U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

SUBSURFACE GEOTECHNICAL INVESTIGATIONS NEAR SITES OF GROUND DEFORMATION CAUSED BY THE JANUARY 17, 1994, NORTHRIDGE, CALIFORNIA, EARTHQUAKE

By

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Open-file report 98-373

1998

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ABSTRACT

This report contains geotechnical and geologic data from 62 CPT soundings and 29 hollow-stem auger borings performed at four sites of permanent ground deformation caused by the 1994 Northridge, California, earthquake. Three of the sites were in the epicentral region within the San Fernando Valley, the fourth site was in Potrero Canyon. All four sites experienced high levels of ground shaking and ground cracking and were in areas where underground utilities, gas transmission lines, and foundations were damaged. The subsurface investigations found materials with a low resistance to liquefaction at three of the sites--Balboa Boulevard, Wynne Avenue, and Potrero Canyon-- and a weak soft clay at the fourth site-- Malden Street.

INTRODUCTION

The January 17, 1994, M_S=6.8 Northridge, California, earthquake created an estimated property loss of between $20 and 30 billion (Holzer and others, 1996), and was responsible for 57 fatalities and more than 9,000 people injured (Gordon, 1994).

The earthquake occurred on a blind reverse fault beneath the San Fernando Valley. No primary surface faulting was associated with the earthquake (Gordon, 1994). The widespread damage to buildings, roads and life lines is attributed to the location of the epicenter within an urban region and the unusually high ground motions for a California earthquake of this size. Peak accelerations ranged from 1.8 g, at Tarzana (7 km from the epicenter) to 0.9 g at Sylmar (15 km from the epicenter) to 0.5 g at several other sites within 40 km of epicenter (Peterson, 1994).

Ground cracks and ground failures in the alluvium underlying the San Fernando Valley were extensive during the earthquake but the mechanism of failure at some sites was unclear. This report contains subsurface data that we collected to help resolve the questions as to the mechanisms of failure. A preliminary report was published by Holzer and others (1996). Holzer and others (in press) present a comprehensive analysis of these data.

Investigations were conducted at four ground failure sites during 1995 and 1996. The investigation consisted of cone and standard penetration tests, in-situ vane tests, and Shelby tube sampling. Laboratory tests on samples included: grain size, water content, bulk density, Atterberg limits, and laboratory vane tests. These investigations also were augmented with other USGS investigations described in Holzer and others (in press).

METHODS

Cone Penetration Test (CPT)

Cone penetration tests were made at each of the four sites to define stratification and measure penetration resistance for use in estimating liquefaction resistance. The cone used is a 10-ton subtraction cone with a single element strain gauge in a 3.6 cm diameter housing. The 60-degree conical tip has an end area of 10 cm^2. The sleeve behind the tip has an area of 150 cm^2. The cone was advanced into the ground at a rate of 2-cm per second. The procedures and equipment follow

the requirements described in the American Society of Testing and Materials (ASTM)guidelines D-3441-79 (ASTM, 1983).

Standard Penetration Test (SPT)

Following CPT soundings, SPT borings were made about 1.5 m away to measure dynamic penetration resistance for liquefaction analyses and to obtain samples for soil index tests. The SPT procedures follow the ASTM guidelines in D1586-67 (ASTM, 1983). These procedures were modified (Youd and Bennett, 1983) for use with hollow-stem augers (25-cm outside and 10-cm inside diameter). A Mobile[2] split barrel "ADO standard penetration sampler" (5 cm outside and 3.5 cm inside diameter) was used with liners. The sampler was driven into the soil with a Mobile "In-hole sampling hammer" (64 kg) falling 76 cm. The hammer is raised and dropped using a Mobile "Safe-T-Driver" hoist. After the hydraulic system has lifted the hammer the required distance the winch is reversed and cable is thrown off the hoist allowing the hammer to fall freely. The penetration resistance (N) is equal to the number of hammer blows to advance the sampler 30 cm after an initial seating of 15 cm. The measured overall efficiency of this system is 68 percent (Douglas and Strutynsky, 1984). Samples were described in the field (including color), water content samples were sealed in containers, and carbon samples for dating were also collected. Undisturbed samples were taken with thin-walled Shelby tubes (7.6 x 91 cm and 8.9 x 76 cm). Tubes were slowly pushed into the soil past the tip of the auger, the auger was then advanced the sampling length, following which the tube was then rotated to shear off the sample from the undisturbed soil.

In-situ field vane tests were made through the hollow-stem auger to a maximum depth of about 6.4 m. The hand held vane instrument is a Pilcon model DR 799. The vane was rotated at 90 degrees per minute. This is a faster than recommended rate, but because the device is hand held and operated without a gearing system it was a rate that could be reproduced with confidence. Justification for the high rate is described in Holzer and others (in press).

Laboratory Methods

Index tests conducted in the laboratory include; grain size (D422-63, ASTM, 1983), liquid limit (D423-66, ASTM, 1983), plastic limit (D424-59, ASTM, 1983), and water content (D2216, ASTM, 1983). Samples were classified using the Unified Soil Classification (D2488-69, ASTM, 1983) as modified by Howard (1984). Shelby tube samples were cut into 15 cm lengths for bulk density and vane tests. The length of each subsample was measured and the tube and sample weighed. A pocket penetrometer was then used to measure compressive strength at the end of the sample. Next, shear strength was measured using a Wykeham Farrance laboratory vane shear with the sample still in the tube. The vane (12.7 x 12.7 mm) was pushed into the sample 40 mm and rotated at 90 degrees per minute. Peak strength, residual strength and remolded strength were determined, then the vane was removed and a water content sample was taken from the area of the vane test. The sample was then extruded and described. Results of the laboratory tests are

[2]Use of trade names is for descriptive purposes only.

shown in Table 2. CPT profiles, SPT data, median grain size and fines content, and brief field descriptions are shown in the logs.

Radiocarbon Analyses

Radiocarbon dates were determined using the accelerator mass spectrometer (AMS) technique. The reported dates have been adjusted by carbon-13 for total isotope effect generated in both nature and during the physical and chemical laboratory procedures. The carbon-13 content was measured concurrently with that of carbon-14 and carbon-12 in the accelerator beam, allowing a precise correction.

These dates are reported as RCYBP (radiocarbon years before 1950 A.D.). By international convention, the half-life of radiocarbon is taken as 5568 years and 95% of the activity of the National Bureau of Standards Oxalic Acid (original batch) used as the modern standard. The quoted errors are from the counting of the modern standard, background, and sample being analyzed. They represent a one standard deviation statistic (68% probability), based on the international convention, no corrections are made for DeVries effect, reservoir effects, or isotope fractionation in nature, unless specifically noted (Table 4). Stable carbon ratios are measured on request and are calculated relative to the PDB-1 international standard; the adjusted ages are normalized to -25 per mil carbon 13 (Bennett and Tinsley, 1995).

Liquefaction Resistance

Liquefaction resistance (figs. 28 and 29) was calculated using guidelines developed in the NCEER workshop on evaluation of liquefaction resistance held in Salt Lake City, Utah, January 4 and 5, 1996 (Youd and Idriss, 1997). These guidelines update the empirical work of Seed and others (1985). The NCEER guidelines were incorporated into an Excel spreadsheet by Sam Gilstrap of Brigham Young University (written communication, 1996). Liquefaction resistance is shown in Table 3. Holzer and others (in press) discuss the levels of ground motion used in the analyses (Table 3) and they also describe the overall approach used in the analysis.

SITES

The first phase of the investigation began in May 1995 when CPT soundings were obtained at each site. Once the stratigraphy had been determined, SPT's were conducted to obtain samples and blow counts for liquefaction analysis. The first phase concluded in August 1995. The second phase started and ended in June 1996. CPT's and SPT's were conducted in areas outside the failure zones at Wynne Avenue and Malden Street to determine with more certainty the subsurface conditions outside the failure zones.

Balboa Boulevard

The Balboa Boulevard site is located in the northern end of the San Fernando Valley where a 5-km wide complex of ground cracks formed. This complex of cracks was the most damaging ground failure to occur during the earthquake (Hecker and others, 1995). Foundations of homes

were damaged and buried utilities were ruptured. One very large gas main in the middle of Balboa Boulevard was ruptured and the gas subsequently caught fire, destroying several homes.

Our investigation was conducted in an unnamed alley (parallel to Balboa Boulevard) about 40 m west of Balboa Boulevard. The alley is in the western section of the main zone of cracks. These cracks run generally perpendicular to the regional topographic slope of 1.6%.

The Balboa profile line was about 570-m long, and included 17 CPT soundings and 13 borings. Borings were used for SPT's, Shelby tube samples, field vane tests, and water monitoring wells. The monitoring wells were used to check the stability of the ground water level. The locations of the soundings and borings are shown in figures 1, 2, and 3.

Malden Street

The Malden Street site is located in a vacant lot that was intersected by a 0.5-km-long system of cracks that broke lifelines and damaged the foundations of several houses. There the crack system trends generally east-west; the most conspicuous cracks in the vacant lot form a 4-m wide graben with 0.1 to 0.2 m of vertical offset. For a detailed description of the failure see Holzer and others (in press). Two CPT sounding lines cross the graben, the first is a 50-m long line that is perpendicular to the graben and parallel with the regional 1 percent topographic gradient. Two SPT's are part of this line, one SPT inside the graben and one outside. The second line consists of closely spaced CPT's (10-14) running north-south across the graben.

In phase one, four auger borings were conducted in the vacant lot. Two were conducted within the graben (mal-3ab) and two outside the graben (mal-5ab). At sounding 3 and 5 the first boring was used to conduct SPT's, the second boring was used to obtain 7.6-cm diameter by 76-cm long Shelby tube samples. Layers that were too dense to sample with tubes where sampled with SPT's. In addition, a boring (mal-3c) in the graben was used exclusively for field vane tests.

In phase two, in addition to the soundings and borings in and immediately adjacent to the Malden failure two soundings/borings were made on Melvin Ave. (mal-15) and Cantara St. (mal-16) to examine the subsurface conditions outside the failure zone. The locations of the soundings and borings is shown in figures 1, 2, 4, and 5.

Wynne Avenue

The Wynne Avenue ground failure consisted of a 150-m-long by 12-m-wide zone of cracks defining a graben (Holzer and others, in press). The failure zone trends northeast-southwest and is oblique to the regional topographic gradient (1.3%). The vertical offset in the graben ranged from 0.1 to 0.2 m. The ground rupture damaged water and sewer lines.

Phase one of the investigation began with 11 CPT soundings running along the west side of Wynne Avenue, from the northernmost part of the cul-de-sac to just south of Cantara Street, a distance of 176 m. One boring was made at sounding 1 that combined SPT and Shelby tube samples. Three borings were made at sounding 5. The first was for SPT (wyn-5a), the second (wyn-5b) for Shelby tubes in the fine-grained material and 2 SPT in a sand unit. However, the sample recovery was less than 10% in 5b between 1.5 and 4.5 m. A third boring (wyn-5c) was made to resample the 1.5-4.5 m interval. In addition to the SPT's and tube sample, field vane tests

were conducted in 5c. The spacing between soundings wyn-5a-5b-5c was about 1.5 m. Two borings were made at sounding 7, one (wyn-7a) was for SPT's, the other (wyn-7b) was for Shelby tube samples and SPT's in the sand deposits.

Phase two was designed to investigate the area outside the zone of deformation. Three additional CPT's were made in line with the soundings from phase one. The northern most sounding (Wyn-14) is located on Schoenborn, north of Roscoe Boulevard, and 43 m west of Garden Grove Avenue. The southern most sounding (Wyn 13) was located on Wynne Avenue about 30 m east of the intersection of Wynne, Nestle, and Lorne. Sounding 12 is located 114 m south of Cantara Street on Wynne. SPT's were conducted at soundings 13 and 14 and included Shelby tube samples and field vane tests. The location of the soundings and borings is shown in figures 1, 2, 6, and 7.

Potrero Canyon

Potrero Canyon is a 5-km-long east-west trending valley about 15 km to the northwest of the San Fernando Valley. Ground cracks formed along the north and south margins of the canyon at the contact between the valley fill and bedrock hills. The zone of cracking on each side was about 30 m wide, most of the cracks were extensional with overall displacement at least 10 cm. Vertical displacement ranged from a few centimeters to 60 cm (Rymer and others, 1995).

Two lines of CPT soundings were conducted across the valley. The eastern line (pot-2-7) runs along a north-south trending dirt road that entered a small opening on the south side of Potrero Canyon. The western line (pot-1, 8-12) extends from a high point in the small opening northwest across Potrero Canyon. Each of the lines of investigation consists of 6 CPT soundings and 2 borings where SPT's were obtained, Shelby tubes were taken, and field vane tests were made. Locations of the site, soundings and borings are shown in figures 1 and 8.

RESULTS

Results from the laboratory tests are shown in Table 2. Included in these results are grain size measurements, Atterberg limits, liquidity index, activity, and strength measurements from field and laboratory vane tests. Many of the index tests can be viewed in the figures plotted against depth. Other index properties are plotted against each other to examine different relations. Figure 16 shows the relation between plasticity index/2-micron clay content or activity. Figures 17a and 17b show the relations between liquid limit and plasticity index, this serves as the basis for the fine-grained Unified Soils Classification. The relation between liquidity index and shear strength is shown in fig. 18. Liquidity index can be used to estimate strength, values greater than 1 indicate low shear strength whereas values less than 0 indicate high shear strengths. The ternary diagram in fig. 19 provides a quick and easy way to compare the hundreds of grain size tests and to determine which of the samples have clay (0.005 mm) contents less than 15%.

Balboa Boulevard

The site is underlain by alluvium composed of lean and fat clay (CL and CH) with varying amounts of sand to sandy gravel (GM) with all combinations in between. Grain size properties of all Balboa samples are shown in Table 2.

The stratigraphy was divided into four informal units (Holzer and others, in press). From top down they are: unit A is about 1-m thick and consists of road material, artificial fill, and agricultural soil. Unit B consists of late-Holocene sheet flood and debris flow deposits. The clast lithology changes from sedimentary north of sounding 13 to mixed sedimentary, crystalline, and metamorphic south of sounding 13.5. No part of units A or B is below the water table. Unit C consists of late Pleistocene to middle Holocene fluvial deposits. Unit D consists of dense and firm sand, silt, and clay fluvial deposits of Pleistocene age. Based on lithology, cementation, and pedogenic soil development unit D may be part of the Saugus Formation. The contact between the Pleistocene and Holocene deposits is marked by a significant increase in tip resistance and blow count. Except for soundings 9 and 14, all soundings were terminated in unit D because the maximum reaction force of the sounding system had been reached.

The northern and southern extent of the ground failure in the alley coincides with the intersection of the ground water and the Holocene units. Because of broken pipes and leaking water we were concerned that the water levels measured during the summer of 1995 did not reflect pre-earthquake conditions. Standpipes were placed in seven augered borings and monitored about 18 months. Water levels over this time were stable indicating that the water levels measured during the investigation probably represent pre-earthquake conditions.

Variation in field blow count, peak vane strength, density, water content, median grain size, liquidity index, and plasticity index with depth are shown in figs. 9-15, respectively. The Unified Soil Classification (USC) for fine-grained soils is shown in fig. 17. A general ternary particle-size classification is shown in fig. 19. A general cross section of the entire Balboa profile is shown in fig. 20. Detailed cross sections of the extension and compression zones are shown in figs. 21 and 22, respectively. A detailed analysis of the Balboa Boulevard investigation is described in Holzer and others (in press).

Malden Street

The site is underlain by two alluvial deposits which were divided into geotechnical units. The first geotechnical unit consists of two parts; unit A is a compacted residential fill, and unit B, Holocene alluvium composed of soft to very soft lean clay to sandy lean clay. The clay deposits are inferred to be of overbank and sheetflood origin. The ground water level beneath the failure was 3.9 m. No Holocene deposits with liquefaction potential were located beneath the failure zone. At a depth of 4.3 to 5.8 m the lean clay with sand is particularly soft. Field blow count is 1, field vane strength averages 26 kPa, and tip resistance is 0.2 MN/m^2.

The second geotechnical unit consists of Pleistocene alluvial deposits; the age is inferred on the basis of pedogenic soil profile developments. As at Balboa Boulevard, the contact between the Holocene and Pleistocene deposits is conspicuous in terms of increased penetration resistance and increased median grain size. The Pleistocene unit consists of very coarse silty sand to sandy lean

clay. Bedding is generally irregular and graded. Although unit D contains sediment susceptible to liquefaction, the factor of safety is greater than 1 at a peak ground acceleration of 0.51 g (Holzer and others, in press).

Geotechnical properties of samples are shown in Table 2. Variation in field blow count, peak vane strength, density, water content, median grain size, liquidity index, and plasticity index with depth are shown in figs. 9-15, respectively. The Unified Soil Classification (USC) for fine-grained soils is shown in fig. 17. A general ternary particle-size classification is shown in fig. 19. A general cross section of the entire profile is shown in fig. 23. Logs of the soundings and borings, with median grain sizes, fines content, and a short field description, are shown in logs mal-1-16.

Wynne Avenue

The site is underlain by Holocene and Pleistocene alluvial deposits composed of lean clay and silty sand (Holzer and others, in press). Unit A (0-2 m) consists of road base material, fill and silty sand to sandy lean clay. Unit B (2-6 m) consists of soft lean clay inferred to be flood basin deposits similar to the B unit at Malden street. Unit C (6-15 m) is texturally similar to unit B although Unit C is much firmer. Also, Unit C contains two subunits of silty sand, C_1 (6-8 m) and C_2 (10-11.5 m). Subunit C_1 extends from sounding 8 northward to sounding 14, in general coarsening towards the north. Subunit C_2 is thickest underneath soundings 5 and 11 (separation only about 3.5 m) and disappears northward at sounding 2 and southward at sounding 8. Unit D was only sampled in one boring (5a) and is inferred to be Pleistocene in age based on the increased penetration resistance shown in the CPT and SPT.

Geotechnical properties of samples are shown in Table 2. Variation in field blow count, peak vane strength, density, water content, median grain size, liquidity index, and plasticity index with depth are shown in figs. 9-15, respectively. The Unified Soil Classification (USC) for fine-grained soils is shown in fig. 17. A general ternary particle-size classification is shown in fig. 19. A general cross section of the entire profile is shown in fig. 24. A detailed cross section of the graben is shown in fig. 25. Logs of the soundings and borings, with median grain sizes, fines content, and a short field description, are shown in logs wyn-1-14.

Potrero Canyon

The site is underlain by 12-13 m of Holocene lean clay (CL) with varying amounts of sand and layers of silty sand (SM) and sandy silt (ML) (Holzer and others, in press). The Holocene deposits can be divided into 2 units. Unit A is 1.8-3.5-m thick and consists of lean clay (CL) to sandy lean clay (CL) and silt with sand (ML). This unit is almost entirely above the water table, which ranges from 2 to 5.6 m below the ground surface. Unit C ranges from 7 to 14.9-m thick and consists of lean clay (CL) with varying amounts of sand with 0.3 to 1.8-m thick discontinuous layers of sandy silt (ML) to silty sand (SM). Unit D is inferred to be Pleistocene in age based on pedogenic soil development and penetration resistance. Not all soundings penetrated into unit D; those that did penetrated 0.2 to 3.8 m into the unit. The unit consists of dense silty sand (SM) and firm lean clay (CL) with varying amounts of sand.

Geotechnical properties of samples are shown in Table 2. Variation in field blow count, peak vane strength, density, water content, median grain size, liquidity index, and plasticity index with

depth are shown in figs. 9-15, respectively. The Unified Soil Classification (USC) for fine-grained soils is shown in fig. 17. A general ternary particle-size classification is shown in fig. 19. Cross sections of the east and west profile lines are shown in figs. 26 and 27, respectively. Logs of the soundings and borings, with median grain sizes, fines content, and a short field description, are shown in logs Pot1-12.

Liquefaction Resistance

The liquefaction resistance of samples below the water table and with 15 percent or less clay (0.005 mm) is shown in Table 3. Samples were not evaluated if the beds the samples came from were less than 20 cm thick and if the sample interval contained more than 8 cm of clay. This last restriction occurred frequently because many beds were thin and the sampler penetrated first sand and then clay. Fines content (<0.075 mm) of the evaluated samples ranged from 8 to 82 percent. Field blow counts ranged from 4 to 220 blows per foot.

ACKNOWLEDGMENTS

We wish to acknowledge the great assistance that the City of Los Angeles provided to us in support of our drilling and sounding program. We thank Rob Hancock for coordinating our project with the city, we thank Bertha Jackson for handling the permitting process, J. Jeffrey Butelo coordinated the field operations, and Cu Long and his team of core drillers allowed us to drill and sound through the streets of Los Angeles. We thank Wayne Nordlund, City of Los Angeles, for allowing us to store our equipment in the street maintenance yard. Our work in Potrero Canyon was aided by Jim Harter and Marilyn Nelson of the Newhall Ranch Corporation, and by R.T. Frankian Associates. Thanks also to Coyn Criley for his assistance with drilling and sounding, and conducting the laboratory tests. John Hamilton helped conduct the surveys to locate the soundings and borings. Help with field and laboratory logging was provided by Suzanne Hecker, John Hamilton, and Tom Fumal. We also thank the citizens of the San Fernando Valley for their help in our investigations, especially Mr. and Mrs. Howard Dalquist and Mr. Richard Hamilton for their help and kindness while we were conducting our investigations at the Malden Street site. We also thank the family that lives adjacent to the sounding at Wynne 5 for their help and kindness while we were conducting tests at the Wynne Avenue site.

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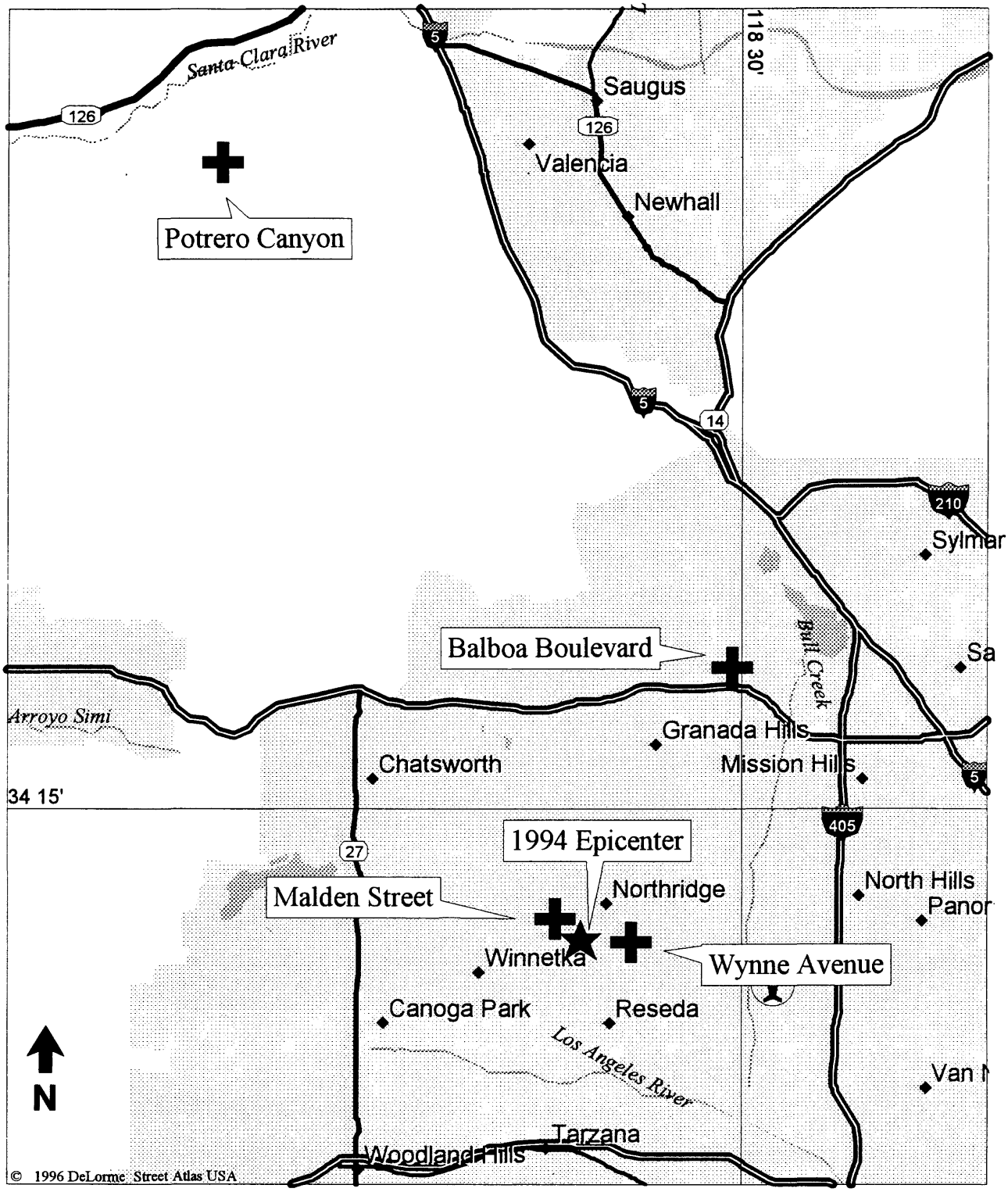
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5
Saugus
126
Valencia
Newhall
118 30'
Potrero Canyon
5
14
210
Sylmar
Balboa Boulevard
Bull Creek
Sa
Arroyo Simi
Granada Hills
Chatsworth
Mission Hills
5
34 15'
405
1994 Epicenter
27
Malden Street
Northridge
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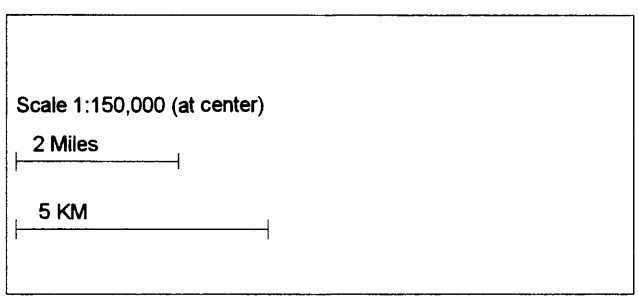
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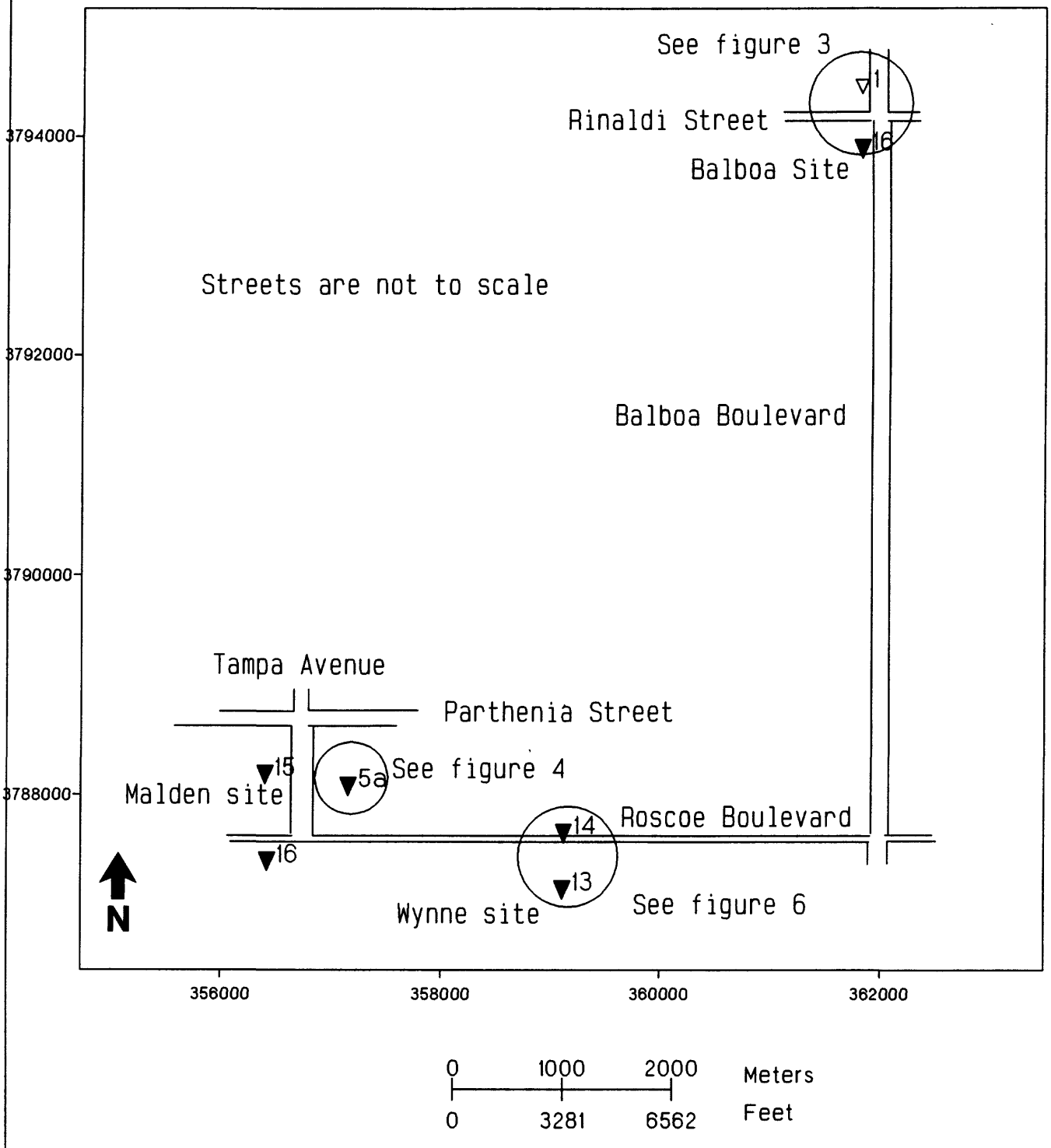
2 Miles
5 KM

Figure 1

County: Los Angeles, 7.5 min Quad: Cangoa Park, UTM zone 11

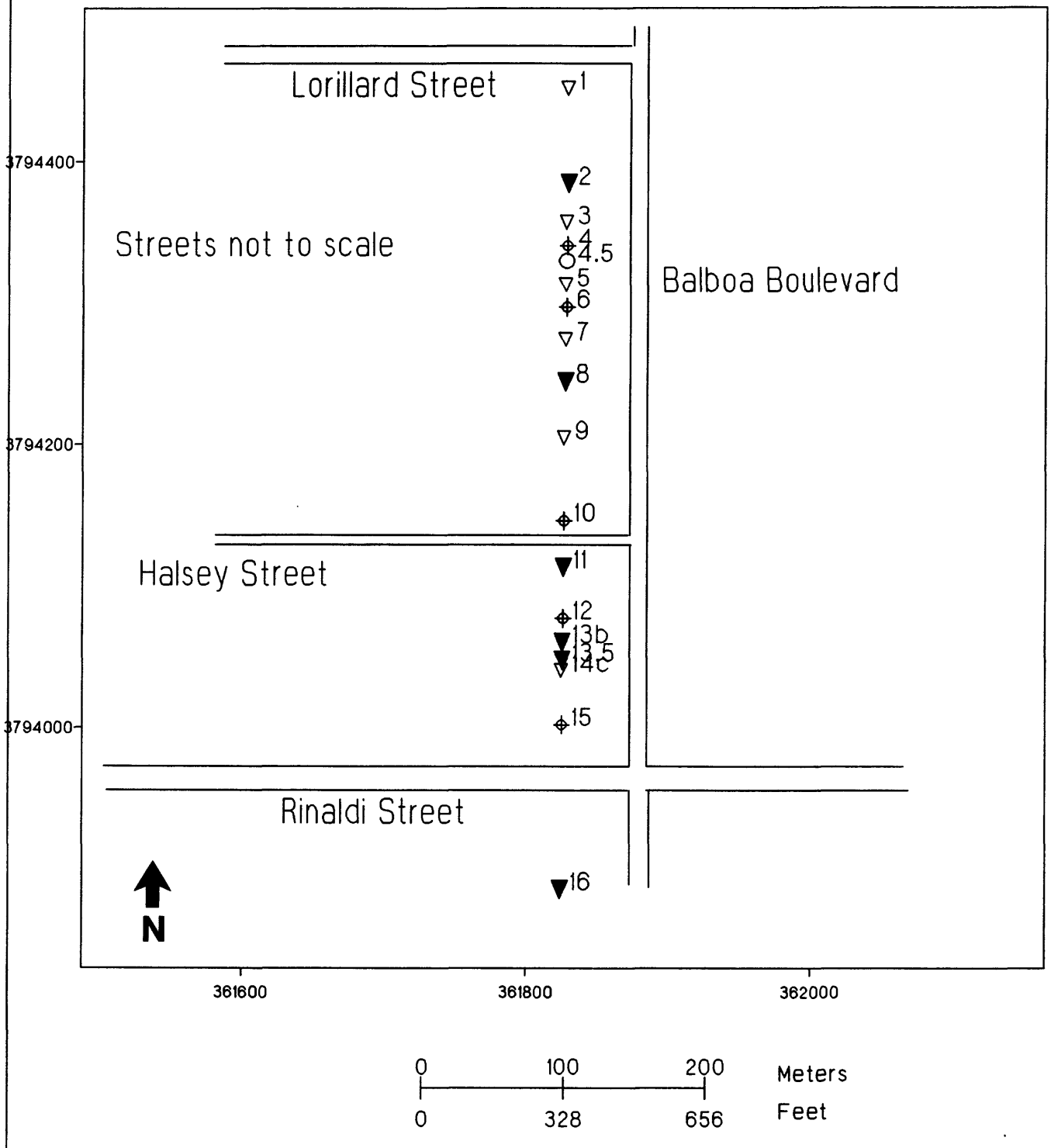


LOCATION: San Fernando Valley, Balboa, Malden, and Wynne

▽=CPT ▼=CPT and SPT

Figure 2

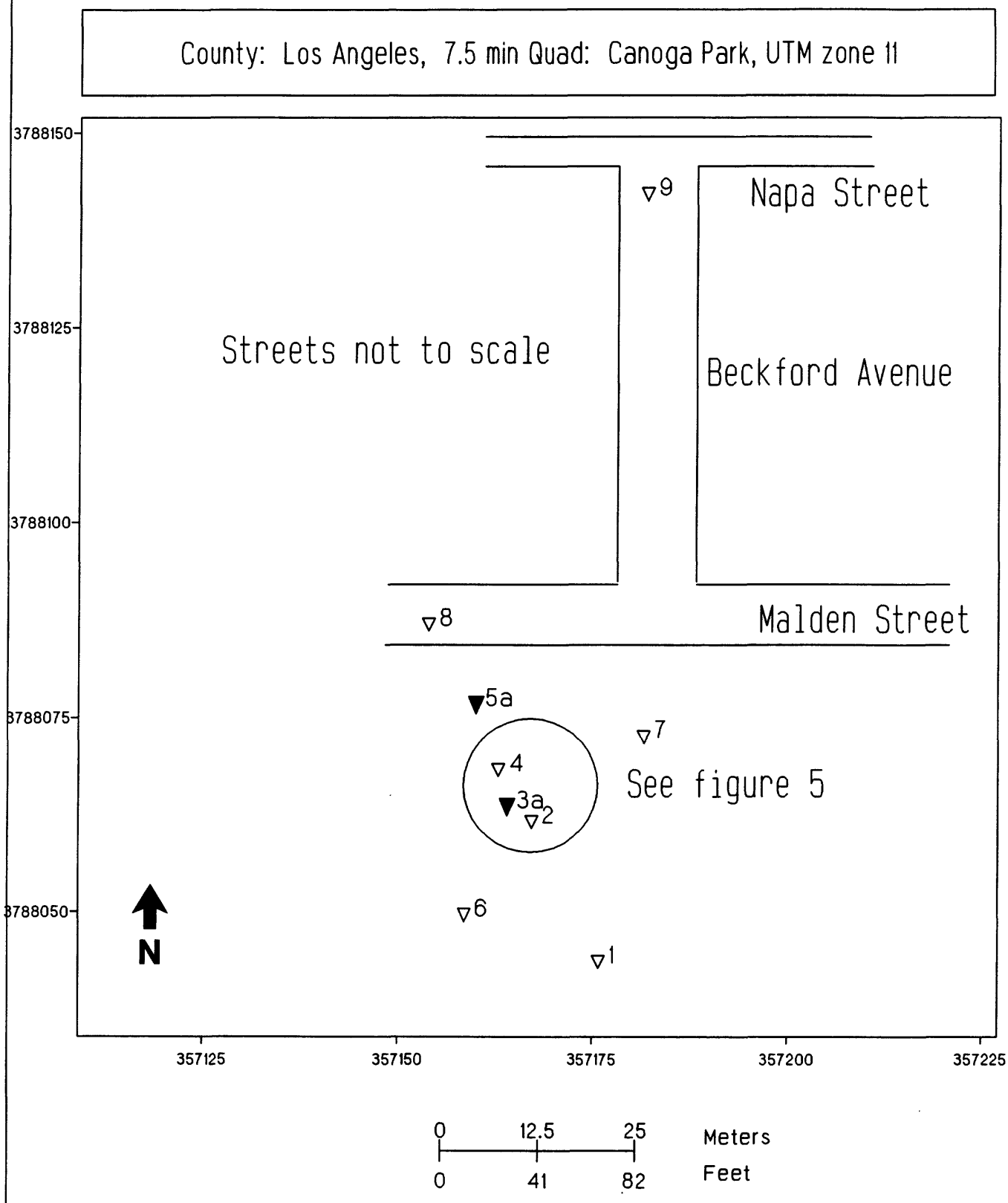
County: Los Angeles, 7.5 min Quad: Oat Mountain, UTM zone 11



LOCATION: Balboa Boulevard

▽=CPT ○=SPT ▼=CPT and SPT ⌖=WELL

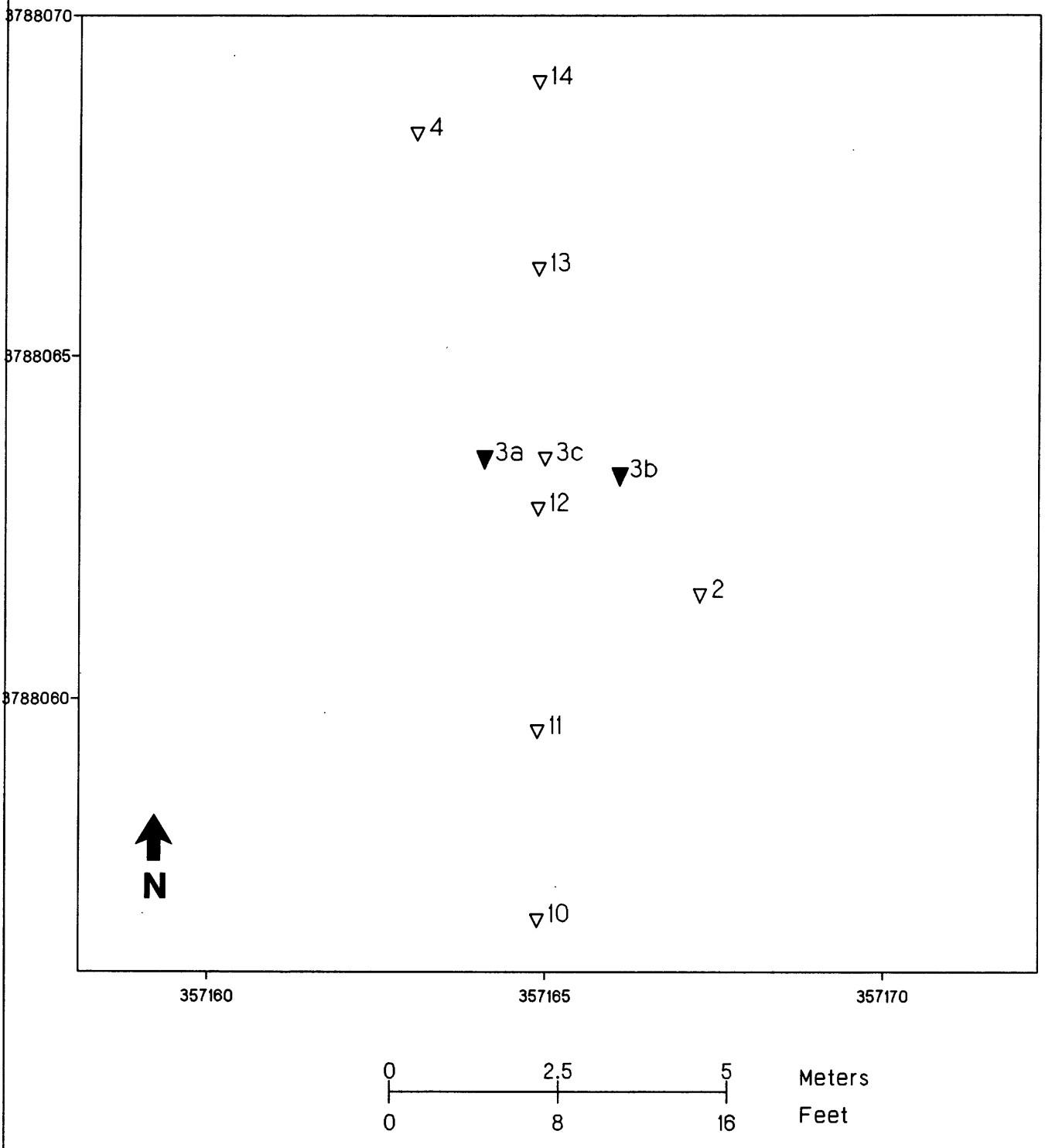
Figure 3



LOCATION: Malden Street, general area

▽=CPT ▼=CPT and SPT

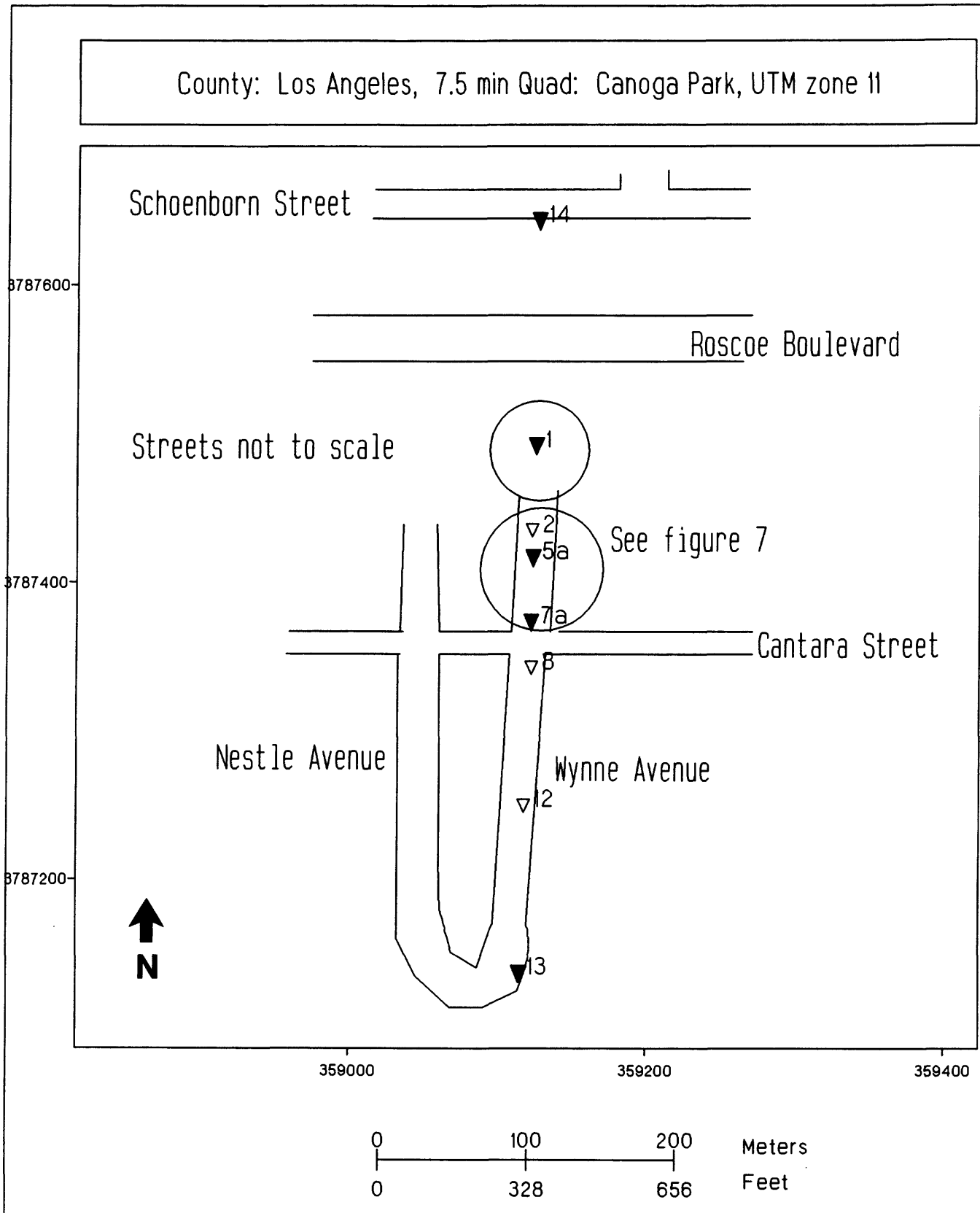
County: Los Angeles, 7.5 min Quad: Canoga Park, UTM zone 11



LOCATION: Malden Street, graben detail

▽=CPT ▼=CPT and SPT

Figure 5

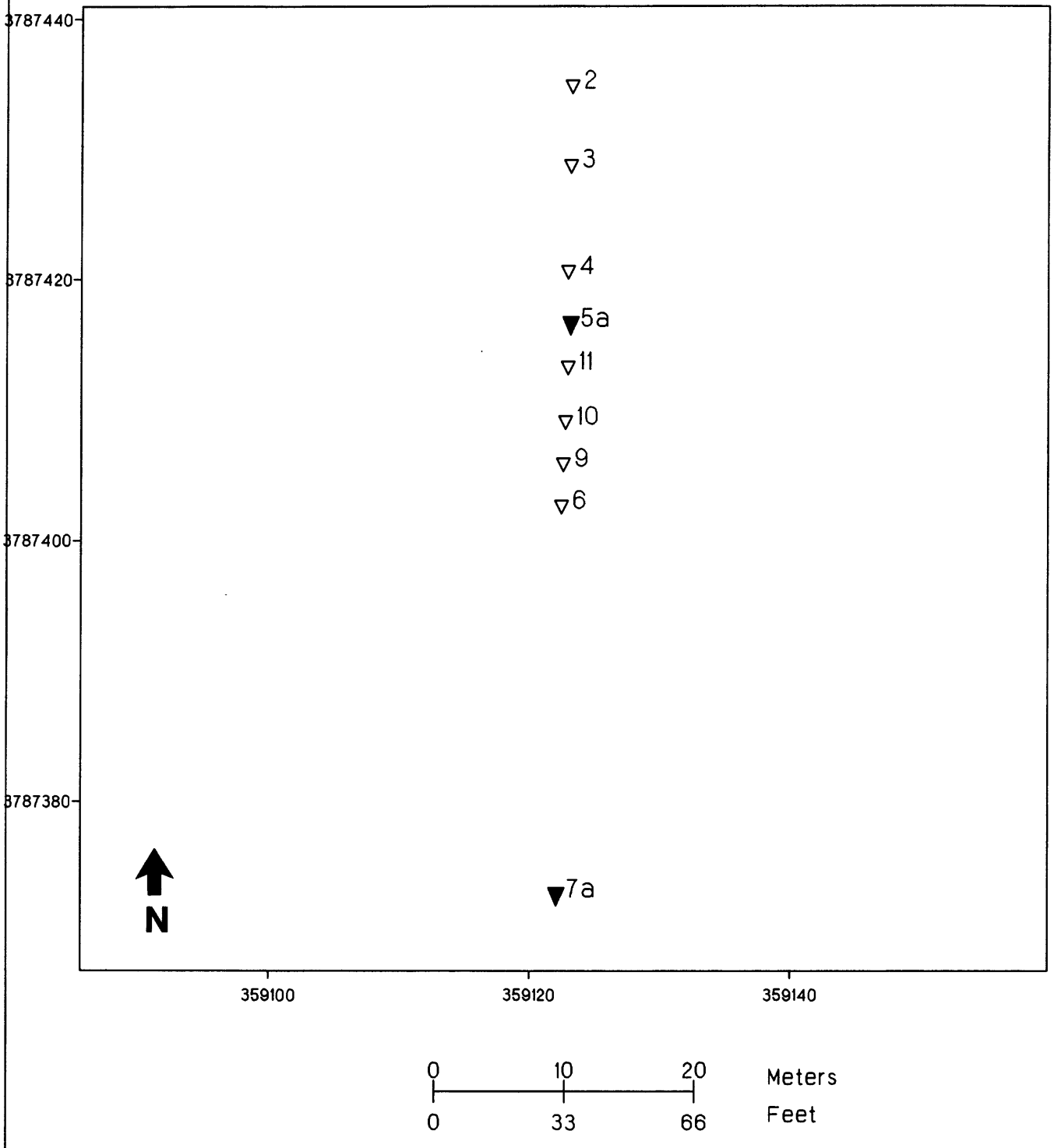


LOCATION: Wynne Avenue, general area

▽=CPT ▼=CPT and SPT

Figure 6

County: Los Angeles, 7.5 min Quad: Cangoa Park, UTM zone 11



LOCATION: Wynne Avenue, graben detail

▽=CPT ▼=CPT and SPT

Figure 7

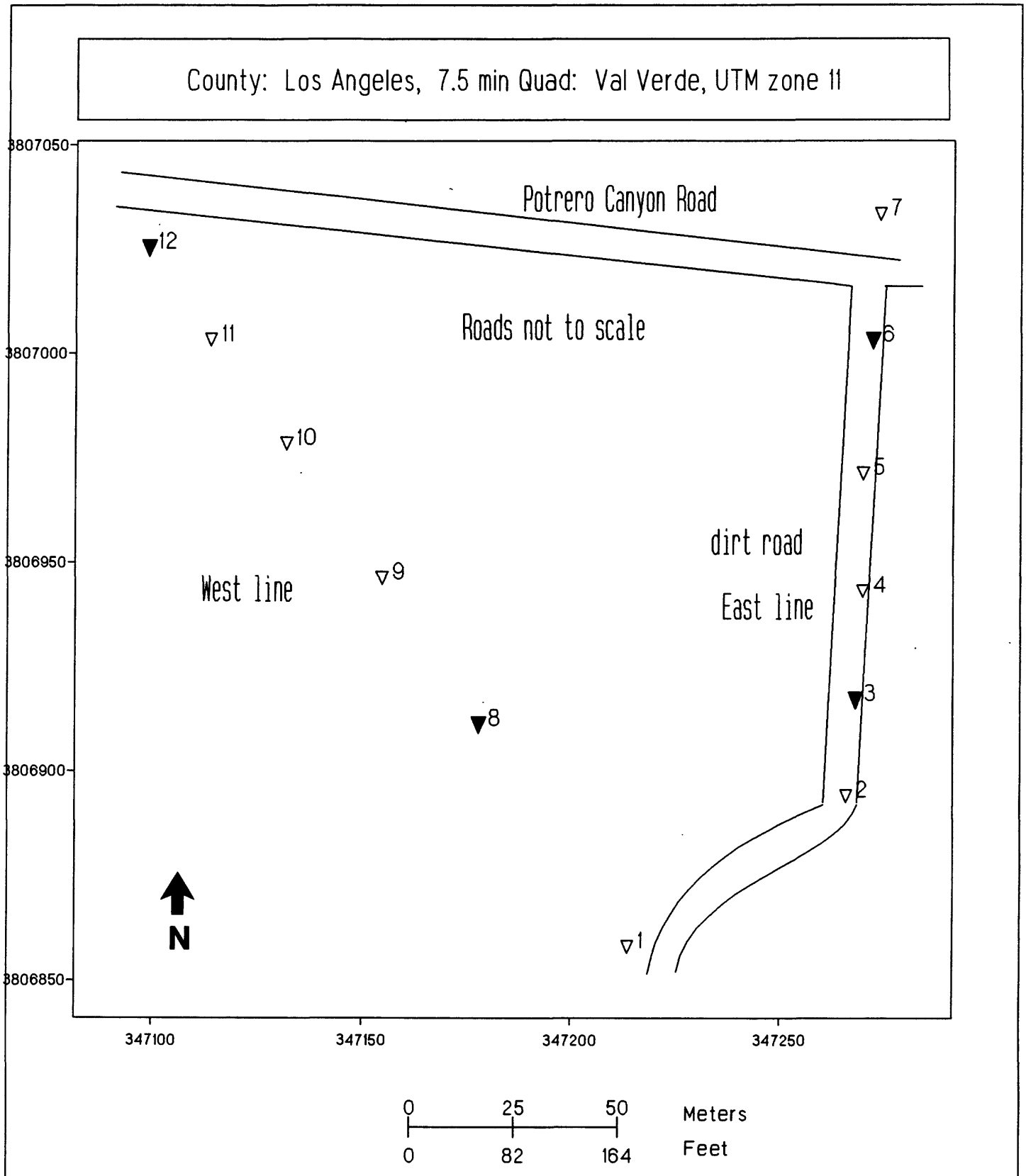

County: Los Angeles, 7.5 min Quad: Val Verde, UTM zone 11
3807050
3807000
3806950
3806900
3806850
347100
347150
347200
347250
Potrero Canyon Road
Roads not to scale
dirt road
East line
West line
N
1
2
3
4
5
6
7
8
9
10
11
12
0
25
50
Meters
0
82
164
Feet
LOCATION: Potrero Canyon
▽=CPT
▼=CPT and SPT

Figure 8

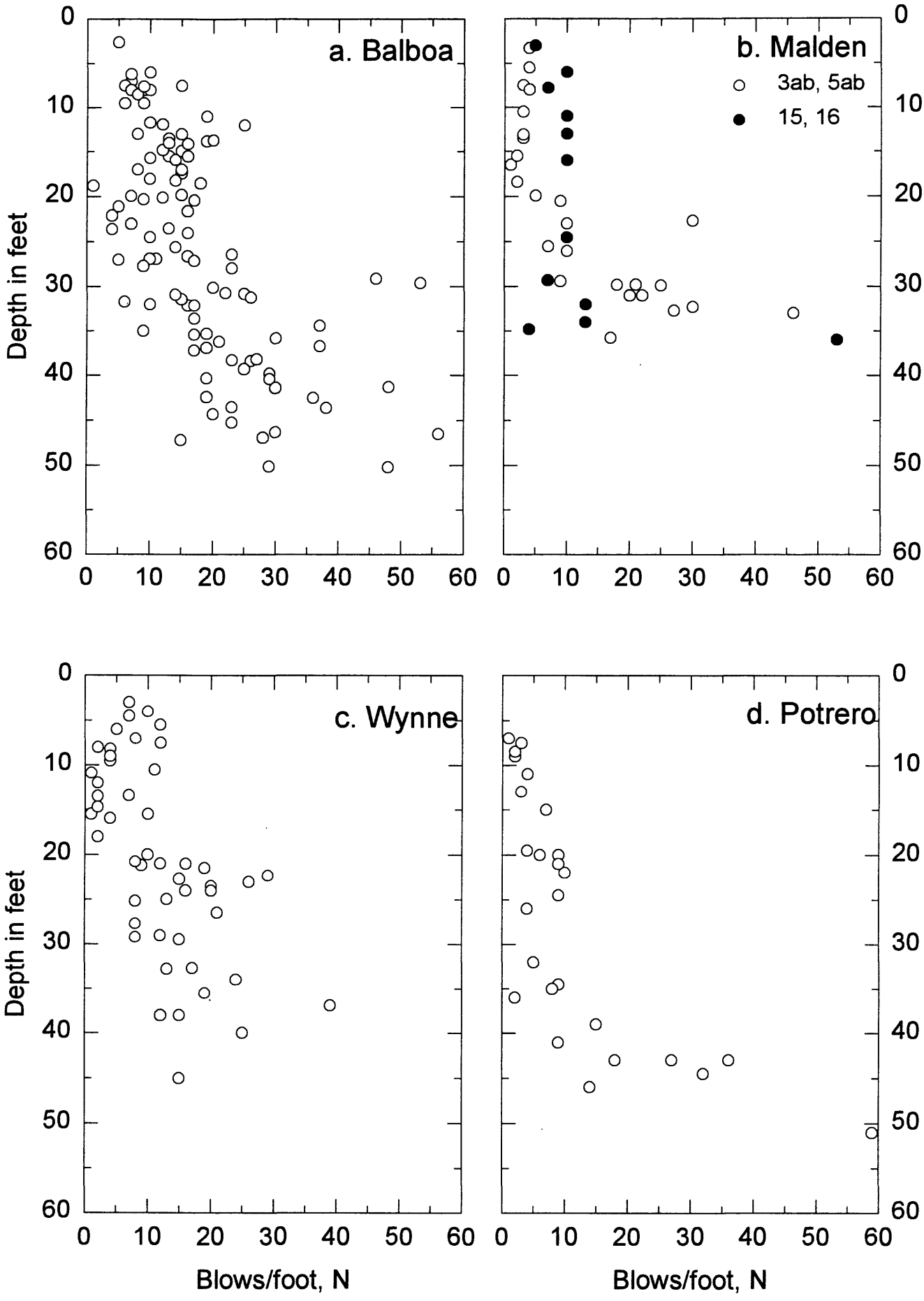

a. Balboa
b. Malden
3ab, 5ab
15, 16
c. Wynne
d. Potrero
Depth in feet
Blows/foot, N
0
10
20
30
40
50
60

Figure 9

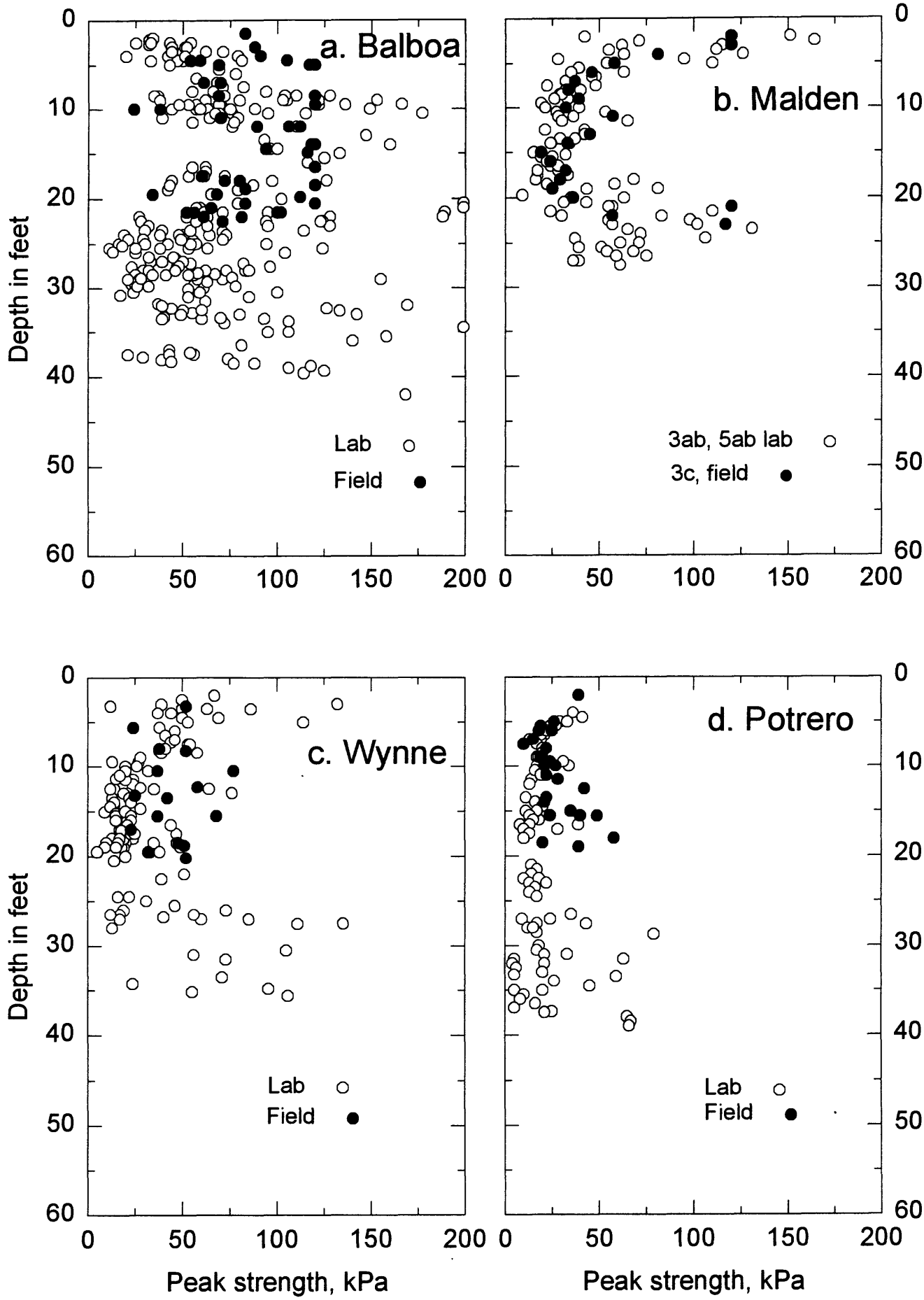

a. Balboa
b. Malden
c. Wynne
d. Potrero
Depth in feet
Peak strength, kPa
Lab
Field
3ab, 5ab lab
3c, field
0
10
20
30
40
50
60
0
50
100
150
200

