GEOTECHNICAL INVESTIGATION FOR LIMITED PRELIMINARY ENGINEERING PROGRAM SAN FERNANDO VALLEY EAST-WEST SEGMENT, METRO RED LINE PROJECT

VOLUME II

Prepared for:

ENGINEERING MANAGEMENT CONSULTANT
707 Wilshire Boulevard, Suite 2900
Los Angeles, California 90017

Prepared by:

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100 West Broadway, Suite 5000
Long Beach, California 90802

December 1993
Project No.: 93-4955

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APPENDIX A

FIELD EXPLORATION

FIELD EXPLORATION

GENERAL

The field exploration program consisting of 14 borings and 14 CPT soundings was conducted from September 3 to September 24, 1993. The CPTs were conducted by Earth Technology. The mud rotary drilling was performed by the drilling subcontractor C & L Drilling, Inc. Logging of borings and soil sampling were performed by qualified geologists and engineers from Earth Technology subcontractors Diaz Yourman and Associates, and Geotechnique Consultants, under the supervision of an Earth Technology Certified Engineering Geologist (CEG). Six piezometers were installed at selected boring locations to monitor groundwater levels. Two monitoring wells were developed to obtain groundwater samples. The boring and CPT sounding locations were established in the field by an Earth Technology engineer by tape measurements from adjacent street curbs, railroad centerlines and other fixed features. The approximate locations of exploration points along the alignment are shown in Figure 2-1. Detailed location maps accompany the borings and CPT logs.

BORINGS AND PIEZOMETER INSTALLATION

Exploratory borings were drilled using a truck-mounted MAYHEW-1000 mud rotary rig. The borings were approximately 5 to 6 inches in diameter and ranged from 70.8 to 85.6 feet below ground surface.

In general, soil samples were obtained at 5-foot-depth intervals and at significant changes in stratigraphy, by alternately using standard split-spoon samplers (Standard Penetration Test Method) and 2.4-inch inner diameter California-type drive samplers lined with 1-inch high brass rings.

Standard Penetration Tests (SPT) were performed according to the American Society for Testing Materials (ASTM) Standard Procedure D1586. This method consists of driving the standard split-spoon sampler 18 inches into the soil with a 140-pound hammer falling 30 inches. Blow counts were recorded for each 6-inch driving increment. The number of blows required to drive a standard split-spoon sampler for the last 12 of 18 inches is called the standard penetration resistance.

The driving was terminated when one of the following occurred:

- A total of 100 blows was reached for penetration of 12 inches or less
- No obvious sampler advance was observed during driving
- Sampler was advanced 18 inches.

Split spoon samples were examined and carefully removed from the spoon, logged, sealed and transported to the laboratory for testing.

Relatively undisturbed soil samples were obtained with the California-type drive sampler by driving the sampler with either a 300- or a 400-pound downhole hammer falling 18 inches. Hammer weights and the corresponding drop heights used for driving the sampler are indicated in boring logs. Blow counts were recorded for each 6-inch driving increment. The 12-inch long samples were examined and the middle six rings were collected in a plastic tube for transportation to the laboratory for testing. In order to compare the blow counts on a uniform basis, the California sampler downhole hammer blow counts were corrected for sampler dimensions, different hammer weights, height of fall, and buoyancy and viscous drag in the bentonite drilling mud. The corrected blow counts designated as "Equivalent SPT Value" are presented in Table 3-4.

Six piezometers were installed after the completion of soil sampling at selected station locations to monitor groundwater levels. Two of the piezometers were developed as monitoring wells to obtain groundwater samples for chemical analyses. Two-inch-diameter PVC casings with 0.01-inch slotted well screen were used for the piezometers at LPE-3, LPE-7, LPE-9, LPE-10 and LPE-14, and a 2-inch-diameter PVC casing with 0.02-inch slotted well screen was used for the piezometer at LPE-1. Piezometers LPE-1, LPE-3 and LPE-7 were screened over the approximate tunnel zone. The other piezometers were screened from a depth of approximately 15 feet to the bottom of the borings. In the rotary wash drilling method, observation of groundwater levels during drilling is generally not possible since the borings are filled with drilling fluid. Estimates of the groundwater level were, however, made by observing the moisture conditions of the samples.

Tap water was used to flush each boring to remove or thin the drilling fluid prior to piezometer installation. Up to 25 feet of backfill sand was placed at the bottom of borings. Following the sand placement, PVC casing assembly was inserted into the boring, backfill sand was placed to about 1 to 10 feet above the top of the screened interval of the casing assembly, and 1/2-inch size bentonite pellets were then dropped in to form a 3-to 6-foot thick bentonite plug. Cement grout was then poured into the annulus between the PVC casing and the boring wall from the top of the bentonite plug to within 12 inches to 18 inches of the ground surface. At completion, a circular 8-inch diameter metal traffic box was installed at the piezometer location flush with the ground surface. Piezometer installation diagrams are presented in Figures A-3B, A-5B, A-9B, A-12B, and A-16B.

Piezometers LPE-1 and LPE-7 were developed on October 8, 1993 by bailing about 10 casing volumes of water from each well. The groundwater was allowed to recover in each well and groundwater samples were obtained on October 11, 1993 for chemical analyses. At every sampling event, at least three well volumes of water were bailed out from each well before obtaining the samples.

The logs of borings accompany this appendix. Stratification lines on the logs represent the approximate boundary between predominant soil types. Geologic and engineering descriptions and material classification used on the boring logs are in general accordance with the Unified Soil Classification System (USCS) and the American Society for Testing and Materials (ASTM

D2487 and D2488 Methods). Figure A-1 presents the Unified Soil Classification System used in material classification, as presented on the logs. Figure A-2 presents an explanation for the log symbols and terminology.

CONE PENETRATION TESTING (CPT)

The Cone Penetration Test consists of pushing a cone-tipped probe into a soil deposit while simultaneously recording the end bearing and side friction resistance of the soil to that penetration.

The Cone Penetration tests described in this report were conducted in general accordance with ASTM specifications (ASTM-D3441-86) using an electric cone penetrometer.

The CPT equipment operated by The Earth Technology Corporation consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to push the cone and rods into the soil, while a continuous record of cone and friction resistance versus depth is obtained in both analog and digital form. A specially designed all wheel drive 20-ton truck is used to transport and house the test equipment, and provide the necessary reaction force during penetration testing.

The cone penetrometer assembly used for this study consists of a conical tip and a cylindrical friction sleeve. The conical tip has a 60° apex angle and a projected cross-sectional area of 15 square centimeters. Both the conical tip and the cylindrical friction sleeve have a surface area of 200 square centimeters. Both the conical tip and the cylindrical friction sleeve have outer diameters of about 4.37 centimeters.

The interior of the cone penetrometer is instrumented with strain gauges that allow simultaneous measurement of cone tip and friction sleeve resistance during penetration. Continuous electric signals for the strain gauges are transmitted by a cable in the sounding rods to analog and digital data recorders in the CPT truck.

The CPT data processing is performed using a computer based data acquisition system. The computer generated plots include cone resistance, friction resistance and friction ratio versus depth at a general data scale.

Data and interpretations (based on existing correlations) tabulated at 0.5-foot intervals include normalized cone tip resistance, friction ratio, soil behavior type, overburden normalized equivalent SPT (N_1) value, overburden normalized fines-content adjusted equivalent SPT (N_{1-f}) value, overburden normalized equivalent relative density, undrained shear strength and overburden normalized equivalent friction angle.

Continuous stratigraphic information and parametric interpretations are based on relationships between cone end bearing and friction resistance. The calculated friction ratio (CPT friction sleeve resistance divided by cone end bearing) is used as an indicator of soil type. Granular

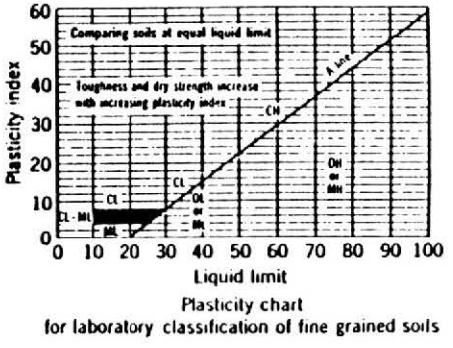
soils typically have low friction ratios and low cone resistance, while cohesive or organic soils have high friction ratios and low cone resistance. These stratigraphic material categories form the basis for all subsequent interpretations. The geotechnical parameters derived for these materials categories are tabulated at 0.5-ft. intervals for each of the soundings performed.

It is important to note that most of the correlative methods presented herein are based on a combination of theory, field research, research performed under laboratory conditions, and literature review. The tabulated information should, therefore, be viewed as guidelines rather than as precise measurements. However, a tabulated Equivalent Relative Density of 20 to 40 percent, for example, having an Equivalent Blow count of less than 10, is clearly a loose granular soil, and cannot be confused with a gravel or a dense sand. Thus, for preliminary assessments of soil properties and expected site behavior, these tabulations are generally adequate.

Some care is recommended when using the Soil Behavior Type tabulations. If a tabulation depth happens to fall on a soil layer interface, or a seam of soil differing from the rest of the layer, the tabulated data can be misleading. The solution to this problem is the proper use of the CPT logs. The continuous penetration resistance is the primary source of profile description; the Soil Behavior Type tabulations are supplemental. The continuous logs should be examined and layer boundaries delineated in accordance with the project requirements. The Soil Behavior Type tabulations are only representative of the response of the soil to the large shear deformations imposed during cone penetration. This is not necessarily a prediction of grain size distribution. However, it has been found that Soil Behavior Types generally agree well with the soil types defined in accordance with the grain size distribution methods such as used in the Unified Soil Classification System.

Computer generated cone penetration test plots and the results of cone penetrometer test data are included in this appendix.

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)					Group Symbols [a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is *larger* than No. 200 sieve size[b] (The No. 200 sieve size is about the smallest particle visible to naked eye)	Gravels More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the ¼ in. size may be used as equivalent to the No. 4 sieve size)	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes		*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand*, gravelly; about 20% hard, angular gravel particles ½-in. maximum size; rounded and subangular sand grains coarse to fine, about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (*SM*)	Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows: Less than 5% — *GW, GP, SW, SP* More than 12% — *GM, GC, SM, SC* 5% to 12% — *Borderline* cases requiring use of dual symbols Use grain size curve in identifying the fractions as given under field identification $C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *GW* Atterberg limits below "A" line, or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols Atterberg limits above "A" line, with *PI* greater than 7
			Predominantly one size or a range of sizes with some intermediate sizes missing		*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)		*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)		*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		
	Sands More than half of coarse fraction is smaller than No. 4 sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes		*SW*	Well graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 Not meeting all gradation requirements for *SW* Atterberg limits below "A" line or *PI* less than 5 — Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols Atterberg limits below "A" line with *PI* greater than 7
			Predominantly one size or a range of sizes with some intermediate sizes missing		*SP*	Poorly graded sands, gravelly sands, little or no fines		
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)		*SM*	Silty sands, poorly graded sand-silt mixtures		
			Plastic fines (for identification procedures, see *CL* below)		*SC*	Clayey sands, poorly graded sand-clay mixtures		
Fine-grained soils More than half of material is *smaller* than No. 200 sieve size (The No. 200 sieve size is about the smallest particle visible to naked eye)	Identification Procedures on Fraction Smaller than No. 40 Sieve Size		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)			
	Silts and clays liquid limit less than 50		None to slight	Quick to slow	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (*ML*)
			Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity	
	Silts and clays liquid limit greater than 50		Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
			High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays	
			Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity	
Highly Organic Soils			Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils	



Plasticity chart
for laboratory classification of fine grained soils

[a] *Boundary classifications*. Soils possessing characteristics of two groups are designated by combinations of group symbols. For example *GW-GC*, well graded gravel-sand mixture with clay binder.
[b] All sieve sizes on this chart are U.S. standard.

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Unified Soil Classified System

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Figure A-1

SAMPLE/TEST TYPE	
S	STANDARD SPLIT SPOON SAMPLE
D	2½" DIA., 12" DRIVE SAMPLE
NR	NO RECOVERY

SIZE PROPORTIONS

FINE-GRAINED SOILS		COARSE-GRAINED SOILS	
TRACE	<5%	TRACE	<5%
SOME	5 TO 15%	SOME	5 TO 15%
WITH	15 TO 30%	USE MODIFIER	>15%
USE MODIFIER	>30%		

SOIL MOISTURE

DRY - ABSENCE OF WATER, DRY TO TOUCH

MOIST - DAMP BUT NO VISIBLE WATER

WET - VISIBLE FREE WATER, USUALLY SOIL IS BELOW WATER TABLE

EXPLANATIONS

BLOW COUNT (PENETRATION RESISTANCE)

- BLOW COUNTS FOR 6" INTERVALS EXCEPT AS NOTED

BLOW COUNTS FOR THE CALIFORNIA DRIVE SAMPLER ARE OBTAINED WITH EITHER A 300- OR A 400- POUND DOWNHOLE HAMMER FALLING 18 INCHES. EQUIVALENT SPT VALUES ARE OBTAINED BY APPLYING APPROPRIATE CORRECTIONS, AS INDICATED ON FIGURE A-2 (SHEET 2 OF 2)

RECOVERY (INCHES RECOVERED/INCHES TOTAL SAMPLE)

MOISTURE CONTENT (%) - LABORATORY DETERMINED MOISTURE CONTENT

PPM -	PARTS PER MILLION
PCF -	POUNDS PER CUBIC FOOT
OVA -	ORGANIC VAPOR ANALYZER
[BACKGROUND] -	BACKGROUND OVA READING
N/A -	NOT APPLICABLE
/ -	DENOTES ALTERNATING SOIL TYPES IN A LAYER (EXAMPLE: SP/SW i.e. ALTERNATING POORLY AND WELL GRADED SANDS IN A PREDOMINANTLY SANDY LAYER)

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Explanation of Boring Logs (Sheet 1 of 2)

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Figure A-2

EQUIVALENT SPT BLOWCOUNTS FOR CALIFORNIA DRIVE SAMPLES

FOR CALIFORNIA DRIVE SAMPLES, EQUIVALENT SPT VALUES ARE OBTAINED BY APPLYING THE APPROPRIATE CORRECTIONS FOR DIFFERENT HAMMER WEIGHTS, HAMMER DROP, SAMPLER DIMENSIONS, AND BUOYANCY AND VISCOUS DRAG WITHIN THE DRILLING MUD. THESE CORRECTIONS ARE INDICATED BELOW:

EQUATION 1

$$N_{SPT} = Nx \frac{W \times H\ (2.0^2 - 1.375^2)}{4200\ (D_o^2 - D_i^2)}$$

WHERE:

N_{SPT}	=	EQUIVALENT SPT BLOW COUNTS
N	=	DOWNHOLE HAMMER BLOW COUNTS FOR 12" PENETRATION OF CALIFORNIA DRIVE SAMPLER
W	=	WEIGHT OF DOWNHOLE HAMMER (300 LBS OR 400 LBS)
H	=	HAMMER DROP (18-INCHES)
D_o, Di	=	OUTER (3.2 INCHES) AND INNER (2.5 INCHES) DIAMETERS OF THE CALIFORNIA DRIVE SAMPLER

ASSUMING A 20% REDUCTION FOR THE BUOYANCY AND VISCOUS DRAG WITHIN THE DRILLING MUD, EQUIVALENT SPT VALUES OBTAINED FROM EQUATION 1 ARE AS FOLLOWS:

FOR 300 LBS DOWNHOLE HAMMER:	$N_{SPT} = 0.543\ N$
FOR 400 LBS DOWNHOLE HAMMER:	$N_{SPT} = 0.725\ N$

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Explanation of Boring Logs (Sheet 2 of 2)

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Figure A-2

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Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE- 1**	Sheet **1** of **4**
Boring Location:	**Owensmouth/Victory**	Elevation and Datum(feet):	**805-MSL**
Health and Safety:	**Level D**	Date Started: **9/23/93**	Date Finished: **9/24/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **80.5**	Depth to Bedrock(feet): **54.5(?)**
Drilling Method:	**Mud Rotary**	Number of Samples: **18**	Depth to Water (feet): **16.9**
Boring Diameter:	**5 inches**	Completion Information:	**Monitoring well installed**
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 300-lb and 18-inch drop.**		Logged By: **Fred Schilling**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		Asphaltic concrete and base		af								
		ALLUVIUM		Qal								
5		SANDY CLAY; light brownish gray, moist, medium stiff, medium plasticity, fine-grained sand, trace gravel (up to 1/2" in size), white caliche stringers, calcareous	CL		1	D	4 6	7/12	6.8 [5.9]	102	16	1020
10					2	S	3 3 4	8/18	9.3 [6.2]			1030
15		grayish brown, infrequent intervals of clayey sand, fine- to coarse-grained sand, trace gravel			3	D	4 4	10/12	9.4 [6.2]	91	31	1040

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 1** | Sheet 2 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		CLAYEY SAND; dark gray, wet, medium dense, fine- to coarse-grained, medium plasticity	SC	Qal	4	S	7 9 12	14/18	10 [6.8]			1048
25		SANDY CLAY; grayish brown, moist, very stiff, medium plasticity, fine-grained sand, mottled, calcareous, interbedded with gravel [periodic rig chatter from 25'-30']	CL		5	D	14 19	11/12	10 [6.8]	113	16	1054
30		SAND; grayish brown, wet, dense to very dense, fine- to medium-grained with thin interbeds of gravel, some silt	SP-SM		6	S	24 26 27	12/18	12 [7.6]			1100
		GRAVEL; pale brown, wet, very dense, some siliceous shale fragments, calcareous	GP		7	D	70	3/6	12 [8.0]	104	18	1110
35		SILTY SAND; grayish brown, wet, very dense, coarse-grained sand with gravel (up to 1" in size), low plasticity	SM		8	S	14 30 31	10/18	14 [8.4]			1120
		GRAVEL; fine to coarse gravel, some fine sand [hard chatter from 36'-38']	GP?									
40		SILTY SAND; grayish brown, wet, dense, fine- to medium-grained sand, with gravel (up to 1" in size), low plasticity [hard rig chatter from 40'-42']	SM		9	D	27 40	10/12	12 [9.0]	107	21	1130
		SANDY CLAY; pale brown, moist, hard, low- to medium plasticity, fine- to medium-grained sand	CL		10	S	6 14 20	10/18	13 [10]			1150
45		very stiff, medium to high plasticity, with coarse-grained sand, caliche stringers, slightly calcareous [smooth drilling]			11	D	12 24	10/12	14 [10]	107	20	1205

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

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Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		SANDY CLAY; very pale brown, moist, very stiff, indistinct clay layers, low to medium plasticity, fine-grained sand	CL	Qal	12	S	6 11 14	15/18	13 [10]			1215
55		MODELO FORMATION (?) SILTY SAND(STONE?); very pale brown, moist, very dense, fine- to coarse-grained sand with gravel, low plasticity, calcareous, slightly cemented	SM	Tm(?)	13	D	100 /5.5"	2/5.5	10 [5.6]	94	29	1230
60		light yellowish brown, fine-grained sand, horizontally stratified, slightly calcareous [rig chatter from 60'to 65'] [driller indicates hard layer at 63']			14	S	50/3"		8.9 [5.2]			1245
65		pale brown, with well cemented calcareous nodules, [rig chatter from 65' to 70']			15	D	100/3"	2/3	10 [5.8]			1300
70		[continuous violent rig chatter from 70' to 75'], well cemented, calcareous nodules/beds light brownish gray, some clay, slightly calcareous, thinly bedded (inclined?)			16	S	60 40/2"	8/8	2.0 [0.0]			1330
75		[increased rig chatter] light gray, uniform and slightly cemented			17	D	100/5"	3/5	2.0 [0.0]			1358

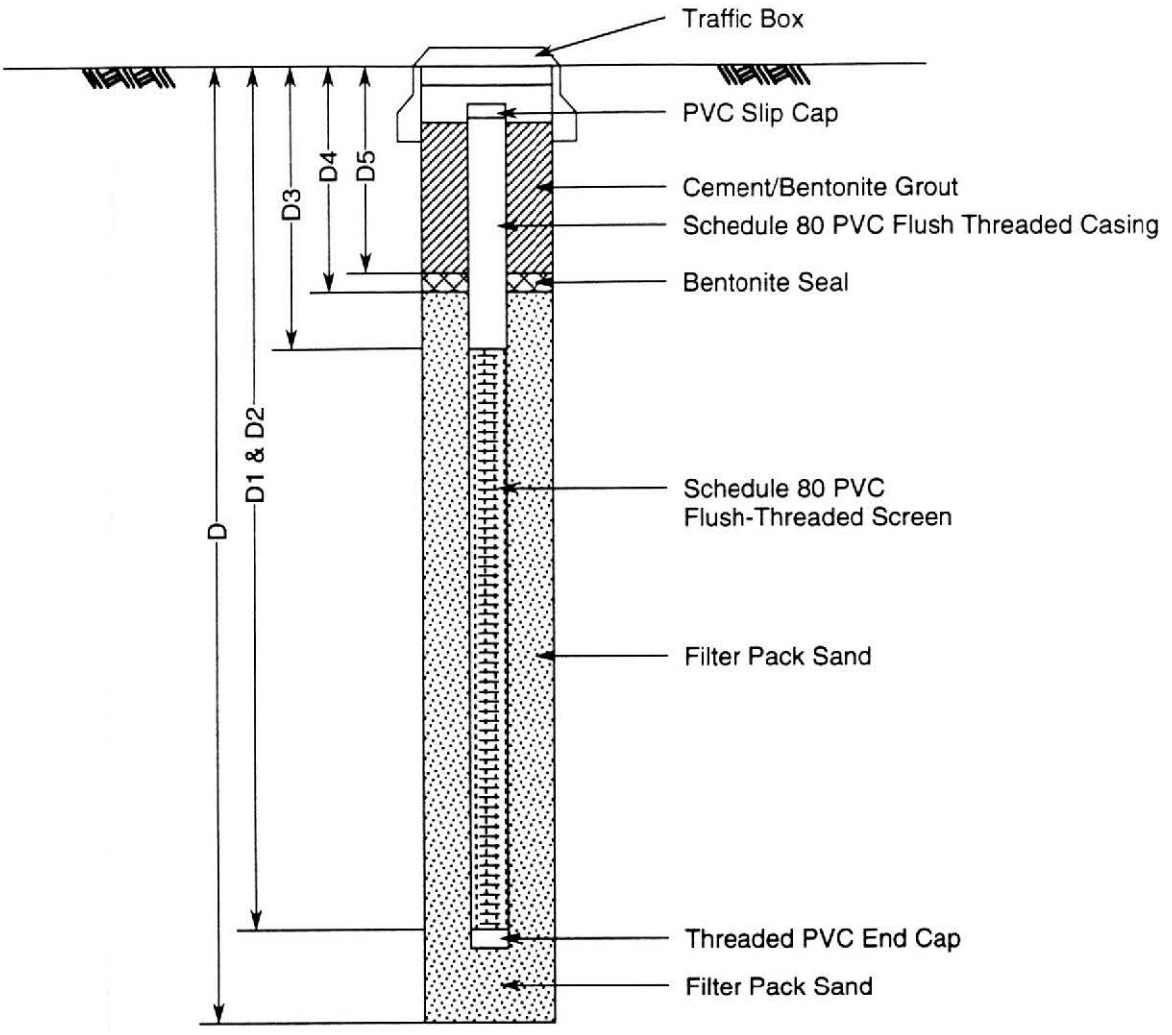
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 1** | Sheet **4** of **4**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Samples: Recovery (inches/inches)	Samples: OVA (ppm) [Background]	Samples: Dry Density (pcf)	Samples: Moisture Content (%)	Drilling Time
		SILTY SAND(STONE?), as above	SM	Tm(?)	18	S	80 /5.5"	3/5.5	2.0 [0.0]			1420
		Boring terminated at 80.5 feet. Groundwater measured on 10/08/93 at 16.9 feet below surface.										
85												
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



Total Depth (D)	=	80.0	Feet
Total Depth of Casing (D1)	=	55.0	Feet
Depth to Bottom of Well Screen (D2)	=	55.0	Feet
Depth to Top of Well Screen (D3)	=	30.0	Feet
Depth to Bottom of Top Seal (D4)	=	27.0	Feet
Depth to Top of Top Seal (D5)	=	21.0	Feet
Well Casing Diameter	=	2.0	Inches
Well Screen Slot Size	=	0.02	Inch
Filter Pack Sand Type	=	#2/12	Monterey
Bentonite Seal Type	=	1/2 Inch	Pellets

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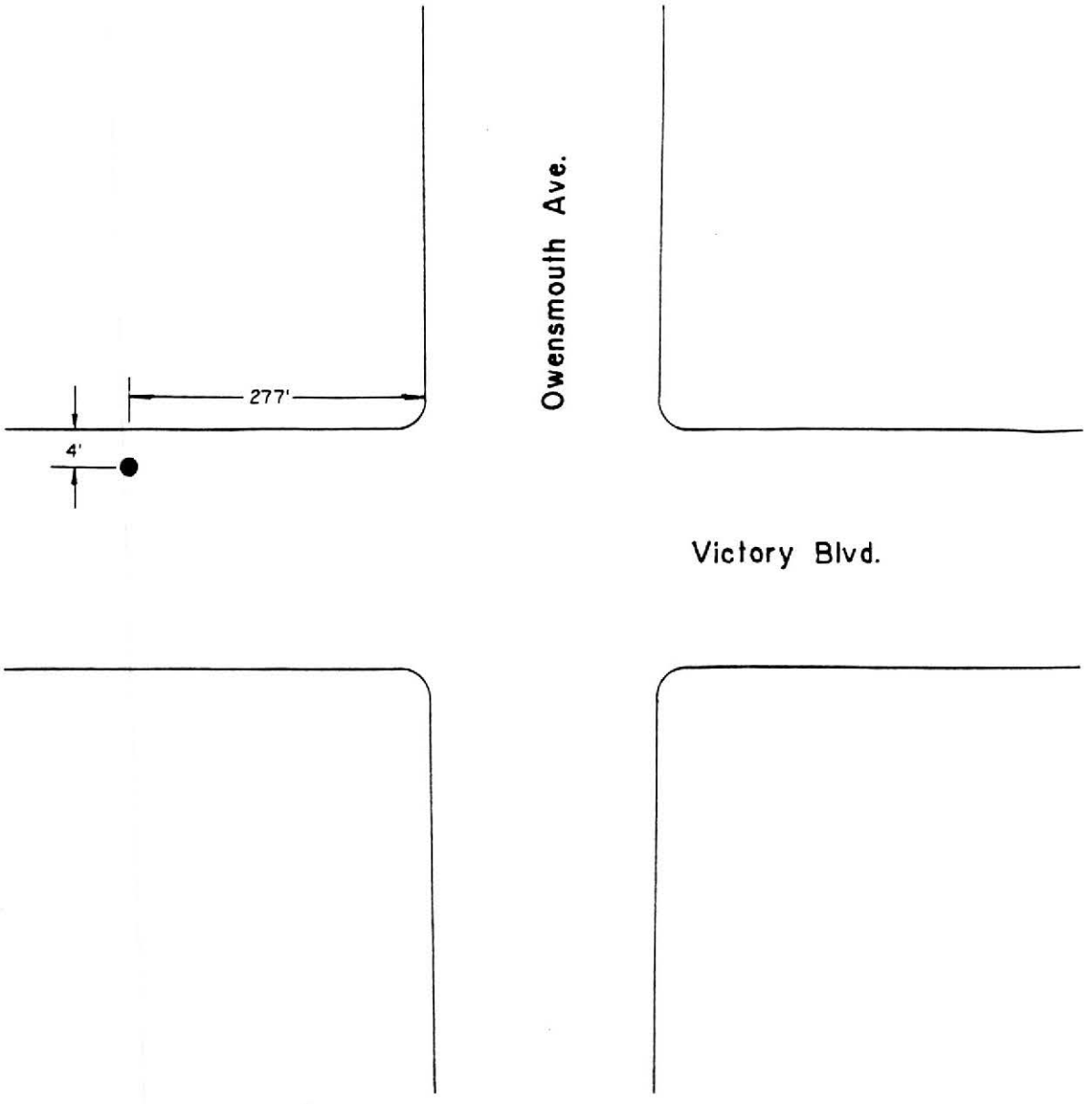
Piezometer Installation Schematic
LPE-1

11-93

Figure A-3B



North

Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of
Boring LPE-1

11-93

Figure A-3A

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE- 2**	Sheet 1 of 3
Boring Location:	**Victory/De Soto**	Elevation and Datum(feet):	**790-MSL**
Health and Safety:	**Level D**	Date Started: **9/23/93**	Date Finished: **9/23/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **70.8**	Depth to Bedrock(feet): **70(?)**
Drilling Method:	**Mud Rotary**	Number of Samples: **14**	Depth to Water (feet): **37(?)**
Boring Diameter:	**5 inches**	Completion Information:	**Grouted to surface**
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 400-lb and 18-inch drop.**		Logged By: **Hossein Rashidi**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		Asphaltic concrete and base		af								
		ALLUVIUM		Qal								
5		CLAY; dark yellowish brown, moist, soft to medium stiff, medium to high plasticity, with fine- to coarse-grained sand, trace gravel (up to 3/8" in size)	CL/CH		1	D	4 5	7/12	7.0 [7.0]	98	25	0949
10					2	S	2 2 2	12/18	8.0 [7.0]			0959
15		SANDY CLAY; dark yellowish brown, moist, medium stiff, medium plasticity, fine- to medium-grained sand, trace angular fine gravel (up to 1/2" in size)	CL		3	D	3 5	10/12	8.0 [7.0]	105	21	1002

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 2** | Sheet 2 of 3

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SANDY CLAY/CLAYEY SAND; olive brown, moist, stiff/medium dense, low to medium plasticity, fine-grained sand	CL/SC	Qal	4	S	3 5 6	16/18	9.0 [7.0]			1008
25		CLAYEY SAND/SILTY SAND; olive brown, moist, loose, fine- to medium-grained sand, non-plastic to low plasticity clay and silt	SC/SM		5	D	3 4	12/12	10 [7.0]	102	22	1014
30		CLAY; dark olive brown, moist, very stiff, medium plasticity, some fine-grained sand	CL		6	S	5 11 14	15/18	11 [8.0]			1017
35		CLAYEY SAND; olive brown, moist, medium dense, fine- to medium-grained sand, low plasticity	SC		7	D	8 10	12/12	10 [8.0]	111	19	1023
40		SILTY SAND; dark olive brown, wet, dense, fine- to coarse-grained, with fine gravel (up to 1/2" in size), low plasticity	SM		8	S	19 22 26	10/18	12 [10]			1033
45		CLAY; olive brown, moist, medium stiff, medium plasticity, with fine- to medium-grained sand, slightly calcareous	CL		9	D	5 5	12/12	15 [12]	98	27	1040

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

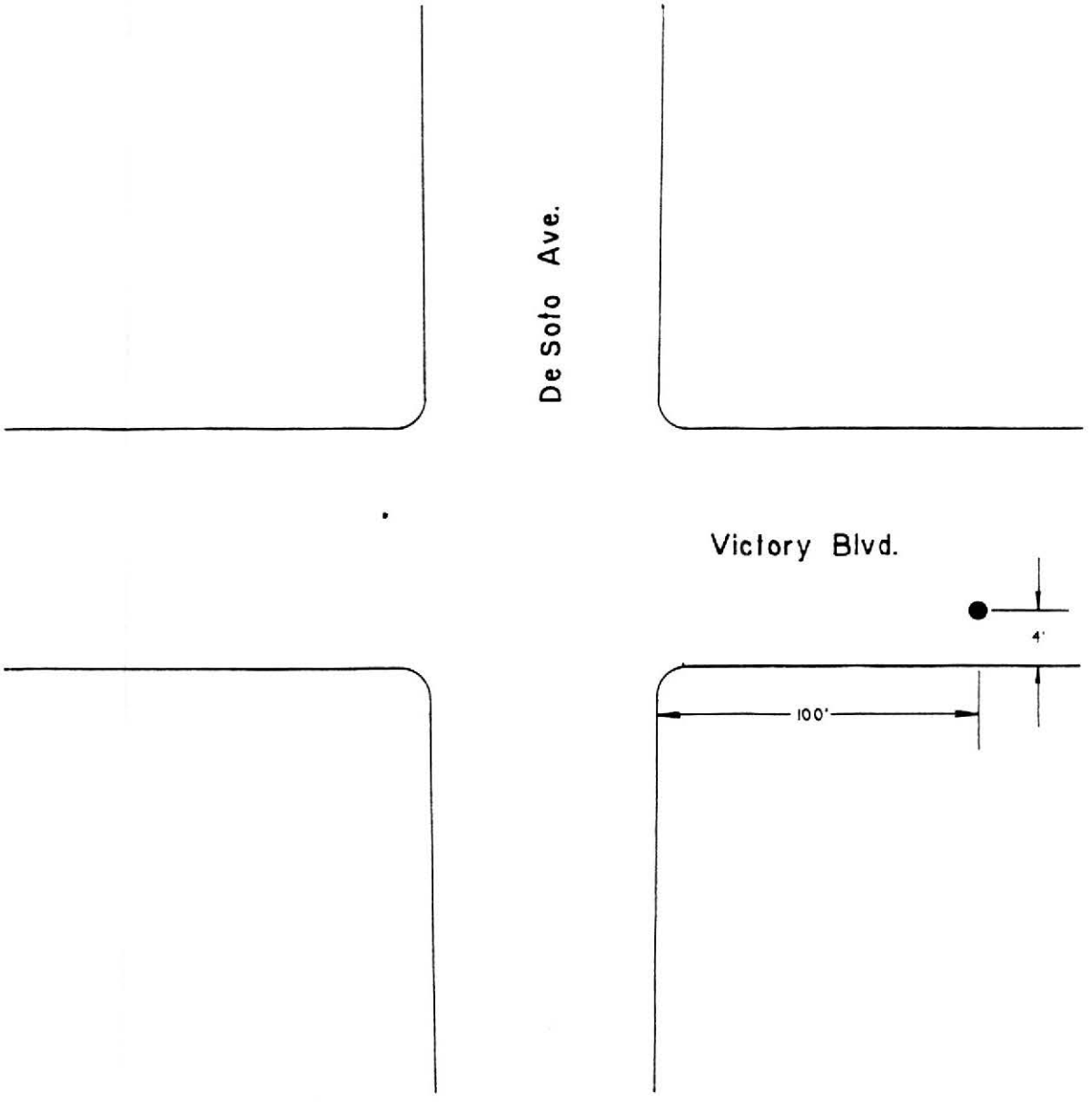
The Earth Technology Corporation

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 2** | Sheet 3 of 3

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		CLAY; dark yellowish brown, wet(?), very stiff, medium plasticity, some fine-grained sand	CL	Qal	10	S	5 9 12	18/18	19 [15]			1047
55		SANDY CLAY; dark yellowish brown, moist, stiff, low plasticity, fine- to medium-grained sand	CL		11	D	3 8	12/12	20 [18]	108	20	1058
60		SILTY SAND; light olive brown, moist, dense, fine-grained, low plasticity	SM		12	S	14 20 22	15/18	20 [21]			1107
65		CLAYEY SAND; light olive brown, moist, medium dense, fine- to medium-grained sand, low plasticity	SC		13	D	9 11	12/12	26 [26]	101	24	1120
70		SANDY SILT; light olive brown, moist, hard, low plasticity, with fine- to medium-grained sand, slightly calcareous	ML									
		MODELO FORMATION (?) SILTSTONE; gray, moist, hard	ML	Tm(?)	14	S	28 50/4"	8/10	34 [32]			1140
		Boring terminated at 70.8 feet. Groundwater possibly encountered at 37 feet below surface.										
75												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of
Boring LPE-2

11-93

Figure A-4

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE- 3**	Sheet 1 of 3
Boring Location:	**Victory/Winnetka**	Elevation and Datum(feet): **762-MSL**	
Health and Safety:	**Level D**	Date Started: **9/22/93**	Date Finished: **9/22/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **71.5**	Depth to Bedrock(feet): **---**
Drilling Method:	**Mud Rotary**	Number of Samples: **16**	Depth to Water (feet): **15.0**
Boring Diameter:	**5 inches**	Completion Information: **Monitoring well installed**	
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 300-lb and 18-inch drop.**		Logged By: **Fred Schilling**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		Sand/Gravel (Railroad Ballast)		af								
		ALLUVIUM		Qal								
5		CLAY; pale brown, moist, medium stiff to stiff, medium plasticity, some fine-grained sand, crude layering, calcareous	CL		1	D	3 4	7/12	1.0 [0.0]	95	22	0815
10		trace medium- to coarse-grained sand			2	S	2 2 7	13/18	2.0 [0.0]			0820
15		dark grayish brown, increasing fine-grained sand content, slightly calcareous			3	D	3 5	12/12	3.5 [0.0]	90	32	0830

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name:	Metro Rail: San Fernando Valley East-West Segment		
Project Number:	93-4955	Boring Number: LPE- 3	Sheet 2 of 3

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		CLAY; light gray, moist, stiff, medium plasticity, with fine-grained sand, massive to crudely layered, mottled, carbonaceous	CL	Qal	4	S	4 6 5	13/18	5.5 [0.0]			0840
25		increasing medium-grained sand, presence of caliche stringers, calcareous			5	D	8 19	10/12	5.5 [0.0]	102	25	0845
30		SANDY CLAY; light gray, moist, very stiff, low to medium plasticity, fine-grained sand, massive, mottled, carbonaceous	CL		6	S	8 13 13	18/18	3.5 [0.0]			0855
		wet, medium plasticity			7	D	11 12	6/12	3.5 [0.0]	99	26	0905
35		pale brown, moist to wet			8	S	5 6 11	18/18	4.8 [0.0]			0920
40		very pale brown, hard, medium plasticity, with fine-grained sand, massive			9	D	30 35	6/12	6.0 [0.0]	106	24	0939
45		very stiff, white stringers			10	S	9 10 12	18/18	4.5 [0.0]			0950

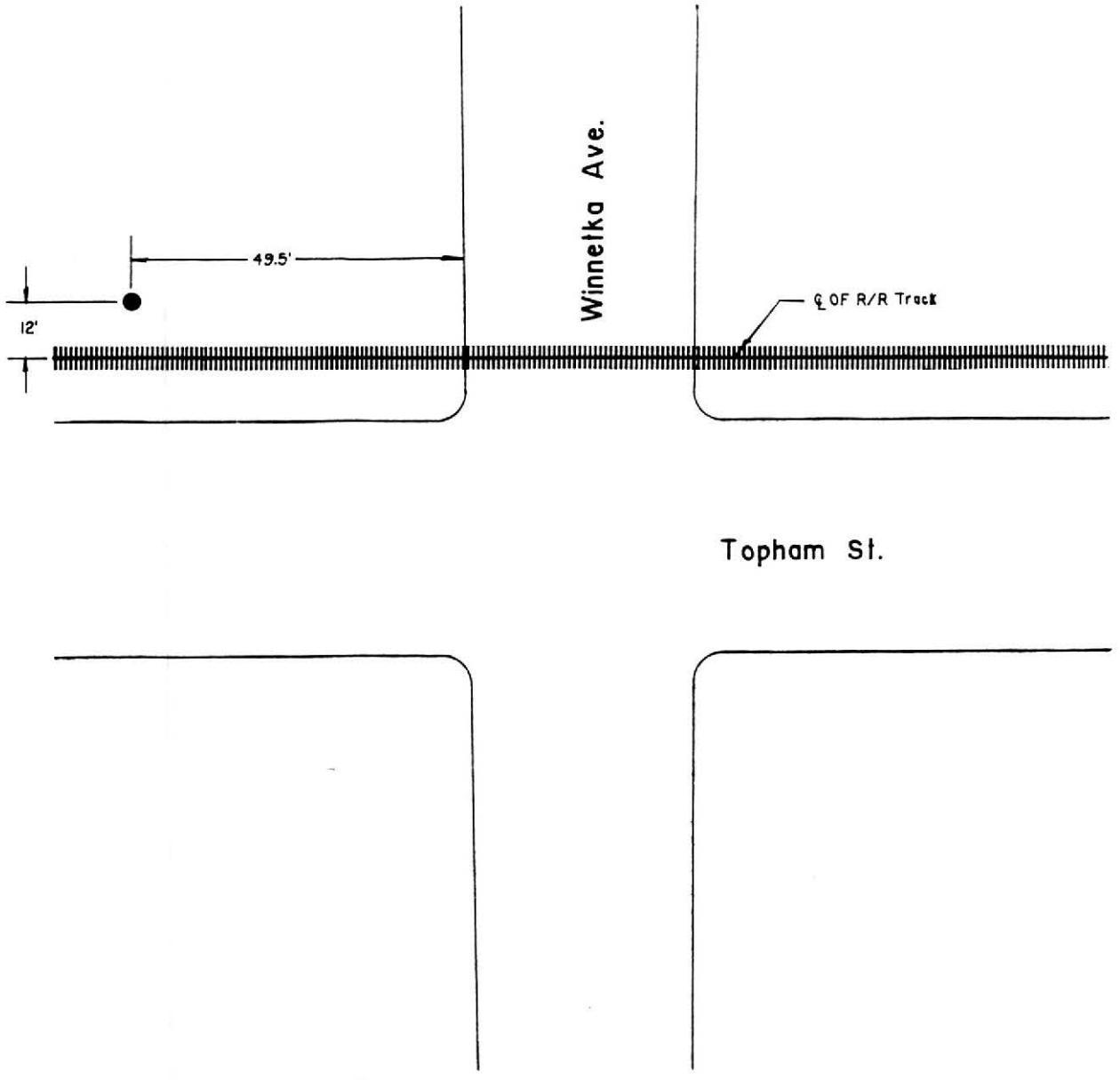
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 3** | Sheet 3 of 3

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		CLAY; very pale brown, moist, hard, medium plasticity, with fine-grained sand	CL	Qal	11	D	30 50	3/12	[0.0]	95	31	1004
		calcareous in patches			12	S	10 19 24	18/18	4.5 [0.0]			1015
55					13	D	27 44	5/12	4.6 [0.0]	96	28	1030
60		very pale brown, very stiff, slightly calcareous			14	S	5 5 16	8/18	3.6 [0.0]			1050
65		SILTY SAND; very pale brown, moist, medium dense, fine-grained , low plasticity silt, trace clay, massive, slightly calcareous	SM		15	D	16 30	9/12	5.0 [0.0]	93	34	1100
70		silt content increases			16	S	4 10 16	18/18	3.0 [0.0]			1120
		Boring terminated at 71.5 feet. Groundwater measured on 10/08/93 at 15.2 feet below surface.										
75												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

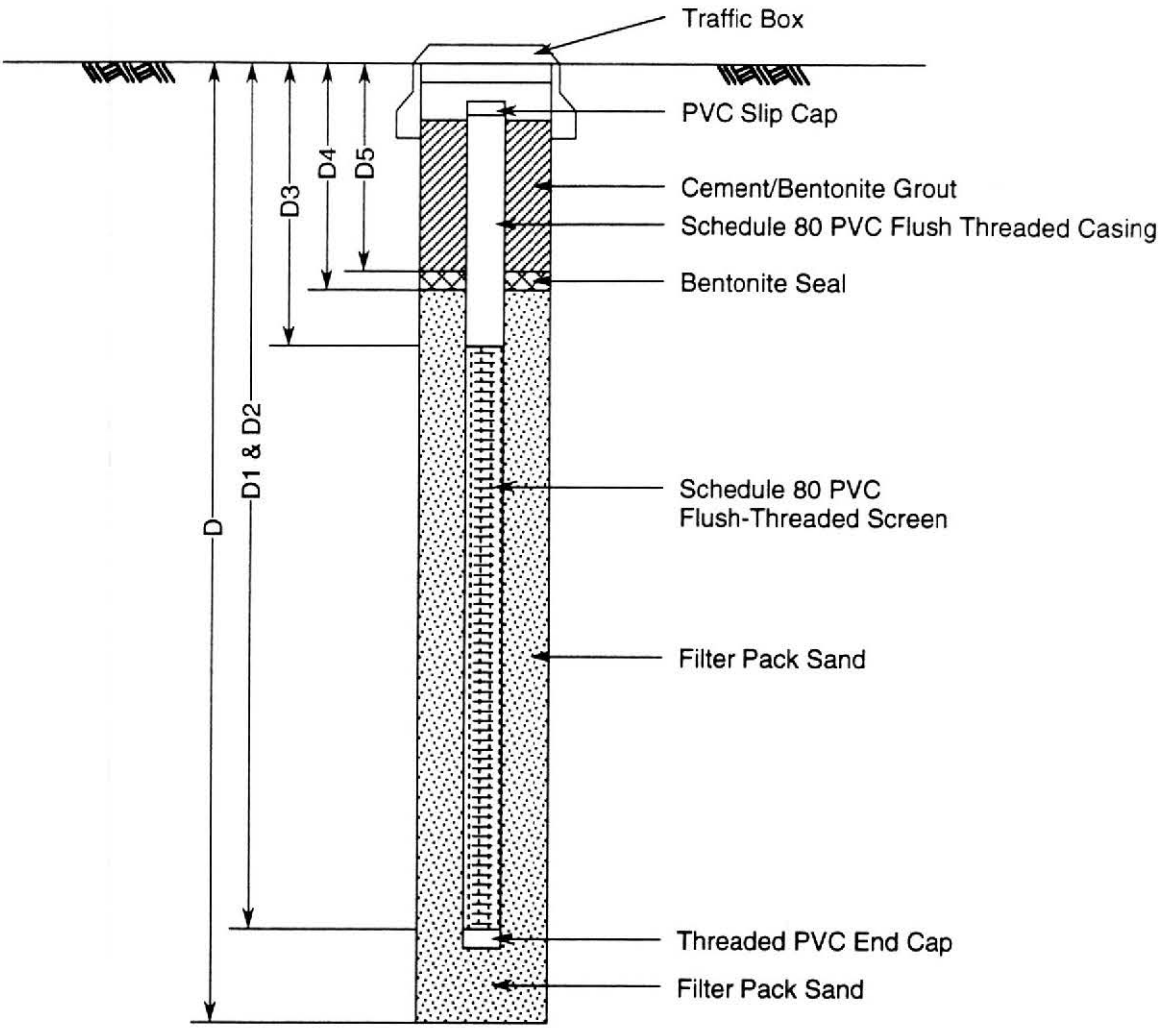
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of
Boring LPE-3

11-93

Figure A-5A



Total Depth (D)	=	70.0	Feet
Total Depth of Casing (D1)	=	53.0	Feet
Depth to Bottom of Well Screen (D2)	=	53.0	Feet
Depth to Top of Well Screen (D3)	=	28.0	Feet
Depth to Bottom of Top Seal (D4)	=	18.0	Feet
Depth to Top of Top Seal (D5)	=	14.0	Feet
Well Casing Diameter	=	2.0	Inches
Well Screen Slot Size	=	0.01	Inch
Filter Pack Sand Type	=	#2/12	Monterey
Bentonite Seal Type	=	1/2 Inch Pellets	

The Earth Technology Corporation

Project No. 93-4955
Geotechnical Investigation
East-West Segment
Metro Red Line

Piezometer Installation Schematic
LPE-3

11-93

Figure A-5B

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE- 4**	Sheet **1** of **3**
Boring Location:	**Corbin/Topham**		Elevation and Datum(feet): **760-MSL**
Health and Safety:	**Level D**	Date Started: **9/15/93**	Date Finished: **9/15/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **72.0**	Depth to Bedrock(feet): **---**
Drilling Method:	**Mud Rotary**	Number of Samples: **16**	Depth to Water (feet): **40(?)**
Boring Diameter:	**5 inches**	Completion Information: **Grouted to surface**	
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 300-lb and 18-inch drop.**		Logged By: **Fred Schilling**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		Sand/Fine Gravel (Railroad Ballast)		af								
		ALLUVIUM		Qal								
5		CLAY; brown, moist, medium stiff, medium plasticity, with fine-grained sand, slightly calcareous	CL		1	D	9 9	8/12	3.0 [2.9]	99	25	0811
10		soft			2	S	2 1 1	13/18	3.0 [3.0]			0823
15		SANDY SILT/SILTY SAND; light yellowish brown, moist, medium stiff/loose	ML/SM		3	D	6 7	12/12	3.0 [3.0]			0841

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

The Earth Technology Corporation

Project Name:	Metro Rail: San Fernando Valley East-West Segment		
Project Number:	93-4955	Boring Number:	LPE- 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		CLAY; grayish brown, moist, stiff, low to medium plasticity, with fine grained sand, massive	CL	Qal	4	S	5 6 8	18/18	3.0 [3.0]			0900
25		SANDY CLAY; light olive brown, moist, stiff, low plasticity, fine-grained sand, slightly calcareous	CL		5	D	7 8	12/12	2.9 [2.9]	100	26	0925
30		low to medium plasticity, increasing sand content			6	S	5 6 8	15/18	2.9 [2.9]			0953
35					7	D	10 11	8/12	2.9 [2.9]	98	25	1015
40		pale yellow, massive, slightly calcareous			8	S	3 5 6	16/18	2.9 [2.9]			1059
		light yellowish brown, very stiff, infrequent layers of clayey sand			9	D	7 21	6/12	2.9 [2.9]	103	24	1120
45		fine- to medium-grained sand			10	S	5 8 10	18/18	2.9 [2.9]			1150

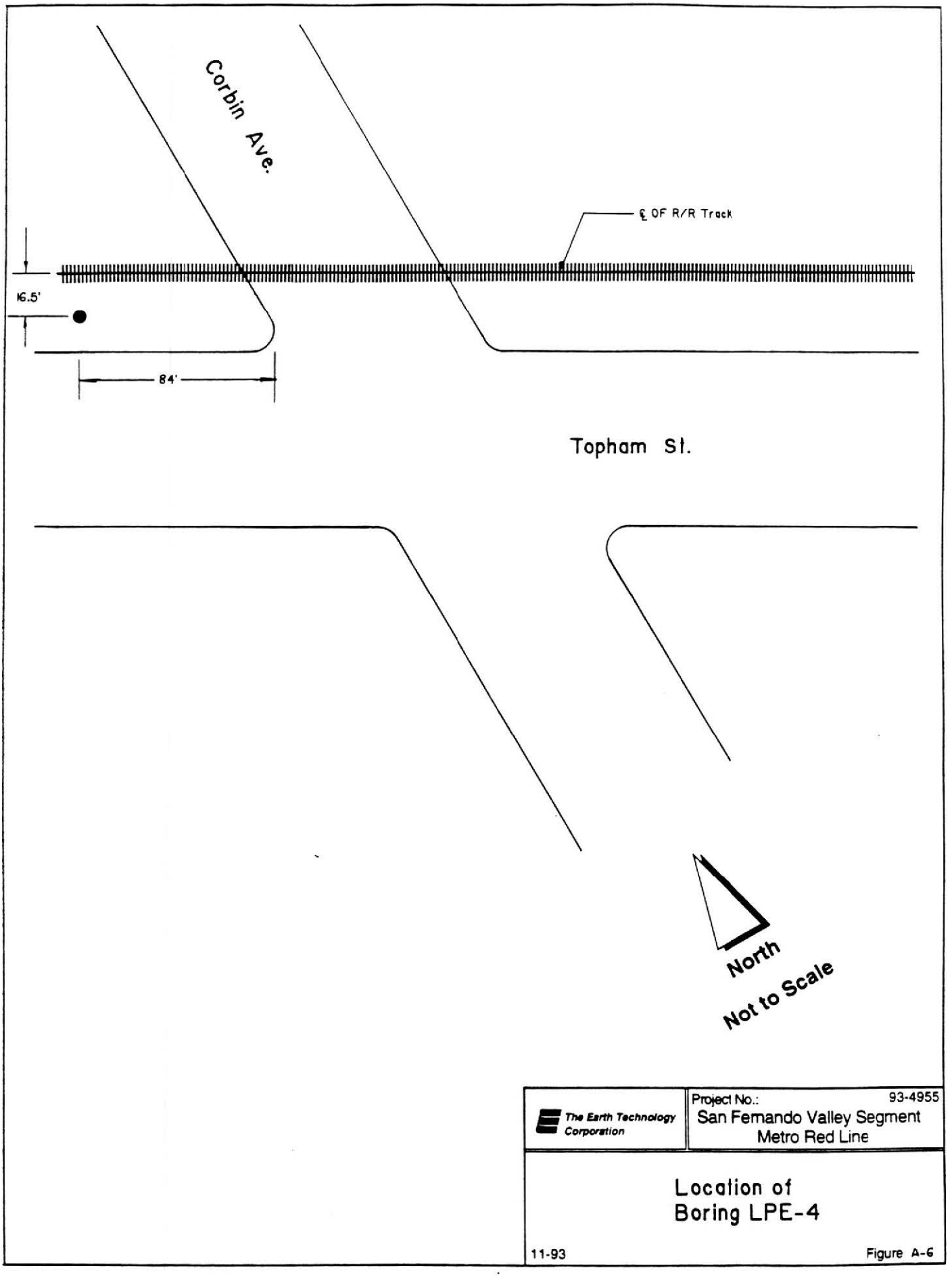
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 4** | Sheet 3 of 3

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SANDY SILT; light yellowish brown, moist, very stiff, low plasticity, fine- to medium-grained sand, slightly calcareous	ML	Qal	11	D	12 14	11/12	2.9 [2.9]	106	22	1220
		SANDY CLAY; light yellowish brown, moist, very stiff, low to medium plasticity, fine- to medium-grained sand, indistinct layering, slightly calcareous	CL		12	S	8 10 18	16/18	2.9 [2.9]			1242
55					13	D	16 20	10/12	2.9 [2.9]	108	20	1307
60		SANDY CLAY/CLAYEY SAND; light yellowish brown, moist, very stiff/medium dense, low to medium plasticity, fine-grained sand, massive	CL/SC		14	S	8 10 16	16/18	3.2 [3.2]			1325
65		SILTY SAND; light yellowish brown, moist, dense, fine- to medium-grained sand, low plasticity silt, massive 1' thick coarse-grained sand interval at 67'	SM		15	D	20 40	8/12	3.2 [3.2]	108	20	1350
70					16	S	8 16 24	14/18	3.2 [3.2]			1414
		Boring terminated at 72.0 feet. Groundwater estimated at approximately 40.0 feet below surface.										
75												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



The Earth Technology Corporation

Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of
Boring LPE-4

11-93

Figure A-6

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE- 5**	Sheet **1** of **4**
Boring Location:	**Tampa/Topham**		Elevation and Datum(feet): **758-MSL**
Health and Safety:	**Level D**	Date Started: **9/15/93**	Date Finished: **9/15/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **80.8**	Depth to Bedrock(feet): **40**
Drilling Method:	**Mud Rotary**	Number of Samples: **18**	Depth to Water (feet): **26(?)**
Boring Diameter:	**5 inches**	Completion Information: **Grouted to surface**	
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 400-lb and 18-inch drop.**		Logged By: **V.R.Nadeswaran**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		SILTY SAND; brown, dry to moist, loose to medium dense, fine- to coarse-grained sand, little fine to coarse gravel (up to 1" in size)	SM	af								0800
		ALLUVIUM		Qal								
5		SANDY CLAY; brown, moist, medium stiff, low to medium plasticity, fine- to coarse-grained sand, with gravel, infrequent layers of clayey sand	CL		1	D	3 3	8/12	6.0 [6.0]	106	16	0805
10		low plasticity, fine-grained sand			2	S	3 3 3	12/18	6.0 [6.0]			0820
		trace medium- to coarse-grained sand										
15		CLAY; dark yellowish brown, moist, medium stiff, medium plasticity, with fine-grained sand, white caliche stringers, trace angular fine gravel (up to 3/4" in size)	CL		3	D	4 7	9/12	6.0 [6.0]	104	22	0827

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 5** | Sheet **2** of **4**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		CLAY; yellowish brown, moist, medium stiff, medium plasticity, some fine-grained sand	CL	Qal	4	S	2 2 3	12/18	6.0 [6.0]			0842
25		very stiff, increasing sand content, moderately calcareous			5	D	12 15	11/12	7.0 [7.0]	109	20	0854
30		SANDY CLAY; dark yellowish brown, moist, very stiff, medium plasticity, fine-grained sand, slightly calcareous	CL		6	S	5 9 11	15/18	6.0 [6.0]			0903
35		medium stiff, increasing sand content			7	D	7 8	12/12	6.0 [6.0]	106	23	0915
40		MODELO FORMATION(?) CLAYSTONE, white to gray to orange brown, moist, very stiff, high plasticity, with fine-grained sand, highly calcareous, intensely weathered	CH	Tm(?)	8	S	8 8 10	18/18	6.0 [6.0]			0940
45		gray to orange brown, moderately weathered			9	D	8 12	11/12	6.0 [6.0]	91	31	0958
		reduced fine-grained sand content, white calcareous material			10	S	4 8 14	17/18	6.0 [6.0]			1005

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 5** | Sheet **3** of **4**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		CLAYSTONE; gray to orange brown, moist, very stiff to hard, high plasticity, trace fine-grained sand, moderately weathered	CH	Tm(?)	11	D	8 18	12/12	6.0 [6.0]	89	33	1017
55					12	S	10 17 18	1/18	6.0 [6.0]			1035
					13	S	12 17 18	18/18	6.0 [6.0]			1040
60					14	D	10 13	12/12	6.0 [6.0]	85	36	1055
65		indistinct banding and less fine-grained sand, slightly to moderately weathered			15	S	7 10 11	18/18	6.0 [6.0]			1120
70		CLAYSTONE; gray to orange brown, moist, very stiff to hard, low to medium plasticity, trace fine-grained sand, slightly to moderately weathered	CL		16	D	17 31	12/12	6.0 [6.0]	87	35	1139
75		dark gray to brown, increased fine-grained sand content, slightly weathered			17	S	7 19 35	15/18	6.0 [6.0]			1150

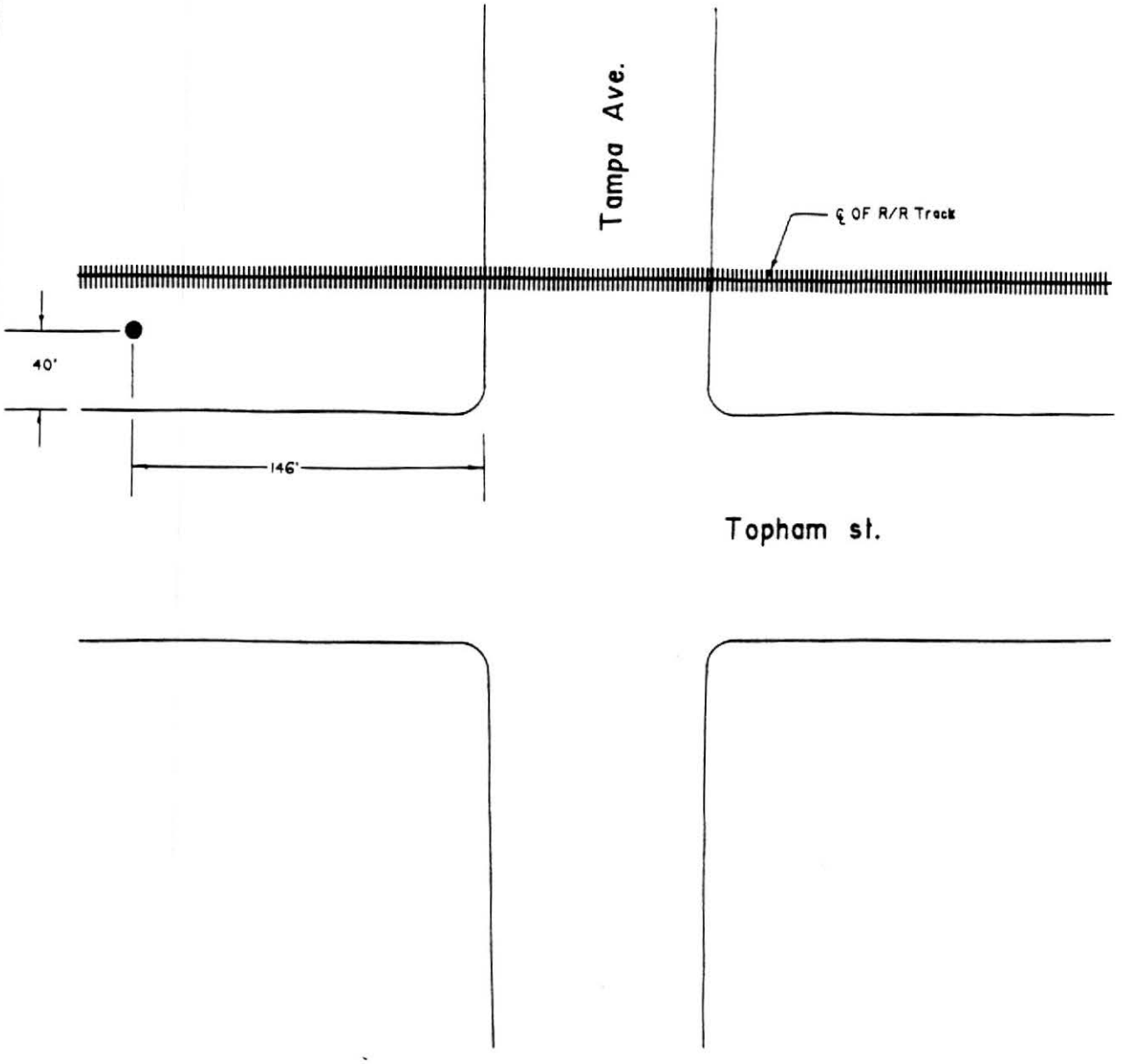
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name:	Metro Rail: San Fernando Valley East-West Segment		
Project Number:	93-4955	Boring Number:	LPE- 5

Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Samples: Recovery (inches/inches)	Samples: OVA (ppm) [Background]	Samples: Dry Density (pcf)	Samples: Moisture Content (%)	Drilling Time
		CLAYSTONE; very dark gray, moist, hard, low plasticity, fine-grained sand, unweathered or fresh	CL	Tm(?)	18	D	50 50/3"	5/9	8.8 [8.0]	101	16	1215
		Boring terminated at 80.8 feet. Groundwater estimated at approximately 26 feet below surface.										
85												
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of
Boring LPE-5

11-93

Figure A-7

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE- 6**	Sheet **1** of **4**
Boring Location:	**Reseda/Topham**	Elevation and Datum(feet):	**748-MSL**
Health and Safety:	**Level D**	Date Started: **9/16/93**	Date Finished: **9/16/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **81.0**	Depth to Bedrock(feet): **---**
Drilling Method:	**Mud Rotary**	Number of Samples: **20**	Depth to Water (feet): **40(?)**
Boring Diameter:	**5 inches**	Completion Information:	**Grouted to surface**
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 300-lb and 18-inch drop.**		Logged By: **Fred Schilling**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		Sand/Fine Gravel(Railroad Ballast)		af								
		ALLUVIUM		Qal								
5		SANDY CLAY; greenish gray, moist, medium stiff, medium plasticity, fine- to coarse-grained sand, with gravel (up to 1" in size)	CL		1	D	5 6	9/12	6.0 [6.0]	102	17	0745
10		CLAYEY SAND; pale yellow, slightly moist, loose, fine-grained, with gravel, low plasticity	SC		2	S	6 4 3	10/18	[6.0]			0759
15		SANDY CLAY; brown, slightly moist, stiff, medium plasticity, massive, fine- to coarse-grained sand, with gravel (up to 1/2" in size), slightly calcareous, white stringers and filaments	CL		3	D	6 10	12/12	6.0 /[6.0]	96	24	0820

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 6** | Sheet 2 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		CLAYEY SAND; light yellowish brown, slightly moist, loose, fine- to medium-grained, low to medium plasticity, massive	SC	Qal	4	S	3 4 5	11/18				0829
25		CLAY; light brownish gray, slightly moist, stiff, medium plasticity, some fine-grained sand, slightly calcareous	CL		5	D	9 17	11/12	6.0 [6.0]	92	31	0837
30		SANDY CLAY/CLAYEY SAND; light yellowish brown, moist, very stiff, medium plasticity, fine- to medium-grained sand	CL/SC		6	S	8 12 14	10/18	6.0 [6.0]			0849
35		SAND/SILTY SAND; light yellowish brown, moist, dense, fine- to medium-grained, some non-plastic silt, massive, some coarse-grained sand [rig chatter at 34']	SP/SM		7	D	21 40	9/12	6.0 [6.0]	111	11	0900
		SILTY SAND; light olive brown, moist, dense, fine- to medium-grained, trace coarse-grained sand, low plasticity silt, layers of gravel (up to 1/2" in size), thin clay layers	SM		8	S	23 24 27	9/18	7.0 [6.0]			0915
40		CLAYEY SAND; light olive brown, moist, medium dense, fine- to medium-grained, medium plasticity, trace coarse-grained sand, gravelly intervals	SC		9	D	20 26	6/12	6.0 [4.0]	116	16	0929
		SANDY CLAY; light yellowish brown mottled with light gray, moist, very stiff, medium plasticity, fine- to medium-grained	CL		10	S	7 12 14	18/18	6.0 [5.0]			0940
45		light olive brown mottled with gray			11	D	14 20	11/12	6.0 [6.0]	108	21	1005
		light yellowish brown, massive, slightly calcareous			12	S	8 12 14	18/18	6.0 [6.0]			

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 6** | Sheet 3 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SANDY CLAY; light brown, moist, very stiff, medium plasticity, fine- to medium-grained sand, massive, slightly calcareous	CL	Qal	13	D	16 28	12/12				1045
		SANDY CLAY/CLAYEY SAND; light brown, moist, very stiff/medium dense, low plasticity, fine- to medium-grained sand	CL/SC		14	D	15 20	6/12		108	20	1133
55					15	S	8 24 50/4"	18/18	6.0 [6.0]			1155
		[rig chatter from 57-60 feet]										
60		CLAYEY SAND/CLAYEY GRAVEL; olive brown, moist, very dense, fine- to coarse-grained, gravel (up to 1" in size), low plasticity clay, non-calcareous, infrequent layers of sandy clay	SC/GC		16	D	70	3/6	6.0 [6.0]	111	15	1215
65		CLAYEY SAND; brown, moist, dense, fine-to medium-grained, medium plasticity clay, trace coarse-grained sand, slightly carbonaceous	SC		17	S	14 20 22	18/18	6.0 [6.0]			1230
70		CLAY; very pale brown to brown, moist, hard, medium plasticity, with fine- to medium-grained sand, porous, slightly carbonaceous, vague stratification	CL		18	D	20 40	8/12	6.0 [6.0]	102	25	1245
75		light reddish brown, very stiff, some fine-grained sand, massive			19	S	7 12 14	17/18	6.0 [6.0]			1315

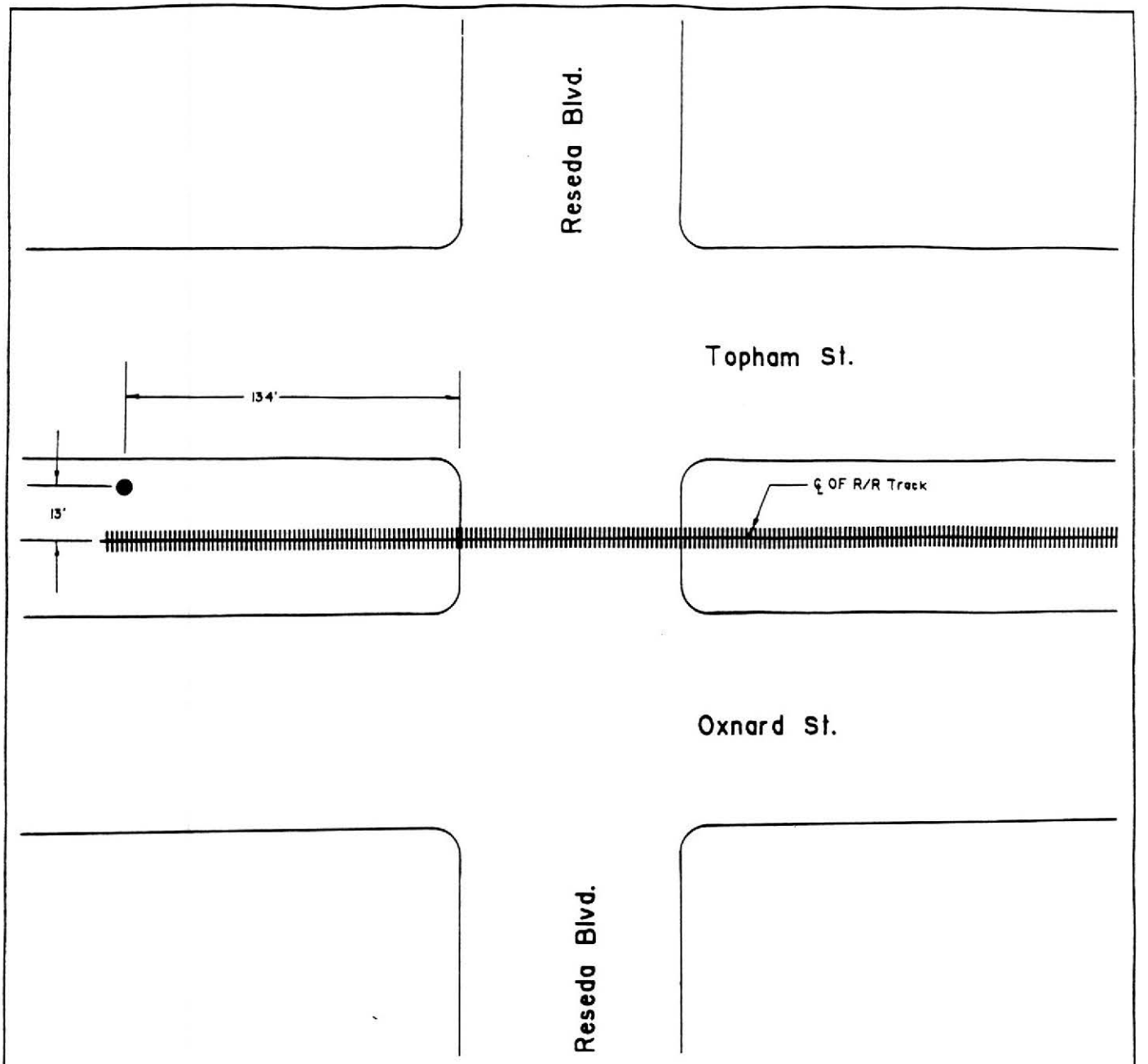
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 6** | Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Samples: Recovery (inches/inches)	Samples: OVA (ppm) [Background]	Samples: Dry Density (pcf)	Samples: Moisture Content (%)	Drilling Time
		SANDY CLAY; light yellowish brown, moist, very stiff, medium plasticity, fine-grained sand, indistinct layering	CL	Qal	20	D	18 30	8/12		105	21	1352
		Boring terminated at 81.0 feet. Groundwater estimated at approximately 40 feet below surface.										
85												
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of
Boring LPE-6

11-93

Figure A-8

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE- 7**	Sheet **1** of **4**
Boring Location:	**Oxnard/White Oak**	Elevation and Datum(feet): **729-MSL**	
Health and Safety:	**Level D**	Date Started: **9/22/93**	Date Finished: **9/22/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **81.0**	Depth to Bedrock(feet): **---**
Drilling Method:	**Mud Rotary**	Number of Samples: **16**	Depth to Water (feet): **38.5**
Boring Diameter:	**5 inches**	Completion Information: **Monitoring well installed**	
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 400-lb and 18-inch drop.**		Logged By: **Hossein Rashidi**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		SILT; light brown, dry, soft to medium stiff, non-plastic, trace coarse-grained sand, trace fine gravel	ML	af								
		ALLUVIUM		Qal								
5		SANDY CLAY; dark yellowish brown, dry to moist, medium stiff, medium plasticity, fine- to medium-grained sand, trace coarse-grained sand, infrequent layers of fine- to coarse-grained sand(SP)	CL		1	D	5 4	7/12	4.0 [4.0]	102	14	0720
10		CLAY; dark yellowish brown, moist, stiff, low plasticity, with fine-grained sand, slightly calcareous	CL		2	S	5 7 6	7/18				0736
15		medium plasticity, with fine- to coarse-grained sand, trace gravel			3	D	4 4	5/12	6.0 [4.0]	103	17	0750

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 7** | Sheet **2** of **4**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SAND/SILTY SAND; dark grayish brown, moist, medium dense, fine- to medium-grained sand, some low plasticity silt, trace coarse-grained sand	SP/SM	Qal	4	S	5 12 16	8/18	6.0 [4.0]			0759
25		CLAY; brown, moist, medium stiff, medium plasticity, with medium- to coarse-grained sand, trace gravel (up to 1" in size)	CL		5	D	4 6	9/12	5.0 [4.0]	106	22	0812
30		CLAYEY SAND; dark yellowish brown with red spots, moist, medium dense, fine- to medium-grained, low plasticity, some rounded to subangular fine gravel	SC		6	S	6 8 8	7/18	7.0 [4.0]			0820
35		CLAYEY GRAVEL; dark yellowish brown, moist, medium dense, medium- to coarse-grained, with low plasticity clay, some fine- to coarse-grained sand, rounded to subangular gravel (up to 3/4" in size)	GC		7	D	10 11	5/12	5.0 [4.0]	122	13	0833
40		CLAYEY SAND; brown, moist, dense, fine- to coarse-grained, low plasticity, some angular fine gravel (up to 1/4" in size)	SC		8	S	8 16 22	12/18	6.0 [5.0]			0850
45		SANDY CLAY; olive, moist, very stiff, medium plasticity, fine- to coarse-grained sand, trace rounded to subangular gravel	CL		9	D	12 16	10/12	7.0 [5.0]	112	18	0902

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 7** | Sheet 3 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SILTY SAND; dark yellowish brown, moist, very dense, fine- to medium-grained, low plasticity, trace coarse-grained sand	SM	Qal	10	S	11 37 30	10/18				0915
		dark brown, dense, increasing coarse-grained sand content with some fine gravel (up to 1/2" in size)			11	D	14 20	10/12	7.5 [5.5]	118	14	0928
55		GRAVEL/SILTY GRAVEL; dark brown, moist, fine- to coarse-grained, rounded to subangular (up to 1/2" in size), some low plasticity silt	GP/GM		12	S	25 50	5/12	9.0 [6.0]			0935
60		no recovery except for a few pieces of gravel in the shoe				D	17 25	0/12				
65		SANDY CLAY; dark yellowish brown, moist, hard, medium plasticity, fine- to coarse-grained sand, some flat gravel-sized clasts derived from the siliceous modelo formation, infrequent layers of clayey sand (SC)	CL		13	S	8 15 20	12/18	10 [7.0]			1006
70		CLAYEY GRAVEL; dark yellowish brown, moist, medium- to coarse-grained, low plasticity, some fine- to coarse-grained sand	GC		14	D	6 8	5/12	10 [7.0]	98	26	1015
75		CLAY; brown, moist, very stiff, low plasticity, with fine-grained sand, trace gravel, layers of sandy clay	CL		15	S	6 8 11	18/18				1026

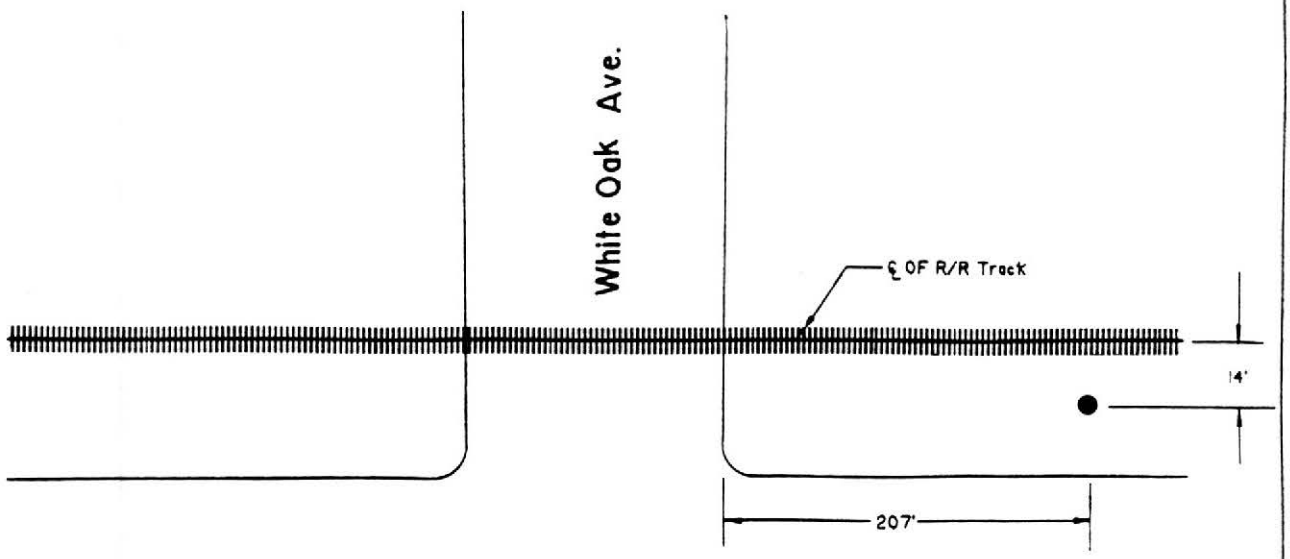
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 7** | Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Samples: Recovery (inches/inches)	Samples: OVA (ppm) [Background]	Samples: Dry Density (pcf)	Samples: Moisture Content (%)	Drilling Time
		CLAYEY SAND; dark yellowish brown, moist, medium dense, medium- to coarse-grained, low plasticity, with gravel	SC	Qal	16	D	10 11	12/12	15 [11]	113	18	1115
		Boring terminated at 81.0 feet. Groundwater measured on 10/08/93 at 38.5 feet below surface.										
85												
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



Oxnard St.

