

SSCL-SR-1084

Project No. 87-888-0012

February 1990

GR-25

**Data Report for  
Structure Study Zone SF 8.6,  
Corehole SF 8.6 and  
Rotary Wash Boring SF 8.1**

**Prepared by: The Earth Technology  
Corporation  
Long Beach, California**

**Prepared for: RTK a joint venture  
Oakland, California**

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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 (the present phase)
- Global data (planned)
- Structure-specific data (planned).

The primary purpose of the present footprint location phase is to quickly assess whether individual components of the collider footprint, or the entire footprint, need to be relocated because of geotechnical constraints. Accordingly, the following areas have been assessed:

- Areas on the western side of the footprint where the geologic structure brings the Eagle Ford Shale close to the depth of the tunnel and experimental halls, thus presenting potential constraints due to weak, deformable rock.
- Areas where the tunnel placement is shallow and/or there are nearby sources of vibration such as major highways and railroads that may represent a problem due to unacceptable vibrations at tunnel depth.
- Zones of potentially poor rock quality and high water inflow in the rock that should be avoided for the experimental hall excavations.

This is one in a series of data reports prepared for the footprint phase of geotechnical characterization at the SSC site. Each data report includes the results of both field and laboratory tests for a specific drilling and sampling site. Interpretations of these data will be covered in topical reports, including three planned reports, as follows:

- Train-, traffic-, and quarry-caused vibrations
- Geomechanical properties of the Eagle Ford Shale
- Structure and stratigraphy of the near-cluster.

Future planned program phases--global and structure-specific data collection--will concentrate on (1) evaluating ring areas where few geotechnical data are currently available and (2) conducting more detailed studies at the sites of the injector and experimental halls.

# DATA REPORT

**Site Designator: SF8.1 and SF8.6**

**Objective:** To determine the existence and constrain the locations of faults based on geologic mapping and stratigraphic correlations between borings (determined from wire-line logs).

**Hole No. SF8.1**

**Location: North 206,750 feet**

**East 2,216,280 feet**

**Surface Elevation 475.5 feet**

SF8.1 is located on the south end of the proposed tunnel alignment, about 0.8 miles east of State Route 55.

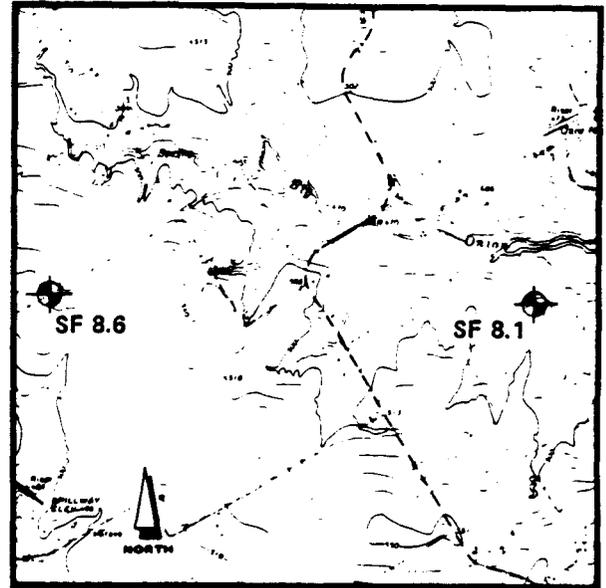
**Hole No. SF8.6**

**Location: North 206,944 feet**

**East 2,206,678 feet**

**Surface Elevation 533.5 feet**

SF8.6 is located on the south end of the proposed tunnel alignment, about 1 mile west of State Route 55.



SCALE 1:48,000

2000 0 2000 4000 6000 Feet

CONTOUR INTERVAL 10 FEET

## Scope and Schedule: Geologic Mapping

**SF8.1: Rotary Wash Drilling**

**Wire-line Logging**

**Plugging and Abandonment**

**SF8.6: Core Drilling**

**Wire-line Logging**

**Plugging and Abandonment**

June 27, 1989

October 2, 1989

October 2, 1989

October 3, 1989

September 28 to 29, 1989

September 29, 1989

October 3, 1989

**Geologic Mapping:** A previously mapped fault trending N2°E crossing the southern end of the proposed ring alignment was field mapped along Onion Creek. Fracture patterns in exposed bedrock along the stream bed indicated the potential presence of a fault. No exposed bedrock in which the presence of a fault might be determined was found along a second previously mapped fault west of Highway 55 (Figure A-1, Appendix A).