Figure 10

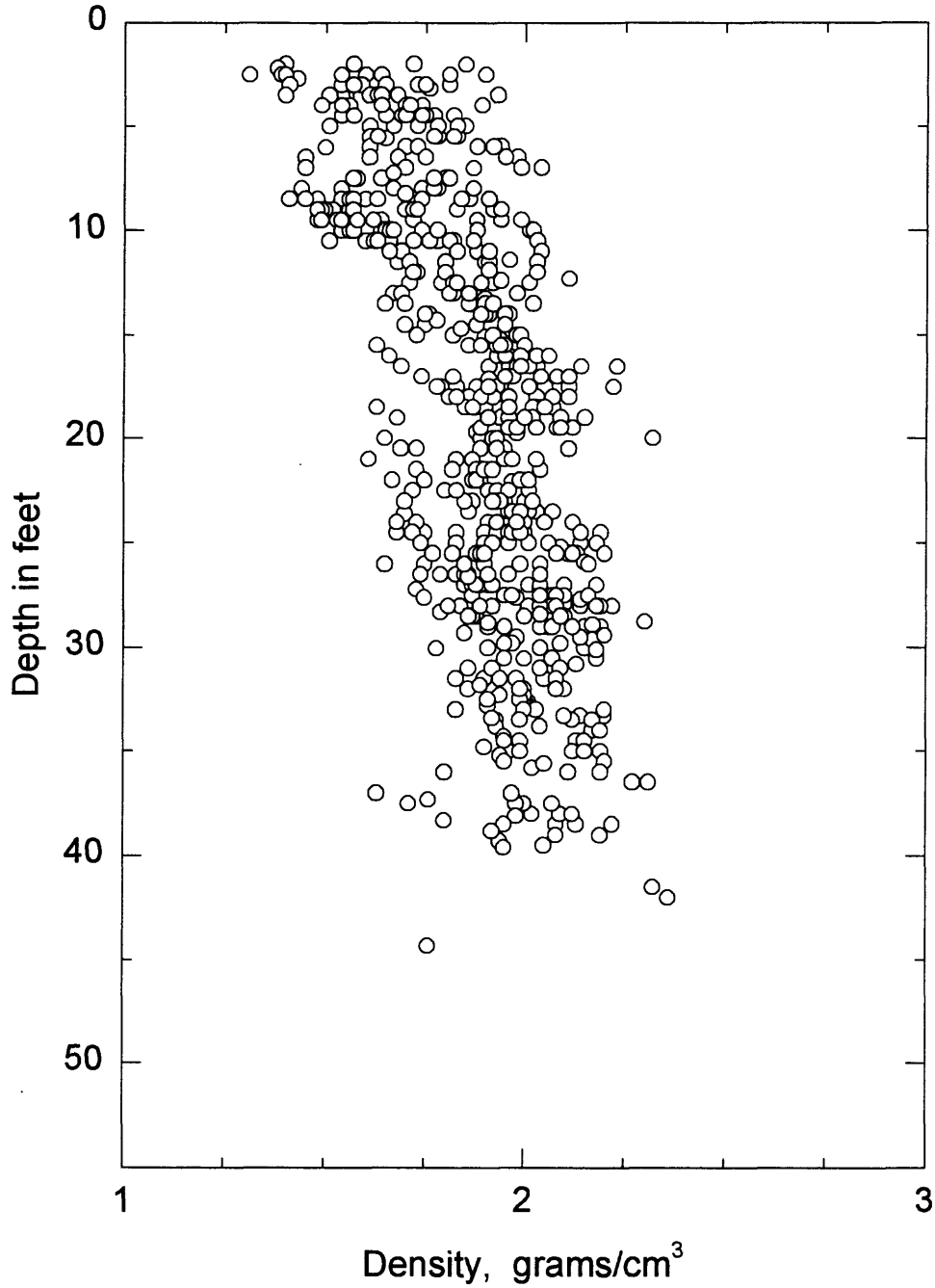


Figure 11

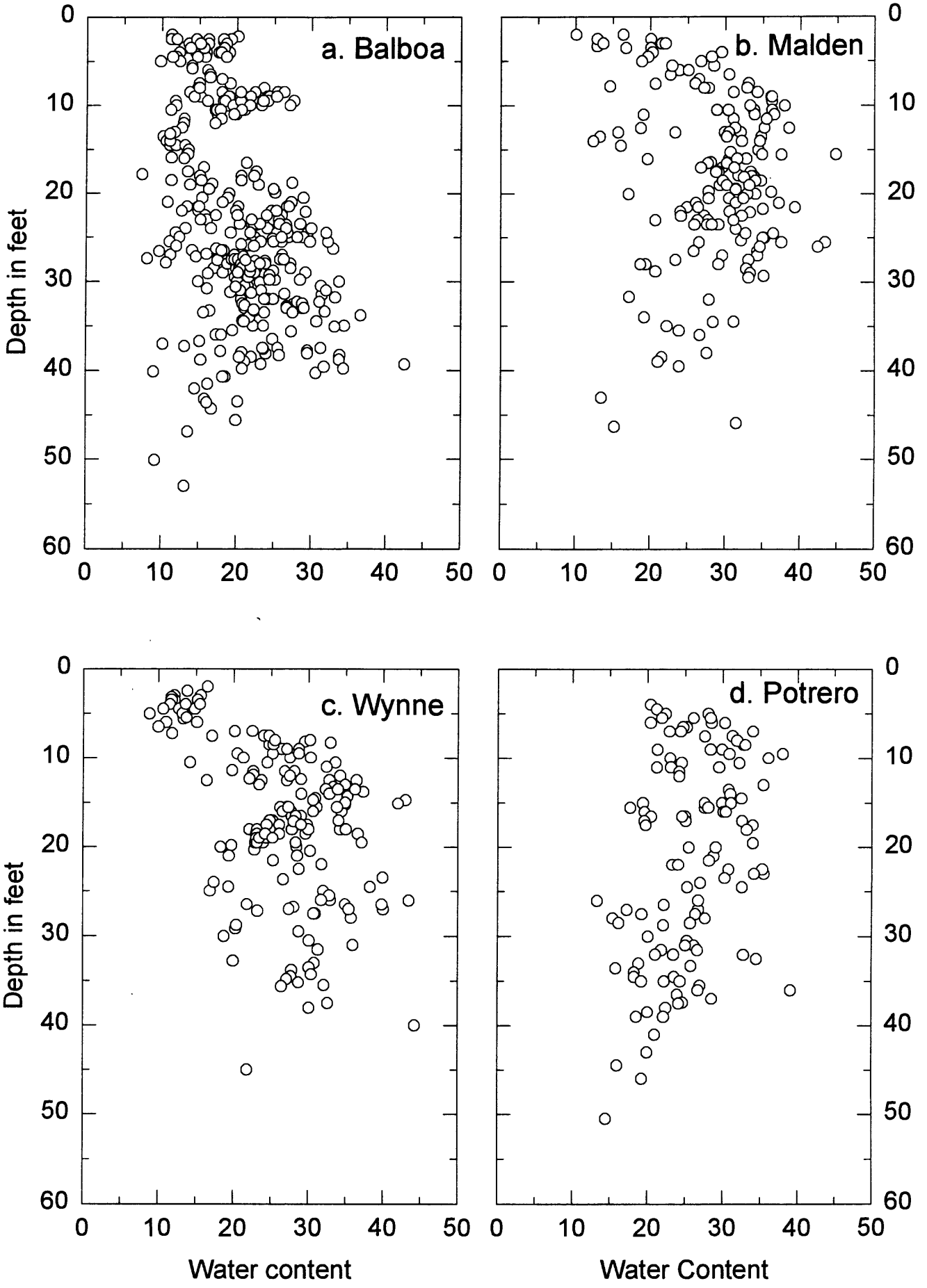

a. Balboa
b. Malden
c. Wynne
d. Potrero
Depth in feet
Depth in feet
Water content
Water Content
0
10
20
30
40
50
60

Figure 12

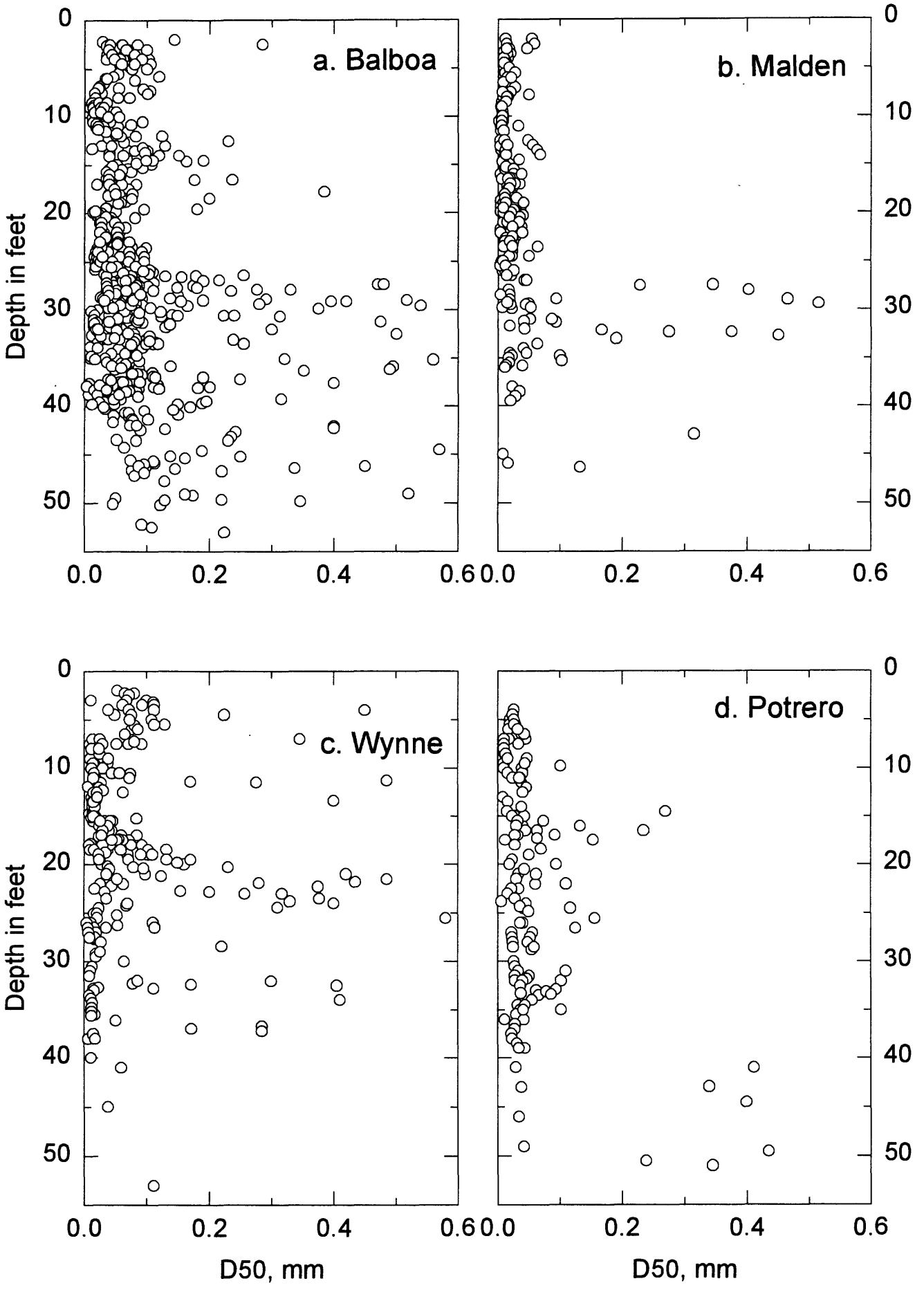

a. Balboa
b. Malden
c. Wynne
d. Potrero
Depth in feet
D50, mm
0
10
20
30
40
50
0.0
0.2
0.4
0.6

Figure 13

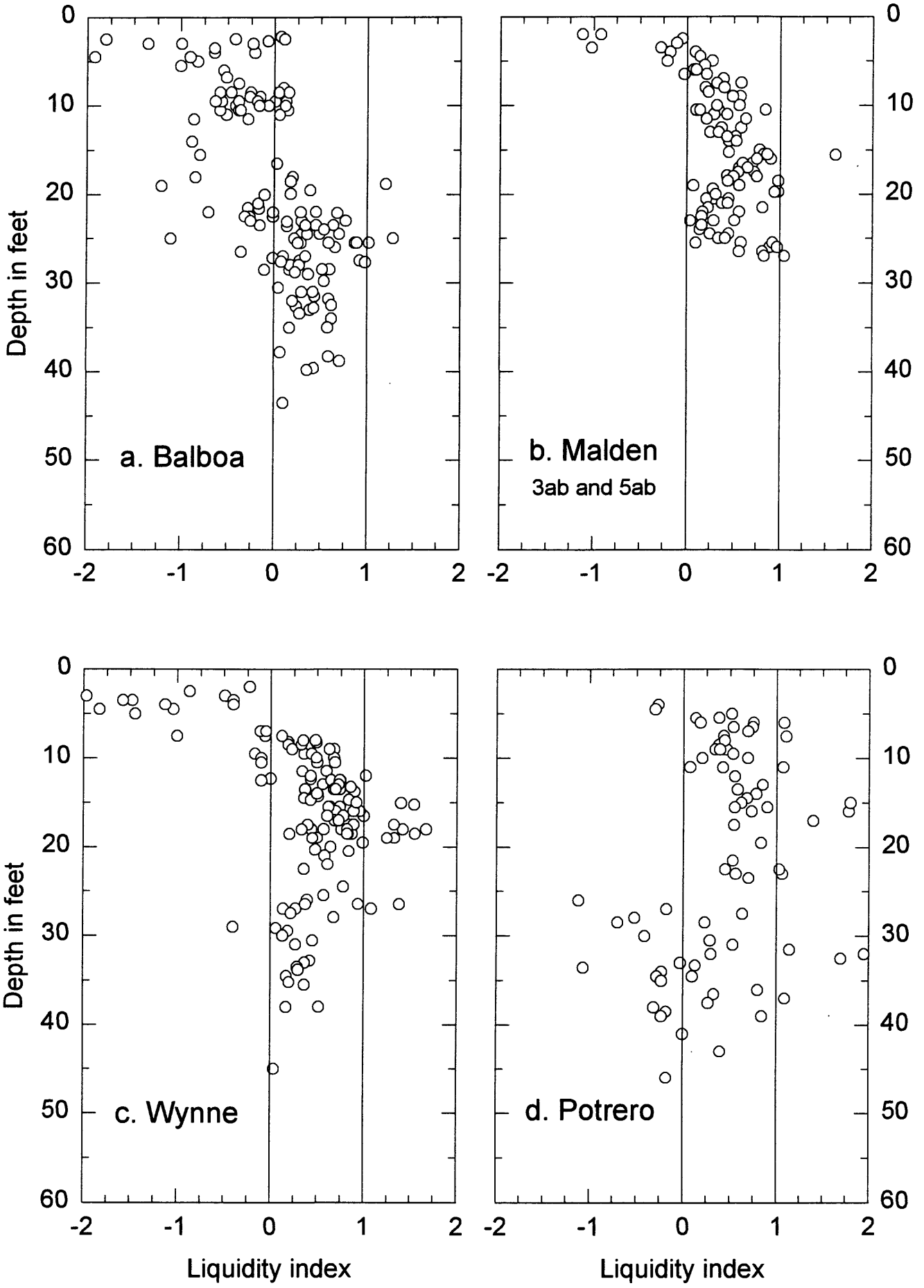

Depth in feet
0
10
20
30
40
50
60
-2
-1
0
1
2
a. Balboa
b. Malden
3ab and 5ab
c. Wynne
d. Potrero
Liquidity index
Liquidity index

Figure 14

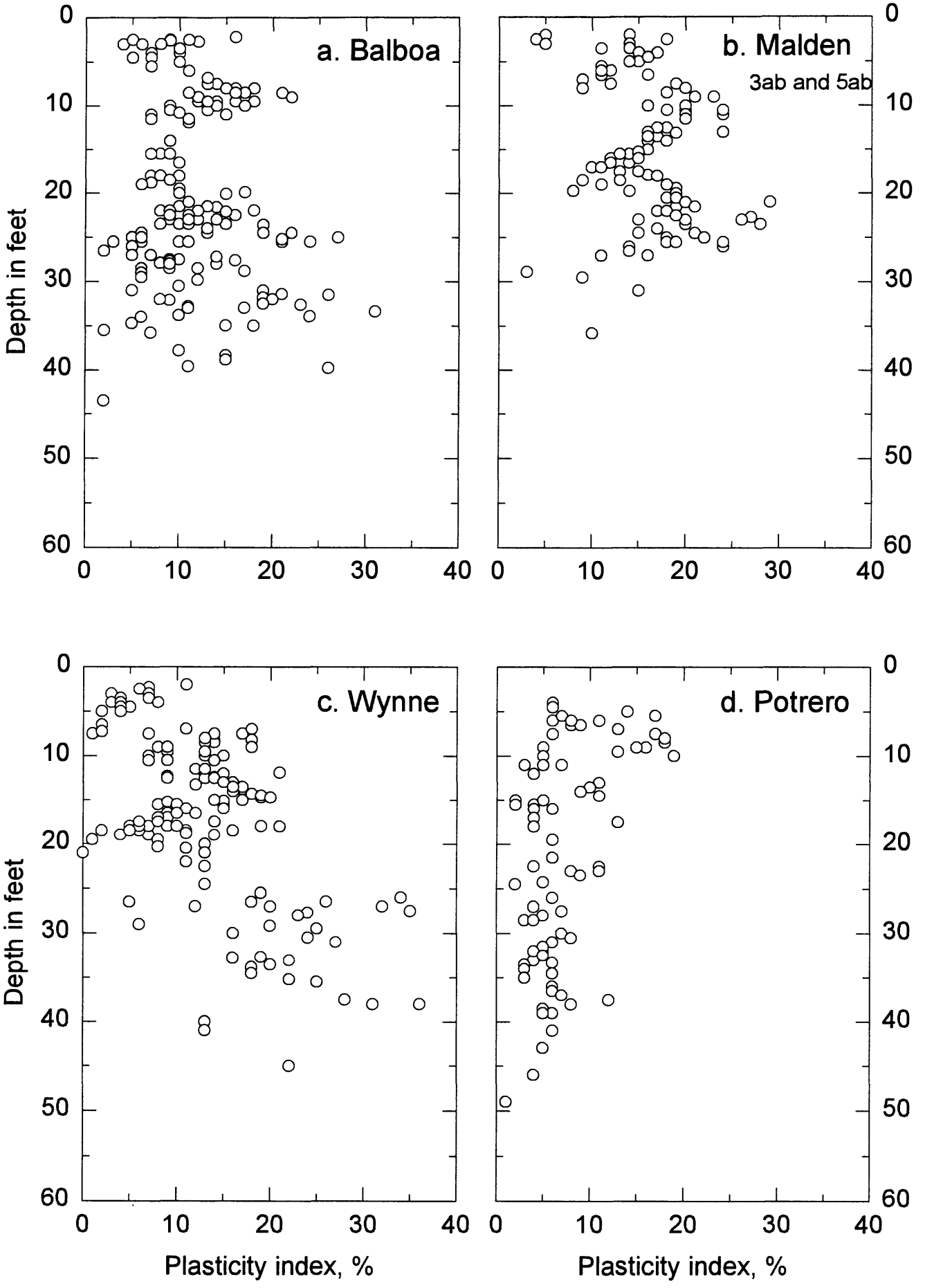

a. Balboa
b. Malden
3ab and 5ab
c. Wynne
d. Potrero
Depth in feet
Depth in feet
Plasticity index, %
Plasticity index, %
0
10
20
30
40
50
60

Figure 15

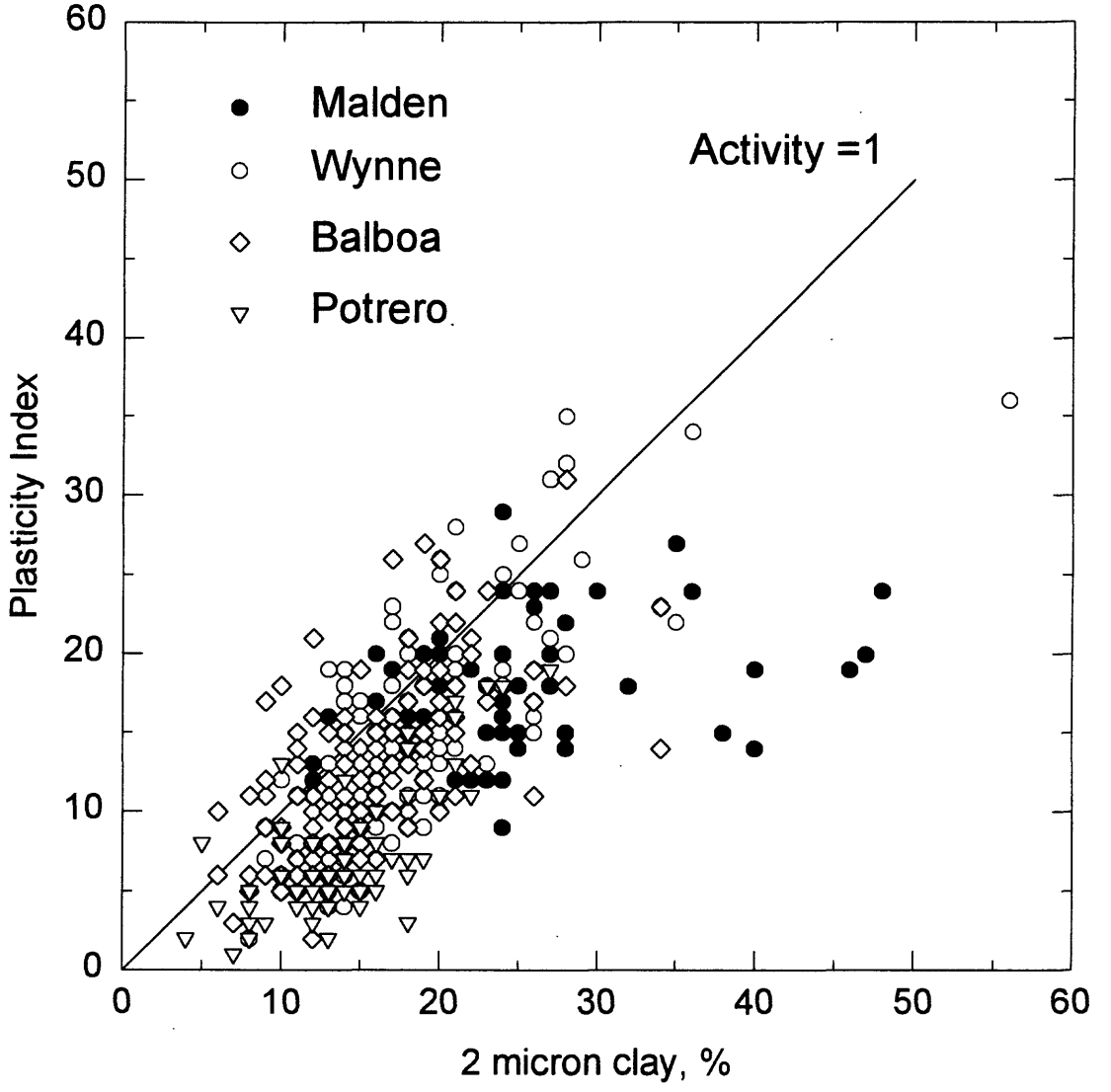
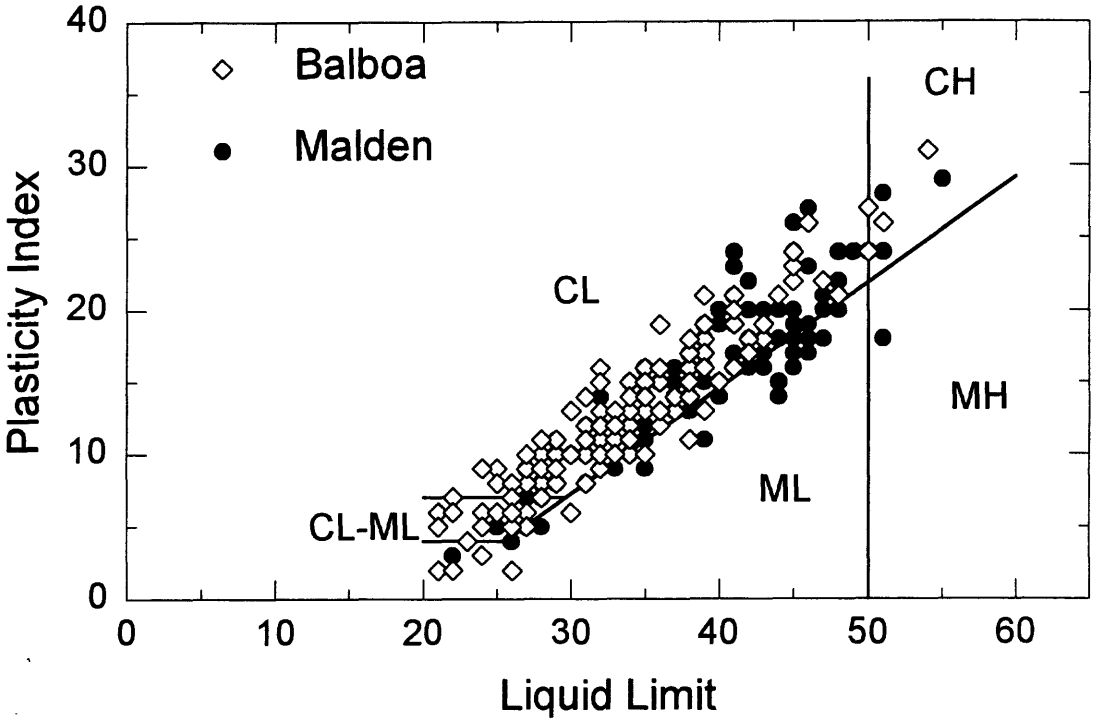

Malden
Wynne
Balboa
Potrero
Activity =1
Plasticity Index
2 micron clay, %
0
10
20
30
40
50
60

Figure 16


Balboa
Malden
CH
CL
MH
ML
CL-ML
Plasticity Index
Liquid Limit
0
10
20
30
40
50
60

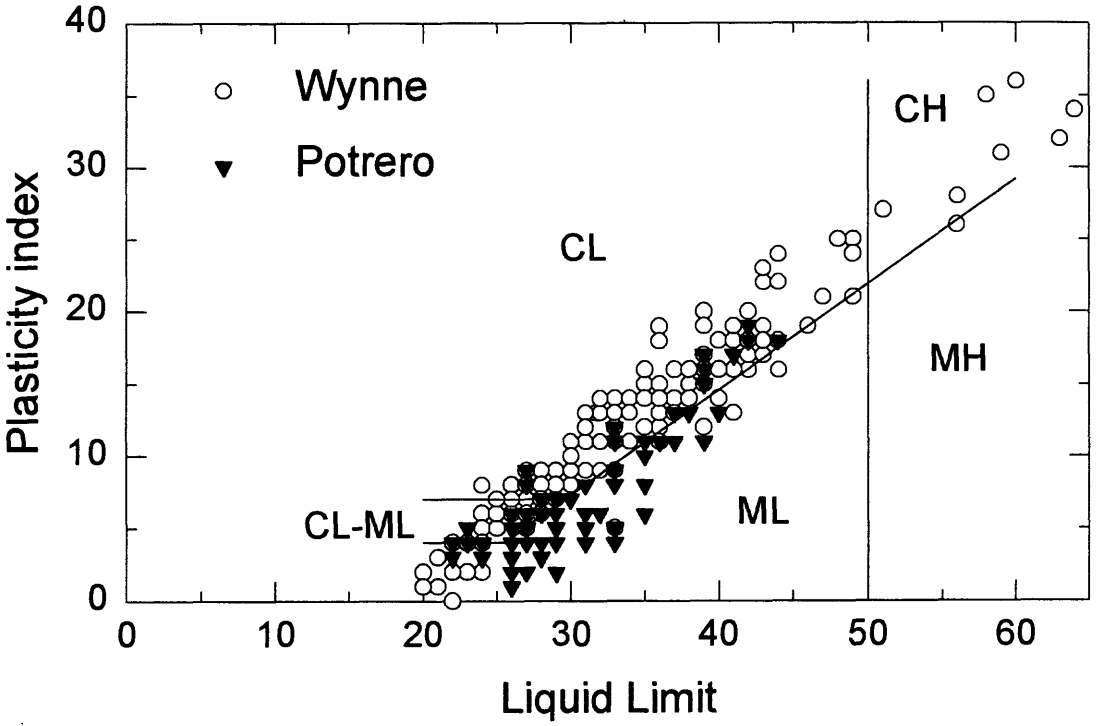

Wynne
Potrero
CH
CL
MH
ML
CL-ML
Plasticity index
Liquid Limit
0
10
20
30
40
50
60

Figure 17

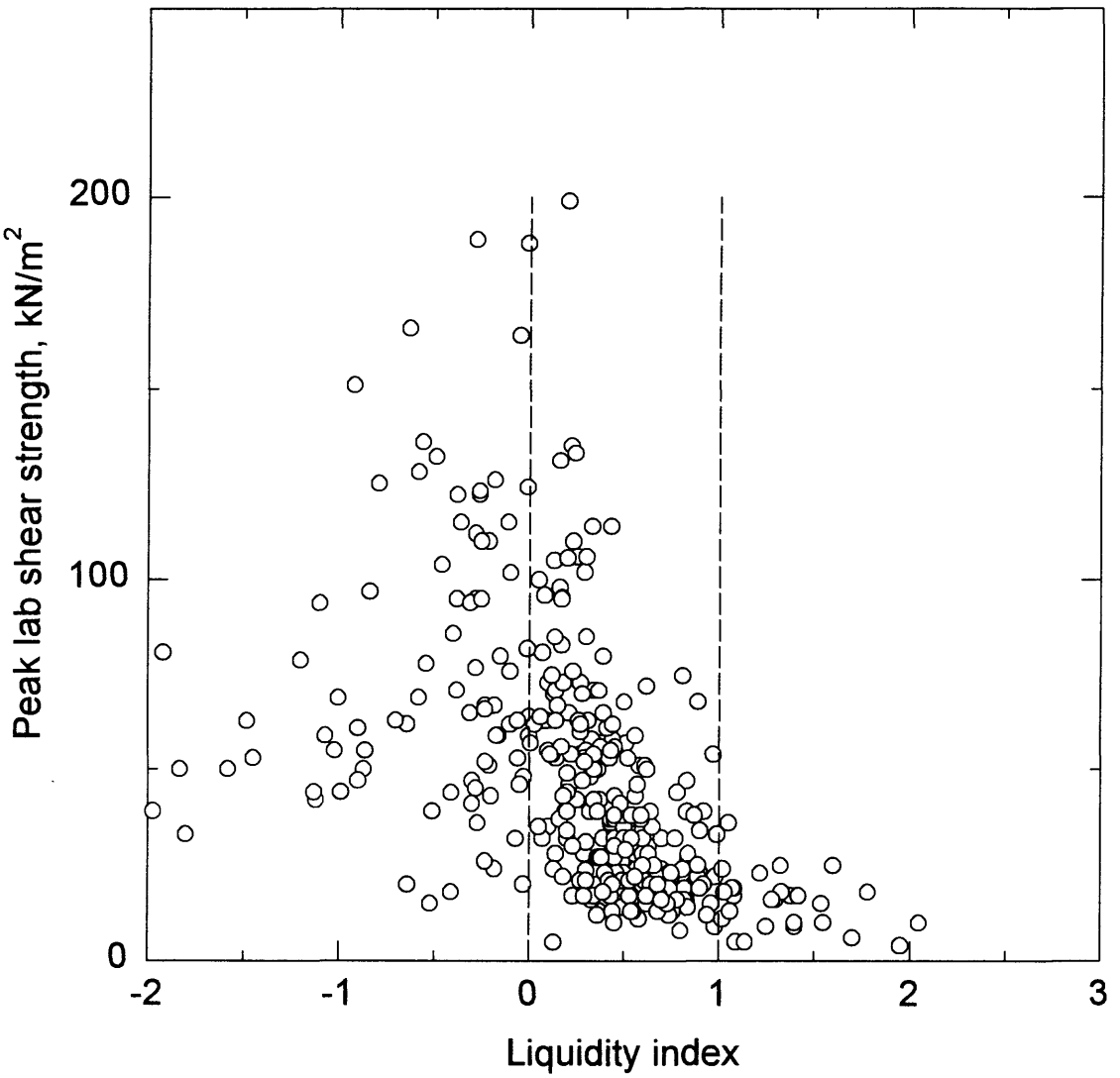

Peak lab shear strength, kN/m2
200
100
0
-2
-1
0
1
2
3
Liquidity index

Figure 18

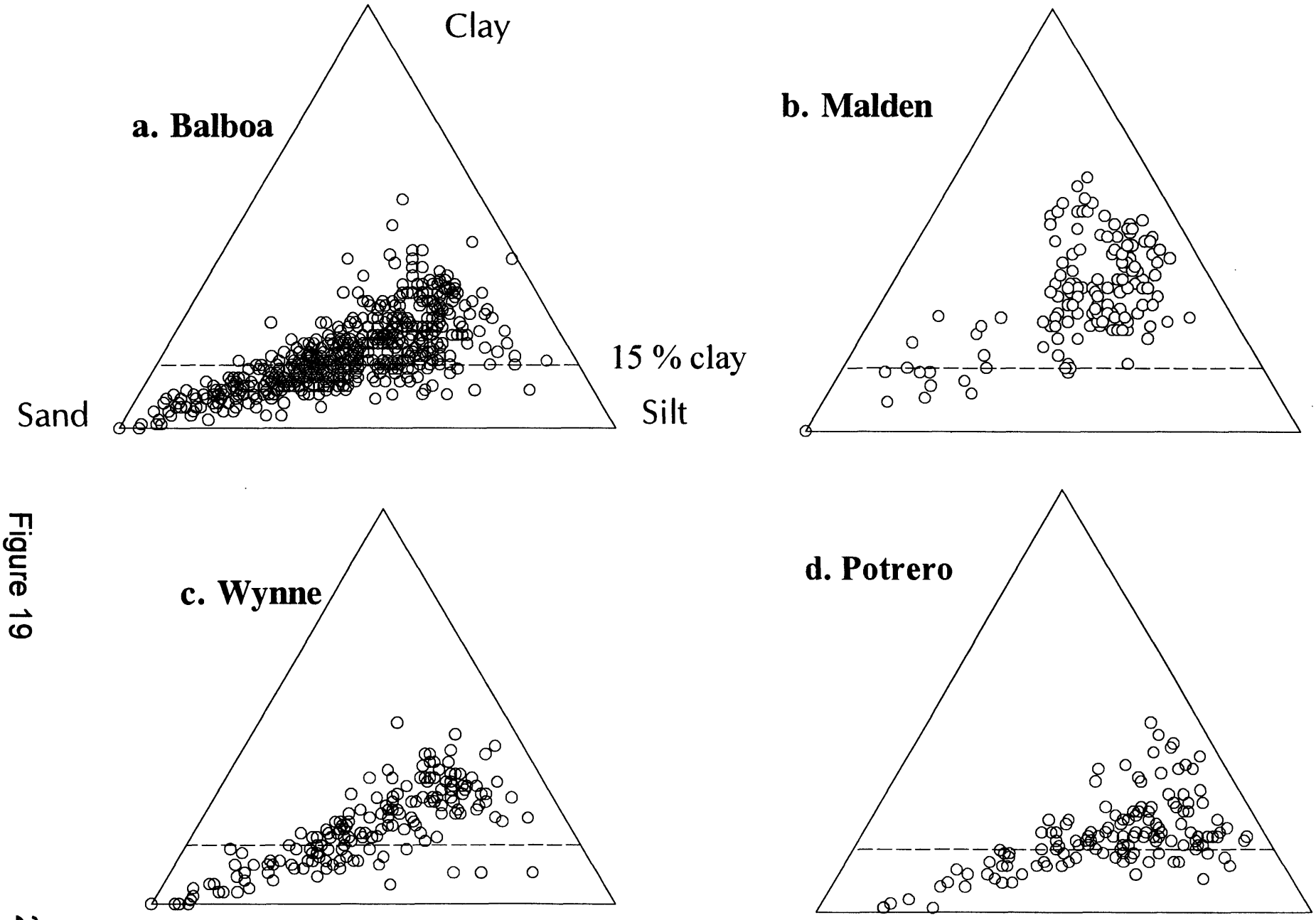


Figure 19

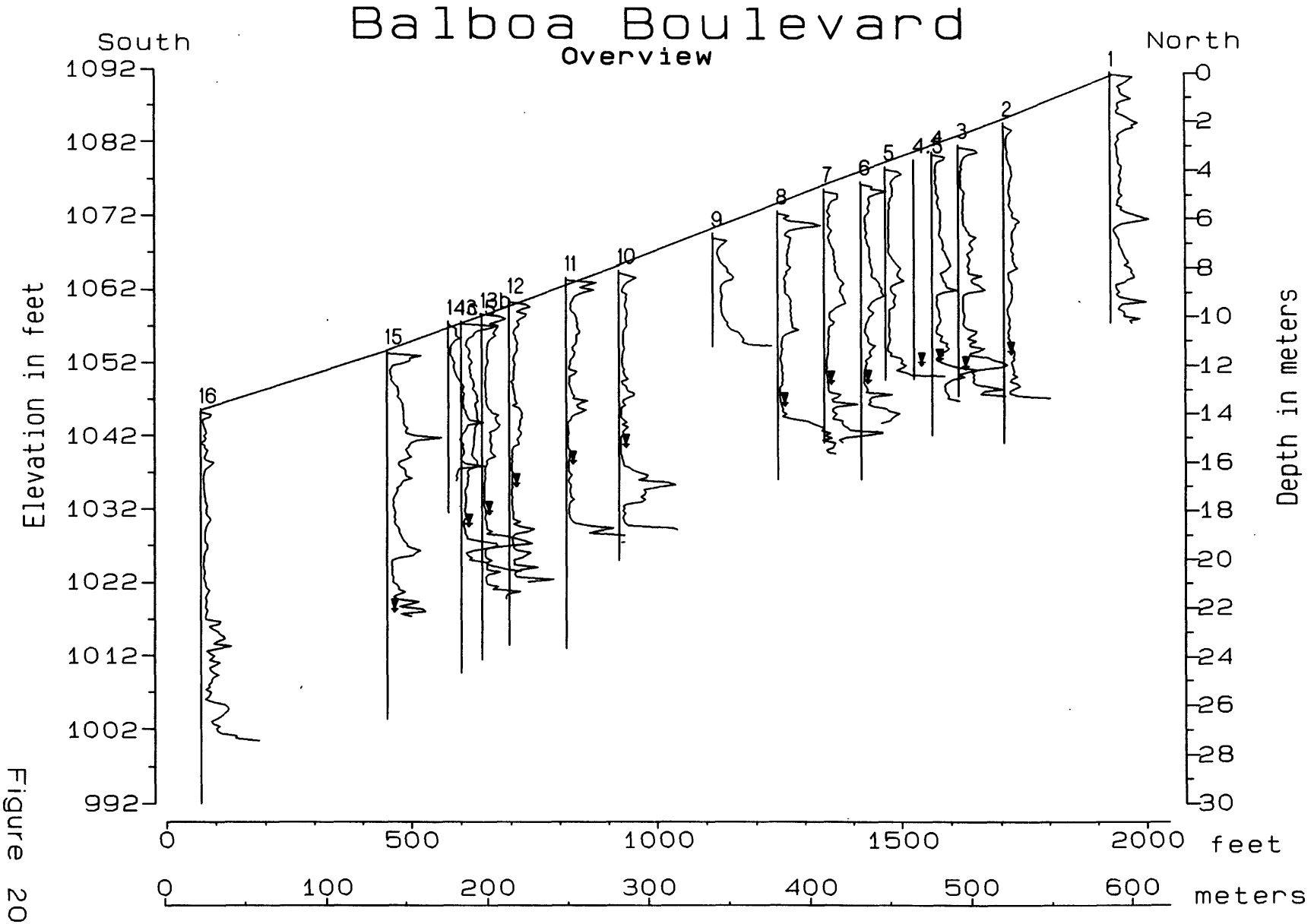


Figure 20

NORTHRIDGE GROUND DEFORMATION STUDIES

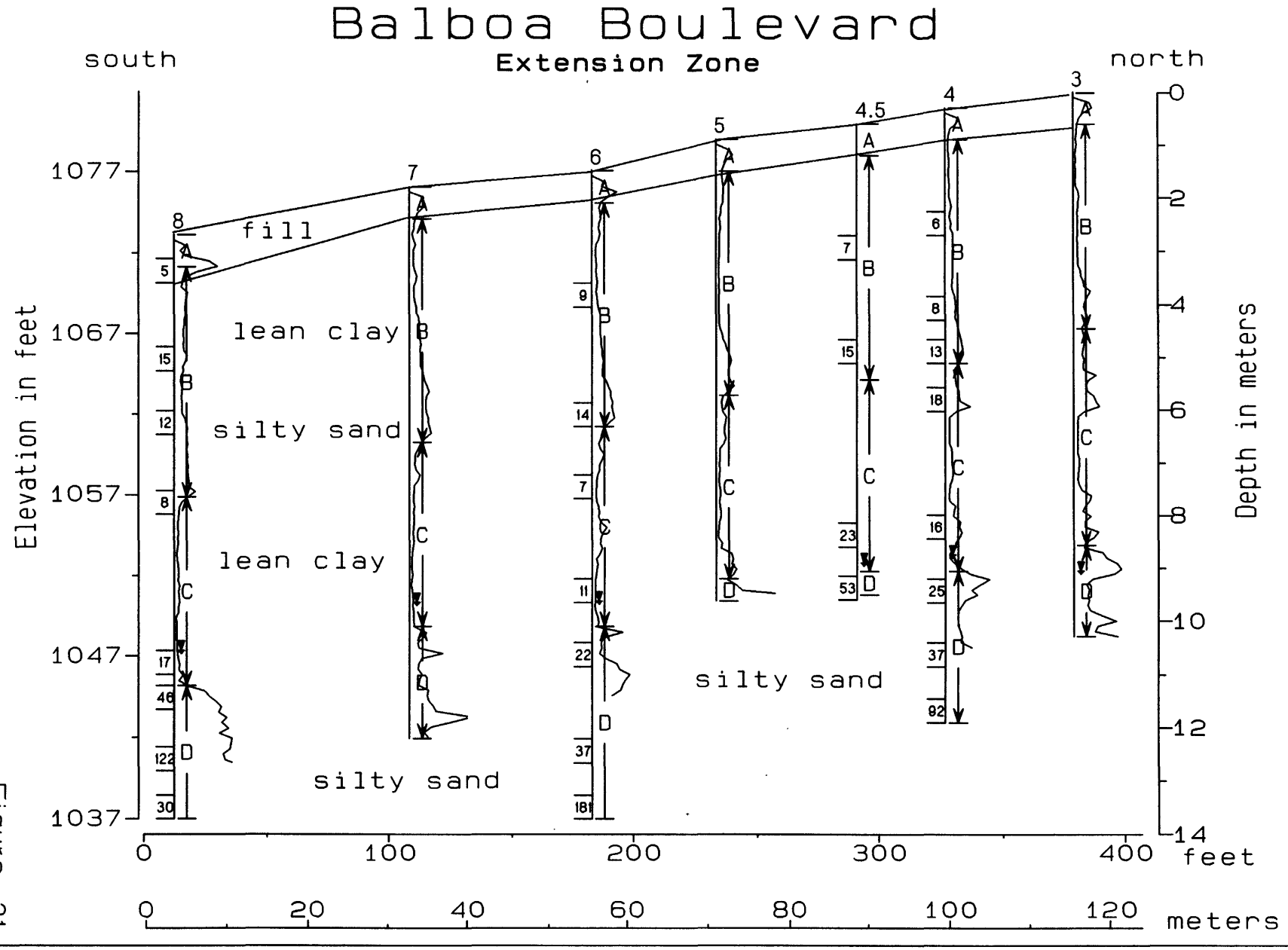


Figure 21

NORTHRIDGE GROUND DEFORMATION STUDIES

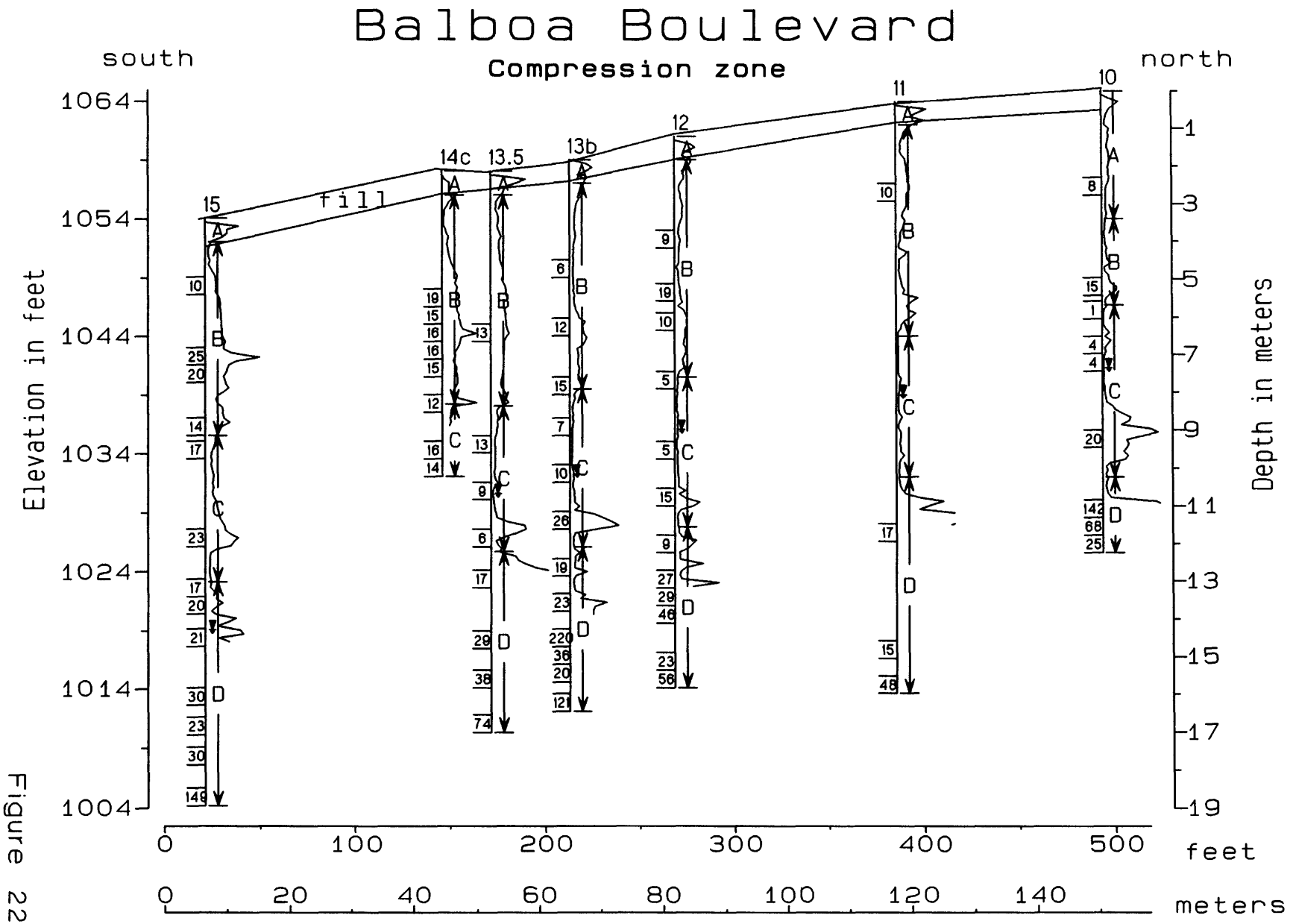


Figure 22

NORTHRIDGE GROUND DEFORMATION STUDIES

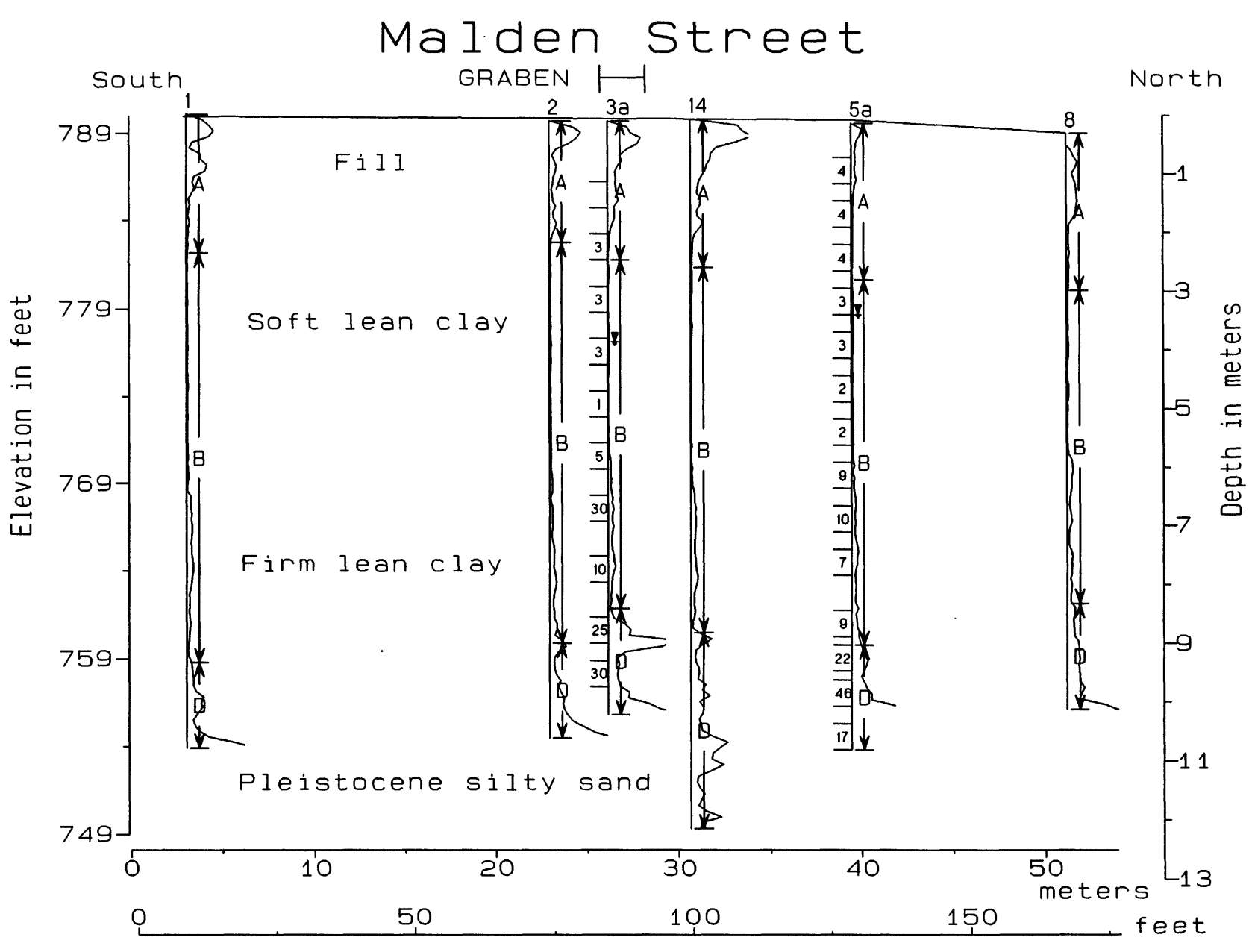

Malden Street
South
GRABEN
North
1
2
3a
14
5a
8
Fill
Soft lean clay
Firm lean clay
Pleistocene silty sand
Elevation in feet
789
779
769
759
749
Depth in meters
1
3
5
7
9
11
13
0
10
20
30
40
50
meters
0
50
100
150
feet

Figure 23

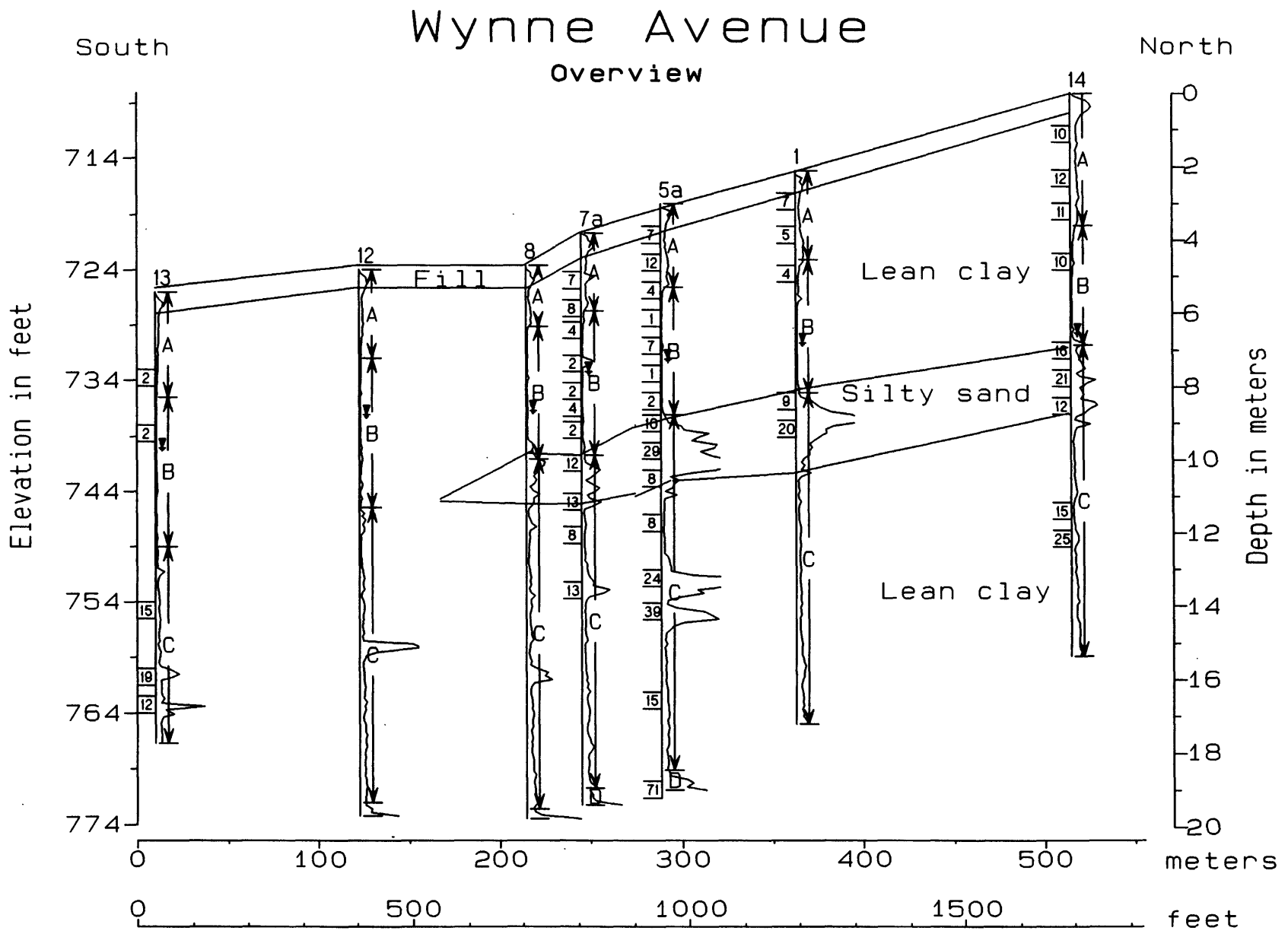


Figure 24

NORTHRIDGE GROUND DEFORMATION STUDIES

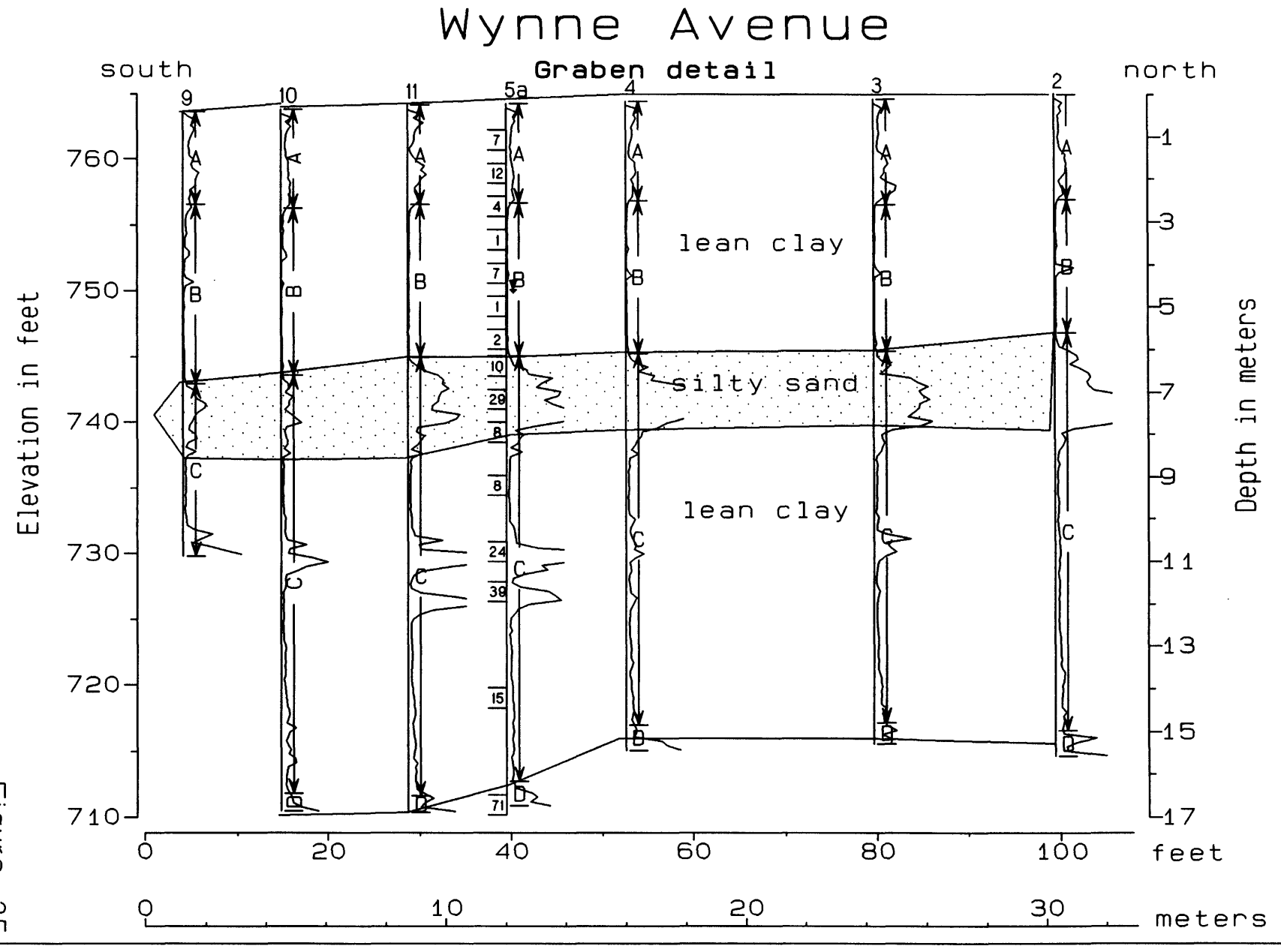

Wynne Avenue
Graben detail
south
north
9
10
11
5a
4
3
2
lean clay
silty sand
lean clay
Elevation in feet
760
750
740
730
720
710
Depth in meters
1
3
5
7
9
11
13
15
17
0
20
40
60
80
100
feet
0
10
20
30
meters

Figure 25

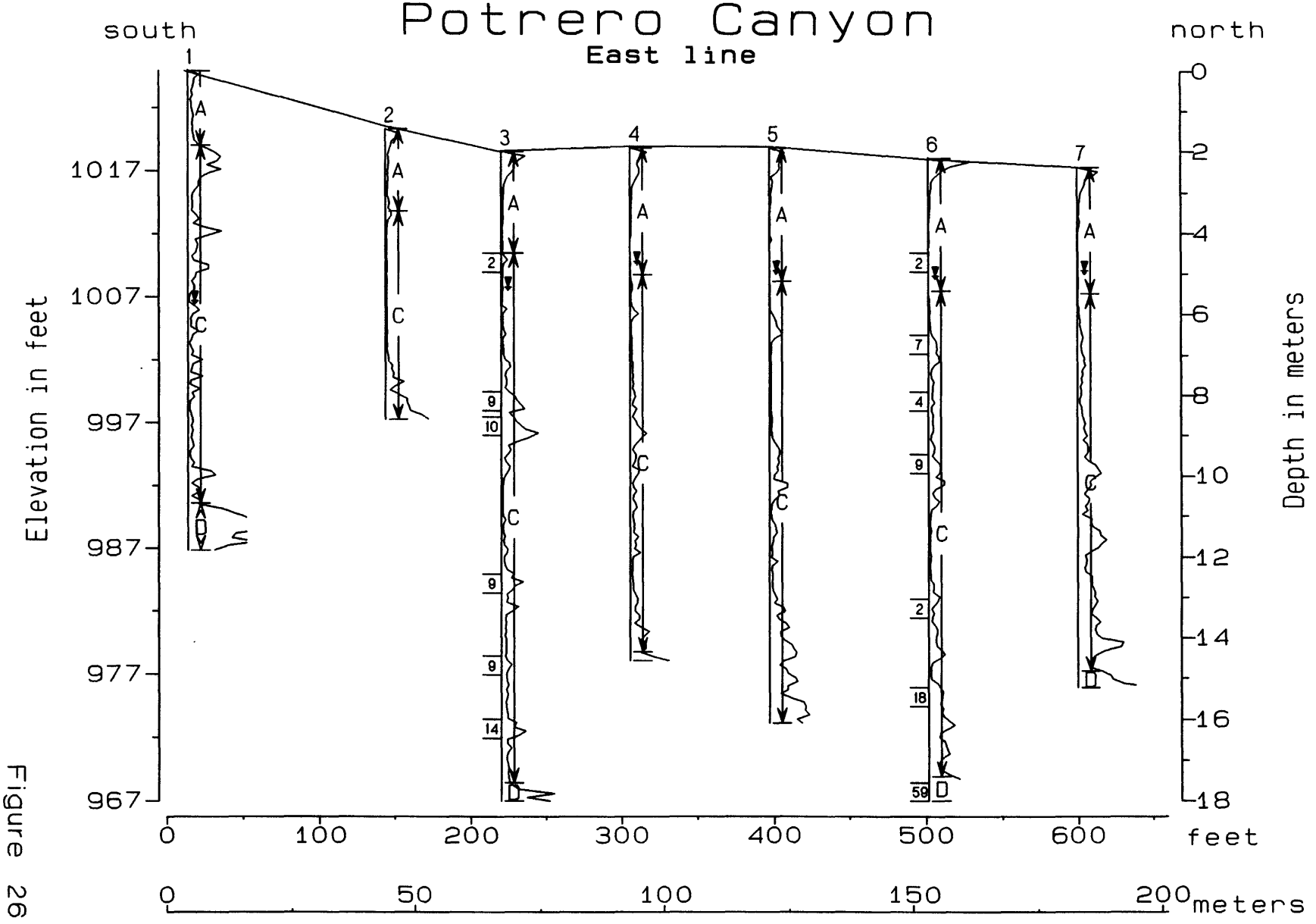


Figure 26

NORTHRIDGE GROUND DEFORMATION STUDIES

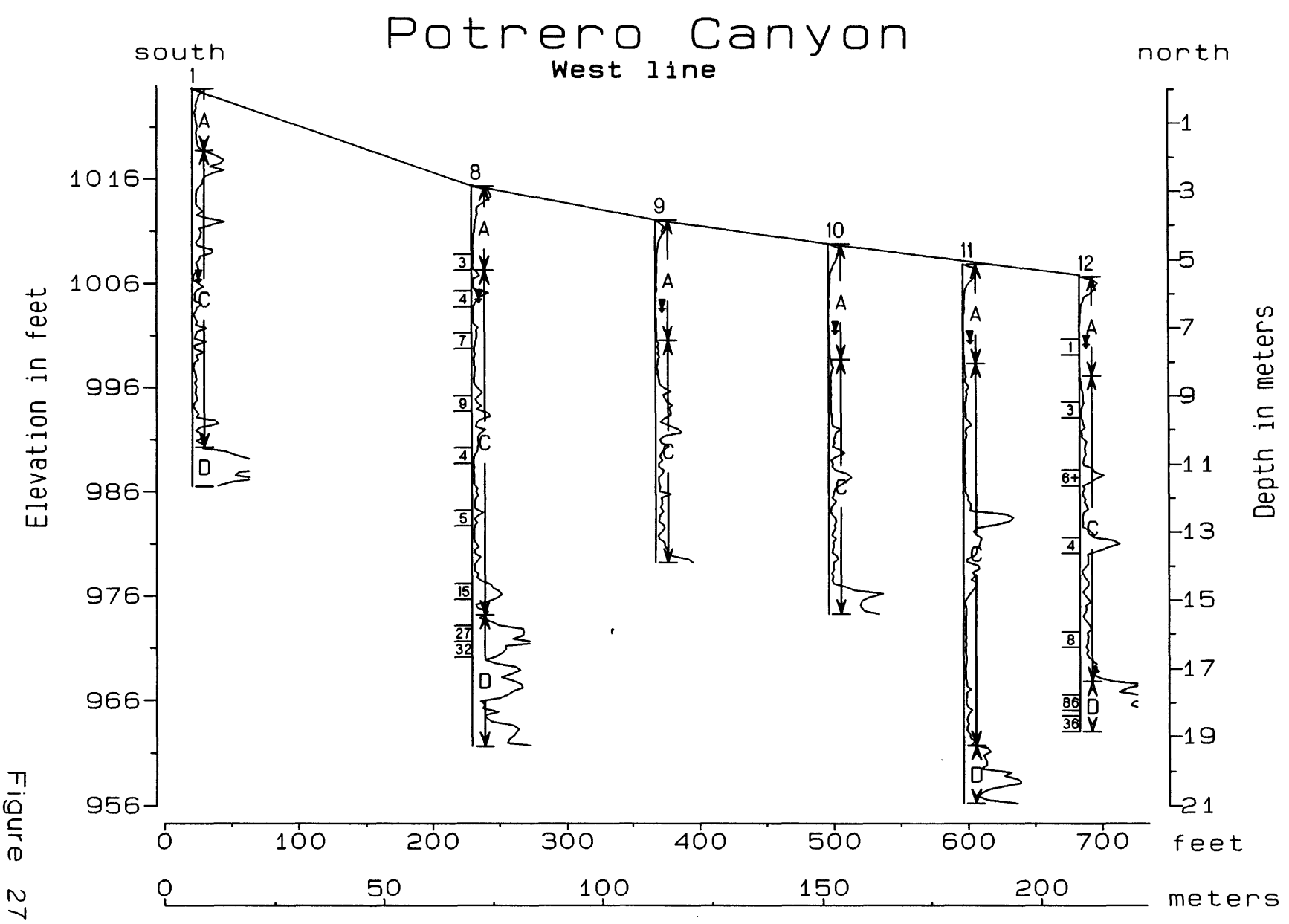


Figure 27

NORTHRIDGE GROUND DEFORMATION STUDIES

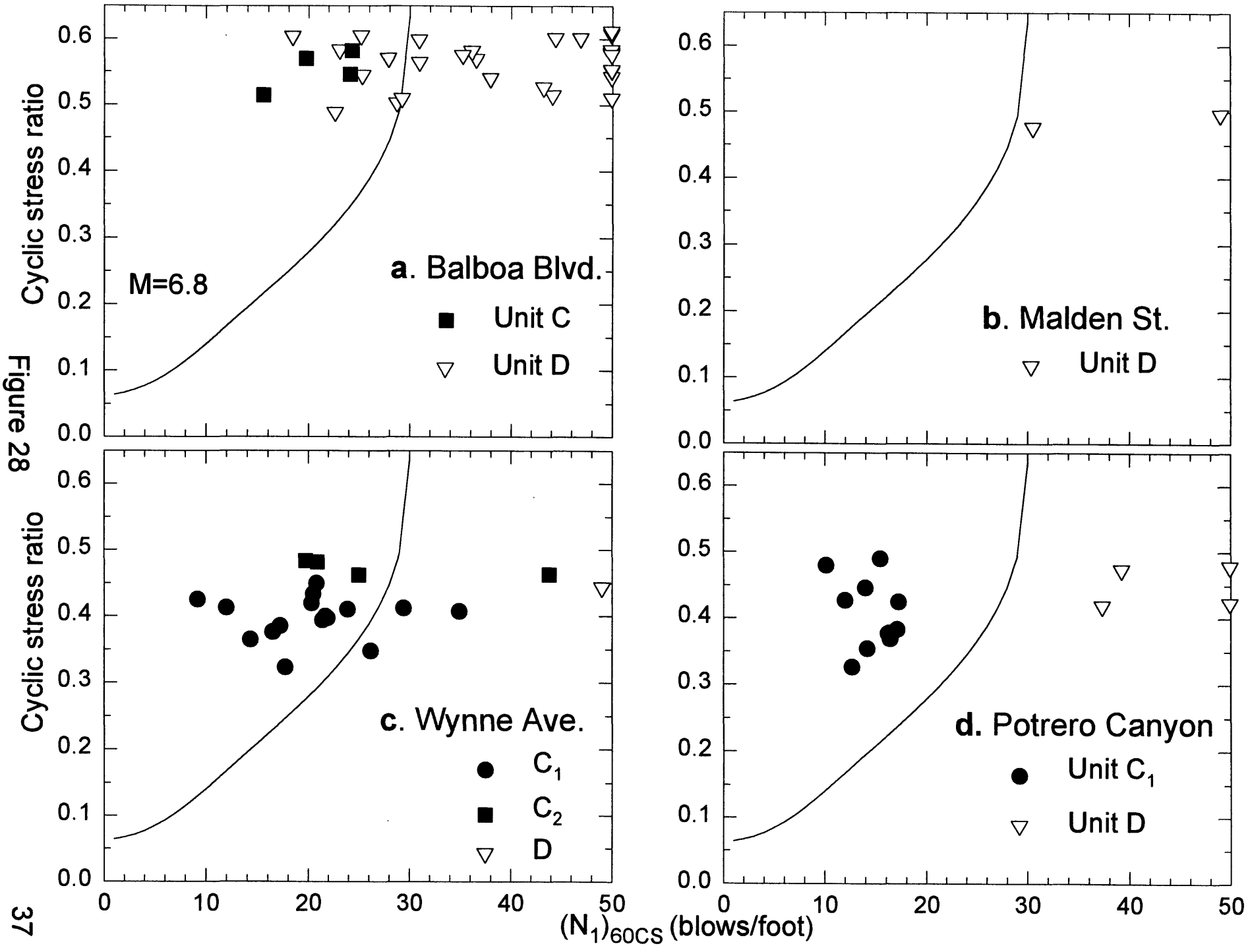

Cyclic stress ratio
M=6.8
a. Balboa Blvd.
Unit C
Unit D
b. Malden St.
Unit D
Cyclic stress ratio
c. Wynne Ave.
C1
C2
D
d. Potrero Canyon
Unit C1
Unit D
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0
10
20
30
40
50
(N1)60CS (blows/foot)

Figure 28

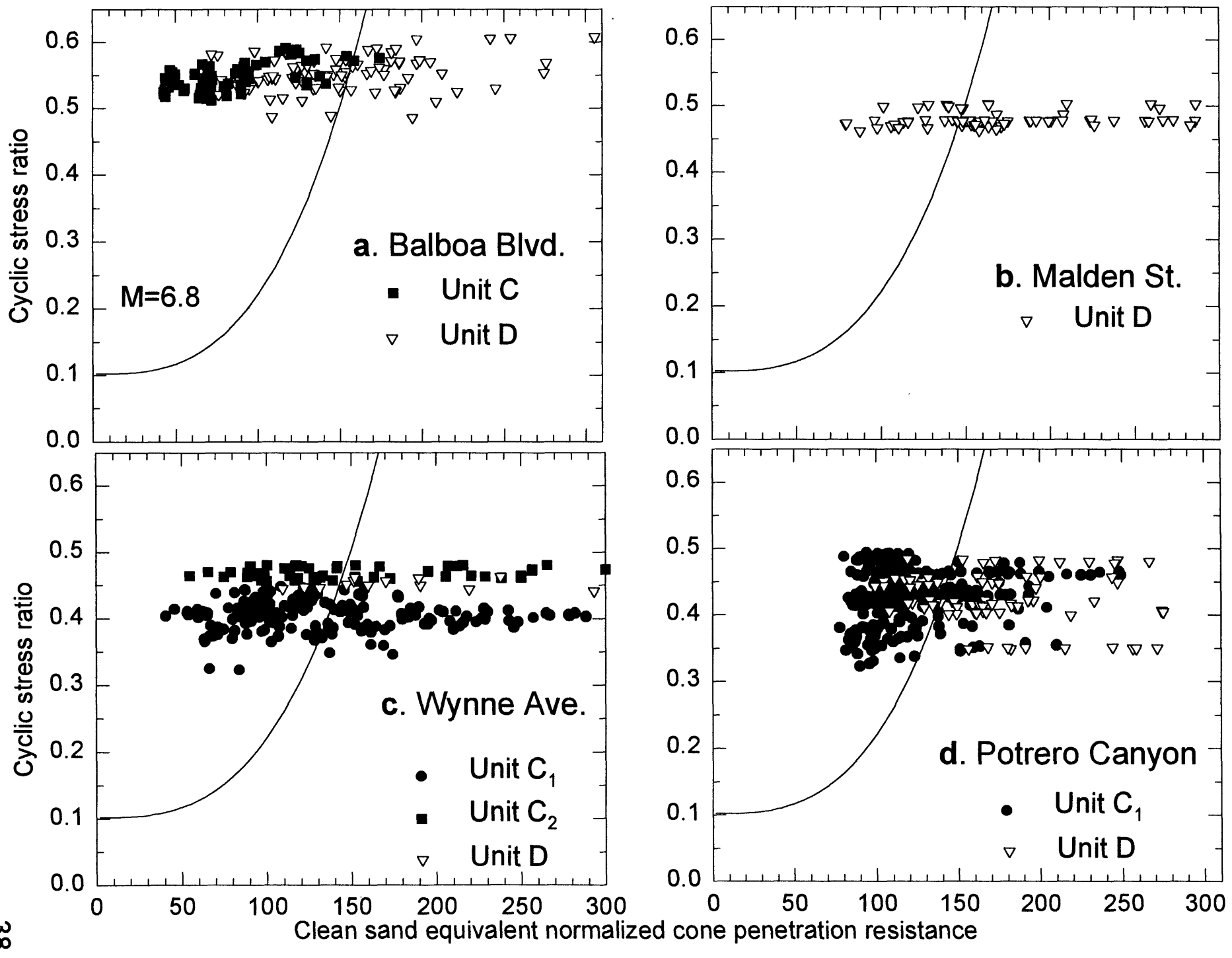

Cyclic stress ratio
0.0
0.1
0.2
0.3
0.4
0.5
0.6
M=6.8
a. Balboa Blvd.
Unit C
Unit D
b. Malden St.
Unit D
c. Wynne Ave.
Unit C_1
Unit C_2
Unit D
d. Potrero Canyon
Unit C_1
Unit D
0
50
100
150
200
250
300
Clean sand equivalent normalized cone penetration resistance

Figure 29

Table 1. Soundings, borings, and tests.