North

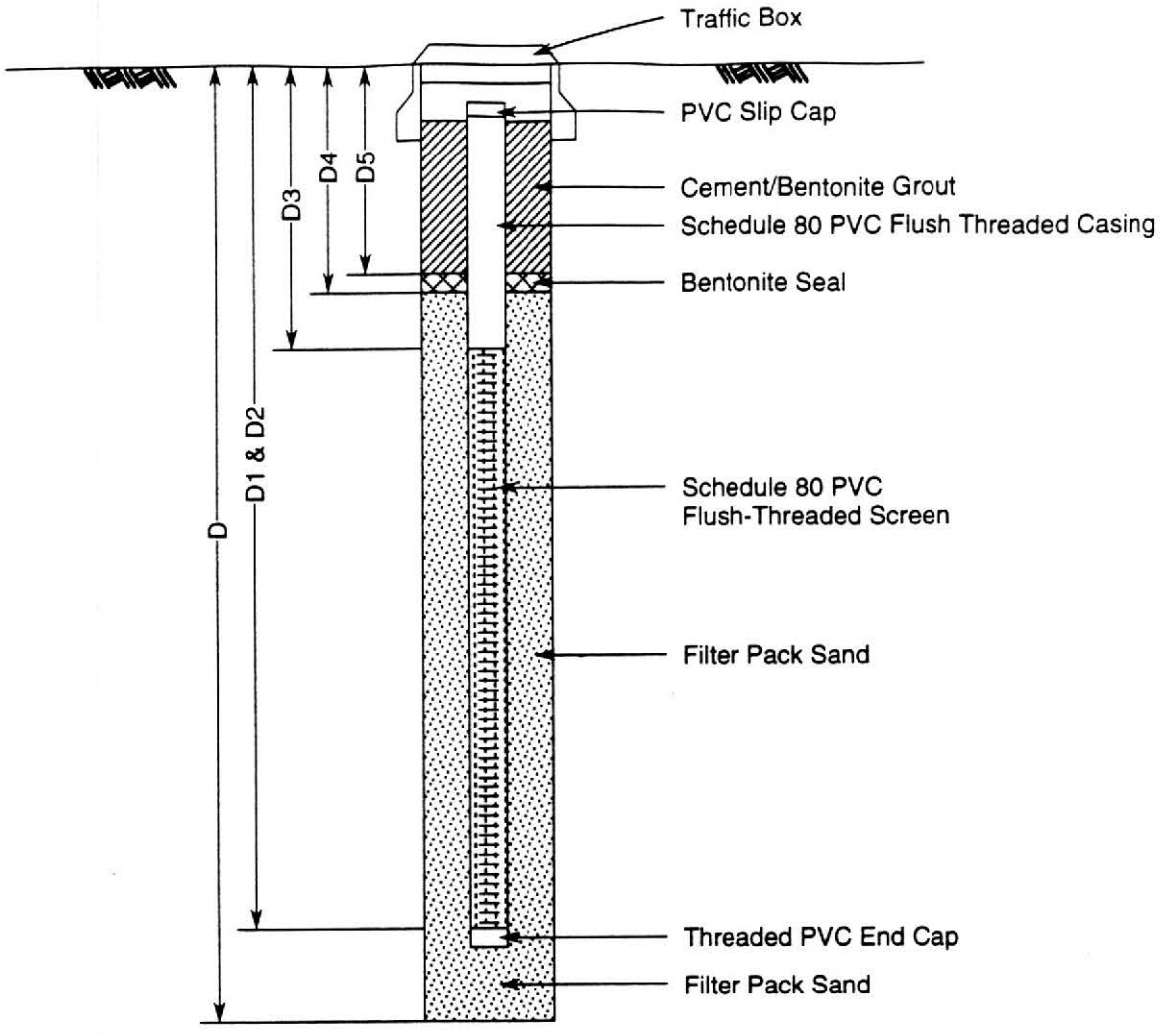
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of
Boring LPE-7

11-93

Figure A-9A



Total Depth (D)	=	79.5	Feet
Total Depth of Casing (D1)	=	60.3	Feet
Depth to Bottom of Well Screen (D2)	=	60.3	Feet
Depth to Top of Well Screen (D3)	=	20.3	Feet
Depth to Bottom of Top Seal (D4)	=	19.0	Feet
Depth to Top of Top Seal (D5)	=	16.0	Feet
Well Casing Diameter	=	2.0	Inches
Well Screen Slot Size	=	0.01	Inch
Filter Pack Sand Type	=	#2/12	Monterey
Bentonite Seal Type	=	1/2 Inch Pellets	

The Earth Technology Corporation

Project No. 93-4955
Geotechnical Investigation
East-West Segment
Metro Red Line

Piezometer Installation Schematic
LPE-7

11-93

Figure A-9B

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE- 8**	Sheet **1** of **4**
Boring Location:	**Victory/Balboa**	Elevation and Datum(feet):	**723-MSL**
Health and Safety:	**Level D**	Date Started: **9/16/93**	Date Finished: **9/16/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **86.0**	Depth to Bedrock(feet): **---**
Drilling Method:	**Mud Rotary**	Number of Samples: **20**	Depth to Water (feet): **33(?)**
Boring Diameter:	**5 inches**	Completion Information:	**Grouted to surface**
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 400-lb and 18-inch drop.**		Logged By: **V.R.Nadeswaran**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		SILTY SAND/SANDY SILT; light yellowish brown to brown, dry to moist, loose/medium stiff, fine-grained sand, low plasticity, trace fine gravel	SM/ML	af								0720
		ALLUVIUM		Qal								
5		SAND; yellowish brown, dry, loose, fine- to medium-grained, trace sub rounded coarse-grained sand, trace silt	SP		1	D	3 4	9/12	5.0 [5.0]	88	6	0730
10		SANDY CLAY; dark yellowish brown, moist, soft to medium stiff, low plasticity, fine- to coarse-grained sand	CL		2	S	2 2 2	10/18	7.0 [7.0]			0748
15		dark yellowish brown, increasing sand content, trace caliche development, moderately calcareous			3	D	3 3	9/12	7.0 [7.0]	102	13	0755

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 8** | Sheet **2** of **4**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SANDY CLAY; dark yellowish brown, moist, stiff, low plasticity, fine- to medium-grained sand, slightly calcareous	CL	Qal	4	S	5 5 5	10/18	7.0 [7.0]			0808
25		increasing sand content, infrequent thin layers of fine sand (SP)			5	D	5 6	11/12	7.0 [7.0]	90	20	0816
30		SILTY SAND; light yellowish brown, moist, medium dense, fine- to medium-grained, non-plastic silt, trace coarse-grained sand	SM		6 7	S S	5 9 13	10/18	7.0 [7.0]			0829
35		wet, increasing sand content, with coarse gravel (up to 1.5" in size)			8	D	11 9	8/12	7.0 [7.0]	101	22	0839
40		SANDY CLAY; strong brown, moist, stiff, high plasticity, fine- to coarse-grained sand	CH									
		SILTY SAND; dark yellowish brown, wet, medium dense, fine- to medium-grained sand, low plasticity, trace coarse-grained sand, slightly calcareous, infrequent layers of fine sand (SP)	SM		9 10	S S	4 7 8	11/18	8.0 [8.0]			0854
45		strong brown with light gray to yellowish brown			11	D	11 13	12/12	8.0 [8.0]	87	34	0914

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 8** | Sheet 3 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		CLAY; orange brown, wet, medium stiff to stiff, high plasticity, trace fine sand	CH	Qal	12	S	2 3 5	18/18	8.0 [8.0]			0950
55		CLAY; pale olive to yellowish brown, wet, medium stiff, medium plasticity, trace fine-grained sand, appears to be horizontally stratified	CL		13	D	4 5	12/12	8.0 [8.0]	80	40	1005
60		SAND; light yellowish brown with intermittent orange brown, wet, very dense, medium- to coarse-grained sand, some non-plastic silt, trace gravel, weak cementation	SP		14	S	14 26 28	14/18	15 [15]			1025
65		increasing amount of subangular to subrounded coarse-grained sand, some subangular fine gravel (up to 1/2" in size) [strong rig chatter at 69', fine gravel in cuttings]			15	D	17 25	7/12	8.0 [8.0]	122	11	1045
70		SILTY SAND; dark olive brown, wet, medium dense, fine-grained sand, trace fine gravel (up to 1/4" in size), well cemented, highly calcareous	SM		16	S	6 9 12	15/18	8.0 [8.0]			1105
75		fine- to medium-grained, trace coarse-grained sand, slightly calcareous			17	D	20 26	9/12	8.0 [8.0]	121	16	1125
		CLAY; dark yellowish brown with light gray mottling, moist, stiff, medium to high plasticity, with fine-grained sand	CL/CH		18	D	7 8	7/12	8.0 [8.0]	107	22	1135

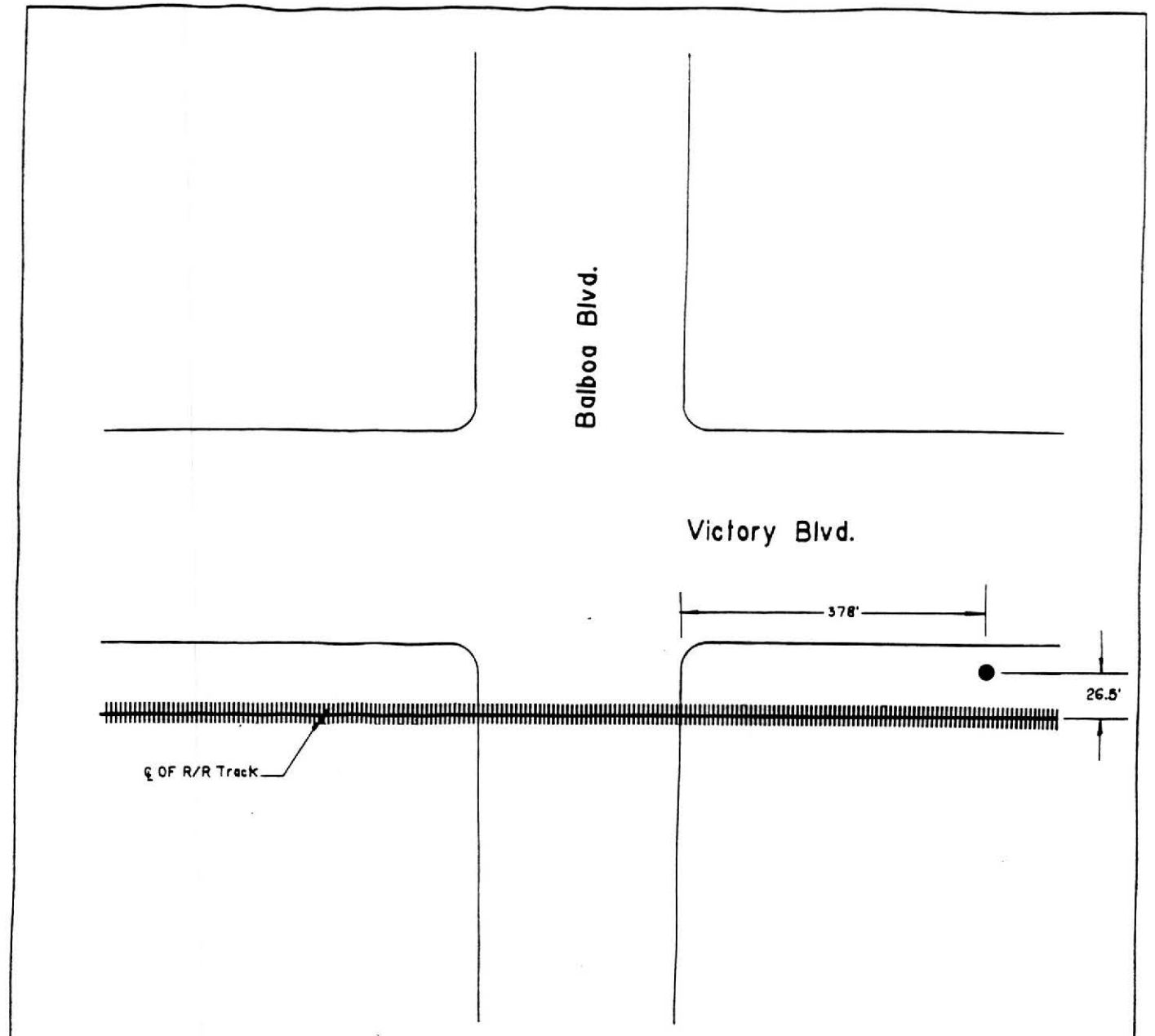
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 8** | Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
85		CLAY; dark yellowish brown with light gray mottling, moist, stiff, medium to high plasticity, with fine-grained sand	CL/CH	Qal	19	S	7 16 20	16/18	8.0 [8.0]			1145
		increasing amount of fine-grained sand			20	D	9 16	8/12	8.0 [8.0]	99	26	1210
		Boring terminated at 86.0 feet . Groundwater estimated at approximately 33 feet below surface.										
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of
Boring LPE-8

11-93

Figure A-10

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE- 9**	Sheet 1 of 4
Boring Location:	**Victory/Woodley**		Elevation and Datum(feet): **717-MSL**
Health and Safety:	**Level D**	Date Started: **9/21/93**	Date Finished: **9/21/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **86.0**	Depth to Bedrock(feet): ---
Drilling Method:	**Mud Rotary**	Number of Samples: **17**	Depth to Water (feet): **46.9**
Boring Diameter:	**5 inches**	Completion Information: **Monitoring well installed**	
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 400-lb and 18-inch drop.**		Logged By: **Hossein Rashidi**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		SILT; very pale brown, dry, soft to medium stiff, non-plastic, some rounded gravel	ML	af								
		ALLUVIUM		Qal								
5		SANDY CLAY; dark brown, moist, medium stiff, medium plasticity, fine-grained sand	CL		1	D	3 3	8/12	8.0 [8.0]	100	19	0727
10		brown, medium stiff to stiff, highly calcareous			2	S	3 3 4	10/18	8.0 [8.0]			0738
15		dark yellowish brown			3	D	4 4	10/12	8.0 [8.0]	101	25	0745

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 9** | Sheet 2 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SANDY CLAY; dark brown, moist, very stiff, low plasticity, fine-grained sand	CL	Qal	4	S	4 7 11	12/18	8.0 [8.0]			0752
25		CLAYEY SAND/SILTY SAND; dark yellowish brown, moist, loose, fine-grained sand, very low plasticity clay and silt	SC/SM		5	D	7 4	10/12	8.0 [8.0]	109	13	0755
30		light gray, medium dense, trace gravel			6	S	4 9 15	13/18	9.0 [9.0]			0801
35		SAND; dark gray, moist, very dense, fine- to coarse-grained sand, with subangular gravel [rig chatter from 36'to 38']	SP/SW		7	D	40 50	8/12		126	11	0815
40		light brown, fine- to medium-grained			8	S	14 40 35	7/18	9.0 [8.0]			0830
45		CLAYEY SAND; light brown, wet, medium dense, fine- to coarse-grained, low plasticity	SC		9	D	12 16	5/12	9.0 [9.0]	110	22	0845

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE- 9** | Sheet **3** of **4**

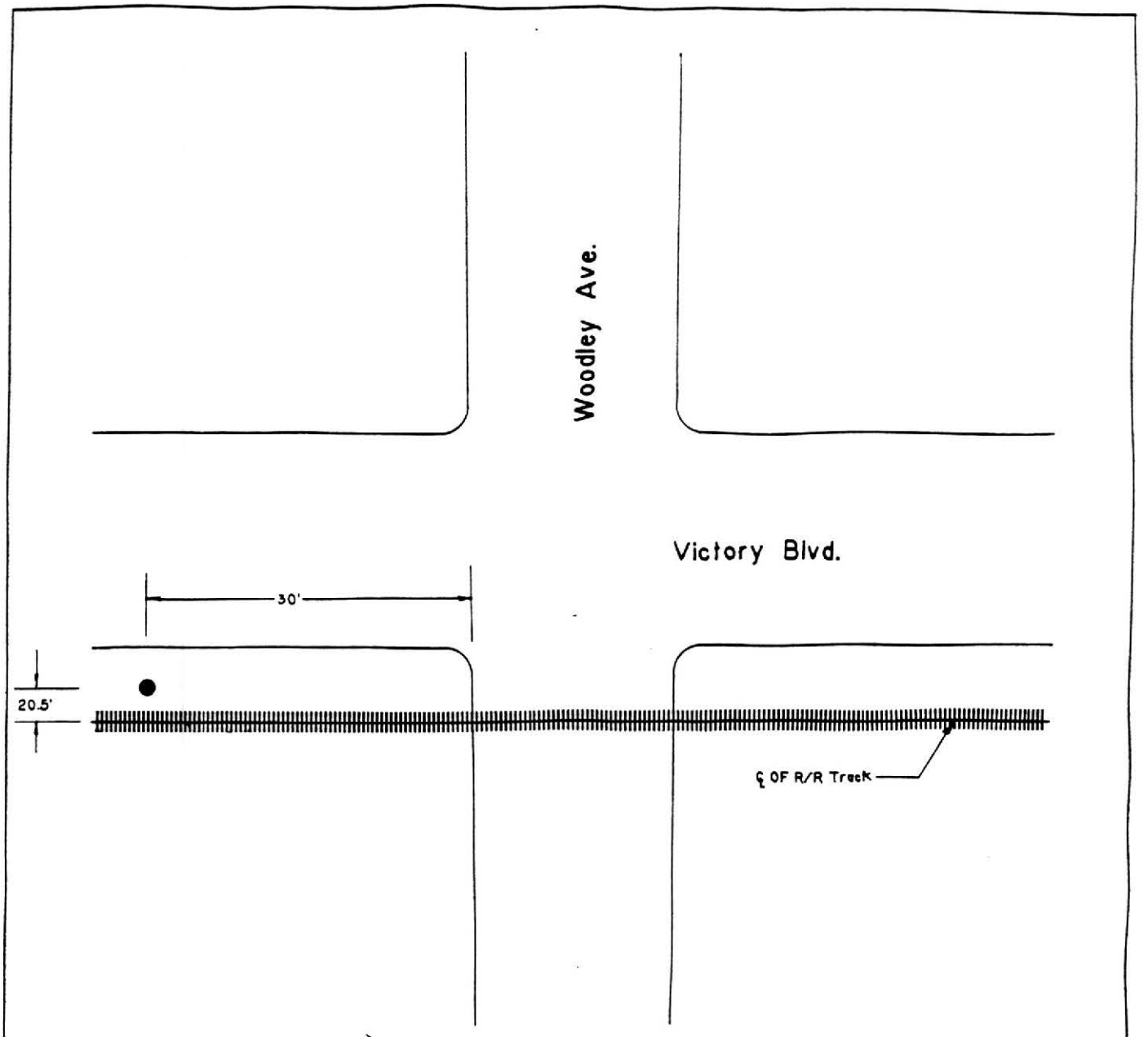
Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		CLAYEY SAND; light to medium dark gray, moist, medium dense, fine-grained sand, low plasticity, trace non-plastic silt	SC	Qal	10	S	4 7 16	7/18	10 [9.0]			0853
55		CLAY; gray, moist, stiff, low to medium plasticity, with fine-grained sand, infrequent layers of fine- to medium-grained sand (SP)	CL		11	D	7 9	12/12	11 [10]	97	29	0915
60		SANDY CLAY; pale olive, moist, very stiff, medium plasticity, fine-grained sand, highly calcareous	CL		12	S	6 14 17	12/18	11 [10]			0923
65		sand content decreases			13	D	7 10	12/12	13 [10]	109	21	0936
70		SILTY SAND; olive brown, moist, very dense, fine-grained, low plasticity	SM		14	S	17 28 25	18/18	14 [10]			0953
75		CLAY; olive brown, moist, very stiff, medium plasticity, with fine- to medium-grained sand, trace gravel, slightly calcareous	CL		15	D	9 11	12/12	14 [10]	96	30	1007

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name:	Metro Rail: San Fernando Valley East-West Segment		
Project Number:	93-4955	Boring Number: LPE- 9	Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) (Background)	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		CLAY; olive brown, moist, hard, medium plasticity, trace fine-grained sand, slightly calcareous	CL	Qal	16	S	9 20 25	8/18	16 [12]			1035
85		light olive brown, stiff			17	D	8 10	11/12	16 [14]	94	30	1048
		Boring terminated at 86.0 feet. Groundwater measured on 10/08/93 at 46.6 feet below surface.										
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

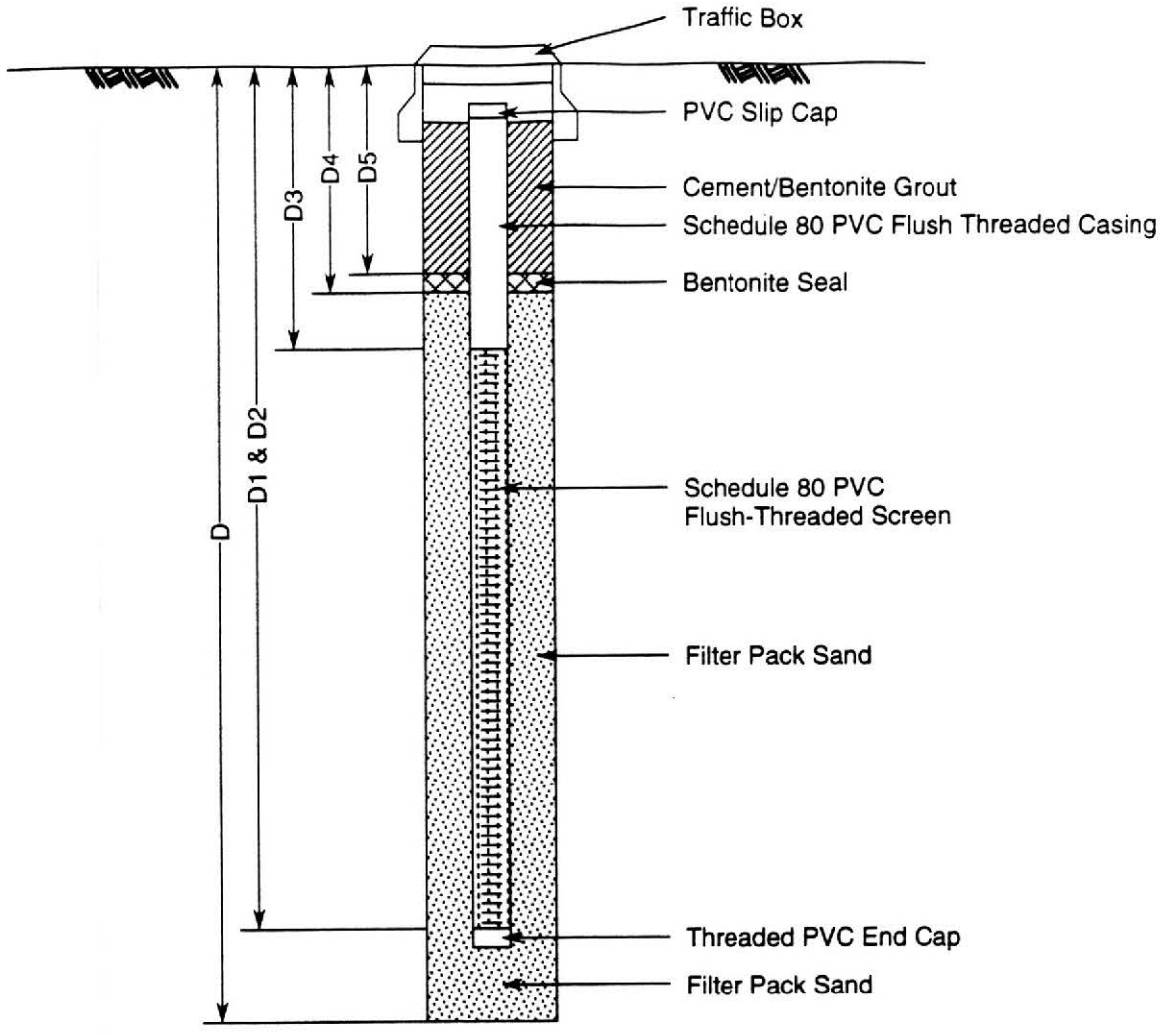
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of Boring LPE-9

11-93

Figure A-8A



Total Depth (D)	=	82.8	Feet
Total Depth of Casing (D1)	=	82.8	Feet
Depth to Bottom of Well Screen (D2)	=	82.8	Feet
Depth to Top of Well Screen (D3)	=	12.8	Feet
Depth to Bottom of Top Seal (D4)	=	9.0	Feet
Depth to Top of Top Seal (D5)	=	3.0	Feet
Well Casing Diameter	=	2.0	Inches
Well Screen Slot Size	=	0.01	Inch
Filter Pack Sand Type	=	#2/12	Monterey
Bentonite Seal Type	=	1/2 Inch Pellets	

The Earth Technology Corporation

Project No. 93-4955
Geotechnical Investigation
East-West Segment
Metro Red Line

Piezometer Installation Schematic
LPE-9

11-93

Figure A-11B

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE-10**	Sheet **1** of **4**
Boring Location:	**Oxnard/Sepulveda**	Elevation and Datum(feet): **705-MSL**	
Health and Safety:	**Level D**	Date Started: **9/21/93**	Date Finished: **9/21/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **85.6**	Depth to Bedrock(feet): **---**
Drilling Method:	**Mud Rotary**	Number of Samples: **17**	Depth to Water (feet): **77.4**
Boring Diameter:	**5 inches**	Completion Information: **Monitoring well installed**	
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 300-lb and 18-inch drop.**		Logged By: **Fred Schilling**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		Sand/Gravel (Railroad Ballast)		af								
		ALLUVIUM		Qal								
5		CLAY/SANDY CLAY; pale brown, moist, medium stiff, medium plasticity, fine-grained sand, massive, highly carbonaceous	CL		1	D	3 5	7/12	5.5 [4.0]	99	17	0740
10		increasing sand content			2	S	3 4 4	14/18	4.3 [4.0]			0755
15		slightly calcareous, indistinct layering			3	D	4 5	8/12	4.9 [4.0]	93	22	0805

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-10** | Sheet 2 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		CLAY/SANDY CLAY; pale brown, moist, medium stiff to stiff, medium plasticity, fine- to coarse-grained sand, slightly calcareous	CL	Qal	4	S	3 4 4	14/18	4.6 [4.0]			0812
25		SANDY CLAY; pale brown, moist, stiff, low plasticity, fine-grained sand, carbonaceous, possibly concretionary	CL		5	D	9 15	10/12	5.9 [5.0]	113	17	0820
30		SANDY CLAY/CLAYEY SAND; pale brown with orange mottling, moist, very stiff/medium dense , medium plasticity, fine- to medium- grained sand, trace coarse-grained sand, highly carbonaceous, indistinctly bedded	CL/SC		6	S	6 9 13	18/18	6.3 [6.3]			0830
35		CLAYEY SAND; brown, moist, medium dense, fine-grained, medium plasticity, with gravel, massive to crudely bedded [intermittent rig chatter from 35' to 40']	SC		7	D	16 25	9/12	6.3 [6.3]	119	15	0840
40		SILTY SAND; brown, moist, very dense, fine-grained sand, low plasticity, massive [regular rig chatter]	SM		8	S	12 21 30	14/18	6.5 [6.5]			0845
45		dense, fine- to medium-grained sand, crudely bedded [periodic rig chatter to 46', smoother drilling below]			9	D	22 25	8/12	7.0 [6.5]	111	14	0904

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-10** | Sheet 3 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SILTY SAND; brown with orange mottling, moist, dense, fine- to coarse-grained, low plasticity, crudely bedded, moderately calcareous [smooth drilling]	SM	Qal	10	S	17 24 41	9/18	7.3 [6.7]			0915
55		SANDY SILT/SANDY CLAY; brown with light brown mottling, moist, hard, low plasticity clay and silt, fine- to medium-grained sand, some gravel, crudely bedded	ML-CL		11	D	23 40	8/12	7.3 [6.9]	108	22	0945
		SILTY SAND/CLAYEY SAND; brown, moist, dense, fine- to coarse-grained, low plasticity clay and silt, massive, slightly calcareous, [rig chatter to 60']	SM/SC									
60					12	S	10 11 22	13/18	7.8 [7.3]			1000
65		SILTY SAND; brownish yellow, moist, very dense, fine-grained, low plasticity silt, some fine- to coarse-gravel [up to 1" in size] [irregular rig chatter]	SM		13	D	70	2/12	7.8 [7.5]	110	18	1010
70		brown, trace coarse-grained sand, massive [rig chatter]			14	S	30 61	12/12	8.3 [7.8]			1030
75		fine- to medium-grained sand			15	D	100/7"	4/7	8.5 [8.0]	116	18	1045

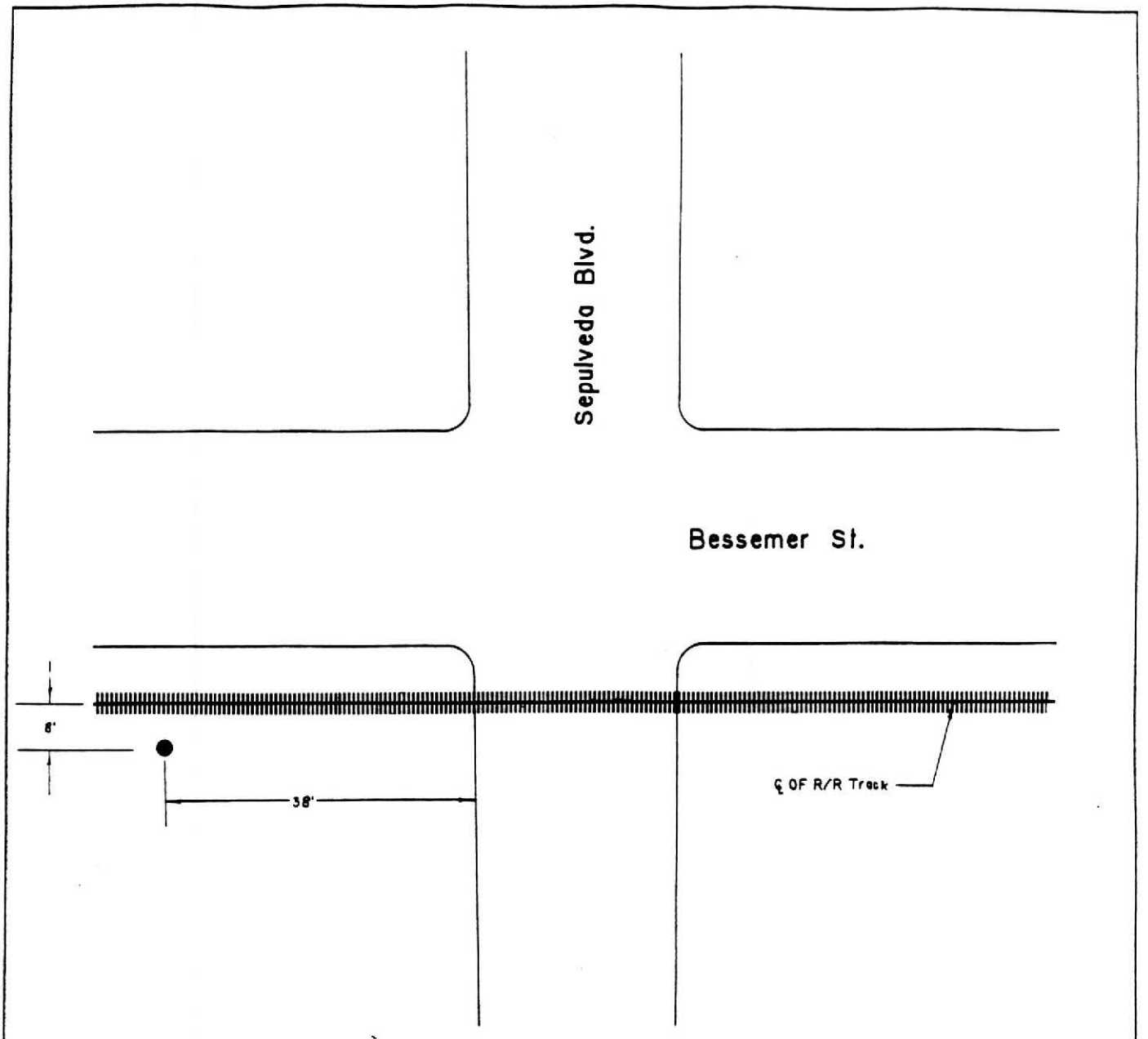
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name:	Metro Rail: San Fernando Valley East-West Segment		
Project Number:	93-4955	Boring Number:	LPE-10

Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SANDY CLAY; brown, moist, hard, medium plasticity, fine-grained sand, slightly calcareous, crudely stratified	CL	Qal	16	S	16 24 27	8/18	8.9 [8.3]			1110
85		SILTY SAND; brown, moist, very dense, fine-grained sand, non-plastic, layer of fine-grained sand (SP)	SM		17	D	100/7"	5/7	10 [8.5]	111	20	1135
		Boring terminated at 85.6 feet. Groundwater measured on 10/08/93 at 77.4 feet below surface.										
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

Not to Scale

The Earth Technology Corporation

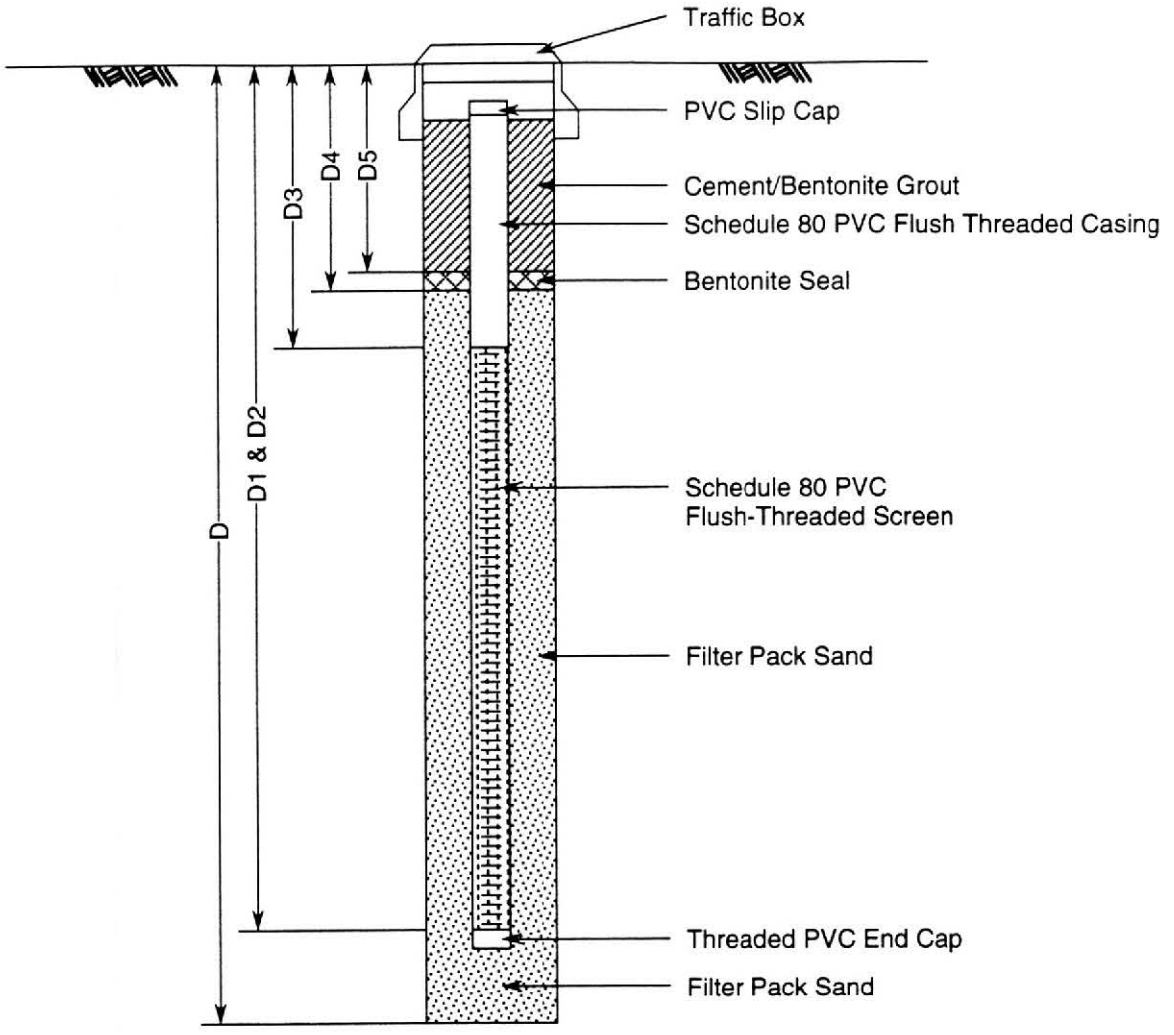
Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of
Boring LPE-10

11-93

Figure A-12A



Total Depth (D)	=	85.0	Feet
Total Depth of Casing (D1)	=	85.0	Feet
Depth to Bottom of Well Screen (D2)	=	85.0	Feet
Depth to Top of Well Screen (D3)	=	15.0	Feet
Depth to Bottom of Top Seal (D4)	=	10.0	Feet
Depth to Top of Top Seal (D5)	=	5.0	Feet
Well Casing Diameter	=	2.0	Inches
Well Screen Slot Size	=	0.01	Inch
Filter Pack Sand Type	=	#2/12	Monterey
Bentonite Seal Type	=	1/2 Inch Pellets	

The Earth Technology Corporation

Project No. 93-4955
Geotechnical Investigation
East-West Segment
Metro Red Line

Piezometer Installation Schematic
LPE-10

11-93

Figure A-12B

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**				
Project Number:	**93-4955**	Boring Number:	**LPE-11**	Sheet 1 of 4	
Boring Location:	**Van Nuys/ Bessemer**		Elevation and Datum(feet): **698-MSL**		
Health and Safety:	**Level D**	Date Started: **9/17/93**		Date Finished: **9/17/93**	
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **86.0**		Depth to Bedrock(feet): ---	
Drilling Method:	**Mud Rotary**	Number of Samples: **17**		Depth to Water (feet): **65(?)**	
Boring Diameter:	**5 inches**	Completion Information: **Grouted to surface**			
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 400-lb and 18-inch drop.**		Logged By: **V.R.Nadeswaran**		Checked By: **Grant Miller**	

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		SILTY SAND; yellowish brown, dry to moist, loose to medium dense, fine- to medium-grained, low plasticity, trace coarse-grained sand and fine gravel	SM	af								0735
		ALLUVIUM		Qal								
5		CLAY; dark yellowish brown, moist, soft, medium plasticity, some fine-grained sand	CL		1	D	2 2	7/12	5.0 [5.0]	97	20	0740
10		yellowish brown, medium stiff, slightly calcareous			2	S	3 3 4	10/18	5.0 [5.0]			0750
15		SANDY CLAY; dark yellowish brown, moist, medium stiff, medium plasticity, fine- to coarse-grained sand, trace caliche (?) lenses, slightly calcareous	CL		3	D	3 4	9/12	6.0 [6.0]	104	18	0800

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

The Earth Technology Corporation

Project Name:	Metro Rail: San Fernando Valley East-West Segment		
Project Number:	93-4955	Boring Number: LPE-11	Sheet 2 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SANDY CLAY; dark yellowish brown with gray shade, moist, medium stiff, medium plasticity, fine- to coarse-grained sand, slightly calcareous	CL	Qal	4	S	2 2 2	9/18	6.0 [6.0]			0810
25		strong brown with orange shade, stiff, fine- to medium-grained sand			5	D	8 9	7/12	7.0 [7.0]	105	22	0824
30		strong brown with gray mottling			6	S	3 5 10	15/18	7.0 [7.0]			0840
35		SANDY CLAY/SILTY CLAY; dark yellowish brown, moist, stiff, low plasticity silt and clay, fine-grained sand	CL-ML		7	D	7 8	8/12	10 [10]	105	17	0855
40		CLAYEY SAND; dark yellowish brown, moist, medium dense, fine- to coarse-grained, low plasticity	SC		8	S	7 10 11	14/18	10 [10]			0925
45		SILTY SAND; dark yellowish brown, moist, medium dense, fine- to medium-grained sand, low plasticity, trace subangular coarse-grained sand and subangular fine gravel (up to 1/4" in size), weak cementation	SM		9	D	15 17	9/12	10 [10]	124	10	0940

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-11** | Sheet 3 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SAND; dark yellowish brown, moist, dense, fine- to coarse-grained, some fine gravel (up to 1/2" in size), some silt, slightly calcareous	SP-SM	Qal	10	S	12 17 21	6/18	10 [10]			0955
		increased gravel portion [rig chatter]										
55		SILTY SAND; dark yellowish brown, moist, medium dense, fine-grained, non-plastic	SM		11	D	10 15	8/12	10 [10]	102	16	1013
60		SANDY CLAY/CLAYEY SAND; dark yellowish brown, moist, very stiff/medium dense, low plasticity, fine-grained sand	CL/SC		12	S	8 14 16	12/18	10 [10]			1028
65		SILTY SAND; dark yellowish brown, wet, dense, medium-grained sand, trace fine- to coarse-grained sand, low plasticity	SM		13	D	20 35	9/12	10 [10]	118	12	1042
70		some subangular, fine gravel (up to 1" in size) and increased coarse-grained sand content [rig chatter from approximately 72' to 74']			14	S	45 55/4"	6/10	10 [10]			1100
75		[rig chatter from 76' to 78']			15	D	60	3/6	10 [10]	124	13	1120
		CLAYEY SAND; see below	SC									

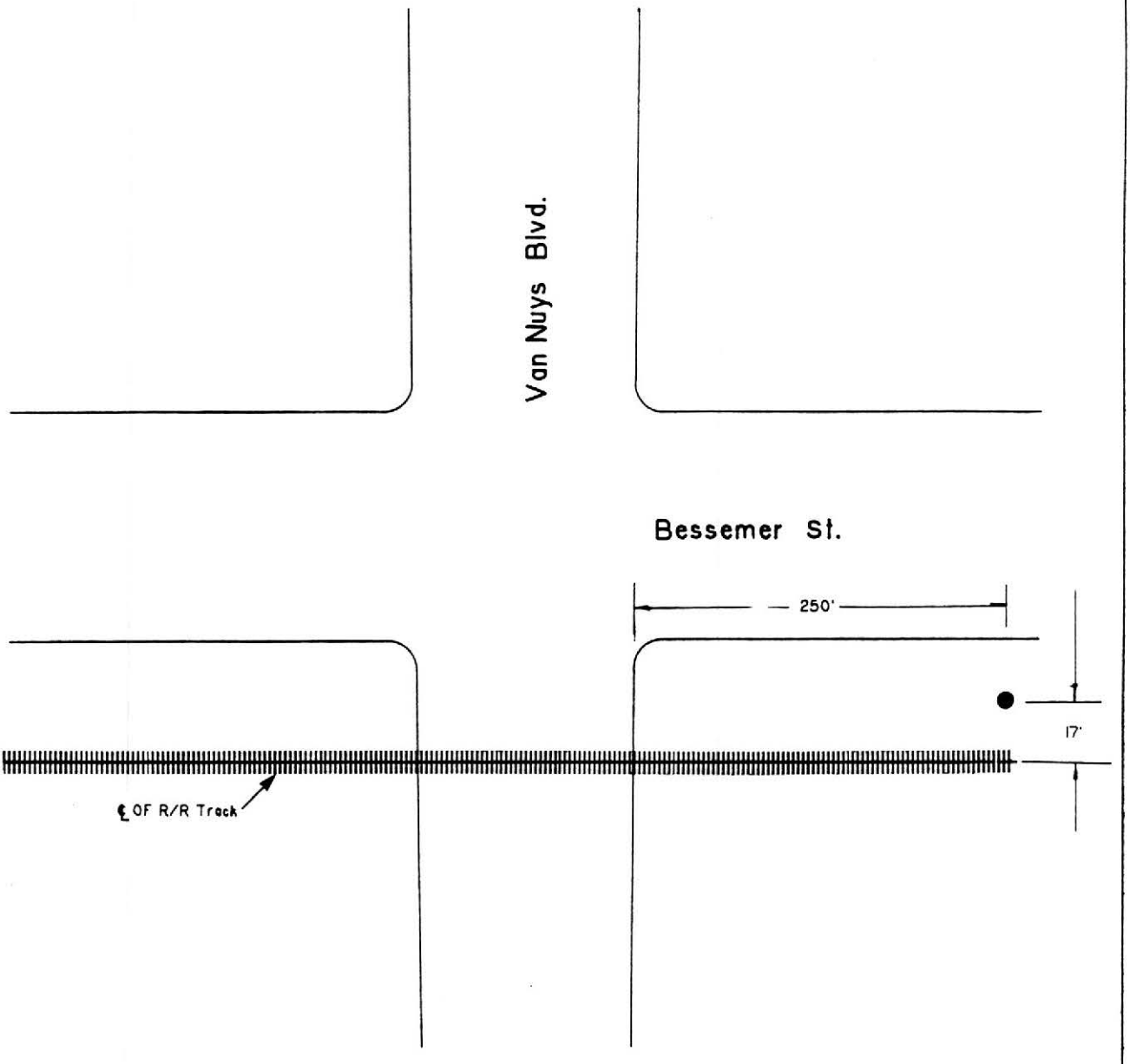
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-11** | Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Samples: Recovery (inches/inches)	Samples: OVA (ppm) [Background]	Samples: Dry Density (pcf)	Samples: Moisture Content (%)	Drilling Time
		CLAYEY SAND; dark yellowish brown, wet, dense, fine-grained sand, low plasticity	SC	Qal	16	S	11 15 23	9/18	12 [12]			1135
85		SILTY SAND; dark yellowish brown, wet, medium dense, fine- to medium-grained sand, low plasticity, thin layer of sand (SP)	SM		17	D	15 20	7/12	14 [14]	110	19	1150
		Boring terminated at 86.0 feet. Groundwater estimated to be at approximately 65 feet below surface.										
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of
Boring LPE-11

11-93

Figure A-13

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE-12**	Sheet **1** of **4**
Boring Location:	**Fulton/Burbank**		Elevation and Datum(feet): **674-MSL**
Health and Safety:	**Level D**	Date Started: **9/17/93**	Date Finished: **9/17/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **80.5**	Depth to Bedrock(feet): ---
Drilling Method:	**Mud Rotary**	Number of Samples: **17**	Depth to Water (feet): ---
Boring Diameter:	**5 inches**	Completion Information: **Grouted to surface**	
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 300-lb and 18-inch drop.**		Logged By: **Fred Schilling**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		Sand/Fine Gravel (Railroad Ballast)		af								
		ALLUVIUM		Qal								
5		SILTY SAND; light brownish gray, moist, loose, fine-grained, low plasticity, massive	SM		1	D	3 5	7/12		105	16	0759
10		gravel and coarse-grained sand [no sample attempted]	GM?									
		SANDY SILT/SANDY CLAY; brown, moist, medium stiff, low plasticity silt and clay, fine-grained sand, massive	ML/CL		2	S	2 3 3	10/18	4.0 [4.0]			
15		SANDY SILT/SILTY SAND; light yellowish brown, moist, medium stiff/loose, medium plasticity, fine-grained sand, massive	ML/SM		3	D	3 5	8/12	4.0 [4.0]	102	17	--

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-12** | Sheet 2 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SILTY SAND; grayish brown, moist, medium dense, fine-grained, low plasticity, trace gravel	SM	Qal	4	S	4 5 5	12/18	4.0 [4.0]			0841
25		SANDY SILT; grayish brown, moist, stiff, low plasticity, fine- to medium-grained sand	ML		5	D	6 14	10/12	4.0 [4.0]	106	21	0852
		SILTY SAND; grayish brown mottled with yellowish red, moist, dense, some silt and gravel, indistinct sand/silt layering	SM		6	S	14 18 18	14/18	5.0 [4.0]			0859
30												
		SILTY SAND/CLAYEY SAND; light olive brown, moist, dense, fine-grained, low plasticity silt and clay	SM/SC		7	D	30 40	9/12	4.0 [4.0]	117	16	0915
35												
		SANDY SILT; light olive brown, moist, very stiff, low plasticity, fine-grained sand, indistinct sand/silt layering	ML		8	S	6 9 10	18/18	4.0 [3.0]			0941
40												
		SILTY SAND/CLAYEY SAND; light yellowish brown, moist, medium dense to dense, fine-grained, low plasticity silt and clay, indistinct layering (finer/coarser) of sand	SM/SC		9	D	18 21	8/12	3.0 [3.0]	120	15	1000
45												
		light olive brown			10	S	6 12 19	14/18	5.0 [4.0]			

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-12** | Sheet 3 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SANDY SILT; brown, moist, hard, low plasticity, fine- to medium-grained sand, slightly carbonaceous, thin layer of fine- to coarse-grained sand (SP/SM)	ML	Qal	11	D	20 30	7/12	3.0 [3.0]	111	16	1030
55		SILTY SAND; light yellowish brown, moist, very dense, medium- to coarse-grained, low plasticity, some fine to coarse gravel	SM		12	S	80	3/6				1040
60		SAND/SILTY SAND ; light yellowish brown, moist, very dense, fine- to coarse-grained, some non-plastic silt and gravel, indistinctly bedded	SP/SM		13	D	70/6.5"	5/6.5	5.0 [5.0]	83	23	1100
65		SAND; light yellowish brown speckled with black, moist, very dense, fine-grained, trace non-plastic silt, some gravel, indistinctly bedded, calcareous	SP		14	S	35 55	12/12	3.0 [3.0]			1120
70		gray, periodic gravel lenses (?)			15	D	70	5/6	4.0 [4.0]	99	19	1200
75		SILTY SAND; light olive brown, moist, very dense, fine-grained, low plasticity, indistinctly bedded			16	S	20 36 52	13/18	4.0 [3.0]			1220

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

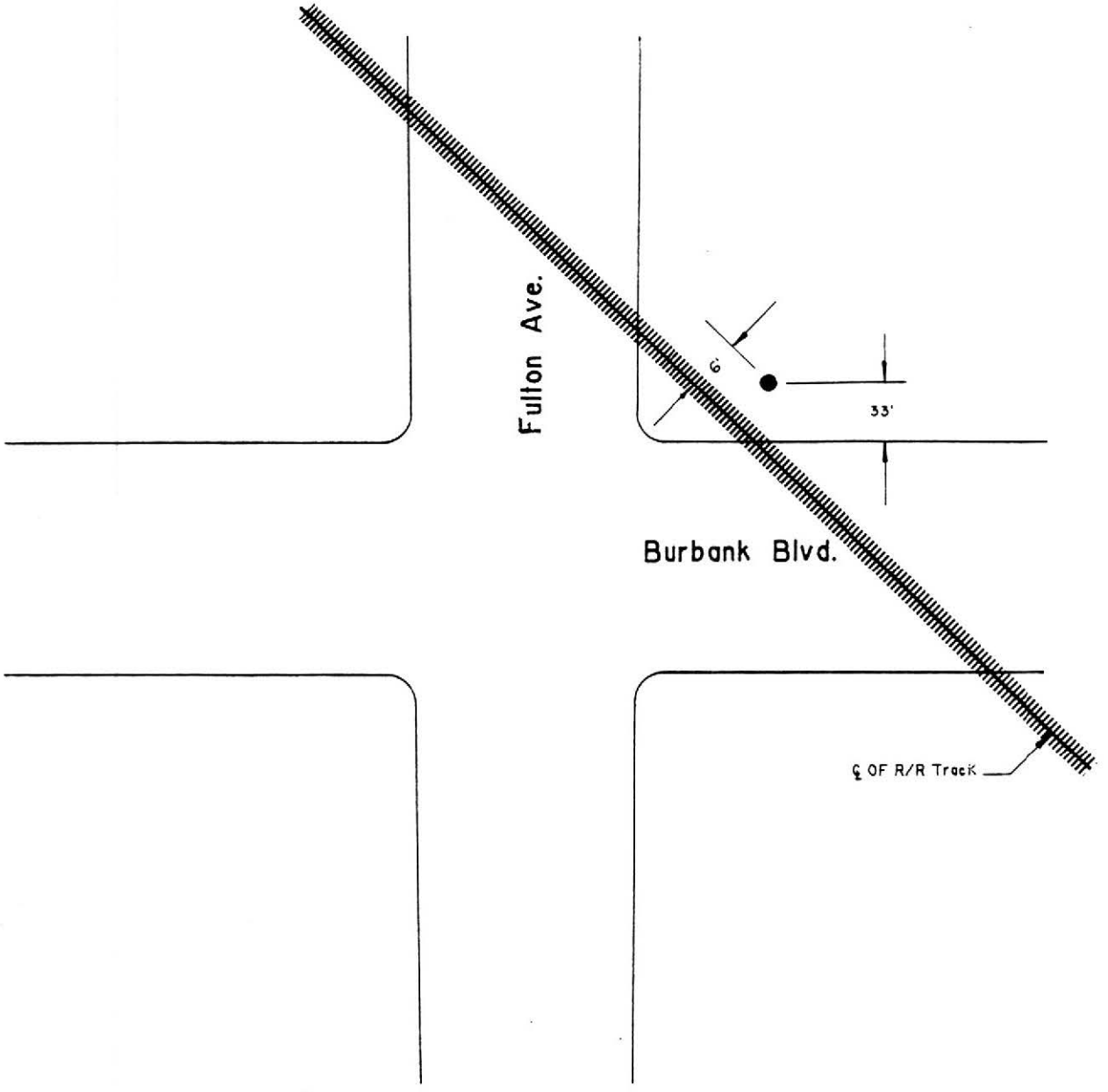
The Earth Technology Corporation

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-12** | Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Samples: Recovery (inches/inches)	Samples: OVA (ppm) [Background]	Samples: Dry Density (pcf)	Samples: Moisture Content(%)	Drilling Time
		SILTY SAND; light yellowish brown, moist, very dense, fine-grained, non-plastic, indistinctly bedded	SM	Qal	17	D	70	4/6	3.0 [3.0]	102	14	1240
		Boring terminated at 80.5 feet.										
85												
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of
Boring LPE-12

11-93

Figure A-14

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE-13**	Sheet **1** of **4**
Boring Location:	**Laurel Canyon/Chandler**	Elevation and Datum(feet): **650-MSL**	
Health and Safety:	**Level D**	Date Started: **9/20/93**	Date Finished: **9/20/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **81.0**	Depth to Bedrock(feet): ---
Drilling Method:	**Mud Rotary**	Number of Samples: **18**	Depth to Water (feet): ---
Boring Diameter:	**5 inches**	Completion Information: **Grouted to surface**	
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 300-lb and 18-inch drop.**		Logged By: **Fred Schilling**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		Sand/Gravel (Railroad Ballast)		af								
		ALLUVIUM		Qal								
5		SILTY SAND; light brownish gray, moist, loose, fine-grained, non-plastic, white stringers, massive, periodic gravelly layers [intermittent rig chatter from 6' to 14']	SM		1	D	4 8	9/12	8.2 [8.3]	90	19	0750
10		SAND-SILTY SAND; grayish brown, moist, dense, some gravel and non-plastic silt, crudely layered	SP-SM		2	S	6 14 18	10/18	8.2 [8.3]			0800
15		SILTY SAND; pale brown, moist, medium dense, fine- to coarse-grained, non-plastic	SM		3	D	12 17	7/12	8.2 [8.4]	107	10	0810

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-13** | Sheet 2 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
25		SANDY SILT; brown, moist, stiff, low plasticity, fine-grained sand, crudely layered, slightly calcareous	ML	Qal	4	S	5 6 7	12/18	8.0 [8.0]			0823
		SILTY SAND; brown, moist, medium dense, fine-grained, non-plastic, trace fine gravel, slightly calcareous	SM		5	D	17 22	7/12	7.9 [7.9]	121	9	0835
30		SANDY SILT; brown, moist, very stiff, low plasticity, fine-grained sand, massive	ML		6	S	5 8 8	14/18	7.9 [7.6]			0845
35		SANDY CLAY; brown, moist, very stiff, low plasticity, fine-grained sand, massive, thin layer of silty sand (SM)	CL		7	D	16 30	9/12	7.7 [7.8]	109	18	0900
40		SANDY SILT/SILTY SAND; brown mottled reddish brown, moist, hard/dense, non-plastic, fine-grained sand, slightly carbonaceous, thinly layered	ML/SM		8	S	12 14 18	16/18	7.9 [7.4]			0908
		SANDY CLAY; brown, moist, very stiff, medium plasticity, fine- to coarse-grained sand, massive	CL		9	D	16 24	8/12	7.1 [6.8]	111	20	0915
45		low to medium plasticity clay, trace coarse-grained sand			10	S	7 8 10	16/18	6.7 [6.3]			0945
		SANDY SILT; brown, moist, hard, low to medium plasticity, fine- to medium-grained sand, crudely layered, highly carbonaceous, slightly calcareous	ML		11	D	18 32	8/12	6.3 [5.7]	113	20	1005

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name:	Metro Rail: San Fernando Valley East-West Segment		
Project Number:	93-4955	Boring Number:	LPE-13

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SANDY SILT; brown, moist, hard, low to medium plasticity, fine- to medium-grained sand, crudely layered, highly carbonaceous, slightly calcareous	ML	Qal								
		increasing clay content										
55		SANDY SILT/SILTY SAND; brown, moist, hard/dense, low to medium plasticity, fine-grained sand	ML/SM		12	S	15 20 27	4/18	5.7 [5.5]			1020
		SILTY SAND; light yellowish brown, moist, very dense, fine-grained, low plasticity	SM		13	D	71	5/6	5.7 [5.2]	103	27	1052
60		light brownish gray			14	S	30 60	12/12	5.3 [5.0]			1104
65		non-plastic silt, massive			15	D	39 50	7/12	4.8 [4.8]	101	10	1126
70		fine- to coarse-grained sand, crudely layered			16	S	16 25 40	12/18	4.9 [4.8]			1154
75		yellowish orange mottling, few thin gravel beds			17	D	80	4/6	4.8 [4.6]	106	18	1218
		[rig chatter at 78']										

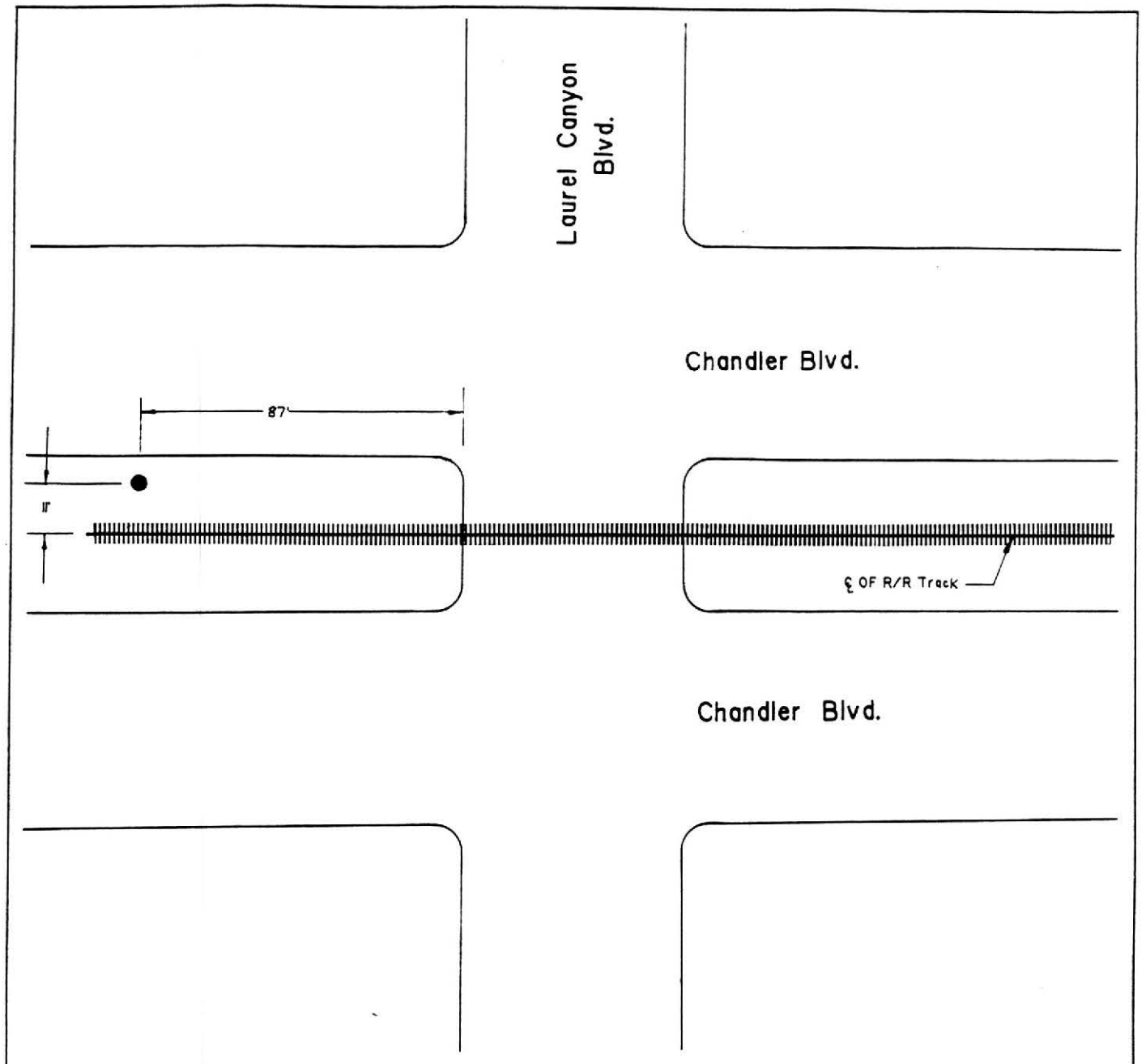
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

The Earth Technology Corporation

Project Name:	Metro Rail: San Fernando Valley East-West Segment		
Project Number:	93-4955	Boring Number: LPE-13	Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Samples: Type	Samples: Blow Count (no./6 inches)	Samples: Recovery (inches/inches)	Samples: OVA (ppm) [Background]	Samples: Dry Density (pcf)	Samples: Moisture Content(%)	Drilling Time
		SILTY SAND; light brownish gray, moist, very dense, fine- to coarse-grained, low plasticity, crudely layered	SM	Qal	18	S	30 58	10/12	4.8 [4.8]			1230
		Boring terminated at 81.0 feet.										
85												
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



North

Not to Scale

The Earth Technology Corporation

Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of
Boring LPE-13

11-93

Figure A-15

The Earth Technology Corporation

Project Name:	**Metro Rail: San Fernando Valley East-West Segment**		
Project Number:	**93-4955**	Boring Number: **LPE-14**	Sheet 1 of 4
Boring Location:	**Lankershim/Chandler**		Elevation and Datum(feet): **632-MSL**
Health and Safety:	**Level D**	Date Started: **9/20/93**	Date Finished: **9/20/93**
Drilling Equipment:	**Mayhew 1000**	Total Depth (feet): **85.6**	Depth to Bedrock(feet): ---
Drilling Method:	**Mud Rotary**	Number of Samples: **16**	Depth to Water (feet): ---
Boring Diameter:	**5 inches**	Completion Information: **Monitoring well installed**	
Hammer Information: **SPT Hammer: 140-lb and 30-inch drop. Downhole Hammer: 400-lb and 18-inch drop.**		Logged By: **Hossein Rashidi**	Checked By: **Grant Miller**

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content(%)	Drilling Time
		SILTY SAND/SANDY SILT; white, dry, loose to soft, fine- to medium-grained sand, low plasticity	SM/ML	af								
		ALLUVIUM		Qal								
5		SANDY SILT; dark brown, moist, medium stiff, non-plastic, fine-grained sand	ML		1	D	2 3	8/12	5.0 [5.0]	96	14	0723
10					2	S	2 2 2	5/18	5.0 [5.0]			0730
15		SILTY SAND; dark yellowish brown, moist, loose, fine- to medium-grained, non-plastic, slightly calcareous	SM		3	D	5 6	9/12	5.0 [5.0]	105	15	0742

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-14** | Sheet 2 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SAND; gray, moist, medium dense to dense, medium- to coarse-grained, some non-plastic silt, trace coarse gravel (up to 1" in size)	SP-SM	Qal	4	S	8 18 19	10/18	5.0 [5.0]			0750
25		light gray			5	D	20 18	8/12	7.0 [7.0]	115	11	0759
		GRAVEL/SAND; coarse-grained sand and some fine gravel (up to 3/4" in size)	SP/GP									
30		SILTY SAND; dark brown, moist, medium dense, fine-grained, low plasticity, slightly calcareous	SM		6	S	8 10 9	13/18	9.0 [7.0]			
35		dark grayish brown			7	D	9 14	9/12	9.0 [7.0]	112	18	0825
40		SAND; dark gray, moist, very dense, coarse-grained, trace granitic coarse gravel (up to 1 1/2" in size), some silt	SP-SM		8	S	12 33 42	10/18	7.0 [7.0]			0841
45		light brown, some angular fine gravel (up to 1/2" in size), increasing sand content			9	D	25 35	8/12	7.0 [7.0]	116	13	0856

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Project Name: **Metro Rail: San Fernando Valley East-West Segment**

Project Number: **93-4955** | Boring Number: **LPE-14** | Sheet 3 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SAND; gray, moist, very dense, coarse-grained, some silt and angular gravel	SP-SM	Qal	10	S	12 70	5/12	7.0 [7.0]			0909
55		SAND to SANDY GRAVEL; pale brown, moist, very dense, fine- to medium-grained sand and rounded to subangular fine gravel (up to 1/2" in size) [frequent rig chatter to 61']	SP-GP		11	D	40 50/4"	6/10	7.0 [7.0]	113	13	0935
60		light brownish gray, wet, coarse-grained, some silt [loud rig chatter from 61' to 65']			12	S	70 30/2"	4/8	9.0 [9.0]			0945
65		no recovery [rig chatter]				D	45 55/5"	0/11				1016
70		grayish brown, trace fine- to medium-grained sand, driller indicates possible caving condition during sampling			13	D	60	3/6	9.0 [9.0]	113	14	
75		dark yellowish brown with rusty appearance, moist			14	S	50 50/4"	5/10	9.0 [9.0]			1055

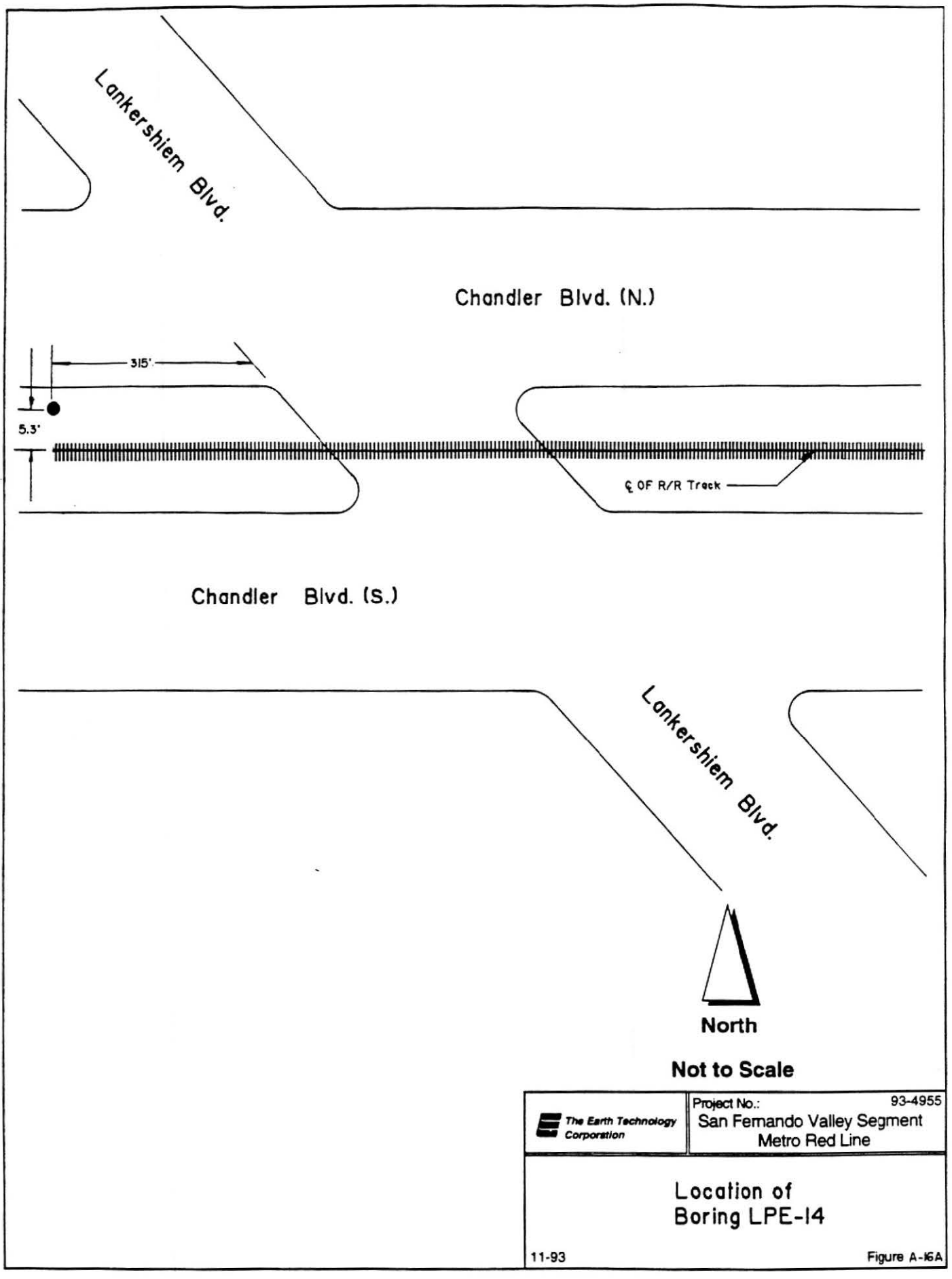
Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.

Project Name:	Metro Rail: San Fernando Valley East-West Segment		
Project Number:	93-4955	Boring Number:	LPE-14

Sheet 4 of 4

Depth (feet)	Lithology	Description	USCS Classification	Geologic Unit	Samples: Number	Type	Blow Count (no./6 inches)	Recovery (inches/inches)	OVA (ppm) [Background]	Dry Density (pcf)	Moisture Content (%)	Drilling Time
		SAND; dark yellowish brown with rusty appearance, moist, very dense, coarse-grained, with subangular fine gravel (up to 1/2" in size), some silt	SP-GP	Qal	15	D	80/5"	1/5				1114
85		light brown, wet(?), with gravel			16	S	80 20/1"	3/7				1150
		Boring terminated at 85.6 feet. Piezometer monitored on 10/08/93 and was found to be dry.										
90												
95												
100												
105												

Note: This boring log is based on field classification and visual soil description and is further modified to include results of laboratory classification tests, where available. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented are a simplification of the actual conditions encountered. Lithologic patterns are generalizations and necessarily imprecise. Lithologic contacts indicated represent the approximate boundary between subsurface material types and the transition may be gradual.



The Earth Technology Corporation

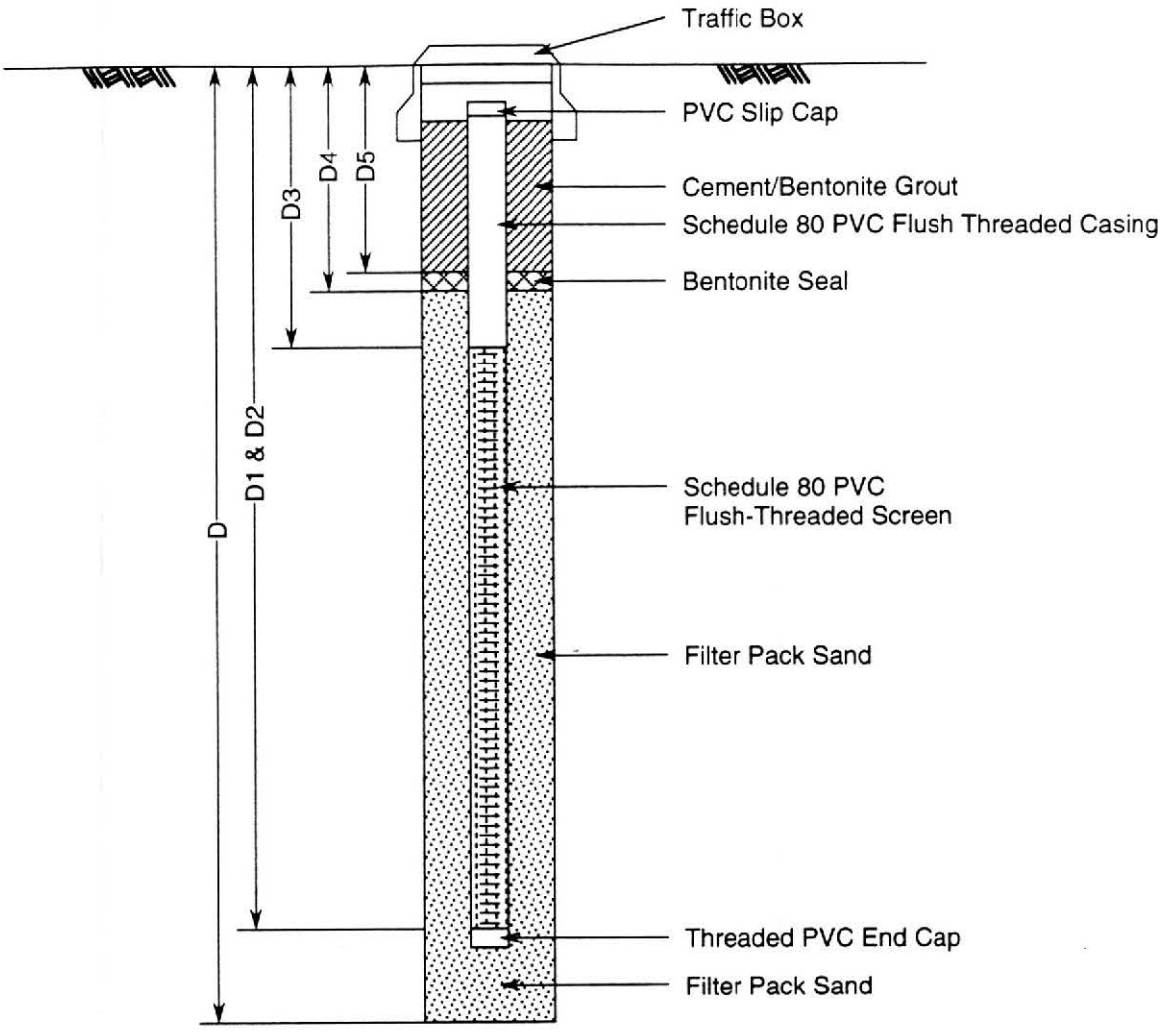
Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of
Boring LPE-14

11-93

Figure A-16A



Total Depth (D)	=	85.0	Feet
Total Depth of Casing (D1)	=	83.7	Feet
Depth to Bottom of Well Screen (D2)	=	83.7	Feet
Depth to Top of Well Screen (D3)	=	13.7	Feet
Depth to Bottom of Top Seal (D4)	=	10.0	Feet
Depth to Top of Top Seal (D5)	=	3.5	Feet
Well Casing Diameter	=	2.0	Inches
Well Screen Slot Size	=	0.01	Inch
Filter Pack Sand Type	=	#2/12	Monterey
Bentonite Seal Type	=	1/2 Inch	Pellets

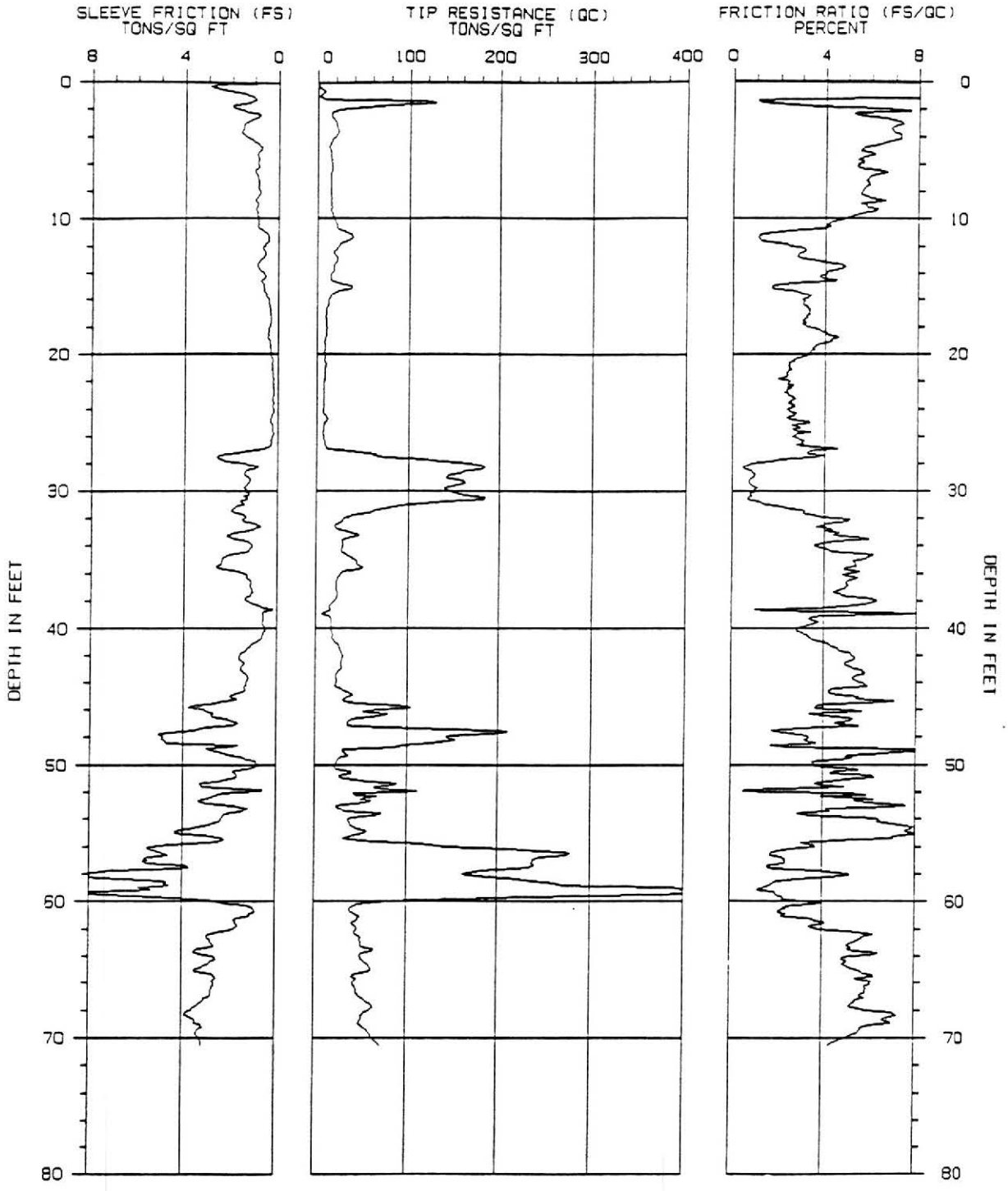
The Earth Technology Corporation

Project No. 93-4955
Geotechnical Investigation
East-West Segment
Metro Red Line

Piezometer Installation Schematic
LPE-14

11-93

Figure A-16B



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-1

PROJECT NAME : TETC/S.F.V. REDLINE

LOCATION : CANOGA PARK

PROJECT NUMBER : 94-382-00001

DATE : 09-09-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-1
PROJECT : TETC/S.F.V. REDLINE
LOCATION : CANOGA PARK
DATE : 09-09-1993

PROJECT NO : 94-382-00001
INSTRUMENT : F15CKE098
SYSTEM : T2/I4/C2/R2
OPERATOR : EC/TM

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	13.3	15.00	CLAY TO ORGANIC CLAY	15-20	25-40		.35	
1.0	6.4	15.00	CLAY TO ORGANIC CLAY	5-10	15-20		.19	
1.5	261.7	1.16	SAND to SILTY SAND	>40	>40	70-80		42-45
2.0	45.8	6.52	*SANDY CLAY to SILTY CLAY	>40	>40		.79	
2.5	28.8	5.55	*SANDY CLAY to SILTY CLAY	25-40	25-40		.52	
3.0	35.3	7.30	*SANDY CLAY to SILTY CLAY	25-40	>40		.67	
3.5	38.7	6.80	*SANDY CLAY to SILTY CLAY	>40	>40		.76	
4.0	30.7	7.23	*SANDY CLAY to SILTY CLAY	25-40	>40		.62	
4.5	22.7	6.53	*SANDY CLAY to SILTY CLAY	20-25	25-40		.47	
5.0	21.3	5.50	SILTY CLAY TO CLAY	15-20	25-40		.91	
5.5	22.6	5.72	SILTY CLAY TO CLAY	20-25	25-40		.99	
6.0	23.5	5.40	SILTY CLAY TO CLAY	20-25	25-40		1.06	
6.5	22.4	6.28	*SANDY CLAY to SILTY CLAY	20-25	25-40		.52	
7.0	20.4	5.87	SILTY CLAY TO CLAY	15-20	25-40		.96	
7.5	20.0	5.90	SILTY CLAY TO CLAY	15-20	25-40		.96	
8.0	19.1	5.61	SILTY CLAY TO CLAY	15-20	25-40		.93	
8.5	20.4	5.99	SILTY CLAY TO CLAY	15-20	25-40		1.02	
9.0	19.5	5.76	SILTY CLAY TO CLAY	15-20	25-40		.99	
9.5	19.7	5.91	SILTY CLAY TO CLAY	15-20	25-40		1.02	
10.0	22.1	4.88	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.17	
10.5	26.0	4.14	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.40	
11.0	38.6	1.75	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
11.5	42.4	1.16	SILTY SAND to SANDY SILT	10-15	15-20	30-40		31-35
12.0	27.2	2.46	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.54	27-31
12.5	21.0	2.98	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.20	27-31
13.0	24.4	3.35	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	1.41	
13.5	19.9	4.88	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.16	
14.0	16.9	4.01	CLAYEY SILT to SILTY CLAY	10-15	15-20		.99	
14.5	16.2	4.50	CLAYEY SILT to SILTY CLAY	10-15	20-25		.96	
15.0	39.8	1.64	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
15.5	18.4	2.92	SANDY SILT to CLAYEY SILT	5-10	15-20	50-60	1.13	
16.0	13.1	2.97	SANDY SILT to CLAYEY SILT	5-10	10-15	40-50	.80	
16.5	11.7	3.24	CLAYEY SILT to SILTY CLAY	5-10	10-15		.71	
17.0	9.9	3.25	SILTY CLAY to CLAY	5-10	10-15		.60	
17.5	9.9	3.13	SILTY CLAY to CLAY	5-10	10-15		.60	
18.0	10.4	3.19	SILTY CLAY to CLAY	5-10	10-15		.65	
18.5	10.1	4.09	CLAYEY SILT to SILTY CLAY	5-10	15-20		.63	
19.0	8.3	4.25	SILTY CLAY to CLAY	5-10	10-15		.51	
19.5	8.6	3.59	SILTY CLAY to CLAY	5-10	10-15		.54	
20.0	7.8	3.36	SILTY CLAY to CLAY	3-5	10-15		.49	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-1

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	8.2	2.69	SILTY CLAY to CLAY	3-5	10-15		.52	
21.0	8.6	2.39	SANDY SILT to CLAYEY SILT	3-5	10-15	20-30	.55	
21.5	8.3	2.38	SANDY SILT to CLAYEY SILT	3-5	10-15	20-30	.53	
22.0	7.6	2.49	SANDY SILT to CLAYEY SILT	3-5	10-15	20-30	.49	
22.5	7.1	2.54	SILTY CLAY to CLAY	3-5	10-15		.46	
23.0	6.8	2.36	SANDY SILT to CLAYEY SILT	3-5	10-15	20-30	.44	
23.5	7.2	2.53	SILTY CLAY to CLAY	3-5	10-15		.47	
24.0	6.3	2.34	SANDY SILT to CLAYEY SILT	3-5	10-15	20-30	.41	
24.5	8.7	2.66	SANDY SILT to CLAYEY SILT	3-5	10-15	30-40	.60	
25.0	7.2	3.35	SILTY CLAY to CLAY	3-5	10-15		.48	
25.5	6.5	2.57	SILTY CLAY to CLAY	3-5	10-15		.43	
26.0	6.5	2.60	SILTY CLAY to CLAY	3-5	10-15		.43	
26.5	7.6	3.07	SILTY CLAY to CLAY	3-5	10-15		.53	
27.0	18.6	3.66	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.46	
27.5	58.0	3.52	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	4.83	27-31
28.0	130.1	.85	SAND to SILTY SAND	25-40	25-40	50-60		40-42
28.5	128.2	.79	SAND to SILTY SAND	25-40	25-40	50-60		40-42
29.0	107.6	.80	SAND to SILTY SAND	25-40	25-40	50-60		40-42
29.5	121.1	.79	SAND to SILTY SAND	25-40	25-40	50-60		40-42
30.0	107.2	.92	SAND to SILTY SAND	25-40	25-40	50-60		40-42
30.5	136.2	.69	SAND to SILTY SAND	25-40	25-40	50-60		40-42
31.0	73.6	1.42	SILTY SAND to SANDY SILT	20-25	20-25	50-60		35-40
31.5	45.3	3.16	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	4.05	27-31
32.0	21.9	4.53	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.91	
32.5	14.7	3.98	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.25	
33.0	23.7	4.30	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.11	
33.5	21.8	5.94	SILTY CLAY TO CLAY	20-25	25-40		1.95	
34.0	20.5	3.57	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.84	
34.5	20.2	4.92	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.83	
35.0	27.6	5.80	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.29	
35.5	32.3	5.45	*SANDY CLAY to SILTY CLAY	25-40	>40		1.53	
36.0	18.4	5.11	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.70	
36.5	15.3	5.20	SILTY CLAY TO CLAY	10-15	20-25		1.40	
37.0	14.5	4.92	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.33	
37.5	15.2	4.74	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.41	
38.0	13.2	6.33	SILTY CLAY TO CLAY	10-15	20-25		1.22	
38.5	9.8	3.63	SILTY CLAY to CLAY	5-10	10-15		.87	
39.0	5.3	6.93	SILTY CLAY TO CLAY	5-10	10-15		.40	
39.5	10.5	3.76	CLAYEY SILT to SILTY CLAY	5-10	10-15		.96	
40.0	10.4	2.78	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	.96	
40.5	11.8	3.33	CLAYEY SILT to SILTY CLAY	5-10	10-15		1.12	
41.0	12.8	3.78	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.23	
41.5	16.5	4.61	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.63	
42.0	18.3	5.20	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.84	
42.5	17.3	5.11	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.73	
43.0	16.9	5.37	SILTY CLAY TO CLAY	10-15	20-25		1.70	
43.5	13.5	5.52	SILTY CLAY TO CLAY	10-15	20-25		1.32	
44.0	13.7	5.62	SILTY CLAY TO CLAY	10-15	20-25		1.35	
44.5	17.8	4.46	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.81	
45.0	23.2	5.13	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.43	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-1

