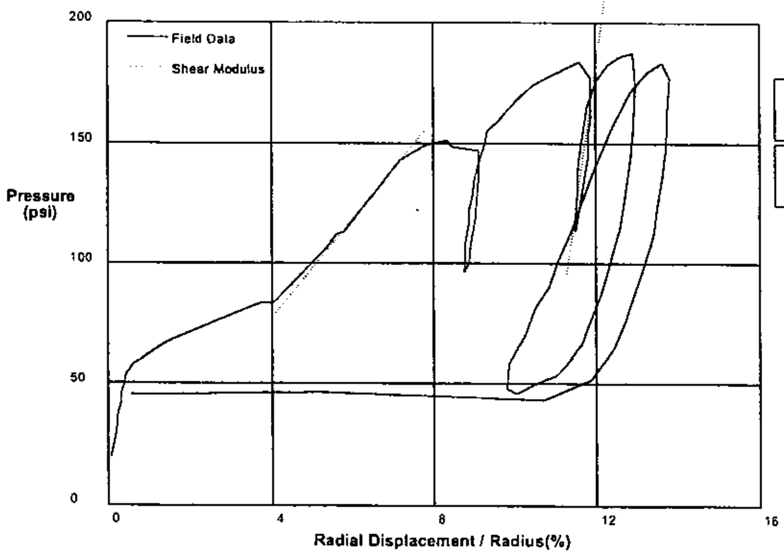
shift 8

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 95 feet File E:\PC157.P



Shear Modulus 1031 psi

Shear Modulus 6105 psi

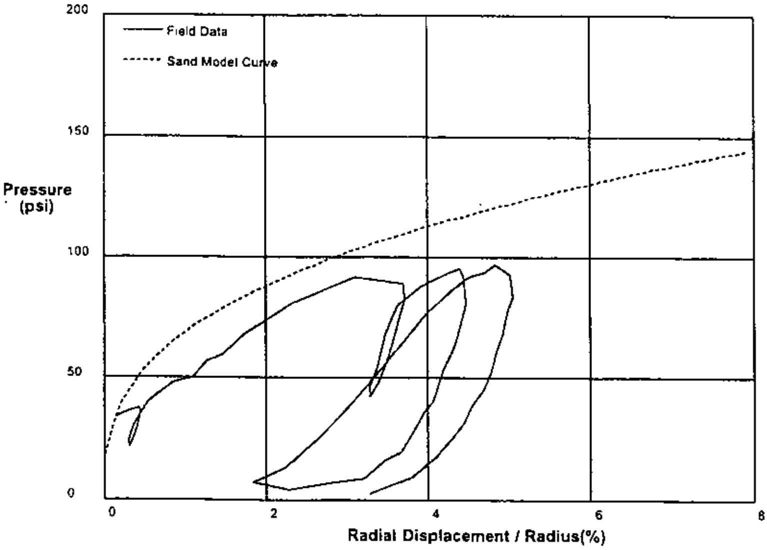
shift 0

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 93.5 feet File E:\PC158.P



THE HUGHES SAND MODEL

Water Pressure	45 psi
Friction Angle	33 deg
Critical Friction Angle	32 deg
Lateral Stress	18 psi
Shear Modulus	6000 psi

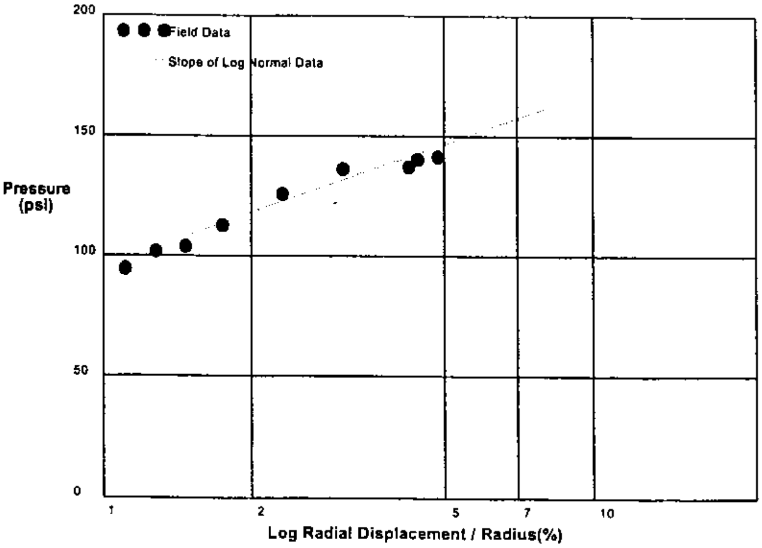
shift 8

HUGHES

PRESSUREMETER DATA Parikh Consultants, Inc.

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 93.5 feet File E:\PC158.P



Shear Strength 31.4 psi
Limit Pressure 213 psi

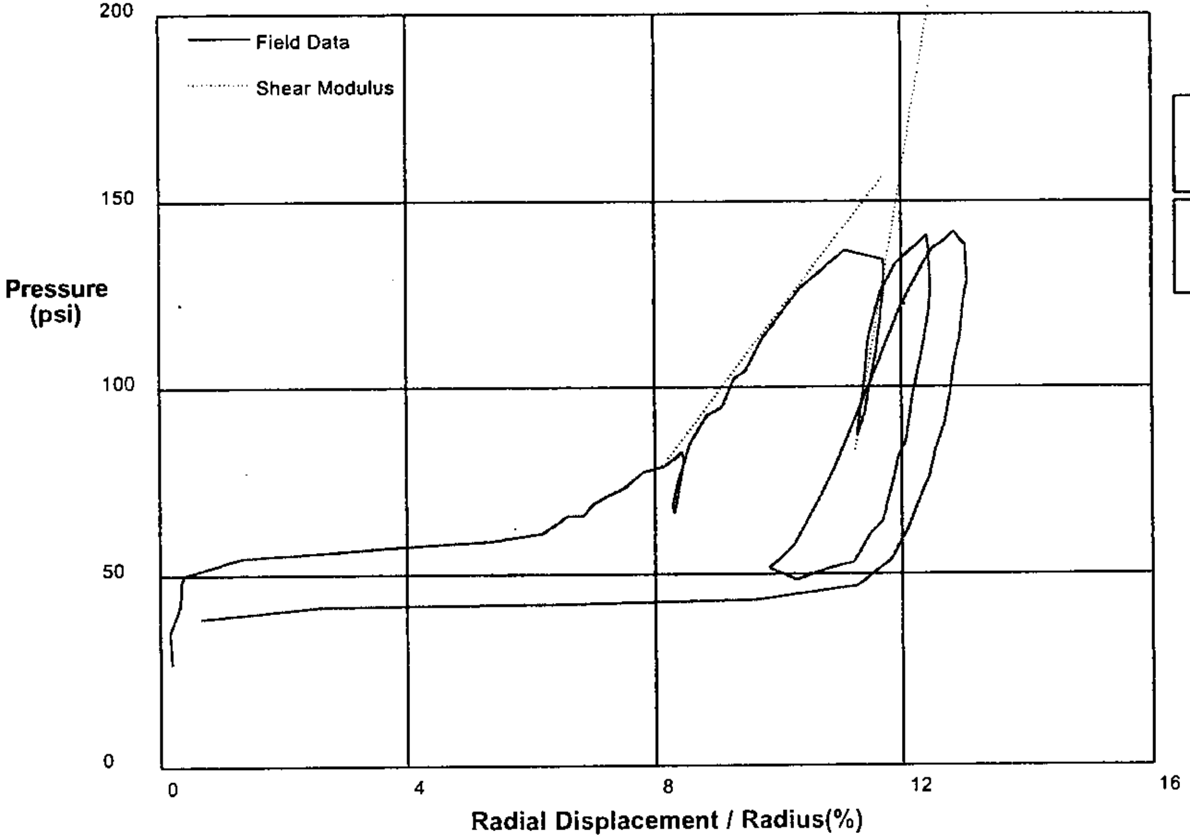
shift 8

HUGHES

PRESSUREMETER DATA **Parikh Consultants, Inc.**

Silicon Valley Rapid Transit (Downtown) 2-1-05

Hole No. BH-76 Depth 93.5 feet File E:\PC158.P



Shear Modulus 1085 psi

Shear Modulus 4929 psi

shift 0

HUGHES

APPENDIX 4

P/S WAVE SUSPENSION LOGGING

Downhole suspension logging was performed by GEOVision Geophysical Services to obtain P-wave and S-wave velocities. A description of the test equipment, testing procedures and results are presented in Appendix 4.

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

APPENDIX 4

P/S WAVE SUSPENSION LOGGING

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 4 – P/S Wave Suspension Logging
Tunnel Segment of Silicon Valley Rapid Transit (SVRT) Project
San Jose, Santa Clara County, California

Dear Mr. Arango:

As requested, we are presenting *Appendix 4 – P/S Wave Suspension Logging* data 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

FW/YDW/GP {\On Going Projects\204104.10\App-4.doc}

356 S. Milpitas Blvd., Milpitas, CA 95035-5421 • (408) 945-1011 • Fax: (408) 945-1012 • www.PARIKHNET.com
Offices: Milpitas • Fremont • Sacramento • Walnut Creek

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ATTACHMENTS

- Exploratory Borehole & In-Situ Test Program (Table A4-1)
- Suspension P & S Velocities in Boring BH-59, BH-68 and BH-79 – San Jose BART Extension Program (GeoVision Geophysical Services, March 2005)

APPENDIX 4 – P/S WAVE SUSPENSION LOGGING

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 A4-1.

METHODLOGY OF EXPLORATION

P/S Wave Suspension Logging

GeoVision performed the downhole suspension logging to obtain P-wave and S-wave velocities in BH-59, BH-68 & BH-79. A report entitled " Suspension P & S Velocities in Boring BH-59, BH-68 and BH-79 – San Jose BART Extension Program", dated March 2005, prepared by GeoVision is attached with this appendix.

In order for P-wave/S-wave suspension logging operation for the intended 200-foot depth, the three boreholes were drilled to approximately 216 to 220 feet depth to provide a "rat hole" to accommodate the suspension logging probe (OYO Model 170).

The probe receives control signals from, and sends the amplified receiver signals to, instrumentation on the surfaced via an armored 7-conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data.

The entire probe is suspended by the cable and centered in the boring by nylon "whiskers," therefore, source motion is not coupled directly to the boring walls; rather, the source motion creates a horizontally propagating impulsive pressure wave in the fluid filling the borehole and surrounding the source. This pressure wave is converted to P and S-waves in the surrounding soil as it impinges upon the borehole wall.

All boreholes were logged uncased, filled with bentonite based drilling fluid. The drilling fluid was agitated immediately before deploying the P/S wave suspension logging. Prior to entering the borehole, the mechanical and electronic depth counters were set to zero. The probe was lowered to the bottom of the borehole, and then returned to grade, stopping at 0.5 m/1.6 feet intervals to collect data. More detailed description of the operation and data is presented in the attached report by GeoVision.

Very Truly Yours,
PARIKH CONSULTANTS, INC.

Y. David Wang

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

REGISTERED PROFESSIONAL ENGINEER
GAURANG R. PARIKH
No. 666
EXP. 12-31-05
GEOTECHNICAL
STATE OF CALIFORNIA

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

FW/YDW/GP APP-3 (\PROJECT\204104.10\APP-3.DOC)

Table A4-1

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)	
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 A4-1

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

GEOVision
geophysical services
a division of Blackhawk Geometrics

SUSPENSION P & S VELOCITIES
IN BORINGS BH-59, BH-68 AND BH-79
SAN JOSE BART EXTENSION PROGRAM

June 7, 2005

SUSPENSION P & S VELOCITIES
IN BORINGS BH-59, BH-68 AND BH-79
SAN JOSE BART EXTENSION PROGRAM

Prepared for

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Project 5145

June 7, 2005
Report 5145-02

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FIGURES

TABLES

APPENDICES

APPENDIX A FIGURES

APPENDIX A TABLES

INTRODUCTION

OYO suspension velocity measurements were performed in three land borings along the proposed alignment of the San Jose BART extension. Suspension logging data acquisition was performed between January 20 and March 2, 2005 by Rob Steller and Tony Martin of Geovision. The work was performed under subcontract with Parikh Consultants, Inc, with David Wang as the field liaison for Parikh.

This report describes the field measurements, data analysis, and results of this work.

SCOPE OF WORK

This report presents the results of suspension velocity measurements collected between January 20 and March 2, 2005, in the uncased borings located in San Jose, California, as designated below. The purpose of these studies was to supplement stratigraphic information obtained from Parikh's soil sampling program and to acquire shear wave velocities and compressional wave velocities as a function of depth, which, in turn, can be used to characterize ground response to earthquake motion.

BORING DESIGNATION	DATE LOGGED	COORDINATES	
		NORTHING	EASTING
BH-59	2/7/05	1953550.6	6164952.0
BH-68	1/20/05	1947803.1	6157096.3
BH-79	3/2/05	1948693.6	6151561.5

Table 1. Boring locations and logging dates

The OYO Model 170 Suspension Logging Recorder and Suspension Logging Probe were used to obtain in-situ horizontal shear and compressional wave velocity measurements at 0.5 m intervals. The acquired data was analyzed and a profile of velocity versus depth was produced for both compressional and horizontally polarized shear waves.

A detailed reference for the velocity measurement techniques used in this study is:

> Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

SUSPENSION INSTRUMENTATION

Suspension soil velocity measurements were performed using the Model 170 Suspension Logging system, manufactured by OYO Corporation. This system directly determines the average velocity of a 1.0 m high segment of the soil column surrounding the boring of interest by measuring the elapsed time between arrivals of a wave propagating upward through the soil column. The receivers that detect the wave, and the source that generates the wave, are moved as a unit in the boring producing relatively constant amplitude signals at all depths.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave source (S_H) and compressional-wave source (P), joined to two biaxial receivers by a flexible isolation cylinder, as shown in Figure 1. The separation of the two receivers is 1.0 m, allowing average wave velocity in the region between the receivers to be determined by inversion of the wave travel time between the two receivers. The total length of the probe as used in this survey is 5.8 m, with the center point of the receiver pair 3.7 m above the bottom end of the probe. The probe receives control signals from, and sends the amplified receiver signals to, instrumentation on the surface via an armored 7 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data.

The entire probe is suspended by the cable and centered in the boring by nylon "whiskers", therefore, source motion is not coupled directly to the boring walls; rather, the source motion creates a horizontally propagating impulsive pressure wave in the fluid filling the boring and surrounding the source. This pressure wave is converted to P and S_H-waves in the surrounding soil and rock as it impinges upon the boring wall. These waves propagate through the soil and rock surrounding the boring, in turn causing a pressure wave to be generated in the fluid surrounding the receivers as the soil waves pass their location. Separation of the P and S_H-waves at the receivers is performed using the following steps:

1. Orientation of the horizontal receivers is maintained parallel to the axis of the source, maximizing the amplitude of the recorded S_H-wave signals.
2. At each depth, S_H-wave signals are recorded with the source actuated in opposite directions, producing S_H-wave signals of opposite polarity, providing a characteristic S_H-wave signature distinct from the P-wave signal.
3. The 2.14 m separation of source and receiver 1 permits the P-wave signal to pass and damp significantly before the slower S_H-wave signal arrives at the receiver. In faster soils or rock, the isolation cylinder is extended to allow greater separation of the P- and S_H-wave signals.
4. In saturated soils, the received P-wave signal is typically of much higher frequency than the received S_H-wave signal, permitting additional separation of the two signals by low pass filtering.
5. Direct arrival of the original pressure pulse in the fluid is not detected at the receivers because the wavelength of the pressure pulse in fluid is significantly greater than the dimension of the fluid annulus surrounding the probe (meter versus centimeter scale), preventing significant energy transmission through the fluid medium.

In operation, a distinct, repeatable pattern of impulses is generated at each depth as follows:

1. The source is fired in one direction producing dominantly horizontal shear with some vertical compression, and the signals from the horizontal receivers situated parallel to the axis of motion of the source are recorded.
2. The source is fired again in the opposite direction and the horizontal receiver signals are recorded.
3. The source is fired again and the vertical receiver signals are recorded. The repeated source pattern facilitates the picking of the P and S_H-wave arrivals; reversal of the source changes the polarity of the S_H-wave pattern but not the P-wave pattern.

The data from each receiver during each source activation is recorded as a different channel on the recording system. The Model 170 has six channels (two simultaneous recording channels), each with a 12 bit 1024 sample record. The recorded data is displayed on a CRT display and on paper tape output as six channels with a common time scale. Data is stored on 3.5 inch floppy diskettes for further processing. Up to 8 sampling sequences can be summed to improve the signal to noise ratio of the signals.

Review of the displayed data on the CRT or paper tape allows the operator to set the gains, filters, delay time, pulse length (energy), sample rate, and summing number to optimize the quality of the data before recording. Verification of the calibration of the Model 170 digital recorder is performed every twelve months using a NIST traceable frequency source and counter, as outlined in Appendix B.

SUSPENSION MEASUREMENT PROCEDURES

All borings were logged uncased, filled with bentonite based drilling fluid. Prior to entering the boring, the mechanical and electronic depth counters were set to zero. The probe was lowered to the bottom of the boring, then returned to grade, stopping at 0.5 m intervals to collect data, as summarized on the following page.

At each measurement depth the measurement sequence of two opposite horizontal records and one vertical record was performed, and the gains were adjusted as required. The data from each depth was printed on paper tape, checked, and recorded on diskette before moving to the next depth.

Upon completion of the measurements, the probe zero depth indication at grade was verified prior to removal from the boring.

BORING NUMBER	RUN NUMBER	DEPTH RANGE (METERS)	DEPTH AS DRILLED (METERS)	LOST TO SLOUGH/COLLAPSE (METERS)	SAMPLE INTERVAL (METERS)	DATE LOGGED
BH-59	1	4.5 – 61.5	65.8	0.6	0.5	2/7/05
BH-68	1	4.0 – 63.5	67.2	0.0	0.5	1/20/05
BH-79	1	1.5 – 61.0	65.8	1.1	0.5	3/2/05

Table 2. Logging dates and depth ranges

SUSPENSION DATA ANALYSIS

The recorded digital records were analyzed to locate the first minima on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between receiver 1 and receiver 2 (R1-R2) arrivals was used to calculate the P-wave velocity for that 1.0 m segment of the soil column. When observable, P-wave arrivals on the horizontal axis records were used to verify the velocities determined from the vertical axis data.

The P-wave velocity calculated from the travel time over the 2.14 m interval from source to receiver 1 (S-R1) was calculated and plotted for quality assurance of the velocity derived from the travel time between receivers. In this analysis, the depth values as recorded were increased by 1.57 m to correspond to the mid-point of the 2.14 m S-R1 interval, as illustrated in Figure 1. Travel times were obtained by picking the first break of the P-wave signal at receiver 1 and subtracting 3.9 milliseconds, the calculated and experimentally verified delay from source trigger pulse (beginning of record) to source impact. This delay corresponds to the duration of acceleration of the solenoid before impact.

The recorded digital records were studied to establish the presence of clear S_H-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the S_H-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital FFT - IFFT lowpass filtering is often used to remove higher frequency P-wave signals from the S_H-wave signal. In this data, no filtering was required due to the very low level of the P-wave signal. Different filter cutoffs were used to separate P- and S_H-waves at different depths, ranging from 400 Hz in the slowest zones to 2500 Hz in the regions of highest velocity. At each depth, the filter frequency was selected to be at least twice the fundamental frequency of the S_H-wave signal being filtered.

Generally, the first maxima was picked for the 'normal' signals and the first minima for the 'reverse' signals, although other points on the waveform were used if the first pulse was distorted. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in the actuation time of the solenoid source caused by constant mechanical bias in the source or by boring inclination. This variation does not affect the R1-R2 velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

As with the P-wave data, S_H-wave velocity calculated from the travel time over the 2.14 m interval from source to receiver 1 was calculated and plotted for verification of the velocity derived from the travel time between receivers. In this analysis, the depth values were increased by 1.57 m to correspond to the mid-point of the 2.14 m S-R1 interval. Travel times were obtained by picking the first break of the S_H-wave signal at the near receiver and subtracting 3.9 milliseconds, the calculated and experimentally verified delay from the beginning of the record at the source trigger pulse to source impact.

Figure 2 shows an example of R1 - R2 measurements on a 1500 Hz low pass filtered record. In Figure 2, the time difference over the 1.0 m interval of 0.57 milliseconds for the horizontal normal (H_N) signal is equivalent to an S_H-wave velocity of 1770 m/sec. Whenever possible, time differences were determined from several phase points on the S_H-waveform records to verify the data obtained from the first arrival of the S_H-wave pulse. Figure 3 displays the same record before filtering of the S_H-waveform record with an 1500 Hz FFT - IFFT digital lowpass filter, illustrating the presence of higher frequency P-wave energy at the beginning of the record, and distortion of the lower frequency S_H-wave by residual P-wave signal.

SUSPENSION RESULTS

Suspension R1-R2 P- and S_H-wave velocities are plotted in Figures 4 – 6. The suspension velocity data presented in these Figures are presented in Tables 3 – 5. P- and S_H-wave velocity data from R1-R2 analysis and quality assurance analysis of S-R1 data are plotted together in Figures A1 – A3 to aid in visual comparison. It must be noted that R1-R2 data is an average velocity over a 1.0 m segment of the soil column; S-R1 data is an average over 2.14 m, creating a significant smoothing relative to the R1-R2 plots. S-R1 data are presented in tabular format in Tables A1 – A3. Good correspondence between the shape of the P- and S_H-wave velocity curves is observed for all these data sets. The velocities derived from S-R1 and R1-R2 data are in excellent agreement, providing verification of the higher resolution R1-R2 data.

Calibration procedures and records for the suspension measurement system are presented in Appendix B.

SUMMARY

Discussion of Suspension Results

Both P- and S_H-wave velocities were measured using the Suspension Method in three land borings at depths up to 63.5 m below grade in San Jose, California. All borings were located in, or adjacent to, city streets, but no significant signal contamination from cultural vibration was observed.

Quality Assurance

These velocity measurements along the proposed alignment of the San Jose BART extension were performed using industry-standard or better methods for both measurements and analyses. All work was performed under Geovision quality assurance procedures, which include:

- Use of NIST-traceable calibrations, where applicable, for field and laboratory instrumentation
- Use of standard field data logs
- Use of independent verification of data by comparison of receiver-to-receiver and source-to-receiver velocities
- Independent review of calculations and results by a registered professional engineer, geologist, or geophysicist.

Data Reliability

P- and S_H-wave velocity measurement using the Suspension Method gives average velocities over a 1.0 m interval of depth. This high resolution results in the scatter of values shown in the graphs. Individual measurements are very reliable with estimated precision of +/- 5%. Standardized field procedures and quality assurance checks add to the reliability of these data.

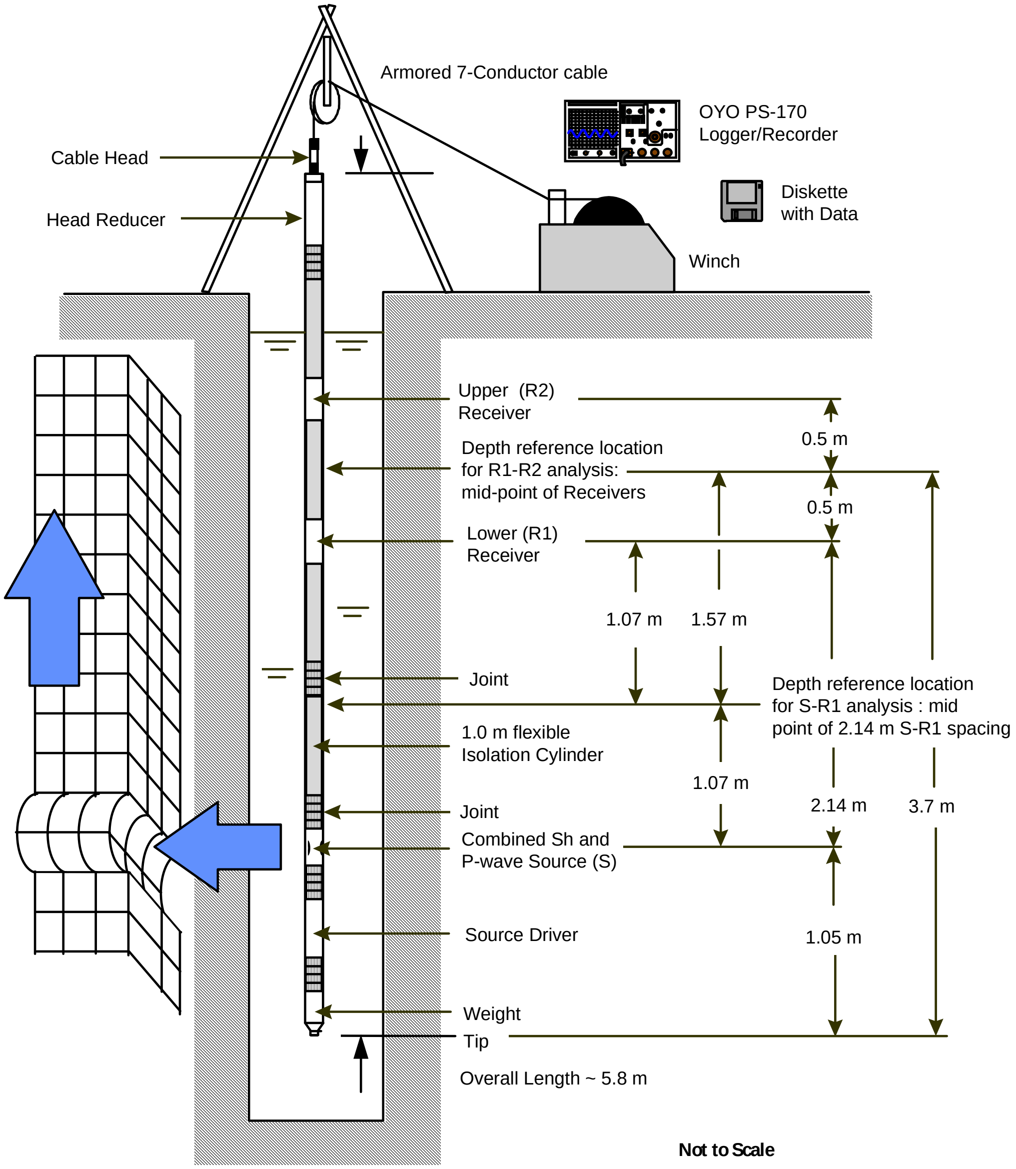


Figure 1. Concept illustration of P-S logging system

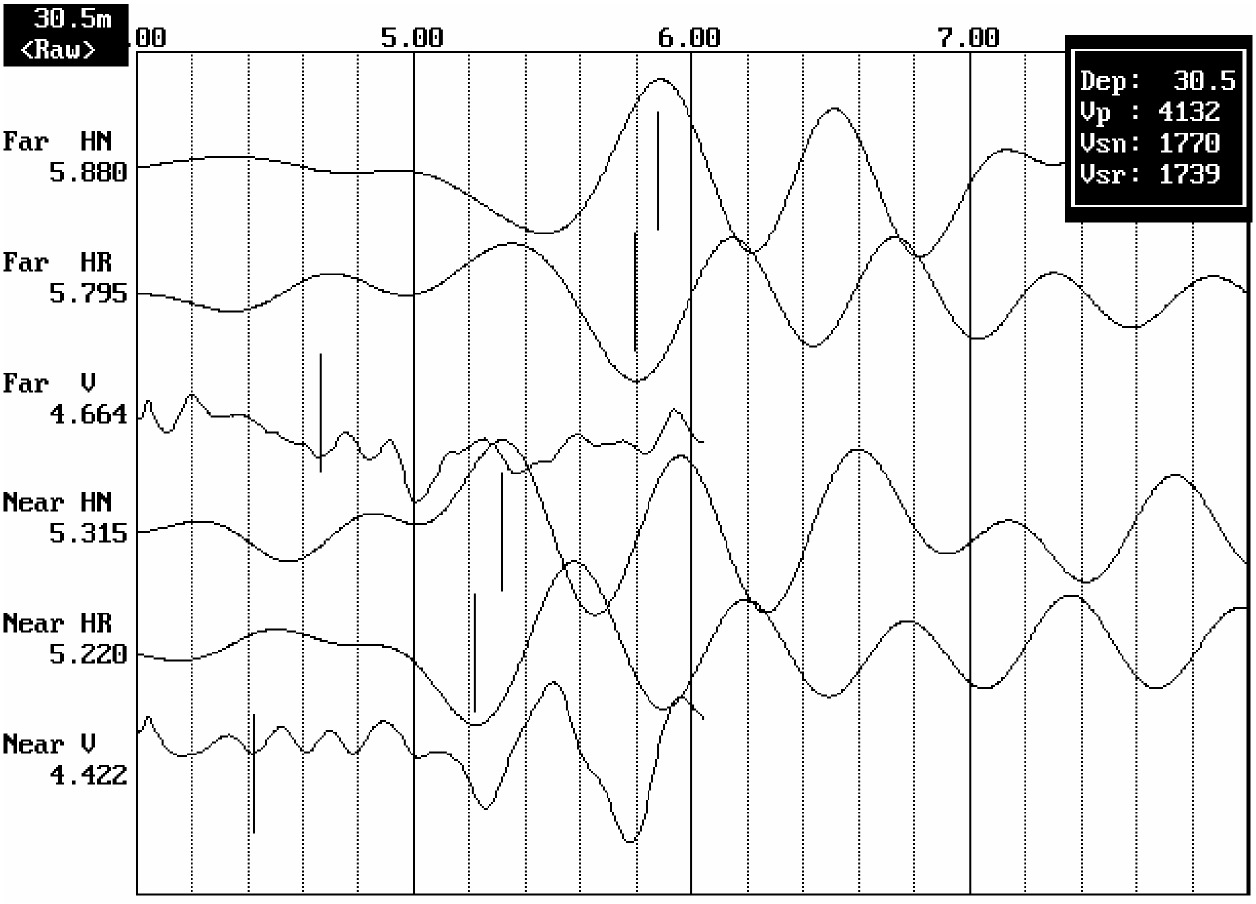


Figure 2. Sample filtered (1500 Hz lowpass) record

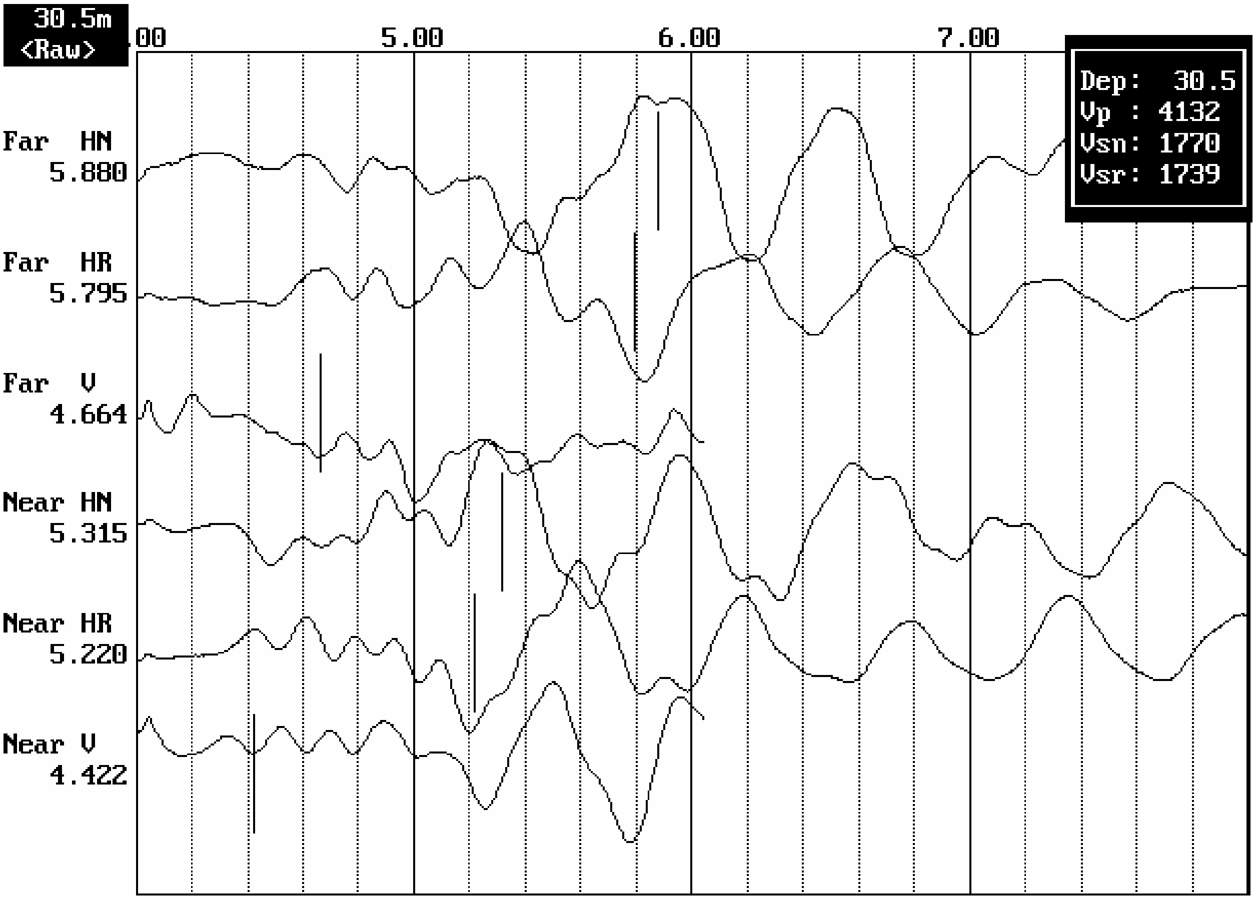


Figure 3. Sample unfiltered 30.5 m record

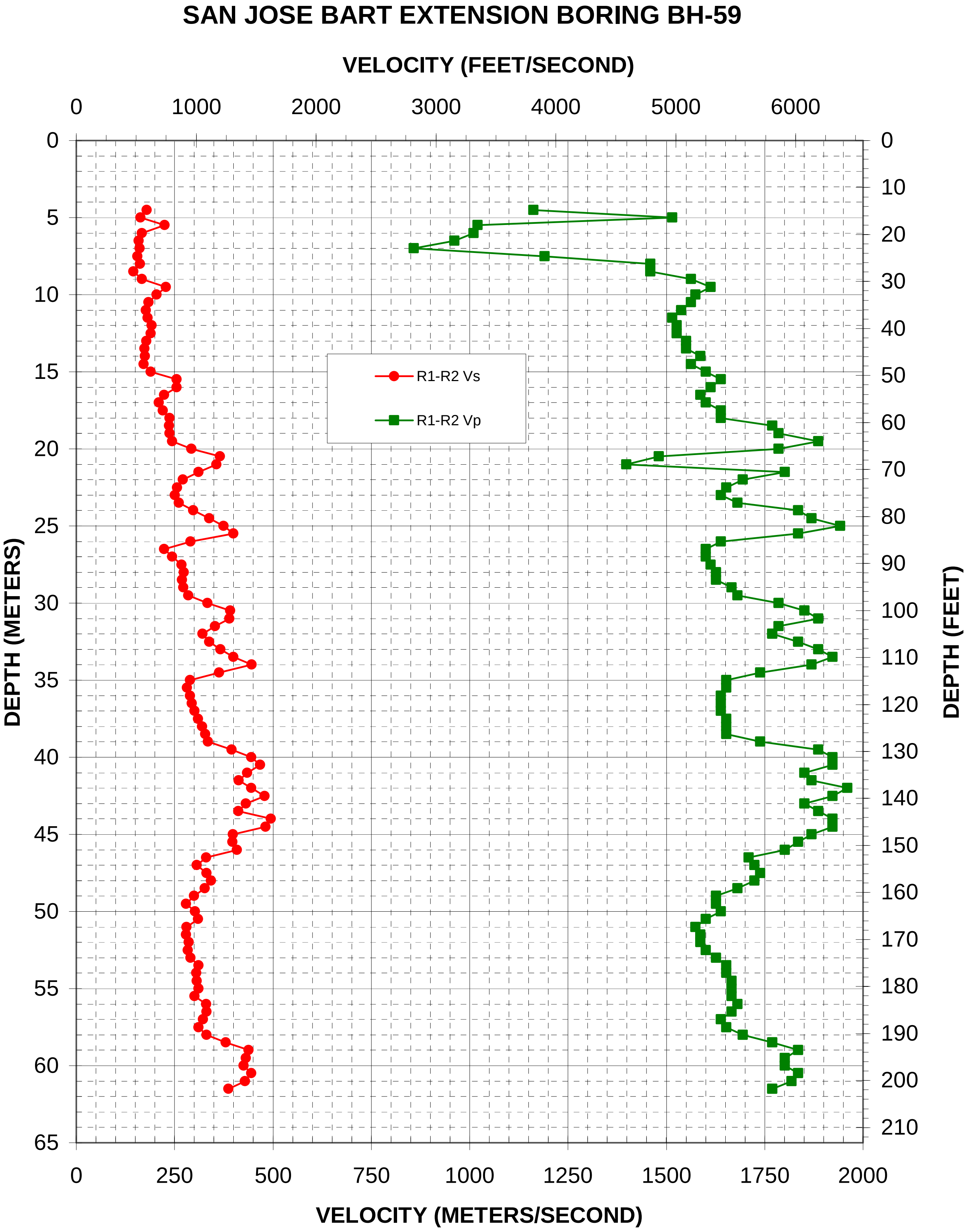


Figure 4. Boring BH-59, Suspension P- and S_H-wave velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S_H (m/sec)	V-P (m/sec)	V-S_H (ft/sec)	V-P (ft/sec)
4.0	13.1				18.65	18.95	6.02				
4.5	14.8	23.35	23.15	7.31	17.65	17.70	6.45	179	1163	588	3815
5.0	16.4	24.35	24.20	6.75	18.10	18.20	6.09	163	1515	536	4971
5.5	18.0	23.90	24.00	7.36	19.50	19.50	6.38	225	1020	737	3348
6.0	19.7	24.10	24.15	7.07	18.10	18.15	6.08	167	1010	547	3314
6.5	21.3	24.75	24.85	6.72	18.50	18.55	5.68	159	962	523	3155
7.0	23.0	22.95	23.05	6.75	16.75	16.80	5.58	161	858	527	2816
7.5	24.6	22.40	22.45	6.23	15.90	16.05	5.39	155	1190	509	3906
8.0	26.2	21.85	21.95	6.08	15.70	15.80	5.39	163	1460	533	4790
8.5	27.9	21.40	21.50	6.02	14.55	14.60	5.34	145	1460	477	4790
9.0	29.5	21.20	21.30	5.99	15.20	15.30	5.35	167	1562	547	5126
9.5	31.2	19.85	20.00	5.98	15.50	15.60	5.36	229	1613	750	5292
10.0	32.8	20.30	20.45	5.96	15.40	15.55	5.33	204	1575	670	5167
10.5	34.4	21.00	21.15	5.98	15.55	15.70	5.34	183	1563	602	5126
11.0	36.1	21.36	21.48	5.99	15.72	15.84	5.34	177	1538	582	5047
11.5	37.7	21.20	21.32	5.99	15.68	15.82	5.33	181	1515	595	4971
12.0	39.4	21.12	21.24	5.98	15.88	16.04	5.32	192	1527	629	5009
12.5	41.0	21.28	21.42	5.95	16.02	16.16	5.29	190	1527	624	5009
13.0	42.7	20.66	20.76	5.94	15.06	15.16	5.29	179	1550	586	5087
13.5	44.3	19.76	19.82	5.91	13.96	14.12	5.27	174	1550	571	5087
14.0	45.9	19.36	19.46	5.92	13.64	13.76	5.29	175	1587	575	5208
14.5	47.6	18.82	18.96	5.90	12.98	13.12	5.26	171	1562	562	5126
15.0	49.2	18.50	18.64	5.89	13.22	13.38	5.27	190	1600	623	5249
15.5	50.9	17.46	17.62	5.87	13.56	13.70	5.26	256	1639	839	5378
16.0	52.5	17.44	17.58	5.88	13.54	13.66	5.26	256	1613	839	5292
16.5	54.1	17.74	17.88	5.88	13.26	13.40	5.25	223	1587	732	5208
17.0	55.8	17.50	17.64	5.87	12.76	12.88	5.25	211	1600	691	5249
17.5	57.4	17.10	17.20	5.86	12.54	12.66	5.25	220	1639	721	5378
18.0	59.1	16.18	16.32	5.92	11.98	12.10	5.31	238	1639	779	5378
18.5	60.7	15.56	15.70	6.03	11.34	11.46	5.47	236	1770	776	5807
19.0	62.3	15.06	15.18	5.90	10.82	10.98	5.34	237	1786	777	5859
19.5	64.0	14.66	14.78	5.86	10.56	10.70	5.33	244	1887	802	6190
20.0	65.6	14.48	14.60	5.84	11.06	11.18	5.28	292	1786	959	5859
20.5	67.3	14.44	14.52	5.86	11.68	11.80	5.18	365	1481	1197	4861
21.0	68.9	14.94	15.06	5.95	12.12	12.26	5.23	356	1399	1168	4589
21.5	70.5	15.48	15.58	5.80	12.24	12.38	5.25	311	1802	1019	5911
22.0	72.2	15.34	15.46	5.81	11.64	11.78	5.22	271	1695	889	5561
22.5	73.8	15.08	15.24	5.79	11.18	11.34	5.19	256	1653	841	5423
23.0	75.5	14.36	14.50	5.75	10.36	10.52	5.14	251	1639	822	5378
23.5	77.1	14.24	14.38	5.71	10.40	10.56	5.11	261	1681	857	5514
24.0	78.7	14.52	14.68	5.70	11.16	11.32	5.16	298	1835	976	6020
24.5	80.4	14.62	14.76	5.73	11.68	11.78	5.20	338	1869	1108	6132
25.0	82.0	14.80	14.98	5.77	12.14	12.30	5.26	375	1942	1229	6371
25.5	83.7	15.22	15.36	5.82	12.72	12.86	5.27	400	1835	1312	6020
26.0	85.3	15.72	15.88	5.87	12.28	12.44	5.26	291	1639	954	5378
26.5	86.9	16.44	16.62	5.88	11.98	12.14	5.25	224	1600	734	5249
27.0	88.6	15.90	16.06	5.86	11.80	11.96	5.24	244	1600	800	5249
27.5	90.2	15.26	15.38	5.86	11.52	11.64	5.24	267	1613	877	5292
28.0	91.9	14.52	14.66	5.83	10.86	11.00	5.21	273	1626	896	5335
28.5	93.5	14.10	14.22	5.79	10.36	10.52	5.18	269	1626	882	5335

Table 3. Boring BH-59, Suspension R1-R2 depth,
pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S$_H$ (m/sec)	V-P (m/sec)	V-S$_H$ (ft/sec)	V-P (ft/sec)
29.0	95.1	13.62	13.70	5.75	9.94	10.04	5.15	272	1667	894	5468
29.5	96.8	13.32	13.48	5.73	9.80	9.98	5.14	285	1681	935	5514
30.0	98.4	13.06	13.16	5.73	10.04	10.18	5.17	333	1786	1094	5859
30.5	100.1	12.72	12.86	5.69	10.18	10.30	5.15	392	1852	1287	6076
31.0	101.7	12.62	12.76	5.68	10.06	10.18	5.15	389	1887	1277	6190
31.5	103.3	12.60	12.72	5.69	9.80	9.86	5.13	353	1786	1159	5859
32.0	105.0	12.52	12.64	5.68	9.40	9.54	5.11	322	1770	1055	5807
32.5	106.6	12.88	13.04	5.69	9.92	10.08	5.14	338	1835	1108	6020
33.0	108.3	12.96	13.12	5.71	10.24	10.38	5.18	366	1887	1202	6190
33.5	109.9	13.32	13.46	5.74	10.82	10.96	5.22	400	1923	1312	6309
34.0	111.5	13.56	13.72	5.77	11.32	11.48	5.23	446	1869	1465	6132
34.5	113.2	14.06	14.20	5.81	11.32	11.44	5.23	364	1739	1193	5706
35.0	114.8	14.52	14.62	5.86	11.06	11.18	5.26	290	1653	951	5423
35.5	116.5	14.42	14.54	5.85	10.86	11.00	5.25	282	1653	924	5423
36.0	118.1	14.20	14.32	5.85	10.74	10.86	5.24	289	1639	948	5378
36.5	119.8	14.08	14.18	5.85	10.66	10.80	5.24	294	1639	965	5378
37.0	121.4	13.62	13.72	5.84	10.26	10.42	5.23	300	1639	985	5378
37.5	123.0	13.12	13.26	5.80	9.88	10.04	5.20	310	1653	1016	5423
38.0	124.7	12.56	12.70	5.76	9.44	9.58	5.15	321	1653	1052	5423
38.5	126.3	12.14	12.28	5.72	9.08	9.24	5.12	328	1653	1076	5423
39.0	128.0	11.94	12.06	5.68	8.94	9.08	5.11	334	1739	1097	5706
39.5	129.6	11.48	11.58	5.64	8.94	9.06	5.11	395	1887	1297	6190
40.0	131.2	11.16	11.30	5.65	8.90	9.06	5.13	444	1923	1458	6309
40.5	132.9	11.30	11.48	5.65	9.16	9.34	5.13	467	1923	1533	6309
41.0	134.5	11.40	11.58	5.66	9.12	9.26	5.12	435	1852	1426	6076
41.5	136.2	11.32	11.48	5.65	8.90	9.06	5.12	413	1869	1356	6132
42.0	137.8	11.28	11.40	5.65	9.02	9.16	5.14	444	1961	1458	6433
42.5	139.4	11.30	11.44	5.65	9.22	9.34	5.13	478	1923	1570	6309
43.0	141.1	11.48	11.54	5.68	9.14	9.24	5.14	431	1852	1414	6076
43.5	142.7	11.38	11.50	5.65	8.94	9.08	5.12	412	1887	1350	6190
44.0	144.4	11.60	11.74	5.67	9.58	9.72	5.15	495	1923	1624	6309
44.5	146.0	12.10	12.22	5.70	10.02	10.14	5.18	481	1923	1577	6309
45.0	147.6	12.60	12.74	5.72	10.08	10.24	5.19	398	1869	1307	6132
45.5	149.3	12.92	13.04	5.74	10.38	10.54	5.20	397	1835	1302	6020
46.0	150.9	13.10	13.22	5.75	10.66	10.76	5.19	408	1802	1339	5911
46.5	152.6	13.68	13.80	5.79	10.66	10.76	5.20	330	1709	1083	5608
47.0	154.2	14.22	14.36	5.81	10.96	11.10	5.23	307	1724	1006	5657
47.5	155.8	14.10	14.22	5.83	11.06	11.22	5.25	331	1739	1086	5706
48.0	157.5	14.20	14.34	5.85	11.28	11.42	5.27	342	1724	1124	5657
48.5	159.1	14.58	14.70	5.86	11.52	11.64	5.26	327	1681	1072	5514
49.0	160.8	14.84	14.98	5.89	11.50	11.64	5.27	299	1626	982	5335
49.5	162.4	15.06	15.18	5.90	11.46	11.62	5.28	279	1626	916	5335
50.0	164.0	15.00	15.12	5.90	11.68	11.82	5.29	302	1639	991	5378
50.5	165.7	14.80	14.96	5.92	11.58	11.72	5.29	310	1600	1016	5249
51.0	167.3	14.94	15.06	5.93	11.36	11.50	5.29	280	1575	919	5167
51.5	169.0	14.80	14.94	5.89	11.22	11.36	5.26	279	1587	916	5208
52.0	170.6	14.60	14.72	5.89	11.10	11.22	5.26	286	1587	937	5208
52.5	172.2	14.42	14.54	5.87	10.90	11.02	5.24	284	1600	932	5249
53.0	173.9	14.28	14.40	5.85	10.84	10.96	5.24	291	1626	954	5335
53.5	175.5	14.06	14.18	5.85	10.84	10.96	5.25	311	1653	1019	5423

Table 3, continued. Boring BH-59, Suspension R1-R2 depth, pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S$_H$ (m/sec)	V-P (m/sec)	V-S$_H$ (ft/sec)	V-P (ft/sec)
54.0	177.2	13.82	13.98	5.85	10.54	10.70	5.25	305	1653	1000	5423
54.5	178.8	13.92	14.06	5.84	10.66	10.80	5.24	307	1667	1006	5468
55.0	180.4	13.88	14.02	5.84	10.66	10.80	5.24	311	1667	1019	5468
55.5	182.1	13.86	13.96	5.85	10.52	10.66	5.25	301	1667	988	5468
56.0	183.7	13.44	13.54	5.83	10.40	10.52	5.24	330	1681	1083	5514
56.5	185.4	13.02	13.10	5.81	9.98	10.10	5.21	331	1667	1086	5468
57.0	187.0	12.62	12.76	5.80	9.54	9.64	5.19	323	1639	1058	5378
57.5	188.6	12.30	12.42	5.77	9.08	9.20	5.17	311	1653	1019	5423
58.0	190.3	11.84	12.00	5.75	8.82	8.98	5.16	331	1695	1086	5561
58.5	191.9	11.34	11.50	5.73	8.70	8.88	5.16	380	1770	1247	5807
59.0	193.6	11.24	11.42	5.71	8.96	9.14	5.17	439	1835	1439	6020
59.5	195.2	11.56	11.74	5.72	9.28	9.38	5.17	431	1802	1414	5911
60.0	196.9	12.38	12.52	5.75	10.02	10.18	5.19	426	1802	1396	5911
60.5	198.5	12.82	12.98	5.77	10.56	10.74	5.22	444	1835	1458	6020
61.0	200.1	13.28	13.48	5.79	10.96	11.14	5.24	429	1818	1408	5965
61.5	201.8	13.78	13.94	5.83	11.22	11.34	5.26	388	1770	1272	5807

Table 3, continued. Boring BH-59, Suspension R1-R2 depth, pick times, and velocities

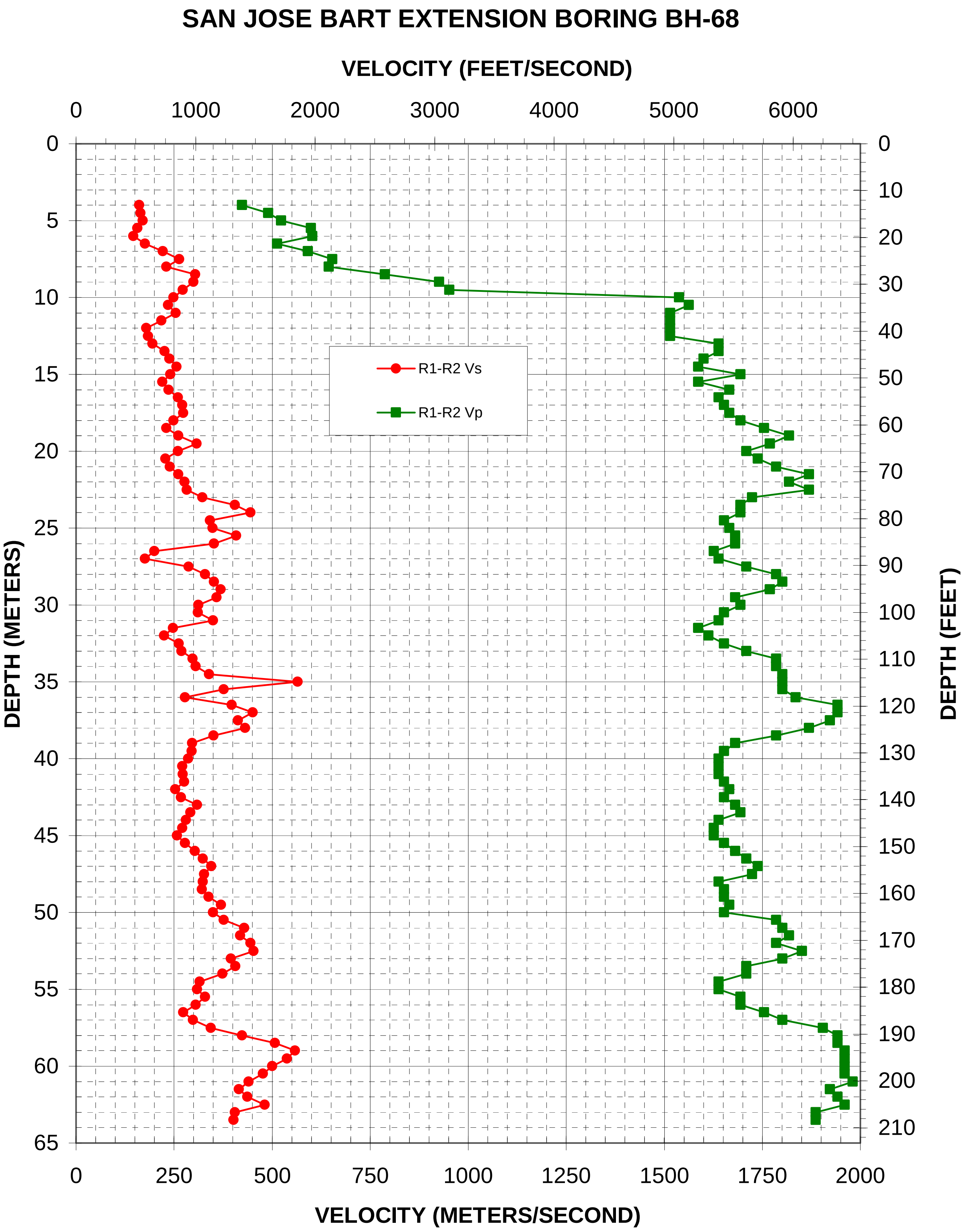


Figure 5. Boring BH-68, Suspension P- and S_H-wave velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S$_H$ (m/sec)	V-P (m/sec)	V-S$_H$ (ft/sec)	V-P (ft/sec)
4.0	13.1	22.35	22.45	9.68	16.10	16.25	7.32	161	424	527	1390
4.5	14.8	21.24	21.54	9.31	15.18	15.42	7.27	164	490	539	1608
5.0	16.4	21.02	21.06	8.97	15.18	15.16	7.06	170	524	559	1718
5.5	18.0	19.56	19.66	8.84	13.20	13.26	7.17	157	599	514	1965
6.0	19.7	18.64	18.78	8.59	11.82	11.98	6.93	147	602	482	1976
6.5	21.3	16.90	16.88	8.80	11.26	11.16	6.85	176	513	578	1682
7.0	23.0	15.68	15.88	8.55	11.12	11.40	6.86	221	592	726	1941
7.5	24.6	15.42	15.24	8.17	11.62	11.44	6.64	263	654	863	2144
8.0	26.2	16.40	16.60	8.03	12.06	12.26	6.48	230	645	756	2117
8.5	27.9	15.94	16.36	6.98	12.58	13.14	5.71	304	787	997	2583
9.0	29.5	16.06	16.50	6.43	12.68	13.20	5.35	299	926	982	3038
9.5	31.2	17.38	17.50	6.43	13.72	13.82	5.38	272	952	894	3125
10.0	32.8	18.18	18.30	5.91	14.16	14.28	5.26	249	1538	816	5047
10.5	34.4	18.68	18.90	5.89	14.44	14.62	5.25	235	1563	770	5126
11.0	36.1	18.82	18.98	5.94	14.92	15.02	5.28	254	1515	835	4971
11.5	37.7	18.72	18.90	5.89	14.16	14.28	5.23	218	1515	715	4971
12.0	39.4	18.94	19.06	5.92	13.38	13.50	5.26	180	1515	590	4971
12.5	41.0	18.44	18.56	5.90	13.00	13.10	5.24	183	1515	602	4971
13.0	42.7	18.08	18.18	5.82	12.96	13.06	5.21	195	1639	641	5378
13.5	44.3	17.32	17.44	5.86	12.88	13.02	5.25	226	1639	741	5378
14.0	45.9	16.90	17.04	5.86	12.72	12.84	5.24	239	1600	783	5249
14.5	47.6	16.60	16.72	5.88	12.70	12.82	5.25	256	1587	841	5208
15.0	49.2	16.38	16.52	5.77	12.24	12.36	5.18	241	1695	791	5561
15.5	50.9	16.84	16.98	5.83	12.30	12.44	5.20	220	1587	723	5208
16.0	52.5	16.84	16.96	5.78	12.60	12.74	5.18	236	1667	776	5468
16.5	54.1	16.40	16.54	5.77	12.56	12.70	5.16	260	1639	854	5378
17.0	55.8	15.76	15.96	5.71	12.08	12.28	5.11	272	1653	892	5423
17.5	57.4	16.10	16.26	5.71	12.44	12.62	5.11	274	1667	899	5468
18.0	59.1	16.42	16.56	5.71	12.40	12.54	5.12	249	1695	816	5561
18.5	60.7	16.50	16.58	5.70	12.16	12.24	5.13	230	1754	756	5756
19.0	62.3	16.08	16.22	5.72	12.26	12.38	5.17	261	1818	857	5965
19.5	64.0	15.82	15.96	5.74	12.58	12.70	5.18	308	1770	1009	5807
20.0	65.6	16.02	16.16	5.75	12.20	12.28	5.16	260	1709	852	5608
20.5	67.3	16.40	16.48	5.74	12.02	12.10	5.17	228	1739	749	5706
21.0	68.9	15.78	15.94	5.83	11.62	11.74	5.27	239	1786	785	5859
21.5	70.5	15.12	15.24	5.90	11.28	11.42	5.36	261	1869	857	6132
22.0	72.2	14.58	14.72	5.91	10.96	11.12	5.36	277	1818	909	5965
22.5	73.8	14.00	14.08	5.77	10.44	10.56	5.24	282	1869	927	6132
23.0	75.5	13.58	13.70	5.78	10.48	10.60	5.20	323	1724	1058	5657
23.5	77.1	14.04	14.16	5.90	11.58	11.68	5.31	405	1695	1328	5561
24.0	78.7	12.98	13.06	5.86	10.72	10.82	5.27	444	1695	1458	5561
24.5	80.4	16.04	16.04	5.93	13.06	13.16	5.32	341	1653	1120	5423
25.0	82.0	13.90	13.84	5.84	11.00	11.00	5.24	348	1667	1143	5468
25.5	83.7	13.18	13.22	5.86	10.72	10.78	5.27	408	1681	1339	5514
26.0	85.3	13.22	13.26	5.86	10.42	10.38	5.27	352	1681	1155	5514
26.5	86.9	16.02	16.20	5.83	11.04	11.16	5.22	200	1626	655	5335
27.0	88.6	16.32	16.46	5.88	10.66	10.78	5.27	176	1639	579	5378
27.5	90.2	14.04	14.14	5.62	10.58	10.64	5.03	287	1709	943	5608
28.0	91.9	13.84	13.94	5.69	10.80	10.90	5.13	329	1786	1079	5859
28.5	93.5	14.10	14.22	5.76	11.26	11.38	5.21	352	1802	1155	5911

