SSCL-SR-1119

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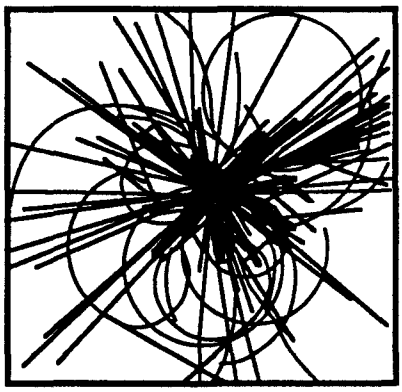
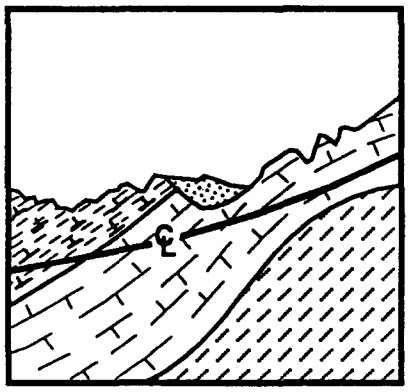
Project No. 87-888-0012
Report No. SSC-GR-60
July 1990
GR-60

Data Report for Structure Study Zone SI 2, Air Rotary Boreholes SI 2A, SI 2B, and Corehole SI 2C





Prepared by: The Earth Technology Corporation
Long Beach, California

Prepared for: RTK a joint venture
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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 is one in a series of data reports prepared for the global data phase of geotechnical characterization at the SSC site. Data collection for this study phase focused on drillhole-based geological, geohydrological, geophysical, and geotechnical tests in the near vicinity of the E and F access shaft sites. Additionally, several coreholes were drilled where the main tunnel is expected to penetrate geotechnically significant as well as possibly problematic stratigraphic and structural intervals. The global data set has three key attributes: (1) uniform geographic distribution over the site footprint, (2) complete coverage of all of the strata through which the SSC tunnels and shafts will pass, and (3) consistency of the data from sampling site to sampling site throughout the SSC site. In combination with data from the other phases, these data will allow conceptual designs of construction methods. Each data report includes the results of both field and laboratory tests for specific drilling and sampling site(s).

DATA REPORT

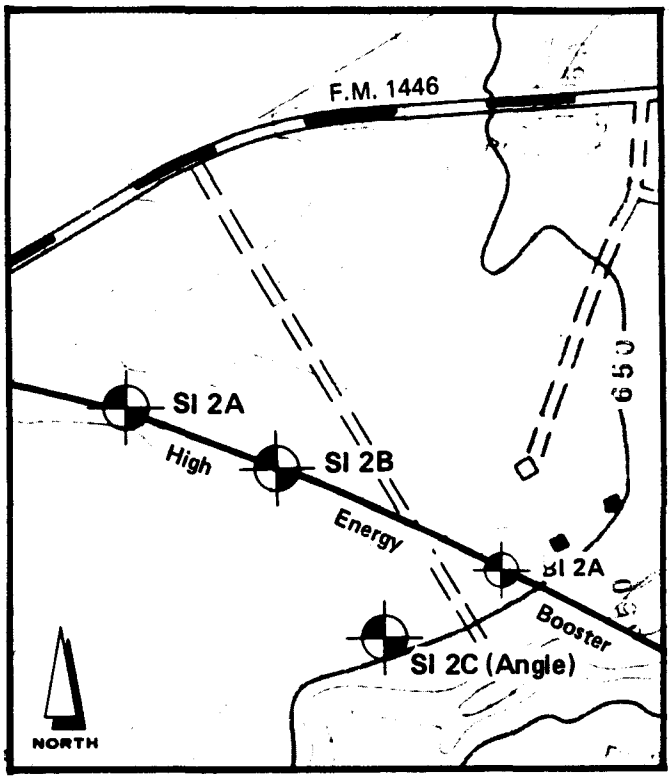
Site Designator: SI 2

Objective: The objectives for drilling at this location are to better define the locations and nature of geologic structures identified through surface geologic mapping and from previous borings, and to determine geotechnical conditions through in-situ hydrological testing and laboratory geomechanical testing.

Structure Study Zone **SI 2** is located on the northeastern sector of the High Energy Booster (HEB), 3.7 miles west southwest of Waxahachie, Texas.

SI 2A and **SI 2B** are air rotary borings.

SI 2C is an angled corehole with a bearing of approximately N68°W, angled 52° from horizontal.



SCALE 1:6,000

0 500 1000 Feet

CONTOUR INTERVAL 10 FEET

Boring Locations:

Boring	Northing (feet)	Easting (feet)	Surface Elevation (feet)
SI 2A	256,641	2,178,171	690.3
SI 2B	256,506	2,178,577	682.1
SI 2C	256,049	2,178,907	655.0

Scope and Schedule:

- Borings

Boring	Coring (full depth)	Wire-Line Logging	Hydrologic Testing	Down-Hole Photography	Laboratory Testing	Plugging
SI 2A	February 15, 1990	February 15, 1990	None	Not Done	None	February 15, 1990
SI 2B	February 15, 1990	February 15, 1990	None	Not Done	None	February 15, 1990
SI 2C	March 19-21, 1990	March 22, 1990	March 23, 1990	March 24, 1990	April 2 to 17, 1990	March 24, 1990

- Geologic Mapping - February 4 to March 2, 1990
- Geophysical Surveys
  - VLF Survey - February 7, 1990.
  - Seismic Reflection Survey - February 4 to 9, 1990

Conditions Encountered: (see Lithologic Logs, Appendix A)

Boring No.	Total Depth (feet)	Soil (feet)	Weathered Austin Chalk (feet)	Austin Chalk (feet)	Eagle Ford Shale
SI 2A	100.0	0.0 to 1.0	1.0 to 14.0	14.0 to 100.0	N.P.
SI 2B	100.0	0.0 to 3.5	3.5 to 23.0	23.0 to 100.0	N.P.
SI 2C	266.5 (inclined)	0.0 to 14.4	14.4 to 15.85	15.85 to 266.5	N.P.
	210.3 (vertical)	0.0 to 11.3	11.3 to 12.5	12.5 to 210.3	N.P.

N.P. = not penetrated.
Note: SI 2A and SI 2B are air rotary borings. Boring SI 2C was cored to the full depth.

Geophysical Logging: (see Wire-line Logs, Appendix B)

Boring No.	Spontaneous Potential (SP)	Normal Resistivity (Short and Long)	Guard Resistivity	Point Resistance	Natural Gamma	Short and Long Gamma	Compensated Density (Caliper)	Sonic Velocity (Full Wave)	Other
SI 2A	X	X	X	X	X	X	X	X	
SI 2B	X	X	X	X	X	X	X	X	
SI 2C	X	X	X	X	X	X	X	Note	Deviation

Note: Tool malfunction.

Geologic Mapping Results Summary: (see also Appendix C)

Analysis of lithologic and wire-line logs and geologic mapping indicates the presence of faulting in the study zone area. Numerous exposed calcite veins were mapped within the zone. Veins are generally slickensided and have a northeast strike and steep northwest or southeast dip. The strikes are similar to the trend of a major lineament that transects the study zone.

A fault exposed in a drainage approximately 800 feet southwest of boring SI 2C has greater than 18 feet of vertical offset based on correlation of beds on either side of the structure. In addition, calcite in float is widely distributed in the zone but concentrated within an approximately 300-foot-wide band (see Figures C-1 and C-2). Very low frequency (VLF) geophysical surveys indicate a zone of highly fractured bedrock approximately 500 feet wide across the trend of the fault (see Appendix D, Geophysical Surveys).

Analysis of wire-line and lithologic logs from boring BI 2A (previous investigation) and similar data from other borings in the vicinity (i.e., BI 4 and BI 5) suggest approximately 80 feet of vertical displacement (down to the southeast). Two relatively shallow air rotary borings were drilled (SI 2A, SI 2B) in an attempt to locate the fault(s). Both borings were in the upthrown block. An angled borehole (SI 2C) was drilled to cross the fault(s) roughly perpendicular to the projected strike. Analysis of wire-line data indicates that a fault was encountered with approximately 40 feet of offset down to the southeast. A second fault, believed to be near SI 2B and to have a similar offset down to the southeast, was not encountered. Geologic mapping and seismic reflection data approximately 2 miles southwest of the study area suggest that this fault is an en echelon continuation of the SE10.9 structure (see Appendix D, Geophysical Surveys).

Hydrologic Test Results Summary: (see also Appendix E)

Boring	Vertical Test Depth (ft)	Packer Pressure (psi)	Gauge Pressure (psi)	Formation/Lithology	Hydraulic Conductivity (cm/sec)
SI 2C	136.1-152.3	180	15	Austin Chalk (fractured)	2.9×10^{-5}

Bulk and Clay Mineralogy Test Results:

Boring: SI2C

Formation: Austin Chalk **Boring Depth:** 187.2-187.4 feet

Whole Rock Composition:

Mineral	Percent
calcite	100
Total	100

Relative Clay Abundance:

Mineral	Percent
Not applicable	

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

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 SI 2C			
144-145	Austin Chalk	14-16	114-119	891-1844 (200)	2.42 (200)-5.05 (200)	
147-150	Austin Chalk	13-19	107-121	467-1330	2.19-2.42	147
156-160	Austin Chalk	13-25	102-121	1092-1725 (300)	2.17 (200)-3.30 (300)	134

* UU triaxial test indicated by confining pressure in parentheses.

Hole Status: (see also plugging reports, Appendix G). All holes plugged with cement grout and abandoned.

APPENDIX A

LITHOLOGIC LOG

LITHOLOGIC LOG

BORING SI 2A

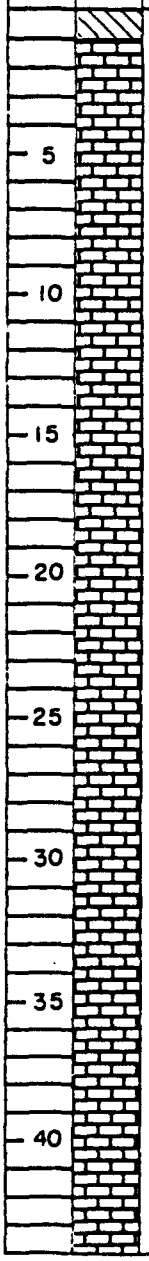
LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 12

BORING NO: SI 2A PG 1 OF 3
LOCATION: N 256,641 ft
E 2,178,171 ft
GROUND EL: 690.3 ft

DATE: 2-15-90 TYPE: Air Rotary 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.	SAMPLE LEGEND	WATER INFORMATION
									S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	No subsurface groundwater encountered. Boring filled with water upon completion.



DESCRIPTION OF STRATUM

CLAY soft, silty, dark brown to black, roots.

1.0

LIMESTONE (Austin Chalk) soft, severely weathered, tan with occasional thin clay layers.

14.0

LIMESTONE (Austin Chalk) medium, fresh, light gray to dark gray with occasional soft argillaceous and shaly layers.

DRILLING GEOLOGIST Shawn Wood ASSISTANT _____ CHECKED BY Shawn Wood

(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SI 2A PG 2 OF 3

LOCATION: N 256,641 ft
E 2,178,171 ft.

GROUND EL: 690.3 ft

DATE: 2-15-90 TYPE: Air Rotary 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.	SAMPLE LEGEND	WATER INFORMATION
									S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	See p. 1 of 3
									DESCRIPTION OF STRATUM	
45									LIMESTONE (Austin Chalk) medium, fresh, light gray to dark gray with occasional soft argillaceous and shaly layers.	
50										
55										
60										
65										
70										
75										
80										

DRILLING GEOLOGIST Shawn Wood ASSISTANT _____ CHECKED BY Shawn Wood

(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SI 2A PG 3 OF 3

LOCATION: N 256,641 ft
E. 2,178,171 ft

GROUND EL: 690.3 ft.

DATE: 2-15-90 TYPE: Air Rotary 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
										LIMESTONE (Austing Chalk) medium, fresh, light gray to dark gray with occasional soft argillaceous and shaly layers.
85										
90										
95										
100										Bottom of Exploration 100.0'
105										
110										
115										
120										

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 3

DRILLING GEOLOGIST Shawn Wood ASSISTANT _____ CHECKED BY Shawn Wood

(3-7-90)

LITHOLOGIC LOG

BORING SI 2B

LOG OF BORING

BORING NO: SI 2B PG 1 OF 3

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: N 256,506 ft
E 2,178,577 ft

GROUND EL: 682.1 ft

DATE: 2-15-90 TYPE: Air Rotary 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, silty, dark brown to black, roots.
									3.5
5									LIMESTONE (Austin Chalk) soft, severely weathered, tan with occasional thin clay layers.
10									
15									
20									
									23.0
25									LIMESTONE (Austin Chalk), medium, fresh, light gray to dark gray with occasional soft argillaceous and shaly layers.
30									
35									
40									

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. Boring filled with water upon completion.

DRILLING GEOLOGIST Shawn Wood ASSISTANT _____ CHECKED BY Shawn Wood

(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SI 2B PG 2 OF 3

LOCATION: N 256,506 ft.
E 2,178,577 ft.

GROUND EL: 682.1 ft.

DATE: 2-15-90 TYPE: Air Rotary 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
										LIMESTONE (Austin Chalk), medium, fresh, light gray to dark gray with occasional soft argillaceous and shaly layers.
45										
50										
55										
60										
65										
70										
75										
80										

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 3

DRILLING GEOLOGIST Shawn Wood ASSISTANT _____ CHECKED BY Shawn Wood

(3-7-90)

LOG OF BORING

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SI 2B PG 3 OF 3

LOCATION: N 256,506 ft
E 2,178,577 ft

GROUND EL: 682.1 ft

DATE: 2-15-90 TYPE: Air Rotary 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
										LIMESTONE (Austin Chalk) medium, fresh, light gray to dark gray with occasional soft argillaceous and shaly layers.
85										
90										
95										
100										
										Bottom of Exploration at 100 ft.
105										
110										
115										
120										

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 3

DRILLING GEOLOGIST Shawn Wood ASSISTANT _____ CHECKED BY Shawn Wood

(3-7-90)

LITHOLOGIC LOG

BORING SI 2C

LOG OF BORING

BORING NO: SI 2C PG 1 OF 7

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 256,049 Feet
~E 2,178,907 Feet

GROUND EL: ~ 655 Feet(6)

DATE: 3/19/90 TYPE: NX Angle Core(1) CASED TO: 18.5' 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

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
5									CLAY (Terrace Material) silty, brown, with rounded pebble to fine gravel sized limestone particles, caliche material (CL)
10		C1	8.5	18.5	50	40			14.4s
15									LIMESTONE (Austin Chalk) faintly weathered, medium hard, tan to light brown, slightly fossiliferous
									15.85s
20		C2	18.5	26.5	99	99			LIMESTONE (Austin Chalk), fresh, medium to moderately hard, lt.gray, slightly fossiliferous, w/occasional pyrite nodules, and 0.2 to 2.4ft. thick moderately argillaceous interbeds spaced 1.2 to 9.8ft. apart.
25									26.0g-28.4g medium thick, moderately argillaceous, medium gray bed
30		C3	26.5	36.5	100	100			29.6g-29.9s thin, moderately argillaceous, medium gray bed with pyrite nodules
									32.1g-32.3g thin, mod.argill.bed consisting of v.thin (0.03 to 0.06ft. thick) individual mod. argill., med.gray interbeds
35									
40		C4	36.5		99	99			42.1s-42.6s thin, mod.argill.bed consisting of v.thin to thin (0.08 to 0.2ft. thick) individual mod.argill., med.gray interbeds

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary Kincaid CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SI 2C PG 2 OF 7

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 256,049 Feet
~E 2,178,907 Feet

GROUND EL: ~655 Feet (6)

DATE: 3/19/90 TYPE: NX Angle Core (1) CASED TO: 18.5' 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

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
		C4			99	99			LIMESTONE (Austin Chalk), fresh, mod.hard, lt.gray, sli.fossil. w/occ.pyrite nodules and 0.15 to 1.3ft.thick mod.to v.argill.and occ.bentonitic interbeds spaced 0.38 to 7.47ft.apart
45				46.5					44.3g-44.65g thin, mod.argill.bed consisting of v.thin (0.08 to 0.1ft.thick) individual mod. argill., med.gray interbeds
		C5	46.5		99	99			48.7g-49.9s thin, mod.argill., med.hard, med.gray bed
50									51.15g-51.3g v.thin, mod.argill., med.hard, med.gray bed 51.68g-51.83g v.thin, mod.argill., soft to med.hard, dk. gray bed
55				56.5					
		C6	56.5		100	100			59.3g-59.9s thin, v.argill., soft, dk.gray bed w/two (2) lt.gray, v.soft bentonitic clay interbeds from 0.02 to 0.05ft.thick
60									64.9g-65.5g thin, mod.argill., med.hard, med.gray bed 65.5g-65.7g thin, mod.argill., med.hard, med.gray bed
65				66.5			Stopped Drilling 3-19-90		
		C7	66.5		100	98	Started Drilling 3-20-90		
70									71.9g-72.75g thin, mod.argill., med.hard, med.gray bed 72.75g-73.2g thin, v.argill., soft, dk.gray bed
75				76.5					76.9g-77.8g thin, mod.argill., med.gray bed
		C8	76.5		100	100			
80									81.7g-82.85g med.thick., mod.argill., med.gray bed

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary Kincaid CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SI 2C PG 3 OF 7

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 256,049 Feet
~E 2,178,907 Feet

GROUND EL: ~655 Feet (6)

DATE: 3/20/90 TYPE: NX Angle Core (1) CASED TO: 18.5' 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

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
		C8		86.5	100	100			LIMESTONE (Austin Chalk), fresh, mod.hard lt.gray, sli.fossil. w/occ.pyrite nodules and 0.55 to 1.55ft.thick mod. argill.interbeds spaced 2.0 to 3.96ft.apart 86.0g-87.14g med.thick, mod.argill., med.hard, med.gray bed
85									
		C9	86.5	96.0	100	100			91.1g-92.65g med.thick, mod.argill., med.gray bed 95.8g-96.6g thin, mod.argill., med.gray bed
90									
95									
		C10	96.0	106.2	100	98			99.9g-100.6g thin, mod.argill., med.gray bed 104.05g-104.6s thin, mod.argill., med.gray bed
100									
105									
		C11	106.2	116.2	100	98			107.8s-108.9g med.thick, mod.argill., med.gray bed 111.4g-112.6g med.thick, mod.argill., med.gray, fossil. bed 114.6s-115.5g thin, mod.argill., med.gray bed
110									
115									
		C12	116.2		100	100			118.7s-119.65g thin, mod.argill., med.gray, fossil.bed
120									

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary Kincaid CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SI 2C PG 4 OF 7

LOCATION: ~N 256,049 Feet
~E 2,178,907 Feet

GROUND EL: ~655 Feet(6)

DATE: 3/20/90 TYPE: NX Angle Core(1) CASED TO: 18.5' 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

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
		C12		126.4	100	100			LIMESTONE (Austin Chalk), fresh, mod.hard, lt.gray, sli. fossil., w/occ.pyrite nodules and 0.15 to 1.9ft.thick mod.to v.argill.interbeds spaced 0.2 to 6.85ft.apart 124.5g-125.0g thin, mod.argill., med.gray bed 126.0g-126.4s thin, mod.argill., med.gray, fossil.bed
125									
		C13	126.4	136.5	98	98			129.05g-130.35g med.thick, mod.argill., med.gray bed 130.55g-130.7s v.thin, v.argill., fissile, dk.gray bed 134.45s-136.35s med.thick, mod.argill., med.gray, fossil. bed
130									
135									
		C14	136.5	146.5	100	100			143.2g-144.9g med.thick, mod.argill., med.hard, med.to dk.gray, fossil.bed
140									
145									
		C15	146.5	156.5	99	95			147.5s-149.1g med.thick, mod.argill., med.gray, fossil. bed 151.8s-152.5g thin, mod.argill., med.gray, fossil.bed
150									
155									
		C16	156.5		100	100			157.3g-158.6g med.thick, mod.argill., soft to med.hard, med.gray to dk.gray, fossil.bed
160									

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary Kincaid CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SI 2C PG 5 OF 7

LOCATION: ~N 256,049 Feet
~E 2,178,907 Feet

GROUND EL: ~ 655 Feet (6)

DATE: 3/20/90 TYPE: NX Angle Core (1) CASED TO: 18.5' 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

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
		C16			100	100			LIMESTONE (Austin Chalk), fresh, mod.hard, lt.gray, sli. fossil., w/occ.pyrite nodules and 0.1 to 1.7ft.thick mod.to v.argill.interbeds spaced 0.4 to 5.75ft.apart.
165							Stopped Drilling 3-20-90		164.35g-165.1g thin, mod.argill., med.hard, med.gray fossil.bed
				166.5					
		C17	166.5		100	100	Started Drilling 3-21-90		167.55g-167.7g v.thin, mod.to v.argill., soft to med. hard, med.gray bed
									168.1g-168.95g thin, mod.argill., med.gray, fossil.bed
170									
									172.1s-172.5s thin, v.argill., soft to med.hard, dk. gray bed w/bentonitic clay
									172.3 fracture, smooth, closed, clean (N23°E, 13°NW)
175									
				176.5					175.6s-176.15s thin, mod.to v.argill., med.hard, dk. gray, fossil.bed
		C18	176.5		100	99			177.2s-177.3s v.thin, mod.argill., med.gray bed
180									
									180.8s-182.5g med.thick, mod.argill., med.gray, fossil. bed
									182.9s-183.0s v.thin, v.argill., soft, dk.gray bed
									184.85g-185.4g thin, mod.to v.argill., med.to dk. gray, fossil.bed
185									
				186.5					186.3s
		C19	186.5		60	45			LIMESTONE (Austin Chalk), highly weathered, soft to med. hard, yellowish-tan, w/reddish-brown oxidized pyrite, numerous calcite crystals up to 0.1ft.dia., evidence of minor voids, slickensides, and fault zone.
190									
195									195.9s
				196.5					
		C20	196.5		100	100			LIMESTONE (Austin Chalk), fresh, mod.hard, lt.gray, sli. fossil.w/occ.pyrite nodules and 0.1 to 1.7ft.thick mod.to v.argill.interbeds spaced 0.4 to 5.75ft.apart
200									200.1g-201.6g med.thick, mod.argill., med.gray bed
									201.65g-201.95g thin, mod.argill., med.hard, med.to dk. gray, fossil.bed w/pyrite crystals up to 0.05ft.dia.