Sites	Soundings	Tests
Balboa Boulevard (Bal)	1	CPT
	2	CPT, SPT, Tubes, Vane
	3	CPT
	4	CPT, SPT, Tubes, Vane, Well
	4.5	SPT, Tubes, Vane
	5	CPT
	6	CPT, SPT, Tubes, Vane, Well
	7	CPT
	8	CPT, SPT, Tubes, Vane
	9	CPT
	10	CPT, SPT, Tubes, Vane, Well
	11	CPT, SPT, Tubes, Vane
	12	CPT, SPT, Tubes, Vane, Well
	13b	CPT, SPT, Tubes, Vane, Well
	13.5	CPT, SPT, Tubes, Vane
	14c	CPT, SPT, Tubes, Vane
	15	CPT, SPT, Tubes, Vane, Well
	16	CPT, SPT, Tubes, Vane
Malden Street (Mal)	1	CPT
	2	CPT
	3a	CPT, SPT
	3b	Tubes, SPT, Well
	3c	Vane
	4	CPT
	5a	CPT, SPT
	5b	Tubes, SPT
	6	CPT
	7	CPT
	8	CPT
	9	CPT
	10	CPT
	11	CPT
	12	CPT
	13	CPT
	14	CPT
	15	CPT, SPT, Tubes, Vane
	16	CPT, SPT, Tubes, Vane

Table 1 continued

Sites	Soundings	Tests
Wynne Avenue (Wyn)	1	CPT
	2	CPT
	3	CPT
	4	CPT
	5a	CPT, SPT
	5b	Tubes, SPT
	5c	Tubes, SPT, Vane
	6	CPT
	7a	CPT, SPT, Tubes
	7b	Tubes, SPT
	8	CPT
	9	CPT
	10	CPT
	11	CPT
	12	CPT
	13	CPT, SPT, Tubes, Vane
	14	CPT, SPT, Tubes, Vane
Potrero Canyon (Pot)	1	CPT
	2	CPT
	3	CPT, SPT, Tubes, Vane
	4	CPT
	5	CPT
	6	CPT, SPT, Tubes, Vane
	7	CPT
	8	CPT, SPT, Tubes, Vane
	9	CPT
	10	CPT
	11	CPT
	12	CPT, SPT, Tubes, Vane

Table 2 Grain size, Atterberg limits, and strength properties

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
Malden																											
mal3a-2b	7.5	2.3	3	6.5-8	0	28	38	34	0.017		CL	Lean CLAY w/sand	20.7														
mal3a-3b	10.5	3.2	3	9.5-11	0	14	40	46	0.006		CL	Lean CLAY	33.8	47	20	0.34	0.74										
mal3a-4c	13.0	4.0		12.5-14	0	14	50	36	0.011		CL	Lean CLAY	29.9														
mal3a-4d	13.5	4.1	3	12.5-14	0	14	35	51	0.005		CL	Lean CLAY															
mal3a-5b	16.0	4.9		15.5-17	0	19	29	52	0.004		CL	Lean CLAY w/sand	30.5														
mal3a-5c	16.5	5.0	1	15.5-17	0	21	31	48	0.006		CL	Lean CLAY w/sand		38	14		0.35										
mal3a-6b	18.8	5.7		18.5-19	0	18	30	52	0.004		CL	Lean CLAY w/sand															
mal3a-6c	19.4	5.9		19-19.8	0	17	31	52	0.004		CL	Lean CLAY w/sand	31.4	45	19	0.28	0.48										
mal3a-6d	19.9	6.1	5	19.9-20	0	25	24	51	0.004		CL	Lean CLAY w/sand															
mal3a-7b	21.7	6.6		21.5-23	0	23	25	52	0.004		CL	Lean CLAY w/sand	35.0														
mal3a-7c	22.1	6.7		21.5-23	0	21	25	54	0.004		CL	Lean CLAY w/sand															
mal3a-7d	22.7	6.9	30	21.5-23	0	25	33	42	0.013		CL	Lean CLAY w/sand		46	27		0.77										
mal3a-8b	25.3	7.7		25-25.5	0	26	25	49	0.005		CL	Lean CLAY w/sand	32.1														
mal3a-8c	26.0	7.9	10	25.5-26.5	0	17	36	46	0.007		CL	Lean CLAY w/sand		49	24		0.67										
mal3a-9c	28.8	8.8		28.5-29	15	60			1.270		SM	Silty SAND w/gravel	20.7														
mal3a-9d	29.4	8.9		29-29.7	14	66	13	7	0.515	100	SM	Silty SAND															
mal3a-9e	29.9	9.1	25	29.7-30	3	24	39	34	0.022		CL	Lean CLAY w/sand															
mal3a-10b	31.3	9.5		31-32.5	0	54	23	23	0.094		SC	Clayey SAND															
mal3a-10c	31.7	9.7		31-32.5	2	30	33	35	0.019		CL	Sandy lean CLAY	17.2														
mal3a-10d	32.3	9.8	30	31-32.5	12	56	11	21	0.375		SC	Clayey SAND															
mal3b-1e	2.0	0.6		2-4.5	1	27	37	35	0.012		CL	Lean CLAY w/sand	10.1	37	14	-0.92	0.56	1.85	151		30	5.0		120			
mal3b-1d	2.5	0.8		2-4.5	0	25	41	34	0.014		CL	Lean CLAY w/sand	20.1	39	18	-0.05	0.78	1.90	164		32	5.1					
mal3b-1c	3.0	0.9		2-4.5	0	30	37	33	0.018		CL	Sandy lean CLAY	21.5	37	14	-0.11	0.56	1.81	115		18	6.5		120			
mal3b-1b	3.5	1.1		2-4.5	0	33	35	32	0.020		CL	Sandy lean CLAY	20.1	38	14	-0.28	0.67	1.93	112		31	3.6					
mal3b-1a	4.0	1.2		2-4.5	0	29	36	35	0.016		CL	Lean CLAY w/sand	20.3	38	15	-0.18	0.79	1.89	126		37	3.5		81	42	19	4.3
mal3b-2e	4.5	1.4		4.5-7	0	28	38	34	0.013		CL	Lean CLAY w/sand	19.7					1.82	95		9	10.8	3.7				
mal3b-2d2	5.0	1.5		4.5-7	0	28	32	40	0.010		CL	Lean CLAY w/sand	18.9	37	15	-0.21	0.54	1.85	110		28	4.0	2.0	58	45	25	2.3
mal3b-2d1	5.4	1.6		4.5-7	0	27	47	26	0.023		CL	Lean CLAY w/sand															
mal3b-2c	5.5	1.7		4.5-7	0	28	45	27	0.024		CL	Lean CLAY w/sand		31	11		0.61	1.83									
mal3b-2b	6.0	1.8		4.5-7	0	29	39	32	0.019		CL	Lean CLAY w/sand	23.9	35	12	0.07	0.50	1.70	63		22	2.9	1.0	46	29	16	2.9
mal3b-2a	6.5	2.0		4.5-7	0	34	33	33	0.015		CL	Sandy lean CLAY	22.7	34	11	-0.03	0.55	1.68	48		21	2.3	0.6				
mal3b-3e	7.0	2.1		7-9.5	0	35	37	28	0.027		CL	Sandy lean CLAY	26.5	32	9	0.39	0.47	1.70	32		13	2.4	0.7	37	24	19	1.9
mal3b-3d	7.5	2.3		7-9.5	0	28	44	28	0.020		CL	Lean CLAY w/sand	26.0	31	12	0.58	0.55	1.64	22		13	1.7	0.2				
mal3b-3c	8.0	2.4		7-9.5	0	25	42	33	0.016		ML	SILT w/sand	27.8	35	9	0.20	0.38	1.67	32		12	2.6	0.2	33.5	26	15	2.2
mal3b-3b	8.5	2.6		7-9.5	0	7	47	46	0.006		CL	Lean CLAY	34.3					1.60	29		9	3.3	0.4				
mal3b-3a	9.0	2.7		7-9.5	0	7	43	50	0.005		CL	Lean CLAY	36.1	46	23	0.57	0.68	1.70	33		12	2.7	0.7	39	24	16	2.4
mal3b-4e	9.5	2.9		9.5-12	0	9	49	42	0.007		CL	Lean CLAY	36.2					1.72	19		7	2.7	0.5				
mal3b-4d	10.0	3.0		9.5-12	0	9	51	40	0.008		ML	SILT	37.9	45	16	0.56	0.84	1.74	21		9	2.5	0.5	32	24	13	2.5
mal3b-4c	10.5	3.2		9.5-12	0	14	44	42	0.008		CL	Lean CLAY	36.2	39	18	0.84	0.75	1.78	27		10	2.6	0.4				
mal3b-4b	11.0	3.4		9.5-12	0	13	38	49	0.005		CH	Fat CLAY	33.9	51	24	0.29	1.00	1.88	28		10	2.8	0.6	57	40	18	3.2
mal3b-4a	11.5	3.5		9.5-12	0	10	41	49	0.005		CL	Lean CLAY	31.1	47	20	0.21	0.71	1.90	65		20	3.3	1.2				
mal3b-5d	12.5	3.8		12-14.5	0	12	44	44	0.007		ML	SILT	38.5	46	18	0.58	0.72	1.79	21		7	3.1					
mal3b-5c	13.0	4.0		12-14.5	0	11	42	47	0.006		CH	Fat CLAY	32.0	50	24	0.25	0.80	1.82	42		12	3.4	0.7	45	29	16	2.8
mal3b-5b	13.5	4.1		12-14.5	0	16	45	39	0.010		CL	Lean CLAY w/sand	34.8	43	17	0.52	0.71	1.87	29		8	3.8	0.4				
mal3b-5a	14.0	4.3		12-14.5	0	16	48	36	0.012		CL	Lean CLAY w/sand	32.2	41	16	0.45	0.94	1.96	34		8	4.0	0.5	33	22	14	2.4
mal3b-6d	15.0	4.6		14.5-17	0	19	53	28	0.018		CL	Lean CLAY w/sand	34.4	38	16	0.78	1.07	1.82	15		4	3.9	0.4	19	16	14	1.4
mal3b-6c	15.5	4.7		14.5-17	0	14	50	36	0.012		CL	Lean CLAY	37.5	40	14	0.82	0.70	1.86	19		4	4.5	0.2				
mal3b-6b	16.0	4.9		14.5-17	0	23	53	24	0.027		CL	Lean CLAY w/sand	32.8	34	12	0.90	0.75	1.94	23		8	2.7	0.3	24	21	18	1.3
mal3b-6a	16.5	5.0		14.5-17	0	26	49	25	0.027		CL	Lean CLAY w/sand	30.4	34	12	0.70	0.75	1.96	24		8	3.0	0.5				
mal3b-7e	17.0	5.2		17-19.5	0	26	50	24	0.035		CL	Lean CLAY w/sand	29.6	34	10	0.56	0.64	1.96	28		8	3.6	0.3	32	26	19	1.7
mal3b-7d	17.5	5.3		17-19.5	0	26	46	28	0.023		CL	Lean CLAY w/sand	33.4	37	13	0.72	0.76	1.89	17		6	3.1	0.3				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
mal3b-7c	18.0	5.5		17-19.5	0	19	53	28	0.021		CL	Lean CLAY w/sand	33.8	38	17	0.75	1.06	1.87	16		5	3.2	0.2	29	24	18.5	1.6
mal3b-7b	18.5	5.6		17-19.5	0	20	58	22	0.029		CL	Lean CLAY w/sand	34.8	35	9	0.98	0.53	1.93	22		7	3.1	0.3				
mal3b-7a	19.0	5.8		17-19.5	0	14	45	41	0.008		ML	SILT	29.3	46	18	0.07	0.67	1.94	81		31	2.6	1.6	25	20	16	1.6
mal3b-8e2	19.7	6.0		19.5-22	0	38	37	25	0.036		CL	Sandy lean CLAY	27.8	28	8	0.98	0.53	1.88	9		2	6.0	0.1				
mal3b-8d28e1	20.0	6.1		19.5-22	0	34	40	26	0.031		CL	Sandy lean CLAY	34.0					1.89	35		6	5.5	0.8	36	28	24	1.5
mal3b-8d1	20.3	6.2		19.5-22	0	34	44	22	0.040		CL	Sandy lean CLAY															
mal3b-8c	20.5	6.2		19.5-22	0	26	45	29	0.019		CL	Sandy lean CLAY	31.4	44	18	0.30	0.95	1.89	31		7	4.3	0.4				
mal3b-8b	21.0	6.4		19.5-22	0	6	53	41	0.008		CH	Fat CLAY	37.1	55	29	0.38	1.21	1.87	57		14	4.0	1.4	120			
mal3b-8a	21.5	6.6		19.5-22	0	17	53	30	0.038		CL	Lean CLAY w/sand	39.3	43	19	0.81	1.12	1.89	24		5	5.0	0.4				
mal3b-9d	22.0	6.7		22-24	0	30	45	25	0.030		CL	Sandy lean CLAY	30.6	38	17	0.56	1.06	1.99	30		3	9.5	0.3	57	44	32	1.8
mal3b-9c	22.5	6.9		22-24	0	28	47	25	0.028		CL	Lean CLAY w/sand	27.2					2.01	55		10	5.4	0.8				
mal3b-9b	23.0	7.0		22-24	0	28	46	26	0.024		CL	Lean CLAY w/sand	27.7	35	15	0.51	0.94	2.00	57		9	6.6	1.0	117	46	34	3.4
mal3b-9a	23.5	7.2		22-24	0	22	49	29	0.022		CL	Lean CLAY w/sand	29.1	44	20		1.18	2.01	65		11	5.9	1.0				
mal3b-10d	24.0	7.3		24-26	0	18	57	25	0.023		ML	SILT w/sand	31.4	46	17	0.14	1.13	1.91	72		15	4.8	1.3				
mal3b-10c	24.5	7.5		24-26	0	27	45	28	0.022		ML	SILT w/sand	32.7	44	15	0.25	0.79	1.90	106		20	5.4	1.8				
mal3b-10b	25.0	7.6		24-26	0	11	41	48	0.006		ML	SILT	35.2	47	18	0.34	0.56	1.90	71		14	5.0	2.0				
mal3b-10a	25.5	7.8		24-26	0	9	51	40	0.010		MH	Elastic SILT	43.4	51	18	0.58	0.64	1.82	51		12	4.3	1.3				
mal3b-11e	26.0	7.9		26-28.5	0	14	50	36	0.011		ML	SILT	42.4	44	14	0.89	0.70	1.75	68		8	8.6	1.3				
mal3b-11d	26.5	8.1		26-28.5	0	24	48	28	0.021		CL	Lean CLAY w/sand	34.3	37	14	0.81	0.82	1.83	75		11	6.8	1.3				
mal3b-11c	27.0	8.2		26-28.5	9	33	34	24	0.043		CL	Sandy lean CLAY	34.3	37	16	0.83	0.89	1.85	39		6	7.1	0.6				
mal3b-11b	27.5	8.4		26-28.5	22	40	26	12	0.228	185	SM	Silty SAND w/gravel	33.1					1.95	61		8	7.8	0.6				
mal3b-11a	28.0	8.5		26-28.5	20	52	20	8	0.402	90	SM	Silty SAND w/gravel	19.4					2.04									
mal3b-12b	29.0	8.8		28.5-30.5	14	58	13	15	0.465		SM	Silty SAND															
mal3b-12a	29.8	9.1	21	28.5-30.5	0	27	28	45	0.007		CL	Lean CLAY w/sand															
mal3b-13b	32.1	9.8		31.5-33	5	54	13	27	0.167		SC	Clayey SAND															
mal3b-13a	32.7	10.0	27	31.5-33	10	67	9	14	0.450		SM	Silty SAND															
mal5a-1b	3.3	1.0	4	2-3.5	0	32	38	30	0.010		CL	Sandy lean CLAY	12.9														
mal5a-2b	5.5	1.7	4	4.5-6	0	16	49	35	0.011		CL	Lean CLAY w/sand	28.5														
mal5a-3b	8.0	2.4	4	7-8.5	0	17	41	42	0.008		CL	Lean CLAY w/sand	27.2														
mal5a-4b	10.5	3.2	3	9.5-11	0	13	27	60	0.002		CL	Lean CLAY	28.9	47	20	0.10	0.43										
mal5a-5b	12.5	3.8		12-13.5	0	15	31	54	0.003		CL	Lean CLAY w/sand	35.2														
mal5a-5c	13.1	4.0	3	12-13.5	0	16	26	58	0.003		CL	Lean CLAY w/sand		43	19		0.41										
mal5a-6c	14.7	4.5		14.5-16	0	16	38	46	0.007		CL	Lean CLAY w/sand															
mal5a-6b	15.5	4.7	2	14.5-16	0	23	34	43	0.011		CL	Lean CLAY w/sand	34.9	37	15	0.86	0.39										
mal5a-7b	17.3	5.3		17-18.5	0	23	41	36	0.015		CL	Lean CLAY w/sand															
mal5a-7c	17.9	5.4		17-18.5	0	20	46	34	0.015		CL	Lean CLAY w/sand	31.8	41	16	0.43	0.67										
mal5a-7d	18.4	5.6	2	18.2-18.5	0	30	36	34	0.020		CL	Sandy lean CLAY															
mal5a-8b	19.8	6.0		19.5-21	0	30	33	37	0.018		CL	Sandy lean CLAY															
mal5a-8c	20.5	6.2	9	19.5-21	0	26	44	30	0.019		CL	Lean CLAY w/sand	27.8	42	18	0.21	0.90										
mal5a-9b	23.0	7.0	10	22-23.5	0	29	39	32	0.021		CL	Lean CLAY w/sand	20.7	40	20	0.04	0.74										
mal5a-10b	25.5	7.8	7	24.5-26	0	16	29	55	0.003		CL	Lean CLAY w/sand	26.5	48	24	0.10	0.50										
mal5a-11a	28.9	8.8		28-29.5	5	50	27	18	0.094		SM	Silty SAND		22	3		0.25										
mal5a-11b	29.4	9.0	9	28-29.5	0	40	42	18	0.050		CL	Sandy lean CLAY															
mal5a-12a	31.0	9.4	22	30-31.5	10	42	23	25	0.087		SC	Clayey SAND		34	15		0.79										
mal5a-13b	32.3	9.8		32-33.5	7	61	18	14	0.275	223	SM	Silty SAND															
mal5a-13a	33.0	10.1	46	32-33.5	4	66	20	11	0.190	98	SM	Silty SAND															
mal5a-14a	34.8	10.6		34.5-36	4	52	29	15	0.100	61	SM	Silty SAND															
mal5a-14b	35.3	10.7		34.5-36	1	61	29	9	0.103	23	SM	Silty SAND															
mal5a-14c	35.8	10.9	17	34.5-36	0	38	40	22	0.039		CL	Sandy lean CLAY		30	10		0.56										
mal5b-1e	2.0	0.6		2-4.5	0	39	45	16	0.055		CL-ML	Sandy silty CLAY	16.4	27	5	-1.12	0.50	1.40	42		11	3.8	1.0				
mal5b-1d	2.5	0.8		2-4.5	0	40	46	14	0.059	27	ML	Sandy SILT	12.9	26	4	-2.28	0.50	1.60	71		14	5.0	1.0				
mal5b-1c	3.0	0.9		2-4.5	0	27	57	16	0.047		ML	SILT w/sand	13.7	28	5	-2.09	0.45	1.59	62		12	5.3	1.0				
mal5b-1b	3.5	1.1		2-4.5	0	14	60	26	0.015		ML	SILT	16.8	39	11	-1.02	0.85	1.55	55		8	7.0	1 1				
mal5b-1a	4.0	1.2		2-4.5	0	14	48	38	0.009		ML	SILT	29.5	45	17	0.09	0.71	1.55	63		20	3.2	1.2				
mal5b-2e	4.5	1.4		4.5-7	0	19	45	36	0.010		CL	Lean CLAY w/sand	28.2	42	16	0.14	0.73	1.65	28		13	2 1	0.8				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
mal5b-2d	5.0	1.5		4.5-7	0	25	43	32	0.018		CL	Lean CLAY w/sand	26.8	37	14	0 27	0.78	1.61	54		18	3.0	1.0				
mal5b-2c	5.5	1.7		4.5-7	0	31	41	28	0 027		CL	Sandy lean CLAY	22.9	32	11	0.19	0.69	1.61	39		13	2.9	0.9				
mal5b-2b	6.0	1.8		4.5-7	0	24	46	30	0.015		CL	Lean CLAY w/sand	25.1	35	11	0 10	0.65	1.61	35		14	2.4	0.8				
mal5b-2a	6.5	2.0		4.5-7	0	11	52	37	0.008		CL	Lean CLAY	30.5	43	16	0.21	0.76	1.61	46		16	2.9	0.6				
mal5b-3d	7.5	2.3		7-9.5	0	7	50	43	0.007		CL	Lean CLAY	33.1	46	19	0.32	0.70	1.57	48		13	3.8	1.0				
mal5b-3c	8.0	2.4		7-9.5	0	9	64	27	0.014		CL	Lean Clay	32.9	45	20	0.40	1.25	1.74	40		13	3.2	0.7				
mal5b-3b	8.5	2.6		7-9.5	0	13	55	32	0.013		CL	Lean CLAY	31.1	45	18	0.23	1 13	1.86	30		6	5.4	0.6				
mal5b-3a	9.0	2.7		7-9.5	0	9	46	45	0.006		CL	Lean Clay	36.2	47	21	0.49	1.05	1.83	26		6	4.7	0.4				
mal5b-4d	10.0	3.0		9.5-12	0	16	41	43	0.007		CL	Lean CLAY w/sand	33.3	47	20	0 32	0.87	1.88	39		13	3.0	0.4				
mal5b-4c	10.5	3.2		9.5-12	0	10	42	48	0.006		CH	Fat CLAY	30.4	51	24	0.14	0.92	1.82	53		22	2.4	0.9				
mal5b-4b	11.0	3.4		9.5-12	0	8	47	45	0.006		CL	Lean CLAY	36.5	48	20	0.43	0.80	1.88	36		11	3.2	0.6				
mal5b-4a	11.5	3.5		9.5-12	0	15	45	40	0.009		CL	Lean Clay	35.5	43	20	0.63	0.83	1.90	30		8	3.7	0.5				
mal5b-5d	12.5	3.8		12-14.5	0	15	47	38	0.010		CL	Lean CLAY	31.3	42	17	0.37	0.77	1.92	42		16	2.6	0.3				
mal5b-5c	13.0	4.0		12-14.5	0	15	55	30	0.014		CL	Lean CLAY	30.5	41	16	0.34	0.89	1.86	42		15	2.8	0.7				
mal5b-5b	13.5	4.1		12-14.5	0	15	51	34	0.012		CL	Lean CLAY w/sand	30.2	39	16	0.43	0.94	1.89	37		14	2.8	0.8				
mal5b-5a	14.0	4.3		12-14.5	0	14	52	34	0 013		CL	Lean CLAY	34.6	43	18	0.53	0.82	1.91	24		6	4.3	0.3				
mal5b-6d	15.3	4.6		14.5-17	0	22	44	34	0.013		CL	Lean CLAY w/sand	30.7	39	15	0.45	0.63	1.93	32		9	3.4	0.8				
mal5b-6c	15.5	4.7		14.5-17	0	22	52	26	0.025		CL	Lean CLAY w/sand	44.8	37	13	1.60	0.76	1.89	25		8	3.3	0.5				
mal5b-6b	16.0	4.9		14.5-17	0	25	47	28	0.025		CL	Lean CLAY w/sand	31.6	35	15	0.75	0.88	1.96	22		5	4.6	0.6				
mal5b-6a	16.5	5.0		14.5-17	0	24	49	27	0.024		CL	Lean CLAY w/sand	30.2	35	12	0.60	0.67	1.98	28		6	4.6	0.5				
mal5b-7e	17.0	5.2		17-19.5	0	25	51	24	0.027		CL	Lean CLAY w/sand	31.2	35	11	0.65	0.73	1.82	17		4	4.0	0.5				
mal5b-7d	17.5	5.3		17-19.5	0	20	47	33	0.017		CL	Lean CLAY w/sand	29.1	36	15	0.55	0.67	1.88	33		7	4.5	0.5				
mal5b-7c	18.0	5.5		17-19.5	1	28	39	32	0.017		CL	Lean CLAY w/sand	33.5	42	17	0.50	0.74	1.86	68		20	3.4	1.2				
mal5b-7b	18.5	5.6		17-19.5	0	36	37	27	0.030		CL	Sandy lean CLAY	29.7	37	13	0.44	0.76	1.88	58		9	6.2	0.7				
mal5b-7a	19.0	5.8		17-19.5	0	37	38	25	0.041		CL	Sandy lean CLAY	30.2	35	11	0.56	0.61	1.94	43		6	7.3	1.0				
mal5b-8e	19.8	6.0		19.5-22	0	31	39	30	0.025		CL	Sandy lean CLAY	36.1	37	14	0.94	0.74	1.98									
mal5b-8d	20.0	6.1		19.5-22	0	16	44	40	0.008		CL	Lean CLAY w/sand	32.9	46	19	0.31	0.73	1.92	63		16	4.0	1.0				
mal5b-8c	20.5	6.2		19.5-22	0	39	35	26	0.035		CL	Sandy lean CLAY	30.5	41	19	0.45	0.95	1.95	43		8	5.5	0.7				
mal5b-8b	21.0	6.4		19.5-22	0	22	44	34	0.015		CL	Lean CLAY w/sand	31.4	42	20	0.44	0.99	1.95	55		13	4.1	1.3				
mal5b-8a	21.5	6.6		19.5-22	0	27	44	29	0.025		CL	Lean CLAY w/sand	24.9	41	21	0.23	1.24	2.04	110		35	3.2	1.8				
mal5b-9d	22.0	6.7		22-24	0	27	47	26	0.028		CL	Lean CLAY w/sand	24.0	39	18	0.17	1.00	1.89	83		28	3.0	1.1				
mal5b-9c	22.5	6.9		22-24	0	22	51	27	0.023		CL	Lean CLAY w/sand	24.1	40	19	0.16	1.06	1.96	98		33	3.0	1.5				
mal5b-9b	23.0	7.0		22-24	0	14	47	39	0.011		CL	Lean CLAY	26.3	45	26	0.29	1.30	1.95	102		28	3.7	1.5				
mal5b-9a	23.5	7.2		22-24	0	15	43	42	0.009		CH	Fat CLAY w/sand	27.6	51	28	0.16	0.93	1.96	131		35	3.7	1.7				
mal5b-10d	24.5	7.5		24.5-26.5	0	18	48	34	0.018		CL	Lean CLAY w/sand	36.4	48	21	0.45	0.81	1.83	37		13	2.9	0.7				
mal5b-10c	25.0	7.6		24.5-26.5	0	13	43	44	0.008		CL	Lean CLAY	35.0	48	22	0.41	0.73	1.83	61		17	3.5	1.7				
mal5b-10b	25.5	7.8		24.5-26.5	0	18	46	36	0.012		CL	Lean CLAY w/sand	37.5	39	19	0.92	0.87	1.88	39		10	3.8	0.5				
mal5b-10a	26.0	7.9		24.5-26.5	0	24	52	24	0.025		CL	Lean CLAY w/sand	34.6	35	14	0.97	0.88	1.90	54		15	3.6	1.3				
mal5b-11d	26.5	8.1		26.5-28.5	0	27	35	38	0.014		CL	Lean CLAY w/sand	25.8	32	14	0.56	0.48	1.96	59		12	5.0	1.1				
mal5b-11c	27.0	8.2		26.5-28.5	0	39	45	16	0.046		CL	Sandy lean CLAY	29.6	29	11	1.05	1.00	2.01	36		6	6.6	0.7				
mal5b-11b	27.5	8.4		26.5-28.5	13	57	16	14	0 345	291	SM	Silty SAND	23.4					2.07									
mal5b-11a	28.0	8.5		26.5-28.5	22	60			0.860		SM	Silty SAND w/gravel	18.7					2.14					1.0				
mal5b-12a	29.5	9.0		28.5-30	3	36	46	15	0.045	30	CL	Sandy lean CLAY		27	9		1.00										
mal5b-12b	29.8	9.1	18	28.5-30	1	39	45	15	0.053		ML	Sandy SILT															
mal5b-13	31.0	9.4	20	30-31.5	4	43	26	27	0.052		CL	Sandy lean CLAY															
mal15-2	6.0	1.8	10	5-6.5	0	26	45	29	0.021		CL	Lean CLAY w/sand												62	35	21	2.95
mal15-3-2	11.0	3.4	10	10-11.5	0	35	42	23	0.033		CL	Sandy lean CLAY	19.1	29	8	-0.24	0.57		43	32	7	6.1	-0.5				
mal15-4-E	12.5	3.8		12.5-15	1	39	36	24	0.048		CL	Sandy lean CLAY	18.7	30	10	-0.13	0.59	1.89	62	30	6	10.3	1.5				
mal15-4-D	13.0	4.0		12.5-15	0	42	37	21	0.056		CL-ML	Sandy silty CLAY	15.7	25	5	-0.86	0.38	1.67	61	39	8	7.6	1.0	59	41	27	2.19
mal15-4-C	13.5	4.1		12.5-15	0	44	44	12	0.063	25	ML	Sandy SILT	13.3					1.65	65	47	17	3.8	1.5				
mal15-4-B	14 0	4.3		12.5-15	0	47	38	15	0.068		CL	Sandy lean CLAY	12.4	30	10	-0 76	0.45	1.76	50	39	6	8.3	-0.5	71	46	25	2 84
mal15-4-A	14.5	4.4		12.5-15	0	34	45	21	0.034		CL	Sandy lean CLAY	16.1	31	10	-0.49	0.63	1.75									
mal15-6-2	16.0	4.9	10	15-16.5	0	38	39	23	0.038		CL	Sandy lean CLAY	19.7	29	10	0.07	0.71		73	62	16	4.6	0.8				
mal15-7-1-D	20.0	6.1		20-22	0	21	56	23	0.021		CL	Lean CLAY w/sand	17.1	31	11	-0.26	0.69	2.32	47	39	13	3.6	0.8				
mal15-7-1-C	20.5	6.2		20-22	0	10	67	23	0.018		CL	Lean CLAY	32.4	38	13	0.57	1.08	1.73	34	28	10	3.4	0.5				
mal15-7-1-B	21.0	6.4		20-22	0	31	51	18	0.034		CL	Sandy lean CLAY	26 1	33	9	0.23	0 90	1.83	47	39	17	2.8	0.7	61	39	28	2 18

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
mal15-7-1-A	21.5	6.6		20-22	0	26	50	24	0.023		CL	Lean CLAY w/sand	26.4	35	11	0.21	1.00	1.88									
mal15-8-2	23.5	7.2		23-24.5	0	44	43	13	0.064	24	ML	Sandy SILT	25.9														
mal15-8-3	24.5	7:5	10	23-24.5	0	30	60	10	0.050	12	ML	Sandy SILT							30	20	8	3.8	<0.1				
mal15-9-1-D	28.0	8.5		28-30	0	18	55	27	0.017		CL	Lean CLAY w/sand	29.1	35	12	0.51	0.75	2.22	24	19	5	4.8	<0.1				
mal15-9-1-C	28.5	8.7		28-30	0	20	55	25	0.019		CL	Lean CLAY w/sand	32.8	39	16	0.61	1.07	1.88	48	31	5	9.6	0.5				
mal15-9-1-B	29.0	8.8		28-30	0	19	55	26	0.019		CL	Lean CLAY w/sand	33.3	41	17	0.55	1.13	1.91	32	25	7	4.6	0.4				
mal15-9-1-A	29.5	9.0		28-30	0	19	52	29	0.020		CL	Lean CLAY w/sand	33.1	40	15	0.54	0.79	1.98									
mal15-10-7	34.5	10.5		33.5-35	0	25	44	31	0.019		CL	Lean CLAY w/sand	31.1	45	24	0.42	0.88										
mal15-10-6	34.8	10.6	4	33.5-35	0	31	39	30	0.022		CL	Sandy lean CLAY											4.0				
mal15-11-1-D	38.0	11.6		38-39.7	0	34	34	32	0.023		CL	Sandy lean CLAY	27.5					2.02	199	+			3.7				
mal15-11-1-C	38.5	11.7		38-39.7	0	37	41	22	0.035		CL	Sandy lean CLAY	21.5	35	16	0.15	1.23	2.08	199	+			3.3				
mal15-11-1-B	39.0	11.9		38-39.7	0	35	39	26	0.028		CL	Sandy lean CLAY	21.0	39	18	-0.00	1.13	2.08	199	+			3.5				
mal15-11-1-A	39.5	12.0		38-39.7	0	28	42	30	0.020		CL	Lean CLAY w/sand	23.8	39	17	0.11	0.94	2.05									
mal15-12-1	45.0	13.7		45-46.5	14	13	30	43	0.008		CL	Lean CLAY w/sand															
mal15-12-2	45.9	14.0		45-46.5	0	24	46	30	0.016		CL	Lean CLAY w/sand	31.4														
mal15-12-3	46.3	14.1	101	45-46.5	0	84	10	6	0.132	8	SM	Silty SAND	15.2														
mal16-1	3.0	0.9	5	2-3.5	1	25	39	35	0.014		CL	Lean CLAY w/sand	22.0	34	12	-0.00	0.52							63	42	20	3.15
mal16-2	7.8	2.4	7	7-8.5	0	38	45	17	0.050		CL-ML	Sandy silty CLAY	14.6	28	7	-0.92	0.64							53	39	21	2.52
mal16-3	13.0	4.0	10	12-13.5	0	20	47	33	0.015		CL	Lean CLAY w/sand	23.3	38	15	0.02	0.75		59	50	24	2.5	0.3				
mal16-4-D	16.4	5.0		16-18	0	24	45	31	0.019		CL	Lean CLAY w/sand	28.1	34	12	0.51	0.57		31	21	16	1.9	0.4				
mal16-4-C	16.5	5.0		16-18	0	19	51	30	0.016		CL	Lean CLAY w/sand	27.7					1.91	54	18	6	9.0	0.4				
mal16-4-B	17.0	5.2		16-18	0	28	43	29	0.020		CL	Lean CLAY w/sand	26.8	32	11	0.53	0.61	1.97	35	17			0.3				
mal16-4-A	17.5	5.3		16-18	0	26	45	29	0.018		CL	Lean CLAY w/sand	28.8	33	9	0.54	0.47	1.94	20	16	2	10.0	0.3	54	40	22	2.45
mal16-5-D	18.1	5.5		18-20	0	19	45	36	0.011		CL	Lean CLAY w/sand	32.5						16	14	2	8.0	0.1				
mal16-5-C	18.5	5.6		18-20	0	14	50	36	0.011		CL	Lean CLAY	34.0	39	15	0.67	0.83	1.90	32	25	6	5.3	0.3				
mal16-5-B	19.0	5.8		18-20	0	15	51	34	0.012		CL	Lean CLAY w/sand	33.2					1.96	32	24	9	3.6	0.5	31	26	20	1.55
mal16-5-A	19.5	5.9		18-20	0	16	45	39	0.008		CL	Lean CLAY w/sand	31.4	40	15	0.43	0.60	1.96			2	0.0	<0.1				
mal16-6-D	22.1	6.7		22-24	0	36	41	23	0.039		CL	Sandy lean CLAY	33.3	31	8	1.28	0.62	1.97	16	9	2	8.0	<0.1				
mal16-6-C	22.5	6.9		22-24	0	18	55	27	0.023		CL	Lean CLAY w/sand	32.2					2.01	17	14	4	4.3	0.2				
mal16-6-B	23.0	7.0		22-24	0	22	47	31	0.019		CL	Lean CLAY w/sand	31.1	35	11	0.65	0.61	1.87	32	27	10	3.2	0.7				
mal16-6-A	23.5	7.2		22-24	0	26	45	29	0.023		CL	Lean CLAY w/sand	28.2	32	9	0.58	0.50	2.03									
mal16-7-A	28.5	8.7		28-29.5	0	14	32	54	0.004		CH	Fat CLAY															
mal16-7-B	29.3	8.9	7	28-29.5	0	21	48	31	0.015		CL	Lean CLAY w/sand	35.1	44	20	0.56	1.05										
mal16-8-A	31.2	9.5		31-32.5	0	34	47	19	0.042		CL	Sandy lean CLAY															
mal16-8-B	32.0	9.8	13	31-32.5	0	32	49	19	0.043		CL	Sandy lean CLAY	27.8	27	7	1.12	0.64										
mal16-9-A	33.5	10.2		33-34.5	5	41	31	23	0.063		CL	Sandy lean CLAY															
mal16-9-B	34.0	10.4	13	33-34.5	0	31	49	20	0.041		CL	Sandy lean CLAY	19.2	32	12	-0.07	1.00						<0.1				
mal16-10-D	34.5	10.5		34.5-36.5	0	37	37	26	0.046		CL	Sandy lean CLAY	28.3	29	10	0.93	0.50	1.99	34	28	11	3.1	0.8				
mal16-10-C	35.0	10.7		34.5-36.5	0	28	36	36	0.017		CL	Lean CLAY w/sand	22.2	41	23	0.18	0.88	1.96									
mal16-10-B-2	35.5	10.8		34.5-36.5	0	28	36	36	0.018		CL	Lean CLAY w/sand	23.8	41	24	0.28	0.89		106	62	25	4.2	1.6				
mal16-10-B-1	35.8	10.9		34.5-36.5	0	26	35	39	0.013		CL	Lean CLAY w/sand		42	23		0.85	2.02	82	54	24	3.4	1.3				
mal16-10-A	36.0	11.0	53	34.5-36.5	0	25	35	40	0.011		CL	Lean CLAY w/sand	26.5	42	22	0.30	0.79	1.80									
mal16-11	43.0	13.1		42-43.5	0	75	14	11	0.315	145	SM	Silty SAND	13.5														

Wynne

wyn1-1a	3.0	0.9	7	2-3.5	0	18	46	36	0.011		CL	Lean CLAY w/sand															
wyn1-2b	6.0	1.8	5	5-6.5	0	51	38	11	0.076	29	SM	Silty SAND	11.0														
wyn1-3b	9.5	2.9	4	8.5-10	0	33	49	18	0.032		CL	Sandy lean CLAY	20.5	31	9	-0.17											
wyn1-4e	11.5	3.5		11.5-14	0	17	58	25	0.019		CL	Lean CLAY w/sand	28.1	36	12	0.34	0.92	1.80	24		10	2.3	1 2				
wyn1-4d	12.0	3.7		11.5-14	0	15	59	26	0.017		CL	Lean CLAY w/sand	34.2	34	13	1.02	1.00	1.80	24		11	2.3	0.1				
wyn1-4c	12.5	3.8		11.5-14	0	22	52	26	0.021		CL	Lean CLAY w/sand	32.8	36	13	0.75	1.08	1.82	14		7	2.1	0 2				
wyn1-4b	13.0	4.0		11.5-14	0	17	50	33	0.012		CL	Lean CLAY w/sand	34.9	42	16	0.56	0.62	1.81	21		7	3.1	0.2				
wyn1-4a	13.5	4.1		11.5-14	0	14	58	28	0.016		CL	Lean CLAY	34.8	39	16	0.74	1.07	2.02	23		7	3.2	0.2				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
wyn1-5e	17.5	5.3		17.5-20	0	35	41	24	0.040		CL	Sandy lean CLAY	29.8	33	14	0.77	0.93	1.83	18		6	3.0	0.1				
wyn1-5d	18.0	5.5		17.5-20	0	36	40	24	0.037		CL	Sandy lean CLAY	27.8	36	19	0.57	1.46	1.96	24		5	4.8	0.2				
wyn1-5c	18.5	5.6		17.5-20	0	38	40	22	0.038		CL	Sandy lean CLAY	29.6	31	11	0.87	0.65	1.96	20		6	3.6	0.2				
wyn1-5b	19.0	5.8		17.5-20	0	49	31	20	0.070		CL	Sandy lean CLAY	23.5	27	7	0.50	0.58	2.02	19		4	4.8	0.4				
wyn1-5a	19.5	5.9		17.5-20	0	49	30	21	0.071		CL-ML	Sandy silty CLAY	23.9	24	8	0.99	0.47	2.08	33		9	3.8	1.2				
wyn1-6b	20.3	6.2		20-21.5	0	53	28	19	0.079		SC	Clayey SAND	22.8	27	8	0.48	0.67										
wyn1-6c	21.2	6.4	9	20-21.5	6	56	24	14	0.123	79	SM	Silty SAND															
wyn1-7a	23.5	7.2	20	22.5-24	10	79	7	4	0.377	10	SW-SM	SAND w/silt															
wyn1-8c	24.5	7.5		24.5-25	33	61	5	0	1.450	22	SW-SM	SAND w/silt+gravel	19.3					1.75	22		3	7.3	0.6				
wyn1-8b	25.0	7.6		24.5-25	27	65	8	0	1.310	2.3	SP-SM	SAND w/silt+gravel	16.9					2.14									
wyn1-9d	25.5	7.8		25.5-27.5	18	66	11	5	0.580	35	SM	Silty SAND w/gravel						2.13									
wyn1-9c2	26.0	7.9		25.5-27.5	8	53	32	7	0.110	17	SM	Silty SAND	32.9					2.04	19		6	3.5	0.4				
wyn1-9c1	26.3	8.0		25.5-27.5	1	24	67	8	0.054	9.7	ML	Sandy SILT															
wyn1-9b	26.5	8.1		25.5-27.5	0	33	51	16	0.035		ML	Sandy SILT	34.9	33	5	1.38	0.50	1.85	17		8	2.3	0.4				
wyn1-9a	27.0	8.2		25.5-27.5	0	8	70	22	0.015		CL	Lean CLAY	40.0	39	12	1.08	1.20	1.87	17		6	2.7	0.3				
wyn5-1a	2.3	0.7		2-3.5	1	50			0.080		SM	Silty SAND															
wyn5-1b	3.0	0.9	7	2-3.5	1	56	28	15	0.100	78	SM	Silty SAND															
wyn5-2a	5.5	1.7	12	4.5-6	1	62	28	9	0.129	27	SM	Silty SAND															
wyn5-3b	7.5	2.3		7-8.5	0	47	44	9	0.071	18	ML	Sandy SILT		21	1												
wyn5-3c	8.2	2.5	4	7-8.5	0	9	64	27	0.013		CL	Lean CLAY	29.5	44	18	0.19	1.29										
wyn5-4b	10.0	3.0		9.5-11	0	30	53	17	0.035	23	CL	Lean CLAY w/sand	21.3	29	7	-0.10	0.78										
wyn5-4c	10.6	3.2		9.5-11	0	49	35	16	0.074	61	CL	Sandy lean CLAY															
wyn5-4d	10.9	3.3	1	9.5-11	0	21	50	29	0.018		CL	Lean CLAY w/sand															
wyn5-5b	12.5	3.8		12-13.5	0	46	37	17	0.062	41	CL	Sandy lean CLAY	16.4														
wyn5-5c	13.4	4.1	7	12-13.5	16	63	15	7	0.400	62	SM	Silty SAND w/gravel															
wyn5-6b	15.5	4.7	1	14.5-16	0	33	39	28	0.015		CL	Sandy lean CLAY	31.1	35	15	0.74	1.07										
wyn5-7b	18.0	5.5	2	17-18.5	0	48	32	20	0.063		CL	Sandy lean CLAY	22.1	26	7	0.44	0.64										
wyn5-8b	20.0	6.1	10	19-20.5	8	61	21	10	0.160	48	SM	Silty SAND	18.3														
wyn5-9a	21.8	6.6		21.5-23	0	94	6	0	0.435	3.9	SP-SM	SAND w/silt															
wyn5-9b	22.8	6.9		21.5-23	0	80	17	3	0.200	8.1	SM	Silty SAND															
wyn5-9c	22.3	6.8	29	21.5-23	8	69	19	4	0.375	29	SM	Silty SAND															
wyn5-10a	24.4	7.4		24-25.5	2	89	8	1	0.310	4.8	SP-SM	SAND w/silt															
wyn5-10b	25.2	7.7	8	24-25.5	0	31	61	8	0.053	11	ML	Sandy SILT															
wyn5-11b	28.4	8.7		28-29.5	0	83	14	3	0.220	4.9	SM	Silty SAND															
wyn5-11c	29.2	8.9	8	28-29.5	0	20	50	30	0.019		CL	Lean CLAY w/sand	20.3	39	20	0.06	0.95										
wyn5-12a	34.0	10.4	24	33-34.5	7	83	8	2	0.410	6.9	SP-SM	SAND w/silt															
wyn5-13a	36.1	11.0		36-37.5	2	37	38	23	0.051		CL	Sandy lean CLAY															
wyn5-13b	36.9	11.2	39	36-37.5	7	62	20	11	0.172	55	SM	Silty SAND															
wyn5-14a	45.0	13.7	15	44-45.5	0	37	38	25	0.038		CL	Sandy lean CLAY	21.8	43	22	0.04	1.29										
wyn5-15a	53.0	16.2	71	52-53.5	0	61	28	11	0.111	40	SM	Silty SAND															
wyn5b-1c	3.0	0.9		3-5.5	0	57	26	17	0.100		SM	Silty SAND	12.1	21	3	-1.97	0.25	1.73	39		5	7.8	0.3				
wyn5b-1b	3.5	1.1		3-5.5	0	56	29	15	0.093		SM	Silty SAND	12.1	22	4	-1.48	0.31	1.61	63		20	3.1	0.6				
wyn5b-1a	4.0	1.2		3-5.5	33	44	13	10	0.450	720	SM	Silty SAND w/gravel															
wyn5b-2	7.5	2.3		5.5-8	3	50	30	17	0.092	65	SM	Silty SAND															
wyn5b-3	10.0	3.0		8-10.5	0	33	45	22	0.030	29	CL	Sandy lean CLAY															
wyn5b-5d	13.8	4.2		13-15.5	0	18	52	30	0.014		CL	Lean CLAY w/sand	37.3	39	17	0.90	1.21						0.1				
wyn5b-5c	14.3	4.4		13-15.5	0	17	53	30	0.013		CL	Lean CLAY w/sand	35.2	44	18	0.51	0.82	1.78	14		6	2.4	0.1				
wyn5b-5b	14.7	4.5		13-15.5	2	4	54	40	0.008		CL	Lean CLAY	43.0	46	19	0.84	0.79	1.84	28		10	2.7	0.3				
wyn5b-5a	15.1	4.6		13-15.5	0	24	41	35	0.012		CL	Lean CLAY w/sand	42.0	36	15	1.40		1.90	9		3	3.1	0.2				
wyn5b-6e	15.5	4.7		15.5-18	0	41	40	19	0.046	53	CL	Sandy lean CLAY	27.1	30	8	0.64	0.73	1.89	22		5	4.8	0.3				
wyn5b-6d	16.0	4.9		15.5-18	1	36	39	24	0.032	36	CL	Sandy lean CLAY	27.7	31	11	0.70	1.00	1.93	21		6	3.8	0.2				
wyn5b-6c	16.5	5.0		15.5-18	0	39	41	20	0.044	41	CL	Sandy lean CLAY	29.0	29	9	1.00	0.82	2.03	NA		NA	NA	0.3				
wyn5b-6b	17.0	5.2		15.5-18	2	51	29	18	0.085	58	SC	Clayey SAND	25.2	28	9	0.69	1.00	2.04	17		6	2.7	0.2				
wyn5b-6a	17.5	5.3		15.5-18	1	49	33	17	0.072		CL	Sandy lean CLAY	24.6	26	8	0.83	0.67	2.05	47		13	3.7	0.2				
wyn5b-7e	18.0	5.5		18-20	3	47	29	21	0.076		SC-SM	Silty clayey SAND	24.8	27	9	0.76	0.64	2.03	13		2	6.2	0.1				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
wyn5b-7d	18.5	5.6		18-20	4	59	22	15	0.132		SC-SM	Silty clayey SAND	23.0	24	6	0.83	0.50	2.07	16		3	6.3	0.4				
wyn5b-7c	19.0	5.8		18-20	1	57	29	13	0.102	79	SM	Silty SAND	24.3	23	4	1.33	0.40	2.15	18		5	3.8	0.1				
wyn5b-7b	19.5	5 9		18-20	4	66	20	10	0.170	44	SM	Silty SAND	22.9					2.12					0.3				
wyn5b-7a	19.8	6.0		18-20	2	65	22	11	0.149	46	SM	Silty SAND	19.7														
wyn5b-8	21.5	6.6	19	20.5-22	19	70			0.485	18	SW-SM	SAND w/silt-gravel															
wyn5b-9	24.0	7.3	20	23-24.5	12	72	13	3	0.400	18	SM	Silty SAND	17.4														
wyn5c-1e	3.2	1.0		3-5.5	1	58	28	13	0.111	82	SM	Silty SAND	11.7					1.76	12		2	7.5	2.3	52	32	12	4.3
wyn5c-1d	3.5	1.1		3-5.5	2	57	23	18	0.112		SM	Silty SAND	11 7	22	4	-1 58	0.29	1.63	50		8	6.4	1.3				
wyn5c-1c	4.0	1.2		3-5.5	0	59	27	14	0.112		SM	Silty SAND	11.5	21	3	-2.17	0.25	1.64	37		6	6.7	0.8				
wyn5c-1b	4.5	1 4		3-5.5	4	69	17	10	0.224	70	SM	Silty SAND	10.6					1.77	69		4	17.4	1.0				
wyn5c-1a	5.0	1.5		3-5.5	0	56	27	17	0.108		SM	Silty SAND	8.8	20	2	-4.60	0.17	1.83	114		11	10.8	1.3				
wyn5c-2e	5.6	1.7		5.5-8	1	51	36	12	0.081	43	SM	Silty SAND	13.3					1.65	38		4	9.6	1.3	24	0	16	1.5
wyn5c-2d	6.0	1.8		5.5-8	0	54	35	11	0.086	44	SM	Silty SAND	15.1					1.73	46		4	11.6	0.9				
wyn5c-2c	6.5	2.0		5.5-8	0	46	44	10	0.065	18	ML	Sandy SILT	10.0	24	2	-6.00	0.25	1.75	41		6	7.4	0.5				
wyn5c-2b2	7.0	2.1		5.5-8	15	61	16	8	0.345	84	SM	ilty SAND w/Gravel															
wyn5c-2b1	7.3	2.2		5.5-8	0	52	34	14	0.080	54	SM	Silty SAND	11.8	23	2	-4.60	0.20	1.67	44		6	7.0	0.8				
wyn5c-2a	7.5	2.3		5.5-8	0	16	45	39	0.009		CL	Lean CLAY w/sand	24.0	42	17	-0.06	0.67	1.80	53		16	3.4	1.3				
wyn5c-3e	8.3	2.5		8-10.5	0	15	55	30	0.017		CL	Lean CLAY w/sand	32.9	40	14	0.49	0.88	1.70	38		13	2.8	0.5	52	31	21	2.5
wyn5c-3d	8.5	2.6		8-10.5	0	26	47	27	0.018		CL	Lean CLAY w/sand	24.7	36	14	0.19	0.82	1.74	39		10	3.8	0.5				
wyn5c-3c	9.0	2.7		8-10.5	2	31	47	20	0.032		CL	Sandy lean CLAY	26.4	29	8	0.68	0.62	1.92			0		0.8				
wyn5c-3b	9.5	2.9		8-10.5	1	35	45	19	0.038		CL	Sandy lean CLAY	25.2	31	9	0.36	0.75	1.94	27		6	4.9	0.3				
wyn5c-3a	10.0	3.0		8-10.5	0	31	43	26	0.030		CL	Sandy lean CLAY	27.5	31.7	13	0.68	1.00	2.01	20		5	4.2	0.3				
wyn5c-4e	10.5	3.2		10.5-13	0	38	48	14	0.045	20	CL-ML	Sandy silty CLAY	24.5	28	7	0.50	1.17	1.76	32		11	2.9	0.5	37	34	20	1.9
wyn5c-4d2	11.0	3.4		10.5-13	1	49	39	11	0.073	27	SM	Silty SAND															
wyn5c-4d1	11.4	3.5		10.5-13	2	63	26	9	0.170	46	SM	Silty SAND	19.8					1.96	15		5	3.2	0.3				
wyn5c-4c	11.5	3.5		10.5-13	1	33	38	27	0.027		CL	Sandy lean CLAY	26.8	32	13	0.60	1.00	1.91	20		8	2.5	0.3				
wyn5c-4b2	12.0	3.7		10.5-13	0	23	48	29	0.017		CL	Lean CLAY w/sand															
wyn5c-4b1	12.4	3.8		10.5-13	0	26	42	32	0 017		CL	Lean CLAY w/sand	29.0	37	14	0.43	0.82	1.94	28		10	2.8	0.1				
wyn5c-4a2	12.5	3.8		10.5-13	0	32	36	32	0.016		CL	Sandy lean CLAY	27.1	32	14	0.65	0.74	2.01	35		10	3.4	0.3				
wyn5c-4a1	12.9	3.9		10.5-13	33	52	10	5	1.620	128	SM	Silty sandy w/gravel															
wyn5c-5e	13.3	4.0		13-15.5	1	24	48	27	0.019		CL	Lean CLAY w/sand	33.3	35	12	0.86	0.92	1.90						25	22	20	1.3
wyn5c-5d	13.5	4.1		13-15.5	1	13	65	21	0.013		CL	Lean CLAY	32.3	43	17	0.37	1.13	1.86	13		5	2.6	0.3				
wyn5c-5c	14.0	4.3		13-15.5	5	17	51	27	0.017		CL	Lean CLAY w/sand	32.8	41	16	0.49	1.14	1.90	14		1	16.3	0.2				
wyn5c-5b	14.5	4.4		13-15.5	0	15	57	28	0.014		CL	Lean CLAY w/sand	30.9	43	19	0.36	1.36	1.88	12		3	4.2	0.2				
wyn5c-5a2	15.0	4.6		13-15.5	0	27	47	26	0.018		CL	Lean CLAY w/sand		39	17		1.13										
wyn5c-5a1	15.3	4.6		13-15.5	2	49	31	18	0.084	67	SC	Clayey SAND	34.9	30	9	1.54	0.90	1.94	15		4	3.5	0.3				
wyn5c-6e	15.5	4.7		15.5-18	1	32	49	18	0.033	22	CL	Sandy lean CLAY	26.2	30	10	0.62	1.25	1.93	15		4	3.5	2.7	37	33	19	1.9
wyn5c-6d	16.0	4.9		15.5-18	0	33	46	21	0.030		CL	Sandy lean CLAY	30.6	31	11	0.96	0.92	1.95	15		5	3.2	0.1				
wyn5c-6c	16.5	5.0		15.5-18	0	38	42	20	0.040		CL	Sandy lean CLAY	27.8	30	10	0.78	0.91	2.03	44		8	5.1	NA				
wyn5c-6b	17.0	5.2		15.5-18	0	46	36	18	0.060	97	CL	Sandy lean CLAY	24.8	27	8	0.73	0.73	2.04	18		6	3.0	0.2				
wyn5c-6a	17.5	5.3		15.5-18	0	46	40	14	0.062	33	CL	Sandy lean CLAY	26.1	27	8	0.89	1.14	2.11	22		6	3.6	0.1				
wyn5c-7d	18.0	5.5		18-20	3	52	31	14	0.093	70	SC-SM	Silty, clayey SAND	23.1	24	5	0.82	0.50	2.07	19		2	10.7	0.3				
wyn5c-7c	18.5	5.6		18-20	2	56	30	12	0.103	45	SM	Silty SAND	23.1	22	2	1.55	0.25	2.03	10		2	4.5	0.2				
wyn5c-7b	19.0	5.8		18-20	1	59	29	11	0.109	43	SM	Silty SAND	23 0	22	4	1.25	0.50	2.09	9		2	3.6	0.2				
wyn5c-7a	19.5	5.9		18-20	1	64	25	10	0.132	41	SM	Silty SAND	23.1	20	1	4.10	0.13	2.09	5		1	5.9	0.3				
wyn5c-8b	20.3	6.2		20-21.5	7	70	17	6	0.230	19	SM	Silty SAND															
wyn5c-8a	21.0	6.4	16	20-21.5	14	77			0.420	6.6	SW-SM	SAND w/silt															
wyn5c-9	23.0	7.0	26	22-23.5	14	72			0.317		SM	Silty SAND															
wyn7-1b	4.5	1.4	7	3.5-5	1	42	33	24	0.049		CL-ML	Sandy silty CLAY	14.8	25	5	-1.04	0.33										
wyn7-2b	7.0	2.1	8	6-7.5	0	15	53	32	0.013		CL	Lean CLAY w/ sand	20.1	40	18	-0.11	1.06										
wyn7-3b	9.0	2.7	4	8-9.5	0	21	41	38	0.010		CL	Lean CLAY w/ sand	27.1	41	18	0.23	0.86										
wyn7-4b	12.0	3.7	2	11-12.5	0	23	54	23	0.024		CL	Lean CLAY w/sand	27.5	36	15	0.43	0.94										
wyn7-5b	13.9	4.2		13.5-15	0	19	48	33	0.013		CL	Lean CLAY w/sand															
wyn7-5c	14.7	4.5	2	13.5-15	0	21	48	31	0.015		CL	Lean clay w/sand	30.6	42	20	0.43	1.11										
wyn7-6b	16.0	4.9	4	15-16.5	0	28	45	27	0.025		CL	Lean CLAY w/sand	34.4	36	15	0 89	0.75										

