SSCL-SR-1118

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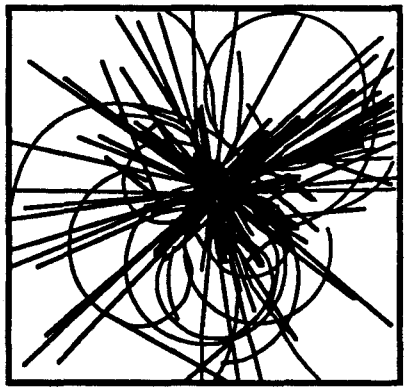
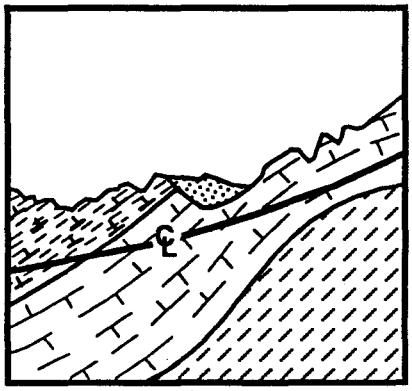
Project No. 87-888-0012
Report No. SSC-GR-59
July 1990

GR-59

Data Report for Structure Study Zone SE 10.9, and Coreholes SE 10.9C and SE 10.9D





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 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).

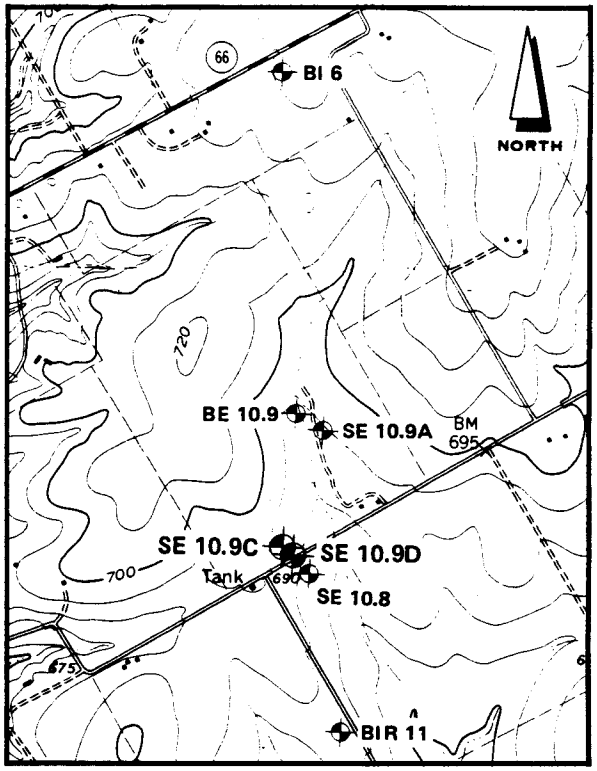
DATA REPORT

Site Designator: SE 10.9

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

Structure Study Zone **SE 10.9** is located on the western side of the proposed tunnel alignment, approximately 1.3 miles north of Boz, Texas.

SE 10.9C and **SE 10.9D** are angled borings with approximate bearings of N8°W and S2°W, respectively, angled 50° from horizontal.



SCALE 1:24,000

0 1000 2000 3000 4000 Feet

CONTOUR INTERVAL 10 FEET

Boring Locations:

Boring	Northing (feet)	Easting (feet)	Surface Elevation (feet)
SE 10.9C	240,951	2,174,744	~684.0
SE 10.9D	240,907	2,174,765	~683.2

Scope and Schedule:

- Borings

Boring	Coring (full depth)	Wire-Line Logging	Hydrologic Testing	Down-Hole Photography	Laboratory Testing	Plugging
SE 10.9C	Mar. 9 to 15, 1990	Mar. 16, 1990	Mar. 20, 1990	Mar. 24, 1990	Mar. 19 to Apr. 10, 1990	Mar. 26, 1990
SE 10.9D	Mar. 1 to 7, 1990	Mar. 8, 1990	Mar. 8, 1990	Not Done	Mar. 21 to Apr. 16, 1990	Mar. 8, 1990

- Geologic Mapping
  January 23 to March 9, 1990 (original mapping was done July 24 to July 29, 1989 for the data report on borings BE 10.9 and SE 10.9A, and structure SE 10.9, January 1990).
- Geophysical Surveys
  VLF Survey - February 4, 1990
  Seismic Reflection Survey - February 8 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
SE 10.9C	343.5 (inclined)	0.0 to 3.5	3.5 to 12.4	12.4 to 286.5	286.5 to 343.5
	266.6 (vertical)	0.0 to 3.2	3.2 to 10.0	10.0 to 222.4	222.4 to 266.6
SE 10.9D	354.5 (inclined)	0.0 to 3.5	3.5 to 11.1	11.1 to 276.5	276.5 to 354.5
	267.2 (vertical)	0.0 to 3.3	3.3 to 9.1	9.1 to 209.1	209.1 to 267.2

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)	Deviation
SE 10.9C	X	X	X	X	X	X	X	--	X
SE 10.9D	X	X	X	X	X	X	X	X	X

-- = Tool malfunction

Geologic Mapping Results Summary: (see also Appendices C and D)

Previous borings (BE 10.9 and SE 10.9) and original geologic mapping identified a major fault crossing the ring alignment north of Boz, Texas. Additional mapping and borings, as well as geophysical surveys (Appendix D) confirmed the location of a major fault. This fault has been mapped to the northeast based on calcite in float and fault exposures and is interpreted to be an en echelon continuation of the SI 2 fault identified crossing the High Energy Booster. This fault (SE 10.9) can be mapped as far north as Highway 66 and Arrowhead Road.

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)
SE 10.9C	217.6-266.6	175	40	Austin Chalk/Eagle Ford Shale (fracture zone)	3.3×10^{-6}
SE 10.9D	130.2-146.3	150	30	Austin Chalk (fractured)	3.1×10^{-7}

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)
			SE 10.9C			
218	Bentonite	30-35	85-95	$286^{(300)}$-$360^{(200)}$	$0.29^{(200)}$-$0.31^{(300)}$	
225-229	Eagle Ford Shale	16	117-122			
235-238	Eagle Ford Shale	12-17	101-132			
241-245	Eagle Ford Shale	17-18	115-123			
253-264	Eagle Ford Shale	15-17	111-121			
			SE 10.9D			
136-137	Austin Chalk	10-12	125-130	1268	2.06	190
138	Bentonite	29				
139-140	Austin Chalk	10-11	126-132	1534-$2708^{(200)}$	$3.21^{(100)}$-$5.78^{(200)}$	

*UU triaxial test indicated by confining pressure in parentheses.

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

APPENDIX A

LITHOLOGIC LOGS

LITHOLOGIC LOG

BORING SE 10.9C

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 10.9C PG 1 OF 9

LOCATION: ~N 240,951 Feet
~E 2,174,744 Feet

GROUND EL: ~684.0 Feet

DATE: 3/9/90 TYPE: NX Angle Core(1) CASED TO: 3.0' 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
No detectable water loss observed

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), slightly silty dk.brown (CH)
									3.5g
5									LIMESTONE(Austin Chalk) mod.to completely weath, sli. fossil., tan to white, v.soft to med.hard, w/ clay interbeds and fractures of various orientations
		C1	5.0		57	5			
10				12.2					
									12.35s
		C2	12.2	16.0	100	100			LIMESTONE(Austin Chalk), fresh, med.to mod.hard, sli. fossil., lt.gray w/ 0.45 to 4.5ft.thick sli.argill.to v.argill.and occ.shaly interbeds spaced 1.6 to 4.4 ft.apart.
15									
		C3	16.0		100	100			12.35s-12.8g thin, sli.argill., med.gray bed 15.3g-17.2g med.thick, sli.argill., med.gray bed 17.7 60°frac., non-slks, sli.rough, iron-stained, closed (N60°W, vertical) 19.1g-19.8g thin, mod.argill, med.to dk.gray bed 19.8g-23.6g thick, sli.argill., med., gray bed
20									
25				26.0					
		C4	26.0		100	100			28.0g-32.1g thick, sli.argill., med.gray bed 33.7g-34.5g thin, sli.argill., med.gray bed
30									
35				36.0					
		C5	36.0		100	100			37.8g-39.0g med.thick, mod.argill, , med.gray bed 41.35g-42.4g med.thick, v.argill/shaly, soft to med. hard, med.gray bed
40									

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

LOG OF BORING

BORING NO: SE 10.9C PG 2 OF 9

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 240,951 Feet
~E 2,174,744 Feet

GROUND EL: ~684.0 Feet

DATE: 3/9/90 TYPE: NX Angle Core (1) CASED TO: 3.0' 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
No detectable water loss observed

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		46.0	100	100				LIMESTONE (Austin Chalk), fresh, med. to mod. hard, sli. fossil., lt. gray w/ 0.3 to 3.0ft. thick sli. argill. to v. argill. and occ. shaly interbeds spaced 1.1 to 3.3ft. apart 44.0g-47.0g thick, sli. argill., med. gray bed
45										
		C6	46.0	56.0	100	100				49.0g-50.0g med. thick, v. argill./shaly, soft to med. hard, med. gray bed 52.9g-54.5g med. thick, sli. argill., med. gray bed
50										
55										56.0g-56.5g thin, sli. argill., med. gray bed 58.1g-59.5g med. thick, sli. argill., med. gray bed 60.5g-61.5g med. thick, v. argill./shaly, soft to med. hard, med. gray bed 62.9g-64.5g med. thick, sli. argill. med. gray bed
		C7	56.0	66.0	100	100				
60										
65										
		C8	66.0	76.0	100	100				67.6g-68.9g med. thick, sli. argill., med. gray bed 70.0g-70.6g thin, sli. argill., med. gray bed 72.2g-72.5g thin, v. argill./shaly, soft to med. hard, med. gray bed 73.55 62° frac. non-slks., sli. rough, clean, closed, fresh (N60°W, vertical) 73.7g-75.0g med. thick, sli. argill., med. gray bed
70										
75							Stopped Drilling 3-9-90			
		C9	76.0				Started Drilling 3-10-90			78.3g-80.8g med. thick, sli. to mod. argill., med. gray bed
80										

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.: 12

BORING NO: SE 10.9C PG 3 OF 9

LOCATION: ~N 240,951 Feet
~E 2,174,744 Feet

GROUND EL: ~684.0 Feet

DATE: 3/10/90 TYPE: NX Angle Core(1) CASED TO: 3.0' 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.
85		C9		86.0	100	100			
90		C10	86.0	96.0	99	99			
95									
100		C11	96.0	106.0	100	94			
105									
110		C12	106.0	116.0	100	100			
115									
120		C13	116.0		100	100			

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
No detectable water loss observed

DESCRIPTION OF STRATUM

LIMESTONE(Austin Chalk),fresh,med.to mod.hard,sli. fossil.,occ.pyrite nodules,lt.gray w/ 0.2 to 2.9ft. thick,sli.argill.to v.argill.and occ.shaly and bentonitic interbeds spaced 0.4 to 3.8ft.apart.

82.0g-82.3s thin,shaly,soft,dk.gray bed w/trace of bentonitic clay
83.3g-84.7g med.thick,v.argill./shaly,soft to med. hard,med.to dk.gray bed
86.6g-88.7g med.thick,sli.argill.,med.gray bed
92.45g-93.3g thin,v.argill.,med.gray bed
94.8g-95.2g thin,sli.argill.,med.gray bed
96.0s-96.2g thin,mod.argill.,med.to dk.gray bed
96.2-96.6 thin,fractured bed,frac.of various orientations,all incipient,one frac,w/ up to 1/16"calcite filling,pyrite nodule approx. 1/2"diameter
96.8g-99.1g med.thick,sli.argill.,med.gray bed
99.1g-99.7g thin,mod.to v.argill.,med.to dk.gray bed
99.45 60°frac.,incipient,closed,fresh(N60°W, 40°SW)
99.6 60°frac.slks,rough,clean,closed,fresh, (E-W,35°S)
101.8g-102.6g thin,sli.argill.,med.gray bed
105.2g-106.1g thin,mod.to v.argill.,dk.gray bed
109.9g-110.8g thin,shaly,soft med.gray bed,w/trace of bentonitic clay and~ 3/4"dia.pyrite nodule
112.2g-112.6g thin,v.argill.,med.to dk.gray bed
115.9g-117.35s med.thick,v.argill./shaly,soft to med. hard,med.to dk.gray bed
119.1g-119.6g thin,sli.argill.,med.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.: 12

BORING NO: SE 10.9C PG 4 OF 9

LOCATION: ~N 240,951 Feet
~E 2,174,744 Feet

GROUND EL: ~684.0 Feet

DATE: 3/10/90 TYPE: NX Angle Core(1) CASED TO: 3.0' 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.
		C13			100	100			
125				126.0					
		C14	126.0		100	100			
130									
135				136.0					
		C15	136.0		99	99			
140									
145				146.0					
		C16	146.0		100	100			
150									
155				156.0					
		C17	156.0		100	100			
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
No detectable water loss observed

DESCRIPTION OF STRATUM

LIMESTONE(Austin Chalk),fresh,med.to mod.hard sli. fossil.,lt.gray,w/0.5 to 1.6ft.thick sli.argill.to v. argill.and occ.shaly interbeds spaced 1.1 to 3.8 ft. apart

123.0g-124.3g med.thick,v.argill./shaly,soft.dk.gray bed w/~1/8"bentonitic clay @124.15

126.0g-126.6g thin,sli.argill.,med.gray bed

127.7g-129.3g med.thick,v.argill.,dk.gray bed

130.0g-134.0g med.thick,mod.argill.,med.to dk.gray bed

136.6g-137.7g med.thick,v.argill.,dk.gray bed

141.5-142.8g med.thick,mod.argill.to v.argill.,dk. gray bed

146.0g-147.1g med.thick,v.argill.,dk.gray bed

149.6g-151.1g med.thick,sli.to v.argill.,med.to dk. gray bed

153.6g-154.1g thin,mod.to v.argill.dk.gray bed

157.2g-159.0g med.thick sli.argill.to v.argill./ shaly,soft to med.hard dk.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.: 12

BORING NO: SE 10.9C PG 5 OF 9

LOCATION: ~N 240,951 Feet
~E 2,174,744 Feet

GROUND EL: ~684.0 Feet

DATE: 3/10/90 TYPE: NX Angle Core (1) CASED TO: 3.0' 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.
		C17			100	100		
165				166.0			Stopped Drilling 3-10-90	
		C18	166.0		100	100	Started Drilling 3-12-90	
170								
175				176.0				
		C19	176.0		100	100		
180								
185				186.0				
		C20	186.0		100	100		
190								
195				196.0				
		C21	196.0		99	99		
200								

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
No detectable water loss observed

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, med. to mod. hard, sli. fossil., lt. gray w/ 0.4 to 2.1ft. thick sli. to very argill., occasional shaly and bentonitic interbeds spaced 0.6 to 3.75ft. apart

160.9g-161.7g	thin, v.argill., dk.gray bed, w/abund. Inoceramus prisms
163.5g-164.4g	thin, v.argill., dk.gray bed
167.15s-169.0g	med.thick, mod. to v.argill./shaly, soft to med.hard, dk.gray bed
169.6g-170.8g	med.thick, sli. to mod.argill., med.gray bed
172.9s-173.2g	thin, shaly, soft, dk.gray bed
173.2g-174.5g	med.thick, sli. to mod.argill., med. gray bed
177.1g-178.4s	med.thick, v.argill./shaly, soft to med.hard, dk.gray bed w/trace of bentonitic clay
182.15s-183.7g	med.thick, v.argill., dk.gray bed
185.6g-186.0g	thin, sli.argill., med.gray bed
186.4-186.6	thin, Inoceramus prism bed (4-5prisms)
189.4g-191.5g	med.thick, v.argill., dk.gray bed
193.4g-195.1s	med.thick, v.argill., dk.gray bed
197.3g-198.0g	thin, mod. to v.argill., dk.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.: 12

BORING NO: SE 10.9C PG 6 OF 9

LOCATION: ~N 240,951 Feet
~E 2,174,744 Feet

GROUND EL: ~684.0 Feet

DATE: 3-12-90 TYPE: NX Angle Core (1) CASED TO: 3.0' 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.
		C21			99	99			
205				206.0					
		C22	206.0		100	100			
210									
215				206.0					
		C23	216.0		100	100			
220									
225				226.0					
		C24	226.0		99	99			
230									
235				236.0					
		C25	236.0		100	100			
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
No detectable water loss observed

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, med. to mod. hard, sli. fossil. lt. gray w/ 0.05 to 8.9ft. thick sli. to v. argill., occ. shaly and bentonitic interbeds spaced 0.6 to 2.95 ft. apart

202.2s-203.5g med. thick, v. argill., dk. gray bed
204.4g-204.8g thin, v. argill./shaly, soft to med. hard, dk. gray bed
206.15g-206.25g v. thin, mod. argill., med. gray bed
208.8g-209.3g thin, v. argill., dk. gray bed
209.3g-209.8g thin, sli. argill., med. gray bed
211.2g-213.0g med. thick, sli. argill., med. gray bed
215.6s-216.05s thin, v. argill./shaly, soft dk. gray bed w/traces of bentonitic clay
219.0g-219.8g thin, v. argill., dk. gray bed
220.45s-220.5s v. thin, mod. argill., med. to dk. gray bed
221.7g-221.9g thin, sli. argill., med. gray bed
223.4g-223.9g thin, sli. to mod. argill., med. gray bed
224.5g-226.0g med. thick, sli. argill., med. gray bed
226.6g-227.8g med. thick, sli. argill., med. gray bed
227.8g-228.7g thin, v. argill., dk. gray bed
228.7g-229.5g thin, sli. argill., med. gray bed
231.8g-234.0g med. thick, v. argill./shaly, soft to med. hard, dk. gray bed
234.0g-237.1g thick, sli. argill., med. gray bed
237.1g-240.7g thick, mod. argill., med. to dk. gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 10.9C PG 7 OF 9

LOCATION: ~N 240,951 Feet
~E 2,174,744 Feet

GROUND EL: ~684.0 Feet

DATE: 3/12/90 TYPE: NX Angle Core(1) CASED TO: 3.0' 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.
		C25			100	100		
245				246.0			Stopped Drilling 3-12-90	
		C26	246.0		100	100	Started Drilling 3-13-90	
250								
255				256.0				
		C27	256.0		100	100		
260								
265				266.0				
		C28	266.0		98	98		
270								
275				276.0				
		C29	276.0		100	100		
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
No detectable water loss observed

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, med. to mod. hard, sli. fossil., lt. gray w/ 0.3 to 2.4ft. thick sli., argill. to v. argill., shaly & occ. bentonitic interbeds spaced 0.5 to 3.7 ft. apart

240.7g-241.15s thin, v. argill./shaly, soft, dk. gray bed w/trace of bentonitic clay
243.4g-245.9g med. thick, mod. argill., med to dk. gray bed
249.6s-249.8g thin, shaly, soft, dk. gray bed
249.8g-251.2g med. thick, mod. to v. argill., dk. gray bed
251.5-252.0 several (5) Inoceramus prisms
252.7g-254.0g med. thick, v. argill., dk. gray bed
255.2g-256.8g med. thick, mod. to v. argill. dk. gray bed w/v. thin (1/2") soft dk. gray shaly bed @256.65
258.8g-260.0g med. thick, mod. to v. argill., med. to dk. gray bed
261.5g-263.5g med. thick, mod. to v. argill., med. to dk. gray bed
264.2g-264.6g thin, sli. argill., med. gray bed
266.6g-268.5s med. thick, mod. to v. argill., med. to dk. gray bed
269.8g-271.95g med. thick, mod. to v. argill., med. to dk. gray bed
271.95g-272.1s v. thin, shaly, soft, dk. gray bed
273.9g-275.2g med. thick, v. argill., dk. gray bed
276.7g-277.0s thin, shaly, soft, med. to dk. gray bed w/traces of bentonitic clay and pyrite nodule (~1/2" dia.)
277.7g-279.6g med. thick, mod. to v. argill., med to dk. gray bed
279.6g-280.35g thin, shaly, soft, med. to dk. gray bed, w/traces of bentonitic clay
280.35-281.4s med. thick, bentonitic clay, v. soft, non-laminated, bluish-gray, pyritic bed.

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 10.9C PG 8 OF 9

LOCATION: ~N 240,951 Feet
~E 2,174,744 Feet

GROUND EL: ~ 684.0 Feet

DATE: 3/13/90 TYPE: NX Angle Core(1) CASED TO: 3.0 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
-285		C29		286.0	100	95			LIMESTONE(Austin Chalk),fresh,med.to mod.hard,sli. fossil.,sli.to v.argill.and shaly w/ lt.gray "pure chalk" from 284.5 to 286.5 285.7-286.5 fracture zone,hairline incipient fractures-all appear to be closed 286.5s
-290 -295		C30	286.0	296.0	100	13			SHALE(Eagle Ford),fresh,soft to med.hard,v.fine grained, v.thinly bedded,non-calc.,dk.gray w/small(1/2"-1"dia.) lt.brown,mod.hard,non-calc.inclusions & occ.thin arenaceous interbeds 286.95 ~1"dia.lt.brown,mod.hard,non-calc. inclusion 288.0-290.0 approx.20 fracs.,slks.,smooth-sli.rough, clean,closed,fresh,most(~80%)are incipient-approx.half(50%)are parallel to bedding planes others are at various orientations 290.0-292.0 ~22 fracs-same characteristics as above
-300 -305		C31	296.0	306.0	100	25	Stopped Drilling 3-13-90		292.0-294.0 ~32 fracs-same characteristics as above 294.0-296.0 ~12 fracs-same characteristics as above 290.5 ~1/8"thick pyrite lens 296.0-298.0 ~21 fracs-same characteristics as above 296.95 ~1/8"dia pyrite lens 298.0-300.0 6 fracs- same characteristics as above 300.0g-300.65s thin arenaceous bed 300.0-302.0 ~12 fracs-same characteristics as above 302.0-304.0 ~17 fracs-same characteristics as above 304.0-306.0 ~16 fracs-same characteristics as above 306.8-307.4 thin arenaceous bed
-310 -315		C32	306.0	316.0	76	10	Started Drilling 3-14-90		306.0-308.0 approx 6 fracs,slks,smooth-sli.rough, clean,closed,fresh,most(~80%)are incipient-approx half(50%)are parallel to bedding planes,others are at various orientations. 308.0-310.0 ~8 fracs-same characteristics as above 310.0-312.0 ~10 fracs-same characteristics as above 312.0-313.6 ~16 fracs-same characteristics as above 316.0-317.5 approx.14 fracs,slks.,smooth-sli.rough, clean,closed,fresh most(80-90%)are incipient-approx.half(50%)are parallel to bedding planes-others are at various orientations
-320		C33	316.0		99	48			319.0g-320.2s med.thick,arenaceous,sli.calc.bed w/ abund.pyrite 320.8-320.9 3 fracs-same characteristics as above 322.4 50°frac.,slks,smooth,clean,closed,fresh 322.5g-322.85s thin,arenaceous,calcareous bed 322.8-325.0 approx.16 fracs-same charac. as above

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
No detectable water loss observed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC - Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 10.9C PG 9 OF 9

LOCATION: ~N 240,951 Feet
~E 2,174,744 Feet

GROUND EL: ~684.0 Feet

DATE: 3/14/90 TYPE: NX Angle Core (1) CASED TO: 3.0' 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
		C33		325.0	99	48			SHALE (Eagle Ford), fresh, soft to med.hard, v.fine grained, v.thinly bedded, non-calc., dark gray, w/occ.pyrite nodules and thin, arenaceous interbeds 325.05 ~50° frac, slks, smooth, clean, closed, fresh, approx.parallel to bedding
325		C34	325.0	335.0	100	60	Stopped Drilling 3-14-90		325.7 ~50° frac-same characteristic as above 327.0-329.0 approx.6 fracs., slks., smooth-sli.rough, clean, closed, fresh, most (~80%) are incipient-approx.half (50%) are parallel to bedding planes, others are at various orientations 329.0-331.0 ~7 fracs-same as characteristics as above 331.0-333.0 ~7 fracs-same as characteristics as above 333.0-335.0 ~4 fracs-same as characteristics as above
330									
335		C35	335.0	343.5	95	28	Started Drilling 3-15-90		335.0-337.0 ~8 fracs., slks., smooth-sli.rough, clean, closed, fresh, most (~80%) are incipient-approx.half (50%) are parallel to bedding planes, others are at various orientations. 336.0-336.1 ~1/2" dia.pyrite nodules 337.0-339.0 ~9 fracs-same characteristics as above 338.4s-338.6s mod.hard calc.concretion (approx.60-70% pyritized) 339.0-341.0 ~14 fracs-same characteristics as above 341.0-343.0 ~15 fracs-same characteristics as above
340									
345									Total Depth 343.5' 3-15-90
350									(1) Angle Hole Field Azimuth: N8°W Plunge : 50° (2) Boring washed without sampling from 0.0' to 5.0' (3) Wireline logged 3-15-90 & 3-16-90 (4) Hydrotestested 3-20-90 (5) Down-hole borehole photography completed 3-24-90 (6) Boring plugged 3-26-90
355									
360									NOTE: ALL FRACTURE ORIENTATIONS (IN PARENTHESES) ARE BASED ON FIELD AZIMUTH AN ASSUME HORIZONTAL BEDDING. OTHER FRACTURES NOT ABLE TO BE ORIENTED.

SAMPLE LEGEND	WATER INFORMATION
S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	Wet rotary core hole, water level not determinable No detectable water loss observed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LITHOLOGIC LOG

BORING SE 10.9D

LOG OF BORING

PROJECT: SSC-Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 10.9DPG 1 OF 9

LOCATION: ~N 240,907 ft
~E 2,174,765 ft

GROUND EL: ~683.2 ft

DATE: 3/1/90 TYPE: NX Angle Core(1) CASED TO: 3.0' CONTRACTOR: MJA

SAMPLE LEGEND	WATER INFORMATION
S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	Slight water loss(~20%) in weathered Austin Chalk (upper 2.0-3.0') 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
									CLAY(Residual Soil),slightly silty,dark brown,becoming lighter with depth (CL) 3.5g
5 10									LIMESTONE(Austin Chalk),moderately to completely weathered,tan,with argillaceous beds. 11.1s
15		C1	11.0	17.0	99	99			LIMESTONE(Austin Chalk),fresh,medium to moderately hard, slightly fossiliferous,occasional pyrite,light gray w/ 0.4 to 0.1 ft. thick slightly to very argillaceous and occasionally shaly interbeds spaced 0.4 to 6.5 ft. apart 14.0g-15.0g med.thick,sli.argill.,med.gray bed
20 25		C2	17.0	27.0	99	99			21.5g-23.6g med.thick,mod.argill.,soft to med.hard, med.gray bed 25.2g-27.0g med.thick,mod.argill.,soft to med.hard, med.gray bed
30 35		C3	27.0	37.0	100	100			31.1g-31.6g thin,mod.argill.,med.gray bed 34.2g-34.6g thin,mod.argill.,med.gray bed 34.7 ~1-1/2"dia.pyrite nodule 35.0g-38.1g thick,mod.argill.,med.gray bed
40		C4	37.0		100	100			39.6g-40.2g thin,sli.argill.med.gray bed 41.6g-42.7g med.thick,sli.to mod.argill.,med.gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SE 10.9DPG 2 OF 9

PROJECT: SSC-Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 240,907 ft ~E 2,174,765 ft

GROUND EL: ~683.2 ft

DATE: 3/1/90 TYPE: NX Angle Core(1) CASED TO: 3.0' 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.
		C4			100	100			
45				46.0					
		C5	46.0	56.0	100	100			
50									
55									
		C6	56.0	64.5	100	100			
60									
65		C7	64.5	67.0	96	96			
		C8	67.0	77.0	100	100			
70									
75									
		C9	77.0		99	99			
80									

SAMPLE LEGEND

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

WATER INFORMATION

Slight water loss(~20%) in weathered Austin Chalk (upper 2.0-3.0')

Wet rotary core hole, water level not determinable

DESCRIPTION OF STRATUM

LIMESTONE(Austin Chalk),fresh,medium to moderately hard, slightly fossiliferous,occasional pyrite,light gray, w/ 0.1 to 4.3ft.thick slightly to very argillaceous and occasionally shaly interbeds spaced 0.5 to 2.6 ft. apart

45.3g-46.6g med.thick,v.argill./shaly,soft,med.to dk. gray bed

47.4g-51.6g thick,sli.argill.,med.gray bed

52.3g-54.6g med.thick,sli.argill.,med.gray bed

54.4 ~1" dia. pyrite nodule

55.4g-59.7g thick, mod. to v. argill., soft, med. gray bed

61.3g-61.6g thin,mod.argill.,med.gray bed

62.4g-64.6g med.thick,mod.argill.,med.gray bed

65.5g-66.8g med.thick,mod.argill.,med.gray bed

67.8g-70.2g med.thick,sli.to mod.argill.,med.gray bed

70.7g-70.8g v.thin,mod.argill.,med.gray bed

72.6g-75.5g med.thick,sli.to mod.argill.,med.gray bed

76.0g-78.2g med.thick,sli.argill.,med.gray bed

78.2g-78.8g thin,v.argill.,soft,dk.gray bed

80.0g-82.5g med.thick,mod.argill.,med.gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC-Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 10.9D PG 3 OF 9

LOCATION: ~N 240,907 ft
~E 2,174,765 ft

GROUND EL: ~683.2 ft

DATE: 3/1/90 TYPE: NX Angle Core(1) CASED TO: 3.0' 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
		C9			99	99			LIMESTONE (Austin Chalk), fresh, medium to moderately hard, slightly fossiliferous, light gray, w/ 0.3 to 2.6ft. thick, slightly to very argillaceous interbeds spaced 1.2 to 3.0ft. apart
85				87.0			Stopped Drilling 3-1-90		85.2g-87.8g med.thick, mod.to v.argill., soft, dk.gray bed
		C10	87.0		100	100	Started Drilling 3-2-90		86.4g-86.5g near vert. (~80-85°) fracture, non-slks., clean, closed, fresh, striking N 20°E
90									89.2g-89.5 thin, mod.to v.argill., soft, med.gray bed
									91.0g-91.9g thin, v.argill., soft, dk.gray bed
95				97.0					94.4g-96.7g med.thick, sli.to mod.argill., med.gray bed
		C11	97.0		100	100			
100									99.3g-99.6g thin, sli.argill., med.gray bed
									100.8g-101.8g med.thick, v.argill., soft, dk.gray bed
105				107.0					104.5g-105.0g thin, sli.argill., med.gray bed
		C12	107.0		100	100			
									108.0g-109.0g med.thick, mod.argill., med.gray bed
110									111.7g-112.2g thin, sli.argill., med.gray bed
115				117.0					114.8g-115.8g med.thick, mod.argill., med.gray bed
		C13	117.0		99	99			
120									120.0g-121.0s med.thick, v.argill./shaly, soft, dk.gray bed

SAMPLE LEGEND

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

WATER INFORMATION

Slight water loss (~20%) in weathered Austin Chalk (upper 2.0-3.0')

Wet rotary core hole, water level not determinable

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC-Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE10.9D PG 4 OF 9

LOCATION: ~N 240,907 ft
~E 2,174,765 ft

GROUND EL: ~683.2 ft

DATE: 3/2/90 TYPE: NX Angle Core(1) CASED TO: 3.0' 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.
		C13			99	99			
125				127.0					
		C14	127.0		99	99			
130									
135				137.0					
		C15	137.0		100	100			
140									
145				146.5					
		C16	146.5		100	100			
150									
155				156.5					
		C17	156.5		97	97			
160									

SAMPLE LEGEND

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

WATER INFORMATION

Slight water loss (~20%) in weathered Austin Chalk (upper 2.0-3.0')

Wet rotary core hole, water level not determinable

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, medium to moderately hard, slightly fossiliferous, occasional pyrite nodules, light gray w/ 0.1 to 2.4ft. thick, slightly to very argillaceous interbeds spaced 0.5 to 4.6ft. apart

122.5g-123.2g thin, sli.argill., med.gray bed

126.7g-128.8s med.thick, sli.argill., med.gray bed
126.6 1/4"-1/2" dia. pyrite nodule

129.6g-132.0g med.thick, sli.to mod.argill., med.gray bed

135.6g-136.8g med.thick, sli.to mod.argill., med.gray bed

138.8g-139.3g thin, mod.to v.argill., med.to dk.gray bed

140.7g-142.6g med.thick, sli.to mod.argill., med.gray bed

147.0g-148.2g med.thick, sli.to mod.argill., med.gray bed

148.7g-148.8g v.thin, fossil.bed

151.6g-153.2g med.thick, mod.argill., med.gray bed

157.8s-159.5g med.thick, mod.to v.argill., dk.gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC-Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 10.9D PG 5 OF 9

LOCATION: ~N 240,907 ft
~E 2,174,765 ft

GROUND EL: ~683.2 ft

DATE: 3/2/90 TYPE: NX Angle Core(1) CASED TO: 3.0' CONTRACTOR: MJA

SAMPLE LEGEND

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

WATER INFORMATION

Slight water loss(~20%) in weathered Austin Chalk (upper 2.0-3.0')

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.
165		C17		166.5	97	97		
170		C18	166.5	176.5	100	100	Stopped Drilling 3-2-90	
175								
180		C19	176.5	186.5	100	97	Started Drilling 3-3-90	
185								
190		C20	186.5	196.5	99	99		
195								
200		C21	196.5		100	100		

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, medium to moderately hard, slightly fossiliferous, occasional pyrite nodules and v. fossiliferous beds, light gray w/ 0.05 to 2.3ft. thick slightly to very argillaceous and occasionally shaly interbeds spaced 0.7 to 5.6ft. apart.

