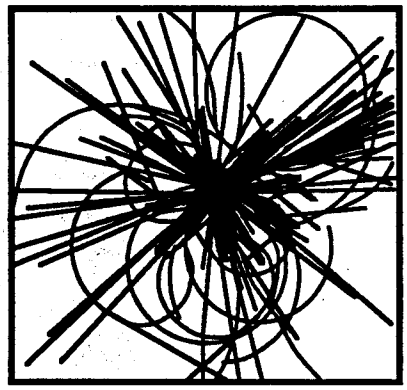
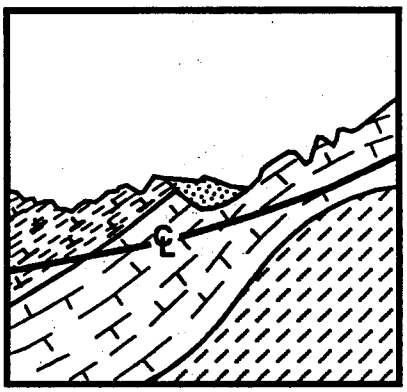
SSCL-SR-1121

SSCL-SR-1121
Project No. 87-888-0017
SSC Report No. GR-62
August 1990

Thickness of Chambers Creek Terrace Near Lumkins, Texas





Prepared by: The Earth Technology Corporation
Long Beach, California

Prepared for: RTK a joint venture
Oakland, California

FOREWORD

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

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

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

- Footprint location data (completed)
- Structure-specific data (completed)
- Global data (completed).

This is one in a series of data reports prepared for the global data phase of geotechnical characterization at the SSC site. This study investigated the thickness of Chambers Creek Terrace near Lumkins along the southern ring perimeter. Data collection focused on geological surface mapping, geophysical refraction profiling, and drillhole data.

CHAMBERS CREEK TERRACE

Site Designator: GTE, B1065, B1066

Objective: Determine the thickness of Chambers Creek Terrace deposits and the elevation of competent Austin Chalk along the southern beam alignment near Lumkins.

Location: GTE extends along the main ring alignment from Interstate 35E on the west to shaft E9 on the east. Table 1 lists the activity positions and Figure 1 shows their locations.

TABLE 1. ACTIVITY COORDINATES

Activity	Ring Station (feet)	Coordinates North (feet)	Coordinates East feet)	Elevation (feet)
Refraction sounding GTE 9A	1015+00	208,092	2,199,692	513
Refraction profile GTE 1-GTE 11	1060+50-1095+00	210,030 to 211,975	2,195,700 2,192,903	517 521
Boring B1065	1065+00	210,286	2,195,382	514
Boring B1066	1067+00	210,420	2,195,170	507

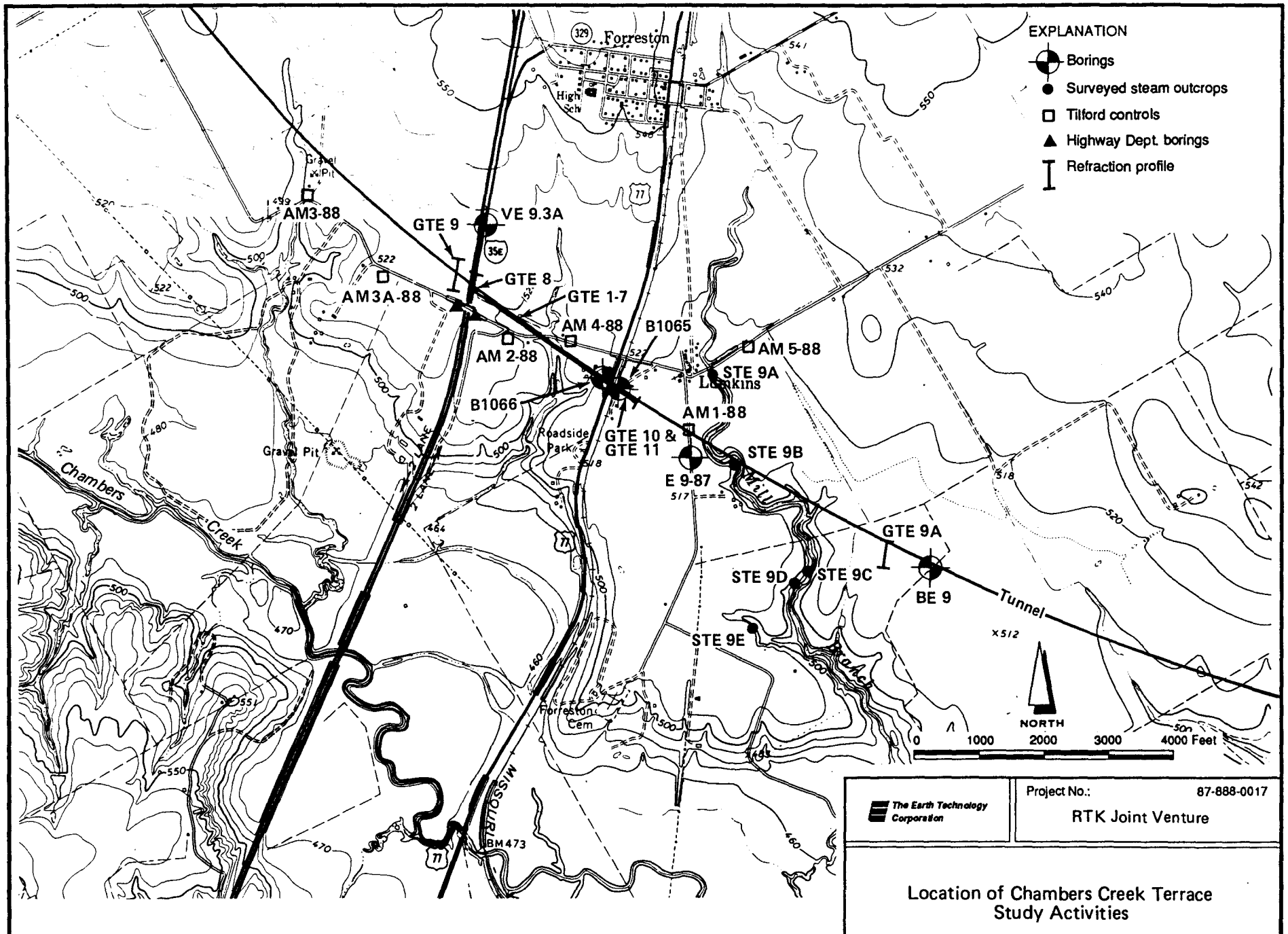
Scope and Schedule:

Geological Mapping (Appendix A) March 8 to 10, 1990
Refraction Sounding, GTE 9A (Appendix B) March 12, 1990
Refraction Profiling, GTE 1-GTE 11 (Appendix B) April 17 to May 4, 1990
Rotary Wash Borings, B1065 and B1066 (Appendix C) July 2, 1990
Boring Plugging (Appendix D) July 2, 1990

Results: Terrace deposits are composed of interbedded silt, sand, and gravel layers that are moderately thick. Gravels consist of primarily chalk, 0.25 to 0.5 inch in diameter, with quartzite and volcanic rock clasts. The matrix is dark brown to dark reddish brown silty sand and clay. Soils developed on the terraces are typically coarser-grained than soils developed on chalk and consist of mixtures of sands, silts, and clay.