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
wyn7-7b	18.0	5.5	2	17-18.5	0	39	41	20	0 042		CL-ML	Sandy silty CLAY	30.0	26	6	1.67	0.43										
wyn7-8b	21.0	6.4	12	20-21.5	0	57	32	11	0.098	27	SM	Silty SAND	19.4	22	0												
wyn7-9a	23.7	7.2		23.5-25	0	46					ML	Sandy SILT	26.6														
wyn7-9b	24.2	7.4		23.5-25	0	46	49	5	0.068	7.3	ML	Sandy SILT															
wyn7-9c	25.0	7.6	13	23.5-25	0	18	49	33	0.016		CL	Lean CLAY w/sand															
wyn7-10b	26.7	8.1		26.5-28	0	9	53	38	0.011		CL	Lean CLAY															
wyn7-10c	27.2	8.3		26.5-28	0	13	44	43	0.008		CL	Lean CLAY	23.2														
wyn7-10d	27.7	8.4	8	26.5-28	0	25	44	31	0.018		CL	Lean CLAY w/sand		44	24		1.14										
wyn7-11b	32.3	9.8		31.5-33	2	49	34	15	0.078		SM	Silty SAND															
wyn7-11c	32.8	10.0	13	31.5-33	0	21	45	34	0.015		CL	Lean CLAY w/sand	20.0														
wyn7b-1e2	2.0	0.6		2-4.5	0	43	29	28	0.053		CL	Sandy lean CLAY	16.5	30	11	-0.23	0.58	1.72	67		9	7.7	2.4				
wyn7b-1e1	2.3	0.7		2-4.5	0	47	32	21	0.065		CL	Sandy lean CLAY		26	7		0 54										
wyn7b-1d	2.5	0.8		2-4.5	2	48	31	19	0.072		CL	Sandy lean CLAY	13.8	25	6	-0.87	0.46	1.81	50		9	5.3	1.3				
wyn7b-1c	3.0	0.9		2-4.5	0	46	37	17	0.068		CL-ML	Sandy silty CLAY	15.6	26	7	-0.49	0.58	1.75	132		28	4.6	3.0				
wyn7b-1b	3.5	1.1		2-4.5	0	46	31	23	0.062		CL-ML	Sandy silty CLAY	15.2	25	7	-0.40	0.44	1.68	86		22	3.9	1.8				
wyn7b-1a	4.0	1.2		2-4.5	2	47	34	17	0.072		CL-ML	Sandy silty CLAY	15.5	24	4	-1.13	0.31	1.74	44		9	4.9	0.9				
wyn7b-2c	4.5	1.4		4.5-7	1	50	31	18	0.076		SC-SM	Silty, clayey SAND	12.7	24	4	-1.83	0.31	1.75	50		11	4 7	1.2				
wyn7b-2b	5.0	1.5		4.5-7	0	49	32	19	0.073		CL-ML	Sandy silty CLAY	13.2	23	4	-1.45	0.29	1.67	53		13	4.2	1.4				
wyn7b-2a	5.5	1.7		4.5-7	3	56	27	14	0.112	175	SM	Silty SAND	13.7														
wyn7b-3e	7.0	2.1		7-9.5	0	25	50	25	0.025		CL	Lean CLAY w/sand	22.5	34	11	-0.05	0.61	2.04	46		20	2.3	0.3				
wyn7b-3d	7.5	2.3		7-9.5	0	26	51	23	0.029		CL	Lean CLAY w/sand	24.7	37	14	0.12	0.88	1.81	54		17	3.1	1.0				
wyn7b-3c	8.0	2.4		7-9.5	0	22	40	38	0.012		CL	Lean CLAY w/sand	30 2	37	13	0.48	0.48	1.78	41		20	2.1	0.9				
wyn7b-3b	8.5	2.6		7-9.5	0	26	48	26	0.025		CL	Lean CLAY w/sand	25.3	34	13	0 33	0.72	1.84	58		23	2.5	0.5				
wyn7b-3a	9.0	2.7		7-9.5	3	32	42	23	0.039		CL	Sandy lean CLAY	28.7	32	9	0.63	0.53	1.92	28		13	2.2	0.4				
wyn7b-4e	9.5	2.9		9.5-12	0	20	49	31	0.014		CL	Lean CLAY w/sand	28.7	36	13	0.44	0.68	1.64	13		3	3.9	0.6				
wyn7b-4d	10.0	3.0		9.5-12	0	21	43	36	0.012		CL	Lean CLAY w/sand	30.3	38	15	0.49	0.58	1.78	26		10	2.6	0.3				
wyn7b-4c	10.5	3.2		9.5-12	0	25	43	32	0.016		CL	Lean CLAY w/sand	33.6	38	14	0.69	0.67	1.81	20		5	4.2	0.1				
wyn7b-4b2	11.0	3.4		9.5-12	4	33	31	32	0.015		CL	Sandy lean CLAY	32.4					1.83	17		5	3.7	0.0				
wyn7b-4b1	11.3	3.4		9.5-12	12	62	13	13	0.485	258	SM	Silty SAND															
wyn7b-4a2	11.5	3.5		9.5-12	6	70	10	14	0.275	179	SM	Silty SAND	22.6														
wyn7b-4a1	11.9	3.6		9.5-12	0	24	30	46	0.006		CL	Lean CLAY w/sand		47	21		0.78	1.91	NA		NA	NA	0.7				
wyn7b-5d	12.5	3.8		12-14.5	0	10	59	31	0.015		CL	Lean CLAY	36.4	40	14	0.74	0.70	1 83	12		5	2.6	0.2				
wyn7b-5c	13.0	4.0		12-14.5	0	19	53	28	0.020		CL	Lean CLAY w/sand	34.9	39	15	0.73	0.88	1.86	19		6	3.0	0.2				
wyn7b-5b	13.5	4.1		12-14.5	1	17	53	29	0.015		CL	Lean CLAY w/sand	33.9	39	16	0.68	1.07	1.90	22		8	2.9	0.3				
wyn7b-5a	14.0	4.3		12-14.5	1	31	34	34	0.017		CL	Sandy lean CLAY	29.0	37	16	0.50	0.70	1.95	23		9	2.5	0.3				
wyn7b-6d	15.0	4.6		14.5-17	0	23	45	32	0.015		CL	Lean CLAY w/sand	34.9	36	14	0.92	0.67	1.92	20		4	4.7	0.3				
wyn7b-6c	15.5	4.7		14.5-17	0	38	35	27	0.042		CL	Sandy lean CLAY	33 8	31	13	1.22	0.68	1.95	23		3	9.2	0.3				
wyn7b-6b	16.0	4.9		14.5-17	0	35	39	26	0.038		CL	Sandy lean CLAY	26.5	34	14	0.46	0.88	2.00	23		5	5.0	NA				
wyn7b-6a	16.5	5.0		14.5-17	0	31	43	26	0.030		CL	Sandy lean CLAY	28.3	33	12	0.61	0.63	2.01	21		5	4.1	0.3				
wyn7b-7e2	17.1	5.2		17-19.5	0	30	40	30	0.024		CL	Sandy lean CLAY	28.0	36	15	0.47	0.71	1.91	18		9	1.9	0.2				
wyn7b-7e1	17.4	5.3		17-19.5	0	45	37	18	0.056		CL	Sandy lean CLAY															
wyn7b-7d	17.5	5.3		17-19.5	0	42	36	22	0.053		CL	Sandy lean CLAY	24 4	28	6	0.40	0.43	1.93	23		4	5.8	0.6				
wyn7b-7c	18.0	5.5		17-19.5	0	22	55	23	0.030		CL	Lean CLAY w/sand	34.2	30	10	1.42	0.67	1.92	17		2	7.3	0.3				
wyn7b-7b	18.5	5.6		17-19.5	0	44	39	17	0.059		ML	Sandy SILT	26.1	27	5	0.82	0.42	2.02	16		2	9.9	0.2				
wyn7b-7a	19.0	5.8		17-19.5	2	54	34	10	0.091	45	SM	Silty SAND	23.4					2.02	15		3	5.8	0.3				
wyn7b-8a	20.4	6.2		19.5-21	2	56	33	9	0.095	20	SM	Silty SAND															
wyn7b-8b	20.8	6.3	8	19.5-21	24	58			0.650		SM	Silty SAND w/gravel															
wyn7b-9d	21.9	6.7		21.5-23	10	61	21	8	0.280	40	SM	Silty SAND															
wyn7b-9c	22.0	6.7		21.5-23	0	44	44	12	0.063	21	ML	Sandy SILT															
wyn7b-9b	22.2	6.8		21.5-23	0	14	78	8	0 044	7.6	ML	SILT															
wyn7b-9a	22.7	6.9	15	21.5-23	1	76	19	4	0.154	17	SM	Silty SAND															
wyn7b-10d	24.5	7.5		24.5-26.5	0	15	63	22	0.024		ML	SILT with sand	38.2	41	13	0.78	1 00	1.93	16		3	5.0	0.2				
wyn7b-10c	25.0	7.6		24.5-26.5	0	18	58	24	0.021		CL	Lean CLAY w/sand	32.0					1.92	31		8	3 9	0.3				
wyn7b-10b	25.5	7.8		24.5-26.5	0	22	54	24	0.021		CL	Lean CLAY w/sand	32.8	41	19	0.57	1.46	1.89	46		13	3.6	0.7				
wyn7b-10a	26.0	7.9		24.5-26.5	0	22	42	36	0.011		CL	Lean CLAY w/sand	31.7					1.99	73		23	3.2	1.0				
wyn7b-11d2	26.5	8.1		26.5-28.5	1	22	45	32	0.016		CL	Lean CLAY w/sand	34.9	36	18	0.94	0.86	1.74	12		4	2.8	NA				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
wyn7b-11d1	26.8	8.2		26.5-28.5								w/c only	28.0						40		9	4.5	0.6				
wyn7b-11c	27.0	8.2		26.5-28.5	0	25	43	32	0.019		CL	Lean CLAY w/sand	27.4	42	20	0.27	0.91	1.91	60		15	3.9	0.8				
wyn7b-11b	27.5	8.4		26.5-28.5	0	24	44	32	0.017		CL	Lean CLAY w/sand	30.9					1 87	111		29	3.8	0.3				
wyn7b-11a	28.0	8.5		26.5-28.5	0	25	48	27	0.027		CL	Lean CLAY w/sand	35.7	43	23	0.68	1.35	1.84	13		4	3.0	0.1				
wyn7b-12c	32.0	9.8		31.5-33	1	54	36	9	0.086	17	SM	Silty SAND															
wyn7b-12b	32.4	9.9		31.5-33	0	71	23	6	0.171	19	SM	Silty SAND															
wyn7b-12a	32.7	10.0	17	31.5-33	0	30	44	26	0.023		CL	Sandy lean CLAY		39	19		0.90										
wyn 13-1	8.0	2.4	2	7-8.5	0	23	51	26	0.024		CL	Lean CLAY w/sand	25.5	34	13	0.35	0.76							38	32	15	2 53
wyn 13-2	13.5	4.1	2	12-13.5	0	19	56	25	0.015		CL	Lean CLAY w/sand	36.2	41	16	0.70								42	35	22	1.91
wyn 13-3-D	17.0	5.2		17-19	0	30	46	24	0.028		CL	Sandy lean CLAY	34.0					1.82			6		<0.1	23	18	15	1 53
wyn 13-3-C	17.5	5.3		17-19	0	33	50	17	0.045		CL	Sandy lean CLAY	29.0	27	6	1.33	0.46	2.01	25	18			<0.1				
wyn 13-3-B-2	17.9	5.5		17-19	0	16	47	37	0.011		CL	Lean CLAY w/sand															
wyn 13-3-B-1	18.0	5.5		17-19	0	7	54	39	0.008		CL	Lean CLAY	35.0	49	21	0.34	1.17	1.89					0.1				
wyn 13-3-A-2	18.5	5.6		17-19	0	8	56	36	0.010		CL	Lean CLAY	36.6					2.05	35	28	10	3.5	0.5				
wyn 13-3-A-1	18.8	5.7		17-19	1	35	37	27	0.034		CL	Sandy lean CLAY		33	11		0.69							51	45	30	1 70
wyn 13-4-C	19.5	5.9		19-21	6	30	32	32	0.025		CL	Sandy lean CLAY	37.1					1.89			4		<0.1				
wyn 13-4-B-2	20.0	6.1		19-21	1	35	33	31	0.028		CL	Sandy lean CLAY	28.4	33	13	0.64	0.57	1.93	20	13	6	3.3	<0.1				
wyn 13-4-B-1	20.2	6.2		19-21	0	39	34	27	0.038		CL	Sandy lean CLAY												52	35	28	1.86
wyn 13-4-A	20.5	6.2		19-21	2	39	31	28	0.041		CL	Sandy lean CLAY	30.2	32	11	0.84	0.55	2.11	14	10	2	7.0	<0.1				
wyn 13-5-D	21.0	6.4		21-23	0	41	31	28	0.036		CL	Sandy lean CLAY	28.5	34	13	0.58	0.65	1 97					0.4				
wyn 13-5-C	21.5	6.6		21-23	6	38	33	23	0.053		CL	Sandy lean CLAY	25.3					1.92					0.5				
wyn 13-5-B	22.0	6.7		21-23	0	33	37	30	0.026		CL	Sandy lean CLAY	31.7	36	11	0.61	0.61	1.89	51	37	9	5.7	0.7				
wyn 13-5-A	22.5	6.9		21-23	2	30	38	30	0.017		CL	Sandy lean CLAY	28.7	37	13	0.36	0.68	1.91	39	22	9	4.3	0.5				
wyn 13-6-D	26.0	7.9		26-28	0	9	38	53	0.004		CH	Fat CLAY	43.4	64	34	0.40	0.94	1.65			3		0.3				
wyn 13-6-C	26.5	8.1		26-28	0	8	44	48	0.006		CH	Fat CLAY	39.8	56	26	0.38	0.90	1.86	56	36	15	3.7	0.7				
wyn 13-6-B	27.0	8.2		26-28	0	10	46	44	0 007		CH	Fat CLAY	35.4	63	32	0.14	1.14	1 89	85	60	24	3.5	1.5				
wyn 13-6-A	27.5	8.4		26-28	0	16	46	38	0.009		CH	Fat CLAY with sand	30.7	58	35	0.22	1.25	1.95	135	85	43	3.1	1.8				
wyn 13-7	29.5	9.0	15	28-29.5	0	25	43	32	0.019		CL	Lean CLAY w/sand	28.7	49	25	0.19	1.25										
wyn 13-8	35.5	10.8	19	34-35.5	0	18	49	33	0.017		CL	Lean CLAY w/sand	32.1	48	25	0.36	1.04										
wyn-13-9-D	36.7	11.2		36.5-38	0	90	8	2	0.285	5	SP-SM	Sand with silt															
wyn 13-9-B	37.2	11.3		36.5-38	0	90	8	2	0.285	5	SP-SM	Sand with silt															
wyn 13-9-A	38.0	11.6	12	36.5-38	0	13	41	46	0.007		CH	Fat CLAY	30.1	60	36	0.17	0.64										
wyn 14-1	4.0	1.2	10	3-4.5	0	34	41	25	0.039		CL	Sandy lean CLAY	13.6	35	14	-0.53	0.82										
wyn 14-2	7.5	2.3	12	7-8.5	0	41	40	19	0.052		CL	Sandy lean CLAY	17.1	28	8	-0.36	0.62										
wyn 14-3	10.5	3.2	11	10-11.5	0	42	37	21	0.057		CL	Sandy lean CLAY	14.2	28	7	-0.97	0.50							77	54		
wyn 14-4-C	12.3	3.7		11.5-13.5	11	24	38	27	0.030		CL	Sandy lean CLAY	22.1	32	9	-0.10	0.47	2.11						58	38	24	2.42
wyn 14-4-B	12.5	3.8		11.5-13.5	0	23	49	28	0.020		ML	SILT with sand	23.7	33	9	-0.03	0.60	1.71	64	41	19	3.4	1.3				
wyn 14-4-A	13.0	4.0		11.5-13.5	0	26	47	27	0.021		ML	SILT with sand	23.4	33	9	-0.07	0.56	1.98	76	45	22	3.5	1.2				
wyn 14-5	15.5	4.7	10	14.5-16	0	27	45	28	0.026		CL	Lean CLAY w/sand	27.3	36	14	0.38	0.88							68	36	21	3 24
wyn 14-6-C	18.5	5.6		18-20	0	24	42	34	0.016		CL	Lean CLAY w/sand	24.2	39	16	0.08	0.70	1.85	47	39	16	2.9	0.5	48	37	24	2.00
wyn 14-6-B	19.0	5.8		18-20	0	27	44	29	0.023		CL	Lean CLAY w/sand	25.2	38	16	0.20	0.94	1.91	49	35	17	2.9	0.6				
wyn 14-6-A	19.5	5.9		18-20	3	30	40	27	0.024		CL	Sandy lean CLAY	28.3	36	14	0.45	0.84	1.98	38	25	11	3.5	0.4	32	29	23	1.39
wyn 14-7-E	22.8	6.9		22.5-24	0	37	33	30	0.033		CL	Sandy lean CLAY															
wyn 14-7-D	23.0	7.0		22.5-24	8	73			0.257		SM	Silty SAND															
wyn 14-7-C	23.5	7.2		22.5-24	0	32	48	20	0.036		CL	Sandy lean CLAY	39.9														
wyn 14-7-B	23.8	7.3		22.5-24	4	74	16	6	0.330	18	SM	silty sand															
wyn 14-7-A	24.0	7.3	16	22.5-24	0	47	40	13	0.070		ML	sandy silt															
wyn 14-8	26.5	8.1	21	25-26.5	0	62	32	6	0.113		SM	Silty SAND	21.8														
wyn 14-9-A	28.8	8.8		27.5-29	48	32			3.400		GM	ilty GRAVEL w/san	20.4														
wyn 14-9-B	29.0	8.8	12	27.5-29	0	16	65	19	0.026		ML	SILT with sand															
wyn 14-10-D	30.0	9.1		30-32	4	43	38	15	0.064	59	CL-ML	Sandy silty CLAY	18.7	27	6	-0.38	0.60	2 04					0.3				
wyn 14-10-C	30.5	9.3		30-32	0	6	65	29	0.013		ML	SILT	30.1	44	16	0.13	0.80	1 95	105	77	17	6.2	0.5				
wyn 14-10-B	31.0	9.4		30-32	0	11	51	38	0.010		CL	Lean CLAY	35.9	49	24	0.45	0.96	1 86	56	32	9	6.2	0.7				
wyn 14-10-A	31.5	9.6		30-32	0	14	46	40	0.009		CH	Fat CLAY	31.3	51	27	0.27	1.08	1 90	73	51	21	3.5	0.8				
wyn 14-11d	32.0	9.8		32-34	2	82			0.299		SM	Silty SAND						1.86									

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
wyn 14-11c3	32.5	9.9		32-34	7	63	17	13	0.405	285	SM	Silty SAND						1 91									
wyn 14-11c2	32.8	10.0		32-34	8	47	23	22	0.111		SM	Silty SAND						1.91									
wyn 14-11b	33.0	10.1		32-34	0	22	43	35	0.016		CL	Lean CLAY w/sand	30.8	40	16	0.43	0.62	1.83									
wyn 14-11a2	33.5	10.2		32-34	0	18	39	43	0.008		CL	Lean CLAY w/sand	30 1	44	22	0.37	0.63	1.93	70.9	55.9	18.9	3.8	0.8				
wyn 14-11a1	33.8	10.3		32-34	0	19	42	39	0.011		CL	Lean CLAY w/sand	27.8	42	20	0.29	0.71	1.93									
wyn 14-12d2	34.3	10.5		34-36	0	16	49	35	0.013		CL	Lean CLAY w/sand	30.4	43	18	0.30	0.86	1.95	23.6	15.8	4.7	5.0	0.2				
wyn 14-12d1	34.5	10.5		34-36									27.7					1.95									
wyn 14-12c	34.8	10.6		34-36	0	14	49	37	0.012		CL	Lean CLAY	27 1	42	18	0.17	0.75	1.90	95.3	63	15.8	6.0	0.9				
wyn 14-12b	35.2	10.7		34-36	0	13	50	37	0.012		CL	Lean CLAY	28 7	46	22	0.21	0.88	1.94	55.2	39.4	14.2	3.9	1.3				
wyn 14-12a	35.6	10.9		34-36	0	14	49	37	0.012		CL	Lean CLAY	26.4	44	22	0.20	0.85	2.05	105.6	51.2	33.1	3.2	1.7				
wyn 14-13-B	37.5	11.4		37-38.5	0	23	44	33	0.015		CL	Lean CLAY w/sand	32.6														
wyn 14-13-A	38.0	11.6	15	37-38.5	0	22	48	30	0.018		CH	Fat CLAY w/sand		56	28		1.33										
wyn 14-14	40.0	12.2	25	39-40.5	0	17	46	37	0.011		CH	Fat CLAY w/sand	44.2	59	31	0.52	1.15										
wyn 14-15	41.0	12.5		41	3	44	26	27	0.060		CL	Sandy lean CLAY		31	13		0.62										

BALBOA

bal2-1e	2.2	0.7		2-4.5	0	31	45	24	0.029		CL	Sandy lean CLAY	20 1	35	16	0.07	0.80	1.38	32		4	8.0	1.0				
bal2-1d	2.5	0.8		2-4.5	2	34	42	22	0.039		CL	Sandy lean CLAY	19.2	31	9	-0.31	0.64	1.39	25		4	6.4	0.5				
bal2-1c2	2.7	0.8		2-4.5	0	36	44	20	0.043		CL	Sandy lean CLAY	18.2	31	12	-0.07	0.92	1.43	32		4	8.2	0.3				
bal2-1c1	3.0	0.9		2-4.5	2	37	41	20	0.048		CL	Sandy lean CLAY															
bal2-1b2	3.5	1.1		2-4.5	0	42	40	18	0.052		CL	Sandy lean CLAY	12.9					1.54	50		7	7.1	0.6				
bal2-1b1	3.7	1.1		2-4.5	0	47	39	14	0.064	36	CL	Sandy lean CLAY															
bal2-1a	4.0	1.2		2-4.5	1	45	38	16	0.062		CL	Sandy lean CLAY	14.5	26	7	-0.64	0.64	1.54	20		3	6.5	0.3				
bal2-2	7.0	2.1	7	6-7.5	2	42	36	20	0.055	84	CL	Sandy lean CLAY															
bal2-3e	7.5	2.3		7.5-10	0	19	57	24	0.020		CL	Lean CLAY w/sand	19.1	37	13	-0.38	0.72	1.58	71		13	5.3	2.2				
bal2-3d	8.0	2.4		7.5-10	0	21	51	28	0.017		CL	Lean CLAY w/sand	23.6	38	16	0.10	0.94	1.54	55		13	4.4	1.7				
bal2-3c	8.5	2.6		7.5-10	0	16	55	29	0.014		CL	Lean CLAY w/sand	25.4	43	18	0.02	0.90	1.54	69		20	3.4	1.8				
bal2-3b	9.0	2.7		7.5-10	1	19	49	31	0.014		CL	Lean CLAY w/sand	24.0					1.52	66		19	3.5	1.6				
bal2-3a	9.5	2.9		7.5-10	1	21	51	27	0.018		CL	Lean CLAY w/sand	23.4	39	18	0.13	0.95	1.53	70		12	5.9	1.5				
bal2-4e	10.0	3.0		10-12.5	0	22	48	30	0.016		CL	Lean CLAY w/sand						1.64	57		9	6.0	1.6	24	21	15	1.6
bal2-4d	10.5	3.2		10-12.5	0	23	52	25	0.020		CL	Lean CLAY w/sand						1.60	76		13	5.6	1.8				
bal2-4c	11.0	3.4		10-12.5	0	41	41	18	0.054		CL	Sandy lean CLAY	17.4	28	7	-0.51	0.47	1.66	39		5	8.2	1.9				
bal2-4b	11.5	3.5		10-12.5	2	46	32	20	0.069		CL	Sandy lean CLAY	13.0	26	7	-0.86	0.47	1.68	55		8	7.0	1.8				
bal2-4a	12.0	3.7		10-12.5	1	51	32	16	0.082	81	SM	Silty SAND	12.9					1.73	76		12	6.4	1.6	106	87	25	4.2
bal2-5	13.5	4.1	13	12.5-14	3	46	39	12	0.070	31	ML	Sandy SILT															
bal2-6e	16.5	5.0		16.5-19	0	40	35	25	0.042		CL	Sandy lean CLAY	21.3	31	10	0.03	0.56		62		6	11.3	1.2				
bal2-6d	17.0	5.2		16.5-19	1	51	33	15	0.083		SM	Silty SAND	15.6										1.8				
bal2-6c	17.5	5.3		16.5-19	1	47	35	17	0.071	57	CL	Sandy lean CLAY	13.5	27	8	-0.69	0.73		72		7	10.2	1.5				
bal2-6b	18.0	5.5		16.5-19	1	40	39	20	0.052		CL	Sandy lean CLAY	15.1	28	7	-0.84	0.54		97		9	11.2	1.2				
bal2-6a	18.5	5.6		16.5-19	1	35	48	16	0.048	32	CL	Sandy lean CLAY	15.3						87		14	6.1	1.6	120			
bal2-7b	19.6	6.0		19-20.5	13	42	26	19	0.095		SM	Silty SAND															
bal2-7a	20.3	6.2	9	19-20.5	0	24	50	26	0.021		CL	Lean CLAY w/sand															
bal2-8b	21.0	6.4		20.5-22	2	28	41	29	0.025		CL	Lean CLAY w/sand															
bal2-8a	21.6	6.6	16	20.5-22	1	39	38	22	0.040		CL	Sandy lean CLAY	14.7	31	14	-0.16	0.93										
bal2-9e	23.6	7.2		23.5-26	0	16	57	27	0.021		CL	Lean CLAY w/sand	22.6	39	19	0.14	1.06	1.70	71		13	5.6	1.0				
bal2-9d	24.0	7.3		23.5-26	0	20	48	32	0.018		CL	Lean CLAY w/sand	25.2	40	17	0.13	0.77	1.73	73		25	2.9	1.5				
bal2-9c	24.5	7.5		23.5-26	0	12	60	28	0.016		CL	Lean CLAY	29.5	45	22	0.30	1.10	1.68	55		17	3.2	2.0				
bal2-9b2	25.0	7.6		23.5-26	0	28	53	19	0.044		CL	Lean CLAY w/sand	27.0					1 74	57		13	4.3	1.5				
bal2-9b1	25.3	7.7		23 5-26	0	23	45	32	0.018		CL	Lean CLAY w/sand															
bal2-9a	25.5	7.8		23.5-26	1	25	50	24	0.033		CL	Sandy lean CLAY	26.0	41	21	0.29	1.17	1.82	53		13	4 2	1.0				
bal2-10e2	28.5	8.7		28.5-31	1	53	29	17	0.090		SM	Silty SAND	17.0					1.87	41		7	5.8	0.8				
bal2-10e1	28.8	8.8		28.5-31	1	53	32	14	0.092	70	SM	Silty SAND															
bal2-10d	29.0	8.8		28.5-31	0	53	33	14	0.085	52	SM	Silty SAND	18 2					2 06	71		11	6.4	1.4				
bal2-10c	29.5	9.0		28.5-31	0	56	29	15	0.093		SM	Silty SAND	19.8					2.17	23		4	5.8	0.9				
bal2-10b2	30.0	9.1		28.5-31	0	45	35	20	0.061		CL	Sandy lean CLAY	20.1					2.15	57		14	4.1	1.6				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal2-10b1	30.2	9 2		28.5-31	0	41	39	20	0.055	80	CL	Sandy lean CLAY															
bal2-10a	30.5	9.3		28.5-31	0	35	44	21	0.040		CL	Sandy lean CLAY	21.5	31	10	0.05	0.67	2.18	100		26	3.9	2.0				
bal2-11b	31.4	9.6		31-32.5	1	30	48	21	0.035	63	CL	Sandy lean CLAY		39	21		1.75										
bal2-11a	32.1	9.8	16	31-32.5	0	52	31	17	0 076	49	SC	Clayey SAND		25	9		0.90										
bal2-12d	35.0	10.7		35-37	0	48	38	14	0 072	48	ML	Sandy SILT	22.2					2.19	106		30	3.6	3.5				
bal2-12c2	35.5	10.8		35-37	1	40	46	13	0.060	32	ML	Sandy SILT	19 5	26	2	-2.25	0.22	2.20	158		48	3.3	4.5				
bal2-12c1	35.8	10.9		35-37	1	46	36	17	0.067	65	CL-ML	Sandy silty CLAY		22	7		0.64										
bal2-12b	36.0	11.0		35-37	0	44	38	18	0.059	60	CL	Sandy lean CLAY	17.3					2.19	140		33	4.2	2.8				
bal2-12a	36.5	11.1		35-37	2	49	31	18	0.076		SM	Silty SAND	24.8					2.27	81		19	4.3	1.5				
bal2-13c	37.2	11.3		37-38.5	1	75	16	8	0.249	41	SM	Silty SAND															
bal2-13b	37.8	11.5		37-38.5	3	55	27	15	0.118		SM	Silty SAND	17.9														
bal2-13a	38.4	11.7	26	37-38.5	10	22	38	30	0.020		CL	Sandy lean CLAY															
bal2-14c	39.0	11.9		39-40.5	3	31	26	40	0.011		CL	Sandy lean CLAY															
bal2-14b	39.6	12.1		39-40.5	6	21	51	22	0 032		CL	Lean CLAY w/sand															
bal2-14a	40.3	12.3	19	39-40.5	4	25	50	21	0.033		CL	Lean CLAY w/sand	30.6														
bal2-15d	42.1	12.8		42-43.5	3	81	9	7	0.400	26	SM	Silty SAND															
bal2-15c	42.3	12.9		42-43.5	7	75	9	9	0.400	81	SM	Silty SAND															
bal2-15b	42.7	13.0		42-43.5	14	62	14	10	0.242	82	SM	Silty SAND															
bal2-15a	43.2	13.2	102	42-43.5	9	61	18	12	0.235		SM	Silty SAND	15.8														
bal4-1e	2.5	0.8		2.5-5	3	49	29	19	0.085	84	SC	Clayey SAND	16.2	29	9	-0.42	1.00	1.31					0.2				
bal4-1d2	3.0	0.9		2.5-5	0	49	36	15	0 070	48	ML	Sandy SILT	16.2					1.54	51		7	7.2	0.5				
bal4-1d1	3.2	1.0		2.5-5	5	51	28	16	0 099	84	SM	Silty SAND															
bal4-1c	3.5	1.1		2.5-5	1	51	32	16	0.081	55	SM	Silty SAND	14.2					1.64	71		8	8.4	0.5				
bal4-1b	4.0	1.2		2.5-5	2	42	35	21	0.057		CL	Sandy lean CLAY	15.9	28	10	-0.21	0.63	1.56	51		6	8.0	0.8				
bal4-1a2	4.5	1.4		2.5-5	2	41	37	20	0.057		CL	Sandy lean CLAY	15.8					1.54	50		8	6.6	0.3	54	34	11	4.9
bal4-1a1	4.7	1.4		2.5-5	7	42	35	16	0 071		CL	Sandy lean CLAY															
bal4-2	7.5	2.3	6	6.5-8	0	23	49	28	0 024		CL	Lean CLAY w/sand		34	14		1.00										
bal4-3e	8.5	2.6		8.5-11	0	18	47	35	0.013		CL	Lean CLAY w/sand	26.3	44	21	0.16	0.95	1.48	37		8	4.7	1.2				
bal4-3d	9.0	2.7		8.5-11	0	18	52	30	0 017		CL	Lean CLAY w/sand	24.3					1.56	62		13	4.6	1.6				
bal4-3c	9.5	2.9		8.5-11	0	23	51	26	0.025		CL	Lean CLAY w/sand	24.1	36	12	0.01	0.75	1.57	57		15	3.8	1.2				
bal4-3b	10.0	3.0		8.5-11	4	25	46	25	0.029		CL	Lean CLAY w/sand	23.3					1.65	66		13	5.2	1.5				
bal4-3a	10.5	3.2		8.5-11	0	30	45	25	0 027		CL	Sandy lean CLAY	21.0	32	13	0.15	0.81	1.66	67		15	4.5	1.6				
bal4-4c	12.2	3.7		11.8-13.3	3	37	34	26	0.038		CL	Sandy lean CLAY															
bal4-4b	12.6	3.8		11.8-13.3	0	47	35	18	0.063		CL	Sandy lean CLAY															
bal4-4a	13.0	4.0	8	11.8-13.3	0	35	35	30	0.027		CL	Sandy lean CLAY															
bal4-5b	14.9	4.5		14.5-16	1	52	32	15	0.083	63	SM	Silty SAND												116	45	22	5.3
bal4-5a	15.5	4.7	13	14.5-16	3	42	39	16	0 055	48	CL	Sandy lean CLAY		28	8		0.80										
bal4-6b	18.0	5.5		17.5-19	0	38	41	21	0.040		CL	Sandy lean CLAY		28	10		0.59										
bal4-6a	18.5	5.6	18	17.5-19	2	69	20	9	0.200	49	SM	Silty SAND															
bal4-7e	21.5	6.6		21.5-24	0	40	40	20	0 050		CL	Sandy lean CLAY	13.4	30	13	-0.28	0.81	1.82	95		24	3.9	1.8	100	63	28	3.6
bal4-7d	22.0	6.7		21.5-24	2	42	36	20	0.056	61	CL	Sandy lean CLAY	14.9					1.87	128		21	6.1	2.3				
bal4-7c	22.5	6.9		21.5-24	2	42	32	24	0.050		CL	Sandy lean CLAY	15.8	32	16	-0.01	1.14	1.93	124		34	3.6	2.4				
bal4-7b	23.0	7.0		21.5-24	0	44	33	23	0.051		CL	Sandy lean CLAY	16.0					1.93	128		40	3.2	2.1				
bal4-7a	23.5	7.2		21.5-24	1	39	40	20	0.040		CL	Sandy lean CLAY	22.0	32	15	0.33	1.15	2.01	114		48	2.4	2.0				
bal4-8c	25.8	7.8		25.5-27	4	47	29	20	0.080		SM	Silty SAND															
bal4-8b	26.1	8.0		25.5-27	20	38	24	18	0.109	117	SM	Silty SAND w/gravel															
bal4-8a	26.6	8.1	16	25.5-27	8	50	29	13	0.096	42	SM	Silty SAND															
bal4-8	26.9	8.2		25.5-27	0	52	39	9	0.077	14	SM	Silty SAND	17.6														
bal4-9e2	27.0	8.2		27-29.5	0	50	38	12	0.076	28	SM	Silty SAND	20.8					1.88	33		9	3.5	NA				
bal4-9e1	27.2	8.3		27-29.5	0	63	25	12	0.111	41	SM	Silty SAND															
bal4-9d3	27.5	8.4		27-29.5	0	72	19	9	0 174	31	SM	Silty SAND															
bal4-9d2	27.6	8.4		27-29.5	1	60	28	11	0.102	41	SM	Silty SAND	17.5					1.98	23		7	3.2	0.4				
bal4-9d1	27.9	8.5		27-29.5	0	47	35	18	0.066		CL	Sandy lean CLAY		25	8	-2.13	0.67										
bal4-9c	28.0	8.5		27-29.5	1	51	33	15	0.080		SM	Silty SAND	23.4					2.01	29		13	2.2	0.5				
bal4-9b	28.5	8.7		27-29.5	0	76	17	7	0.149	12	SM	Silty SAND	21.2					2.07	55		9	6.3	0.7				
bal4-9a2	29.0	8.8		27-29.5	3	74	17	6	0 190	14	SM	Silty SAND						2.04					0.8				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal4-9a1	29.1	8.9		27-29.5	11	74	9	6	0.395	19	SM	Silty SAND															
bal4-10c	29.6	9.0		29.5-31	15	49	22	14	0.165	141	SM	Silty SAND w/gravel						2.17	56		14	4.2	1.6				
bal4-10b	30.1	9.2		29.5-31	0	54	37	9	0.085	21	SM	Silty SAND						2.18	53		12	4.5	1.7				
bal4-10a	30.8	9.4	25	29.5-31	6	41	31	22	0.068		CL	Sandy lean CLAY	16.1					2.13	17		3	5.5	1.1				
bal4-11c	32.0	9.8		32-33.5	0	44	41	15	0.060	41	CL	Sandy lean CLAY	20.6	27	8	0.20	0.80										
bal4-11b	32.5	9.9		32-33.5	6	46	33	15	0.079	54	SM	Silty SAND	20.8														
bal4-11a	33.0	10.1		32-33.5	0	55	32	13	0.082	38	SM	Silty SAND	21.1														
bal4-12b	33.9	10.3		33.5-35	0	58	28	14	0.093		SM	Silty SAND															
bal4-12a	34.4	10.5	37	33.5-35	2	48	36	14	0.075	35	SM	Silty SAND	20.8														
bal4-13b	37.4	11.4		37-38.5	1	49	41	9	0.072	16	ML	Sandy SILT															
bal4-13a	38.1	11.6	92	37-38.5	0	69	23	8	0.182	33	SM	Silty SAND	23.9														
bal4.5-1	8.0	2.4	7	7-8.5	0	20	53	27	0.021		CL	Lean CLAY w/sand		36	15		0.88										
bal4.5-2e	8.5	2.6		8.5-11	1	19	46	34	0.016		CL	Lean CLAY w/sand	22.4					1.63	72		12	5.9	1.6				
bal4.5-2d	9.0	2.7		8.5-11	3	18	31	48	0.009		CL	Lean CLAY w/sand	21.8	47	22	-0.15	1.05	1.50	80		14	5.5	2.0				
bal4.5-2c	9.5	2.9		8.5-11	0	17	52	31	0.016		CL	Lean CLAY w/sand	20.6					1.48	53		10	5.3	1.0				
bal4.5-2b	10.0	3.0		8.5-11	1	21	50	28	0.023		ML	SILT w/sand	20.7	39	13	-0.41	1.08	1.54	44		6	8.0	1.0				
bal4.5-2a	10.5	3.2		8.5-11	0	33	41	26	0.035		CL	Sandy lean CLAY	17.1	35	13	-0.38	0.87	1.72	95		11	8.6	2.0				
bal4.5-3d	14.2	4.3		13.5-15	1	52	30	17	0.085		SM	Silty SAND															
bal4.5-3c	14.6	4.5		13.5-15	0	72	18	10	0.163	43	SM	Silty SAND															
bal4.5-3a	14.9	4.5	15	13.5-15	0	57	31	12	0.107	51	SM	Silty SAND															
bal4.5-4b	25.8	7.9		25-26.5	3	54	33	10	0.096		SM	Silty SAND															
bal4.5-4a	26.4	8.0	23	25-26.5	8	65	20	7	0.255	42	SM	Silty SAND															
bal4.5-5e	26.5	8.1		26.5-28.3	0	75	19	6	0.178	12	SM	Silty SAND	14.1					1.79	32		7	4.4	0.4				
bal4.5-5d	26.6	8.1		26.5-28.3	2	72	21	5	0.155	10	SM	Silty SAND	9.7					1.86	46		2	29.3	0.7				
bal4.5-5c2	27.0	8.2		26.5-28.3	0	81	14	5	0.190	9.6	SM	Silty SAND	11.2					1.92	39		14	2.8	0.8				
bal4.5-5c1	27.2	8.3		26.5-28.3	0	34	57	9	0.053	11	ML	Sandy SILT	14.6					2.04	54		9	6.2	0.7				
bal4.5-5b	27.4	8.4		26.5-28.3	3	79	13	5	0.470	32	SM	Silty SAND															
bal4.5-5a2	27.9	8.5		26.5-28.3	9	73	13	5	0.276	17	SM	Silty SAND	10.6					2.10									
bal4.5-5a1	28.1	8.6		26.5-28.3	1	55	34	10	0.085	21	SM	Silty SAND															
bal4.5-6b	29.0	8.8		28.3-29.8	3	89	7	1	0.517	7.7	SW-SM	SAND w/ silt															
bal4.5-6a	29.6	9.0	53	28.3-29.8	23	58	12	7	0.540	128	SM	Silty SAND w/gravel															
vane 1	5.0	1.5																						69	49	8	8.63
vane 2	7.0	2.1																						70	50	27	2.59
bal6-1	8.0	2.4	9	7-8.5	0	26	42	32	0.018		CL	Lean CLAY w/sand		39	18		0.86										
vane 3	8.5	2.6																						120			
vane 4	12.0	3.7																						112	78	55	2.04
vane 5	14.5	4.4																						94	25	24	3.92
bal6-2b	15.3	4.7		14.5-16	1	55	29	15	0.093		SM	Silty SAND															
bal6-2a	15.9	4.8	14	14.5-16	0	35	45	20	0.037	35	CL	Sandy lean CLAY	11.3														
bal6-3	19.9	6.1	7	19-20.5	0	18	49	33	0.014		CL	Lean CLAY w/sand	25.1	39	17	0.18	0.85										
bal6-4c	25.8	7.9		25.5-27	5	20	43	32	0.017		CL	Lean CLAY w/sand															
bal6-4b	26.3	8.0		25.5-27	8	25	41	26	0.032		CL	Sandy lean CLAY	32.9														
bal6-4a	26.7	8.1		25.5-27	0	36	38	26	0.035		CL	Sandy lean CLAY															
bal6-4	26.9	8.2	11	25.5-27	0	34	41	25	0.038		CL	Sandy lean CLAY															
bal6-5e	27.0	8.2		27-29.5	0	34	43	23	0.043		CL	Sandy lean CLAY	26.1														
bal6-5d	27.5	8.4		27-29.5	0	34	46	20	0.047	63	CL	Sandy lean CLAY	25.8	33	10	0.28	0.77	1.97	47		15	3.2	1.1				
bal6-5c	28.0	8.5		27-29.5	8	31	45	16	0.052	71	CL	Sandy lean CLAY	27.2					1.92	29		7	4.1	0.8				
bal6-5b	28.5	8.7		27-29.5	0	39	41	20	0.047		CL	Sandy lean CLAY	22.1	32	9	-0.10	0.75	2.00					1.6				
bal6-5a2	29.0	8.8		27-29.5	0	46	41	13	0.067	35	ML	Sandy SILT	23.2					2.19	58		15	3.9	1.3				
bal6-5a1	29.3	8.9		27-29.5	0	53	34	13	0.082	59	SM	Silty SAND															
bal6-6b	30.0	9.1		29.5-31	0	54	37	9	0.084	22	SM	Silty SAND	14.9														
bal6-6a	30.7	9.3	22	29.5-31	5	57	28	10	0.123	30	SM	Silty SAND															
bal6-7e2	33.0	10.1		33-35.5	0	59	32	9	0.100	27	SM	Silty SAND															
bal6-7e1	33.3	10.1		33-35.5	0	61	29	10	0.112	32	SM	Silty SAND	16.4					2.20	40		9	4.5	2.1				
bal6-7d	33.5	10.2		33-35.5	0	61	29	10	0.110	35	SM	Silty SAND	15.6					2.17	60		17	3.6	2.0				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal6-7c	34.0	10.4		33-35.5	0	37	49	14	0.055	21	CL-ML	Sandy silty CLAY	21.7	24	6	0.62	1.00	2.17	72		20	3.6	3.5				
bal6-7b	34.5	10.5		33-35.5	0	26	59	15	0.043	53	ML	SILT w/sand	21.0					2.13	199		58	3.5	3.5				
bal6-7a	35.0	10.7		33-35.5	0	29	55	16	0.033	48	CL	Lean CLAY w/sand	23.6	36	15	0.17	1.36	2.12	95		23	4.1	3.5				
bal6-8b	36.0	11.0		35.5-37	0	57	32	11	0.087	45	SM	Silty SAND	18.0														
bal6-8a	36.7	11.2	37	35.5-37	1	57	28	14	0.092	55	SM	Silty SAND	15.1														
bal6-9d	39.3	12.0		39-40.3	32	47	13	8	1.110	331	SM	Silty SAND w/gravel															
bal6-9c	39.5	12.0		39-40.3	77	19	4	0	10.000		GW	GRAVEL w/sand															
bal6-9b	39.7	12.1		39-40.3	12	52	27	9	0.188	62	SM	Silty SAND															
bal6-9a	40.1	12.2	181	39-40.3	1	70	23	6	0.169	31	SM	Silty SAND	9.0														
vane 1	1.5	0.5																						83	30	22	3 8
bal8-1	2.6	0.8	5	1.5-3	0	33	45	22	0.035		CL	Sandy lean CLAY		29	9		0.64										
bal8-2d	3.5	1.1		3-5.5	5	50	31	14	0.089	66	SM	Silty SAND	13.8								NA						
bal8-2c	4.0	1.2		3-5.5	11	47	29	13	0.103	49	SM	Silty SAND	12.3					1.70			NA		2.6				
bal8-2b	4.5	1.4		3-5.5	9	51	29	11	0.106	37	SM	Silty SAND	11.9					1.69			NA		1.8				
bal8-2a	5.0	1.5		3-5.5	1	49	31	19	0.076	84	SC	Silty SAND	9.8	28	10	-0 82	0.83				NA		4.5	117	79	35	3.3
bal8-3	7.5	2.3	15	7-8.5	2	33	39	26	0.027		CL	Sandy lean CLAY		33	13		0.72								120		
bal8-4e	8.5	2.6		8.5-11	1	24	46	29	0.017		CL	Lean CLAY w/sand	18.0	38	16	-0.25	1.00	1.56	110		9	12 4	2.3	120			
bal8-4d	9.0	2.7		8.5-11	1	23	46	30	0.015		CL	Lean CLAY w/sand	19.0					1.49	105		10	10.5	2.5				
bal8-4c	9.5	2.9		8.5-11	1	19	52	28	0.025		CL	Lean CLAY w/sand	18.2	43	18	-0.38	1.06	1.55	122		17	7.3	2.3				
bal8-4b	10.0	3.0		8.5-11	0	25	49	26	0.021		CL	Lean CLAY w/sand	18.8					1.57	88		8	11.4	2.6				
bal8-4a	10.5	3.2		8.5-11	0	29	45	26	0.033		CL	Lean CLAY w/sand	17.3	35	13	-0 36	0.93	1.51	115		13	8.6	2.2				
bal8-5	11.9	3.6	12	11-12.5	0	41	38	21	0.050		CL	Sandy lean CLAY		29	11		0.73										
bal8-6e	12.5	3.8		12.5-15	22	46	21	11	0.230	106	SM	Silty SAND w/gravel	12.7														
bal8-6d	13.0	4.0		12.5-15	8	53	24	15	0.129		SM	Silty SAND	11.7					1.69	147		10	14.8	1.7				
bal8-6c	13.5	4.1		12.5-15	2	55	31	12	0.101	60	SM	Silty SAND	10.2					1.70	93		9	10.5	1.7				
bal8-6b	14.0	4.3		12.5-15	3	59	27	11	0.119		SM	Silty SAND	10.6					1.75	160		10	16.1	1.7				
bal8-6a	14.5	4.4		12.5-15	16	52	21	11	0.190	175	SM	Silty SAND w/gravel	11.1					1.70	96		13	7.2	1.2				
bal8-7b	16.5	5.0		16-17.5	0	77	19	4	0.237	14	SM	Silty SAND															
bal8-7a	17.0	5.2	8	16-17.5	0	27	50	23	0 020		CL	Lean CLAY w/sand															
bal8-8e	17.5	5.3		17.5-20	0	38	42	20	0.045	68	CL	Sandy lean CLAY	22.6					1.79	53		13	4.2	1.0	60	50	27	2.2
bal8-8d	18.0	5.5		17.5-20	3	41	35	21	0.056	85	CL	Sandy lean CLAY	20.6	27	8	0.20	0.62	1.81	44		9	4 7	0.5	72	50	37	1 9
bal8-8c	18.5	5.6		17.5-20	0	39	41	20	0.043		CL	Sandy lean CLAY	20.6	28	9	0.18	0.75	1.87	43		11	4.1	0.7				
bal8-8b	19.0	5.8		17.5-20	1	37	38	24	0.042		CL	Sandy lean CLAY	22.9					2.00	42		6	6.6	0.8				
bal8-8a	19.5	5.9		17.5-20	2	34	43	21	0.036		CL	Sandy lean CLAY	24.9	31	10	0.39	0.77	2.03	65		17	3.9	0.8	68	55	34	2.0
bal8-9e2	23.5	7.2		23.5-26	1	50	32	17	0.076		SM	Silty SAND	22.3														
bal8-9e1	23.8	7.2		23.5-26	0	33	46	21	0.038		CL	Sandy lean CLAY															
bal8-9d	24.0	7.3		23.5-26	0	25	51	24	0.031		CL	Lean CLAY w/sand	24.1					1.98	50		10	4.9	0.8				
bal8-9c	24.5	7.5		23.5-26	0	20	58	22	0.030		CL	Lean CLAY w/sand	26.8	39	19	0.36	1.27	1.96	50		13	3.9	0.8				
bal8-9b2	25.0	7.6		23.5-26	0	14	56	30	0.018		CH	Fat CLAY	28.9	50	27	0 22	1.42	1.96	54		21	2 6	1.0				
bal8-9b1	25.2	7.7		23.5-26	0	12	62	26	0.021		CL	Lean CLAY		48	21		1.24										
bal8-9a	25.5	7.8		23.5-26	1	16	50	33	0.018		CH	Fat CLAY w/sand	32.2	50	24	0.26	1.14	1.90	63		14	4.4	1.0				
bal8-10c	26.0	7.9		26-27.5	0	37	41	22	0.046		CL	Sandy lean CLAY															
bal8-10b	26.5	8.1		26-27.5	0	34	38	28	0.035		CL	Sandy lean CLAY															
bal8-10a	27.1	8.3	17	26-27.5	3	49	32	16	0.081		SM	Silty SAND															
bal8-11c	27.5	8.4		27.5-28.2	4	50	29	17	0.087		SC	Clayey SAND	26.3	27	9	0 92	0.75										
bal8-11b	27.7	8.4		27.5-28.2	10	54	21	15	0.180		SC	Clayey SAND	23.8	24	9	0.98	0.75	2.14			NA		2.0				
bal8-11a	28.0	8.5		27.5-28.2	6	61	19	14	0.235	195	SM	Silty SAND	18.8								NA						
bal8-12	29.1	8.9	46	28.2-29.7	17	58	21	4	0.420	44	SM	Silty SAND w/gravel	16.2														
bal8-13a	33.1	10.1		32-33.5	6	66	20	8	0.238	30	SM	Silty SAND															
bal8-13b	32.5	9.9	122	32-33.5	1	87	9	3	0.500	10	SW-SM	SAND w/silt															
bal8-14	35.8	10.9	30	35-36.5	0	64	27	9	0.138	37	SM	Silty SAND															
bal8-15	36.5	11.1		36.5	0	60	29	11	0.109	48	SM	Silty SAND															
bal10-1c	2.0	0.6		2-4.5	10	55	20	15	0.144		SM	Silty SAND	11.3					1.57	34								
bal10-1b	2.5	0.8		2-4.5	24	48	16	12	0.285	179	SM	Silty SAND w/gravel	11.2					1.64									
bal10-1a	3.0	0.9		2-4.5	3	54	28	15	0 100	83	SM	Silty SAND	13.6	23	4	-1.35	0.40						0.5	88	58	29	3.0

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal10-2	8.5	2.6	8	7.5-9	0	26	55	19	0.035		CL	Lean CLAY w/sand															
bal10-3e	9.0	2.7		9-11.5	0	28	48	24	0.034		CL	Lean CLAY w/sand	18.9	34	12	-0.26	0.71	1.73	122		NA		1.5				
bal10-3d	9.5	2.9		9-11.5	0	32	50	18	0.041		CL	Sandy lean CLAY	18.4					1.62	69		12	5.9	1.2				
bal10-3c	10.0	3.0		9-11.5	0	35	46	19	0.040		CL	Sandy lean CLAY	19.5	29	9	-0 06	0.75	1.66	63		11	5.7	0.9				
bal10-3b2	10.5	3.2		9-11.5	1	30	50	19	0.041		CL	Sandy lean CLAY	17.8	32	9	-0.58	0.64	1.72	69		16	4.4	1.2				
bal10-3b1	10.8	3.3		9-11.5	1	29	45	25	0.030		CL	Sandy lean CLAY															
bal10-3a	11.0	3.4		9-11.5	2	30	43	25	0.031		CL	Sandy lean CLAY	19.9	34	15	0.06	0.94	1.69	64		14	4.4	1.1	70	47	21	3 3
bal10-4c	16.5	5.0		16-17.5	12	57	24	7	0.176	16	SM	Silty SAND												120			
bal10-4b	17.1	5.2		16-17.5	28	57	10	5	0.750	56	SM	Silty SAND w/gravel															
bal10-4a	17.4	5.3	15	16-17.5	4	33	48	15	0.048	66	ML	Sandy SILT															
bal10-5b	18.0	5.5		18-19.5	0	51	37	12	0.077	28	SM	Silty SAND	22.3														
bal10-5a	18.8	5.7	1	18-19.5	1	45	36	18	0.066	47	CL	Sandy lean CLAY	27.4	26	7	1.20	0.64										
vane	19.5	5.9																						34	29	19	1.79
bal10-6b	21.5	6.5		21-22.5	1	45	42	12	0.066	22	ML	Sandy SILT	26.7														
bal10-6a	22.1	6.7	4	21-22.5	0	31	48	21	0.032		CL	Sandy lean CLAY	29.2	34	15	0.68	1.07										
bal10-7b	22.7	6.9		22.5-24	0	44	38	18	0.056	43	CL	Sandy lean CLAY															
bal10-7a	23.6	7.2	4	22.5-24	7	49	36	8	0.099	23	SM	Silty SAND	26.6														
bal10-8f	24.0	7.3		24-26.5	0	56	32	12	0.092	43	SM	Silty SAND	16.6					2 12	50		9	5.3	2.1				
bal10-8e	24.5	7.5		24-26.5	2	55	29	14	0.096		SC-SM	Silty clayey SAND	19.2	21	6	0.70	0.50	2.19	19		2	11.1	1.3				
bal10-8d	25.0	7.6		24-26.5	0	57	31	12	0.096	45	SC-SM	Silty clayey SAND	22.4	21	5	1.28	0.63	2.18	16		2	9.6	0.1				
bal10-8c	25.5	7.8		24-26.5	0	53	36	11	0.082	39	SC-SM	Silty clayey SAND	22.1	22	6	1 02	0.67	2 11	11		2	5.0	0.1				
bal10-8b	25.9	7.9		24-26.5	0	59	31	10	0.104	33	SM	Silty SAND	21.6					2.15	13		3	5.2	0.1				
bal10-8a	26.3	8.0		24-26.5	0	59	30	11	0.103	44	SM	Silty SAND	17.3								NA						
bal10-9a	26.5	8.1		26.5-27.8	2	62	24	12	0.129	61	SM	Silty SAND	18.3	21	2	-0.35	0.25										
bal10-10c	29.1	8.9		29-30.5	0	77	17	6	0.154	14	SM	Silty SAND															
bal10-10b	29.5	9.0		29-30.5	1	48	41	10	0.072	20	ML	Sandy SILT															
bal10-10a	30.1	9.2	20	29-30.5	8	38	42	12	0.064	24	ML	Sandy SILT	23.1														
bal10-11d	30.5	9.3		30.5-32.5	5	60	21	14	0.140	105	SM	Silty SAND	21.1					2.07	24		3	7.3	0.1				
bal10-11c2	31.0	9.4		30.5-32.5	3	49	32	16	0.082	61	SC-SM	Silty clayey SAND	20.5	24	5	0.30	0.50	2.09	85		13	6.4	1.0				
bal10-11c1	31.3	9.5		30.5-32.5	2	55	32	11	0.093	35	SM	Silty SAND															
bal10-11b2	31.5	9.6		30.5-32.5	0	13	60	27	0.016		CL	Lean CLAY	31.4	46	26	0.44	1.53	1.98	62		18	3.5	1.0				
bal10-11b1	31.8	9.7		30.5-32.5	0	19	47	34	0.016		CL	Lean CLAY w/sand															
bal10-11a	32.0	9.8		30.5-32.5	1	19	45	35	0.016		CL	Lean CLAY w/sand	24.2					2.10	169		59	2.9	2.0				
bal10-12d	32.6	9.9		32.5-34.3	0	20	42	38	0.012		CL	Lean CLAY w/sand	27.5	45	23	0 24	0.68	2.01	133		49	2.7	1.5				
bal10-12c	33.0	10.1		32.5-34.3	0	32	39	29	0.027		CL	Sandy lean CLAY	28.7	39	17	0.39	0.74	2.00	80		23	3.4	1.5				
bal10-12b	33.4	10.2		32.5-34.3	0	17	46	37	0.020		CH	Fat CLAY w/sand	31.8	54	31	0.28	1.11	1.92	70		21	3.3	1.0				
bal10-12a2	33.8	10.3		32.5-34.3	0	20	38	42	0.009		CH	Fat CLAY w/sand	36.6					2.04	106		31	3.4	1.5				
bal10-12a1	33.9	10.3		32.5-34.3	0	23	51	26	0.021		CL	Lean CLAY w/sand		45	24		1.04										
bal10-13c	35.2	10.7		35-36.5	4	91	4	1	0.560	3.7	SP	SAND															
bal10-13b	35.9	10.9		35-36.5	14	69	13	4	0.495	48	SM	Silty SAND															
bal10-13a	36.2	11.0	142	35-36.5	17	55	20	8	0.490	135	SM	Silty SAND w/gravel															
bal10-14b	37.0	11.3		36.5-38	12	53	24	11	0.190	66	SM	Silty SAND															
bal10-14a	37.6	11.5	68	36.5-38	20	54	17	9	0.400	150	SM	Silty SAND															
bal10-15c	38.4	11.7		38-39.5	0	13	72	15	0.036	15	ML	SILT															
bal10-15b	38.8	11.8		38-39.5	0	1	59	40	0.007		CH	Fat CLAY															
bal10-15a	39.3	12.0	25	38-39.5	0	35	51	14	0.052	32	ML	Sandy SILT	42.5														
bal11-1b	7.3	2.2		7-8.5	0	63	25	12	0.105	39	SM	Silty SAND															
bal11-1a	8.0	2.5	10	7-8.5	0	49	41	10	0.072	17	ML	Sandy SILT															
vane	21.5	6.6																						56	33	26	2 15
bal11-2e	22.0	6.7		22-24.5	1	34	44	21	0.037		CL	Sandy lean CLAY	24.6	29	8	0.45	0.62	1.88	27		4	6.4	0.5	81	25	33	2 45
bal11-2d	22.5	6.9		22-24.5	0	39	41	20	0.047	37	CL	Sandy lean CLAY	26.0					2.01	28		6	4.3	0.3	71	40	34	2 09
bal11-2c	23.0	7.0		22-24.5	8	41	34	17	0.072	57	CL	Sandy lean CLAY	24.9	27	9	0.77	0.90	2.02	32		4	7.5	0.2				
bal11-2b	23.5	7.2		22-24.5	1	41	34	24	0.047		CL	Sandy lean CLAY	23.1	26	8	0.64	0.53	2 07	39		8	4.8	0.4				
bal11-2a	24.0	7.3		22-24.5	0	38	38	24	0.044		CL	Sandy lean CLAY	26.4					2.05	19		5	3.8	0.4				
bal11-3d	24.5	7.5		24.5-26.5	0	24	46	30	0.024		CL	Lean CLAY w/sand	25.4	32	13	0.49	0.72	1.97	21		4	5.0	0.4				
bal11-3c	25.2	7.7		24.5-26.5	0	47	36	17	0.067	52	CL	Sandy lean CLAY	24.8					2.09	18		8	2.2	0.3				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal11-3b2	25.5	7.8		24.5-26.5	0	48	35	17	0.068		CL-ML	Sandy silty CLAY	23.2	24	6	0.87	0.55	2.12	38		5	8.1	0.2				
bal11-3b1	25.8	7.9		24.5-26.5	1	48	36	15	0.071	42	ML	Sandy SILT	20.6														
bal11-3a	26.0	7.9		24.5-26.5	1	48	35	16	0.071	66	ML	Sandy SILT	22.3	24	5	0.66	0.45	2.16	25		4	5.9	0.5				
bal11-4e	26.5	8.1		26.5-29	1	49	32	18	0.075	54	SM	Silty SAND	18.0					1.91	45		4	10.5	2.7				
bal11-4d	27.0	8.2		26.5-29	1	50	32	17	0.076	58	SC-SM	Silty clayey SAND	20.7	24	5	0.34	0.50	2.10	50		13	3.7	0.8				
bal11-4c	27.5	8.4		26.5-29	2	51	29	18	0.087	72	SM	Silty SAND	19.4					2.10	48		6	7.6	0.4				
bal11-4b	28.0	8.5		26.5-29	1	58	27	14	0.110	62	SM	Silty SAND	20.0					2.19	83		6	13.1	1.3				
bal11-4a	28.5	8.7		26.5-29	1	48	36	15	0.072	47	CL-ML	Sandy silty CLAY	20.0	25	6	0 17	0.67	2.09	56		8	6.6	1.1				
bal11-5e	29.0	8.8		29-31.5	0	32	53	15	0.048	46	ML	Sandy SILT	29.2					1.95	25		4	5.8	0.9				
bal11-5d2	29.5	9.0		29-31.5	0	25	58	17	0.040	35	ML	SILT w/sand		30	6		0.55										
bal11-5d1	29.8	9.1		29-31.5	0	36	40	24	0 037		CL	Sandy lean CLAY	28.5	34	12	0.54	0.80	1.97	32		6	5.8	1.0				
bal11-5c2	30.0	9.1		29-31.5	3	19	49	29	0.021		CL	Lean CLAY w/sand	33.7					1.91	61		18	3.4	0.8				
bal11-5c1	30.1	9.2		29-31.5	1	17	40	42	0.011		CL	Lean CLAY w/sand															
bal11-5b	30.5	9.3		29-31.5	0	19	49	32	0.016		CL	Lean CLAY w/sand	31.3					1.95	59		19	3.1	0.9				
bal11-5a2	31.0	9.4		29-31.5	0	23	41	36	0.015		CL	Lean CLAY w/sand	32.0	43	19	0.42	0.73	1.92	53		17	3.2	0.9				
bal11-5a1	31.3	9.5		29-31.5	1	27	41	31	0.020		CL	Lean CLAY w/sand															
bal11-6e	31.5	9.6		31.5-33.8	0	23	43	34	0.015		CL	Lean CLAY w/sand						1.83			NA		NA				
bal11-6d2	31.8	9.7		31.5-33.8	0	27	41	32	0.019		CL	Lean CLAY w/sand	33.2	41	19	0.59	1.00	1.89	37		13	2.8	1.0				
bal11-6d1	32.4	9.9		31.5-33.8	0	30	44	26	0.024		CL	Sandy lean CLAY															
bal11-6c	32.3	9.8		31.5-33.8	0	30	46	24	0.038		CL	Sandy lean CLAY	31.1					1.94	44		12	3.6	0.8				
bal11-6b	32.8	10.0		31.5-33.8	0	36	42	22	0.047		CL	Sandy lean CLAY	26.7	33	11	0.43	0 79	2.01	55		12	4.5	2.3				
bal11-6a2	33.3	10.1		31.5-33.8	5	47	35	13	0.079	58	SM	Silty SAND	22.4					2.14			NA		3.0				
bal11-6a1	33.5	10.2		31.5-33.8	15	56	17	12	0 255	126	SM	Silty SAND w/gravel															
bal11-7b	36.6	11.2		36-37.5	0	54	32	14	0.085	43	SM	Silty SAND															
bal11-7a	37.2	11.4	17	36-37.5	1	34	43	22	0.038		CL	Sandy lean CLAY															
bal11-8b	46.6	14.2		46-47.5	1	50	39	10	0.076	10	SM	Silty SAND															
bal11-8a	47.2	14.4	15	46-47.5	1	52	34	13	0.080	35	SM	Silty SAND															
bal11-9c	49.2	15.0		49-50.5	1	66	25	8	0.174	35	SM	Silty SAND															
bal11-9b	49.6	15.1		49-50.5	7	58	27	8	0 220	70	SM	Silty SAND															
bal11-9a	50.2	15.3	48	49-50.5	0	61	29	10	0.122	37	SM	Silty SAND															
bal12-1	9.5	2.9	9	8.5-10	0	21	50	29	0 021		CL	ean CLAY with san	20.5	37	14	-0.18	0.74										
bal12-2b	13.3	4.1		12.5-14	0	23	41	36	0.012		CL	Lean CLAY w/sand															
bal12-2a	13.8	4.2	19	12.5-14	0	38	40	22	0.040		CL	Sandy lean CLAY															
bal12-3c	15.4	4.7		15-16.5	1	48	36	15	0.070	59	ML	Sandy SILT	13.4														
bal12-3b	15.7	4.8	10	15-16.5	2	48	40	10	0.075	22	ML	Sandy SILT															
bal12-3a	16.2	4.9		15-16.5	1	44	41	14	0.057	34	ML	Sandy SILT															
bal12-4b	20.5	6.2		20-21.5	1	29	48	22	0.031		CL	Sandy lean CLAY	28.9														
bal12-4a	21.1	6.4	5	20-21.5	0	34	41	25	0.031		CL	Sandy lean CLAY															
vane	21.5	6.6																						52	20	21	2 5
vane	22.0	6.7																						61	31	23	2 7
bal12-5e	23.5	7.2		23.5-26	0	22	56	22	0.028		CL	Lean CLAY w/sand	28.5	34	10	0.45	0.56	1.86	30		8	3.9	0.8				
bal12-5d	24.0	7.3		23.5-26	0	24	52	24	0.025		CL	Lean CLAY w/sand	30.0	36	13	0.54	0.60	1.93	38		11	3.3	0.6				
bal12-5c2	24.5	7.5		23.5-26	0	22	50	28	0.020		CL	Lean CLAY w/sand	32.0					2.00	29		11	2 7	0.5				
bal12-5c1	24.8	7.6		23.5-26	0	22	46	32	0 023		CL	Lean CLAY w/sand															
bal12-5b	25.0	7.6		23.5-26	0	32	42	26	0.026		CL	Sandy lean CLAY	28.1					2.01	42		15	2.8	0.5				
bal12-5a	25.5	7.8		23 5-26	2	38	36	24	0.046		CL	Sandy lean CLAY	24.9	29	10	0.59	0.50	2.20	38		7	5.6	0.5				
bal12-6	27.0	8.2	5	26-27.5	1	46	34	19	0.062	94	CL	Sandy lean CLAY	19.7	26	7	0 10	0.58										
bal12-7e	27.5	8.4		27.5-30	1	48	38	13	0.070	45	ML	Sandy SILT	19.7					2.08									
bal12-7d	28.0	8.5		27.5-30	0	49	37	14	0.072	52	ML	Sandy SILT	21.2					2.07	32		9	3.6	0.8				
bal12-7c	28.5	8.7		27.5-30	0	49	37	14	0.070	34	CL-ML	Sandy silty CLAY	22.6	25	6	0.60	0 75	2.09	25		5	5 0	0.6				
bal12-7b	29.0	8.8		27.5-30	1	49	34	16	0.076	59	SC-SM	Silty, clayey SAND	22.2	26	6	0.37	0.55	2.15	27				0.8				
bal12-7a	29.5	9.0		27.5-30	7	43	36	14	0.075	36	SM	Silty SAND	21.6					2.14	25		4	6.0	0.5				
bal12-8c	30.7	9.4		30-31.5	18	53	21	8	0.313	93	SM	Silty SAND w/gravel															
bal12-8b	31.2	9.5		30-31.5	9	44	31	16	0.085	68	SM	Silty SAND	19.2														
bal12-8a	31.4	9.6	15	30-31.5	0	26	40	34	0.016		CL	Lean CLAY w/sand	26.4														
bal12-9e2	31.5	9.6		31.5-34	2	41	36	21	0.051		CL	Sandy lean CLAY						2.05									