163.25s-163.3s v.thin, v.argill., dk.gray bed

168.9s-169.1g thin, mod.argill., med.gray bed
169.6s-170.5s thin v.fossil.bed (coquina-like)
169.85g-171.3g med.thick, mod.to v.argill., med.to dk.gray bed

175.2g-175.9g thin, mod.to v.argill., dk.gray bed
175.45 40° fracture (along fossil parting) smooth, clean, closed (horizontal)

177.2 ~1" dia.pyrite nodule
177.6 15° fracture, slks., sli.rough, clean, closed, fresh (N40°E, 40°NW)
177.6 60° incipient fracture
177.95 35° fracture, slks., sli.rough, clean, closed, fresh (N35°E, 35°NW)
176.6g-178.1g thin, sli.argill., med.gray bed
178.1g-179.1g med.thick, v.argill., soft to med.hard, dk. gray bed
178.4 50° fracture, incipient (vertical)
179.0 40° fracture, slks., sli.rough, clean, closed (horizontal)

180.0s-180.2s thin, v.argill./shaly, soft, dk.gray bed
181.0g-181.6g thin, mod.argill., med.gray bed
182.2 70° incipient fracture, up to 1/8" calcite filling
182.3s-182.8g thin, shaly, soft, dk.gray bed
182.5 15° fracture, slks., smooth, clean, closed, fresh (E-W, 25°N)
182.8g-183.7s thin, bentonitic clay, v.soft, pyritic, fractured
184.2g-186.5g med.thick, sli.to mod.argill., med.gray bed
188.4g-190.1g med.thick, sli.argill., med.gray bed
191.1g-192.6g med.thick, sli.argill., med.gray bed
193.6g-194.6g med.thick, sli.argill., med.gray bed
196.0g-197.2g med.thick, sli.argill., med.gray bed

199.5g-201.9s med.thick, sli.argill., med.gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC-Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE10.9D PG 6 OF 9

LOCATION: ~N 240,907 ft
~E 2,174,765 ft

GROUND EL: ~683.2 ft

DATE: 3/3/90 TYPE: NX Angle Core(1) CASED TO: 3.0' 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.
		C21			100	100		
205				206.5				
		C22	206.5		100	100		
210								
215				216.5				
		C23	216.5		99	99		
220								
225				226.5				
		C24	226.5		100	100		
230								
235				236.5			Stopped Drilling 3-3-90	
		C25	236.5		87	87	Started Drilling 3-5-90	
240								

SAMPLE LEGEND

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

WATER INFORMATION

Slight water loss (~20%) in weathered Austin Chalk (upper 2.0-3.0')

Wet rotary core hole, water level not determinable

DESCRIPTION OF STRATUM

LIMESTONE (Austin Chalk), fresh, medium to moderately hard, slightly fossiliferous, occasional pyrite nodules, light gray, w/ 0.2 to 1.8ft. thick slightly to very argillaceous and occasionally shaly interbeds spaced 0.5 to 5.8ft. apart

201.9 27° fracture, slks., sli.rough, up to 1/8" calcite filling, fresh (N70°W, 65°NE)
203.4g-204.3g thin, v.argill./shaly, soft, dk.gray bed
206.0g-207.8g med.thick, mod.to v.argill./shaly, soft, dk. gray bed
206.6 ~1" dia.pyrite nodule
207.2 ~1/4" dia.pyrite nodule
207.3 ~1/4" dia pyrite nodules
208.3g-208.5g thin, mod.argill., med.gray bed
214.3g-214.8g thin, mod.argill., med.gray bed
215.7s-216.0g thin, v.argill./shaly, soft, dk.gray bed
215.7 40° fracture, slks., sli.rough, clean, closed, fresh (horizontal)
218.1 ~1/2" dia.pyrite nodule
220.9g-221.8s thin, mod.argill., med.gray bed
221.8 60° fracture, slks., sli.rough, clean, closed, fresh (N80°E, 15°NW)
225.2g-225.5g thin, sli.to mod.argill., med.gray bed
228.4g-228.9g thin, sli.to mod.argill., med.gray bed
228.8 60° fracture, slks., sli.rough, clean, closed, fresh (N-S, 25°E)
229.7g-229.9g thin, sli.to mod.argill., med.gray bed
232.9g-233.2g thin, sli.to mod.argill., med.gray bed
234.2g-234.5g thin, sli.to mod.argill., med.gray bed
235.65s-235.9s thin, v.argill./shaly, soft, dk.gray bed
237.4g-238.5g med.thick, sli.argill. med.gray bed

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC-Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 10.9D PG 7 OF 9

LOCATION: ~N 240,907 ft
~E 2,174,765 ft

GROUND EL: ~683.2 ft

DATE: 3/5/90 TYPE: NX Angle Core(1) CASED TO: 3.0' CONTRACTOR: MJA

SAMPLE LEGEND	WATER INFORMATION
S= SPLIT SPOON T= 2" THIN WALL TUBE U= 3" THIN WALL TUBE C= NX ROCK CORE	Slight water loss(~20%) in weathered Austin Chalk (upper 2.0-3.0') 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
		C25		245.5	87	87			LIMESTONE(Austin Chalk),fresh,medium to moderately hard, slightly fossiliferous, occasional pyrite nodules, light gray,w/ 0.6 to 2.3ft. thick slightly to very argillaceous interbeds spaced 2.3 to 5.3ft. apart 240.9g-241.1s thin,v.argill./shaly,soft,dk.gray bed 244.1g-246.0g med.thick,mod.argill.,med.gray bed
245									
		C26	245.5	255.5	100	100			249.8g-251.1g med.thick,mod.argill.med.gray bed
250									
255									
		C27	255.5	265.5	99	99			256.4g-257.0g thin,sli.to mod.argill.,med.gray bed 259.3g-260.0g thin,mod.to v.argill.,dk.gray bed
260									
265									265.2g-267.5g med.thick,sli.argill.,med.gray bed 266.1 40° fracture (along fossil parting),slks., smooth to sli.rough,clean,closed (horizontal)
		C28	265.5	275.5	100	100			267.5g-270.5g med.thick,mod.to v.argill,dk.gray bed 270.5g-271.5g med.thick,sli.argill.,med.gray bed 271.5g-272.1g thin,mod.argill.,dk.gray bed 272.1g-273.5g med.thick,sli. argill., dk.gray bed 273.5g-275.5g med thick,v.argill.,dk.gray bed 274.6 becoming increasingly arenaceous 274.6 ~1/2"pyrite nodule 275.1 ~1/2"pyrite nodule
270									
275									275.5g
		C29	275.5		100	100			Transition zone,fresh,med.hard,fossiliferous(bio-clastics)argillaceous,arenaceous,dk.gray 276.5s SHALE(Eagle Ford)-(DESCRIPTION SEE PAGE 8) 277.7 ~1/2" pyrite nodule 277.9 ~1" pyrite nodule 279.85 20° fracture,slks.,smooth to sli.rough, closed,fresh,undulatory surface w/small amount of pyrite along fracture plane (N80°E, 55°NW)
280									

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

PROJECT: SSC-Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

BORING NO: SE 10.9D PG 8 OF 9

LOCATION: ~N 240,907 ft
~E 2,174,765 ft

GROUND EL: ~683.2 ft

DATE: 3/5/90 TYPE: NX Angle Core(1) CASED TO: 3.0' 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.
		C29			100	100			
285				285.5			Stopped Drilling 3-5-90		
		C30	285.5		100	100	Started Drilling 3-6-90		
290									
295				295.5					
		C31	295.5		100	100			
300									
305				305.5					
		C32	305.5		100	100			
310									
315				315.5					
		C33	315.5		100	100			
320									

SAMPLE LEGEND

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

WATER INFORMATION

Slight water loss (~20%) in weathered Austin Chalk (upper 2.0-3.0')

Wet rotary core hole, water level not determinable

DESCRIPTION OF STRATUM

SHALE (Eagle Ford), fresh, soft to medium hard, very fine grained, very thinly bedded, non-calcareous, dark gray w/1/8" to 1" diameter moderately hard, non-calcareous light brown and occasionally gray inclusions; occasional pyrite nodules, calcareous septarian concretions and thin arenaceous interbeds

290.25s-290.55s calcareous concretion, mod.hard to hard, lt.gray w/calcite crystals inside cracks
291.35g-291.6s thin, arenaceous, mod.hard bed
294.0s-294.1g lt.gray, non-calc.inclusion
294.25s-294.3s lt.gray, non-calc.inclusion
296.3 ~1/4" dia.non-calc.inclusion
297.9 ~1/2" dia.non-calc.inclusion
298.1 ~1/2" dia.non-calc.inclusion
299.9 ~1/4" dia.non-calc.inclusion
301.2 ~1/2" dia.non-calc.inclusion
302.55 45° fracture, slks., smooth, clean, closed, fresh, sli.und. (N30°W, 25°NE)
303.0 ~1/4" dia.non-calc.inclusion
303.8 ~1/2" dia.non-calc.inclusion
304.4 50° fracture, slks., smooth, clean, closed, fresh, sli.und. (N30°W, 45°NE)
304.8 ~1" dia.non-calc.inclusion
305.6 ~1" dia.non-calc.inclusion
318.35 ~1/4" dia.non-calc.inclusion

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W.D. Flanigan

LOG OF BORING

BORING NO: SE 10.9D PG 9 OF 9

PROJECT: SSC-Texas Site

CLIENT: The Earth Technology Corporation

TASK NO.: 12

LOCATION: ~N 240,907 ft
~E 2, 174,765 ft

GROUND EL: ~683.2 ft

DATE: 3-6-90 TYPE: NX Angle Core (1) CASED TO: 3.0' CONTRACTOR: MJA

SAMPLE LEGEND

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

WATER INFORMATION

Slight water loss(~20%) in weathered Austin Chalk (upper 2.0-3.0')
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
		C33		325.5	100	100				SHALE (Eagle Ford), fresh, soft to medium hard, very fine grained, very thinly bedded, non-calcareous, dark gray w/ occasional ~1/4" diameter moderately hard, non-calcareous, light brown inclusions; occasional pyrite nodules, calcareous septarian concretions and, thin arenaceous interbeds.
325										
		C34	325.5	335.5	100	100		stopped drilling 3-6-90		322.05 ~1/4" dia. non-calc. inclusion 325.0 1/2"-1" dia. pyrite nodule 328.8g-329.7s Thin, arenaceous bed
330										
335										
		C35	335.5	344.5	87	87		started drilling 3-7-90		336.55 ~1/4" pyrite lens 339.85s-340.45s calcareous concretion, mod. hard to hard, lt. gray w/calcite crystal-filled cracks 340.45s-340.9g thin arenaceous bed
340										
345		C36	344.5	354.5	100	100				
350										
355										Total Depth: 354.5 3-7-90 (1) Angle Hole Field Azimuth: ~S8°E Plunge: ~50°S (2) Wireline Logged 3-8-90 (3) Hydrotested 3-8-90 (4) Boring Plugged 3-8-90 NOTE: ALL FRACTURE ORIENTATIONS (IN PARENTHESES) ARE BASED ON FIELD AZIMUTH AND ASSUME HORIZONTAL BEDDING
360										

DRILLING GEOLOGIST Scott E. Lesikar ASSISTANT Mark G. Thomas CHECKED BY W. D. Flanigan

APPENDIX B

WIRE-LINE LOGS

WIRE-LINE LOGGING PARAMETERS

Hole No. SE 10.9C **Log Measured From:** Ground Level

Drilling Parameters

Depth 343.5 feet

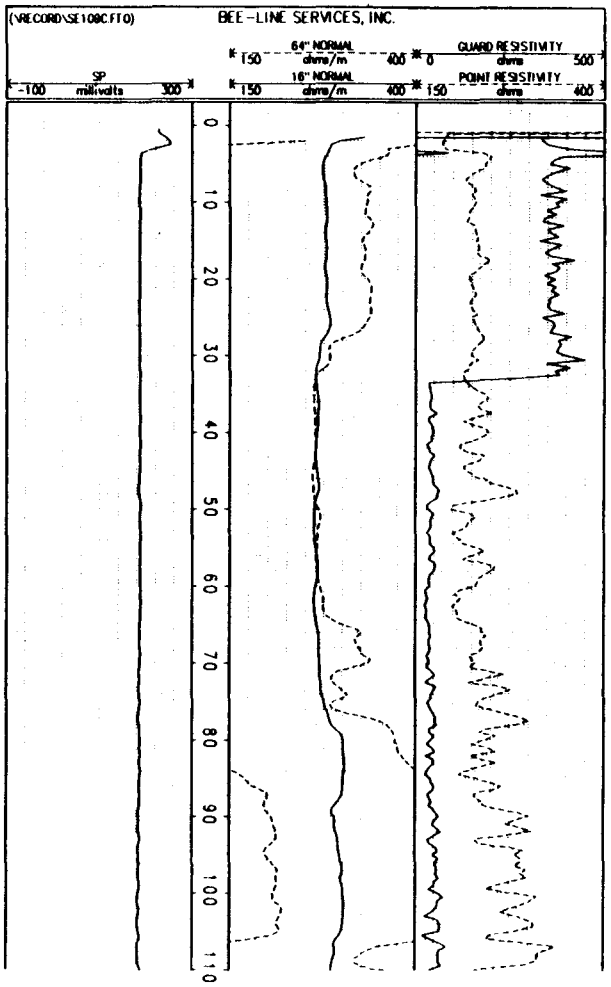
Bit Diameter 3.125 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log	Deviation Log
Date	March 16, 1990	March 16, 1990	Tool Malfunction	March 16, 1990
Bottom Log Interval	333.5 feet	333.5 feet		343.1 feet
Top Log Interval	surface	surface		surface
Type of Fluid in Hole	drilling mud	drilling mud		drilling mud
Time Since Circulation Stop	25 hours	25 hours		25 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

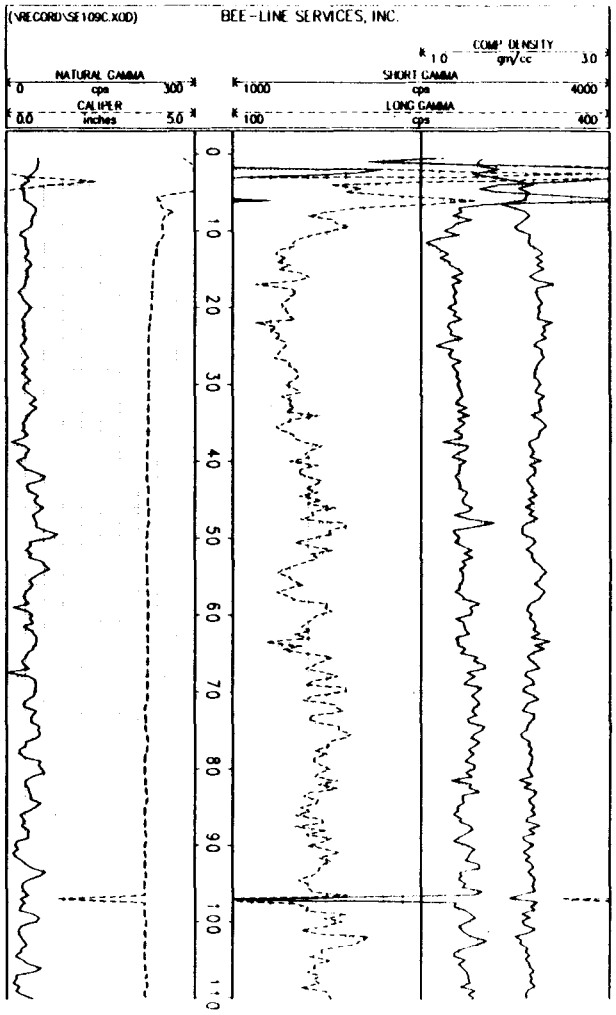
Logged by: BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

SE 10.9C Wire-line logs run March 16, 1990. Surface elevation 684.0 feet.

ELECTRICAL LOG

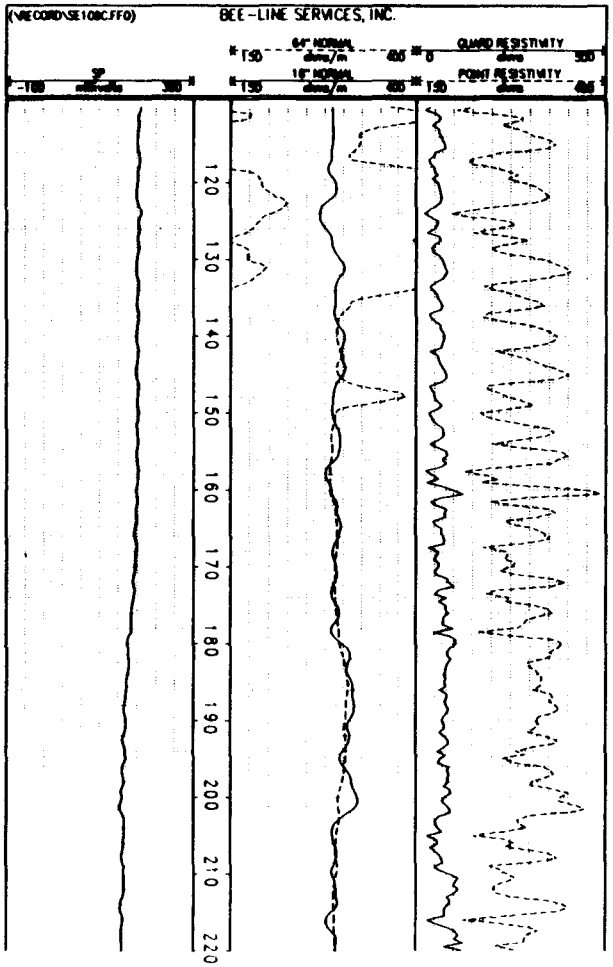


GAMMA LOG

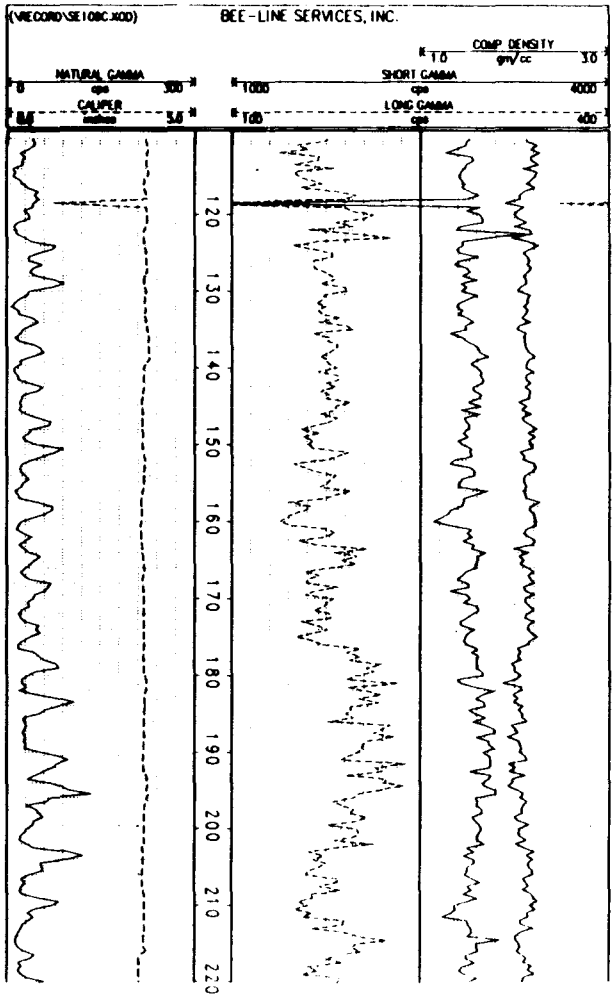


SE 10.9C Wire-line logs run March 16, 1990 (Continued). Surface elevation 684.0 feet.

ELECTRICAL LOG CONTINUED

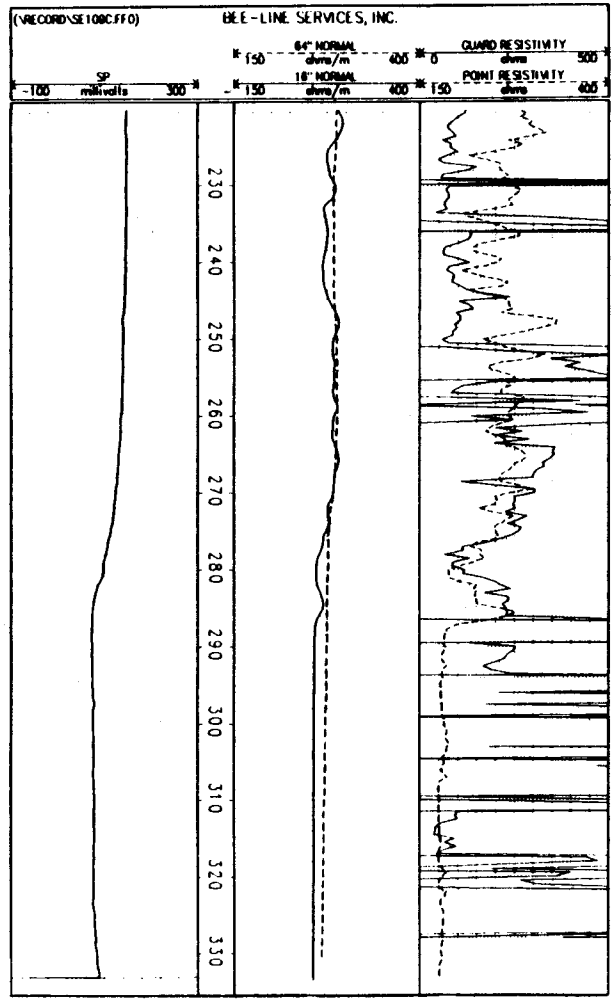


GAMMA LOG CONTINUED

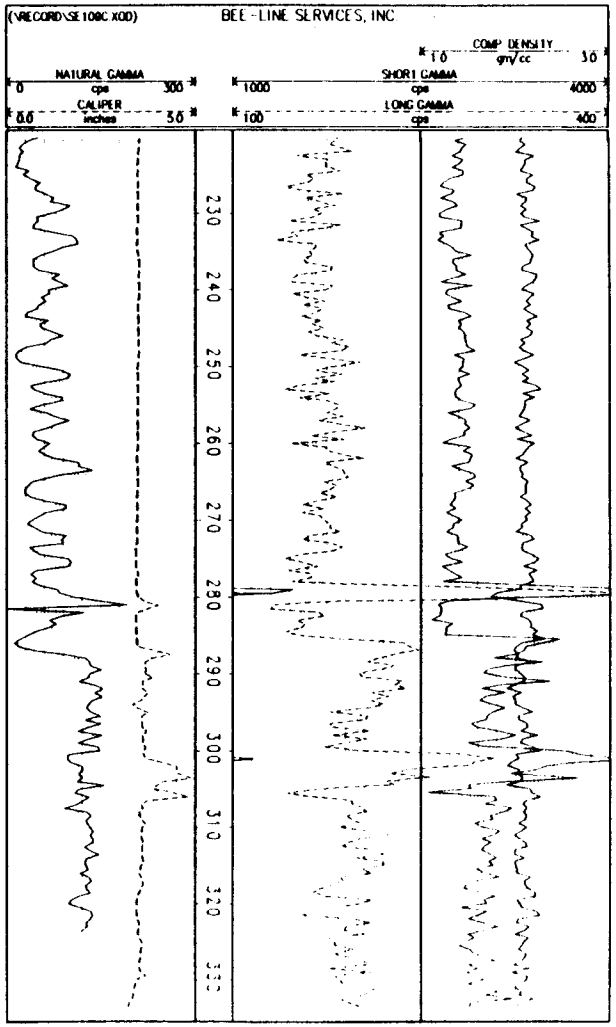


SE 10.9C Wire-line logs run March 16, 1990 (Continued). Surface elevation 684.0 feet.

ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



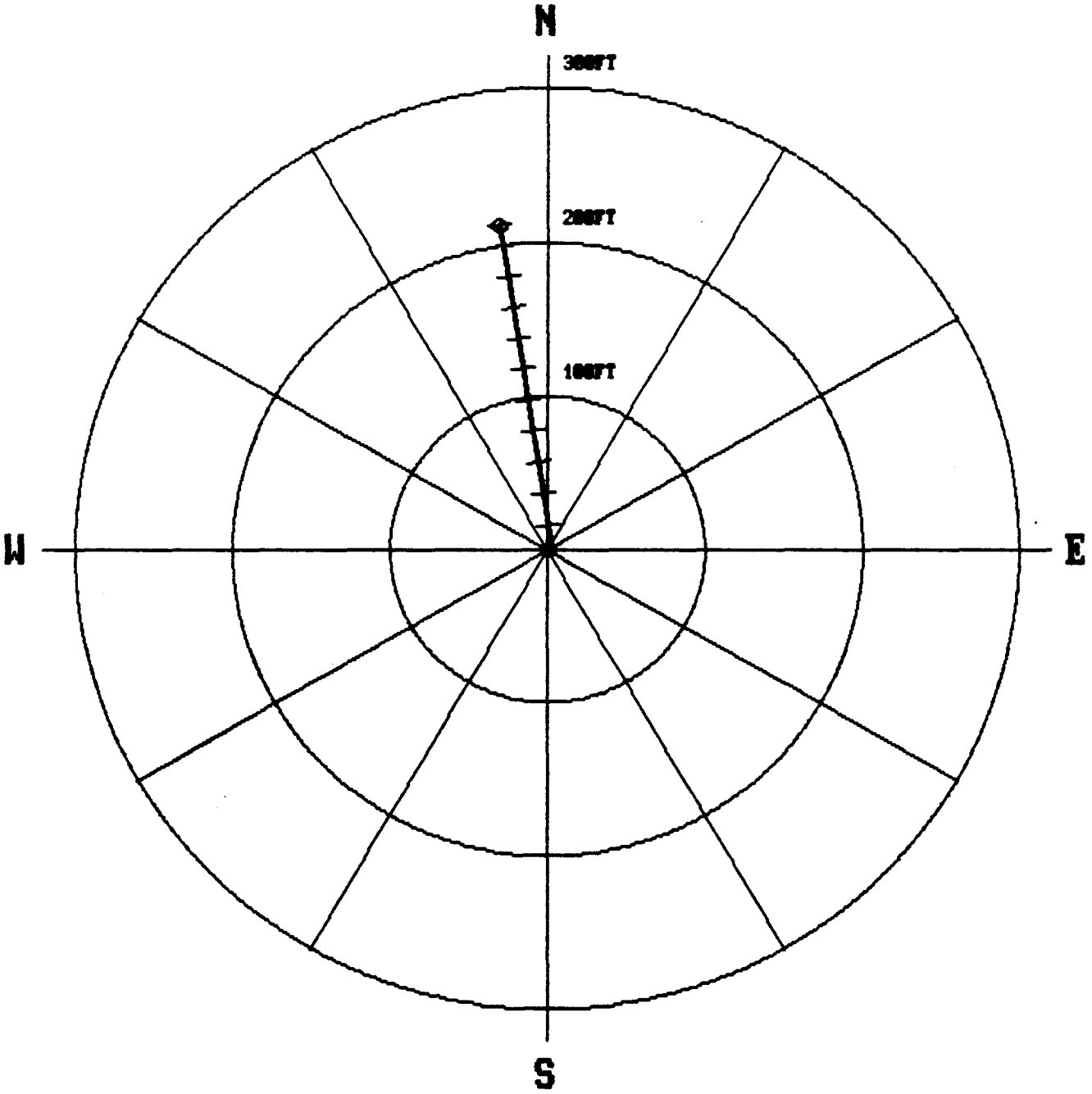
PLAN VIEW

COMPU-LOG DEVIATION

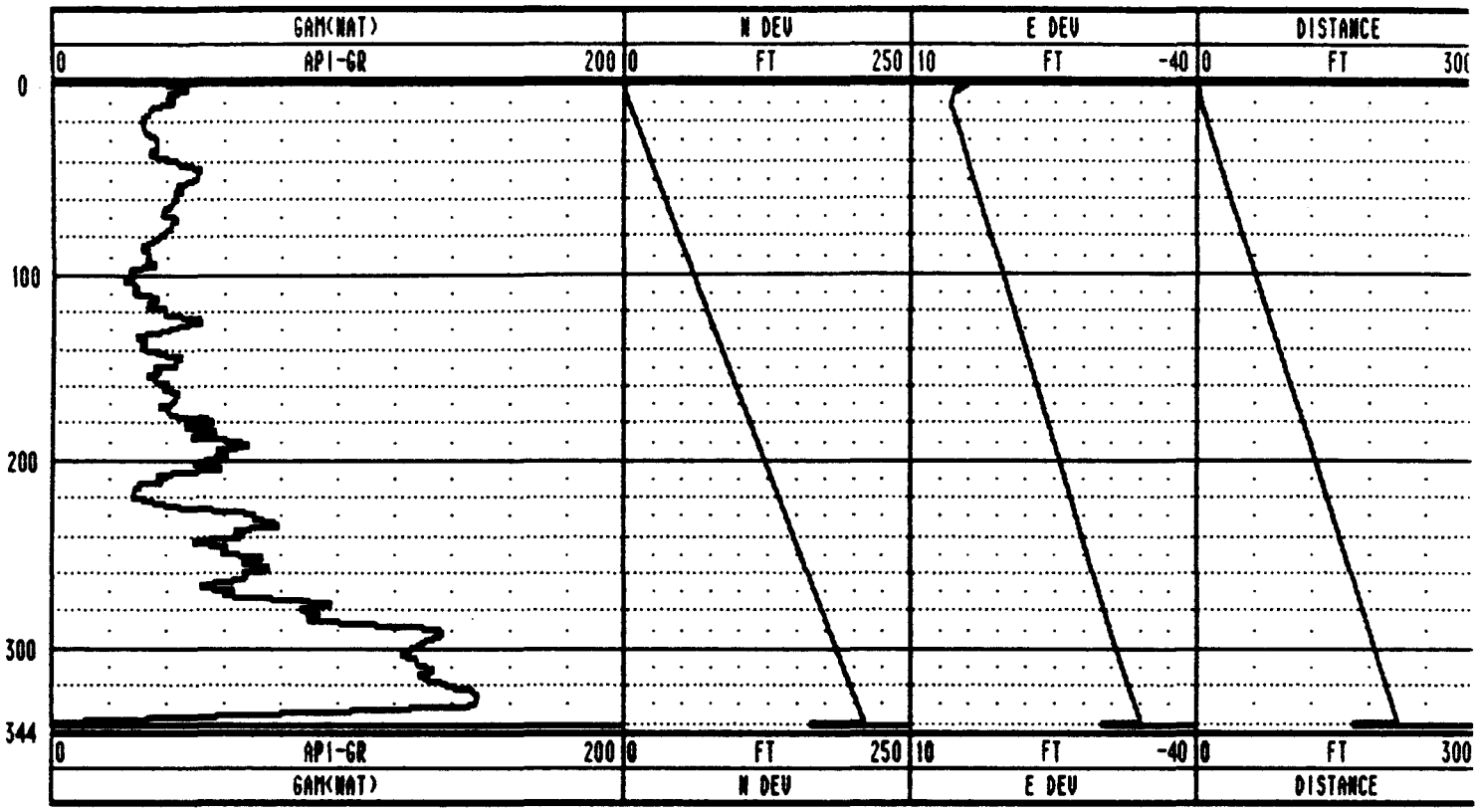
CLIENT: TETC
LOCATION: SSC
HOLE ID: SE 10.9 C
DATE OF LOG: 03/16/90
PROBE: 9055A 249

MAG DECL: 7.0

SCALE: 100 FT/IN
TRUE DEPTH: 266.01 F
AZIMUTH: 351.8
DISTANCE: 212.4 FT
+ = 25 FT INCR
○ = BOTTOM OF HOLE



Profile View
Compu-log Deviation Survey
SE 10.9C



* * * * * * * COMPU-LOG - VERTICAL DEVIATION * * * * * * *

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

HOLE ID. : SE 10.9 C
DATE OF LOG : 03/16/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
3.0	2.82	0.36	0.24	0.4	33.9	46.5	33.5
4.0	3.54	0.90	0.67	1.1	36.9	44.0	40.6
5.0	4.26	1.35	1.20	1.8	41.5	44.1	51.5
6.0	5.02	1.49	1.81	2.3	50.6	40.0	87.8
7.0	5.79	1.54	2.44	2.9	57.8	39.6	68.9
8.0	6.56	1.96	2.62	3.3	53.2	40.0	345.9
9.0	7.33	2.40	2.75	3.6	48.9	39.6	1.1
10.0	8.11	3.03	2.76	4.1	42.4	39.3	2.0
11.0	8.88	3.63	2.66	4.5	36.2	38.6	332.4
12.0	9.66	4.16	2.78	5.0	33.8	39.5	68.0
13.0	10.43	4.59	3.14	5.6	34.3	39.4	6.8
14.0	11.20	5.22	3.10	6.1	30.7	39.2	352.8
15.0	11.98	5.84	3.00	6.6	27.2	39.2	349.3
16.0	12.75	6.47	2.87	7.1	24.0	39.5	348.3
17.0	13.52	7.09	2.74	7.6	21.1	39.7	346.9
18.0	14.29	7.71	2.61	8.1	18.7	39.4	347.7
19.0	15.06	8.34	2.47	8.7	16.5	39.7	348.8
20.0	15.83	8.96	2.34	9.3	14.7	39.6	348.6
21.0	16.61	9.58	2.22	9.8	13.0	39.4	348.7
22.0	17.38	10.21	2.10	10.4	11.6	39.3	349.2
23.0	18.15	10.83	1.99	11.0	10.4	39.3	349.5
24.0	18.92	11.46	1.88	11.6	9.3	39.4	350.7
25.0	19.70	12.08	1.77	12.2	8.3	39.6	349.7
26.0	20.47	12.71	1.66	12.8	7.4	39.3	350.2
27.0	21.24	13.34	1.55	13.4	6.6	39.6	351.1
28.0	22.01	13.96	1.45	14.0	5.9	39.4	351.0
29.0	22.78	14.59	1.35	14.7	5.3	39.6	351.2
30.0	23.56	15.22	1.25	15.3	4.7	39.3	351.0
31.0	24.33	15.85	1.16	15.9	4.2	39.3	350.8
32.0	25.10	16.48	1.05	16.5	3.7	39.7	351.0
33.0	25.87	17.10	0.96	17.1	3.2	39.4	350.9
34.0	26.64	17.73	0.86	17.8	2.8	39.5	351.9
35.0	27.41	18.36	0.77	18.4	2.4	39.6	351.1
36.0	28.18	18.99	0.67	19.0	2.0	39.6	351.5
37.0	28.96	19.62	0.58	19.6	1.7	39.4	351.8
38.0	29.73	20.25	0.49	20.3	1.4	39.6	352.3
39.0	30.50	20.88	0.39	20.9	1.1	39.5	351.7
40.0	31.27	21.50	0.30	21.5	0.8	39.4	351.5
41.0	32.05	22.13	0.20	22.1	0.5	39.5	351.2
42.0	32.82	22.76	0.10	22.8	0.3	39.7	351.6
43.0	33.59	23.39	0.01	23.4	0.0	39.5	351.7
44.0	34.36	24.02	-0.09	24.0	359.8	39.4	351.4
45.0	35.14	24.64	-0.19	24.6	359.6	39.3	351.5
46.0	35.91	25.27	-0.28	25.3	359.4	39.2	350.8
47.0	36.69	25.89	-0.38	25.9	359.2	39.1	351.3
48.0	37.46	26.52	-0.48	26.5	359.0	39.4	351.4
49.0	38.23	27.14	-0.58	27.2	358.8	39.4	351.0
50.0	39.01	27.77	-0.68	27.8	358.6	39.3	351.1
51.0	39.78	28.40	-0.77	28.4	358.4	39.2	350.8
52.0	40.55	29.02	-0.87	29.0	358.3	39.5	351.0
53.0	41.33	29.65	-0.97	29.7	358.1	39.5	351.3
54.0	42.10	30.28	-1.07	30.3	358.0	39.3	350.9