Table 4. Boring BH-68, Suspension R1-R2 depth,
pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S$_H$ (m/sec)	V-P (m/sec)	V-S$_H$ (ft/sec)	V-P (ft/sec)
29.0	95.1	14.96	15.06	5.71	12.24	12.36	5.15	369	1770	1211	5807
29.5	96.8	15.76	15.82	5.80	12.96	13.04	5.20	358	1681	1176	5514
30.0	98.4	15.60	15.68	5.76	12.40	12.48	5.17	313	1695	1025	5561
30.5	100.1	15.70	15.76	5.82	12.48	12.56	5.22	312	1653	1022	5423
31.0	101.7	15.56	15.66	5.80	12.70	12.80	5.19	350	1639	1147	5378
31.5	103.3	15.74	15.82	5.78	11.68	11.78	5.15	247	1587	810	5208
32.0	105.0	15.98	16.08	5.77	11.54	11.64	5.15	225	1613	739	5292
32.5	106.6	14.82	14.86	5.74	10.98	11.06	5.13	262	1653	859	5423
33.0	108.3	15.26	15.34	5.82	11.52	11.64	5.24	269	1709	882	5608
33.5	109.9	14.32	14.34	5.69	10.96	10.98	5.13	298	1786	976	5859
34.0	111.5	13.22	13.26	5.62	9.90	10.02	5.06	305	1786	1000	5859
34.5	113.2	12.94	13.02	5.67	9.98	10.08	5.12	339	1802	1112	5911
35.0	114.8	12.08	12.22	5.63	10.32	10.44	5.08	565	1802	1854	5911
35.5	116.5	12.20	12.06	5.55	9.46	9.50	4.99	377	1802	1238	5911
36.0	118.1	12.80	12.82	5.53	9.18	9.26	4.98	279	1835	914	6020
36.5	119.8	12.60	12.74	5.58	10.08	10.22	5.06	397	1942	1302	6371
37.0	121.4	12.70	12.88	5.64	10.50	10.64	5.13	450	1942	1478	6371
37.5	123.0	13.52	13.66	5.69	11.10	11.24	5.17	413	1923	1356	6309
38.0	124.7	14.00	14.14	5.72	11.68	11.82	5.19	431	1869	1414	6132
38.5	126.3	14.58	14.74	5.76	11.74	11.88	5.20	351	1786	1151	5859
39.0	128.0	15.18	15.26	5.79	11.80	11.90	5.20	297	1681	974	5514
39.5	129.6	15.46	15.54	5.81	12.06	12.16	5.21	295	1653	968	5423
40.0	131.2	15.58	15.68	5.79	12.08	12.18	5.18	286	1639	937	5378
40.5	132.9	15.44	15.52	5.81	11.74	11.86	5.20	272	1639	892	5378
41.0	134.5	15.42	15.52	5.79	11.74	11.86	5.18	272	1639	894	5378
41.5	136.2	15.48	15.60	5.77	11.88	11.96	5.17	276	1653	906	5423
42.0	137.8	15.48	15.54	5.80	11.54	11.58	5.20	253	1667	831	5468
42.5	139.4	15.70	15.74	5.79	11.94	12.02	5.19	267	1653	877	5423
43.0	141.1	15.42	15.48	5.78	12.16	12.26	5.18	309	1681	1013	5514
43.5	142.7	15.48	15.54	5.80	12.04	12.12	5.21	292	1695	957	5561
44.0	144.4	15.46	15.58	5.81	11.92	12.00	5.20	281	1639	922	5378
44.5	146.0	15.20	15.30	5.80	11.52	11.62	5.18	272	1626	892	5335
45.0	147.6	15.08	15.18	5.78	11.20	11.30	5.16	258	1626	846	5335
45.5	149.3	14.64	14.70	5.77	11.02	11.14	5.17	279	1653	914	5423
46.0	150.9	14.10	14.18	5.78	10.80	10.88	5.19	303	1681	994	5514
46.5	152.6	13.72	13.82	5.77	10.62	10.74	5.19	324	1709	1062	5608
47.0	154.2	13.38	13.48	5.76	10.48	10.58	5.18	345	1739	1131	5706
47.5	155.8	13.62	13.62	5.78	10.56	10.56	5.20	327	1724	1072	5657
48.0	157.5	13.34	13.32	5.83	10.18	10.30	5.22	324	1639	1062	5378
48.5	159.1	12.90	12.94	5.77	9.76	9.86	5.17	322	1653	1055	5423
49.0	160.8	12.42	12.46	5.74	9.42	9.54	5.14	338	1653	1108	5423
49.5	162.4	12.00	12.06	5.70	9.32	9.34	5.10	370	1667	1215	5468
50.0	164.0	11.72	11.80	5.69	8.84	8.96	5.08	350	1653	1147	5423
50.5	165.7	11.40	11.50	5.64	8.72	8.88	5.08	377	1786	1238	5859
51.0	167.3	11.42	11.50	5.65	9.10	9.16	5.10	429	1802	1408	5911
51.5	169.0	11.50	11.60	5.65	9.10	9.22	5.10	418	1818	1373	5965
52.0	170.6	12.06	12.14	5.67	9.80	9.90	5.11	444	1786	1458	5859
52.5	172.2	12.54	12.58	5.72	10.30	10.40	5.18	452	1852	1485	6076
53.0	173.9	13.02	13.14	5.76	10.48	10.62	5.20	395	1802	1297	5911
53.5	175.5	13.56	13.64	5.79	11.08	11.20	5.21	407	1709	1334	5608

Table 4, continued. Boring BH-68, Suspension R1-R2 depth, pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S_H (m/sec)	V-P (m/sec)	V-S_H (ft/sec)	V-P (ft/sec)
54.0	177.2	13.92	14.02	5.78	11.24	11.34	5.20	373	1709	1224	5608
54.5	178.8	14.74	14.80	5.74	11.56	11.64	5.13	315	1639	1035	5378
55.0	180.4	14.46	14.54	5.77	11.20	11.32	5.16	309	1639	1013	5378
55.5	182.1	13.94	14.00	5.76	10.88	10.98	5.17	329	1695	1079	5561
56.0	183.7	13.08	13.14	5.69	9.80	9.88	5.10	306	1695	1003	5561
56.5	185.4	12.64	12.68	5.62	8.96	9.06	5.05	274	1754	899	5756
57.0	187.0	11.82	11.88	5.57	8.44	8.56	5.01	299	1802	979	5911
57.5	188.6	11.12	11.12	5.55	8.14	8.28	5.02	344	1905	1127	6249
58.0	190.3	10.58	10.66	5.54	8.22	8.30	5.02	424	1942	1390	6371
58.5	191.9	10.44	10.54	5.54	8.48	8.56	5.02	508	1942	1665	6371
59.0	193.6	10.58	10.70	5.59	8.78	8.92	5.08	559	1961	1833	6433
59.5	195.2	10.68	10.74	5.59	8.80	8.90	5.08	538	1961	1764	6433
60.0	196.9	10.88	10.98	5.73	8.86	9.00	5.22	500	1961	1640	6433
60.5	198.5	11.12	11.20	5.66	9.00	9.12	5.15	476	1961	1562	6433
61.0	200.1	11.40	11.48	5.66	9.12	9.22	5.15	441	1980	1445	6497
61.5	201.8	11.14	11.22	5.62	8.70	8.84	5.10	415	1923	1361	6309
62.0	203.4	11.04	11.16	5.62	8.74	8.88	5.11	437	1942	1433	6371
62.5	205.1	11.16	11.26	5.64	9.06	9.20	5.13	481	1961	1577	6433
63.0	206.7	11.70	11.82	5.75	9.22	9.36	5.22	405	1887	1328	6190
63.5	208.3	12.22	12.34	5.81	9.72	9.86	5.28	402	1887	1318	6190

Table 4, continued. Boring BH-68, Suspension R1-R2 depth, pick times, and velocities

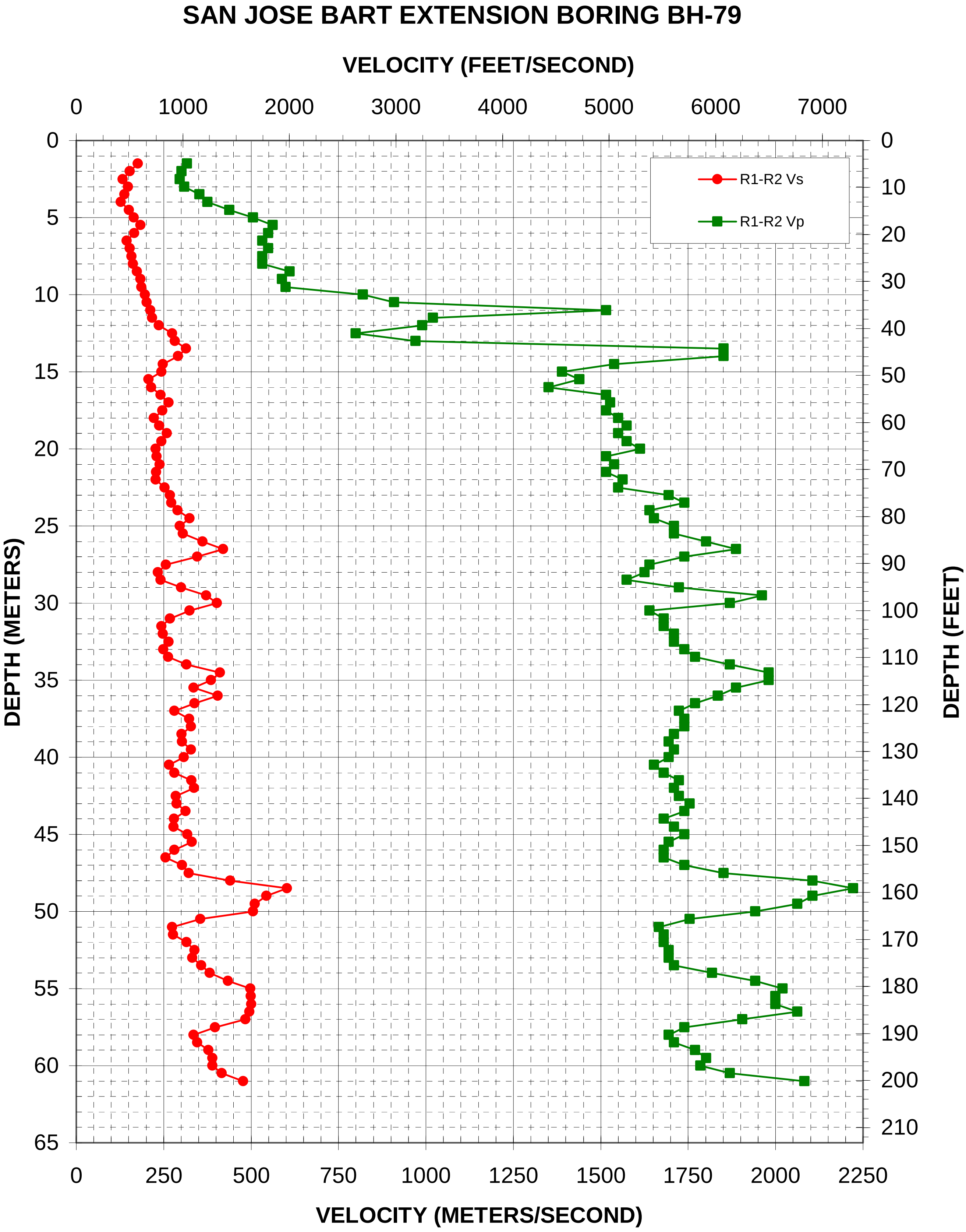


Figure 6. Boring BH-79, Suspension P- and S_H-wave velocities

Depth		Pick Times						Velocity			
		Far-Hn	Far-Hr	Far-V	Near-Hn	Near-Hr	Near-V	V-S_H	V-P	V-S_H	V-P
(m)	(feet)	(millisec)	(millisec)	(millisec)	(millisec)	(millisec)	(millisec)	(m/sec)	(m/sec)	(ft/sec)	(ft/sec)
1.5	4.9	25.25	25.10	13.42	19.70	19.30	10.26	176	316	578	1038
2.0	6.6	25.45	25.35	12.96	18.75	18.95	9.64	153	301	501	988
2.5	8.2	26.15	25.55	12.64	18.50	18.10	9.26	132	296	435	971
3.0	9.8	24.70	24.20	11.86	17.65	17.70	8.62	148	309	484	1013
3.5	11.5	24.20	23.80	11.28	16.70	16.80	8.44	138	352	453	1155
4.0	13.1	24.20	24.50	10.96	16.60	16.50	8.30	128	376	421	1233
4.5	14.8	23.70	23.85	10.30	16.90	17.35	8.02	150	439	493	1439
5.0	16.4	23.25	23.45	10.02	17.05	17.50	8.04	165	505	540	1657
5.5	18.0	23.20	23.40	9.74	17.75	17.95	7.96	183	562	602	1843
6.0	19.7	23.20	23.55	9.64	17.10	17.60	7.82	166	549	545	1803
6.5	21.3	23.80	23.80	9.54	16.75	16.95	7.66	144	532	472	1745
7.0	23.0	22.75	23.00	9.62	16.30	16.45	7.80	154	549	505	1803
7.5	24.6	22.00	22.10	9.50	15.70	15.75	7.62	158	532	519	1745
8.0	26.2	21.38	21.46	9.08	15.08	15.42	7.20	162	532	532	1745
8.5	27.9	20.56	20.72	8.46	14.78	14.98	6.82	174	610	570	2001
9.0	29.5	20.00	20.22	7.92	14.56	14.82	6.22	185	588	605	1930
9.5	31.2	19.68	19.94	7.57	14.34	14.58	5.90	187	599	613	1965
10.0	32.8	19.00	19.24	7.48	13.84	14.22	6.26	196	820	645	2689
10.5	34.4	18.54	18.32	7.21	13.46	13.48	6.11	202	909	661	2983
11.0	36.1	17.30	17.58	6.98	12.56	12.90	6.32	212	1515	697	4971
11.5	37.7	16.64	16.80	7.31	11.78	12.46	6.33	217	1020	713	3348
12.0	39.4	16.30	16.04	7.08	11.56	12.32	6.07	236	990	776	3248
12.5	41.0	16.18	15.82	6.99	12.52	12.18	5.74	274	800	899	2625
13.0	42.7	16.12	15.68	6.70	12.44	12.28	5.67	282	971	927	3185
13.5	44.3	16.42	16.22	6.35	13.10	13.18	5.81	314	1852	1032	6076
14.0	45.9	16.82	16.64	6.31	13.18	13.42	5.77	292	1852	957	6076
14.5	47.6	17.14	17.12	6.40	13.12	13.08	5.75	248	1538	814	5047
15.0	49.2	17.28	17.34	6.45	13.18	13.22	5.73	243	1389	798	4557
15.5	50.9	17.94	17.88	6.41	13.00	13.16	5.71	207	1439	679	4721
16.0	52.5	17.60	17.76	6.40	12.90	13.16	5.66	215	1351	706	4434
16.5	54.1	17.00	17.18	6.27	12.86	13.04	5.61	242	1515	792	4971
17.0	55.8	16.90	17.16	6.31	13.18	13.32	5.65	265	1527	868	5009
17.5	57.4	17.26	17.48	6.29	13.16	13.48	5.63	247	1515	810	4971
18.0	59.1	17.60	17.94	6.32	13.08	13.48	5.67	223	1550	731	5087
18.5	60.7	17.60	17.76	6.29	13.28	13.68	5.65	238	1575	781	5167
19.0	62.3	17.52	17.64	6.26	13.62	13.84	5.61	260	1550	852	5087
19.5	64.0	17.58	17.88	6.24	13.64	13.62	5.61	244	1575	800	5167
20.0	65.6	17.64	18.00	6.27	13.32	13.50	5.65	227	1613	744	5292
20.5	67.3	17.40	17.66	6.23	13.12	13.26	5.57	230	1515	756	4971
21.0	68.9	16.92	17.02	6.23	12.82	12.76	5.58	239	1538	785	5047
21.5	70.5	16.40	16.66	6.18	12.08	12.22	5.52	228	1515	749	4971
22.0	72.2	15.98	15.96	6.14	11.52	11.60	5.50	227	1563	744	5126
22.5	73.8	15.18	15.30	6.18	11.14	11.44	5.54	253	1550	831	5087
23.0	75.5	14.96	15.04	6.14	11.22	11.32	5.55	268	1695	880	5561
23.5	77.1	14.32	14.44	6.08	10.64	10.76	5.51	272	1739	892	5706
24.0	78.7	13.72	13.92	6.06	10.26	10.48	5.45	290	1639	951	5378
24.5	80.4	13.20	13.32	5.97	10.12	10.24	5.37	325	1653	1065	5423
25.0	82.0	13.88	14.04	6.00	10.54	10.64	5.42	297	1709	974	5608
25.5	83.7	14.34	14.46	5.97	11.02	11.22	5.38	305	1709	1000	5608
26.0	85.3	14.66	14.66	5.95	11.84	11.94	5.39	361	1802	1184	5911

Table 5. Boring BH-79, Suspension R1-R2 depth,
pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S_H (m/sec)	V-P (m/sec)	V-S_H (ft/sec)	V-P (ft/sec)
26.5	86.9	14.84	14.96	5.94	12.46	12.58	5.41	420	1887	1379	6190
27.0	88.6	15.02	15.00	5.92	12.10	12.14	5.35	346	1739	1135	5706
27.5	90.2	15.14	15.16	5.94	11.28	11.22	5.33	256	1639	841	5378
28.0	91.9	15.00	15.10	5.94	10.64	10.88	5.32	233	1626	765	5335
28.5	93.5	14.74	14.80	5.91	10.54	10.70	5.28	241	1575	791	5167
29.0	95.1	14.40	14.54	5.90	11.04	11.24	5.32	300	1724	985	5657
29.5	96.8	14.64	14.78	5.89	11.94	12.10	5.38	372	1961	1220	6433
30.0	98.4	15.10	15.24	5.90	12.62	12.74	5.37	402	1869	1318	6132
30.5	100.1	15.86	16.02	5.98	12.78	12.94	5.37	325	1639	1065	5378
31.0	101.7	16.56	16.68	5.94	12.84	12.94	5.34	268	1681	880	5514
31.5	103.3	16.24	16.36	5.91	12.14	12.26	5.32	244	1681	800	5514
32.0	105.0	15.64	15.68	5.92	11.58	11.68	5.33	248	1709	814	5608
32.5	106.6	14.98	15.04	5.88	11.20	11.26	5.30	265	1709	868	5608
33.0	108.3	14.44	14.58	5.80	10.42	10.58	5.22	249	1739	818	5706
33.5	109.9	13.66	13.74	5.79	9.82	9.98	5.23	263	1770	863	5807
34.0	111.5	13.26	13.38	5.78	10.08	10.22	5.25	315	1869	1035	6132
34.5	113.2	13.08	13.18	5.76	10.64	10.76	5.26	412	1980	1350	6497
35.0	114.8	13.06	13.18	5.78	10.46	10.60	5.28	386	1980	1267	6497
35.5	116.5	13.46	13.60	5.81	10.48	10.62	5.28	336	1887	1101	6190
36.0	118.1	13.48	13.62	5.83	11.04	11.12	5.29	405	1835	1328	6020
36.5	119.8	13.82	13.92	5.86	10.86	10.98	5.30	339	1770	1112	5807
37.0	121.4	14.32	14.44	5.93	10.74	10.90	5.35	281	1724	922	5657
37.5	123.0	14.02	14.18	5.92	10.94	11.08	5.34	324	1739	1062	5706
38.0	124.7	14.30	14.42	5.89	11.24	11.38	5.32	328	1739	1076	5706
38.5	126.3	14.60	14.78	5.94	11.28	11.46	5.36	301	1709	988	5608
39.0	128.0	14.54	14.66	5.95	11.22	11.36	5.36	302	1695	991	5561
39.5	129.6	14.38	14.50	5.94	11.32	11.46	5.36	328	1709	1076	5608
40.0	131.2	14.78	14.90	5.98	11.54	11.64	5.39	308	1695	1009	5561
40.5	132.9	15.00	15.08	5.95	11.20	11.34	5.35	265	1653	870	5423
41.0	134.5	14.54	14.68	5.91	10.98	11.12	5.32	281	1681	922	5514
41.5	136.2	14.34	14.48	5.93	11.30	11.44	5.35	329	1724	1079	5657
42.0	137.8	14.66	14.80	5.93	11.72	11.80	5.34	337	1709	1105	5608
42.5	139.4	14.74	14.88	5.91	11.24	11.36	5.33	285	1724	935	5657
43.0	141.1	14.82	14.86	5.91	11.30	11.42	5.34	287	1754	943	5756
43.5	142.7	14.54	14.64	5.90	11.34	11.44	5.33	313	1739	1025	5706
44.0	144.4	14.90	15.04	5.92	11.32	11.46	5.32	279	1681	916	5514
44.5	146.0	15.02	15.06	5.91	11.38	11.50	5.33	278	1709	911	5608
45.0	147.6	14.56	14.68	5.89	11.40	11.54	5.32	317	1739	1042	5706
45.5	149.3	14.24	14.18	5.92	11.16	11.22	5.33	331	1695	1086	5561
46.0	150.9	13.34	13.44	5.83	9.78	9.88	5.23	281	1681	922	5514
46.5	152.6	12.94	13.02	5.76	8.98	9.16	5.16	256	1681	839	5514
47.0	154.2	11.66	11.78	5.67	8.34	8.50	5.09	303	1739	994	5706
47.5	155.8	11.04	11.14	5.62	7.90	8.06	5.08	322	1852	1055	6076
48.0	157.5	10.74	10.88	5.57	8.48	8.60	5.09	441	2105	1445	6907
48.5	159.1	11.14	11.32	5.60	9.50	9.64	5.15	602	2222	1976	7291
49.0	160.8	12.08	12.22	5.68	10.24	10.38	5.20	543	2105	1783	6907
49.5	162.4	12.62	12.78	5.74	10.68	10.80	5.25	510	2062	1674	6765
50.0	164.0	13.12	13.24	5.78	11.14	11.26	5.26	505	1942	1657	6371
50.5	165.7	13.58	13.74	5.82	10.78	10.90	5.25	355	1754	1163	5756
51.0	167.3	14.06	14.22	5.85	10.42	10.58	5.25	275	1667	901	5468

Table 5, continued. Boring BH-79, Suspension R1-R2 depth, pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S_H (m/sec)	V-P (m/sec)	V-S_H (ft/sec)	V-P (ft/sec)
51.5	169.0	13.84	13.93	5.84	10.22	10.32	5.25	277	1681	908	5514
52.0	170.6	13.11	13.22	5.82	9.95	10.05	5.22	316	1681	1037	5514
52.5	172.2	12.34	12.45	5.76	9.38	9.49	5.17	338	1695	1108	5561
53.0	173.9	11.73	11.85	5.72	8.72	8.83	5.13	332	1695	1088	5561
53.5	175.5	11.50	11.60	5.69	8.68	8.83	5.11	358	1709	1174	5608
54.0	177.2	11.01	11.12	5.64	8.40	8.50	5.09	382	1818	1255	5965
54.5	178.8	10.68	10.80	5.57	8.37	8.50	5.06	434	1942	1423	6371
55.0	180.4	10.62	10.74	5.57	8.62	8.72	5.08	498	2020	1632	6628
55.5	182.1	11.09	11.25	5.62	9.09	9.24	5.12	499	2000	1636	6562
56.0	183.7	11.44	11.57	5.68	9.44	9.57	5.18	500	2000	1640	6562
56.5	185.4	11.74	11.88	5.71	9.73	9.85	5.23	495	2062	1624	6765
57.0	187.0	11.99	12.12	5.76	9.93	10.05	5.23	484	1905	1589	6249
57.5	188.6	12.38	12.53	5.79	9.87	10.01	5.22	398	1739	1305	5706
58.0	190.3	12.63	12.73	5.79	9.65	9.75	5.20	336	1695	1101	5561
58.5	191.9	12.17	12.34	5.75	9.27	9.47	5.16	347	1709	1137	5608
59.0	193.6	11.50	11.65	5.68	8.86	9.00	5.12	378	1770	1240	5807
59.5	195.2	11.06	11.21	5.63	8.48	8.65	5.08	389	1802	1277	5911
60.0	196.9	10.64	10.84	5.61	8.06	8.28	5.05	389	1786	1277	5859
60.5	198.5	10.20	10.33	5.54	7.78	7.94	5.00	416	1869	1364	6132
61.0	200.1	9.80	9.94	5.51	7.71	7.84	5.03	477	2083	1566	6835

Table 5, continued. Boring BH-79, Suspension R1-R2 depth, pick times, and velocities

APPENDIX A

SUSPENSION VELOCITY MEASUREMENT QUALITY ASSURANCE SUSPENSION SOURCE TO RECEIVER ANALYSIS RESULTS

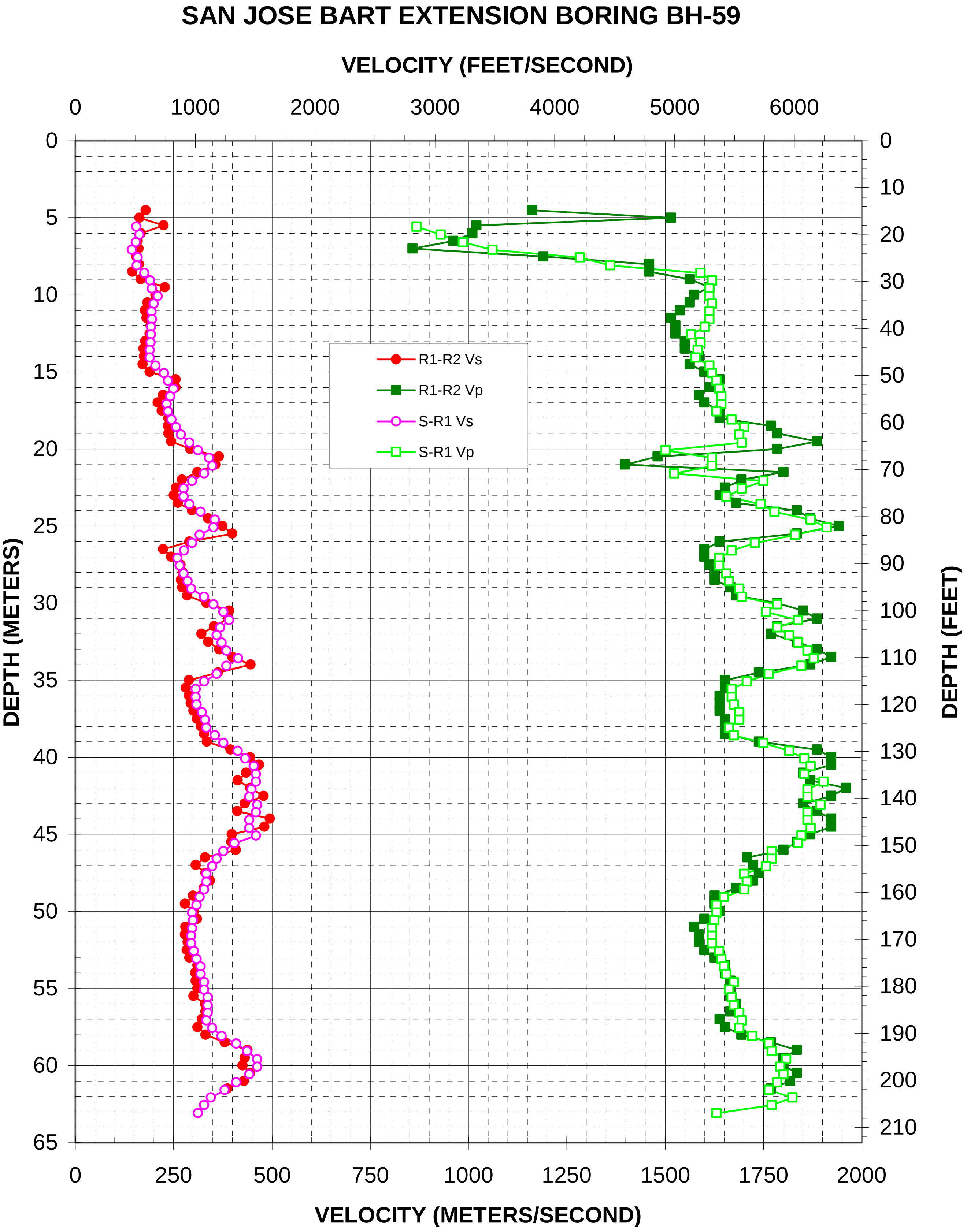


Figure A-1. Boring BH-59, R1 - R2 high resolution analysis and S-R1 quality assurance analysis P- and S_H-wave data

	Velocity			Velocity	
Depth (meters)	V-S_H (m/sec)	V-p (m/sec)	Depth (feet)	V- S_H (ft/sec)	V-p (ft/sec)
5.6	155	868	18.3	509	2848
6.1	164	929	20.0	537	3049
6.6	155	986	21.6	508	3236
7.1	144	1061	23.2	473	3481
7.6	159	1284	24.9	522	4213
8.1	157	1361	26.5	514	4464
8.6	176	1590	28.2	579	5216
9.1	190	1619	29.8	625	5313
9.6	195	1613	31.4	641	5293
10.1	210	1613	33.1	688	5293
10.6	200	1619	34.7	656	5313
11.1	195	1613	36.4	639	5293
11.6	195	1613	38.0	641	5293
12.1	193	1601	39.6	633	5254
12.6	193	1567	41.3	632	5140
13.1	192	1590	42.9	629	5216
13.6	190	1584	44.6	622	5197
14.1	190	1578	46.2	622	5178
14.6	204	1613	47.9	669	5293
15.1	226	1619	49.5	742	5313
15.6	236	1632	51.1	774	5353
16.1	250	1638	52.8	820	5373
16.6	242	1644	54.4	794	5394
17.1	233	1644	56.1	764	5394
17.6	236	1632	57.7	774	5353
18.1	245	1669	59.3	804	5476
18.6	257	1702	61.0	842	5584
19.1	269	1689	62.6	883	5540
19.6	290	1695	64.3	952	5562
20.1	312	1502	65.9	1023	4927
20.6	340	1619	67.5	1116	5313
21.1	349	1619	69.2	1145	5313
21.6	328	1523	70.8	1075	4996
22.1	297	1750	72.5	975	5741
22.6	275	1695	74.1	903	5562
23.1	275	1656	75.7	903	5435
23.6	290	1743	77.4	952	5718
24.1	319	1779	79.0	1047	5836
24.6	356	1871	80.7	1167	6137
25.1	352	1912	82.3	1156	6273
25.6	317	1831	83.9	1041	6008
26.1	297	1729	85.6	975	5673
26.6	277	1669	87.2	910	5476
27.1	260	1638	88.9	854	5373
27.6	266	1638	90.5	872	5373
28.1	275	1656	92.1	903	5435
28.6	286	1663	93.8	937	5455
29.1	295	1689	95.4	967	5540
29.6	328	1695	97.1	1075	5562
30.1	352	1786	98.7	1156	5860
30.6	377	1757	100.3	1236	5765
31.1	392	1839	102.0	1285	6033
31.6	369	1786	103.6	1211	5860
32.1	359	1816	105.3	1179	5958
32.6	373	1839	106.9	1223	6033
33.1	385	1863	108.5	1262	6111
33.6	414	1879	110.2	1359	6164
34.1	385	1847	111.8	1262	6059
34.6	359	1764	113.5	1179	5788
35.1	328	1709	115.1	1075	5606
35.6	306	1669	116.7	1006	5476
36.1	306	1669	118.4	1006	5476
36.6	309	1676	120.0	1014	5498
37.1	322	1689	121.7	1056	5540
37.6	331	1689	123.3	1085	5540
38.1	334	1663	125.0	1095	5455
38.6	356	1676	126.6	1167	5498
39.1	377	1750	128.2	1236	5741
39.6	414	1816	129.9	1357	5958
40.1	432	1855	131.5	1418	6085
40.6	454	1871	133.2	1489	6137
41.1	460	1855	134.8	1508	6085
41.6	460	1904	136.4	1508	6245
42.1	448	1863	138.1	1471	6111
42.6	443	1863	139.7	1453	6111
43.1	464	1895	141.4	1521	6218
43.6	460	1863	143.0	1508	6111
44.1	443	1863	144.6	1453	6111
44.6	443	1871	146.3	1453	6137
45.1	460	1847	147.9	1508	6059

Table A-1. Boring BH-59, S - R1 quality assurance analysis P- and S_H-wave data

Depth (meters)	Velocity		Depth (feet)	Velocity	
	V-S$_H$ (m/sec)	V-p (m/sec)		V- S$_H$ (ft/sec)	V-p (ft/sec)
45.6	405	1839	149.6	1328	6033
46.1	377	1771	151.2	1236	5812
46.6	359	1771	152.8	1179	5812
47.1	349	1757	154.5	1145	5765
47.6	334	1702	156.1	1095	5584
48.1	334	1709	157.8	1095	5606
48.6	328	1702	159.4	1075	5584
49.1	317	1650	161.0	1041	5414
49.6	309	1632	162.7	1014	5353
50.1	297	1632	164.3	975	5353
50.6	299	1625	166.0	982	5333
51.1	297	1619	167.6	975	5313
51.6	295	1619	169.2	967	5313
52.1	295	1619	170.9	967	5313
52.6	302	1638	172.5	990	5373
53.1	309	1644	174.2	1014	5394
53.6	319	1650	175.8	1047	5414
54.1	319	1656	177.4	1047	5435
54.6	328	1676	179.1	1075	5498
55.1	328	1663	180.7	1075	5455
55.6	337	1669	182.4	1106	5476
56.1	337	1676	184.0	1106	5498
56.6	337	1689	185.6	1106	5540
57.1	334	1695	187.3	1095	5562
57.6	349	1689	188.9	1145	5540
58.1	373	1722	190.6	1223	5650
58.6	409	1764	192.2	1343	5788
59.1	438	1771	193.8	1435	5812
59.6	464	1808	195.5	1521	5933
60.1	464	1793	197.1	1521	5884
60.6	443	1801	198.8	1453	5908
61.1	409	1786	200.4	1343	5860
61.6	381	1764	202.1	1249	5788
62.1	346	1824	203.7	1134	5983
62.6	328	1771	205.3	1075	5812
63.1	312	1632	207.0	1023	5353

Table A-1, continued. Boring BH-59, S - R1 quality assurance analysis P- and S$_H$-wave data

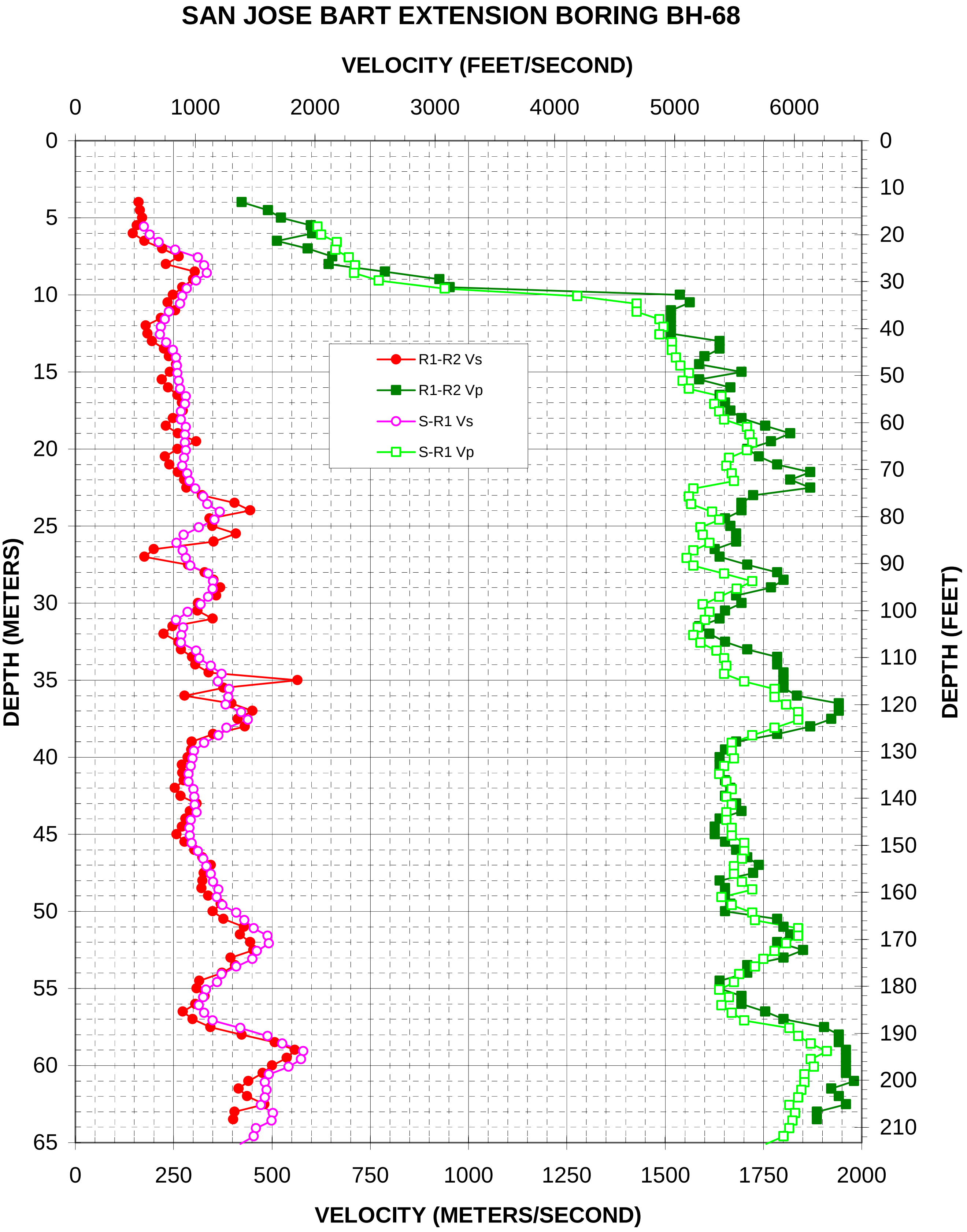


Figure A-2. Boring BH-68, R1 - R2 high resolution analysis and S-R1 quality assurance analysis P- and S_H-wave data

Depth (meters)	Velocity		Depth (feet)	Velocity	
	V-S_H (m/sec)	V-p (m/sec)		V- S_H (ft/sec)	V-p (ft/sec)
5.6	175	616	18.3	574	2023
6.1	190	625	20.0	623	2052
6.6	212	666	21.6	697	2184
7.1	255	662	23.2	836	2171
7.6	313	696	24.9	1026	2282
8.1	328	711	26.5	1075	2334
8.6	334	709	28.2	1097	2327
9.1	307	772	29.8	1008	2534
9.6	284	939	31.4	932	3082
10.1	272	1276	33.1	892	4188
10.6	267	1428	34.7	875	4684
11.1	238	1428	36.4	781	4684
11.6	228	1486	38.0	749	4876
12.1	217	1497	39.6	713	4910
12.6	216	1486	41.3	708	4876
13.1	232	1517	42.9	761	4979
13.6	248	1517	44.6	815	4979
14.1	257	1528	46.2	842	5014
14.6	259	1539	47.9	850	5049
15.1	260	1561	49.5	852	5122
15.6	263	1544	51.1	864	5067
16.1	267	1561	52.8	875	5122
16.6	281	1644	54.4	922	5394
17.1	279	1625	56.1	915	5333
17.6	269	1638	57.7	881	5373
18.1	269	1650	59.3	881	5414
18.6	281	1709	61.0	922	5606
19.1	279	1715	62.6	915	5628
19.6	279	1722	64.3	915	5650
20.1	282	1709	65.9	925	5606
20.6	277	1663	67.5	910	5455
21.1	272	1656	69.2	892	5435
21.6	284	1669	70.8	933	5476
22.1	290	1676	72.5	952	5498
22.6	305	1572	74.1	1000	5159
23.1	326	1561	75.7	1069	5122
23.6	336	1567	77.4	1102	5140
24.1	368	1619	79.0	1207	5313
24.6	355	1638	80.7	1163	5373
25.1	314	1590	82.3	1032	5216

Depth (meters)	Velocity		Depth (feet)	Velocity	
	V-S_H (m/sec)	V-p (m/sec)		V- S_H (ft/sec)	V-p (ft/sec)
25.6	275	1596	83.9	903	5235
26.1	258	1613	85.6	846	5293
26.6	273	1572	87.2	897	5159
27.1	282	1556	88.9	925	5104
27.6	293	1572	90.5	962	5159
28.1	338	1650	92.1	1109	5414
28.6	351	1722	93.8	1152	5650
29.1	350	1682	95.4	1148	5519
29.6	338	1638	97.1	1109	5373
30.1	319	1596	98.7	1047	5235
30.6	286	1613	100.3	937	5293
31.1	257	1601	102.0	842	5254
31.6	274	1584	103.6	899	5197
32.1	271	1572	105.3	888	5159
32.6	269	1590	106.9	881	5216
33.1	307	1632	108.5	1008	5353
33.6	315	1650	110.2	1035	5414
34.1	346	1656	111.8	1134	5435
34.6	373	1650	113.5	1223	5414
35.1	363	1702	115.1	1191	5584
35.6	392	1779	116.7	1285	5836
36.1	389	1779	118.4	1276	5836
36.6	382	1808	120.0	1253	5933
37.1	422	1839	121.7	1385	6033
37.6	439	1839	123.3	1441	6033
38.1	385	1779	125.0	1262	5836
38.6	364	1722	126.6	1195	5650
39.1	328	1669	128.2	1075	5476
39.6	302	1669	129.9	992	5476
40.1	298	1676	131.5	978	5498
40.6	294	1650	133.2	965	5414
41.1	288	1638	134.8	944	5373
41.6	288	1656	136.4	944	5435
42.1	301	1669	138.1	986	5476
42.6	303	1656	139.7	994	5435
43.1	305	1669	141.4	999	5476
43.6	308	1656	143.0	1011	5435
44.1	294	1656	144.6	965	5435
44.6	290	1669	146.3	952	5476
45.1	292	1669	147.9	957	5476

Table A-2. Boring BH-68, S - R1 quality assurance analysis P- and S_H-wave data

	Velocity			Velocity	
Depth (meters)	V-S_H (m/sec)	V-p (m/sec)	Depth (feet)	V- S_H (ft/sec)	V-p (ft/sec)
45.6	296	1702	149.6	973	5584
46.1	312	1702	151.2	1023	5584
46.6	326	1695	152.8	1069	5562
47.1	334	1676	154.5	1095	5498
47.6	346	1676	156.1	1134	5498
48.1	351	1695	157.8	1152	5562
48.6	364	1722	159.4	1195	5650
49.1	359	1644	161.0	1179	5394
49.6	374	1669	162.7	1227	5476
50.1	409	1722	164.3	1343	5650
50.6	431	1729	166.0	1413	5673
51.1	454	1839	167.6	1489	6033
51.6	489	1839	169.2	1603	6033
52.1	493	1808	170.9	1618	5933
52.6	462	1779	172.5	1515	5836
53.1	450	1750	174.2	1477	5741
53.6	409	1729	175.8	1343	5673
54.1	373	1689	177.4	1223	5540
54.6	360	1676	179.1	1183	5498
55.1	333	1638	180.7	1092	5373
55.6	326	1663	182.4	1069	5455
56.1	314	1644	184.0	1031	5394
56.6	328	1669	185.6	1075	5476
57.1	350	1702	187.3	1148	5584
57.6	421	1816	188.9	1380	5958
58.1	489	1839	190.6	1603	6033
58.6	527	1871	192.2	1728	6137
59.1	580	1912	193.8	1904	6273
59.6	574	1871	195.5	1883	6137
60.1	543	1879	197.1	1780	6164
60.6	493	1855	198.8	1618	6085
61.1	482	1855	200.4	1582	6085
61.6	487	1847	202.1	1596	6059
62.1	482	1839	203.7	1582	6033
62.6	472	1816	205.3	1548	5958
63.1	502	1831	207.0	1648	6008
63.6	500	1824	208.6	1640	5983
64.1	460	1816	210.3	1508	5958
64.6	454	1801	211.9	1489	5908
65.1	421	1757	213.5	1380	5765

Table A-2, continued. Boring BH-68, S - R1 quality assurance analysis P- and S_H-wave data

SAN JOSE BART EXTENSION BORING BH-79

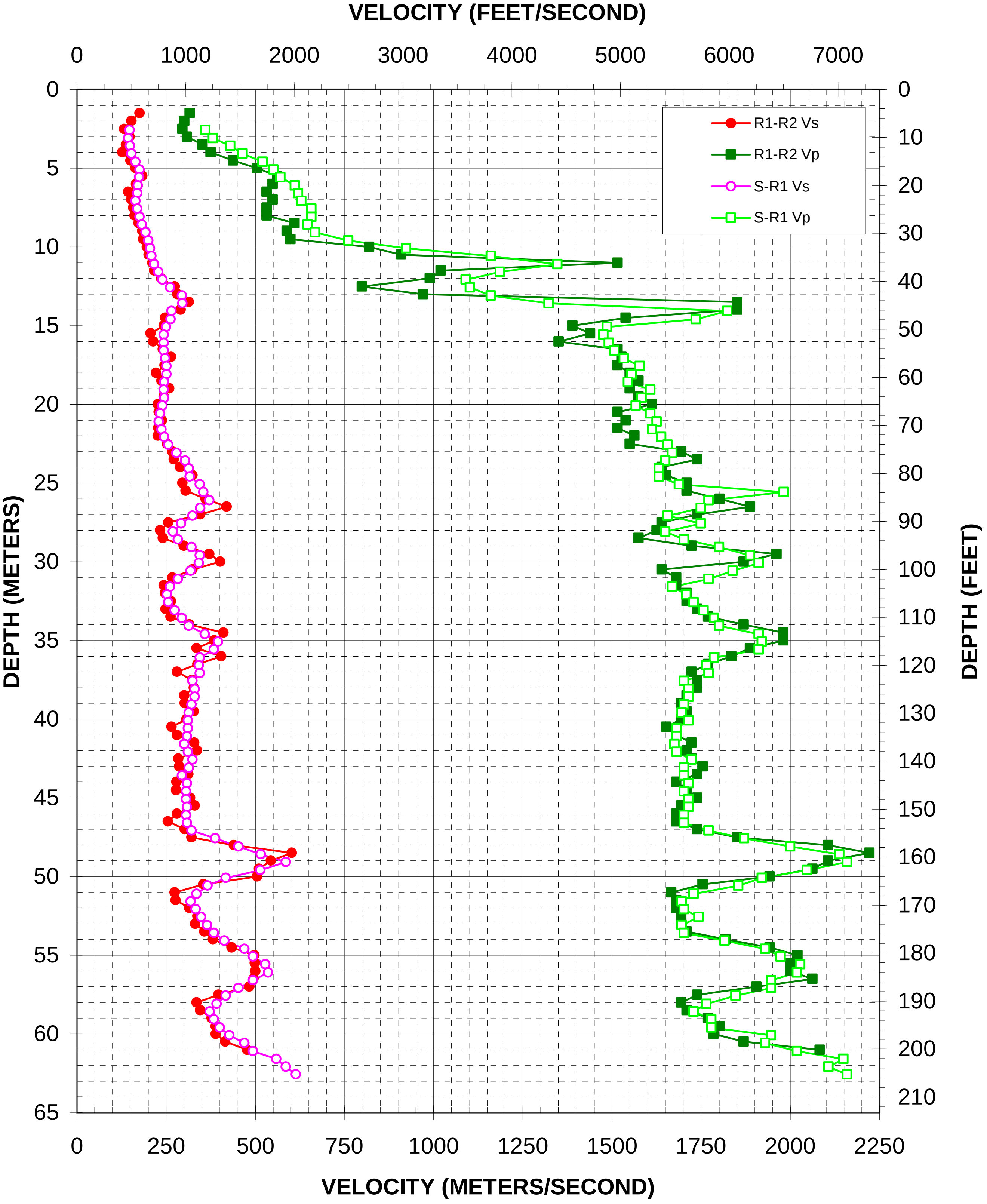


Figure A-3. Boring BH-79, R1 - R2 high resolution analysis
and S-R1 quality assurance analysis

Depth (meters)	Velocity		Depth (feet)	Velocity	
	V-S_H (m/sec)	V-p (m/sec)		V- S_H (ft/sec)	V-p (ft/sec)
2.6	148	360	8.5	484	1181
3.1	145	381	10.1	475	1251
3.6	149	430	11.8	489	1410
4.1	153	465	13.4	502	1525
4.6	164	520	15.0	539	1707
5.1	176	552	16.7	578	1812
5.6	175	571	18.3	574	1874
6.1	172	611	20.0	563	2005
6.6	170	620	21.6	558	2034
7.1	165	629	23.2	541	2064
7.6	170	658	24.9	556	2157
8.1	176	658	26.5	579	2157
8.6	183	648	28.2	601	2125
9.1	193	668	29.8	633	2191
9.6	201	761	31.4	659	2498
10.1	206	923	33.1	676	3030
10.6	210	1160	34.7	688	3807
11.1	217	1348	36.4	711	4422
11.6	229	1186	38.0	750	3890
12.1	240	1090	39.6	788	3578
12.6	262	1102	41.3	859	3614
13.1	294	1160	42.9	966	3807
13.6	297	1323	44.6	974	4341
14.1	266	1824	46.2	871	5983
14.6	264	1736	47.9	865	5696
15.1	250	1486	49.5	819	4876
15.6	244	1476	51.1	799	4843
16.1	244	1491	52.8	799	4893
16.6	244	1507	54.4	799	4944
17.1	248	1534	56.1	814	5031
17.6	251	1578	57.7	825	5178
18.1	251	1556	59.3	825	5104
18.6	245	1544	61.0	803	5067
19.1	244	1607	62.6	799	5274
19.6	245	1584	64.3	803	5197
20.1	240	1567	65.9	788	5140
20.6	234	1607	67.5	768	5274
21.1	230	1625	69.2	755	5333
21.6	237	1613	70.8	778	5293
22.1	245	1638	72.5	803	5373
22.6	256	1656	74.1	841	5435
23.1	279	1669	75.7	916	5476
23.6	303	1650	77.4	996	5414
24.1	314	1632	79.0	1030	5353
24.6	317	1632	80.7	1039	5353
25.1	345	1689	82.3	1132	5540
25.6	355	1982	83.9	1165	6502
26.1	372	1771	85.6	1221	5812
26.6	346	1750	87.2	1134	5741
27.1	324	1656	88.9	1064	5435
27.6	292	1750	90.5	958	5741
28.1	269	1650	92.1	883	5414
28.6	284	1702	93.8	931	5584
29.1	321	1801	95.4	1055	5908
29.6	345	1887	97.1	1132	6191
30.1	343	1912	98.7	1125	6273
30.6	320	1839	100.3	1049	6033
31.1	284	1771	102.0	931	5812
31.6	262	1669	103.6	859	5476
32.1	253	1709	105.3	831	5606
32.6	256	1729	106.9	841	5673
33.1	275	1757	108.5	902	5765
33.6	294	1786	110.2	966	5860
34.1	314	1801	111.8	1030	5908
34.6	359	1912	113.5	1177	6273
35.1	395	1920	115.1	1297	6300
35.6	384	1912	116.7	1260	6273
36.1	345	1786	118.4	1132	5860
36.6	343	1764	120.0	1125	5788
37.1	345	1771	121.7	1132	5812
37.6	324	1702	123.3	1064	5584
38.1	330	1715	125.0	1084	5628
38.6	330	1715	126.6	1084	5628
39.1	321	1702	128.2	1055	5584
39.6	314	1695	129.9	1030	5562
40.1	311	1715	131.5	1021	5628
40.6	311	1682	133.2	1021	5519
41.1	309	1682	134.8	1013	5519
41.6	302	1676	136.4	990	5498
42.1	311	1682	138.1	1021	5519

Table A-3. Boring BH-79, S - R1 quality assurance analysis P- and S_H-wave

Depth (meters)	Velocity		Depth (feet)	Velocity	
	V-S_H (m/sec)	V-p (m/sec)		V- S_H (ft/sec)	V-p (ft/sec)
42.6	324	1722	139.7	1064	5650
43.1	314	1702	141.4	1030	5584
43.6	294	1702	143.0	966	5584
44.1	309	1715	144.6	1013	5628
44.6	306	1702	146.3	1004	5584
45.1	306	1715	147.9	1004	5628
45.6	309	1715	149.6	1013	5628
46.1	306	1702	151.2	1004	5584
46.6	309	1702	152.8	1013	5584
47.1	321	1771	154.5	1055	5812
47.6	388	1871	156.1	1274	6137
48.1	453	2000	157.8	1486	6562
48.6	515	2138	159.4	1691	7014
49.1	586	2159	161.0	1922	7084
49.6	514	2047	162.7	1687	6716
50.1	418	1920	164.3	1372	6300
50.6	366	1855	166.0	1201	6085
51.1	336	1729	167.6	1103	5673
51.6	320	1695	169.2	1049	5562
52.1	333	1702	170.9	1094	5584
52.6	348	1743	172.5	1143	5718
53.1	365	1695	174.2	1199	5562
53.6	384	1702	175.8	1260	5584
54.1	413	1816	177.4	1356	5958
54.6	470	1929	179.1	1541	6328
55.1	494	1973	180.7	1622	6472
55.6	529	2028	182.4	1736	6654
56.1	536	2019	184.0	1758	6623
56.6	494	1946	185.6	1622	6385
57.1	453	1946	187.3	1486	6385
57.6	418	1847	188.9	1372	6059
58.1	392	1764	190.6	1285	5788
58.6	373	1729	192.2	1223	5673
59.1	384	1779	193.8	1260	5836
59.6	400	1779	195.5	1314	5836
60.1	427	1946	197.1	1401	6385
60.6	470	1929	198.8	1541	6328
61.1	494	2019	200.4	1622	6623
61.6	559	2149	202.1	1835	7049
62.1	586	2107	203.7	1924	6912
62.6	615	2159	205.3	2017	7084

Table A-3, continued. Boring BH-79, S - R1 quality assurance analysis P- and S_H-wave

APPENDIX B

OYO 170 VELOCITY LOGGING SYSTEM

NIST TRACEABLE

CALIBRATION PROCEDURE

TABLE B1

GEOVISION VELOCITY LOGGING EQUIPMENT DESCRIPTION AND CALIBRATION PROCEDURES

EQUIPMENT	FUNCTION	CALIBRATION REQUIREMENTS	MAINTENANCE REQUIREMENTS
OYO Model 170 Suspension Logging Data Logger	Records data from probe and sends control signals to probe	Every twelve months, calibrate sample clock using an NTIS-traceable external signal counter and signal generator per attached procedure. (see Attachment B2)	Diagnose and repair by manufacturer's authorized representative if sample clock is out of specification or instrument fails.
OYO Model 170 Suspension Logging Probe	Suspended in borehole to provide both seismic source and sense wave arrivals at two locations 1 meter apart	No sensor calibration is necessary, as amplitude is not important to the velocity measurement.	Repair as needed by manufacturer-trained personnel.
Winch System (several interchangeable models available)	The winch and cable suspend the probe in the borehole and connect it to the data logger	No calibration required	Repair as needed. Lubricate moving parts frequently, and keep cable clean.

ATTACHMENT B2

CALIBRATION PROCEDURE FOR GEOVISION'S VELOCITY LOGGING SYSTEM

1.0 OYO Model 170 Data Logger Unit

1.1 Purpose

The purpose of this calibration procedure is to verify that the sample clock of the OYO Model 170 is accurate to within 1%.

1.2 Calibration Frequency

The calibration described in this procedure shall be performed every twelve months minimum.

1.3 Test Equipment

- Function Generator, Krohn Hite 5400B or equivalent
- Frequency Counter, HP 5315A or equivalent, current NIST traceable calibration
- Test cable, function generator to OYO 170 Data Logger input channels

1.4 Procedure

- Connect function generator to OYO Model 170 data logger using test cable
- Set up function generator to produce a 100.0 Hz, 0.250 volt peak square wave
- Record a data record with 100 microsecond sample period
- Measure the square wave frequency in the digital data using the data logger's screen display or utility software

1.5 Calibration Criteria

The measured square wave frequency in the digital data must fall between 99.0 and 101.0 Hz to be deemed acceptable. If outside this range, the data logger must be repaired and retested.

MICRO PRECISION
CALIBRATION INC.

11562 Knott Avenue. Suite 3, Garden Grove, CA 92841
Ph. (714) 901-5659 Fax (714) 901-5649

Calibration Report

Customer: **GEOVISION Corona CA 92882**

Account: **15214**

Instrument: **BB9414 Digital Universal Test Center**

Mfg: **Tenma**	Model: **72-5085**	Serial #: **MB00006378**
Size:	Resltn:	Location:

Cust Ctrl:	Dept:	P.O.:
Job Number: **L19625**	Report Number: **146108**	Report Date: **081903**

Work Performed: **Inspected, cleaned, and calibrated.** Page **1** of **1**

Parts Replaced: **None**

Received Condition: **In tolerance** Returned Condition: **In tolerance**

Function Tested	
Multimeter	Function Generator cont'
AC/DC Volts & Current	Amplitude
Resistance & Capacitance	Sine wave distortion& flatness
Power Supply	Square wave symmetry, rise & fall time
Voltage	Triangle wave linearity
Current	TTL rise & fall time, output level
Ripple	
Frequency Counter	
Frequency range & Accuracy	
Input Sensitivity	
Function Generator	
Frequency	

Ctrl #	Manufacture, Model #, & Description of standards used for calibration	Due Date	Traceability
T1300	Hewlett Packard 33120A Arbitary Waveform Ge	011704	83836
J8300	Hewlett Packard 8657A Signal Generator	052704	137792
P5300	Tektronix THS710 Oscilloscope w/DMM	030504	133387
L1600	Hewlett Packard 34401A Multimeter	121803	97906

Services provided conform to ANSI/NCSL Z540-1-1994, ISO 10012-1:1992 or ISO/IEC 17025 as applicable.
All work performed complies with MPC Quality System QM 540-94, Rev 1e.

Environmental: 73 Deg F / 45% Rh
Test Date: 081903
Uncertainty: Accuracy Ratio > 4:1
Cycle: 12
Cal Procedure: Manufacture Man
Due Date: 081904
Technician: HOMERO E. CARDONA
Quality Approval: QC 3

Form Cert 2-25-02

GEOVision
geophysical services
a division of Blackhawk GeoServices

SEISMOGRAPH CALIBRATION DATA SHEET REV 7/11/02

INSTRUMENT DATA

SYSTEM MFR: OYO MODEL NO.: 3331
SERIAL NO.: 15014 CALIBRATION DATE: 6/17/04
BY: R. STELLER DUE DATE: 6/16/05

COUNTER MFR: TENMA MODEL NO.: 72-5085
SERIAL NO.: MB00006378 CALIBRATION DATE: 8/19/03
BY: MICRO PRECISION CAL DUE DATE: 8/19/04

FCTN GEN MFR: TENMA MODEL NO.: 72-5085
SERIAL NO.: MB00006378 CALIBRATION DATE: 8/19/03
BY: MICRO PRECISION CAL DUE DATE: 8/19/04

SYSTEM SETTINGS:

GAIN: 10
FILTER: 20 KHZ
RANGE: 100 MSEC
DELAY: 0
STACK: 1 (STD) 1
PULSE: 1.6 MSEC
DISPLAY: VARIABLE
SYSTEM: DATE = CORRECT DATE & TIME 6/17/04 11:44 Am

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISKETTE AND PAPER TAPE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 AS LEFT 100.0

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	101	100.0	90.0	70.0	90.0	100.0
SQUARE	102	100.0	89.9	89.9	90.0	100.1
SINE	103	100.0	90.0	90.1	89.9	100.0
SINE	104	100.0	90.1	89.9	89.9	100.0

CALIBRATED BY: ROBERT STELLER 6/17/03
NAME DATE SIGNATURE

APPENDIX 5

VIBRATING WIRE PIEZOMETERS

Appendix 5 presents a description of the vibrating wire piezometer installation procedures and a summary of all vibrating wire piezometer readings taken during the 10% CE and 35% PE studies.

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

APPENDIX 5

VIBRATING WIRE PIEZOMETERS

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 5 – Vibrating Wire Piezometers
Tunnel Segment of Silicon Valley Rapid Transit (SVRT) Project
San Jose, Santa Clara County, California

Dear Mr. Arango:

As requested, we are presenting *Appendix 5 – Vibrating Wire Piezometers* 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, P.E., G.E., 666
Project Manager

FW/YDW/GP {\Projects\204104.10\App-5.doc}

TABLE OF CONTENTS

ATTACHMENTS

- Exploratory Borehole & In-Situ Test Program (Table A5-1)
- Summary Table of Vibrating Wire Piezometers (Table A5-2)
- Schematic Drawings of Vibrating Wire Piezometer Installation (Figures A5-1 and A5-2)
- Summary Table of Piezometer & Groundwater Monitoring (Table A5-3, provided by HMM/Bechtel)
- Geokon Vibrating Wire Piezometer Calibration Reports (Figures A5-3 thru A5-33)

APPENDIX 5 – VIBRATING WIRE PIEZOMETERS

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 A5-1.

METHODLOGY OF EXPLORATION

Vibrating Wire Piezometers

Vibrating wire piezometers were installed at 17 borehole locations designated by the design team. The piezometers consist of Geokon Model 4500 AL (for groundwater table level at shallow depths) and Geokon Model 4500 S (for piezometers at deeper levels). A summary table (Table A5-2) of the installation of vibrating wire piezometers is attached with factory calibration sheets of each piezometer. Zero readings including engineering digit and temperature were taken before installation.

The piezometers were contained in filter sock filled with sand and put in a bucket of water a minimum of 24 hours prior to installation. The prepared piezometer “packs” were attached to 1” PVC pipe at desired depths; the boreholes were then tremie-grouted through the 1” PVC pipe. A drum (55 gallons) of the grout mix contained three bags of 47-lb cement and one bag of 50-lb bentonite (Figure A5-1).

For “tunnel” boreholes, typically two piezometers were installed in one fully grouted borehole. For “station” boreholes, typically one piezometer was installed in one borehole except BH-68. At BH-68, two boreholes at seven feet apart were drilled for installation of piezometers (Figure A5-2). A piezometer was installed in a 30-foot borehole. The second borehole was drilled and logged to 216 feet for P/S wave suspension logging and grouted to 160 feet depth. The grout was left overnight to set. Next day, a piezometer was installed at 160 feet depth with sand pack and bentonite pellets/seal for isolation. The rest of the borehole was then tremie-grouted through 1” PVC pipe with a piezometer attached at 80 feet depth. The piezometers installed in “Station” boreholes are summarized below:

• Alum Rock Station	BH-58 (Piezometer @ 30.5’) BH-63 (Piezometer @ 81’) BH-59 (Standpipe Monitoring Well @ 217’)
• Crossover/Downtown Station	BH-68 (Piezometer @ 30’ in a separate borehole; Piezometers @ 80’ & 160’ had bentonite pellet/seal layer between 156’ and 158’)
• Diridon Station	BH-74 (Piezometer @ 30’) BH-76 (Piezometer @ 105’) BH-75 (Standpipe Monitoring Well @ 200’)

In addition to installation of vibrating wire piezometers, Parikh began monitoring the groundwater pressures and levels on May 5, 2005. The monitoring also includes the vibrating wire piezometers (Slope Indicator Co.) installed during 10% Design stage (2002/2003) and slug test wells installed by Bechtel/URS (2005). We rented the Slope Indicator Readout box from Robert Chew Geotechnical Co. for monitoring.