Terrace deposits were mapped to assess the likely three-dimensional form of the terrace base. Elevation data on the top of Austin Chalk beneath the terrace deposits were compiled from existing borings in the area. Stream outcrops also provided valuable data on the top of chalk elevations. The base of terrace deposits as identified from prior borings extends from 505 to 466 feet in elevation. The lower elevations are generally closer to modern Chambers Creek. However, there appear to be several localized elevation lows that may mark tributaries or old meanders.

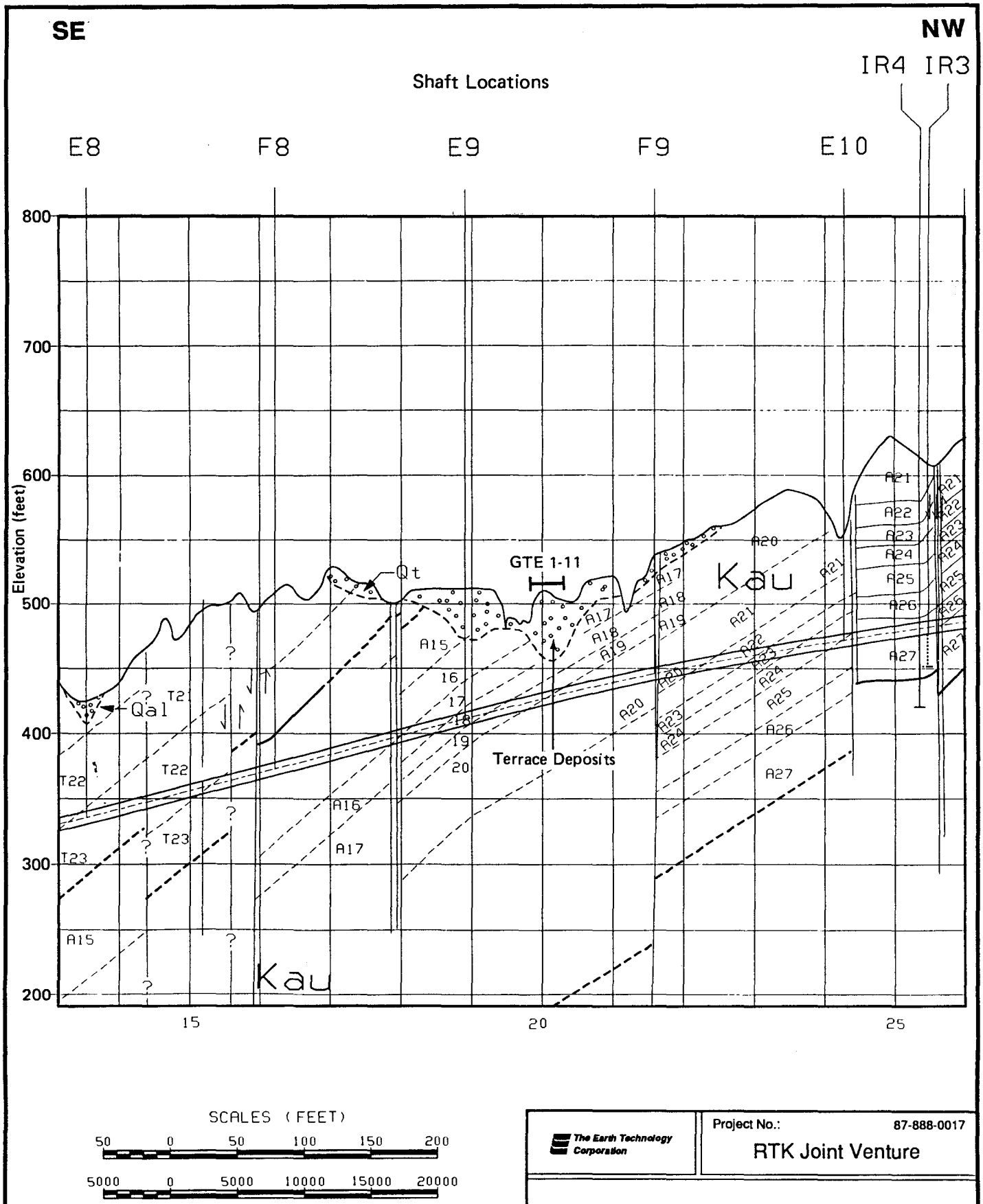
Austin Chalk elevations were interpreted beneath 12 refraction spreads (shown in Figure 1). Geological correlation of the velocity zones was made with results of previous refraction and drilling by Tilford (1988) and a downhole velocity profile in nearby boring VE-9.3A (Earth Technology, 1989). The refraction profiles indicated 5 to 35 feet of unsaturated terrace deposits overlying 5 to 80 feet of



Reference: Base maps are USGS Italy and Avalon 7.5 minute quadrangle topography maps. Scale 1:24,000

saturated deposits or weathered chalk, overlying competent chalk.

Two new drill holes were completed at locations where the top of chalk was interpreted from the refraction data to be the lowest elevation. The lowest chalk elevation is 458 feet at boring B 1065 (survey location 1065 +00), near Route 77. Terrace deposits along the ring alignment are shown in Figure 2, an enlarged section of drawing TP-18. Figure 3 shows top of chalk elevations at the activity locations.



Reference: Geologic section from RTK drawing TP-18 BW, dated 7/17/89, revision 6, 7/17/90, scale 1:24,000.