* * * * * * * COMPU-LOG - VERTICAL DEVIATION * * * * * * *

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

HOLE ID. : SE 10.9 C
DATE OF LOG : 03/16/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
55.0	42.87	30.90	-1.17	30.9	357.8	39.4	350.9
56.0	43.65	31.53	-1.28	31.6	357.7	39.4	350.5
57.0	44.42	32.15	-1.38	32.2	357.6	39.2	351.0
58.0	45.20	32.78	-1.48	32.8	357.4	39.2	350.8
59.0	45.97	33.40	-1.58	33.4	357.3	39.4	350.6
60.0	46.74	34.02	-1.69	34.1	357.2	39.2	350.5
61.0	47.52	34.65	-1.79	34.7	357.0	39.1	350.7
62.0	48.29	35.27	-1.89	35.3	356.9	39.2	351.3
63.0	49.07	35.90	-1.99	36.0	356.8	39.5	350.5
64.0	49.84	36.52	-2.09	36.6	356.7	39.2	350.9
65.0	50.62	37.15	-2.19	37.2	356.6	39.3	350.8
66.0	51.39	37.77	-2.30	37.8	356.5	39.2	350.6
67.0	52.17	38.39	-2.40	38.5	356.4	39.3	350.6
68.0	52.94	39.02	-2.50	39.1	356.3	39.1	350.9
69.0	53.71	39.64	-2.61	39.7	356.2	39.5	350.5
70.0	54.49	40.27	-2.71	40.4	356.2	39.5	350.9
71.0	55.26	40.90	-2.81	41.0	356.1	39.4	350.6
72.0	56.03	41.52	-2.91	41.6	356.0	39.3	350.7
73.0	56.81	42.15	-3.02	42.3	355.9	39.4	350.6
74.0	57.58	42.77	-3.12	42.9	355.8	39.2	350.6
75.0	58.36	43.39	-3.22	43.5	355.8	39.2	350.7
76.0	59.13	44.02	-3.33	44.1	355.7	39.3	350.6
77.0	59.90	44.65	-3.43	44.8	355.6	39.4	350.7
78.0	60.68	45.27	-3.53	45.4	355.5	39.2	350.4
79.0	61.45	45.89	-3.64	46.0	355.5	39.2	350.5
80.0	62.23	46.51	-3.75	46.7	355.4	39.1	350.4
81.0	63.01	47.14	-3.85	47.3	355.3	39.1	350.2
82.0	63.78	47.76	-3.96	47.9	355.3	39.2	350.4
83.0	64.55	48.38	-4.06	48.6	355.2	39.2	350.3
84.0	65.33	49.00	-4.17	49.2	355.1	39.0	350.8
85.0	66.11	49.63	-4.27	49.8	355.1	39.2	350.4
86.0	66.88	50.25	-4.37	50.4	355.0	39.4	350.6
87.0	67.66	50.87	-4.48	51.1	355.0	39.0	350.7
88.0	68.43	51.50	-4.58	51.7	354.9	39.1	350.5
89.0	69.21	52.12	-4.68	52.3	354.9	39.1	350.4
90.0	69.98	52.74	-4.79	53.0	354.8	39.2	350.6
91.0	70.76	53.36	-4.89	53.6	354.8	39.1	350.4
92.0	71.53	53.99	-4.99	54.2	354.7	39.2	350.8
93.0	72.31	54.61	-5.10	54.8	354.7	39.2	350.6
94.0	73.09	55.23	-5.20	55.5	354.6	39.0	350.7
95.0	73.86	55.86	-5.30	56.1	354.6	39.2	350.7
96.0	74.64	56.48	-5.41	56.7	354.5	39.2	350.4
97.0	75.41	57.10	-5.51	57.4	354.5	39.1	350.7
98.0	76.19	57.72	-5.61	58.0	354.4	39.0	350.6
99.0	76.96	58.35	-5.72	58.6	354.4	39.2	350.5
100.0	77.74	58.97	-5.82	59.3	354.4	38.9	350.8
101.0	78.52	59.59	-5.92	59.9	354.3	39.3	350.6
102.0	79.29	60.21	-6.02	60.5	354.3	39.3	350.2
103.0	80.07	60.83	-6.13	61.1	354.2	39.0	350.4
104.0	80.85	61.45	-6.23	61.8	354.2	38.8	350.6
105.0	81.62	62.08	-6.34	62.4	354.2	38.9	350.7
106.0	82.40	62.70	-6.44	63.0	354.1	39.1	350.6

* * * * SCHLUMBERGER - VERTICAL DEVIATION * * * * * * *

CLIENT	: TETC	HOLE ID.	: SE 10.9 C
FIELD OFFICE	: CORSICANA	DATE OF LOG	: 03/16/90
DATA FROM	:	PROBE	: 9055A , 249
MAG. DECL.	: 7.000	DEPTH UNITS	: FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
107.0	83.17	63.32	-6.54	63.7	354.1	39.2	350.6
108.0	83.95	63.94	-6.65	64.3	354.1	38.9	350.4
109.0	84.73	64.56	-6.75	64.9	354.0	39.1	350.7
110.0	85.50	65.19	-6.85	65.5	354.0	39.1	350.8
111.0	86.28	65.81	-6.95	66.2	354.0	38.9	350.8
112.0	87.06	66.43	-7.05	66.8	353.9	39.2	350.7
113.0	87.83	67.05	-7.15	67.4	353.9	39.0	351.3
114.0	88.61	67.68	-7.25	68.1	353.9	39.1	351.0
115.0	89.38	68.30	-7.35	68.7	353.9	39.1	350.8
116.0	90.16	68.92	-7.45	69.3	353.8	39.2	350.6
117.0	90.93	69.55	-7.55	70.0	353.8	39.1	351.0
118.0	91.71	70.17	-7.65	70.6	353.8	39.2	350.8
119.0	92.48	70.79	-7.75	71.2	353.7	39.1	350.8
120.0	93.26	71.42	-7.86	71.8	353.7	39.0	351.0
121.0	94.04	72.04	-7.96	72.5	353.7	39.0	350.5
122.0	94.81	72.66	-8.06	73.1	353.7	39.1	350.9
123.0	95.59	73.28	-8.16	73.7	353.6	39.1	351.1
124.0	96.37	73.90	-8.26	74.4	353.6	39.4	350.7
125.0	97.14	74.53	-8.36	75.0	353.6	39.5	350.4
126.0	97.91	75.16	-8.46	75.6	353.6	38.9	350.9
127.0	98.69	75.78	-8.56	76.3	353.6	39.0	350.9
128.0	99.47	76.40	-8.66	76.9	353.5	39.2	350.8
129.0	100.24	77.02	-8.76	77.5	353.5	39.2	350.9
130.0	101.02	77.65	-8.86	78.2	353.5	39.2	351.0
131.0	101.79	78.27	-8.96	78.8	353.5	39.2	351.0
132.0	102.57	78.90	-9.06	79.4	353.4	39.1	351.0
133.0	103.34	79.52	-9.16	80.0	353.4	39.3	351.1
134.0	104.12	80.14	-9.26	80.7	353.4	39.1	351.3
135.0	104.89	80.77	-9.36	81.3	353.4	39.2	350.9
136.0	105.67	81.39	-9.45	81.9	353.4	39.2	351.2
137.0	106.44	82.02	-9.55	82.6	353.4	39.3	350.9
138.0	107.21	82.64	-9.65	83.2	353.3	39.2	351.1
139.0	107.99	83.27	-9.75	83.8	353.3	39.3	350.9
140.0	108.76	83.89	-9.85	84.5	353.3	39.1	351.0
141.0	109.54	84.52	-9.95	85.1	353.3	39.2	351.0
142.0	110.31	85.14	-10.05	85.7	353.3	39.4	350.9
143.0	111.09	85.77	-10.15	86.4	353.3	39.2	350.9
144.0	111.86	86.39	-10.25	87.0	353.2	39.1	351.1
145.0	112.64	87.02	-10.35	87.6	353.2	39.4	350.8
146.0	113.41	87.64	-10.45	88.3	353.2	39.3	351.1
147.0	114.18	88.27	-10.55	88.9	353.2	39.3	350.8
148.0	114.96	88.89	-10.65	89.5	353.2	39.2	351.0
149.0	115.73	89.52	-10.75	90.2	353.2	39.3	350.9
150.0	116.51	90.14	-10.85	90.8	353.1	39.5	350.7
151.0	117.28	90.77	-10.95	91.4	353.1	39.3	351.5
152.0	118.05	91.39	-11.04	92.1	353.1	39.2	350.5
153.0	118.83	92.02	-11.15	92.7	353.1	39.3	350.9
154.0	119.60	92.64	-11.24	93.3	353.1	39.3	351.1
155.0	120.38	93.27	-11.34	94.0	353.1	39.3	351.5
156.0	121.15	93.90	-11.44	94.6	353.1	39.2	351.1
157.0	121.92	94.52	-11.54	95.2	353.0	39.2	350.8
158.0	122.70	95.14	-11.64	95.9	353.0	39.2	350.8

* * * * * * * COMPU-LOG - VERTICAL DEVIATION * * * * * * *

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

HOLE ID. : SE 10.9 C
DATE OF LOG : 03/16/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
159.0	123.48	95.77	-11.74	96.5	353.0	38.9	350.9
160.0	124.25	96.39	-11.84	97.1	353.0	39.6	350.8
161.0	125.02	97.02	-11.94	97.7	353.0	39.1	350.8
162.0	125.80	97.64	-12.04	98.4	353.0	38.9	351.4
163.0	126.58	98.26	-12.13	99.0	353.0	39.2	351.3
164.0	127.35	98.89	-12.23	99.6	353.0	39.2	350.9
165.0	128.13	99.51	-12.33	100.3	352.9	39.3	351.7
166.0	128.90	100.14	-12.43	100.9	352.9	39.6	350.0
167.0	129.67	100.76	-12.53	101.5	352.9	38.8	351.4
168.0	130.45	101.38	-12.63	102.2	352.9	39.1	350.8
169.0	131.23	102.01	-12.73	102.8	352.9	39.5	350.7
170.0	132.00	102.63	-12.83	103.4	352.9	38.7	351.4
171.0	132.78	103.25	-12.92	104.1	352.9	39.2	351.0
172.0	133.55	103.88	-13.02	104.7	352.9	39.1	350.5
173.0	134.33	104.50	-13.13	105.3	352.8	39.6	350.3
174.0	135.10	105.13	-13.22	106.0	352.8	39.1	352.0
175.0	135.88	105.75	-13.32	106.6	352.8	39.2	351.2
176.0	136.65	106.38	-13.42	107.2	352.8	39.0	351.0
177.0	137.43	107.00	-13.51	107.8	352.8	39.1	351.0
178.0	138.20	107.62	-13.61	108.5	352.8	39.1	350.9
179.0	138.98	108.24	-13.71	109.1	352.8	38.9	351.3
180.0	139.76	108.86	-13.81	109.7	352.8	39.0	350.6
181.0	140.53	109.49	-13.91	110.4	352.8	39.5	352.1
182.0	141.31	110.12	-14.00	111.0	352.8	38.8	351.2
183.0	142.09	110.73	-14.10	111.6	352.7	39.0	350.7
184.0	142.86	111.36	-14.20	112.3	352.7	39.2	350.9
185.0	143.64	111.98	-14.29	112.9	352.7	39.2	351.0
186.0	144.42	112.60	-14.39	113.5	352.7	38.8	351.1
187.0	145.19	113.22	-14.49	114.1	352.7	39.1	351.0
188.0	145.97	113.85	-14.59	114.8	352.7	39.1	351.2
189.0	146.75	114.47	-14.69	115.4	352.7	39.0	350.6
190.0	147.52	115.09	-14.79	116.0	352.7	38.8	350.8
191.0	148.30	115.71	-14.89	116.7	352.7	39.1	350.8
192.0	149.08	116.33	-14.99	117.3	352.7	38.6	351.4
193.0	149.86	116.95	-15.08	117.9	352.7	38.8	351.4
194.0	150.64	117.57	-15.18	118.5	352.6	39.0	350.7
195.0	151.42	118.19	-15.28	119.2	352.6	39.0	351.0
196.0	152.19	118.81	-15.38	119.8	352.6	38.7	351.2
197.0	152.97	119.43	-15.48	120.4	352.6	38.9	350.6
198.0	153.75	120.05	-15.58	121.1	352.6	39.0	350.9
199.0	154.53	120.67	-15.68	121.7	352.6	39.3	351.0
200.0	155.30	121.30	-15.78	122.3	352.6	39.3	351.1
201.0	156.08	121.92	-15.87	122.9	352.6	38.9	351.2
202.0	156.85	122.54	-15.97	123.6	352.6	39.0	350.9
203.0	157.63	123.16	-16.07	124.2	352.6	39.0	351.1
204.0	158.41	123.79	-16.16	124.8	352.6	39.0	351.6
205.0	159.18	124.41	-16.26	125.5	352.6	39.3	350.8
206.0	159.96	125.03	-16.36	126.1	352.5	39.1	351.3
207.0	160.74	125.65	-16.45	126.7	352.5	38.7	351.3
208.0	161.52	126.28	-16.55	127.4	352.5	39.3	351.7
209.0	162.29	126.90	-16.64	128.0	352.5	39.1	350.8
210.0	163.07	127.52	-16.74	128.6	352.5	38.9	351.0

* * * * * * * COMPU-LOG - VERTICAL DEVIATION * * * * * * *

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

HOLE ID. : SE 10.9 C
DATE OF LOG : 03/16/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
211.0	163.84	128.14	-16.84	129.2	352.5	39.0	350.9
212.0	164.62	128.76	-16.94	129.9	352.5	39.1	350.6
213.0	165.40	129.39	-17.04	130.5	352.5	39.0	350.9
214.0	166.18	130.01	-17.14	131.1	352.5	38.9	351.0
215.0	166.95	130.63	-17.24	131.8	352.5	39.5	351.2
216.0	167.73	131.26	-17.34	132.4	352.5	39.0	350.5
217.0	168.50	131.88	-17.45	133.0	352.5	39.0	350.5
218.0	169.28	132.50	-17.55	133.7	352.5	39.1	350.2
219.0	170.05	133.12	-17.66	134.3	352.4	39.6	350.7
220.0	170.83	133.75	-17.76	134.9	352.4	38.8	351.4
221.0	171.61	134.37	-17.85	135.5	352.4	39.1	350.7
222.0	172.38	134.99	-17.95	136.2	352.4	38.9	351.2
223.0	173.16	135.61	-18.05	136.8	352.4	38.7	351.5
224.0	173.94	136.23	-18.14	137.4	352.4	39.0	351.0
225.0	174.72	136.85	-18.24	138.1	352.4	39.2	350.4
226.0	175.49	137.48	-18.34	138.7	352.4	39.4	351.5
227.0	176.26	138.10	-18.44	139.3	352.4	39.2	351.6
228.0	177.04	138.73	-18.53	140.0	352.4	39.1	351.2
229.0	177.82	139.35	-18.63	140.6	352.4	38.9	351.2
230.0	178.60	139.97	-18.72	141.2	352.4	38.8	351.4
231.0	179.37	140.59	-18.82	141.8	352.4	39.1	351.1
232.0	180.15	141.21	-18.92	142.5	352.4	39.2	350.6
233.0	180.92	141.84	-19.02	143.1	352.4	39.1	351.4
234.0	181.70	142.46	-19.11	143.7	352.4	38.9	351.7
235.0	182.48	143.08	-19.21	144.4	352.4	39.1	351.7
236.0	183.25	143.71	-19.30	145.0	352.4	39.0	351.4
237.0	184.03	144.33	-19.39	145.6	352.3	39.1	351.4
238.0	184.81	144.95	-19.48	146.3	352.3	38.9	351.3
239.0	185.59	145.57	-19.58	146.9	352.3	39.0	351.2
240.0	186.36	146.20	-19.68	147.5	352.3	39.2	351.5
241.0	187.14	146.82	-19.77	148.1	352.3	39.1	350.8
242.0	187.92	147.44	-19.87	148.8	352.3	38.9	351.2
243.0	188.69	148.06	-19.97	149.4	352.3	39.3	351.1
244.0	189.47	148.69	-20.07	150.0	352.3	38.9	350.8
245.0	190.25	149.31	-20.16	150.7	352.3	38.9	351.0
246.0	191.02	149.93	-20.26	151.3	352.3	39.3	351.2
247.0	191.80	150.55	-20.36	151.9	352.3	38.8	351.4
248.0	192.58	151.17	-20.45	152.6	352.3	39.1	351.3
249.0	193.35	151.80	-20.55	153.2	352.3	39.3	350.6
250.0	194.13	152.42	-20.65	153.8	352.3	38.9	351.3
251.0	194.90	153.04	-20.75	154.4	352.3	39.3	351.4
252.0	195.68	153.67	-20.84	155.1	352.3	39.0	351.3
253.0	196.46	154.29	-20.93	155.7	352.3	38.8	351.2
254.0	197.24	154.91	-21.03	156.3	352.3	38.5	350.9
255.0	198.02	155.52	-21.13	157.0	352.3	38.9	351.7
256.0	198.80	156.15	-21.22	157.6	352.3	38.9	351.2
257.0	199.57	156.77	-21.31	158.2	352.3	39.0	352.4
258.0	200.35	157.39	-21.40	158.8	352.3	39.8	351.5
259.0	201.12	158.02	-21.49	159.5	352.3	39.2	351.5
260.0	201.89	158.65	-21.59	160.1	352.3	38.2	353.0
261.0	202.68	159.26	-21.66	160.7	352.3	39.0	351.5
262.0	203.46	159.88	-21.76	161.4	352.3	39.2	350.7

* * * * * * * COMPU-LOG - VERTICAL DEVIATION * * * * * * *

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

HOLE ID. : SE 10.9 C
DATE OF LOG : 03/16/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
263.0	204.23	160.51	-21.86	162.0	352.2	40.4	350.9
264.0	205.00	161.14	-21.96	162.6	352.2	39.2	350.6
265.0	205.77	161.77	-22.07	163.3	352.2	40.0	350.0
266.0	206.54	162.40	-22.17	163.9	352.2	39.2	350.7
267.0	207.32	163.02	-22.27	164.5	352.2	38.8	351.2
268.0	208.09	163.64	-22.37	165.2	352.2	39.3	351.4
269.0	208.87	164.27	-22.46	165.8	352.2	39.5	351.0
270.0	209.64	164.89	-22.56	166.4	352.2	39.3	351.0
271.0	210.42	165.52	-22.65	167.1	352.2	38.5	353.2
272.0	211.20	166.14	-22.74	167.7	352.2	38.6	351.0
273.0	211.98	166.75	-22.84	168.3	352.2	40.1	350.1
274.0	212.75	167.38	-22.94	168.9	352.2	38.6	350.9
275.0	213.53	168.00	-23.04	169.6	352.2	38.9	350.7
276.0	214.30	168.63	-23.14	170.2	352.2	39.2	352.0
277.0	215.08	169.25	-23.23	170.8	352.2	39.9	351.2
278.0	215.85	169.88	-23.33	171.5	352.2	39.2	350.6
279.0	216.63	170.50	-23.43	172.1	352.2	39.3	350.3
280.0	217.40	171.12	-23.54	172.7	352.2	40.4	349.2
281.0	218.17	171.76	-23.65	173.4	352.2	39.4	350.8
282.0	218.93	172.39	-23.75	174.0	352.2	39.4	351.6
283.0	219.71	173.02	-23.84	174.7	352.2	39.0	351.5
284.0	220.48	173.64	-23.95	175.3	352.1	39.1	351.0
285.0	221.26	174.27	-24.04	175.9	352.1	39.2	351.0
286.0	222.03	174.89	-24.14	176.5	352.1	39.6	350.0
287.0	222.81	175.51	-24.25	177.2	352.1	39.3	349.3
288.0	223.58	176.13	-24.37	177.8	352.1	39.1	349.1
289.0	224.36	176.75	-24.48	178.4	352.1	38.4	350.7
290.0	225.14	177.37	-24.58	179.1	352.1	38.9	351.3
291.0	225.92	177.99	-24.67	179.7	352.1	38.8	351.5
292.0	226.70	178.61	-24.78	180.3	352.1	39.3	349.8
293.0	227.47	179.23	-24.88	180.9	352.1	39.7	350.0
294.0	228.25	179.86	-24.99	181.6	352.1	39.5	350.2
295.0	229.02	180.49	-25.09	182.2	352.1	40.1	350.3
296.0	229.78	181.12	-25.18	182.9	352.1	38.5	353.6
297.0	230.56	181.74	-25.27	183.5	352.1	39.8	350.6
298.0	231.33	182.38	-25.38	184.1	352.1	39.2	351.7
299.0	232.11	182.99	-25.49	184.8	352.1	38.4	349.4
300.0	232.89	183.60	-25.59	185.4	352.1	38.5	350.7
301.0	233.67	184.22	-25.70	186.0	352.1	41.0	347.9
302.0	234.44	184.84	-25.83	186.6	352.0	38.1	346.6
303.0	235.22	185.47	-25.93	187.3	352.0	39.5	353.8
304.0	235.99	186.09	-26.03	187.9	352.0	39.7	350.5
305.0	236.76	186.72	-26.13	188.5	352.0	39.1	350.1
306.0	237.53	187.35	-26.25	189.2	352.0	40.1	350.4
307.0	238.30	187.98	-26.35	189.8	352.0	39.8	350.4
308.0	239.07	188.60	-26.46	190.4	352.0	39.3	348.3
309.0	239.84	189.23	-26.58	191.1	352.0	40.1	349.2
310.0	240.62	189.85	-26.70	191.7	352.0	38.0	349.2
311.0	241.39	190.47	-26.82	192.3	352.0	39.2	350.5
312.0	242.16	191.09	-26.93	193.0	352.0	41.1	349.4
313.0	242.93	191.73	-27.03	193.6	352.0	38.8	349.5
314.0	243.70	192.35	-27.15	194.3	352.0	39.4	351.1

* * * * * * * COMPU-LOG - VERTICAL DEVIATION * * * * * * *

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

HOLE ID. : SE 10.9 C
DATE OF LOG : 03/16/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 6

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
315.0	244.48	192.97	-27.25	194.9	352.0	37.7	349.9
316.0	245.27	193.57	-27.38	195.5	351.9	38.7	347.0
317.0	246.04	194.19	-27.50	196.1	351.9	39.5	350.9
318.0	246.82	194.81	-27.61	196.8	351.9	39.6	348.8
319.0	247.60	195.43	-27.74	197.4	351.9	38.8	346.7
320.0	248.37	196.05	-27.85	198.0	351.9	39.4	351.5
321.0	249.14	196.67	-27.97	198.7	351.9	40.5	347.8
322.0	249.91	197.31	-28.09	199.3	351.9	39.1	348.9
323.0	250.69	197.93	-28.18	199.9	351.9	39.2	352.8
324.0	251.45	198.56	-28.29	200.6	351.9	40.9	351.4
325.0	252.22	199.20	-28.38	201.2	351.9	37.9	352.1
326.0	252.99	199.82	-28.49	201.8	351.9	40.0	351.6
327.0	253.74	200.47	-28.60	202.5	351.9	42.8	350.5
328.0	254.49	201.12	-28.71	203.2	351.9	38.8	348.4
329.0	255.27	201.74	-28.82	203.8	351.9	38.3	350.4
330.0	256.06	202.35	-28.94	204.4	351.9	39.4	349.5
331.0	256.84	202.96	-29.06	205.0	351.9	38.7	346.4
332.0	257.63	203.56	-29.18	205.6	351.8	36.6	348.2
333.0	258.41	204.17	-29.32	206.3	351.8	39.0	350.6
334.0	259.19	204.79	-29.39	206.9	351.8	37.7	352.8
335.0	259.97	205.41	-29.48	207.5	351.8	39.5	351.7
336.0	260.75	206.02	-29.59	208.1	351.8	38.0	346.8
337.0	261.52	206.65	-29.69	208.8	351.8	39.2	350.4
338.0	262.30	207.26	-29.81	209.4	351.8	38.8	349.3
339.0	263.08	207.88	-29.91	210.0	351.8	39.2	350.8
340.0	263.86	208.50	-30.01	210.6	351.8	38.8	352.0
341.0	264.64	209.12	-30.12	211.3	351.8	40.0	349.4
342.0	265.39	209.76	-30.23	211.9	351.8	41.5	354.5
343.0	266.21	210.26	-30.32	212.4	351.8	0.0	0.0
343.1	266.11	210.26	-30.32	212.4	351.8	0.0	0.0

WIRE-LINE LOGGING PARAMETERS

Hole No. SE 10.9D **Log Measured From:** Ground Level

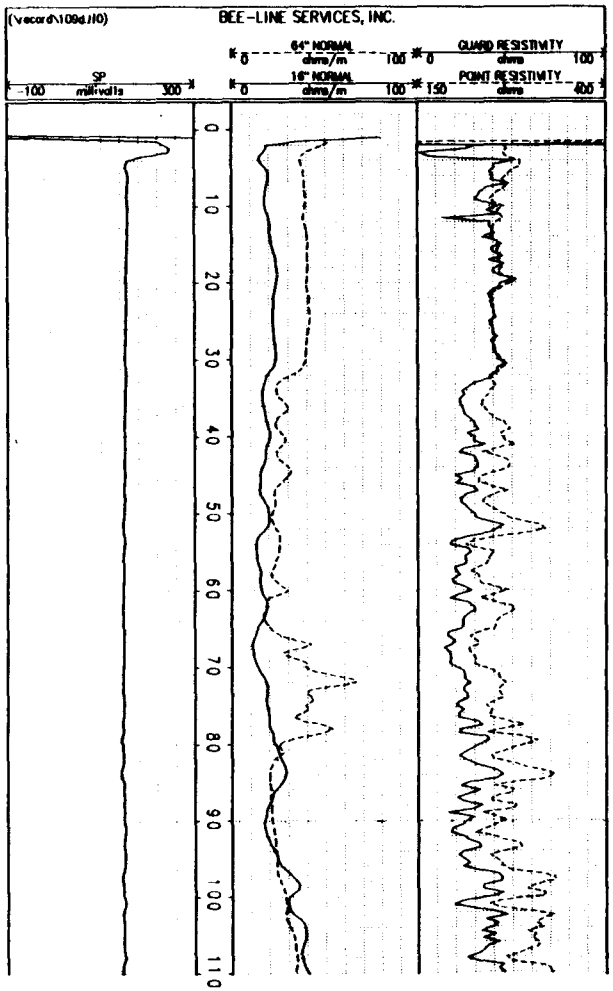
Drilling Parameters
Depth 354.5 feet
Bit Diameter 3.125 inches

Logging Parameters	Electrical Log	Gamma Log	Sonic Log	Deviation Log
Date	March 8, 1990	March 8, 1990	March 8, 1990	March 8, 1990
Bottom Log Interval	344.0 feet	344.0 feet	339.3 feet	344.0 feet
Top Log Interval	surface	surface	surface	surface
Type of Fluid in Hole	water	water	water	water
Time Since Circulation Stop	1 hour	1 hour	1 hour	4 hours
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A	9055A/135
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A	COMPU-LOG
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.	60 feet/min.
Sample Interval	0.5 foot	0.5 foot	0.5 foot	0.1 foot

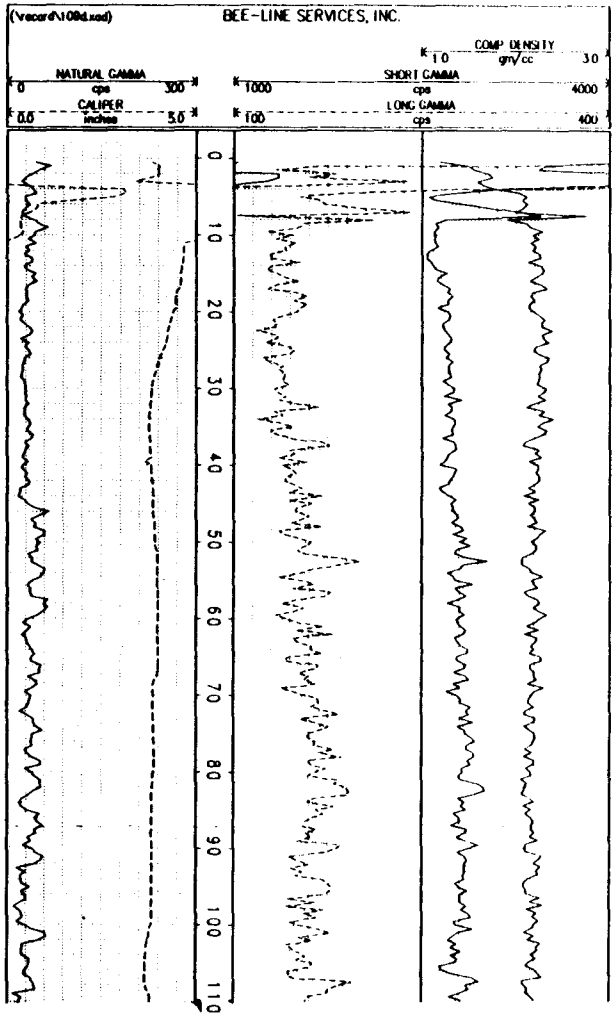
Logged by: BEE-LINE SERVICES, INC.
P. O. Box 2096
Corsicana, TX 75151

SE 10.9D Wire-line logs run March 8, 1990. Surface elevation 683.2 feet.

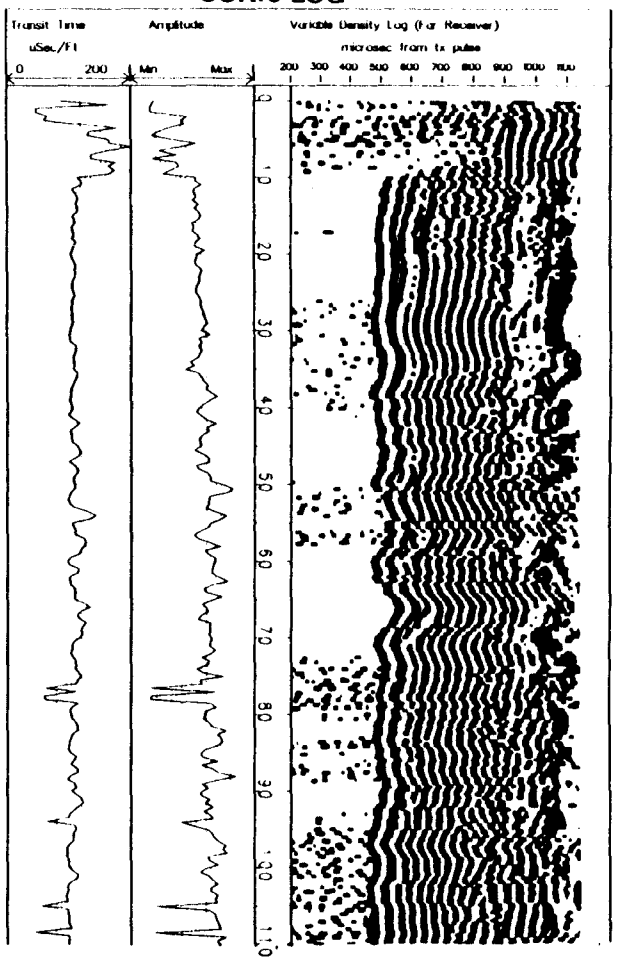
ELECTRICAL LOG



GAMMA LOG

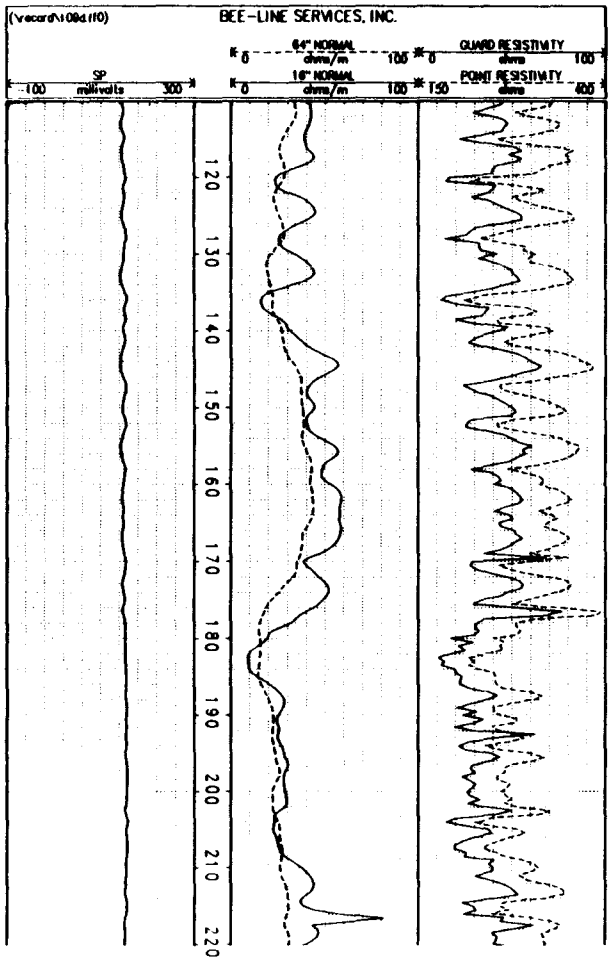


SONIC LOG

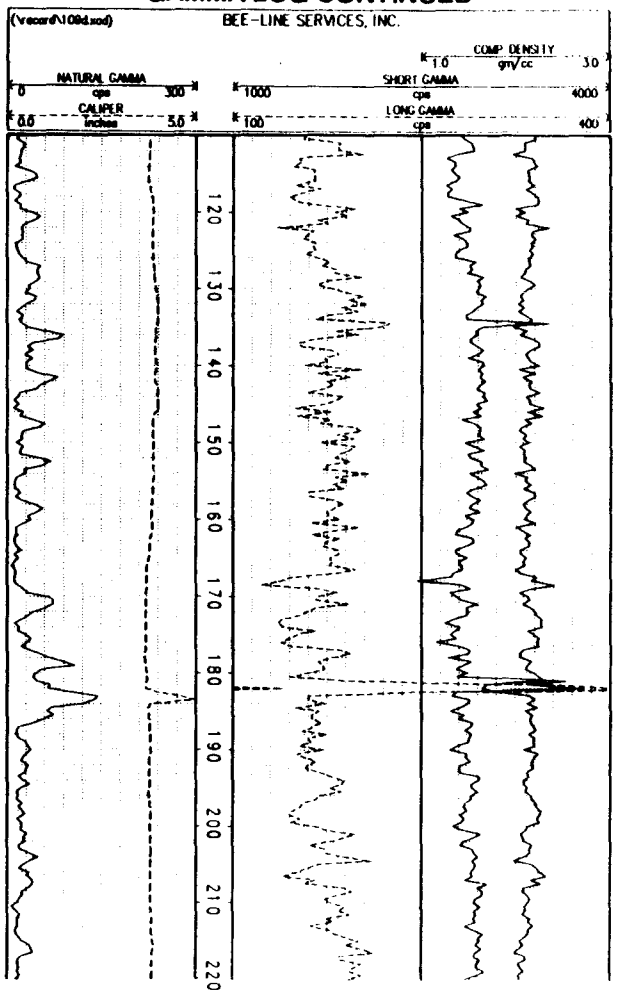


SE 10.9D Wire-line logs run March 8, 1990 (Continued). Surface elevation 683.2 feet.

