SSCL-SR-1109

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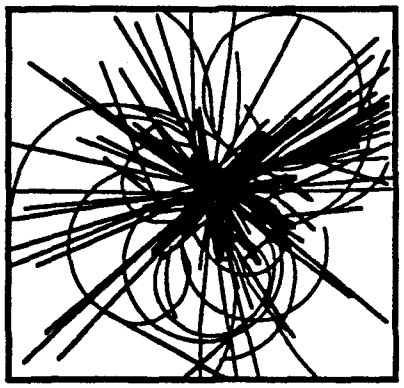
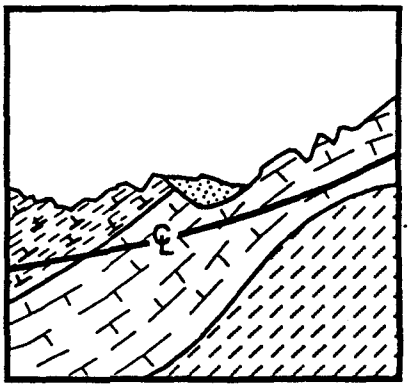
Project No. 87-888-0015
Report No. SSC-GR-50
July 1990

Data Report for High Energy Booster and Coreholes BI 1, BI 2, BI 2A, BI 3, BI 4, BI 5, BI 6, B 1527, B 1533, and B 1540





Prepared by: The Earth Technology Corporation
Long Beach, California

Prepared for: RTK a joint venture
Oakland, California

FOREWORD

The goal of the geotechnical studies at the Texas Superconducting Super Collider (SSC) site is to allow the geologist and engineer to build their level of knowledge and confidence about the geologic structures and geotechnical properties of the site materials to the point at which there remains only a realistically small risk of encountering geotechnical conditions during construction that would significantly increase construction costs or delay construction schedules. To do this, a characterization program has been designed to meet the following objectives:

- To confirm the site's suitability and optimize the ring location (the "footprint") and hall positions on the ring
- To provide data for a preliminary structural design
- To provide a rational framework within which construction contracts and schedules can be formulated
- To maximize the use of the site-specific data already gathered by the proposer.

The geotechnical program to meet these objectives has been divided into the following three phases of study:

- Footprint location data
- Structure-specific data
- Global data.

This data report was prepared as part of the structure-specific phase of geotechnical characterization at the SSC site. Data collection for this study phase focused on drillhole-based geological, geohydrological, geophysical, and geotechnical tests at locations around the proposed injector and experimental halls. In combination with data from the other phases, these data will allow conceptual designs of construction methods and structural supports for key underground structures. This data report includes the results of both field and laboratory tests for specific drilling and sampling site(s).

DATA REPORT

Site Designator: High Energy Booster (HEB) Area

Objective: Drill coreholes along the proposed HEB alignment and at the transfer tunnels to the main ring, obtain samples for geomechanical testing, and do in situ geohydrological and geophysical testing and geologic mapping to characterize the geotechnical conditions around the HEB.

The **High Energy Booster** is located on the western side of the ring in the area known as the West Campus Area. This area covers a total of approximately 4.3 square miles and is located generally north of FM 1446 and south of State Highway 66 and extends from west of Arrowhead Road northeastward to South Prong Creek. See Figure 1 for the location of the coreholes (borings).

Boring Locations:

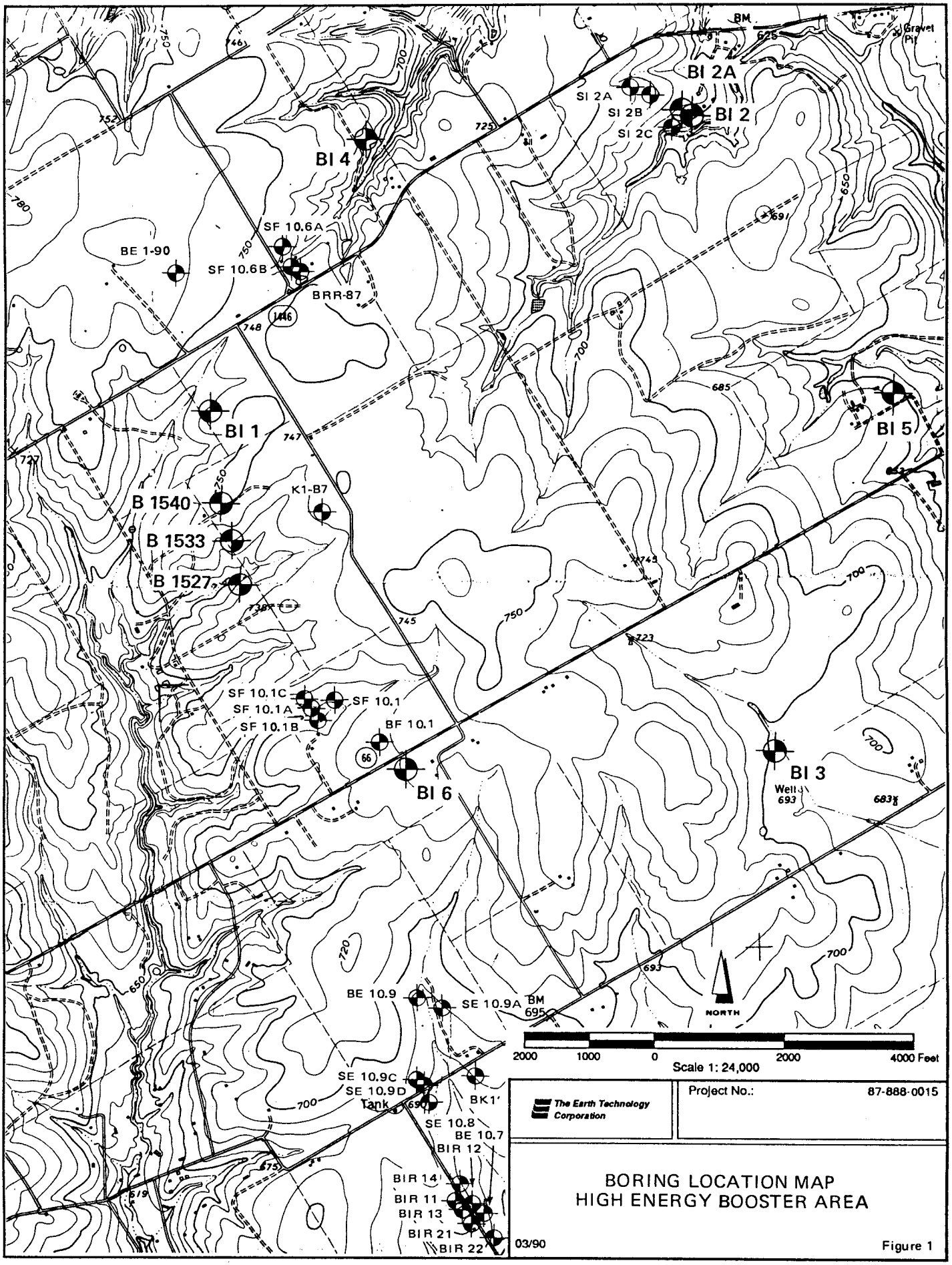
Boring	Northing (feet)	Easting (feet)	Surface Elevation (feet)
BI 1	251,717	2,171,756	741.4
BI 2*	256,245	2,179,235	641.4
BI 2A	256,267	2,179,204	639.9
BI 3	246,179	2,180,466	696.7
BI 4	255,921	2,174,201	710.9
BI 5	251,800	2,182,381	658.4
BI 6	245,951	2,174,687	734.1
B 1527	248,994	2,172,201	713.3
B 1533	249,576	2,172,058	729.6
B 1540	250,250	2,171,882	750.0

Scope and Schedule:

- **Borings**

Boring	Coring (full depth)	Wire-Line Logging	Hydrologic Testing	Laboratory Testing	Well Construction or Plugging
BI 1	Nov. 27 to 29, 1989	Nov. 29, 1989	Nov. 30, 1989	Dec. 11, 1989 to Jan. 13, 1990	Dec. 2, 1989 (well)
BI 2*	Nov. 20, 1989	Not done	Not done	Not done	Dec. 7, 1989 (plugging)
BI 2A	Dec. 1 to 5, 1989	Dec. 5, 1989	Dec. 6, 1989	Dec. 17, 1989 to Mar. 5, 1990	Dec. 7, 1989 (well)
BI 3	Dec. 6 to 8, 1989	Dec. 8, 1989	Dec. 9 to 11, 1989	Dec. 17, 1989 to Feb. 13, 1990	Dec. 12, 1989 (well)
BI 4	Jan. 15 to 16, 1990	Jan. 16, 1990	Jan. 22, 1990	Jan. 24 to Mar. 7, 1990	Jan. 23, 1990 (well)
BI 5	Jan. 24 to 27, 1990	Jan. 27, 1990	Jan. 29, 1990	Feb. 1 to Mar. 9, 1990	Jan. 30, 1990 (well)
BI 6	Jan. 16 to 23, 1990	Jan. 23, 1990	Jan. 23, 1990	Jan. 26 to Mar. 7, 1990	Jan. 25, 1990 (well)
B 1527	Mar. 23 to 29, 1990	Mar. 29, 1990	Not done	Apr. 4 to May 2, 1990	Mar. 30, 1990 (plugging)
B 1533	Mar. 19 to 22, 1990	Mar. 22, 1990	Not done	Apr. 4 to May 1, 1990	Mar. 23, 1990 (plugging)
B 1540	Mar. 19 to 22, 1990	Mar. 22, 1990	Not done	Apr. 4 to May 3, 1990	Mar. 23, 1990 (plugging)

*Planned boring BI 2 was abandoned at a depth of 110 feet on November 20, 1989, when the drill rig caught fire and the core boxes burned. It was replaced by boring BI 2A, approximately 38 feet away.


BI 2A
SI 2A
SI 2B
SI 2C
BI 2
BI 4
SF 10.6A
BE 1-90
SF 10.6B
BRR-87
BI 1
BI 5
K1-B7
B 1540
B 1533
B 1527
SF 10.1C
SF 10.1
SF 10.1A
SF 10.1B
BF 10.1
BI 6
BI 3
Well
BE 10.9
SE 10.9A
BM
SE 10.9C
SE 10.9D
Tank
BK1'
SE 10.8
BE 10.7
BIR 12
BIR 14
BIR 11
BIR 13
BIR 21
BIR 22
Gravel Pit
NORTH
2000 1000 0 2000 4000 Feet
Scale 1: 24,000
The Earth Technology Corporation
Project No.: 87-888-0015
BORING LOCATION MAP
HIGH ENERGY BOOSTER AREA
03/90
Figure 1

- **Geologic Mapping** (See Appendix A)

Four faults have been identified in the area of the High Energy Booster. These faults are described in detail in individual Structure Zone Study reports. Each suspected fault was mapped in the field. Fault characteristics are summarized in Appendix A, Site Geology.

Conditions Encountered: (See lithologic logs, Appendix B)

Boring	Total Depth (feet)	Soil (feet)	Weathered Austin Chalk (feet)	Fresh Austin Chalk (feet)	Eagle Ford Shale (feet)	Static Water Level (feet above MSL)
BI 1	211.0	0.0 to 0.5 silty clay	0.5 to 7.2	7.2 to 183.0	183.0 to 211.0	720.9 (estimated)
BI 2	110.0	Hole abandoned due to fire underneath drilling rig.				
BI 2A	261.5	0.0 to 4.7 silty clay	4.7 to 7.8	7.8 to 234.2	234.2 to 261.5	611.9
BI 3	282.0	0.0 to 5.0 silty clay	5.0 to 12.2	12.2 to 261.5	261.5 to 282.0	694.2
BI 4	184.5	0.0 to 2.0 clay	2.0 to 14.9	14.9 to 164.5	164.5 to 184.5	680.9
BI 5	280.0	0.0 to 1.0 sandy clay	1.0 to 10.0	10.0 to 255.6	255.6 to 280.0	641.2
BI 6	231.0	0.0 to 0.5 silty clay	0.5 to 21.4	21.4 to 211.0	211.0 to 231.0	717.5
B 1527	238.0	0.0 to 20.0 silty clay	20.0 to 30.4	30.4 to 160.5	160.5 to 238.0	Not Applicable
B 1533	255.0	0.0 to 0.5 clay	0.5 to 16.3	16.3 to 170.2	170.2 to 255.0	Not Applicable
B 1540	275.0	0.0 to 0.5 silty clay	0.5 to 12.8	12.8 to 187.9	187.9 to 275.0	Not Applicable

Geophysical Logging: (see wire-line logs, Appendix C)

Boring	Spontaneous Potential	Normal Resistivity (Short & Long)	Guard Resistivity	Point Resistance	Natural Gamma	Short & Long Gamma	Compensated Density (caliper)	Sonic Velocity (full wave)
BI 1	X	X	X	--	X	X	X	
BI 2A	X	X	X	X	X	X	X	--
BI 3	X	X	X	X	X	X	X	--
BI 4	X	X	X	X	X	X	X	X
BI 5	X	X	X	X	X	X	X	X
BI 6	X	X	X	X	X	X	X	X
B 1527	X	X	X	X	X	X	X	X
B 1533	X	X	X	X	X	X	X	--
B 1540	X	X	X	X	X	X	X	--

-- =Tool malfunction.

Hydrologic Test Results Summary: (see also Appendix D)

Boring	Test Depth (feet)	Packer Pressure (psi)	Gauge Pressure (psi)	Formation/Lithology	Hydraulic Conductivity (cm/sec)
BI 1	103.0-123.0	145	15	Austin Chalk	$<4.4\times10^{-8}$
	172.0-192.0	140	15	Austin Chalk/Eagle Ford Shale (fractured)	$<4.4\times10^{-8}$
BI 2A	67.9-89.0	125	20	Austin Chalk	$<3.0\times10^{-8}$
	222.9-244.0	150	20	Austin Chalk/Eagle Ford Shale (fractured)	$<3.0\times10^{-8}$
BI 3	76.0-96.0	150	7	Austin Chalk (fractured)	2.1×10^{-4}
	127.0-147.0	180	15	Austin Chalk	$<6.1\times10^{-8}$
BI 4	141.0-161.0	130	15	Austin Chalk	$<3.8\times10^{-8}$
BI 5	88.0-108.0	155	15	Austin Chalk	$<4.8\times10^{-8}$
	180.0-200.0	145	15	Austin Chalk	$<4.8\times10^{-8}$
BI 6	164.0-184.0	150	15	Austin Chalk	$<1.4\times10^{-6}$

Bulk and Clay Minerology Test Results Summary: (see also Appendix E)

Formation: Austin Chalk

Whole Rock Composition:

Mineral	Percent
quartz	up to 20
K feldspar	up to 3
plagioclase	up to 1
calcite	up to 99
pyrite	up to 5
total clay	0-95

Relative Clay Abundance:

Mineral	Percent
montmorillonite	up to 68
illite	up to 30
kaolinite	up to 36
smectite	up to 98
mixed layer (illite/smectite)	up to 34

Formation: Eagle Ford Shale

Whole Rock Composition:

Mineral	Percent
quartz	0-26
K feldspar	0-5
plagioclase	0-3
siderite	0-26
pyrite	0-2
total clay	38-100

Relative Clay Abundance:

Mineral	Percent
montmorillonite	0-70
illite	14-54
kaolinite	8-26
Fe-chlorite	0-4
mixed layer (illite/smectite)	0-63

Laboratory Geomechanical Test Results Summary: (see also Appendix E)

Vertical Depth (ft)	Formation/ Lithology	Moisture Content (%)	Dry Density (pcf)	*Compressive Strength (psi)	Tangent Young's Modulus E_{50} (psi x 10^5)	Brazil Tensile Strength (psi)
			BORING BI 1			
111	Bentonite	28-38	71-96			
132	Austin Chalk	10-11	131	1895	1.39	
145	Austin Chalk	11	128			
175-177	Austin Chalk	11-13	123-129	1770 (100)-2677 (300)	1.59 (100)-4.76	
180-182	Austin Chalk	11-13	127	2583	3.45	221
183-188	Eagle Ford Shale	16-18	112-119	323	1.00	
195	Eagle Ford Shale	14	121			
207-208	Eagle Ford Shale	16	118	205	1.02	
			BORING BI 2A			
55-56	Austin Chalk	11-12	124-127	1739 (50)-2173 (100)	1.43 (50)-2.44 (100)	
66-70	Austin Chalk	13-14	120-123	2180		
74-76	Austin Chalk	9-15	119-134	1282	2.00	248
81-85	Austin Chalk	11-15	119-125	2167-2944	4.90-12.98	230
87-88	Austin Chalk	13-15	120			224
98-99	Austin Chalk	14-16	112-117	1817	6.90	
163	Austin Chalk	12	122	2290	3.81	
232-233	Austin Chalk	12-13	118-124			
233	Transition	11	127	2305	3.96	282
236-241	Eagle Ford Shale	12-17	116-125	317-497 (300)	0.74-1.58 (300)	
255-257	Eagle Ford Shale	15-16	118-120	356	0.69	
			BORING BI 3			
94-95	Austin Chalk	15-18	110-116	1121-1407 (200)	1.45 (200)-2.80	
123-128	Austin Chalk	16-21	106-113	1408	2.70	161-216
132	Austin Chalk	14-17	117	1576	2.29	
143-148	Austin Chalk	14-18	114-120	1526-1727	2.55-3.89	
220	Austin Chalk	14	119			244
256-260	Austin Chalk	9-10	123-128	1999-3491	2.57-6.69	
261	Eagle Ford Shale	16	118			
276-277	Eagle Ford Shale	14-15	121-127	522-673 (300)	0.70-1.53 (100)	

Laboratory Geomechanical Test Results Summary (Continued)

Vertical Depth (ft)	Formation/ Lithology	Moisture Content (%)	Dry Density (pcf)	*Compressive Strength (psi)	Tangent Young's Modulus E_{50} (psi x 10^5)	Brazil Tensile Strength (psi)
			BORING BI 4			
45	Austin Chalk	13-14	125	2185	2.30	
87-88	Austin Chalk	13-15	116-120	2070-2596 (200)	2.75 (200)-4.49	
90-91	Austin Chalk	14-15	117	2484	2.04	
94-95	Bentonite	38-39				
114-115	Austin Chalk	13-18	124	3213	4.84	
158-159	Austin Chalk	11	127	3506	4.87	287
163	Austin Chalk	10-15	118	1931	3.97	
170-173	Eagle Ford Shale	16-18	112-115	290 (100)-419 (200)	0.27-1.38 (100)	
176-180	Eagle Ford Shale	16-17	118	336	0.64	
			BORING BI 5			
35-36	Austin Chalk	14	121	2737	6.75	
52	Austin Chalk	16	116	2591	7.88	
70	Austin Chalk	13-15	124	2259	2.44	
94	Austin Chalk	14-16	122	411	0.46	
114-115	Austin Chalk	15	115	2094	4.46	
135	Austin Chalk	13				
141	Bentonite	17				
161-162	Austin Chalk	11-12	122	2658	3.20	270
185-186	Austin Chalk	10-13	122-131	1712-2452 (100)	1.94 (200)-3.47 (100)	
187	Bentonite	34				
202	Austin Chalk	9	132			
230	Austin Chalk	15-16	118	2851	5.33	
251	Austin Chalk	12-13	124	2889	6.67	
262-264	Eagle Ford Shale	15	119	385	0.65	
272-273	Eagle Ford Shale	15-16	117-119			

Laboratory Geomechanical Test Results Summary (Continued)

Vertical Depth (ft)	Formation/ Lithology	Moisture Content (%)	Dry Density (pcf)	*Compressive Strength (psi)	Tangent Young's Modulus E_{50} (psi x 10^5)	Brazil Tensile Strength (psi)
			BORING BI 6			
25	Austin Chalk	14	119	1562	1.46	
49	Austin Chalk	16-17	103	1963	3.04	
77-78	Austin Chalk	16	116			197
101-102	Austin Chalk	13-15	117-120	$1440^{(200)}$-$2014^{(100)}$	$2.07^{(200)}$-$2.78^{(100)}$	
125-126	Austin Chalk	17	113	1594	8.82	
137	Bentonite	36-39	79-88			
156-157	Austin Chalk	14-16	120	2358	5.66	
208-210	Austin Chalk	14-15	118	1410	2.24	
213-215	Eagle Ford Shale	16-17	111-114	$390^{(100)}$-$421^{(200)}$	$0.81^{(200)}$-$1.03^{(100)}$	
221-226	Eagle Ford Shale	16-17	114-120	288	0.99	
			BORING B 1527			
0-1	Clay	20-29	89-101			
25-26	Austin Chalk	16-23	105	413	0.73	
61-62	Austin Chalk	13-14	120-125	$2142^{(50)}$-$2377^{(100)}$	$4.51^{(50)}$-$5.95^{(100)}$	
83-84	Austin Chalk	18	114	2164	6.00	
133	Austin Chalk	16-17	116	2125	6.75	
152-153	Austin Chalk	12-13	126	746	0.89	181
159	Austin Chalk	12-14	114-123	$2341^{(200)}$-$2585^{(100)}$	$2.63^{(200)}$-$3.10^{(300)}$	
164	Eagle Ford Shale	19	112	64	0.03	
179-180	Eagle Ford Shale	17	113-119			
201	Eagle Ford Shale	12	127	427	0.46	
221-222	Eagle Ford Shale	15-16	115-125	$225^{(200)}$-$365^{(300)}$	$0.76^{(200)}$-$1.10^{(300)}$	
228	Eagle Ford Shale	15	121	251	1.00	

Laboratory Geomechanical Test Results Summary (Continued)

Vertical Depth (ft)	Formation/ Lithology	Moisture Content (%)	Dry Density (pcf)	*Compressive Strength (psi)	Tangent Young's Modulus E_{50} (psi x 10^5)	Brazil Tensile Strength (psi)
			BORING B 1533			
0	Clay	21				
4-7	Austin Chalk	13-15	118-121	1745	9.25	216
34-36	Austin Chalk	14	116-119	3188	4.43	
52-54	Austin Chalk	10-16	115-131	1773-2236 (100)	2.37-3.77 (100)	
98	Austin Chalk	12-13	120	2120	3.19	
102-103	Bentonite	22-35	83-103			
106	Austin Chalk	12	126	2614	5.63	
118	Austin Chalk	11-12	127	810	2.91	
143	Austin Chalk	11-13	124	2908	8.74	249
150-152	Austin Chalk	14-15	120	3010 (100)-3029 (200)	5.96 (200)-11.82 (100)	
160-161	Austin Chalk	16-17	117	2431	7.30	236
174-175	Eagle Ford Shale	17	115-116	330 (200)-348 (100)	0.90(100) -1.34 (100)	
182-183	Eagle Ford Shale	15-16	112-120	259	1.08	
200-203	Eagle Ford Shale	16-17	115-117	218-314 (300)	0.86 (200)-1.08 (300)	
220-221	Eagle Ford Shale	16-17	115-120	283	0.70	
246	Eagle Ford Shale	15	122	239	0.66	
			BORING B 1540			
7	Austin Chalk	14	119	1972	6.84	227
46	Austin Chalk	17-18	113	1939	6.60	201
101	Austin Chalk	13-14	120	1662	1.67	
111-112	Austin Chalk	13-15	118-121	2287 (100)-2840 (200)	2.61 (100)-4.15 (200)	
118	Austin Chalk	16-17	118	306	0.21	
119	Bentonite	35	85			
133	Austin Chalk	13-14	122	2977	6.93	
158-159	Austin Chalk	12-14	120-127	2749 (100)-3416 (200)	5.13 (100)-9.71 (200)	
167-168	Austin Chalk	14-15	121	2520	8.51	
182-184	Austin Chalk	12-15	117-125	3104-3248 (300)	4.57-9.35 (200)	
187	Transition	10-13	136	816	2.04	

Laboratory Geomechanical Test Results Summary (Continued)

Vertical Depth (ft)	Formation/ Lithology	Moisture Content (%)	Dry Density (pcf)	*Compressive Strength (psi)	Tangent Young's Modulus E_{50} (psi x 10^5)	Brazil Tensile Strength (psi)
			BORING B 1540 (Cont'd)			
188-189	Eagle Ford Shale	17	114			
197-198	Eagle Ford Shale	14-15	122	216	0.62	
203-204	Eagle Ford Shale	16	116-118	$375^{(200)}$-$381^{(300)}$	$0.72^{(200)}$-$1.32^{(300)}$	
213	Eagle Ford Shale	15-16	116			
238-241	Eagle Ford Shale	17-18	112-117	185	0.46	
253-254	Eagle Ford Shale	16	117	$315^{(300)}$-$318^{(200)}$	$0.62^{(300)}$-$0.68^{(200)}$	
266-267	Eagle Ford Shale	15-16	115-120	252	0.54	

* UU triaxial test indicated by confining pressure in parentheses.

Hole Status: Monitoring wells were installed in six borings along the HEB alignment. Borings at the transfer tunnel locations, and partially completed Boring BI 2 were plugged and abandoned (see Appendix F).

APPENDIX A

SITE GEOLOGY

APPENDIX A

SITE GEOLOGY

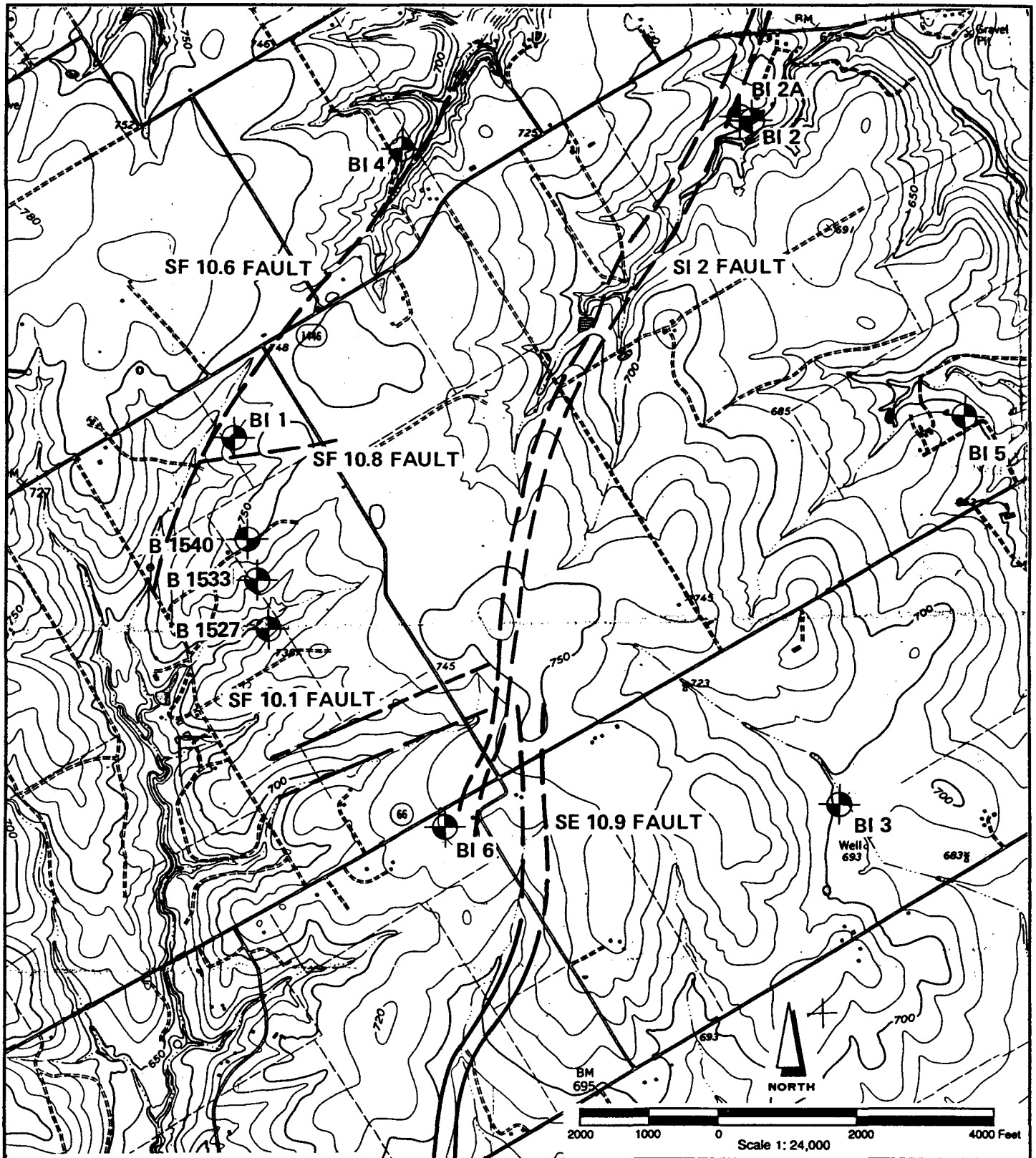
Field mapping primarily consisted of locating and mapping faults within the HEB area. Faults were identified by photo interpretation of lineaments and field verification based on the presence of crystalline or slickensided calcite in float and along joints in exposed bedrock. Crystalline and fibrous calcite formed in fractures are primary indicators of faulting in the SSC study area. Five faults have been identified that cross or lie within close proximity to the High Energy Booster (see Figure A-1). The following table summarizes the characteristics of these faults based on correlation of borehole data, geologic mapping, shallow seismic reflection surveys, very low frequency (VLF) geophysical surveys, and downhole geophysical logging. Detailed discussions of each fault are presented in four separate Structure Study Zone reports (see the reference list at the end of Appendix A). Drawing PI-3 (in pocket) illustrates the subsurface geologic conditions expected to be encountered at the HEB.

List of References:

- Data Report for Structure Study Zone SF 10.6 and Rotary Wash Borings SF 10.6A and SF 10.6B, Report No. GR-9, August 1989.
- Data Report for Structure Study Zones SF 10 and SF 10.1 and Coreholes BF 10.1 and SF 10.1, Report No. GR-22, January 1990.
- Data Report for Structure Study Zone SF 10.1, Air Rotary Boreholes SF 10.1A, SF 10.1B, and Corehole SF 10.1C, Report No. GR-54, July 1990.
- Data Report for Structure Study Zone SE 10.9 and Coreholes BE 10.9, SE 10.9A, and SE 10.8, Data Report GR-10, December 1989.
- Data Report for Structure Study Zone SE 10.9, and Coreholes SE 10.9C and SE 10.9D, Report No. GR-59, July 1990.
- Data Report for Structure Study Zone SI 2 and Rotary Wash Borings SI-2A and SI-2B and Corehole SI-2C, Data Report No. GR-60, July 1990.
- Bedrock Geology of the Superconducting Super Collider Site, Data Report No. GR-65, July 1990.

Fault	Location	Orientation	Thickness	Displacement	Reference Borings	Notes
SF 10.6	Along northwest alignment of HEB tunnel near the intersection of Hoyt Road and FM 1446.	N10°-20°E, dipping steeply northwest.	Greater than 10 feet but less than 50 feet.	Approximately 10 feet down to the northwest	SF 10.6 and SF 10.6B	Correlation of wire-line units from BI 4, BI 1, and BC-1, it appears the SF 10.6 fault may have less offset where it crosses the HEB (less than 5 feet). The fault is defined in the field by the presence of crystalline calcite in float and calcite veins up to 3 miles thick in the drainage northwest of BC-1A.
SF 10.8	Along northwest alignment of HEB tunnel, 1,100 feet southwest of the intersection of Arrowhead Road and FM 1446.	N70°W to S80°W, dipping steeply north.	Appears to be about 100 feet wide based on zone of calcite float near boring BC-1A.	Approximately 8 feet down-to-the north	BC-1A, BI-1, B 1540	Analysis of wire-line units in boring BC-1A indicates about 8 feet of Austin Chalk (Base of A26, top of A27) is missing.
SF 10.1 Graben	West side of HEB tunnel alignment, 1,000 to 1,400 feet north of Highway 66, west of Arrowhead Road.	N50°E, 30° to 90° northwest on the main fault; the smaller antithetic fault trends roughly N50°E, dipping about 65° southeast.	The graben is 500-600 feet wide. Individual faults are about 2.3 feet thick in the Eagle Ford Shale and range from 0.3 to 1.1 feet thick in the Austin Chalk.	50-57 ft of down-to-the north offset on the southern fault; 25 ft. down-to-the south displacement on the northern antithetic fault.	SF 10.1, SF 10.1A, SF 10.1B, SF 10.1C, BF 10.1, B 1527, and BI 6	Two parallel lineaments are assumed to define the faults. No faults could be found in outcrops; however, calcite float was observed along the southern lineament.
SE 10.9 Graben	Southwest side of the HEB tunnel alignment, 1 mile south of Highway 66.	Both faults have an average trend of about N28°E, the main fault dips approximately 65° southeast; the antithetic fault dips about 55° northwest.	The graben is 200 to 300 feet wide; the antithetic fault is about 4.5 feet thick in the Austin Chalk and the main fault is about 11.9 feet thick in the Eagle Ford Shale.	The southeast dipping main fault has a net offset of 20-25 feet down-to-the south which is surmounted by an antithetic fault(s) that has produced a graben with as much as 86 feet of displacement locally.	BE 10.9, SE 10.9, SE 10.8, SE 10.9C, SE 10.9D, and BK1'.	The fault is defined on air photos by a prominent lineament comprising aligned drainage segments and tonal linears. Field mapping identified a zone of crushed rock west of Arrowhead Road and a continuous zone of calcite float along the lineament extending from Old Maypearl Road to an area east of the intersection of Arrowhead Road and Highway 66. Seismic reflection surveys perpendicular to the trace of the fault suggest an en-echelon continuation of the SI 2 fault.

Fault	Location	Orientation	Thickness	Displacement	Reference Borings	Notes
SI 2	Crosses the HEB on the northeast along FM 1446 4 miles west of Waxahachie and continues southwest through the center of the HEB.	N15° to 40°E, dipping about 65° southeast.	The fault zone consists of at least two parallel trending faults up to 300 feet wide.	Net offset is 80 feet down-to-the southeast with the southern fault having 37 feet of down-to-the south displacement.	BI 2A, SI 2A, SI 2B and SI 2C	The fault is defined by a prominent lineament comprising aligned drainage segments and tonal linears. Field mapping identified a zone of calcite veins and closely spaced fractures 300 feet wide near FM 1446 and a zone of calcite float that extends southwest through the HEB to the intersection of Highway 66 and Arrowhead Road. Seismic reflection surveys suggest an en-echelon continuation of the SE 10.9 fault.



EXPLANATION

BI 1 Location and boring number

SI 2 Location and fault identification

The Earth Technology Corporation

Project No.: 87-888-0015

FAULT MAP
HIGH ENERGY BOOSTER AREA

7/90

Figure A-1

APPENDIX B

LITHOLOGIC LOGS

LITHOLOGIC LOG

BORING BI 1

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 1 PG 1 OF 6

LOCATION: N 251,717 feet
E 2,171,756 feet

GROUND EL: 741.4 feet

DATE: 11/27-29/89 TYPE: Nx Core CASED TO: N/A CONTRACTOR: SwL (89-192)

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									0.5 CLAY, silty, embedded limestone fragments, trace roots, brown
5									LIMESTONE, (Austin Chalk) soft, moderately weathered, sound, medium bedded, tan with occasional thin tan clay layers, and trace fossils
		C1	5.0	10.0	100 / 100	77 / 100			7.2
10		C2	10.0	20.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.3' to 1' thick extremely argillaceous to shaly limestone interbeds 1' to 2' apart. Also shale layers 1' thick, fossil partings, and fossiliferous layers. -shaly layer, soft, dark gray, sharp contact at 8.5' to sharp contact at 9.4' -fossil parting at 11.9' -shaly layer, soft, dark gray, sharp contact at 12.2' to gradational contact at 13.5' -fossil parting at 14.3' -shaly layer, soft, dark gray, sharp contact at 15.7' to gradational contact at 16.6' -fossil parting at 17.2' -shaly layer, soft, dark gray, sharp contact at 18.6' to gradational contact at 19.4' -fossil parting at 21.1' -shaly layer, soft, dark gray, sharp contact at 21.6' to sharp contact at 21.9' -fossil partings at 23.0', 23.3', 23.8', 25.8', 26.2', 26.5' and 28.3' -shaly layer, soft, fossiliferous, dark gray, gradational contacts at 24.2'-25.9' -shaly layer, soft, dark gray, sharp contacts at 29.4'-30.0' -shaly layer, soft, dark gray, sharp contact at 32.0' to gradational contact at 32.7' -shaly limestone layer, soft, fissile, dark gray, sharp contacts at 31.4'-31.7' -extremely fossiliferous, hard, gray, sharp contact at 27.1' to sharp contact at 28.0'
15									
20									
25		C3	20.0	30.0	98	98			
30									
35		C4	30.0	40.0	100	100			
40			40.0						-very argillaceous layer, soft, dark gray, gradational contact at 40.0' to sharp contact at 40.8', trace of bentonite -fossil parting at 43.5' -shaly layer, soft, dark gray, sharp contact at 43.4' to sharp contact at 44.8'

SAMPLE LEGEND	WATER INFORMATION
S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	Begin drilling with water at ground surface. Unable to determine parameters of sub-surface water table.

DRILLING GEOLOGIST D. Hartsfield ASSISTANT D. Brown CHECKED BY C. Bommarito

CB 12/28/89

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: BI 1 PG 2 OF 6
LOCATION: N 251,717 feet
E 2,171,756 feet
GROUND EL: 741.4 feet

DATE: 11/27-29/89 TYPE: Nx Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION
See Page 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
45		C5	40.0	50.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.5' to 2' thick slightly, moderately, extremely argillaceous to shaly limestone interbeds 1' to 5' apart. Also shale layers 2' thick, fossil partings, bentonite layer, low angle fractures. -fossil partings at 46.5' and 49.3' -shaly layer, soft, dark gray, gradational contacts at 49.4'-50.0'
50		C6	50.0	60.0	100	100			-very argillaceous layer, soft, dark gray, sharp contact at 52.5' to sharp contact at 53.5' -slightly argillaceous layer, soft, gray gradational contacts at 55.3'-55.8' -fossil partings at 58.2' and 58.3' -shaly and fossiliferous layer, soft, dark gray, sharp contact at 59.0' to sharp contact at 59.9' -shaly layer, soft, dark gray, sharp contacts at at 60.7'-60.9' and 64.0'-64.4'
55									
60									
65		C7	60.0	70.0	100	96			-fossil parting at 69.2' -shaly limestone layer, soft, bentonitic, light to dark gray, sharp contacts at 69.2'-69.6' -bentonite seam (½") at 69.5' -30° smooth, tight slickensided fracture at 69.6' -fossil parting at 70.2' -shaly layer, soft, dark gray, sharp contact at 70.8' to sharp contact at 72.2' -fossil parting at 73.8', 74.8', 75.2', 75.6' and 76.0' -moderately argillaceous layer, soft, dark gray, gradational contacts at 76.4'-77.1' -fossil parting at 77.0' -moderately argillaceous layer, soft, gray, gradational contacts at 78.3'-79.3'
70									
75		C8	70.0	80.0	100	100			
80									

DRILLING GEOLOGIST D. Hartsfield ASSISTANT D. Brown CHECKED BY C. Bommarito

CB 12/28/89

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 1 PG 3 OF 6

LOCATION: N 251,717 feet
E 2,171,756 feet

GROUND EL: 741.4 feet

DATE: 11/27-29/89 TYPE: Nx Core CASED TO: N/A CONTRACTOR: SwL (89-192)

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.
85		C9	80.0	90.0	100	100		
90		C10	90.0	100.0	100	100		
95								
100		C11	100.0	110.0	100	100		
105								
110		C12	110.0	120.0	70	70		
115								
120								

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See Page 1 of 6

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 9' thick moderately argillaceous to shaly limestone interbeds 2' to 6' apart. Also shale layers 1' to 2' thick, fossil partings, bentonite layer.
-moderately argillaceous layer, medium to soft, gray to dark gray, gradational contacts at 81.3'-90.0'
-shaly limestone layer, soft. dark gray, sharp contacts at 87.6'-87.8'
-fossiliferous, hard, light gray at 93.6'-94.0'
-bentonite seam, soft, blue gray, at 92.8'

-shaly layer, soft, dark gray, sharp contact at 90.0' to sharp contact at 91.6'
-fossil partings at 91.4', 92.5', 93.0', and 94.5'
-shaly layer, soft, dark gray, sharp contact at 93.8' to gradational contact at 95.0', gradational contact at 96.2' to gradational contact at 97.0', gradational contact at 93.0' to gradational contact at 94.1'
-shaly layer, soft, dark gray, sharp contact at 100.4' to sharp contact at 101.4', gradational contacts at 102.2'-103.8'
-fossil parting at 104.5'
-fossil parting at 106.0'
-shaly layer, soft, dark gray, sharp contact at 106.0' - 107.2', gradational contact at 103.6' to sharp contact at 104.5'

DRILLING GEOLOGIST D. Hartsfield ASSISTANT D. Brown CHECKED BY C. Bommarito

CB 12/28/89

LOG OF BORING

BORING NO: BI 1 PG 4 OF6

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

LOCATION: N 251,717 feet
E 2,171,756 feet

GROUND EL: 741.4 feet

DATE: 11/27-29/89 TYPE: Nx Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND:
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION: See Page 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
125		C13	120.0	130.0	10	0			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 1' thick slightly, extremely argillaceous limestone interbeds 1' to 5' apart. Also traces of pyrite.
130		C14	130.0	140.0	100	100			-very argillaceous layers, soft, dark gray with traces of pyrite at 131.0'-132.2' -pyrite nodule at 134.8' -slightly argillaceous layer, gray, with occasional pyrite nodules, gradational contacts at 136.75'-137.35' -slightly argillaceous layer, gray, with occasional pyrite nodules, gradational contacts at 138.0'-138.2' -pyrite nodule at 138.75'
135									
140		C15	140.0	150.0	100	100			-slightly argillaceous layer, gray, gradational contacts at 141.6'-142.25' -pyrite nodules at 145.0', 145.2' and 145.4' -slightly argillaceous layers, gray, gradational contacts at 147.0'-147.4' and 148.0'-148.2'
145									
150		C16	150.0	160.0	100	100			-slightly argillaceous layers, gray, gradational contacts at 150.8'-151.0', gradational contacts at 152.7'-152.9', gradational contacts at 156.7'-156.8' and gradational contacts at 159.5'-160.0'
155									
160									

DRILLING GEOLOGIST D. Hartsfield ASSISTANT D. Brown CHECKED BY C. Bommarito

CB 12/28/89

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 1 PG 5 OF 6

LOCATION: N 251,717 feet
E 2,171,756 feet

GROUND EL: 741.4 feet

DATE: 11/27-29/89 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See Page 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C17	160.0	170.0	100	100			LIMESTONE (Austin Chalk), modertely to medium hard, fresh, light gray to dark gray with 0.1' to 6' thick slightly argillaceous limestone interbeds 3' to 5' apart. Also shale partings, fossil partings. -slightly argillaceous layer, gray, sharp contact at 160.0' to gradational contact at 160.1' -shale parting at 162.0' -slightly argillaceous layer, gray, fossiliferous, gradational contacts at 163.0'-163.7' -fossil parting at 166.1' -slightly argillaceous layer, gray, fossiliferous, gradational contacts at 168.2'-168.4' -slightly argillaceous layer at 170.0'-170.4'
165									
170		C18	170.0	180.0	100	100			-slightly argillaceous layer, gray, gradational contact at 174.5' to sharp contact 180.0'
175									
180		C19	180.0	190.0	96	81			182.25 -gradational contact- 183.0 SHALY LIMESTONE (Transition) medium hard, fresh, fossiliferous, gray with abundant fossil debris SHALE (Eagle Ford), soft, fresh, fissile, dark gray with medium angle fractures, septarian concretions and pyrite nodules.
185									
190		C20	190.0	200.0	98	98			-35° smooth, tight, slickensided fractures at 192.4'-192.6' -pyrite nodules at 194.7', 195.1', and 195.4' -septarian concretions with pyrite nodules at 195.9'-196.0', 197.0',198.1'-198.2' and 199.2'
195									
200									

DRILLING GEOLOGIST D. Hartsfield ASSISTANT D. Brown CHECKED BY C. Bommarito

CB 12/28/89

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: BI 1 PG 6 OF 6
LOCATION: N 251,717 feet
E 2,171,756 feet
GROUND EL: 741.4 feet

DATE: 11/27-29/89 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION
See Page 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
			200.0						SHALE (Eagle Ford), soft, fresh, fissile, dark gray with septarian concretions and pyrite nodules
									-pyrite nodule at 201.3'
205		C21			98	98			-septarian concretions at 202.6' and 205.6' -pyrite nodule at 205.7'
									-septarian concretion at 209.8' and 210.4'
210		C22	210.0	210.0 211.0	100	100			
									Bottom of Exploration at 211.0 feet
									Monitor Well installed upon completion
215									
220									
225									
230									
235									
240									

DRILLING GEOLOGIST D. Hartsfield ASSISTANT D. Brown CHECKED BY C. Bommarito

CB 12/28/89

LITHOLOGIC LOG

BORING BI 2A

LOG OF BORING

BORING NO: BI 2A PG 1 OF 7

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 15

LOCATION: ~N 256,267 feet
~E 2,179,204 feet

GROUND EL: ~639.9 feet

DATE: 12-1-89 TYPE: Nx Core CASED TO: 3.5' CONTRACTOR: MJA

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation Well installed for continued monitoring of water level

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									CLAY (Residual Soil), silty, dk. brown 4.7g
5		C1	4.7		38	0			LIMESTONE (Austin Chalk), highly to completely wea., soft to med. hd., tan w/frac., iron-staining, sli. fossil
					100	100			6.3s LIMESTONE (Austin Chalk), mod. wea., med. to mod. hd. tan, sli. fossiliferous
				9.7	100	100			7.8s LIMESTONE (Austin Chalk), fresh, med. to mod. hard, lt. gray, with 0.5 to 2.1 ft. thick sli. argill. to shaly interbeds 1.0 to 2.65 ft. apart
10		C2	9.7						7.8s-8.5g Mod.-v. arg., med. hd., med. gray bed
					100	100			10.3g-12.2g Med. thick, mod. argill., med. hd., med. gray bed
									14.0g-14.85g Thin, v. argill./shaly soft, dk. gray bed
15									17.5g-19.6g Med. thick, sli. argill., med. gray bed
				19.3					
20		C3	19.3						21.4g-21.9g Thin, v. argill., soft, dk. gray bed
					99	99			23.7g-24.2g Thin, sli. argill., med. gray bed
									25.8g-26.5g Thin, sli. argill., med. gray bed
25									26.5g-27.1g Thin, mod.-v. argill., med. hd., dk. gray bed
				29.0					28.7g-29.3g Med. thick, sli. argill., med. gray bed
30		C4	29.0						31.2g-32.0g Thin, v. argill., soft to med. hard, dark gray bed
					100	100			35.2g-36.2s Thin, v. argill./shaly, soft to med. hard, dark gray bed
35				37.0					37.2g-37.6g Thin, sli. argill., med. gray bed
		C5	37.0		100	100			
40				40.5					

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Gary S. Kincaid CHECKED BY W. D. Flanigan

LOG OF BORING

BORING NO: BI2A PG 2 OF 7

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 15

LOCATION: ~N 256,267 feet ~E 2,179,204 feet

GROUND EL: ~ 639.9 feet

DATE: 12-1-89 TYPE: Nx Core CASED TO: 3.5' CONTRACTOR: MJA

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation well installed for continued monitoring of water level

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES		HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C6	40.5	50.5	97	97				LIMESTONE (Austin Chalk), fresh, med. to mod. hard, sli. fossiliferous, lt. gray with 0.3 to 1.7 ft. tnick sli. argill. to shaly and occ. bentonitic interbeds 0.4 to 2.9 ft. apart 40.8g-41.1g Thin, shaly, soft, med. to dk. gray bed 41.5g-42.8g Med. thick, sli. argill., med. gray bed 45.0g-46.2s Med. thick, v. argill/shaly, soft, dk. gray, sli. bentonitic bed 47.4g-47.7g Thin, sli. argill., med. gray bed 48.8g-49.8g Thin, v. argill., med. hd., dk. gray bed
45										
50										52.4g-53.2g Thin, v. argill., med. hard, dk. gray bed
		C7	50.5	59.5	96	96				55.3g-56.2g Thin, v. argill., med. hard, dk. gray bed 59.1g-59.9g Thin, v. argill., med. hard, dk. gray bed 59.9g-60.7g Thin, sli. argill., med. gray bed
55										
60		C8	59.5	69.5	100	100				62.9g-63.7g Thin, v. argill., med. hard, dk. gray bed 65.8g-66.8g Thin, v. argill., med. hard, dk. gray bed 69.0g-69.3g Thin, v. argill., med. hard, dk. gray bed
65										
70		C9	69.5	79.5	100	100				71.5g-73.2g Med. thick, mod. to v. argill., med. hard, dark gray bed 74.35g-75.7g Med. thick, sli. argill., med. gray, fossiliferous bed 76.6g-77.4g Thin, mod. to v. argill., med. hard, dk. gray bed 79.4g-80.4g Thin, mod. to v. argill., med. hard, dark gray bed
75										
80			79.5							

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Gary S. Kincaid CHECKED BY W. D. Flanigan

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI2A PG 3 OF 7

LOCATION: ~N 256,267 feet ~E 2,179,204 feet

GROUND EL: ~639.9 feet

DATE: 12-1-89 TYPE: Nx Core CASED TO: 3.5' CONTRACTOR: MJA

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES		HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C10		89.5	100	100				LIMESTONE (Austin Chalk), fresh, med. to mod. hard, sli. fossiliferous, lt. gray with 0.3 to 1.9 ft. thick interbeds 0.8 to 4.4 ft. apart 80.4g-82.3g Med. thick, sli. argill., med. gray bed 84.0g-84.3s Thin, shaly, soft, dk. gray bed 84.3s-85.5g Med. thick, sli. argill., med. gray bed 87.2g-88.5g Med. thick, mod. argill., med. hard, dk. gray bed
90		C11	89.5	99.5	100	100				91.3g-93.0g Med. thick, v. argill., med. hard, dk. gray bed 97.4g-99.0g Med. thick, v. argill., med. hard, dk. gray bed 100.8g-102.2s Med. thick, v. argill./shaly, soft to med. hard, dk. gray bed
100		C12	99.5	109.5	99	99				104.15g-104.6g Thin, v. argill., med. hard, dk.gray bed 108.0g-109.0g Thin, v. argill., med. hard, dk.gray bed 109.8g-110.1g Thin, mod. argill., med. hard, dk.gray bed
110		C13	109.5	119.5	100	100				111.0g-111.3g Thin, sli. argill., med. gray bed 113.2g-113.8g Thin, v. argill., med. hd., dk. gray bed 115.3g-116.6g Med. thick, sli. to mod. argill., med. hard, dk. gray bed 118.7s-119.1s Thin, v. argill./shaly, soft to med. hd., dk. gray bed w/1/2" bentonitic clay (v. soft) @ 119.0'
120			119.5							

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation well installed for continued monitoring of water level

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Gary S. Kincaid CHECKED BY W. D. Flanigan

LOG OF BORING

BORING NO: BI 2A PG 4 OF 7

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 15

LOCATION: ~N 256,267 feet
~E 2,179,204 feet

GROUND EL: ~639.9 feet

DATE: 12-1-89 TYPE: Nx Core CASED TO: 3.5' CONTRACTOR: MJA

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.
125		C14		129.5	99	99	Stopped Drilling 12-1-89	
130		C15	129.5	138.5	100	100	Started Drilling 12-4-89	
135								
140		C16	138.5	141.5	97	97		
145		C17	141.5	151.5	98	98		
150								
155		C18	151.5	161.5	98	98		
160								

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation well installed for continued monitoring of water level

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, med. to mod. hard, sli. fossil., with occ. pyrite, lt. gray, and with 0.1 to 3.1 sli. to very argill. interbeds 0.75 to 2.8 ft. apart

121.25g-121.65g Thin, v. argill., med. hd., dk. gray bed
122.4g-122.5g Very thin, sli. argill., med. gray bed
124.7g-126.4g Med. thick, sli. argill., med. gray bed
126.4g-129.5g Thick, mod. to v. argill., soft to med. hard, dk. gray bed
131.0g-132.5g Med. thick, mod. to v. argill., med. hard, dk. gray bed
135.3g-137.2g Med. thick, mod. argill., med. hard, med. gray bed
138.5g-140.7g Med. thick, mod. argill., med. hard, med. gray bed
143.2g-144.3g Med. thick, mod. argill., med. hard, med. gray bed
145.5g-146.1g Thin, mod. argill., med. hard, med. gray bed
147.35g-148.1g Thin, v. argill., soft to med. hard, dk. gray bed
149.6g-150.4g Thin, mod. argill., med. hard, med. gray bed
150.4g-153.5g Thick, sli. argill., med. gray bed
155.2g-156.5g Med. thick, mod. argill., med. hard, med. gray bed
157.6g-158.9g Med. thick, v. argill., med. hard, dark gray bed
160.2g-161.3g Med. thick, v. argill., med. hard, dark gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Gary S. Kincaid CHECKED BY W. D. Flanigan

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: B12A PG 5 OF 7

LOCATION: ~N 256,267 feet
~E 2,179,204 feet

GROUND EL: ~ 639.9 feet

DATE: 12-4-89 TYPE: Nx Core CASED TO: 3.5' CONTRACTOR: MJA

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.
		C18		161.5				
		C19	161.5	165.0	100	100		
165		C20	165.0	171.5	100	100		
170								
175		C21	171.5	181.5	97	97		
180								
185		C22	181.5	191.5	88	88	Stopped Drilling 12-4-89	
190								
195		C23	191.5	201.5	100	100	Started Drilling 12-5-89	
200								
			201.5					

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation well installed for continued monitoring of water level

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, med. to mod. hard, sli. fossiliferous, lt. gray, with pyrite and with 0.1 to 4.1 ft. thick sli. argill. to shaly and bentonitic clay interbeds 0.45 to 4.6 ft. apart

164.2 (2) intersecting 50° fractures w/sli. rough, slks., clean, fresh surfaces, closed (both fractures within bentonitc clay)

162.15s-162.25s Very thin, shaly, soft, dk. gray bed

163.0g-164.1g Med. thick, mod. to v. argill., med. hard, dk. gray bed

164.1g-165.25s Med. thick bentonitic clay, v. soft, non-laminated, bluish-gray bed

166.3 60° fracture, sli. rough, slks., clean, fresh surface, closed

165.7g-167.3g Med. thick, mod. to v. argill., med. hard, dk. gray bed

169.1g-170.1g Thin, sli. to mod. argill., med. hard, med. gray bed

170.7g-171.5g Thin, sli. to mod. argill., med. hard, med. gray bed

172.4g-173.1g Thin, mod. argill., med. hd., med. gray bed

174.3g-178.4g Thick, sli.-mod. argill., med. hard, med. gray bed

179.6g-180.2g Thin, v. argill./shaly, soft to med. hard, dk. gray bed

181.5g-182.8g Med. thick, sli. argill., med. gray bed

187.4g-187.8g Thin, sli. to med. argill., med. hard, med. gray bed

188.4s-188.6g Thin, shaly, soft, dk. gray bed

192.5g-193.4g Thin, mod. to v. argill., med. hard, dark gray bed

195.4g-195.5g V. thin, sli. argill., med. gray bed

197.7g-198.5g Thin, mod. argill., med. hard, dk. gray bed

198.8g-199.0s Thin, mod. argill., med. hard, dk. gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Gary S. Kincaid CHECKED BY W. D. Flanigan

LOG OF BORING

BORING NO: BI 2A PG 6 OF 7

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 15

LOCATION: ~N 256,267 feet ~E 2,179,204 feet

GROUND EL: ~ 639.9 feet

DATE: 12-5-89 TYPE: Nx Core CASED TO: 3.5' CONTRACTOR: MJA

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.
		C23		201.5				
205		C24	201.5	211.5	99	99		
210								
215		C25	211.5	221.5	98	98		
220								
225		C26	221.5	231.5	99	99		
230								
235		C27	231.5	241.5	99	99		
240								

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation well installed for continued monitoring of water level

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, mod. hard, sli. fossil., lt. gray, with 0.1 to 7.0 ft. thick sli. argill. to shaly interbeds 0.7 to 4.4 ft. apart

201.6g-202.6g Thin, sli. argill., med. gray bed
203.3g-203.7g Thin, sli. argill., med. gray bed
205.1s-205.2s Very thin, shaly, soft, dk. gray bed
207.4g-207.7g Thin, mod. argill., med. hard, dk. gray bed

210.0g-211.2g Med. thick, v. argill./shaly, soft to mod. hard, dk. gray bed

213.6g-214.6g Thin, mod. to v. argill., med. hard, dk. gray bed

219.0g-219.25s Thin, mod. to v. argill., med. hard, dark gray bed
219.2 Pyrite nodule (~3/8" dia.)
221.5-223.0 Near vertical fracture, ranging from 80° to 90°, sli. rough to rough, narrow separation (.2-.4mm), calcite filled, non slickensided fresh surface
225.1g-225.8s Thin, sli. argill., med. gray bed
225.8s-232.8g Thick, mod.-v. argill., increasingly arenaceous, med. hard, dk. gray bed
226.3-226.5 Abundant pyrite nodules 3/8"-1/2" dia.
227.7-227.8 Abundant pyrite nodules 1/4"-3/8" dia.

232.8g

TRANSITION ZONE (Austin Chalk), fresh, soft to med. hd., med. thick, med. to dk. gray, fossil., arenaceous, argill., w/abundant pyrite nodules from 233.8-234.0' (1/4"-3/4" dia.)

234.2s SHALE (Eagle Ford), fresh, soft, v. thin bedding, v. fine grained, dk. gray

241.0 40° fracture, slks., smooth to sli. rough, undulatory, closed, clean, fresh surface

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Gary S. Kincaid CHECKED BY W. D. Flanigan

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI2A PG 7 OF 7

LOCATION: ~N 256,267 feet
~E 2,179,204 feet

GROUND EL: ~639.9 feet

DATE: 12-5-89 TYPE: Nx Core CASED TO: 3.5' CONTRACTOR: MJA

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES		HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C27		241.5						SHALE (Eagle Ford), fresh, soft, v. thin bedding, v. fine grained, dk. gray, sli. fossil., with very thin (less than 1/2") sli. calcareous siltstone beds at 247.6, 248.1, 248.7, 249.4, 250.1, 251.9, 252.5, 253.0, 254.1, 257.35 and 259.1
245		C28	241.5	251.5	99	99				245.25 45° fracture, slks., smooth to sli. rough, undulatory, closed, clean, fresh surface
250										
255		C29	251.5	261.5	100	100				Calcareous concretion, hard, (~1"), lt. gray w/calcite crystals @ 258.1
260										
265										Total Depth: 261.5' 12-5-89
270										(1) Wireline Logged: 12-5-89 (2) Hydrotested: 12-6-89 (3) Borehole reamed to 6 3/4" down to 77.3': 12-6-89 and 12-7-89 (4) Well construction completed: 12-7-89 (5) Boring BI2A replaces Boring BI2 located at N256,245, E2,179,235, drilled and abandoned at approximately 110' on 11-20-89 and plugged on 12-7-89.
275										Log Revised 1/22/90
280										

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Wet Rotary Core Hole
Water level not determinable
Observation well installed for continued monitoring of water level

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Gary S. Kincaid CHECKED BY W. D. Flanigan

LITHOLOGIC LOG

BORING BI 3

LOG OF BORING

PROJECT: Superconducting Superroilider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 3 PG 1 OF 7

LOCATION: N 246,179 feet
E 2,180,466 feet

GROUND EL: 696.7 feet

DATE: 12-6/12-8-89 TYPE: NX Core CASED TO: 3.0' CONTRACTOR: SwL (89-192)

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									CLAY, silty, soft, trace organic debris, dark brown
5									
		C1	7.0	12.0	100	76			LIMESTONE (Austin Chalk) soft, moderately weathered, slightly fractured, tan
10									-Sharp Contact-
		C2	12.0	22.0	98	98			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray. Also fossil partings, medium angle fracture and septarian concretions
15									-fossil partings at 17.4', 21.1' and 28.6'
20									
		C3	22.0	32.0	100	100			
25									
30									-45° rough, open, calcite filled (½"), healed fracture at 32.4'
		C4	32.0	42.0	91	86			
35									-fossil parting at 37.5'
40									-septarian concretion (½"), at 40.3'

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Drilled with air rotary to 52.0' where seepage was encountered. Switched to water rotary at 52.0' Unable to determine parameters of subsurface water table below 52.0'

DRILLING GEOLOGIST M. Granger ASSISTANT J. Lu CHECKED BY C. Bommarito

CB 12/28/89
Shawn Wood
(3-7-90

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 3 PG 2 OF 7

LOCATION: N 246,179 feet
E 2,180,466 feet

GROUND EL: 696.7 feet

DATE: 12-6/12-8-89 TYPE: NX Core CASED TO: 3.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See page 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.5' thick moderately to extremely argillaceous limestone interbeds 4' apart. Also fossil partings, low, medium, high angle fractures, traces of pyrite.
45		C5	42.0	52.0	95	95			-fossil partings at 43.5', 53.1', 57.7' and 59.1'
50									
55		C6	52.0	62.0	97	97			-trace pyrite at 58.7' -very argillaceous layer, medium gray, sharp contacts at 62.0'-62.3'
60									
65		C7	62.0	72.0	100	98			-moderately argillaceous layer, medium gray gradational contacts at 68.4'-68.8'
70									
75		C8	72.0	82.0	99	99			-trace pyrite at 74.2' -75° closed, clean hairline fracture at 77.0'-77.7' -80° closed, calcite filled (1/8'), healed fracture at 77.4'-78.8' -trace calcite and pyrite at 79.1' -40° closed, clean hairline fracture at 80.4'-80.6' -25° smooth, tight, slickensided fracture at 81.6'
80									

DRILLING GEOLOGIST M. Granger ASSISTANT I. Lu CHECKED BY C. Bommarito

CB 12/28/89
Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 3 PG 3 OF 7

LOCATION: N 246,179 feet
E 2,180,466 feet

GROUND EL: 696.7 feet

DATE: 12-6/12-8-89 TYPE: NX core CASED TO: 3.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See page 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 2' thick extremely argillaceous to shaly limestone interbeds 3' to 9' apart. Also fossil partings, low, medium, high angle fractures with occasional calcite filling.
85		C9	82.0	92.0	100	97			-20° smooth, open, slickensided fracture at 82.0'-82.1' -20° closed, hairline fracture at 82.1'-82.2' -90° closed, calcite filled fracture at 85.8'-87.8' -40° smooth, open, slickensided fracture at 87.6-87.7' -85° closed, calcite filled, hairline fracture at 88.6'-89.4' -50° smooth, open, slickensided fracture at 89.9-90.0 -20° smooth, open, slickensided fracture at 90.9'
90									
95		C10	92.0	102.0	86	82			-40° smooth, open, slickensided fracture with trace of pyrite at 91.2' -85° closed, calcite filled (1/16"), healed fracture at 92.0'-92.1' -40° calcite filled (1"-1½"), healed fracture at 92.6' -90° calcite filled (1/16"), healed fracture at 93.7'-94.5' -shaly limestone layer, dark gray, gradational contacts at 94.5'-95.3' -shaly limestone layer, dark gray, gradational contacts at 98.0'-98.7'
100									
105		C11	102.0	112.0	64	64			-fossil parting at 103.3' -shaly limestone layer, dark gray, gradational contacts at 103.2'-103.4'
110									
115		C12	112.0	122.0	87	87			-shaly limestone layer, dark gray, gradational contacts at 112.0'-113.4' -very argillaceous layer, dark gray, gradational contacts at 117.7'-119.8'
120									

DRILLING GEOLOGIST M. Granger ASSISTANT J. Lu CHECKED BY C. Bommarito

CB 12/28/89

Shawn Wood
3-7-90

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 3 PG 4 OF 7

LOCATION: N 246,179 feet
E 2,180,466 feet

GROUND EL: 696.7 feet

DATE: 12-6/8-89 TYPE: NX Core CASED TO: 3.0' CONTRACTOR: SwL (89-192)

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.5' to 5' thick slightly, moderately, extremely, argillaceous to shaly limestone interbeds 1' to 6' apart. Also shale layers 1' thick, fossil partings, bentonite layer.
125		C13	122.0	132.0	69	69			-moderately argillaceous layer, medium gray, gradational contacts at 122.2'-123.6' -very argillaceous layer, dark gray, sharp contact at 127.3' to gradational contact at 128.0'
130									
135		C14	132.0	142.0	47	47			-very argillaceous layer, dark gray, gradational contacts at 134.9'-136.0'
140									
145		C15	142.0	146.0	100	100			-slightly argillaceous layer, medium gray, gradational contacts at 142.0'-142.6' -fossil parting at 142.6' -soft shale layer, dark gray, gradational contacts at 144.9'-145.4' with bentonite layer (½") at 145.2'
150		C16	146.0	156.0	100	100			-shaly limestone layer, dark gray gradational contacts at 147.5'-148.2' -moderately argillaceous layer(½"), medium gray at 149.0' -slightly argillaceous layer, light gray, gradational contacts at 152.6'-153.5' -soft shale layer, dark gray, gradational contact at 153.5' to sharp contact at 153.7' -very argillaceous layer, dark gray, gradational contacts at 155.2'-156.3'
155									
160		C17	156.0	162.0	100	100			-moderately argillaceous, medium gray, gradational contact at 156.3' to sharp contact at 161.9' -bentonite layer(½"), at 162.0'

SAMPLE LEGEND
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION
See page 1 of 7

DRILLING GEOLOGIST M. Granger ASSISTANT J. Lu CHECKED BY C. Bommarito

CB 12/28/89

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 3 PG 5 OF 7

LOCATION: N 246,179 feet
E 2,180,466 feet

GROUND EL: 696.7 feet

DATE: 12/6-8/89 TYPE: NX Core CASED TO: 3.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See page 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 1' to 3' thick moderately to extremely argillaceous limestone interbeds 1' to 4' apart. Also shale layers, fossil partings, and bentonite layer.
165		C18	162.0	172.0	100	100			-moderately argillaceous layer, medium gray gradational contacts at 163.4'-165.9' -fossil parting at 164.2' -very argillaceous layers, dark gray, gradational contacts at 168.5'-169.8' and 171.0'-172.1' -fossil partings at 170.1' and 170.5'
170									
175		C19	172.0	182.0	99	99			-very argillaceous layer, dark gray, gradational contacts at 173.0'-174.1' -very argillaceous layer, dark gray, gradational contacts at 175.7'-176.7' -moderately argillaceous layer, medium gray, gradational contacts at 177.6'-180.0' -moderately argillaceous layer, medium gray, gradational contacts at 181.6'-183.1' -fossil parting at 182.0'
180									
185		C20	182.0	192.0	92	92			-moderately argillaceous layer, medium gray, gradational contact at 184.0' and sharp contact at 185.5' -soft shale layer, dark gray sharp contacts at 185.5'-185.6' -moderately argillaceous layer, medium gray, gradational contacts at 187.0'-188.1' -soft shale layer, medium gray with trace bentonite sharp contacts at 189.0'-189.1'
190									
195		C21	192.0	201.0	100	100			-moderately argillaceous layer, medium gray, gradational contact at 189.9' to sharp contact at 190.2 -½"pyrite nodule at 192.0' -fossil parting at 192.5' -moderately argillaceous layer, medium gray, sharp contacts at 192.5'-194.2' -moderately argillaceous layer, medium gray, sharp contacts at 196.1'-197.2' -moderately argillaceous layer, medium gray, gradational contacts at 197.8'-198.1' -moderately argillaceous layer, medium gray, sharp contacts at 199.7'-200.5' -fossil partings at 194.8', 196.0' and 197.3'
200									

DRILLING GEOLOGIST M. Granger ASSISTANT J. Lu CHECKED BY C. Bommarito

CB 12/28/89

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 3 PG 6 OF 7

LOCATION: N 246,179 feet
E 2,180,466 feet

GROUND EL: 696.7 feet

DATE: 12/6-8/89 TYPE: NX Core CASED TO: 3.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See page 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
205, 210		C22	201.0	211.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.1' to 2' thick slightly to moderately argillaceous and fossiliferous limestone interbeds 1' to 6' apart. Also shale layers 0.1' thick, fossil partings, medium angle fractures, traces of pyrite. -slightly argillaceous layer, light gray, gradational contacts at 201.6'-203.3' -slightly argillaceous layer, light gray, gradational contact at 204.2' to sharp contact at 207.3' -soft shale layer, dark gray, sharp contacts at 208.1'-208.2' -moderately argillaceous layer, medium gray, gradational contact at 209.6' to sharp contact at 211.0'
215, 220		C23	211.0	221.0	100	100			-pyrite nodule (¼"), at 210.0' -pyrite nodule (½"), at 210.8' -moderately argillaceous layer, medium gray, sharp contact at 213.2' to gradational contact at 213.3' -slightly argillaceous layer, light gray, gradational contacts at 215.7'-216.2' -shale layer (½"), soft, dark gray at 217.0'
225, 230		C24	221.0	231.0	99	99			-moderatly argillaceous layer, medium gray, gradational contact at 221.0' to sharp contact at 221.7' -trace pyrite at 221.4' -pyrite nodules (1"), at 222.6' and 224.1' -40° tight, smooth, slickensided fracture at 227.2' -slightly argillaceous layer, light gray, gradational contact at 227.0' to sharp contact 228.0'
235, 240		C25	231.0	241.0	100	100			-shale layer (½"), soft, dark gray at 232.9' -fossiliferous seam (½"), with interbedded pyrite at 233.7' -moderately argillaceous and fossiliferous layer, medium gray. sharp contact at 237.6' to gradational contact at 238.7'

DRILLING GEOLOGIST M. Granger ASSISTANT J. Lu CHECKED BY C. Bommarito

CB 12/28/89

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 3 PG 7 OF 7

LOCATION: N 246,179 feet
E 2,180,466 feet

GROUND EL: 696.7 feet

DATE: 12/6-8/89 TYPE: NX Core CASED TO: 3.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See page 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
245, 250		C26	241.0	251.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 1' thick slightly, moderately argillaceous limestone interbeds 3' to 17' apart. Also fossil partings, traces of pyrite. -pyrite nodule (½") at 242.5' -pyrite nodule (¼") at 242.8' -slightly argillaceous layer, light gray, sharp contacts at 242.3'-243.0' -fossil parting at 245.2' -slightly argillaceous layer, light gray, sharp contacts at 245.7'-246.5'
255, 260		C27	251.0	261.0	100	100			-pyrite nodule (¼") at 259.0' -moderately argillaceous layer, medium gray, gradational contact at 245.7' to sharp contact at 246.5' 260.0 -gradational contact-
265, 270, 275		C28	261.0	269.0	100	100			261.5 SHALY LIMESTONE (Transition) medium hard, fresh, medium gray to dark gray with abundant fishbones, teeth and fossil debris -gradational contact- SHALE (Eagle Ford), soft, fresh, fissile, dark gray with low, medium angle fractures, fossil partings and septarian concretions and traces of pyrite. -15°, smooth, tight, slickensided fracture at 262.0' -pyrite nodule (1") at 262.1' -20°, smooth, tight, slickensided fracture at 263.7' -pyrite nodule (½"), at 263.8' -30°, smooth, tight, slickensided fracture at 265.0' -40°, smooth, tight, slickensided fracture at 266.0' -25°, smooth, tight, slickensided fracture at 267.0' -fossil parting at 272.7' -trace pyrite at 274.2' -septarian concretions at 275.8', 275.9', 276.4', 277.1', 270.4', and 279.7'
280		C29	269.0	278.0	98	98			
		C30	278.0	282.0	90	90			-50°, smooth, tight, slickensided fracture at 279.8'
									Boring exploration terminated at 282.0'

DRILLING GEOLOGIST M. Granger ASSISTANT J. Lu CHECKED BY C. Bommarito

CB 12/28/89

Shawn Wood
(3-7-90)

LITHOLOGIC LOG

BORING BI 4

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: BI 4 PG 1 OF 5
LOCATION: N 255,921 feet
E 2,174,201 feet
GROUND EL: 710.9 feet

DATE: 1-15/1-16-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									CLAY, soft, weathered, trace organics, weathered limestone fragments, brown
									2.0
5		C1	4.0	9.0	60	30			LIMESTONE (Austin Chalk) soft, extremely weathered, extremely fractured, tan to light brown with occasional tan clay seams
10		C2	9.0	14.0	58	25			
									14.9
15		C3	14.0	24.0	100	98			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.3' to 2' thick slightly, moderately argillaceous limestone interbeds 1' to 5' apart. Also fossil partings, low, high angle fractures, traces of pyrite. -moderately argillaceous layers, gray, gradational contact at 16.8' to sharp contact at 18.0', gradational contact at 20.7' to sharp contact at 22.3' -fossil partings at 18.7' and 21.9' -moderately argillaceous layers, gray, gradational contacts at 26.9'-28.5', gradational contact at 30.5' to sharp contact at 31.8' -slightly argillaceous layer, medium gray, gradational contacts at 32.8'-33.3' -fossil partings at 27.9', 30.9', 31.7' and 31.8' -85° fracture, planar, closed with trace pyrite at 29.4'-30.5' -planar, closed, non slickensided fracture with trace pyrite at 29.4'-30.5' -pyrite at 32.5' -fossil partings at 34.5', 35.4', 35.8', 37.9', 37.6', 38.0', 38.2', 38.4', 38.7', 42.0', 42.1' and 42.7'
20					98	98			
25		C4	24.0	34.0	92	90			
30									
35		C5	34.0	44.0	91	91			-moderately argillaceous layers, gray, sharp contact at 37.1' to gradational contact at 38.2', sharp contacts at 39.1'-39.4' and sharp contacts at 42.3'-42.9'
40									

SAMPLE LEGEND
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION
No seepage encountered. Begin drilling with water at 4.0'. Unable to determine parameters of subsurface water table.

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood 3-7-90

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 4 PG 2 OF 5

LOCATION: N 255,921 feet
E 2,174,201 feet

GROUND EL: 710.9 feet

DATE: 1-15/1-16-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See page 1 of 5

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
				44.0					LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.4' to 6' thick slightly, moderately argillaceous limestone interbeds 1' to 6' apart. Also fossil partings.
45		C6	44.0	54.0	83	83			-moderately argillaceous layer , gray, sharp contacts at 50.9'-51.3' -fossil partings at 49.7', 50.7', and 51.0'
50									
55		C7	54.0	64.0	97	97			-moderately argillaceous layers, gray, gradational contacts at 57.2'-57.6' and gradational contacts at 60.0'-61.3' -fossil partings at 57.4', 60.2', 61.2' and 63.2'
60									
65		C8	64.0	74.0	100	100			-fossil partings at 65.7', 68.6', 71.1', 71.8' and 73.2' -slightly to moderately argillaceous stratum, medium gray to gray, sharp contacts at 64.0'-70.5'
70									-moderately argillaceous layer, gray, sharp contacts at 73.1'-74.0'
75		C9	74.0	84.0	100	100			-fossil partings at 74.6', 75.4', 77.2', 78.8', and 82.6' -moderately argillaceous layers, gray, sharp contact at 75.4' to gradational contact at 76.3', gradational contacts at 77.4'-78.3', gradational contacts at 79.8'-80.5', and gradational contacts at 81.6'-83.2'
80									

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood 3-7-90

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: BI 4 PG 3 OF 5
LOCATION: N 255,921 feet
E 2,174,201 feet
GROUND EL: 710.9 feet

DATE: 1-15/1-16-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION
See page 1 of 5

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
				84.0					LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.3' to 2' thick slightly, moderately argillaceous limestone interbeds 1' to 7' apart. Also shale layers, fossil partings, bentonite layers, medium angle fractures, traces of pyrite.
85		C10	84.0	94.0	100	100			-moderately argillaceous layers, gray, gradational contacts at 85.3'-86.5' and gradational contacts at 88.0'-89.1' -moderately argillaceous layers, gray, gradational contact at 90.5' to sharp contact at 91.4' and gradational contacts at 93.2'-93.5' -fossil parting at 91.0' -45° grooved, open (1/8"), slickensided fracture at 92.3'-94.0' -bentonite layer, soft, blue gray, at 94.2'-94.7' -slightly argillaceous layers, medium gray, gradational contacts at 95.2'-96.7', gradational contacts at 98.6'-99.6', gradational contacts at 100.3'-101.0', and gradational contacts at 102.1'-102.7' -fossil parting at 97.9'
90									
95		C11	94.0	104.0	99	99			
100									
105		C12	104.0	114.0	100	100			-fossil parting at 108.4' -pyrite nodule at 108.4' -slightly argillaceous layers, medium gray, sharp contact at 110.0' to gradational contact at 110.8' and gradational contacts at 111.8'- 113.0'
110									
115		C13	114.0	124.0	100	100			-pyrite nodules at 116.1', 117.0'-117.1' and 123.9' -bentonite layer at 118.8'-119.2' -fossil partings at 121.3', 121.4', 121.6' and 123.5' -bentonitic shale layer at 123.7'-123.9' -slightly argillaceous layer, medium gray, gradational contacts at 117.5'-118.4'
120									

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood 3-7-90

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 4 PG 4 OF 5

LOCATION: N 255,921 feet
E 2,174,201 feet

GROUND EL: 710.9 feet

DATE: 1-15/1-16-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See page 1 of 5

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
				124.0					LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.3' to 3' thick slightly, moderately argillaceous limestone interbeds 1' to 6' apart. Also fossil partings, low, medium angle fractures, and traces of pyrite.
125		C14	124.0	134.0	100	100			-pyrite nodules at 124.5', 126.5', 126.6', 127.5', and 127.7' -slightly argillaceous layers, medium gray, gradational contacts at 125.2'-125.7', gradational contacts at 127.7'-128.3', gradational contacts at 129.0'-129.3', gradational contacts at 132.2'-132.6', and gradational contacts at 133.4'-133.7' -35°-45°, grooved, tight, semi-planar, slickensided fracture at 131.3'
130									
135		C15	134.0	144.0	100	100			-moderately argillaceous layers, gray, sharp contact at 137.4' to gradational contact at 137.7' and sharp contacts at 140.2'-141.0' -fossil parting at 140.3' -15° smooth, tight, planar, slickensided fracture at 137.6' -moderately argillaceous layers, gray, sharp contacts at 144.0'-144.8', sharp contacts at 149.1'-149.5' and sharp contacts at 151.0'-151.6' -fossil partings at 146.3', 151.8', and 153.0'
140									
145		C16	144.0	154.0	93	93			
150									
155		C17	154.0	164.0	100	100			-moderately argillaceous layers, gray, gradational contacts at 157.2'-159.0', gradational contacts at 161.5'-164.0' -fossil parting at 160.5'
160									

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood 3-7-90

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 4 PG 5 OF 5

LOCATION: N 255,921 feet
E 2,174,201 feet

GROUND EL: 710.9 feet

DATE: 1-15/1-16-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See page 1 of 5

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
				164.0					LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray. 164.0 -gradational contact-
165		C18	164.0	171.6	100	100			SHALY LIMESTONE (transition) medium hard, fresh, extremely argillaceous, medium gray to dark gray with abundant fragments of fish bones, teeth and other fossil debris. 164.5 -gradational contact-
170		C18	171.6	174.0	100	100			SHALE (Eagle Ford), soft, fresh, fissile, dark gray with occasional medium angle fractures, limestone seams, traces of pyrite.
175		C19	174.0	181.2	100	100			-45° smooth, planar joint at 166.8' -high pyrite content at 175.4' - 179.5' -limestone seams soft, fresh, tan at 178.4', 178.7', 179.8', 179.3', 180.6', 183.0', 183.4' and 183.5' -pyrite nodule at 183.9'
180		C20	181.2	184.5	82	82			184.5
185									Bottom of exploration at 184.5 feet Monitor Well Installed Upon Completion
190									
195									
200									

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood 3-7-90

LITHOLOGIC LOG

BORING BI 5

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 5 PG 1 OF 7

LOCATION: N 251,800 feet
E 2,182,381 feet

GROUND EL: 658.4 feet

DATE: 1/24-26/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.
5		C-1	4.0	9.0	96	96		
10		C-2	9.0	14.0	100	100		
15, 20		C-3	14.0	24.0	100	98		
25, 30		C-4	24.0	34.0	100	100		
35, 40		C-5	34.0	44.0	100	98		

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Begin drilling with water at 4.0'. Unable to determine parameters of subsurface water table.

DESCRIPTION OF STRATUM

1.0 CLAY soft, heavy organic content, fine to coarse particles of sand, moist, light tan

2.0 LIMESTONE (Austin Chalk) soft, extremely weathered, moist, light tan, trace organics (ie roots)

4.0 LIMESTONE (Austin Chalk) soft, extremely weathered, fractured, (clay seams (extremely weathered) yellowish tan) trace organics (ie roots)

10.0 LIMESTONE (Austin Chalk), soft, moderately weathered, slightly argillaceous, tan to light brown with fossil partings and insipient fractures.
-fractures at 4.7', 5.1', 6.3' and 8.0'
-fossil parting at 8.8'
-pyrite nodule at 6.8'
-fractures at 9.3', 9.4', 9.6', and 9.8'

LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.3' to 1' thick slightly argillaceous limestone interbeds 1' to 16' apart. Also fossil partings.
-fossil parting at 13.5'
-pyrite nodule at 12.2'
-slightly argillaceous layer, gradational contact at 19.6' to sharp contact at 19.9'

-fossil partings at 28.4' and 30.4'

-slightly argillaceous layer, gray, gradational contact at 24.9' to sharp contact at 25.5'
-slightly argillaceous layer, gray, gradational contact at 26.4' to sharp contact at 27.4'

-slightly argillaceous layer, gray, gradational contacts at 43.6'-44.0'

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 5 PG 2 OF 7

LOCATION: N 251,800 feet
E 2,182,381 feet

GROUND EL: 658.4 feet

DATE: 1/24-26/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.5' to 1' thick slightly, moderately, extremely argillaceous limestone interbeds 3' to 4' apart. Also fossil partings, bentonite layer, medium angle fractures, traces of calcite and pyrite.
45			44.0						-slightly argillaceous layers, gray, sharp contact at 44.0' to gradational contact at 44.5'; gradational contacts at 48.7'-49.6', gradational contact at 53.8' to sharp contact at 54.0'
50		C-6			100	100			-fossil partings at 46.2' and 52.3'
				54.0					-slightly argillaceous layers, gray, sharp contacts at 54.0'-54.6'; gradational contact at 57.6' to sharp contact at 58.0', gradational contacts at 62.1'-63.1'
55			54.0						-fossil partings at 54.6', 56.3' and 62.0'
60		C-7			100	100			
				64.0					-calcite nodule at 68.6' -pyrite nodules at 65.1' and 68.5'
65			64.0						-45°, planar, open slickensided fracture at 67.7'
70		C-8			100	100			-slightly argillaceous layers, gray, soft, gradational contacts at 67.3'-68.0', gradational contact at 69.3' to sharp contact at 69.6', gradational contacts at 70.7'-71.7' -bentonite layer (1/2") at 67.8' -fossil partings at 65.6', 68.4', 69.5', 72.4' and 73.7'
				74.0					
75			74.0						-slightly argillaceous layers, gray, gradational contacts at 74.4'-75.1', gradational contacts at 77.3'-78.3'; sharp contact at 81.2' to gradational contact at 81.9' -fossil partings at 75.7', 76.9', 78.4', 80.1', 81.3' and 83.6'
80		C-9			100	100			
				84.0					

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: BI 5 PG 3 OF 7
LOCATION: N 251,800 feet, E 2,182,381 feet
GROUND EL: 658.4 feet

DATE: 1-24/25-90 TYPE: NX Core CASED TO: CONTRACTOR: SwL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									LIMESTONE (Ausitn Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.1 to 2' thick slightly to moderately argillaceous limestone interbeds 2' to 7' apart. Also fossil partings.
85		C-10	84.0	94.0	100	100			-fossil partings 84.0', 85.7', and 92.7' -slightly argillaceous layers, gray, gradational contacts at 84.7'-85.8', gradational contacts at 87.6'-88.4', gradational contacts at 91.0'-91.3' -moderately argillaceous layers, gray, gradational contact at 93.6' to sharp contact at 94.0' -moderately argillaceous layers, gray, sharp at 94.0' to gradational contact at 94.7', gray, soft, fossiliferous, gradational contact at 95.1' to sharp contact 95.6', sharp contact at 101.1' to gradational contact at 102.2',
90									
95		C-11	94.0	104.0	92	92			-fossil interbed, soft , shaly at 95.5'-95.6' -slightly argillaceous layer, gray, gradational contacts at 98.2'-98.9' -fossil partings at 95.2', 95.6', 96.1', 96.3', 96.4', 96.7', 96.9', 97.0', 97.1', 97.2', 97.6', 99.2' and 99.3' -moderately argillaceous layer, gray , soft, fossiliferous, sharp contact at 106.3' to gradational contact at 106.9'; gray, soft, gradational contact at 109.5' to sharp contact at 111.0' -fossil partings at 106.6', 108.6', and 110.7'
100									
105		C-12	104.0	114.0	95	95			-moderately argillaceous layer, dark gray, soft, gradational contact at 114.1' to sharp contact at 115.7'; dark gray, soft, fissile, sharp contact at 120.4' to gradational contact at 122.0'; gray, sharp contacts at 123.2'-123.3' -fossil partings at 117.2' and 121.4'
110									
115		C-13	114.0	124.0	93	93			
120									

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: BI 5 PG 4 OF 7.
LOCATION: N 251,800 feet, E 2,182,381 feet
GROUND EL: 658.4 feet

DATE: 1/24-26/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: see p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.3' to 5' thick slightly to moderately argillaceous limestone interbeds 0.5' to 15' apart. Also fossil partings, bentonite layer and low angle fractures.
125		C-14	124.0	134.0	85	85			-moderately argillaceous layer, dark gray, sharp contact at 124.0' to gradational contact at 124.5'; dark gray, sharp contact at 129.8' to gradational contact at 130.8'; gray, soft, sharp contacts at 131.6'-131.9' -slightly argillaceous layer, gray, gradational contacts at 126.2'-126.7' -fossil partings at 128.5', 128.5', 130.5', and 130.6'
130									
135		C-15	134.0	144.0	96	96			-moderately argillaceous layer, soft, dark gray, fissile, sharp contact at 135.4' to gradational contact at 135.8' -slightly argillaceous layer, gray, sharp contacts at 137.8'-138.3' -interbedded bentonite seams, soft, blue gray, sharp contacts at 141.2'-142.3' -fossil partings at 137.5', 138.2', 139.2', 139.5', 139.7', 140.3', and 143.4'
140									
145		C-16	144.0	154.0	100	100			-moderately argillaceous layer, dark gray, fossiliferous, sharp contacts at 153.4'-154.0' -slightly argillaceous layer, gray, sharp contact at 144.0' to gradational contact at 144.5'; gray, gradational contacts at 150.5'-151.3' -bentonite shale, soft, fissile, gray, sharp contacts at 149.2'-149.3' -fossil partings at 145.0', 150.7', 152.0', & 153.9' -slightly argillaceous layer, gray, sharp contacts at 154.0'- 159.7'; gray, gradational contact at 161.3' to sharp contact at 163.5' -bentonite seam (¼"), soft, blue gray, sharp contact at 159.7' -fossil partings at 155.8', 156.4', 160.9', 161.3', 163.4', and 163.7' -10° slickensided fracture, rough, grooved, non planar at 157.8'
150									
155		C-17	154.0	164.0	100	99.5			
160									

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: BI 5 PG 5 OF 7
LOCATION: N 251,800 feet
E 2,182,381 feet
GROUND EL: 658.4 feet

DATE: 1/24-26/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SWL (89-192)

SAMPLE LEGEND
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION
See p.1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.5' to 2' thick slightly argillaceous limestone interbeds 0.2' to 3' apart. Also fossil partings, bentonite layer.
165		C-18	164.0	174.0	100	100			-slightly argillaceous layers, gray, gradational contacts at 165.6'-167.3'; 168.0'-169.0'; 170.0'-171.2'; and 172.3'-173.3' -fossil partings at 165.3', 165.5. and 168.1' -slightly argillaceous layers, gradational contacts at 174.2'-175.6'; 175.8'-176.3'; 177.8'-179.2'; 180.1'-181.4'; and 183.1'-183.8'
170									
175		C-19	174.0	184.0	100	100			-fossil partings at 176.1', 178.1', 178.7', and 183.6'
180									
185		C-20	184.0	194.0	94	93			-slightly argillaceous layers, gray, gradational contacts at 185.3'-186.3'; gray, gradational contact at 187.2' to sharp contact at 189.0'; gray, gradational contact at 192.5' to sharp contact at 193.4' -bentonitic shale layer (¼"), soft, fissile, gray to blue gray at 184.7' -bentonitic shale layer, soft, fissile, gray to blue gray, sharp contacts at 186.5' -186.9'
190									
195		C-21	194.0	204.0	94	94			-bentonitic shale, soft, dark gray, fissile, sharp contacts at 202.8'-203.0' -fossil partings at 196.0', 197.6', and 198.5'
200									

DRILLING GEOLOGIST Dale Brown ASSISTANT Allan Dover CHECKED BY Clem Bommarito

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 5 PG 6 OF 7

LOCATION: N 251,800 feet
E 2,182, 381 feet

GROUND EL: 658.4 feet

DATE: 1/24-25/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
				204.0					LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.1' to 2' thick slightly to moderately argillaceous limestone interbeds 1' to 6' apart. Also fossil partings, bentonite layer and low, medium, high angle fractures.
205		C-22	204.0	214.0	89	89			-45°, planar, open, slickensided fracture at 205.0' -bentonitic shale layer, soft, fissile, blue gray to gray, sharp contacts at 201.1'-201.2' -moderately argillaceous layers, gray, bentonitic, sharp contacts at 214.4'-215.3'; gray, gradational contacts at 217.1'-217.9'; gradational contacts at 220.1'-220.5'; gray, gradational contacts at 221.0'-221.7'; gray, gradational contacts at 222.5'-223.5'
210									
215		C-23	214.0	224.0	100	100			-low angle to high angle, non-planar (irregular), slickensided fracture at 223.2' -fossil parting (boring) at 223.8'
220									
225		C-24	224.0	234.0	100	100			-slightly argillaceous layer, gray, gradational contacts at 229.4'-229.5'
230									
235		C-25	234.0	240.0	84	84			-fossil partings at 236.9' and 238.0'
240			240.0						

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Clem Bommarito

Shawn Wood
(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 5 PG 7 OF 7

LOCATION: N 251,800 feet, E 2,182,381 feet

GROUND EL: 658.4 feet

DATE: 1/24-26/90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
			240.0						LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.1' to 3' thick slightly to moderately argillaceous limestone interbeds 2' to 6' apart. Also pyrite.
245		C-26			100	100			-moderately argillaceous layer, soft, dark gray, fissile, high pyrite content, sharp contacts at 240.9'-241.0' -slightly argillaceous layer, gray, gradational contact at 247.0' to sharp contact at 250.0' -pyrite nodules at 248.3' and 249.7'
250				250.0					
			250.0						-slightly argillaceous layer, gray, sharp contact at 250.0' to gradational contact at 253.2' -moderately argillaceous layer, dark gray, at 253.2'-255.6'
255		C-27			60	60			-large pyrite nodules at 254.4'-255.5' -gradational contact- SHALY LIMESTONE (Transition) medium hard, fresh, dark gray with abundant fishbones, sharks teeth, and fossil debris, sharp contacts at 255.3'-255.6'
260				260.0					
			260.0						SHALE (Eagle Ford), soft, fresh, fissile, dark gray with occasional harder limestone layers 0.3' thick, medium angle fractures, tan clay layers 0.1' thick and traces of pyrite. -30°, planar, open, slickensided fracture at 261.1' -30°, planar, open, slickensided fracture at 262.0' -high pyrite content at 262.5', 264.1', and 267.1'-268.4'
265		C-28			91	91			-limestone layer, medium, fresh, gray to light gray with high pyrite content, fractured (calcite healed), sharp contacts at 264.7'-265.0'
270				270.0					
			270.0						-limestone interbed (3/8"), medium, fresh, light gray, high pyrite content, sharp contact at 266.6' -limestone nodule, at 266.7' -clay layer (3/4"), soft, tan, fresh at 269.0' -clay layers at 270.0', 270.7' (1/4"), 271.8' (1/8"), 273.0' (1/4"), 275.8' (1/2"), and 276.4' (1/2")
275		C-29			100	100			-30° smooth, planar, fractures at 275.9'-279.4' -pyrite nodule at 277.6'
280				280.0					280.0
									Bottom of Exploration at 280.0 feet

DRILLING GEOLOGIST Dale Brown ASSISTANT Alan Dover CHECKED BY Shawn Wood

Clem Bommarito

(3-7-90)

LITHOLOGIC LOG

BORING BI 6

LOG OF BORING

BORING NO: BI 6 PG 1 OF 6

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

LOCATION: N 245,951 ft. E 2,174,687 ft.

GROUND EL: 734.1 ft.

DATE: 1-16/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

No surface groundwater encountered. Air rotary 0'-71', Water Rotary at 71'-231' T.D.

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
			2.0	0.5					CLAY, silty, dark brown with traces of roots, organic debris and weathered limestone fragments.
5		C1		11.0	84	63			LIMESTONE (Austin Chalk) soft, severely weathered, moderately fractured, tan.
10			11.0	17.0					
15		C2		21.0	91	76			LIMESTONE (Austin Chalk) soft, moderately weathered, slightly fractured, tan with occasional gray shaley limestone layers.
20			21.0	21.4					
25		C3		31.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.5' to 2' thick moderately argillaceous to shaly limestone interbeds 2' to 5' apart. Also fossil partings.
30			31.0	41.0					-moderately argillaceous layers, medium gray, at 24.5'-25.5' -shaly limestone layers, dark gray, sharp contacts at 28.6'-29.3' -shaly limestone layers, dark gray, sharp contact at 31.2' to gradational contact at 33.0' -shaly limestone layers, dark gray, gradational contacts at 38.4'-38.9' -fossil parting at 35.4'
35		C4			100	100			
40									

DRILLING GEOLOGIST M. Granger ASSISTANT S. Stevens CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 6 PG 2 OF 6

LOCATION: N 245,951 ft. E 2,174,687 ft.

GROUND EL: 734.1 ft.

DATE: 1-16/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
45, 50		C5	41.0	51.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 1' to 2' thick slightly to moderately argillaceous to shaly limestone interbeds 1' to 5' apart. Also shale layers 0.2' thick, fossil partings, bentonite layer. -shaly limestone layer, dark gray, gradational contacts at 41.0'-42.5' -moderately argillaceous layer, medium gray, gradational contacts at 46.0'-46.9' -bentonitic layer (½") bluish-gray at 49.1' -moderately argillaceous layer, medium gray, gradational contacts at 49.1'-50.4'
55, 60		C6	51.0	61.0	100	100			-slightly argillaceous layer, medium gray, gradational contacts at 51.0'-52.4' -fossil parting at 54.0' -soft shale layer, dark gray, gradational contact at 54.0' to sharp contact at 54.2' -shaly limestone layer, medium gray, gradational contact at 57.4' to sharp contact at 58.5' -moderately argillaceous layer, medium gray, gradational contacts at 61.4'-62.3' -moderately argillaceous layer, medium gray, gradational contacts at 67.1'-68.9'
65, 70		C7	61.0	71.0	98	98			-moderately argillaceous layer, medium gray, sharp contacts at 71.0'-72.1' -slightly argillaceous layer, light gray, gradational contacts at 73.8'-74.5' -moderately argillaceous layer, medium gray, gradational contacts at 79.8'-80.2'
75, 80		C8	71.0	81.0	100	100			

DRILLING GEOLOGIST M. Granger ASSISTANT S. Stevens CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 6 PG 3 OF 6

LOCATION: N 245,951 ft.
E 2,174,687 ft.

GROUND EL: 734.1 ft.

DATE: 1-16/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C9	81.0	91.0	98	98			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.4' to 3' thick moderately argillaceous to shaly limestone interbeds 1' to 8' apart. Also fossil partings, bentonite layer. -moderately argillaceous layer, medium gray, gradational contacts at 83.1'-83.7' -shaly limestone layer, medium gray, sharp contact at 88.7' to gradational contact at 89.1' -fossil parting at 89.2' -shaly limestone layer, dark gray, gradational contact at 91.0' to sharp contact at 91.4'
		C10	91.0	101.0	68	68			-shaly limestone layer, dark gray, gradational contacts at 99.5'-100.1' -fossil parting at 100.0' -moderately argillaceous layer, medium gray, gradational contacts at 101.0'-103.1'
		C11	101.0	111.0	99	99			-moderately argillaceous layer, medium gray, gradational contacts at 104.6'-107.0' -bentonitic shale layer, bluish-gray, gradational contact at 107.6' to sharp contact at 107.8' -moderately argillaceous layer, medium gray, gradational contacts at 111.0'-112.1' -moderately argillaceous layer, medium gray, sharp contact at 114.4' to gradational contact at 115.5'
		C12	111.0	121.0	89	89			-moderately argillaceous layer, medium gray, sharp contact at 117.0' to gradational contact at 117.8' -shaly limestone layer, dark gray, gradational contacts at 118.8'-119.9'

DRILLING GEOLOGIST M. Granger ASSISTANT S. Stevens CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 6 PG 4 OF 6

LOCATION: N 245,951 ft.
E 2,174,687 ft.

GROUND EL: 734.1 ft.

DATE: 1-16/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
125, 130		C13	121.0	131.0	88	88			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 1' to 2' thick moderately argillaceous limestone interbeds 1' to 10' apart. Also fossil partings, bentonite layer, medium angle fractures, and pyrite nodules. -moderately argillaceous layers, medium gray, gradational contacts at 121.4'-122.2'; 123.3'-125.5'; 127.2'-128.6'; 132.6'-133.1'; 134.8'-136.3'
135, 140		C14	131.0	141.0	93	93			-60°, closed, tight, fracture at 135.0' -bentonitic layer, soft, bluish-gray, sharp contacts at 136.3'-137.5' -fossil partings at 137.5' and 138.3' -moderately argillaceous layer, medium gray, sharp contact at 137.5' to gradational contact at 139.2' -moderately argillaceous layer, medium gray, sharp contacts at 141.4'-142.3' -moderately argillaceous layer, medium gray, sharp contact at 143.1' to gradational contact at 144.2' -moderately argillaceous layer, medium gray, sharp contacts at 145.0'-145.9' -moderately argillaceous layer, medium gray, gradational contact at 154.8' to sharp contact at 156.3'
145, 150		C15	141.0	151.0	90	90			
155, 160		C16	151.0	161.0	100	100			-pyrite nodule (1") at 155.1' -pyrite nodule (3/4") at 160.0' -pyrite nodule (¼") at 160.3'

DRILLING GEOLOGIST M. Granger ASSISTANT S. Stevens CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 6 PG 5 OF 6

LOCATION: N 245,951 ft.
E 2,174,687 ft.

GROUND EL: 734.1 ft.

DATE: 1-16/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SWL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C17	161.0	171.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 2' thick moderately argillaceous limestone interbeds 2' to 9' apart. Also pyrite nodules. -moderately argillaceous layers, medium gray, sharp contact at 164.7' to gradational contact at 165.5'; gradational contact 174.0' to sharp contact at 174.7'; gradational contacts at 176.0'-178.0'
		C18	171.0	181.0	73	73			
		C19	181.0	191.0	57	57			-moderately argillaceous layer., medium gray, gradational contacts at 183.1'-184.0'
		C20	191.0	201.0	59	59			-moderately argillaceous layer., medium gray, sharp contacts at 192.2'-192.4' -moderately arigillaceous layer., medium gray, gradational contacts at 193.7'-194.5' -pyrite nodule (1") at 196.8'

DEPTH IN FEET: 165, 170, 175, 180, 185, 190, 195, 200

DRILLING GEOLOGIST M. Granger ASSISTANT S. Stevens CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: BI 6 PG 6 OF 6

LOCATION: N 245,951 ft.
E 2,174,687 ft.

GROUND EL: 734.1 ft.

DATE: 1-16/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
205, 210		C21	201.0	211.0	55	55			LIMESTONE (Austin Chalk) moderately to medium hard, light gray.
									209.0 -Gradational Contact-
215, 220		C22	211.0	221.0	61	61			SHALY LIMESTONE (Transition) medium hard, fresh, extremely argillaceous, medium gray, with abundant fragments of fish bones, teeth, and other fossil debris.
									211.0 -Gradational Contact-
225, 230		C23	221.0	231.0	98	98			SHALE (Eagle Ford), soft, fresh, fissile, dark gray with low to medium angle fractures, and septarian concretions. -20°, closed, tight fracture at 211.3' -40°, closed, tight fracture at 211.7' -30°, open, clean fracture at 212.6' -10°, smooth, open, slickensided fracture at 216.9' -septarian concretions at 221.9', 222.3', 222.7', 223.0', 223.6', 225.2', 225.6' and 226.9' -40°, smooth, open, fracture at 225.1'
235, 240									Bottom of Exploration at 231.0'

DRILLING GEOLOGIST M. Granger ASSISTANT S. Stevens CHECKED BY Shawn Wood

LITHOLOGIC LOG

BORING B 1527

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1527 PG 1 OF6
LOCATION: N. 248,994 ft. E. 2,172,201 ft.
GROUND EL: 713.3 ft.

DATE: 3/23-28/90 TYPE: NX Core CASED TO: 21.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: Seepage at 6.0', Abundant water at 20.0', Air Rotary method 0-30', Water Rotary method 30'-T.D.

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									CLAY, silty, dark brown with traces of roots and organic debris. 0.5
5									CLAY, silty, light brown with traces of organic debris and weathered limestone fragments. 6.0
10									
									CLAY, silty, tan with abundant weathered limestone fragments. 20.0
15									
20			20.0						LIMESTONE (Austin Chalk) severely weathered, moderately to severely fractured, tan.
25		C1			84	69			
30				30.0					30.4
			30.0						LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray with 1' to 4' thick moderately argillaceous to shaly limestone interbeds 1' to 3' apart. -moderately argillaceous layer, medium gray, sharp contacts at 30.4'-31.0' -moderately argillaceous layer, medium gray, 32.8'-33.4' -fossil partings at 30.5', 37.8' and 40.0' -shaly limestone layers, dark gray, sharp contact at 36.7' to gradational contact at 37.6', and gradational contacts at 38.4'-38.7'
35		C2			96	96			
40				40.0					

DRILLING GEOLOGIST Mike Granger ASSISTANT Kevin Jones CHECKED BY Shawn Wood

LOG OF BORING

BORING NO: B 1527 PG 2 OF 6

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

LOCATION: N. 248,994 ft. E. 2,172,201 ft.

GROUND EL: 713.3 ft.

DATE: 3/23-28/90 TYPE: NX Core CASED TO: 21.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
45		C3	40.0	50.0	97	97			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.5' to 3' thick shaly limestone interbeds 1' to 7' apart. Also shale layers 0.1' to 2' thick, fossil partings, bentonite layer, medium angle fractures. -shaly limestone layer, dark gray, sharp contact at 41.6' to gradational contact at 42.1' -fossil partings at 43.9' and 48.3' -shale layer, soft, dark gray, sharp contacts at 47.1'-47.3' with bentonite layer (½"), soft, bluish-gray at 47.15'
50		C4	50.0	60.0	100	100			-shaly limestone layer, dark gray, sharp contacts at 49.6'-50.1' -fossil partings at 50.1', 51.1', 52.6', 53.6', and 54.3' -50°, open, rough, calcite healed (¼"), slickensided fracture, at 55.4' -shaly limestone layer, dark gray, gradational contacts at 55.7'-56.8' -fossil partings at 56.7', 57.9' and 59.2' -shale layer, soft, dark gray, gradational contacts at 58.7'-60.7'
55									
60		C5	60.0	70.0	100	100			-shaly limestone layer, dark gray, gradational contacts at 62.2'-65.6' -bentonite seam, soft, bluish-gray, (¼"), at 65.4'
65									
70		C6	70.0	80.0	100	100			-shaly limestone layer, dark gray, gradational contacts at 67.0'-69.2' -shale layer, soft, dark gray, gradational contacts at 69.2'-69.3' -fossil partings at 61.5', 62.3', and 63.8' -shaly limestone layers, dark gray, gradational contacts at 71.0'-72.0', 74.3'-75.2', 76.3'-77.2', and 78.7'-79.6' -fossil partings at 72.8', 77.3' and 79.3'
75									
80									

DRILLING GEOLOGIST Mike Granger ASSISTANT Kevin Jones CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1527 PG 3 OF 6
LOCATION: N. 248,994 ft. E. 2,172,201 ft.
GROUND EL: 713.3 ft.

DATE: 3/23-28/90 TYPE: NX Core CASED TO: 21.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
85		C7	80.0	90.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.5' to 2' thick moderately argillaceous to shaly limestone interbeds 1' to 7' apart. Also shale layers 1' thick, fossil partings, bentonite layer, medium angle fractures. -shaly limestone layers, dark gray, gradational contacts at 80.5'-83.1', 84.3'-85.6' and 86.5'-87.8' -shale layer, soft, dark gray, gradational contact at 87.8' to sharp contact at 88.1' -shaly limestone layer, dark gray, gradational contacts at 89.3'-90.2'
90		C8	90.0	100.0	100	99			-bentonite shale layer, soft, light gray, gradational contacts at 91.1'-91.4' -shaly limestone layer, dark gray, gradational contacts at 92.0'-92.4' -fossil partings at 92.5', 96.1' and 98.6' -45°, smooth, open, slickensided fracture at 93.1' -bentonite layer, soft, bluish-gray, gradational contacts at 93.4'-94.2' -shaly limestone layers, dark gray, sharp contacts at 95.0'-96.1', gradational contacts at 98.0'-99.0'. gradational contacts at 100.0'-100.6', sharp contact at 101.4' to gradational contact at 102.1'
95									
100		C9	100.0	110.0	96	96			-moderately argillaceous layers, medium gray, gradational contacts at 103.3'-104.4' and 107.4'-108.0' -½" pyrite nodule at 107.6' -shale layer, soft, dark gray, sharp contacts at 109.2'-110.1'
105									
110		C10	110.0	120.0	100	97			-shaly limestone layer, dark gray, gradational contacts at 111.3'-112.9' -45°, smooth, open, slickensided fracture at 112.9' -¼"-2", pyrite nodules at 115.1'-115.5', possible fracture. Unable to determine from recovered core. -shaly limestone layers, dark gray, gradational contacts at 117.4'-117.8' and sharp contacts at 118.5'-118.7' -45°, rough, open, slickensided fracture at 119.1'
115									
120									

DRILLING GEOLOGIST Mike Granger ASSISTANT Kevin Jones CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1527 PG 4 OF 6
LOCATION: N. 248,994 ft. E. 2,172,201 ft.
GROUND EL: 713.3 ft.

DATE: 3/23-28/90 TYPE: NX Core CASED TO: 21.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
125		C11	120.0	130.0	93	91			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 3' thick moderately argillaceous to shaly limestone interbeds 0.6' to 6' apart. Also medium to high angle fractures. -85°, rough, open, slickensided fracture at 120.9'-121.3' -45°, rough, open, calcite healed (½"), fracture at 122.5' -45°, tight, closed, calcite healed (¼"), fracture at 122.9' -45°, smooth, open, slickensided fracture at 123.2' -shaly layers, soft, dark gray, sharp contacts at 123.2'-123.6', sharp contacts at 124.2'-124.4', gradational contacts at 127.0'-127.7', and gradational contacts at 128.8'-129.1' -moderately argillaceous layer, medium gray, gradational contacts at 130.9'-131.7' -shaly limestone layers, dark gray, sharp contacts at 133.5'-133.7', gradational contacts at 136.3'-137.3', sharp contacts at 140.0'-140.8' and gradational contacts at 145.0'-145.5
130									
135		C12	130.0	140.0	100	100			
140									
145		C13	140.0	150.0	68	68			
150									
155		C14	150.0	160.0	100	100			-moderately argillaceous layer, medium gray, gradational contacts at 151.9'-154.9' -shaly limestone layer, dark gray, gradational contacts at 154.9'-155.6' -moderately argillaceous layer, medium gray, gradational contacts at 155.6'-157.4' 158.1 -Gradational Contact-
160									SHALY LIMESTONE (Transition) medium hard, fresh, dark gray, extremely argillaceous, abundant fragments of fish bones, teeth, and other fossil debris.

DRILLING GEOLOGIST Mike Granger ASSISTANT Kevin Jones CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1527 PG 5 OF 6
LOCATION: N. 248,994 ft. E. 2,172,201 ft.
GROUND EL: 713.3 ft.

DATE: 3/23-28/90 TYPE: NX Core CASED TO: 21.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
			160.0						SHALY LIMESTONE (Transition) medium, fresh, sound, dark gray, extremely argillaceous, abundant fragment of fish bones, teeth and other fossil debris.
165		C15			78	78			
170				170.0					160.5 -Sharp Contact-
			170.0						SHALE (Eagle Ford), soft, fresh, fissile, dark gray with occasional harder carbonate layers 0.1' thick, and septarian concretions.
175		C16			32	32			
180				180.0					-septarian concretions at 178.6', 179.0', 179.9' and 180.0' -limestone layer (1"), light gray at 181.0' -2" pyrite nodule 183.0' -septarian concretions at 183.0' and 185.2'
			180.0						
185		C17			100	100			
190				190.0					
			190.0						-septarian concretion at 194.3'
195		C18			100	100			
200				200.0					

DRILLING GEOLOGIST Mike Granger ASSISTANT Kevin Jones CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1527 PG 6 OF 6
LOCATION: N. 248,994 ft. E. 2,172,201 ft.
GROUND EL: 713.3 ft.

DATE: 3/23-28/90 TYPE: NX Core CASED TO: 21.0' CONTRACTOR: SwL (89-192)

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 6

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C19	200.0	210.0	90	90			SHALE (Eagle Ford), soft, fresh, fissile, dark gray with occasional calcareous shale and harder carbonate layers 1' thick and septarian concretions, pyrite nodules and calcite veins. -calcareous shale layer, sharp contacts at 200.7' -201.4' with interbedded pyrite at 201.3' -¼" pyrite nodule at 201.7' -limestone layer, light gray with intersecting calcite veins (¼"-½"), at sharp contacts at 208.8'-208.9'
205									
210		C20	210.0	220.0	100	100			
215									
220		C21	220.0	228.0	100	100			-calcareous shale layer, gradational contacts at 220.0'-221.0' -¼" limestone seams, light gray, at 221.3' and 221.4' -calcareous shale layer, sharp contact at 223.5' to gradational contact at 223.9' -septarian concretion at 224.0' -1" pyrite nodule 229.2'
225									
230		C22	228.0	238.0	50	50			-½" pyrite nodule 232.6'
235									
240									Bottom of Exploration 238.0 feet

DRILLING GEOLOGIST Mike Granger ASSISTANT Kevin Jones CHECKED BY Shawn Wood

LITHOLOGIC LOG

BORING B 1533

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: B 1533 PG 1 OF 7

LOCATION: N 249,576 ft. E 2,172,058 ft.

GROUND EL: 729.6 ft.

DATE: 3-20/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Encountered ground water at 5.4' and again at 8.2'. Began using water at 60.0'. Unable to determine parameters of sub-surface water table below this point.

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		U-1	0.0	0.5	100	100			CLAY, tan to brown with limestone fragments, trace roots in upper horizon. 0.5
		C1	2.0	4.0	30	30			
5		C2	4.0	10.0	97	80			LIMESTONE (Austin Chalk), severely weathered, moderately fractured, tan. -shaly limestone layers, gradational contacts at 5.5'-5.8' and 8.2'-8.5'
10		C3	10.0	20.0	88	80			-clay layers, gradational contacts at 10.9-11.2', 12.0'-12.2' and 13.9'-14.3' 16.3 LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 1' thick slightly to extremely argillaceous to shaly limestone interbeds 3' to 7' apart. Also shale layers 0.3' thick, fossil partings.
15									
20		C4	20.0	30.0	100	100			-slightly argillaceous layer, soft, medium gray, sharp contact at 16.3' to gradational contact at 16.5' -shaly limestone layer, soft, dark gray, gradational contacts at 19.6'-19.8' -shale layer, soft, dark gray, fissile, sharp contacts at 24.2'-24.5' -fossil partings at 25.4' and 28.0' -shaly limestone layer, medium gray, soft, gradational contacts at 27.3'-28.5'
25									
30		C5	30.0	40.0	100	100			-very argillaceous layers, dark gray, sharp contact at 30.2' to gradational contact at 31.3', gradational contacts at 35.7'-37.1', and gradational contact at 39.0' to sharp contact at 40.0'
35									
40									

DRILLING GEOLOGIST A. Dover ASSISTANT B. Long CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: B 1533 PG 2 OF 7

LOCATION: N 249,576 ft. E 2,172,058 ft.

GROUND EL: 729.6 ft.

DATE: 3-20/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
45		C6	40.0	50.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 1' thick slightly, moderately, extremely argillaceous to shaly limestone interbeds 1' to 8' apart. Also shale layers 1' thick, fossil partings. -moderately argillaceous layer , gradational contacts at 41.6'-42.4' -fossil parting at 42.15' -shaly limestone layer , soft, fissile, dark gray, at 45.5'-46.5' -fossil parting at 47.0'
50		C7	50.0	60.0	89	89			-shale layer , soft, fissile, dark gray, sharp contacts at 46.3'-47.5' -very argillaceous layer , dark gray, gradational contact at 50.4' to sharp contact at 50.9' -very argillaceous layer , dark gray, fossiliferous, sharp contacts at 58.0'-58.5' -fossil partings at 52.4' and 53.65'
60		C8	60.0	70.0	100	100			-slightly argillaceous layer , light gray, gradational contacts at 61.6'-62.0' -fossil parting at 62.1' -moderately argillaceous layer , medium gray, gradational contacts at 62.5'-63.5' -shaly limestone layers, gradational contacts at 64.6'-65.8' and gradational contacts at 67.4'-68.7' -fossil parting at 65.3'
70		C9	70.0	80.0	84	84			-shaly limestone layer , medium gray, fissile, sharp contacts at 74.0'-74.2' -fossil parting at 76.2'
75									
80									

DRILLING GEOLOGIST A. Dover ASSISTANT ~~B. Long/G. White~~ CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: B 1533 PG 3 OF 7

LOCATION: N 249,576 ft.
E 2,172,058 ft.

GROUND EL: 729.6 ft.

DATE: 3-20/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.
85		C10	80.0	90.0	98.5	98.5		
90		C11	90.0	100.0	96.5	96.5		
100		C12	100.0	110.0	97.0	97.0		
105								
110		C13	110.0	120.0	100	100		
115								
120								

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.3' to 1' thick moderately to extremely argillaceous limestone interbeds 0.5' to 7' apart. Also shale layers 0.2' thick, fossil partings, bentonite layer, medium angle fractures, and traces of pyrite.

-moderately argillaceous layers, soft, dark gray sharp contact at 80.3' to gradational contact at 81.7'; gradational contacts at 82.5'-83.6'; gradational contacts at 84.5'-85.6'; gradational contacts at 86.8'-87.8'; and gradational contact at 88.7' to sharp contact at 89.85'

-fossil parting at 81.8'

-moderately argillaceous layer, medium gray, sharp contact at 90.0' to gradational contact at 91.0'

-very argillaceous layer, dark gray, gradational contacts at 92.4'-93.9'

-fossil parting with pyrite at 91.4'

-moderately argillaceous layer, medium gray, gradational contacts at 95.3'-96.3'

-shale layer, gradational contact at 91.2' to sharp contact at 91.4'

-very argillaceous layer, soft, dark gray, gradational contact at 97.7' to sharp contact at 98.7'

-moderately-very argillaceous layer, medium to dark gray, gradational contacts at 100.6'-100.5'

-bentonite layer, very soft, blue-gray, sharp contacts at 102.0'-102.5'

-45°, smooth, tight, slickensided fracture at 102.5'

-fossil partings at 102.7', 103.0', and 104.4'

-moderately argillaceous layers, medium gray, gradational 106.2'-107.3'
107.8'-109.1'

-fossil parting at 111.1'

-shale layer (2"), soft, dark gray at 107.7' and 108.1'

-moderately argillaceous layer , medium, gray, gradational contacts at 115.9'-116.2'

-pyrite nodule ½" at 119.2'

DRILLING GEOLOGIST A. Dover ASSISTANT G. White CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: B 1533 PG 4 OF 7

LOCATION: N 249,576 ft. E 2,172,058 ft.

GROUND EL: 729.6 ft.

DATE: 3-20/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C14	120.0	130.0	99	99			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.1' to 1' thick moderately, extremely argillaceous to shaly limestone interbeds 0.3' to 15' apart. Also shale layers 0.1' thick, fossil partings, low angle fractures, traces of pyrite. -shaly limestone layer , soft, dark gray, sharp contact at 120.2' to gradational contact at 120.4' -pyrite nodules at 124.2' and 124.6' -shale layer 1½", soft, fissile, dark gray, at 126.4' -pyrite nodule ½", at 126.4' -bedding plane parting at 127.8' -35°, smooth, tight, slickensided fracture at 130.3'
125									
130		C15	130.0	140.0	100	100			-moderately argillaceous layers, soft, medium gray, gradational contacts at 135.1'-135.8', 136.4'-136.6', and 138.9'-139.1'
135									
140		C16	140.0	150.0	100	100			-moderately argillaceous layers, medium gray, gradational contacts at 141.1'-141.5', 142.7'-142.8', and 143.1'-143.4' -fossil parting at 143.0' -moderately argillaceous layer , medium gray, gradational contact at 145.3' to sharp contact at 145.5' -moderately argillaceous layer , medium gray, fossiliferous, gradational contacts at 147.9'-148.7'
145									
150		C17	150.0	160.0	100	100			-very argillaceous layer , soft, dark gray, gradational contacts at 151.4'-151.9' -fossil parting at 154.7' -very argillaceous layers, soft, dark gray, sharp contacts at 156.7'-157.0' and gradational contact at 158.4' to sharp contact at 158.9' -pyritic fossil parting at 158.8'
155									
160									

DRILLING GEOLOGIST A. Dover ASSISTANT G. White CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: B 1533 PG 5 OF 7

LOCATION: N 249,576 ft.
E 2,172,058 ft.

GROUND EL: 729.6 ft.

DATE: 3-20/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C18	160.0	170.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 1' thick extremely argillaceous interbeds. Also fossil partings. -fossil parting at 161.9' -very argillaceous layer , soft, dark gray, fossiliferous, gradational contacts at 168.9'-169.8' -fossil parting at 169.2' 169.8 -Gradational Contact-
165									
170		C19	170.0	180.0	88	88			SHALY LIMESTONE (Transition) medium hard, fresh, extremely argillaceous, medium gray to dark gray with abundant fragments of fish bones, teeth and other fossil debris. 170.2 SHALE (Eagle Ford), soft, fresh, fissile, dark gray with occasional harder limestone layers 0.3' thick, low angle fractures and septarian concretions. -septarian concretion (1") at 171.6' -25°, smooth, tight, slickensided fractures at 171.3', 172.6' and 172.9' -30°, tight, planar, healed fracture at 173.0' -45°, tight, planar, healed fracture at 173.5' -30°, smooth, tight, curved, slickensided fracture at 175.8'
175									
180		C20	180.0	190.0	28	28			-limestone layer , medium, light gray, with calcite filled fractures, sharp contacts at 181.1'-181.4' -limestone layer (½"), light gray, at 181.8' -limestone layer (½"), light gray, at 182.8' -septarian concretion (½"), at 191.7' -septarian concretion (1"), at 192.2' -septarian concretion (1"), at 192.7' -septarian concretion (1"), at 194.3' -septarian concretion (1"), at 194.9'
185									
190		C21	190.0	200.0	100	100			-limestone layer (1½"), light gray, at 197.1'
195									
200									

DRILLING GEOLOGIST A. Dover ASSISTANT G. White CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: B 1533 PG 6 OF 7

LOCATION: N 249,576 ft. E 2,172,058 ft.

GROUND EL: 729.6 ft.

DATE: 3-20/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
			200.0						SHALE (Eagle Ford), soft, fresh, fissile, dark gray with occasional harder carbonate layers 1' thick, medium to high angle fractures, fossil partings and septarian concretions and traces of pyrite.
205		C22			98	98			-bedding plane parting with pyrite filling at 205.1' -pyrite nodule at 207.7' -calcareous shale, soft-medium, dark gray, fissile, gradational contacts at 208.7'-209.6'
210				210.0					-65°, smooth, tight, planar, slickensided fracture at 210.8' -45°, smooth, tight, planar, slickensided fracture at 211.4' -fossil parting at 213.6'
			210.0						-calcareous shale, soft-medium, dark gray gradational contact at 206.6' to sharp contact at 207.3'
215		C23			83	83			
220				220.0					
			220.0						-septarian concretion (¼"), at 222.6' -septarian concretion (½"), at 223.5' -septarian concretion (½"), at 224.7'
		C24			100	100			
225				225.0					
			225.0						-calcareous shale layer, soft-medium, dark gray, gradational contact at 230.8' to sharp contact at 232.0'
230		C25			49	47			-limestone layer, medium fresh, light gray, sharp contact at 234.5' to gradational contact at 234.85'
235				235.0					
			235.0						-septarian concretion (½"), at 236.1 and 236.2'
240		C26			58	58			-septarian concretion (1½"), at 240.8'

DRILLING GEOLOGIST A. Dover ASSISTANT G. White CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: B 1533 PG 7 OF 7

LOCATION: N 249,576 ft. E 2,172,058 ft.

GROUND EL: 729.6 ft.

DATE: 3-20/22-90 TYPE: NX Core CASED TO: N/A CONTRACTOR: SwL 89-192

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES		HAND PEN. TSF.	DESCRIPTION OF STRATUM
										SHALE (Eagle Ford), soft, fresh, fissile, dark gray with occasional harder carbonate layers 1' thick.
245										-calcareous shale, soft, dark gray, gradational contacts at 245.0'-246.1'
			245.0							
250		C27			100	100				
255				255.0						
										Bottom of Exploration at 255.0'
260										
265										
270										
275										
280										

DRILLING GEOLOGIST A. Dover ASSISTANT G. White CHECKED BY Shawn Wood

LITHOLOGIC LOG

BORING B 1540

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 15

BORING NO: B 1540 PG 1 OF 7

LOCATION: N 250,250 ft. E 2,171,882 ft.

GROUND EL: 750.0 ft.

DATE: 3-19/22-90 TYPE: NX Core CASED TO: 5.0' CONTRACTOR: SwL 89-192

SAMPLE LEGEND

S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION

Seepage encountered 5.0'
Air Rotary Method 0-61.0'
Water Rotary Method 61.0'-T.D.

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		S-1	Shelby tube 0.0-0.8'						
			2.0						CLAY, silty, dark brown with traces of roots, organic debris and weathered limestone fragments. 0.5 -Sharp Contact-
5		C1			72	44			LIMESTONE (Austin Chalk) severely weathered, moderately to severely fractured, tan.
10				11.0					
			11.0		100	92			12.8 -Sharp Contact-
15		C2			100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 2' thick moderately argillaceous limestone interbeds 1' to 3' apart. Also fossil partings. -moderately argillaceous layer , medium gray, sharp contacts at 13.0'-13.9' -moderately argillaceous layer , medium gray, sharp contact at 16.8' to gradational contact at 17.7'
20				21.0					-moderately argillaceous layer , medium gray. gradational contacts at 20.1'-21.0' -fossil partings at 21.5', 24.7', 28.0', 28.5', and 30.4'
			21.0						
25		C3			100	100			-moderately argillaceous layer , medium gray, gradational contacts at 22.8'-23.7' -moderately argillaceous layer , medium gray, gradational contacts at 25.9'-26.3' -moderately argillaceous layer , medium gray, gradational contacts at 28.4'-30.0'
30				31.0					-fossil partings at 31.0' and 39.8'
			31.0						-moderately fossiliferous layer , light gray, gradational contacts at 31.4'-32.4' -moderately argillaceous layer , medium gray, gradational contacts at 33.5'-34.3'
35		C4			99	99			-moderately argillaceous layer , medium gray, sharp contact at 36.3' to gradational contact at 37.1'
40				41.0					-moderately argillaceous layer , medium gray, gradational contacts at 40.7'-40.9'

DRILLING GEOLOGIST M. Granger ASSISTANT R. Grimstead CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1540 PG 2 OF 7
LOCATION: N 250,250 ft. E 2,171,882 ft.
GROUND EL: 750.0 ft.

DATE: 3-19/22-90 TYPE: NX Core CASED TO: 5.0' CONTRACTOR: SwL 89-192

SAMPLE LEGEND
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION
See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C5	41.0	51.0	98	98			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 2' thick slightly to moderately argillaceous to shaly limestone interbeds 1' to 4' apart. Also shale layers 0.5' thick, fossil partings. -moderately argillaceous layer , medium gray, gradational contacts at 44.0'-45.0' -moderately argillaceous layer , medium gray, gradational contacts at 48.0'-49.1'
45									
50									
		C6	51.0	61.0	100	100			-moderately argillaceous layer , medium gray, gradational contacts at 53.7'-55.2' -shaly limestone layer , dark gray, sharp contacts at 57.0'-58.3' -fossil parting at 57.6' -slightly argillaceous layer , medium gray, gradational contacts at 59.9'-60.5'
55									
60									
		C7	61.0	71.0	100	100			-fossil partings at 63.1', 64.0', 64.5', 69.5', and 69.9' -shaly limestone layer , dark gray, sharp contacts at 63.7'-64.5' -shaly limestone layer , dark gray, sharp contacts at 65.5'-65.7' -shale layer , soft, dark gray, gradational contacts at 68.6'-69.1' -shaly limestone layer , dark gray, sharp contacts at 71.0'-71.6'
65									
70									
		C8	71.0	81.0	76	76			-fossil partings at 72.0' and 73.6' -shale layer , soft, dark gray, sharp contacts at 73.9'-74.1' -shale layer , soft, dark gray, sharp contacts at 75.6'-76.0'
75									
80									

DRILLING GEOLOGIST M. Granger ASSISTANT R. Grimstead CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1540 PG 3 OF 7
LOCATION: N 250,250 ft. E 2,171,882 ft.
GROUND EL: 750.0 ft.

DATE 8-19/22-90 TYPE: NX Core CASED TO: 5.0' CONTRACTOR: SWL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C9	81.0	91.0	98	98			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 1' to 2' thick moderately argillaceous to shaly limestone interbeds 1' to 4' apart. Also fossil partings, bentonite layer, medium to high angle fractures. -shaly limestone layer , dark gray, gradational contacts at 82.9'-84.0' -shaly limestone layer , dark gray, gradational contacts at 85.7'-87.3' -fossil parting at 87.7'
85									
90									-moderately argillaceous layer , medium gray, gradational contacts at 91.0'-92.6' -moderately argillaceous layer , medium gray, gradational contacts at 95.0'-96.1' -moderately argillaceous layer , medium gray, gradational contacts at 97.2'-98.1'
		C10	91.0	101.0	75	75			
95									
100									-shaly limestone layer , dark gray, gradational contacts at 101.3'-102.0' -70°, open, healed, calcite filled, (½") fracture at 102.3'-102.8' -shaly limestone layer , dark gray, gradational contacts at 103.0'-103.9' -shaly limestone layer , dark gray, gradational contacts at 105.5'-106.2' -shaly limestone layer , dark gray, gradational contacts at 107.2'-108.7' -fossil partings at 108.6' and 112.1' -moderately argillaceous layer , medium gray, gradational contacts at 111.0'-112.1' -moderately argillaceous layer , medium gray, gradational contacts at 113.2'-114.5' -moderately argillaceous layer , medium gray, gradational contacts at 115.6'-116.1'
		C11	101.0	111.0	100	100			
105									
110									
		C12	111.0	121.0	90	90			-shaly limestone layer , medium gray, gradational contact at 117.7' to sharp contact at 119.1' -bentonite layer , soft, bluish-gray, sharp contacts at 119.1'-119.6' -45°, smooth, open, slickensided fracture at 119.6'
115									
120									

DRILLING GEOLOGIST M. Granger ASSISTANT R. Grimstead CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1540 PG 4 OF 7
LOCATION: N 250,250 ft. E 2,171,882 ft.
GROUND EL: 750.0 ft.

DATE: 3-19/22-90 TYPE: NX Core CASED TO: 5.0' CONTRACTOR: SwL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
125, 130		C13	121.0	131.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 2' thick moderately argillaceous to shaly limestone interbeds 0.5' to 5' apart. Shale layers up to 2' thick, medium angle fractures, pryite nodule -moderately argillaceous layer , medium gray, gradational contacts at 121.0-121.6' -45°, open, healed, calcite filled (¼") fracture at 121.4' -shaly limestone layer , dark gray, gradational contacts at 123.3'-124.3' -50°, open, healed, calcite filled, (1/8") fracture at 123.8'
135, 140		C14	131.0	141.0	100	100			-moderately argillaceous layer , medium gray, gradational contacts at 124.8'-126.0' -moderately argillaceous layer , medium gray, gradational contacts at 126.7'-127.2' -moderately argillaceous layer , medium gray, gradational contacts at 128.4'-129.2' -moderately argillaceous layer , medium gray, gradational contacts at 130.7'-131.0' -moderately argillaceous layer , medium gray, gradational contacts at 132.0'-132.7' -moderately argillaceous layer , medium gray, sharp contacts at 134.0'-134.6'
145, 150		C15	141.0	151.0	91	91			-shale layer , soft, dark gray, gradational contacts at 135.9'-137.9' -¼" pyrite nodule at 137.8' -1" pyrite nodule at 140.0' -shaly limestone layer , dark gray, sharp contacts at 142.6'-142.8' -shale layer , soft, dark gray, sharp contacts at 143.4'-143.6' -shale layer , soft, dark gray, sharp contacts at 146.5'-147.0' -3/4" pyrite nodule at 151.9'
155, 160		C16	151.0	161.0	100	100			-moderately argillaceous layer , medium gray, gradational contacts at 151.8'-152.6' -shale layer , soft, dark gray, sharp contacts at 153.4'-153.7' -50°, smooth, open, slickensided fracture at 156.2' and traces of pyrite -shaly limestone layer , dark gray, gradational contacts at 157.7'-158.0'

DRILLING GEOLOGIST M. Granger ASSISTANT R. Grimstead CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1540 PG 5 OF 7
LOCATION: N 250,250 ft. E 2,171,882 ft.
GROUND EL: 750.0 ft.

DATE: 3-19/22-90 TYPE: NX Core CASED TO: 5.0' CONTRACTOR: SwL 89-192

SAMPLE LEGEND
S= SPLIT SPOON
T= 2" THIN WALL TUBE
U= 3" THIN WALL TUBE
C= NX ROCK CORE

WATER INFORMATION
see p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
		C17	161.0	171.0	100	100			LIMESTONE (Austin Chalk), moderately to medium hard, fresh, light gray to dark gray with 0.2' to 2' thick moderately argillaceous to shaly limestone interbeds 1' to 4' apart. Also fossil partings. -shaly limestone layer , dark gray, gradational contact at 161.2' to sharp contact at 161.4' -shaly limestone layer , dark gray, sharp contacts at 163.9'-164.5' -shaly limestone layer , dark gray, sharp contacts at 167.5'-168.2'
		C18	171.0	181.0	100	100			-shaly limestone layer , dark gray, gradational contacts at 172.5'-172.8' -moderately argillaceous layer , medium gray, gradational contacts at 174.5'-175.0' -moderately argillaceous layer , medium gray, gradational contacts at 178.9'-181.0' -1" pyrite nodules at 179.7', 180.1' and 181.0' -fossil parting at 180.5'
		C19	181.0	191.0	95	95			-moderately argillaceous layer , medium gray, gradational contacts at 181.7'-182.8' -moderately argillaceous layer , medium gray, gradational contacts at 185.0'-187.0' 187.0
									SHALY LIMESTONE (Transition) medium hard, fresh, extremely argillaceous, abundant fragments of fish bones teeth and other fossil debris, dark gray. 187.9
		C20	191.0	201.0	47	47			SHALE (Eagle Ford), soft, fresh, fissile, dark gray with occasional harder carbonate layers 0.1' thick, septarian concretions and pyrite nodule. -limestone layer , light gray with intersecting calcite veins, (1/16" to 1"), sharp contacts at 197.5'-197.7' -septarian concretions at 200.4' and 200.7' -1" pyrite nodule at 200.9'

DEPTH IN FEET: 165, 170, 175, 180, 185, 190, 195, 200

DRILLING GEOLOGIST M. Granger ASSISTANT R. Grimstead CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1540 PG 6 OF 7
LOCATION: N 250,250 ft. E 2,171,882 ft.
GROUND EL: 750.0 ft.

DATE: 3-19/22-90 TYPE: NX Core CASED TO: 5.0' CONTRACTOR: SwL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
			201.0						SHALE (Eagle Ford), soft, fresh, fissile, dark gray with harder calcareous layers 1' thick, septarian concretions and pyrite nodules.
205		C21			89	89			-½" pyrite nodules at 201.2', 206.1' and 207.0'
210				211.0					
			211.0						
215		C22			96	96			-septarian concretions at 201.3', 204.9', 205.5', 206.0', 207.1', 207.3', 208.4' and 219.1'
220				221.0					-septarian concretion at 221.8'
			221.0						
225		C23			77	77			-½" pyrite nodule at 224.8'
230				231.0					
			231.0						-calcareous layer , dark gray, sharp contacts at 232.3'-233.3'
235		C24			97	97			
240				241.0					

DRILLING GEOLOGIST M. Granger ASSISTANT R. Grimstead CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 15

BORING NO: B 1540 PG 7 OF 7
LOCATION: N 250,250 ft. E 2,171,882 ft.
GROUND EL: 750.0 ft.