Very Truly Yours,
PARIKH CONSULTANTS, INC.

Y. David Wang

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

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

REGISTERED PROFESSIONAL ENGINEER
GAURANG R. PARIKH
No. 666
EXP. 12-31-05
GEOTECHNICAL
STATE OF CALIFORNIA

FW/YDW/GP APP-5 (\PROJECT\204104.10\APP-5.DOC)

Table A5-1

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)	
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 A5-1

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
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

TABLE A5-2

Installation of Vibrating Wire Piezometers
Silicon Valley Rapid Transit (SVRT) Project – Tunnel Segment

Borehole No.	Depth (ft)	Serial No.	On-Site Zero Reading		Date	Approximate Location
			Digit	Temp (°C)		
2	25	04-16533	9124	11.4	01/21/05	N. Marburg Way
	52	04-10929	9212	11.3	01/21/05	
4	20	04-10932	9124	8.3	01/14/05	Route 101/McKee Rd I.C
	52	04-10927	9012	8.2	01/14/05	
9	30	04-10930	9584	8.9	01/04/05	Santa Clara St. & 25th St.
	75	04-7962	8512	8.8	01/04/05	
13	30.5	04-10928	9229	12.6	01/15/05	Santa Clara St. & 19th St.
	100.5	04-7960	8847	11.3	01/15/05	
15	30	04-8553	9725	10.1	12/18/04	Santa Clara St. & 17th St.
	90	04-7959	9013	9.6	12/18/04	
19	30	04-17579	9997	7.6	01/31/05	Santa Clara St. & 11th St.
	60	04-15175	9117	7.9	01/31/05	
31	30	04-17584	10456	13.9	02/11/05	SJW Co. parking lot/Los Gatos Creek
	60	04-15247	8594	13.9	02/11/05	
37	20.5	04-10931	9491	14.6	12/23/04	Morrison Ave
	60.5	04-7961	8962	13.6	12/23/04	
41	20	04-9828	9940	10.9	12/22/04	Stockton Ave. & Pershing Ave.
	40	04-8552	9882	10.8	12/22/04	
47	20	04-10933	9000	7.5	01/16/05	Stockton Ave. & W. Hedding St.
	40	04-9827	10169	7.5	01/16/05	
58	30.5	04-17586	9874	12.9	03/04/05	St. James St./Monarch Truck Ctr.
63	81	04-16908	8867	17.0	02/26/05	Honco Property/Mission Concrete
68	30	04-10934	9380	9.7	01/17/05	Santa Clara St. & Market St. (Washington Mutual parking lot); Piezo at 30' depth in a separate hole
	80	04-15198	9062	11.4	01/21/05	
	160	04-7963	8727	10.9	01/21/05	
74	30	04-17580	9907	10.8	02/03/05	VTA parking lot/HP Pavilion
76	105	04-15199	8946	12.1	02/02/05	PCJPB parking lot/HP Pavilion
79	35.5	04-7966	8848	13.0	03/02/05	Stockton Ave. & Harding Ave.
	75.5	04-7964	9405	12.8	03/02/05	
	118.5	04-7965	8876	13.3	03/02/05	
80	47	04-16542	10181	12.7	02/23/05	Stockton Ave. & W. Taylor St.

TABLE A5-3
VIBRATING WIRE PIEZOMETER SUMMARY TABLE
Silicon Valley Rapid Transit - Tunnel Segment
San Jose, California

	NB-17		NB-07 [1]		NB-16		NB-13A		BH-2 (P-2)		BH-4 (P-4)		BH-9 (P-9)		BH-13 (P-13)		BH-15 (P-15)		BH-19 (P-19)		BH-31 (P-31)		BH-37 (P-37)		BH-41 (P-41)		BH-47 (P-47)		BH-58 (P-58)	BH-63 (P-63)	BH-68 (P-68)			BH-74 (P-74)	BH-76 (P-76)	BH-79 (P-79)			BH-80 (P-80)
	P1-1	P1-2	P2-1	P2-2	P3-1	P3-2	P4-1	P4-2	2-1	2-2	4-1	4-2	9-1	9-2	13-1	13-2	15-1	15-2	19-1	19-2	31-1	31-2	37-1	37-2	41-1	41-2	47-1	47-2	58-1	63-1	68-1	68-2	68-3	74-1	76-1	79-1	79-2	79-3	80-1
Vibrating Wiire Piezometer Type	Slope Indicator		Slope Indicator		Slope Indicator		Slope Indicator		Geokon		Geokon		Geokon		Geokon		Geokon		Geokon		Geokon		Geokon		Geokon		Geokon		Geokon	Geokon	Geokon			Geokon	Geokon	Geokon			Geokon
Model Number	52611020	52611024	52611020	52611024	52611020	52611024	52611020	52611024	AL	AL	AL	AL	AL	S	AL	S	AL	S	AL	S	AL	S	AL	S	AL	AL	AL	AL	AL	S	AL	S	S	AL	S	S	S	S	AL
Surface Elevation (ft. NAVD88)	87.7	87.7	86[2]	86[2]	79.8	79.8	87.5	87.5	85.8	85.8	91.0	91.0	91.0	91.0	95.3	95.3	92.0	92.0	80.8	80.8	86.2	86.2	90.9	90.9	81.4	81.4	72.4	72.4	87.5	88.2	87.6	87.6	87.6	88.3	90.5	81.6	81.6	81.6	80.2
Piezometer Depth (ft)	45.0	70.0	40.0	65.0	42.0	60.0	40.0	70.0	25.0	52.0	20.0	52.0	30.0	75.0	30.5	100.5	30.0	90.0	30.0	60.0	30.0	60.0	20.5	60.5	20.0	40.0	20.0	40.0	30.5	81.0	30.0	80.0	160.0	30.0	105.0	35.5	75.5	118.5	47.0
Piezometer Elevation (ft)	42.7	17.7	46.0	21.0	37.8	19.8	47.5	17.5	60.8	33.8	71.0	39.0	61.0	16.0	64.8	-5.2	62.0	2.0	50.8	20.8	56.2	26.2	70.4	30.4	61.4	41.4	52.4	32.4	57.0	7.2	57.6	7.6	-72.4	58.3	-14.5	46.1	6.1	-36.9	33.2
Installation Date	11/13/02	11/13/02	11/15/02	11/15/02	11/22/02	11/22/02	11/25/02	11/25/02	01/21/05	01/21/05	01/14/05	01/14/05	01/04/05	01/04/05	01/15/05	01/15/05	12/18/04	12/18/04	01/31/05	01/31/05	02/11/05	02/11/05	12/23/04	12/23/04	12/22/04	12/22/04	01/16/05	01/16/05	03/04/05	02/26/05	01/17/05	01/21/05	01/21/05	02/03/05	02/02/05	03/02/05	03/02/05	03/02/05	02/23/05

Read Date	Subcontractor	Reading (piezometric depth in feet)																																						
11/13/02	URS	22.2	24.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/15/02	URS	--	--	17.0	17.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/22/02	URS	--	--	--	--	8.7	14.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/25/02	URS	--	--	--	--	--	--	10.3	10.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/09/02	URS	25.6	25.9	18.1	18.7	15.3	13.9	10.7	14.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/20/02	URS	25.2	25.0	16.6	17.7	14.1	13.3	9.4	13.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01/16/03	URS	24.4	24.5	15.2	16.4	13.7	13.9	8.9	12.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01/24/03	URS	24.3	24.1	15.1	16.0	14.0	13.5	8.8	11.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
02/13/03	URS	24.2	23.9	15.0	15.7	12.9	12.7	9.4	12.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
03/03/03	URS	23.6	23.1	14.5	14.7	10.8	10.9	8.8	11.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10/25/04	Geomatrix	23.3	22.5	N/A	N/A	10.4	12.0	10.6	13.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/17/04	Geomatrix	N/A	N/A	N/A	N/A	10.1	11.1	10.6	13.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/02/04	Geomatrix	23.4	22.3	N/A	N/A	9.7	10.5	10.8	13.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/30/04	Geomatrix	23.4	21.8	N/A	N/A	8.7	9.3	10.9	13.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
02/09/05	Geomatrix	22.5	21.2	N/A	N/A	6.0	6.7	10.1	11.6	--	--	--	--	--	--	--	--	23.6	18.2	--	--	--	--	19.3	21.7	15.1	15.5	--	--	--	--	--	--	--	--	--	--	--	--	--
03/03/05	Geomatrix	22.3	20.9	N/A	N/A	N/A	N/A	9.2	9.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	23.5	16.8	1.7	4.8	-11.0	17.9	17.5	20.6	13.4	14.1	N/A	N/A	N/A	N/A	N/A	22.1	11.4	N/A	N/A	N/A	17.6	-30.1	N/A
05/05/05	Parikh	--	--	N/A	N/A	--	--	9.5	7.9	9.3	4.6	--	--	14.6	8.4	22.7	14.3	22.5	12.0	9.6	0.5	--	--	14.9	18.2	12.1	12.3	12.6	12.4	--	--	--	--	--	--	--	13.8	13.7	8.8	12.2
05/06/05	Parikh	21.5	19.7	N/A	N/A	1.4	1.4	--	--	--	--	10.1	6.0	--	--	--	--	--	--	--	--	16.7	15.3	--	--	--	--	--	--	8.2	7.0	23.3	19.9	7.5	15.8	17.4	--	--	--	--

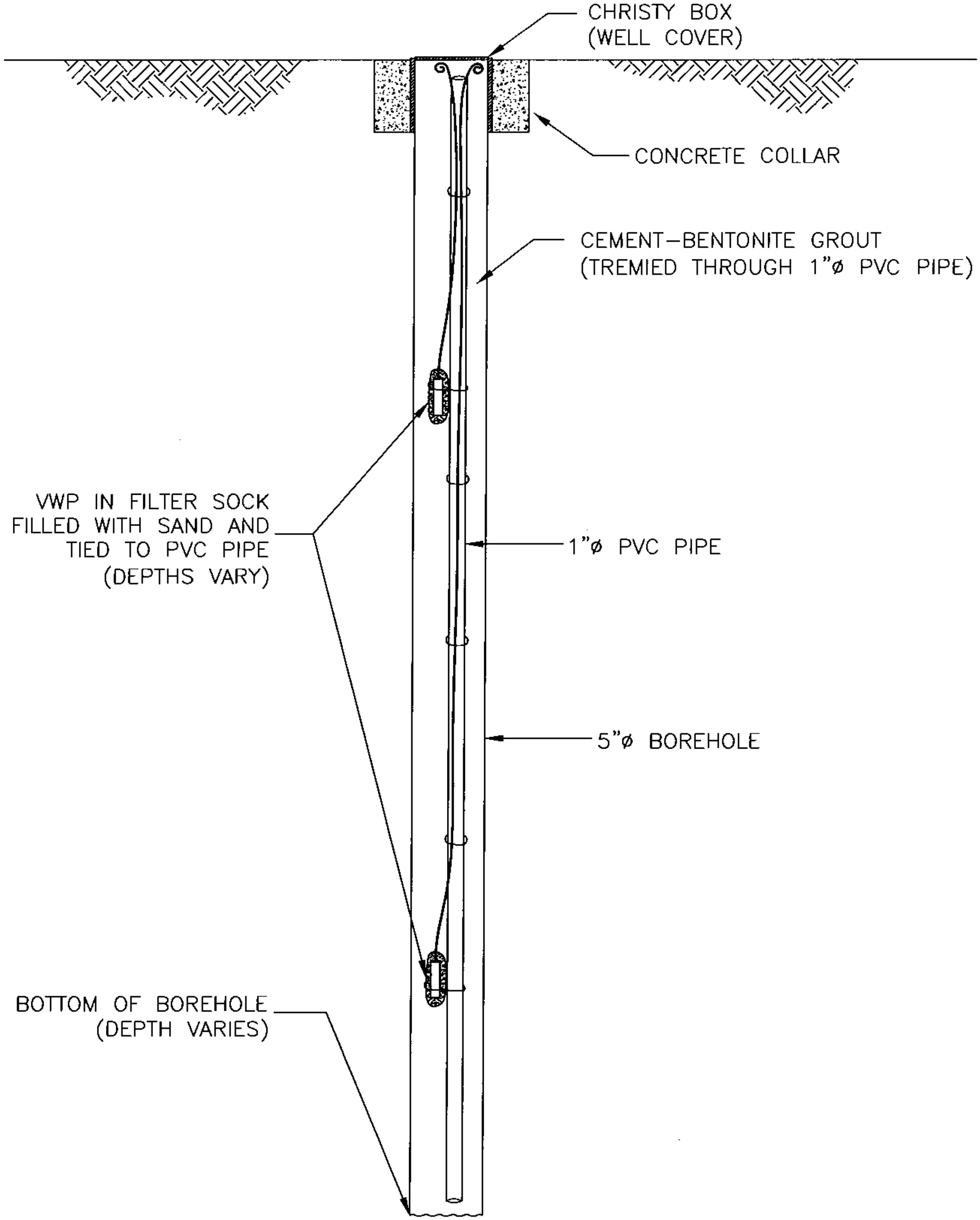
Read Date	Subcontractor	Water Level Elevation (feet NAVD88)																																						
11/13/02	URS	65.5	63.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/15/02	URS	--	--	69.0	68.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/22/02	URS	--	--	--	--	71.1	65.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/25/02	URS	--	--	--	--	--	--	77.2	76.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/09/02	URS	62.1	61.8	67.9	67.3	64.5	65.9	76.8	73.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/20/02	URS	62.5	62.7	69.4	68.3	65.7	66.5	78.1	73.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01/16/03	URS	63.3	63.2	70.8	69.6	66.1	65.9	78.6	75.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01/24/03	URS	63.4	63.6	70.9	70.0	65.8	66.3	78.7	75.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
02/13/03	URS	63.5	63.8	71.0	70.3	66.9	67.1	78.1	75.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
03/03/03	URS	64.1	64.6	71.5	71.3	69.0	68.9	78.7	76.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10/25/04	Geomatrix	64.4	65.2	N/A	N/A	69.4	67.8	76.9	74.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/17/04	Geomatrix	N/A	N/A	N/A	N/A	69.7	68.7	76.9	74.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/02/04	Geomatrix	64.3	65.4	N/A	N/A	70.1	69.3	76.7	74.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/30/04	Geomatrix	64.3	65.9	N/A	N/A	71.1	70.5	76.6	73.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
02/09/05	Geomatrix	65.2	66.5	N/A	N/A	73.8	73.1	77.4	75.9	--	--	--	--	--	--	--	--	68.4	73.8	--	--	--	--	71.6	69.2	66.3	65.9	--	--	--	--	--	--	--	--	--	--	--	--	--
03/03/05	Geomatrix	65.4	66.8	N/A	N/A	N/A	N/A	78.3	78.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	68.5	75.2	79.1	76.0	97.2[3]	68.3	73.4	70.3	68.0	67.3	N/A	N/A	N/A	N/A	N/A	65.5	76.2	N/A	N/A	N/A	64.0	111.7[3]	N/A
05/05/05	Parikh	--	--	N/A	N/A	--	--	78.0	79.6	76.5	81.2	--	--	76.4	82.6	72.6	81.0	69.5	80.0	71.2	80.3	--	--	76.0	72.7	69.3	69.1	59.8	60.0	--	--	--	--	--	--	--	67.8	67.9	72.8	68.0
05/06/05	Parikh	66.2	68.0	N/A	N/A	78.4	78.4	--	--	--	--	80.9	85.0	--	--	--	--	--	--	--	--	69.5	70.9	--	--	--	--	--	--	79.3	81.2	64.3	67.7	80.1	72.5	73.1	--	--	--	--

Notes:

[1] Location abandoned. N/A = Not available or not applicable.

[2] Approximate surface elevation based on City of San Jose survey elevations.

[3] Values appear to be an incorrect field measurements.



TYPICAL INSTALLATION OF VIBRATING WIRE PIEZOMETERS IN FULLY GROUTED BOREHOLE

PARIKH CONSULTANTS INC.
GEOTECHNICAL CONSULTANTS AND MATERIALS TESTING

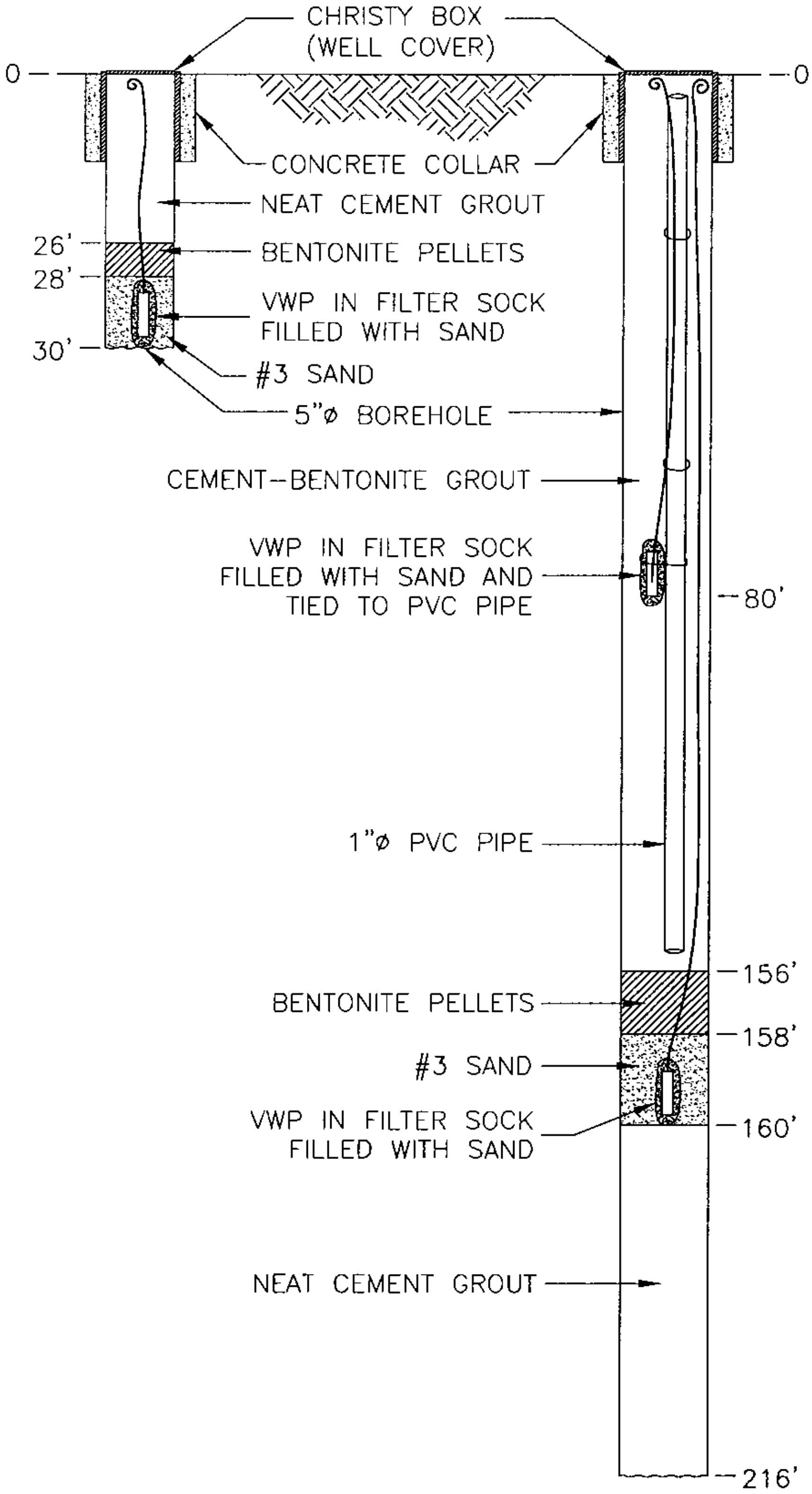
TUNNEL SEGMENT OF SILICON VALLEY
RAPID TRANSIT (SVRT) PROJECT
SAN JOSE, CALIFORNIA

JOB NO.: 204104.10

MAY, 2005

FIGURE A5-1

BH-68 (2 BOREHOLES, 7 FEET AWAY)



BH-68

PARIKH CONSULTANTS INC.
GEOTECHNICAL CONSULTANTS AND MATERIALS TESTING

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

JOB NO.: 204104.10

MAY, 2005

FIGURE A5-2

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-80, 47'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Serial Number: 04-16542

Pressure Range: 170 kPa

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 500, 399, 403, 018

Date of Calibration: January 27, 2005

Temperature: 20.7 °C

†Barometric Pressure: 1006.8 mbar

Technician: KBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	10195	10196	10196	0.189	0.11	-0.007	0.00
34.0	9313	9313	9313	34.04	0.02	34.08	0.05
68.0	8433	8433	8433	67.79	-0.12	67.96	-0.02
102.0	7548	7548	7548	101.7	-0.16	101.9	-0.06
136.0	6653	6652	6653	136.1	0.05	136.1	0.06
170.0	5764	5763	5764	170.2	0.10	169.9	-0.04

(kPa) Linear Gage Factor (G): 0.03835 (kPa/ digit)

Regression Zero: 10200

Polynomial Gage Factors: A: -8.240E-08 B: -0.03704 C: 386.17

Thermal Factor (K): -0.05310 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.005563 (psi/ digit)

Polynomial Gage Factors: A: -1.19511E-08 B: -0.005372 C: 56.010

Thermal Factor (K): -0.007702 (psi/ °C)

Calculated Pressures:

Linear, $P = G(R_0 - R_1) + K(T_1 - T_0) - (S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 10201 Temp(T_0): 21.7 °C †Baro(S_0): 995.8 mbar Date: February 08, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1. Figure A5-3

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-2, 25'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Serial Number: 04-16533

Pressure Range: 170 kPa

Cal. Std. Cntrl. #(s): 123-L, 216, 506, 468, 524, 529, 428, 028

Date of Calibration: January 4, 2005

Temperature: 23.2 °C

†Barometric Pressure: 1000.2 mbar

Technician: KDBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9148	9148	9148	0.280	0.16	0.008	0.00
34.0	8307	8309	8308	33.95	-0.03	34.05	0.03
68.0	7465	7466	7466	67.73	-0.16	67.96	-0.02
102.0	6614	6615	6615	101.8	-0.09	102.1	0.05
136.0	5764	5764	5764	135.9	-0.04	136.0	-0.01
170.0	4908	4907	4908	170.3	0.16	170.0	-0.02

(kPa) Linear Gage Factor (G): 0.04009 (kPa/ digit)

Regression Zero: 9155

Polynomial Gage Factors: A: -1.139E-07 B: -0.03848 C: 361.60

Thermal Factor (K): -0.01883 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.005814 (psi/ digit)

Polynomial Gage Factors: A: -1.65251E-08 B: -0.005582 C: 52.446

Thermal Factor (K): -0.002731 (psi/ °C)

Calculated Pressures: **Linear,** $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9136 Temp(T_0): 21.5 °C †Baro(S_0): 1005.7 mbar Date: January 12, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1. Figure A5-4

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-2, 52'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: November 3, 2004

Serial Number: 04-10929

Temperature: 23.1 °C

Pressure Range: 170 kPa

†Barometric Pressure: 996.1 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9272	9273	9273	0.402	0.24	0.011	0.01
34.0	8402	8402	8402	33.94	-0.04	34.02	0.01
68.0	7527	7526	7527	67.67	-0.19	67.98	-0.01
102.0	6646	6644	6645	101.6	-0.22	101.9	-0.04
136.0	5755	5754	5755	135.9	-0.04	136.0	0.01
170.0	4860	4860	4860	170.4	0.24	170.0	0.00

(kPa) Linear Gage Factor (G): 0.03853 (kPa/ digit)

Regression Zero: 9283

Polynomial Gage Factors: A: -1.590E-07 B: -0.03628 C: 350.07

Thermal Factor (K): 0.04749 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.005588 (psi/ digit)

Polynomial Gage Factors: A: -2.30639E-08 B: -0.005262 C: 50.773

Thermal Factor (K): 0.006888 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9241

Temp(T_0): 20.4 °C

†Baro(S_0): 1000.9 mbar

Date: November 29, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1. Figure A5-5

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-4, 20'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: November 3, 2004

Serial Number: 04-10932

Temperature: 23.1 °C

Pressure Range: 170 kPa

†Barometric Pressure: 996.1 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician:

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9190	9191	9191	0.372	0.22	0.021	0.01
34.0	8326	8326	8326	33.92	-0.05	33.99	0.00
68.0	7455	7455	7455	67.72	-0.16	68.02	0.01
102.0	6581	6581	6581	101.6	-0.21	101.9	-0.03
136.0	5697	5696	5697	136.0	-0.02	136.0	0.02
170.0	4811	4810	4811	170.4	0.21	170.0	-0.02

(kPa) Linear Gage Factor (G): **0.03881** **(kPa/ digit)**

Regression Zero: **9200**

Polynomial Gage Factors: **A:** **-1.458E-07** **B:** **-0.03677** **C:** **350.22**

Thermal Factor (K): **0.03965** **(kPa/ °C)**

(psi) Linear Gage Factor (G): **0.005629** **(psi/ digit)**

Polynomial Gage Factors: **A:** **-2.11518E-08** **B:** **-0.005333** **C:** **50.796**

Thermal Factor (K): **0.005751** **(psi/ °C)**

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9163

Temp(T_0): 20.4 °C

†Baro(S_0): 1000.9 mbar

Date: November 29, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-6

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-4, 52'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: November 3, 2004

Serial Number: 04-10927

Temperature: 23.1 °C

Pressure Range: 170 kPa

†Barometric Pressure: 996.1 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9075	9075	9075	0.375	0.22	-0.002	0.00
34.0	8249	8249	8249	33.94	-0.03	34.02	0.01
68.0	7419	7419	7419	67.67	-0.19	67.98	-0.01
102.0	6582	6582	6582	101.7	-0.18	102.0	0.00
136.0	5739	5739	5739	135.9	-0.03	136.0	0.02
170.0	4892	4892	4892	170.4	0.22	170.0	-0.01

(kPa) Linear Gage Factor (G): 0.04064 **(kPa/ digit)**

Regression Zero: 9084

Polynomial Gage Factors: **A:** -1.628E-07 **B:** -0.03836 **C:** 361.56

Thermal Factor (K): 0.03306 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.005894 **(psi/ digit)**

Polynomial Gage Factors: **A:** -2.36083E-08 **B:** -0.005564 **C:** 52.441

Thermal Factor (K): 0.004795 **(psi/ °C)**

Calculated Pressures: **Linear,** $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9047

Temp(T_0): 20.3 °C

†Baro(S_0): 1000.9 mbar

Date: November 29, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-7

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-9, 30'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Serial Number: 04-10930

Pressure Range: 170 kPa

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Date of Calibration: November 3, 2004

Temperature: 23.1 °C

†Barometric Pressure: 996.1 mbar

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9616	9617	9617	0.291	0.17	0.017	0.01
34.0	8784	8782	8783	33.96	-0.02	33.98	-0.01
68.0	7947	7946	7947	67.75	-0.15	67.97	-0.02
102.0	7106	7105	7106	101.7	-0.16	101.9	-0.03
136.0	6257	6257	6257	136.0	0.00	136.1	0.03
170.0	5408	5409	5409	170.3	0.16	170.0	0.00

(kPa) Linear Gage Factor (G): 0.04039 (kPa/ digit)

Regression Zero: 9624

Polynomial Gage Factors: A: -1.253E-07 B: -0.03851 C: 381.94

Thermal Factor (K): 0.05007 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.005859 (psi/ digit)

Polynomial Gage Factors: A: -1.81666E-08 B: -0.005586 C: 55.396

Thermal Factor (K): 0.007262 (psi/ °C)

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9586 Temp(T_0): 20.3 °C †Baro(S_0): 1000.9 mbar Date: November 29, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-8

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-9, 75'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Serial Number: 04-7962

Pressure Range: 2 MPa

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 402, 428

Date of Calibration: June 30, 2004

Temperature: 23.9 °C

†Barometric Pressure: 997.8 mbar

Technician: KLBellavance

Applied Pressure (MPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8517	8517	8517	0.005	0.23	0.000	0.00
0.4	7764	7764	7764	0.399	-0.06	0.400	-0.01
0.8	7005	7004	7005	0.797	-0.17	0.800	0.00
1.2	6241	6241	6241	1.196	-0.18	1.200	0.00
1.6	5472	5472	5472	1.599	-0.05	1.600	0.00
2.0	4697	4698	4698	2.005	0.23	2.000	0.01

(MPa) Linear Gage Factor (G): 0.0005236 (MPa/ digit)

Regression Zero: 8526

Polynomial Gage Factors: A: -2.331E-09 B: -0.0004928 C: 4.3664

Thermal Factor (K): 0.0003151 (MPa/ °C)

(psi) Linear Gage Factor (G): 0.07588 (psi/ digit)

Polynomial Gage Factors: A: -3.37853E-07 B: -0.07142 C: 632.81

Thermal Factor (K): 0.04566 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1) + K(T_1 - T_0) - (S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8515 Temp(T_0): 22.7 °C †Baro(S_0): 1007.5 mbar Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1. Figure A5-9

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-13, 30.5'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Serial Number: 04-10928

Pressure Range: 170 kPa

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Date of Calibration: November 3, 2004

Temperature: 23.1 °C

†Barometric Pressure: 996.1 mbar

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9270	9270	9270	0.361	0.21	-0.014	-0.01
34.0	8418	8419	8419	33.96	-0.02	34.06	0.03
68.0	7564	7564	7564	67.68	-0.19	67.99	-0.01
102.0	6703	6703	6703	101.7	-0.20	102.0	-0.02
136.0	5834	5834	5834	136.0	-0.03	136.0	0.02
170.0	4962	4962	4962	170.4	0.21	170.0	-0.01

(kPa) Linear Gage Factor (G): **0.03946** **(kPa/ digit)**

Regression Zero: **9279**

Polynomial Gage Factors: **A:** **-1.524E-07** **B:** **-0.03729** **C:** **358.79**

Thermal Factor (K): **-0.03910** **(kPa/ °C)**

(psi) Linear Gage Factor (G): **0.005724** **(psi/ digit)**

Polynomial Gage Factors: **A:** **-2.20995E-08** **B:** **-0.005409** **C:** **52.039**

Thermal Factor (K): **-0.005671** **(psi/ °C)**

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9046

Temp(T_0): 20.4 °C

†Baro(S_0): 1000.9 mbar

Date: November 29, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-13, 100.5'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: June 30, 2004

Serial Number: 04-7960

Temperature: 23.9 °C

Pressure Range: 2 MPa

†Barometric Pressure: 997.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 402, 428

Technician: KLBellavance

Applied Pressure (MPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8851	8850	8851	0.004	0.21	0.000	-0.02
0.4	8106	8106	8106	0.399	-0.03	0.400	0.01
0.8	7358	7357	7358	0.797	-0.17	0.800	-0.01
1.2	6605	6604	6605	1.196	-0.19	1.200	-0.02
1.6	5846	5846	5846	1.599	-0.06	1.600	-0.01
2.0	5081	5082	5082	2.005	0.23	2.000	0.02

(MPa) Linear Gage Factor (G): 0.0005307 **(MPa/ digit)**

Regression Zero: 8858

Polynomial Gage Factors: **A:** -2.336E-09 **B:** -0.0004982 **C:** 4.5920

Thermal Factor (K): -0.0000033 **(MPa/ °C)**

(psi) Linear Gage Factor (G): 0.07692 **(psi/ digit)**

Polynomial Gage Factors: **A:** -3.38541E-07 **B:** -0.07220 **C:** 665.51

Thermal Factor (K): -0.00048 **(psi/ °C)**

Calculated Pressures: **Linear,** $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8847

Temp(T_0): 22.8 °C

†Baro(S_0): 1007.5 mbar

Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-11

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-15, 30'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: August 26, 2004

Serial Number: 04-8553

Temperature: 21.9 °C

Pressure Range: 170 kPa

†Barometric Pressure: 1004.9 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: KDBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9776	9777	9777	0.330	0.19	0.039	0.02
34.0	8937	8937	8937	33.92	-0.05	33.98	-0.01
68.0	8092	8092	8092	67.73	-0.16	67.98	-0.01
102.0	7242	7242	7242	101.7	-0.15	102.0	0.00
136.0	6386	6386	6386	136.0	-0.01	136.1	0.03
170.0	5529	5529	5529	170.3	0.17	170.0	-0.02

(kPa) Linear Gage Factor (G): 0.04001 **(kPa/ digit)**

Regression Zero: 9785

Polynomial Gage Factors: **A:** -1.301E-07 **B:** -0.03802 **C:** 384.16

Thermal Factor (K): 0.02009 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.005803 **(psi/ digit)**

Polynomial Gage Factors: **A:** -1.88752E-08 **B:** -0.005514 **C:** 55.718

Thermal Factor (K): 0.002914 **(psi/ °C)**

Calculated Pressures: **Linear,** $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9754

Temp(T_0): 21.4 °C

†Baro(S_0): 1007.1 mbar

Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-12

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-15, 90'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: June 30, 2004

Serial Number: 04-7959

Temperature: 23.9 °C

Pressure Range: 2 MPa

†Barometric Pressure: 997.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 402, 428

Technician: KDBellavance

Applied Pressure (MPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9018	9019	9019	0.004	0.22	0.000	0.02
0.4	8254	8254	8254	0.399	-0.05	0.400	-0.01
0.8	7485	7485	7485	0.796	-0.19	0.799	-0.03
1.2	6708	6708	6708	1.197	-0.13	1.201	0.03
1.6	5930	5930	5930	1.599	-0.05	1.600	0.00
2.0	5145	5146	5146	2.004	0.20	2.000	0.01

(MPa) Linear Gage Factor (G): 0.0005163 (MPa/ digit)

Regression Zero: 9027

Polynomial Gage Factors: A: -2.089E-09 B: -0.0004867 C: 4.5597

Thermal Factor (K): 0.0000491 (MPa/ °C)

(psi) Linear Gage Factor (G): 0.07483 (psi/ digit)

Polynomial Gage Factors: A: -3.0281E-07 B: -0.07054 C: 660.83

Thermal Factor (K): 0.00711 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9014 Temp(T_0): 22.6 °C †Baro(S_0): 1007.5 mbar Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-13

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-19, 30'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Serial Number: 04-17579

Pressure Range: 170 kPa

Cal. Std. Cntrl. #(s): 524, 529, 123-L, 506, 500, 468, 428, 028

Date of Calibration: January 14, 2005

Temperature: 23.4 °C

†Barometric Pressure: 994.8 mbar

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	10034	10034	10034	0.392	0.23	0.025	0.01
34.0	9215	9216	9216	33.88	-0.07	33.97	-0.02
68.0	8388	8388	8388	67.73	-0.16	68.03	0.02
102.0	7559	7558	7559	101.7	-0.19	101.9	-0.03
136.0	6720	6720	6720	136.0	-0.01	136.1	0.03
170.0	5880	5880	5880	170.3	0.20	170.0	-0.02

(kPa) Linear Gage Factor (G): 0.04091 **(kPa/ digit)**

Regression Zero: 10044

Polynomial Gage Factors: **A:** -1.603E-07 **B:** -0.03836 **C:** 401.08

Thermal Factor (K): -0.04605 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.005934 **(psi/ digit)**

Polynomial Gage Factors: **A:** -2.32449E-08 **B:** -0.005564 **C:** 58.172

Thermal Factor (K): -0.006680 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9997 Temp(T_0): 21.3 °C †Baro(S_0): 1006.8 mbar Date: January 18, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1

Figure A5-14

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-19, 60'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Serial Number: 04-15175

Pressure Range: 700 kPa

Cal. Std. Cntrl. #(s): 524, 529, 123-L, 506, 216, 468, 428, 028

Date of Calibration: January 7, 2005

Temperature: 22.9 °C

†Barometric Pressure: 999.5 mbar

Technician: KDBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9122	9123	9123	1.012	0.14	0.123	0.02
140.0	8178	8179	8179	139.8	-0.02	140.1	0.01
280.0	7232	7233	7233	279.0	-0.15	279.8	-0.03
420.0	6278	6277	6278	419.4	-0.09	420.1	0.01
560.0	5322	5322	5322	559.9	-0.01	560.1	0.02
700.0	4363	4364	4364	700.9	0.12	700.0	0.00

(kPa) Linear Gage Factor (G): 0.1471 (kPa/ digit)

Regression Zero: 9129

Polynomial Gage Factors: A: -3.202E-07 B: -0.1427 C: 1328.9

Thermal Factor (K): -0.0588 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.02133 (psi/ digit)

Polynomial Gage Factors: A: -4.64405E-08 B: -0.02070 C: 192.74

Thermal Factor (K): -0.00852 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9117 Temp(T_0): 22.0 °C †Baro(S_0): 1006.2 mbar Date: January 12, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-15

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-31, 30'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: January 14, 2005

Serial Number: 04-17584

Temperature: 23.4 °C

Pressure Range: 170 kPa

†Barometric Pressure: 994.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 123-L, 506, 500, 468, 428, 028

Technician: KLBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	10471	10472	10472	0.329	0.19	0.039	0.02
34.0	9733	9734	9734	33.91	-0.05	34.00	0.00
68.0	8990	8990	8990	67.75	-0.15	68.00	0.00
102.0	8242	8244	8243	101.7	-0.15	102.0	0.02
136.0	7490	7492	7491	136.0	-0.02	136.1	0.04
170.0	6736	6737	6737	170.3	0.17	170.0	0.00

(kPa) Linear Gage Factor (G): 0.04551 **(kPa/ digit)**

Regression Zero: 10479

Polynomial Gage Factors: **A:** -1.696E-07 **B:** -0.04259 **C:** 464.58

Thermal Factor (K): -0.03044 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.006600 **(psi/ digit)**

Polynomial Gage Factors: **A:** -2.45984E-08 **B:** -0.006177 **C:** 67.382

Thermal Factor (K): -0.004414 **(psi/ °C)**

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$****

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 10480 Temp(T_0): 20.8 °C †Baro(S_0): 985.8 mbar Date: January 25, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-16

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-31, 60'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: January 21, 2005

Serial Number: 04-15247

Temperature: 21.9 °C

Pressure Range: 700 kPa

†Barometric Pressure: 998.5 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 500, 399, 403, 018

Technician: KLBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8596	8596	8596	0.309	0.04	0.192	0.03
140.0	7683	7683	7683	139.5	-0.07	139.6	-0.06
280.0	6761	6761	6761	280.1	0.02	280.2	0.03
420.0	5844	5845	5845	419.9	-0.01	420.1	0.01
560.0	4926	4925	4926	560.1	0.01	560.0	0.00
700.0	4006	4009	4008	700.0	0.01	700.2	0.02

(kPa) Linear Gage Factor (G): 0.1525 **(kPa/ digit)**

Regression Zero: 8598

Polynomial Gage Factors: **A:** -4.183E-08 **B:** -0.1520 **C:** 1309.6

Thermal Factor (K): -0.0146 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.02212 **(psi/ digit)**

Polynomial Gage Factors: **A:** -6.06689E-09 **B:** -0.02204 **C:** 189.95

Thermal Factor (K): -0.00212 **(psi/ °C)**

Calculated Pressures: **Linear,** $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8595 Temp(T_0): 23.2 °C †Baro(S_0): 986.0 mbar Date: January 25, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1. Figure A5-17

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GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-37, 20.5'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: November 3, 2004

Serial Number: 04-10931

Temperature: 23.1 °C

Pressure Range: 170 kPa

†Barometric Pressure: 996.1 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9560	9560	9560	0.289	0.17	-0.025	-0.01
34.0	8733	8733	8733	33.98	-0.01	34.04	0.02
68.0	7904	7904	7904	67.75	-0.15	68.00	0.00
102.0	7070	7070	7070	101.7	-0.16	102.0	-0.01
136.0	6231	6231	6231	135.9	-0.05	136.0	-0.01
170.0	5386	5386	5386	170.3	0.20	170.0	0.01

(kPa) Linear Gage Factor (G): 0.04074 **(kPa/ digit)**

Regression Zero: 9567

Polynomial Gage Factors: **A:** -1.358E-07 **B:** -0.03871 **C:** 382.45

Thermal Factor (K): 0.06782 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.005909 **(psi/ digit)**

Polynomial Gage Factors: **A:** -1.96924E-08 **B:** -0.005614 **C:** 55.470

Thermal Factor (K): 0.009837 **(psi/ °C)**

Calculated Pressures:

Linear, $P = G(R_0 - R_1) + K(T_1 - T_0) - (S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9525

Temp(T_0): 20.3 °C

†Baro(S_0): 1000.9 mbar

Date: November 29, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1. Figure A5-18

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-37, 60.5'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: June 30, 2004

Serial Number: 04-7961

Temperature: 23.9 °C

Pressure Range: 2 MPa

†Barometric Pressure: 997.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 402, 428

Technician: KLBellavance

Applied Pressure (MPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8973	8974	8974	0.004	0.22	0.000	0.00
0.4	8237	8236	8237	0.400	-0.01	0.400	0.02
0.8	7498	7498	7498	0.796	-0.20	0.800	-0.02
1.2	6753	6752	6753	1.196	-0.21	1.199	-0.03
1.6	6000	6000	6000	1.600	-0.02	1.601	0.03
2.0	5245	5246	5246	2.004	0.22	2.000	0.00

(MPa) Linear Gage Factor (G): 0.0005365 (MPa/ digit)

Regression Zero: 8982

Polynomial Gage Factors: A: -2.473E-09 B: -0.0005013 C: 4.6975

Thermal Factor (K): 0.0002684 (MPa/ °C)

(psi) Linear Gage Factor (G): 0.07775 (psi/ digit)

Polynomial Gage Factors: A: -3.58414E-07 B: -0.07266 C: 680.80

Thermal Factor (K): 0.03890 (psi/ °C)

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8968

Temp(T_0): 22.6 °C

†Baro(S_0): 1007.5 mbar

Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-19

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-41, 20'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: October 5, 2004

Serial Number: 04-9828

Temperature: 21.7 °C

Pressure Range: 170 kPa

†Barometric Pressure: 1004.4 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 028, 428

Technician: KBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9954	9955	9955	0.281	0.17	-0.005	0.00
34.0	9065	9065	9065	33.99	-0.01	34.05	0.03
68.0	8174	8174	8174	67.75	-0.15	67.99	0.00
102.0	7277	7278	7278	101.7	-0.16	102.0	-0.01
136.0	6374	6375	6375	135.9	-0.03	136.0	0.01
170.0	5467	5468	5468	170.3	0.18	170.0	0.01

(kPa) Linear Gage Factor (G): 0.03789 (kPa/ digit)

Regression Zero: 9962

Polynomial Gage Factors: A: -1.139E-07 B: -0.03614 C: 370.99

Thermal Factor (K): -0.04932 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.005496 (psi/ digit)

Polynomial Gage Factors: A: -1.65182E-08 B: -0.005241 C: 53.808

Thermal Factor (K): -0.007154 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$**

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9929

Temp(T_0): 21.4 °C

†Baro(S_0): 1007.1 mbar

Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-20

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-41, 40'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: August 26, 2004

Serial Number: 04-8552

Temperature: 21.9 °C

Pressure Range: 170 kPa

†Barometric Pressure: 1004.9 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Technician: KLBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9890	9892	9891	0.353	0.21	0.059	0.03
34.0	9055	9055	9055	33.91	-0.06	33.97	-0.02
68.0	8213	8212	8213	67.72	-0.16	67.97	-0.02
102.0	7365	7364	7365	101.8	-0.14	102.0	0.00
136.0	6513	6513	6513	135.9	-0.04	136.0	0.00
170.0	5656	5656	5656	170.3	0.19	170.0	-0.01

(kPa) Linear Gage Factor (G): 0.04014 (kPa/ digit)

Regression Zero: 9900

Polynomial Gage Factors: A: -1.408E-07 B: -0.03795 C: 389.12

Thermal Factor (K): -0.04771 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.005821 (psi/ digit)

Polynomial Gage Factors: A: -2.04242E-08 B: -0.005504 C: 56.437

Thermal Factor (K): -0.006920 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9868 Temp(T_0): 21.2 °C †Baro(S_0): 1007.1 mbar Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-21

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-47, 20'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Serial Number: 04-10933

Pressure Range: 170 kPa

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Date of Calibration: November 3, 2004

Temperature: 23.1 °C

†Barometric Pressure: 996.1 mbar

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9074	9074	9074	0.402	0.24	0.001	0.00
34.0	8193	8193	8193	33.92	-0.04	34.00	0.00
68.0	7307	7306	7307	67.66	-0.20	67.96	-0.02
102.0	6411	6412	6412	101.7	-0.17	102.1	0.03
136.0	5514	5513	5514	135.9	-0.07	136.0	-0.03
170.0	4606	4606	4606	170.4	0.24	170.0	0.01

(kPa) Linear Gage Factor (G): 0.03805 (kPa/ digit)

Regression Zero: 9085

Polynomial Gage Factors: A: -1.519E-07 B: -0.03597 C: 338.92

Thermal Factor (K): 0.00627 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.005519 (psi/ digit)

Polynomial Gage Factors: A: -2.20333E-08 B: -0.005217 C: 49.156

Thermal Factor (K): 0.000910 (psi/ °C)

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9048 Temp(T_0): 20.3 °C †Baro(S_0): 1000.9 mbar Date: November 29, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-22

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-47, 40'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Serial Number: 04-9827

Pressure Range: 170 kPa

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 028, 428

Date of Calibration: October 5, 2004

Temperature: 21.7 °C

†Barometric Pressure: 1004.4 mbar

Technician: KDBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	10200	10199	10200	0.310	0.18	-0.027	-0.02
34.0	9380	9378	9379	33.95	-0.03	33.97	-0.02
68.0	8555	8555	8555	67.74	-0.15	67.99	0.00
102.0	7725	7726	7726	101.7	-0.15	102.0	0.02
136.0	6892	6892	6892	135.9	-0.05	136.0	-0.01
170.0	6053	6053	6053	170.3	0.19	170.0	0.00

(kPa) Linear Gage Factor (G): **0.04100** **(kPa/ digit)**

Regression Zero: **10207**

Polynomial Gage Factors: **A:** **-1.390E-07** **B:** **-0.03874** **C:** **409.61**

Thermal Factor (K): **-0.06110** **(kPa/ °C)**

(psi) Linear Gage Factor (G): **0.005947** **(psi/ digit)**

Polynomial Gage Factors: **A:** **-2.01534E-08** **B:** **-0.005619** **C:** **59.409**

Thermal Factor (K): **-0.008861** **(psi/ °C)**

Calculated Pressures: **Linear,** $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 10178

Temp(T_0): 21.5 °C

†Baro(S_0): 1007.1 mbar

Date: October 07, 2004

***Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.**

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1. Figure A5-23

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-58 , 30.5'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: January 14, 2005

Serial Number: 04-17586

Temperature: 23.4 °C

Pressure Range: 170 kPa

†Barometric Pressure: 994.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 123-L, 506, 500, 468, 428, 028

Technician:

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9900	9900	9900	0.326	0.19	-0.007	0.00
34.0	9088	9087	9088	33.94	-0.03	33.99	-0.01
68.0	8271	8270	8271	67.74	-0.15	67.99	-0.01
102.0	7449	7449	7449	101.7	-0.16	102.0	0.00
136.0	6623	6623	6623	135.9	-0.06	136.0	-0.01
170.0	5790	5791	5791	170.3	0.20	170.0	0.02

(kPa) Linear Gage Factor (G): 0.04137 (kPa/ digit)

Regression Zero: 9908

Polynomial Gage Factors: A: -1.488E-07 B: -0.03904 C: 401.05

Thermal Factor (K): -0.07980 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.006001 (psi/ digit)

Polynomial Gage Factors: A: -2.1579E-08 B: -0.005662 C: 58.168

Thermal Factor (K): -0.011574 (psi/ °C)

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9867 Temp(T_0): 20.1 °C †Baro(S_0): 1007.6 mbar Date: February 01, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-24

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-63, 81'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Serial Number: 04-16908

Pressure Range: 700 kPa

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 500, 399, 403, 018

Date of Calibration: January 26, 2005

Temperature: 22.3 °C

†Barometric Pressure: 987.2 mbar

Technician: KBellavance

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8888	8888	8888	0.403	0.06	0.145	0.02
140.0	8006	8007	8007	139.7	-0.04	139.8	-0.03
280.0	7121	7121	7121	279.6	-0.05	279.8	-0.03
420.0	6230	6230	6230	420.4	0.06	420.6	0.09
560.0	5350	5349	5350	559.5	-0.07	559.5	-0.07
700.0	4458	4459	4459	700.3	0.05	700.2	0.02

(kPa) Linear Gage Factor (G): 0.1580 (kPa/ digit)

Regression Zero: 8891

Polynomial Gage Factors: A: -9.899E-08 B: -0.1567 C: 1400.7

Thermal Factor (K): -0.0059 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.02292 (psi/ digit)

Polynomial Gage Factors: A: -1.43577E-08 B: -0.02273 C: 203.15

Thermal Factor (K): -0.00086 (psi/ °C)

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8865 Temp(T_0): 20.5 °C †Baro(S_0): 1007.6 mbar Date: February 01, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-25

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-68, 30'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Serial Number: 04-10934

Pressure Range: 170 kPa

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 403, 018

Date of Calibration: November 3, 2004

Temperature: 23.1 °C

†Barometric Pressure: 996.1 mbar

Technician:

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9456	9456	9456	0.241	0.14	-0.003	0.00
34.0	8622	8621	8622	33.97	-0.02	34.00	0.00
68.0	7785	7785	7785	67.78	-0.13	67.97	-0.02
102.0	6943	6943	6943	101.8	-0.11	102.0	0.00
136.0	6098	6098	6098	136.0	-0.02	136.0	0.01
170.0	5250	5250	5250	170.2	0.14	170.0	0.00

(kPa) Linear Gage Factor (G): 0.04042 **(kPa/ digit)**

Regression Zero: 9462

Polynomial Gage Factors: **A:** -1.035E-07 **B:** -0.03889 **C:** 377.04

Thermal Factor (K): 0.02867 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.005862 **(psi/ digit)**

Polynomial Gage Factors: **A:** -1.50145E-08 **B:** -0.005641 **C:** 54.686

Thermal Factor (K): 0.004158 **(psi/ °C)**

Calculated Pressures:

Linear, $P = G(R_0 - R_1) + K(T_1 - T_0) - (S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9426

Temp(T_0): 20.3 °C

†Baro(S_0): 1000.9 mbar

Date: November 29, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-26

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-68, 80'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: January 11, 2005

Serial Number: 04-15198

Temperature: 22.8 °C

Pressure Range: 700 kPa

†Barometric Pressure: 1003.4 mbar

Cal. Std. Cntrl. #(s): 524, 529, 123-L, 506, 216, 468, 403, 018

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9070	9070	9070	0.606	0.09	0.080	0.01
140.0	8152	8152	8152	139.8	-0.03	139.9	-0.02
280.0	7230	7229	7230	279.6	-0.06	279.9	-0.01
420.0	6306	6306	6306	419.6	-0.06	420.0	0.00
560.0	5380	5379	5380	560.0	0.00	560.0	0.01
700.0	4453	4453	4453	700.5	0.06	699.9	-0.01

(kPa) Linear Gage Factor (G): 0.1516 **(kPa/ digit)**

Regression Zero: 9074

Polynomial Gage Factors: **A:** -1.856E-07 **B:** -0.1491 **C:** 1367.4

Thermal Factor (K): -0.0660 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.02199 **(psi/ digit)**

Polynomial Gage Factors: **A:** -2.69226E-08 **B:** -0.02162 **C:** 198.33

Thermal Factor (K): -0.00957 **(psi/ °C)**

Calculated Pressures: **Linear,** $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9056 Temp(T_0): 17.9 °C †Baro(S_0): 1005.7 mbar Date: January 18, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-27

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-68, 160'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: June 30, 2004

Serial Number: 04-7963

Temperature: 23.9 °C

Pressure Range: 2 MPa

†Barometric Pressure: 997.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 402, 428

Technician: K Bellavance

Applied Pressure (MPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8731	8732	8732	0.006	0.28	0.000	0.02
0.4	7973	7974	7974	0.399	-0.06	0.400	0.01
0.8	7209	7209	7209	0.795	-0.23	0.800	-0.01
1.2	6437	6437	6437	1.196	-0.21	1.200	0.01
1.6	5660	5660	5660	1.599	-0.06	1.600	0.00
2.0	4875	4877	4876	2.005	0.27	2.000	0.02

(MPa) Linear Gage Factor (G): 0.0005187 (MPa/ digit)

Regression Zero: 8742

Polynomial Gage Factors: A: -2.804E-09 B: -0.0004805 C: 4.4097

Thermal Factor (K): 0.0003119 (MPa/ °C)

(psi) Linear Gage Factor (G): 0.07517 (psi/ digit)

Polynomial Gage Factors: A: -4.06315E-07 B: -0.06964 C: 639.09

Thermal Factor (K): 0.04520 (psi/ °C)

Calculated Pressures: **Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8727 Temp(T_0): 22.4 °C †Baro(S_0): 1007.5 mbar Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-28

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-74, 30'

Vibrating Wire Pressure Transducer Calibration Report

Type: A

Date of Calibration: January 14, 2005

Serial Number: 04-17580

Temperature: 23.4 °C

Pressure Range: 170 kPa

†Barometric Pressure: 994.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 123-L, 506, 500, 468, 428, 028

Technician: J. Ouellette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9945	9946	9946	0.315	0.19	0.004	0.00
34.0	9094	9095	9095	33.96	-0.02	34.05	0.03
68.0	8241	8240	8241	67.73	-0.16	67.98	-0.01
102.0	7382	7380	7381	101.7	-0.17	101.9	-0.03
136.0	6516	6516	6516	135.9	-0.05	136.0	0.00
170.0	5645	5646	5646	170.3	0.20	170.0	0.02

(kPa) Linear Gage Factor (G): 0.03954 **(kPa/ digit)**

Regression Zero: 9953

Polynomial Gage Factors: **A:** -1.351E-07 **B:** -0.03743 **C:** 385.65

Thermal Factor (K): -0.07721 **(kPa/ °C)**

(psi) Linear Gage Factor (G): 0.005735 **(psi/ digit)**

Polynomial Gage Factors: **A:** -1.95988E-08 **B:** -0.005429 **C:** 55.934

Thermal Factor (K): -0.011198 **(psi/ °C)**

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C +K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9903 Temp(T_0): 20.8 °C †Baro(S_0): 1006.8 mbar Date: January 18, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1. Figure A5-29

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-76, 105'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: January 11, 2005

Serial Number: 04-15199

Temperature: 22.8 °C

Pressure Range: 700 kPa

†Barometric Pressure: 1003.4 mbar

Cal. Std. Cntrl. #(s): 524, 529, 123-L, 506, 216, 468, 403, 018

Technician: J. Oullette

Applied Pressure (kPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8951	8952	8952	1.012	0.14	0.039	0.01
140.0	8004	8004	8004	139.8	-0.02	140.1	0.01
280.0	7053	7053	7053	279.2	-0.11	280.0	0.01
420.0	6099	6098	6099	419.1	-0.13	419.8	-0.02
560.0	5138	5138	5138	559.8	-0.03	560.0	0.00
700.0	4174	4174	4174	701.1	0.15	700.0	0.00

(kPa) Linear Gage Factor (G): 0.1465 (kPa/ digit)

Regression Zero: 8958

Polynomial Gage Factors: A: -3.454E-07 B: -0.1420 C: 1298.7

Thermal Factor (K): -0.0639 (kPa/ °C)

(psi) Linear Gage Factor (G): 0.02125 (psi/ digit)

Polynomial Gage Factors: A: -5.00965E-08 B: -0.02059 C: 188.36

Thermal Factor (K): -0.00927 (psi/ °C)

Calculated Pressures:

$$\text{Linear, } P = G(R_0 - R_1) + K(T_1 - T_0) - (S_1 - S_0)^{**}$$

$$\text{Polynomial, } P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^{**}$$

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8940 Temp(T_0): 17.8 °C †Baro(S_0): 1005.7 mbar Date: January 18, 2005

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-30

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-79, 35.5'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Serial Number: 04-7966

Pressure Range: 2 MPa

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 402, 428

Date of Calibration: June 30, 2004

Temperature: 23.9 °C

†Barometric Pressure: 997.8 mbar

Technician: KLBellavance

Applied Pressure (MPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8858	8858	8858	0.004	0.22	0.000	-0.01
0.4	8119	8119	8119	0.399	-0.03	0.400	0.01
0.8	7377	7376	7377	0.796	-0.20	0.800	-0.02
1.2	6627	6627	6627	1.197	-0.17	1.200	0.02
1.6	5874	5875	5875	1.599	-0.07	1.600	0.00
2.0	5114	5115	5115	2.005	0.24	2.000	0.02

(MPa) Linear Gage Factor (G): 0.0005343 **(MPa/ digit)**

Regression Zero: 8866

Polynomial Gage Factors: **A:** -2.469E-09 **B:** -0.0004998 **C:** 4.6211

Thermal Factor (K): 0.0004839 **(MPa/ °C)**

(psi) Linear Gage Factor (G): 0.07744 **(psi/ digit)**

Polynomial Gage Factors: **A:** -3.5781E-07 **B:** -0.07244 **C:** 669.72

Thermal Factor (K): 0.07013 **(psi/ °C)**

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8852 Temp(T_0): 22.3 °C †Baro(S_0): 1007.5 mbar Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-31

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-79, 75.5'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: June 30, 2004

Serial Number: 04-7964

Temperature: 23.9 °C

Pressure Range: 2 MPa

†Barometric Pressure: 997.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 402, 428

Technician: KDBellavance

Applied Pressure (MPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	9405	9405	9405	0.004	0.22	0.000	0.00
0.4	8643	8645	8644	0.399	-0.03	0.401	0.04
0.8	7880	7880	7880	0.796	-0.20	0.800	-0.02
1.2	7109	7109	7109	1.196	-0.19	1.200	-0.01
1.6	6332	6332	6332	1.600	-0.02	1.601	0.03
2.0	5552	5553	5553	2.004	0.21	2.000	0.00

(MPa) Linear Gage Factor (G): 0.0005191 (MPa/ digit)

Regression Zero: 9413

Polynomial Gage Factors: A: -2.256E-09 B: -0.0004853 C: 4.7642

Thermal Factor (K): 0.0001543 (MPa/ °C)

(psi) Linear Gage Factor (G): 0.07523 (psi/ digit)

Polynomial Gage Factors: A: -3.26945E-07 B: -0.07034 C: 690.47

Thermal Factor (K): 0.02237 (psi/ °C)

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)$**

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)$**

†Barometric pressures are absolute. Barometric compensation is not required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 9401 Temp(T_0): 22.3 °C †Baro(S_0): 1007.5 mbar Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-32

GEOKON 48 Spencer St. Lebanon, N.H. 03766 USA

BH-79, 118.5'

Vibrating Wire Pressure Transducer Calibration Report

Type: S

Date of Calibration: June 30, 2004

Serial Number: 04-7965

Temperature: 23.9 °C

Pressure Range: 2 MPa

†Barometric Pressure: 997.8 mbar

Cal. Std. Cntrl. #(s): 524, 529, 511, 506, 216, 468, 402, 428

Technician: KLBellavance

Applied Pressure (MPa)	Gage Reading 1st Cycle	Gage Reading 2nd Cycle	Average Gage Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8880	8879	8880	0.004	0.22	0.000	-0.01
0.4	8109	8110	8110	0.399	-0.05	0.400	0.00
0.8	7334	7334	7334	0.796	-0.18	0.800	-0.01
1.2	6553	6553	6553	1.197	-0.16	1.200	0.01
1.6	5768	5768	5768	1.599	-0.05	1.600	0.00
2.0	4977	4978	4978	2.004	0.21	2.000	0.01

(MPa) Linear Gage Factor (G): 0.0005125 **(MPa/ digit)**

Regression Zero: 8888

Polynomial Gage Factors: **A:** -2.111E-09 **B:** -0.0004833 **C:** 4.4577

Thermal Factor (K): 0.0003081 **(MPa/ °C)**

(psi) Linear Gage Factor (G): 0.07428 **(psi/ digit)**

Polynomial Gage Factors: **A:** -3.05955E-07 **B:** -0.07004 **C:** 646.04

Thermal Factor (K): 0.04465 **(psi/ °C)**

Calculated Pressures:

Linear, $P = G(R_0 - R_1)+K(T_1 - T_0)-(S_1 - S_0)^{**}$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0)-(S_1 - S_0)^{**}$

†Barometric pressures are absolute. Barometric compensation is <u>not</u> required with vented and differential pressure transducers.

Factory Zero Reading:

GK-401 Pos. B or F(R_0): 8875

Temp(T_0): 22.4 °C

†Baro(S_0): 1007.5 mbar

Date: October 07, 2004

*Initial zero readings must be established in the field following the procedures described in the Instruction Manual. If the Polynomial equation is used the field value of C must be calculated by plugging the initial zero reading into the polynomial equation with the value of P set to zero.

The above instrument was found to be in tolerance in all operating ranges.