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary Kincaid CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SI 2C PG 6 OF 7

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 256,049 Feet
~E 2,178,907 Feet

GROUND EL: ~655 Feet (6)

DATE: 3/21/90 TYPE: NX Angle Core (1) CASED TO: 18.5' 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

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
		C20			100	100				LIMESTONE (Austin Chalk), fresh, mod.hard, lt.gray, sli. fossil.w/occ.pyrite nodules and 0.5 to 1.7ft.thick mod.to v.argill.interbeds spaced 0.05 to 6.8ft.apart
										203.9g-204.55g thin, mod.argill., med.gray bed
205										204.55g-204.7g v.thin, v.argill., soft, fissile, dk. gray bed
				206.5						
		C21	206.5		100	100				204.7g-205.3g thin, mod.argill., med.gray bed
										206.1g-207.8g med.thick, mod.argill., med.gray bed
210										
										214.6g-215.3g thin, mod.argill., med.gray bed
215										216.28g-216.5g thin, mod.argill., med.gray bed
				216.5						
		C22	216.5		100	100				
220										221.4g-222.25g thin, mod.argill., med.gray bed
225										226.45g-226.5s v.thin, mod.argill., med.hard, med. gray bed
				226.5						
		C23	226.5		100	100				228.2g-229.05g thin, mod.argill., med.gray, fossil.bed
										229.65g-229.8g thin, mod.argill., med.gray bed
230										
										233.0g-233.8g thin, mod.argill., med.gray bed
235										235.1g-235.4g thin, mod.argill., med.hard, med.gray bed
				236.5						
		C24	236.5		100	100				236.25g-236.65g thin, mod.argill., med.hard, med.gray bed
										238.15g-238.63g thin, mod.argill., med.gray bed
240										241.3g-241.55g thin, mod.argill., med.gray, fossil.bed
										244.97g-246.05g med.thick, mod.argill., med.gray, fossil.bed

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary Kincaid CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SI 2C PG 7 OF 7

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 256,049 Feet
~E 2,178,907 Feet

GROUND EL: ~655 Feet(6)

DATE: 3/21/90 TYPE: NX Angle Core(1) CASED TO: 18.5' 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

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		C24		246.5	100	100				LIMESTONE(Austin Chalk),fresh,mod.hard,lt.gray,sli. fossil.,w/occ.pyrite nodules and 0.25 to 1.5ft. thick mod.argill.interbeds spaced 2.4 to 10.4ft.
250		C25	246.5	256.5	100	100				249.95g-251.3g med.thick,mod.argill.,med.gray fossil.bed
260		C26	256.5	266.5	100	99				261.7g-262.6g thin,mod.argill.,med.gray bed 265.0g-266.5 mod.argill.,med.gray,fossil.bed
270										Total Depth: 266.5 Feet 3-21-90
275										(1) Angle Hole Field Azimuth: N65°W Plunge : 50° (2) Wireline Logged 3-22-90 (3) Hydrotested 3-23-90 (4) Down-hole Borehole Photography completed 3-24-90 (5) Boring Plugged 3-24-90 (6) Ground elevation determined by hand level from Control Points Nos. CP-1A and CP-2.
280										NOTE: ALL FRACTURE ORIENTATIONS (IN PARENTHESES) ARE BASED ON FIELD AZIMUTH AND ASSUME HORIZONTAL BEDDING

DRILLING GEOLOGIST Jim Sansom ASSISTANT Gary Kincaid CHECKED BY W.D. Flanigan

APPENDIX B

WIRE-LINE LOGS

WIRE-LINE LOGGING PARAMETERS

Hole No. SI 2A **Log Measured From:** Ground Level

Drilling Parameters

Depth 100.0 feet

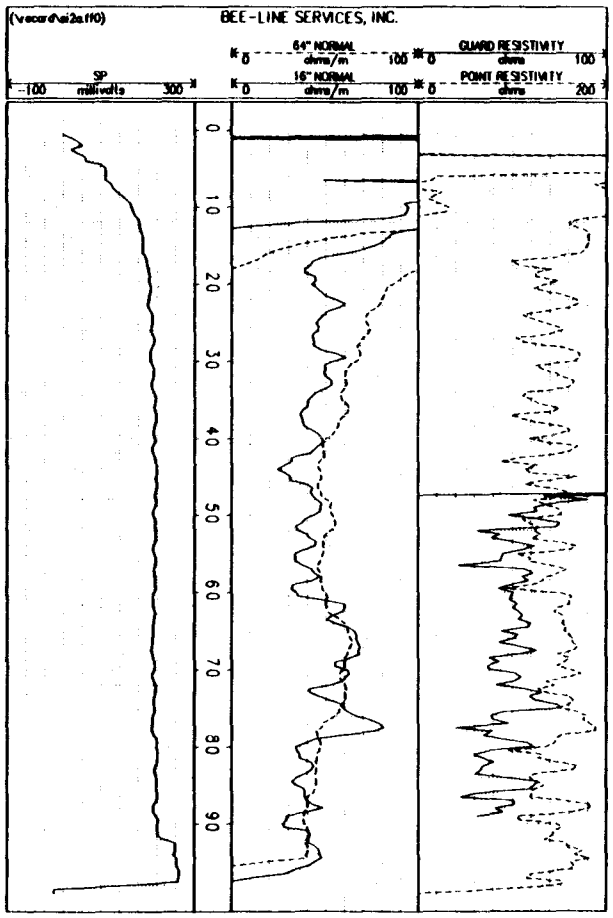
Bit Diameter 4.75 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	February 15, 1989	February 15, 1989	February 15, 1989
Bottom Log Interval	99.0 feet	94.5 feet	93.8 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling mud	drilling mud	drilling mud
Time Since Circulation Stop	3 hours	3 hours	3 hours
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

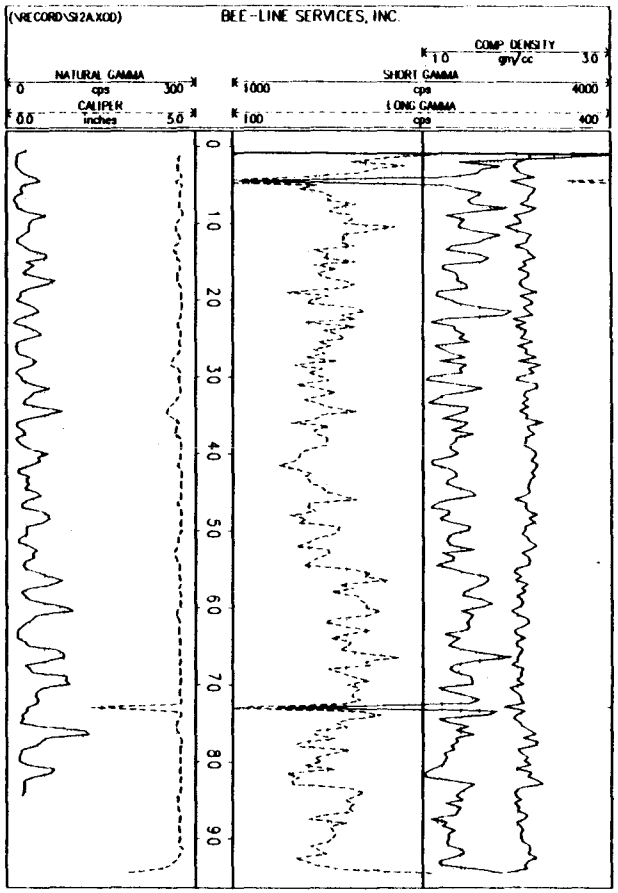
Logged by: **BEE-LINE SERVICES, INC.**
P. O. Box 2096
Corsicana, TX 75151

SI 2A Wire-line logs run February 15, 1990. Surface elevation 690.3 feet.

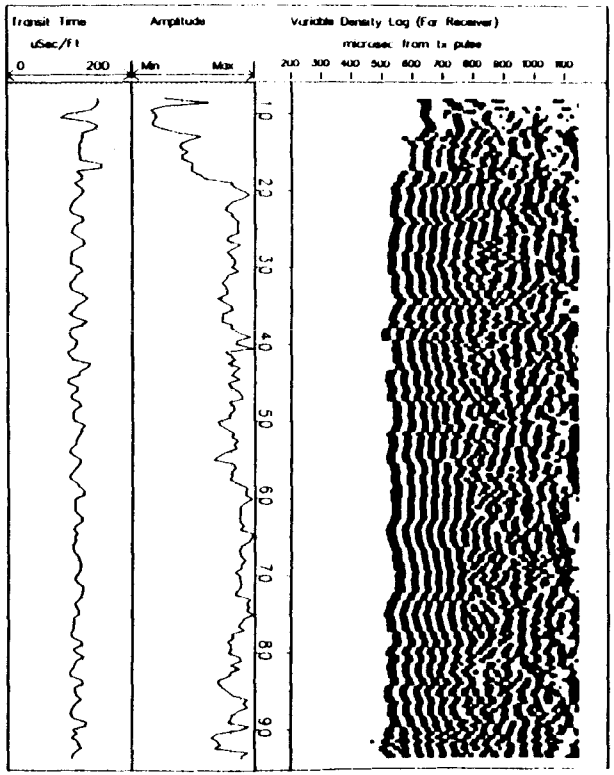
ELECTRICAL LOG



GAMMA LOG



SONIC LOG



WIRE-LINE LOGGING PARAMETERS

Hole No. SI 2B **Log Measured From:** Ground Level

Drilling Parameters

Depth 100.0 feet

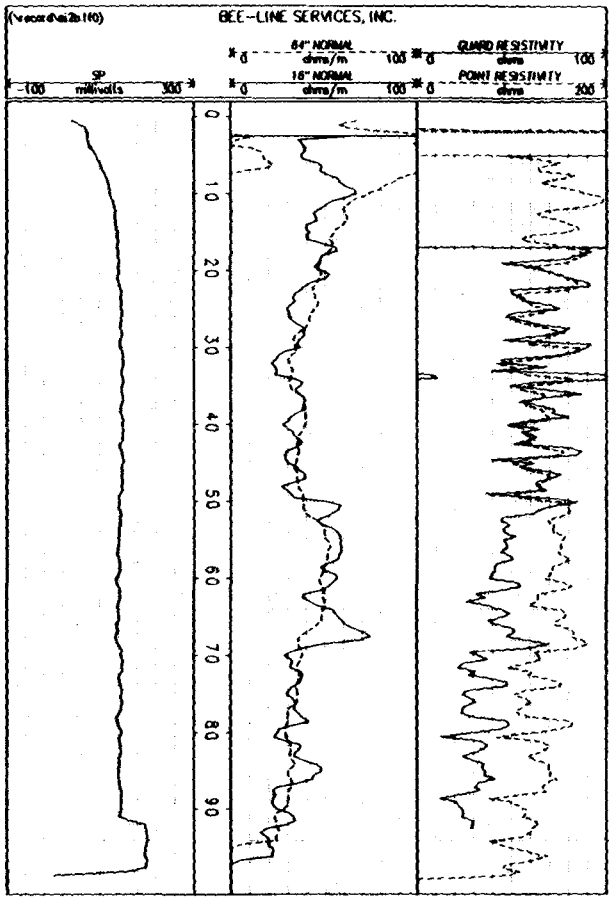
Bit Diameter 4.75 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log
Date	February 15, 1989	February 15, 1989	February 15, 1989
Bottom Log Interval	98.5 feet	98.0 feet	93.9 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling mud	drilling mud	drilling mud
Time Since Circulation Stop	3 hours	3 hours	3 hours
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

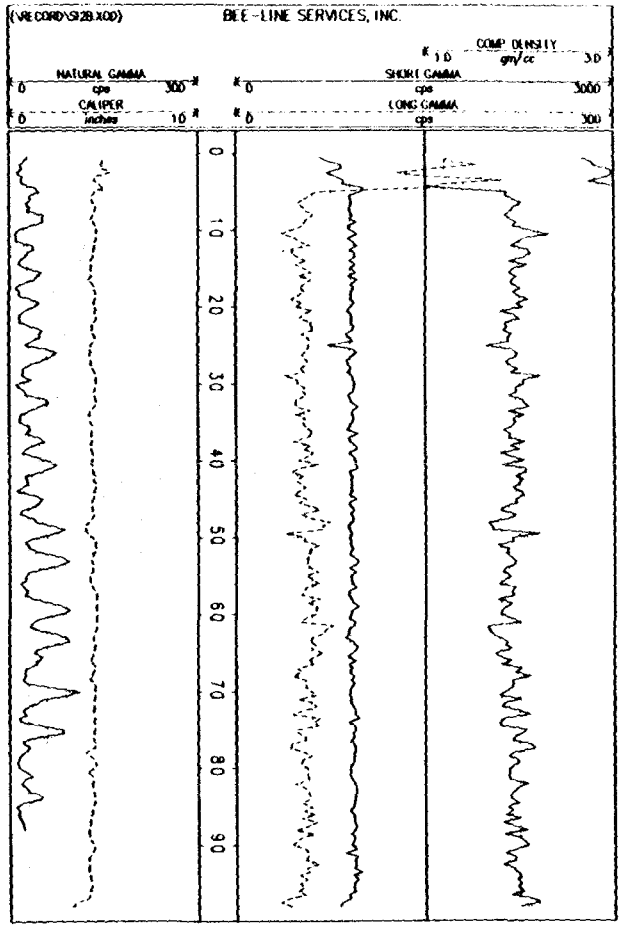
Logged by: **BEE-LINE SERVICES, INC.**
P. O. Box 2096
Corsicana, TX 75151

SI 2B Wire-line logs run February 15, 1990. Surface elevation 682.1 feet.

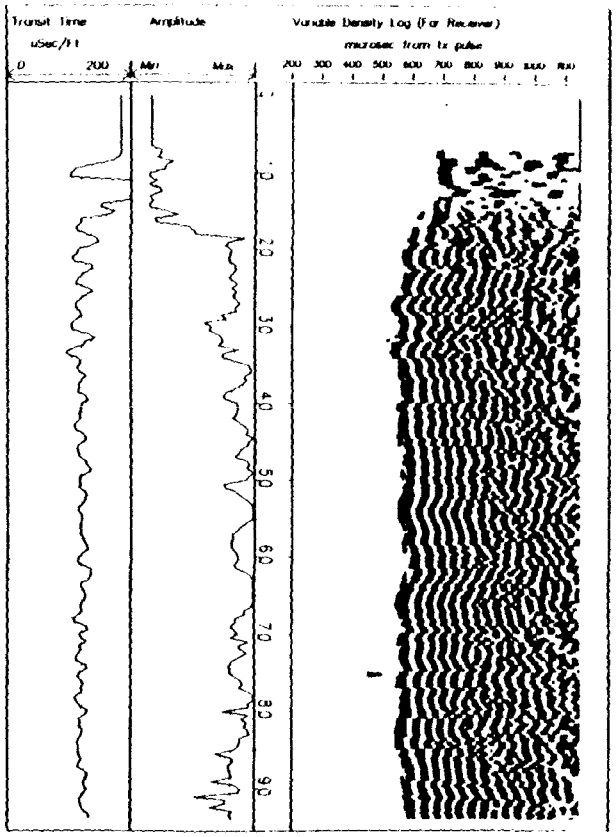
ELECTRICAL LOG



GAMMA LOG



SONIC LOG



WIRE-LINE LOGGING PARAMETERS

Hole No. SI 2C

Log Measured From: Ground Level

Drilling Parameters

Depth 266.5 feet

Bit Diameter 3.125 inches

Logging Parameters	Electrical Log	Gamma Log	Deviation Log
Date	March 22, 1990	March 22, 1990	March 22, 1990
Bottom Log Interval	264.0 feet	264.5 feet	265.5 feet
Top Log Interval	surface	surface	23.5 feet
Type of Fluid in Hole	drilling fluid	drilling fluid	drilling fluid
Time Since Circulation Stop	17.5 hours	17.5 hours	18 hours
Probe Type/S.N.	ALP-4979	XAP-4383	9055A/135
Module Type/S.N.	ALM-4979	XAM-4383	COMPU-LOG
Logging Speed	40 feet/min.	20 feet/min.	60 feet/min.
Sample Interval	0.5 foot	0.5 foot	0.1 foot

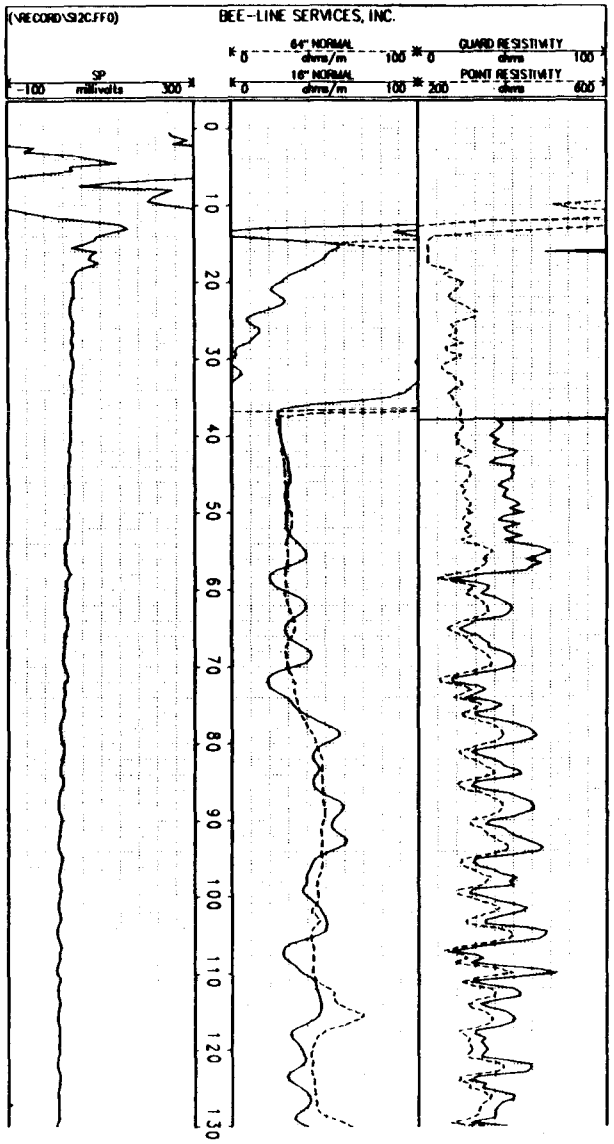
Logged by:

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

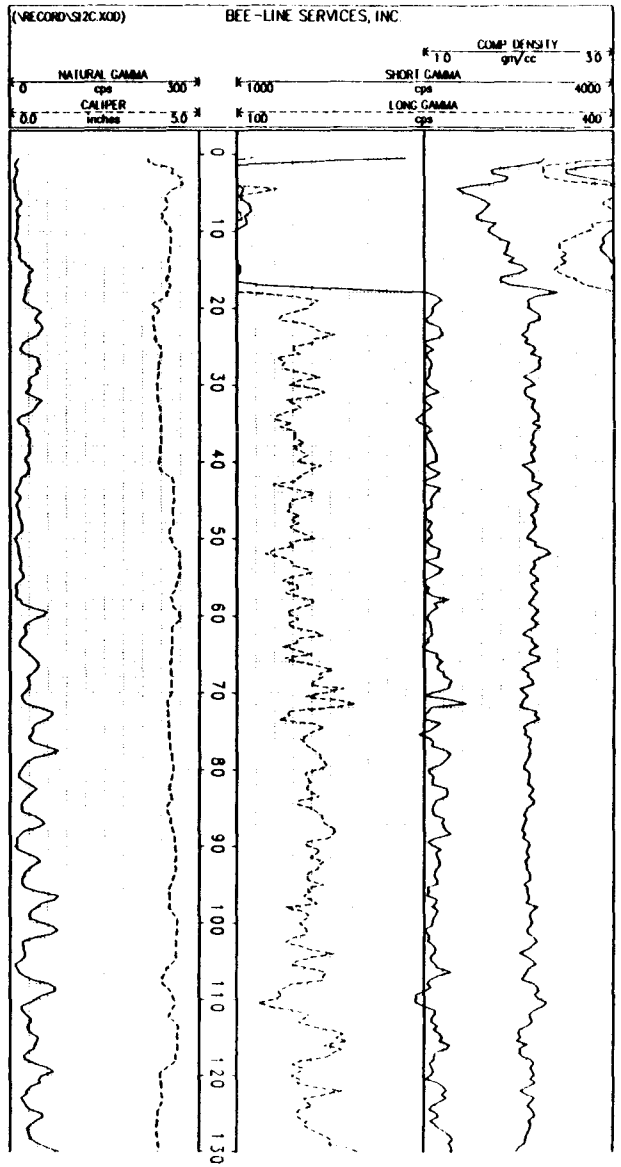
wp.V96M/SI2

SI 2C Wire-line logs run March 22, 1990. Surface elevation 655 feet.

ELECTRICAL LOG

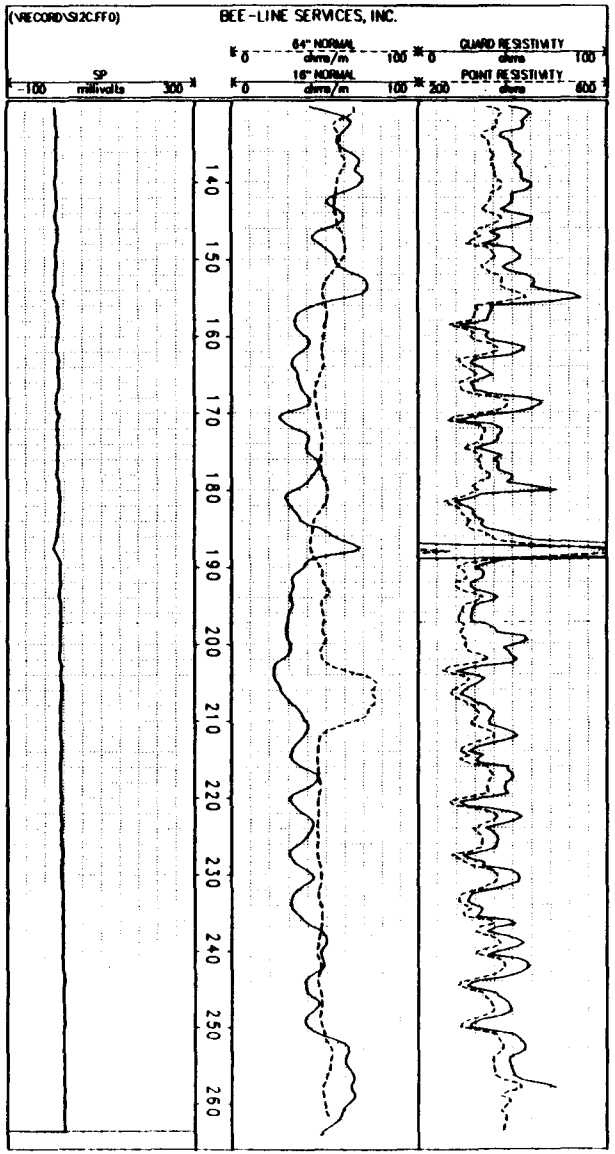


GAMMA LOG

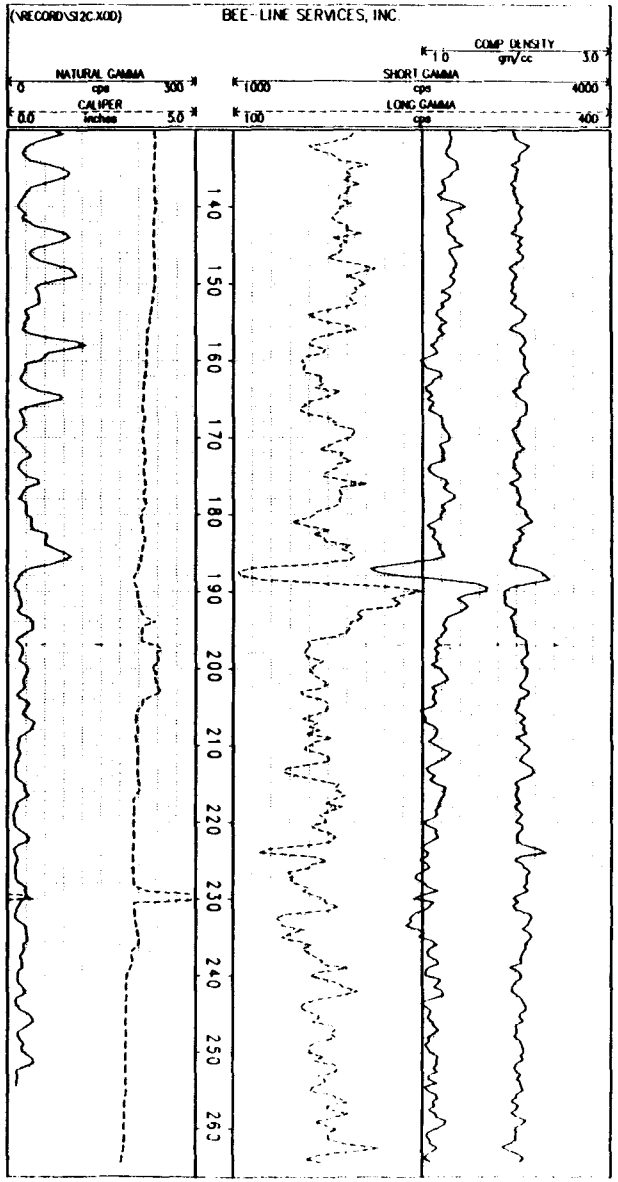


SI 2C Wire-line logs run March 22, 1990 (Continued). Surface elevation 655 feet.

ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



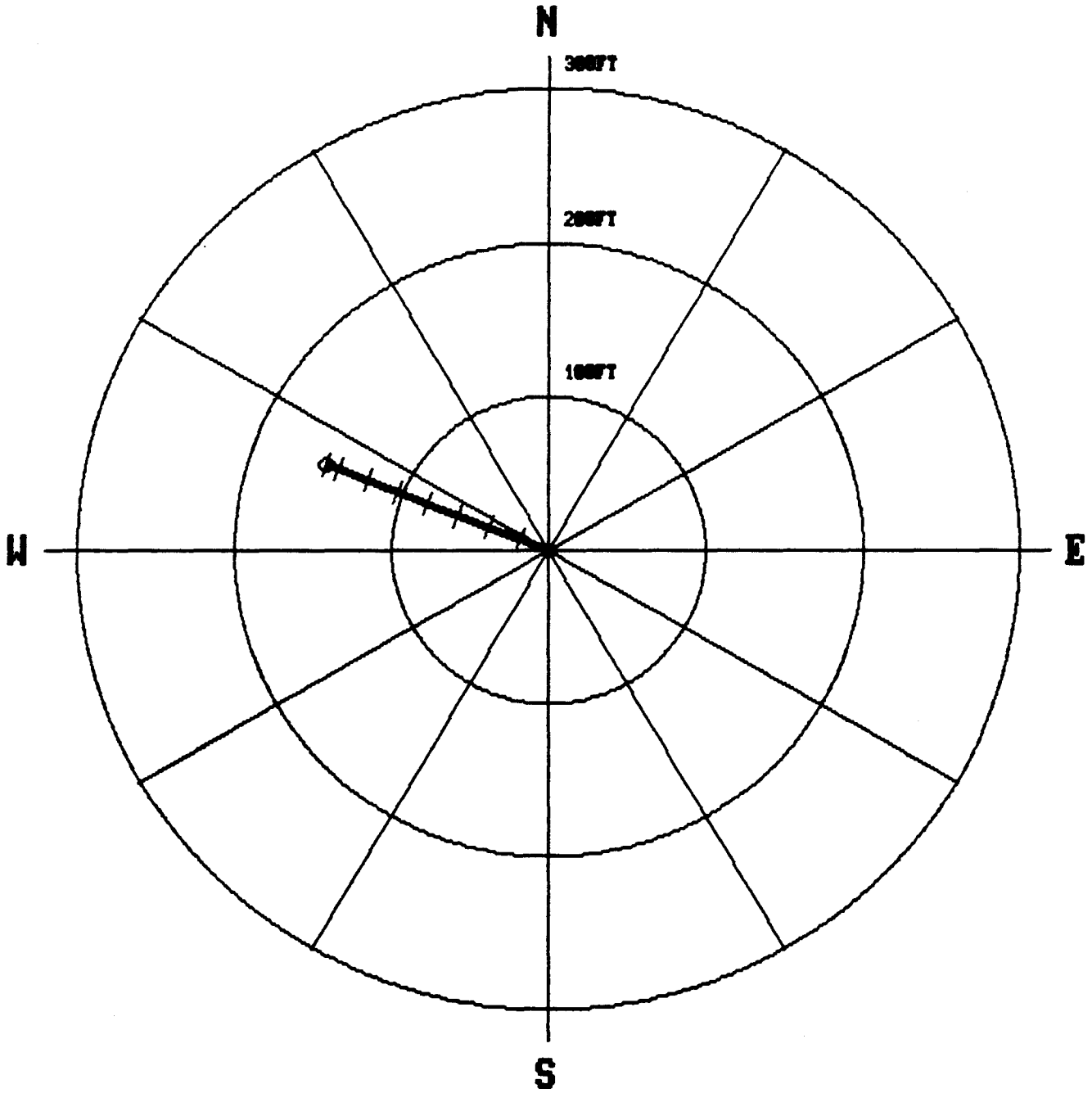
PLAN VIEW

COMPU-LOG DEVIATION

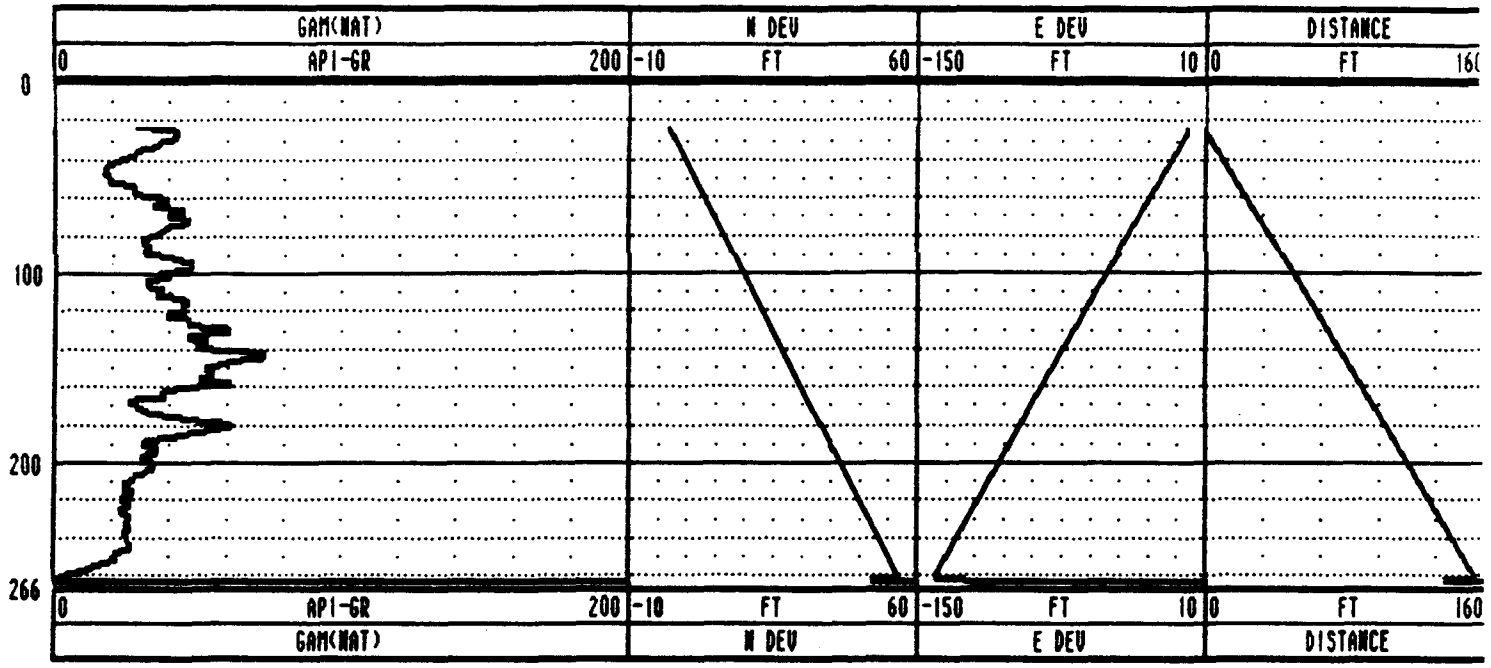
CLIENT: TETC
LOCATION: SSC
HOLE ID: SI 2C
DATE OF LOG: 03/22/90
PROBE: 9055A 249

MAG DECL: 7.0

SCALE: 100 FT/IN
TRUE DEPTH: 210.30 F
AZIMUTH: 291.6
DISTANCE: 151.7 FT
+ = 25 FT INCR
O = BOTTOM OF HOLE



Profile View
Compu-log Deviation Survey
SI 2C



CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SI 2C
DATE OF LOG : 03/22/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 8

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
29.0	28.85	0.23	-0.32	0.4	305.0	41.0	303.7
30.0	29.61	0.54	-0.90	1.0	301.0	41.0	297.0
31.0	30.36	0.82	-1.49	1.7	298.8	41.1	294.2
32.0	31.12	1.09	-2.09	2.4	297.4	40.9	293.7
33.0	31.87	1.34	-2.70	3.0	296.4	41.1	292.4
34.0	32.63	1.58	-3.30	3.7	295.6	41.0	291.5
35.0	33.38	1.82	-3.92	4.3	295.0	41.1	291.3
36.0	34.14	2.06	-4.53	5.0	294.5	40.9	291.0
37.0	34.89	2.30	-5.14	5.6	294.1	41.2	291.3
38.0	35.64	2.53	-5.75	6.3	293.8	40.9	290.9
39.0	36.40	2.77	-6.37	6.9	293.5	41.0	290.8
40.0	37.15	3.00	-6.98	7.6	293.3	41.1	290.8
41.0	37.91	3.23	-7.59	8.3	293.1	41.0	290.5
42.0	38.66	3.46	-8.21	8.9	292.9	41.0	290.5
43.0	39.41	3.70	-8.82	9.6	292.7	41.0	290.4
44.0	40.17	3.93	-9.44	10.2	292.6	41.0	291.5
45.0	40.92	4.16	-10.05	10.9	292.5	41.0	290.7
46.0	41.68	4.39	-10.67	11.5	292.4	40.9	289.1
47.0	42.43	4.62	-11.28	12.2	292.3	41.0	290.6
48.0	43.18	4.86	-11.90	12.8	292.2	41.3	291.2
49.0	43.94	5.09	-12.51	13.5	292.1	41.0	290.8
50.0	44.69	5.32	-13.12	14.2	292.1	41.0	290.5
51.0	45.45	5.56	-13.74	14.8	292.0	41.0	291.2
52.0	46.20	5.79	-14.35	15.5	292.0	41.1	290.8
53.0	46.96	6.02	-14.96	16.1	291.9	40.9	290.5
54.0	47.71	6.25	-15.58	16.8	291.9	41.0	290.5
55.0	48.47	6.48	-16.19	17.4	291.8	41.0	290.6
56.0	49.22	6.72	-16.80	18.1	291.8	41.0	291.0
57.0	49.98	6.95	-17.42	18.8	291.8	41.0	290.8
58.0	50.73	7.18	-18.03	19.4	291.7	40.9	290.7
59.0	51.49	7.41	-18.64	20.1	291.7	40.8	290.5
60.0	52.25	7.65	-19.25	20.7	291.7	40.9	291.1
61.0	53.00	7.88	-19.86	21.4	291.6	41.0	290.9
62.0	53.76	8.11	-20.48	22.0	291.6	40.8	290.8
63.0	54.51	8.35	-21.09	22.7	291.6	40.9	291.0
64.0	55.27	8.58	-21.70	23.3	291.6	40.8	290.8
65.0	56.03	8.81	-22.31	24.0	291.6	40.8	290.8
66.0	56.79	9.05	-22.92	24.6	291.5	40.8	291.1
67.0	57.54	9.28	-23.53	25.3	291.5	40.8	291.1
68.0	58.30	9.51	-24.14	25.9	291.5	40.8	291.0
69.0	59.06	9.75	-24.75	26.6	291.5	40.7	290.9
70.0	59.81	9.98	-25.36	27.2	291.5	40.7	291.1
71.0	60.57	10.21	-25.97	27.9	291.5	40.8	290.9
72.0	61.33	10.45	-26.57	28.6	291.5	40.6	291.1
73.0	62.09	10.68	-27.18	29.2	291.4	40.7	290.8
74.0	62.85	10.91	-27.79	29.9	291.4	40.6	291.0
75.0	63.61	11.14	-28.40	30.5	291.4	40.8	291.2
76.0	64.36	11.38	-29.01	31.2	291.4	40.6	291.1
77.0	65.12	11.61	-29.62	31.8	291.4	40.6	290.9
78.0	65.88	11.84	-30.22	32.5	291.4	40.6	290.9
79.0	66.64	12.08	-30.83	33.1	291.4	40.7	291.2
80.0	67.40	12.31	-31.44	33.8	291.4	40.6	290.5

CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SI 2C
DATE OF LOG : 03/22/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 8

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
81.0	68.16	12.54	-32.05	34.4	291.4	40.7	291.2
82.0	68.92	12.78	-32.66	35.1	291.4	40.6	291.0
83.0	69.68	13.01	-33.26	35.7	291.4	40.7	291.2
84.0	70.43	13.25	-33.87	36.4	291.4	40.7	290.9
85.0	71.19	13.48	-34.48	37.0	291.4	40.6	291.1
86.0	71.95	13.72	-35.09	37.7	291.3	40.7	291.3
87.0	72.71	13.95	-35.70	38.3	291.3	40.6	291.2
88.0	73.47	14.19	-36.30	39.0	291.3	40.6	291.0
89.0	74.23	14.42	-36.91	39.6	291.3	40.6	291.1
90.0	74.99	14.66	-37.52	40.3	291.3	40.6	291.2
91.0	75.75	14.89	-38.12	40.9	291.3	40.5	291.1
92.0	76.51	15.12	-38.73	41.6	291.3	40.6	291.2
93.0	77.27	15.36	-39.34	42.2	291.3	40.5	291.4
94.0	78.03	15.60	-39.94	42.9	291.3	40.5	290.7
95.0	78.79	15.83	-40.55	43.5	291.3	40.6	291.6
96.0	79.55	16.07	-41.15	44.2	291.3	40.5	291.6
97.0	80.31	16.31	-41.76	44.8	291.3	40.3	290.9
98.0	81.07	16.54	-42.36	45.5	291.3	40.5	291.3
99.0	81.83	16.78	-42.97	46.1	291.3	40.5	291.3
100.0	82.59	17.02	-43.57	46.8	291.3	40.5	291.2
101.0	83.35	17.25	-44.18	47.4	291.3	40.4	291.1
102.0	84.11	17.49	-44.78	48.1	291.3	40.6	291.8
103.0	84.87	17.72	-45.39	48.7	291.3	40.3	290.9
104.0	85.63	17.95	-45.99	49.4	291.3	40.6	291.3
105.0	86.39	18.19	-46.60	50.0	291.3	40.2	291.5
106.0	87.16	18.43	-47.20	50.7	291.3	40.3	291.7
107.0	87.92	18.67	-47.80	51.3	291.3	40.5	291.5
108.0	88.68	18.91	-48.40	52.0	291.3	40.4	291.6
109.0	89.44	19.14	-49.00	52.6	291.3	40.3	291.3
110.0	90.21	19.38	-49.60	53.3	291.3	40.2	291.2
111.0	90.97	19.62	-50.21	53.9	291.3	40.4	292.2
112.0	91.73	19.86	-50.81	54.5	291.4	40.2	291.9
113.0	92.50	20.10	-51.40	55.2	291.4	40.0	291.2
114.0	93.26	20.33	-52.00	55.8	291.4	39.9	290.9
115.0	94.03	20.56	-52.60	56.5	291.3	40.0	291.3
116.0	94.79	20.80	-53.20	57.1	291.4	40.4	291.4
117.0	95.56	21.03	-53.80	57.8	291.4	40.0	291.2
118.0	96.32	21.27	-54.40	58.4	291.4	40.2	291.8
119.0	97.09	21.51	-55.00	59.1	291.4	38.7	289.7
120.0	97.86	21.74	-55.60	59.7	291.4	40.1	291.3
121.0	98.62	21.97	-56.20	60.3	291.4	40.1	290.9
122.0	99.39	22.20	-56.80	61.0	291.3	39.9	291.1
123.0	100.16	22.43	-57.39	61.6	291.3	39.9	291.5
124.0	100.92	22.67	-57.99	62.3	291.4	40.0	291.7
125.0	101.69	22.90	-58.59	62.9	291.4	39.9	291.4
126.0	102.45	23.14	-59.19	63.5	291.4	39.8	291.2
127.0	103.22	23.37	-59.78	64.2	291.4	39.9	291.6
128.0	103.99	23.61	-60.38	64.8	291.4	39.9	291.5
129.0	104.76	23.84	-60.98	65.5	291.4	39.8	291.4
130.0	105.52	24.08	-61.57	66.1	291.4	39.8	291.5
131.0	106.29	24.31	-62.17	66.8	291.4	39.8	291.5
132.0	107.06	24.55	-62.77	67.4	291.4	39.9	291.5

CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SI 2C
DATE OF LOG : 03/22/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 8

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
133.0	107.83	24.78	-63.36	68.0	291.4	39.9	291.8
134.0	108.60	25.02	-63.96	68.7	291.4	39.8	291.6
135.0	109.36	25.26	-64.55	69.3	291.4	39.8	291.6
136.0	110.13	25.49	-65.15	70.0	291.4	39.9	291.7
137.0	110.90	25.73	-65.74	70.6	291.4	39.9	291.9
138.0	111.67	25.97	-66.34	71.2	291.4	39.7	292.0
139.0	112.44	26.21	-66.93	71.9	291.4	39.5	291.1
140.0	113.21	26.44	-67.53	72.5	291.4	39.9	291.4
141.0	113.97	26.67	-68.12	73.2	291.4	39.9	291.3
142.0	114.74	26.91	-68.72	73.8	291.4	39.8	291.9
143.0	115.51	27.15	-69.31	74.4	291.4	39.7	291.7
144.0	116.27	27.39	-69.91	75.1	291.4	40.2	293.2
145.0	117.04	27.63	-70.50	75.7	291.4	39.7	291.9
146.0	117.81	27.86	-71.10	76.4	291.4	39.5	291.0
147.0	118.58	28.10	-71.69	77.0	291.4	39.7	291.9
148.0	119.35	28.34	-72.28	77.6	291.4	39.7	291.7
149.0	120.12	28.57	-72.88	78.3	291.4	39.8	291.6
150.0	120.89	28.81	-73.47	78.9	291.4	39.8	291.6
151.0	121.66	29.05	-74.07	79.6	291.4	39.8	291.7
152.0	122.43	29.28	-74.66	80.2	291.4	39.7	292.0
153.0	123.20	29.52	-75.25	80.8	291.4	39.6	291.9
154.0	123.97	29.76	-75.84	81.5	291.4	39.7	291.5
155.0	124.74	29.99	-76.43	82.1	291.4	39.7	291.9
156.0	125.51	30.23	-77.03	82.7	291.4	39.6	292.2
157.0	126.28	30.47	-77.62	83.4	291.4	39.7	291.7
158.0	127.05	30.71	-78.21	84.0	291.4	39.6	291.6
159.0	127.82	30.94	-78.80	84.7	291.4	39.5	291.5
160.0	128.59	31.17	-79.40	85.3	291.4	39.5	291.7
161.0	129.36	31.42	-79.99	85.9	291.4	39.8	291.6
162.0	130.12	31.65	-80.59	86.6	291.4	39.7	291.6
163.0	130.89	31.89	-81.18	87.2	291.4	39.5	291.5
164.0	131.67	32.13	-81.77	87.9	291.4	39.5	292.0
165.0	132.44	32.36	-82.36	88.5	291.5	39.5	291.7
166.0	133.21	32.60	-82.95	89.1	291.5	39.5	291.6
167.0	133.98	32.83	-83.54	89.8	291.5	39.4	291.4
168.0	134.75	33.07	-84.13	90.4	291.5	39.5	291.8
169.0	135.52	33.30	-84.72	91.0	291.5	39.4	292.0
170.0	136.30	33.54	-85.31	91.7	291.5	39.5	291.8
171.0	137.07	33.77	-85.90	92.3	291.5	39.6	291.4
172.0	137.84	34.01	-86.49	92.9	291.5	39.6	291.6
173.0	138.61	34.24	-87.09	93.6	291.5	39.5	291.5
174.0	139.38	34.48	-87.68	94.2	291.5	39.9	292.9
175.0	140.15	34.72	-88.26	94.8	291.5	39.3	292.1
176.0	140.93	34.96	-88.85	95.5	291.5	39.1	292.3
177.0	141.70	35.20	-89.44	96.1	291.5	39.3	291.2
178.0	142.48	35.43	-90.02	96.7	291.5	39.2	291.8
179.0	143.25	35.66	-90.61	97.4	291.5	39.2	291.5
180.0	144.03	35.90	-91.20	98.0	291.5	39.4	292.2
181.0	144.80	36.14	-91.79	98.6	291.5	38.9	291.2
182.0	145.57	36.37	-92.38	99.3	291.5	39.5	292.5
183.0	146.35	36.61	-92.96	99.9	291.5	39.2	292.8
184.0	147.12	36.85	-93.55	100.5	291.5	39.1	292.1

* * * * * * SCHLO LOG - VERTICAL DEVIATION * * * * * * *

CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SI 2C
DATE OF LOG : 03/22/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 8

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
185.0	147.90	37.09	-94.13	101.2	291.5	39.5	292.1
186.0	148.67	37.32	-94.72	101.8	291.5	39.2	291.5
187.0	149.44	37.56	-95.31	102.4	291.5	39.5	292.3
188.0	150.22	37.80	-95.90	103.1	291.5	39.1	291.4
189.0	150.99	38.03	-96.49	103.7	291.5	39.5	292.5
190.0	151.77	38.25	-97.07	104.3	291.5	39.4	290.4
191.0	152.55	38.49	-97.66	105.0	291.5	39.5	291.8
192.0	153.32	38.73	-98.25	105.6	291.5	39.4	292.1
193.0	154.10	38.95	-98.83	106.2	291.5	38.9	290.5
194.0	154.88	39.17	-99.42	106.9	291.5	39.1	290.4
195.0	155.65	39.40	-100.01	107.5	291.5	39.4	292.9
196.0	156.43	39.64	-100.59	108.1	291.5	39.4	292.6
197.0	157.20	39.89	-101.17	108.8	291.5	39.1	295.0
198.0	157.98	40.14	-101.75	109.4	291.5	39.4	293.1
199.0	158.75	40.38	-102.34	110.0	291.5	39.1	291.3
200.0	159.53	40.62	-102.92	110.6	291.5	38.8	293.8
201.0	160.31	40.85	-103.50	111.3	291.5	39.0	290.9
202.0	161.08	41.09	-104.08	111.9	291.5	39.2	292.6
203.0	161.86	41.34	-104.67	112.5	291.6	38.7	291.7
204.0	162.64	41.57	-105.25	113.2	291.6	39.1	291.9
205.0	163.41	41.81	-105.83	113.8	291.6	39.0	292.3
206.0	164.19	42.05	-106.42	114.4	291.6	39.0	292.7
207.0	164.97	42.29	-107.00	115.1	291.6	39.1	292.2
208.0	165.74	42.54	-107.58	115.7	291.6	39.4	293.4
209.0	166.52	42.78	-108.16	116.3	291.6	38.8	291.5
210.0	167.29	43.02	-108.75	116.9	291.6	39.8	293.6
211.0	168.07	43.26	-109.33	117.6	291.6	39.2	291.3
212.0	168.84	43.50	-109.91	118.2	291.6	38.9	292.0
213.0	169.62	43.73	-110.50	118.8	291.6	38.9	291.6
214.0	170.40	43.96	-111.08	119.5	291.6	39.0	291.9
215.0	171.18	44.20	-111.66	120.1	291.6	38.7	291.3
216.0	171.95	44.45	-112.25	120.7	291.6	39.8	293.3
217.0	172.72	44.68	-112.84	121.4	291.6	38.7	291.7
218.0	173.50	44.91	-113.42	122.0	291.6	39.0	292.1
219.0	174.28	45.15	-114.00	122.6	291.6	39.1	291.3
220.0	175.06	45.37	-114.59	123.2	291.6	39.1	290.9
221.0	175.84	45.61	-115.17	123.9	291.6	38.9	292.0
222.0	176.62	45.84	-115.75	124.5	291.6	38.6	290.9
223.0	177.39	46.08	-116.33	125.1	291.6	38.9	292.3
224.0	178.17	46.31	-116.92	125.8	291.6	38.3	290.9
225.0	178.95	46.54	-117.50	126.4	291.6	39.2	291.9
226.0	179.73	46.77	-118.09	127.0	291.6	39.0	291.2
227.0	180.50	47.01	-118.67	127.6	291.6	39.2	292.5
228.0	181.28	47.24	-119.26	128.3	291.6	39.2	291.8
229.0	182.05	47.48	-119.84	128.9	291.6	39.0	292.0
230.0	182.83	47.71	-120.43	129.5	291.6	38.7	291.3
231.0	183.61	47.93	-121.02	130.2	291.6	40.0	292.7
232.0	184.39	48.16	-121.60	130.8	291.6	39.0	291.3
233.0	185.16	48.39	-122.19	131.4	291.6	39.0	291.5
234.0	185.94	48.62	-122.77	132.0	291.6	38.7	291.0
235.0	186.72	48.85	-123.36	132.7	291.6	39.3	292.3
236.0	187.50	49.08	-123.94	133.3	291.6	38.6	290.0

CLIENT : TETC
FIELD OFFICE : CORSICANA
DATA FROM :
MAG. DECL. : 7.000

HOLE ID. : SI 2C
DATE OF LOG : 03/22/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 8

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
237.0	188.28	49.31	-124.52	133.9	291.6	38.9	291.5
238.0	189.05	49.55	-125.11	134.6	291.6	39.0	291.6
239.0	189.83	49.78	-125.69	135.2	291.6	38.9	291.7
240.0	190.61	50.01	-126.27	135.8	291.6	39.0	291.5
241.0	191.39	50.25	-126.86	136.4	291.6	38.9	291.9
242.0	192.17	50.48	-127.44	137.1	291.6	38.9	291.6
243.0	192.94	50.71	-128.02	137.7	291.6	38.9	291.9
244.0	193.72	50.94	-128.61	138.3	291.6	39.5	293.3
245.0	194.50	51.17	-129.19	139.0	291.6	38.4	291.1
246.0	195.28	51.41	-129.77	139.6	291.6	38.9	291.5
247.0	196.06	51.64	-130.36	140.2	291.6	38.9	291.0
248.0	196.84	51.86	-130.94	140.8	291.6	38.8	290.9
249.0	197.62	52.09	-131.52	141.5	291.6	38.8	290.4
250.0	198.40	52.32	-132.11	142.1	291.6	39.0	291.7
251.0	199.17	52.56	-132.69	142.7	291.6	38.8	292.0
252.0	199.95	52.79	-133.27	143.3	291.6	38.8	291.0
253.0	200.73	53.02	-133.86	144.0	291.6	39.0	292.3
254.0	201.51	53.25	-134.44	144.6	291.6	38.8	291.1
255.0	202.29	53.48	-135.03	145.2	291.6	38.9	291.8
256.0	203.07	53.72	-135.61	145.9	291.6	39.0	291.8
257.0	203.84	53.95	-136.19	146.5	291.6	38.9	291.8
258.0	204.62	54.18	-136.78	147.1	291.6	38.9	291.6
259.0	205.40	54.41	-137.36	147.7	291.6	39.0	291.2
260.0	206.18	54.64	-137.94	148.4	291.6	38.3	290.4
261.0	206.96	54.87	-138.53	149.0	291.6	39.0	291.7
262.0	207.74	55.09	-139.11	149.6	291.6	39.1	292.0
263.0	208.52	55.32	-139.70	150.3	291.6	38.9	291.6
264.0	209.29	55.55	-140.28	150.9	291.6	38.9	291.5
265.0	210.07	55.79	-140.87	151.5	291.6	39.1	291.7
265.6	210.40	55.86	-141.04	151.7	291.6	0.0	0.0

APPENDIX C

STRUCTURE STUDY ZONE

APPENDIX C

STRUCTURE STUDY ZONE SI 2

Field mapping of the structure study zone consisted primarily of locating and noting areas of exposed vein calcite, sheared Austin Chalk, and calcite in float. Crystalline and fibrous calcite formed in fractures are primary indicators of faulting in the SSC study area.

Initial borings (BI 2A and BI 4) drilled to characterize the geotechnical conditions around the High Energy Booster (HEB) suggested the presence of a fault in the region. Aerial photographic interpretations and geological mapping indicated that a previously mapped fault (TNRLC Site Proposal, 1987) northeast of the HEB, could extend southwest through the study area. Very low frequency (VLF) geophysical surveys, two shallow rotary wash borings, and additional geologic mapping in the area confirmed the location of the fault. An angled corehole (SI 2C) was drilled in an attempt to penetrate the main fault and to characterize the geomechanical and geohydrologic characteristics of the structure.