DATE: 3-19/22-90 TYPE: NX Core CASED TO: 5.0' CONTRACTOR: SwL 89-192

SAMPLE LEGEND: S= SPLIT SPOON; T= 2" THIN WALL TUBE; U= 3" THIN WALL TUBE; C= NX ROCK CORE

WATER INFORMATION: See p. 1 of 7

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
			241.0						SHALE (Eagle Ford), soft, fresh, fissile, dark gray with calcareous layers 1' thick, fossil partings and pyrite nodules.
245		C25			93	93			-calcareous layer , dark gray, gradational contact at 248.0' to sharp contact at 248.7'
250				251.0					-fossil parting at 252.9'
			251.0						
255		C26			92	92			-traces of pyrite at 257.7'
260				261.0					-½" pyrite nodules 259.7', 259.8' and 262.7'
			261.0						-1" pyrite nodules at 263.7' and 273.1'
265		C27			80	80			
270				271.0					
			271.0						
		C28			100	100			
275				275.0					
									Bottom of Exploration at 275.0'
280									

DRILLING GEOLOGIST M. Granger ASSISTANT R. Grimstead CHECKED BY Shawn Wood

APPENDIX C

WIRE-LINE LOGS

WIRE-LINE LOGGING PARAMETERS

Hole No. BI 1

Log Measured From: Ground Level

Drilling Parameters

Depth 211.0 feet

Bit Diameter 4.0 inches

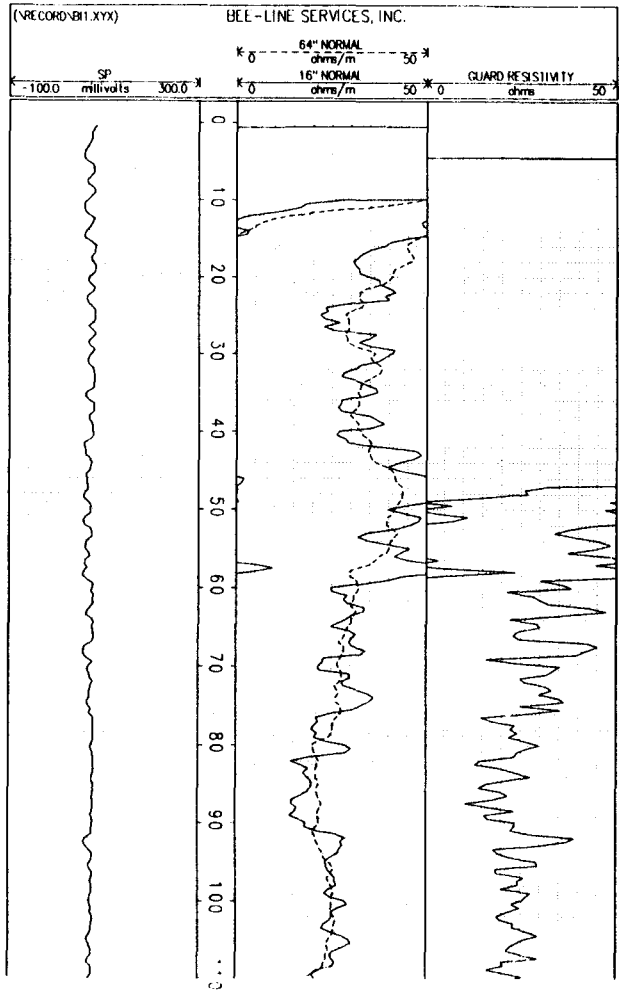
Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	November 29, 1989	November 29, 1989	November 29, 1989
Bottom Log Interval	211.5 feet	211.0 feet	206.8 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling mud	drilling mud	drilling mud
Time Since Circulation Stop	30 minutes	30 minutes	30 minutes
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.
Sample Interval	0.5 foot	0.5 foot	0.5 foot

Logged by:

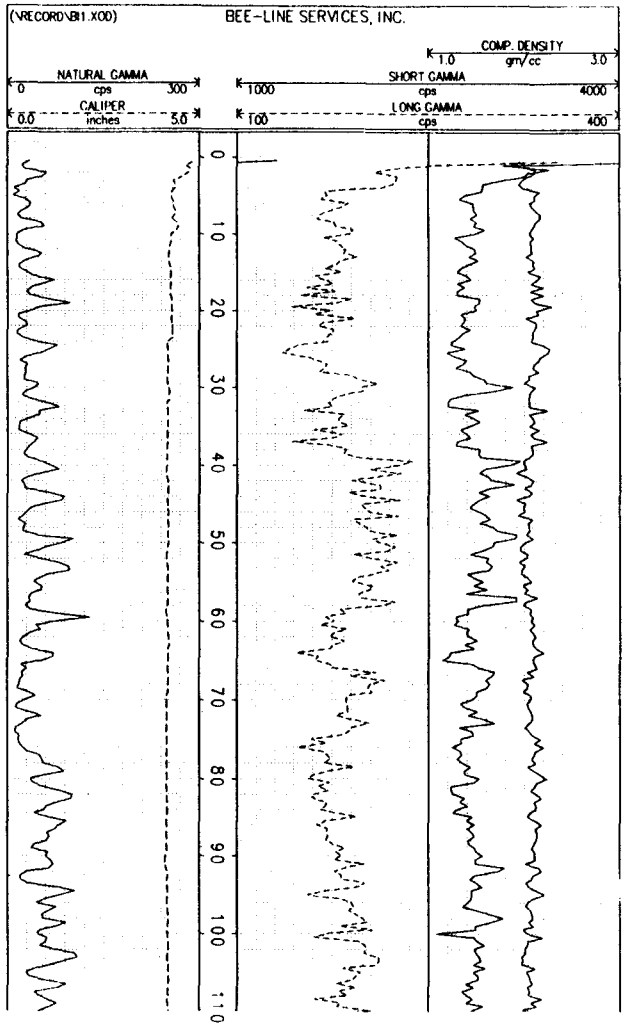
BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

BI 1 Wire-line logs run November 29, 1989. Surface elevation 741.4 feet.

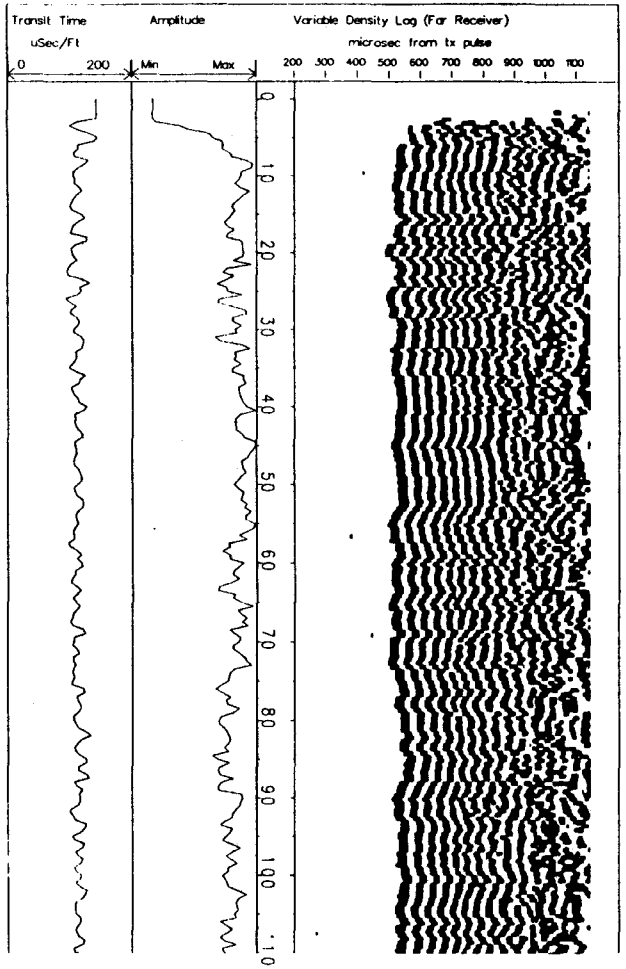
ELECTRICAL LOG



GAMMA LOG

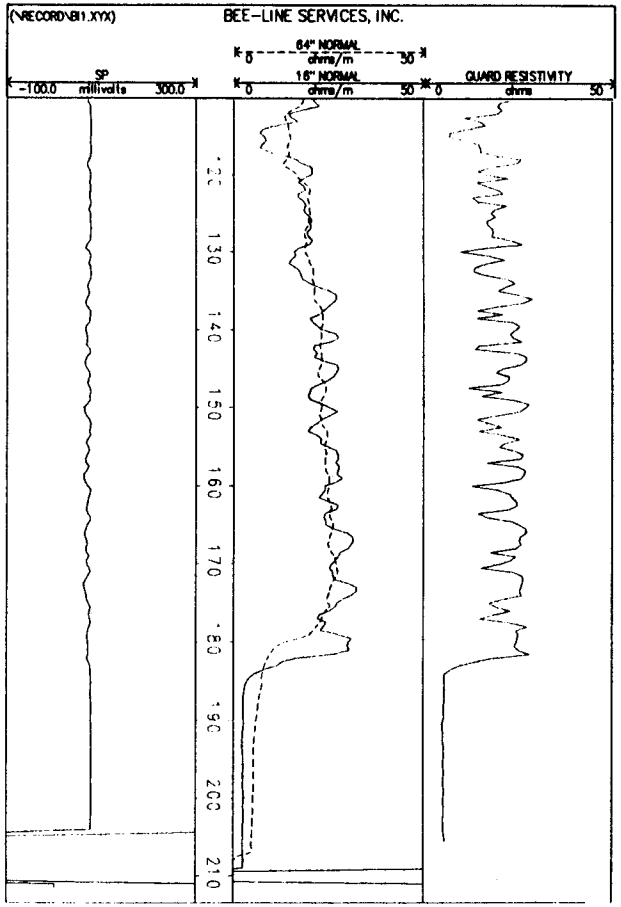


SONIC LOG

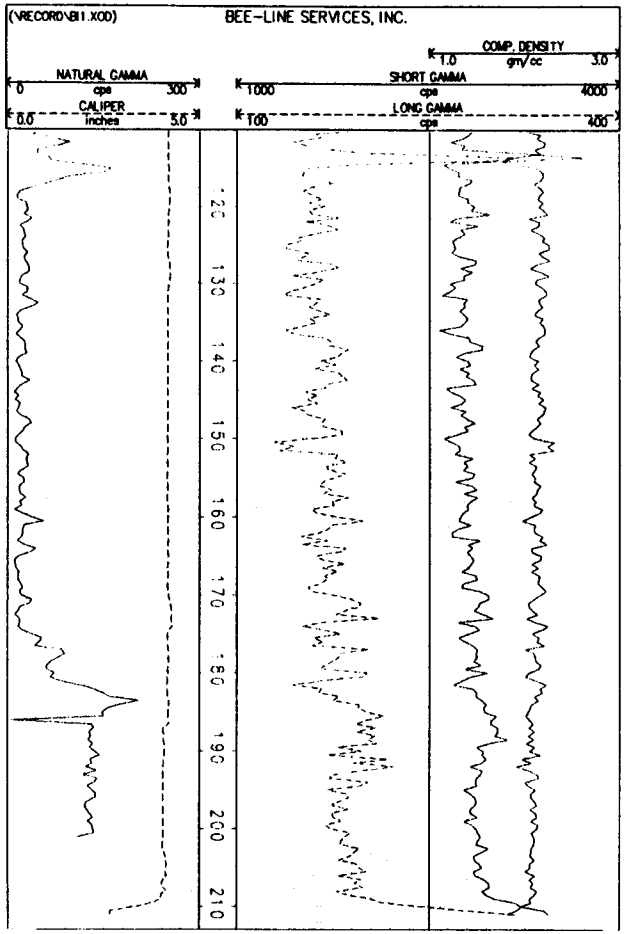


BI 1 Wire-line logs run November 29, 1989 (Continued). Surface elevation 741.4 feet.

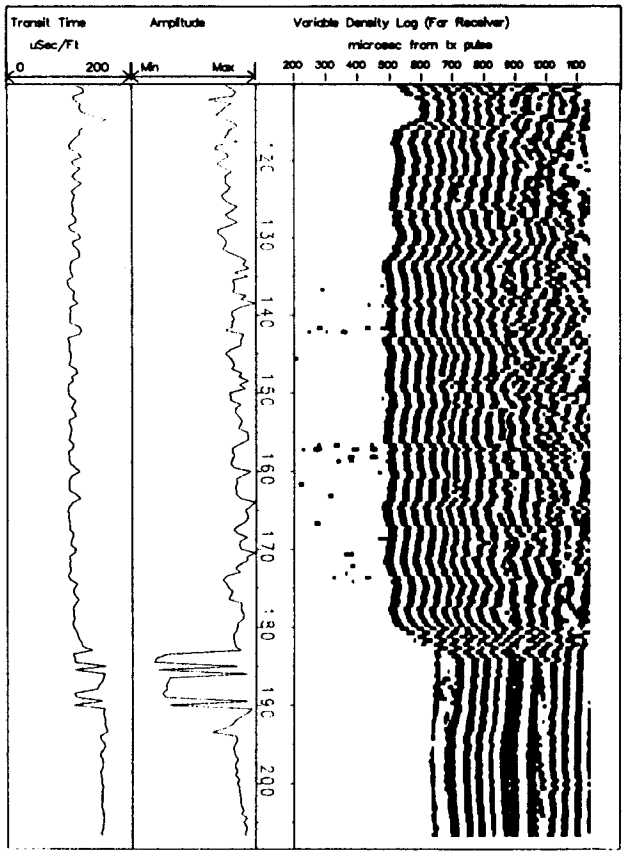
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



SONIC LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. BI 2A

Log Measured From: Ground Level

Drilling Parameters

Depth 261.5 feet

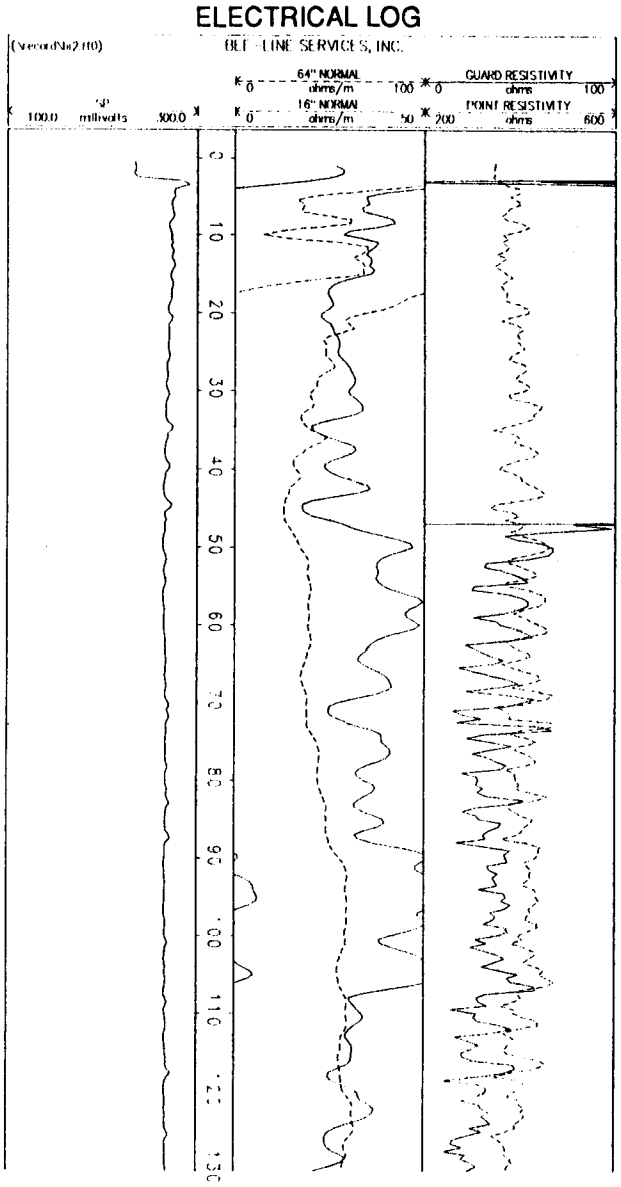
Bit Diameter 3.125 inches

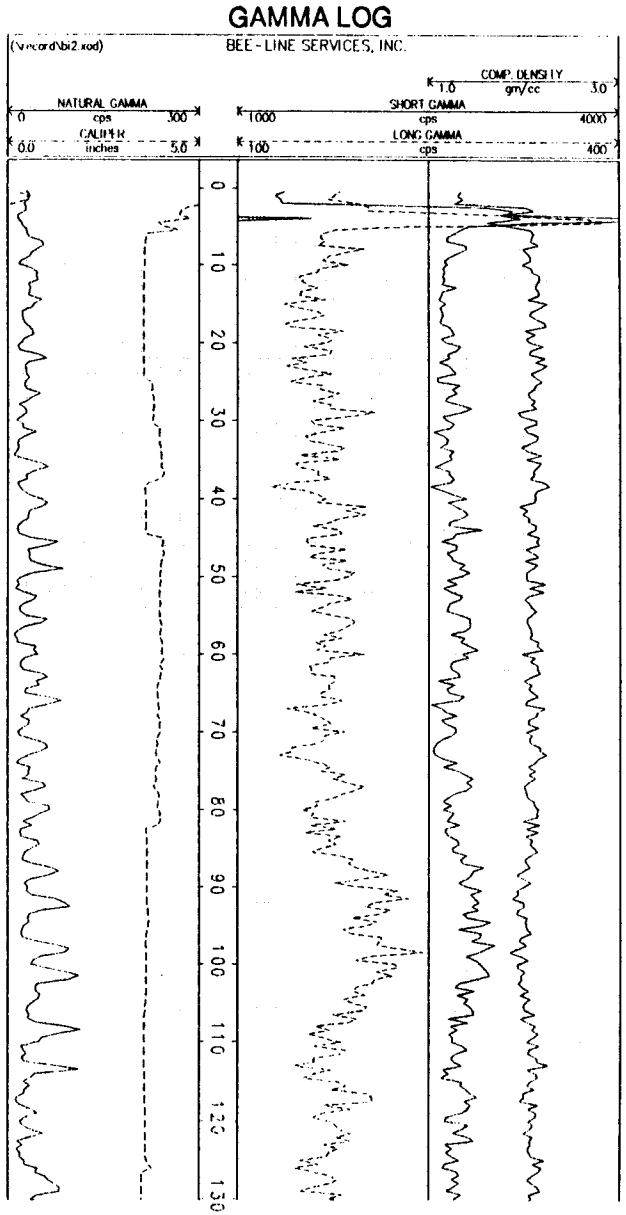
Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	December 5, 1989	December 5, 1989	Tool Malfunction
Bottom Log Interval	259.5 feet	259.5 feet	
Top Log Interval	surface	surface	
Type of Fluid in Hole	fresh water	fresh water	
Time Since Circulation Stop	120 minutes	120 minutes	
Probe Type/S.N.	ALP-4979	XAP-4383	
Module Type/S.N.	ALM-4979	XAM-4383	
Logging Speed	40 feet/min.	20 feet/min.	
Sample Interval	0.5 foot	0.5 foot	

Logged by:

BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

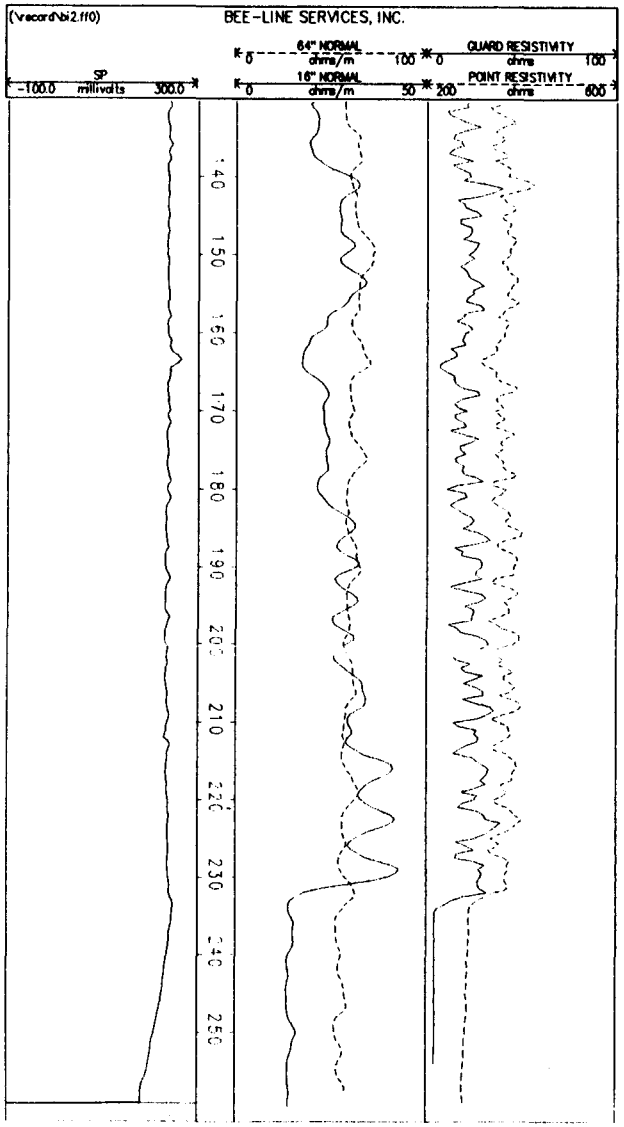
BI 2A Wire-line logs run December 5, 1989. Surface elevation 639.9 feet.



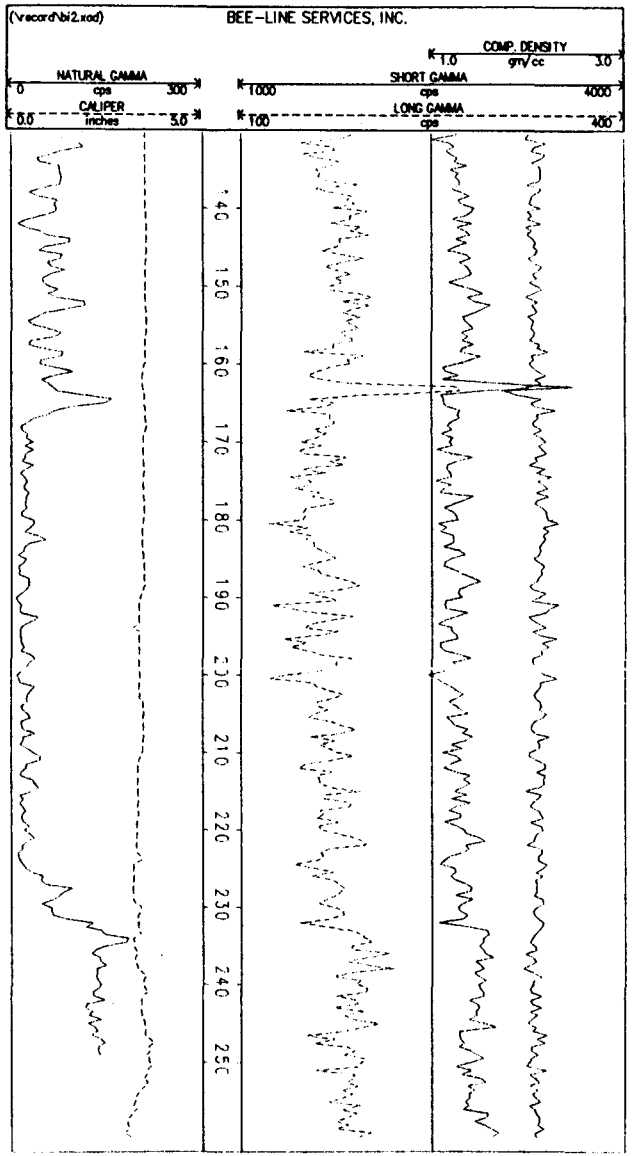


BI 2A Wire-line logs run December 5, 1989 (Continued). Surface elevation 639.9 feet.

ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. BI 3

Log Measured From: Ground Level

Drilling Parameters

Depth 282.0 feet

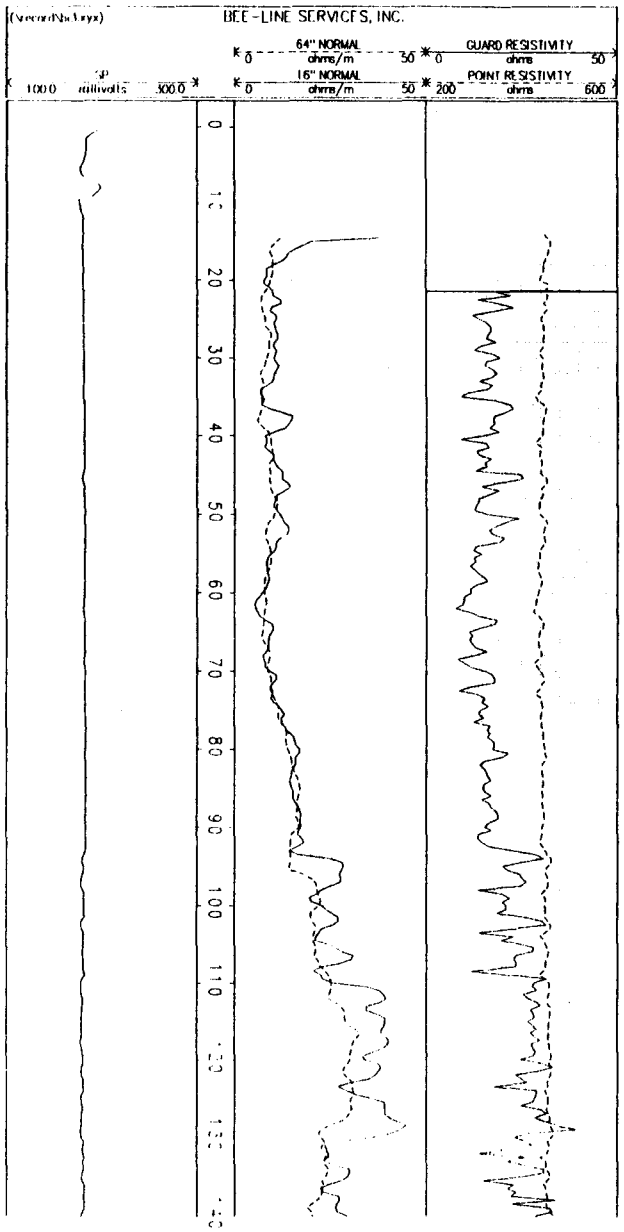
Bit Diameter 4.0 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	December 8, 1989	December 8, 1989	Tool Malfunction
Bottom Log Interval	282.0 feet	280.0 feet	
Top Log Interval	surface	surface	
Type of Fluid in Hole	drilling mud	drilling mud	
Time Since Circulation Stop	45 minutes	45 minutes	
Probe Type/S.N.	ALP-4979	XAP-4383	
Module Type/S.N.	ALM-4979	XAM-4383	
Logging Speed	40 feet/min.	20 feet/min.	
Sample Interval	0.5 foot	0.5 foot	

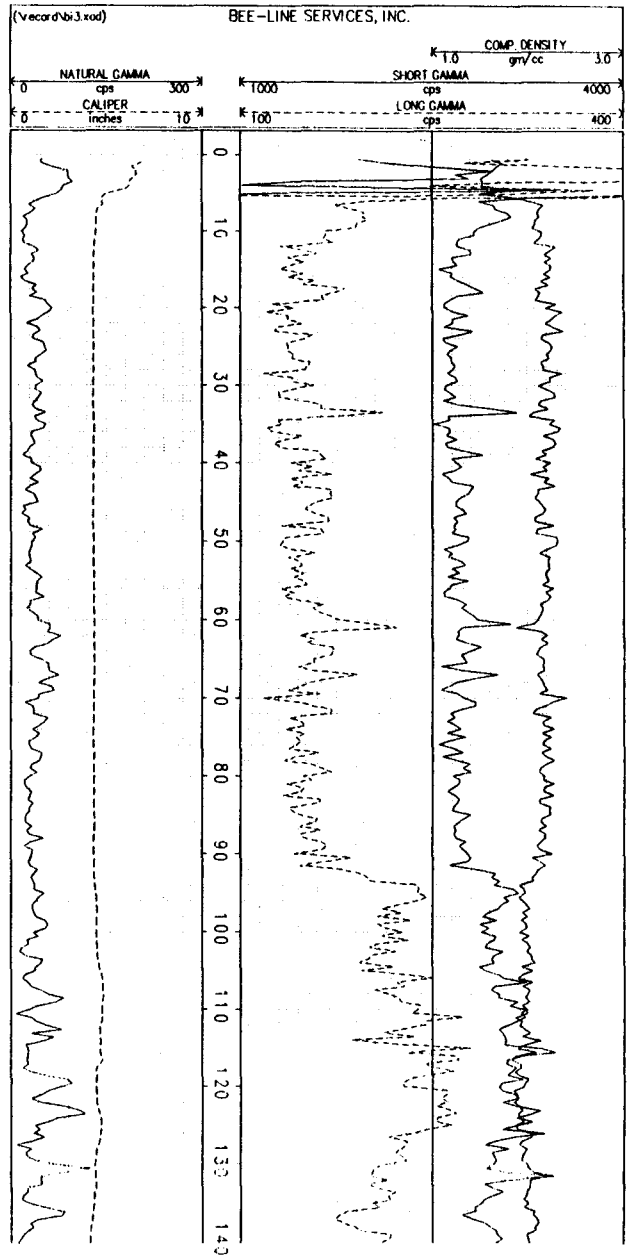
Logged by: BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

BI 3 Wire-line logs run December 8, 1989. Surface elevation 696.7 feet.

ELECTRICAL LOG

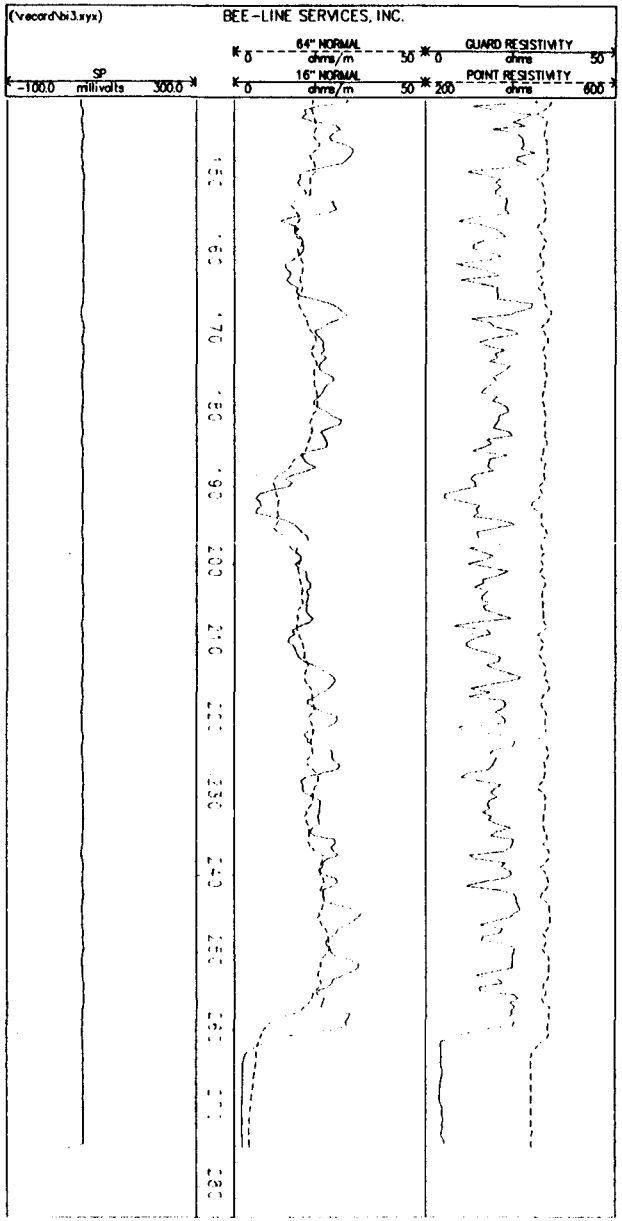


GAMMA LOG

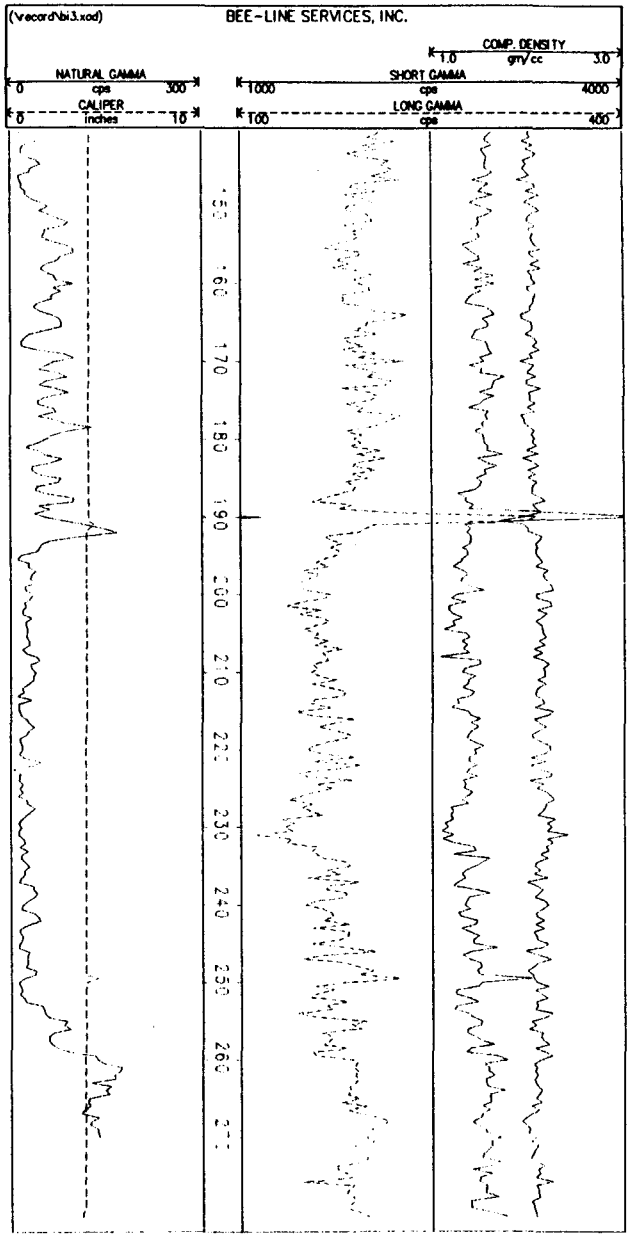


BI 3 Wire-line logs run December 8, 1989 (Continued). Surface elevation 696.7 feet.

ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. BI 4

Log Measured From: Ground Level

Drilling Parameters

Depth 184.5 feet

Bit Diameter 4.75 inches

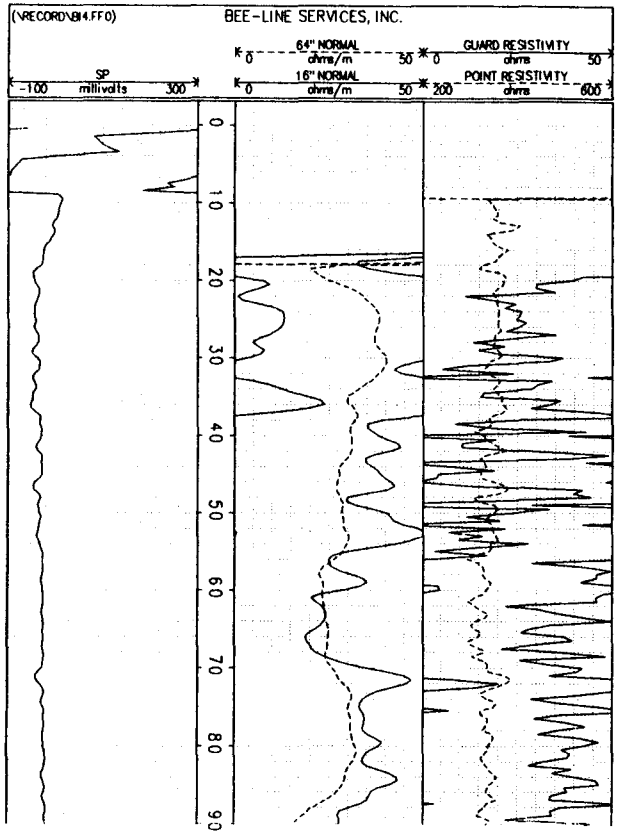
Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	January 16, 1990	January 16, 1990	January 16, 1990
Bottom Log Interval	184.5 feet	184.5 feet	180.0 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling mud	drilling mud	drilling mud
Time Since Circulation Stop	105 minutes	105 minutes	105 minutes
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.
Sample Interval	0.5 foot	0.5 foot	0.5 foot

Logged by:

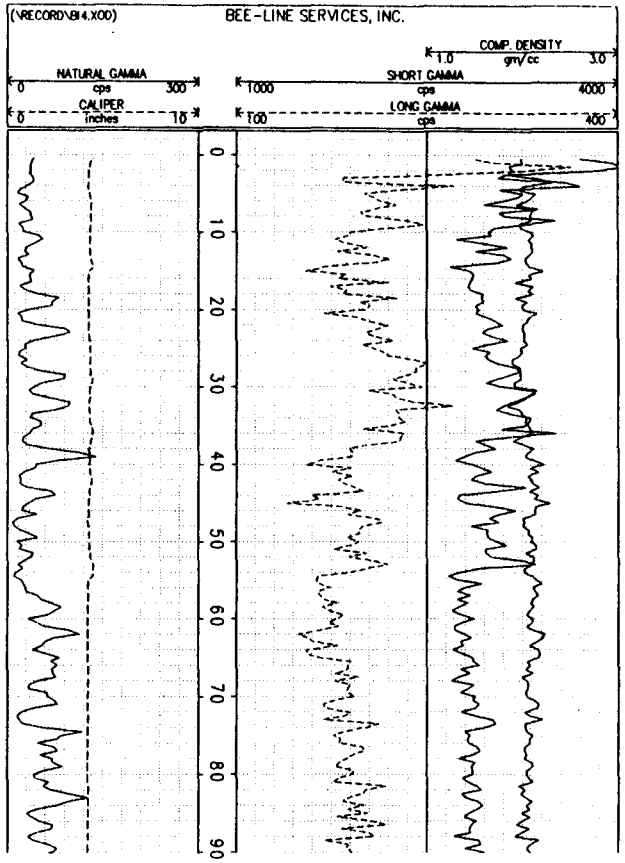
BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

BI 4 Wire–line logs run January 16, 1990. Surface elevation 710.9 feet.

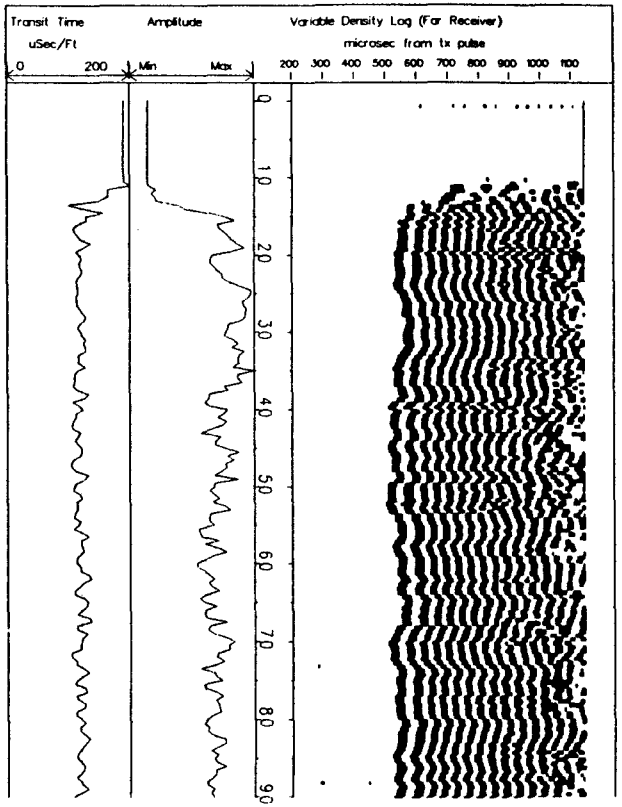
ELECTRICAL LOG



GAMMA LOG

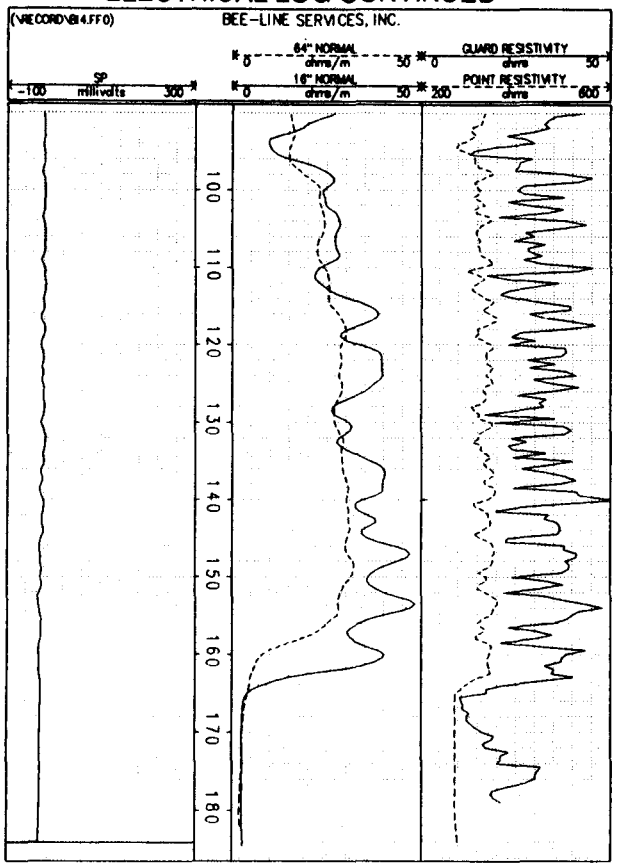


SONIC LOG

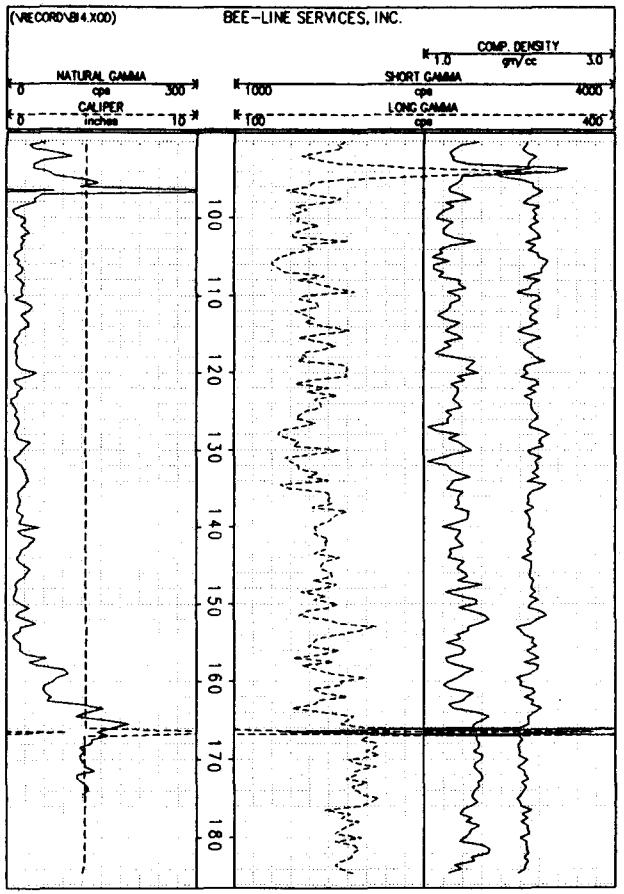


BI 4 Wire–line logs run January 16, 1990 (Continued). Surface elevation 710.9 feet.

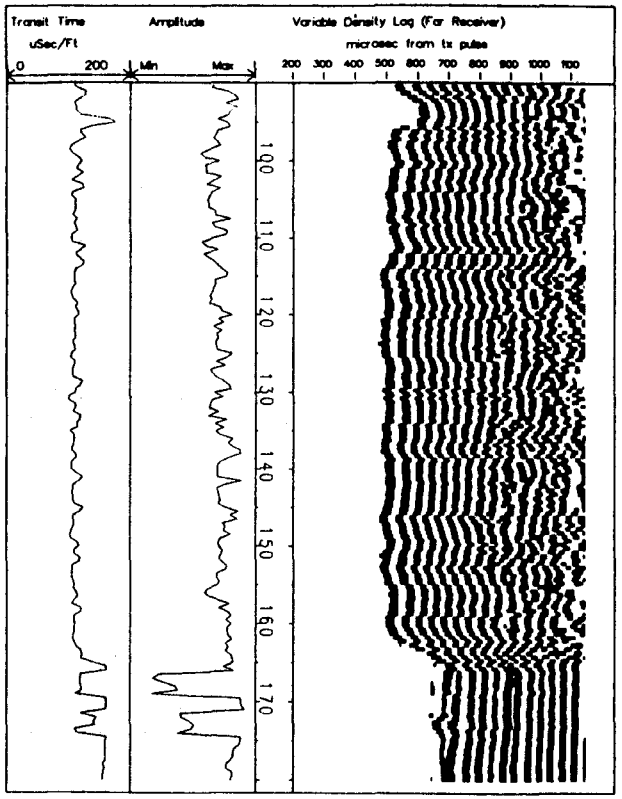
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



SONIC LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. BI 5

Log Measured From: Ground Level

Drilling Parameters

Depth 280.0 feet

Bit Diameter 4.75 inches

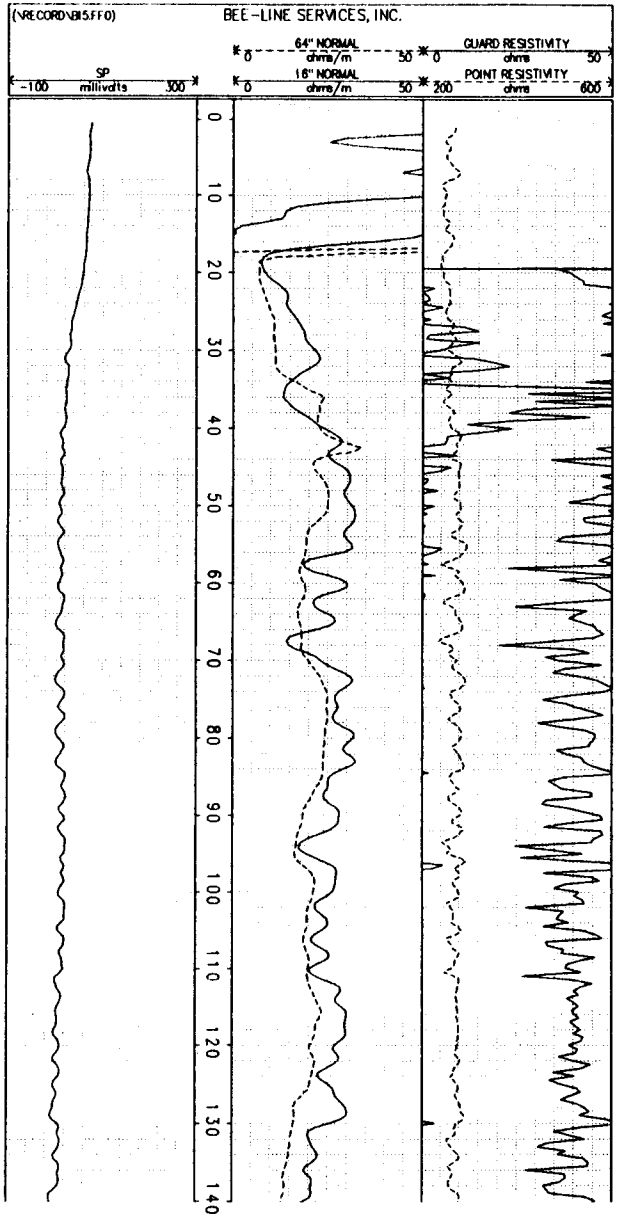
Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	January 27, 1990	January 27, 1990	January 27, 1990
Bottom Log Interval	280.5 feet	280.5 feet	274.5 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling mud	drilling mud	drilling mud
Time Since Circulation Stop	75 minutes	75 minutes	75 minutes
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.
Sample Interval	0.5 foot	0.5 foot	0.5 foot

Logged by:

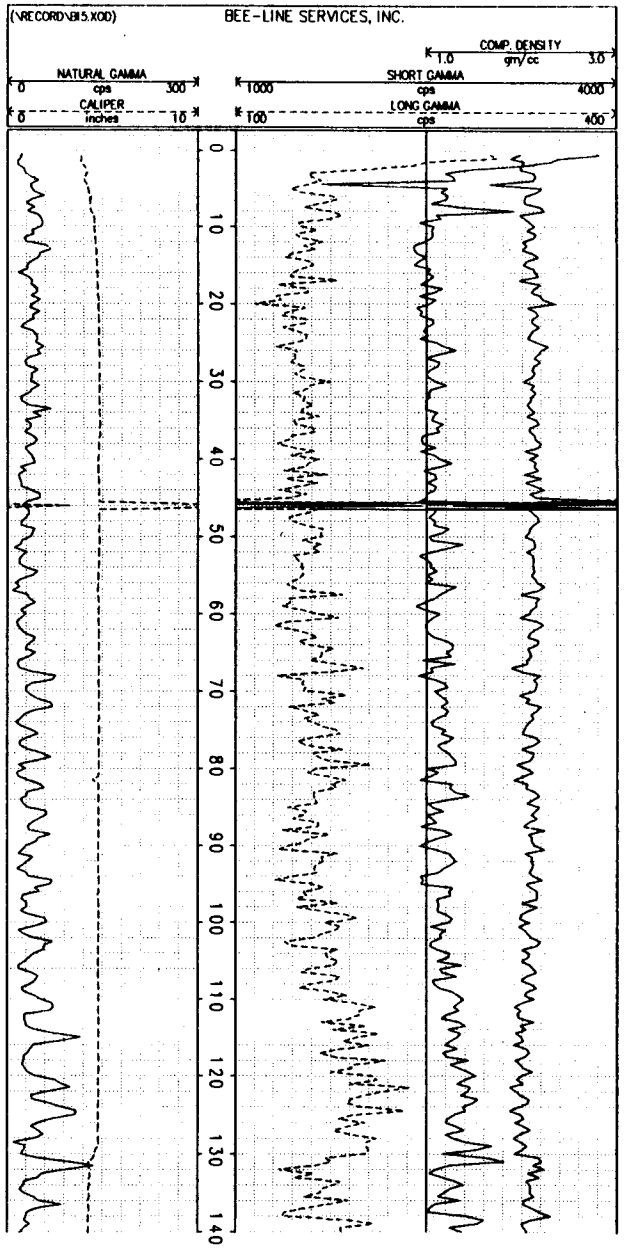
BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

BI 5 Wire-line logs run January 27, 1990. Surface elevation 658.4 feet.

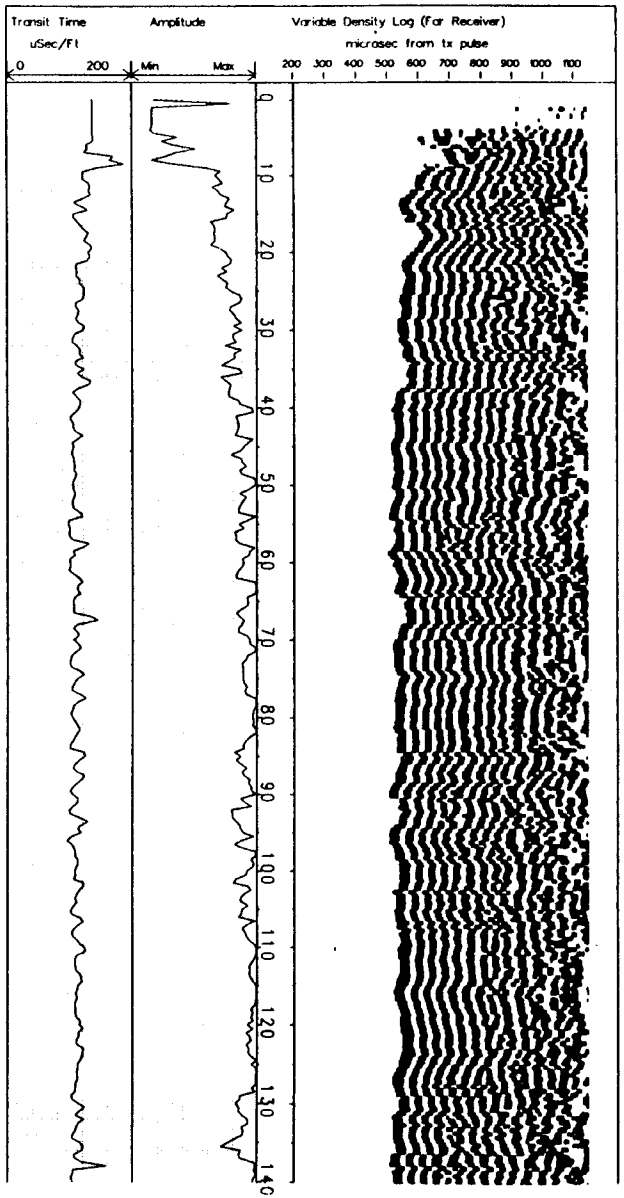
ELECTRICAL LOG



GAMMA LOG

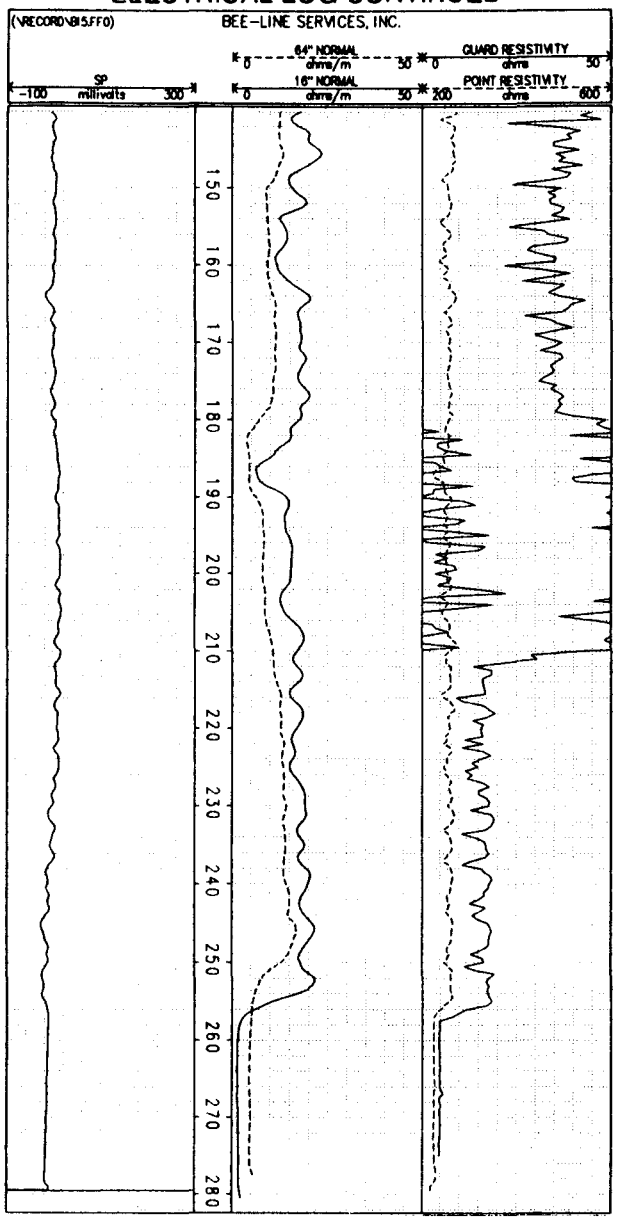


SONIC LOG

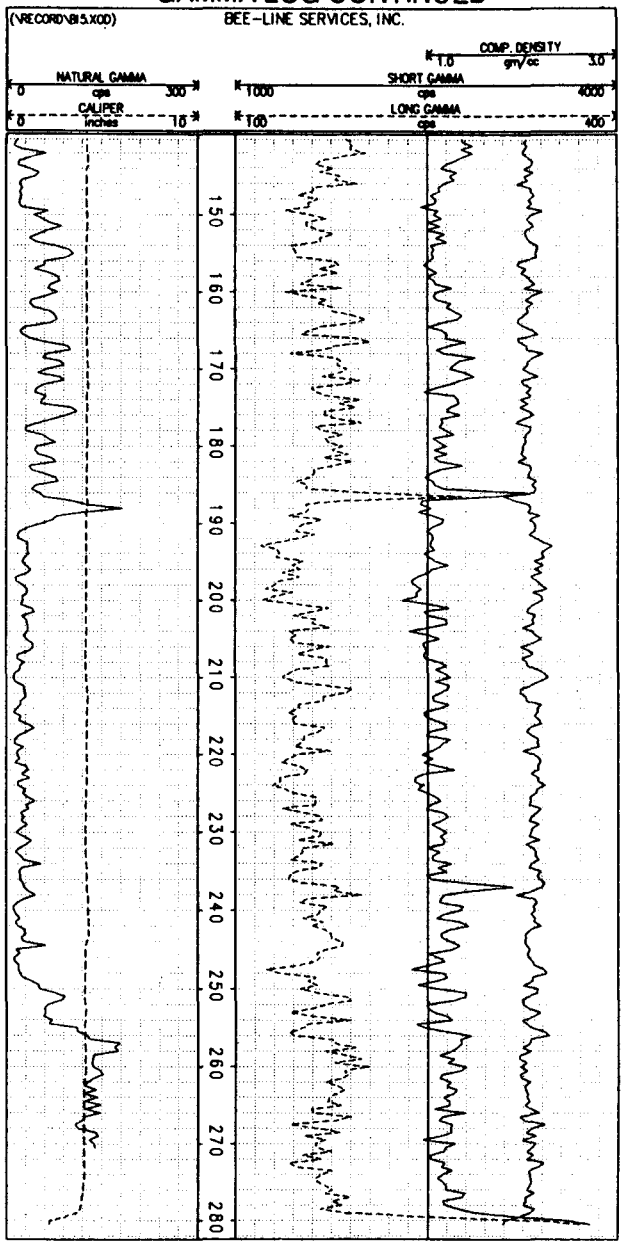


BI 5 Wire-line logs run January 27, 1990 (Continued). Surface elevation 658.4 feet.

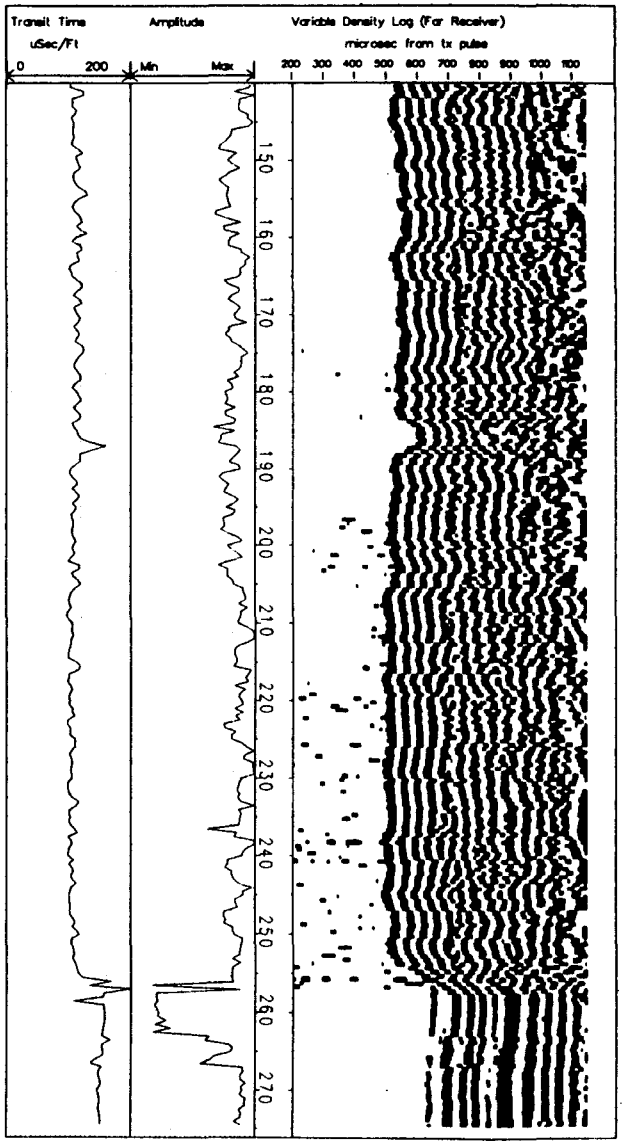
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



SONIC LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. BI 6 **Log Measured From:** Ground Level

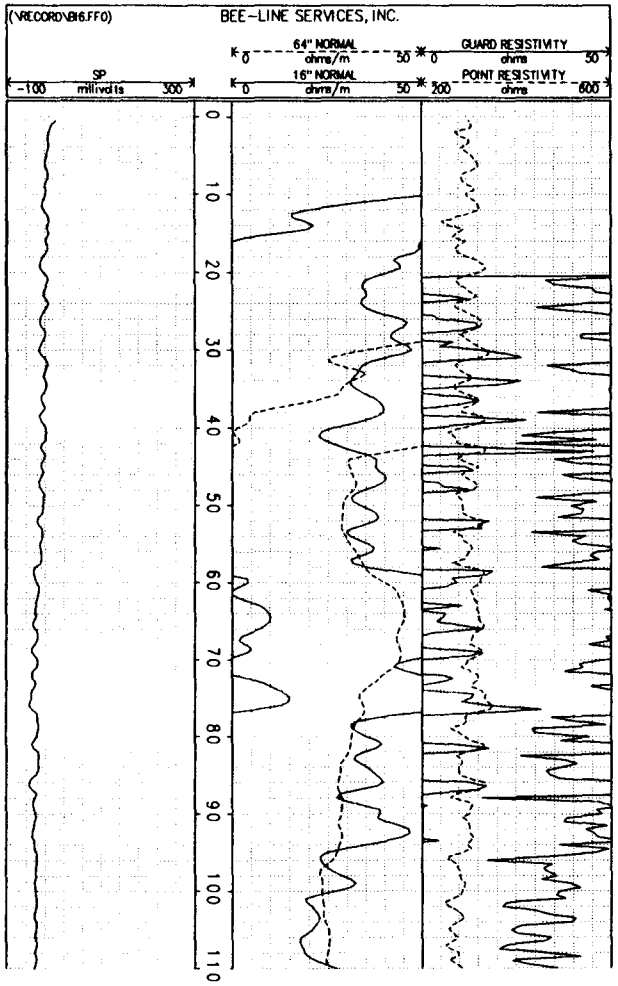
Drilling Parameters
Depth 231.0 feet
Bit Diameter 4.125 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	January 23, 1990	January 23, 1990	January 23, 1990
Bottom Log Interval	230.0 feet	229.5 feet	223.1 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling mud	drilling mud	drilling mud
Time Since Circulation Stop	30 minutes	30 minutes	30 minutes
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.
Sample Interval	0.5 foot	0.5 foot	0.5 foot

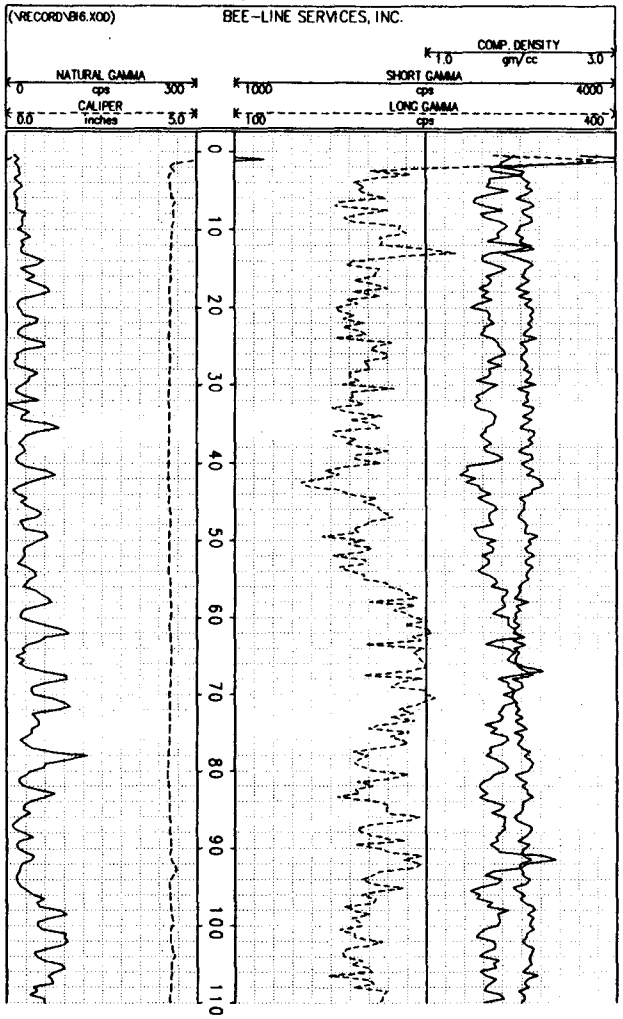
Logged by: BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

BI 6 Wire-line logs run January 23, 1990. Surface elevation 734.1 feet.

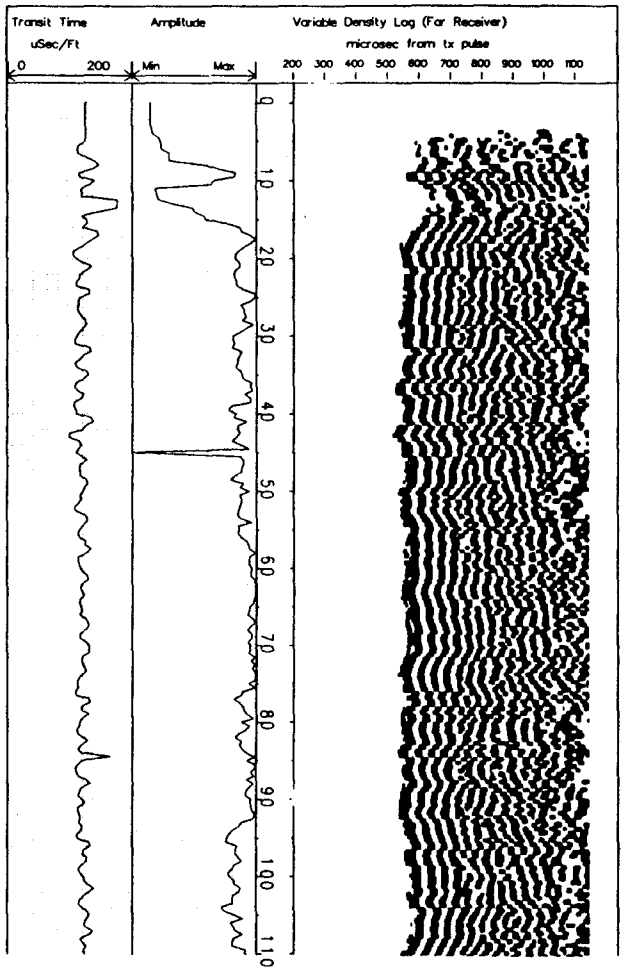
ELECTRICAL LOG



GAMMA LOG

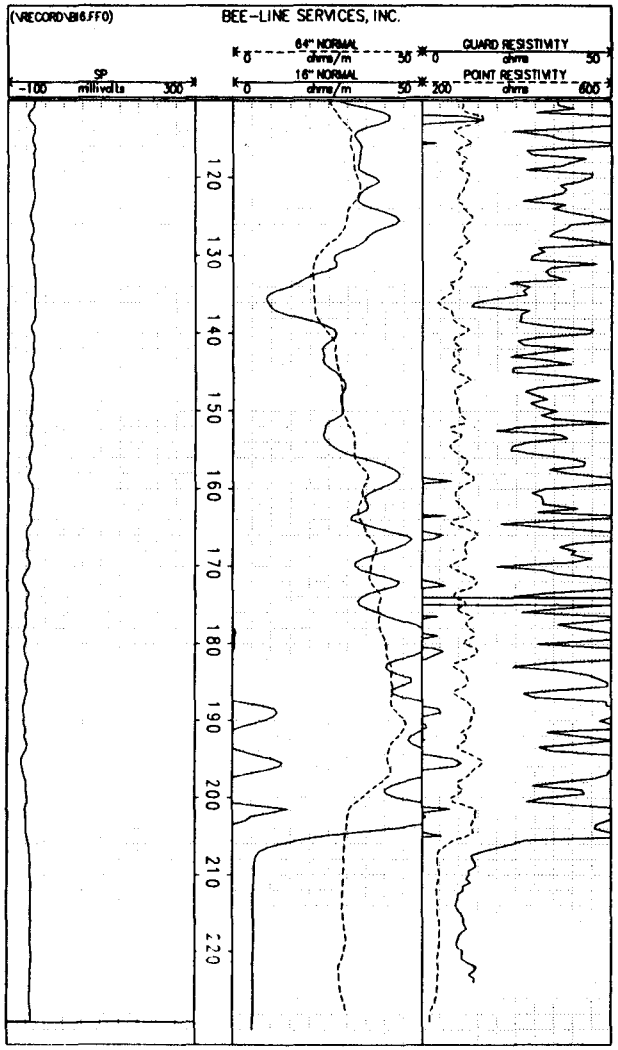


SONIC LOG

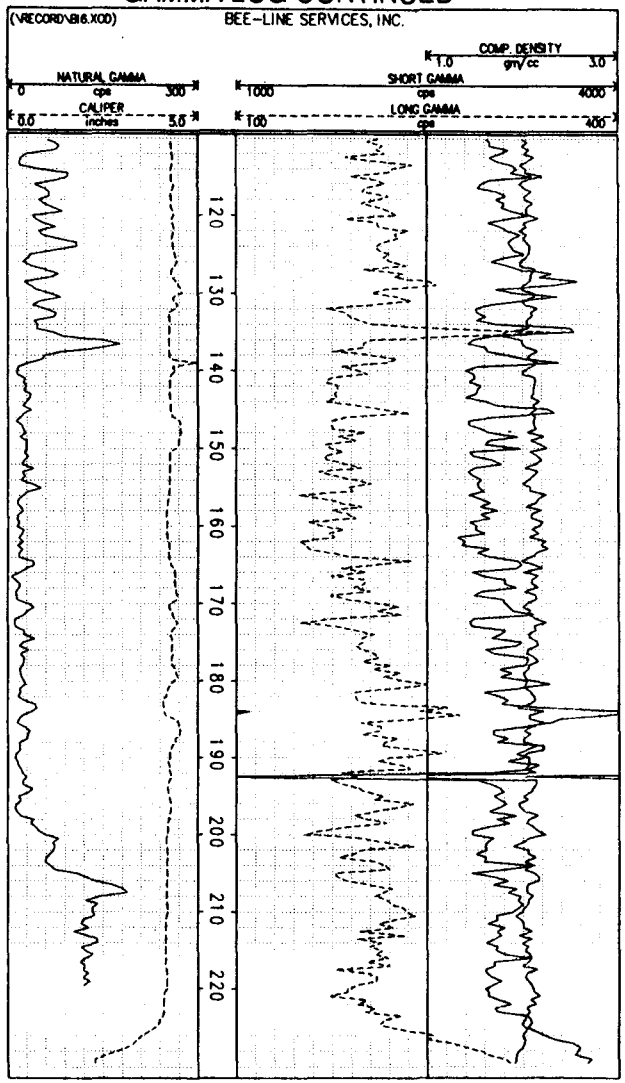


BI 6 Wire-line logs run January 23, 1990 (Continued). Surface elevation 734.1 feet.

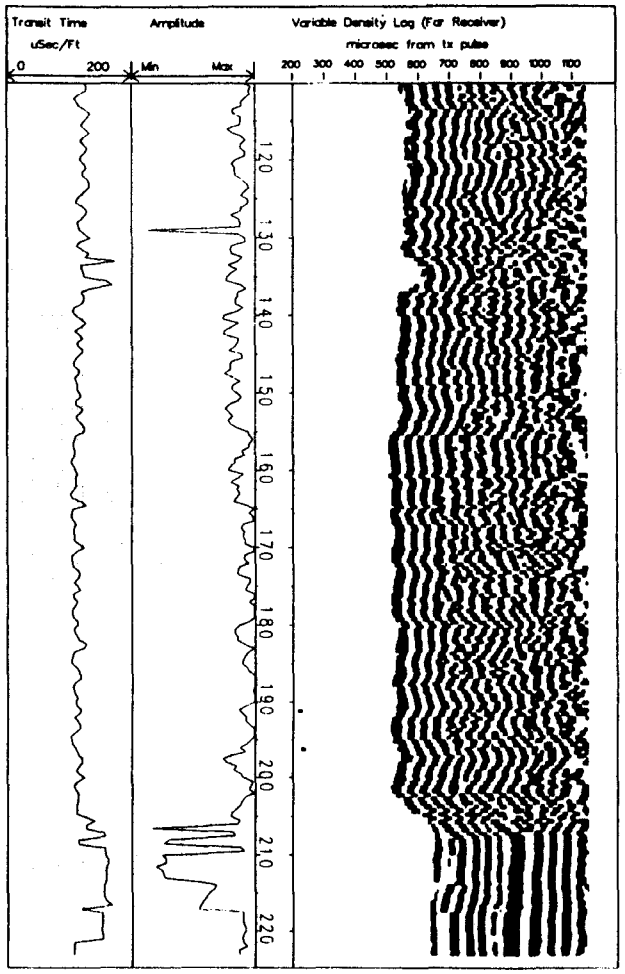
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



SONIC LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. B 1527 **Log Measured From:** Ground Level

Drilling Parameters

Depth 238.0 feet

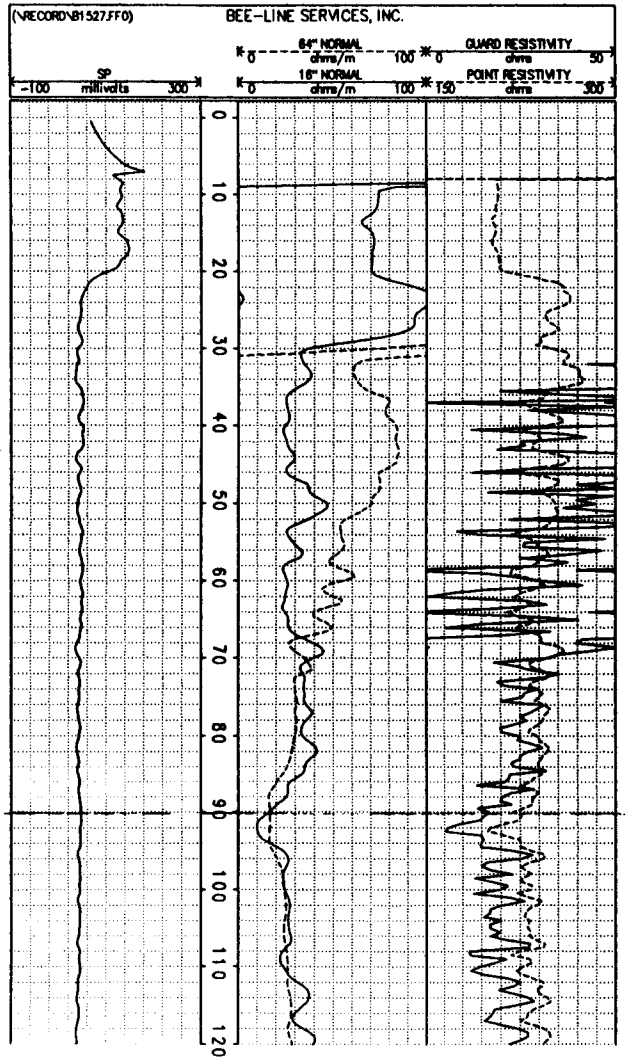
Bit Diameter 4.5 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	March 29, 1990	March 29, 1990	March 29, 1990
Bottom Log Interval	236.5 feet	236.0 feet	232.1 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling fluid	drilling fluid	drilling fluid
Time Since Circulation Stop	30 minutes	30 minutes	30 minutes
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.
Sample Interval	0.5 foot	0.5 foot	0.5 foot

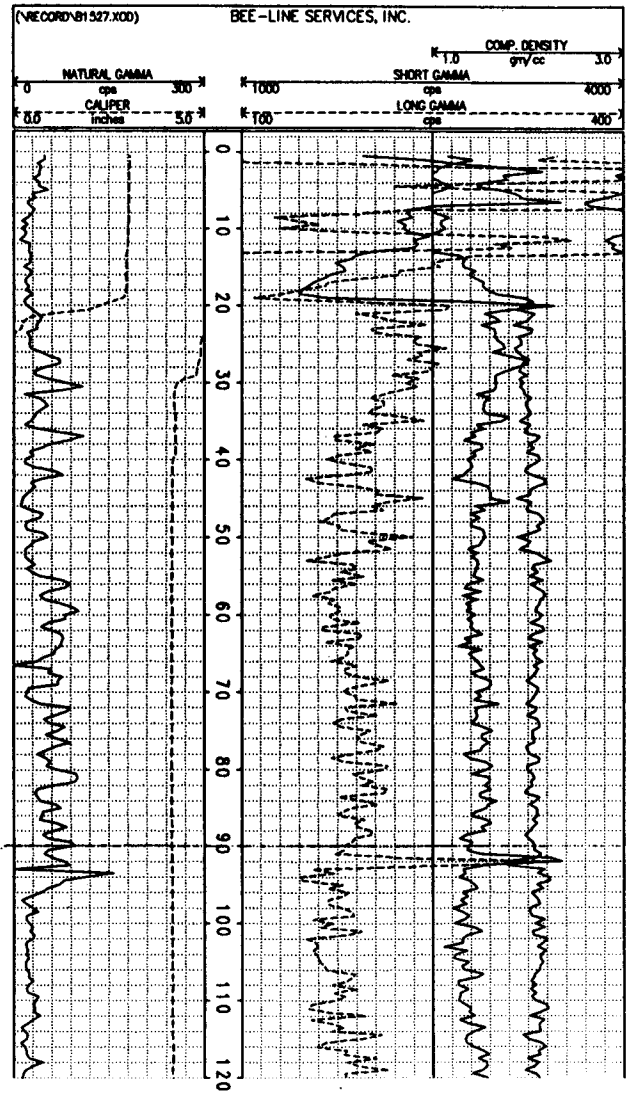
Logged by: BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

B 1527 Wire-line logs run March 29, 1990. Surface elevation 713.3 feet.

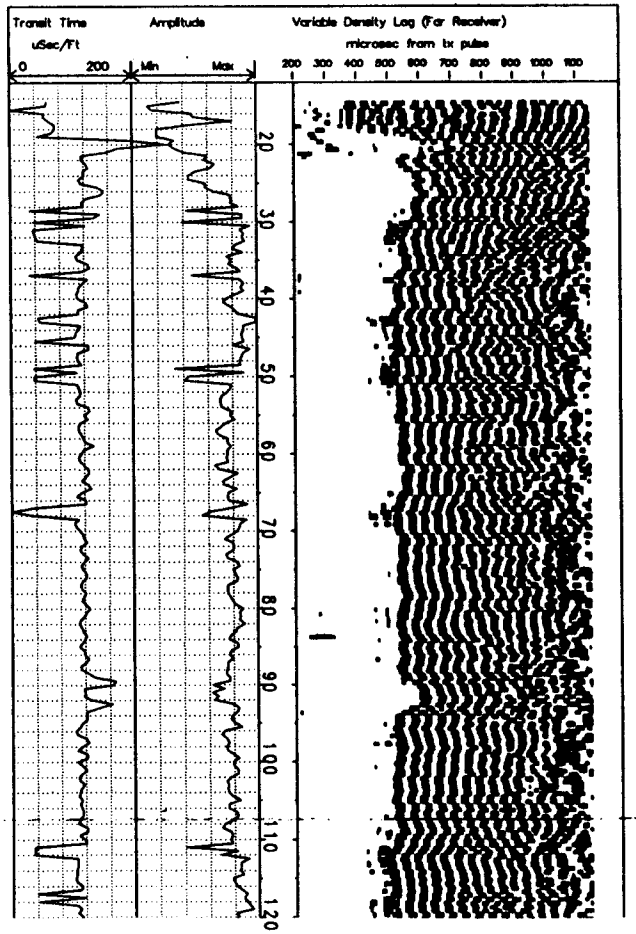
ELECTRICAL LOG



GAMMA LOG

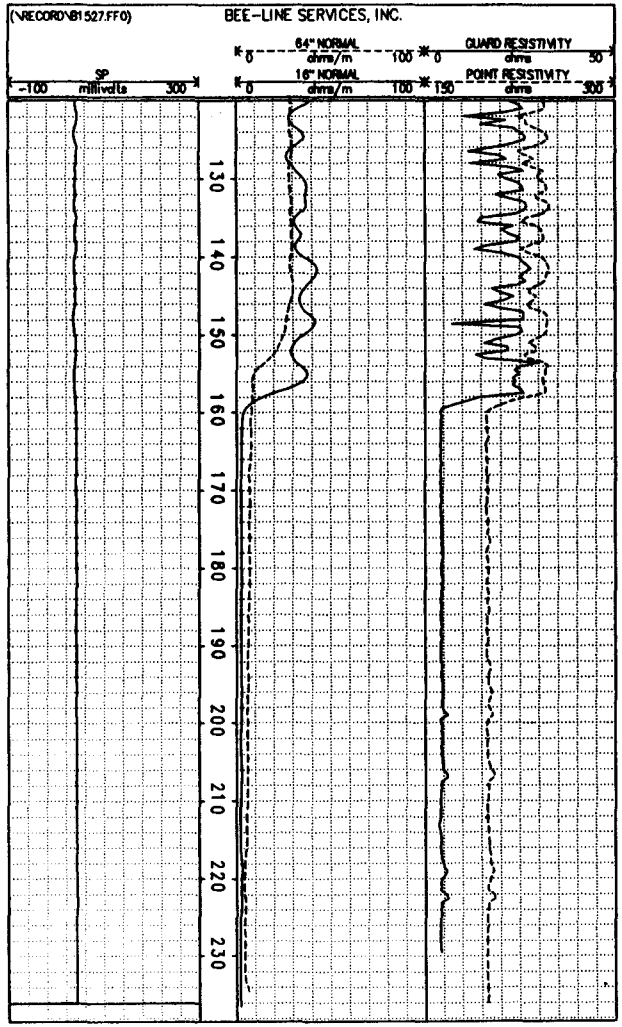


SONIC LOG

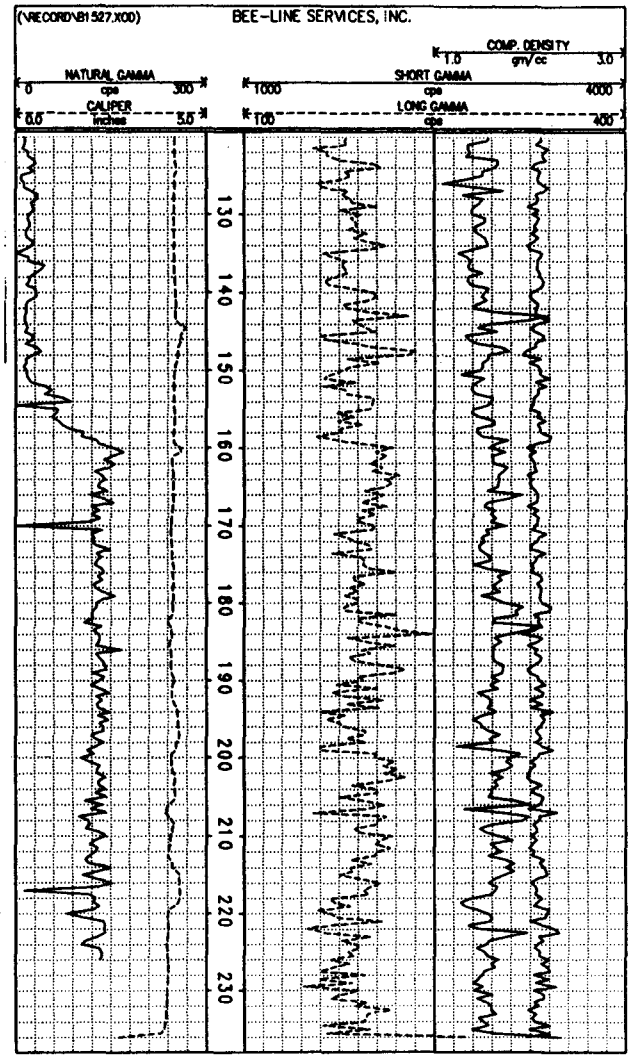


B 1527 Wire-line logs run March 29, 1990 (Continued). Surface elevation 713.3 feet.

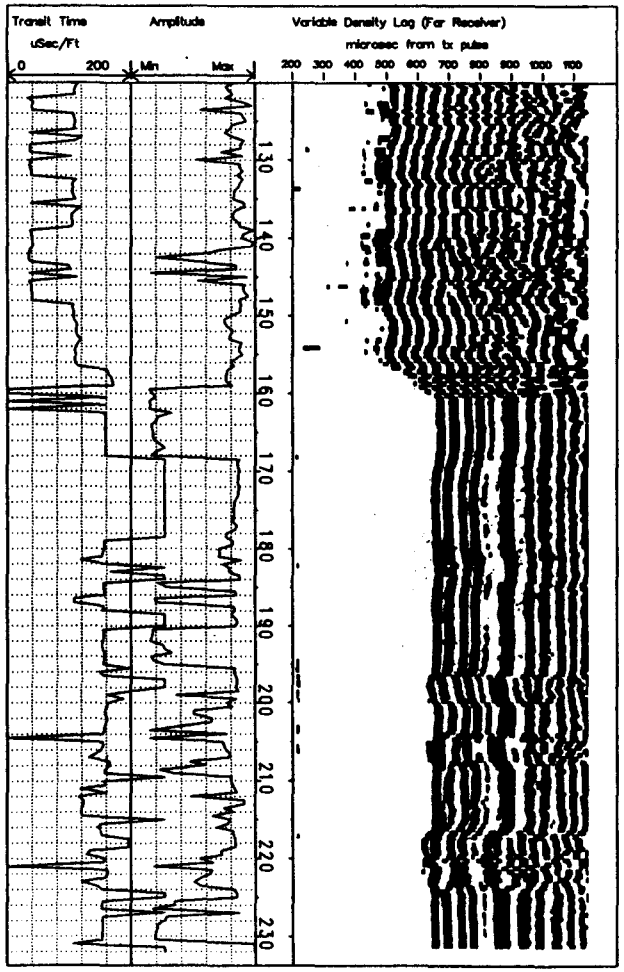
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



SONIC LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. B 1533 **Log Measured From:** Ground Level

Drilling Parameters

Depth 255.0 feet

Bit Diameter 4.75 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	March 22, 1990	March 22, 1990	Tool Malfunction
Bottom Log Interval	252.5 feet	252.0 feet	
Top Log Interval	surface	surface	
Type of Fluid in Hole	drilling mud	drilling mud	
Time Since Circulation Stop	20 minutes	20 minutes	
Probe Type/S.N.	ALP-4979	XAP-4383	
Module Type/S.N.	ALM-4979	XAM-4383	
Logging Speed	40 feet/min.	20 feet/min.	
Sample Interval	0.5 foot	0.5 foot	

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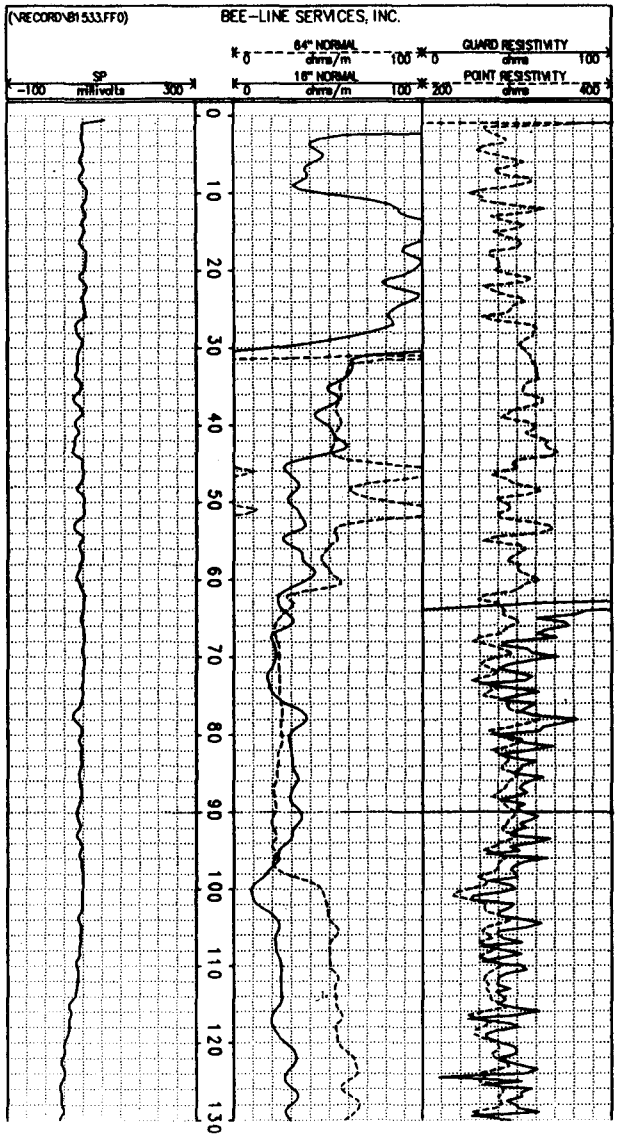
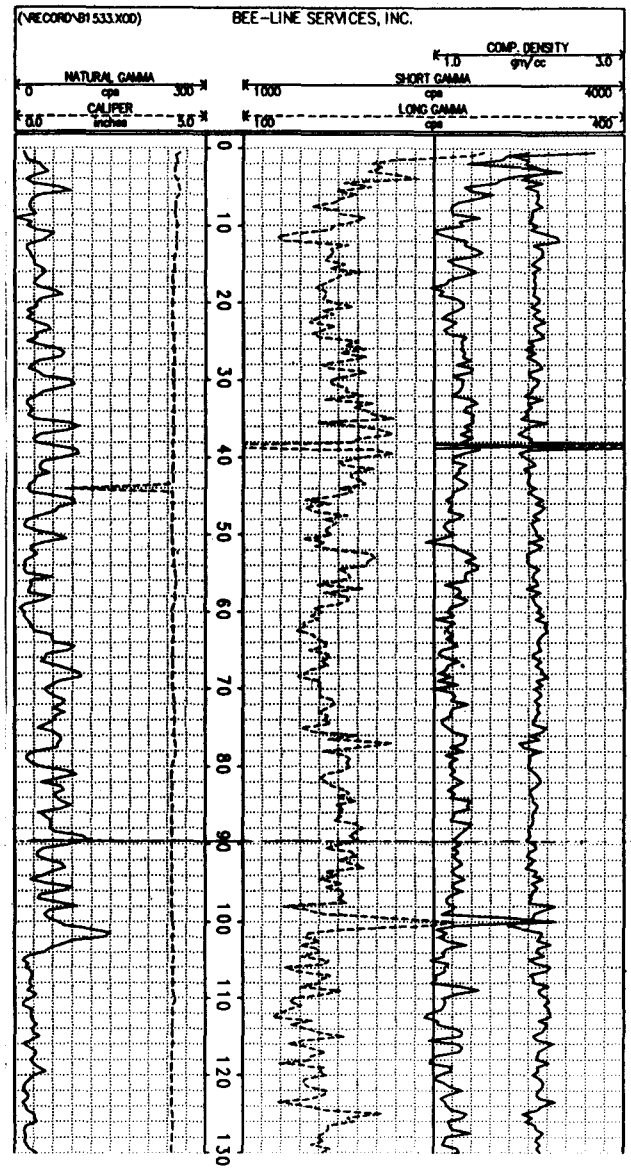
Corsicana, TX 75151

B 1533 Wire-line logs run March 22, 1990. Surface elevation 729.6 feet.

ELECTRICAL LOG

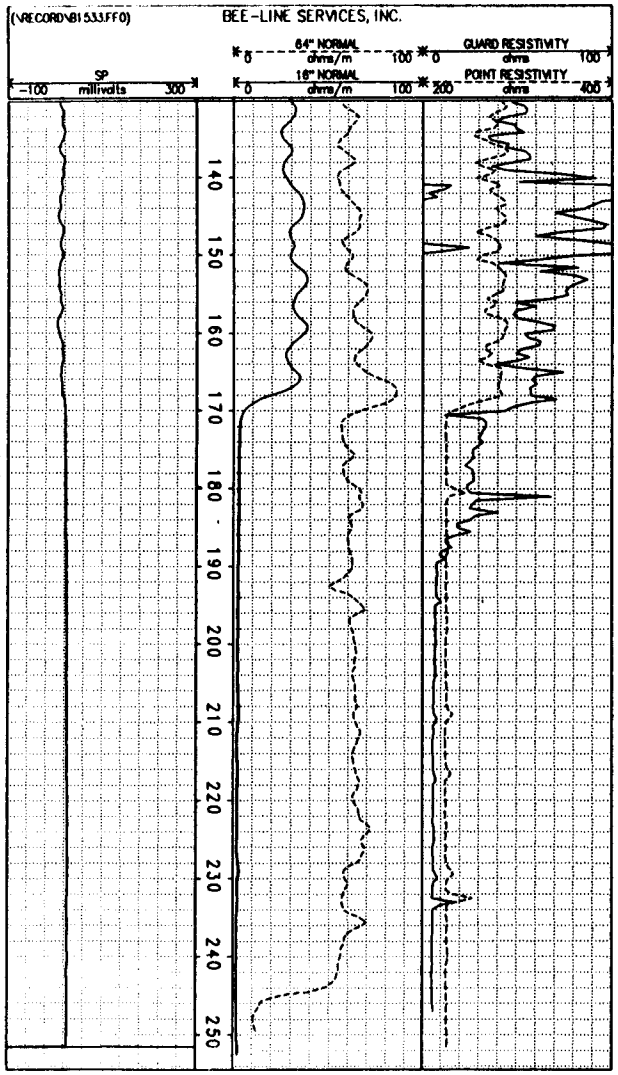


GAMMA LOG

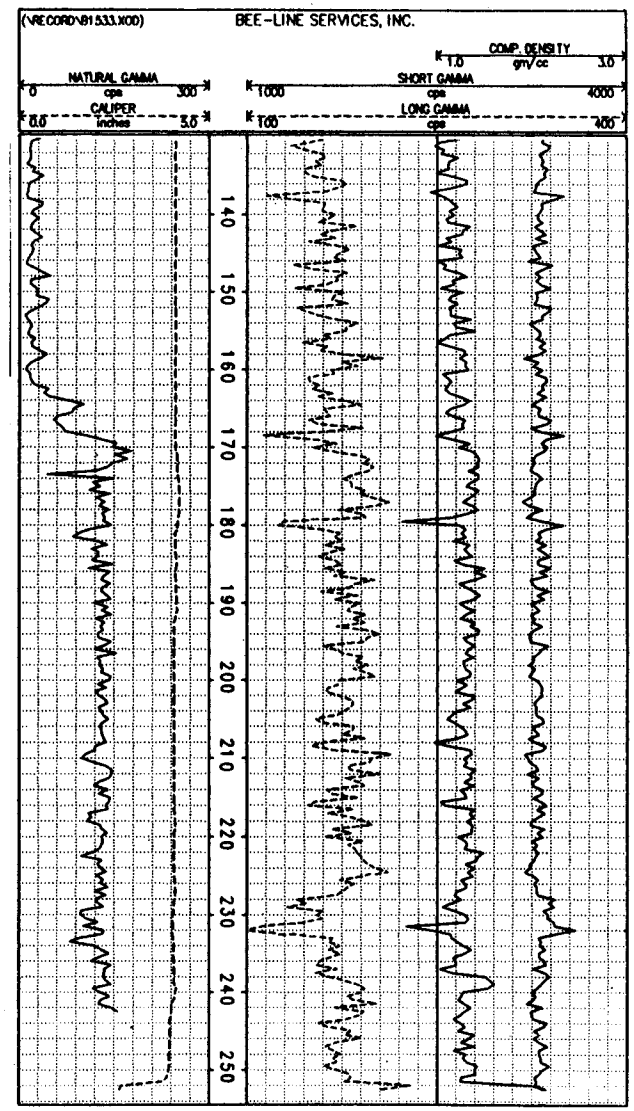


B 1533 Wire-line logs run March 22, 1990 (Continued). Surface elevation 729.6 feet.

ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



WIRE-LINE LOGGING PARAMETERS

Hole No. B 1540 **Log Measured From:** Ground Level

Drilling Parameters

Depth 275.0 feet

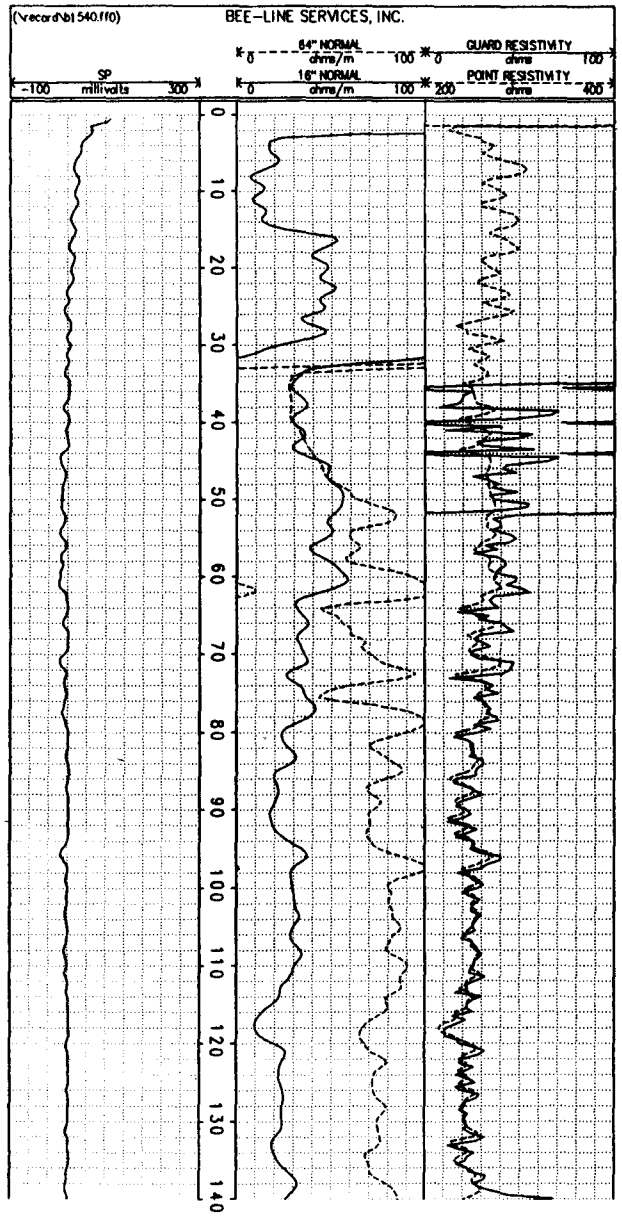
Bit Diameter 4.75 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	March 22, 1990	March 22, 1990	Tool Malfunction
Bottom Log Interval	272.5 feet	272.5 feet	
Top Log Interval	surface	surface	
Type of Fluid in Hole	drilling mud	drilling mud	
Time Since Circulation Stop	1.5 hours	1.5 hours	
Probe Type/S.N.	ALP-4979	XAP-4383	
Module Type/S.N.	ALM-4979	XAM-4383	
Logging Speed	40 feet/min.	20 feet/min.	
Sample Interval	0.5 foot	0.5 foot	

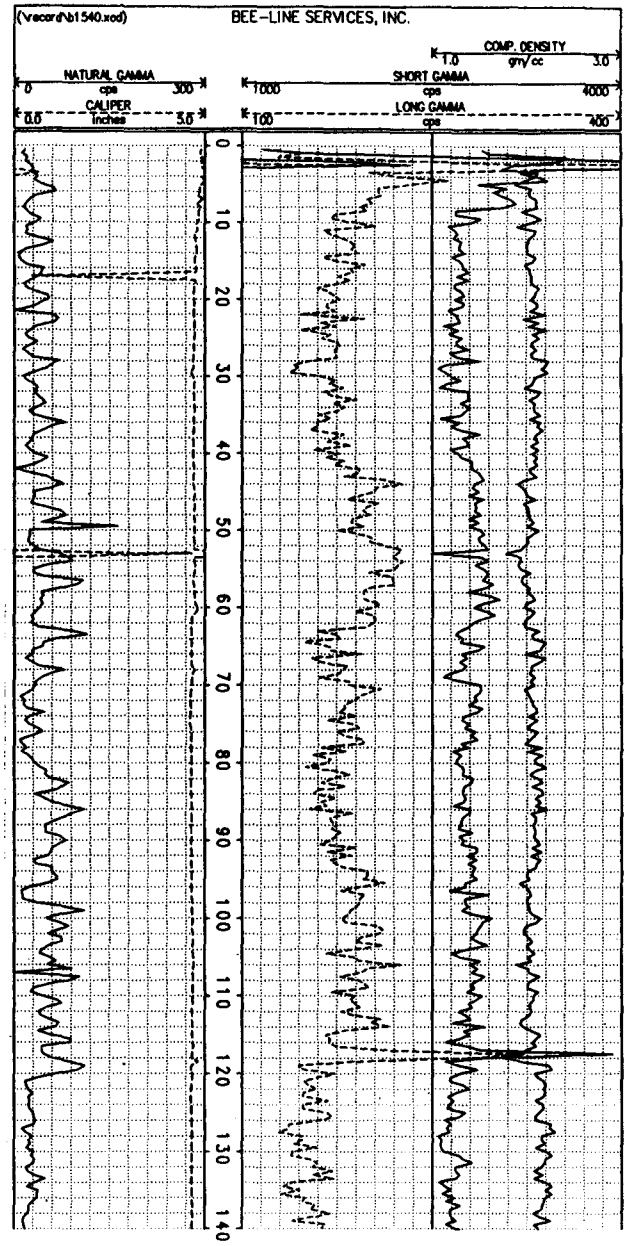
Logged by: BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

B 1540 Wire-line logs run March 22, 1990. Surface elevation 750.0 feet.

ELECTRICAL LOG

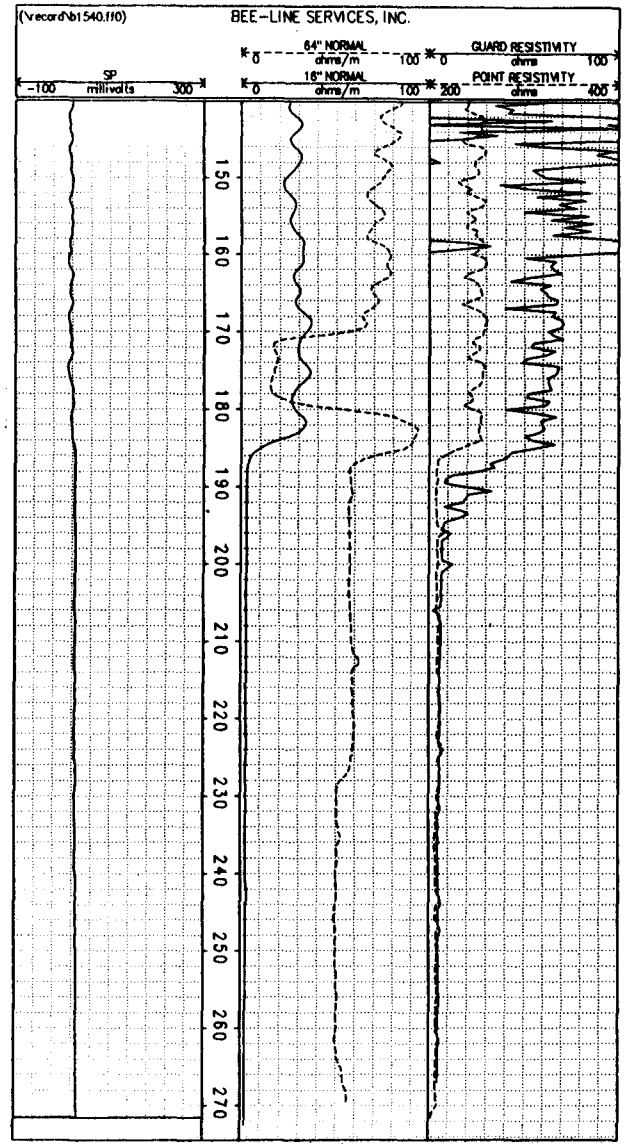


GAMMA LOG

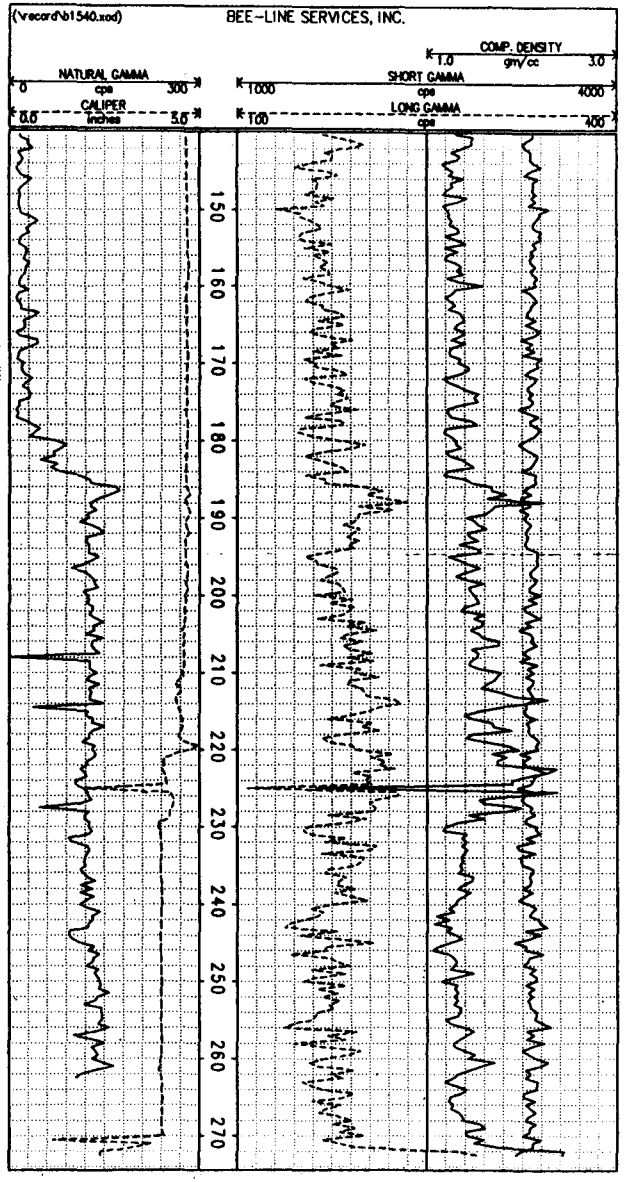


B 1540 Wire-line logs run March 22, 1990 (Continued). Surface elevation 750.0 feet.

ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



APPENDIX D

HYDROLOGIC TEST RESULTS

APPENDIX D

HYDROLOGIC TEST RESULTS

The objectives of the hydrologic (packer) tests were to provide estimates of the hydraulic conductivity within the Taylor Marl, Austin Chalk, and Eagle Ford Shale formations in unfractured zones, fractured or other suspected water-bearing zones, at the formation contacts, and at the tunnel elevation. Intervals within boreholes were selected for packer testing based on visual inspections of rock cores and the results of borehole geophysical testing. Sections of a borehole that exhibited increased frequency of fractures or bedding plane parting were commonly packer tested.

Standard procedures used to conduct these tests included lowering a pair of pneumatically operated rubber packers (in straddle-packer configuration) separated by a known length of perforated pipe into the drill hole to a predetermined depth. The packer interval was approximately 20 feet. The packers were then inflated to a precalculated pressure to seal against the rock side walls and water was pumped into the test interval at a selected pressure while the flow rate was measured with a cumulative flow meter. To improve the accuracy of measurements at low flow rates, water was pumped from a large container (e.g., a drum or section of casing) and the volume removed was recorded. In addition to monitoring the water pressure and flow rate at appropriate intervals, the height of the water pressure gauge above ground surface, as well as the diameter and length of water pipe used, were recorded. The tests were continued until five consecutive readings indicated a stabilization of the flow rate but for a minimum of at least 10 minutes. Standard forms were used for data records and the hydraulic conductivity was calculated using standard Bureau of Reclamation procedures.

STRADDLE PACKER TEST RESULTS

Boring	Test Depth (feet)	Packer Pressure (psi)	Gauge Pressure (psi)	Formation/Lithology	Hydraulic Conductivity* (cm/sec)	Remarks
BI 1	103.0-123.0	145	15	Austin Chalk	$<4.4\times10^{-8}$	Note 1
	172.0-192.0	140	15	Austin Chalk/ Eagle Ford Shale (fractured)	$<4.4\times10^{-8}$	Note 2
BI 2A	67.9-89.0	125	20	Austin Chalk	$<3.0\times10^{-8}$	Note 3
	222.9-244.0	150	20	Austin Chalk/ Eagle Ford Shale (fractured)	$<3.0\times10^{-8}$	Note 2
BI 3	76.0-96.0	150	7	Austin Chalk (fractured)	2.1×10^{-4}	Note 4
	127.0-147.0	180	15	Austin Chalk	$<6.1\times10^{-8}$	Note 3
BI 4	141.0-161.0	130	15	Austin Chalk	$<3.8\times10^{-8}$	Note 1
BI 5	88.0-108.0	155	15	Austin Chalk	$<4.8\times10^{-8}$	Note 3
	180.0-200.0	145	15	Austin Chalk	$<4.8\times10^{-8}$	Note 1
BI 6	164.0-184.0	150	15	Austin Chalk	$<1.4\times10^{-6}$	Note 1

* Based on approximate static water level.

Notes:
1. Test done in unfractured Austin Chalk.
2. Test done at contact between Austin Chalk and Eagle Ford Shale.
3. Test done at the level of HEB.
4. Test done in fractured Austin Chalk.

APPENDIX E

LABORATORY RESULTS

BULK AND CLAY MINERALOGY TEST RESULTS

TABLE E-1. BULK AND CLAY MINERALOGY TEST RESULTS

BORING BI 1

Formation: Austin Chalk **Depth:** 110.8 ft

Whole Rock Composition:

Mineral	Percent
total clay	28
others (not analyzed)	72
Total	100

Relative Clay Abundance:

Mineral	Percent
illite	14
smectite	86
Total	100

Formation: Austin Chalk **Depth:** 127.5 ft

Whole Rock Composition:

Mineral	Percent
quartz	20
K feldspar	3
plagioclase	1
calcite	2
pyrite	5
total clay	69
Total	100

Relative Clay Abundance:

Mineral	Percent
illite	30
kaolinite	36
mixed layer (illite/smectite)	34
Total	100

BORING BI 2A

Formation: Austin Chalk **Depth:** 65.9-66.2 ft

Whole Rock Composition:

Mineral	Percent
calcite	95
total clay	5
Total	100

Relative Clay Abundance:

Mineral	Percent
Not analyzed	

Formation: Austin Chalk **Depth:** 66.2-66.4 ft

Whole Rock Composition:

Mineral	Percent
calcite	5
total clay	95
Total	100

Relative Clay Abundance:

Mineral	Percent
montmorillonite	68
illite	27
kaolinite	5
Total	100

TABLE E-1. BULK AND CLAY MINERALOGY TEST RESULTS (Cont'd)

BORING BI 2A (Cont'd)

Formation: Austin Chalk **Depth:** 87.6 ft

Whole Rock Composition:

Mineral	Percent
quartz	3
calcite	95
pyrite	2
Total	100

Relative Clay Abundance:

Not analyzed

Formation: Austin Chalk **Depth:** 97.4-97.8 ft

Whole Rock Composition:

Mineral	Percent
calcite	10
total clay	90
Total	100

Relative Clay Abundance:

Mineral	Percent
montmorillonite	59
illite	28
kaolinite	13
Total	100

Formation: Eagle Ford Shale **Depth:** 236.9-237.2 ft

Whole Rock Composition:

Mineral	Percent
total clay	100
Total	100

Relative Clay Abundance:

Mineral	Percent
montmorillonite	30
illite	54
kaolinite	16
Total	100

BORING BI 3

Formation: Austin Chalk **Depth:** 127.3 ft

Whole Rock Composition:

Mineral	Percent
quartz	3
calcite	93
pyrite	2
total clay	2
Total	100

Relative Clay Abundance:

Not analyzed

TABLE E-1. BULK AND CLAY MINERALOGY TEST RESULTS (Cont'd)

BORING BI 4

Formation: Austin Chalk **Depth:** 94.2 ft

Whole Rock Composition:

Mineral	Percent
total clay	52
others (not analyzed)	48
Total	100

Relative Clay Abundance:

Mineral	Percent
illite	10
smectite	90
Total	100

BORING BI 5

Formation: Austin Chalk **Depth:** 141.1 ft

Whole Rock Composition:

Mineral	Percent
total clay	47
others (not analyzed)	53
Total	100

Relative Clay Abundance:

Mineral	Percent
illite	2
smectite	98
Total	100

BORING BI 6

Formation: Eagle Ford Shale **Depth:** 222.6 ft

Whole Rock Composition:

Mineral	Percent
quartz	26
K feldspar	5
plagioclase	3
siderite	26
pyrite	2
total clay	38
Total	100

Relative Clay Abundance:

Mineral	Percent
illite	32
kaolinite	26
Fe-chlorite	3
mixed layer (illite/smectite)	39
Total	100

BORING B 1527

Formation: Eagle Ford Shale **Depth:** 178.9 ft

Whole Rock Composition:

Mineral	Percent
total clay	73
others (not analyzed)	27
Total	100

Relative Clay Abundance:

Mineral	Percent
illite	33
kaolinite	10
Fe-chlorite	4
mixed layer (illite/smectite)	53
Total	100

TABLE E-1. BULK AND CLAY MINERALOGY TEST RESULTS (Cont'd)

BORING B 1533

Formation: Austin Chalk **Depth:** 6.6 ft

Whole Rock Composition:

Mineral	Percent
quartz	2
calcite	97
total clay	1
Total	100

Relative Clay Abundance:

Mineral	Percent
Not analyzed	

Formation: Eagle Ford Shale **Depth:** 174.8 ft

Whole Rock Composition:

Mineral	Percent
total clay	100
Total	100

Relative Clay Abundance:

Mineral	Percent
montmorillonite	70
illite	14
kaolinite	16
Total	100

BORING B 1540

Formation: Austin Chalk **Depth:** 8.3 ft

Whole Rock Composition:

Mineral	Percent
quartz	1
calcite	99
Total	100

Relative Clay Abundance:

Mineral	Percent
Not analyzed	

Formation: Austin Chalk Depth: 119.3 ft

Whole Rock Composition:

Mineral	Percent
total clay	84
others (not analyzed)	16
Total	100

Relative Clay Abundance:

Mineral	Percent
illite	2
smectite	98
Total	100

TABLE E-1. BULK AND CLAY MINERALOGY TEST RESULTS (Cont'd)

BORING B 1540 (Cont'd)

Formation: Eagle Ford Shale **Depth:** 198.0 ft

Whole Rock Composition:

Mineral	Percent
total clay	60
others (not analyzed)	40
Total	100

Relative Clay Abundance:

Mineral	
illite	28
kaolinite	8
Fe-chlorite	<2
mixed layer (illite/smectite)	63
Total	100

GEOMECHANICAL TEST RESULTS

GEOMECHANICAL TEST RESULTS

BORING BI 1

TABLE E-2. GEOMECHANICAL TEST RESULTS - BORING B11

GENERAL LITHOLOGY	BORING DEPTH	MOISTURE CONTENT	DRY DENSITY	SPECIFIC GRAVITY	ATTERBERG LIMITS		FRACTION FINER THAN	CARBONATE CONTENT	SAMPLE DIMENSION RATIO	SAMPLE FAILURE MODE/	UNCONFINED COMPRESSIVE	TRIAXIAL COMPRESSION		FAILURE STRAIN	TANGENT YOUNG'S MODULUS			POISSON'S RATIO	BRAZIL TENSILE STRENGTH	2ND CYCLE SLAKE DURABILITY INDEX	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX	COMMENTS
					LL	PI	# 200 SIEVE		L/D	DEGREES*	STRENGTH	CONFINING PRESSURE	DEVIATOR STRESS		E50	UNLOAD/ RELOAD	σ_3						
	feet	percent	pcf				percent	percent			psi	σ_3 psi	$\sigma_1-\sigma_3$ psi	percent	(psi)x10E5	(psi)x10E5	psi		psi	percent		psi	
BENTONITE	110.6	33.0		2.71	103	67	93.3	13.5															
BENTONITE	110.7	38.1	71.3																				
BENTONITE	111.1	28.3	95.7																			23.5	
BENTONITE	111.2	34.0	87.7																			29.0	
AUSTIN CHALK	131.6	10.4																					
AUSTIN CHALK	131.7	10.7	130.9						2.5	E	1895			1.32	1.39		0						NOTE 1
AUSTIN CHALK	144.6	11.4	128.1																				
AUSTIN CHALK	175.2	13.1	123.1	2.66					2.3	D	2288			0.50	4.76		0						
AUSTIN CHALK	175.2														4.08 (1)			0.27 (1)					NOTES 2, 3 and 4
AUSTIN CHALK	176.2	11.4	127.2						2.3	D		100	1770	1.05	1.59		100						
AUSTIN CHALK	176.6	10.9	128.9						2.4	B-1/23		300	2677	0.99	2.98		300						
AUSTIN CHALK	177.0	13.4	122.6																				
AUSTIN CHALK	180.0	13.3																					
AUSTIN CHALK	180.1	11.9							0.5										221				
AUSTIN CHALK	181.5	11.9																					
AUSTIN CHALK	181.6	10.9	127.4						2.3	D	2583			0.89	3.45		0						
EAGLE FORD SHALE	183.5	17.4	113.8																			32.6	
EAGLE FORD SHALE	183.7	17.2	119.5																			29.9	
EAGLE FORD SHALE	183.9				86	55	99.4	6.2															
EAGLE FORD SHALE	184.6	17.0																		20.9			
EAGLE FORD SHALE	185.5	16.9	117.8																				
EAGLE FORD SHALE	185.7	16.2	118.6		80	52	99.3	4.5	2.4	B-1/60	323			0.50	1.00		0						
EAGLE FORD SHALE	185.7														1.09(1)			0.37 (1)					NOTE 2
EAGLE FORD SHALE	186.6	17.6	114.3																			43.5	
EAGLE FORD SHALE	186.8	17.0	112.5																			14.4	
EAGLE FORD SHALE	187.7	17.1			106	72	99.3	5.9															
EAGLE FORD SHALE	187.8	17.1	114.6																				
EAGLE FORD SHALE	195.1	14.4	120.9																				
EAGLE FORD SHALE	207.5	15.9																					
EAGLE FORD SHALE	207.6	15.9	118.5	2.66					2.2	B-1/45	205			0.27	1.02		0						
EAGLE FORD SHALE	208.0	15.7			99	68	99.9	6.7															
EAGLE FORD SHALE	208.2				96	61																	
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

EHFF720 WKT
REVISION 2.0
DATE 07/17/90

* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

Symbol	Failure Type	Symbol	Failure Type
A	No discernible failure plane	B-4	Combination
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core	C	Barreling/Bulging
B-1	Shear plane	D	Longitudinal (axial) splitting
B-2	Bedding plane shear	E	Conical
B-3	Shear plane along pre-existing fracture, shear zone, etc.	F	No information

NOTES:

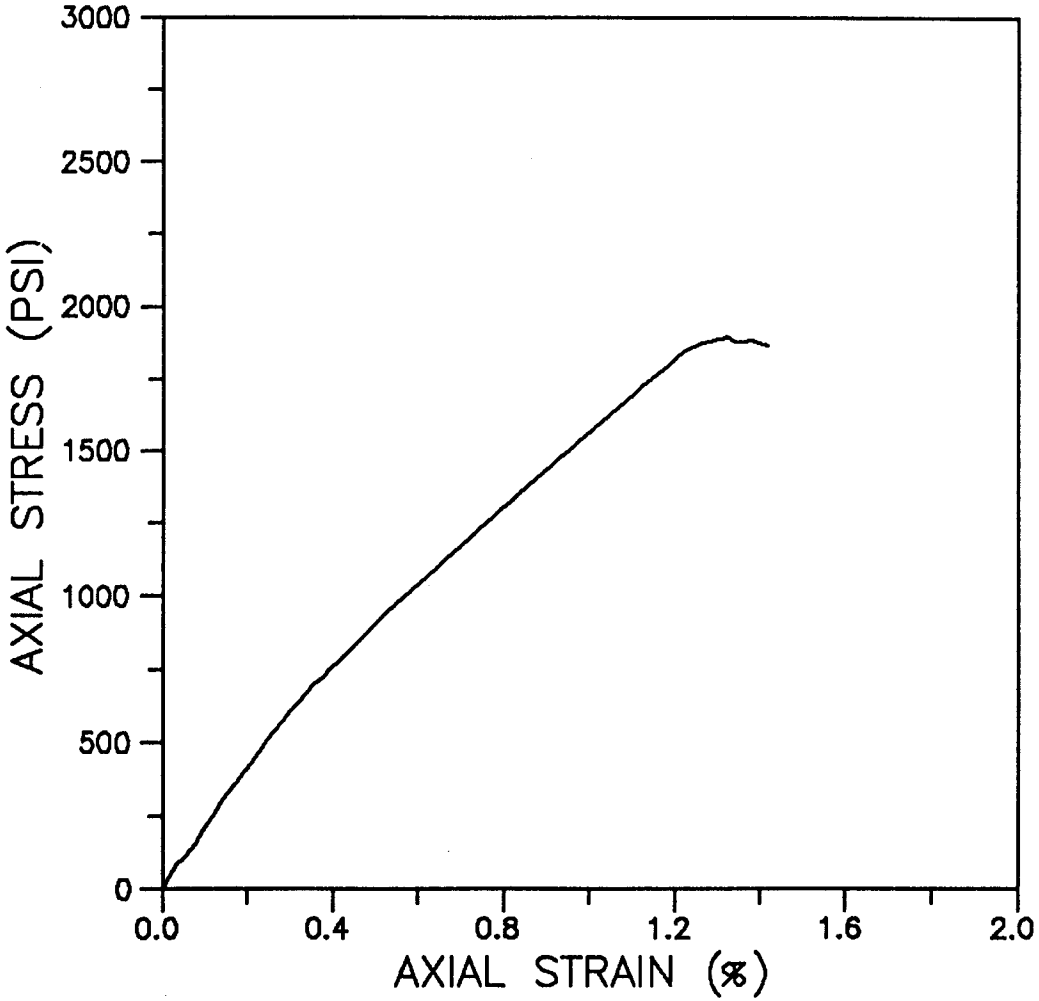
1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

2) Modulus and Poisson's ratio calculated from axial and lateral strains measured using LVDTs. Axial gage length is 2.8 inches.

3) For Poisson's ratio values; the value within parentheses indicates the number of LVDTs recording lateral strains. Otherwise all 3 LVDTs recorded strains.

4) For Young's modulus values; the value within parentheses indicates the number of LVDTs recording axial strains. Otherwise all 3 LVDTs recorded strains.

BORING NO: BI1
DEPTH (FT): 131.7
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.7
DRY UNIT WEIGHT (PCF): 130.9
DEG. OF SATURATION (%): 99.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.39 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

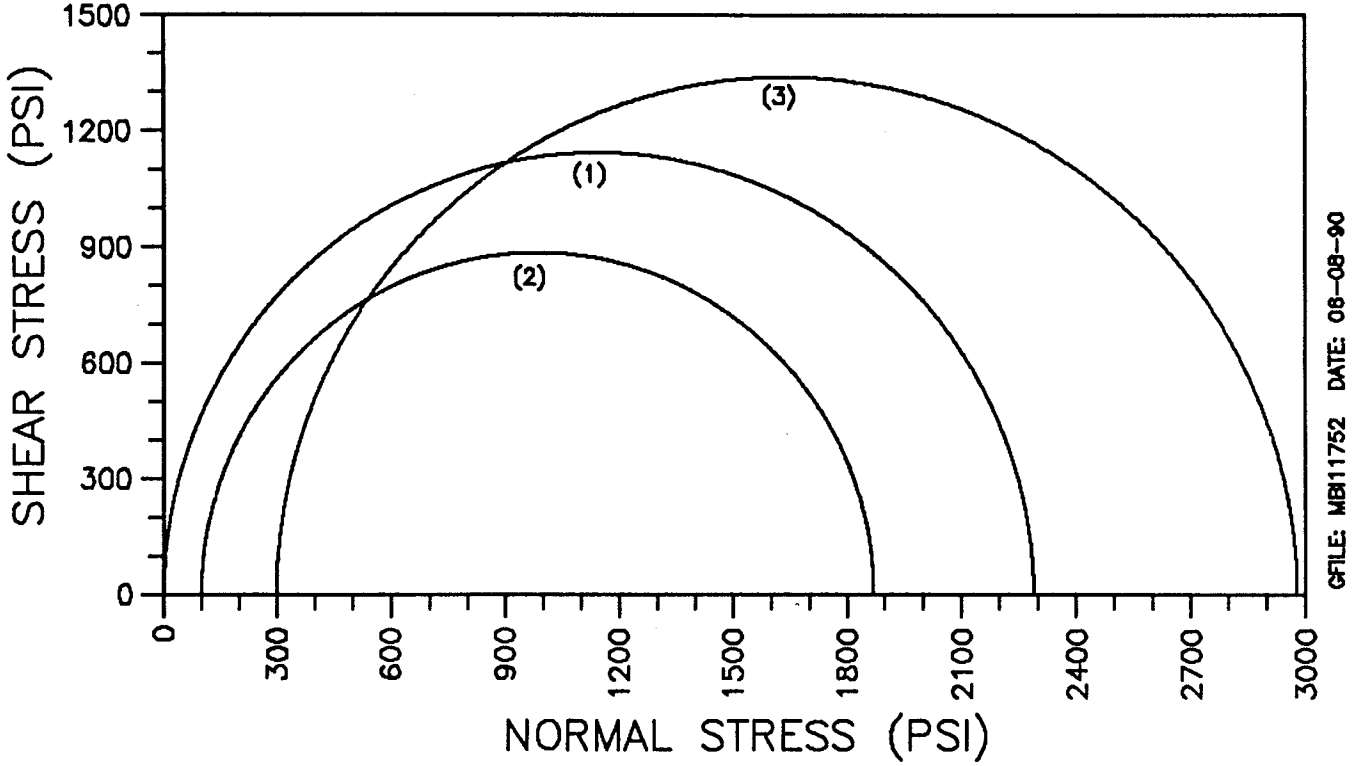
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: BI1
DEPTH RANGE (FT): 175.2–177.0
AUSTIN CHALK LIMESTONE



GFILE: MBI11752 DATE: 08-08-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 175.2
(2) DEPTH (FT): 176.2
(3) DEPTH (FT): 176.6

INCLINATION (DEG): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

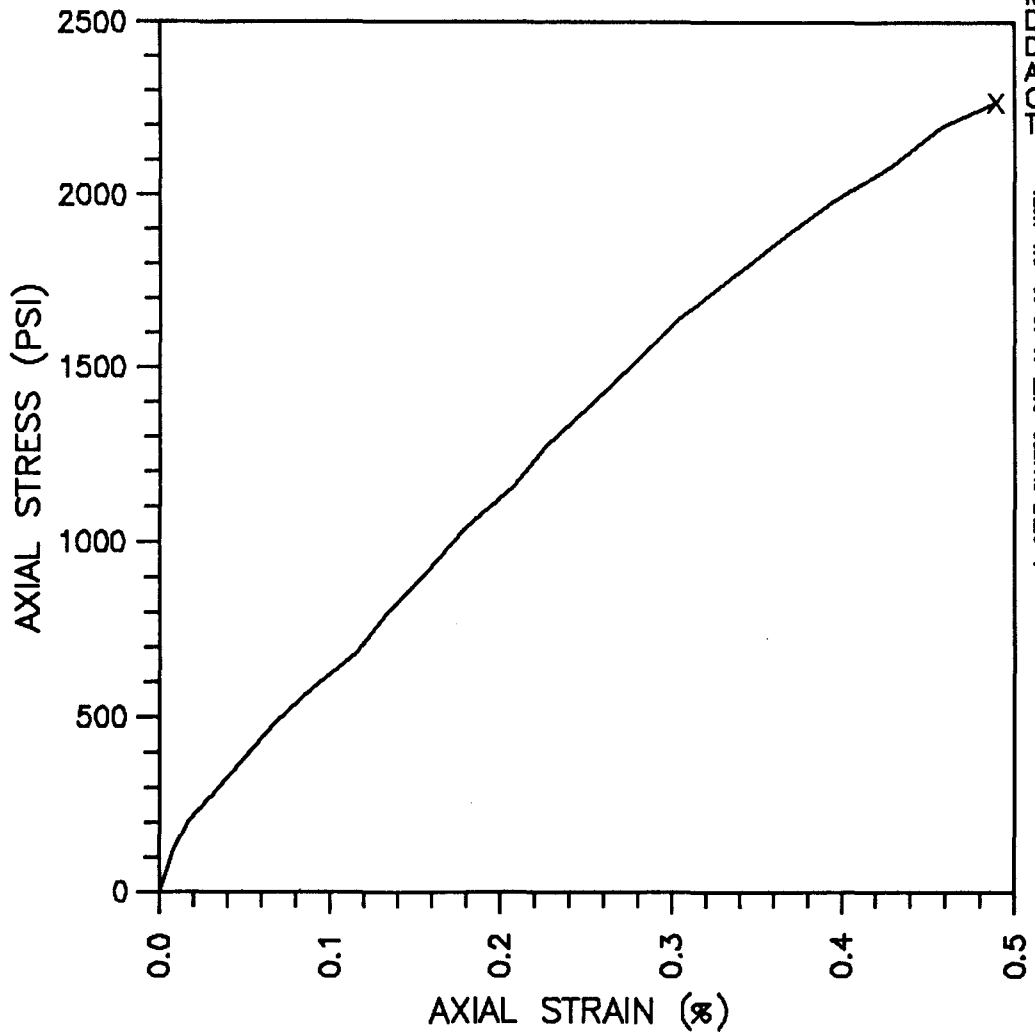
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI1
DEPTH (FT): 175.2
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.1
DRY UNIT WEIGHT (PCF): 123.1
DEG. OF SATURATION (%): 96.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

DFILE: BI11732 DATE: 06-09-00 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.762 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

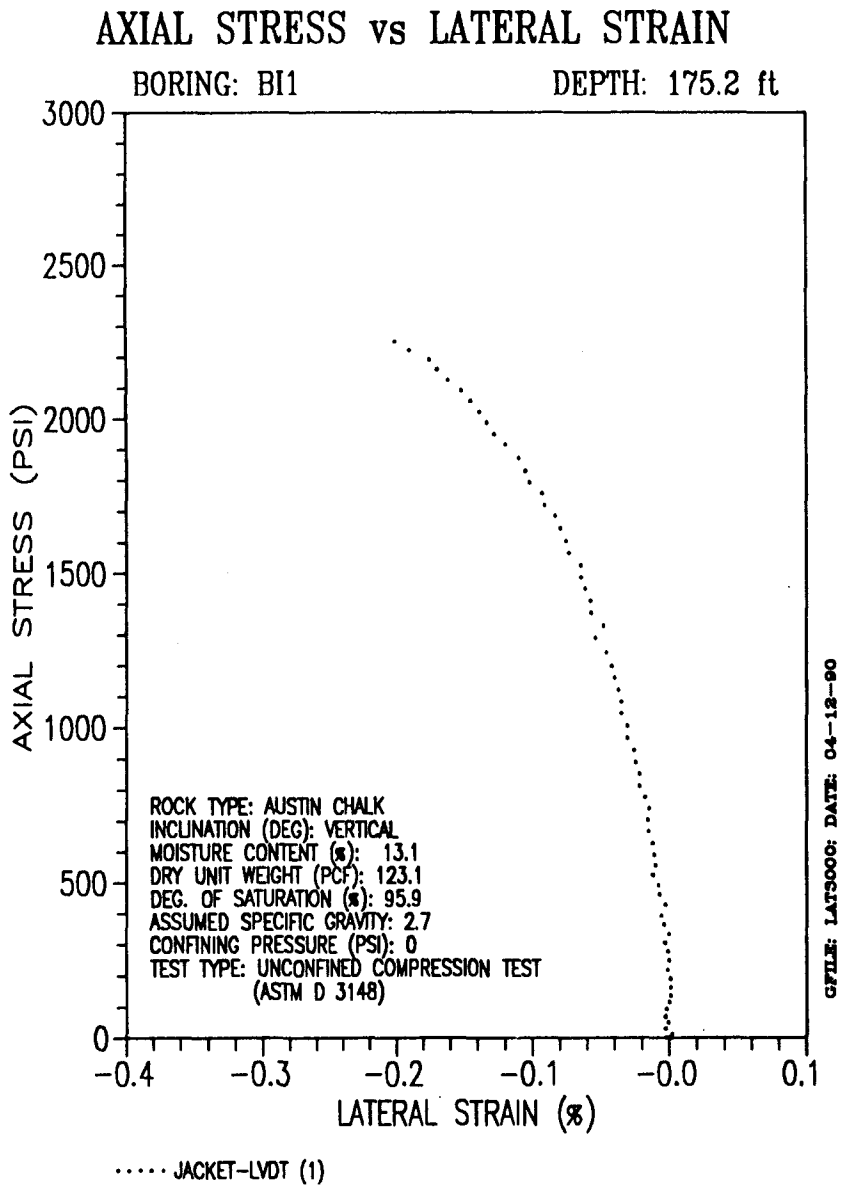
TEXAS SSC SITE

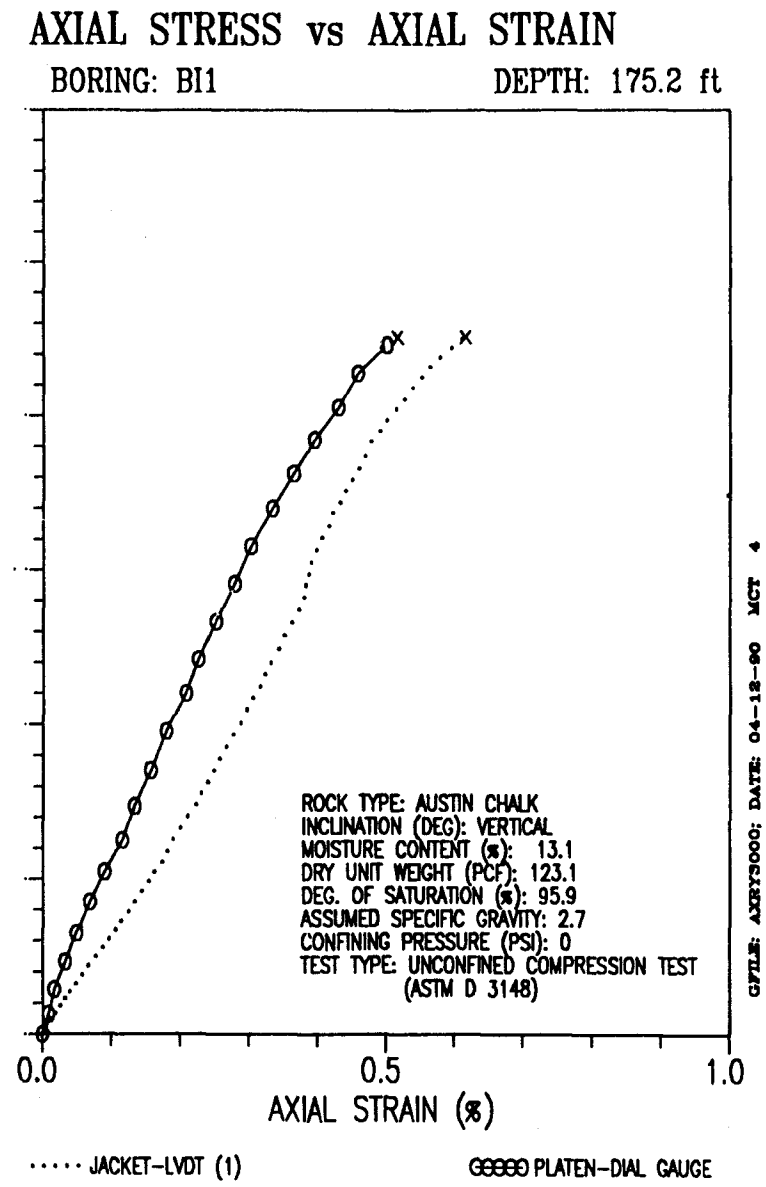
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

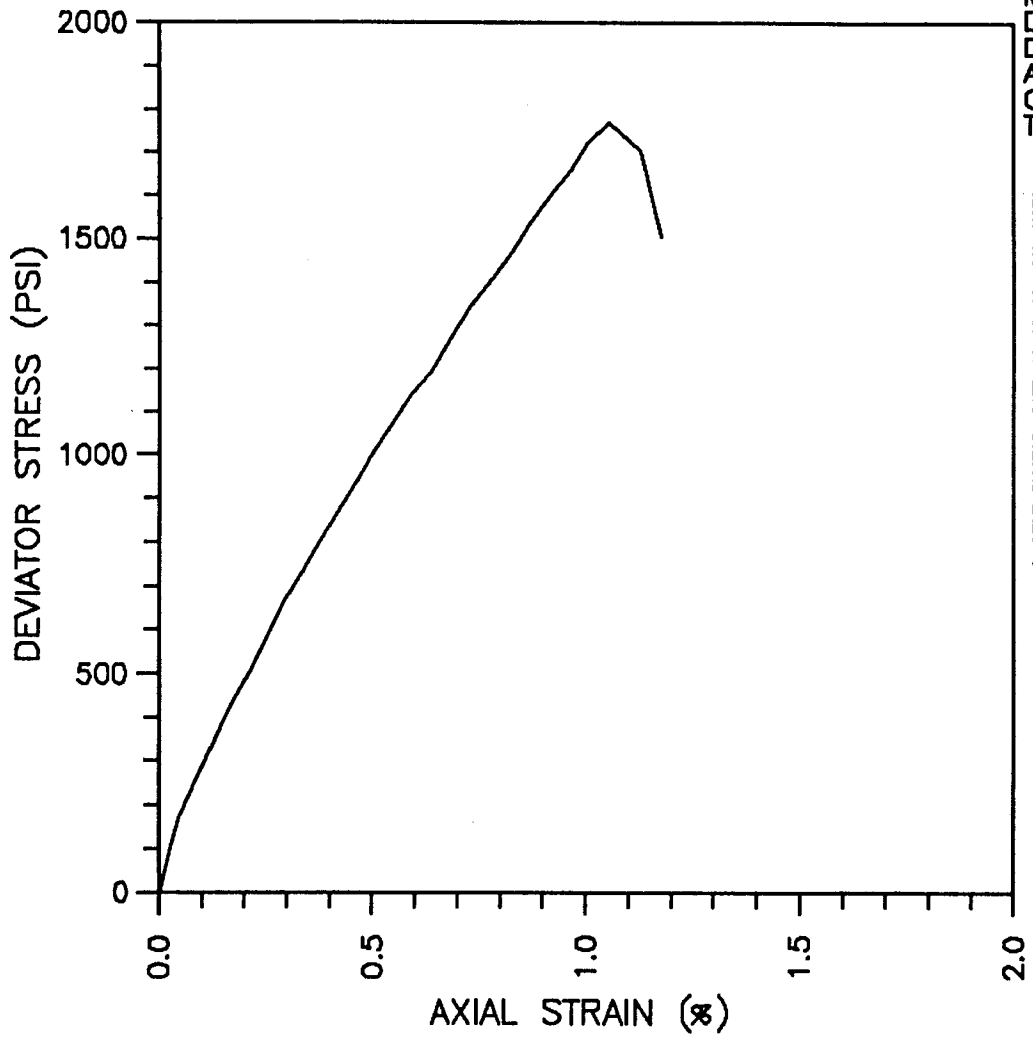
JOB NO.: 5530.15

FIGURE


AXIAL STRESS vs LATERAL STRAIN
BORING: BI1
DEPTH: 175.2 ft
AXIAL STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.4
-0.3
-0.2
-0.1
-0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.1
DRY UNIT WEIGHT (PCF): 123.1
DEG. OF SATURATION (%): 95.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION TEST
(ASTM D 3148)
GFILE: LAT3000; DATE: 04-12-90
····· JACKET-LVDT (1)


AXIAL STRESS vs AXIAL STRAIN
BORING: BI1
DEPTH: 175.2 ft
0.0
0.5
1.0
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.1
DRY UNIT WEIGHT (PCF): 123.1
DEG. OF SATURATION (%): 95.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION TEST
(ASTM D 3148)
GFILE: AXY3000; DATE: 04-12-90 MCT 4
····· JACKET-LVDT (1)
PLATEN-DIAL GAUGE

BORING NO.: BI1
DEPTH (FT): 176.2
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.4
DRY UNIT WEIGHT (PCF): 127.2
DEG. OF SATURATION (%): 94.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BI11782 DATE: 06-08-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.594 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

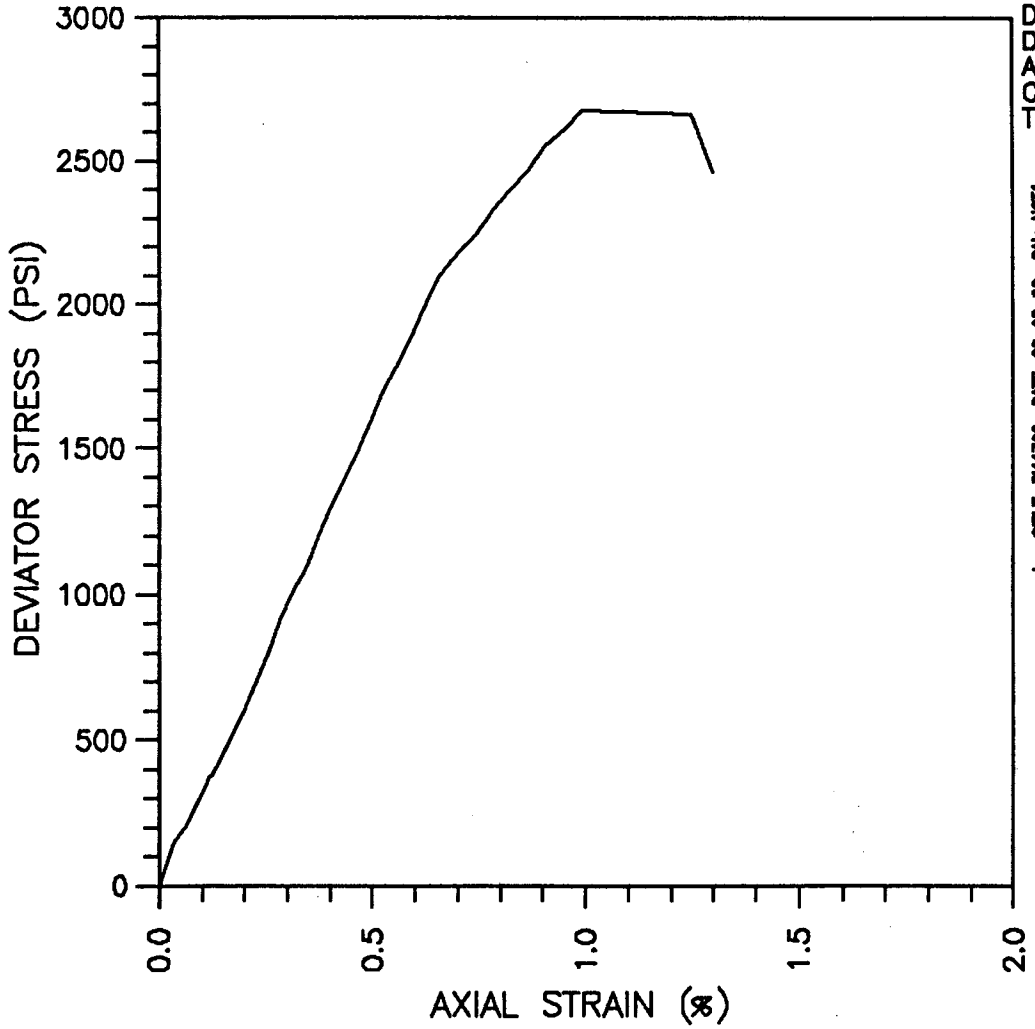
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI1
DEPTH (FT): 176.6
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.9
DRY UNIT WEIGHT (PCF): 128.9
DEG. OF SATURATION (%): 95.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BI11764 DATE: 08-08-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.976 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 23 DEG.