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal12-9e1	31.8	9.7		31.5-34	1	60	27	12	0.130	57	SM	Silty SAND															
bal12-9d	32.0	9.8		31.5-34	0	28	41	31	0.019		CL	Lean CLAY w/sand	24.9	41	20	0.20	0.91	2 00	39		12	3.2	0.6				
bal12-9c3	32.5	9.9		31.5-34	1	30	55	24	0.026		CL	Sandy lean CLAY	28.6					2.00	60		12	4.9	0.6				
bal12-9c2	32.7	10.0		31.5-34	6	52	30	12	0.104	40	SM	Silty SAND															
bal12-9c1	32.8	10.0		31.5-34	0	34	44	22	0.040		CL	Sandy lean CLAY															
bal12-9b	33.0	10.1		31.5-34	2	42	40	16	0.056		CL	Sandy leań CLAY	26.7	32	11		0.92	2.03	142				1.0				
bal12-9a	33.5	10.2		31.5-34	0	64	25	11	0.118	41	SM	Silty SAND	23.7					2.12	93		7	13.1	1.2				
bal12-10	35.0	10.7	9	34-35.5	0	21	39	40	0.010		CL	Lean CLAY w/sand	34 4	42	18	0.58	0.64										
bal12-11d	37.6	11.5		37-38.5	0	7	49	44	0.008		CL	Lean CLAY															
bal12-11c	37.7	11.5		37-38.5	0	9																					
bal12-11b	37.9	11.5		37-38.5	0	16	30	54	0.004		CL	Lean CLAY w/sand															
bal12-11a	38.2	11.7	27	37-38.5	4	50	30	17	0.087		SM	Silty SAND															
bal12-12b	39.3	12.0		38.5-40	12	56	16	16	0.315		SM	Silty SAND															
bal12-12a	39.8	12.1	29	38.5-40	13	50	28	9	0.149	67	SM	Silty SAND															
bal12-13c	40.5	12.3		40-41.5	1	61	28	10	0.096	17	SM	Silty SAND															
bal12-13b	40.9	12.5		40-41.5	6	60	25	9	0.150	48	SM	Silty SAND															
bal12-13a	41.3	12.6	48	40-41.5	0	51	37	12	0.076	27	SM	Silty SAND															
bal12-14b	44.6	13.6		44-45.5	3	64	19	14	0.188		SM	Silty SAND															
bal12-14a	45.2	13.8	23	44-45.5	5	64	19	12	0.250	115	SM	Silty SAND															
bal12-15	46.5	14.2	56	45.5-47	9	53	28	10	0.145	54	SM	Silty SAND															
vane 1	4.0	1.2																						91	49	15	6.1
vane 2	7.0	2 1																						61	42	15	4.1
vane 3	8.5	2.6																						69	41	19	3.6
bal13-1	9.5	2.9	6	8.5-10	1	21	44	34	0.015		CL	Lean CLAY w/sand	23.5														
bal13-2e	10.0	3.0		10-12.5	1	24	34	41	0.013		CL	Lean CLAY w/sand	21.7	38	14	-0.16	0.41	1.56	59		9	6.3	1.2	38	27	12	3.2
bal13-2d	10.5	3.2		10-12.5	0	25	36	39	0.014		CL	Lean CLAY w/sand	20.6					1.62	67		10	6.5	1.0				
bal13-2c	11.0	3.4		10-12.5	0	33	31	36	0.019		CL	Sandy lean CLAY	19.6					1.66	79		13	6.2	1.3				
bal13-2b	11.5	3.5		10-12.5	2	37	29	32	0.034		CL	Sandy lean CLAY	17.9	32	11	-0.28	0.42	1.71	77		17	4.7	1.1				
bal13-2a	12.0	3.7		10-12.5	2	44	29	25	0.058		CL	Sandy lean CLAY	17.1					1.72	110		16	7.0	1.8	89	58	25	3.6
bal13-3c	14.0	4.3		13.5-15	2	59	22	17	0.151		SM	Silty SAND												118	10	28	4.2
bal13-3b	14.5	4.4		13.5-15	5	52	18	25	0.109		SM	Silty SAND	11.9														
bal13-3a	14.8	4.5	12	13.5-15	2	52	30	16	0.083	49	SM	Silty SAND															
bal13-4c	18.9	5.8		18.5-20	1	45	34	20	0.058		CL	Sandy lean CLAY	16.7											83	79	31	2.7
bal13-4b	19.5	5.9		18.5-20	33	53	9	5	0.870	90	SM	Silty SAND w/gravel															
bal13-4a	19.8	6.0	15	18.5-20	3	38	41	18	0.050		CL	Sandy lean CLAY												112	37	44	2.5
bal13-5	23.0	7.0	7	22-23.5	3	29	43	25	0.025		CL	Sandy lean CLAY	25.6	34	12	0.30	0.63										
bal13-6e	23.5	7.2		23.5-26	0	29	47	24	0.029		CL	Lean CLAY w/sand	25.7	33	11	0.34	0.79	1.97	54		13	4.1	0.6				
bal13-6d	24.0	7.3		23.5-26	1	35	42	22	0.038		CL	Sandy lean CLAY	26.6					2.00	48		14	3.4	0.8				
bal13-6c	24.5	7.5		23.5-26	0	38	46	16	0.057	31	ML	Sandy SILT	21.8					1.99	49		13	3.9	0.8				
bal13-6b	25.0	7.6		23.5-26	0	38	41	21	0.045		CL	Sandy lean CLAY	26.0					2.06	30		6	5.4	0.5				
bal13-6a	25.5	7.8		23.5-26	3	39	34	24	0.052		CL	Sandy lean CLAY	29.8	31	11	0.89	0.69	2.08	25		5	5.3	0.2				
bal13-7b	26.2	8.0		26-27.5	3	42	34	21	0.062		CL	Sandy lean CLAY															
bal13-7a	26.9	8.2	10	26-27.5	0	49	36	15	0.073		ML	Sandy SILT	16.0														
bal13-8e	27.5	8.4		27.5-30	8	49	28	15	0.084		SM	Silty SAND	20.2										0.6				
bal13-8d	28.0	8.5		27.5-30	1	53	32	14	0.086	68	SM	Silty SAND	20.7					2.04	46		9	4.9	0.6				
bal13-8c	28.5	8.7		27.5-30	2	52	32	14	0.088	46	SM	Silty SAND	20.4					2.10	34		9	3.6	0.5				
bal13-8b	29.0	8.8		27.5-30	1	50	33	16	0.078	50	SM	Silty SAND	22.4					2.12	21		4	5.4	0.5				
bal13-8a2	29.5	9.0		27.5-30	3	39	40	18	0.057	42	CL	Sandy lean CLAY		27	6		0.60										
bal13-8a	29.8	9.1		27.5-30	12	45	27	16	0.106		SM	Silty SAND	25.1					2.09	26		9	3.0	0.6				
bal13-9c	30.2	9.2		30-31.5	41	47	6	6	1.750	33	SW-SM	SAND w/silt-gravel															
bal13-9b	30.6	9 3		30-31.5	0	88	8	4	0.223	5	SW-SM	SAND w/silt	19.9														
bal13-9a	31.2	9.5	26	30-31.5	14	70	11	5	0.475	36	SM	Silty SAND															
bal13-10d2	32.0	9.8		31.5-34	24	44	21	11	0.300	161	SM	Silty SAND w/gravel															
bal13-10d1	32.3	9.8		31.5-34	8	28	32	32	0.023		CL	Sandy lean CLAY	28.1					2.00	126		16	8.0	0.8				
bal13-10c	32.5	9.9		31.5-34	4	29	38	29	0.032		CL	Sandy lean CLAY	28.8	36	19	0.62	0.95	1 99	50		14	3.6	0.7				
bal13-10b	33.0	10.1		31.5-34	1	37	36	26	0.038		CL	Sandy lean CLAY	29.0					2.00	49		13	3.6	0.6				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal13-10a2	33.5	10.2		31.5-34	10	47	26	17	0.099		SM	Silty SAND	27.5					1.99	39		11	3.5	0.8				
bal13-10a1	33.8	10.3		31.5-34	0	50	29	21	0.074		CL	Sandy lean CLAY		30	10		0.71										
bal13-11d	34.5	10.5		34-35.5	7	40	32	21	0.065		CL	Sandy lean CLAY	30.7														
bal13-11c	34.8	10.6		34-35.5	0	22	40	38	0.011		CL	Lean CLAY w/sand															
bal13-11b	35.1	10.7		34-35.5	0	78	16	6	0.320	27	SM	Silty SAND	33.1														
bal13-11a	35.3	10.8	19	34-35.5	0	58	30	12	0.088	29	SM	Silty SAND															
bal13-12d	37.5	11.4		37-38.5	32	51	13	4	1.300	136	SM	Silty SAND w/gravel															
bal13-12c	37.6	11.5		37-38.5	0	47	36	17	0.068	98	CL	Sandy lean CLAY	23.6														
bal13-12b	38.0	11.6		37-38.5	20	44	25	11	0.201	105	SM	Silty SAND w/gravel															
bal13-12a	38.3	11.7	23	37-38.5	0	34	50	16	0.048	31	ML	Sandy SILT															
bal13-13c	40.4	12.3		40-41.5	1	68	24	7	0.142	22	SM	Silty SAND															
bal13-13b	40.7	12.4		40-41.5	3	44	42	11	0.065	25	ML	Sandy SILT	18.5														
bal13-13a	41.1	12.5	220	40-41.5	0	50	44	16	0.072		ML	Sandy SILT															
bal13-14	42.5	13.0	36	41.5-43	4	51	31	14	0.090	49	SM	Silty SAND															
bal13-15b	43.6	13.3		43-44.5	4	49	37	10	0.083	26	SM	Silty SAND															
bal13-15a	44.3	13.5	20	43-44.5	0	47	39	14	0.064	27	ML	Sandy SILT	16.7														
bal13-16c	45.9	14.0		45.5-47	3	60	24	13	0.112	76	SM	Silty SAND															
bal13-16b	46.2	14.1		45.5-47	22	53	17	8	0.450	104	SM	Silty SAND w/gravel															
bal13-16a	46.7	14.2	121	45.5-47	22	41	27	10	0.220	90	SM	Silty SAND w/gravel															
bal13.5-1	14.0	4.3	13	13-14.5	7	40	28	25	0.062		CL	Sandy lean CLAY	11.1	28	9	-0.88	0.50							120			
bal13.5-2e	18.5	5.6		18.5-21	1	50	37	12	0.076	29	SM	Silty SAND	11.3					1.63	43		4	9.8	1.0				
bal13.5-2d	19.0	5.8		18.5-21	0	41	41	18	0.054		CL-ML	Sandy silty CLAY	13.8	27	6	-1.20	0.50	1.68	79		9	8.9	1.5				
bal13.5-2c	19.5	5.9		18.5-21	1	33	43	23	0.034		CL	Sandy lean CLAY	16.3														
bal13.5-2b	20.0	6.1		18.5-21	0	31	43	26	0.027		CL	Sandy lean CLAY	19.0	30	10	-0.10	0.50	1.65	102		12	8.4	1.8				
bal13.5-2a2	20.5	6.2		18.5-21	0	36	44	20	0.043		CL	Sandy lean CLAY	18.8					1.69	79		10	7.9	2.0	83	35	26	3 19
bal13.5-2a1	20.8	6.4		18.5-21	0	37	45	18	0.042	43	CL	Sandy lean CLAY															
bal13.5-3	23.5	7.2	13	22.5-24	1	34	36	29	0.027		CL	Sandy lean CLAY	20.4	33	11	-0.15	0.53										
bal13.5-4b	27.0	8.2		26.5-28	1	47	32	20	0.066		CL	Sandy lean CLAY															
bal13.5-4a	27.7	8.4	9	26.5-28	9	43	28	20	0.081		SM	Silty SAND	22.5														
bal13.5-5e	28.0	8.5		28-30.1	1	46	33	20	0.067		CL	Sandy lean CLAY	20.6	28	9	0.18	0.75		73		6	11.5	0.5				
bal13.5-5d	28.4	8.7		28-30.1	2	53	33	12	0.090	40	SM	Silty SAND	20.8					2.04	67				0.5				
bal13.5-5c2	28.8	8.8		28-30.1	3	59	25	13	0.137	74	SM	Silty SAND															
bal13.5-5c1	28.9	8.8		28-30.1	12	63	17	8	0.291	46	SM	Silty SAND	21.8					2.17	28		6	5.2	0.6				
bal13.5-5b	29.4	9.0		28-30.1	2	73	16	9	0.280	66	SM	Silty SAND						2.20									
bal13.5-5a	29.9	9.1		28-30.1	3	76	14	7	0.375	34	SM	Silty SAND															
bal13.5-6c	30.6	9.3		30.5-32	0	72	20	8	0.240	39	SM	Silty SAND															
bal13.5-6b	31.0	9.5		30.5-32	12	41	27	20	0.087		SM	Silty SAND	23.3														
bal13.5-6a	31.7	9.7	6	30.5-32	2	39	34	25	0.045		CL	Sandy lean CLAY															
bal13.5-7b	34.7	10.6		34-35.5	4	51	24	21	0.084		SM	Silty SAND		27	5		0.33										
bal13.5-7a	35.4	10.8	17	34-35.5	0	28	48	24	0.036		CL	Sandy lean CLAY															
bal13.5-8d	37.5	11.4		37.5-39.2	0	41	45	14	0.057	33	ML	Sandy SILT	23.5					2.00	56		4	12.8	1.2				
bal13.5-8c2	38.0	11.6		37.5-39.2	6	57	28	9	0.112	23	SM	Silty SAND	20.7					2.09	74		9	8.4	2.3				
bal13.5-8c1	38.4	11.7		37.5-39.2	7	43	35	15	0.076	115	SM	Silty SAND															
bal13.5-8b	38.5	11.7		37.5-39.2	0	54	36	10	0.084	22	SM	Silty SAND	22.0					2 13	88		12	7.3	2.0				
bal13.5-8a2	39.0	11.9		37.5-39.2	3	52	33	12	0.086	36	SM	Silty SAND	21.1					2.08	106		14	7.4	2.8				
bal13.5-8a1	39.3	12.0		37.5-39.2	0	41	44	15	0.058	38	ML	Sandy SILT															
bal13.5-9c	39.5	12.0		39.2-40.7	0	71	18	11	0.195	83	SM	Silty SAND															
bal13.5-9b	39.8	12.1		39.2-40.7	0	34	54	12	0.048	18	ML	Sandy SILT	20.8														
bal13.5-9a	40.4	12.3	29	39.2-40.7	4	68	17	11	0.142	49	SM	Silty SAND															
bal13.5-10a	43.6	13.3	38	42.5-44	29	39	22	10	0.230	88	SM	Silty SAND w/gravel	16.1														
bal13.5-11b	46.4	14.2		46.3-47.8	0	87	6	7	0.336	10	SM	Silty SAND															
bal13.5-11a1	47.5	14.5		46.3-47.8	28	53	17	2	1.090	130	SM	Silty SAND w/gravel															
bal13.5-11a	47.7	14.5	74	46.3-47.8	2	67	28	3	0.128	11	SM	Silty SAND															
bal14-1e	2.5	0.8		2.5-5	0	45	38	17	0.060	44	CL-ML	Sandy silty CLAY	12.0	26	5	-1.80	0 50	1.54	33		7	4.7	0 8				
bal14-1d	3.0	0.9		2.5-5	1	37	47	15	0.048		ML	Sandy SILT	15.0					1 57	44		8	5.6	1.3				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal14-1c	3.5	1.1		2.5-5	0	29	53	18	0.036		CL	Lean CLAY w/sand	15.6	32	10	-0.64	0.67	1.51	62		20	3.2	0.9				
bal14-1b	4.0	1.2		2.5-5	0	30	52	18	0 035		CL	Lean CLAY w/sand	19 0					1.49	42		7	5.9	0.7				
bal14-1a	4.5	1.4		2.5-5	2	42	39	17	0.060		CL	Sandy lean CLAY	14.7	28	7	-0.90	0.44	1.65	47		8	6.0	0.6				
bal14-2e	5.0	1.5		5-7.5	1	57	34	8	0.100	21	SM	Silty SAND	12.4					1.51	43		2	17.9	1.0	120			
bal14-2d2	5.5	1.7		5-7.5	1	40	45	14	0.054	22	CL-ML	Sandy silty CLAY	14.0	28	7	-1.00		1.63	69		13	5.5	1.6				
bal14-2d1	5.8	1.8		5-7.5	1	36	48	15	0.046	21	CL	Sandy lean CLAY	14.0														
bal14-2c	6.0	1.8		5-7.5	0	28	54	18	0.033	25	CL	Lean CLAY w/sand	16.1	33	11	-0.54	0.85	1.50	78		11	7.1	2.1				
bal14-2b2	6.5	2.0		5-7.5	0	28	53	19	0.031	24	CL	Lean CLAY w/sand	16.4					1.45	57		9	6.6	1.4				
bal14-2b1	6.8	2.1		5-7.5	0	23	51	26	0.024		CL	Lean CLAY w/sand	16.4	36	13	-0.51	0.76										
bal14-2a	7.0	2.1		5-7.5	0	19	59	22	0.022		CL	Lean CLAY w/sand	18.0					1.45	68		11	6.1	1.2				
bal14-3e	7.5	2.3		7.5-10	0	17	48	35	0.016		CL	Lean CLAY w/sand	15 0					1.57	82		10	8.2	2.6				
bal14-3d	8.0	2.4		7.5-10	0	16	52	32	0.017		CL	Lean CLAY w/sand	14.8					1.44	94		15	6.1	3.0				
bal14-3c2	8.5	2.6		7.5-10	0	16	48	36	0.012		CL	Lean CLAY w/sand	14.2	39	17	-0.46	0.65	1.45	104		14	7.2	3.0				
bal14-3c1	8.8	2.7		7.5-10	0	15	49	33	0.015		CL	Lean CLAY w/sand															
bal14-3b	9.0	2.7		7.5-10	0	16	51	33	0.014		CL	Lean CLAY w/sand	15.1					1.48	103		14	7.1	2.5				
bal14-3a	9.5	2.9		7.5-10	0	17	51	32	0.016		CL	Lean CLAY w/sand	16.1	41	16	-0.56	0.76	1.49	136		17	8.2	2.3	120			
bal14-4b	10.7	3.3		10-11.5	0	23	47	30	0.019		CL	Lean CLAY w/sand															
bal14-4a	11.0	3.4	19	10-11.5	3	33	34	30	0.022		CL	Sandy lean CLAY		36	15		0.71										
bal14-5	13.0	4.0	15	11.5-13	0	42	34	24	0.043		CL	Sandy lean CLAY															
bal14-6b	13.5	4.1		13-14.5	0	52	28	20	0.080		SM	Silty SAND															
bal14-6a	14.1	4.3	16	13-14.5	0	38	41	21	0.040		CL	Sandy lean CLAY															
bal14-7	15.5	4.7	16	14.5-16	0	37	42	21	0 039		CL	Sandy lean CLAY		28	9		0.60										
bal14-8b	16.4	5.0		16-17.5	0	35	35	30	0.035		CL	Sandy lean CLAY															
bal14-8a	17.0	5.2	15	16-17.5	0	43	38	19	0.060		CL	Sandy lean CLAY															
bal14-9b	19.6	6.0		19-20.5	4	66	25	5	0.180	21	SM	Silty SAND															
bal14-9a	20.1	6.1	12	19-20.5	0	30	43	27	0.023		CL	Sandy lean CLAY		35	15		0.79										
bal14-10e	20.5	6.2		20.5-23	13	39	28	20	0.081		SM	Silty SAND	15.4					1.93	199		NA		4.5	120			
bal14-10d	21.0	6.4		20.5-23	2	34	44	20	0.041		CL	Sandy lean CLAY	10.8					2.03	199		NA		3.8				
bal14-10c	21.5	6.6		20.5-23	8	30	38	24	0 040		CL	Sandy lean CLAY	20.2	33	10	-0.28	0.77	1.90	189		27	7.1	4.2				
bal14-10b	22.0	6.7		20.5-23	0	29	47	24	0.031		CL	Lean CLAY w/sand	19.9	32	12	-0 01	0.80	1.99	188		60	3.1	3.5				
bal14-10a	22.5	6.9		20.5-23	0	30	48	22	0.036		CL	Sandy lean CLAY	20.1	34	11	-0.26	0.92	1.83	123		25	4.8	2.5				
bal14-11	24.0	7.3	16	23-24.5	0	29	42	29	0.022		CL	Lean CLAY w/sand		34	13		0.73										
bal14-12a	25.5	7.8		24.5-26	0	33	43	24	0.036		CL	Sandy lean CLAY															
bal14-12b	25.6	7.8	14	24.5-26	0	36	43	22	0.043		CL	Sandy lean CLAY															
bal15-1e	2.5	0.8		2.5-5	1	30	55	14	0.041	16	ML	Sandy SILT	14.6					1.40	43		3	12.9	0.8				
bal15-1d	3.0	0.9		2.5-5	0	30	52	18	0.039		CL	Sandy lean CLAY	15.1	31	8	-0.99	0.67	1.41	44		6	8.0	0.8				
bal15-1c	3.5	1.1		2.5-5	0	32	53	15	0.044	22	ML	Sandy SILT	13.8					1.40	44		8	5.7	0.9				
bal15-1b	4.0	1.2		2.5-5	1	37	49	13	0.048	21	ML	Sandy SILT	17.6					1.54	79		11	7.1	1.7				
bal15-1a	4.5	1.4		2.5-5	1	42	45	12	0.060	41	CL-ML	Sandy silty CLAY	11.4	26	5	-1.92	0.50	1.57	81		12	6.6	1.6	105	68	16	6.6
bal15-2	6.0	1.8	10	5-6.5	0	32	44	24	0.036		CL	Sandy lean CLAY															
bal15-3f	8.5	2.6		8.5-11	1	25	54	20	0.023		CL	Lean CLAY w/sand	13.7	39	16	-0.58	1.33	1.41	128		14	8.9	3.5				
bal15-3e	9.0	2.7		8.5-11	3	28	45	24	0.026		CL	Sandy lean CLAY	14.3					1.72	153		17	9.2	3.2				
bal15-3d	9.5	2.9		8.5-11	1	42	39	18	0.051		CL	Sandy lean CLAY	11.8	33	13	-0.63	1.18	1.54	166		28	6.0	3.5				
bal15-3c	10.0	3.0		8.5-11	1	44	40	15	0.056	34	ML	Sandy SILT	11.9					1.57	149		15	9.6	3.5				
bal15-3b	10.5	3.2		8.5-11	3	51	32	14	0.093	31	SM	Silty SAND	11.2					1.63	177		20	8.9	3.0				
bal15-3a	10.8	3.3		8.5-11	1	49	31	19	0.075	93	SC	Clayey SAND		27	10		0.77										
bal15-4b	11.5	3.5		11-12.5	56	34			6.600	159	GW-GM	Gravel w/silt-sand															
bal15-4a	12.0	3.7	25	11-12.5	2	58	24	16	0.124		SM	Silty SAND															
bal15-5b	13.2	4.0		12.5-14	6	49	27	18	0.093		SM	Silty SAND	11.1														
bal15-5a	13.7	4.2	20	12.5-14	8	47	31	14	0.097	64	SM	Silty SAND															
bal15-6e	14.0	4.3		14-16.5	30	49	13	8	0.740	206	SM	Silty SAND w/gravel															
bal15-6d	14.5	4.4		14-16.5	15	41	29	15	0.099		SM	Silty SAND w/gravel	13.1						100		13	7.5	2.6				
bal15-6c	15.0	4.6		14-16.5	1	41	40	18	0.052	43	CL	Sandy lean CLAY	13.6					1.73	133				3.3				
bal15-6b	15.5	4.7		14-16.5	2	43	35	20	0.060		CL	Sandy lean CLAY	13.5	26	7	-0.79	0.47	1.63	125		19	6.6	2.4				
bal15-6a	16.0	4.9		14-16.5	0	42	42	16	0.056	54	CL	Sandy lean CLAY	13.0						116		10	11 7	2.2				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal15-7c	17.4	5.3		17-18.5	0	38	42	20	0.044		CL	Sandy lean CLAY															
bal15-7b	17.8	5.4		17-18.5	16	61	12	11	0.385	193	SM	Silty SAND w/gravel	7.4														
bal15-7a	18.2	5.5	14	17-18.5	0	35	43	22	0.038		CL	Sandy lean CLAY															
bal15-8b	19.8	6.0		19-20.5	0	24	45	31	0.017		CL	Lean CLAY w/sand															
bal15-8a	20.4	6.2	17	19-20.5	3	31	38	28	0.034		CL	Lean CLAY w/sand															
bal15-9e	21.0	6.4		21-23.5	1	37	42	20	0.049		CL	Sandy lean CLAY	18.1	31	11	-0.17	0.79	1.61	59		6	10.7	1.4				
bal15-9d	21.5	6.6		21-23.5	0	41	43	16	0.055		CL	Sandy lean CLAY	15.0					1.73	71				1.4	102	43	27	3.8
bal15-9c	22.0	6.7		21-23.5	1	42	36	21	0.052		CL	Sandy lean CLAY	12.7	28	9	-0.70	0.64	1.67	63		6	10.0	1.4				
bal15-9b	22.5	6.9		21-23.5	1	39	45	15	0.054		CL	Sandy lean CLAY	17.2	29	9	-0.31	0.90	1.72	94		13	7.4	2.0				
bal15-9a2	23.0	7.0		21-23.5	0	42	39	19	0.054	7	CL	Sandy lean CLAY	15.2	29	11	-0.25	1.00	1.70	95		10	9.3	1.2				
bal15-9a1	23.2	7.1		21-23.5	0	42	42	16	0.053	51	CL	Sandy lean CLAY															
bal15-10e	24.0	7.3		24-26.5	0	49	37	14	0.072		ML	Sandy SILT	13.2					1.68	64		10	6.4	1.2				
bal15-10d	24.5	7.5		24-26.5	0	49	38	13	0.073	34	ML	Sandy SILT	11.9					1.72	71		11	6.4	1.4				
bal15-10c	25.0	7.6		24-26.5	0	49	37	14	0.071	42	CL-ML	Sandy silty CLAY	12.4	25	6	-1.10	0 67	1.74	94		22	4.3	2.0				
bal15-10b	25.5	7.8		24-26.5	1	52	34	13	0.082	36	SM	Silty SAND	11.1	24	3		0.43	1.77	124		9	14.0	1.7				
bal15-10a	26.0	7.9		24-26.5	1	55	31	13	0.094	41	SM	Silty SAND	12.0					1.85	104		15	6.7	2.0				
bal15-11d	26.9	8.2		26.5-28	4	66	18	12	0.215	95	SM	Silty SAND															
bal15-11c	27.4	8.3		26.5-28	24	57	11	8	0.480	131	SM	Silty SAND w/gravel	8.1														
bal15-11b	27.7	8.4		26.5-28	1	62	25	12	0.148	94	SM	Silty SAND															
bal15-11a	27.9	8.5	23	26.5-28	2	74	15	9	0.330	71	SM	Silty SAND															
bal15-12e	28.0	8.5		28-30.3	1	35	42	22	0.035		CL	Sandy lean CLAY	23.8	34	14	0.27	0.88	1.89	62		18	3.4	1.0				
bal15-12d2	28.3	8.6		28-30.3	6	36	42	16	0.050		CL	Sandy lean CLAY	21.9					1.79	58		11	5.2	1.3				
bal15-12d1	28.7	8.7		28-30.3	0	26	52	22	0.026		CL	Lean CLAY w/sand															
bal15-12c	28.8	8.8		28-30.3	0	27	49	24	0.030		CL	Lean CLAY w/sand	24.9	38	17	0.23	0.94	1.91	76		18	4.2	1.2				
bal15-12b	29.3	8.9		28-30.3	1	28	51	20	0.037		CL	Lean CLAY w/sand	24.4					1.85	63		19	3.3	1.3				
bal15-12a2	29.8	9.1		28-30.3	0	30	48	22	0.039		CL	Lean CLAY w/sand	24.4					1.95	78		17	4.5	1.1				
bal15-12a1	30.3	9.2		28-30.3	9	42	37	12	0.088	50	SM	Silty SAND															
bal15-13c	31.3	9.6		30.5-32.3	0	35	47	18	0.045		CL	Sandy lean CLAY	22.0														
bal15-13b	31.8	9.7		30.5-32.3	0	27	60	13	0.041		ML	SILT w/sand															
bal15-13a	32.1	9.8	17	30.5-32.3	0	36	52	12	0.052		ML	Sandy SILT															
bal15-14e	32.4	9.9		32.3-33.8	0	48	37	15	0.070		ML	Sandy SILT															
bal15-14d	32.7	10.0		32.3-33.8	0	12	68	20	0.026	13	CL	Lean CLAY	21.1														
bal15-14c	32.9	10.0		32.3-33.8	0	36	53	11	0.048	33	ML	Sandy SILT															
bal15-14b	33.2	10.1		32.3-33.8	3	54	31	12	0.104		SM	Silty SAND	22.3														
bal15-14a	33.6	10.2	17	32.3-33.8	0	50	41	9	0.075		SM	Silty SAND															
bal15-15c	35.1	10.7		35-36.5	0	23	52	25	0.017		CL	Lean CLAY w/sand															
bal15-15b	35.6	10.8		35-36.5	0	43	46	11	0.066	24	ML	Sandy SILT	27.3														
bal15-15a	36.2	11.0	21	35-36.5	0	38	51	11	0.049	17	ML	Sandy SILT															
bal15-16e2	37.5	11.4		37.5-40	0	41	51	8	0.062	10	ML	Sandy SILT	25.5					1.98	21		3	6.3	0.5				
bal15-16e1	37.8	11.5		37.5-40	0	24	67	9	0.046	10	ML	SILT w/sand	29.5						29		6	5.2	1.5				
bal15-16d3	38.1	11.6		37.5-40	0	13	78	9	0.037	6.6	ML	SILT	29.5					1.98	39		7	5.8	1.5				
bal15-16d2	38.3	11.7		37.5-40	0	12	62	26	0.016		CL	Lean CLAY	33.8	40	15	0.59	0.94										
bal15-16d1	38.4	11.7		37.5-40	0	49	39	12	0.072	27	ML	Sandy SILT															
bal15-16c2	38.5	11.7		37.5-40	0	45	48	7	0.067	8.4	ML	Sandy SILT	20.4					1.95	77		20	3.9	2.0				
bal15-16c1	38.8	11.8		37.5-40	0	11	66	23	0.021	24	CL	Lean CLAY	33.7	38	15	0.71	1.15										
bal15-16b	39.3	12.0		37.5-40	0	32	58	10	0.047	13	ML	Sandy SILT	23.3					1.94	125		29	4.3	2.0				
bal15-16a2	39.6	12.1		37.5-40	0	6	78	16	0.024	14	ML	SILT	31.7	38	11	0.43	1.22	1.95	114		29	4.0	2.6				
bal15-16a1	39.8	12.1		37.5-40	0	11	57	32	0 012		CH	Fat CLAY	34.3	51	26	0.36	1.30										
bal15-17c	40.1	12.2		40-41.5	0	21	57	22	0.031		CL	Lean CLAY w/sand															
bal15-17b	40.7	12.4		40-41.5	1	46	38	15	0.071	69	ML	Sandy SILT	18.2														
bal15-17a	41.4	12.6	30	40-41.5	0	50	39	11	0.076	27	SM	Silty SAND															
bal15-18b	41.5	12.6		41.5-42.3	1	50	39	10	0.078	22	SM	Silty SAND	16.2					2.32									
bal15-18a	42.0	12.8		41.5-42.3	0	50	38	12	0.073	40	ML	Sandy SILT	14.5					2.36	168		23	7.3	4.5				
bal15-19	43.5	13.3	23	42.5-44	0	35	49	16	0.052	64	ML	Sandy SILT	20.2	22	2	0.10	0.17										
bal15-20b	45.6	13.9		45-46.5	1	47	40	12	0.074	31	ML	Sandy SILT	20.0														
bal15-20a	46.3	14.1	30	45-46.5	0	63	27	10	0.098	21	SM	Silty SAND															
bal15-21b	49.0	14.9		48.5-50	1	90	8	1	0.520	7	SW-SM	Sand w/silt															

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal15-21a	49.8	15.2	149	48.5-50	14	63	15	8	0.346	79	SM	Silty SAND															
bal16-1e	2.5	0.8		2.5-5	3	42	39	16	0.061		CL	Sandy lean CLAY	18 2	28	11	0.11	1.00		54		6	9.1	1.4				
bal16-1d	3.0	0.9		2.5-5	4	44	35	17	0.067		CL-ML	Sandy silty CLAY	18.6	26	6	-0.23	0.46	1.65	52		6	8 8	1.0				
bal16-1c	3.5	1.1		2.5-5	3	49	35	13	0.080	52	SM	Silty SAND	18 3					1.64					0.6				
bal16-1b	4.0	1.2		2.5-5	5	50	30	15	0.092	85	SM	Silty SAND	17.9					1.64	51		6	9.3	0.9				
bal16-1a	4.5	1.4		2.5-5	1	51	34	14	0.080	53	SM	Silty SAND	18.6					1.70	33		3	9 6	0.5	59	50	16	3.7
bal16-2b	5.8	1.8		5-6.5	2	59	27	12	0.119	99	SM	Silty SAND															
bal16-2a	6.2	1.9	7	5-6.5	3	49	36	12	0.080	61	SM	Silty SAND															
bal16-3b	7.1	2.2		6.5-8	1	56	31	12	0.094	41	SM	Silty SAND															
bal16-3a	7.6	2.3	9	6.5-8	2	58	29	11	0.101	35	SM	Silty SAND															
bal16-4e	8.0	2.4		8-10.5	1	40	48	11	0 054	18	ML	Sandy SILT	15 0					1.77	66		7	9.3	1.4				
bal16-4d	8.5	2.6		8-10.5	0	31	52	17	0.036	22	CL	Sandy lean CLAY	20 5	31	11	0.05	1.38	1.57	35		4	9.0	0.7				
bal16-4c	9.0	2.7		8-10.5	0	17	64	19	0.031	15	CL	Lean CLAY w/sand	25 3					1.57	38		9	4.4	0.8				
bal16-4b	9.5	2.9		8-10.5	1	19	58	22	0.026	16	CL	Lean CLAY w/sand	27.6					1.58	48		9	5.1	1.3				
bal16-4a	10.0	3.0		8-10.5	1	18	56	25	0.038		CL	Lean CLAY w/sand	27.1	42	17	0.12	1.89	1.67	75		16	4.8	1.3				
bal16-5b	11.3	3.4		10.5-12	0	30	40	30	0.022		CL	Sandy lean CLAY															
bal16-5a	11.7	3.6	10	10.5-12	2	41	38	19	0.052		CL	Sandy lean CLAY															
bal16-6b	15.1	4.6		14.5-16	1	35	49	15	0.045	29	ML	Sandy SILT															
bal16-6a	15.7	4.8		14.5-16	0	33	47	20	0.035		CL	Sandy lean CLAY															
bal16-7e	16.0	4.9		16-18.5	0	27	56	17	0.040	33	CL	Lean CLAY w/sand						1.66					0.6				
bal16-7d	16.5	5.0		16-18.5	0	30	55	15	0.039	35	ML	Sandy SILT						1.69	55		3	17.3	1.2				
bal16-7c	17.0	5.2		16-18.5	1	32	49	18	0.040		CL	Sandy lean CLAY						1.74	62		14	4.4	1.5				
bal16-7b	17.5	5.3		16-18.5	3	35	48	14	0.048	34	ML	Sandy SILT						1.78	61		10	6 4	1.5				
bal16-7a	18.0	5.5	10	16-18.5	4	35	46	15	0.050	28	ML	Sandy SILT						1.83	126				1.5	80	60	31	2.6
bal16-8e	21.0	6.4		21-23.5	0	25	52	23	0.027		CL	Lean CLAY w/sand	27.3					1.61	57		16	3.6	0.8	65	42	27	2.4
bal16-8d	21.5	6.6		21-23.5	0	20	60	20	0.027	37	CL	Lean CLAY w/sand	27.0					1.73	61		17	3.5	1.2				
bal16-8c	22.0	6.7		21-23.5	0	23	53	24	0.025		CL	Lean CLAY w/sand	25.3	38	18	0.29	1.80	1.75	52		20	2.6	1.2				
bal16-8b	22.5	6.9		21-23.5	0	25	55	20	0.034		CL	Lean CLAY w/sand	24.0					1.80	57		20	2.8	0.8				
bal16-8a	23.0	7.0		21-23.5	0	15	67	18	0.025		CL	Lean CLAY w/sand	22.0	34	14	0.14	1.27	1.85	63		22	2.9	1.2				
bal16-9	24.5	7.5	10	23.5-25	0	32	42	26	0.029		CL	Sandy lean CLAY															
bal16-10e	27.2	8.3		27-29.5	0	29	55	16	0.035		CL	Lean CLAY w/sand	20.9	35	14	-0.01	1.27	1.73	82		17	4.9	1.8				
bal16-10d	27.6	8.4		27-29.5	1	27	57	15	0.036	17	CL	Lean CLAY w/sand	21.2	36	16	0.08		1.75	96		18	5.4	1.7				
bal16-10c	28.0	8.5		27-29.5	0	18	67	15	0.038	16	CL	Lean CLAY w/sand	23.1					1.81	85		19	4.5	1.6				
bal16-10b	28.5	8.7		27-29.5	1	34	49	16	0.039	24	CL	Sandy lean CLAY	27.2	33	12	0.52	1.33	1.86	53		11	4.8	1.2				
bal16-10a	29.0	8.8		27-29.5	2	26	56	16	0.032	18	CL	Lean CLAY w/sand	20 2					2.07	155		31	5.0	2.4				
bal16-11d	29.8	9.1		29.5-31	0	37	43	20	0.046		CL	Sandy lean CLAY															
bal16-11c	30.2	9.2		29.5-31	1	60	28	11	0.122	38	SM	Silty SAND															
bal16-11b	30.6	9.3		29.5-31	2	64	27	7	0.149	16	SM	Silty SAND															
bal16-11a	30.9	9.4	14	29.5-31	1	40	41	18	0.054		CL	Sandy lean CLAY															
bal16-12c	31.2	9.5		31-32.5	1	32	50	17	0.040	32	CL	Sandy lean CLAY															
bal16-12b	31.5	9.6		31-32.5	7	59	25	9	0.137	32	SM	Silty SAND															
bal16-12a	32.0	9.8	10	31-32.5	0	16	61	23	0.022		CL	Lean CLAY w/sand	23.7														
bal16-13e	35.8	10.9		35.5-37	0	37	43	20	0.044		CL	Sandy lean CLAY															
bal16-13d	36.0	11.0		35.5-37	0	40	46	14	0.059	24	ML	Sandy SILT															
bal16-13c	36.3	11.1		35.5-37	0	77	17	6	0.351	27	SM	Silty SAND															
bal16-13b	36.6	11.2		35.5-37	0	51	39	10	0.077	20	SM	Silty SAND															
bal16-13a	36.9	11.3	19	35.5-37	0	66	26	8	0.110	11	SM	Silty SAND															
bal16-14e	37.0	11.3		37-39.3	0	55	35	10	0.114	23	SM	Silty SAND	10.2					1.63	43		7	6.5	0.6				
bal16-14d2	37.3	11.4		37-39.3	0	30	62	8	0.043	9	ML	Sandy SILT	13.1					1.76	54		16	3 5	0.8				
bal16-14d1	37.5	11.4		37-39.3	0	57	38	5	0.089	7	SM	Silty SAND	31.2					1.71	43		10	4.3	0 7				
bal16-14c2	37.8	11.5		37-39.3	0	12	71	17	0.025	11	ML	SILT		35	10	0.07	1.67										
bal16-14c1	38.2	11.6		37-39.3	0	64	30	6	0.120	18	SM	Silty SAND															
bal16-14b	38.3	11.7		37-39.3	0	25	61	14	0.036	11	ML	SILT w/sand	25.7					1.80	44		10	4.4	1.1				
bal16-14a	38.8	11.8		37-39.3	0	35	57	8	0.056	9	ML	Sandy SILT	15.3					1.92	118		31	3.8	1 5				
bal16-15e	41.0	12.5		41-42.5	0	34	52	14	0.047	26	ML	Sandy SILT															
bal16-15d	41.4	12.6		41-42.5	0	61	25	14	0.102	70	SM	Silty SAND															

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
bal16-15c	41.7	12.7		41-42.5	0	30	53	17	0.046		CL	Sandy lean CLAY															
bal16-15b	42.0	12.8		41-42 5	0	54	33	13	0.084	36	SM	Silty SAND															
bal16-15a	42.4	12.9	19	41-42.5	0	69	21	10	0.129	36	SM	Silty SAND															
bal16-16b	44.3	13.5		44-44.6	14	77	7	2	0.780	13	SW-SM	SAND w/silt						1.76									
bal16-16a	44.5	13.6		44-44.6	3	88	5	4	0.570	9.0	SW-SM	SAND w/silt															
bal16-17e	45.1	13.7		44.6-46.1	0	85	7	8	0.870	50	SM	Silty SAND															
bal16-17d	45.2	13.8		44.6-46.1	0	84	13	3	0.138	3.0	SM	Silty SAND															
bal16-17c	45.4	13.8		44.6-46.1	1	74	21	4	0.161	9.3	SM	Silty SAND															
bal16-17b	45.7	13.9		44.6-46.1	0	66	31	3	0.111	4.6	SM	Silty SAND															
bal16-17a	46.0	14.0	103	44.6-46.1	7	55	26	12	0.096	37	SM	Silty SAND															
bal16-18b	46.2	14.1		46.1-47.6	0	59	33	8	0.087	17	SM	Silty SAND															
bal16-18a	46.9	14.3	28	46.1-47.6	1	59	30	10	0.096	23	SM	Silty SAND	13.6														
bal16-19d	49.1	15.0		49-50.5	0	78	17	5	0.161	13	SM	Silty SAND															
bal16-19c	49.5	15.1		49-50.5	0	32	51	17	0.050		CL	Sandy lean CLAY															
bal16-19b	49.7	15.1		49-50.5	0	66	24	10	0.129	31	SM	Silty SAND															
bal16-19a	50.1	15.3	29	49-50.5	0	33	50	17	0.046		CL	Sandy lean CLAY	9.2														
bal16-20c	52.2	15.9		52-53.5	0	59	32	19	0.092	19	SM	Silty SAND															
bal16-20b	52.5	16.0		52-53.5	1	61	26	12	0.108	45	SM	Silty SAND															
bal16-20a	53.0	16.2	75	52-53.5	18	52	20	10	0.224	98	SM	Silty SAND w/gravel	13.1														

Potrero

pot3-1e	5.0	1.5		5-7.5	0	14	62	24	0.020		CL	Lean CLAY	28.1	35	14	0.51	0.78	1.73	29		11	2.7	0.5	26	23	10	2.6
pot3-1d	5.5	1.7		5-7.5	0	21	58	21	0.028		CL	Lean CLAY w/sand	26.1					1.82	25		10	2.5	0.2				
pot3-1c	6.0	1.8		5-7.5	2	24	55	19	0.031		CL-ML	Silty CLAY w/sand	28.5	28	6	1.08	0.50	1.94	19		8	2.4	0.2				
pot3-1b	6.5	2.0		5-7.5	5	26	49	20	0.038		CL	Sandy lean CLAY	25.2	29	8	0.53	0.80	1.98	21		6	3.3	0.2				
pot3-1a	7.0	2.1		5-7 5	4	35	45	16	0.045	35	ML	Sandy SILT	22.9					1.99	19		3	7.3	0.3				
pot3-2	9.0	2.7	2	8-9.5	0	35	51	14	0 047	25	CL-ML	Sandy silty CLAY	21.3	24	5	0.46	0.63										
pot3-3e	10.0	3.0		10-12.5	0	23	59	18	0.039		ML	SILT w/sand	23.0	27	5	0.20	0.45	2.02	34		6	5.7	1.0	21	20	18	1.2
pot3-3d	10.5	3.2		10-12.5	2	25	55	18	0.040		ML	SILT w/sand	24.5					2.03	18		3	6.1	0.5				
pot3-3c	11.0	3.4		10-12.5	4	27	51	18	0.036		CL-ML	Sandy silty CLAY	23.1	26	5	0.42	0.42	2.04	21		5	4.1	0.3				
pot3-3b	11.5	3.5		10-12.5	2	28	54	16	0.038		ML	Sandy SILT	24.2					2.03	14		3	5.7	0.3				
pot3-3a	12.0	3.7		10-12.5	3	28	54	15	0.046		ML	Sandy SILT	24.2	26	4	0.55	0.50	2.03	13		3	4.3	0.2				
pot3-4e	15.0	4.6		15-17.5	0	15	69	16	0.028		ML	SILT	29.9					1.98	11		3	3.9	0.1	35	30	21	1.7
pot3-4d	15.5	4.7		15-17.5	0	12	70	18	0.031		ML	SILT	27.6	28	4	0.90	0.36	2.00	19		6	3 4	0.3				
pot3-4c	16.0	4.9		15-17.5	0	15	66	19	0.040		ML	SILT	30.1	27	4	1.78	0.64	2.03	18		5	3.9	0.3				
pot3-4b	16.5	5.0		15-17.5	0	31	55	14	0.045		ML	Sandy SILT	25.0					2.14	8		3	3.3	0.2				
pot3-4a	17.0	5.2		15-17.5	0	14	72	14	0.032	14	ML	SILT	25.1					2.08	11		3	4.5	0.3				
pot3-5	20.0	6.1	9	19-20.5	10	44	37	9	0.094	32	SM	Silty SAND	25.5														
pot3-6	22.0	6.7	10	21-22.5	5	52	36	7	0.110	25	SM	Silty SAND	23.3														
pot3-7d	27.0	8.2		27-29	1	19	55	25	0.022		CL	Lean CLAY w/sand	26.8					2.04	9		3	3 7	0.1				
pot3-7c	27.5	8.4		27-29	0	12	62	26	0.023		CL	Lean CLAY	26.4	29	7	0.63	0.37	2.04	17		4	4.3	0.1				
pot3-7b	28.0	8.5		27-29	1	14	60	25	0.024		CL	Lean CLAY w/sand	27.7					2.08	12		4	3 1	0.2				
pot3-7a	28.5	8.7		27-29	0	13	63	24	0.025		ML	SILT	25.7	28	3	0.23	0.17	2.09	17		4	3.9	0.3				
pot3-8	34.5	10.5	9	33.5-35	0	24	57	19	0.032	44	ML	SILT w/sand	23.6	29	6	0.10	0.46										
pot3-9d	35.0	10.7		35-37	0	29	55	16	0.036		ML	SILT w/sand	24.4					1.99	5		1	4.5	0.1				
pot3-9c	35.5	10.8		35-37	1	21	60	18	0.030		CL	Lean CLAY w/sand	27.0					1.95	10		2	4.3	0.1				
pot3-9b	36.0	11.0		35-37	5	30	46	19	0.042		CL	Sandy lean CLAY	26.8	28	6	0.80	0.43	2.11	8		2	3.3	0.1				
pot3-9a	36.5	11.1		35-37	0	11	71	18	0.028		CL	Lean CLAY	24.0	28	6	0.33	0.50	2.31	16		3	5.0	0.7				
pot3-10e2	37.0	11.3		37-39.5	0	21	60	19	0.027		CL	Lean CLAY w/sand	28.6	28	7	1.09	0.50	1.97	5		2	3.0	0.0				
pot3-10e1	37.4	11.4		37-39.5								w/c only	24.7						25		5	5.3	0.2				
pot3-10d	37.5	11.4		37-39.5	0	8	70	22	0.022		CL	Lean CLAY	24.2	33	12	0.27	0.86	2.07	21		7	3.0	0.5				
pot3-10c	38.0	11.6		37-39.5	0	9	65	26	0.023		CL	Lean CLAY	22.5	33	8	-0 31	0.50	2.12	65		20	3.3	1.6				
pot3-10b	38.5	11.7		37-39.5	5	23	49	23	0.031		CL-ML	Silty CLAY w/sand	20.1	26	5	-0.18	0.31	2.22	67		8	8.5	1.0				
pot3-10a	39.0	11.9		37-39.5	12	27	40	21	0 044		CL-ML	Sandy silty CLAY	18.6	26	6	-0.23	0.38	2.19	66		11	6.0	1.3				
pot3-11	41.0	12.5	9	40-41.5	0	29	53	18	0.029	22	CL-ML	Silty CLAY w/sand	21.0	27	6	0 00	0.60										

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
pot3-12	46.0	14.0	14	45-46.5	0	36	46	18	0.034	58	CL-ML	Sandy silty CLAY	19.3	24	4	-0.18	0 36										
pot6-1d	5.5	1.7		5-7.5	0	19	49	32	0.019		CL	Lean CLAY w/sand	28.4	39	17	0.38	0.81	1.78	27		7	4 1	0.2	19	17	9	2.1
pot6-1c	6.0	1.8		5-7.5	0	19	50	31	0.017		CL	Lean CLAY w/sand	30.3	33	11	0.75	0.55	1.92	23		7	3.5	0.2				
pot6-1b	6.5	2.0		5-7.5	0	42	36	22	0.043		CL	Sandy lean CLAY	24.7	27	9	0.74	0 60	1.95	19		3	5.7	0.1				
pot6-1a	7.0	2.1		5-7.5	0	15	57	28	0.018		CL	Lean CLAY w/sand	24.4					1.87	13		3	3.8	0.1	15	14	10	1.5
pot6-2	8.5	2.6	2	7.5-9	0	4	59	37	0.011		CL	Lean CLAY	32.8	44	18	0.38	0.75										
pot6-3e	9.0	2.7		9-11.5	0	8	57	35	0.016		CL	Lean CLAY	28.4	39	16	0.34	0.76	1 73	17		NA		0.2	19	18	12	1.6
pot6-3d	9.5	2.9		9-11.5	0	9	52	39	0.010		CL	Lean CLAY	38.0					1.88	31		11	2.7	0.3				
pot6-3c	10.0	3.0		9-11.5	0	8	52	40	0.010		CL	Lean CLAY	36.1	42	19	0.69	0.70	1.88	17		6	3.1	0.2				
pot6-3b	10.5	3.2		9-11.5	0	14	53	33	0.016		CL	Lean CLAY	32.2					1.87	16		5	3.5	0.2				
pot6-3a	11.0	3.4		9-11.5	0	29	46	25	0.024		CL-ML	Silty CLAY w/sand	29.5	29	7	1.07	0.39	1.91	19		7	2.7	0.2	22	21	17	1.3
pot6-4	15.0	4.6	7	14-15.5	0	22	66	12	0.043	18	ML	SILT w/sand	27.6	26	2	1.80	0.25										
vane	15.5	4.7																						49	37	16	3.1
vane	18.5	5.6																						20	18	15	1.3
pot6-5	19.5	5.9	4	18.5-20	0	9	72	19	0.023	17	ML	SILT	34.0	35	6	0.83	0.60										
pot6-6e	21.0	6.4		21-23.5	0	16	69	15	0.033	17	ML	SILT w/sand	28.8					1.97	14		3	4.5	0.4				
pot6-6d	21.5	6.6		21-23.5	0	10	72	18	0.030		ML	SILT	28.2	31	6	0.53	0.50	1.92	17		4	3.9	0.3				
pot6-6c	22.0	6.7		21-23.5	0	43	40	17	0.061		ML	Sandy SILT	24.1					2 01	14		3	4.8	0.1				
pot6-6b	22.5	6.9		21-23.5	0	18	66	16	0.034		ML	SILT w/sand	30.8	33	4	0.45	0.36	1.96	10		3	3.3	0.2				
pot6-6a	23.0	7.0		21-23.5	0	5	78	17	0.022	10	ML	SILT	35.5	35	8	1.06	1.60	1.94	13		4	3.6	0.2				
pot6-7	24.5	7.5	9	23.5-25	0	18	74	8	0.042	7	ML	SILT w/sand	32.6	27	2	3.80	0.50										
pot6-8e	30.0	9.1		30-32.5	2	20	56	22	0.026		CL	Lean CLAY w/sand	20.1	30	7	-0.41	0.50	1.78	18		5	3.8	0.4				
pot6-8d	30.5	9.3		30-32.5	0	23	53	24	0.028		CL	Lean CLAY w/sand	25.3	31	8	0.29	0.57	2.00	17		3	5.5	0.2				
pot6-8c	31.0	9.4		30-32.5	0	24	53	23	0.033		ML	SILT w/sand	26.2	29	6	0.53	0.43	2.04	21		5	4.5	0.1				
pot6-8b	31.5	9.6		30-32.5	0	26	52	22	0.028		CL	Lean CLAY w/sand	21.9					2.08	63		12	5.3	1.2				
pot6-8a	32.0	9.8		30-32.5	0	27	51	22	0.028	4	CL-ML	Silty CLAY w/sand	23.5	27	5	0.30	0.31	2.08	21		3	6.8	0.3				
pot6-9	36.0	11.0	2	35-36.5	0	14	53	33	0.011		CL	Lean CLAY	39.1														
lost sample	43.0	13.1	18	42-43.5																							
pot6-tubend	49.0	14.9		47-49	0	24	62	14	0.042	18	ML	SILT w/sand		26	1		0.14										
pot6-11a	49.5	15.1		49.5-51	2	84	13	1	0.435	10	SM	Silty SAND															
pot6-11b	50.5	15.4		49.5-51	3	73	23	1	0.239	11	SM	Silty SAND	14.5														
pot6-11c	51.0	15.5	59	49.5-51	13	66	17	3	0.345	15	SM	Silty SAND															
														50													
														20													
pot8-1e	4.0	1.2		4-6.5	2	22	52	24	0.026		CL-ML	Silty CLAY w/sand	20.4	28	6	-0.27	0.40	1.71	36		8	4.7	0.9				
pot8-1d	4.5	1.4		4-6.5	1	21	53	25	0.024		CL-ML	Silty CLAY w/sand	21.2	29	6	-0.30	0.43	1.74	41		10	4.2	0.7				
pot8-1c	5.0	1.5		4-6.5	0	21	55	24	0.026		CL	Lean CLAY w/sand	22.4					1.78	33		7	4.8	0.5				
pot8-1b	5.5	1.7		4-6.5	0	22	53	25	0.026		CL	Lean CLAY w/sand	21.9	28	7	0.13	0.41	1.77	24		5	5.2	0.4				
pot8-1a	6.0	1.8		4-6.5	4	3C	48	18	0.032		CL	Sandy lean CLAY	20.4	27	8	0.18	0.67	1.88	22		4	5.2	0.5	25	21	14	1.8
pot8-2	7.5	2.3	3	6.5-8	0	25	57	18	0.033	45	CL-ML	Silty CLAY w/sand	27.6	27	6	1.10	0.50										
vane	8.0																							22	18	14	1.6
vane	10.0																							27	25	15	1.8
pot8-3	11.0	3.4	4	10-11.5	0	36	47	17	0.035	65	ML	Sandy SILT	21.2	24	3	0.07	0.25										
vane	11.5																							28	24	21	1.3
vane	14.0																							21	19		
pot8-4t	14.5	4.4		14-15.5	8	62	23	7	0.270	47	SM	Silty SAND															
pot8-4b	15.0	4.6	7	14-15.5	1	31	56	12	0.043	14	ML	Sandy SILT	19.4														
pot8-5e	15.5	4.7		15.5-18	2	48	39	11	0.074	34	SM	Silty SAND	17.7					1.94					1.0	40	35		
pot8-5d	16.0	4.9		15.5-18	10	49	34	7	0.133	33	SM	Silty SAND	19.6					2.06					1.0				
pot8-5c	16.5	5.0		15.5-18	7	59	23	10	0.235	88	SM	Silty SAND	20.5					2.23	39		6	6.1	0.7				
pot8-5b	17.0	5.2		15.5-18	0	56	33	11	0.092	46	SM	Silty SAND	19.6					2.11	28		4	7.2	1.8				
pot8-5a	17.5	5.3		15.5-18	15	46	30	9	0.154	46	SM	Silty SAND w/gravel	19.8					2.22					1.0				
vane	19.0	5.8																						39	34	31	1.3
pot8-6t	20.5	6.2		20-21.5	0	29	57	14	0.043	16	ML	SILT w/sand															
pot8-6b	21.0	6.4	9	20-21.5	7	41	41	11	0.062	29	ML	Sandy SILT															
pot8-7	26.0	7.9	4	25-26.5	9	30	44	17	0.040	4	CL-ML	Sandy silty CLAY	13.3	26	6	-1.12	0.50										

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Density gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
pot8-8e	26.5	8.1		26.5-29	28	28	30	15	0.125		SM	Silty SAND w/gravel	22.2					2.04	35		4	8.8	1.0				
pot8-8d	27.0	8.2		26.5-29	7	36	38	19	0.056		CL-ML	Sandy silty CLAY	17.3	22	4	-0.18	0.33	2.18	24		5	5.0	0.6				
pot8-8c	27.5	8.4		26.5-29	4	37	46	13	0.052		ML	Sandy SILT	19.3					2.16	43		7	6.5	2.5				
pot8-8b2	28.0	8.5		26.5-29	2	35	47	16	0.048		CL-ML	Sandy silty CLAY	15.4	23	5	-0.52	0.38	2.18	15		4	3.5	0.2				
pot8-8b1	28.8	8.8		26.5-29	3	40	45	12	0.055	35	ML	Sandy SILT	22.1					2.30	79		10	7.9	2.9				
pot8-8a	28.5	8.7		26.5-29	9	35	41	15	0.059		CL-ML	Sandy silty CLAY	16.2	23	4	-0.70	0.36										
pot9-9t	31.5	9.6		31-32.5	27	40	27	6	0.610	134	SM	Silty SAND w/gravel															
pot8-9b	32.0	9.8	5	31-32.5	17	38	31	14	0.102	117	SM	Silty SAND w/gravel	21.1														
pot8-10e	33.0	10.1		32.5-35	1	44	36	19	0.062		CL-ML	Sandy silty CLAY	18.9	23	4	-0.03	0.33	2.20	20				0.2				
pot8-10d	33.5	10.2		32.5-35	5	42	38	15	0.066		ML	Sandy SILT	15.8	22	3	-1.07	0.33	2.17	59		5	12.8	1.7				
pot8-10c	34.0	10.4		32.5-35	2	42	42	16	0.055	32	ML	Sandy SILT	18.3	22	3	-0.23	0.38	2.19	26		4	6.1	0.5				
pot8-10b	34.5	10.5		32.5-35	2	37	45	16	0.044		CL-ML	Sandy silty CLAY	18.3	26	6	-0.28	0.46	2.15	45		6	7.1	0.5				
pot8-10a	35.0	10.7		32.5-35	7	47	32	14	0.102		SM	Silty SAND	19.3					2.15	20		5	4.4	0.5				
pot8-11	39.0	11.9	15	38-39.5	2	36	40	22	0.034	41	CL-ML	Sandy silty CLAY	22.2	23	5	0.84	0.45										
pot8-12	43.0	13.1	27	42-43.5	6	36	39	19	0.038	85	CL-ML	Sandy silty CLAY	20.0	23	5	0.40	0.42										
pot8-13	44.5	13.6	32	43.5-45	14	51	26	9	0.400	135	SM	Silty SAND	16.0														
vane	2.0	0.6																						39	24	9	4.3
vane	6.0	1.8																						18	16	10	1.8
pot12-1	7.0	2.1	1	6-7.5	0	7	59	34	0.010		CL	Lean CLAY	34.0	38	13	0.69	0.62										
pot12-2e	7.5	2.3		7.5-10	0	13	49	38	0.010		CL	Lean CLAY	31.3	41	17	0.43	0.81	1.77	17		6	2.9	0.1	10	9	8	1.3
pot12-2d	8.0	2.4		7.5-10	0	20	45	35	0.010		CL	Lean CLAY w/sand	31.9	42	18	0.44	0.78	1.87	20		6	3.1	0.1				
pot12-2c	8.5	2.6		7.5-10	0	26	40	34	0.013		CL	Lean CLAY w/sand	33.0					1.91	20		6	3.1	0.1				
pot12-2b	9.0	2.7		7.5-10	0	28	41	31	0.016		CL	Lean CLAY w/sand	29.9	39	15	0.39	0.83	1.94	18		3	5.8	0.4				
pot12-2a2	9.5	2.9		7.5-10	0	36	49	15	0.044		CL	Sandy lean CLAY	30.9	37	13	0.53	1.30	1.99	21		6	3.4	0.3	24	22	14	1.7
pot12-2a1	9.8	3.0		7.5-10	0	57	32	11	0.101	43	SM	Silty SAND															
pot12-3t	12.5	3.8		12-13.5	0	32	49	19	0.040		CL	Sandy lean CLAY												42	31	15	2.8
pot12-3b	13.0	4.0	3	12-13.5	0	10	48	42	0.008		ML	SILT	35.4	37	11	0.85	0.50										
pot12-4e	13.5	4.1		13.5-16	0	15	59	26	0.016		ML	SILT w/sand	30.8	35	10	0.58	0.63	1.92	11		5	2.1	0.2	22	16	13	1.7
pot12-4d	14.0	4.3		13.5-16	0	23	60	17	0.038	24	ML	SILT w/sand	31.0	33	9	0.78	0.90	1.89	16		4	4.2	0.5				
pot12-4c	14.5	4.4		13.5-16	0	8	63	29	0.015		ML	SILT	32.5	36	11	0.68	0.61	1.95	20		7	2.9	0.4				
pot12-4b	15.0	4.6		13.5-16	0	4	78	18	0.023		ML	SILT	31.1	33	5	0.62	0.36	1.99	17		5	3.6	0.4				
pot12-4a	15.5	4.7		13.5-16	0	15	68	17	0.032		ML	SILT	28.1	29	2	0.55	0.15	2.00	13		4	3.1	0.3	24	22	17	1.4
pot12-5e	16.0	4.9		16-18.5	0	14	68	18	0.030		ML	SILT	30.4	32	6	0.73	0.43	1.99	15		3	5.0	0.5				
pot12-5d	16.5	5.0		16-18.5	0	45	44	11	0.064	41	ML	Sandy SILT	24.6					1.99	13		3	5.0	0.3				
pot12-5c2	17.0	5.2		16-18.5	0	14	70	16	0.028		ML	Sandy SILT	32.6	31	4	1.40	0.31	1.95	10		3	3.3	0.1				
pot12-5c1	17.3	5.3		16-18.5	0	43	43	14	0.064		ML	Sandy SILT															
pot12-5b	17.5	5.3		16-18.5	0	10	56	34	0.012		ML	SILT	34.0	40	13	0.54	0.62	1.91	13		3	3.7	0.1				
pot12-5a2	18.0	5.5		16-18.5	0	21	59	20	0.028		ML	SILT w/sand	33.2	29	4	2.05	0.27	2.11	10		3	4.0	0.2	58	40	34	1.7
pot12-5a1	18.4	5.6		16-18.5	0	48	40	12	0.070	32	ML	Sandy SILT															
pot12-6t	19.0	5.8		18.5-20.5	0	31	60	9	0.050	10	ML	Sandy SILT															
pot12-6b	20.0	6.1	6	18.5-20.5	0	7	73	20	0.019		CL	Lean CLAY	29.1														
pot12-7e	22.5	6.9		22.5-25	0	11	76	13	0.022		CL	Lean CLAY	35.3	35	11	1.03	0.61	1.83	18		6	3.0	0.4				
pot12-7d	23.0	7.0		22.5-25	0	12	60	28	0.016		CL	Lean CLAY	34.2	39	11	0.56	0.61	1.92	22		6	3.5	0.7				
pot12-7c2	23.5	7.2		22.5-25	0	21	58	21	0.028		ML	SILT w/sand	30.3	33	9	0.70	0.60	1.99	16		6	2.8	0.7				
pot12-7c1	23.8	7.3		22.5-25	0	10	45	45	0.006		CL	Lean CLAY															
pot12-7b2	24.0	7.3		22.5-25	0	21	67	12	0.046		ML	SILT w/sand	27.0					1.98	13		3	5.0	0.8				
pot12-7b1	24.3	7.4		22.5-25	0	14	68	18	0.036		ML	SILT		29	5		0.36										
pot12-7a2	24.5	7.5		22.5-25	2	57	34	7	0.117	21	SM	Silty SAND	25.3					2.14	17		4	4.5	0.7				
pot12-7a1	24.8	7.6		22.5-25	0	33	54	13	0.050	31	ML	Sandy SILT															
pot12-8t	25.5	7.8		25-26.5	1	71	22	6	0.156	15	SM	Silty SAND															
pot12-8b	26.0	7.9	4	25-26.5	0	11	78	11	0.036	11	ML	SILT	26.8														
pot12-9e	31.0	9.4		31-33.5	0	60	32	8	0.110	15	SM	Silty SAND	25.1						33		4	8.3	1.1				
pot12-9d2	31.5	9.6		31-33.5	0	37	46	17	0.051		CL-ML	Sandy silty CLAY	26.7	26	5	1.14	0.38	1.94	5		0	11.9	0.2				
pot12-9d1	31.8	9.7		31-33.5	0	30	57	13	0.047		ML	Sandy SILT															
pot12-9c	32.0	9.8		31-33.5	0	20	63	17	0.040		ML	SILT w/sand	32.8	29	4	1.95	0.36	1.99	4		0	8.9	0.0				
pot12-9b2	32.5	9.9		31-33.5	0	16	63	21	0.036		ML	SILT w/sand	34.5	31	5	1.70	0.33	1.91	6		2	3.8	0.1				

SITE	Depth (ft)	Depth (m)	SPT N	Depth Range	G	S	M	C	D50 mm	Cu	USC	Name	Wn	LL	PI	LI	ACT	Den-sity gcc	Lab vane Peak kPa	Lab vane Residual kPa	Lab vane Remold kPa	Lab vane St	PP ksc	Field Peak kPa	Field Residual kPa	Field Remold kPa	Field vane St
pot12-9b1	32.9	10.0		31-33.5	0	59	29	12	0.094	59	SM	Silty SAND															
pot12-9a3	33.1	10.1		31-33.5	0	53	37	10	0.078	39	SM	Silty SAND															
pot12-9a2	33.3	10.1		31-33.5	0	28	51	21	0.037		ML	SILT w/sand	25.8	31	6	0.13	0.33	2.10	5		1	3.9	0.1				
pot12-9a1	33.4	10.2		31-33.5	1	53	32	13	0.086	41	SM	Silty SAND															
pot12-10	35.0	10.7	8	34-35.5	0	27	61	12	0.041		ML	SILT w/sand	22.3	26	3	-0.23	0.38										
pot12-11	41.0	12.5	86	40-41.5	13	72	13	1	0.411	11	SM	Silty SAND															
pot12-12	43.0	13.1	36	42-43.5	2	82	14	2	0.340	9	SM	Silty SAND															

Gravel (G) = >4.75 mm
Sand (S) = 4.75-0.075 mm
Silt (M) = 0.075-0.005 mm
Clay (C) = <0.005 mm
Cu = D60/D10
Density= grams per cubic centimeter
PP= Pocket penetrometer, kg/cm^2

CL	Lean CLAY, lean CLAY with sand, sandy lean CLAY
ML	SILT, SILT with sand, sandy SILT
CH	Fat CLAY, fat CLAY with sand
MH	Plastic SILT
SM	Silty SAND
SP-SM	SAND with SILT
SC	Clayey SAND
CL-ML	Sandy silty CLAY
SW-SM	SAND with silt and gravel

Table 3 **Liquefaction Resistance**

Balboa

Depth (m)	Depth (ft)	N	(N1)60CS	Fines	Fs, SPT	CSRi	Unit	Sounding	Water table (ft)	Acceler-ation (g)
9.1	30.0	20	24.3	54	0.60	0.582	c2	10	23.7	0.84
9.4	31.0	15	19.7	47	0.48	0.570	c2	12	25.0	0.84
8.3	27.0	10	15.5	51	0.42	0.515	c2	13	26.8	0.84
9.4	31.0	26	24.1	16	0.64	0.546	c2	13	26.8	0.84
13.1	43.0	102	85.4	30	1.99	0.543	d	2	31.0	0.84
10.5	34.5	37	37.9	50	1.99	0.541	d	4	29.0	0.84
11.6	38.0	92	81.2	31	1.99	0.553	d	4	29.0	0.84
9.0	29.5	53	53	8	1.99	0.520	d	4.5	28.9	0.84
9.3	30.5	22	25.3	38	0.68	0.545	d	6	27.5	0.84
11.1	36.5	37	36.5	42	1.99	0.570	d	6	27.5	0.84
12.2	40.0	181	146.9	29	1.99	0.578	d	6	27.5	0.84
8.8	29.0	46	43.2	25	1.99	0.527	d	8	27.3	0.84
10.1	33.0	122	104.6	28	1.99	0.554	d	8	27.3	0.84
11.0	36.0	30	30.9	36	1.99	0.565	d	8	27.3	0.84
11.0	36.0	142	122.9	28	1.99	0.608	d	10	23.7	0.84
11.4	37.5	68	63.6	26	1.99	0.612	d	10	23.7	0.84
14.3	47.0	15	18.4	50	0.42	0.620	d	11	25.0	0.84
15.2	50.0	48	44.4	33	1.99	0.630	d	11	25.0	0.84
12.0	39.5	29	30.9	33	1.99	0.625	d	12	25.0	0.84
12.5	41.0	48	46.9	38	1.99	0.625	d	12	25.0	0.84
13.7	45.0	23	25.2	33	0.61	0.625	d	12	25.0	0.84
14.2	46.5	56	52.1	38	1.99	0.625	d	12	25.0	0.84
12.5	41.0	220	186.7	50	1.99	0.600	d	13	26.8	0.84
13.0	42.5	36	36.1	45	1.99	0.600	d	13	26.8	0.84
13.4	44.0	20	23.1	47	0.56	0.600	d	13	26.8	0.84
14.2	46.5	121	102.7	37	1.99	0.600	d	13	26.8	0.84
12.2	40.0	29	27.9	28	0.77	0.570	d	13.5	27.5	0.84
13.3	43.5	38	35.2	32	1.99	0.580	d	13.5	27.5	0.84
14.3	47.0	74	61.2	31	1.99	0.590	d	13.5	27.5	0.84
11.0	36.0	21	22.6	62	0.65	0.489	d	15	35.1	0.84
12.5	41.0	30	28.7	50	0.95	0.500	d	15	35.1	0.84
14.0	46.0	30	29.2	37	1	0.540	d	15	35.1	0.84
14.9	49.0	149	113.1	23	1.99	0.560	d	15	35.1	0.84

Malden

Depth (m)	Depth (ft)	N	(N1)60CS	Fines	Fs, SPT	CSRi	Unit	Sounding	Water table (ft)	Acceler-ation (g)
10.0	32.8	27	30.5	23	1.99	0.477	d	3b	12.7	0.51
10.1	33.1	46	51.5	31	1.99	0.497	d	5a	11.2	0.51

Wynne

Depth (m)	Depth (ft)	N	(N1)60CS	Fines	Fs, SPT	CSRi	Unit	Sounding	Water table (ft)	Acceler-ation (g)
6.4	21.0	9	16.5	37	0.61	0.376	c1	1	15.5	0.51
7.2	23.5	20	21.9	11	0.77	0.397	c1	1	15.5	0.51
6.1	20.0	10	17.2	32	0.62	0.385	c1	5a	14.0	0.51
6.9	22.5	29	34.9	23	1.9	0.407	c1	5a	14.0	0.51
7.6	25.0	8	9.2	9	0.31	0.425	c1	5a	14.0	0.51
6.6	21.5	19	21.7	11	0.76	0.399	c1	5b	14.0	0.51
7.0	23.0	20	23.9	17	0.84	0.410	c1	5b	14.0	0.51
6.4	21.0	16	21.4	23	0.76	0.394	c1	5c	14.0	0.51
7.1	23.0	26	29.4	14	1.27	0.412	c1	5c	14.0	0.51
6.4	21.0	12	20.3	43	0.68	0.419	c1	7a	12.5	0.51
7.6	25.0	13	20.8	54	0.65	0.449	c1	7a	12.5	0.51
6.2	20.5	8	12	18	0.41	0.413	c1	7b	12.5	0.51
6.9	22.5	15	20.5	23	0.66	0.433	c1	7b	12.5	0.51
6.9	22.5	16	17.7	23	0.76	0.323	c1	14	21.7	0.51
7.9	26.0	21	22.7	20	0.93	0.347	c1	14	21.7	0.51
8.7	28.5	12	13.8	18	0.53	0.364	c1	14	21.7	0.51
9.8	32.5	17	20.9	29	0.61	0.481	c2	7b	12.5	0.51
9.9	32.5	13	19.7	49	0.57	0.483	c2	7a	12.5	0.51
10.4	34.0	24	25	10	0.79	0.462	c2	5a	14.0	0.51
11.3	37.0	39	43.8	31	1.9	0.463	c2	5a	14.0	0.51
16.2	53.0	71	67.9	38	1.9	0.444	d	5a	14.0	0.51

Potrero

Depth (m)	Depth (ft)	N	(N1)60CS	Fines	Fs, SPT	CSRi	Unit	Sounding	Water table (ft)	Acceler-ation (g)
6.1	20.0	9	16.4	46	0.62	0.369	c1	**3**	10.7	0.43
6.7	22.0	10	17.1	43	0.62	0.383	c1	**3**	10.7	0.43
4.6	15.1	7	14.2	78	0.56	0.354	c1	**6**	9.3	0.43
7.5	25.6	9	17.2	82	0.56	0.425	c1	**6**	9.3	0.43
4.6	15.0	7	12.7	30	0.55	0.326	c1	**8**	10.8	0.43
6.4	21.0	9	16.2	52	0.6	0.377	c1	**8**	10.8	0.43
9.8	32.2	5	12	45	0.39	0.427	c1	**8**	10.8	0.43
5.9	19.4	6	14	69	0.44	0.446	c1	**12**	6.6	0.43
7.9	25.9	4	10.1	28	0.29	0.480	c1	**12**	6.5	0.43
10.7	35.1	8	15.4	73	0.44	0.490	a	**12**	6.5	0.43
15.4	50.527	59	58.2	21	1.99	0.424	d	**6**	9.3	0.43
13.6	44.622	32	37.3	35	1.99	0.419	d	**8**	10.8	0.43
12.5	41.013	86	91.6	15	1.99	0.479	d	**12**	6.5	0.43
13.1	42.981	36	39.2	16	1.99	0.474	d	**12**	6.5	0.43

Table 4. Radiocarbon analyses from Balboa Boulevard.