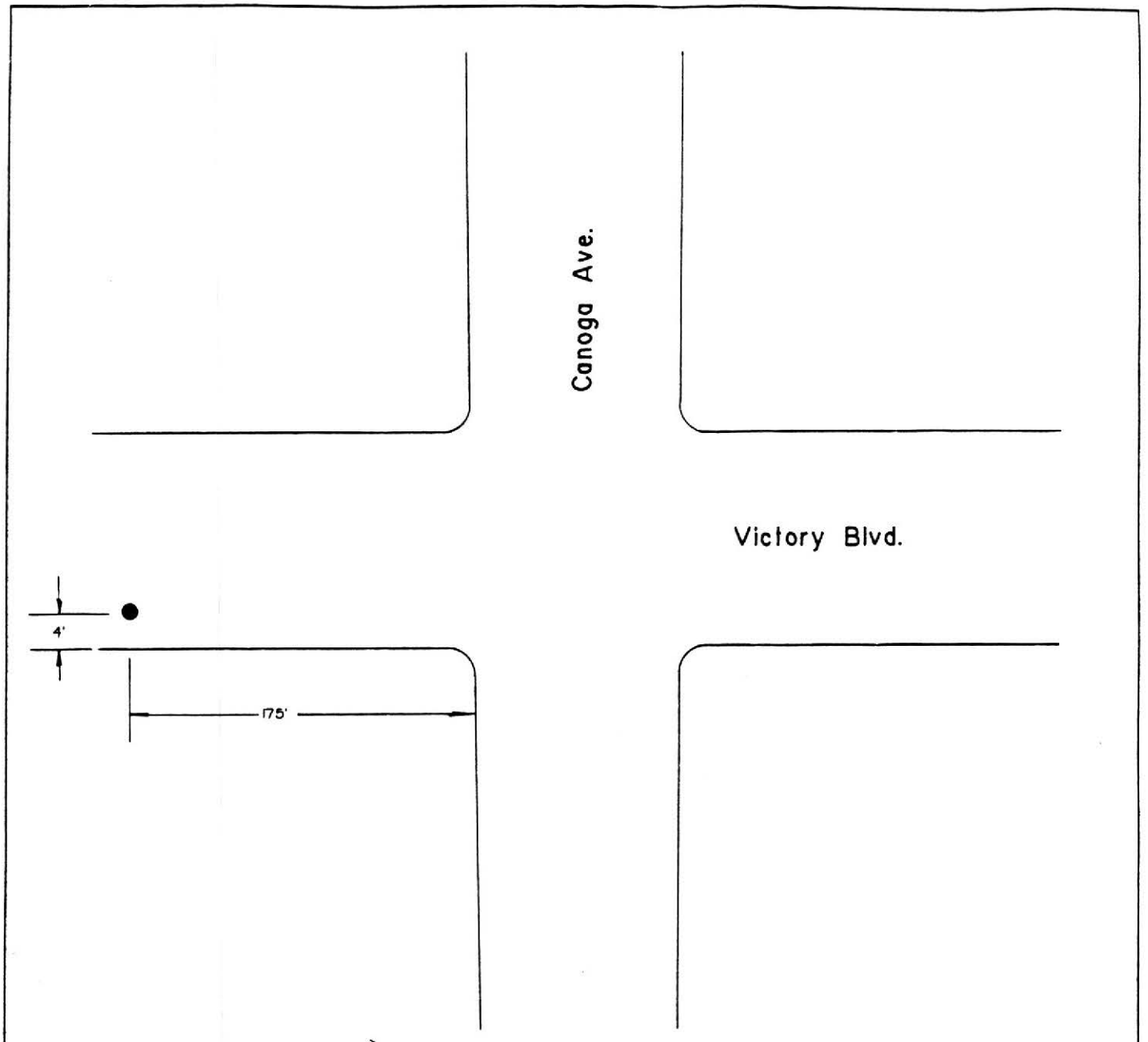
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	26.3	5.91	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.39	
46.0	40.4	4.51	*SANDY CLAY to SILTY CLAY	25-40	>40		2.19	
46.5	36.1	4.49	CLAYEY SILT to SILTY CLAY	25-40	25-40		3.92	
47.0	21.2	4.50	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.23	
47.5	116.1	1.76	SILTY SAND to SANDY SILT	>40	>40	60-70		35-40
48.0	82.3	3.39	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	4.64	31-35
48.5	63.4	3.32	SANDY SILT to CLAYEY SILT	>40	>40	80-90	7.12	27-31
49.0	17.2	8.54	CLAY TO ORGANIC CLAY	15-20	25-40		1.80	
49.5	15.2	5.29	SILTY CLAY TO CLAY	10-15	20-25		1.58	
50.0	12.5	3.54	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.26	
50.5	23.2	4.56	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.52	
51.0	19.3	5.58	SILTY CLAY TO CLAY	15-20	25-40		2.07	
51.5	45.0	3.99	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	5.12	27-31
52.0	52.0	1.74	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
52.5	27.9	6.24	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.56	
53.0	13.5	7.58	SILTY CLAY TO CLAY	15-20	20-25		1.40	
53.5	30.4	3.36	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	3.44	27-31
54.0	20.3	6.41	SILTY CLAY TO CLAY	20-25	25-40		2.23	
54.5	22.3	7.62	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.24	
55.0	29.5	7.99	*SANDY CLAY to SILTY CLAY	25-40	>40		1.68	
55.5	22.2	5.47	SILTY CLAY TO CLAY	15-20	25-40		2.49	
56.0	78.1	3.69	*CLAYEY SAND to SANDY CLAY	>40	>40		4.68	
56.5	149.9	1.76	SAND to SILTY SAND	>40	>40	70-80		40-42
57.0	128.4	2.28	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
57.5	125.4	1.60	SAND to SILTY SAND	>40	>40	60-70		35-40
58.0	87.0	5.10	*SANDY CLAY to SILTY CLAY	>40	>40		5.31	
58.5	126.8	2.03	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
59.0	206.5	1.50	SAND to SILTY SAND	>40	>40	70-80		40-42
59.5	197.1	1.96	SAND to SILTY SAND	>40	>40	80-90		40-42
60.0	42.0	3.22	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	5.08	27-31
60.5	20.4	2.40	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	2.35	27-31
61.0	25.2	2.17	SANDY SILT to CLAYEY SILT	10-15	15-20	40-50	2.98	27-31
61.5	21.9	4.09	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.56	
62.0	24.1	3.87	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.86	
62.5	25.4	5.94	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.51	
63.0	26.2	5.40	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.15	
63.5	33.2	5.09	*SANDY CLAY to SILTY CLAY	25-40	25-40		2.03	
64.0	25.9	5.35	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.13	
64.5	29.1	4.97	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.57	
65.0	31.8	5.51	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.97	
65.5	21.1	6.29	SILTY CLAY TO CLAY	20-25	25-40		2.53	
66.0	21.4	6.11	SILTY CLAY TO CLAY	20-25	25-40		2.58	
66.5	23.4	5.91	SILTY CLAY TO CLAY	20-25	25-40		2.85	
67.0	24.9	5.68	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.53	
67.5	29.7	5.40	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.86	
68.0	29.8	5.93	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.87	
68.5	25.6	6.99	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.60	
69.0	24.3	6.51	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.52	
69.5	29.0	5.63	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.84	
70.0	30.8	5.05	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.97	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-1

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	35.1	4.32	CLAYEY SILT to SILTY CLAY	25-40	25-40		4.54	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

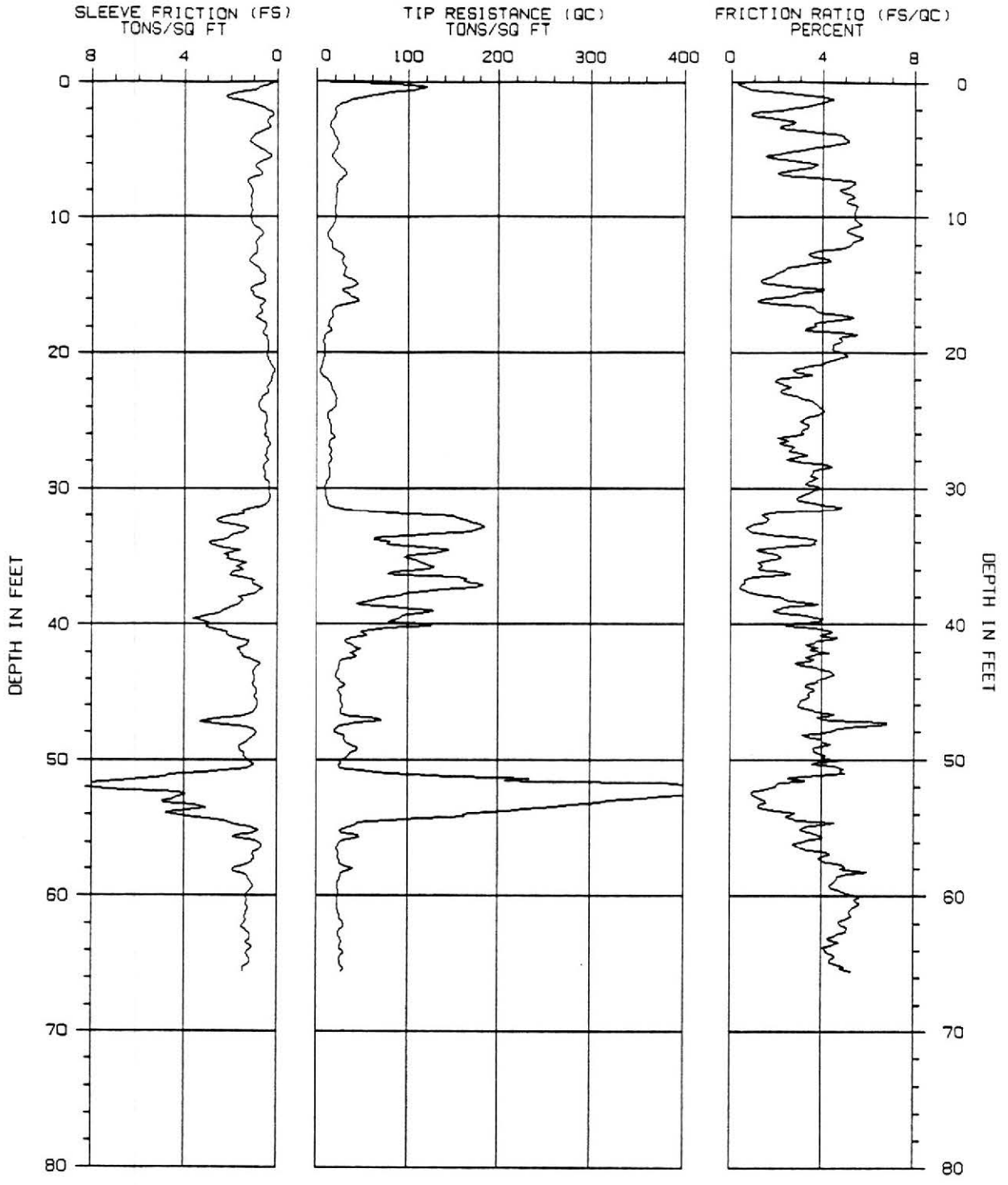
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of CPT-1

11-93

Figure A-17



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-2

PROJECT NAME : TETC/S.F.V. REDLINE

LOCATION : CANOGA PARK

PROJECT NUMBER : 94-382-00001

DATE : 09-03-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-2
PROJECT : TETC/S.F.V. REDLINE
LOCATION : CANOGA PARK
DATE : 09-03-1993

PROJECT NO : 94-382-00001
INSTRUMENT : F15CKE098
SYSTEM : T2/I4/C2/R2
OPERATOR : EC/BR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	288.9	.69	SANDY GRAVEL to SAND	>40	>40	60-70		42-45
1.0	140.6	3.38	*CLAYEY SAND to SANDY CLAY	>40	>40		2.11	
1.5	68.5	4.00	*CLAYEY SAND to SANDY CLAY	>40	>40		1.11	
2.0	39.5	2.53	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	1.36	27-31
2.5	36.8	.91	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
3.0	27.8	2.75	SANDY SILT to CLAYEY SILT	10-15	20-25	50-60	1.05	27-31
3.5	28.4	2.44	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.12	27-31
4.0	33.2	4.93	*SANDY CLAY to SILTY CLAY	25-40	25-40		.68	
4.5	36.6	4.94	*SANDY CLAY to SILTY CLAY	25-40	>40		.77	
5.0	32.8	3.16	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	1.42	27-31
5.5	25.3	1.48	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
6.0	32.6	3.65	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	1.48	27-31
6.5	42.1	2.72	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	1.97	27-31
7.0	41.6	2.82	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	1.98	27-31
7.5	30.9	5.42	*SANDY CLAY to SILTY CLAY	25-40	25-40		.75	
8.0	30.0	4.73	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.48	
8.5	27.1	5.40	*SANDY CLAY to SILTY CLAY	20-25	25-40		.68	
9.0	27.5	5.16	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.41	
9.5	24.7	5.44	SILTY CLAY TO CLAY	20-25	25-40		1.29	
10.0	25.6	5.48	SILTY CLAY TO CLAY	20-25	25-40		1.36	
10.5	22.1	5.69	SILTY CLAY TO CLAY	20-25	25-40		1.19	
11.0	16.1	5.01	CLAYEY SILT to SILTY CLAY	10-15	20-25		.87	
11.5	16.0	5.72	SILTY CLAY TO CLAY	10-15	20-25		.87	
12.0	19.5	5.24	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.09	
12.5	25.9	3.81	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.49	
13.0	32.7	3.95	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.92	
13.5	33.2	3.17	SANDY SILT to CLAYEY SILT	15-20	25-40	60-70	1.97	27-31
14.0	33.3	2.24	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	2.01	27-31
14.5	38.7	1.48	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
15.0	46.1	2.19	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
15.5	32.2	3.26	SANDY SILT to CLAYEY SILT	15-20	25-40	60-70	2.02	27-31
16.0	45.1	1.57	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
16.5	24.8	3.02	SANDY SILT to CLAYEY SILT	10-15	20-25	50-60	1.58	27-31
17.0	17.2	3.89	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.09	
17.5	15.4	5.13	SILTY CLAY TO CLAY	10-15	20-25		.98	
18.0	12.7	3.74	CLAYEY SILT to SILTY CLAY	5-10	15-20		.81	
18.5	12.1	4.78	CLAYEY SILT to SILTY CLAY	5-10	15-20		.77	
19.0	8.2	4.84	SILTY CLAY TO CLAY	5-10	15-20		.50	
19.5	8.5	4.43	CLAYEY SILT to SILTY CLAY	5-10	10-15		.53	
20.0	8.6	4.84	SILTY CLAY TO CLAY	5-10	15-20		.54	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-2

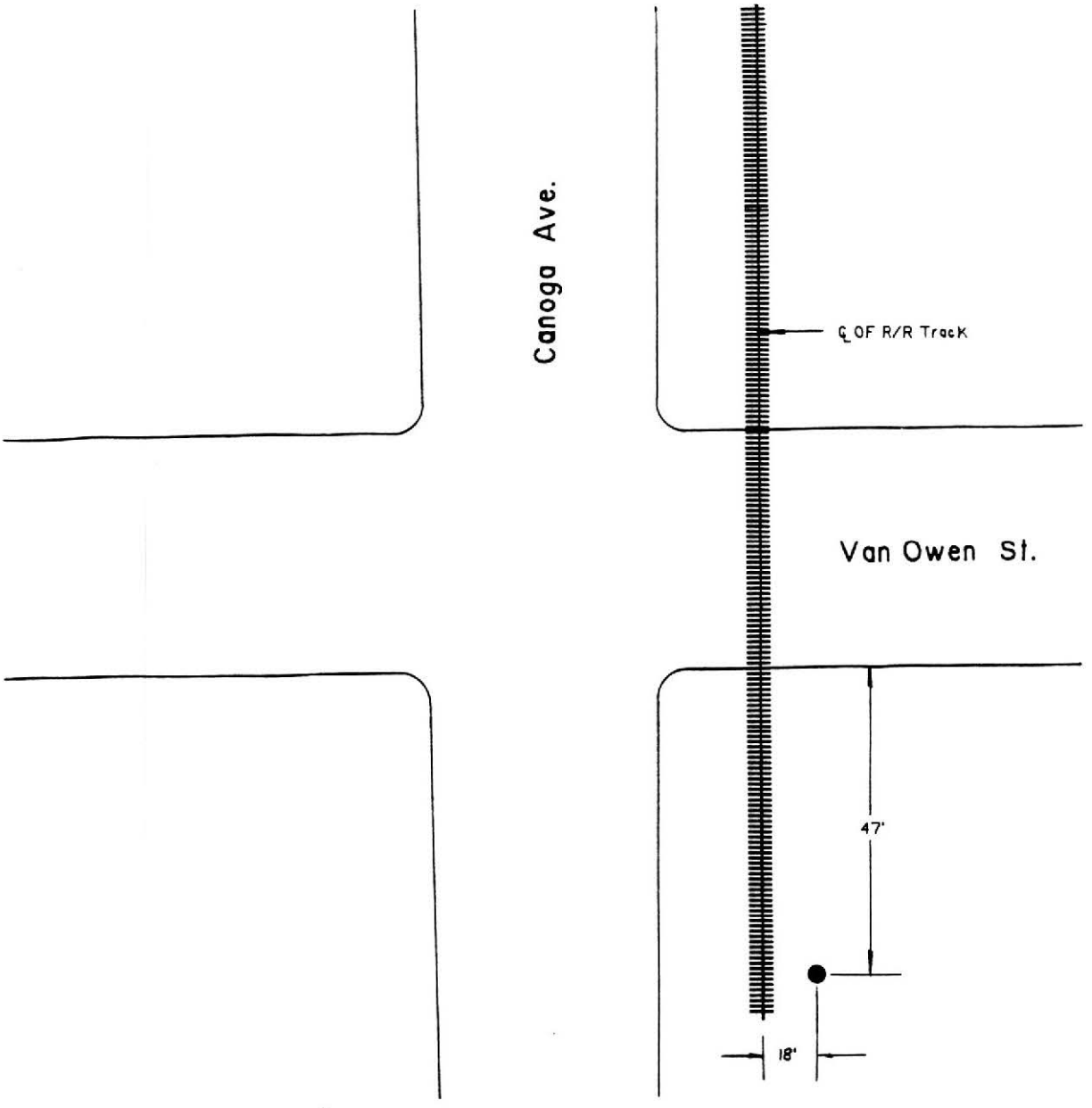
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	7.7	4.52	SILTY CLAY to CLAY	5-10	10-15		.48	
21.0	5.5	3.49	SILTY CLAY to CLAY	3-5	10-15		.33	
21.5	4.7	2.96	SILTY CLAY to CLAY	3-5	10-15		.27	
22.0	11.0	2.00	SANDY SILT to CLAYEY SILT	3-5	10-15	20-30	.75	27-31
22.5	14.5	2.58	SANDY SILT to CLAYEY SILT	5-10	10-15	40-50	1.02	
23.0	17.4	2.28	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	1.25	27-31
23.5	18.5	3.29	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.36	
24.0	17.5	3.87	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.29	
24.5	10.7	3.92	CLAYEY SILT to SILTY CLAY	5-10	15-20		.76	
25.0	11.8	3.11	SILTY CLAY to CLAY	5-10	10-15		.85	
25.5	13.1	3.41	CLAYEY SILT to SILTY CLAY	5-10	15-20		.97	
26.0	13.0	3.15	CLAYEY SILT to SILTY CLAY	5-10	15-20		.97	
26.5	12.0	2.52	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	.90	
27.0	11.2	2.76	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	.83	
27.5	11.9	3.20	CLAYEY SILT to SILTY CLAY	5-10	10-15		.90	
28.0	12.0	2.61	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	.92	
28.5	10.9	4.30	CLAYEY SILT to SILTY CLAY	5-10	15-20		.84	
29.0	11.2	3.50	CLAYEY SILT to SILTY CLAY	5-10	10-15		.86	
29.5	8.9	3.49	SILTY CLAY to CLAY	5-10	10-15		.67	
30.0	7.2	3.91	SILTY CLAY to CLAY	5-10	10-15		.52	
30.5	7.6	3.22	SILTY CLAY to CLAY	3-5	10-15		.57	
31.0	9.2	3.29	SILTY CLAY to CLAY	5-10	10-15		.72	
31.5	16.4	4.81	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.38	
32.0	94.4	1.37	SAND to SILTY SAND	25-40	25-40	50-60		35-40
32.5	119.0	1.51	SAND to SILTY SAND	>40	>40	60-70		35-40
33.0	126.8	.68	SAND to SILTY SAND	20-25	20-25	50-60		40-42
33.5	70.6	2.03	SILTY SAND to SANDY SILT	25-40	25-40	60-70		35-40
34.0	55.5	3.65	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	5.23	27-31
34.5	96.1	1.30	SAND to SILTY SAND	25-40	25-40	50-60		35-40
35.0	69.0	2.05	SILTY SAND to SANDY SILT	25-40	25-40	60-70		35-40
35.5	76.4	1.18	SAND to SILTY SAND	20-25	20-25	40-50		35-40
36.0	76.9	1.26	SAND to SILTY SAND	20-25	20-25	50-60		35-40
36.5	81.0	1.55	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
37.0	111.5	.63	SAND to SILTY SAND	15-20	20-25	40-50		40-42
37.5	89.2	.54	SAND to SILTY SAND	10-15	15-20	40-50		40-42
38.0	52.4	2.05	SILTY SAND to SANDY SILT	20-25	25-40	50-60		31-35
38.5	27.5	3.83	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.73	
39.0	79.7	1.86	SILTY SAND to SANDY SILT	25-40	25-40	60-70		35-40
39.5	57.7	3.64	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	6.00	27-31
40.0	77.0	2.34	SILTY SAND to SANDY SILT	25-40	>40	70-80		35-40
40.5	31.3	4.42	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.22	
41.0	24.3	4.68	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.47	
41.5	24.0	3.28	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	2.45	
42.0	24.6	3.98	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.52	
42.5	22.2	3.35	SANDY SILT to CLAYEY SILT	10-15	15-20	60-70	2.26	
43.0	15.3	3.08	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.52	
43.5	13.9	4.41	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.37	
44.0	14.4	4.03	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.42	
44.5	18.5	3.33	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.89	
45.0	14.6	3.57	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.46	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-2

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	16.2	3.32	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.64	
46.0	17.4	2.92	SANDY SILT to CLAYEY SILT	5-10	15-20	50-60	1.78	
46.5	15.6	3.75	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.59	
47.0	39.5	3.93	CLAYEY SILT to SILTY CLAY	25-40	25-40	80-90	4.31	
47.5	15.7	6.45	SILTY CLAY TO CLAY	15-20	20-25		1.61	
48.0	12.0	4.38	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.19	
48.5	17.6	3.92	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.84	
49.0	23.3	4.06	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.50	
49.5	21.5	3.77	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.31	
50.0	15.7	4.55	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.64	
50.5	13.9	4.56	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.43	
51.0	45.3	5.00	*SANDY CLAY to SILTY CLAY	>40	>40		2.57	
51.5	117.3	3.27	*CLAYEY SAND to SANDY CLAY	>40	>40		6.84	
52.0	244.1	1.97	SAND to SILTY SAND	>40	>40	90-100		40-42
52.5	237.2	.93	SAND to SILTY SAND	>40	>40	60-70		42-45
53.0	177.8	1.54	SAND to SILTY SAND	>40	>40	70-80		40-42
53.5	136.5	1.24	SAND to SILTY SAND	>40	>40	60-70		40-42
54.0	88.9	2.74	SILTY SAND to SANDY SILT	>40	>40	80-90		31-35
54.5	31.5	3.80	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.59	
55.0	16.6	3.12	SANDY SILT to CLAYEY SILT	5-10	15-20	50-60	1.80	
55.5	25.1	3.86	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.84	
56.0	14.0	3.06	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.50	
56.5	12.3	3.11	CLAYEY SILT to SILTY CLAY	5-10	10-15		1.29	
57.0	13.1	4.25	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.39	
57.5	14.1	4.24	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.52	
58.0	21.4	4.79	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.44	
58.5	14.3	4.77	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.55	
59.0	12.8	4.55	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.38	
59.5	12.7	4.66	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.37	
60.0	12.7	5.53	SILTY CLAY TO CLAY	10-15	20-25		1.37	
60.5	12.2	5.63	SILTY CLAY TO CLAY	10-15	15-20		1.31	
61.0	12.6	5.24	SILTY CLAY TO CLAY	10-15	15-20		1.36	
61.5	13.4	5.28	SILTY CLAY TO CLAY	10-15	20-25		1.47	
62.0	15.4	4.81	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.74	
62.5	13.5	5.08	SILTY CLAY TO CLAY	10-15	15-20		1.50	
63.0	13.2	4.42	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.46	
63.5	14.1	4.64	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.58	
64.0	15.1	4.21	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.71	
64.5	13.2	4.52	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.48	
65.0	13.6	4.64	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.54	
65.5	14.0	5.31	SILTY CLAY TO CLAY	10-15	20-25		1.59	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

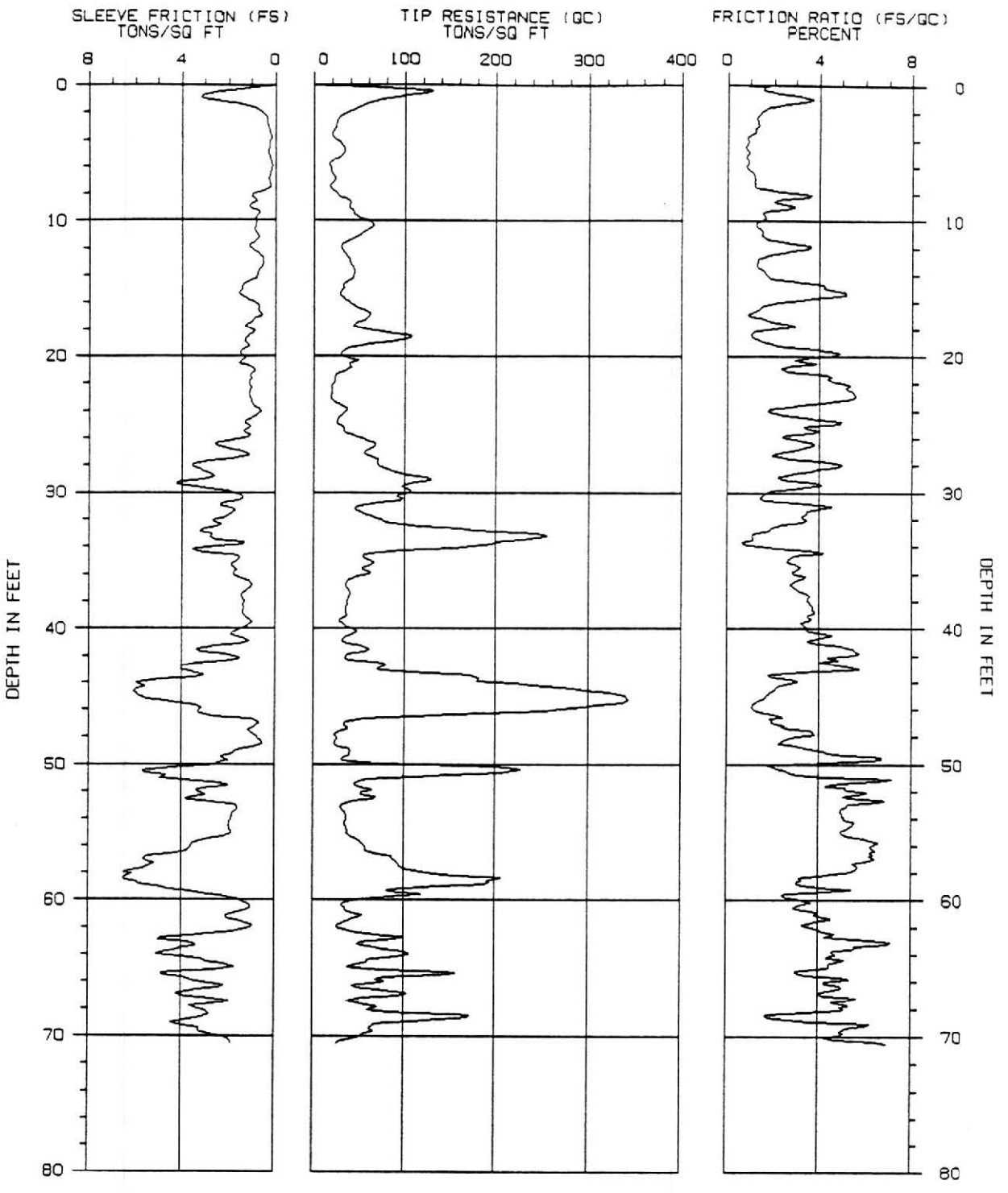
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of CPT-2

11-93

Figure A-18



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-3

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-10-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-3
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-10-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	327.9	1.84	*SAND to SILTY SAND	>40	>40			
1.0	186.6	3.69	*CLAYEY SAND to SANDY CLAY	>40	>40		2.80	
1.5	112.4	2.20	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
2.0	73.4	1.46	SILTY SAND to SANDY SILT	20-25	25-40	50-60		35-40
2.5	49.4	1.26	SILTY SAND to SANDY SILT	10-15	15-20	40-50		35-40
3.0	42.8	1.33	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
3.5	33.7	1.17	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
4.0	40.7	.88	SAND to SILTY SAND	5-10	10-15	30-40		35-40
4.5	50.9	.77	SAND to SILTY SAND	10-15	10-15	30-40		35-40
5.0	49.8	.89	SAND to SILTY SAND	10-15	10-15	30-40		35-40
5.5	33.0	.90	SILTY SAND to SANDY SILT	5-10	10-15	20-30		31-35
6.0	26.8	.81	SILTY SAND to SANDY SILT	5-10	10-15	20-30		31-35
6.5	28.2	1.13	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
7.0	33.0	1.18	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
7.5	24.8	1.27	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
8.0	34.2	3.36	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	1.70	27-31
8.5	50.0	2.04	SILTY SAND to SANDY SILT	20-25	20-25	50-60		31-35
9.0	49.1	2.88	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	2.54	31-35
9.5	54.6	1.57	SILTY SAND to SANDY SILT	15-20	20-25	50-60		35-40
10.0	73.8	1.44	SILTY SAND to SANDY SILT	20-25	25-40	50-60		35-40
10.5	75.7	1.36	SAND to SILTY SAND	20-25	20-25	50-60		35-40
11.0	61.1	1.50	SILTY SAND to SANDY SILT	15-20	20-25	50-60		35-40
11.5	42.5	2.33	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
12.0	34.7	3.52	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	1.98	27-31
12.5	40.1	1.84	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
13.0	44.2	1.33	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
13.5	48.2	1.47	SILTY SAND to SANDY SILT	15-20	15-20	40-50		31-35
14.0	47.4	1.75	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
14.5	38.5	3.32	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	2.36	27-31
15.0	34.2	4.31	CLAYEY SILT to SILTY CLAY	25-40	25-40		2.12	
15.5	30.8	4.82	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.93	
16.0	40.5	2.22	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
16.5	53.5	1.38	SILTY SAND to SANDY SILT	15-20	15-20	40-50		35-40
17.0	60.2	1.03	SAND to SILTY SAND	15-20	15-20	40-50		35-40
17.5	46.8	2.12	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
18.0	57.0	1.73	SILTY SAND to SANDY SILT	20-25	20-25	50-60		35-40
18.5	101.6	1.06	SAND to SILTY SAND	25-40	25-40	50-60		40-42
19.0	68.8	1.73	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
19.5	33.5	3.88	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.32	
20.0	28.2	4.34	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.97	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-3

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	35.8	3.89	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.54	
21.0	33.0	2.39	SANDY SILT to CLAYEY SILT	10-15	20-25	50-60	2.36	27-31
21.5	20.7	4.55	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.46	
22.0	19.8	5.01	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.41	
22.5	17.4	5.35	SILTY CLAY TO CLAY	10-15	20-25		1.25	
23.0	16.7	5.53	SILTY CLAY TO CLAY	10-15	20-25		1.21	
23.5	22.6	3.65	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.68	
24.0	30.4	1.73	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
24.5	23.6	3.36	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	1.79	
25.0	22.3	4.40	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.70	
25.5	27.3	3.97	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.13	
26.0	42.0	2.53	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	3.37	31-35
26.5	54.4	3.73	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	4.43	27-31
27.0	44.7	2.54	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	3.66	31-35
27.5	54.0	2.71	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	4.49	31-35
28.0	55.1	4.99	*SANDY CLAY to SILTY CLAY	>40	>40		2.31	
28.5	69.3	3.26	SANDY SILT to CLAYEY SILT	>40	>40	90-100	5.91	31-35
29.0	97.9	2.39	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
29.5	73.4	3.94	*CLAYEY SAND to SANDY CLAY	>40	>40		3.20	
30.0	77.8	1.73	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
30.5	71.9	1.42	SILTY SAND to SANDY SILT	20-25	20-25	50-60		35-40
31.0	37.5	4.54	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.65	
31.5	38.1	3.46	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	3.39	27-31
32.0	52.4	3.43	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	4.74	27-31
32.5	83.1	2.14	SILTY SAND to SANDY SILT	25-40	>40	60-70		35-40
33.0	157.4	1.33	SAND to SILTY SAND	>40	>40	60-70		40-42
33.5	159.4	1.10	SAND to SILTY SAND	>40	>40	60-70		40-42
34.0	119.2	1.43	SAND to SILTY SAND	25-40	>40	60-70		40-42
34.5	42.8	4.12	CLAYEY SILT to SILTY CLAY	25-40	>40		4.03	
35.0	40.8	2.63	SANDY SILT to CLAYEY SILT	15-20	25-40	60-70	3.88	27-31
35.5	38.2	3.21	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	3.65	27-31
36.0	40.9	2.91	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	3.96	27-31
36.5	25.3	3.02	SANDY SILT to CLAYEY SILT	10-15	20-25	50-60	2.41	27-31
37.0	24.3	2.91	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	2.33	27-31
37.5	25.9	3.52	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.51	
38.0	23.9	3.50	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	2.33	
38.5	22.5	3.75	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.21	
39.0	23.5	3.56	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.32	
39.5	18.2	3.34	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.79	
40.0	25.4	3.48	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.57	
40.5	24.2	4.57	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.46	
41.0	20.1	3.51	CLAYEY SILT to SILTY CLAY	10-15	15-20		2.02	
41.5	37.3	5.43	*SANDY CLAY to SILTY CLAY	25-40	>40		1.95	
42.0	21.6	5.18	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.19	
42.5	41.0	4.05	CLAYEY SILT to SILTY CLAY	25-40	25-40		4.33	
43.0	42.6	5.75	*SANDY CLAY to SILTY CLAY	>40	>40		2.26	
43.5	103.6	1.77	SILTY SAND to SANDY SILT	>40	>40	60-70		35-40
44.0	118.5	3.01	*SILTY SAND to CLAYEY SAND	>40	>40			
44.5	169.1	2.09	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
45.0	201.3	1.72	SAND to SILTY SAND	>40	>40	80-90		40-42

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-3

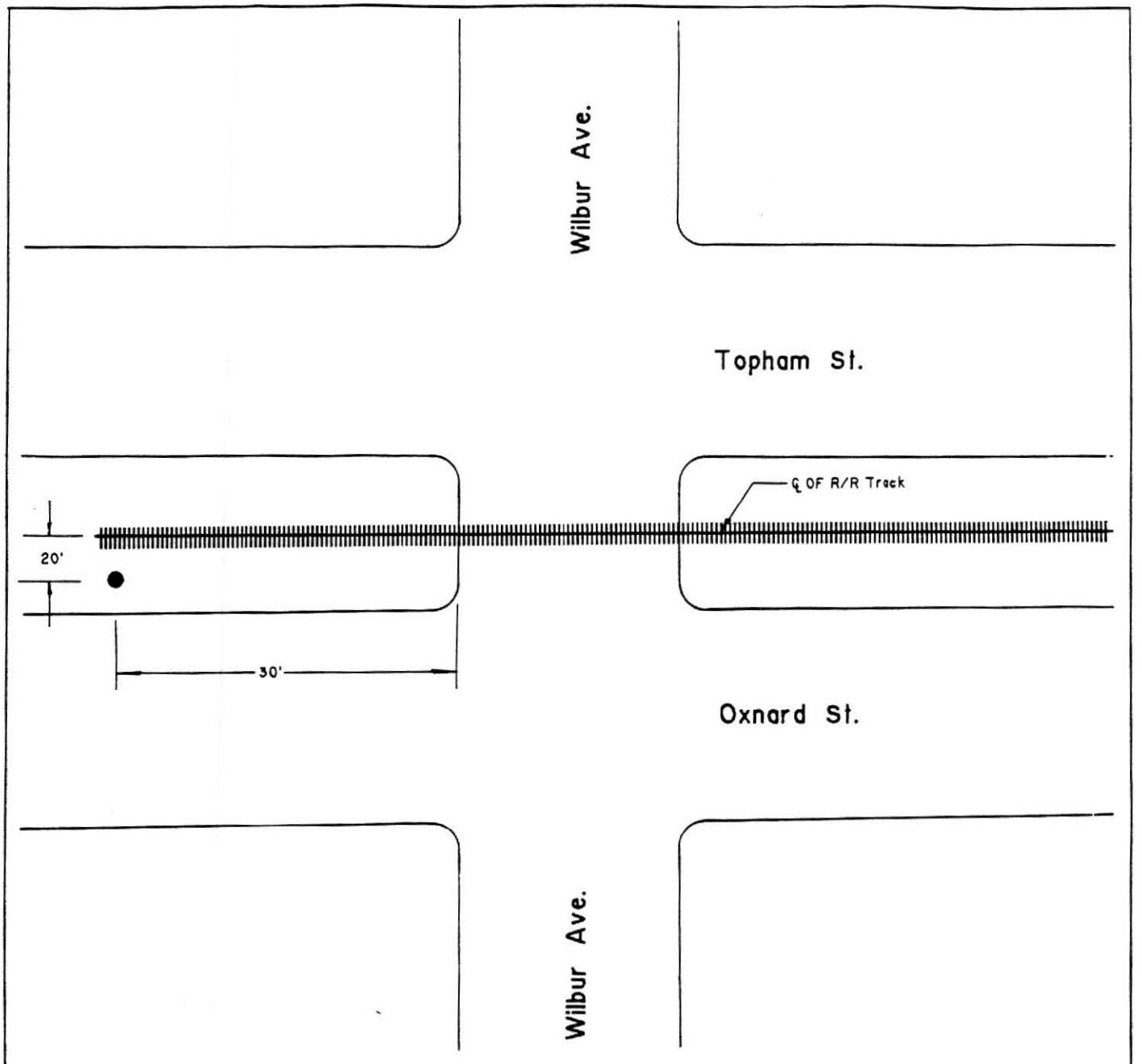
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	199.1	1.24	SAND to SILTY SAND	>40	>40	70-80		40-42
46.0	159.7	1.19	SAND to SILTY SAND	>40	>40	60-70		40-42
46.5	66.4	2.34	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
47.0	20.5	1.91	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	2.15	27-31
47.5	19.1	3.55	CLAYEY SILT to SILTY CLAY	10-15	15-20		2.00	
48.0	14.8	2.99	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.51	
48.5	13.9	2.25	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	1.41	27-31
49.0	23.8	4.16	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.56	
49.5	19.5	6.73	SILTY CLAY TO CLAY	20-25	25-40		2.07	
50.0	65.7	2.24	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
50.5	124.8	2.58	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
51.0	45.9	6.06	*SANDY CLAY to SILTY CLAY	>40	>40		2.60	
51.5	26.1	4.35	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.88	
52.0	32.2	5.80	*SANDY CLAY to SILTY CLAY	25-40	>40		1.81	
52.5	37.3	5.72	*SANDY CLAY to SILTY CLAY	25-40	>40		2.12	
53.0	17.6	5.22	SILTY CLAY TO CLAY	10-15	20-25		1.90	
53.5	19.7	4.96	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.15	
54.0	20.3	5.09	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.24	
54.5	19.9	5.47	SILTY CLAY TO CLAY	15-20	25-40		2.19	
55.0	20.2	4.99	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.24	
55.5	26.1	5.95	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.48	
56.0	30.8	6.31	*SANDY CLAY to SILTY CLAY	25-40	>40		1.78	
56.5	34.3	6.21	*SANDY CLAY to SILTY CLAY	25-40	>40		2.00	
57.0	47.5	6.40	*SANDY CLAY to SILTY CLAY	>40	>40		2.82	
57.5	51.3	5.71	*SANDY CLAY to SILTY CLAY	>40	>40		3.07	
58.0	67.1	5.15	*SANDY CLAY to SILTY CLAY	>40	>40		4.06	
58.5	104.0	3.29	*CLAYEY SAND to SANDY CLAY	>40	>40		6.39	
59.0	72.6	3.67	*CLAYEY SAND to SANDY CLAY	>40	>40		4.44	
59.5	61.6	2.69	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	7.54	31-35
60.0	24.6	3.23	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	2.88	27-31
60.5	17.9	2.92	SANDY SILT to CLAYEY SILT	5-10	15-20	50-60	2.04	
61.0	25.3	3.87	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.99	
61.5	20.9	4.14	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.43	
62.0	14.3	3.73	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.59	
62.5	31.0	4.71	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.75	
63.0	32.6	6.72	*SANDY CLAY to SILTY CLAY	25-40	>40		1.99	
63.5	35.3	5.66	*SANDY CLAY to SILTY CLAY	25-40	>40		2.17	
64.0	54.1	4.75	*SANDY CLAY to SILTY CLAY	>40	>40		3.41	
64.5	30.9	4.79	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.80	
65.0	23.1	4.36	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.79	
65.5	70.3	3.42	SANDY SILT to CLAYEY SILT	>40	>40	90-100	9.04	27-31
66.0	39.4	4.26	CLAYEY SILT to SILTY CLAY	25-40	25-40		4.97	
66.5	28.8	4.93	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.57	
67.0	47.3	4.27	*SANDY CLAY to SILTY CLAY	25-40	>40		3.03	
67.5	21.2	4.60	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.58	
68.0	31.8	5.11	*SANDY CLAY to SILTY CLAY	25-40	25-40		2.01	
68.5	84.6	1.69	SILTY SAND to SANDY SILT	25-40	25-40	60-70		35-40
69.0	41.4	5.22	*SANDY CLAY to SILTY CLAY	25-40	>40		2.68	
69.5	30.6	5.17	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.95	
70.0	25.4	4.46	CLAYEY SILT to SILTY CLAY	15-20	25-40		3.20	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-3

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	13.1	6.95	SILTY CLAY TO CLAY	15-20	20-25		1.52	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

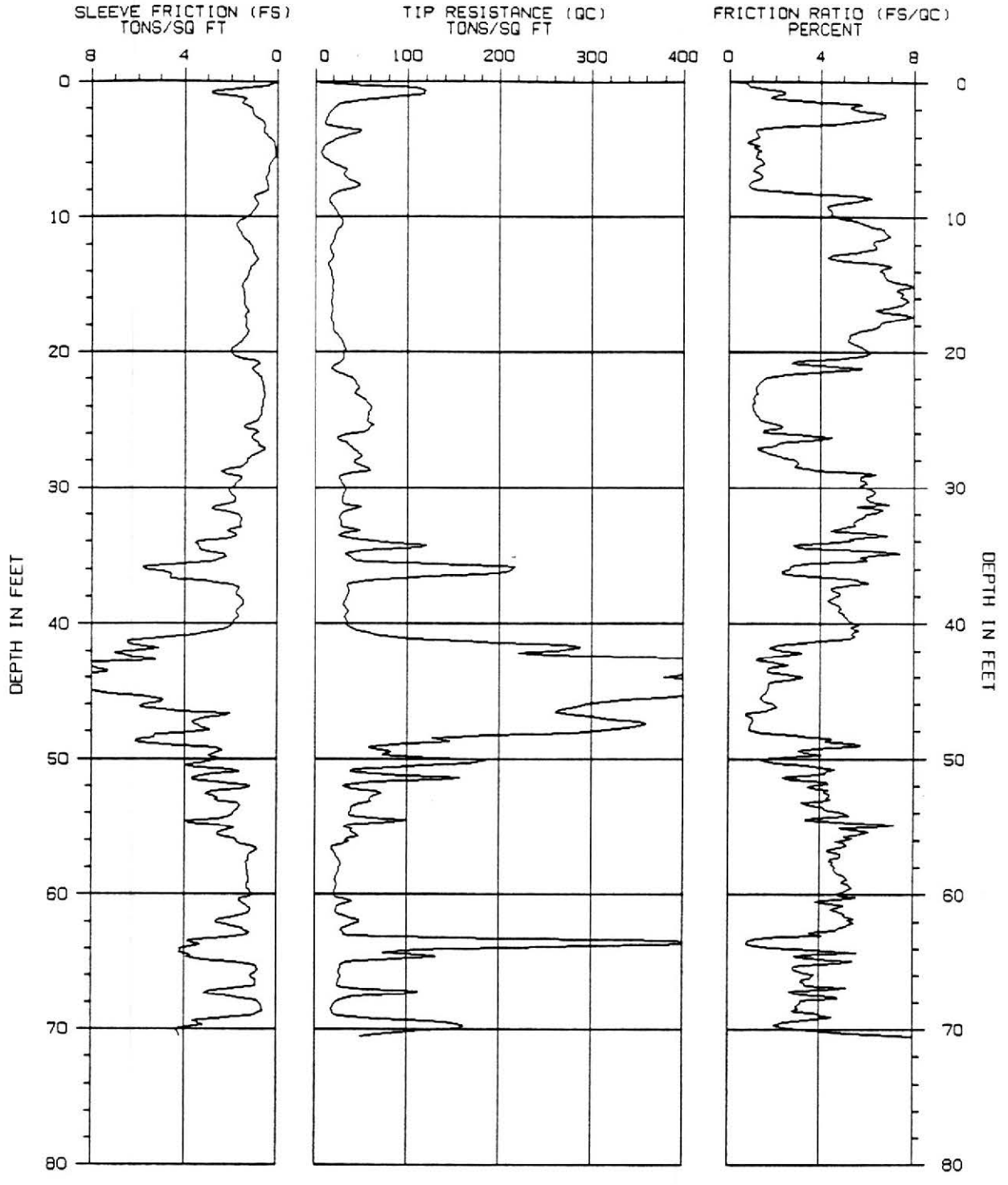
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of CPT-3

11-93

Figure A-19



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-4

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-10-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-4
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-10-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	272.9	1.25	SAND to SILTY SAND	>40	>40	70-80		42-45
1.0	247.3	2.20	*SILTY SAND to CLAYEY SAND	>40	>40			
1.5	76.0	4.06	*CLAYEY SAND to SANDY CLAY	>40	>40		1.23	
2.0	38.3	5.40	*SANDY CLAY to SILTY CLAY	25-40	>40		.66	
2.5	26.4	6.74	*SANDY CLAY to SILTY CLAY	25-40	25-40		.48	
3.0	19.5	5.16	CLAYEY SILT to SILTY CLAY	15-20	25-40		.73	
3.5	77.2	1.26	SAND to SILTY SAND	20-25	20-25	50-60		35-40
4.0	51.7	1.29	SILTY SAND to SANDY SILT	10-15	15-20	40-50		35-40
4.5	24.9	.78	SILTY SAND to SANDY SILT	5-10	10-15	20-30		31-35
5.0	11.9	1.33	SANDY SILT to CLAYEY SILT	3-5	10-15	20-30	.50	27-31
5.5	13.9	1.15	SILTY SAND to SANDY SILT	3-5	10-15	20-30		27-31
6.0	28.6	1.51	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
6.5	48.3	1.08	SILTY SAND to SANDY SILT	10-15	15-20	30-40		35-40
7.0	44.6	1.44	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
7.5	64.0	.89	SAND to SILTY SAND	10-15	15-20	40-50		35-40
8.0	40.8	1.31	SILTY SAND to SANDY SILT	10-15	15-20	30-40		31-35
8.5	21.5	6.06	SILTY CLAY TO CLAY	20-25	25-40		1.08	
9.0	22.6	4.80	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.15	
9.5	29.0	4.43	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.52	
10.0	34.3	4.67	*SANDY CLAY to SILTY CLAY	25-40	25-40		.92	
10.5	36.0	5.88	*SANDY CLAY to SILTY CLAY	25-40	>40		.98	
11.0	28.5	6.77	*SANDY CLAY to SILTY CLAY	25-40	>40		.78	
11.5	24.9	6.89	*SANDY CLAY to SILTY CLAY	25-40	25-40		.69	
12.0	20.8	6.27	SILTY CLAY TO CLAY	20-25	25-40		1.17	
12.5	19.9	5.88	SILTY CLAY TO CLAY	15-20	25-40		1.13	
13.0	22.0	4.31	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.27	
13.5	16.4	6.86	SILTY CLAY TO CLAY	15-20	25-40		.95	
14.0	19.9	6.55	SILTY CLAY TO CLAY	20-25	25-40		1.18	
14.5	20.7	6.84	*SANDY CLAY to SILTY CLAY	20-25	25-40		.62	
15.0	20.3	7.88	*SANDY CLAY to SILTY CLAY	20-25	25-40		.62	
15.5	20.3	7.38	*SANDY CLAY to SILTY CLAY	20-25	25-40		.62	
16.0	19.3	7.55	*SANDY CLAY to SILTY CLAY	20-25	25-40		.60	
16.5	19.1	7.41	SILTY CLAY TO CLAY	20-25	25-40		1.20	
17.0	18.6	6.71	SILTY CLAY TO CLAY	15-20	25-40		1.18	
17.5	17.4	7.61	SILTY CLAY TO CLAY	15-20	25-40		1.11	
18.0	20.2	6.53	SILTY CLAY TO CLAY	20-25	25-40		1.32	
18.5	20.7	5.66	SILTY CLAY TO CLAY	15-20	25-40		1.37	
19.0	26.4	5.23	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.79	
19.5	29.6	5.51	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.02	
20.0	29.6	6.10	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.03	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-4

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	28.2	4.71	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.98	
21.0	19.6	3.99	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.37	
21.5	21.8	3.83	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.54	
22.0	36.8	1.56	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
22.5	40.8	1.28	SILTY SAND to SANDY SILT	10-15	15-20	30-40		31-35
23.0	37.1	1.26	SILTY SAND to SANDY SILT	10-15	15-20	30-40		31-35
23.5	46.1	1.10	SILTY SAND to SANDY SILT	10-15	15-20	30-40		35-40
24.0	51.4	1.02	SAND to SILTY SAND	10-15	15-20	30-40		35-40
24.5	48.8	1.15	SILTY SAND to SANDY SILT	10-15	15-20	40-50		35-40
25.0	47.5	1.37	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
25.5	50.5	2.31	SILTY SAND to SANDY SILT	20-25	25-40	60-70		31-35
26.0	35.3	2.06	SILTY SAND to SANDY SILT	10-15	15-20	50-60		31-35
26.5	21.7	3.50	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.71	
27.0	31.0	1.76	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
27.5	38.0	1.79	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
28.0	34.1	2.91	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.83	27-31
28.5	43.0	2.90	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	3.63	27-31
29.0	25.5	6.34	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.06	
29.5	21.6	5.77	SILTY CLAY TO CLAY	20-25	25-40		1.80	
30.0	25.0	5.88	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.06	
30.5	23.3	6.30	*SANDY CLAY to SILTY CLAY	20-25	25-40		.99	
31.0	22.2	6.07	SILTY CLAY TO CLAY	20-25	25-40		1.90	
31.5	36.1	5.57	*SANDY CLAY to SILTY CLAY	25-40	>40		1.60	
32.0	20.8	5.98	SILTY CLAY TO CLAY	20-25	25-40		1.80	
32.5	20.4	5.53	SILTY CLAY TO CLAY	15-20	25-40		1.79	
33.0	22.5	5.04	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.00	
33.5	18.7	6.63	SILTY CLAY TO CLAY	15-20	25-40		1.65	
34.0	44.7	5.20	*SANDY CLAY to SILTY CLAY	>40	>40		2.09	
34.5	64.9	3.50	SANDY SILT to CLAYEY SILT	>40	>40	90-100	6.19	27-31
35.0	23.2	6.57	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.07	
35.5	39.4	5.10	*SANDY CLAY to SILTY CLAY	25-40	>40		1.88	
36.0	142.3	2.68	*SILTY SAND to CLAYEY SAND	>40	>40	90-100		35-40
36.5	100.7	2.98	SANDY SILT to CLAYEY SILT	>40	>40	90-100	10.04	31-35
37.0	29.2	6.05	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.41	
37.5	24.2	4.45	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.34	
38.0	22.8	4.74	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.21	
38.5	20.3	4.58	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.98	
39.0	22.8	4.79	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.25	
39.5	20.6	5.07	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.04	
40.0	21.9	5.43	SILTY CLAY TO CLAY	15-20	25-40		2.20	
40.5	29.1	5.63	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.49	
41.0	52.2	5.47	*SANDY CLAY to SILTY CLAY	>40	>40		2.75	
41.5	146.1	2.67	*SILTY SAND to CLAYEY SAND	>40	>40	90-100		35-40
42.0	159.8	2.40	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
42.5	208.8	1.78	SAND to SILTY SAND	>40	>40	80-90		40-42
43.0	267.8	2.28	*SILTY SAND to CLAYEY SAND	>40	>40			
43.5	261.9	1.68	SAND to SILTY SAND	>40	>40	80-90		40-42
44.0	227.2	3.23	*SILTY SAND to CLAYEY SAND	>40	>40			
44.5	313.8	1.76	SAND to SILTY SAND	>40	>40	90-100		42-45
45.0	288.6	1.69	SAND to SILTY SAND	>40	>40	90-100		42-45

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-4

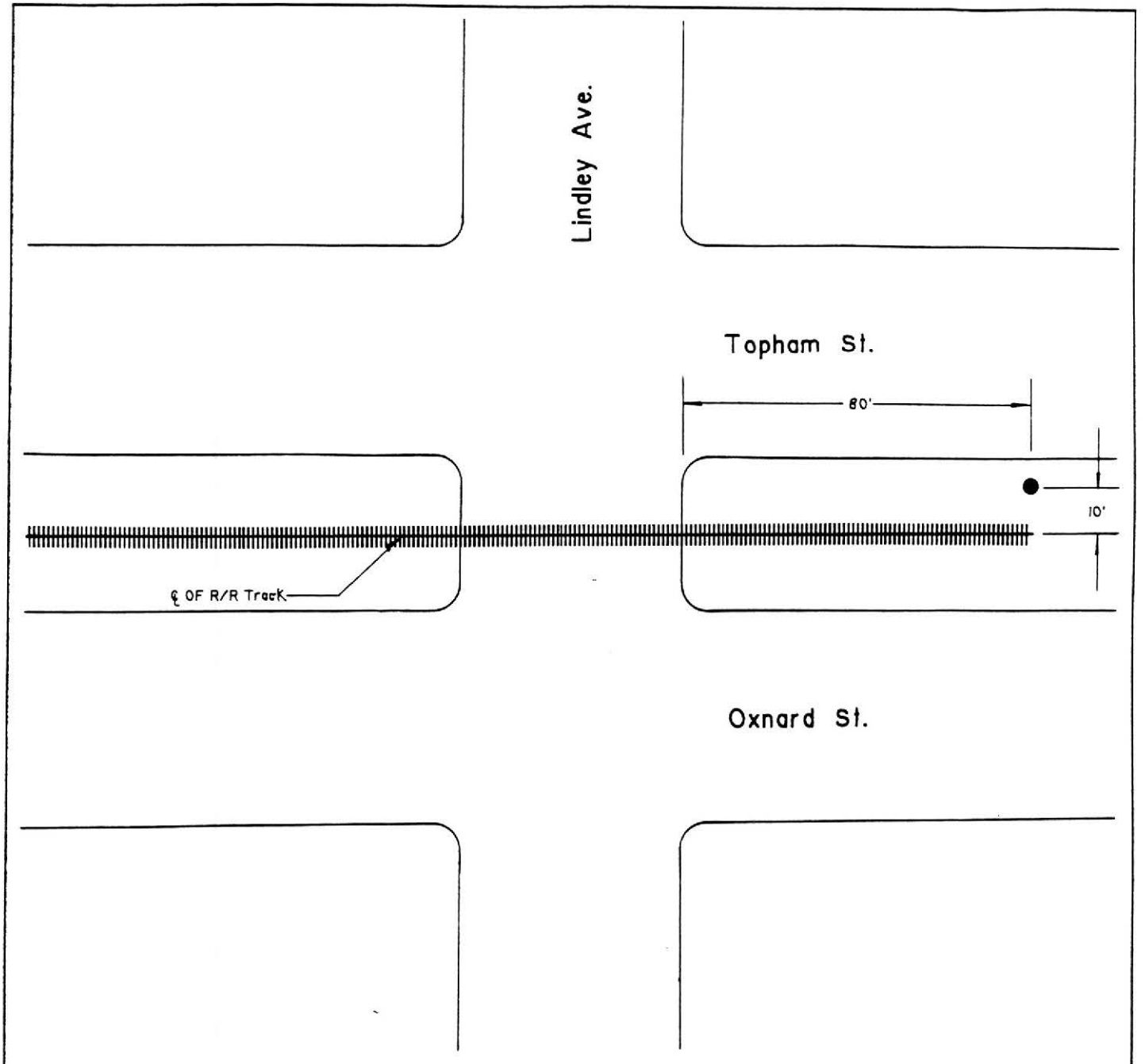
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	223.6	1.41	SAND to SILTY SAND	>40	>40	70-80		40-42
46.0	173.1	1.95	SILTY SAND to SANDY SILT	>40	>40	80-90		40-42
46.5	153.9	1.62	SAND to SILTY SAND	>40	>40	70-80		40-42
47.0	178.9	1.02	SAND to SILTY SAND	>40	>40	60-70		40-42
47.5	209.0	.97	SAND to SILTY SAND	>40	>40	60-70		40-42
48.0	176.5	1.08	SAND to SILTY SAND	>40	>40	60-70		40-42
48.5	73.5	4.47	*SANDY CLAY to SILTY CLAY	>40	>40		4.15	
49.0	42.9	5.73	*SANDY CLAY to SILTY CLAY	>40	>40		2.39	
49.5	47.0	3.13	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	5.28	27-31
50.0	94.5	1.52	SAND to SILTY SAND	25-40	25-40	50-60		35-40
50.5	65.7	3.40	SANDY SILT to CLAYEY SILT	>40	>40	90-100	7.51	27-31
51.0	27.1	4.24	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.99	
51.5	74.8	2.75	SILTY SAND to SANDY SILT	>40	>40	70-80		31-35
52.0	17.9	3.62	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.92	
52.5	40.8	4.21	CLAYEY SILT to SILTY CLAY	25-40	>40		4.65	
53.0	33.7	4.44	CLAYEY SILT to SILTY CLAY	25-40	25-40		3.82	
53.5	22.6	3.99	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.50	
54.0	21.1	4.96	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.33	
54.5	54.2	3.37	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	6.35	27-31
55.0	18.0	6.30	SILTY CLAY TO CLAY	15-20	25-40		1.97	
55.5	23.6	5.91	SILTY CLAY TO CLAY	20-25	25-40		2.66	
56.0	18.5	5.07	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.05	
56.5	10.7	5.06	SILTY CLAY TO CLAY	5-10	15-20		1.09	
57.0	12.8	4.88	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.36	
57.5	15.1	4.40	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.65	
58.0	14.7	4.65	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.60	
58.5	13.5	4.87	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.45	
59.0	12.6	4.97	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.34	
59.5	12.6	5.40	SILTY CLAY TO CLAY	10-15	15-20		1.35	
60.0	11.7	4.70	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.25	
60.5	21.9	3.81	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.55	
61.0	12.9	4.56	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.40	
61.5	15.2	5.08	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.70	
62.0	25.5	5.43	SILTY CLAY TO CLAY	20-25	25-40		3.04	
62.5	15.8	4.80	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.80	
63.0	19.4	4.08	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.27	
63.5	225.0	.88	SAND to SILTY SAND	>40	>40	60-70		42-45
64.0	76.1	2.83	SANDY SILT to CLAYEY SILT	>40	>40	80-90	9.69	31-35
64.5	65.2	2.90	SANDY SILT to CLAYEY SILT	25-40	>40	70-80	8.31	31-35
65.0	17.9	5.23	SILTY CLAY TO CLAY	15-20	20-25		2.10	
65.5	14.2	2.84	SANDY SILT to CLAYEY SILT	5-10	10-15	40-50	1.62	
66.0	14.6	3.74	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.68	
66.5	13.4	3.30	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.52	
67.0	27.2	4.16	CLAYEY SILT to SILTY CLAY	15-20	25-40		3.37	
67.5	31.2	3.80	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.93	
68.0	12.0	3.18	CLAYEY SILT to SILTY CLAY	5-10	10-15		1.34	
68.5	9.8	3.07	SILTY CLAY to CLAY	5-10	10-15		1.05	
69.0	13.8	4.11	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.60	
69.5	68.4	2.44	SILTY SAND to SANDY SILT	25-40	25-40	70-80		31-35
70.0	68.1	3.11	SANDY SILT to CLAYEY SILT	>40	>40	80-90	9.05	31-35

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-4

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	24.6	8.33	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.55	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

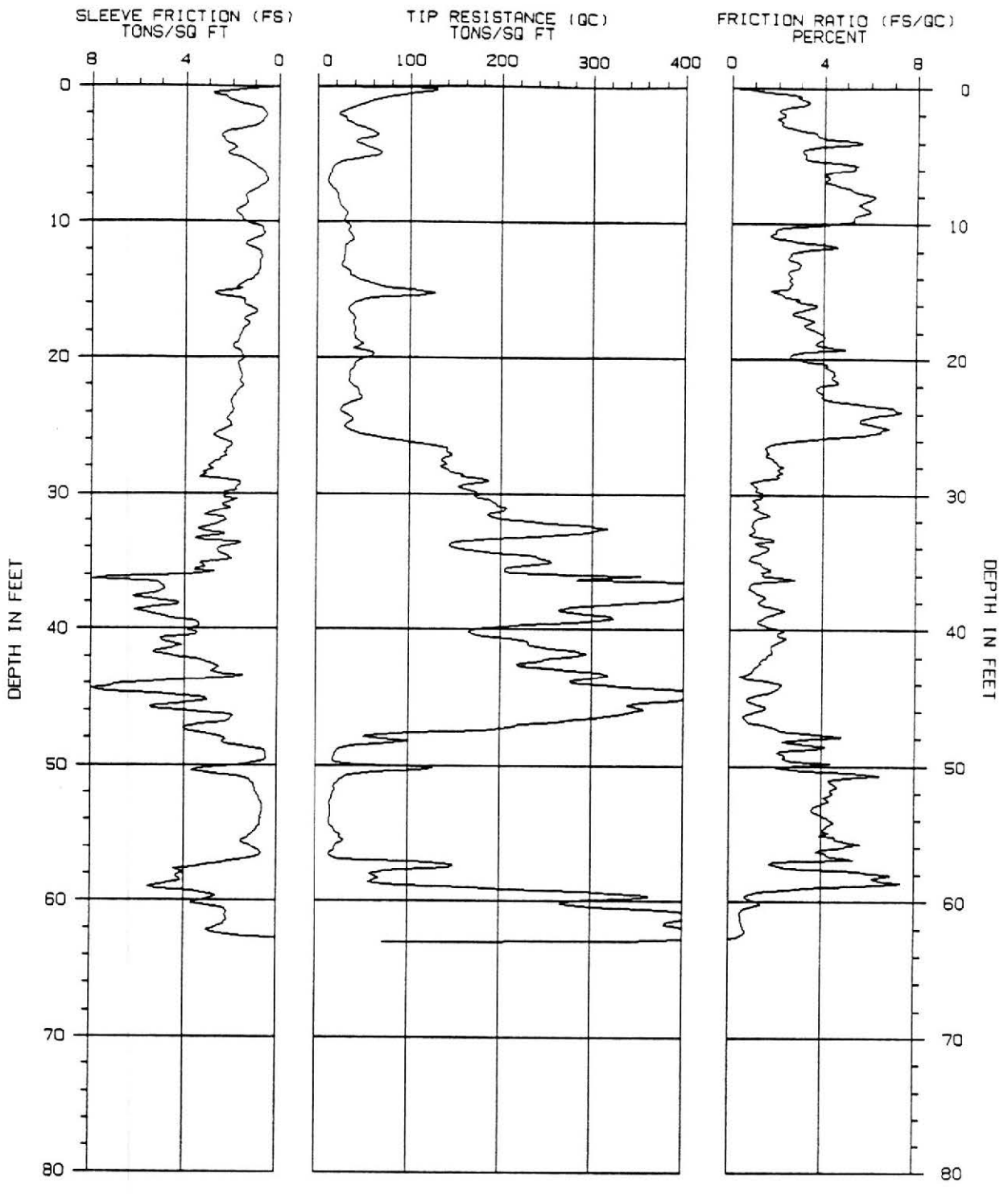
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of CPT-4

11-93

Figure A-20



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-5

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-10-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-5
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-10-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	269.8	2.64	*SILTY SAND to CLAYEY SAND	>40	>40			
1.0	136.8	3.35	*CLAYEY SAND to SANDY CLAY	>40	>40		2.05	
1.5	81.9	2.20	SILTY SAND to SANDY SILT	25-40	>40	70-80		35-40
2.0	45.1	2.29	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
2.5	57.6	2.19	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
3.0	85.3	2.63	SILTY SAND to SANDY SILT	>40	>40	80-90		31-35
3.5	110.6	3.70	*CLAYEY SAND to SANDY CLAY	>40	>40		2.19	
4.0	66.9	5.61	*SANDY CLAY to SILTY CLAY	>40	>40		1.37	
4.5	90.7	3.17	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	1.92	31-35
5.0	101.2	3.21	*CLAYEY SAND to SANDY CLAY	>40	>40		2.21	
5.5	41.6	4.60	*SANDY CLAY to SILTY CLAY	25-40	>40		.93	
6.0	23.9	5.31	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.08	
6.5	19.8	4.11	CLAYEY SILT to SILTY CLAY	10-15	20-25		.91	
7.0	16.4	4.14	CLAYEY SILT to SILTY CLAY	10-15	15-20		.77	
7.5	22.8	5.19	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.10	
8.0	29.6	6.17	*SANDY CLAY to SILTY CLAY	25-40	25-40		.73	
8.5	31.1	5.56	*SANDY CLAY to SILTY CLAY	25-40	25-40		.79	
9.0	35.9	5.97	*SANDY CLAY to SILTY CLAY	25-40	>40		.93	
9.5	39.5	5.28	*SANDY CLAY to SILTY CLAY	25-40	>40		1.04	
10.0	38.0	4.40	CLAYEY SILT to SILTY CLAY	25-40	25-40		2.04	
10.5	41.6	1.87	SILTY SAND to SANDY SILT	15-20	15-20	50-60		31-35
11.0	45.3	1.85	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
11.5	40.4	3.97	CLAYEY SILT to SILTY CLAY	25-40	25-40		2.27	
12.0	35.1	2.98	SANDY SILT to CLAYEY SILT	15-20	25-40	60-70	2.00	27-31
12.5	33.3	2.46	SANDY SILT to CLAYEY SILT	15-20	20-25	50-60	1.92	27-31
13.0	30.4	2.97	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	1.77	27-31
13.5	36.9	2.45	SANDY SILT to CLAYEY SILT	15-20	20-25	50-60	2.20	27-31
14.0	41.7	2.61	SANDY SILT to CLAYEY SILT	15-20	25-40	60-70	2.53	31-35
14.5	62.9	2.58	SILTY SAND to SANDY SILT	25-40	25-40	70-80		31-35
15.0	107.4	1.72	SILTY SAND to SANDY SILT	>40	>40	60-70		35-40
15.5	78.7	2.76	SILTY SAND to SANDY SILT	>40	>40	80-90		31-35
16.0	40.7	3.69	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	2.60	27-31
16.5	34.7	2.75	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.24	27-31
17.0	40.8	3.35	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	2.67	27-31
17.5	39.0	3.15	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	2.58	27-31
18.0	39.9	3.78	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	2.68	27-31
18.5	40.0	4.02	CLAYEY SILT to SILTY CLAY	25-40	25-40		2.72	
19.0	47.1	3.77	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	3.25	27-31
19.5	47.9	3.29	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	3.35	27-31
20.0	49.8	2.71	SANDY SILT to CLAYEY SILT	25-40	25-40	60-70	3.53	31-35

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-5

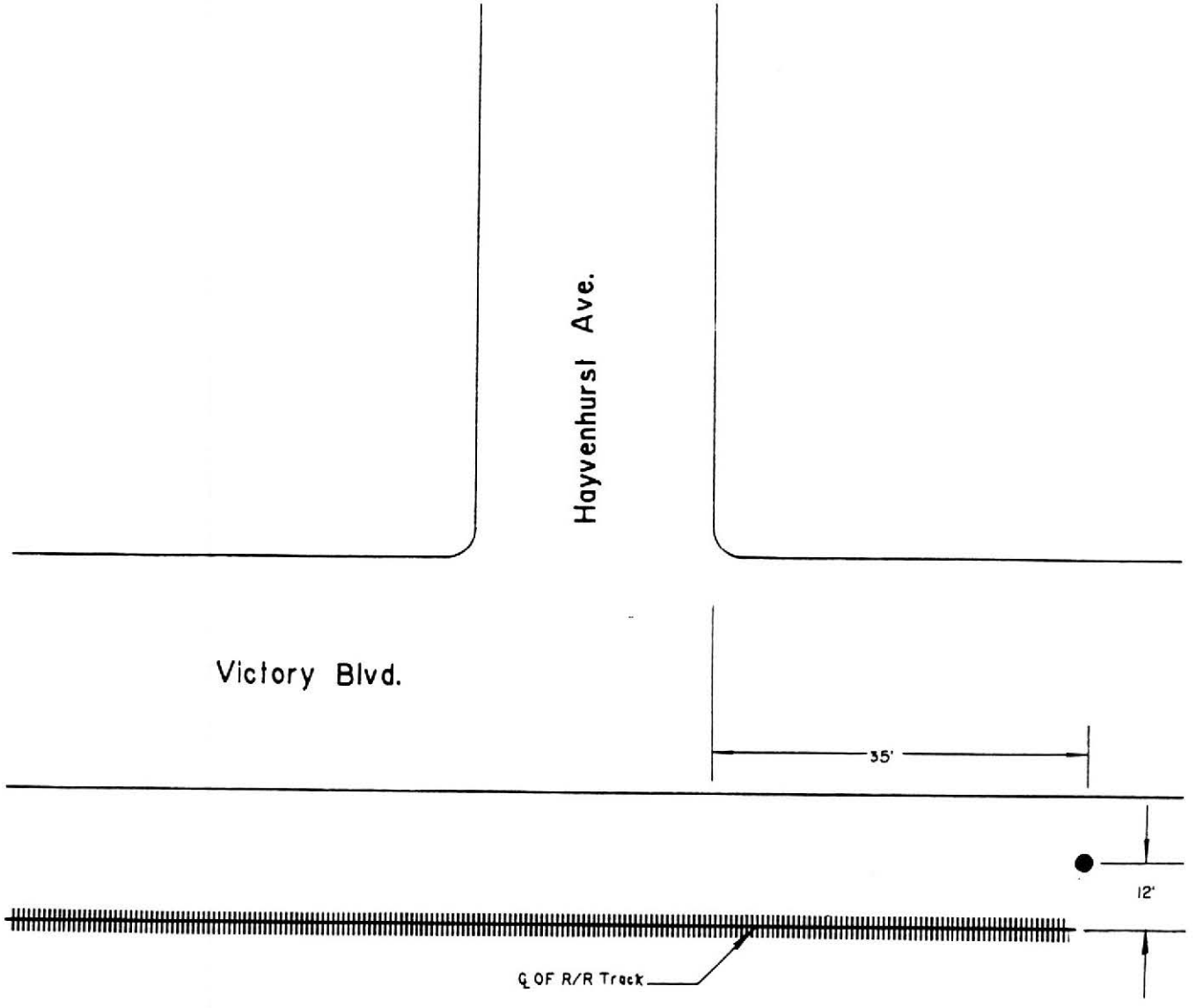
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	37.1	4.19	CLAYEY SILT to SILTY CLAY	25-40	25-40		2.64	
21.0	32.7	4.47	CLAYEY SILT to SILTY CLAY	25-40	25-40		2.34	
21.5	31.9	4.42	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.30	
22.0	33.9	3.91	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.49	
22.5	39.9	3.86	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	2.97	27-31
23.0	40.9	4.22	CLAYEY SILT to SILTY CLAY	25-40	>40		3.08	
23.5	26.0	6.53	*SANDY CLAY to SILTY CLAY	25-40	25-40		.97	
24.0	23.5	6.99	*SANDY CLAY to SILTY CLAY	25-40	25-40		.88	
24.5	32.7	5.61	*SANDY CLAY to SILTY CLAY	25-40	>40		1.26	
25.0	25.0	6.63	*SANDY CLAY to SILTY CLAY	25-40	25-40		.96	
25.5	34.5	6.15	*SANDY CLAY to SILTY CLAY	25-40	>40		1.36	
26.0	65.0	3.05	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	5.27	31-35
26.5	105.5	1.54	SAND to SILTY SAND	25-40	25-40	60-70		35-40
27.0	111.4	1.65	SAND to SILTY SAND	>40	>40	60-70		35-40
27.5	105.2	1.84	SILTY SAND to SANDY SILT	>40	>40	60-70		35-40
28.0	103.0	2.26	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
28.5	116.5	2.05	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
29.0	141.4	1.07	SAND to SILTY SAND	25-40	>40	50-60		40-42
29.5	114.3	1.16	SAND to SILTY SAND	25-40	25-40	50-60		40-42
30.0	131.1	1.24	SAND to SILTY SAND	25-40	>40	60-70		40-42
30.5	139.4	.99	SAND to SILTY SAND	25-40	25-40	50-60		40-42
31.0	147.9	1.04	SAND to SILTY SAND	>40	>40	50-60		40-42
31.5	137.8	1.54	SAND to SILTY SAND	>40	>40	60-70		40-42
32.0	154.8	1.03	SAND to SILTY SAND	>40	>40	60-70		40-42
32.5	215.6	1.04	SAND to SILTY SAND	>40	>40	60-70		40-42
33.0	200.0	.81	SAND to SILTY SAND	>40	>40	60-70		40-42
33.5	113.0	1.87	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
34.0	101.0	1.64	SILTY SAND to SANDY SILT	25-40	>40	60-70		35-40
34.5	143.8	1.16	SAND to SILTY SAND	>40	>40	60-70		40-42
35.0	171.4	.90	SAND to SILTY SAND	>40	>40	60-70		40-42
35.5	140.0	1.51	SAND to SILTY SAND	>40	>40	60-70		40-42
36.0	186.4	1.38	SAND to SILTY SAND	>40	>40	70-80		40-42
36.5	237.6	1.64	SAND to SILTY SAND	>40	>40	80-90		40-42
37.0	376.7	.84	SANDY GRAVEL to SAND	>40	>40	70-80		42-45
37.5	277.2	1.34	SAND to SILTY SAND	>40	>40	80-90		42-45
38.0	232.7	1.23	SAND to SILTY SAND	>40	>40	70-80		42-45
38.5	170.3	2.18	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
39.0	195.5	1.64	SAND to SILTY SAND	>40	>40	70-80		40-42
39.5	174.7	1.23	SAND to SILTY SAND	>40	>40	60-70		40-42
40.0	107.2	2.18	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
40.5	112.8	2.19	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
41.0	141.7	2.05	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
41.5	163.4	1.81	SAND to SILTY SAND	>40	>40	70-80		40-42
42.0	167.6	1.60	SAND to SILTY SAND	>40	>40	70-80		40-42
42.5	135.5	1.34	SAND to SILTY SAND	>40	>40	60-70		40-42
43.0	166.0	1.00	SAND to SILTY SAND	>40	>40	60-70		40-42
43.5	187.0	.53	SAND to SILTY SAND	25-40	25-40	50-60		42-45
44.0	174.0	2.24	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
44.5	239.6	1.96	SAND to SILTY SAND	>40	>40	90-100		40-42
45.0	244.2	.84	SAND to SILTY SAND	>40	>40	60-70		42-45

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-5

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	201.9	1.27	SAND to SILTY SAND	>40	>40	70-80		40-42
46.0	205.6	1.18	SAND to SILTY SAND	>40	>40	70-80		40-42
46.5	177.2	.67	SAND to SILTY SAND	25-40	25-40	50-60		40-42
47.0	129.3	1.50	SAND to SILTY SAND	>40	>40	60-70		40-42
47.5	83.6	2.61	SILTY SAND to SANDY SILT	>40	>40	70-80		31-35
48.0	35.7	3.72	SANDY SILT to CLAYEY SILT	20-25	25-40	80-90	3.92	27-31
48.5	28.3	3.93	CLAYEY SILT to SILTY CLAY	15-20	25-40		3.08	
49.0	13.1	2.05	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	1.33	27-31
49.5	11.4	2.32	SANDY SILT to CLAYEY SILT	3-5	10-15	30-40	1.12	
50.0	49.7	2.14	SILTY SAND to SANDY SILT	20-25	25-40	50-60		31-35
50.5	36.1	5.24	*SANDY CLAY to SILTY CLAY	25-40	>40		2.02	
51.0	15.9	4.33	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.67	
51.5	11.7	4.66	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.18	
52.0	11.1	4.49	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.11	
52.5	9.7	4.33	CLAYEY SILT to SILTY CLAY	5-10	15-20		.95	
53.0	9.4	3.65	SILTY CLAY to CLAY	5-10	10-15		.91	
53.5	9.5	3.93	CLAYEY SILT to SILTY CLAY	5-10	10-15		.93	
54.0	8.7	4.42	CLAYEY SILT to SILTY CLAY	5-10	10-15		.83	
54.5	10.2	4.24	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.02	
55.0	14.4	3.99	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.53	
55.5	17.0	4.86	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.86	
56.0	11.8	4.99	SILTY CLAY TO CLAY	5-10	15-20		1.22	
56.5	8.7	4.23	CLAYEY SILT to SILTY CLAY	5-10	10-15		.84	
57.0	29.8	3.08	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	3.45	27-31
57.5	77.5	2.47	SILTY SAND to SANDY SILT	25-40	>40	70-80		31-35
58.0	31.5	6.88	*SANDY CLAY to SILTY CLAY	25-40	>40		1.85	
58.5	32.6	6.72	*SANDY CLAY to SILTY CLAY	25-40	>40		1.92	
59.0	88.8	3.32	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	5.46	
59.5	184.0	.83	SAND to SILTY SAND	>40	>40	60-70		40-42
60.0	147.0	1.15	SAND to SILTY SAND	>40	>40	60-70		40-42
60.5	170.9	.74	SAND to SILTY SAND	25-40	25-40	50-60		40-42
61.0	218.2	.53	SANDY GRAVEL to SAND	25-40	25-40	60-70		42-45
61.5	201.2	.56	SAND to SILTY SAND	25-40	25-40	50-60		42-45
62.0	211.3	.67	SAND to SILTY SAND	>40	>40	60-70		42-45
62.5	208.5	.54	SAND to SILTY SAND	25-40	25-40	50-60		42-45
63.0	37.7	.00						

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

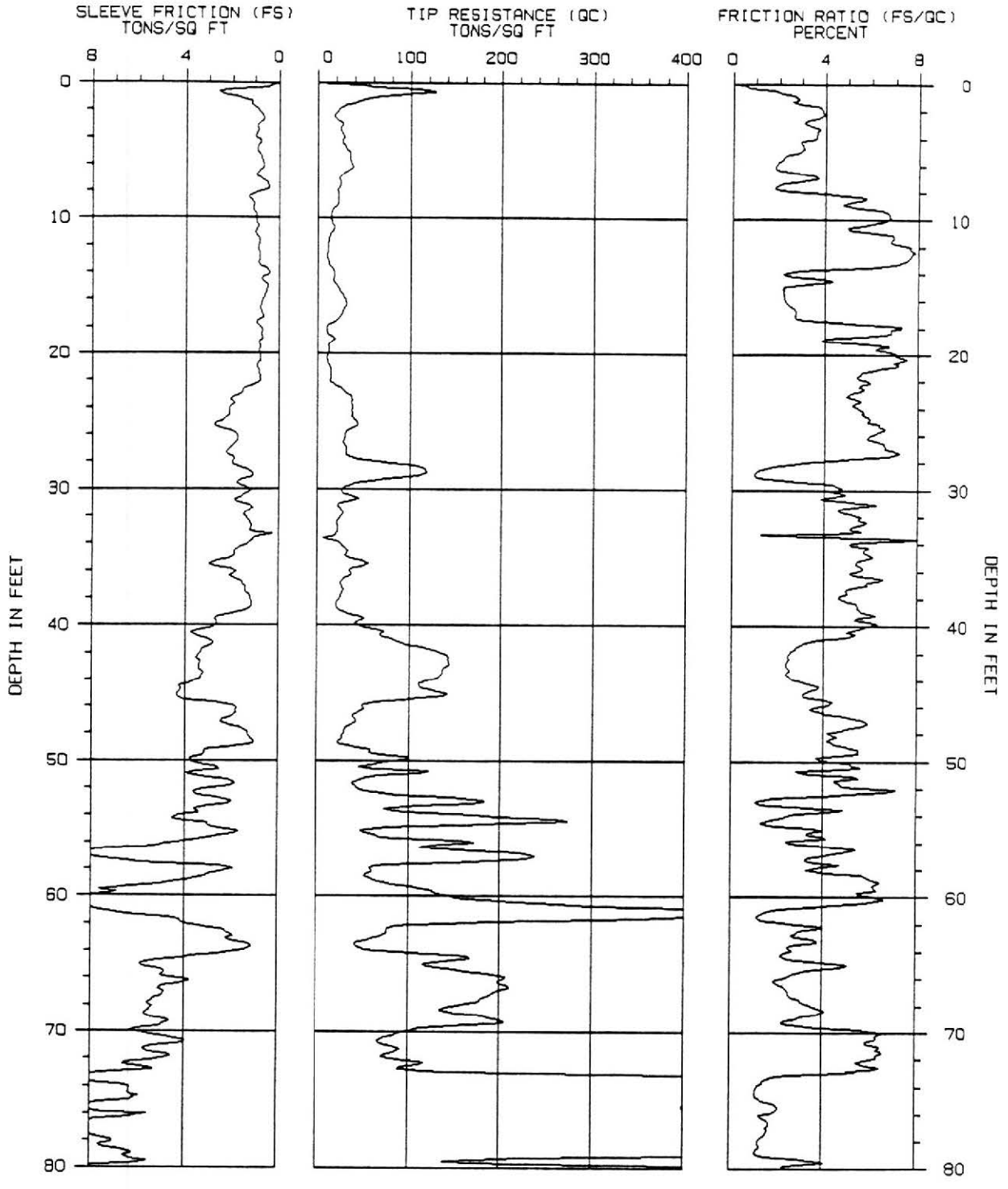
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of CPT-5