TEXAS SSC SITE

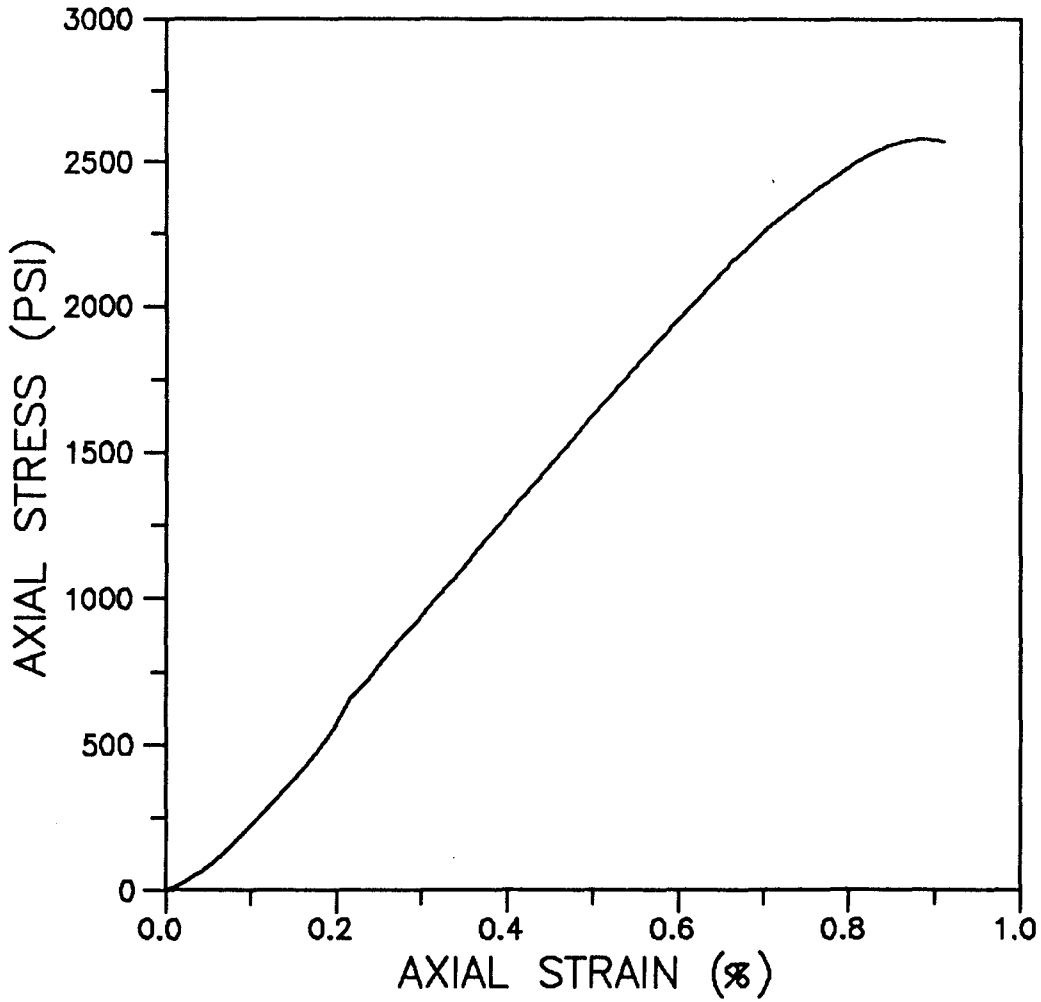
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO: BI1
DEPTH (FT): 181.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.9
DRY UNIT WEIGHT (PCF): 127.4
DEG. OF SATURATION (%): 91.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.45 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

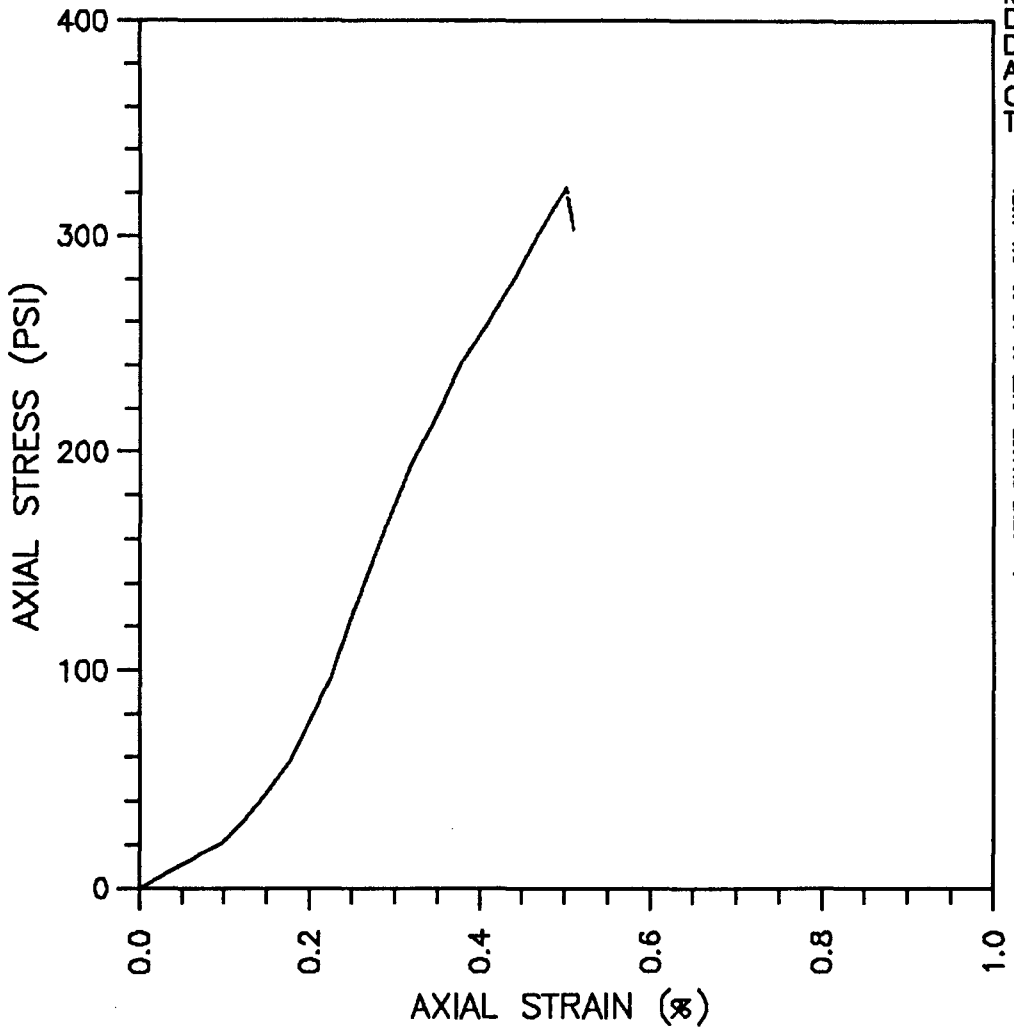
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: BI1
DEPTH (FT): 185.7
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.2
DRY UNIT WEIGHT (PCF): 118.6
DEG. OF SATURATION (%): 103.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: BI11857 DATE: 08-08-90 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.000 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 60 DEG.

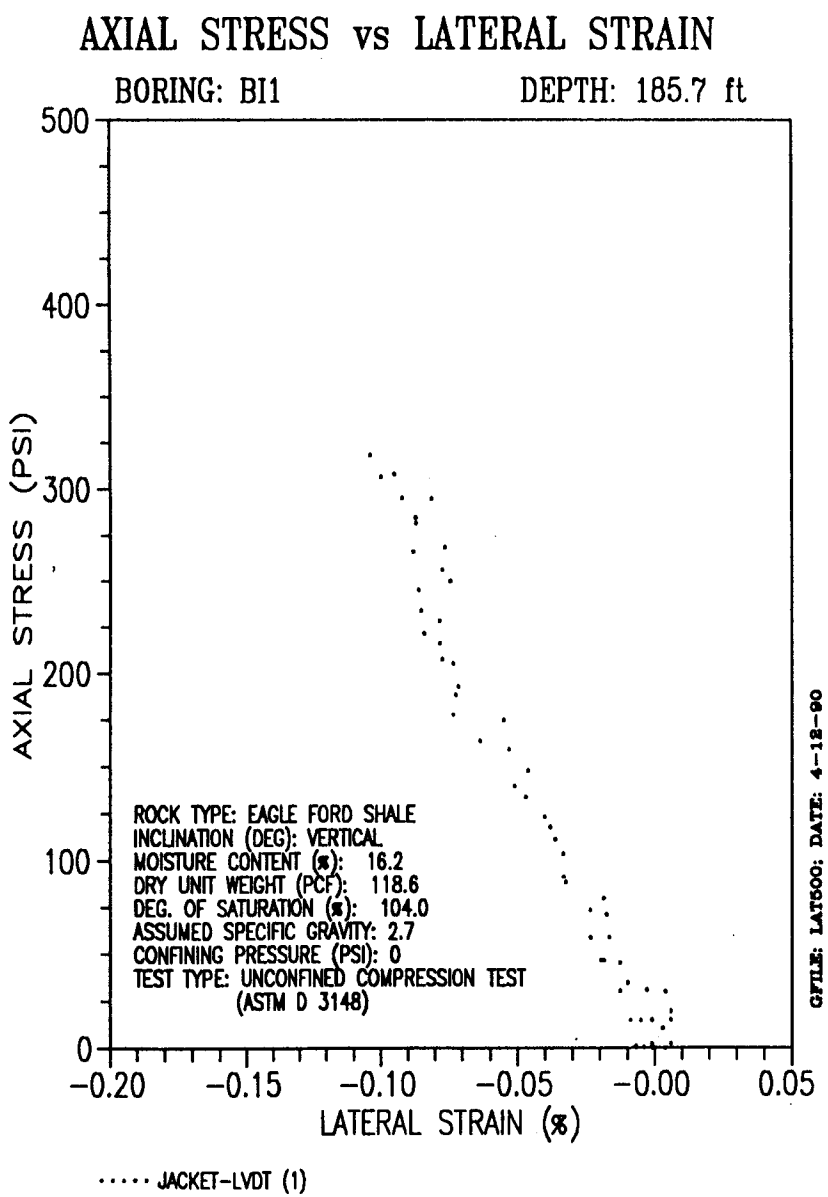
TEXAS SSC SITE

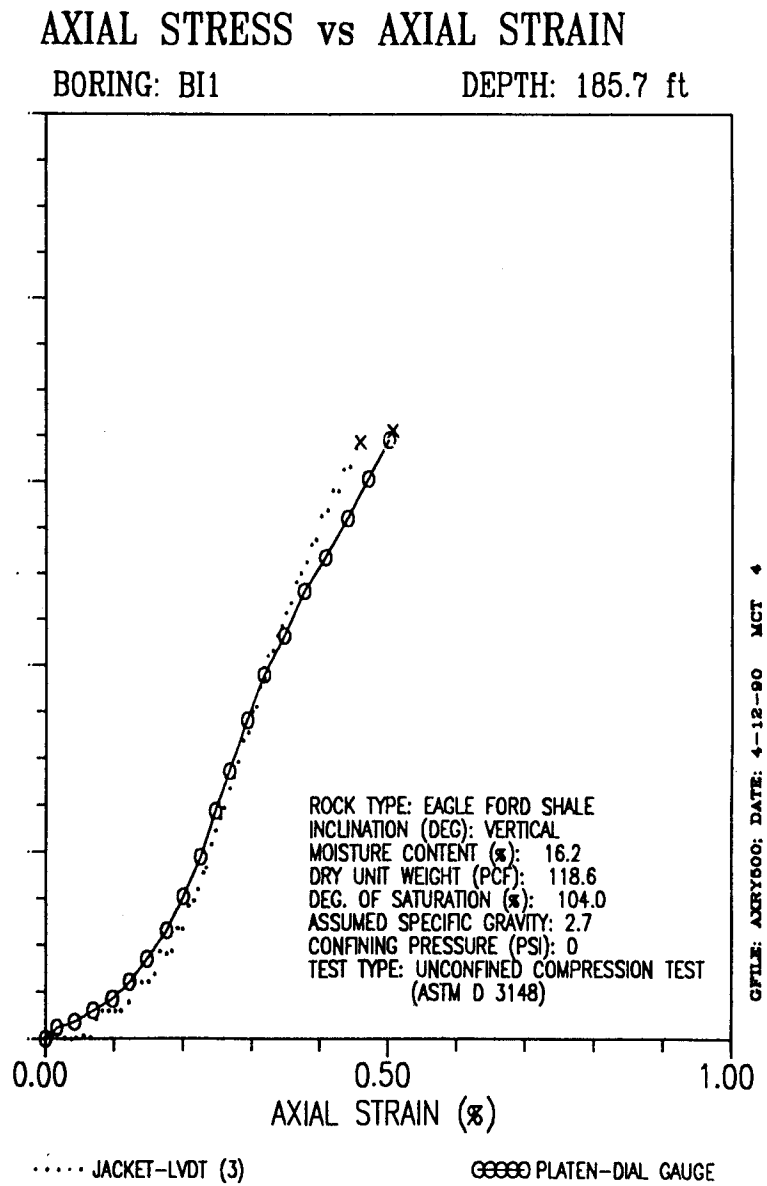
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

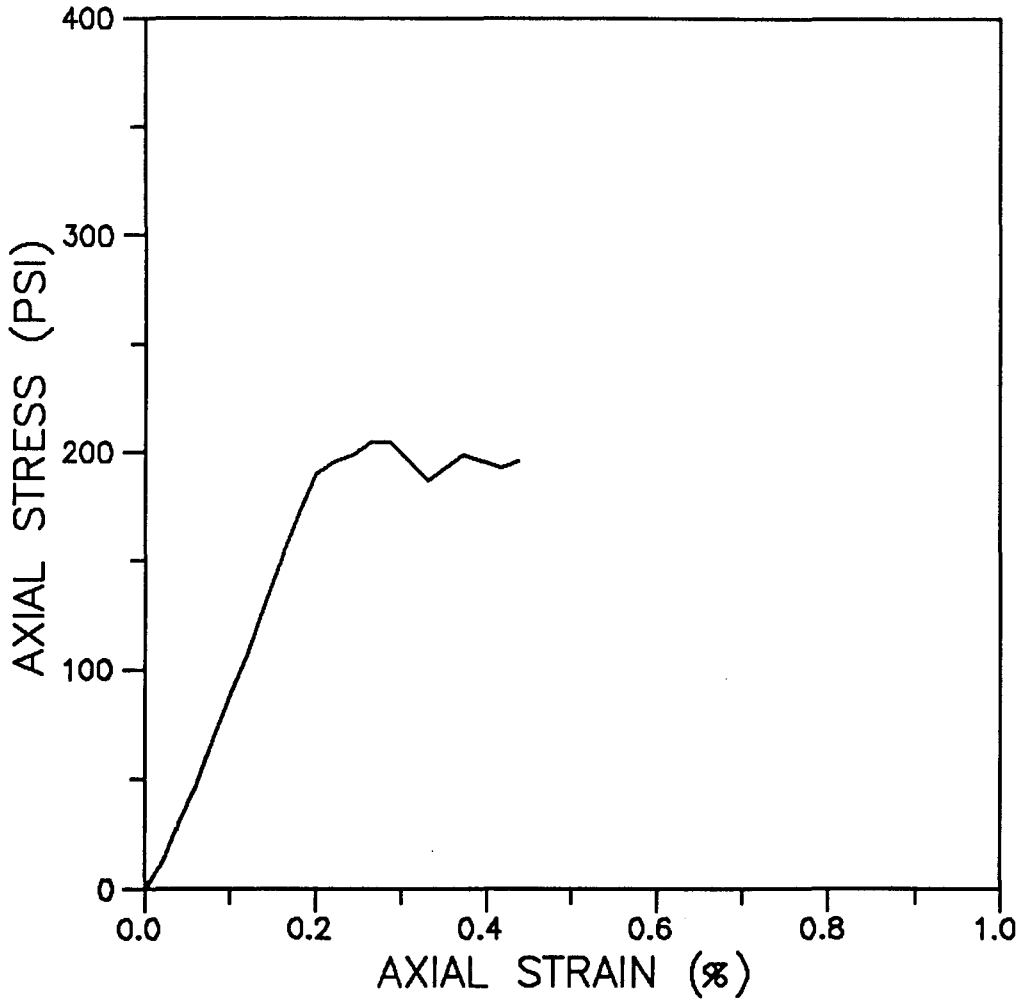
JOB NO.: 5530.15

FIGURE


AXIAL STRESS vs LATERAL STRAIN
BORING: BI1
DEPTH: 185.7 ft
AXIAL STRESS (PSI)
500
400
300
200
100
0
-0.20
-0.15
-0.10
-0.05
-0.00
0.05
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.2
DRY UNIT WEIGHT (PCF): 118.6
DEG. OF SATURATION (%): 104.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION TEST
(ASTM D 3148)
GFILE: LAT500; DATE: 4-12-90
JACKET-LVDT (1)


AXIAL STRESS vs AXIAL STRAIN
BORING: BI1
DEPTH: 185.7 ft
0.00
0.50
1.00
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.2
DRY UNIT WEIGHT (PCF): 118.6
DEG. OF SATURATION (%): 104.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION TEST
(ASTM D 3148)
GFILE: AXRY500; DATE: 4-12-90 MCT 4
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: BI1
DEPTH (FT): 207.6
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.9
DRY UNIT WEIGHT (PCF): 118.5
DEG. OF SATURATION (%): 101.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.02 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 45 DEG

TEXAS SSC SITE

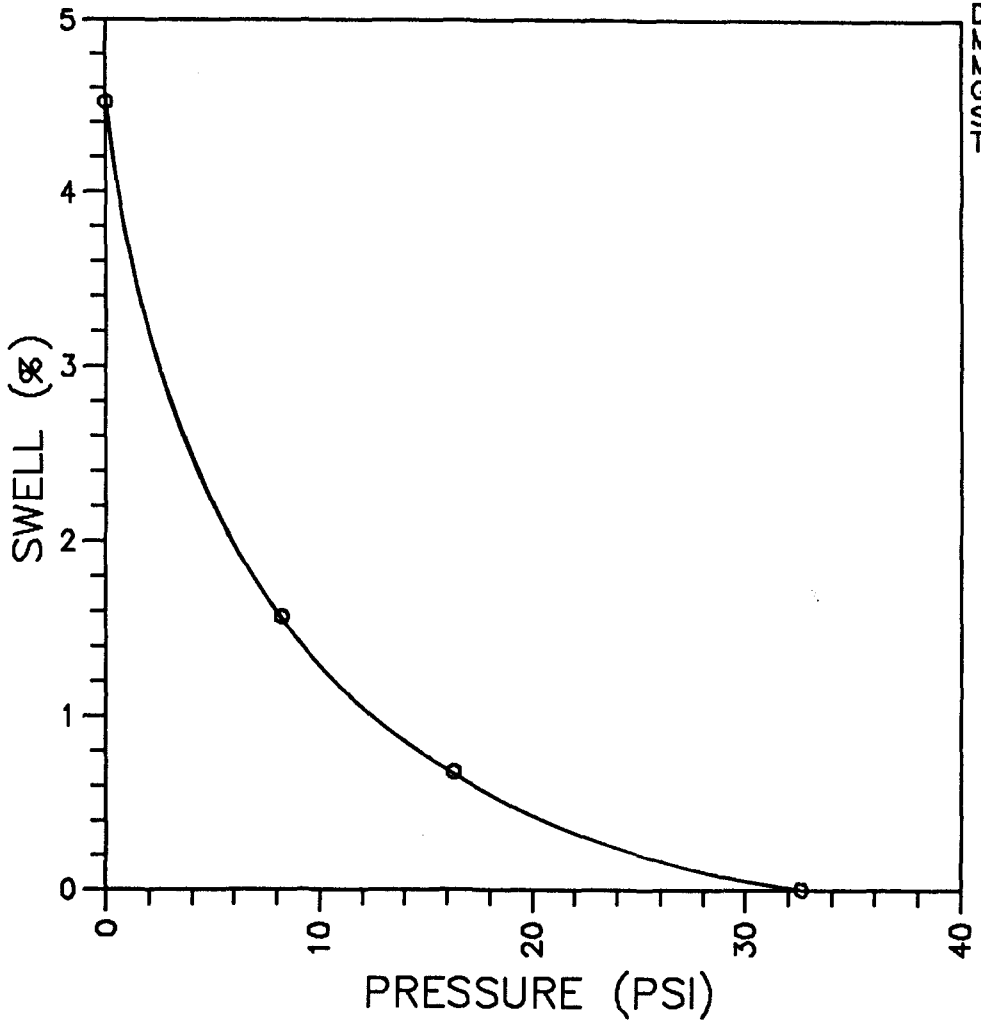
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: BI1
DEPTH (FT): 183.5
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
DRY UNIT WEIGHT (PCF): 113.8
M.C. BEFORE TEST (%): 17.4
M.C.AFTER TEST (%): 23.1
GAIN IN MOISTURE (%): 5.6
SWELLING PRESSURE INDEX (PSI): 33
TEST TYPE: SWELLING PRESSURE INDEX (ISRM)

TEXAS SSC SITE

SWELLING PRESSURE INDEX

MASON–JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

GEOMECHANICAL TEST RESULTS

BORING BI 2A

TABLE 2-3. GEOMECHANICAL TEST RESULTS - BORING B12A

GENERAL LITHOLOGY	BORING DEPTH	MOISTURE CONTENT	DRY DENSITY	SPECIFIC GRAVITY	ATTERBERG LIMITS		FRACTION FINER THAN # 200 SIEVE	CARBONATE CONTENT	SAMPLE DIMENSION RATIO	SAMPLE FAILURE MODE/ DEGREES *	UNCONFINED COMPRESSIVE STRENGTH	TRIAXIAL COMPRESSION		FAILURE STRAIN	TANGENT YOUNG'S MODULUS			POISSON'S RATIO	BRAZIL TENSILE STRENGTH	2ND CYCLE SLAKE DURABILITY INDEX	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX	COMMENTS
					LL	PI						CONFINING PRESSURE σ_3	DEVIATOR STRESS $\sigma_1-\sigma_3$		E50	UNLOAD/ RELOAD	σ_3						
	feet	percent	pcf				percent	percent	L/D	DEGREES *	psi	psi	psi	percent	(psi)x10E5	(psi)x10E5	psi		psi	percent		psi	
AUSTIN CHALK	55.3	11.5	123.7						2.4	D		50	1739	1.11	1.67		50						NOTE 1
AUSTIN CHALK	55.3														1.43			0.26 (2)					NOTES 2 and 3
AUSTIN CHALK	55.7	11.9																					
AUSTIN CHALK	55.9	11.5	126.6						2.4	B-1/20		100	2173	0.86	2.44		100						
AUSTIN CHALK	55.9														1.97			0.16 (2)					NOTE 2
AUSTIN CHALK	65.9	13.0	123.1					77.6															
AUSTIN CHALK	69.9	14.2	120.3																				
AUSTIN CHALK	70.3	13.6	121.4						2.4	E	2180			0.46			0						
AUSTIN CHALK	74.5	10.7	130.9																				FOSSILIFEROUS
AUSTIN CHALK	74.9	8.9	133.9						2.3	B-1/25	1282			0.77	2.00		0						FOSSILIFEROUS
AUSTIN CHALK	75.4								0.5										248				
AUSTIN CHALK	75.8	15.0	118.6																				
AUSTIN CHALK	80.9	11.5																					
AUSTIN CHALK	81.0	13.8							0.5										230				
AUSTIN CHALK	81.1	12.8	124.2						2.3	B-1/20	2697			0.64	4.93		0						
AUSTIN CHALK	81.5																			97.7			
AUSTIN CHALK	82.4	15.1																					
AUSTIN CHALK	82.6	14.9	118.8						2.5	B-1/30	2944			0.31	12.98		0						
AUSTIN CHALK	83.0																				0.517		
AUSTIN CHALK	84.4	13.8	122.2						2.4	D	2167			0.52	6.90		0						
AUSTIN CHALK	84.8	12.5	124.7																				
AUSTIN CHALK	87.2			2.69																			
AUSTIN CHALK	87.4	14.9	119.6																				
AUSTIN CHALK	87.5	13.2							0.5										224				
AUSTIN CHALK	87.7																			88.4			
AUSTIN CHALK	97.8	16.3	111.9																				
AUSTIN CHALK	98.0	14.4	115.7																				
AUSTIN CHALK	98.2	15.6	115.6																				
AUSTIN CHALK	98.6	15.0	116.9					86.2	2.4	D	1817			0.26	6.90		0						
AUSTIN CHALK	163.3	12.5	122.2					83.2	2.4	D	2290			0.80	3.81		0						
AUSTIN CHALK	232.2	13.4	117.9																				
AUSTIN CHALK	232.7	11.8	124.3																				
AUSTIN CHALK	233.1	11.0	126.7						2.3	D	2305			0.73	3.96		0						TRANSITION ZONE
AUSTIN CHALK	233.5								0.5										282				TRANSITION ZONE
EAGLE FORD SHALE	236.5	16.8	118.0		104	73	98.4																
EAGLE FORD SHALE	238.5	15.5	124.9																			23.9	
EAGLE FORD SHALE	238.7	17.4	119.5																			43.8	
EAGLE FORD SHALE	238.9	16.2	116.9		95	67	98.3	6.2	2.4	D	317			0.83	0.85	1.18	0						
EAGLE FORD SHALE	238.9														0.74	1.22		0.16 (1)					NOTES 2 and 4
EAGLE FORD SHALE	239.3	12.0	120.3																				
EAGLE FORD SHALE	239.6	16.5	117.4						2.0	D		100	441	0.69	1.20		100						
EAGLE FORD SHALE	239.6														1.14								NOTE 2
EAGLE FORD SHALE	240.1	16.6	116.3						2.4	B-1/40		300	497	0.51	1.27		300						
EAGLE FORD SHALE	240.1														1.58			0.15 (2)					NOTE 2
EAGLE FORD SHALE	240.5	16.6	117.7	2.75				5.2															
EAGLE FORD SHALE	241.5				85	57		5.1															
EAGLE FORD SHALE	254.8	15.2	119.0						2.3	B-1/30	358			0.82	0.69		0						
EAGLE FORD SHALE	255.2	16.0	118.2																				
EAGLE FORD SHALE	256.8	15.9	120.0		90	62	99.8																
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

B12APRT2.WK1
REVISION 2.0
DATE 07/17/90

* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

Symbol	Failure Type	Symbol	Failure Type
A	No discernible failure plane	B-4	Combination
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core	C	Barreling/Bulging
B-1	Shear plane	D	Longitudinal (axial) splitting
B-2	Bedding plane shear	E	Conical
B-3	Shear plane along pre-existing fracture, shear zone, etc.	F	No information

NOTES.

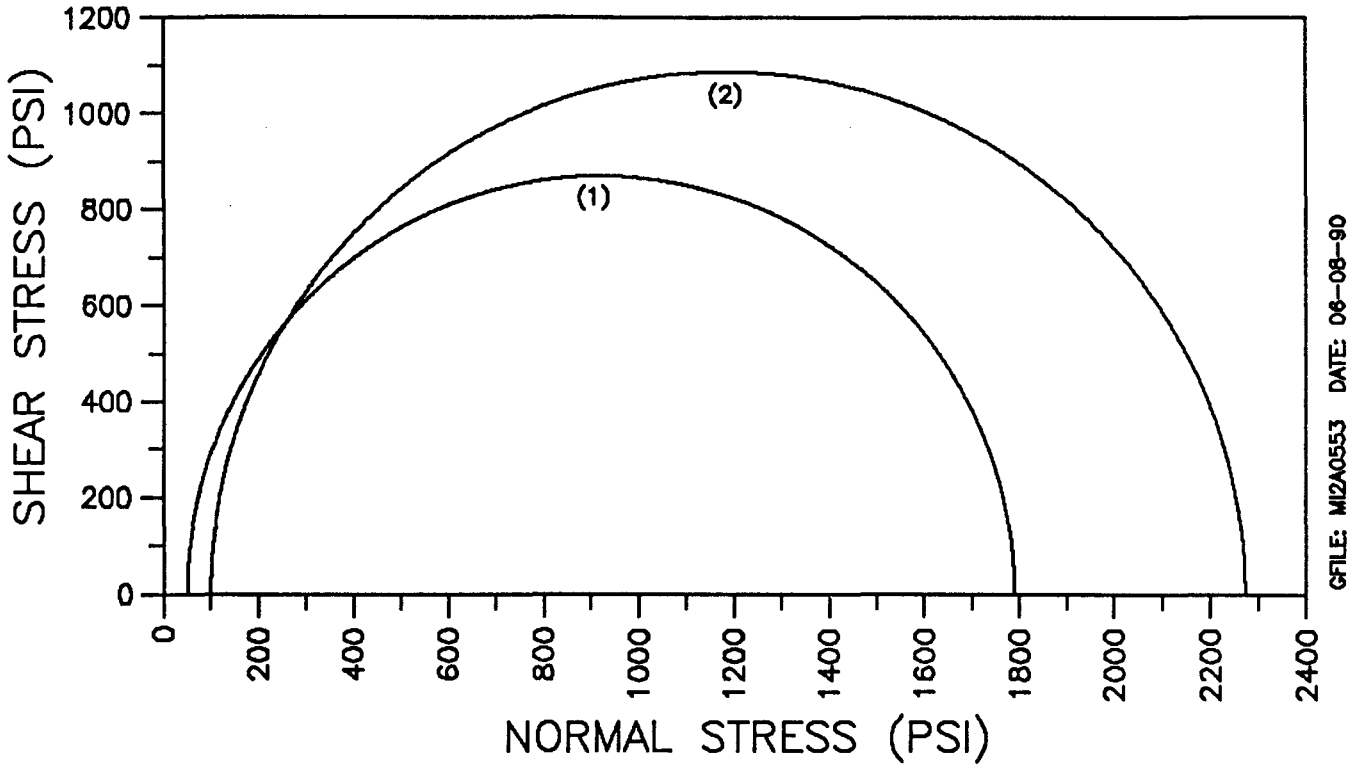
1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

2) Modulus and Poisson's ratio calculated from axial and lateral strains measured using LVDTs. Axial gage length is 2.8 inches.

3) For Poisson's ratio values: the value within parentheses indicates the number of LVDTs recording lateral strains. Otherwise all 3 LVDTs recorded strains.

4) Triaxial compression test is cyclic with one unload/reload cycle

BORING NO.: BI2A
DEPTH RANGE (FT): 55.3–56.3
AUSTIN CHALK LIMESTONE



GFILE: MI2A0553 DATE: 06-08-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 55.3
(2) DEPTH (FT): 55.9

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

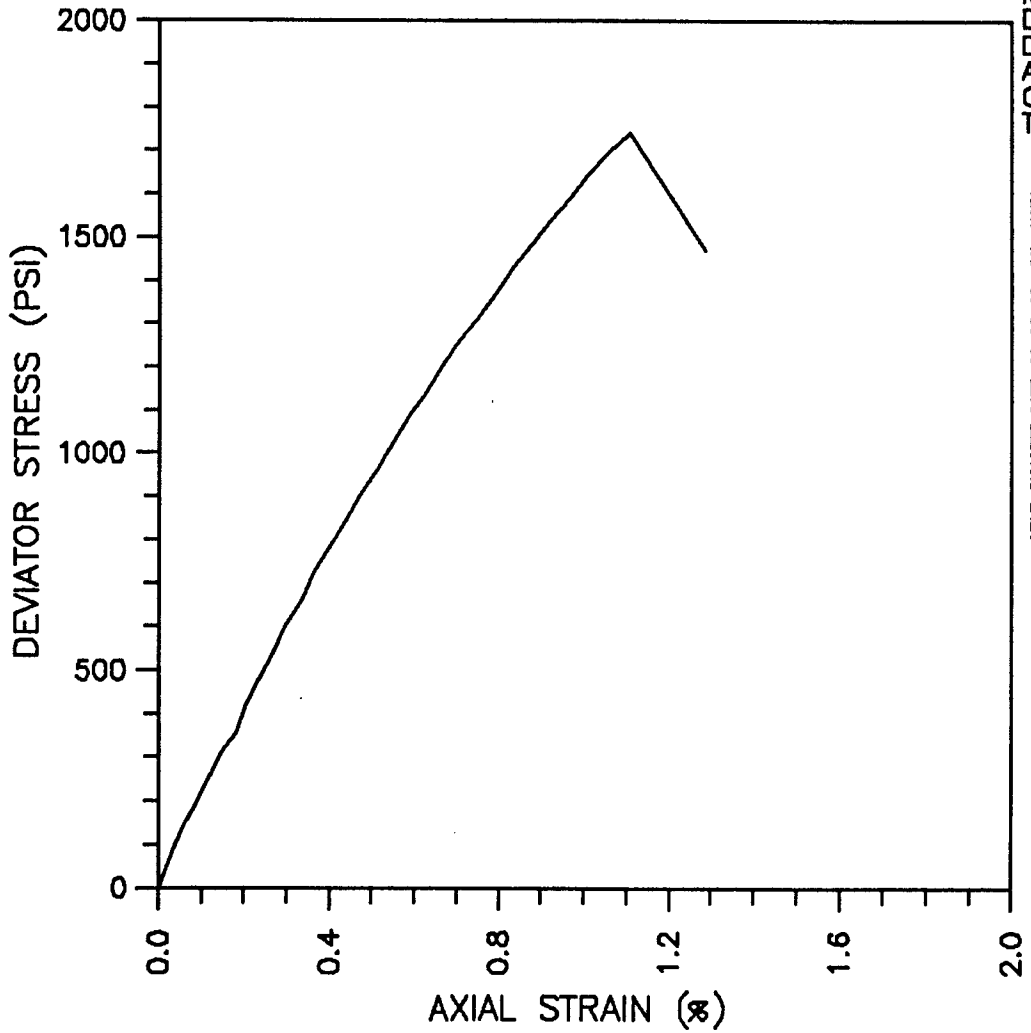
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI2A
DEPTH (FT): 55.3
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.5
DRY UNIT WEIGHT (PCF): 123.7
DEG. OF SATURATION (%): 85.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BI2A0553 DATE: 08-08-90 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.667 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

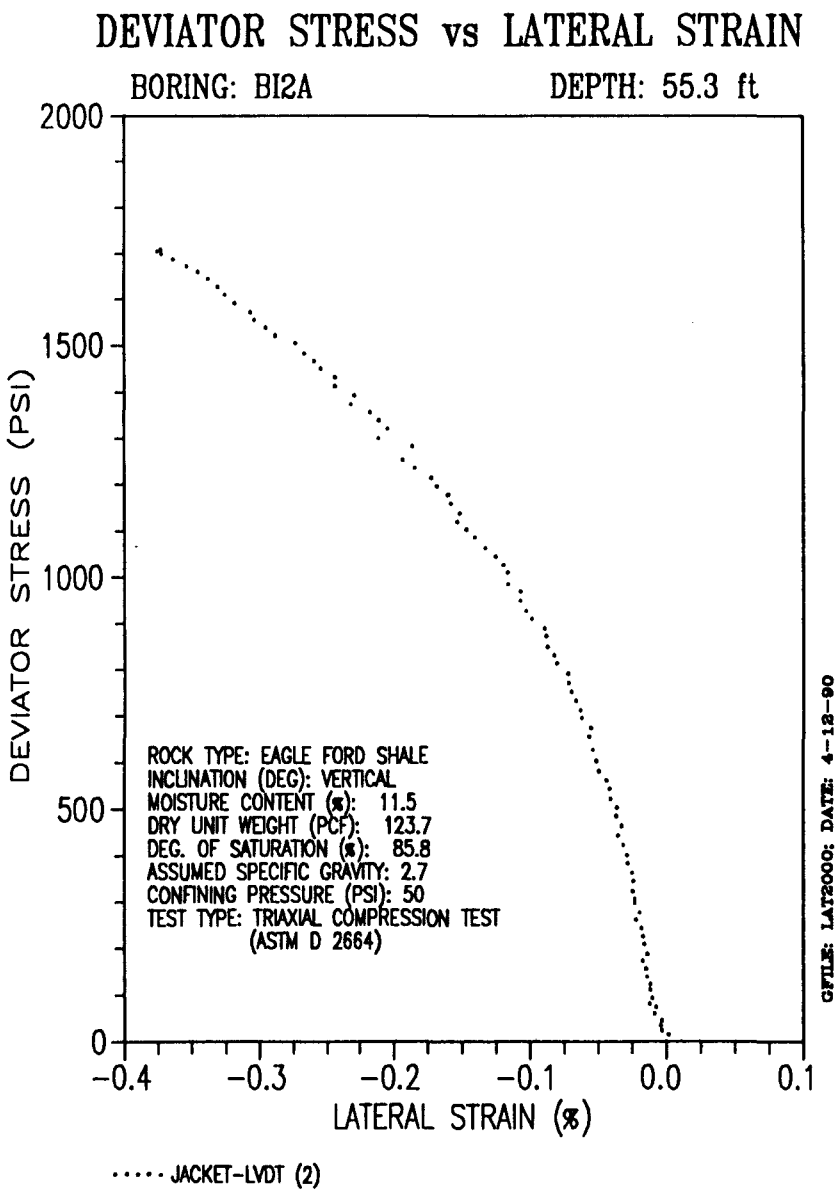
TEXAS SSC SITE

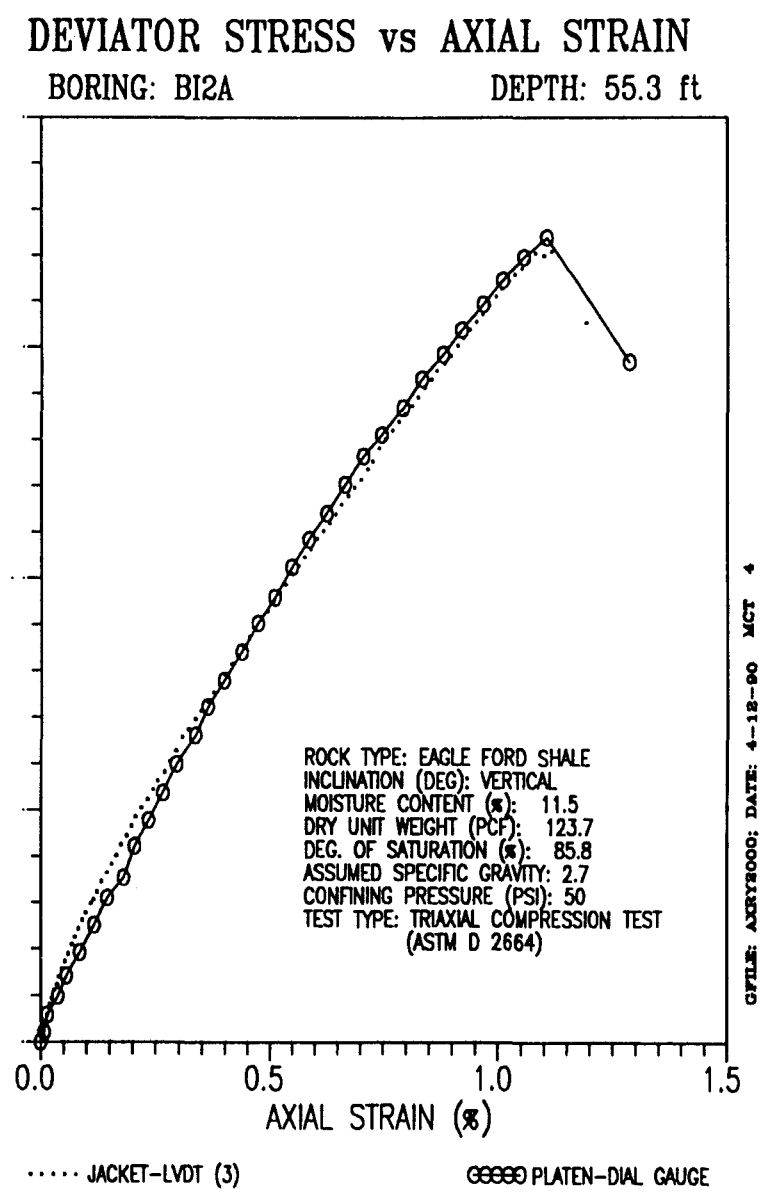
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

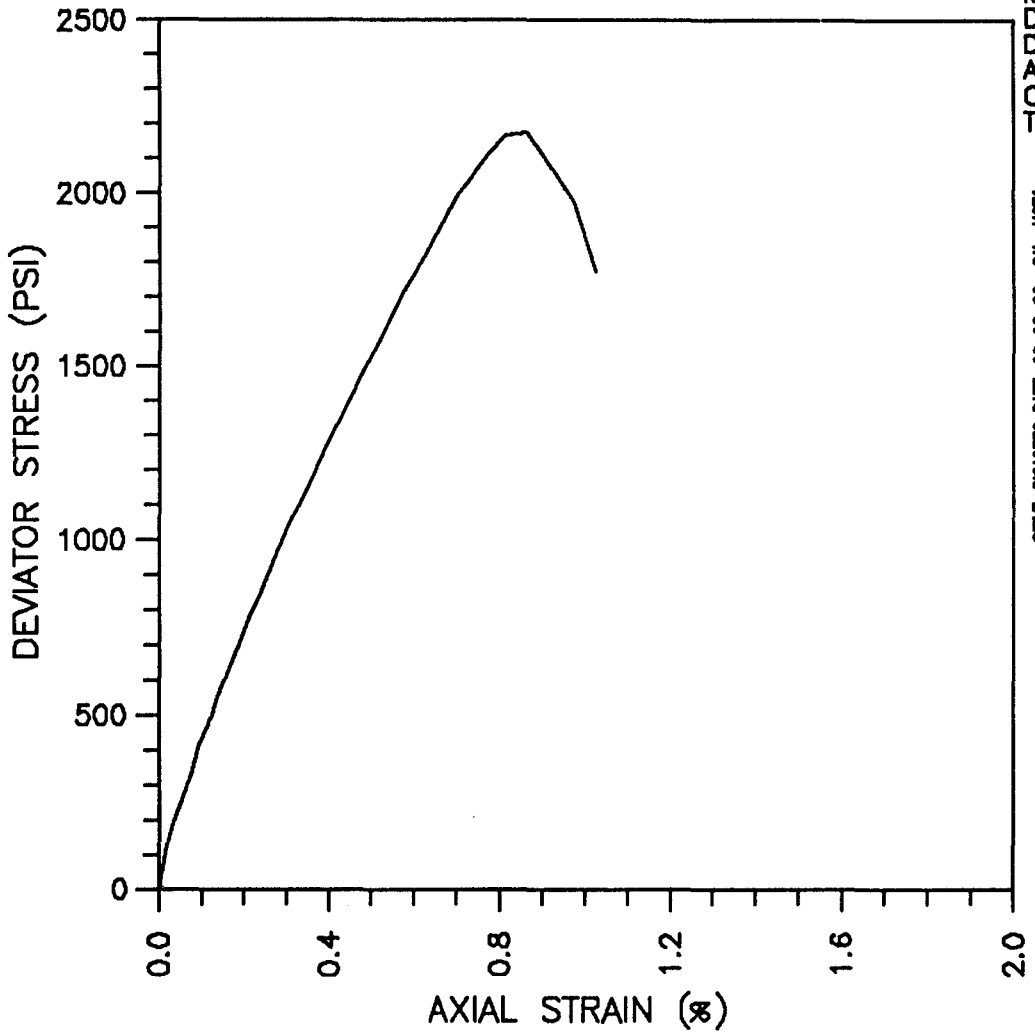
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI2A
DEPTH: 55.3 ft
DEVIATOR STRESS (PSI)
2000
1500
1000
500
0
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.5
DRY UNIT WEIGHT (PCF): 123.7
DEG. OF SATURATION (%): 85.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT2000; DATE: 4-12-90
JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI2A
DEPTH: 55.3 ft
0.0
0.5
1.0
1.5
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.5
DRY UNIT WEIGHT (PCF): 123.7
DEG. OF SATURATION (%): 85.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY2000; DATE: 4-12-90 MGT 4
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BI2A
DEPTH (FT): 55.9
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.5
DRY UNIT WEIGHT (PCF): 126.6
DEG. OF SATURATION (%): 93.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

TITLE: BI2A0559 DATE: 06-08-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.439 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 20 DEG.

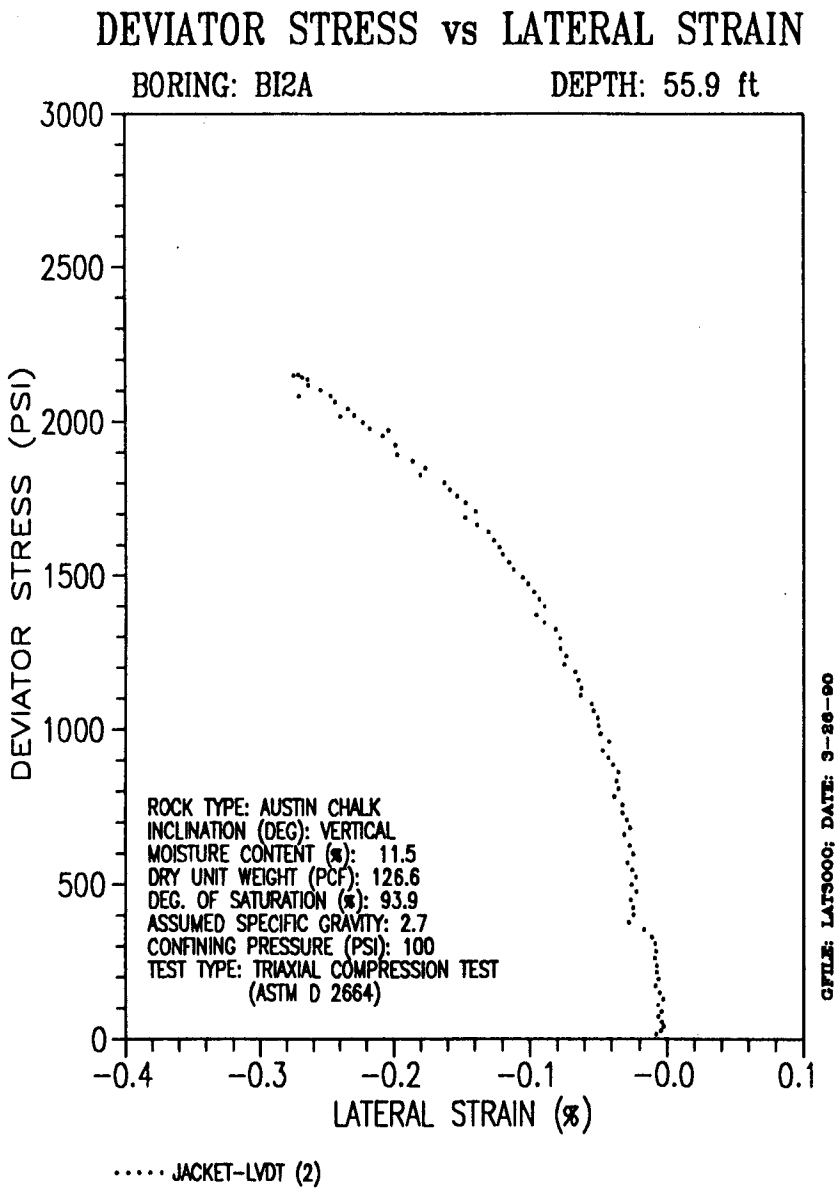
TEXAS SSC SITE

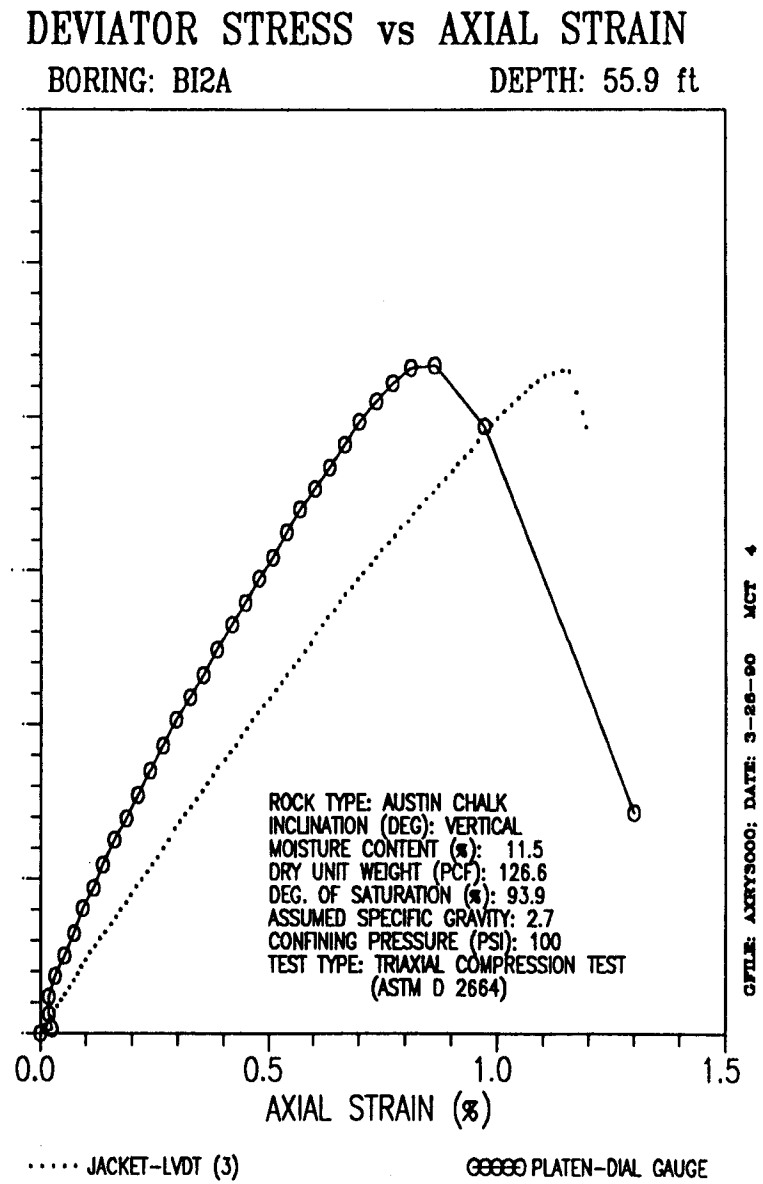
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

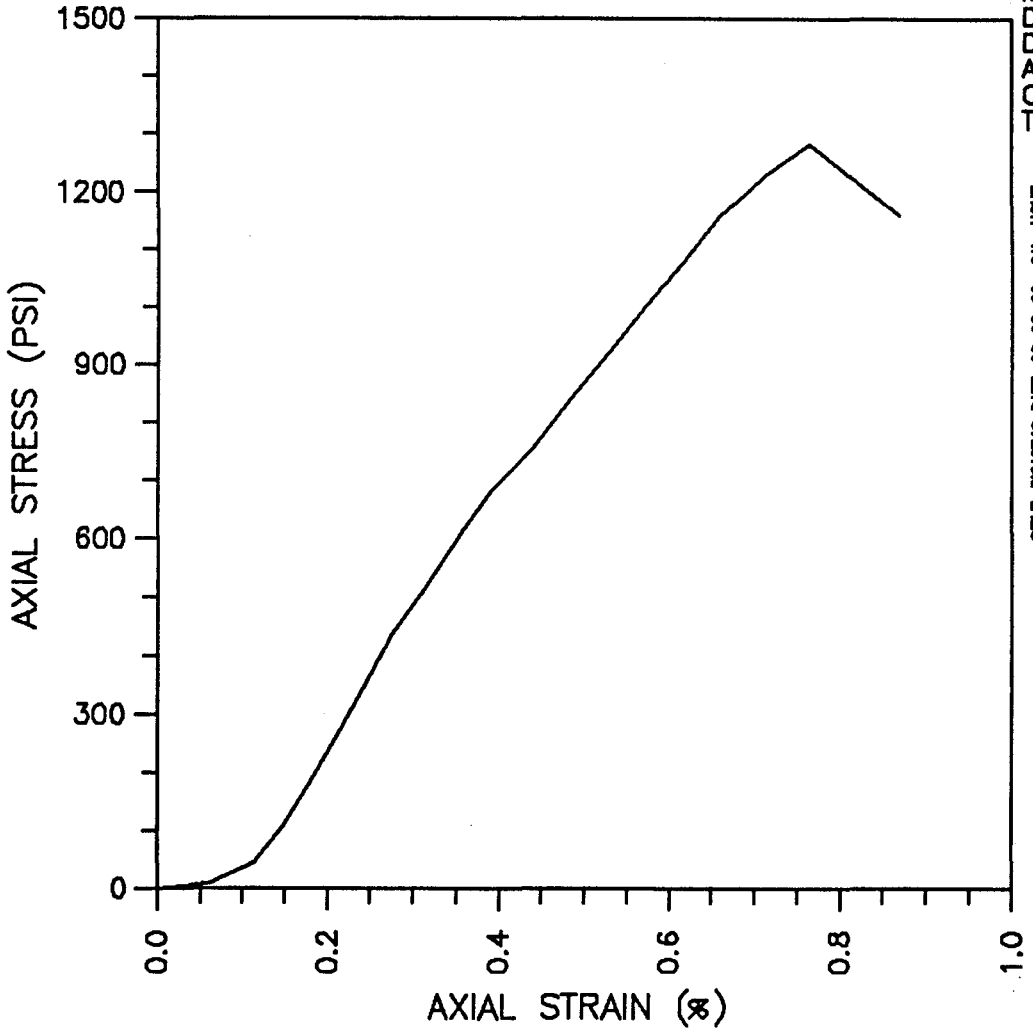
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI2A
DEPTH: 55.9 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.4
-0.3
-0.2
-0.1
-0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.5
DRY UNIT WEIGHT (PCF): 126.6
DEG. OF SATURATION (%): 93.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 3-26-90
JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI2A
DEPTH: 55.9 ft
0.0
0.5
1.0
1.5
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.5
DRY UNIT WEIGHT (PCF): 126.6
DEG. OF SATURATION (%): 93.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 3-26-90 MCT 4
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BI2A
DEPTH (FT): 74.9
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 8.9
DRY UNIT WEIGHT (PCF): 133.9
DEG. OF SATURATION (%): 93.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: BI2A0748 DATE: 06-08-90 CAL: MCUS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.000 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 25 DEG.

TEXAS SSC SITE

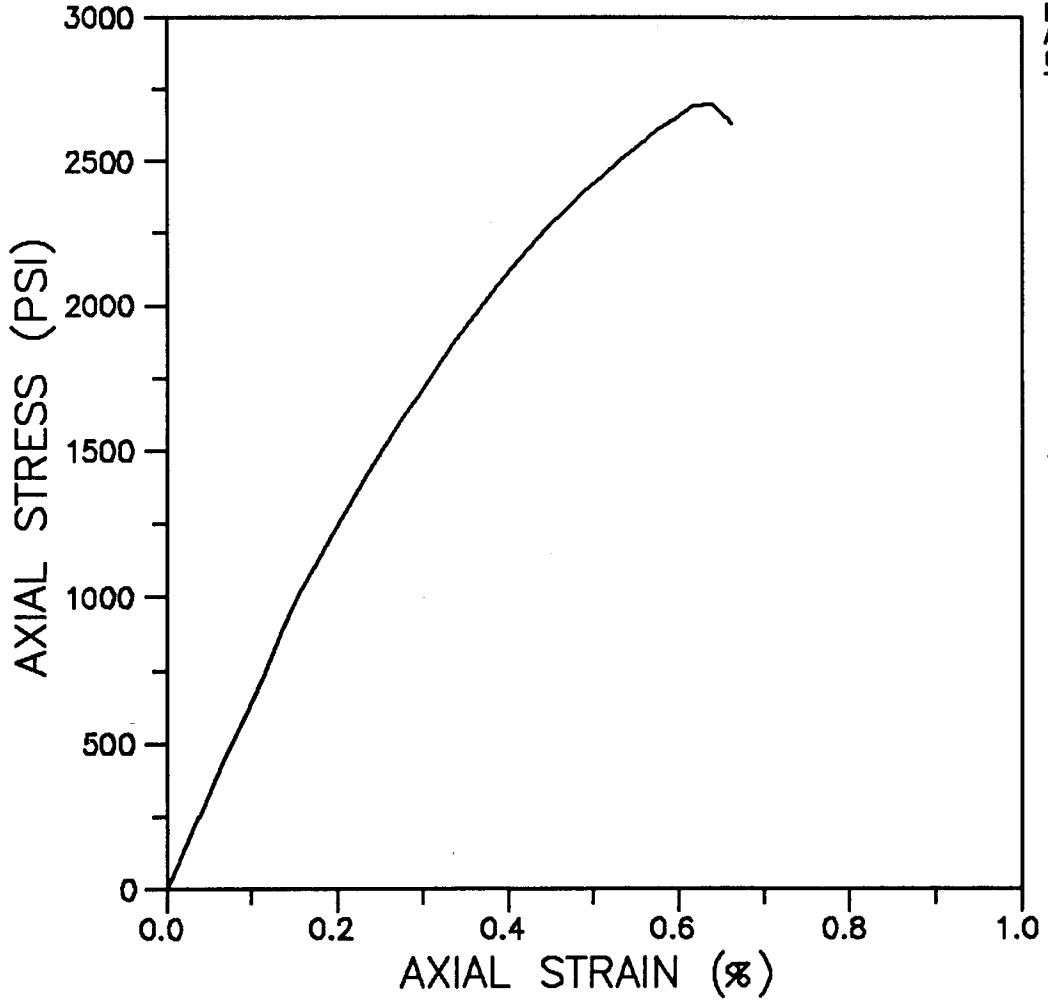
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO: BI2A
DEPTH (FT): 81.1
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.8
DRY UNIT WEIGHT (PCF): 124.2
DEG. OF SATURATION (%): 96.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.93 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 20 DEG

TEXAS SSC SITE

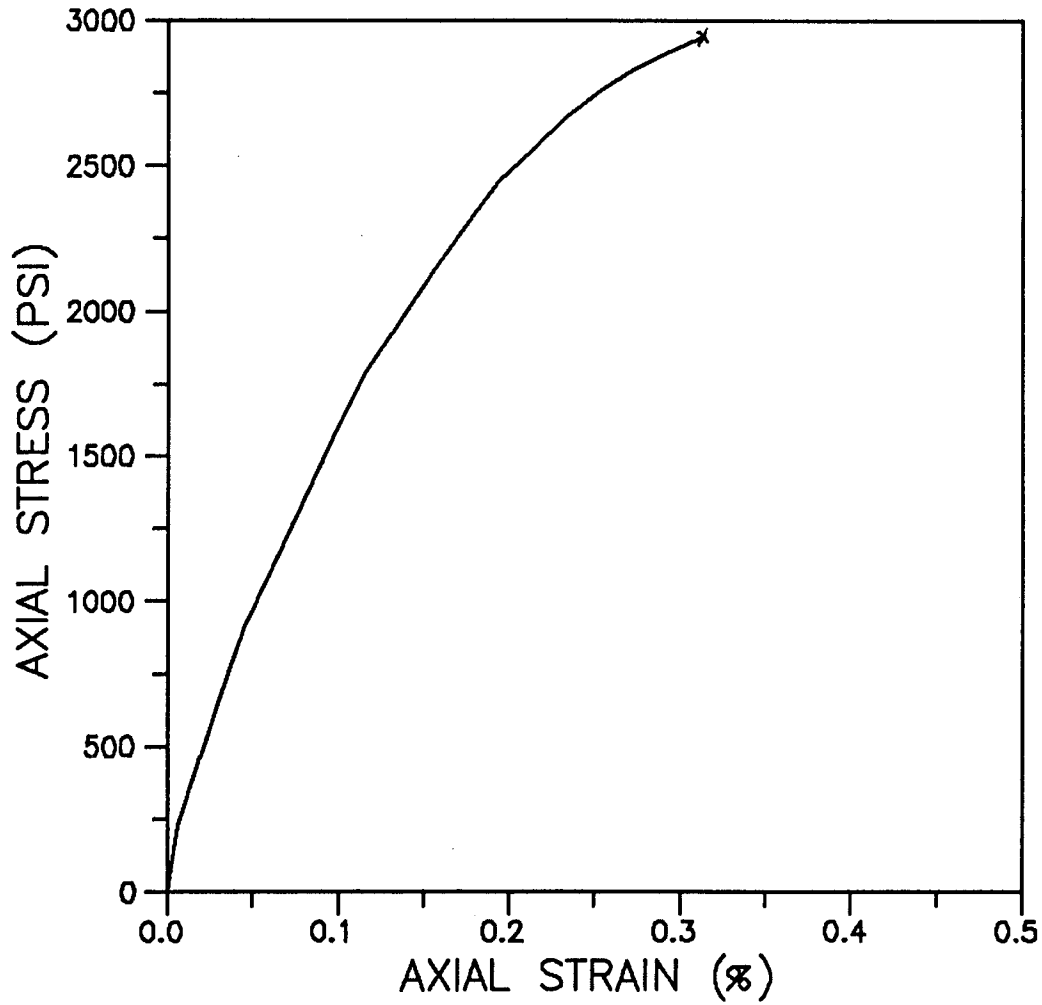
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI2A
DEPTH (FT): 82.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.9
DRY UNIT WEIGHT (PCF): 118.8
DEG. OF SATURATION (%): 96.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.30 x 10E6 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

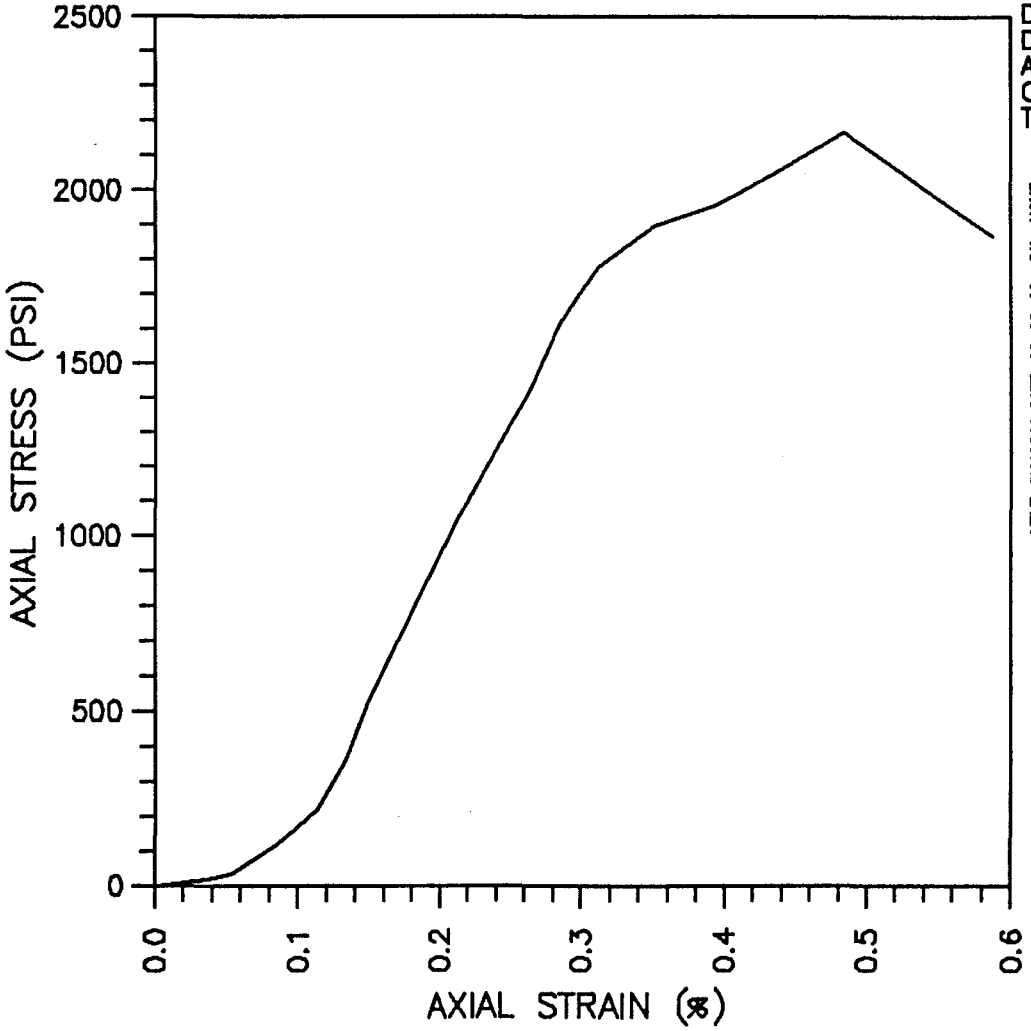
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: BI2A
DEPTH (FT): 84.4
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.8
DRY UNIT WEIGHT (PCF): 122.2
DEG. OF SATURATION (%): 98.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: BI2A0844 DATE: 06-06-90 CAL: MCLS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.897 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

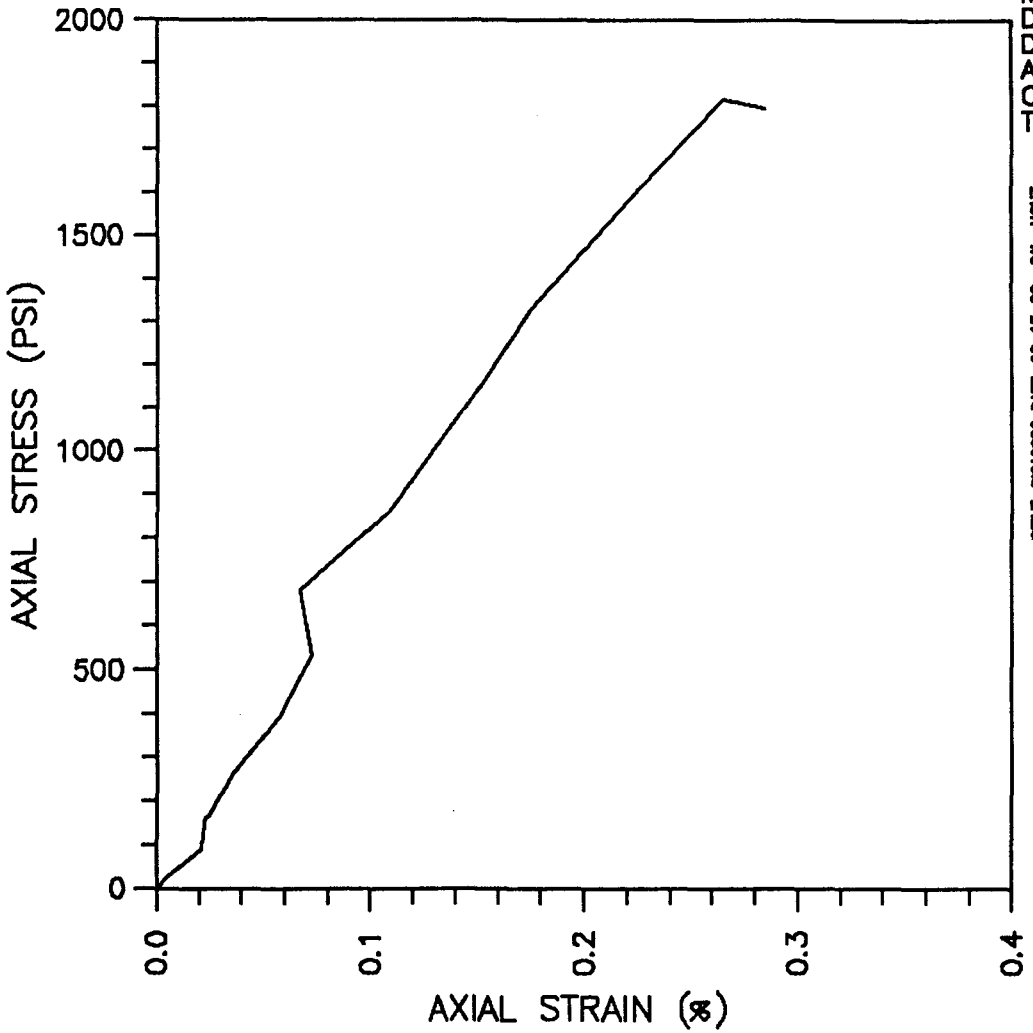
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI2A
DEPTH (FT): 98.6
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.0
DRY UNIT WEIGHT (PCF): 116.9
DEG. OF SATURATION (%): 91.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: BI2A0986 DATE: 06-15-90 CAL: MCUS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.897 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

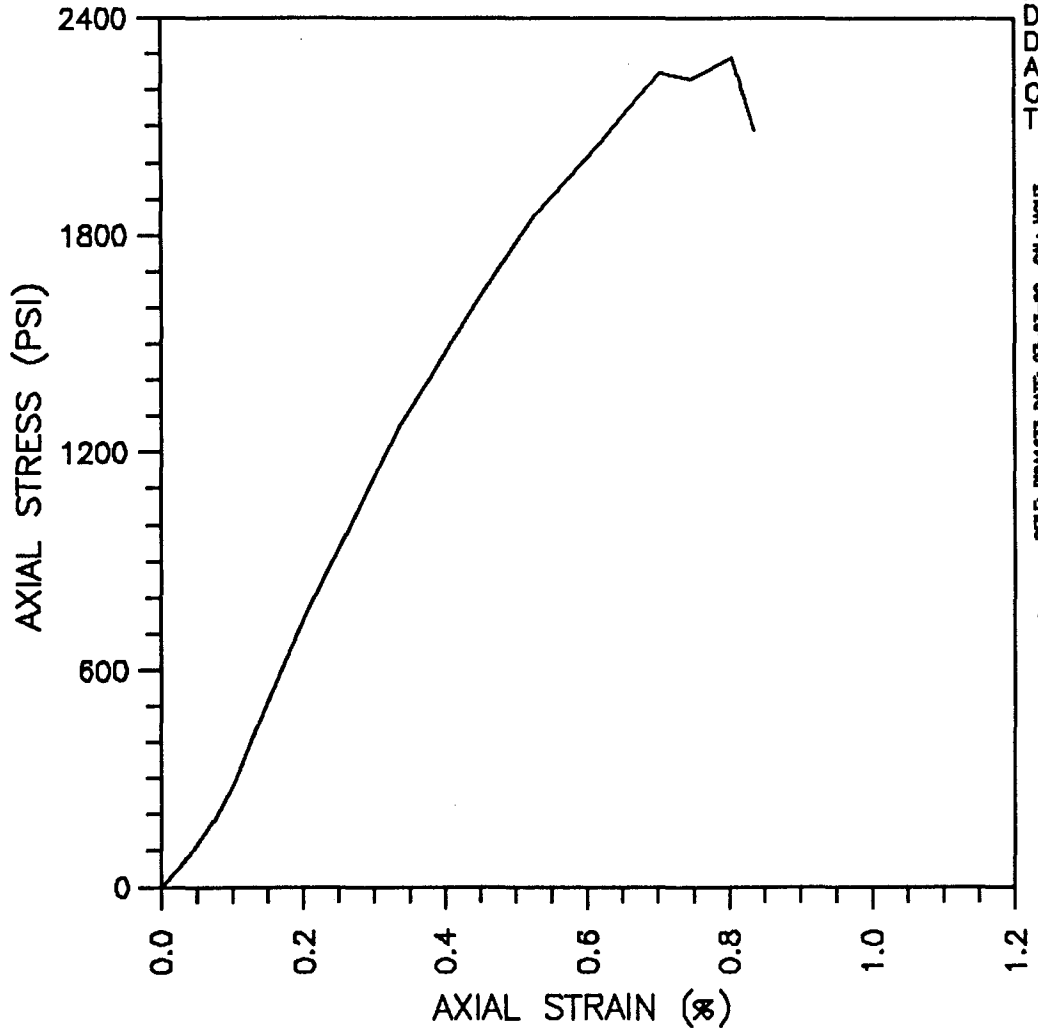
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI2A
DEPTH (FT): 163.3
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.5
DRY UNIT WEIGHT (PCF): 122.2
DEG. OF SATURATION (%): 88.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: BI2A1633 DATE: 07-23-90 CAL: MCUS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.810 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

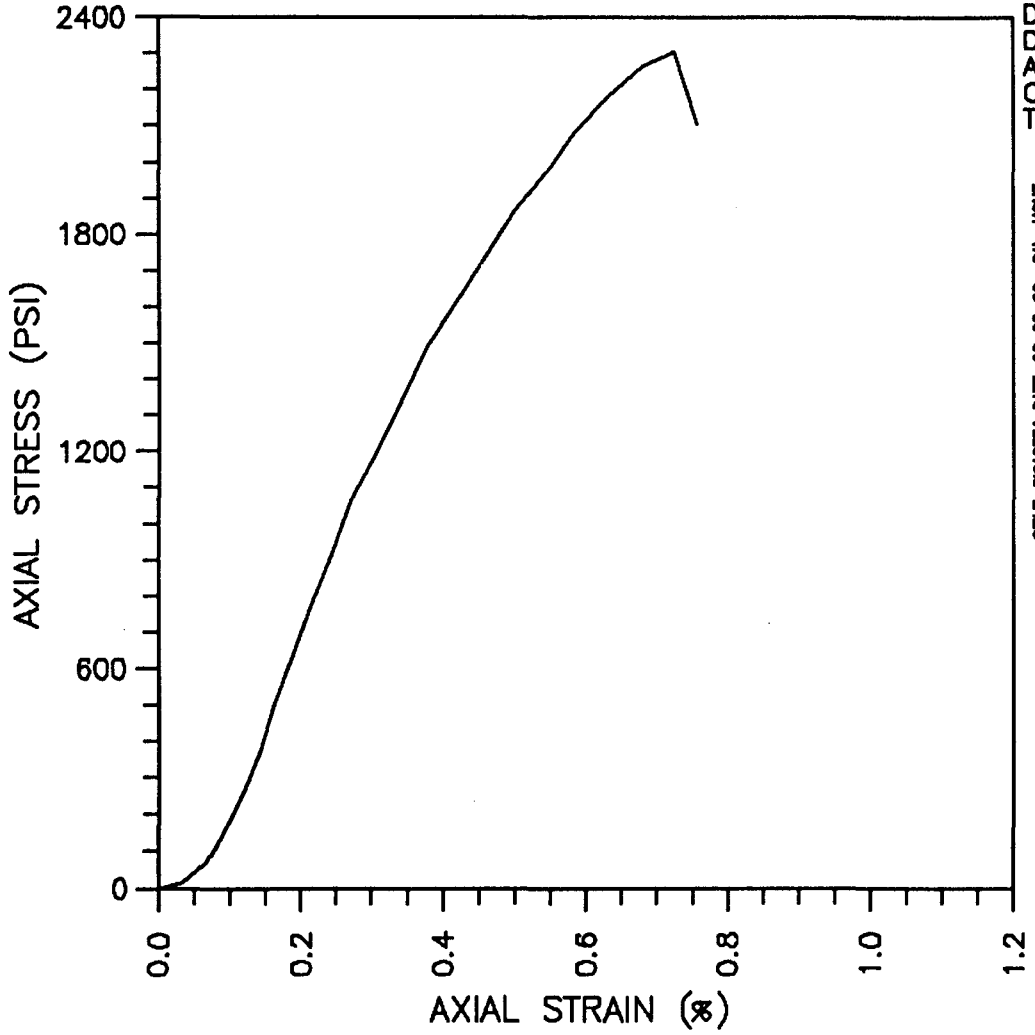
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI2A
DEPTH (FT): 233.1
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.0
DRY UNIT WEIGHT (PCF): 126.7
DEG. OF SATURATION (%): 90.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: BI2A2331 DATE: 08-08-90 CAL: MCLS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.960 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

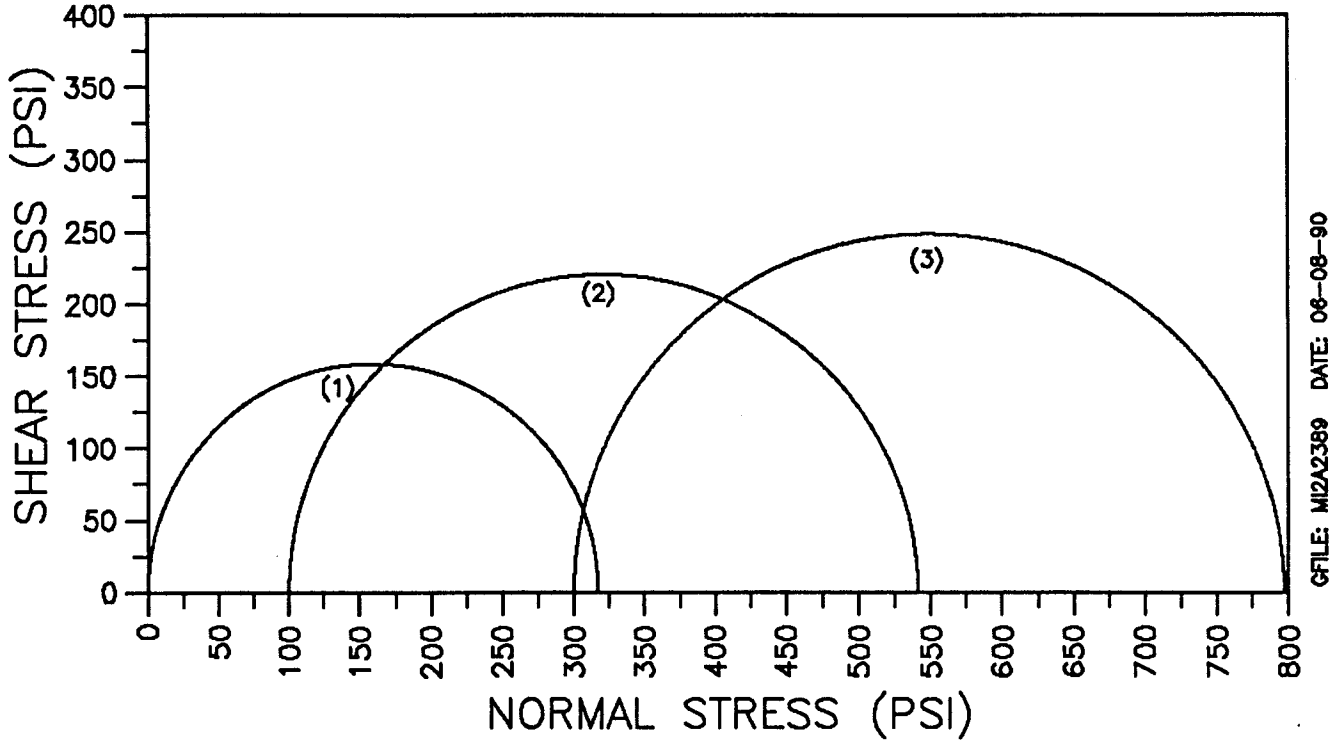
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI2A
DEPTH RANGE (FT): 238.9–240.5
EAGLE FORD SHALE



GFILE: MI2A2389 DATE: 06-08-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 238.9
(2) DEPTH (FT): 239.6
(3) DEPTH (FT): 240.1

INCLINATION (DEG): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

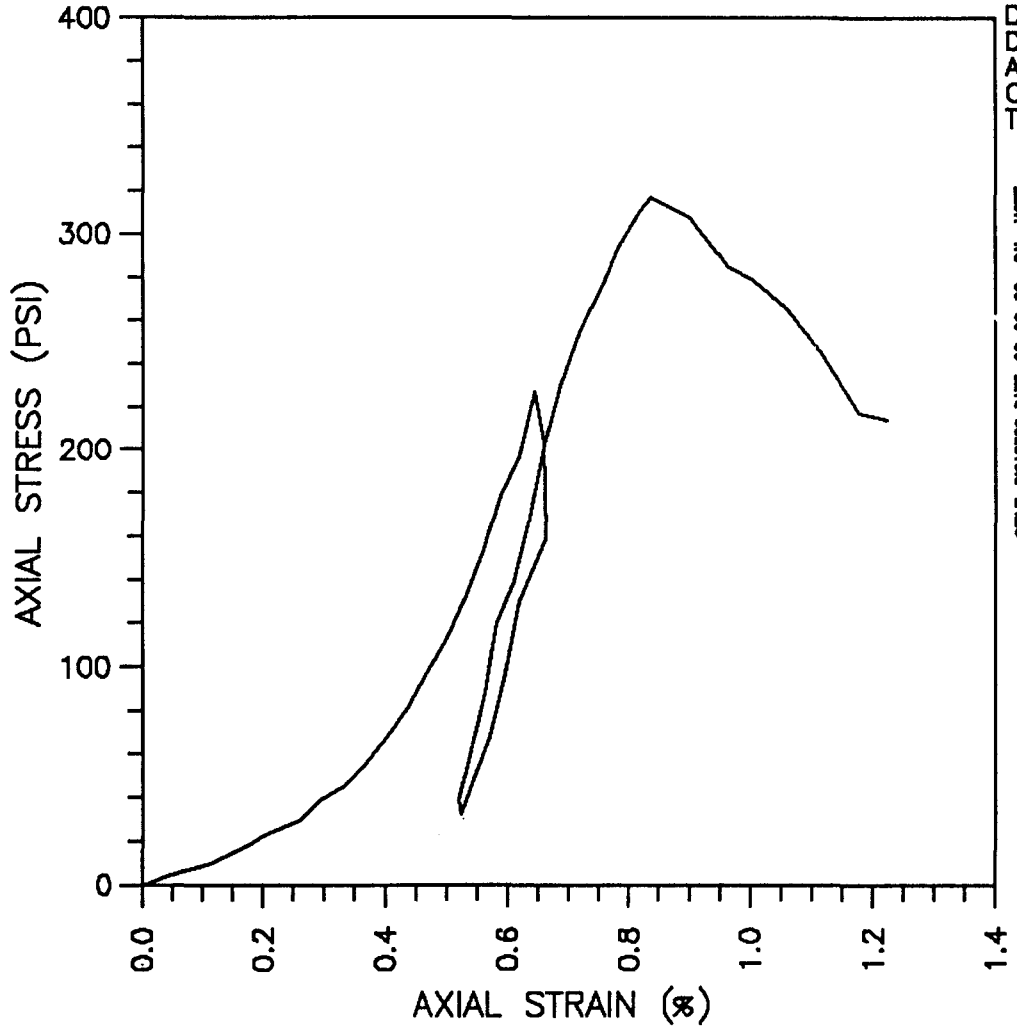
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI2A
DEPTH (FT): 238.9
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.2
DRY UNIT WEIGHT (PCF): 116.9
DEG. OF SATURATION (%): 98.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GTLE: BI2A2380 DATE: 08-08-90 CAL: MCT3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.845 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

STRESS-STRAIN PLOT

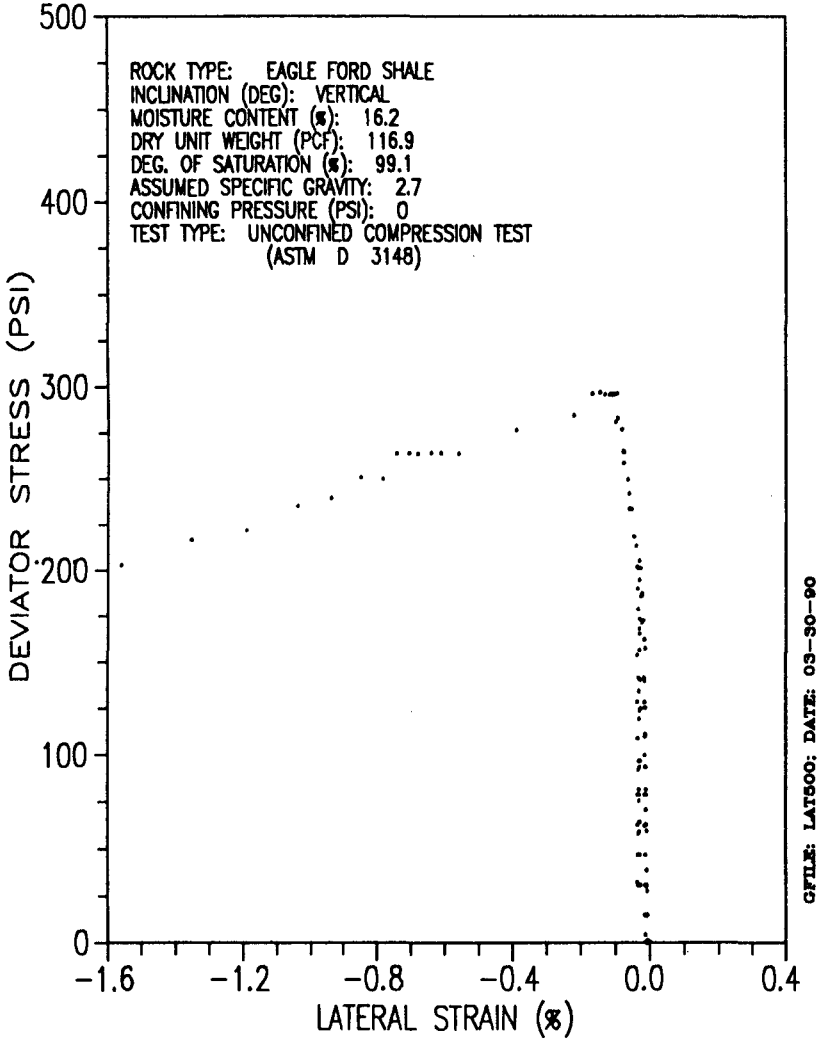
MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

DEVIATOR STRESS vs LATERAL STRAIN

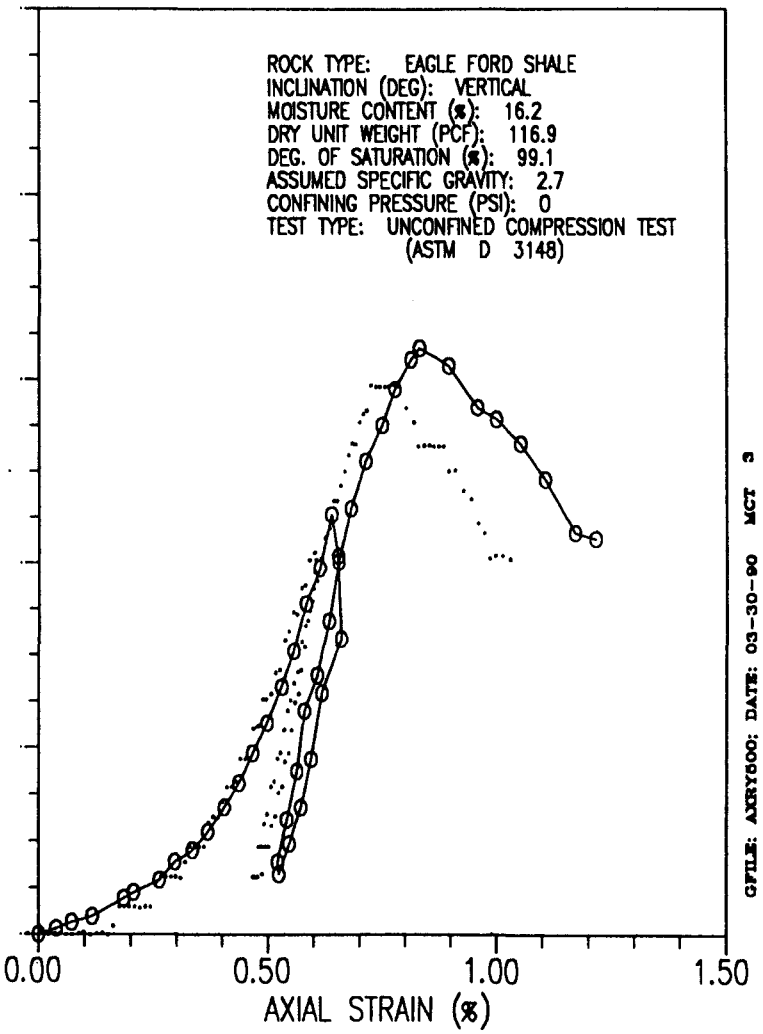
BORING: BI2A DEPTH: 238.9 ft



····· JACKET-LVDT (1)

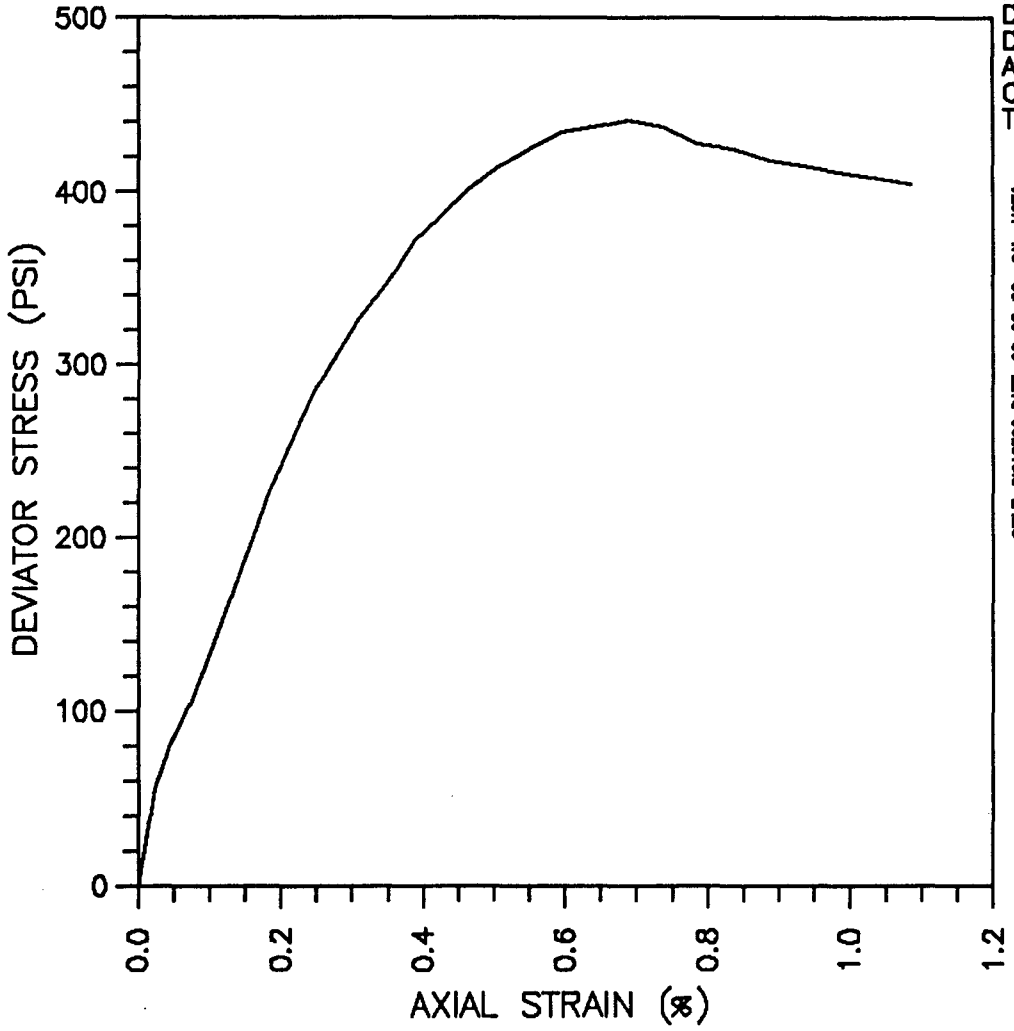
DEVIATOR STRESS vs AXIAL STRAIN

BORING: BI2A DEPTH: 238.9 ft



····· JACKET-LVDT (3) GGGGG PLATEN-DIAL GAUGE

BORING NO.: BI2A
DEPTH (FT): 239.6
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.5
DRY UNIT WEIGHT (PCF): 117.4
DEG. OF SATURATION (%): 102.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

CFILE: BI2A2396 DATE: 06-06-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.200 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

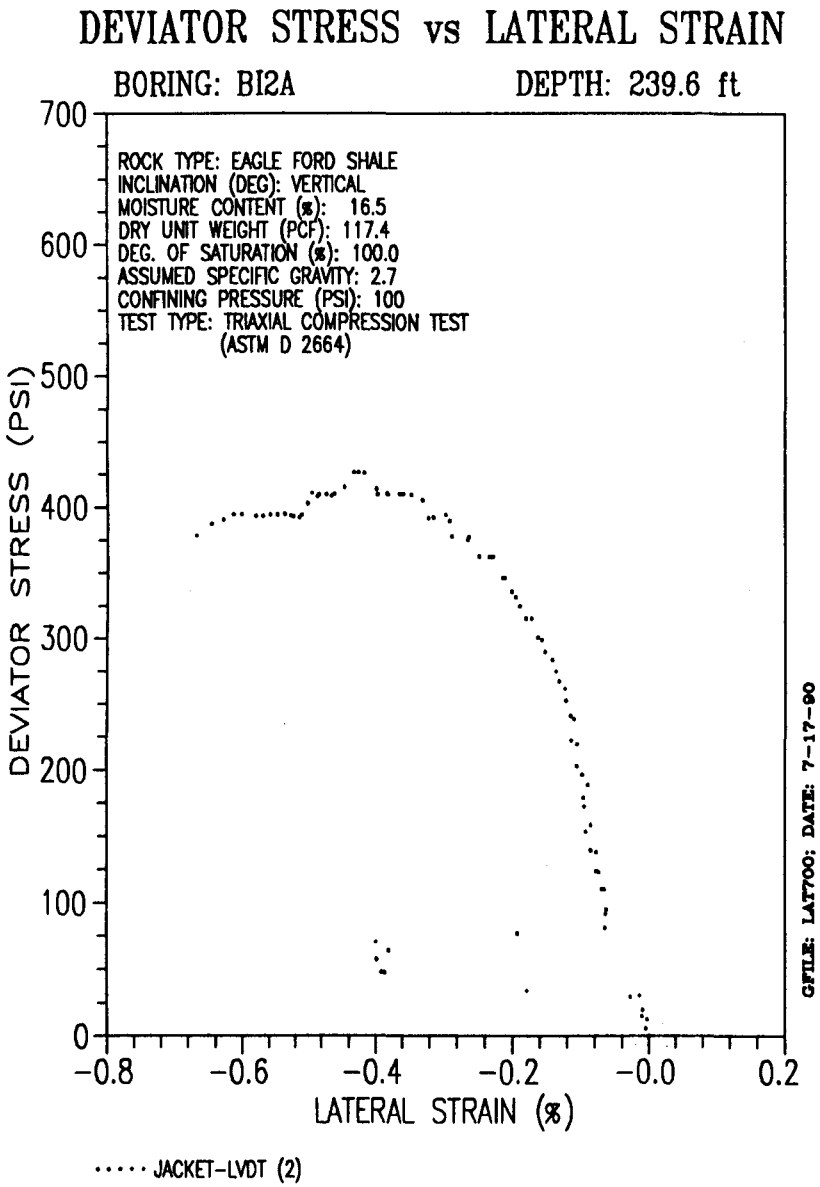
TEXAS SSC SITE

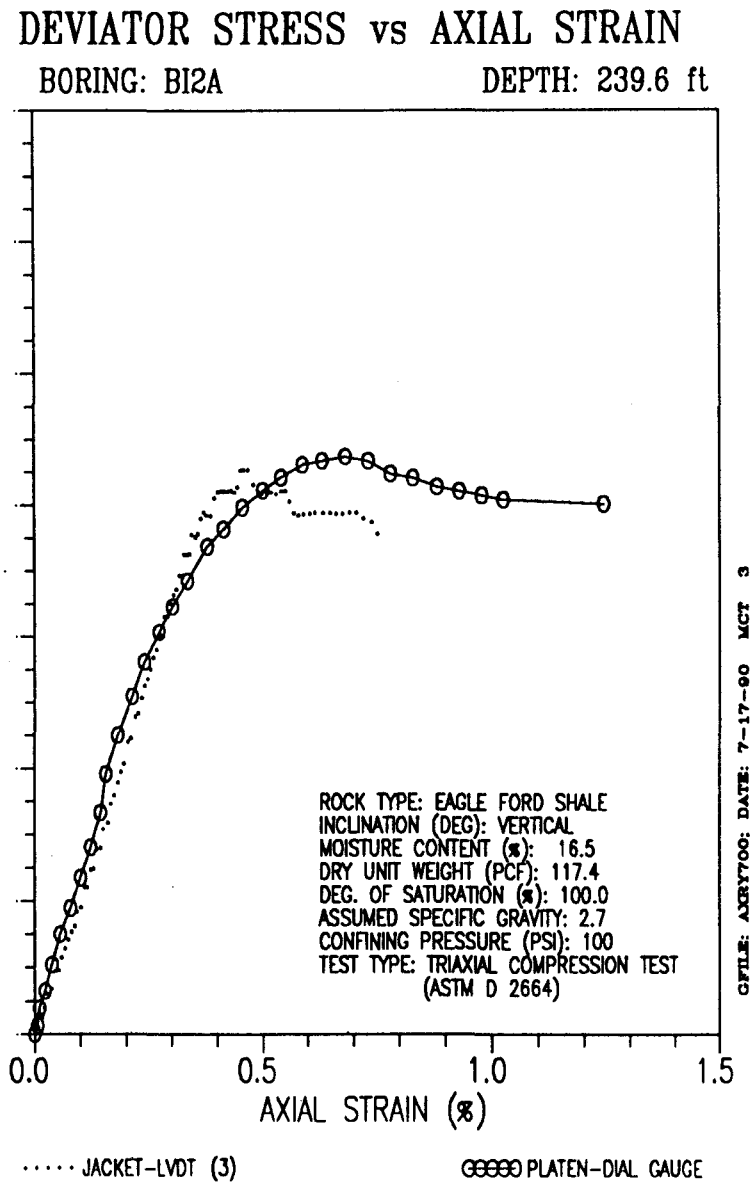
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

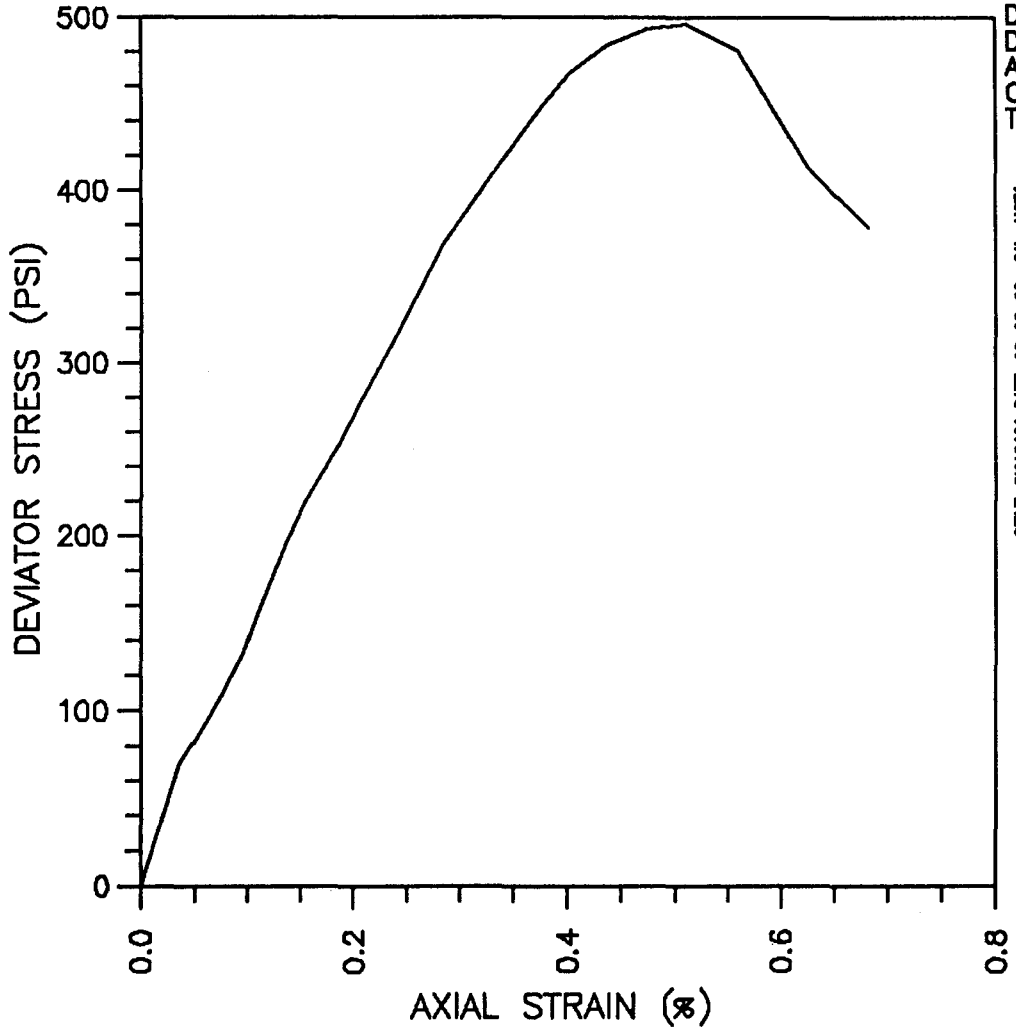
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI2A
DEPTH: 239.6 ft
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.5
DRY UNIT WEIGHT (PCF): 117.4
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
DEVIATOR STRESS (PSI)
700
600
500
400
300
200
100
0
-0.8
-0.6
-0.4
-0.2
-0.0
0.2
LATERAL STRAIN (%)
GFILE: LAT700; DATE: 7-17-90
JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI2A
DEPTH: 239.6 ft
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.5
DRY UNIT WEIGHT (PCF): 117.4
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
0.0
0.5
1.0
1.5
AXIAL STRAIN (%)
GFILE: AXY700; DATE: 7-17-90 MCT 3
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BI2A
DEPTH (FT): 240.1
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.6
DRY UNIT WEIGHT (PCF): 116.3
DEG. OF SATURATION (%): 99.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BI2A2401 DATE: 06-08-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.268x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 40 DEG.

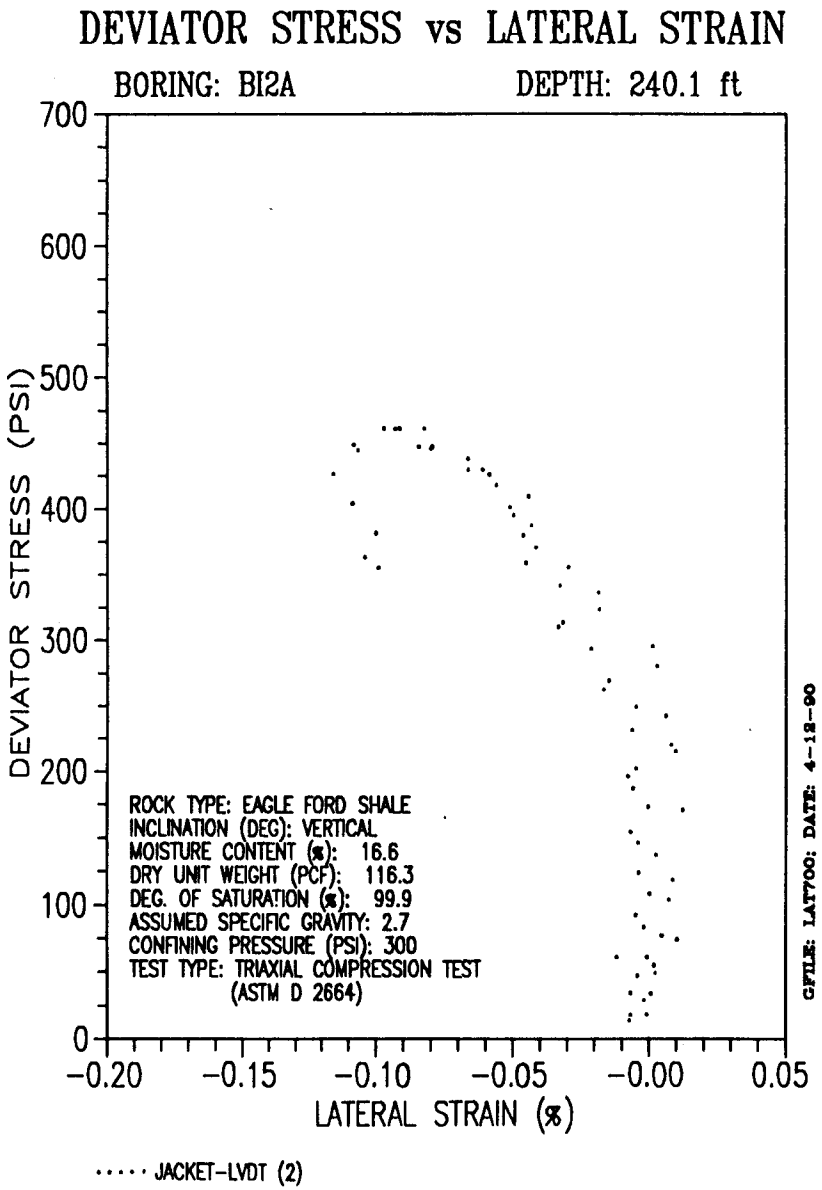
TEXAS SSC SITE

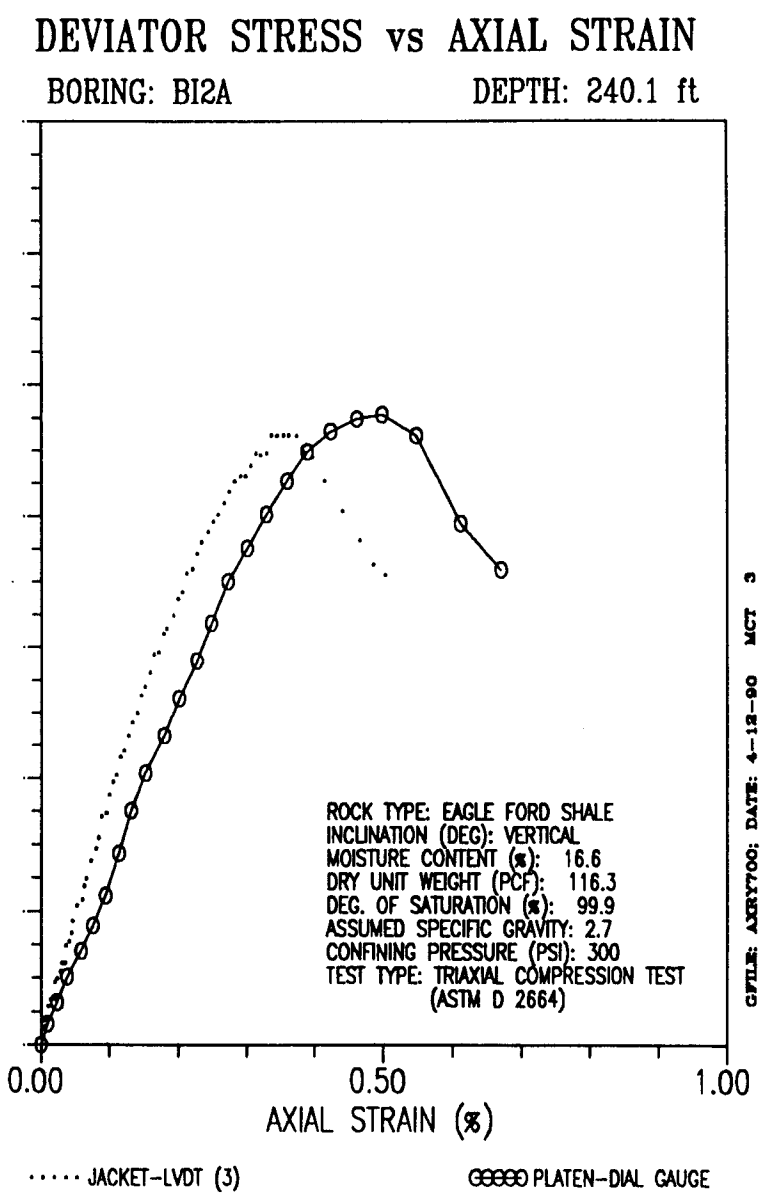
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

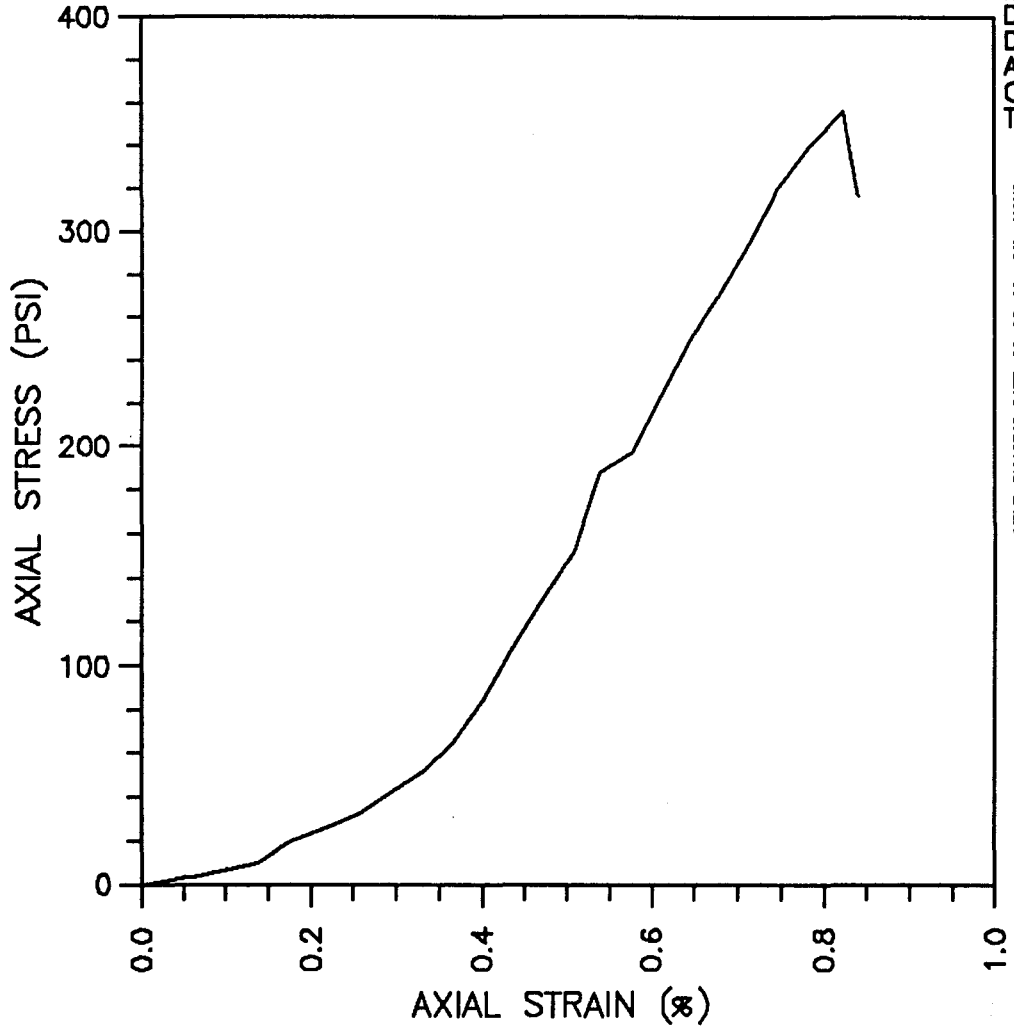
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI2A
DEPTH: 240.1 ft
DEVIATOR STRESS (PSI)
700
600
500
400
300
200
100
0
-0.20
-0.15
-0.10
-0.05
-0.00
0.05
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.6
DRY UNIT WEIGHT (PCF): 116.3
DEG. OF SATURATION (%): 99.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT700; DATE: 4-12-90
····· JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI2A
DEPTH: 240.1 ft
0.00
0.50
1.00
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.6
DRY UNIT WEIGHT (PCF): 116.3
DEG. OF SATURATION (%): 99.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXY700; DATE: 4-12-90 MCT 3
····· JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BI2A
DEPTH (FT): 254.8
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.2
DRY UNIT WEIGHT (PCF): 119.0
DEG. OF SATURATION (%): 98.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: BI2A2548 DATE: 06-08-90 CAL: MCU2

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.690x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 30 DEG.

TEXAS SSC SITE

STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

GEOMECHANICAL TEST RESULTS

BORING BI 3

TABLE E-4. GEOMECHANICAL TEST RESULTS - BORING BI 3

GENERAL LITHOLOGY	BORING DEPTH	MOISTURE CONTENT	DRY DENSITY	SPECIFIC GRAVITY	ATTERBERG LIMITS		FRACTION FINER THAN # 200 SIEVE	CARBONATE CONTENT	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES *	UNCONFINED COMPRESSIVE STRENGTH	TRIAXIAL COMPRESSION		FAILURE STRAIN	TANGENT YOUNG'S MODULUS			POISSON'S RATIO	BRAZIL TENSILE STRENGTH	2ND CYCLE SLAKE DURABILITY INDEX	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX	COMMENTS
					LL	PI						CONFINING PRESSURE	DEVIATOR STRESS		E50	UNLOAD/ RELOAD							
	feet	percent	pcf				percent	percent			psi	σ_3 psi	$\sigma_1-\sigma_3$ psi	percent	(psi)x10E5	(psi)x10E5	σ_3 psi		psi	percent		psi	
AUSTIN CHALK	94.0	16.4																					
AUSTIN CHALK	94.2	15.5	116.1						2.4	D	1121			0.49	2.80		0						NOTE 1
AUSTIN CHALK	94.8	18.5	110.5						2.2	E		100	1316	0.95	1.60	3.06	100						SHALY
AUSTIN CHALK	94.8														1.82	2.77		0.16					NOTES 2 and 3
AUSTIN CHALK	95.2	17.6	111.8						2.3	B-1/25		200	1407	0.99	1.91	3.69	200						SHALY
AUSTIN CHALK	95.2														1.45	2.50		0.17					NOTES 2 and 3
AUSTIN CHALK	122.6	21.0																					
AUSTIN CHALK	122.7	20.7	105.7						2.3	B-1/30	1408			0.65	2.70		0						
AUSTIN CHALK	123.0	19.8							0.5										161				
AUSTIN CHALK	127.4	15.7	112.7																				
AUSTIN CHALK	127.5	15.8							0.5										216				
AUSTIN CHALK	127.6																				0.502		
AUSTIN CHALK	132.0	14.4																					
AUSTIN CHALK	132.1	16.7	116.8						2.2	D	1576			0.94	2.29		0						
AUSTIN CHALK	143.1	15.7	114.3																				
AUSTIN CHALK	143.2	17.0																					
AUSTIN CHALK	143.3	18.5	115.4						2.1	B-1/45	1727			0.63	3.89		0						
AUSTIN CHALK	143.7																				0.272		
AUSTIN CHALK	147.6	18.4																					SHALY
AUSTIN CHALK	147.8	14.3	120.0						2.4	E	1526			0.83	2.55		0						
AUSTIN CHALK	219.6	14.2	118.7																				
AUSTIN CHALK	219.7	13.8							0.4										244				
AUSTIN CHALK	219.8																				0.282		
AUSTIN CHALK	256.0	9.5																					
AUSTIN CHALK	256.1	10.4	123.5						2.4	E	3491			0.61	6.69		0						
AUSTIN CHALK	260.0	10.5																					
AUSTIN CHALK	260.1	9.8	128.4						2.4	E	1999			0.89	2.57		0						
EAGLE FORD SHALE	261.4	15.6	118.4																				
EAGLE FORD SHALE	275.7	14.9																					
EAGLE FORD SHALE	276.2	14.1	122.3						2.2	B-1/45		100	640	0.58	1.40		100						
EAGLE FORD SHALE	276.2														1.53			0.24(2)					NOTES 3 and 4
EAGLE FORD SHALE	276.6	15.1	120.9																				
EAGLE FORD SHALE	276.7	12.1	127.2	2.73	69	48	98.4	9.4	2.1	B-1/45		300	673	0.61	1.41		300						
EAGLE FORD SHALE	276.7														1.37								NOTE 3
EAGLE FORD SHALE	277.1	14.5	122.2																				
EAGLE FORD SHALE	277.3	14.5	121.4						2.4	B-1/50	522			0.54	1.22		0						
EAGLE FORD SHALE	277.3														0.70			0.19					NOTE 3
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

Symbol	Failure Type	Symbol	Failure Type
A	No discernible failure plane	B-4	Combination
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core	C	Barreling/Bulging
B-1	Shear plane	D	Longitudinal (axial) splitting
B-2	Bedding plane shear	E	Conical
B-3	Shear plane along pre-existing fracture, shear zone, etc.	F	No information

NOTES:

1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

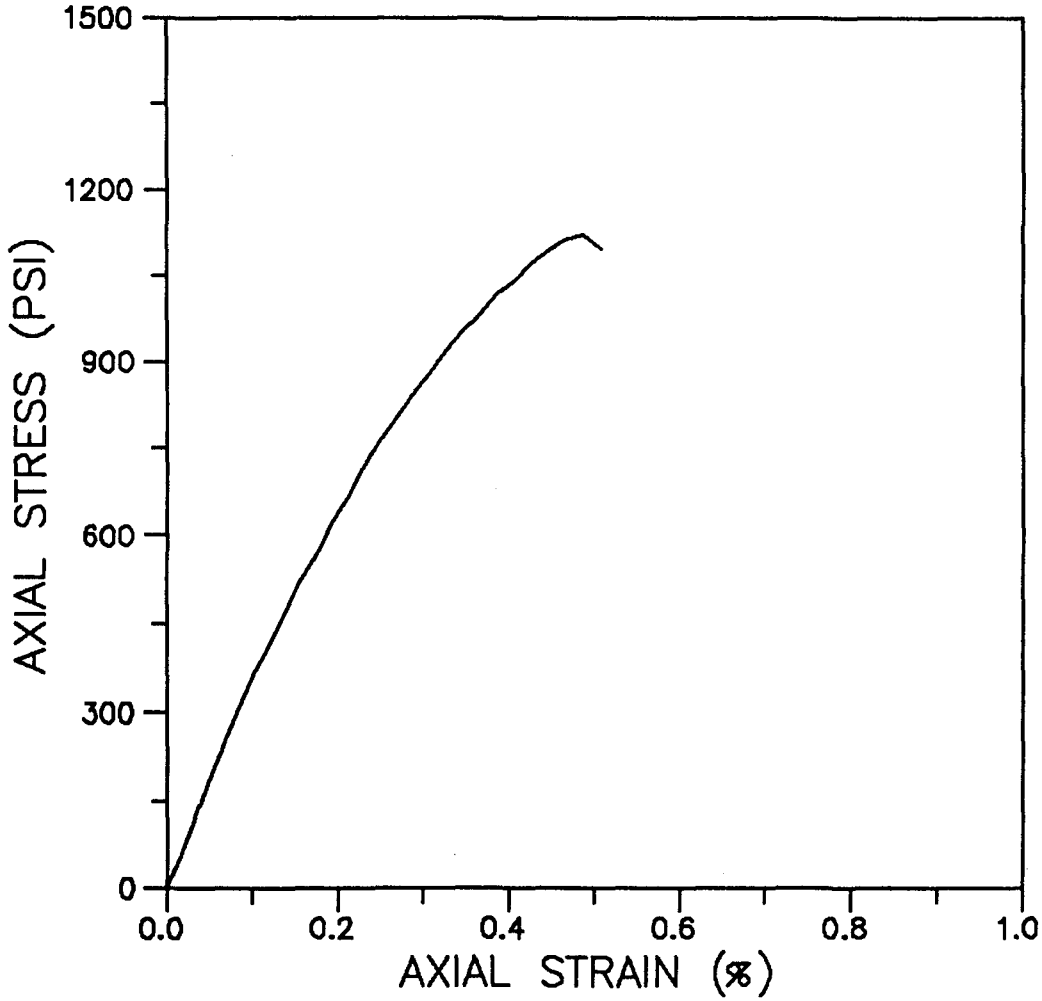
2) Triaxial compression test is cyclic with one unload/reload cycle.

3) Modulus and Poisson's ratio calculated from axial and lateral strains measured using LVDTs. Axial gage length is 2.8 inches.

4) For Poisson's ratio values, the value within parentheses indicates the number of LVDTs recording lateral strains. Otherwise all 3 LVDTs recorded strains.