Lab Number	Sample Name	Depth ft (m)	^{14}C AGE	Description
CAMS-26048	Bal2-10D-A	29.4 (8.96)	11710 ± 100	Several 2 mm size organic fragments, prob. charcoal.
CAMS-26049	Bal10-15A	39.3 (11.99)	12150 ± 70	Charcoal frags. to 4 mm.
CAMS-26050	Bal12-10	34.6 (10.56)	12650 ± 90	Several 2-3 mm fragments, prob. charcoal.
CAMS-26051	Bal13-5	23.1 (7.04)	6200 ± 80	2 primary organic fragments; probably charcoal to 5 mm.
CAMS-26052	Bal13-11	34.3 (10.45)	12130 ± 70	Numerous charcoal fragments to 4 mm.
CAMS-26053	Bal15-14C	32.9 (10.02)	11560 ± 100	Numerous charcoal(?) fragments to 3 mm.
CAMS-26054	Bal16-15E	41.0 (12.5)	14630 ± 110	Very small organic fragments (charcoal?)

USGS GEOTECHNICAL LOG

HOLE NUMBER 1

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-12-95

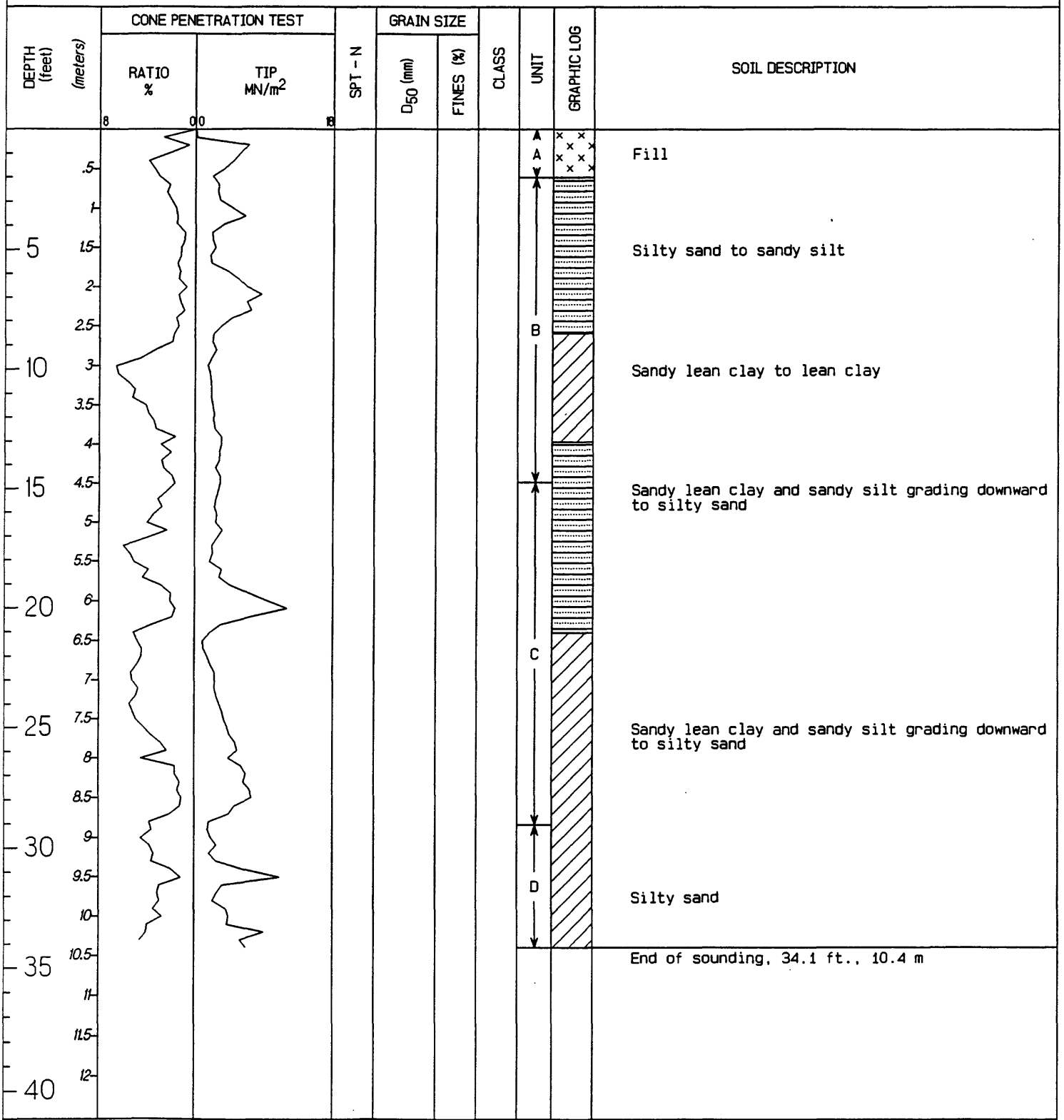
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361829.5, Y: 3794451.4

GROUNDWATER

ELEVATION 1092 ft.; 332.8 m MSL



REMARKS: Most northern sounding, out of failure zone. Dry at 34 ft.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 2

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-12-95; SPT: 5-17-95

PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361828.9, Y: 3794384.6

GROUNDWATER 31 ft.; 9.4 m

ELEVATION 1085 ft.; 330.7 m MSL

DEPTH (feet)	DEPTH (meters)	CONE PENETRATION TEST: RATIO %	CONE PENETRATION TEST: TIP MN/m² (8 0 0 18)	SPT - N	GRAIN SIZE: D_{50} (mm)	GRAIN SIZE: FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
								A		
	.5				0.029 0.064	69 53	CL			Sandy lean CLAY, 10YR4/3 to 3/3, dark yellowish brown, not sticky or plastic, friable, massive; 3% clasts to 7 mm
5	1.5									
	2			7	0.055	56	CL			Sandy lean CLAY massive, 10YR4/4, dark yellowish brown, modern roots, not sticky or plastic
	2.5				0.020 0.014	84 78	CL	B		Lean CLAY with sand, 10YR4/4, dark yellowish brown not sticky, slightly plastic, friable, massive, pebbles to 15 mm,
10	3				0.069 0.082	78 48	CL SM			Lean CLAY with sand to silty SAND at base, 10YR4/4, dark yellowish brown, slightly sticky and plastic, rare pebble to 30 mm, massive
	3.5									
	4			13	0.070	51	ML			Sandy SILT, 10YR4/4, dark yellowish brown, slightly sticky and plastic friable, roots present
15	4.5									
	5				0.083 0.071	48 64	SM CL			Silty SAND to sandy lean CLAY, 10YR4/4, dark yellowish brown, not sticky, slightly plastic, massive, some pebbles to 15 mm, pp=1.2-1.6 ksc
	5.5									
20	6			9	0.095 0.021	76 45	CL			Silty SAND, 10YR4/4, dark yellowish brown, part of above; and in sharp contact, lean CLAY with sand, same color, slightly sticky and plastic
	6.5			16	0.025 0.040	60 70	CL			Lean CLAY with sand to sandy lean CLAY 10YR4/3, dark yellowish brown, slightly sticky and plastic, massive, pp=2-4 ksc
	7							C		
25	7.5				0.016 0.044	88 74	CL			Lean CLAY with sand, 10YR4/3, dark yellowish brown, slightly sticky and plastic, soft, moderately effervescent
	8									
	8.5									
30	9				0.093 0.040	44 65	SM CL			Silty SAND, 10YR4/2, yellowish brown, to sandy lean CLAY, same color, red mottles, 7.5YR3/4, few thin $CaCO_3$ stringers
	9.5			16	0.035 0.076	48 69	CL SC			**11,710+-100 uncorrected radiocarbon years** Sandy lean CLAY grades downward to clayey SAND, 10YR4/3, dark yellowish brown, slightly sticky and plastic, rare carbonate
	10									
35	10.5							D		
	11				0.059 0.118	59 41	CL SM			Sandy SILT to sandy lean CLAY to silty SAND at the base, 10YR4/3, dark yellowish brown, not sticky or plastic, rare carbonate
	11.5			26	0.249 0.020	42 24	SM CL			Silty SAND to lean CLAY with sand, with depth, 10YR3/3 dark yellowish brown, poorly sorted, soft, not sticky or plastic, pp=1.6-4.5 ksc
	12			19	0.011 0.033	66 73	CL			Sandy lean CLAY to lean CLAY with sand, 10YR4/3, dark yellowish brown, slightly sticky and plastic, CaCo3 near top
40										

REMARKS: Out of failure zone.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 2
PROJECT Northridge Ground Deformation Studies
LOCATION Balboa Boulevard (BAL)
COORDINATES X: 361828.9, Y: 3794384.6
DATE DRILLED CPT: 4-12-95; SPT: 5-17-95
GROUNDWATER 31 ft.; 9.4 m
PERSONNEL L: Ponti; D: Bennett/Criley
ELEVATION 1085 ft.; 330.7 m MSL

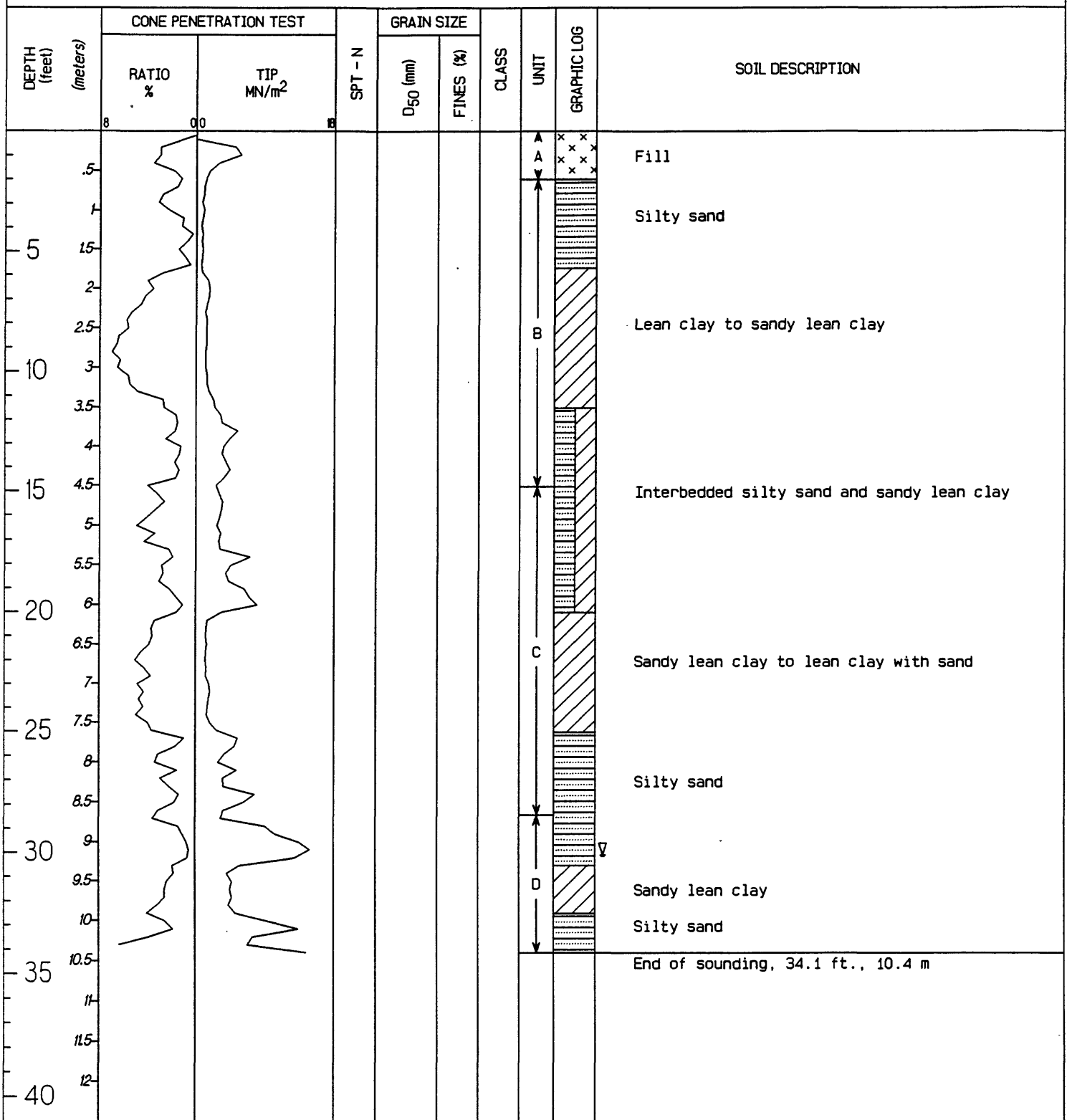
DEPTH (feet)	DEPTH (meters)	CONE PENETRATION TEST: RATIO % (8 … 0 … 0)	CONE PENETRATION TEST: TIP MN/m² (0 … 18)	SPT - N	GRAIN SIZE: D_{50} (mm)	GRAIN SIZE: FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
	12.5			19			CL	D		Silty SAND, 10YR4/3 dark brown, at top to 5Y7/1 to 5/3 light gray to olive, not plastic, (Saugus Formation??)
	13			102	0.400 0.235	16 30	SM			End of boring, 43.5 ft., 13.3 m
45	13.5									
	14									
	14.5									
	15									
50	15.5									
	16									
	16.5									
55	17									
	17.5									
	18									
60	18.5									
	19									
	19.5									
65	20									
	20.5									
	21									
70	21.5									
	22									
	22.5									
75	23									
	23.5									
	24									
80										

Magnitude= 6.8
Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 3
LOCATION Balboa Boulevard (BAL)
DATE DRILLED CPT: 4-12-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 361828.6, Y: 3794356.6
GROUNDWATER 30 ft.; 9.1 m
ELEVATION 1082 ft.; 329.8 m MSL



REMARKS: Outside of failure zone, next to cracks.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 4

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4/2/5; SPT: 5/18/95

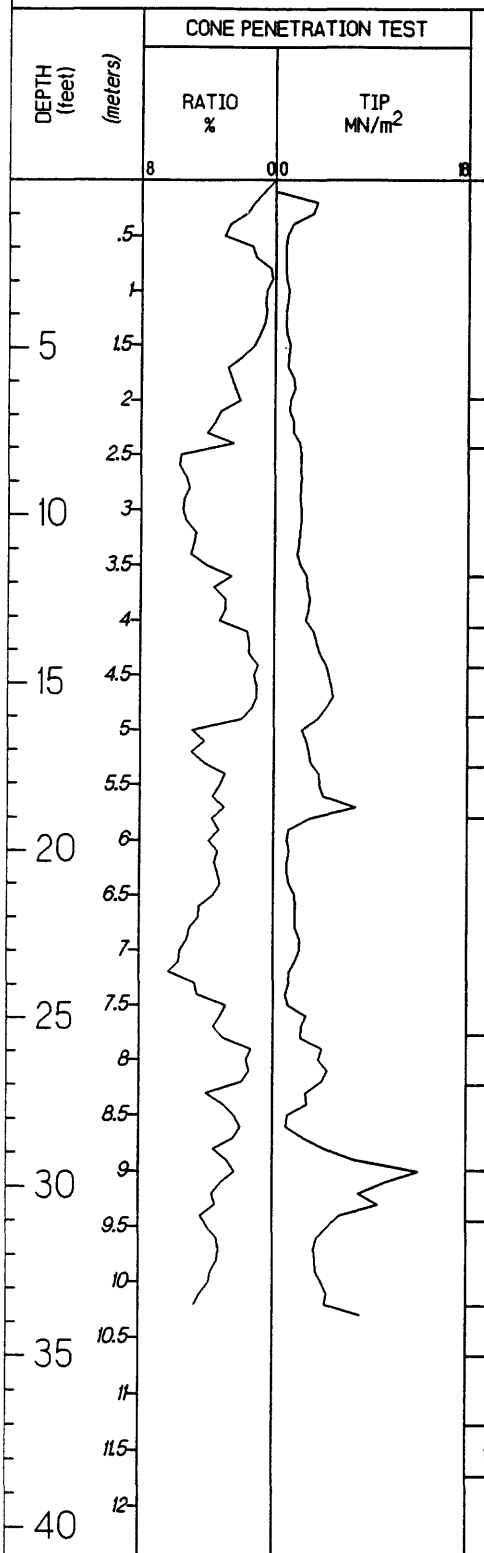
PERSONNEL L: Ponti/Hecker, D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361828.5, Y: 3794340.5

GROUNDWATER 28 ft.; 8.5 m

ELEVATION 1081 ft.; 329.5 m MSL



SPT - N	GRAIN SIZE D_{50} (mm)	FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
				A		Fill
	0.099 0.057	44 57	SM CL	B		Silty SAND to sandy lean CLAY, 10YR3/3 dark brown to 10YR3/2 very dark grayish brown, massive, firm to friable, effervescent
6	0.024	77	CL			Lean CLAY with sand, Brown 10YR4/3, soft, slightly sticky and plastic, pebbles to 10mm, violently effervescent
	0.013 0.029	82 70	CL			Lean CLAY with sand, brown 10YR4/3 to dark yellowish brown 10YR4/4, massive, strongly effervescent, pp=0.2-3.2 ksc
8	0.063 0.027	53 65	CL			Sandy lean CLAY, dark yellowish brown 10YR4/4, massive, pebbles to 10 mm, violently effervescent
13	0.083 0.055	55	SM CL			Silty SAND to sandy lean CLAY, dark yellowish brown 10YR4/4, massive, slightly plastic, pebbles to 20 mm, violently effervescent
18	0.040 0.200	62 29	CL SM	C		Sandy lean CLAY to silty SAND, dark yellowish brown 10YR4/4, massive, distinct contact between the two
	0.056 0.040	60 56	CL			Sandy lean CLAY, brown 10YR3/4 to dark yellowish brown 10YR4/4, massive, some pebbles to 15 mm
16	0.109 0.077	48 42	SM			Silty SAND to silty SAND with gravel, 10YR4/4-5/4 dark yellowish brown to yellowish brown, gravel rare to 20% and up to 20 mm
	0.066 0.395	53 15	CL SM			Mostly silty SAND, one layer sandy lean CLAY, dark yellowish brown 10YR4/4 to variable, dark gray 5GY4/1, grayish brown 2.5Y5/3, not sticky or plastic, friable
25	0.165 0.068	36 53	SM CL			Silty SAND with gravel to sandy lean CLAY at base, Brown 10YR4/3 with mottles of strong brown 7.5YR5/6, slightly sticky and plastic, massive, not effervescent
	0.060 0.082	56 45	CL SM			Sandy lean CLAY to silty SAND, dark yellowish brown 10YR4/8 mottled with grayish brown-light olive brown 2.5Y5/3, breaks along horizontal partings; not effervescent, massive
37	0.093 0.075	42 50	SM	D		Silty SAND, light olive brown 2.5Y5/4 with strong brown 7.5Y4/6 mottles, massive, pebbles to 30 mm, not effervescent
92	0.072 0.182	50 31	ML SM			Silty SAND, light brownish gray to light yellowish brown 2.5Y6/3, with mottles of brown to strong brown 7.5Y4/5, pebbles to 30 mm, massive
						End of sounding, 38.5 ft., 11.7 m

REMARKS: Northernmost sounding in failure zone. In the graben.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 4.5
PROJECT Northridge Ground Deformation Studies
LOCATION Balboa Boulevard (BAL)
COORDINATES X: 361828.3, Y: 3794329.5
DATE DRILLED SPT: 5-16-95
GROUNDWATER 27.5 ft; 8.4 m
PERSONNEL L: Ponti; D: Bennett/Criley
ELEVATION 1080 ft.; 329.2 m MSL

DEPTH (feet)	DEPTH (meters)	CONE PENETRATION TEST: RATIO % (8 0 0 18)	CONE PENETRATION TEST: TIP MN/m²	SPT - N	GRAIN SIZE: D_{50} (mm)	GRAIN SIZE: FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
	.5							A		Sandy lean clay, very dark grayish brown, 10YR3/2
	1									Pebbley gravel, 50-100 mm
5	1.5									
	2									
	2.5			7	0.021	80	CL			Lean CLAY with sand, brown to dark brown, 10YR4/3, massive, moderately plastic and slightly sticky, soft
10	3				0.009 0.035	83 67	CL	B		Lean CLAY with sand, dark yellowish brown, 10YR4/4, slightly sticky and plastic, similar to above
	3.5									
	4									
15	4.5			15	0.085 0.163	47 28	SM			Silty SAND, dark yellowish brown, 10YR4/4, massive, non-plastic to slightly plastic, not sticky to slighty sticky, gravel to 10 mm, some sharp bedding changes
	5									
	5.5									
20	6									
	6.5							C		
	7									
	7.5									
25	8			23	0.255 0.096	27 43	SM			Silty SAND, yellowish brown, 10YR5/4, top-slightly sticky and plastic, firm; bottom-massive, gravel to 70 mm, not sticky or plastic
	8.5				0.053 0.470	66 18	ML SM			Silty SAND, yellowish brown 10YR5/4 to dark yellowish brown 10YR4/4, and light olive brown 2.5Y5/4 at bottom, not plastic or sticky, arkosic sand, boundaries between subsamples sharp, 50 mm layer of sandy SILT in middle
	9			53	0.540 0.517	19 8	SW-SM	D		SAND with silt to silty SAND with gravel, brown, 10YR5/3, gravel to 30 mm, consists of weathered sedimentary and granitic clasts
30	9.5									End of sounding, 29.8 ft., 9.1 m
	10									
	10.5									
35	11									
	11.5									
	12									
40										

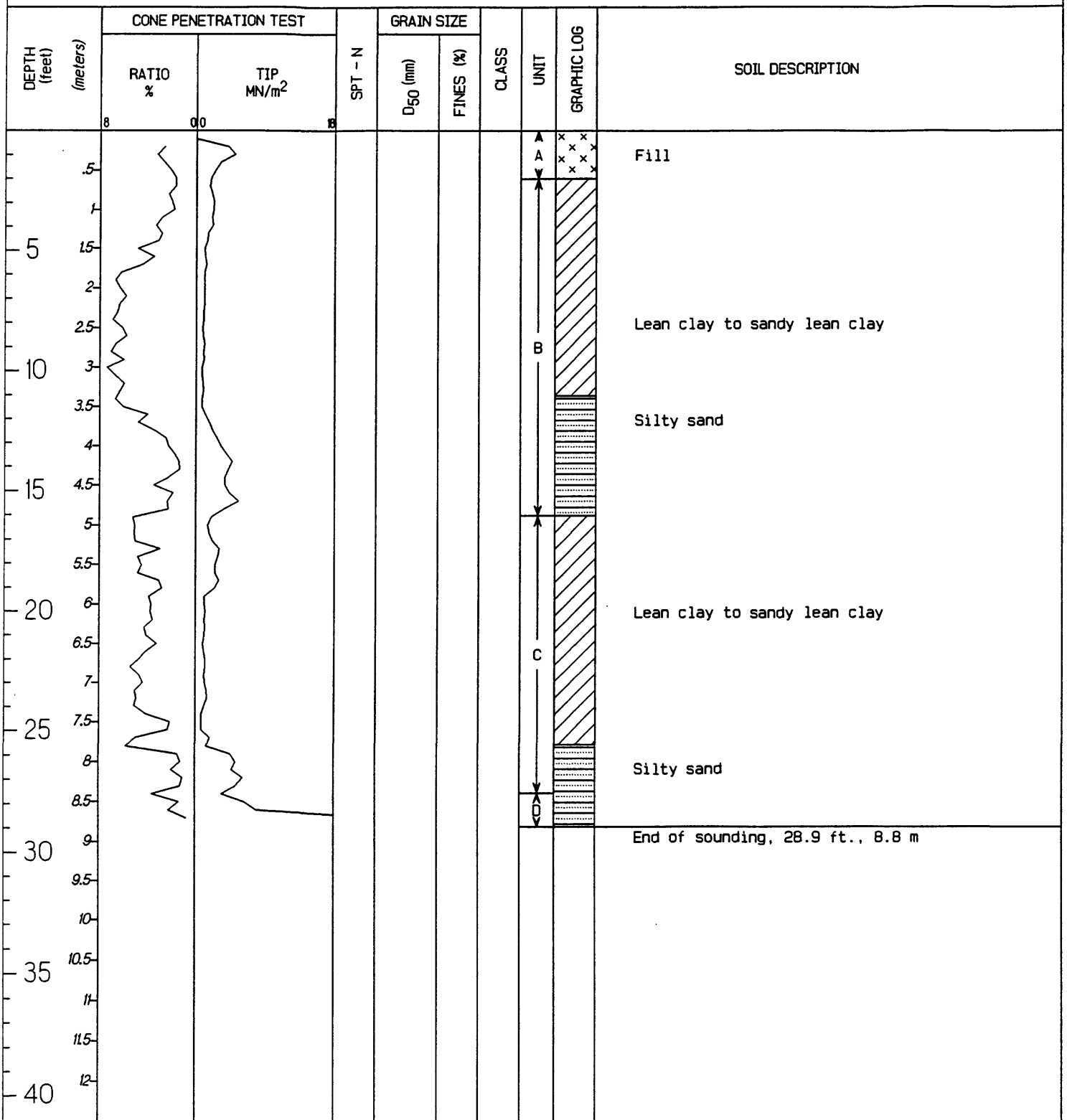
REMARKS: In failure zone bewteen soundings 4 and 5, no CPT.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 5
PROJECT Northridge Ground Deformation Studies
LOCATION Balboa Boulevard (BAL)
COORDINATES X: 361828.2, Y: 3794312.1
DATE DRILLED CPT: 4-13-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 1079 ft.; 328.9 m MSL



REMARKS: Dry to 28.9 in CPT sounding.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 6

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-13-95; SPT: 7-10-95

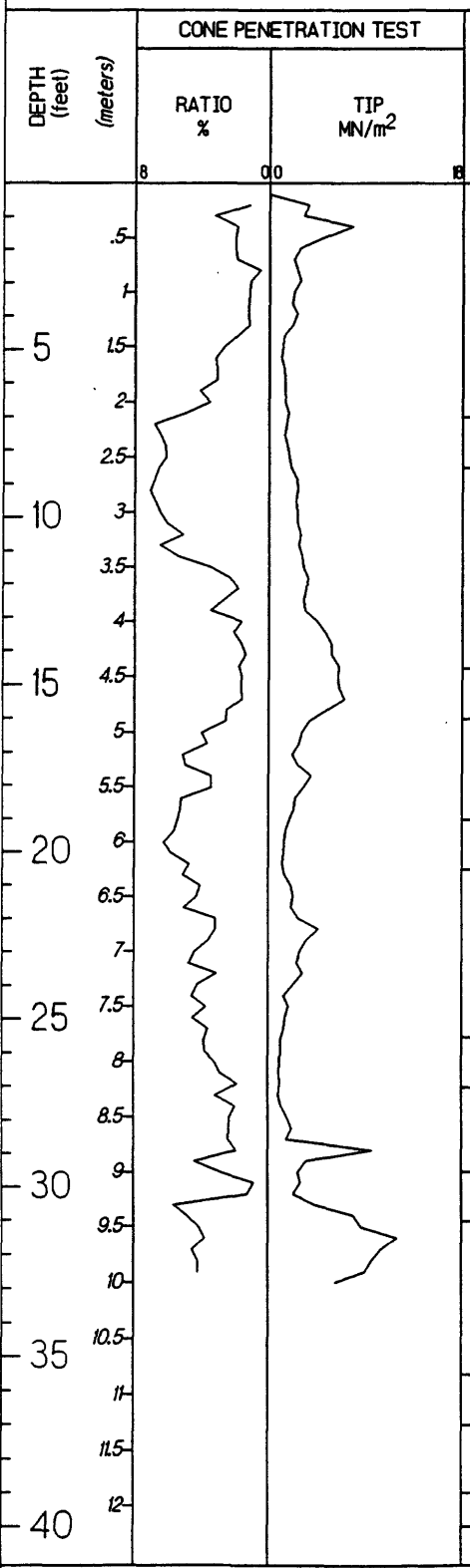
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361828.0, Y: 3794296.6

GROUNDWATER 26.9 ft; 8.2 m

ELEVATION 1077 ft; 328.3 m MSL



SPT - N	GRAIN SIZE D_{50} (mm)	GRAIN SIZE FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
				A		
9	0.018	74	CL	B		Lean CLAY with sand, dark yellowish brown 10YR4/4, sticky and plastic, firm, one piece of gravel to 20 mm, one modern root, carbonate filaments common, effervescent
14	0.093 0.037	46 65	SM CL			Silty SAND, dark yellowish brown, 10YR4/4, friable, gravel to 15 mm, effervescent; and, sandy lean CLAY, same color, slightly sticky and plastic, sand to 4 mm, few carbonate filaments
7	0.014	82	CL	C		Lean CLAY with sand, dark yellowish brown, 10YR4/4, friable, gravel to 10 mm, matrix supported, moderate effervescence, modern root in bottom
11	0.017 0.035	75 67	CL			Lean CLAY with sand to sandy lean CLAY, dark grayish brown, 10YR4/2, slightly sticky and plastic, moderately effervescent, some light brown mottles
	0.043 0.082	66 47	CL SM			Sandy lean CLAY, dark grayish brown to olive brown 2.5Y4/3, sand to 3 mm; and sandy SILT to silty SAND at bottom, olive brown, 2.5Y4/5, massive, common roots and carbonized roots
22	0.084 0.123	46 38	SM			Silty SAND, dark brown 7.5Y3/3, gravel to 10 mm, some effervescence, some brown mottling, not sticky or plastic
	0.112 0.033	39 71	SM CL	D		Mostly silty SAND to lean CLAY with sand, very dark grayish brown 10YR3/2, very poorly sorted, massive, slight effervescece, olive brown 2.5Y4/4 and olive 5Y4/2 mottles
37	0.087 0.092	43 42	SM			Silty SAND, brown to dark brown 7.5Y4/2 and dark grayish brown 2.5Y4/2 mottles, not sticky or plastic, diffuse contact, friable
181	10.00 0.169	4 36	GW SM			GRAVEL with sand to silty SAND, light brownish gray 2.5Y6/2, weathered and rotten sedimentary clasts, black basalt clast, white 2.5Y8/2, hard, carbonate cement, Saugus soils (?)

REMARKS:

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 6

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-13-95; SPT: 7-10-95

PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361828.0, Y: 3794296.6

GROUNDWATER 26.9 ft.; 8.2 m

ELEVATION 1077 ft.; 328.3 m MSL

DEPTH (feet)	(meters)	CONE PENETRATION TEST: RATIO % (8 … 0)	CONE PENETRATION TEST: TIP MN/m² (0 … 8)	SPT - N	GRAIN SIZE: D_{50} (mm)	GRAIN SIZE: FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
				(8)				D		
	12.5									End of sounding, 40.5 ft., 12.3 m
	13									
45	13.5									
	14									
	14.5									
50	15									
	15.5									
	16									
55	16.5									
	17									
	17.5									
60	18									
	18.5									
	19									
65	19.5									
	20									
	20.5									
70	21									
	21.5									
	22									
75	22.5									
	23									
	23.5									
80	24									

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 7

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-13-95

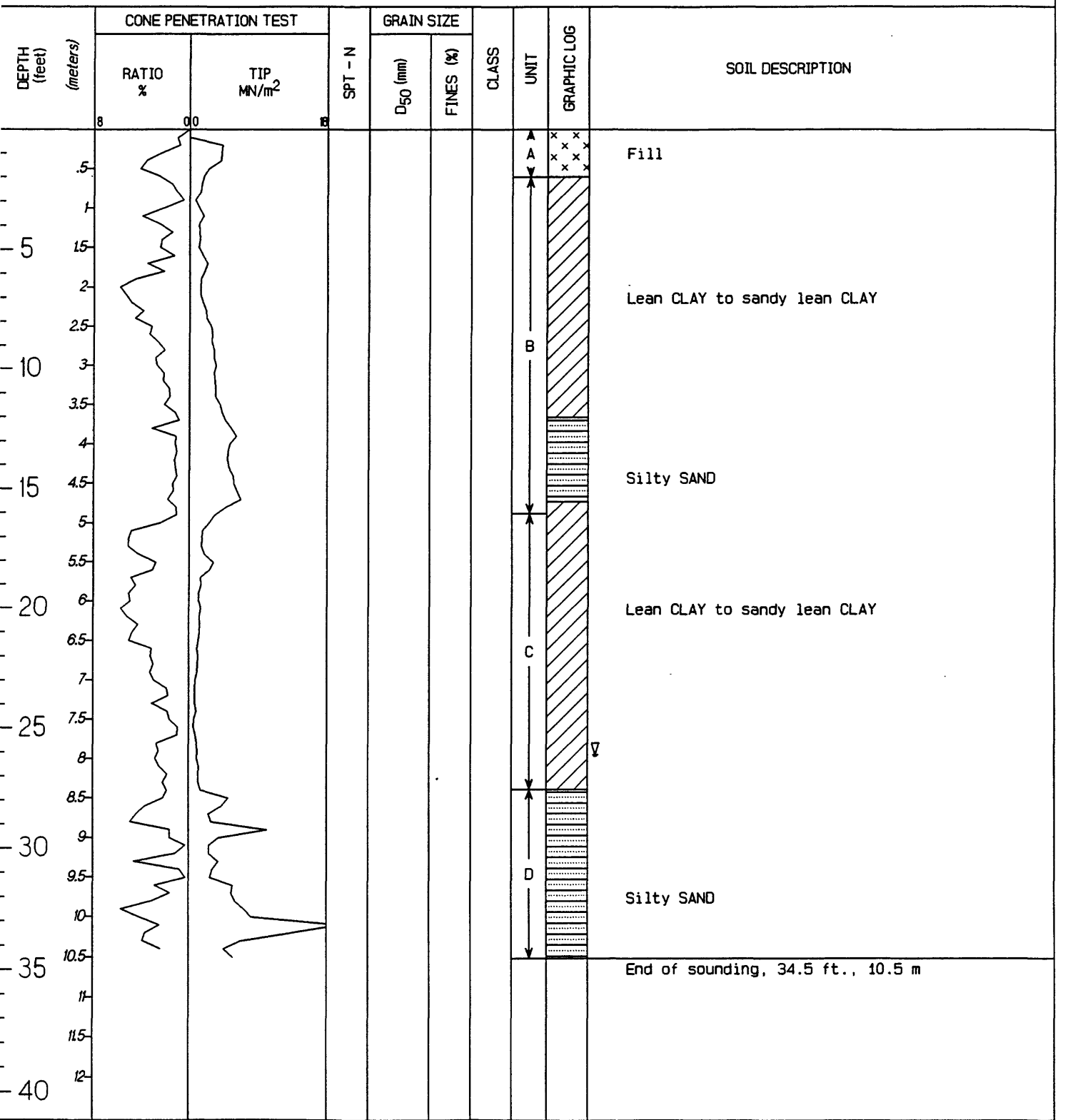
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361827.8, Y: 3794273.7

GROUNDWATER 26 ft.; 7.9 m

ELEVATION 1076 ft.; 328.0 m MSL



REMARKS:

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 8

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4/13/95; SPT:5/19/95

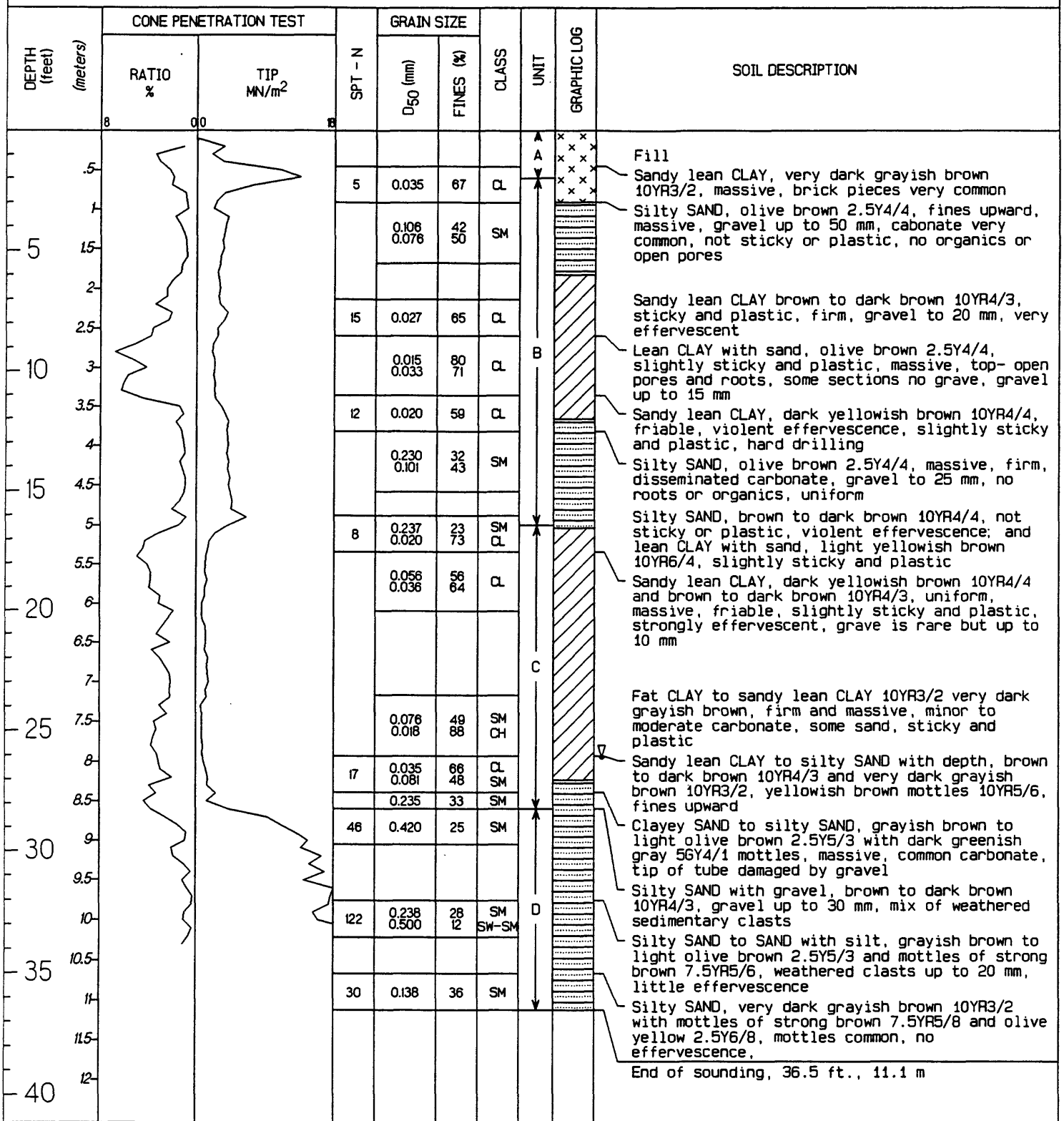
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361827.5, Y: 3794244.5

GROUNDWATER 26 ft.; 7.9 m

ELEVATION 1073 ft.; 327.1 m MSL



REMARKS:

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 9

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-13-95

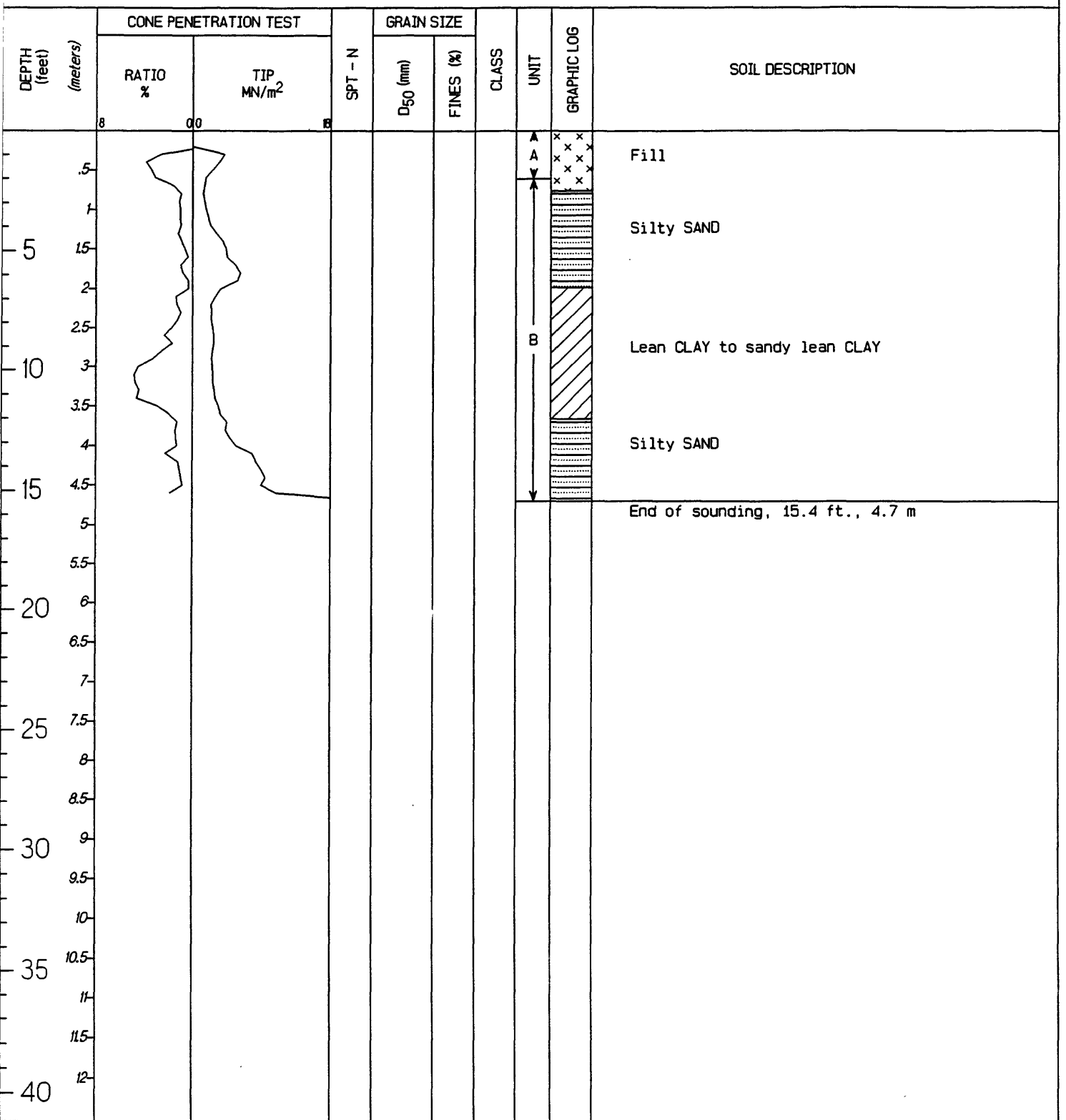
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361827.1, Y: 3794204.5

GROUNDWATER

ELEVATION 1070 ft.; 326.1 m MSL



REMARKS: Dry to 4.7 m. Could not penetrate hard layer at 4.7 with CPT.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 10

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-13-95; SPT: 5-20-95

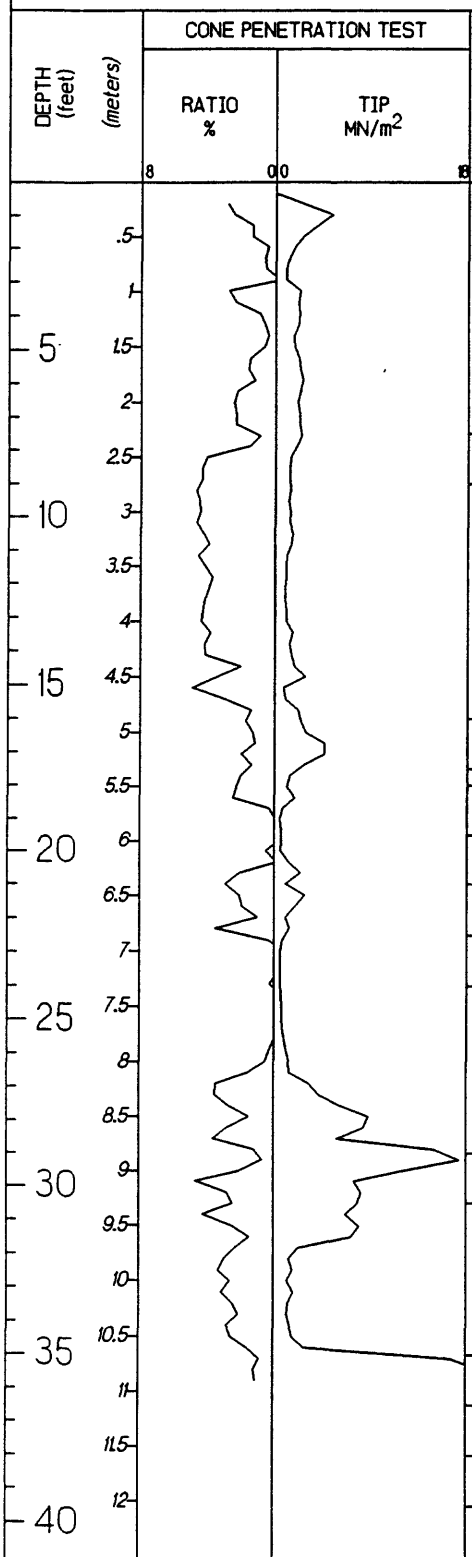
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361826.6, Y: 3794146.0

GROUNDWATER 23.7 ft.; 7.2 m

ELEVATION 1065 ft.; 324.6 m MSL



SPT - N	GRAIN SIZE D_{50} (mm)	FINES (%)	CLASS	UNIT	SOIL DESCRIPTION
				A	Fill
	0.285 0.100	28 43	SM		Silty SAND to silty SAND with gravel, dark yellowish brown 10YR4/4, massive, clasts to 50 mm, very effervescent
8	0.035	74	CL		Lean CLAY with sand, dark yellowish brown 10YR4/4, massive, soft, slightly sticky and plastic
	0.041 0.030	74 65	CL	B	Sandy lean CLAY, dark yellowish brown 10YR4/4, uniform massive, friable, slightly sticky and plastic, gravel to 5 mm, few roots, yellowish red mottles at bottom
15	0.750 0.048	15 63	SM ML		Silty SAND with gravel to sandy SILT, dark yellowish brown 10YR4/6 and 3/4, clasts to 40 mm, fiable, angular to rounded
1	0.077 0.066	49 54	SM CL		Silty SAND, dark yellowish brown 10YR3/4, massive, gravel to 5 mm; and sandy SILT, same color, slightly plastic, massive
4	0.066 0.032	54 69	ML CL		Sandy SILT to sandy lean CLAY, dark yellowish brown 10YR4/4, slightly sticky and plastic, slightly effervescent, gravel to 10 mm
4	0.056 0.099	56 44	CL SM		Sandy lean CLAY, dark yellowish brown 10YR4/4, slighty sticky and plastic, massive, gravel to 5 mm; and silty SAND, dark brown
	0.082 0.104	47 41	SC-SM SM	C	Silty clayey SAND to silty SAND, dark brown to dark yellowish brown 10YR4/4, slightly stick and plastic (upper), massive, soft
	0.129	36	SM		Silty SAND, yellowish brown 10YR5/4, uniform, massive, tube end damaged
20	0.154 0.064	23 59	SM ML		Silty SAND to sandy SILT, dark yellowish brown 10YR4/4, gravel to 20 mm
	0.140 0.016	35 87	SM CL		Silty SAND and silty clayey SAND, yellowish brown 10YR5/4, massive, gravel to 20 mm; and lean CLAY with sand, very dark grayish brown 10YR3/2
	0.027 0.009	68 87	CL CH		Lean to fat CLAY with sand, very dark grayish brown 10YR3/2 with dark greenish gray mottles, sticky and plastic, massive, uniform
142	0.560 0.490	5 29	SP SM	D	SAND to silty SAND with gravel, yellowish brown 10YR5/4 to light olive brown-light brownish gray 2.5Y5/3, well to poorly sorted, gravel to 5mm
68	0.190 0.400	35 26	SM		Silty SAND
25	0.007 0.052	99 65	CH ML		Fat CLAY to sandy SILT, dark grayish brown 2.5Y4/2, very to slightly sticky and plastic, charcoal (?), rusty mottles
					12,150+-70 uncorrected radiocarbon years
					End of sounding, 39.5 ft., 12 m

REMARKS: In alley about 25 ft north of Halsey.
Pearched water at 6 m?