11-93

Figure A-21



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-6 (1 OF 2)

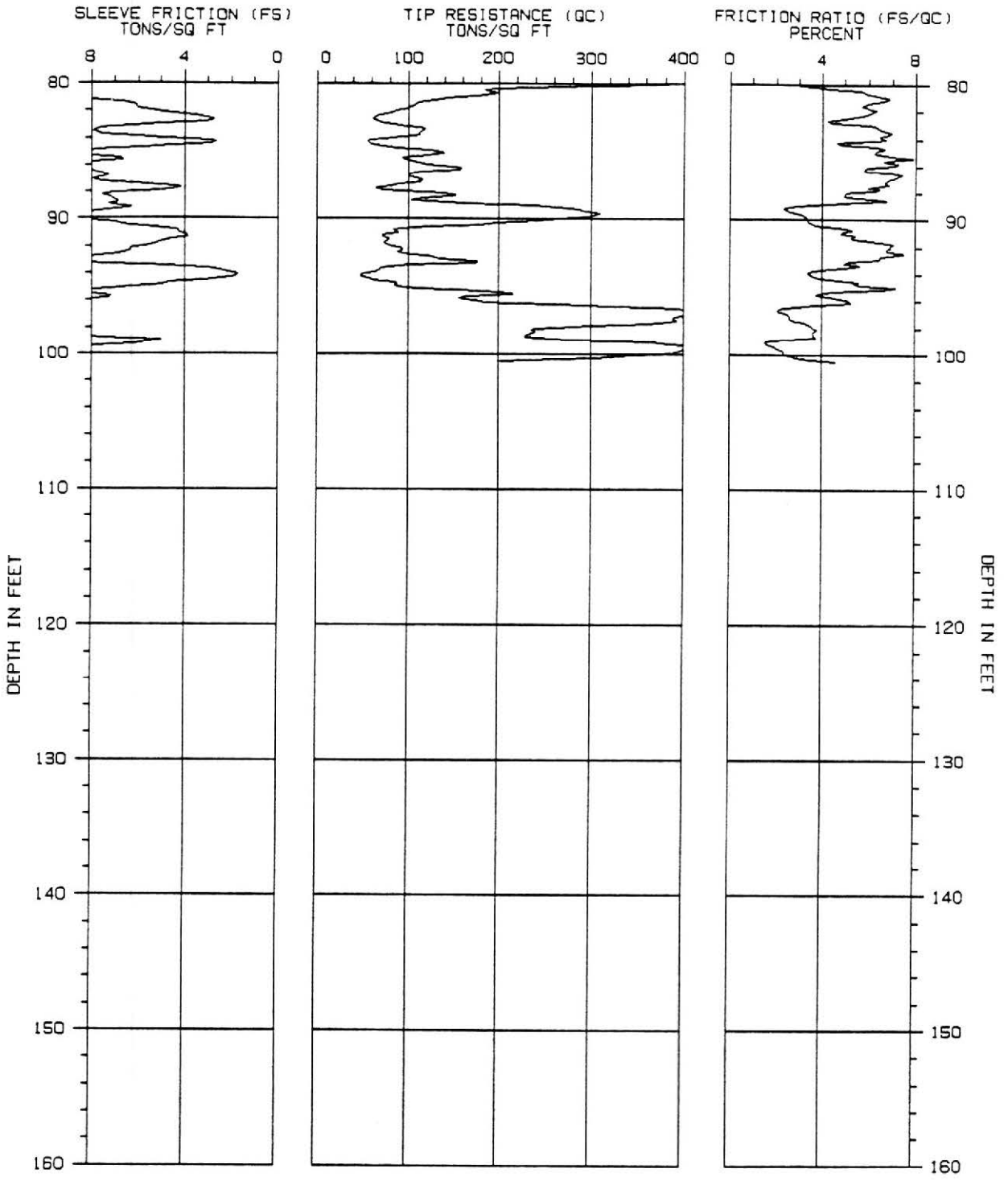
PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-10-1993

THE EARTH TECHNOLOGY CORPORATION



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-6 (2 OF 2)

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-10-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-6
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-10-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	273.8	1.75	SAND to SILTY SAND	>40	>40	90-100		40-42
1.0	156.2	2.69	*SILTY SAND to CLAYEY SAND	>40	>40			
1.5	79.1	3.09	SANDY SILT to CLAYEY SILT	>40	>40	90-100	2.57	31-35
2.0	43.4	3.87	SANDY SILT to CLAYEY SILT	25-40	25-40	90-100	1.50	27-31
2.5	33.5	3.67	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	1.21	27-31
3.0	46.9	3.19	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	1.78	27-31
3.5	42.2	3.60	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	1.66	27-31
4.0	46.6	3.57	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	1.90	27-31
4.5	42.6	3.01	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	1.79	27-31
5.0	50.3	2.88	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	2.18	31-35
5.5	51.3	2.15	SILTY SAND to SANDY SILT	20-25	25-40	50-60		31-35
6.0	53.2	1.83	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
6.5	47.0	2.47	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	2.20	31-35
7.0	33.4	3.56	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	1.59	27-31
7.5	33.1	1.93	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
8.0	28.8	3.26	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	1.42	27-31
8.5	29.2	5.67	*SANDY CLAY to SILTY CLAY	25-40	25-40		.74	
9.0	27.0	4.99	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.39	
9.5	19.6	6.72	SILTY CLAY TO CLAY	20-25	25-40		1.01	
10.0	17.9	6.70	SILTY CLAY TO CLAY	15-20	25-40		.93	
10.5	20.5	5.28	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.10	
11.0	18.6	6.43	SILTY CLAY TO CLAY	15-20	25-40		1.01	
11.5	14.6	6.83	SILTY CLAY TO CLAY	15-20	20-25		.79	
12.0	13.1	7.70	SILTY CLAY TO CLAY	15-20	20-25		.71	
12.5	12.4	7.75	SILTY CLAY TO CLAY	10-15	20-25		.69	
13.0	12.4	7.49	SILTY CLAY TO CLAY	10-15	20-25		.69	
13.5	14.5	5.86	SILTY CLAY TO CLAY	10-15	20-25		.83	
14.0	19.7	2.21	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.17	27-31
14.5	18.3	4.30	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.09	
15.0	22.6	2.20	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.38	27-31
15.5	26.6	2.21	SANDY SILT to CLAYEY SILT	10-15	15-20	40-50	1.66	27-31
16.0	30.7	2.28	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.95	27-31
16.5	30.3	2.59	SANDY SILT to CLAYEY SILT	10-15	20-25	50-60	1.95	27-31
17.0	26.7	2.69	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.73	27-31
17.5	21.3	3.78	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.38	
18.0	10.6	7.22	SILTY CLAY TO CLAY	10-15	20-25		.66	
18.5	10.8	6.57	SILTY CLAY TO CLAY	10-15	20-25		.68	
19.0	17.1	4.22	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.14	
19.5	11.6	6.33	SILTY CLAY TO CLAY	10-15	20-25		.75	
20.0	10.9	7.08	SILTY CLAY TO CLAY	10-15	20-25		.71	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-6

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	10.1	7.14	SILTY CLAY TO CLAY	10-15	20-25		.66	
21.0	12.6	6.53	SILTY CLAY TO CLAY	10-15	20-25		.85	
21.5	13.5	5.55	SILTY CLAY TO CLAY	10-15	20-25		.93	
22.0	12.2	5.86	SILTY CLAY TO CLAY	10-15	20-25		.83	
22.5	20.3	5.66	SILTY CLAY TO CLAY	15-20	25-40		1.47	
23.0	27.8	5.02	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.06	
23.5	32.0	5.55	*SANDY CLAY to SILTY CLAY	25-40	>40		1.21	
24.0	32.5	5.46	*SANDY CLAY to SILTY CLAY	25-40	>40		1.24	
24.5	31.3	5.63	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.21	
25.0	34.9	5.81	*SANDY CLAY to SILTY CLAY	25-40	>40		1.36	
25.5	32.1	6.59	*SANDY CLAY to SILTY CLAY	25-40	>40		1.26	
26.0	24.4	5.98	*SANDY CLAY to SILTY CLAY	20-25	25-40		.96	
26.5	22.6	6.43	*SANDY CLAY to SILTY CLAY	20-25	25-40		.89	
27.0	24.9	6.59	*SANDY CLAY to SILTY CLAY	25-40	25-40		.99	
27.5	25.0	6.73	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.01	
28.0	49.7	3.14	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	4.17	27-31
28.5	89.1	1.26	SAND to SILTY SAND	25-40	25-40	50-60		35-40
29.0	81.6	1.03	SAND to SILTY SAND	20-25	20-25	40-50		35-40
29.5	36.8	3.66	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	3.14	27-31
30.0	20.1	4.52	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.68	
30.5	26.4	4.30	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.26	
31.0	19.2	6.12	SILTY CLAY TO CLAY	15-20	25-40		1.63	
31.5	18.7	4.59	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.60	
32.0	18.7	5.62	SILTY CLAY TO CLAY	15-20	25-40		1.61	
32.5	14.9	5.69	SILTY CLAY TO CLAY	10-15	20-25		1.27	
33.0	15.9	5.34	SILTY CLAY TO CLAY	10-15	20-25		1.38	
33.5	11.7	5.65	SILTY CLAY TO CLAY	10-15	15-20		.98	
34.0	17.4	5.11	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.54	
34.5	22.5	5.68	SILTY CLAY TO CLAY	20-25	25-40		2.05	
35.0	21.6	6.09	SILTY CLAY TO CLAY	20-25	25-40		1.98	
35.5	37.4	5.37	*SANDY CLAY to SILTY CLAY	25-40	>40		1.78	
36.0	23.4	5.39	SILTY CLAY TO CLAY	20-25	25-40		2.20	
36.5	21.3	6.32	SILTY CLAY TO CLAY	20-25	25-40		2.01	
37.0	17.1	5.87	SILTY CLAY TO CLAY	15-20	20-25		1.59	
37.5	18.5	4.97	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.75	
38.0	16.3	4.70	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.54	
38.5	13.4	5.47	SILTY CLAY TO CLAY	10-15	20-25		1.25	
39.0	17.8	5.67	SILTY CLAY TO CLAY	15-20	20-25		1.73	
39.5	32.3	5.34	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.64	
40.0	28.6	5.88	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.46	
40.5	44.6	5.24	*SANDY CLAY to SILTY CLAY	>40	>40		2.33	
41.0	49.9	3.80	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	5.25	27-31
41.5	64.1	2.82	SANDY SILT to CLAYEY SILT	25-40	>40	70-80	6.81	31-35
42.0	81.6	2.51	SILTY SAND to SANDY SILT	>40	>40	70-80		31-35
42.5	86.0	2.47	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
43.0	85.4	2.42	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
43.5	81.6	2.39	SILTY SAND to SANDY SILT	25-40	>40	70-80		35-40
44.0	74.4	2.81	SANDY SILT to CLAYEY SILT	>40	>40	80-90	8.10	31-35
44.5	66.2	3.84	*CLAYEY SAND to SANDY CLAY	>40	>40		3.61	
45.0	81.3	3.13	SANDY SILT to CLAYEY SILT	>40	>40	90-100	8.94	31-35

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-6

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	55.5	4.29	*SANDY CLAY to SILTY CLAY	>40	>40		3.03	
46.0	29.7	3.67	SANDY SILT to CLAYEY SILT	15-20	25-40	70-80	3.18	
46.5	25.6	4.15	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.72	
47.0	25.1	5.70	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.34	
47.5	19.8	5.22	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.07	
48.0	17.3	4.29	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.80	
48.5	14.7	4.17	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.51	
49.0	24.6	5.16	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.66	
49.5	35.4	5.14	*SANDY CLAY to SILTY CLAY	25-40	>40		1.96	
50.0	47.9	4.41	*SANDY CLAY to SILTY CLAY	25-40	>40		2.70	
50.5	26.4	5.61	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.45	
51.0	50.7	4.32	*SANDY CLAY to SILTY CLAY	>40	>40		2.88	
51.5	24.4	4.52	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.67	
52.0	24.4	6.51	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.34	
52.5	48.5	3.97	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	5.57	27-31
53.0	102.0	1.09	SAND to SILTY SAND	25-40	25-40	50-60		40-42
53.5	41.0	4.86	*SANDY CLAY to SILTY CLAY	25-40	>40		2.36	
54.0	95.3	2.44	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
54.5	138.1	1.29	SAND to SILTY SAND	>40	>40	60-70		40-42
55.0	31.0	3.98	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.55	
55.5	35.4	3.92	CLAYEY SILT to SILTY CLAY	20-25	25-40		4.10	
56.0	92.9	2.53	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
56.5	72.6	5.41	*SANDY CLAY to SILTY CLAY	>40	>40		4.35	
57.0	127.9	3.68	*CLAYEY SAND to SANDY CLAY	>40	>40		7.80	
57.5	78.7	4.09	*CLAYEY SAND to SANDY CLAY	>40	>40		4.77	
58.0	31.4	3.28	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	3.68	27-31
58.5	28.1	5.87	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.64	
59.0	38.3	6.39	*SANDY CLAY to SILTY CLAY	>40	>40		2.29	
59.5	63.8	6.30	*SANDY CLAY to SILTY CLAY	>40	>40		3.90	
60.0	76.2	6.16	*SANDY CLAY to SILTY CLAY	>40	>40		4.70	
60.5	126.3	5.29	*SANDY CLAY to SILTY CLAY	>40	>40		7.91	
61.0	238.5	1.67	SAND to SILTY SAND	>40	>40	80-90		40-42
61.5	238.4	1.16	SAND to SILTY SAND	>40	>40	70-80		42-45
62.0	72.9	2.87	SANDY SILT to CLAYEY SILT	>40	>40	80-90	9.14	31-35
62.5	39.4	2.94	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	4.85	27-31
63.0	33.2	3.28	SANDY SILT to CLAYEY SILT	15-20	25-40	70-80	4.05	27-31
63.5	21.9	2.87	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	2.59	27-31
64.0	33.8	2.59	SANDY SILT to CLAYEY SILT	15-20	20-25	50-60	4.16	27-31
64.5	84.4	2.48	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
65.0	58.7	5.09	*SANDY CLAY to SILTY CLAY	>40	>40		3.74	
65.5	81.0	3.01	SANDY SILT to CLAYEY SILT	>40	>40	80-90	10.46	31-35
66.0	103.8	2.18	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
66.5	102.9	2.23	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
67.0	97.2	2.48	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
67.5	89.3	2.94	SANDY SILT to CLAYEY SILT	>40	>40	90-100	11.74	31-35
68.0	76.2	3.56	*CLAYEY SAND to SANDY CLAY	>40	>40		5.01	
68.5	69.4	3.95	*CLAYEY SAND to SANDY CLAY	>40	>40		4.56	
69.0	94.6	2.65	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
69.5	79.8	3.02	SANDY SILT to CLAYEY SILT	>40	>40	80-90	10.63	31-35
70.0	45.9	6.53	*SANDY CLAY to SILTY CLAY	>40	>40		3.01	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-6

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	34.4	6.25	*SANDY CLAY to SILTY CLAY	25-40	>40		2.23	
71.0	37.0	6.30	*SANDY CLAY to SILTY CLAY	25-40	>40		2.41	
71.5	40.5	6.58	*SANDY CLAY to SILTY CLAY	>40	>40		2.67	
72.0	39.1	6.06	*SANDY CLAY to SILTY CLAY	>40	>40		2.58	
72.5	48.1	6.18	*SANDY CLAY to SILTY CLAY	>40	>40		3.22	
73.0	68.3	4.87	*SANDY CLAY to SILTY CLAY	>40	>40		4.64	
73.5	258.1	1.48	SAND to SILTY SAND	>40	>40	80-90		42-45
74.0	256.6	1.16	SAND to SILTY SAND	>40	>40	70-80		42-45
74.5	262.4	1.14	SAND to SILTY SAND	>40	>40	70-80		42-45
75.0	213.9	1.37	SAND to SILTY SAND	>40	>40	70-80		40-42
75.5	185.7	2.10	SILTY SAND to SANDY SILT	>40	>40	90-100		40-42
76.0	202.4	1.28	SAND to SILTY SAND	>40	>40	70-80		40-42
76.5	229.4	1.71	SAND to SILTY SAND	>40	>40	80-90		40-42
77.0	243.3	1.59	SAND to SILTY SAND	>40	>40	80-90		40-42
77.5	248.7	1.54	SAND to SILTY SAND	>40	>40	80-90		40-42
78.0	259.0	1.24	SAND to SILTY SAND	>40	>40	70-80		42-45
78.5	265.1	1.26	SAND to SILTY SAND	>40	>40	70-80		42-45
79.0	234.3	1.21	SAND to SILTY SAND	>40	>40	70-80		42-45
79.5	63.4	3.98	*CLAYEY SAND to SANDY CLAY	>40	>40		4.53	
80.0	199.0	2.50	*SILTY SAND to CLAYEY SAND	>40	>40			
80.5	82.7	5.63	*SANDY CLAY to SILTY CLAY	>40	>40		5.99	
81.0	69.7	6.86	*SANDY CLAY to SILTY CLAY	>40	>40		5.05	
81.5	47.9	5.78	*SANDY CLAY to SILTY CLAY	>40	>40		3.43	
82.0	38.6	6.22	*SANDY CLAY to SILTY CLAY	>40	>40		2.74	
82.5	27.4	4.97	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.81	
83.0	36.6	6.06	*SANDY CLAY to SILTY CLAY	25-40	>40		2.61	
83.5	49.7	6.93	*SANDY CLAY to SILTY CLAY	>40	>40		3.62	
84.0	31.9	6.71	*SANDY CLAY to SILTY CLAY	25-40	>40		2.27	
84.5	27.6	5.60	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.95	
85.0	58.9	6.22	*SANDY CLAY to SILTY CLAY	>40	>40		4.37	
85.5	40.1	7.23	*SANDY CLAY to SILTY CLAY	>40	>40		2.93	
86.0	57.8	6.52	*SANDY CLAY to SILTY CLAY	>40	>40		4.32	
86.5	48.7	6.92	*SANDY CLAY to SILTY CLAY	>40	>40		3.63	
87.0	48.4	6.86	*SANDY CLAY to SILTY CLAY	>40	>40		3.62	
87.5	34.4	6.27	*SANDY CLAY to SILTY CLAY	25-40	>40		2.53	
88.0	49.9	5.05	*SANDY CLAY to SILTY CLAY	>40	>40		3.76	
88.5	45.3	6.60	*SANDY CLAY to SILTY CLAY	>40	>40		3.41	
89.0	100.2	2.96	SILTY SAND to SANDY SILT	>40	>40	90-100		31-35
89.5	126.5	2.82	*SILTY SAND to CLAYEY SAND	>40	>40	90-100		35-40
90.0	109.8	3.35	*CLAYEY SAND to SANDY CLAY	>40	>40		8.62	
90.5	63.9	4.07	*CLAYEY SAND to SANDY CLAY	>40	>40		4.96	
91.0	36.7	4.79	*SANDY CLAY to SILTY CLAY	25-40	>40		2.78	
91.5	32.4	5.78	*SANDY CLAY to SILTY CLAY	25-40	>40		2.45	
92.0	34.0	6.90	*SANDY CLAY to SILTY CLAY	25-40	>40		2.58	
92.5	36.3	7.49	*SANDY CLAY to SILTY CLAY	>40	>40		2.79	
93.0	61.4	5.87	*SANDY CLAY to SILTY CLAY	>40	>40		4.86	
93.5	32.6	4.97	*SANDY CLAY to SILTY CLAY	25-40	25-40		2.50	
94.0	22.1	3.42	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	3.28	
94.5	24.6	5.12	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.72	
95.0	35.4	7.14	*SANDY CLAY to SILTY CLAY	25-40	>40		2.76	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
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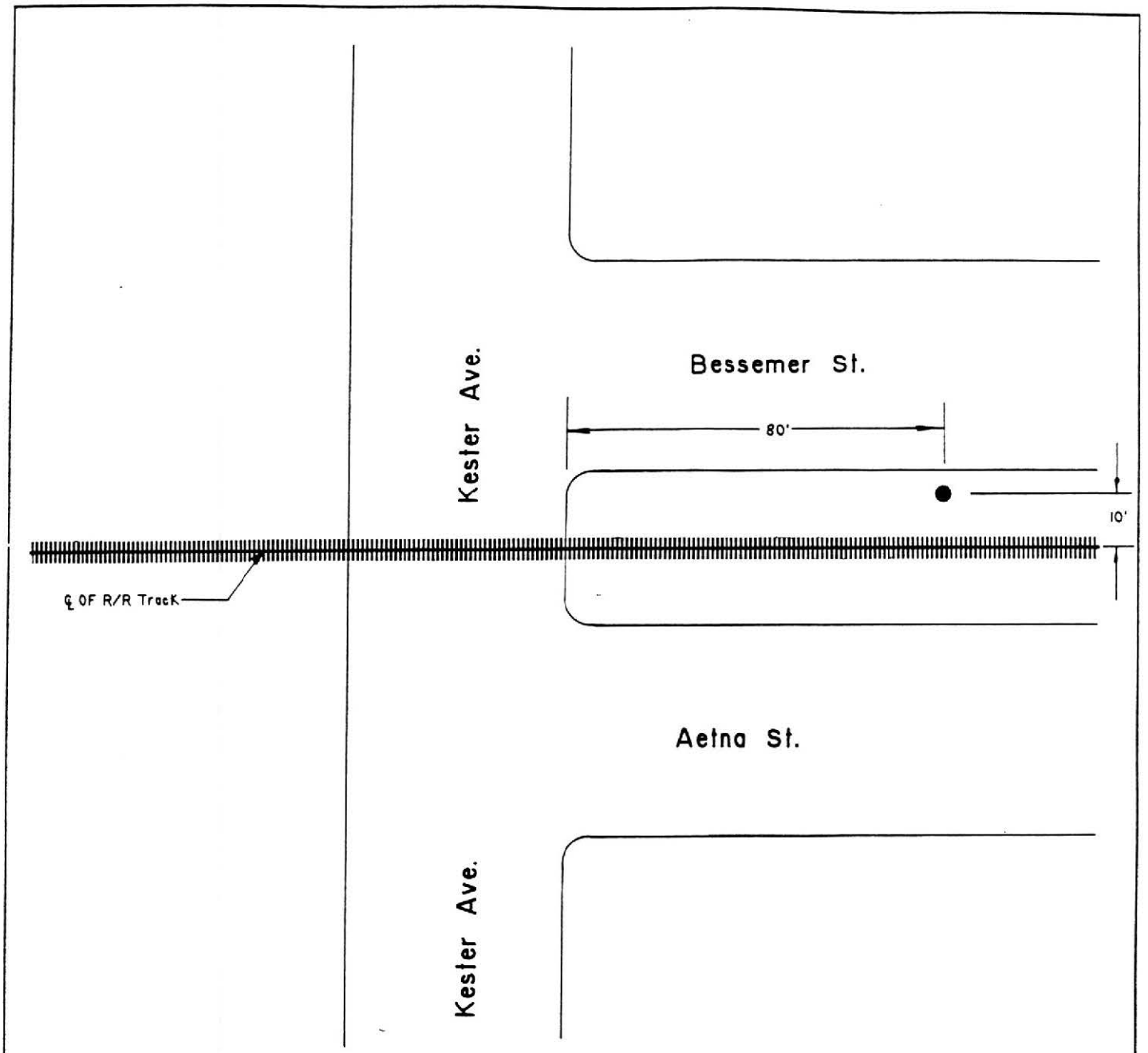
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED EQUIVALENT FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-6

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
95.5	86.0	3.74	*CLAYEY SAND to SANDY CLAY	>40	>40		6.98	
96.0	69.5	5.16	*SANDY CLAY to SILTY CLAY	>40	>40		5.60	
96.5	145.5	2.43	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
97.0	165.5	2.54	*SILTY SAND to CLAYEY SAND	>40	>40	90-100		35-40
97.5	156.9	2.91	*SILTY SAND to CLAYEY SAND	>40	>40			
98.0	105.2	3.63	*CLAYEY SAND to SANDY CLAY	>40	>40		8.57	
98.5	93.1	3.64	*CLAYEY SAND to SANDY CLAY	>40	>40		7.56	
99.0	129.9	1.61	SAND to SILTY SAND	>40	>40	60-70		40-42
99.5	166.2	1.98	SILTY SAND to SANDY SILT	>40	>40	80-90		40-42
100.0	149.2	2.34	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
100.5	80.7	4.58	*SANDY CLAY to SILTY CLAY	>40	>40		6.53	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

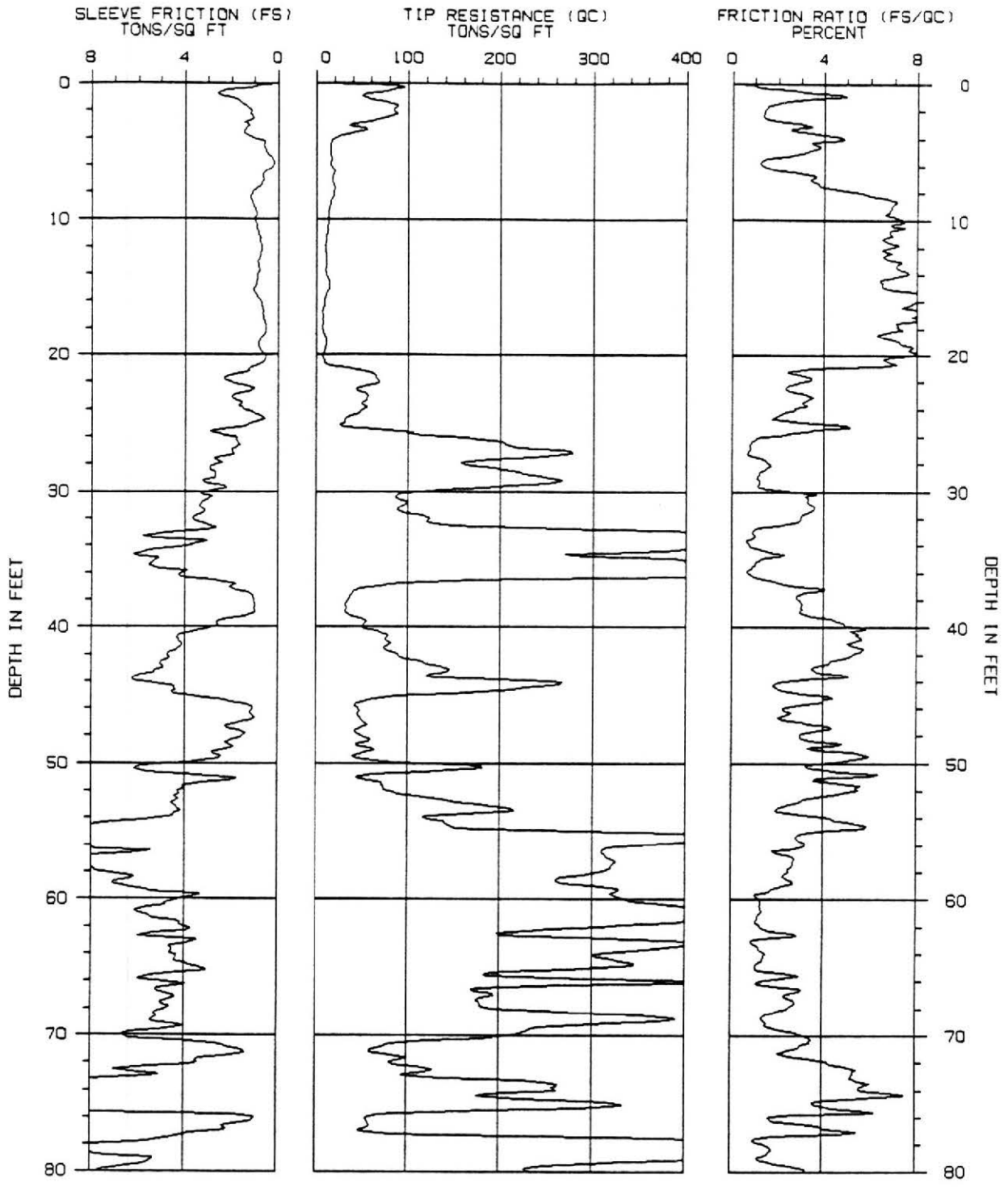
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of CPT-6

11-93

Figure A-22



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-7 (1 OF 2)

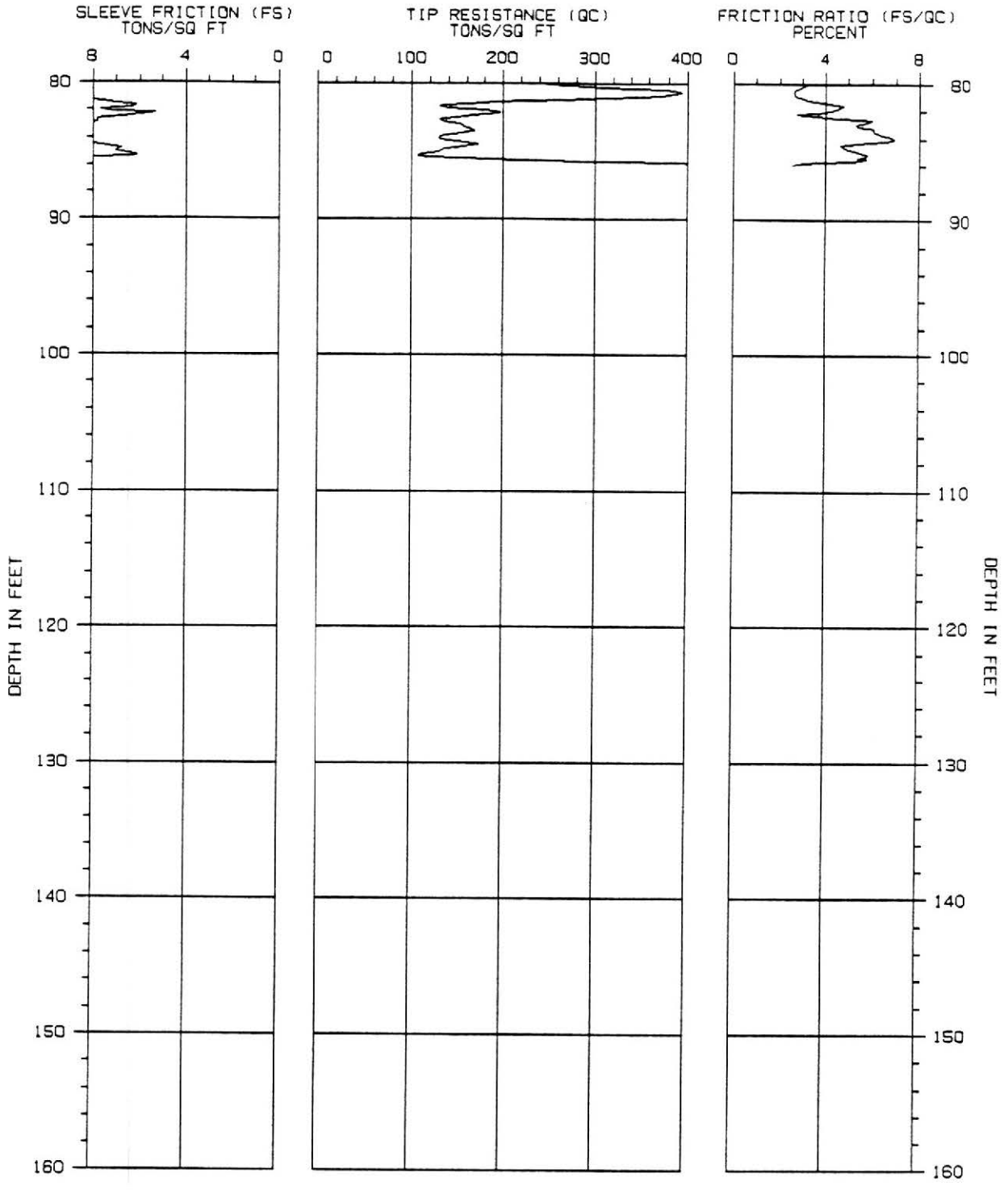
PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-10-1993

THE EARTH TECHNOLOGY CORPORATION



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-7 (2 OF 2)

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-10-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-7
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-10-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	211.2	2.63	*SILTY SAND to CLAYEY SAND	>40	>40			
1.0	112.6	4.49	*CLAYEY SAND to SANDY CLAY	>40	>40		1.69	
1.5	169.7	1.89	SAND to SILTY SAND	>40	>40	80-90		40-42
2.0	162.4	1.38	SAND to SILTY SAND	>40	>40	60-70		40-42
2.5	141.0	1.39	SAND to SILTY SAND	>40	>40	60-70		40-42
3.0	72.7	3.13	SANDY SILT to CLAYEY SILT	>40	>40	80-90	2.77	31-35
3.5	83.6	2.98	SANDY SILT to CLAYEY SILT	>40	>40	80-90	3.31	31-35
4.0	35.5	4.86	*SANDY CLAY to SILTY CLAY	25-40	>40		.72	
4.5	25.6	3.72	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.07	
5.0	24.7	3.25	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	1.06	
5.5	25.4	1.52	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
6.0	23.1	1.30	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
6.5	28.4	2.60	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.32	27-31
7.0	25.0	3.45	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	1.18	
7.5	26.6	3.85	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.29	
8.0	25.9	5.56	*SANDY CLAY to SILTY CLAY	20-25	25-40		.64	
8.5	21.8	6.94	*SANDY CLAY to SILTY CLAY	20-25	25-40		.55	
9.0	19.4	6.89	SILTY CLAY TO CLAY	20-25	25-40		.98	
9.5	17.1	6.63	SILTY CLAY TO CLAY	15-20	25-40		.88	
10.0	16.5	7.40	SILTY CLAY TO CLAY	15-20	25-40		.86	
10.5	15.2	7.47	SILTY CLAY TO CLAY	15-20	25-40		.80	
11.0	14.3	6.89	SILTY CLAY TO CLAY	15-20	20-25		.76	
11.5	13.5	6.66	SILTY CLAY TO CLAY	10-15	20-25		.73	
12.0	11.8	6.78	SILTY CLAY TO CLAY	10-15	20-25		.64	
12.5	12.5	6.76	SILTY CLAY TO CLAY	10-15	20-25		.69	
13.0	13.0	7.25	SILTY CLAY TO CLAY	15-20	20-25		.73	
13.5	12.5	7.18	SILTY CLAY TO CLAY	10-15	20-25		.71	
14.0	12.7	7.55	SILTY CLAY TO CLAY	10-15	20-25		.73	
14.5	15.5	6.42	SILTY CLAY TO CLAY	15-20	20-25		.91	
15.0	15.8	6.56	SILTY CLAY TO CLAY	15-20	20-25		.95	
15.5	12.0	8.06	CLAY TO ORGANIC CLAY	10-15	20-25		.71	
16.0	9.5	8.19	CLAY TO ORGANIC CLAY	10-15	15-20		.56	
16.5	8.6	7.66	CLAY TO ORGANIC CLAY	5-10	15-20		.51	
17.0	7.7	8.46	CLAY TO ORGANIC CLAY	5-10	15-20		.45	
17.5	7.5	7.54	SILTY CLAY TO CLAY	5-10	15-20		.44	
18.0	7.0	7.34	SILTY CLAY TO CLAY	5-10	15-20		.41	
18.5	9.0	6.25	SILTY CLAY TO CLAY	5-10	15-20		.56	
19.0	10.7	7.23	SILTY CLAY TO CLAY	10-15	20-25		.68	
19.5	9.5	7.82	CLAY TO ORGANIC CLAY	10-15	15-20		.60	
20.0	7.0	7.74	CLAY TO ORGANIC CLAY	5-10	15-20		.43	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-7

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	8.1	6.81	SILTY CLAY TO CLAY	5-10	15-20		.51	
21.0	31.2	3.49	SANDY SILT to CLAYEY SILT	15-20	25-40	70-80	2.23	27-31
21.5	57.1	3.08	SANDY SILT to CLAYEY SILT	25-40	>40	70-80	4.19	31-35
22.0	61.2	3.00	SANDY SILT to CLAYEY SILT	25-40	>40	70-80	4.55	31-35
22.5	38.4	2.30	SANDY SILT to CLAYEY SILT	15-20	20-25	50-60	2.85	31-35
23.0	48.7	3.45	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	3.69	27-31
23.5	43.6	3.03	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	3.32	27-31
24.0	44.5	2.78	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	3.43	27-31
24.5	32.3	1.98	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
25.0	26.3	3.63	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.03	
25.5	54.0	3.66	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	4.31	27-31
26.0	112.9	1.32	SAND to SILTY SAND	25-40	25-40	50-60		40-42
26.5	164.5	.82	SAND to SILTY SAND	25-40	25-40	50-60		40-42
27.0	208.8	.75	SAND to SILTY SAND	>40	>40	60-70		42-45
27.5	184.8	1.11	SAND to SILTY SAND	>40	>40	60-70		40-42
28.0	122.1	1.65	SAND to SILTY SAND	>40	>40	60-70		35-40
28.5	162.6	1.32	SAND to SILTY SAND	>40	>40	60-70		40-42
29.0	191.9	1.10	SAND to SILTY SAND	>40	>40	60-70		40-42
29.5	174.7	1.17	SAND to SILTY SAND	>40	>40	60-70		40-42
30.0	84.4	2.69	SILTY SAND to SANDY SILT	>40	>40	80-90		31-35
30.5	65.2	3.36	SANDY SILT to CLAYEY SILT	>40	>40	90-100	5.77	27-31
31.0	70.3	3.51	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	3.14	27-31
31.5	66.4	3.45	SANDY SILT to CLAYEY SILT	>40	>40	90-100	5.99	27-31
32.0	88.6	2.98	SANDY SILT to CLAYEY SILT	>40	>40	90-100	8.12	31-35
32.5	104.3	2.01	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
33.0	328.3	.90	SAND to SILTY SAND	>40	>40	70-80		42-45
33.5	384.5	.85	SANDY GRAVEL to SAND	>40	>40	80-90		42-45
34.0	337.8	.75	SANDY GRAVEL to SAND	>40	>40	70-80		42-45
34.5	236.0	1.67	SAND to SILTY SAND	>40	>40	80-90		40-42
35.0	262.1	1.32	SAND to SILTY SAND	>40	>40	70-80		42-45
35.5	381.6	.98	SAND to SILTY SAND	>40	>40	80-90		42-45
36.0	382.0	.71	SANDY GRAVEL to SAND	>40	>40	70-80		42-45
36.5	154.7	1.40	SAND to SILTY SAND	>40	>40	60-70		40-42
37.0	46.0	2.85	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	4.55	27-31
37.5	25.9	3.15	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	2.51	27-31
38.0	23.0	2.89	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	2.24	27-31
38.5	21.3	2.98	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	2.07	27-31
39.0	21.5	3.04	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	2.12	27-31
39.5	34.1	4.51	CLAYEY SILT to SILTY CLAY	25-40	25-40		3.48	
40.0	31.5	5.49	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.61	
40.5	46.0	5.50	*SANDY CLAY to SILTY CLAY	>40	>40		2.40	
41.0	47.5	5.47	*SANDY CLAY to SILTY CLAY	>40	>40		2.50	
41.5	45.8	5.62	*SANDY CLAY to SILTY CLAY	>40	>40		2.41	
42.0	55.0	5.26	*SANDY CLAY to SILTY CLAY	>40	>40		2.92	
42.5	69.2	4.33	*SANDY CLAY to SILTY CLAY	>40	>40		3.71	
43.0	85.0	3.52	*CLAYEY SAND to SANDY CLAY	>40	>40		4.60	
43.5	74.7	4.70	*SANDY CLAY to SILTY CLAY	>40	>40		4.05	
44.0	153.9	2.33	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
44.5	135.6	1.96	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
45.0	68.1	3.59	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	3.73	27-31

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-7

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	30.4	3.97	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.25	
46.0	27.6	2.24	SANDY SILT to CLAYEY SILT	10-15	15-20	40-50	2.94	27-31
46.5	27.3	2.27	SANDY SILT to CLAYEY SILT	10-15	15-20	40-50	2.91	27-31
47.0	31.0	2.98	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	3.35	27-31
47.5	26.8	4.21	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.88	
48.0	29.0	3.01	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	3.14	27-31
48.5	29.3	4.45	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.18	
49.0	37.3	3.69	SANDY SILT to CLAYEY SILT	20-25	25-40	80-90	4.13	27-31
49.5	23.4	5.94	SILTY CLAY TO CLAY	20-25	25-40		2.52	
50.0	69.5	3.78	*CLAYEY SAND to SANDY CLAY	>40	>40		3.96	
50.5	82.3	4.13	*CLAYEY SAND to SANDY CLAY	>40	>40		4.73	
51.0	25.1	4.65	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.75	
51.5	41.3	5.13	*SANDY CLAY to SILTY CLAY	25-40	>40		2.34	
52.0	44.8	5.39	*SANDY CLAY to SILTY CLAY	>40	>40		2.56	
52.5	69.3	3.52	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	4.03	27-31
53.0	98.9	2.52	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
53.5	115.6	2.02	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
54.0	65.3	4.30	*SANDY CLAY to SILTY CLAY	>40	>40		3.83	
54.5	79.3	5.71	*SANDY CLAY to SILTY CLAY	>40	>40		4.70	
55.0	182.8	3.48	*CLAYEY SAND to SANDY CLAY	>40	>40		11.01	
55.5	272.3	2.85	*SILTY SAND to CLAYEY SAND	>40	>40			
56.0	189.3	3.22	*SILTY SAND to CLAYEY SAND	>40	>40			
56.5	167.7	1.83	SAND to SILTY SAND	>40	>40	70-80		40-42
57.0	171.2	2.76	*SILTY SAND to CLAYEY SAND	>40	>40			
57.5	171.4	2.65	*SILTY SAND to CLAYEY SAND	>40	>40			
58.0	163.3	2.48	*SILTY SAND to CLAYEY SAND	>40	>40	90-100		35-40
58.5	139.2	2.44	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
59.0	158.4	2.22	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
59.5	169.9	1.46	SAND to SILTY SAND	>40	>40	70-80		40-42
60.0	175.8	1.26	SAND to SILTY SAND	>40	>40	60-70		40-42
60.5	214.4	1.24	SAND to SILTY SAND	>40	>40	70-80		40-42
61.0	241.9	1.27	SAND to SILTY SAND	>40	>40	70-80		42-45
61.5	224.0	1.13	SAND to SILTY SAND	>40	>40	70-80		40-42
62.0	160.2	1.28	SAND to SILTY SAND	>40	>40	60-70		40-42
62.5	102.3	2.68	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
63.0	196.7	.90	SAND to SILTY SAND	>40	>40	60-70		40-42
63.5	199.6	1.19	SAND to SILTY SAND	>40	>40	60-70		40-42
64.0	155.6	1.51	SAND to SILTY SAND	>40	>40	70-80		40-42
64.5	166.9	1.34	SAND to SILTY SAND	>40	>40	60-70		40-42
65.0	155.1	1.10	SAND to SILTY SAND	>40	>40	60-70		40-42
65.5	92.5	2.76	SILTY SAND to SANDY SILT	>40	>40	80-90		31-35
66.0	209.7	1.24	SAND to SILTY SAND	>40	>40	70-80		40-42
66.5	88.5	2.89	SANDY SILT to CLAYEY SILT	>40	>40	80-90	11.53	31-35
67.0	96.7	2.32	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
67.5	87.6	2.79	SILTY SAND to SANDY SILT	>40	>40	80-90		31-35
68.0	95.2	2.45	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
68.5	172.9	1.48	SAND to SILTY SAND	>40	>40	70-80		40-42
69.0	170.9	1.54	SAND to SILTY SAND	>40	>40	70-80		40-42
69.5	115.1	1.89	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
70.0	101.0	3.18	*CLAYEY SAND to SANDY CLAY	>40	>40		6.78	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-7

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	46.0	3.49	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	6.06	27-31
71.0	31.2	2.72	SANDY SILT to CLAYEY SILT	15-20	20-25	50-60	4.02	27-31
71.5	42.6	2.58	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	5.63	31-35
72.0	38.7	4.25	CLAYEY SILT to SILTY CLAY	25-40	25-40		5.10	
72.5	61.1	5.47	*SANDY CLAY to SILTY CLAY	>40	>40		4.13	
73.0	49.9	5.23	*SANDY CLAY to SILTY CLAY	>40	>40		3.36	
73.5	121.4	6.03	*SANDY CLAY to SILTY CLAY	>40	>40		8.41	
74.0	123.3	5.67	*SANDY CLAY to SILTY CLAY	>40	>40		8.57	
74.5	89.3	6.33	*SANDY CLAY to SILTY CLAY	>40	>40		6.20	
75.0	154.2	3.63	*CLAYEY SAND to SANDY CLAY	>40	>40		10.84	
75.5	85.2	5.60	*SANDY CLAY to SILTY CLAY	>40	>40		5.94	
76.0	26.3	1.67	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
76.5	27.8	3.48	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	3.70	
77.0	22.5	5.08	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.94	
77.5	174.9	1.23	SAND to SILTY SAND	>40	>40	60-70		40-42
78.0	241.9	1.52	SAND to SILTY SAND	>40	>40	80-90		40-42
78.5	226.0	1.72	SAND to SILTY SAND	>40	>40	80-90		40-42
79.0	204.4	1.18	SAND to SILTY SAND	>40	>40	70-80		40-42
79.5	121.9	2.21	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
80.0	105.7	3.29	*CLAYEY SAND to SANDY CLAY	>40	>40		7.68	
80.5	168.7	2.65	*SILTY SAND to CLAYEY SAND	>40	>40			
81.0	155.9	2.81	*SILTY SAND to CLAYEY SAND	>40	>40			
81.5	71.5	4.39	*SANDY CLAY to SILTY CLAY	>40	>40		5.20	
82.0	80.2	4.24	*CLAYEY SAND to SANDY CLAY	>40	>40		5.88	
82.5	65.6	4.50	*SANDY CLAY to SILTY CLAY	>40	>40		4.79	
83.0	66.2	5.29	*SANDY CLAY to SILTY CLAY	>40	>40		4.86	
83.5	73.2	6.03	*SANDY CLAY to SILTY CLAY	>40	>40		5.41	
84.0	56.4	6.92	*SANDY CLAY to SILTY CLAY	>40	>40		4.15	
84.5	74.6	4.63	*SANDY CLAY to SILTY CLAY	>40	>40		5.56	
85.0	55.9	5.46	*SANDY CLAY to SILTY CLAY	>40	>40		4.14	
85.5	65.7	5.75	*SANDY CLAY to SILTY CLAY	>40	>40		4.92	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
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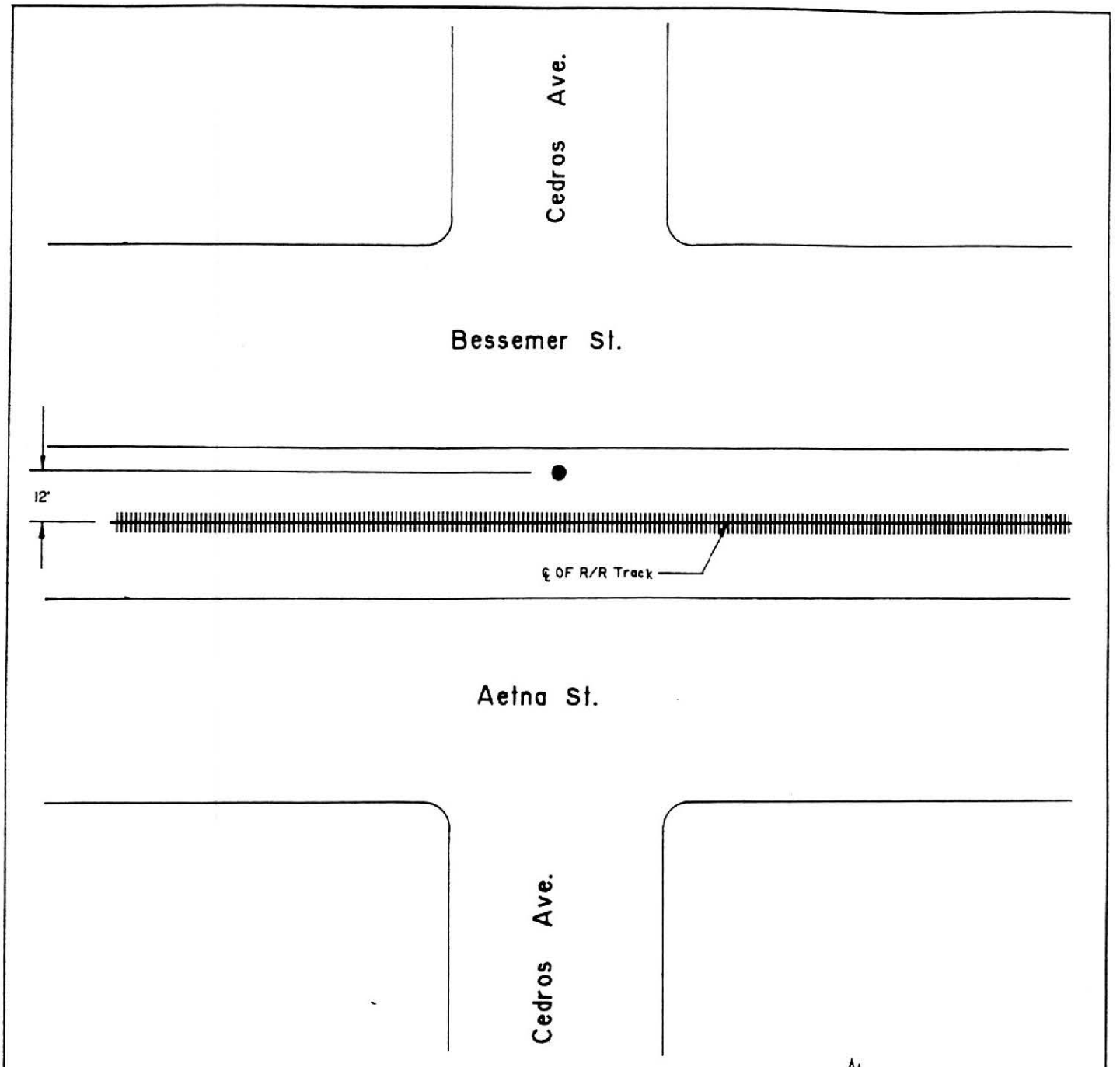
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

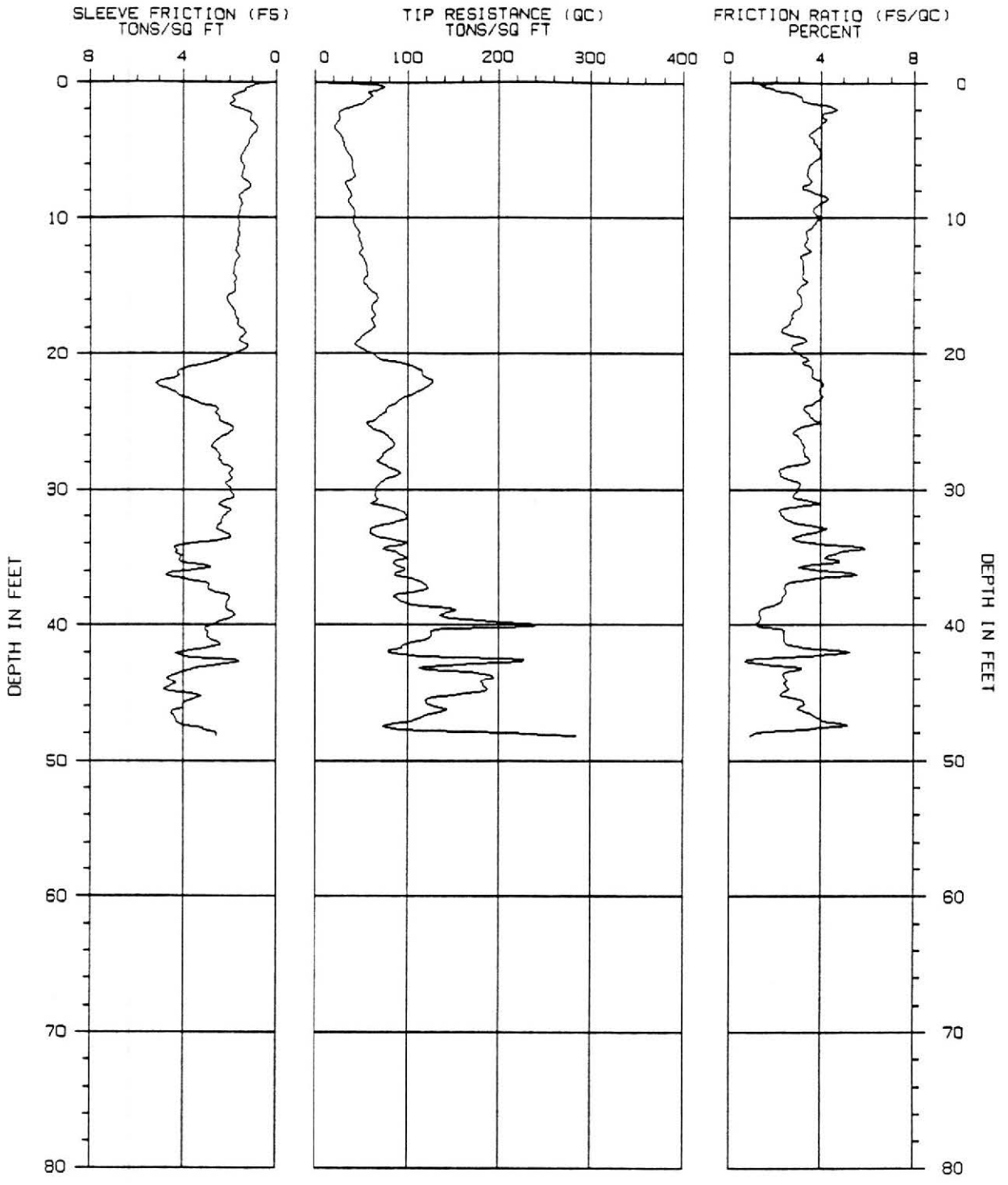


The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of CPT-7

11-93

Figure A-23



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-8

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-13-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-8
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-13-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	180.8	1.86	SAND to SILTY SAND	>40	>40	80-90		40-42
1.0	139.4	2.98	*SILTY SAND to CLAYEY SAND	>40	>40			
1.5	107.4	3.60	*CLAYEY SAND to SANDY CLAY	>40	>40		1.75	
2.0	59.8	4.66	*SANDY CLAY to SILTY CLAY	>40	>40		1.03	
2.5	48.6	4.03	*CLAYEY SAND to SANDY CLAY	25-40	>40	90-100	.88	27-31
3.0	42.1	4.04	CLAYEY SILT to SILTY CLAY	25-40	>40		1.60	
3.5	37.2	3.73	SANDY SILT to CLAYEY SILT	20-25	25-40	80-90	1.47	27-31
4.0	47.6	3.57	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	1.94	27-31
4.5	48.7	3.76	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	2.05	27-31
5.0	51.9	3.96	*CLAYEY SAND to SANDY CLAY	25-40	>40	90-100	1.13	27-31
5.5	57.6	3.90	*CLAYEY SAND to SANDY CLAY	>40	>40		1.29	
6.0	58.4	3.56	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	2.67	27-31
6.5	57.9	3.41	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	2.72	27-31
7.0	59.4	3.45	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	2.85	27-31
7.5	43.8	3.46	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	2.14	27-31
8.0	48.6	3.47	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	2.43	27-31
8.5	48.6	4.28	*SANDY CLAY to SILTY CLAY	25-40	>40		1.24	
9.0	48.1	3.92	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	2.49	27-31
9.5	53.3	3.66	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	2.82	27-31
10.0	50.8	3.96	*CLAYEY SAND to SANDY CLAY	25-40	>40	90-100	1.37	27-31
10.5	51.7	3.72	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	2.83	27-31
11.0	56.3	3.35	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	3.14	27-31
11.5	55.5	3.41	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	3.14	27-31
12.0	57.3	3.28	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	3.30	27-31
12.5	54.0	3.55	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	3.15	27-31
13.0	59.0	3.15	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	3.50	31-35
13.5	60.6	3.25	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	3.65	27-31
14.0	60.7	3.25	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	3.71	27-31
14.5	56.2	3.27	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	3.48	27-31
15.0	59.9	3.11	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	3.76	31-35
15.5	66.7	2.93	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	4.25	31-35
16.0	68.4	3.13	SANDY SILT to CLAYEY SILT	>40	>40	80-90	4.41	31-35
16.5	61.5	3.09	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	4.01	31-35
17.0	63.9	2.77	SANDY SILT to CLAYEY SILT	25-40	>40	70-80	4.23	31-35
17.5	59.6	2.66	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	3.99	31-35
18.0	62.0	2.43	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
18.5	52.4	2.44	SILTY SAND to SANDY SILT	20-25	25-40	60-70		31-35
19.0	43.9	3.40	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	3.03	27-31
19.5	42.6	2.70	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	2.97	27-31
20.0	56.1	3.01	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	3.98	31-35

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-8

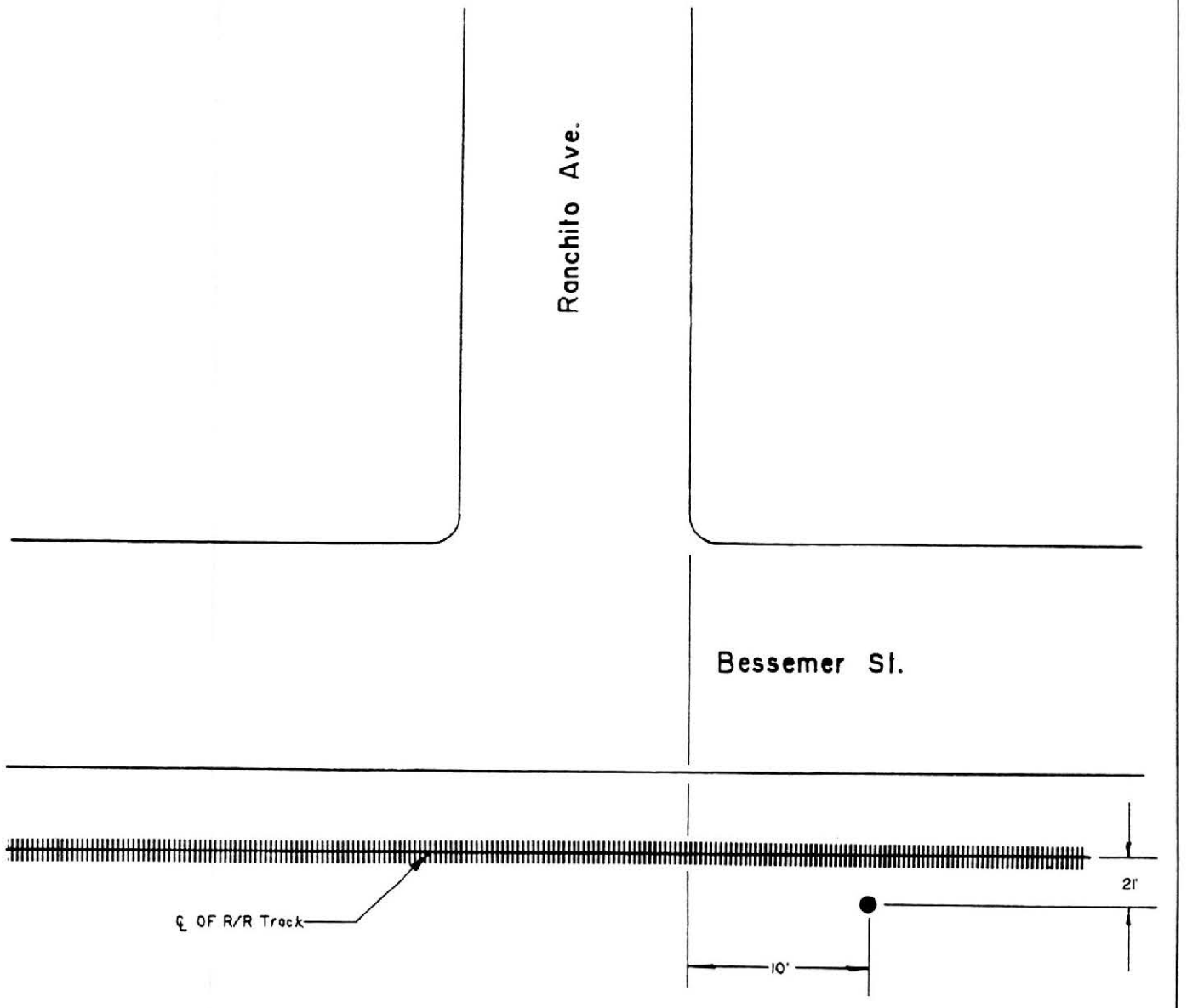
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	66.7	3.48	SANDY SILT to CLAYEY SILT	>40	>40	90-100	4.81	27-31
21.0	96.0	3.55	*CLAYEY SAND to SANDY CLAY	>40	>40		3.52	
21.5	102.6	3.64	*CLAYEY SAND to SANDY CLAY	>40	>40		3.80	
22.0	111.1	3.89	*CLAYEY SAND to SANDY CLAY	>40	>40		4.17	
22.5	104.8	4.02	*CLAYEY SAND to SANDY CLAY	>40	>40		3.97	
23.0	91.2	3.99	*CLAYEY SAND to SANDY CLAY	>40	>40		3.49	
23.5	77.0	3.87	*CLAYEY SAND to SANDY CLAY	>40	>40		2.97	
24.0	65.3	3.25	SANDY SILT to CLAYEY SILT	>40	>40	80-90	5.07	31-35
24.5	60.0	3.53	SANDY SILT to CLAYEY SILT	>40	>40	90-100	4.71	27-31
25.0	50.9	3.81	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	4.02	27-31
25.5	49.6	3.03	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	3.96	27-31
26.0	62.2	2.88	SANDY SILT to CLAYEY SILT	25-40	>40	70-80	5.04	31-35
26.5	67.6	3.13	SANDY SILT to CLAYEY SILT	>40	>40	80-90	5.54	31-35
27.0	64.9	3.26	SANDY SILT to CLAYEY SILT	>40	>40	80-90	5.36	31-35
27.5	57.1	3.30	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	4.76	27-31
28.0	52.5	3.49	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	4.40	27-31
28.5	64.7	2.21	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
29.0	66.0	2.25	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
29.5	53.7	3.02	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	4.64	31-35
30.0	48.7	2.99	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	4.24	27-31
30.5	48.5	2.78	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	4.27	31-35
31.0	44.3	4.02	CLAYEY SILT to SILTY CLAY	25-40	>40	90-100	3.92	27-31
31.5	64.7	2.20	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
32.0	70.7	2.30	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
32.5	59.1	2.82	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	5.42	31-35
33.0	42.1	4.22	CLAYEY SILT to SILTY CLAY	25-40	>40		3.86	
33.5	46.4	2.95	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	4.31	27-31
34.0	68.4	3.63	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	3.24	27-31
34.5	53.0	5.50	*SANDY CLAY to SILTY CLAY	>40	>40		2.51	
35.0	65.4	4.26	*SANDY CLAY to SILTY CLAY	>40	>40		3.15	
35.5	57.0	4.35	*SANDY CLAY to SILTY CLAY	>40	>40		2.76	
36.0	63.6	3.98	*CLAYEY SAND to SANDY CLAY	>40	>40		3.11	
36.5	63.9	4.50	*SANDY CLAY to SILTY CLAY	>40	>40		3.15	
37.0	77.2	2.43	SILTY SAND to SANDY SILT	25-40	>40	70-80		31-35
37.5	73.9	2.46	SILTY SAND to SANDY SILT	25-40	>40	70-80		31-35
38.0	55.5	2.29	SILTY SAND to SANDY SILT	20-25	25-40	60-70		31-35
38.5	66.5	2.02	SILTY SAND to SANDY SILT	25-40	25-40	60-70		35-40
39.0	94.7	1.31	SAND to SILTY SAND	25-40	25-40	50-60		35-40
39.5	91.6	1.36	SAND to SILTY SAND	25-40	25-40	50-60		35-40
40.0	149.0	1.15	SAND to SILTY SAND	>40	>40	60-70		40-42
40.5	76.8	2.34	SILTY SAND to SANDY SILT	25-40	>40	70-80		35-40
41.0	75.6	2.35	SILTY SAND to SANDY SILT	25-40	>40	70-80		31-35
41.5	57.7	2.56	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
42.0	48.0	5.26	*SANDY CLAY to SILTY CLAY	>40	>40		2.54	
42.5	123.5	1.39	SAND to SILTY SAND	25-40	>40	60-70		40-42
43.0	86.1	1.92	SILTY SAND to SANDY SILT	25-40	>40	60-70		35-40
43.5	100.9	2.44	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
44.0	113.3	2.47	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
44.5	109.0	2.47	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
45.0	104.7	2.35	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-8

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	71.5	3.01	SANDY SILT to CLAYEY SILT	>40	>40	80-90	7.87	31-35
46.0	74.4	3.14	SANDY SILT to CLAYEY SILT	>40	>40	80-90	8.23	31-35
46.5	77.4	3.43	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	4.30	31-35
47.0	63.6	3.95	*CLAYEY SAND to SANDY CLAY	>40	>40		3.53	
47.5	42.6	4.77	*SANDY CLAY to SILTY CLAY	25-40	>40		2.34	
48.0	123.1	1.22	SAND to SILTY SAND	25-40	25-40	50-60		40-42

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

Not to Scale

The Earth Technology Corporation

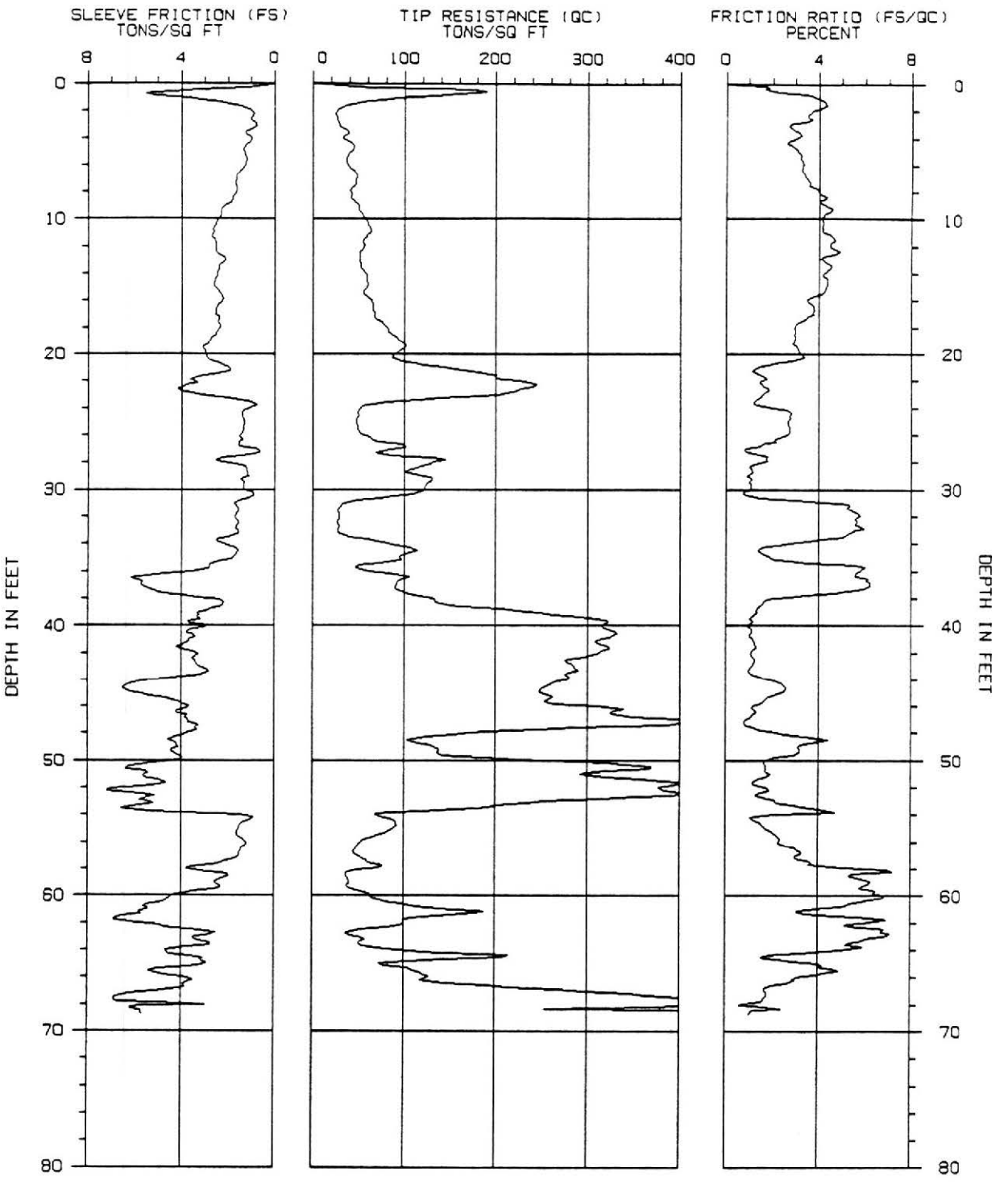
Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of CPT-8

11-93

Figure A-24



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-9

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-13-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-9
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-13-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	449.0	1.85	*SAND to SILTY SAND	>40	>40			
1.0	249.5	3.78	*CLAYEY SAND to SANDY CLAY	>40	>40		3.74	
1.5	93.3	4.34	*CLAYEY SAND to SANDY CLAY	>40	>40		1.52	
2.0	52.1	3.68	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	1.80	27-31
2.5	49.4	3.57	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	1.80	27-31
3.0	50.3	2.74	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	1.91	31-35
3.5	64.2	3.04	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	2.54	31-35
4.0	53.0	3.04	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	2.17	27-31
4.5	68.8	2.70	SILTY SAND to SANDY SILT	25-40	>40	70-80		31-35
5.0	64.4	3.09	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	2.80	31-35
5.5	55.6	3.22	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	2.48	27-31
6.0	55.1	3.30	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	2.52	27-31
6.5	64.2	3.31	SANDY SILT to CLAYEY SILT	>40	>40	80-90	3.01	27-31
7.0	65.5	3.46	SANDY SILT to CLAYEY SILT	>40	>40	90-100	3.15	27-31
7.5	62.0	3.58	SANDY SILT to CLAYEY SILT	>40	>40	90-100	3.04	27-31
8.0	54.5	3.96	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	1.36	27-31
8.5	54.8	4.26	*SANDY CLAY to SILTY CLAY	>40	>40		1.40	
9.0	63.1	4.25	*SANDY CLAY to SILTY CLAY	>40	>40		1.64	
9.5	64.8	4.43	*SANDY CLAY to SILTY CLAY	>40	>40		1.72	
10.0	71.4	4.15	*CLAYEY SAND to SANDY CLAY	>40	>40		1.93	
10.5	74.3	4.14	*CLAYEY SAND to SANDY CLAY	>40	>40		2.04	
11.0	73.5	4.25	*CLAYEY SAND to SANDY CLAY	>40	>40		2.05	
11.5	64.3	4.68	*SANDY CLAY to SILTY CLAY	>40	>40		1.82	
12.0	64.4	4.49	*SANDY CLAY to SILTY CLAY	>40	>40		1.85	
12.5	57.4	4.85	*SANDY CLAY to SILTY CLAY	>40	>40		1.68	
13.0	56.6	4.16	*SANDY CLAY to SILTY CLAY	>40	>40		1.68	
13.5	57.3	4.55	*SANDY CLAY to SILTY CLAY	>40	>40		1.72	
14.0	62.7	4.22	*SANDY CLAY to SILTY CLAY	>40	>40		1.92	
14.5	62.9	4.34	*SANDY CLAY to SILTY CLAY	>40	>40		1.95	
15.0	62.3	4.32	*SANDY CLAY to SILTY CLAY	>40	>40		1.96	
15.5	58.1	4.13	*CLAYEY SAND to SANDY CLAY	>40	>40		1.85	
16.0	65.4	3.54	SANDY SILT to CLAYEY SILT	>40	>40	90-100	4.22	27-31
16.5	66.2	3.79	*CLAYEY SAND to SANDY CLAY	>40	>40		2.16	
17.0	67.3	3.77	*CLAYEY SAND to SANDY CLAY	>40	>40		2.23	
17.5	71.1	3.36	SANDY SILT to CLAYEY SILT	>40	>40	90-100	4.77	31-35
18.0	78.3	2.92	SANDY SILT to CLAYEY SILT	>40	>40	80-90	5.33	31-35
18.5	82.3	2.94	SANDY SILT to CLAYEY SILT	>40	>40	80-90	5.68	31-35
19.0	89.4	2.95	SANDY SILT to CLAYEY SILT	>40	>40	90-100	6.25	31-35
19.5	94.1	3.07	SANDY SILT to CLAYEY SILT	>40	>40	90-100	6.66	31-35
20.0	83.2	3.23	SANDY SILT to CLAYEY SILT	>40	>40	90-100	5.94	31-35

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-9

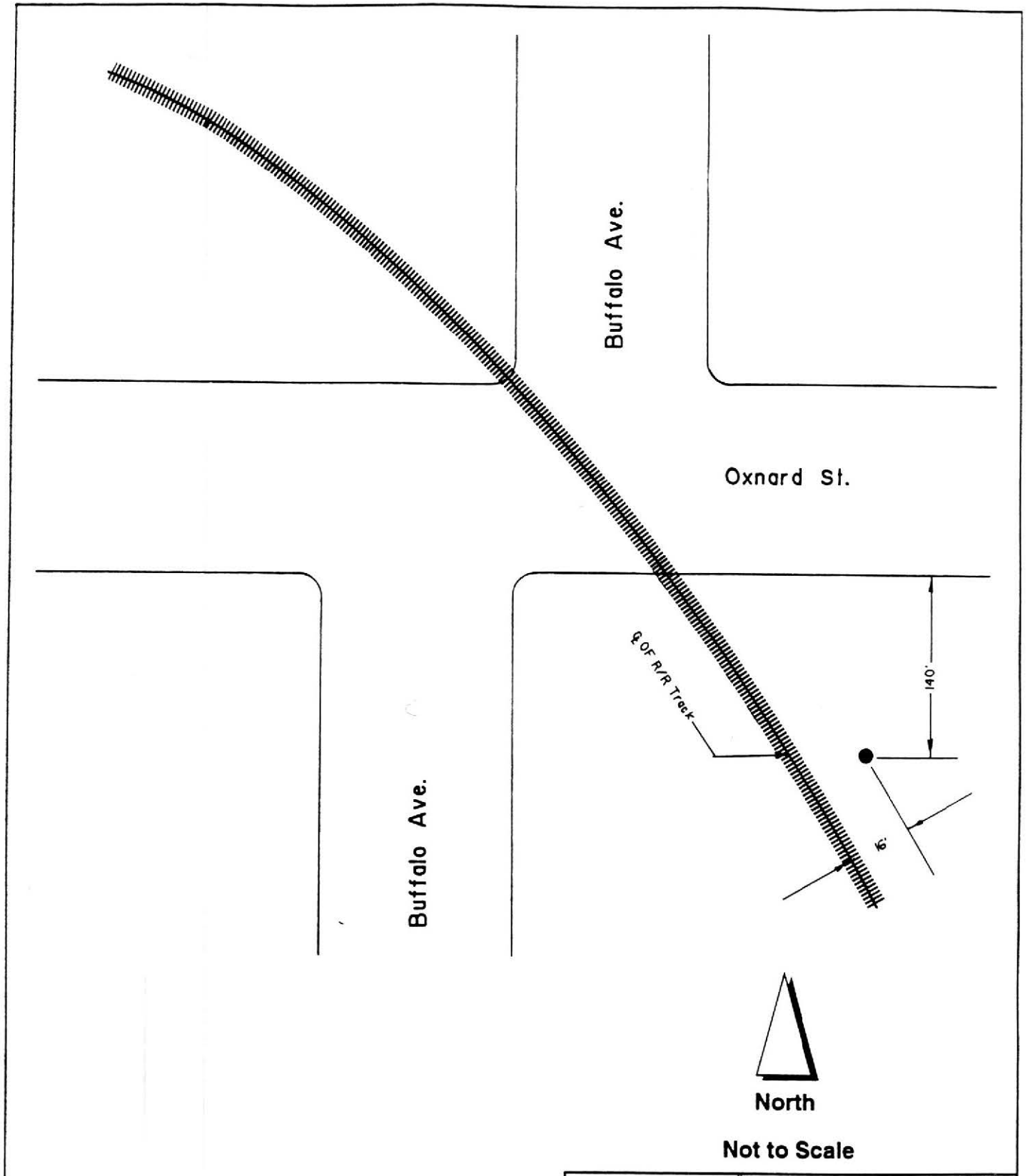
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	88.1	2.79	SILTY SAND to SANDY SILT	>40	>40	80-90		31-35
21.0	128.6	1.39	SAND to SILTY SAND	>40	>40	60-70		40-42
21.5	172.2	1.37	SAND to SILTY SAND	>40	>40	60-70		40-42
22.0	197.8	1.54	SAND to SILTY SAND	>40	>40	70-80		40-42
22.5	204.0	1.73	SAND to SILTY SAND	>40	>40	80-90		40-42
23.0	173.4	1.56	SAND to SILTY SAND	>40	>40	70-80		40-42
23.5	82.4	1.24	SAND to SILTY SAND	20-25	25-40	50-60		35-40
24.0	44.5	1.99	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
24.5	41.7	2.78	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	3.24	27-31
25.0	39.3	2.66	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	3.08	27-31
25.5	39.8	2.72	SANDY SILT to CLAYEY SILT	15-20	25-40	60-70	3.15	27-31
26.0	44.9	2.65	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	3.60	31-35
26.5	58.0	2.16	SILTY SAND to SANDY SILT	20-25	25-40	60-70		31-35
27.0	74.5	.92	SAND to SILTY SAND	15-20	15-20	40-50		35-40
27.5	66.8	1.59	SILTY SAND to SANDY SILT	20-25	25-40	50-60		35-40
28.0	102.0	1.65	SILTY SAND to SANDY SILT	25-40	>40	60-70		35-40
28.5	83.4	1.11	SAND to SILTY SAND	20-25	20-25	40-50		35-40
29.0	91.5	.92	SAND to SILTY SAND	20-25	20-25	40-50		35-40
29.5	95.4	1.01	SAND to SILTY SAND	25-40	25-40	50-60		35-40
30.0	90.7	1.08	SAND to SILTY SAND	20-25	25-40	50-60		35-40
30.5	64.9	1.08	SAND to SILTY SAND	15-20	15-20	40-50		35-40
31.0	25.4	4.93	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.20	
31.5	20.7	5.36	SILTY CLAY TO CLAY	15-20	25-40		1.78	
32.0	21.1	5.76	SILTY CLAY TO CLAY	15-20	25-40		1.83	
32.5	19.7	5.62	SILTY CLAY TO CLAY	15-20	25-40		1.72	
33.0	19.8	5.71	SILTY CLAY TO CLAY	15-20	25-40		1.74	
33.5	27.6	5.09	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.51	
34.0	56.6	2.71	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	5.33	31-35
34.5	78.1	1.37	SAND to SILTY SAND	20-25	25-40	50-60		35-40
35.0	63.8	1.87	SILTY SAND to SANDY SILT	20-25	25-40	50-60		35-40
35.5	40.2	4.65	*SANDY CLAY to SILTY CLAY	25-40	>40		1.92	
36.0	40.8	5.79	*SANDY CLAY to SILTY CLAY	>40	>40		1.97	
36.5	69.2	5.86	*SANDY CLAY to SILTY CLAY	>40	>40		3.42	
37.0	60.0	6.24	*SANDY CLAY to SILTY CLAY	>40	>40		2.99	
37.5	63.0	5.24	*SANDY CLAY to SILTY CLAY	>40	>40		3.17	
38.0	83.8	2.14	SILTY SAND to SANDY SILT	25-40	>40	60-70		35-40
38.5	94.7	1.51	SAND to SILTY SAND	25-40	25-40	50-60		35-40
39.0	147.7	1.35	SAND to SILTY SAND	>40	>40	60-70		40-42
39.5	192.9	1.03	SAND to SILTY SAND	>40	>40	60-70		40-42
40.0	195.7	.91	SAND to SILTY SAND	>40	>40	60-70		40-42
40.5	204.1	1.15	SAND to SILTY SAND	>40	>40	60-70		40-42
41.0	194.0	1.17	SAND to SILTY SAND	>40	>40	60-70		40-42
41.5	195.8	1.30	SAND to SILTY SAND	>40	>40	70-80		40-42
42.0	189.8	1.07	SAND to SILTY SAND	>40	>40	60-70		40-42
42.5	169.8	1.25	SAND to SILTY SAND	>40	>40	60-70		40-42
43.0	172.4	1.13	SAND to SILTY SAND	>40	>40	60-70		40-42
43.5	168.5	1.06	SAND to SILTY SAND	>40	>40	60-70		40-42
44.0	165.6	1.88	SAND to SILTY SAND	>40	>40	70-80		40-42
44.5	152.6	2.51	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
45.0	147.9	2.39	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-9