513PRTOG.WK1
REVISION 2.0
DATE 07/17/90

BORING NO: BI3
DEPTH (FT): 94.2
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.5
DRY UNIT WEIGHT (PCF): 116.1
DEG. OF SATURATION (%): 92.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.80 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

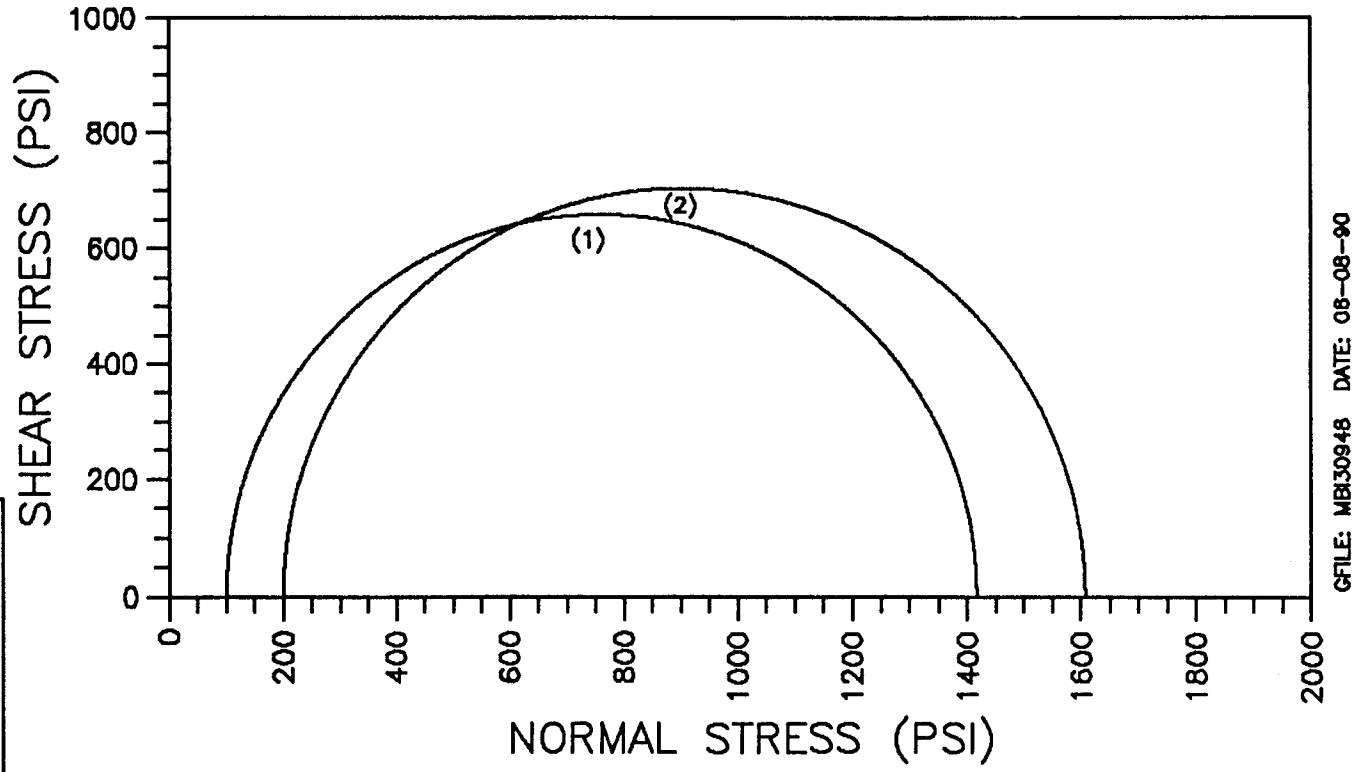
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: BI3
DEPTH RANGE (FT): 94.8–95.6
AUSTIN CHALK LIMESTONE



GFILE: MBI30948 DATE: 08-08-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 94.8
(2) DEPTH (FT): 95.2

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

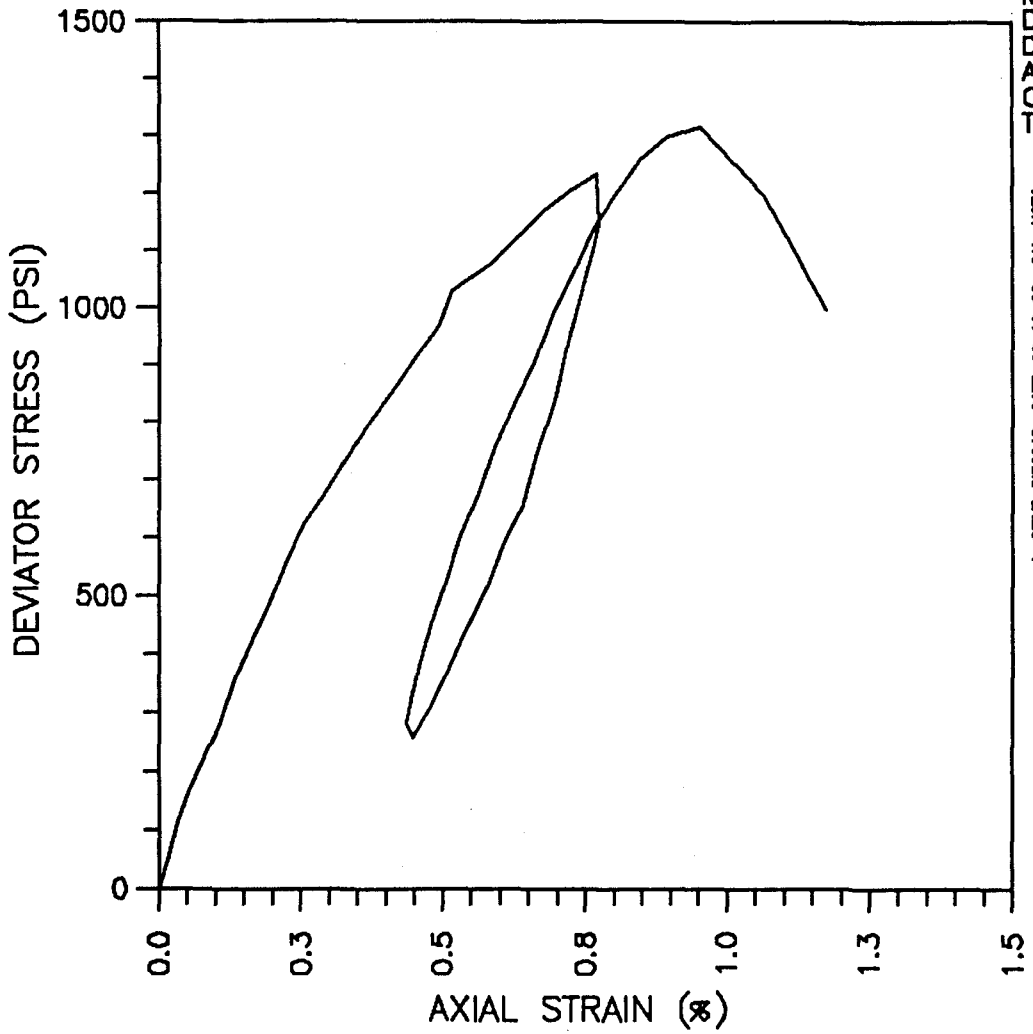
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI3
DEPTH (FT): 94.8
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 18.5
DRY UNIT WEIGHT (PCF): 110.5
DEG. OF SATURATION (%): 95.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

STILE: BI30848 DATE: 06-09-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.600 x10E5 PSI

FAILURE MODE:
CONICAL FAILURE EACH END

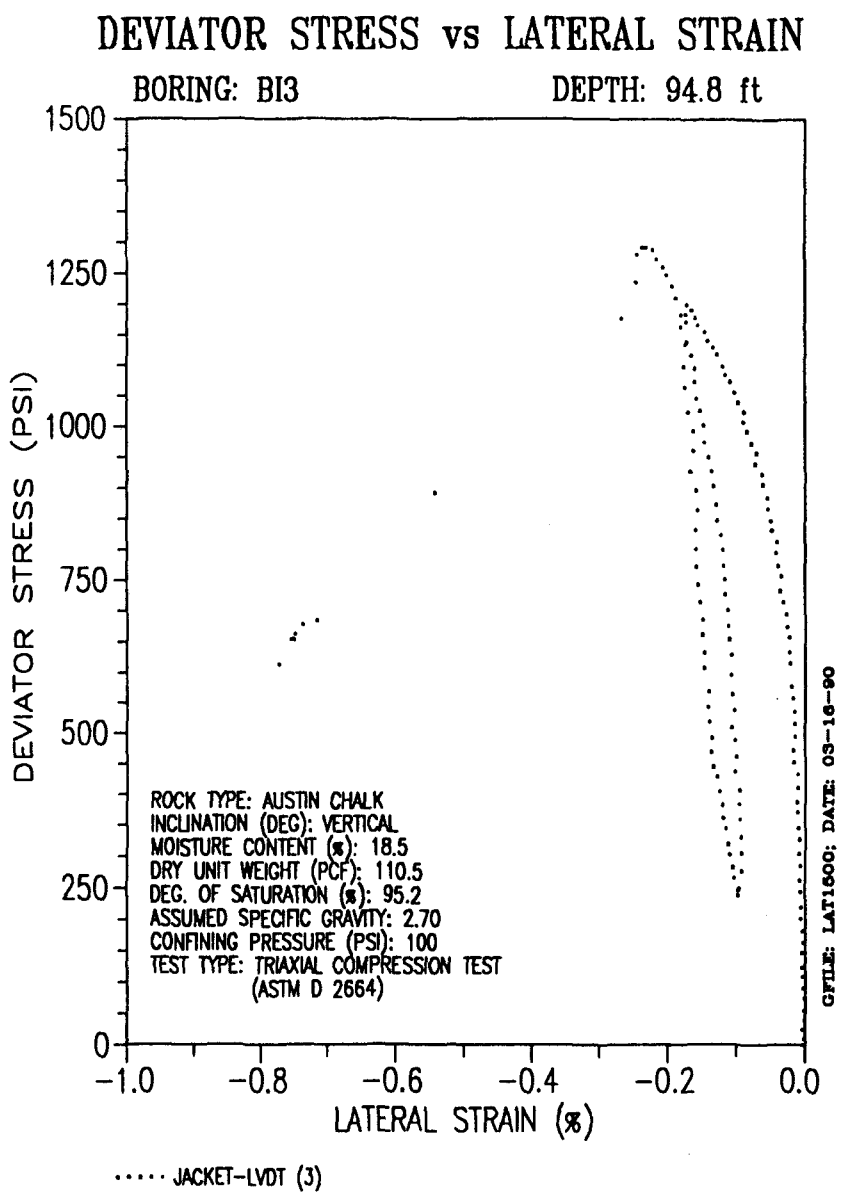
TEXAS. SSC SITE

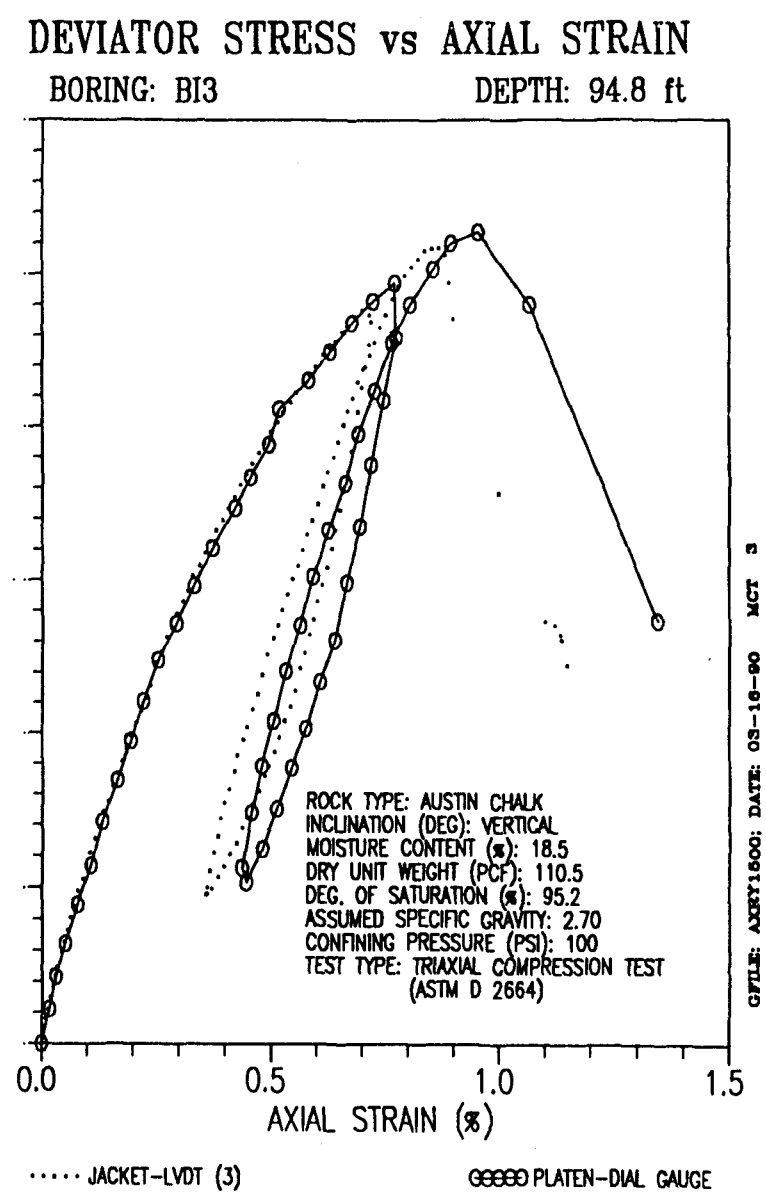
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

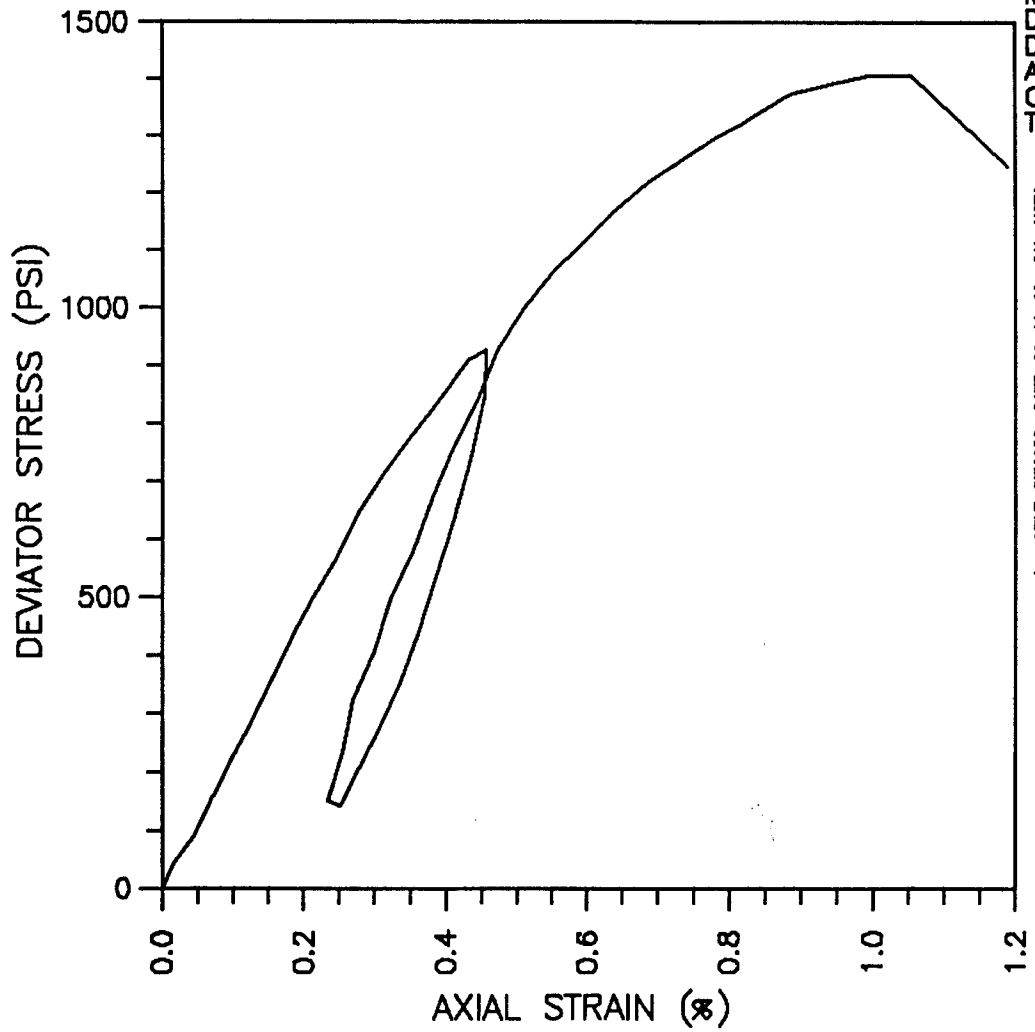
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI3
DEPTH: 94.8 ft
DEVIATOR STRESS (PSI)
1500
1250
1000
750
500
250
0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 18.5
DRY UNIT WEIGHT (PCF): 110.5
DEG. OF SATURATION (%): 95.2
ASSUMED SPECIFIC GRAVITY: 2.70
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT1500; DATE: 03-16-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI3
DEPTH: 94.8 ft
0.0
0.5
1.0
1.5
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 18.5
DRY UNIT WEIGHT (PCF): 110.5
DEG. OF SATURATION (%): 95.2
ASSUMED SPECIFIC GRAVITY: 2.70
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY1500; DATE: 03-16-90 MCT 3
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BI3
DEPTH (FT): 95.2
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.6
DRY UNIT WEIGHT (PCF): 111.8
DEG. OF SATURATION (%): 93.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

DATE: 08-09-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.905 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 25 DEG.
CONICAL AT BOTTOM

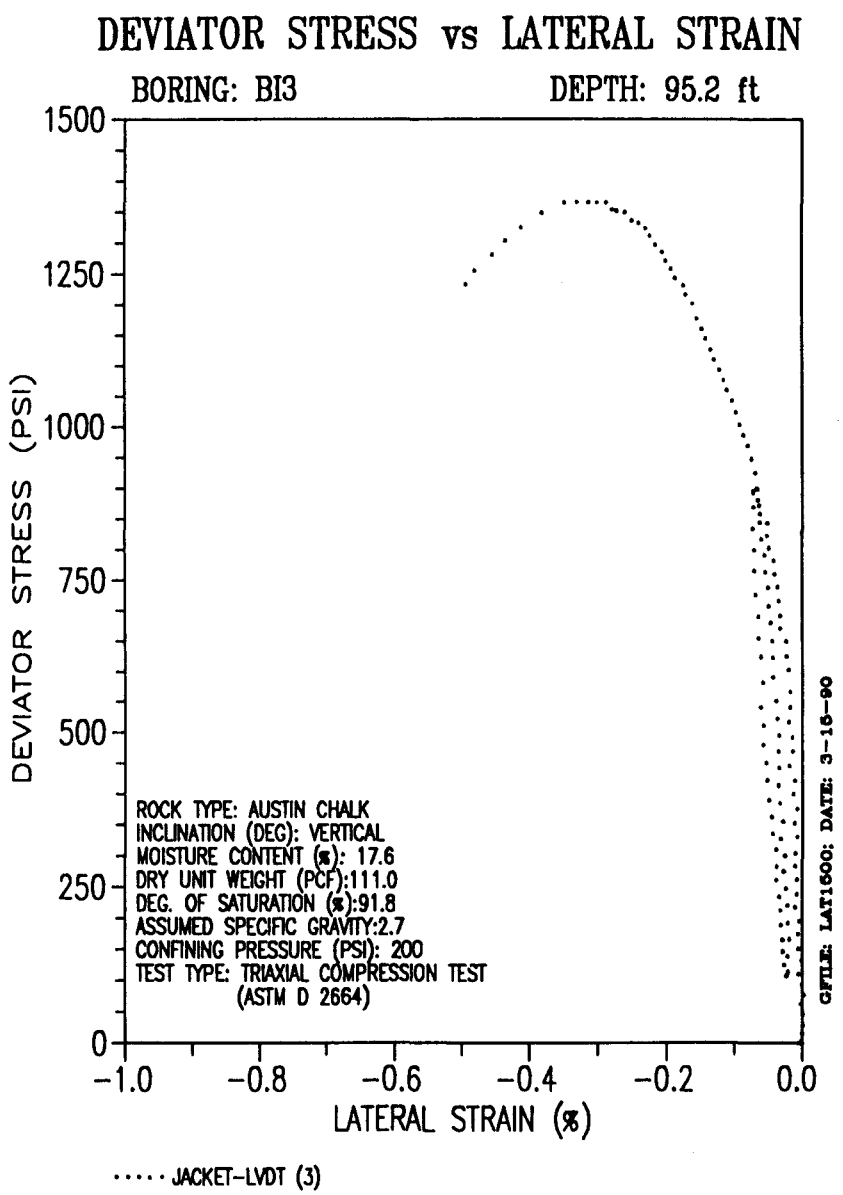
TEXAS SSC SITE

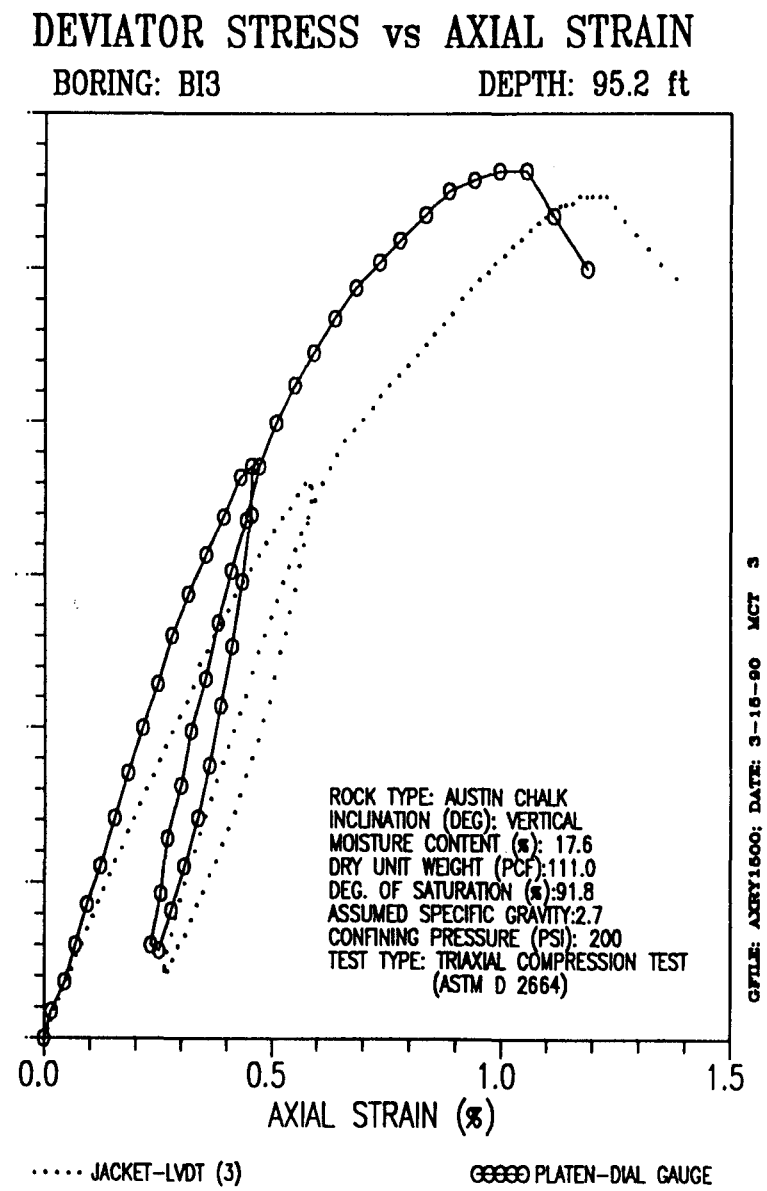
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

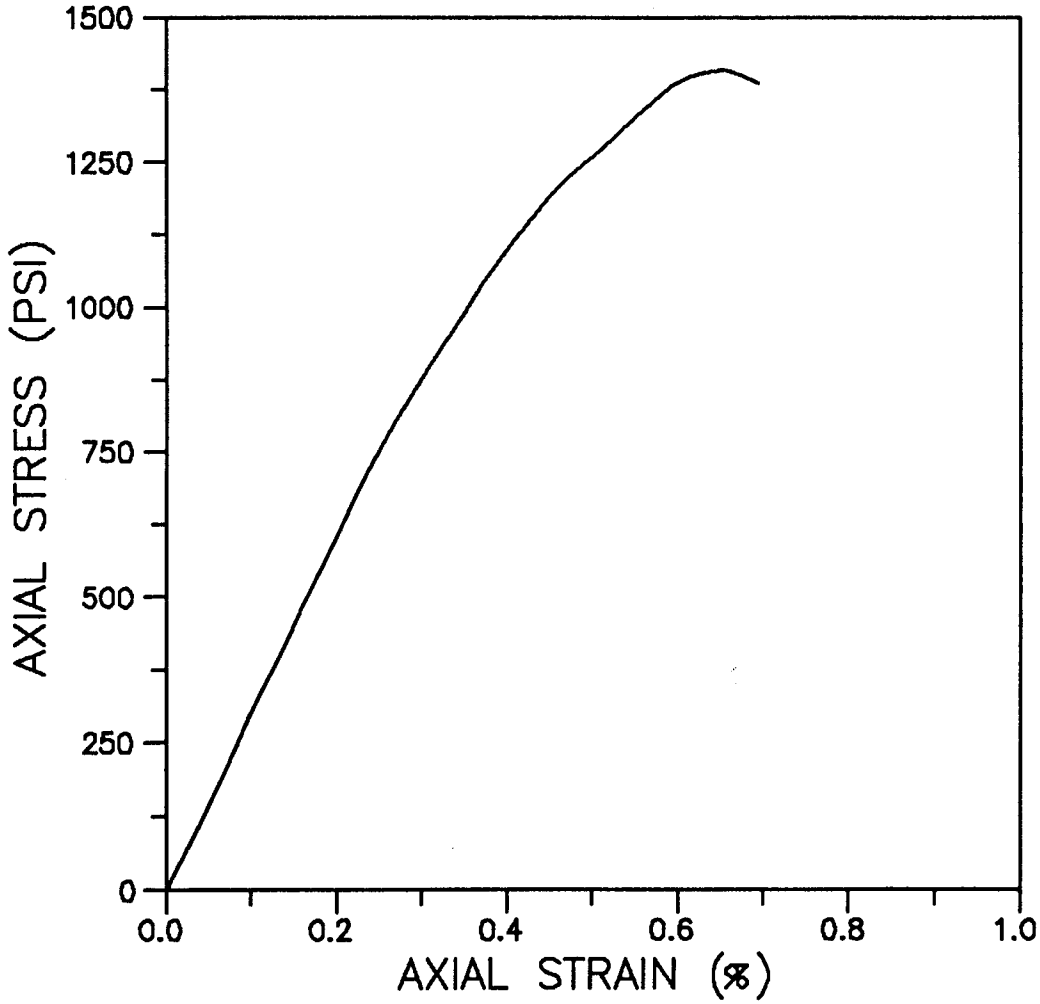
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI3
DEPTH: 95.2 ft
DEVIATOR STRESS (PSI)
1500
1250
1000
750
500
250
0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.6
DRY UNIT WEIGHT (PCF):111.0
DEG. OF SATURATION (%):91.8
ASSUMED SPECIFIC GRAVITY:2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT1500; DATE: 3-15-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI3
DEPTH: 95.2 ft
0.0
0.5
1.0
1.5
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.6
DRY UNIT WEIGHT (PCF):111.0
DEG. OF SATURATION (%):91.8
ASSUMED SPECIFIC GRAVITY:2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY1500; DATE: 3-15-90 MCT 3
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: BI3
DEPTH (FT): 122.7
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 20.7
DRY UNIT WEIGHT (PCF): 105.7
DEG. OF SATURATION (%): 94.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.70 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

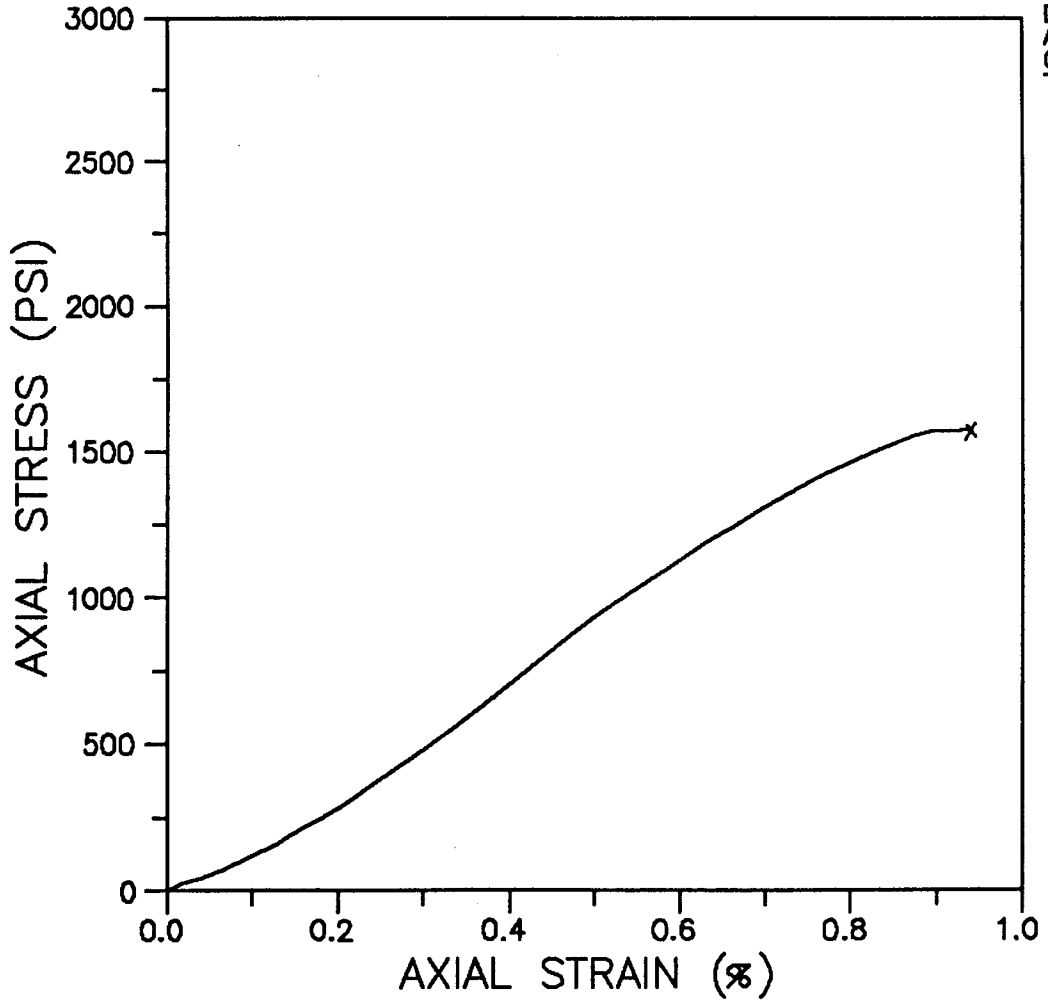
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: BI3
DEPTH (FT): 132.1
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.7
DRY UNIT WEIGHT (PCF): 116.8
DEG. OF SATURATION (%): 101.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.29 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

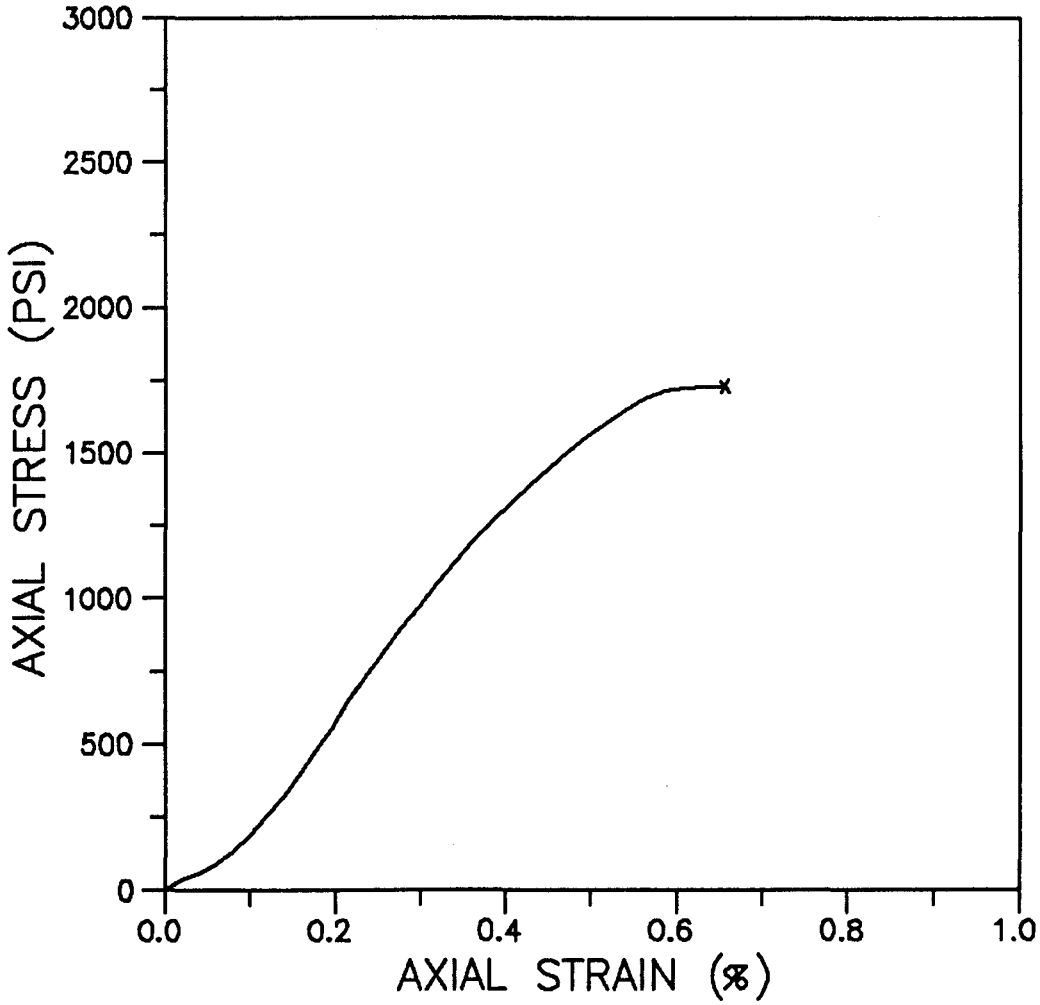
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: BI3
DEPTH (FT): 143.3
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 18.5
DRY UNIT WEIGHT (PCF): 115.4
DEG. OF SATURATION (%): 108.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.89 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 45 DEG

TEXAS SSC SITE

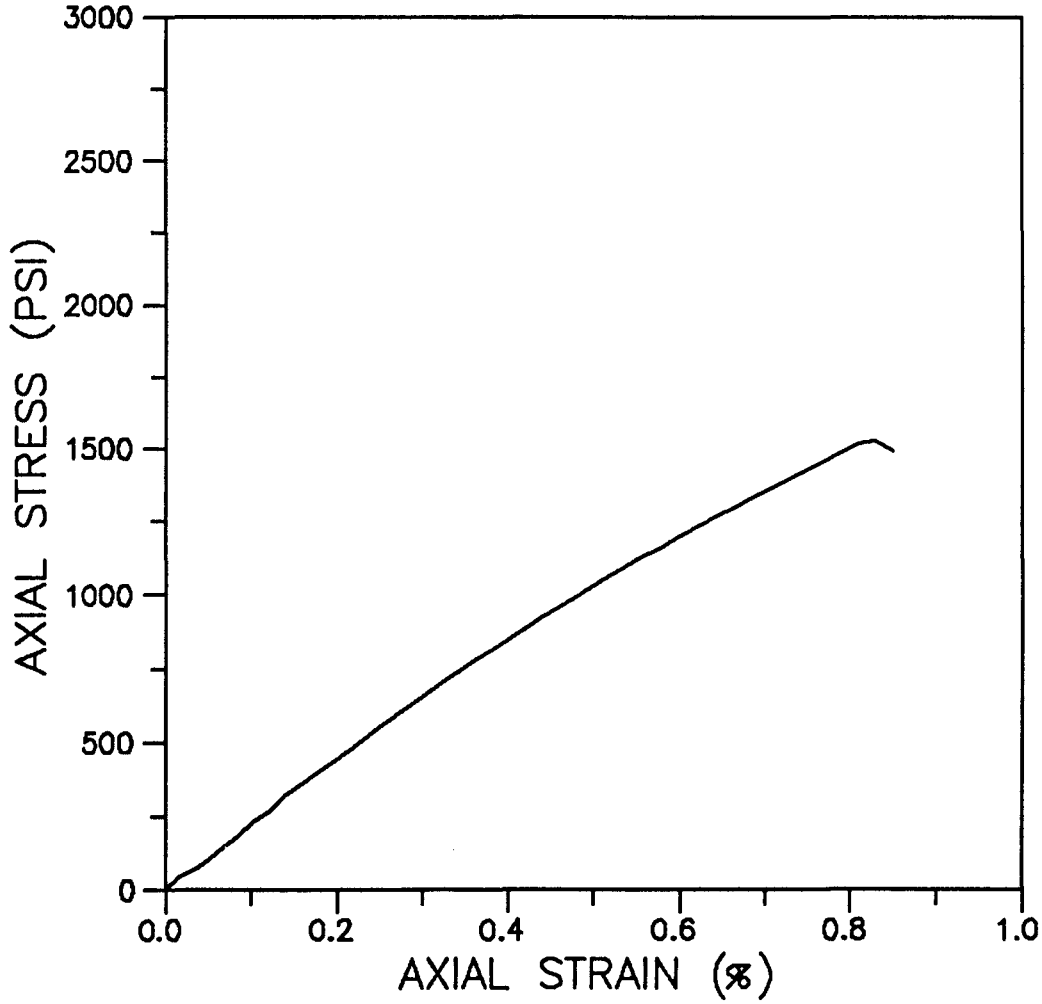
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI3
DEPTH (FT): 147.8
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.3
DRY UNIT WEIGHT (PCF): 120.0
DEG. OF SATURATION (%): 95.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.55 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

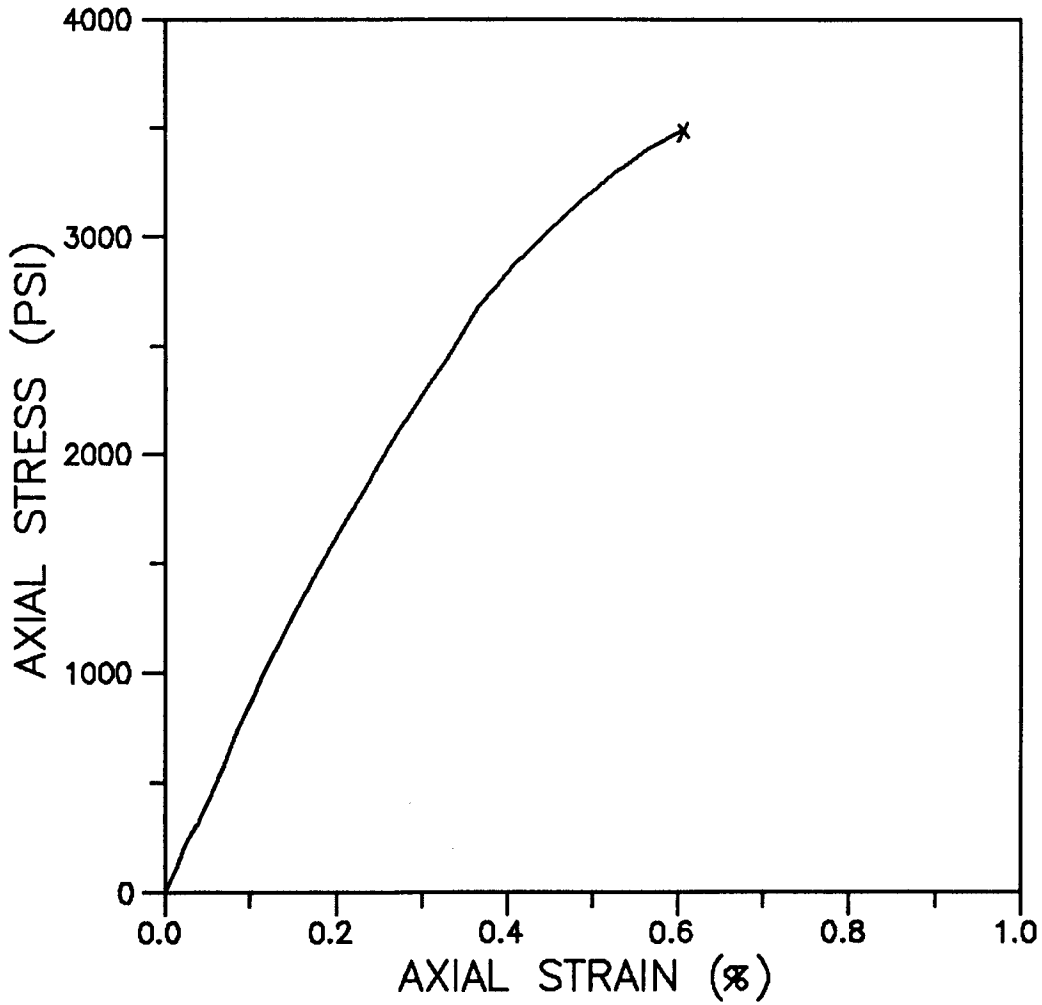
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: BI3
DEPTH (FT): 256.1
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.4
DRY UNIT WEIGHT (PCF): 123.5
DEG. OF SATURATION (%): 76.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.69 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

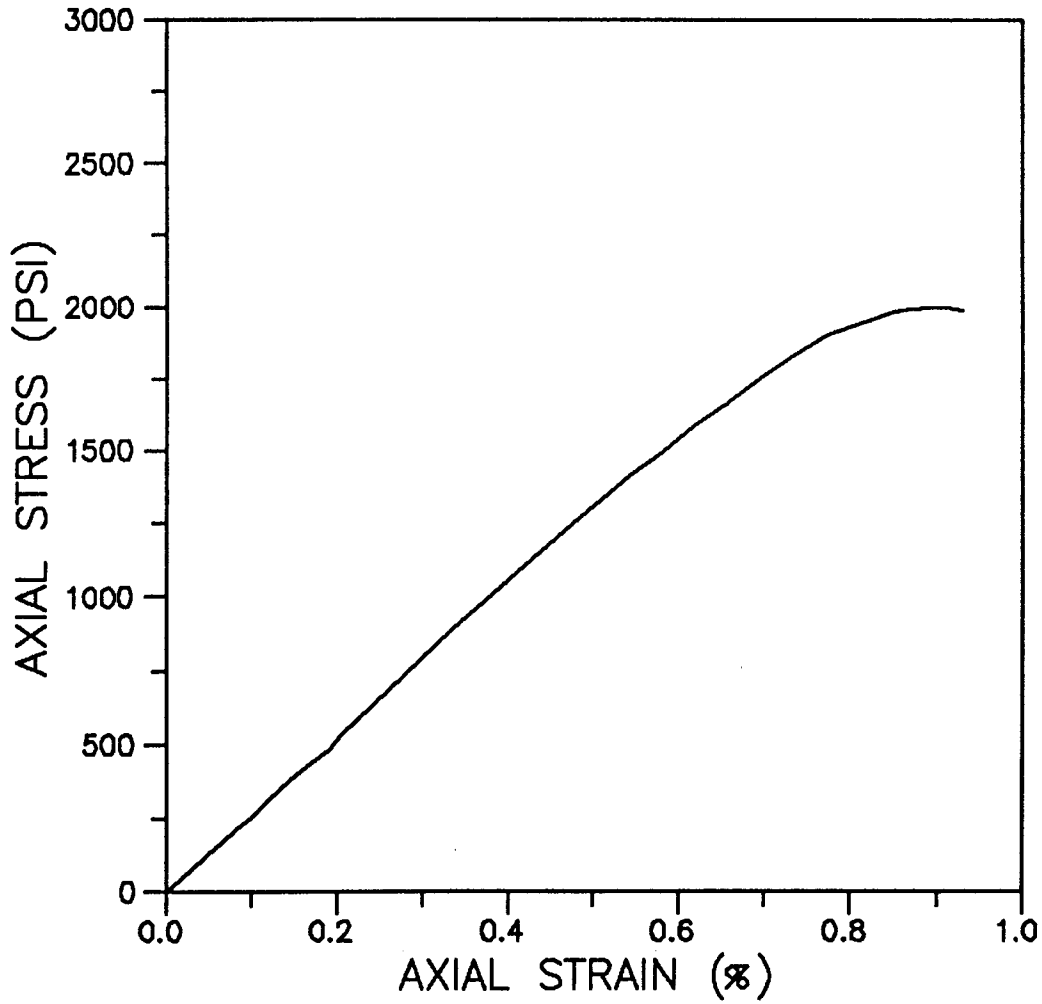
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI3
DEPTH (FT): 260.1
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 9.8
DRY UNIT WEIGHT (PCF): 128.4
DEG. OF SATURATION (%): 84.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.57 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

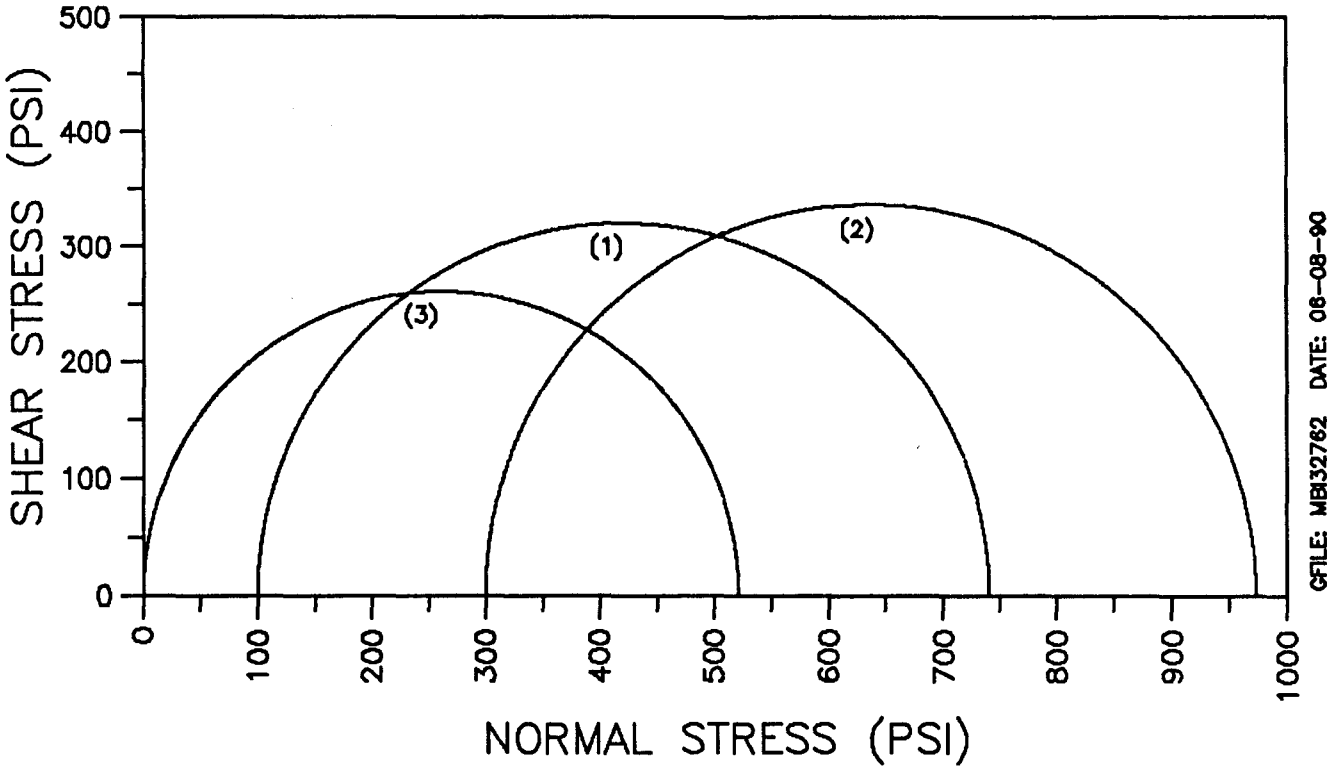
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: BI3
DEPTH RANGE (FT): 276.2-277.7
EAGLE FORD SHALE



SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 276.2
(2) DEPTH (FT): 276.7
(3) DEPTH (FT): 277.3

INCLINATION (DEG): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

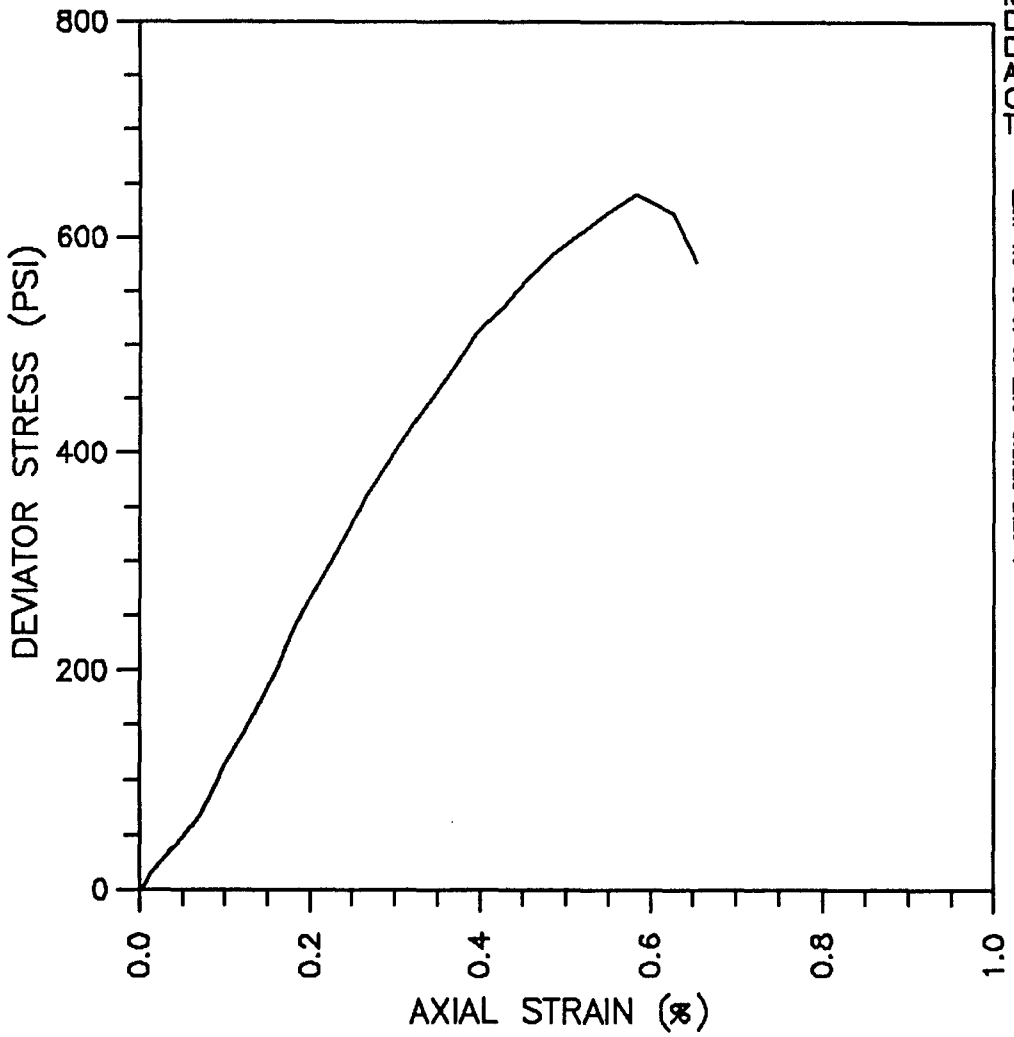
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI3
DEPTH (FT): 276.2
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.1
DRY UNIT WEIGHT (PCF): 122.3
DEG. OF SATURATION (%): 100.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

CAL: MCT3
DATE: 08-09-90
FILE: BI3/2/82

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.395 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 45 DEG.

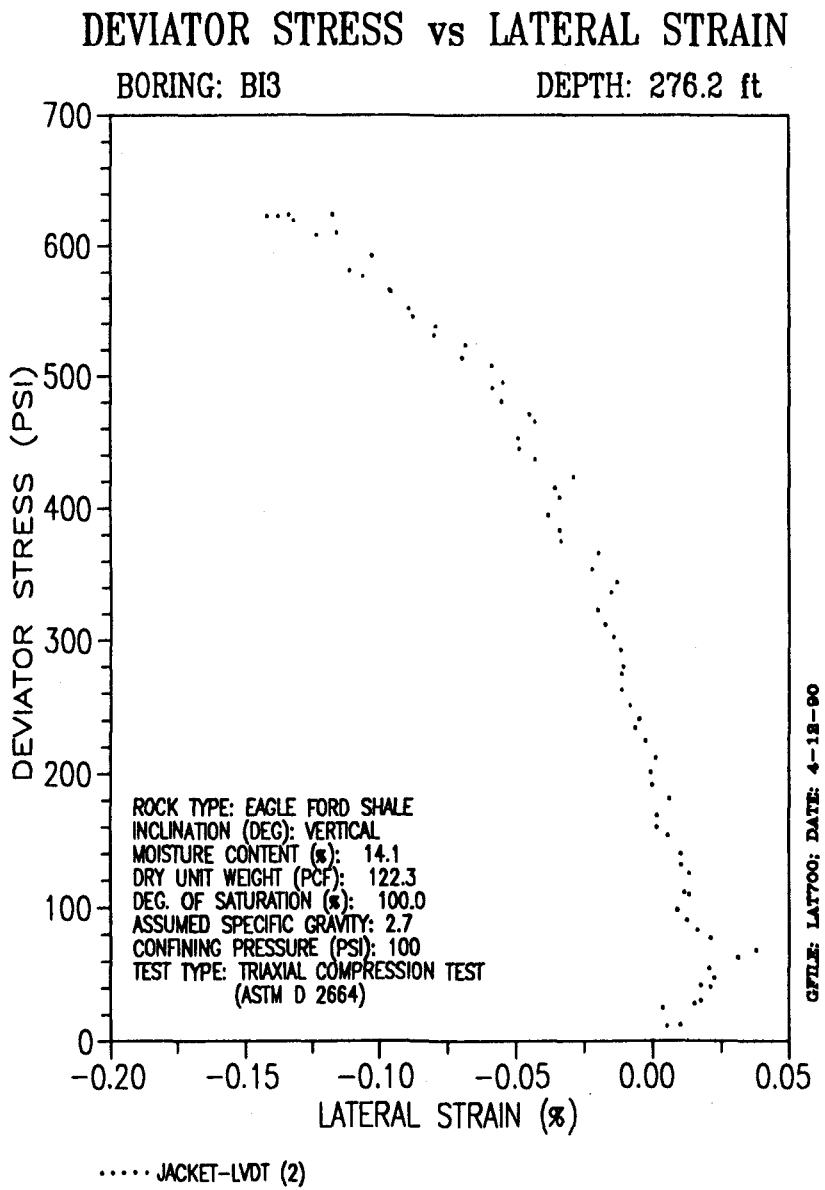
TEXAS SSC SITE

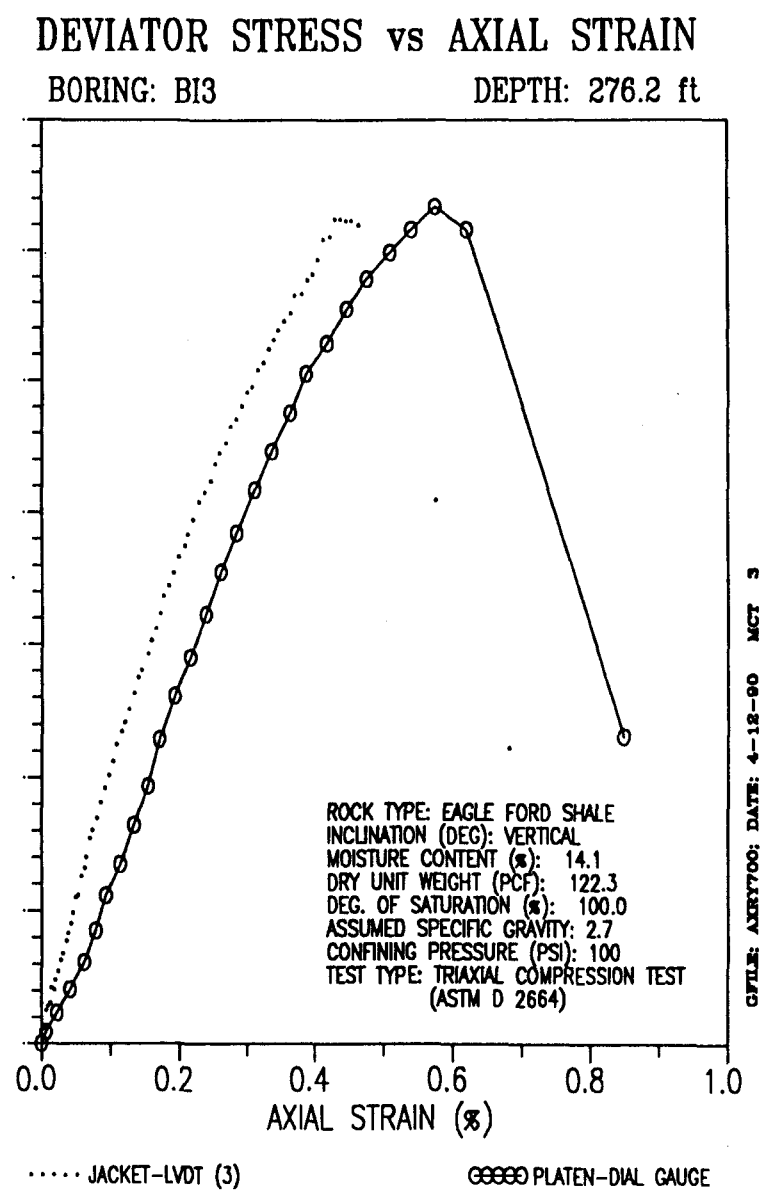
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

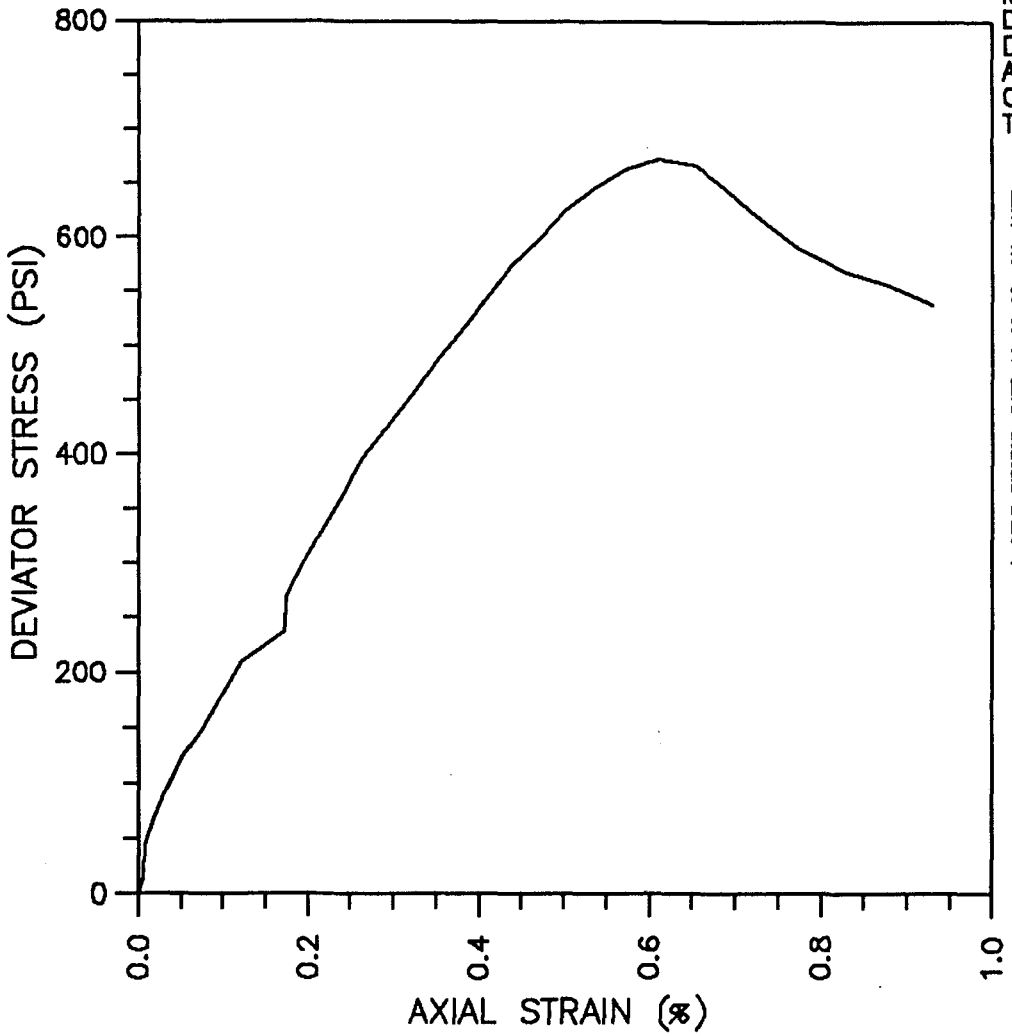
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI3
DEPTH: 276.2 ft
DEVIATOR STRESS (PSI)
700
600
500
400
300
200
100
0
-0.20
-0.15
-0.10
-0.05
0.00
0.05
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.1
DRY UNIT WEIGHT (PCF): 122.3
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT700; DATE: 4-12-90
JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI3
DEPTH: 276.2 ft
0.0
0.2
0.4
0.6
0.8
1.0
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.1
DRY UNIT WEIGHT (PCF): 122.3
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY700; DATE: 4-12-90 MCT 3
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BI3
DEPTH (FT): 276.7
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.1
DRY UNIT WEIGHT (PCF): 127.2
DEG. OF SATURATION (%): 100.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BI32787 DATE: 06-08-90 CAL: MCT3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.412 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 45 DEG.

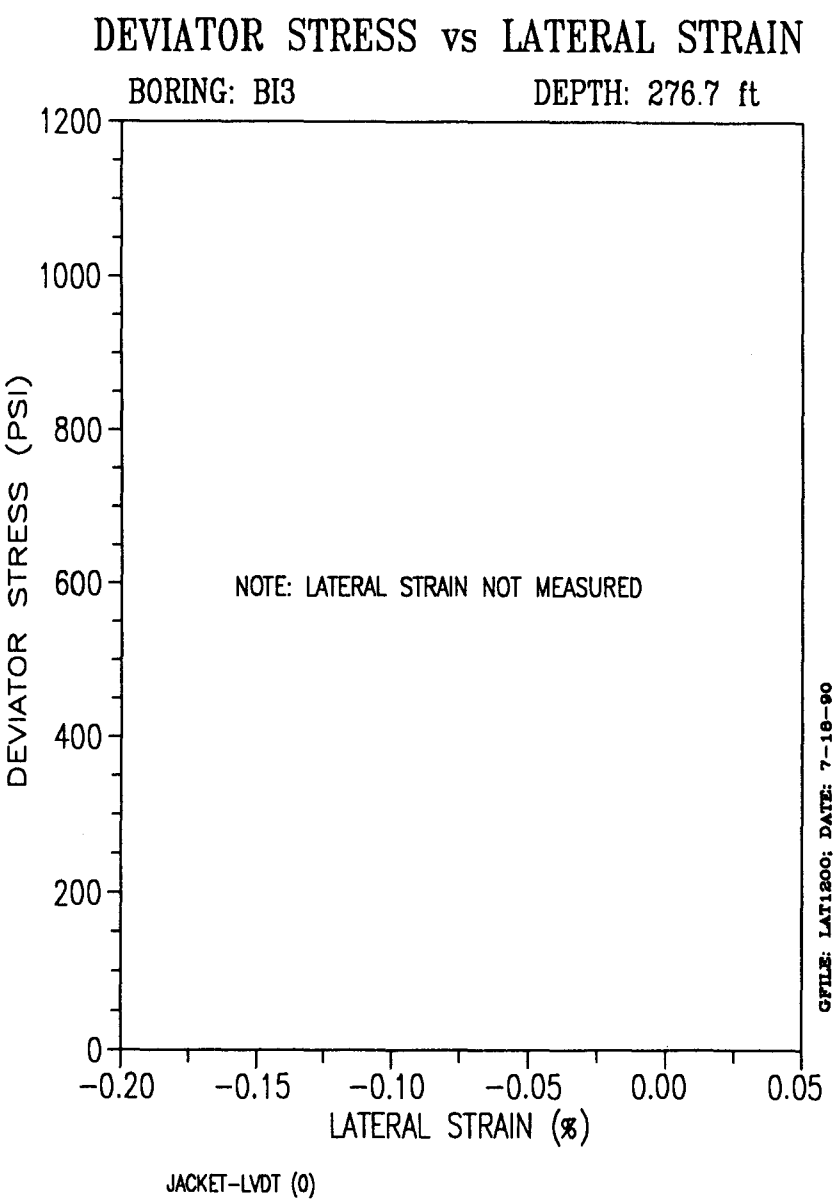
TEXAS SSC SITE

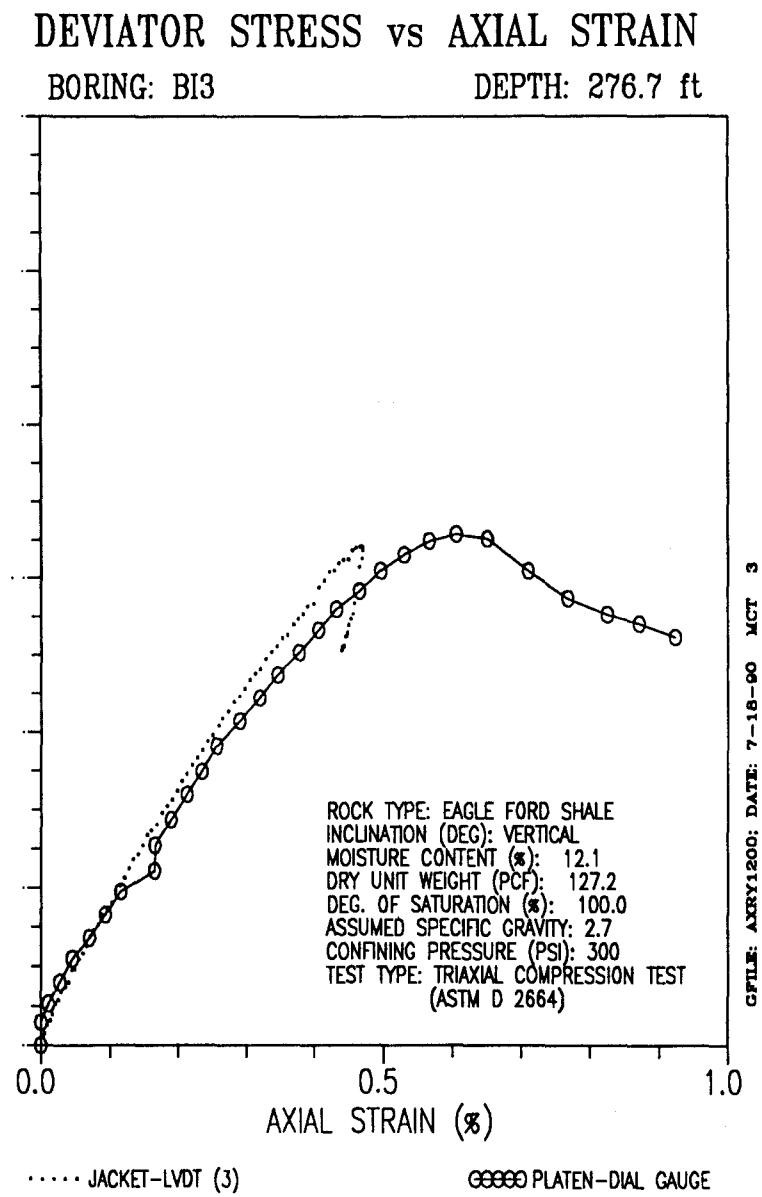
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

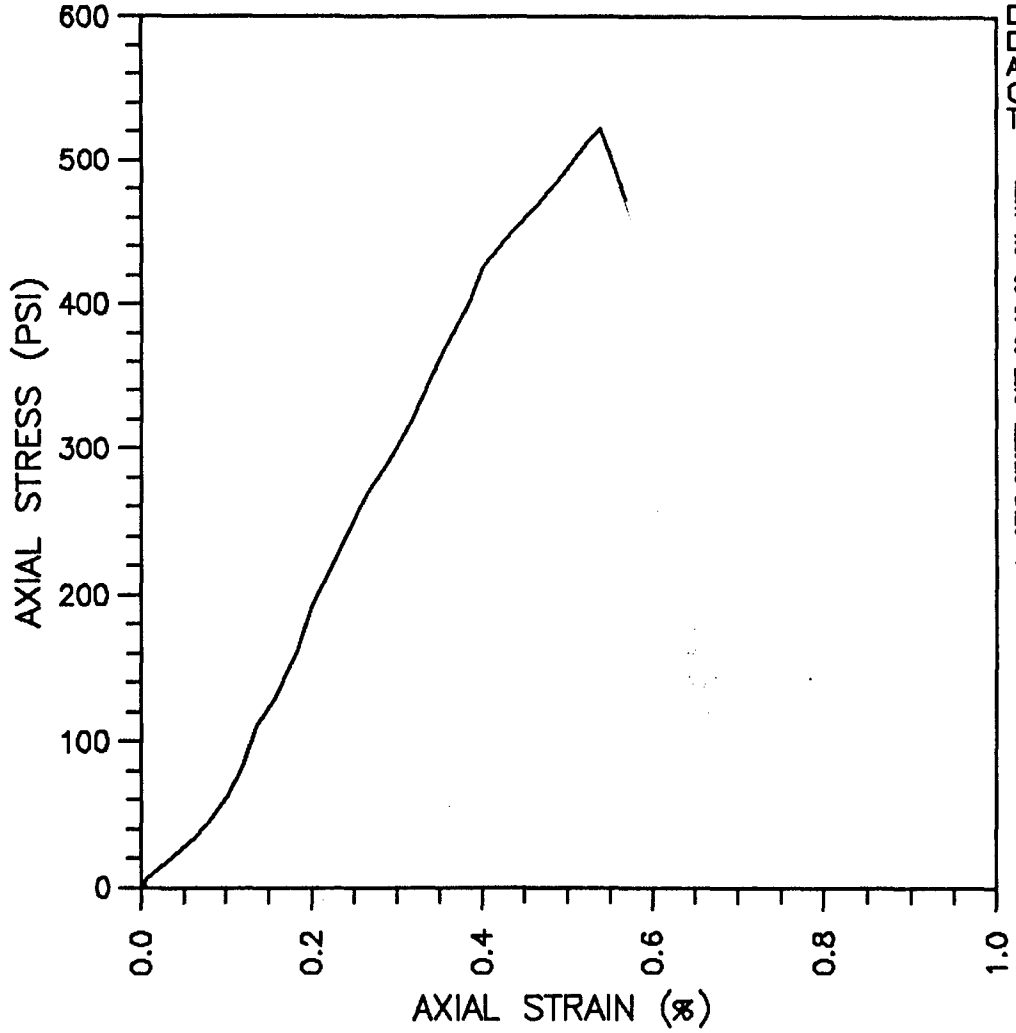
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI3
DEPTH: 276.7 ft
DEVIATOR STRESS (PSI)
1200
1000
800
600
400
200
0
NOTE: LATERAL STRAIN NOT MEASURED
-0.20
-0.15
-0.10
-0.05
0.00
0.05
LATERAL STRAIN (%)
GFILE: LAT1200; DATE: 7-18-90
JACKET-LVDT (0)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI3
DEPTH: 276.7 ft
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.1
DRY UNIT WEIGHT (PCF): 127.2
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
0.0
0.5
1.0
AXIAL STRAIN (%)
GFILE: AXRY1200; DATE: 7-18-90 MCT 3
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BI3
DEPTH (FT): 277.3
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.5
DRY UNIT WEIGHT (PCF): 121.4
DEG. OF SATURATION (%): 101.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

CFILE: BI3277.3 DATE: 08-08-00 CAL: MCT3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.216 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 50 DEG

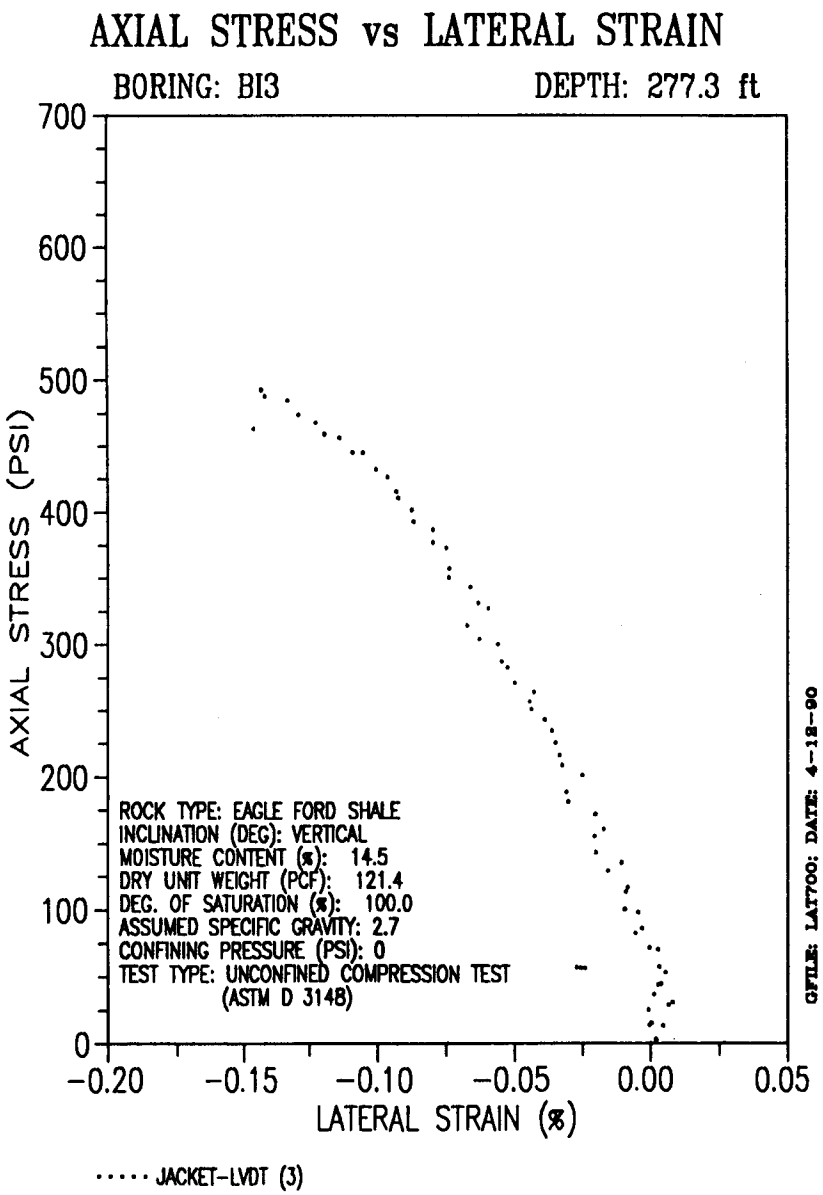
TEXAS SSC SITE

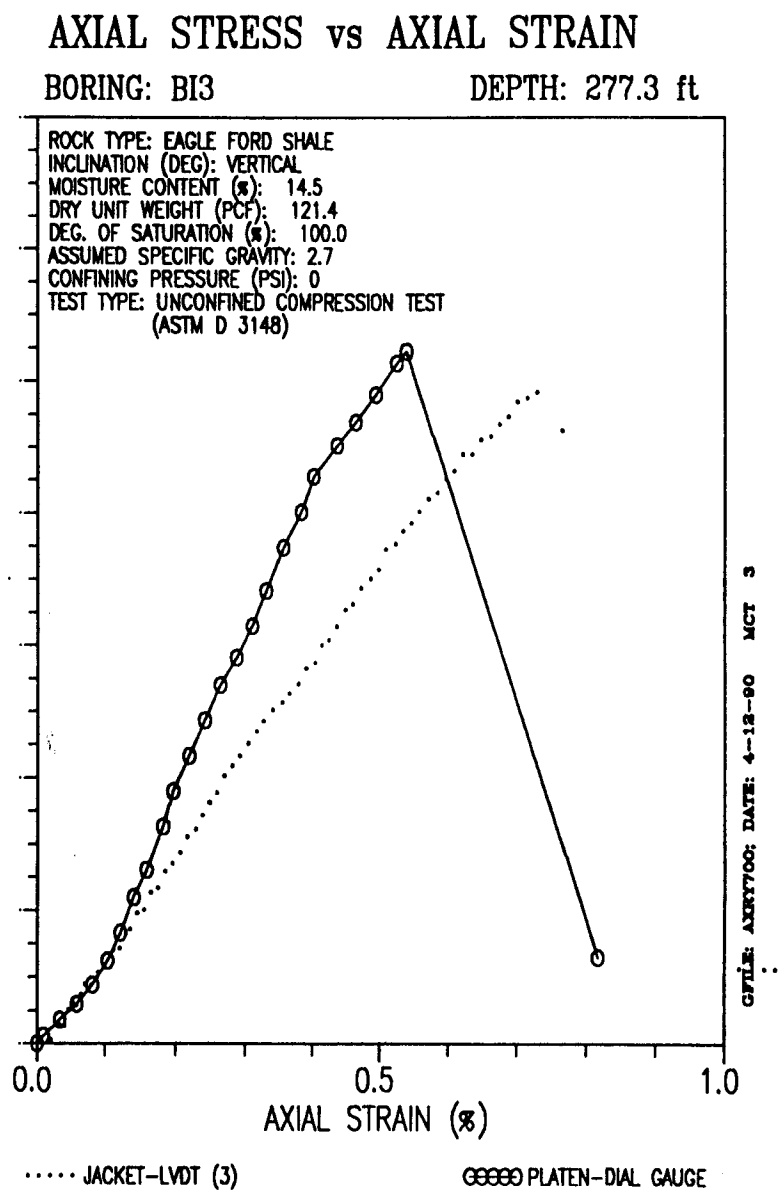
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE


AXIAL STRESS vs LATERAL STRAIN
BORING: BI3
DEPTH: 277.3 ft
AXIAL STRESS (PSI)
700
600
500
400
300
200
100
0
-0.20
-0.15
-0.10
-0.05
0.00
0.05
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.5
DRY UNIT WEIGHT (PCF): 121.4
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION TEST
(ASTM D 3148)
GFILE: LAT700; DATE: 4-12-90
JACKET-LVDT (3)


AXIAL STRESS vs AXIAL STRAIN
BORING: BI3
DEPTH: 277.3 ft
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.5
DRY UNIT WEIGHT (PCF): 121.4
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION TEST
(ASTM D 3148)
0.0
0.5
1.0
AXIAL STRAIN (%)
GFILE: AXX700; DATE: 4-12-90 MCT 3
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

GEOMECHANICAL TEST RESULTS

BORING BI 4

TABLE E-5. GEOMECHANICAL TEST RESULTS - BORING BI 4

GENERAL LITHOLOGY	BORING DEPTH feet	MOISTURE CONTENT percent	DRY DENSITY pcf	SPECIFIC GRAVITY	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	FRACTION FINER THAN # 200 SIEVE percent	CARBONATE CONTENT percent	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES*	UNCONFINED COMPRESSIVE STRENGTH psi	TRIAXIAL COMPRESSION CONFINING PRESSURE σ_3 psi	TRIAXIAL COMPRESSION DEVIATOR STRESS $\sigma_1-\sigma_3$ psi	FAILURE STRAIN percent	TANGENT YOUNG'S MODULUS E50 (psi)x10E5	TANGENT YOUNG'S MODULUS UNLOAD/ RELOAD (psi)x10E5	TANGENT YOUNG'S MODULUS σ_3 psi	POISSON'S RATIO	BRAZIL TENSILE STRENGTH psi	2ND CYCLE SLAKE DURABILITY INDEX percent	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX psi	COMMENTS
AUSTIN CHALK	44.8	13.8																					
AUSTIN CHALK	44.9	12.7	124.6						2.3	B-1/45	2185			1.05	2.30		0						NOTE 1
AUSTIN CHALK	87.2	15.3	115.7	2.68																			
AUSTIN CHALK	87.6	14.0	119.2						2.2	D	2070			0.54	4.49		0						
AUSTIN CHALK	88.0	13.5	119.9						2.2	D		100	2506	0.87	3.18		100						
AUSTIN CHALK	88.0														4.14			0.27 (2)					NOTES 2 and 3
AUSTIN CHALK	88.4	13.5	117.8						2.2	B-1/20		200	2596	1.13	2.75		200						
AUSTIN CHALK	88.4														3.32			0.17 (1)					NOTE 2
AUSTIN CHALK	90.5	14.8																					
AUSTIN CHALK	90.6	14.1	117.5						2.3	A	2484			1.47	2.04		0						
BENTONITE	94.4																						
BENTONITE	94.5	38.4																					
BENTONITE	94.6	38.9			110	74	96.6																
AUSTIN CHALK	114.5	18.5																					
AUSTIN CHALK	114.7	13.4	124.3	2.63					2.3	D	3213			0.83	4.84		0						
AUSTIN CHALK	158.0	11.5																					
AUSTIN CHALK	158.1	10.6	127.1						2.3	E	3506			0.92	4.87		0						
AUSTIN CHALK	158.6	10.9							0.4										287				
AUSTIN CHALK	162.6	9.8																					
AUSTIN CHALK	162.7	15.0	118.1						2.4	E	1931			0.61	3.97		0						
EAGLE FORD SHALE	170.4	17.7	112.9																			25.9	
EAGLE FORD SHALE	170.6	17.6	115.5																			28.5	
EAGLE FORD SHALE	170.9	16.4	114.4	2.73	83	53	88.6		1.9	D	310			1.24	0.27		0						
EAGLE FORD SHALE	171.2	17.1	111.9																				
EAGLE FORD SHALE	171.6	16.5	115.2	2.74	75	46	99.2		2.3	B-1/40,50		100	290	0.27	1.38		100						
EAGLE FORD SHALE	171.6														0.85			0.32 (2)					NOTE 2
EAGLE FORD SHALE	172.0	17.3	111.7																				
EAGLE FORD SHALE	172.8	16.8	113.2					7.5	2.2	B-1/40		200	419	0.50	1.18		200						
EAGLE FORD SHALE	172.8														1.04			0.28 (2)					NOTE 2
EAGLE FORD SHALE	176.1	16.8																					
EAGLE FORD SHALE	176.3	16.0	118.2		112	75		5.0	2.3	C	336			1.03	0.64		0						
EAGLE FORD SHALE	180.4	17.0																					
EAGLE FORD SHALE	180.5																			23.1			
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

BI4PRT20.WK1
REVISION: 2.0
DATE: 7.17/90

* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

Symbol	Failure Type	Symbol	Failure Type
A	No discernible failure plane	B-4	Combination
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core	C	Barreling/Bulging
B-1	Shear plane	D	Longitudinal (axial) splitting
B-2	Bedding plane shear	E	Conical
B-3	Shear plane along pre-existing fracture, shear zone, etc.	F	No information

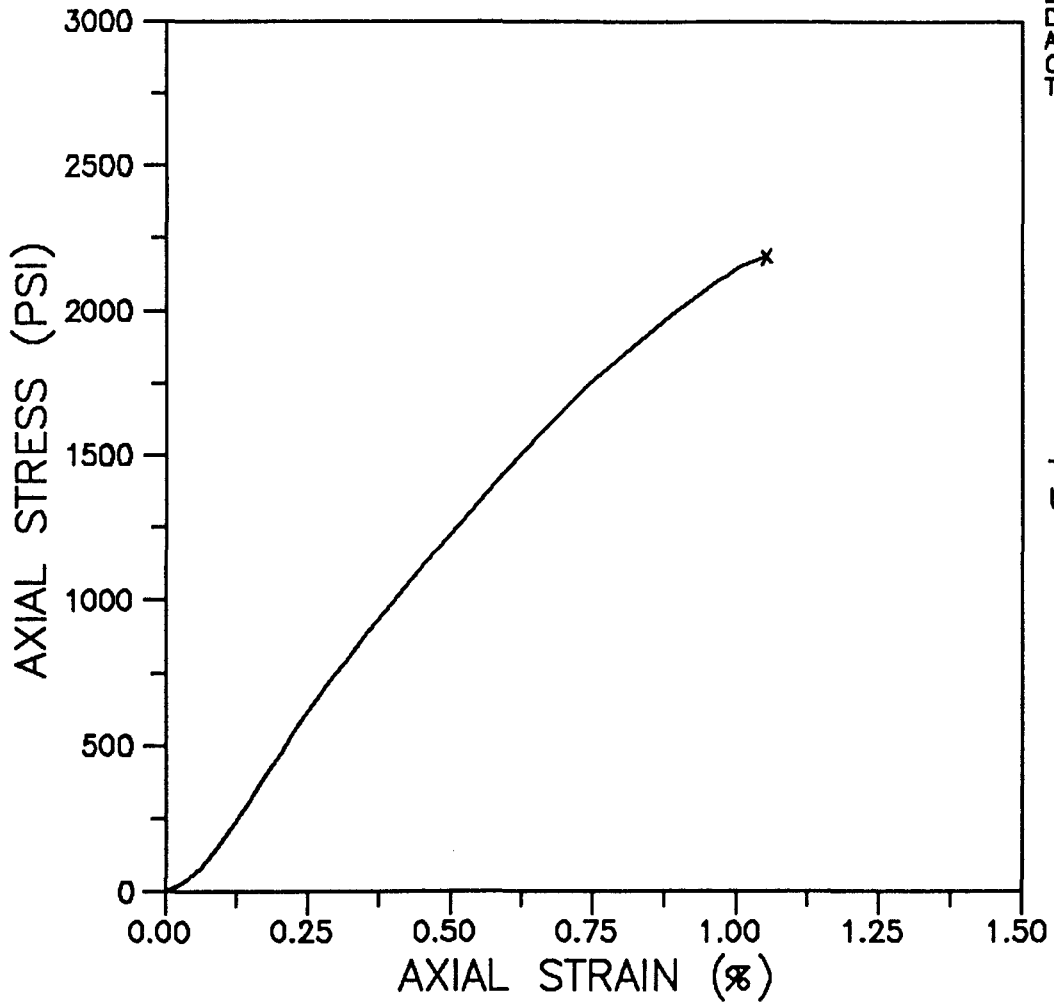
NOTES:

1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

2) Modulus and Poisson's ratio calculated from axial and lateral strains measured using LVDTs. Axial gage length is 2.8 inches.

3) For Poisson's ratio values: the value within parentheses indicates the number of LVDTs recording lateral strains. Otherwise all 3 LVDTs recorded strains.

BORING NO: B14
DEPTH (FT): 44.9
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.7
DRY UNIT WEIGHT (PCF): 124.6
DEG. OF SATURATION (%): 97.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.30 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 45 DEG

TEXAS SSC SITE

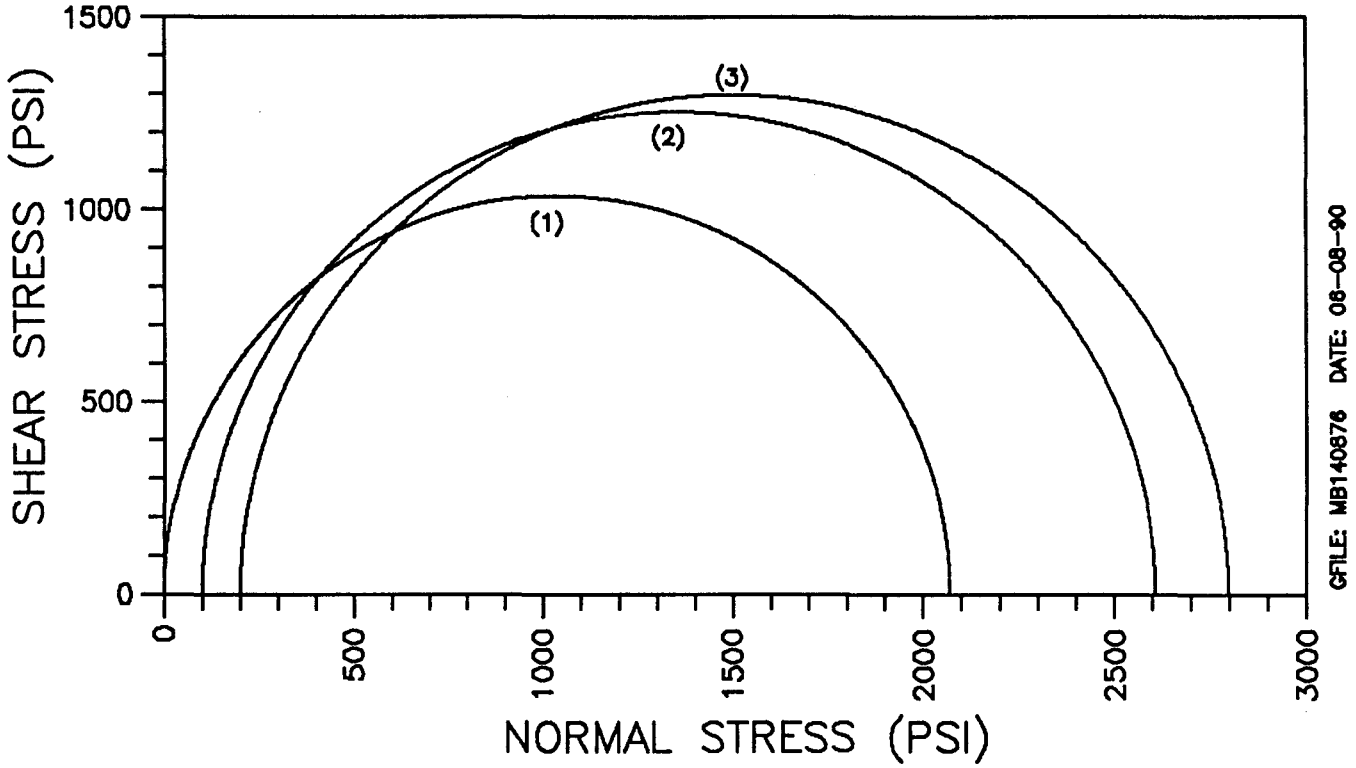
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: BI4
DEPTH RANGE (FT): 87.6–88.8
AUSTIN CHALK LIMESTONE



GFILE: MB140876 DATE: 06-08-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 87.6
(2) DEPTH (FT): 88.0
(3) DEPTH (FT): 88.4

INCLINATION (DEG.): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

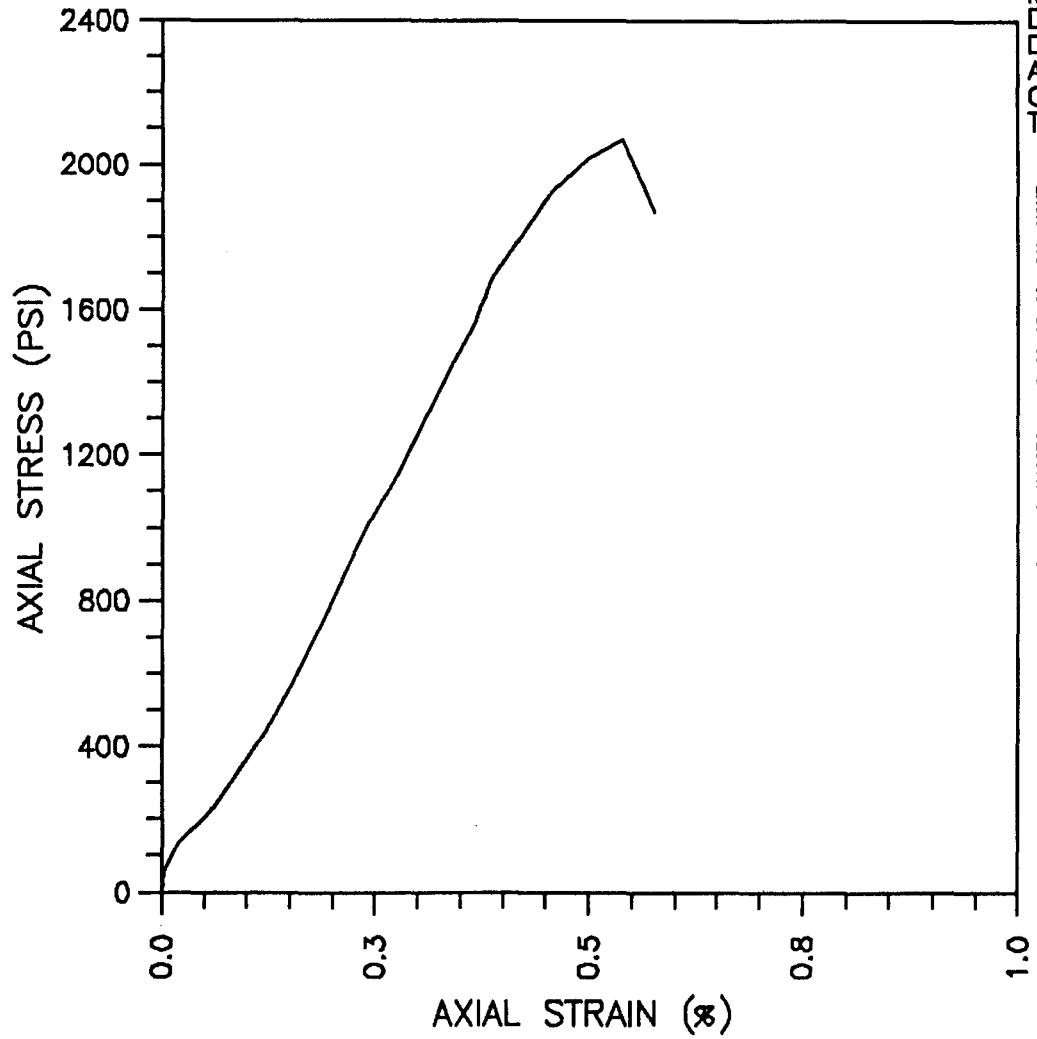
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI4
DEPTH (FT): 87.6
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.0
DRY UNIT WEIGHT (PCF): 119.2
DEG. OF SATURATION (%): 91.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: BI40876 DATE: 06-09-90 CAL: MCU3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.494 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

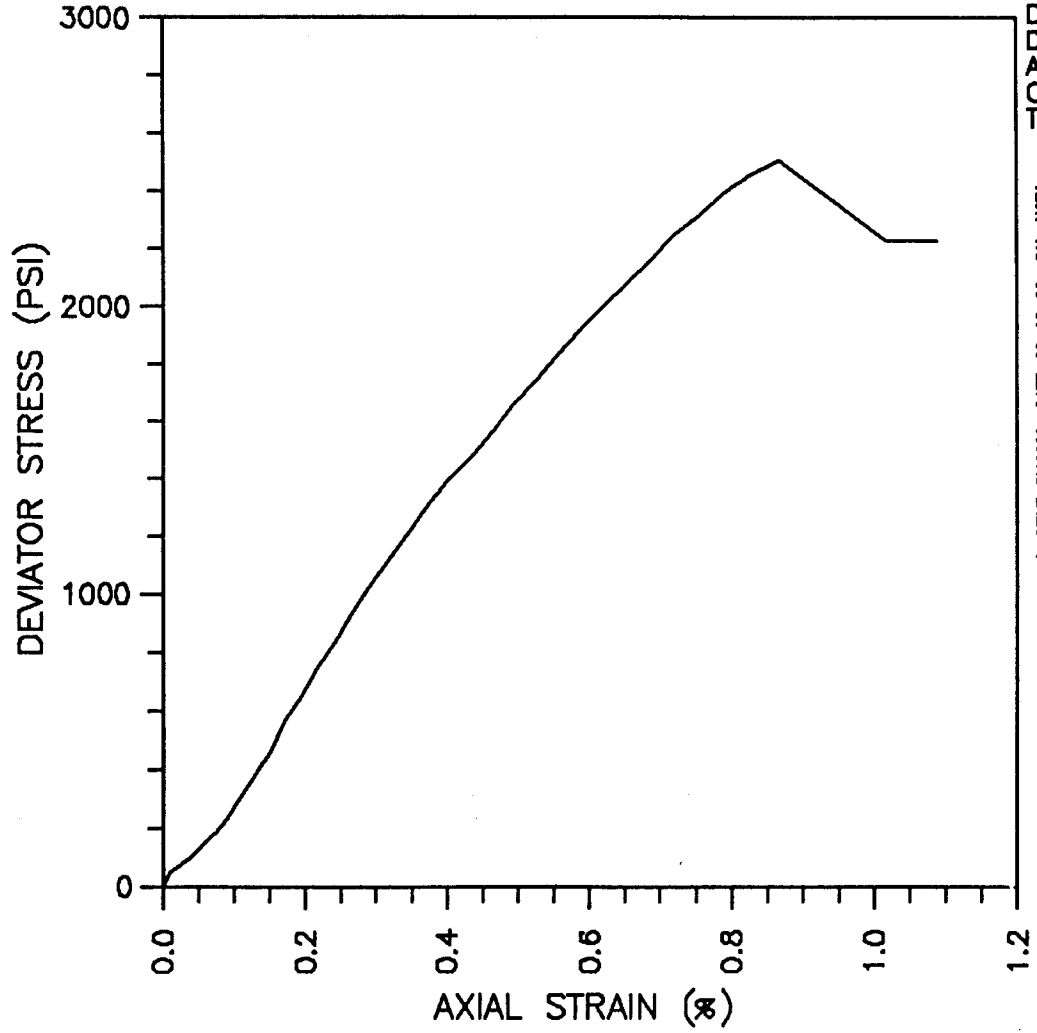
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI4
DEPTH (FT): 88.0
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.5
DRY UNIT WEIGHT (PCF): 119.9
DEG. OF SATURATION (%): 89.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BI4CB80 DATE: 06-06-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.175 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

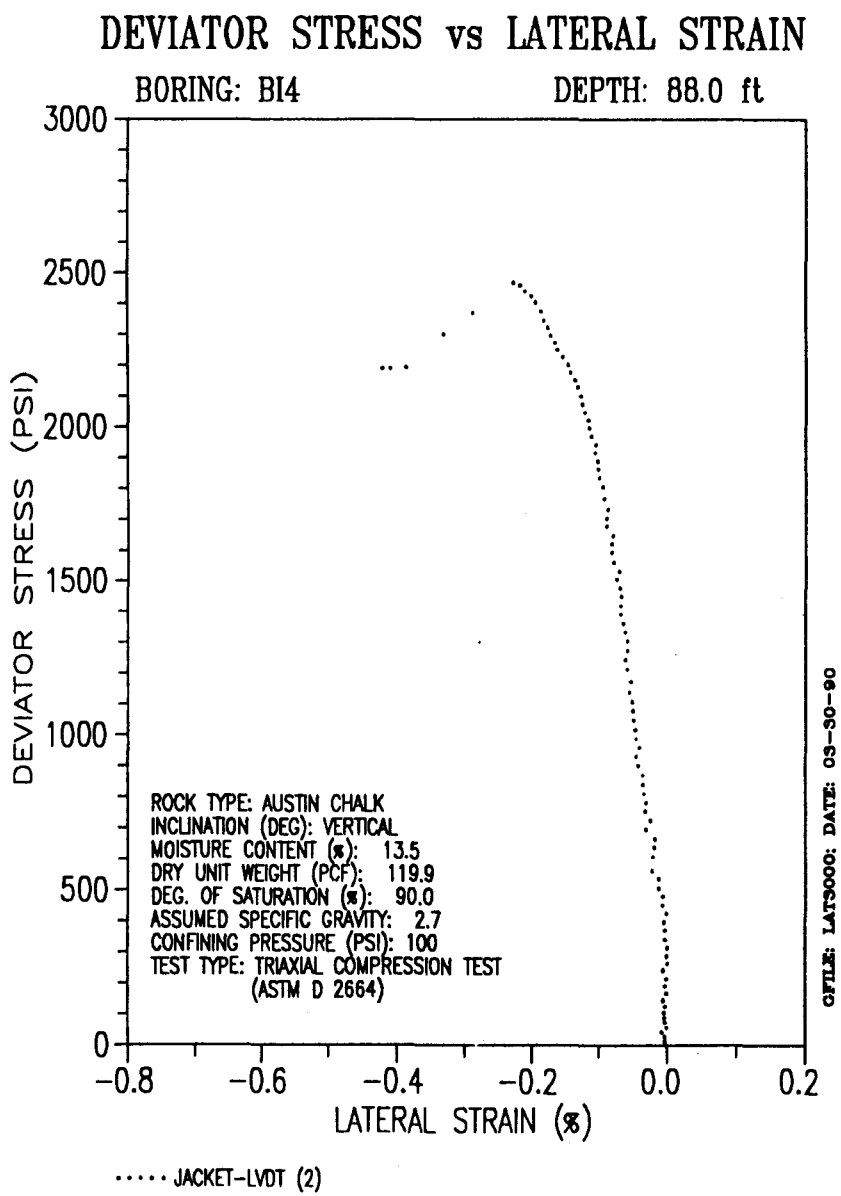
TEXAS SSC SITE

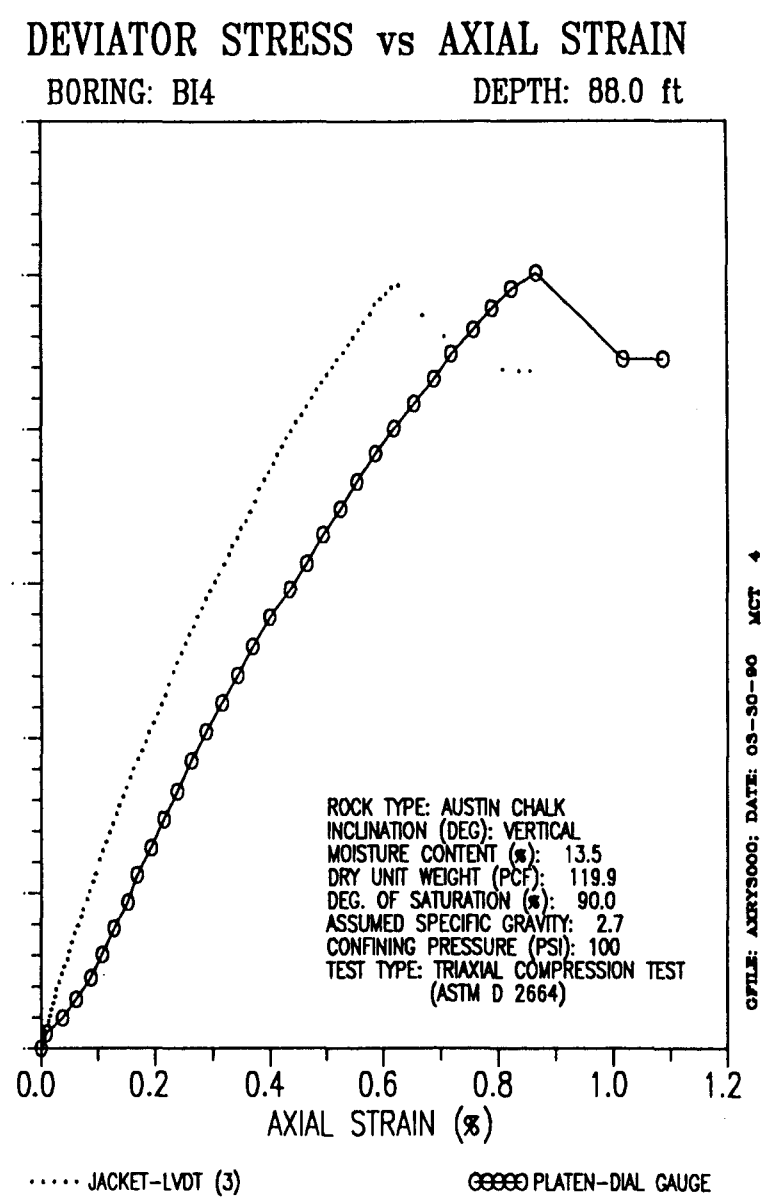
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

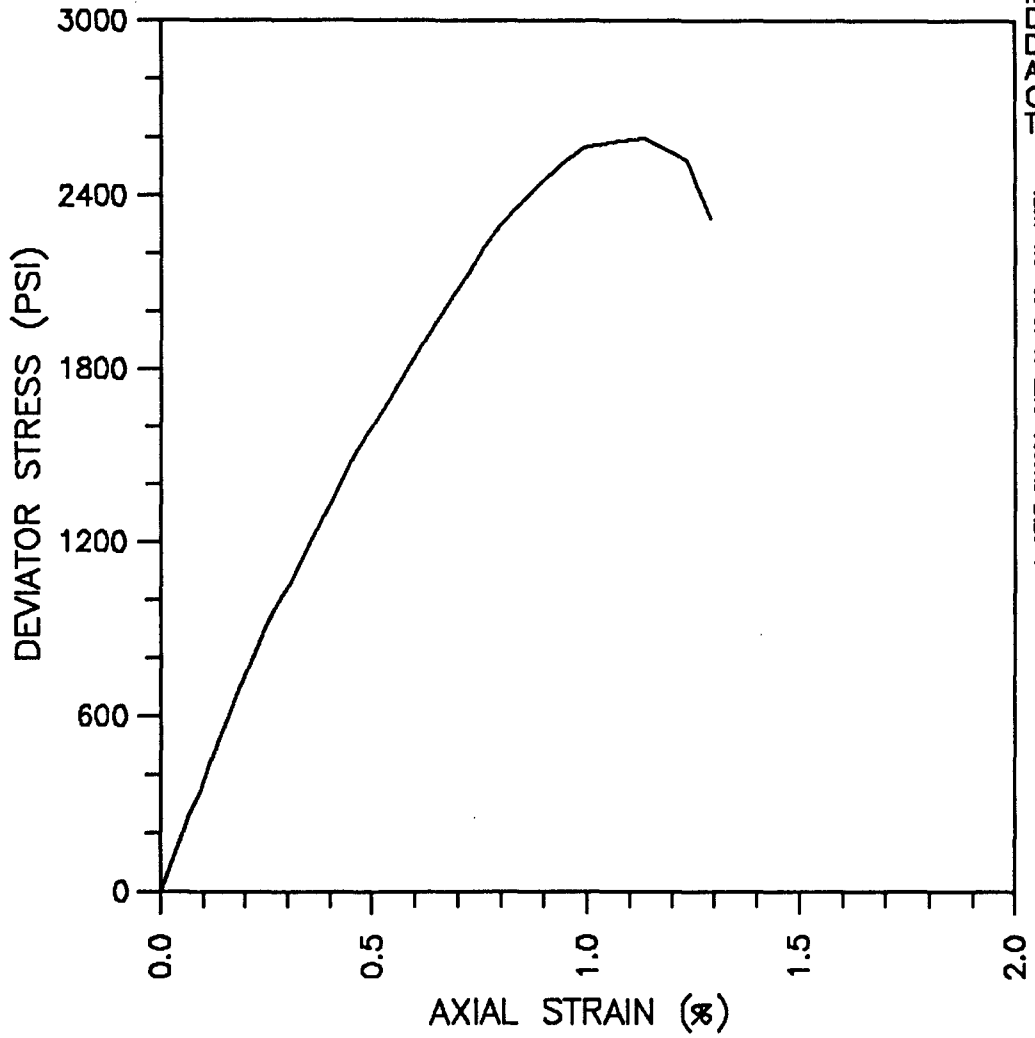
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI4
DEPTH: 88.0 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.5
DRY UNIT WEIGHT (PCF): 119.9
DEG. OF SATURATION (%): 90.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
CFILE: LAT3000; DATE: 03-30-90
JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI4
DEPTH: 88.0 ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.5
DRY UNIT WEIGHT (PCF): 119.9
DEG. OF SATURATION (%): 90.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
CFILE: AXRY3000; DATE: 03-30-90 MCT 4
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: B14
DEPTH (FT): 88.4
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.5
DRY UNIT WEIGHT (PCF): 117.8
DEG. OF SATURATION (%): 84.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: B14C664 DATE: 06-08-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.747 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 20 DEG

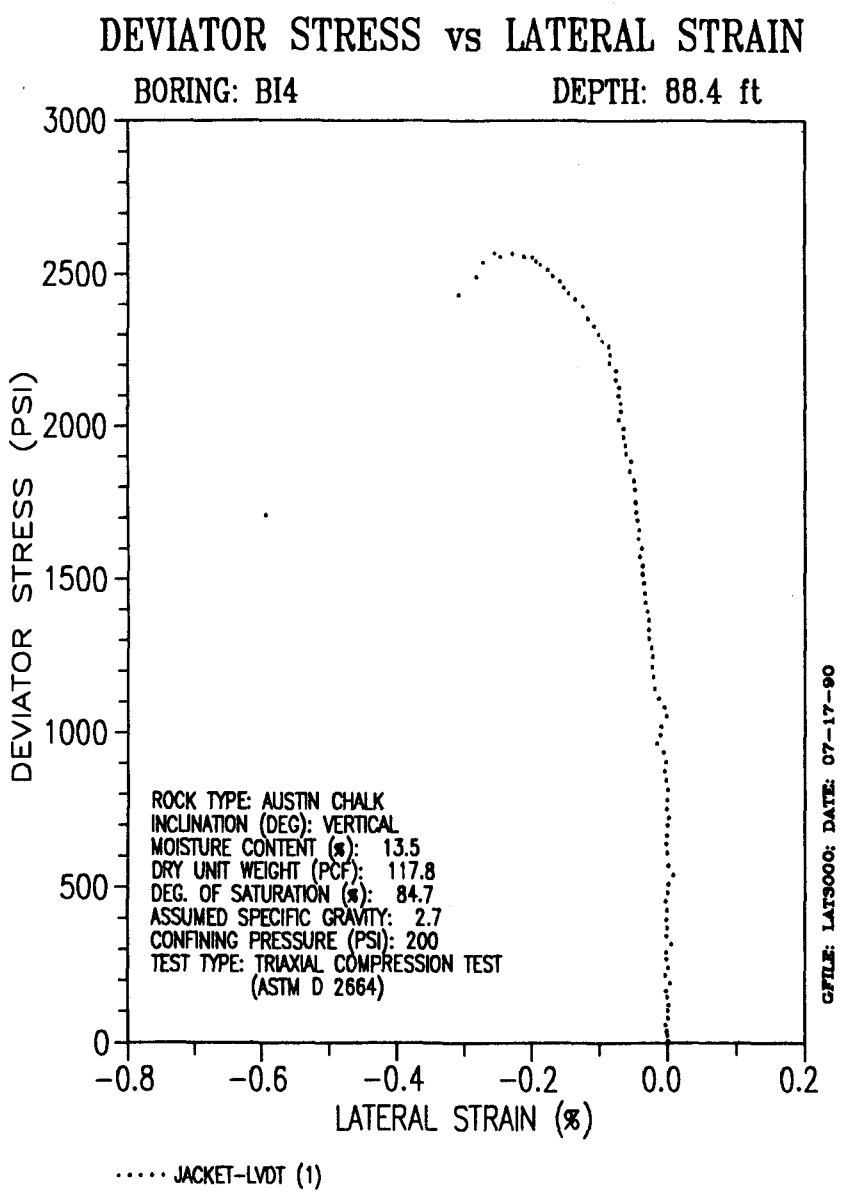
TEXAS SSC SITE

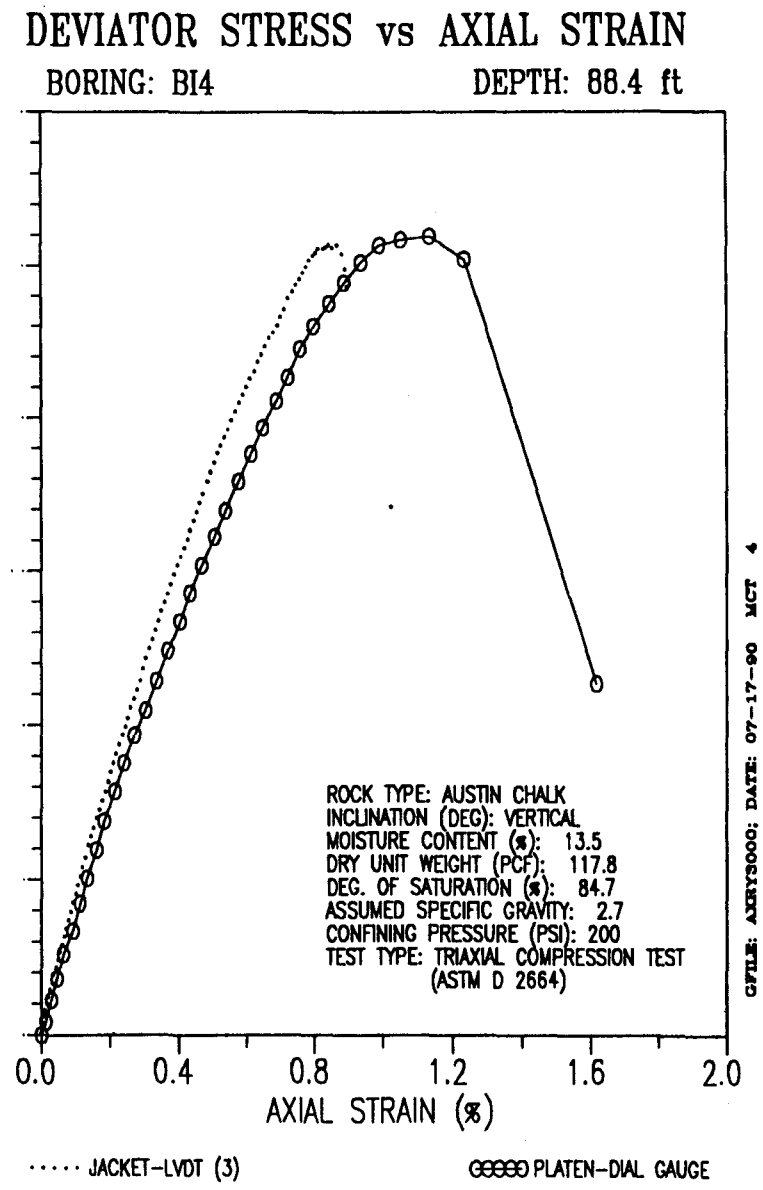
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

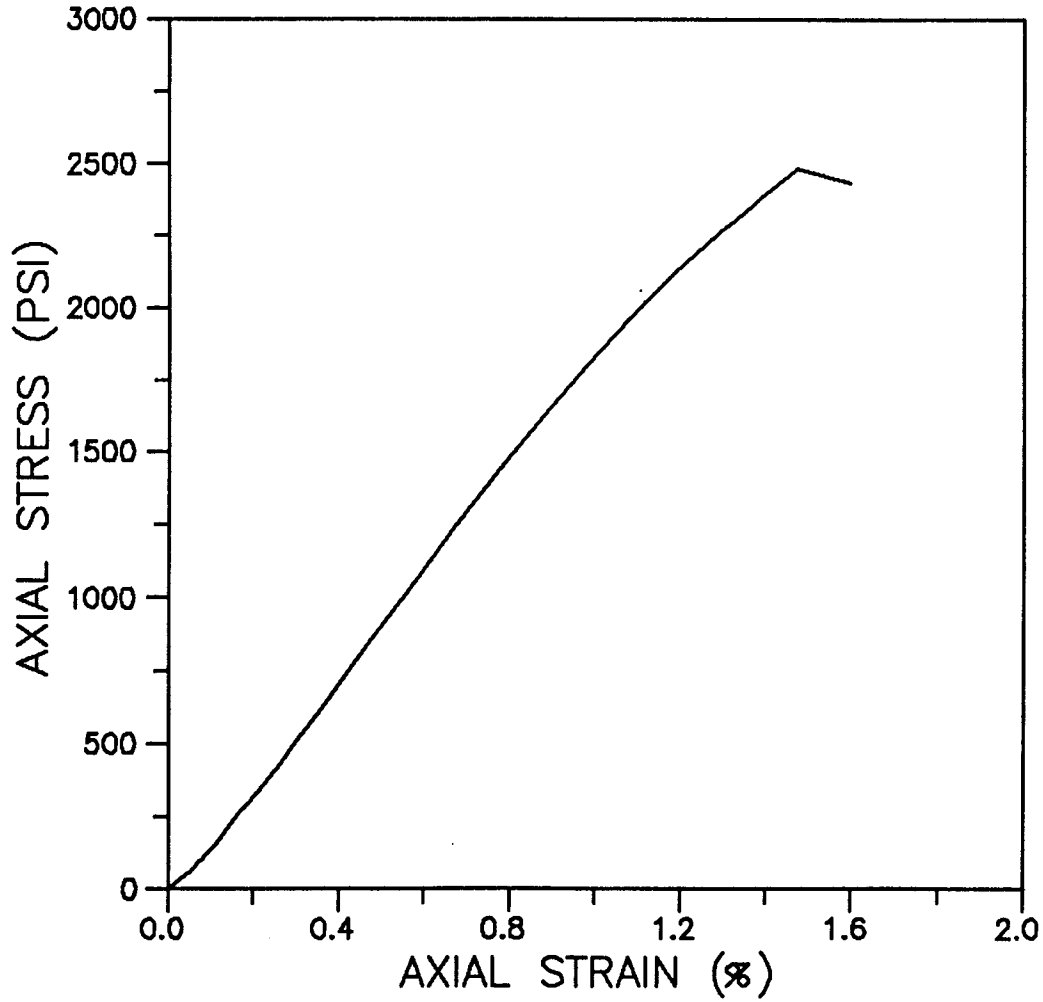
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI4
DEPTH: 88.4 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.5
DRY UNIT WEIGHT (PCF): 117.8
DEG. OF SATURATION (%): 84.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 07-17-90
····· JACKET-LVDT (1)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI4
DEPTH: 88.4 ft
0.0
0.4
0.8
1.2
1.6
2.0
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.5
DRY UNIT WEIGHT (PCF): 117.8
DEG. OF SATURATION (%): 84.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXIY3000; DATE: 07-17-90 MCT 4
····· JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: BI4
DEPTH (FT): 90.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.1
DRY UNIT WEIGHT (PCF): 117.5
DEG. OF SATURATION (%): 87.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.04 x 10E5 PSI

FAILURE MODE:
NO DISCERNIBLE FAILURE
PLANE

TEXAS SSC SITE

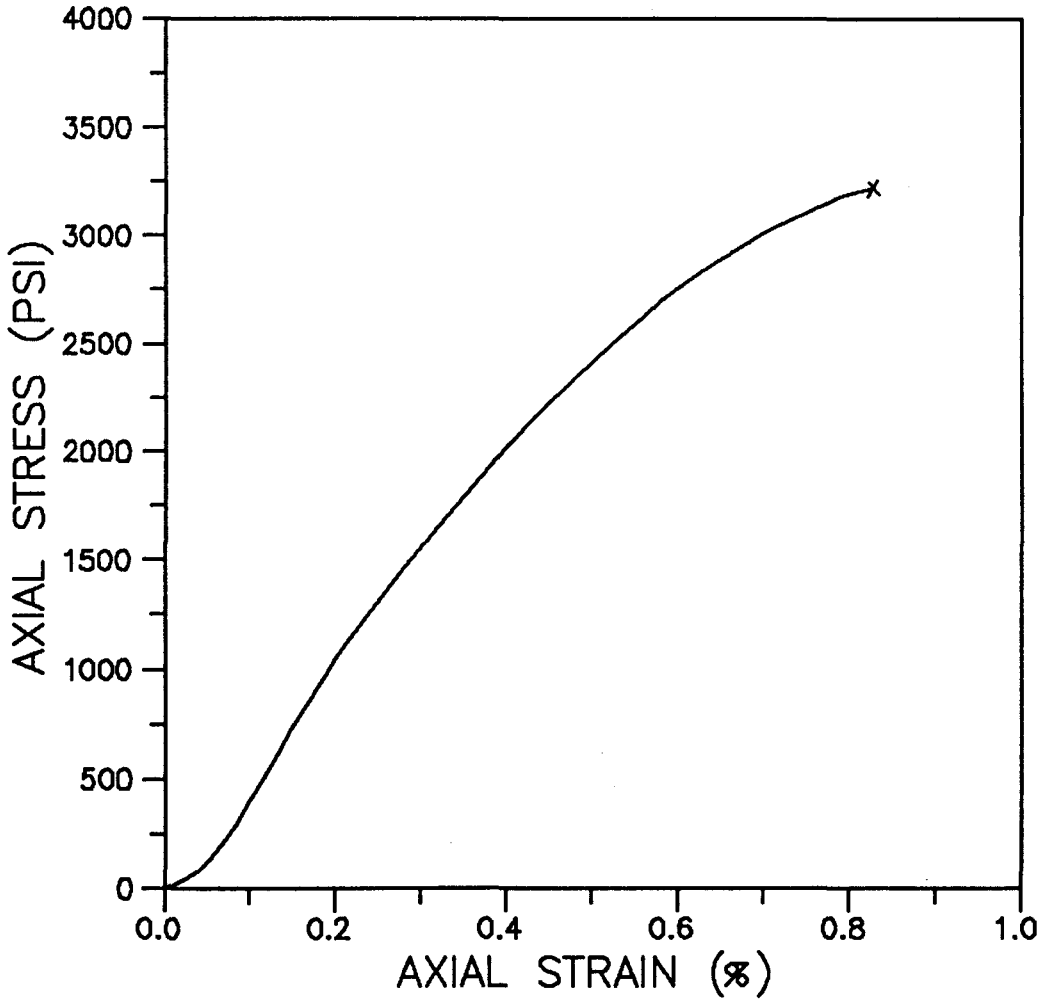
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI4
DEPTH (FT): 114.7
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.4
DRY UNIT WEIGHT (PCF): 124.3
DEG. OF SATURATION (%): 101.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.84 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

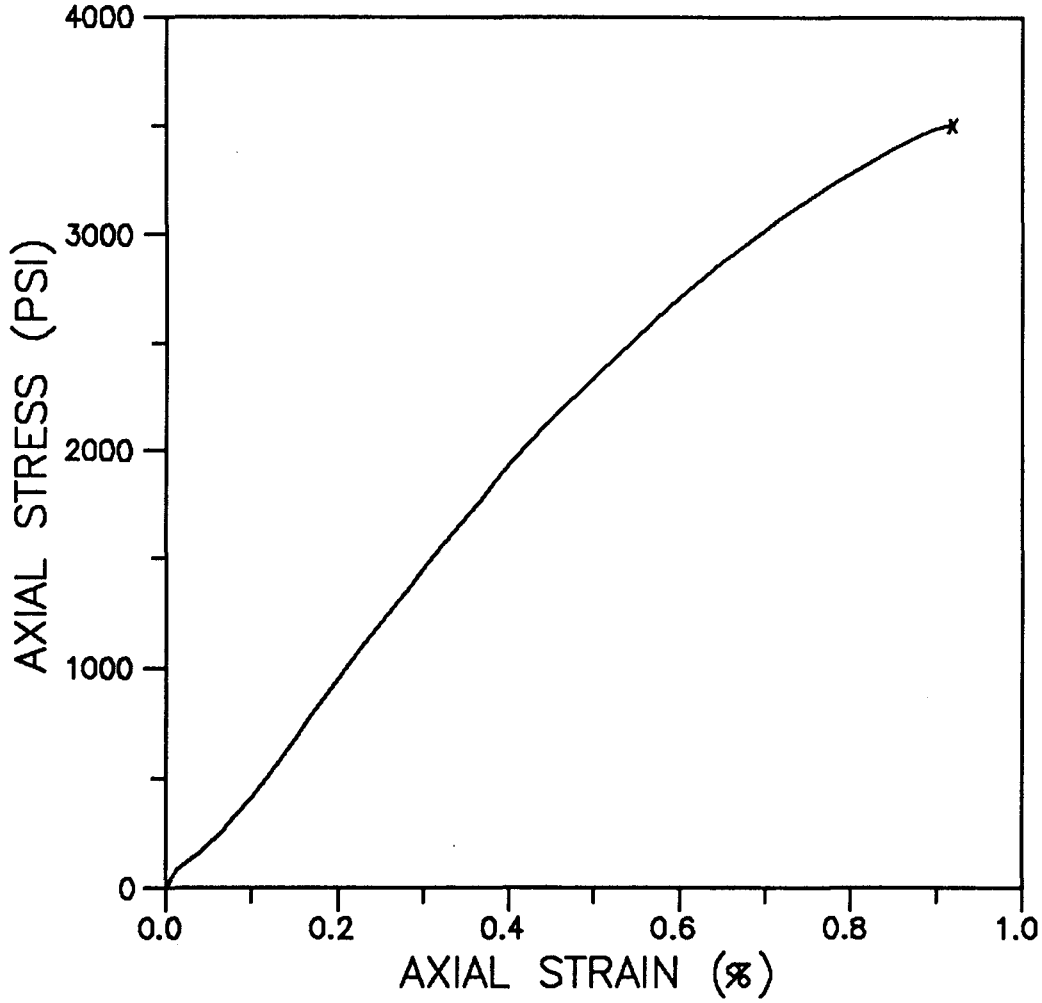
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: B14
DEPTH (FT): 158.1
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.6
DRY UNIT WEIGHT (PCF): 127.1
DEG. OF SATURATION (%):87.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.87 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

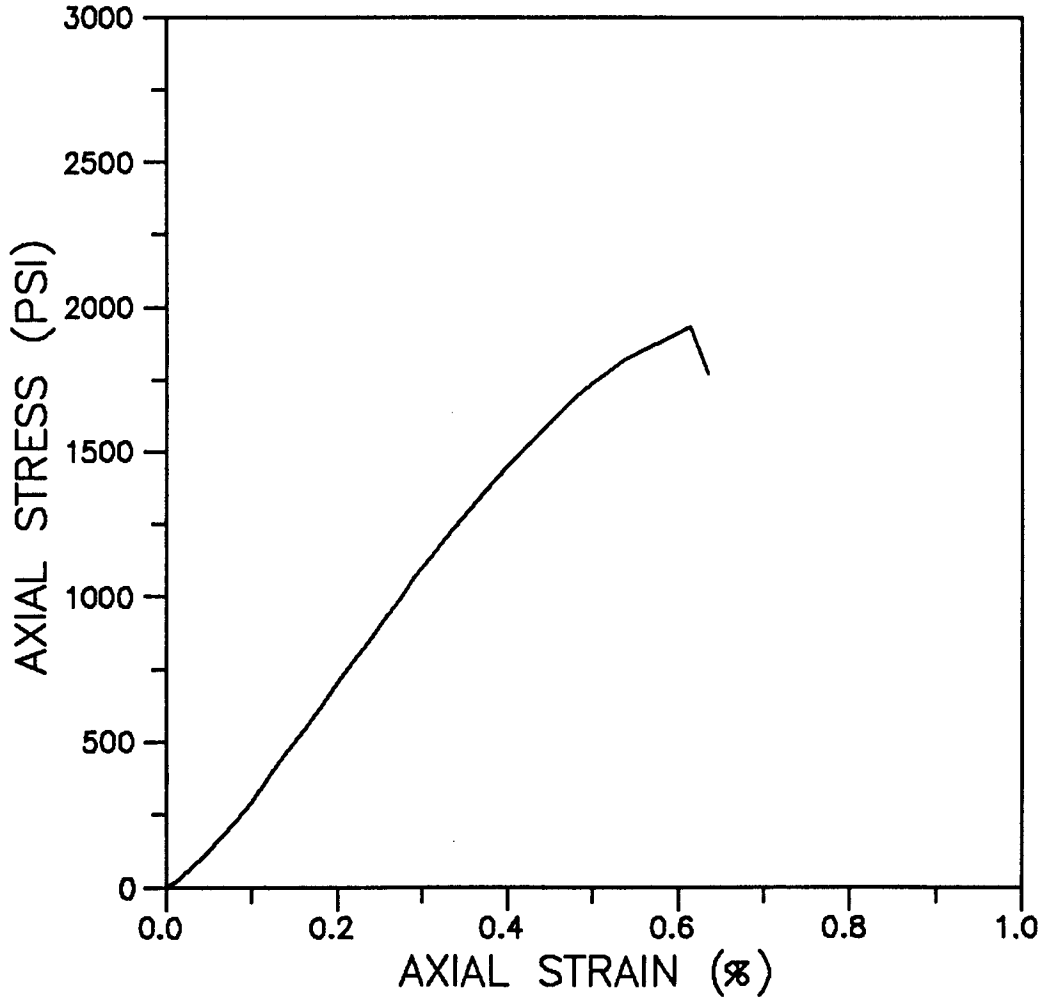
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI4
DEPTH (FT): 162.7
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.0
DRY UNIT WEIGHT (PCF): 118.1
DEG. OF SATURATION (%): 94.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.97 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

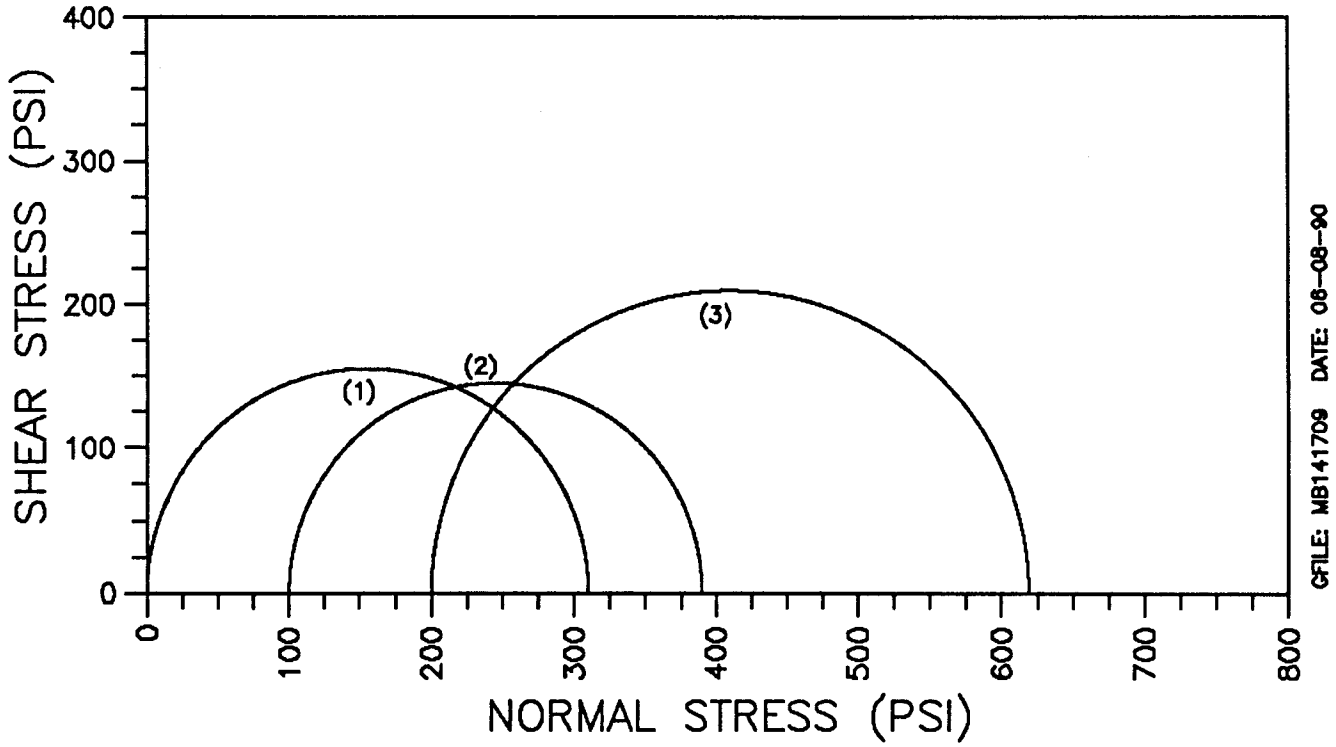
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B14
DEPTH RANGE (FT): 170.9–173.2
EAGLE FORD SHALE



GFILE: MB141709 DATE: 08-08-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 170.9
(2) DEPTH (FT): 171.6
(3) DEPTH (FT): 172.8

INCLINATION (DEG.): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

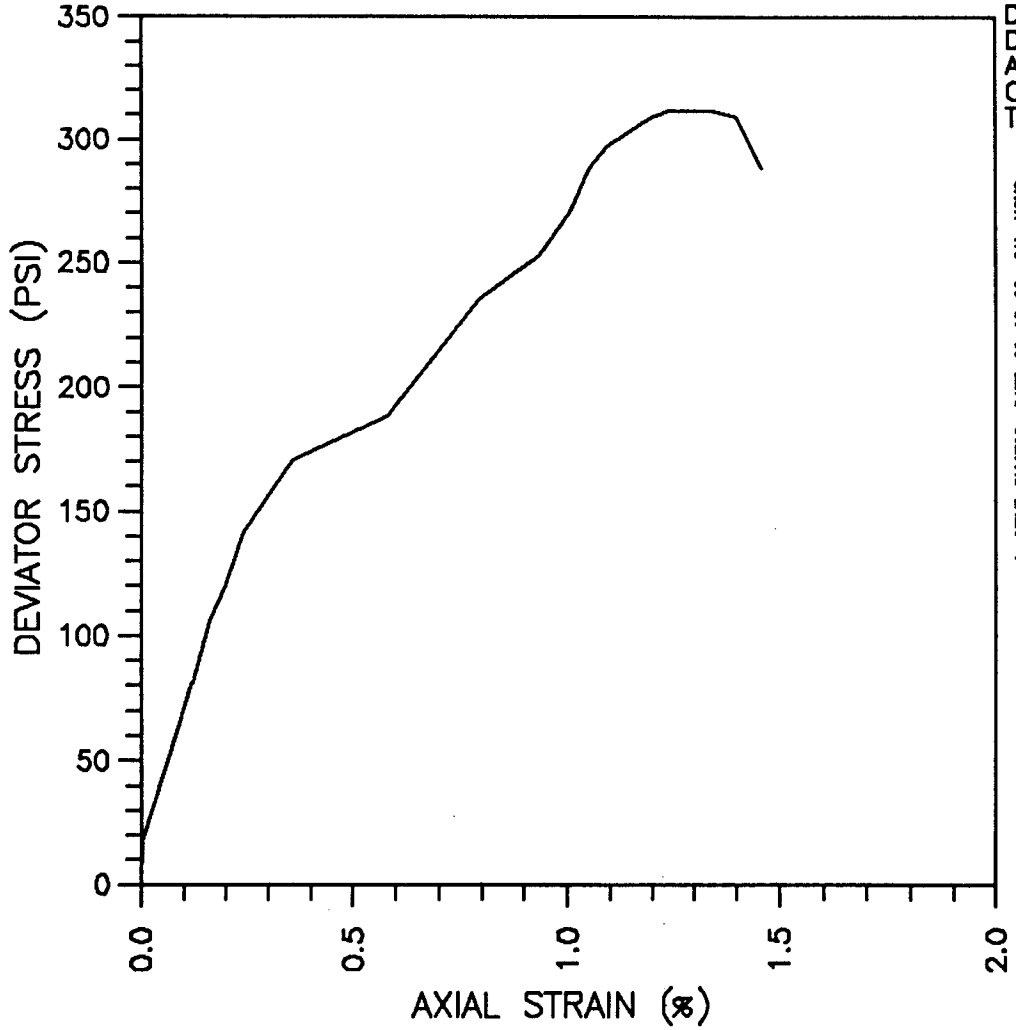
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI4
DEPTH (FT): 170.9
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.4
DRY UNIT WEIGHT (PCF): 114.4
DEG. OF SATURATION (%): 93.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: BI41709 DATE: 06-06-90 CAL: MCU2

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.267 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

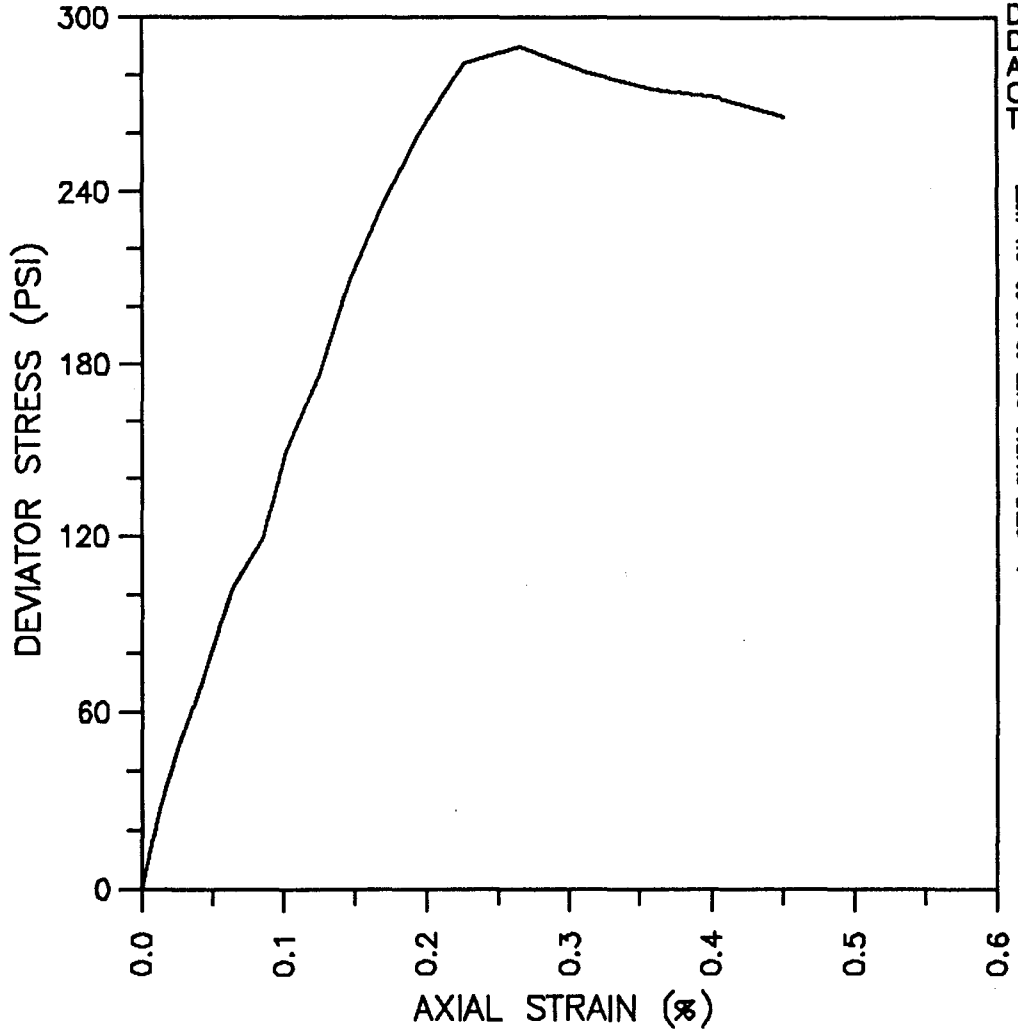
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI4
DEPTH (FT): 171.6
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.5
DRY UNIT WEIGHT (PCF): 115.2
DEG. OF SATURATION (%): 96.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