The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

Figure A5-33

APPENDIX 6

OBSERVATION WELLS

Appendix 6 presents a description of the observation well installation procedures and a summary of all observation wells readings taken during the 10% CE and 35% PE studies.

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

APPENDIX 6

OBSERVATION WELLS

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 ■
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Construction Inspection ■

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

June 3, 2005 (Rev.)
Job No.: 204104.10

Attn.: Mr. Ignacio Arango

Sub: Appendix 6 – Observation Wells
Tunnel Segment of Silicon Valley Rapid Transit (SVRT) Project
San Jose, Santa Clara County, California

Dear Mr. Arango:

As requested, we are presenting *Appendix 6 – Observation Wells* 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, P.E., G.E., 666
Project Manager

FW/YDW/GP {\Projects\204104.10\App-6 (cover).doc}

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TABLE OF CONTENTS

ATTACHMENTS

- Exploratory Borehole & In-Situ Test Program (Table A6-1)
- Schematic Drawings of Well Installations In BH-59 & 75 (Figure A6-1)
- Observation Well Summary Table (Table A6-2)

APPENDIX 6 – OBSERVATION WELLS

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 A6-1.

METHODLOGY OF EXPLORATION

Observation Wells

Standpipe monitoring wells were installed in BH-59 and 75 in sand/gravel zone at or below 200 feet depths. The depths of the wells, screen depths, sand pack and bentonite pellet layers are summarized in Figure A6-1. The wells were installed in accordance with the Santa Clara Valley Water District (SCVWD) standards and guidelines, and SCVWD representative inspected the installation of the wells.

In addition to installation of the observation wells, Parikh began monitoring the groundwater levels on May 5, 2005. The monitoring also includes the monitoring wells installed by URS during 10% Design stage (2002/2003) and slug test wells installed by Bechtel/URS (2005). Water samples were obtained from the slug test wells and BH-59 & 75 on May 6, 2005 for corrosion evaluation. A summary of the observation well data is provided on Table A6-2.

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
No. 666
EXP. 12-31-05
GEOTECHNICAL
STATE OF CALIFORNIA

FW/YDW/GP APP-5 (\PROJECT\204104.10\APP-6.DOC}

Table A6-1

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

7/26/2005

Exploration	Boring	Station	Offset		Structure	In-Situ Tests			Vib. Wire Piezometers
	Depth	(ft)	(ft)	R/L		Type	Qty	Depth (ft)	& 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 A6-1

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

7/26/2005

Exploration	Boring	Station	Offset		Structure	In-Situ Tests			Vib. Wire Piezometers
	Depth	(ft)	(ft)	R/L		Type	Qty	Depth (ft)	& Standpipe Wells
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

TABLE A6-2
OBSERVATION WELL SUMMARY TABLE
Silicon Valley Rapid Transit - Tunnel Segment
San Jose, California

	NW-01	NW-04 [1]	NW-05	NW-06	WELL #18[1]	MW-1[3]	MW-2	MW-3[1]	BH-59 (OW-1)	BH-75 (OW-5)	ST-1	ST-2	ST-3	ST-5	ST-7	ST-8	ST-10	ST-11	ST-12	ST-13
Surface Elevation (ft. NAVD88)	86.8	80[2]	85.0	88.0	80[2]	79.2	80.5	80[2]	87.7	89.8	86	87.4	87.8	81.1	81.1	87.7	88.8	90.3	82.3	68.0
Depth to PVC (inches)	3.7	--	3.3	4.0	--	6.4	3.3	--	4.3	4.5	6.2	5.7	6.1	TBD	4.3	7.1	4.2	3.7	4.9	3.0
Top PVC Elevation (ft)	86.5	80.0	84.7	87.7	80.0	78.7	80.2	80.0	87.3	89.4	85.5	86.9	87.3	81.1	80.7	87.1	88.5	90.0	81.9	67.8
Screen Depth (ft)	70.0 to 80.0	70.0 to 80.0	80.0 to 90.0	90.0 to 100.0	N/A	64.0 to 74.0	60.0 to 80.0	74.0 to 84.0	203.0 to 217.0	190.0 to 200.0	67.5 to 72.5	77.5 to 87.5	59.5 to 79.5	55.0 to 65.0	67.5 to 72.5	76.3 to 86.3	68.0 to 73.0	79.5 to 84.5	64.5 to 69.0	21.0 to 31.0
Installation Date	10/17/01	09/05/01	10/17/01	09/06/01	N/A	03/01/03	03/01/03	03/02/03	2/7/2005	01/26/05	02/18/05	02/19/05	02/23/05	02/17/05	02/25/05	02/14/05	02/16/05	02/16/05	02/11/05	04/19/05

Read Date	Subcontractor	Measured Water Depth (feet below top of PVC casing)																			
10/16/01	URS	--	13.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10/17/01	URS	18.5	--	--	20.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/08/01	URS	--	13.6	21.6	20.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01/07/02	URS	16.4	--	20.5	19.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
03/03/03	URS	--	--	--	--	38	12.3	12.2	12.3	--	--	--	--	--	--	--	--	--	--	--	--
03/08/03	URS	--	--	--	--	38.4	12.0	13.3	12.2	--	--	--	--	--	--	--	--	--	--	--	--
04/14/03	URS	11.7	N/A	18.7	16.9	40.3	14.7	12.2	11.3	--	--	--	--	--	--	--	--	--	--	--	--
10/25/04	Geomatrix	18.1	N/A	20.1	20.3	N/A	N/A	12.4	11.7	--	--	--	--	--	--	--	--	--	--	--	--
11/17/04	Geomatrix	17.5	N/A	20.4	20.8	N/A	11.1	12.1	11.4	--	--	--	--	--	--	--	--	--	--	--	--
12/02/04	Geomatrix	16.7	N/A	20.2	20.5	N/A	10.5	11.6	10.9	--	--	--	--	--	--	--	--	--	--	--	--
12/30/04	Geomatrix	N/A	N/A	19.6	18.9	N/A	9.0	10.0	9.4	--	--	--	--	--	--	--	--	--	--	--	--
02/03/05	Geomatrix	12.3	N/A	19.6	17.7	N/A	N/A	8.1	N/A	--	--	--	--	--	--	--	--	--	--	--	--
03/03/05	Geomatrix	N/A	N/A	17.8	17.1	N/A	N/A	7.0	N/A	--	--	--	--	--	--	--	--	--	--	--	--
05/05/05	Parikh	--	N/A	14.9	--	N/A	--	3.2	N/A	--	--	3.0	--	4.7	0.0[4]	5.8	--	--	--	11.2	8.4
05/06/05	Parikh	5.8	N/A	--	13.5	N/A	2.1	--	N/A	28.1	13.5	--	5.1	--	--	--	16.6	14.2	14.6	--	--

Read Date	Subcontractor	Water Level Elevation (feet NAVD88)																			
10/16/01	URS	--	66.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10/17/01	URS	68.0	--	--	67.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/08/01	URS	--	66.4	63.1	67.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01/07/02	URS	70.1	--	64.2	68.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
03/03/03	URS	--	--	--	--	42.0	66.4	68.0	67.7	--	--	--	--	--	--	--	--	--	--	--	--
03/08/03	URS	--	--	--	--	41.6	66.7	66.9	67.8	--	--	--	--	--	--	--	--	--	--	--	--
04/14/03	URS	74.8	N/A	66.0	70.8	39.7	64.0	68.0	68.7	--	--	--	--	--	--	--	--	--	--	--	--
10/25/04	Geomatrix	68.4	N/A	64.6	67.4	N/A	N/A	67.8	68.3	--	--	--	--	--	--	--	--	--	--	--	--
11/17/04	Geomatrix	69.0	N/A	64.3	66.9	N/A	67.6	68.1	68.6	--	--	--	--	--	--	--	--	--	--	--	--
12/02/04	Geomatrix	69.8	N/A	64.6	67.2	N/A	68.2	68.7	69.1	--	--	--	--	--	--	--	--	--	--	--	--
12/30/04	Geomatrix	N/A	N/A	65.1	68.8	N/A	69.7	70.2	70.6	--	--	--	--	--	--	--	--	--	--	--	--
02/03/05	Geomatrix	74.2	N/A	65.1	70.0	N/A	N/A	72.1	N/A	--	--	--	--	--	--	--	--	--	--	--	--
03/03/05	Geomatrix	N/A	N/A	66.9	70.6	N/A	N/A	73.2	N/A	--	--	--	--	--	--	--	--	--	--	--	--
05/05/05	Parikh	--	N/A	69.8	--	N/A	--	77.0	N/A	--	--	82.5	--	82.6	81.1[4]	74.9	--	--	--	70.7	59.4
05/06/05	Parikh	80.7	N/A	--	74.2	N/A	76.6	--	N/A	59.2	75.9	--	81.8	--	--	--	70.5	74.3	75.4	--	--

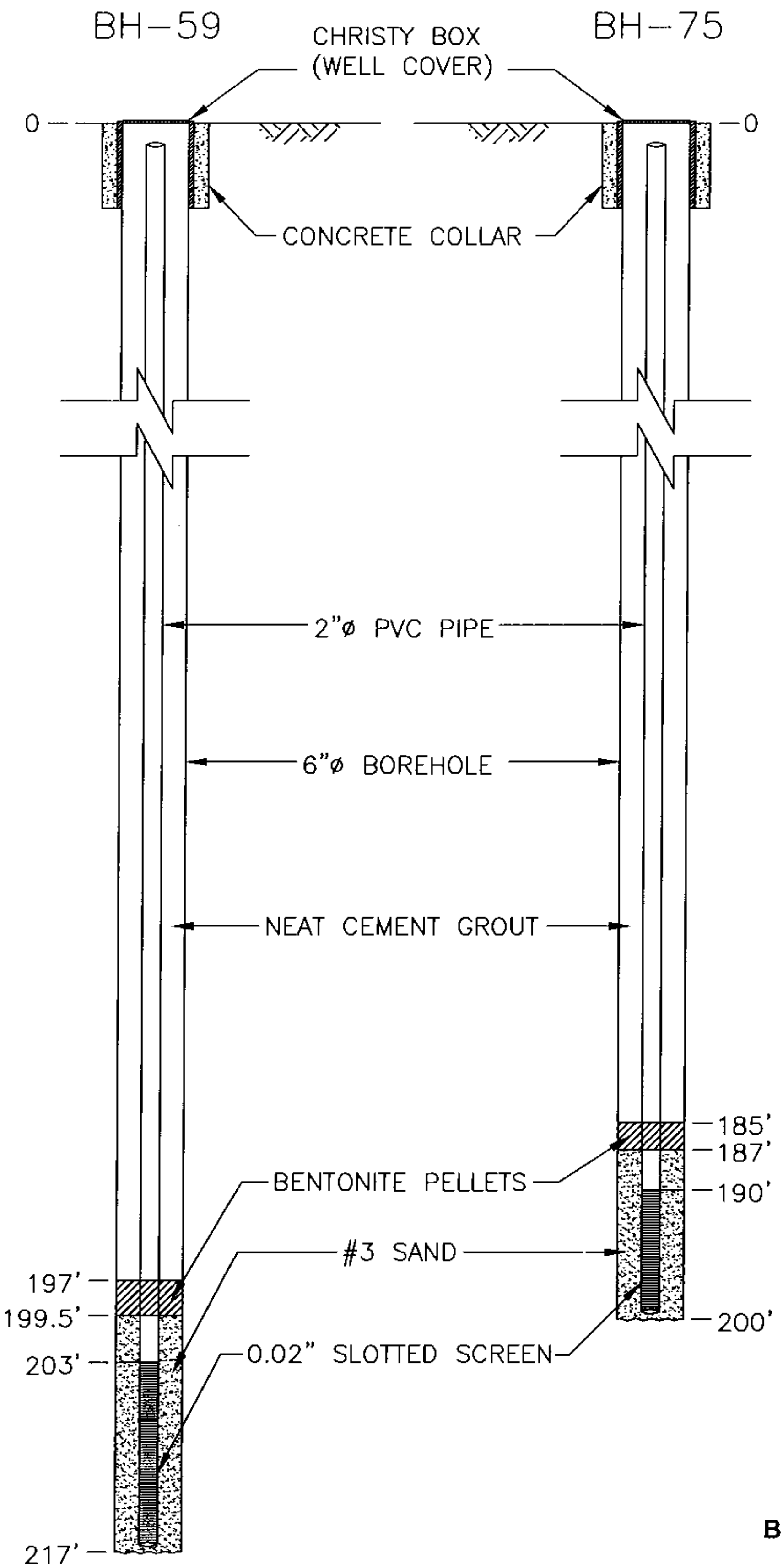
Notes:

[1] Well abandoned. N/A = Not available or not applicable.

[2] Approximate surface elevation based on City of San Jose survey elevations.

[3] Well was uncovered during construction activities on 11/17/04. During monitoring from 11/17/04 to 12/30/04, field technician observed debris in the well; well has not been re-developed since 11/17/0

[4] Upon removal of well cap for monitoring on 05/05/05, water began to flow from well onto the ground surface. Piezometric level appears to be above ground surface, indicating artesian conditions.



BH-59 AND BH-75

PARIKH CONSULTANTS INC.
GEOTECHNICAL CONSULTANTS AND MATERIALS TESTING

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

JOB NO.: 204104.10

MAY, 2005

FIGURE A6-1

APPENDIX 7

SLUG TESTING PROGRAM

Appendix 7 presents a description of the slug testing installation procedures and the results of slug tests performed by HMM/Bechtel.

Slug Testing

Introduction

A slug test involves the instantaneous lowering or raising of the water level in a well and measuring the response of the water level as it returns to its static level. The purpose of such a test is to collect data with which to determine estimates of the aquifer properties, primarily hydraulic conductivity. The test is performed by dropping a slug, commonly a sealed PVC pipe of known volume into a well to displace an equivalent volume of water. Once the water level in the well has returned to its static level, the slug is then removed. During both the "slug-in" and "slug-out" parts of the test, the water level is monitored with either a water level meter or pressure transducer until the water level has recovered to at least 80% of its initial displacement. Following the collection of data in the field, analytical techniques are commonly used to interpret the data and determine aquifer properties. The slug test procedure used for the project follows the guidelines outlined in the ASTM standard D4044 entitled "(Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers".

Equipment

The following equipment was used for performing the slug tests:

- Water-level meter.
- Pressure transducer and data logger system (In-situ mini-Troll system).
- Slug (constructed from PVC pipe, filled with clean sand, sealed at both ends, and connected at one end by rope).
- Personal protective equipment.
- Field data sheets.

Procedure

The following procedure was followed when conducting the slug tests:

- Measure and record the water level.
- Lower the transducer into the well and secure at the well head to avoid movement of transducer in well during the test. The transducer is placed below water the static water level, several feet deeper than the length of the slug.
- Connect the transducer cable to the data logger.

- Allow the water level in the well to stabilize after placement of the transducer.
- Measure the length of rope required to completely submerge the slug during the test and note its position.
- Secure the free end of the rope attached to the slug at the well head.
- Start the data logger and then lower the slug into the well until it reaches water, then lower it quickly into the water.
- Once the water level has recovered to within 80 percent of static water level, the slug-in portion of the test is complete.
- Allow sufficient time for the water level to recover to a static condition before stopping the data logger and starting the slug-out portion of the test.
- Start the data logger and quickly pull the slug out of the well.
- Run the test until the water level has returned to a static condition.
- Inspect the data to ensure that the test was acceptable.
- Repeat the test for repeatability.

Testing

Slug tests were performed between March 2 and April 20, 2005 in all of the ST designated wells. Between four and twelve tests were conducted in each well to ensure repeatability, the number of tests dependant on the response time of the aquifer.

Slug Test Well Location	Slug_In Test #	Slug-Out Test #	Initial Displacement (So), ft	Base of Screen, ft	Length of Screen (d), ft	Head of Water above Base (H)	Aquifer Thickness (D), ft
ST-1	1		1.75	72.5	5	68.62	5
		1	1.75	72.5	5	68.64	5
	2		1.75	72.5	5	68.62	5
		2	1.75	72.5	5	68.64	5
ST-2	1		1.75	86.6	8.9	77.76	8.9
		1	1.75	86.6	8.9	77.78	8.9
	2		1.75	86.6	8.9	77.78	8.9
		2	1.75	86.6	8.9	77.78	8.9
	3		1.75	86.6	8.9	77.76	8.9
		3	1.75	86.6	8.9	77.78	8.9
	4		1.75	86.6	8.9	77.78	8.9
		4	1.75	86.6	8.9	77.78	8.9
ST-3	1		1.75	79.5	20	68.76	20
		1	1.75	79.5	20	68.76	20
	2		1.75	79.5	20	68.76	20
		2	1.75	79.5	20	68.76	20
	3		1.75	79.5	20	68.76	20
		3	1.75	79.5	20	68.76	20
	4		1.75	79.5	20	68.76	20
		4	1.75	79.5	20	68.76	20
ST-5	1		1.75	65	10	60.82	10
		1	1.75	65	10	60.82	10
	2		1.75	65	10	60.82	10
		2	1.75	65	10	60.82	10
	3		1.75	65	10	60.82	10
		3	1.75	65	10	60.82	10
	4		1.75	65	10	60.82	10
		4	1.75	65	10	60.82	10
	5		1.75	65	10	60.82	10
ST-7	1		1.75	72.5	5	63.16	5
		1	1.75	72.5	5	63.16	5
	2		1.75	72.5	5	63.16	5
		2	1.75	72.5	5	63.17	5
	3		1.75	72.5	5	63.16	5
		3	1.75	72.5	5	63.18	5
ST-8	1		1.75	86.3	10	67.58	10
		1	1.75	86.3	10	67.58	10
	2		1.75	86.3	10	67.58	10
		2	1.75	86.3	10	67.58	10
	3		1.75	86.3	10	67.58	10
		3	1.75	86.3	10	67.58	10
	4		1.75	86.3	10	67.58	10
		4	1.75	86.3	10	67.58	10
		5	1.75	86.3	10	67.58	10
	6		1.75	86.3	10	67.58	10
		6	1.75	86.3	10	67.58	10

Table A7-1. Slug Test Well Data

Slug Test Well Location	Slug_In Test #	Slug-Out Test #	Initial Displacement (So), ft	Base of Screen, ft	Length of Screen (d), ft	Head of Water above Base (H)	Aquifer Thickness (D), ft
		1	1.75	73.6	5	56.88	5
	2		1.75	73.6	5	56.88	5
		2	1.75	73.6	5	56.88	5
	3		1.75	73.6	5	56.88	5
		3	1.75	73.6	5	56.88	5
	4		1.75	73.6	5	56.88	5
		4	1.75	73.6	5	56.88	5
	5		1.75	73.6	5	56.88	5
		5	1.75	73.6	5	56.88	5
ST-11	1		1.75	84.5	5	66.49	5
		1	1.75	84.5	5	66.49	5
	2		1.75	84.5	5	66.49	5
		2	1.75	84.5	5	66.49	5
	3		1.75	84.5	5	66.49	5
		3	1.75	84.5	5	66.49	5
ST-12	1		1.75	69	5	55.11	5
		1	1.75	69	5	55.11	5
	2		1.75	69	5	55.11	5
		2	1.75	69	5	55.11	5
	3		1.75	69	5	55.1	5
		3	1.75	69	5	55.11	5
	4		1.75	69	5	55.11	5
		4	1.75	69	5	55.11	5
ST-13	1		1.93	31	10	21.86	10
Data is bgs no 0.4 added		1	1.93	31	10	21.86	10
	2		1.93	31	10	21.86	10
		2	1.93	31	10	21.86	10
	3		1.93	31	10	21.86	10
		3	1.93	31	10	21.86	10
	4		1.93	31	10	21.86	10
		4	1.93	31	10	21.86	10

Table A7-1. Slug Test Well Data

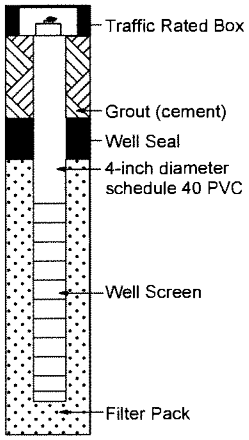
MAJOR DIVISIONS			GROUP NAMES		
COARSE-GRAINED SOILS More than 50% retained on the No. 200 sieve	GRAVELS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	Clean gravels less than 5% fines	**GW**	▨	Well-Graded Gravel
			GP	▨	Poorly Graded Gravel
		Gravels with 5-12% fines	**GW-GM**	▨	Well-Graded Gravel with Silt
			GW-GC	▨	Well-Graded Gravel with Clay (or Silty Clay)
			GP-GM	▨	Poorly Graded Gravel with Silt
			GP-GC	▨	Poorly Graded Gravel with Clay (or Silty Clay)
		Gravels with more than 12% fines	**GM**	▨	Silty Gravel
			GC	▨	Clayey Gravel
			GC-GM	▨	Silty, Clayey Gravel
	SANDS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	Clean sand less than 5% fines	**SW**	▨	Well-Graded Sand
			SP	▨	Poorly Graded Sand
		Sands with 5-12% fines	**SW-SM**	▨	Well-Graded Sand with Silt
			SW-SC	▨	Well-Graded Sand with Clay (or Silty Clay)
			SP-SM	▨	Poorly Graded Sand with Silt
			SP-SC	▨	Poorly Graded Sand with Clay (or Silty Clay)
		Sands with more than 12% fines	**SM**	▨	Silty Sand
			SC	▨	Clayey Sand
			SC-SM	▨	Silty, Clayey Sand
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	SILTS AND CLAYS Liquid Limit Less than 50%		**ML**	▨	Silt
			CL	▨	Lean Clay
			CL-ML	▨	Silty Clay
			OL	▨	Organic Silt
	SILTS AND CLAYS Liquid Limit Greater than 50%		**MH**	▨	Elastic Silt
			CH	▨	Fat Clay
			OH	▨	Organic Clay
HIGHLY ORGANIC SOILS			**PT**	▨	Peat or Highly Organic Soils
			FILL	▨	Debris or Mixed Fill
			AC	▨	Asphalt Concrete Pavement with Aggregate Base

GENERAL NOTES

Classification of Soils per ASTM D2487 or D2488

Length of sample symbol approximates recovery length

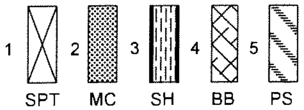
EXAMPLE WELL DIAGRAM



OTHER TESTS

LEL = Lower Explosive Limit
OXY = Oxygen Level Reading (%)
OVM = Organic Vapor Measurement

SAMPLER TYPE



Samplers and sampler dimensions (unless otherwise noted in report text) are as follows:

1 SPT Sampler, driven
1 3/8" ID, 2" OD

2 MOD CA Liner Sampler
2.416" ID, 3" OD

3 Thin-walled Tube, pushed
2 7/8" ID, 3" OD

4 Bulk Bag Sample (from cuttings)

5 Pitcher Sample

SOIL STRUCTURE

Fissured: Containing shrinkage or relief cracks, often filled with fine sand or silt, usually more or less vertical.

Pocket: Inclusion of material of different texture that is smaller than the diameter of the sample.

Parting: Inclusion less than 1/8 inch thick extending through the sample.

Seam: Inclusion 1/8 inch to 3 inches thick extending through the sample.

Layer: Inclusion greater than 3 inches thick extending through the sample.

Laminated: Soil sample composed of alternating partings or seams of different soil types.

Interlayered: Soil sample composed of alternating layers of different soil type.

Intermixed: Soil sample composed of pockets of different soil type, and layered or laminated structure is not evident.

CONSISTENCY

Clays	Blows/Foot SPT	Undrained Shear Strength (ksf)
Very Soft	**< 2**	**0 - 0.25**
Soft	**2 - 4**	**0.25 - 0.5**
Medium	**4 - 8**	**0.5 - 1**
Stiff	**8 - 15**	**1 - 2**
Very Stiff	**15 - 30**	**2 - 4**
Hard	**> 30**	**Over 4**

RELATIVE DENSITY

Sands and Gravels	Blows/Foot SPT
Very Loose	**0 - 4**
Loose	**4 - 10**
Medium Dense	**10 - 30**
Dense	**30 - 50**
Very Dense	**Over 50**

INCREASING VISUAL MOISTURE CONTENT

↓
Dry
Moist
Wet

Information on each well log is a compilation of subsurface conditions and soil or rock classifications obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and approximate in nature. Water level measurements refer only to those observed at the time and places indicated, and can vary with time, geologic condition, or construction activity.

TERMS AND SYMBOLS USED ON WELL LOGS

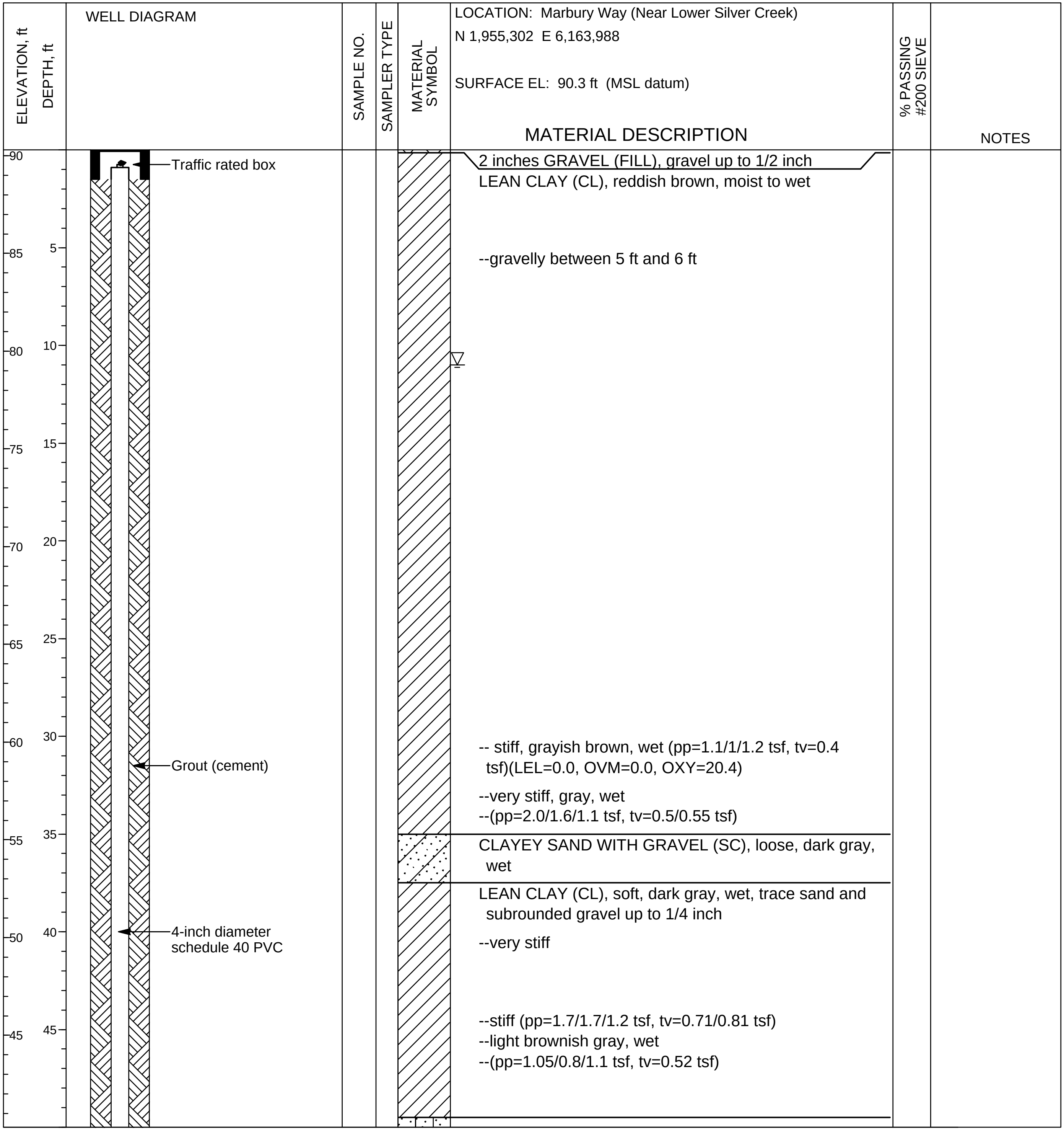
FIGURE A7-1

Project No. 1637.001

Sheet 1 of 2

LOCATION: Marbury Way (Near Lower Silver Creek)
N 1,955,302 E 6,163,988

SURFACE EL: 90.3 ft (MSL datum)



2 inches GRAVEL (FILL), gravel up to 1/2 inch

LEAN CLAY (CL), reddish brown, moist to wet

--gravelly between 5 ft and 6 ft

-- stiff, grayish brown, wet (pp=1.1/1/1.2 tsf, tv=0.4 tsf)(LEL=0.0, OVM=0.0, OXY=20.4)

--very stiff, gray, wet
--(pp=2.0/1.6/1.1 tsf, tv=0.5/0.55 tsf)

CLAYEY SAND WITH GRAVEL (SC), loose, dark gray, wet

LEAN CLAY (CL), soft, dark gray, wet, trace sand and subrounded gravel up to 1/4 inch

--very stiff

--stiff (pp=1.7/1.7/1.2 tsf, tv=0.71/0.81 tsf)
--light brownish gray, wet
--(pp=1.05/0.8/1.1 tsf, tv=0.52 tsf)

Continued

BORING DEPTH: 75.0 ft
DEPTH TO WATER: 11.0 ft., 1/4/2005
START DATE: January 3, 2005
COMPLETION DATE: January 4, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling, R. Medina
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-1

BART to San Jose
San Jose, California

FIGURE A7-2a

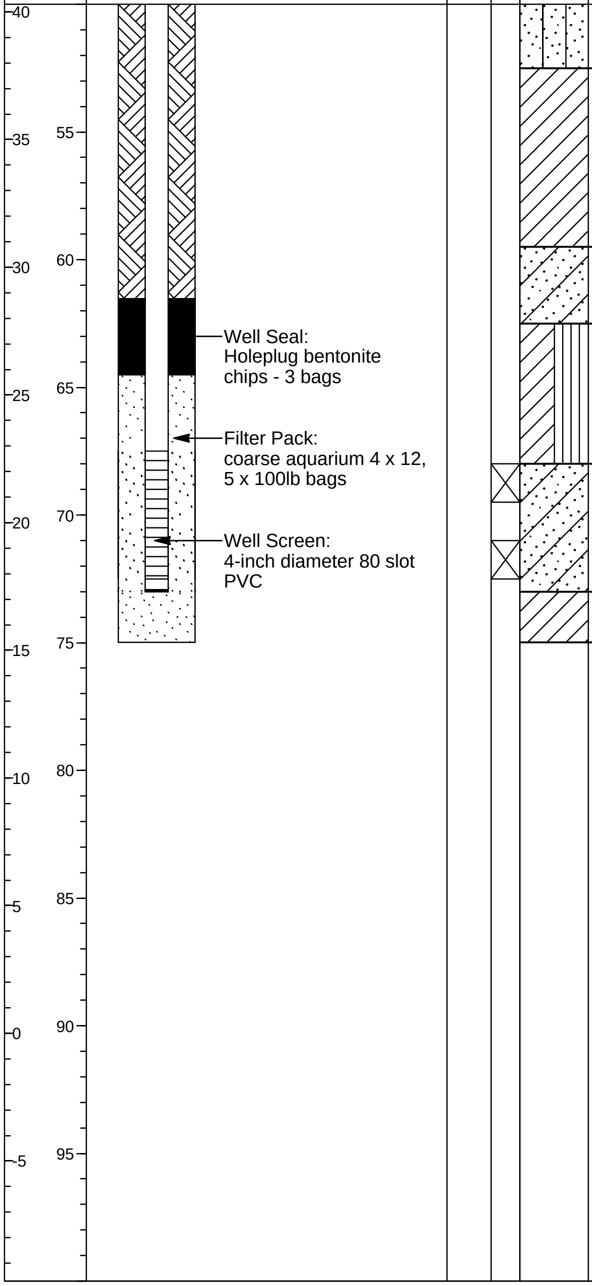
Project No. 1637.001

Sheet 2 of 2

LOCATION: Marbury Way (Near Lower Silver Creek)
N 1,955,302 E 6,163,988

SURFACE EL: 90.3 ft (MSL datum)

ELEVATION, ft | DEPTH, ft | WELL DIAGRAM | SAMPLE NO. | SAMPLER TYPE | MATERIAL SYMBOL | MATERIAL DESCRIPTION | % PASSING #200 SIEVE | NOTES



SILTY SAND WITH GRAVEL (SM), medium dense, dark gray, wet, subrounded fine grained gravel up to 3/4 inch

LEAN CLAY WITH SAND (CL), very stiff, olive gray, wet, fine grained sand (pp=2.6/2.6/2.8 tsf, tv=0.36/0.58 tsf)(LEL=0.0,OVM=0.0,OXY=20.4)
--more sand at 57 ft
--(pp=2.7/3.4/3.2 tsf, tv=0.3/0.38 tsf)
--light olive gray, less sand at 58 ft
--(pp=3.0/3.2/2.4 tsf, tv=0.54/0.68 tsf)

CLAYEY SAND WITH GRAVEL (SC), light olive gray, wet
--Ended drilling on 1/3/05 at 62.5 ft
--Began drilling on 1/4/05 at 62.5 ft

SILTY CLAY WITH SAND (CL-ML), very stiff, gray mottled brown, wet (pp=2.2/2.5/2.3 tsf, tv=0.49/0.72 tsf)
--silty sand with gravel layer at 64.0 ft
--stiff (pp=1.5/1.5/1.5 tsf, tv=0.63/0.72 tsf)

CLAYEY SAND WITH GRAVEL (SC)

18

CLAY (CL)

NOTE: Material description for depths 0' to 68' is based on Boring BH-03, drilled previously and located adjacent to ST-1.

BORING DEPTH: 75.0 ft
DEPTH TO WATER: 11.0 ft., 1/4/2005
START DATE: January 3, 2005
COMPLETION DATE: January 4, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling, R. Medina
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-1
BART to San Jose
San Jose, California

FIGURE A7-2b

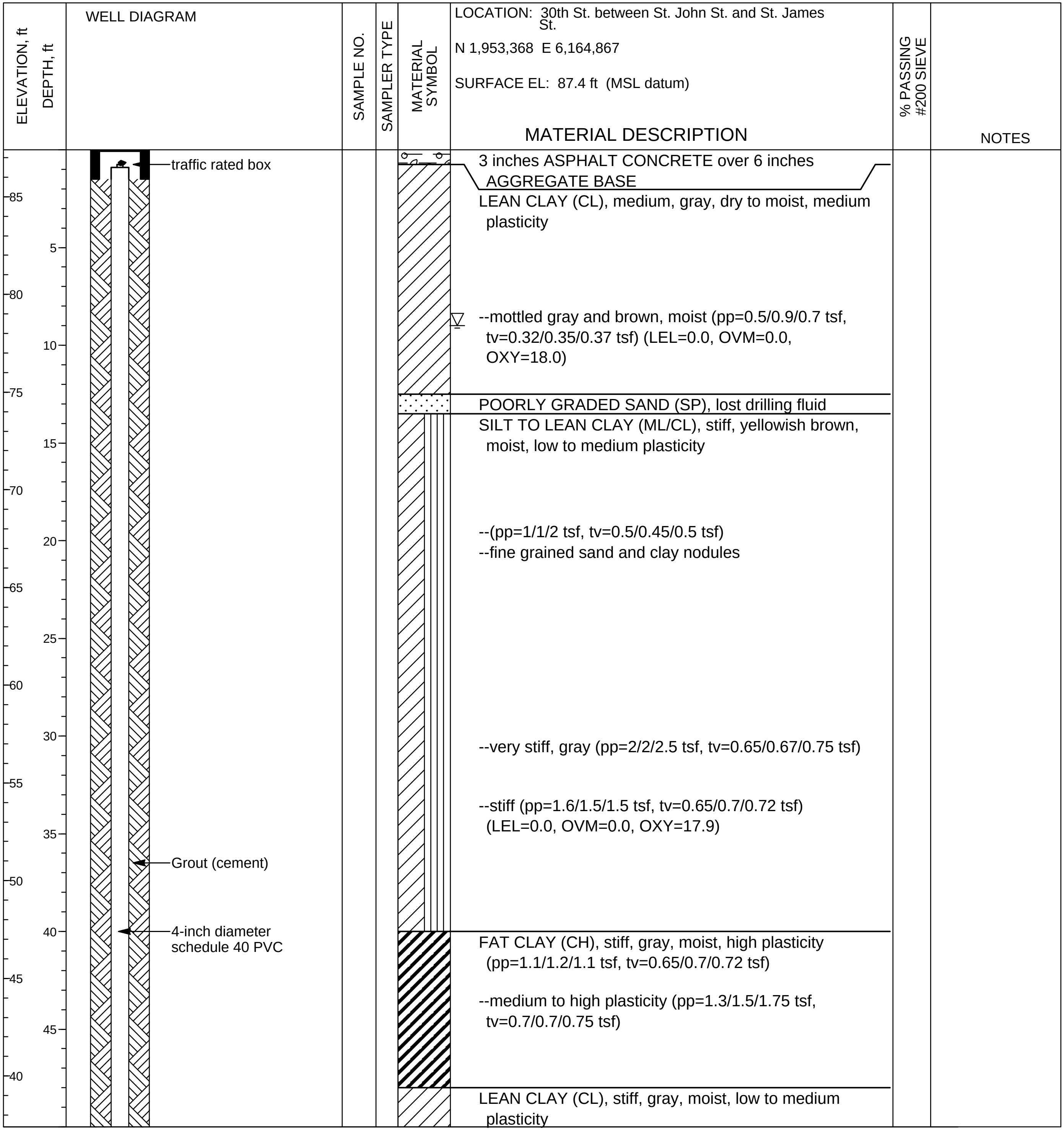
Project No. 1637.001

Sheet 1 of 2

LOCATION: 30th St. between St. John St. and St. James St.

N 1,953,368 E 6,164,867

SURFACE EL: 87.4 ft (MSL datum)



MATERIAL DESCRIPTION

3 inches ASPHALT CONCRETE over 6 inches AGGREGATE BASE

LEAN CLAY (CL), medium, gray, dry to moist, medium plasticity

--mottled gray and brown, moist (pp=0.5/0.9/0.7 tsf, tv=0.32/0.35/0.37 tsf) (LEL=0.0, OVM=0.0, OXY=18.0)

POORLY GRADED SAND (SP), lost drilling fluid

SILT TO LEAN CLAY (ML/CL), stiff, yellowish brown, moist, low to medium plasticity

--(pp=1/1/2 tsf, tv=0.5/0.45/0.5 tsf)

--fine grained sand and clay nodules

--very stiff, gray (pp=2/2/2.5 tsf, tv=0.65/0.67/0.75 tsf)

--stiff (pp=1.6/1.5/1.5 tsf, tv=0.65/0.7/0.72 tsf) (LEL=0.0, OVM=0.0, OXY=17.9)

FAT CLAY (CH), stiff, gray, moist, high plasticity (pp=1.1/1.2/1.1 tsf, tv=0.65/0.7/0.72 tsf)

--medium to high plasticity (pp=1.3/1.5/1.75 tsf, tv=0.7/0.7/0.75 tsf)

LEAN CLAY (CL), stiff, gray, moist, low to medium plasticity

Continued

BORING DEPTH: 88.0 ft
DEPTH TO WATER: 9.0 ft., 2/6/2005
START DATE: February 5, 2005
COMPLETION DATE: February 7, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Marl B-61
DRILLED BY: Pitcher Drilling, E. Castellan
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-2

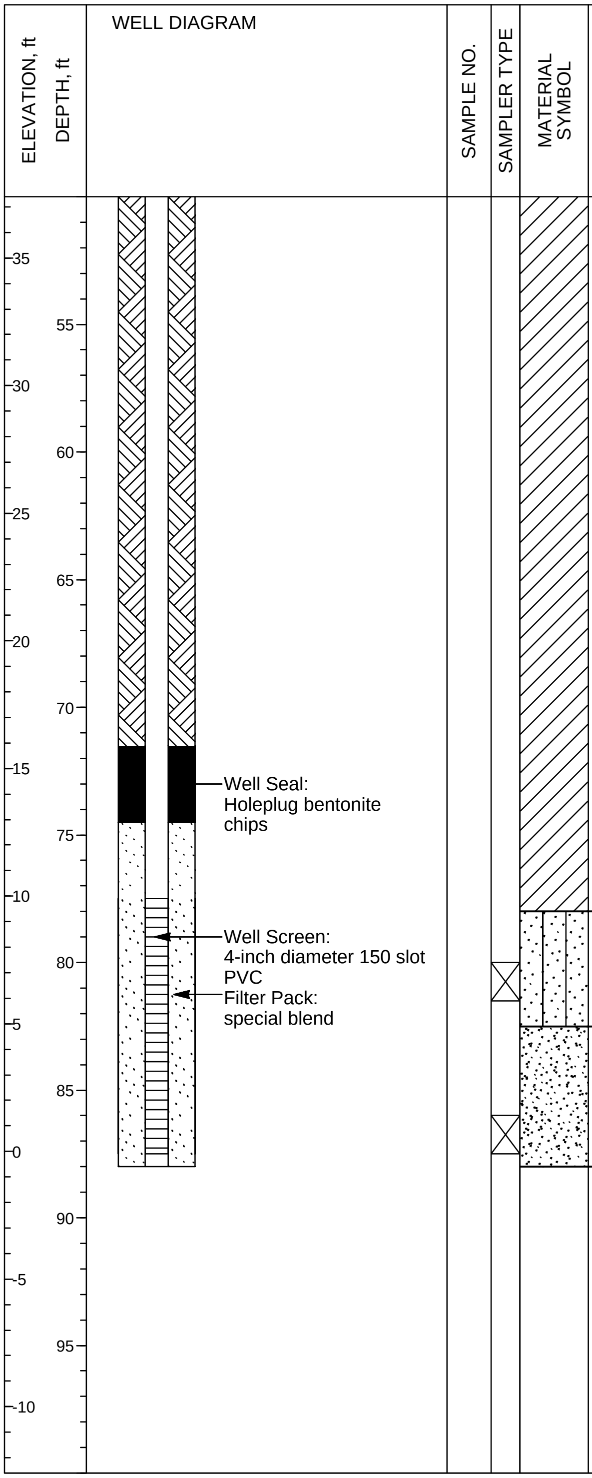
BART to San Jose
San Jose, California

FIGURE A7-3a

LOCATION: 30th St. between St. John St. and St. James St.

N 1,953,368 E 6,164,867

SURFACE EL: 87.4 ft (MSL datum)



MATERIAL DESCRIPTION	% PASSING #200 SIEVE	NOTES
LEAN CLAY (CL), stiff, gray, moist, low to medium plasticity (pp=1.2/1.2/1.5 tsf, tv=0.6/0.65/0.75 tsf) --trace stiff fissured lean clay (blocky structure) at 52.5 ft --medium plasticity --(pp=1.5/1.7/1.8 tsf, tv=0.7/0.72/0.8 tsf) --brown, medium plasticity --(pp=1.8/2.0/2.2 tsf, tv=0.7/0.75/0.8 tsf) --very stiff, brown (pp=2.7/3.2/2.5 tsf, tv=0.75/0.85/0.9 tsf) --Ended drilling on 2/5/05 at 75 ft --Began drilling on 2/6/05 at 75 ft		
SILT WITH SAND (ML), brown, moist, fine grained sand, refusal after 12 inches	15	
WELL-GRADED SAND (SW), fine to coarse grained sand, trace fine grained gravel (based on the cuttings)		

NOTE: Material description for depths 0' to 88' is based on Boring BH-60, drilled previously and located adjacent to ST-2.

BORING DEPTH: 88.0 ft
DEPTH TO WATER: 9.0 ft., 2/6/2005
START DATE: February 5, 2005
COMPLETION DATE: February 7, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Marl B-61
DRILLED BY: Pitcher Drilling, E. Castellan
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-2

BART to San Jose
San Jose, California

FIGURE A7-3b

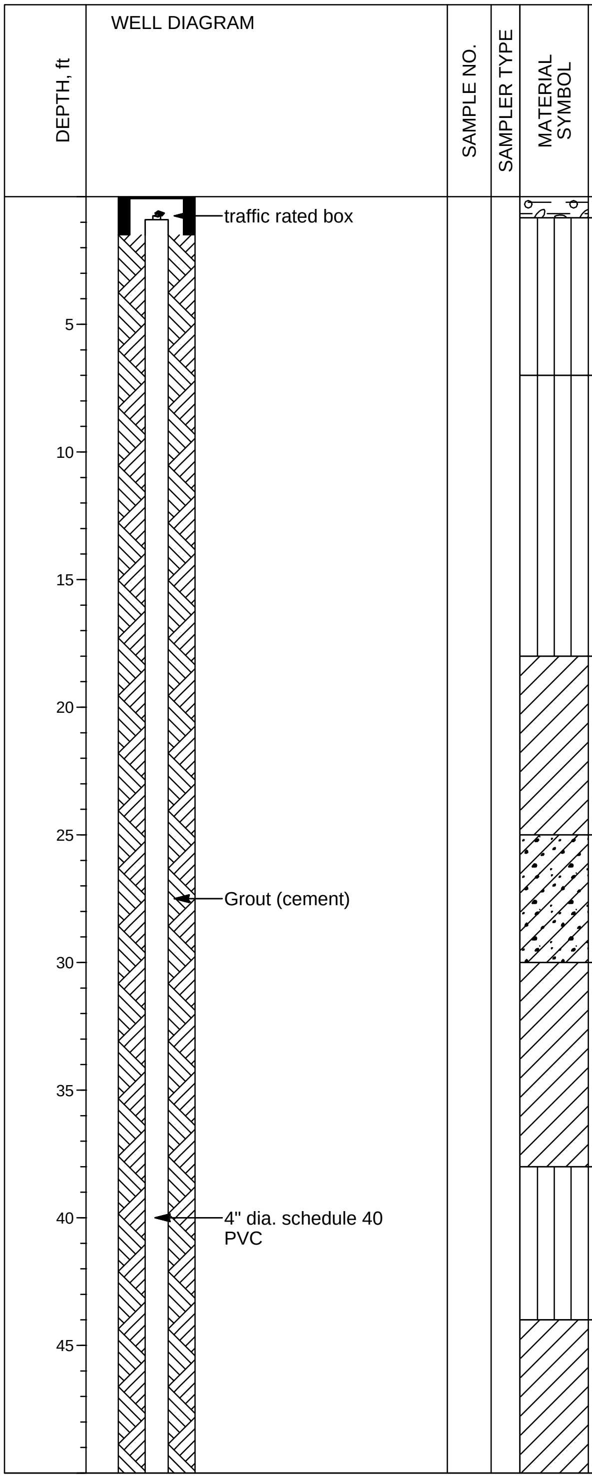
Project No. 1637.001

Sheet 1 of 2

LOCATION: 28th St. West of Intersection with Five Wounds Ln.

N 1,952,856 E 6,164,789

SURFACE EL: 87.8 ft (MSL datum)



MATERIAL DESCRIPTION

% PASSING #200 SIEVE

NOTES

10" ASPHALT CONCRETE (AC)

SILT (ML), very dark gray 10 yr 3/1

SILT WITH SAND (ML), very dark gray 10 yr 3/2

- Angular coarse gravel - trace. Appeared to be serpentine

CLAY (CL), very dark grayish brown 10 yr 3/2, wet

CLAY WITH GRAVEL (CL), very dark grayish brown 10 yr 3/2

- Gravel is angular, coarse serpentine

CLAY (CL), dark grayish brown 10 yr 4/2, wet

SANDY SILT (ML), dark grayish brown 10 yr 4/2, wet

CLAY (CL), dark grayish brown 10 yr 4/2, wet

Continued

BORING DEPTH: 80.0 ft
DEPTH TO WATER: Not Measured
START DATE: February 10, 2005
COMPLETION DATE: February 23, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Marl M10
DRILLED BY: Pitcher Drilling, E. Castellan
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-3

BART to San Jose
San Jose, California

FIGURE A7-4a

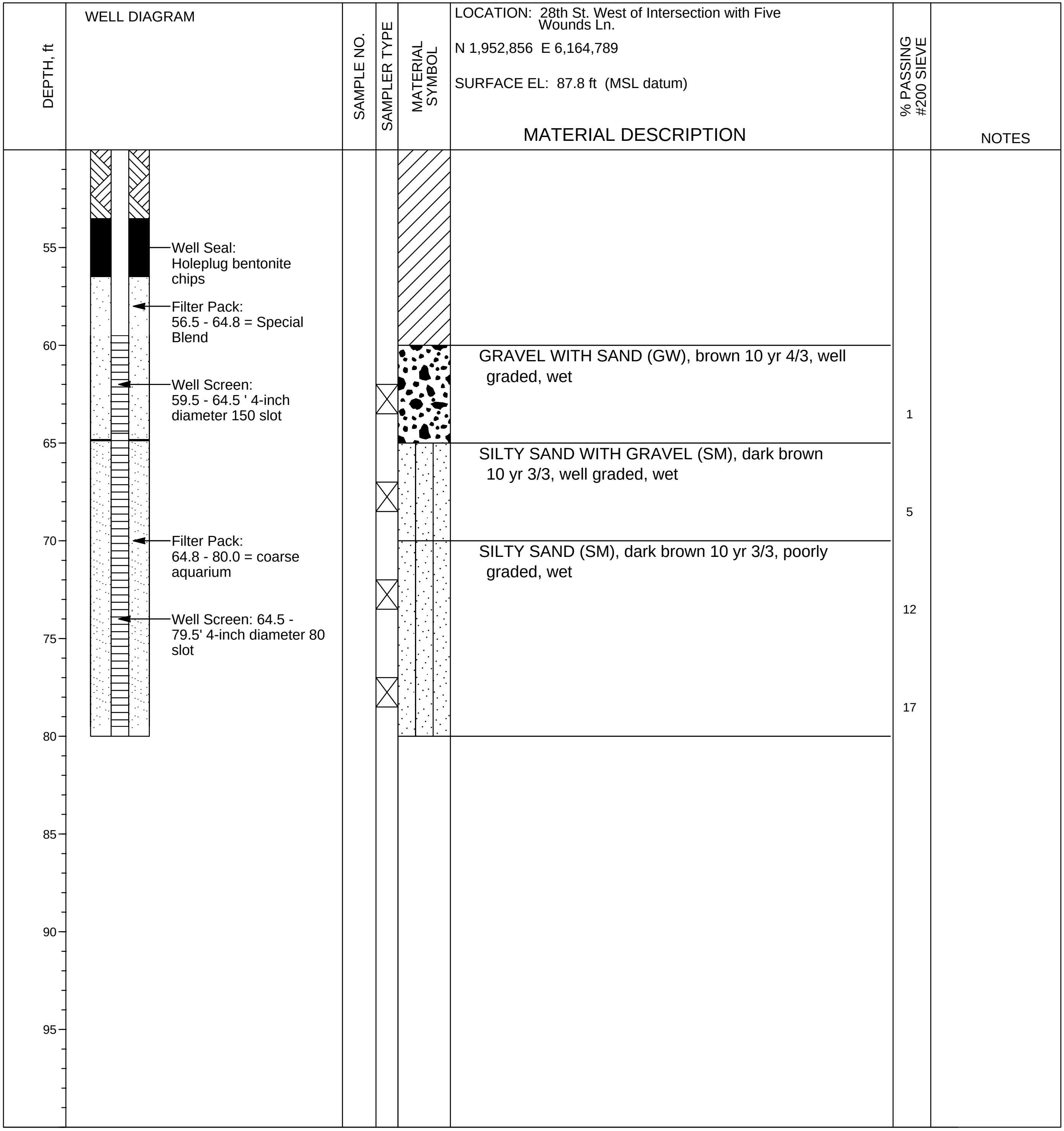
Project No. 1637.001

Sheet 2 of 2

LOCATION: 28th St. West of Intersection with Five Wounds Ln.

N 1,952,856 E 6,164,789

SURFACE EL: 87.8 ft (MSL datum)



GRAVEL WITH SAND (GW), brown 10 yr 4/3, well graded, wet

SILTY SAND WITH GRAVEL (SM), dark brown 10 yr 3/3, well graded, wet

SILTY SAND (SM), dark brown 10 yr 3/3, poorly graded, wet

BORING DEPTH: 80.0 ft
DEPTH TO WATER: Not Measured
START DATE: February 10, 2005
COMPLETION DATE: February 23, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Marl M10
DRILLED BY: Pitcher Drilling, E. Castellan
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-3

BART to San Jose
San Jose, California

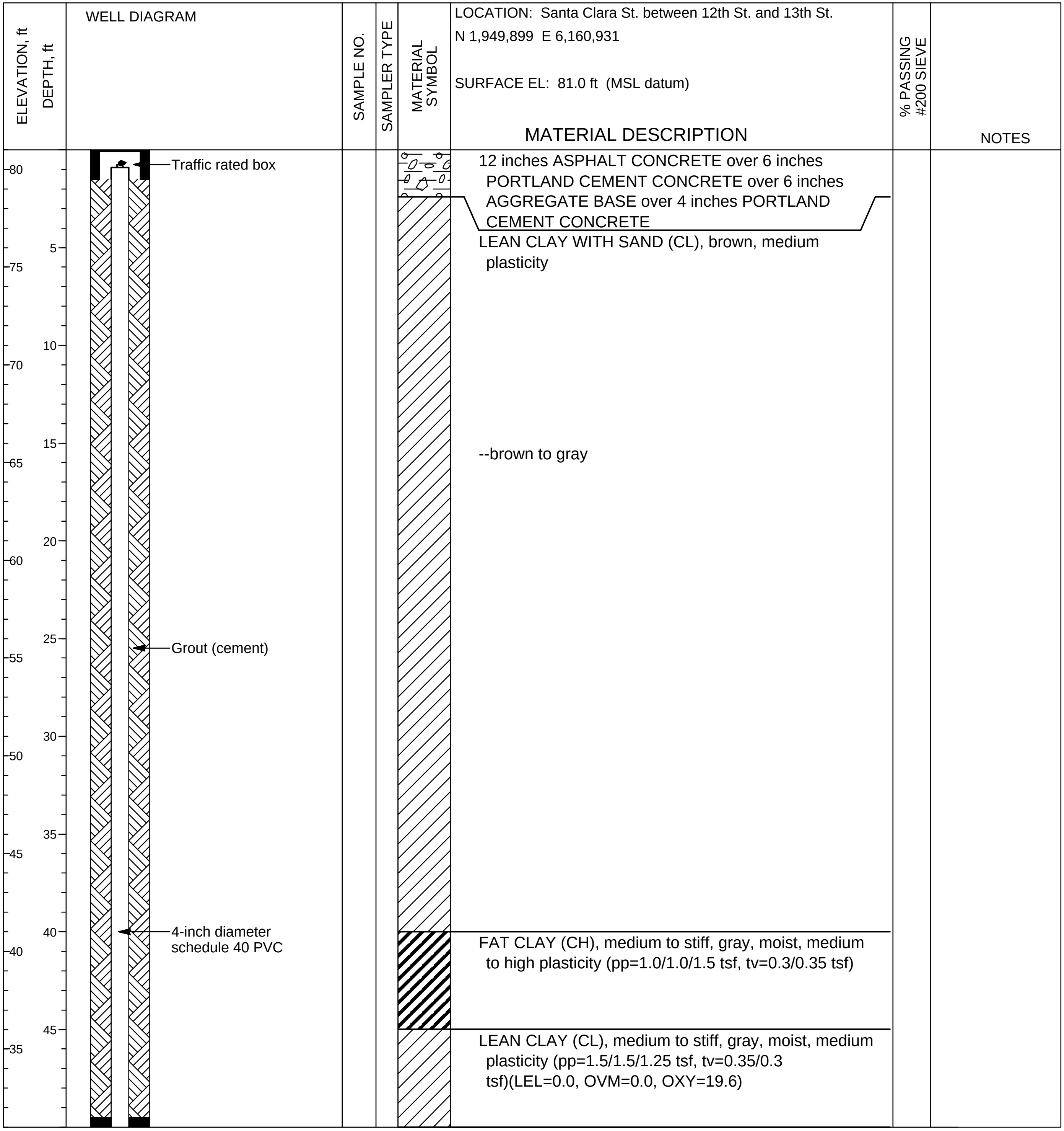
FIGURE A7-4b

Project No. 1637.001

Sheet 1 of 2

LOCATION: Santa Clara St. between 12th St. and 13th St.
N 1,949,899 E 6,160,931

SURFACE EL: 81.0 ft (MSL datum)



MATERIAL DESCRIPTION

12 inches ASPHALT CONCRETE over 6 inches PORTLAND CEMENT CONCRETE over 6 inches AGGREGATE BASE over 4 inches PORTLAND CEMENT CONCRETE

LEAN CLAY WITH SAND (CL), brown, medium plasticity

--brown to gray

FAT CLAY (CH), medium to stiff, gray, moist, medium to high plasticity (pp=1.0/1.0/1.5 tsf, tv=0.3/0.35 tsf)

LEAN CLAY (CL), medium to stiff, gray, moist, medium plasticity (pp=1.5/1.5/1.25 tsf, tv=0.35/0.3 tsf)(LEL=0.0, OVM=0.0, OXY=19.6)

Continued

BORING DEPTH: 65.5 ft
DEPTH TO WATER: Not Measured
START DATE: January 10, 2005
COMPLETION DATE: January 12, 2005
DRILLING METHOD: 10-in. dia. Hollow Stem Auger

RIG TYPE: Marl B-61
DRILLED BY: Pitcher Drilling, J. Neff
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-5

BART to San Jose
San Jose, California

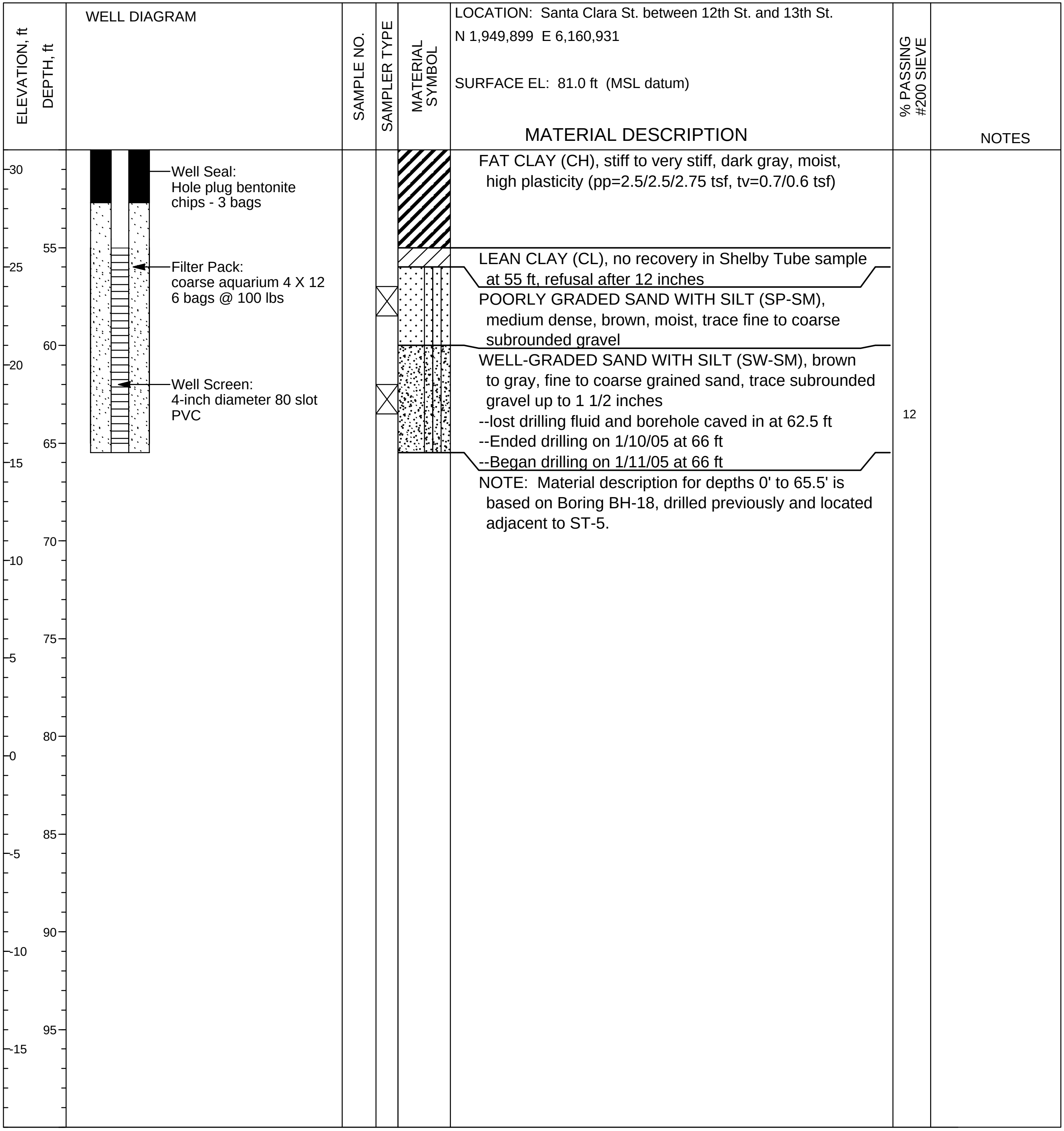
FIGURE A7-5a

Project No. 1637.001

Sheet 2 of 2

LOCATION: Santa Clara St. between 12th St. and 13th St.
N 1,949,899 E 6,160,931

SURFACE EL: 81.0 ft (MSL datum)



FAT CLAY (CH), stiff to very stiff, dark gray, moist, high plasticity (pp=2.5/2.5/2.75 tsf, tv=0.7/0.6 tsf)

LEAN CLAY (CL), no recovery in Shelby Tube sample at 55 ft, refusal after 12 inches

POORLY GRADED SAND WITH SILT (SP-SM), medium dense, brown, moist, trace fine to coarse subrounded gravel

WELL-GRADED SAND WITH SILT (SW-SM), brown to gray, fine to coarse grained sand, trace subrounded gravel up to 1 1/2 inches
--lost drilling fluid and borehole caved in at 62.5 ft
--Ended drilling on 1/10/05 at 66 ft
--Began drilling on 1/11/05 at 66 ft

NOTE: Material description for depths 0' to 65.5' is based on Boring BH-18, drilled previously and located adjacent to ST-5.