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	151.8	1.71	SAND to SILTY SAND	>40	>40	70-80		40-42
46.0	182.7	1.19	SAND to SILTY SAND	>40	>40	60-70		40-42
46.5	190.1	1.29	SAND to SILTY SAND	>40	>40	70-80		40-42
47.0	240.0	.91	SAND to SILTY SAND	>40	>40	60-70		42-45
47.5	194.6	1.00	SAND to SILTY SAND	>40	>40	60-70		40-42
48.0	99.9	2.18	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
48.5	59.6	4.42	*SANDY CLAY to SILTY CLAY	>40	>40		3.35	
49.0	76.1	3.13	SANDY SILT to CLAYEY SILT	>40	>40	90-100	8.62	31-35
49.5	78.1	3.12	SANDY SILT to CLAYEY SILT	>40	>40	90-100	8.89	31-35
50.0	146.9	1.75	SAND to SILTY SAND	>40	>40	70-80		40-42
50.5	210.2	1.70	SAND to SILTY SAND	>40	>40	80-90		40-42
51.0	165.1	1.92	SILTY SAND to SANDY SILT	>40	>40	80-90		40-42
51.5	214.8	1.27	SAND to SILTY SAND	>40	>40	70-80		40-42
52.0	211.8	1.69	SAND to SILTY SAND	>40	>40	80-90		40-42
52.5	228.3	1.31	SAND to SILTY SAND	>40	>40	70-80		40-42
53.0	141.2	2.14	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
53.5	99.6	3.66	*CLAYEY SAND to SANDY CLAY	>40	>40		5.88	
54.0	38.4	2.10	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
54.5	50.2	1.39	SILTY SAND to SANDY SILT	15-20	15-20	40-50		35-40
55.0	48.5	1.73	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
55.5	38.9	2.21	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
56.0	29.2	2.27	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	3.36	27-31
56.5	25.8	3.02	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	2.95	27-31
57.0	26.8	3.05	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	3.09	27-31
57.5	33.1	3.71	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	3.88	
58.0	33.4	6.02	*SANDY CLAY to SILTY CLAY	25-40	>40		1.97	
58.5	19.7	5.32	SILTY CLAY TO CLAY	15-20	25-40		2.23	
59.0	21.7	6.26	SILTY CLAY TO CLAY	20-25	25-40		2.48	
59.5	23.6	6.00	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.37	
60.0	33.9	6.78	*SANDY CLAY to SILTY CLAY	25-40	>40		2.03	
60.5	46.4	5.57	*SANDY CLAY to SILTY CLAY	>40	>40		2.83	
61.0	79.3	3.59	*CLAYEY SAND to SANDY CLAY	>40	>40		4.94	
61.5	71.8	4.70	*SANDY CLAY to SILTY CLAY	>40	>40		4.48	
62.0	51.4	5.93	*SANDY CLAY to SILTY CLAY	>40	>40		3.18	
62.5	27.5	6.84	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.65	
63.0	25.4	6.78	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.52	
63.5	26.4	5.36	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.18	
64.0	47.5	4.99	*SANDY CLAY to SILTY CLAY	>40	>40		2.98	
64.5	105.5	1.57	SAND to SILTY SAND	25-40	>40	60-70		35-40
65.0	37.1	3.99	CLAYEY SILT to SILTY CLAY	25-40	25-40		4.63	
65.5	55.6	4.88	*SANDY CLAY to SILTY CLAY	>40	>40		3.55	
66.0	63.8	3.10	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	8.22	31-35
66.5	83.3	2.33	SILTY SAND to SANDY SILT	25-40	>40	70-80		35-40
67.0	147.3	1.72	SAND to SILTY SAND	>40	>40	70-80		40-42
67.5	197.9	1.72	SAND to SILTY SAND	>40	>40	80-90		40-42
68.0	223.2	.66	SAND to SILTY SAND	>40	>40	60-70		42-45
68.5	245.8	1.14	SAND to SILTY SAND	>40	>40	70-80		42-45

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



The Earth Technology Corporation

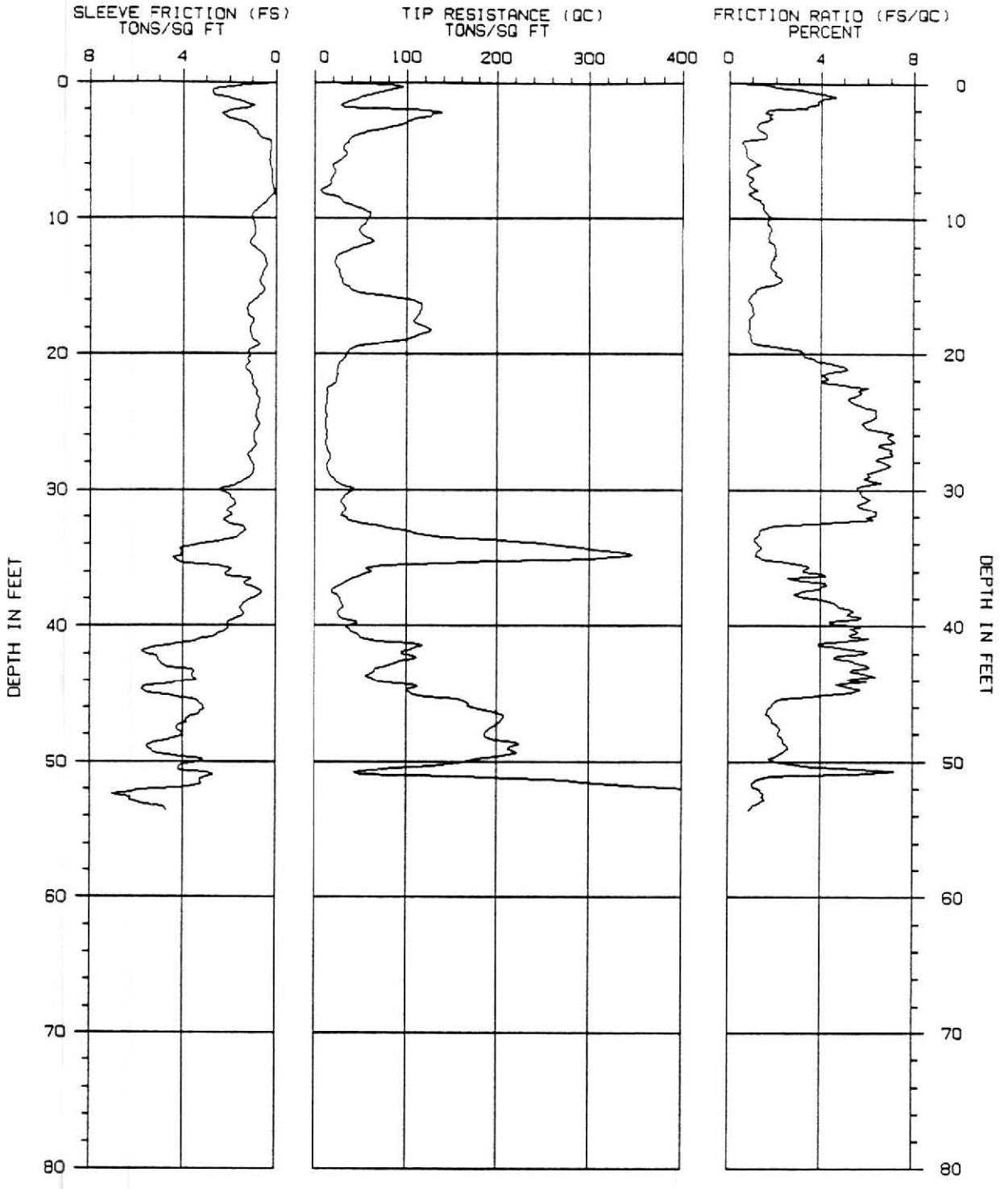
Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of CPT-9

11-93

Figure A-25



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-10

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-13-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-10
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-13-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	216.8	3.11	*SILTY SAND to CLAYEY SAND	>40	>40			
1.0	119.4	4.62	*SANDY CLAY to SILTY CLAY	>40	>40		1.79	
1.5	67.3	3.87	*CLAYEY SAND to SANDY CLAY	>40	>40		1.09	
2.0	203.0	1.68	SAND to SILTY SAND	>40	>40	80-90		40-42
2.5	229.1	1.68	SAND to SILTY SAND	>40	>40	80-90		40-42
3.0	172.5	1.25	SAND to SILTY SAND	>40	>40	60-70		40-42
3.5	110.6	1.30	SAND to SILTY SAND	25-40	25-40	50-60		40-42
4.0	66.0	1.62	SILTY SAND to SANDY SILT	20-25	25-40	50-60		35-40
4.5	54.7	.63	SAND to SILTY SAND	10-15	10-15	30-40		35-40
5.0	49.7	.72	SAND to SILTY SAND	5-10	10-15	30-40		35-40
5.5	46.9	.82	SAND to SILTY SAND	10-15	10-15	30-40		35-40
6.0	28.1	1.36	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
6.5	32.1	.80	SILTY SAND to SANDY SILT	5-10	10-15	20-30		31-35
7.0	26.0	.93	SILTY SAND to SANDY SILT	5-10	10-15	20-30		31-35
7.5	23.6	.85	SILTY SAND to SANDY SILT	5-10	10-15	20-30		31-35
8.0	8.7	1.16	SANDY SILT to CLAYEY SILT	1-3	7-10	10-20	.41	27-31
8.5	36.5	1.10	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
9.0	49.4	1.46	SILTY SAND to SANDY SILT	15-20	15-20	40-50		31-35
9.5	73.6	1.57	SILTY SAND to SANDY SILT	20-25	25-40	50-60		35-40
10.0	70.3	1.76	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
10.5	63.0	1.74	SILTY SAND to SANDY SILT	20-25	25-40	50-60		35-40
11.0	58.8	1.75	SILTY SAND to SANDY SILT	20-25	20-25	50-60		35-40
11.5	72.6	1.72	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
12.0	56.2	1.97	SILTY SAND to SANDY SILT	20-25	25-40	50-60		31-35
12.5	33.5	2.01	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
13.0	25.6	1.87	SILTY SAND to SANDY SILT	5-10	15-20	40-50		27-31
13.5	26.5	1.79	SILTY SAND to SANDY SILT	5-10	15-20	30-40		31-35
14.0	29.8	2.02	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
14.5	32.2	2.30	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.97	27-31
15.0	39.7	1.42	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
15.5	61.3	1.03	SAND to SILTY SAND	15-20	15-20	40-50		35-40
16.0	108.5	.87	SAND to SILTY SAND	25-40	25-40	50-60		40-42
16.5	117.6	1.04	SAND to SILTY SAND	25-40	25-40	50-60		40-42
17.0	112.4	1.06	SAND to SILTY SAND	25-40	25-40	50-60		40-42
17.5	105.5	.90	SAND to SILTY SAND	20-25	20-25	50-60		40-42
18.0	118.3	.89	SAND to SILTY SAND	25-40	25-40	50-60		40-42
18.5	109.8	.93	SAND to SILTY SAND	25-40	25-40	50-60		40-42
19.0	84.3	.98	SAND to SILTY SAND	20-25	20-25	40-50		35-40
19.5	42.2	1.96	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
20.0	32.6	3.23	SANDY SILT to CLAYEY SILT	15-20	25-40	60-70	2.28	27-31

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-10

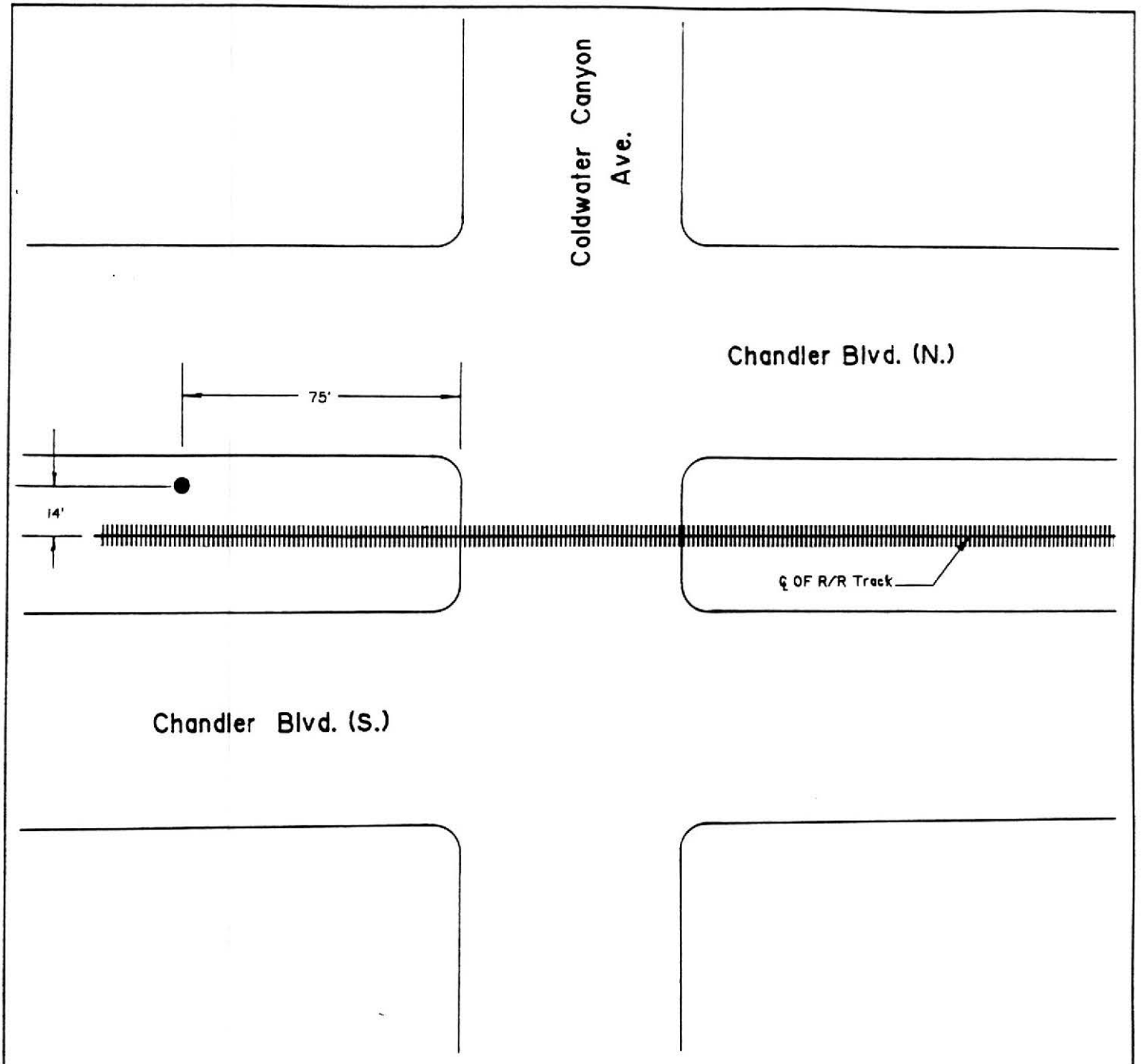
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	27.2	3.81	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.91	
21.0	23.2	5.06	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.64	
21.5	22.7	4.13	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.61	
22.0	21.1	4.04	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.51	
22.5	13.0	6.04	SILTY CLAY TO CLAY	10-15	20-25		.91	
23.0	12.3	5.63	SILTY CLAY TO CLAY	10-15	15-20		.86	
23.5	11.5	5.27	SILTY CLAY TO CLAY	5-10	15-20		.81	
24.0	10.7	6.01	SILTY CLAY TO CLAY	10-15	15-20		.75	
24.5	11.2	6.41	SILTY CLAY TO CLAY	10-15	20-25		.80	
25.0	10.2	5.97	SILTY CLAY TO CLAY	5-10	15-20		.73	
25.5	10.7	5.98	SILTY CLAY TO CLAY	10-15	15-20		.77	
26.0	10.6	7.09	SILTY CLAY TO CLAY	10-15	20-25		.77	
26.5	10.2	7.18	SILTY CLAY TO CLAY	10-15	20-25		.74	
27.0	11.2	6.84	SILTY CLAY TO CLAY	10-15	20-25		.84	
27.5	13.2	7.11	SILTY CLAY TO CLAY	15-20	20-25		1.01	
28.0	11.7	6.69	SILTY CLAY TO CLAY	10-15	20-25		.90	
28.5	11.0	6.62	SILTY CLAY TO CLAY	10-15	20-25		.84	
29.0	13.4	6.14	SILTY CLAY TO CLAY	10-15	20-25		1.06	
29.5	18.3	6.63	SILTY CLAY TO CLAY	15-20	25-40		1.51	
30.0	32.6	5.66	*SANDY CLAY to SILTY CLAY	25-40	>40		1.40	
30.5	24.4	5.84	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.04	
31.0	21.9	5.75	SILTY CLAY TO CLAY	20-25	25-40		1.88	
31.5	24.8	6.14	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.08	
32.0	22.9	6.22	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.00	
32.5	38.2	3.68	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	3.46	27-31
33.0	68.1	1.34	SILTY SAND to SANDY SILT	20-25	20-25	50-60		35-40
33.5	97.5	1.20	SAND to SILTY SAND	25-40	25-40	50-60		35-40
34.0	172.8	1.27	SAND to SILTY SAND	>40	>40	60-70		40-42
34.5	216.4	1.26	SAND to SILTY SAND	>40	>40	70-80		40-42
35.0	220.8	1.36	SAND to SILTY SAND	>40	>40	70-80		40-42
35.5	71.0	3.01	SANDY SILT to CLAYEY SILT	>40	>40	80-90	6.90	31-35
36.0	41.9	3.26	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	4.05	27-31
36.5	29.6	2.53	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	2.84	27-31
37.0	19.4	4.27	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.83	
37.5	12.4	3.21	CLAYEY SILT to SILTY CLAY	5-10	10-15		1.12	
38.0	17.8	3.72	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.70	
38.5	19.8	4.76	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.92	
39.0	16.4	5.43	SILTY CLAY TO CLAY	10-15	20-25		1.58	
39.5	19.4	5.64	SILTY CLAY TO CLAY	15-20	25-40		1.91	
40.0	22.9	5.47	SILTY CLAY TO CLAY	20-25	25-40		2.30	
40.5	26.7	5.61	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.36	
41.0	34.7	5.86	*SANDY CLAY to SILTY CLAY	25-40	>40		1.80	
41.5	70.3	4.34	*SANDY CLAY to SILTY CLAY	>40	>40		3.74	
42.0	57.6	5.92	*SANDY CLAY to SILTY CLAY	>40	>40		3.07	
42.5	60.7	5.05	*SANDY CLAY to SILTY CLAY	>40	>40		3.25	
43.0	45.3	6.14	*SANDY CLAY to SILTY CLAY	>40	>40		2.41	
43.5	36.9	5.86	*SANDY CLAY to SILTY CLAY	25-40	>40		1.96	
44.0	39.5	5.43	*SANDY CLAY to SILTY CLAY	25-40	>40		2.11	
44.5	67.3	5.07	*SANDY CLAY to SILTY CLAY	>40	>40		3.67	
45.0	63.0	4.89	*SANDY CLAY to SILTY CLAY	>40	>40		3.44	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-10

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	96.0	2.06	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
46.0	101.0	1.81	SILTY SAND to SANDY SILT	>40	>40	60-70		35-40
46.5	119.8	1.62	SAND to SILTY SAND	>40	>40	60-70		35-40
47.0	119.7	1.88	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
47.5	113.3	2.19	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
48.0	108.4	2.14	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
48.5	120.8	2.36	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
49.0	122.0	2.59	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
49.5	121.8	2.18	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
50.0	92.6	2.07	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
50.5	49.3	4.81	*SANDY CLAY to SILTY CLAY	>40	>40		2.79	
51.0	52.3	2.96	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	5.96	31-35
51.5	165.2	1.11	SAND to SILTY SAND	>40	>40	60-70		40-42
52.0	229.7	1.25	SAND to SILTY SAND	>40	>40	70-80		40-42
52.5	249.0	1.49	SAND to SILTY SAND	>40	>40	80-90		40-42
53.0	236.4	1.40	SAND to SILTY SAND	>40	>40	70-80		40-42
53.5	278.2	.94	SAND to SILTY SAND	>40	>40	70-80		42-45

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

Not to Scale

The Earth Technology Corporation

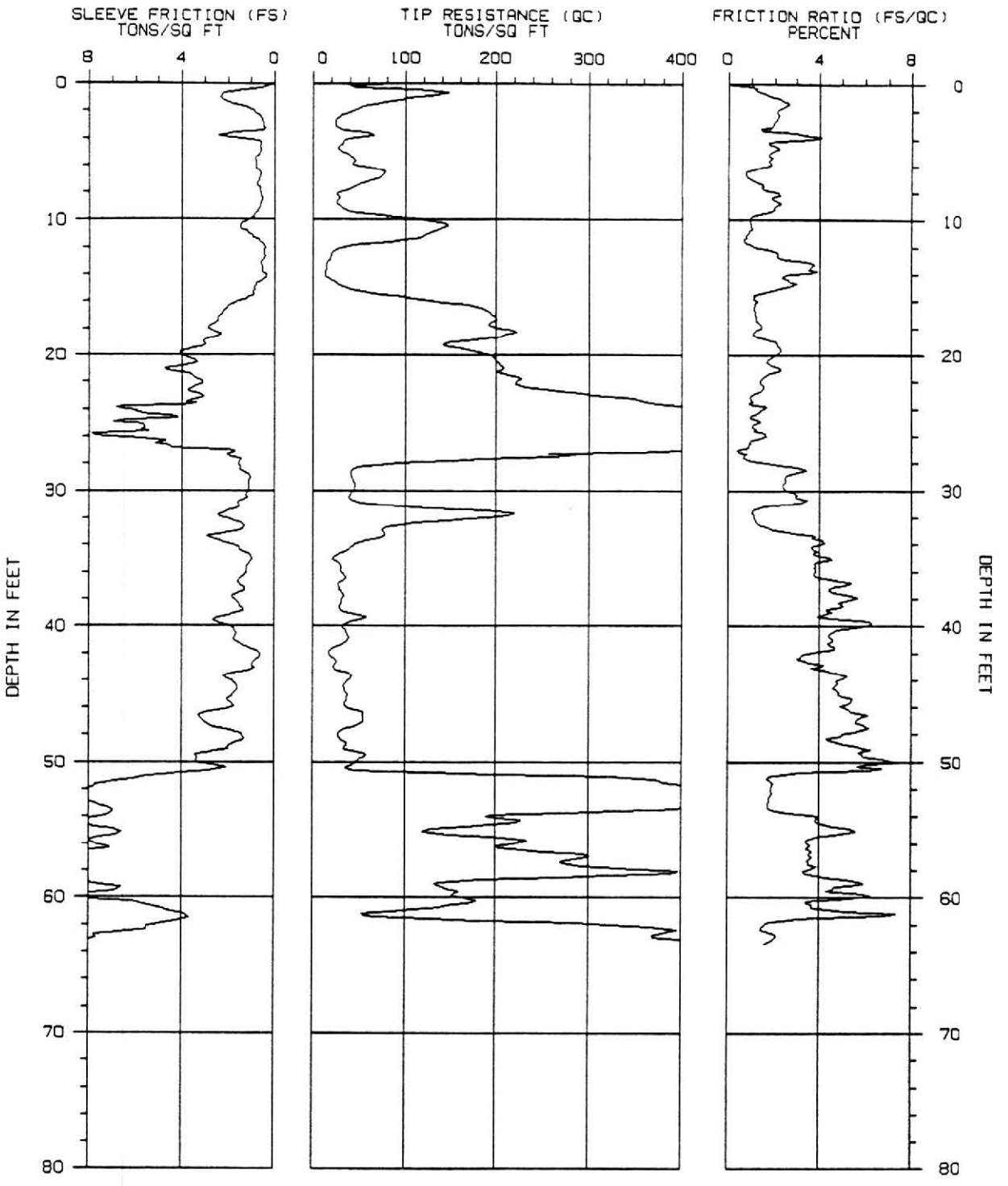
Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of CPT-10

11-93

Figure A-26



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-11

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-13-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-11
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-13-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	283.8	1.17	SAND to SILTY SAND	>40	>40	70-80		42-45
1.0	255.0	2.03	*SAND to SILTY SAND	>40	>40	90-100		40-42
1.5	140.2	2.59	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
2.0	83.5	2.09	SILTY SAND to SANDY SILT	25-40	>40	60-70		35-40
2.5	50.6	2.11	SILTY SAND to SANDY SILT	20-25	25-40	50-60		31-35
3.0	43.0	1.91	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
3.5	75.6	2.22	SILTY SAND to SANDY SILT	25-40	>40	60-70		35-40
4.0	63.9	3.64	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	1.31	27-31
4.5	48.8	1.87	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
5.0	48.4	1.89	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
5.5	64.8	1.89	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
6.0	65.9	1.77	SILTY SAND to SANDY SILT	20-25	25-40	50-60		35-40
6.5	109.6	.77	SAND to SILTY SAND	20-25	20-25	40-50		40-42
7.0	94.9	.94	SAND to SILTY SAND	20-25	20-25	40-50		40-42
7.5	64.0	1.54	SILTY SAND to SANDY SILT	20-25	20-25	50-60		35-40
8.0	38.2	2.08	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
8.5	37.0	1.91	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
9.0	37.7	2.05	SILTY SAND to SANDY SILT	15-20	15-20	50-60		31-35
9.5	61.3	1.58	SILTY SAND to SANDY SILT	20-25	20-25	50-60		35-40
10.0	142.8	.93	SAND to SILTY SAND	25-40	25-40	50-60		40-42
10.5	174.7	1.00	SAND to SILTY SAND	>40	>40	60-70		40-42
11.0	147.5	.88	SAND to SILTY SAND	25-40	25-40	50-60		40-42
11.5	113.2	.68	SAND to SILTY SAND	20-25	20-25	40-50		40-42
12.0	40.0	1.11	SILTY SAND to SANDY SILT	10-15	10-15	30-40		31-35
12.5	23.4	2.16	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.34	27-31
13.0	19.6	2.91	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.13	
13.5	16.0	3.63	CLAYEY SILT to SILTY CLAY	5-10	15-20		.92	
14.0	14.4	2.66	SANDY SILT to CLAYEY SILT	5-10	10-15	40-50	.83	
14.5	23.7	2.64	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.43	27-31
15.0	38.0	2.40	SANDY SILT to CLAYEY SILT	15-20	20-25	50-60	2.36	31-35
15.5	76.8	1.17	SAND to SILTY SAND	20-25	20-25	40-50		35-40
16.0	129.3	1.25	SAND to SILTY SAND	25-40	>40	60-70		40-42
16.5	184.4	1.10	SAND to SILTY SAND	>40	>40	60-70		40-42
17.0	194.0	1.19	SAND to SILTY SAND	>40	>40	60-70		40-42
17.5	193.8	1.23	SAND to SILTY SAND	>40	>40	60-70		40-42
18.0	194.8	1.43	SAND to SILTY SAND	>40	>40	70-80		40-42
18.5	201.7	1.09	SAND to SILTY SAND	>40	>40	60-70		40-42
19.0	145.1	2.02	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
19.5	147.4	2.22	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
20.0	177.5	2.06	SILTY SAND to SANDY SILT	>40	>40	80-90		40-42

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-11

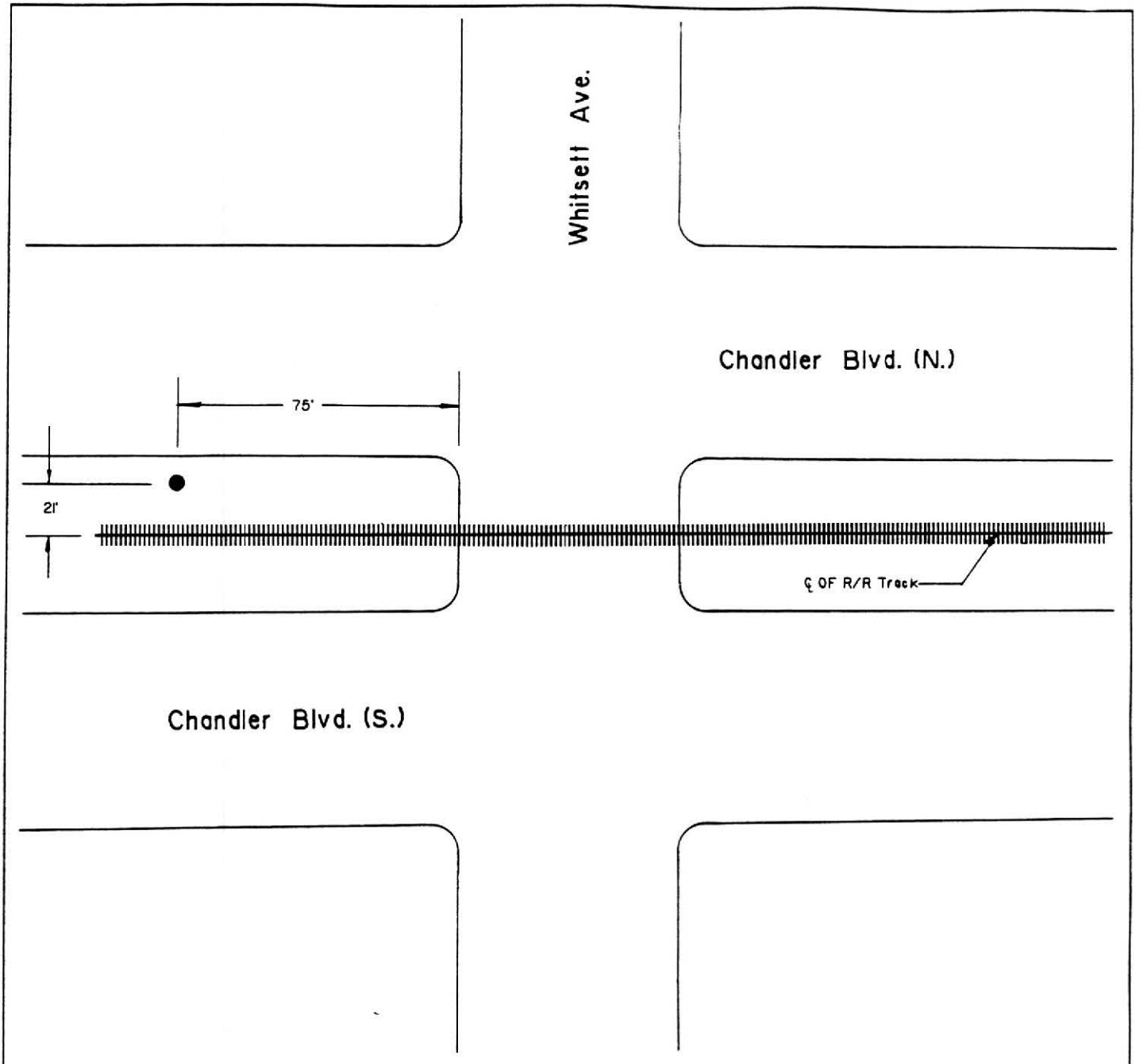
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	183.2	1.66	SAND to SILTY SAND	>40	>40	70-80		40-42
21.0	187.5	2.25	SILTY SAND to SANDY SILT	>40	>40	90-100		40-42
21.5	189.7	1.65	SAND to SILTY SAND	>40	>40	70-80		40-42
22.0	195.4	1.39	SAND to SILTY SAND	>40	>40	70-80		40-42
22.5	209.0	1.50	SAND to SILTY SAND	>40	>40	70-80		40-42
23.0	260.7	1.02	SAND to SILTY SAND	>40	>40	70-80		42-45
23.5	306.4	1.06	SAND to SILTY SAND	>40	>40	70-80		42-45
24.0	354.2	1.52	SAND to SILTY SAND	>40	>40	90-100		42-45
24.5	366.8	1.01	SAND to SILTY SAND	>40	>40	80-90		42-45
25.0	393.1	1.28	SAND to SILTY SAND	>40	>40	90-100		42-45
25.5	389.7	1.21	SAND to SILTY SAND	>40	>40	80-90		42-45
26.0	351.0	1.67	SAND to SILTY SAND	>40	>40	90-100		42-45
26.5	421.4	.97	SAND to SILTY SAND	>40	>40	80-90		42-45
27.0	356.8	.46	SANDY GRAVEL to SAND	>40	>40	70-80		42-45
27.5	205.6	.70	SAND to SILTY SAND	>40	>40	60-70		42-45
28.0	72.8	1.64	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
28.5	32.5	3.42	SANDY SILT to CLAYEY SILT	15-20	25-40	70-80	2.71	27-31
29.0	31.9	2.47	SANDY SILT to CLAYEY SILT	10-15	20-25	50-60	2.69	27-31
29.5	34.2	2.43	SANDY SILT to CLAYEY SILT	15-20	20-25	50-60	2.91	27-31
30.0	32.5	2.54	SANDY SILT to CLAYEY SILT	15-20	20-25	50-60	2.79	27-31
30.5	29.3	2.95	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.52	27-31
31.0	45.3	2.53	SANDY SILT to CLAYEY SILT	20-25	25-40	60-70	4.01	31-35
31.5	136.9	1.08	SAND to SILTY SAND	25-40	25-40	50-60		40-42
32.0	136.4	1.12	SAND to SILTY SAND	25-40	>40	50-60		40-42
32.5	69.0	1.36	SILTY SAND to SANDY SILT	20-25	20-25	50-60		35-40
33.0	53.2	2.22	SILTY SAND to SANDY SILT	20-25	25-40	60-70		31-35
33.5	50.8	3.69	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	4.73	27-31
34.0	31.2	3.99	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.87	
34.5	24.3	3.90	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.23	
35.0	15.2	4.45	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.35	
35.5	20.2	3.81	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.86	
36.0	20.6	3.82	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.92	
36.5	23.3	4.17	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.21	
37.0	18.5	5.13	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.74	
37.5	20.5	4.51	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.96	
38.0	20.3	5.55	SILTY CLAY TO CLAY	15-20	25-40		1.96	
38.5	18.9	5.02	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.83	
39.0	21.6	4.54	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.13	
39.5	32.5	5.05	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.65	
40.0	20.2	6.00	SILTY CLAY TO CLAY	15-20	25-40		2.02	
40.5	22.5	4.48	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.27	
41.0	23.6	4.57	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.39	
41.5	16.4	4.60	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.62	
42.0	10.7	3.53	CLAYEY SILT to SILTY CLAY	5-10	10-15		1.01	
42.5	15.3	3.10	SANDY SILT to CLAYEY SILT	5-10	15-20	50-60	1.51	
43.0	13.9	4.05	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.36	
43.5	23.3	4.68	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.41	
44.0	23.3	4.74	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.41	
44.5	20.5	4.67	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.11	
45.0	21.9	4.81	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.28	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-11

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	22.0	5.39	SILTY CLAY TO CLAY	15-20	25-40		2.30	
46.0	21.6	5.04	CLAYEY SILT to SILTY CLAY	15-20	25-40		2.26	
46.5	31.9	5.94	*SANDY CLAY to SILTY CLAY	25-40	>40		1.72	
47.0	31.7	5.62	*SANDY CLAY to SILTY CLAY	25-40	>40		1.72	
47.5	23.0	6.11	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.22	
48.0	16.1	4.96	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.66	
48.5	19.7	4.60	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.08	
49.0	19.6	5.91	SILTY CLAY TO CLAY	15-20	25-40		2.07	
49.5	33.2	5.88	*SANDY CLAY to SILTY CLAY	25-40	>40		1.83	
50.0	26.0	7.37	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.42	
50.5	20.2	6.73	SILTY CLAY TO CLAY	20-25	25-40		2.16	
51.0	151.4	2.03	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
51.5	214.5	1.93	SAND to SILTY SAND	>40	>40	90-100		40-42
52.0	240.3	1.89	SAND to SILTY SAND	>40	>40	90-100		40-42
52.5	248.2	1.83	SAND to SILTY SAND	>40	>40	90-100		40-42
53.0	248.0	1.73	SAND to SILTY SAND	>40	>40	80-90		40-42
53.5	205.1	1.89	SAND to SILTY SAND	>40	>40	80-90		40-42
54.0	104.8	3.94	*CLAYEY SAND to SANDY CLAY	>40	>40		6.22	
54.5	116.9	4.04	*CLAYEY SAND to SANDY CLAY	>40	>40		6.97	
55.0	66.1	5.57	*SANDY CLAY to SILTY CLAY	>40	>40		3.91	
55.5	107.2	3.86	*CLAYEY SAND to SANDY CLAY	>40	>40		6.44	
56.0	119.4	3.51	*CLAYEY SAND to SANDY CLAY	>40	>40		7.21	
56.5	124.4	3.62	*CLAYEY SAND to SANDY CLAY	>40	>40		7.55	
57.0	161.6	3.68	*CLAYEY SAND to SANDY CLAY	>40	>40		9.88	
57.5	149.1	3.54	*CLAYEY SAND to SANDY CLAY	>40	>40		9.14	
58.0	205.0	3.46	*CLAYEY SAND to SANDY CLAY	>40	>40		12.66	
58.5	144.5	4.26	*CLAYEY SAND to SANDY CLAY	>40	>40		8.93	
59.0	70.0	5.89	*SANDY CLAY to SILTY CLAY	>40	>40		4.28	
59.5	83.6	4.33	*CLAYEY SAND to SANDY CLAY	>40	>40		5.16	
60.0	84.8	5.70	*SANDY CLAY to SILTY CLAY	>40	>40		5.25	
60.5	80.7	3.68	*CLAYEY SAND to SANDY CLAY	>40	>40		5.01	
61.0	45.5	5.07	*SANDY CLAY to SILTY CLAY	>40	>40		2.79	
61.5	47.9	4.00	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	5.90	27-31
62.0	166.1	1.62	SAND to SILTY SAND	>40	>40	70-80		40-42
62.5	200.2	1.63	SAND to SILTY SAND	>40	>40	70-80		40-42
63.0	195.8	2.03	SILTY SAND to SANDY SILT	>40	>40	80-90		40-42

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

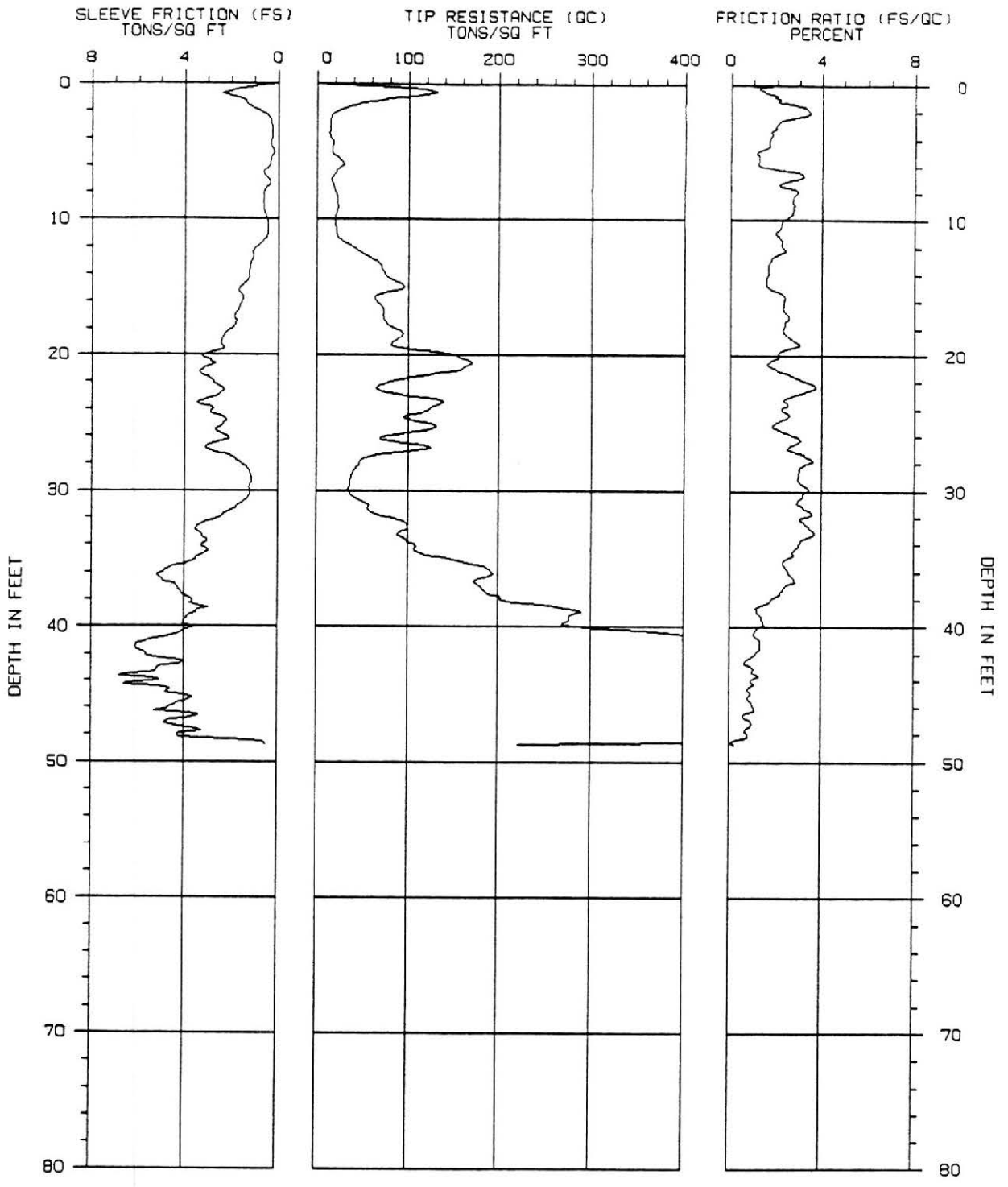
Not to Scale

The Earth Technology Corporation	Project No.: 93-4955 San Fernando Valley Segment Metro Red Line

Location of CPT-II

11-93

Figure A-27



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-12

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-13-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-12
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-13-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	309.8	1.47	SAND to SILTY SAND	>40	>40	80-90		42-45
1.0	203.9	2.08	SILTY SAND to SANDY SILT	>40	>40	90-100		40-42
1.5	92.8	2.94	SANDY SILT to CLAYEY SILT	>40	>40	90-100	3.02	31-35
2.0	44.7	3.47	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	1.54	27-31
2.5	28.7	2.48	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.04	27-31
3.0	26.1	1.98	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	.99	27-31
3.5	24.5	1.75	SILTY SAND to SANDY SILT	5-10	10-15	30-40		27-31
4.0	26.4	1.71	SILTY SAND to SANDY SILT	5-10	15-20	30-40		31-35
4.5	28.5	1.71	SILTY SAND to SANDY SILT	5-10	15-20	30-40		31-35
5.0	26.2	1.10	SILTY SAND to SANDY SILT	5-10	10-15	20-30		31-35
5.5	37.3	1.27	SILTY SAND to SANDY SILT	10-15	15-20	30-40		31-35
6.0	41.9	1.29	SILTY SAND to SANDY SILT	10-15	15-20	30-40		31-35
6.5	29.6	2.95	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	1.37	27-31
7.0	22.2	2.82	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.05	27-31
7.5	24.7	2.21	SANDY SILT to CLAYEY SILT	10-15	15-20	40-50	1.19	27-31
8.0	27.5	2.89	SANDY SILT to CLAYEY SILT	10-15	20-25	50-60	1.36	27-31
8.5	29.1	2.71	SANDY SILT to CLAYEY SILT	10-15	20-25	50-60	1.47	27-31
9.0	29.4	2.71	SANDY SILT to CLAYEY SILT	10-15	20-25	50-60	1.51	27-31
9.5	26.9	2.68	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.40	27-31
10.0	24.6	2.32	SANDY SILT to CLAYEY SILT	10-15	15-20	40-50	1.30	27-31
10.5	24.8	2.17	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.33	27-31
11.0	25.9	1.98	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.42	27-31
11.5	31.4	2.22	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.76	27-31
12.0	44.8	2.26	SILTY SAND to SANDY SILT	15-20	20-25	50-60		31-35
12.5	57.2	2.11	SILTY SAND to SANDY SILT	20-25	25-40	60-70		31-35
13.0	71.4	1.74	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
13.5	77.7	1.67	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
14.0	80.6	1.68	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
14.5	90.7	1.55	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
15.0	100.2	1.71	SILTY SAND to SANDY SILT	25-40	>40	60-70		35-40
15.5	69.0	2.31	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
16.0	66.8	2.34	SILTY SAND to SANDY SILT	25-40	25-40	60-70		31-35
16.5	73.3	2.29	SILTY SAND to SANDY SILT	25-40	>40	60-70		31-35
17.0	72.4	2.53	SILTY SAND to SANDY SILT	25-40	>40	70-80		31-35
17.5	74.2	2.36	SILTY SAND to SANDY SILT	25-40	>40	70-80		31-35
18.0	82.7	2.30	SILTY SAND to SANDY SILT	25-40	>40	70-80		35-40
18.5	89.4	2.46	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
19.0	80.1	2.86	SANDY SILT to CLAYEY SILT	>40	>40	80-90	5.58	31-35
19.5	84.8	2.53	SILTY SAND to SANDY SILT	>40	>40	70-80		31-35
20.0	138.6	2.10	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-12

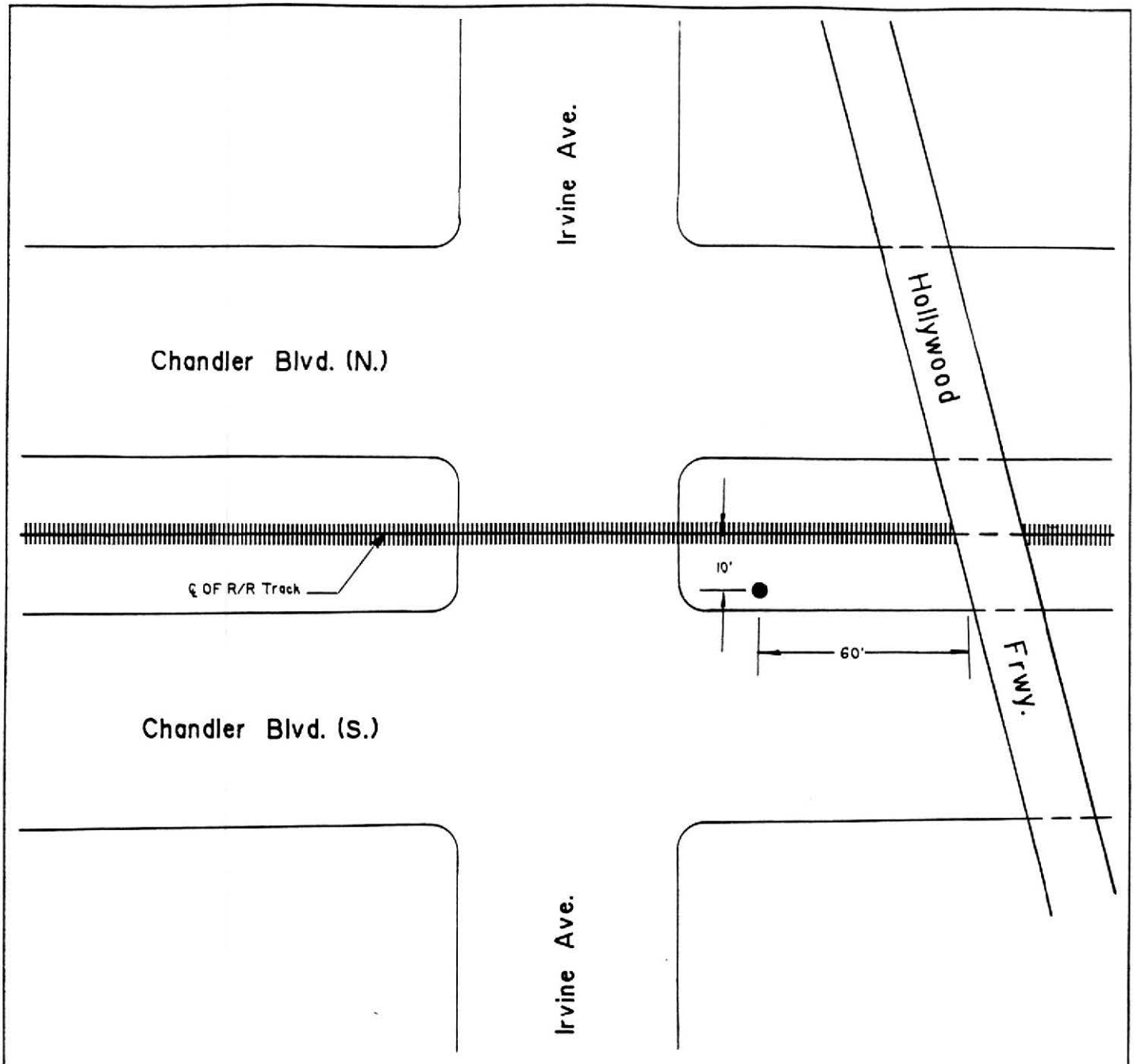
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	153.4	1.71	SAND to SILTY SAND	>40	>40	70-80		40-42
21.0	144.4	1.95	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
21.5	108.5	2.65	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
22.0	71.2	3.40	SANDY SILT to CLAYEY SILT	>40	>40	90-100	5.31	31-35
22.5	56.2	3.63	SANDY SILT to CLAYEY SILT	25-40	>40	90-100	4.22	27-31
23.0	82.3	2.67	SILTY SAND to SANDY SILT	>40	>40	80-90		31-35
23.5	118.1	2.47	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
24.0	104.1	2.24	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
24.5	82.0	2.56	SILTY SAND to SANDY SILT	>40	>40	70-80		31-35
25.0	96.1	1.98	SILTY SAND to SANDY SILT	>40	>40	60-70		35-40
25.5	102.3	2.10	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
26.0	63.4	2.82	SANDY SILT to CLAYEY SILT	25-40	>40	70-80	5.13	31-35
26.5	75.1	2.87	SANDY SILT to CLAYEY SILT	>40	>40	80-90	6.16	31-35
27.0	93.4	2.54	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
27.5	46.5	3.33	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	3.85	27-31
28.0	36.5	3.38	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	3.03	27-31
28.5	31.7	3.02	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.64	27-31
29.0	28.9	2.95	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.42	27-31
29.5	27.8	3.14	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.34	27-31
30.0	26.3	3.40	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.23	
30.5	30.7	3.12	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.65	27-31
31.0	41.2	2.95	SANDY SILT to CLAYEY SILT	20-25	25-40	70-80	3.64	27-31
31.5	41.5	3.46	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	3.70	27-31
32.0	56.5	3.11	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	5.13	31-35
32.5	70.1	3.33	SANDY SILT to CLAYEY SILT	>40	>40	90-100	6.45	31-35
33.0	67.7	3.64	*CLAYEY SAND to SANDY CLAY	>40	>40	90-100	3.14	27-31
33.5	66.0	3.36	SANDY SILT to CLAYEY SILT	>40	>40	90-100	6.18	27-31
34.0	74.3	3.00	SANDY SILT to CLAYEY SILT	>40	>40	80-90	7.04	31-35
34.5	74.6	2.72	SILTY SAND to SANDY SILT	>40	>40	70-80		31-35
35.0	95.4	2.48	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
35.5	118.2	2.38	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
36.0	128.3	2.53	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
36.5	118.3	2.79	SILTY SAND to SANDY SILT	>40	>40	90-100		35-40
37.0	117.1	2.42	SILTY SAND to SANDY SILT	>40	>40	80-90		35-40
37.5	121.0	2.20	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
38.0	130.1	1.81	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
38.5	167.3	1.24	SAND to SILTY SAND	>40	>40	60-70		40-42
39.0	179.8	1.22	SAND to SILTY SAND	>40	>40	60-70		40-42
39.5	172.5	1.45	SAND to SILTY SAND	>40	>40	70-80		40-42
40.0	175.7	1.27	SAND to SILTY SAND	>40	>40	60-70		40-42
40.5	242.0	1.08	SAND to SILTY SAND	>40	>40	70-80		42-45
41.0	249.5	1.36	SAND to SILTY SAND	>40	>40	70-80		42-45
41.5	274.3	1.36	SAND to SILTY SAND	>40	>40	80-90		42-45
42.0	310.5	1.11	SAND to SILTY SAND	>40	>40	70-80		42-45
42.5	360.3	.71	SANDY GRAVEL to SAND	>40	>40	70-80		42-45
43.0	298.2	1.04	SAND to SILTY SAND	>40	>40	70-80		42-45
43.5	347.1	1.10	SAND to SILTY SAND	>40	>40	80-90		42-45
44.0	325.9	.93	SAND to SILTY SAND	>40	>40	70-80		42-45
44.5	348.4	.88	SAND to SILTY SAND	>40	>40	70-80		42-45
45.0	283.7	.94	SAND to SILTY SAND	>40	>40	70-80		42-45

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-12

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	249.1	.92	SAND to SILTY SAND	>40	>40	70-80		42-45
46.0	254.8	1.08	SAND to SILTY SAND	>40	>40	70-80		42-45
46.5	323.3	.63	SANDY GRAVEL to SAND	>40	>40	70-80		42-45
47.0	288.9	.95	SAND to SILTY SAND	>40	>40	70-80		42-45
47.5	269.8	.81	SAND to SILTY SAND	>40	>40	60-70		42-45
48.0	303.6	.81	SAND to SILTY SAND	>40	>40	70-80		42-45
48.5	299.1	.13	SANDY GRAVEL to SAND	25-40	25-40	60-70		42-45

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



North

Not to Scale

The Earth Technology Corporation

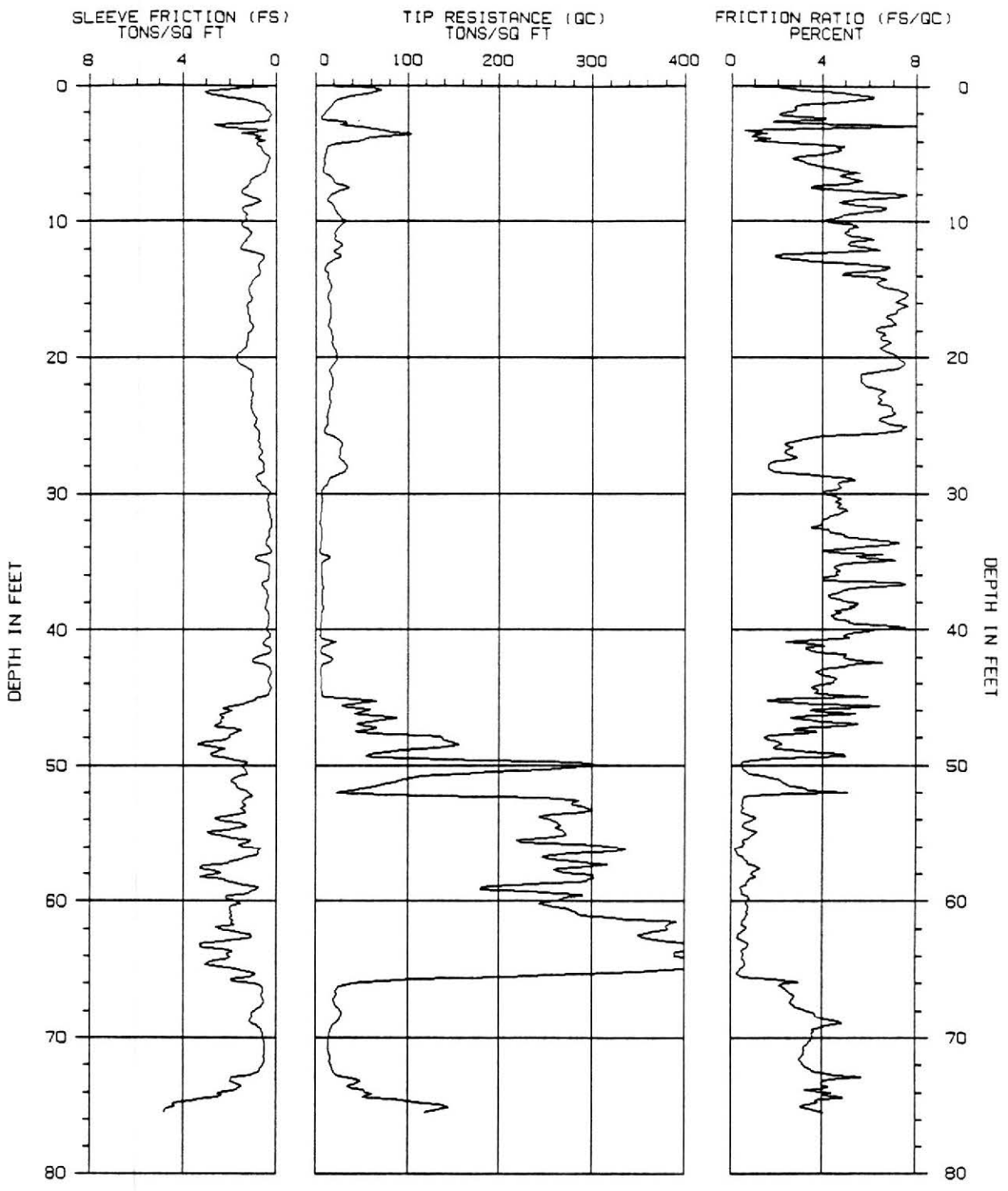
Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of CPT-12

11-93

Figure A-28



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-13

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-380-00001

DATE : 09-10-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-13
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-10-1993

PROJECT NO : 94-380-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	160.9	4.80	*SANDY CLAY to SILTY CLAY	>40	>40		2.13	
1.0	61.3	5.61	*SANDY CLAY to SILTY CLAY	>40	>40		.92	
1.5	37.8	2.75	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	1.23	27-31
2.0	22.4	2.20	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	.77	27-31
2.5	14.2	4.00	CLAYEY SILT to SILTY CLAY	5-10	15-20		.51	
3.0	63.0	6.94	*SANDY CLAY to SILTY CLAY	>40	>40		1.20	
3.5	167.4	1.51	SAND to SILTY SAND	>40	>40	70-80		40-42
4.0	83.0	.94	SAND to SILTY SAND	20-25	20-25	40-50		35-40
4.5	22.0	4.89	CLAYEY SILT to SILTY CLAY	15-20	25-40		.92	
5.0	18.2	4.02	CLAYEY SILT to SILTY CLAY	10-15	20-25		.77	
5.5	15.8	3.05	SANDY SILT to CLAYEY SILT	5-10	15-20	50-60	.69	
6.0	14.2	4.38	CLAYEY SILT to SILTY CLAY	10-15	15-20		.63	
6.5	16.9	5.14	CLAYEY SILT to SILTY CLAY	10-15	20-25		.77	
7.0	28.0	5.68	*SANDY CLAY to SILTY CLAY	25-40	25-40		.66	
7.5	50.2	3.46	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	2.45	27-31
8.0	26.0	7.47	*SANDY CLAY to SILTY CLAY	25-40	25-40		.64	
8.5	18.0	4.92	CLAYEY SILT to SILTY CLAY	10-15	20-25		.89	
9.0	27.2	6.71	*SANDY CLAY to SILTY CLAY	25-40	25-40		.70	
9.5	31.8	4.90	*SANDY CLAY to SILTY CLAY	25-40	25-40		.83	
10.0	41.0	4.10	CLAYEY SILT to SILTY CLAY	25-40	25-40		2.20	
10.5	29.5	5.18	*SANDY CLAY to SILTY CLAY	25-40	25-40		.80	
11.0	26.7	5.09	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.46	
11.5	30.7	5.16	*SANDY CLAY to SILTY CLAY	25-40	25-40		.86	
12.0	28.7	6.20	*SANDY CLAY to SILTY CLAY	25-40	25-40		.81	
12.5	31.6	1.93	SILTY SAND to SANDY SILT	10-15	15-20	40-50		31-35
13.0	17.7	4.45	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.01	
13.5	11.8	6.71	SILTY CLAY TO CLAY	10-15	20-25		.67	
14.0	15.6	5.59	SILTY CLAY TO CLAY	10-15	20-25		.91	
14.5	18.1	6.32	SILTY CLAY TO CLAY	15-20	25-40		1.08	
15.0	17.6	7.18	SILTY CLAY TO CLAY	15-20	25-40		1.06	
15.5	14.7	7.53	SILTY CLAY TO CLAY	15-20	20-25		.89	
16.0	17.2	7.27	SILTY CLAY TO CLAY	15-20	25-40		1.06	
16.5	17.6	7.17	SILTY CLAY TO CLAY	15-20	25-40		1.10	
17.0	16.7	6.73	SILTY CLAY TO CLAY	15-20	25-40		1.05	
17.5	14.5	7.15	SILTY CLAY TO CLAY	15-20	20-25		.92	
18.0	17.1	6.33	SILTY CLAY TO CLAY	15-20	25-40		1.11	
18.5	18.1	6.50	SILTY CLAY TO CLAY	15-20	25-40		1.19	
19.0	17.7	6.84	SILTY CLAY TO CLAY	15-20	25-40		1.17	
19.5	20.9	6.59	SILTY CLAY TO CLAY	20-25	25-40		1.42	
20.0	22.0	7.25	*SANDY CLAY to SILTY CLAY	20-25	25-40		.76	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-13

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	18.8	7.51	SILTY CLAY TO CLAY	20-25	25-40		1.29	
21.0	14.4	6.58	SILTY CLAY TO CLAY	15-20	20-25		.98	
21.5	16.7	5.66	SILTY CLAY TO CLAY	15-20	20-25		1.17	
22.0	17.0	5.79	SILTY CLAY TO CLAY	15-20	20-25		1.20	
22.5	13.9	6.70	SILTY CLAY TO CLAY	15-20	20-25		.98	
23.0	14.2	6.45	SILTY CLAY TO CLAY	10-15	20-25		1.01	
23.5	14.0	6.63	SILTY CLAY TO CLAY	15-20	20-25		1.00	
24.0	12.4	7.02	SILTY CLAY TO CLAY	10-15	20-25		.89	
24.5	11.1	6.46	SILTY CLAY TO CLAY	10-15	20-25		.79	
25.0	11.0	7.22	SILTY CLAY TO CLAY	10-15	20-25		.79	
25.5	8.7	6.98	SILTY CLAY TO CLAY	5-10	15-20		.61	
26.0	19.4	3.21	SANDY SILT to CLAYEY SILT	10-15	15-20	50-60	1.50	
26.5	23.4	2.48	SANDY SILT to CLAYEY SILT	10-15	15-20	40-50	1.85	27-31
27.0	21.2	2.31	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.68	27-31
27.5	21.7	2.56	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.74	27-31
28.0	26.8	1.62	SILTY SAND to SANDY SILT	5-10	10-15	30-40		31-35
28.5	22.1	2.38	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.80	27-31
29.0	11.1	5.39	SILTY CLAY TO CLAY	5-10	15-20		.86	
29.5	8.2	4.75	SILTY CLAY TO CLAY	5-10	10-15		.60	
30.0	5.1	4.01	SILTY CLAY to CLAY	3-5	10-15		.34	
30.5	6.4	4.70	SILTY CLAY TO CLAY	5-10	10-15		.46	
31.0	5.1	4.62	SILTY CLAY TO CLAY	3-5	10-15		.34	
31.5	4.6	4.86	SILTY CLAY TO CLAY	3-5	10-15		.30	
32.0	4.0	4.02	SILTY CLAY TO CLAY	3-5	10-15		.24	
32.5	4.8	3.48	SILTY CLAY to CLAY	3-5	10-15		.32	
33.0	4.8	4.69	SILTY CLAY TO CLAY	3-5	10-15		.33	
33.5	4.8	6.57	SILTY CLAY TO CLAY	5-10	10-15		.32	
34.0	4.0	5.54	SILTY CLAY TO CLAY	3-5	10-15		.25	
34.5	4.9	6.57	SILTY CLAY TO CLAY	5-10	10-15		.34	
35.0	7.3	7.10	SILTY CLAY TO CLAY	5-10	15-20		.58	
35.5	4.7	4.51	SILTY CLAY TO CLAY	3-5	10-15		.32	
36.0	4.7	4.68	SILTY CLAY TO CLAY	3-5	10-15		.33	
36.5	5.6	5.24	SILTY CLAY TO CLAY	5-10	10-15		.42	
37.0	5.9	5.20	SILTY CLAY TO CLAY	5-10	10-15		.45	
37.5	5.5	4.28	SILTY CLAY to CLAY	3-5	10-15		.41	
38.0	5.1	5.15	SILTY CLAY TO CLAY	3-5	10-15		.38	
38.5	5.8	5.03	SILTY CLAY TO CLAY	5-10	10-15		.45	
39.0	4.5	4.38	SILTY CLAY TO CLAY	3-5	10-15		.32	
39.5	4.0	5.09	SILTY CLAY TO CLAY	3-5	10-15		.27	
40.0	3.9	6.30	SILTY CLAY TO CLAY	3-5	10-15		.26	
40.5	3.4	4.91	SILTY CLAY TO CLAY	3-5	10-15		.21	
41.0	11.7	3.01	SILTY CLAY to CLAY	5-10	10-15		1.10	
41.5	3.9	3.47	SILTY CLAY to CLAY	3-5	10-15		.26	
42.0	10.4	4.91	SILTY CLAY TO CLAY	5-10	15-20		.97	
42.5	6.4	5.69	SILTY CLAY TO CLAY	5-10	10-15		.53	
43.0	3.7	3.81	SILTY CLAY to CLAY	3-5	10-15		.24	
43.5	4.2	4.47	SILTY CLAY TO CLAY	3-5	10-15		.29	
44.0	4.3	4.33	SILTY CLAY TO CLAY	3-5	10-15		.30	
44.5	4.3	3.84	SILTY CLAY to CLAY	3-5	10-15		.30	
45.0	7.1	5.95	SILTY CLAY TO CLAY	5-10	15-20		.62	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
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N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-13

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	23.0	3.69	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.40	
46.0	32.9	3.43	SANDY SILT to CLAYEY SILT	15-20	25-40	70-80	3.54	27-31
46.5	51.6	2.58	SANDY SILT to CLAYEY SILT	25-40	25-40	60-70	5.67	31-35
47.0	26.4	5.50	*SANDY CLAY to SILTY CLAY	20-25	25-40		1.41	
47.5	25.2	3.65	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.69	
48.0	80.3	1.43	SILTY SAND to SANDY SILT	25-40	25-40	50-60		35-40
48.5	89.8	2.18	SILTY SAND to SANDY SILT	>40	>40	70-80		35-40
49.0	44.7	3.39	SANDY SILT to CLAYEY SILT	25-40	25-40	70-80	4.98	27-31
49.5	60.1	1.99	SILTY SAND to SANDY SILT	20-25	25-40	50-60		31-35
50.0	173.8	.47	SAND to SILTY SAND	25-40	25-40	50-60		40-42
50.5	107.9	.69	SAND to SILTY SAND	20-25	20-25	40-50		40-42
51.0	55.2	1.97	SILTY SAND to SANDY SILT	20-25	25-40	50-60		31-35
51.5	36.8	2.57	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	4.14	27-31
52.0	13.6	5.06	SILTY CLAY TO CLAY	10-15	15-20		1.40	
52.5	155.5	.50	SAND to SILTY SAND	20-25	20-25	50-60		40-42
53.0	159.8	.47	SAND to SILTY SAND	20-25	20-25	50-60		40-42
53.5	153.3	.51	SAND to SILTY SAND	20-25	20-25	50-60		40-42
54.0	140.4	1.01	SAND to SILTY SAND	25-40	25-40	50-60		40-42
54.5	145.6	.51	SAND to SILTY SAND	20-25	20-25	50-60		40-42
55.0	148.8	1.05	SAND to SILTY SAND	>40	>40	60-70		40-42
55.5	119.4	.50	SAND to SILTY SAND	15-20	15-20	40-50		40-42
56.0	175.3	.43	SAND to SILTY SAND	25-40	25-40	50-60		40-42
56.5	149.9	.28	SANDY GRAVEL to SAND	15-20	15-20	40-50		40-42
57.0	143.6	.63	SAND to SILTY SAND	25-40	25-40	50-60		40-42
57.5	152.1	1.16	SAND to SILTY SAND	>40	>40	60-70		40-42
58.0	153.2	.87	SAND to SILTY SAND	25-40	25-40	50-60		40-42
58.5	156.4	.75	SAND to SILTY SAND	25-40	25-40	50-60		40-42
59.0	95.3	.42	SAND to SILTY SAND	10-15	15-20	40-50		40-42
59.5	151.8	.52	SAND to SILTY SAND	20-25	20-25	50-60		40-42
60.0	136.7	.70	SAND to SILTY SAND	25-40	25-40	50-60		40-42
60.5	141.3	.74	SAND to SILTY SAND	25-40	25-40	50-60		40-42
61.0	150.2	.67	SAND to SILTY SAND	25-40	25-40	50-60		40-42
61.5	203.7	.48	SANDY GRAVEL to SAND	25-40	25-40	50-60		42-45
62.0	198.2	.64	SAND to SILTY SAND	25-40	25-40	50-60		42-45
62.5	180.3	.31	SANDY GRAVEL to SAND	20-25	20-25	50-60		42-45
63.0	208.7	.74	SAND to SILTY SAND	>40	>40	60-70		42-45
63.5	217.3	.55	SANDY GRAVEL to SAND	25-40	25-40	60-70		42-45
64.0	198.7	.52	SAND to SILTY SAND	25-40	25-40	50-60		42-45
64.5	240.3	.62	SANDY GRAVEL to SAND	>40	>40	60-70		42-45
65.0	192.5	.43	SANDY GRAVEL to SAND	25-40	25-40	50-60		42-45
65.5	105.9	.52	SAND to SILTY SAND	15-20	15-20	40-50		40-42
66.0	20.2	2.34	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	2.42	27-31
66.5	11.5	2.42	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	1.27	
67.0	10.7	2.72	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	1.17	
67.5	10.7	2.65	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	1.16	
68.0	14.0	3.35	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.61	
68.5	13.5	3.83	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.56	
69.0	10.2	4.51	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.11	
69.5	8.1	3.64	SILTY CLAY to CLAY	5-10	10-15		.83	
70.0	7.5	3.60	SILTY CLAY to CLAY	3-5	10-15		.75	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
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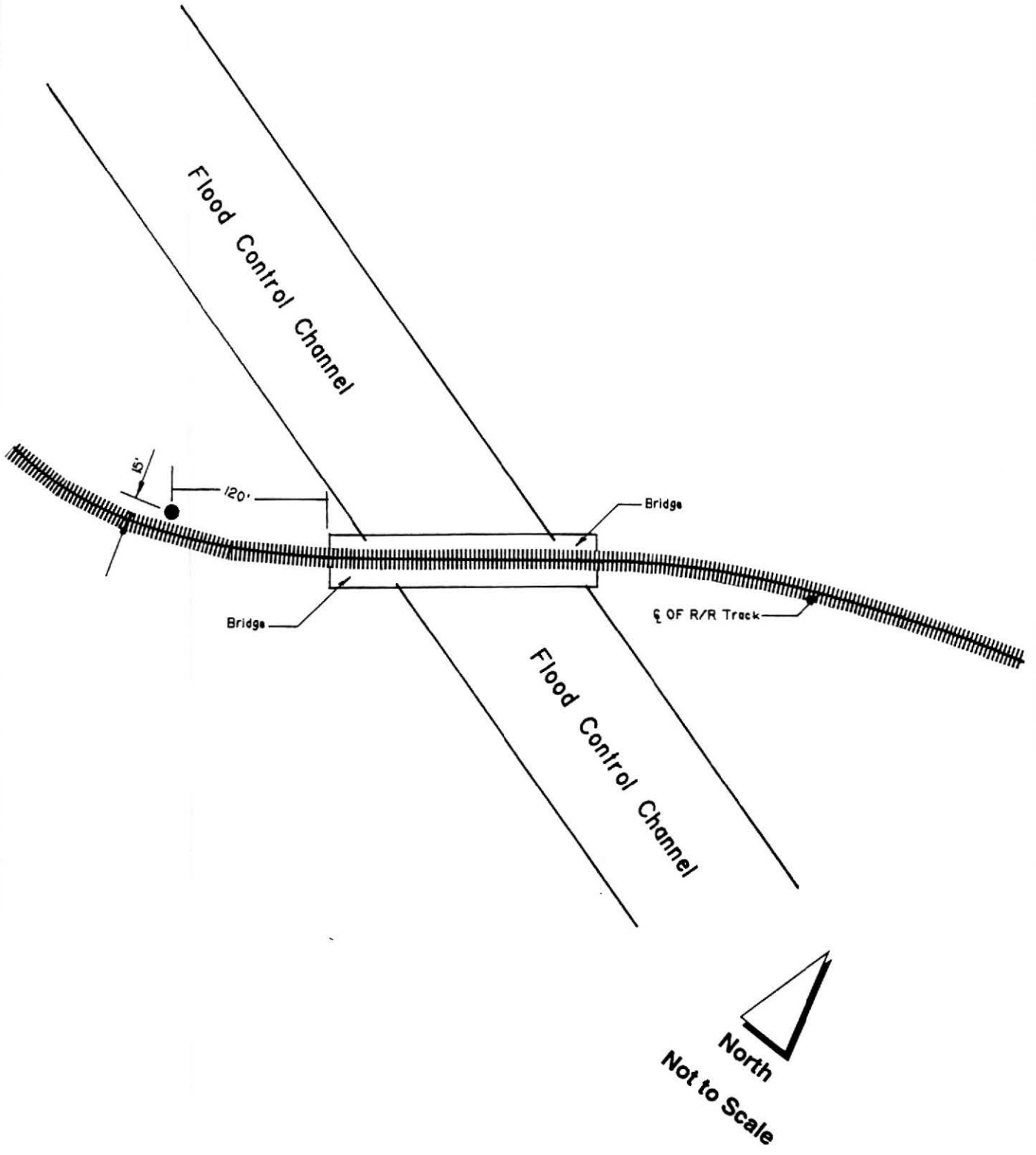
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-13

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	7.3	3.29	SILTY CLAY to CLAY	3-5	10-15		.73	
71.0	7.3	3.15	SILTY CLAY to CLAY	3-5	10-15		.73	
71.5	8.1	2.99	SILTY CLAY to CLAY	3-5	10-15		.83	
72.0	8.6	3.15	SILTY CLAY to CLAY	3-5	10-15		.90	
72.5	9.9	3.73	CLAYEY SILT to SILTY CLAY	5-10	10-15		1.09	
73.0	19.4	4.79	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.43	
73.5	17.2	4.09	CLAYEY SILT to SILTY CLAY	10-15	15-20		2.13	
74.0	25.8	4.42	CLAYEY SILT to SILTY CLAY	15-20	25-40		3.35	
74.5	39.6	3.87	SANDY SILT to CLAYEY SILT	25-40	25-40	80-90	5.33	27-31
75.0	66.8	3.05	SANDY SILT to CLAYEY SILT	25-40	>40	80-90	9.22	31-35
75.5	55.2	4.04	*CLAYEY SAND to SANDY CLAY	>40	>40		3.80	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



The Earth Technology Corporation

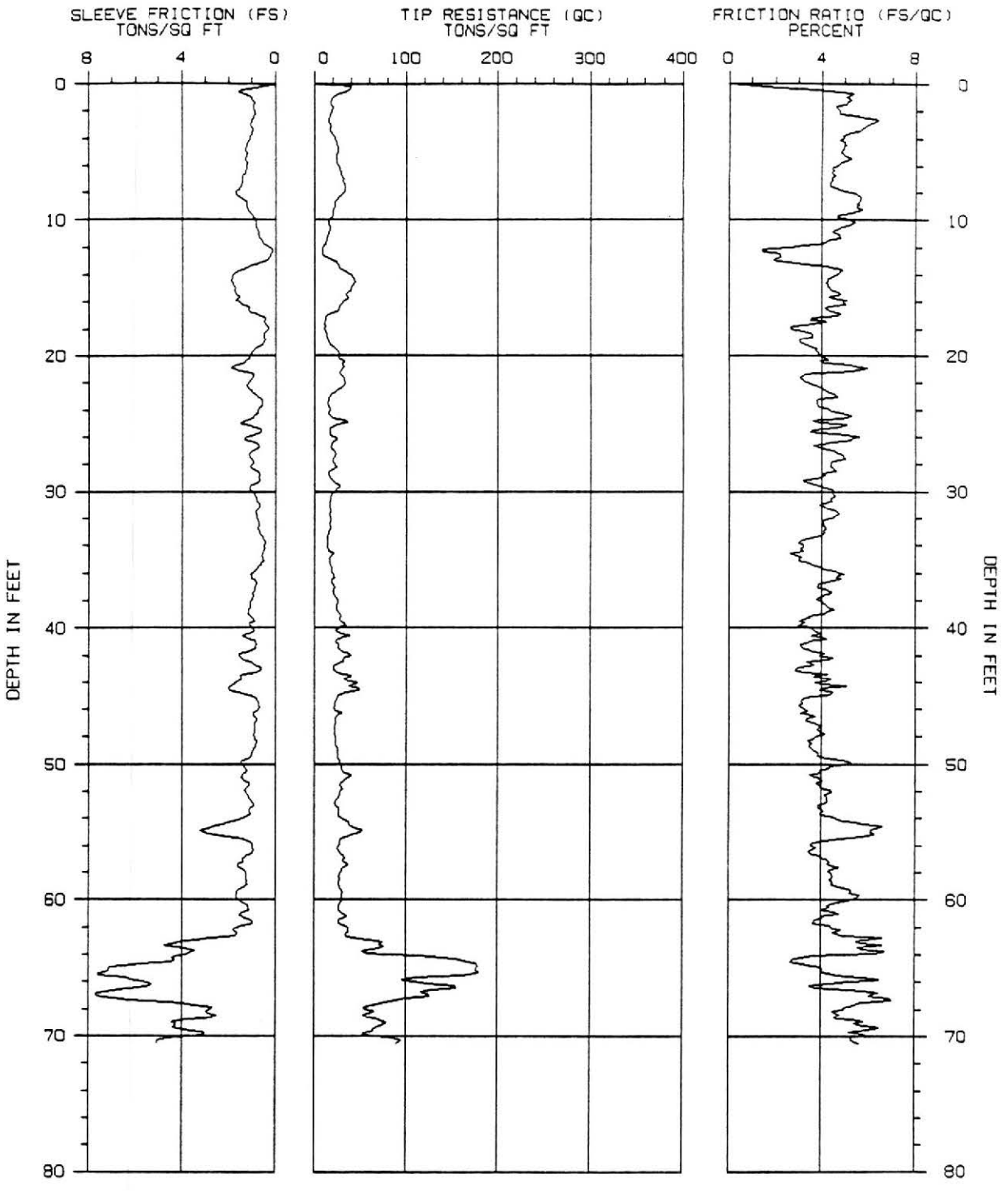
Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of CPT-13

11-93

Figure A-29



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-14

PROJECT NAME : TETC/S.F.V.RED LINE

LOCATION : CANOGA PARK CA.