CFILE: BI41716 DATE: 06-06-90 CAL: MCT3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.375 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 40 DEG
AND 50 DEG

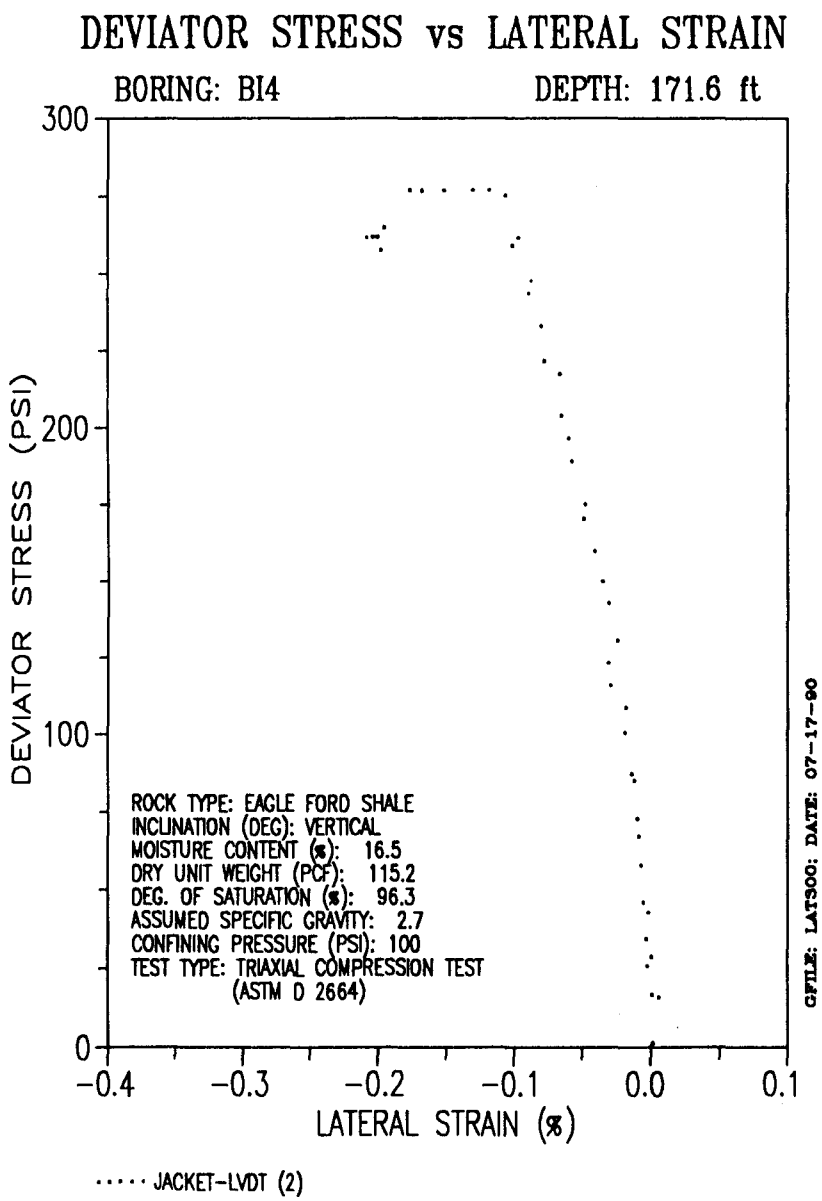
TEXAS SSC SITE

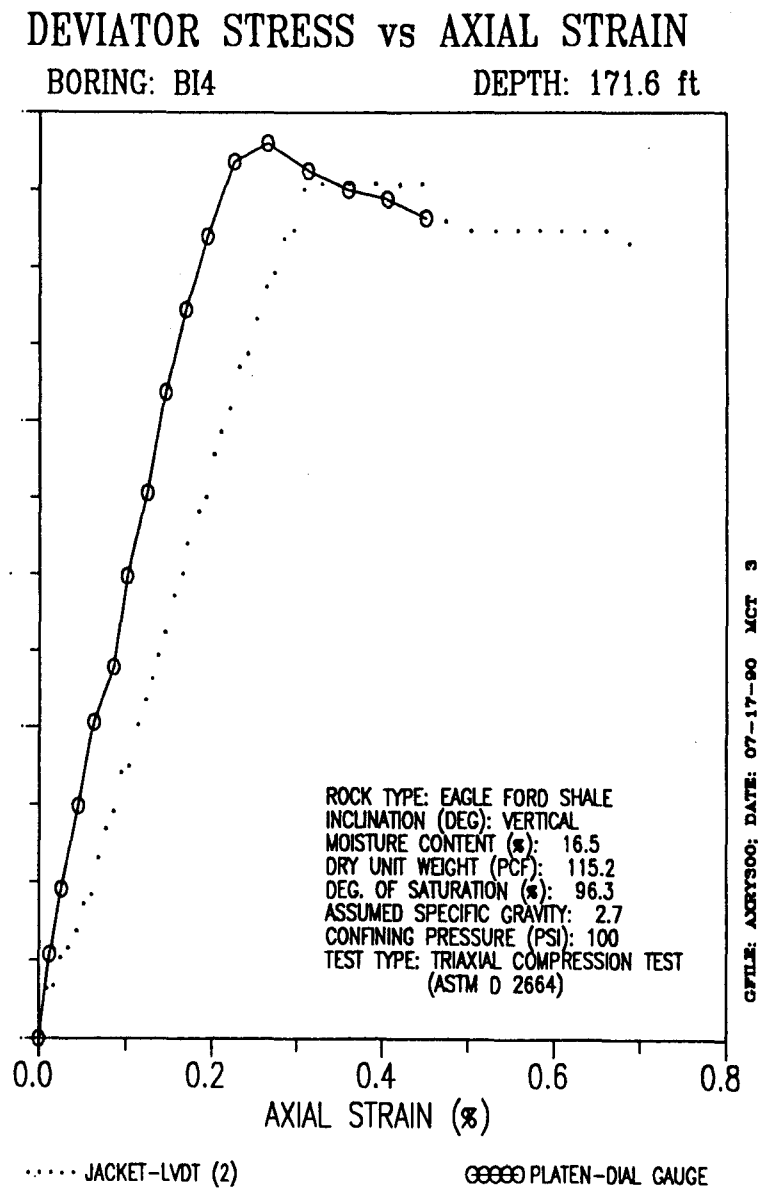
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

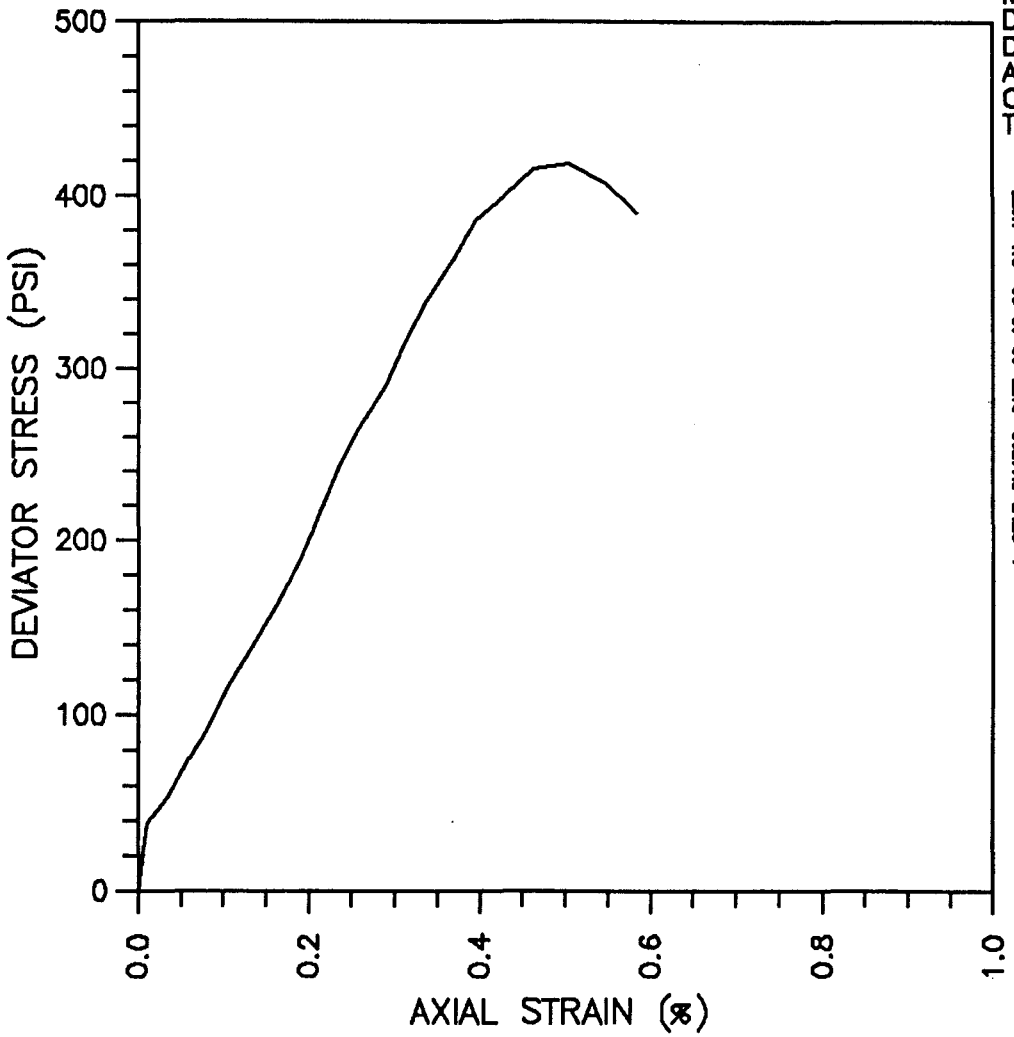
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI4
DEPTH: 171.6 ft
DEVIATOR STRESS (PSI)
300
200
100
0
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.5
DRY UNIT WEIGHT (PCF): 115.2
DEG. OF SATURATION (%): 96.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT300; DATE: 07-17-90
JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI4
DEPTH: 171.6 ft
0.0
0.2
0.4
0.6
0.8
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.5
DRY UNIT WEIGHT (PCF): 115.2
DEG. OF SATURATION (%): 96.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY300; DATE: 07-17-90 MCT 3
JACKET-LVDT (2)
PLATEN-DIAL GAUGE

BORING NO.: B14
DEPTH (FT): 172.8
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.8
DRY UNIT WEIGHT (PCF): 113.2
DEG. OF SATURATION (%): 93.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: B141728 DATE: 08-08-90 CAL: MCT3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.176 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 40 DEG

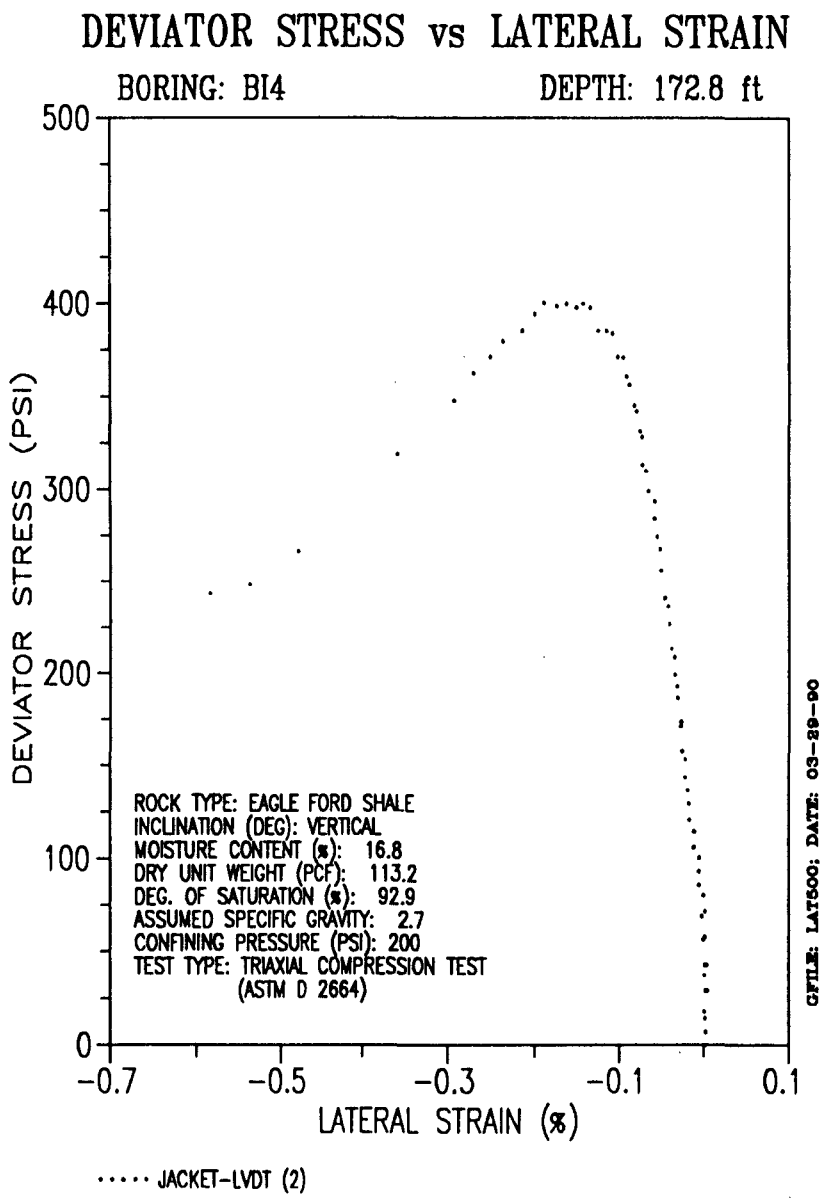
TEXAS SSC SITE

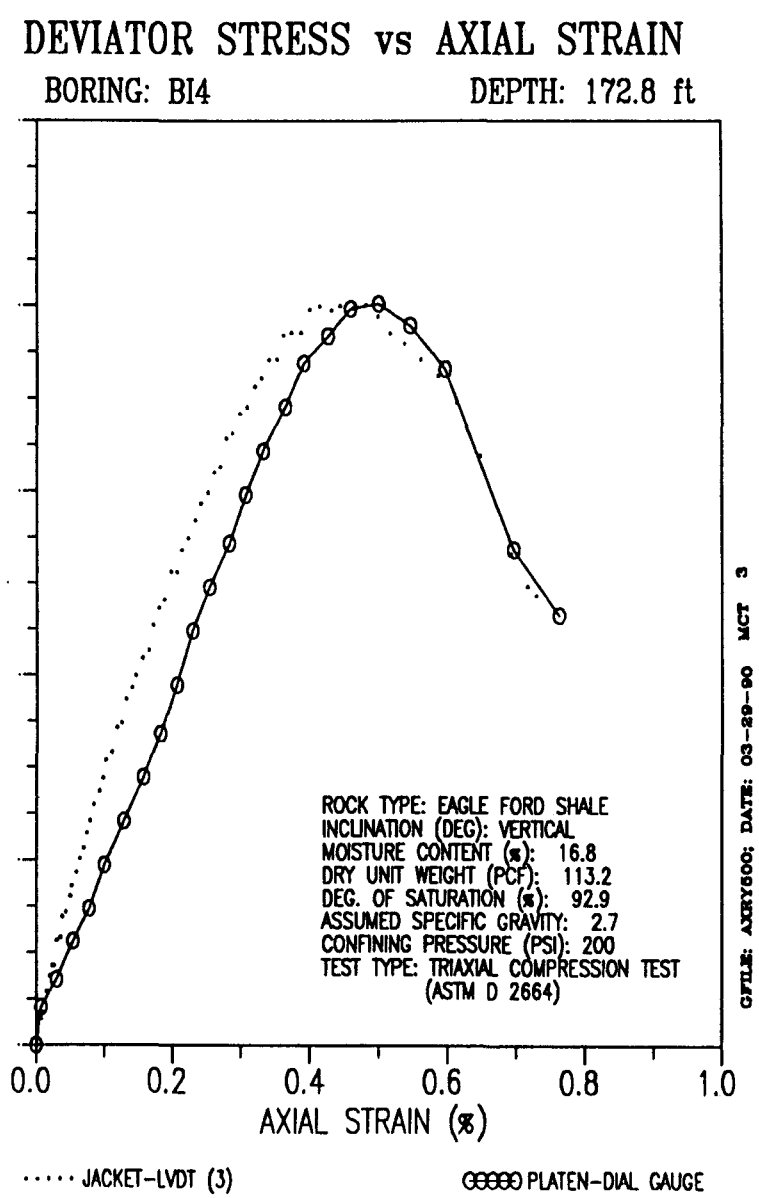
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

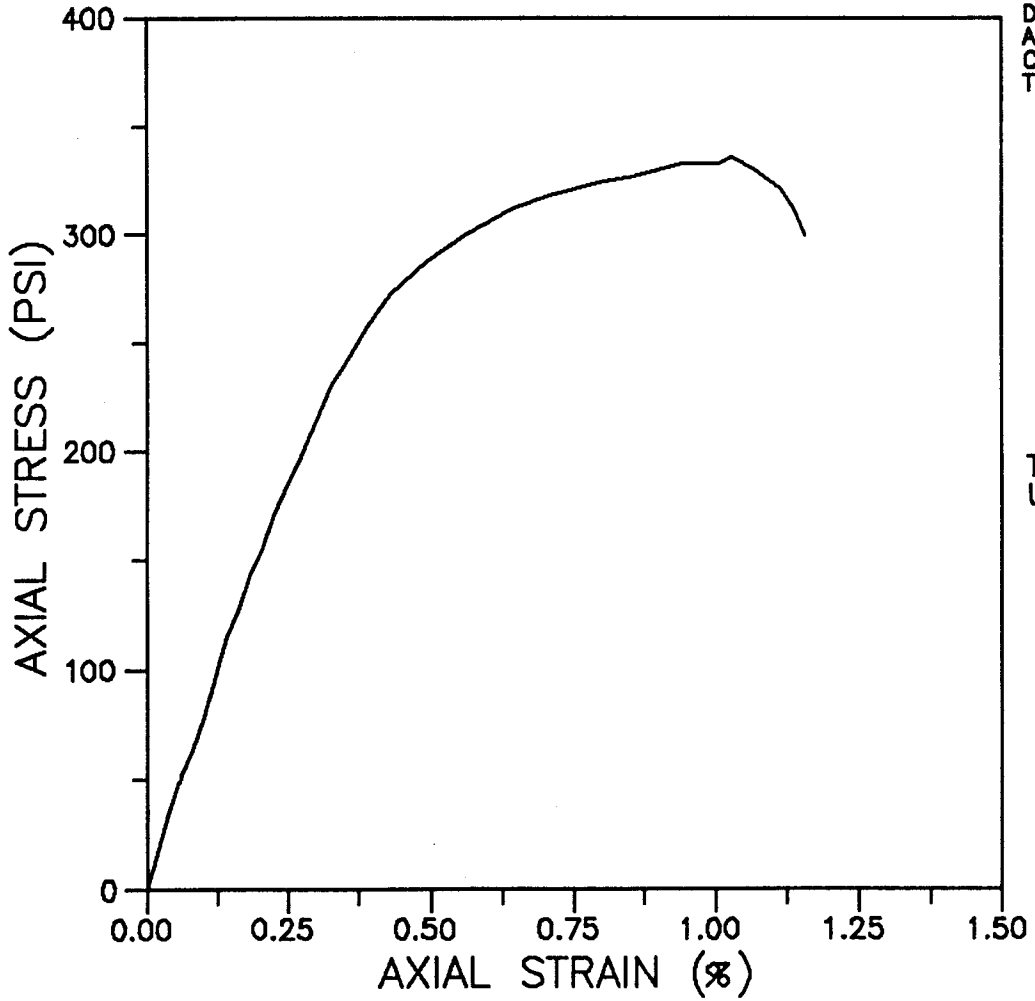
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI4
DEPTH: 172.8 ft
DEVIATOR STRESS (PSI)
500
400
300
200
100
0
-0.7
-0.5
-0.3
-0.1
0.1
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.8
DRY UNIT WEIGHT (PCF): 113.2
DEG. OF SATURATION (%): 92.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT500; DATE: 03-29-90
JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI4
DEPTH: 172.8 ft
0.0
0.2
0.4
0.6
0.8
1.0
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.8
DRY UNIT WEIGHT (PCF): 113.2
DEG. OF SATURATION (%): 92.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY500; DATE: 03-29-90 MCT 3
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: BI4
DEPTH (FT): 176.3
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.0
DRY UNIT WEIGHT (PCF): 118.2
DEG. OF SATURATION (%): 101.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.40 x 10E4 PSI

FAILURE MODE:
BARRELING / BULGING

TEXAS SSC SITE

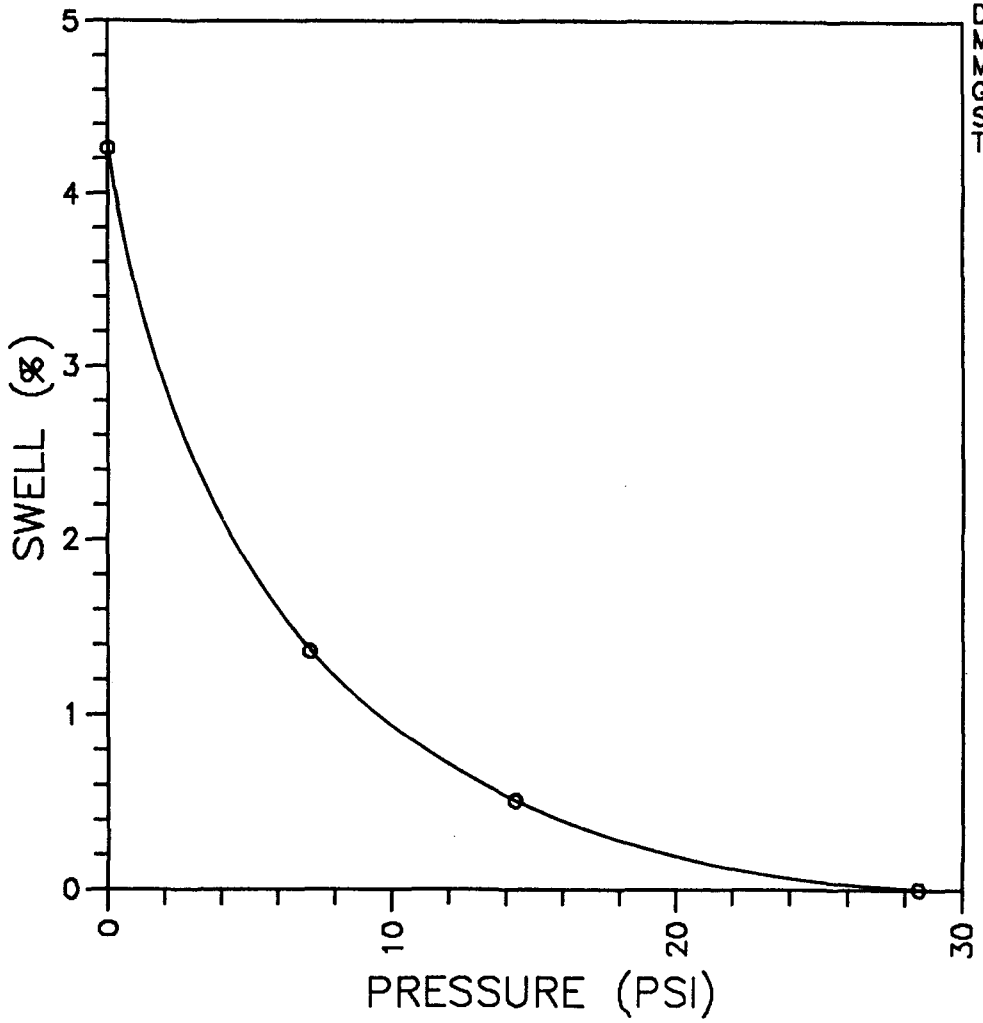
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: BI4
DEPTH (FT): 170.6
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
DRY UNIT WEIGHT (PCF): 115.5
M.C. BEFORE TEST (%): 17.6
M.C.AFTER TEST (%): 22.9
GAIN IN MOISTURE (%): 5.4
SWELLING PRESSURE INDEX (PSI): 29
TEST TYPE: SWELLING PRESSURE INDEX (ISRM)

TEXAS SSC SITE

SWELLING PRESSURE INDEX

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

GEOMECHANICAL TEST RESULTS

BORING BI 5

TABLE E-6. GEOMECHANICAL TEST RESULTS - BORING B1 5

GENERAL LITHOLOGY	BORING DEPTH	MOISTURE CONTENT	DRY DENSITY	SPECIFIC GRAVITY	ATTERBERG LIMITS		FRACTION FINER THAN # 200 SIEVE	CARBONATE CONTENT	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES *	UNCONFINED COMPRESSIVE STRENGTH	TRIAXIAL COMPRESSION		FAILURE STRAIN	TANGENT YOUNG'S MODULUS			POISSON'S RATIO	BRAZIL TENSILE STRENGTH	2ND CYCLE SLAKE DURABILITY INDEX	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX	COMMENTS
					LL	PI						CONFINING PRESSURE σ_3	DEVIATOR STRESS $\sigma_1-\sigma_3$		E50	UNLOAD/ RELOAD	σ_3						
	feet	percent	pcf				percent	percent			psi	psi	psi	percent	(psi)x10E5	(psi)x10E5	psi		psi	percent		psi	
AUSTIN CHALK	35.4	14.1																					
AUSTIN CHALK	35.6	13.8	121.4						2.3	E	2737			0.48	6.75		0						NOTE 1
AUSTIN CHALK	52.3	16.0																					
AUSTIN CHALK	52.4	16.4	116.2						2.3	B-1/30	2591			0.47	7.88		0						
AUSTIN CHALK	70.3	15.0																					
AUSTIN CHALK	70.4	12.6	123.8						2.3	D	2259			1.18	2.44		0						
AUSTIN CHALK	93.6	15.6																					
AUSTIN CHALK	93.7	14.2	121.6						2.2	B-1/45	411			1.03	0.46		0						
AUSTIN CHALK	114.5	15.0																					
AUSTIN CHALK	114.6	15.0	114.7						2.4	D	2094			0.57	4.46		0						
AUSTIN CHALK	135.5	13.5																					
BENTONITE	141.0	17.1																					
AUSTIN CHALK	161.5	10.7							0.5										270				
AUSTIN CHALK	161.6	12.3	122.1						2.3	B-1/45	2658			0.95	3.20		0						
AUSTIN CHALK	162.4																				0.606		
AUSTIN CHALK	184.7	13.0	123.4						2.3	D	1712			0.59	2.94		0						
AUSTIN CHALK	185.3	12.9	121.6																				
AUSTIN CHALK	185.6	11.9	123.3	2.69					2.3	D		100	2452	0.86	2.96		100						
AUSTIN CHALK	185.6														3.47			0.10					NOTE 2
AUSTIN CHALK	186.0	10.5	130.6						2.3	B-1/30		200	2031	1.01	1.94		200						
AUSTIN CHALK	186.0														2.57			0.13 (2)					NOTES 2 and 3
BENTONITE	186.7	33.6			139	100	98.7																
AUSTIN CHALK	202.4	9.5	131.9																				
BENTONITE	202.9				99	64																	
AUSTIN CHALK	229.8	15.7																					
AUSTIN CHALK	230.0	15.5	118.2						2.3	B-1/30	2851			0.64	5.33		0						
AUSTIN CHALK	250.8	12.4																					
AUSTIN CHALK	250.9	12.7	123.8						2.2	D	2889			0.67	6.67		0						
EAGLE FORD SHALE	262.4			2.74																			
EAGLE FORD SHALE	262.6	15.2			119	82	99.2																
EAGLE FORD SHALE	262.7	14.7																		20.8			
EAGLE FORD SHALE	263.5	14.7																					
EAGLE FORD SHALE	263.7	15.0	119.0					7.4	2.0	B-1/45	385			0.69	0.65		0						
EAGLE FORD SHALE	271.9	15.3			118	81	100.0																
EAGLE FORD SHALE	272.4	14.9	118.9																				
EAGLE FORD SHALE	272.6			2.74				9.4															
EAGLE FORD SHALE	272.8	16.2	117.2																			57.7	
EAGLE FORD SHALE	273.0	15.9	118.9																			43.4	
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

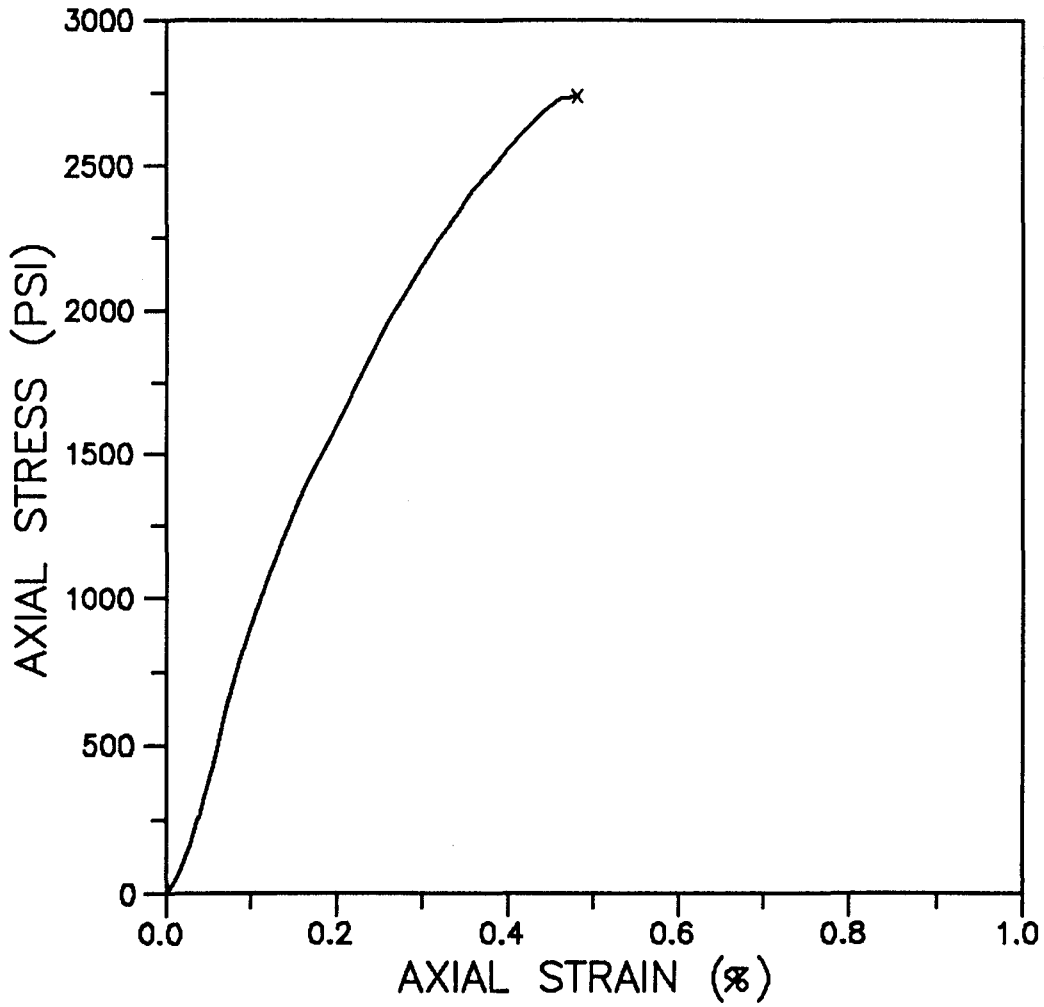
Symbol	Failure Type	Symbol	Failure Type
A	No discernible failure plane	B-4	Combination
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core	C	Barreling/Bulging
B-1	Shear plane	D	Longitudinal (axial) splitting
B-2	Bedding plane shear	E	Conical
B-3	Shear plane along pre-existing fracture, shear zone, etc.	F	No information

NOTES: 1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

2) Modulus and Poisson's ratio calculated from axial and lateral strains measured using LVDTs. Axial gage length is 2.8 inches.

3) For Poisson's ratio values: the value within parentheses indicates the number of LVDTs recording lateral strains. Otherwise all 3 LVDTs recorded strains.

BORING NO: BI5
DEPTH (FT): 35.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.8
DRY UNIT WEIGHT (PCF): 121.4
DEG. OF SATURATION (%): 95.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.75 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

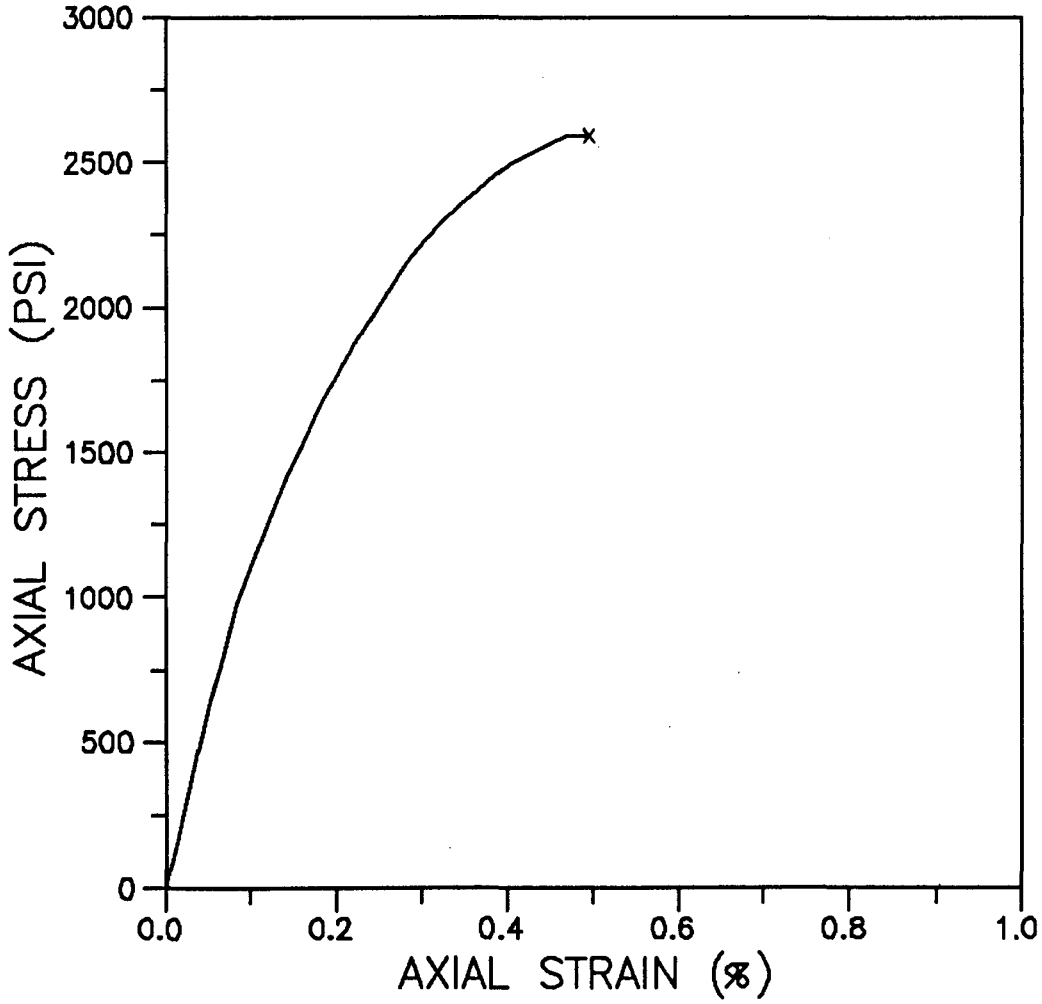
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI5
DEPTH (FT): 52.4
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.4
DRY UNIT WEIGHT (PCF): 116.2
DEG. OF SATURATION (%): 2.7
ASSUMED SPECIFIC GRAVITY: 98.2
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
7.88 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

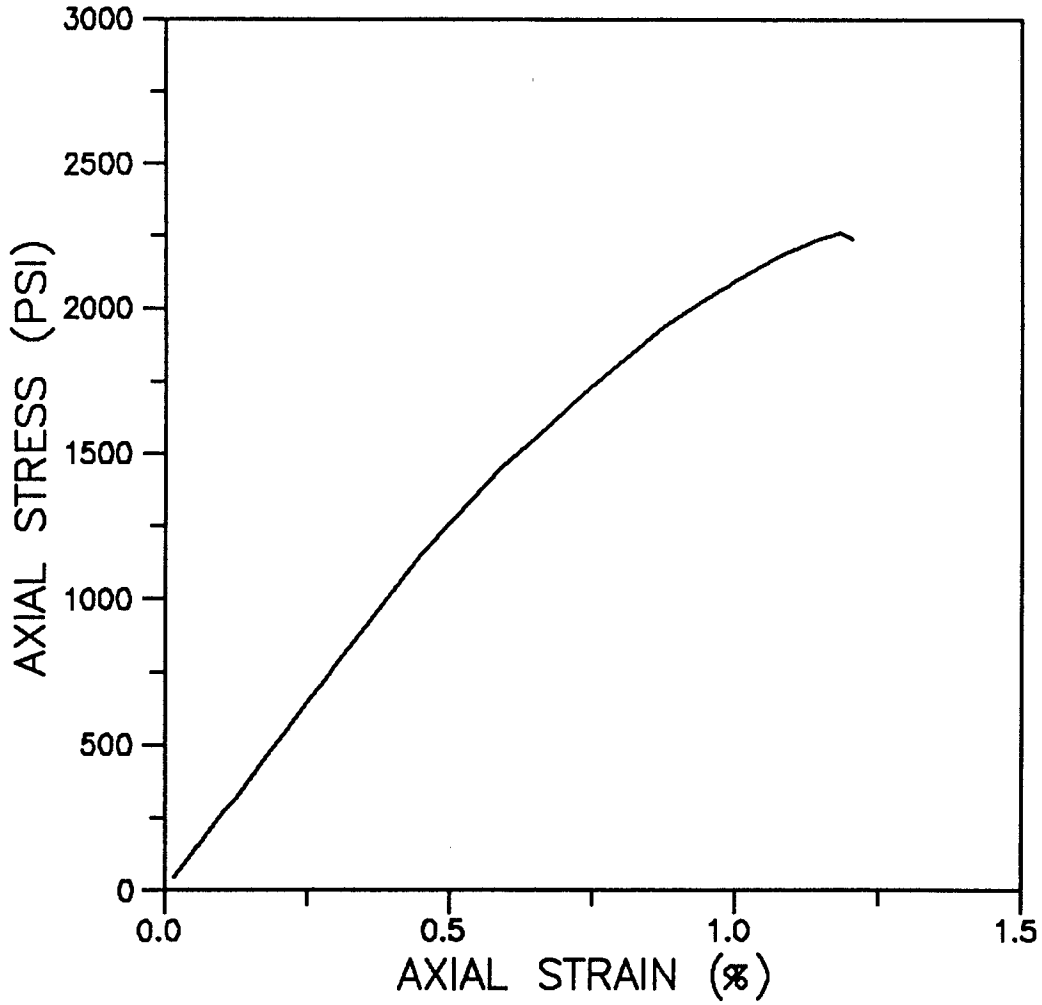
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI5
DEPTH (FT): 70.4
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.6
DRY UNIT WEIGHT (PCF): 123.8
DEG. OF SATURATION (%): 94.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.44 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

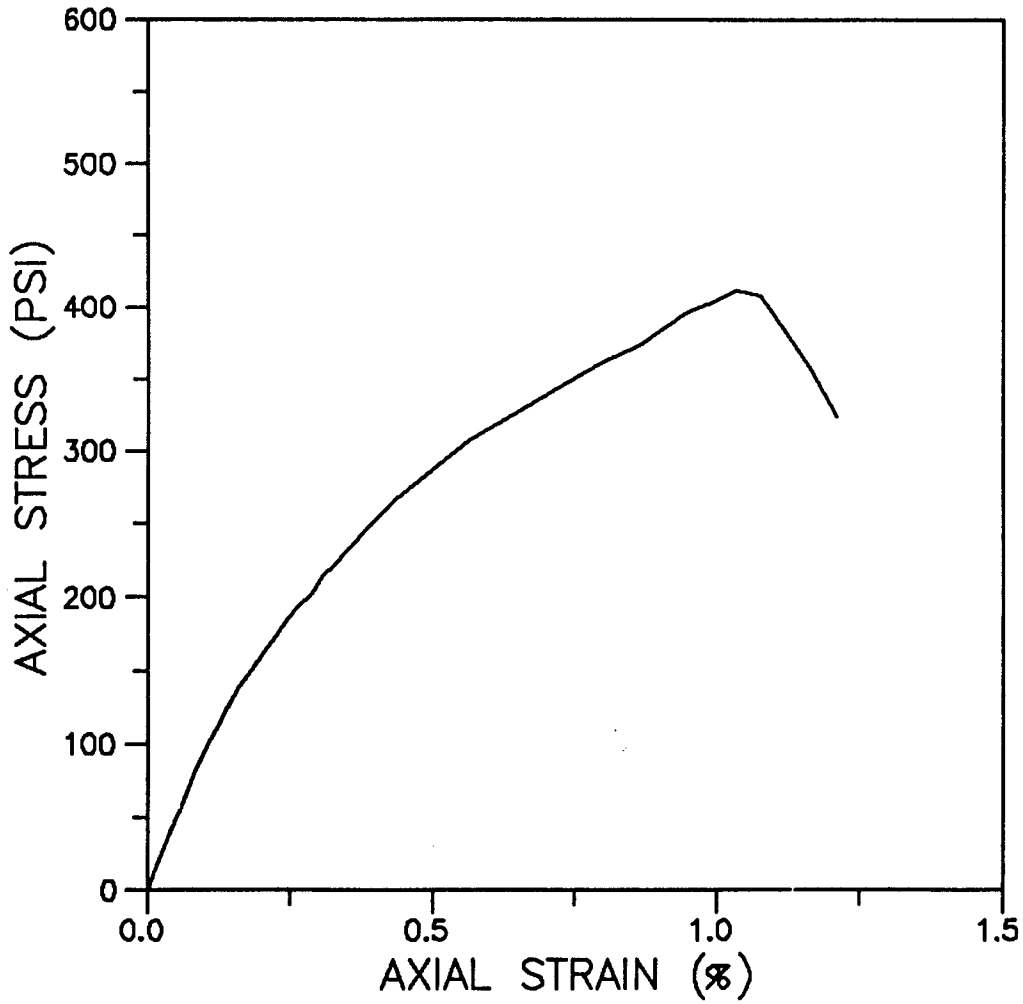
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI5
DEPTH (FT): 93.7
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.2
DRY UNIT WEIGHT (PCF): 121.6
DEG. OF SATURATION (%): 99.2
ASSUMED SPECIFIC GRAVITY: 2.7.
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.60 x 10E4 PSI

FAILURE MODE:
SHEAR AT TOP OF
SAMPLE

TEXAS SSC SITE

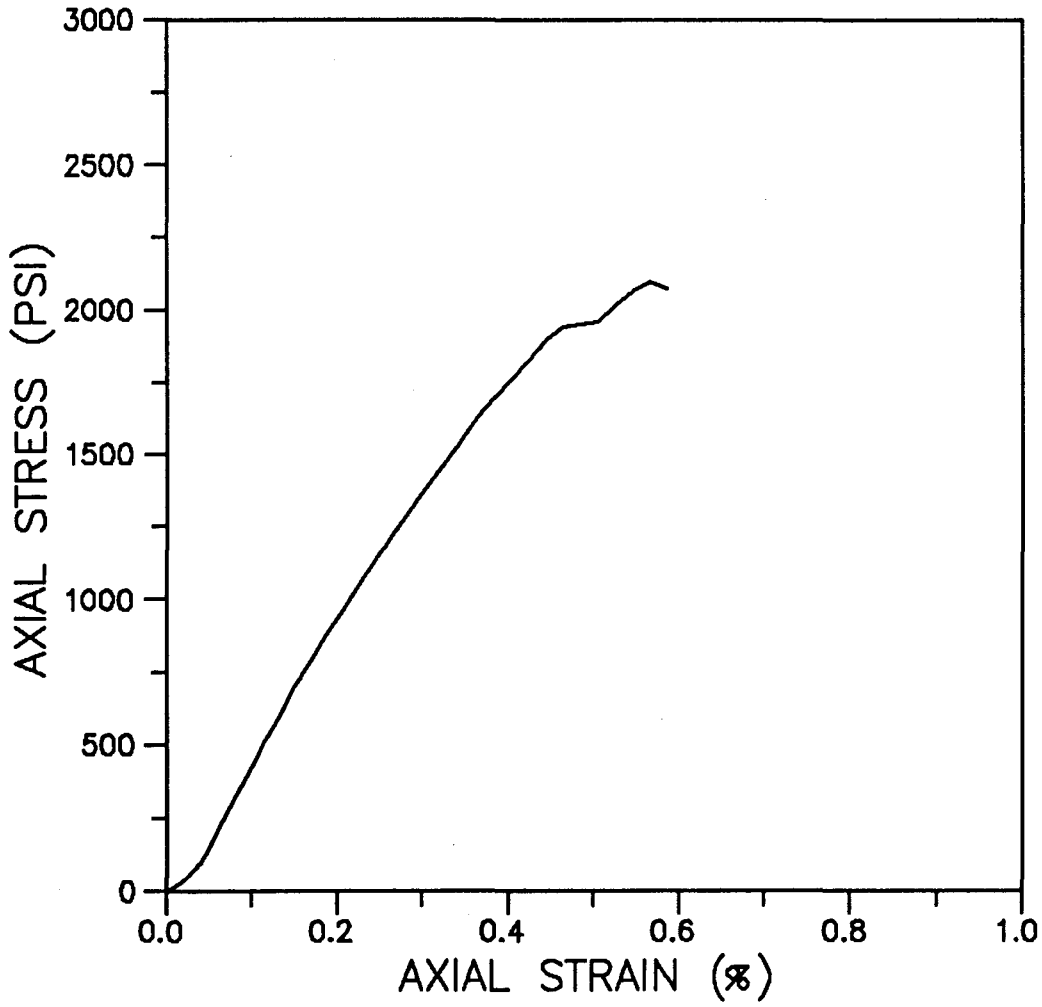
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI5
DEPTH (FT): 114.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.0
DRY UNIT WEIGHT (PCF): 114.7
DEG. OF SATURATION (%): 86.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.46 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

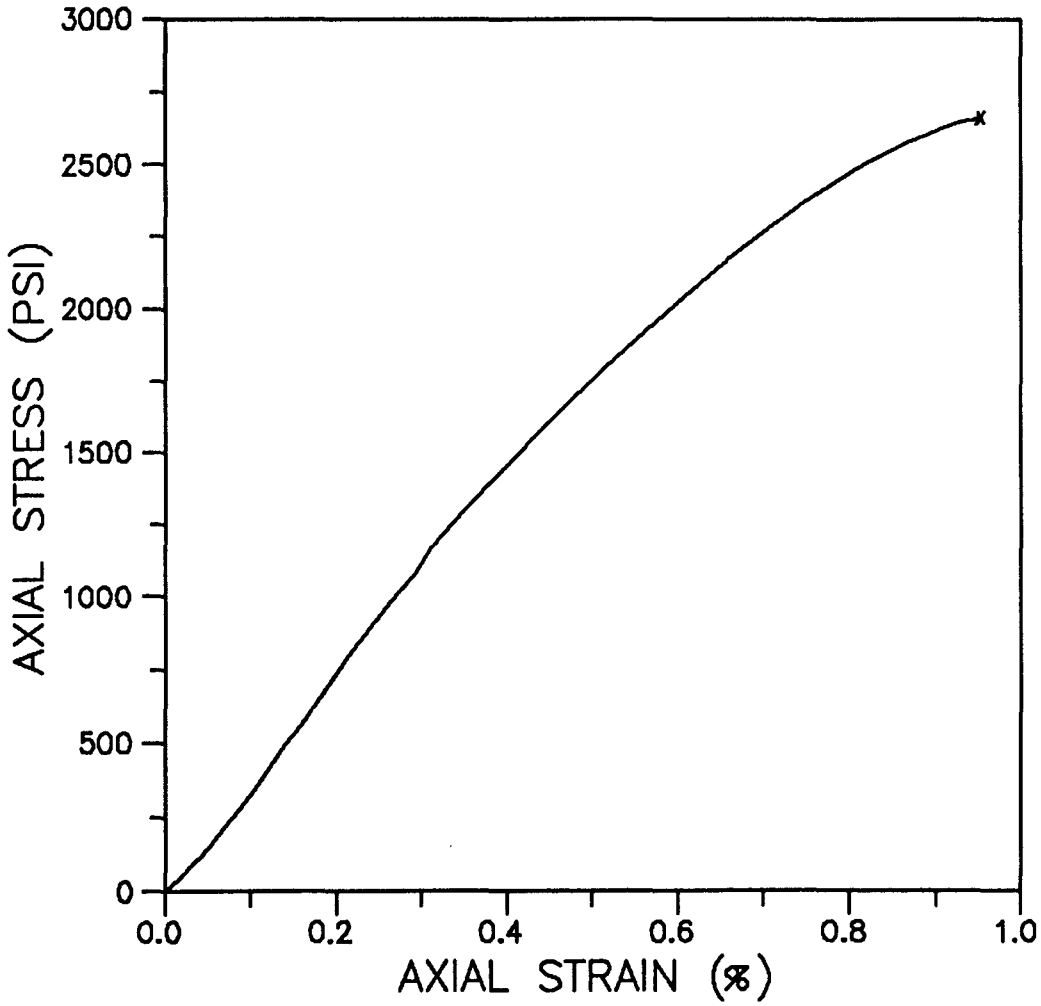
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: BI5
DEPTH (FT): 161.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.3
DRY UNIT WEIGHT (PCF): 122.1
DEG. OF SATURATION (%): 87.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.20 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 45 DEG

TEXAS SSC SITE

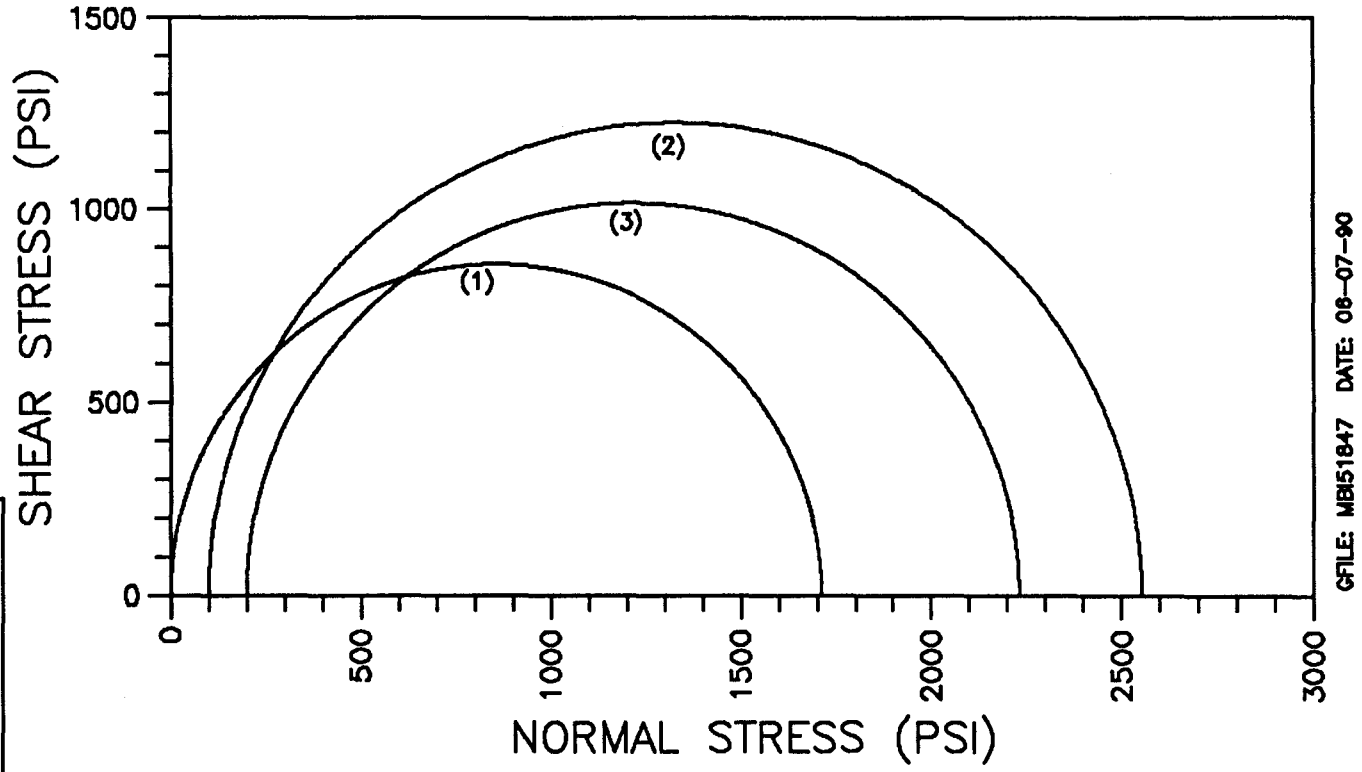
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: BI5
DEPTH RANGE (FT): 184.7–186.4
AUSTIN CHALK LIMESTONE



CFILE: MBI51847 DATE: 08-07-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 184.7
(2) DEPTH (FT): 185.6
(3) DEPTH (FT): 186.0

INCLINATION (DEG): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

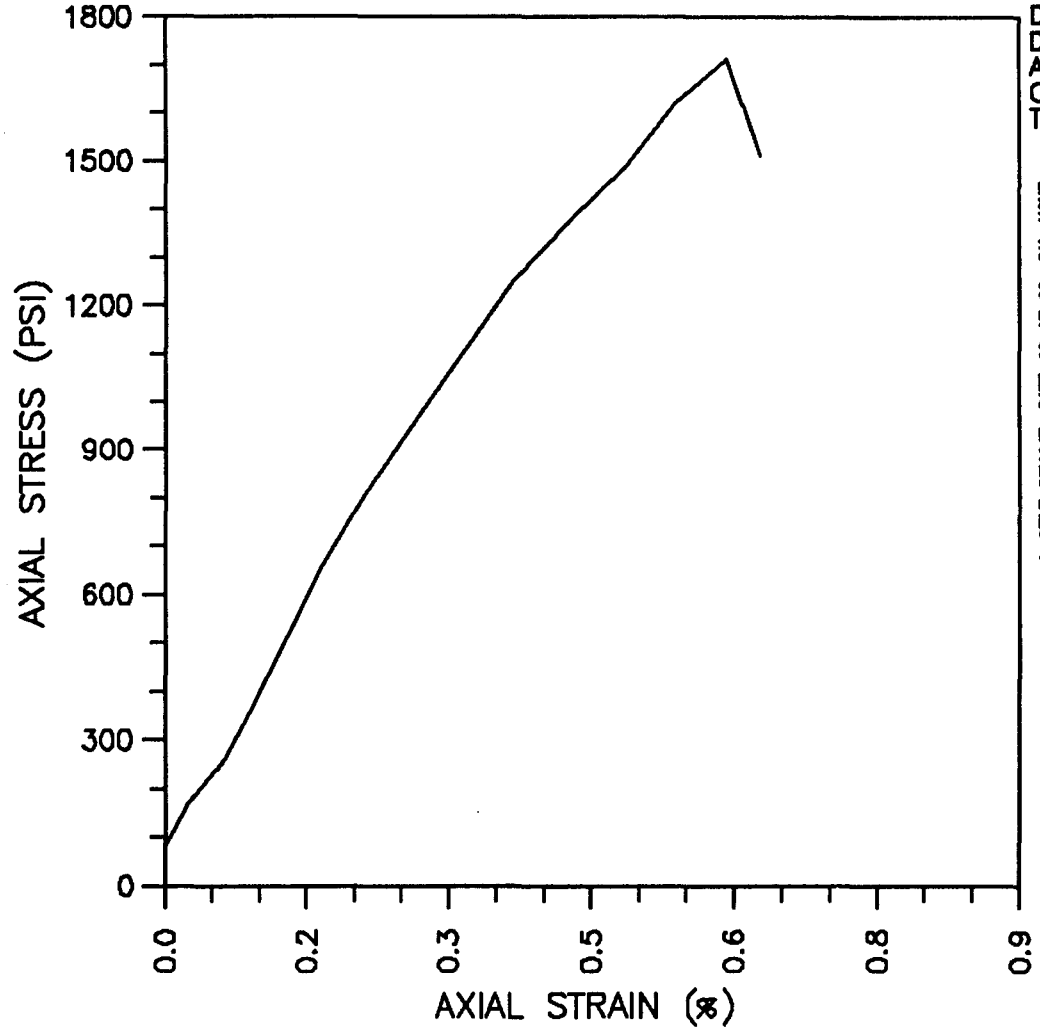
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI5
DEPTH (FT): 184.7
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.0
DRY UNIT WEIGHT (PCF): 123.4
DEG. OF SATURATION (%): 95.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: BI51847 DATE: 06-07-90 CAL: MCU3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.941 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

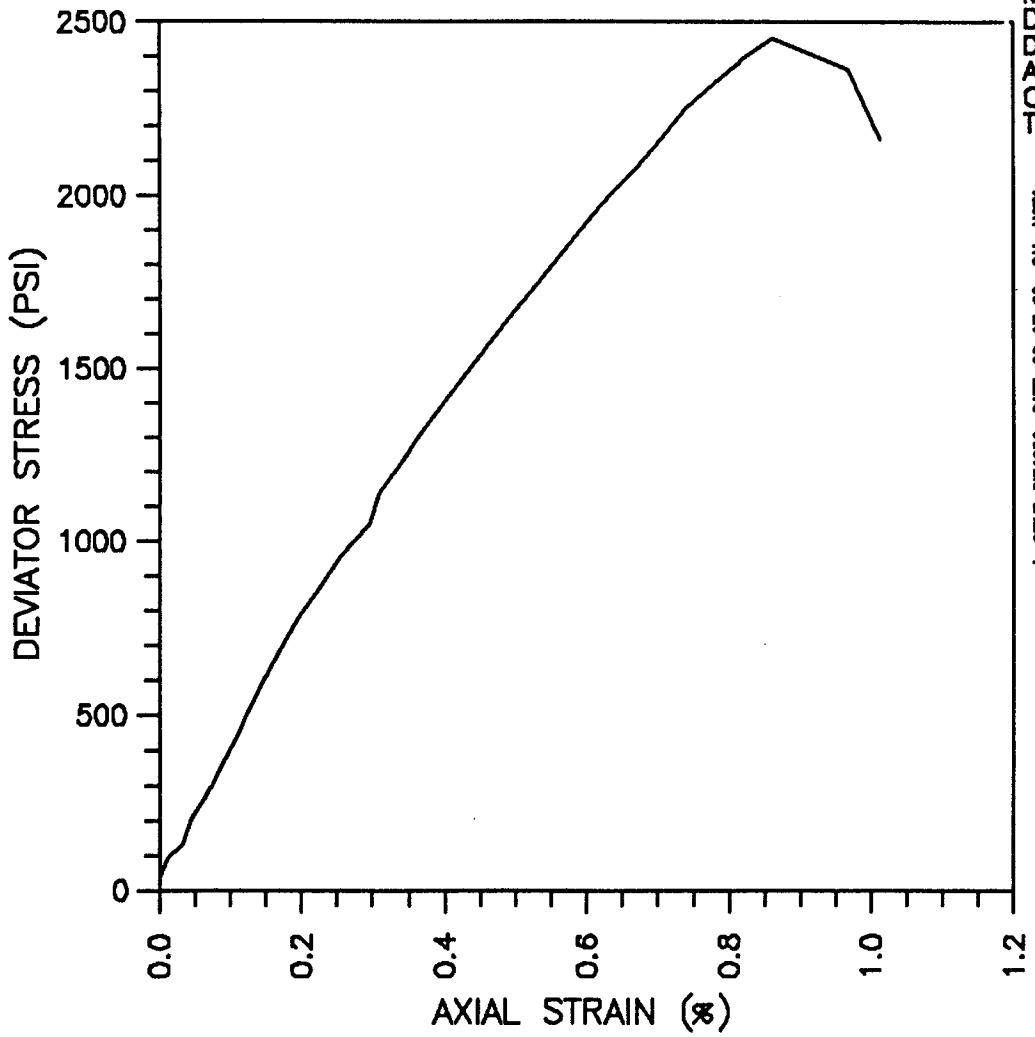
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI5
DEPTH (FT): 185.6
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.9
DRY UNIT WEIGHT (PCF): 123.3
DEG. OF SATURATION (%): 87.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: BI51654 DATE: 06-07-90 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.963 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

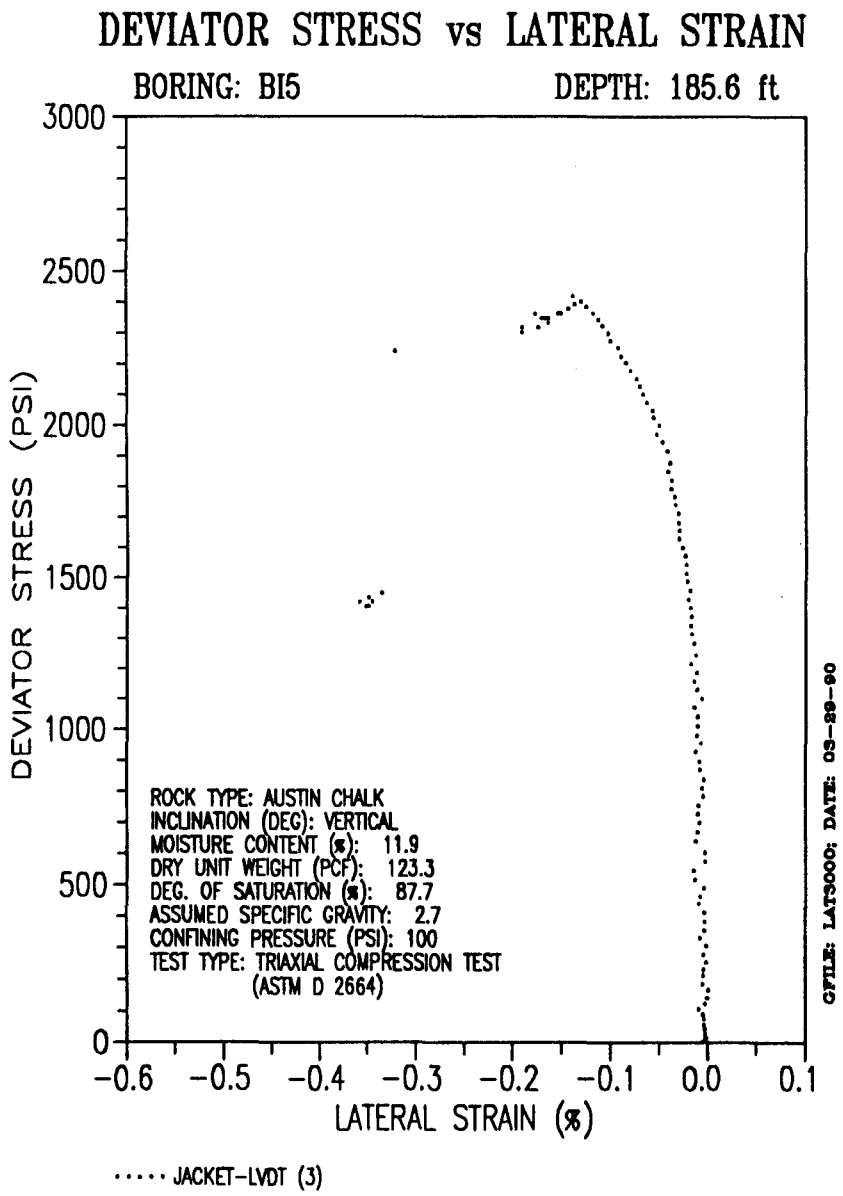
TEXAS SSC SITE

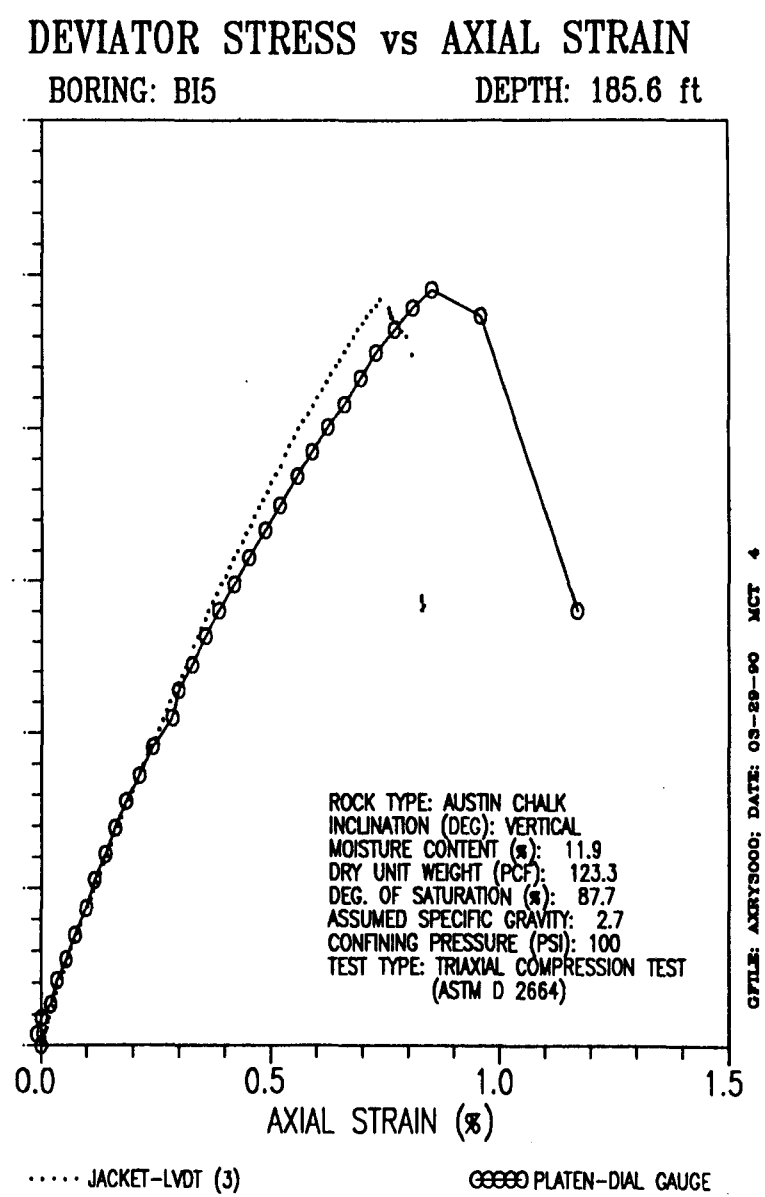
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

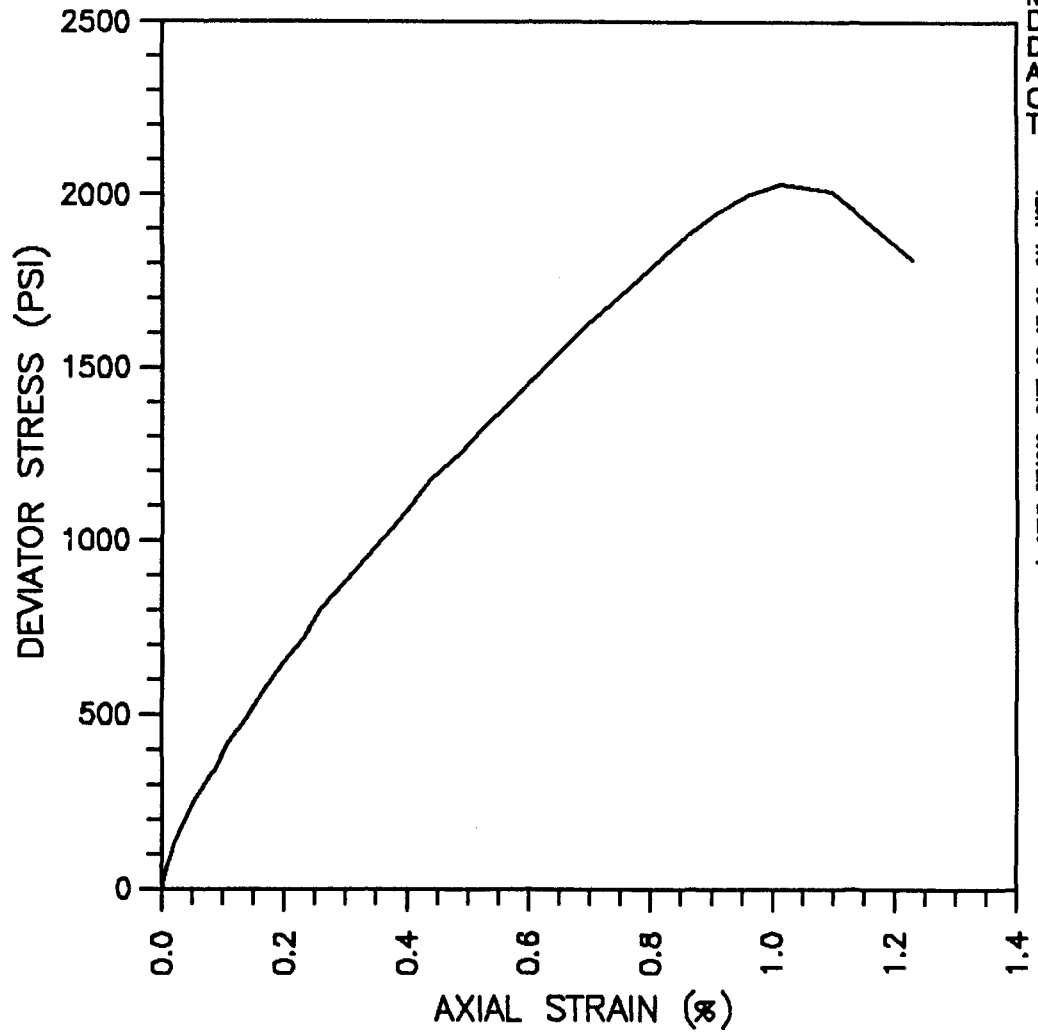
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI5
DEPTH: 185.6 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.6
-0.5
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.9
DRY UNIT WEIGHT (PCF): 123.3
DEG. OF SATURATION (%): 87.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 03-29-90
····· JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI5
DEPTH: 185.6 ft
0.0
0.5
1.0
1.5
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.9
DRY UNIT WEIGHT (PCF): 123.3
DEG. OF SATURATION (%): 87.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 03-29-90 MCT 4
····· JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BI5
DEPTH (FT): 186.0
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.5
DRY UNIT WEIGHT (PCF): 130.6
DEG. OF SATURATION (%): 97.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BI5180 DATE: 08-07-90 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.942 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

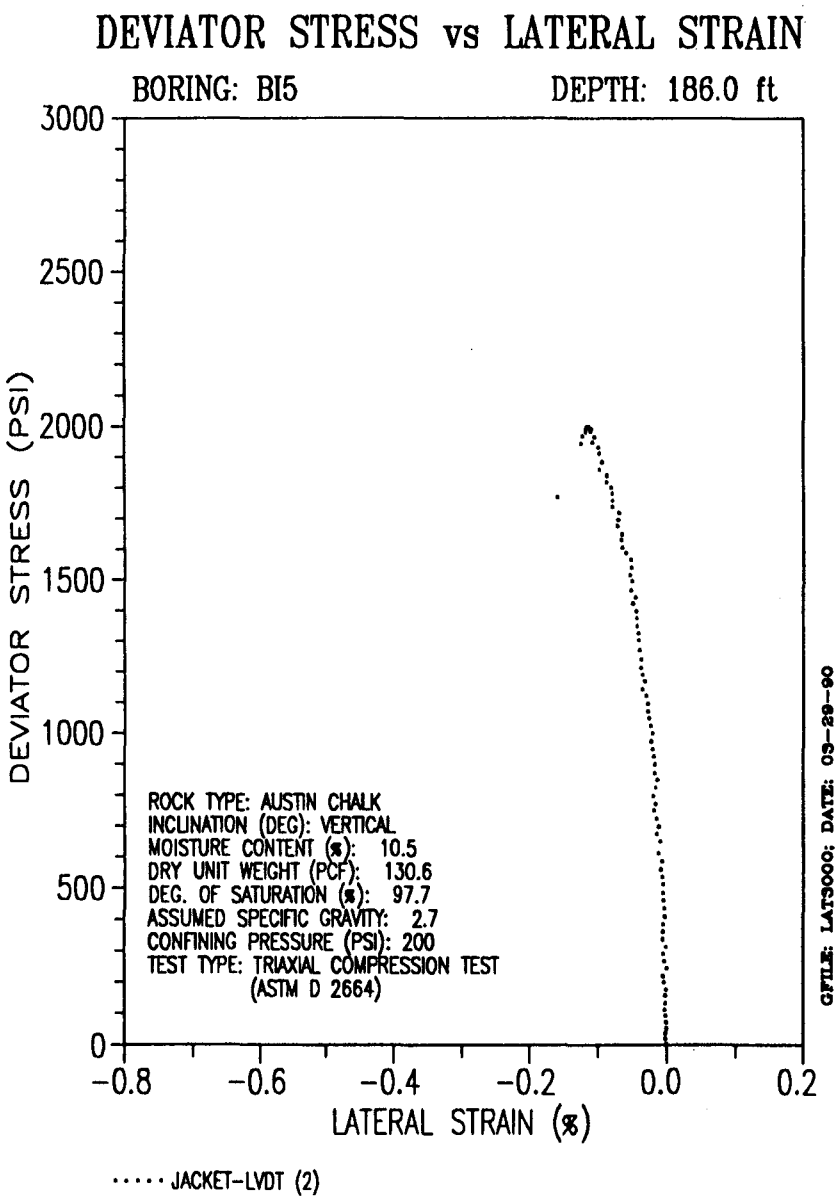
TEXAS SSC SITE

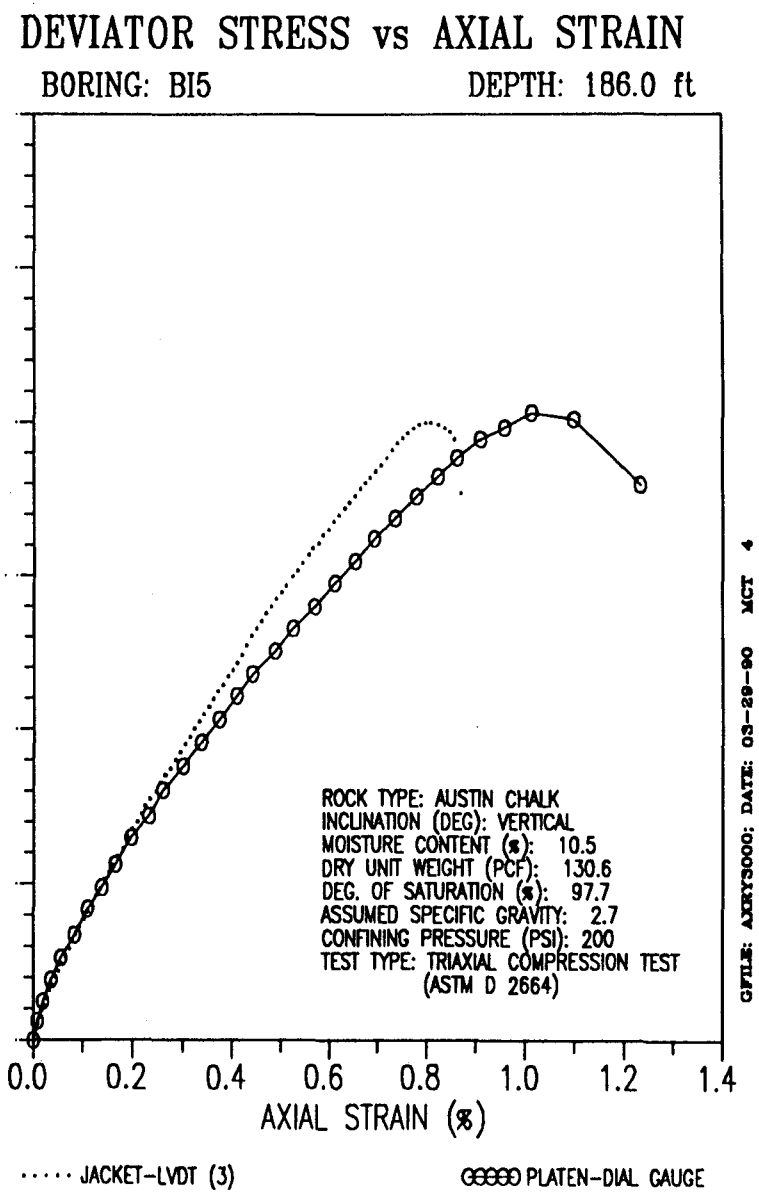
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

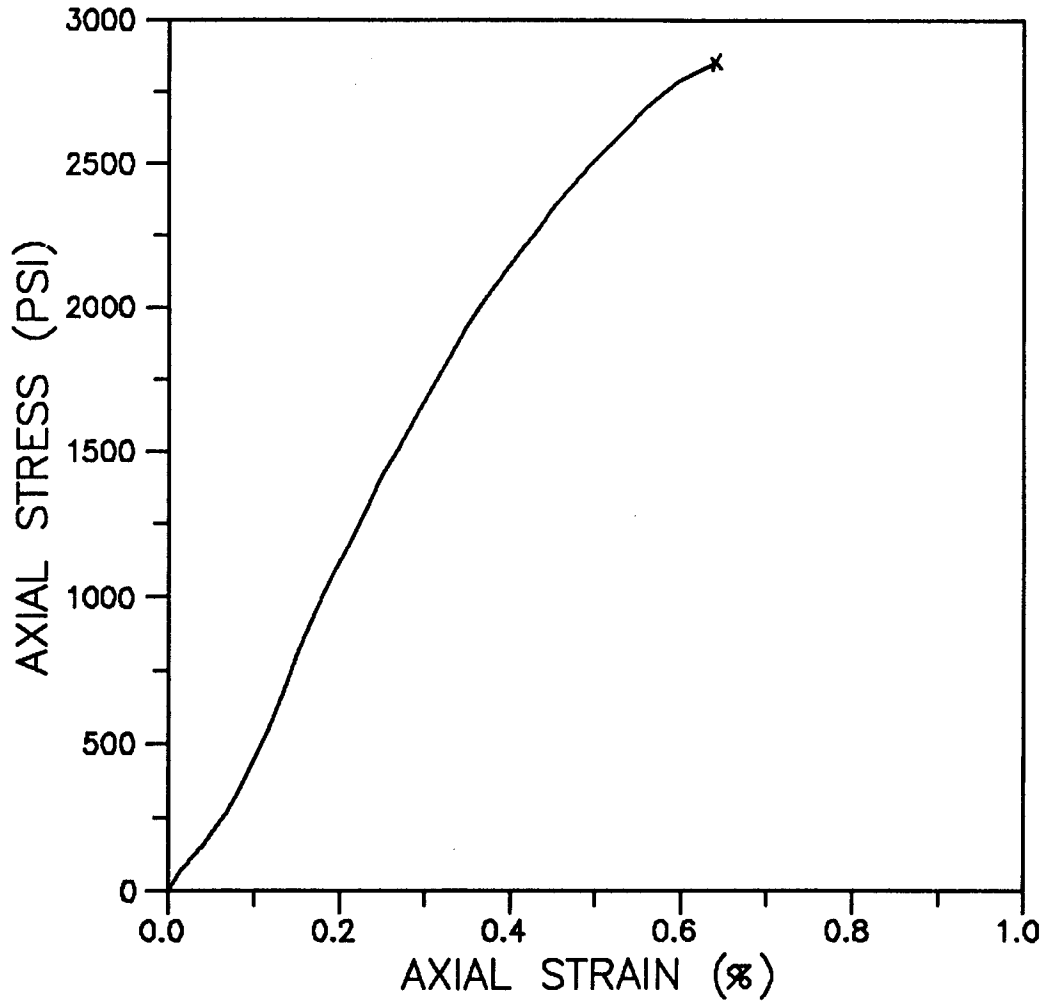
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI5
DEPTH: 186.0 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.5
DRY UNIT WEIGHT (PCF): 130.6
DEG. OF SATURATION (%): 97.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 03-29-90
····· JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI5
DEPTH: 186.0 ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.5
DRY UNIT WEIGHT (PCF): 130.6
DEG. OF SATURATION (%): 97.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 03-29-90 MCT 4
····· JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: BI5
DEPTH (FT): 230.0
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.5
DRY UNIT WEIGHT (PCF): 118.2
DEG. OF SATURATION (%): 2.7
ASSUMED SPECIFIC GRAVITY: 98.2
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.33 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

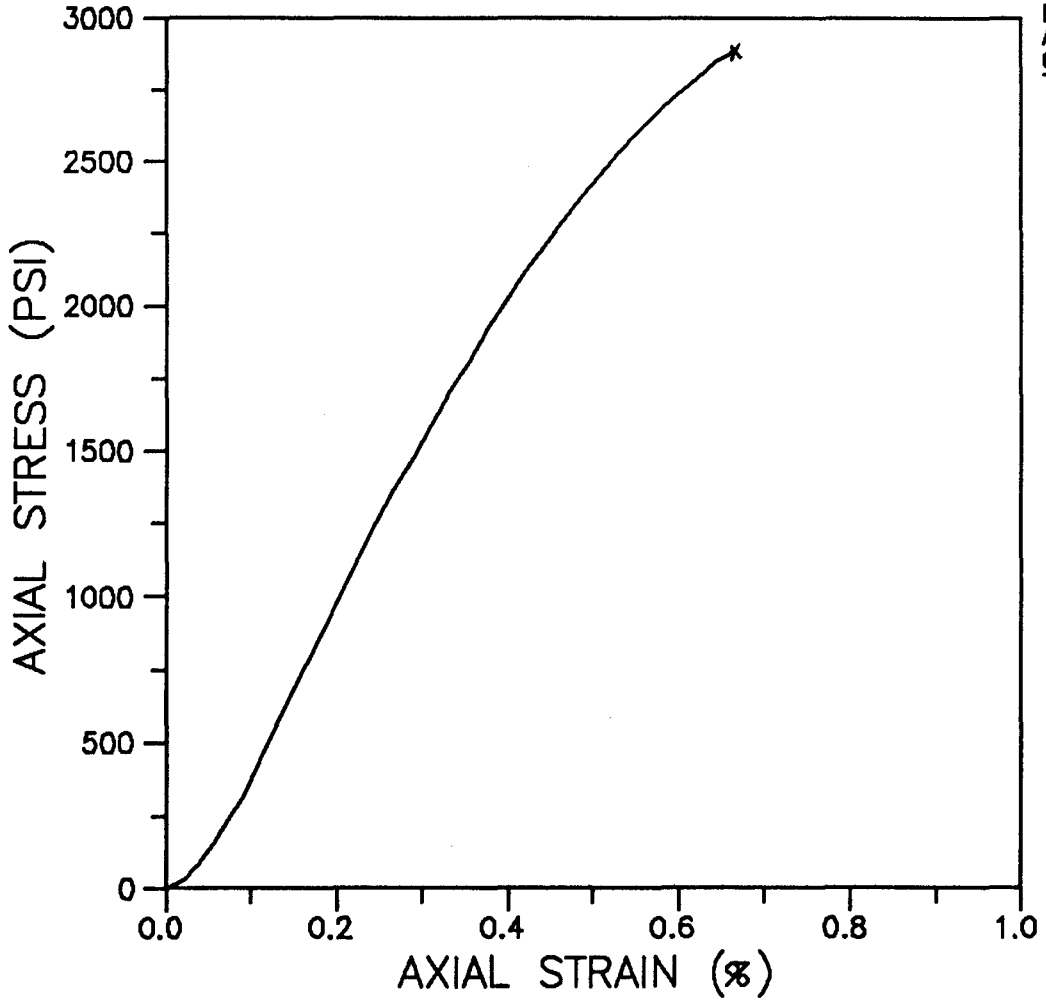
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI5
DEPTH (FT): 250.9
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.7
DRY UNIT WEIGHT (PCF): 123.8
DEG. OF SATURATION (%): 95.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.67 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

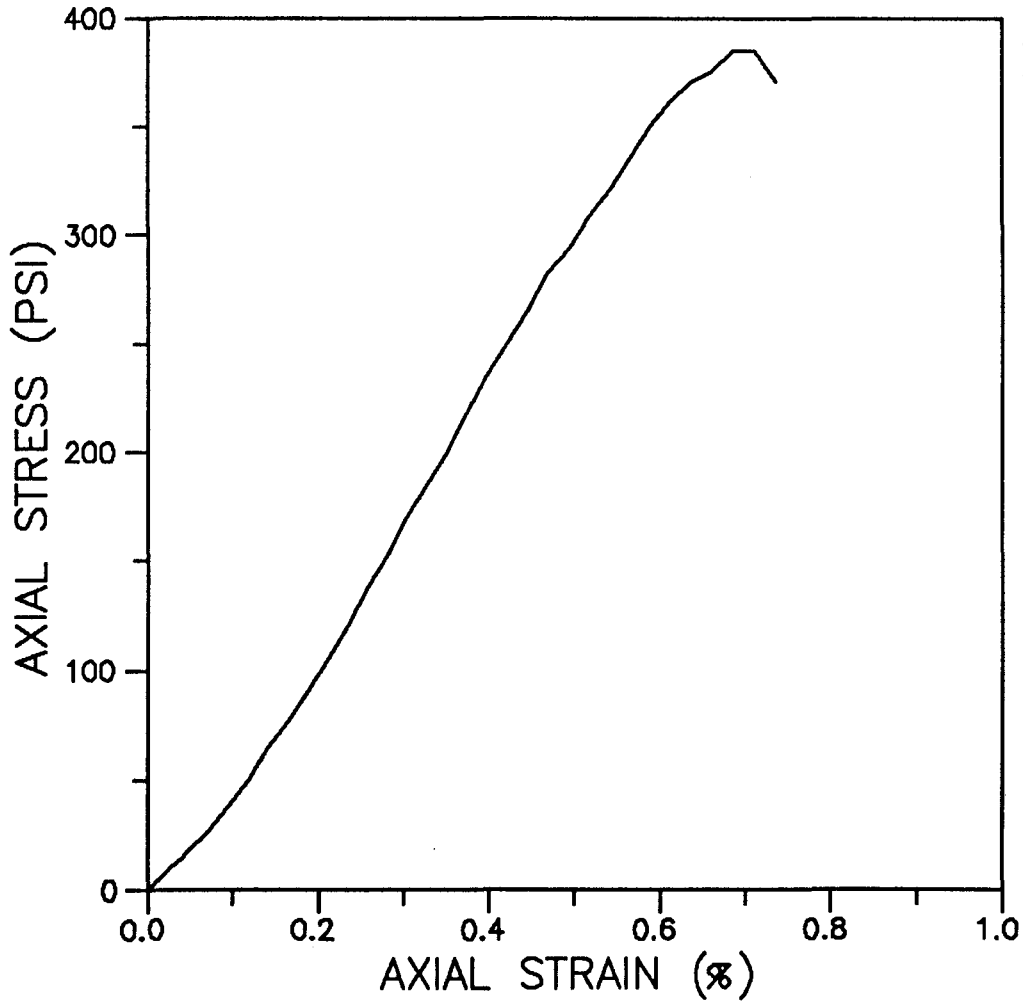
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: BI5
DEPTH (FT): 263.7
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.0
DRY UNIT WEIGHT (PCF): 119.0
DEG. OF SATURATION (%): 97.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.46 x 10E4 PSI

FAILURE MODE:
SHEAR PLANE AT 45 DEG

TEXAS SSC SITE

STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

GEOMECHANICAL TEST RESULTS

BORING BI 6

TABLE E-7. GEOMECHANICAL TEST RESULTS - BORING BI 6

GENERAL LITHOLOGY	BORING DEPTH	MOISTURE CONTENT	DRY DENSITY	SPECIFIC GRAVITY	ATTERBERG LIMITS		FRACTION FINER THAN # 200 SIEVE	CARBONATE CONTENT	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES *	UNCONFINED COMPRESSIVE STRENGTH	TRIAXIAL COMPRESSION		FAILURE STRAIN	TANGENT YOUNG'S MODULUS *			POISSON'S RATIO	BRAZIL TENSILE STRENGTH	2ND CYCLE SLAKE DURABILITY INDEX	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX	COMMENTS
					LL	PI						CONFINING PRESSURE σ_3	DEVIATOR STRESS $\sigma_1-\sigma_3$		E50	UNLOAD/ RELOAD	σ_3						
	feet	percent	pcf				percent	percent			psi	psi	psi	percent	(psi)x10E5	(psi)x10E5	psi		psi	percent		psi	
AUSTIN CHALK	24.7	14.5																					
AUSTIN CHALK	24.8	14.0	119.2						2.2	E	1562			1.18	1.46		0						NOTE 1
AUSTIN CHALK	49.2	17.0																					
AUSTIN CHALK	49.3	16.0	102.7						2.3	D	1963			0.90	3.04		0						
AUSTIN CHALK	77.0																				0.358		
AUSTIN CHALK	78.0	16.1	115.6																				
AUSTIN CHALK	78.2	15.7																	197				
AUSTIN CHALK	101.0	13.2	119.8						2.3	D & E		100	2014	0.88	2.78		100						
AUSTIN CHALK	101.4	14.0	117.5						2.3	D & E		200	1440	0.87	2.07		200						
AUSTIN CHALK	101.8	15.2	116.8																				
AUSTIN CHALK	125.5	17.2																					
AUSTIN CHALK	125.6	17.5	113.1						2.6	E	1594			0.27	8.82		0						
BENTONITE	136.6	37.3	82.9		119	58	97.7															4.8	
BENTONITE	136.8	35.8	88.4																			4.8	
BENTONITE	136.9	39.0	78.6																				
AUSTIN CHALK	156.4	15.9																					
AUSTIN CHALK	156.5	14.0	119.6						2.4	E	2358			0.49	5.66		0						
AUSTIN CHALK	156.6			2.69																			
AUSTIN CHALK	207.6			2.66																			
AUSTIN CHALK	209.6	13.9																					
AUSTIN CHALK	209.8	14.8	118.4						2.4	E	1410			0.73	2.24		0						
EAGLE FORD SHALE	213.1			2.70	66	31	98.9																
EAGLE FORD SHALE	214.4	17.2	111.3																				
EAGLE FORD SHALE	214.7	16.8	112.0	2.72	60	26	99.0	25.0	2.3	D		100	390	0.70	1.03		100						
EAGLE FORD SHALE	214.7														0.92			0.10					NOTE 2
EAGLE FORD SHALE	215.4	16.3	113.6						2.5	B-1/50		200	421	0.67	0.81		200						
EAGLE FORD SHALE	215.4														0.97			0.53					NOTE 2
EAGLE FORD SHALE	221.1	16.3	116.5																			28.9	
EAGLE FORD SHALE	221.4	16.2	114.3																			14.4	
EAGLE FORD SHALE	221.6	15.9	117.3																				
EAGLE FORD SHALE	221.8			2.72																			
EAGLE FORD SHALE	222.0	16.1			76	45	97.6																
EAGLE FORD SHALE	222.3							6.8															
EAGLE FORD SHALE	222.5	16.7																					
EAGLE FORD SHALE	222.6	16.5	119.7						2.4	D	288			0.42	0.99		0						
EAGLE FORD SHALE	225.6	16.9	115.8																				
EAGLE FORD SHALE	225.8	16.9																		47.2			CONCRETIONS (?)
EAGLE FORD SHALE	226.5							6.5															
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664				ASTM-D3148		ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

BI6PRT20 WK1
REVISION: 2.0
DATE 07/17/90

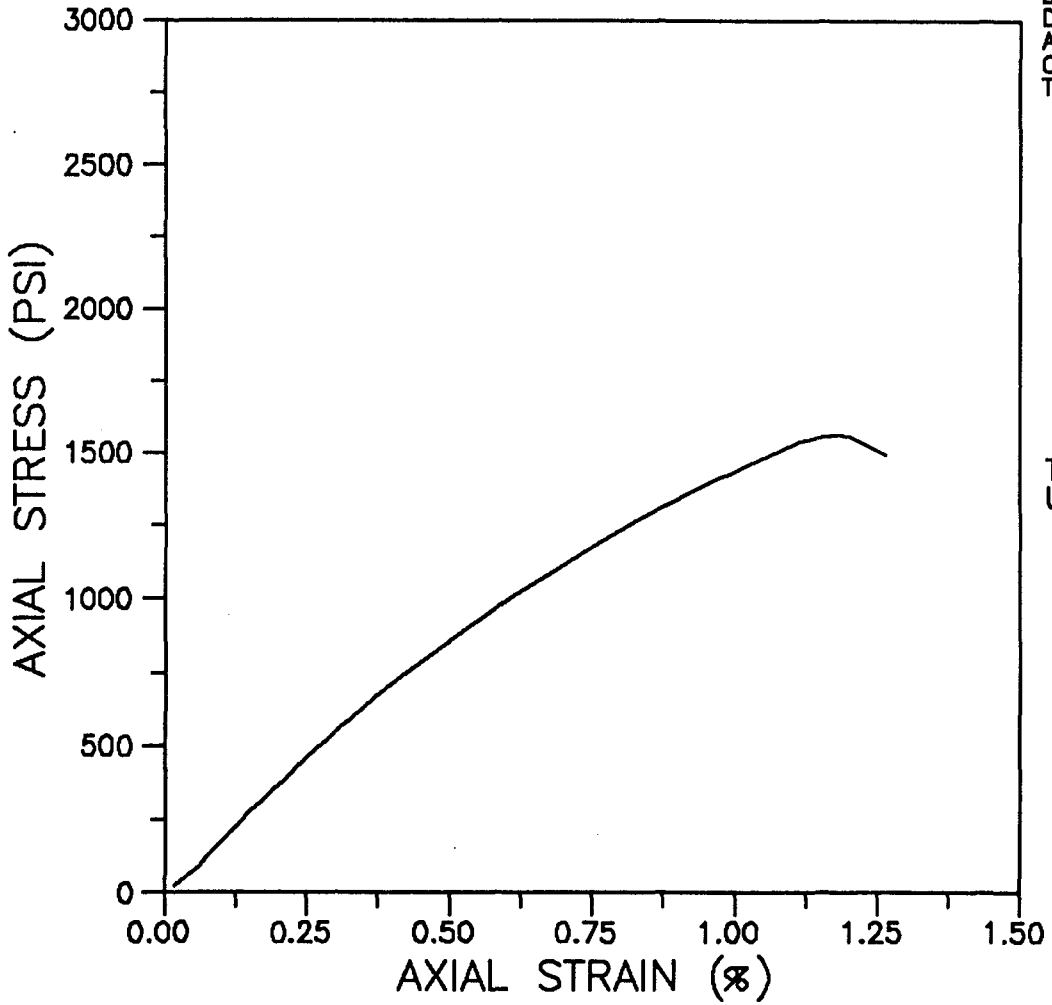
* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

Symbol	Failure Type	Symbol	Failure Type
A	No discernible failure plane	B-4	Combination
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core	C	Barreling/Bulging
B-1	Shear plane	D	Longitudinal (axial) splitting
B-2	Bedding plane shear	E	Conical
B-3	Shear plane along pre-existing fracture, shear zone, etc.	F	No information

NOTES: 1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

2) Modulus and Poisson's ratio calculated from axial and lateral strains measured using LVDTs. Axial gage length is 2.8 inches.

BORING NO: B16
DEPTH (FT): 24.8
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.0
DRY UNIT WEIGHT (PCF): 119.2
DEG. OF SATURATION (%): 91.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.46 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

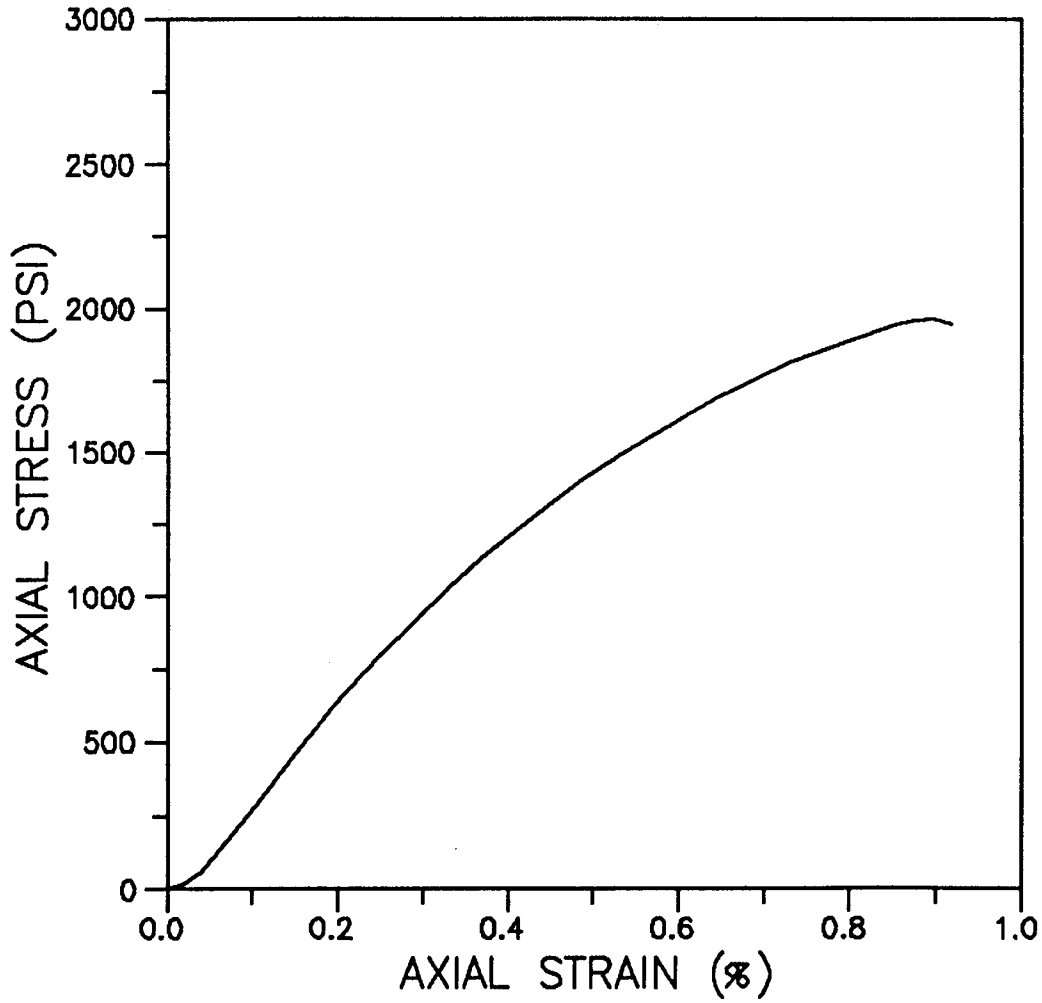
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: BI6
DEPTH (FT): 49.3
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.0
DRY UNIT WEIGHT (PCF): 102.7
DEG. OF SATURATION (%): 67.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.04 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

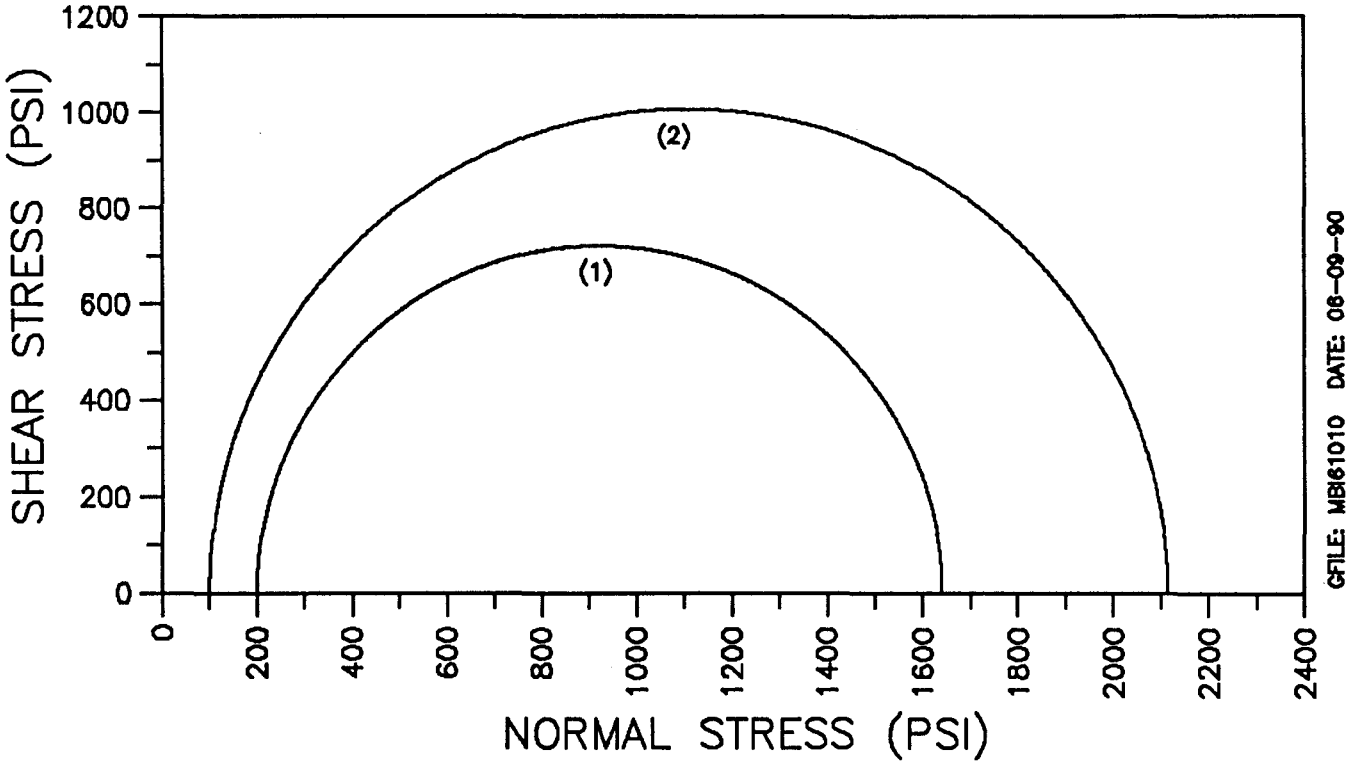
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B16
DEPTH RANGE (FT): 101.0–101.8
AUSTIN CHALK LIMESTONE



GFILE: MB61010 DATE: 06-09-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 101.0
(2) DEPTH (FT): 101.4

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

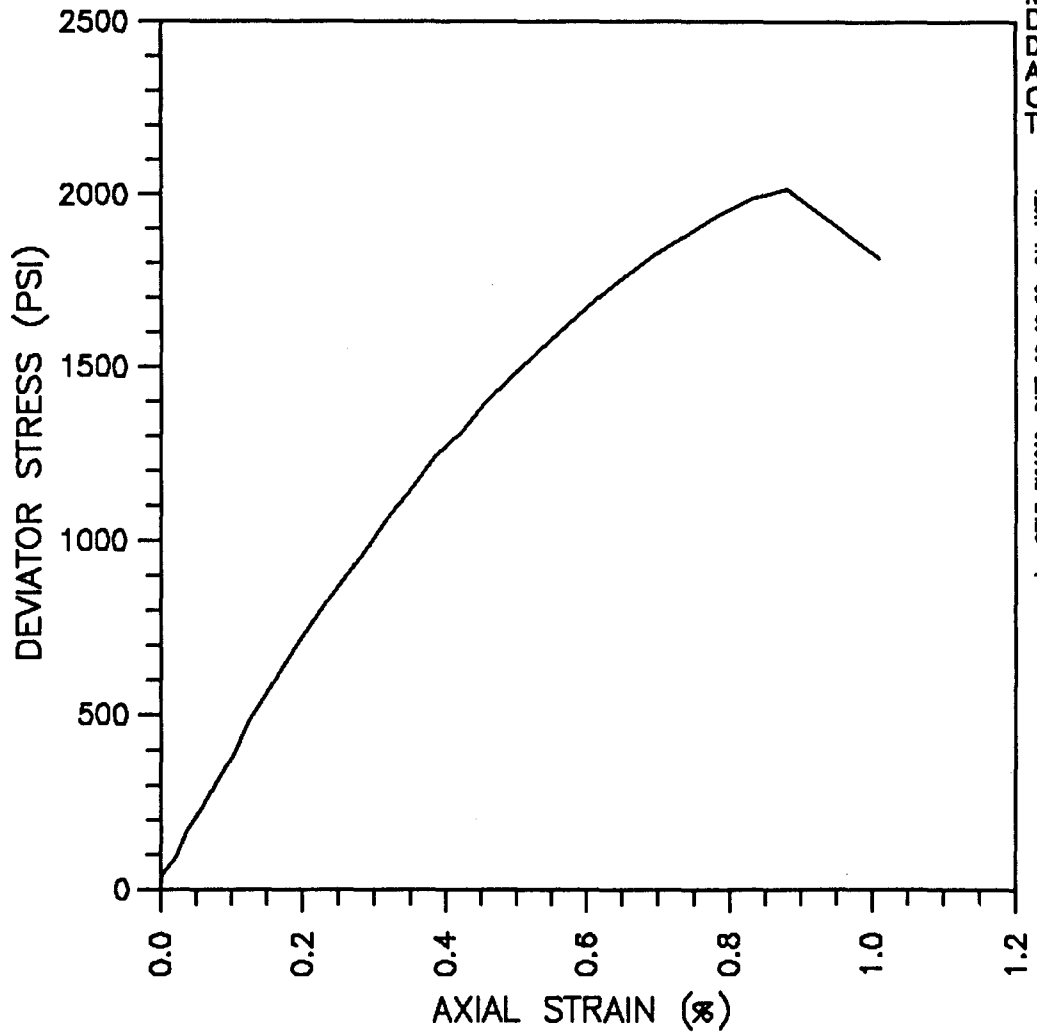
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI6
DEPTH (FT): 101.0
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.2
DRY UNIT WEIGHT (PCF): 119.8
DEG. OF SATURATION (%): 87.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

DFILE: BI61010 DATE: 06-09-90 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.778 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING W/
CONICAL AT TOP

TEXAS SSC SITE

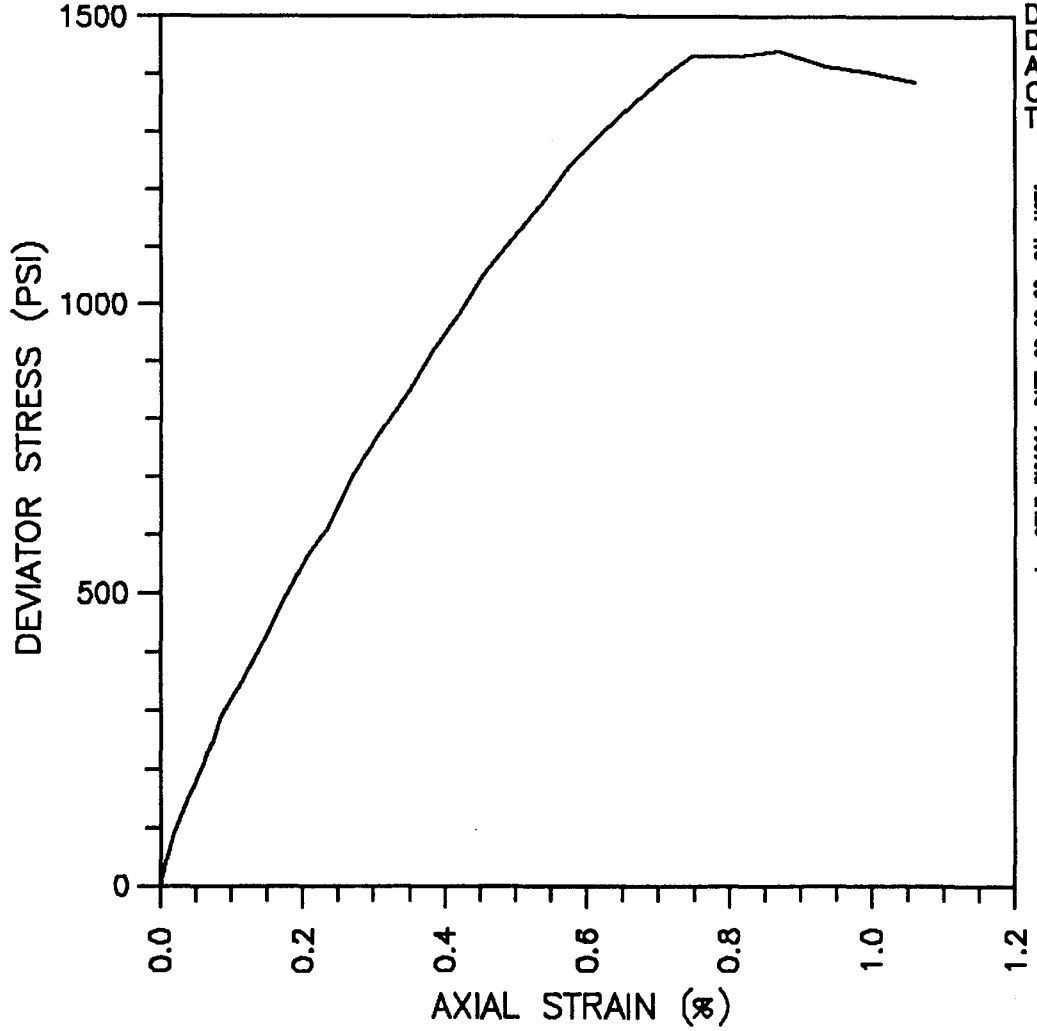
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI6
DEPTH (FT): 101.4
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.0
DRY UNIT WEIGHT (PCF): 117.5
DEG. OF SATURATION (%): 86.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: BI61014 DATE: 08-09-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.069 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING W/
CONICAL AT TOP

TEXAS SSC SITE

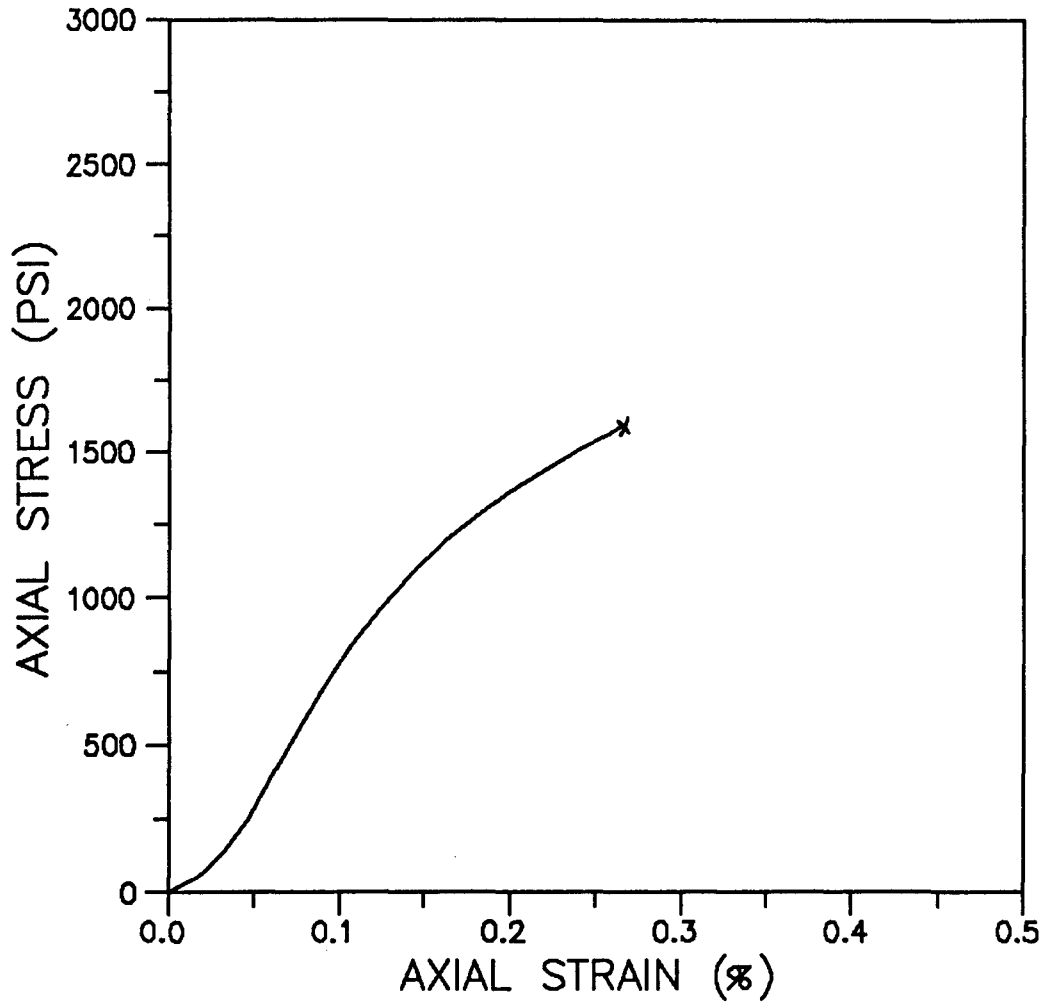
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO: BI6
DEPTH (FT): 125.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.5
DRY UNIT WEIGHT (PCF): 113.1
DEG. OF SATURATION (%): 96.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
8.82 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

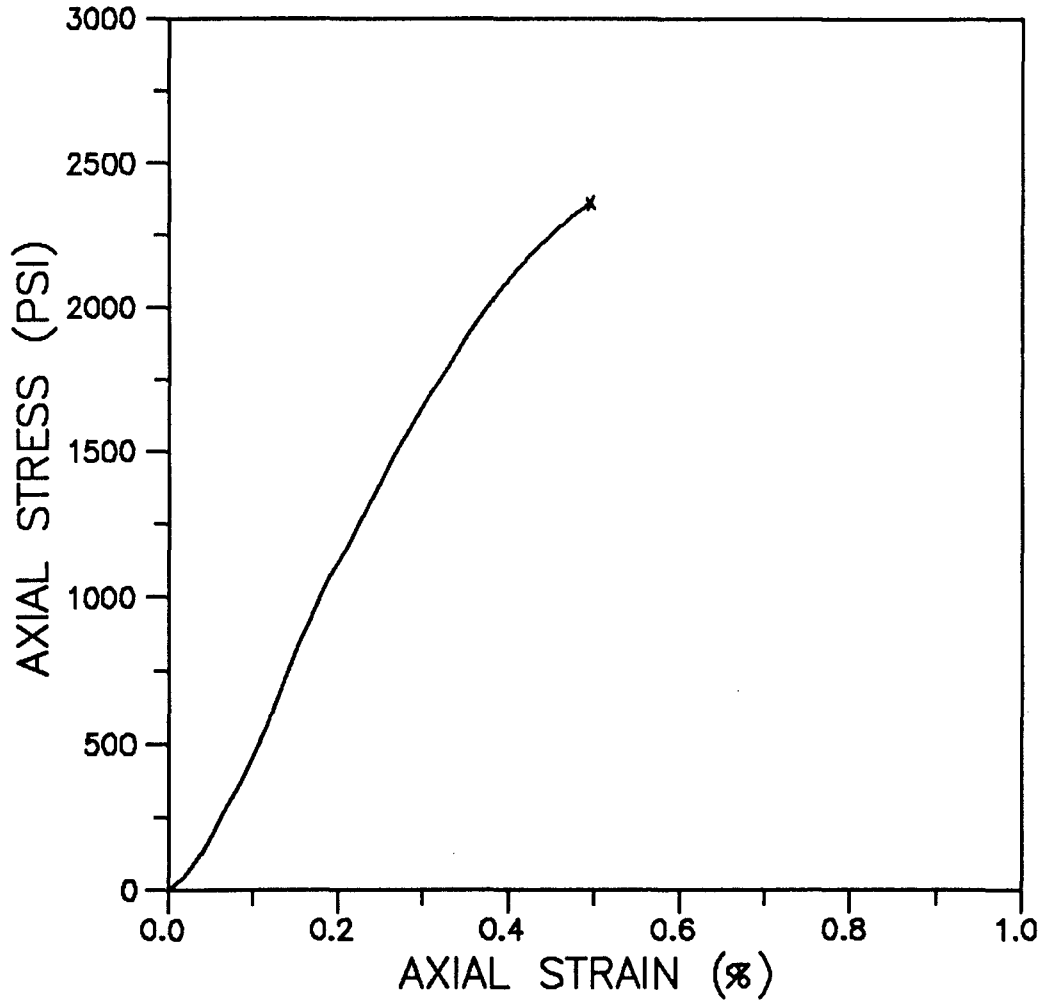
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: BI6
DEPTH (FT): 156.5
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.0
DRY UNIT WEIGHT (PCF): 119.6
DEG. OF SATURATION (%): 92.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.66 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

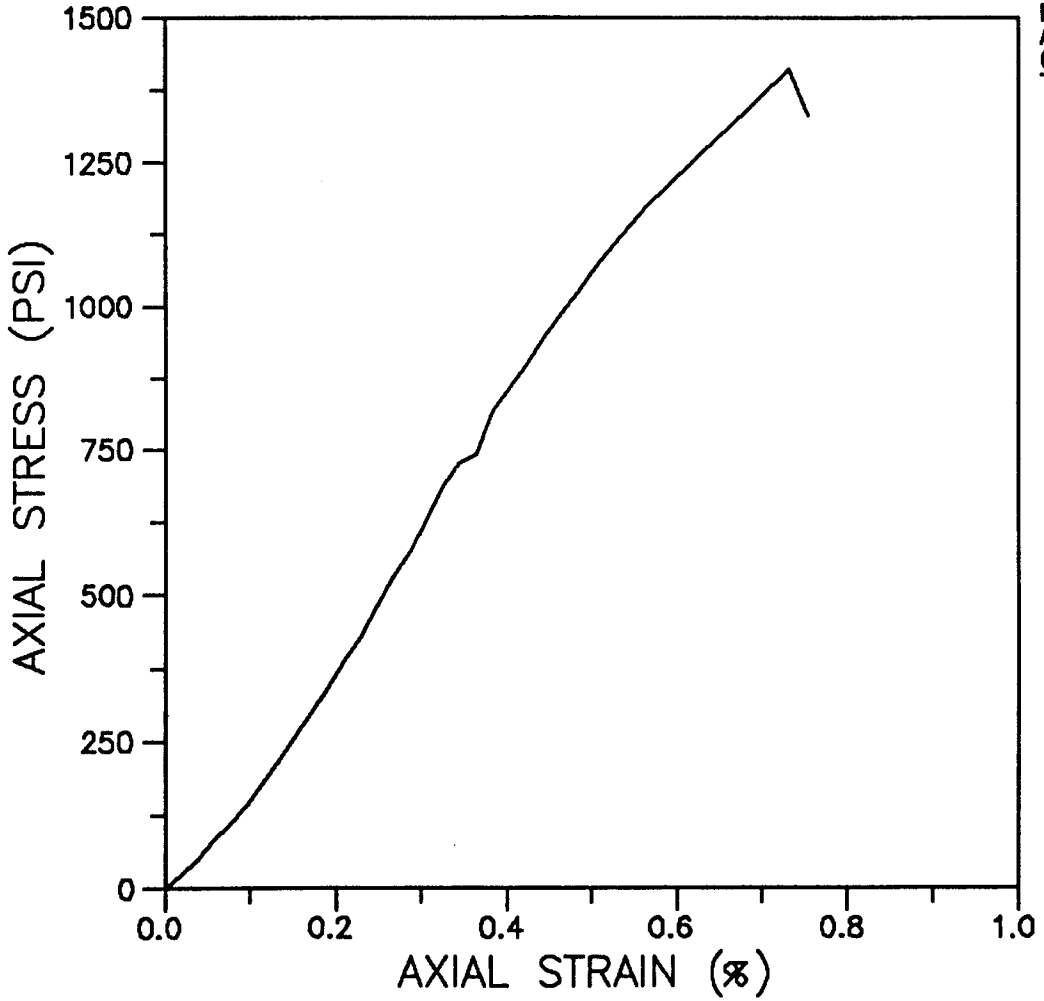
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: BI6
DEPTH (FT): 209.8
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.8
DRY UNIT WEIGHT (PCF): 118.4
DEG. OF SATURATION (%): 94.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.24 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

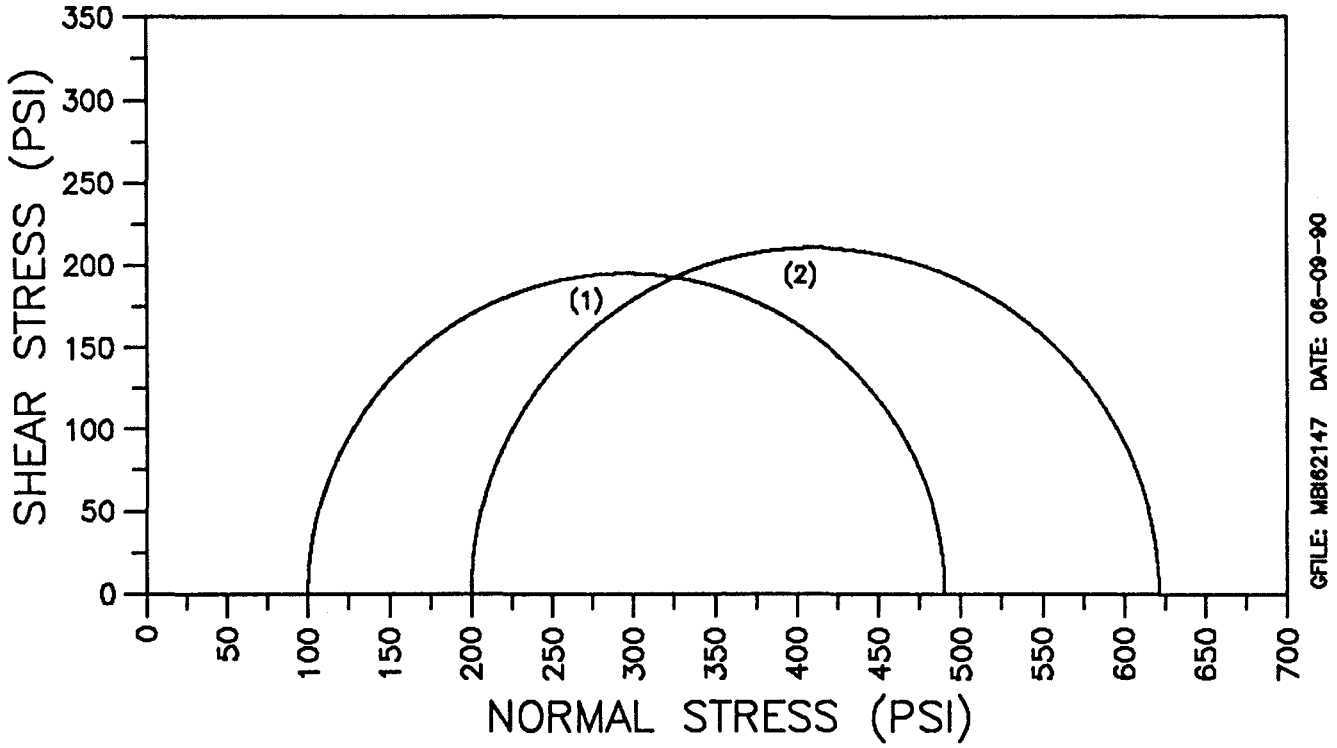
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: BI6
DEPTH RANGE (FT): 214.7-215.8
EAGLE FORD SHALE



GFILE: MBI62147 DATE: 06-09-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 214.7
(2) DEPTH (FT): 215.4

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

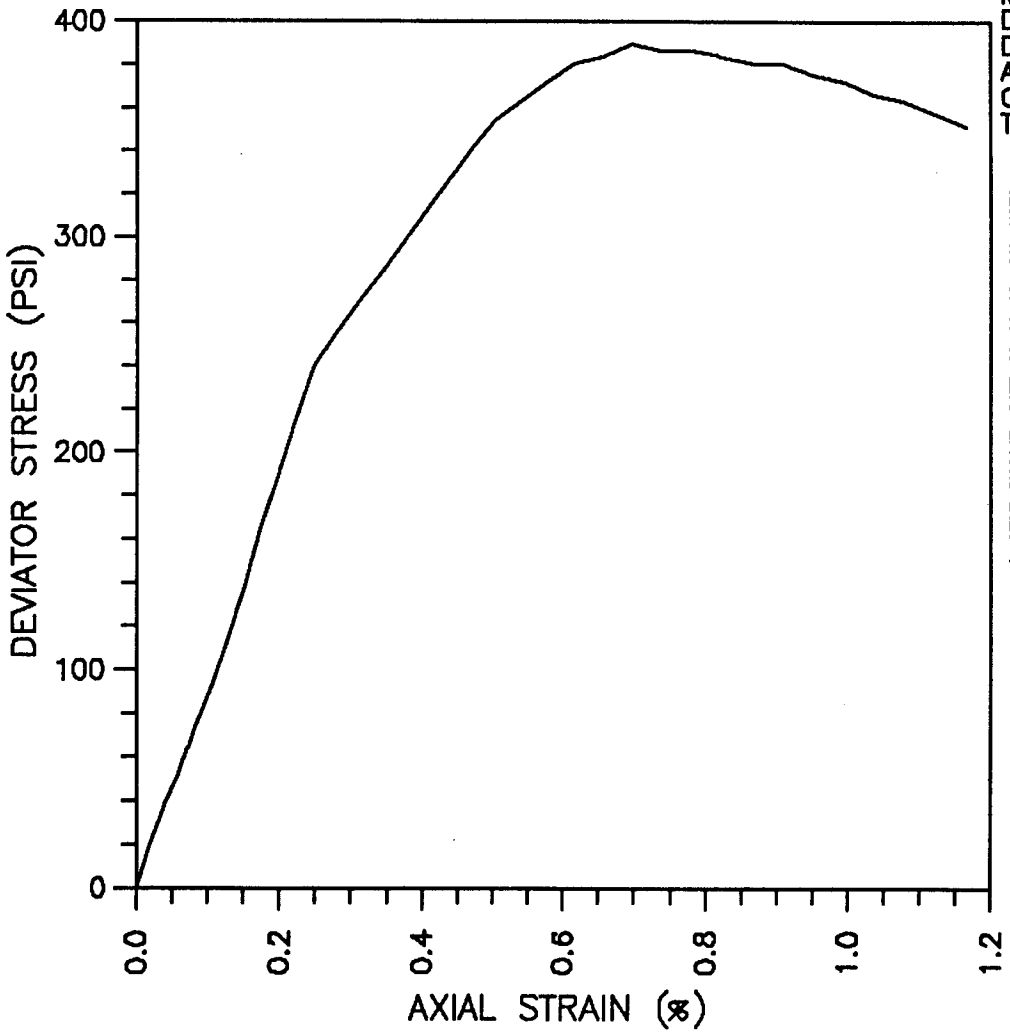
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: BI6
DEPTH (FT): 214.7
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.8
DRY UNIT WEIGHT (PCF): 112.0
DEG. OF SATURATION (%): 89.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BI62147 DATE: 08-08-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.026 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

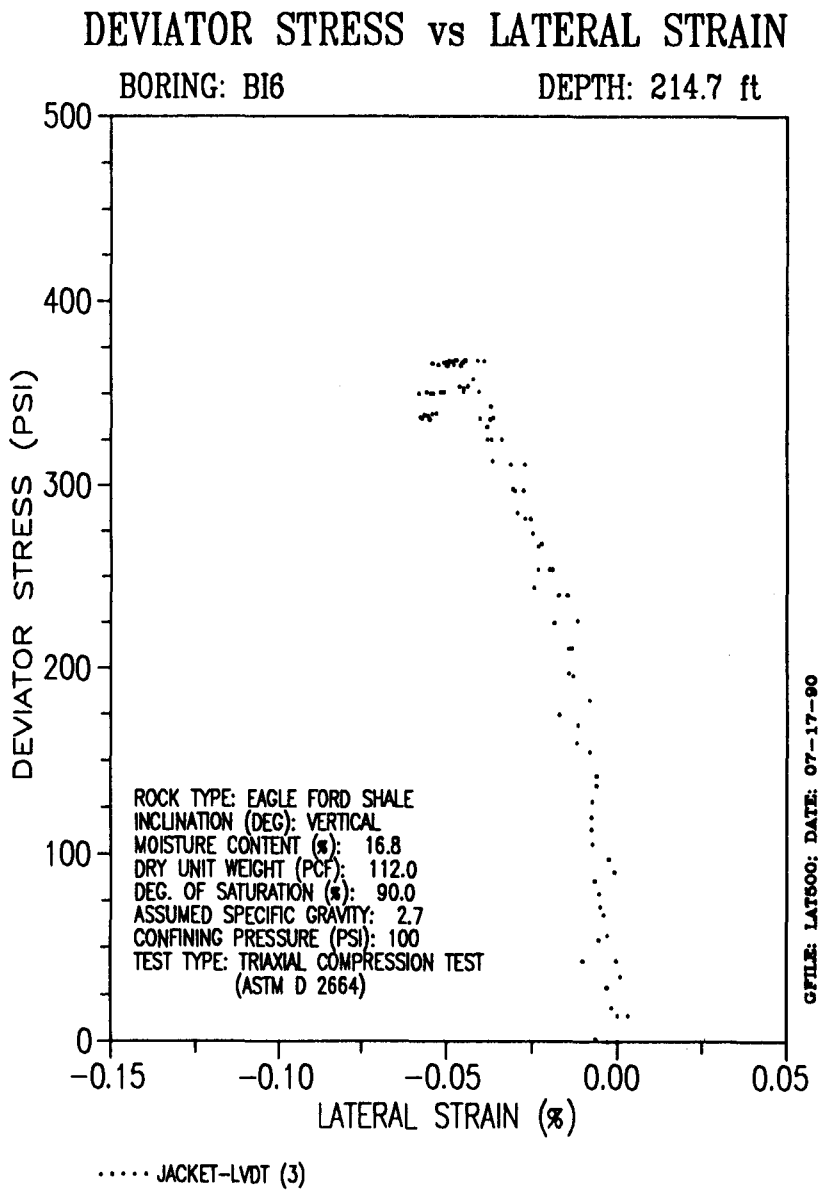
TEXAS SSC SITE

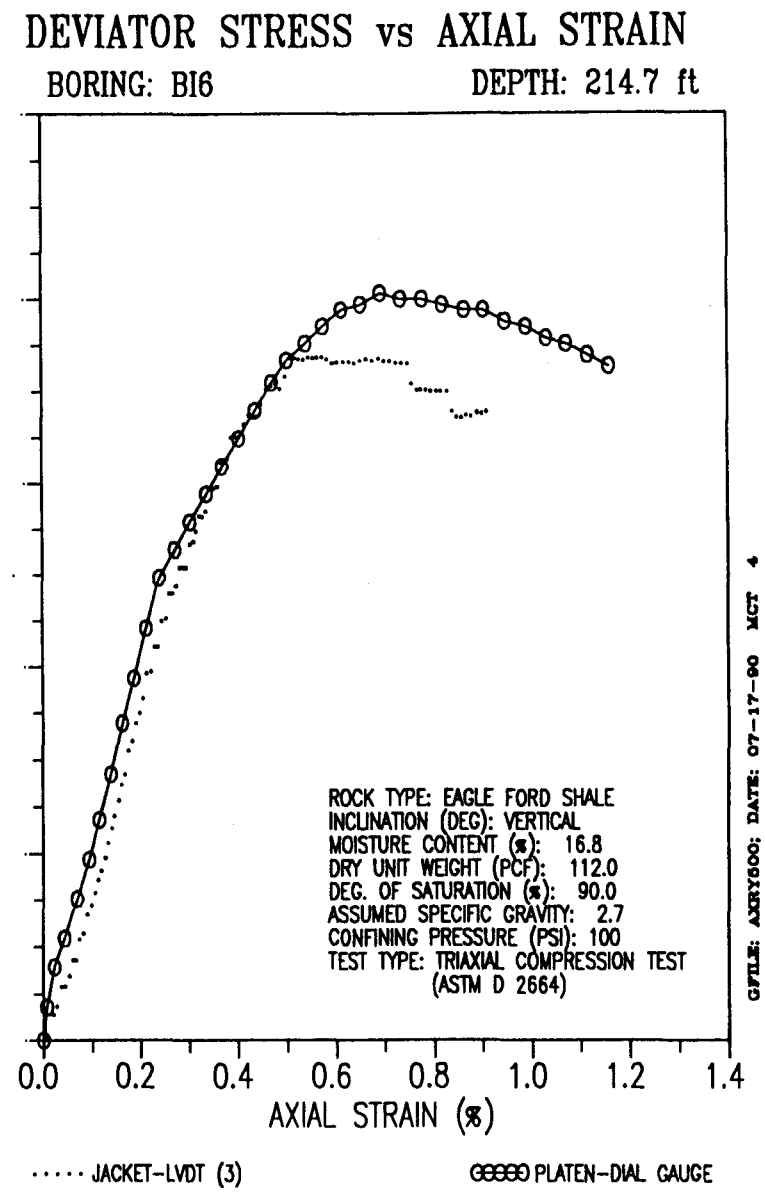
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