BORING DEPTH: 65.5 ft
DEPTH TO WATER: Not Measured
START DATE: January 10, 2005
COMPLETION DATE: January 12, 2005
DRILLING METHOD: 10-in. dia. Hollow Stem Auger

RIG TYPE: Marl B-61
DRILLED BY: Pitcher Drilling, J. Neff
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-5

BART to San Jose

San Jose, California

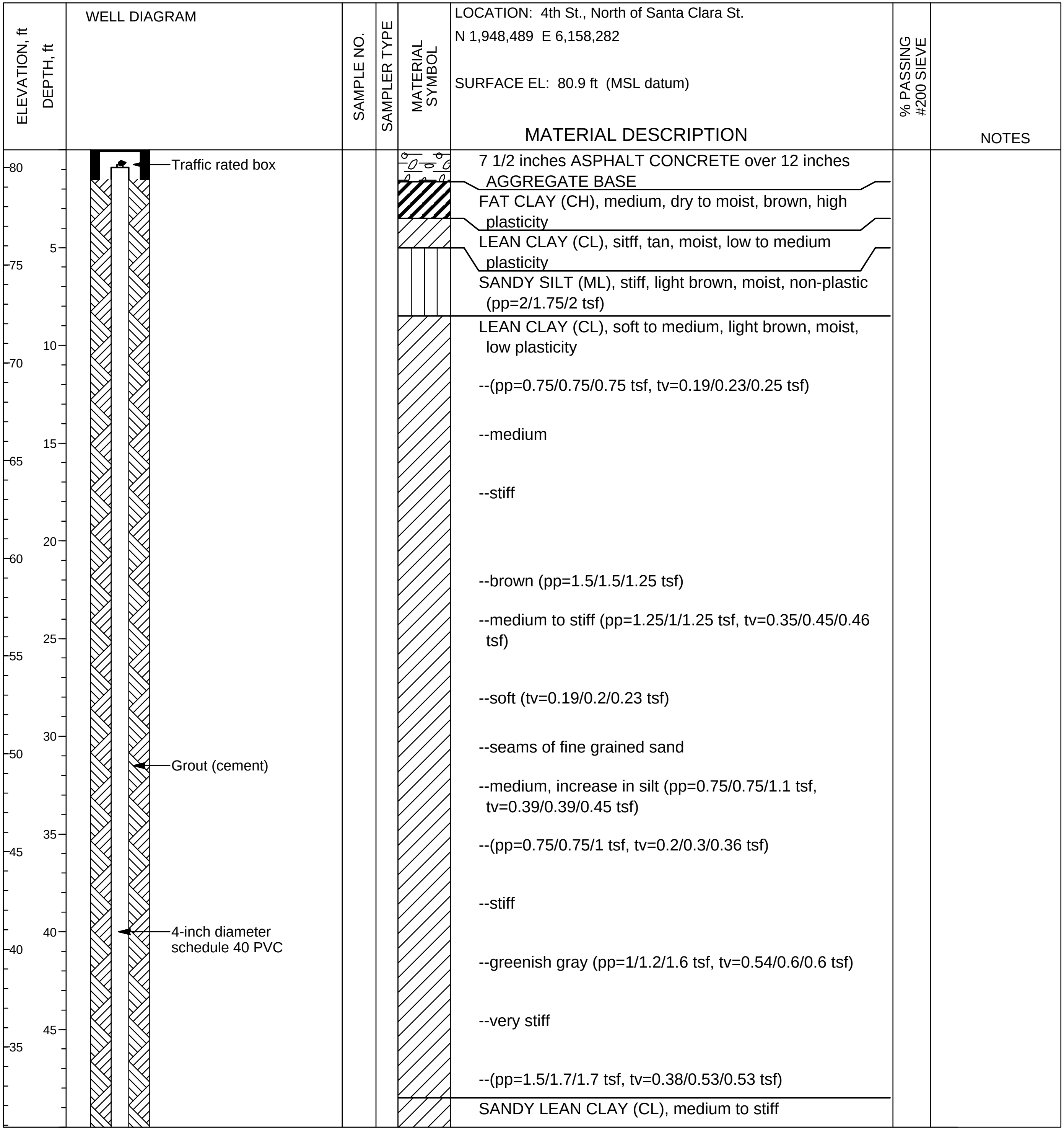
FIGURE A7-5b

Project No. 1637.001

Sheet 1 of 2

LOCATION: 4th St., North of Santa Clara St.
N 1,948,489 E 6,158,282

SURFACE EL: 80.9 ft (MSL datum)



MATERIAL DESCRIPTION

7 1/2 inches ASPHALT CONCRETE over 12 inches AGGREGATE BASE

FAT CLAY (CH), medium, dry to moist, brown, high plasticity

LEAN CLAY (CL), sitff, tan, moist, low to medium plasticity

SANDY SILT (ML), stiff, light brown, moist, non-plastic (pp=2/1.75/2 tsf)

LEAN CLAY (CL), soft to medium, light brown, moist, low plasticity

--(pp=0.75/0.75/0.75 tsf, tv=0.19/0.23/0.25 tsf)

--medium

--stiff

--brown (pp=1.5/1.5/1.25 tsf)

--medium to stiff (pp=1.25/1/1.25 tsf, tv=0.35/0.45/0.46 tsf)

--soft (tv=0.19/0.2/0.23 tsf)

--seams of fine grained sand

--medium, increase in silt (pp=0.75/0.75/1.1 tsf, tv=0.39/0.39/0.45 tsf)

--(pp=0.75/0.75/1 tsf, tv=0.2/0.3/0.36 tsf)

--stiff

--greenish gray (pp=1/1.2/1.6 tsf, tv=0.54/0.6/0.6 tsf)

--very stiff

--(pp=1.5/1.7/1.7 tsf, tv=0.38/0.53/0.53 tsf)

SANDY LEAN CLAY (CL), medium to stiff

Continued

BORING DEPTH: 73.0 ft
DEPTH TO WATER: Not Measured
START DATE: October 30, 2004
COMPLETION DATE: October 31, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling, M. MacDonald
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

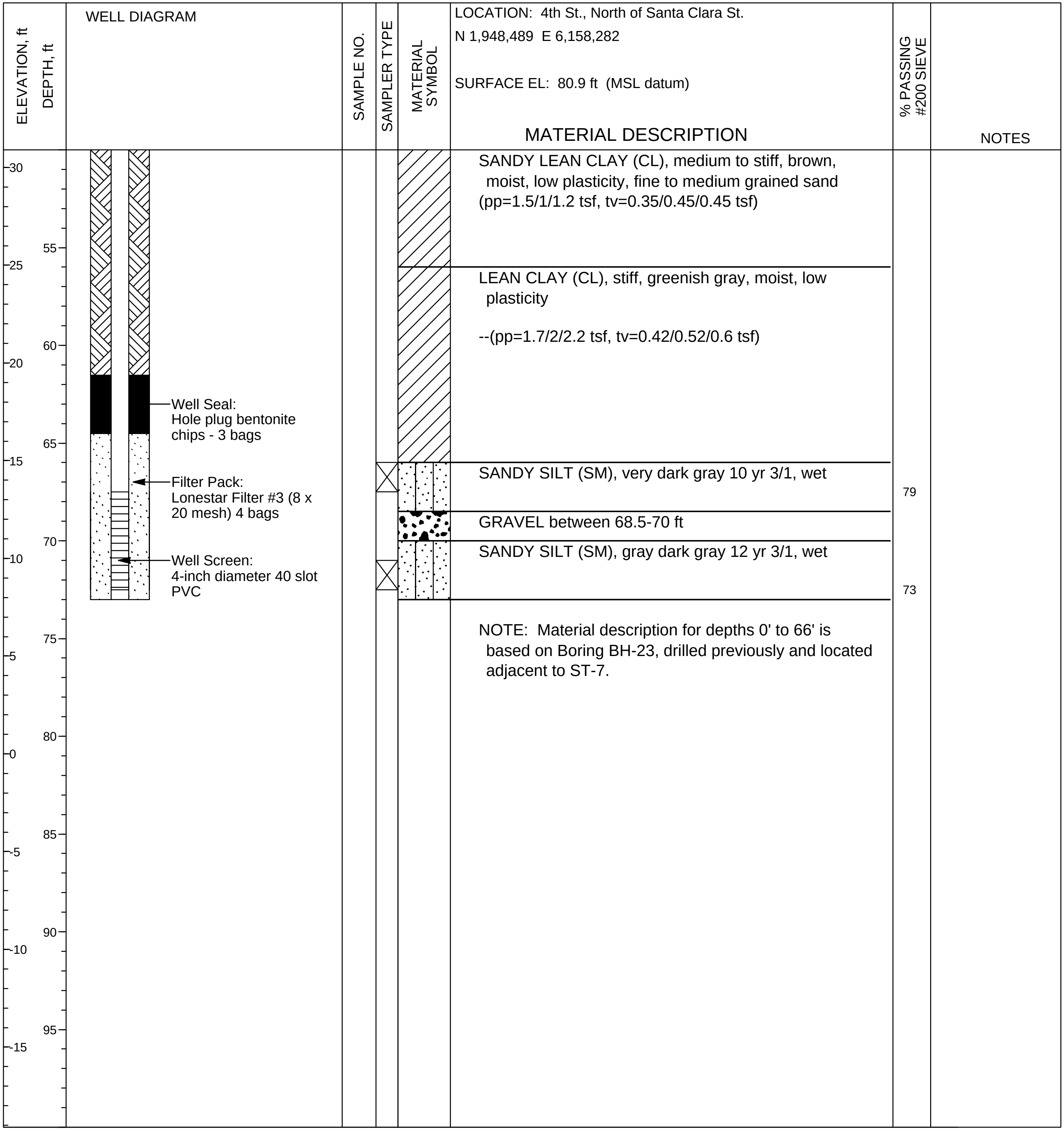
LOG OF ST-7

BART to San Jose
San Jose, California

FIGURE A7-6a

Project No. 1637.001

Sheet 2 of 2



LOCATION: 4th St., North of Santa Clara St.
N 1,948,489 E 6,158,282

SURFACE EL: 80.9 ft (MSL datum)

MATERIAL DESCRIPTION

SANDY LEAN CLAY (CL), medium to stiff, brown, moist, low plasticity, fine to medium grained sand (pp=1.5/1/1.2 tsf, tv=0.35/0.45/0.45 tsf)

LEAN CLAY (CL), stiff, greenish gray, moist, low plasticity

--(pp=1.7/2/2.2 tsf, tv=0.42/0.52/0.6 tsf)

SANDY SILT (SM), very dark gray 10 yr 3/1, wet

GRAVEL between 68.5-70 ft

SANDY SILT (SM), gray dark gray 12 yr 3/1, wet

NOTE: Material description for depths 0' to 66' is based on Boring BH-23, drilled previously and located adjacent to ST-7.

BORING DEPTH: 73.0 ft
DEPTH TO WATER: Not Measured
START DATE: October 30, 2004
COMPLETION DATE: October 31, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling, M. MacDonald
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-7

BART to San Jose
San Jose, California

FIGURE A7-6b

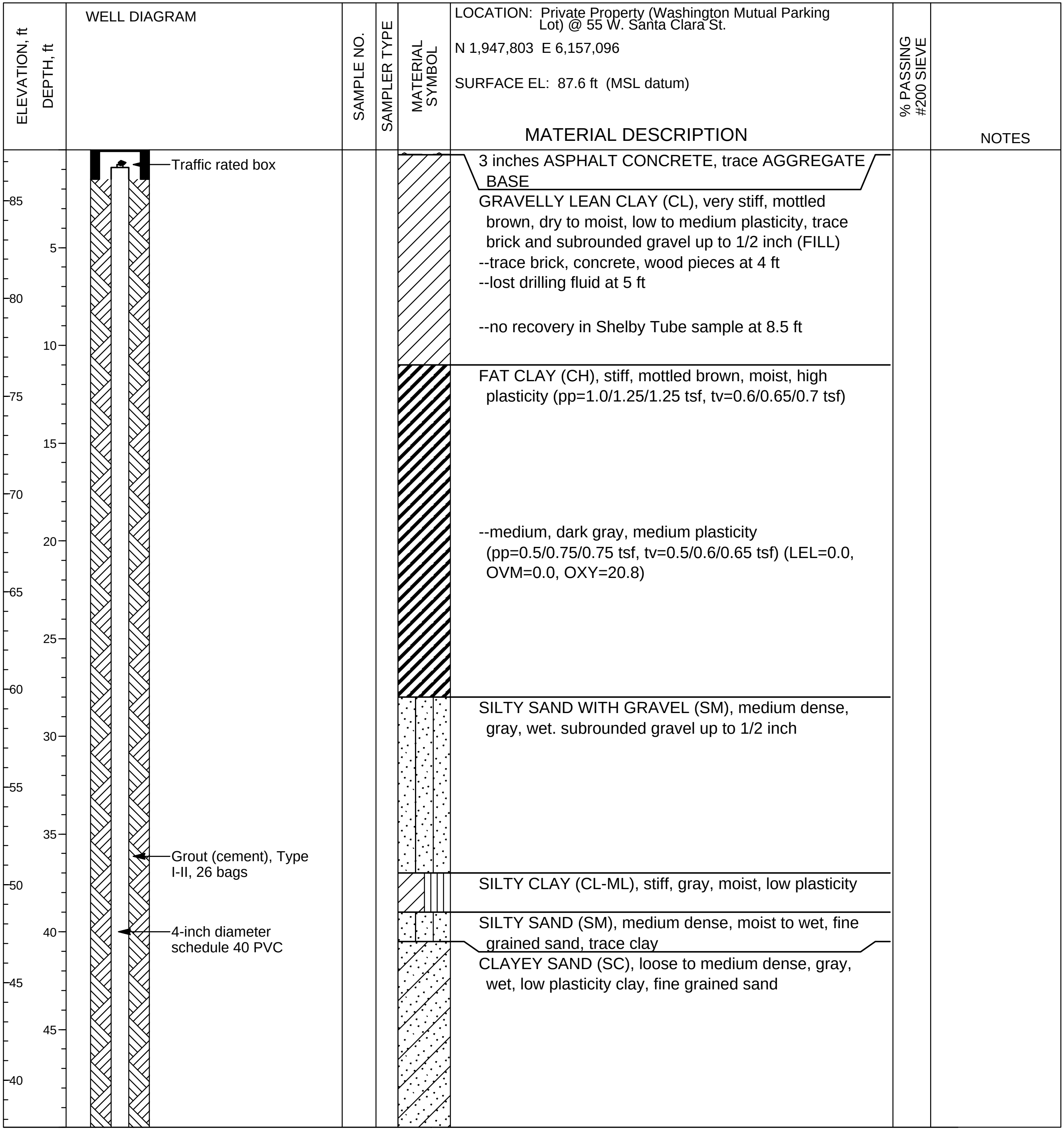
Project No. 1637.001

Sheet 1 of 2

LOCATION: Private Property (Washington Mutual Parking Lot) @ 55 W. Santa Clara St.

N 1,947,803 E 6,157,096

SURFACE EL: 87.6 ft (MSL datum)



3 inches ASPHALT CONCRETE, trace AGGREGATE BASE

GRAVELLY LEAN CLAY (CL), very stiff, mottled brown, dry to moist, low to medium plasticity, trace brick and subrounded gravel up to 1/2 inch (FILL)
--trace brick, concrete, wood pieces at 4 ft
--lost drilling fluid at 5 ft

--no recovery in Shelby Tube sample at 8.5 ft

FAT CLAY (CH), stiff, mottled brown, moist, high plasticity (pp=1.0/1.25/1.25 tsf, tv=0.6/0.65/0.7 tsf)

--medium, dark gray, medium plasticity (pp=0.5/0.75/0.75 tsf, tv=0.5/0.6/0.65 tsf) (LEL=0.0, OVM=0.0, OXY=20.8)

SILTY SAND WITH GRAVEL (SM), medium dense, gray, wet. subrounded gravel up to 1/2 inch

SILTY CLAY (CL-ML), stiff, gray, moist, low plasticity

SILTY SAND (SM), medium dense, moist to wet, fine grained sand, trace clay

CLAYEY SAND (SC), loose to medium dense, gray, wet, low plasticity clay, fine grained sand

Continued

BORING DEPTH: 90.0 ft
DEPTH TO WATER: Not Measured
START DATE: January 17, 2005
COMPLETION DATE: January 19, 2005
DRILLING METHOD: 10-in. dia. Hollow Stem Auger

RIG TYPE: Marl B-61
DRILLED BY: Pitcher Drilling, E. Castellan
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

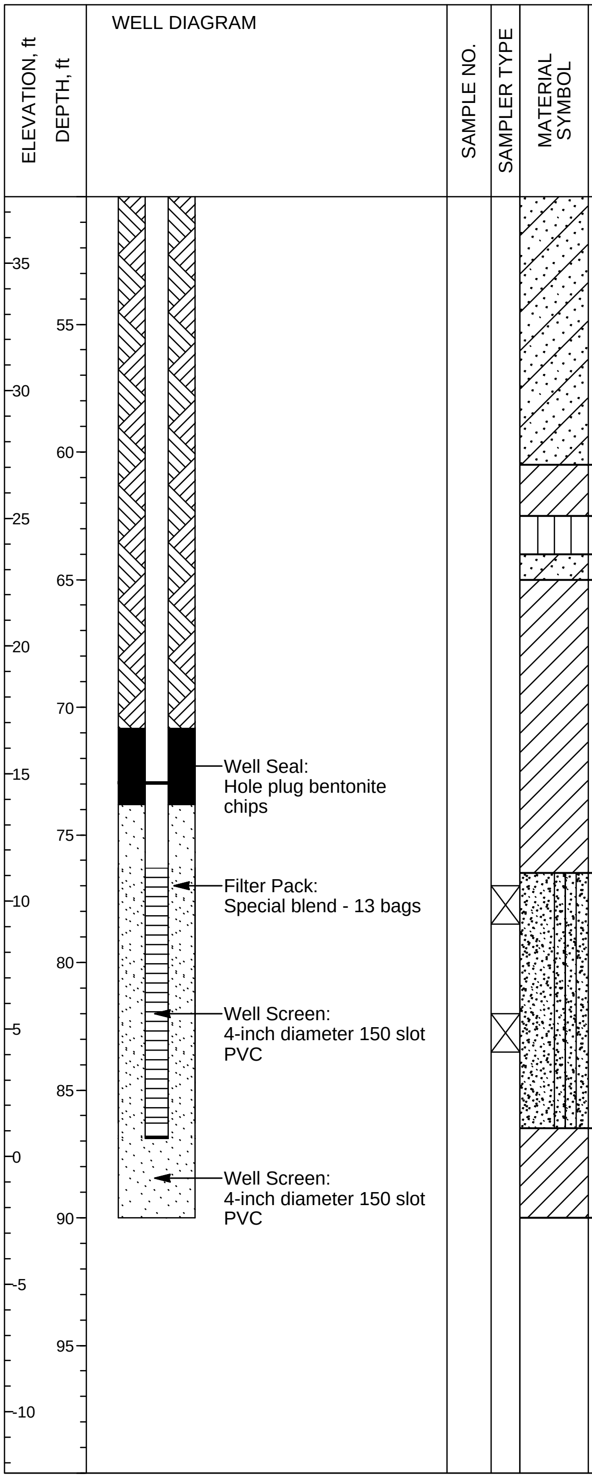
LOG OF ST-8

BART to San Jose
San Jose, California

FIGURE A7-7a

Project No. 1637.001

Sheet 2 of 2



LOCATION: Private Property (Washington Mutual Parking Lot) @ 55 W. Santa Clara St.

N 1,947,803 E 6,157,096

SURFACE EL: 87.6 ft (MSL datum)

MATERIAL DESCRIPTION

% PASSING #200 SIEVE

NOTES

--(pp=0.75/0.75/1.0 tsf, tv=0.3/0.35 tsf) (LEL=0.0, OVM=0.0, OXY=20.8)

--no recovery in Shelby Tube sample at 58.5 ft

LEAN CLAY WITH GRAVEL (CL), very stiff, light gray, moist, low to medium plasticity, fine gravel, trace root

SANDY SILT (ML), very stiff, gray, moist, low plasticity, fine grained sand

CLAYEY SAND (SC) layer

LEAN CLAY (CL), hard, greenish gray, moist, medium plasticity, trace fine grained sand (pp=2.25/2.5/2.5 tsf, tv=0.8/1.0/1.05 tsf)

WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM), very dense, mottled brown, wet, fine to medium grained sand, subangular gravel up to 3/4 inch — % passing #200 sieve: 13

LEAN CLAY (CL)

NOTE: Material description for depths 0' to 90' is based on Boring BH-68, drilled previously and located adjacent to ST-8.

BORING DEPTH: 90.0 ft
DEPTH TO WATER: Not Measured
START DATE: January 17, 2005
COMPLETION DATE: January 19, 2005
DRILLING METHOD: 10-in. dia. Hollow Stem Auger

RIG TYPE: Marl B-61
DRILLED BY: Pitcher Drilling, E. Castellan
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-8

BART to San Jose
San Jose, California

FIGURE A7-7b

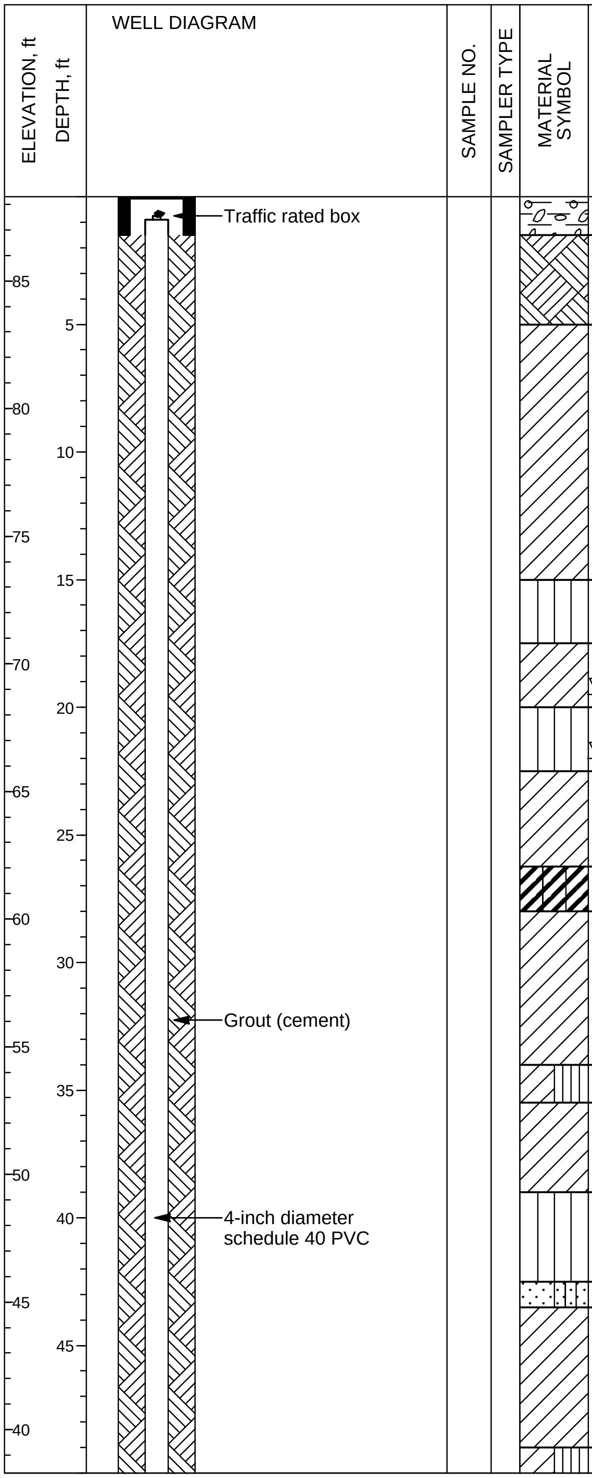
Project No. 1637.001

Sheet 1 of 2

LOCATION: Santa Clara St., between Cahill St. and Montgomery St.

N 1,946,092 E 6,154,195

SURFACE EL: 88.3 ft (MSL datum)



MATERIAL DESCRIPTION

% PASSING #200 SIEVE

NOTES

6 inches ASPHALT CONCRETE over 12 inches AGGREGATE BASE

LEAN TO FAT CLAY (CL/CH) (FILL), very stiff, mottled dark grayish brown, brown, black, and yellowish brown, moist, medium to high plasticity, trace fine grained sand and angular to subrounded gravel up to 1 inch (pp=2.75/3.25/3.25 tsf)

LEAN CLAY (CL), very stiff, light grayish brown, moist, medium plasticity, trace fine grained sand, disturbed sample (pp=1.75/2.0/2.25 tsf, tv=0.5/0.5 tsf)
--(pp=2.5/2.5/2.75 tsf, tv=0.77/0.77 tsf) at 9.9 ft
--hard, mottled brown and gray (pp=>4.5 tsf, tv=0.7/0.7 tsf)

--very stiff (pp=1.8/2.25/2.1 tsf, tv=0.55/0.55 tsf) trace silt at 15 ft

SILT (ML), hard, brown, moist, low to medium plasticity, trace fine grained sand (pp=>4.5 tsf, tv=0.43/0.55 tsf)

LEAN CLAY (CL), stiff, brown, moist, medium plasticity, trace fine grained sand (pp=1.0/1.25/1.5 tsf, tv=0.4/0.51 tsf) (LEL=0.0, OVM=0.0, OXY=20.9)

SILT (ML), stiff to very stiff, brown, moist, low plasticity (pp=1.75/2.0/2.25 tsf, tv=0.4/0.41 tsf)

LEAN CLAY (CL), very stiff, gray, moist, medium to high plasticity, trace fine grained sand (pp=2.2/2.25/2.25 tsf, tv=0.73/0.75 tsf)

ELASTIC SILT TO FAT CLAY (MH/CH), very stiff, mottled olive brown and orange brown, moist, medium plasticity, trace fine grained sand (pp=2.0/2.25/2.3 tsf, tv=0.7/0.85 tsf)

LEAN CLAY (CL), stiff, mottled olive brown and orange brown, moist, medium plasticity, trace fine grained sand and rounded gravel up to 3/4 inch (pp=1.25/1.3/1.5 tsf, tv=0.47/0.53 tsf) at 29 ft; trace rounded gravel up to 1/2 inch at 32 ft
(pp=1/1.25/1.5 tsf, tv=0.4/0.45 tsf)

SILTY CLAY (CL-ML), grayish brown, subrounded to rounded gravel up to 1 inch

LEAN CLAY (CL), very stiff, light grayish brown and orange brown mottling, moist, medium plasticity, trace fine grained sand (pp=2.25/2.5/2.7 tsf, tv=0.46/0.53 tsf)

SANDY SILT (ML), stiff, brown, moist, low plasticity, fine grained sand (pp=1.6/1.7/1.8 tsf, tv=0.33/0.34 tsf) (LEL=0.0, OVM=0.0, OXY=20.9)
--grayish brown, non-plastic (pp=1.75/1.5/2.5 tsf, tv=0.32/0.35 tsf) at 42 ft

Continued

BORING DEPTH: 73.5 ft
DEPTH TO WATER: 19.5 ft., 2/2/05, 22.0 ft., 2/3/05
START DATE: February 1, 2005
COMPLETION DATE: February 3, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling, R. Medina
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-10

BART to San Jose
San Jose, California

FIGURE A7-8a

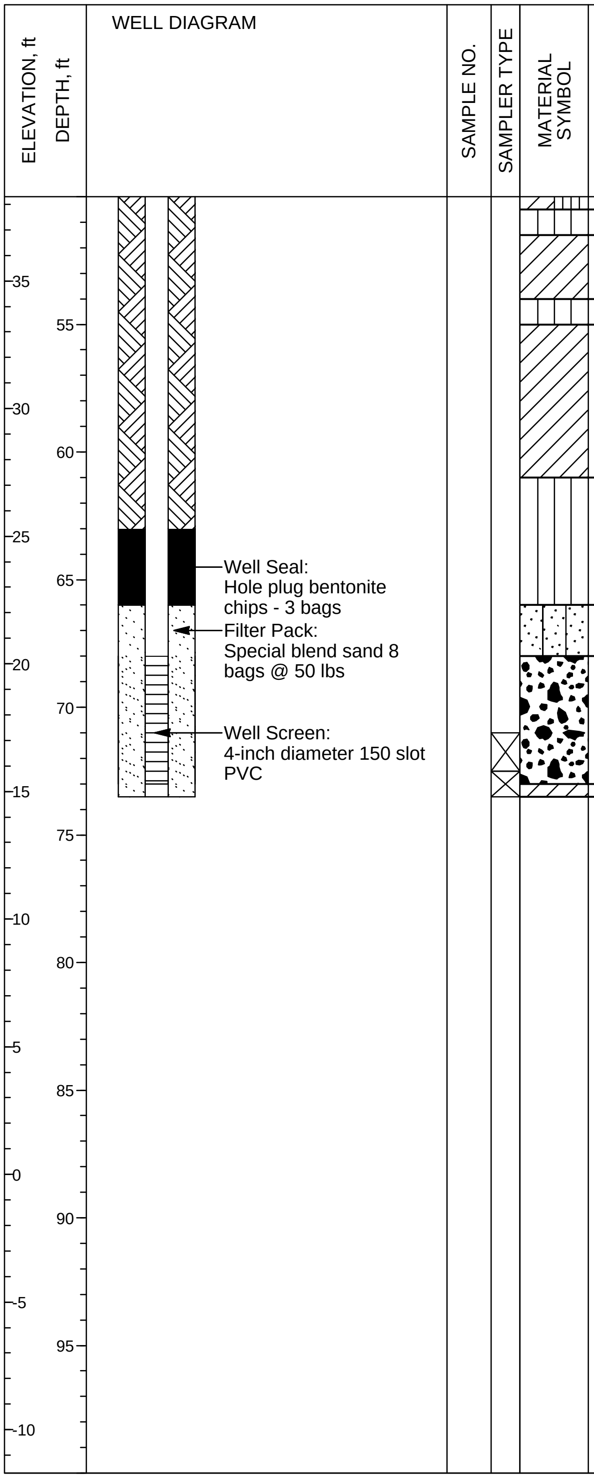
Project No. 1637.001

Sheet 2 of 2

LOCATION: Santa Clara St., between Cahill St. and Montgomery St.

N 1,946,092 E 6,154,195

SURFACE EL: 88.3 ft (MSL datum)



MATERIAL DESCRIPTION	% PASSING #200 SIEVE	NOTES
POORLY GRADED SAND WITH SILT (SP-SM), medium dense, brown, moist, fine grained sand		
LEAN CLAY (CL), very stiff, light bluish gray, moist, medium plasticity, trace fine grained sand (pp=2.0/2.1/2.25 tsf, tv=0.57/0.6 tsf) --stiff (pp=1.4/1.7/1.7 tsf)		
SILTY CLAY WITH SAND (CL-ML), stiff, mottled brown and bluish gray, moist, low to medium plasticity, fine grained sand (pp=1.25/1.5/0.5 tsf tv=0.19/0.27 tsf)		
SILT (ML), very stiff, bluish gray, moist, low plasticity		
LEAN CLAY (CL), very stiff, bluish gray, moist, high plasticity, trace fine grained sand (pp=2.0/2.2/2.25 tsf, tv=0.71/0.7 tsf)		
SILT (ML), very siff, bluish gray, moist, low plasticity		
LEAN CLAY (CL), very stiff, gray, moist, medium plasticity, trace fine grained sand (pp=2.1/2.1/2.3 tsf, tv=0.41/0.5 tsf) at 55 ft --(pp=2.75/3.5/2.8 tsf, tv=0.65/0.7 tsf) at 57.3 ft --(pp=2.6/2.6/2.8 tsf, tv=0.7/0.7 tsf) at 59.7 ft (LEL=0.0, OVM=0.0, OXY=20.9)		
SILT (ML), stiff, mottled brown and gray, moist, low plasticity, trace fine grained sand --yellowish brown (pp=1.0/1.25/1.5 tsf, tv=0.15/0.2 tsf)		
SILTY SAND (SM), medium dense, yellowish brown, moist, trace subangular to subrounded gravel up to 3/4 inch		
WELL GRADED GRAVEL (GW), dark grayish brown 2.5 y 4/2, well rounded, well graded, wet	7	
CLAY (CL), very dark grayish brown 2.5 y 3/2, wet		

NOTE: Material description for depths 0' to 68' is based on Boring BH-74, drilled previously and located adjacent to ST-10.

BORING DEPTH: 73.5 ft
DEPTH TO WATER: 19.5 ft., 2/2/05, 22.0 ft., 2/3/05
START DATE: February 1, 2005
COMPLETION DATE: February 3, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling, R. Medina
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-10

BART to San Jose
San Jose, California

FIGURE A7-8b

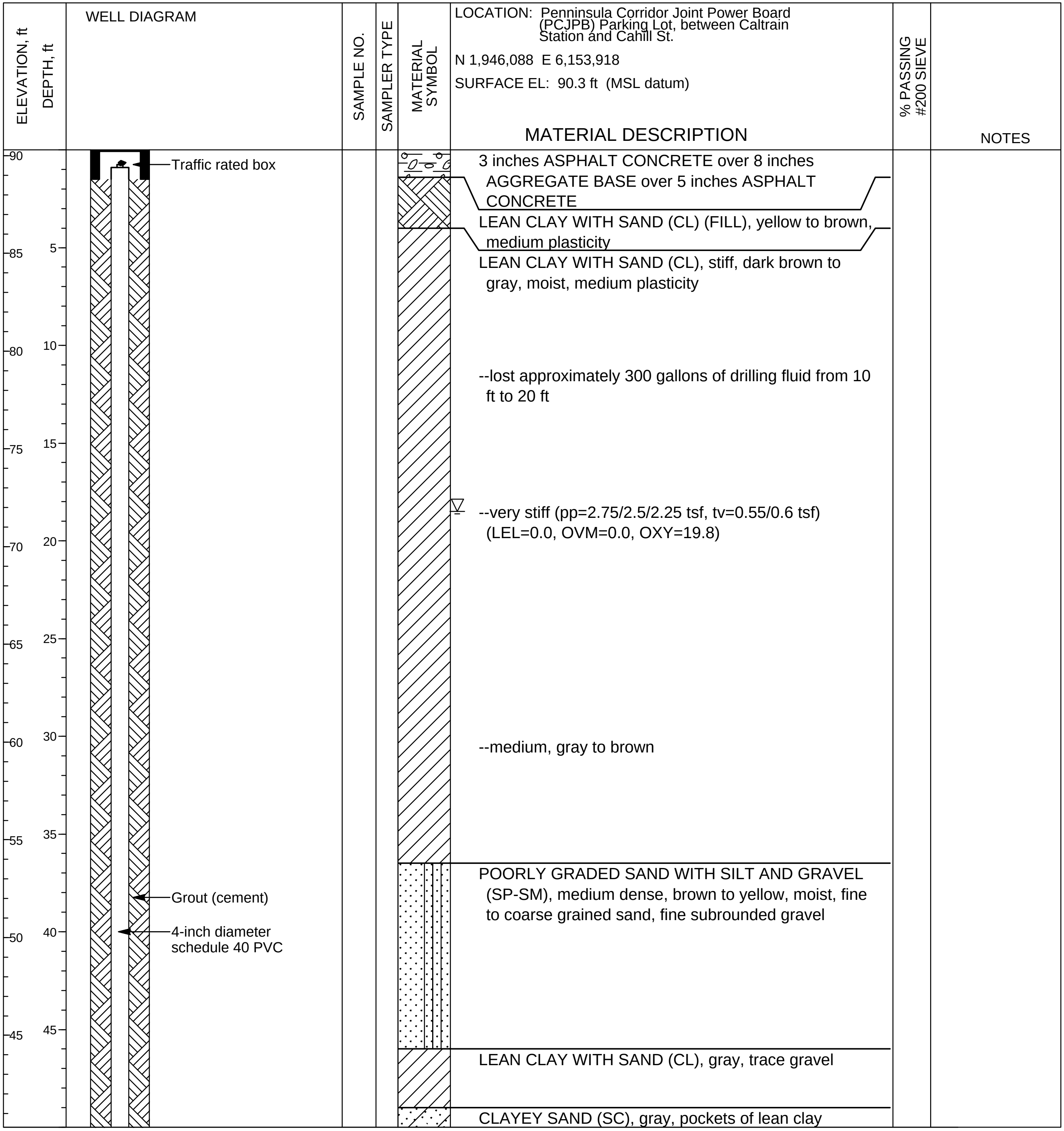
Project No. 1637.001

Sheet 1 of 2

LOCATION: Penninsula Corridor Joint Power Board (PCJPB) Parking Lot, between Caltrain Station and Cahill St.

N 1,946,088 E 6,153,918

SURFACE EL: 90.3 ft (MSL datum)



MATERIAL DESCRIPTION

3 inches ASPHALT CONCRETE over 8 inches AGGREGATE BASE over 5 inches ASPHALT CONCRETE

LEAN CLAY WITH SAND (CL) (FILL), yellow to brown, medium plasticity

LEAN CLAY WITH SAND (CL), stiff, dark brown to gray, moist, medium plasticity

--lost approximately 300 gallons of drilling fluid from 10 ft to 20 ft

--very stiff (pp=2.75/2.5/2.25 tsf, tv=0.55/0.6 tsf) (LEL=0.0, OVM=0.0, OXY=19.8)

--medium, gray to brown

POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), medium dense, brown to yellow, moist, fine to coarse grained sand, fine subrounded gravel

LEAN CLAY WITH SAND (CL), gray, trace gravel

CLAYEY SAND (SC), gray, pockets of lean clay

Continued

BORING DEPTH: 85.5 ft
DEPTH TO WATER: 18.5 ft., 2/1/05
START DATE: January 31, 2005
COMPLETION DATE: February 2, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Marl M5T
DRILLED BY: Pitcher Drilling, J. Neff
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-11

BART to San Jose
San Jose, California

FIGURE A7-9a

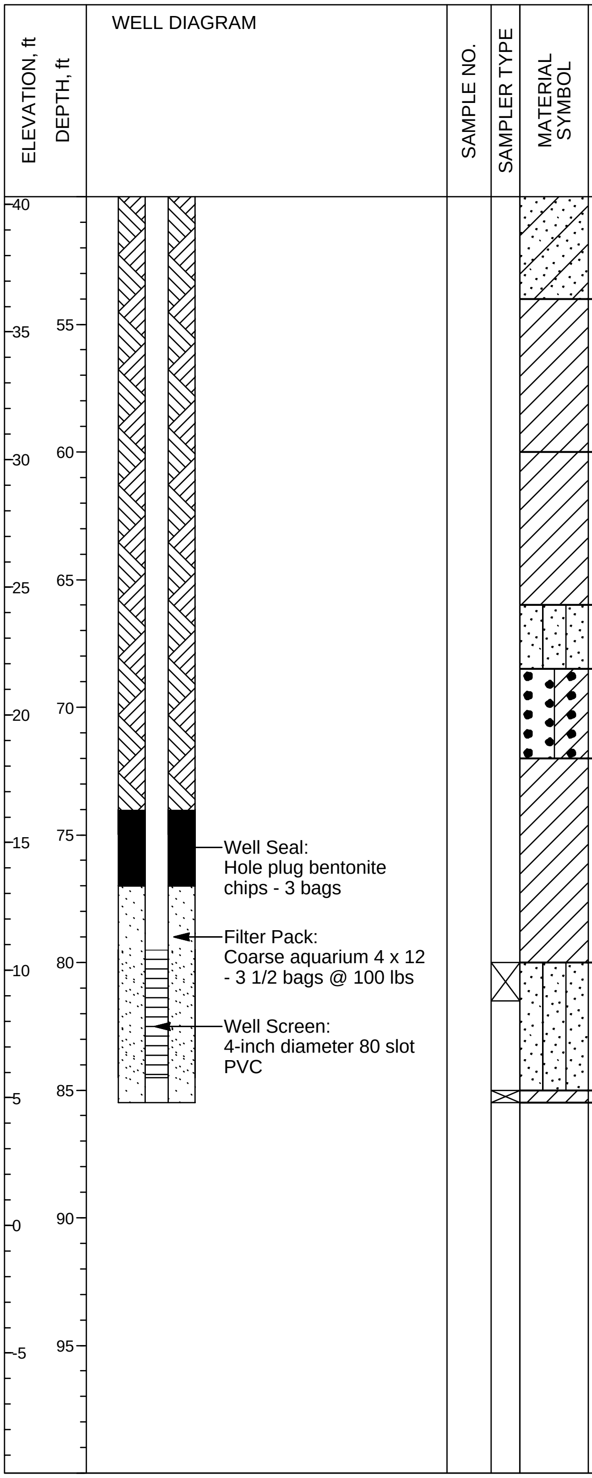
Project No. 1637.001

Sheet 2 of 2

LOCATION: Penninsula Corridor Joint Power Board (PCJPB) Parking Lot, between Caltrain Station and Cahill St.

N 1,946,088 E 6,153,918

SURFACE EL: 90.3 ft (MSL datum)



MATERIAL DESCRIPTION	% PASSING #200 SIEVE	NOTES
- no recovery with Shelby Tube sample at 50 ft		
LEAN CLAY WITH SAND (CL), very stiff, gray, moist, medium plasticity (pp=2.5/2.75/2.75 tsf, tv=0.6/0.55 tsf)(LEL=0.0, OVM=0.0, OXY=20.1)		
SANDY LEAN CLAY (CL), very stiff, gray, moist, low plasticity (pp=2.75/3.0/3.0 tsf, tv=0.5/0.55 tsf) --Ended drilling on 1/31/05 at 62.5 ft --Began drilling on 2/1/05 at 62.5 ft		
SILTY SAND WITH GRAVEL (SM)		
POORLY GRADED GRAVEL WITH CLAY AND SAND (GP-GC), dense, brown to gray, moist, subrounded gravel up to 1 inch		
SANDY LEAN CLAY (CL), brown to gray, low plasticity --gray, low to medium plasticity, no recovery		
SILTY SAND (SM), black 2.5 y 2.5/1, wet, well graded	18	
CLAY (CL), black 2.5 y 2.5/1	23	
NOTE: Material description for depths 0' to 80' is based on Boring BH-76, drilled previously and located adjacent to ST-11.		

BORING DEPTH: 85.5 ft
DEPTH TO WATER: 18.5 ft., 2/1/05
START DATE: January 31, 2005
COMPLETION DATE: February 2, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

RIG TYPE: Marl M5T
DRILLED BY: Pitcher Drilling, J. Neff
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-11

BART to San Jose
San Jose, California

FIGURE A7-9b

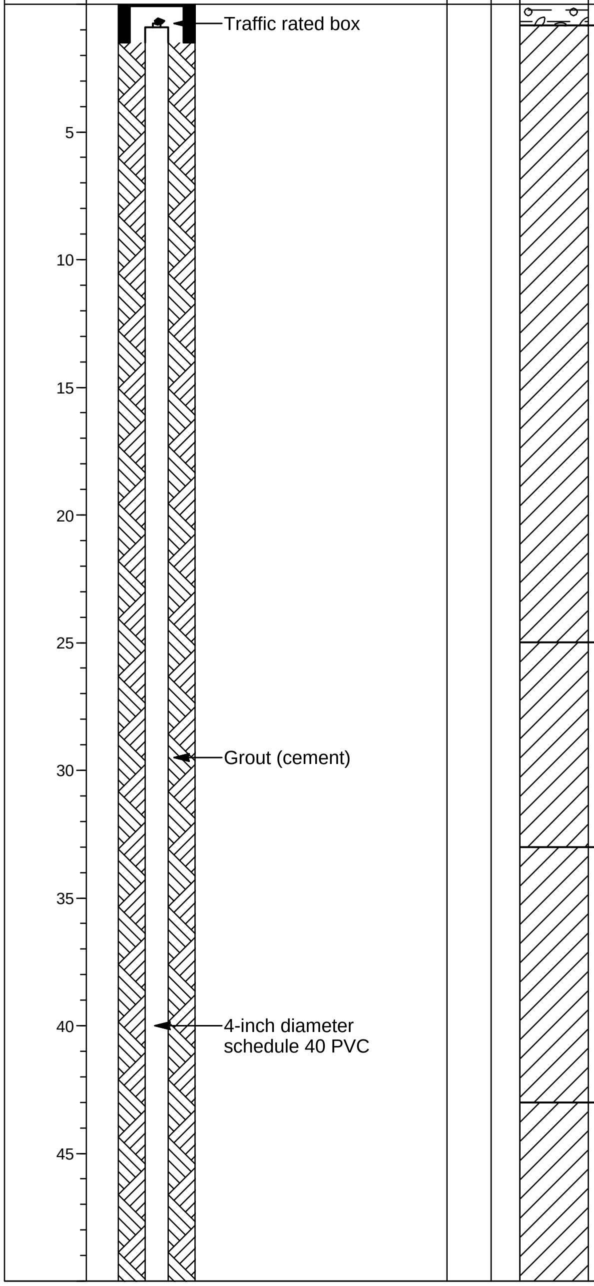
Project No. 1637.001

Sheet 1 of 2

LOCATION: EB Lenzen Ave., West of Stockton Ave.
N 1,948,103 E 615,853

SURFACE EL: 82.3 ft (MSL datum)

DEPTH, ft	WELL DIAGRAM	SAMPLE NO.	SAMPLER TYPE	MATERIAL SYMBOL	MATERIAL DESCRIPTION	% PASSING #200 SIEVE	NOTES



10" ASPHALT CONCRETE

CLAY (CL), brown 10 yr 4/3

- approximately 5% angular coarse sand, down to approximately 25 ft

CLAY (CL), black 2.5y 2.5/1, wet

- color transition to very dark greenish gray 5 gy 3/1, wet

CLAY WITH SAND (CL), brown 10 yr 4/3, wet

CLAY (CL), black 2.5 y 2.5/1, wet

Continued

BORING DEPTH: 70.0 ft
DEPTH TO WATER: Not Measured
START DATE: February 11, 2005
COMPLETION DATE: February 11, 2005
DRILLING METHOD: 10-in. dia. Hollow Stem Auger

RIG TYPE: Mobile B-61
DRILLED BY: Pitcher Drilling, T. Carver
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-12

BART to San Jose
San Jose, California

FIGURE A7-10a

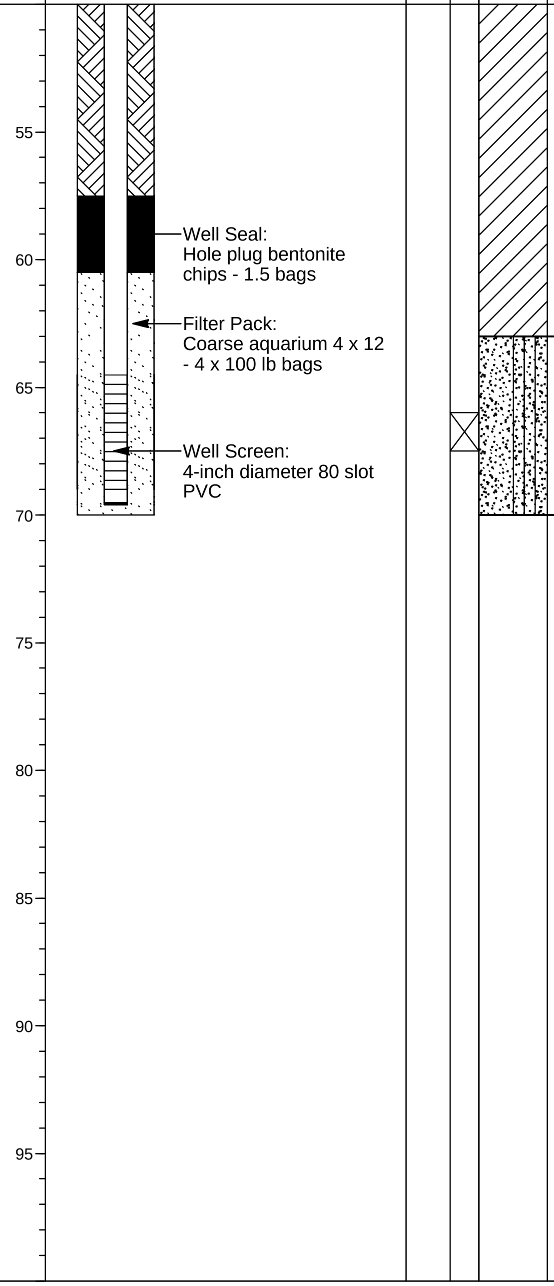
Project No. 1637.001

Sheet 2 of 2

LOCATION: EB Lenzen Ave., West of Stockton Ave.
N 1,948,103 E 615,853

SURFACE EL: 82.3 ft (MSL datum)

DEPTH, ft	WELL DIAGRAM	SAMPLE NO.	SAMPLER TYPE	MATERIAL SYMBOL	MATERIAL DESCRIPTION	% PASSING #200 SIEVE	NOTES



- occasional sand seam, medium sand - 2 to 3 mm thick

- eggshell-like coating on clay (shell fragments ?)

SAND WITH SILT (SW-SM), well graded brown 10 yr 4/3, wet

% PASSING #200 SIEVE: 6

BORING DEPTH: 70.0 ft
DEPTH TO WATER: Not Measured
START DATE: February 11, 2005
COMPLETION DATE: February 11, 2005
DRILLING METHOD: 10-in. dia. Hollow Stem Auger

RIG TYPE: Mobile B-61
DRILLED BY: Pitcher Drilling, T. Carver
LOGGED BY: M. Waterman

NOTES: 1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-12

BART to San Jose
San Jose, California

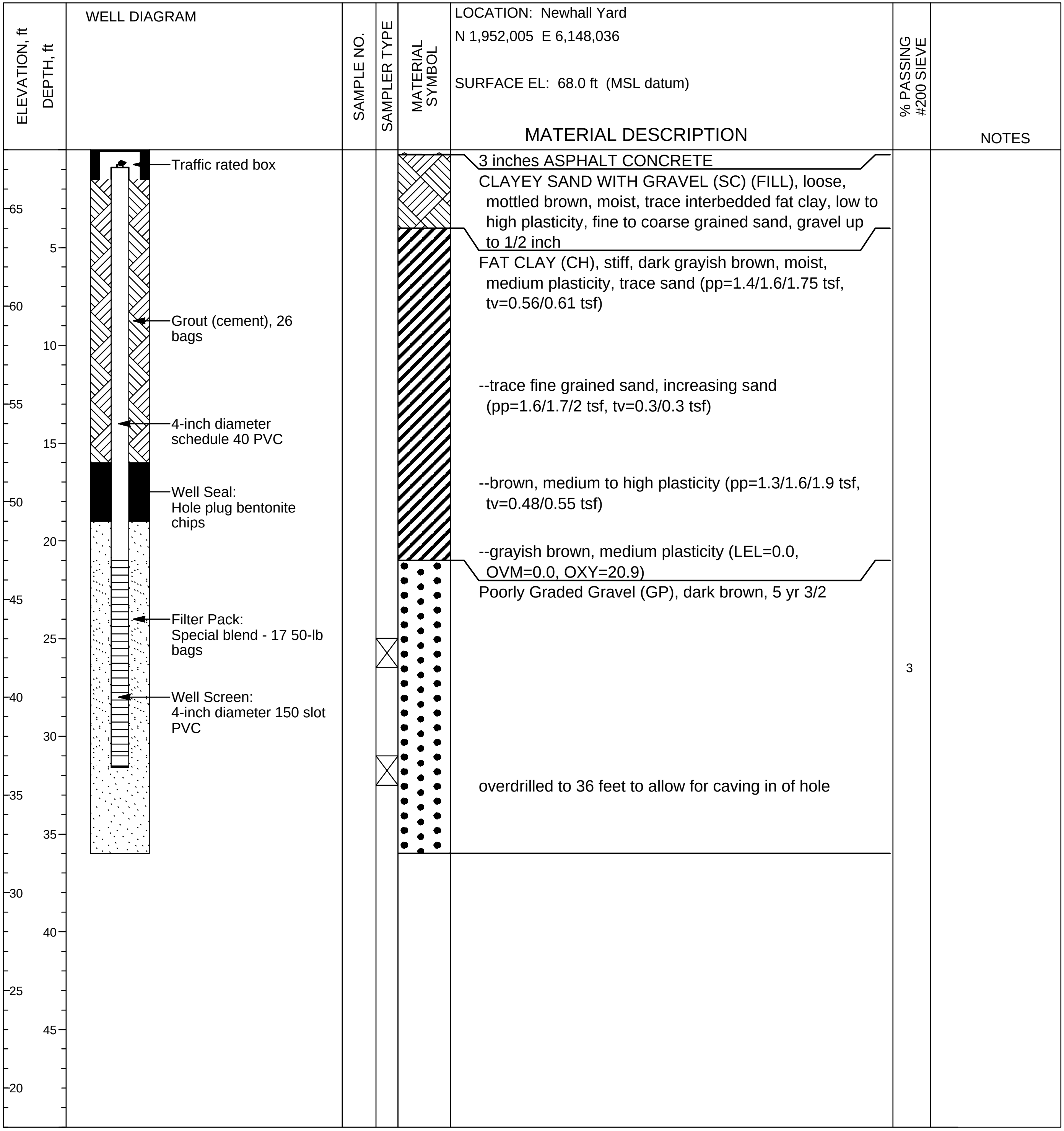
FIGURE A7-10b

Project No. 1637.001

Sheet 1 of 1

LOCATION: Newhall Yard
N 1,952,005 E 6,148,036

SURFACE EL: 68.0 ft (MSL datum)



3 inches ASPHALT CONCRETE

CLAYEY SAND WITH GRAVEL (SC) (FILL), loose, mottled brown, moist, trace interbedded fat clay, low to high plasticity, fine to coarse grained sand, gravel up to 1/2 inch

FAT CLAY (CH), stiff, dark grayish brown, moist, medium plasticity, trace sand (pp=1.4/1.6/1.75 tsf, tv=0.56/0.61 tsf)

--trace fine grained sand, increasing sand (pp=1.6/1.7/2 tsf, tv=0.3/0.3 tsf)

--brown, medium to high plasticity (pp=1.3/1.6/1.9 tsf, tv=0.48/0.55 tsf)

--grayish brown, medium plasticity (LEL=0.0, OVM=0.0, OXY=20.9)

Poorly Graded Gravel (GP), dark brown, 5 yr 3/2

overdrilled to 36 feet to allow for caving in of hole

BORING DEPTH: 36.0 ft
DEPTH TO WATER: Not Measured
START DATE: April 18, 2005
COMPLETION DATE: April 18, 2005
DRILLING METHOD: 10-in. dia. Rotary Wash

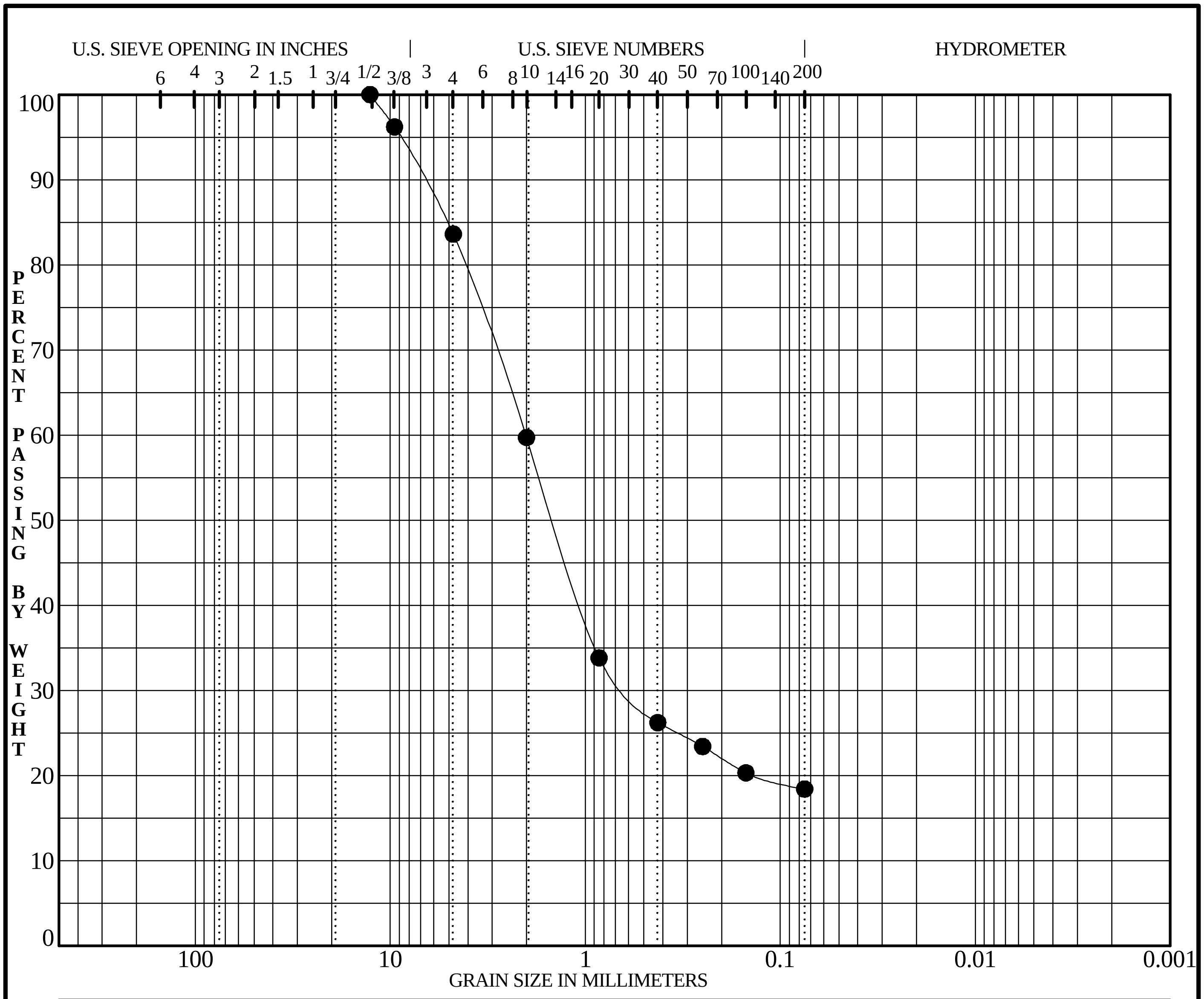
RIG TYPE: Failing 1500
DRILLED BY: Pitcher Drilling, M. MacDonald
LOGGED BY: M. Waterman

NOTES:
1. Terms and symbols defined on Plate A-1.
2. Groundwater levels measured at the time of drilling may not be representative of actual groundwater conditions and should not be used for design purposes. For applicable groundwater information, please refer to piezometer and observation well data.