PROJECT NUMBER : 94-382-00001

DATE : 09-17-1993

THE EARTH TECHNOLOGY CORPORATION

CPT INTERPRETATIONS

SOUNDING : CPT-14
PROJECT : TETC/S.F.V.RED LINE
LOCATION : CANOGA PARK CA.
DATE : 09-17-1993

PROJECT NO : 94-382-00001
INSTRUMENT : F15CKE090
SYSTEM : SYSTEM#3
OPERATOR : KC/BCR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00						
.5	96.4	3.81	*CLAYEY SAND to SANDY CLAY	>40	>40		1.27	
1.0	45.9	5.03	*SANDY CLAY to SILTY CLAY	>40	>40		.69	
1.5	37.2	5.01	*SANDY CLAY to SILTY CLAY	25-40	>40		.60	
2.0	36.3	4.75	*SANDY CLAY to SILTY CLAY	25-40	>40		.63	
2.5	29.5	5.82	*SANDY CLAY to SILTY CLAY	25-40	25-40		.53	
3.0	30.8	6.00	*SANDY CLAY to SILTY CLAY	25-40	>40		.58	
3.5	29.6	5.49	*SANDY CLAY to SILTY CLAY	25-40	25-40		.58	
4.0	37.3	4.87	*SANDY CLAY to SILTY CLAY	25-40	>40		.76	
4.5	39.2	5.01	*SANDY CLAY to SILTY CLAY	25-40	>40		.82	
5.0	39.3	4.79	*SANDY CLAY to SILTY CLAY	25-40	>40		.85	
5.5	36.8	5.24	*SANDY CLAY to SILTY CLAY	25-40	>40		.82	
6.0	38.4	4.69	*SANDY CLAY to SILTY CLAY	25-40	>40		.88	
6.5	40.5	4.45	*SANDY CLAY to SILTY CLAY	25-40	>40		.94	
7.0	44.1	4.41	*SANDY CLAY to SILTY CLAY	25-40	>40		1.05	
7.5	45.2	4.37	*SANDY CLAY to SILTY CLAY	25-40	>40		1.10	
8.0	43.1	5.24	*SANDY CLAY to SILTY CLAY	>40	>40		1.07	
8.5	31.8	5.63	*SANDY CLAY to SILTY CLAY	25-40	>40		.80	
9.0	28.3	5.51	*SANDY CLAY to SILTY CLAY	25-40	25-40		.73	
9.5	25.3	5.26	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.32	
10.0	20.0	5.16	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.05	
10.5	20.1	4.91	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.07	
11.0	18.7	4.65	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.01	
11.5	15.6	4.28	CLAYEY SILT to SILTY CLAY	10-15	15-20		.85	
12.0	11.2	2.62	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	.60	
12.5	10.4	2.20	SANDY SILT to CLAYEY SILT	3-5	10-15	20-30	.57	
13.0	25.0	2.06	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.45	27-31
13.5	30.9	4.59	CLAYEY SILT to SILTY CLAY	20-25	25-40		1.83	
14.0	42.3	4.67	*SANDY CLAY to SILTY CLAY	25-40	>40		1.28	
14.5	47.0	4.22	*SANDY CLAY to SILTY CLAY	25-40	>40		1.45	
15.0	41.9	4.36	*SANDY CLAY to SILTY CLAY	25-40	>40		1.31	
15.5	35.9	4.66	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.13	
16.0	32.3	4.91	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.03	
16.5	27.3	4.19	CLAYEY SILT to SILTY CLAY	15-20	25-40		1.74	
17.0	13.8	4.69	CLAYEY SILT to SILTY CLAY	10-15	15-20		.86	
17.5	11.0	4.16	CLAYEY SILT to SILTY CLAY	5-10	15-20		.68	
18.0	10.7	2.66	SANDY SILT to CLAYEY SILT	5-10	10-15	30-40	.67	
18.5	13.5	3.61	CLAYEY SILT to SILTY CLAY	5-10	15-20		.87	
19.0	15.3	3.04	SANDY SILT to CLAYEY SILT	5-10	15-20	40-50	1.01	
19.5	21.2	3.80	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.44	
20.0	25.3	3.94	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.75	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-14

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	29.2	4.08	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.06	
21.0	27.7	5.76	*SANDY CLAY to SILTY CLAY	25-40	25-40		.99	
21.5	26.6	3.16	SANDY SILT to CLAYEY SILT	10-15	20-25	60-70	1.91	27-31
22.0	29.6	3.37	SANDY SILT to CLAYEY SILT	15-20	20-25	60-70	2.16	27-31
22.5	23.1	4.14	CLAYEY SILT to SILTY CLAY	15-20	20-25		1.68	
23.0	14.3	4.66	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.02	
23.5	12.7	3.80	CLAYEY SILT to SILTY CLAY	5-10	15-20		.90	
24.0	14.2	4.35	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.03	
24.5	14.7	5.26	SILTY CLAY TO CLAY	10-15	20-25		1.08	
25.0	26.2	4.68	CLAYEY SILT to SILTY CLAY	20-25	25-40		2.02	
25.5	14.0	3.68	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.05	
26.0	17.4	5.58	SILTY CLAY TO CLAY	15-20	20-25		1.33	
26.5	15.3	4.04	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.17	
27.0	16.7	4.51	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.30	
27.5	16.7	5.00	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.31	
28.0	17.3	4.42	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.37	
28.5	13.4	4.64	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.05	
29.0	14.1	3.80	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.12	
29.5	19.9	3.67	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.65	
30.0	16.6	4.43	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.37	
30.5	13.4	4.39	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.09	
31.0	12.2	3.93	CLAYEY SILT to SILTY CLAY	5-10	15-20		.99	
31.5	12.9	4.61	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.06	
32.0	12.9	4.39	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.07	
32.5	12.5	4.08	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.04	
33.0	11.6	4.11	CLAYEY SILT to SILTY CLAY	5-10	15-20		.96	
33.5	10.3	3.45	SILTY CLAY to CLAY	5-10	10-15		.85	
34.0	10.3	3.19	SILTY CLAY to CLAY	5-10	10-15		.85	
34.5	12.8	2.94	SANDY SILT to CLAYEY SILT	5-10	10-15	40-50	1.11	
35.0	11.5	3.02	SILTY CLAY to CLAY	5-10	10-15		.99	
35.5	12.5	3.73	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.10	
36.0	13.5	4.82	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.20	
36.5	13.1	4.74	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.17	
37.0	14.8	3.82	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.36	
37.5	14.1	4.42	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.30	
38.0	17.0	3.89	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.61	
38.5	15.7	4.32	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.49	
39.0	18.1	4.13	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.75	
39.5	18.4	3.05	SANDY SILT to CLAYEY SILT	5-10	15-20	50-60	1.81	
40.0	17.1	3.58	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.67	
40.5	23.0	3.71	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.32	
41.0	14.8	3.52	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.44	
41.5	16.2	3.22	SANDY SILT to CLAYEY SILT	5-10	15-20	50-60	1.60	
42.0	24.4	3.90	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.50	
42.5	19.4	3.39	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.96	
43.0	12.8	2.89	SANDY SILT to CLAYEY SILT	5-10	10-15	40-50	1.24	
43.5	24.1	3.75	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.49	
44.0	27.4	3.76	CLAYEY SILT to SILTY CLAY	15-20	20-25		2.87	
44.5	29.4	4.00	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.11	
45.0	15.5	4.23	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.56	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-14

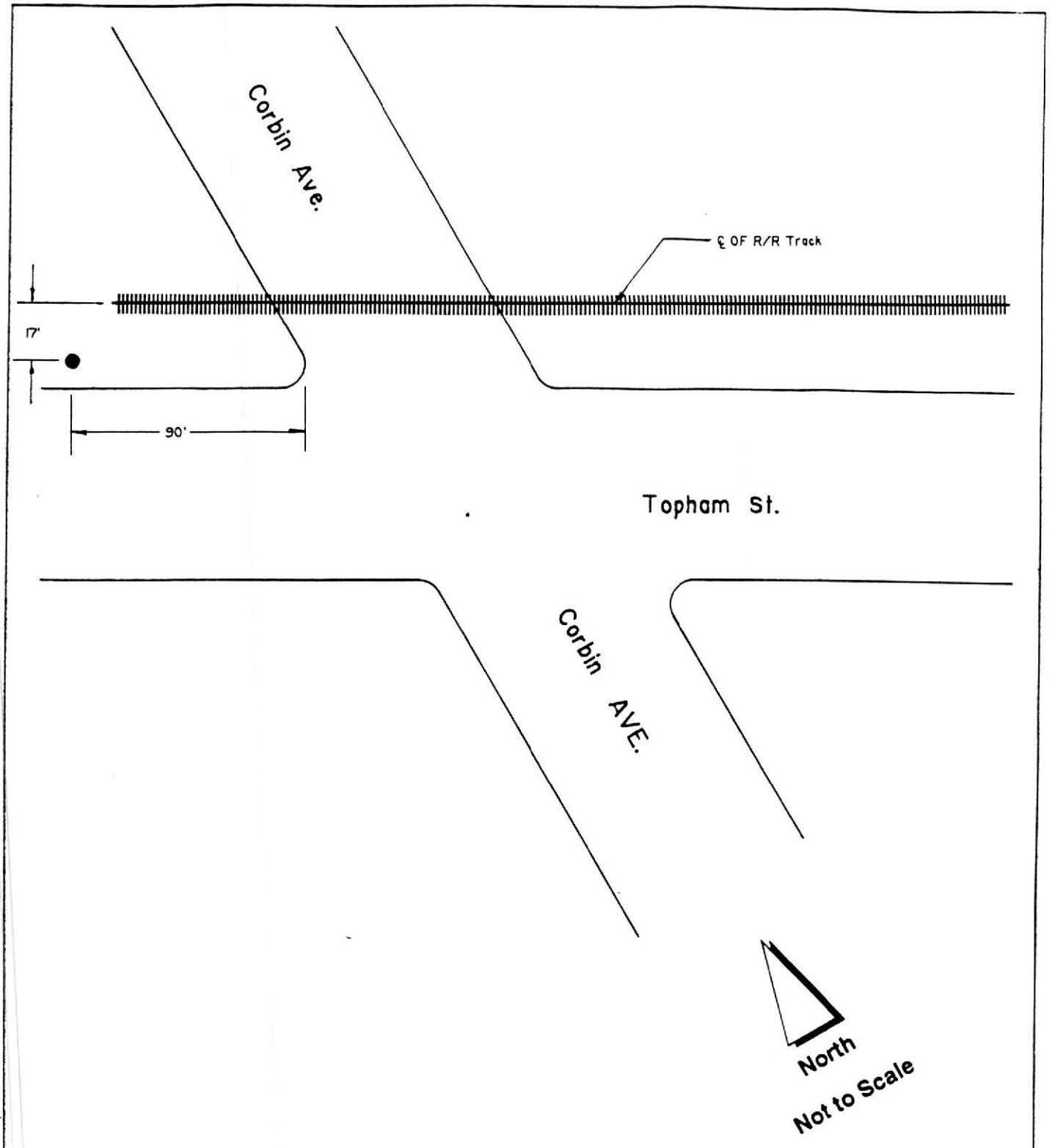
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	13.6	3.16	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.35	
46.0	13.0	3.31	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.29	
46.5	14.4	3.75	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.44	
47.0	13.8	3.67	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.39	
47.5	13.2	3.83	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.32	
48.0	13.5	3.78	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.35	
48.5	13.4	3.62	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.35	
49.0	15.0	3.70	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.54	
49.5	15.1	4.03	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.56	
50.0	16.2	5.08	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.69	
50.5	17.6	3.92	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.87	
51.0	21.0	3.90	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.27	
51.5	15.9	3.93	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.68	
52.0	16.2	4.46	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.72	
52.5	14.5	4.26	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.52	
53.0	13.3	3.89	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.39	
53.5	14.9	4.05	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.58	
54.0	17.0	4.61	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.84	
54.5	21.6	6.29	SILTY CLAY TO CLAY	20-25	25-40		2.40	
55.0	27.5	6.11	*SANDY CLAY to SILTY CLAY	25-40	25-40		1.56	
55.5	16.2	4.78	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.76	
56.0	14.7	3.62	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.57	
56.5	15.3	3.47	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.66	
57.0	18.2	4.18	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.02	
57.5	19.5	4.43	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.19	
58.0	15.6	4.34	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.71	
58.5	14.9	4.37	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.63	
59.0	14.8	4.64	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.62	
59.5	16.7	5.22	SILTY CLAY TO CLAY	10-15	20-25		1.87	
60.0	15.9	5.33	SILTY CLAY TO CLAY	10-15	20-25		1.77	
60.5	14.0	4.35	CLAYEY SILT to SILTY CLAY	10-15	15-20		1.53	
61.0	16.7	4.76	CLAYEY SILT to SILTY CLAY	10-15	20-25		1.89	
61.5	14.4	3.73	CLAYEY SILT to SILTY CLAY	5-10	15-20		1.60	
62.0	19.2	4.43	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.22	
62.5	18.0	4.68	CLAYEY SILT to SILTY CLAY	10-15	20-25		2.07	
63.0	35.4	5.52	*SANDY CLAY to SILTY CLAY	25-40	>40		2.17	
63.5	38.4	5.55	*SANDY CLAY to SILTY CLAY	25-40	>40		2.37	
64.0	40.3	4.89	*SANDY CLAY to SILTY CLAY	25-40	>40		2.50	
64.5	84.8	2.66	SILTY SAND to SANDY SILT	>40	>40	80-90		31-35
65.0	89.6	4.03	*CLAYEY SAND to SANDY CLAY	>40	>40		5.78	
65.5	81.3	4.70	*SANDY CLAY to SILTY CLAY	>40	>40		5.25	
66.0	55.1	5.17	*SANDY CLAY to SILTY CLAY	>40	>40		3.53	
66.5	72.4	4.39	*SANDY CLAY to SILTY CLAY	>40	>40		4.69	
67.0	62.7	6.06	*SANDY CLAY to SILTY CLAY	>40	>40		4.07	
67.5	39.3	5.84	*SANDY CLAY to SILTY CLAY	>40	>40		2.51	
68.0	27.8	4.97	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.48	
68.5	26.4	4.72	CLAYEY SILT to SILTY CLAY	20-25	25-40		3.31	
69.0	38.9	5.58	*SANDY CLAY to SILTY CLAY	25-40	>40		2.51	
69.5	31.8	6.29	*SANDY CLAY to SILTY CLAY	25-40	>40		2.04	
70.0	31.5	5.48	*SANDY CLAY to SILTY CLAY	25-40	25-40		2.02	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-14

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	N1-F	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	43.4	5.65	*SANDY CLAY to SILTY CLAY	>40	>40		2.85	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 PCF
ASSUMED DEPTH OF WATER TABLE = 40.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
N1-F = OVERBURDEN NORMALIZED FINES-CONTENT ADJUSTED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



The Earth Technology Corporation

Project No.: 93-4955

San Fernando Valley Segment
Metro Red Line

Location of CPT-14

11-93

Figure A-30

APPENDIX B

GEOTECHNICAL LABORATORY TEST RESULTS

LABORATORY TESTING

GENERAL

The results of laboratory testing performed in conjunction with this project accompany this appendix. The following laboratory tests were performed on representative samples in accordance with the latest applicable American Society for Testing Materials (ASTM) and California Department of Transportation (Caltrans) standards. Laboratory test results are summarized in Tables 3-4 and 5-1.

CLASSIFICATION

Soils were classified in accordance with ASTM Test Methods D2487-90 and D2488-90. The soil classification is presented in the test data and boring logs.

MOISTURE AND IN PLACE DENSITY

The field moisture content and in place dry density determinations were performed on relatively undisturbed California Drive samples obtained from test borings. The moisture content was obtained in accordance with ASTM Test Method D2216. The in place dry density was computed using the net weight of the entire (ring) sample. The results of these tests are presented in the boring logs.

PARTICLE SIZE ANALYSIS

Grain size distribution of soil samples were obtained in accordance with ASTM Test Method D422. Laboratory test results for the grain size analysis are summarized in Table B-1. Figures B-1 through B-28 present the grain size distribution curves.

FINES CONTENT ANALYSIS

Fines content (percent passing #200 sieve) of soil samples were obtained in accordance with ASTM Test Method D1140. Laboratory test results for the fines content analysis are summarized in Table B-1.

ATTERBERG LIMITS

Tests for Atterberg Limits (Liquid Limit and Plasticity Index) were performed according to ASTM Tests Method D4318. Laboratory test results for the Atterberg Limits are summarized in Table B-2. These results are also presented, along with grain size distribution curves, in Figures B-1, B-4, B-5, B-7, B-8, B-9, B-16, B-18 and B-22.

SPECIFIC GRAVITY

Specific gravity tests were performed on fine-grained (passing #4 sieve) soil samples in accordance with ASTM Test Method D854.

DIRECT SHEAR TESTS

Direct shear tests were performed on selected relatively undisturbed soil samples which were saturated under surcharge equal to the applied normal force during testing. The apparatus used is in conformance with the requirements outlined in ASTM Test Method D3080. The test specimens, 2.4 inches in diameter and 1 inch in height, were subjected to shear along a plane mid-height after allowing time for pore pressure dissipation prior to application of shearing force.

The samples were tested under normal loads 3, 6 and 12 ksf, respectively, a different specimen being used for each normal load. During the drained direct shear tests, the samples were sheared at a constant rate of strain of 0.013 inches per minute. During the undrained direct shear tests, the samples were sheared at a constant rate of 0.06 inches per minute. Shearing of the specimens were continued until the shear stress became essentially constant or until a deformation of approximately 10% of original diameter had been reached. Laboratory test results for the direct shear tests are summarized in Table B-3 and graphically presented in Figures B-29 through B-39.

CONSOLIDATION AND COLLAPSE TESTS

Consolidation tests were preformed on selected relatively undisturbed soil samples in accordance with procedures outlined in ASTM Test Method D2435. The samples were placed in a consolidometer and loads were applied incrementally in geometric progression. The samples (2.4 inches in diameter and 1 inch in height) were permitted to consolidate under each load increment until the slope of the characteristic linear secondary compression portion of the thickness versus log of time plot was apparent.

The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. Hydroconsolidation (collapse) and/or expansion characteristics were also evaluated by monitoring the change in volume with the addition of water while specimen was confined under a constant normal stress close to the in-situ vertical stress. The consolidation test results are graphically presented in Figures B-40, B-41, B-42 and B-43.

SULFATE CONTENT pH, CHLORIDE CONTENT

The concentration of water soluble sulfate ions of selected soil samples were determined in accordance with the Caltrans Method No. 417-B. Soil pH values were determined in accordance with USEPA Method 9045. Chloride content was determined in accordance with Caltrans Method No 422. The results of soluble sulfate content, pH and chloride content tests are presented in Table B-4.

TABLE B–1. RESULTS OF GRAIN SIZE AND FINES CONTENT TESTS (PAGE 1 OF 3)

Alignment Segment	Boring No.	Sample No.	Depth (feet)	USCS Symbol	Geological Unit	Grain Size Distribution		
						Gravel Content (%)	Sand Content (%)	Fines Content[1] (%)
Western Tunnel Segment	LPE–1	D–3	15.0	CL	Qal	0	47	53
		S–6	30.0	SP–SM				9.9
		D–7	32.0	GP–GM				8.1
		S–8	35.0	SM		23	59	18
		D–9	40.0	SM				30.1
		D–11	45.0	CL				60.7
		D–13	55.0	SM	Tm			21.5
	LPE–2	D–3	15.0	CL	Qal			63.1
		S–4	20.0	SC				51.7
		S–6	30.0	CL				87.7
		D–7	35.0	SC				43.4
		S–8	40.0	SM		23	57	20
		D–9	45.0	CL		0	39	61
	LPE–3	D–3	15.0	CL	Qal	0	18	82
		D–5	25.0	CL		0	18	82
		S–6	30.0	CL				67.7
		D–9	40.0	CL		0	42	58
		D–11	50.0	CL				73.2
	LPE–4	S–6	30.0	CL	Qal			69.3
		S–8	40.0	CL				59.3
		S–10	46.0	CL		0	35	65
		D–11	50.0	ML				55.5
		S–12	53.5	CL				63.8
	LPE–5	D–5	25.5	CL	Qal	0	32	68
		D–7	35.0	CL				55.0
		D–9	45.0	CH	Tm			84.9
		D–11	51.0	CH		0	6	94
	LPE–6	D–3	15.0	CL	Qal			66.3
		S–6	28.0	CL		0	49	51
		D–7	33.0	SP/SM				12.2
		S–8	36.0	SM				14.1
		D–9	39.3	SC				39.1
		D–11	45.0	CL				61.7
		D–14	52.5	SC				43.9
		D–16	60.3	SM				24.4

TABLE B–1. RESULTS OF GRAIN SIZE AND FINES CONTENT TESTS (PAGE 2 OF 3)

Alignment Segment	Boring No.	Sample No.	Depth (feet)	USCS Symbol	Geological Unit	Grain Size Distribution		
						Gravel Content (%)	Sand Content (%)	Fines Content[1] (%)
Western Tunnel Segment	LPE–7	D–3	15.0	CL	Qal	0	18	82
		S–6	30.0	SC				28.6
		D–7	35.0	GC				20.2
		S–8	40.0	SC		10	59	31
		D–9	45.0	CL				54.0
		S–10	50.0	SM				20.5
Central Above Ground Segment	LPE–8	S–6/S–7	30.0	SM	Qal	0	75	25
		S–10	40.5	ML				51.3
		D–11	45.0	SM				45.7
	LPE–9	D–3	15.0	CL	Qal			68.6
		D–5	25.0	SC/SM				17.4
		S–6	30.0	SM		2	50	48
		D–7	35.0	SP/SW				2.8
		S–8	40.0	SP/SW				10.6
	LPE–10	D–3	15.0	CL	Qal			70.3
		D–5	25.0	CL		0	34	66
		S–8	40.0	SM				36.1
		D–9	45.0	SM		2	61	37
	LPE–11	D–5	25.0	CL	Qal	0	46	54
		D–7	35.0	CL–ML				56.7
		S–10	50.0	SP–SM		11	81	8
		D–13	65.0	SM				15.0
Eastern Tunnel Segment	LPE–12	D–5	25.5	ML	Qal			62.8
		S–6	28.2	SM		11	74	15
		D–7	33.0	SM/SC				42.1
		S–8	38.0	ML		0	26	74
		D–9	43.0	SM/SC				38.1
		S–10	47.0	SM/SC				38.1
		D–11	50.0	ML		0	31	69
	LPE–13	S–2	10.0	SP–SM	Qal	6	88	6
		S–4	20.0	ML				58.2
		D–5	25.3	SM		3	72	25
		S–6	30.0	ML				54.5
		D–7	34.0	CL				69.1
		S–8	39.0	ML		0	36	64

TABLE B–1. RESULTS OF GRAIN SIZE AND FINES CONTENT TESTS (PAGE 3 OF 3)

Alignment Segment	Boring No.	Sample No.	Depth (feet)	USCS Symbol	Geological Unit	Grain Size Distribution		
						Gravel Content (%)	Sand Content (%)	Fines Content[1] (%)
Eastern Tunnel Segment	LPE–13	D–9	42.0	CL	Qal	0	37	63
		D–11	47.1	ML				62.7
	LPE–14	D–3	15.0	SM	Qal			48.6
		S–4	20.0	SP–SM				6.7
		D–5	25.0	SP/GP		20	75	5
		S–6	30.0	SM				38.5
		D–7	35.0	SM				36.0
		S–8	40.0	SP–SM				8.0
		D–9	45.0	SP				4.3
		S–10	50.0	SP–SM		31	62	7
		D–11	55.0	SP–SM				6.3
		S–12	60.0	SP				8.0

Note:

1) Sample is analyzed only for fines content (percent passing through #200 Sieve), wherever gravel and sand contents are not indicated

TABLE B–2. RESULTS OF ATTERBERG LIMITS TESTS

Alignment Segment	Boring No.	Sample No.	Depth (feet)	USCS Symbol	Geological Unit	Atterberg Limits	
						Liquid Limit (%)	Plasticity Index (%)
Western Tunnel Segment	LPE–1	D–3	15.0	CL	Qal	32	14
	LPE–2	D–9	45.0	CL	Qal	36	16
	LPE–3	D–3	15.0	CH	Qal	52	28
		D–9	40.0	CL		28	9
	LPE–4	S–6	30.0	CL	Qal	36	18
		S–10	46.0	CL		34	17
	LPE–5	D–3	15.0	CL	Qal	49	28
		D–5	25.5	CL		38	19
		D–9	45.0	CH	Tm	50	27
	LPE–6	D–11	45.0	CL	Qal	32	15
	LPE–7	D–5	25.0	CL	Qal	43	26
Central Above Ground Segment	LPE–8	D–13	55.0	CL	Qal	48	22
	LPE–9	D–3	15.0	CL	Qal	32	15
		S–12	60.0	CL		31	13
	LPE–10	D–5	25.0	CL	Qal	31	16
		D–11	55.0	CL–ML		27	5
	LPE–11	D–5	25.0	CL	Qal	28	13
		D–7	35.0	CL–ML		23	6
Eastern Tunnel Segment	LPE–12	D–11	50.0	ML	Qal	30	7
	LPE–13	D–5	25.3	SM	Qal	NP[1]	
		S–8	39.0	ML/SM		NP	

NOTE:

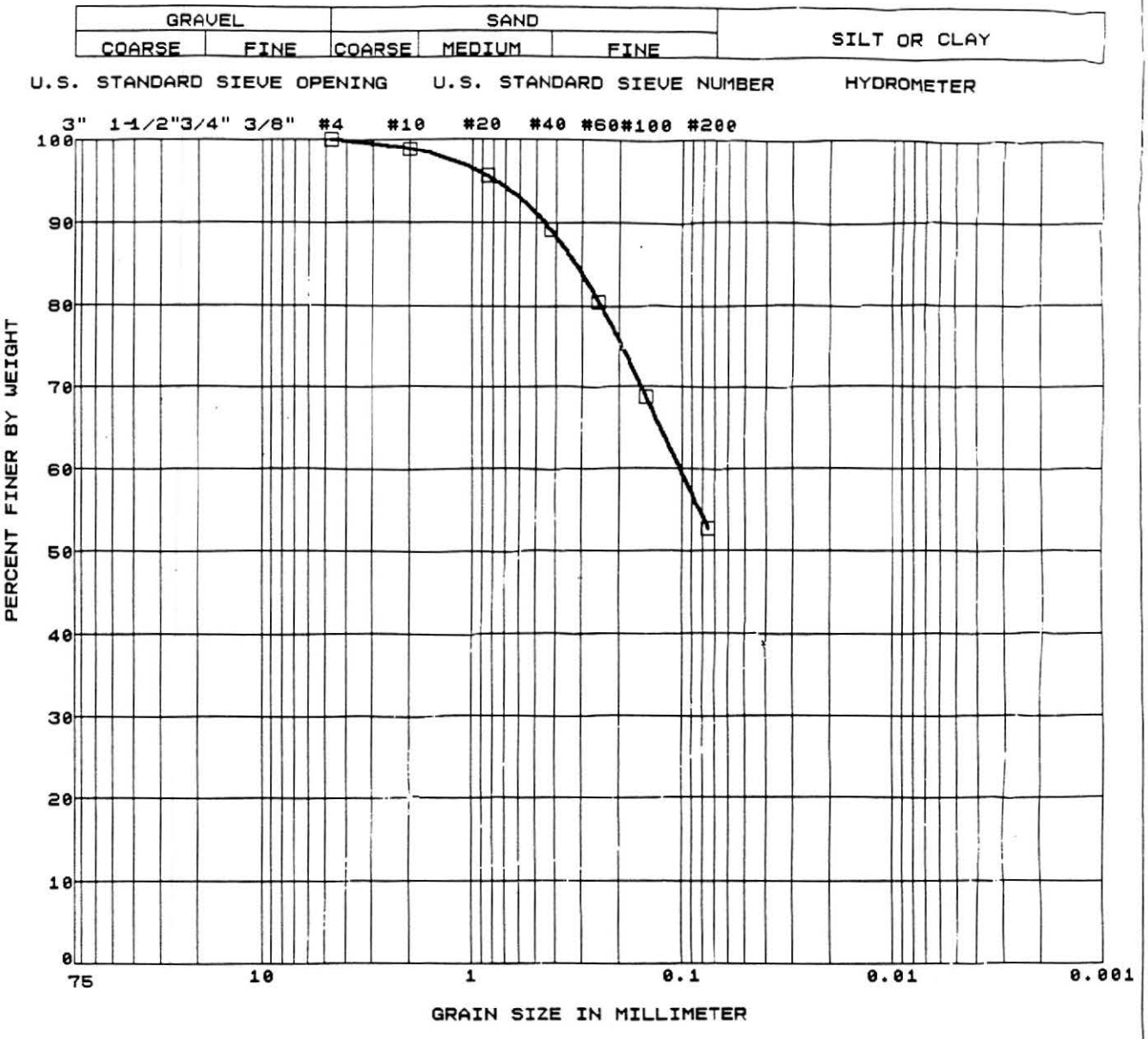
1) NP = Non – plastic

TABLE B-3. RESULTS OF DIRECT SHEAR TESTS

Alignment Segment	Boring No.	Sample No.	Depth (feet)	USCS Symbol	Geological Unit	Direct Shear Peak Strength	
						Friction Angle (Degrees)	Cohesion Intercept (psf)
Western Tunnel Segment	LPE-1	D-3	15.0	CL	Qal	26	600
	LPE-3	D-5	25.0	CL	Qal	26	900
	LPE-5	D-5	25.5	CL	Qal	24	2000
	LPE-5	D-11	51.0	CH	Tm	20	2000
	LPE-7	D-3	15.0	CL	Qal	23	600
Central Above Ground Segment	LPE-9	D-3	15.0	CL	Qal	18	1000
	LPE-10	D-5	25.0	CL	Qal	25	500
		D-9	45.0	SM		26	600
		D-11	55.0	CL-ML		30	600
	LPE-11	D-5	25.0	CL	Qal	28	600
Eastern Tunnel Segment	LPE-13	D-9	42.0	CL	Qal	24	1200

TABLE B–4. RESULTS OF CORROSIVITY TESTS

Alignment Segment	Boring No.	Sample No.	Depth (feet)	USCS Symbol	Geological Unit	Corrosivity		
						pH	Chloride Content (ppm)	Sulphate Content (ppm)
Western Tunnel Segment	LPE–1	D–5	25.2	CL	Qal	7.15	95	108
	LPE–2	D–9	45.0	CL	Qal	7.15	109	45
	LPE–3	D–3	15.0	CL	Qal	6.96	263	187
	LPE–4	S–8	40.0	CL	Qal	7.28	505	77
	LPE–5	D–9	45.0	CH	Tm	6.97	259	42
	LPE–6	D–9	39.3	SC	Qal	6.90	215	217
	LPE–7	D–3	15.0	CL	Qal	7.23	338	144
Central Above Ground Segment	LPE–8	D–3	15.0	CL	Qal	6.96	92	76
	LPE–9	S–2	10.0	CL	Qal	7.35	394	110
	LPE–10	D–3	15.0	CL	Qal	6.82	232	69
	LPE–11	D–7	35.0	CL–ML	Qal	7.13	217	129
Eastern Tunnel Segment	LPE–12	D–9	43.0	SM/SC	Qal	7.04	212	271
	LPE–13	D–5	25.3	SM	Qal	6.85	198	213
	LPE–14	D–7	35.0	SM	Qal	7.32	343	96



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-1	D-3	15.0	Drive	CL	32	14

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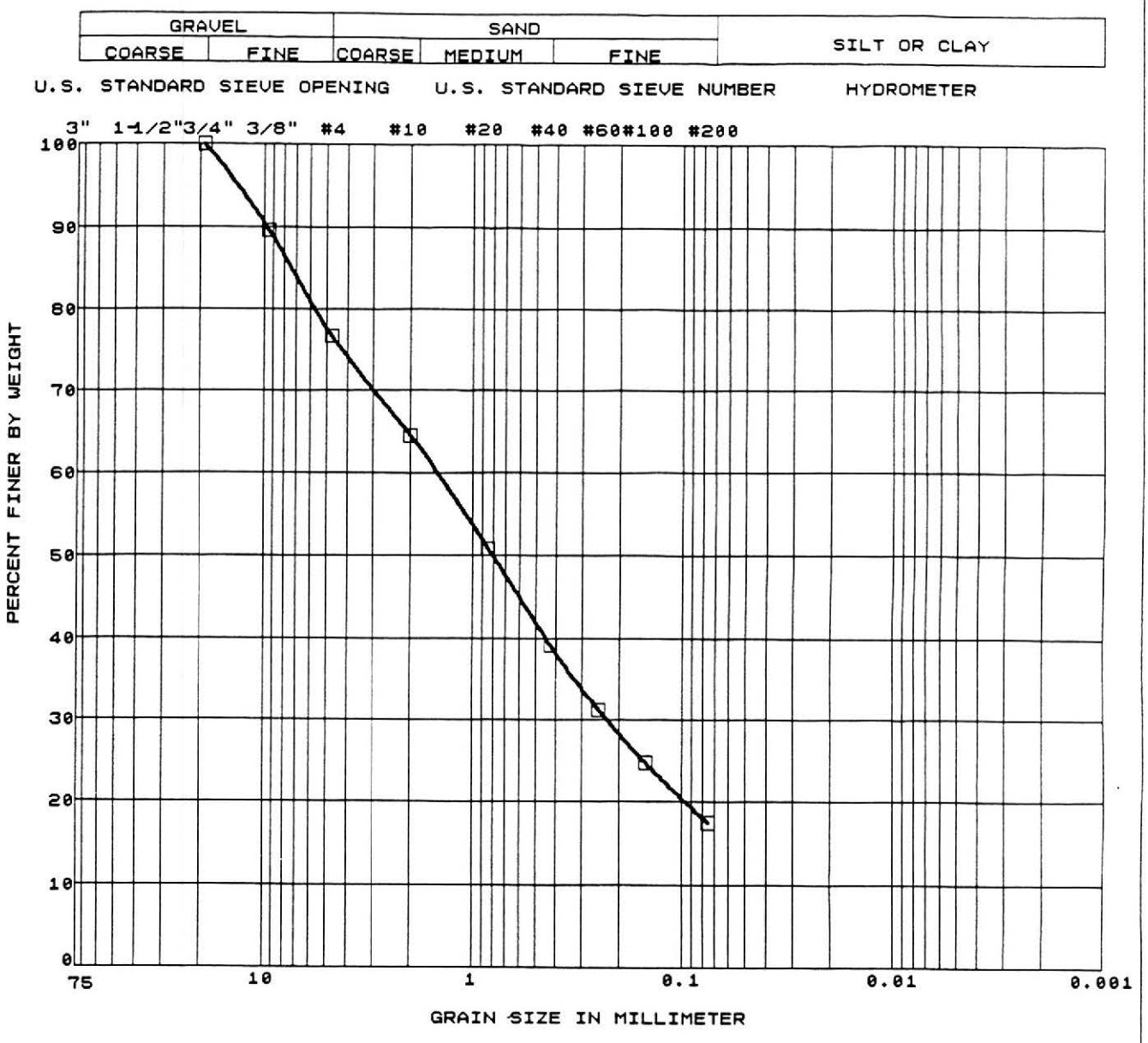
FIGURE B-1



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-1	S-8	35.0	Bag	SM		

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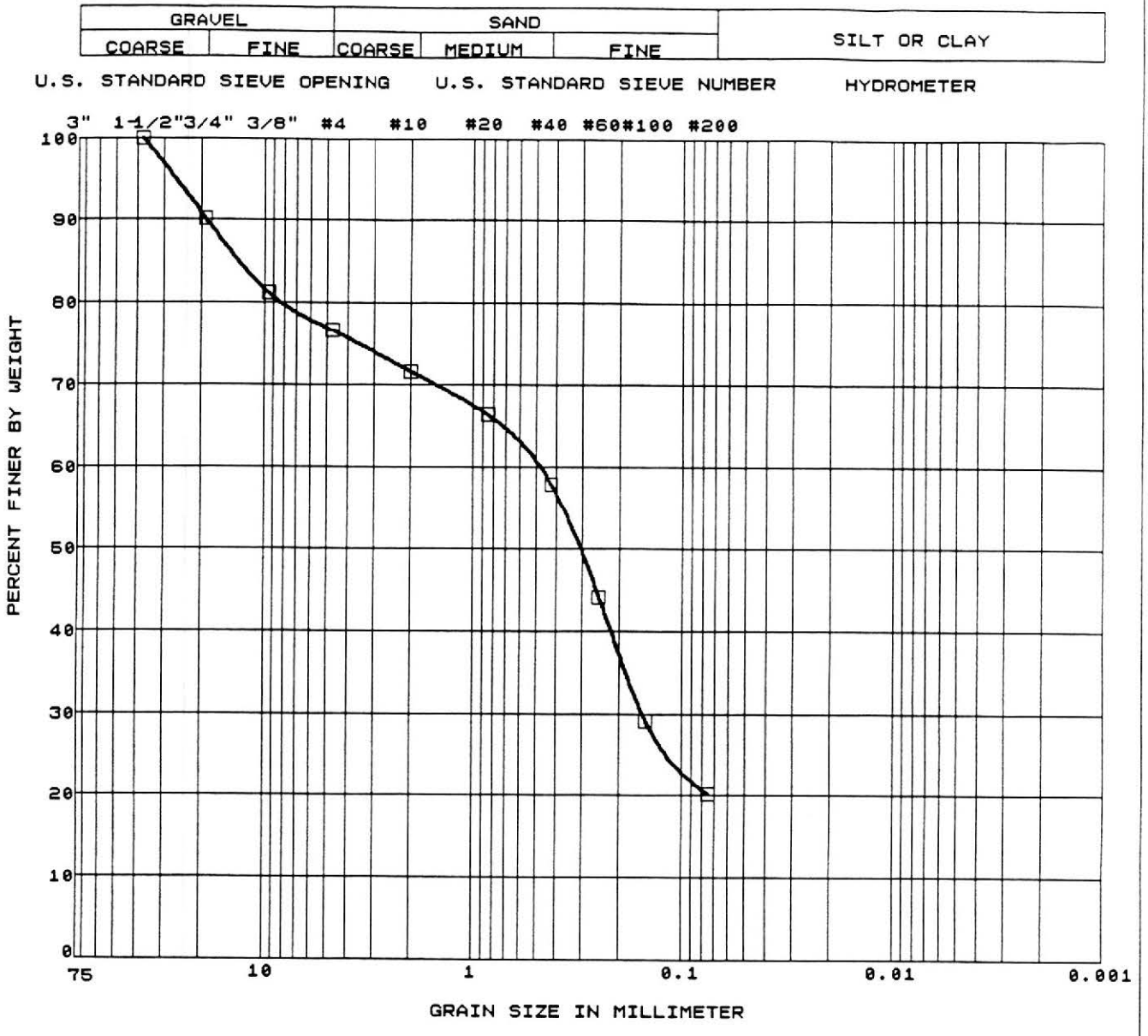
FIGURE B-2



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-2	S-8	40.0	Bag	SC		

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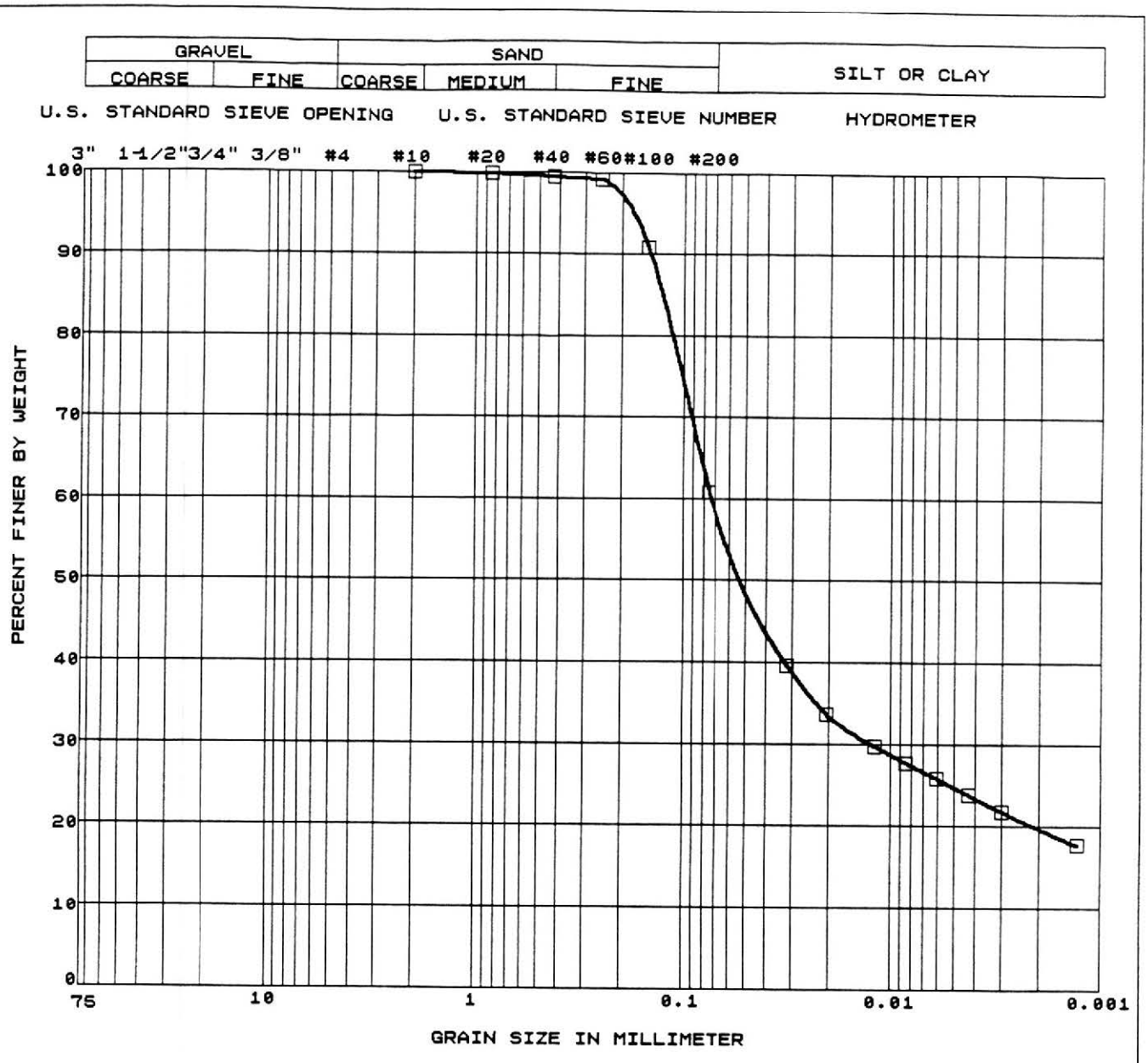
FIGURE B-3



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-2	D-9	45.0	Ring	CL	36	16

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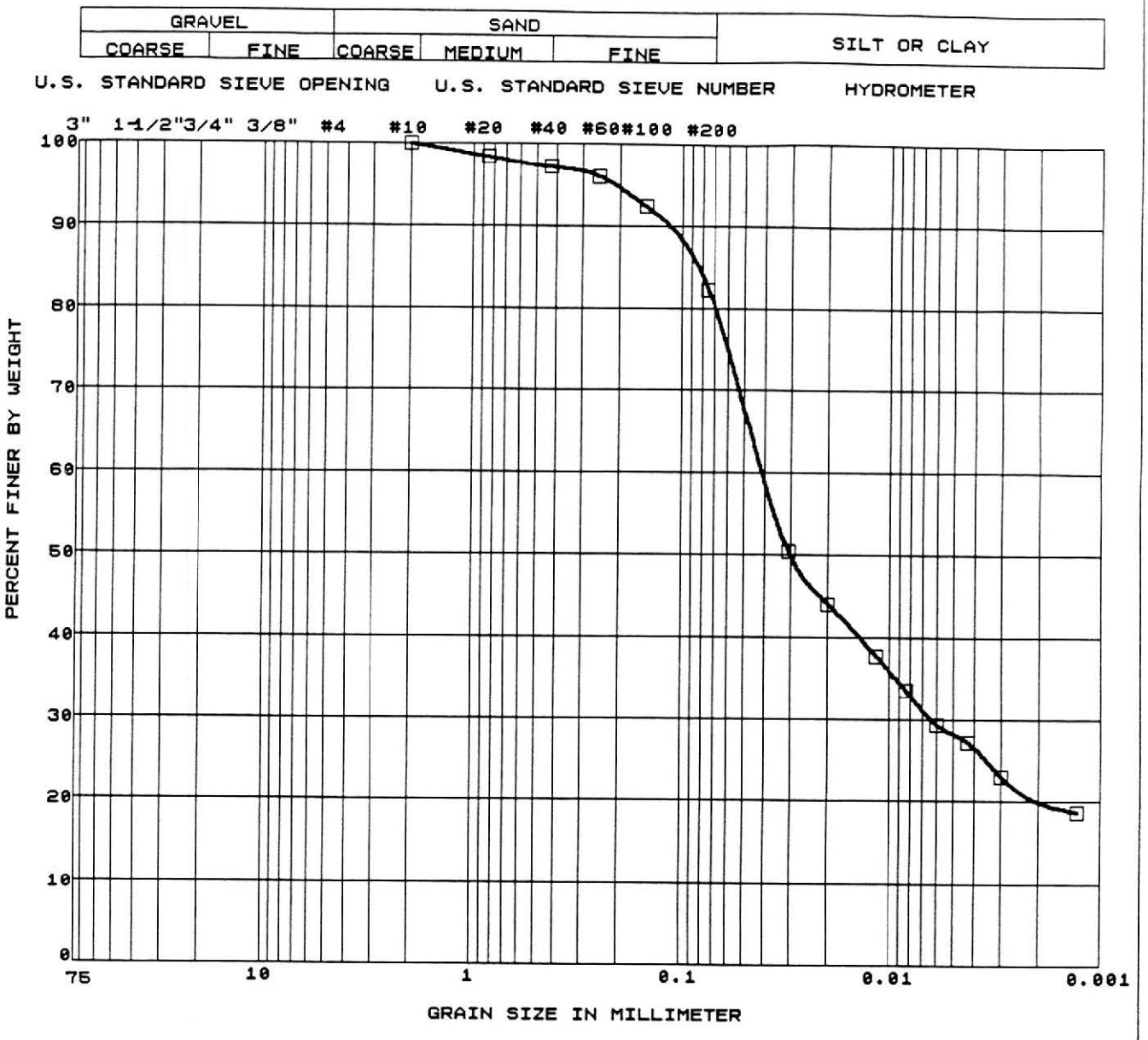
FIGURE B-4



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-3	D-3	15.0	Ring	CH	52	28

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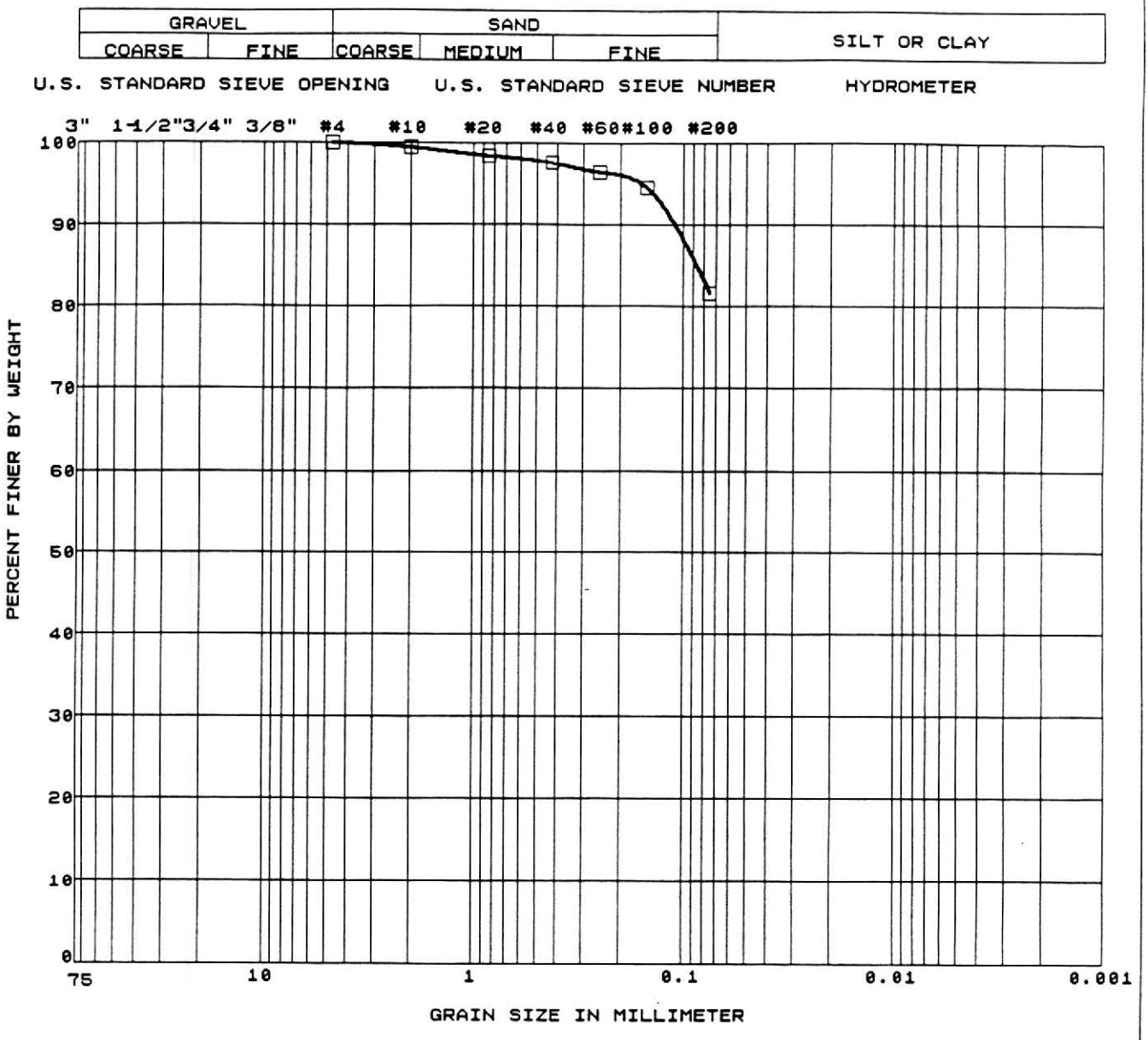
FIGURE 8-5



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-3	D-5	25.0	Ring	CL		

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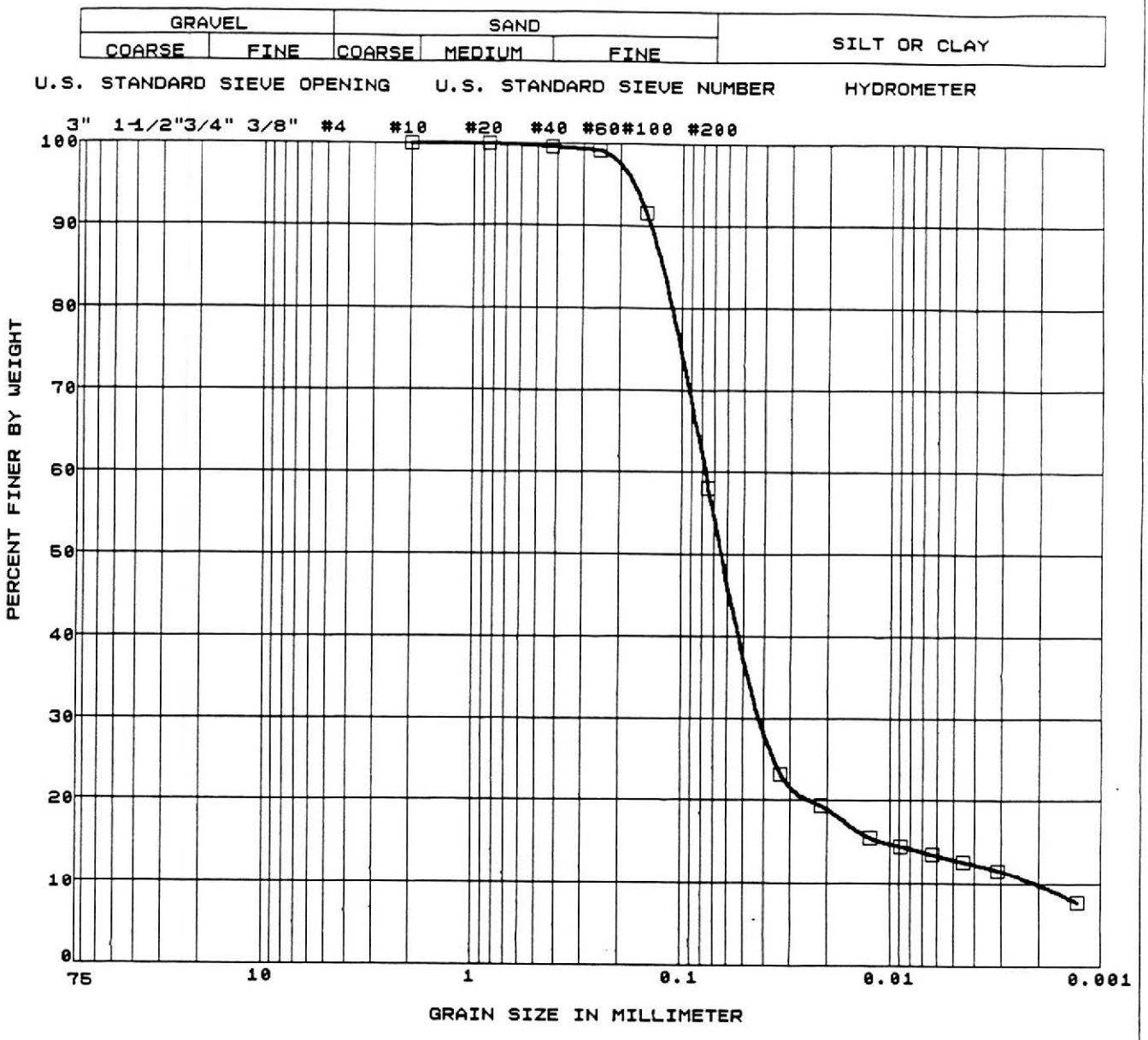
FIGURE 8-6



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-3	D-9	40.0	Ring	CL	28	9

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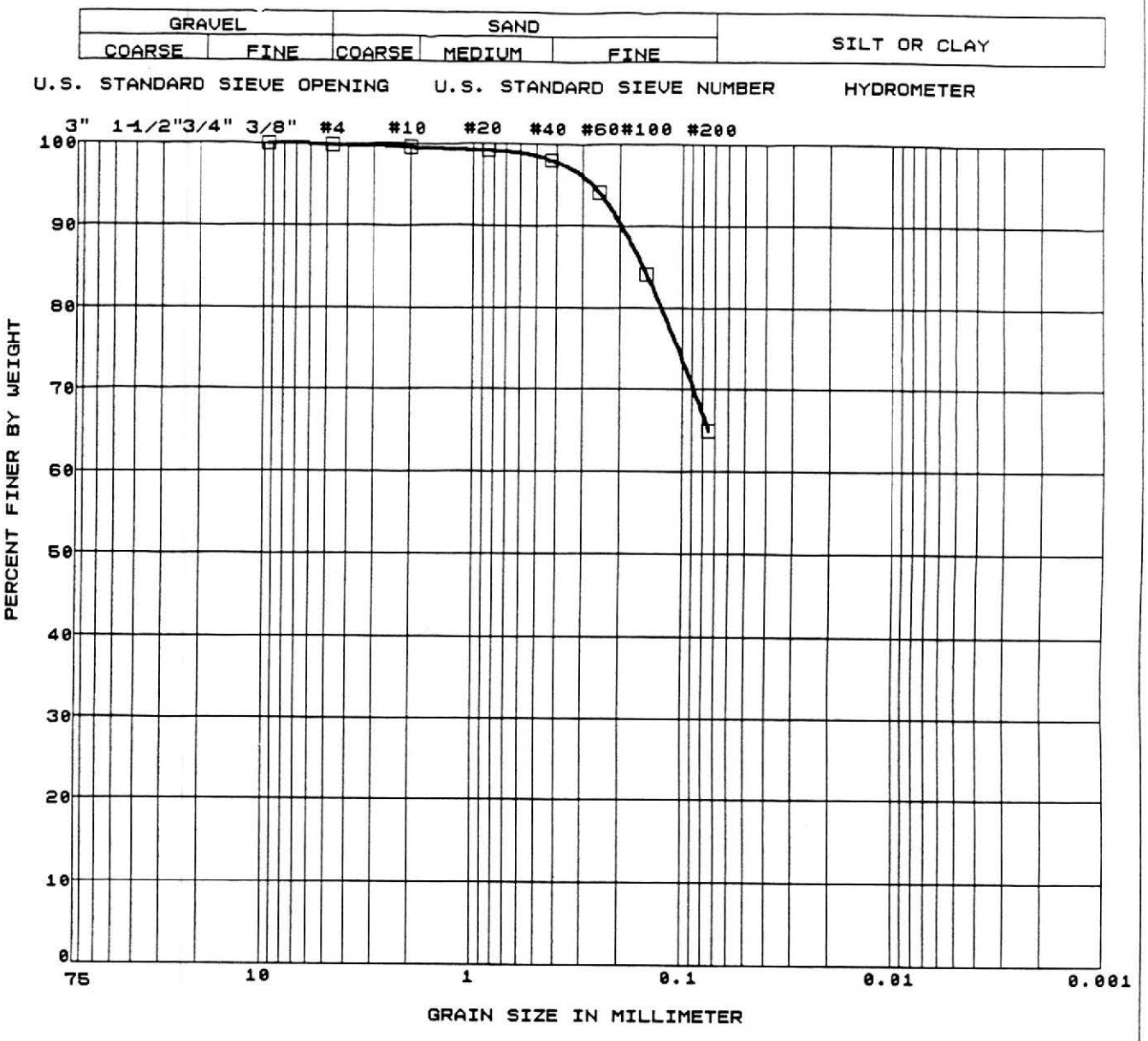
FIGURE B-7



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-4	S-10	46.0	Bag	CL	34	17

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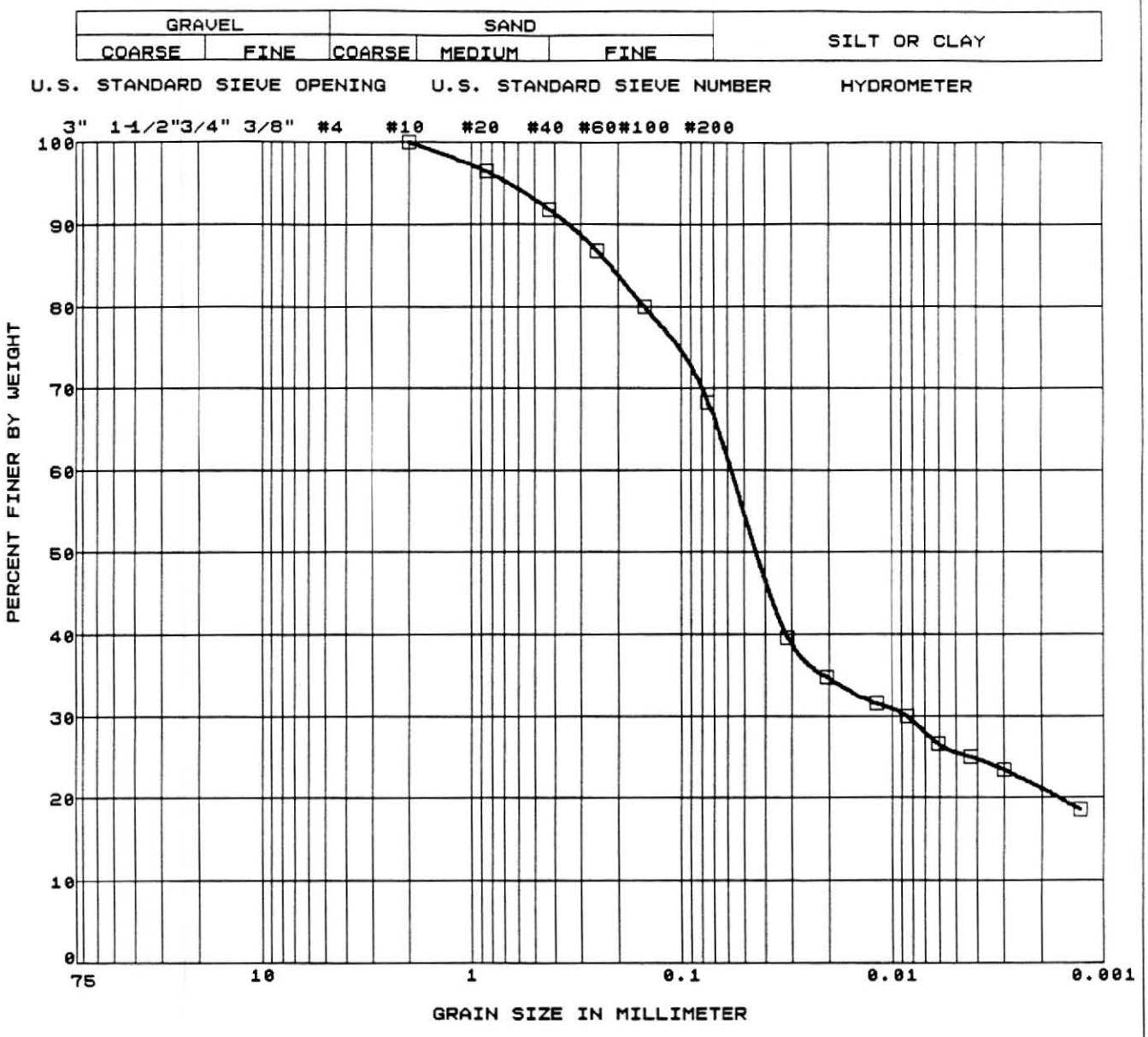
FIGURE B-8



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-5	D-5	25.5-26.5	Ring	CL	38	19

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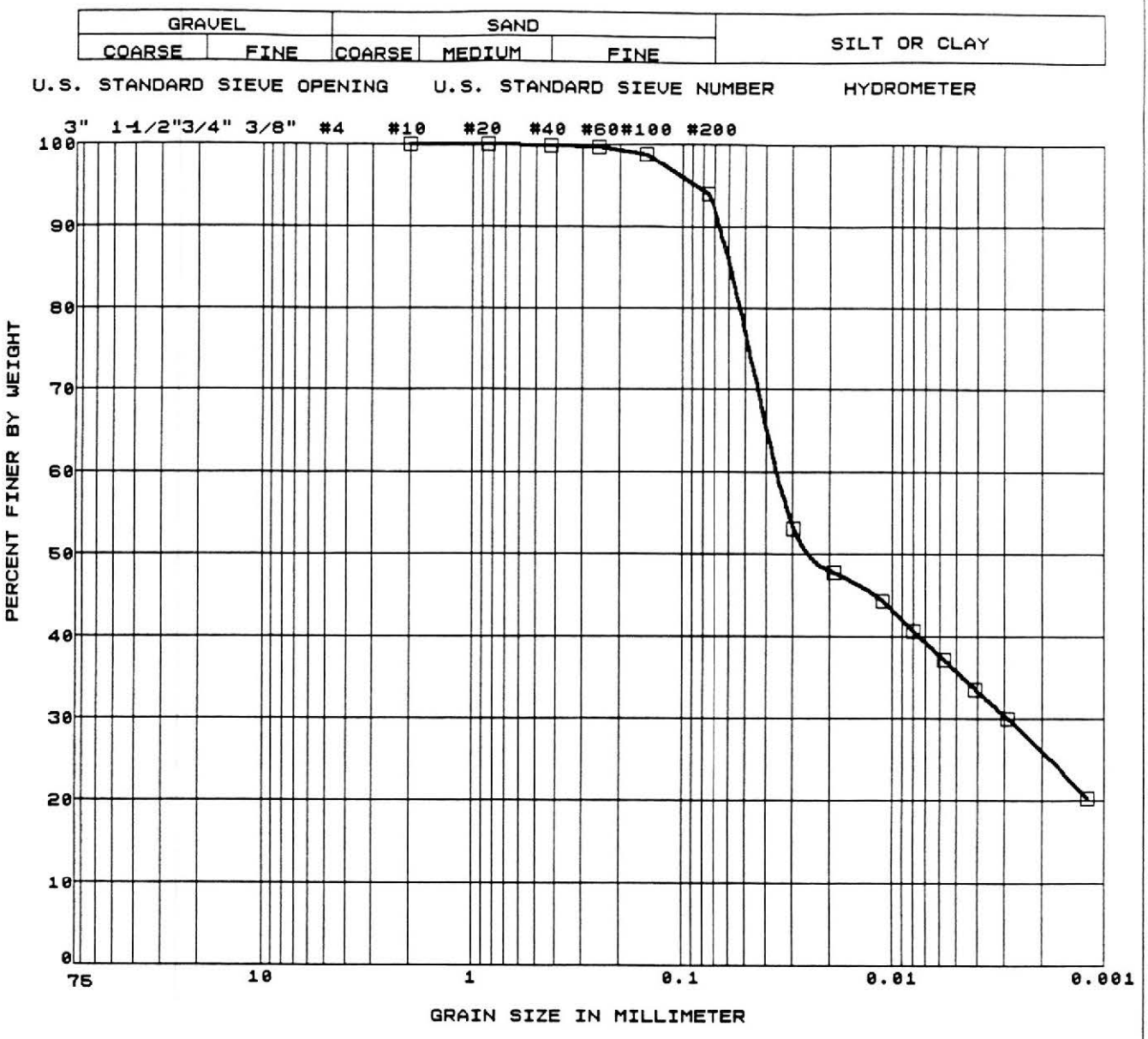
FIGURE B-9



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-5	D-11	51-52	Ring	CH		

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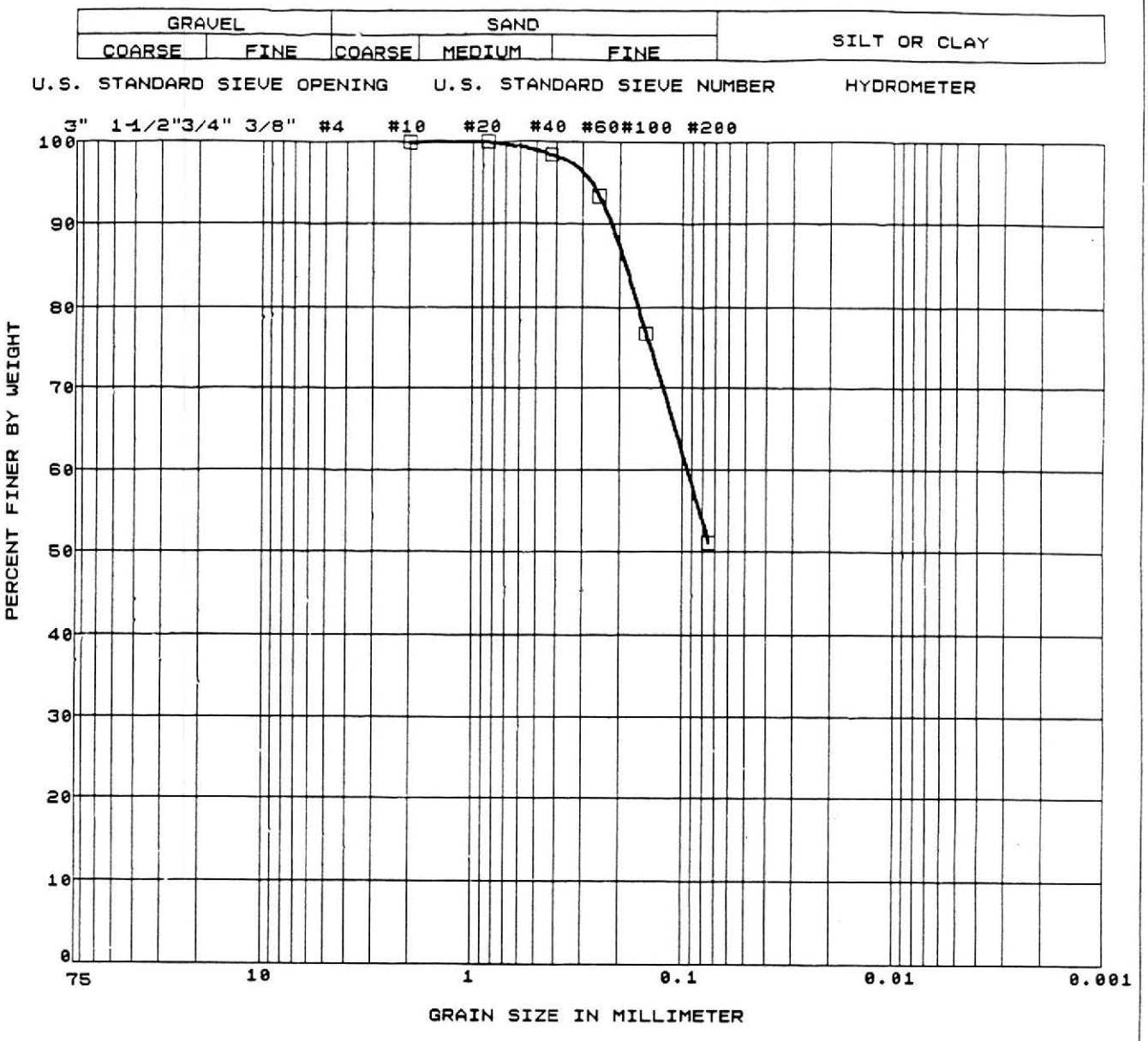
FIGURE B-10



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-6	S-6	28.0	Bag	CL		

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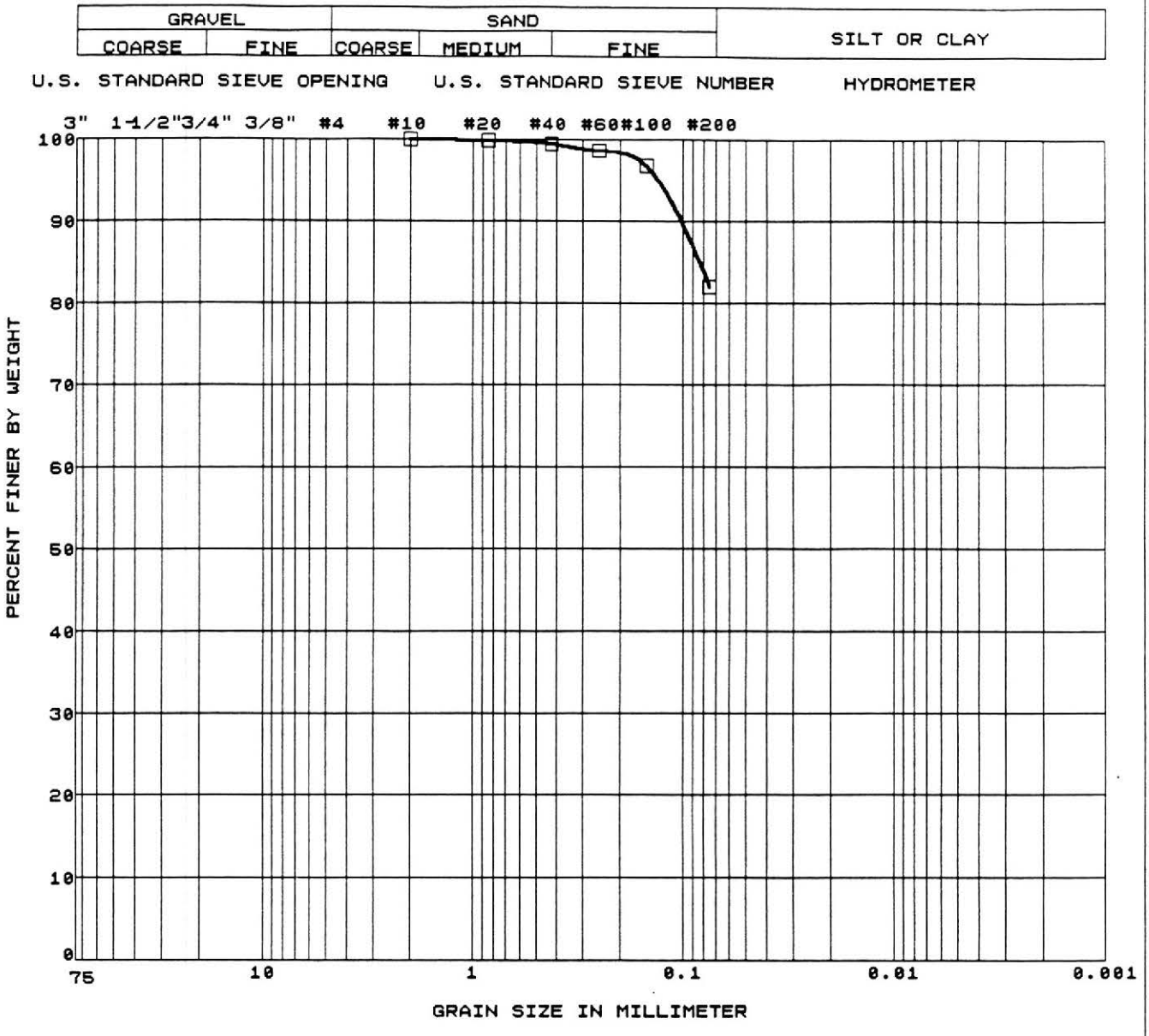
FIGURE B-11



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-7	D-3	15.0	Ring	CL		

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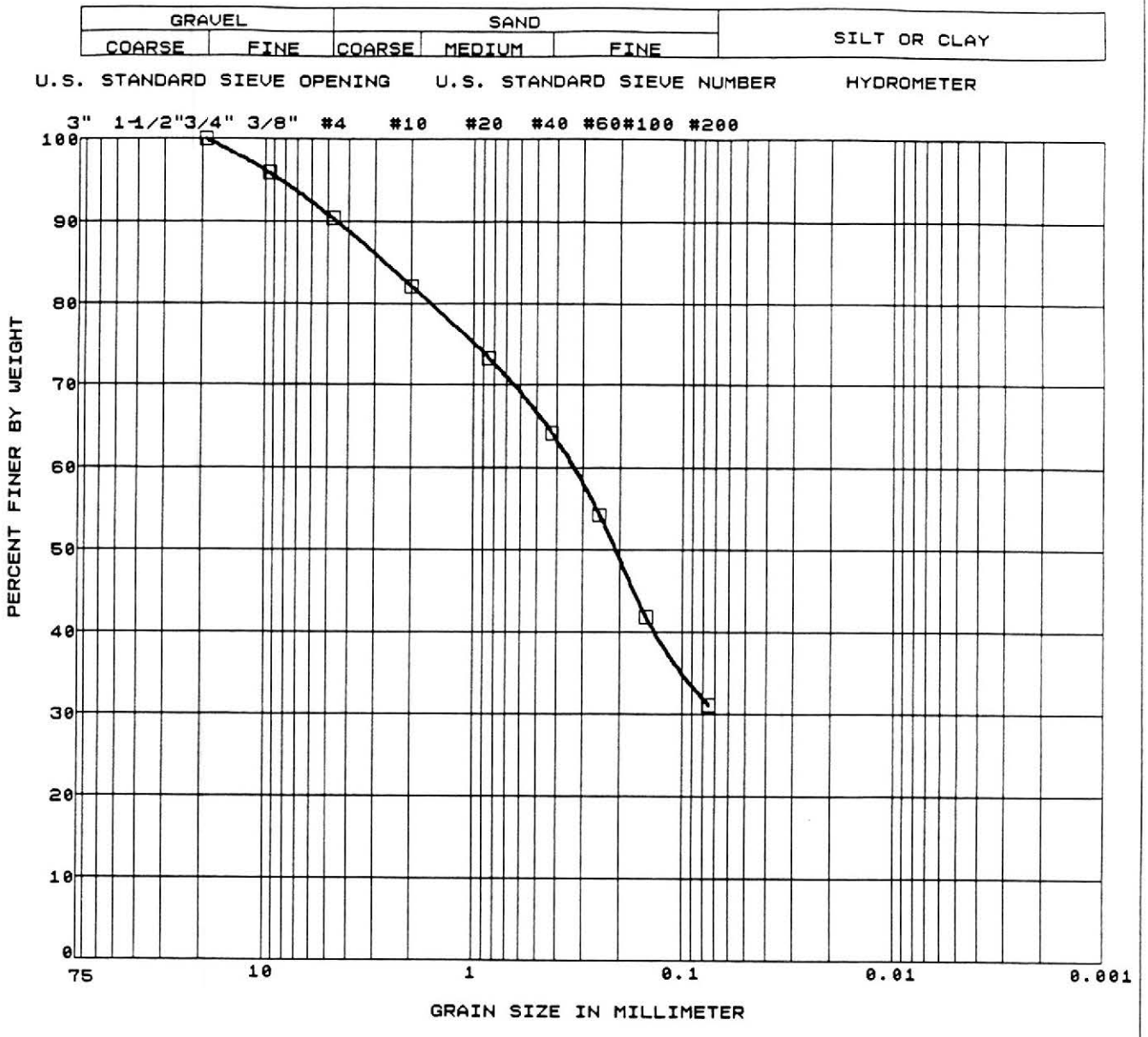
FIGURE B-12



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-7	S-8	40.0	Bag	SC		

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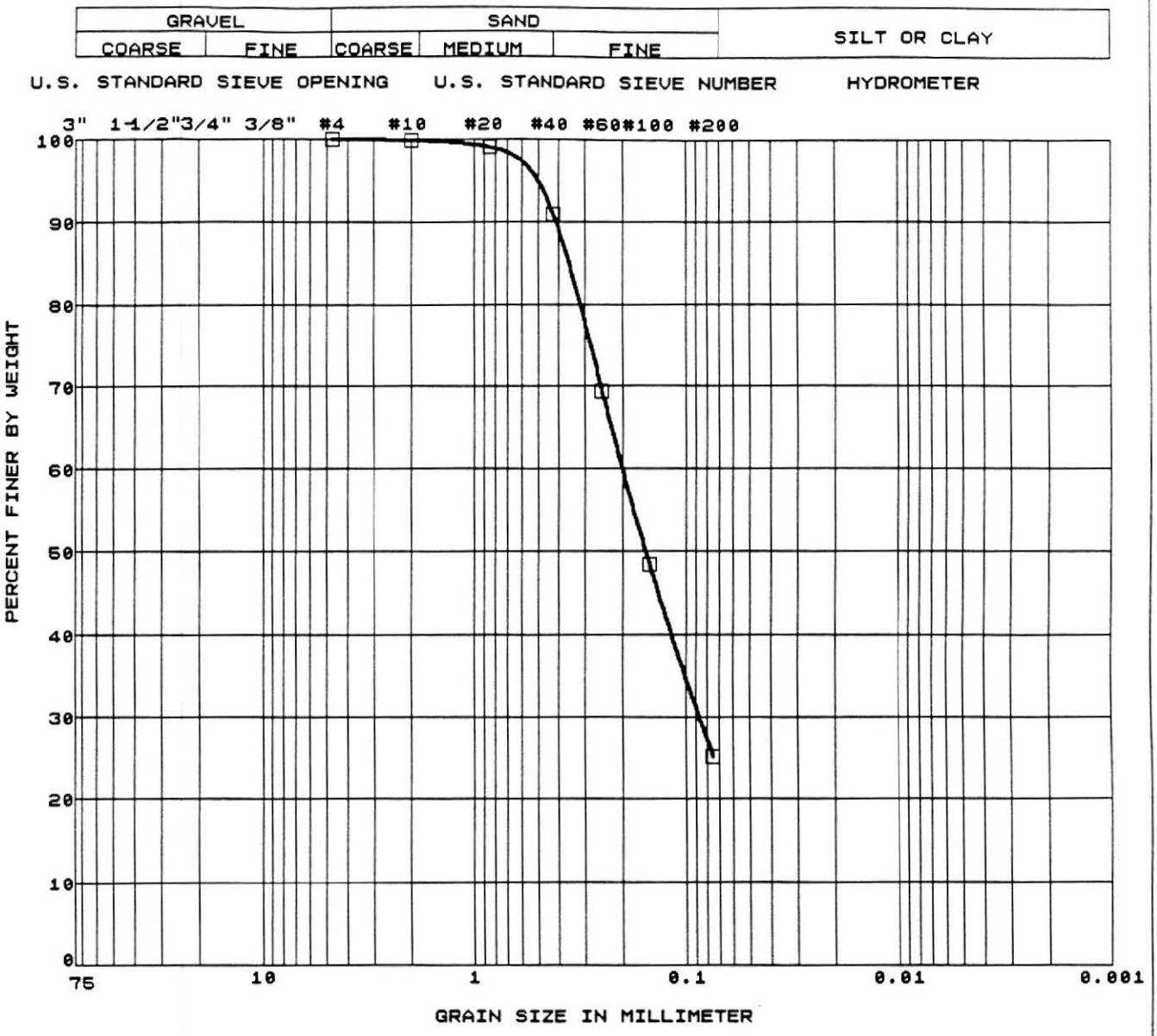
FIGURE B-13



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-8	S-6/S-7	30.0	Bag	SM		

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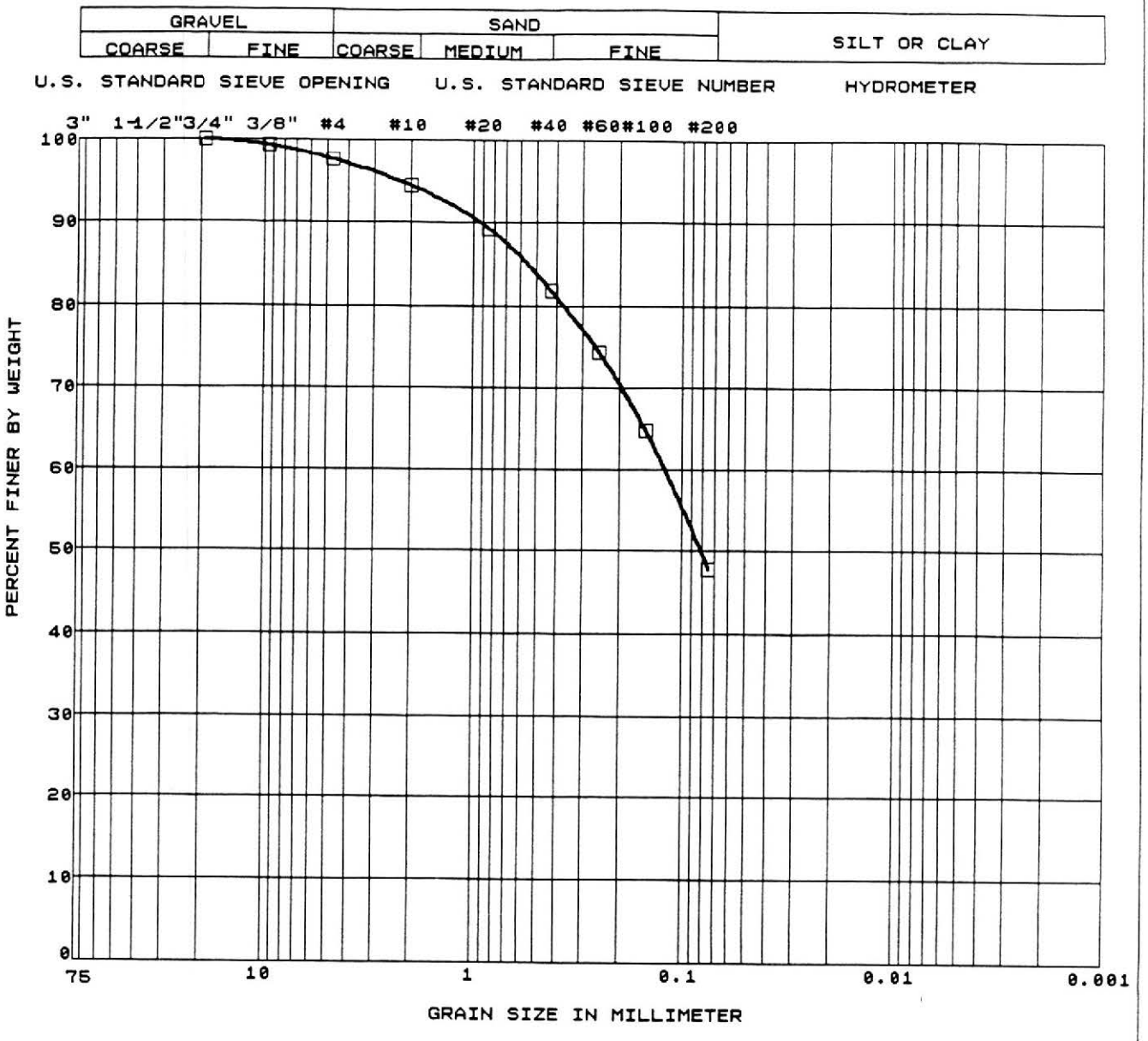
FIGURE 8-14