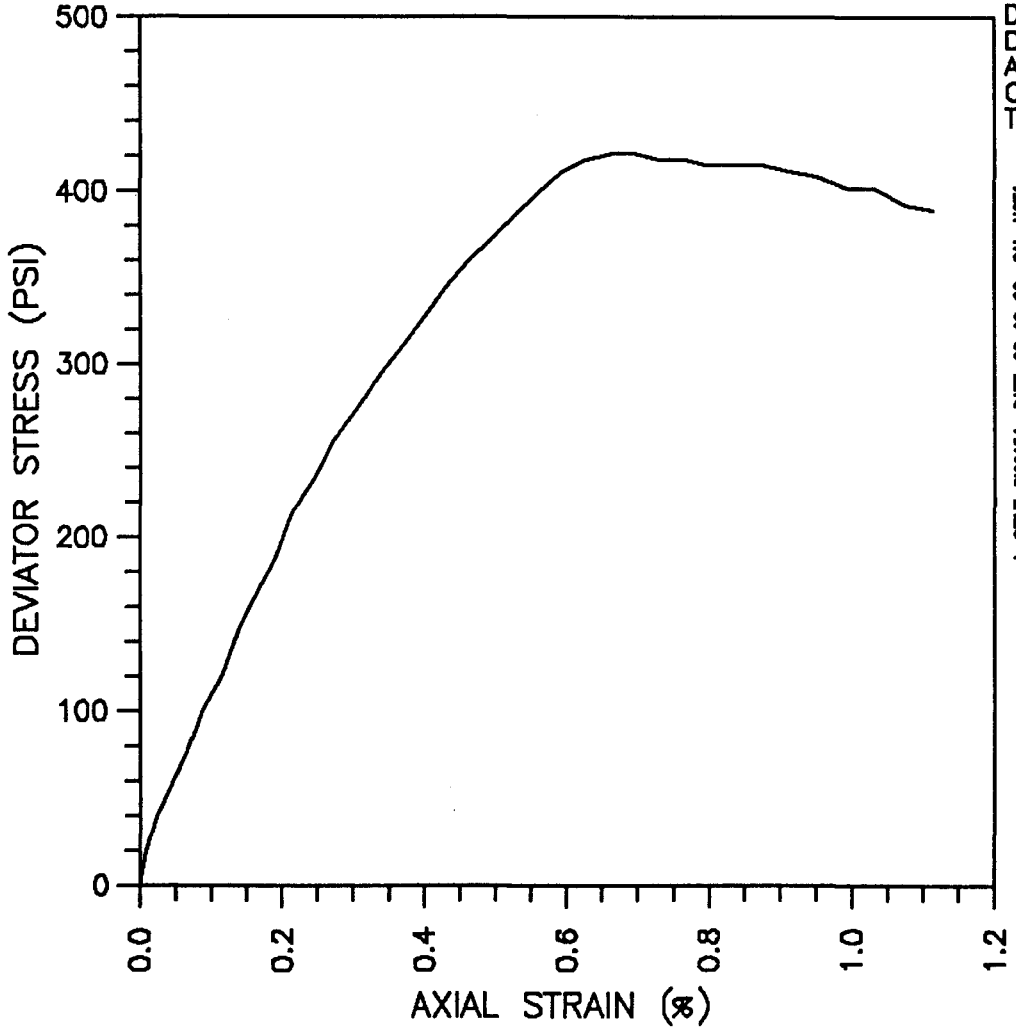
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI6
DEPTH: 214.7 ft
DEVIATOR STRESS (PSI)
500
400
300
200
100
0
-0.15
-0.10
-0.05
0.00
0.05
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.8
DRY UNIT WEIGHT (PCF): 112.0
DEG. OF SATURATION (%): 90.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT500; DATE: 07-17-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI6
DEPTH: 214.7 ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.8
DRY UNIT WEIGHT (PCF): 112.0
DEG. OF SATURATION (%): 90.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY500; DATE: 07-17-90 MGT 4
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: BI6
DEPTH (FT): 215.4
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.3
DRY UNIT WEIGHT (PCF): 113.6
DEG. OF SATURATION (%): 91.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: BI62154 DATE: 06-09-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.811 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 50 DEG

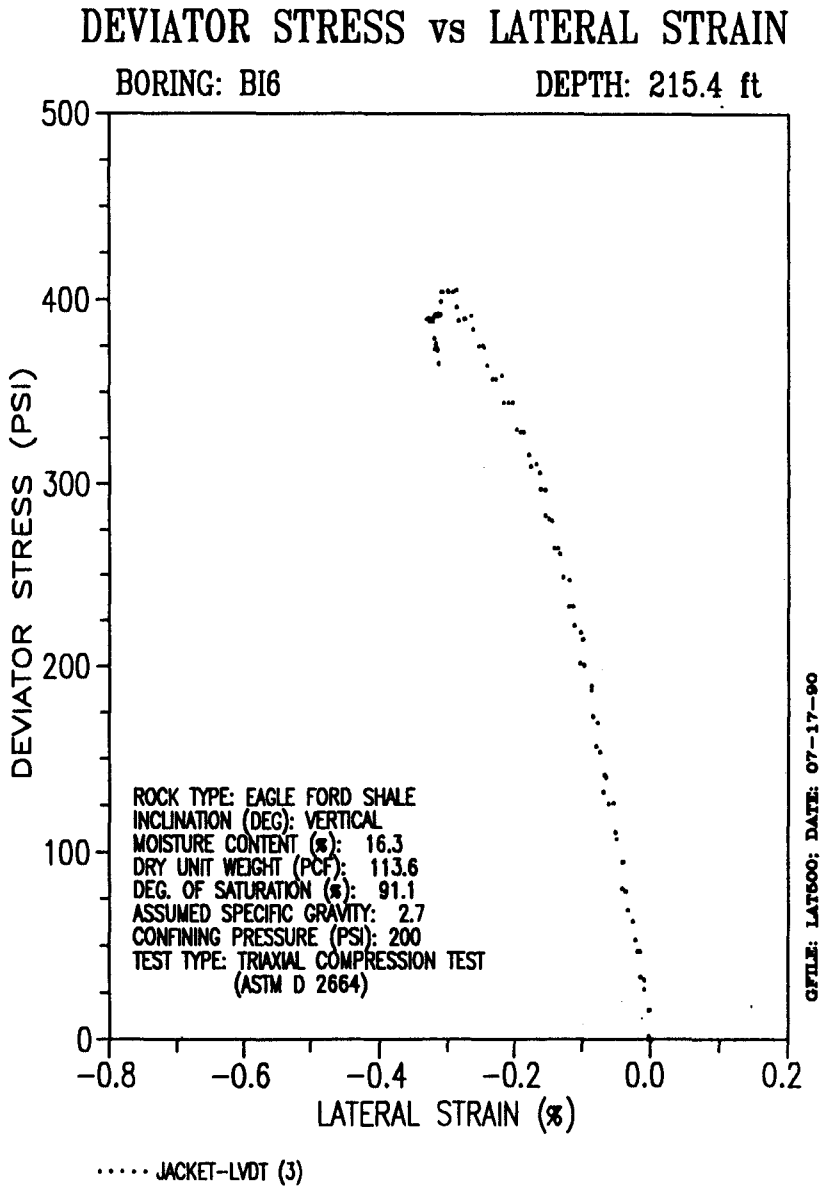
TEXAS SSC SITE

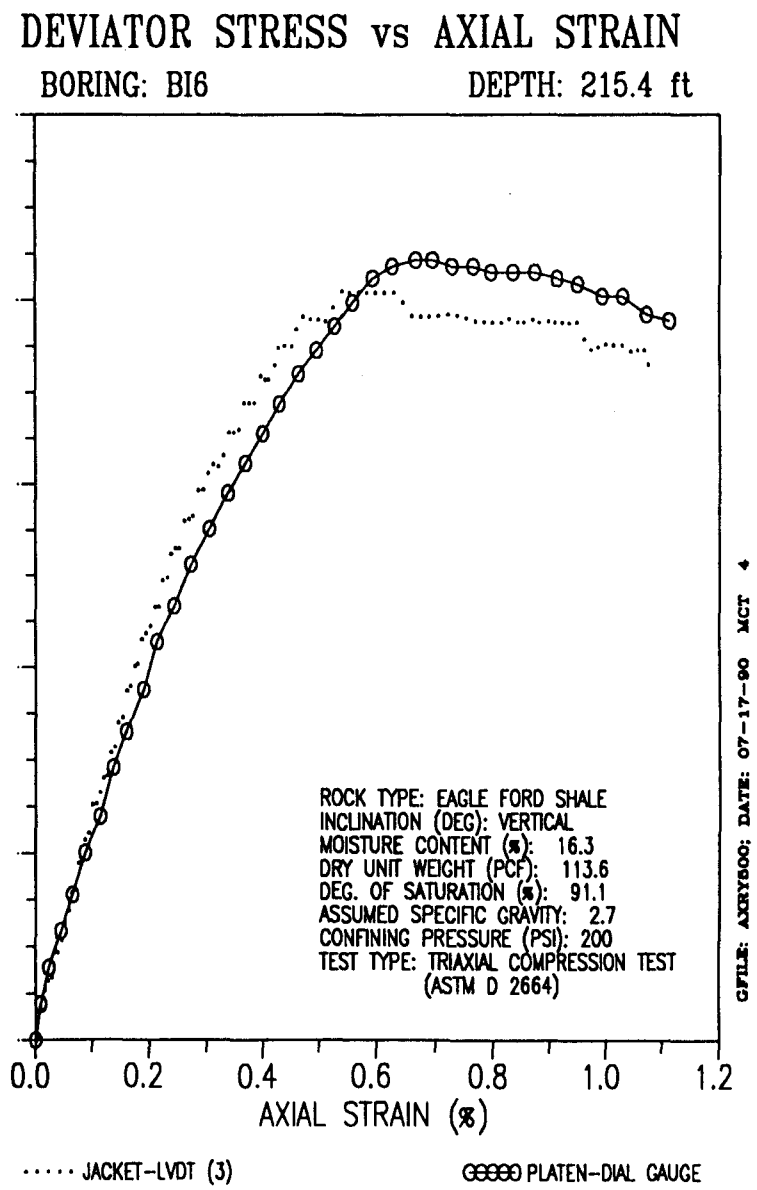
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

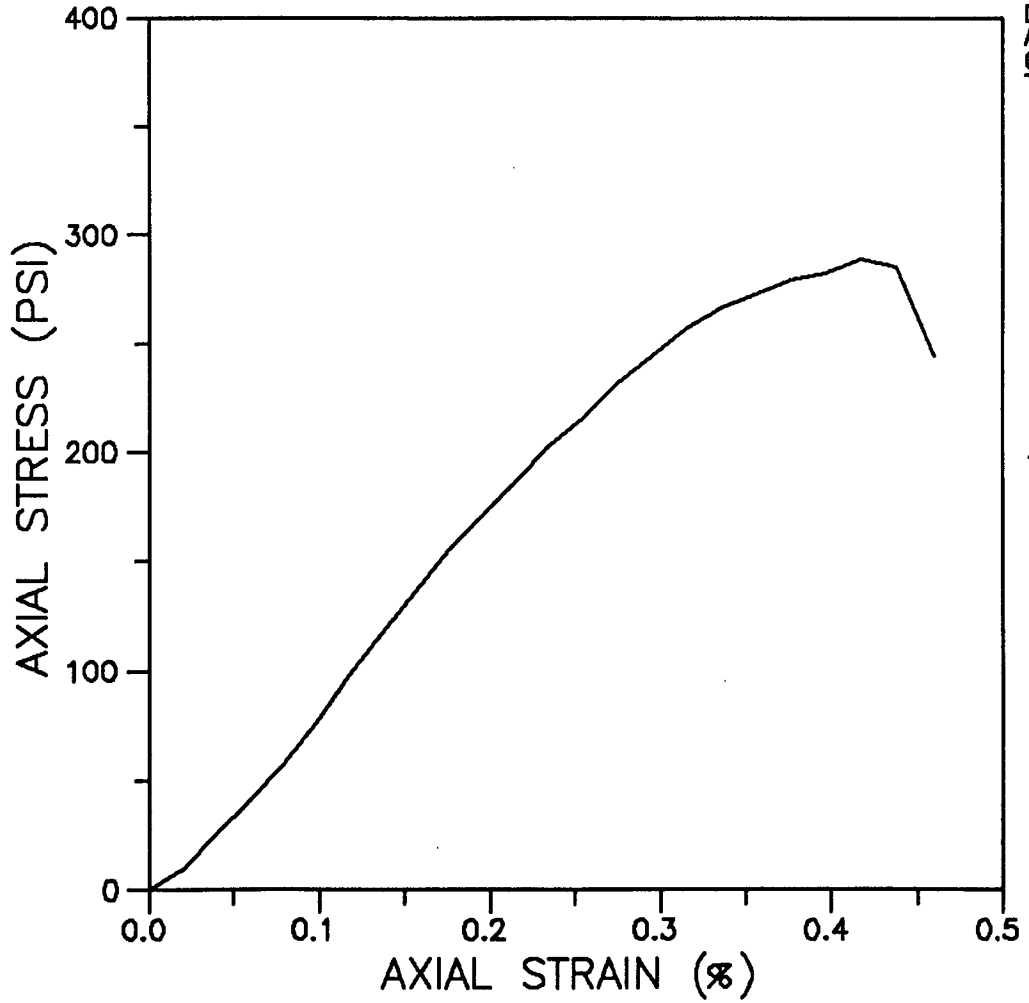
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: BI6
DEPTH: 215.4 ft
DEVIATOR STRESS (PSI)
500
400
300
200
100
0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.3
DRY UNIT WEIGHT (PCF): 113.6
DEG. OF SATURATION (%): 91.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT500; DATE: 07-17-90
····· JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: BI6
DEPTH: 215.4 ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.3
DRY UNIT WEIGHT (PCF): 113.6
DEG. OF SATURATION (%): 91.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY500; DATE: 07-17-90 MCT 4
····· JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: BI6
DEPTH (FT): 222.6
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.5
DRY UNIT WEIGHT (PCF): 119.7
DEG. OF SATURATION (%): 109.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
9.85 x 10E4 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

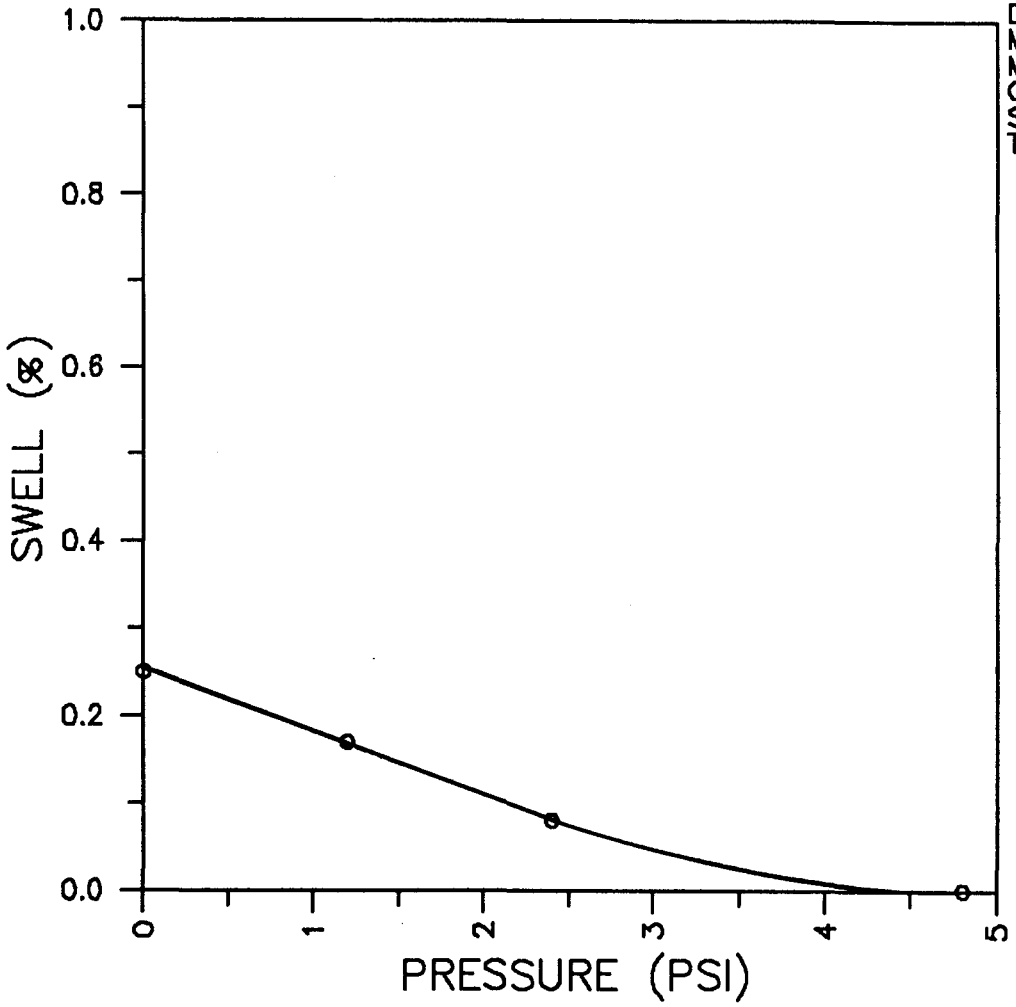
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: BI6
DEPTH (FT): 136.6
BENTONITIC CLAY



INCLINATION (DEG): VERTICAL
DRY UNIT WEIGHT (PCF): 82.9
M.C. BEFORE TEST (%): 37.3
M.C.AFTER TEST (%): 41.1
GAIN IN MOISTURE (%): 3.9
SWELLING PRESSURE INDEX (PSI): 5
TEST TYPE: SWELLING PRESSURE INDEX (ISRM)

TEXAS SSC SITE

SWELLING PRESSURE INDEX

MASON–JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

GEOMECHANICAL TEST RESULTS

BORING B 1527

TABLE E-8. GEOMECHANICAL TEST RESULTS - BORING B 1527

GENERAL LITHOLOGY	BORING DEPTH feet	MOISTURE CONTENT percent	DRY DENSITY pcf	SPECIFIC GRAVITY	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	FRACTION FINER THAN # 200 SIEVE percent	CARBONATE CONTENT percent	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES *	UNCONFINED COMPRESSIVE STRENGTH psi	TRIAXIAL COMPRESSION CONFINING PRESSURE σ_3 psi	TRIAXIAL COMPRESSION DEVIATOR STRESS $\sigma_1-\sigma_3$ psi	FAILURE STRAIN percent	TANGENT YOUNG'S MODULUS E50 (psi)x10E5	TANGENT YOUNG'S MODULUS UNLOAD/ RELOAD (psi)x10E5	TANGENT YOUNG'S MODULUS σ_3 psi	POISSON'S RATIO	BRAZIL TENSILE STRENGTH psi	2ND CYCLE SLAKE DURABILITY INDEX percent	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX psi	COMMENTS
CLAY	0.0	29.0	88.8		69	45	72.7																
CLAY	1.0	20.0	101.4		54	32	62.5																
AUSTIN CHALK	25.5	16.0																					SEVERELY WEATHERED
AUSTIN CHALK	25.6	22.9	104.9						2.1	C	413			0.75	0.73		0						SEVERELY WEATHERED
AUSTIN CHALK	61.1	12.7	125.5																				
AUSTIN CHALK	61.5	13.8	121.9	2.67					2.2	D		50	2142	0.59	4.51		50						NOTE 1
AUSTIN CHALK	61.9	14.3	120.4						2.3	D		100	2377	0.71	4.49	7.20	100						NOTE 2
AUSTIN CHALK	61.9														5.95	8.47		0.26					NOTE 3
AUSTIN CHALK	83.5	17.9																					
AUSTIN CHALK	83.6	17.6	114.0						2.2	E	2154			0.57	6.00		0						
AUSTIN CHALK	132.7	16.9																					
AUSTIN CHALK	132.8	16.4	115.7						2.1	B-1/30	2125			0.35	6.75		0						
AUSTIN CHALK	152.3	13.3																					
AUSTIN CHALK	152.5	12.2							0.5										181				
AUSTIN CHALK	152.6	12.1	126.5						2.2	C	746			1.35	0.89		0						SHALY
AUSTIN CHALK	158.7	13.8	115.2	2.67					2.1	E		100	2585	1.10	3.10		100						
AUSTIN CHALK	159.2	12.9	113.7																				
AUSTIN CHALK	159.5	12.2	123.1						2.3	B-1/20		200	2341	1.21	2.63		200						
AUSTIN CHALK	159.5														3.26			0.29 (2)					NOTES 3 and 4
EAGLE FORD SHALE	163.9	19.3																					
EAGLE FORD SHALE	164.0	19.4	112.4		116	77	99.8	5.4	2.1	B-3/45	64			1.61	0.03		0						PRE-EXISTING SLICKENSIDES
EAGLE FORD SHALE	164.4	18.6																		6.9			
EAGLE FORD SHALE	178.7	16.7	119.3																				
EAGLE FORD SHALE	179.2	17.3	112.9																			29.0	
EAGLE FORD SHALE	179.4	17.4	115.3																			36.1	
EAGLE FORD SHALE	179.6				105	67	99.7																
EAGLE FORD SHALE	200.7	12.3																					CALCAREOUS SHALE
EAGLE FORD SHALE	200.8	12.0	127.4		59	36	79.3	44.6	2.2	B-1/30	427			0.89	0.46		0						CALCAREOUS SHALE
EAGLE FORD SHALE	221.4	15.2	124.9																				
EAGLE FORD SHALE	222.0	16.4	114.8	2.71	65	39	98.3	6.1	2.2	D		200	225	1.88	0.76		200						
EAGLE FORD SHALE	222.5	15.8	114.8						2.2	B-1/30		300	365	1.24	1.10	2.31	300						NOTES 2 and 5
EAGLE FORD SHALE	228.1	14.6	121.1		83	51	99.6	6.0	2.4	D	251			0.40	1.00		0						
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

B1527P22.WK1
REVISION: 2.2
DATE: 8/24/90

* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

Symbol	Failure Type
A	No discernible failure plane
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core
B-1	Shear plane
B-2	Bedding plane shear
B-3	Shear plane along pre-existing fracture, shear zone, etc.
B-4	Combination
C	Barreling/Bulging
D	Longitudinal (axial) splitting
E	Conical
F	No information

NOTES:

1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

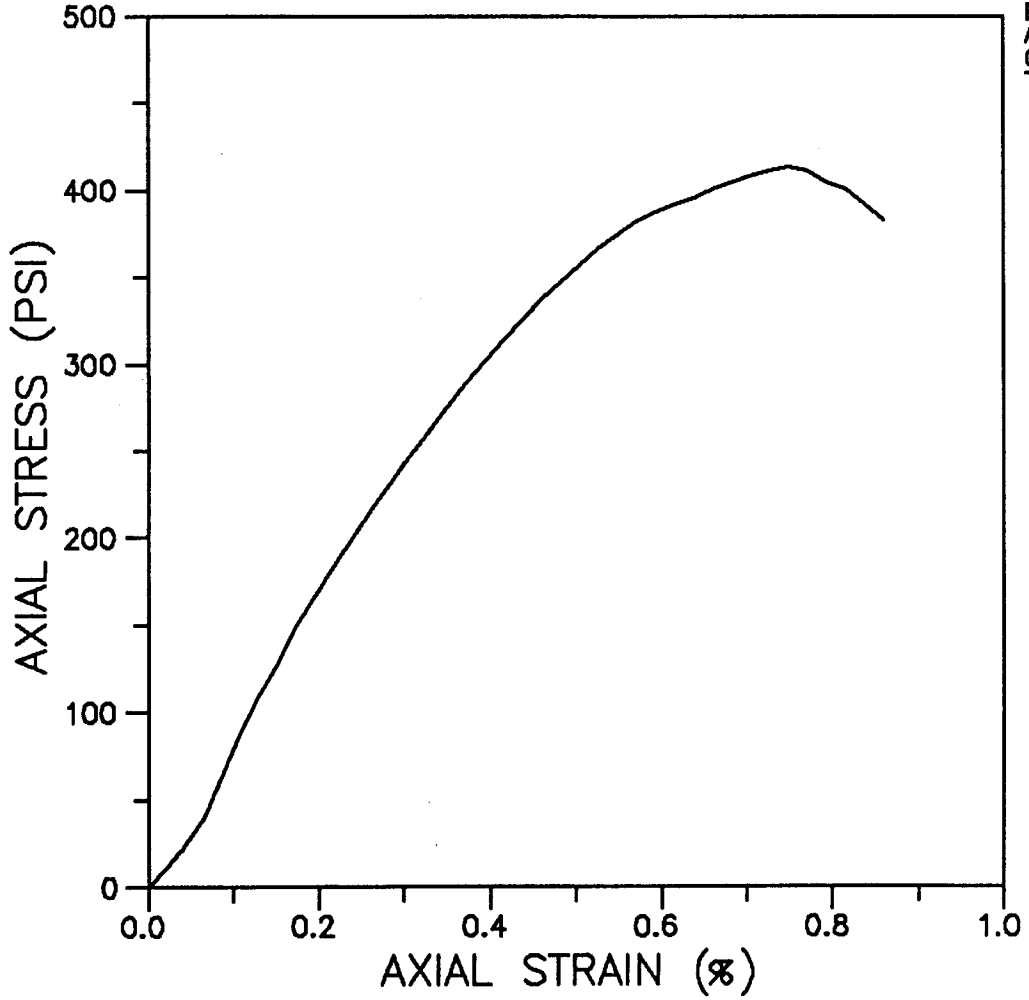
2) Triaxial compression test is cyclic with one unload/reload cycle

3) Modulus and Poisson's ratio calculated from axial and lateral strains measuired using LVDTs. Axial gage length is 2.8 inches.

4) For Poisson's ratio values: the value within parenthesis indicates the number of LVDTs recording lateral strains. Otherwise all 3 LVDTs recorded strains.

5) Sample separated along bedding prior to compression test.

BORING NO: B1527
DEPTH (FT): 25.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 22.9
DRY UNIT WEIGHT (PCF): 104.9
DEG. OF SATURATION (%): 102.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
7.28 x 10E4 PSI

FAILURE MODE:
BARRELING / BULGING

TEXAS SSC SITE

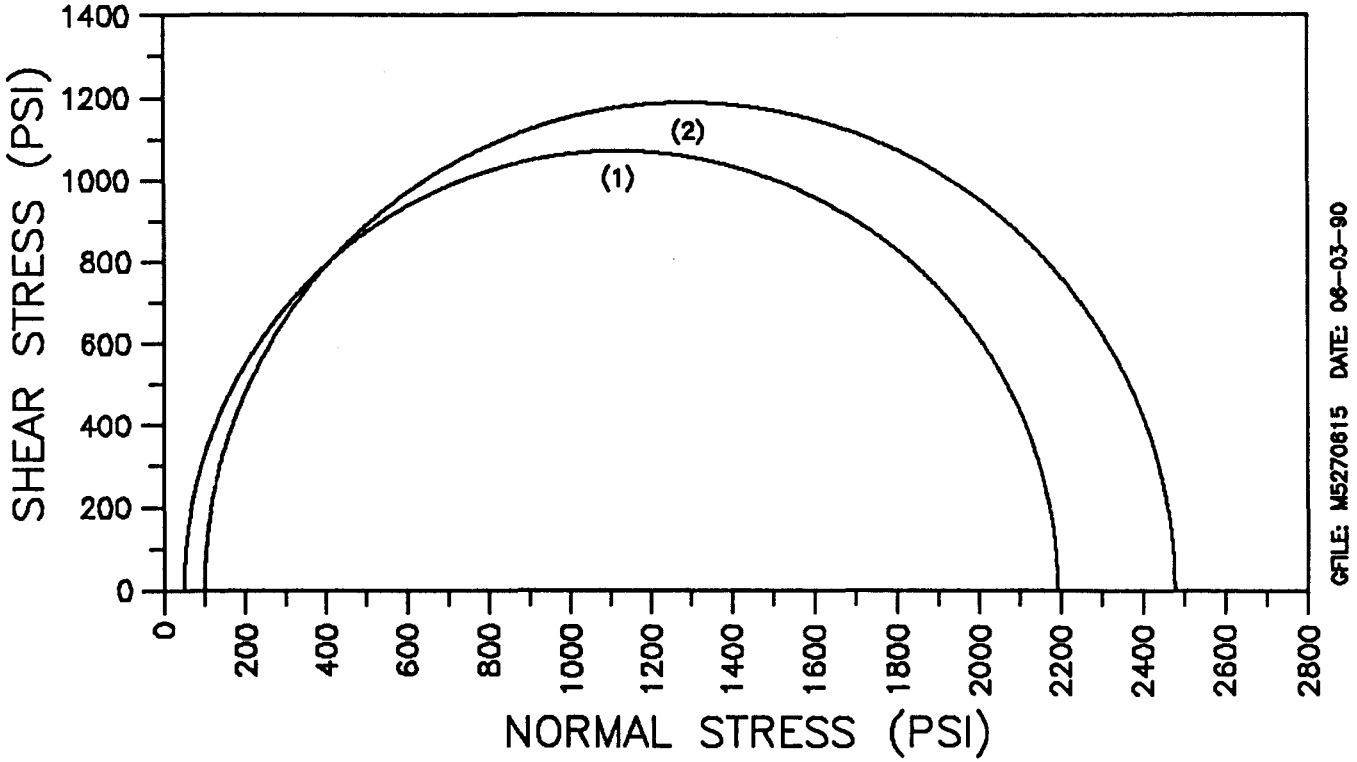
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B1527
DEPTH RANGE (FT): 61.5–62.3
AUSTIN CHALK LIMESTONE



GFILE: M5270615 DATE: 06-03-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 61.5
(2) DEPTH (FT): 61.9

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

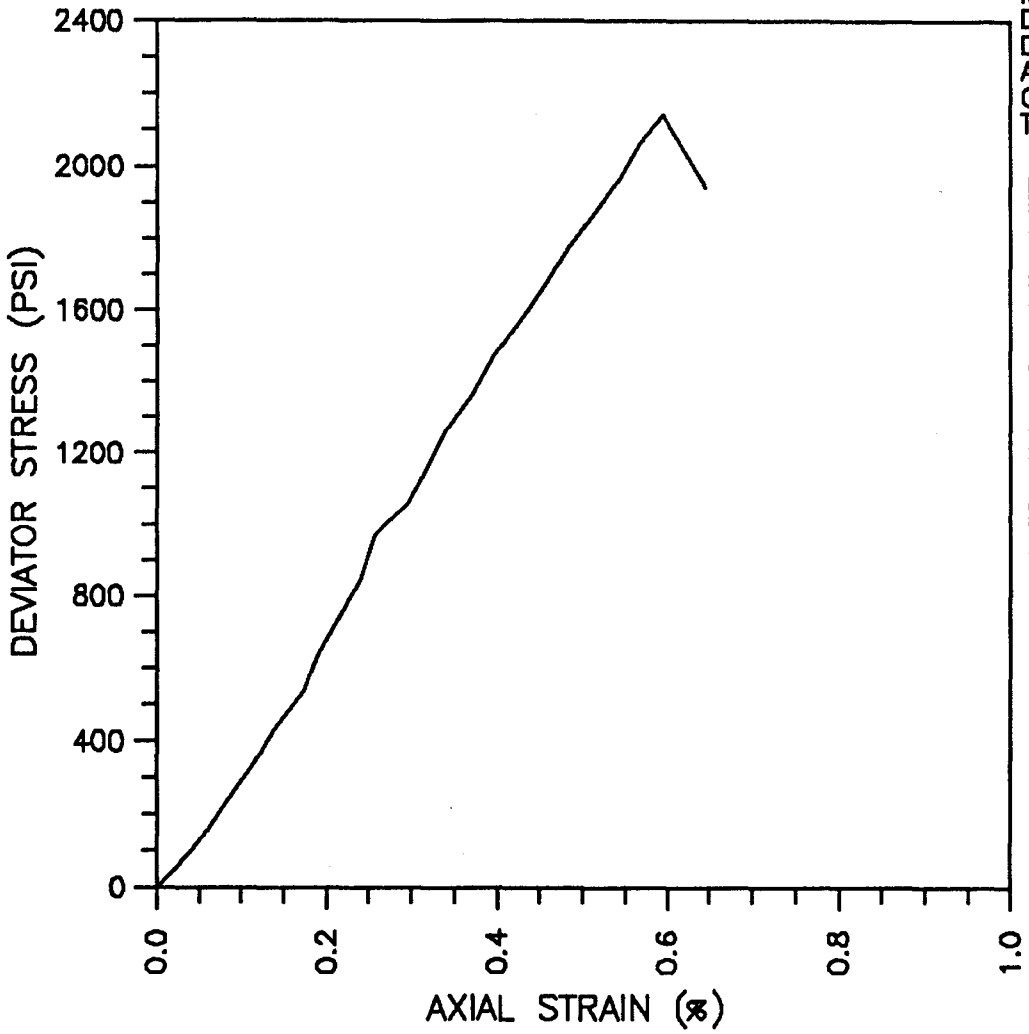
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1527
DEPTH (FT): 61.5
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.8
DRY UNIT WEIGHT (PCF): 121.9
DEG. OF SATURATION (%): 97.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

STILE: 15270615 DATE: 08-04-90 CAL: MGT5

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.507 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

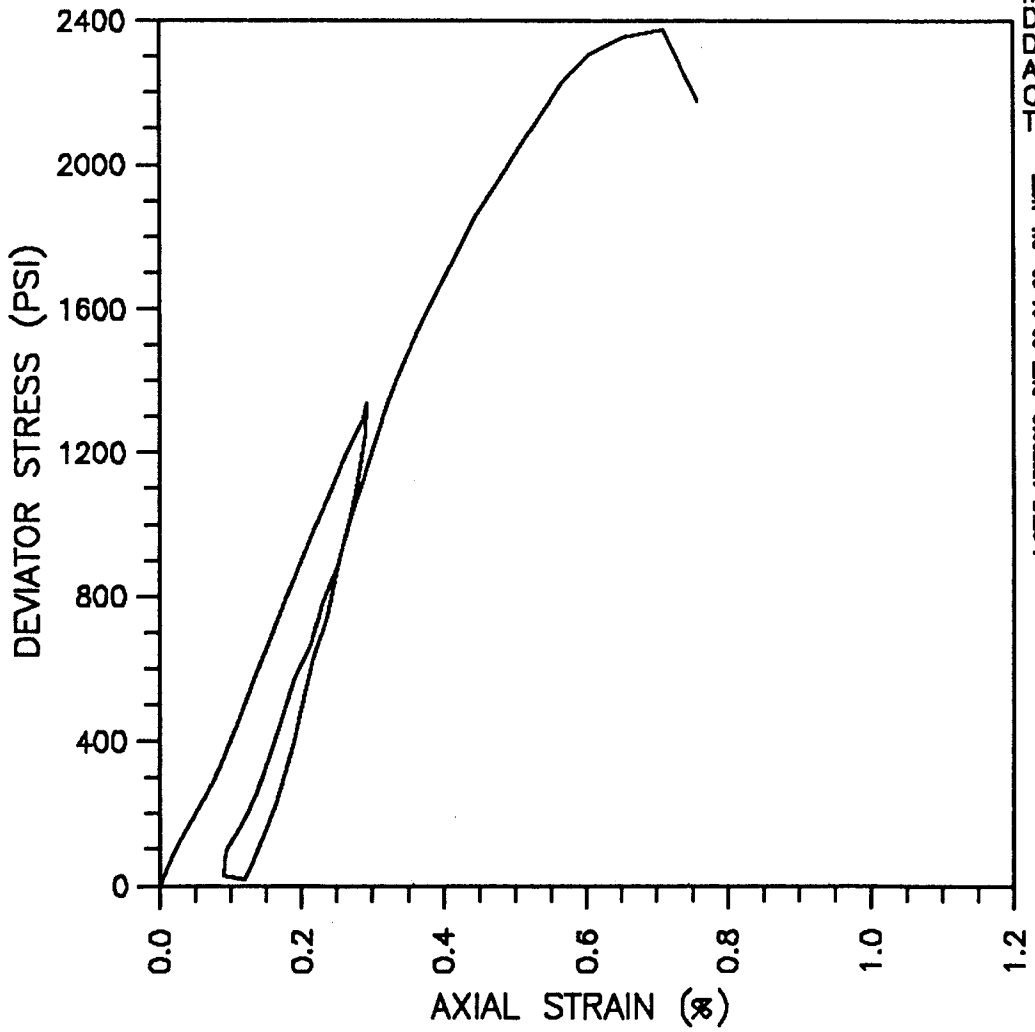
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1527
DEPTH (FT): 61.9
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.3
DRY UNIT WEIGHT (PCF): 120.4
DEG. OF SATURATION (%): 96.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

SFILE: 18270619 DATE: 06-04-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.494 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

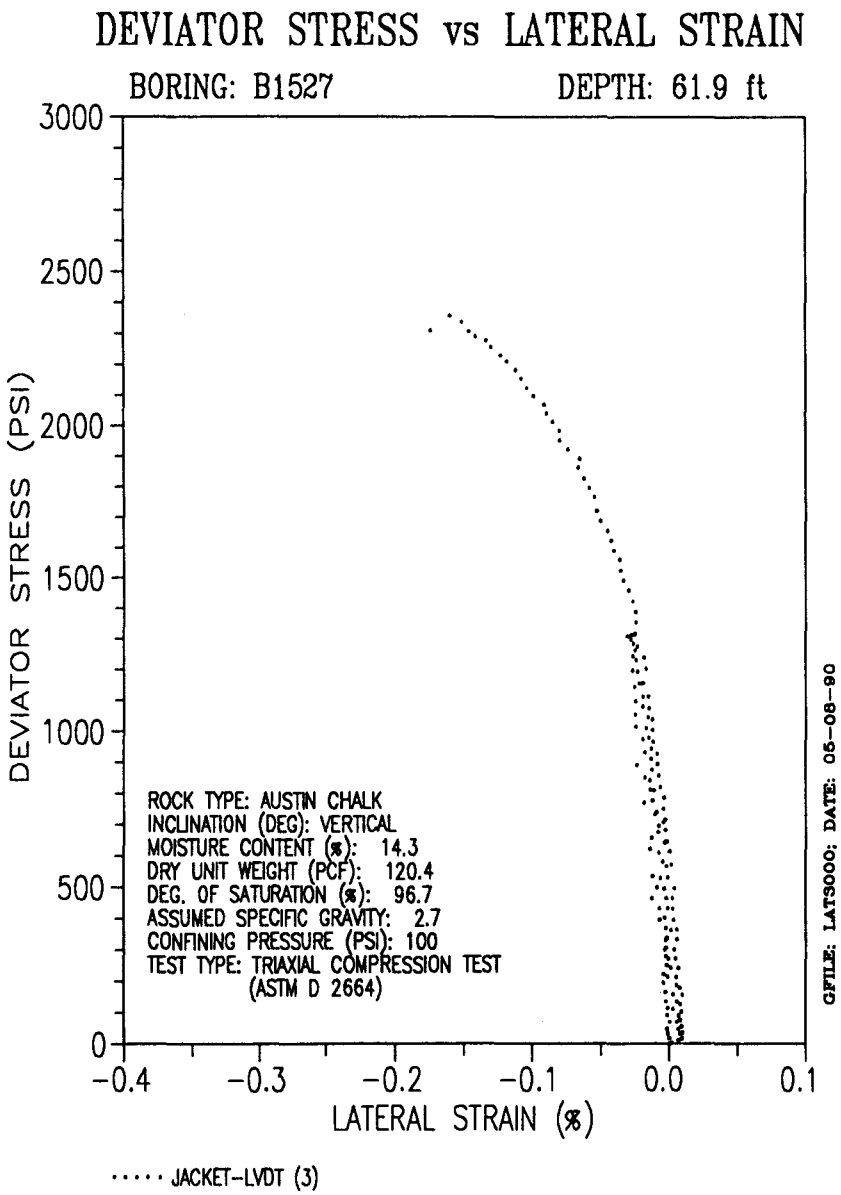
TEXAS SSC SITE

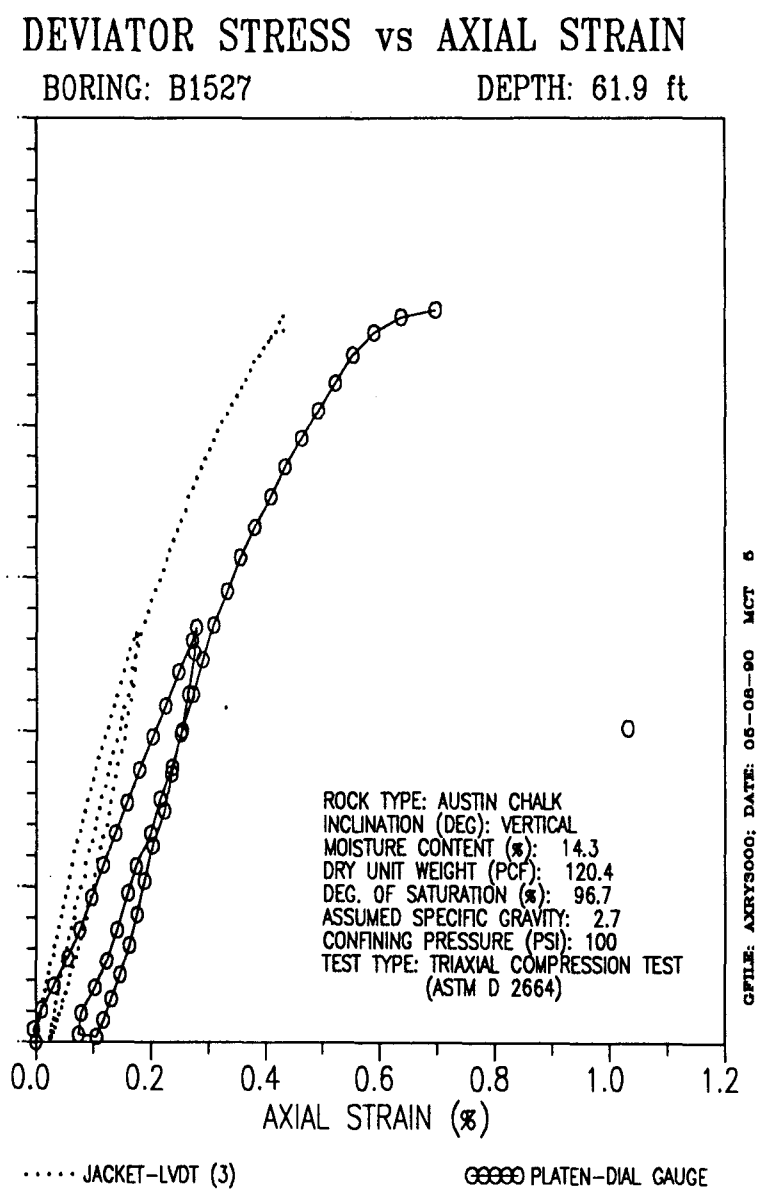
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

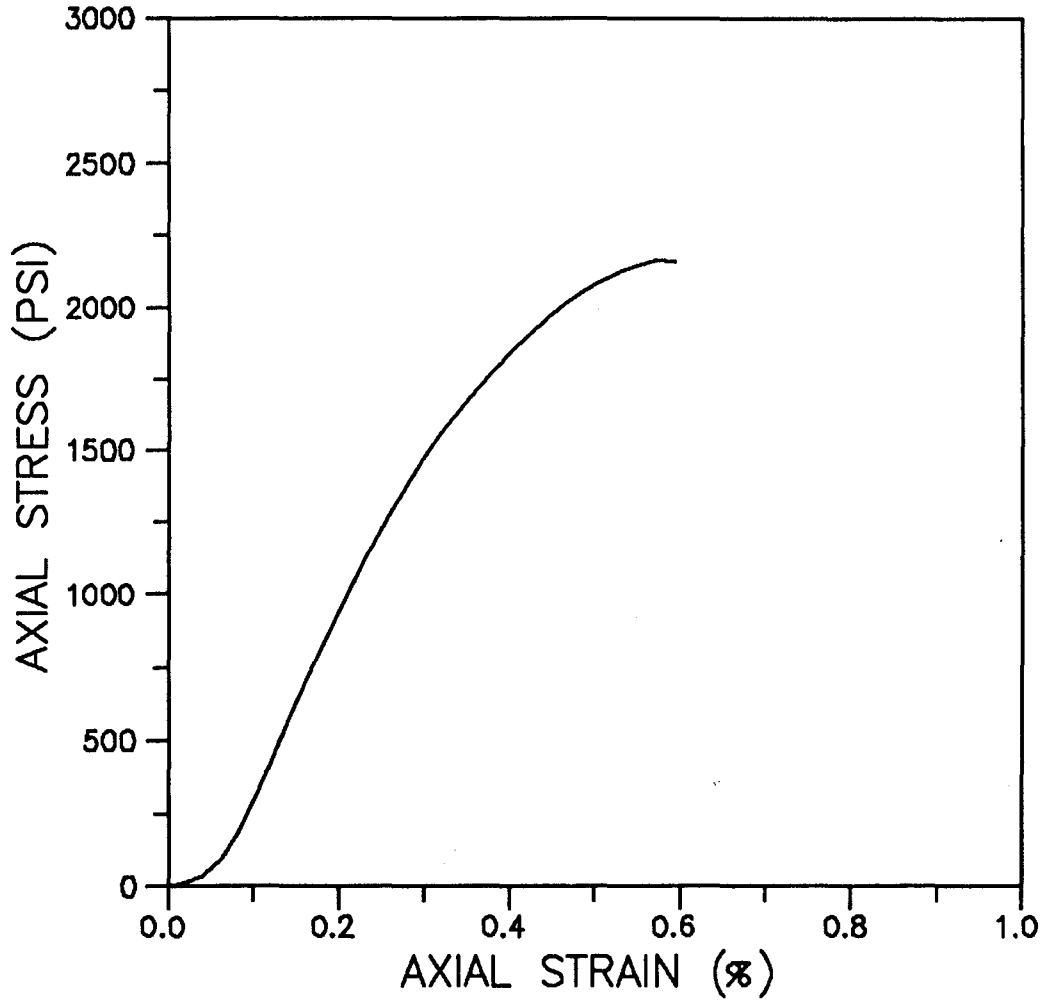
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1527
DEPTH: 61.9 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.3
DRY UNIT WEIGHT (PCF): 120.4
DEG. OF SATURATION (%): 96.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LATS000; DATE: 05-08-90
····· JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1527
DEPTH: 61.9 ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.3
DRY UNIT WEIGHT (PCF): 120.4
DEG. OF SATURATION (%): 96.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRYS000; DATE: 05-08-90 MCT 5
····· JACKET-LVDT (3)
ooooo PLATEN-DIAL GAUGE

BORING NO: B1527
DEPTH (FT): 83.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.8
DRY UNIT WEIGHT (PCF): 114.0
DEG. OF SATURATION (%): 100.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.00 x 10E5 PSI

FAILURE MODE:
CONICAL BREAK

TEXAS SSC SITE

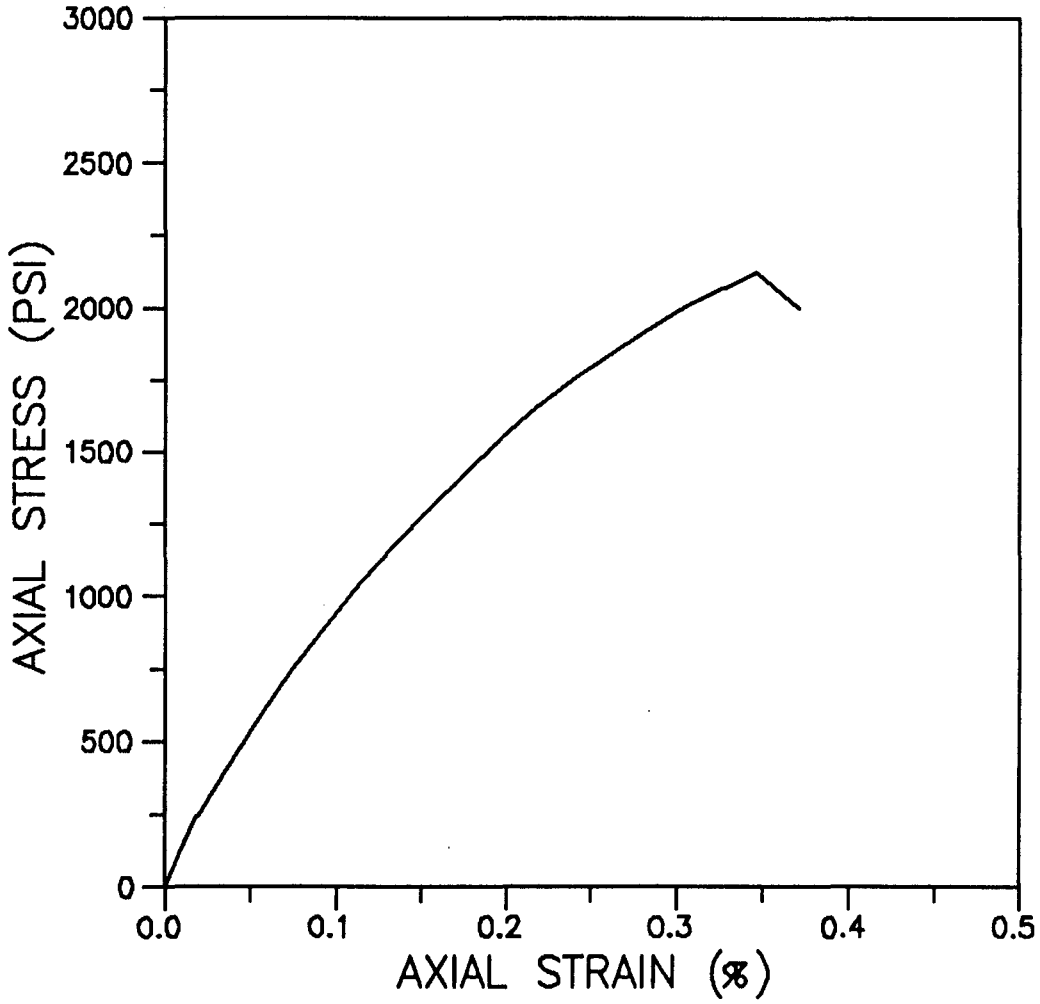
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: B1527
DEPTH (FT): 132.8
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.4
DRY UNIT WEIGHT (PCF): 115.7
DEG. OF SATURATION (%): 97.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.75 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

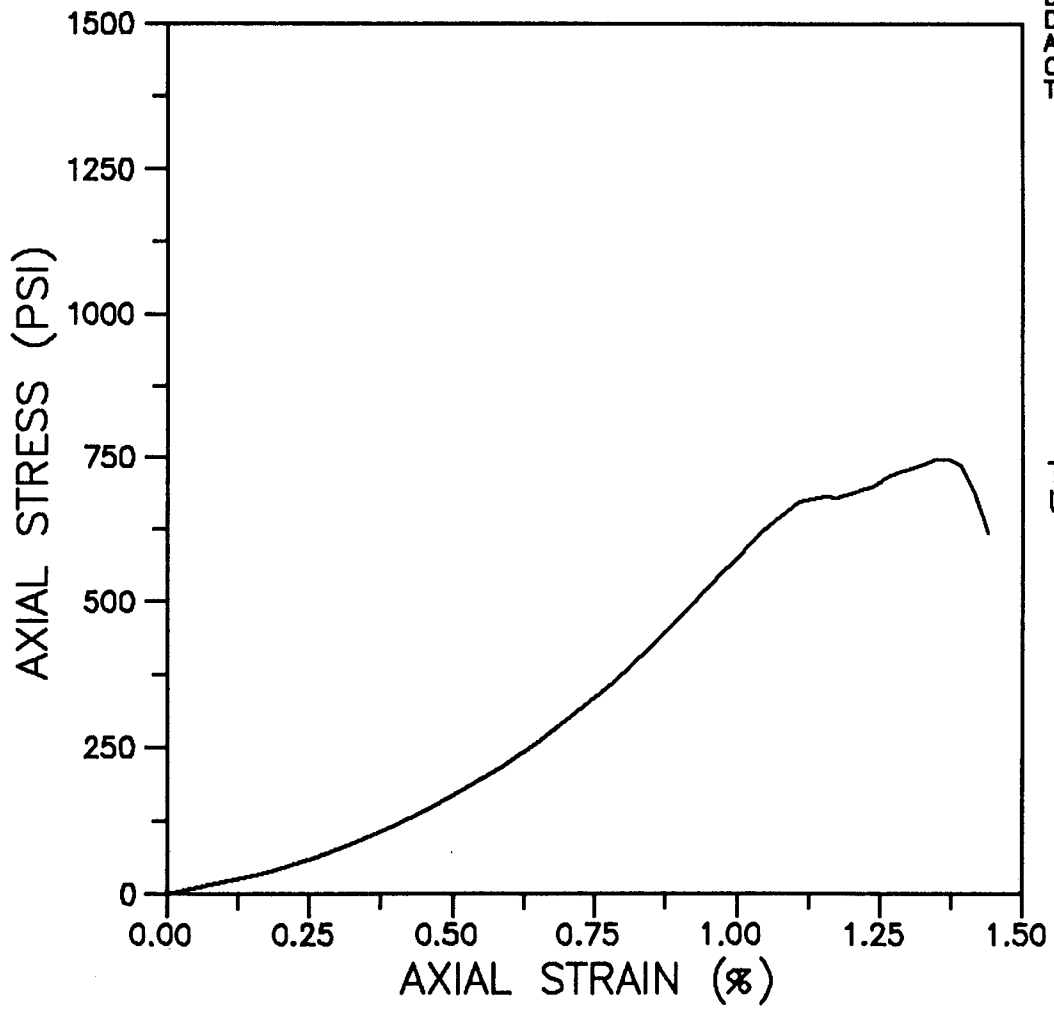
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: B1527
DEPTH (FT): 152.6
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.1
DRY UNIT WEIGHT (PCF): 126.5
DEG. OF SATURATION (%): 99.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
8.89 x 10E4 PSI

FAILURE MODE:
BARRELING / BULGING

TEXAS SSC SITE

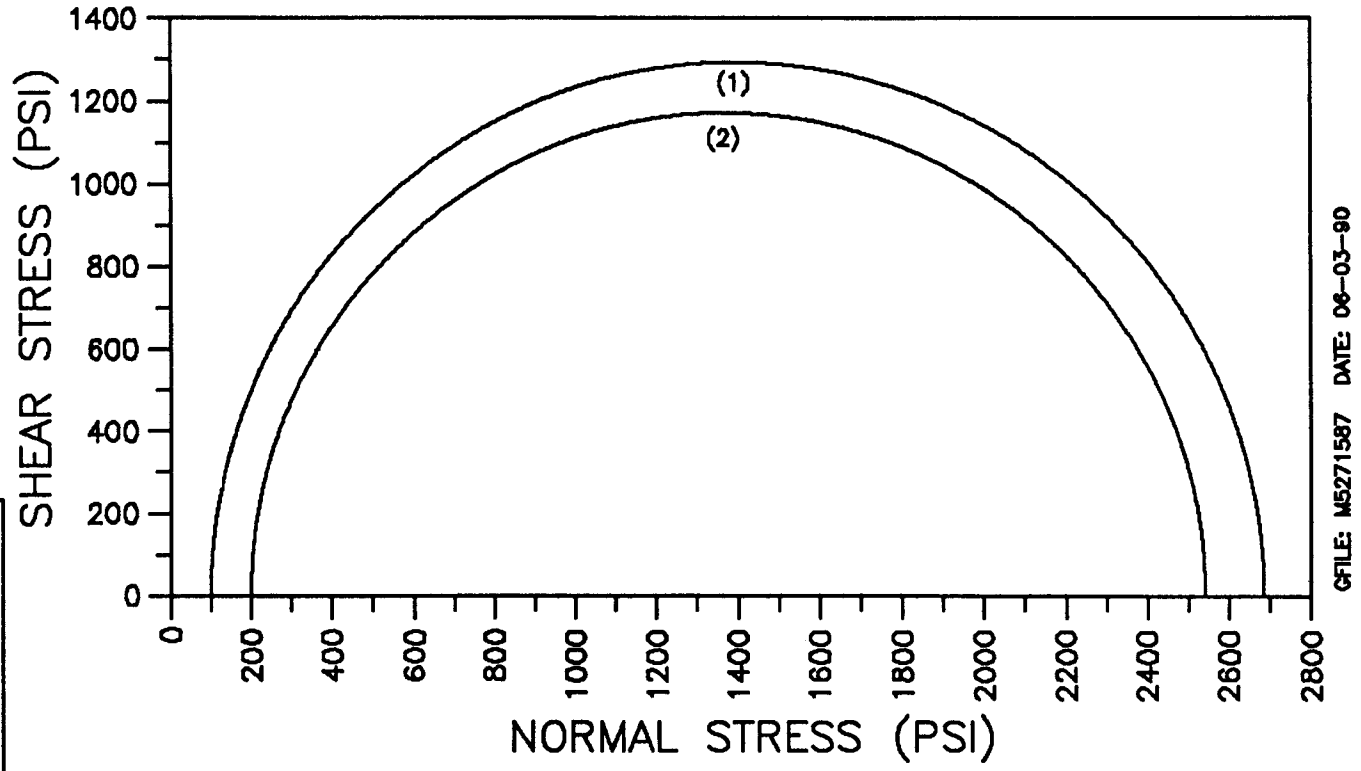
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B1527
DEPTH RANGE (FT): 158.7–159.9
AUSTIN CHALK LIMESTONE



GFILE: M5271587 DATE: 06-03-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 158.7
(2) DEPTH (FT): 159.5

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

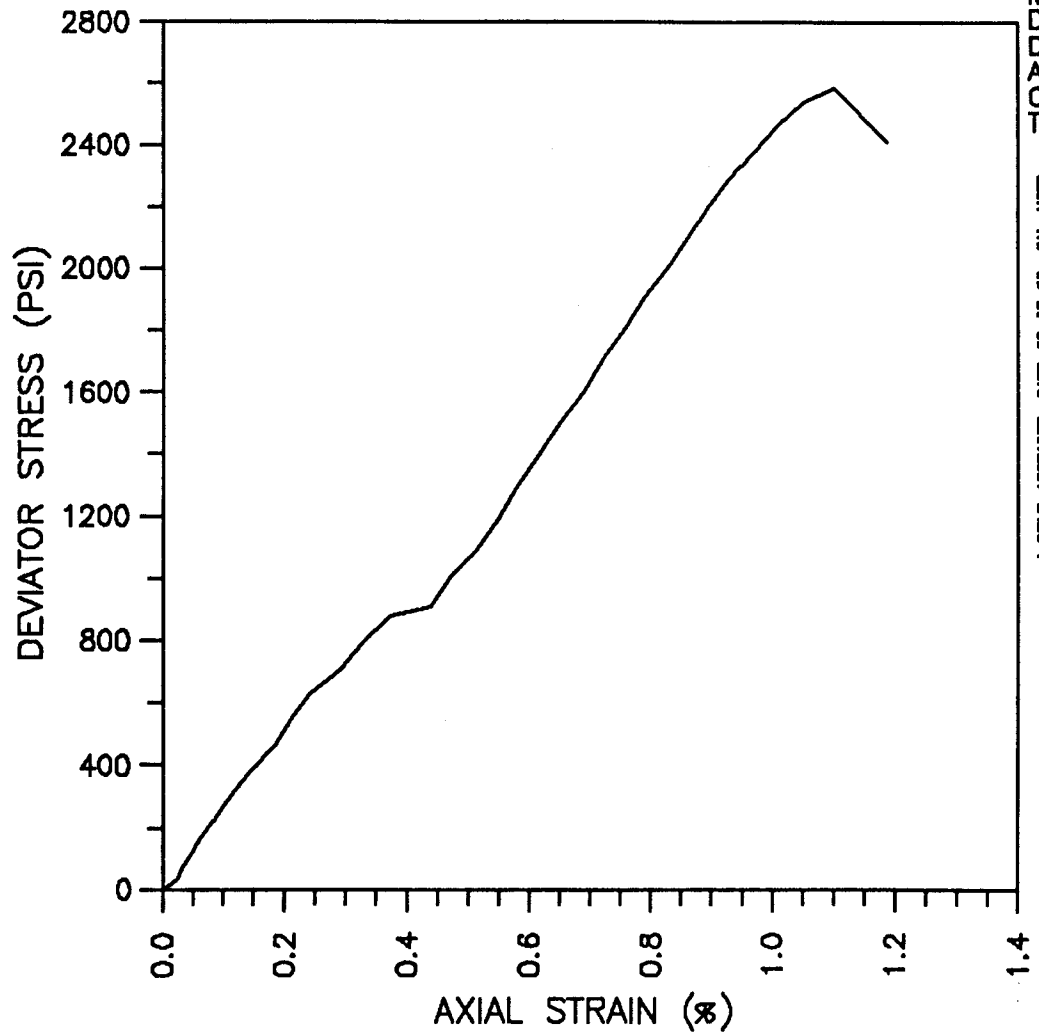
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1527
DEPTH (FT): 158.7
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.8
DRY UNIT WEIGHT (PCF): 115.2
DEG. OF SATURATION (%): 80.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: 15271567 DATE: 05-03-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.101 x10E5 PSI

FAILURE MODE:
CONICAL FAILURE

TEXAS SSC SITE

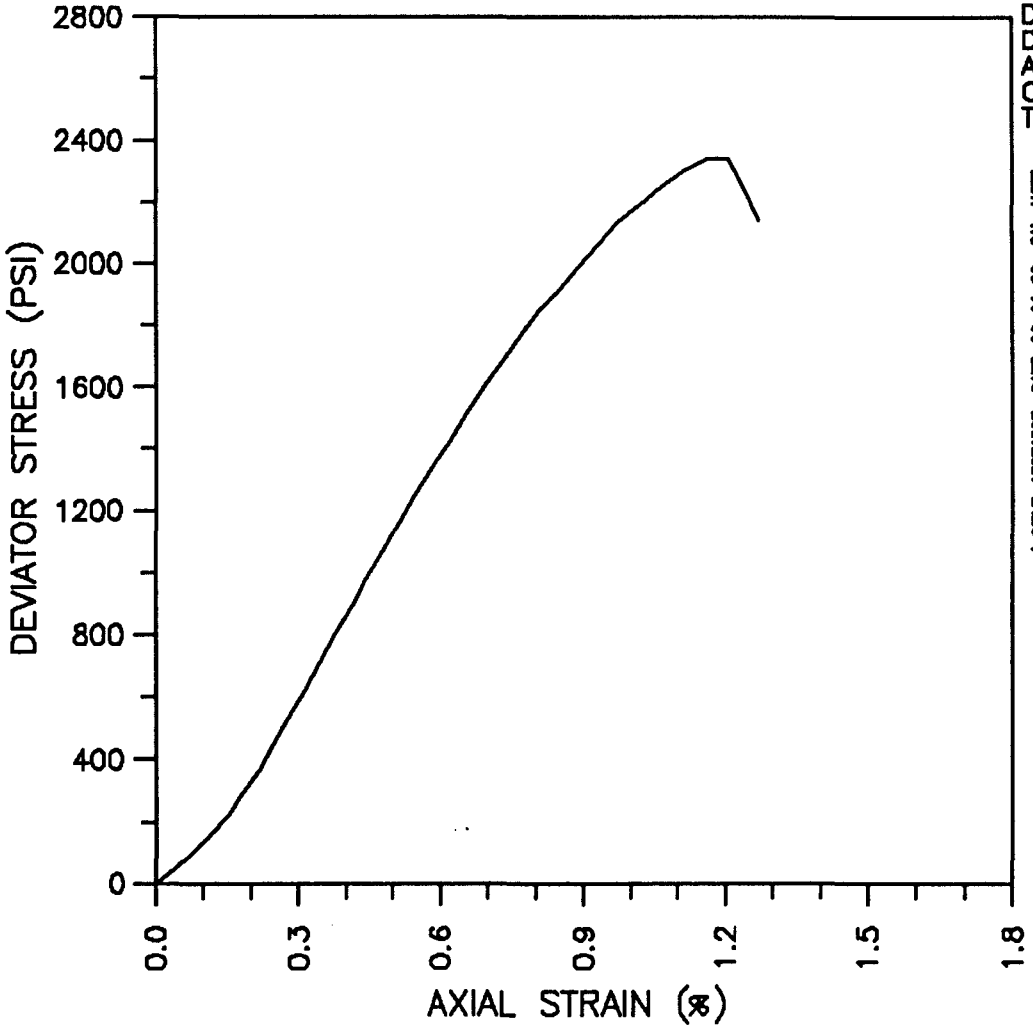
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1527
DEPTH (FT): 159.5
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.2
DRY UNIT WEIGHT (PCF): 123.1
DEG. OF SATURATION (%): 89.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

STILE: 152271595 DATE: 08-04-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.632 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 20 DEG.

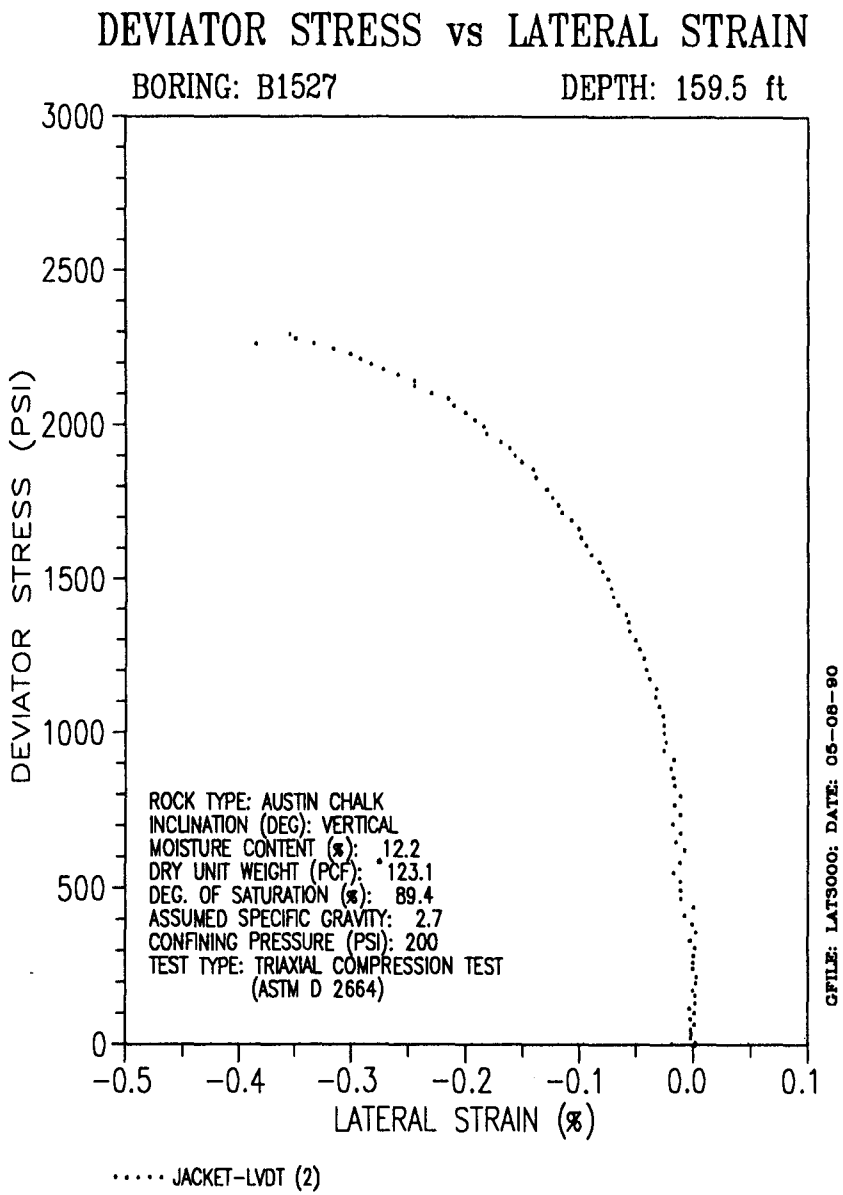
TEXAS SSC SITE

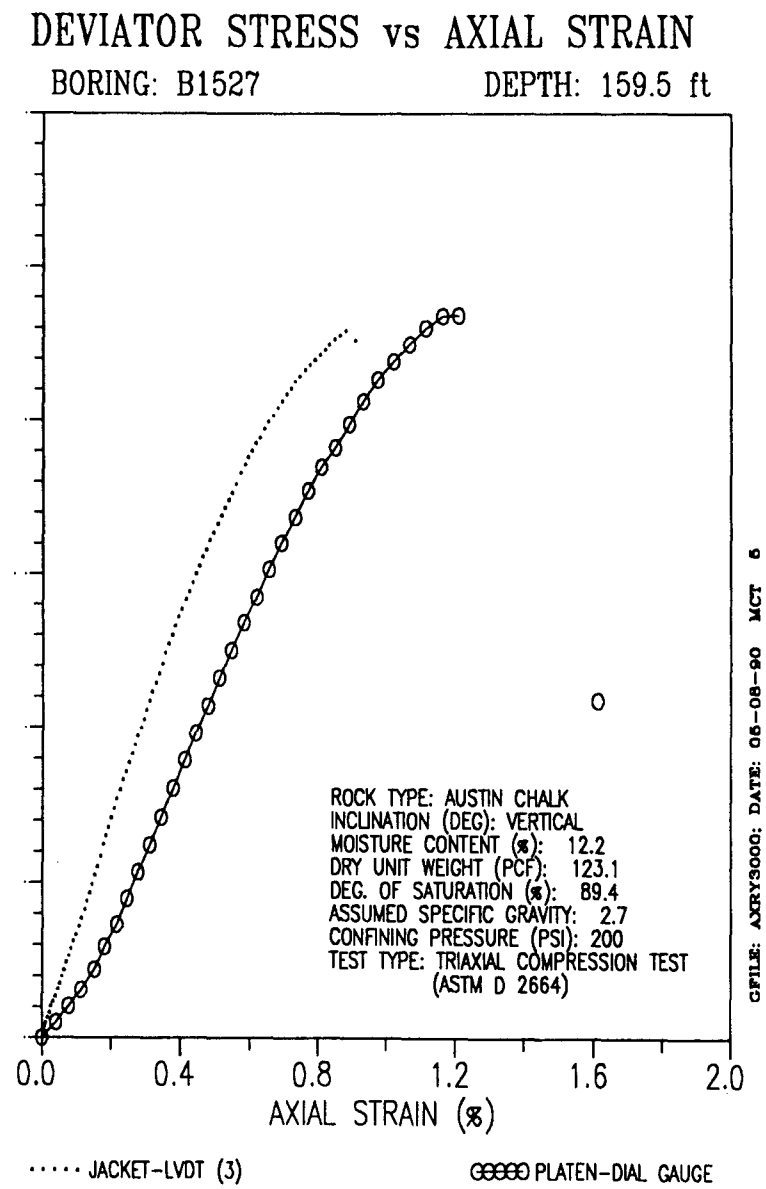
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

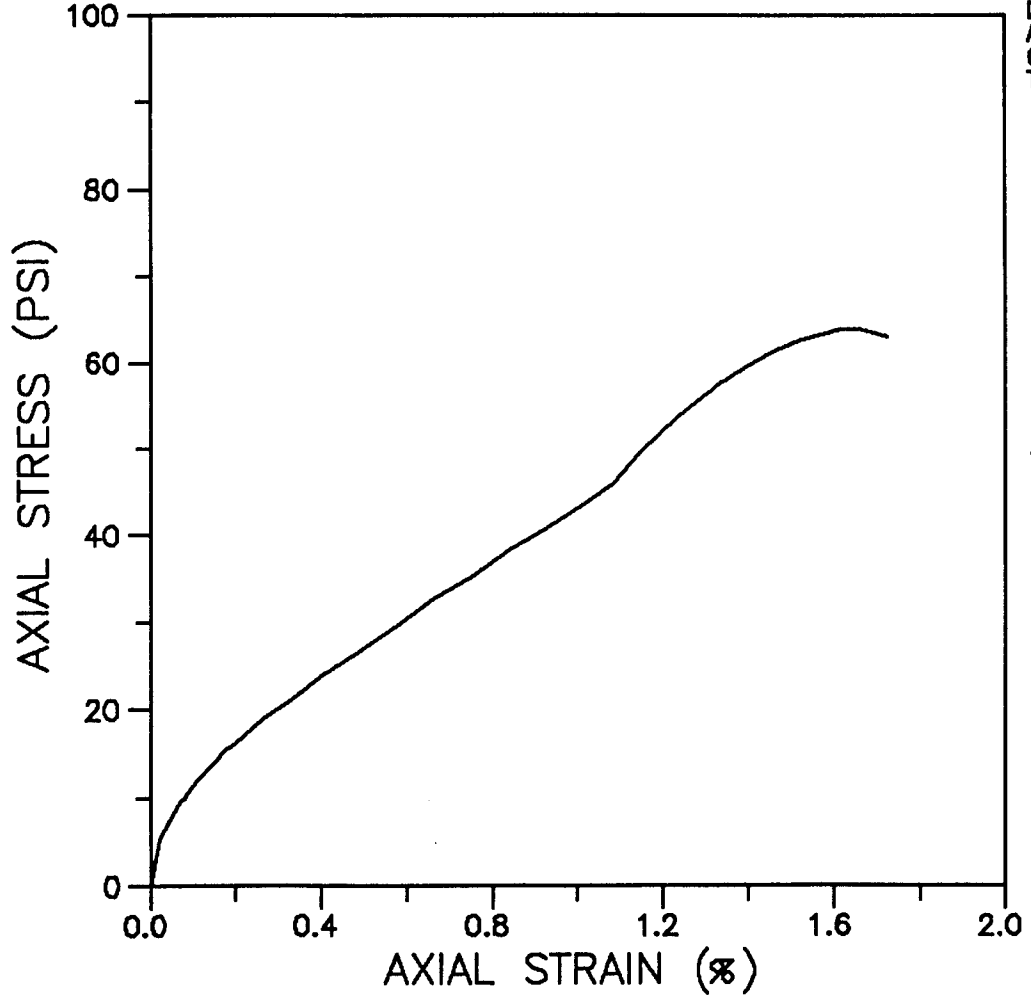
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1527
DEPTH: 159.5 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.5
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.2
DRY UNIT WEIGHT (PCF): 123.1
DEG. OF SATURATION (%): 89.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 05-08-90
JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1527
DEPTH: 159.5 ft
0.0
0.4
0.8
1.2
1.6
2.0
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.2
DRY UNIT WEIGHT (PCF): 123.1
DEG. OF SATURATION (%): 89.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 05-08-90 MCT 5
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: B1527
DEPTH (FT): 164.0
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 19.4
DRY UNIT WEIGHT (PCF): 112.4
DEG. OF SATURATION (%): 105.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.48 x 10E3 PSI

FAILURE MODE:
FAILURE ALONG A
PREXISTING SHEAR
ZONE AT 45 DEG.

TEXAS SSC SITE

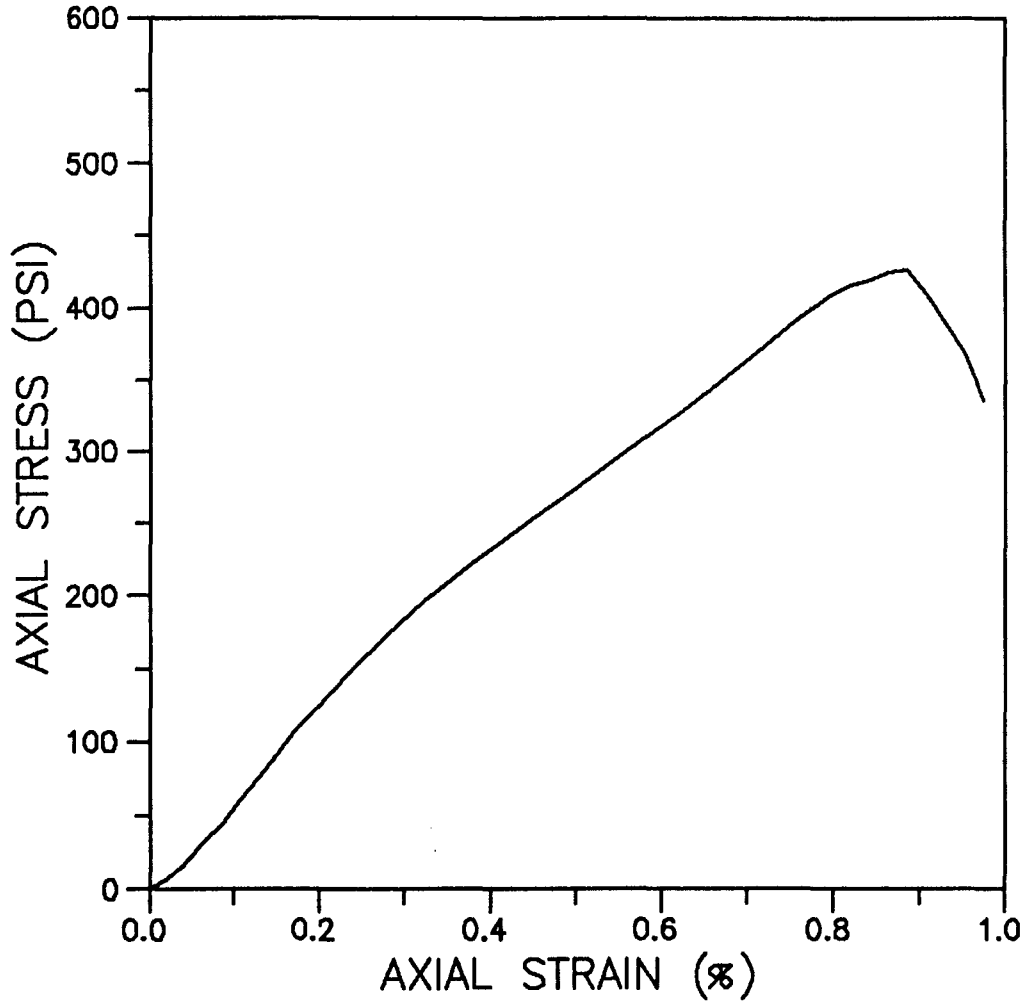
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: B1527
DEPTH (FT): 200.8
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.0
DRY UNIT WEIGHT (PCF): 127.4
DEG. OF SATURATION (%): 100.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.64 x 10E4 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

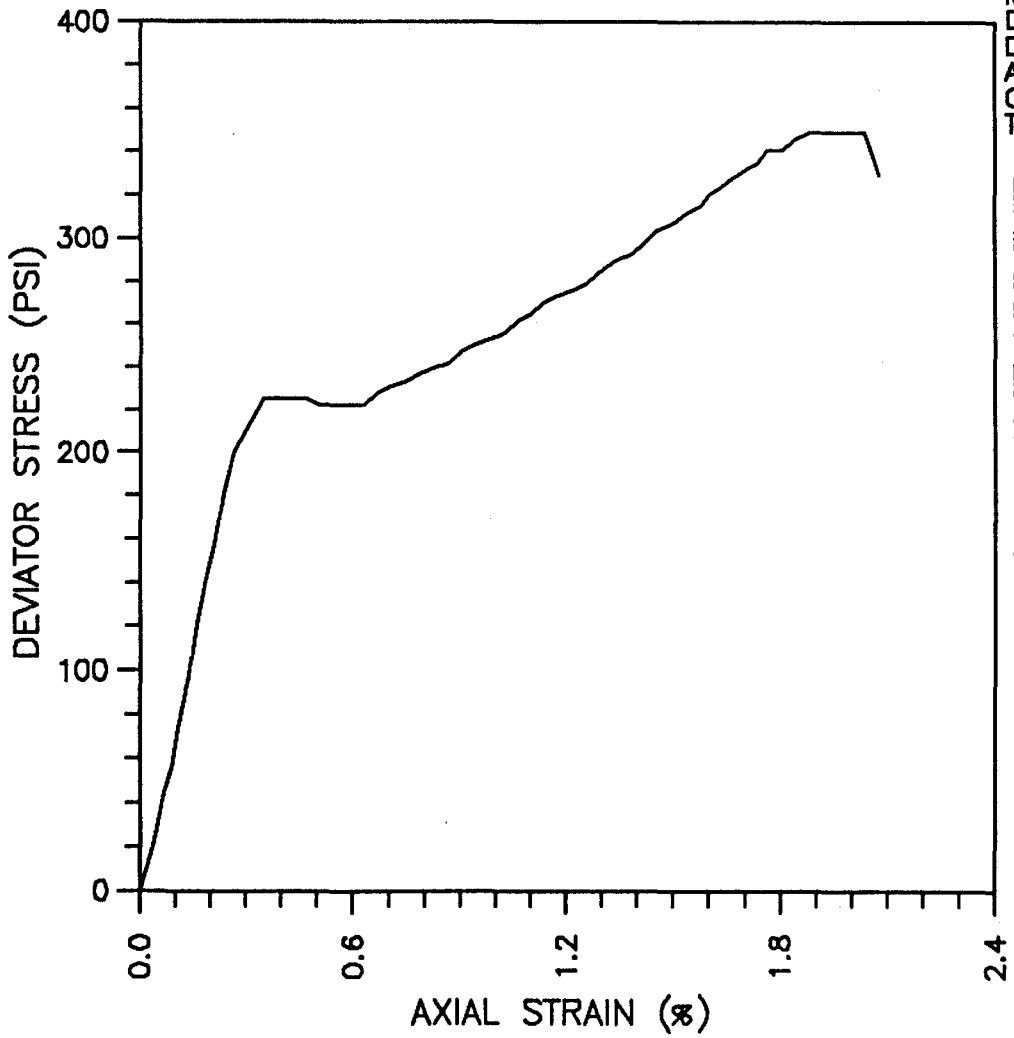
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: B1527
DEPTH (FT): 222.0
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.4
DRY UNIT WEIGHT (PCF): 114.8
DEG. OF SATURATION (%): 95.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

DFILE: 15272220 DATE: 05-03-00 CAL: MGTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.755 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

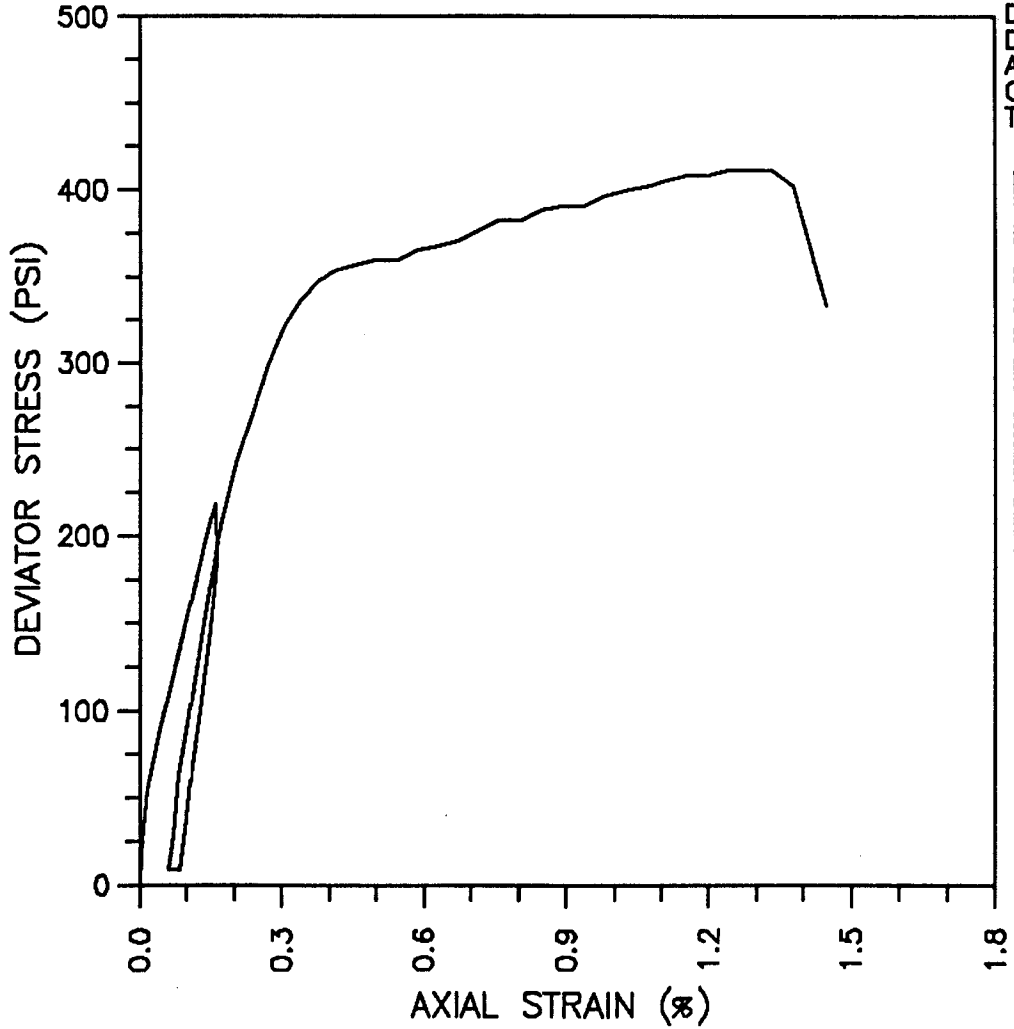
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1527
DEPTH (FT): 222.5
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.8
DRY UNIT WEIGHT (PCF): 114.8
DEG. OF SATURATION (%): 91.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

DFILE: 15272225 DATE: 05-04-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.099 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 30 DEG.

TEXAS SSC SITE

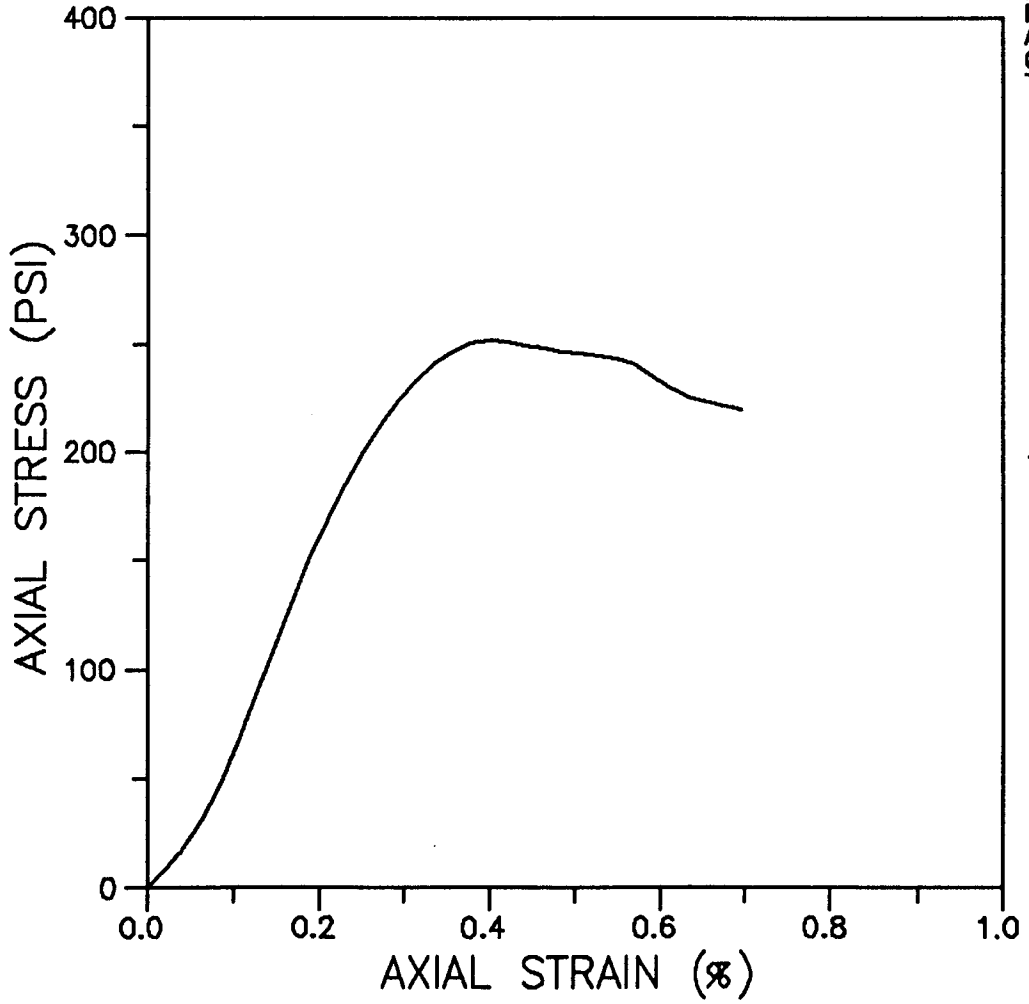
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO: B1527
DEPTH (FT): 228.1
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.6
DRY UNIT WEIGHT (PCF): 121.1
DEG. OF SATURATION (%): 100.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.00 x10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

GEOMECHANICAL TEST RESULTS

BORING B 1533

TABLE E-9. GEOMECHANICAL TEST RESULTS - BORING B 1533

GENERAL LITHOLOGY	BORING DEPTH feet	MOISTURE CONTENT percent	DRY DENSITY pcf	SPECIFIC GRAVITY	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	FRACTION FINER THAN # 200 SIEVE percent	CARBONATE CONTENT percent	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES*	UNCONFINED COMPRESSIVE STRENGTH psi	TRIAXIAL COMPRESSION CONFINING PRESSURE σ_3 psi	TRIAXIAL COMPRESSION DEVIATOR STRESS $\sigma_1-\sigma_3$ psi	FAILURE STRAIN percent	TANGENT YOUNG'S MODULUS E50 (psi)x10E5	TANGENT YOUNG'S MODULUS UNLOAD/ RELOAD (psi)x10E5	TANGENT YOUNG'S MODULUS σ_3 psi	POISSON'S RATIO	BRAZIL TENSILE STRENGTH psi	2ND CYCLE SLAKE DURABILITY INDEX percent	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX psi	COMMENTS
CLAY	0.0	21.1			43	25	52.9																
AUSTIN CHALK	4.0	13.1																					
AUSTIN CHALK	4.2	13.8	120.7						2.3	B-1/30	1745			0.25	9.25		0						NOTE 1
AUSTIN CHALK	6.9	14.8	118.3	2.70																			
AUSTIN CHALK	7.0	14.6							0.5										216				
AUSTIN CHALK	33.8	13.8	119.4																				
AUSTIN CHALK	36.0	13.9																					
AUSTIN CHALK	36.1	14.0	116.2						2.2	B-1/30	3188			0.96	4.43		0						
AUSTIN CHALK	52.4	10.5	129.3						2.2	D & E	1773			0.82	2.37		0						
AUSTIN CHALK	52.8	10.1	130.6						2.3	B-1/30		50	1988	0.92	2.38		50						
AUSTIN CHALK	53.2	11.0	127.6	2.67					2.3	B-1/20		100	2236	0.69	3.50		100						
AUSTIN CHALK	53.2														3.77			0.48					NOTE 2
AUSTIN CHALK	53.7	16.4	115.3																				
AUSTIN CHALK	97.7	13.5																					
AUSTIN CHALK	97.9	12.5	120.2						2.2	B-4	2120			0.67	3.19		0						
BENTONITE	102.0	22.4	103.2																				
BENTONITE	102.2				106	71	90.2	32.3															
BENTONITE	102.4	35.1	82.7																				
BENTONITE	102.6				112	75	96.5	8.4															
AUSTIN CHALK	106.1	12.0	125.8						2.1	B-1/30	2614			0.63	5.63		0						
AUSTIN CHALK	106.5	12.5																					
AUSTIN CHALK	118.0	11.1																					
AUSTIN CHALK	118.2	11.7	126.7						2.2	D	810			0.35	2.91		0						
AUSTIN CHALK	143.1	12.9																					
AUSTIN CHALK	143.2	11.5							0.5										249				
AUSTIN CHALK	143.3	12.5	124.3						2.2	B-1/30	2908			0.41	8.74		0						
AUSTIN CHALK	150.2	15.2	119.6						2.3	D & E		100	3010	0.47	8.53	12.66	100						NOTE 3
AUSTIN CHALK	150.2														11.82	13.75		0.15 (2)					NOTES 2 and 4
AUSTIN CHALK	150.6	14.1	122.7																				
AUSTIN CHALK	151.9	14.1	120.2	2.67					2.3	B-1/20		200	3029	0.55	5.96		200						
AUSTIN CHALK	151.9														9.68			0.13 (1)					NOTE 2
AUSTIN CHALK	152.3	15.5	117.6																				
AUSTIN CHALK	160.4	16.9																					
AUSTIN CHALK	160.6	16.3							0.5										236				
AUSTIN CHALK	160.7	15.6	117.3						2.2	D	2431			0.54	7.30		0						
EAGLE FORD SHALE	173.9	17.0	116.1						2.4	B-1/40		100	348	0.63	0.90		100						
EAGLE FORD SHALE	174.4	17.5	114.6	2.71	103	74	98.7	2.8	2.2	B-1/60		200	330	0.36	1.16	1.57	200						NOTE 3
EAGLE FORD SHALE	174.4														1.34	1.51		0.18					NOTE 2
EAGLE FORD SHALE	175.1	17.5	114.7																				
EAGLE FORD SHALE	181.8	15.2	119.8						2.3	B-1/40	259			0.29	1.08		0						
EAGLE FORD SHALE	182.2	16.0	116.9																				
EAGLE FORD SHALE	182.8	16.4	112.5		77	51	99.6	11.8														26.6	
EAGLE FORD SHALE	183.0	16.0	113.1																			31.9	
EAGLE FORD SHALE	200.0	16.4																					
EAGLE FORD SHALE	200.1	16.6	116.2		106	70	99.9	6.2	2.2	B-1/30	218			0.34	0.97		0						

TABLE E-9. GEOMECHANICAL TEST RESULTS – BORING B 1533 (Continued)

GENERAL LITHOLOGY	BORING DEPTH feet	MOISTURE CONTENT percent	DRY DENSITY pcf	SPECIFIC GRAVITY	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	FRACTION FINER THAN # 200 SIEVE percent	CARBONATE CONTENT percent	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES*	UNCONFINED COMPRESSIVE STRENGTH psi	TRIAXIAL COMPRESSION CONFINING PRESSURE σ_3 psi	TRIAXIAL COMPRESSION DEVIATOR STRESS $\sigma_1-\sigma_3$ psi	FAILURE STRAIN percent	TANGENT YOUNG'S MODULUS E50 (psi)x10E5	TANGENT YOUNG'S MODULUS UNLOAD/ RELOAD (psi)x10E5	TANGENT YOUNG'S MODULUS σ_3 psi	POISSON'S RATIO	BRAZIL TENSILE STRENGTH psi	2ND CYCLE SLAKE DURABILITY INDEX percent	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX psi	COMMENTS
EAGLE FORD SHALE	200.5	16.3																		29.2			
EAGLE FORD SHALE	202.6	16.3	117.4		87	58	99.0	3.8	2.4	D		300	314	0.39	1.98		300						NOTE 5
EAGLE FORD SHALE	203.0	17.1	114.8						2.2	B-1/40		200	254	0.33	0.86		200						NOTE 5
EAGLE FORD SHALE	203.5	16.1	117.3																				
EAGLE FORD SHALE	220.1	16.4	116.4						2.3	D	283			0.52	0.70		0						
EAGLE FORD SHALE	220.5	16.7	114.7																				
EAGLE FORD SHALE	220.8	16.2	115.8	2.72	99	70	98.1	3.2														47.6	
EAGLE FORD SHALE	221.1	16.3	120.4																			31.3	
EAGLE FORD SHALE	246.3	14.7																					
EAGLE FORD SHALE	246.5	14.6	121.9		95	60	99.9	5.7	2.3	B-1/45	239			0.73	0.66		0						
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

B1533P22.WK1
REVISION: 2.2
DATE: 07/24/90

* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

Symbol	Failure Type
A	No discernible failure plane
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core
B-1	Shear plane
B-2	Bedding plane shear
B-3	Shear plane along pre-existing fracture, shear zone, etc.
B-4	Combination
C	Barreling/Bulging
D	Longitudinal (axial) splitting
E	Conical
F	No information

NOTES:

1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

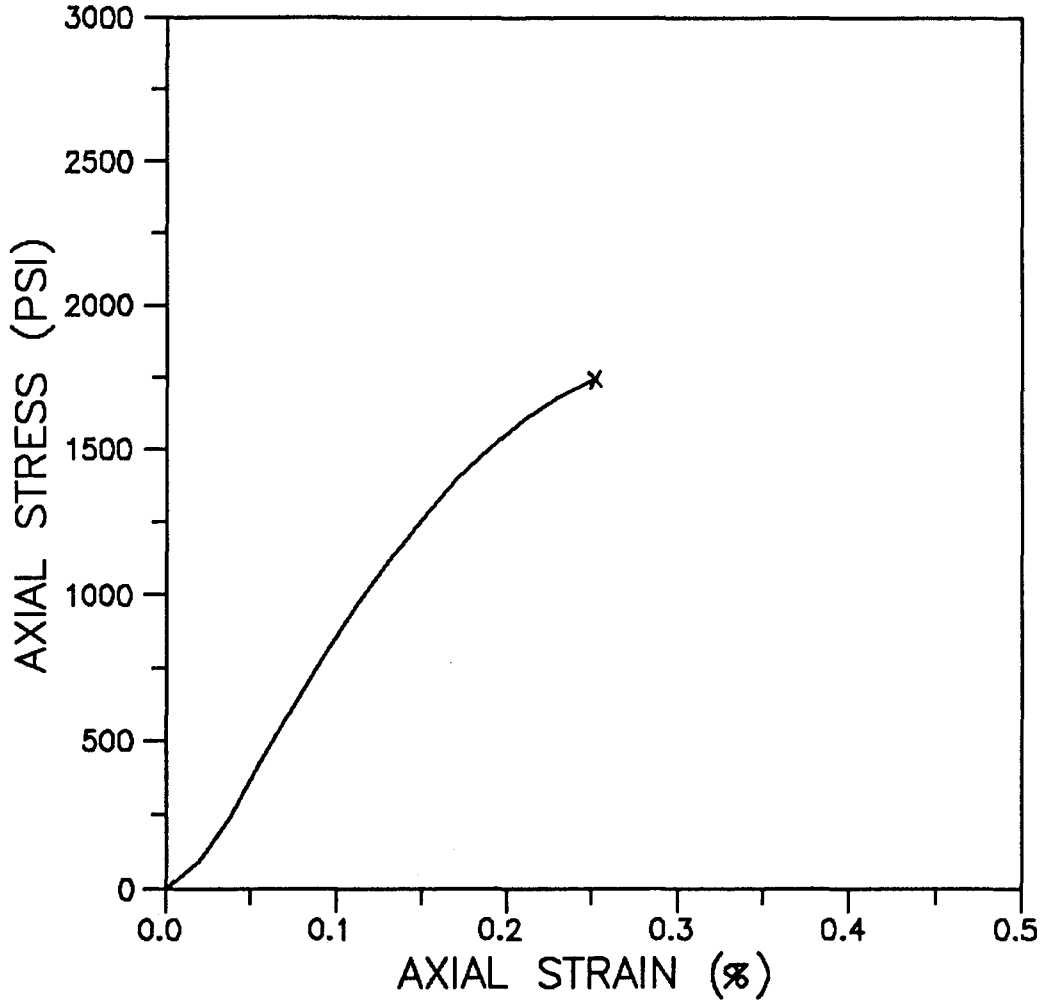
2) Modulus and Poisson's ratio calculated from axial and lateral strains measured using LVDTs. Axial gage length is 2.8 inches.

3) Triaxial compression test is cyclic with one unload/reload cycle.

4) For Poisson's ratio values: the value within parenthesis indicates the number of LVDTs recording lateral strains. Otherwise all 3 LVDTs recorded strains.

5) Sample separated along bedding plane prior to compression test.

BORING NO: 1533
DEPTH (FT): 4.2
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.8
DRY UNIT WEIGHT (PCF): 120.7
DEG. OF SATURATION (%): 94.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
9.25 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

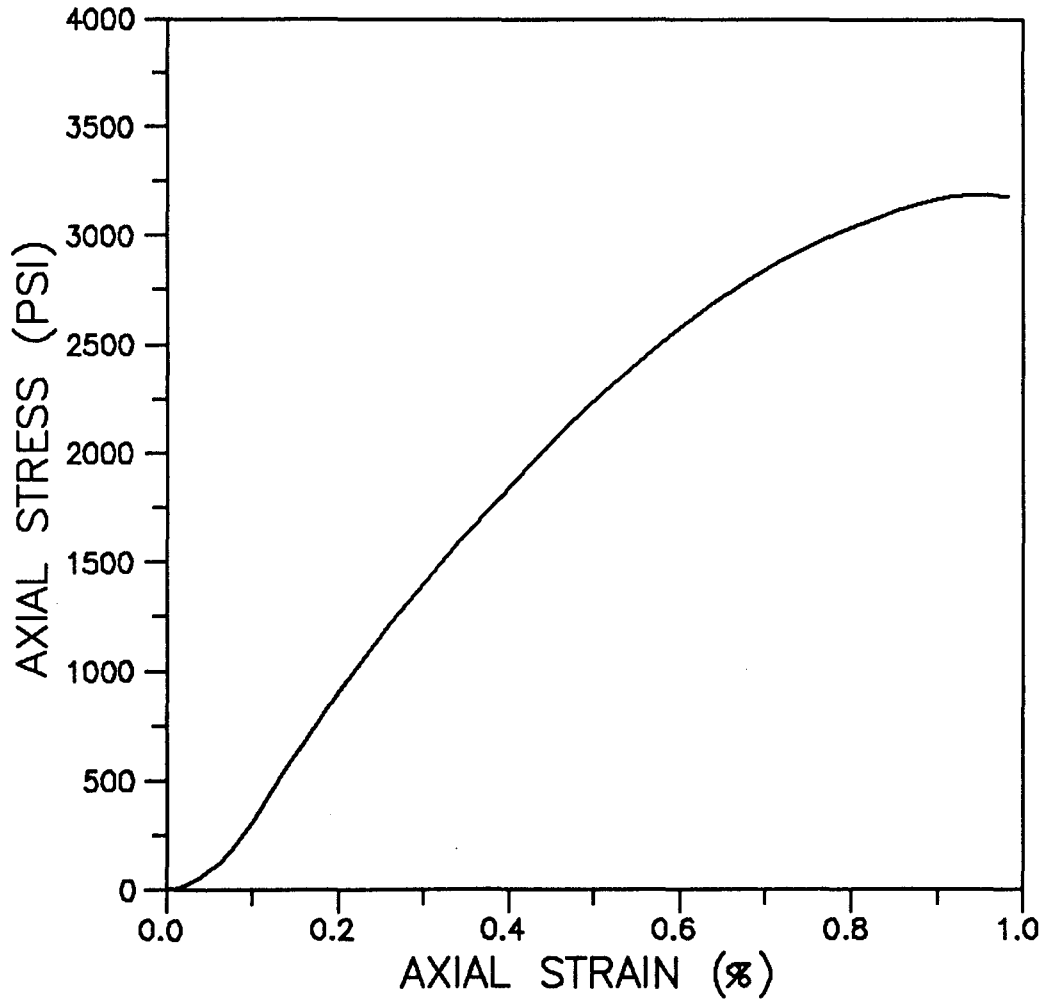
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: 1533
DEPTH (FT): 36.1
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.0
DRY UNIT WEIGHT (PCF): 116.2
DEG. OF SATURATION (%): 84
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.43 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

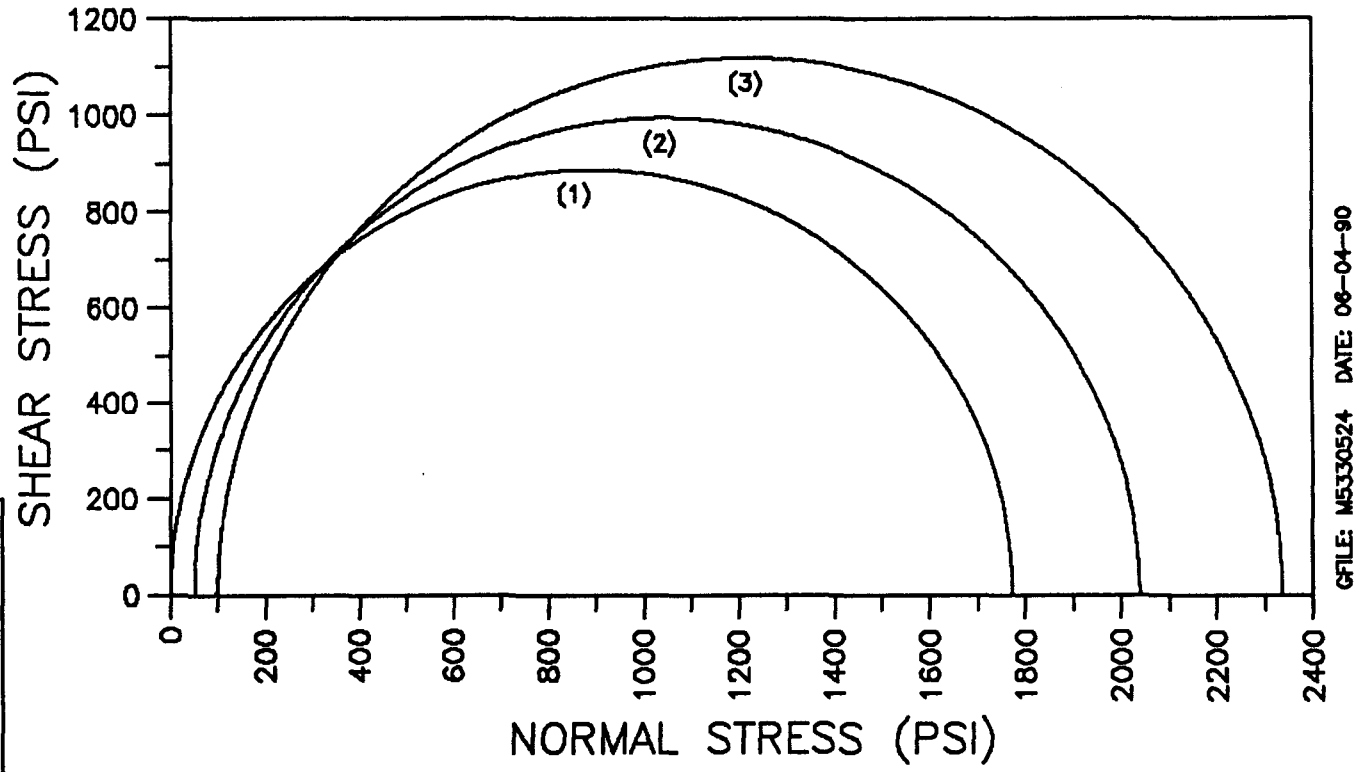
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B1533
DEPTH RANGE (FT): 52.4–53.6
AUSTIN CHALK LIMESTONE



GFILE: M5330524 DATE: 06-04-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 52.4
(2) DEPTH (FT): 52.8
(3) DEPTH (FT): 53.2

INCLINATION (DEG): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

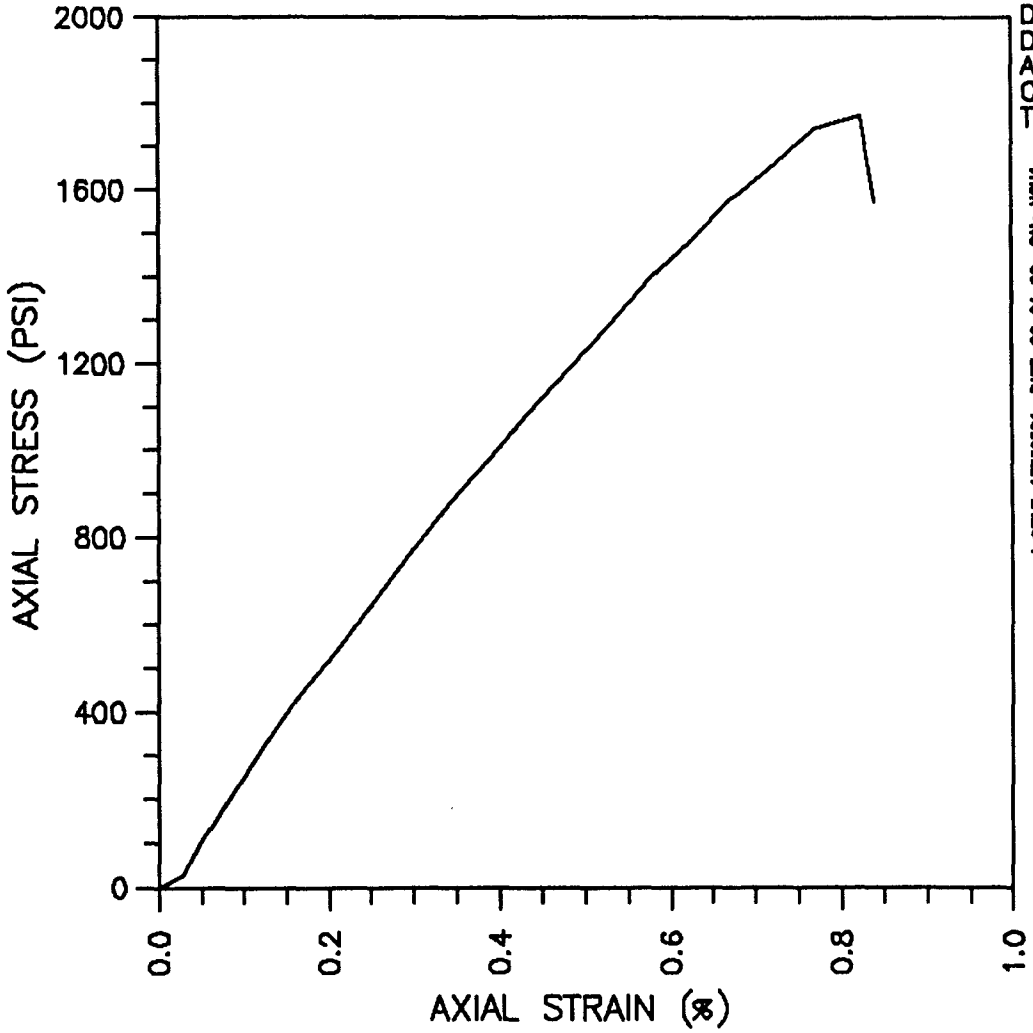
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 52.4
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.5
DRY UNIT WEIGHT (PCF): 129.3
DEG. OF SATURATION (%): 93.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: 15330524 DATE: 09-04-90 CAL: MGU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.367 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING
W/CONICAL AT TOP

TEXAS SSC SITE

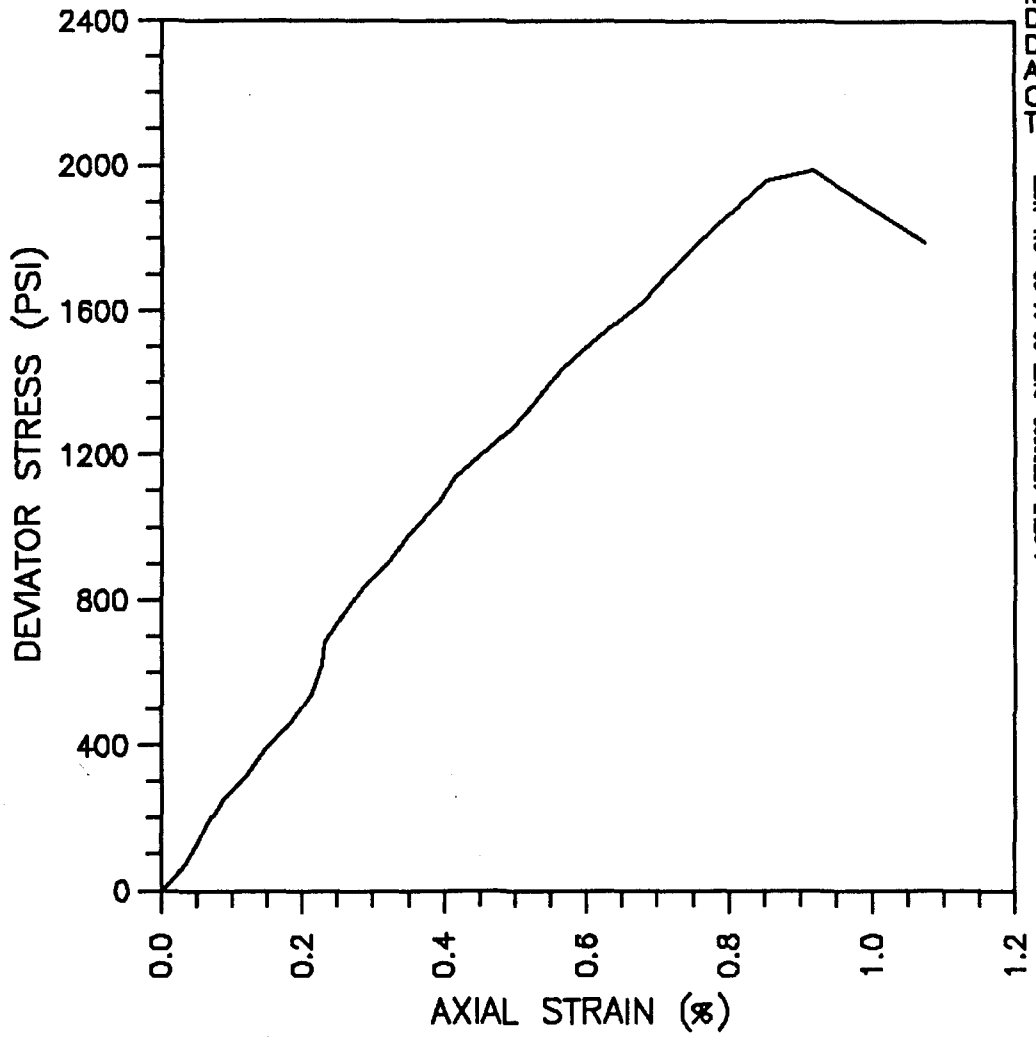
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 52.8
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 10.1
DRY UNIT WEIGHT (PCF): 130.6
DEG. OF SATURATION (%): 93.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 50
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: 15330528 DATE: 06-04-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.376 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 30 DEG

TEXAS SSC SITE

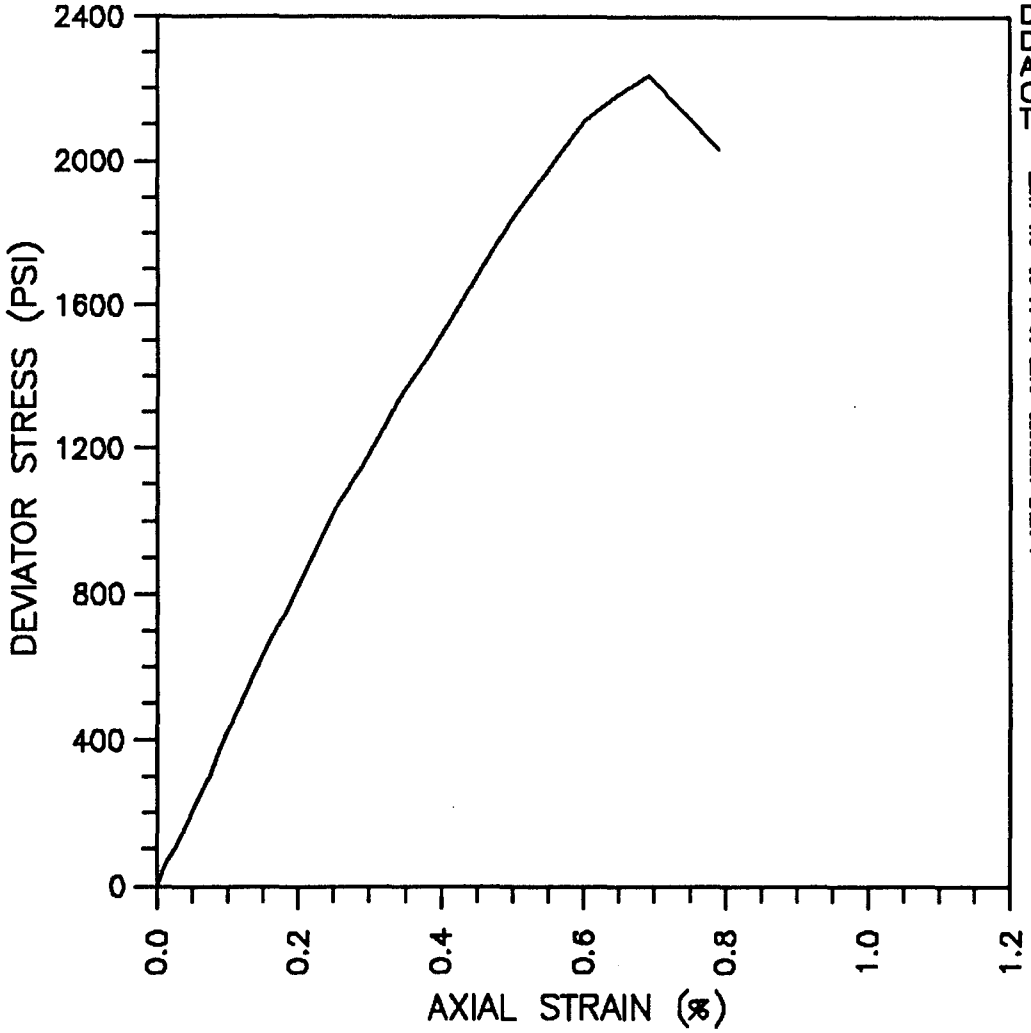
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 53.2
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.0
DRY UNIT WEIGHT (PCF): 127.6
DEG. OF SATURATION (%): 93.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.504 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 20 DEG.