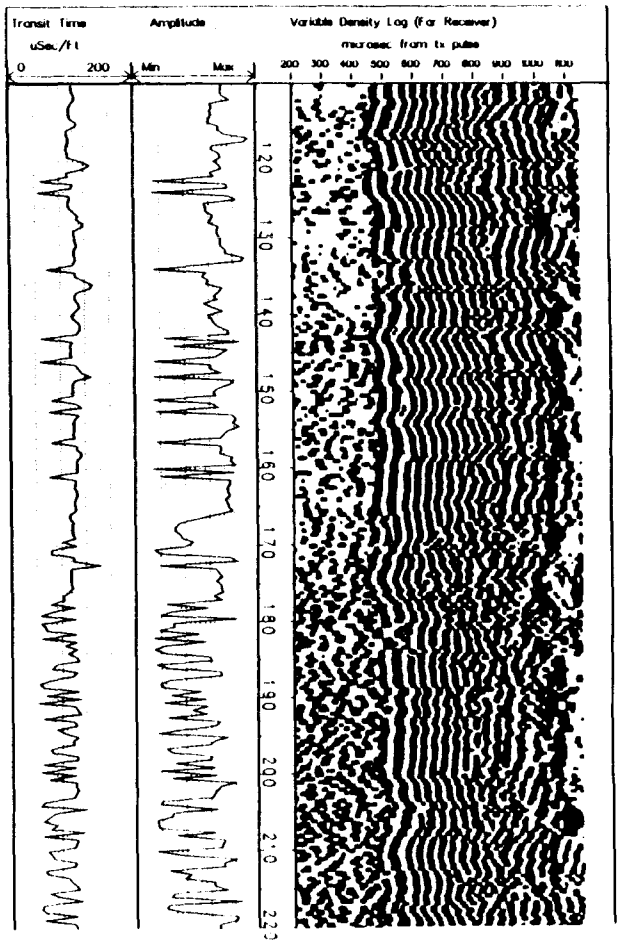
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED

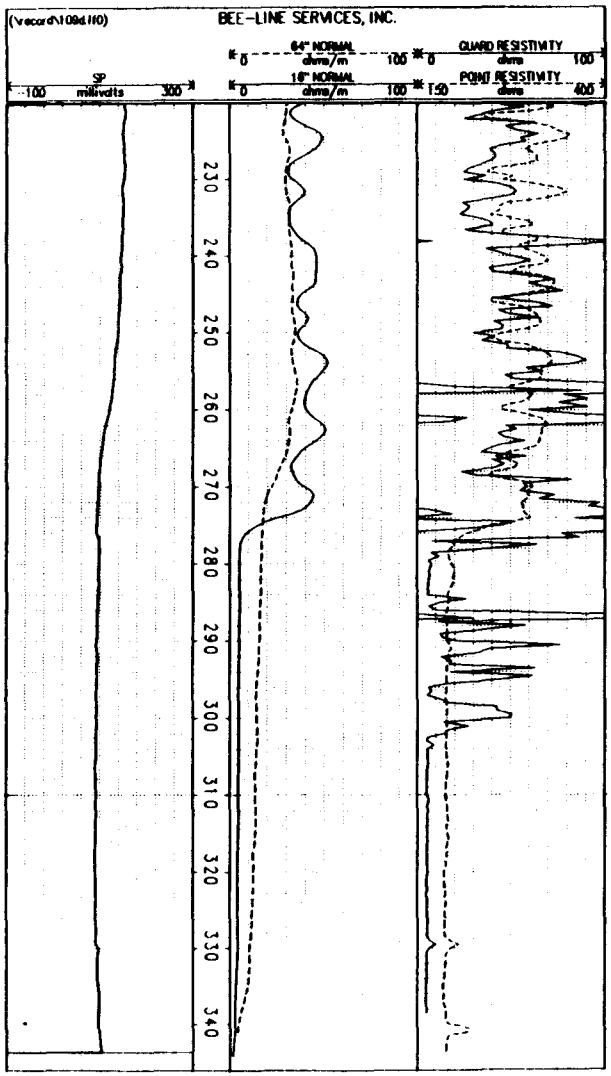


SONIC LOG CONTINUED

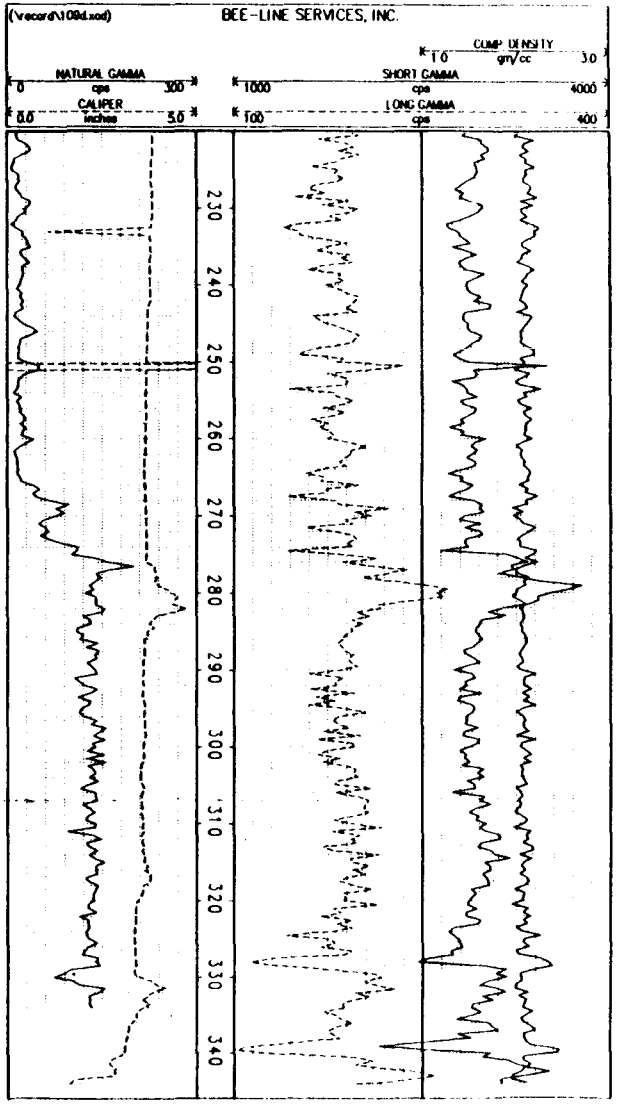


SE 10.9D Wire-line logs run March 8, 1990 (Continued). Surface elevation 683.2 feet.

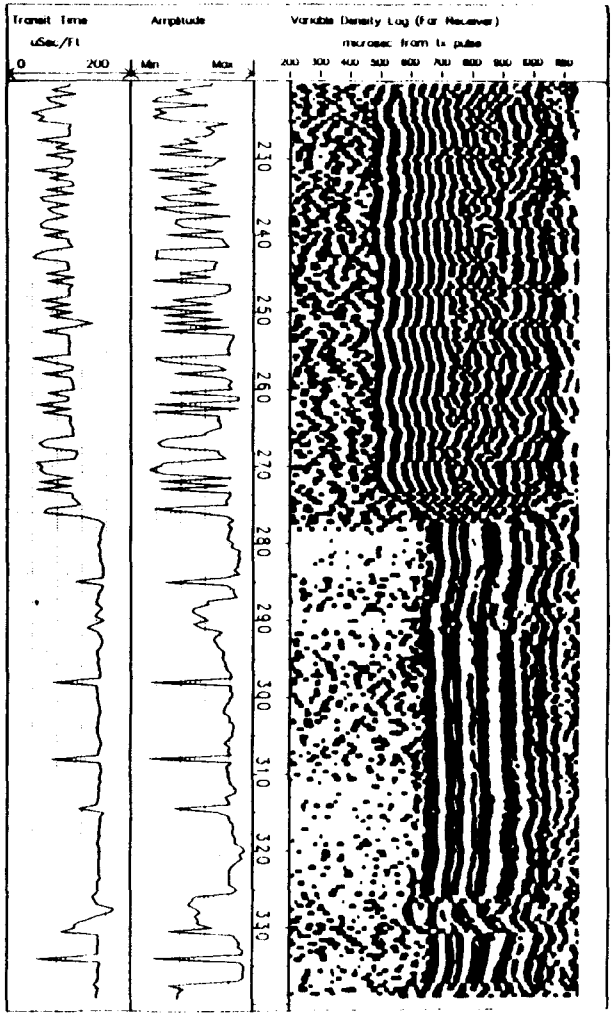
ELECTRICAL LOG CONTINUED



GAMMA LOG CONTINUED



SONIC LOG CONTINUED



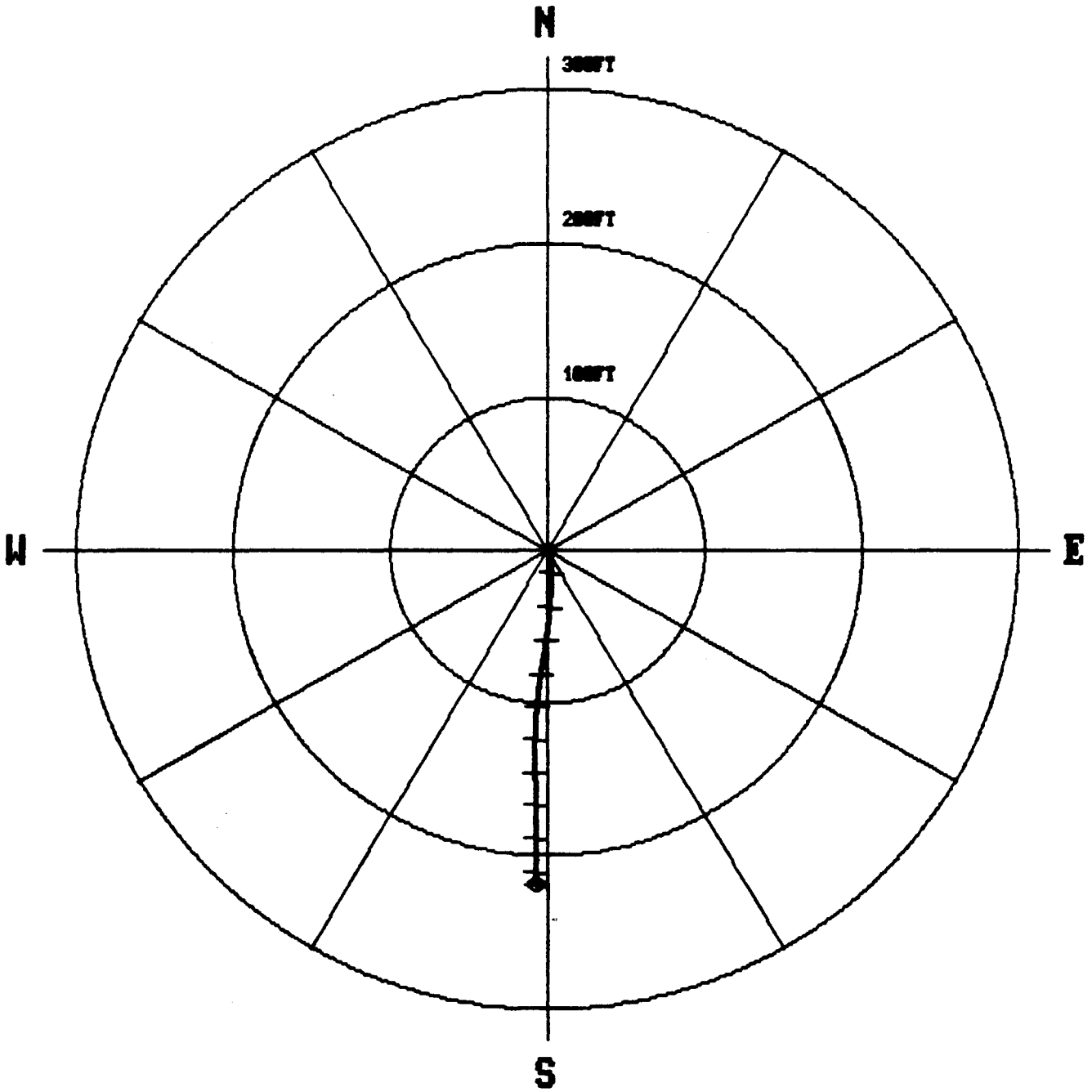
PLAN VIEW

COMPU-LOG DEVIATION

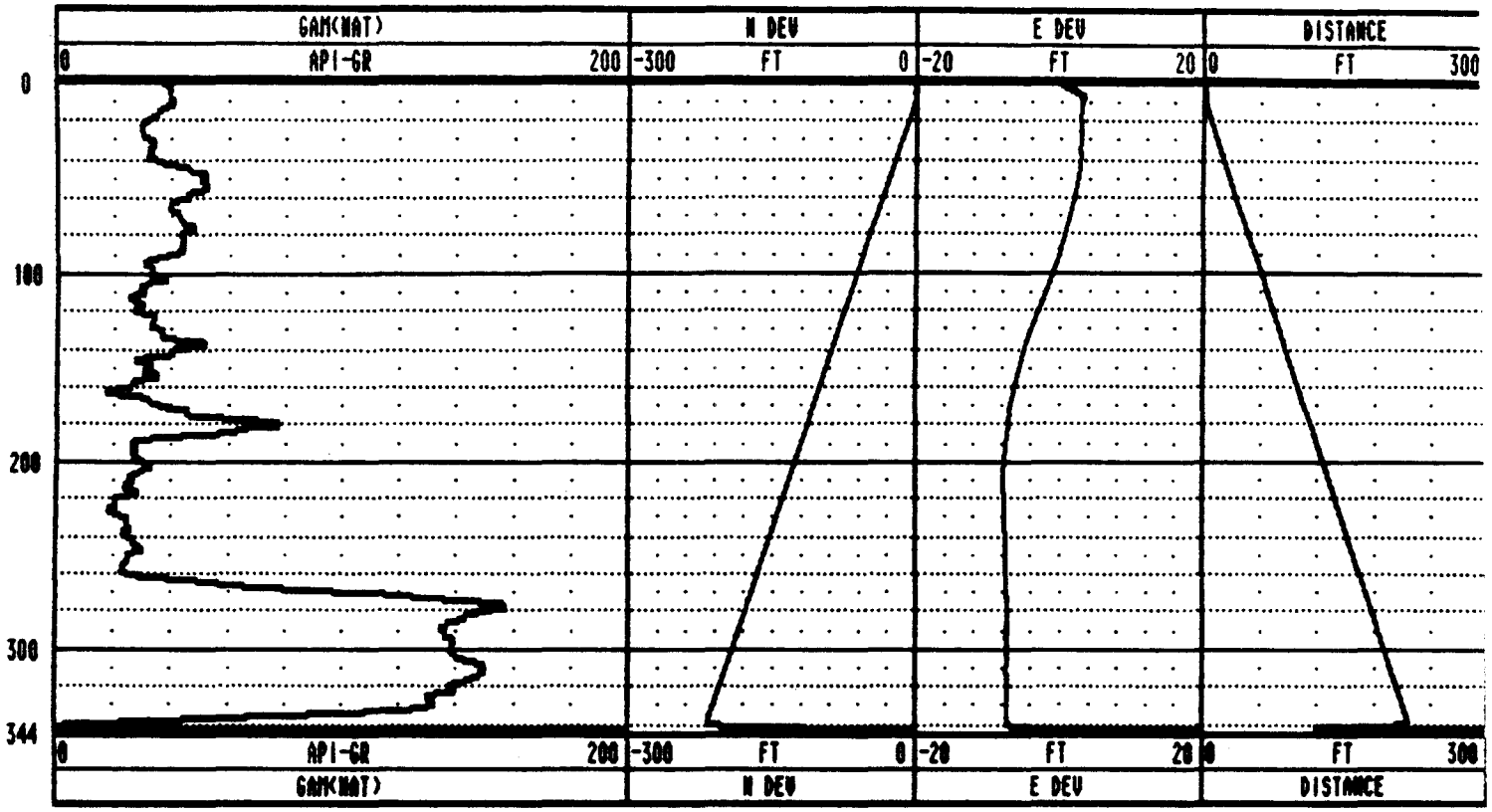
CLIENT: TETC
LOCATION: SSC
HOLE ID: SE 10.9 B
DATE OF LOG: 03/08/90
PROBE: 9055A 249

MAG DECL: 7.0

SCALE: 100 FT/IN
TRUE DEPTH: 259.23 F
AZIMUTH: 181.9
DISTANCE: 218.6 FT
+ = 25 FT INCR
O = BOTTOM OF HOLE



Profile View
Compu-log Deviation Survey
SE 10.9D



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

HOLE ID. : SE 10.9 D
DATE OF LOG : 03/08/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 1

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
3.0	2.90	-0.28	0.11	0.3	159.3	36.8	158.5
4.0	3.69	-0.80	0.43	0.9	151.4	39.1	139.2
5.0	4.44	-1.18	0.96	1.5	140.9	42.5	117.4
6.0	5.20	-1.49	1.54	2.1	134.1	40.8	110.1
7.0	5.96	-1.31	2.11	2.5	121.8	40.5	50.5
8.0	6.72	-1.70	2.54	3.1	123.8	40.6	132.9
9.0	7.48	-1.24	2.95	3.2	112.8	41.1	75.1
10.0	8.23	-1.27	3.56	3.8	109.7	41.6	163.6
11.0	8.98	-1.89	3.35	3.8	119.3	42.7	197.1
12.0	9.72	-2.00	2.78	3.4	125.7	41.6	280.3
13.0	10.46	-1.76	2.97	3.4	120.6	42.0	170.3
14.0	11.21	-2.42	3.02	3.9	128.7	41.6	172.8
15.0	11.96	-3.06	2.94	4.2	136.2	41.8	169.4
16.0	12.71	-3.72	2.98	4.8	141.4	41.1	179.4
17.0	13.45	-4.39	3.00	5.3	145.7	41.5	187.1
18.0	14.20	-5.05	2.96	5.9	149.7	41.3	186.6
19.0	14.95	-5.71	2.94	6.4	152.7	41.6	179.5
20.0	15.69	-6.38	2.95	7.0	155.1	41.6	180.1
21.0	16.44	-7.04	2.96	7.6	157.2	41.7	179.2
22.0	17.19	-7.71	2.96	8.3	159.0	41.6	181.1
23.0	17.94	-8.37	2.96	8.9	160.5	41.6	179.4
24.0	18.68	-9.03	2.98	9.5	161.8	41.6	179.2
25.0	19.43	-9.70	2.98	10.1	162.9	41.6	179.4
26.0	20.18	-10.36	2.96	10.8	164.0	41.6	180.2
27.0	20.93	-11.03	2.95	11.4	165.0	41.6	181.3
28.0	21.67	-11.69	2.96	12.1	165.8	41.9	178.2
29.0	22.42	-12.36	2.97	12.7	166.5	41.8	178.1
30.0	23.16	-13.02	2.97	13.4	167.1	41.5	183.2
31.0	23.91	-13.69	2.97	14.0	167.7	41.6	180.8
32.0	24.66	-14.35	2.97	14.7	168.3	41.7	180.0
33.0	25.40	-15.02	2.98	15.3	168.8	41.6	180.5
34.0	26.15	-15.68	2.96	16.0	169.3	41.6	184.4
35.0	26.90	-16.34	2.95	16.6	169.8	41.6	183.5
36.0	27.65	-17.01	2.94	17.3	170.2	41.8	182.3
37.0	28.39	-17.67	2.93	17.9	170.6	42.1	177.6
38.0	29.14	-18.34	2.93	18.6	170.9	41.6	182.9
39.0	29.88	-19.01	2.95	19.2	171.2	42.1	173.4
40.0	30.63	-19.67	2.98	19.9	171.4	41.4	178.5
41.0	31.38	-20.33	2.95	20.5	171.7	41.6	181.3
42.0	32.13	-20.99	2.96	21.2	172.0	41.7	179.0
43.0	32.87	-21.66	2.92	21.9	172.3	41.6	182.9
44.0	33.62	-22.32	2.88	22.5	172.6	40.6	186.7
45.0	34.37	-22.98	2.88	23.2	172.9	41.2	184.0
46.0	35.12	-23.64	2.85	23.8	173.1	41.6	183.1
47.0	35.87	-24.30	2.81	24.5	173.4	41.5	182.3
48.0	36.62	-24.96	2.77	25.1	173.7	41.5	183.2
49.0	37.37	-25.62	2.74	25.8	173.9	41.7	181.5
50.0	38.12	-26.29	2.70	26.4	174.1	41.6	183.4
51.0	38.86	-26.95	2.66	27.1	174.4	41.5	183.9
52.0	39.61	-27.61	2.61	27.7	174.6	41.6	183.8
53.0	40.36	-28.27	2.58	28.4	174.8	41.6	185.0
54.0	41.11	-28.93	2.54	29.0	175.0	41.9	183.7

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

HOLE ID. : SE 10.9 D
DATE OF LOG : 03/08/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 1

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
55.0	41.86	-29.59	2.47	29.7	175.2	41.0	184.7
56.0	42.61	-30.25	2.43	30.4	175.4	41.6	181.9
57.0	43.36	-30.92	2.39	31.0	175.6	41.7	184.3
58.0	44.11	-31.57	2.32	31.7	175.8	41.7	182.3
59.0	44.85	-32.23	2.26	32.3	176.0	41.6	185.1
60.0	45.60	-32.90	2.21	33.0	176.2	41.4	183.7
61.0	46.35	-33.56	2.16	33.6	176.3	41.8	184.4
62.0	47.10	-34.22	2.10	34.3	176.5	41.6	185.7
63.0	47.84	-34.88	2.06	34.9	176.6	41.9	187.3
64.0	48.59	-35.54	2.00	35.6	176.8	41.5	184.9
65.0	49.34	-36.21	1.94	36.3	176.9	41.7	185.7
66.0	50.09	-36.86	1.87	36.9	177.1	41.4	185.5
67.0	50.84	-37.53	1.81	37.6	177.2	41.7	186.0
68.0	51.58	-38.19	1.75	38.2	177.4	41.7	184.0
69.0	52.33	-38.85	1.70	38.9	177.5	41.7	183.5
70.0	53.08	-39.51	1.64	39.5	177.6	41.7	185.0
71.0	53.82	-40.17	1.57	40.2	177.8	41.8	187.1
72.0	54.57	-40.83	1.49	40.9	177.9	41.5	186.9
73.0	55.32	-41.49	1.44	41.5	178.0	41.7	183.4
74.0	56.07	-42.16	1.37	42.2	178.1	41.7	185.7
75.0	56.81	-42.82	1.30	42.8	178.3	41.6	186.0
76.0	57.56	-43.47	1.22	43.5	178.4	41.6	186.1
77.0	58.31	-44.14	1.16	44.2	178.5	41.5	185.9
78.0	59.06	-44.79	1.08	44.8	178.6	41.5	186.7
79.0	59.81	-45.45	1.01	45.5	178.7	41.7	185.8
80.0	60.56	-46.11	0.95	46.1	178.8	41.6	187.4
81.0	61.31	-46.77	0.87	46.8	178.9	41.6	186.8
82.0	62.06	-47.43	0.78	47.4	179.1	41.4	188.8
83.0	62.81	-48.08	0.74	48.1	179.1	41.5	187.3
84.0	63.55	-48.74	0.64	48.7	179.2	41.6	189.8
85.0	64.30	-49.40	0.55	49.4	179.4	40.9	189.0
86.0	65.06	-50.05	0.48	50.1	179.5	41.2	185.0
87.0	65.81	-50.71	0.40	50.7	179.5	41.4	186.7
88.0	66.56	-51.36	0.33	51.4	179.6	41.4	186.0
89.0	67.31	-52.02	0.24	52.0	179.7	41.3	188.1
90.0	68.06	-52.68	0.16	52.7	179.8	41.5	186.0
91.0	68.81	-53.33	0.07	53.3	179.9	41.4	188.1
92.0	69.56	-53.99	-0.02	54.0	180.0	41.3	185.9
93.0	70.31	-54.64	-0.11	54.6	180.1	41.4	187.6
94.0	71.06	-55.30	-0.20	55.3	180.2	41.5	187.9
95.0	71.81	-55.96	-0.27	56.0	180.3	41.3	189.3
96.0	72.56	-56.61	-0.36	56.6	180.4	41.5	187.0
97.0	73.31	-57.27	-0.45	57.3	180.5	41.4	188.7
98.0	74.06	-57.92	-0.54	57.9	180.5	41.4	187.4
99.0	74.81	-58.58	-0.64	58.6	180.6	41.4	188.5
100.0	75.56	-59.23	-0.73	59.2	180.7	41.4	188.7
101.0	76.31	-59.88	-0.84	59.9	180.8	41.4	186.4
102.0	77.06	-60.54	-0.93	60.5	180.9	41.2	187.6
103.0	77.81	-61.19	-1.00	61.2	180.9	41.5	187.2
104.0	78.56	-61.85	-1.08	61.9	181.0	41.4	187.3
105.0	79.31	-62.50	-1.17	62.5	181.1	41.3	186.7
106.0	80.06	-63.16	-1.28	63.2	181.2	41.4	190.9

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

HOLE ID. : SE 10.9 D
DATE OF LOG : 03/08/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 1

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
107.0	80.81	-63.81	-1.37	63.8	181.2	41.3	186.9
108.0	81.56	-64.47	-1.46	64.5	181.3	41.5	187.0
109.0	82.31	-65.12	-1.55	65.1	181.4	41.5	189.1
110.0	83.06	-65.78	-1.64	65.8	181.4	41.3	186.5
111.0	83.81	-66.43	-1.71	66.5	181.5	41.2	181.8
112.0	84.56	-67.08	-1.81	67.1	181.5	41.3	192.4
113.0	85.32	-67.72	-1.95	67.8	181.6	41.1	190.9
114.0	86.07	-68.38	-2.05	68.4	181.7	41.4	192.3
115.0	86.82	-69.02	-2.17	69.1	181.8	41.0	187.8
116.0	87.57	-69.67	-2.27	69.7	181.9	41.5	192.0
117.0	88.32	-70.32	-2.35	70.4	181.9	41.2	189.0
118.0	89.08	-70.98	-2.45	71.0	182.0	41.2	188.5
119.0	89.83	-71.63	-2.53	71.7	182.0	41.4	187.9
120.0	90.58	-72.28	-2.64	72.3	182.1	41.2	187.4
121.0	91.33	-72.93	-2.75	73.0	182.2	41.1	190.1
122.0	92.08	-73.58	-2.85	73.6	182.2	41.2	189.4
123.0	92.84	-74.23	-2.95	74.3	182.3	41.2	190.7
124.0	93.59	-74.88	-3.07	74.9	182.3	41.1	188.8
125.0	94.34	-75.53	-3.16	75.6	182.4	41.1	188.1
126.0	95.10	-76.18	-3.26	76.3	182.4	41.2	187.5
127.0	95.85	-76.83	-3.35	76.9	182.5	41.2	188.0
128.0	96.60	-77.48	-3.46	77.6	182.6	41.1	189.5
129.0	97.36	-78.13	-3.55	78.2	182.6	41.2	188.1
130.0	98.11	-78.78	-3.65	78.9	182.7	41.2	188.8
131.0	98.86	-79.43	-3.75	79.5	182.7	41.2	189.4
132.0	99.61	-80.08	-3.85	80.2	182.8	41.1	188.5
133.0	100.37	-80.74	-3.95	80.8	182.8	41.1	188.5
134.0	101.12	-81.39	-4.04	81.5	182.8	41.0	187.7
135.0	101.88	-82.04	-4.13	82.1	182.9	41.0	187.7
136.0	102.63	-82.68	-4.23	82.8	182.9	41.0	188.8
137.0	103.39	-83.33	-4.34	83.4	183.0	40.9	187.4
138.0	104.14	-83.98	-4.41	84.1	183.0	40.9	190.2
139.0	104.90	-84.62	-4.51	84.7	183.1	40.5	192.4
140.0	105.66	-85.26	-4.61	85.4	183.1	40.9	183.7
141.0	106.42	-85.91	-4.70	86.0	183.1	41.3	189.3
142.0	107.18	-86.55	-4.79	86.7	183.2	40.7	186.6
143.0	107.94	-87.20	-4.86	87.3	183.2	40.3	184.4
144.0	108.70	-87.84	-4.95	88.0	183.2	40.6	186.7
145.0	109.45	-88.49	-5.00	88.6	183.2	40.6	191.8
146.0	110.22	-89.13	-5.08	89.3	183.3	39.7	189.2
147.0	110.98	-89.78	-5.12	89.9	183.3	40.6	188.8
148.0	111.74	-90.42	-5.20	90.6	183.3	40.4	186.9
149.0	112.50	-91.07	-5.27	91.2	183.3	40.4	184.1
150.0	113.26	-91.71	-5.33	91.9	183.3	40.5	186.6
151.0	114.02	-92.36	-5.41	92.5	183.4	40.1	185.6
152.0	114.79	-93.00	-5.47	93.2	183.4	40.1	187.9
153.0	115.55	-93.64	-5.54	93.8	183.4	40.4	185.8
154.0	116.31	-94.29	-5.60	94.5	183.4	40.2	186.1
155.0	117.07	-94.93	-5.67	95.1	183.4	40.6	185.8
156.0	117.83	-95.58	-5.73	95.7	183.4	40.1	186.0
157.0	118.59	-96.22	-5.80	96.4	183.4	40.7	185.4
158.0	119.35	-96.87	-5.86	97.0	183.5	40.5	186.6

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

HOLE ID. : SE 10.9 D
DATE OF LOG : 03/08/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 1