**Hole No. SF8.1**

**Conditions Encountered:**

**Total Hole Depth:** 129.0  
**Soil:** 0.0 to 7.0 feet  
**Taylor Marl:** 7.0 to 72.8 feet  
**Austin Chalk:** 72.8 to 129.0 feet  
(see lithologic log, Appendix B)

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

Spontaneous Potential  
Normal Resistivity (short and long)  
Guard Resistivity  
Point Resistivity  
Natural Gamma  
Short and Long Gamma  
Compensated Density (caliper)  
Sonic Velocity

**Hole Status:** Plugged with cement grout and abandoned on October 3, 1989.  
(see plugging report, Appendix D)

**Hole No. SF8.6**

**Conditions Encountered:**

**Total Hole Depth:** 128.2  
**Soil:** 0.0 to 13.0 feet  
**Taylor Marl:** 13.0 to 74.2 feet  
**Austin Chalk:** 74.2 to 128.2 feet  
(see lithologic log, Appendix B)

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

Spontaneous Potential  
Normal Resistivity (short and long)  
Guard Resistivity  
Point Resistivity  
Natural Gamma  
Short and Long Gamma  
Compensated Density (caliper)  
Sonic Velocity (full wave)

**Hole Status:** Plugged with cement grout and abandoned on October 3, 1989.  
(see plugging report, Appendix D)

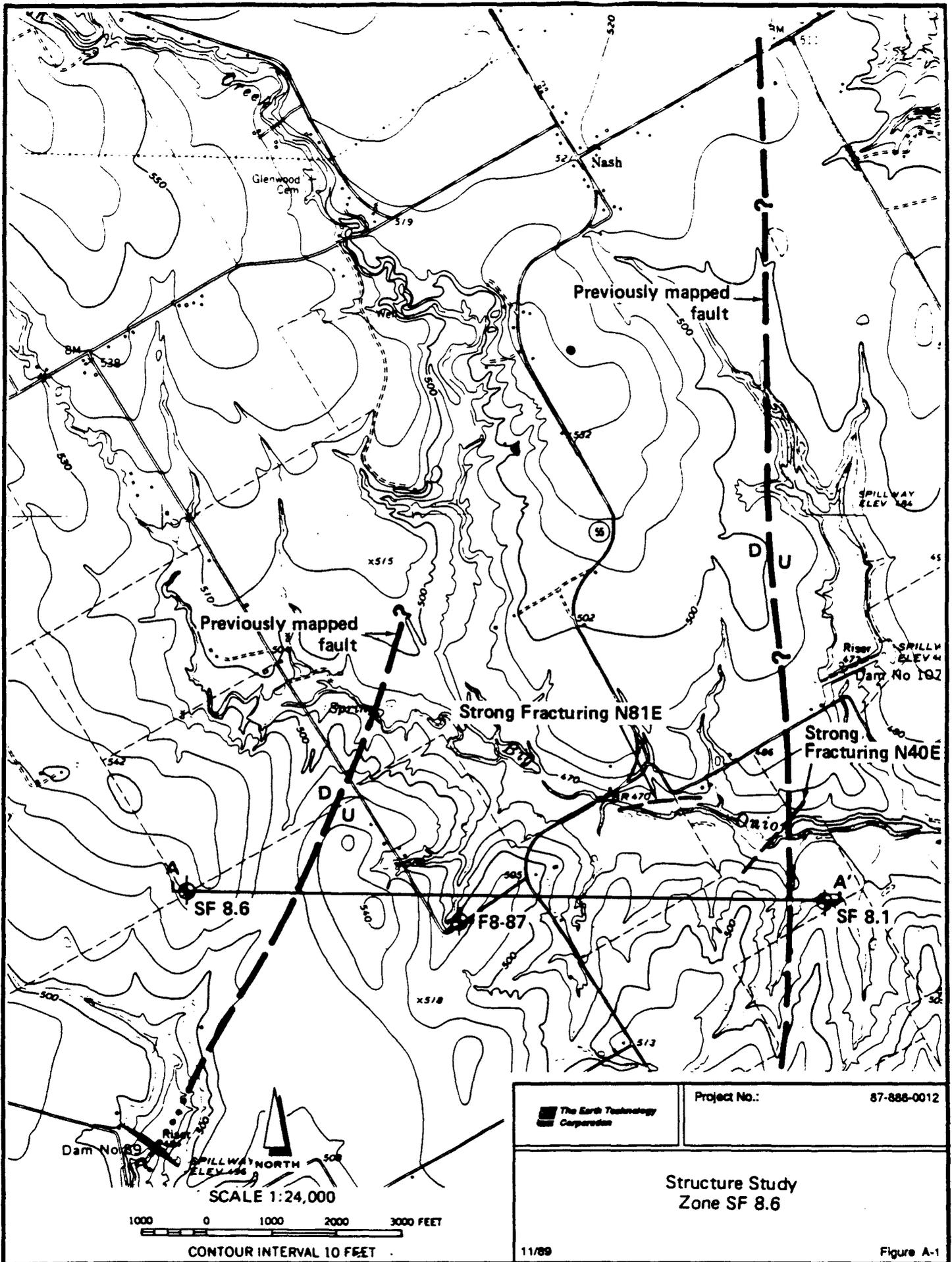
**APPENDIX A**  
**STRUCTURE ZONE MAP**

## STRUCTURE STUDY ZONE

Field mapping of the structure study zone consisted primarily of locating and measuring the bearing of calcite-filled veins and noting areas of abundant, loose calcite fragments (float). Crystalline and fibrous calcite formed in fractures are primary indicators of faulting in the SSC study area. The bearing of significant bedrock fractures was also mapped.