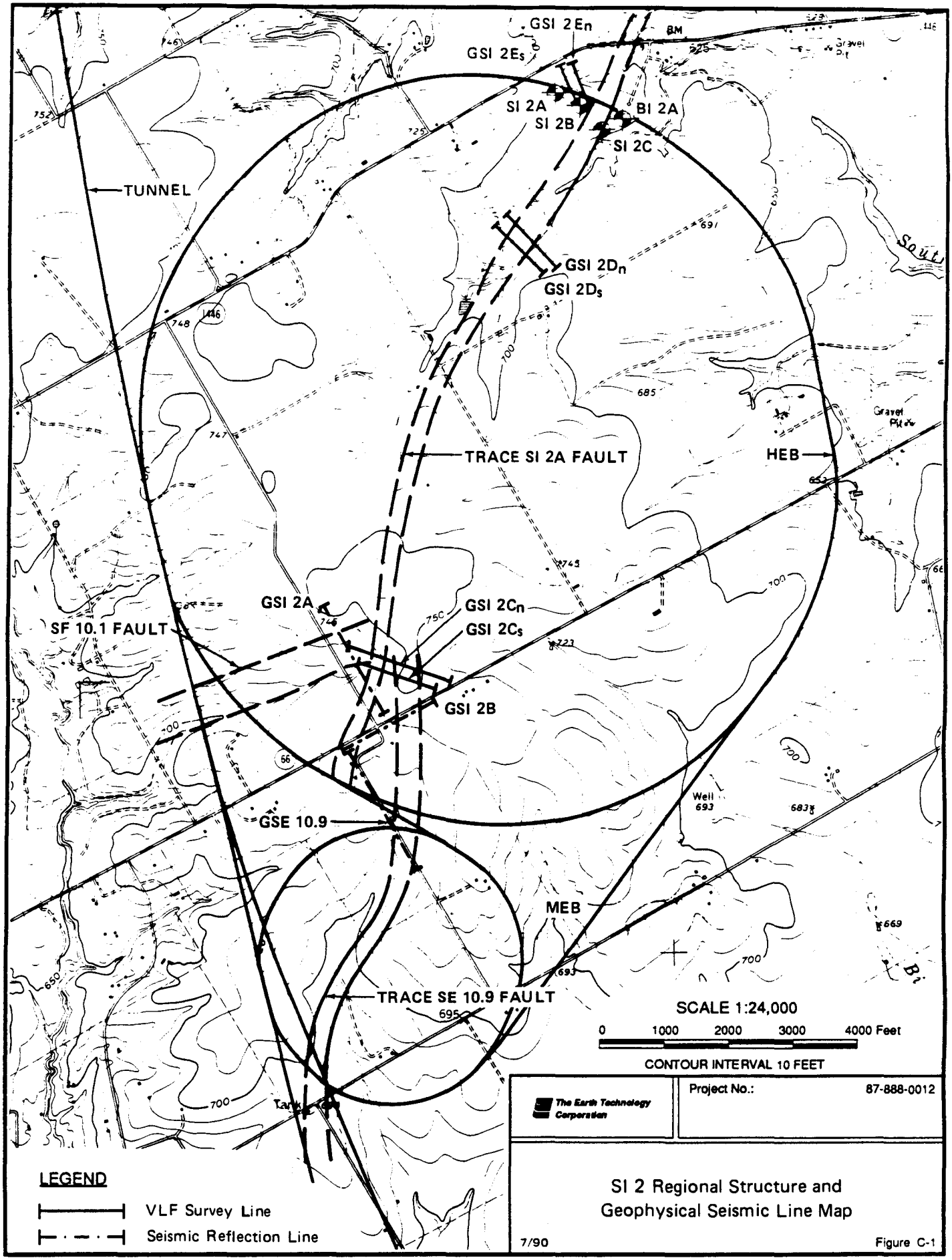
Seismic reflection profiles and additional VLF data were collected 2 miles southwest of boring SI 2C to determine if the SI 2 fault could be connected with the SE 10.9 fault.

- Name of Structure: SI 2
- Faults in Outcrop: A fault exposed in a drainage approximately 800 feet southwest of SI 2C shows at least 18 feet of offset based on visual inspection of beds on either side of the fault. Slickensided calcite along the fault surface strikes approximately N40°W with a 70° southwest dip contrary to the overall N 15°-30° E trend of the structure. This apparent anomaly may represent local shearing or drag-type folding associated with faulting.
- Trend: A topographic lineament identified on aerial photographs crosses the proposed HEB tunnel approximately 2,000 feet west of South Prong Creek along F.M. 1446 and extends southwest for several miles, intersecting the main tunnel near Highway 66 and Arrowhead Road. The lineament trends N40°E near F.M. 1446 and gently bends more southerly near Highway 66. VLF data suggest a dominant fracture trend of N 51°-55° E. Field mapping, VLF surveys, and seismic reflection data suggest that this fault could be an en echelon continuation of the SE 10.9 fault (see Figures C-1 and C-2; and Appendix D, Geophysical Surveys).
- Offset in Borings: Correlation of lithologic and wire-line logs from borings SI 2A and SI 2B with previous boring BI 2A indicates approximately 80 feet of down-to-the- southeast displacement along this fault. Analysis of wire-line logs from angled corehole SI 2C indicates that this boring penetrated a fault with approximately 37 feet of down-to- the-southeast offset. A second fault, near SI 2B (based on VLF data and field mapping of calcite in float), should have similar offset down to the southeast (see Geologic Cross-Section, Figure C-3). The overall interpretation is approximately 80 feet of down-to-the-southeast displacement along at least two faults.
- Mineralization/Alteration: Mapping of vein calcite in the SI 2 area indicates that the fault zone is healed by calcite mineralization. Exposed calcite veins northeast and southwest of boring SI 2A are typically slickensided and range from less than 0.1 foot to over 0.6 foot thick. The entire zone of calcite veining is approximately 300 feet wide at the surface (see Geologic Map, Figure C-2).

  The lithologic log for angled corehole SI 2C, which crosses the southerly SI 2 fault, indicates that rock adjacent to the fault is weathered at depth and consists of soft to medium-hard limestone that is yellowish-tan colored with oxidized pyrite. This zone contains calcite veins with crystals up to 0.1 foot in diameter and numerous void spaces. The photographic log (Table C-1) indicates that the fractures along the fault are filled with calcite up to 2 inches thick and void spaces ¼ inch to ½ inch wide are common.
- Direction of Dip: Near-vertical slickensides are present on most mapped calcite veins with predominant strikes ranging from N 22°-61° E with 28°-87° southeast dips (see Geologic Map). VLF data suggest a dominant fracture trend of N 51°-55°E. The photographic log from a boring depth of 170.0 to 211.0 feet indicates that the fractures have a N9°W to N35°E strike and dips of 20° to 71° north and 82° southeast (see photographic log Table C-1).

- Width of Fault Zone: Data collected from two rotary borings, one vertical corehole, one angled corehole, VLF geophysical surveys, and geologic mapping suggest that the fault zone is approximately 300 feet wide. Seismic reflection data 2 miles southwest of boring SI 2C indicate that the fault zone is approximately 160 feet wide. Analysis of boring data indicates that the zone consists of at least two steeply dipping (approximately 65° SE) normal faults (see Geologic Cross-Section). The 65° southeast dips of the SI 2 faults were determined on the basis of limited field data (i.e., attitudes and locations of slickensides on healed calcite veins), VLF surveys, and the occurrence of similar structures (SIR 3B, SF 10.1) in the SSC study area.

  Analysis of wire-line and lithologic logs from angled corehole SI 2C shows a relatively discrete zone of sheared chalk 9.6 feet wide at a depth of about 190 feet (see lithologic logs, Appendix A, and wire-line logs, Appendix B). Assuming a 65° southeasterly dip of the fault, the thickness of the fault zone is about 8.7 feet. One fracture orientation (N 23° E, 13° NW) was obtained from boring SI 2C 18 feet (angle) above the fault. The relatively low angle dip may reflect drag or rotation of bedding planes along the fault.



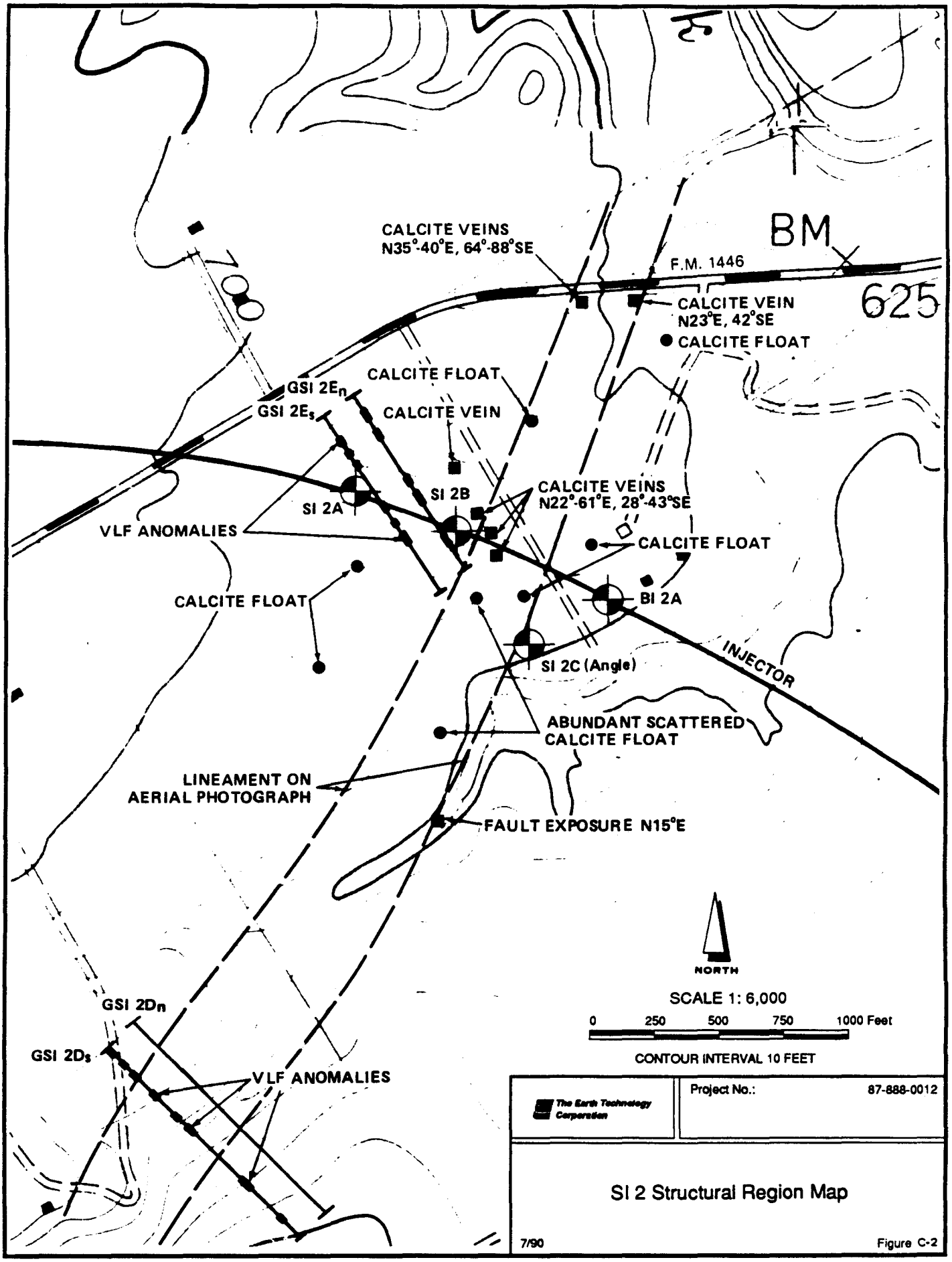
The Earth Technology Corporation

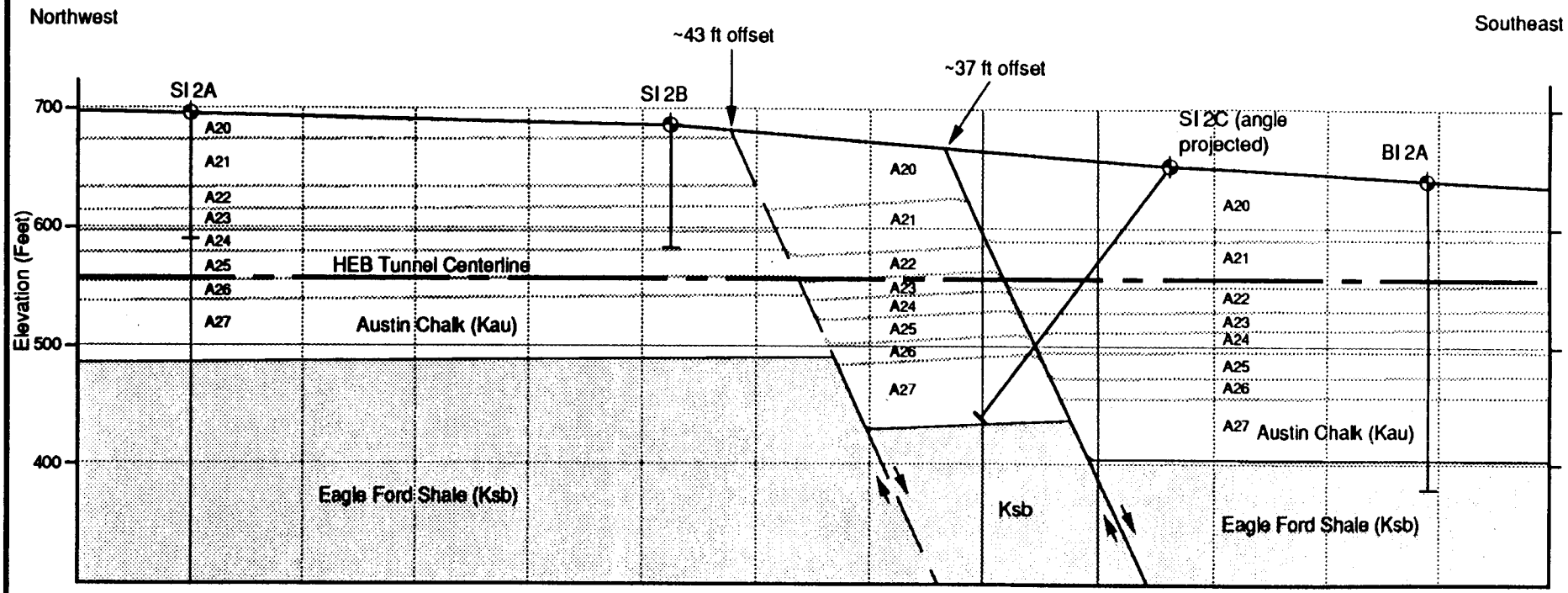
Project No.: 87-888-0012

SI 2 Regional Structure and Geophysical Seismic Line Map

7/90

Figure C-1


CALCITE VEINS
N35°-40°E, 64°-88°SE
BM
F.M. 1446
625
CALCITE VEIN
N23°E, 42°SE
CALCITE FLOAT
CALCITE FLOAT
GSI 2En
GSI 2Es
CALCITE VEIN
SI 2A
SI 2B
CALCITE VEINS
N22°-61°E, 28°-43°SE
VLF ANOMALIES
CALCITE FLOAT
CALCITE FLOAT
BI 2A
SI 2C (Angle)
INJECTOR
ABUNDANT SCATTERED
CALCITE FLOAT
LINEAMENT ON
AERIAL PHOTOGRAPH
FAULT EXPOSURE N15°E
NORTH
SCALE 1: 6,000
0 250 500 750 1000 Feet
CONTOUR INTERVAL 10 FEET
GSI 2Dn
GSI 2Ds
VLF ANOMALIES
The Earth Technology Corporation
Project No.: 87-888-0012
SI 2 Structural Region Map
7/90
Figure C-2



0 100 200 Feet

Horizontal Scale

0 100 200 Feet

Vertical Scale

The Earth Technology Corporation

Project No.: 87-888-0012

SI 2 Geologic Cross-Section

7-90

Figure C 3

DALLAS/FT. WORTH
SSC PROJECT

PHOTOGRAPHIC LOG

Boring No. SI 2C

Date Photographed: 3/24/90
Bearing: N65°W
Vertical Angle: 40° (plunge 50°) NW
Surface Elevation: ~ 655'

Iris Setting: ~ 10.5
Boring Condition: Fair-Poor
Water Condition: Fair
Rock Section Photo: 171.0-211.0

Inclined Depth(ft)	Structural Feature	Notes
171.0		Start Photography
173.1-173.2	Fracture, hairline, appears tight, Strike Trend N 17°E Dip Trend 20°WNW	
183.6-191.3	Zone of tan weathered Austin Chalk	
183.9	Fracture, hairline, discontinuous	
184.2	Fracture, hairline, discontinuous	
185.2-185.3	Multiple parallel (3) hairline fractures very closely spaced, closed to very narrow Strike Trend N 17° E Dip Trend 82°ESE	
185.5-187.6	Complex fracture zone, some rock missing in places (1/4" to 1/2") abundant calcite filling up to 2" or more with irregularly spaced apparently clay or severely weathered limestone filled pockets. Approx. 12 fractures noted. Major Fracture Trend Strike Trend N 35° E Dip Trend 60°NW Minor Fracture Trend Strike Trend N 9°W Dip Trend 71°ENE	
211.0		Terminate Photography

NOTES:
1) Fair to poor conditions may obstruct other fractures from camera view
2) All strike and dip trends were resolved from apparent trends to "true trends" assuming field bearing and field plunge by stereographic projection techniques
3) No other structural defects were distinguishable

TABLE C-1

DALLAS/FT. WORTH
SSC PROJECT

PHOTOGRAPHIC LOG

Boring No. SI 2C

Date Photographed: 3/24/90
Bearing: N65°W
Vertical Angle: 40° (plunge 50°) NW
Surface Elevation: ~ 655'

Iris Setting: ~ 10.5
Boring Condition: Fair-Poor
Water Condition: Fair
Rock Section Photo: 171.0-211.0

Inclined Depth(ft)	Structural Feature	Notes
171.0		Start Photography
173.1-173.2	Fracture, hairline, appears tight, Strike Trend N 17°E Dip Trend 20°WNW	
183.6-191.3	Zone of tan weathered Austin Chalk	
183.9	Fracture, hairline, discontinuous	
184.2	Fracture, hairline, discontinuous	
185.2-185.3	Multiple parallel (3) hairline fractures very closely spaced, closed to very narrow Strike Trend N 17° E Dip Trend 82°ESE	
185.5-187.6	Complex fracture zone, some rock missing in places (1/4" to 1/2") abundant calcite filling up to 2" or more with irregularly spaced apparently clay or severely weathered limestone filled pockets. Approx. 12 fractures noted. Major Fracture Trend Strike Trend N 35° E Dip Trend 60°NW Minor Fracture Trend Strike Trend N 9° W Dip Trend 71°ENE	
211.0		Terminate Photography

NOTES:
1) Fair to poor conditions may obstruct other fractures from camera view
2) All strike and dip trends were resolved from apparent trends to "true trends" assuming field bearing and field plunge by stereographic projection techniques
3) No other structural defects were distinguishable

TABLE C-1

APPENDIX D

GEOPHYSICAL SURVEYS

APPENDIX D
GEOPHYSICAL SURVEYS

The objective of the geophysical surveys was to locate faults previously identified by geologic mapping near the medium- and high-energy boosters and the IR 3 experimental hall. Two geophysical techniques were used: very low frequency (VLF) surveys; and high resolution seismic reflection surveys.

VLF Surveys: A VLF technique was used to map electrically conductive subsurface zones. Water- and/or saturated clay-filled, normal faults within the Austin Chalk could produce such anomalies.

The ABEM Company "WADI" system was used to collect the VLF data. This system can measure and store the horizontal component of the primary VLF signal and both the in-phase and quadrature-phase of the vertical component of the induced secondary signal. The system also stores profile geometry. The instruments and capabilities are described by ABEM (1987a).

At each site, the probable fault location was determined by interpreting aerial photographs and by geologic field mapping. A VLF profile was constructed perpendicular to the suspected fault trace to more accurately define the fault's location. Another profile was then constructed parallel with the first and offset 100 to 130 feet. Profiles usually terminated at buried utilities, metal fences, or other cultural features that would have negatively affected data quality. Stations along the profiles were established at 16.4-foot intervals using a measuring tape. Detailed VLF measuring procedures are described by ABEM (1987a). Data were continuously monitored during acquisition to ensure good data quality.

Data were electronically transferred from the instrument to a personal computer for analysis. Data were convolved with an Hjelt filter (Wright, 1988) and the resulting cross-sections plotted. Raw data files and graphs, pseudo-sections, and individual cross sections were plotted. All data and results were stored on diskette. Qualitative interpretations of the data followed the procedures described by ABEM (1987b) and Wright (1988).

VLF anomalies thought to represent faults in the Austin Chalk were highlighted on the cross sections and transferred to the base maps. Similar shaped anomalies on the pair of lines at a site were connected and the general anomaly direction measured. The anomalies' locations and orientations were compared to the expected fault characteristics. Profile and anomaly locations were marked on aerial photographs and USGS quad maps (scale 1:24,000). See Figure C-1, structure study map, for the location of the VLF lines and the identified anomalies. Figures D-1 through D-6 are profiles of the actual data. VLF anomalies are interpreted as high-value peaks on the filtered data graphs.

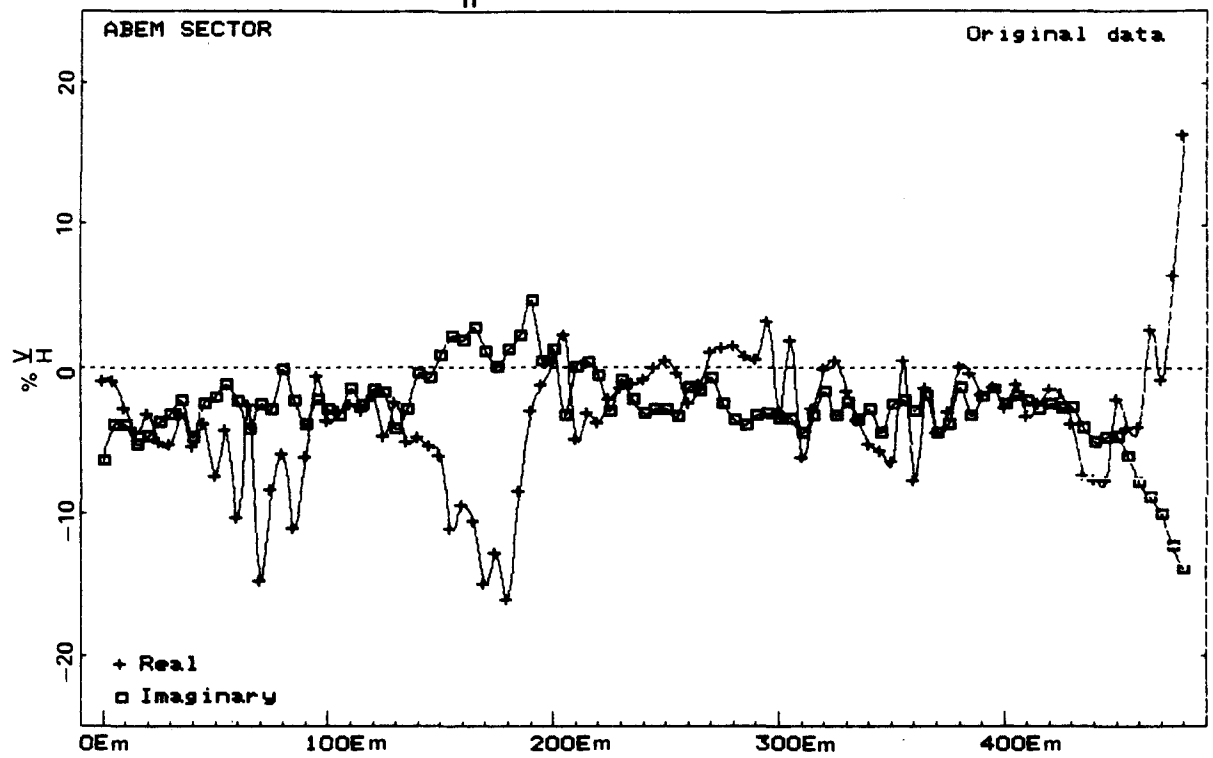
REFERENCES:

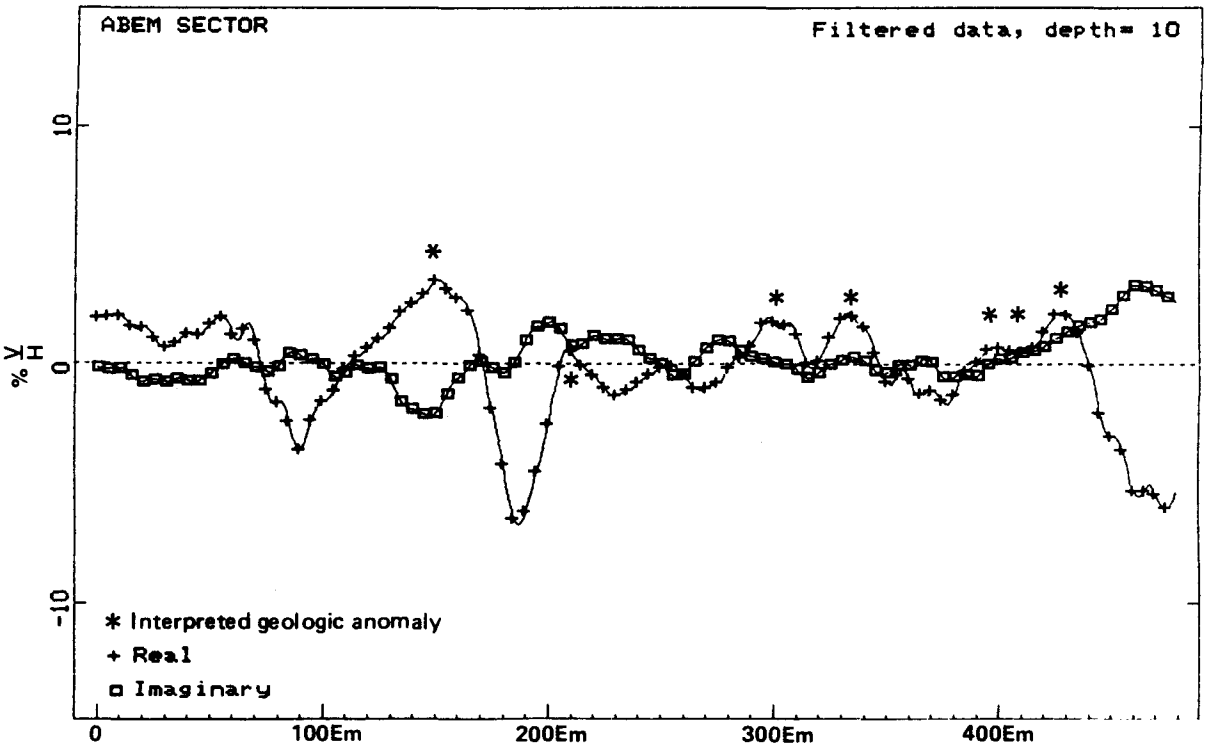
ABEM, 1987a. WADI INSTRUCTION MANUAL, Bromma, Sweden.