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Project No.: 87-888-0017

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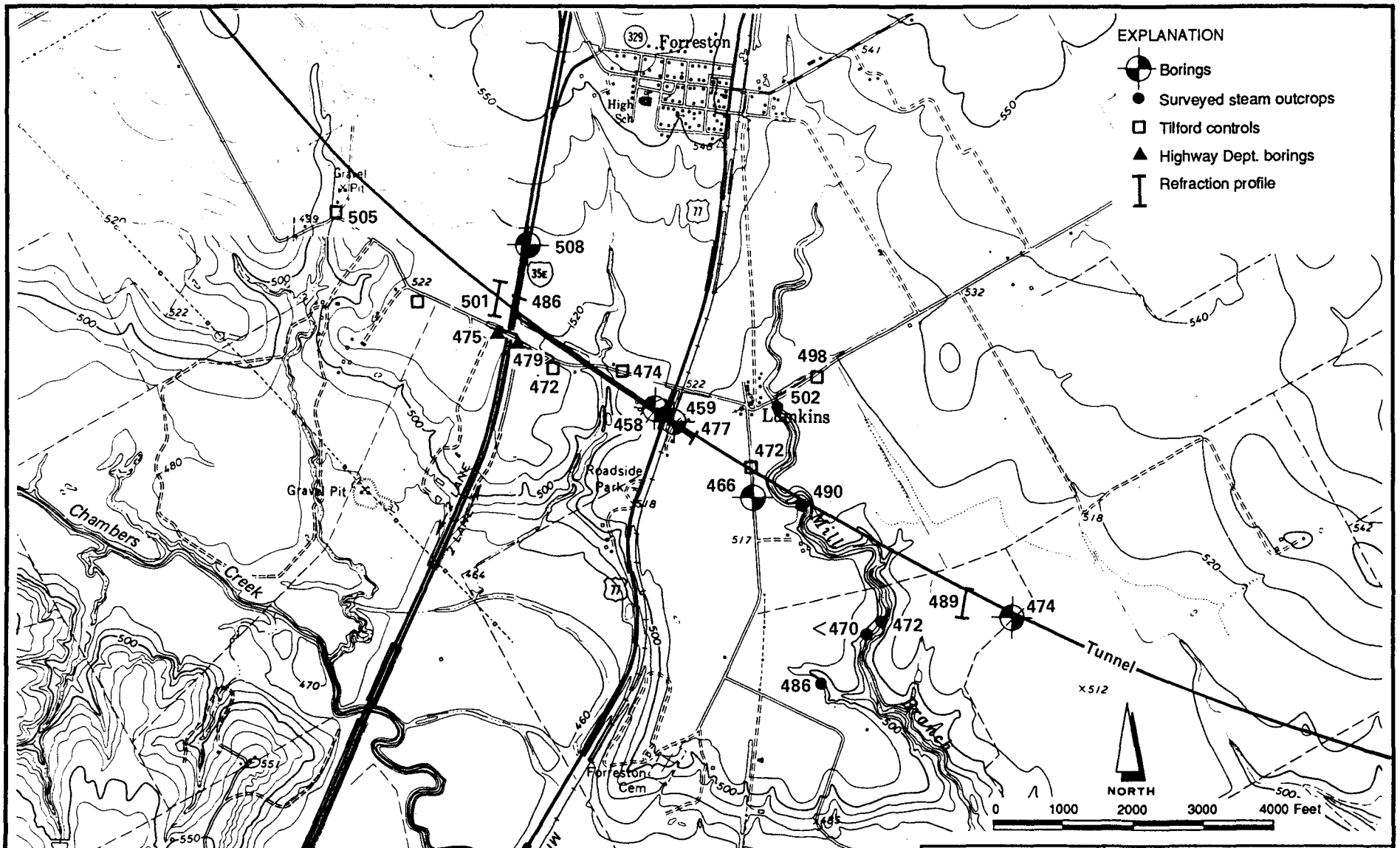
Geologic Section of Tunnel Profile
Chambers Creek Terrace

7/90

Figure 2



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Project No.: 87-888-0017

RTK Joint Venture

Top of Austin Chalk Elevations
Chambers Creek Terrace

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Figure 3

Reference: Base maps are USGS Italy and Avalon 7.5 minute quadrangle topography maps. Scale 1:24,000

REFERENCES:

ABEM, 1985. TERRALOC Mark 3 Operation's Manual, Bromma, Sweden.

Earth Technology, 1989. Measurement and Analysis of Underground Vibrations at the SSC Site, GR-4, Long Beach, CA.

Earth Technology, 1990. Data Report for Boring BE-9, GR-42, Long Beach, CA.

Mooney, H., 1984. Handbook Of Engineering Geophysics, Vol. 1, Bison Instruments, Minneapolis, MN.

Palmer, D., 1980. The Generalized Reciprocal Method of Seismic Refraction Interpretation, Society of Exploration Geophysicists, Tulsa, OK.

Redpath, B., 1973. Seismic Refraction Exploration for Engineering Site Investigations, National Technical Information Service, Springfield, VA.

Tilford, N., 1988. Geological and Geophysical Investigations of the Quaternary Alluvium Near Forreston, Texas, Texas A&M University, Bryon, TX.

APPENDIX A

GEOLOGICAL DATA

APPENDIX A

GEOLOGICAL DATA

Terrace deposits and cut terrace surfaces dominate the surface geology in the area between boring BE 9 and Interstate Highway 35E, north of Chambers Creek. Three features are of particular interest:

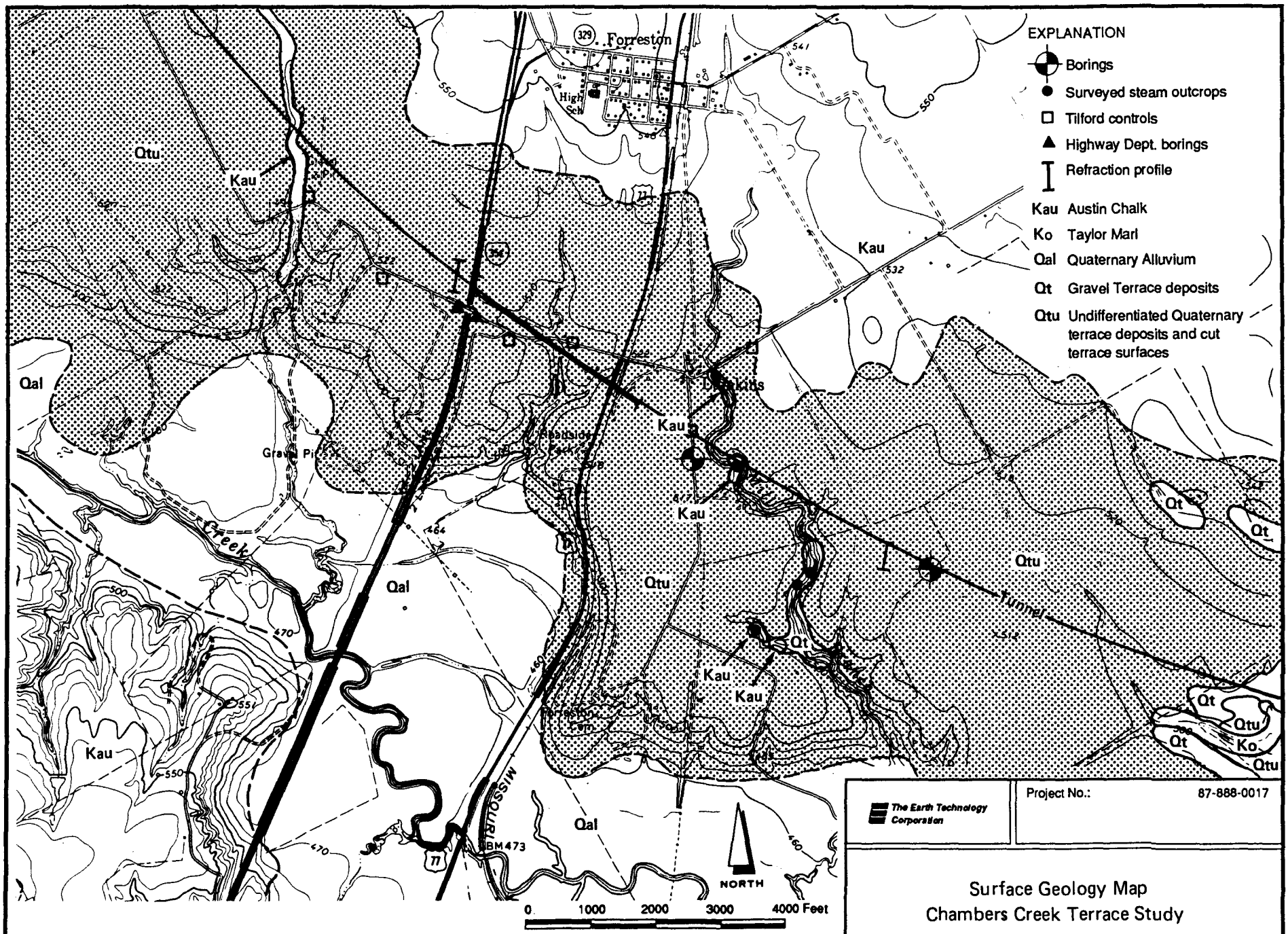
1. Patches of ochre-colored fine sand to fine gravel were noted at several locations and elevations. These appear to be remnants of terrace deposits (Qt) at at least two elevations on the northern flank of paleo-Chambers Creek (see map).