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
159.0	120.11	-97.51	-5.94	97.7	183.5	40.4	184.6
160.0	120.87	-98.16	-5.99	98.3	183.5	40.2	184.6
161.0	121.64	-98.80	-6.05	99.0	183.5	40.5	185.7
162.0	122.40	-99.45	-6.10	99.6	183.5	40.3	184.6
163.0	123.16	-100.09	-6.16	100.3	183.5	40.2	184.3
164.0	123.92	-100.74	-6.21	100.9	183.5	40.4	184.0
165.0	124.68	-101.39	-6.26	101.6	183.5	40.5	184.7
166.0	125.45	-102.03	-6.31	102.2	183.5	40.4	184.7
167.0	126.21	-102.68	-6.37	102.9	183.5	40.4	185.7
168.0	126.97	-103.33	-6.42	103.5	183.6	40.5	185.8
169.0	127.73	-103.97	-6.48	104.2	183.6	40.3	184.3
170.0	128.49	-104.62	-6.54	104.8	183.6	40.6	185.3
171.0	129.25	-105.26	-6.59	105.5	183.6	40.5	185.0
172.0	130.00	-105.92	-6.68	106.1	183.6	41.9	184.2
173.0	130.76	-106.57	-6.72	106.8	183.6	40.7	184.3
174.0	131.52	-107.22	-6.76	107.4	183.6	40.4	181.8
175.0	132.28	-107.86	-6.79	108.1	183.6	40.6	182.9
176.0	133.04	-108.51	-6.83	108.7	183.6	40.3	183.3
177.0	133.80	-109.16	-6.85	109.4	183.6	40.2	183.7
178.0	134.58	-109.79	-6.85	110.0	183.6	38.6	180.7
179.0	135.34	-110.44	-6.90	110.7	183.6	40.6	185.7
180.0	136.10	-111.09	-6.95	111.3	183.6	41.1	185.1
181.0	136.86	-111.74	-6.97	112.0	183.6	40.5	178.6
182.0	137.62	-112.39	-6.99	112.6	183.6	40.6	182.4
183.0	138.37	-113.04	-7.04	113.3	183.6	41.1	182.3
184.0	139.12	-113.70	-7.02	113.9	183.5	41.9	184.6
185.0	139.88	-114.35	-7.05	114.6	183.5	40.2	182.6
186.0	140.65	-114.99	-7.09	115.2	183.5	40.1	182.8
187.0	141.41	-115.64	-7.13	115.9	183.5	41.0	184.7
188.0	142.17	-116.29	-7.17	116.5	183.5	40.2	182.4
189.0	142.92	-116.94	-7.20	117.2	183.5	40.7	182.3
190.0	143.68	-117.59	-7.23	117.8	183.5	40.7	182.9
191.0	144.44	-118.24	-7.26	118.5	183.5	40.6	183.0
192.0	145.20	-118.89	-7.31	119.1	183.5	40.6	184.9
193.0	145.96	-119.54	-7.30	119.8	183.5	40.0	180.2
194.0	146.73	-120.18	-7.33	120.4	183.5	40.3	182.4
195.0	147.48	-120.83	-7.37	121.1	183.5	40.6	180.3
196.0	148.25	-121.48	-7.40	121.7	183.5	40.4	185.2
197.0	149.01	-122.13	-7.44	122.4	183.5	40.6	182.3
198.0	149.76	-122.78	-7.47	123.0	183.5	40.7	182.3
199.0	150.52	-123.43	-7.50	123.7	183.5	40.6	182.4
200.0	151.28	-124.08	-7.51	124.3	183.5	40.5	181.8
201.0	152.04	-124.73	-7.55	125.0	183.5	40.8	182.7
202.0	152.80	-125.38	-7.57	125.6	183.5	40.6	182.6
203.0	153.56	-126.03	-7.59	126.3	183.4	40.1	181.5
204.0	154.33	-126.67	-7.61	126.9	183.4	40.2	181.4
205.0	155.09	-127.32	-7.63	127.5	183.4	40.5	182.9
206.0	155.85	-127.97	-7.67	128.2	183.4	40.5	181.1
207.0	156.61	-128.62	-7.66	128.8	183.4	40.4	179.7
208.0	157.36	-129.27	-7.68	129.5	183.4	41.4	182.7
209.0	158.12	-129.93	-7.69	130.2	183.4	40.5	178.3
210.0	158.88	-130.58	-7.69	130.8	183.4	40.3	179.8

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

HOLE ID. : SE 10.9 D
DATE OF LOG : 03/08/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 1

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
211.0	159.64	-131.22	-7.69	131.4	183.4	40.4	178.9
212.0	160.40	-131.88	-7.71	132.1	183.3	41.1	183.3
213.0	161.16	-132.53	-7.73	132.8	183.3	40.9	181.8
214.0	161.93	-133.15	-7.61	133.4	183.3	38.6	170.7
215.0	162.69	-133.80	-7.67	134.0	183.3	40.9	188.0
216.0	163.44	-134.45	-7.69	134.7	183.3	41.5	178.5
217.0	164.21	-135.09	-7.59	135.3	183.2	40.7	186.4
218.0	164.97	-135.74	-7.62	135.9	183.2	40.8	180.5
219.0	165.73	-136.38	-7.63	136.6	183.2	40.7	185.5
220.0	166.49	-137.02	-7.56	137.2	183.2	39.5	162.5
221.0	167.25	-137.66	-7.57	137.9	183.1	41.3	190.2
222.0	168.00	-138.31	-7.65	138.5	183.2	41.0	182.2
223.0	168.76	-138.95	-7.60	139.2	183.1	40.4	169.5
224.0	169.52	-139.60	-7.58	139.8	183.1	41.3	186.3
225.0	170.28	-140.25	-7.57	140.5	183.1	40.9	182.6
226.0	171.04	-140.91	-7.60	141.1	183.1	40.6	181.9
227.0	171.80	-141.55	-7.59	141.8	183.1	40.3	174.5
228.0	172.56	-142.21	-7.57	142.4	183.0	41.0	179.5
229.0	173.31	-142.86	-7.60	143.1	183.0	40.9	181.4
230.0	174.07	-143.51	-7.55	143.7	183.0	40.6	174.8
231.0	174.83	-144.16	-7.53	144.4	183.0	40.9	181.9
232.0	175.58	-144.82	-7.54	145.0	183.0	41.0	184.8
233.0	176.34	-145.47	-7.51	145.7	183.0	40.9	178.5
234.0	177.09	-146.12	-7.51	146.3	182.9	40.9	179.3
235.0	177.85	-146.78	-7.52	147.0	182.9	41.0	182.3
236.0	178.60	-147.44	-7.50	147.6	182.9	41.1	176.1
237.0	179.36	-148.09	-7.50	148.3	182.9	41.0	180.7
238.0	180.11	-148.75	-7.50	148.9	182.9	41.1	176.9
239.0	180.87	-149.40	-7.49	149.6	182.9	40.6	177.4
240.0	181.63	-150.05	-7.42	150.2	182.8	40.5	176.2
241.0	182.38	-150.70	-7.40	150.9	182.8	40.8	179.7
242.0	183.14	-151.36	-7.39	151.5	182.8	41.1	177.3
243.0	183.89	-152.01	-7.37	152.2	182.8	41.1	177.3
244.0	184.65	-152.67	-7.36	152.8	182.8	41.1	180.0
245.0	185.40	-153.33	-7.35	153.5	182.7	41.3	174.3
246.0	186.15	-153.98	-7.33	154.2	182.7	41.3	178.4
247.0	186.91	-154.64	-7.33	154.8	182.7	41.2	180.1
248.0	187.66	-155.30	-7.35	155.5	182.7	41.2	182.5
249.0	188.41	-155.96	-7.37	156.1	182.7	41.2	177.4
250.0	189.16	-156.62	-7.36	156.8	182.7	41.1	181.6
251.0	189.92	-157.27	-7.33	157.4	182.7	41.1	176.0
252.0	190.67	-157.93	-7.31	158.1	182.7	41.3	177.1
253.0	191.42	-158.59	-7.30	158.8	182.6	41.2	183.6
254.0	192.17	-159.25	-7.31	159.4	182.6	41.4	178.8
255.0	192.92	-159.91	-7.29	160.1	182.6	41.3	180.7
256.0	193.67	-160.57	-7.30	160.7	182.6	41.3	180.2
257.0	194.43	-161.23	-7.31	161.4	182.6	41.2	182.5
258.0	195.18	-161.89	-7.34	162.1	182.6	41.4	181.2
259.0	195.93	-162.54	-7.26	162.7	182.6	41.4	169.6
260.0	196.68	-163.20	-7.28	163.4	182.6	41.1	180.3
261.0	197.43	-163.86	-7.25	164.0	182.5	41.4	178.5
262.0	198.18	-164.52	-7.29	164.7	182.5	41.2	176.0

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

HOLE ID. : SE 10.9 D
DATE OF LOG : 03/08/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 1

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
263.0	198.94	-165.17	-7.25	165.3	182.5	41.2	184.3
264.0	199.69	-165.83	-7.26	166.0	182.5	41.5	180.1
265.0	200.44	-166.49	-7.30	166.7	182.5	41.0	186.0
266.0	201.19	-167.15	-7.32	167.3	182.5	40.8	187.6
267.0	201.94	-167.81	-7.31	168.0	182.5	41.4	177.7
268.0	202.69	-168.47	-7.30	168.6	182.5	41.6	179.4
269.0	203.44	-169.14	-7.30	169.3	182.5	41.2	180.6
270.0	204.19	-169.80	-7.30	170.0	182.5	41.4	181.2
271.0	204.94	-170.46	-7.31	170.6	182.5	41.3	184.1
272.0	205.69	-171.11	-7.38	171.3	182.5	41.6	180.0
273.0	206.44	-171.77	-7.40	171.9	182.5	41.4	188.3
274.0	207.18	-172.43	-7.37	172.6	182.4	42.4	168.8
275.0	207.93	-173.09	-7.34	173.2	182.4	41.2	185.4
276.0	208.68	-173.74	-7.23	173.9	182.4	41.5	165.2
277.0	209.42	-174.40	-7.20	174.5	182.4	41.5	186.6
278.0	210.17	-175.06	-7.22	175.2	182.4	41.7	178.5
279.0	210.93	-175.70	-7.16	175.8	182.3	39.9	171.4
280.0	211.69	-176.35	-7.20	176.5	182.3	41.1	191.2
281.0	212.44	-177.00	-7.26	177.1	182.3	41.2	175.1
282.0	213.19	-177.66	-7.18	177.8	182.3	41.4	173.6
283.0	213.95	-178.31	-7.16	178.5	182.3	40.9	177.7
284.0	214.70	-178.97	-7.14	179.1	182.3	40.9	175.0
285.0	215.46	-179.62	-7.09	179.8	182.3	41.2	174.2
286.0	216.21	-180.28	-7.07	180.4	182.2	41.1	183.4
287.0	216.96	-180.94	-7.09	181.1	182.2	42.1	177.7
288.0	217.71	-181.59	-7.13	181.7	182.2	40.7	180.7
289.0	218.46	-182.26	-7.06	182.4	182.2	42.2	176.9
290.0	219.19	-182.93	-7.07	183.1	182.2	42.7	183.1
291.0	219.94	-183.58	-7.21	183.7	182.2	40.9	186.3
292.0	220.70	-184.23	-7.22	184.4	182.2	41.4	176.9
293.0	221.45	-184.89	-7.19	185.0	182.2	41.1	178.0
294.0	222.20	-185.55	-7.21	185.7	182.2	41.8	182.1
295.0	222.95	-186.22	-7.22	186.4	182.2	41.4	180.2
296.0	223.69	-186.88	-7.27	187.0	182.2	41.6	177.0
297.0	224.44	-187.54	-7.26	187.7	182.2	41.5	178.6
298.0	225.19	-188.21	-7.21	188.3	182.2	42.4	174.9
299.0	225.93	-188.87	-7.20	189.0	182.2	41.6	177.4
300.0	226.68	-189.53	-7.23	189.7	182.2	41.4	184.4
301.0	227.43	-190.20	-7.24	190.3	182.2	42.2	179.6
302.0	228.17	-190.87	-7.21	191.0	182.2	42.4	173.5
303.0	228.91	-191.54	-7.21	191.7	182.2	42.1	183.2
304.0	229.65	-192.20	-7.24	192.3	182.2	41.8	179.8
305.0	230.40	-192.87	-7.25	193.0	182.2	41.6	179.6
306.0	231.14	-193.54	-7.21	193.7	182.1	42.1	175.2
307.0	231.88	-194.21	-7.17	194.3	182.1	42.0	179.4
308.0	232.63	-194.87	-7.18	195.0	182.1	40.9	183.1
309.0	233.38	-195.53	-7.20	195.7	182.1	41.8	186.4
310.0	234.13	-196.19	-7.21	196.3	182.1	41.8	177.0
311.0	234.88	-196.85	-7.25	197.0	182.1	41.3	182.7
312.0	235.62	-197.52	-7.27	197.7	182.1	41.5	184.5
313.0	236.37	-198.18	-7.29	198.3	182.1	40.7	186.3
314.0	237.12	-198.85	-7.30	199.0	182.1	41.9	180.7

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

HOLE ID. : SE 10.9 D
DATE OF LOG : 03/08/90
PROBE : 9055A , 249
DEPTH UNITS : FEET LOG 1

CABLE DEPTH	TRUE DEPTH	NORTH DEV.	EAST DEV.	DISTANCE	AZIMUTH	SANG	SANGB
315.0	237.86	-199.51	-7.26	199.6	182.1	41.6	170.4
316.0	238.61	-200.17	-7.21	200.3	182.1	41.4	182.7
317.0	239.36	-200.83	-7.18	201.0	182.0	42.2	171.8
318.0	240.10	-201.49	-7.20	201.6	182.0	41.1	186.8
319.0	240.85	-202.15	-7.20	202.3	182.0	41.9	182.7
320.0	241.60	-202.82	-7.23	202.9	182.0	41.3	185.6
321.0	242.34	-203.49	-7.23	203.6	182.0	43.1	180.3
322.0	243.09	-204.15	-7.21	204.3	182.0	42.0	168.1
323.0	243.83	-204.82	-7.16	204.9	182.0	42.6	181.0
324.0	244.57	-205.47	-7.24	205.6	182.0	41.3	187.4
325.0	245.32	-206.14	-7.22	206.3	182.0	41.7	177.8
326.0	246.06	-206.81	-7.21	206.9	182.0	42.1	185.5
327.0	246.80	-207.48	-7.16	207.6	182.0	44.3	173.5
328.0	247.55	-208.13	-7.23	208.3	182.0	38.8	189.5
329.0	248.31	-208.78	-7.24	208.9	182.0	41.9	176.5
330.0	249.05	-209.45	-7.23	209.6	182.0	42.2	179.4
331.0	249.80	-210.12	-7.21	210.2	182.0	42.0	179.7
332.0	250.54	-210.78	-7.18	210.9	182.0	41.6	178.8
333.0	251.29	-211.44	-7.10	211.6	181.9	41.9	171.2
334.0	252.04	-212.10	-7.08	212.2	181.9	42.2	171.8
335.0	252.77	-212.77	-7.04	212.9	181.9	43.0	178.5
336.0	253.51	-213.44	-7.07	213.6	181.9	42.0	181.4
337.0	254.26	-214.11	-7.08	214.2	181.9	41.7	183.6
338.0	255.02	-214.76	-7.04	214.9	181.9	41.3	175.2
339.0	255.76	-215.43	-7.07	215.5	181.9	42.3	183.1
340.0	256.50	-216.10	-7.11	216.2	181.9	42.2	184.0
341.0	257.24	-216.76	-7.23	216.9	181.9	38.4	193.3
342.0	257.98	-217.42	-7.19	217.5	181.9	41.2	182.8
343.0	258.73	-218.07	-7.32	218.2	181.9	41.2	201.6
344.0	259.33	-218.52	-7.40	218.6	181.9	0.0	0.0
344.0	259.33	-218.52	-7.40	218.6	181.9	0.0	0.0

APPENDIX C

STRUCTURE STUDY ZONE

APPENDIX C
STRUCTURE STUDY ZONE SE 10.9

Field mapping of the structure study zone consisted primarily of locating and noting areas of sheared rock and vein calcite and mapping areas of loose calcite fragments (float). Crystalline and fibrous calcite formed in fractures are primary indicators of faulting in the SSC study area.

Field mapping and the analysis of wire-line and lithologic logs from previous borings (BE 10.9, SE 10.9A, and SE 10.8 and BK1') identified a fault trending N20°-30° E. Analysis of wire-line logs indicates that previous boring BE 10.9 penetrated this fault, which shortened the Austin Chalk by about 23 feet. A total of 26-30 feet of down-to-the-south offset was interpreted between BE 10.9 and SE 10.8. Additional borings (this report) have been drilled to better constrain the location of the fault and to provide more specific information regarding engineering and hydrogeologic properties of the geologic structure.

- Name of Structure: SE 10.9

- Faults in Outcrop: A zone of brecciated limestone and vein calcite surrounds borings SE 10.9C and SE 10.9D and can be mapped northeast along a small drainage for over 4,500 feet. The zone is approximately 300 feet wide at the surface and consists of sheared rock, vein calcite, and closely spaced fractures. Calcite in float trends N20°-N25° E and can be mapped continuously from borings SF 10.1C and SF 10.1D north-northeast for over a mile to the intersection of Highway 66 and Arrowhead Road (see Structure Zone Map SE 10.9, Figure C-1). Previous boring BE 10.9 and new angled borings have penetrated a total of three faults with the maximum displacement being about 86 feet.

  Trend: An 8,000-foot-long aerial photograph lineament (aligned drainage segments and tonal lineaments) trends roughly N20°-53° E with an average trend of N28° E.

- Offset in Borings: The overall interpretation is a southeast-dipping main fault penetrated by boring BE 10.9 with approximately 26 feet of overall displacement. The fault is surmounted by an antithetic fault to the south that has produced a graben with as much as 86 feet of displacement locally. Correlation of wire-line and lithologic logs indicates that previous boring BE 10.9 encountered a fault at a depth of about 82 feet, which shortened the Austin Chalk by about 23 feet. Previous borings SE 10.9A and SE 10.8, southeast of the fault, encountered Austin Chalk and Eagle Ford Shale strata at elevations that suggest a total of 26-30 feet of down-to-the-southeast offset as compared to strata in BE 10.9.

  Comparing wire-line units in the upper part of borings SE 10.9C and SE 10.9D indicates that both borings began in a down-thrown block. Wire-line and lithologic logs from boring SE 10.9D indicate that as much as 86 feet of down-drop has occurred along a northwest-dipping fault encountered by this boring. Boring SF 10.9C penetrated a southeast-dipping fault at a vertical depth of 218 feet, which resulted in shortening the Austin Chalk by about 73 feet. Strata above the fault are about 80 feet lower than comparable strata in SE 10.8 south of the fault and about 73 feet lower than comparable strata in the upper part of BE 10.9 (above the fault). See Figure C-2 (Geologic Cross-section) for an interpretation of the structure.

  The Austin Chalk/Eagle Ford Shale contact is about 36 feet lower in boring SE 10.9C than the same strata in BE 10.9. The Austin Chalk/Eagle Ford Shale contact is 20-26 feet lower in borings SE 10.8 and SE 10.9D than in boring BE 10.9.

- Mineralization/Alteration: The fault is exposed in several places along a small drainage and indicates that the fault zone consists of brecciated limestone and calcite-filled fractures and faults. The calcite is typically striated or fibrous with numerous voids. No evidence of clay-filling could be found in the fractures but the entire zone is severely weathered.

  Analysis of boring logs from BE 10.9, SE 10.9C, and SE 10.9D indicates that all three borings penetrated faults. Boring BE 10.9 penetrated a fault at about 88 feet where approximately 2 feet of calcite was encountered. The zone from 68 feet to 88 feet was soft and severely weathered and took water at a rate of 10 to 15 gallons per minute. The water-level in the hole continually subsided to 13 feet below ground surface, suggesting connection to nearby surface drainages.

Boring SE 10.9C penetrated a fault at about 285 feet (boring depth). At this depth, the fault places Austin Chalk against Eagle Ford Shale. The Austin Chalk is only slightly fractured and characterized by hairline width fractures that are calcite-filled; the Eagle Ford Shale is severely fractured. The fractures are typically slickensided, smooth to slightly rough, clean, and closed. No mineralization or alteration is noted.

Boring SE 10.9D encountered a fault in the Austin Chalk at a depth of 175 to 182 feet (boring depth). The fractures are typically slickensided, slightly rough, clean, closed, and non-mineralized. Two calcite veins up to 1/8-inch thick were noted.

- Dip Direction: Field observations indicate that the fracture spacing at the surface ranges from less than 0.1 foot to about 3.2 feet. Typically, the fractures are calcite-filled and trend N10° to 56°E and dip 52° southeast to 50° northwest (through vertical).

  Fractures noted in borings SE 10.9C and SE 10.9D suggest two dominant dip directions. Boring SE 10.9C has a N68° W striking fracture with an average dip of about 64° southeast. Fracture orientations in boring SE 10.9D range from N70° W to N90° E dipping 15° to 65° northwest. Although the orientation of the northwest-dipping fault is not well documented in the lithologic log (SE 10.9C), the interpretation (Figure C-2) reflects a 65° dip northwest (assumes the same dip as the main fault, but in the opposite direction). This is consistent with fracture orientations measured at the surface (see stereographic plot of poles to fractures, Figure C-1).

  Downhole photography was acquired from 280.9 to 309.8 feet (boring depth); however, the photography detected primarily red grout and detailed fracture analysis was not possible (see Table C-1).

- Width of the Fault Zone: Data collected from four vertical borings, two angled borings, VLF surveys, seismic reflection surveys, and field mapping suggest that the fault zone ranges from 200 to 300 feet wide. Boring data, VLF surveys, and field mapping of exposed bedrock indicate that the zone is highly fractured and faulted (see Appendix D, Geophysical Surveys).

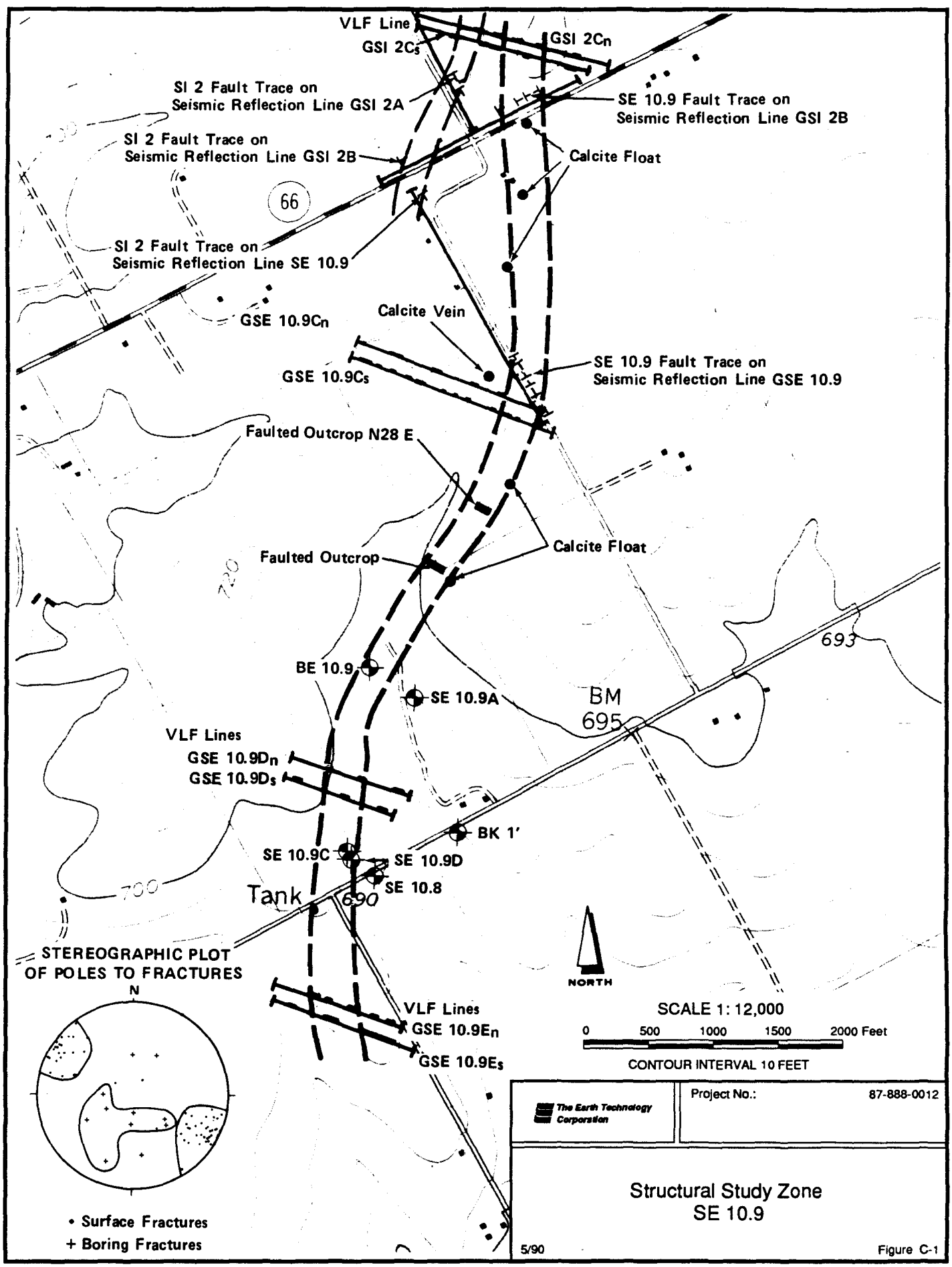
- Width of Individual Faults: Boring data suggest that the fault penetrated by boring SE 10.1D is approximately 4.5 feet thick in the Austin Chalk. This assumes a dip of 65° to the northwest on the fault plane. The fault encountered by boring SE 10.9C is about 11.9 feet thick in the Eagle Ford Shale. This assumes a dip of 65° dip to the southeast. As noted in the lithologic log, the Eagle Ford Shale is highly fractured well beyond the trace of the fault. This may represent additional splays of the fault forming in the weaker shale unit.

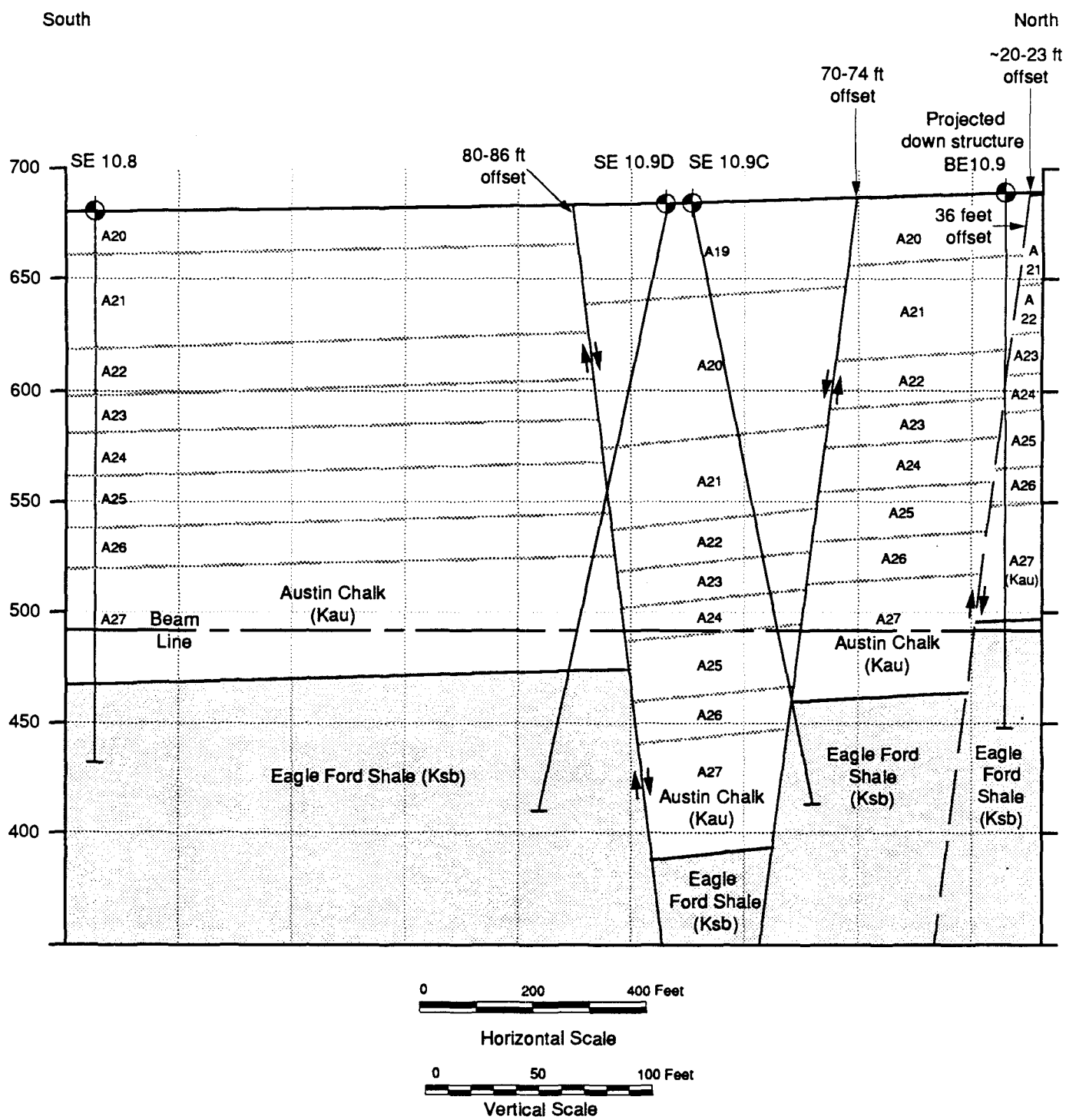
  Boring BE 10.9 penetrated a 2-foot-thick zone of calcite. A detailed description of this fault was not possible because of poor drilling conditions. Based on the thickness of the calcite encountered and the assumed dip of 65° for the fault plane, the width of the fault zone is at least 1.1 feet thick.

  Fault Characteristics at Depth: Analysis of boring logs from boring SE 10.1D indicates that the fracture spacing in the Austin Chalk ranges from less than 0.1 foot to 3.2 feet, with an average spacing of 1.2 feet. The fractures are typically slickensided, slightly rough, clean, and closed. Very thin calcite seams up to 1/8-inch thick are occasionally found. Boring SE 10.1C penetrated the fault where the fault placed Austin Chalk against Eagle Ford Shale. The Austin Chalk does not appear to be highly fractured.

  Fractures in the Eagle Ford Shale are numerous; fracture spacing ranges from 0.3 foot (about 3 fractures per foot) to less than 0.1 foot (about 16 fractures per foot). The average spacing is about 0.12 foot. The fractures are typically slickensided, smooth to slightly rough, clean, and closed with no mineralization. As evidenced from the core, the faults appear to be unweathered at depth.

  Data from BE 10.9 do not allow an interpretation of the fracture spacing near this fault. However, boring data indicate that this fault zone is severely weathered at a depth of 68 to 88 feet and loss of drilling water indicates that the fault zone is highly permeable (allowing 10 to 15 gallons per minute to flow through this fault zone at this depth).


VLF Line
GSI 2Cs
GSI 2Cn
SI 2 Fault Trace on
Seismic Reflection Line GSI 2A
SE 10.9 Fault Trace on
Seismic Reflection Line GSI 2B
SI 2 Fault Trace on
Seismic Reflection Line GSI 2B
Calcite Float
66
SI 2 Fault Trace on
Seismic Reflection Line SE 10.9
GSE 10.9Cn
Calcite Vein
GSE 10.9Cs
SE 10.9 Fault Trace on
Seismic Reflection Line GSE 10.9
Faulted Outcrop N28 E
Calcite Float
Faulted Outcrop
720
693
BE 10.9
SE 10.9A
BM
695
VLF Lines
GSE 10.9Dn
GSE 10.9Ds
BK 1'
SE 10.9C
SE 10.9D
SE 10.8
700
Tank
690
STEREOGRAPHIC PLOT
OF POLES TO FRACTURES
N
NORTH
VLF Lines
GSE 10.9En
GSE 10.9Es
SCALE 1: 12,000
0 500 1000 1500 2000 Feet
CONTOUR INTERVAL 10 FEET
• Surface Fractures
+ Boring Fractures
The Earth Technology Corporation
Project No.: 87-888-0012
Structural Study Zone
SE 10.9
5/90
Figure C-1



The Earth Technology Corporation

Project No.: 87-888-0012

SE 10.9 Geologic Cross-Section

7-90

Figure C-2

DALLAS/FT. WORTH
SSC PROJECT

PHOTOGRAPHIC LOG

Boring No. SE 10.9C

Date Photographed: 3/24/90
Bearing: N 8°W
Vertical Angle: 40° (Plunge 50°)NW
Surface Elevation: ~ 684'

Iris Setting: ~ 10.5
Boring Condition: Poor
Water Condition: Fair
Rock Section Photo: 280-390.8

Inclined Depth(ft)	Feature	Notes
280.0		Start Photography
309.8		Terminate Photography

Photography detected primarily red grout. Detailed analysis not possible

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 IR3 experimental hall. Two geophysical methods were used: very low frequency (VLF) surveys and shallow seismic reflection surveys.

VFL Surveys: The 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 an anomaly.

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.