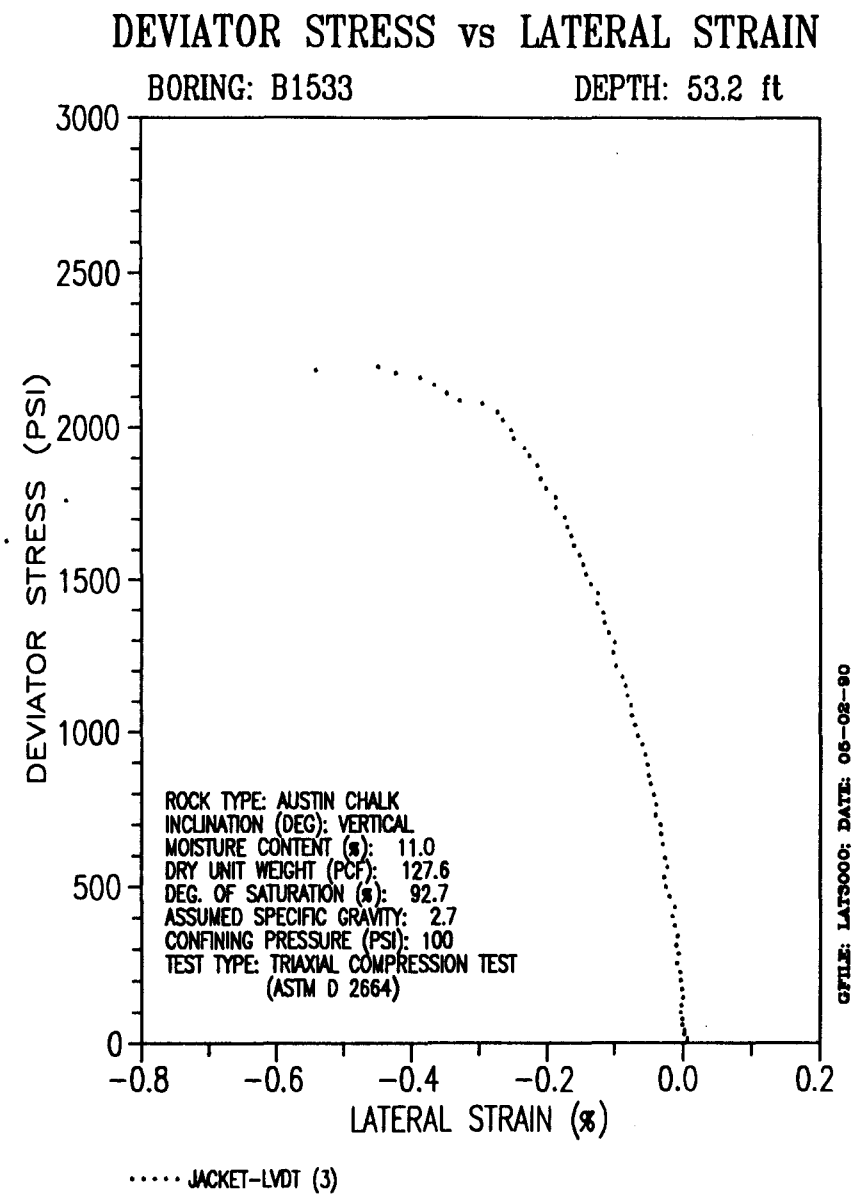
TEXAS SSC SITE

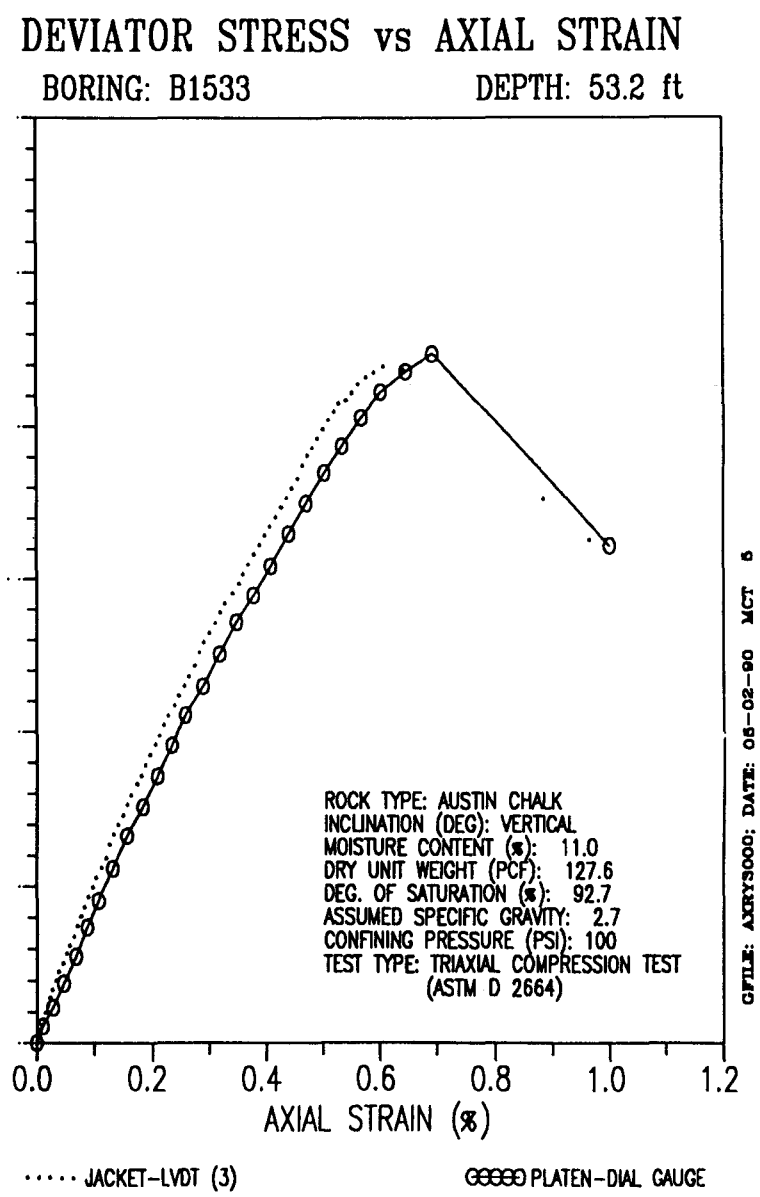
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

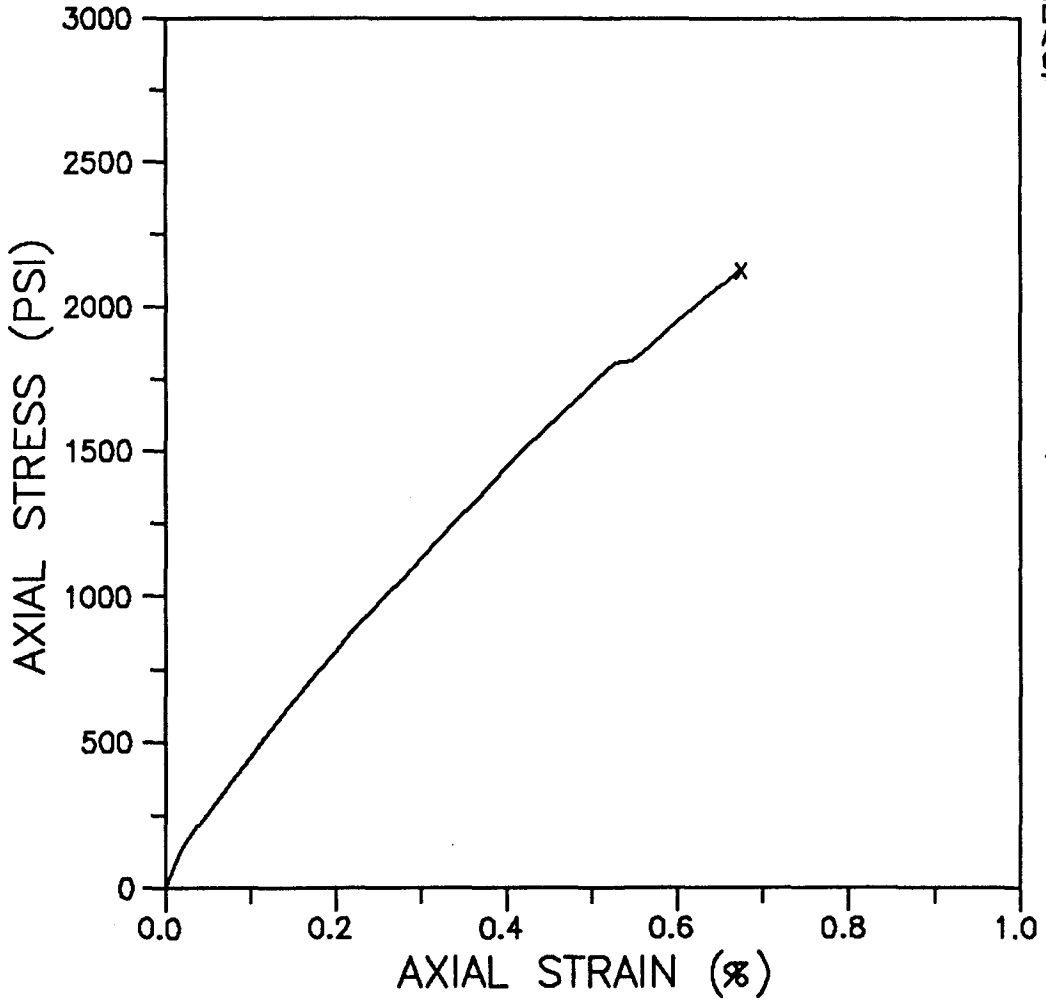
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1533
DEPTH: 53.2 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.0
DRY UNIT WEIGHT (PCF): 127.6
DEG. OF SATURATION (%): 92.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LATS000; DATE: 05-02-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1533
DEPTH: 53.2 ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.0
DRY UNIT WEIGHT (PCF): 127.6
DEG. OF SATURATION (%): 92.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 05-02-90 MCT 5
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: 1533
DEPTH (FT): 97.9
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.5
DRY UNIT WEIGHT (PCF): 120.2
DEG. OF SATURATION (%): 84.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.19 x10E5 PSI

FAILURE MODE:
COMBINATION SHEAR PLANE
AT 30 DEG & LONGITUDINAL
(AXIAL) SPLITTING

TEXAS SSC SITE

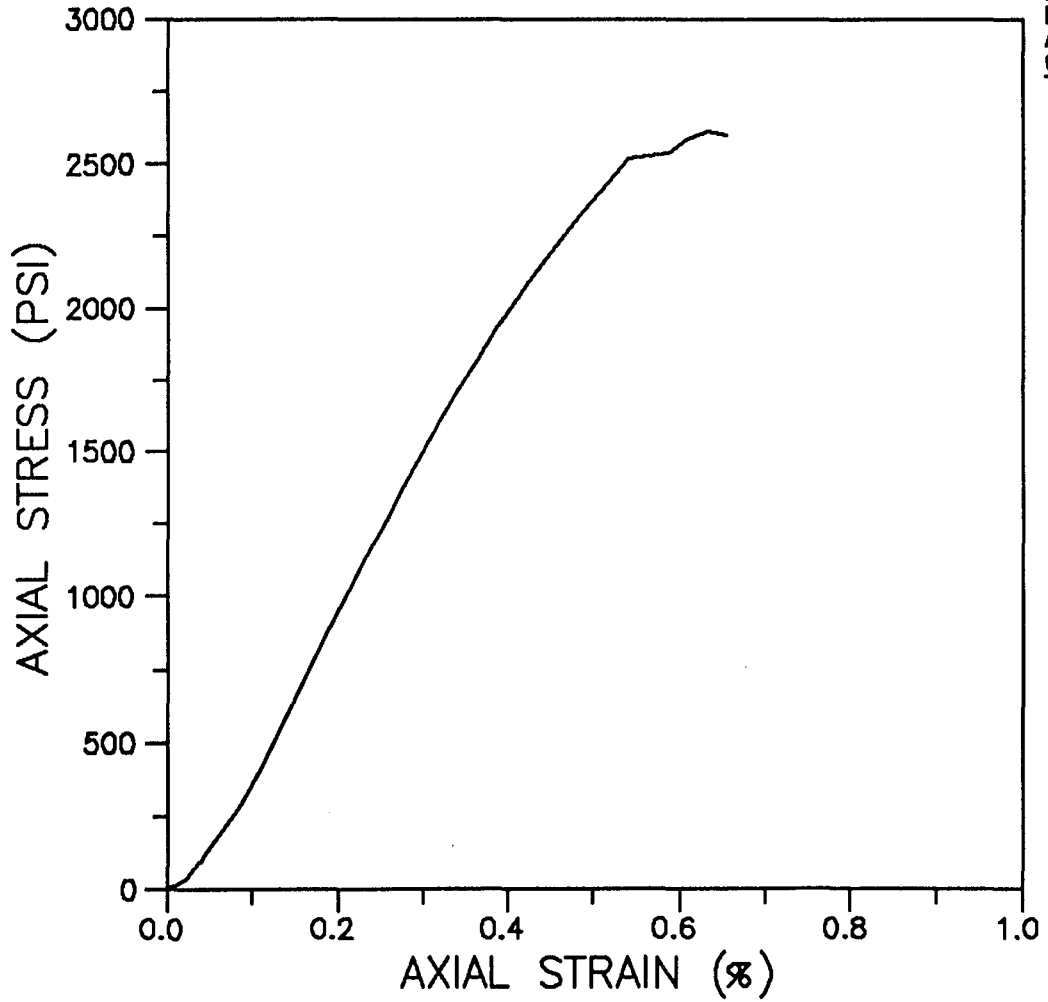
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: 1533
DEPTH (FT): 106.1
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.0
DRY UNIT WEIGHT (PCF): 125.8
DEG. OF SATURATION (%): 95.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.63 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

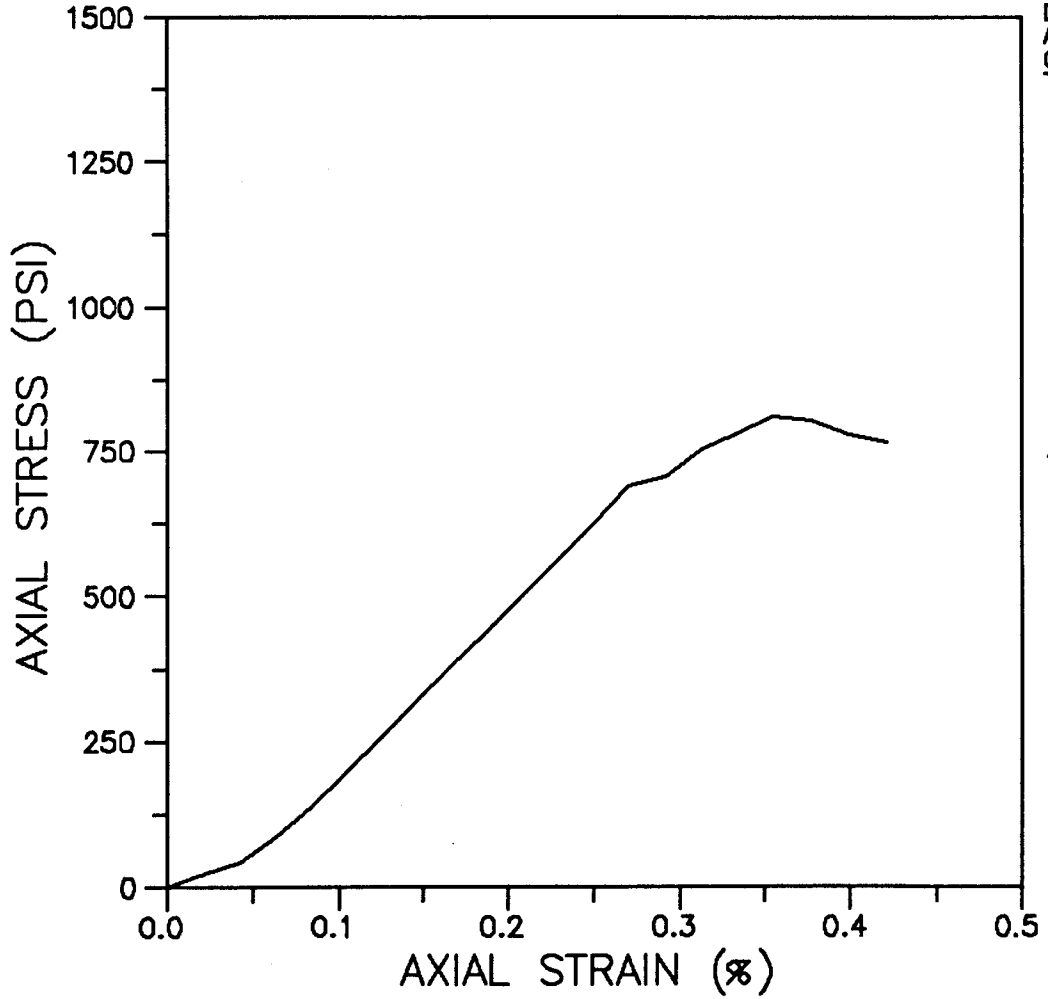
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: 1533
DEPTH (FT): 118.2
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 11.7
DRY UNIT WEIGHT (PCF): 126.7
DEG. OF SATURATION (%): 95.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.91 x10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

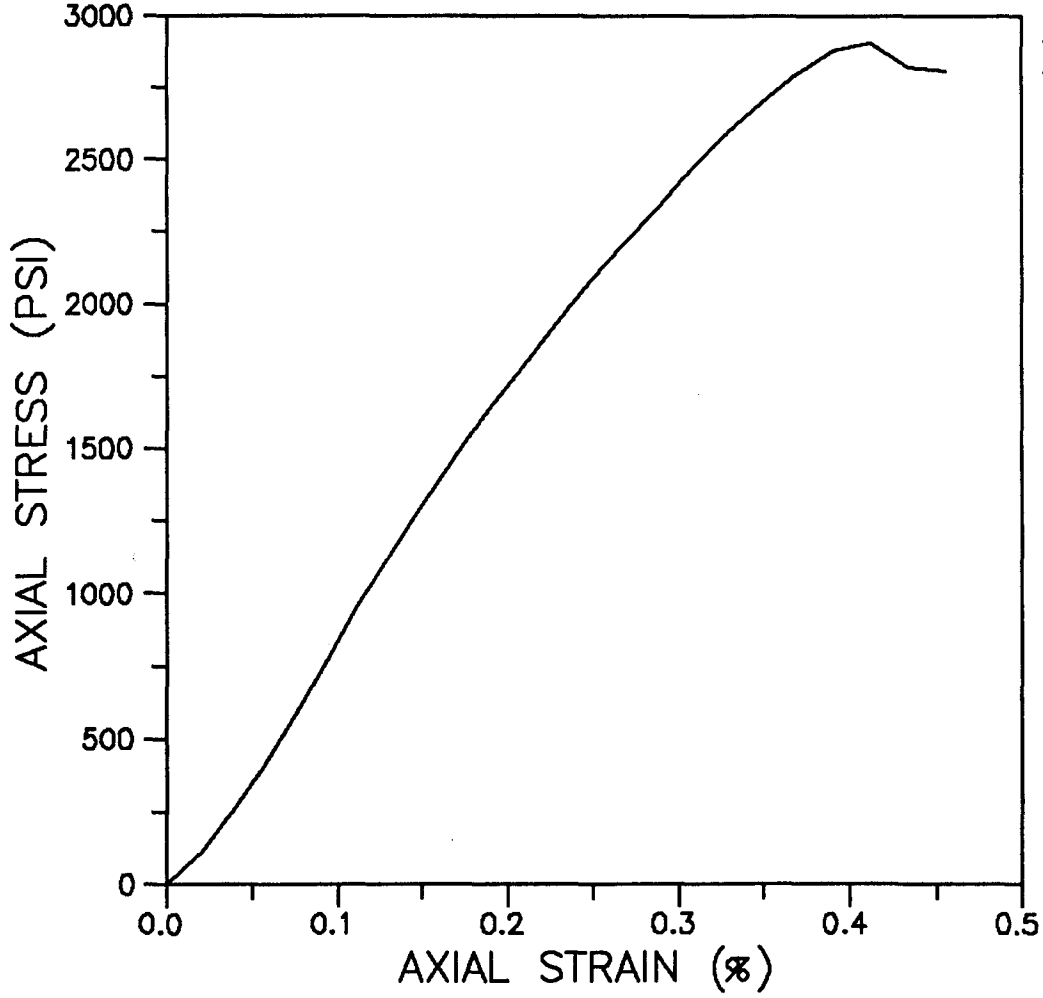
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: 1533
DEPTH (FT): 143.3
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.5
DRY UNIT WEIGHT (PCF): 124.3
DEG. OF SATURATION (%): 95.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
8.74 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

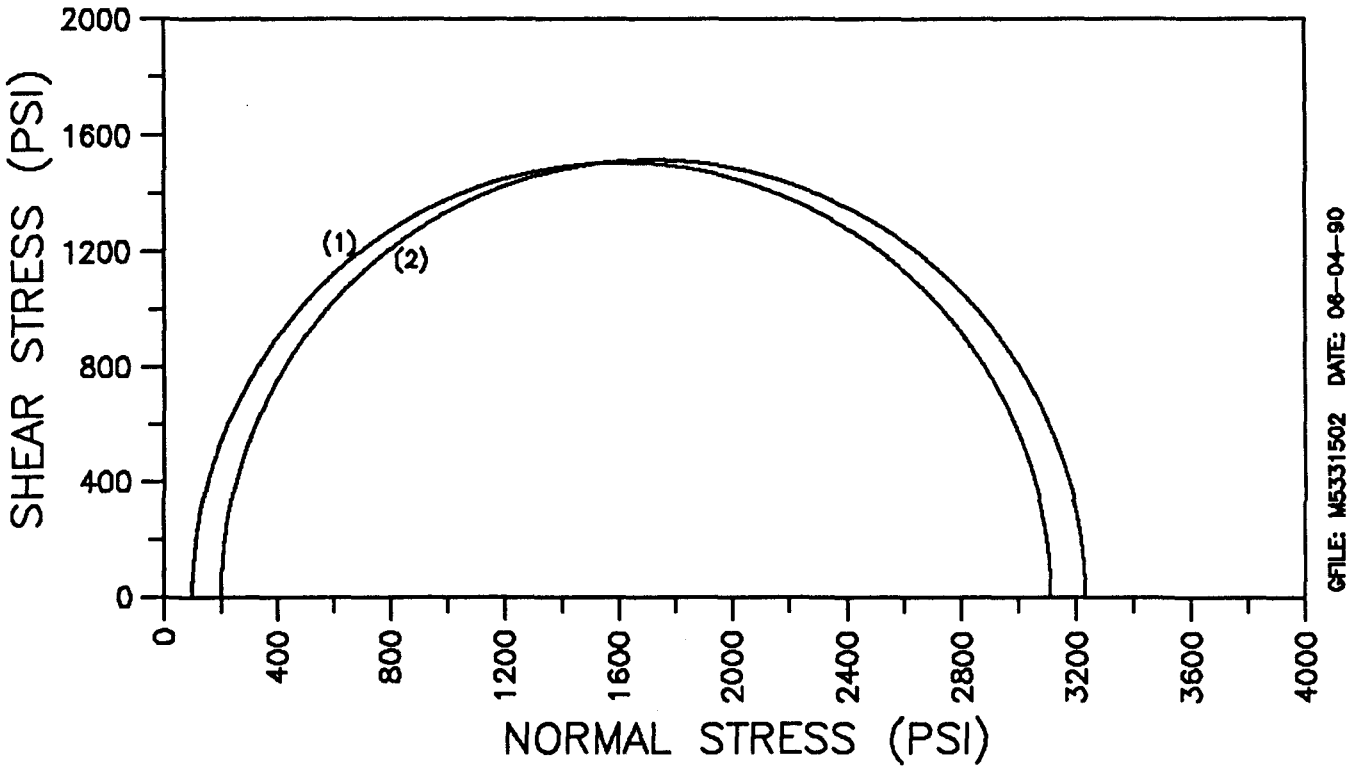
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B1533
DEPTH RANGE (FT): 150.2–152.3
AUSTIN CHALK LIMESTONE



GFILE: M5331502 DATE: 06-04-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 150.2
(2) DEPTH (FT): 151.9

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

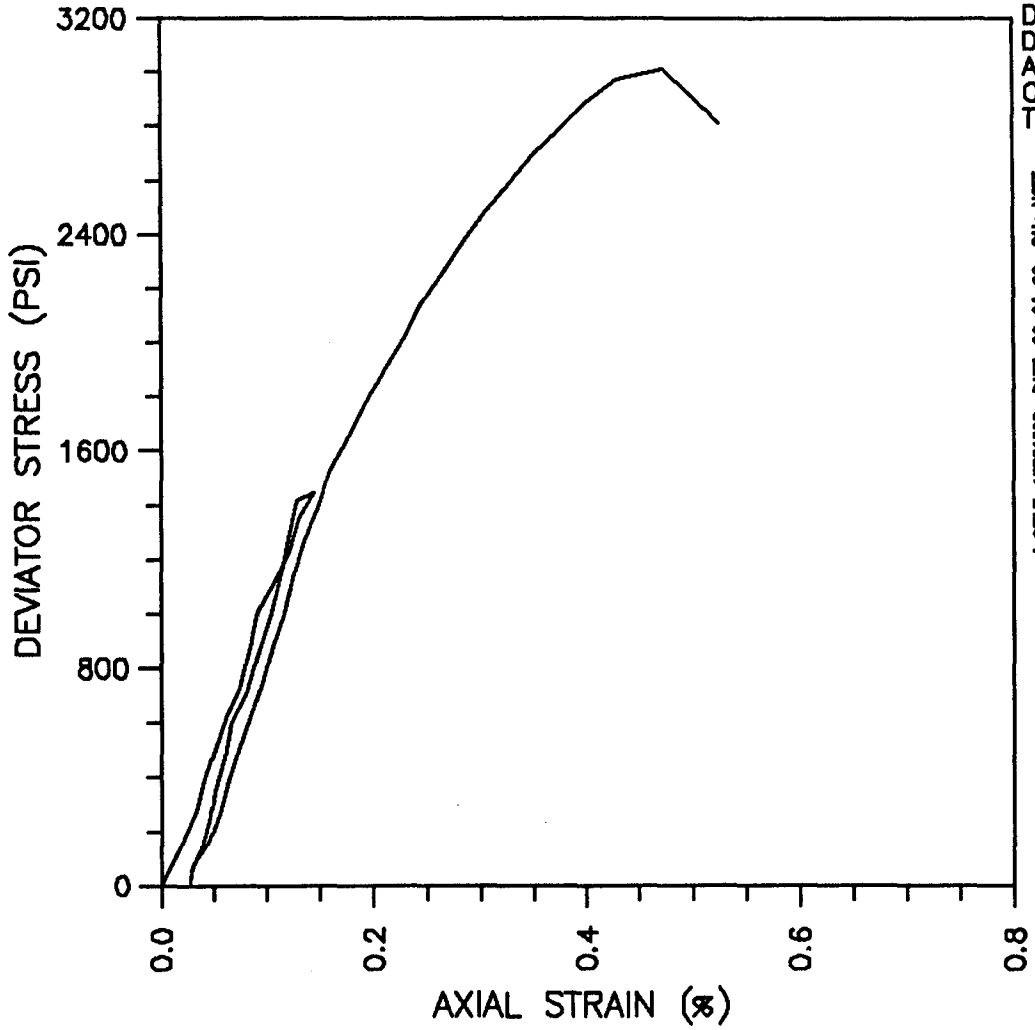
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 150.2
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.2
DRY UNIT WEIGHT (PCF): 119.6
DEG. OF SATURATION (%): 100.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

SFILE: 15331502 DATE: 06-04-00 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
8.533 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING
W/CONICAL AT TOP

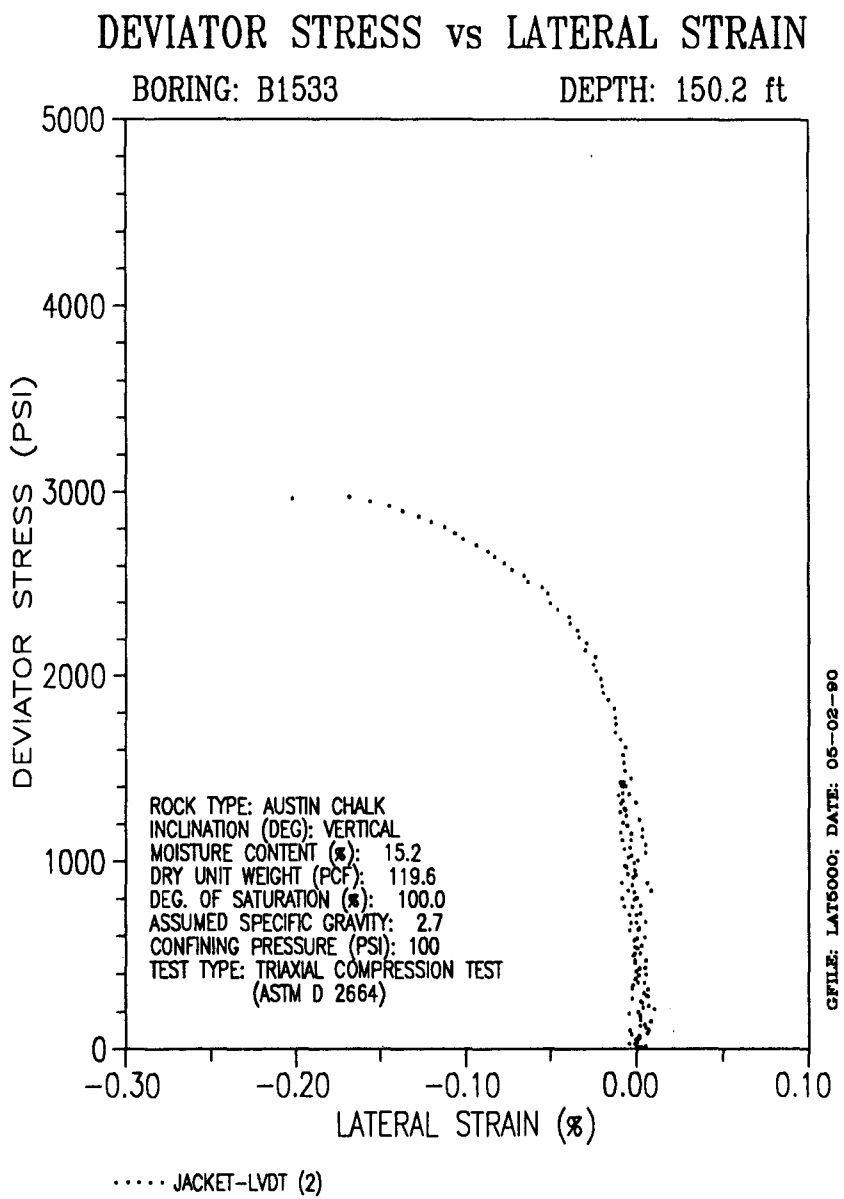
TEXAS SSC SITE

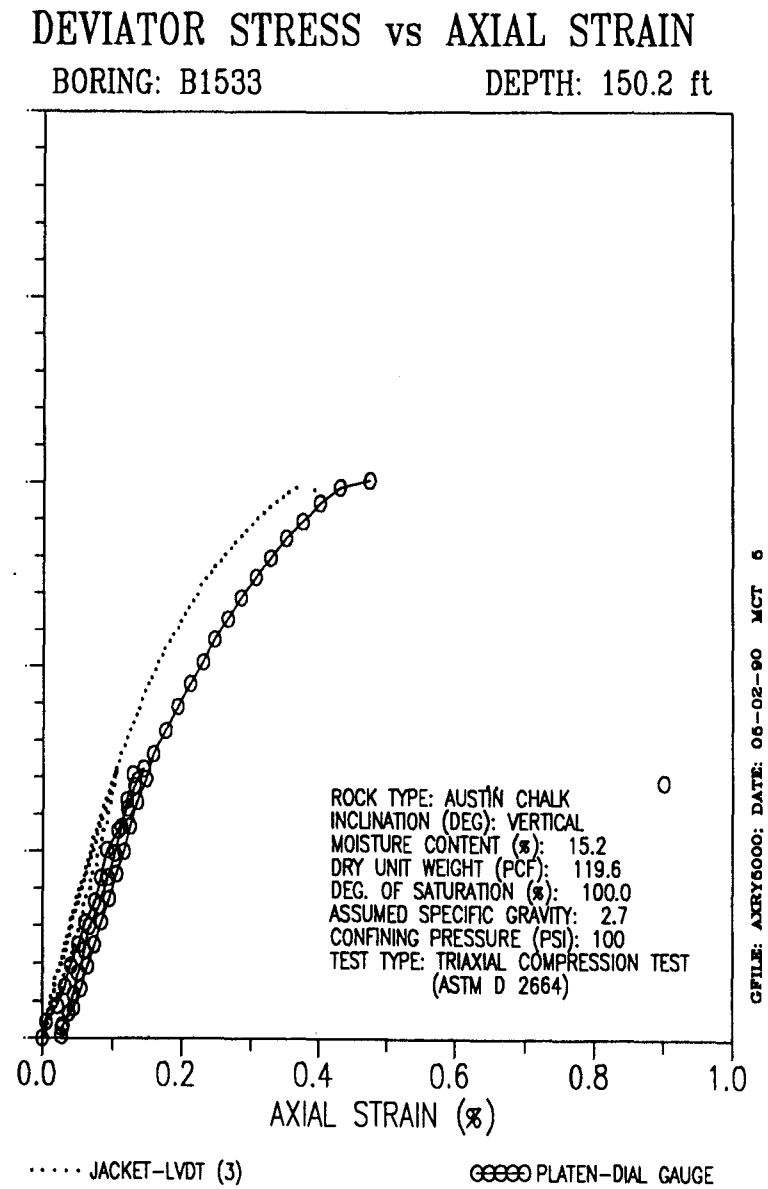
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

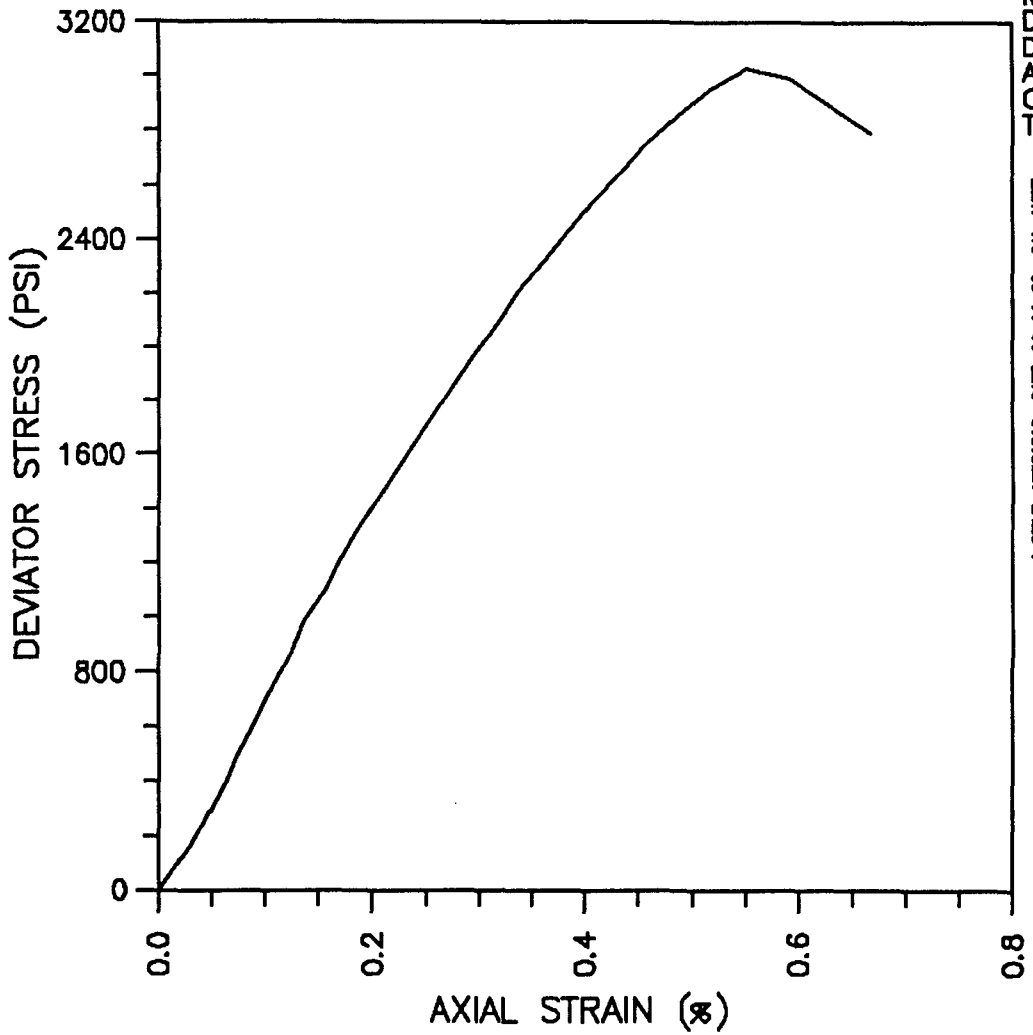
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1533
DEPTH: 150.2 ft
DEVIATOR STRESS (PSI)
5000
4000
3000
2000
1000
0
-0.30
-0.20
-0.10
0.00
0.10
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.2
DRY UNIT WEIGHT (PCF): 119.6
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT5000; DATE: 05-02-90
JACKET-LVDT (2)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1533
DEPTH: 150.2 ft
0.0
0.2
0.4
0.6
0.8
1.0
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.2
DRY UNIT WEIGHT (PCF): 119.6
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY5000; DATE: 05-02-90 MCT 5
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: B1533
DEPTH (FT): 151.9
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.1
DRY UNIT WEIGHT (PCF): 120.2
DEG. OF SATURATION (%): 94.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: 15331519 DATE: 06-04-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.963 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 20 DEG

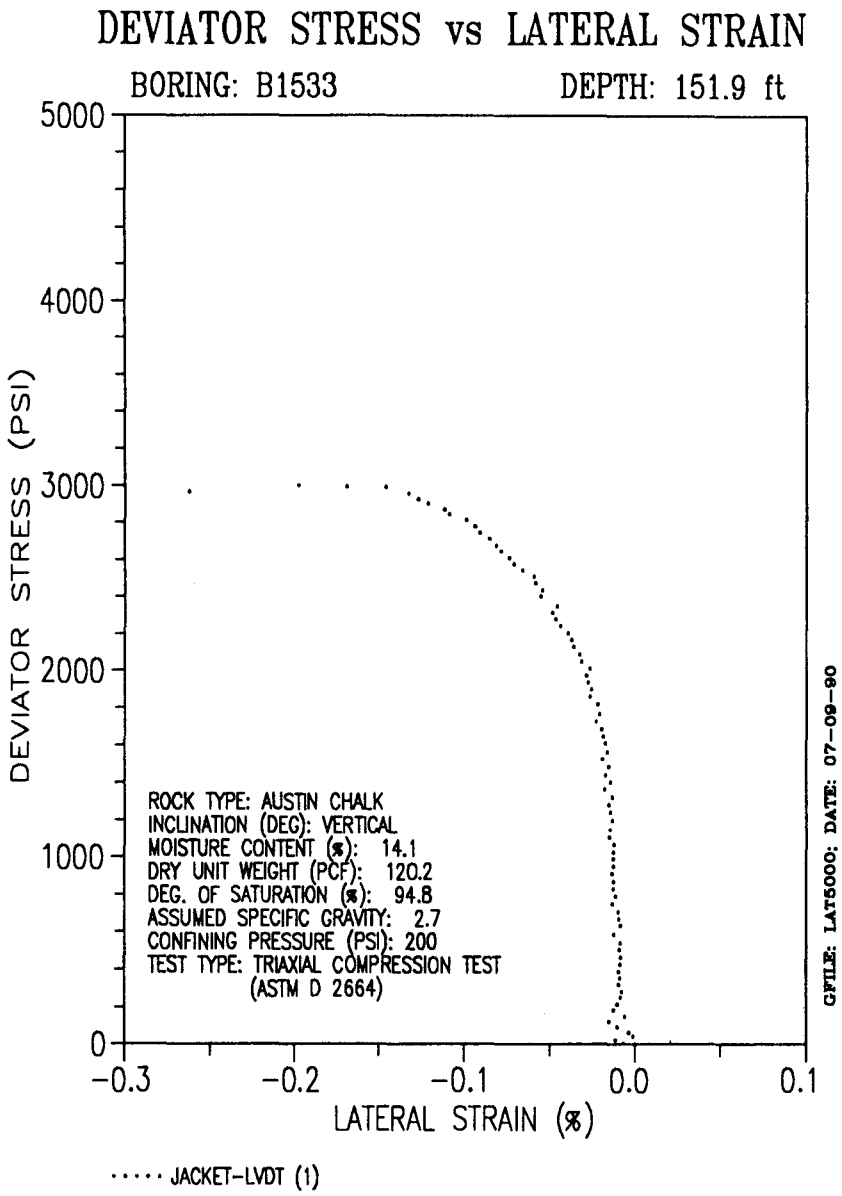
TEXAS SSC SITE

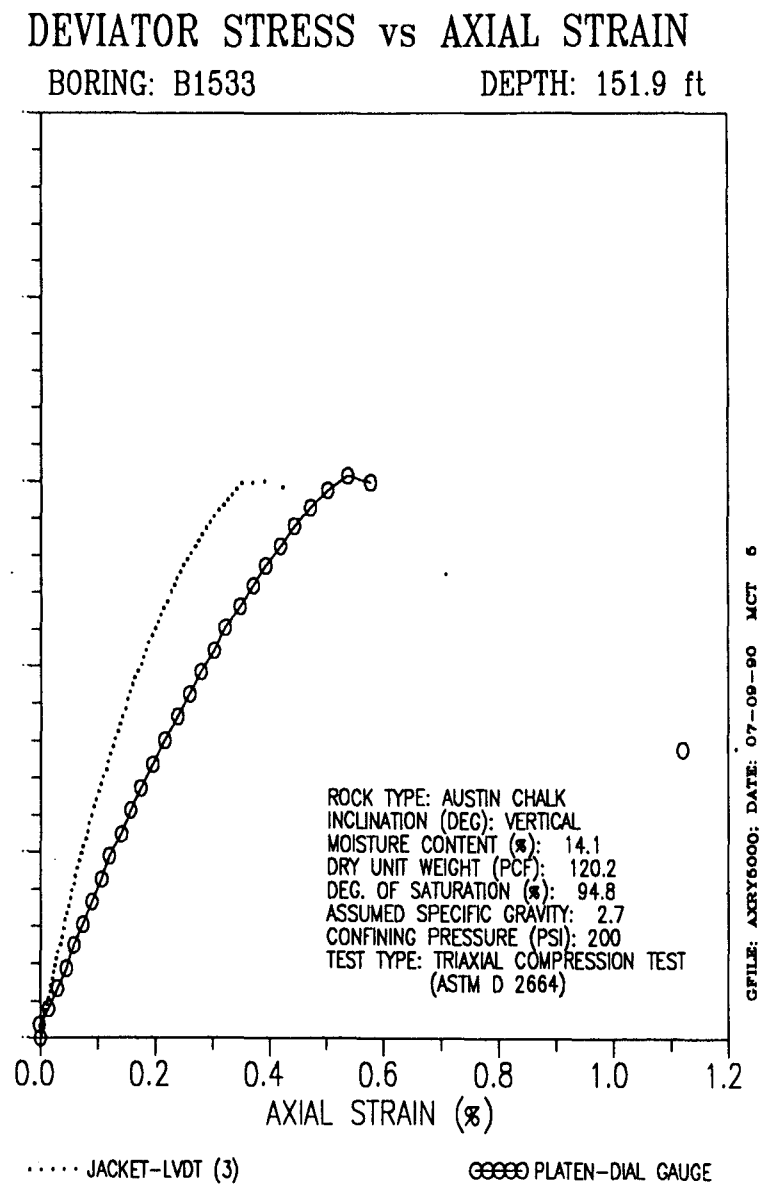
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

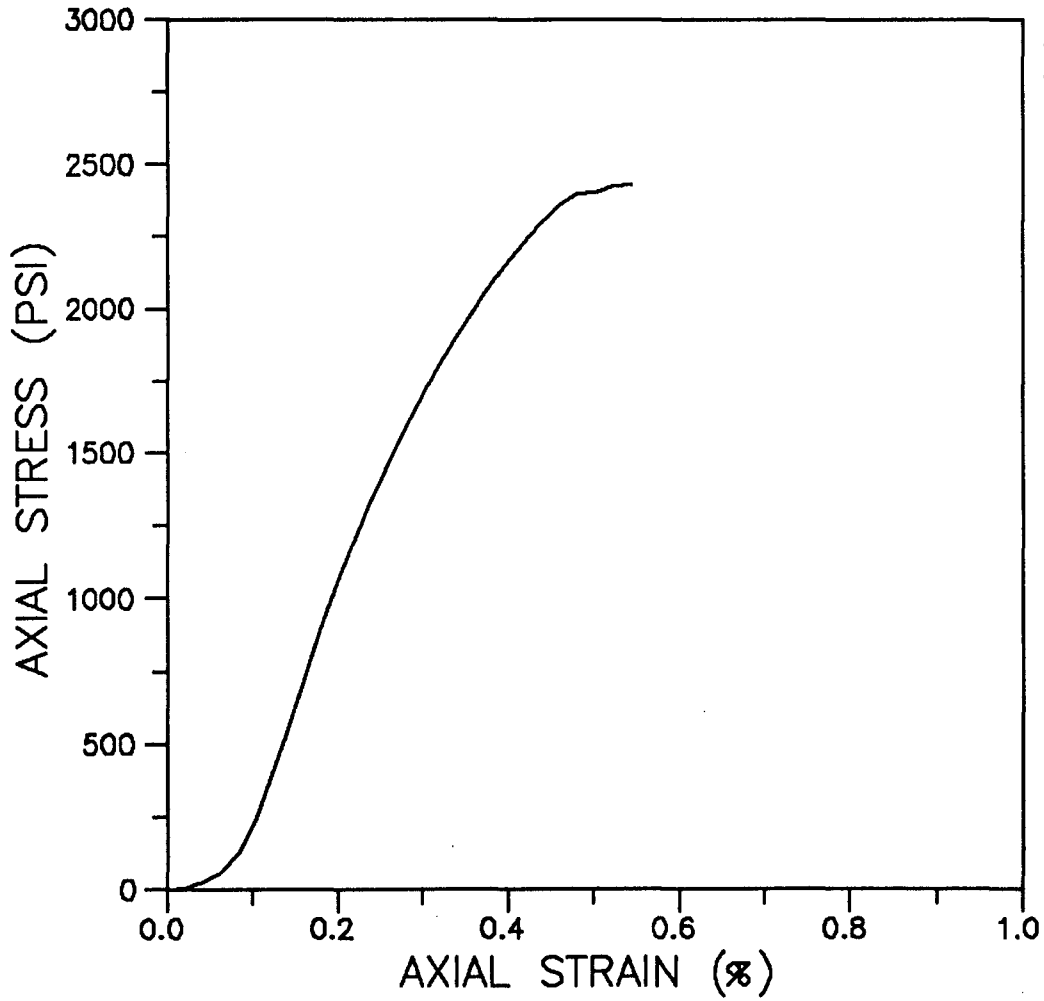
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1533
DEPTH: 151.9 ft
DEVIATOR STRESS (PSI)
5000
4000
3000
2000
1000
0
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.1
DRY UNIT WEIGHT (PCF): 120.2
DEG. OF SATURATION (%): 94.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT5000; DATE: 07-09-90
JACKET-LVDT (1)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1533
DEPTH: 151.9 ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.1
DRY UNIT WEIGHT (PCF): 120.2
DEG. OF SATURATION (%): 94.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY6000; DATE: 07-09-90 MCT 6
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: 1533
DEPTH (FT): 160.7
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.6
DRY UNIT WEIGHT (PCF): 117.3
DEG. OF SATURATION (%): 96.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
7.30 x10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

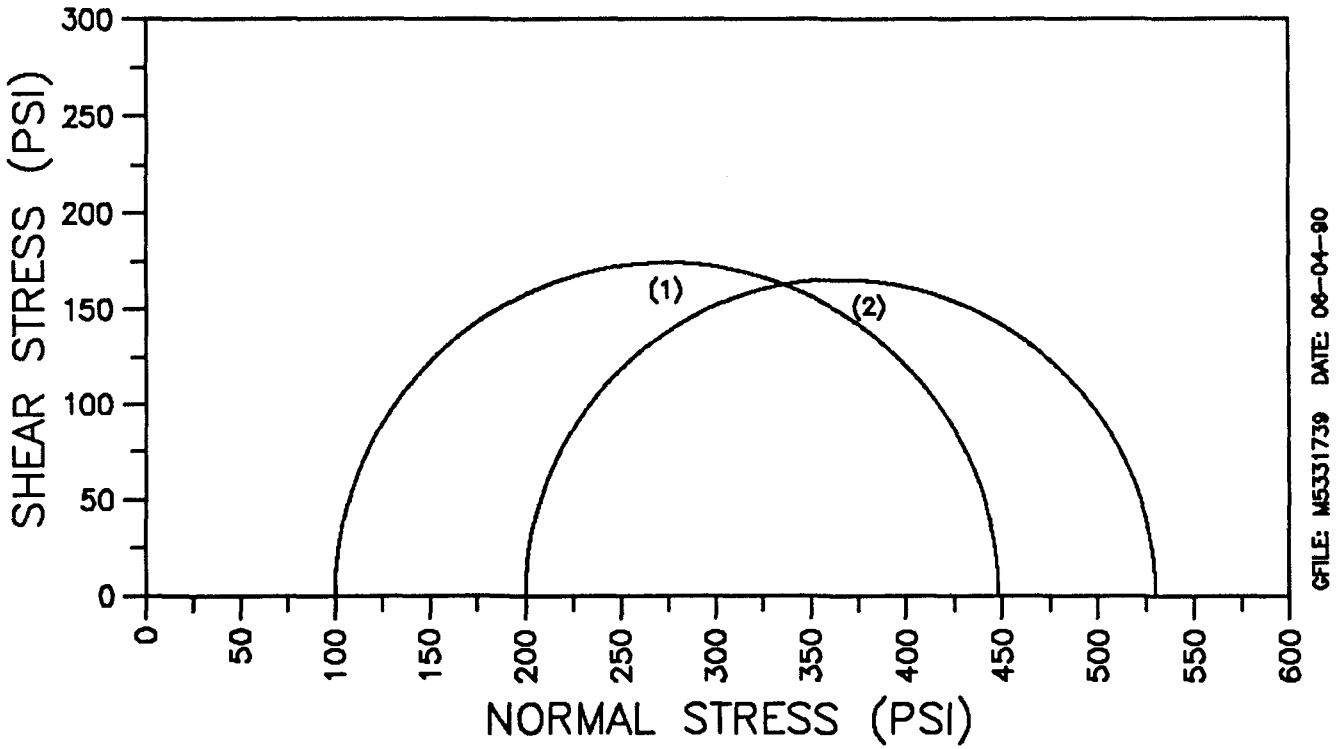
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B1533
DEPTH RANGE (FT): 173.9–174.8
EAGLE FORD SHALE



GFILE: M5331739 DATE: 06-04-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 173.9
(2) DEPTH (FT): 174.4

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

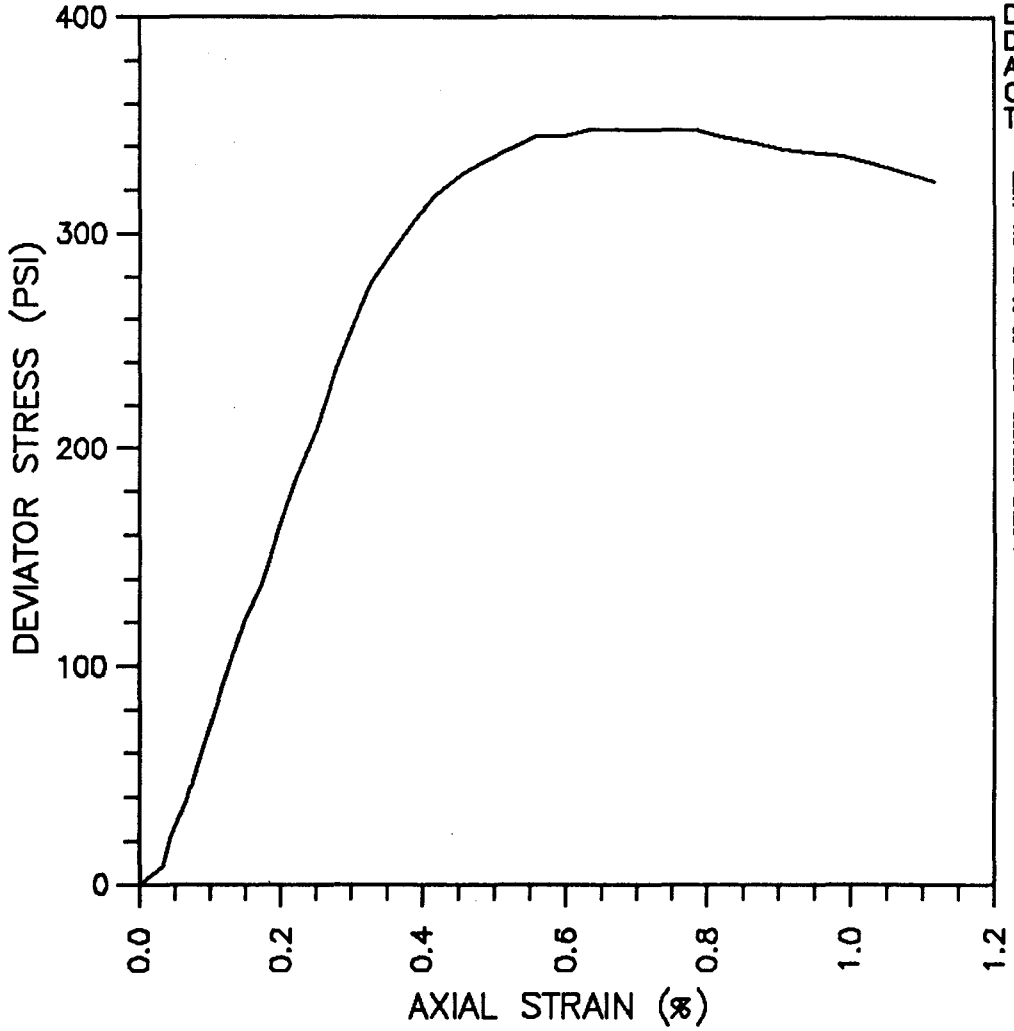
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 173.9
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.0
DRY UNIT WEIGHT (PCF): 116.1
DEG. OF SATURATION (%): 101.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: 15331739 DATE: 06-01-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.899 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 40 DEG

TEXAS SSC SITE

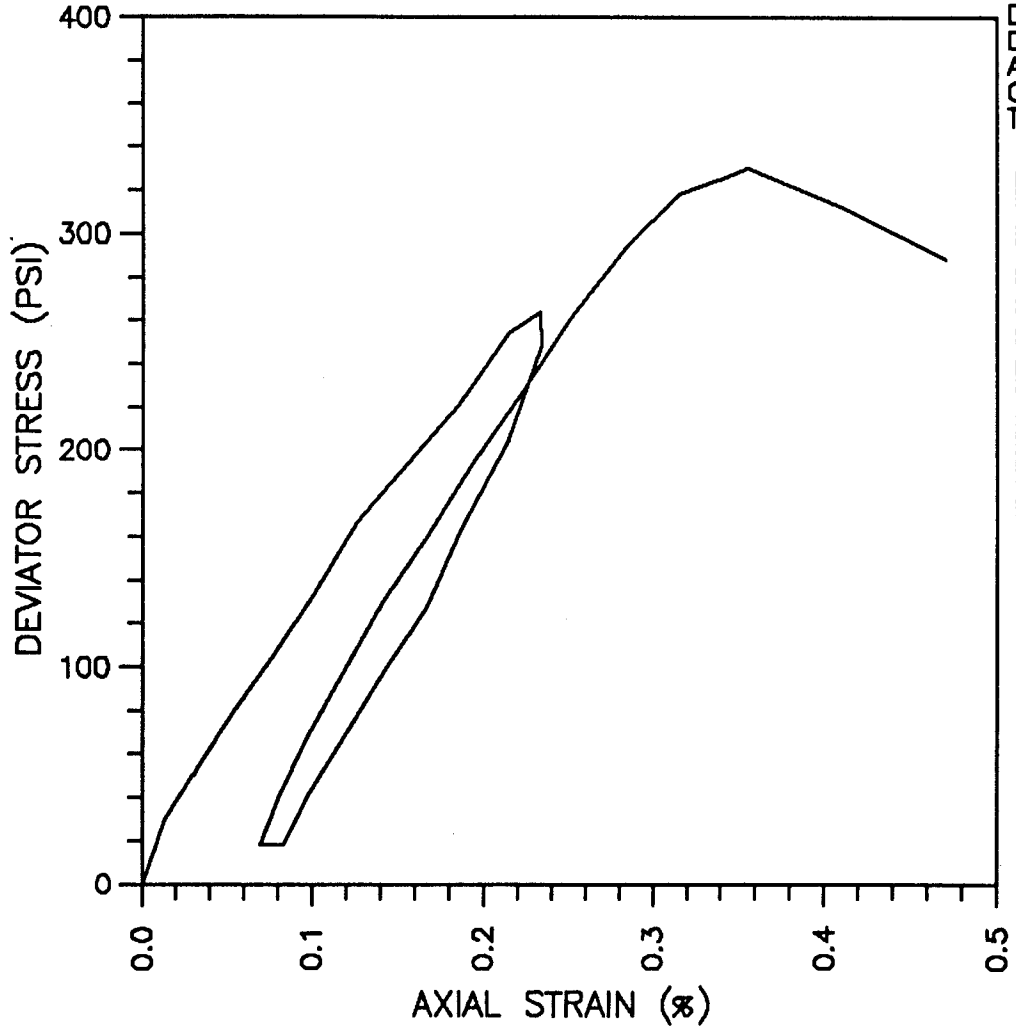
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 174.4
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.5
DRY UNIT WEIGHT (PCF): 114.6
DEG. OF SATURATION (%): 100.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

CFILE: 15331744 DATE: 05-01-00 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.159 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 60 DEG.

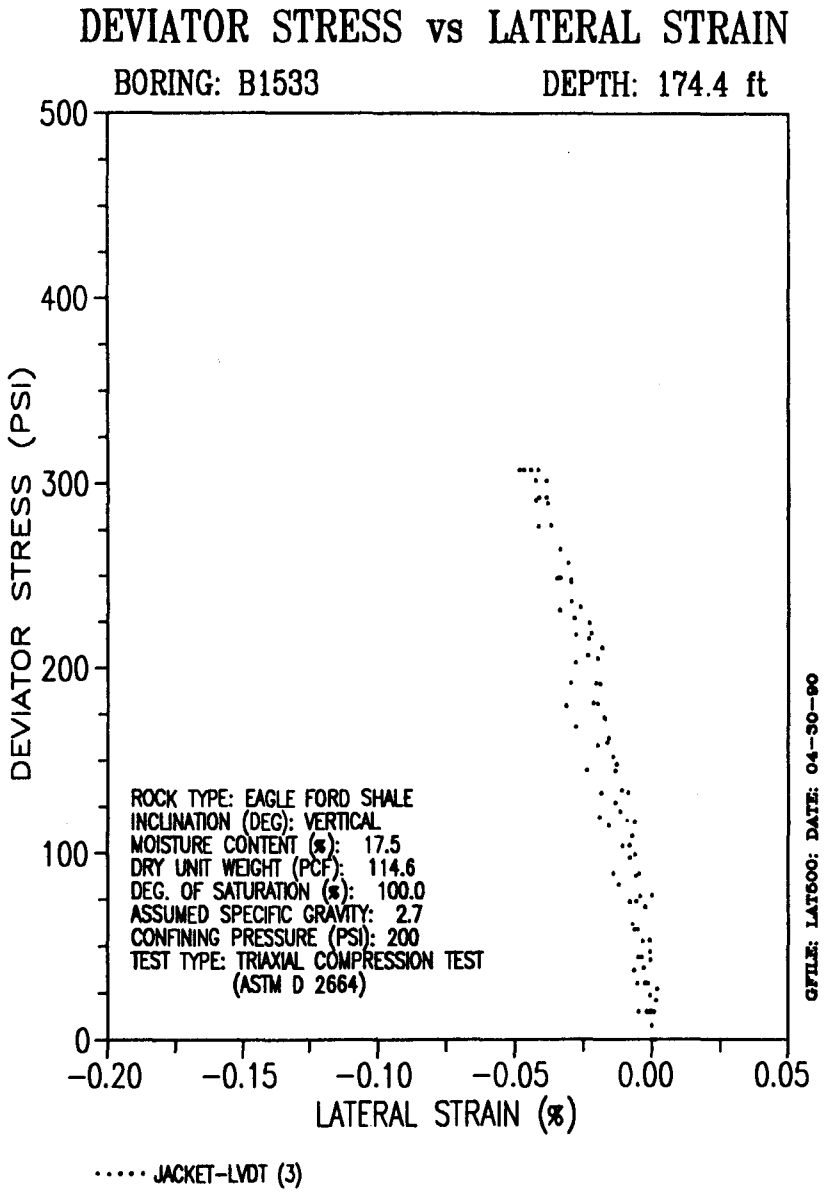
TEXAS SSC SITE

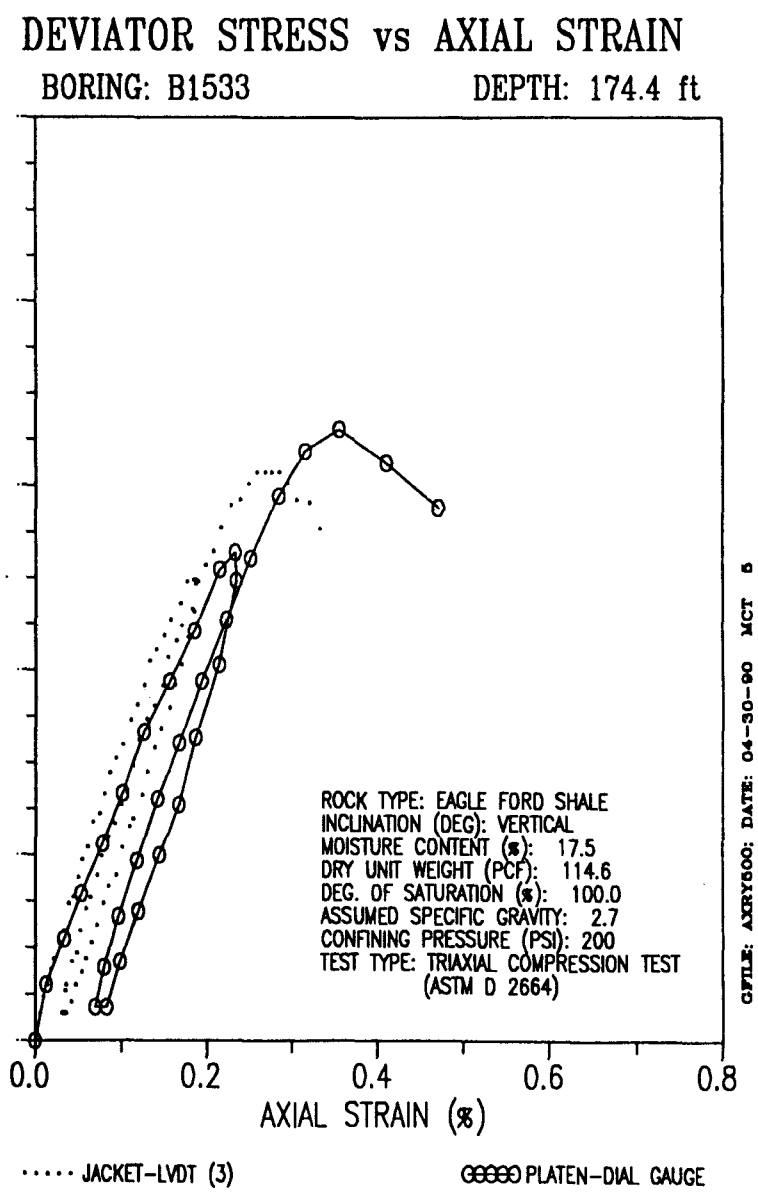
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

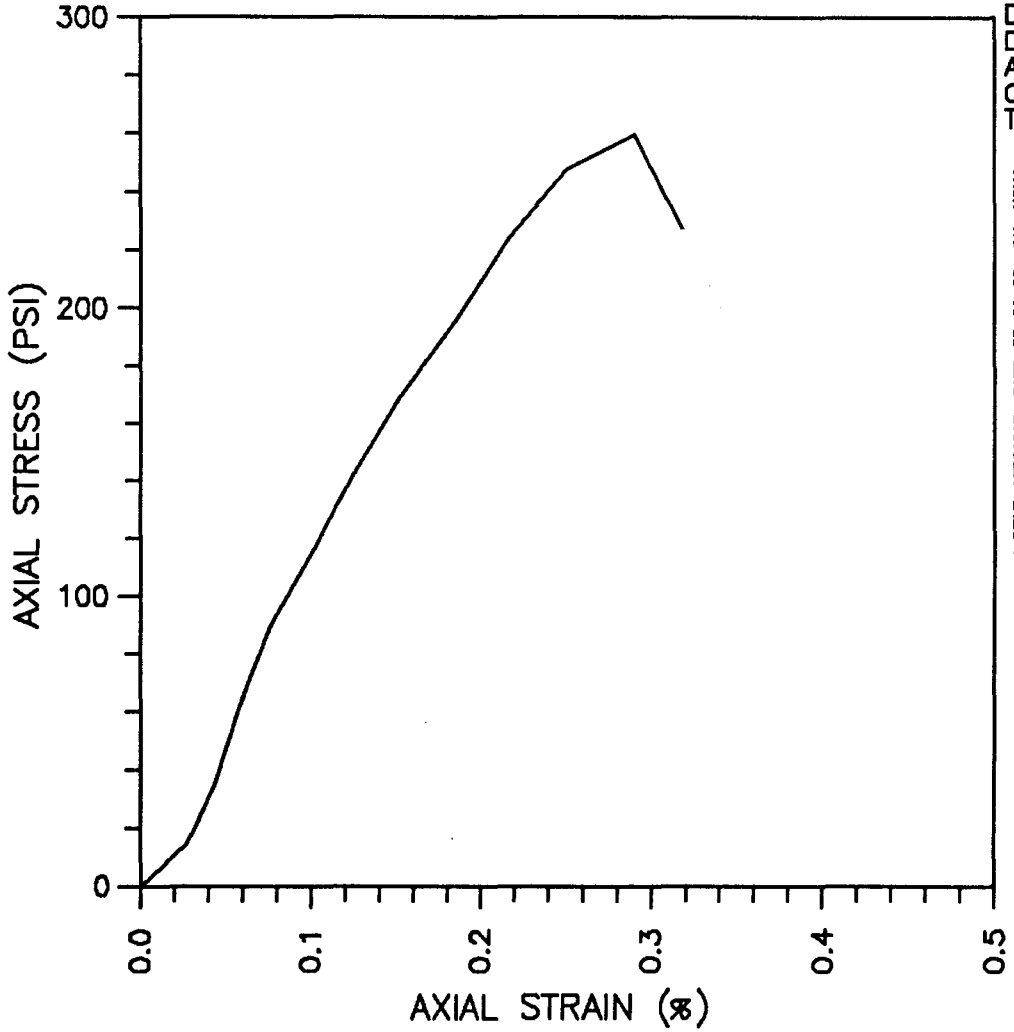
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1533
DEPTH: 174.4 ft
DEVIATOR STRESS (PSI)
500
400
300
200
100
0
-0.20
-0.15
-0.10
-0.05
0.00
0.05
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.5
DRY UNIT WEIGHT (PCF): 114.6
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT500; DATE: 04-30-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1533
DEPTH: 174.4 ft
0.0
0.2
0.4
0.6
0.8
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.5
DRY UNIT WEIGHT (PCF): 114.6
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY500; DATE: 04-30-90 MCT 5
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: B1533
DEPTH (FT): 181.8
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.2
DRY UNIT WEIGHT (PCF): 119.8
DEG. OF SATURATION (%): 101.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

DFILE: 1533181B DATE: 05-01-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.081 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 40 DEG

TEXAS SSC SITE

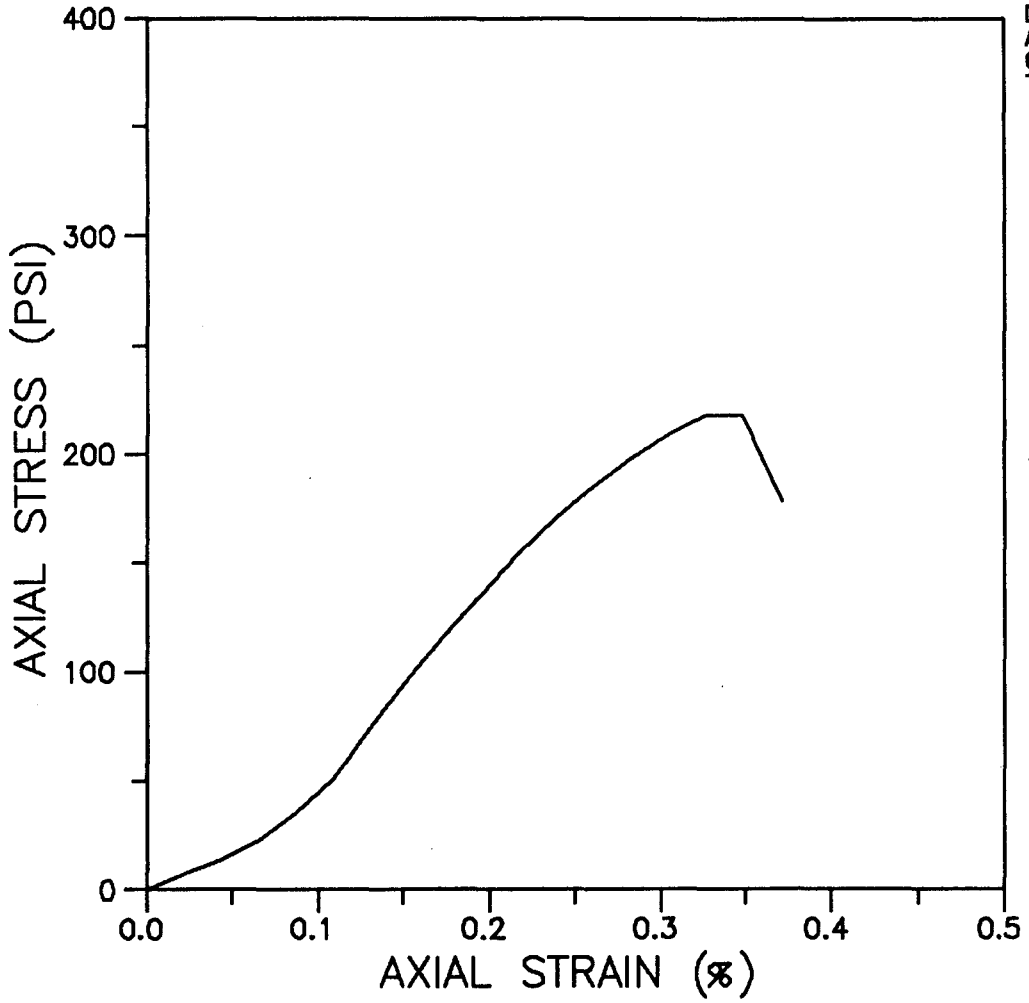
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO: B1533
DEPTH (FT): 200.1
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.8
DRY UNIT WEIGHT (PCF): 116.2
DEG. OF SATURATION (%): 102.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.97 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

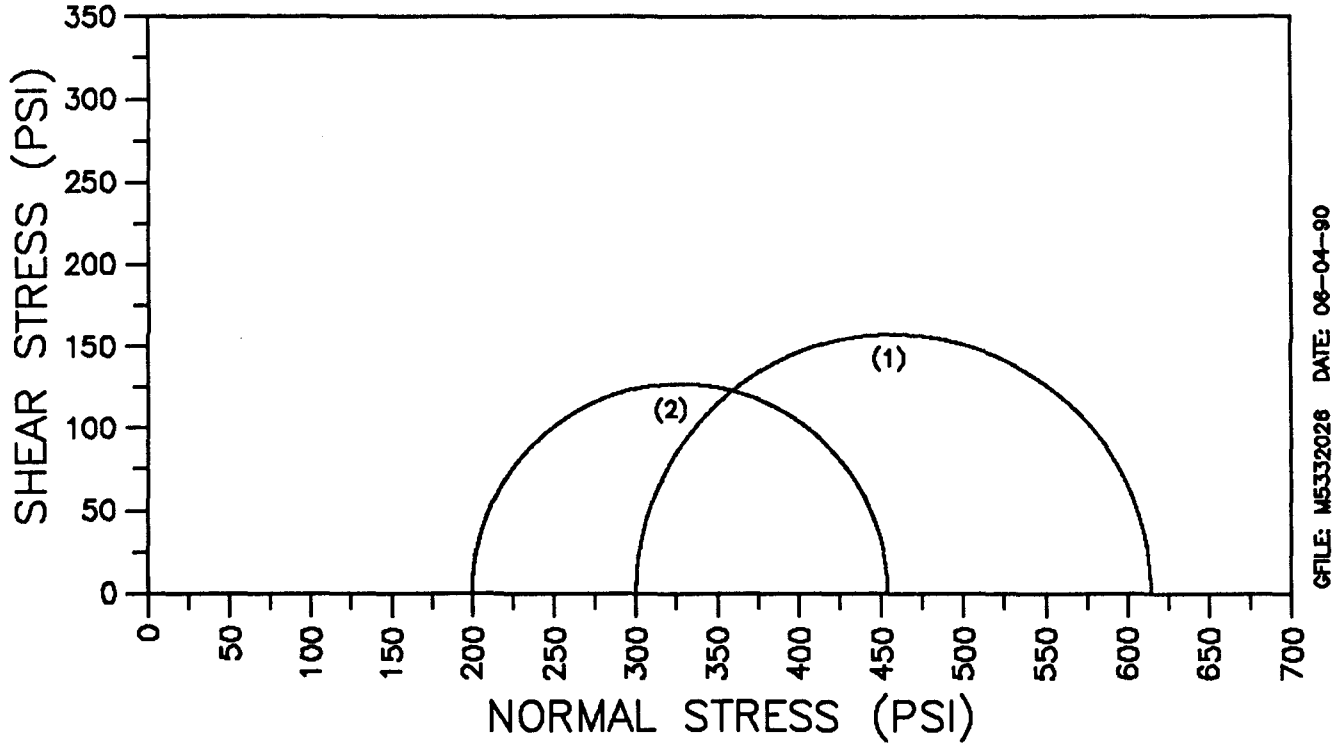
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B1533
DEPTH RANGE (FT): 202.6–203.4
EAGLE FORD SHALE



GFILE: M5332028 DATE: 06-04-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 202.6
(2) DEPTH (FT): 203.0

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

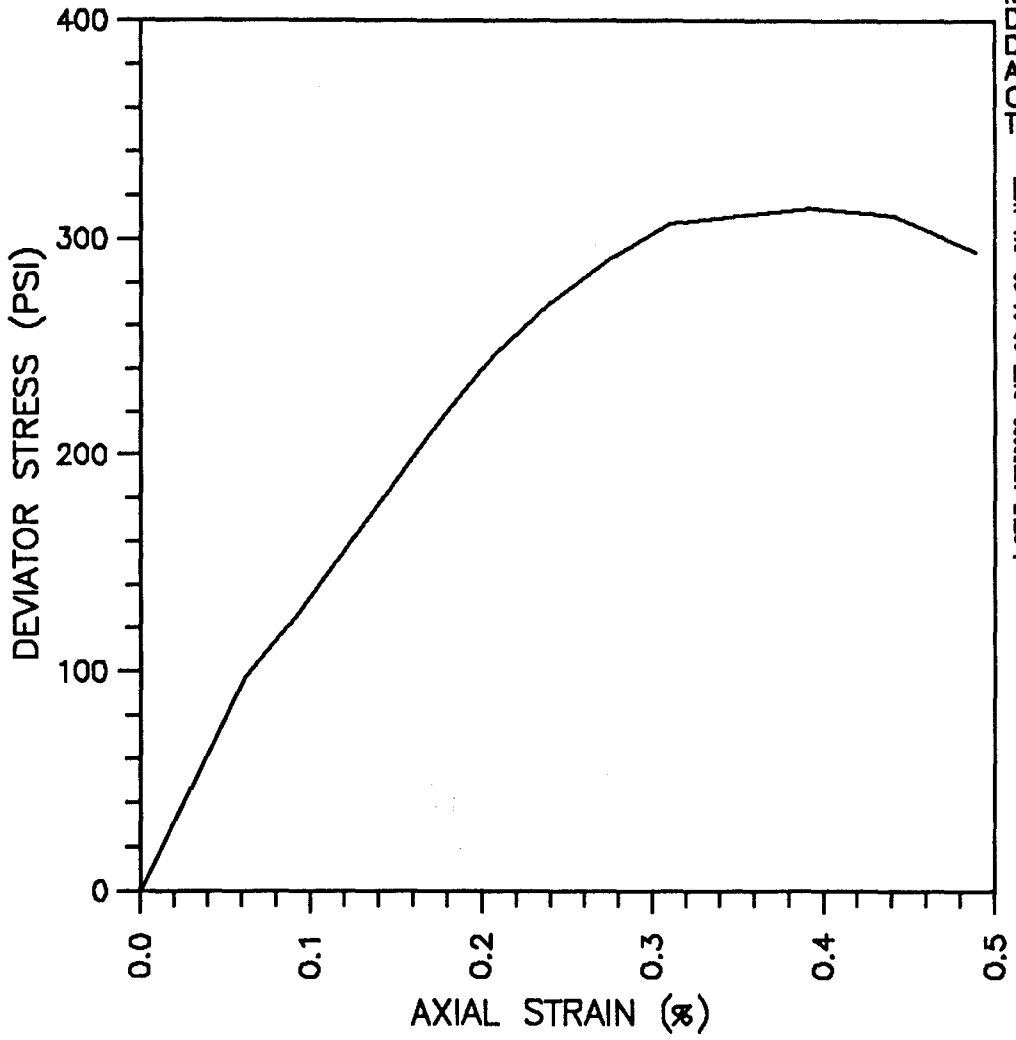
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 202.6
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.3
DRY UNIT WEIGHT (PCF): 117.4
DEG. OF SATURATION (%): 101.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: 15330028 DATE: 08-04-00 CAL: MGT5

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.081 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

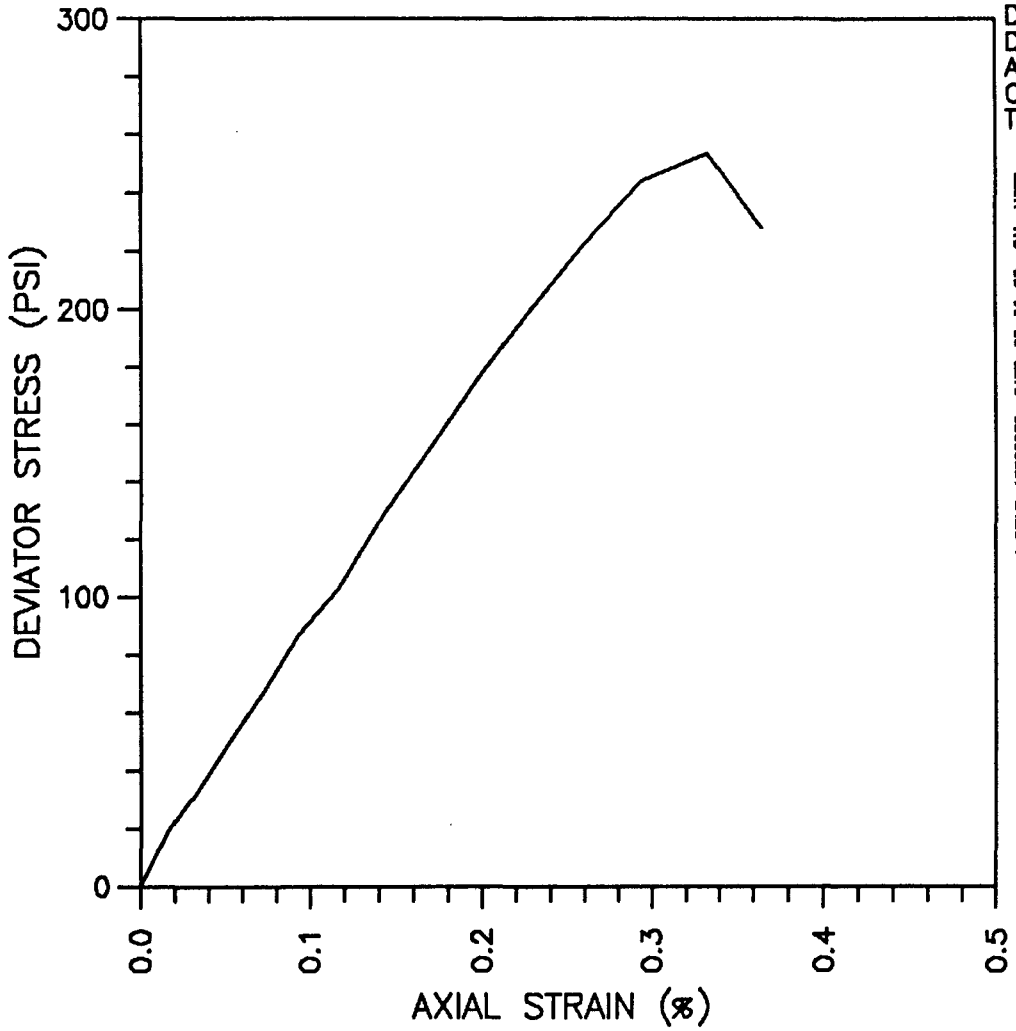
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 203.0
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.1
DRY UNIT WEIGHT (PCF): 114.8
DEG. OF SATURATION (%): 99.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: 15330030 DATE: 05-01-00 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.858 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 40 DEG.

TEXAS SSC SITE

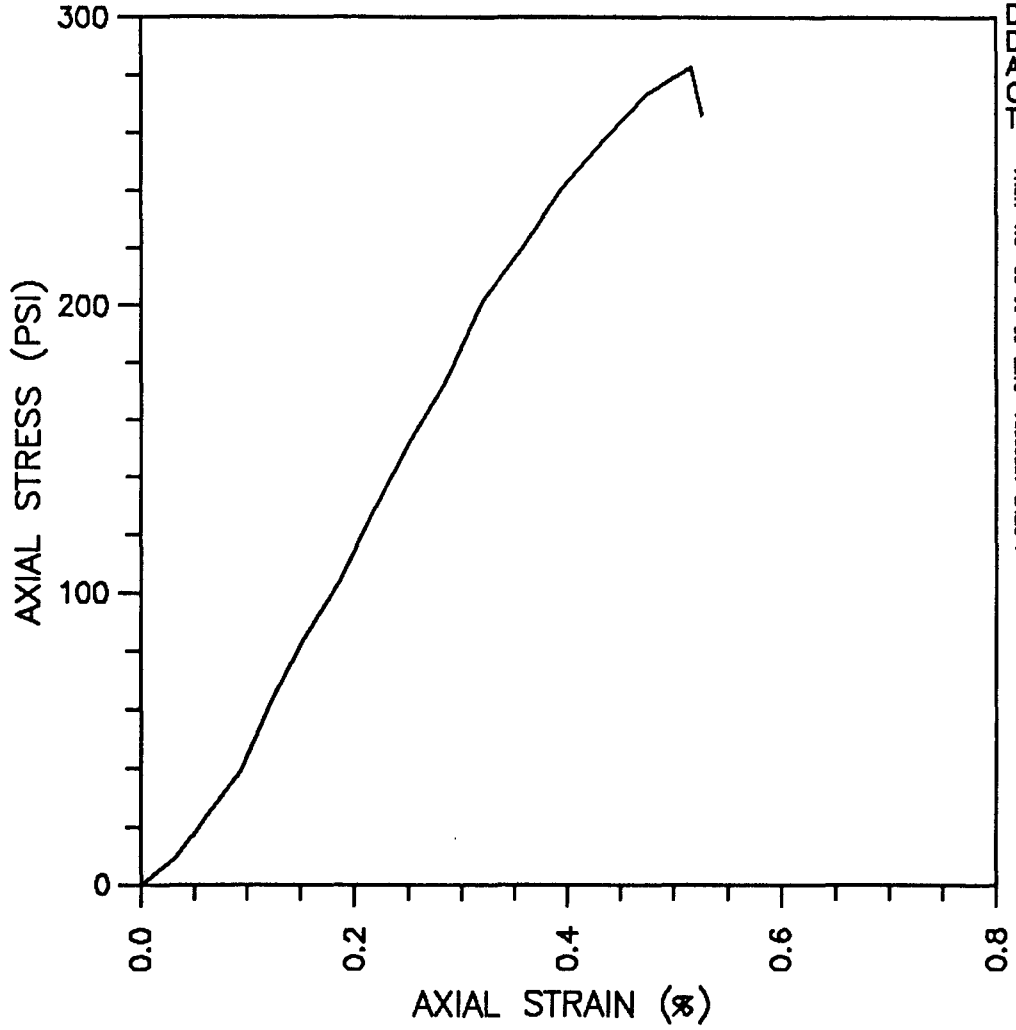
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 220.1
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.4
DRY UNIT WEIGHT (PCF): 116.4
DEG. OF SATURATION (%): 99.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: 1533220I DATE: 05-01-98 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.702 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

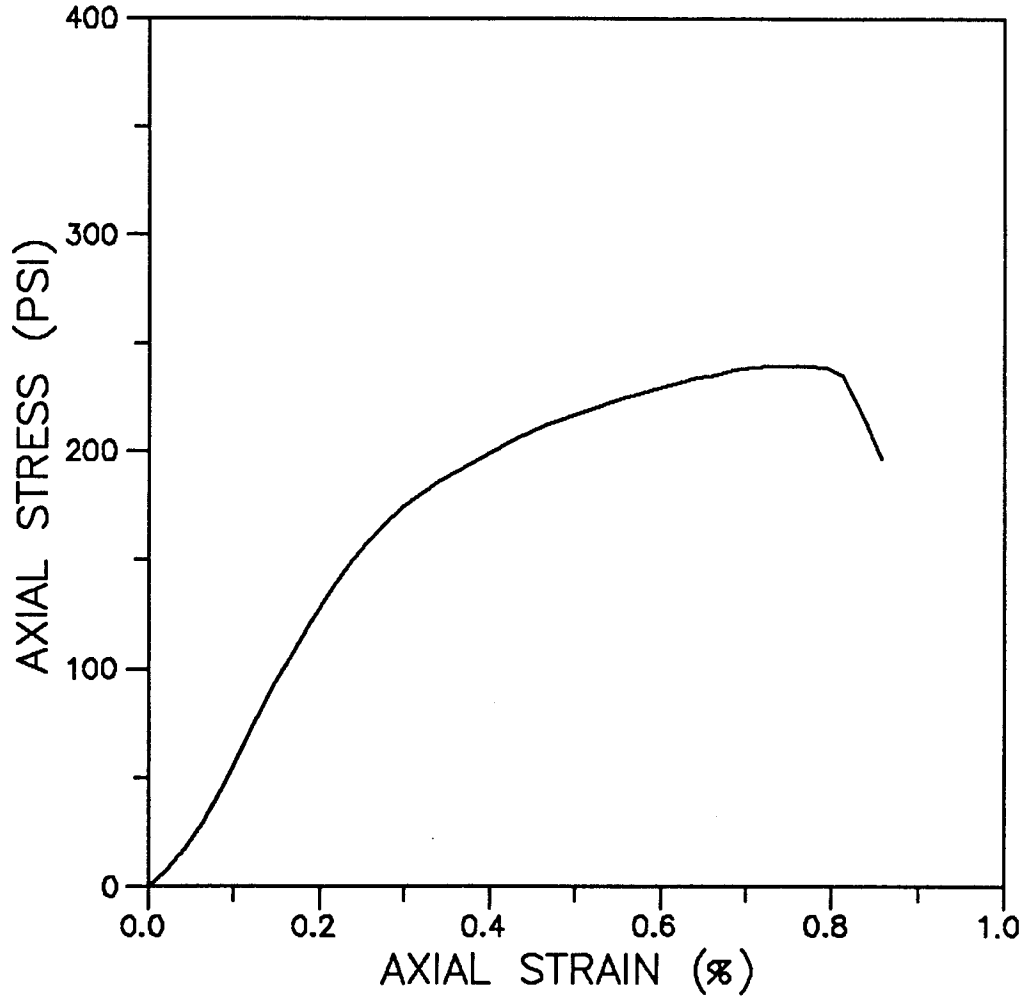
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO: B1533
DEPTH (FT): 246.5
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.6
DRY UNIT WEIGHT (PCF): 121.9
DEG. OF SATURATION (%): 103.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.66 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 45 DEG.

TEXAS SSC SITE

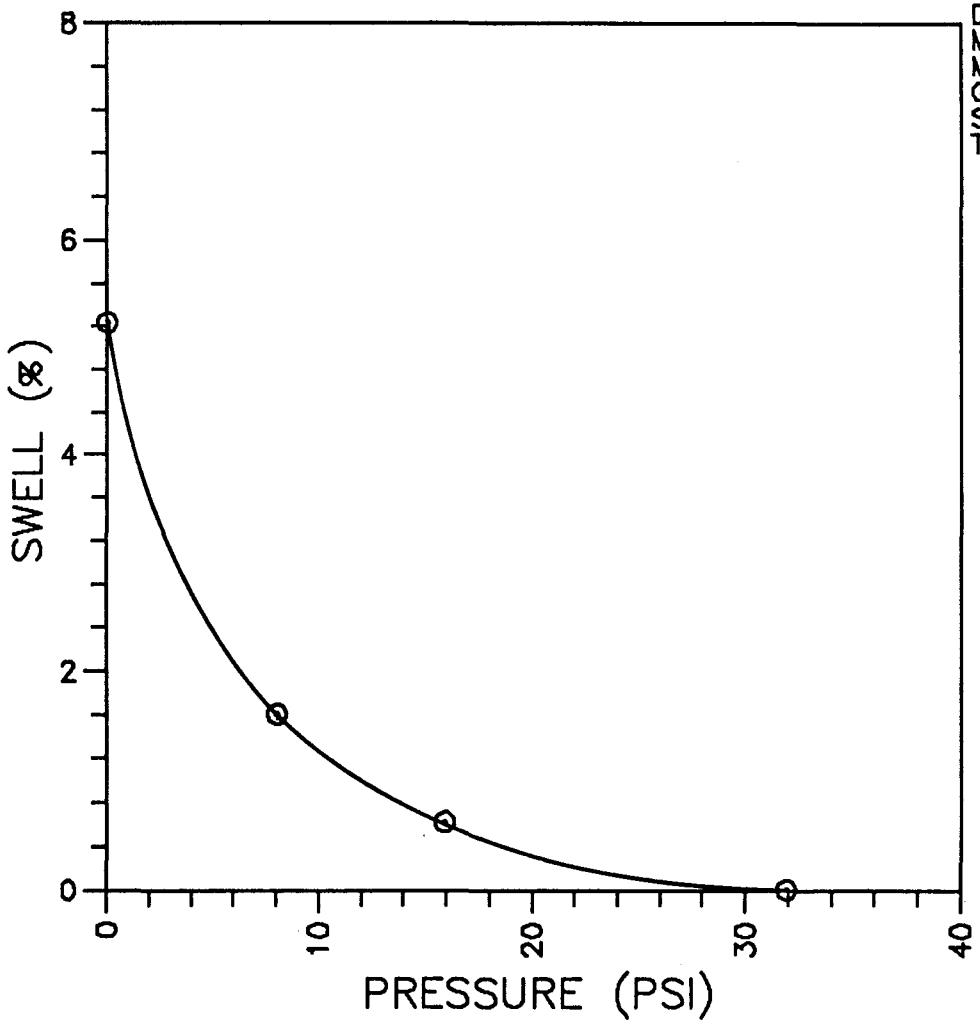
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: B1533
DEPTH (FT): 183.0
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
DRY UNIT WEIGHT (PCF): 113.1
M.C. BEFORE TEST (%): 16.0
M.C.AFTER TEST (%): 23.6
GAIN IN MOISTURE (%): 7.6
SWELLING PRESSURE INDEX (PSI): 32
TEST TYPE: SWELLING PRESSURE INDEX (ISRM)

TEXAS SSC SITE

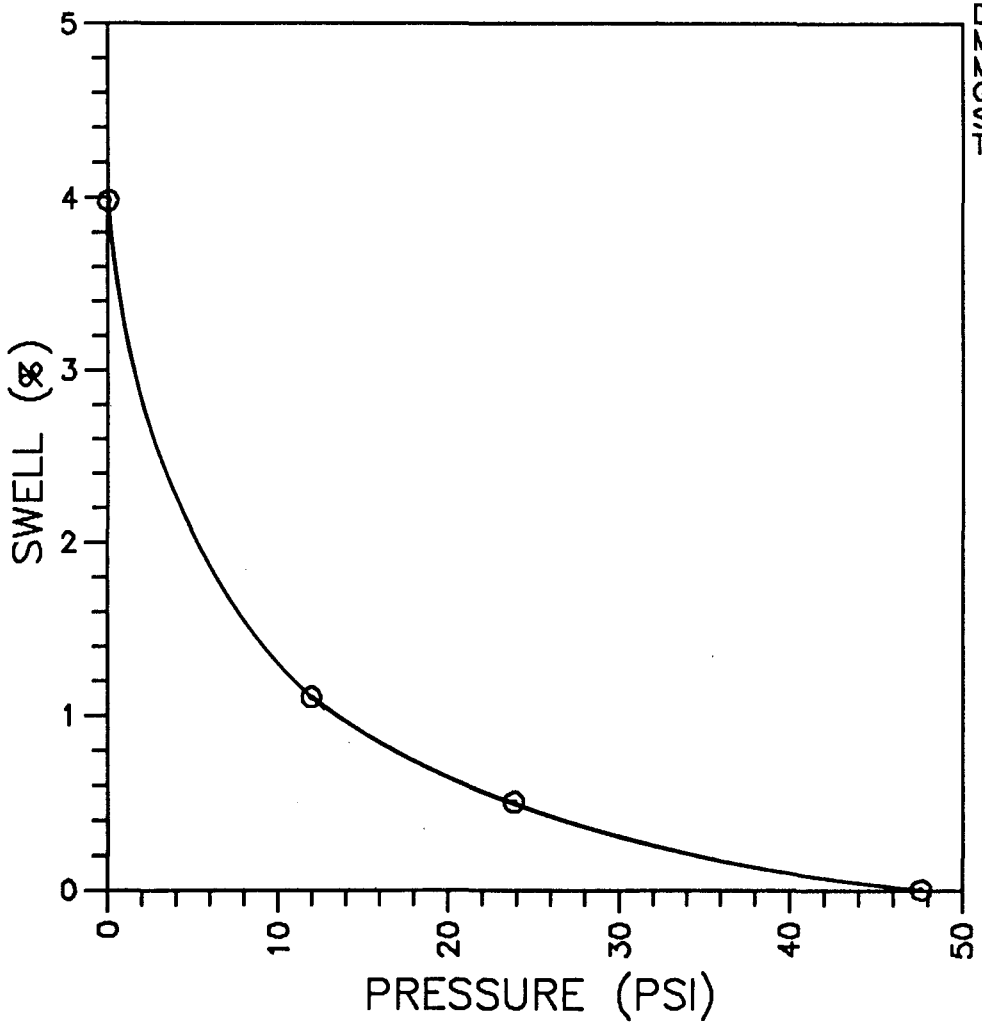
SWELLING PRESSURE INDEX

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1533
DEPTH (FT): 220.8
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
DRY UNIT WEIGHT (PCF): 115.8
M.C. BEFORE TEST (%): 16.2
M.C.AFTER TEST (%): 21.5
GAIN IN MOISTURE (%): 5.3
SWELLING PRESSURE INDEX (PSI): 48
TEST TYPE: SWELLING PRESSURE INDEX (ISRM)

TEXAS SSC SITE

SWELLING PRESSURE INDEX

MASON–JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

GEOMECHANICAL TEST RESULTS

BORING B 1540

TABLE E-10. GEOMECHANICAL TEST RESULTS - BORING B 1540

GENERAL LITHOLOGY	VERTICAL DEPTH feet	MOISTURE CONTENT percent	DRY DENSITY pcf	SPECIFIC GRAVITY	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	FRACTION FINER THAN # 200 SIEVE percent	CARBONATE CONTENT percent	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES *	UNCONFINED COMPRESSIVE STRENGTH psi	TRIAXIAL COMPRESSION CONFINING PRESSURE σ_3 psi	TRIAXIAL COMPRESSION DEVIATOR STRESS $\sigma_1-\sigma_3$ psi	FAILURE STRAIN percent	TANGENT YOUNG'S MODULUS E50 (psi)x10E5	TANGENT YOUNG'S MODULUS UNLOAD/ RELOAD (psi)x10E5	TANGENT YOUNG'S MODULUS σ_3 psi	POISSON'S RATIO	BRAZIL TENSILE STRENGTH psi	2ND CYCLE SLAKE DURABILITY INDEX percent	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX psi	COMMENTS
SILTY CLAY	0.0	16.8			42	24	69.2																
AUSTIN CHALK	7.3	14.5																					
AUSTIN CHALK	7.4	14.5							0.5										227				
AUSTIN CHALK	7.5	14.3	119.2						2.2	B-1/30	1972			0.39	6.84		0						NOTE 1
AUSTIN CHALK	46.1	17.4																					
AUSTIN CHALK	46.4	17.8							0.5										201				
AUSTIN CHALK	46.5	17.7	112.8	2.70					2.2	B-1/30	1939			0.37	6.60		0						
AUSTIN CHALK	101.0	12.6																					
AUSTIN CHALK	101.2	13.7	120.5						2.2	D	1662			1.41	1.67		0						
AUSTIN CHALK	111.0	13.7	118.2																				
AUSTIN CHALK	111.2	12.9	121.4	2.67					2.2	B-1/20		100	2287	1.10	2.61		100						
AUSTIN CHALK	111.6	14.6	117.6						2.4	D & E		200	2840	1.31	2.57	2.98	200						NOTE 2
AUSTIN CHALK	111.6														4.15	5.29		0.18					NOTE 3
AUSTIN CHALK	118.3	16.5																					
AUSTIN CHALK	118.4	16.8	117.6						2.2	D	306			1.70	0.21		0						SHALY
BENTONITE	119.1	35.1	84.9																				
BENTONITE	119.4				114	79	90.3	10.9															
AUSTIN CHALK	132.6	13.1																					
AUSTIN CHALK	132.7	13.7	121.7						2.3	B-1/30	2977			0.46	6.93		0						
AUSTIN CHALK	158.1	14.1	120.0	2.68					2.3	D & E		100	2749	0.76	5.13	5.14	100						NOTE 2
AUSTIN CHALK	158.1														9.23	13.85							NOTE 3
AUSTIN CHALK	158.5	13.5	122.5						2.2			200	3416	0.94	5.74		200						NOTE 4
AUSTIN CHALK	158.5														9.71			0.29					NOTE 3
AUSTIN CHALK	158.9	11.6	127.0																				
AUSTIN CHALK	167.5	14.8																					
AUSTIN CHALK	167.8	14.2	120.7						2.2	D	2520			0.45	8.51		0						
AUSTIN CHALK	168.3																				1.137		
AUSTIN CHALK	182.3	12.0	124.8						2.1	D & E	3104			0.88	4.57	5.54	0						NOTE 2
AUSTIN CHALK	182.3														7.06	9.00		0.13					NOTE 3
AUSTIN CHALK	182.9	14.5	119.4						2.1	B-1/20		200	3115	0.66	5.71		200						
AUSTIN CHALK	182.9														9.35								NOTE 3
AUSTIN CHALK	183.3	14.6	118.9						2.2	B-1/20		300	3248	0.66	7.87		300						
AUSTIN CHALK	183.3														8.76								NOTE 3
AUSTIN CHALK	183.7	14.7	117.5																				
TRANSITION	187.0	12.6																					SHALY LIMESTONE
TRANSITION	187.2	9.8	135.7						2.1	D	816			0.50	2.04		D						SHALY LIMESTONE
EAGLE FORD SHALE	188.5	16.8	113.6																				
EAGLE FORD SHALE	188.6				105	69	91.9	8.3															
EAGLE FORD SHALE	196.7				105	69	99.5																
EAGLE FORD SHALE	198.2	14.3																					
EAGLE FORD SHALE	198.5	14.7	121.9	2.76	80	48	96.3	14.0	2.3	D	216			0.57	0.62		0						
EAGLE FORD SHALE	203.2	15.9	117.9		83	55	98.9	6.0	2.1	E		200	375	0.95	0.72		200						
EAGLE FORD SHALE	203.6	15.8	118.1						2.2	B-1/60		300	381	0.62	0.90	1.15	300						NOTES 2 and 5
EAGLE FORD SHALE	203.6														1.32	1.77		0.18					NOTE 3
EAGLE FORD SHALE	204.0	16.2	115.8																				

TABLE E-10. GEOMECHANICAL TEST RESULTS - BORING B 1540 (Continued)

GENERAL LITHOLOGY	VERTICAL DEPTH feet	MOISTURE CONTENT percent	DRY DENSITY pcf	SPECIFIC GRAVITY	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	FRACTION FINER THAN # 200 SIEVE percent	CARBONATE CONTENT percent	SAMPLE DIMENSION RATIO L/D	SAMPLE FAILURE MODE/ DEGREES *	UNCONFINED COMPRESSIVE STRENGTH psi	TRIAXIAL COMPRESSION CONFINING PRESSURE σ_3 psi	TRIAXIAL COMPRESSION DEVIATOR STRESS $\sigma_1-\sigma_3$ psi	FAILURE STRAIN percent	TANGENT YOUNG'S MODULUS E50 (psi)x10E5	TANGENT YOUNG'S MODULUS UNLOAD/ RELOAD (psi)x10E5	TANGENT YOUNG'S MODULUS σ_3 psi	POISSON'S RATIO	BRAZIL TENSILE STRENGTH psi	2ND CYCLE SLAKE DURABILITY INDEX percent	MODIFIED TABER ABRASION INDEX	SWELL PRESSURE INDEX psi	COMMENTS
EAGLE FORD SHALE	213.2	15.8	115.6																				
EAGLE FORD SHALE	213.3	15.4																		14.5			
EAGLE FORD SHALE	237.8	17.1	114.8		102	73	98.8															21.2	
EAGLE FORD SHALE	238.0	17.6	111.8																			26.6	
EAGLE FORD SHALE	238.2	18.0	116.7																				
EAGLE FORD SHALE	241.1	17.8																					
EAGLE FORD SHALE	241.3	17.3	116.7		116	78	99.3	6.5	2.3	A	185			0.77	0.46		0						
EAGLE FORD SHALE	253.0	16.0	116.8																				
EAGLE FORD SHALE	253.4	15.7	117.3	2.72	58	33	97.9	7.8	2.2	D		200	318	1.56	0.68		200						NOTE 5
EAGLE FORD SHALE	254.1	16.0	117.1						2.1	B-1/40		300	315	1.96	0.62	0.62	300						NOTE 2
EAGLE FORD SHALE	254.1														0.71	0.94		0.29					NOTE 3
EAGLE FORD SHALE	265.9	15.1	120.3																				
EAGLE FORD SHALE	266.3	14.9	117.7		73	47	99.3	10.7	2.4	E	252			0.86	0.54		0						
EAGLE FORD SHALE	266.7	15.6	119.8																			13.3	
EAGLE FORD SHALE	266.9	15.7	114.9																			15.9	
PROCEDURE		ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D1140				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ASTM-D3967	ISRM	ISRM	ISRM	

B1540P20.WK1
REVISION: 2.0
DATE: 07/19/90

* EXPLANATION OF SAMPLE FAILURE MODE AS FOLLOWS.

Symbol	Failure Type	Symbol	Failure Type
A	No discernible failure plane	B-4	Combination
(B)	Well defined shear plane @ "X" angle (deg) to vertical or to long axis of core	C	Barreling/Bulging
B-1	Shear plane	D	Longitudinal (axial) splitting
B-2	Bedding plane shear	E	Conical
B-3	Shear plane along pre-existing fracture, shear zone, etc.	F	No information

NOTES:

1) All moduli calculated from axial strains using a dial micrometer except where noted. Axial gage length is the sample length.

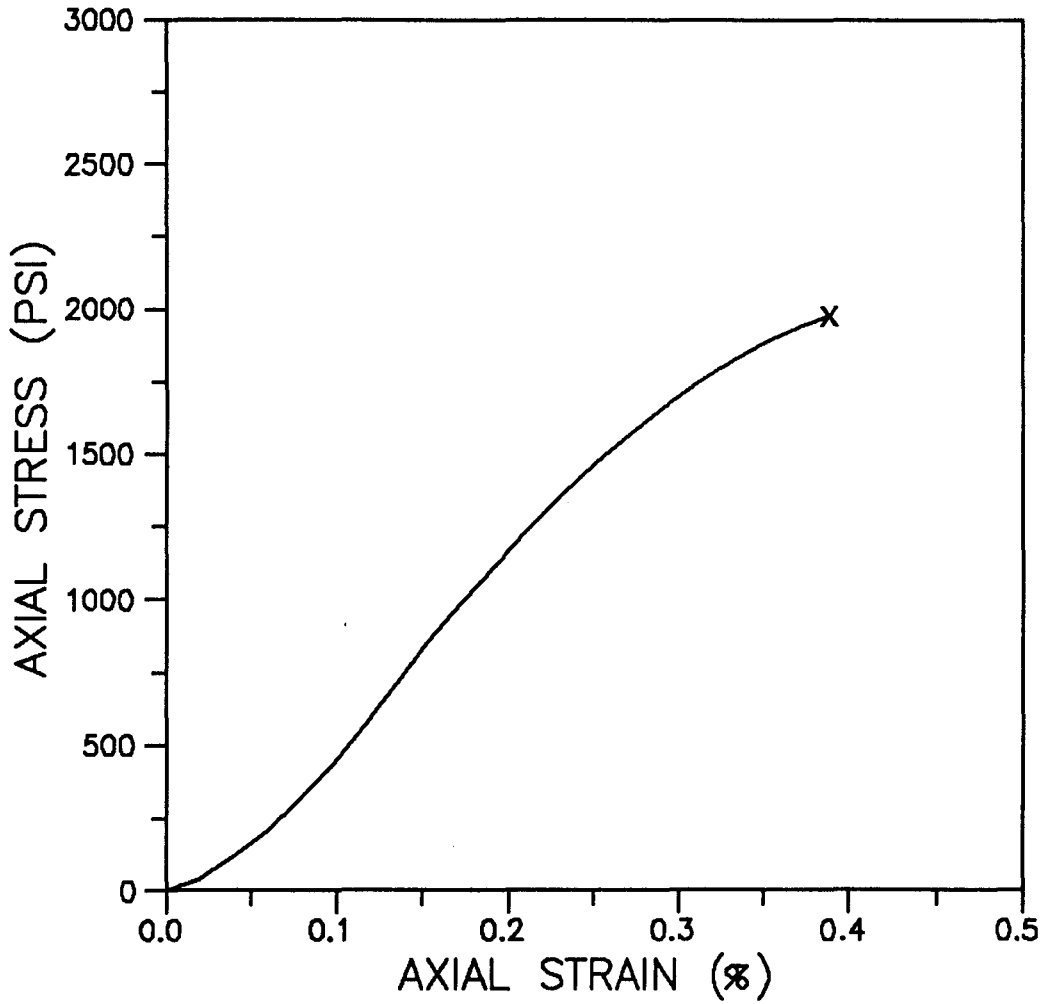
2) Triaxial compression test is cyclic with one unload/reload cycle.

3) Modulus and Poisson's ratio calculated from axial and lateral strains measured using LVDTs. Axial gage length is 2.8 inches.

4) Load frame capacity exceeded. Sample not taken to failure. Modulus taken at 50 % of maximum stress.

5) Sample separated along bedding prior to compression test.

BORING NO: B1540
DEPTH (FT): 7.5
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.3
DRY UNIT WEIGHT (PCF): 119.2
DEG. OF SATURATION (%): 93.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.84 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

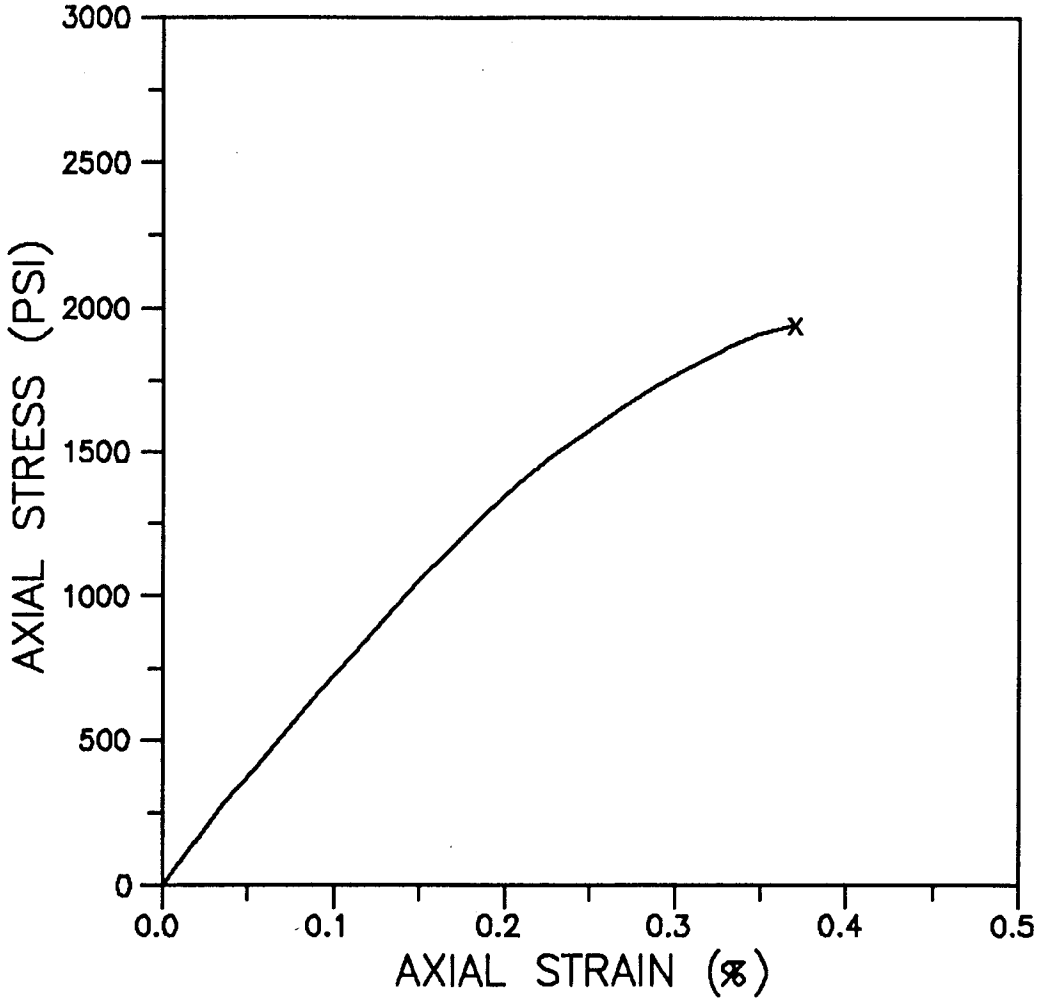
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: B1540
DEPTH (FT): 46.5
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.7
DRY UNIT WEIGHT (PCF): 112.8
DEG. OF SATURATION (%): 96.82
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.60 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

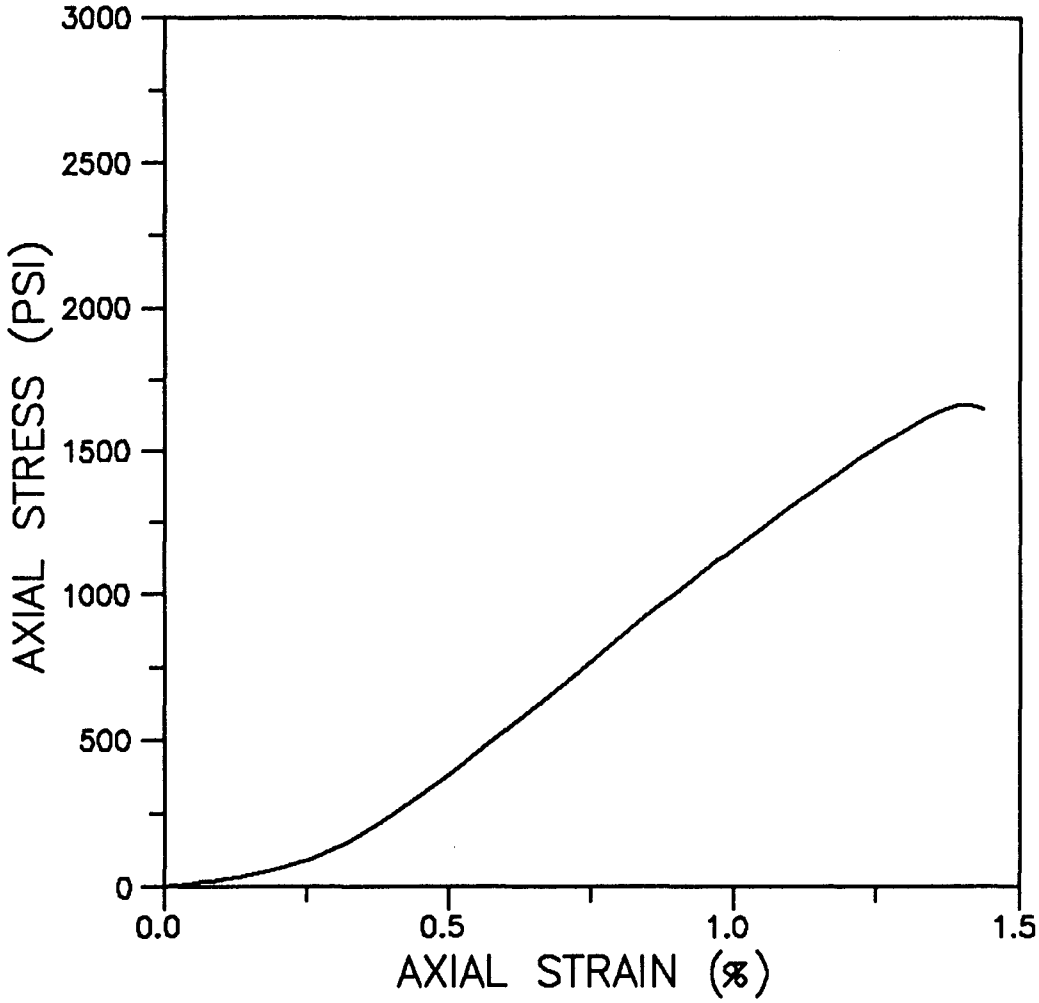
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: B1540
DEPTH (FT): 101.2
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.7
DRY UNIT WEIGHT (PCF): 120.4
DEG. OF SATURATION (%): 92.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
1.67 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

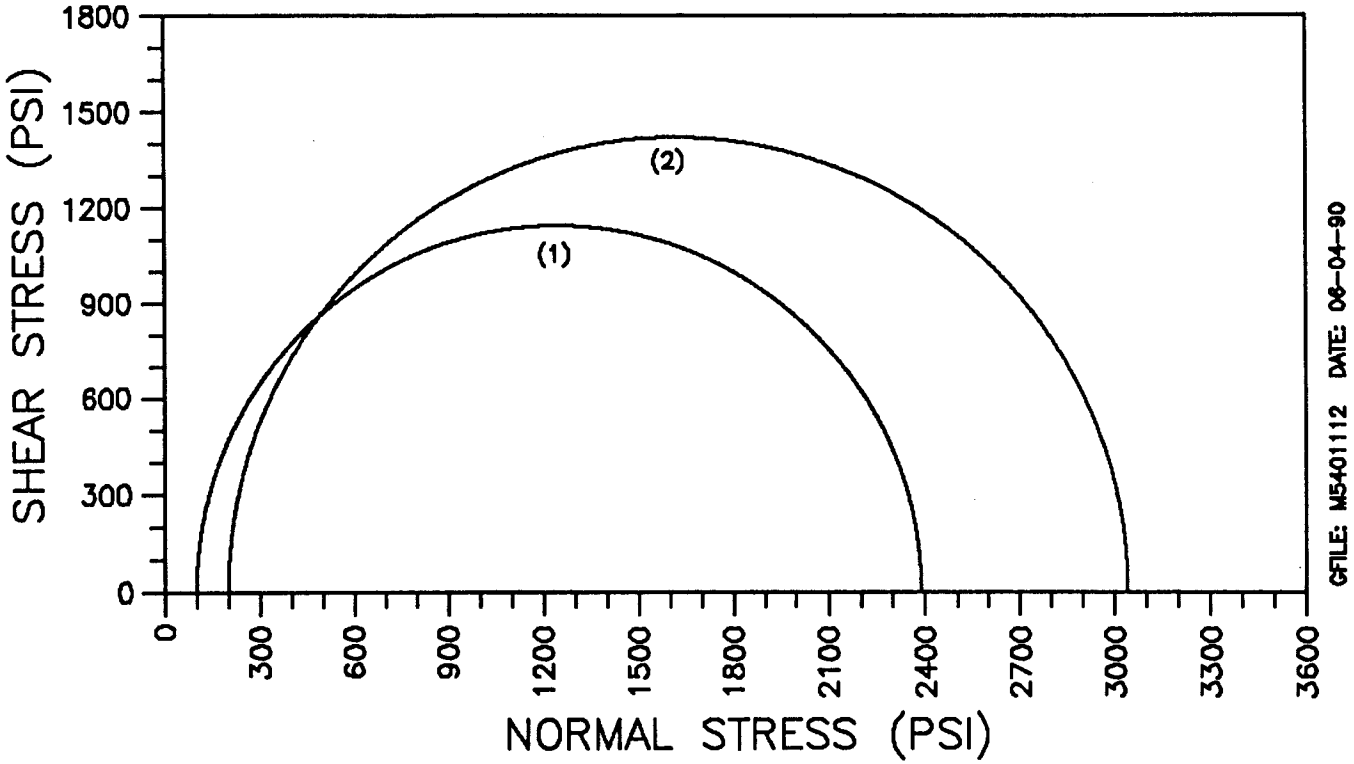
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B1540
DEPTH RANGE (FT): 111.2–112.0
AUSTIN CHALK LIMESTONE



GFILE: M5401112 DATE: 06-04-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 111.2
(2) DEPTH (FT): 111.6

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

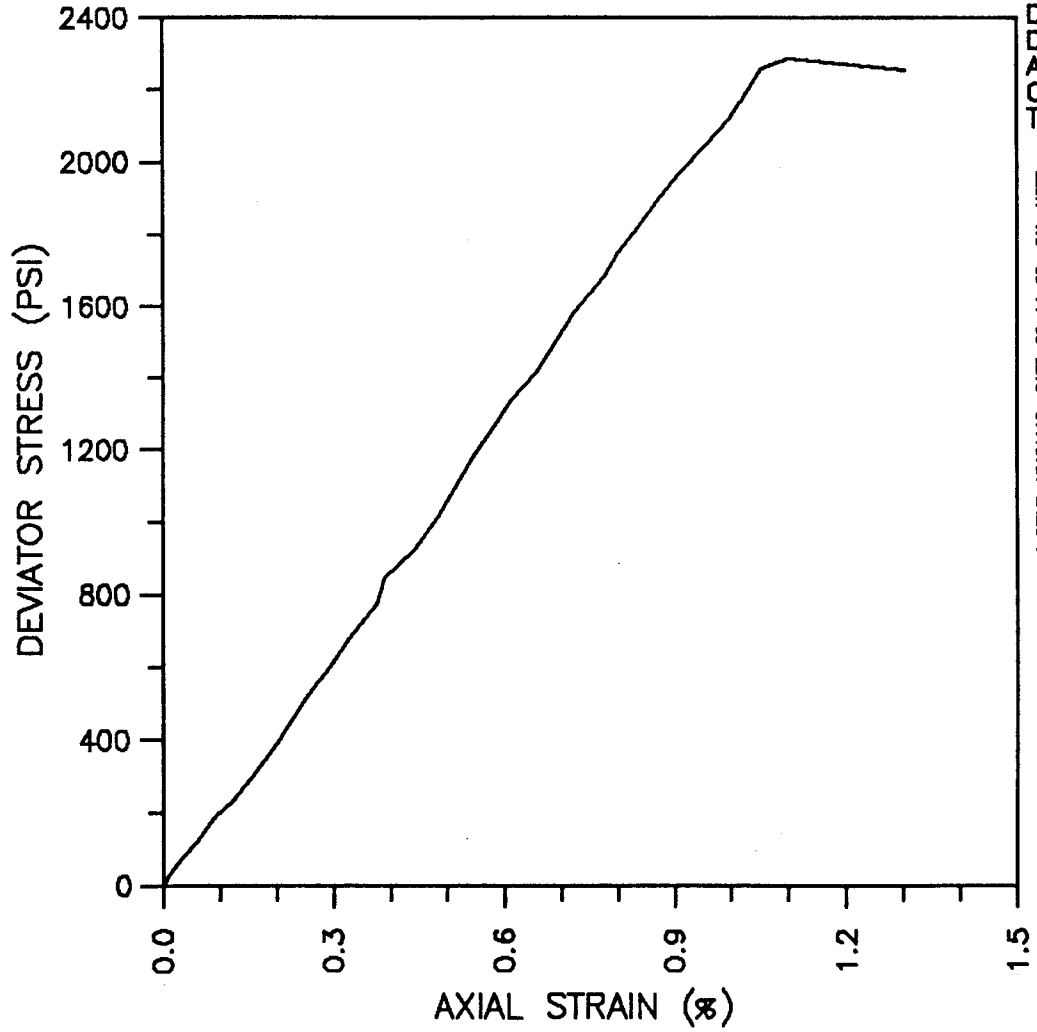
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 111.2
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.9
DRY UNIT WEIGHT (PCF): 121.4
DEG. OF SATURATION (%): 90.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: 15401112 DATE: 05-14-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.614 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 20 DEG.

TEXAS SSC SITE

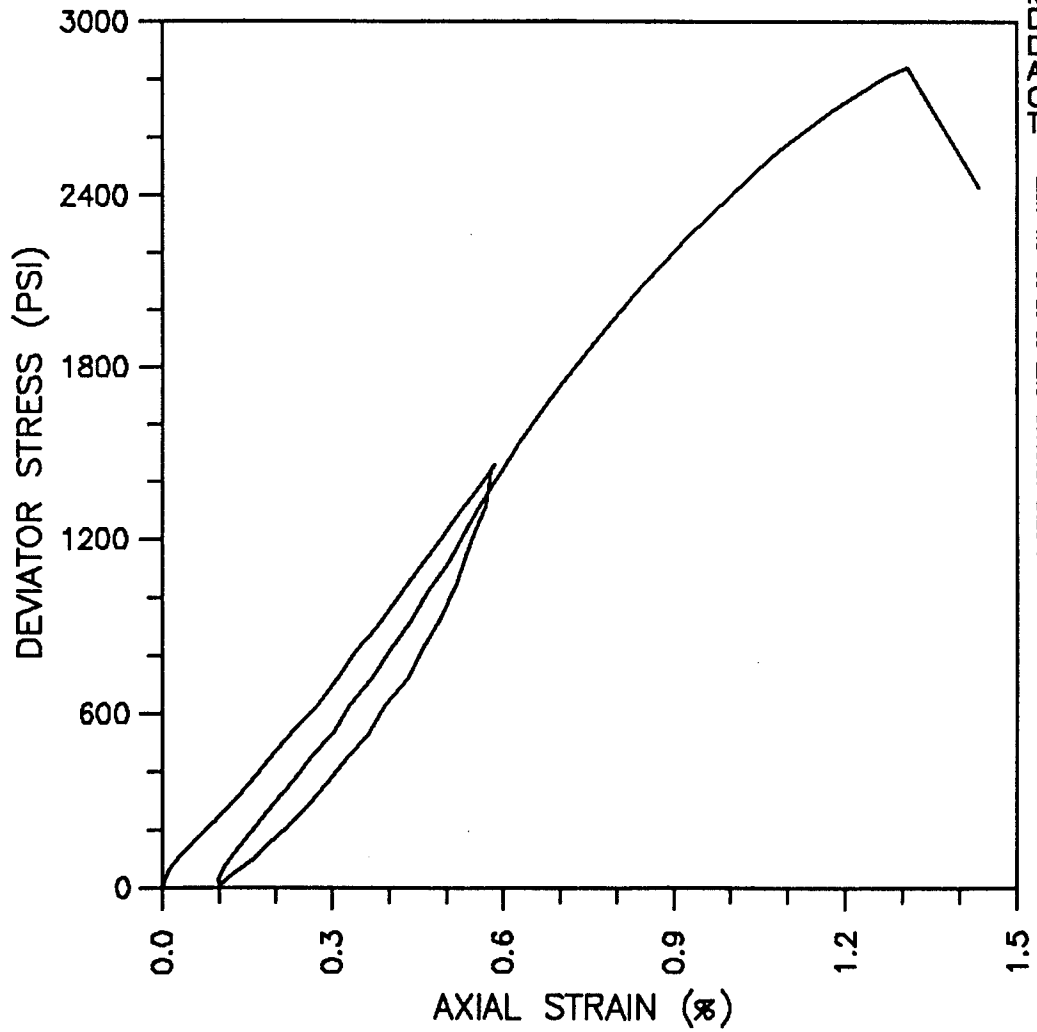
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 111.6
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.6
DRY UNIT WEIGHT (PCF): 117.6
DEG. OF SATURATION (%): 91.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: 15401118 DATE: 05-07-00 CAL: MGTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.567 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING W/
CONICAL AT BOTTOM

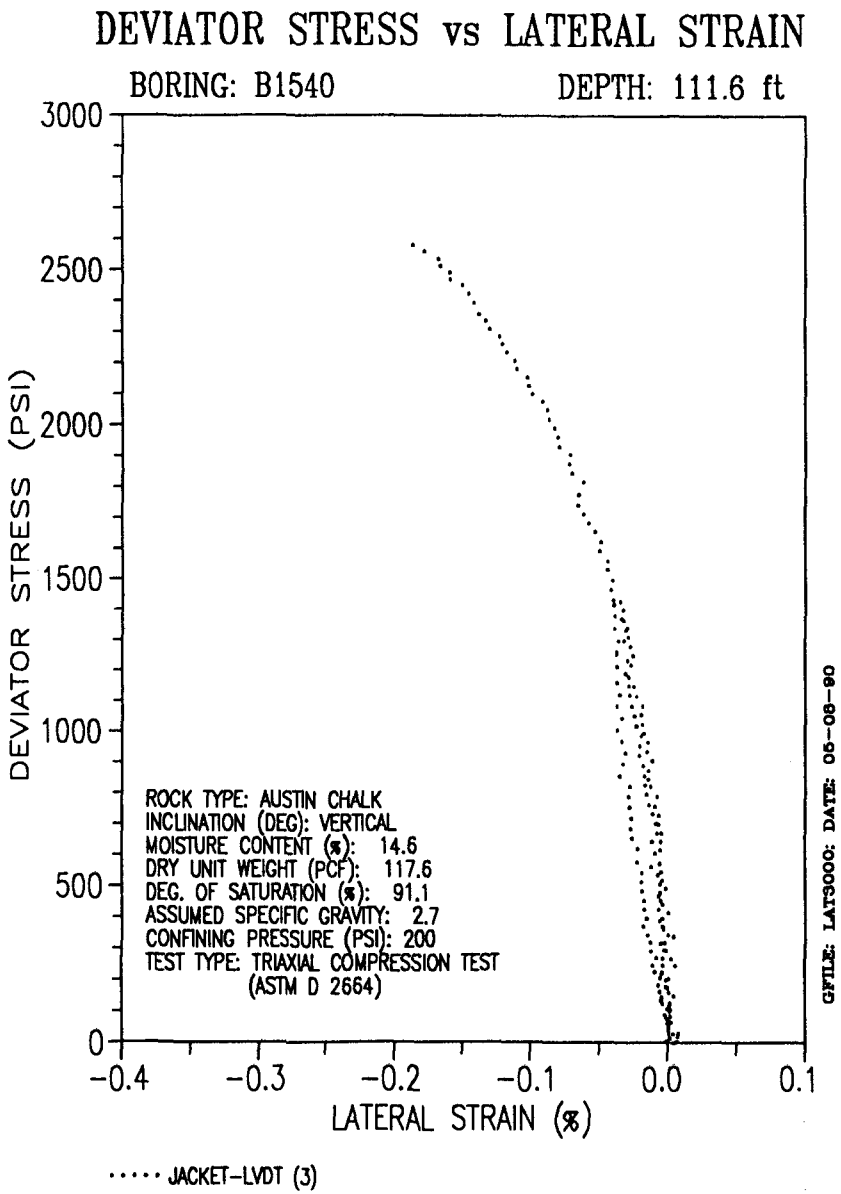
TEXAS SSC SITE

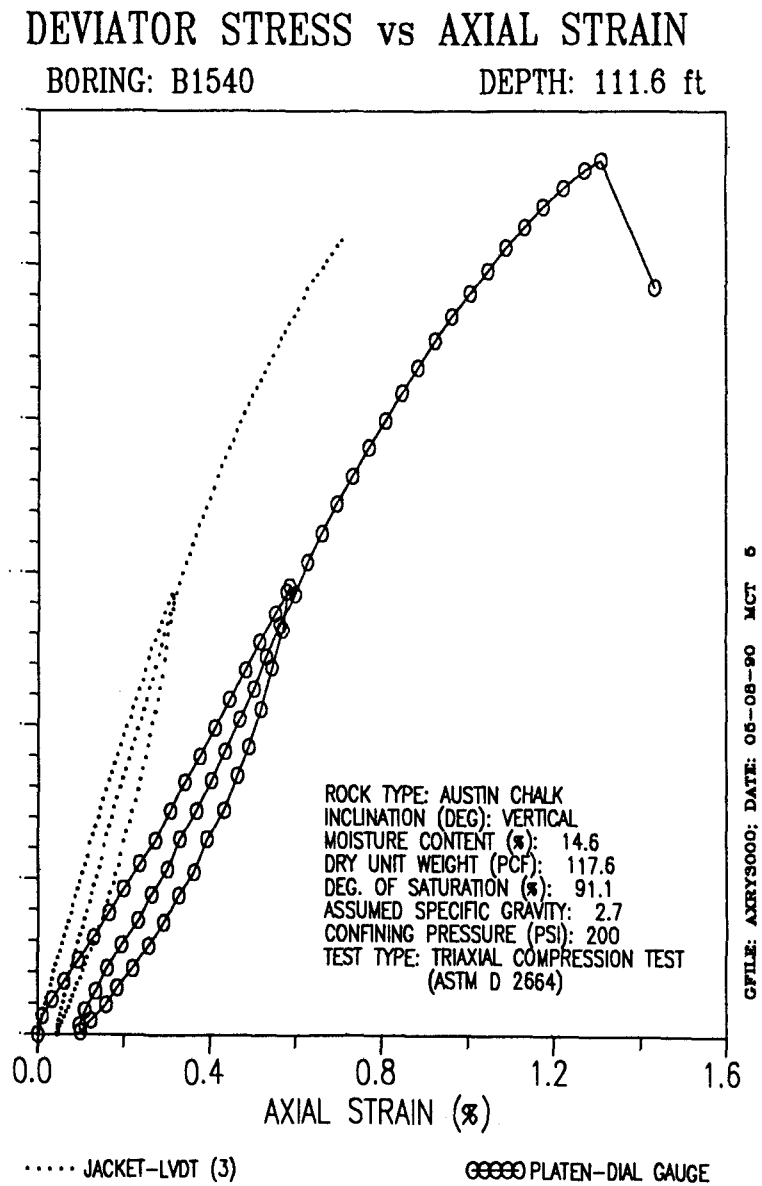
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

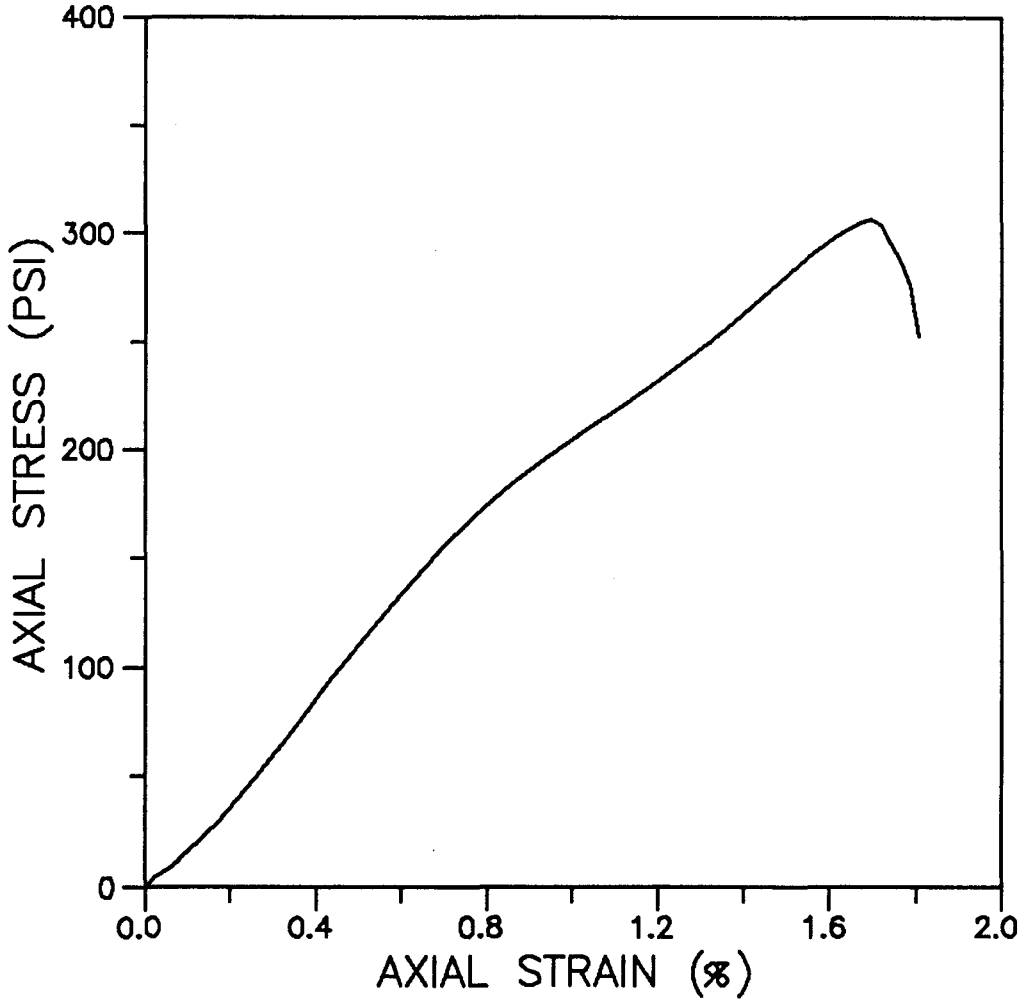
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1540
DEPTH: 111.6 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.6
DRY UNIT WEIGHT (PCF): 117.6
DEG. OF SATURATION (%): 91.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT3000; DATE: 05-08-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1540
DEPTH: 111.6 ft
0.0
0.4
0.8
1.2
1.6
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.6
DRY UNIT WEIGHT (PCF): 117.6
DEG. OF SATURATION (%): 91.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY3000; DATE: 05-08-90 MCT 5
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: B1540
DEPTH (FT): 118.4
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.8
DRY UNIT WEIGHT (PCF): 117.6
DEG. OF SATURATION (%): 104.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.06 x 10E4 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

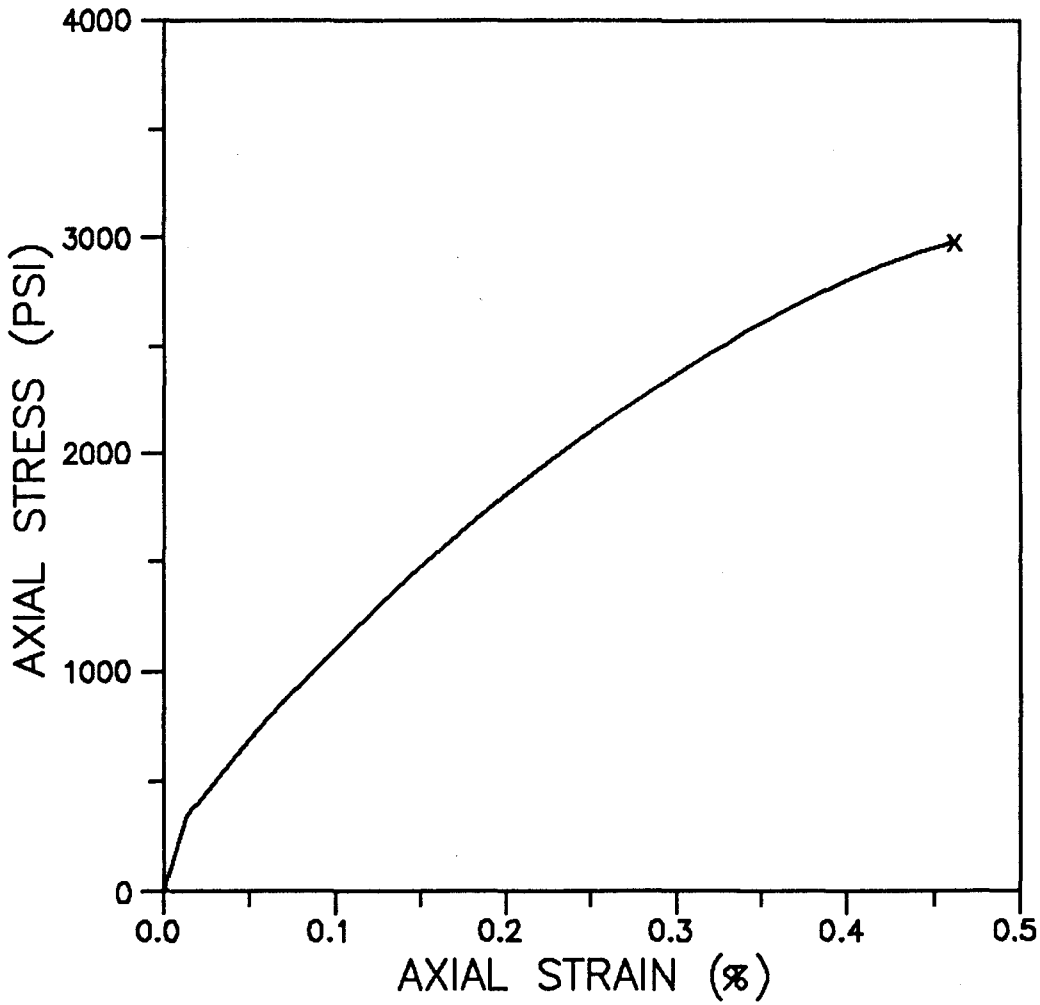
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO: B1540
DEPTH (FT): 132.7
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.7
DRY UNIT WEIGHT (PCF): 121.7
DEG. OF SATURATION (%): 96.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.93 x 10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG.