2. Over much of the terrace topography, the surface is made of very fine-grained material. This is partially fine-grained terrace deposits and partially cut-terrace surfaces cut into Taylor Marl. It is mapped as Qtu (see map).

3. Top-of-bedrock, beneath the terrace deposits, was located in several incised drainages extending north from present Chambers Creek.

Figure 1 shows the locations of existing borings in the study area and chalk outcrops in streams. Table A-1 lists these activity locations and chalk elevations.

Figure A-1 is based on the above understanding of terrace development in this area, and illustrates the terrace deposits perimeter based on mapped outcrops and 1:24,000-scale topographic map control. It appears that the deepest part of paleo-Chambers Creek in this area is about 2,000 feet south of the ring alignment. The lowest top of rock elevation noted is about 470 feet.



The Earth Technology Corporation

Project No.: 87-888-0017

Surface Geology Map
Chambers Creek Terrace Study

Reference: Base maps are USGS Italy and Avalon 7.5 minute quadrangle topography maps. Scale 1:24,000

7/90

Figure A-1

TABLE A-1

TOP OF CHALK ELEVATIONS

Location I.D.	Reference	Northing (feet)	Easting (feet)	Surface Elevation (feet)	Chalk Elevation (feet)
Existing Borings:					
AMI-88*	Tilford	209,950	2,196,540	524	472
AM2-88*	Tilford	211,030	2,193,710	523	472
AM3-88*	Tilford	213,170	2,190,640	523	505
AM3A-88*	Tilford	211,960	2,191,740	523	–
AM4-88*	Tilford	211,010	2,194,680	510	474
AM5-88*	Tilford	210,960	2,197,530	520	489
E9-87*	Proposal	209,100	2,196,580	517	466
#1*	Highway Dept	211,410	2,192,900	522	475
#2*	Highway Dept	211,320	2,193,100	522	479
VE-9.3A	Earth Technology - GR-4	212,767	2,193,347	527	502
BE9	Earth Technology - GR-42	207,540	2,200,560	512	474
New Borings:					
B1065	Earth Technology	210,286	2,195,882	514	459
B1066	Earth Technology	210,420	2,195,170	507	458
Stream Outcrops:					
STE9A	Earth Technology	210,536	2,196,977	502	502
STE9B	Earth Technology	209,212	2,197,127	490	490
STE9C	Earth Technology	206,890	2,198,296	472	472
STE9D	Earth Technology	206,789	2,198,380	469	<470
STE9E	Earth Technology	206,499	2,198,060	486	486

Note: Coordinates are in Texas State Plane coordinate system.

* Positional coordinates estimated.

APPENDIX B

REFRACTION SURVEY

INTRODUCTION:

A refraction survey was designed to estimate the thickness of terrace deposits along the southern ring alignment near Lumkins. These deposits have accumulated in the channel eroded into Austin Chalk by the ancestral Chambers Creek. The maximum deposit thickness measured in prior borings is about 50 feet.

The refraction method can indirectly measure layer thickness when each layer in the section has a higher seismic velocity than the overlying one. The interface between the terrace deposits (low-velocity material) and the underlying Austin Chalk (high-velocity material) can be mapped by this technique.

LOCATION:

The survey consisted of 12 refraction spreads as shown in Figure 1. Spread GTE9A was oriented north-northeast, which is approximately perpendicular to the estimated creek axis. This test sounding showed that refraction could detect the chalk topography and established the measurement parameters used during the rest of the survey. The landowner refused permission to access other potential spread locations in the vicinity of GTE9A.

The other 11 spreads were located west of GTE9A. Spreads GTE 1 through GTE 7 were spaced end-to-end approximately parallel with the creek axis, from Route 77 (southeast) to Interstate 35E (northwest). Spreads GTE 8 and GTE 9 were oriented north-south and located on the Interstate 35E median and west shoulder, respectively. Spreads GTE 10 and GTE 11 were completed later to provide additional data surrounding Route 77. Spread GTE 10 is collinear with the western portion of Spread GTE 1 and Spread GTE 11 overlays the eastern part of Spread GTE 2.

Refraction spreads were positioned on the ring alignment. Ring alignment in the study area was defined by stakes placed at 250-foot intervals by Kimley-Horn surveyors. The coordinates of these stakes are shown in Table B-1 and their positions are shown on the interpreted cross sections. Geophone locations were chained between these reference stakes and marked with small wooden stakes. Relative elevations of geophone positions were measured and adjusted to the Kimley-Horn stakes.

PROCEDURES:

Seismic energy was generated by detonating shotgun shells (12 gauge) buried about 2 feet deep. Seismic waveforms were recorded with the ABEM TERRALOC Mark 3 system. This system can measure, document, store, and process seismic waveforms. Especially useful for this survey was the instrument's ability to stack waveforms produced from multiple detonations at a shot point. Usually three to six individual events were stacked together to produce a finished data record. The raw data were processed to increase the amplitude of the first arriving wave, thus making the first break clearer and easier to identify. No filtering was performed during data acquisition or processing. ABEM (1985) describes the instrument's capabilities.

Each spread consisted of 24 geophones spaced at 20-foot intervals along a line. This small interval was necessary to adequately measure the overburden materials' velocities. Adjacent spreads had a two-geophone overlap to improve edge-matching of the interpreted velocity zones between spreads. Seismic waves were generated successively at shot points located at geophones 1, 12, and 24. Shot points were also located at positions offset 100 feet from spread ends to extend the lateral coverage of the top of Austin Chalk.

Data were recorded on March 12, 1990 for Spread GTE9A; between April 17 and 23 for spreads GTE1 through GTE9; and on May 3 and 4 for spreads GTE10 and GTE11. Data were collected using the measuring procedures described by Radpath (1973) and Mooney (1984). Data were continuously monitored and processed nightly during acquisition to ensure good data quality.

TABLE B-1

ELEVATION OF TOP OF COMPETENT AUSTIN CHALK ALONG THE TUNNEL ALIGNMENT

Refraction Spread	Tunnel Station	Surface Elevation (feet)	Top of Competent Chalk Elevation (feet)
GTE9A	center	513	489
GTE1	1062+50	517.3	477
GTE1&10	1065+00	514.1	464
GTE2&11	1067+50	507.0	460
GTE2	1070+00	514.6	477
GTE3	1072+50	507.9	483
GTE4	1075+00	499.7	479
GTE4	1077+50	505.8	484
GTE5	1080+00	514.4	472
GTE5	1082+50	514.6	482
GTE6	1085+00	516.8	466
GTE6	1087+50	518.7	473
GTE7	1090+00	517.5	486
GTE8(near)	1092+50	520.2	486
GTE9	1095+00	521.2	501

Quantitative interpretation followed the procedures by Palmer (1980). The Generalized Reciprocal method is especially suited for mapping undulating rock. These individual results were compared and the following average velocity zones established.