LOG OF ST-13

BART to San Jose
San Jose, California

FIGURE A7-11



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
●	ST-1	72.5	18	84	Clayey SAND with gravel (SC)	SC

PREP'D BY:

APP'D BY:

DATE:
7/21/05

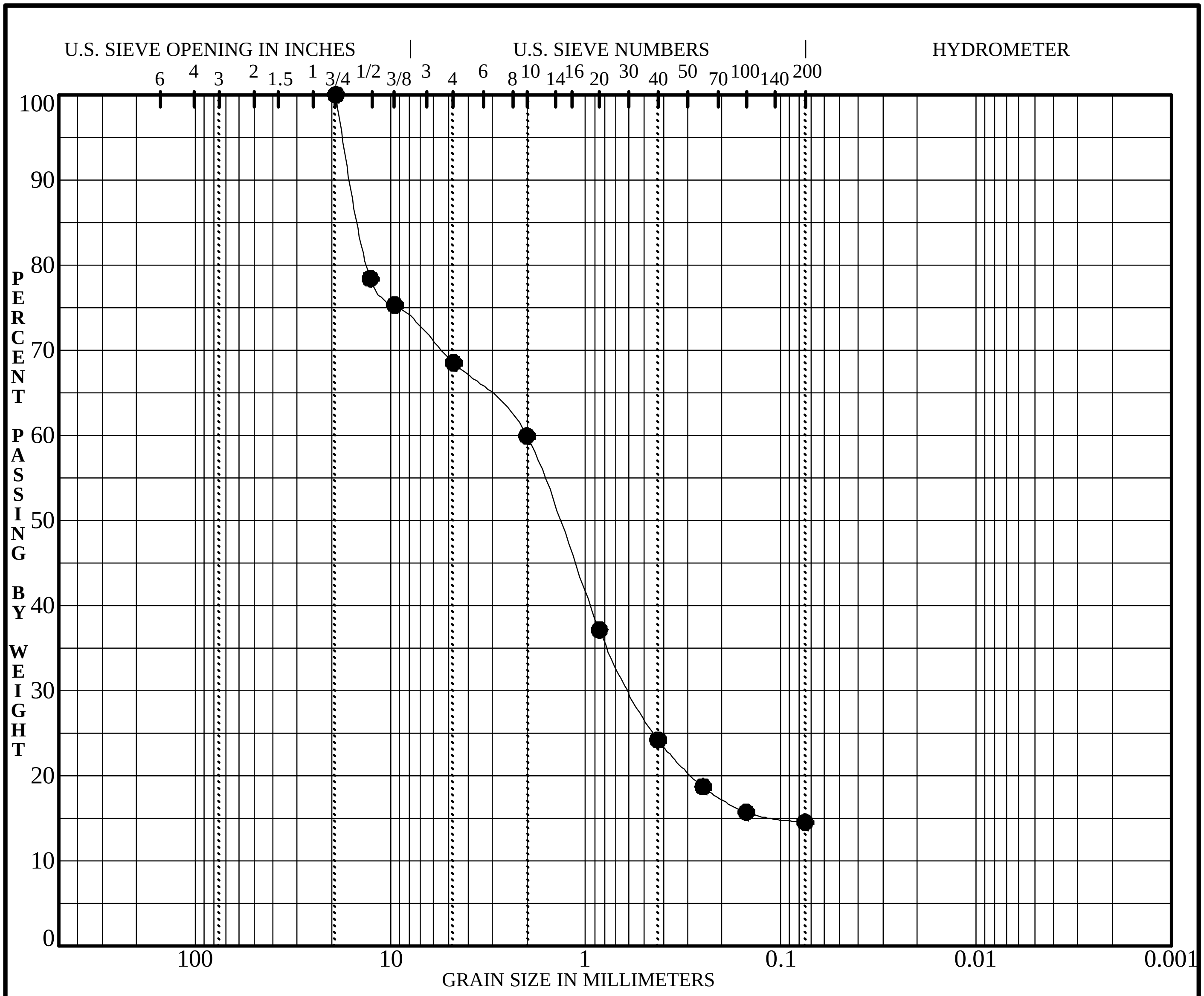
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A7-12

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
●	ST-2	81.5	15	69	Clayey SAND with gravel (SC)	SC

PREP'D BY:

APP'D BY:

DATE: 7/28/05

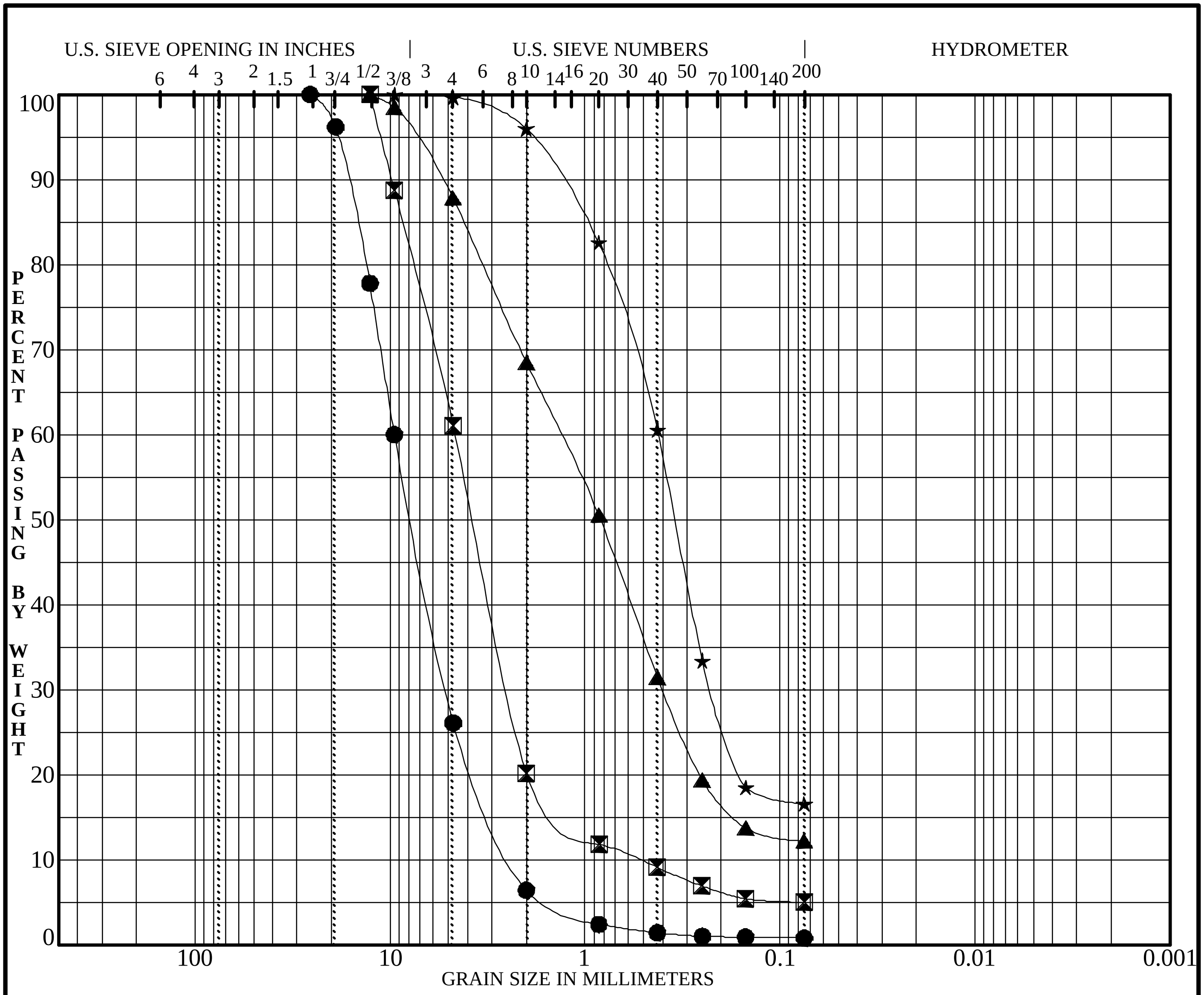
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A7-13

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
●	ST-3	63.5	1	26	Well-graded GRAVEL with silt and sand (GW-GM)	GW-GM
⊠	ST-3	68.5	5	61	Well-graded SAND with silt and gravel (SW-SM)	SW-SM
▲	ST-3	73.5	12	88	Silty SAND (SM)	SM
★	ST-3	78.5	17	100	Silty SAND (SM)	SM

PREP'D BY:

APP'D BY:

DATE:
7/28/05

DWG FILE:

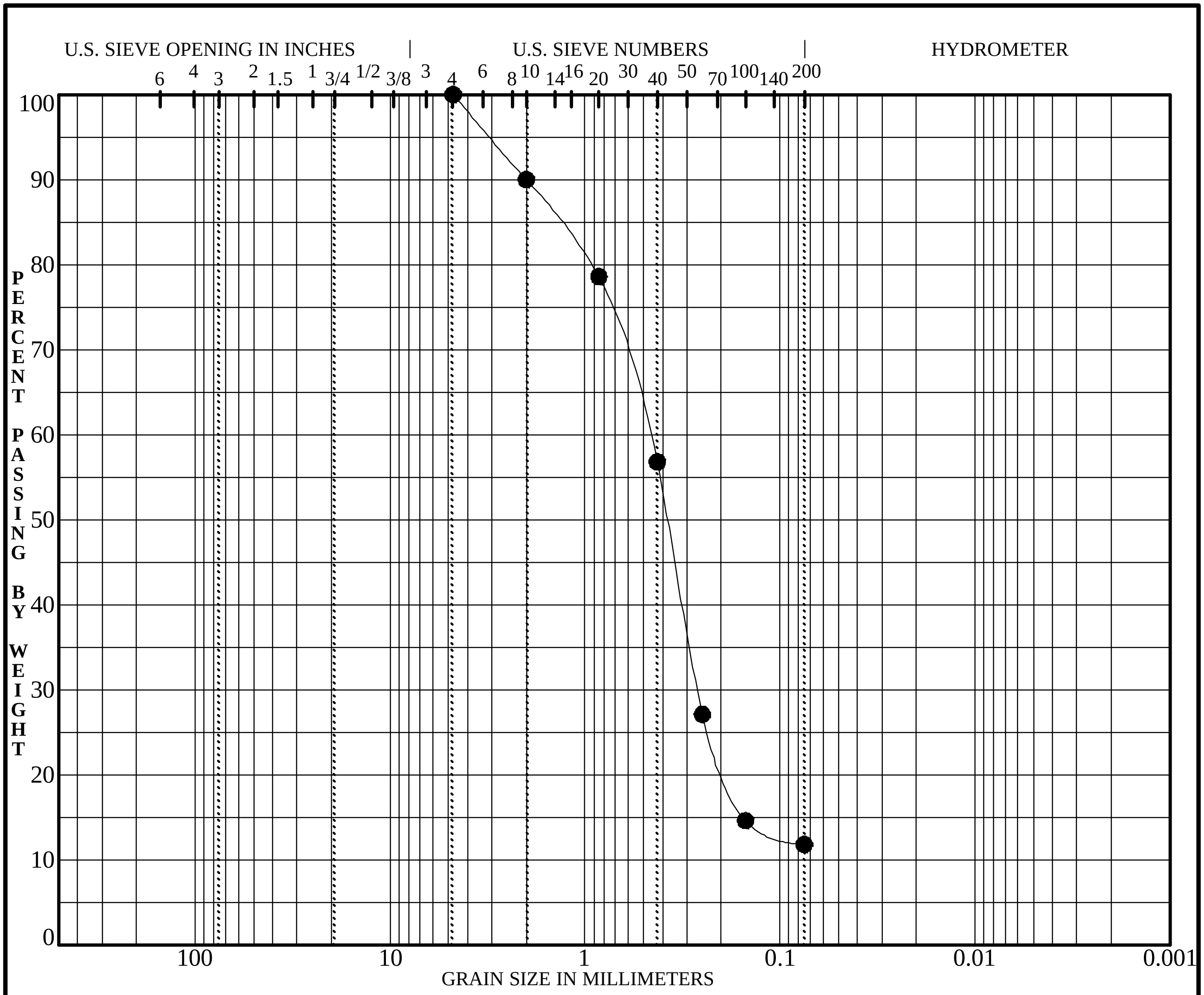
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A7-14

PROJECT No.
204104.10

GRADATION B 204104 07 22 2005 (WITH PM).GPJ STD.GDT 7/28/05



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
●	ST-5	63.5	12	100	Poorly-graded SAND with silt (SP-SM)	SP-SM

PREP'D BY:

APP'D BY:

DATE:
7/28/05

DWG FILE:

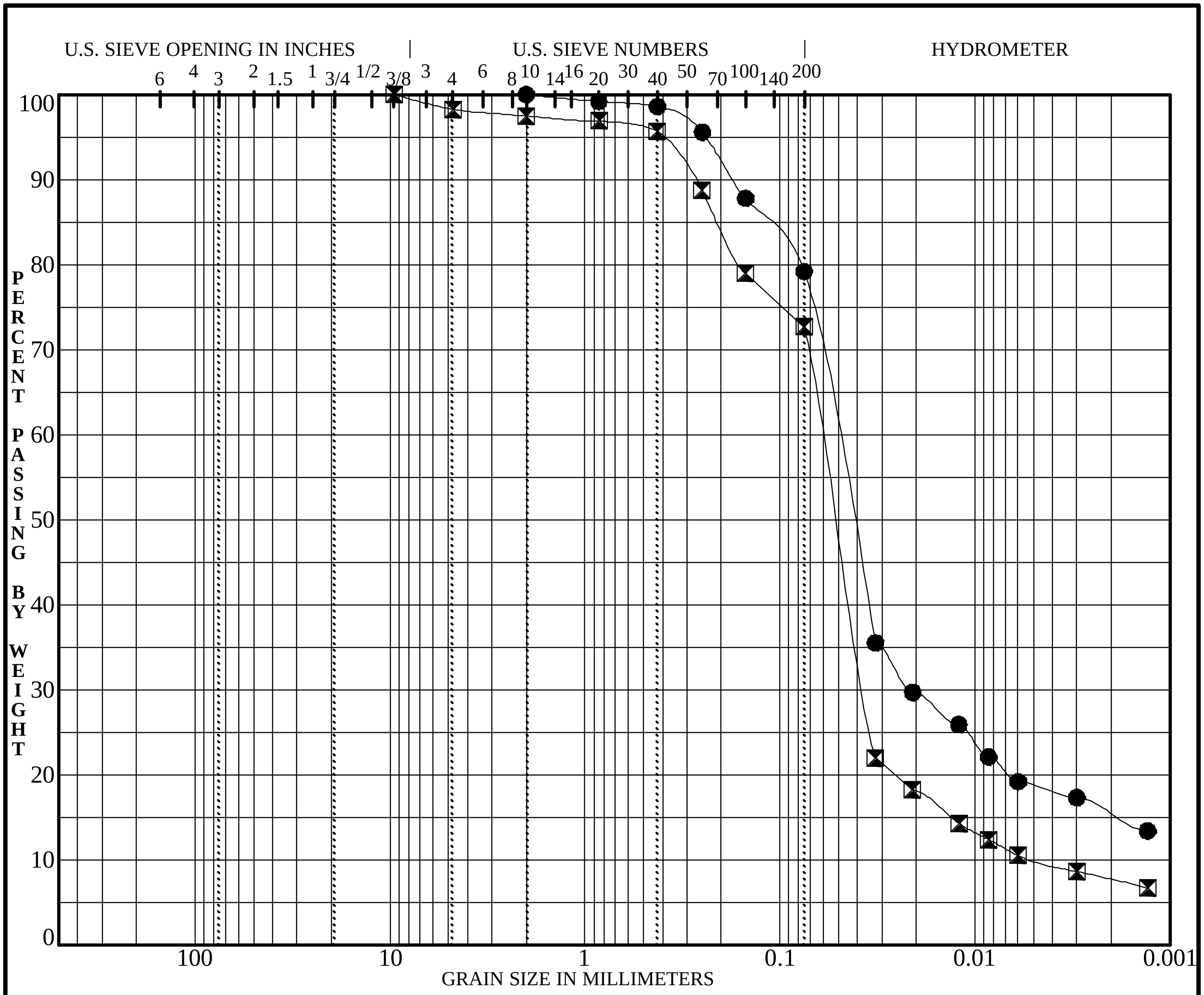
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A7-15

PROJECT No.
204104.10

GRADATION B 204104 07 22 2005 (WITH PM).GPJ STD.GDT 7/28/05



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
●	ST-7	67.5	79		SILT with sand (ML)	ML
☒	ST-7	72.5	73	98	SILT with sand (ML)	ML

PREP'D BY:

APP'D BY:

DATE:
7/28/05

DWG FILE:

GRADATION TEST DATA

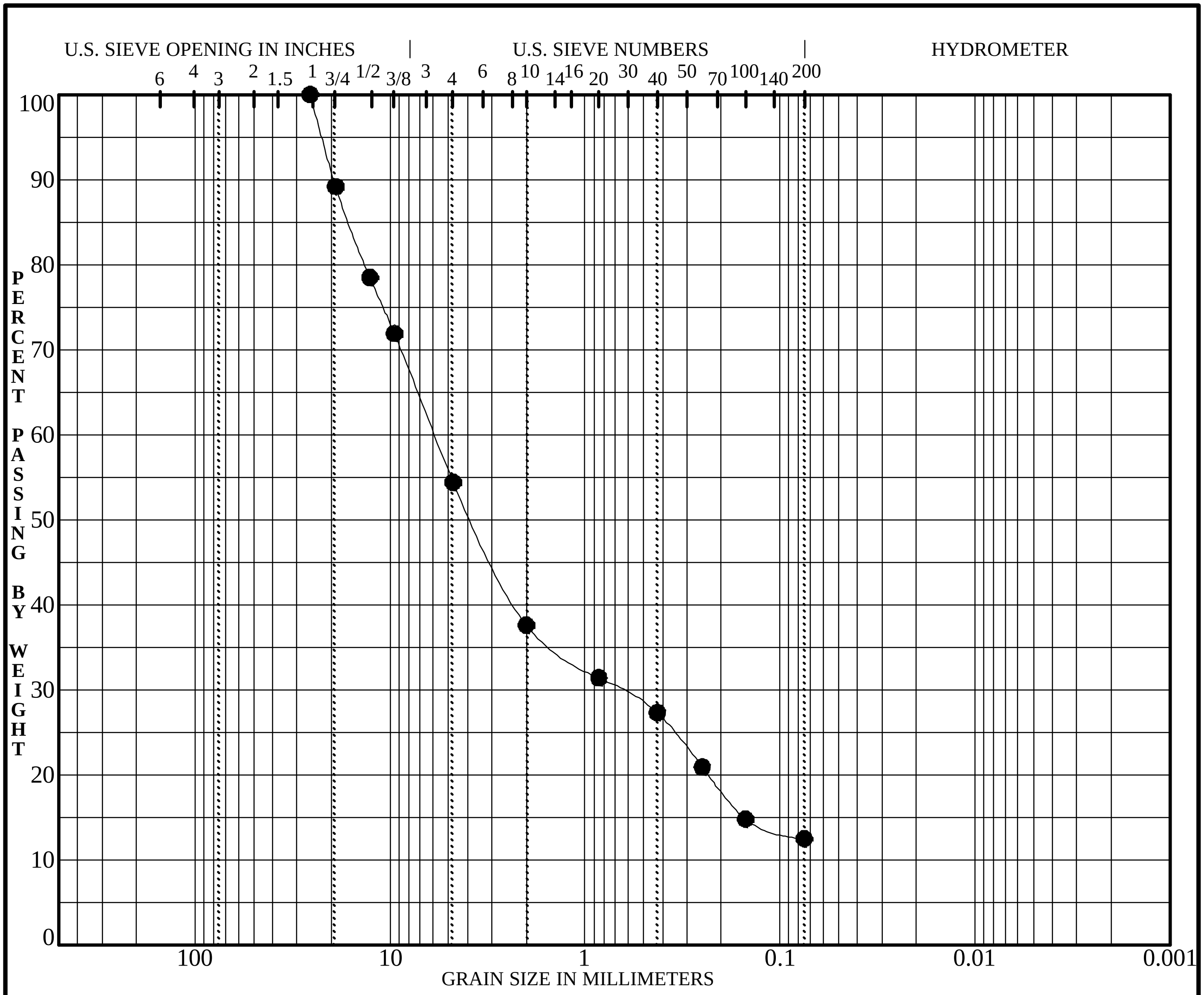
SVRT DOWNTOWN
San Jose, California

FIGURE

A7-16

PROJECT No.
204104.10

GRADATION B 204104 07 22 2005 (WITH PM).GPJ STD.GDT 7/28/05



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
●	ST-8	78.5	13	54	Silty GRAVEL (GM)	GM

PREP'D BY:

APP'D BY:

DATE:
7/28/05

DWG FILE:

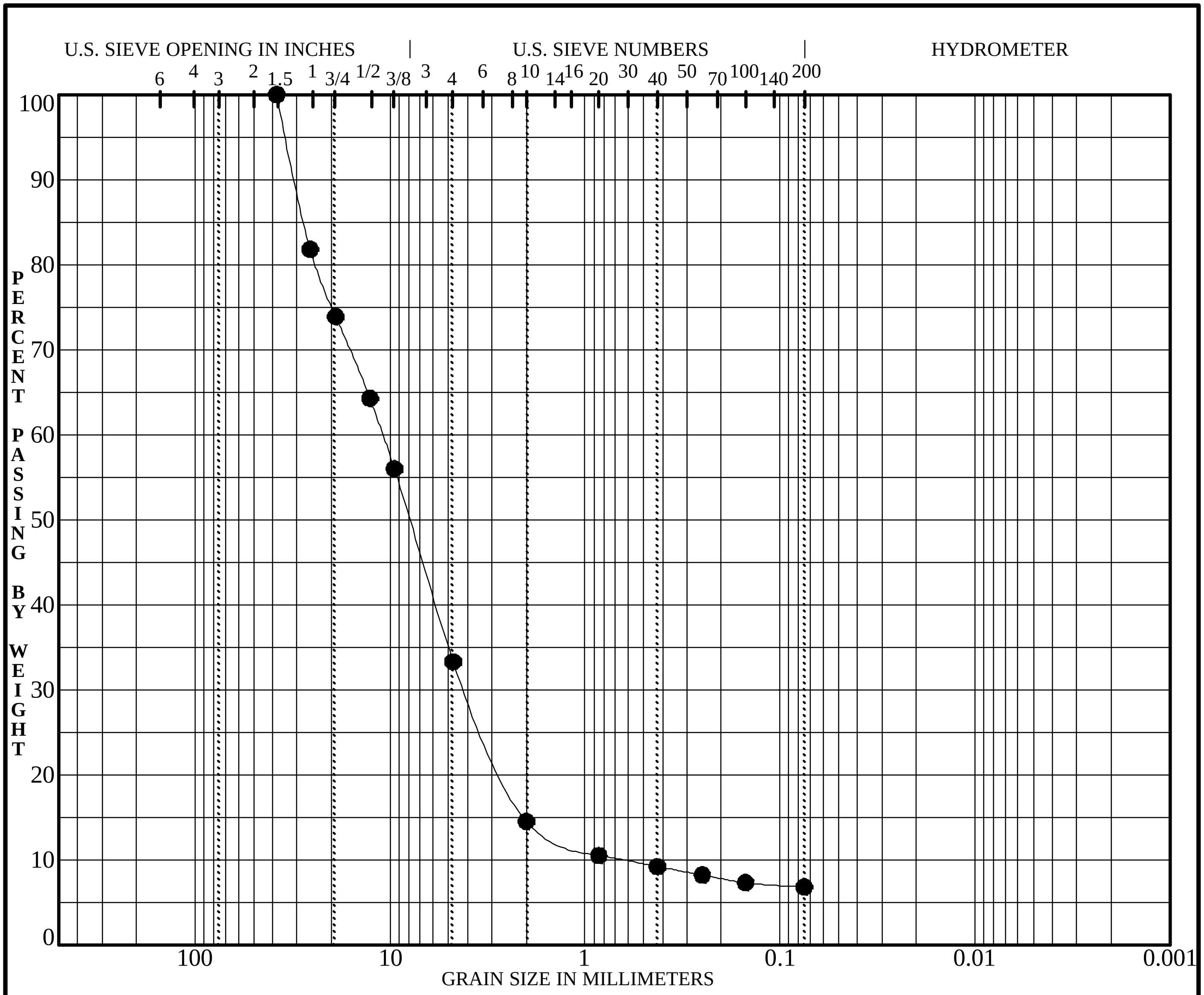
GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A7-17

PROJECT No.
204104.10

GRADATION B 204104 07 22 2005 (WITH PM).GPJ STD.GDT 7/28/05



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
●	ST-10	72.5	7	33	Well-graded GRAVEL with clay and sand (GW-GC)	GW-GC

PREP'D BY:

APP'D BY:

DATE:
7/28/05

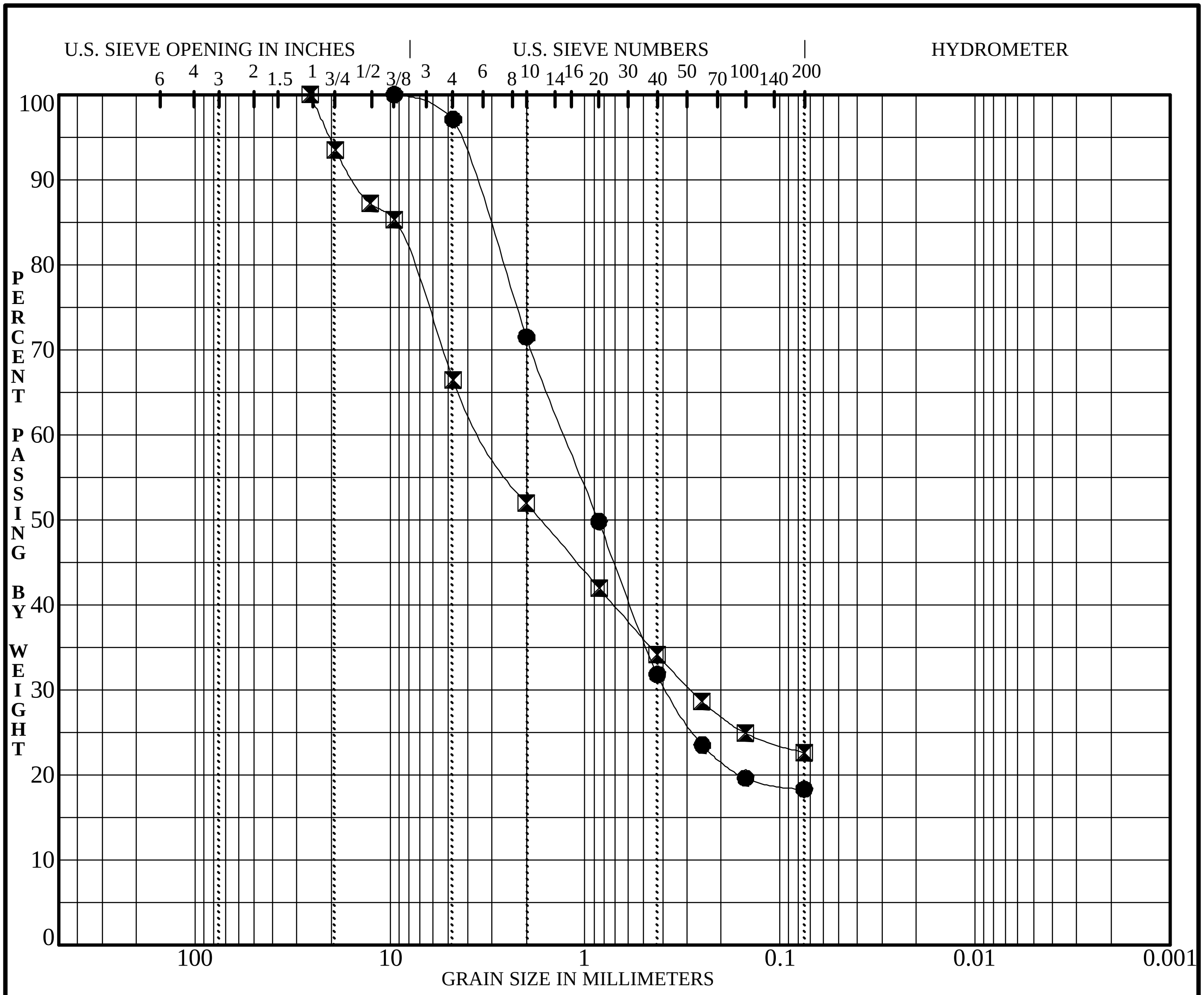
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A7-18

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
●	ST-11	81.5	18	97	Silty SAND (SM)	SM
☒	ST-11	85.5	23	66	Clayey SAND with gravel (SC)	SC

GRADATION B 204104 07 22 2005 (WITH PM).GPJ STD.GDT 7/28/05

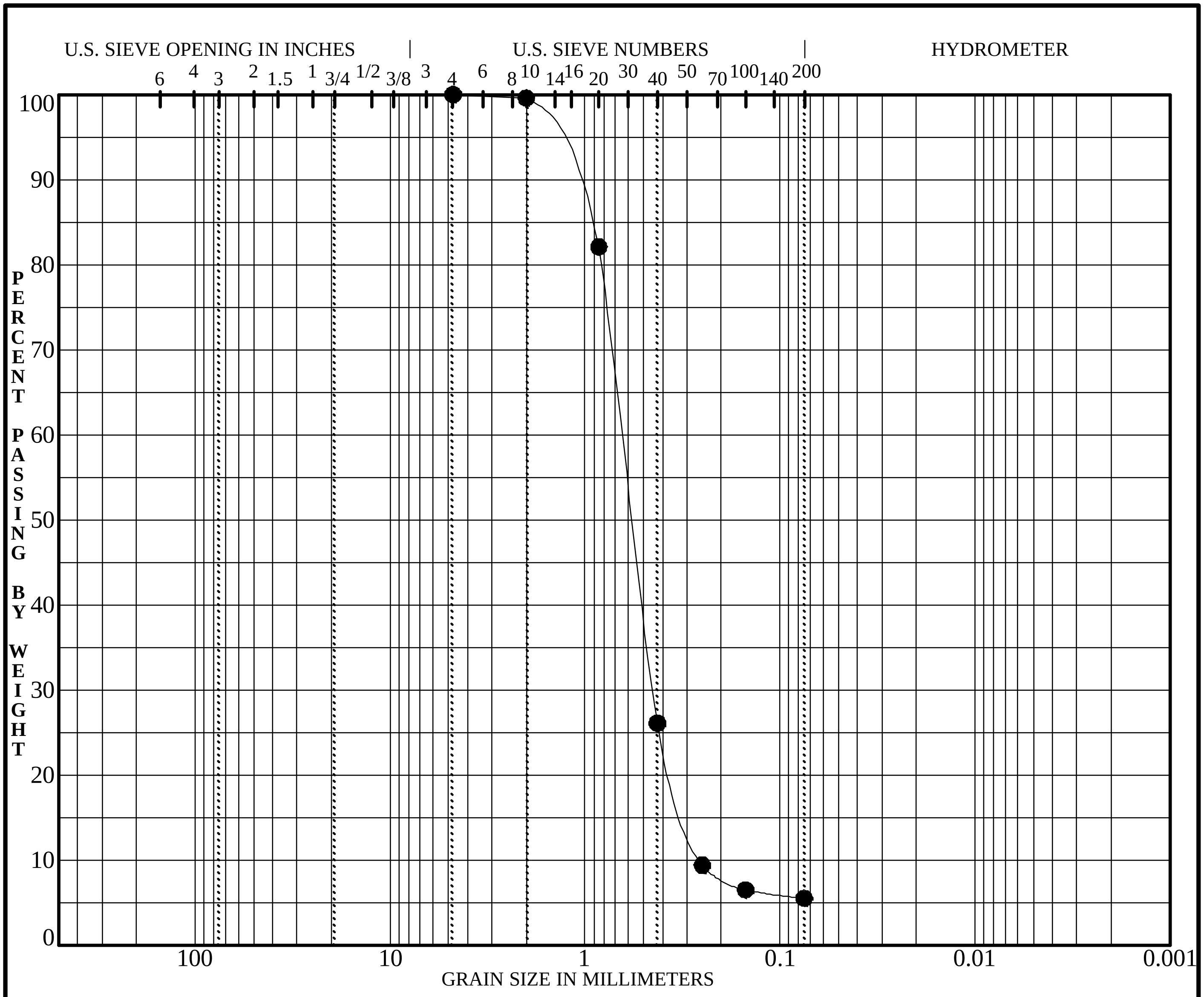
PREP'D BY:
APP'D BY:
DATE: 7/28/05
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A7-19

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
●	ST-12	67.5	6	100	Poorly-graded SAND with silt (SP-SM)	SP-SM

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APP'D BY:

DATE:
7/28/05

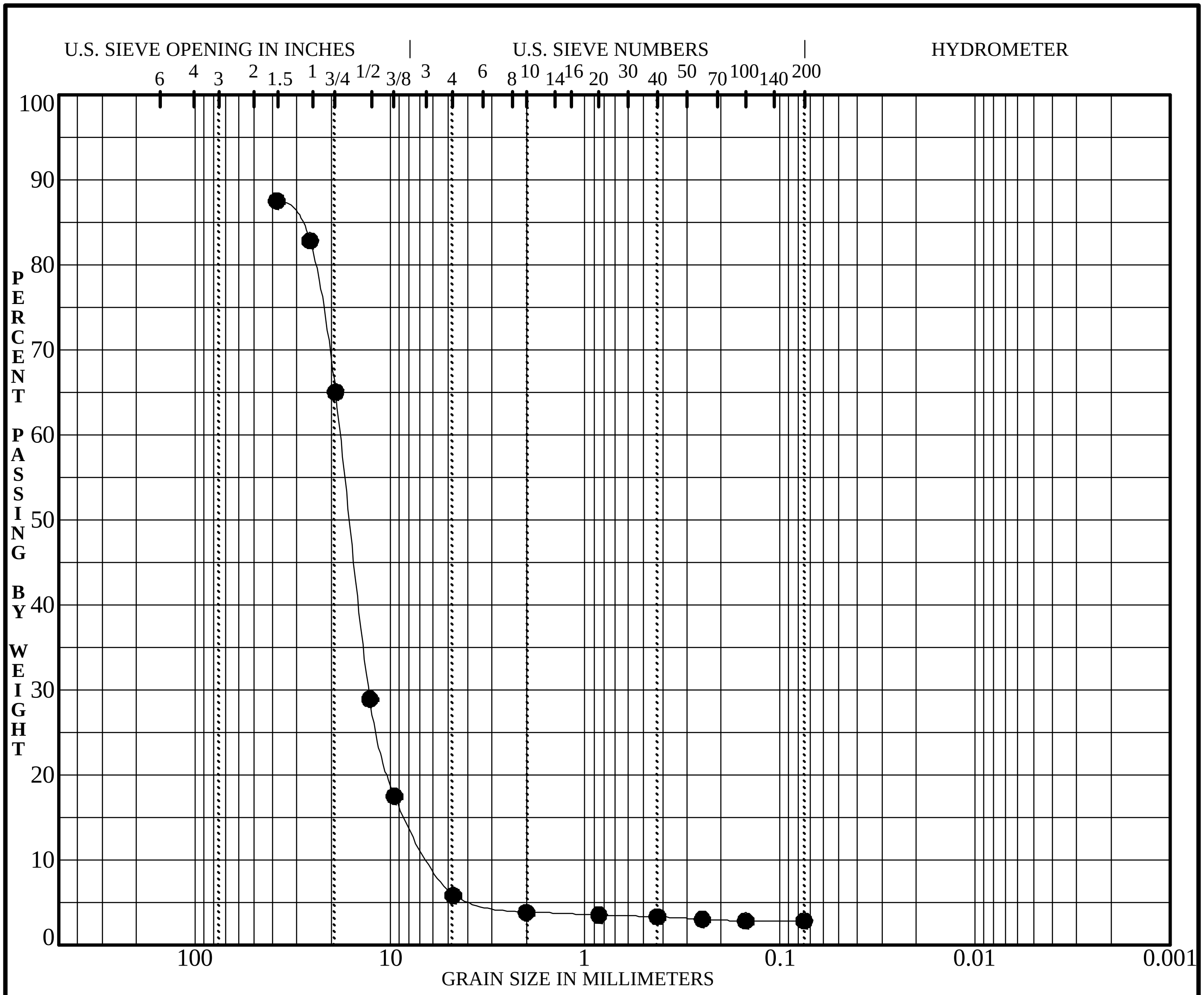
DWG FILE:

GRADATION TEST DATA

SVRT DOWNTOWN
San Jose, California

FIGURE
A7-20

PROJECT No.
204104.10



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<tr><td rowspan="2">Cobbles</td><td colspan="2">Gravel</td><td colspan="3">Sand</td><td rowspan="2">Silt and Clay</td></tr>
<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
●	ST-13	26.5	3	6	Poorly-graded GRAVEL (GP)	GP

GRADATION B 204104 07 22 2005 (WITH PM).GPJ STD.GDT 7/28/05

PREP'D BY:

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DATE:
7/28/05

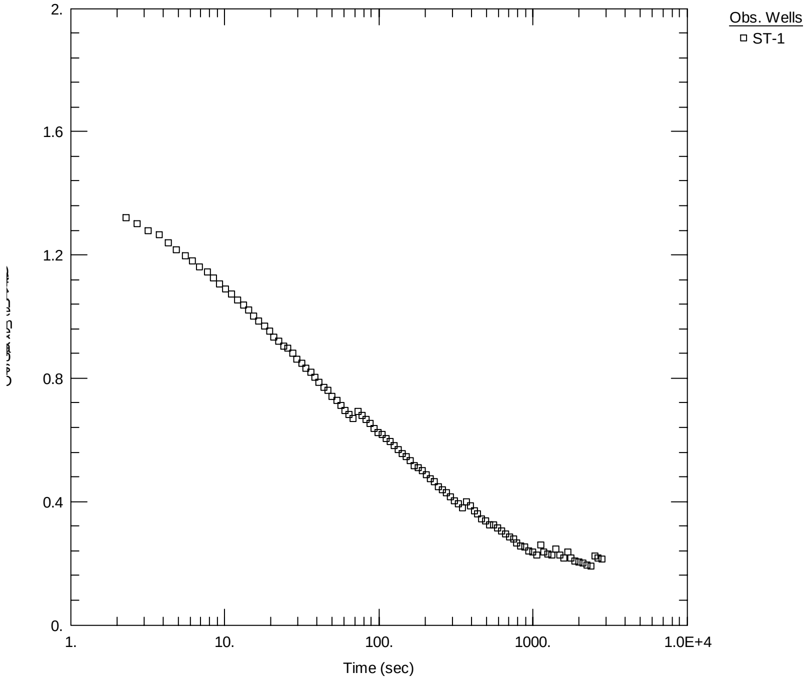
DWG FILE:

GRADATION TEST DATA

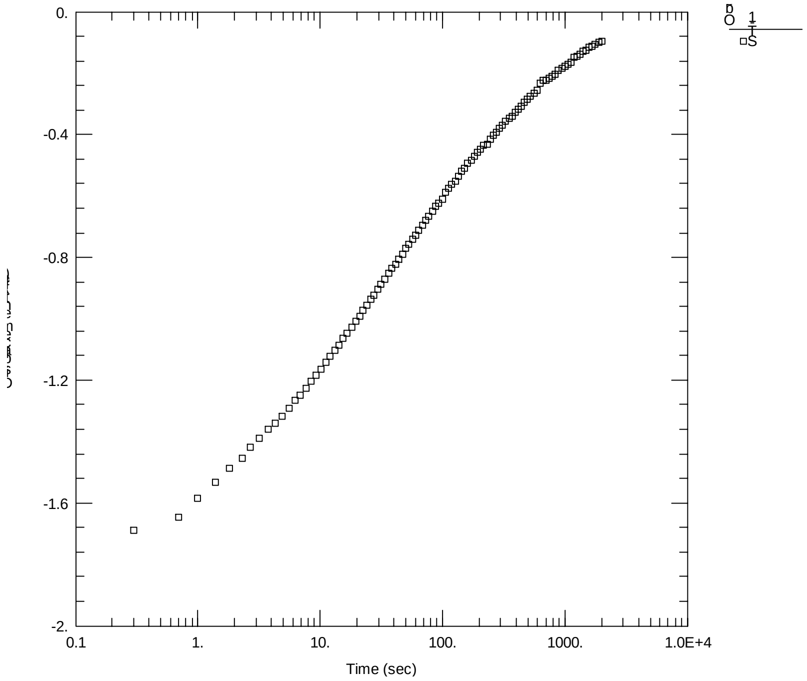
SVRT DOWNTOWN
San Jose, California

FIGURE
A7-21

PROJECT No.
204104.10

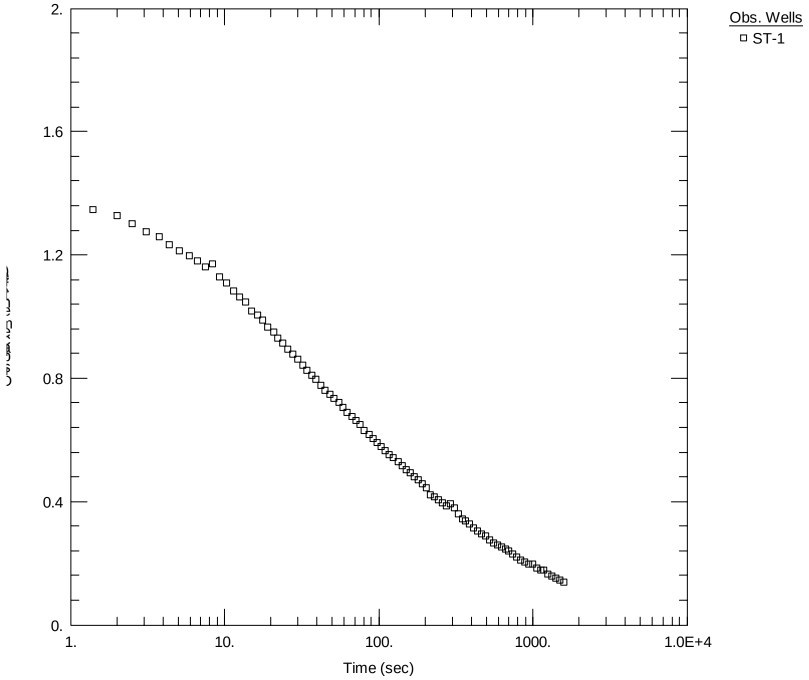


Slug-In Test at ST-1 (Test # 1)

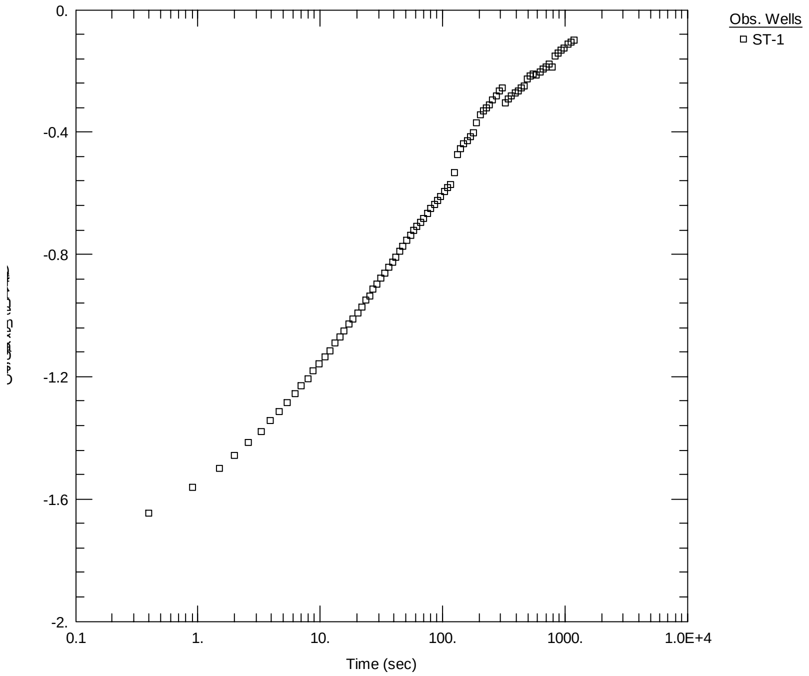


Slug-Out Test at ST-1 (Test # 1)

Figure A7-22. Slug-In and Slug-Out Test Results at ST-1 (Test #1)

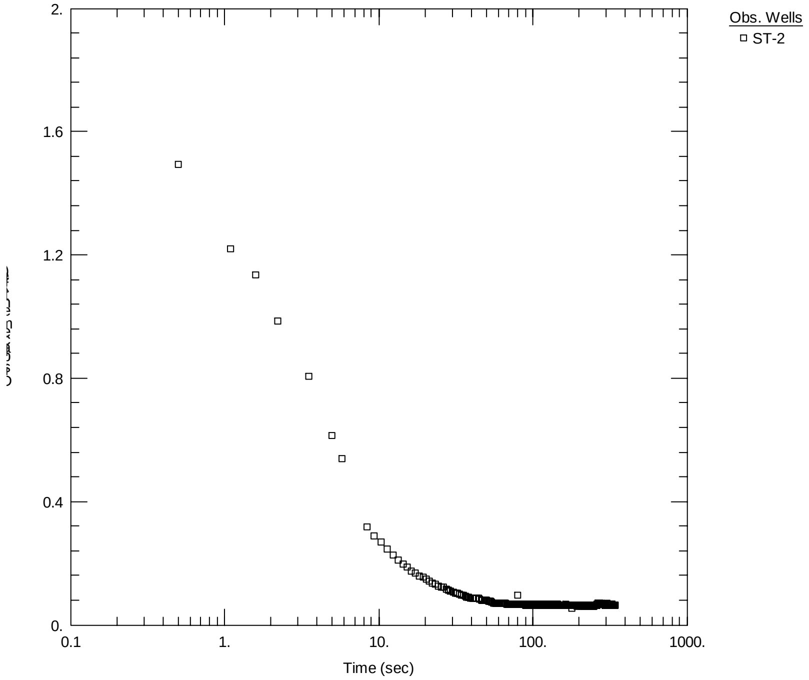


Slug-In Test at ST-1 (Test # 2)

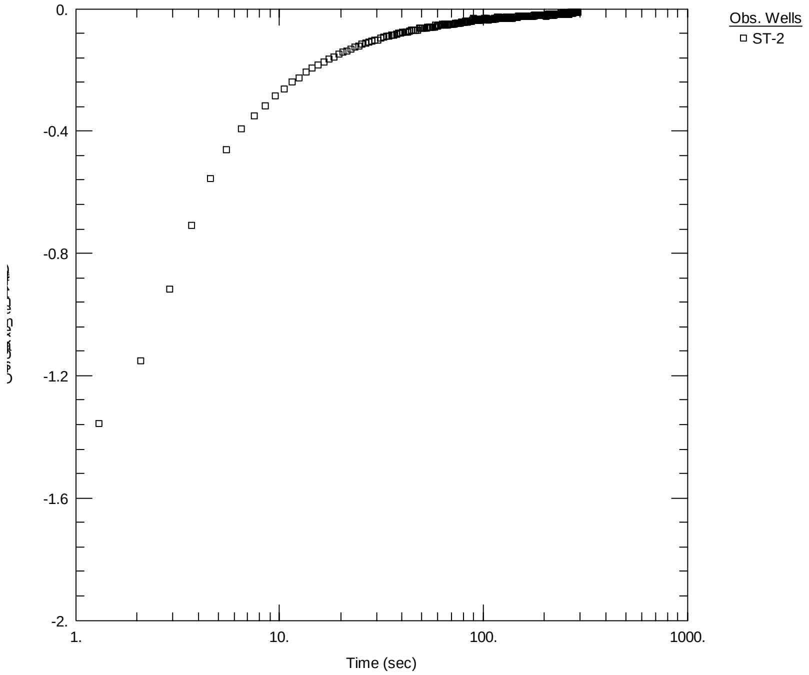


Slug-Out Test at ST-1 (Test # 2)

Figure A7-23. Slug-In and Slug-Out Test Results at ST-1 (Test #2)

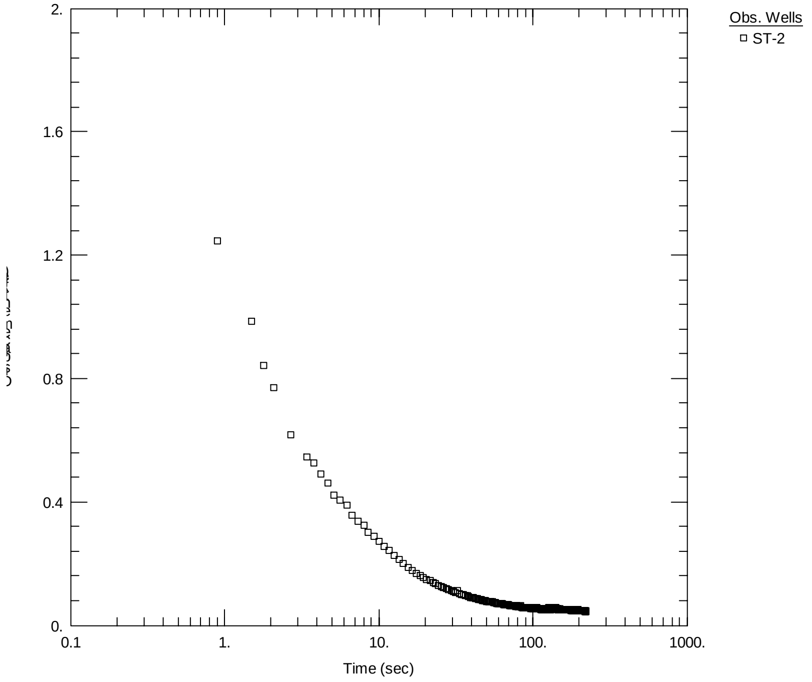


Slug-In Test at ST-2 (Test # 1)

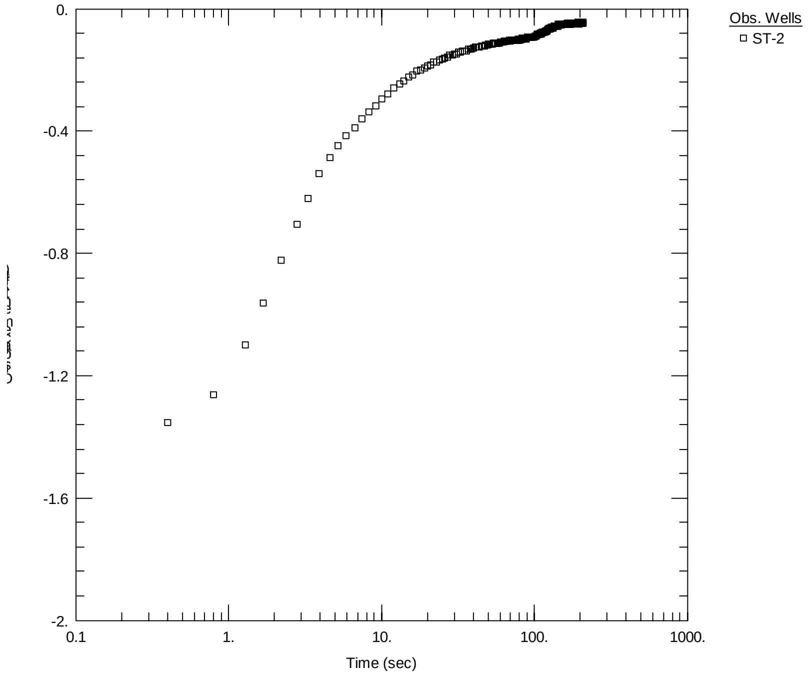


Slug-Out Test at ST-2 (Test # 1)

Figure A7-24. Slug-In and Slug-Out Test Results at ST-2 (Test #1)

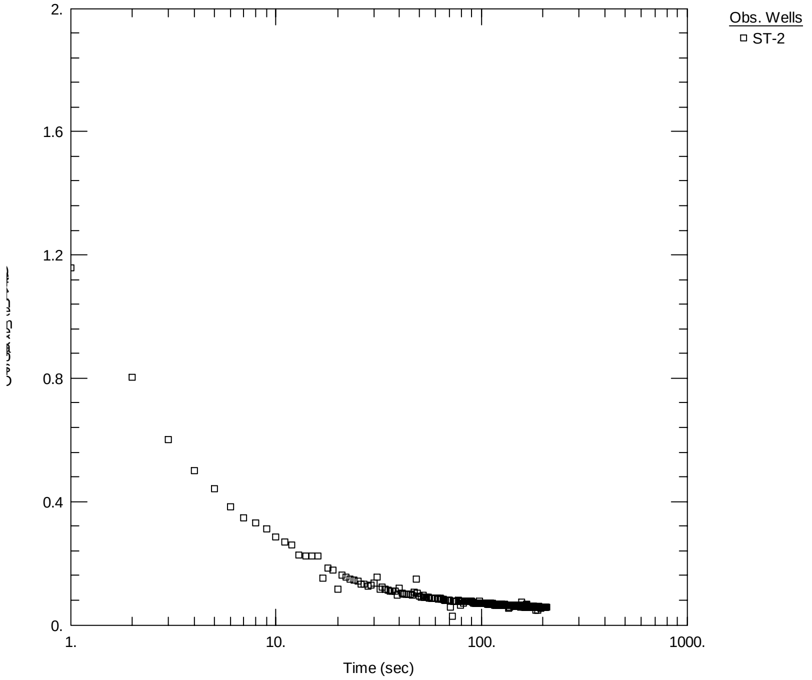


Slug-In Test at ST-2 (Test # 2)

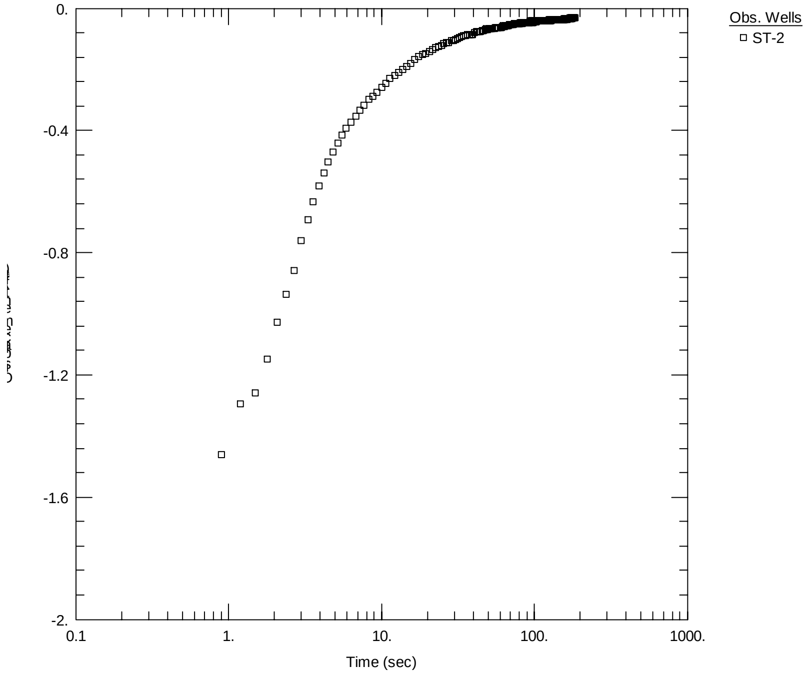


Slug-Out Test at ST-2 (Test # 2)

Figure A7-25. Slug-In and Slug-Out Test Results at ST-2 (Test #2)

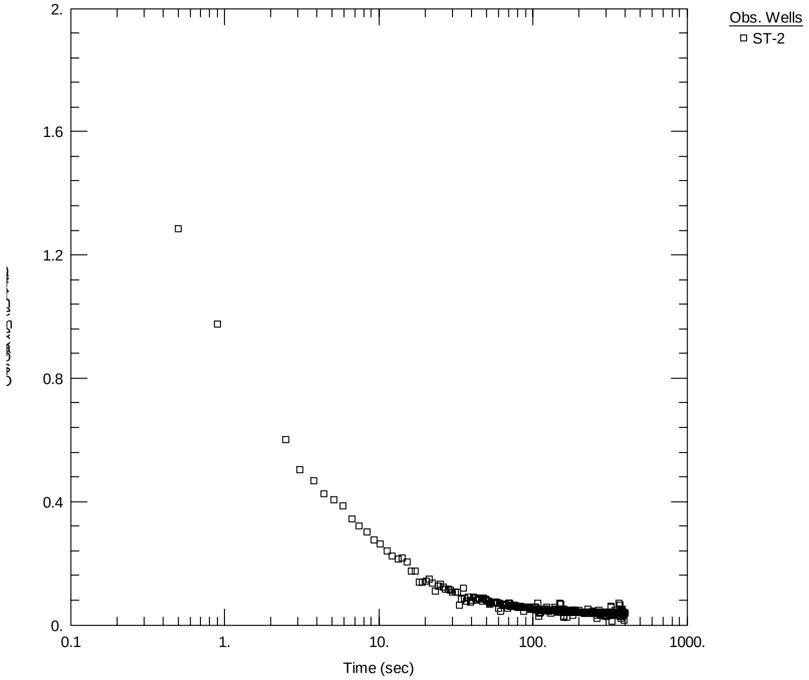


Slug-In Test at ST-2 (Test # 3)

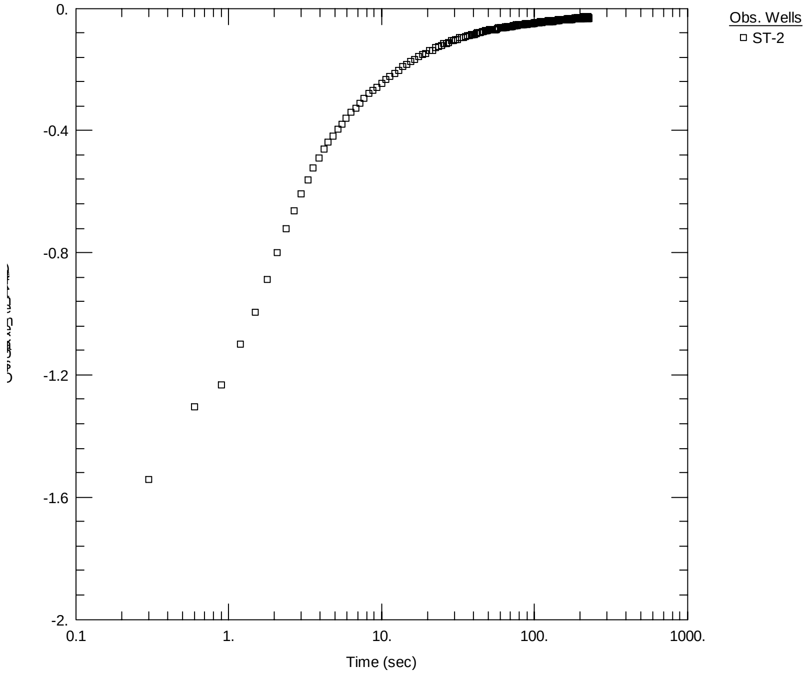


Slug-Out Test at ST-2 (Test # 3)

Figure A7-26. Slug-In and Slug-Out Test Results at ST-2 (Test #3)

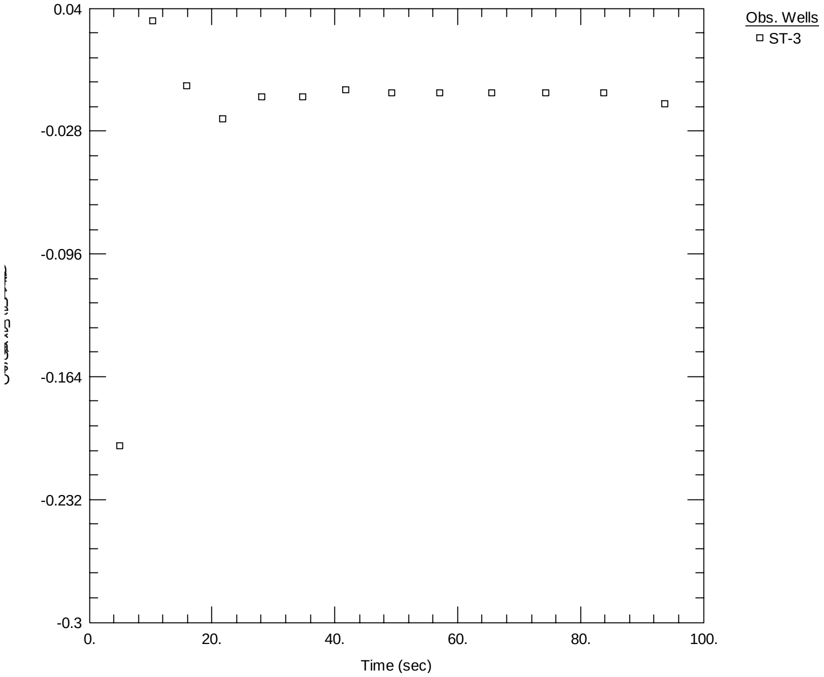


Slug-In Test at ST-2 (Test # 4)

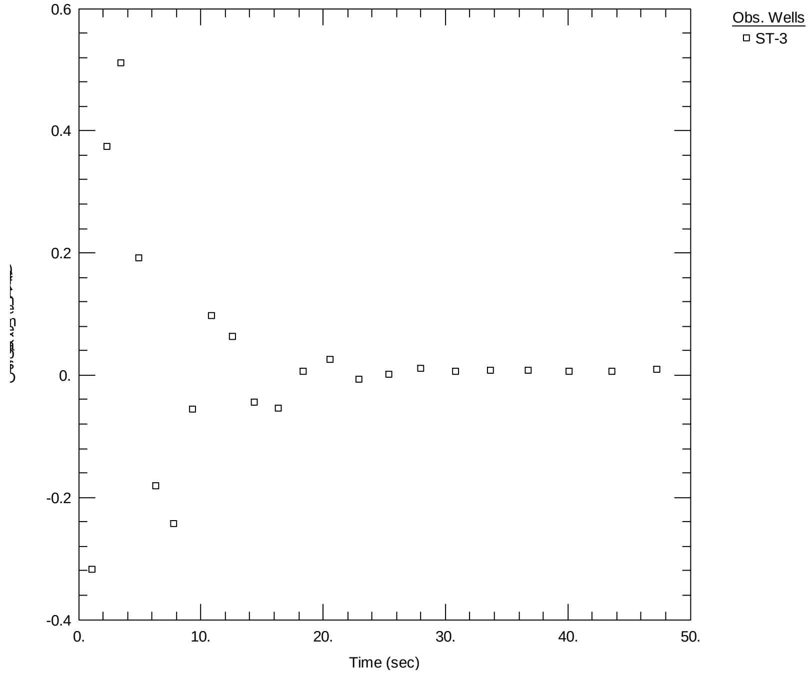


Slug-Out Test at ST-2 (Test # 4)