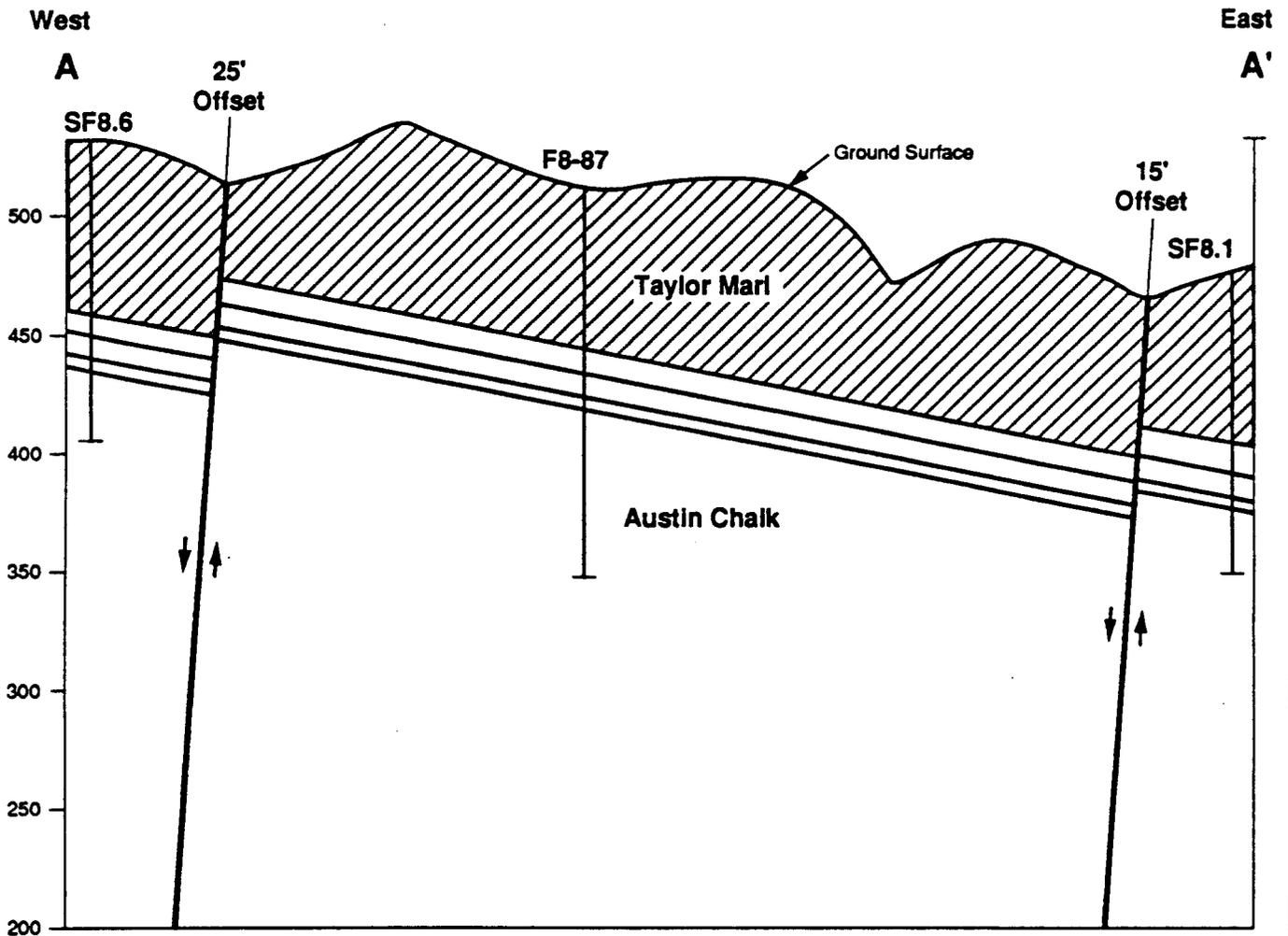
Field mapping along Onion Creek, 0.2 miles north of Borings SF8.1 and SF8.6, revealed numerous fracture zones in the drainage. Fractures along the stream bed were measured in the Taylor Marl with an average trend of N48°E and near-vertical dips along measurable planes. Although no single fault was identified, a concentration of major fractures was measured near previously mapped faults. These fractures, some arcuate, trended N42°E, 80°W. Calcite and clay along with slickensided surfaces are common in the fractures observed.

Analysis of boring logs and wire-line logs from borings SF8.1, F8-87, and SF8.6 indicates offset along two faults. Using the Taylor Marl/Austin Chalk contact as a correlatable reference, one fault between SF8.6 and F8-87 has approximately 25 feet down-to-the-west offset and a second fault, between F8-87 and SF8.1, has approximately 15 feet down-to-the-west offset (see Figure A-2).



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<p><b>Structure Study</b> <b>Zone SF 8.6</b></p>	
11/89	Figure A-1



**Notes:**

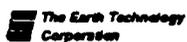
1. Divisions presented in the Austin Chalk Formation represent distinct, correlative beds and zones within the chalk as determined from the rock core and geophysical logs.
2. Assumes regional dip of approximately 1% (approximately 50 feet per mile) to the southeast.