Zone No.	Velocity Range (ft/sec)	Thickness Range (ft)	Possible Geologic Material
1	1000-1500	5-20	Dry unconsolidated alluvium
2	2100-2800	0-15	Dry terrace deposits
3	5000-6100	10-45	Saturated terrace deposits and/or weathered Austin Chalk
4	8300-9600	–	Fresh Austin Chalk

Geologic correlations of the velocity zones were made with results of previous refraction surveying in the area (Tilford, 1988) and a downhole velocity profile obtained in boring VE-9.3A (Earth Technology, 1989) about 600 feet north of the Spread 8 center point.

The entire data set was reinterpreted as an entity using these generalized velocity zones. Recorded data and interpreted velocity layers are shown in Figure B1 for Spread GTE9A, Figure B2 for spreads GTE1 through GTE7 (see map pocket), Figure B3 for Spread GTE8, Figure B4 for Spread GTE9, and Figure B5 for spreads GTE10 and GTE11. The upper portion of these figures show the measured travel times from the shot points to each geophone plotted versus the shot-point-to-geophone distance. Times representing right-going waves are shown as squares and left-going waves as diamonds. These data points were grouped into line segments representing subsurface velocity zones. The inverse slope of the regression line shown through the data equals the apparent velocity of the interpreted zones (two times vertical exaggeration). Interfaces are dashed where interpolated. Nearby borings (locations shown on Figure 1 and described in Table A1) were projected onto the cross sections.

RESULTS:

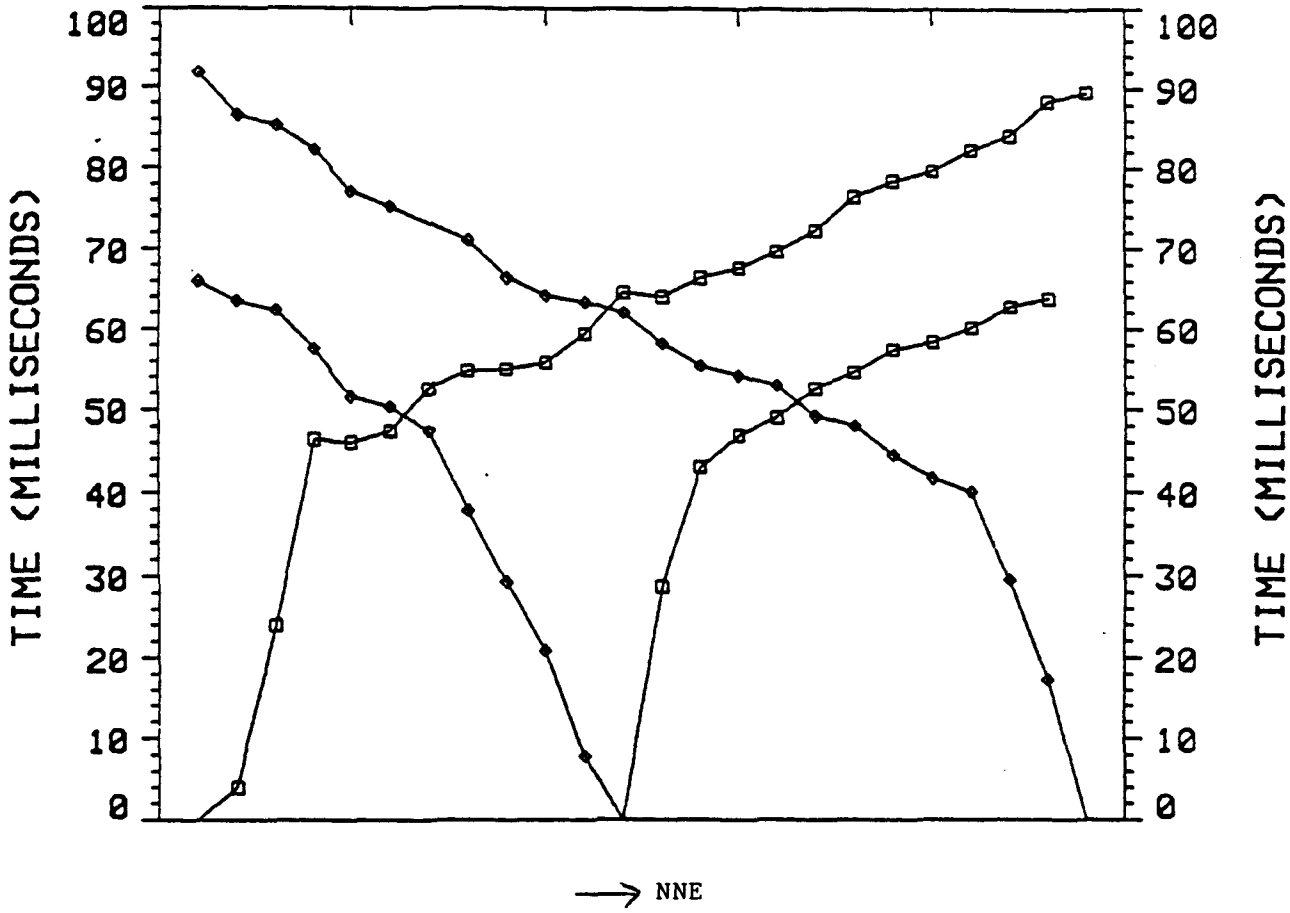
The four velocity zones are described below.

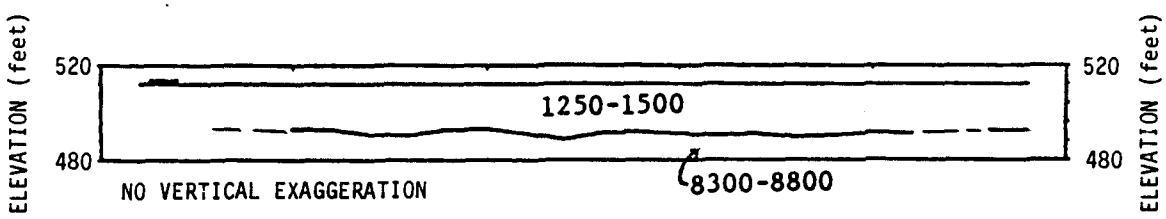
Zone 1 (1000-1500 ft/sec)
This zone is the surficial, unsaturated alluvium. Velocity is very low because this material is unconsolidated. The zone thickness is 5 to 20 feet and is roughly conformal to the topography that dips toward the creek.

Zone 2 (2100-2800 ft/sec)
This zone is probably relatively unconsolidated terrace deposits. The low velocity indicates that this material is unsaturated. The zone's thickness is highly variable. It is about 15 feet thick near Interstate 35E and gradually thins to the east until it pinches out about 220 feet north of the alignment along the Interstate 35E median. Farther west, along the Interstate shoulder, there is no evidence of this zone.