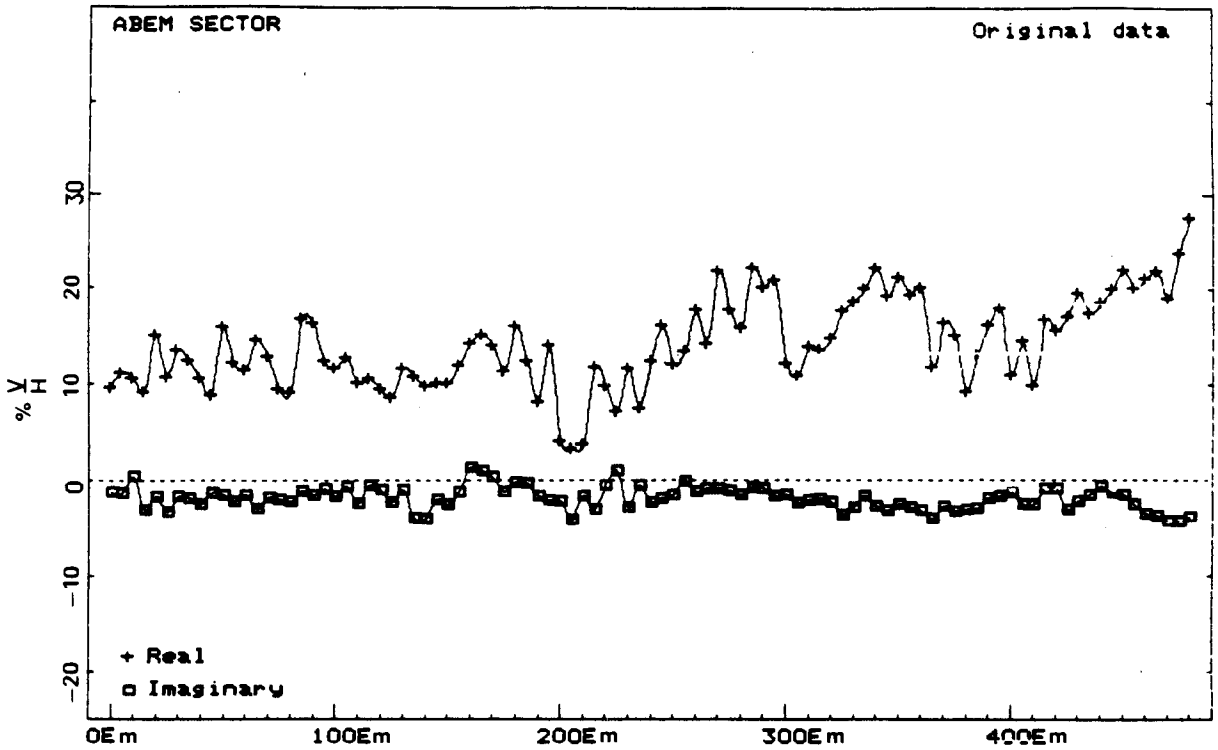
Data were electronically transferred from the instrument to a personal computer for analysis. Data were convolved with an Hjelt filter (Wright, 1988) and the resulting cross sections plotted. Raw data files and graphs, pseudo-sections, and individual cross sections were plotted. All data and results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

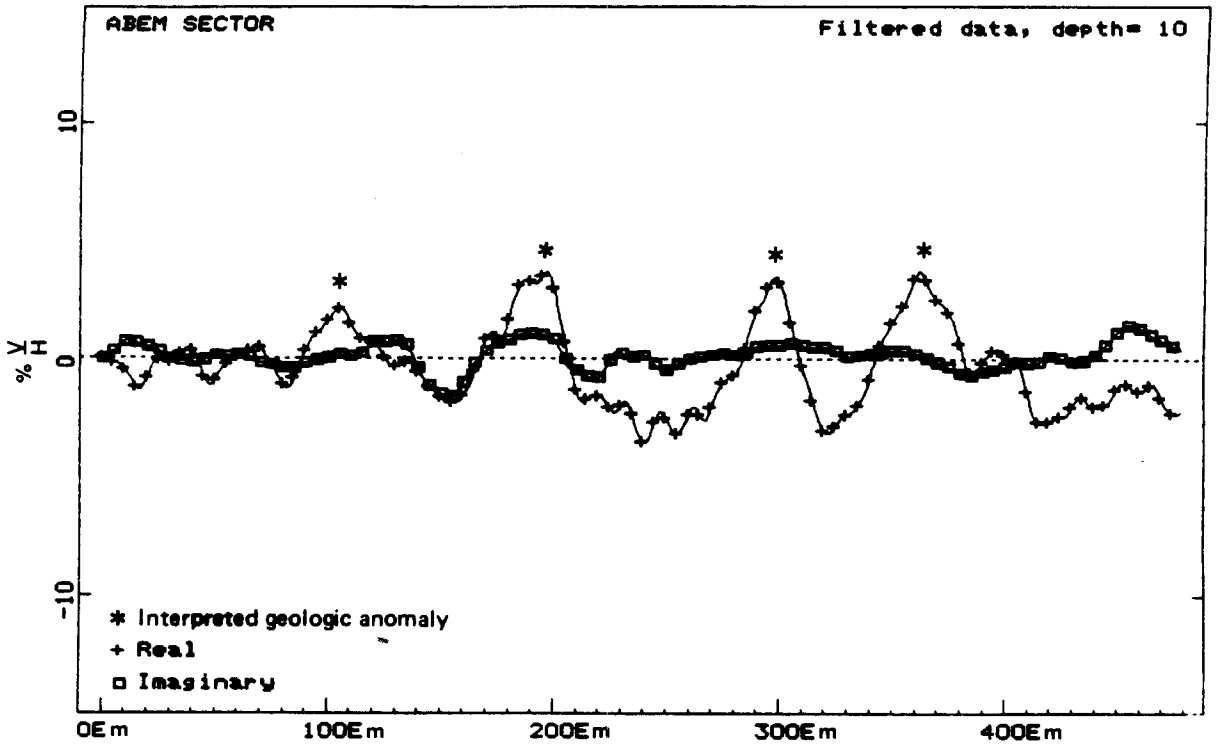
VLF anomalies thought to represent faults in the Austin Chalk were highlighted on the cross sections and transferred to the base maps. Similar shaped anomalies on the pair of lines at a site were connected and the general anomaly direction measured. The anomalies' locations and orientations were compared to the expected fault characteristics. Profile and anomaly locations were marked on air photographs and USGS quad maps (scale 1:24,000). See Figure C-1, structure study map, for the locations of the VLF lines and the identified anomalies. Figures D-1 through D-8 are profiles of the actual data. VLF anomalies are interpreted as high-value peaks on the filtered data graphs (indicated by asterisks).

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: 0060S (24 kHz) GSE 10.9C_n S70°E





The Earth Technology Corporation

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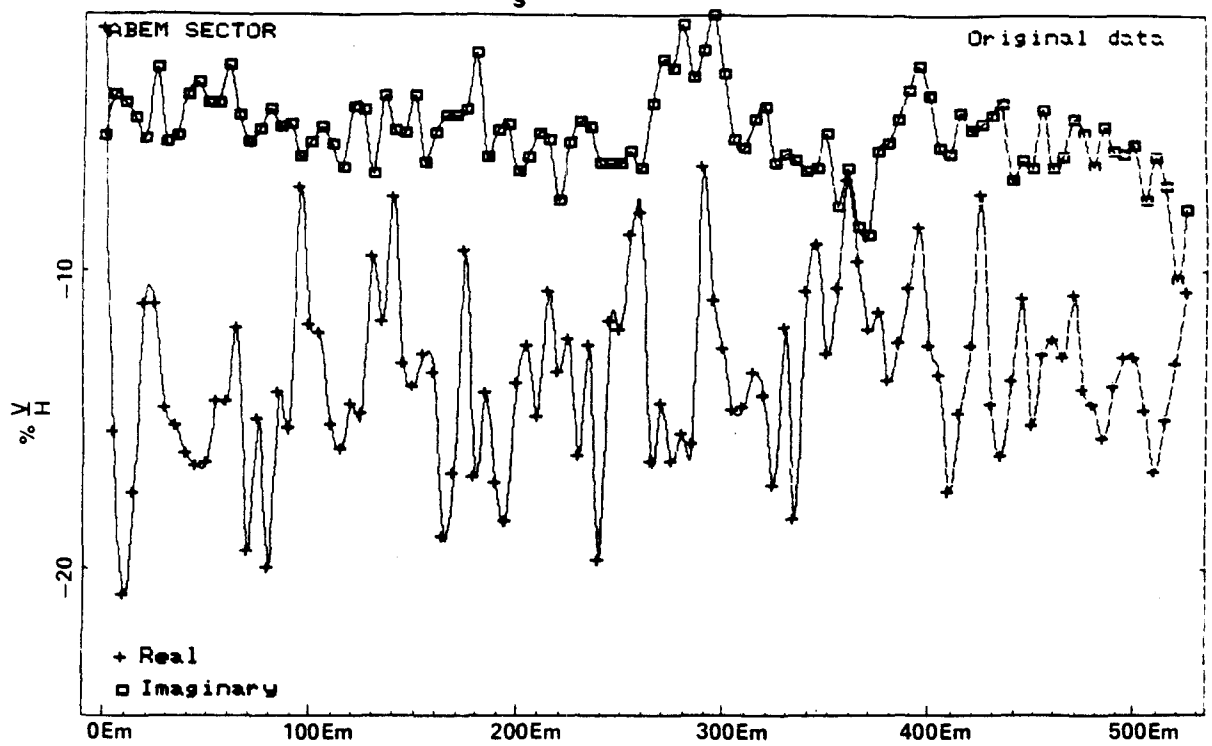
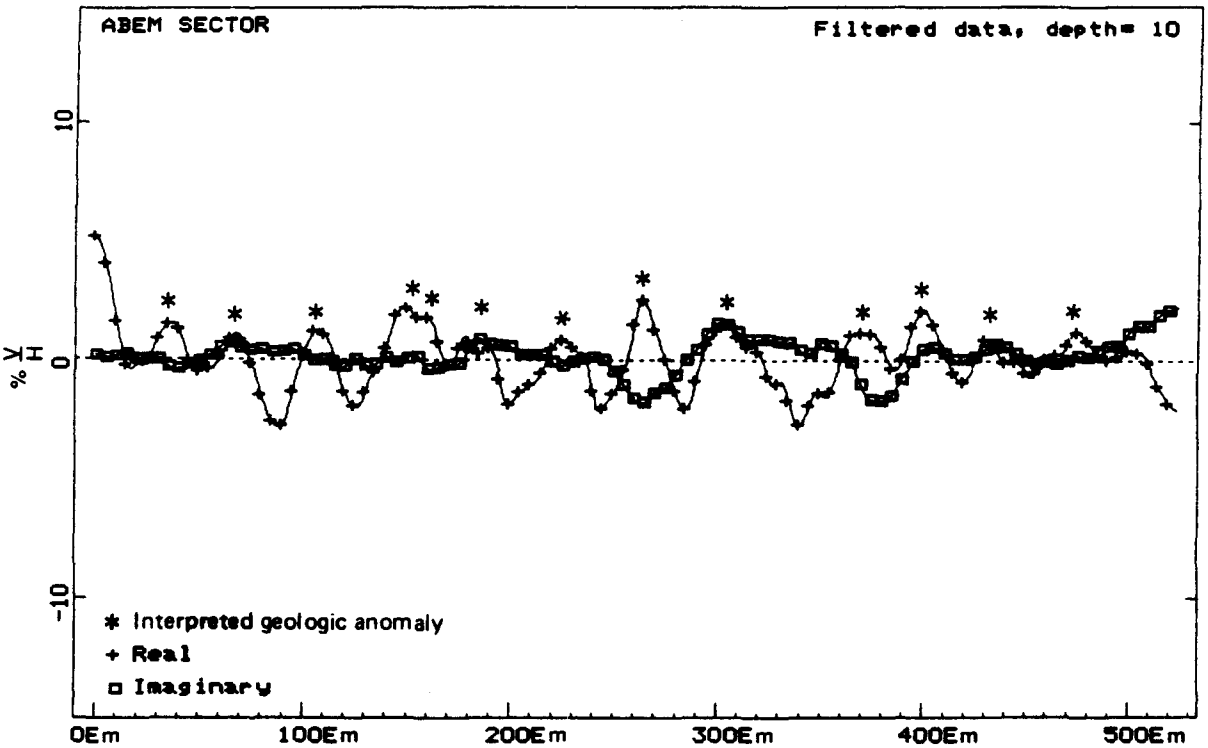
VLF Profile
GSE 10.9C_n

5/90

Figure D-1

Profile: 0061S (24 kHz) GSE 10.9C_s S70°E





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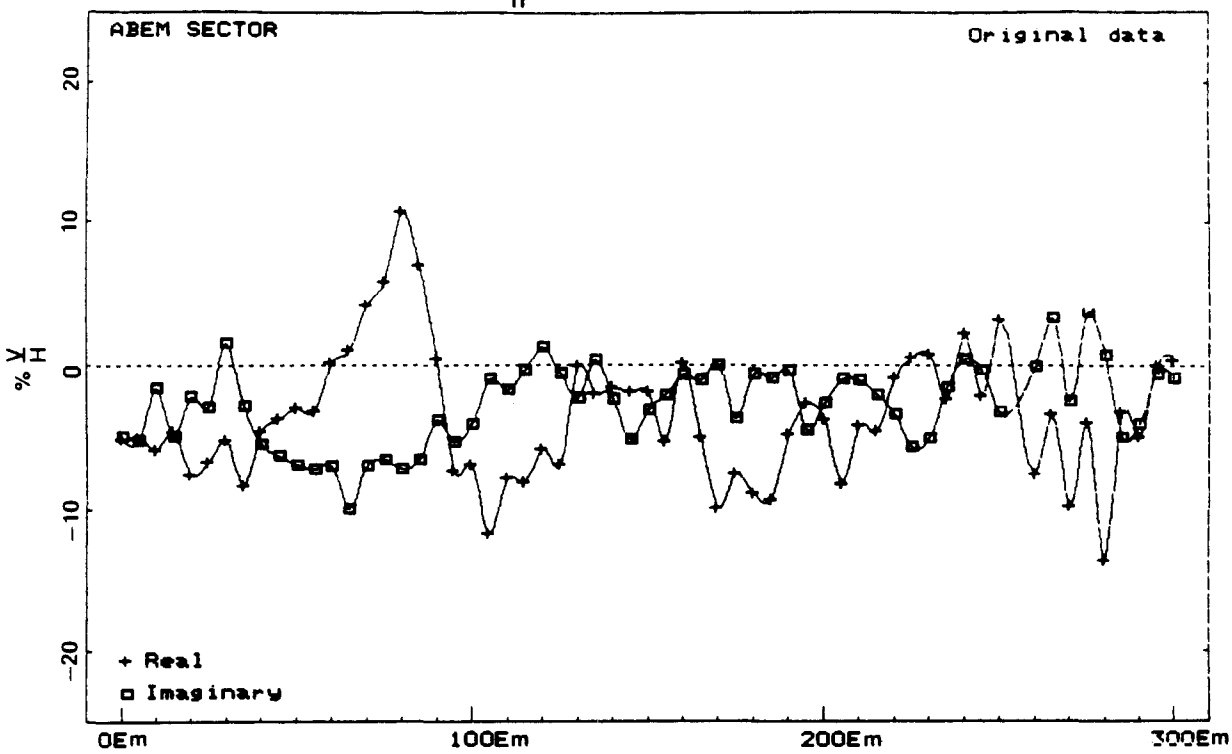
Project No.: 87-888-0012

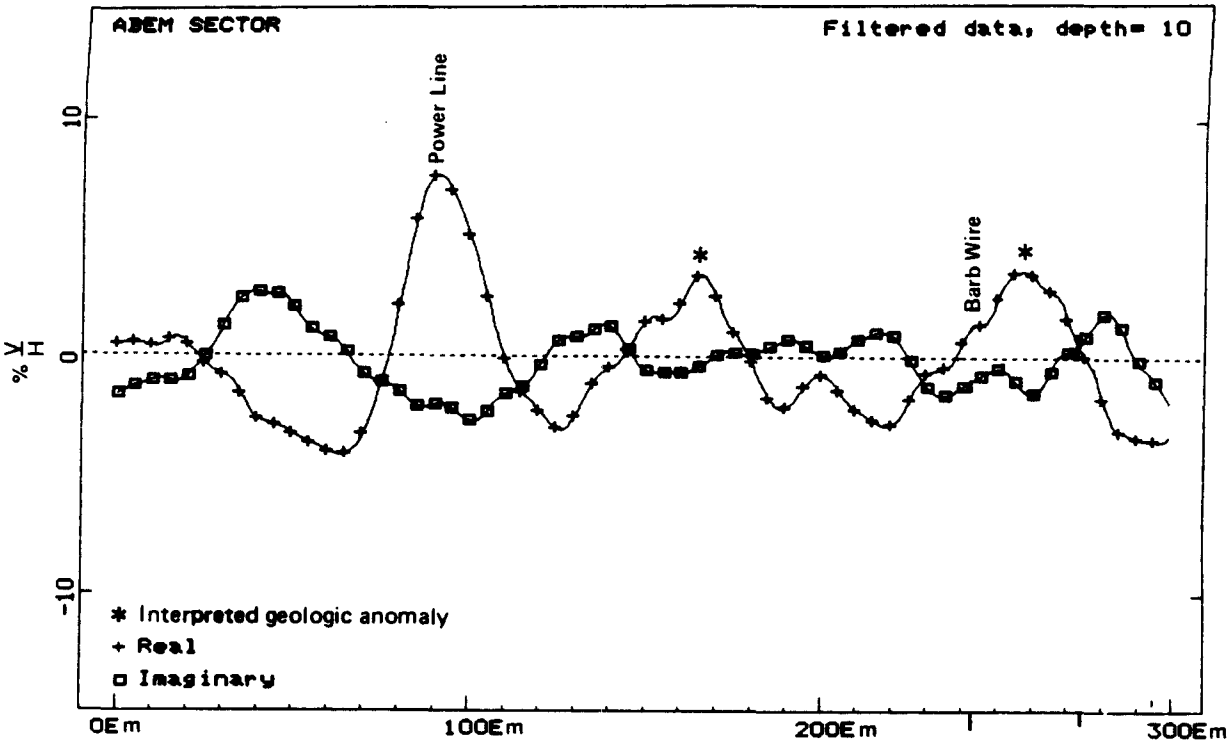
VLF Profile
GSE 10.9C_s

5/90

Figure D-2

Profile: 0080S (24 kHz) GSE 10.9D_n S68°E





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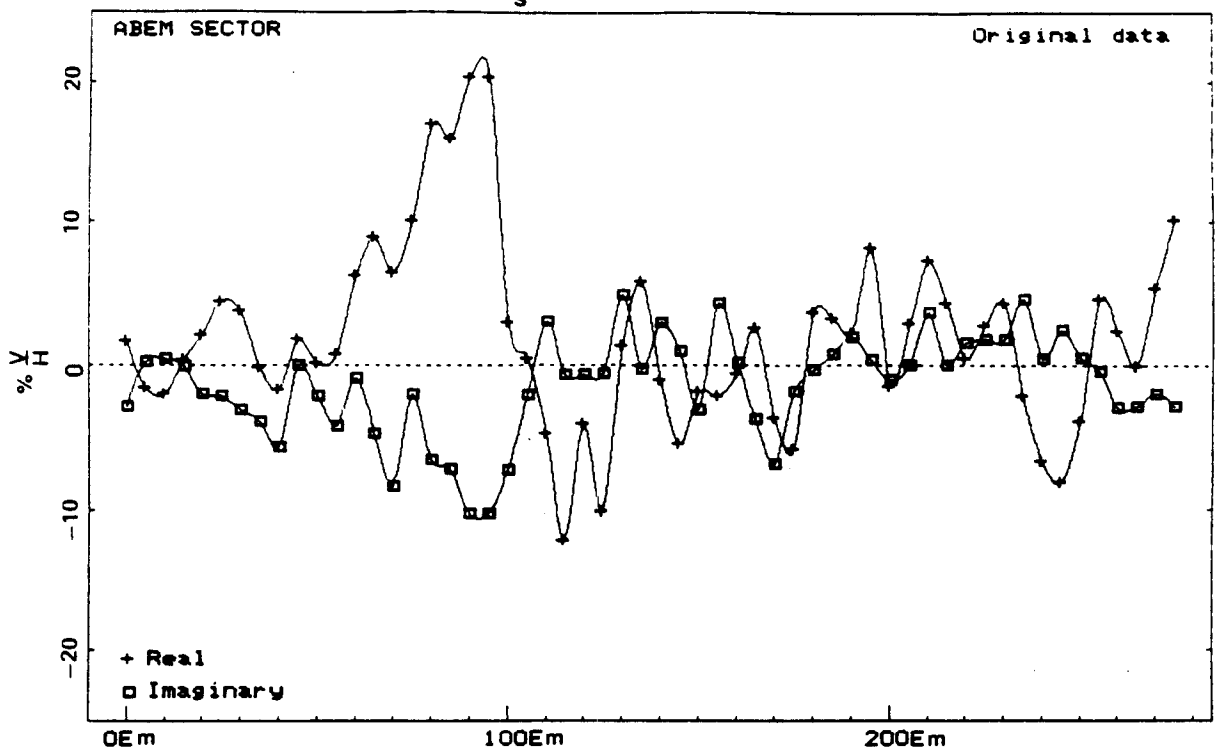
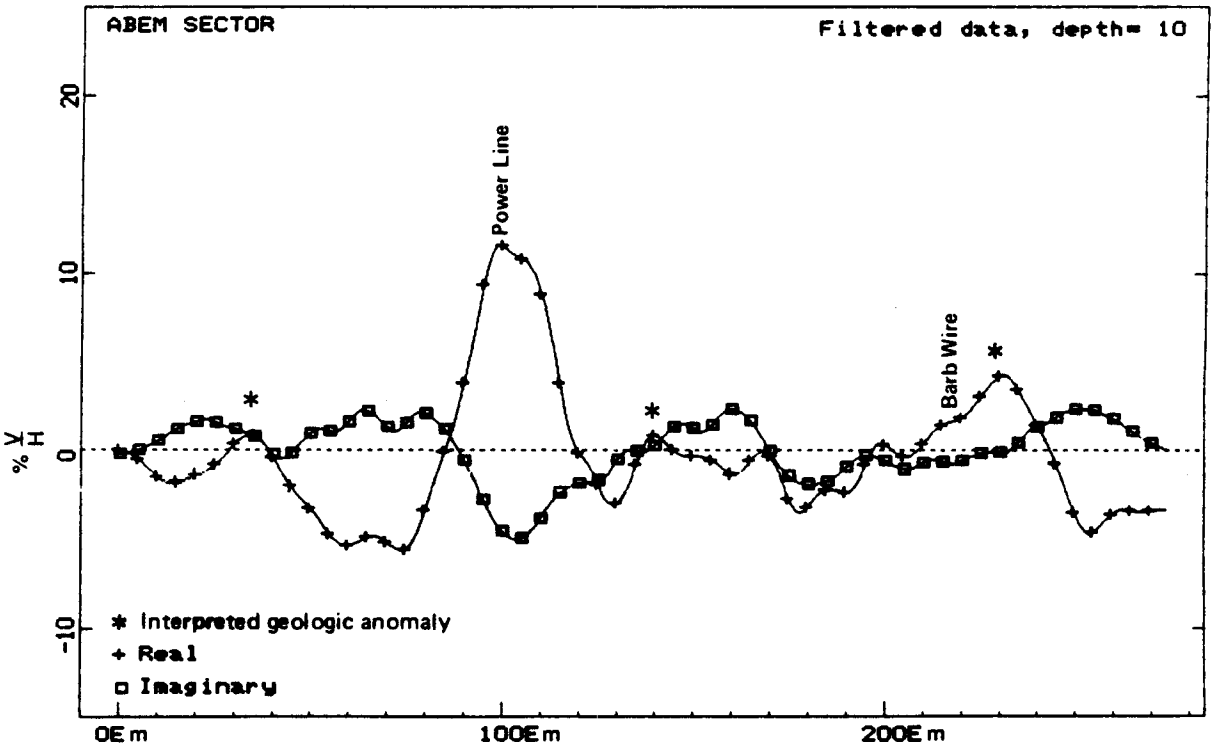
VLF Profile
GSE 10.9D_n

5/90

Figure D-3

Profile: 0081S (24 kHz) **GSE 10.9D$_s$** **S68°E**





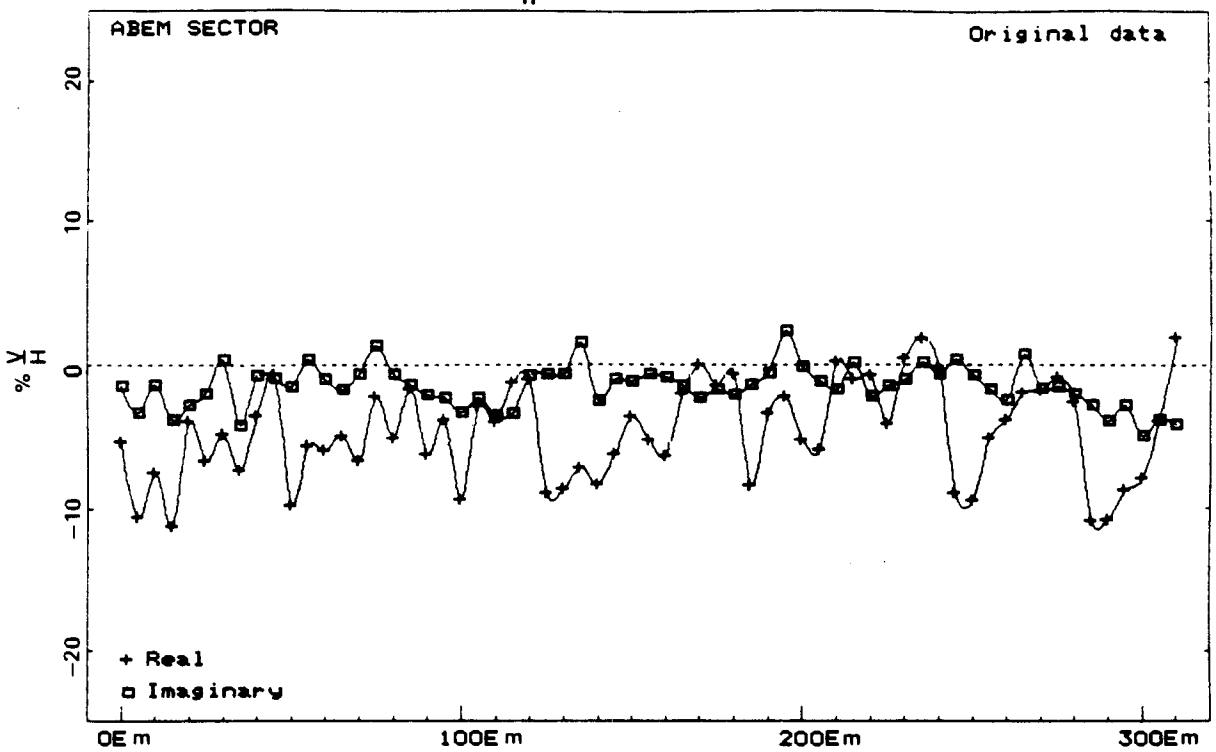
The Earth Technology Corporation	Project No.:	87-888-0012

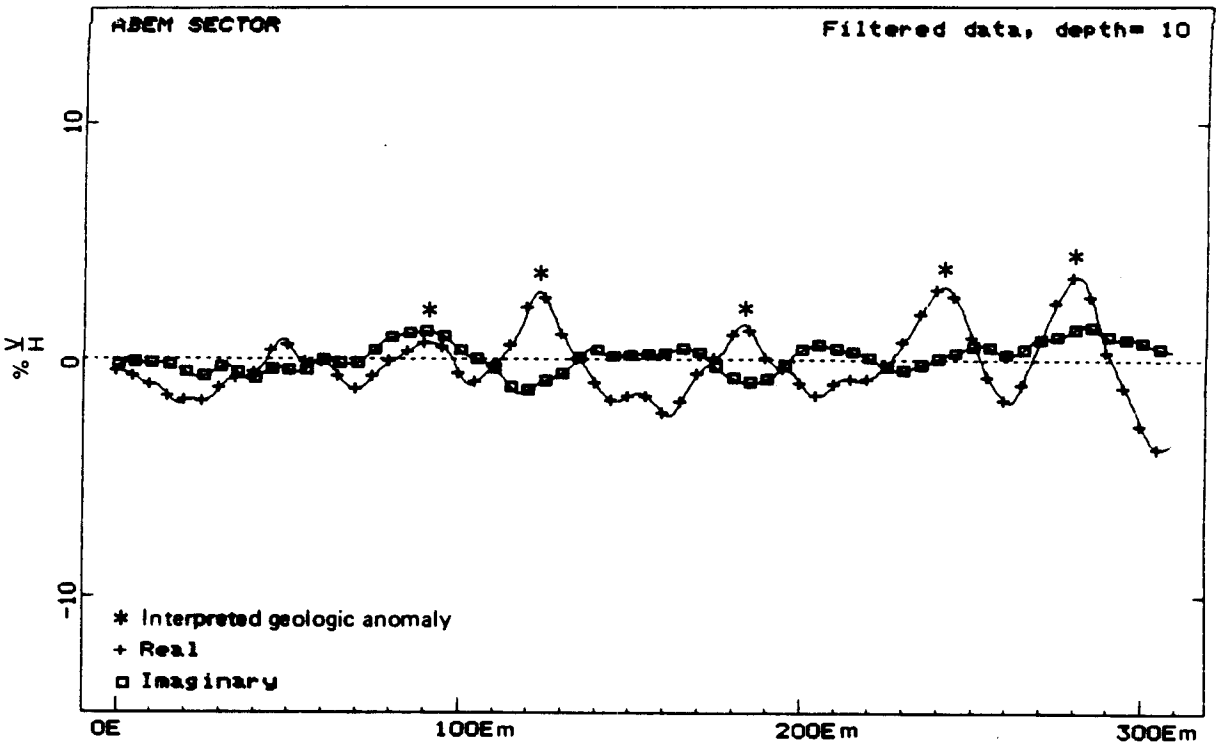
VLF Profile
GSE 10.9D$_s$

5/90

Figure D-4

Profile: 0100S (24 kHz) GSE 10.9E$_n$ S67°E





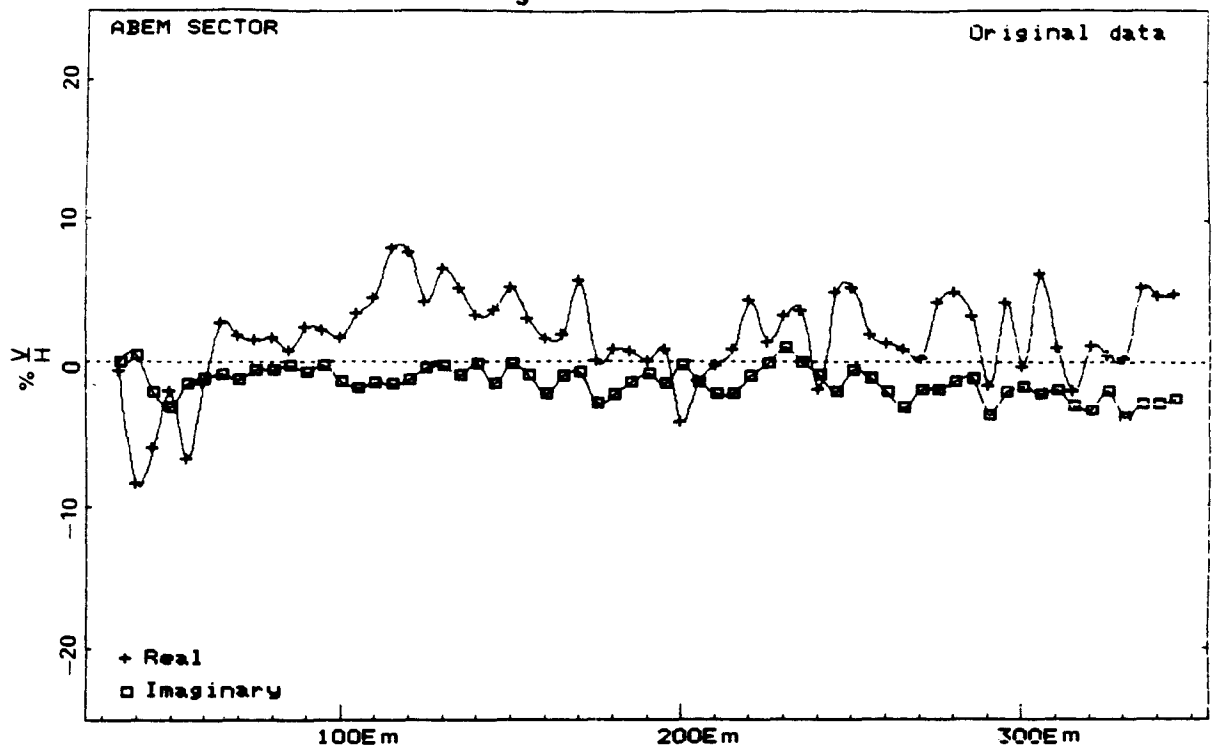
The Earth Technology Corporation	Project No.:	87-888-0012