0      50      100      150 feet

Horizontal Scale

0      1000      2000      3000 feet

Vertical Scale  
(Vertical exaggeration 20x)

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**Geologic Cross Section  
 Between Borings  
 SF8.1 and SF8.6**

**APPENDIX B**  
**LITHOLOGIC LOGS**

# LOG OF BORING

BORING NO: SF8.1 PG 1 OF 4

PROJECT: SSC - Texas Site  
 CLIENT: The Earth Technology Corporation  
 TASK NO.: 19

LOCATION: N 206,750 feet  
 E 2,216,280 feet  
 GROUND EL: 475.5 feet

DATE: 9/29/89 TYPE: Rotary Wash CASED TO: 4.0' CONTRACTOR: MJA

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE		PERCENT REC.	PERCENT ROD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	SAMPLE LEGEND	WATER INFORMATION
			TOP	BOT.					S = SPLIT SPOON T = 2" THIN WALL TUBE U = 3" THIN WALL TUBE C = NX ROCK CORE	Rotary Wash Boring Water level not determinable  1.0' stickup on casing
DESCRIPTION OF STRATUM										
	/ / / / /								CLAY, med. stiff, dk. brown	
									2.0g	
- 5	/ / / / /								CLAY, stiff, calc. nodules, lt. brown	
									7.0g	
- 10	. . . . .								SHALE (Taylor Marl), highly wea., very soft to soft, v. fine grained, sli. calc., calc. nodules, tan w/orange staining	
									11.1g	
- 15	. . . . .								SHALE (Taylor Marl), faintly wea., soft to med. hard, v. fine grained, occasional fossil. fragments, occ. iron staining, dk. gray	
- 20	. . . . .									
- 25	. . . . .									
- 30	. . . . .									
- 35	. . . . .									
- 40	. . . . .									

DRILLING GEOLOGIST H. C. Crowder ASSISTANT Ken Simmons CHECKED BY W. D. Flanigan









**LOG OF BORING**

BORING NO: SF8.6 PG 2 OF 4

PROJECT: SSC - Texas Site

LOCATION: N 206,944 feet  
E 2,206,678 feet

CLIENT: The Earth Technology Corporation

GROUND EL: 533.5 feet

TASK NO.: 19

DATE: 9/28/89 TYPE: Nx Core CASED TO: 4.0' CONTRACTOR: MJA

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE		PERCENT REC.	PERCENT ROD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	SAMPLE LEGEND	WATER INFORMATION
			TOP	BOT.					S = SPLIT SPOON T = 2" THIN WALL TUBE U = 3" THIN WALL TUBE C = NX ROCK CORE	Rotary Wash Boring Water level not available
DESCRIPTION OF STRATUM										
45		C2			83	83				SHALE (Taylor Marl), faintly wea., soft to med. hard, v. fine grained, calcareous, dk. gray w/some orange staining
										44.9 Horizontal fracture, orange stained
										46.9 82° fracture, iron stained, smooth
										48.0-49.2 82° fracture, iron stained, smooth, material filled w/iron oxide
										48.1-49.6 82° fracture, iron stained, smooth, material filled w/iron oxide
50		C3	48.0	51.0	100	100				49.6s
										SHALE (Taylor Marl), fresh, soft to med. hard, v. fine grained, calcareous, dark gray w/v. thin (1/8"-1/16") silt-size CaCO <sub>3</sub> crystal laminations
										54.7 Calcareous laminae
										57.4 Fossiliferous
										59.0 Fossiliferous
60										
										63.6 Calcareous lens
										64.6 Fossiliferous w/fossil. hash
65		C5	61.0	68.5	100	100				
										68.5 Calc. lens
70										
										71.3-74.2 Numerous thin calc. laminae
										74.2s
75										LIMESTONE (Austin Chalk), fresh, mod. hard to hard, fossiliferous, lt. gray with 0.2 to 0.4 ft. thick very argill. interbeds spaced 0.1 to 4.0 ft. apart
										75.2 Fossiliferous
										78.2g-78.6g Thin very argill. bed, dk. gray
										78.7g-78.9g Thin very argill. bed, dk. gray
80										79.1g-79.3g Thin very argill. bed, dk. gray

DRILLING GEOLOGIST H. C. Crowder ASSISTANT Ken Simmons CHECKED BY W. D. Flanigan

**LOG OF BORING**

BORING NO: SF8.6 PG 3 OF 4

PROJECT: SSC - Texas Site  
 CLIENT: The Earth Technology Corporation  
 TASK NO.: 19