Zone 3 (5000-6100 ft/sec)
This zone is thought to represent, at least in part, the same terrace deposits defined by Zone 2, except that they are saturated. In unconsolidated material, the compressional wave velocity abruptly increases to 5,000 to 5,800 ft/sec when the material becomes saturated. The thickness of this zone is highly variable, ranging from 10 to 45 feet. Weathered Austin Chalk has a velocity of 4,900 ft/sec as measured in boring VE-9.3A. The top of weathered chalk could not be differentiated from saturated terrace deposits because their representative velocities are too similar. A thin layer of weathering is expected above the fresh chalk.

Zone 4 (8300-9600 ft/sec)
This high-velocity zone should represent fresh Austin Chalk. The chalk topography is very irregular. Chalk elevations are shown in Table B-1. The top of chalk is at the lowest elevation at survey marker 1067+00 (elevation 460 feet) and is also deep at 1063+00, 1076+50, and 1085+00. The top of the chalk dips slightly south and becomes very shallow (less than 20 feet deep) west of Interstate 35E.





EXPLANATION

1250-1500 ALLUVIUM/TERRACE DEPOSITS
8300-8800 FRESH AUSTIN CHALK

SEISMIC VELOCITIES IN FEET/SECOND

The Earth Technology Corporation

PROJECT NO.: 87-888-0017

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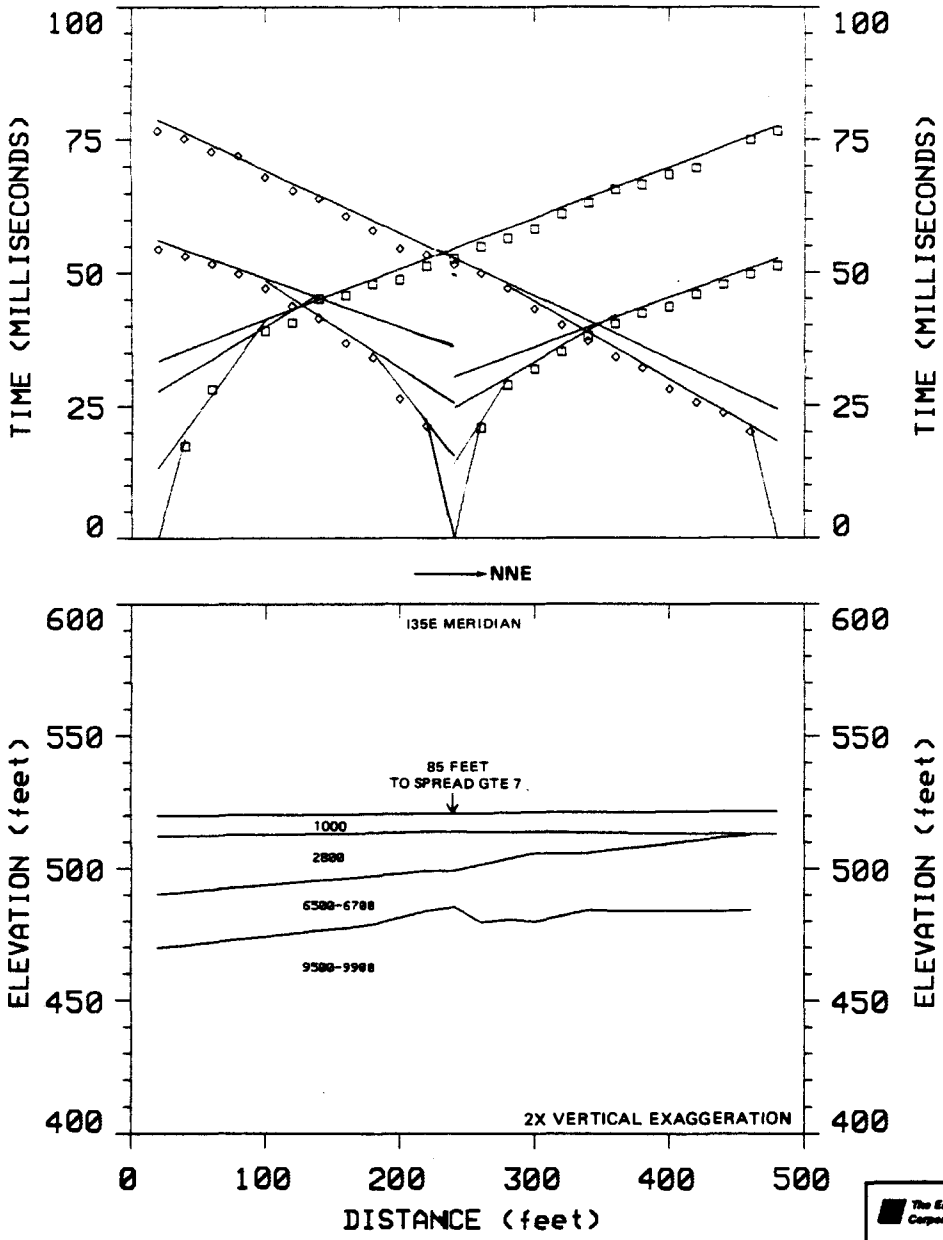
Refraction Spread GTE 9A
Data and Interpreted Velocity Profile
Chambers Creek Terrace

7/90

Figure B-1

FIGURE B2
(see map pocket)