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 11

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-13-95; SPT: 7-13-95

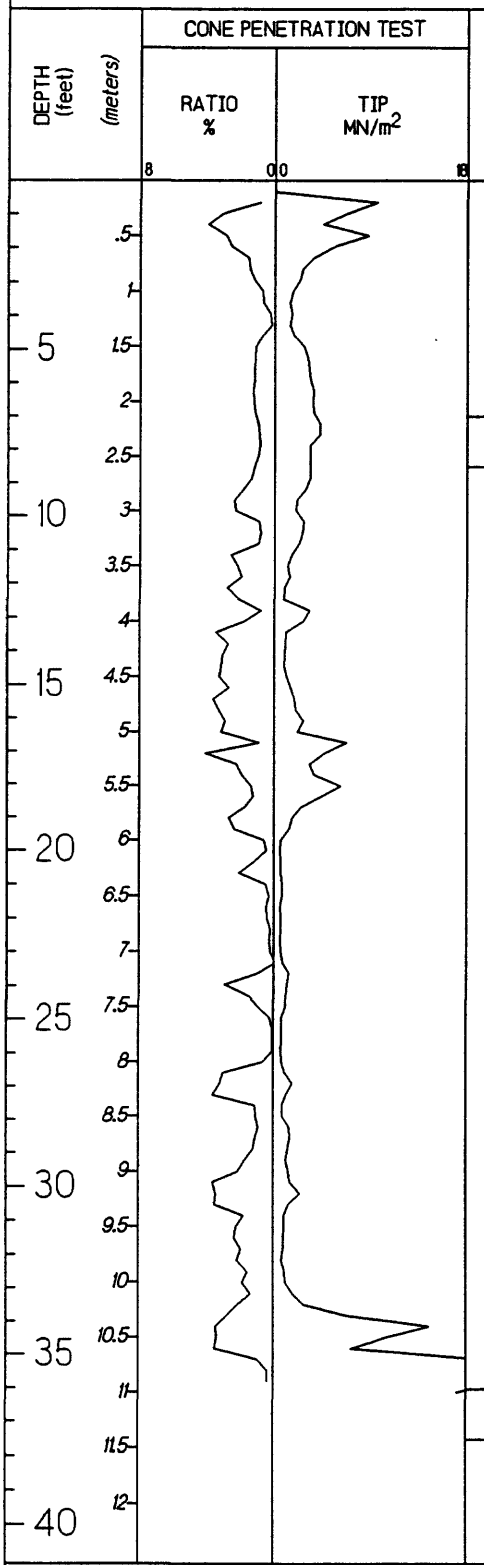
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361826.2, Y: 3794113.1

GROUNDWATER 25 ft.; 7.6 m

ELEVATION 1064 ft.; 324.3 m MSL



SPT - N	GRAIN SIZE D_{50} (mm)	GRAIN SIZE FINES (%)	CLASS	UNIT	SOIL DESCRIPTION
				A	Fill
					Silty SAND
10	0.105 0.072	37 51	SM ML		Silty SAND to sandy SILT, dark yellowish brown 10YR4/6, loose, very friable, not sticky or plastic, sharp contact between the two sediment types, modern root, no gravel
				B	Lean CLAY to sandy lean CLAY
					Silty SAND
	0.037 0.072	65 51	CL		Sandy lean CLAY, brown to dark brown 10YR4/3, uniform, soft, massive, slightly sticky and plastic, pebbles to 15 mm
	0.024 0.071	76 51	CL ML	C	Lean CLAY with sand to sandy SILT, dark brown 10YR3/3, massive, soft and loose, effervescent,
	0.110 0.072	41 51	SM ML		Silty SAND to sandy SILT, dark brown-brown 10YR4/3 to dark yellowish brown 10YR4/6, massive, well defined upward fining sequence continues into sample above
	0.048 0.011	64 82	ML CL		Sandy SILT to lean CLAY with sand, upper part is dark yellowish brown 10YR4/6 the lower part is heavily mottled; light brownish gray, very dark grayish brown,
	0.015 0.255	77 29	CL SM		Lean CLAY with sand to silty SAND with gravel, dark grayish brown to olive brown 2.5Y4/3 and dark yellowish brown 10YR4/3, massive, this sample is mostly clay
17	0.085 0.038	46 65	SM CL	D	Silty SAND and sandy lean CLAY, dark grayish brown to olive brown 2.5Y4/3, some olive yellow mottling, slight effervescence, friable

REMARKS: First sounding south of Halsey.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 11

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-13-95; SPT: 7-13-95

PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361826.2, Y: 3794113.1

GROUNDWATER 25 ft.; 7.6 m

ELEVATION 1064 ft.; 324.3 m MSL

DEPTH (feet)	DEPTH (meters)	CONE PENETRATION TEST: RATIO % (8 … 0 … 0)	CONE PENETRATION TEST: TIP MN/m² (0 … 0 … 15)	SPT - N	GRAIN SIZE: D_{50} (mm)	GRAIN SIZE: FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
45	13.5							D		
	14			15	0.076 0.080	50 47	SM			Silty SAND, dark greenish gray 5G4/1, light gray mottles, friable, no carbonate blebs
	14.5									
50	15			48	0.220 0.122	35 39	SM			Silty SAND, light greenish gray 5GY7/1, with dark greenish gray mottles, not sticky or plastic, light colors are engulfed in carbonate, gravel to 25 mm, subangular
	15.5									End of sounding, 50.5 ft., 15.4 m
	16									
55	16.5									
	17									
	17.5									
60	18									
	18.5									
	19									
65	19.5									
	20									
	20.5									
70	21									
	21.5									
	22									
75	22.5									
	23									
	23.5									
80	24									

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 12

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-14-95; SPT: 7-12-95

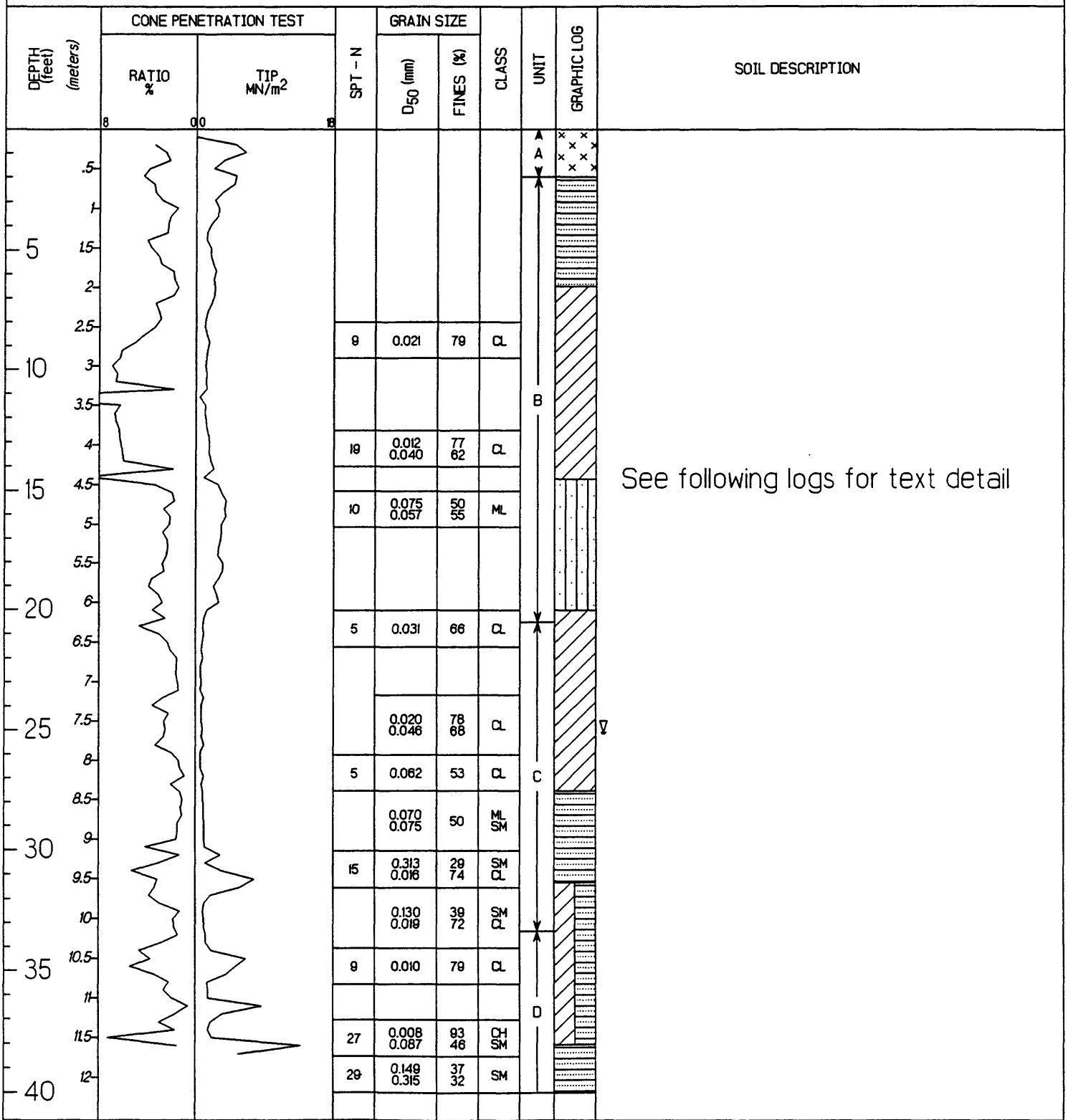
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361825.9, Y: 3794077.5

GROUNDWATER 25 ft.; 7.6 m

ELEVATION 1061 ft.; 323.4 m MSL



REMARKS: Last water remeasure 6-3-96; toc 25'4"

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 12

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-14-95; SPT: 7-12-95

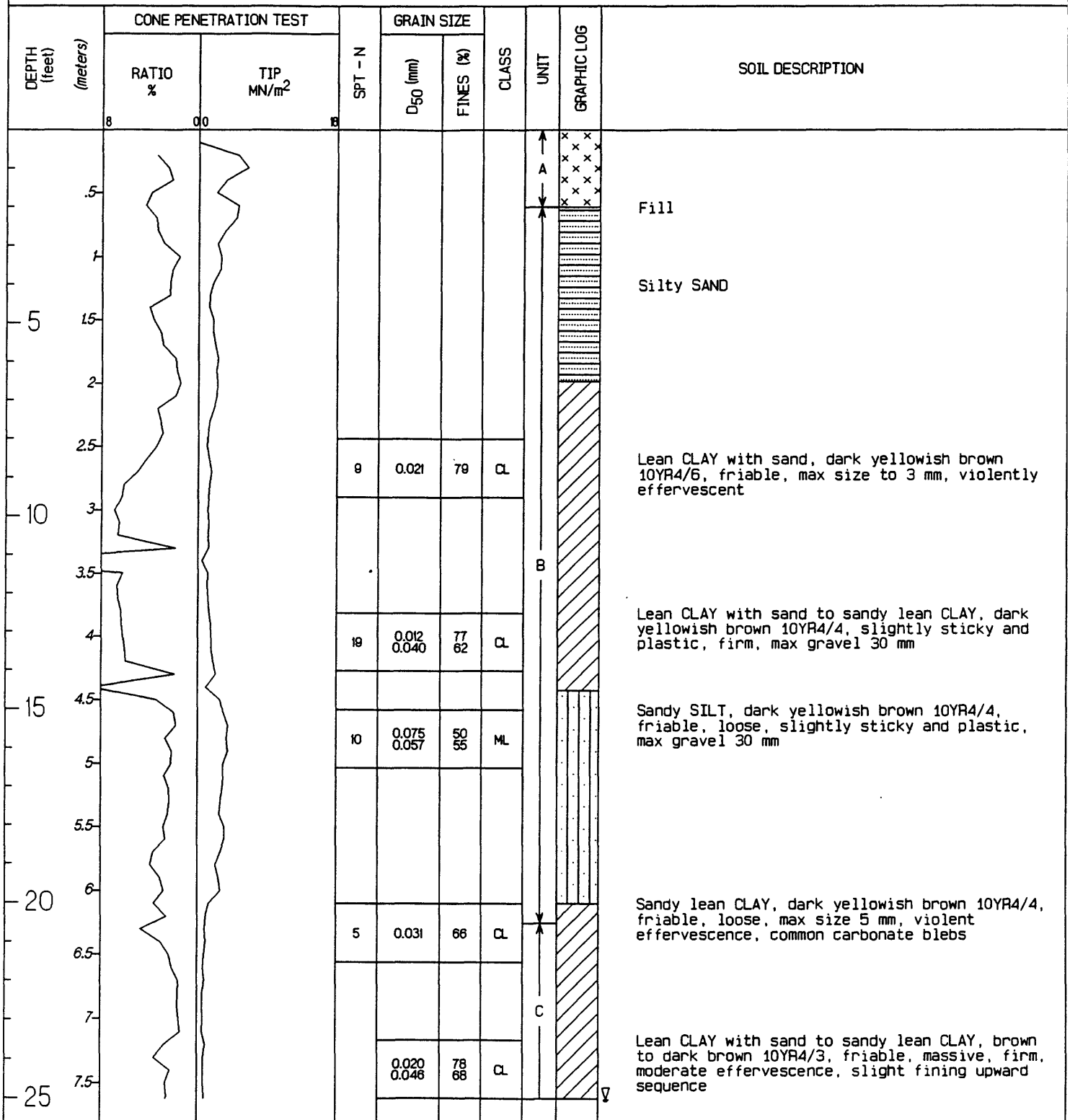
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361825.9, Y: 3794077.5

GROUNDWATER 25 ft.; 7.6 m

ELEVATION 1061 ft.; 323.4 m MSL



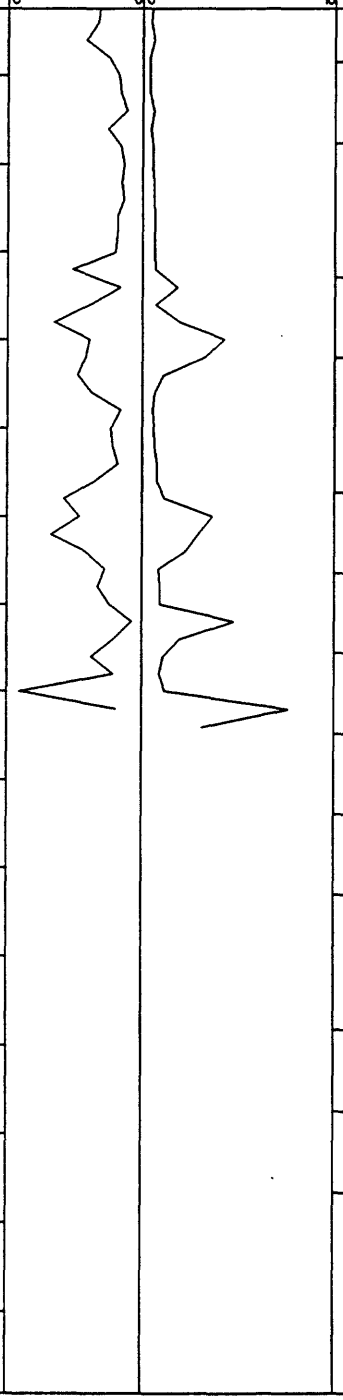
REMARKS: Last water remeasure 6-3-96; toc 25'4"

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 12
PROJECT Northridge Ground Deformation Studies
LOCATION Balboa Boulevard (BAL)
COORDINATES X: 361825.9, Y: 3794077.5
DATE DRILLED CPT: 4-14-95; SPT: 7-12-95
GROUNDWATER 25 ft.; 7.6 m
PERSONNEL L: Ponti; D: Bennett/Criley
ELEVATION 1061 ft.; 323.4 m MSL



DEPTH (feet)	(meters)	SPT - N	GRAIN SIZE D_{50} (mm)	FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
			0.020 0.046	78 68	CL			Sandy lean CLAY, dark brown 10YR3/3, slightly sticky and plastic, friable, slightly effervescent
	8	5	0.062	53	CL			
	8.5		0.070 0.075	50	ML SM	C		Sandy SILT grades downward to silty SAND, brown 10YR4/4, 5/3, to light yellowish brown 10YR6/4, massive, uniform but slight upward fining sequence, friable, soft
30	9							
	9.5	15	0.313 0.016	29 74	SM CL			Silty SAND with gravel to silty SAND, very dark grayish brown 10YR3/2 to dark yellowish brown 10YR4/4, rusty mottles, firm, not sticky or plastic, gravel to 15 mm; and lean CLAY with sand, sharp contact
	10		0.130 0.019	39 72	SM CL			Silty Sand to lean CLAY with sand, very variable, olive brown 2.5Y4/4, firm, slightly sticky and plastic, some charcoal (?), common carbonate blebs, moderate effervescence
	10.5	9	0.010	79	CL			Lean CLAY with sand, dark yellowish brown 10YR4/4, max size 3 mm, few carbonate filaments, friable, charcoal (?)
35	11							**12,650+-90 uncorrected radiocarbon years**
	11.5	27	0.008 0.067	93 46	CH SM			Fat CLAY with sand, dark grayish brown to olive brown 2.5Y4/3, very dark grayish brown 10YR3/2 mottling, sticky and plastic, firm, sharp contact with; silty SAND, same color, gravel to 10 mm
	12	29	0.149 0.315	37 32	SM			Silty SAND, dark grayish brown to olive brown 2.5Y4/3, mottles of strong brown 7.5YR5/6 and very dark grayish brown 2.5Y3/2, gravel to 10 mm, looks like soil but no carbonate
40	12.5	46	0.076 0.150	49 34	SM	D		Silty SAND, dark grayish brown to olive brown 2.5Y4/3, with strong brown mottles 7.5YR4/6, friable
	13							
	13.5	23	0.250 0.188	31 33	SM			Silty SAND, dark bluish gray 5B4/1, max size 10 mm, not effervescent, firm, gradational contact
45	14	56	0.145	38	SM			Silty SAND, greenish gray 5BG5/1, hard, very effervescent, Saugus soil
	14.5							End of sounding, 47 ft., 14.3 m
	15							
50								

Magnitude= 6.8
Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 13b

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-14-95; SPT: 7-11-95

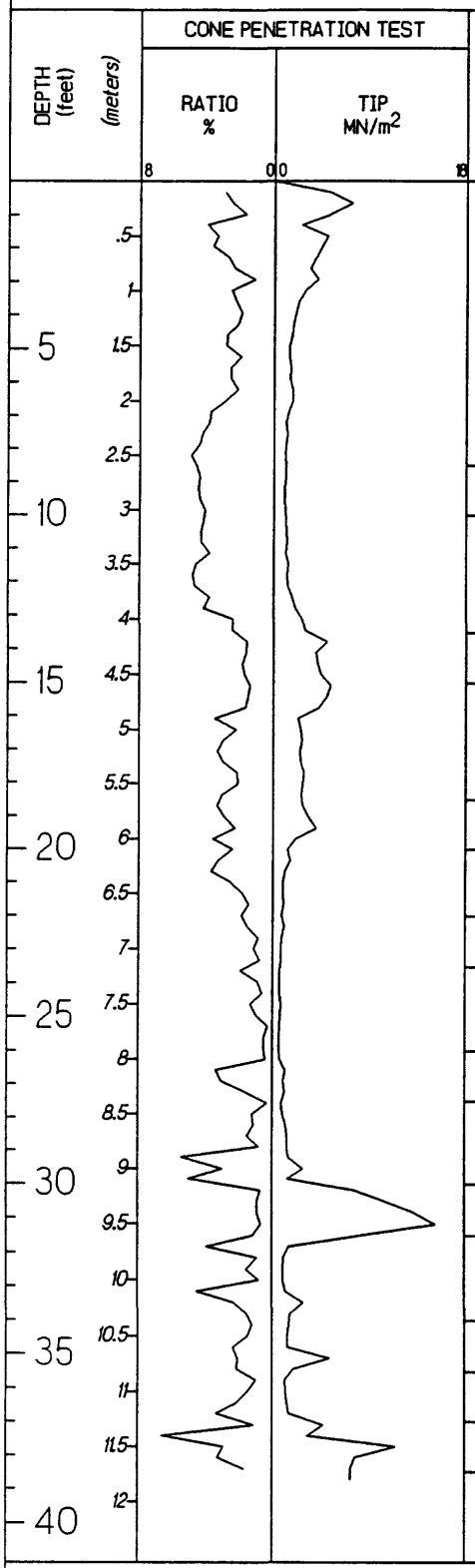
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361825.7, Y: 3794060.7

GROUNDWATER 26.8 ft.; 8.2 m

ELEVATION 1059 ft.; 322.8 m MSL



SPT - N	GRAIN SIZE D_{50} (mm)	GRAIN SIZE FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
				A		Fill
						Silty SAND
6	0.015	78	CL	B		Lean CLAY with sand, dark yellowish brown 10YR4/4, slightly sticky and plastic, few thin carbonate filaments, violently effervescent
	0.013 0.058	75 54	CL			Lean CLAY with sand to sandy lean CLAY, dark yellowish brown 10YR3/6 and 3/4, massive, firm, few open pores, disseminated carbonate, no mottles, slightly sticky and plastic
12	0.151 0.083	39 46	SM			Siltly SAND, dark yellowish brown 10YR4/4, friable, gravel to 25 mm, some "rotten" sedimentary clasts
15	0.870 0.050	14 59	SM CL			Silty SAND with gravel, yellowish brown 10YR5/4, gravel to 20 mm, abrupt contact with; sandy lean CLAY, dark yellowish brown 10YR4/4, friable
7	0.025	68	CL	C		Sandy lean CLAY, brown to dark brown 10YR4/3, soft and friable, common thin carbonate filaments, charcoal present
	0.029 0.052	71 58	CL			**6,200+-80 uncorrected radiocarbon years**
10	0.062 0.073	55 51	CL			Sandy lean CLAY, brown to dark brown 10YR4/3, massive, soft, disseminated carbonate varies
	0.057 0.106	58 43	SM			Sandy lean CLAY; and sandy SILT Silty SAND with thin layer of sandy lean CLAY near bottom
26	1.750 0.223	12 16	SW-SM SM			SAND with silt and gravel to silty SAND
	0.300 0.023	32 67	CL SM			Interbedded sandy lean CLAY and silty SAND
19	0.011 0.320	78 22	CL SM	D		Lean CLAY with sand and silty SAND **12,130+-70 uncorrected radiocarbon years**
23	1.300 0.048	18 66	SM CL			Silty SAND with gravel and sandy lean CLAY

REMARKS: In zone of compression.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

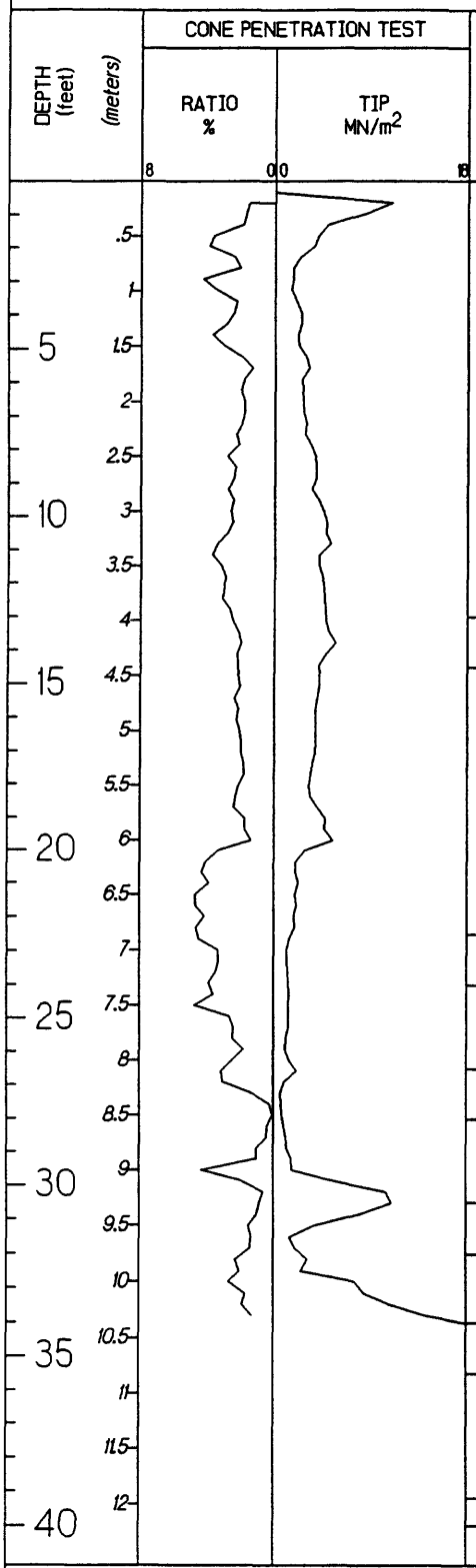
HOLE NUMBER 13b
PROJECT Northridge Ground Deformation Studies
LOCATION Balboa Boulevard (BAL)
COORDINATES X: 361825.7, Y: 3794060.7
DATE DRILLED CPT: 4-14-95; SPT: 7-11-95
GROUNDWATER 26.8 ft.; 8.2 m
PERSONNEL L: Ponti; D: Bennett/Criley
ELEVATION 1059 ft.; 322.8 m MSL

DEPTH (feet)	(meters)	CONE PENETRATION TEST: RATIO % (8 … 0 … 0)	CONE PENETRATION TEST: TIP MN/m²	SPT - N	GRAIN SIZE: D_{50} (mm)	GRAIN SIZE: FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
	12.5			220	0.142 0.065	31 53	SM ML	D		~~Silty SAND to sandy SILT~~
	13			36	0.090	45	SM			Silty SAND
	13.5			20	0.083 0.064	47 53	SM ML			Silty SAND to sandy SILT
45	14			121	0.112 0.450	37 25	SM			Silty SAND to silty SAND with gravel
	14.5									End of sounding, 47 ft., 14.3 m
	15									
50	15.5									
	16									
	16.5									
55	17									
	17.5									
	18									
60	18.5									
	19									
	19.5									
65	20									
	20.5									
	21									
70	21.5									
	22									
	22.5									
75	23									
	23.5									
	24									
80										

Magnitude= 6.8
Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 13.5
PROJECT Northridge Ground Deformation Studies
LOCATION Balboa Boulevard (BAL)
COORDINATES X: 361825.6, Y: 3794047.9
DATE DRILLED CPT: 5-12-95; SPT:6-22&23-95
GROUNDWATER 27.5 ft.; 8.4 m
PERSONNEL L:Ponti; D: Bennett/Criley
ELEVATION 1058 ft.; 322.5 m MSL



SPT - N	GRAIN SIZE D_{50} (mm)	FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
				A		Fill
13	0.062	53	CL	B		Sandy lean CLAY, brown 10YR5/3, gravel to 15 mm, mixed lithologies, few carbonate filaments
	0.076 0.027	49 69	SM CL			Silty SAND, dark yellowish brown 10YR4/4, massive, and sandy lean CLAY, same color, mixed lithics to 15 mm, some platy structure
13	0.027	65	CL			Sandy lean CLAY, dark yellowish brown 10YR4/4, common small carbonate blebs, gravel to 10 mm
9	0.066 0.081	52 48	CL SM	C		Sandy lean CLAY, brown to dark brown 10YR4/3, slightly sticky and plastic, one gravel to 20 mm, and, silty SAND, dark brown
	0.067 0.375	53 21	CL SM			Silty SAND, brown to dark brown 10YR4/3 at top, olive brown 2.5Y4/4 bottom 2/2, not sticky or plastic, loose
6	0.240 0.045	28 59	SM CL			Silty SAND to sandy lean CLAY in bottom 1/2, dark yellowish brown 10YR4/2, loose, gravel to 10 mm, slightly sticky and plastic
17	0.084 0.036	45 72	SM CL	D		Silty SAND and sandy lean CLAY, grayish brown to light olive brown 2.5Y5/3, dark yellowish brown mottles, sharp contact
	0.057 0.112	59 37	ML SM			Silty SAND, dark grayish brown to olive brown 2.5Y5/3, friable, common carbonate blebs, slighty plastic
29						Silty SAND and sandy SILT, olive brown 2.5Y4/4, friable, heavily mottled, moderate disseminated carbonate, sharp boundaries

REMARKS: Between 13 and 14.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 13.5
PROJECT Northridge Ground Deformation Studies
LOCATION Balboa Boulevard (BAL)
COORDINATES X: 361825.6, Y: 3794047.9
DATE DRILLED CPT: 5-12-95; SPT:6-22&23-95
GROUNDWATER 27.5 ft.; 8.4 m
PERSONNEL L:Ponti; D: Bennett/Criley
ELEVATION 1058 ft.; 322.5 m MSL

DEPTH (feet)	DEPTH (meters)	CONE PENETRATION TEST: RATIO % (8 … 0 … 0)	CONE PENETRATION TEST: TIP MN/m² (0 … 16)	SPT - N	GRAIN SIZE: D_{50} (mm)	GRAIN SIZE: FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
	12.5			29						
	13			38	0.230	32	SM	D		Silty SAND with gravel, very dark gray 5Y3/1, not sticky or plastic, gravel to 8 mm, basalt pebble, gradual contacts
45	13.5									
	14			74	1.090 0.128	19 31	SM			Silty SAND and silty SAND with gravel, greenish gray to dark greenish gray, hard, weathered rock
	14.5									End of sounding, 47.8 ft., 14.6 m
50	15									
	15.5									
	16									
55	16.5									
	17									
	17.5									
60	18									
	18.5									
	19									
65	19.5									
	20									
	20.5									
70	21									
	21.5									
	22									
75	22.5									
	23									
	23.5									
80	24									

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 14C

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 5-12-95; SPT: 5-21-95

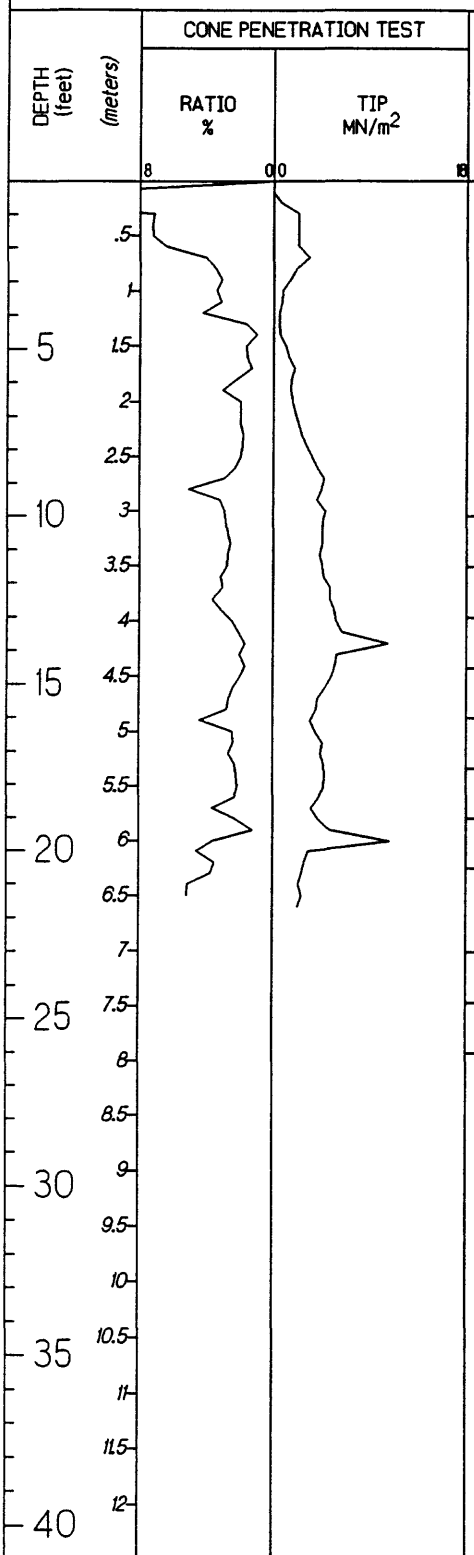
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361825.5, Y: 3794040.3

GROUNDWATER

ELEVATION 1058 ft.; 322.5 m MSL



SPT - N	D_{50} (mm)	FINES (%)	CLASS	UNIT	SOIL DESCRIPTION
				A	Fill
	0.060 0.035	55 71	ML CL	B	Sandy SILT to sandy lean CLAY, dark yellowish brown 10YR4/6, massive, friable, few to common carbonate filaments,
	0.100 0.022	42 81	SM CL		Silty SAND to sandy silty CLAY in the top 1/2, sandy lean CLAY bottom 1/2, all dark yellowish brown 10YR4/4, slightly sticky and plastic, massive, friable
	0.017 0.012	83 85	CL		Lean CLAY with sand, dark yellowish brown 10YR4/5, massive, friable, slightly sticky and plastic, firm,
19	0.019 0.022	77 65	CL		Lean CLAY with sand to sandy lean CLAY, dark brown to dark yellowish brown 10YR7/3, slightly sticky and plastic, friable
15	0.043	58	CL		Sandy lean CLAY, dark yellowish brown 10YR4/3, uniform, slightly sticky and plastic, 5% rotten and weathered clasts, moderate effervescence
16	0.080 0.040	48 62	SM CL		Silty SAND and sandy lean CLAY, yellowish brown to dark yellowish brown 10YR5/4-4/4, silty SAND see CPT spike on log, gravel to 15 mm
16	0.039	63	CL		Sandy lean CLAY, dark yellowish brown 10YR4/4, massive, gravel to 15 mm
15	0.035 0.060	65 57	CL		Sandy lean CLAY, dark yellowish brown 10YR4/4, massive, slightly sticky and plastic, gravel to 10 mm
12	0.180 0.023	30 70	SM CL	C	Silty SAND, top; sandy lean CLAY bottom, dark yellowish brown 10YR4/4, gravel to 20 mm, gypsum filaments in clay
	0.081 0.031	71 70	SM CL		Sandy lean CLAY, brown to dark brown 10YR4/3, massive, firm, carbonate common
16	0.022	71	CL		Lean CLAY with sand, dark yellowish brown 10YR4/4, massive, firm, uniform, common carbonate blebs
14	0.036 0.043	67 64	CL		Sandy lean CLAY, brown to dark yellowish brown 10YR4/3-4/4, massive, firm, rare rust-colored blebs may be rotten clasts
					End of sounding, 26 ft., 7.9 m

Drillers notes:
The drilling at Bal-14 was very unusual, 2 days were spent drilling to 7.9 m. Drilling was very hard, the lead augers got very hot, samplers couldn't be handled without gloves. The SPT were higher than those in the zone of extension. The liquidity index was more negative than in the zone of extension indicating a more desiccated history. Every effort was made to get through the stiff zone.

REMARKS: CPT made in the same 6" hole as 14b. This boring was remarkably difficult to drill, 3 days were spent getting to 26 ft.

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 15

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-14-95; SPT: 6-20, 21, 22-95

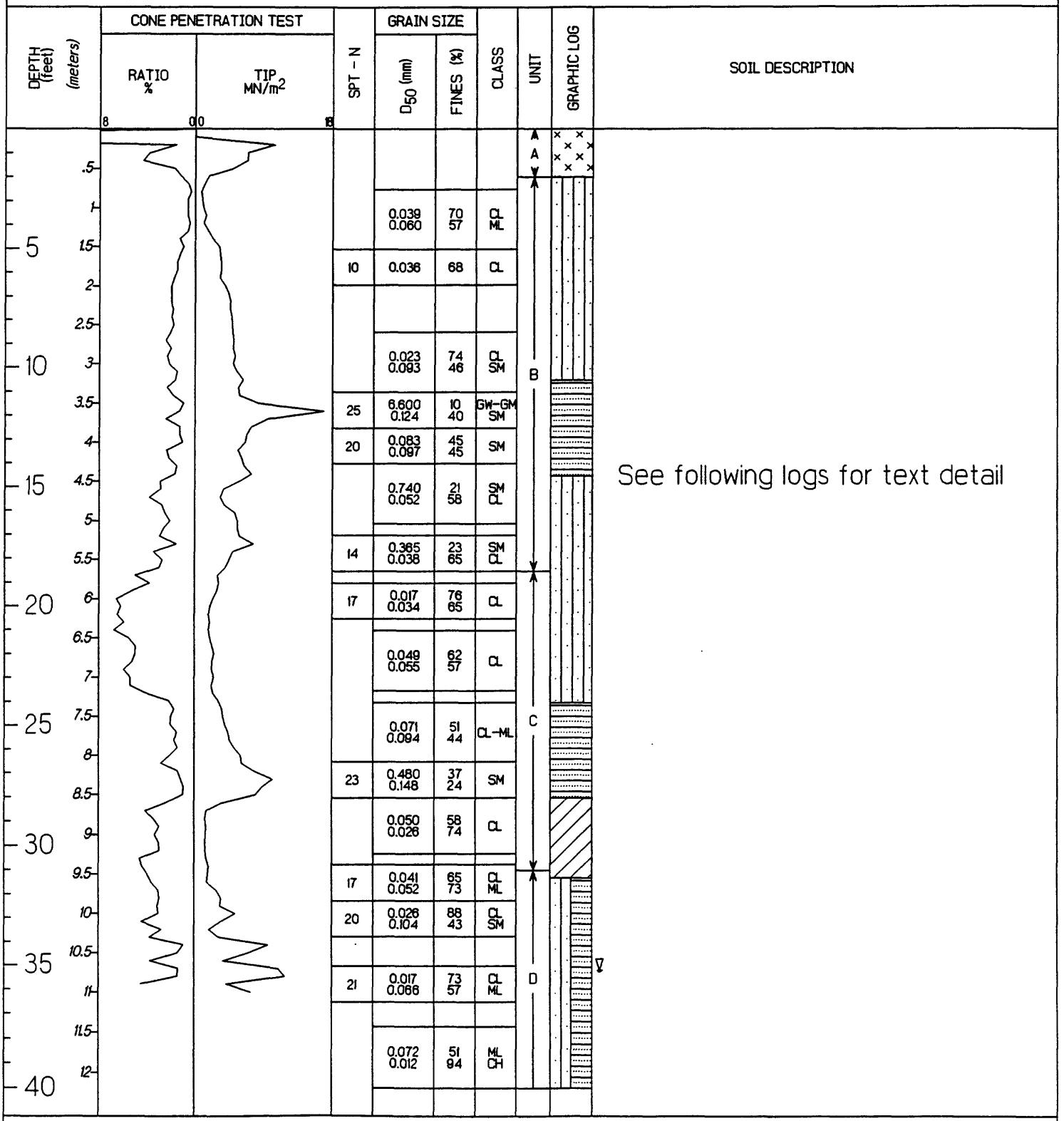
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361825.1, Y: 3794002.2

GROUNDWATER 35.1 ft.; 10.7 m

ELEVATION 1054 ft.; 321.3 m MSL



REMARKS: Piezometer
Last water remeasure 6-3-96; toc 35'2"

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 15

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-14-95; SPT: 6-20, 21, 22-95

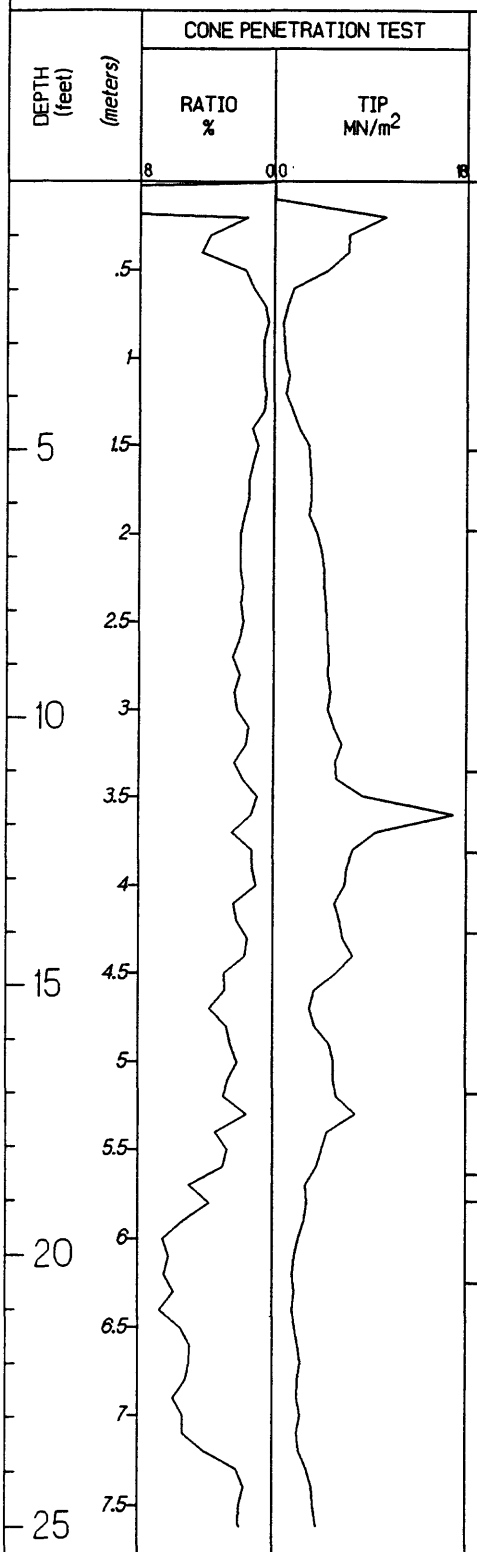
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361825.1, Y: 3794002.2

GROUNDWATER 35.1 ft.; 10.7 m

ELEVATION 1054 ft.; 321.3 m MSL



SPT - N	D_{50} (mm)	FINES (%)	CLASS	UNIT	SOIL DESCRIPTION
				A	
	0.039 0.060	70 57	CL ML	B	Sandy lean CLAY to sandy SILT, olive brown 2.5Y4/4, disseminated carbonate throughtout, open pores and carbonate stringers most abundant in top half, not sticky or plastic, massive, firm, dry, some roots in top
10	0.036	68	CL		Sandy lean CLAY, yellowish brown 10YR5/4, firm, carbonate stringers to 5 mm long
	0.023 0.093	74 46	CL SM		Sandy silt to silt with sand, olive brown 2.5Y4/4, very firm, not sticky or plastic, open pores abundant in top 1/2, massive, carbonate abundant
25	6.600 0.124	10 40	GW-GM SM		GRAVEL with silt and sand, and silty SAND, dark yellowish brown 10YR4/4 to very pale brown 10YR7/3, firm, AP soil (?)
20	0.083 0.097	45 45	SM		Silty SAND, dark yellowish brown 10YR4/4, mixed lithology, firm
	0.740 0.052	21 58	SM CL		Silty SAND with gravel (top) to sandy lean CLAY (bottom), olive brown 2.5Y4/4, uniform, no mottling, firm, no open pores, carbonate stringers and nodules in lower half, disseminated carbonate abundant, gravel to 50 mm,
14	0.385 0.038	23 65	SM CL		Sandy lean CLAY and silty SAND with gravel, clay, sand, clay, dark yellowish brown 10YR4/6, firm, slightly plastic and sticky, gravel in sand to 15 mm, charcoal in clay
17	0.017 0.034	76 65	CL	C	Lean CLAY with sand, dark yellowish brown to brown 10YR4/4-4/3, firm, massive
	0.049 0.055	62 57	CL		Sandy lean CLAY, dark yellowish brown 10YR4/4, massive, friable, slightly sticky and slightly plastic, rare pores, carbonate filaments to 4 mm, strongly effervescent
	0.071 0.094	51 44	CL-ML		Sandy silty CLAY to silty SAND at base olive brown 2.5Y4/4, to dark yellowish brown 10YR3/6, not sticky or plastic, firm, crumbles when broken, minor to moderate disseminated carbonate 25 mm

REMARKS: Piezometer
Last water remeasure 6-3-96; toc 35'2"

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 15

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-14-95; SPT: 6-20, 21, 22-95

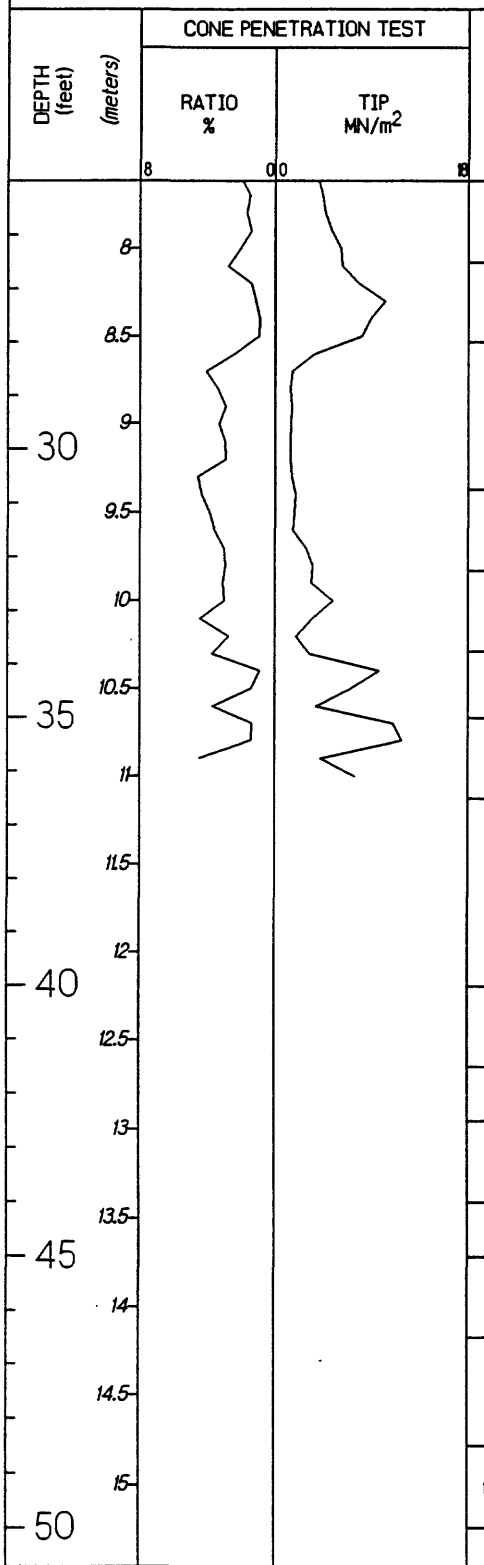
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361825.1, Y: 3794002.2

GROUNDWATER 35.1 ft.; 10.7 m

ELEVATION 1054 ft.; 321.3 m MSL



SPT - N	D_{50} (mm)	FINES (%)	CLASS	UNIT	SOIL DESCRIPTION
	0.071 0.094	51 44	CL-ML	C	Sandy lean CLAY and lean CLAY with sand, silty SAND at bottom dark yellowish brown 10YR4/4 and olive brown 2.5Y4/3, massive, friable, few pores, many carbonate filaments to 5 mm, some blocky structure, variable plasticty
23	0.480 0.148	37 24	SM		
	0.050 0.026	58 74	CL		Sandy lean CLAY to sandy SILT, dark yellowish brown 10YR4/4 to olive brown 2.5Y4/4, firm, organic matter common in middle
17	0.041 0.052	65 73	CL ML		Lean CLAY to sandy SILT and silty SAND, dark yellowish brown 10YR4/4 and olive brown 2.5Y4/4, gradational contacts, firm, carbonate common
20	0.026 0.104	88 43	CL SM		**11,560+-100 uncorrected radiocarbon years**
					Lean CLAY with sand to sandy SILT, olive brown 2.5Y4/4 and dark yellowish brown 10YR4/4, light gray mottling,
21	0.017 0.066	73 57	CL ML		
	0.072 0.012	51 94	ML CH		Interbedded lean CLAY and sandy SILT, olive 5Y4/3, and very dark grayish brown 2.5Y3/2 sharp contacts, slight to moderate disseminated carbonate, some organic flecks, fat CLAY, olive gray 5Y4/2
30	0.076	79 50	CL SM	D	Lean CLAY with sand to silty SAND, gray 2.5Y5/1 to black 2.5Y2.5/1, metallic odor, some effervescence, plastic
	0.078	49	SM		Silty SAND to sandy SILT, 2.5Y2/1 black, not plastic, massive, hard, metallic odor
23	0.052	65	ML		Sandy SILT, black 2.5Y2.5/1, uniform, metallic odor, friable, massive
30	0.074 0.098	52 37	ML SM		Sandy SILT to silty SAND, fines upward, black 2.5Y2.5/1 to very dark gray 5Y3/1, some light gray mottles not plastic, friable,
149	0.520 0.346	9 23	SW-SM SM		SAND with silt to silty SAND, gray 2.5YN5/, Saugus soil, not sticky or plastic, no bedding

Magnitude= 6.8

Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 16

LOCATION Balboa Boulevard (BAL)

DATE DRILLED CPT: 4-14-95; SPT: 5-23-95

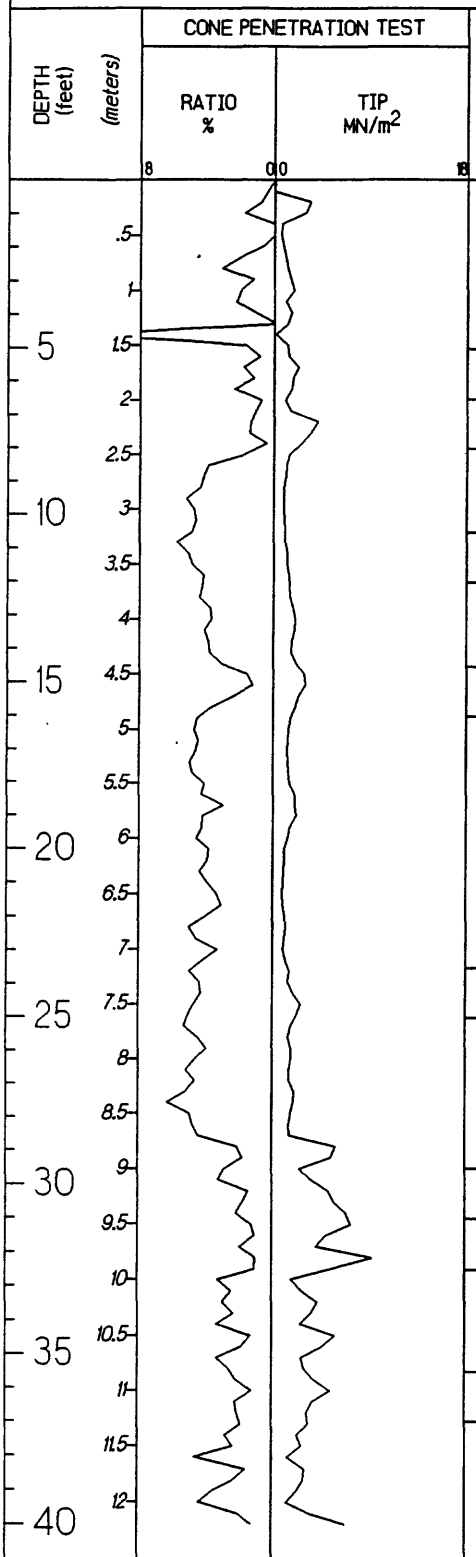
PERSONNEL L: Ponti; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 361824.0, Y: 3793886.1

GROUNDWATER

ELEVATION 1046 ft.; 318.8 m MSL



SPT - N	D_{50} (mm)	FINES (%)	CLASS	UNIT	SOIL DESCRIPTION
				A	Fill, Sandy silt, very dark grayish brown 10YR3/2
	0.061 0.092	55 45	CL SM		Sandy lean CLAY, very dark brown, 10YR2/2, no roots/organics, no open pores, gravel to 30 mm slightly plastic, disseminated carbonate increases with depth; and silty SAND
7	0.119 0.080	40 48	SM		Silty SAND, dark yellowish brown 10YR4/4, massive, loose, violent effervescence
9	0.094 0.101	43 40	SM		Silty SAND, dark yellowish brown 10YR4/6, massive, friable, gravel to 25 mm
	0.054 0.022	59 81	CL		Sandy lean CLAY to lean CLAY with sand, dark yellowish brown 10YR4/4 (top) 3/6 (bottom) massive, abundant disseminated carbonate, open pores and carbonate stringers most abundant in bottom 1/2
10	0.022 0.052	70 57	CL	B	Sandy lean CLAY, brown to dark brown 10YR4/3, slightly plastic and sticky, massive, carbonate filaments,
10	0.045 0.035	64 68	CL		Sandy lean CLAY, dark yellowish brown 10YR4/4, slightly plastic and sticky, massive, friable, gravel to 7 mm
	0.039 0.050	73 62	CL		Lean CLAY with sand to sandy lean CLAY, dark yellowish brown 10YR4/4, slightly sticky and plastic, massive to weakly platy, rare gravel, carbonate filaments, and small pores
	0.034 0.025	75 85	CL		Lean CLAY with sand, 2.5Y4/4 olive brown to 10YR3/6 dark yellowish brown, small open pores abundant, strongly effervescent massive, slightly plastic, large blocky structure, no roots or organics
10	0.029	68	CL		Sandy lean CLAY, dark brown 10YR3/3, plastic and sticky, firm, some carbonate filaments
	0.039 0.032	82 65	CL	C	Lean CLAY with sand, brown to dark brown 10YR4/3, slightly sticky and plastic massive, very friable, few to common pores
14	0.046 0.149	63 34	CL SM		Sandy lean CLAY (top), silty SAND (bottom), both dark yellowish brown 10YR4/4, slightly sticky and plastic, few pores, moderate effervescence
10	0.137 0.022	34 84	SM CL		Silty SAND to lean CLAY with sand, dark yellowish brown 10YR4/4, gravel to 20 mm, some rotten clasts
19	0.044 0.351	63 23	CL SM		Lean CLAY with sand to silty SAND, dark yellowish brown 10YR4/4, gravel to 20 mm,
	0.025 0.120	88 36	ML SM		Interbedded silty SAND to SILT with sand, dark yellowish brown 10YR4/4, not sticky or plastic, massive, very friable, rare pores, few-common carbonate filaments, moderately effervescent
				D	

REMARKS: Dry at 53.5 ft.
South of Rinaldi, behind gas station, 159 ft west of Balboa curb.

Magnitude= 6.8

Acceleration= 0.84

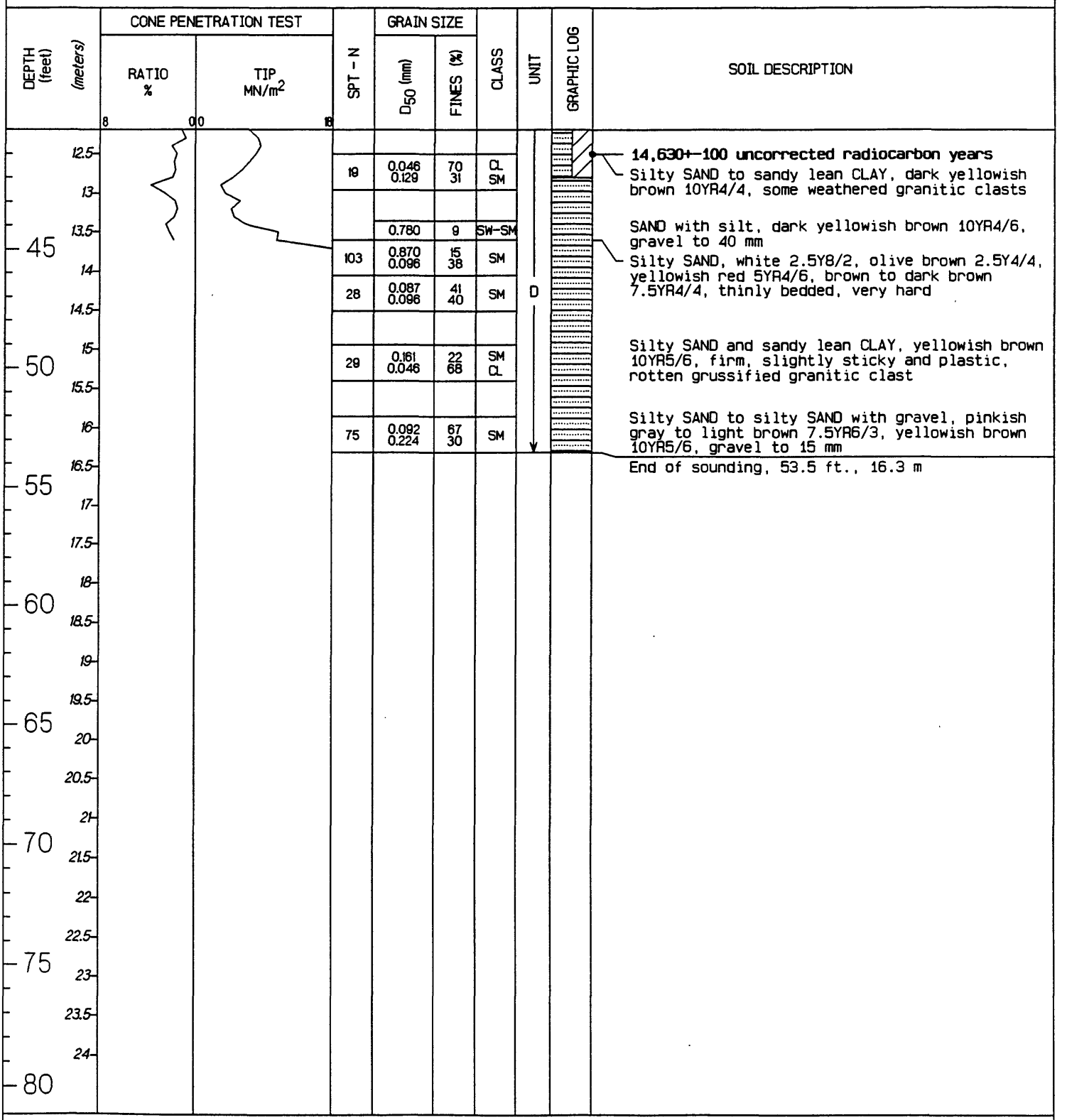
USGS GEOTECHNICAL LOG

HOLE NUMBER 16 | PROJECT Northridge Ground Deformation Studies

LOCATION Balboa Boulevard (BAL) | COORDINATES X: 361824.0, Y: 3793886.1

DATE DRILLED CPT: 4-14-95; SPT: 5-23-95 | GROUNDWATER

PERSONNEL L: Ponti; D: Bennett/Criley | ELEVATION 1046 ft.; 318.8 m MSL

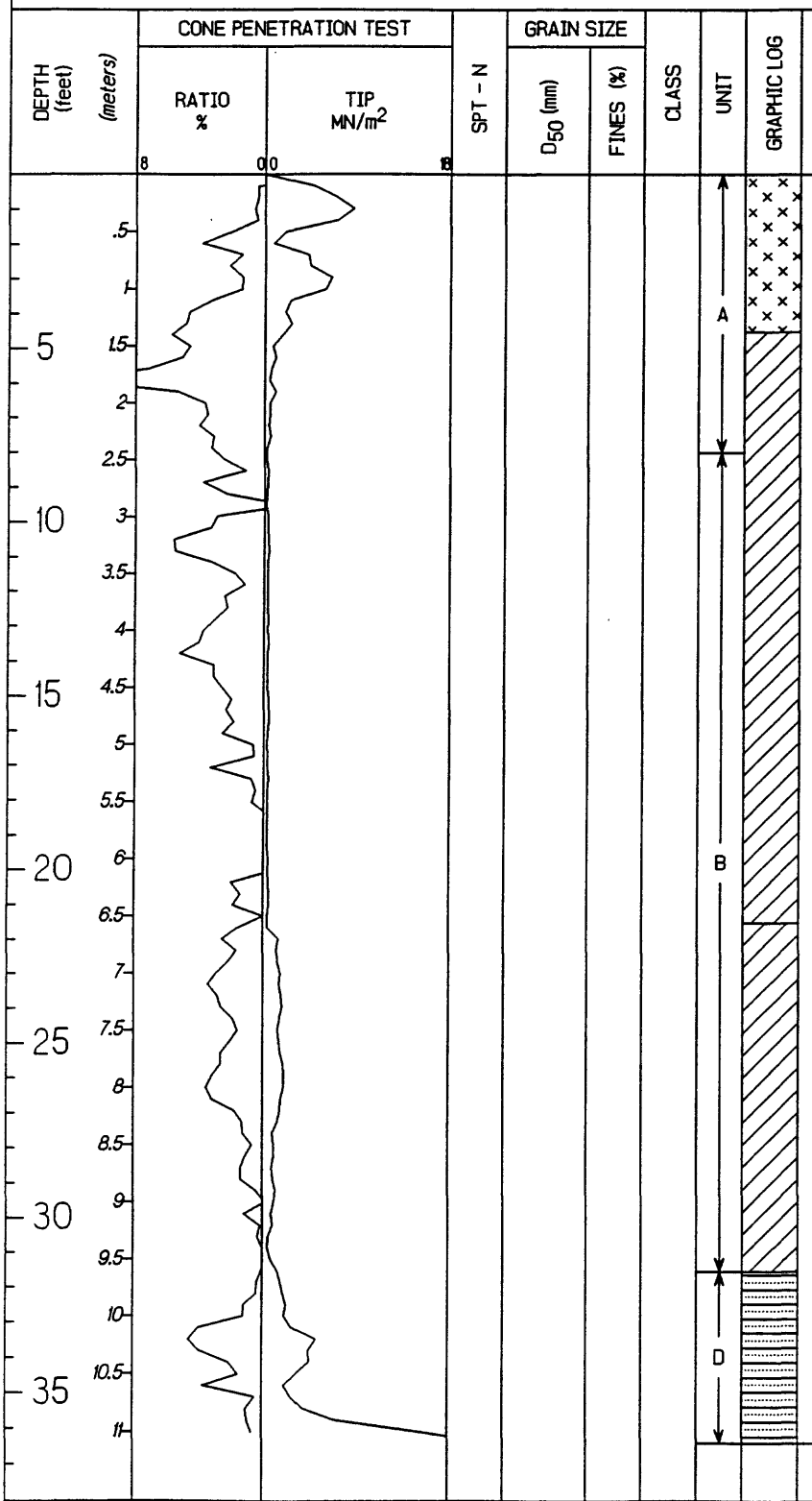


Magnitude= 6.8 | Acceleration= 0.84

USGS GEOTECHNICAL LOG

HOLE NUMBER 1
LOCATION Malden Street (MAL)
DATE DRILLED CPT: 4-4-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 357176.0, Y: 3788043.5
GROUNDWATER
ELEVATION 790.5 ft.; 240.9 m MSL



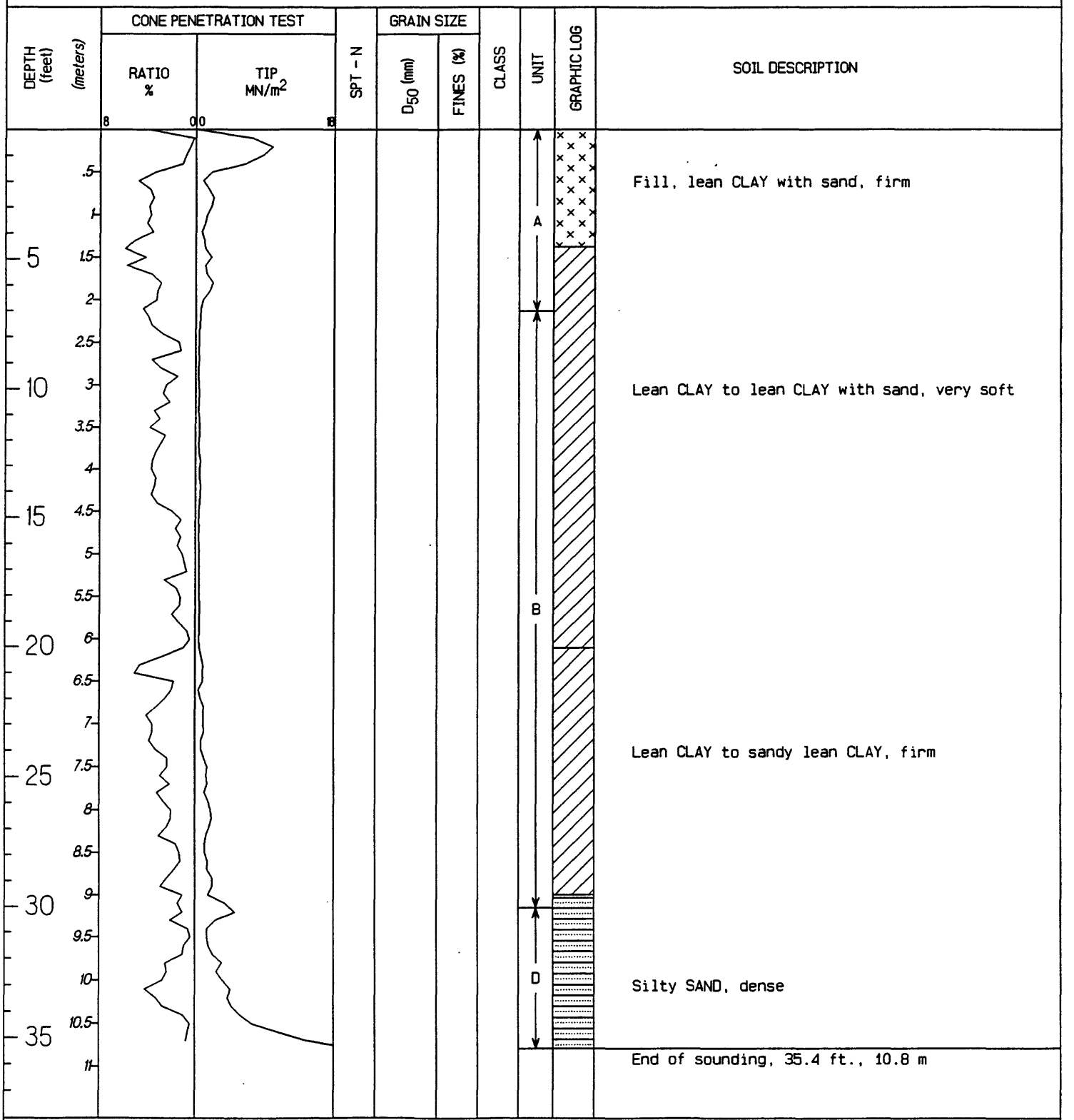
REMARKS: Southernmost sounding, closest to brick fence.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 2
PROJECT Northridge Ground Deformation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357167.3, Y: 3788061.4
DATE DRILLED CPT: 4-5-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 790.1 ft.; 240.8 m MSL



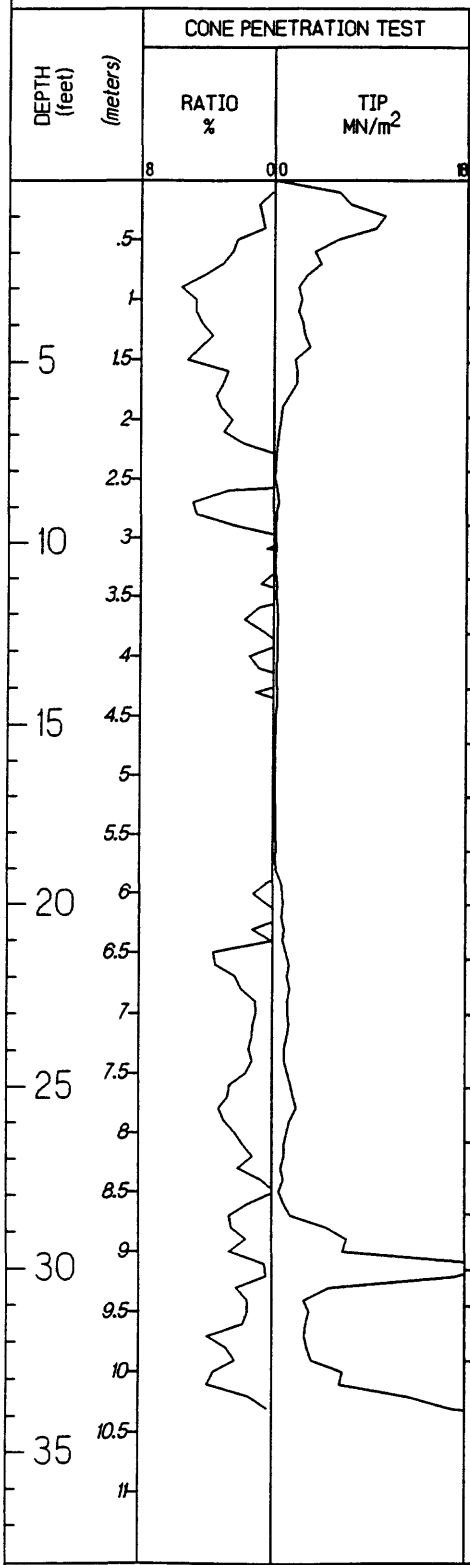
REMARKS:

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 3a
PROJECT Northridge Ground Dedormation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357164.1, Y: 3788063.6
DATE DRILLED CPT: 4-4-95; SPT: 4-25-95
GROUNDWATER 12.7 ft.; 3.9 m
PERSONNEL L: Tinsley; D: Bennett/Criley
ELEVATION 790.1 ft.; 240.8 m MSL



SPT - N	GRAIN SIZE D_{50} (mm)	GRAIN SIZE FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
				A		Silty sand, fill, compacted, dark yellowish brown, 10YR3/3, dense, poorly sorted, imported granitic pebbles to 30 mm, massive, clay and silt increase downward, slightly sticky and plastic
						No recoverey, asphalt chunk in tip of sampler, fill
3	0.017	72	CL			Lean CLAY with sand, soft, olive brown 2.5Y4/4, slightly sticky and plastic, poorly bedded, few fine tubular pores, no organics, highly effervescent, pp=1 ksc
3	0.006	86	CL			Lean CLAY, olive brown 2.5Y4/4 moist, micaeous, soft, slightly sticky and plastic, thin silty laminations to 3 mm, gravel to 5 mm, effervescent, no organics or fossils, pp=0.8 ksc
3	0.011 0.005	86	CL			Lean CLAY, olive brown 2.5Y4/4, abundant tubular pores, very minor paleosol, slightly sticky and plastic, soft, pp=0.4 ksc, occassional 3-mm thick silt laminations disseminated carbonate, carbonate fills pores
1	0.004 0.006	81 79	CL	B		Lean CLAY with sand, light olive brown 2.5Y5/4, soft, slightly sticky and plastic, minor "A" horizon darkened by organic matter, disseminated carbonate, pp=1.5 ksc
5	0.004	83 75	CL			Lean CLAY with sand, dark grayish brown, 10YR4/3 to 4/2, soft, slightly sticky and plastic, disseminated carbonate, carbonate in tubular pores, silt stringers to 12-mm thick; organic mottles "A6"; soft to slightly hard, pp=0.6 ksc
30	0.004 0.013	79 75	CL			Lean CLAY with sand, dark grayish brown 2.5Y4/2, soft to hard, slightly sticky and plastic, many fine distinct brownish yellow mottles, disseminated carbonate, carbonate fills tubular pores, few organics
10	0.005 0.007	74 83	CL			Lean CLAY with sand, olive 5Y5/3 and grayish brown 2.5Y5/2, soft, sticky and slightly plastic, massive, no roots, thinly laminated to 2 mm, many light olive mottles, filigree carbonate in tubular pores, no organics or fossils, pp=0.3 ksc
25	1.270 0.022	25 73	SM CL	D		Silty SAND with gravel, light brownish gray 2.5Y6/2, clasts to 150 mm, dense, 30 mm sandstone clast, slight carbonate cementation, many pores, weak SAB; lean CLAY with sand, brown 10YR5/3, hard, slightly sticky and plastic, effervescent, possible paleosol
30	0.019 0.375	68 32	CL SM			Silty SAND, grayish brown 2.5Y5/2, dense, well stratified, effervescent; sandy lean CLAY, yellow brown 10YR5/4, gravel to 20 mm, dense, poorly bedded, sticky and plastic; silty SAND, light yellowish brown 10YR6/4
						End of sounding, 34.1 ft., 10.4 m