ABEM, 1987b. WADI INTERPRETATION GUIDE, Bromma, Sweden.

Wright, J.L., 1988. VLF INTERPRETATION MANUAL, Ontario, Canada.

Profile: 0040S (24 kHz) GSI $2C_n$ → S74°E





The Earth Technology Corporation

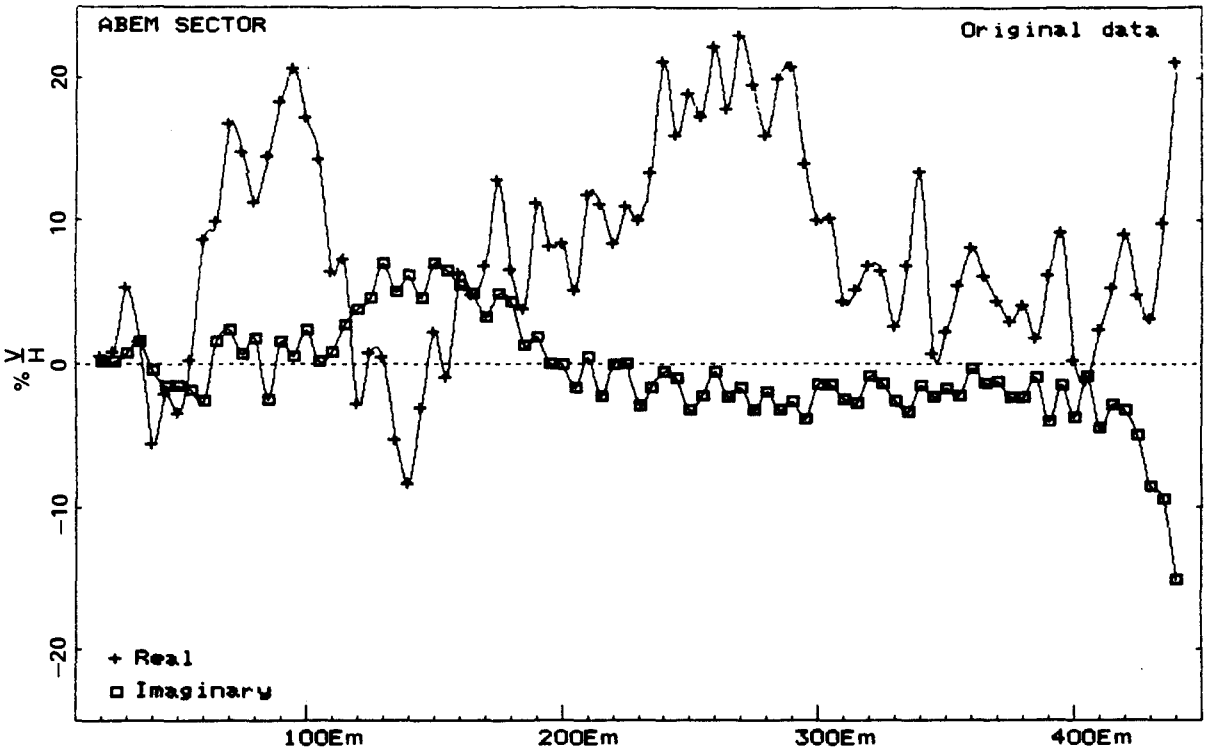
Project No.: 87-888-0012

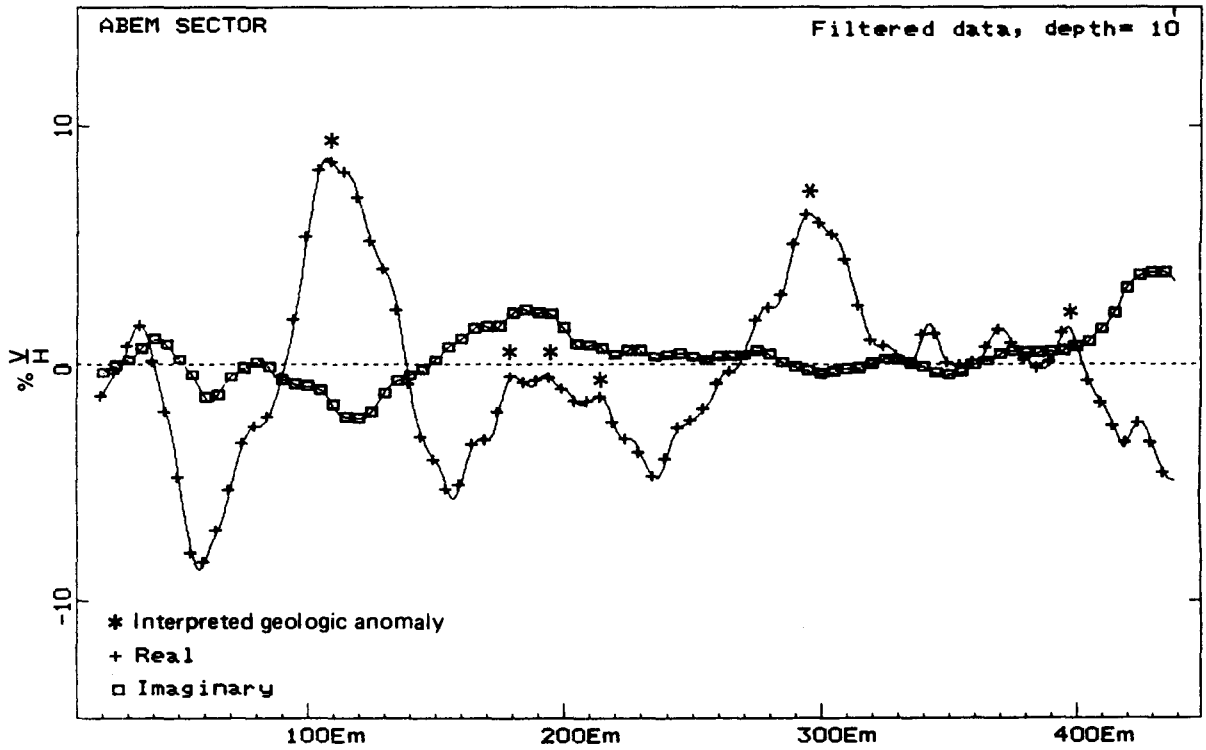
VLF Profile
GSI $2C_n$

7/90

Figure D-1

Profile: 0052S (24 kHz) GSI $2C_s$ S74°E





The Earth Technology Corporation

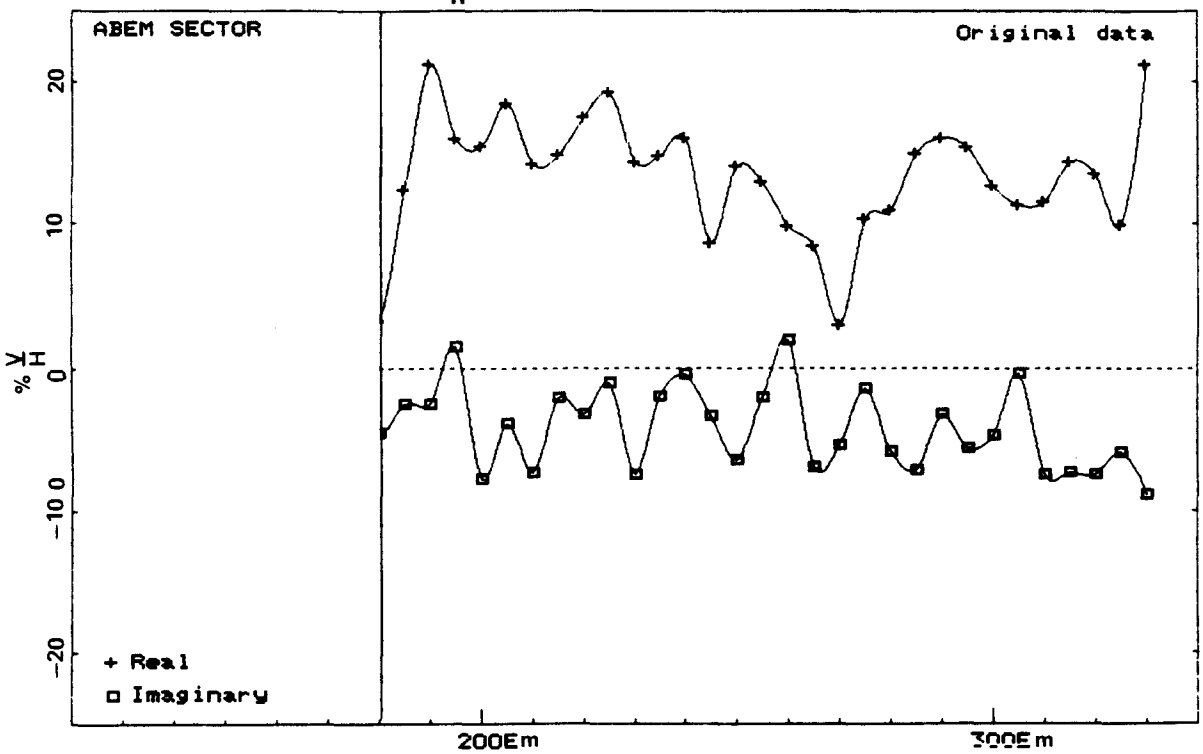
Project No.: 87-888-0012

VLF Profile
GSI $2C_s$

7/90

Figure D-2

Profile: 0019S (24 kHz) **GSI 2D$_n$** **S43°E**



NOT ENOUGH DATA TO FILTER

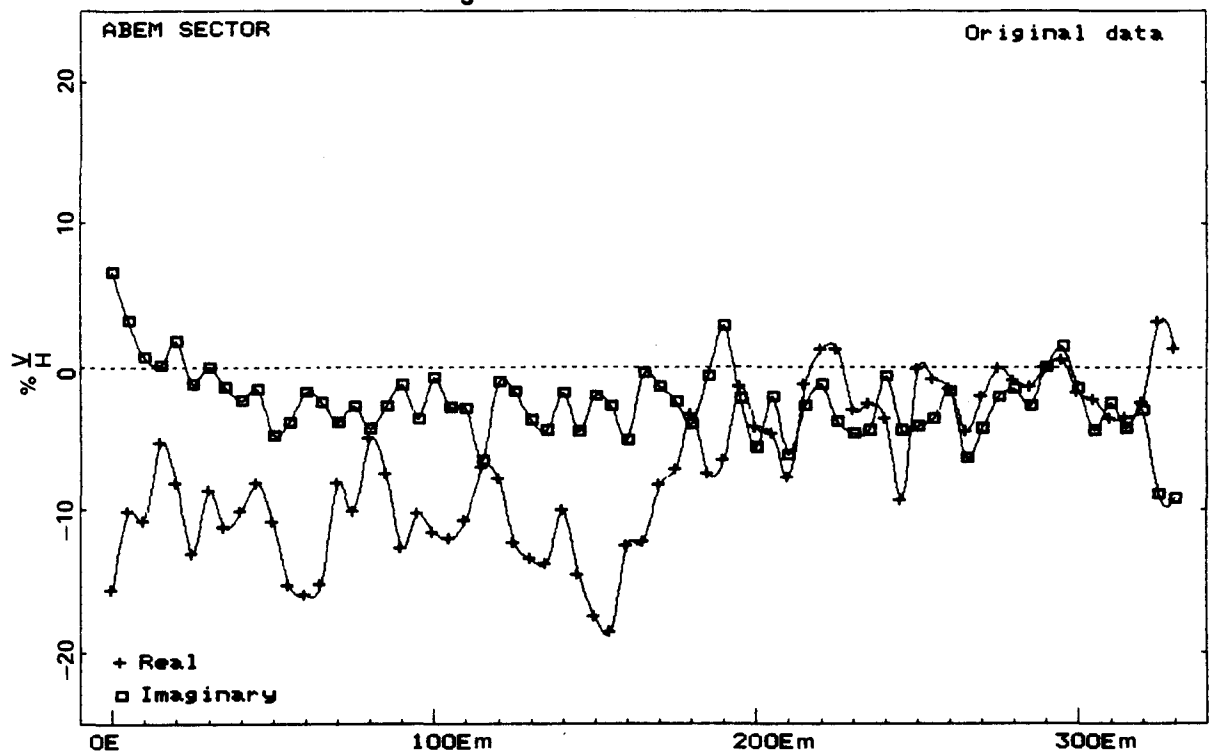
The Earth Technology Corporation	Project No.:	87-888-0012

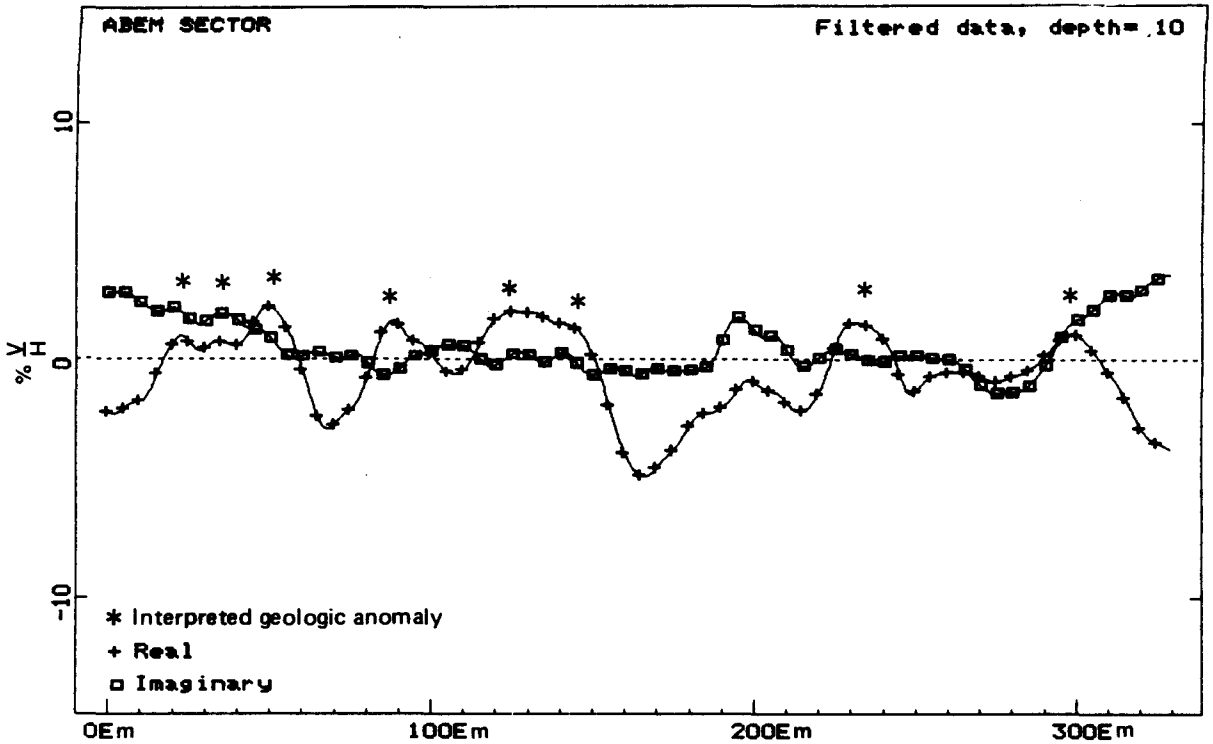
VLF Profile
GSI 2D$_n$

5/90

Figure D-3

Profile: 0020S (24 kHz) **GSI 2D$_S$** **S43°E**





The Earth Technology Corporation

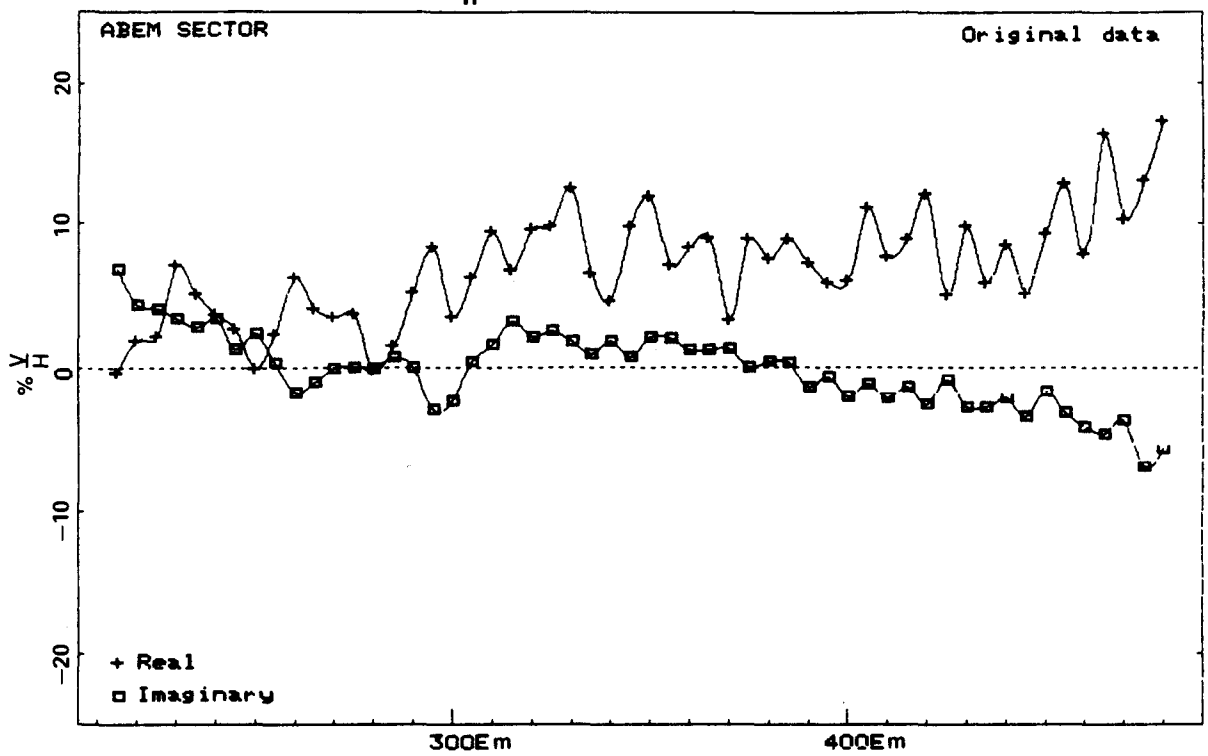
Project No.: 87-888-0012

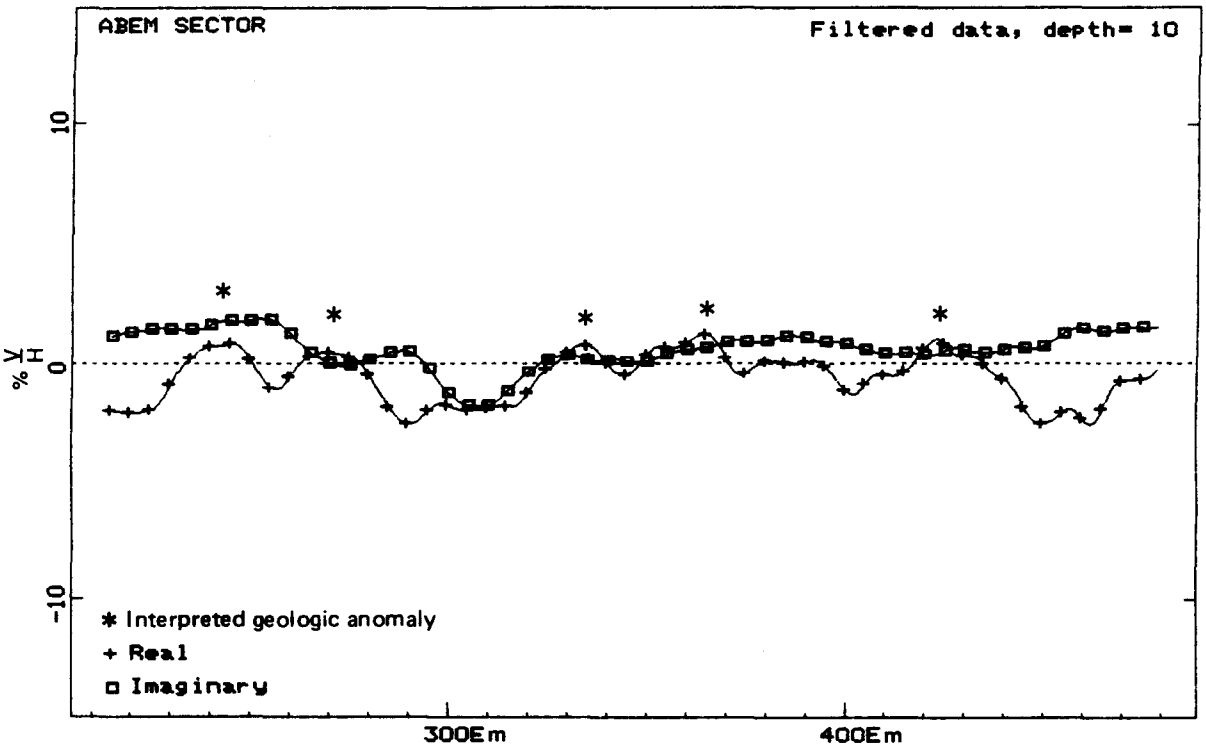
VLF Profile
GSI 2D$_S$

7/90

Figure D-4

Profile: 0000S (24 kHz) **GSI 2E$_n$** **S23°E**





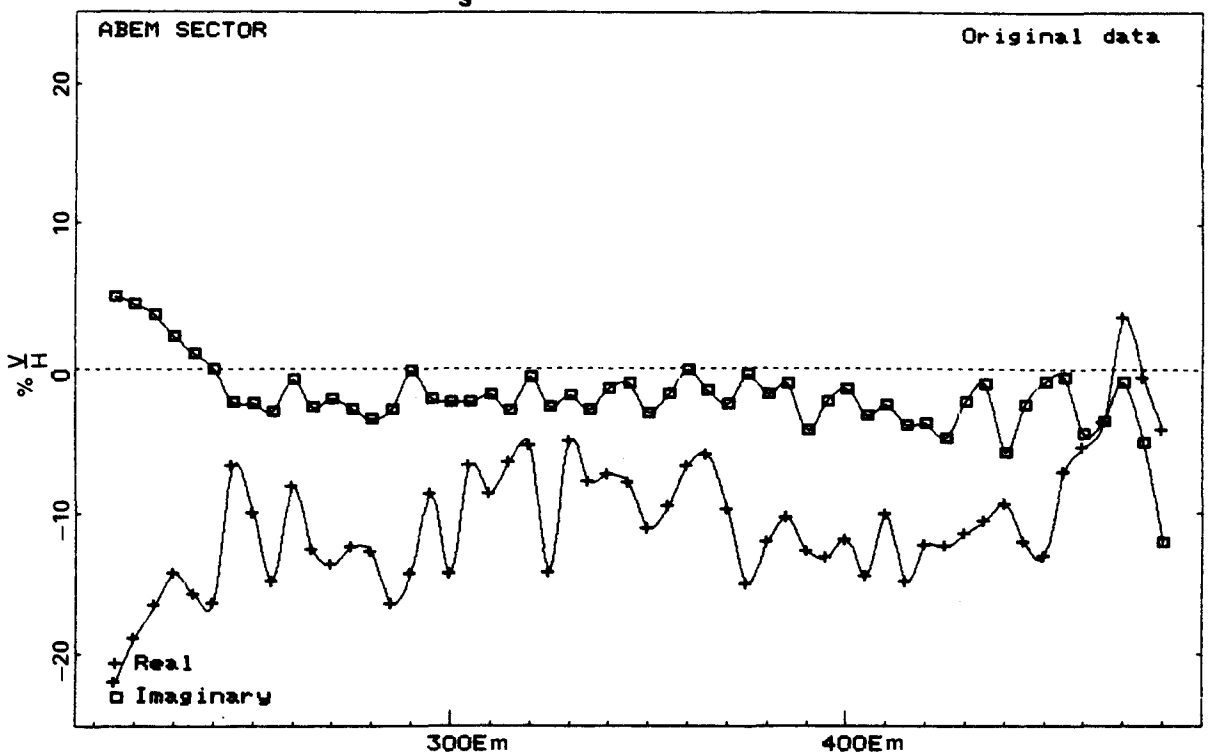
The Earth Technology Corporation	Project No.: 87-888-0012

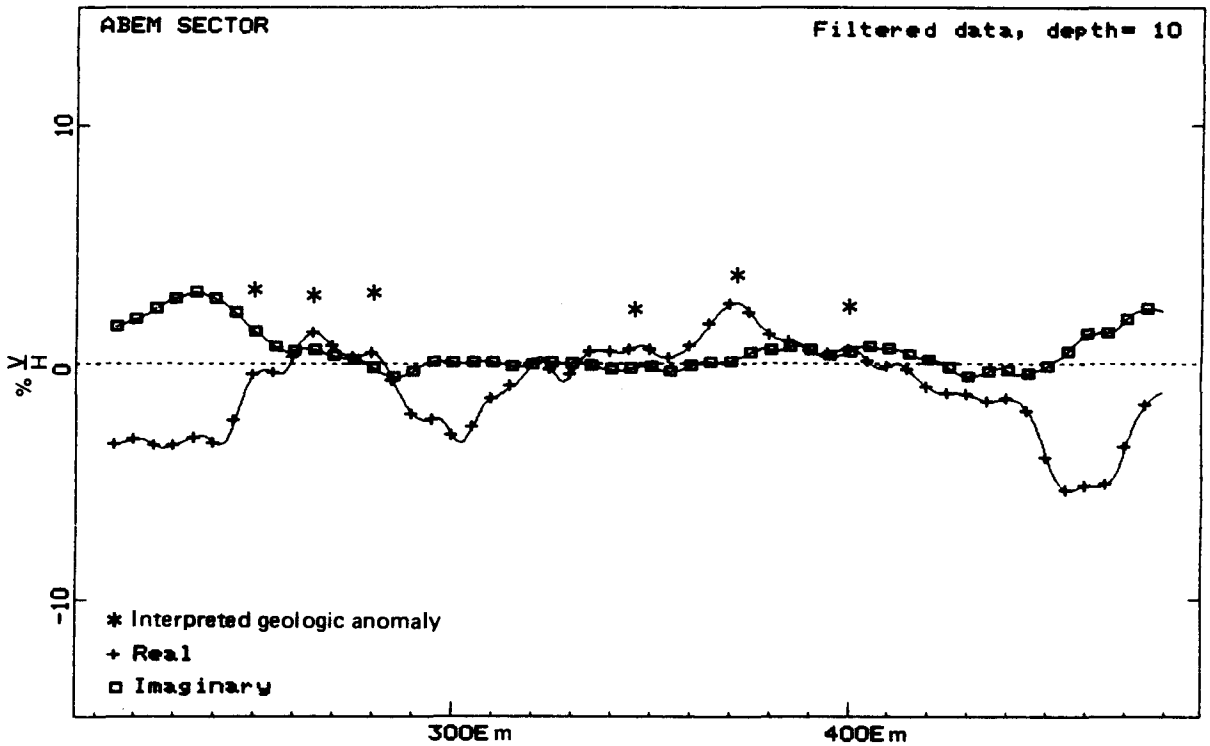
VLF Profile
GSI 2E$_n$

7/90

Figure D-5

Profile: 0011S (24 kHz) GSI $2E_s$ S23°E





The Earth Technology Corporation	Project No.:	87-888-0012

VLF Profile
GSI $2E_s$

7/90

Figure D-6

Seismic Reflection Profiles:

Figures D-7 through D-9 are high-resolution shallow penetration seismic reflection lines across the fault about 2 miles south-southwest of boring SI 2A. These seismic reflection surveys were used to locate offset strata and contacts.