EXPLANATION

1000	ALLUVIUM
2800	DRY TERRACE DEPOSITS
6500-6700	SATURATED TERRACE DEPOSITS
9500-9900	FRESH AUSTIN CHALK

SEISMIC VELOCITIES IN FEET/SECOND

The Earth Technology Corporation

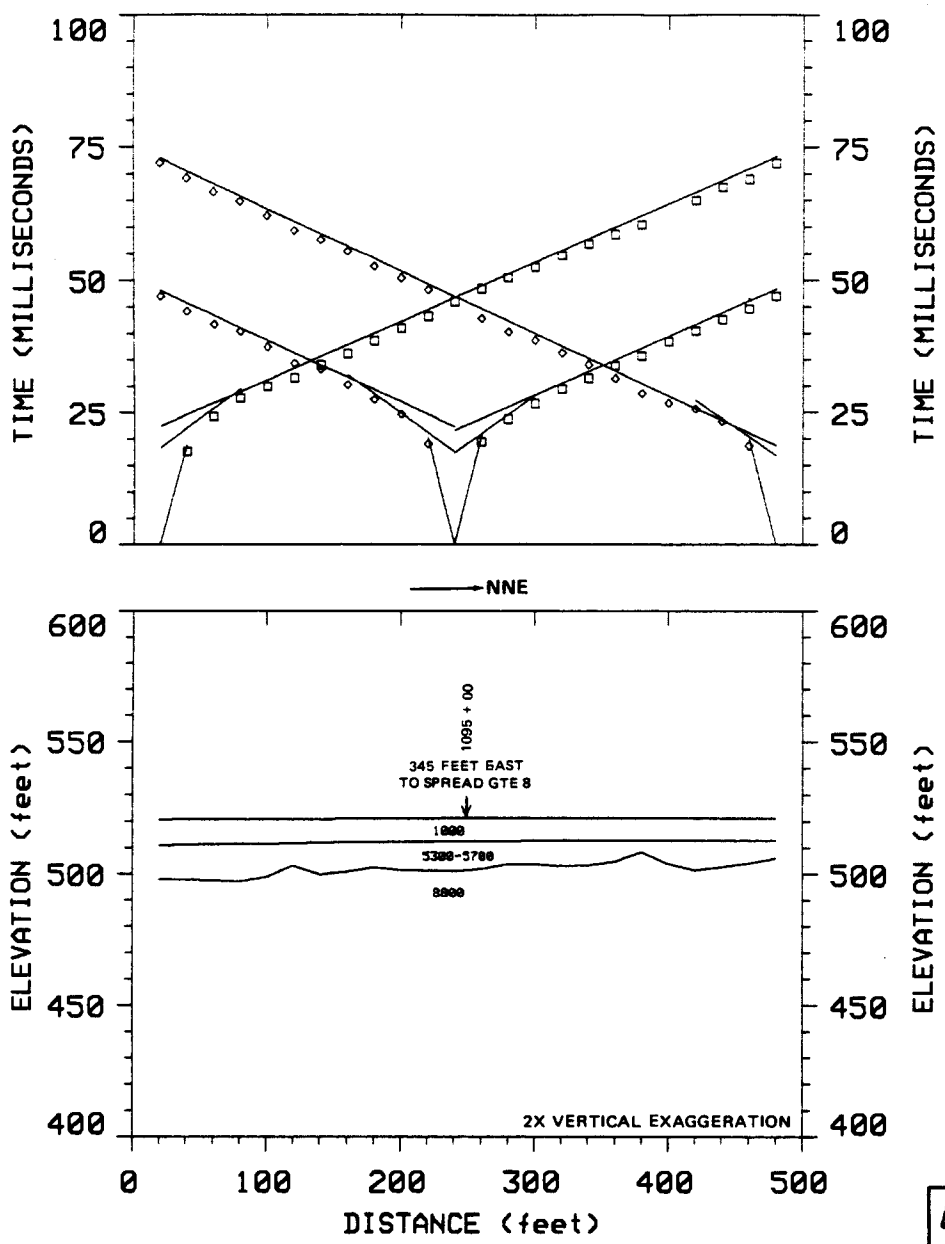
Project No.: 87-888-0017

RTK Joint Venture

Refraction Spread GTE 8
Data and Interpreted Velocity Profile
Chambers Creek Terrace

7/90

Figure 8-3



EXPLANATION

1000	ALLUVIUM
5300-5700	SATURATED TERRACE DEPOSITS
8800	FRESH AUSTIN CHALK

SEISMIC VELOCITIES IN FEET/SECOND

The Earth Technology Corporation

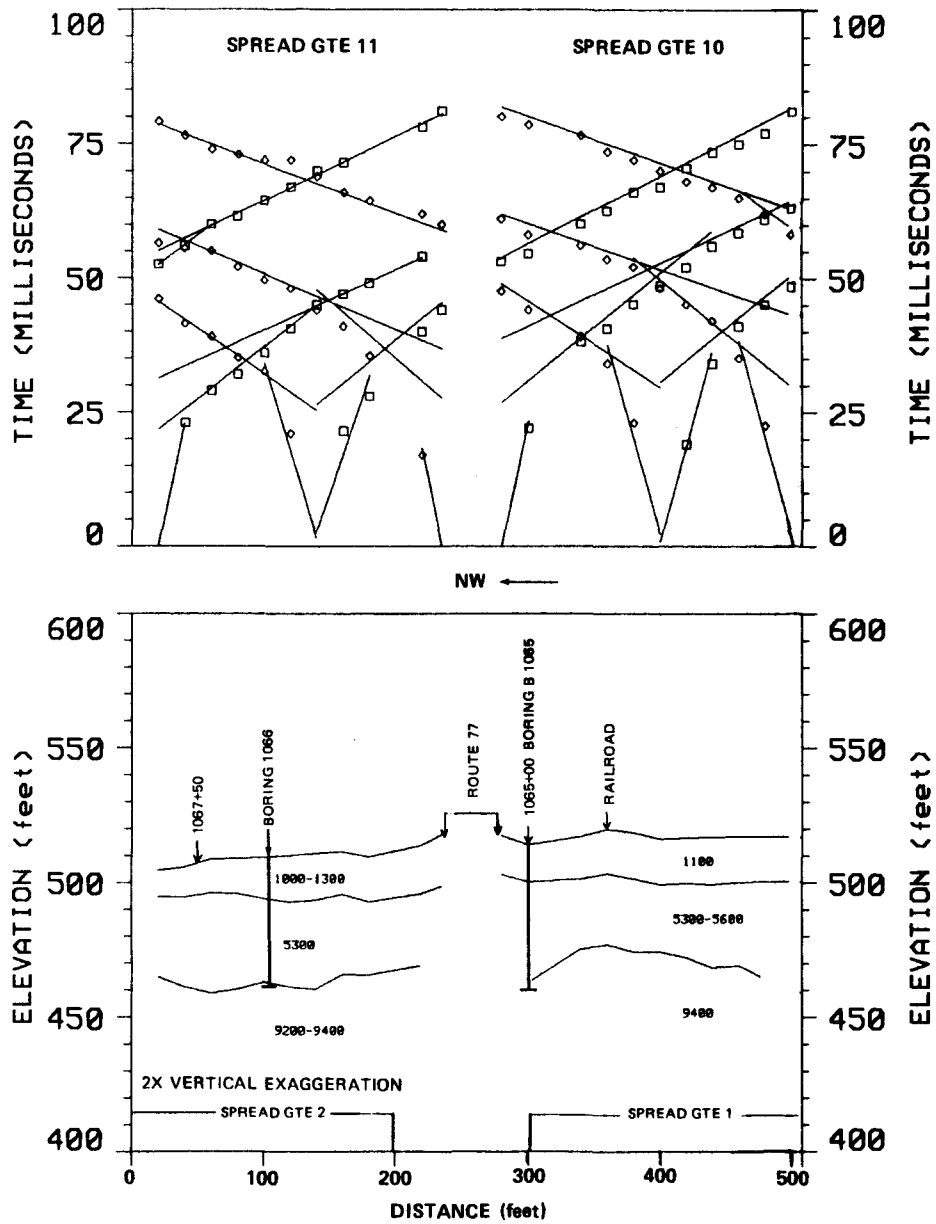
Project No.: 87-888-0017

RTK Joint Venture

Refraction Spread GTE 9
Data and Interpreted Velocity Profile
Chambers Creek Terrace

7/90

Figure B-4



EXPLANATION

1000-1300	ALLUVIUM
5300-5700	SATURATED TERRACE DEPOSITS
9200-9400	FRESH AUSTIN CHALK

SEISMIC VELOCITIES IN FEET/SECOND

The Earth Technology Corporation

Project No.: 87-888-0017

RTK Joint Venture

Refraction Spreads GTE 10-11
Data and Interpreted Velocity Profile
Chambers Creek Terrace