LOCATION: N 206,944 feet  
 E 2,206,678 feet  
 GROUND EL: 533.5 feet

DATE: 9/29/89 TYPE: Nx Core CASED TO: 4.0' CONTRACTOR: MJA

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE		PERCENT REC.	PERCENT ROD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	SAMPLE LEGEND	WATER INFORMATION
			TOP	BOT.					S = SPLIT SPOON T = 2" THIN WALL TUBE U = 3" THIN WALL TUBE C = NX ROCK CORE	Rotary Wash Boring Water level not available
DESCRIPTION OF STRATUM										
85		C7		88.5	100	100				80.2g-80.6g Thin mod. argill. bed, med. gray 81.8g-82.1g Thin mod. argill. bed, med. gray 81.9g-84.6g Med. thick fossiliferous bed 82.5g-83.6g Med. thick very argill. bed, dk. gray 84.5g-85.3g Thin mod. argill. bed, med. gray 86.5g-87.6g Med. thick very argill. bed, dk. gray LIMESTONE (Austin Chalk), fresh, mod. hard to hard, fossiliferous, sli. argill, lt. gray with 0.1 to 0.8 ft. thick mod. argill. to shaly interbeds 0.4 to 4.5 ft. apart 88.7g-90.0g Med. thick mod. to v. argill. bed, dk. gray
90		C8	88.5		100	100				92.0g-93.8g Med. thick mod. to v. argill. bed, dk. gray
95				98.5						98.3g-98.7s Thin, soft, shaly bed, dk. gray 99.8g-100.2g Thin very argill. bed, dk. gray
100		C9	98.5		100	100				100.9g-101.3g Thin, soft, shaly bed, dk. gray 102.4g-102.5g Very thin very argill. bed, dk. gray
105				108.5						106.4g-106.6g Thin mod. argill. bed, med. gray 108.8s-109.2g Thin, soft, shaly bed, dk. gray
110		C10	108.5		100	100				111.6g-111.8g Thin, soft, shaly bed, dk. gray 114.5g-115.0g Thin mod. argill. bed, med. gray
115				118.5						116.4g-116.7g Thin mod. to very argill. bed, dk. gray
120		C11	118.5							119.1g-119.3g Thin, soft, shaly bed, dk. gray 119.7g-119.9g Thin very argill. bed, dk. gray

DRILLING GEOLOGIST H. C. Crowder ASSISTANT Ken Simmons CHECKED BY W. D. Flanigan

LOG OF BORING										BORING NO: SF8.6 PG 4 OF 4	
PROJECT: SSC - Texas Site										LOCATION: N 206,944 feet	
CLIENT: The Earth Technology Corporation										E 2,206,678 feet	
TASK NO.: 19										GROUND EL: 533.5 feet	
DATE: 9/29/89			TYPE: Nx Core			CASED TO: 4.0'		CONTRACTOR: MJA			
DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE		PERCENT REC.	PERCENT ROD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	SAMPLE LEGEND	WATER INFORMATION	
			TOP	BOT.					S = SPLIT SPOON T = 2" THIN WALL TUBE U = 3" THIN WALL TUBE C = NX ROCK CORE	Rotary Wash Boring Water level not available	
									DESCRIPTION OF STRATUM		
-125		E1		128.2	100	100			LIMESTONE (Austin Chalk), fresh, mod. hard to hard, fossiliferous, sli. argill. with 0.1 to 1.5 ft. thick v. argill. to shaly and chalky interbeds 0.2 to 3.6 ft. apart 123.5g-123.6g Very thin very argill. bed, dk. gray 124.0g-124.8g Thin, soft, shaly bed, dk. gray 125.0g-126.5g Med. thick chalky bed, very lt. gray 126.7g-126.9g Thin, soft shaly bed, dk. gray		
-130									Total Depth: 128.2' 9/29/89 (1) Wireline Logged 9/29/89 (2) Boring Plugged 9/30/89  Log Revised 1/23/90		
-135											
-140											
-145											
-150											
-155											
-160											