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-9	S-6	30.0	Bag	SC		

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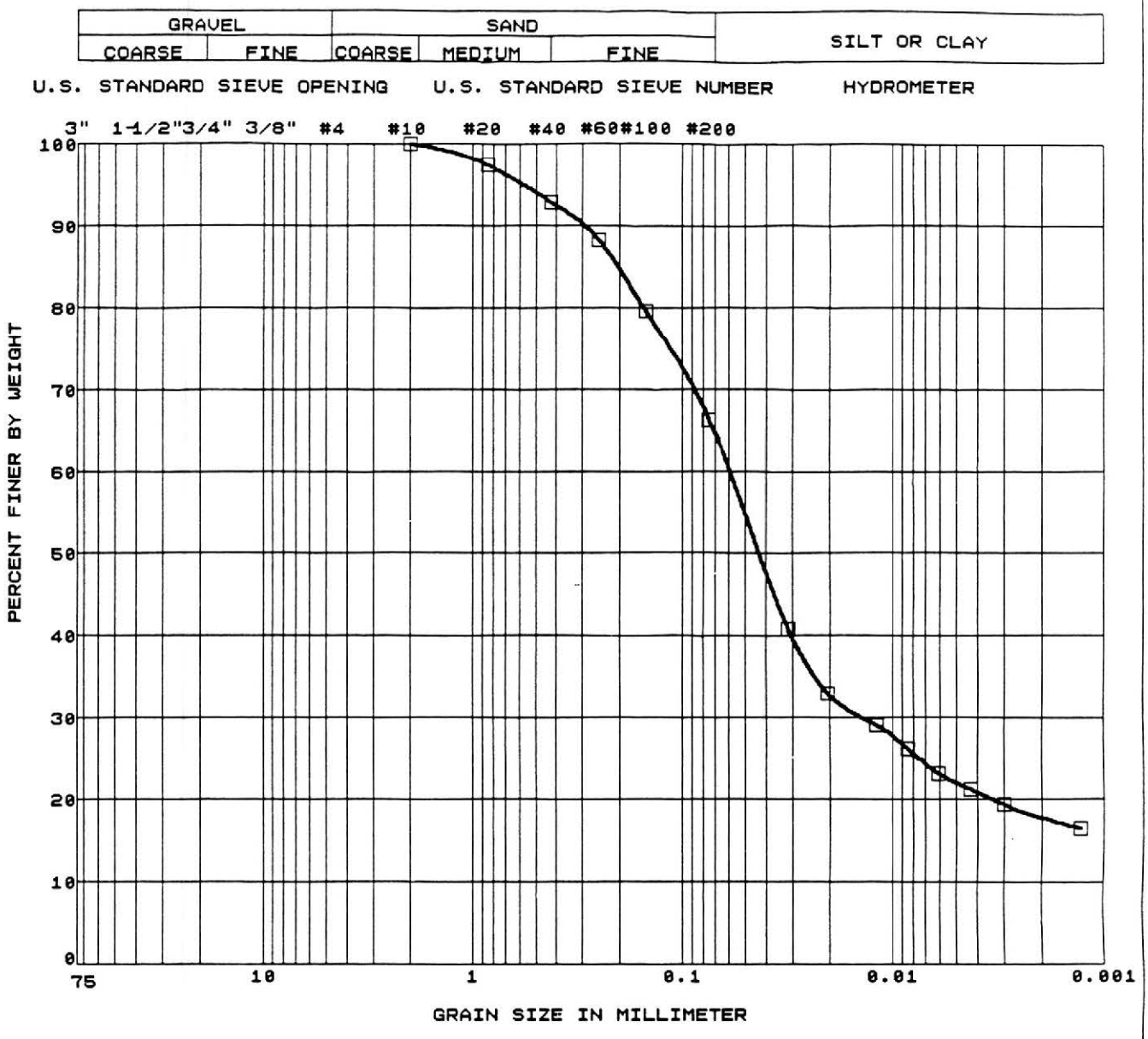
FIGURE B-15



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-10	D-5	25.0	Ring	CL	31	16

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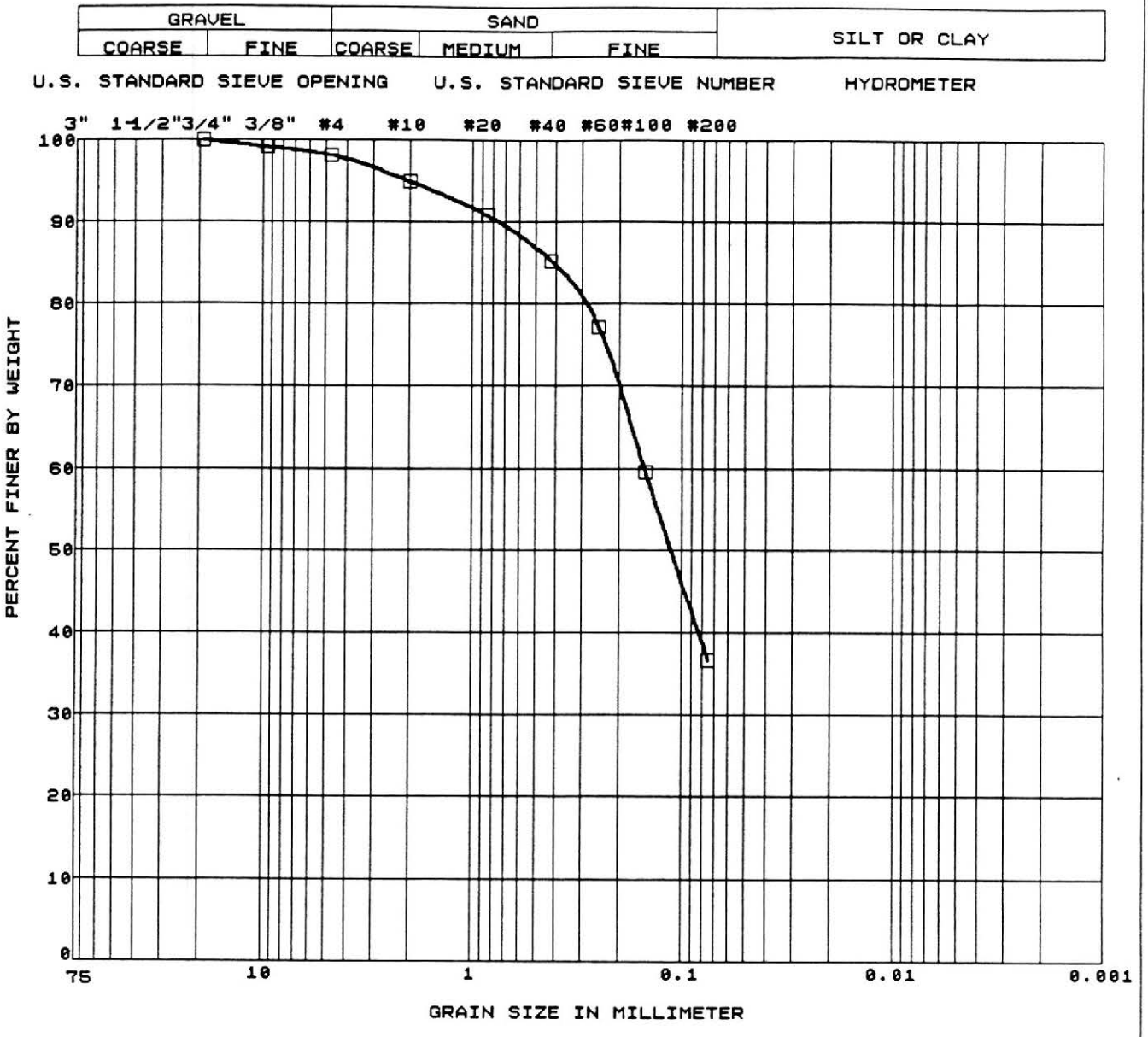
FIGURE B-16



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-10	D-9	45.0	Ring	SM		

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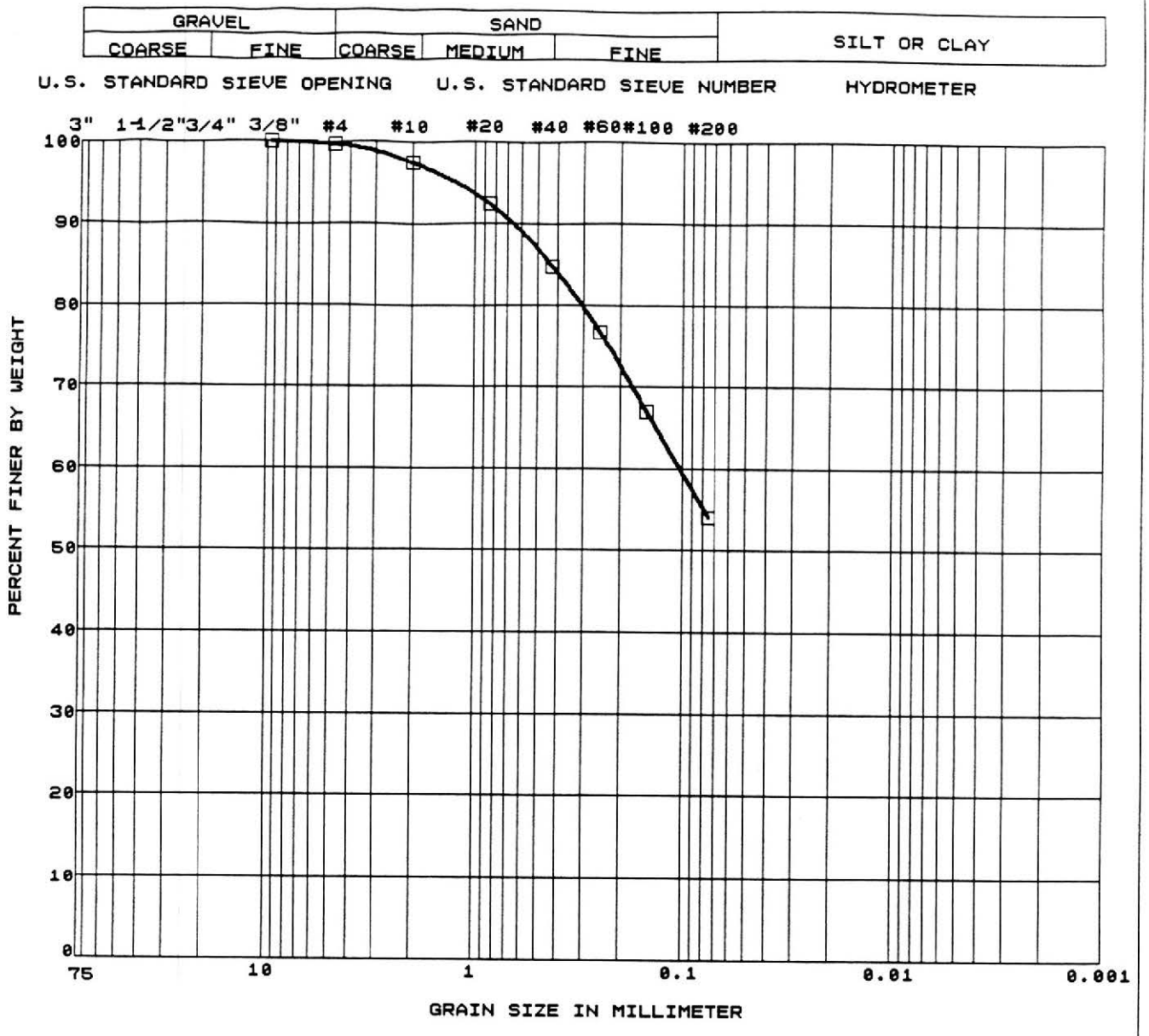
FIGURE B-17



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-11	D-5	25-26	Ring	CL	28	13

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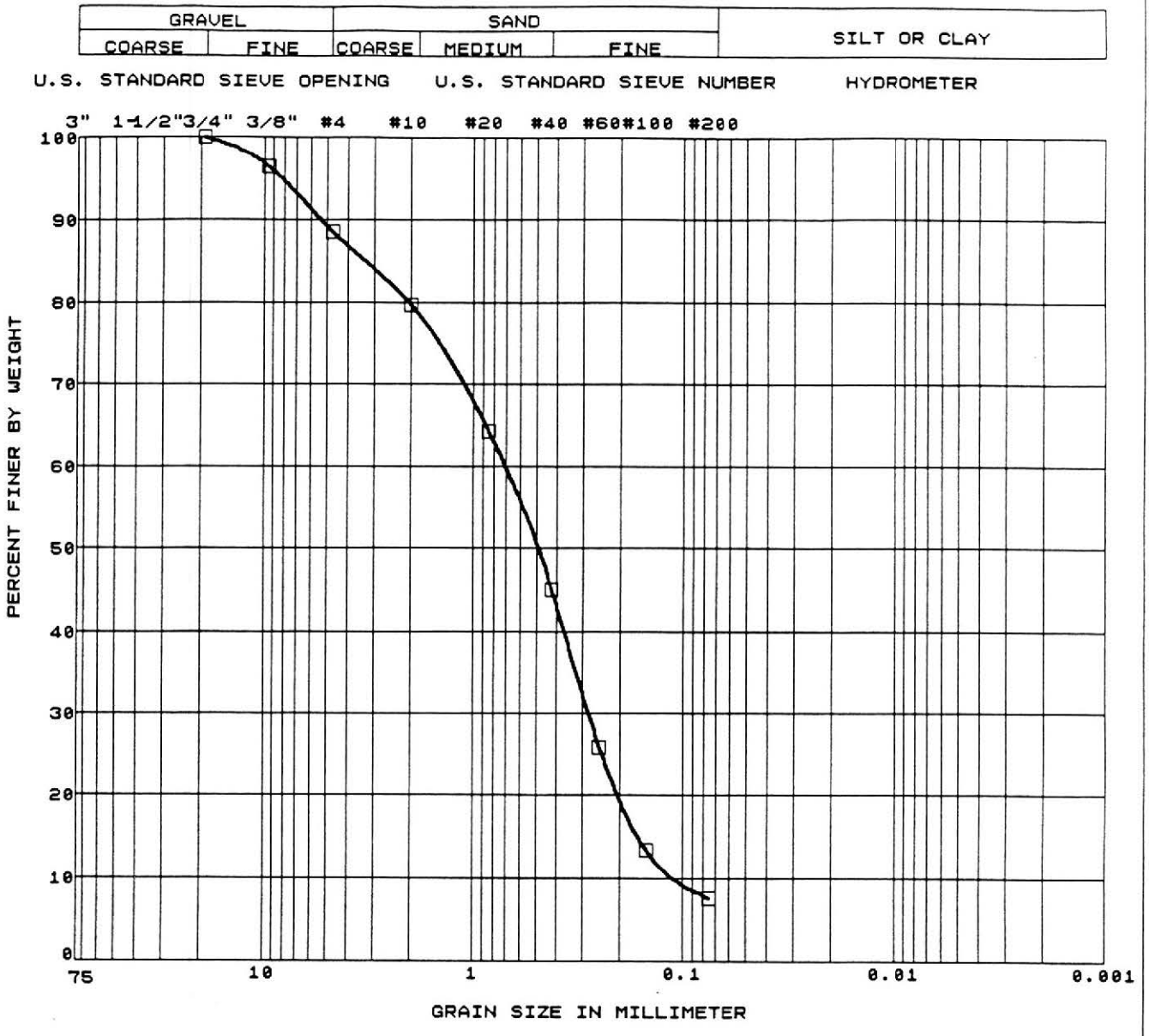
FIGURE B-18



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-11	S-10	50.0	Bag	SP-SM		

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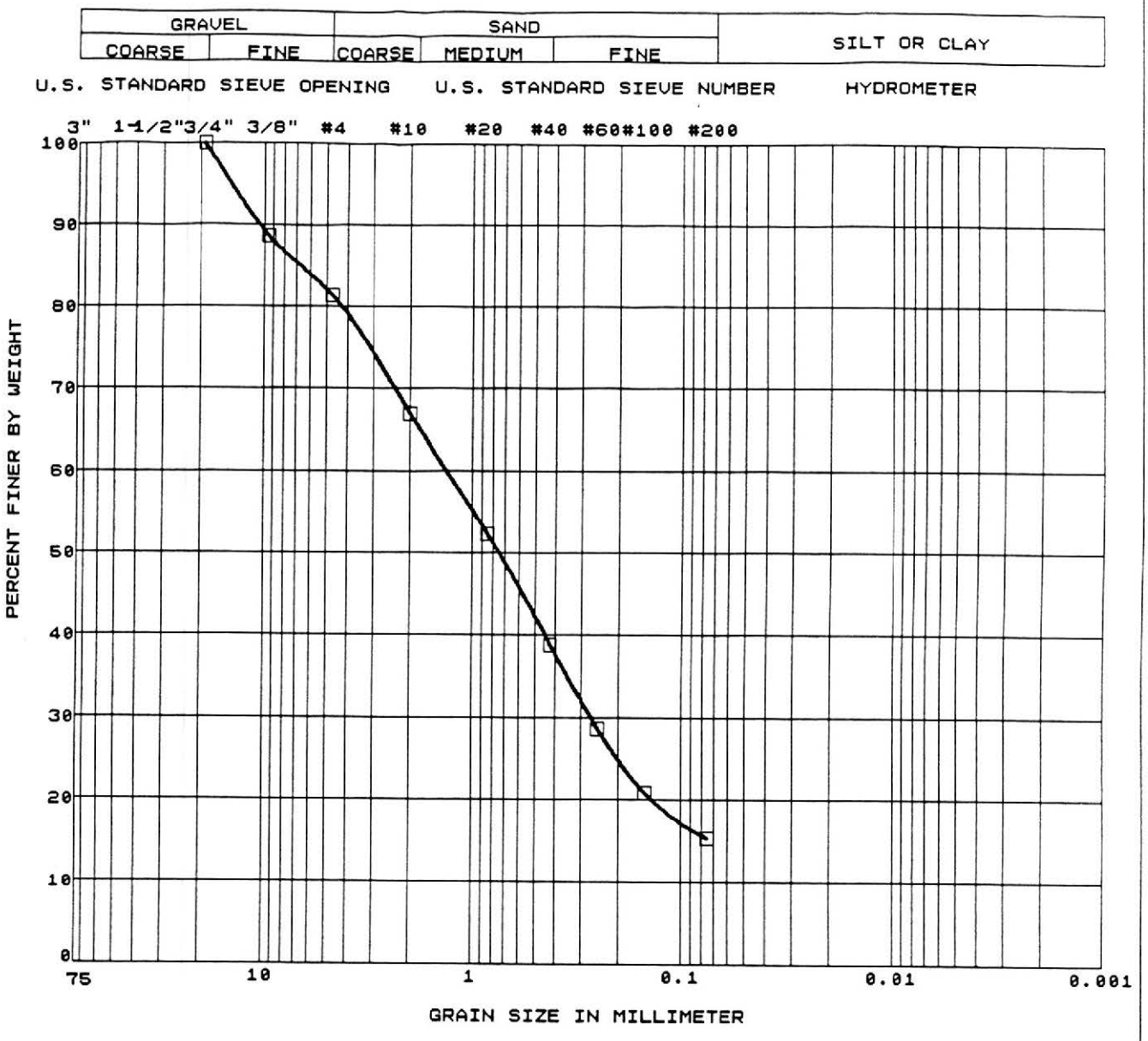
FIGURE B-19



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-12	S-6	28.2	Bag	CL		

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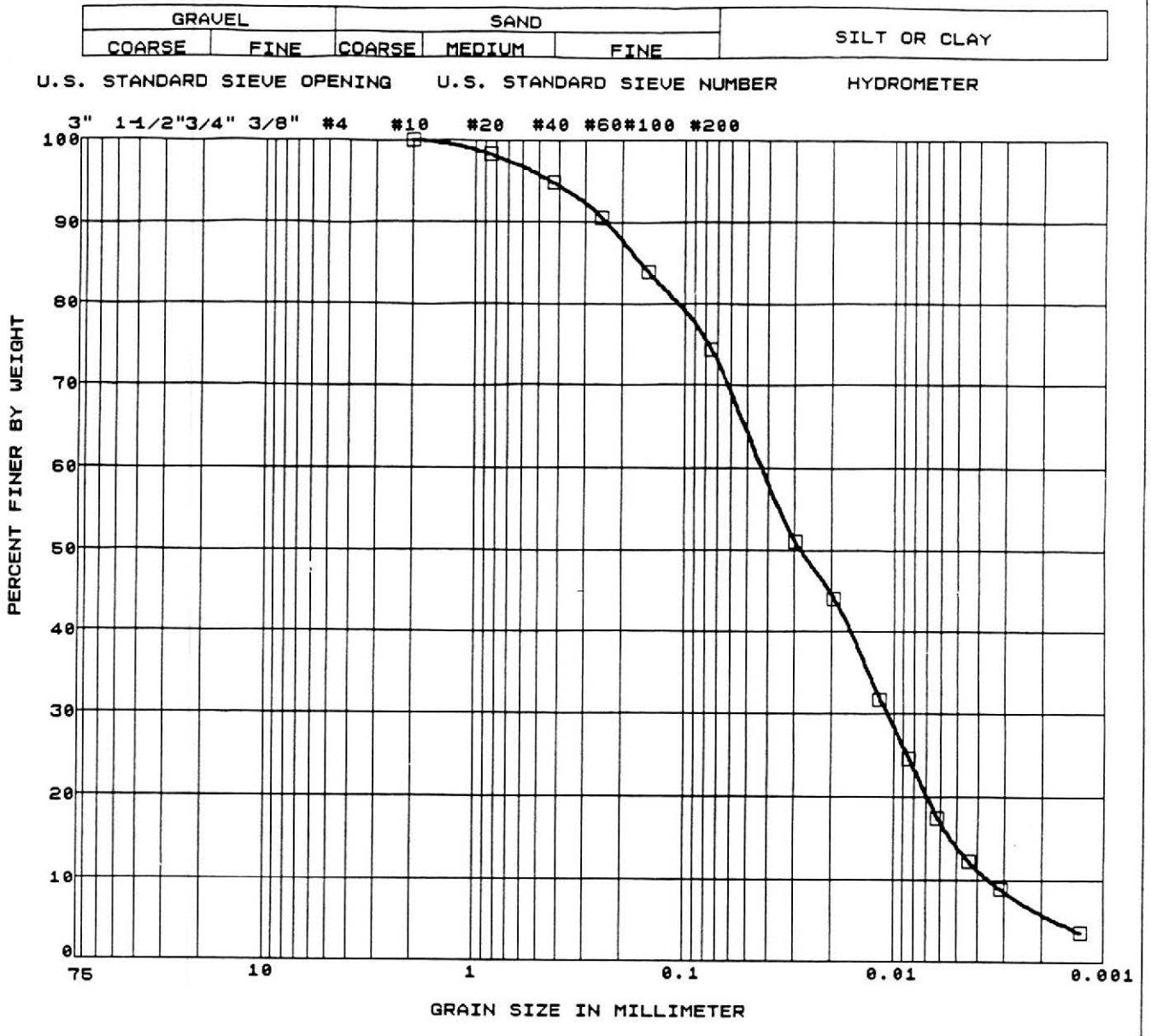
FIGURE B-20



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-12	S-8	38.0	Bag	ML		

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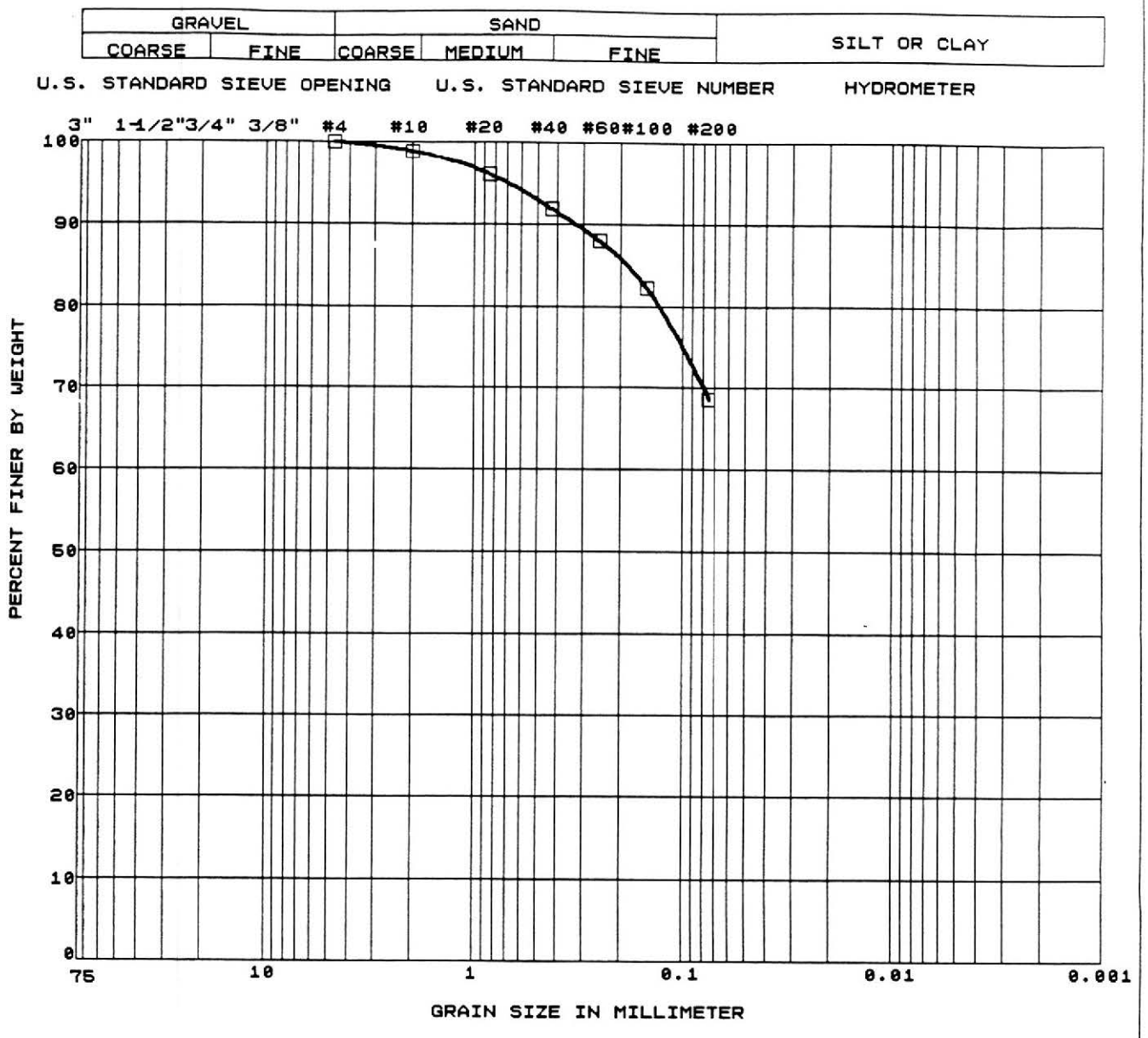
FIGURE B-21



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-12	D-11	50-51	Ring	ML	30	7

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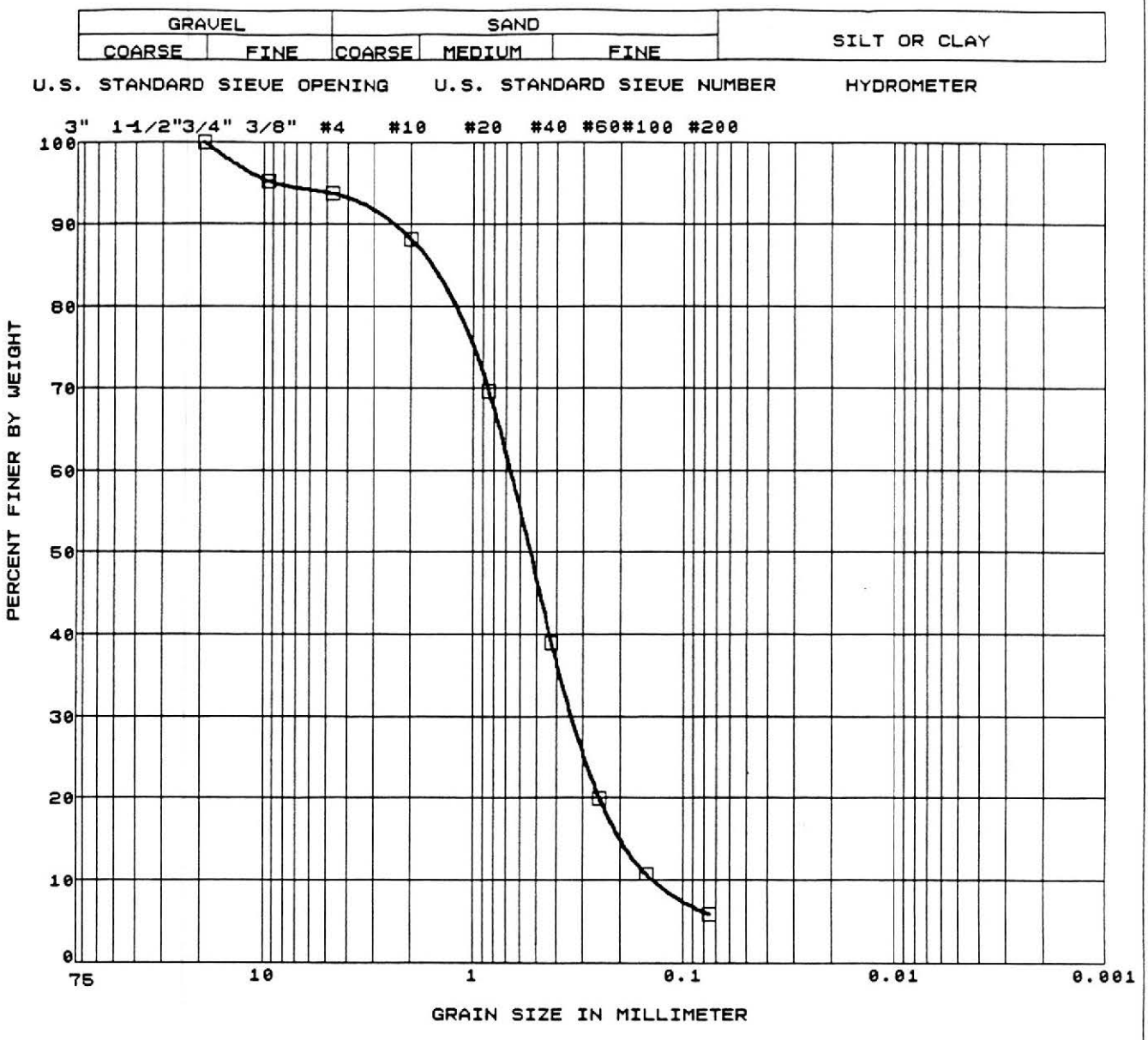
FIGURE B-22



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-13	S-2	10.0	Bag	SP-SM		

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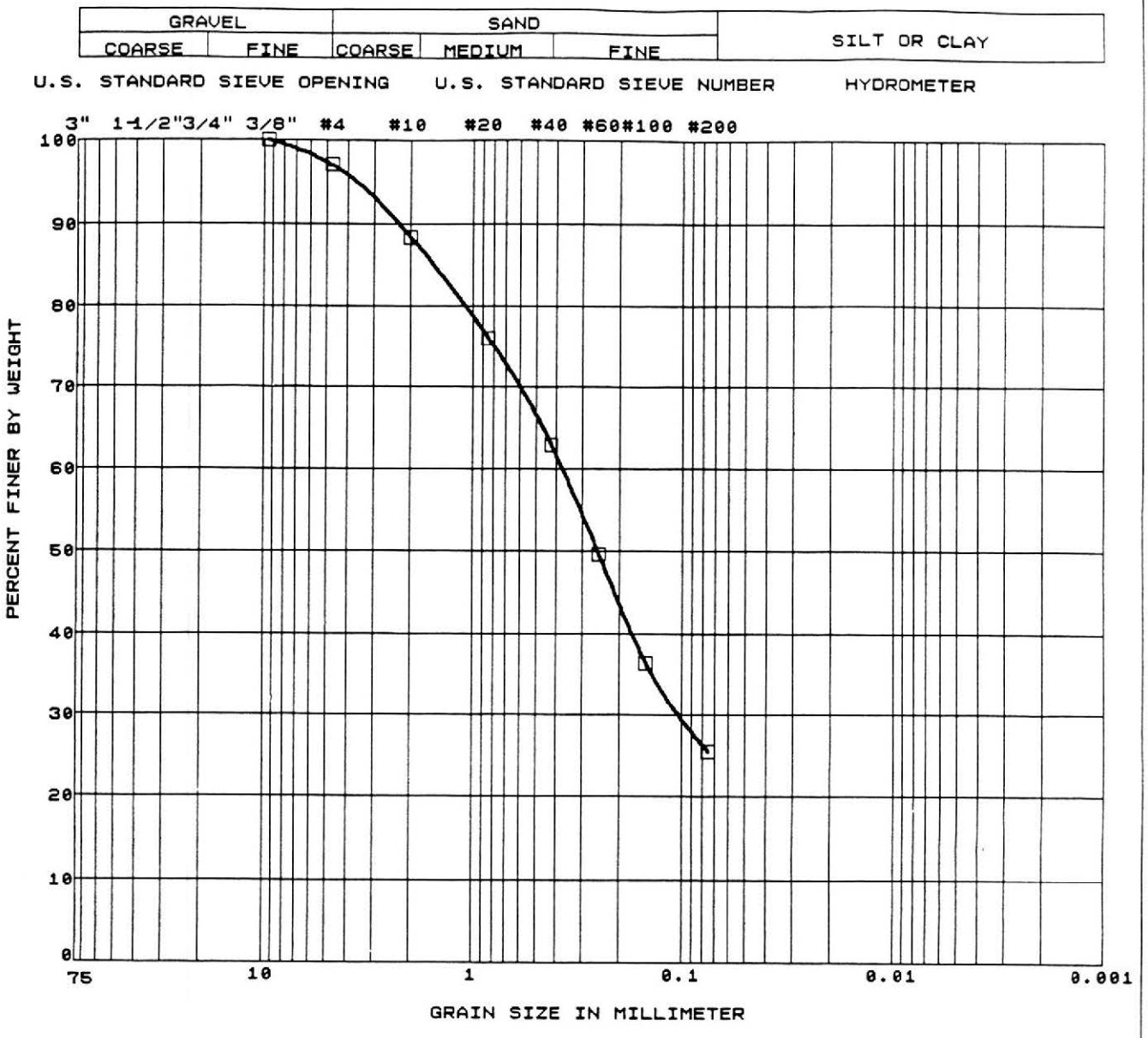
FIGURE B-25



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-13	D-5	25.3-26.3	Ring	SM		

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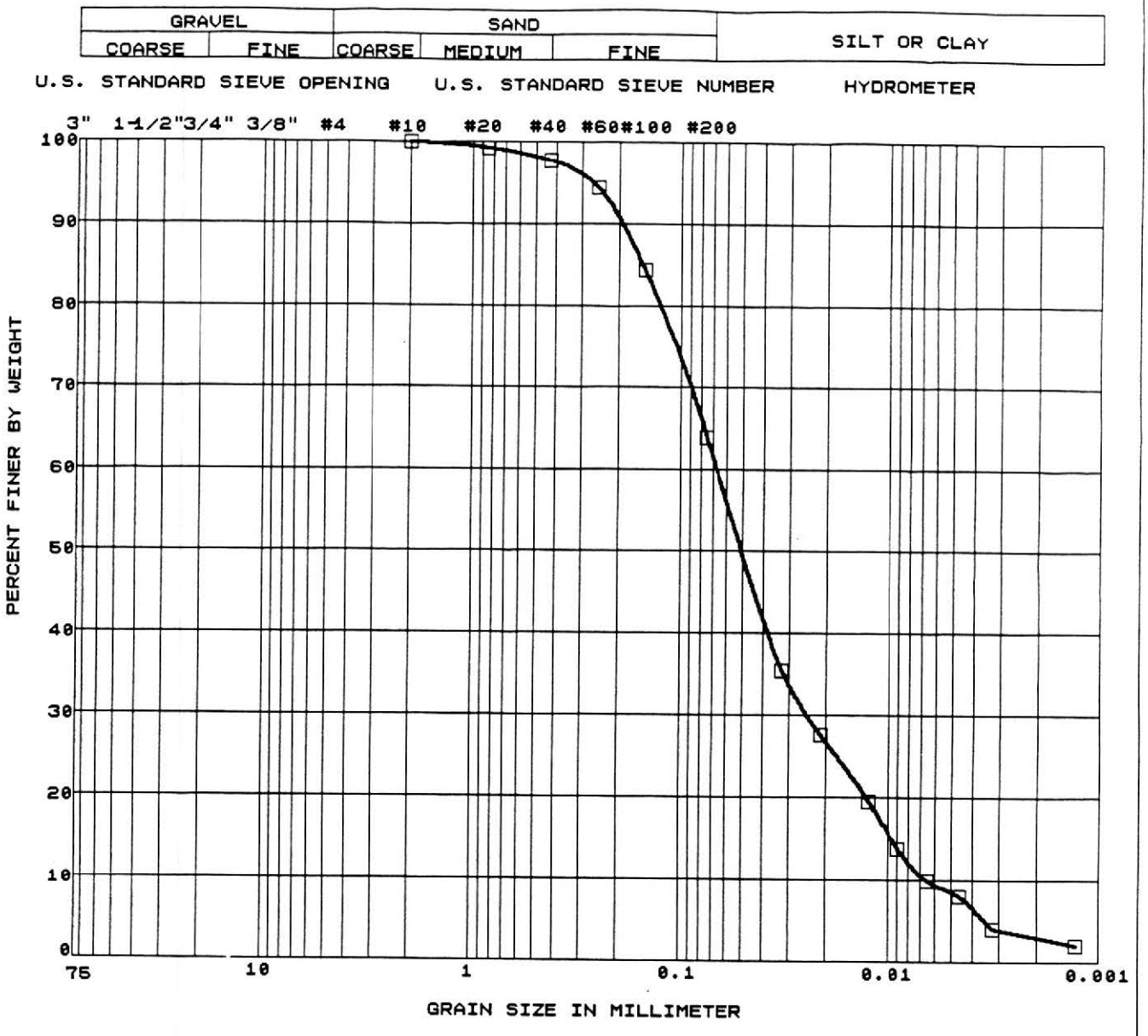
FIGURE B-24



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-13	S-8	39.0	Bag	ML		

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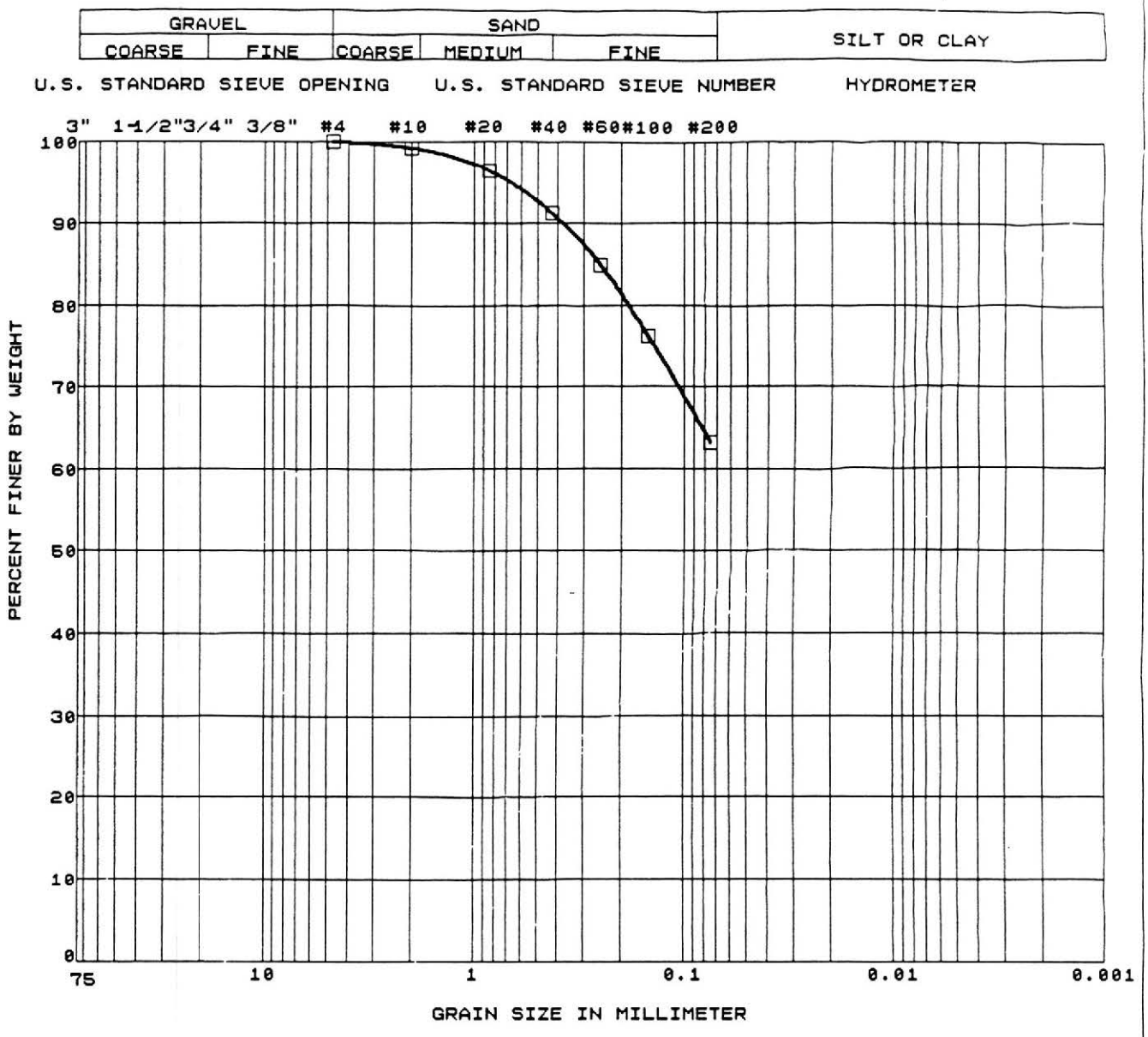
FIGURE B-25



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTICITY INDEX
□	LPE-13	D-9	42-43	Ring	CL		

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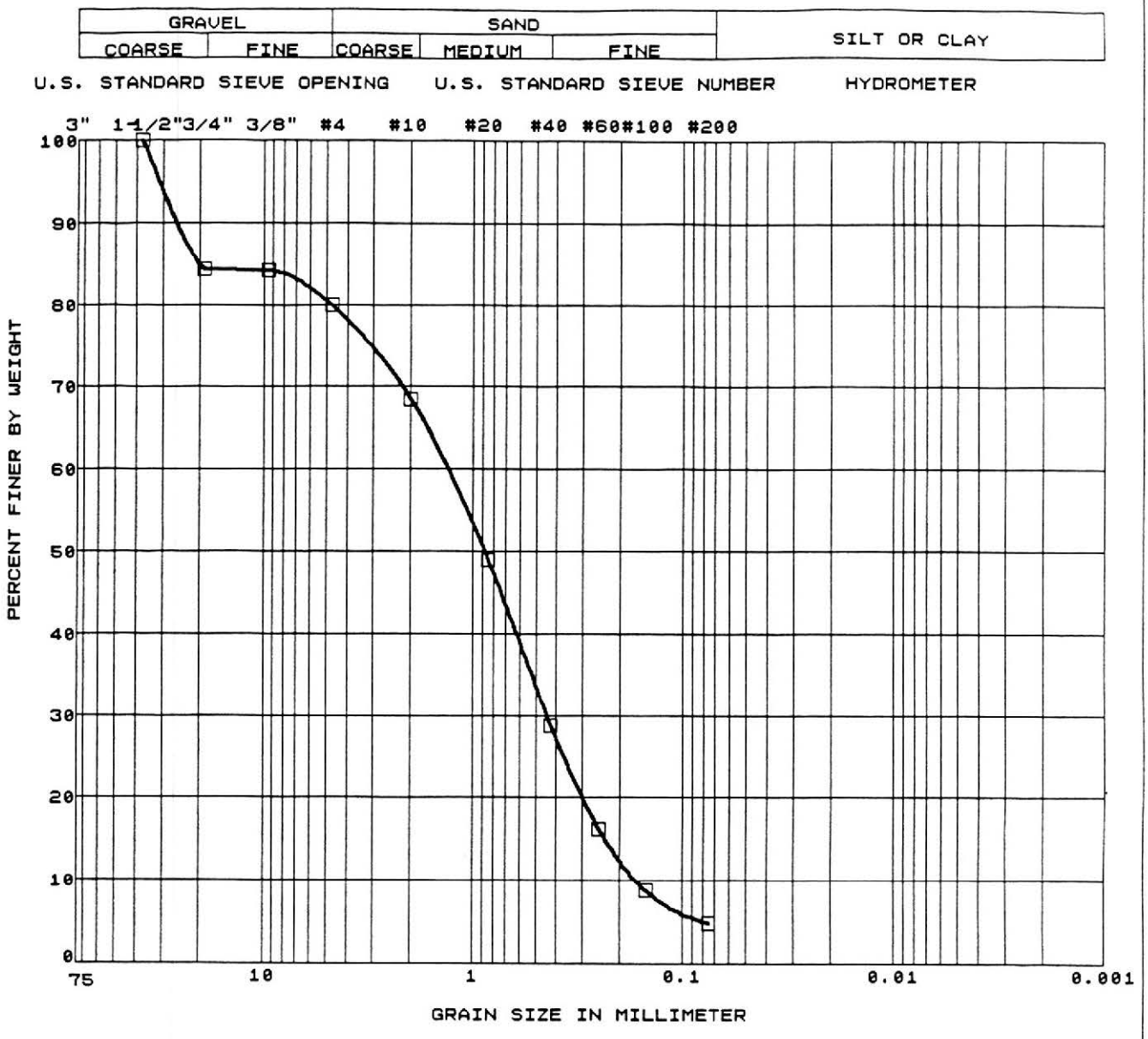
FIGURE B-26



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-14	D-5	25-26	Ring	SP		

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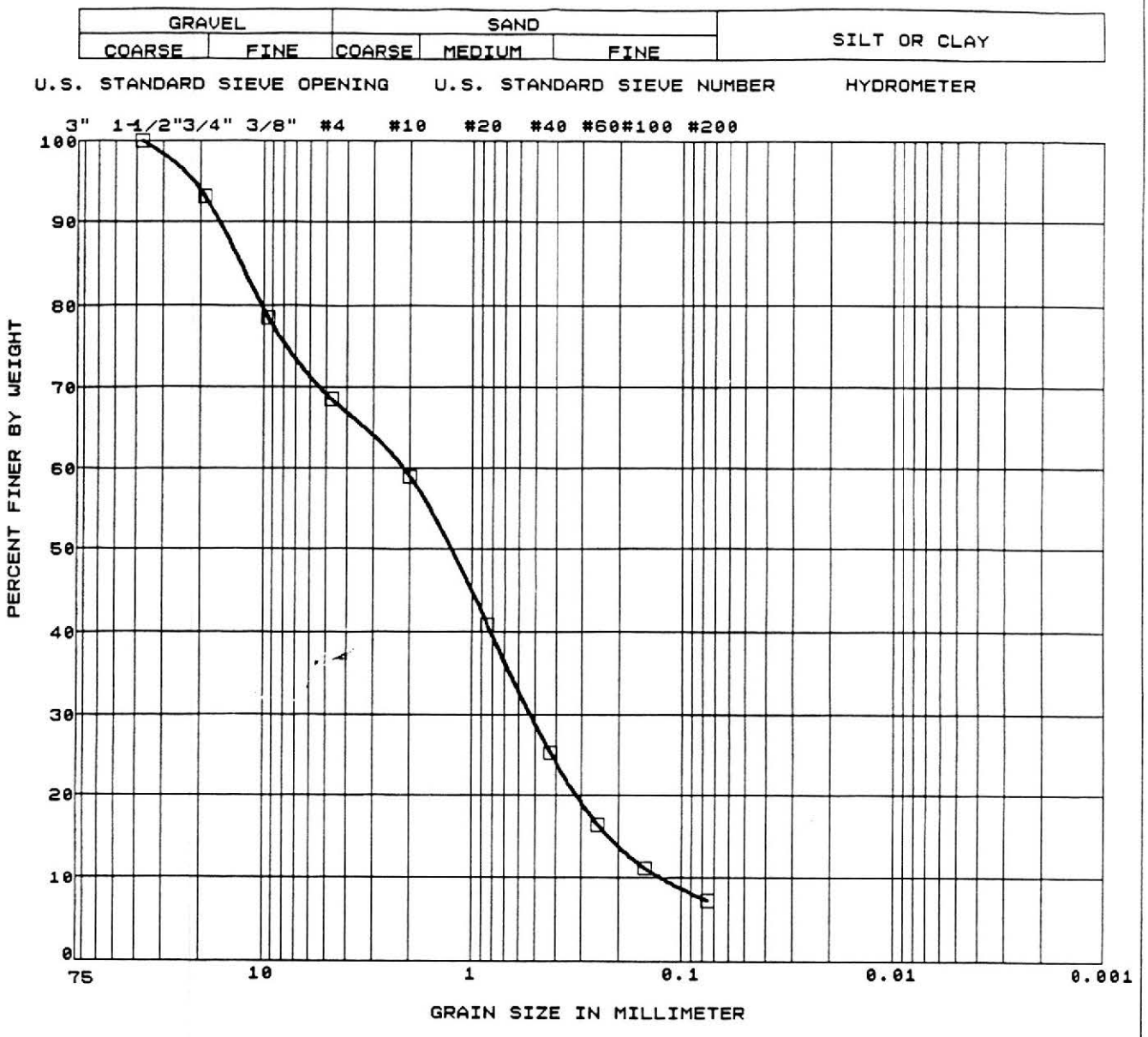
FIGURE B-27



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	LIQUID LIMIT	PLASTI-CITY INDEX
□	LPE-14	S-10	50.0	Bag	SP-SM		

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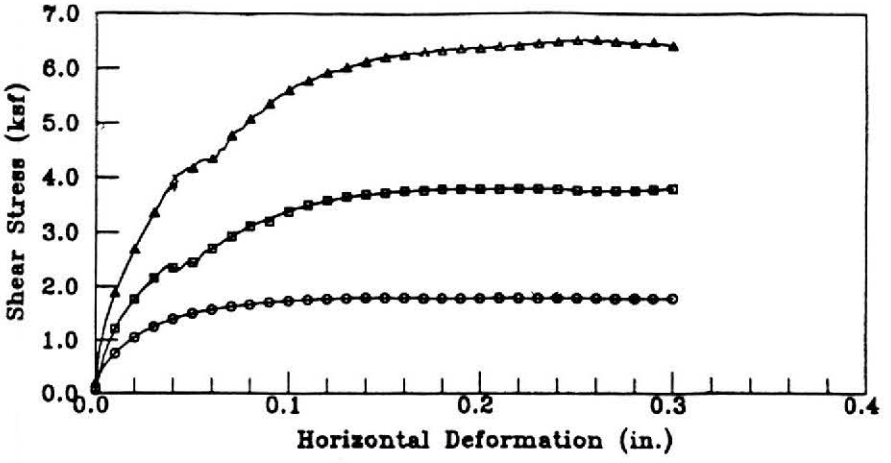
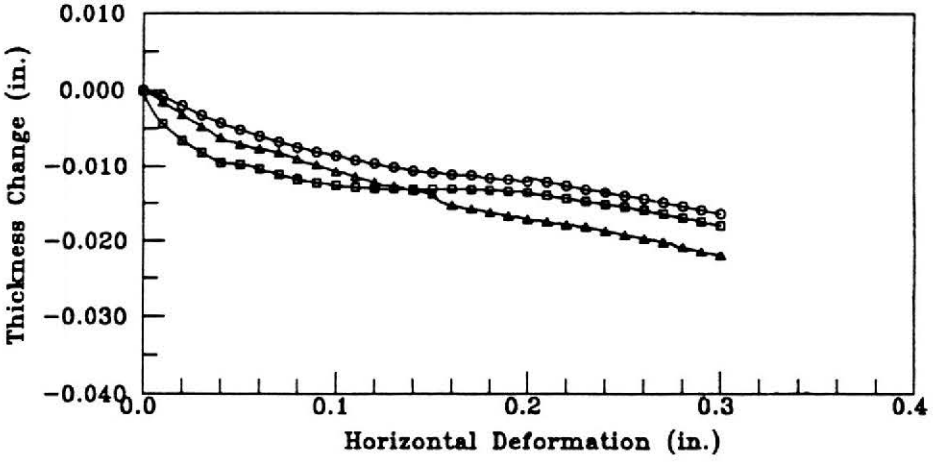
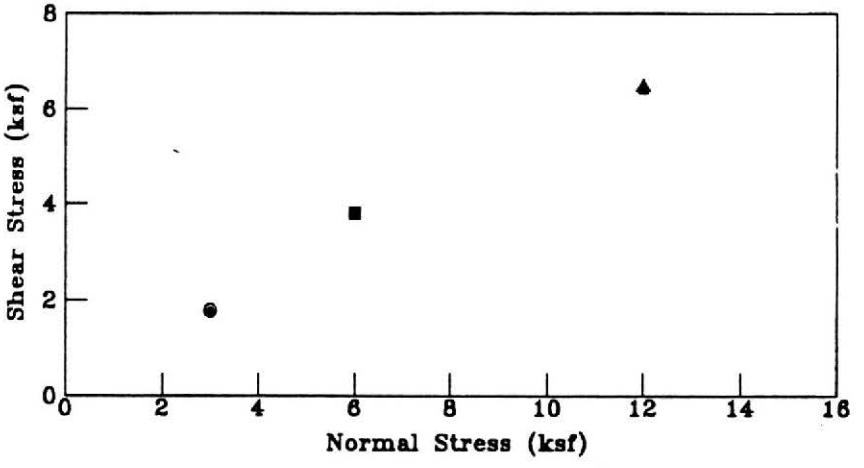
FIGURE B-28







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
○○○○○	3.000	1.793	1.764
□□□□□	6.000	3.803	3.791
△△△△△	12.000	6.512	6.409

Boring No.: LPE-1
Sample No.: D−3
Depth (ft.): 15.0
Sample Type: Undisturbed
Soil Type: Brown Sandy Clay (CL)

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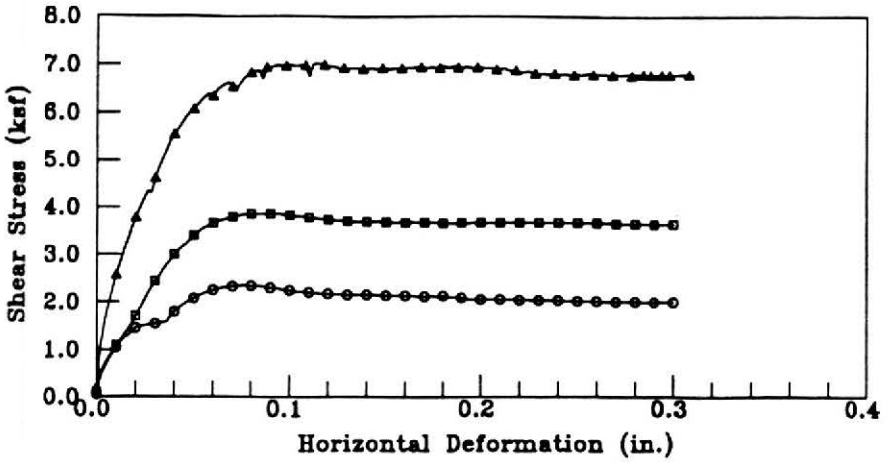
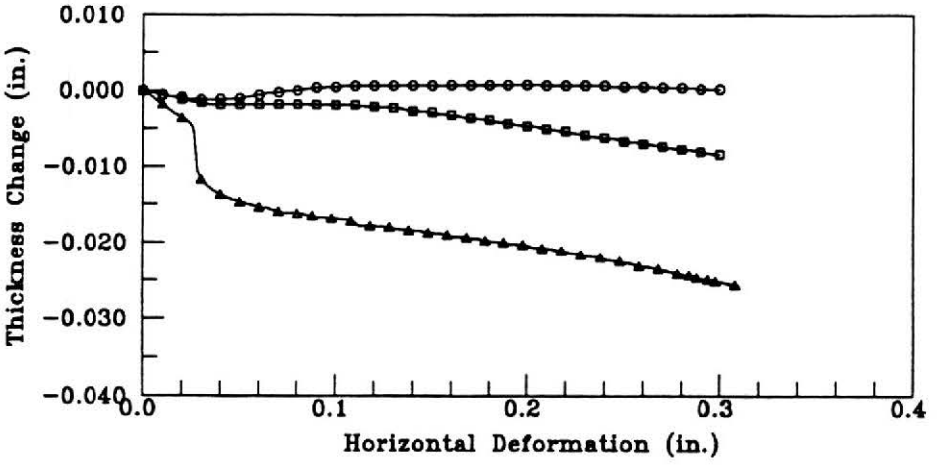
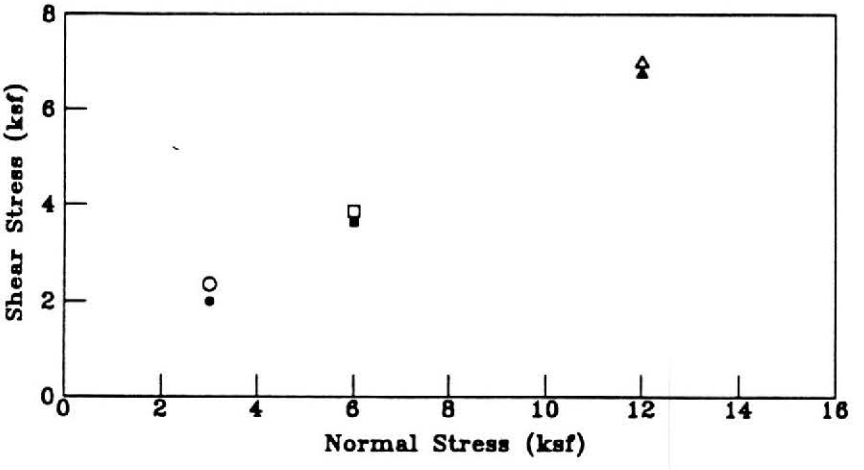
Figure B-29







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
○-○-○-○-○	3.000	2.351	2.004
□-□-□-□-□	6.000	3.868	3.648
△-△-△-△-△	12.000	7.026	6.792

Boring No.: LPE-3
Sample No.: D-5
Depth (ft.): 25.0
Sample Type: Undisturbed
Soil Type: Drk Brown lean Clay w/ fine Sand (CL)

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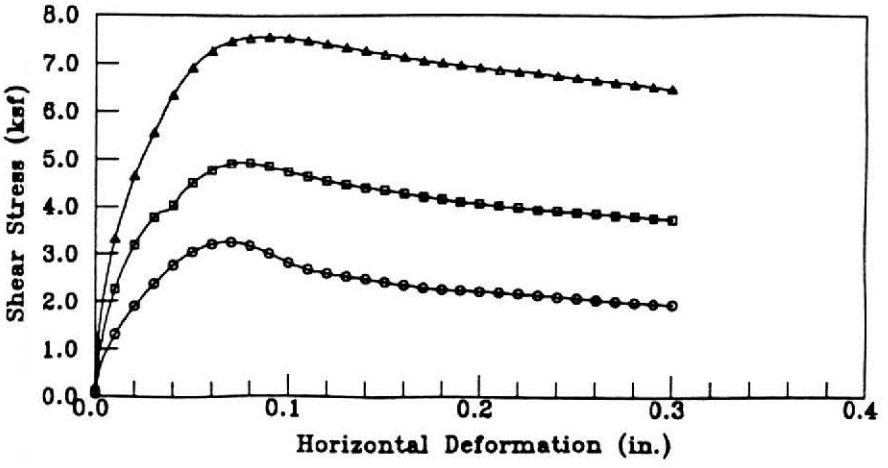
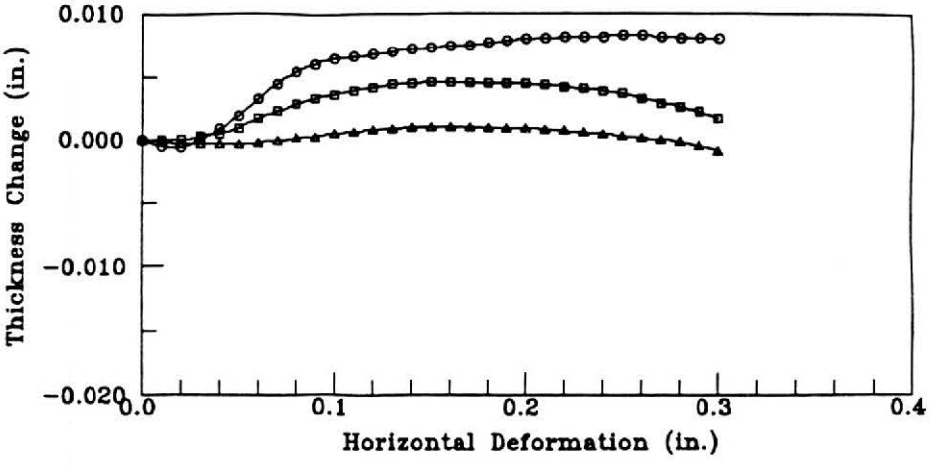
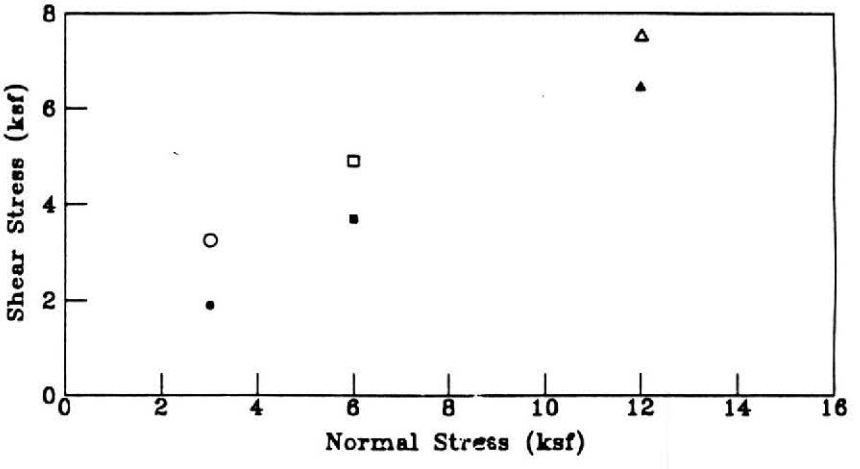
Figure B-30







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
○	3.000	3.246	1.898
□	6.000	4.917	3.699
△	12.000	7.560	6.490

Boring No.: LPE-5
Sample No.: D-5
Depth (ft.): 25.5-26.5
Sample Type: Undisturbed
Soil Type: Drk Yellowish Brown lean Clay (CL)

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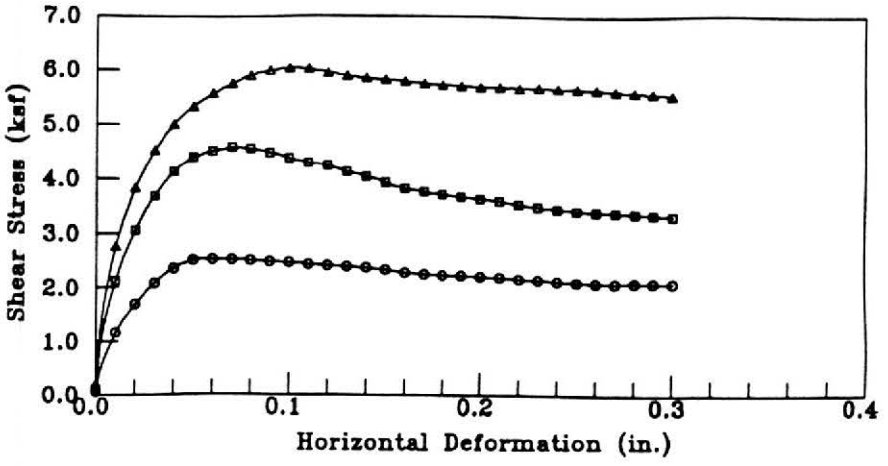
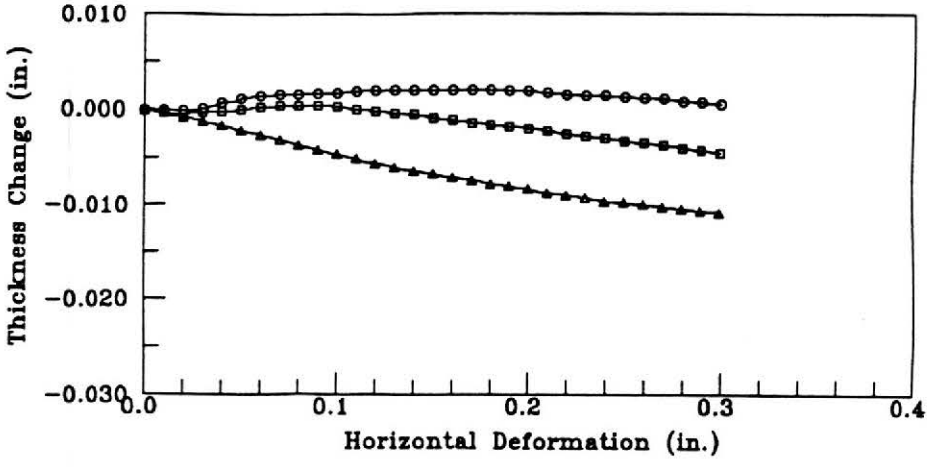
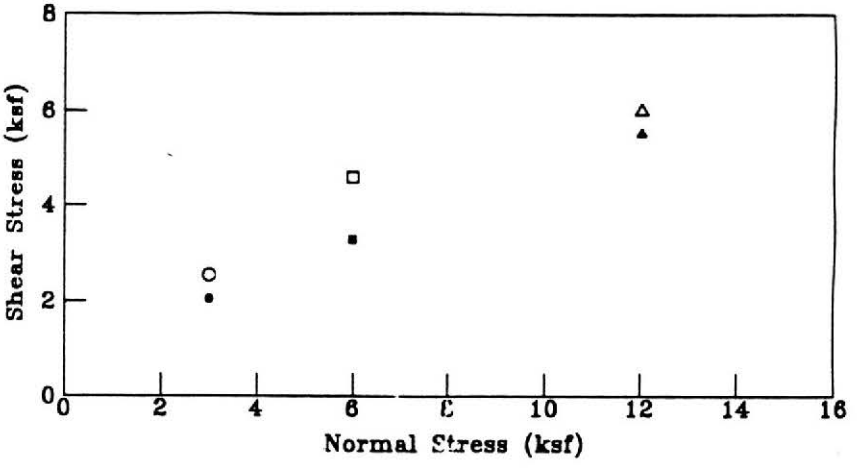
Figure B-31







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
○	3.000	2.556	2.057
□	6.000	4.595	3.298
△	12.000	6.039	5.554

Boring No.: LPE-5
Sample No.: D-11
Depth (ft.): 51.0-52.0
Sample Type: Undisturbed
Soil Type: Olive Yellow Fat Clay (CH)

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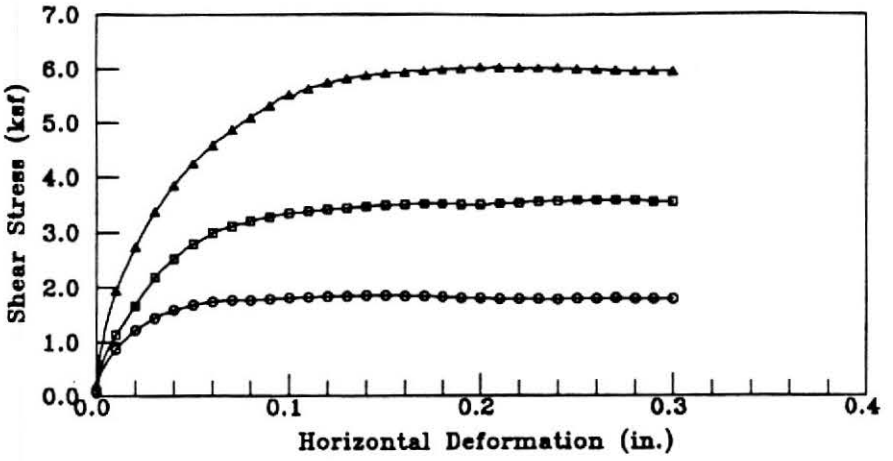
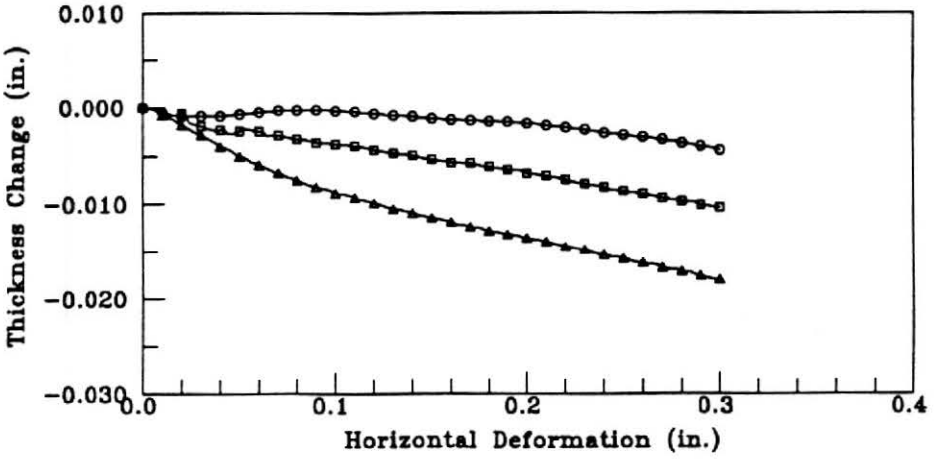
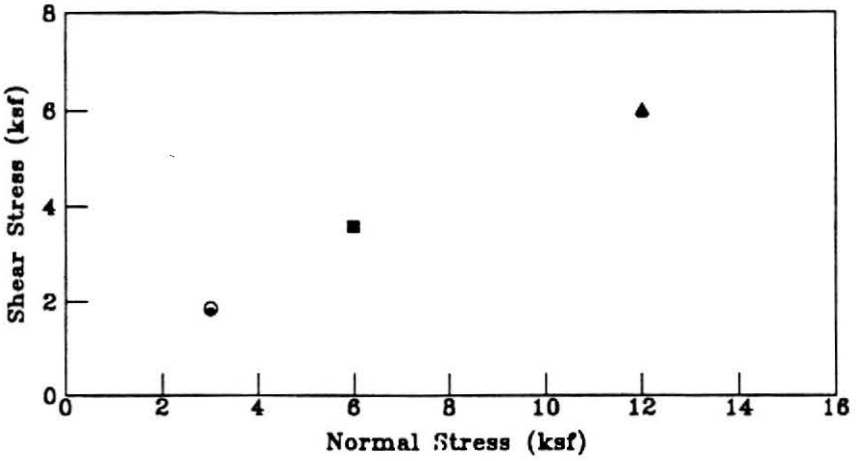
Figure B-32







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
●●●●●	3.000	1.852	1.789
■■■■■	6.000	3.584	3.554
▲▲▲▲▲	12.000	6.022	5.950

Boring No.: LPE-7
Sample No.: D−3
Depth (ft.): 15.0
Sample Type: Undisturbed
Soil Type: Yellwsh Brown lean Clay with Sand (CL)

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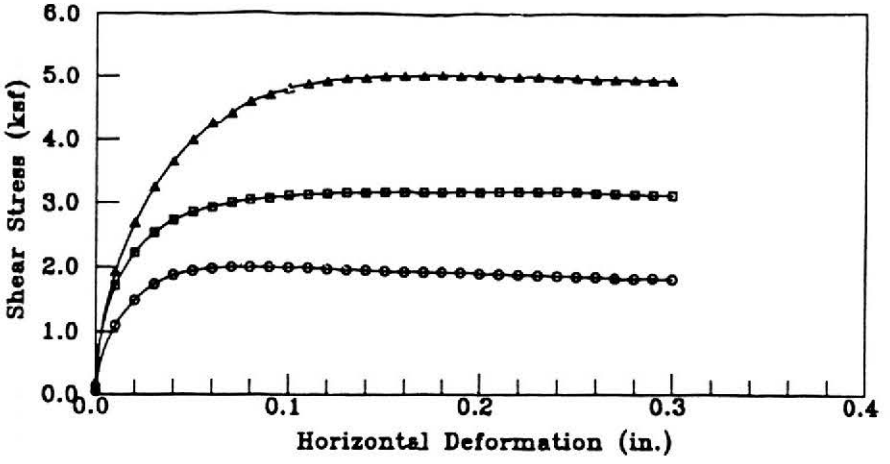
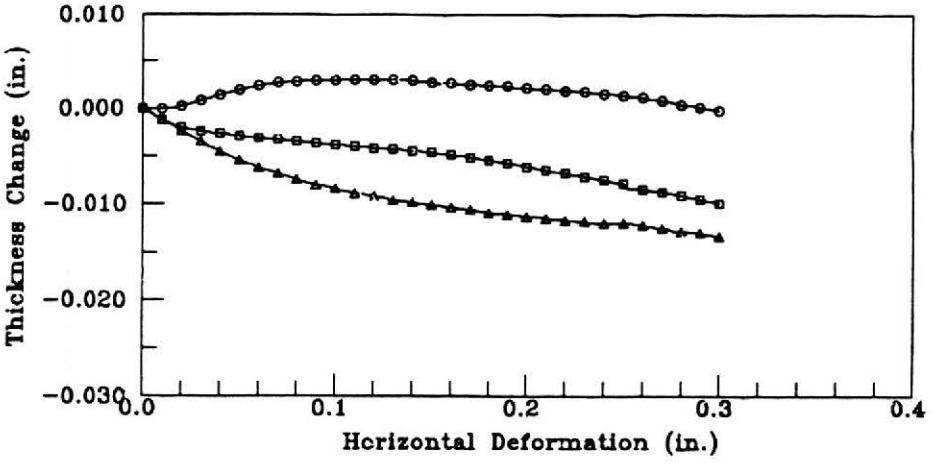
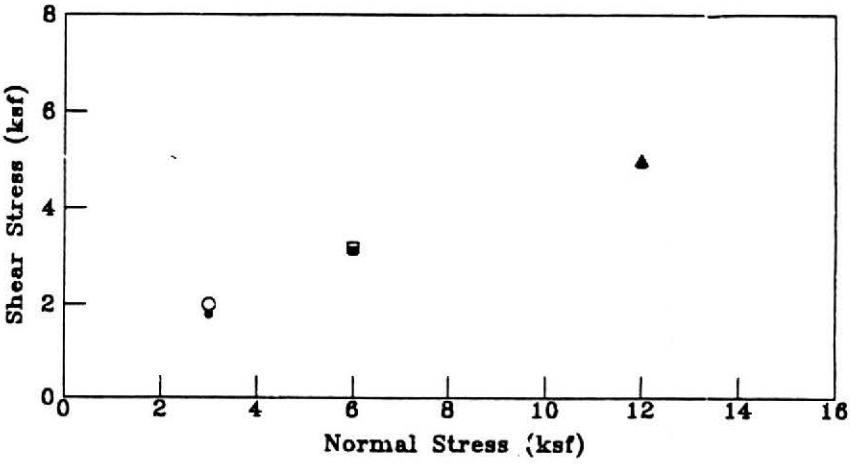
Figure B-33







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
●●●●●	3.000	2.008	1.802
■■■■■	6.000	3.184	3.123
▲▲▲▲▲	12.000	5.017	4.944

Boring No.: LPE-9
Sample No.: D-3
Depth (ft.): 15.0-16.0
Sample Type: Undisturbed
Soil Type: Drk. Yellwsh Brown Sandy lean Clay (CL)

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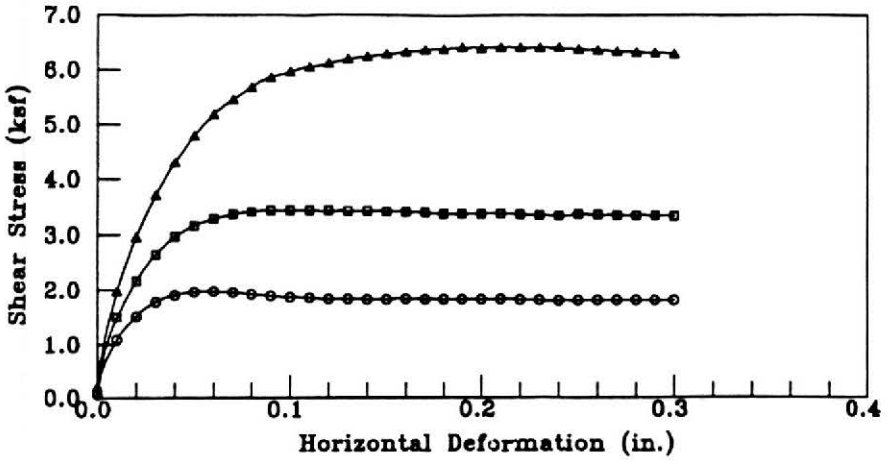
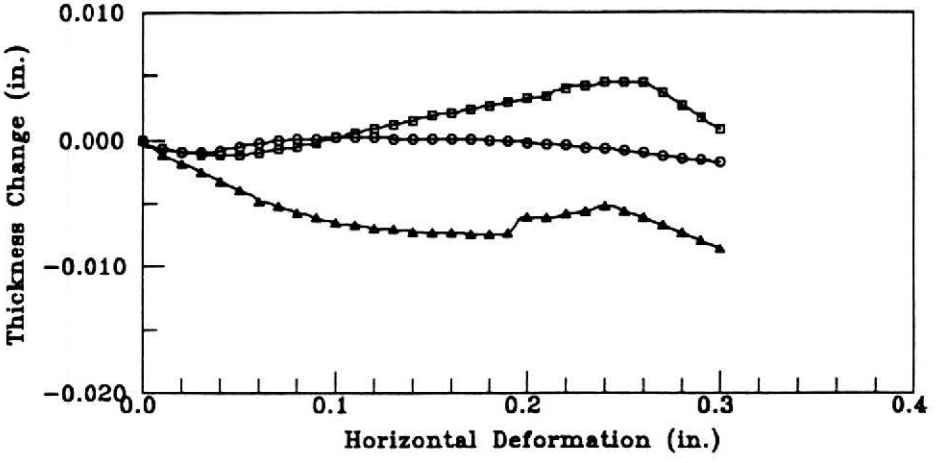
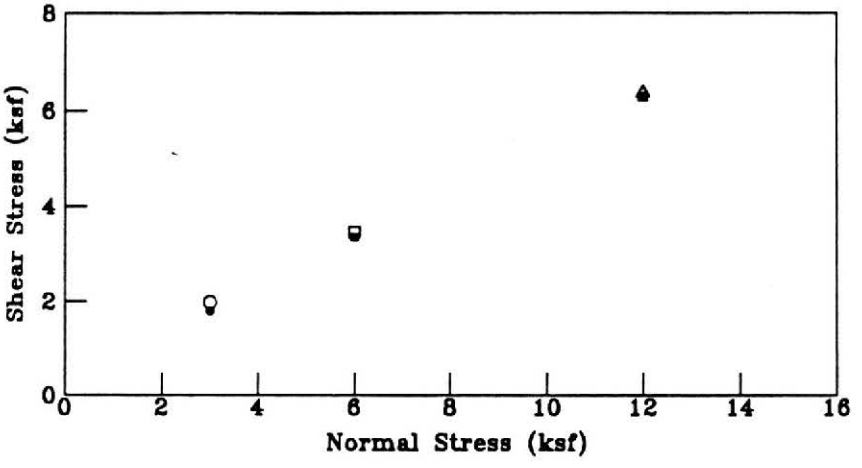
Figure B-34







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
○	3.000	1.978	2.004
□	6.000	3.456	3.648
△	12.000	6.416	6.792

Boring No.: LPE-10
Sample No.: D-5
Depth (ft.): 25.0
Sample Type: Undisturbed
Soil Type: Olive Brown Sandy lean Clay (CL)

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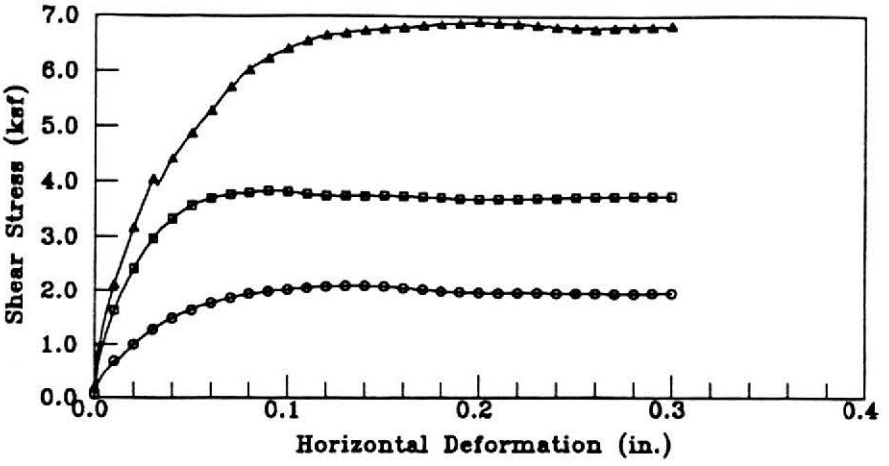
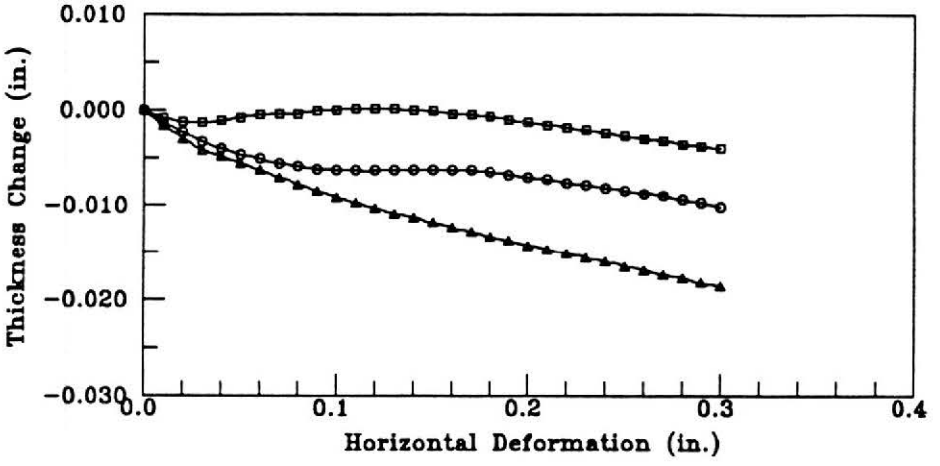
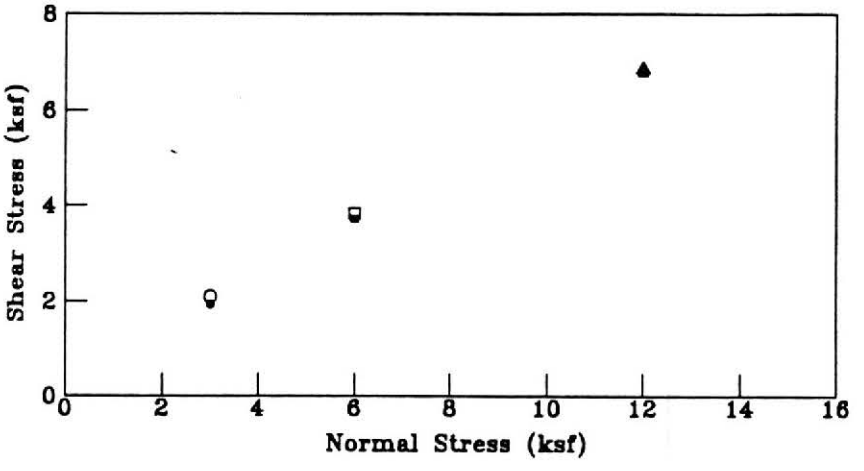
Figure B-35