7/90

Figure B-5

APPENDIX C

LITHOLOGIC LOGS

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 17

BORING NO: B1065 PG 1 OF 2
LOCATION: N 210,286 feet
E 2,195,382 feet
GROUND EL: 514.1 feet

DATE: 7-2-90 TYPE: Air Rotary CASED TO: N/A CONTRACTOR: SwL (89-192)

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

WATER INFORMATION
Seepage encountered at 20.0'

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
									1.5 CLAY, stiff, loamy, dark brown with embedded limestone fragments, gravel, trace roots
5		S1	4.0	5.5	100	-	7-11-16		CLAY, very stiff, mottled, tan and light brown
10		S2	10.0	11.5	100	-	6-10-13		14.0
15		S3	15.0	16.5	100	-	5-8-11		CLAY, stiff to very stiff, sandy, mottled, tan and gray
									19.0
20		S4	20.0	21.5	100	-	7-7-11		SAND & GRAVEL, medium dense, fine to medium, rounded to sub -angular, tan and brown
25		S5	25.0	26.5	100	-	12-8-18		27.0
30		S6	30.0	31.5	100	-	4-12-28		SAND & GRAVEL, dense, medium to coarse, rounded to sub-angular, tan and brown
35		S7	35.0	36.5	100	-	21-21-22		
40		S8	40.0	41.5	100	-	7-9-13		41.0
									CLAY, stiff to very stiff, mottled, tan, brown and gray

DRILLING GEOLOGIST Shawn Wood ASSISTANT B. Morgan CHECKED BY Shawn Wood

LOG OF BORING

PROJECT: Superconducting Supercollider
CLIENT: The Earth Technology Corporation
TASK NO.: 17

BORING NO: B1065 PG 2 OF 2
LOCATION: N 210,286 feet
E 2,195,382 feet
GROUND EL: 514.1 feet

DATE: 7-2-90 TYPE: Air Rotary CASED TO: N/A CONTRACTOR: SwL (89-192)

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

WATER INFORMATION
See p. 1 of 2

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT ROD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
									CLAY, very stiff, mottled, tan, brown and gray
45		S9	45.0	46.5	100	-	9-11-13		
50		S10	50.0	51.5	100	-	11-18-40		
55		S11	55.0	55.2	0	-	50=2"		55.0 LIMESTONE (Austin Chalk), soft, severely weathered, tan with occasional clay layers
60		THD	60.0	60.1	0		100=1"		57.5 LIMESTONE (Austin Chalk), medium dense, fresh, bluish gray with occasional argillaceous and shaly layers.
65		THD	65.0	65.05	0	-	100=½"		
70									Bottom of exploration at 65.0'
75									
80									

DRILLING GEOLOGIST Shawn Wood ASSISTANT B. Morgan CHECKED BY Shawn Wood

LOG OF BORING

BORING NO: B1066 PG 1 OF 2

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 17

LOCATION: N 210,420 feet
E 2,195,170 feet

GROUND EL: 507.0 feet

DATE: 7-2-90 TYPE: Air Rotary CASED TO: N/A CONTRACTOR: SwL (89-192)

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

WATER INFORMATION
Seepage encountered at 15.0'

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
									1.0 CLAY, stiff, loamy, dark brown with embedded limestone fragments, gravel, roots
5		S1	5.0	6.5	100	-	5-12-13		CLAY, very stiff, mottled, tan, brown and gray, trace silt
10		S2	10.0	11.5	100	-	4-7-8		
15		S3	15.0	16.5	100	-	12-16-19		16.0
									CLAY, very stiff, mottled, tan, brown and gray, very sandy 19.0
20		S4	20.0	21.5	100	-	25-20-18		SAND & GRAVEL, dense, medium to coarse, rounded to sub-angular, tan and brown, occasional clay layers
25		S5	25.0	26.5	100	-	11-11-13		
30		S6	30.0	31.5	100	-	8-16-25		34.0
35		S7	35.0	36.5	100	-	11-12-15		CLAY, very stiff, silty, mottled, tan and gray
40		S8	40.0	41.5	100	-	8-11-12		

DRILLING GEOLOGIST Shawn Wood ASSISTANT B. Morgan CHECKED BY Shawn Wood

LOG OF BORING

BORING NO: B1066 PG 2 OF 2

PROJECT: Superconducting Supercollider

CLIENT: The Earth Technology Corporation

TASK NO.: 17

LOCATION: N 210,420 feet
E 2,195,170 feet

GROUND EL: 507.0 feet

DATE: 7-2-90 TYPE: Air Rotary CASED TO: N/A CONTRACTOR: SwL (89-192)

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

WATER INFORMATION: See p. 1 of 2

DEPTH IN FEET	SYMBOL	SAMPLE TYPE & NUMBER	DEPTH RANGE TOP	DEPTH RANGE BOT.	PERCENT REC.	PERCENT RQD.	STANDARD PENETRATION TEST PER 6 INCHES	HAND PEN. TSF.	DESCRIPTION OF STRATUM
45		S9	45.0	46.5	100	-	26-31-45		CLAY, stiff, silty, mottled tan and gray
									49.0
50		THD	50.0	50.3	-	-	100=3½"		LIMESTONE, (Austin Chalk), soft, severely weathered, tan with occasional clay layers, trace of sand
55		THD	55.0	55.1	-	-	100=1"		
									58.0
60		THD	60.0	60.01	-	-	100=½"		LIMESTONE, (Austin Chalk) medium dense, fresh, bluish-gray with occasional argillaceous and shaly layers
65		THD	65.0	65.01	-	-	100=½"		
70									Bottom of exploration at 68.0'
75									
80									

DRILLING GEOLOGIST Shawn Wood ASSISTANT B. Morgan CHECKED BY Shawn Wood

APPENDIX D

BORING PLUGGING REPORTS

SSC BOREHOLE PLUGGING REPORT

Project No. 87-888

Task No. 17

Boring No. B1065

Texas Coordination Location: N 210,286
E 2,195,382

Surface Elevation: 514.1 feet

Total Boring Depth: 65.0 feet

Date Drilled: 7/2/90

Date Plugged: 7/2 - 7/3/90

Time Completed: 11:30 A.M.

Remarks:

236 gallons (22 sacks - 94 lbs. each) of grout was used to completely cement boring from bottom to top. Water/cement ratio was approximately 7 gallons per sack.

Drilling geologist: Shawn Wood
Coordinator: Shawn Wood
SwL Report No. 89-192

SSC BOREHOLE PLUGGING REPORT

Project No. 87-888

Task No. 17

Boring No. B1066

Texas Coordination Location: N 210,420
E 2,195,170

Surface Elevation: 507.0 feet

Total Boring Depth: 68.0 feet

Date Drilled: 7/2/90

Date Plugged: 7/3/90

Time Completed: 10:00 A.M.

Remarks:

236 gallons (22 sacks - 94 lbs. each) of grout was used to completely cement boring from bottom to top. Water/cement ratio was approximately 7 gallons per sack.

Drilling geologist: Shawn Wood
Coordinator: Shawn Wood
SwL Report No. 89-192