DRILLING GEOLOGIST H. C. Crowder ASSISTANT Ken Simmons CHECKED BY W. D. Flanigan

**APPENDIX C**  
**WIRE-LINE LOGS**

# WIRE-LINE LOGGING PARAMETERS

Hole No. SF8.1

Log Measured From: Ground level

## Drilling Parameters

Depth 129.0 feet  
Bit Diameter 3.125 inches

## Logging Parameters

## Electrical Log

## Gamma Log

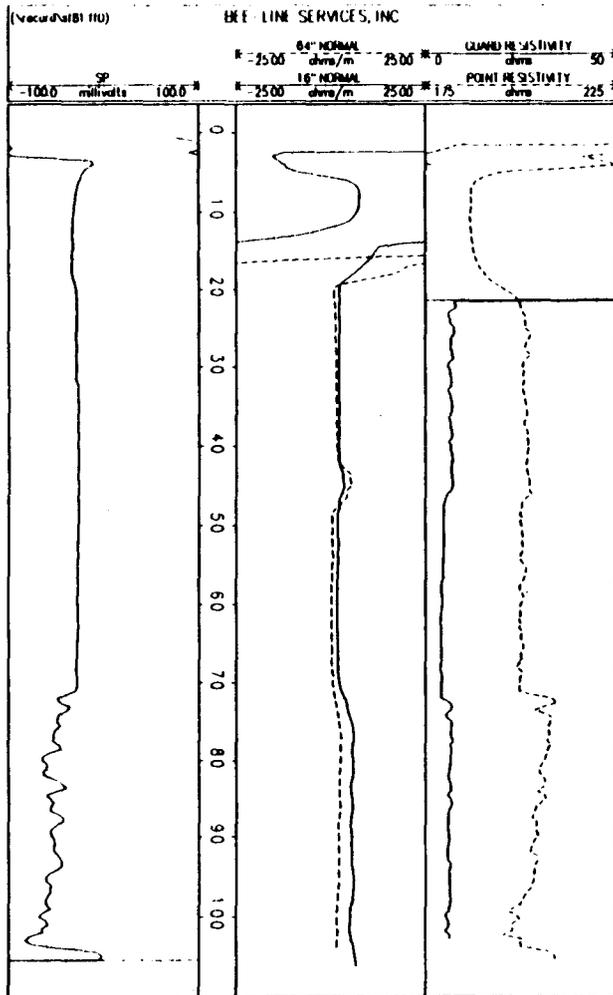
## Sonic Log

Date	October 2, 1989	October 2, 1989	October 2, 1989
Bottom Log Interval	108.5 feet	108.5 feet	105 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling mud	drilling mud	drilling mud
Time Since Circulation Stop	Unknown	Unknown	Unknown
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.
Sample Interval	0.5 feet	0.5 feet	0.5 feet

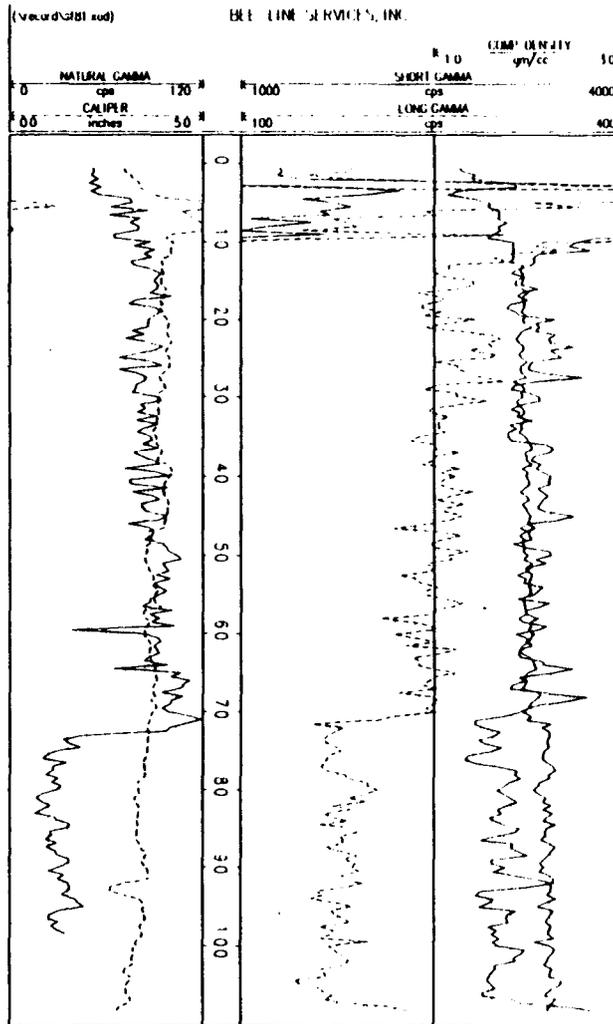
Logged by: BEE-LINE SERVICES, INC.  
P.O. Box 2096  
Corsicana, TX 75151

SF 8.1. Wire-line log run October 2, 1989. Surface elevation 475.5 feet.