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
○○○○○	3.000	2.099	1.942
□□□□□	6.000	3.838	3.731
△△△△△	12.000	6.898	6.806

Boring No.: LPE-10
Sample No.: D-9
Depth (ft.): 45.0
Sample Type: Undisturbed
Soil Type: Olive Silty Sand (SM)

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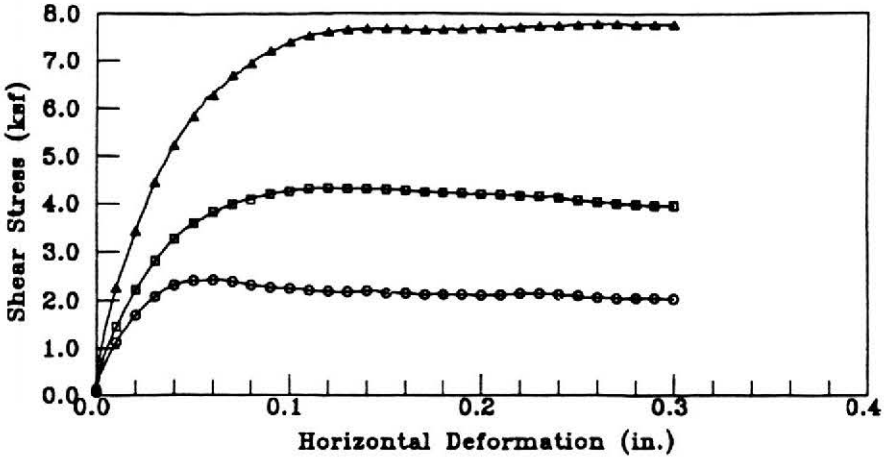
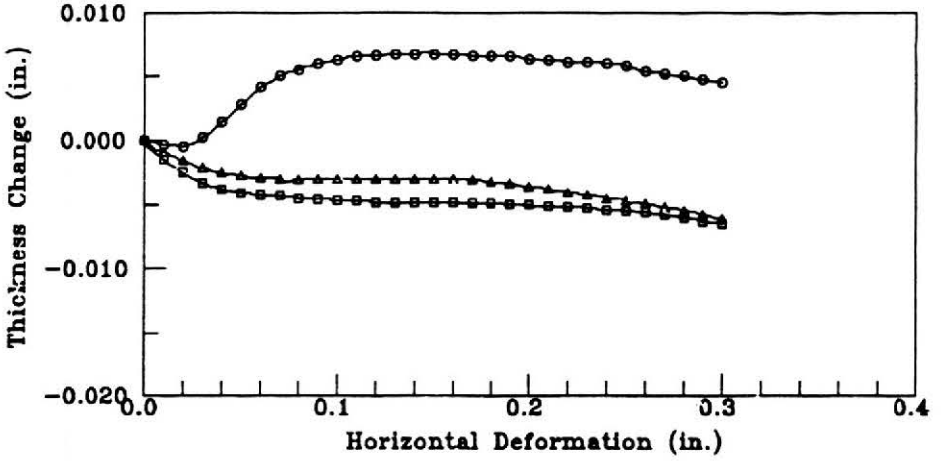
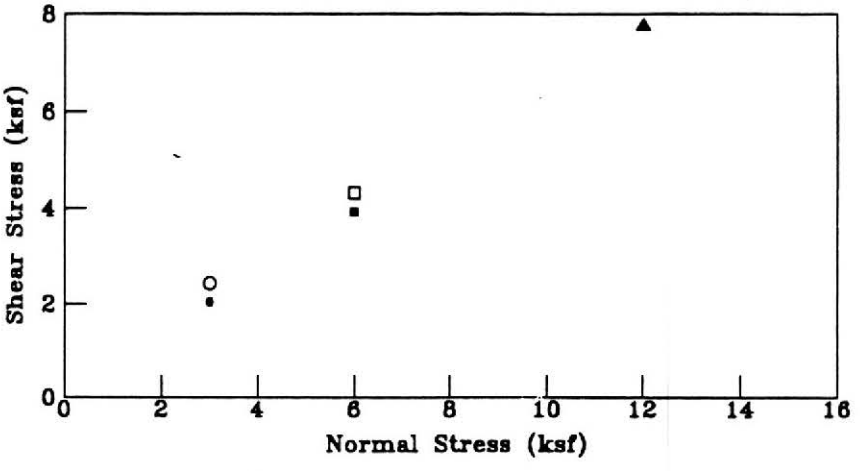
Figure B-36







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
●●●●●	3.000	2.432	2.045
■■■■■	6.000	4.322	3.938
▲▲▲▲▲	12.000	7.795	7.762

Boring No.: LPE-10
Sample No.: D-11
Depth (ft.): 55.0
Sample Type: Undisturbed
Soil Type: Olive Silty-Clayey Sand (SC-SM)

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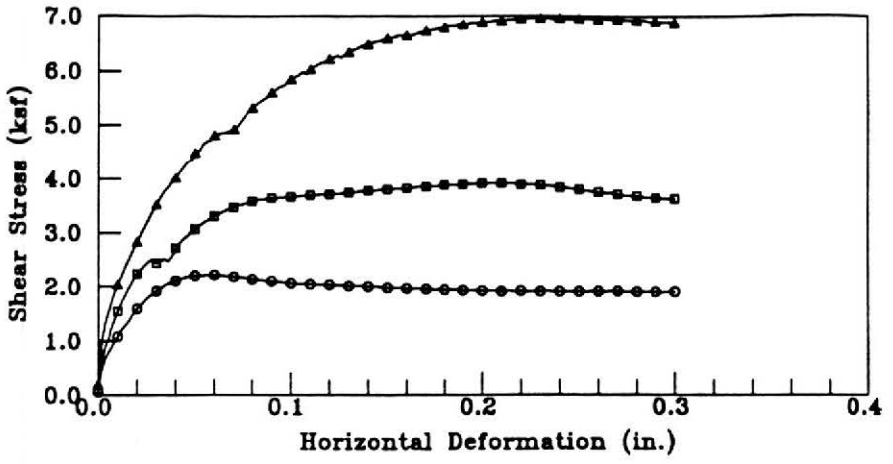
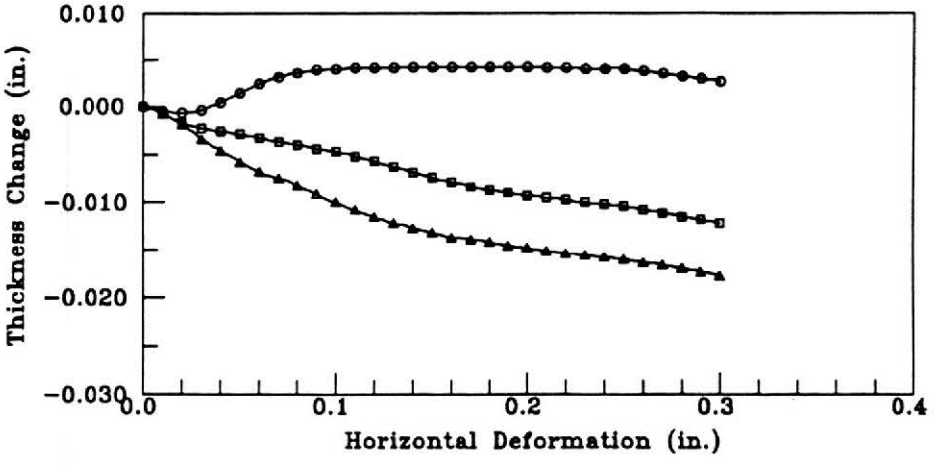
Project No. 92-4955-01
Metro Rail
San Fernando Valley

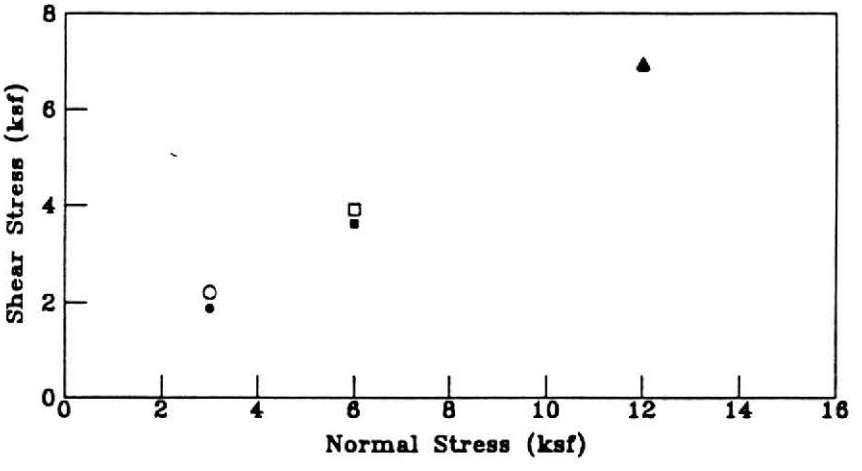
DIRECT SHEAR TEST
Consolidated Drained
(ASTM D 3080)

10-93

Figure B-37







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
●●●●●	3.000	2.211	1.898
■■■■■	6.000	3.921	3.699
▲▲▲▲▲	12.000	6.956	6.490

Boring No.: LPE-11
Sample No.: D-5
Depth (ft.): 25.0-26.0
Sample Type: Undisturbed
Soil Type: Dark Brown Sandy lean Clay (CL)

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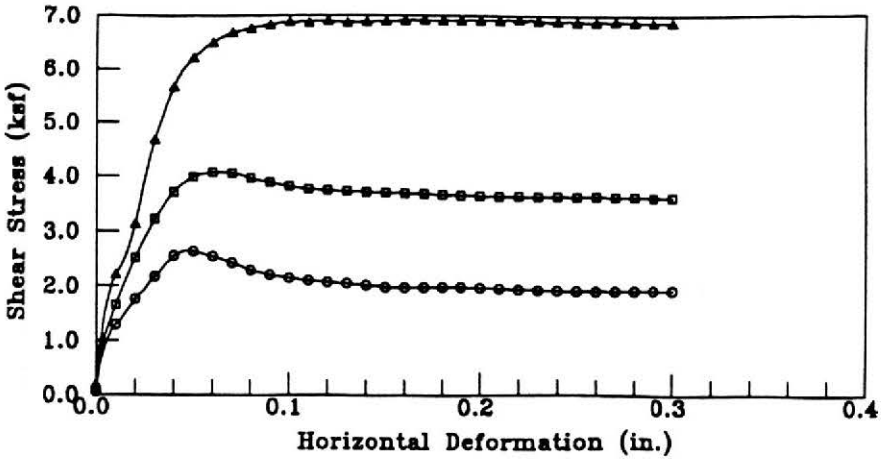
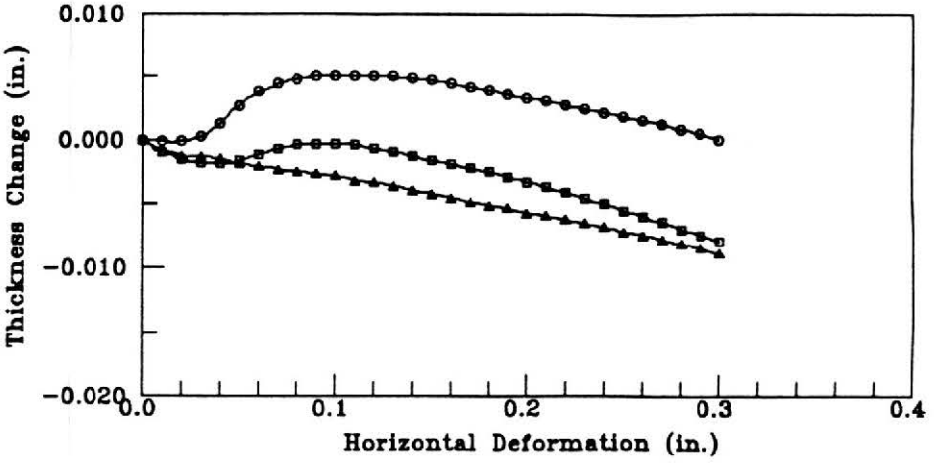
Project No. 92-4955-01
Metro Rail
San Fernando Valley

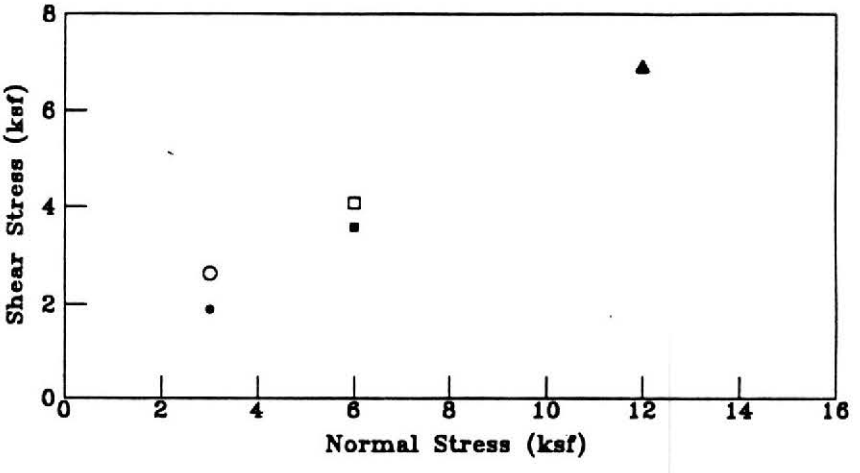
DIRECT SHEAR TEST
Consolidated Undrained

10-93

Figure B-38







	Normal Stress (ksf)	Peak Shear Stress (ksf)	Residual Shear Stress (ksf)
○	3.000	2.645	1.898
□	6.000	4.071	3.588
△	12.000	6.931	6.867

Boring No.: LPE-13
Sample No.: D-9
Depth (ft.): 42.0-43.0
Sample Type: Undisturbed
Soil Type: V-Drk Grnsh Brwn. Sandy Lean Clay (CL)

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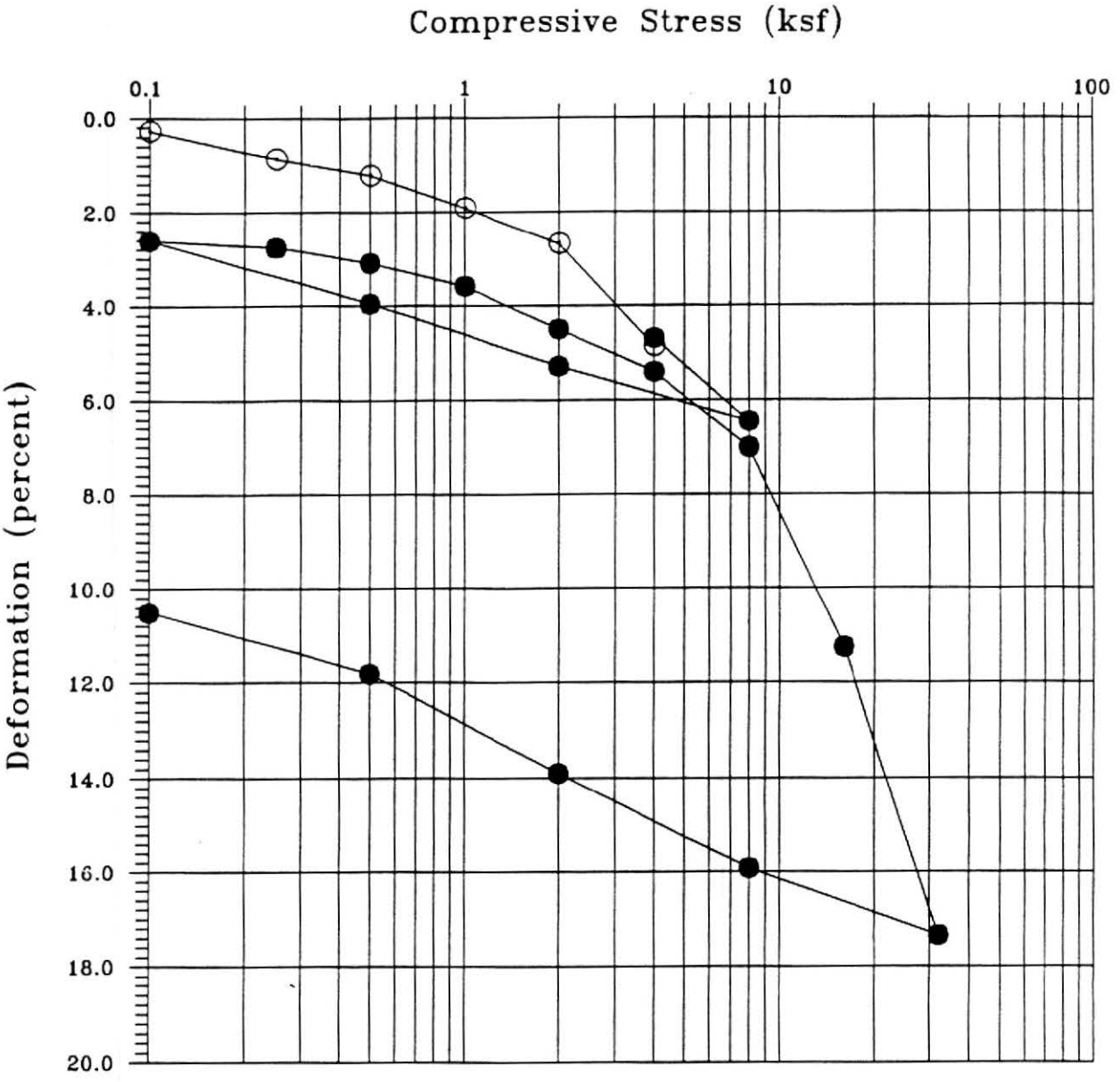
Metro Rail
San Fernando Valley

DIRECT SHEAR TEST
Consolidated Drained
(ASTM D 3080)

10-93

Figure B-39



Boring No.:	LPE-8
Sample No.:	D-13
Depth(ft.):	55.0
Initial Dry Density(pcf)	77.0
Initial Moisture Content(pct)	43.8
Initial Void Ratio:	1.188
Final Dry Density(pcf):	86.0
Final Moisture Content(pct):	37.4
Soil Type:	CL

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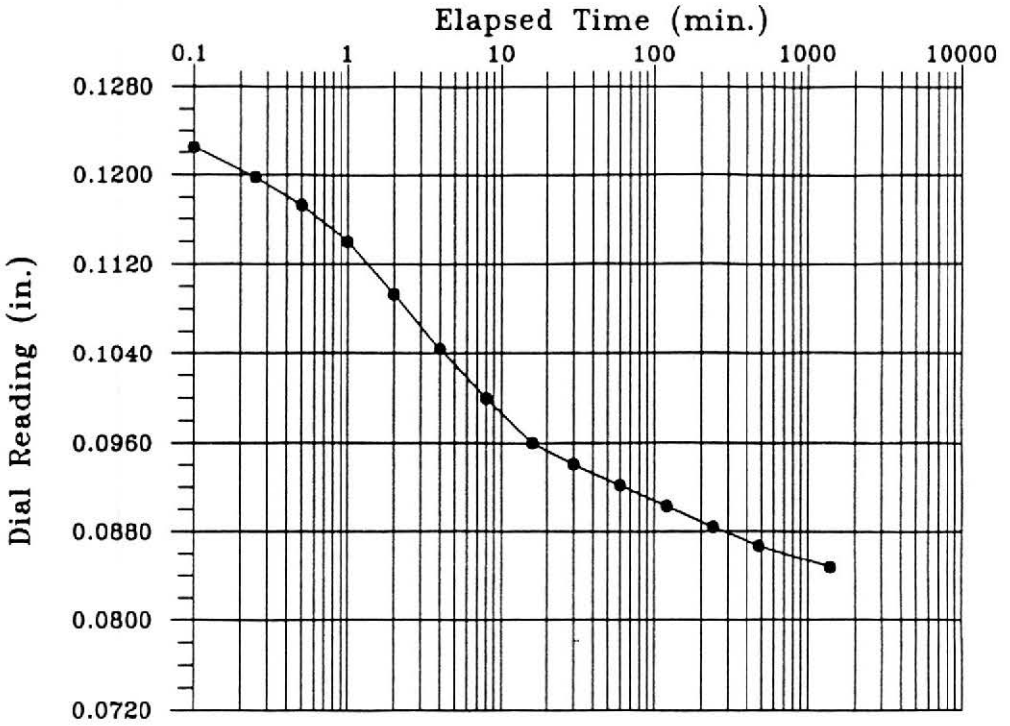
Project No. 93-495501
Metro Rail
San Fernando Valley

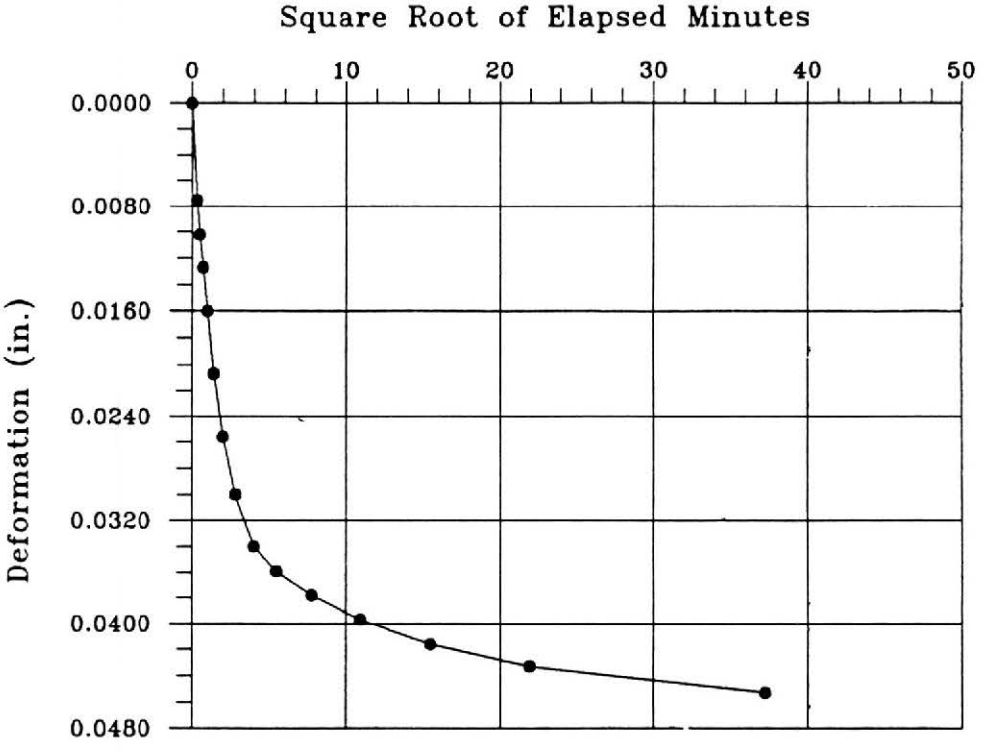
ONE-DIMENSIONAL CONSOLIDATION TEST

(ASTM D 2435)

10-93

Figure B-40





Boring No.: LPE-8
Sample No.: D-13
Depth(ft): 55.0

Compressive:
Stress (ksf): 16.0

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Project No. 93-495501

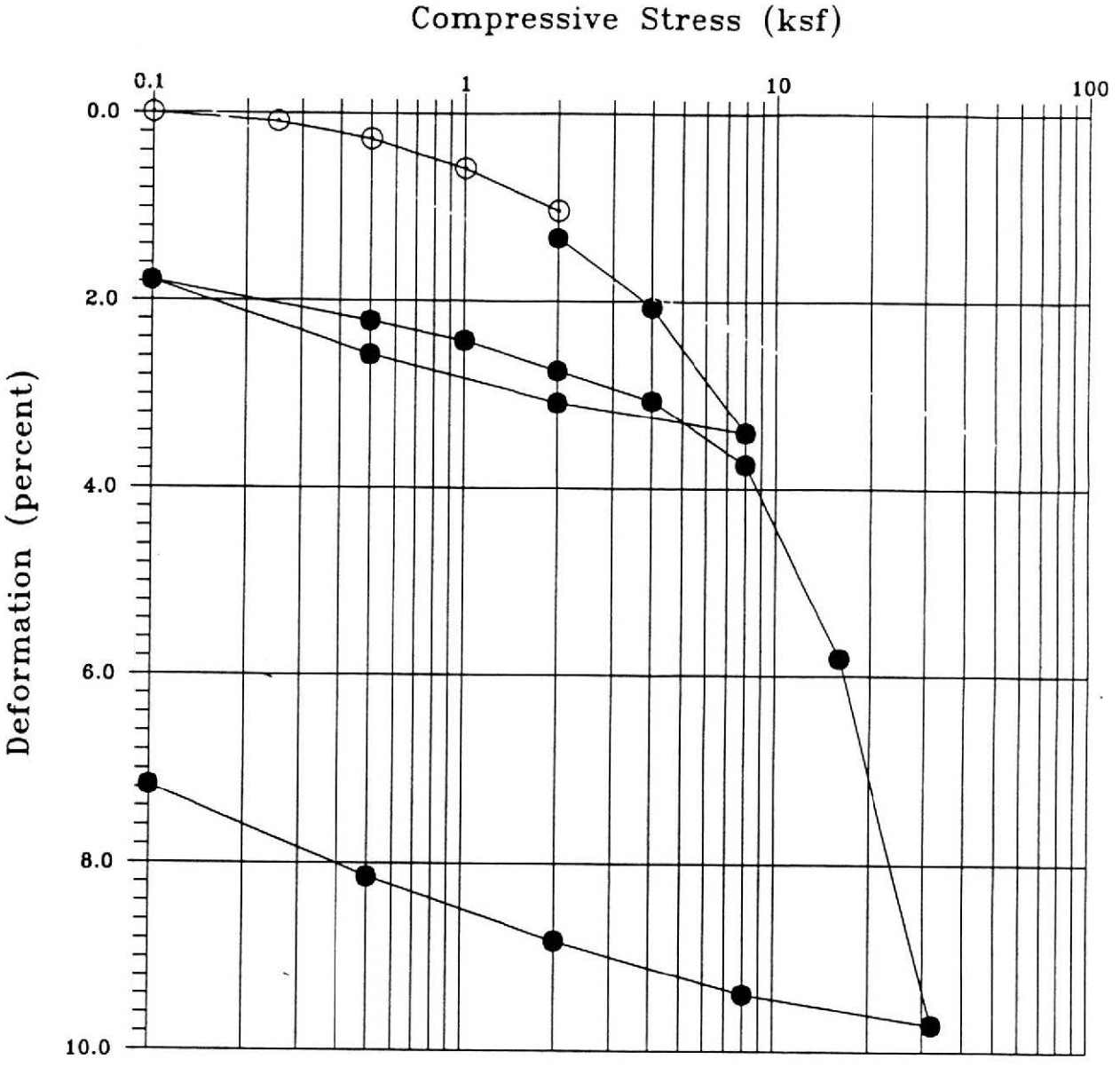
Metro Rail
San Fernando Valley

ONE-DIMENSIONAL CONSOLIDATION TEST

(ASTM D 2435)

10-93

Figure B-41



Boring No.:	LPE-11
Sample No.:	D-7
Depth(ft.):	35.0
Initial Dry Density(pcf)	104.7
Initial Moisture Content(pct)	16.5
Initial Void Ratio:	0.609
Final Dry Density(pcf):	112.7
Final Moisture Content(pct):	19.8
Soil Type:	CL

The Earth Technology Corporation

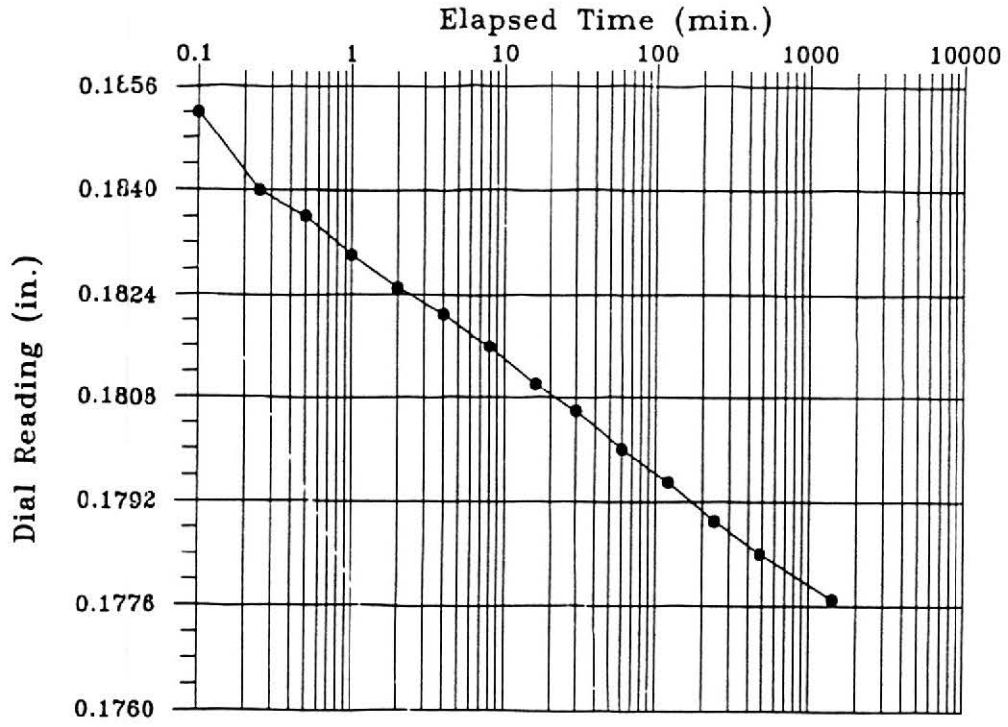
Project No. 93-495501
Metro Rail
San Fernando Valley

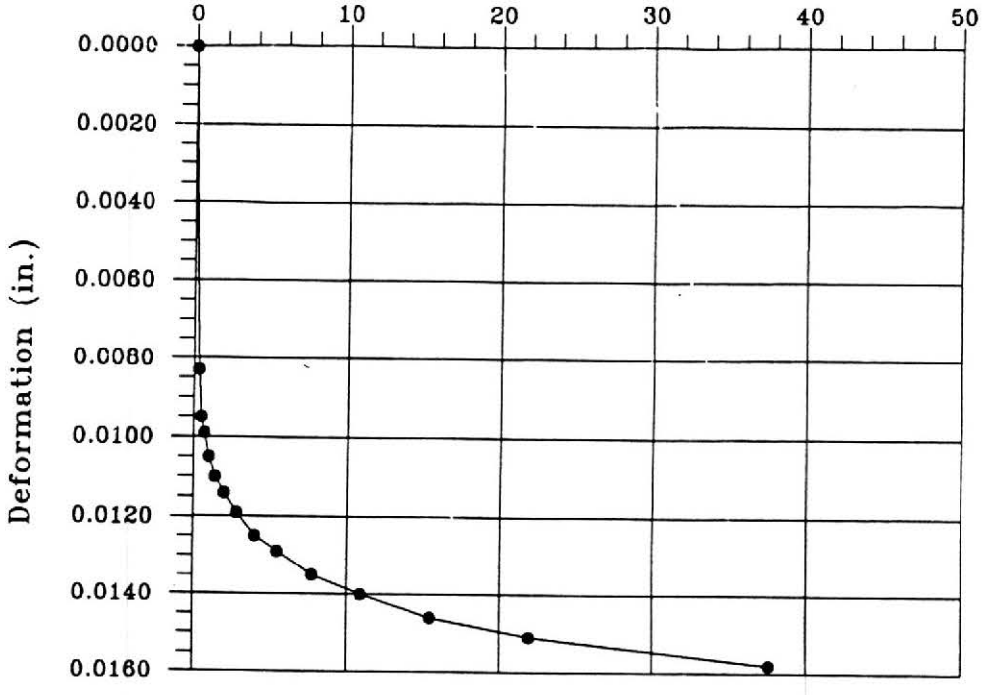
ONE-DIMENSIONAL CONSOLIDATION TEST

(ASTM D 2435)

10-93

Figure B-42





Boring No.: LPE-11
Sample No.: D-7
Depth(ft): 350

Compressive:
Stress (ksf): 8.0

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Project No. 93-495501

Metro Rail
San Fernando Valley

ONE-DIMENSIONAL CONSOLIDATION TEST

(ASTM D 2435)

10-93

Figure B-43

APPENDIX C

CHEMICAL LABORATORY TEST RESULTS

The laboratory test results pertaining to chemical analyses of groundwater samples collected from piezometers LPE-1 and LPE-7 are presented in this appendix. Two groundwater samples were transported to Pace Incorporated of Huntington Beach, California for a limited characterization of potential chemical contamination. The chemical results on groundwater samples are summarized in Table 3-6 of Section 3.2.

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THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

November 03, 1993

Mr. Suji Somasandaram
Earth Technology Corporation
13900 Alton Parkway
Suite 120
Irvine, CA 92718

RE: PACE Project No. 731011.500
Client Reference: Metro Rail (93-4955.02)

Dear Mr. Somasandaram:

Enclosed is the report of laboratory analyses for samples received October 11, 1993.

Footnotes are given at the end of the report.

If you have any questions concerning this report, please feel free to contact us.

Sincerely,

Eric S. Howarth
Project Manager

Enclosures

5702 Bolsa Avenue
Huntington Beach, CA 92649
TEL: 714-892-2565
FAX: 714-890-4032

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THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Earth Technology Corporation
13900 Alton Parkway
Suite 120
Irvine, CA 92718

November 03, 1993
PACE Project Number: 731011500

Attn: Mr. Suji Somasandaram

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:			75 0173115		
Date Collected:			10/11/93		
Date Received:			10/11/93		
			B-1/LPE-1		
Parameter	Units	MDL		METHOD	DATE ANALYZED
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
GFAA, Arsenic	mg/L	0.0025	0.0028	7060	10/29/93
GFAA, Date Digested			-	3005	10/25/93
GFAA, Selenium	mg/L	0.0025	0.018	7740	10/29/93
ICP Thallium	mg/L	0.2	ND	6010	10/27/93
Spectrophotometric-Total Sulfide	mg/L	0.05	ND	376.2	10/18/93
ORGANIC ANALYSIS					
AROMATIC VOLATILE ORGANICS-BTEX				8020	
Benzene	ug/L	0.3	0.4		10/18/93
Toluene	ug/L	0.3	0.7		10/18/93
Ethylbenzene	ug/L	0.3	ND		10/18/93
Xylenes, Total	ug/L	0.6	ND		10/18/93
a,a,a-Trifluorotoluene Surrogate Rec.	%		106		10/18/93
VOLATILE ORGANICS				8240	
Chloromethane	ug/L	10	ND		10/22/93
Vinyl chloride	ug/L	10	ND		10/22/93
Bromomethane	ug/L	10	ND		10/22/93
Chloroethane	ug/L	10	ND		10/22/93
Trichlorofluoromethane	ug/L	10	ND		10/22/93
1,1-Dichloroethene	ug/L	5	ND		10/22/93
Acetone	ug/L	50	130		10/22/93
Carbon disulfide	ug/L	5	ND		10/22/93
Methylene chloride	ug/L	5	ND		10/22/93
trans-1,2-Dichloroethene	ug/L	5	ND		10/22/93
1,1-Dichloroethane	ug/L	5	ND		10/22/93
2-Butanone	ug/L	50	26 (1)		10/22/93
cis-1,2-Dichloroethene	ug/L	5	ND		10/22/93
Chloroform	ug/L	5	ND		10/22/93

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REPORT OF LABORATORY ANALYSIS

Mr. Suji Somasandaram
Page 2

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

Parameter	Units	MDL		METHOD	DATE ANALYZED
PACE Sample Number:			75 0173115		
Date Collected:			10/11/93		
Date Received:			10/11/93		
Client Sample ID:			B-1/LPE-1		
ORGANIC ANALYSIS					
VOLATILE ORGANICS				8240	
1,2-Dichloroethane	ug/L	5	ND		10/22/93
1,1,1-Trichloroethane	ug/L	5	ND		10/22/93
Carbon tetrachloride	ug/L	5	ND		10/22/93
Benzene	ug/L	5	ND		10/22/93
Trichloroethene	ug/L	5	ND		10/22/93
1,2-Dichloropropane	ug/L	5	ND		10/22/93
Bromodichloromethane	ug/L	5	ND		10/22/93
cis-1,3-Dichloropropene	ug/L	5	ND		10/22/93
trans-1,3-Dichloropropene	ug/L	5	ND		10/22/93
1,1,2-Trichloroethane	ug/L	5	ND		10/22/93
Dibromochloromethane	ug/L	5	ND		10/22/93
Bromoform	ug/L	5	ND		10/22/93
4-Methyl-2-pentanone	ug/L	50	ND		10/22/93
Toluene	ug/L	5	ND		10/22/93
2-Hexanone	ug/L	50	ND		10/22/93
1,1,2,2-Tetrachloroethane	ug/L	5	ND		10/22/93
Tetrachloroethene	ug/L	5	6.5		10/22/93
Chlorobenzene	ug/L	5	ND		10/22/93
Ethylbenzene	ug/L	5	ND		10/22/93
Styrene	ug/L	5	ND		10/22/93
Xylenes (Total)	ug/L	5	ND		10/22/93
1,3-Dichlorobenzene	ug/L	5	ND		10/22/93
1,4-Dichlorobenzene	ug/L	5	ND		10/22/93
1,2-Dichlorobenzene	ug/L	5	ND		10/22/93
1,2-Dichloroethane-d4 (Surrog. Recovery)	%		86		10/22/93
Toluene-d8 (Surrog. Recovery)	%		100		10/22/93
4-Bromofluorobenzene (Surrog. Recovery)	%		93		10/22/93
SEMI-VOLATILES				8270	
8270 Date Extracted			-		10/13/93
n-Nitrosodimethylamine	ug/L	10	ND		10/27/93
Phenol	ug/L	10	ND		10/27/93

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Mr. Suji Somasandaram
Page 3

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:			75 0173115		
Date Collected:			10/11/93		
Date Received:			10/11/93		
Client Sample ID:			B-1/LPE-1		
Parameter	Units	MDL		METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
SEMI-VOLATILES				8270	
Aniline	ug/L	10	ND		10/27/93
bis(2-Chloroethyl)ether	ug/L	10	ND		10/27/93
2-Chlorophenol	ug/L	10	ND		10/27/93
1,3-Dichlorobenzene	ug/L	10	ND		10/27/93
1,4-Dichlorobenzene	ug/L	10	ND		10/27/93
Benzyl alcohol	ug/L	10	ND		10/27/93
1,2-Dichlorobenzene	ug/L	10	ND		10/27/93
2-Methylphenol	ug/L	10	ND		10/27/93
bis(2-Chloroisopropyl)ether	ug/L	10	ND		10/27/93
4-Methylphenol	ug/L	10	ND		10/27/93
n-Nitroso-di-n-propylamine	ug/L	10	ND		10/27/93
Hexachloroethane	ug/L	10	ND		10/27/93
Nitrobenzene	ug/L	10	ND		10/27/93
Isophorone	ug/L	10	ND		10/27/93
2-Nitrophenol	ug/L	10	ND		10/27/93
2,4-Dimethylphenol	ug/L	10	ND		10/27/93
Benzoic acid	ug/L	50	67		10/27/93
bis(2-Chloroethoxy)methane	ug/L	10	ND		10/27/93
2,4-Dichlorophenol	ug/L	10	ND		10/27/93
1,2,4-Trichlorobenzene	ug/L	10	ND		10/27/93
Naphthalene	ug/L	10	ND		10/27/93
4-Chloroaniline	ug/L	20	ND		10/27/93
Hexachlorobutadiene	ug/L	10	ND		10/27/93
4-Chloro-3-methylphenol	ug/L	10	ND		10/27/93
2-Methylnaphthalene	ug/L	10	ND		10/27/93
Hexachlorocyclopentadiene	ug/L	10	ND		10/27/93
2,4,6-Trichlorophenol	ug/L	10	ND		10/27/93
2,4,5-Trichlorophenol	ug/L	10	ND		10/27/93
2-Chloronaphthalene	ug/L	50	ND		10/27/93
2-Nitroaniline	ug/L	50	ND		10/27/93
Dimethylphthalate	ug/L	10	24		10/27/93

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THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Mr. Suji Somasandaram
Page 4

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:	75 0173115
Date Collected:	10/11/93
Date Received:	10/11/93
Client Sample ID:	B-1/LPE-1

Parameter	Units	MDL		METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
SEMI-VOLATILES				8270	
Acenaphthylene	ug/L	10	ND		10/27/93
2,6-Dinitrotoluene	ug/L	10	ND		10/27/93
3-Nitroaniline	ug/L	50	ND		10/27/93
Acenaphthene	ug/L	10	ND		10/27/93
2,4-Dinitrophenol	ug/L	50	ND		10/27/93
4-Nitrophenol	ug/L	50	ND		10/27/93
Dibenzofuran	ug/L	10	ND		10/27/93
2,4-Dinitrotoluene	ug/L	10	ND		10/27/93
Diethylphthalate	ug/L	10	ND		10/27/93
4-Chlorophenyl-phenylether	ug/L	10	ND		10/27/93
Fluorene	ug/L	10	ND		10/27/93
4-Nitroaniline	ug/L	50	ND		10/27/93
4,6-Dinitro-2-methylphenol	ug/L	50	ND		10/27/93
n-Nitrosodiphenylamine	ug/L	10	ND		10/27/93
4-Bromophenyl-phenylether	ug/L	10	ND		10/27/93
Hexachlorobenzene	ug/L	10	ND		10/27/93
Pentachlorophenol	ug/L	10	ND		10/27/93
Phenanthrene	ug/L	10	ND		10/27/93
Anthracene	ug/L	10	ND		10/27/93
Di-n-butylphthalate	ug/L	10	ND		10/27/93
Fluoranthene	ug/L	10	ND		10/27/93
Benzidine	ug/L	50	ND		10/27/93
Pyrene	ug/L	10	ND		10/27/93
Butylbenzylphthalate	ug/L	10	ND		10/27/93
Benzo(a)anthracene	ug/L	10	ND		10/27/93
Chrysene	ug/L	10	ND		10/27/93
bis(2-Ethylhexyl)phthalate	ug/L	10	74		10/27/93
Di-n-octylphthalate	ug/L	10	ND		10/27/93
Benzo(b)fluoranthene	ug/L	10	ND		10/27/93
Benzo(k)fluoranthene	ug/L	10	ND		10/27/93
Benzo(a)pyrene	ug/L	10	ND		10/27/93

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Mr. Suji Somasandaram
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November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:				75 0173115		
Date Collected:				10/11/93		
Date Received:				10/11/93		
Client Sample ID:				B-1/LPE-1		
Parameter		Units	MDL		METHOD	DATE ANALYZED
ORGANIC ANALYSIS						
SEMI-VOLATILES					8270	
Indeno(1,2,3-cd)pyrene		ug/L	10	ND		10/27/93
Dibenzo(a,h)anthracene		ug/L	10	ND		10/27/93
Benzo(g,h,i)perylene		ug/L	10	ND		10/27/93
2-Fluorophenol	(Surrog. Recovery)	%		93		10/27/93
Phenol-d5	(Surrog. Recovery)	%		94		10/27/93
Nitrobenzene-d5	(Surrog. Recovery)	%		83		10/27/93
2-Fluorobiphenyl	(Surrog. Recovery)	%		85		10/27/93
2,4,6-Tribromophenol	(Surrog. Recovery)	%		97		10/27/93
Terphenyl-d14	(Surrog. Recovery)	%		74		10/27/93
TPH CARBON CHAIN					8015	
TPH Carbon Chain Date Extracted				-		10/23/93
Carbon Chain Range C10-C11		ug/L	100	230		11/02/93
Carbon Chain Range C12-C14		ug/L	100	500		11/02/93
Carbon Chain Range C16-C18		ug/L	100	490		11/02/93
Carbon Chain Range C20-C24		ug/L	100	920		11/02/93
Carbon Chain Range C28-C32		ug/L	100	600		11/02/93
Carbon Chain Range C36-C44		ug/L	100	240		11/02/93

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pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

November 04, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:			75 0173123		
Date Collected:			10/11/93		
Date Received:			10/11/93		
Client Sample ID:			B-1/LPE-1		
Parameter	Units	MDL		METHOD	DATE ANALYZED
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
ICP Aluminum	mg/L	0.05	0.19	6010	10/27/93
ICP Antimony	mg/L	0.2	ND	6010	10/27/93
ICP Barium	mg/L	0.004	0.054	6010	10/27/93
ICP Beryllium	mg/L	0.002	ND	6010	10/27/93
ICP Boron	mg/L	0.1	0.6	6010	10/27/93
ICP Cadmium	mg/L	0.006	ND	6010	10/27/93
ICP Calcium	mg/L	0.3	170	6010	10/27/93
ICP Chromium	mg/L	0.004	ND	6010	10/27/93
ICP Cobalt	mg/L	0.004	ND	6010	10/27/93
ICP Copper	mg/L	0.02	0.04	6010	10/27/93
ICP Date Digested			-	3005	10/27/93
ICP Iron	mg/L	0.02	0.22	6010	10/27/93
ICP Lead	mg/L	0.05	ND	6010	10/27/93
ICP Magnesium	mg/L	0.2	37	6010	10/27/93
ICP Manganese	mg/L	0.003	0.093	6010	10/27/93
ICP Molybdenum	mg/L	0.006	0.033	6010	10/27/93
ICP Nickel	mg/L	0.02	ND	6010	10/27/93
ICP Potassium	mg/L	1.0	19	6010	10/27/93
ICP Silicon	mg/L	2.0	13	6010	10/28/93
ICP Silver	mg/L	0.02	ND	6010	10/27/93
ICP Sodium	mg/L	0.2	62	6010	10/27/93
ICP Strontium	mg/L	0.005	0.88	6010	10/27/93
ICP Tin	mg/L	0.03	ND	6010	10/27/93
ICP Titanium	mg/L	0.005	ND	6010	10/27/93
ICP Vanadium	mg/L	0.005	0.017	6010	10/27/93
ICP Zinc	mg/L	0.007	0.24	6010	10/27/93
TITLE 22 TTLC MERCURY BY CV				7470	
TTLC, CV Date Digested			-		10/29/93
TTLC, CV Mercury	mg/L	0.0003	ND		10/29/93
GFAA, Arsenic	mg/L	0.0025	0.0028	7060	10/29/93
GFAA, Date Digested			-	3005	10/25/93
GFAA, Selenium	mg/L	0.0025	0.018	7740	10/29/93
ICP Thallium	mg/L	0.2	ND	6010	10/27/93
Spectrophotometric-Total Sulfide	mg/L	0.05	ND	376.2	10/18/93

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REPORT OF LABORATORY ANALYSIS

Mr. Suji Somasandaram
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November 04, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:			75 0173131		
Date Collected:			10/11/93		
Date Received:			10/11/93		
Client Sample ID:			B-7/LPE-7		
Parameter	Units	MDL		METHOD	DATE ANALYZED
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
ICP Aluminum	mg/L	0.05	ND	6010	10/27/93
ICP Antimony	mg/L	0.2	ND	6010	10/27/93
ICP Barium	mg/L	0.004	0.065	6010	10/27/93
ICP Beryllium	mg/L	0.002	ND	6010	10/27/93
ICP Boron	mg/L	0.1	0.6	6010	10/27/93
ICP Cadmium	mg/L	0.006	ND	6010	10/27/93
ICP Calcium	mg/L	0.3	180	6010	10/27/93
ICP Chromium	mg/L	0.004	ND	6010	10/27/93
ICP Cobalt	mg/L	0.004	ND	6010	10/27/93
ICP Copper	mg/L	0.02	ND	6010	10/27/93
ICP Date Digested			-	3005	10/27/93
ICP Iron	mg/L	0.02	ND	6010	10/27/93
ICP Lead	mg/L	0.05	ND	6010	10/27/93
ICP Magnesium	mg/L	0.2	53	6010	10/27/93
ICP Manganese	mg/L	0.003	0.011	6010	10/27/93
ICP Molybdenum	mg/L	0.006	0.015	6010	10/27/93
ICP Nickel	mg/L	0.02	ND	6010	10/27/93
ICP Potassium	mg/L	1.0	2.6	6010	10/27/93
ICP Silicon	mg/L	2.0	16	6010	10/28/93
ICP Silver	mg/L	0.02	ND	6010	10/27/93
ICP Sodium	mg/L	0.2	100	6010	10/27/93
ICP Strontium	mg/L	0.005	0.80	6010	10/27/93
ICP Tin	mg/L	0.03	ND	6010	10/27/93
ICP Titanium	mg/L	0.005	ND	6010	10/27/93
ICP Vanadium	mg/L	0.005	ND	6010	10/27/93
ICP Zinc	mg/L	0.007	ND	6010	10/27/93
TITLE 22 TTLC MERCURY BY CV				7470	
TTLC, CV Date Digested			-		10/29/93
TTLC, CV Mercury	mg/L	0.0003	ND		10/29/93
GFAA, Arsenic	mg/L	0.0025	0.0034	7060	10/29/93
GFAA, Date Digested			-	3005	10/25/93
GFAA, Selenium	mg/L	0.0025	0.0087	7740	10/29/93
ICP Thallium	mg/L	0.2	ND	6010	10/27/93
Spectrophotometric-Total Sulfide	mg/L	0.05	0.05	376.2	10/18/93

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Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:			75 0173140		
Date Collected:			10/11/93		
Date Received:			10/11/93		
Client Sample ID:			B-7/LPE-7		
Parameter	Units	MDL		METHOD	DATE ANALYZED
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
GFAA, Arsenic	mg/L	0.0025	0.0034	7060	10/29/93
GFAA, Date Digested			-	3005	10/25/93
GFAA, Selenium	mg/L	0.0025	0.0087	7740	10/29/93
ICP Thallium	mg/L	0.2	ND	6010	10/27/93
Spectrophotometric-Total Sulfide	mg/L	0.05	0.05	376.2	10/18/93
ORGANIC ANALYSIS					
AROMATIC VOLATILE ORGANICS-BTEX				8020	
Benzene	ug/L	0.3	ND		10/18/93
Toluene	ug/L	0.3	0.4		10/18/93
Ethylbenzene	ug/L	0.3	ND		10/18/93
Xylenes, Total	ug/L	0.6	ND		10/18/93
a,a,a-Trifluorotoluene Surrogate Rec.	%		107		10/18/93
VOLATILE ORGANICS				8240	
Chloromethane	ug/L	10	ND		10/22/93
Vinyl chloride	ug/L	10	ND		10/22/93
Bromomethane	ug/L	10	ND		10/22/93
Chloroethane	ug/L	10	ND		10/22/93
Trichlorofluoromethane	ug/L	10	ND		10/22/93
1,1-Dichloroethene	ug/L	5	ND		10/22/93
Acetone	ug/L	50	ND		10/22/93
Carbon disulfide	ug/L	5	ND		10/22/93
Methylene chloride	ug/L	5	ND		10/22/93
trans-1,2-Dichloroethene	ug/L	5	ND		10/22/93
1,1-Dichloroethane	ug/L	5	ND		10/22/93
2-Butanone	ug/L	50	ND		10/22/93
cis-1,2-Dichloroethene	ug/L	5	ND		10/22/93
Chloroform	ug/L	5	5.4		10/22/93
1,2-Dichloroethane	ug/L	5	ND		10/22/93
1,1,1-Trichloroethane	ug/L	5	ND		10/22/93
Carbon tetrachloride	ug/L	5	ND		10/22/93
Benzene	ug/L	5	ND		10/22/93

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November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:			75 0173140		
Date Collected:			10/11/93		
Date Received:			10/11/93		
Client Sample ID:			B-7/LPE-7		
Parameter	Units	MDL		METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
VOLATILE ORGANICS				8240	
Trichloroethene	ug/L	5	ND		10/22/93
1,2-Dichloropropane	ug/L	5	ND		10/22/93
Bromodichloromethane	ug/L	5	ND		10/22/93
cis-1,3-Dichloropropene	ug/L	5	ND		10/22/93
trans-1,3-Dichloropropene	ug/L	5	ND		10/22/93
1,1,2-Trichloroethane	ug/L	5	ND		10/22/93
Dibromochloromethane	ug/L	5	ND		10/22/93
Bromoform	ug/L	5	ND		10/22/93
4-Methyl-2-pentanone	ug/L	50	ND		10/22/93
Toluene	ug/L	5	ND		10/22/93
2-Hexanone	ug/L	50	ND		10/22/93
1,1,2,2-Tetrachloroethane	ug/L	5	ND		10/22/93
Tetrachloroethene	ug/L	5	ND		10/22/93
Chlorobenzene	ug/L	5	ND		10/22/93
Ethylbenzene	ug/L	5	ND		10/22/93
Styrene	ug/L	5	ND		10/22/93
Xylenes (Total)	ug/L	5	ND		10/22/93
1,3-Dichlorobenzene	ug/L	5	ND		10/22/93
1,4-Dichlorobenzene	ug/L	5	ND		10/22/93
1,2-Dichlorobenzene	ug/L	5	ND		10/22/93
1,2-Dichloroethane-d4 (Surrog. Recovery)	%		86		10/22/93
Toluene-d8 (Surrog. Recovery)	%		101		10/22/93
4-Bromofluorobenzene (Surrog. Recovery)	%		91		10/22/93
SEMI-VOLATILES				8270	
8270 Date Extracted			-		10/13/93
n-Nitrosodimethylamine	ug/L	10	ND		10/27/93
Phenol	ug/L	10	ND		10/27/93
Aniline	ug/L	10	ND		10/27/93
bis(2-Chloroethyl)ether	ug/L	10	ND		10/27/93
2-Chlorophenol	ug/L	10	ND		10/27/93
1,3-Dichlorobenzene	ug/L	10	ND		10/27/93

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:			75 0173140		
Date Collected:			10/11/93		
Date Received:			10/11/93		
Client Sample ID:			B-7/LPE-7		
Parameter	Units	MDL		METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
SEMI-VOLATILES				8270	
1,4-Dichlorobenzene	ug/L	10	ND		10/27/93
Benzyl alcohol	ug/L	10	ND		10/27/93
1,2-Dichlorobenzene	ug/L	10	ND		10/27/93
2-Methylphenol	ug/L	10	ND		10/27/93
bis(2-Chloroisopropyl)ether	ug/L	10	ND		10/27/93
4-Methylphenol	ug/L	10	ND		10/27/93
n-Nitroso-di-n-propylamine	ug/L	10	ND		10/27/93
Hexachloroethane	ug/L	10	ND		10/27/93
Nitrobenzene	ug/L	10	ND		10/27/93
Isophorone	ug/L	10	ND		10/27/93
2-Nitrophenol	ug/L	10	ND		10/27/93
2,4-Dimethylphenol	ug/L	10	ND		10/27/93
Benzoic acid	ug/L	50	ND		10/27/93
bis(2-Chloroethoxy)methane	ug/L	10	ND		10/27/93
2,4-Dichlorophenol	ug/L	10	ND		10/27/93
1,2,4-Trichlorobenzene	ug/L	10	ND		10/27/93
Naphthalene	ug/L	10	ND		10/27/93
4-Chloroaniline	ug/L	20	ND		10/27/93
Hexachlorobutadiene	ug/L	10	ND		10/27/93
4-Chloro-3-methylphenol	ug/L	10	ND		10/27/93
2-Methylnaphthalene	ug/L	10	ND		10/27/93
Hexachlorocyclopentadiene	ug/L	10	ND		10/27/93
2,4,6-Trichlorophenol	ug/L	10	ND		10/27/93
2,4,5-Trichlorophenol	ug/L	10	ND		10/27/93
2-Chloronaphthalene	ug/L	50	ND		10/27/93
2-Nitroaniline	ug/L	50	ND		10/27/93
Dimethylphthalate	ug/L	10	16		10/27/93
Acenaphthylene	ug/L	10	ND		10/27/93
2,6-Dinitrotoluene	ug/L	10	ND		10/27/93
3-Nitroaniline	ug/L	50	ND		10/27/93
Acenaphthene	ug/L	10	ND		10/27/93

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November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:			75 0173140		
Date Collected:			10/11/93		
Date Received:			10/11/93		
Client Sample ID:			B-7/LPE-7		
Parameter	Units	MDL		METHOD	DATE ANALYZED
ORGANIC ANALYSIS					
SEMI-VOLATILES				8270	
2,4-Dinitrophenol	ug/L	50	ND		10/27/93
4-Nitrophenol	ug/L	50	ND		10/27/93
Dibenzofuran	ug/L	10	ND		10/27/93
2,4-Dinitrotoluene	ug/L	10	ND		10/27/93
Diethylphthalate	ug/L	10	ND		10/27/93
4-Chlorophenyl-phenylether	ug/L	10	ND		10/27/93
Fluorene	ug/L	10	ND		10/27/93
4-Nitroaniline	ug/L	50	ND		10/27/93
4,6-Dinitro-2-methylphenol	ug/L	50	ND		10/27/93
n-Nitrosodiphenylamine	ug/L	10	ND		10/27/93
4-Bromophenyl-phenylether	ug/L	10	ND		10/27/93
Hexachlorobenzene	ug/L	10	ND		10/27/93
Pentachlorophenol	ug/L	10	ND		10/27/93
Phenanthrene	ug/L	10	ND		10/27/93
Anthracene	ug/L	10	ND		10/27/93
Di-n-butylphthalate	ug/L	10	ND		10/27/93
Fluoranthene	ug/L	10	ND		10/27/93
Benzidine	ug/L	50	ND		10/27/93
Pyrene	ug/L	10	ND		10/27/93
Butylbenzylphthalate	ug/L	10	ND		10/27/93
Benzo(a)anthracene	ug/L	10	ND		10/27/93
Chrysene	ug/L	10	ND		10/27/93
bis(2-Ethylhexyl)phthalate	ug/L	10	10		10/27/93
Di-n-octylphthalate	ug/L	10	ND		10/27/93
Benzo(b)fluoranthene	ug/L	10	ND		10/27/93
Benzo(k)fluoranthene	ug/L	10	ND		10/27/93
Benzo(a)pyrene	ug/L	10	ND		10/27/93
Indeno(1,2,3-cd)pyrene	ug/L	10	ND		10/27/93
Dibenzo(a,h)anthracene	ug/L	10	ND		10/27/93
Benzo(g,h,i)perylene	ug/L	10	ND		10/27/93
2-Fluorophenol (Surrog. Recovery)	%		90		10/27/93

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November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

PACE Sample Number:				75 0173140		
Date Collected:				10/11/93		
Date Received:				10/11/93		
Client Sample ID:				B-7/LPE-7		
Parameter		Units	MDL		METHOD	DATE ANALYZED
ORGANIC ANALYSIS						
SEMI-VOLATILES					8270	
Phenol-d5	(Surrog. Recovery)	%		77		10/27/93
Nitrobenzene-d5	(Surrog. Recovery)	%		88		10/27/93
2-Fluorobiphenyl	(Surrog. Recovery)	%		88		10/27/93
2,4,6-Tribromophenol	(Surrog. Recovery)	%		85		10/27/93
Terphenyl-d14	(Surrog. Recovery)	%		65		10/27/93
TPH CARBON CHAIN					8015	
TPH Carbon Chain Date Extracted				-		10/23/93
Carbon Chain Range C10-C11		ug/L	100	ND		11/02/93
Carbon Chain Range C12-C14		ug/L	100	ND		11/02/93
Carbon Chain Range C16-C18		ug/L	100	ND		11/02/93
Carbon Chain Range C20-C24		ug/L	100	ND		11/02/93
Carbon Chain Range C28-C32		ug/L	100	ND		11/02/93
Carbon Chain Range C36-C44		ug/L	100	ND		11/02/93

These data have been reviewed and are approved for release.

Kenneth D. Faust,
Southern California Regional Director

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FOOTNOTES
for pages 1 through 12

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

MDL Method Detection Limit
ND Not detected at or above the MDL.
(1) Detected but below the MDL; therefore, result is an estimated concentration.

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QUALITY CONTROL DATA

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

GFAA, Arsenic
Batch: 75 09431
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
GFAA, Arsenic	mg/L	0.0025	ND

LABORATORY CONTROL SAMPLE AND CONTROL SAMPLE DUPLICATE:

Parameter	Units	MDL	Reference Value	Recv	Dupl Recv	RPD
GFAA, Arsenic	mg/L	0.0025	0.030	90%	87%	3%

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QUALITY CONTROL DATA

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

GFAA, Selenium
Batch: 75 09427
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
GFAA, Selenium	mg/L	0.0025	ND

LABORATORY CONTROL SAMPLE AND CONTROL SAMPLE DUPLICATE:

Parameter	Units	MDL	Reference Value	Recv	Dupl Recv	RPD
GFAA, Selenium	mg/L	0.0025	0.030	103%	103%	0%

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Mr. Suji Somasandaram QUALITY CONTROL DATA November 03, 1993
Page 16 PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

ICP Silver
Batch: 75 09470
Samples: 75 0173123, 75 0173131

METHOD BLANK:

Parameter	Units	MDL	Method Blank
ICP Aluminum	mg/L	0.05	ND
ICP Antimony	mg/L	0.2	ND
ICP Barium	mg/L	0.004	ND
ICP Beryllium	mg/L	0.002	ND
ICP Boron	mg/L	0.1	ND
ICP Cadmium	mg/L	0.006	ND
ICP Calcium	mg/L	0.3	ND
ICP Chromium	mg/L	0.004	ND
ICP Cobalt	mg/L	0.004	ND
ICP Copper	mg/L	0.02	ND
ICP Iron	mg/L	0.02	ND
ICP Lead	mg/L	0.05	ND
ICP Magnesium	mg/L	0.2	ND
ICP Manganese	mg/L	0.003	ND
ICP Molybdenum	mg/L	0.006	ND
ICP Nickel	mg/L	0.02	ND
ICP Potassium	mg/L	1.0	ND
ICP Silicon	mg/L	2.0	ND
ICP Silver	mg/L	0.02	ND
ICP Sodium	mg/L	0.2	ND
ICP Strontium	mg/L	0.005	ND
ICP Thallium			
ICP Tin	mg/L	0.03	ND
ICP Titanium	mg/L	0.005	ND
ICP Vanadium	mg/L	0.005	ND
ICP Zinc	mg/L	0.007	ND

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QUALITY CONTROL DATA

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

ICP Silver
Batch: 75 09470
Samples: 75 0173123, 75 0173131

LABORATORY CONTROL SAMPLE AND CONTROL SAMPLE DUPLICATE:

Parameter	Units	MDL	Reference Value	Recv	Dupl Recv	RPD
ICP Aluminum	mg/L	0.05	5.0	98%	98%	0%
ICP Antimony	mg/L	0.2	0.50	98%	98%	0%
ICP Barium	mg/L	0.004	0.50	94%	94%	0%
ICP Beryllium	mg/L	0.002	0.50	96%	96%	0%
ICP Boron	mg/L	0.1	0.50	118%	116%	2%
ICP Cadmium	mg/L	0.006	0.50	96%	96%	0%
ICP Calcium	mg/L	0.3	50	98%	98%	0%
ICP Chromium	mg/L	0.004	0.50	96%	98%	2%
ICP Cobalt	mg/L	0.004	0.50	96%	96%	0%
ICP Copper	mg/L	0.02	0.50	98%		
ICP Copper	mg/L	0.005			98%	0%
ICP Iron	mg/L	0.02	5.0	96%	98%	2%
ICP Lead	mg/L	0.05	0.50	102%	100%	2%
ICP Magnesium	mg/L	0.2	50	94%	94%	0%
ICP Manganese	mg/L	0.003	0.50	96%	96%	0%
ICP Molybdenum	mg/L	0.006	0.50	96%	98%	2%
ICP Nickel	mg/L	0.02	0.50	96%	94%	2%
ICP Potassium	mg/L	1.0	50	94%	94%	0%
ICP Silver	mg/L	0.02	0.50	94%	96%	2%
ICP Sodium	mg/L	0.2	50	92%	94%	2%
ICP Thallium			0.50	&	&	
ICP Titanium	mg/L	0.005	0.50	96%	96%	0%
ICP Vanadium	mg/L	0.005	0.50	94%	96%	2%
ICP Zinc	mg/L	0.007	0.50	94%	96%	2%

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QUALITY CONTROL DATA

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

ICP Thallium
Batch: 75 09512
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
ICP Thallium	mg/L	0.2	ND

LABORATORY CONTROL SAMPLE AND CONTROL SAMPLE DUPLICATE:

Parameter	Units	MDL	Reference Value	Recv	Dupl Recv	RPD
ICP Thallium	mg/L	0.2	0.50	94%	98%	4%

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QUALITY CONTROL DATA

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

Spectrophotometric-Dissolved Sulfide
Batch: 75 09152
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
Spectrophotometric-Dissolved Sulfide	mg/L	0.05	ND

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	MDL	750173395	Spike	Spike Recv	Spike Dupl Recv	RPD
Spectrophotometric-Dissolved Sulfide	mg/L	0.05	ND	0.37	116%	116%	0%

LABORATORY CONTROL SAMPLE:

Parameter	Units	MDL	Reference Value	Recv
Spectrophotometric-Dissolved Sulfide	mg/L	0.05	0.37	111%

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QUALITY CONTROL DATA

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

TITLE 22 TTLC MERCURY BY CV
Batch: 75 09424
Samples: 75 0173123, 75 0173131

METHOD BLANK:

Parameter	Units	MDL	Method Blank
TTLC, CV Mercury	mg/L	0.0003	ND

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	MDL	750173387	Spike	Spike Recv	Spike Dupl Recv	RPD
TTLC, CV Mercury	mg/L	0.0003	ND	0.0050	86%	84%	2%

LABORATORY CONTROL SAMPLE:

Parameter	Units	MDL	Reference Value	Recv
TTLC, CV Mercury	mg/L	0.0003	0.0050	106%

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Client Reference: Metro Rail (93-4955.02)

BTEX & TPH QUANTIFIED AS GASOLINE
Batch: 75 09070
Samples: 75 0173115

METHOD BLANK:

Parameter	Units	MDL	Method Blank
TPH Quantified as Gasoline	ug/L	50	ND
Benzene	ug/L	0.3	ND
Toluene	ug/L	0.3	ND
Ethylbenzene	ug/L	0.3	ND
Xylenes, Total	ug/L	0.6	ND
a,a,a-Trifluorotoluene Surrogate Rec.	%		99

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	MDL	750173441	Spike	Spike Recv	Spike Dupl Recv	RPD
Benzene	ug/L	0.3	ND	20	94%	99%	5%
Toluene	ug/L	0.3	ND	20	97%	102%	5%
Ethylbenzene	ug/L	0.3	ND	20	93%	99%	6%
Xylenes, Total	ug/L	0.6	ND	60	95%	100%	5%

LABORATORY CONTROL SAMPLE:

Parameter	Units	MDL	Reference Value	Recv
TPH Quantified as Gasoline	ug/L	50	450	107%
Benzene	ug/L	0.3	20	106%
Toluene	ug/L	0.3	20	109%
Ethylbenzene	ug/L	0.3	20	108%
Xylenes, Total	ug/L	0.6	60	108%

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Client Reference: Metro Rail (93-4955.02)

BTEX & TPH QUANTIFIED AS GASOLINE
Batch: 75 09096
Samples: 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
TPH Quantified as Gasoline	ug/L	50	ND
Benzene	ug/L	0.3	ND
Toluene	ug/L	0.3	ND
Ethylbenzene	ug/L	0.3	ND
Xylenes, Total	ug/L	0.6	ND
a,a,a-Trifluorotoluene Surrogate Rec.	%		109

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	MDL	750173484	Spike	Spike Recv	Spike Dupl Recv	RPD
Benzene	ug/L	0.3	0.7	20	87%	90%	3%
Toluene	ug/L	0.3	0.4	20	90%	91%	1%
Ethylbenzene	ug/L	0.3	ND	20	90%	93%	3%
Xylenes, Total	ug/L	0.6	ND	60	91%	92%	1%

LABORATORY CONTROL SAMPLE:

Parameter	Units	MDL	Reference Value	Recv
TPH Quantified as Gasoline	ug/L	50	450	100%
Benzene	ug/L	0.3	20	110%
Toluene	ug/L	0.3	20	110%
Ethylbenzene	ug/L	0.3	20	108%
Xylenes, Total	ug/L	0.6	60	110%

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QUALITY CONTROL DATA

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

SEMI-VOLATILES
Batch: 75 09417
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
n-Nitrosodimethylamine	ug/L	10	ND
Phenol	ug/L	10	ND
Aniline	ug/L	10	ND
bis(2-Chloroethyl)ether	ug/L	10	ND
2-Chlorophenol	ug/L	10	ND
1,3-Dichlorobenzene	ug/L	10	ND
1,4-Dichlorobenzene	ug/L	10	ND
Benzyl alcohol	ug/L	10	ND
1,2-Dichlorobenzene	ug/L	10	ND
2-Methylphenol	ug/L	10	ND
bis(2-Chloroisopropyl)ether	ug/L	10	ND
4-Methylphenol	ug/L	10	ND
n-Nitroso-di-n-propylamine	ug/L	10	ND
Hexachloroethane	ug/L	10	ND
Nitrobenzene	ug/L	10	ND
Isophorone	ug/L	10	ND
2-Nitrophenol	ug/L	10	ND
2,4-Dimethylphenol	ug/L	10	ND
Benzoic acid	ug/L	50	ND
bis(2-Chloroethoxy)methane	ug/L	10	ND
2,4-Dichlorophenol	ug/L	10	ND
1,2,4-Trichlorobenzene	ug/L	10	ND
Naphthalene	ug/L	10	ND
4-Chloroaniline	ug/L	20	ND
Hexachlorobutadiene	ug/L	10	ND
4-Chloro-3-methylphenol	ug/L	10	ND
2-Methylnaphthalene	ug/L	10	ND
Hexachlorocyclopentadiene	ug/L	10	ND
2,4,6-Trichlorophenol	ug/L	10	ND
2,4,5-Trichlorophenol	ug/L	10	ND
2-Chloronaphthalene	ug/L	50	ND
2-Nitroaniline	ug/L	50	ND

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QUALITY CONTROL DATA

November 03, 1993
PACE Project Number: 731011500

Client Reference: Metro Rail (93-4955.02)

SEMI-VOLATILES
Batch: 75 09417
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
Dimethylphthalate	ug/L	10	ND
Acenaphthylene	ug/L	10	ND
2,6-Dinitrotoluene	ug/L	10	ND
3-Nitroaniline	ug/L	50	ND
Acenaphthene	ug/L	10	ND
2,4-Dinitrophenol	ug/L	50	ND
4-Nitrophenol	ug/L	50	ND
Dibenzofuran	ug/L	10	ND
2,4-Dinitrotoluene	ug/L	10	ND
Diethylphthalate	ug/L	10	ND
4-Chlorophenyl-phenylether	ug/L	10	ND
Fluorene	ug/L	10	ND
4-Nitroaniline	ug/L	50	ND
4,6-Dinitro-2-methylphenol	ug/L	50	ND
n-Nitrosodiphenylamine	ug/L	10	ND
4-Bromophenyl-phenylether	ug/L	10	ND
Hexachlorobenzene	ug/L	10	ND
Pentachlorophenol	ug/L	10	ND
Phenanthrene	ug/L	10	ND
Anthracene	ug/L	10	ND
Di-n-butylphthalate	ug/L	10	ND
Fluoranthene	ug/L	10	ND
Benzidine	ug/L	50	ND
Pyrene	ug/L	10	ND
Butylbenzylphthalate	ug/L	10	ND
Benzo(a)anthracene	ug/L	10	ND
Chrysene	ug/L	10	ND
bis(2-Ethylhexyl)phthalate	ug/L	10	ND
Di-n-octylphthalate	ug/L	10	ND
Benzo(b)fluoranthene	ug/L	10	ND
Benzo(k)fluoranthene	ug/L	10	ND
Benzo(a)pyrene	ug/L	10	ND

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Client Reference: Metro Rail (93-4955.02)

SEMI-VOLATILES
Batch: 75 09417
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter		Units	MDL	Method Blank
Indeno(1,2,3-cd)pyrene		ug/L	10	ND
Dibenzo(a,h)anthracene		ug/L	10	ND
Benzo(g,h,i)perylene		ug/L	10	ND
2-Fluorophenol	(Surrog. Recovery	%		94
Phenol-d5	(Surrog. Recovery	%		84
Nitrobenzene-d5	(Surrog. Recovery	%		81
2-Fluorobiphenyl	(Surrog. Recovery	%		87
2,4,6-Tribromophenol	(Surrog. Recovery	%		87
Terphenyl-d14	(Surrog. Recovery	%		95

LABORATORY CONTROL SAMPLE AND CONTROL SAMPLE DUPLICATE:

Parameter	Units	MDL	Reference Value	Recv	Dupl Recv	RPD
Phenol	ug/L	10	100	72%	83%	14%
2-Chlorophenol	ug/L	10	100	73%	74%	1%
1,4-Dichlorobenzene	ug/L	10	100	73%	78%	7%
n-Nitroso-di-n-propylamine	ug/L	10	100	74%	85%	14%
1,2,4-Trichlorobenzene	ug/L	10	100	79%	85%	7%
4-Chloro-3-methylphenol	ug/L	10	100	80%	89%	11%
Acenaphthene	ug/L	10	100	74%	80%	8%
4-Nitrophenol	ug/L	50	100	65%	68%	5%
2,4-Dinitrotoluene	ug/L	10	100	79%	87%	10%
Pentachlorophenol	ug/L	10	100	114%	122%	7%
Pyrene	ug/L	10	100	81%	85%	5%

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Client Reference: Metro Rail (93-4955.02)

TPH CARBON CHAIN
Batch: 75 09598
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
Carbon Chain Range C10-C11	ug/L	100	ND
Carbon Chain Range C12-C14	ug/L	100	ND
Carbon Chain Range C16-C18	ug/L	100	ND
Carbon Chain Range C20-C24	ug/L	100	ND
Carbon Chain Range C28-C32	ug/L	100	ND
Carbon Chain Range C36-C44	ug/L	100	ND

LABORATORY CONTROL SAMPLE AND CONTROL SAMPLE DUPLICATE:

Parameter	Units	MDL	Reference Value	Recv	Dupl Recv	RPD
Carbon Chain Range C10-C11	ug/L	100	720	95%	104%	9%
Carbon Chain Range C12-C14	ug/L	100	720	105%	115%	9%
Carbon Chain Range C16-C18	ug/L	100	450	99%	109%	10%
Carbon Chain Range C20-C24	ug/L	100	120	104%	114%	9%
Carbon Chain Range C28-C32	ug/L	100	60	170%	237%	33%

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Client Reference: Metro Rail (93-4955.02)

VOLATILE ORGANICS
Batch: 75 09269
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
Chloromethane	ug/L	10	ND
Vinyl chloride	ug/L	10	ND
Bromomethane	ug/L	10	ND
Chloroethane	ug/L	10	ND
Trichlorofluoromethane	ug/L	10	ND
1,1-Dichloroethene	ug/L	5	ND
Acetone	ug/L	50	ND
Carbon disulfide	ug/L	5	ND
Methylene chloride	ug/L	5	ND
trans-1,2-Dichloroethene	ug/L	5	ND
1,1-Dichloroethane	ug/L	5	ND
2-Butanone	ug/L	50	ND
cis-1,2-Dichloroethene	ug/L	5	ND
Chloroform	ug/L	5	ND
1,2-Dichloroethane	ug/L	5	ND
1,1,1-Trichloroethane	ug/L	5	ND
Carbon tetrachloride	ug/L	5	ND
Benzene	ug/L	5	ND
Trichloroethene	ug/L	5	ND
1,2-Dichloropropane	ug/L	5	ND
Bromodichloromethane	ug/L	5	ND
cis-1,3-Dichloropropene	ug/L	5	ND
trans-1,3-Dichloropropene	ug/L	5	ND
1,1,2-Trichloroethane	ug/L	5	ND
Dibromochloromethane	ug/L	5	ND
Bromoform	ug/L	5	ND
4-Methyl-2-pentanone	ug/L	50	ND
Toluene	ug/L	5	ND
2-Hexanone	ug/L	50	ND
1,1,2,2-Tetrachloroethane	ug/L	5	ND
Tetrachloroethene	ug/L	5	ND
Chlorobenzene	ug/L	5	ND

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Client Reference: Metro Rail (93-4955.02)

VOLATILE ORGANICS
Batch: 75 09269
Samples: 75 0173115, 75 0173140

METHOD BLANK:

Parameter	Units	MDL	Method Blank
Ethylbenzene	ug/L	5	ND
Styrene	ug/L	5	ND
Xylenes (Total)	ug/L	5	ND
1,3-Dichlorobenzene	ug/L	5	ND
1,4-Dichlorobenzene	ug/L	5	ND
1,2-Dichlorobenzene	ug/L	5	ND
1,2-Dichloroethane-d4 (Surrog. Recovery	%		88
Toluene-d8 (Surrog. Recovery	%		102
4-Bromofluorobenzene (Surrog. Recovery	%		93

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	MDL	750173140 B-7/LPE-7	Spike	Spike Recv	Spike Dupl Recv	RPD
1,1-Dichloroethene	ug/L	5	ND	50	105%	108%	3%
Benzene	ug/L	5	ND	50	113%	111%	2%
Trichloroethene	ug/L	5	ND	50	106%	98%	8%
Toluene	ug/L	5	ND	50	94%	99%	5%
Chlorobenzene	ug/L	5	ND	50	87%	90%	3%

LABORATORY CONTROL SAMPLE:

Parameter	Units	MDL	Reference Value	Recv
1,1-Dichloroethene	ug/L	5	50	104%
Benzene	ug/L	5	50	106%
Trichloroethene	ug/L	5	50	102%
Toluene	ug/L	5	50	97%
Chlorobenzene	ug/L	5	50	88%

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Client Reference: Metro Rail (93-4955.02)

&	Recovery not calculated because solution units don't match
MDL	Method Detection Limit
ND	Not detected at or above the MDL.
RPD	Relative Percent Difference

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THE ASSURANCE OF QUALITY

109632

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: TETC
Address: 100 W. Broadway, Long Beach CA
Phone: 714-458-7414

Report To: G. Miller / Suji
Bill To:
P.O. # / Billing Reference:
Project Name / No.: Metro Rail / 93-4955-02

Pace Client No.:
Pace Project Manager:
Pace Project No.: 731011.500
*Requested Due Date:

Sampled By (PRINT):
Robert J. Bryan — 10/11/93
Sampler Signature — Date Sampled

PRESERVATIVES: UNPRESERVED, H_2SO_4, HNO_3, VOA, HCL

ANALYSES REQUEST: BTEX, 624, 625, Sulfide 316.1*, C.C.I.D., Metals filtered, * Total H2S

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	HCL	BTEX	624	625	Sulfide 316.1	C.C.I.D.	Metals filtered	REMARKS
1	40ml Glass	1230	GW		2				✓	✓	✓						B-7/LPE-7
2	↓	↓	↓		2				✓	✓		✓					B-7/LPE-7 17313.1
3	1 Liter AG				1	✓							✓				B-7/LPE-7 17314.0
4	↓				1	✓								✓			B-7/LPE-7
5	↓	↓	↓		1	✓									✓		B-7/LPE-7
6	500ml Plastic	1230	GW		1			✓								✓	B-7/LPE-7
7																	
8																	

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	RETURNED / DATE
25	Disposable		

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-6	Robert J. Bryan / TETC	[signature] PACE	10-11	1516

Additional Comments
316.1 Container unlabeled as to Preservative

REDO@

Cont'D ↓

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

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109630

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: TETC
Address: 100 W. Broadway, Long Beach CA
Phone: 714 458-7414

Report To: G. Miller / Suji
Bill To:
P.O. # / Billing Reference:
Project Name / No.: Metro Rail / 93-4955-02

Pace Client No.:
Pace Project Manager:
Pace Project No.: 731011.500
*Requested Due Date:

Sampled By (PRINT):
Sampler Signature: Robert J. Bryan
Date Sampled: 10/11/93

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	HCL	BTEX (602)	624	625	Sulfide 316.1	CC I.O.	Metals Filtered	REMARKS
1	40ml Glass	0945	GW		2				✓	✓	✓						B-1/LPE-1
2	↓	↓	↓		2				✓	✓		✓					B-1/LPE-1 17311.5
3	1 Liter AG	↓	↓		1	✓							✓				B-1/LPE-1 17312.3
4	↓	↓	↓		1	✓								✓			B-1/LPE-1
5	1 Liter AG	0945	GW		1	✓									✓		B-1/LPE-1
6	500ml Plastic	0945	GW		1			✓								✓	B-1/LPE-1
7																	
8																	

Total Sulfide Ashim/SH 10/12/93

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	RETURNED / DATE
25	Disposable		

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-6	Robert J. Bryan / TETC	[signature] PACE	10-11	1516

Additional Comments
316.1 container unlabeled as to preservative
REC @ 6 4° C
GW

ORIGINAL Al Sb (As) Ba Be B Cd Ca Cr Co, Cu Ag Fe Pb ...

SEE REVERSE SIDE FOR INSTRUCTIONS