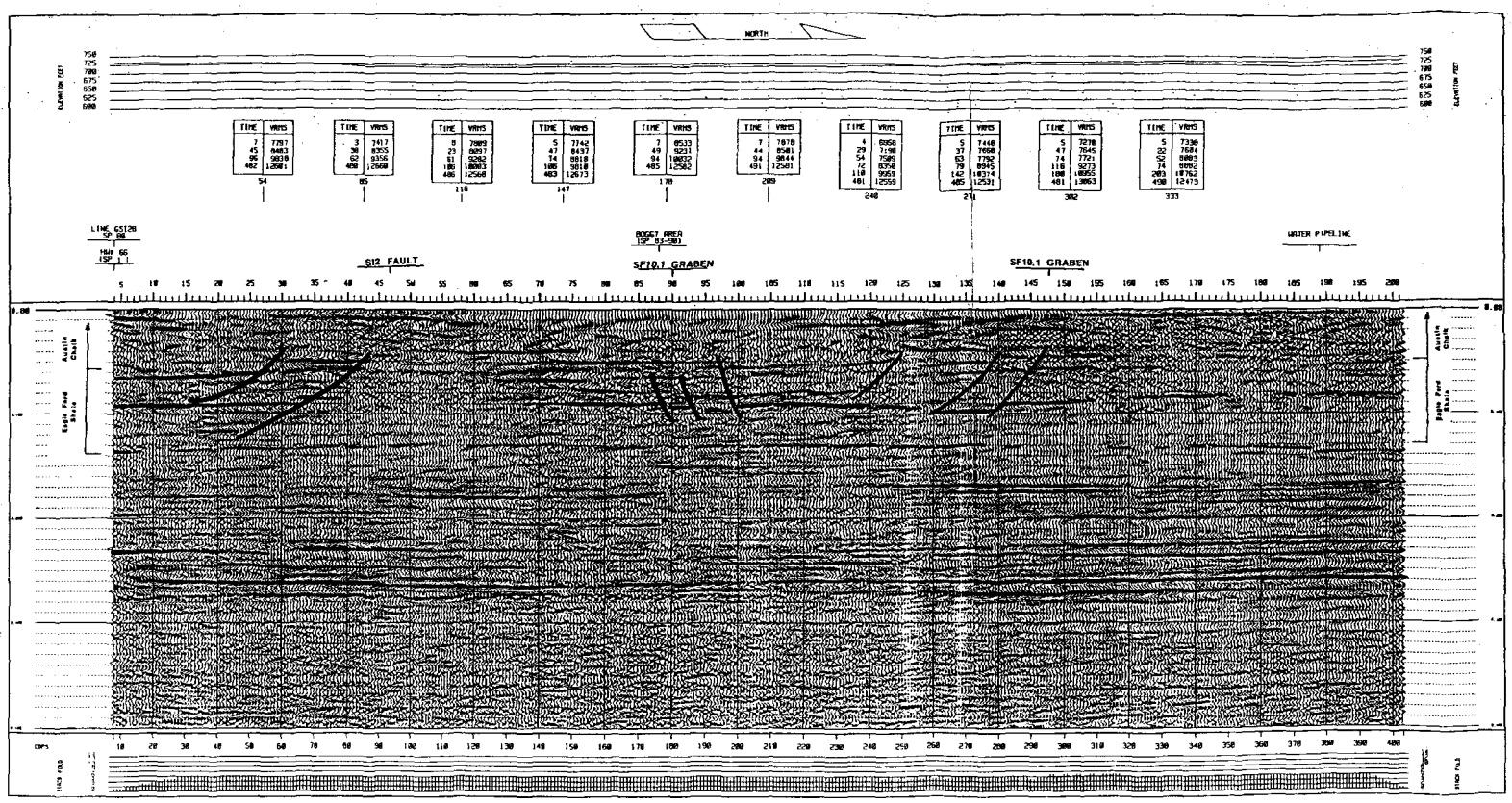
Figure D-7 shows seismic reflection results along Arrowhead Road south of Highway 66. An anomalous region occurs near shotpoint 205 where the Austin Chalk/Eagle Ford Shale contact and an intermediate reflection layer seem offset only slightly. This might be an expression of a fault; note however, that this is near the end of the line where fold is rapidly falling off, and data quality is decreased. The presence of this fault is only suggested but is not certain or even clear enough to be able to estimate offset.

Figure D-8 is a more east-west trending line off the northern end of Figure D-7; it intersects the southern end of Figure D-9. As such, this line should detect both the northern extension of fault SE 10.9 (if it extends this far north) and the SI 2 fault mapped north of Highway 66. By tieing the reflections of Figure D-7 to those of Figure D-8, we are able to bring the same reflecting horizons onto the interpreted record section. The fault is clearer on this line and shows apparently greater displacement of the intermediate reflection than of the Austin Chalk/Eagle Ford Shale contact. This is somewhat misleading and is caused by the unusual velocity inversion structure of a higher velocity Austin Chalk overlying a slower Eagle Ford Shale. For example, a hypothetical 20-foot displacement of the Austin Chalk/Eagle Ford Shale contact would be a *time* displacement of 0.004 seconds. This same 20-foot displacement of the intermediate layer (because of the low, 6,300 feet/second velocity of the Eagle Ford Shale) would result in a time displacement of 0.006 seconds at its level. Therefore, the same displacement would appear 50 percent larger for the intermediate layer than for the Austin Chalk/Eagle Ford Shale contact on a reflection section. This false indication of a displacement being seen deeper and not shallower at this location suggests that the displacement is likely small.

Figure D-9 was the initial line acquired. It runs north along Arrowhead Road from Highway 66, for just over 2,000 feet. The line crosses a boggy creek area from approximately shot points 83 to 93. Heavy vegetation cover in this area made for poorer source and geophone ground coupling and increased wind noise. The line should cross at least two structural features: the same SI 2 fault and a graben (SF 10.1). The seismic section shows the same sets of reflections as seen on all other lines. This seismic reflection profile shows a possible fault or fault zone between shot points 35 and 45 that corresponds to the approximate position of fault SI 2. Here too, the fault is elusive; there is a definite offset of the intermediate reflection (down to the southeast) and a less clearly defined offset of the Austin Chalk/Eagle Ford Shale contact. The Austin Chalk/Eagle Ford Shale reflection is lost south of the fault, making it difficult to estimate whether it truly is offset at that location.

REFERENCES:

LCT Geophysical Services, 1990. Seismic Reflection Investigation Superconducting Super Collider Ring near Waxahachie, Texas, Technical Memorandum prepared for RTK Joint Venture, Oakland, California.



RTK

PROSPECT : SUPERCOLLIDER TEST

WAXAHACHIE, TX

LINE GSI2A

SPS. 1 - 193

MIGRATION

RECORDING PARAMETERS

DATE	:	2/4/90
RECORDED BY	:	CET HOUSTON, INC.
PARTY NO	:	1
ENERGY SOURCE	:	DYNAMITE
SOURCE SIZE	:	12 LBS.
SHOT INTERVAL	:	50 FT
CABLE	:	24 OVER TRACES
GEOPHONE PATTERN	:	SINGLE
GROUP INTERVAL	:	10 FT
RECORDING INSTRUMENTS	:	DFS-IVRS
FORMAT	:	SEG-Y DFS/FPV DISKS
SAMPLE RATE	:	1 MSEC
FILTER	:	LOW : 10 HZ HI : 100 HZ

PROCESSING PARAMETERS

1 REFORMAT
2 TRACE EDIT
3 SPHERICAL DIVERGENCE CORRECTION
4 REFRACTION STATICS ANALYSIS
5 DECONVOLUTION: BURG TECHNIQUE ON SHOT CHANNELS 25 FT GROUPING
6 CDP SORT
7 SPECTRAL WHITENING 70 - 300 HZ
8 VELOCITY ANALYSIS
9 TRIM STATICS
10 VELOCITY ANALYSIS
11 NMO APPLICATION
12 NMO STRETCH MUTE
13 STACK GMSC
14 SURFACE TO FIXED DATUM. DATUM = 700 FT.
15 ENHIGHT : TRU-F NOISE REDUCTION
16 MIGRATION
17 FILTER 30 - 250 HZ
18 200 MSEC SLIDING GATE BALANCE
19 DISPLAY

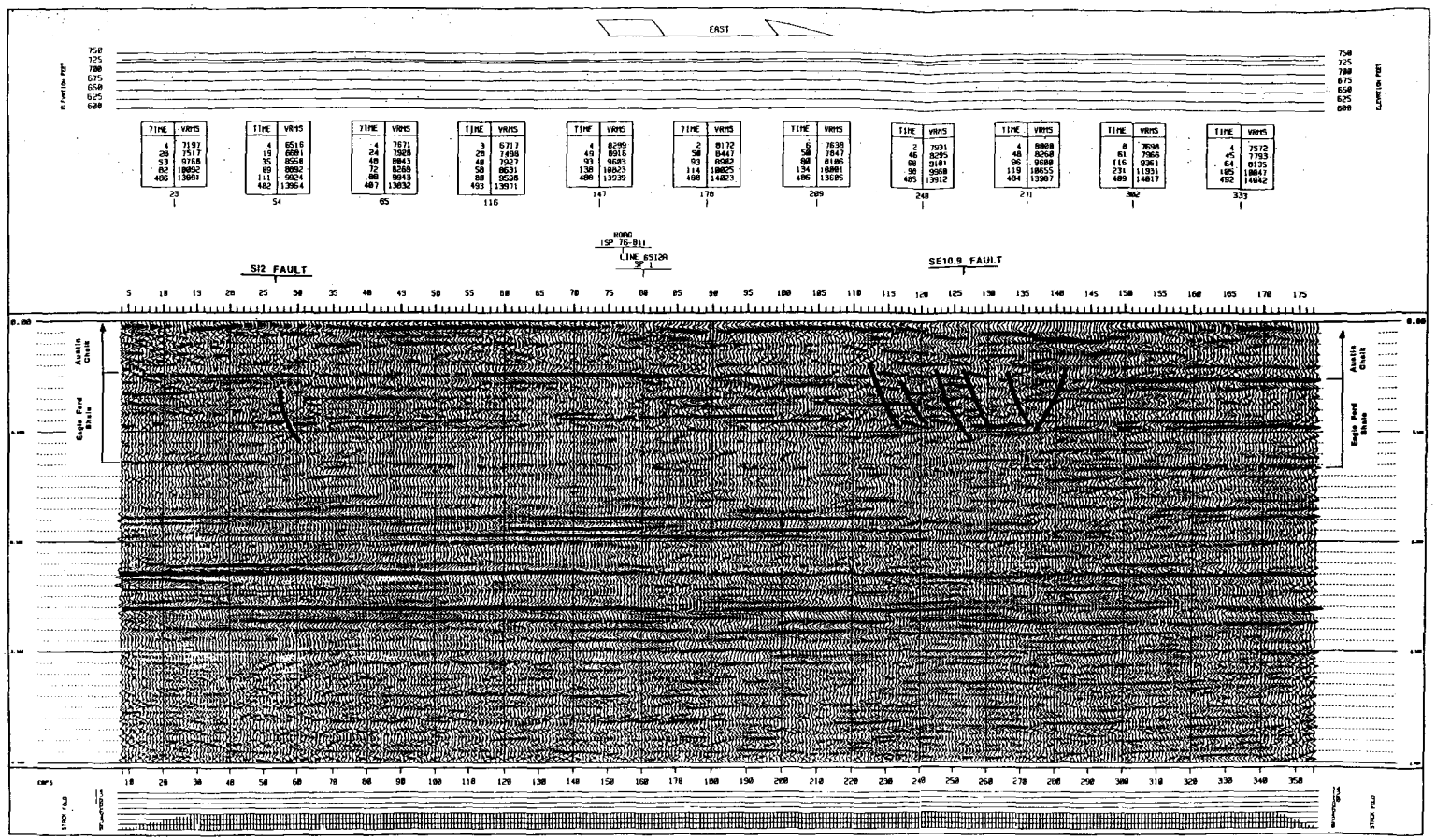
PRESENTATION

VERTICAL SCALE	:	200.0 MS/SEC
HORIZONTAL SCALE	:	12 TR/IN
GAIN	:	1.0
EDIT	:	6
POLARITY	:	SEG POSITIVE
PROCESSING DATE	:	FEBRUARY, 1990

ENTROPIC GEOPHYSICAL

11255 DENPH FORWORD #105
HOUSTON, TX 77015

Figure D-7
Seismic Reflection Profile
Structure Study Zone SI 2



RTK

PROSPECT : SUPERCOLLIDER TEST

WAXAHACHIE, TX

LINE GSI2B

SPS. 1 - 169

MIGRATION

RECORDING PARAMETERS

DATE	:	3/7/88
ACQUIRED BY	:	LCT HOUSTON, INC.
PARTY NO	:	1
CHANNEL SOURCE	:	BUFFALO GUN
CHANNEL SIZE	:	12 GAUGE
SHOT INTERVAL	:	20 FT
CABLE	:	24 GRTR TRACES
GEOPHONE PATTERN	:	SINGLE
GROUP INTERVAL	:	10 FT
RECORDING INSTRUMENTS	:	ES-2401
FORMAT	:	SEG-1 (FLOPPY DISK)
SAMPLE RATE	:	1 MSEC
FILTER	:	LOW : 70 HZ HI : 500 HZ

PROCESSING PARAMETERS

1 REFORMAT
2 TRACE EDIT
3 SPHERICAL DIVERGENCE CORRECTION
4 REFRACTION STATICS ANALYSIS
5 DECONVOLUTION SURF TECHNIQUE ON SHOT EXCEPTIONS 21 FT OPERATOR
6 CDP SORT
7 SPECTRAL WHITENING 70 - 300 HZ
8 VELOCITY ANALYSIS
9 TRUN STATICS
10 VELOCITY ANALYSIS
11 NMO APPLICATION
12 NMO STRETCH MUTE
13 STACK 600%
14 SURFACE TO FIXED DATUM DATUM = 700 FT.
15 ENSIGHT : TRU-F NOISE REDUCTION
16 MIGRATION
17 FILTER 70 - 250 HZ
18 200 MSEC SLIDING GATE BALANCE
19 DISPLAY

PRESENTATION

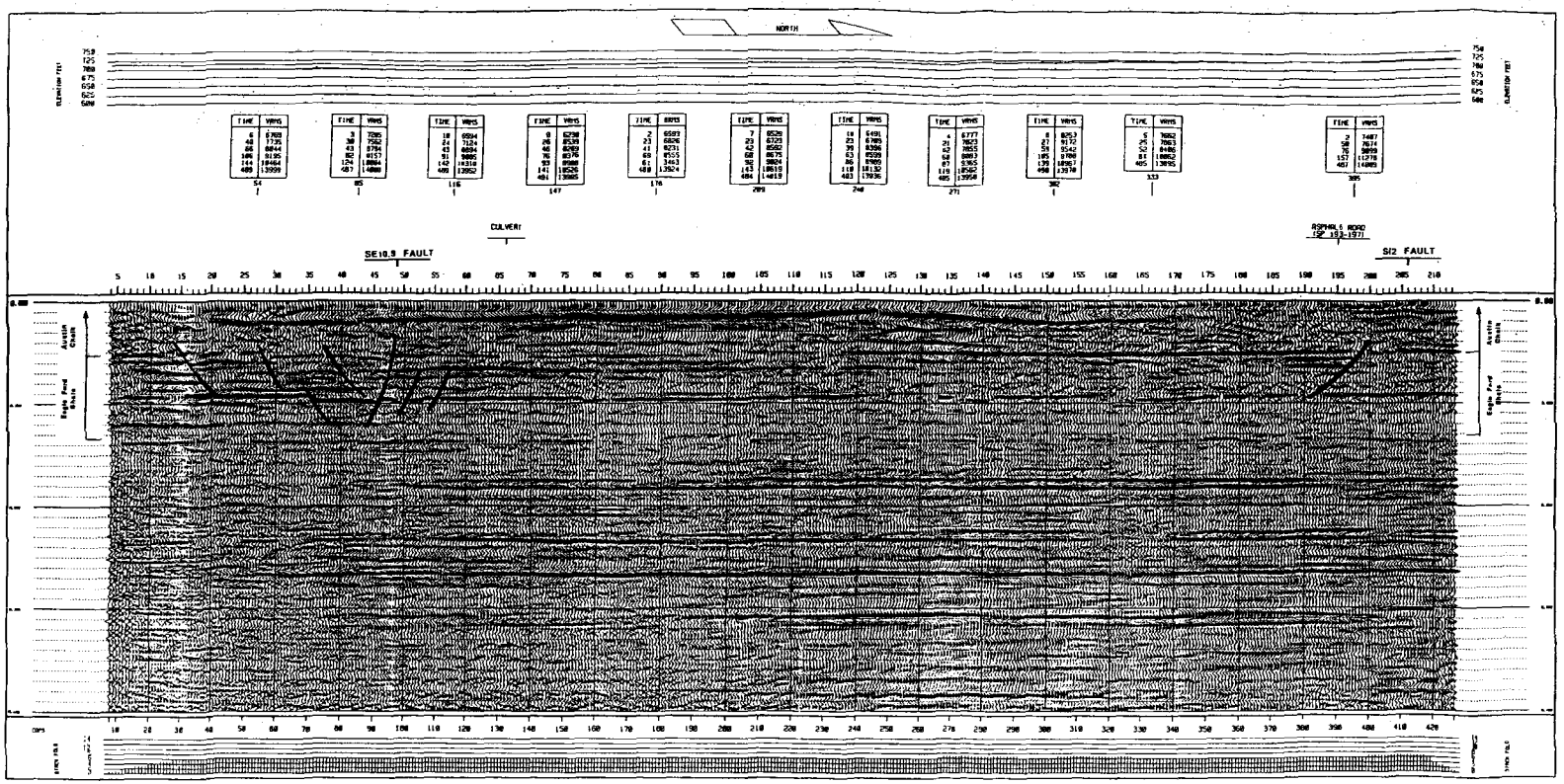
VERTICAL SCALE	:	20.0 INS/SEC
HORIZONTAL SCALE	:	12 TR/IN
GAIN	:	0
BIAS	:	0
POLARITY	:	SEG POSITIVE
PROCESSING DATE	:	FEBRUARY, 1988

ENTROPIC GEOPHYSICAL

1195 DRIVE ASHFORD #185
HOUSTON, TX 77079

Figure D-8

Seismic Reflection Profile
Structure Study Zone SI 2



RTK

PROSPECT : SUPERCOLLIDER TEST

WAXAHACHIE, TX

LINE GSE10.9

SPS. 1 - 205

MIGRATION

RECORDING PARAMETERS

DATE	:	2/5/88
RECORDED BY	:	CGG VOLNTSOV, INC.
PROCESSED BY	:	
ENERGY SOURCE	:	BUFFALO GUN
SOURCE SIZE	:	20 GAUGE
SHOT INTERVAL	:	50 FT
CABLE	:	24 DATA TRACES
SOURCE-SPACE PATTERN	:	SINGLE
GROUP INTERVAL	:	10 FT
RECORDING INSTRUMENTS	:	DFS-IVHS
FORMAT	:	9 TRACK, FLOPPY DISKS
SAMPLE RATE	:	2 MS
FILTER	:	LOW : 140 HZ HI : 300 HZ

PROCESSING PARAMETERS

1 REFORMAT
2 TRACE EDIT
3 SPHERICAL DIVERGENCE CORRECTION
4 REFRACTION STATICS ANALYSIS
5 DECONVOLUTION: BURG TECHNIQUE ON SHOT ENSEMBLE 21 PT OPERATOR
6 CDP SORT
7 SPECTRAL WHITENING 70 - 300 HZ
8 VELOCITY ANALYSIS
9 TRIM STATICS
10 VELOCITY ANALYSIS
11 NMO APPLICATION
12 NMO STRETCH MUTE
13 STACK 600%
14 SURFACE TO FIXED DATUM. DATUM = 700 FT.
15 ENSIGHT : TRI-P NOISE REDUCTION
16 MIGRATION
17 FILTER 70 - 250 HZ
18 200 MSEC SLIDING DATE BALANCE
19 DISPLAY

PRESENTATION

VERTICAL SCALE	:	20.0 MS/SEC
HORIZONTAL SCALE	:	14.70/IN
GAIN	:	1.0
BIAS	:	0
POLARITY	:	SEG POSITIVE
PROCESSING DATE	:	FEBRUARY, 1988

ENTROPIC GEOPHYSICAL

1100 TRIPH, PO#1202-4195
HOUSTON, TX 77079

Figure D-9
Seismic Reflection Profile
Structure Study Zone SI 2

APPENDIX E

HYDROLOGIC TEST RESULTS

APPENDIX E

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)
SI 2C	177.7-198.8 (136.1-152.3 vertical)	180	15	Austin Chalk	2.9×10^{-5}

* Based on static water level of 12.2 feet below ground surface.

At boring SI 2C one test interval was selected based on a review of the lithologic and wire-line logs. The test interval was selected to provide hydrologic data for fractured Austin Chalk along the suspected fault. Hydrologic (packer) testing followed the general procedures outlined above. Packer and gauge pressures used during the testing along with the calculated hydraulic conductivities are listed in the table above. Flow volumes were measured using a flow meter; no calibrated container was used for the tests.

GEOMECHANICAL TEST RESULTS–BORING SI 2C

GENERAL LITHOLOGY	VERTICAL DEPTH	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 TABOR ABRASION/ HARDNESS INDEX	SWELL PRESSURE INDEX	COMMENTS
						LL	PI						CONFINING PRESSURE σ_3	DEVIATOR STRESS $\sigma_1-\sigma_3$		ES0	UNLOAD/ RELOAD	σ_3						
	feet	feet	percent	pcf				percent	percent	L/D	DEGREES*	psi	psi	psi	percent	(psi)x10E5	(psi)x10E5	psi		psi	percent			
AUSTIN CHALK	144.3	180.4	14.7	119.3						2.3	B-2/40		100	1252	0.63	3.43		100						
AUSTIN CHALK	144.7	180.8	14.7	117.3						2.3	B-1/40		200	1844	0.83	2.42		200						NOTE 1
AUSTIN CHALK	144.7	180.6														5.05			0.21					NOTE 2
AUSTIN CHALK	145.1	181.4	15.8	114.2	2.67					2.1	D	891			0.26	3.81		0						
AUSTIN CHALK	145.4	181.8	14.1	117.1																				
AUSTIN CHALK	147.0	183.8	14.3	119.2																				
AUSTIN CHALK	147.3	184.2	13.2	121.5						2.3	O	1330			0.58	2.42		0						
AUSTIN CHALK	148.3	185.5	15.2	111.6						0.5										147				
AUSTIN CHALK	148.4	185.7	15.5	115.2																				
AUSTIN CHALK	149.4	187.0	19.1	107.4																				
AUSTIN CHALK	149.7	187.4	17.9	112.2						2.4	B-2/40	467			0.28	2.19		0						
AUSTIN CHALK	156.2	195.7	25.4	101.7																				
AUSTIN CHALK	156.4	196.0	20.8	103.9																				
AUSTIN CHALK	156.8	196.5	18.0	109.3																				
AUSTIN CHALK	157.1	196.9	17.1	113.2						0.5										134				
AUSTIN CHALK	157.4	197.2	15.8	116.8						2.4	D	1092			0.59	2.60		0						
AUSTIN CHALK	158.2	198.3	15.3	117.2																				
AUSTIN CHALK	159.7	200.2	14.8	117.0	2.68					2.2	D		200	1577	1.13	2.17		200						
AUSTIN CHALK	160.0	200.6	14.5	116.7						2.2	B-1/20		300	1725	0.91	2.42		300						NOTE 1
AUSTIN CHALK	160.0	200.6														3.30			0.01					NOTE 2
AUSTIN CHALK	160.3	201.0	13.1	121.2																				
PROCEDURE			ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D422				ASTM-D2938	ASTM-D2664				ASTM-D3148		ASTM-D3148	ISRM	ISRM	ISRM	ISRM	

SI2CPRT.WK1
REVISION: 1.0
DATE: 4/26/90

PRELIMINARY
(Subject to Revision)

* 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

Note: Some values in this table may be revised based on reviews of test procedures and individual test results. The reader should refer to the latest revision of the gINT geotechnical data base (geotechnical report GR-70).