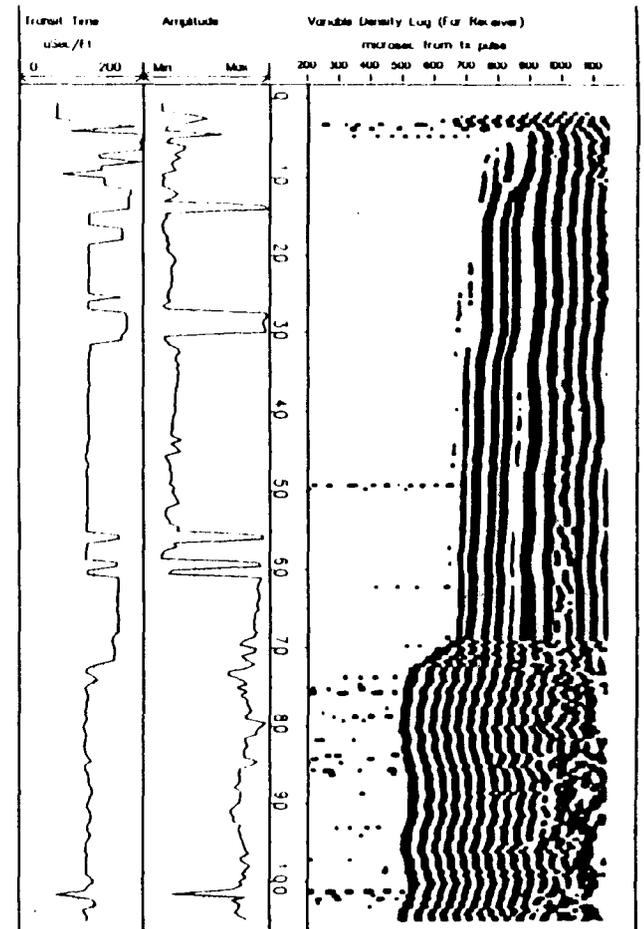
### ELECTRICAL LOG



### GAMMA LOG



### SONIC LOG



# WIRE-LINE LOGGING PARAMETERS

Hole No. SF8.6

Log Measured From: Ground level

## Drilling Parameters

Depth 128.2 feet  
Bit Diameter 3.125 inches

## Logging Parameters

## Electrical Log

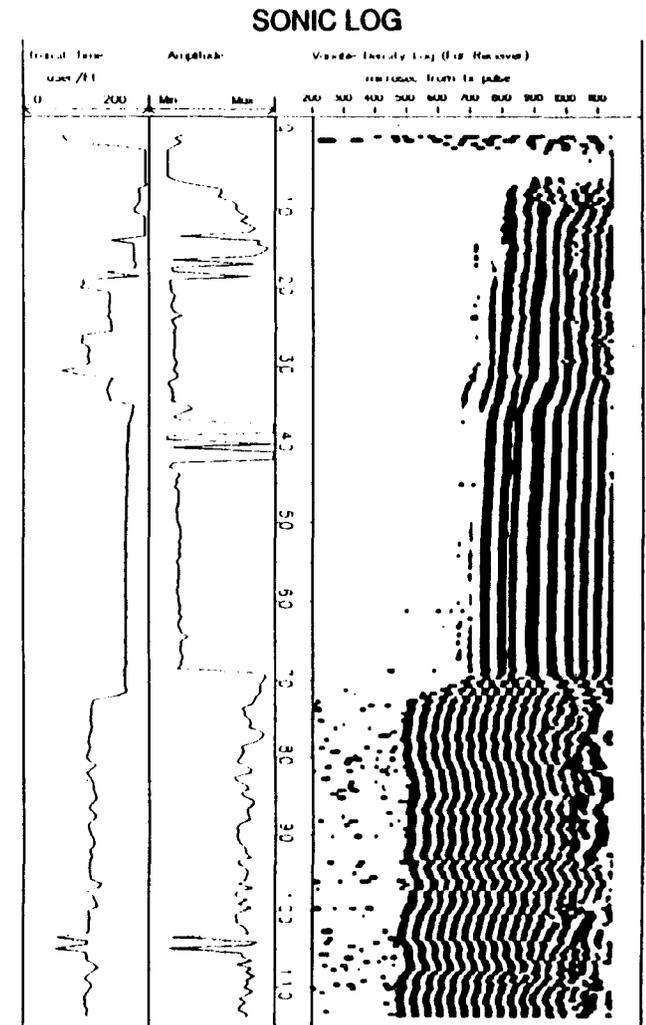
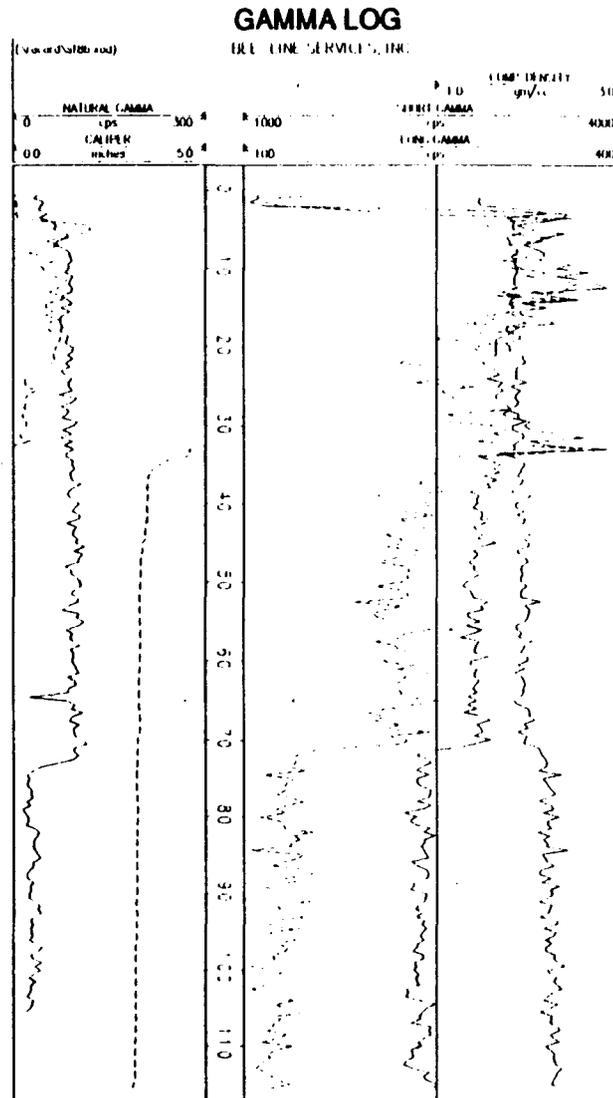
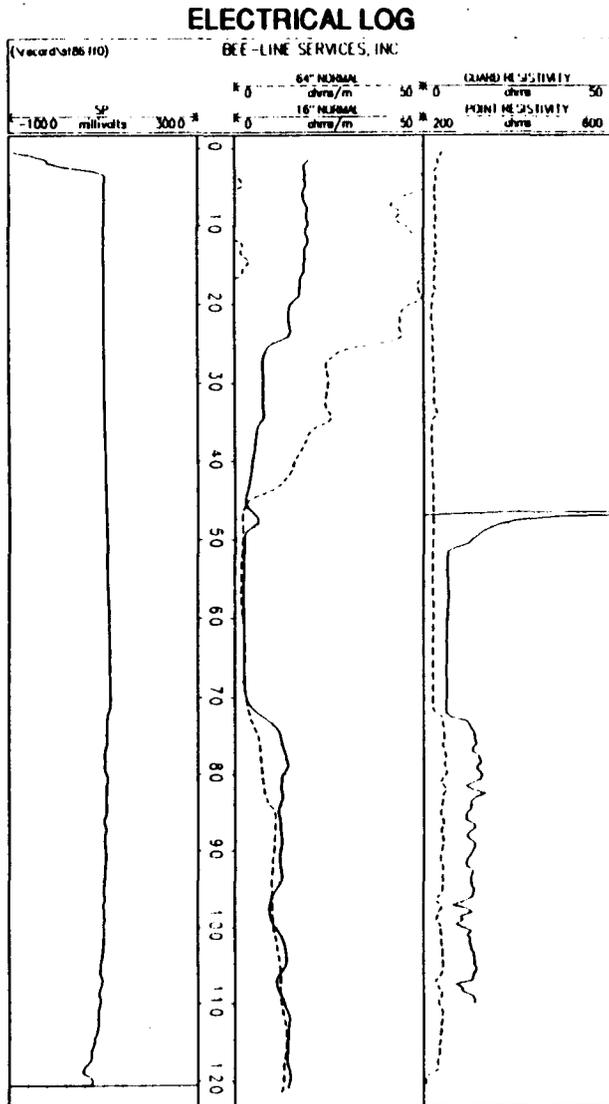
## Gamma Log