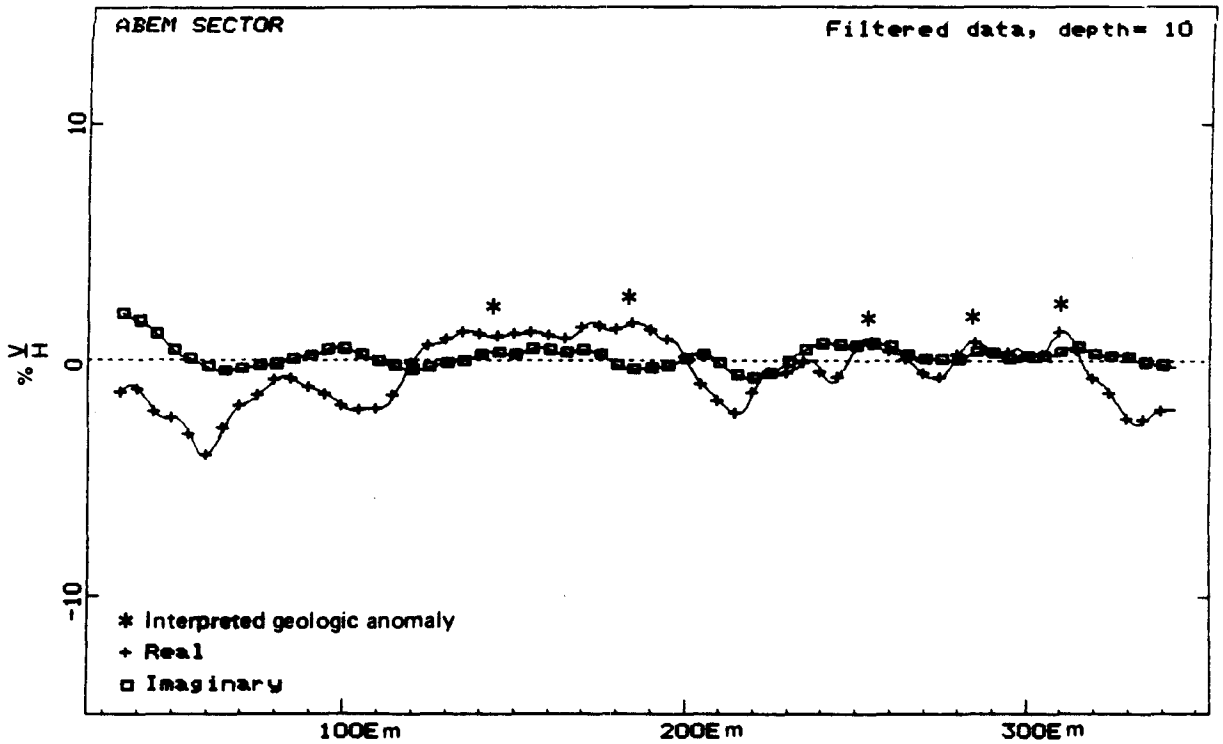
VLF Profile
GSE 10.9E$_n$

5/90

Figure D-5

Profile: 0101S (24 kHz) GSE 10.9E$_s$ S67°E





The Earth Technology Corporation

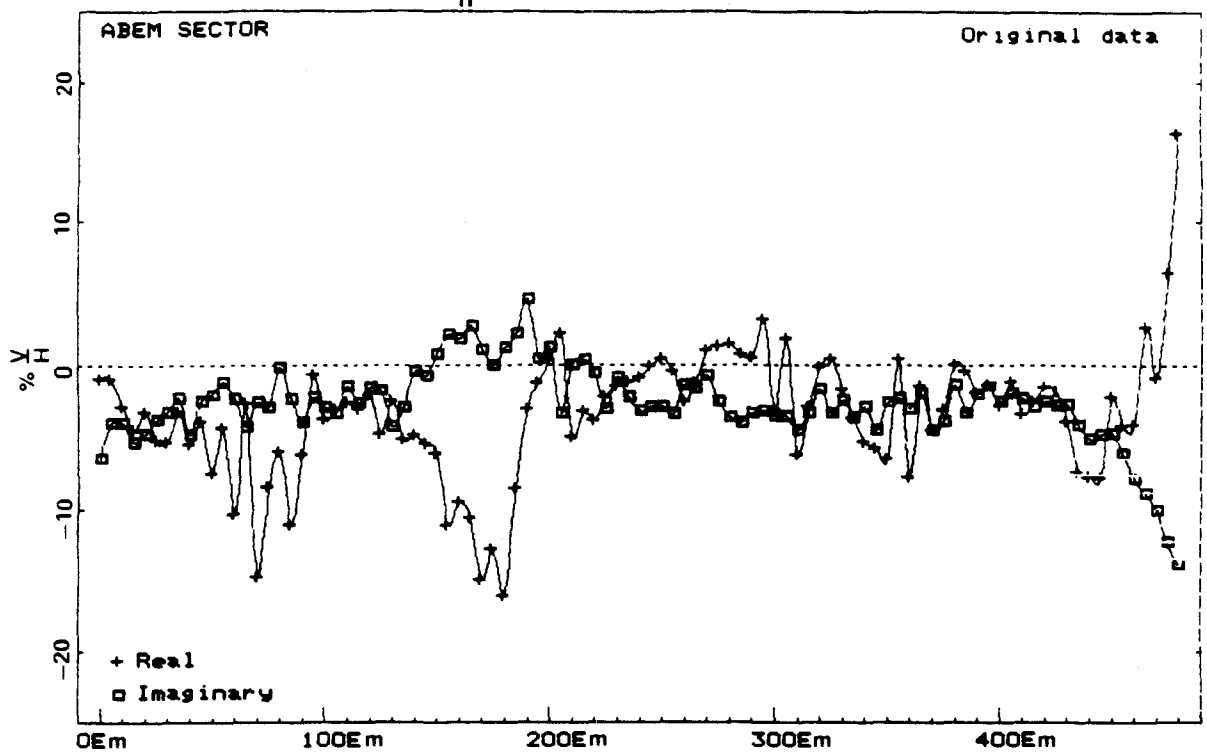
Project No.: 87-888-0012

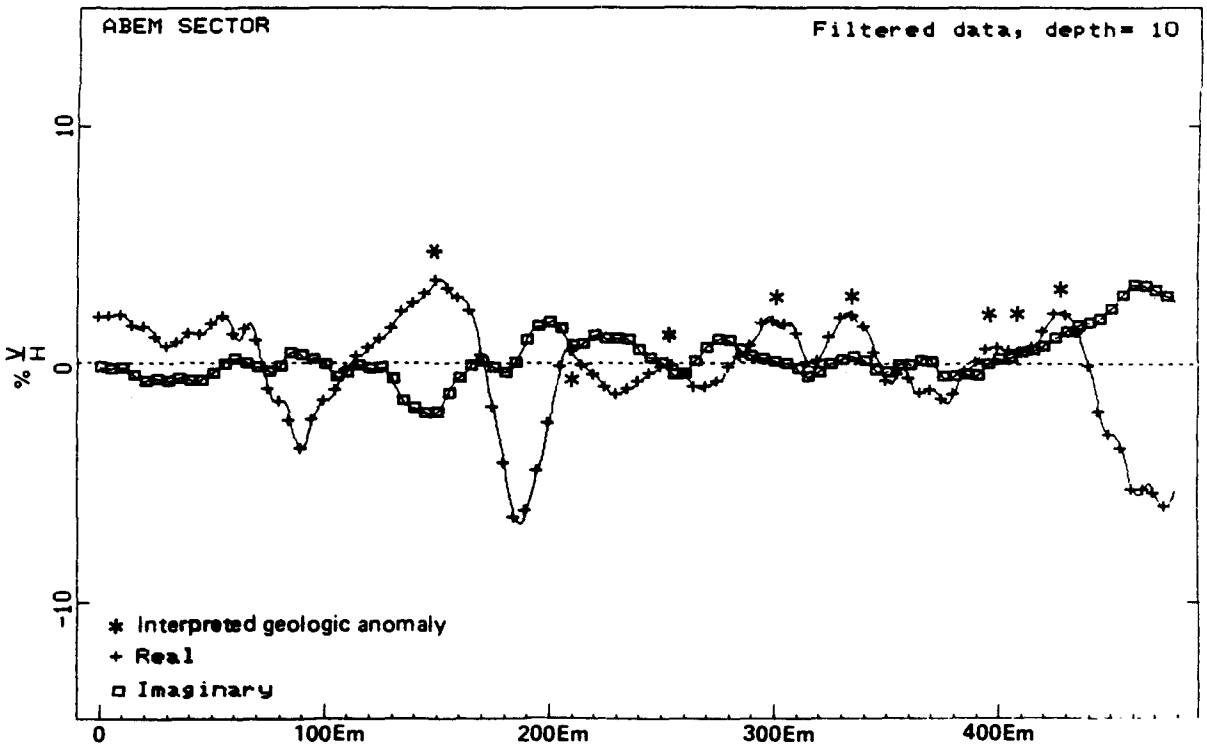
VLF Profile
GSE 10.9E$_s$

5/90

Figure D-6

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





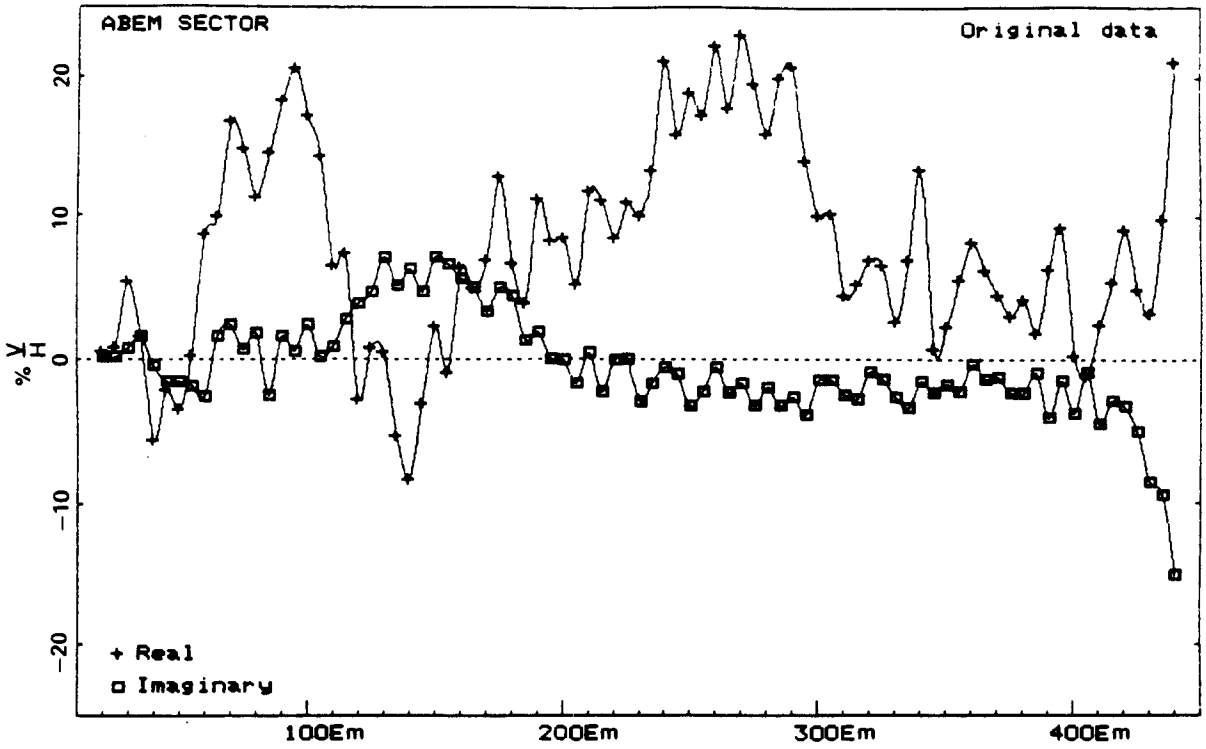
The Earth Technology Corporation	Project No.: 87-888-0012

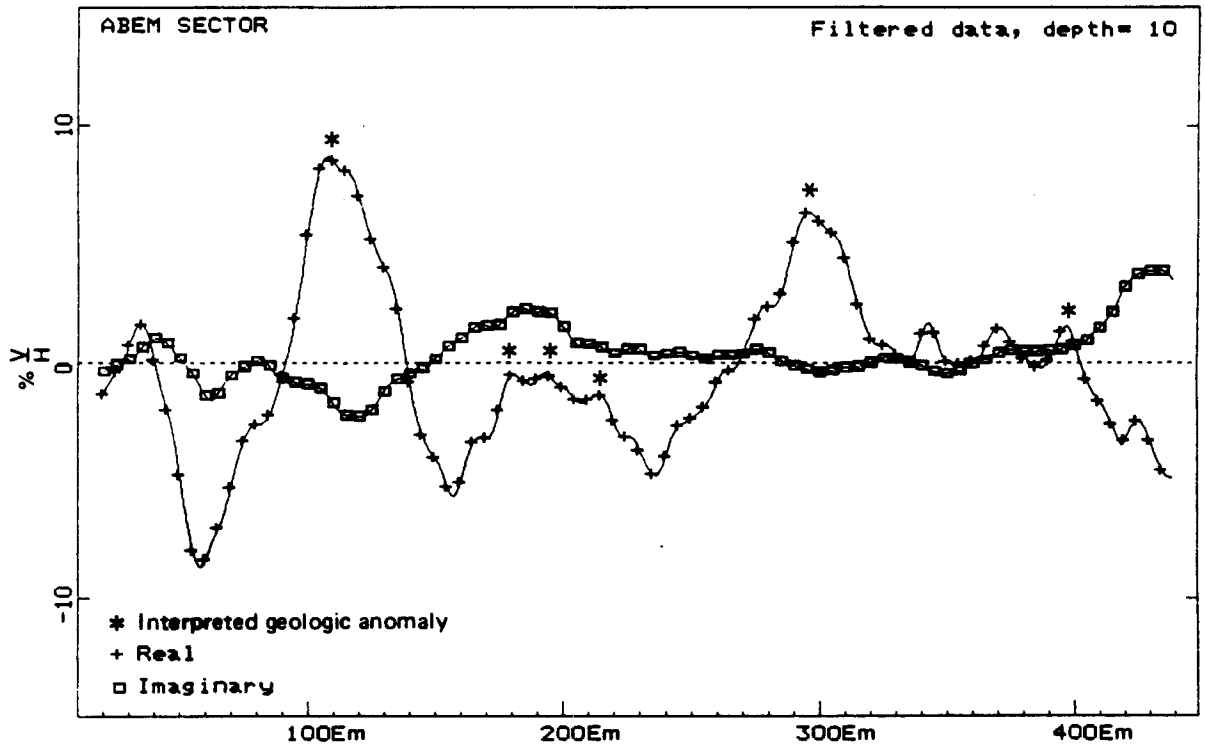
VLF Profile
GSI $2C_n$

5/90

Figure D-7

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





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

VLF Profile
GSI $2C_s$

5/90

Figure D-8

Seismic Reflection Surveys:

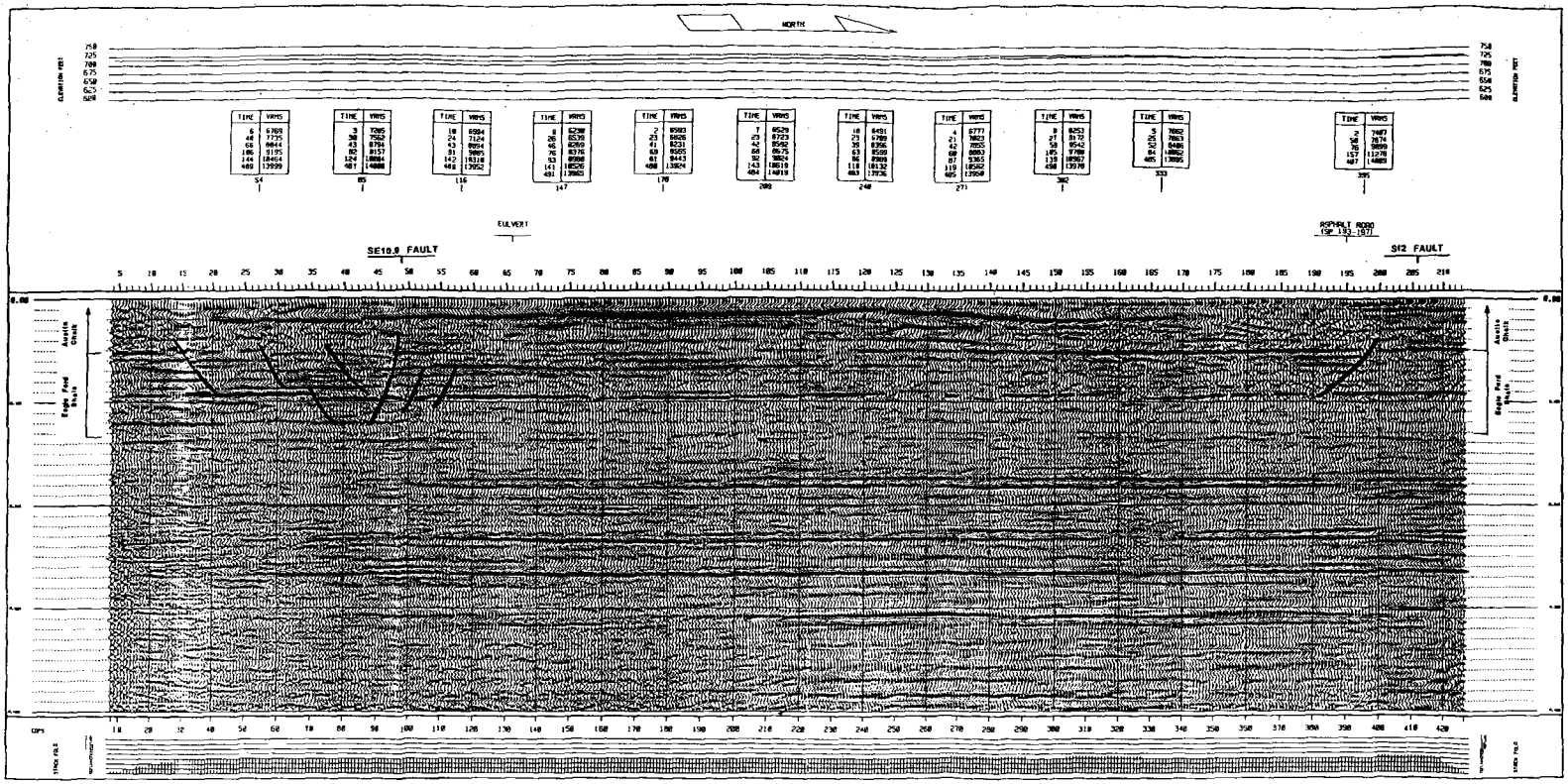
Figures D-9 and D-10 are seismic reflection lines that cross the fault near the intersection of Highway 66 and Arrowhead Road.

Seismic line GSE10.9, Figure D-9, was chosen to cross the SE10.9 fault near its northeast end and generally follows Arrowhead Road south of Highway 66. Reflections marking the Austin Chalk/Eagle Ford Shale contact and the base of the Eagle Ford Shale are quite continuous across most of the line except for a rather disrupted zone between shot points 15 and 50. This zone of faulting correlates well with the mapped position of fault zone SE10.9. The sense of faulting (down to the southeast) and the estimated throw (apparent offset of 25 feet or so on each of several faults) compares well with the interpretation presented in Appendix C. Note that extrapolation of these offsets down to the base of the Eagle Ford Shale shows it to be unaffected (at least to the resolution we are able to discern from the seismic section).

Line GSI2B is a more east-west line off the north end of Line GSE10.9 (Figure D-9). As such, this line should see the northern extension of fault SE10.9 (if it extends this far north). By tieing the reflection of Line GSE10.9 (Figure D-10) to those of GSI 2B (Figure D-10), we are able to bring the same reflecting horizons onto the interpreted record section. The Austin Chalk/Eagle Ford Shale contact is relatively continuous except for an interval between shot points 115 and 140. This faulted area has the same appearance and sense of displacement (including some antithetical faulting) as fault SE10.9 on line GSE10.9 (Figure D-9). The slightly narrower appearance on this section is a result of crossing the faults closer to perpendicular whereas the other line crosses them at an acute angle (apparent width of fault zone). The real fault zone width, then, is closer to 200 feet. The width as mapped elsewhere (by surface mapping and VLF surveys) is as much as 300 feet. Total fault offset across the zone is approximately 36 feet using a time offset of 0.008 sec. and an interval velocity of 9,000 ft/sec. Net offset is down to the southeast.

REFERENCES:

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



RTK

PROSPECT : SUPERCOLLIDER TEST

WAXAHACHIE, TX

LINE GSE10.9

SPS. 1 - 205

MIGRATION

RECORDING PARAMETERS

DATE RECORDED BY PARTY NO	:	3/2/88 CGG HOUSTON, INC. 1
ENERGY SOURCE CHARGE SIZE SHOT INTERVAL	:	BUFFALO GUN 12 GAUGE 20 FT
CABLE GEOPHONE PATTERN GROUP INTERVAL	:	24 DATA TRACES SINGLE 10 FT
RECORDING INSTRUMENTS FORMAT SAMPLE RATE FILTER	:	DFS-IV SEG-Y (FLOPPY DISK) 24 TRACE 2 MS HC : 128 HZ HT : 500 HZ

PROCESSING PARAMETERS

1. REFORMAT
2. TRACE EDIT
3. SPHERICAL DIVERGENCE CORRECTION
4. REFRACTION STATICS ANALYSIS
5. DECONVOLUTION: SUM TECHNIQUE ON SHOT ENSEMBLE
   2 TH OPERATOR
6. CDP SORT
7. SPECTRAL WHITENING 70 - 200 HZ
8. VELOCITY ANALYSIS
9. TRIM STATICS
10. VELOCITY ANALYSIS
11. NMO APPLICATION
12. NMO STRETCH MUTE
13. STACK 800%
14. SURFACE TO FIXED DATUM. DATUM = 700 FT.
15. INSIGHT : TRI-F NOISE REDUCTION
16. MIGRATION
17. FILTER 70 - 250 HZ
18. 200 MSEC SLIDING GATE BALANCE
19. DISPLAY

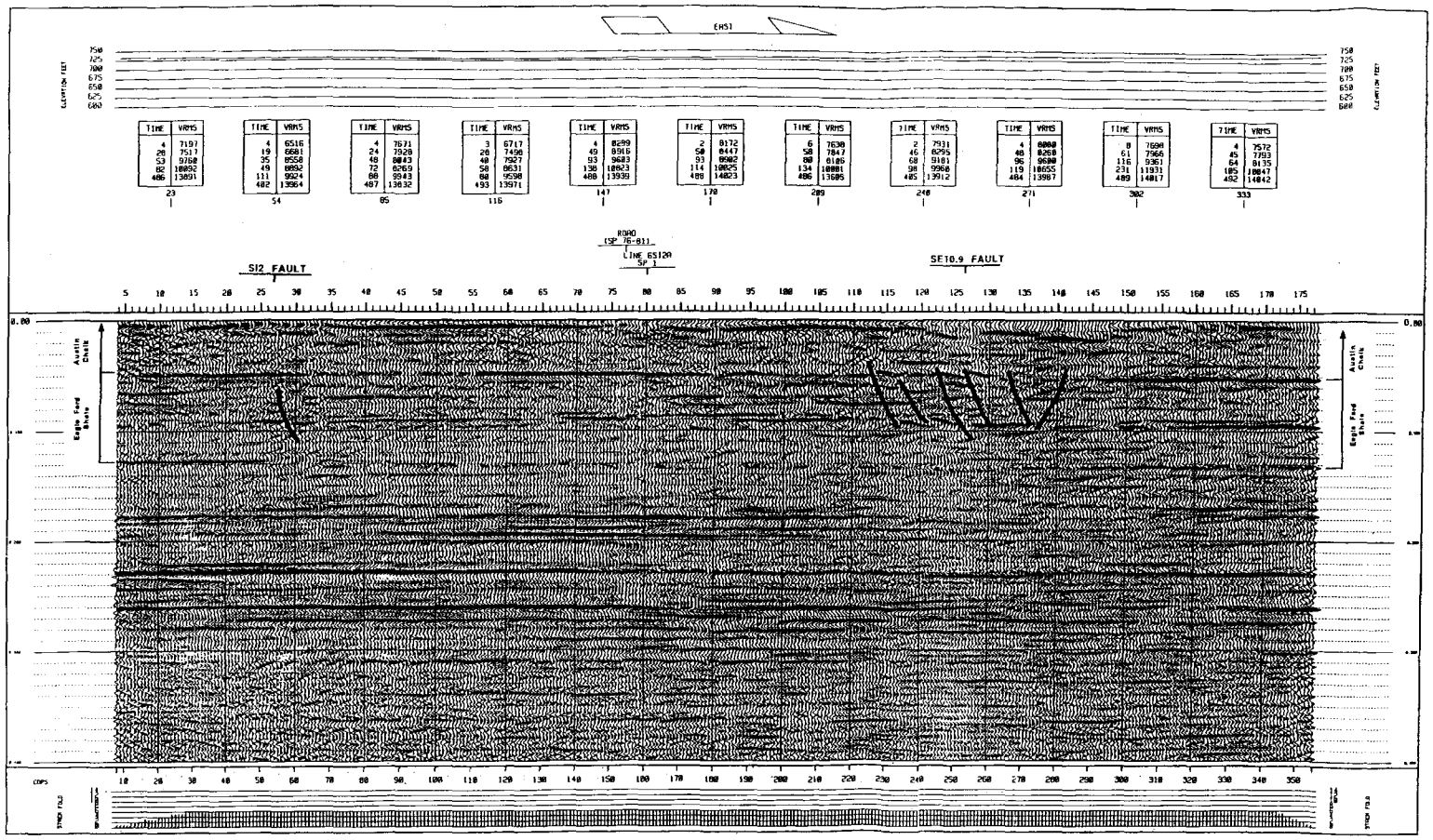
PRESENTATION

VERTICAL SCALE	:	2.0 @ INCH/SEC
HORIZONTAL SCALE	:	10 TR/IN
GAIN	:	1.0
BIAS	:	0.0
POLARITY	:	SEG POSITIVE
PROCESSING DATE	:	FEBRUARY, 1988

ENTROPIC GEOPHYSICAL

1155 DAIRY ASHFORD - 1105
HOUSTON, TX 77079

Figure D-9
Seismic Reflection Profile
Structure Study Zone SE 10.9



RTK

PROSPECT : SUPERCOLLIDER TEST

WAXAHACHIE, TX

LINE GSI2B

SPS. 1 - 169

MIGRATION

RECORDING PARAMETERS

DATE	:	2/7/90
RECORDED BY	:	LCT HOUSTON, INC.
PARTY NO	:	1
ENERGY SOURCE	:	BUFFALO GUN
CHARGE SIZE	:	12 GAUGE
SHOT INTERVAL	:	20 FT
CABLE	:	24 DATA TRACES
GEOPHONE PATTERN	:	SINGLE
GROUP INTERVAL	:	10 FT
RECORDING INSTRUMENTS	:	ES-2401
FORMAT	:	SEG-1 (FLOPPY DISK)
SAMPLE RATE	:	1 MSEC
FILTER	:	LCH = 36 HZ HCH = 500 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 - 500 HZ
8. VELOCITY ANALYSIS
9. TRIM STATICS
10. VELOCITY ANALYSIS
11. NMO APPLICATION
12. NMO STRETCH MUTE
13. STACK BOOK
14. SURFACE TO FIXED DATUM. DATUM - 700 FT.
15. ENHIGHT : TAU-P NOISE REDUCTION
16. MIGRATION
17. FILTER 70 - 250 HZ
18. 2MS MSEC SLIDING GATE BALANCE
19. DISPLAY

PRESENTATION

VERTICAL SCALE	:	200 @ 1MS/SEC
HORIZONTAL SCALE	:	12 TR/IN
GAIN	:	1:0
BIAS	:	0
POLARITY	:	SEG POSITIVE
PROCESSING DATE	:	FEBRUARY, 1990

ENTROPIC GEOPHYSICAL

1155 DAIRY ASHFORD #105
HOUSTON, TX 77079

Figure D-10
Seismic Reflection Profile
Structure Study Zone SE 10.9

APPENDIX E

HYDROLOGIC TEST RESULTS

APPENDIX E

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 or a single pneumatically operated packer into the drill hole to a predetermined depth. 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)	Estimated Depth to Static Water Level* (feet)
SE 10.9C	280.3-343.5 (217.6-266.6 vertical depth)	175	40	Austin Chalk/Eagle Ford Shale (fracture zone)	3.3×10^{-6}	10
SE 10.9D	172.3-193.4 (130.2-146.3 vertical depth)	150	30	Austin Chalk (fractured)	3.1×10^{-7}	10

* Estimated based on measured water level in boring BIR 11 (<0.4 mile away to the south).

One test interval was selected in each boring based on a review of the lithologic and wire-line logs. In boring SE 10.9C, a single packer was used to test the basal portion of Austin Chalk and the upper portion of Eagle Ford Shale that contained numerous fractures. Two packers in straddle configuration were used in boring SE 10.9D to provide hydrologic data for a fractured interval in Austin Chalk. 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.

APPENDIX F

LABORATORY RESULTS

GEOMECHANICAL TEST RESULTS

BORING SE 10.9C

TABLE F-1. GEOMECHANICAL TEST RESULTS-BORING SE 10.9C

GENERAL LITHOLOGY	VERTICAL DEPTH feet	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 TABOR ABRASION/ HARDNESS INDEX	COMMENTS
BENTONITE	217.8	280.5	29.8	90.8	2.74	102	42	94.6	8.0	2.1	B-1/40		200	360	1.34	0.29		200					
BENTONITE	218.0	280.8	29.6	95.5						2.1	B-1/30		300	286	0.98	0.31		300					
BENTONITE	218.3	281.2	35.4	84.7																			
EAGLE FORD	224.8	289.6	16.2	122.4	2.72	60	34	99.2	6.9														
EAGLE FORD	228.7	294.6	15.8	116.9		59	34	99.2	14.9														
EAGLE FORD	235.5	303.3	16.6	101.2		56	27	99.0	4.7														
EAGLE FORD	238.1	306.7	12.2	131.9	2.64	39	21	83.8	34.6														
EAGLE FORD	241.3	311.9	18.0	123.3		62	34	98.8	6.4														
EAGLE FORD	245.3	316.0	17.1	114.8		63	37	98.1	5.0														
EAGLE FORD	253.0	326.0	15.7	120.9	2.70	53	28	98.8	4.4														
EAGLE FORD	257.2	331.4	15.4	121.2		55	30	98.8	4.1														
EAGLE FORD	263.6	339.7	16.8	111.0		58	32	98.7	4.4														
PROCEDURE			ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D422				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ISRM	ISRM	ISRM	

SE109CPR.WK1
REVISION: 1.0
DATE: 5/9/90

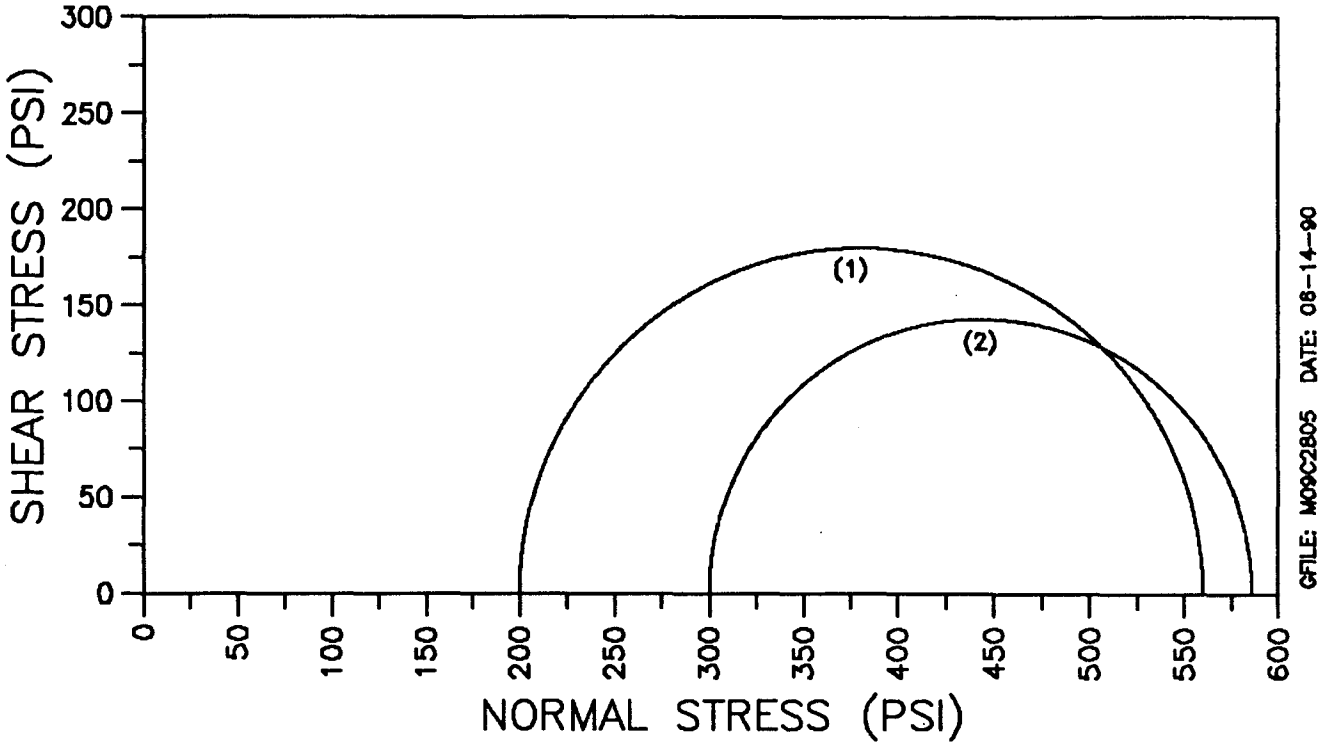
PRELIMINARY
(Subject to Revision)

* 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).