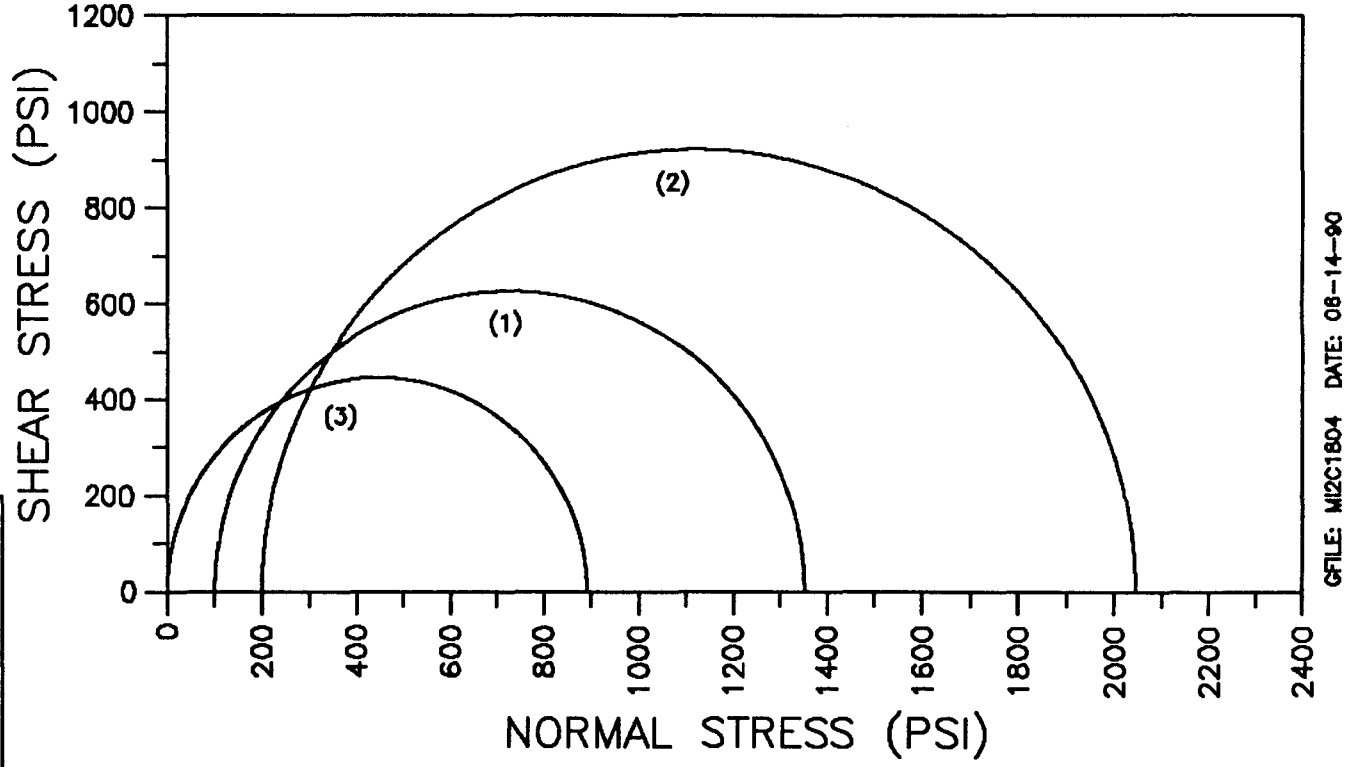
NOTES: 1) MODULUS WAS CALCULATED FROM AXIAL STRAINS MEASURED USING DIAL MICROMETER. AXIAL LENGTH IS THE SAMPLE LENGTH.

2) MODULII AND POISSON'S RATIO WERE CALCULATED FROM AXIAL AND LATERAL STRAINS MEASURED USING 3 AXIAL AND 3 LATERAL LVDTS OFFSET @ 120 DEGREES APART. AXIAL LENGTH IS 2.8 INCHES.

APPENDIX F

LABORATORY RESULTS

BORING NO.: SI2C
BORING DEPTH RANGE: 180.4-181.8 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH RANGE: 144.3-145.4 FEET



GFILE: MI2C1804 DATE: 08-14-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

INCL. (DEG. FROM VERT.): APPROX. 40
TEST TYPE: UNCONFINED COMPRESSION (ASTM D2938)
TRIAXIAL COMPRESSION (ASTM D2664)

(1) BORING DEPTH: 180.4 FEET; VERTICAL DEPTH: 144.3 FEET
(2) BORING DEPTH: 180.8 FEET; VERTICAL DEPTH: 144.7 FEET
(3) BORING DEPTH: 181.4 FEET; VERTICAL DEPTH: 145.1 FEET

TEXAS SSC SITE

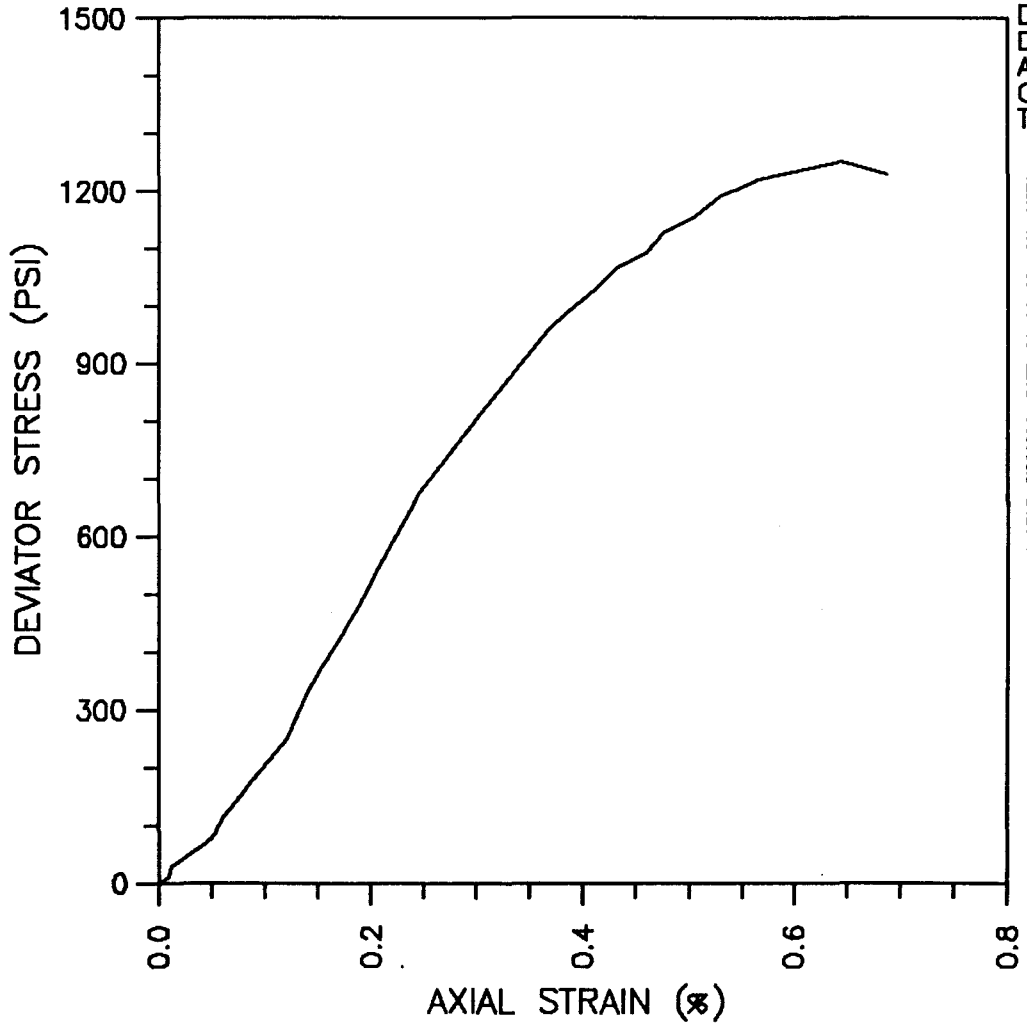
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SI 2C
BORING DEPTH: 180.4 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 144.3 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 14.7
DRY UNIT WEIGHT (PCF): 119.3
DEG. OF SATURATION (%): 96.2
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: 3S2C1804 DATE: 06-11-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.425 x10E5 PSI

FAILURE MODE:
BEDDING PLANE
SHEAR AT 40 DEG.

TEXAS SSC SITE

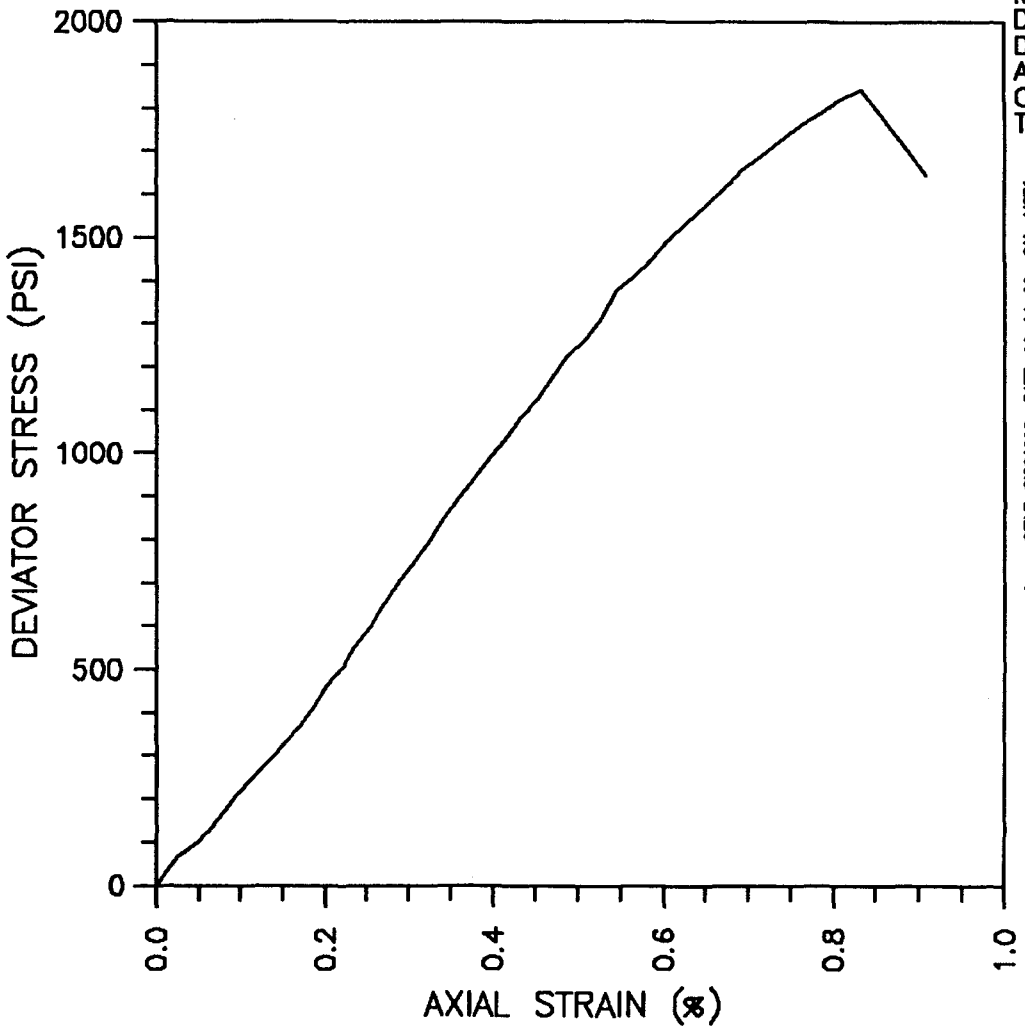
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SI 2C
BORING DEPTH: 180.8 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 144.7 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 14.7
DRY UNIT WEIGHT (PCF): 117.3
DEG. OF SATURATION (%): 90.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: 3S2C1808 DATE: 06-14-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.424 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 40 DEG

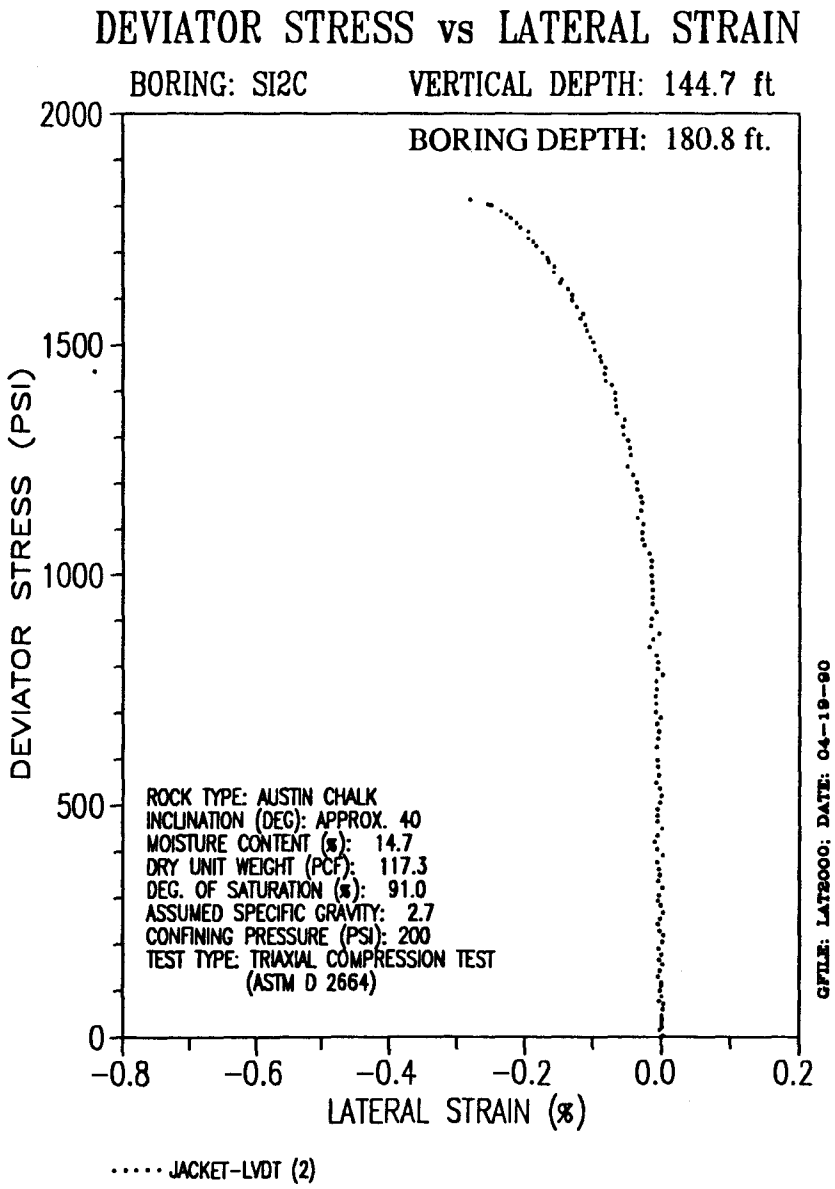
TEXAS SSC SITE

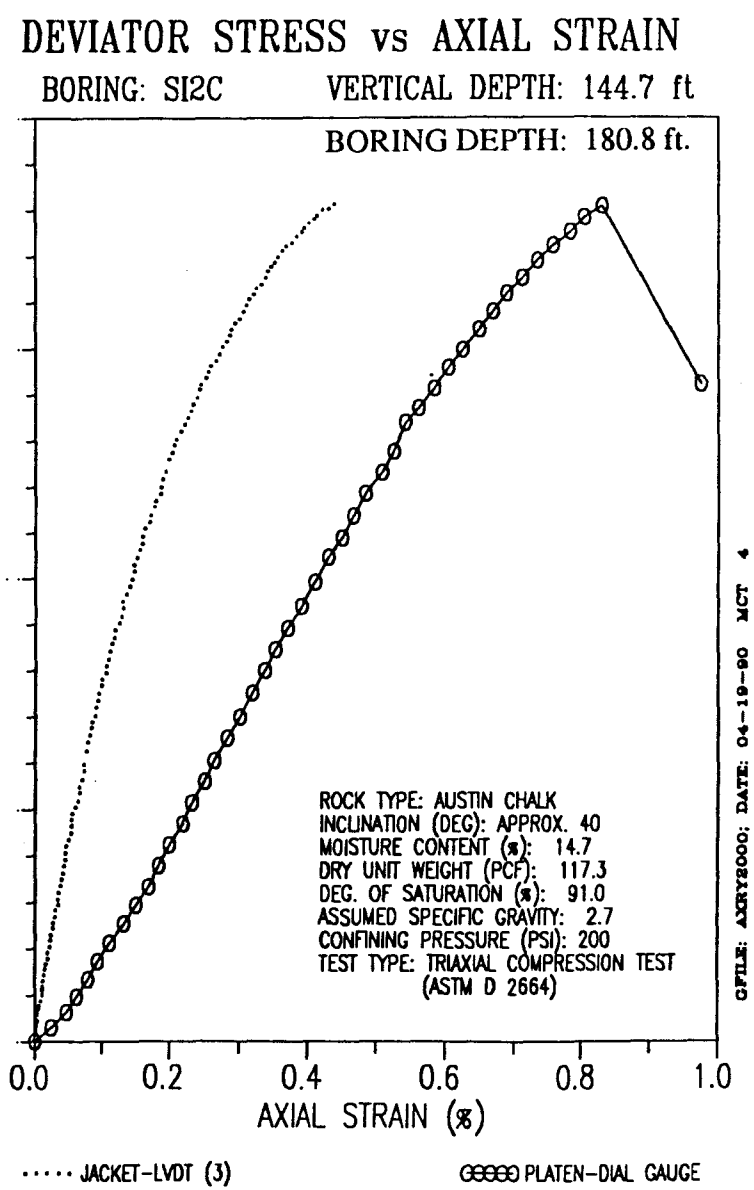
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

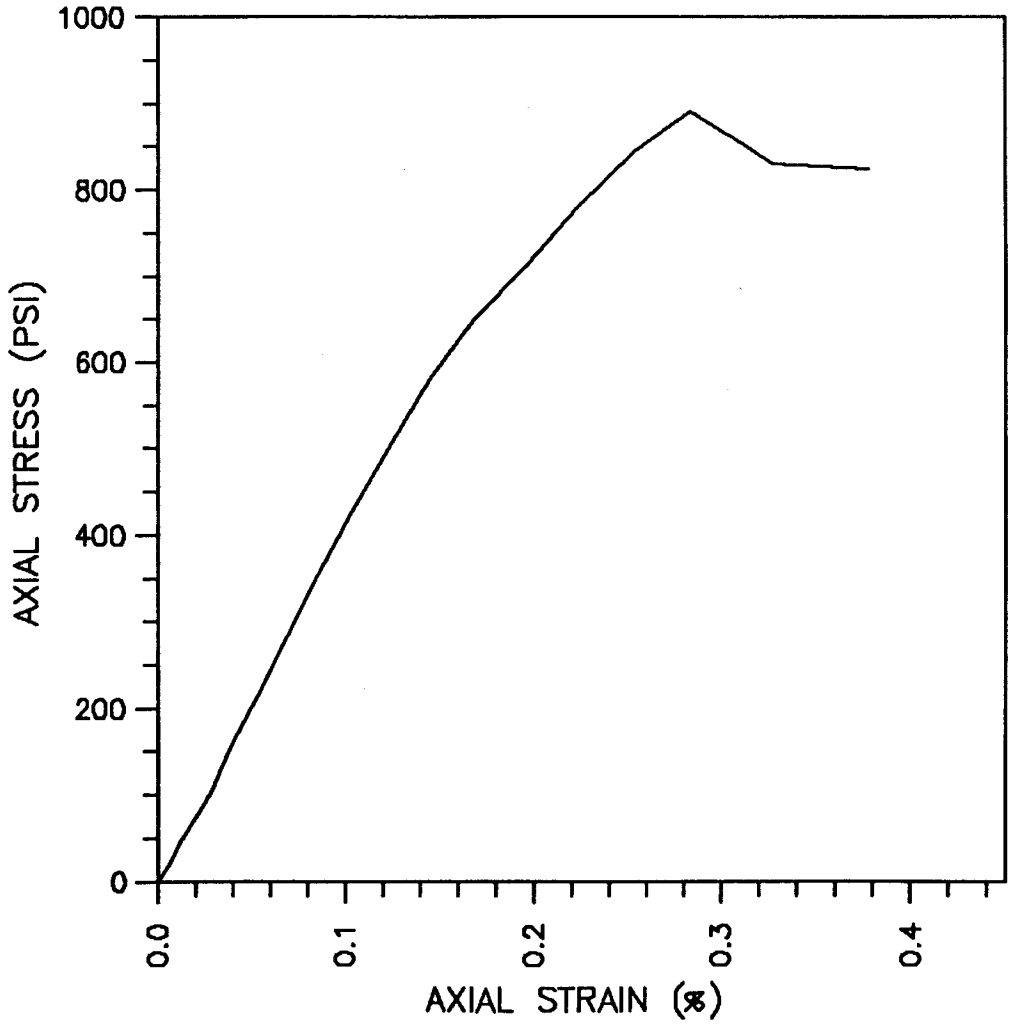
FIGURE





PRELIMINARY

BORING NO.: SI 2C
BORING DEPTH: 181.4 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 145.1 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 15.8
DRY UNIT WEIGHT (PCF): 114.2
DEG. OF SATURATION (%): 89.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: SK021814 DATE: 06-14-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.810 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

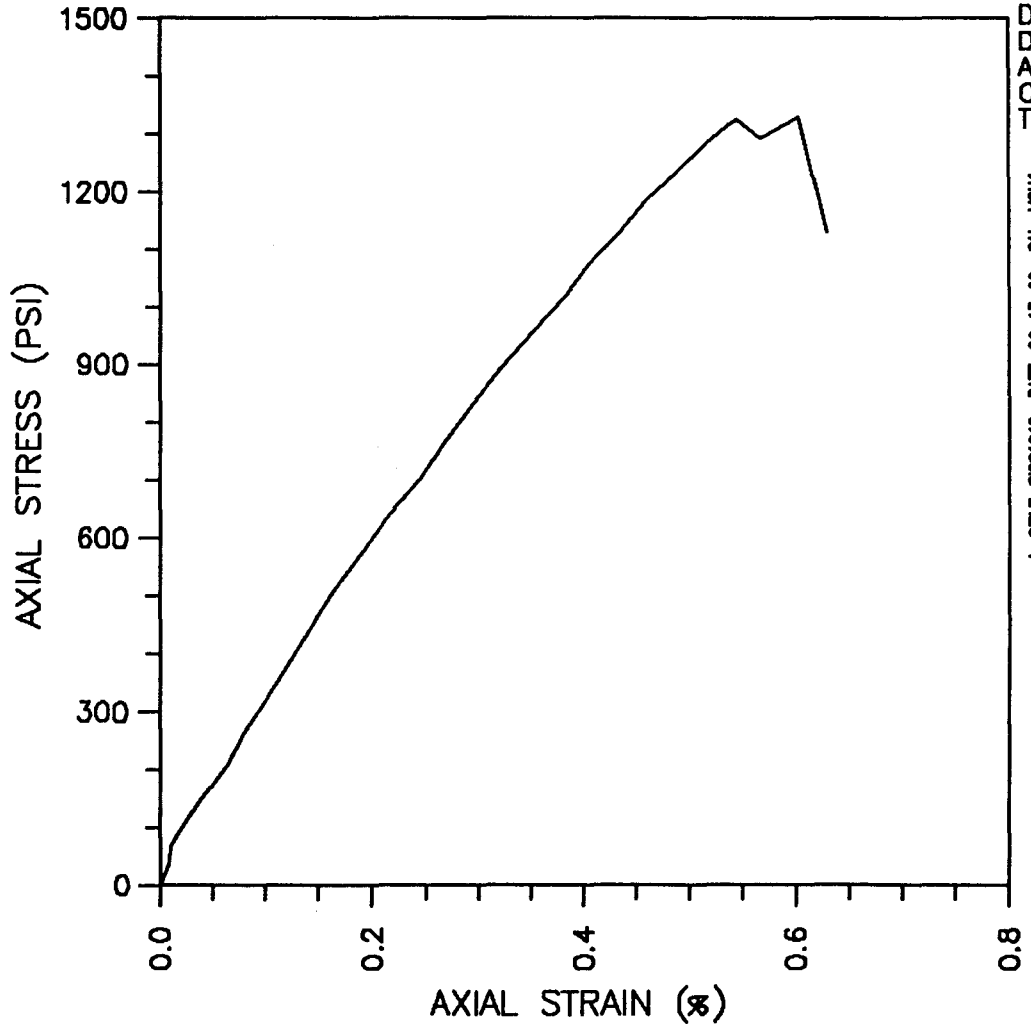
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SI 2C
BORING DEPTH: 184.2 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 147.3 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 13.2
DRY UNIT WEIGHT (PCF): 121.5
DEG. OF SATURATION (%): 92.1
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

STYLE: S22C1842 DATE: 06-13-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.421 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

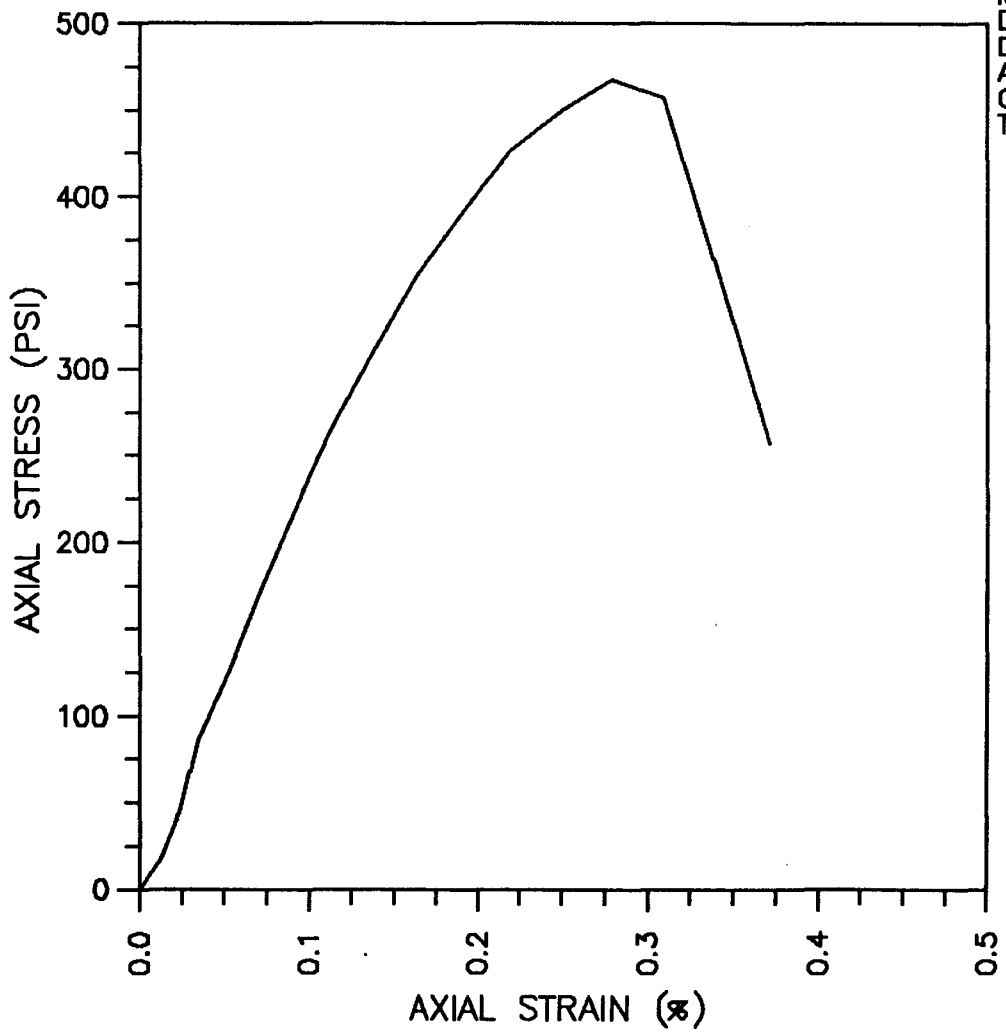
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SI 2C
BORING DEPTH: 187.4 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 149.7 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 17.9
DRY UNIT WEIGHT (PCF): 112.2
DEG. OF SATURATION (%): 96.4
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: SI2C1674 DATE: 06-14-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.186 x10E5 PSI

FAILURE MODE:
BEDDING PLANE
SHEAR AT 40 DEG.