## Sonic Log

Date	September 29, 1989	September 29, 1989	September 29, 1989
Bottom Log Interval	121.5 feet	115.5 feet	113.9 feet
Top Log Interval	surface	surface	surface
Type of Fluid in Hole	drilling mud	drilling mud	drilling mud
Time Since Circulation Stop	2 hours	2 hours	2 hours
Probe Type/S.N.	ALP-4979	XAP-4383	CLP-4877A
Module Type/S.N.	ALM-4979	XAM-4383	CLM-4877A
Logging Speed	40 feet/min.	20 feet/min.	20 feet/min.
Sample Interval	0.5 feet	0.5 feet	0.5 feet

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

SF 8.6 Wire-line logs run September 29, 1989. Surface elevation 533.5 feet.



**APPENDIX D**  
**PLUGGING REPORTS**

## SSC BOREHOLE PLUGGING REPORT

TETC Project No. 87-888-0019

Task No. 19

Boring No. SF8.1

Texas Coordinate Location: N 206,750 feet E 2,216,280 feet

Surface Elevation: 475.5 feet

Total Boring Depth: 129.0 feet

Plugging Remarks:

Grout was mixed @ a ratio of 9 gallons of water per sack of cement and 5 pounds of powdered bentonite per sack of cement. Grout was placed through a PVC pipe tremie that was set one foot off the bottom of the hole. Grout was held down 4 feet and remainder of hole was filled with a mix of powdered bentonite and clay. All surface casing was removed from the borehole.

Date Plugged: 10-3-89

Time Completed: 9:00 am

Drilling Geologist: Herbert C. Crowder

MJA Coordinator: W. D. Flanigan

MJA No.: 5530.19

## SSC BOREHOLE PLUGGING REPORT

TETC Project No. 87-888-0019

Task No. 19

Boring No. SF8.6

Texas Coordinate Location: N 206,944 feet E 2,206,678 feet

Surface Elevation: 533.5 feet

Total Boring Depth: 128.2 feet

Plugging Remarks:

Grout was mixed at a ratio of 9 gallons water per sack of cement and 5 pounds of powdered bentonite per sack of cement. Grout was placed through a PVC tremie pipe that was set one foot off the bottom of the boring. Grout was held down 1.5 feet from the surface. Boring was topped off with a mixture of powdered bentonite and soil. All surface casing was removed from the borehole.

Date Plugged: 10-3-89

Time Completed: 11:00 am

Drilling Geologist: Herbert C. Crowder

MJA Coordinator: W. D. Flanigan

MJA No.: 5530.19