TEXAS SSC SITE

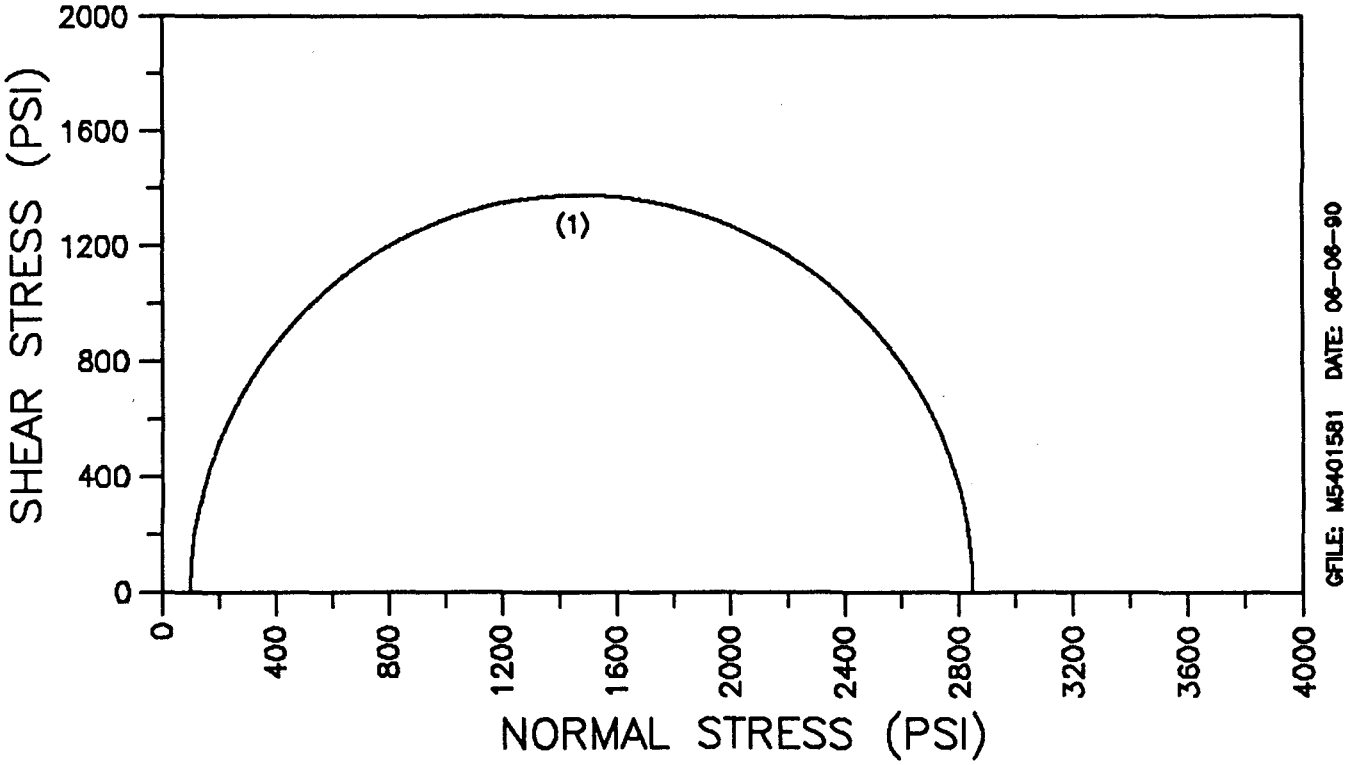
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: B1540
DEPTH RANGE (FT): 158.1–158.9
AUSTIN CHALK LIMESTONE



GFILE: M5401581 DATE: 06-06-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

(1) DEPTH (FT): 158.1
(2) DEPTH (FT): 158.5(THIS SAMPLE DID NOT FAIL-DELETED FROM MOHR CIRCLE PLOT)

TEXAS SSC SITE

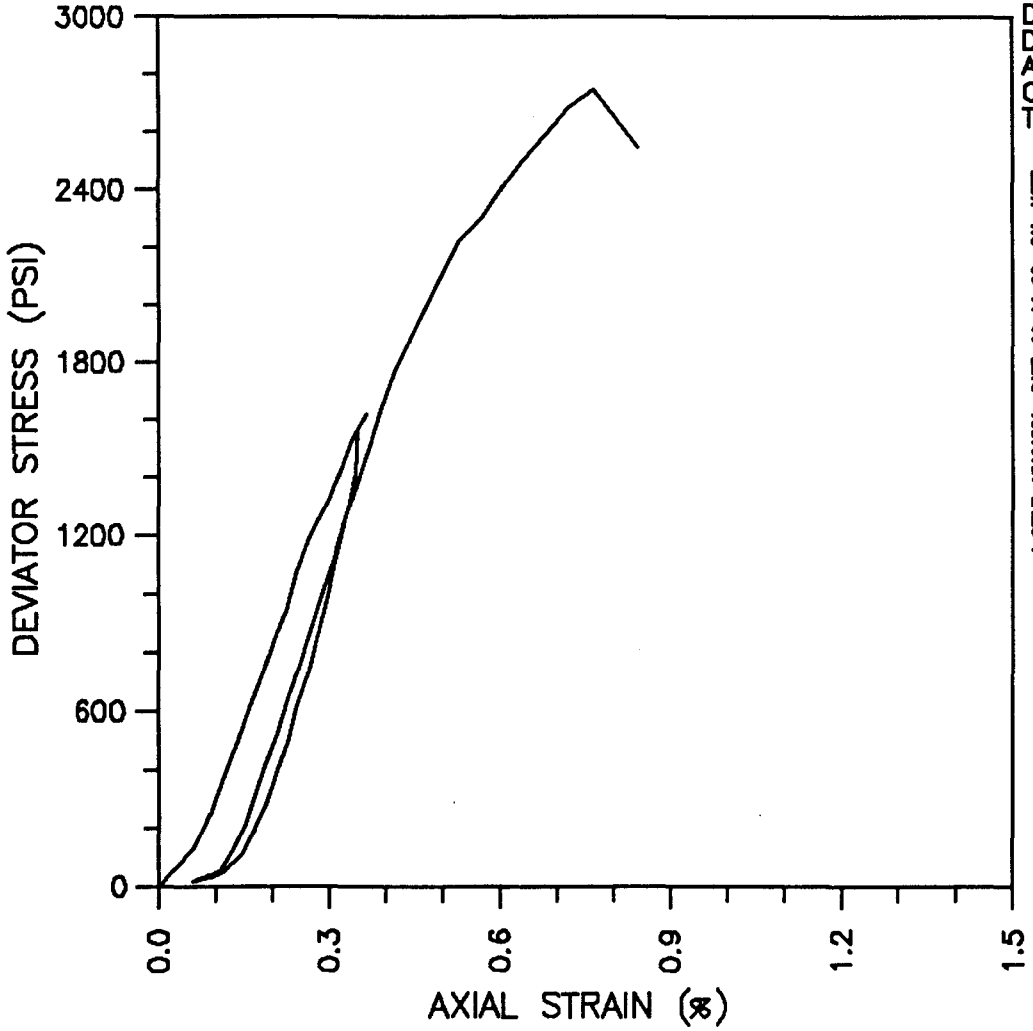
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 158.1
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.1
DRY UNIT WEIGHT (PCF): 120.0
DEG. OF SATURATION (%): 94.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: 15401581 DATE: 06-04-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.134 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING W/
CONICAL AT BOTTOM

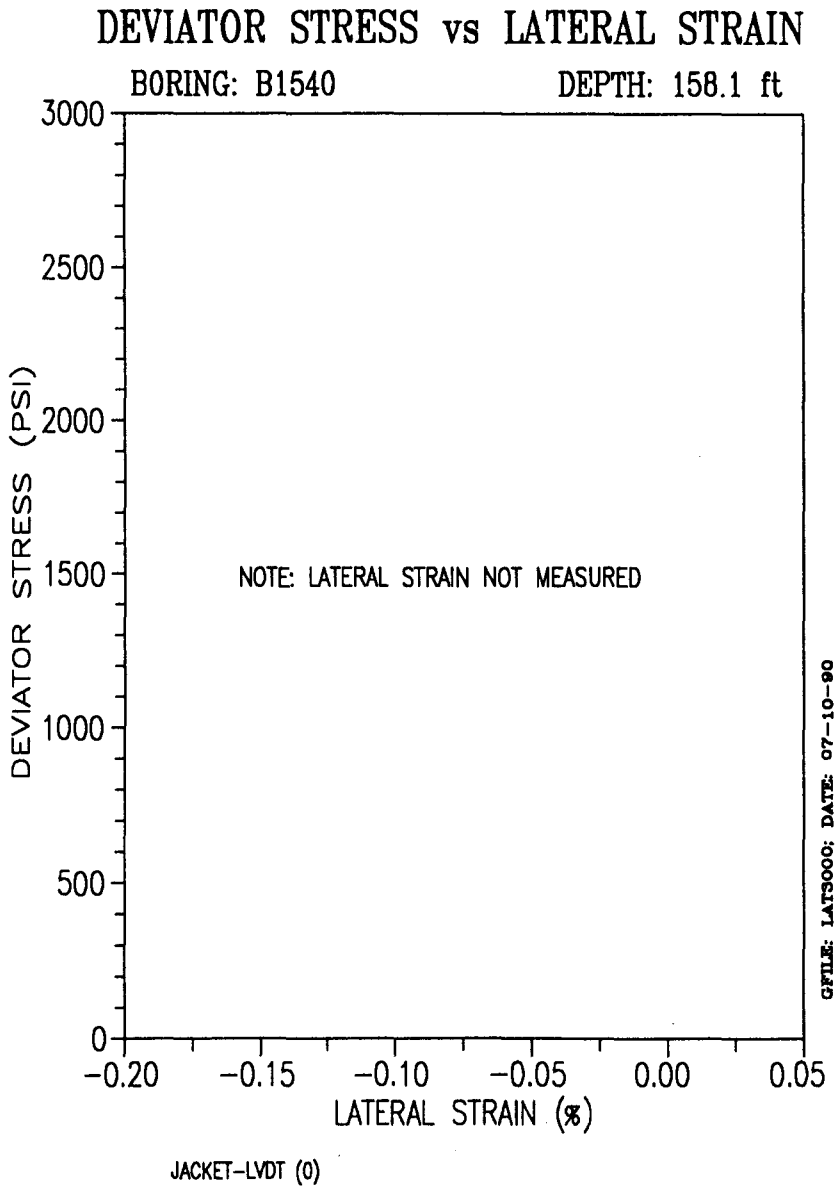
TEXAS SSC SITE

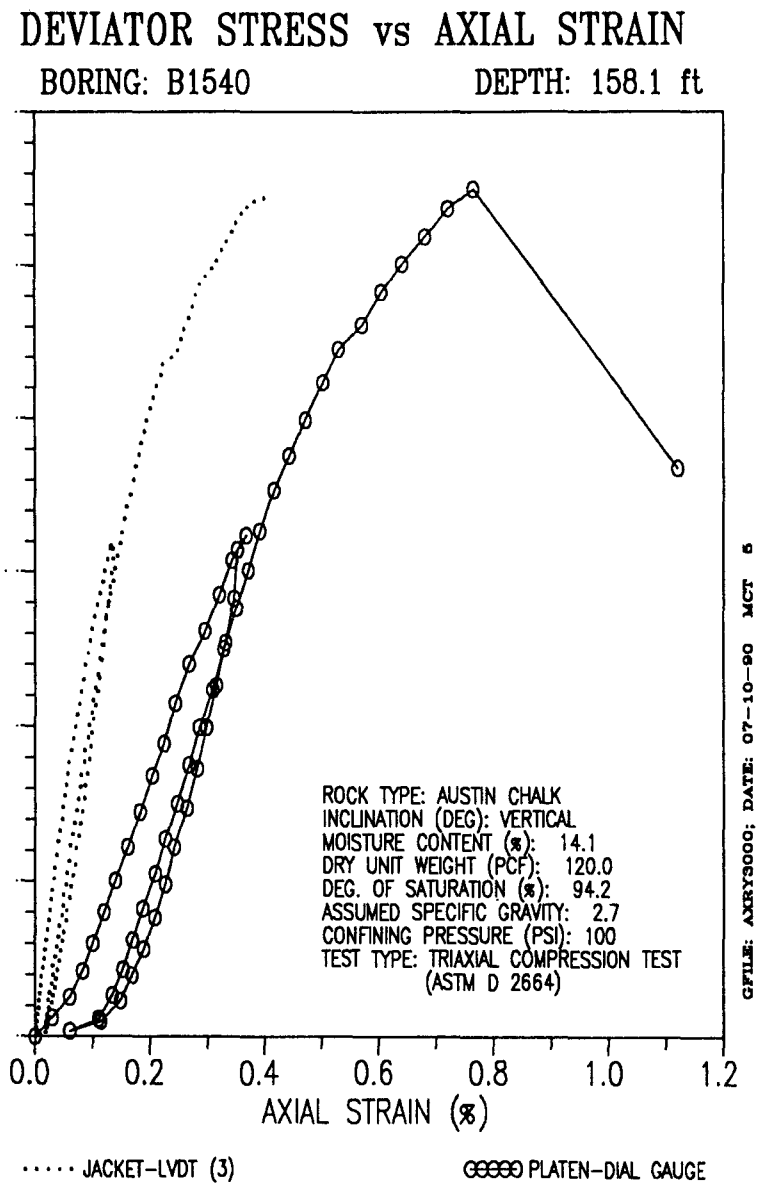
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

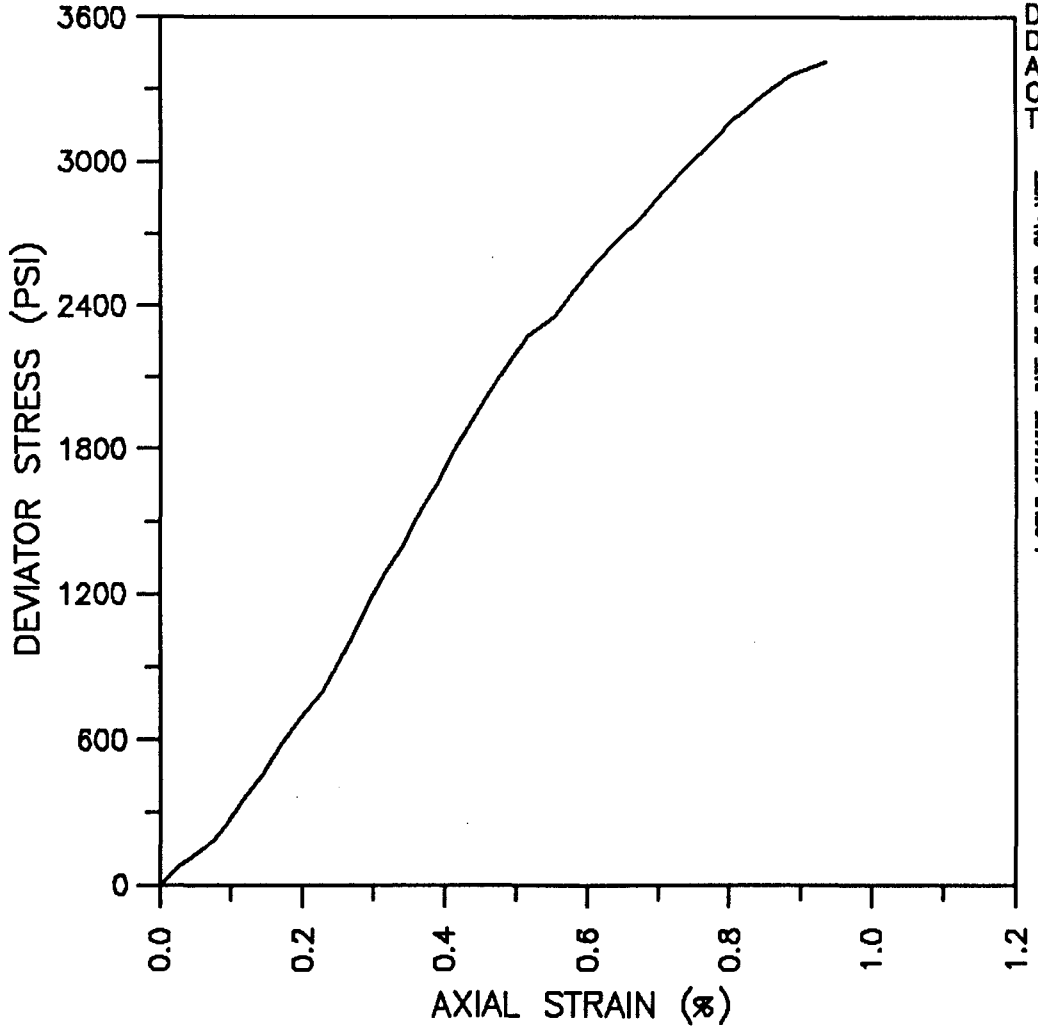
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1540
DEPTH: 158.1 ft
DEVIATOR STRESS (PSI)
3000
2500
2000
1500
1000
500
0
NOTE: LATERAL STRAIN NOT MEASURED
-0.20
-0.15
-0.10
-0.05
0.00
0.05
LATERAL STRAIN (%)
JACKET-LVDT (0)
GFILE: LAT3000; DATE: 07-10-90


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1540
DEPTH: 158.1 ft
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.1
DRY UNIT WEIGHT (PCF): 120.0
DEG. OF SATURATION (%): 94.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
AXIAL STRAIN (%)
JACKET-LVDT (3)
PLATEN-DIAL GAUGE
GFILE: AXRY3000; DATE: 07-10-90 MCT 6

BORING NO.: B1540
DEPTH (FT): 158.5
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.5
DRY UNIT WEIGHT (PCF): 122.5
DEG. OF SATURATION (%): 96.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: 154015B5 DATE: 05-07-90 CAL: MCT5

TANGENT MODULUS AT 50%
MAXIMUM STRESS:
5.742 x10E5 PSI

FAILURE MODE:
LOADED TO 3416 PSI
W/O FAILURE

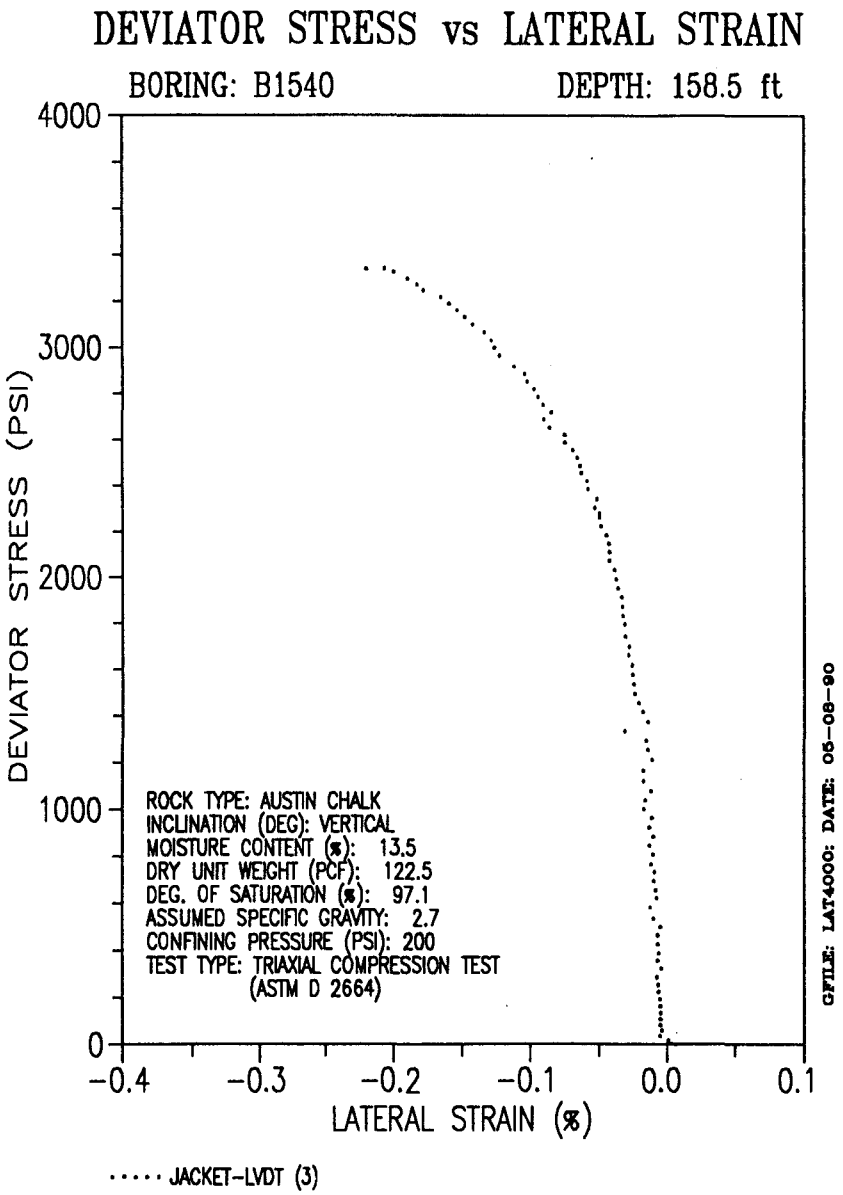
TEXAS SSC SITE

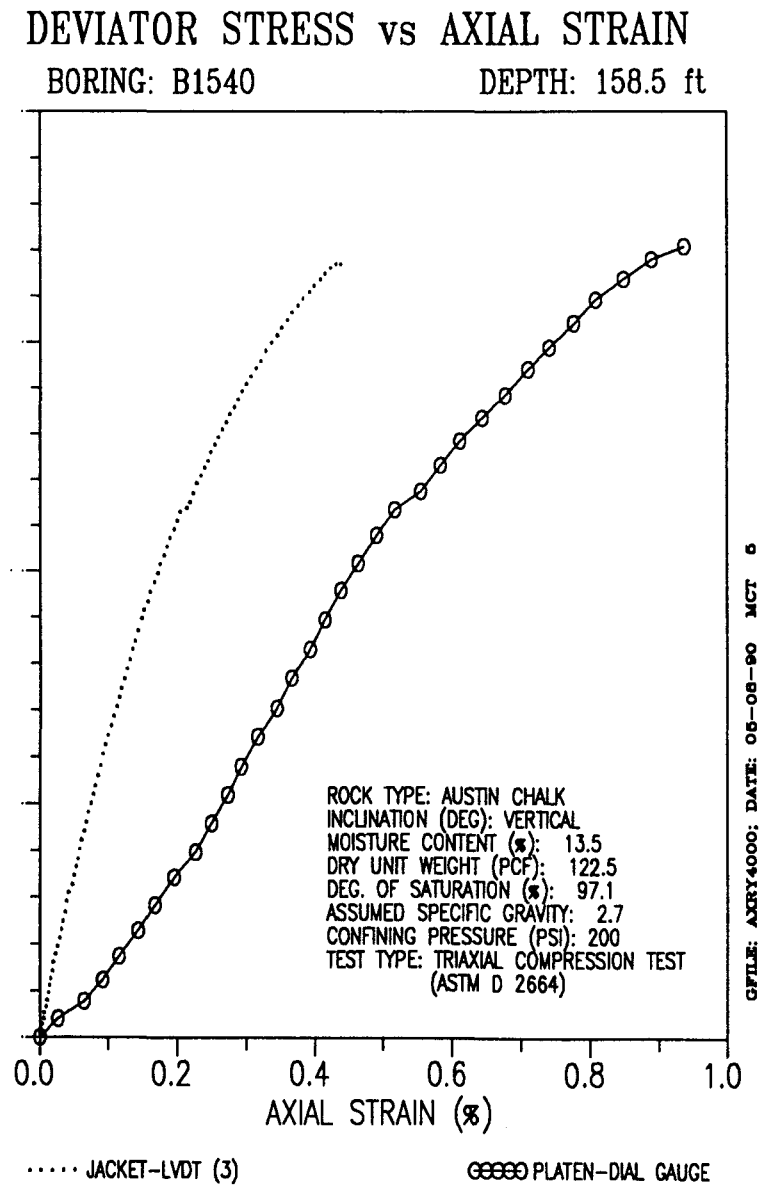
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

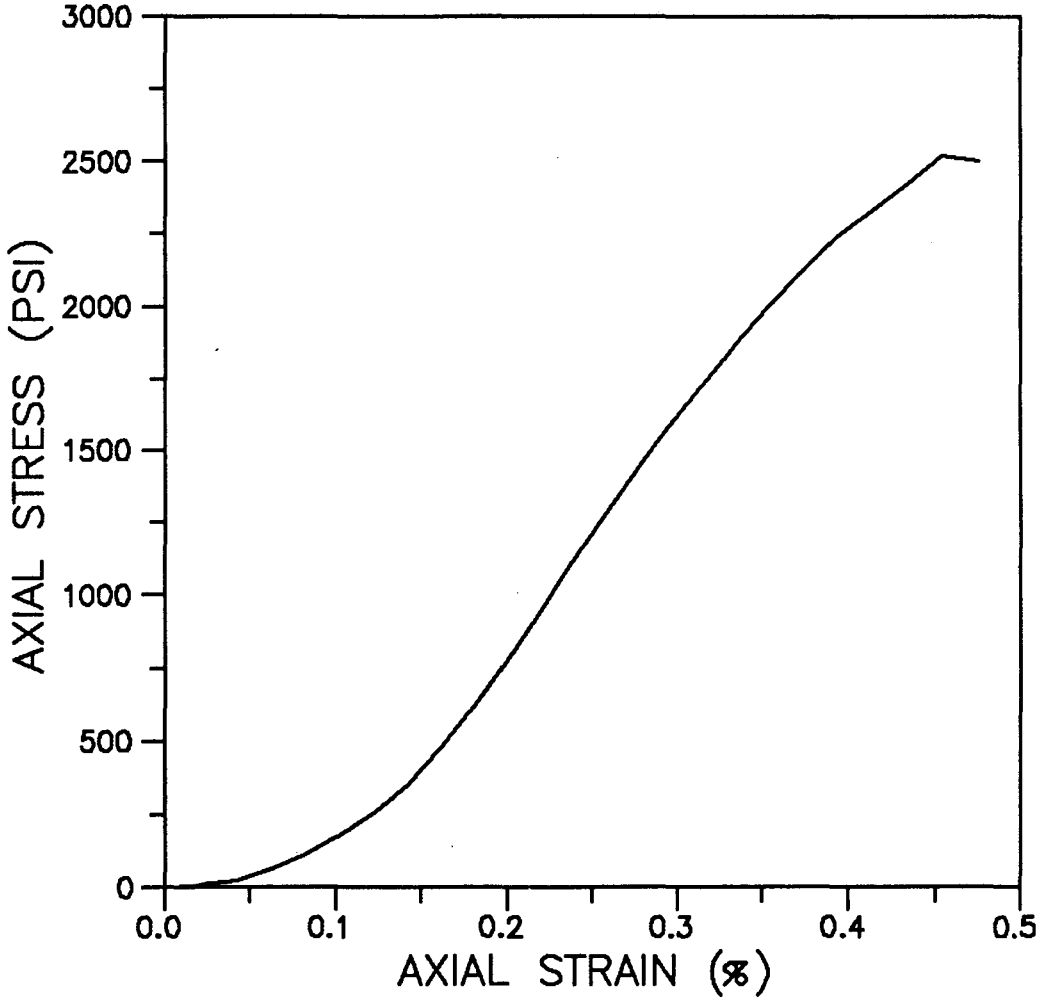
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1540
DEPTH: 158.5 ft
DEVIATOR STRESS (PSI)
4000
3000
2000
1000
0
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.5
DRY UNIT WEIGHT (PCF): 122.5
DEG. OF SATURATION (%): 97.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT4000; DATE: 05-08-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1540
DEPTH: 158.5 ft
0.0
0.2
0.4
0.6
0.8
1.0
AXIAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 13.5
DRY UNIT WEIGHT (PCF): 122.5
DEG. OF SATURATION (%): 97.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY4000; DATE: 05-08-90 MCT 6
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: B1540
DEPTH (FT): 167.8
AUSTIN CHALK



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.2
DRY UNIT WEIGHT (PCF): 120.7
DEG. OF SATURATION (%): 96.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
8.51 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

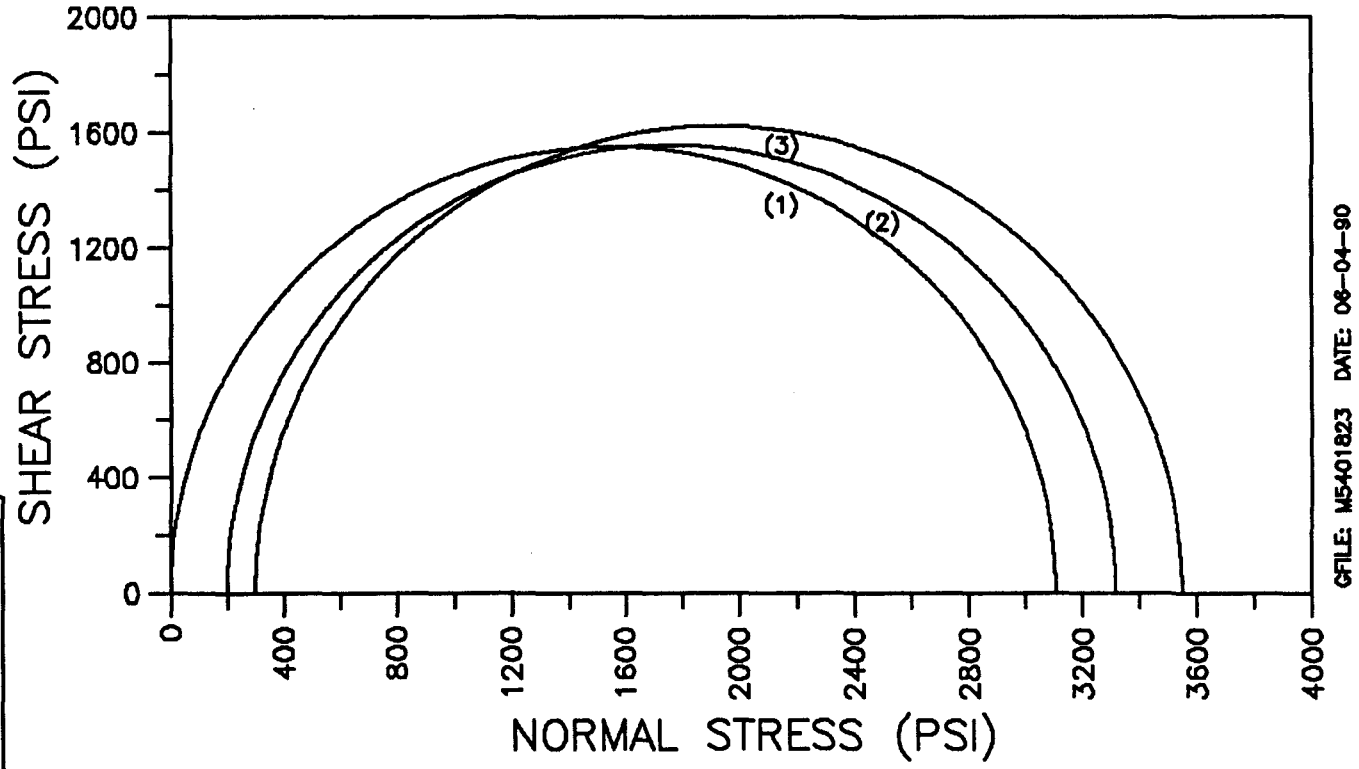
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: B1540
DEPTH RANGE (FT): 182.3–183.7
AUSTIN CHALK LIMESTONE



GFILE: M5401823 DATE: 06-04-90

SEE STRESS–STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 182.3
(2) DEPTH (FT): 182.9
(3) DEPTH (FT): 183.3

INCLINATION (DEG): VERTICAL
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

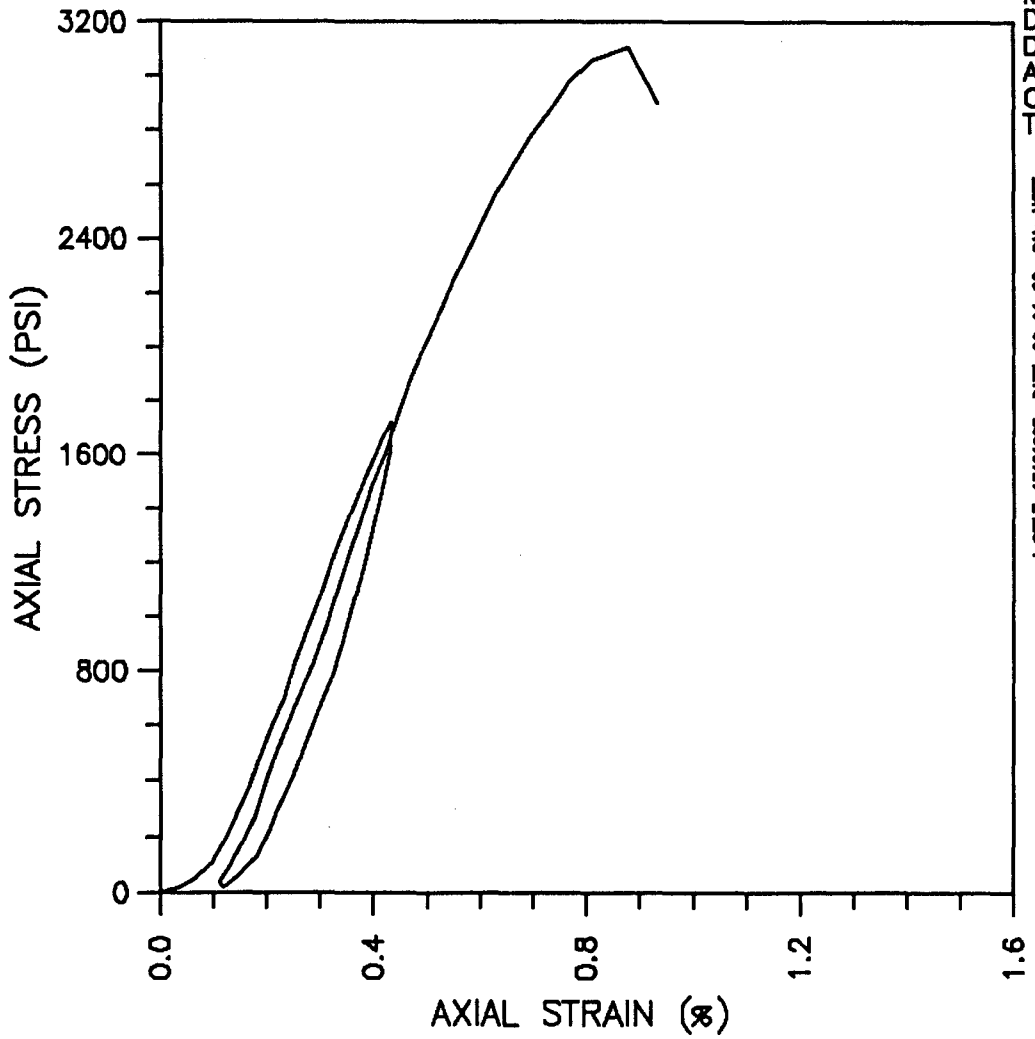
MOHR CIRCLE PLOT

MASON–JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 182.3
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.0
DRY UNIT WEIGHT (PCF): 124.8
DEG. OF SATURATION (%): 92.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: 15401823 DATE: 08-04-90 CAL: MCT3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.571 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING
W/CONICAL AT TOP

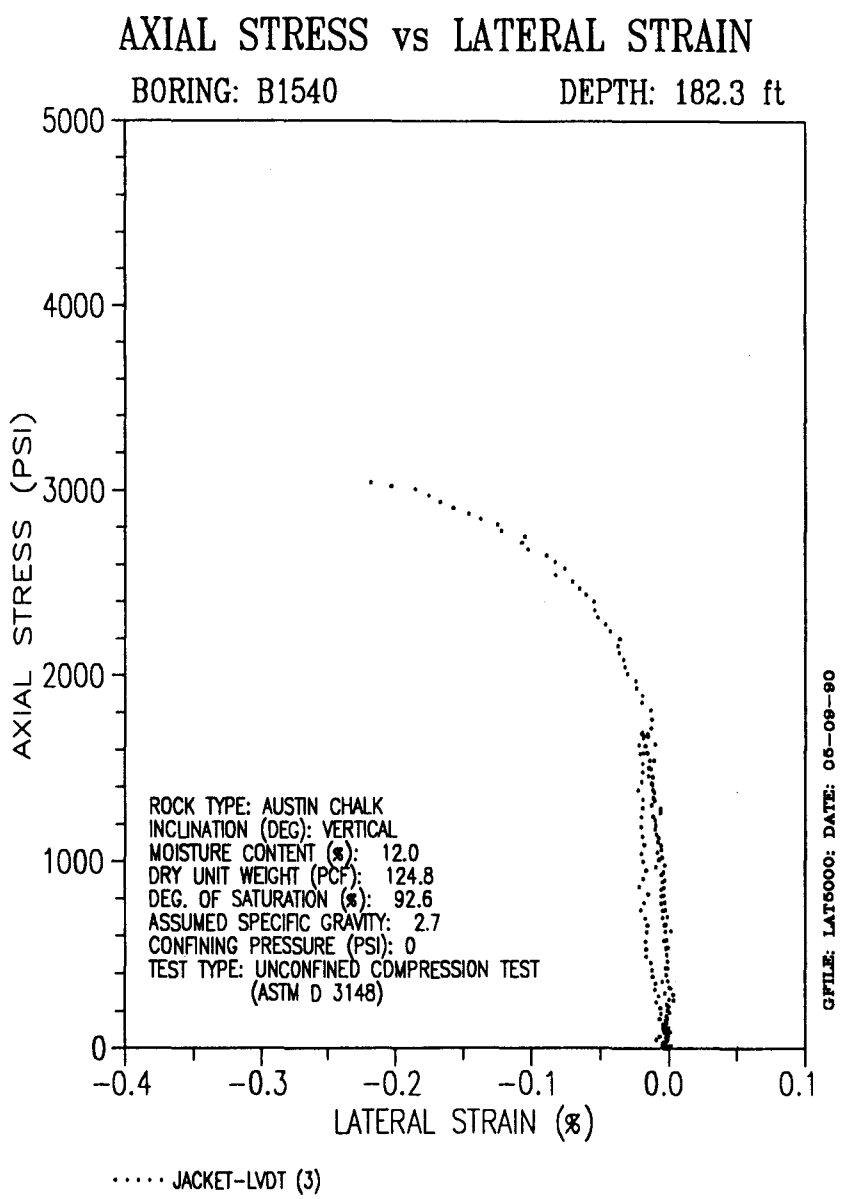
TEXAS SSC SITE

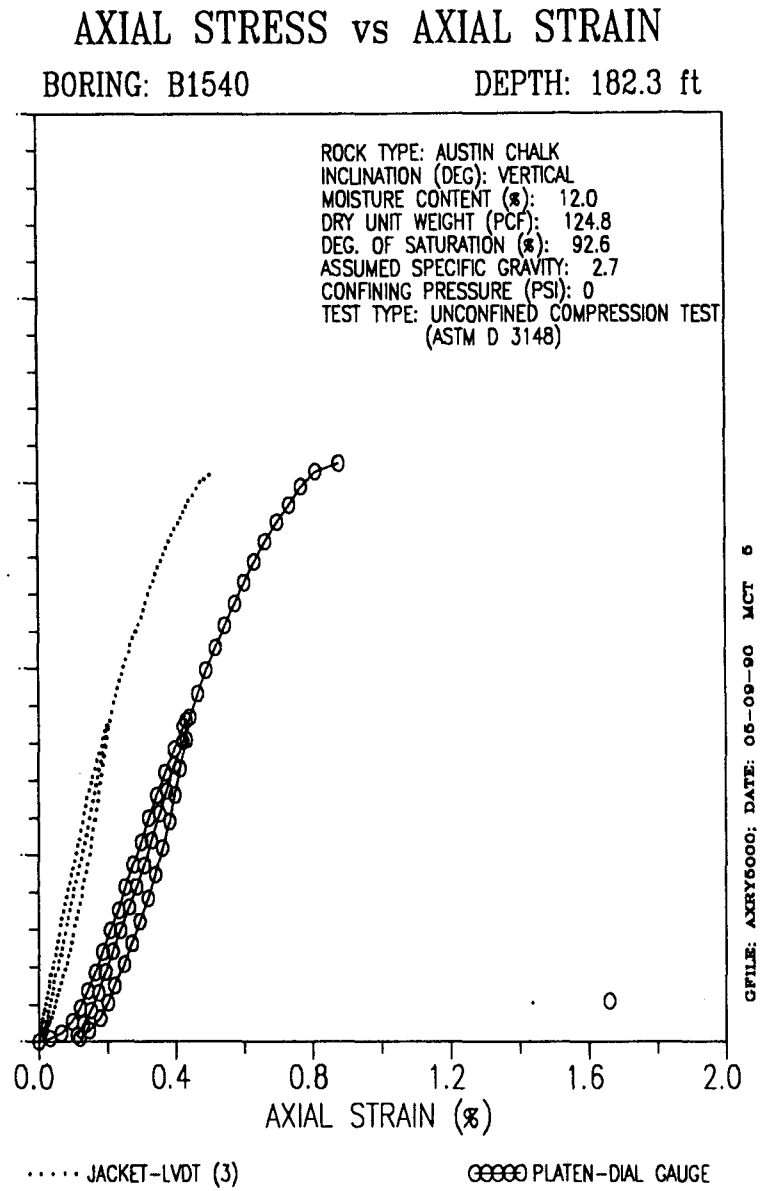
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

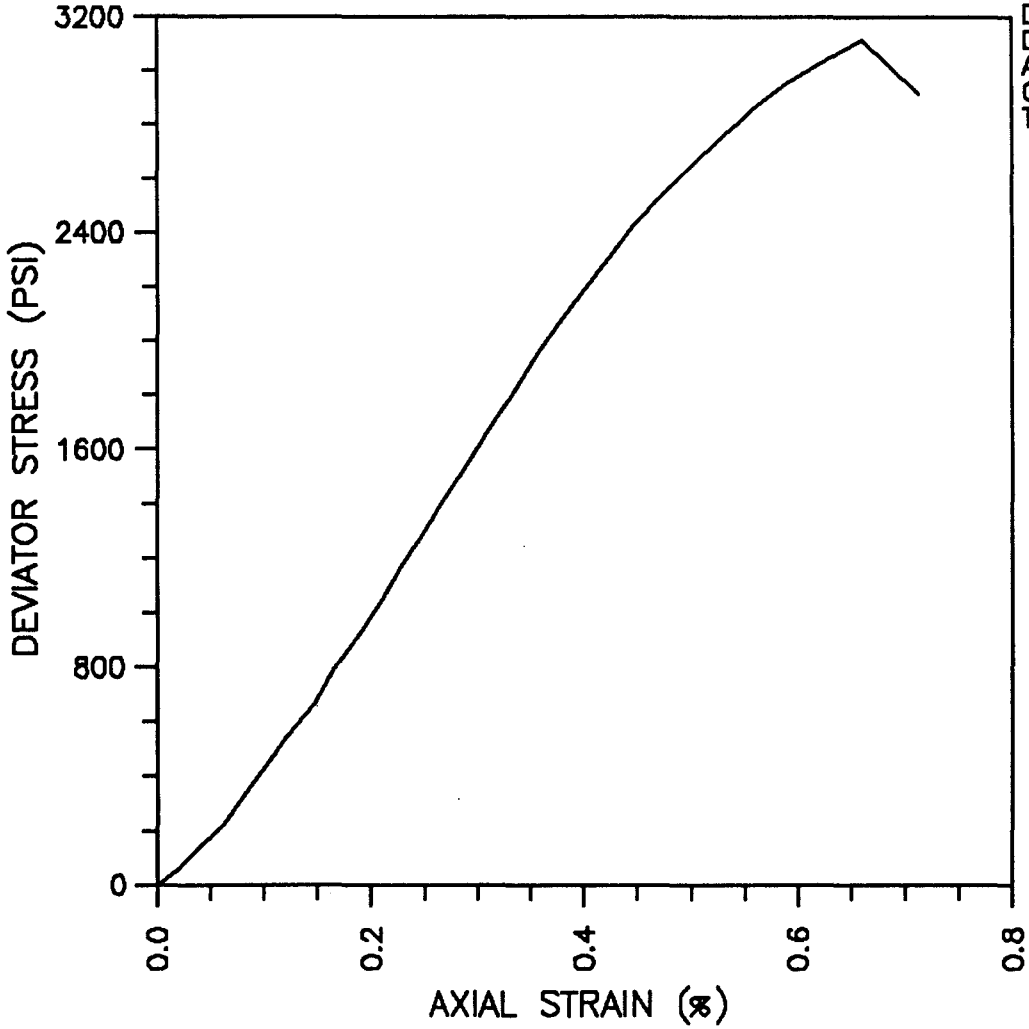
JOB NO.: 5530.15

FIGURE


AXIAL STRESS vs LATERAL STRAIN
BORING: B1540
DEPTH: 182.3 ft
AXIAL STRESS (PSI)
5000
4000
3000
2000
1000
0
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.0
DRY UNIT WEIGHT (PCF): 124.8
DEG. OF SATURATION (%): 92.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION TEST
(ASTM D 3148)
GFILE: LAT5000; DATE: 05-09-90
····· JACKET-LVDT (3)


AXIAL STRESS vs AXIAL STRAIN
BORING: B1540
DEPTH: 182.3 ft
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 12.0
DRY UNIT WEIGHT (PCF): 124.8
DEG. OF SATURATION (%): 92.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION TEST
(ASTM D 3148)
0.0
0.4
0.8
1.2
1.6
2.0
AXIAL STRAIN (%)
GFILE: AXRY6000; DATE: 05-09-90 MCT 5
····· JACKET-LVDT (3)
ooooo PLATEN-DIAL GAUGE

BORING NO.: B1540
DEPTH (FT): 182.9
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.5
DRY UNIT WEIGHT (PCF): 119.4
DEG. OF SATURATION (%): 95.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: 15401629 DATE: 06-04-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.714 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 20 DEG.

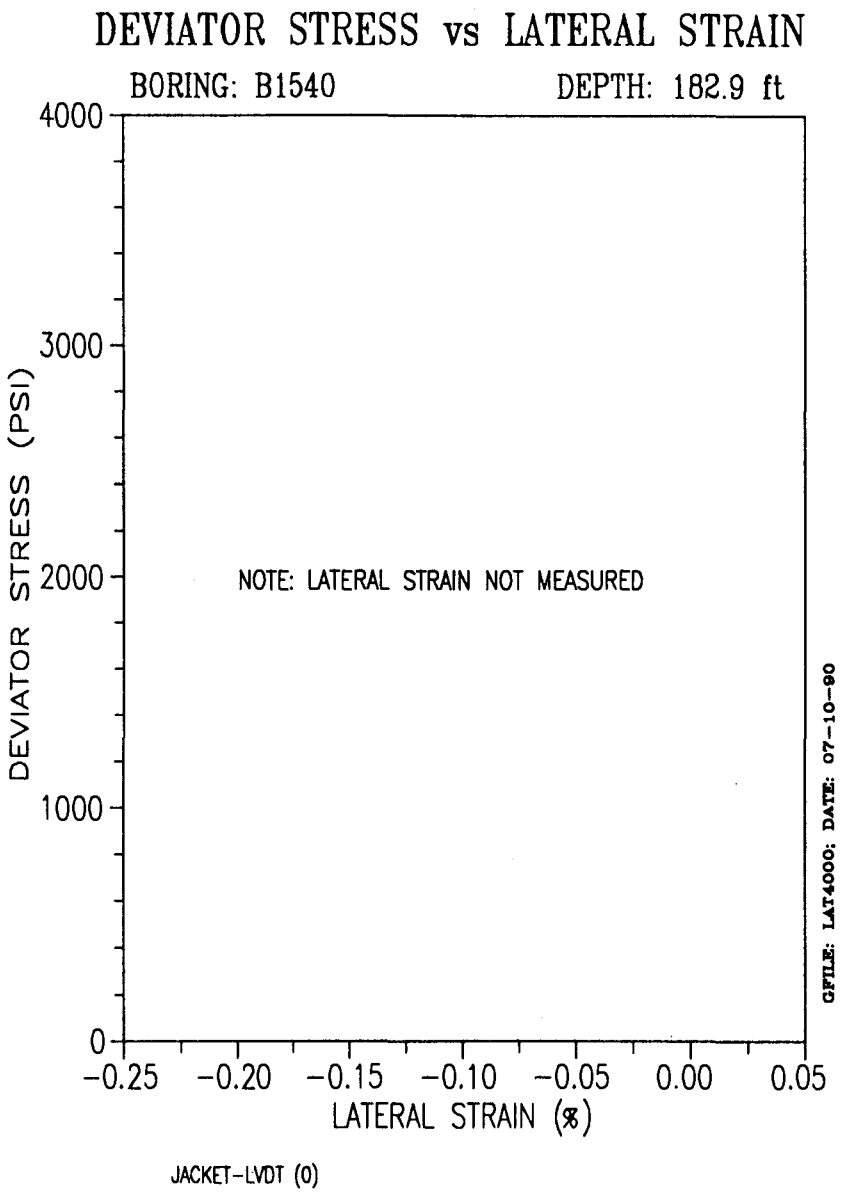
TEXAS SSC SITE

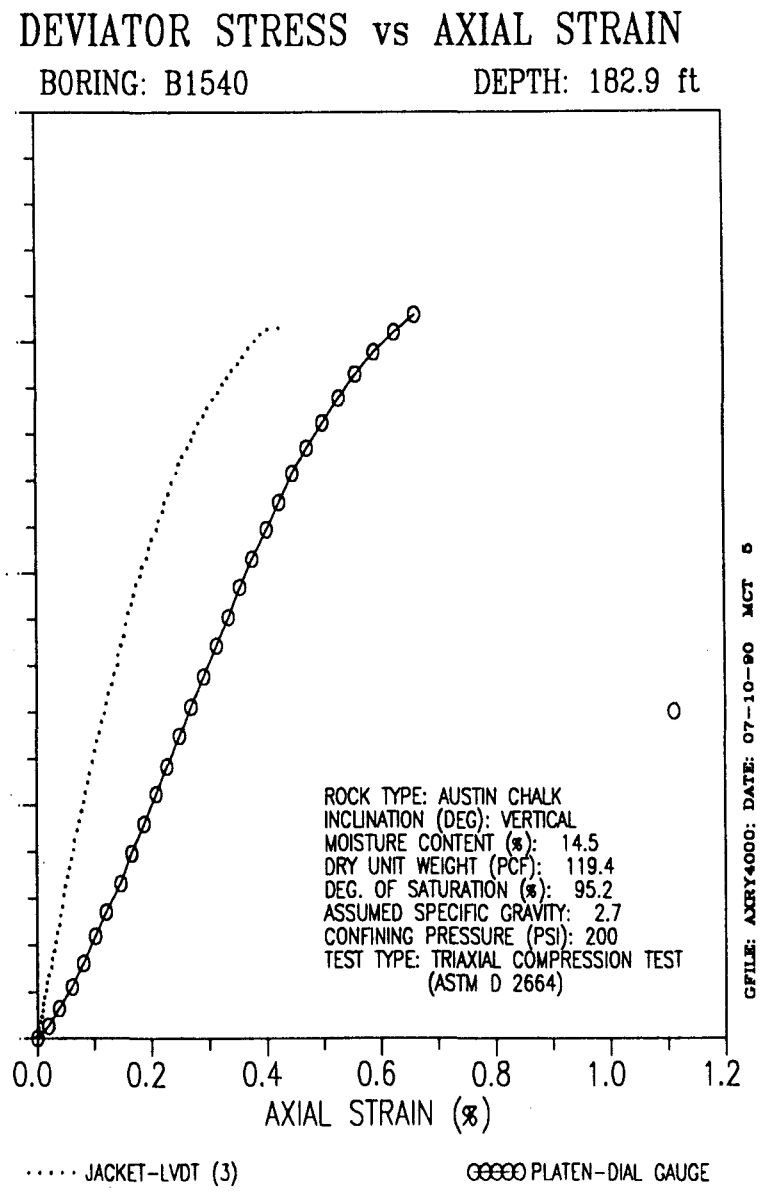
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

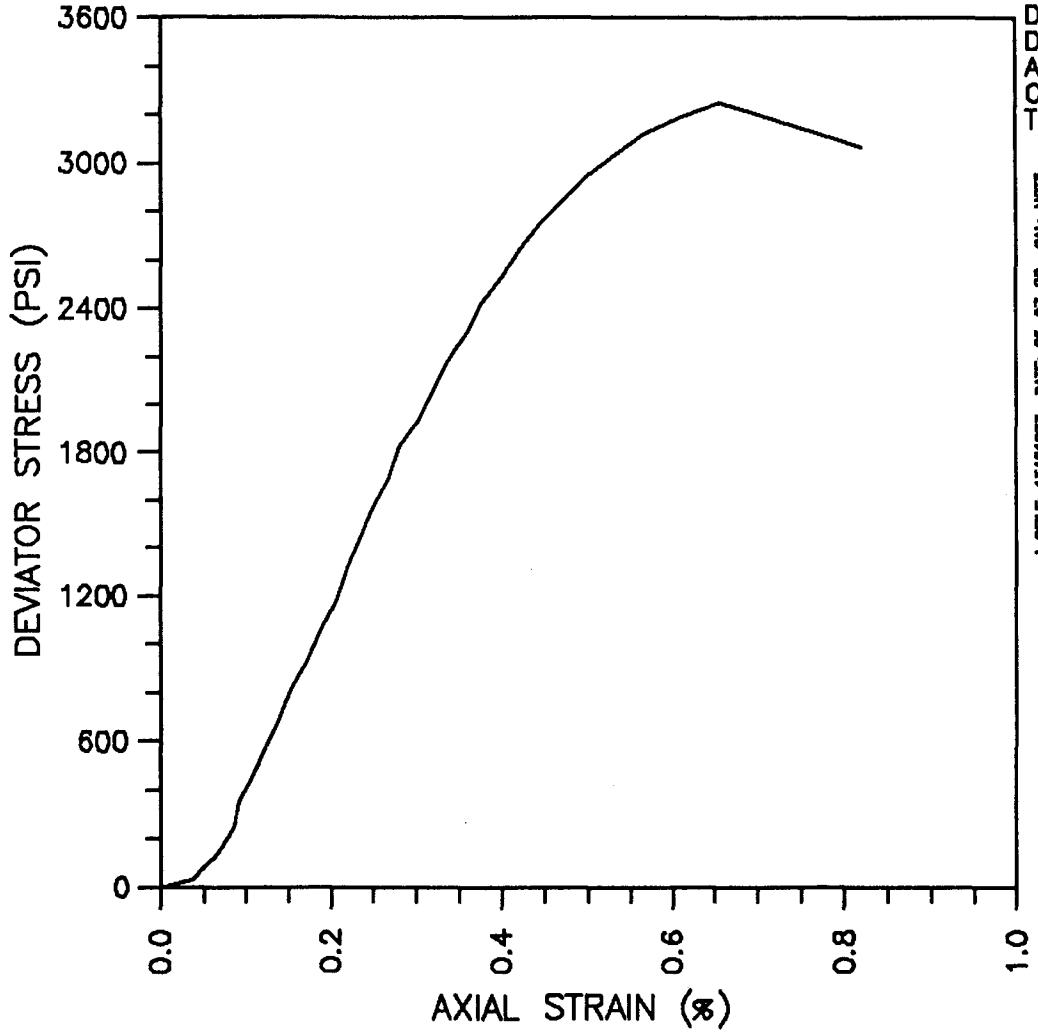
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1540
DEPTH: 182.9 ft
DEVIATOR STRESS (PSI)
4000
3000
2000
1000
0
NOTE: LATERAL STRAIN NOT MEASURED
-0.25
-0.20
-0.15
-0.10
-0.05
0.00
0.05
LATERAL STRAIN (%)
GFILE: LAT4000; DATE: 07-10-90
JACKET-LVDT (0)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1540
DEPTH: 182.9 ft
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.5
DRY UNIT WEIGHT (PCF): 119.4
DEG. OF SATURATION (%): 95.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
AXIAL STRAIN (%)
GFILE: AXRY4000; DATE: 07-10-90 MGT 6
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: B1540
DEPTH (FT): 183.3
AUSTIN CHALK LIMESTONE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.6
DRY UNIT WEIGHT (PCF): 118.9
DEG. OF SATURATION (%): 94.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: 15401633 DATE: 05-07-90 CAL: MCT5

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
7.869 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 20 DEG.

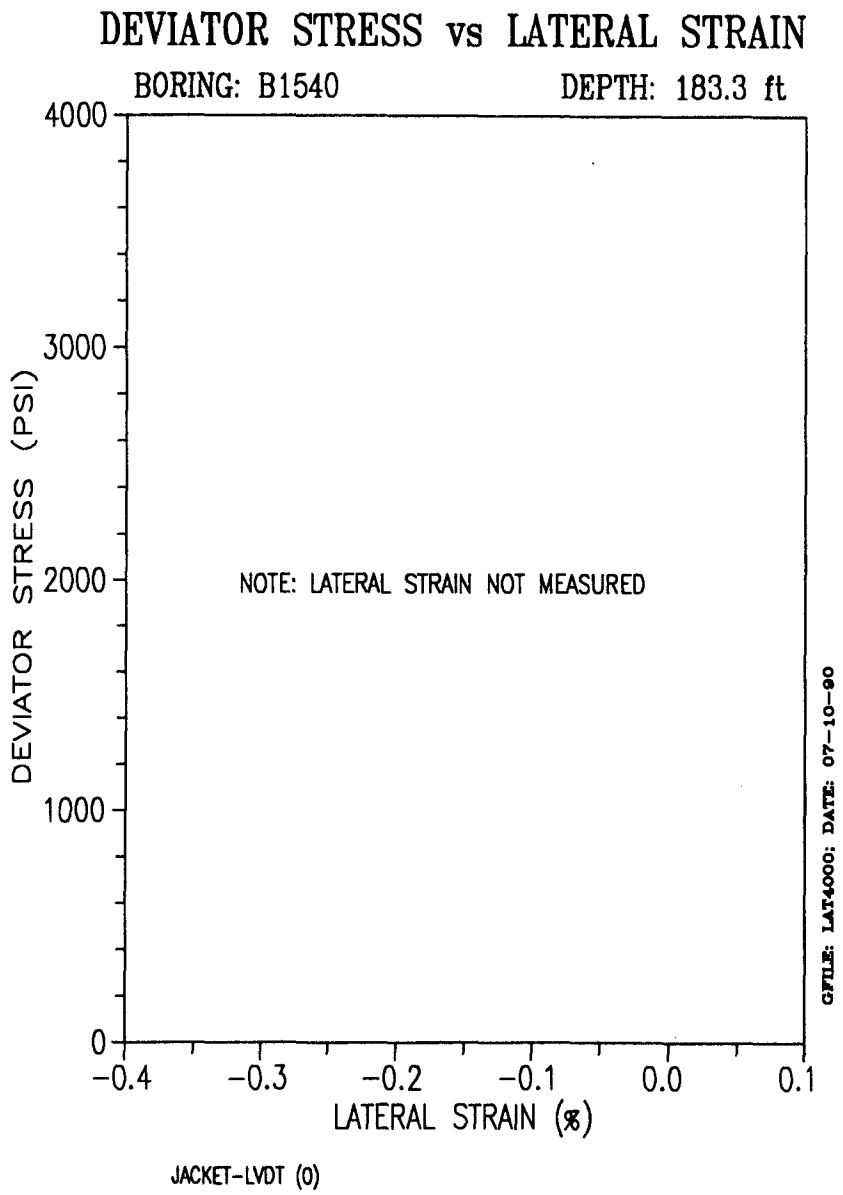
TEXAS SSC SITE

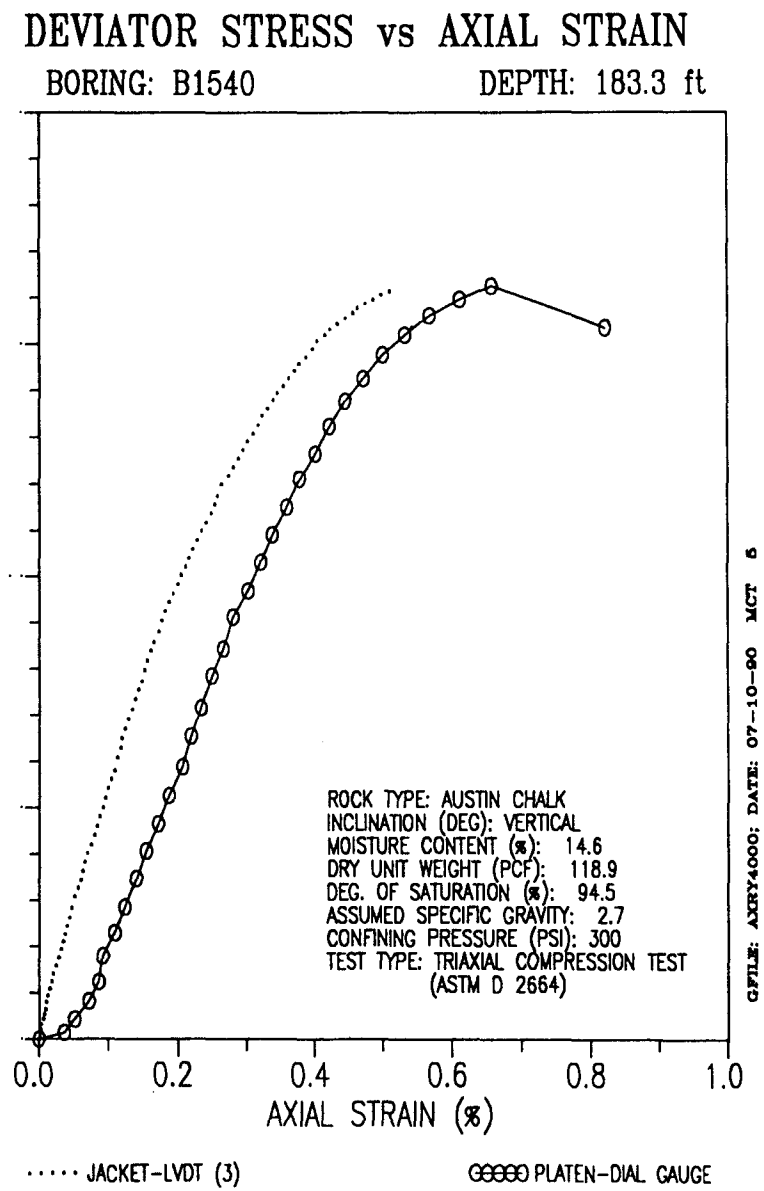
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

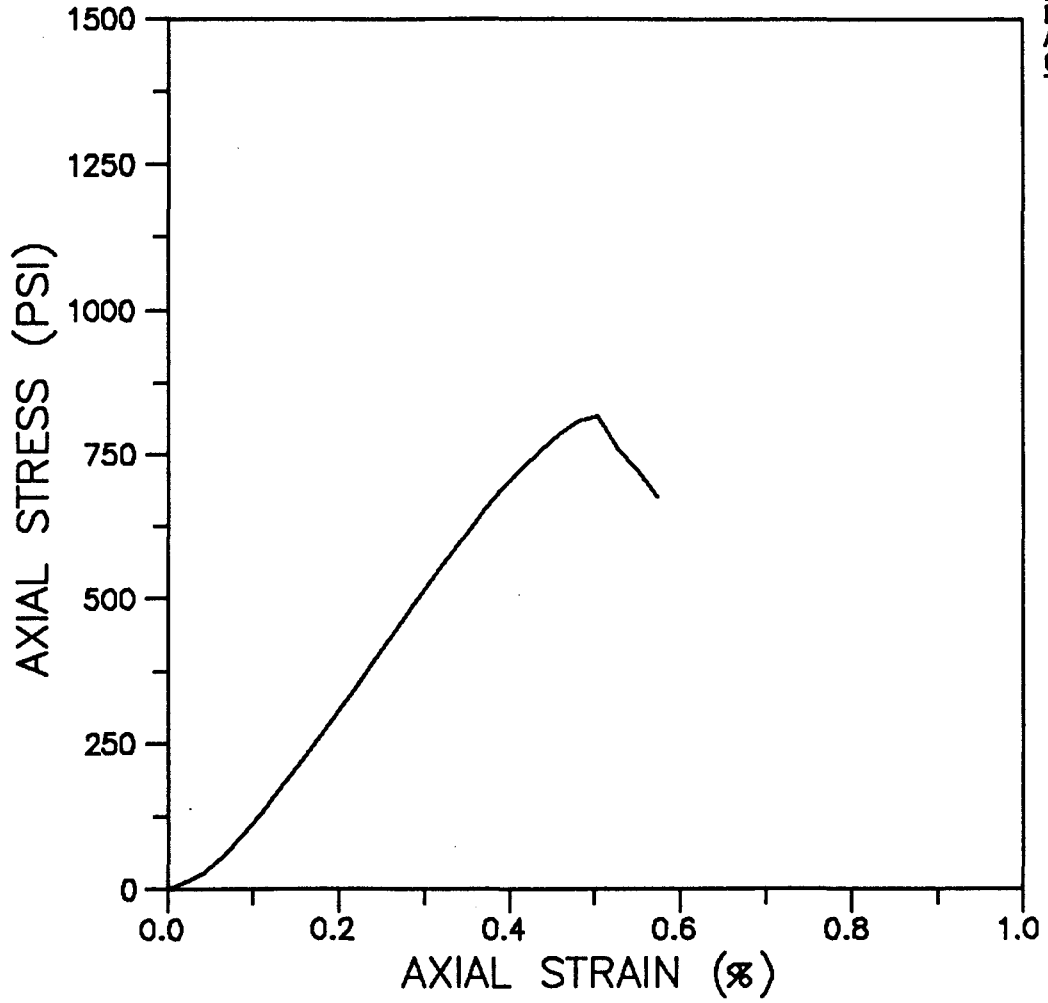
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1540
DEPTH: 183.3 ft
DEVIATOR STRESS (PSI)
4000
3000
2000
1000
0
NOTE: LATERAL STRAIN NOT MEASURED
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
JACKET-LVDT (0)
GFILE: LAT4000; DATE: 07-10-90


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1540
DEPTH: 183.3 ft
ROCK TYPE: AUSTIN CHALK
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.6
DRY UNIT WEIGHT (PCF): 118.9
DEG. OF SATURATION (%): 94.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
0.0
0.2
0.4
0.6
0.8
1.0
AXIAL STRAIN (%)
JACKET-LVDT (3)
PLATEN-DIAL GAUGE
GFILE: AXRY4000; DATE: 07-10-90 MCT 5

BORING NO: B1540
DEPTH (FT): 187.2
TRANSITION
AUSTIN/EAGLE FORD



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 9.8
DRY UNIT WEIGHT (PCF): 135.7
DEG. OF SATURATION (%): 109.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.04 x 10E5 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

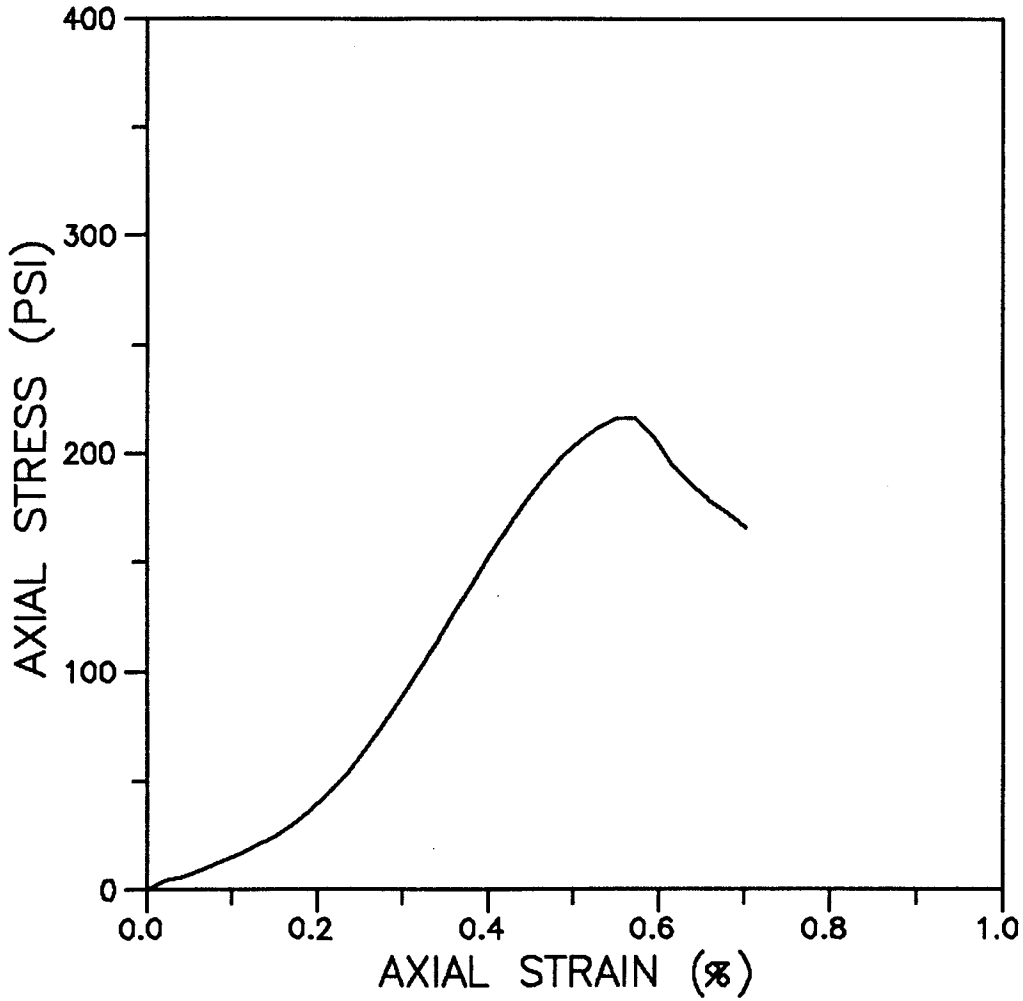
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO: B1540
DEPTH (FT): 198.5
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.7
DRY UNIT WEIGHT (PCF): 121.9
DEG. OF SATURATION (%): 103.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
6.21 x 10E4 PSI

FAILURE MODE:
LONGITUDINAL (AXIAL)
SPLITTING

TEXAS SSC SITE

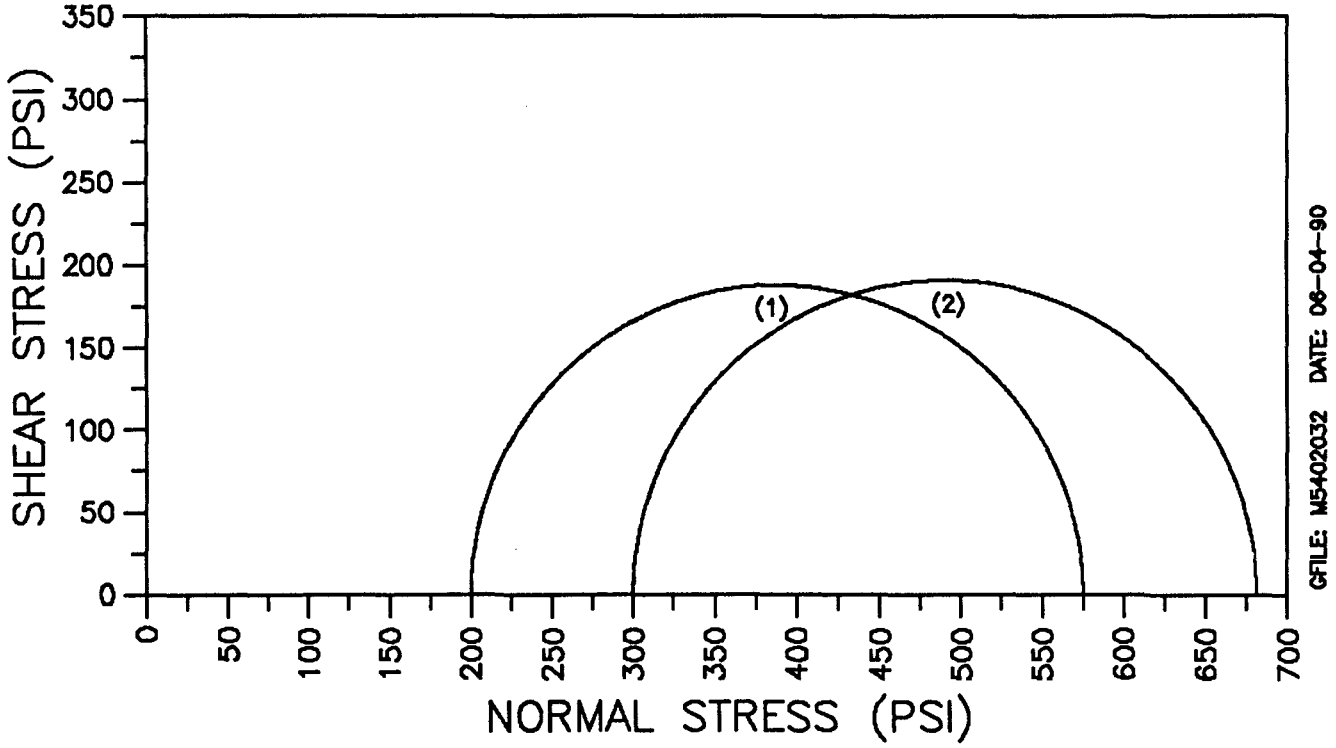
STRESS–STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89–192

FIGURE

BORING NO.: B1540
DEPTH RANGE (FT): 203.2–204.0
EAGLE FORD SHALE



GFILE: M5402032 DATE: 06-04-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 203.2
(2) DEPTH (FT): 203.6

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

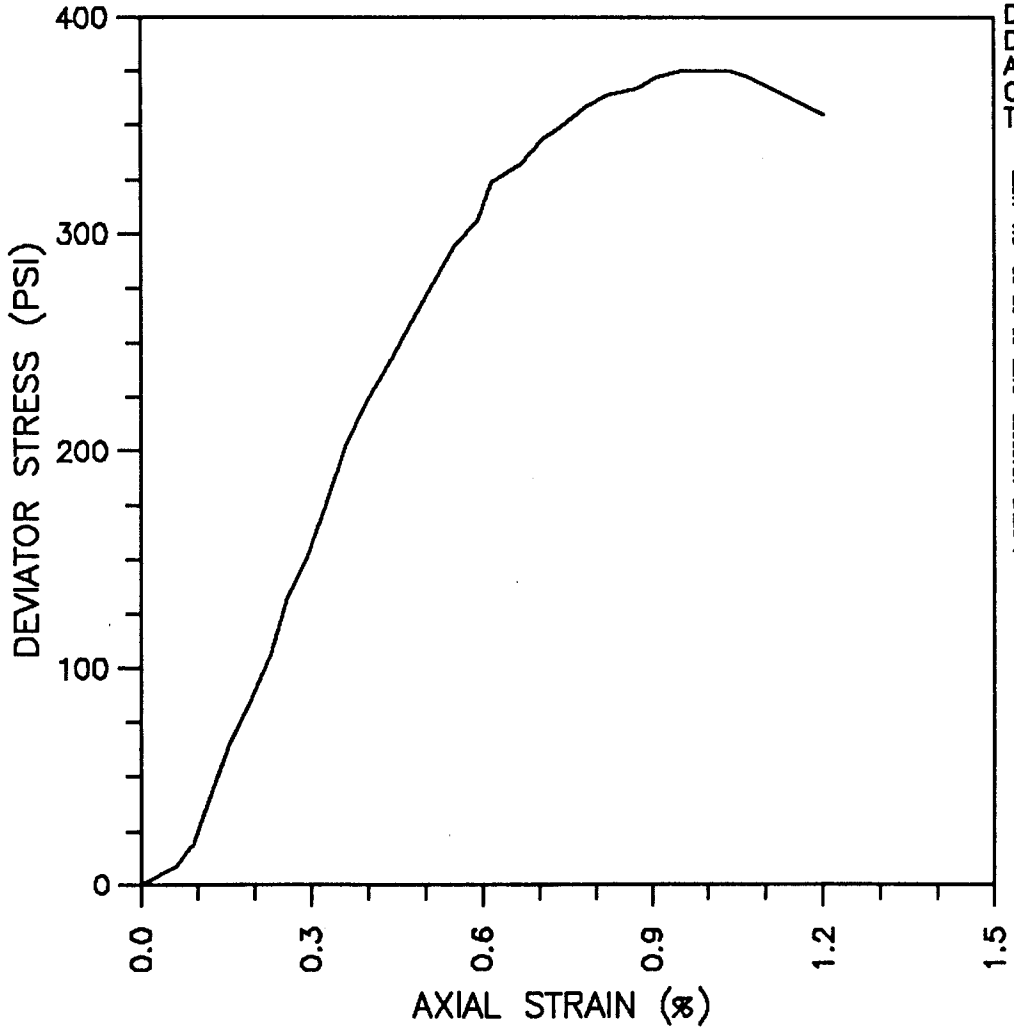
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 203.2
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.9
DRY UNIT WEIGHT (PCF): 117.9
DEG. OF SATURATION (%): 100.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: 15402032 DATE: 05-07-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.724 x10E5 PSI

FAILURE MODE:
CONICAL FAILURE

TEXAS SSC SITE

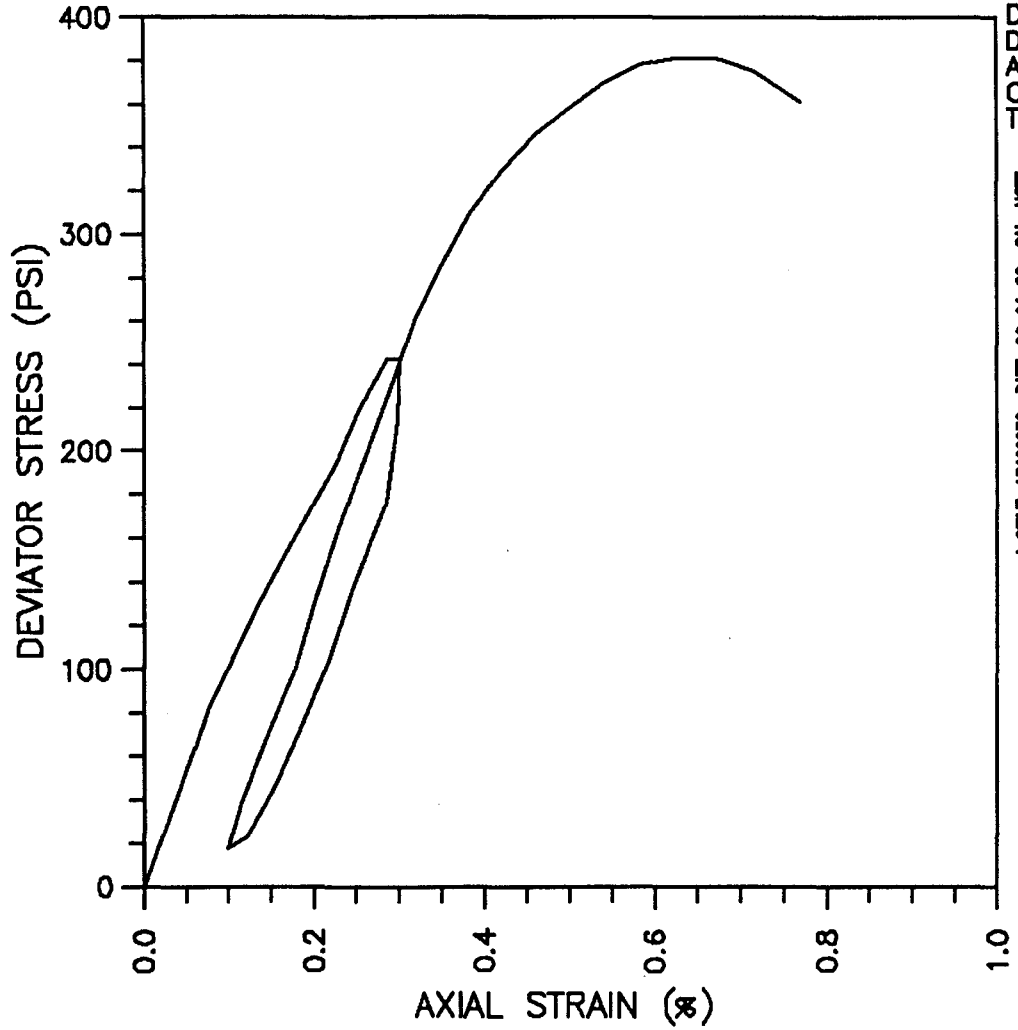
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 203.6
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.8
DRY UNIT WEIGHT (PCF): 118.1
DEG. OF SATURATION (%): 100.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

STILE: 15402038 DATE: 06-04-00 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.902 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 60 DEG.

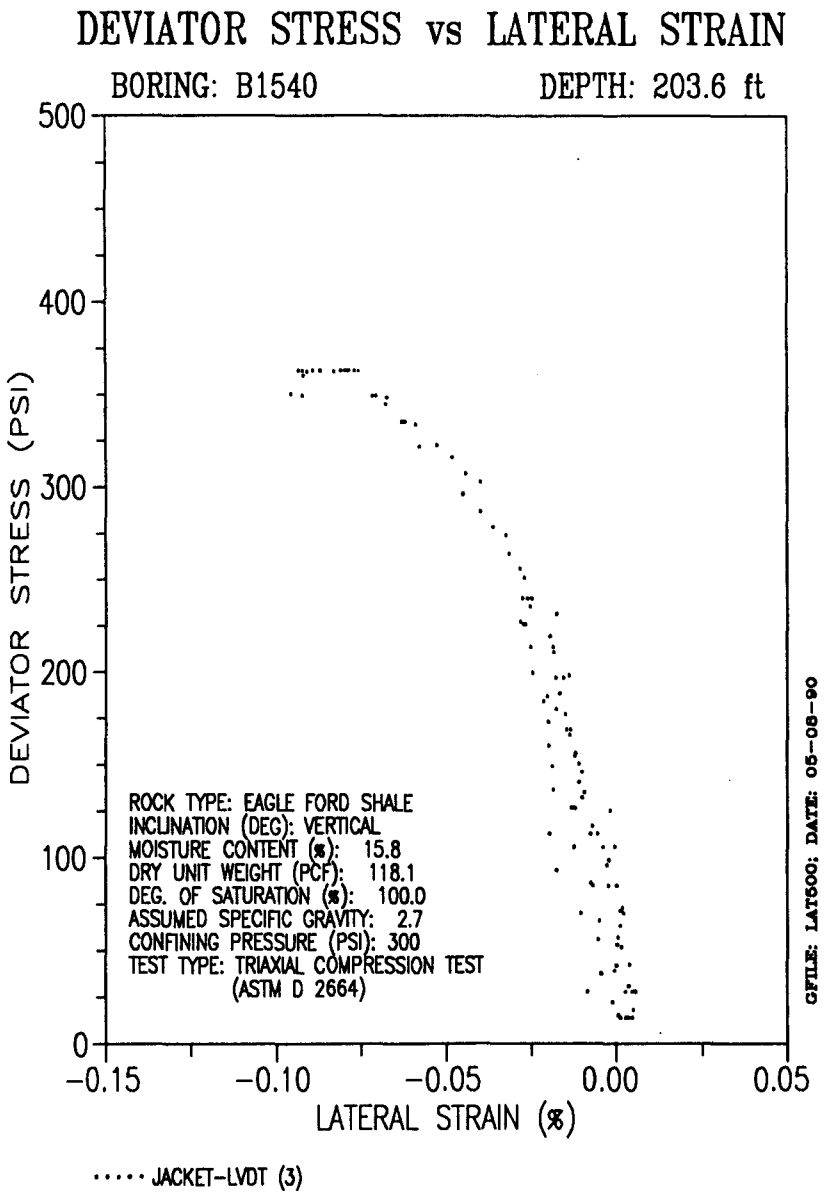
TEXAS SSC SITE

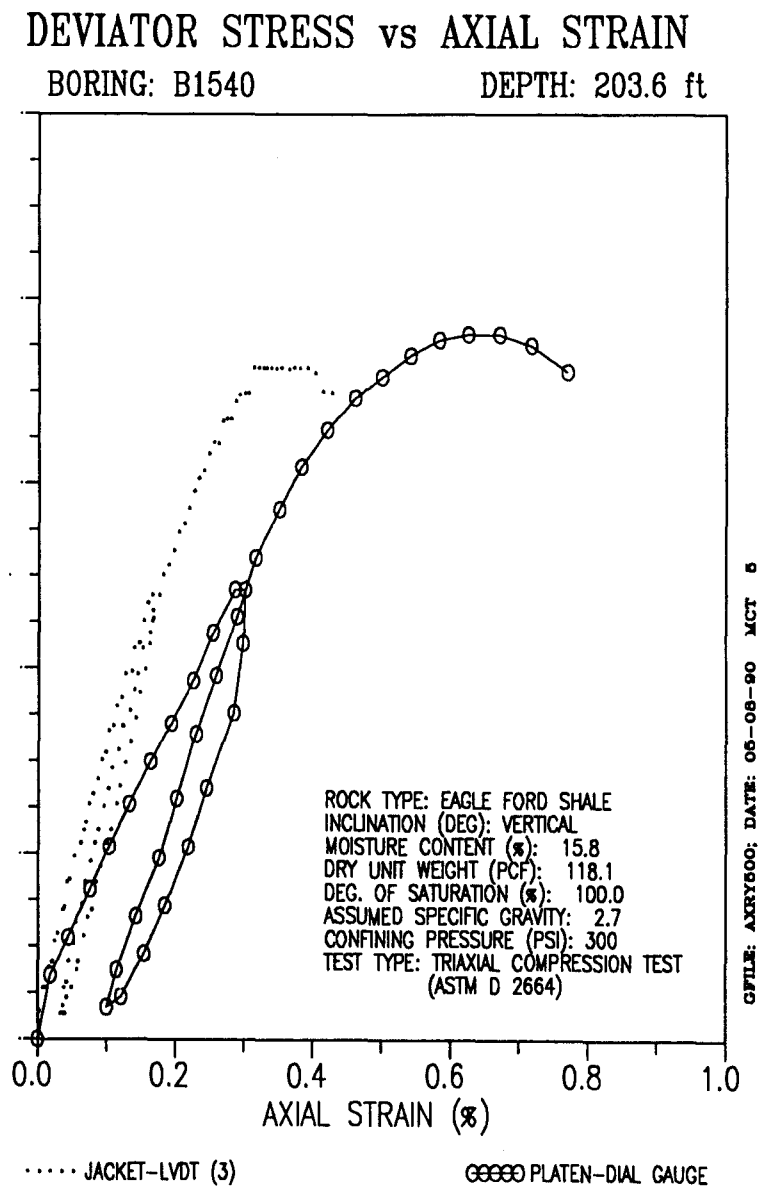
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

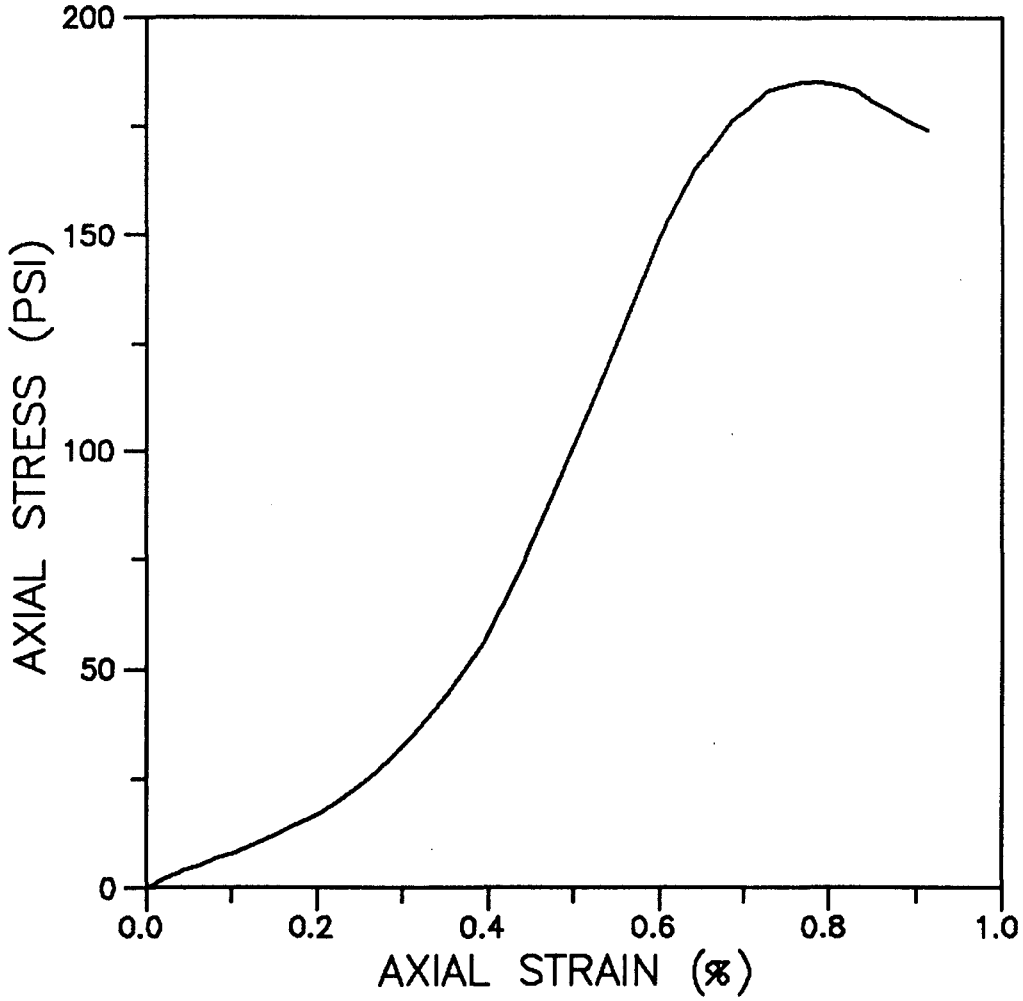
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1540
DEPTH: 203.6 ft
DEVIATOR STRESS (PSI)
500
400
300
200
100
0
-0.15
-0.10
-0.05
0.00
0.05
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.8
DRY UNIT WEIGHT (PCF): 118.1
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT500; DATE: 05-08-90
····· JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1540
DEPTH: 203.6 ft
0.0
0.2
0.4
0.6
0.8
1.0
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.8
DRY UNIT WEIGHT (PCF): 118.1
DEG. OF SATURATION (%): 100.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY500; DATE: 05-08-90 MCT 5
····· JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO: B1540
DEPTH (FT): 241.3
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 17.3
DRY UNIT WEIGHT (PCF): 116.7
DEG. OF SATURATION (%): 105.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE:UNCONFINED COMPRESSION
(ASTM D 2938)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
4.58 x 10E4 PSI

FAILURE MODE:
NO APPARENT FAILURE

TEXAS SSC SITE

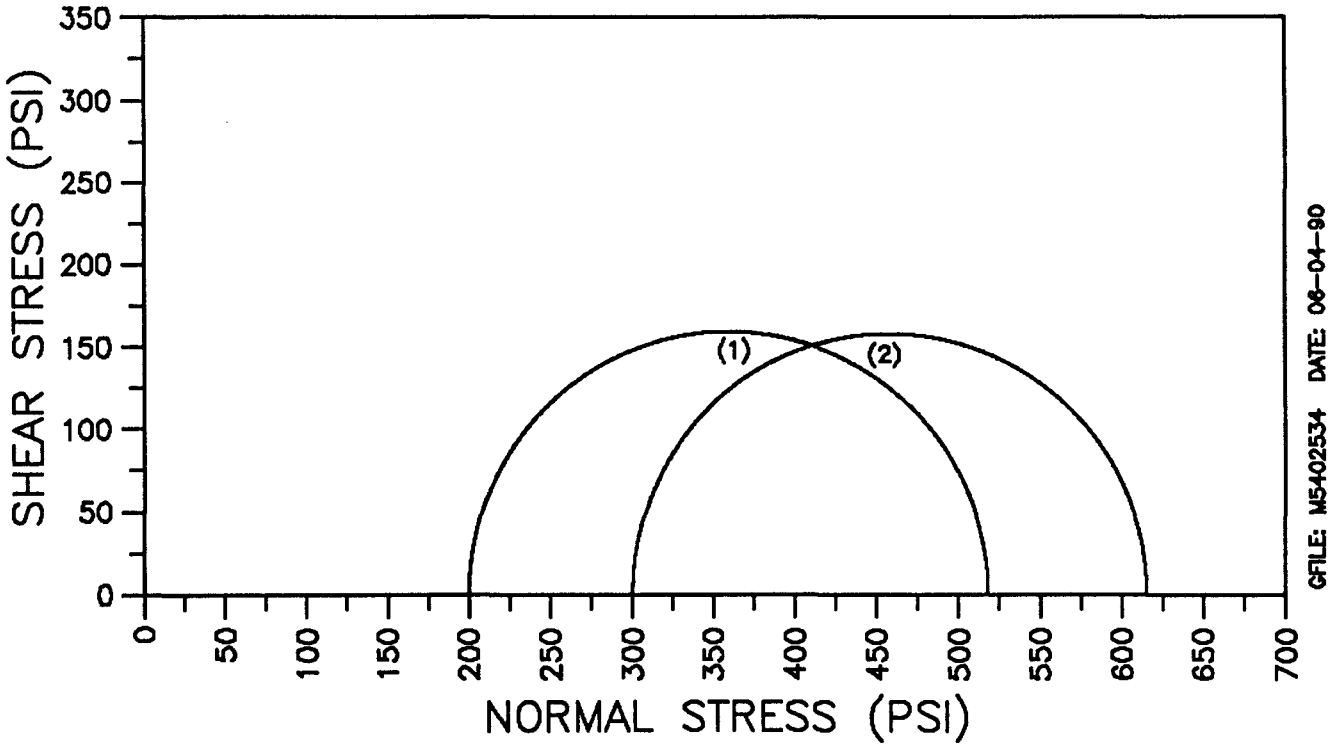
STRESS-STRAIN PLOT

SOUTHWESTERN LABORATORIES
DALLAS, TEXAS

JOB NO.: 89-192

FIGURE

BORING NO.: B1540
DEPTH RANGE (FT): 253.4–254.5
EAGLE FORD SHALE



GFILE: M5402534 DATE: 06-04-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

(1) DEPTH (FT): 253.4
(2) DEPTH (FT): 254.1

INCLINATION (DEG): VERTICAL
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

TEXAS SSC SITE

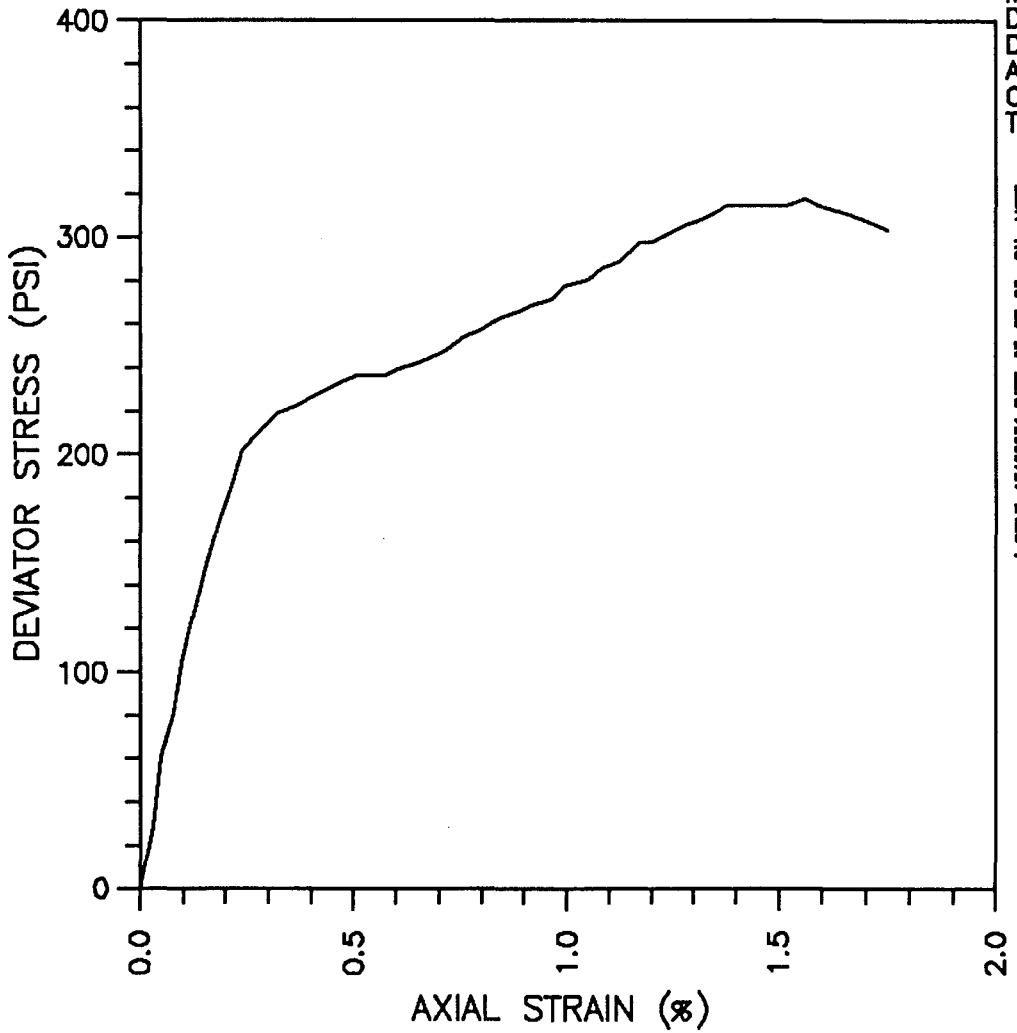
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 253.4
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 15.7
DRY UNIT WEIGHT (PCF): 117.3
DEG. OF SATURATION (%): 97.3
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

DFILE: 15402534 DATE: 05-07-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.678 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

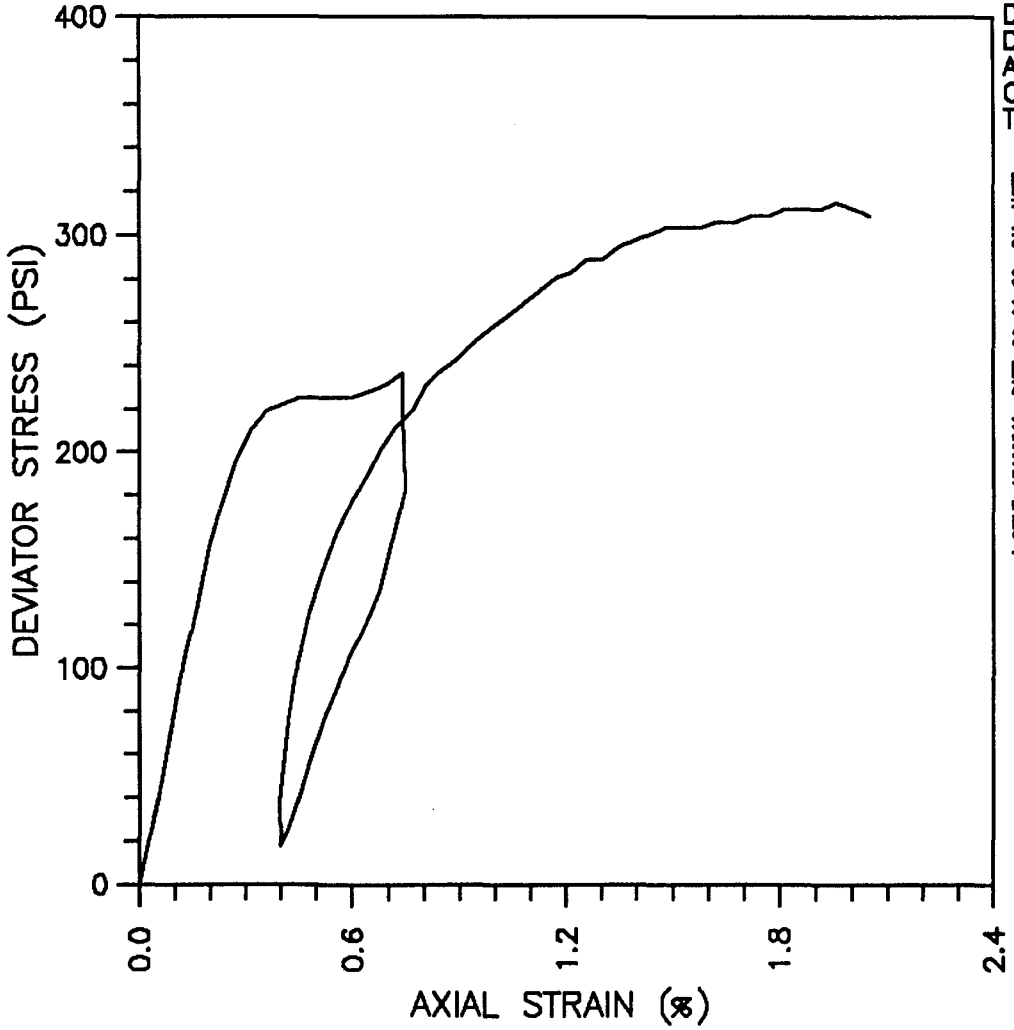
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 254.1
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.0
DRY UNIT WEIGHT (PCF): 117.1
DEG. OF SATURATION (%): 98.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

STLE: 15402541 DATE: 06-04-90 CAL: MCTS

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.620 x10E5 PSI

FAILURE MODE:
SHEAR PLANE
AT 40 DEG.

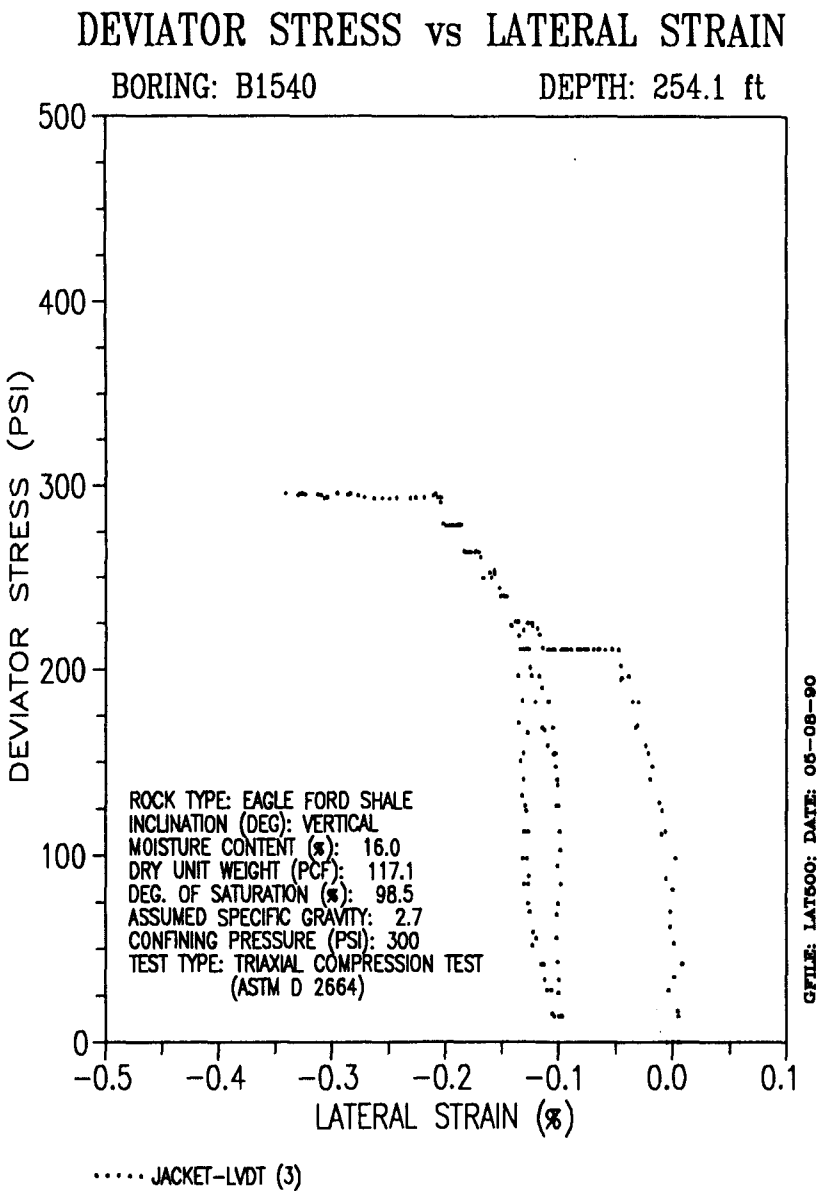
TEXAS SSC SITE

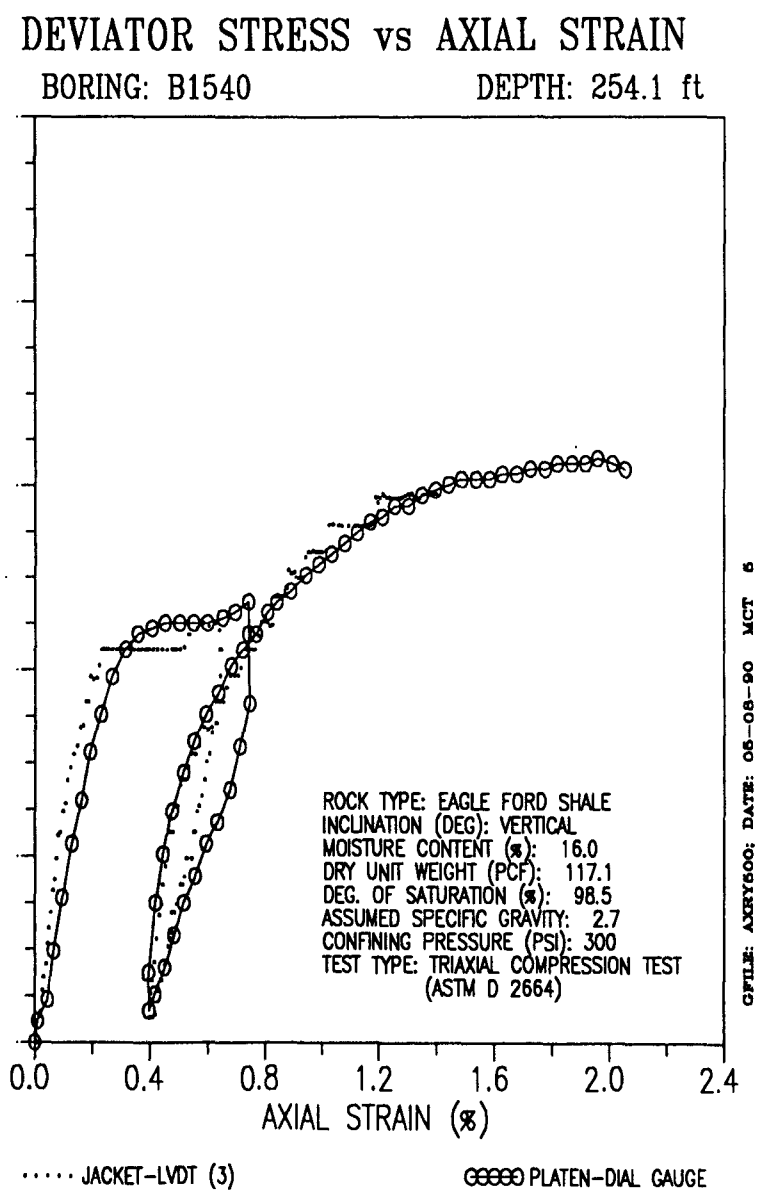
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

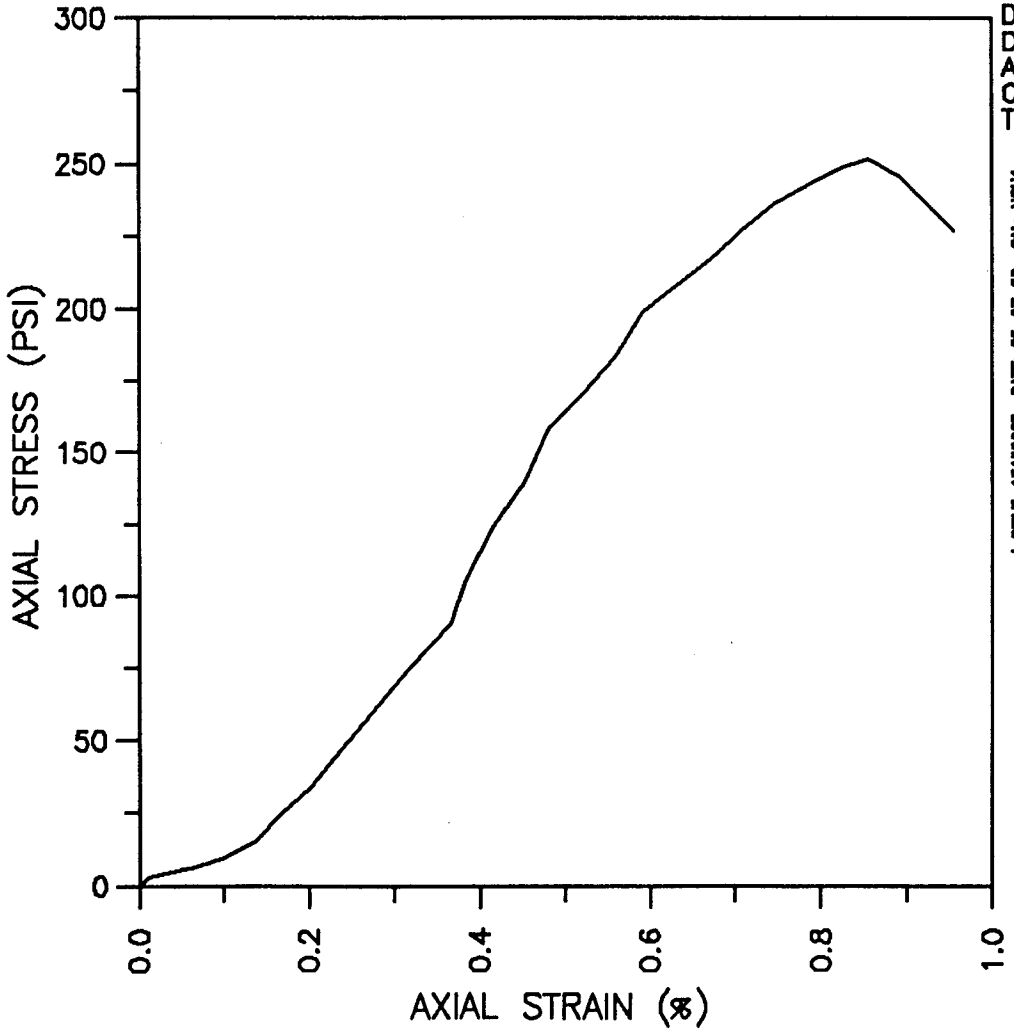
JOB NO.: 5530.15

FIGURE


DEVIATOR STRESS vs LATERAL STRAIN
BORING: B1540
DEPTH: 254.1 ft
DEVIATOR STRESS (PSI)
500
400
300
200
100
0
-0.5
-0.4
-0.3
-0.2
-0.1
0.0
0.1
LATERAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.0
DRY UNIT WEIGHT (PCF): 117.1
DEG. OF SATURATION (%): 98.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: LAT500; DATE: 05-08-90
JACKET-LVDT (3)


DEVIATOR STRESS vs AXIAL STRAIN
BORING: B1540
DEPTH: 254.1 ft
0.0
0.4
0.8
1.2
1.6
2.0
2.4
AXIAL STRAIN (%)
ROCK TYPE: EAGLE FORD SHALE
INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 16.0
DRY UNIT WEIGHT (PCF): 117.1
DEG. OF SATURATION (%): 98.5
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION TEST
(ASTM D 2664)
GFILE: AXRY500; DATE: 05-08-90 MCT 5
JACKET-LVDT (3)
PLATEN-DIAL GAUGE

BORING NO.: B1540
DEPTH (FT): 266.3
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
MOISTURE CONTENT (%): 14.9
DRY UNIT WEIGHT (PCF): 117.7
DEG. OF SATURATION (%): 93.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: 1540268B3 DATE: 05-07-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.537 x10E5 PSI

FAILURE MODE:
CONICAL FAILURE
AT BOTTOM

TEXAS SSC SITE

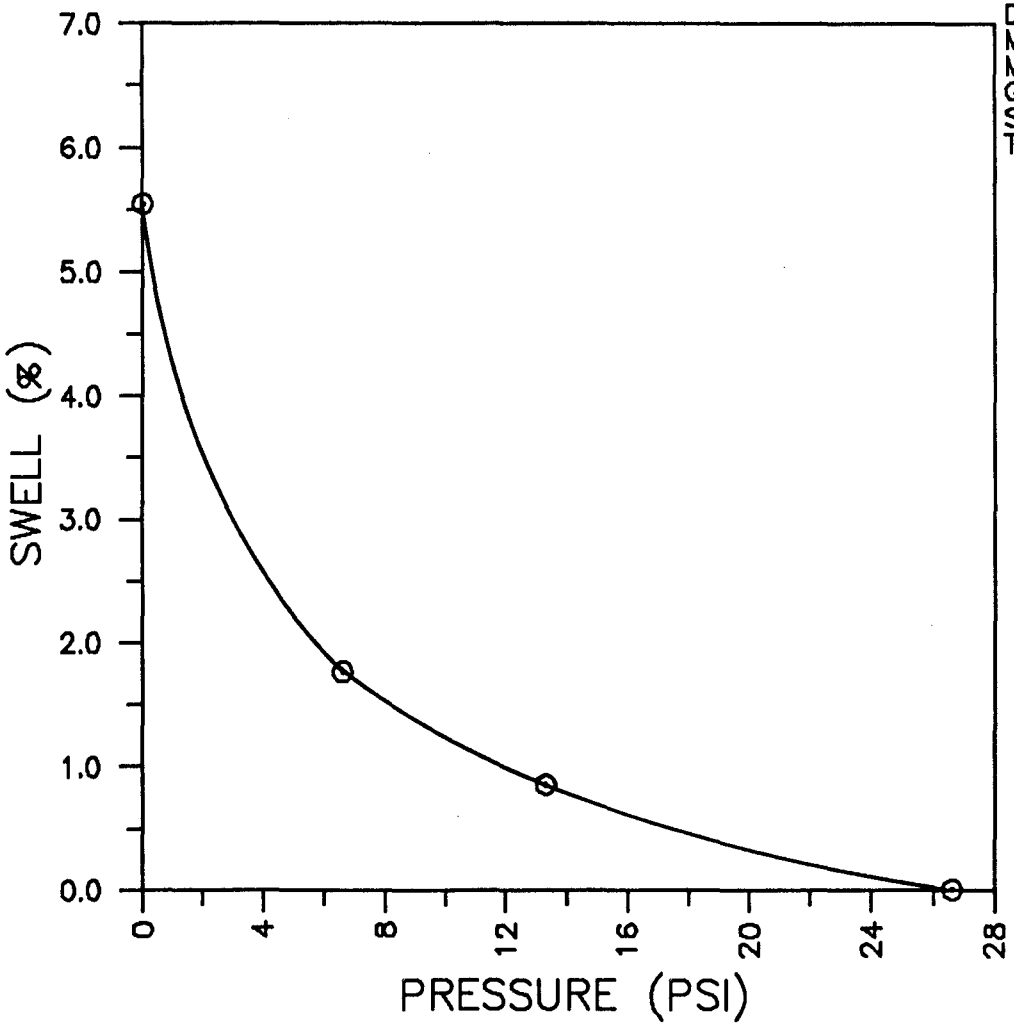
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 238.0
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
DRY UNIT WEIGHT (PCF): 111.8
M.C. BEFORE TEST (%): 17.6
M.C.AFTER TEST (%): 25.9
GAIN IN MOISTURE (%): 8.3
SWELLING PRESSURE INDEX (PSI): 27
TEST TYPE: SWELLING PRESSURE INDEX (ISRM)

TEXAS SSC SITE

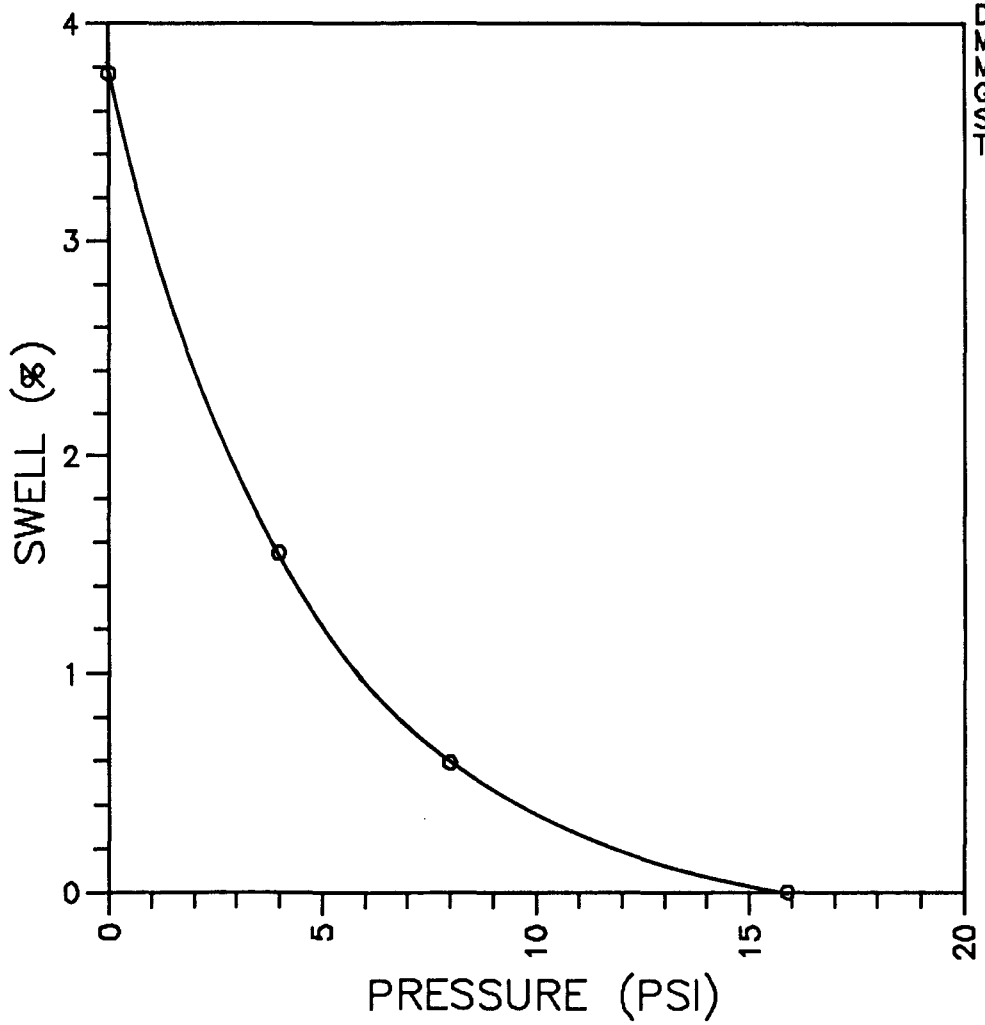
SWELLING PRESSURE INDEX

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.15

FIGURE

BORING NO.: B1540
DEPTH (FT): 266.9
EAGLE FORD SHALE



INCLINATION (DEG): VERTICAL
DRY UNIT WEIGHT (PCF): 114.9
M.C. BEFORE TEST (%): 15.7
M.C.AFTER TEST (%): 21.9
GAIN IN MOISTURE (%): 6.3
SWELLING PRESSURE INDEX (PSI): 16
TEST TYPE: SWELLING PRESSURE INDEX (ISRM)

TEXAS SSC SITE

SWELLING PRESSURE INDEX

MASON–JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS–ENGINEERS

JOB NO.: 5530.15

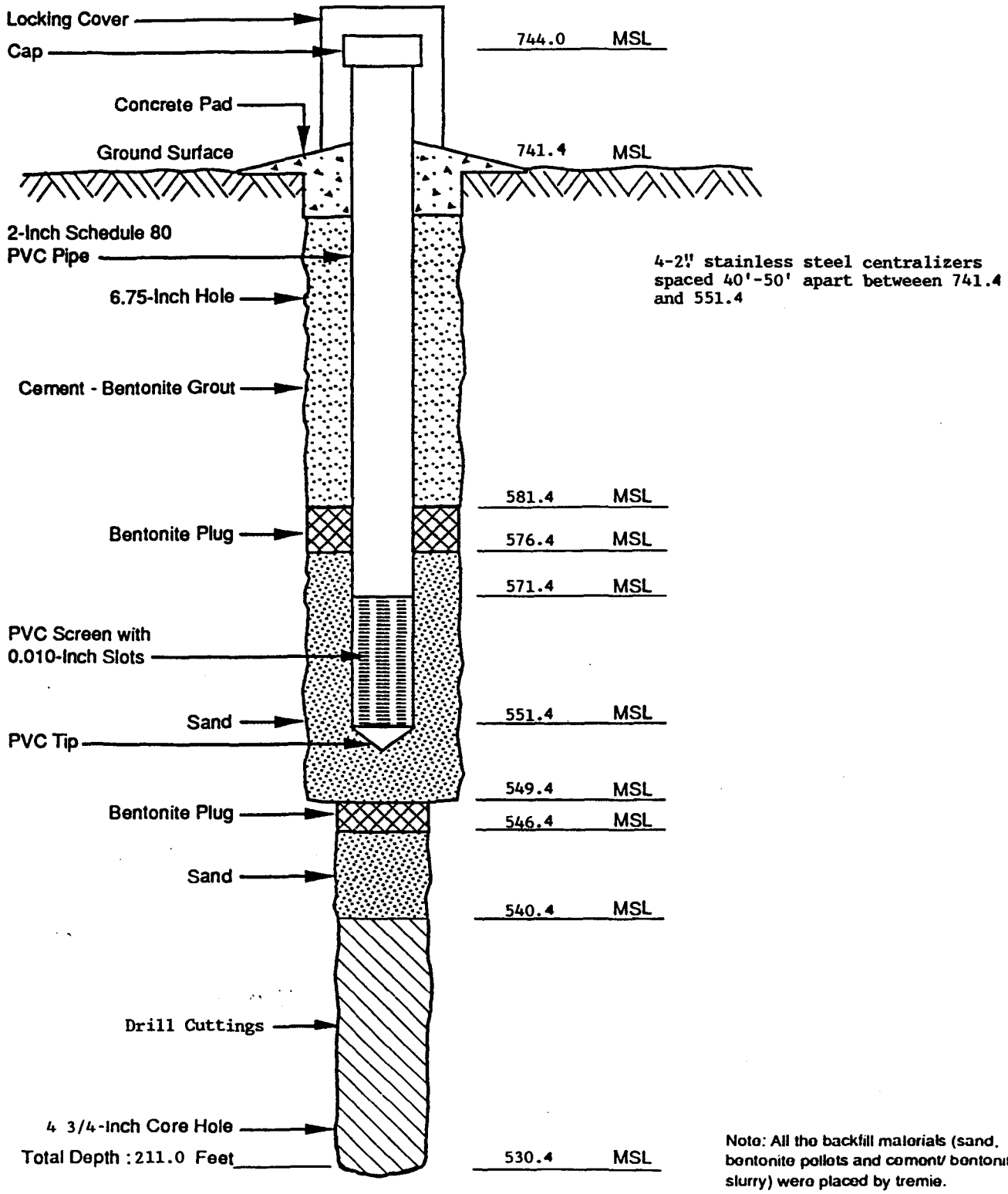
FIGURE

APPENDIX F

WELL AS-BUILT DIAGRAMS

AND

PLUGGING REPORTS



Note: All the backfill materials (sand, bentonite pellets and cement/ bentonite slurry) were placed by tremie.

NOT TO SCALE

Boring: BI 1
Location: N 251,717
E 2,171,756
Date(s) Installed: 12-2-89
Well Construction Supervising Geologist: David Hartsfield
Approved By: Shawn Wood **Date:** 5-14-90

"As Built"
Well Construction Diagram
Observation Well
No.
BI 1

5/90 Figure

SSC BOREHOLE PLUGGING REPORT

TETC Project No. 87-888-0015

Task No. 15

Boring No. BI 2

Texas Coordinate Location: N 256,245 E 2,179,235

Surface Elevation: 664.4

Total Boring Depth: ~110.0'

Plugging Remarks:

Boring was bailed of excess water and then grouted with a cement-bentonite grout mixture using approximately 45 gallons of water, 5 sacks of cement, and 1/2 sack of bentonite. Water:grout ratio of 9:1 was used. Surface casing was removed at conclusion of grouting process.

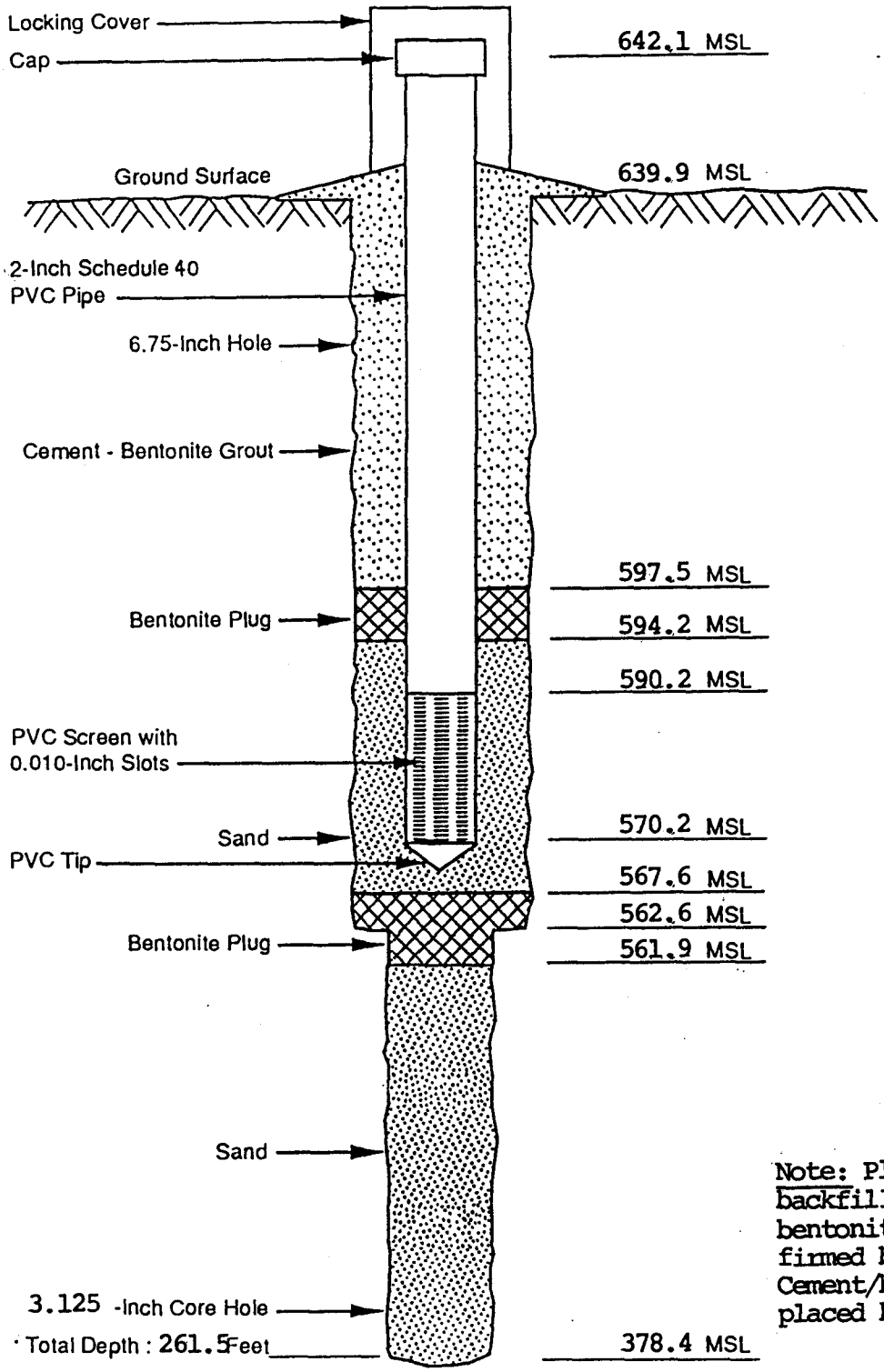
Date Plugged: 12-07-89

Time Completed: 3:00 pm

Drilling Geologist: Scott Lesikar

MJA Coordinator: W. D. Flanigan

MJA No.: 5530.15



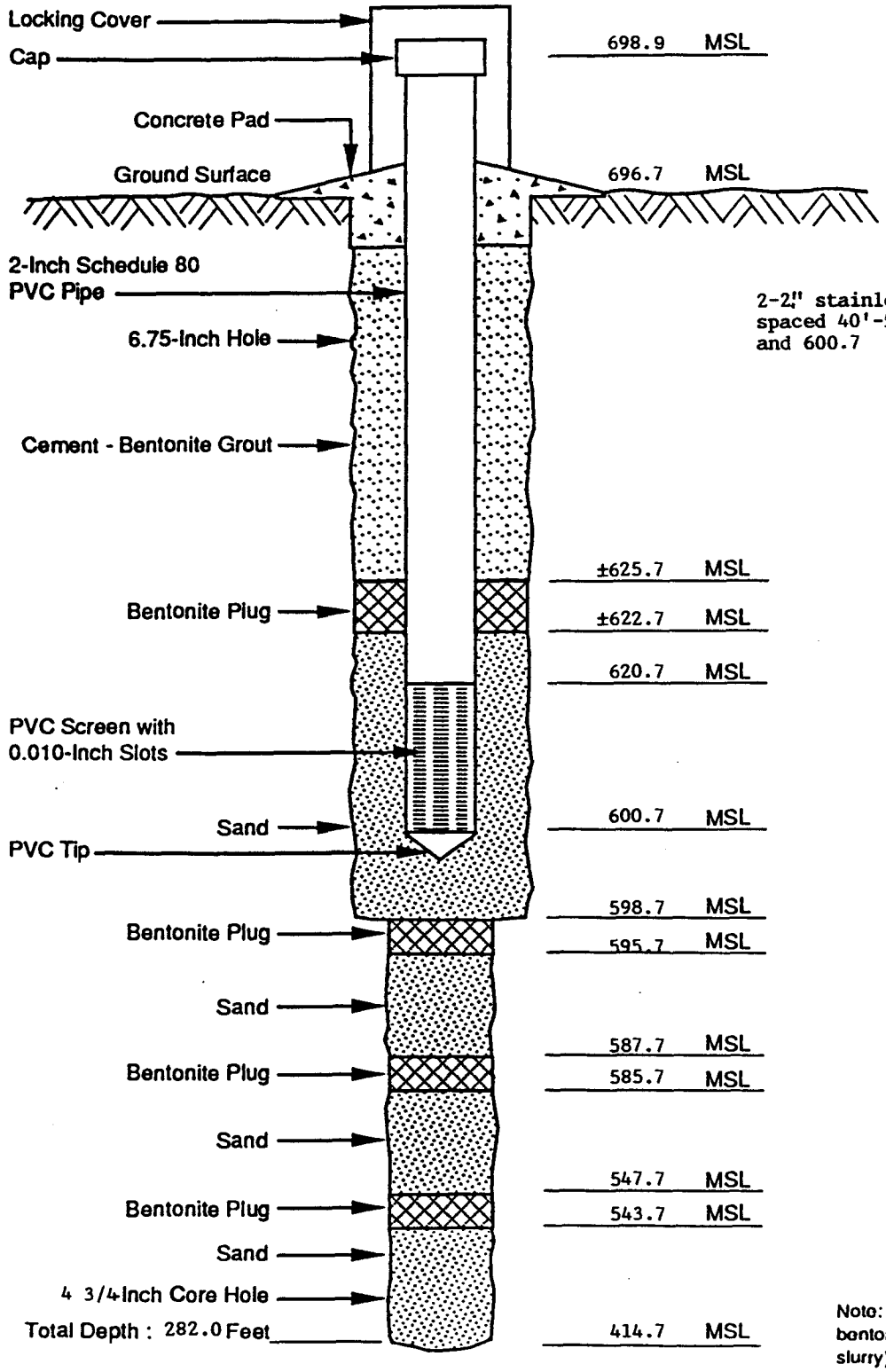
Note: Placement depths of backfill materials (sand & bentonite pellets) were confirmed by manual measurement. Cement/bentonite slurry was placed by tremie.

NOT TO SCALE

Boring: BI 2A
Location: N 256, 267
E 2,179,204
Date(s) Installed: 12/6/89-12/7/89
Well Construction
Supervising Geologist: Scott Lesikar
Approved By: W.D. Flanigan Date: 5/15/90

Observation Well
No.BI 2A

5/90 Figure



2-2" stainless steel centralizers spaced 40'-50' apart between 696.7 and 600.7

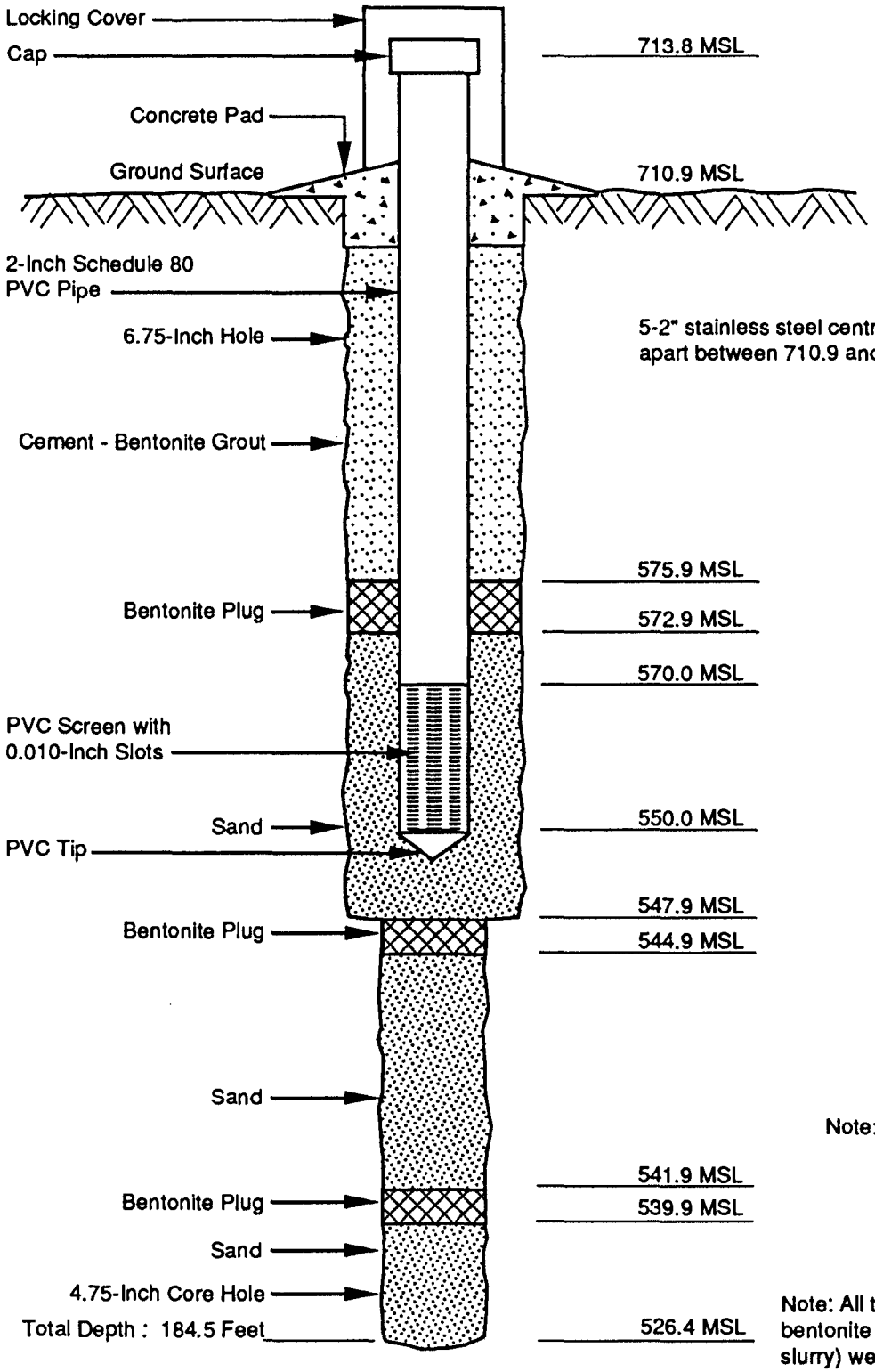
Note: All the backfill materials (sand, bentonite pellets and cement/ bentonite slurry) were placed by tremie.

NOT TO SCALE

Boring: BI 3
Location: N 246,179
E 2,180,466
Date(s) Installed: 12-12-89
Well Construction Supervising Geologist: Mike Granger
Approved By: Shawn Wood **Date:** 5-14-90

"As Built"
Well Construction Diagram
Observation Well
No.

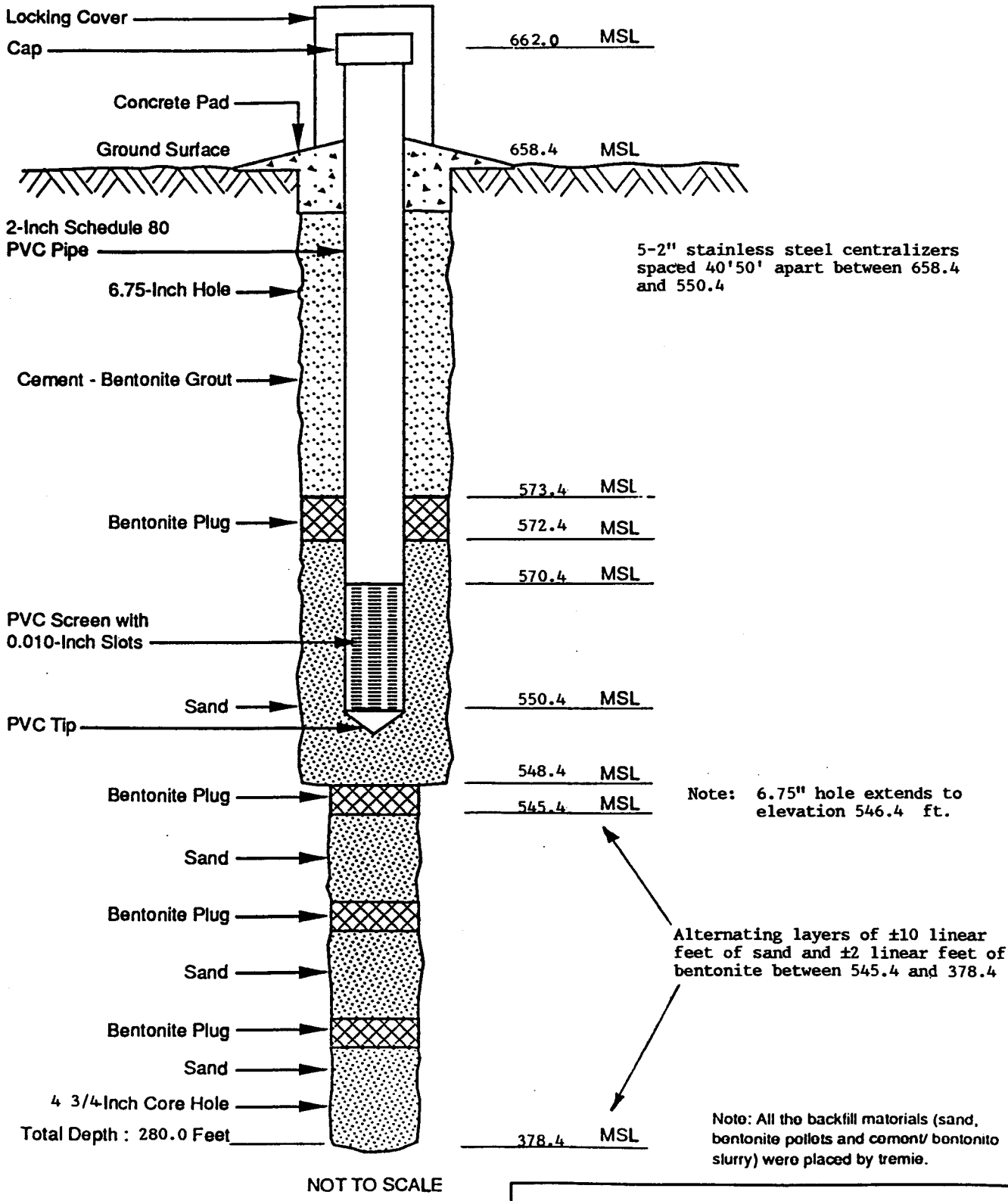
5/90 BI 3 Figure



Boring: BI 4
Location: N 255,921
E 2,174,201
Date(s) Installed: 1/23/90
Well Construction
Supervising Geologist: Dale Brown
Approved By: Shawn Wood **Date: 5/14/90**

"As Built"
Well Construction Diagram
Observation Well
No. BI 4

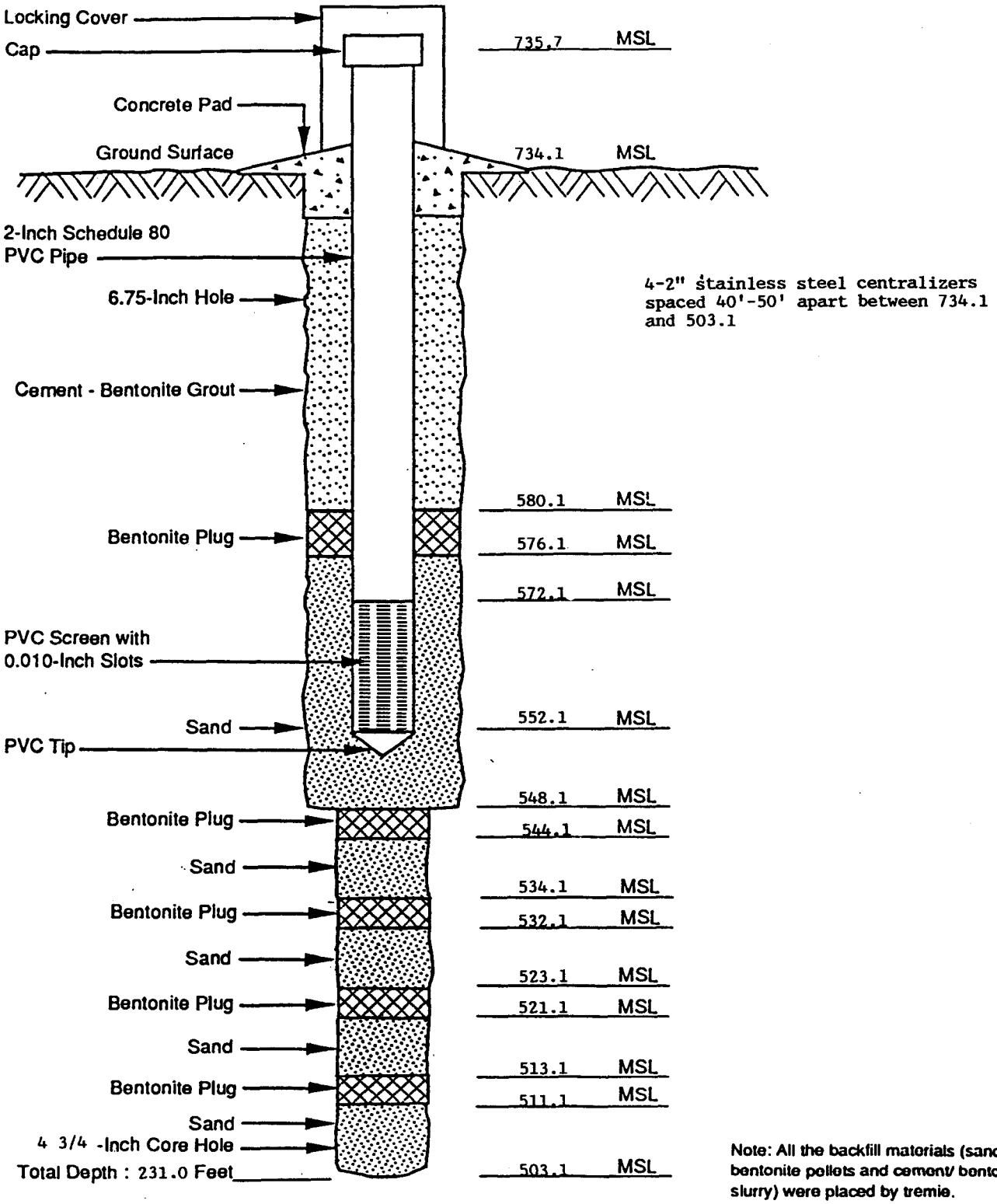
5/90 Figure A10



Boring: BI 5
Location: N 251,800
E 2,182,381
Date(s) Installed: 1-30-90
Well Construction Supervising Geologist: Dale Brown
Approved By: Shawn Wood
Date: 5-15-90

"As Built"
Well Construction Diagram
Observation Well
No.
BI 5

5/90 Figure



Note: All the backfill materials (sand, bentonite pellets and cement/ bentonite slurry) were placed by tremie.

NOT TO SCALE

Boring: BI 6
Location: N 245,951
E 2,174,687
Date(s) Installed: 1-24-90
Well Construction Supervising Geologist: Mike Granger
Approved By: Shawn Wood **Date:** 5-15-90

"As Built"
Well Construction Diagram
Observation Well
No.
BI 6

5/90 Figure

SSC BOREHOLE PLUGGING REPORT

Project No. 87-888

Task No. 15

Boring No. B 1527

Texas Coordination Location: N 248,994
E 2,172,201

Surface Elevation: 713.3 feet

Total Boring Depth: 238.0 feet

Date Drilled: 3/23-3/29/90

Date Plugged: 3/30/90

Time Completed: 3:45 p.m.

Remarks:

280 gallons of grout was used to completely cement boring from bottom to top. Water/cement ratio was approximately 7 gallons per sack.

Drilling geologist: Mike Granger
Coordinator: Shawn Wood
SwL Report No. 89-192

SSC BOREHOLE PLUGGING REPORT

Project No. 87-888

Task No. 15

Boring No. B 1533

Texas Coordination Location: N 249,576
E 2,172,058

Surface Elevation: 729.6 feet

Total Boring Depth: 255.0 feet

Date Drilled: 3/19/90-3/22/90

Date Plugged: 3/23/90

Time Completed: 12:00 p.m.

Remarks:

258 gallons of grout (tremie placed) was used to completely cement boring from bottom to top. Water/cement ratio was approximately 7 gallons per sack.

Drilling geologist: Alan Dover
Coordinator: Shawn Wood
SwL Report No. 89-192

SSC BOREHOLE PLUGGING REPORT

Project No. 87-888

Task No. 15

Boring No. B 1540

Texas Coordination Location: N 250,250
E 2,171,882

Surface Elevation: 750.0 feet

Total Boring Depth: 275.0 feet

Date Drilled: 3/19/90-3/22/90

Date Plugged: 3/23/90

Time Completed: 12:00 p.m.

Remarks:

280 gallons of grout (tremie placed) was used to completely cement boring from bottom to top. Water/cement ratio was approximately 7 gallons per sack.

Drilling geologist: Mike Granger
Coordinator: Shawn Wood
SwL Report No. 89-192