Figure A7-27. Slug-In and Slug-Out Test Results at ST-2 (Test #4)

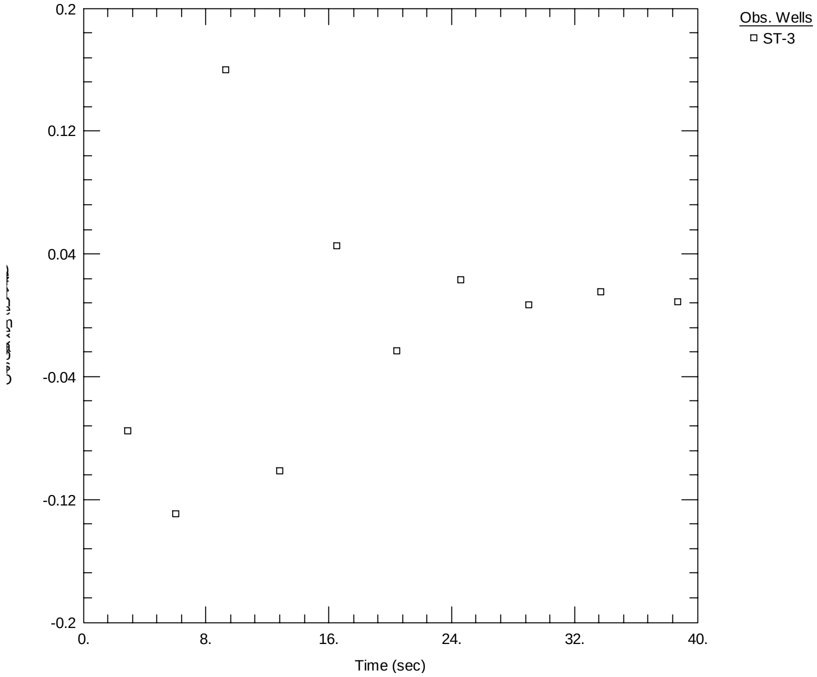


Slug-In Test at ST-3 (Test # 1)

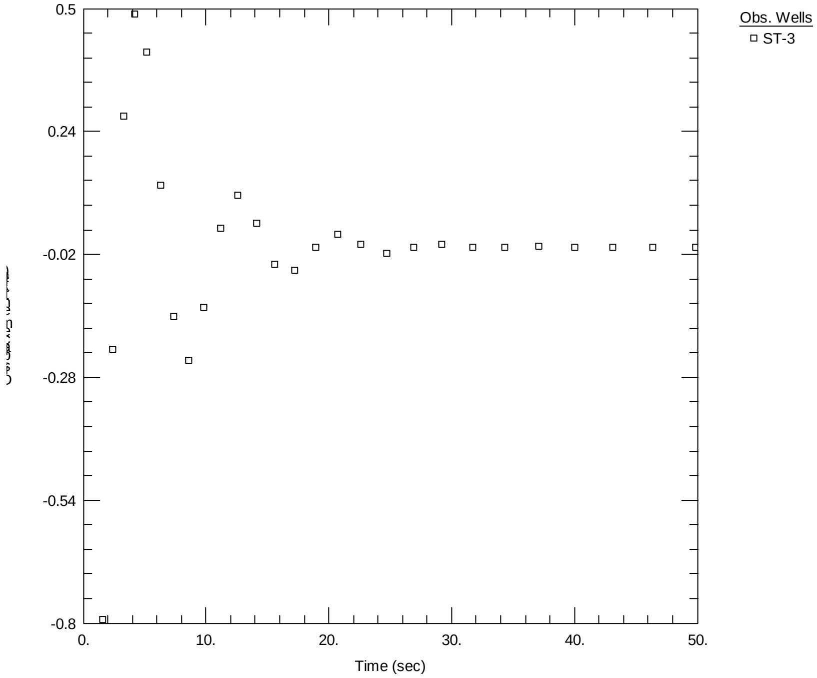


Slug-Out Test at ST-3 (Test # 1)

Figure A7-28. Slug-In and Slug-Out Test Results at ST-3 (Test #1)

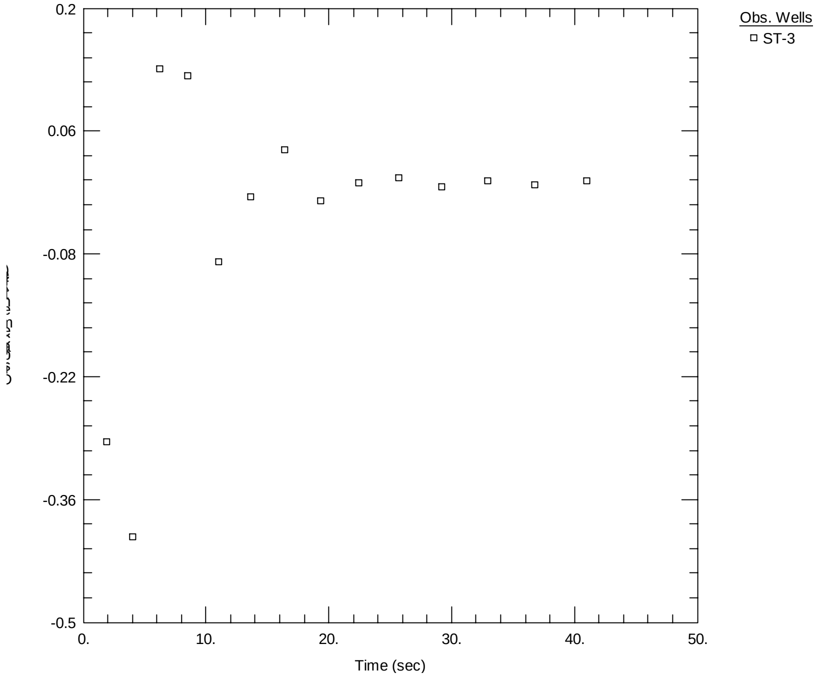


Slug-In Test at ST-3 (Test # 2)

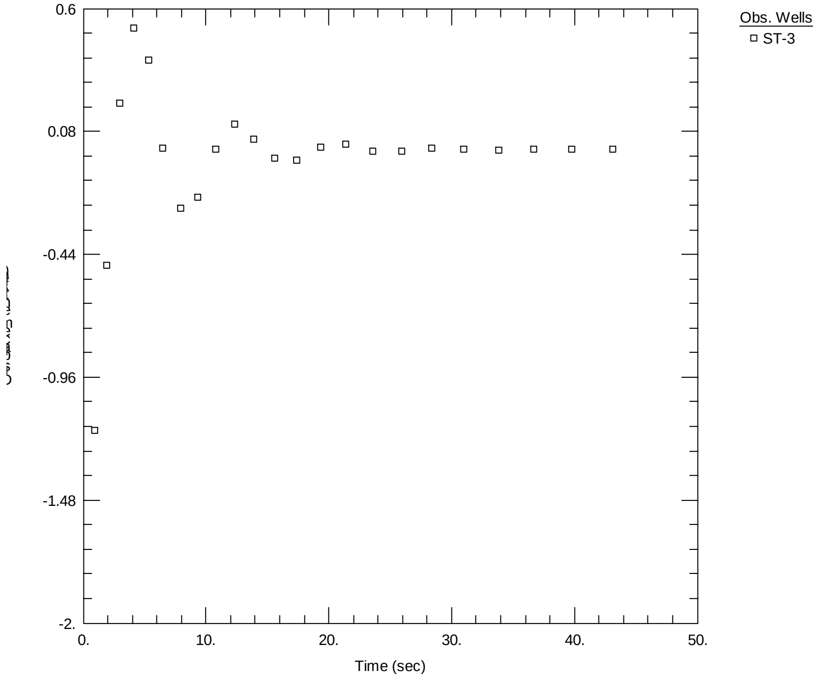


Slug-Out Test at ST-3 (Test # 2)

Figure A7-29. Slug-In and Slug-Out Test Results at ST-3 (Test #2)

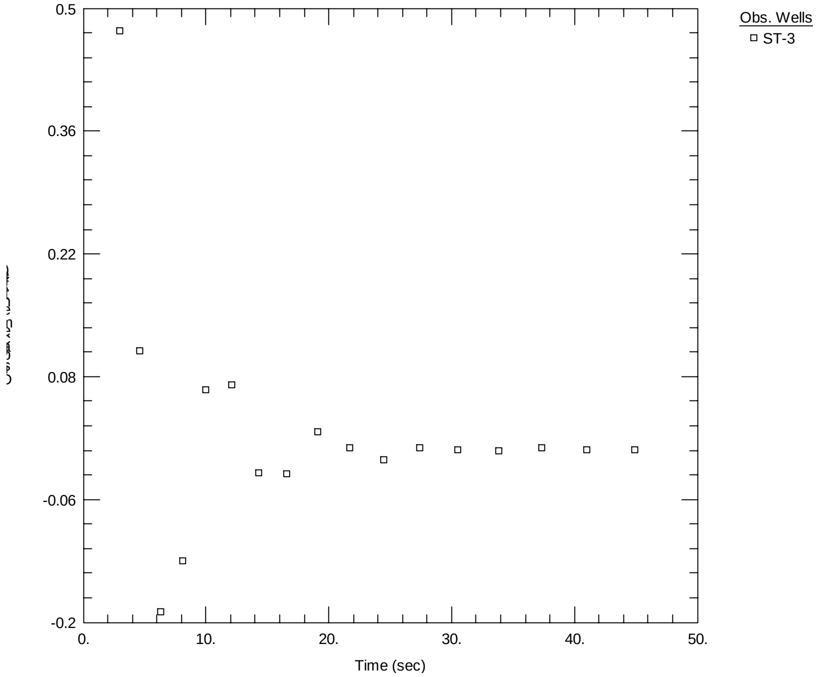


Slug-In Test at ST-3 (Test # 3)

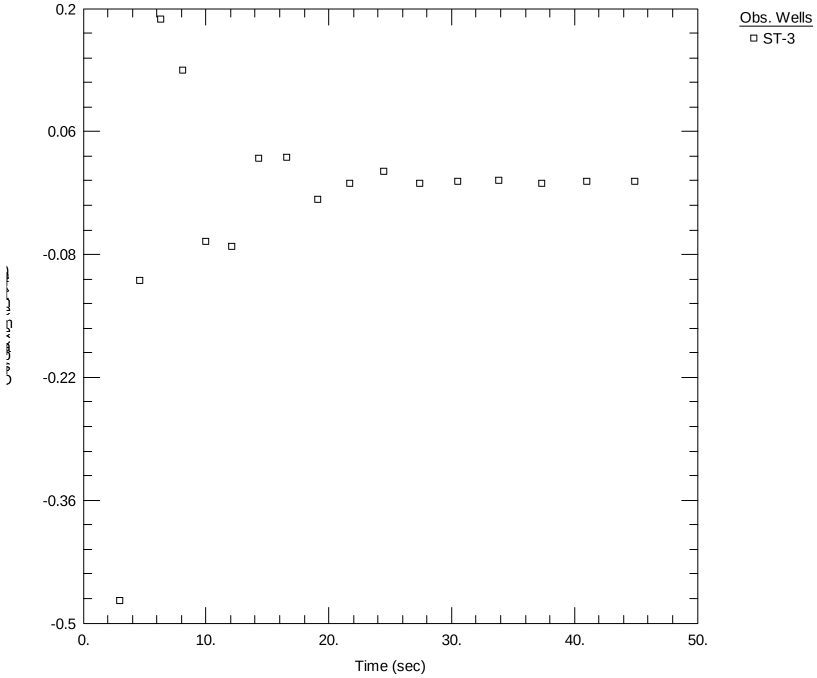


Slug-Out Test at ST-3 (Test # 3)

Figure A7-30. Slug-In and Slug-Out Test Results at ST-3 (Test #3)

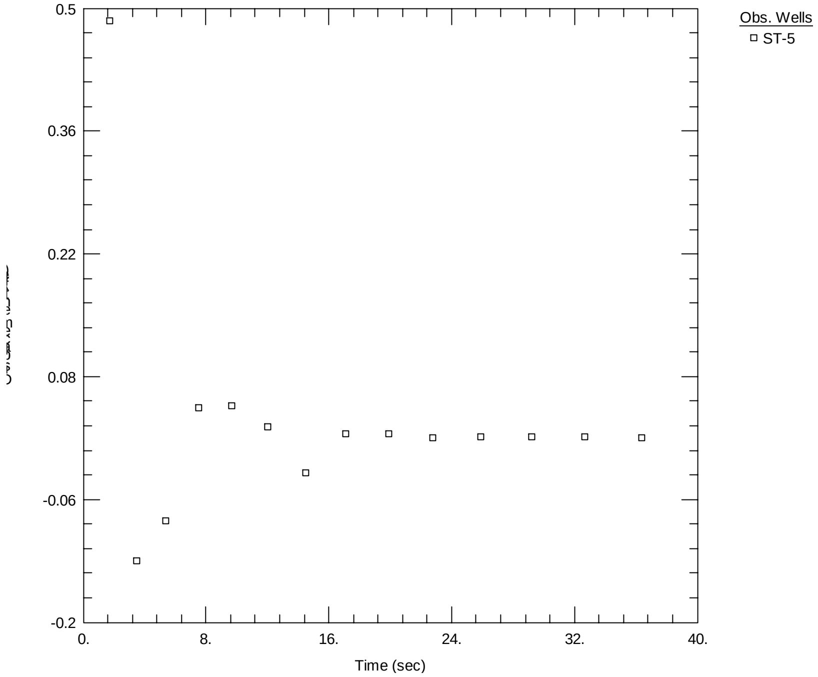


Slug-In Test at ST-3 (Test # 4)

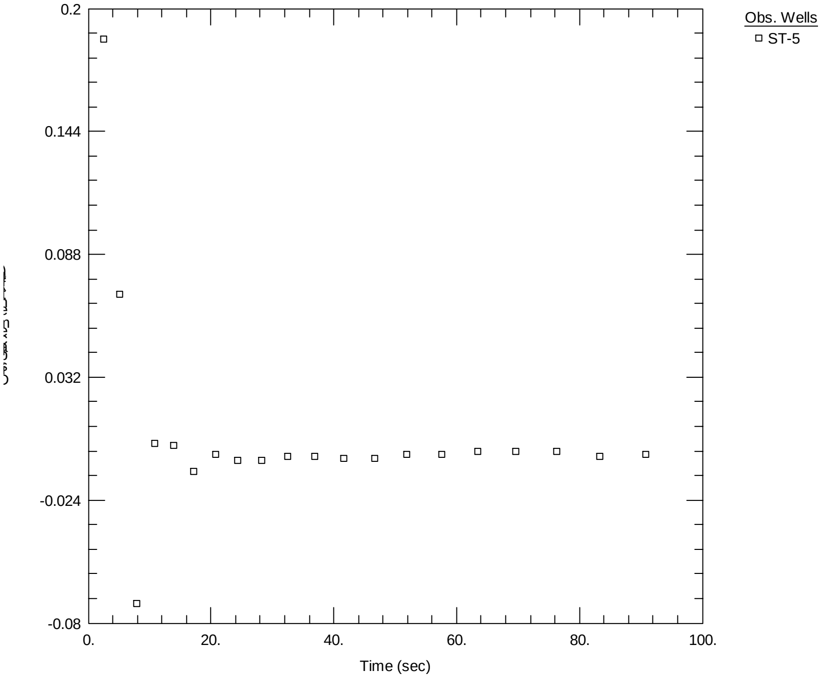


Slug-Out Test at ST-3 (Test # 4)

Figure A7-31. Slug-In and Slug-Out Test Results at ST-3 (Test #4)

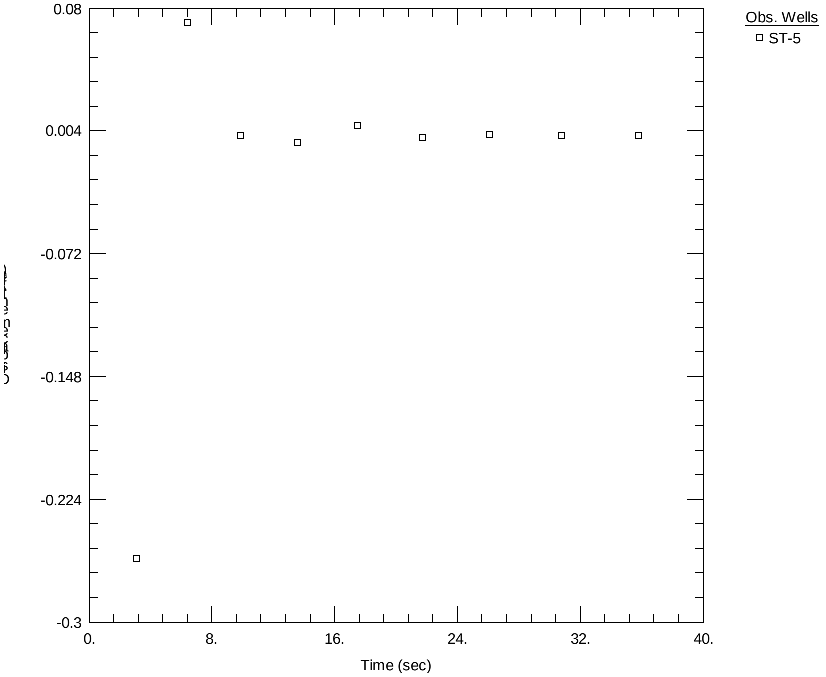


Slug-In Test at ST-5 (Test # 1)

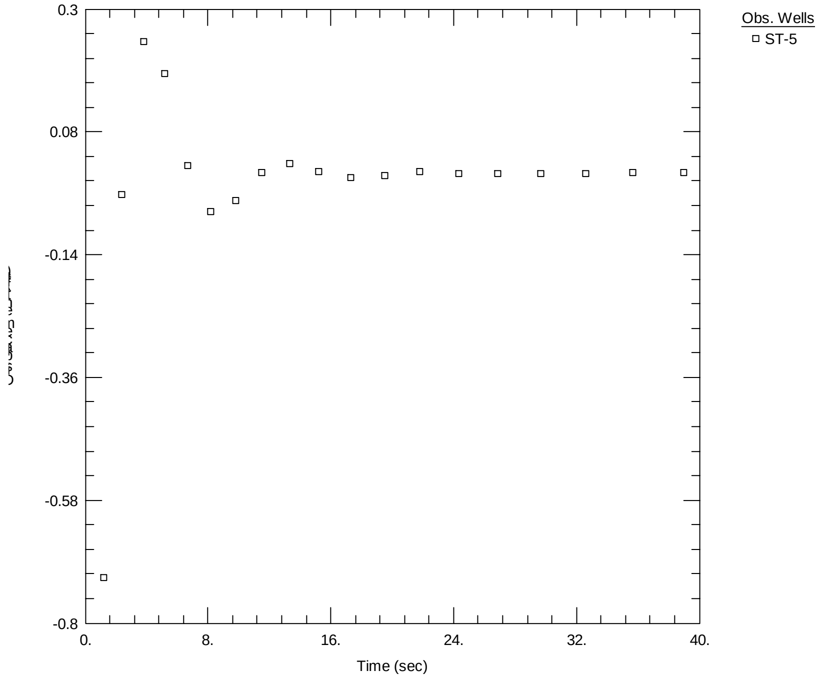


Slug-Out Test at ST-5 (Test # 1)

Figure A7-32. Slug-In and Slug-Out Test Results at ST-5 (Test #1)

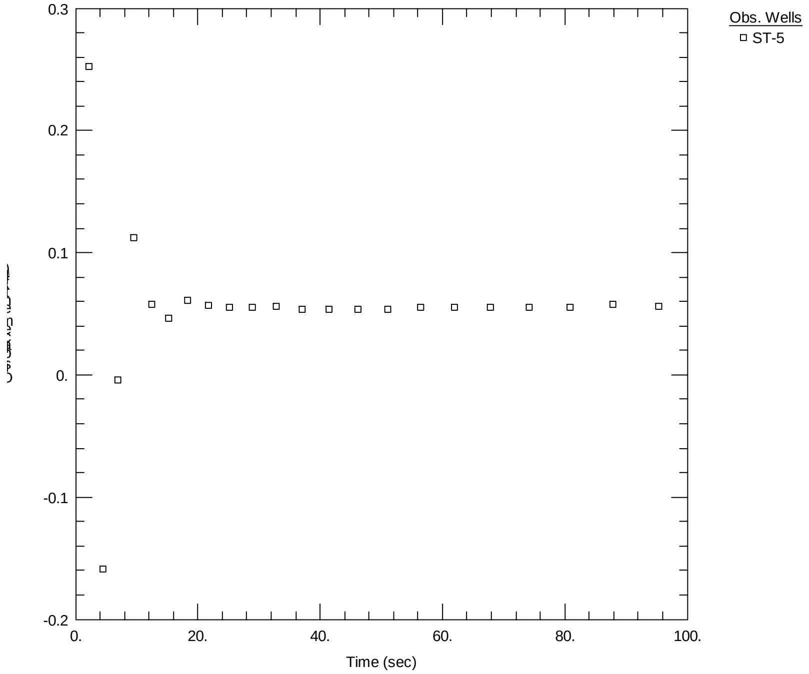


Slug-In Test at ST-5 (Test # 2)

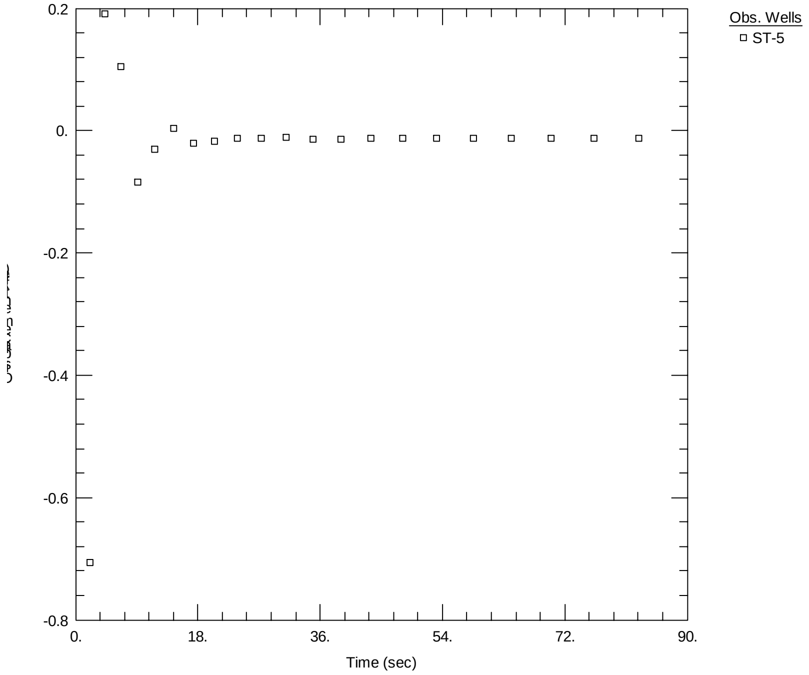


Slug-Out Test at ST-5 (Test # 2)

Figure A7-33. Slug-In and Slug-Out Test Results at ST-5 (Test #2)

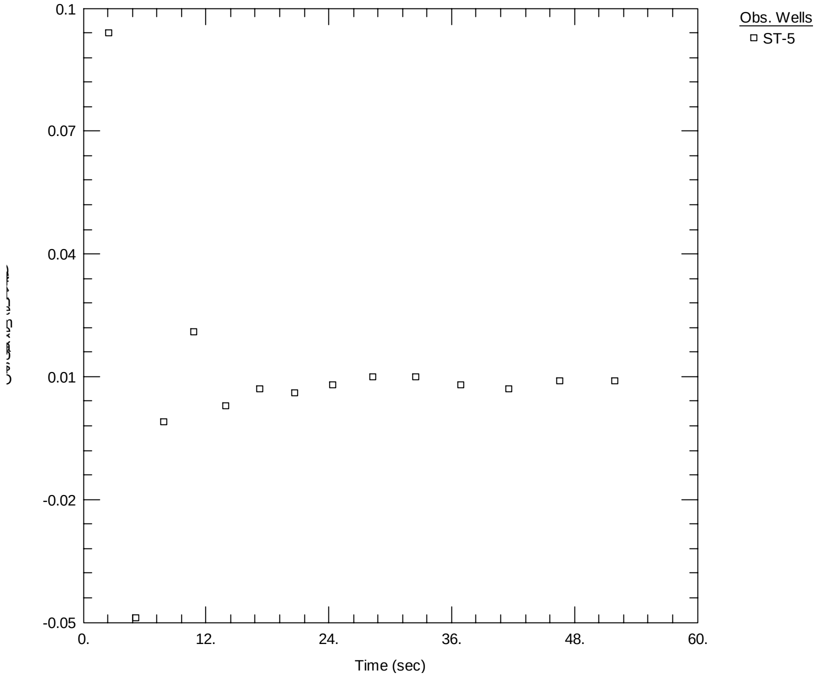


Slug-In Test at ST-5 (Test # 3)

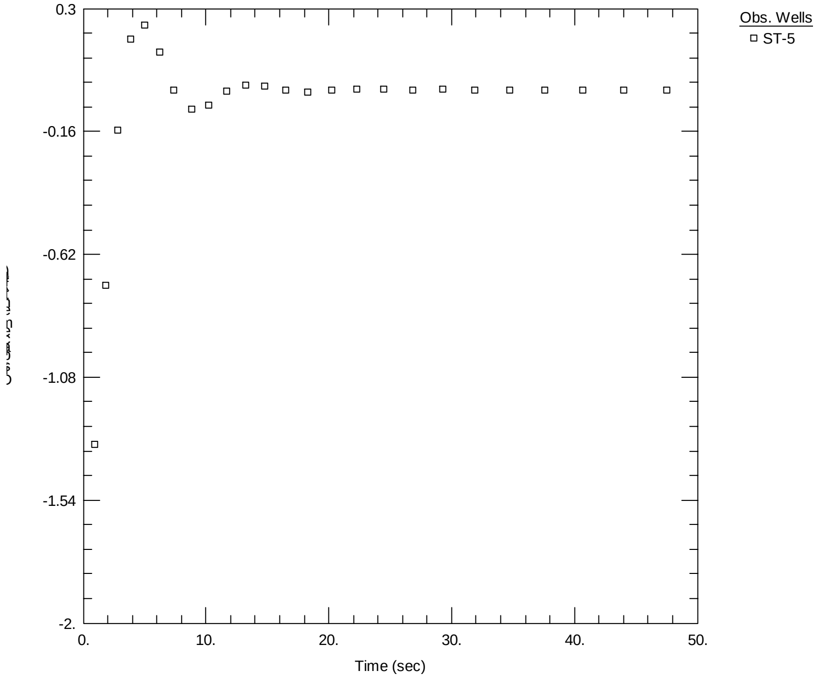


Slug-Out Test at ST-5 (Test # 3)

Figure A7-34. Slug-In and Slug-Out Test Results at ST-5 (Test #3)

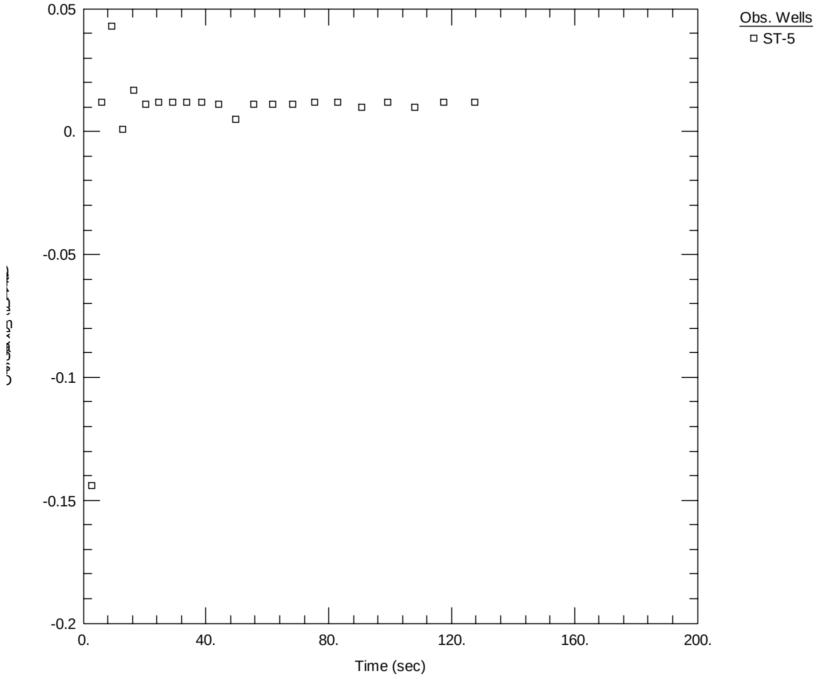


Slug-In Test at ST-5 (Test # 4)



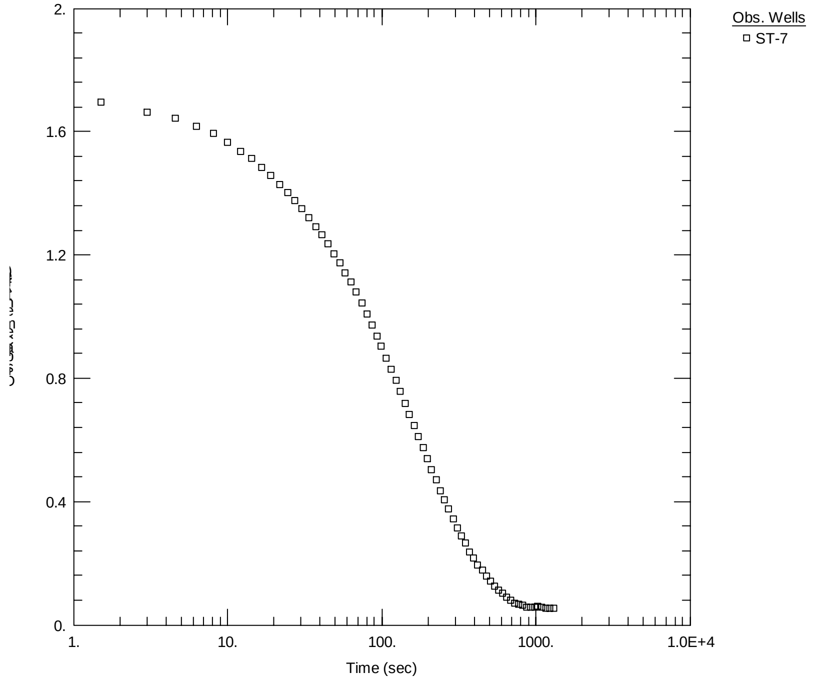
Slug-Out Test at ST-5 (Test # 4)

Figure A7-35. Slug-In and Slug-Out Test Results at ST-5 (Test #4)

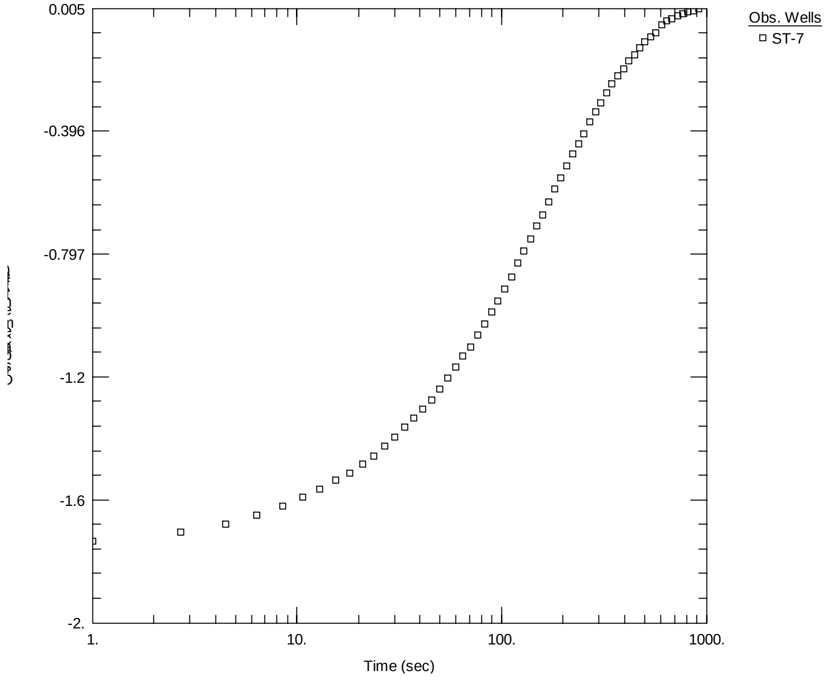


Slug-In Test at ST-5 (Test # 5)

Figure A7-36. Slug-In Test Results at ST-5 (Test #5)

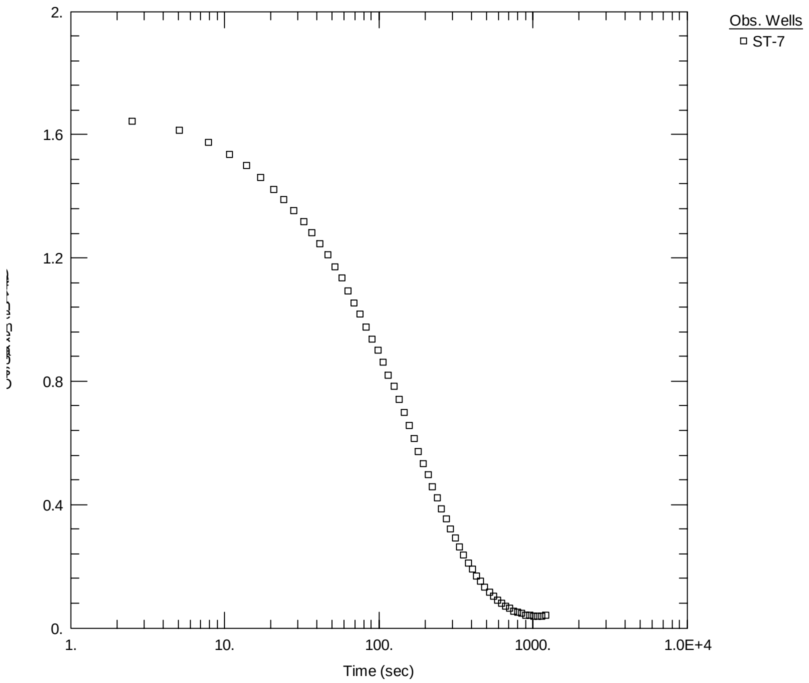


Slug-In Test at ST-7 (Test # 1)

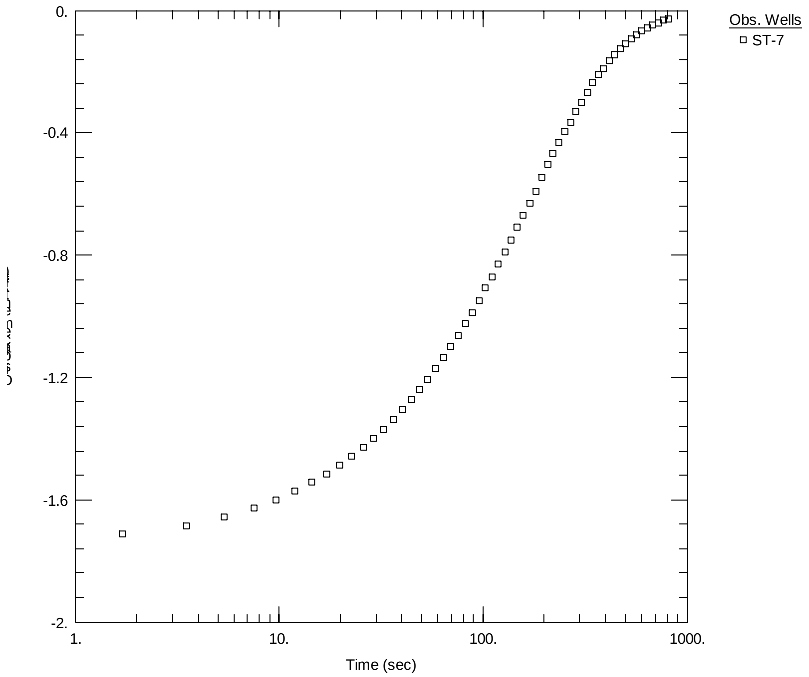


Slug-Out Test at ST-7 (Test # 1)

Figure A7-37. Slug-In and Slug-Out Test Results at ST-7 (Test #1)

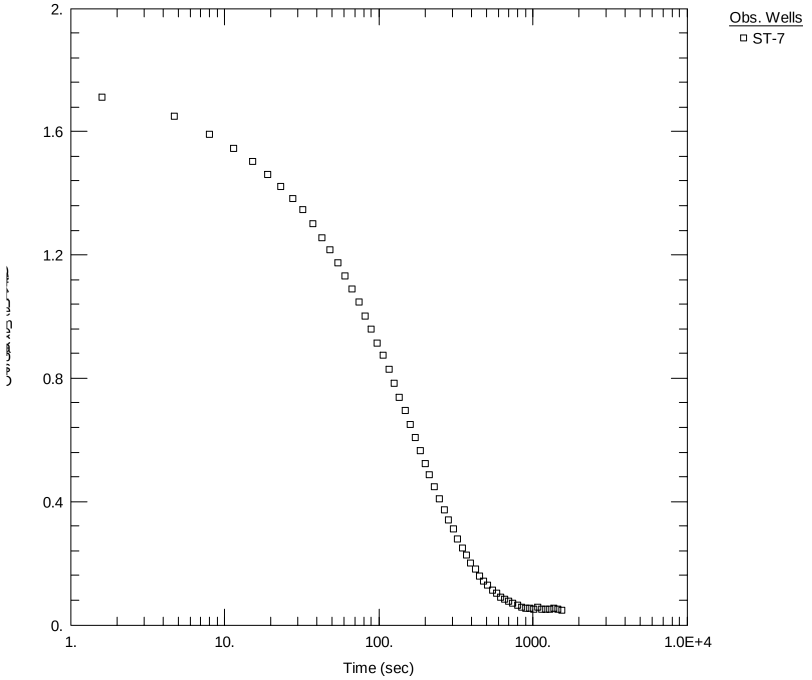


Slug-In Test at ST-7 (Test # 2)

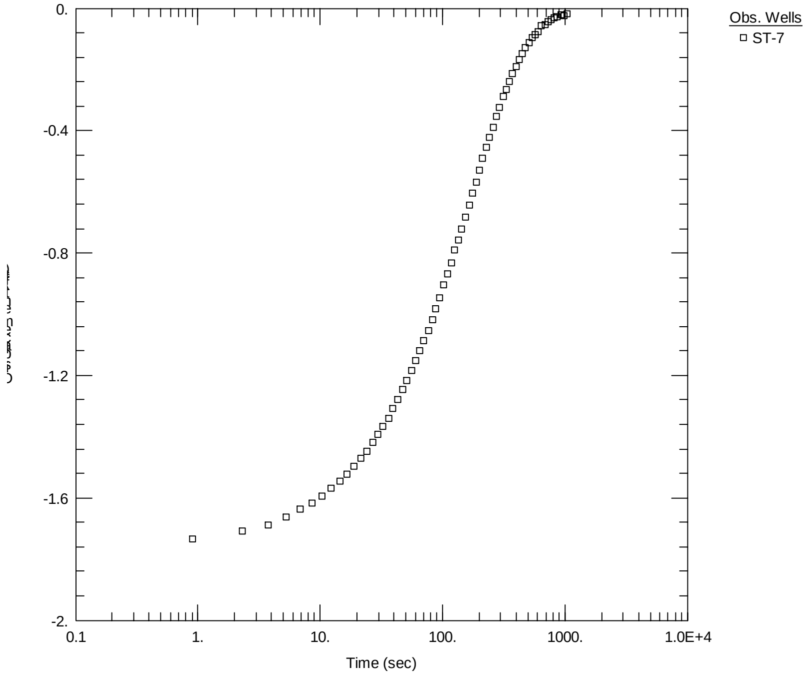


Slug-Out Test at ST-7 (Test # 2)

Figure A7-38. Slug-In and Slug-Out Test Results at ST-7 (Test #2)

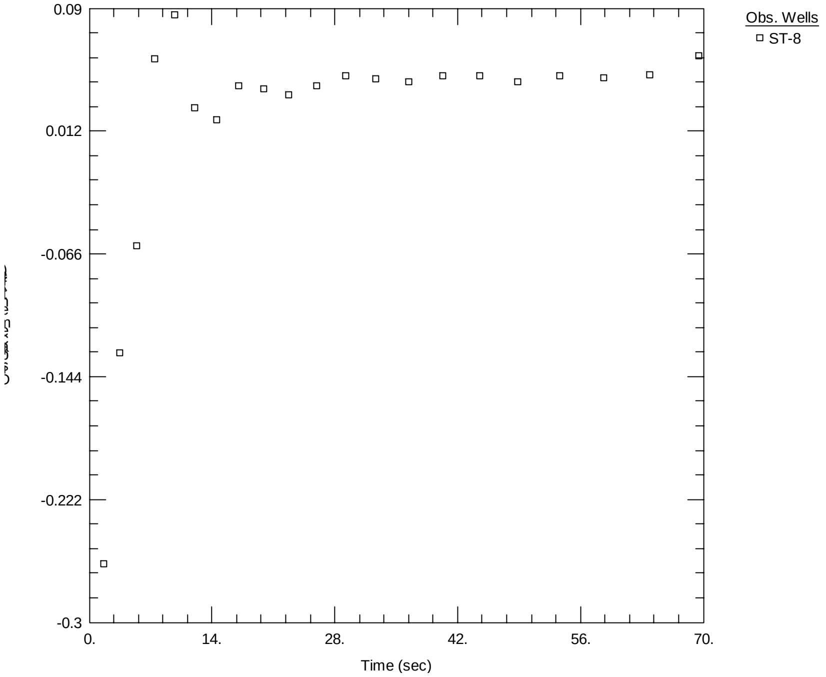


Slug-In Test at ST-7 (Test # 3)

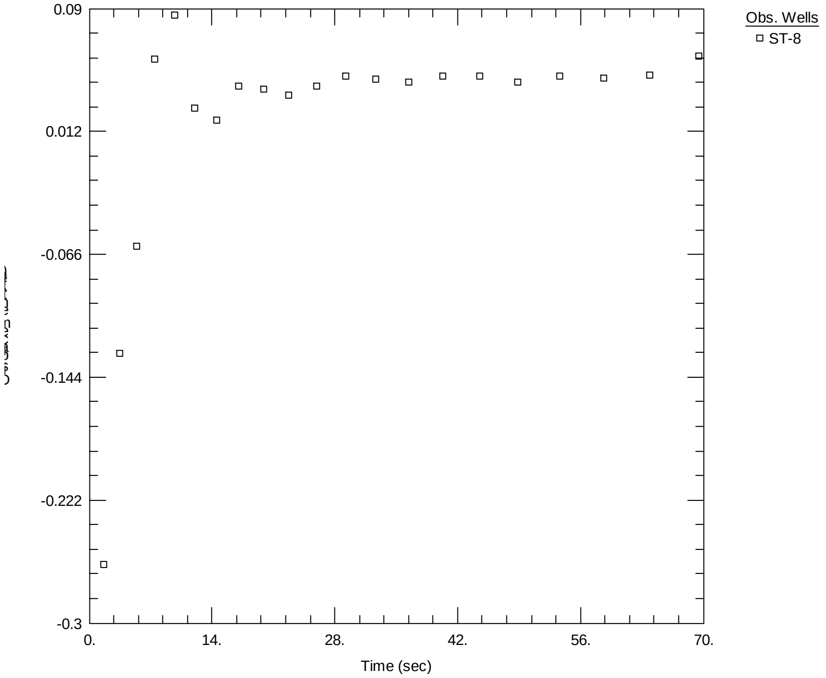


Slug-Out Test at ST-7 (Test # 3)

Figure A7-39. Slug-In and Slug-Out Test Results at ST-7 (Test #3)

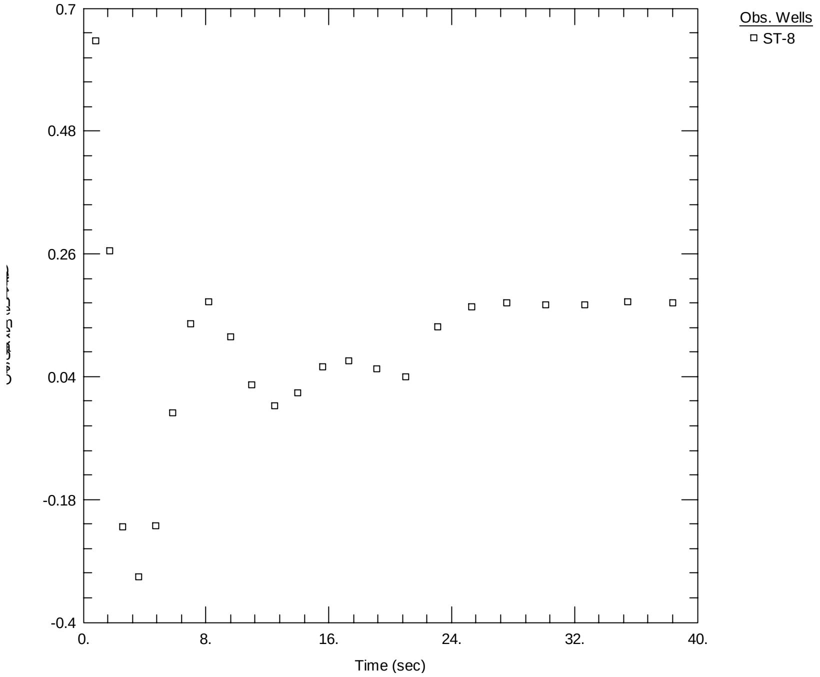


Slug-In Test at ST-8 (Test # 1)

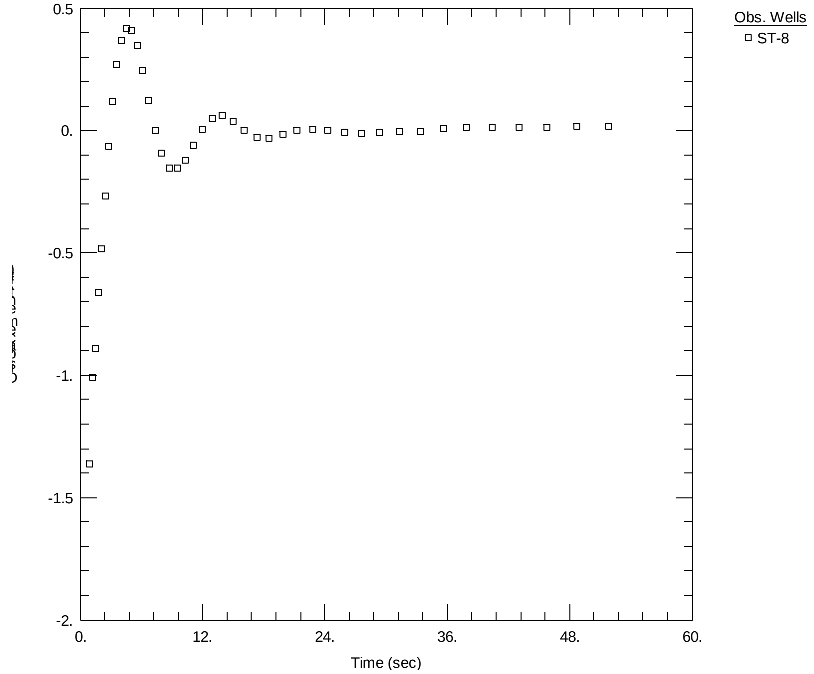


Slug-Out Test at ST-8 (Test # 1)

Figure A7-40. Slug-In and Slug-Out Test Results at ST-8 (Test #1)

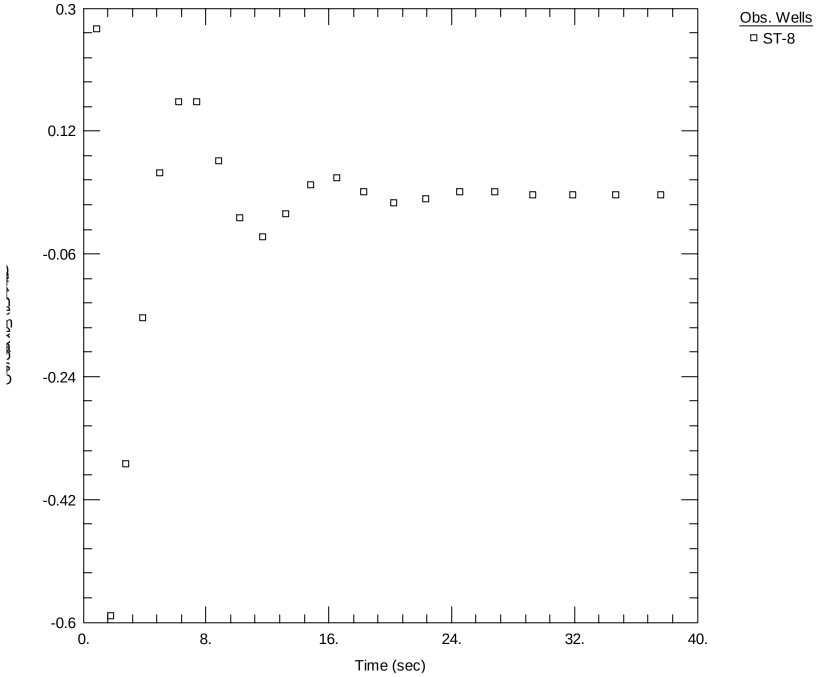


Slug-In Test at ST-8 (Test # 2)

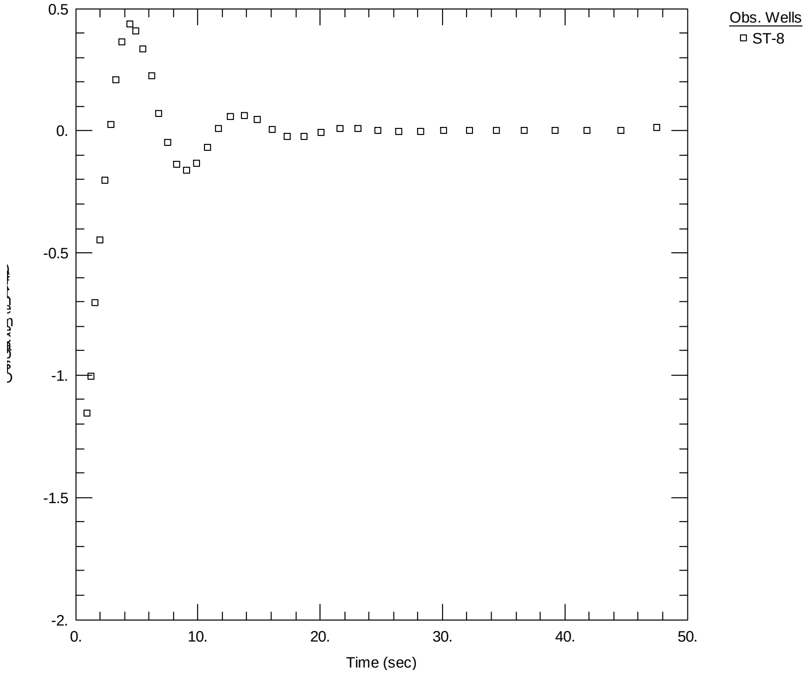


Slug-Out Test at ST-8 (Test # 2)

Figure A7-41. Slug-In and Slug-Out Test Results at ST-8 (Test #2)

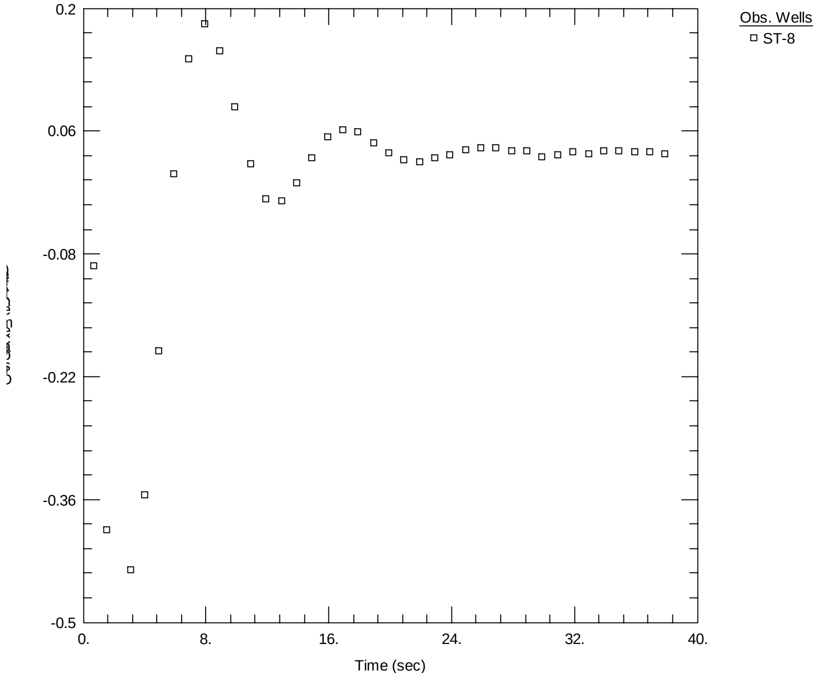


Slug-In Test at ST-8 (Test # 3)

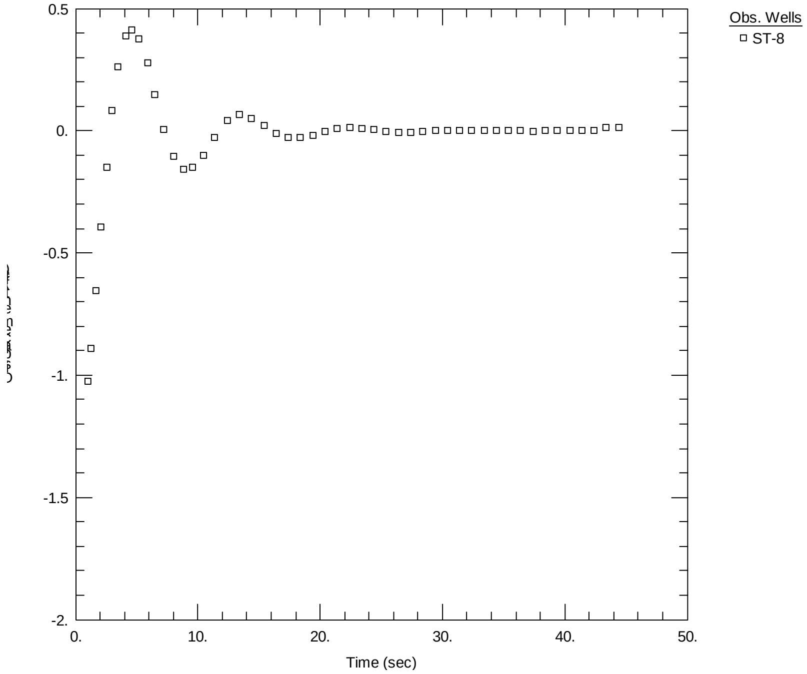


Slug-Out Test at ST-8 (Test # 3)

Figure A7-42. Slug-In and Slug-Out Test Results at ST-8 (Test #3)

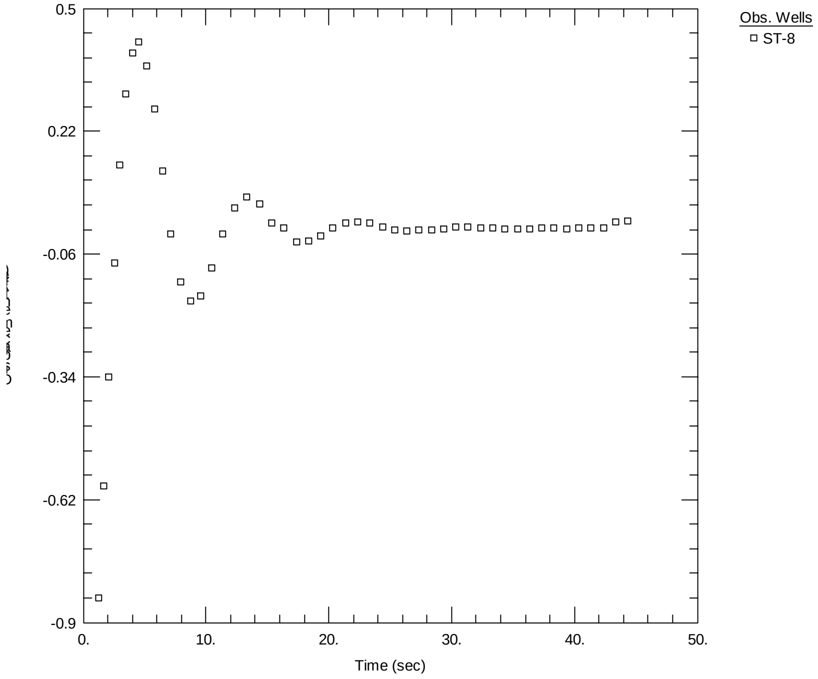


Slug-In Test at ST-8 (Test # 4)



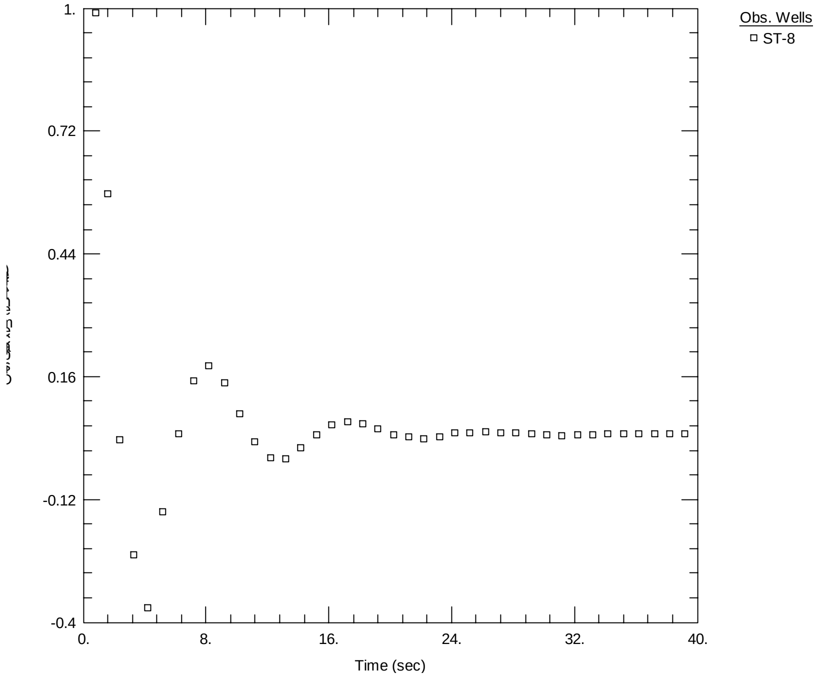
Slug-Out Test at ST-8 (Test # 4)

Figure A7-43. Slug-In and Slug-Out Test Results at ST-8 (Test #4)

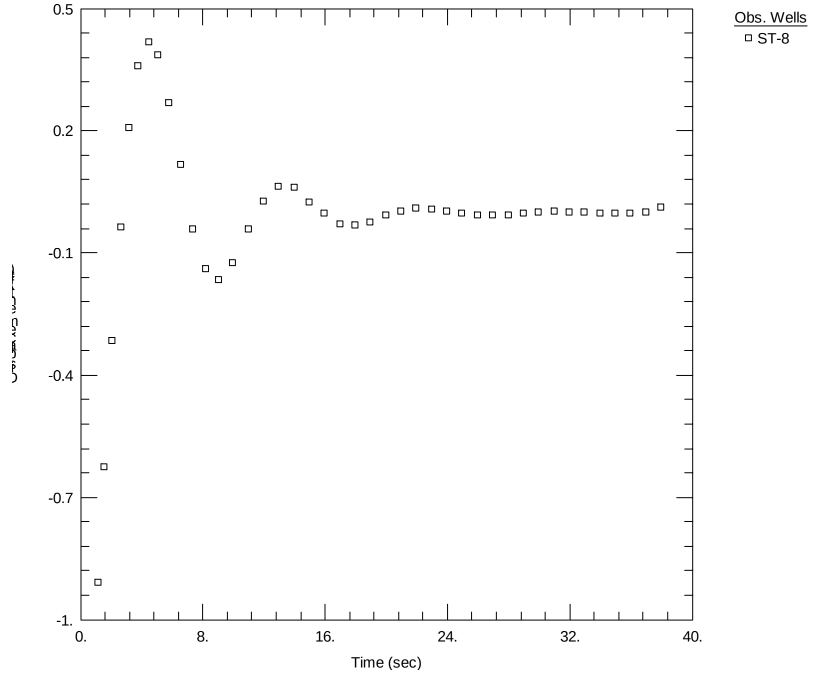


Slug-Out Test at ST-8 (Test # 5)