TEXAS SSC SITE

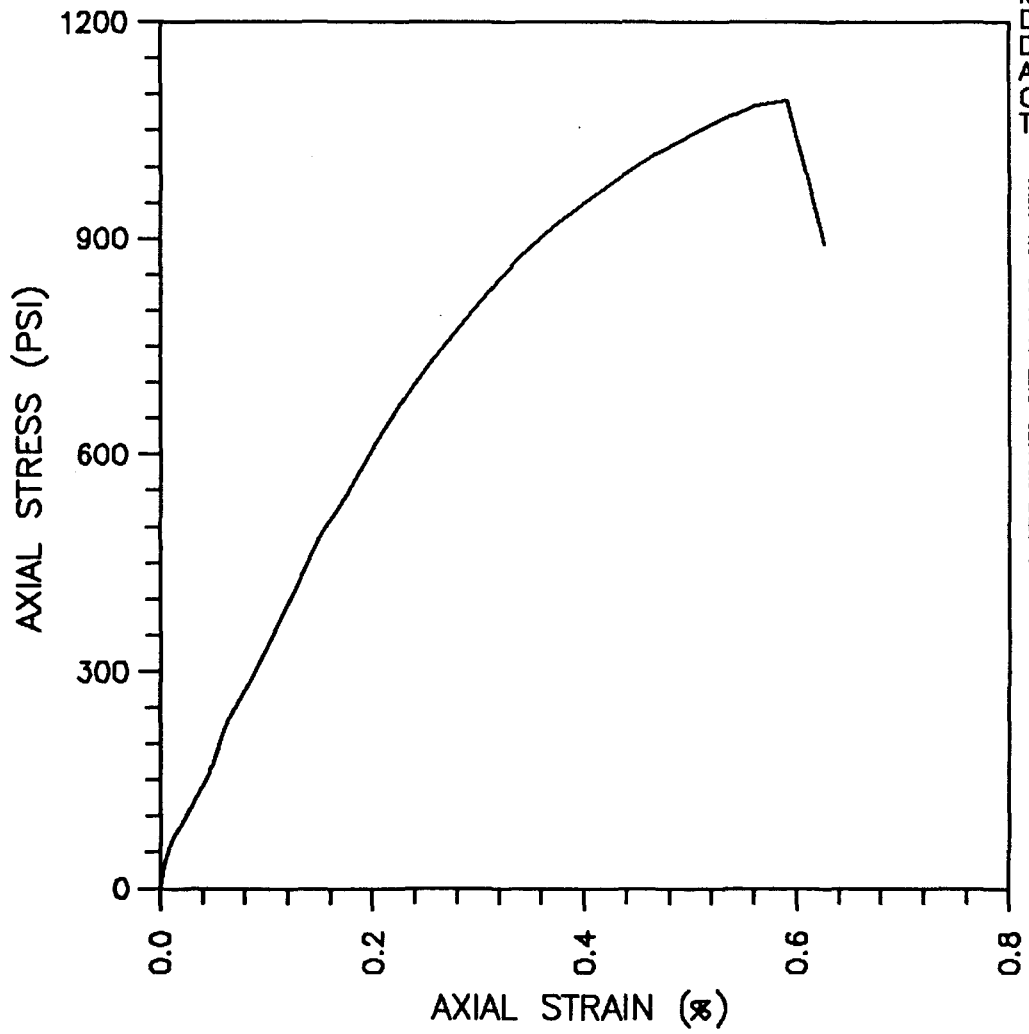
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SI 2C
BORING DEPTH: 197.2 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 157.4 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 15.8
DRY UNIT WEIGHT (PCF): 116.8
DEG. OF SATURATION (%): 96.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

GFILE: SI2C1972 DATE: 06-14-90 CAL: MCU4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.597 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

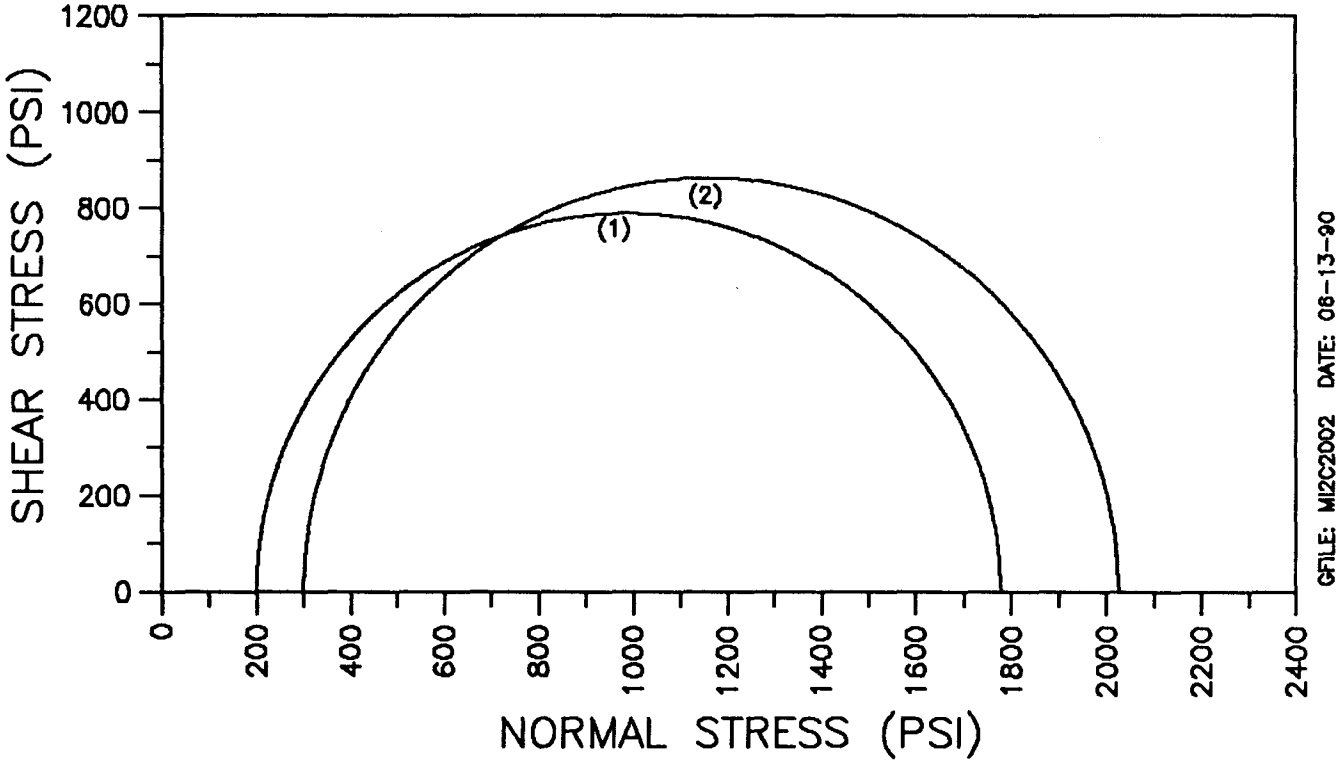
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SI 2C
BORING DEPTH RANGE: 200.2-201.0 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH RANGE: 159.7-160.3 FEET



GFILE: MI2C2002 DATE: 06-13-90

SEE STRESS-STRAIN PLOTS
FOR INDIVIDUAL SAMPLE DATA

INCL. (DEG. FROM VERT.): APPROX. 40
TEST TYPE: TRIAXIAL COMPRESSION (ASTM D2664)

(1) BORING DEPTH: 200.2 FEET; VERTICAL DEPTH: 159.7 FEET
(2) BORING DEPTH: 200.6 FEET; VERTICAL DEPTH: 160.0 FEET

TEXAS SSC SITE

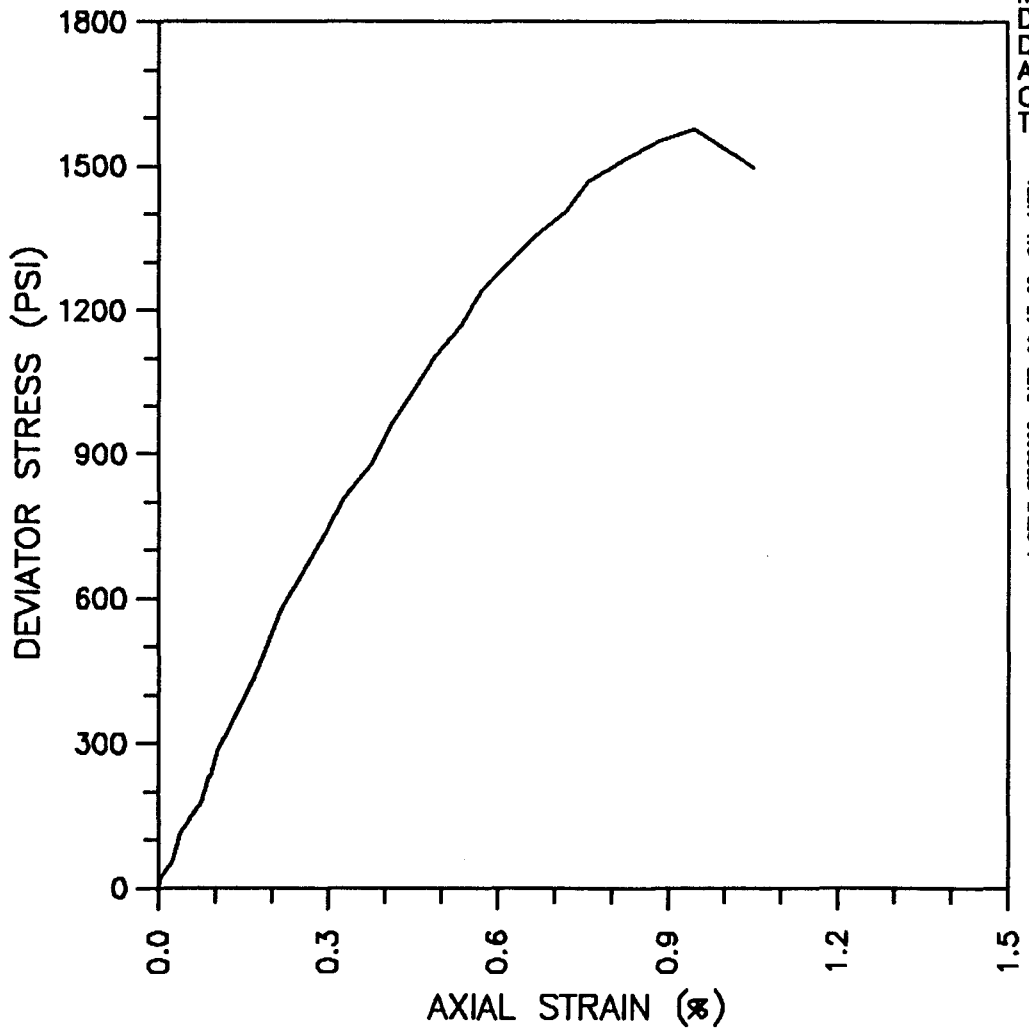
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SI 2C
BORING DEPTH: 200.2 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 159.7 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 14.8
DRY UNIT WEIGHT (PCF): 117.0
DEG. OF SATURATION (%): 90.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: SI2C2002 DATE: 06-13-90 CAL: MCT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.174 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

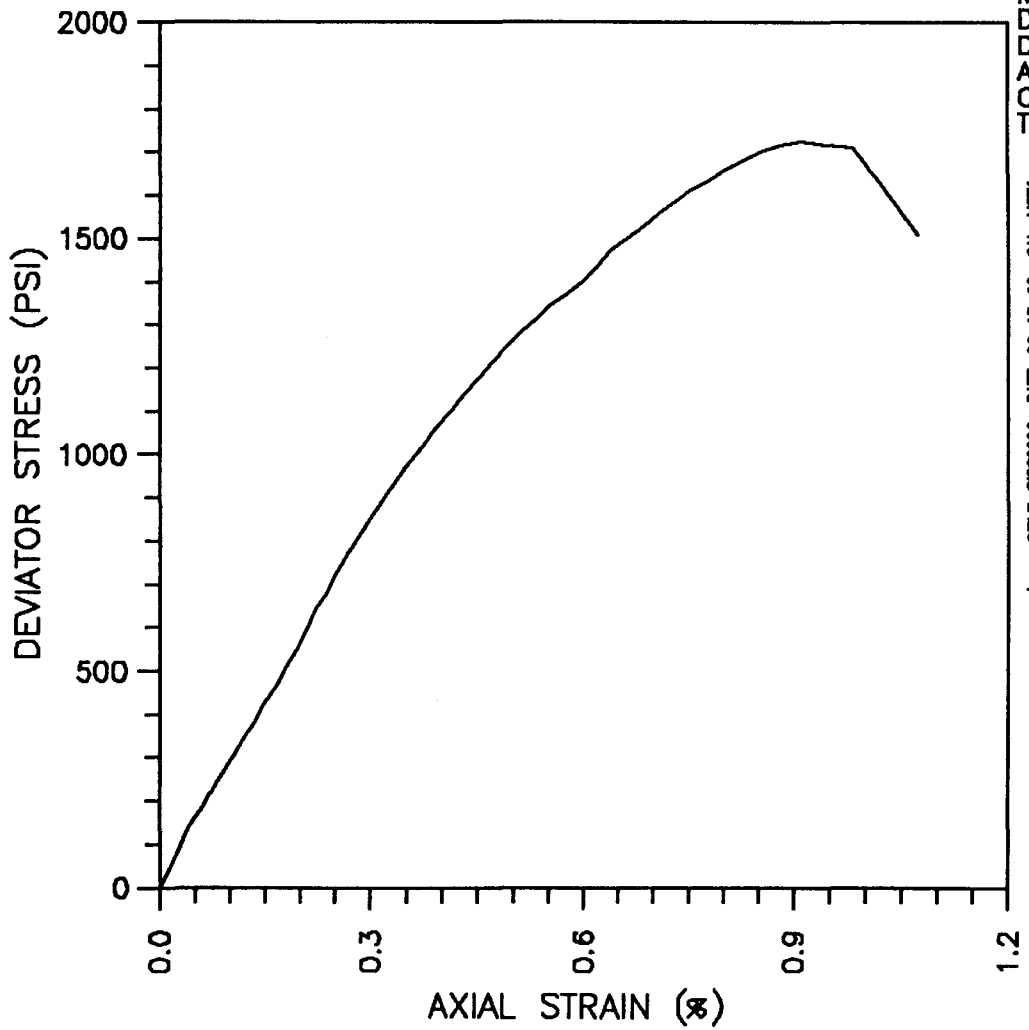
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SI 2C
BORING DEPTH: 200.6 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 160.0 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 14.5
DRY UNIT WEIGHT (PCF): 116.7
DEG. OF SATURATION (%): 87.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

FILE: SI2C2006 DATE: 06-13-00 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.419 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 20 DEG

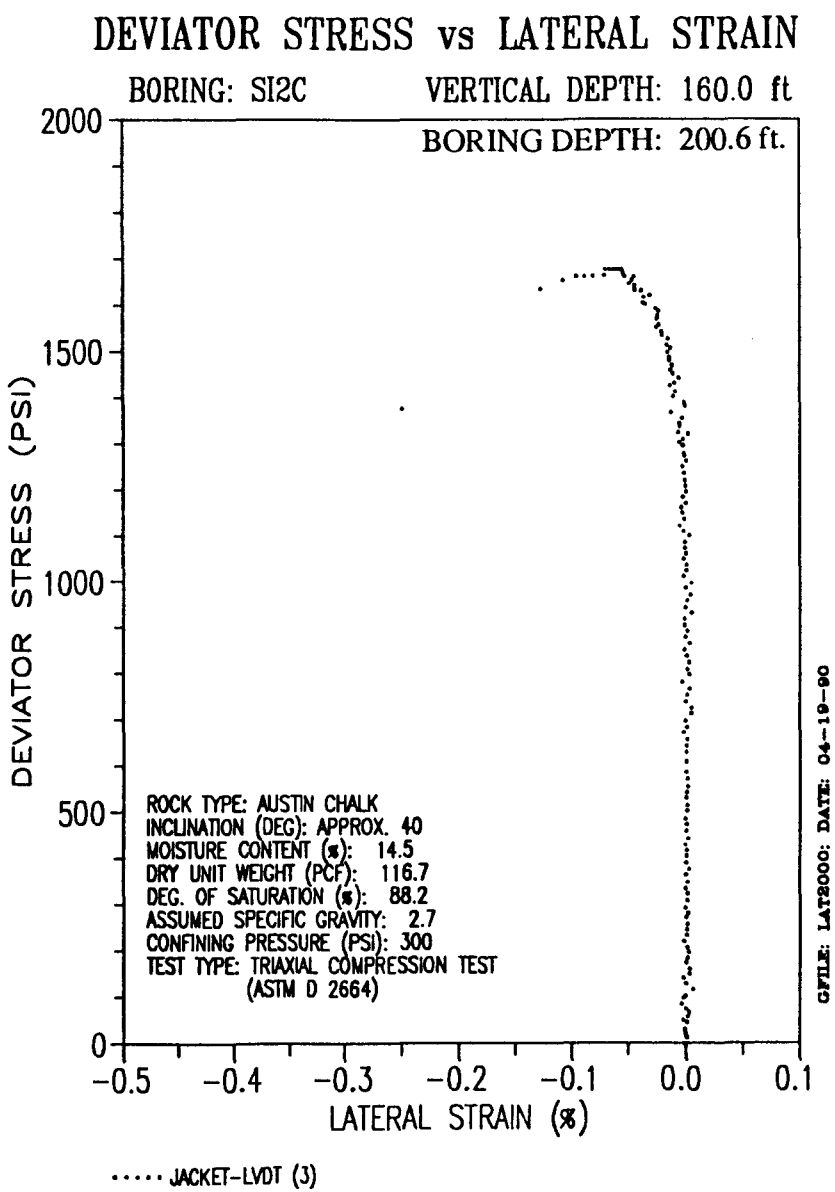
TEXAS SSC SITE

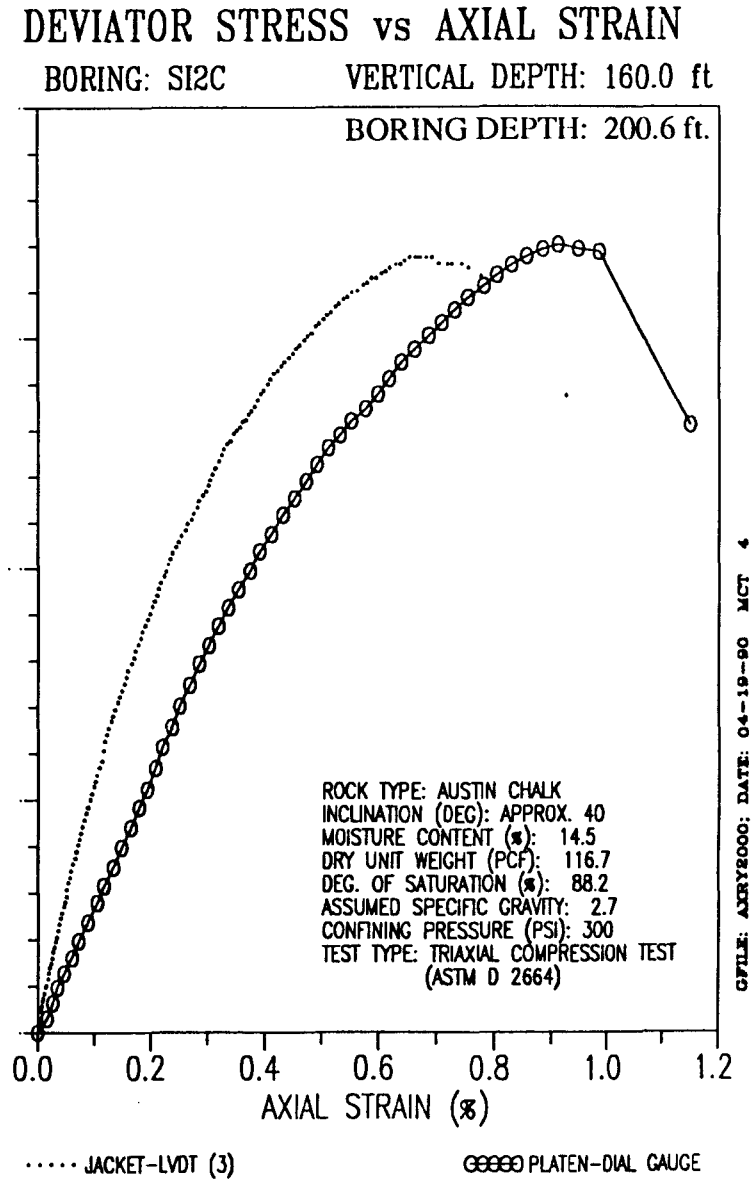
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE





PRELIMINARY

APPENDIX G

PLUGGING REPORTS

SSC BOREHOLE PLUGGING REPORT

Project No. 87-888

Task No. 12

Boring No. SI 2A

Texas Coordination Location: N 256,641
E 2,178,171

Surface Elevation: 690.3 feet

Total Boring Depth: 100.0 feet

Date Drilled: 2/15/90

Date Plugged: 2/15/90

Time Completed: 5:00 p.m.

Remarks:

102 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: Shawn Wood
Coordinator: Shawn Wood
SwL Report No. 89-192

SSC BOREHOLE PLUGGING REPORT

Project No. 87-888

Task No. 12

Boring No. SI 2B

Texas Coordination Location: N 256,506
E 2,178,577

Surface Elevation: 682.1 feet

Total Boring Depth: 100.0 feet

Date Drilled: 2/15/90

Date Plugged: 2/15/90

Time Completed: 3.00 p.m.

Remarks:

102 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: Shawn Wood
Coordinator: Shawn Wood
SwL Report No. 89-192

SSC BOREHOLE PLUGGING REPORT

TETC Project No. 87-888-0012

Task No. 12

Boring No. SI 2C (Nx Angle Boring)

Texas Coordinate Location:

~N256,049 Feet; ~E2,178,907 Feet

Surface Elevation: ~ 655 Feet

Total Boring Depth: 266.5 Feet

Plugging Remarks:

Grouted through 260 feet of 2" diameter tremie pipe. Tremie pipe was pulled as grout was placed. All casing was pulled from the hole and the grout placed to the ground surface. Grout mix used was a ratio of approx. 5.8 gallons of water to each 94 lb. bag of Type I cement and approx. 5 lbs. of bentonite per bag of cement.

Materials used:

20 bags (94 lb.) Type I Cement
2 bags (50 lb.) Bentonite
Approx. 115 gallons of water

Date Plugged: 3/24/90

Time Completed: 2:00 pm

Drilling Geologist: Jim Sansom
MJA Coordinator: W.D. Flanigan
MJA No.: 5530.12