BORING NO.: SE 10.9C
BORING DEPTH RANGE: 280.5-281.2 FEET
VERTICAL DEPTH RANGE: 217.8-218.3 FEET
BENTONITIC SHALE



GFILE: M09C2805 DATE: 08-14-90

SEE STRESS-STRAIN PLOTS FOR INDIVIDUAL SAMPLE DATA

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

(1) BORING DEPTH: 280.5 FEET; VERTICAL DEPTH: 217.8 FEET
(2) BORING DEPTH: 280.8 FEET; VERTICAL DEPTH: 218.0 FEET

TEXAS SSC SITE

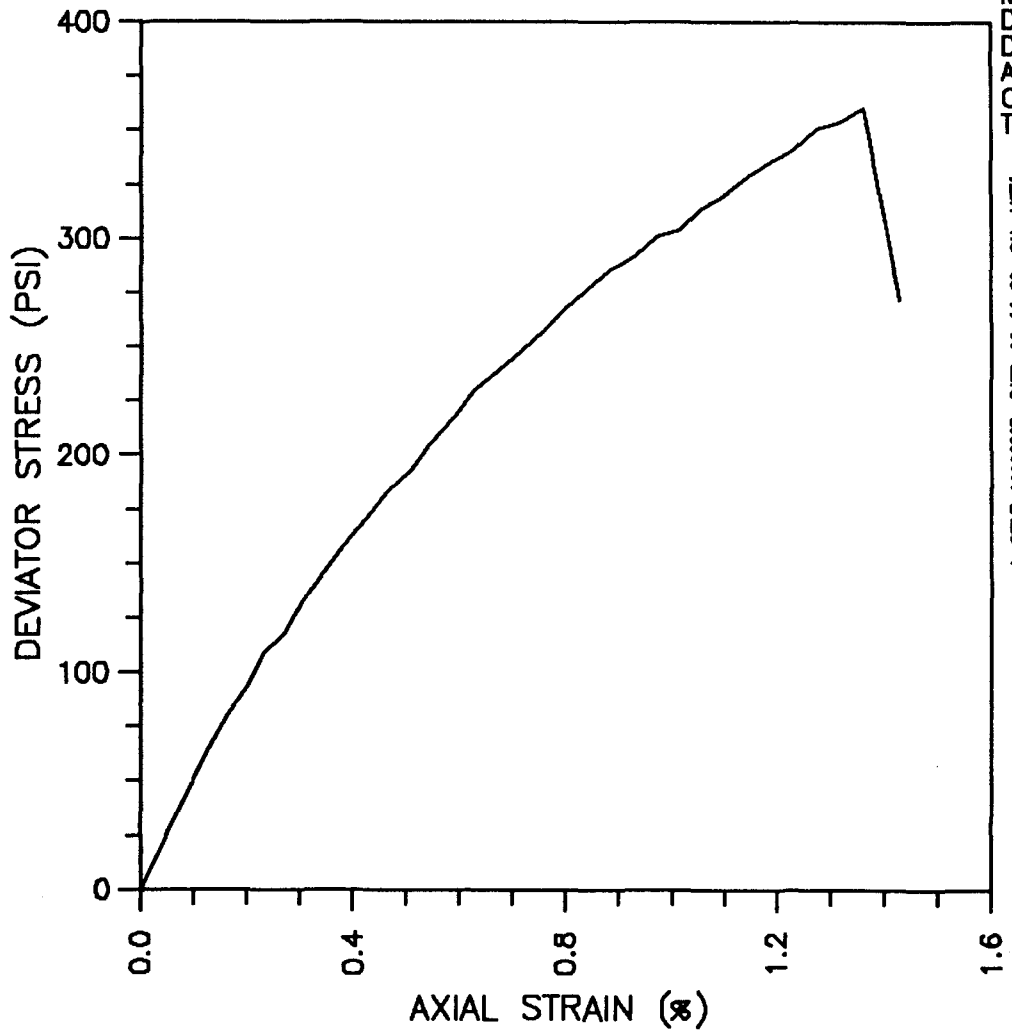
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE 10.9C
BORING DEPTH: 280.5 FEET
BENTONITIC SHALE
VERTICAL DEPTH: 217.8 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 29.8
DRY UNIT WEIGHT (PCF): 90.8
DEG. OF SATURATION (%): 93.9
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.291 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 40 DEG

TEXAS SSC SITE

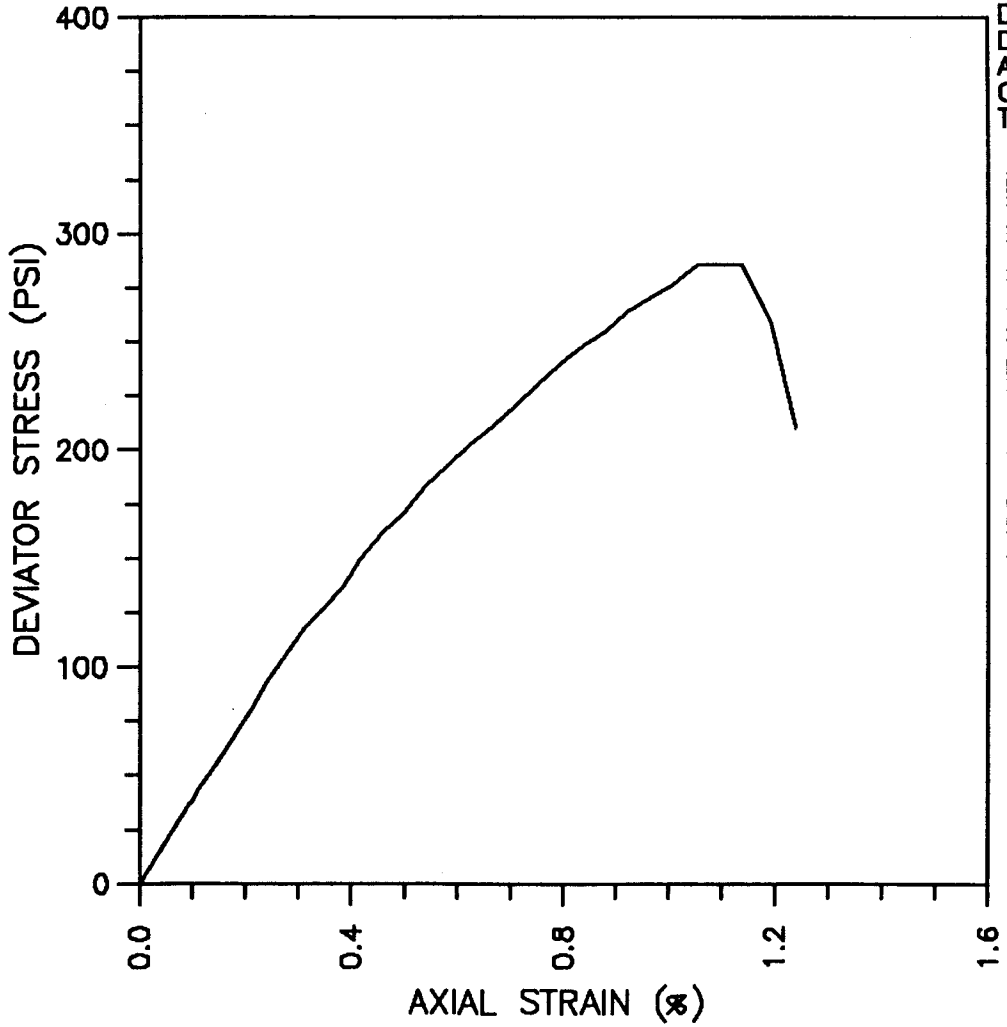
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE 10.9C
BORING DEPTH: 280.8 FEET
BENTONITIC SHALE
VERTICAL DEPTH: 218.0 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 29.6
DRY UNIT WEIGHT (PCF): 95.5
DEG. OF SATURATION (%): 104.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 300
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

DFILE: 109C2808 DATE: 06-14-90 CAL: MC74

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
0.305 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

GEOMECHANICAL TEST RESULTS

BORING SE 10.9D

TABLE F-2. GEOMECHANICAL TEST RESULTS–BORING SE 10.9D

GENERAL LITHOLOGY	VERTICAL DEPTH feet	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 TABOR ABRASION/ HARDNESS INDEX	COMMENTS
AUSTIN CHALK	136.3	180.3	12.3	125.4																			
AUSTIN CHALK	136.6	180.7	10.8							0.5										190			
AUSTIN CHALK	136.7	180.8	10.0	130.4						2.5	B-1/40	1268			0.62	2.06		0					
BENTONITE	138.2	182.8	28.7			89	46	92.7	12.8														
AUSTIN CHALK	138.9	183.7	11.4	128.6																			
AUSTIN CHALK	139.3	184.2	10.1	132.1						2.5	D	1534			0.37	5.22		0					
AUSTIN CHALK	139.8	184.9	11.2	128.0																			
AUSTIN CHALK	140.0	185.2	10.8	127.2	2.68					2.2	B-1/30		100	1633	0.62	3.21		100					
AUSTIN CHALK	140.3	185.6	11.5	126.4						2.2	B-1/20		200	2708	0.82	3.97		200					NOTE 1
AUSTIN CHALK	140.3	185.6														5.78			0.14				NOTE 2
PROCEDURE			ASTM-D2216		ASTM-D854	ASTM-D4318		ASTM-D422				ASTM-D2938	ASTM-D2664			ASTM-D3148			ASTM-D3148	ISRM	ISRM	ISRM	

SE109DPR.WK1
REVISION: 1.0
DATE: 5/9/90

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

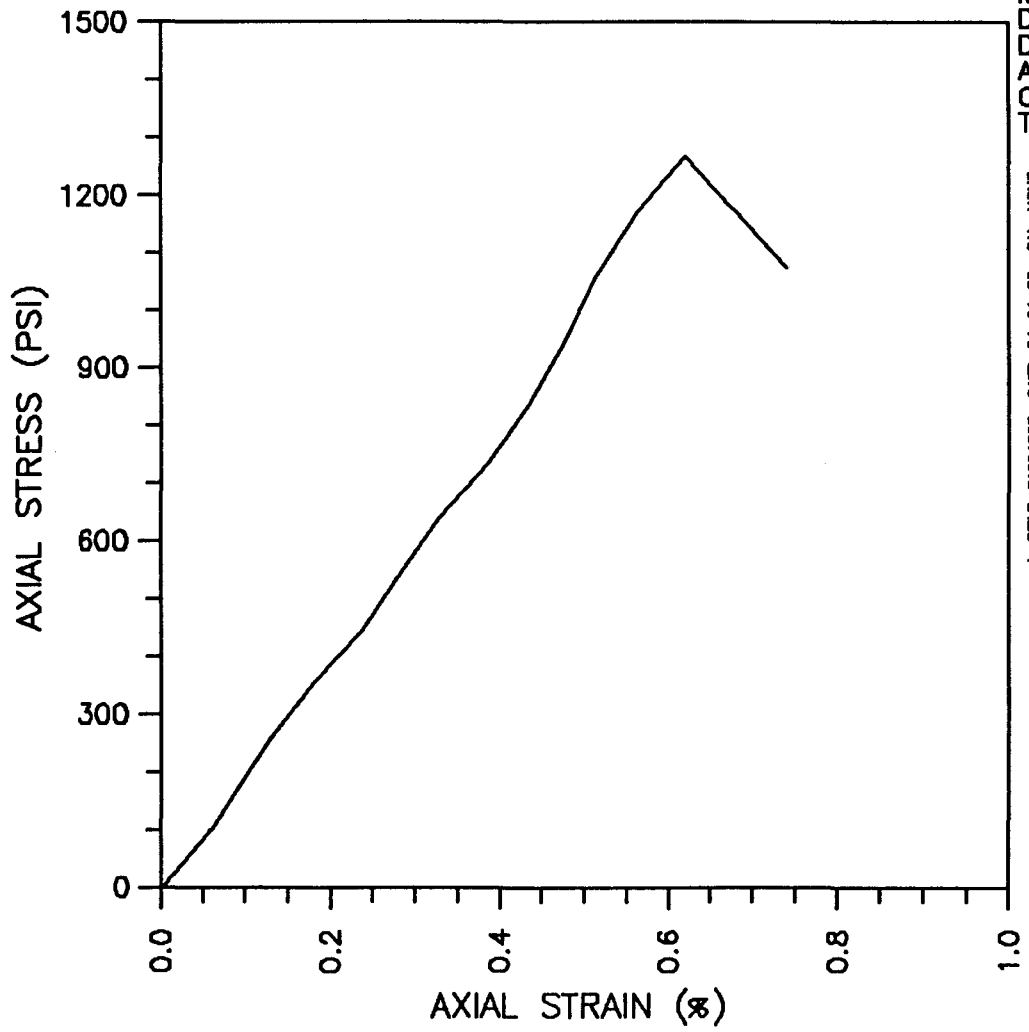
Note: Some values in this table may be revised based on reviews of test procedures and individual test results. The reader should refer to the latest revision of the gINT geotechnical data base (geotechnical report GR-70).

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.

BORING NO.: SE 10.9D
BORING DEPTH: 180.8 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 136.7 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 10.0
DRY UNIT WEIGHT (PCF): 130.4
DEG. OF SATURATION (%): 92.8
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

DFILE: E10D1808 DATE: 04-24-90 CAL: MCU3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
2.062 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 40 DEG.

TEXAS SSC SITE

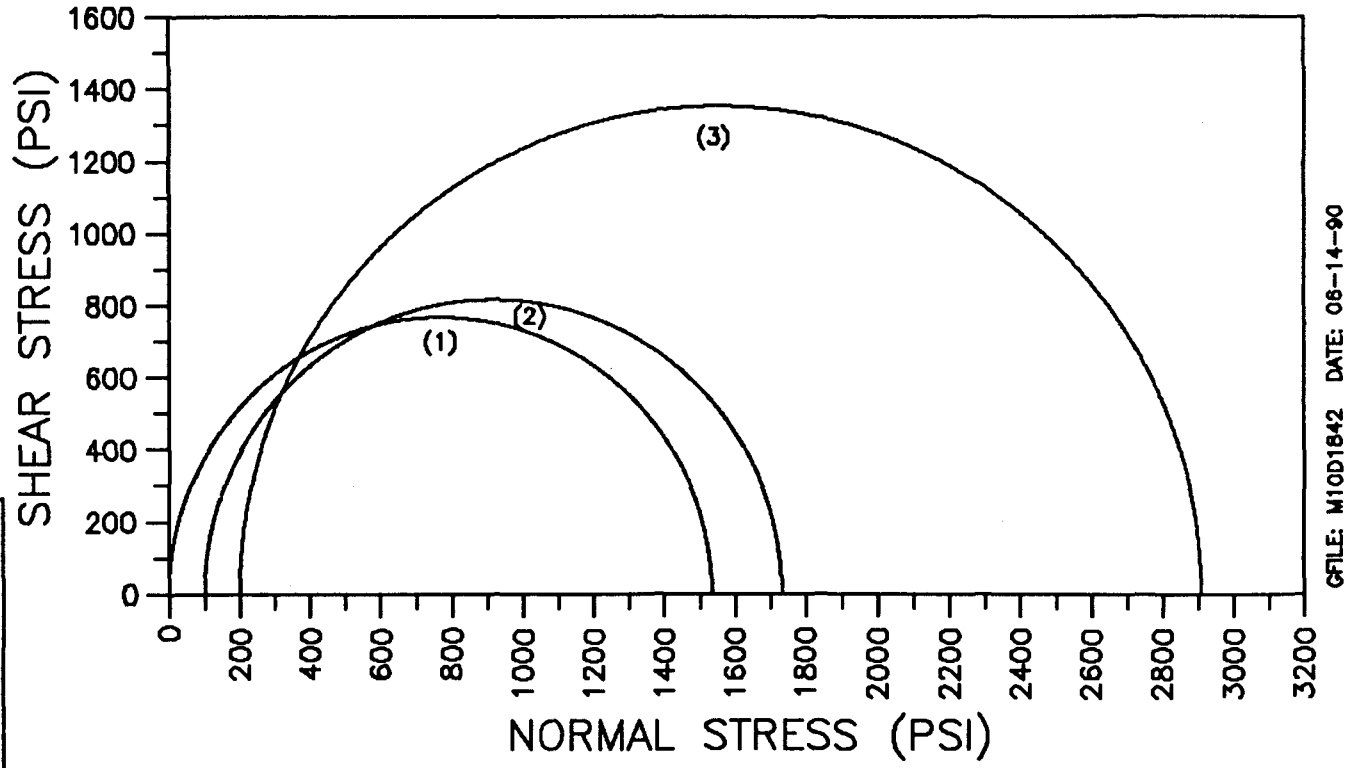
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE10.9D
BORING DEPTH RANGE: 184.2-186.0 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH RANGE: 139.3-140.7 FEET



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: 184.2 FEET; VERTICAL DEPTH: 139.3 FEET
(2) BORING DEPTH: 185.2 FEET; VERTICAL DEPTH: 140.0 FEET
(3) BORING DEPTH: 185.6 FEET; VERTICAL DEPTH: 140.3 FEET

TEXAS SSC SITE

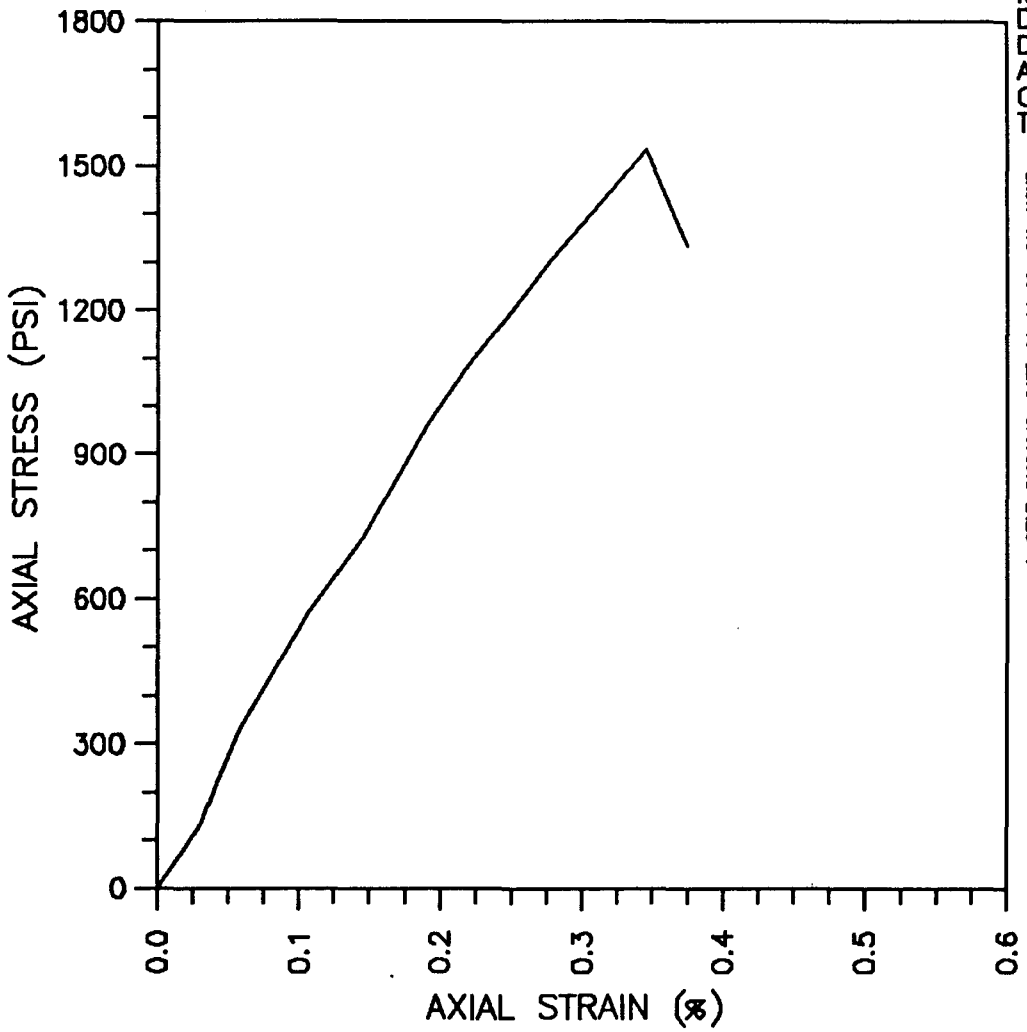
MOHR CIRCLE PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE10.9D
BORING DEPTH: 184.2 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 139.3 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 10.1
DRY UNIT WEIGHT (PCF): 132.1
DEG. OF SATURATION (%): 98.6
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 0
TEST TYPE: UNCONFINED COMPRESSION
(ASTM D 2938)

FILE: E1001842 DATE: 06-14-00 CAL: MCU3

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
5.217 x10E5 PSI

FAILURE MODE:
AXIAL SPLITTING

TEXAS SSC SITE

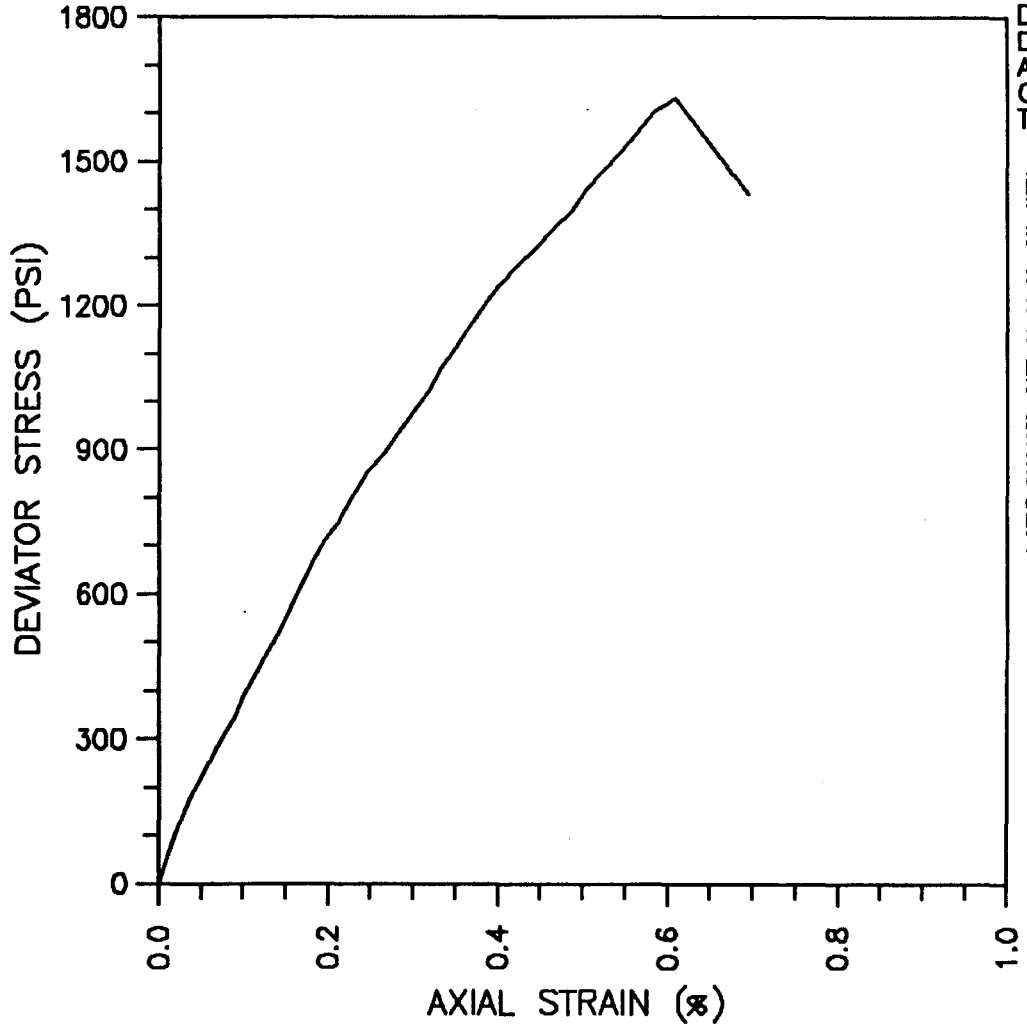
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES,INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE10.9D
BORING DEPTH: 185.2 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 140.0 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 10.8
DRY UNIT WEIGHT (PCF): 127.2
DEG. OF SATURATION (%): 89.7
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 100
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

STYLE: E10001852 DATE: 06-14-90 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.214 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 30 DEG

TEXAS SSC SITE

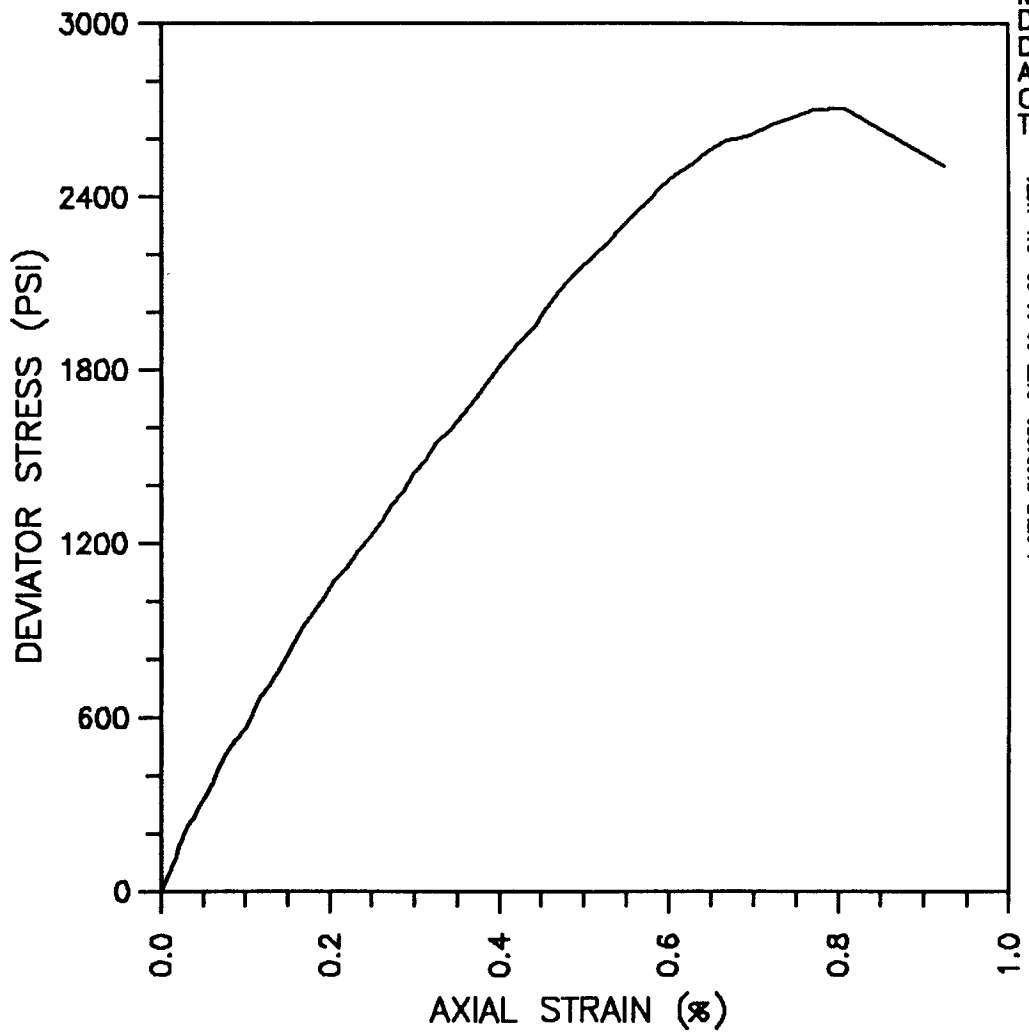
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE

BORING NO.: SE10.9D
BORING DEPTH: 185.6 FEET
AUSTIN CHALK LIMESTONE
VERTICAL DEPTH: 140.3 FEET



INCL. (DEG. FROM VERT.): APPROX. 40
MOISTURE CONTENT (%): 11.5
DRY UNIT WEIGHT (PCF): 126.4
DEG. OF SATURATION (%): 93.0
ASSUMED SPECIFIC GRAVITY: 2.7
CONFINING PRESSURE (PSI): 200
TEST TYPE: TRIAXIAL COMPRESSION
(ASTM D 2664)

GFILE: E10D1856 DATE: 06-14-90 CAL: MGT4

TANGENT MODULUS AT 50%
ULTIMATE STRESS:
3.968 x10E5 PSI

FAILURE MODE:
SHEAR PLANE AT 20 DEG

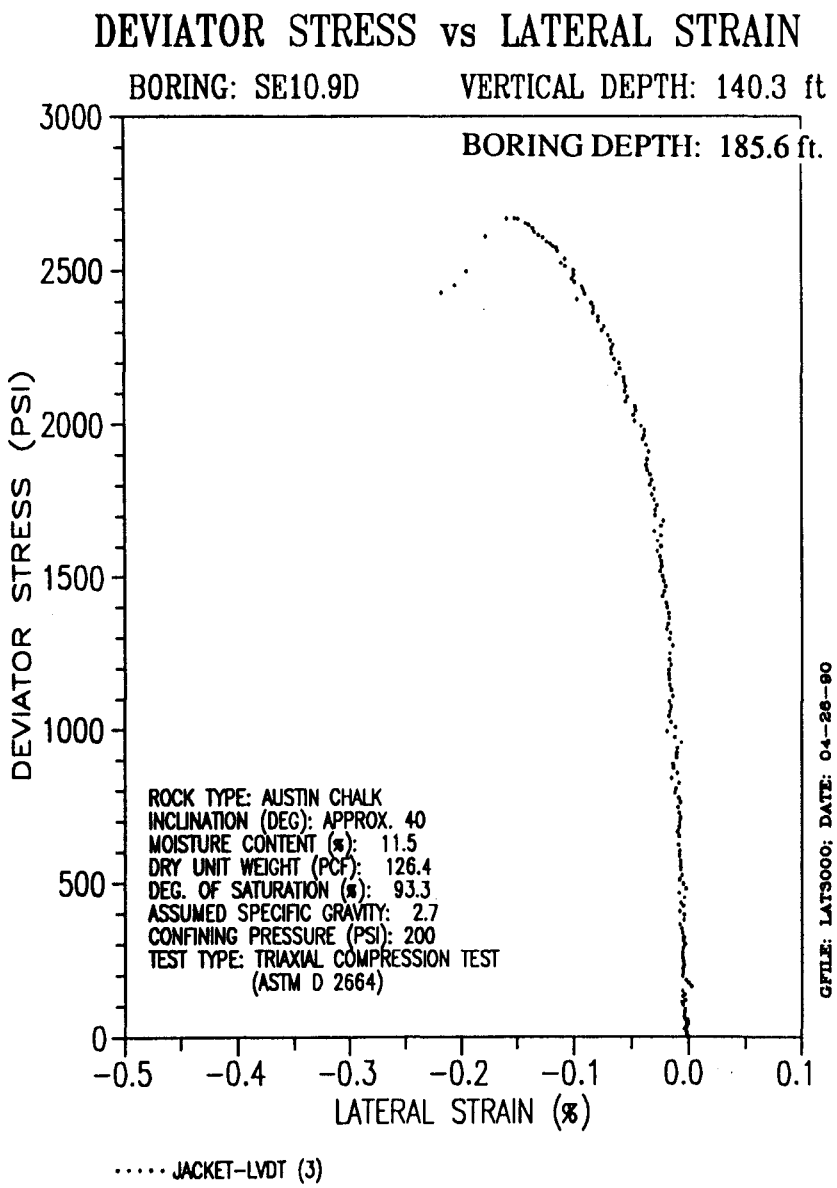
TEXAS SSC SITE

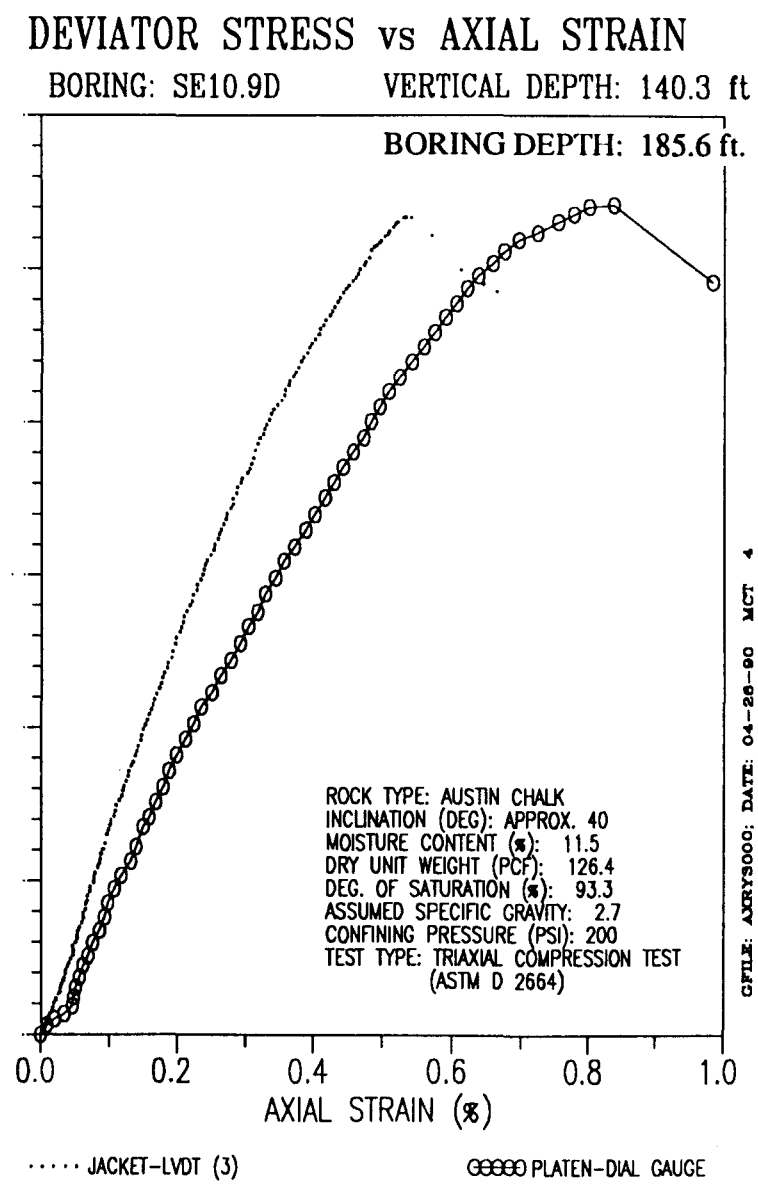
STRESS-STRAIN PLOT

MASON-JOHNSTON & ASSOCIATES, INC.
GEOLOGISTS-ENGINEERS

JOB NO.: 5530.12

FIGURE





PRELIMINARY

APPENDIX G

BOREHOLE PLUGGING REPORTS

SSC BOREHOLE PLUGGING REPORT

TETC Project No. 87-888-0012

Task No. 12

Boring No. SE 10.9C

Texas Coordinate Location: N 240,951
E 2,174,744

Surface Elevation: ~684.0 Feet

Total Boring Depth: 343.5 Feet

Plugging Remarks:

Boring was plugged with a cement / bentonite grout mixture @ approximately 7:1 water: mixture ratio. Grout was placed using a 2" pvc tremie pipe to ensure grout placement from bottom of hole to surface. Surface casing was removed and boring was topped off with grout. Total amount of cement used: 21 sacks, Total amount of bentonite used : 1-1/2 sacks (75 #), Total amount of water used: approx. 150 gallons.

Date Plugged: 3/26/90

Time Completed: 9:30 am

Drilling Geologist: Scott Lesikar
MJA Coordinator: W.D. Flanigan
MJA No.: 5530.12

SSC BOREHOLE PLUGGING REPORT

TETC Project No. 87-888-0012

Task No. 12

Boring No. SE 10.9D

Texas Coordinate Location: N 240,907
E 2,174,765

Surface Elevation: ~683.2

Total Boring Depth: 354.5

Plugging Remarks:

NX size angle boring was plugged with a mixture of cement, water, and bentonite at a ratio of 1 sack (94#) cement: approximately 7 gallons water: approximately 10# bentonite. Mixture was blended throughly and grouted through a 2" PVC tremie pipe from the bottom of the hole. Surface casing was removed and grout was brought to the surface. Supplies used:22 sacks Portland cement, 50# bentonite, and approximately 155 gallons of water.

Date Plugged: 3/8/90

Time Completed: 4:00 pm

Drilling Geologist: Scott Lesikar
MJA Coordinator: W.D. Flanigan
MJA No.: 5530.12