Figure A7-44. Slug-Out Test Results at ST-8 (Test #5)

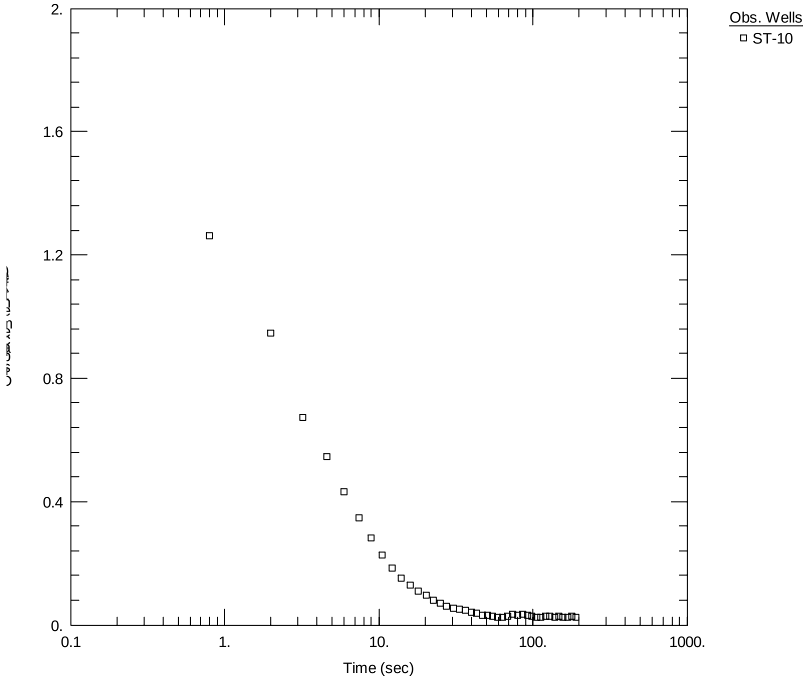


Slug-In Test at ST-8 (Test # 6)

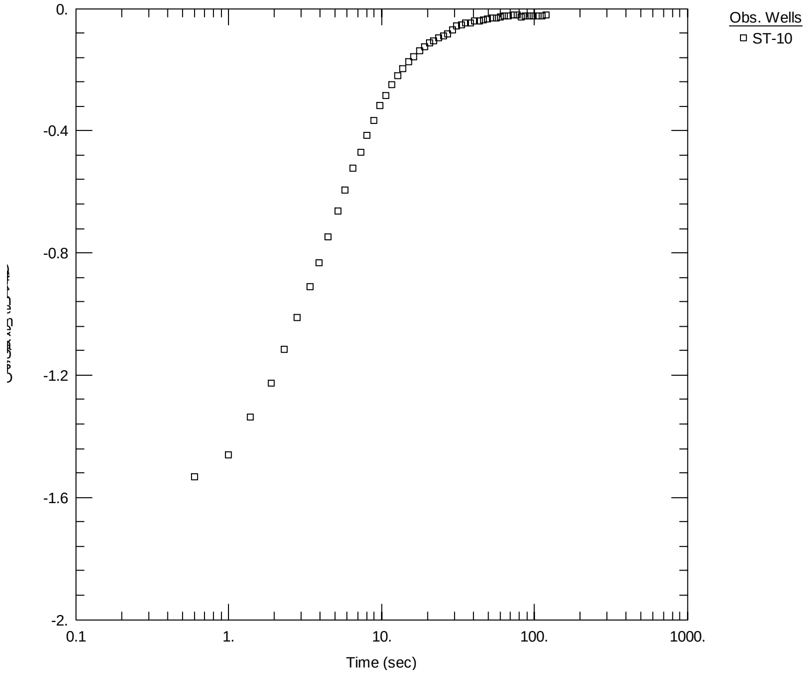


Slug-Out Test at ST-8 (Test # 6)

Figure A7-45. Slug-In and Slug-Out Results at ST-8 (Test #6)

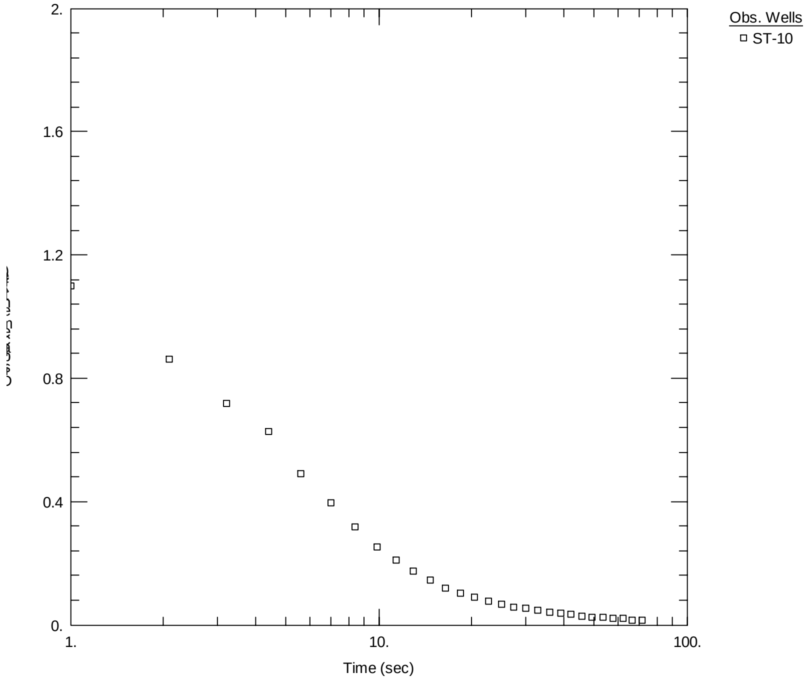


Slug-In Test at ST-10 (Test # 1)

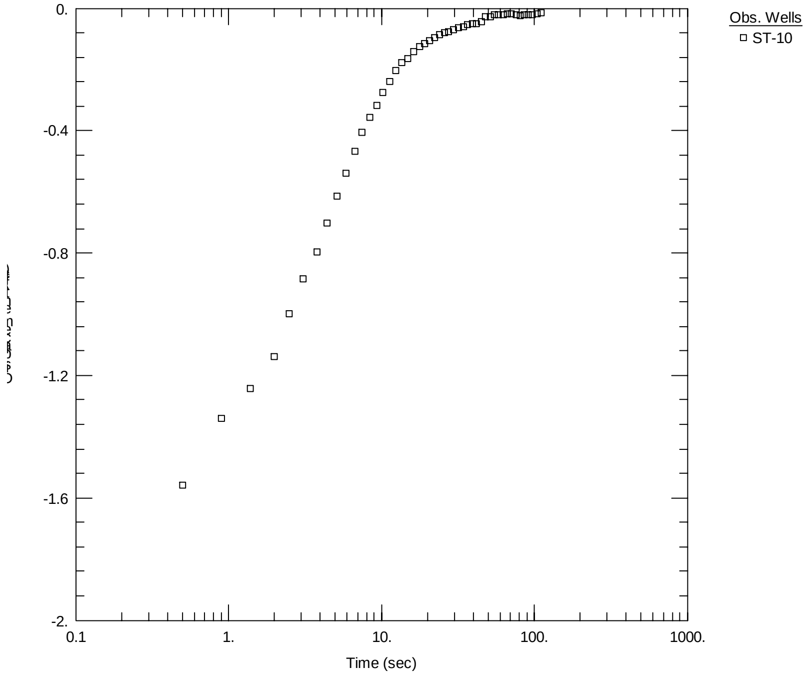


Slug-Out Test at ST-10 (Test # 1)

Figure A7-46. Slug-In and Slug-Out Test Results at ST-10 (Test #1)

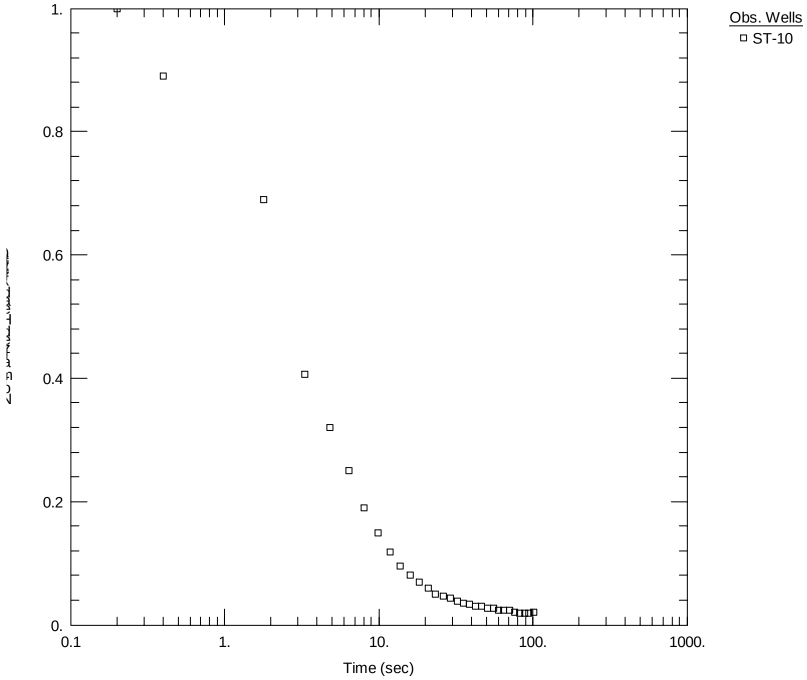


Slug-In Test at ST-10 (Test # 2)

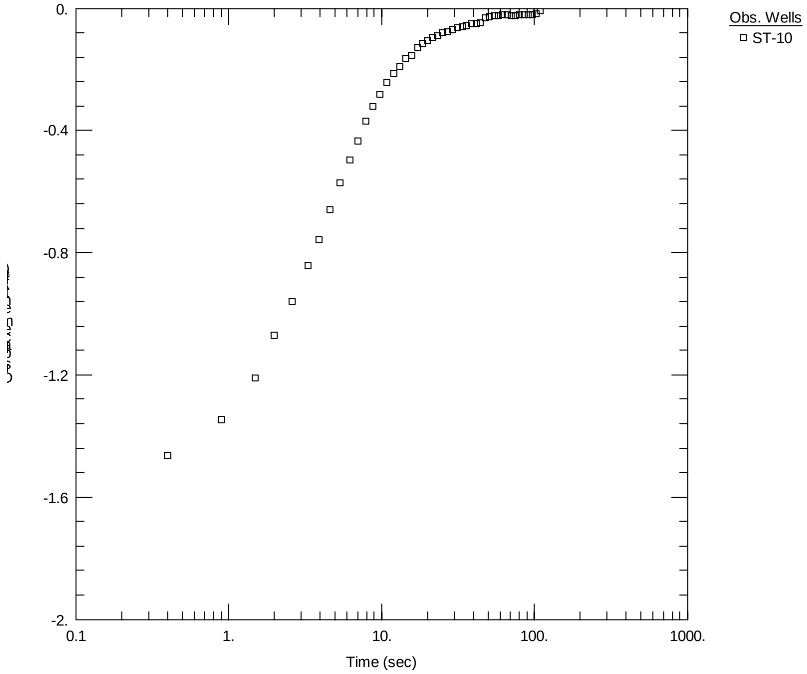


Slug-Out Test at ST-10 (Test # 2)

Figure A7-47. Slug-In and Slug-Out Test Results at ST-10 (Test #2)

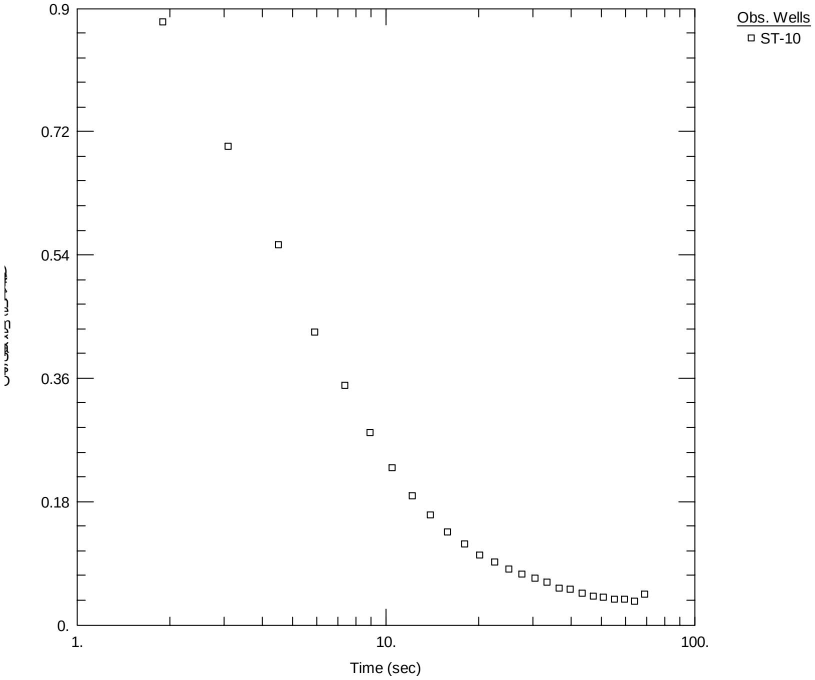


Slug-In Test at ST-10 (Test # 3)

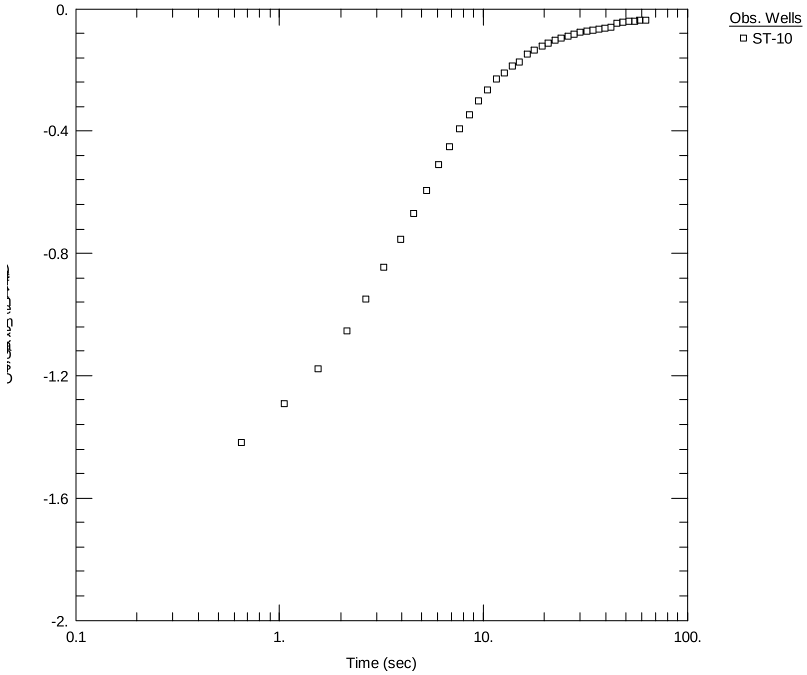


Slug-Out Test at ST-10 (Test # 3)

Figure A7-48. Slug-In and Slug-Out Test Results at ST-10 (Test #3)

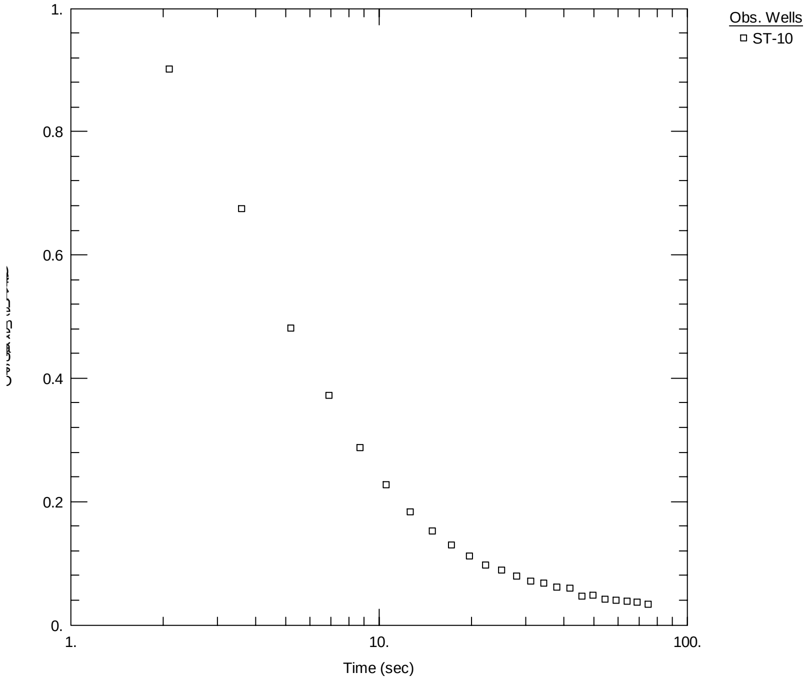


Slug-In Test at ST-10 (Test # 4)

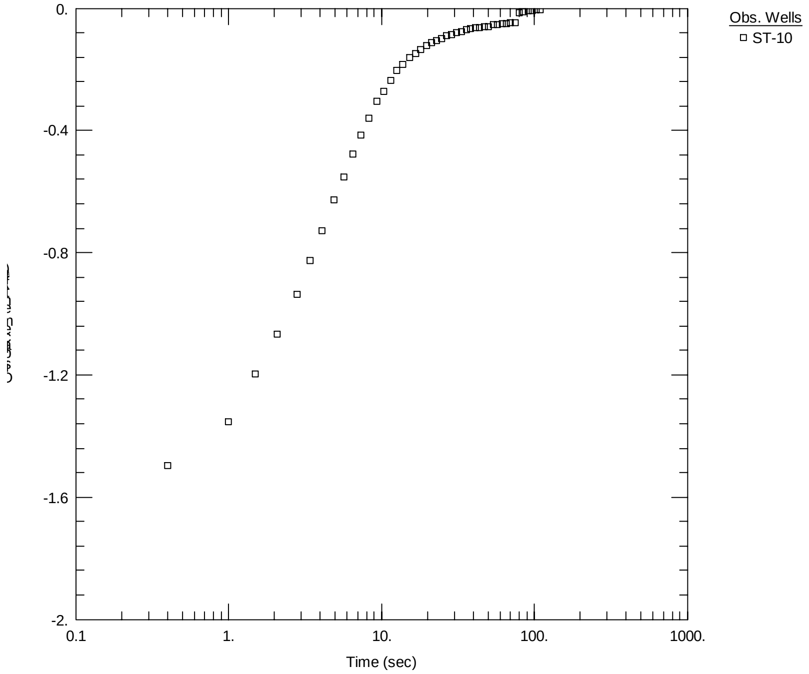


Slug-Out Test at ST-10 (Test # 4)

Figure A7-49. Slug-In and Slug-Out Test Results at ST-10 (Test #4)

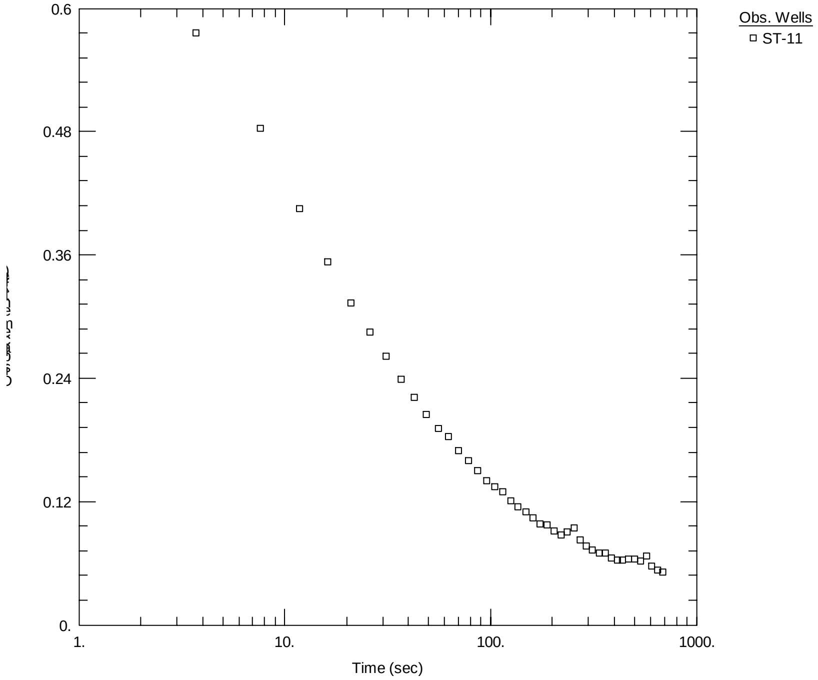


Slug-In Test at ST-10 (Test # 5)

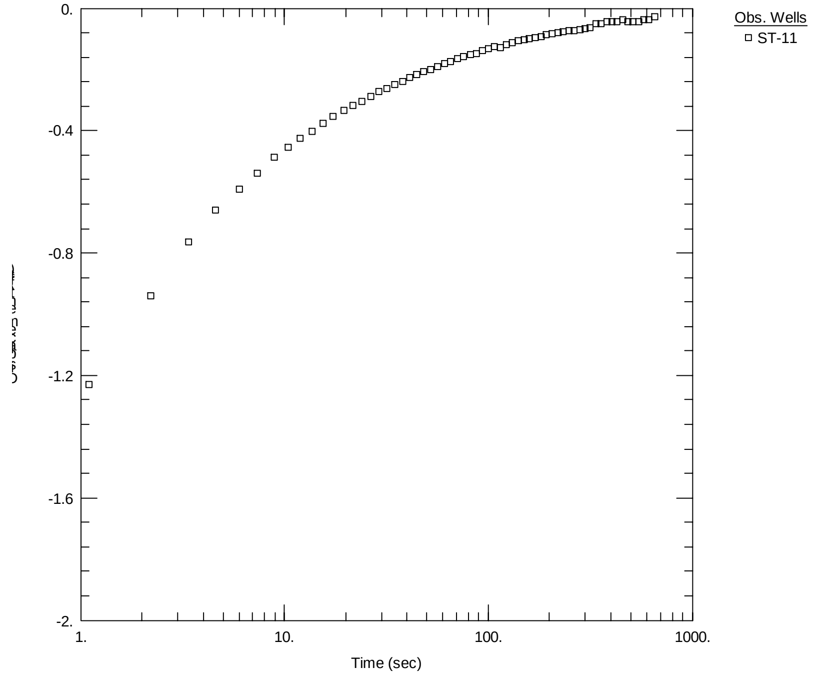


Slug-Out Test at ST-10 (Test # 5)

Figure A7-50. Slug-In and Slug-Out Test Results at ST-10 (Test #5)

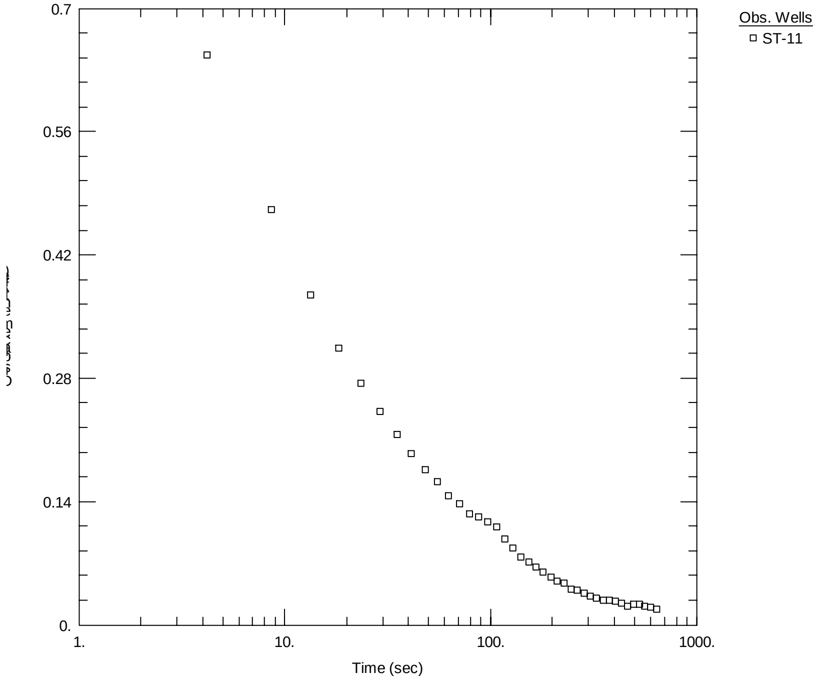


Slug-In Test at ST-11 (Test # 1)

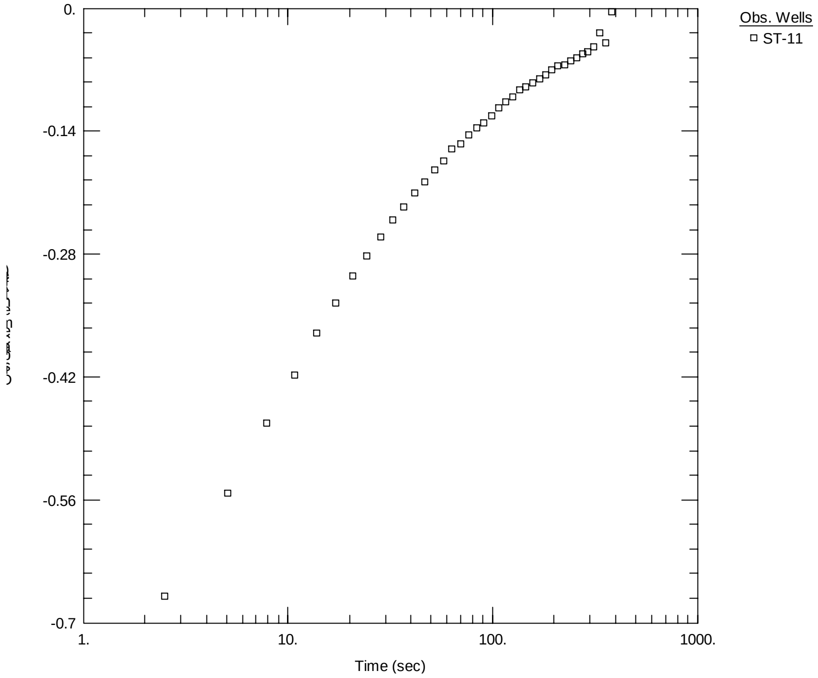


Slug-Out Test at ST-11 (Test # 1)

Figure A7-51. Slug-In and Slug-Out Test Results at ST-11 (Test #1)

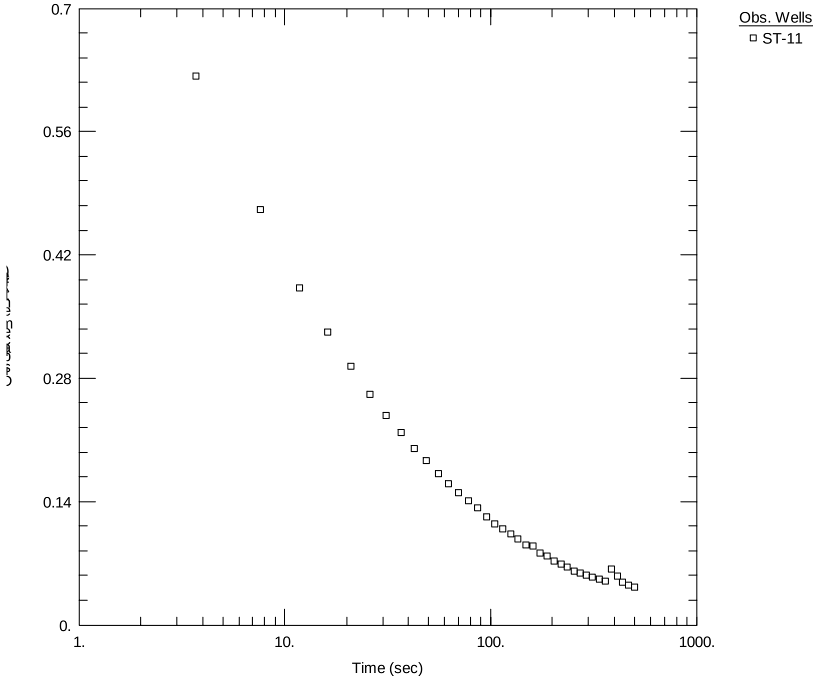


Slug-In Test at ST-11 (Test # 2)

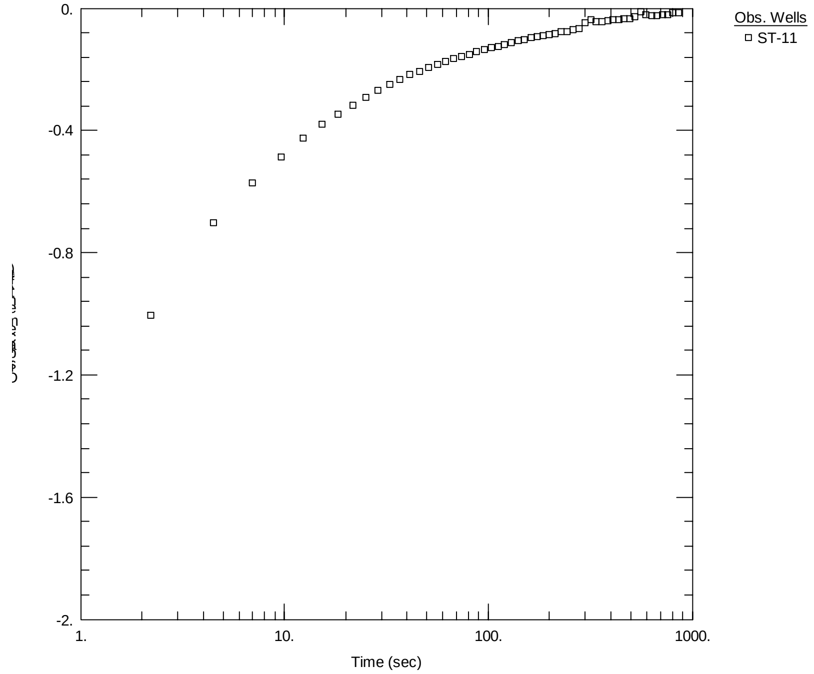


Slug-Out Test at ST-11 (Test # 2)

Figure A7-52. Slug-In and Slug-Out Test Results at ST-11 (Test #2)

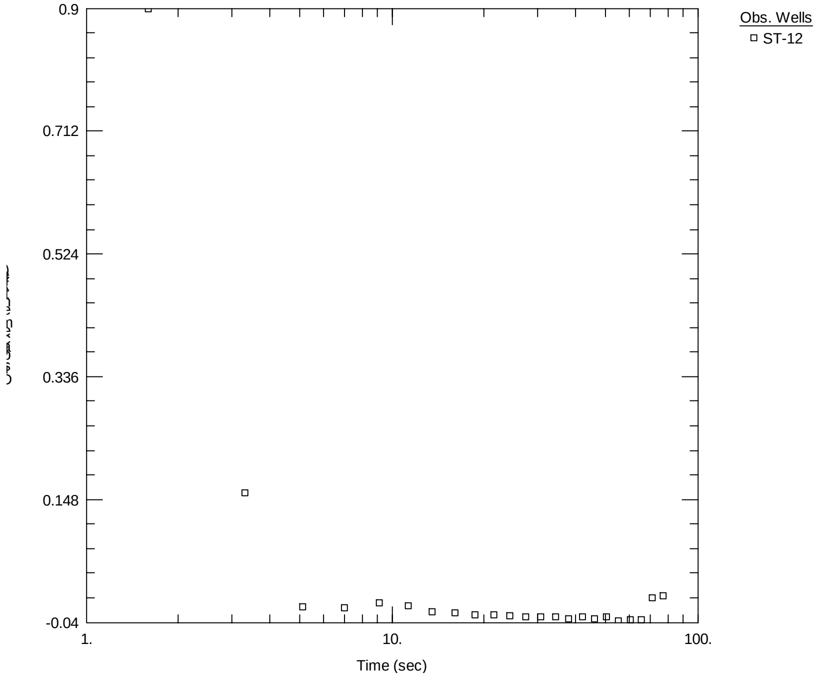


Slug-In Test at ST-11 (Test # 3)

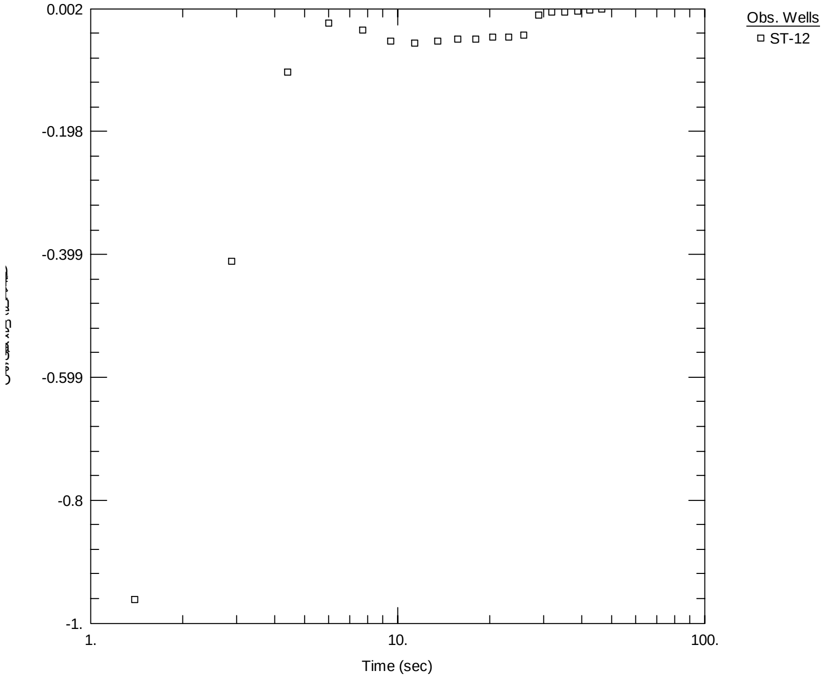


Slug-Out Test at ST-11 (Test # 3)

Figure A7-53. Slug-In and Slug-Out Test Results at ST-11 (Test #3)

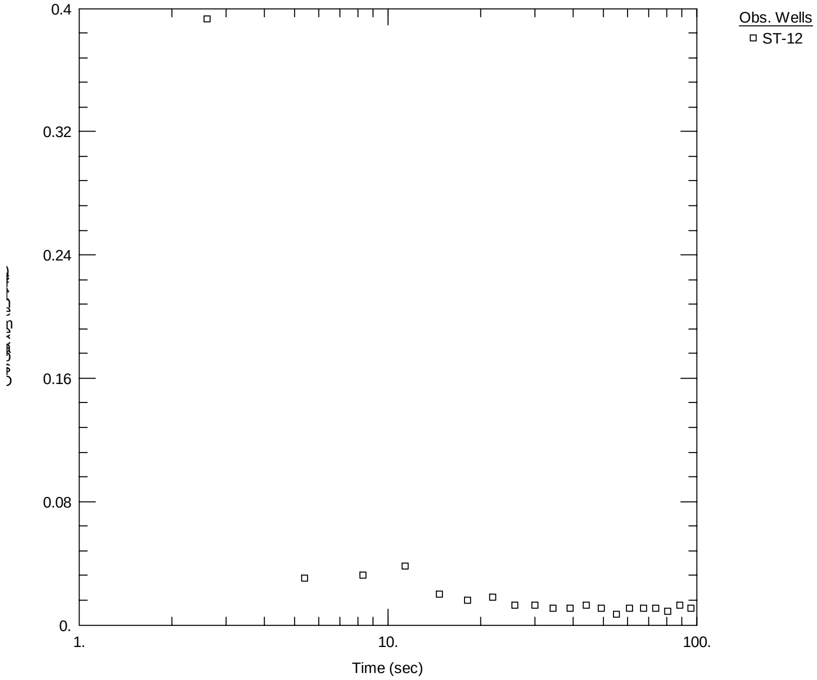


Slug-In Test at ST-12 (Test # 1)

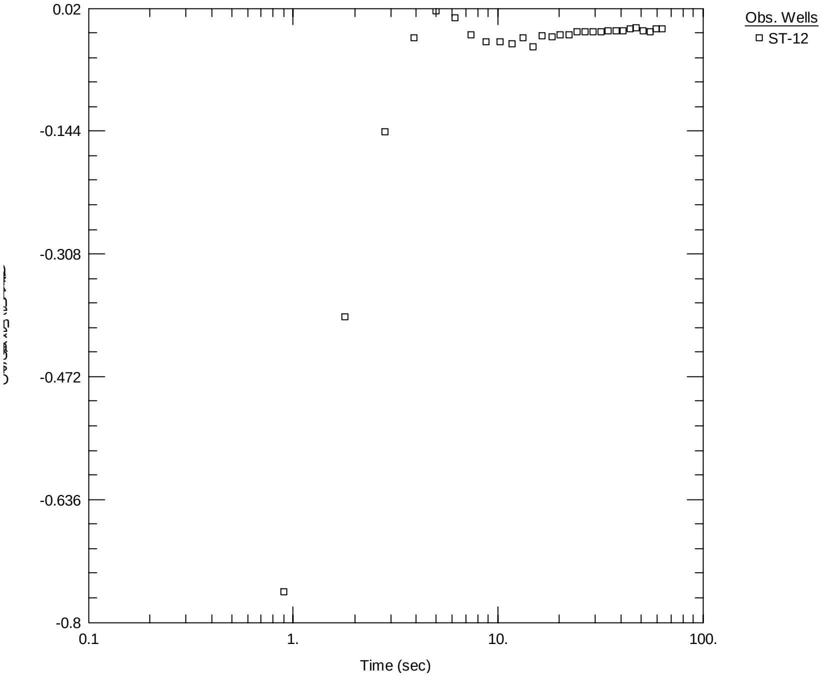


Slug-Out Test at ST-12 (Test # 1)

Figure A7-54. Slug-In and Slug-Out Test Results at ST-12 (Test #1)

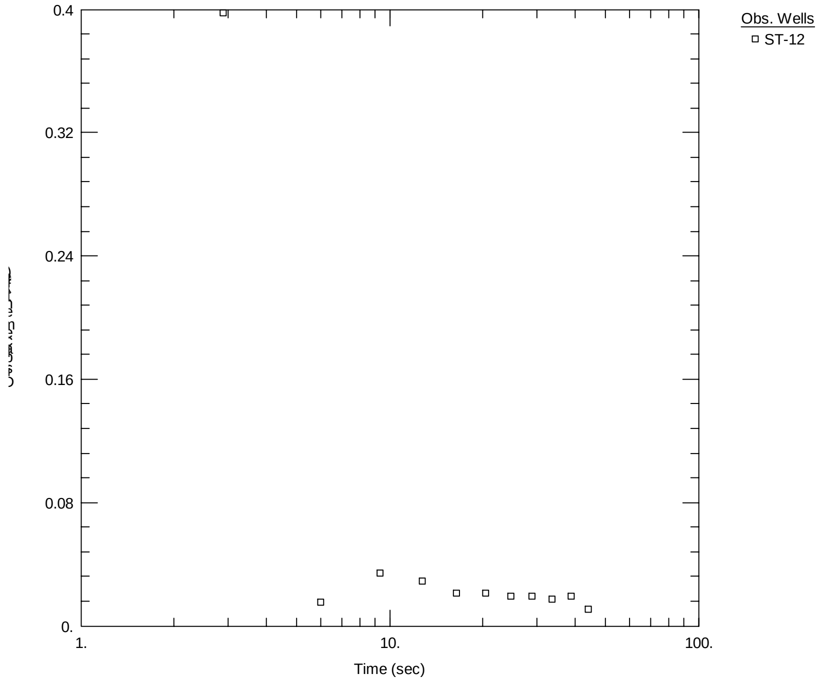


Slug-In Test at ST-12 (Test # 2)

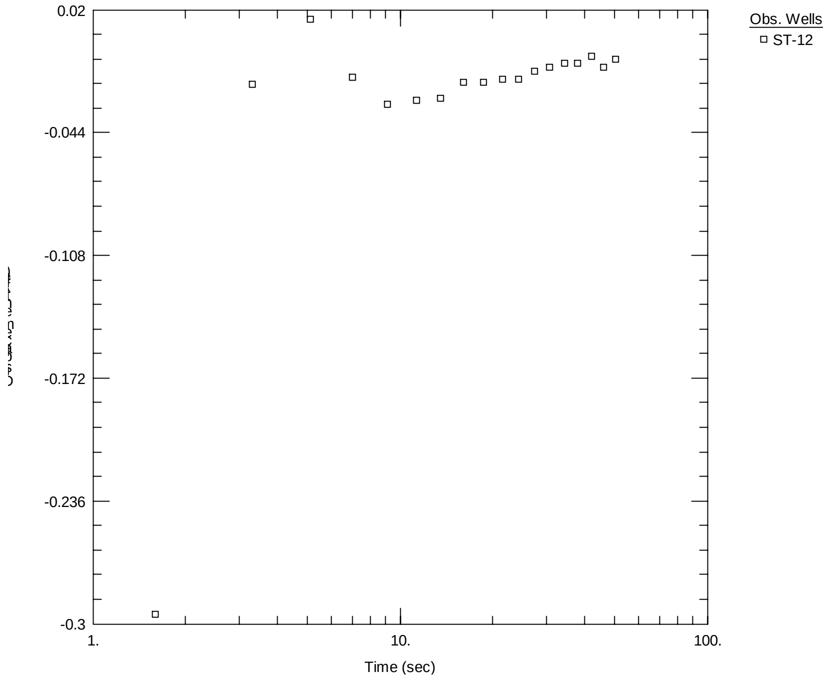


Slug-Out Test at ST-12 (Test # 2)

Figure A7-55. Slug-In and Slug-Out Test Results at ST-12 (Test #2)

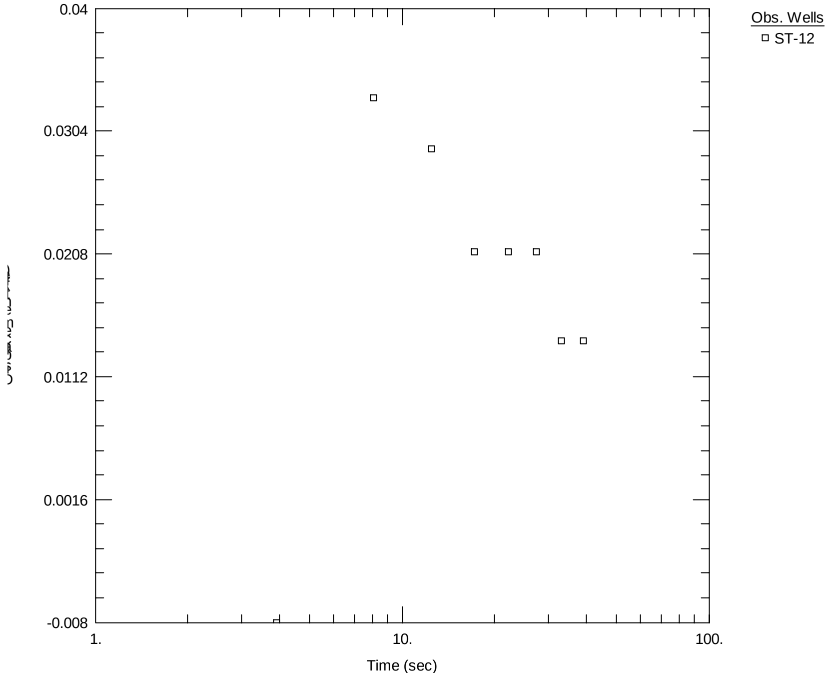


Slug-In Test at ST-12 (Test # 3)

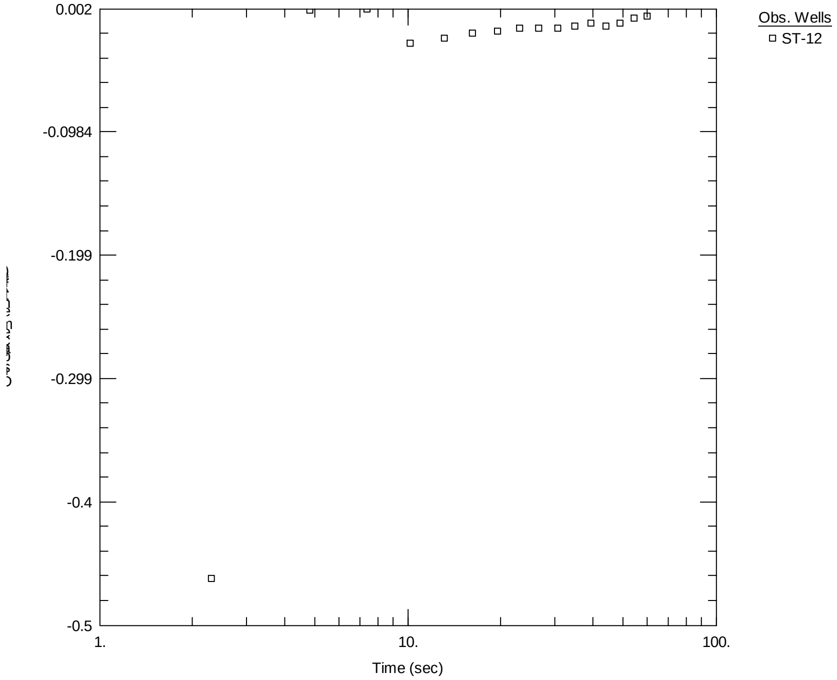


Slug-Out Test at ST-12 (Test # 3)

Figure A7-56. Slug-In and Slug-Out Test Results at ST-12 (Test #3)

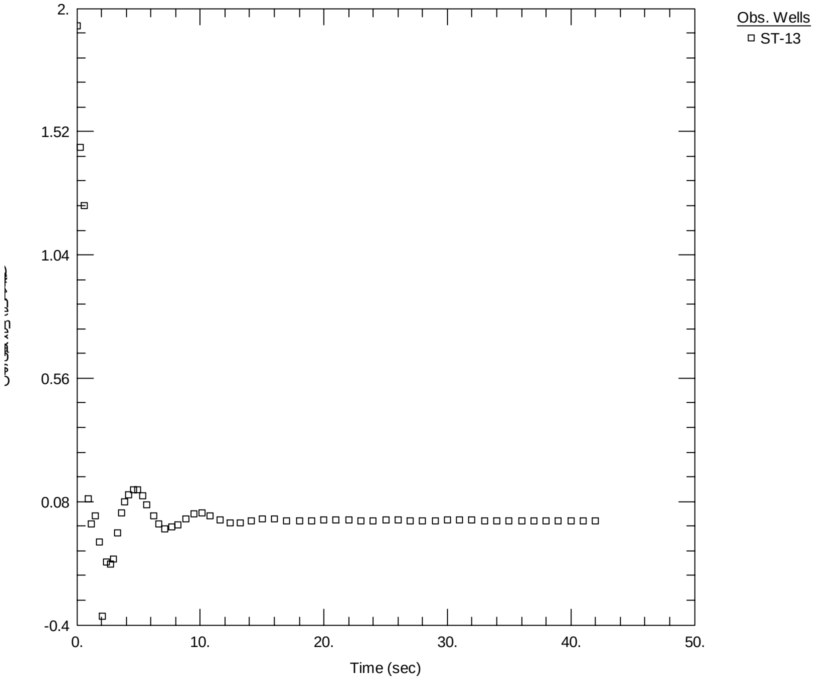


Slug-In Test at ST-12 (Test # 4)

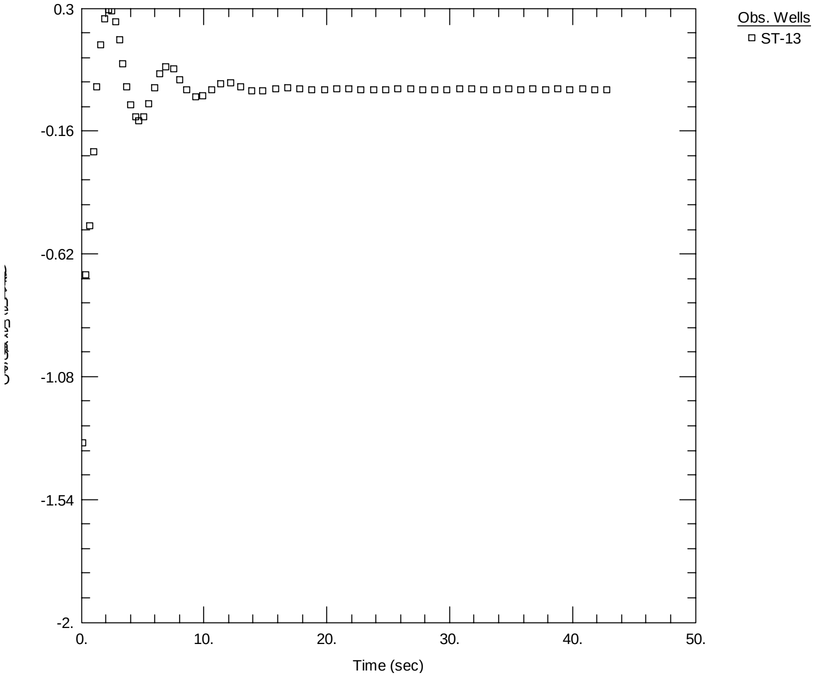


Slug-Out Test at ST-12 (Test # 4)

Figure A7-57. Slug-In and Slug-Out Test Results at ST-12 (Test #4)

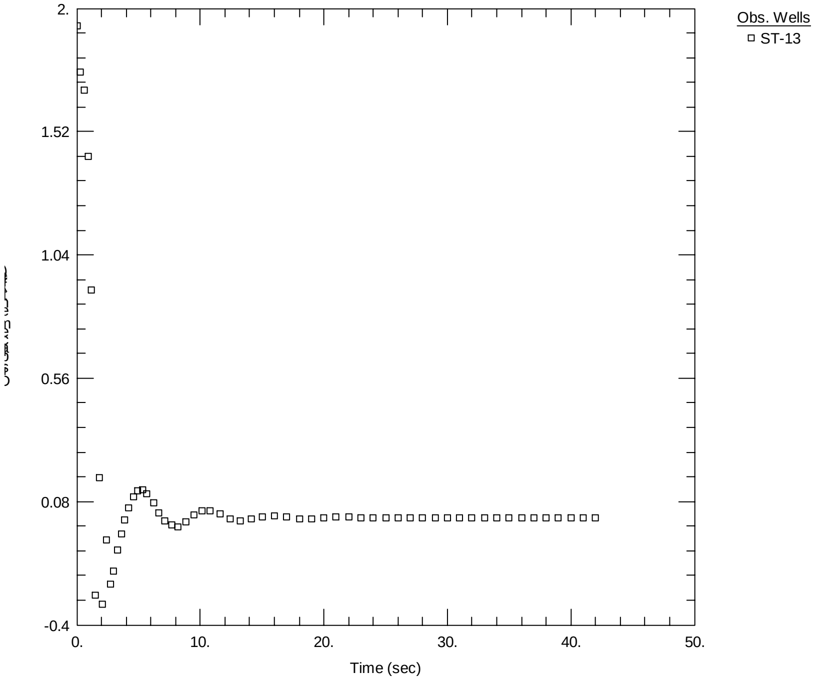


Slug-In Test at ST-13 (Test # 1)

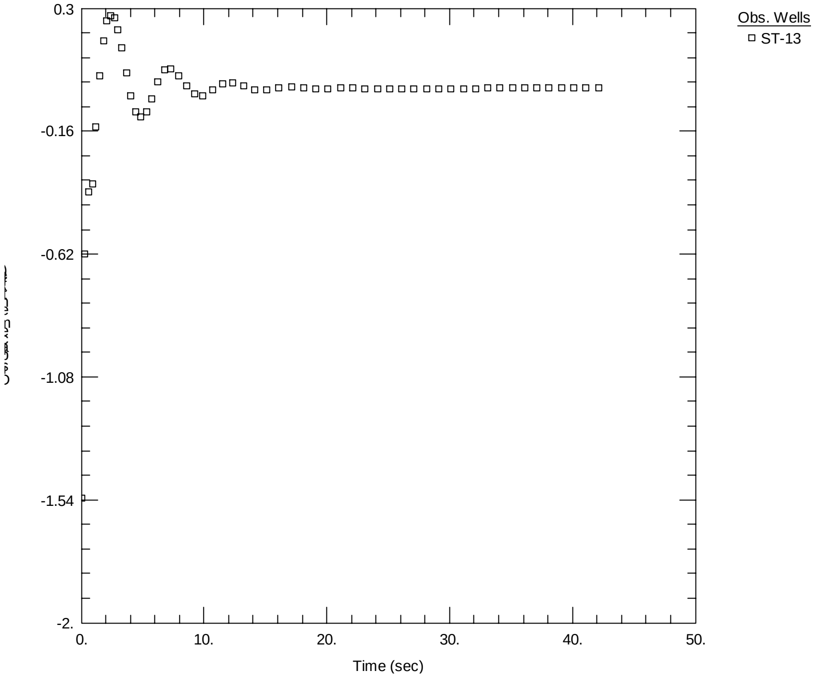


Slug-Out Test at ST-13 (Test # 1)

Figure A7-58. Slug-In and Slug-Out Test Results at ST-13 (Test #1)

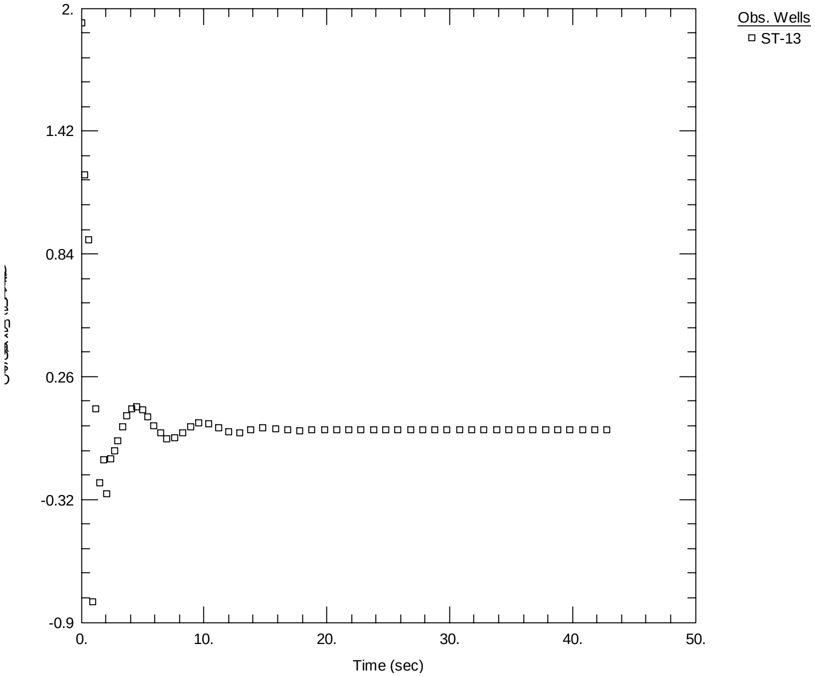


Slug-In Test at ST-13 (Test # 2)

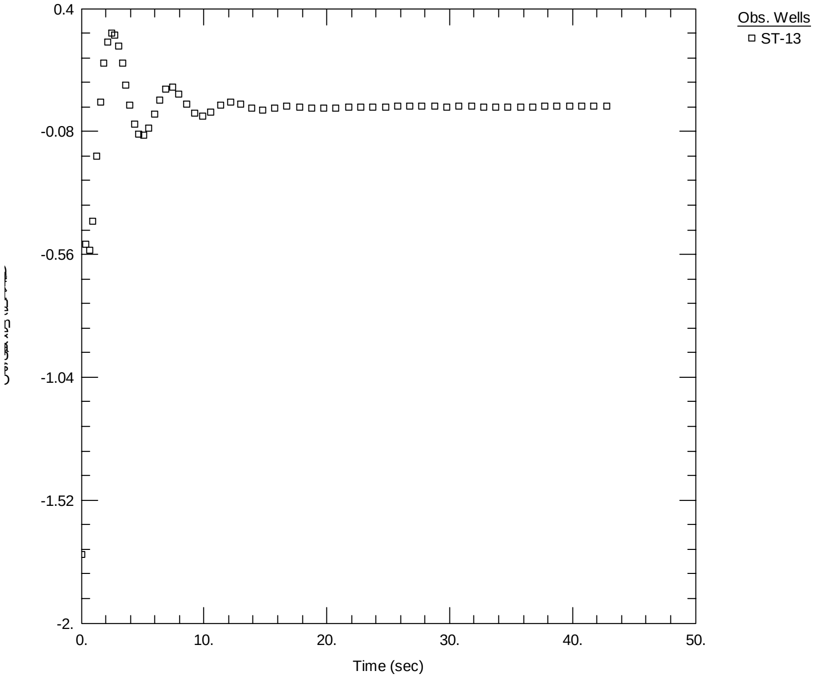


Slug-Out Test at ST-13 (Test # 2)

Figure A7-59. Slug-In and Slug-Out Test Results at ST-13 (Test #2)

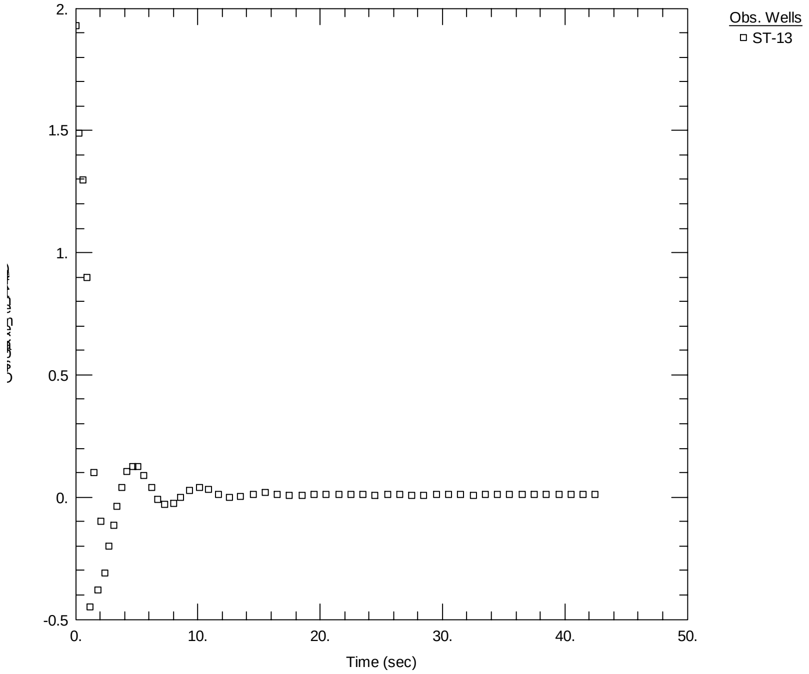


Slug-In Test at ST-13 (Test # 3)

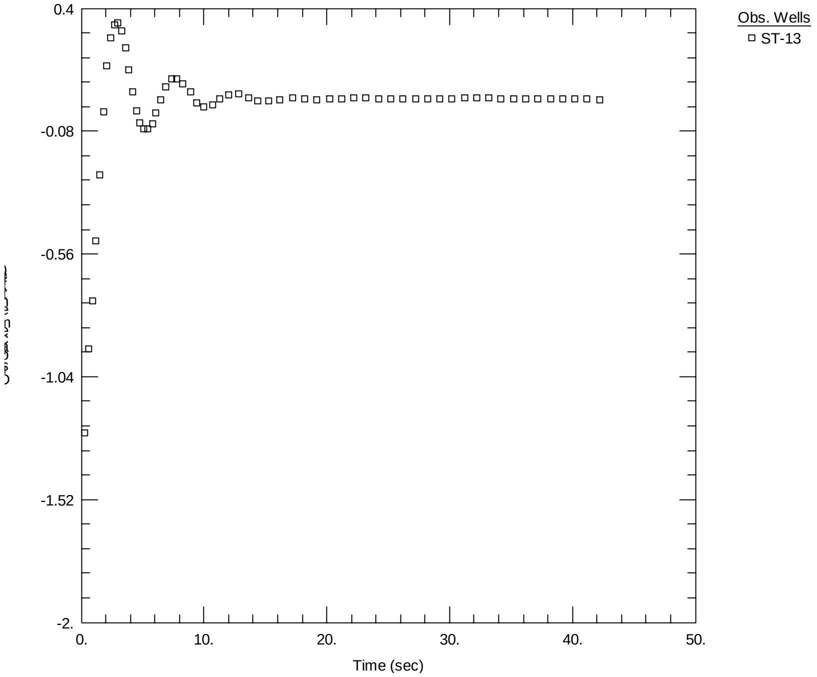


Slug-Out Test at ST-13 (Test # 3)

Figure A7-60. Slug-In and Slug-Out Test Results at ST-13 (Test #3)



Slug-In Test at ST-13 (Test # 4)



Slug-Out Test at ST-13 (Test # 4)

Figure A7-61. Slug-In and Slug-Out Test Results at ST-13 (Test #4)