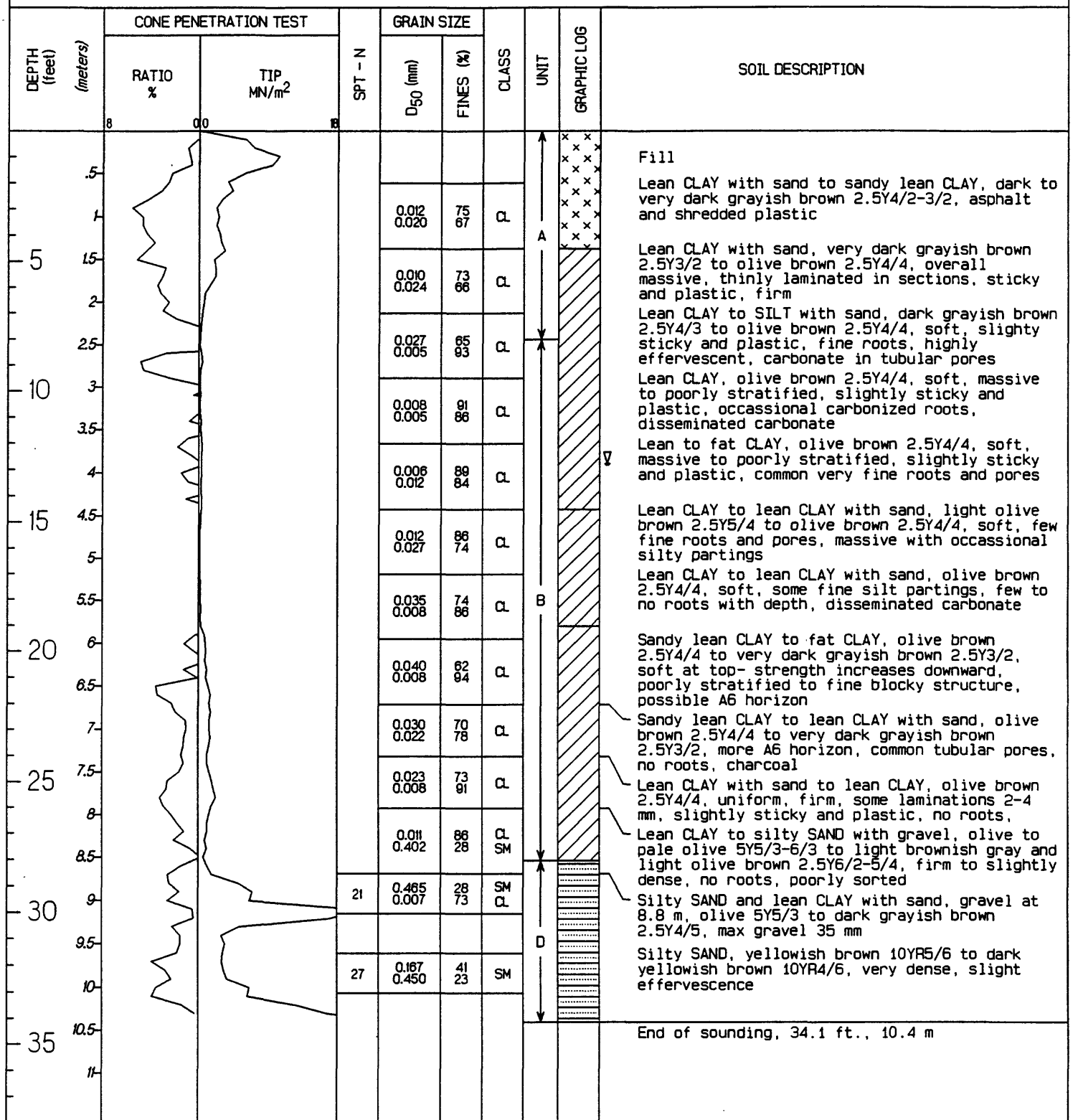
REMARKS: In graben, in failure zone.
Vane measurements from mal3c.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 3b
PROJECT Northridge Ground Deformation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357166.1, Y: 3788063.3
DATE DRILLED CPT: 4-4-95; Tubes: 5-2 & 3-95
GROUNDWATER 12.7 ft.; 3.9 m
PERSONNEL L: Bennett; D: Bennett/Criley
ELEVATION 790 ft.; 240.8 m MSL



REMARKS: In graben, in failure zone.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 3c

LOCATION Malden Street (MAL)

DATE DRILLED Vane test: 7-31-95

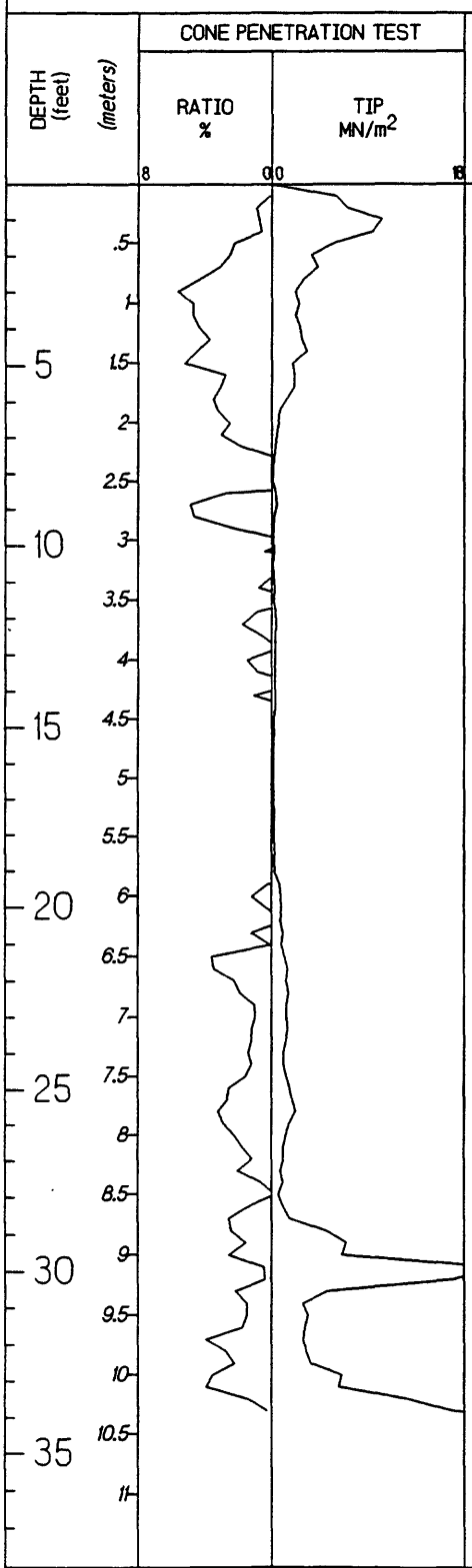
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Dedormation Studies

COORDINATES X: 357165, Y: 3788063.5

GROUNDWATER 12.7 ft.; 3.9 m

ELEVATION 790 ft.; 240.8 m MSL



Vane peak kPa	Vane remolded kPa
120+	na
120+	na
81	19
58	25
46	16
37	19
34	15
39	16
32	13
57	18
44	16
45	16
33	14
19	14
24	18
32	19
29	19
25	16
36	24
120	na
57	32
117	34

SOIL DESCRIPTION

Silty sand, fill, compacted, dark yellowish brown, 10YR3/3, dense, poorly sorted, imported granitic pebbles to 30 mm, massive, clay and silt increase downward, slightly sticky and plastic

No recoverey, asphalt chunk in tip of sampler, fill

Lean CLAY with sand, soft, olive brown 2.5Y4/4, slightly sticky and plastic, poorly bedded, few fine tubular pores, no organics, highly effervescent, pp=1 ksc

Lean CLAY, olive brown 2.5Y4/4 moist, micaeous, soft, slightly sticky and plastic, thin silty laminations to 3 mm, gravel to 5 mm, effervescent, no organics or fossils, pp=0.8 ksc

Lean CLAY, olive brown 2.5Y4/4, abundant tubular pores, very minor paleosol, slightly sticky and plastic, soft, pp=0.4 ksc, occassional 3-mm thick silt laminations disseminated carbonate, carbonate fills pores

Lean CLAY with sand, light olive brown 2.5Y5/4, soft, slightly sticky and plastic, minor "A" horizon darkened by organic matter, disseminated carbonate, pp=1.5 ksc

Lean CLAY with sand, dark grayish brown, 10YR4/3 to 4/2, soft, slightly sticky and plastic, disseminated carbonate, carbonate in tubular pores, silt stringers to 12-mm thick; organic mottles "A6"; soft to slightly hard, pp=0.6 ksc

Lean CLAY with sand, dark grayish brown 2.5Y4/2, soft to hard, slightly sticky and plastic, many fine distinct brownish yellow mottles, disseminated carbonate, carbonate fills tubular pores, few organics

End of sounding, 23 ft., 7 m

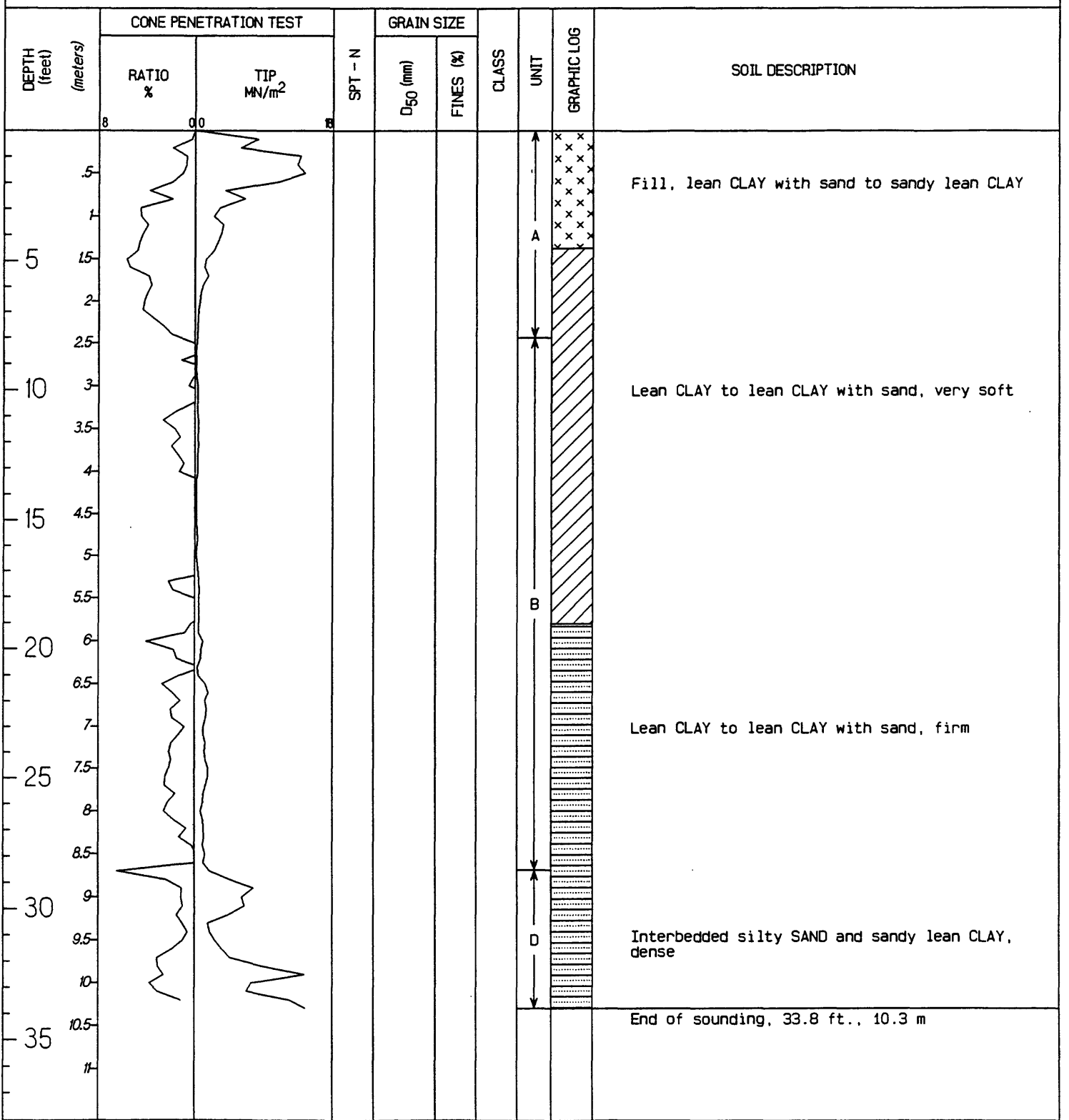
REMARKS: In graben, in failure zone.
Descriptions from Mal-3a

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 4
PROJECT Northridge Ground Deformation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357163.1, Y: 3788068.2
DATE DRILLED CPT: 4-4-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 790.2 ft.; 240.9 m MSL



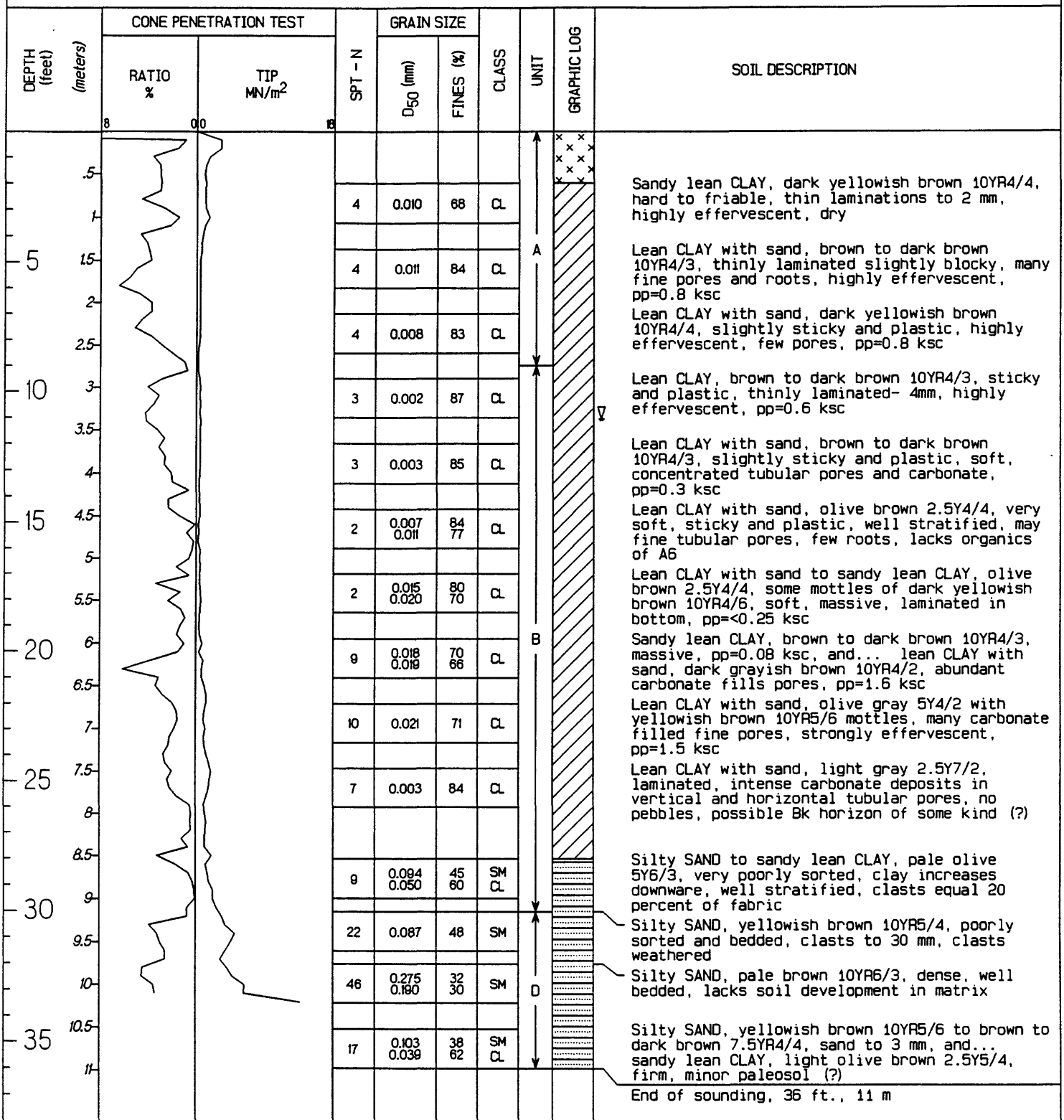
REMARKS: Outside of graben.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 5a
PROJECT Northridge Ground Deformation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357160.1, Y: 3788076.6
DATE DRILLED CPT: 4-4-95; SPT: 4-26-95
GROUNDWATER 11 ft.; 3.4 m
PERSONNEL L: Tinsley; D: Bennett/Criley
ELEVATION 790.0 ft.; 240.8 m MSL



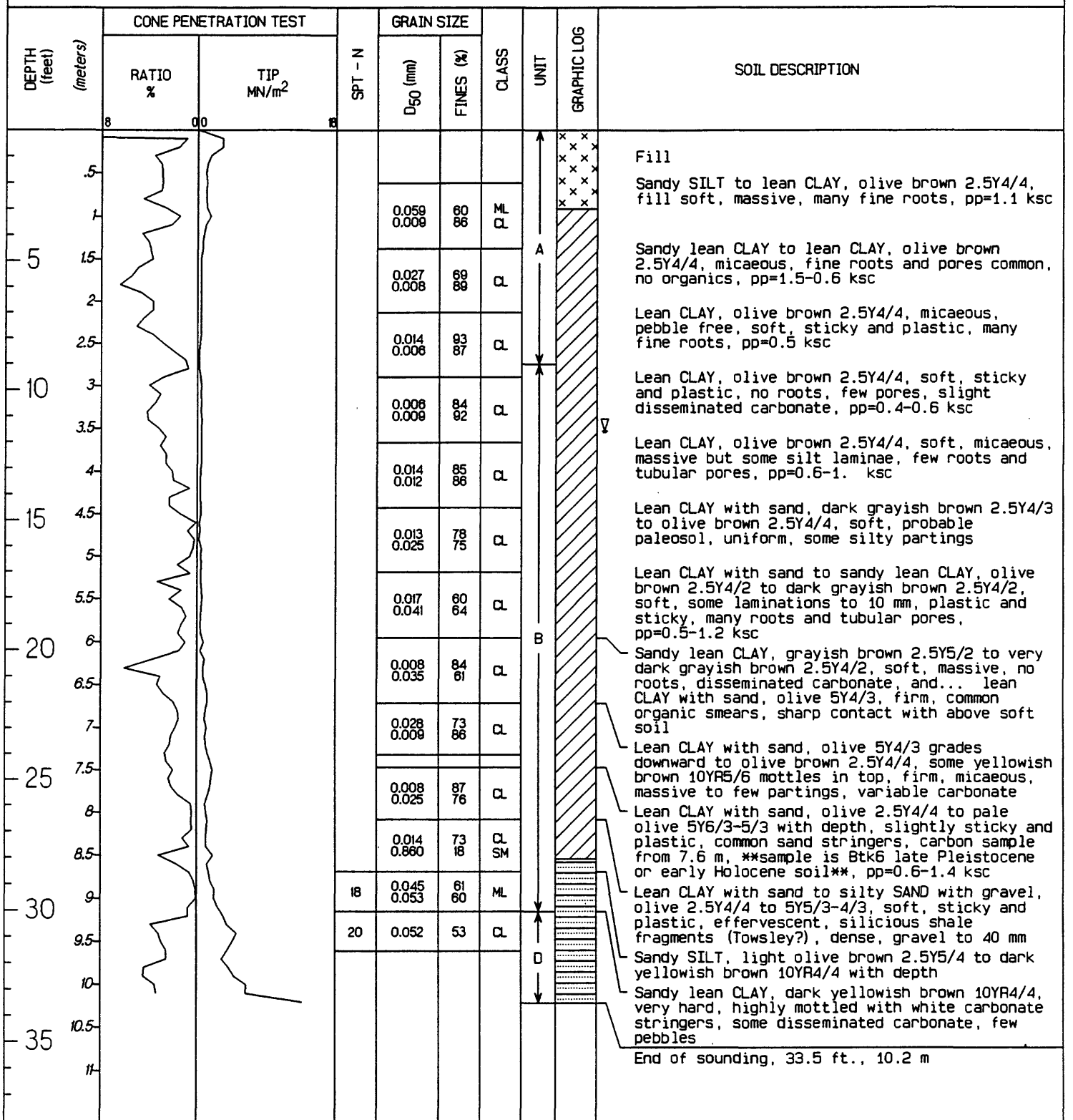
REMARKS: Northernmost within lot.
Next to the fence on Malden.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 5b
PROJECT Northridge Ground Deformation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357158.6, Y: 3788076.8
DATE DRILLED CPT: 4-4-95; Tubes: 5-1-95
GROUNDWATER 11.5 ft.; 3.5 m
PERSONNEL L: Bennett; D: Bennett/Criley
ELEVATION 790.0 ft.; 240.8 m MSL



REMARKS: Northernmost within lot.

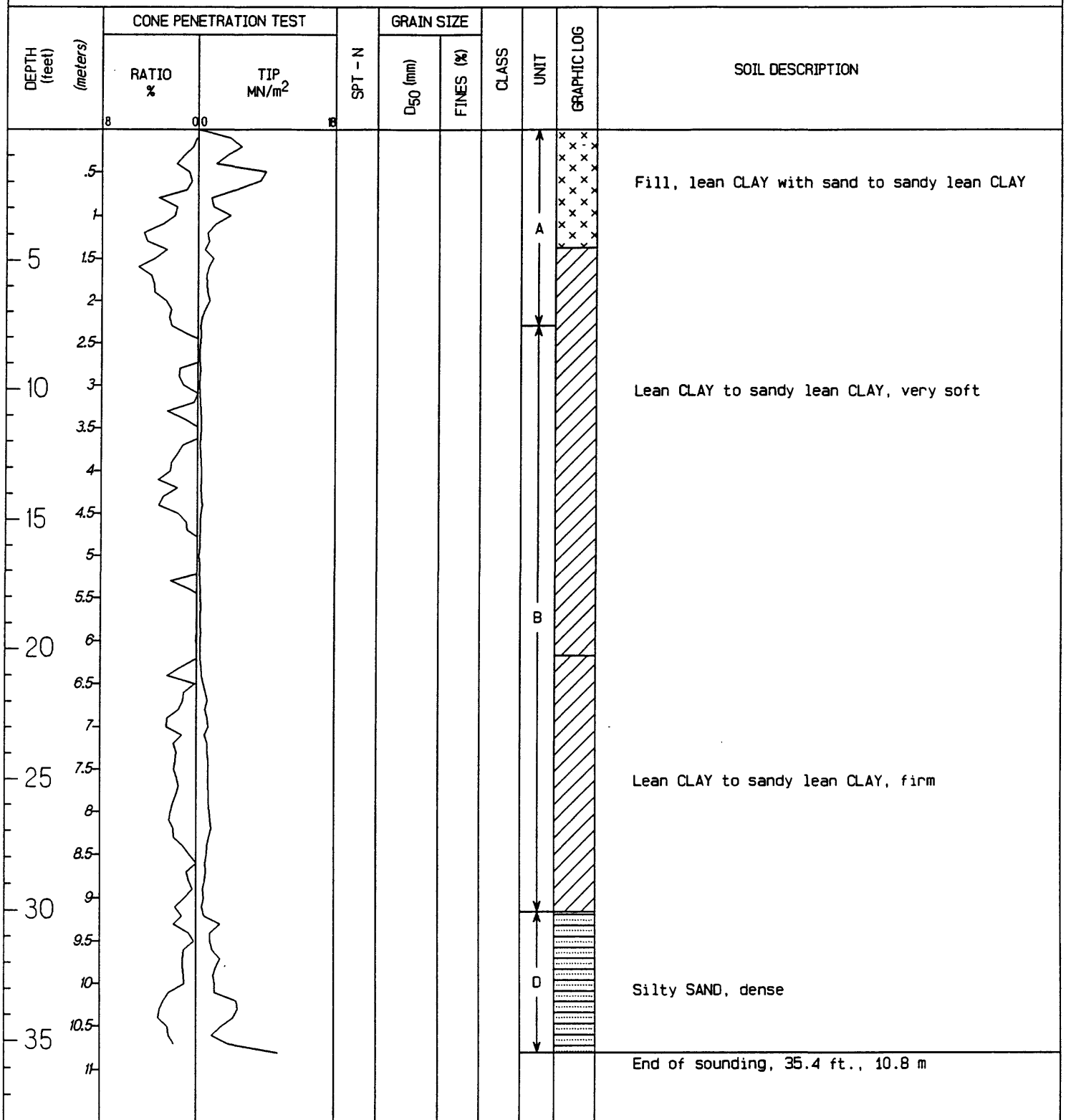
Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 6
LOCATION Malden Street (MAL)
DATE DRILLED CPT: 4-5-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 357158.7, Y: 3788049.5
GROUNDWATER
ELEVATION 790.3 ft.; 240.9 m MSL



REMARKS: Westernmost within lot, near southwest corner.

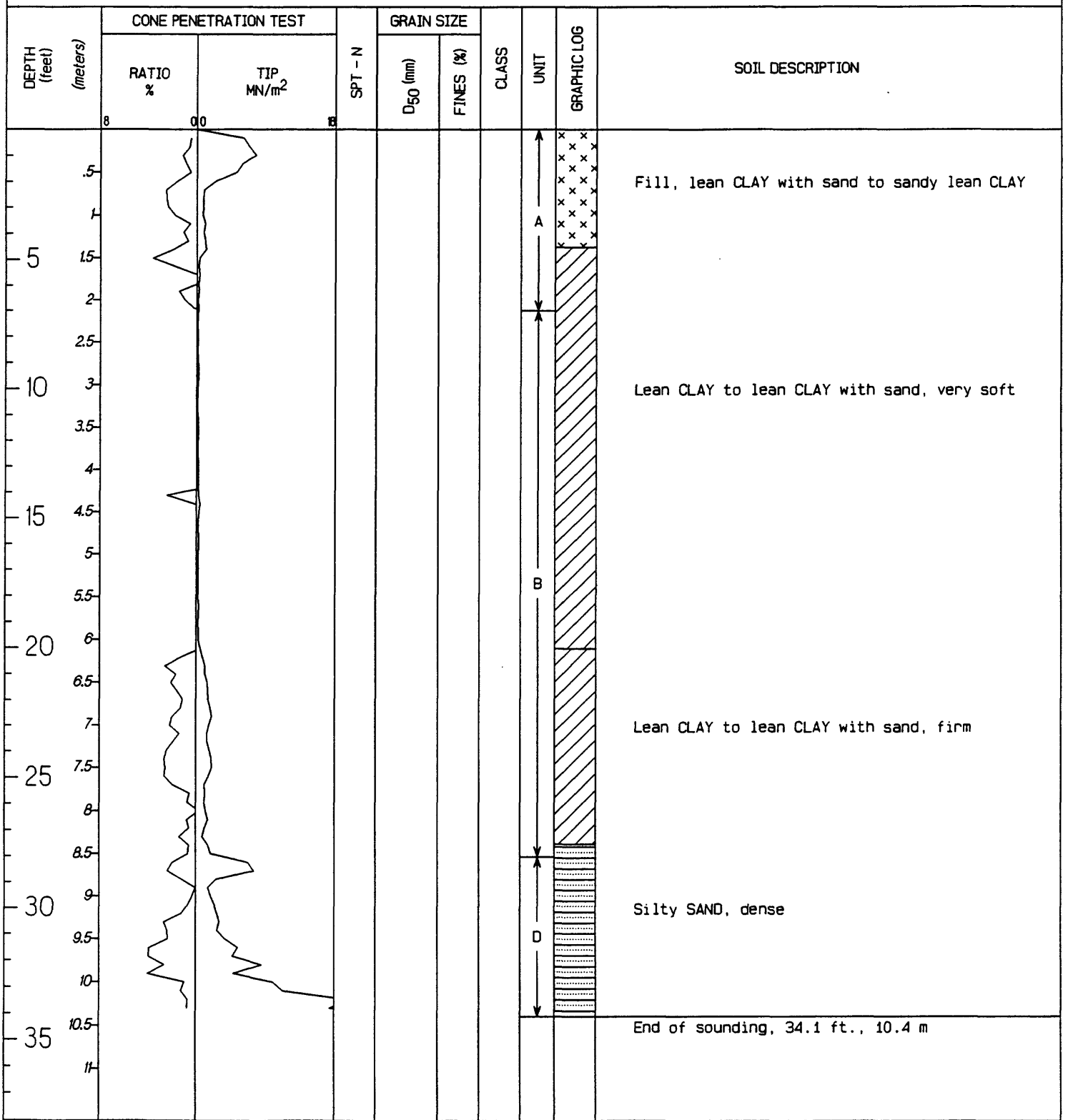
Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 7
LOCATION Malden Street (MAL)
DATE DRILLED CPT: 4-5-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 357181.8, Y: 3788072.4
GROUNDWATER
ELEVATION 789.4 ft.; 240.6 m MSL



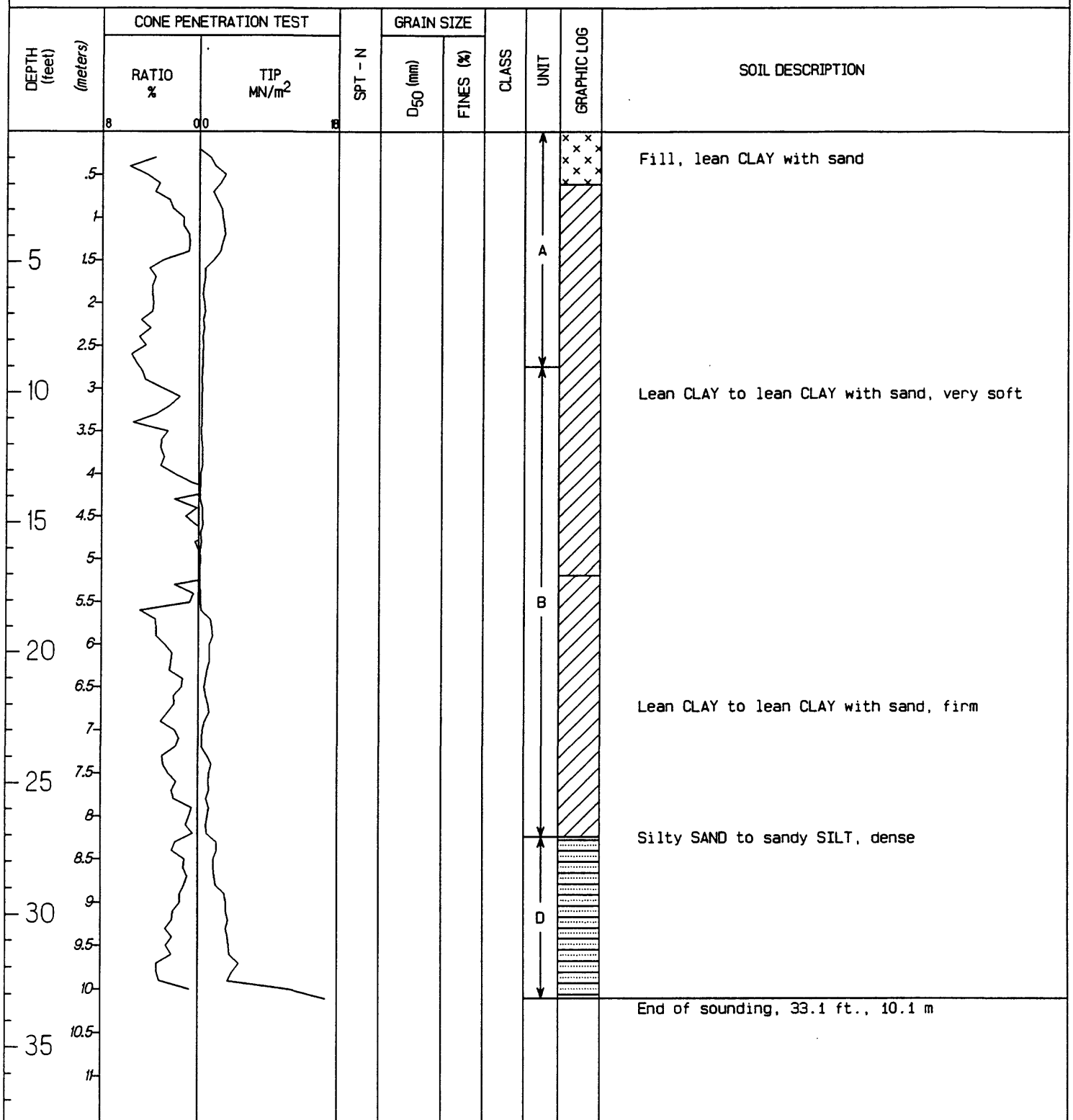
REMARKS: In northeastern corner, in front of gate.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 8
PROJECT Northridge Ground Deformation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357154.1, Y: 3788086.7
DATE DRILLED CPT: 4-5-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 789.4 ft.; 240.6 m MSL



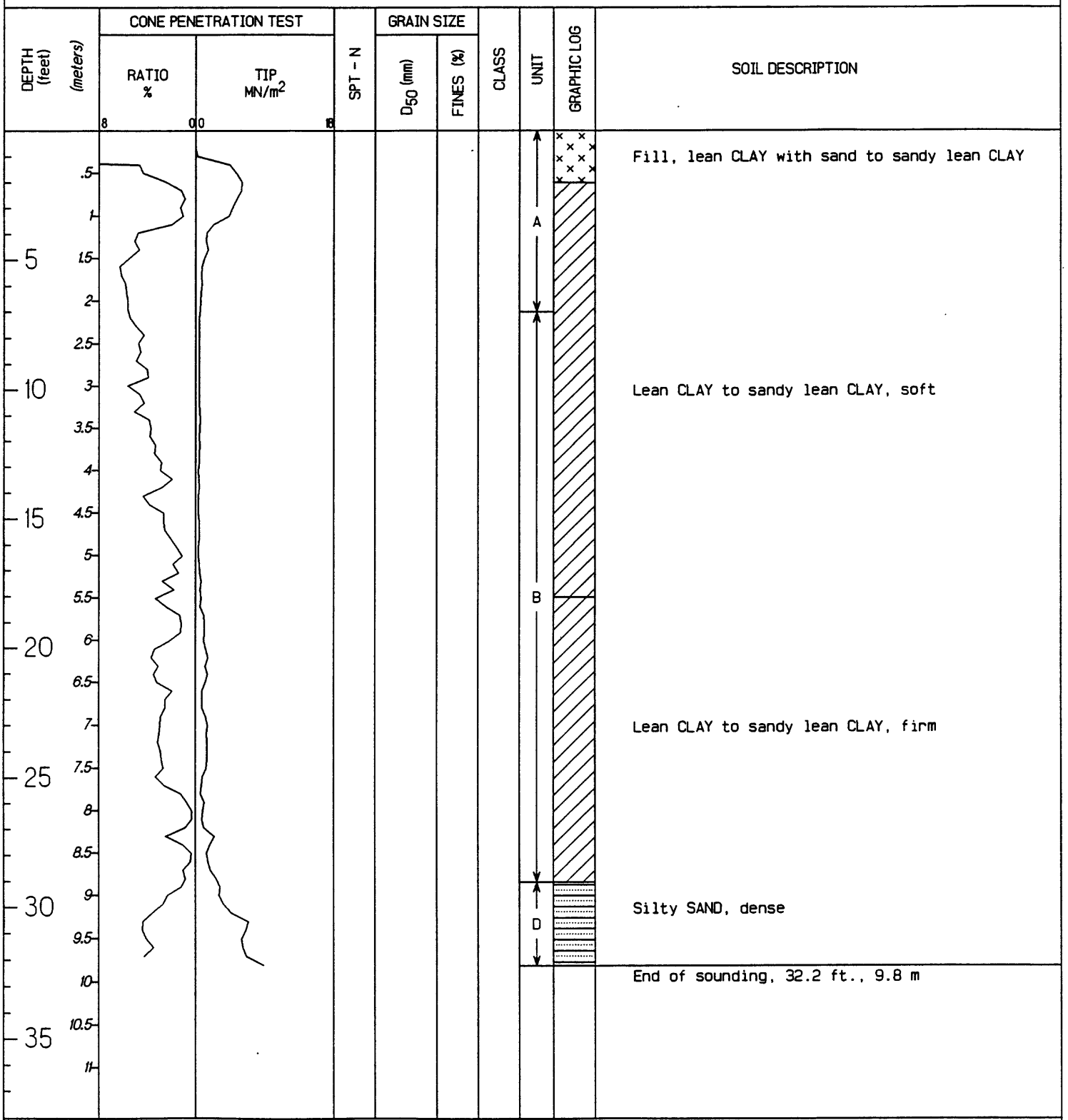
REMARKS: Located in Malden Street in line with sounding line 1-5.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 9
PROJECT Northridge Ground Deformation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357182.1, Y: 3788142.1
DATE DRILLED CPT: 4-5-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 791 ft.; 241.1 m MSL



REMARKS: On Beckford Avenue, furthest from failure.

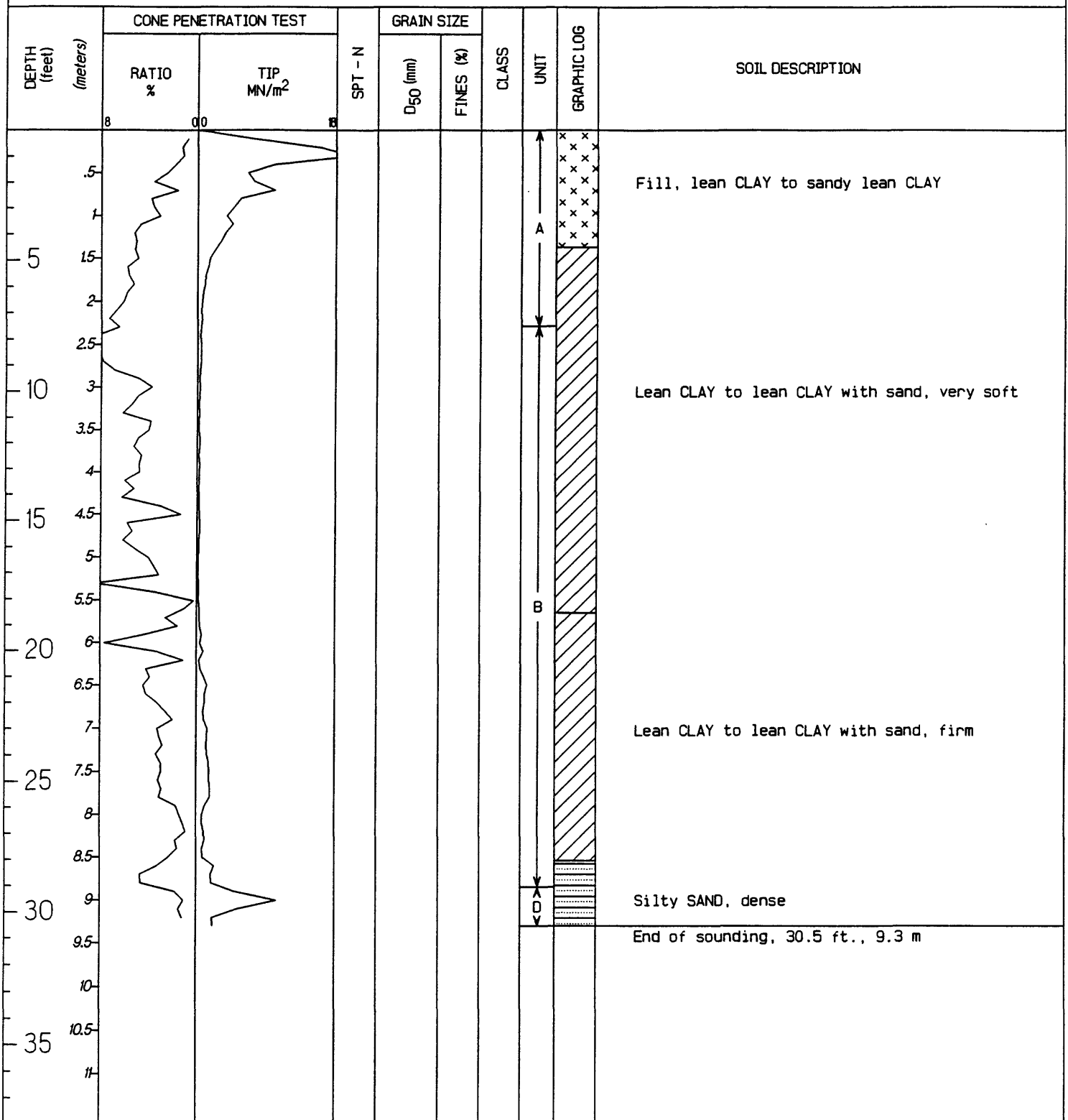
Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 10
LOCATION Malden Street (MAL)
DATE DRILLED CPT: 8-1-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 357164.9, Y: 3788056.7
GROUNDWATER
ELEVATION 790.1 ft.; 240.8 m MSL



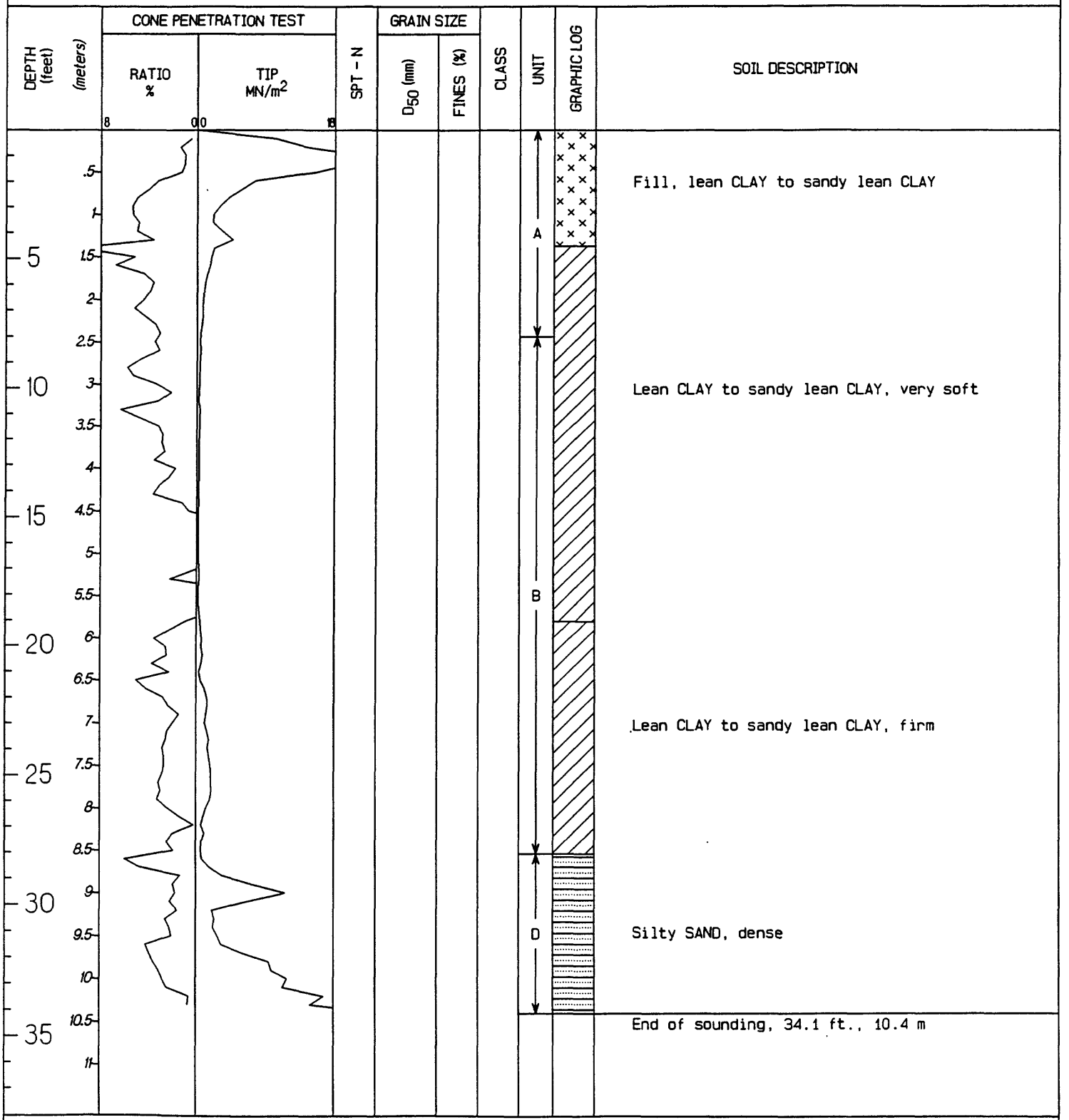
REMARKS: Southern most sounding in mini-line across graben.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 11
PROJECT Northridge Ground Deformation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357164.9, Y: 3788059.5
DATE DRILLED CPT: 8-1-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 790 ft.; 240.8 m MSL



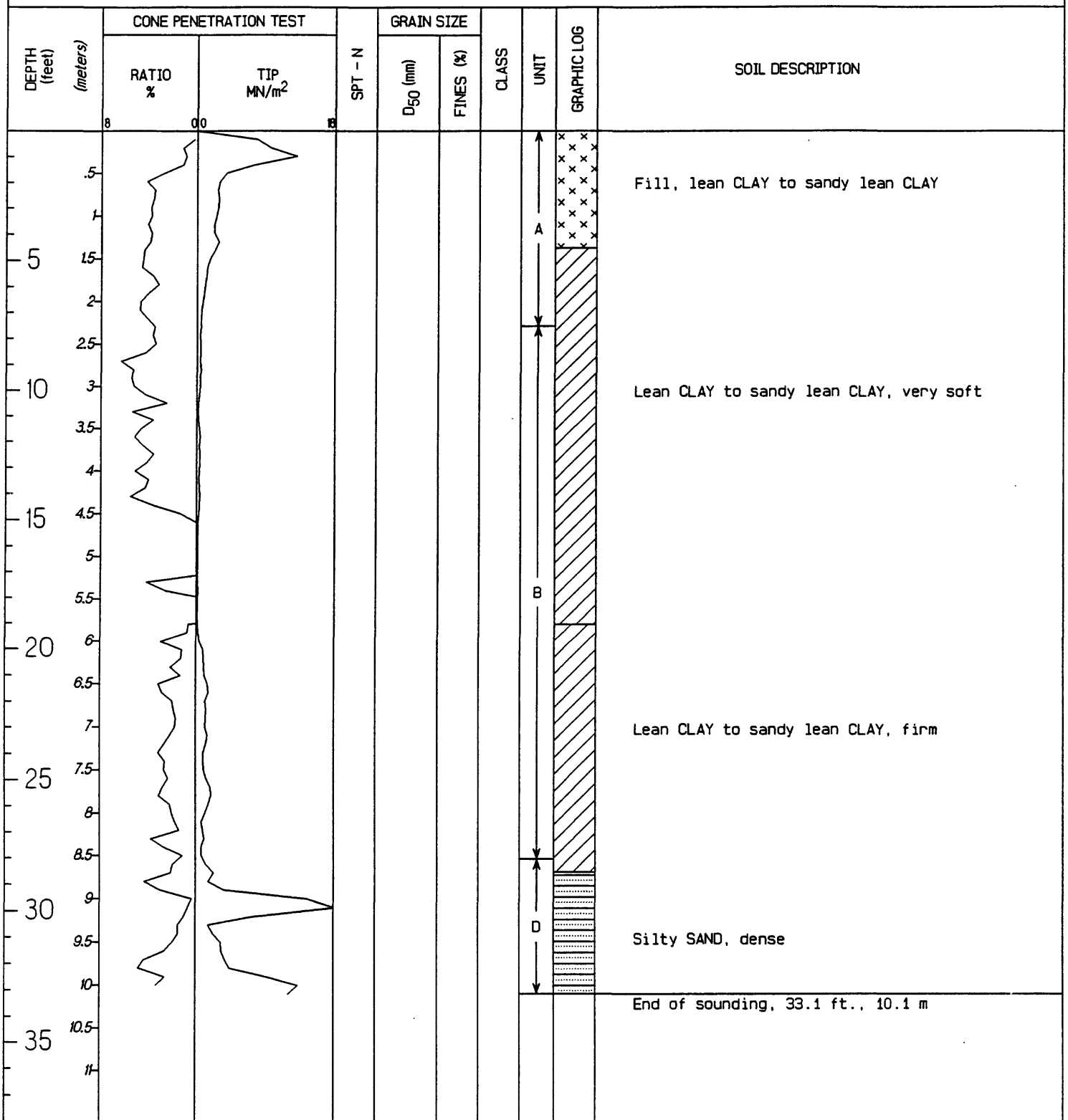
REMARKS: Mini-line.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 12
PROJECT Northridge Ground Deformation Studies
LOCATION Malden Street (MAL)
COORDINATES X: 357164.9, Y: 3788062.8
DATE DRILLED CPT: 8-1-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 789.9 ft.; 240.8 m MSL



REMARKS: Mini-line.

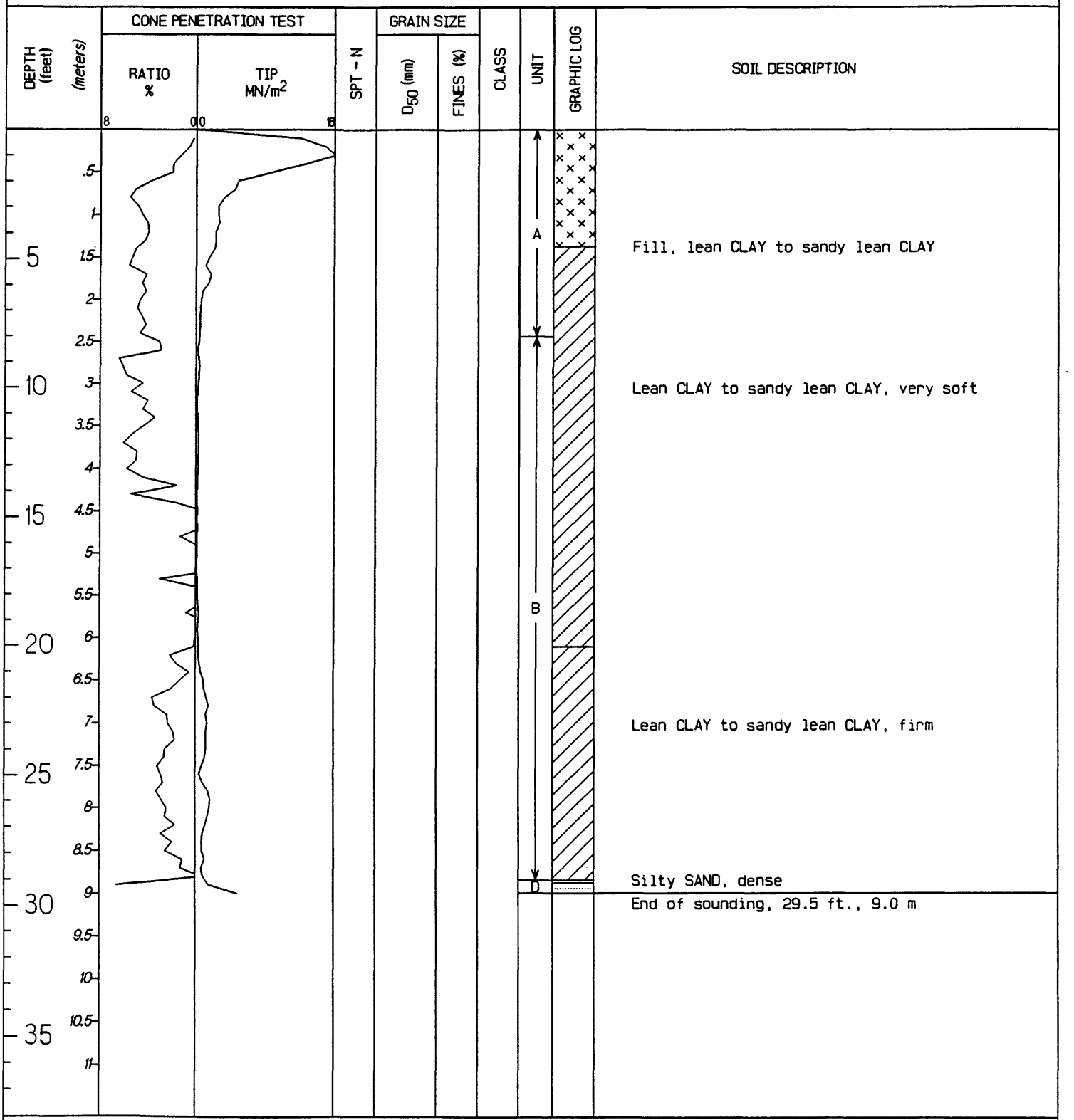
Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 13
LOCATION Malden Street (MAL)
DATE DRILLED CPT: 8-1-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 357164.9, Y: 3788066.2
GROUNDWATER
ELEVATION 790 ft.; 240.8 m MSL



REMARKS: Mini-line.

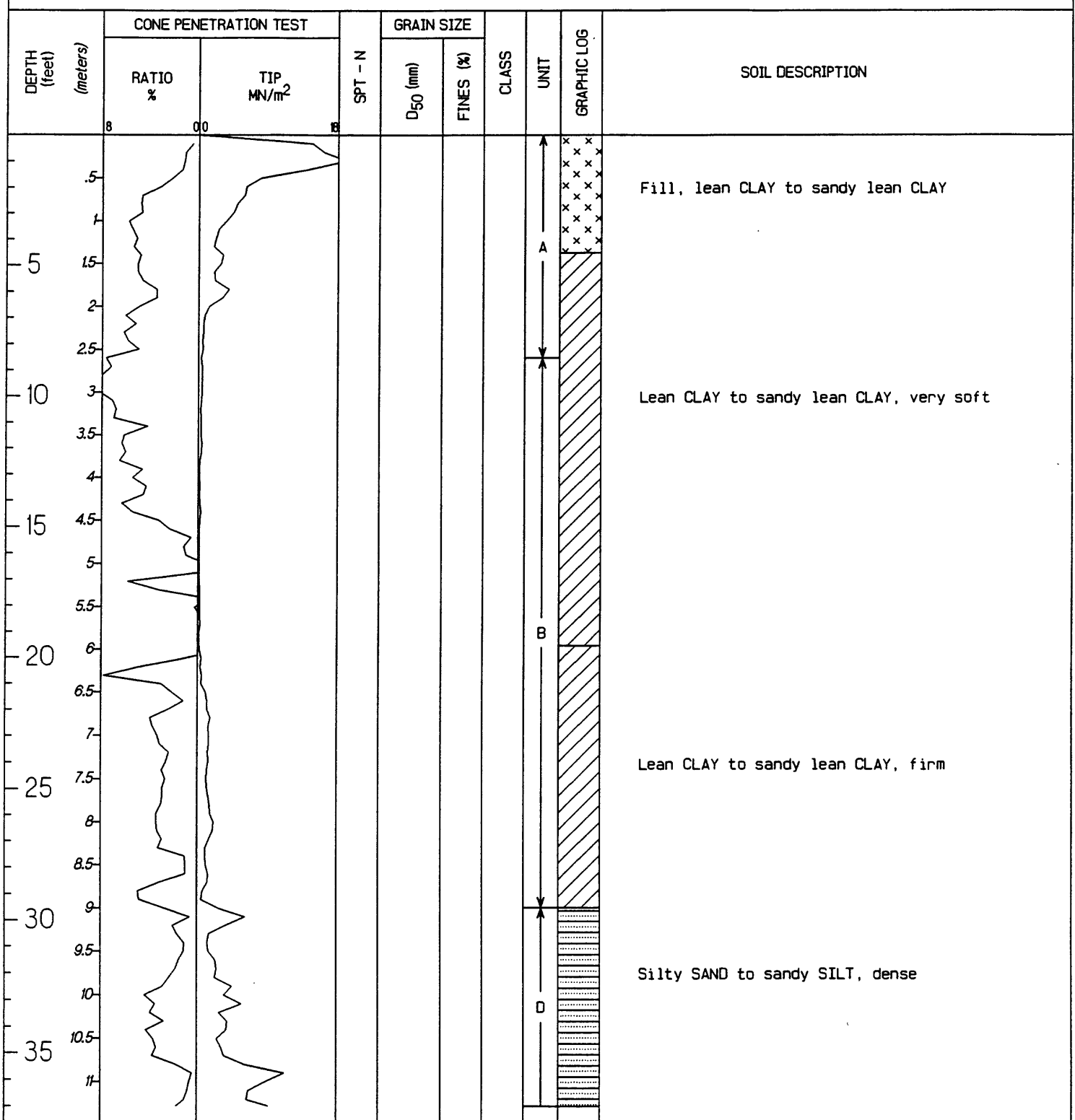
Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 14
LOCATION Malden Street (MAL)
DATE DRILLED CPT: 8-1-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 357164.9, Y: 3788068.9
GROUNDWATER
ELEVATION 790.2 ft; 240.9 m MSL



REMARKS: Northern most in mini-line.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 14
LOCATION Malden Street (MAL)
DATE DRILLED CPT: 8-1-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 357164.9, Y: 3788068.9
GROUNDWATER
ELEVATION 790.2 ft.; 240.9 m MSL

DEPTH (feet)	(meters)	CONE PENETRATION TEST: RATIO %	CONE PENETRATION TEST: TIP MN/m² (0 – 18)	SPT - N	GRAIN SIZE: D_{50} (mm)	GRAIN SIZE: FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
	11.5							D		
	12									
	12.5									End of sounding, 40.7 ft., 12.4 m
42	13									
	13.5									
	14									
47	14.5									
	15									
	15.5									
52	16									
	16.5									
	17									
57	17.5									
	18									
	18.5									
62	19									
	19.5									
	20									
67	20.5									
	21									
	21.5									
72	22									
	22.5									

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 15

LOCATION Melvin Avenue (MAL)

DATE DRILLED CPT: 6-18-96; SPT: 6-20-96

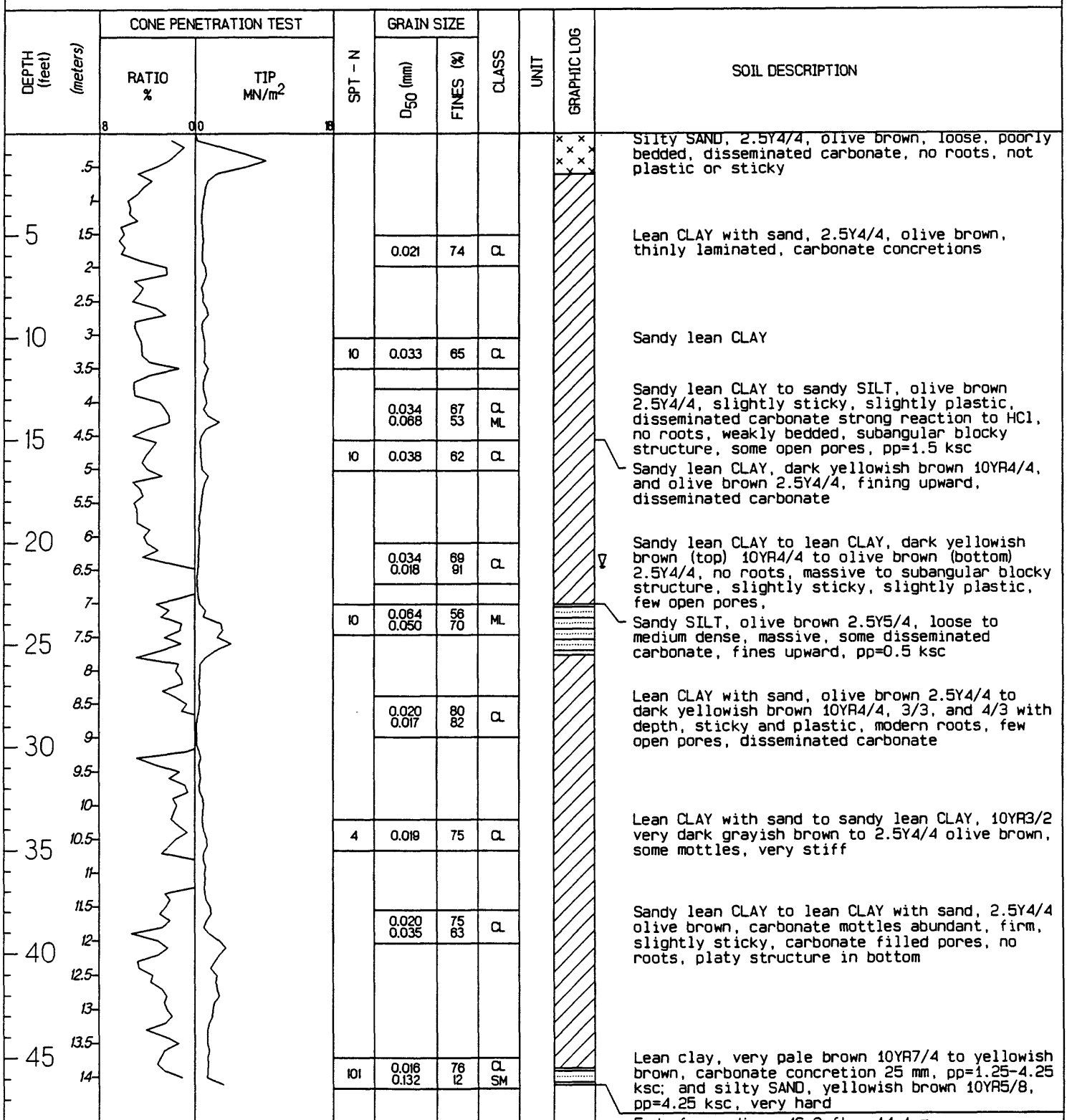
PERSONNEL L:Tinsley/Conaway; D:Bennett/Conaway

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 356404.2, Y: 3788181.7

GROUNDWATER 21.1 ft.; 6.4 m

ELEVATION 807 ft.; 246.0 m MSL



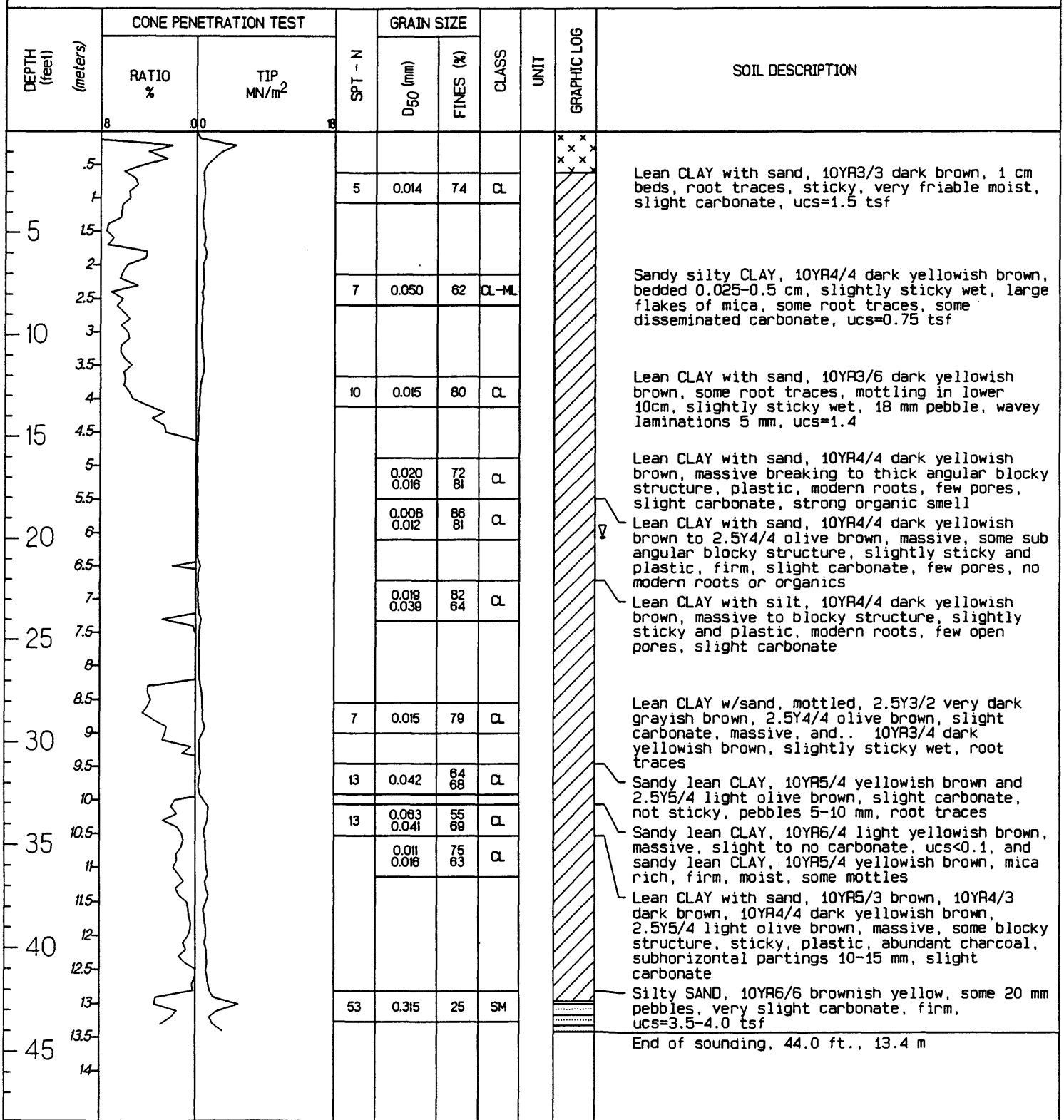
REMARKS: On Melvin Ave., between Chase and Bryant. 320 ft south of Bryant.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 16
PROJECT Northridge Ground Deformation Studies
LOCATION Cantara Street (MAL)
COORDINATES X: 356419.3, Y: 3787389.1
DATE DRILLED CPT: 6-18-96; SPT: 6-22-96
GROUNDWATER 19.8 ft.; 6.0 m
PERSONNEL L:Conaway; D:Bennett/Conaway
ELEVATION 789 ft.; 240.5 m MSL



SPT - N	D_{50} (mm)	FINES (%)	CLASS
5	0.014	74	CL
7	0.050	62	CL-ML
10	0.015	80	CL
	0.020	72	CL
	0.016	81	
	0.008	86	CL
	0.012	81	
	0.019	82	CL
	0.039	64	
7	0.015	79	CL
13	0.042	64	CL
		68	
13	0.063	55	CL
	0.041	69	
	0.011	75	CL
	0.016	63	
53	0.315	25	SM

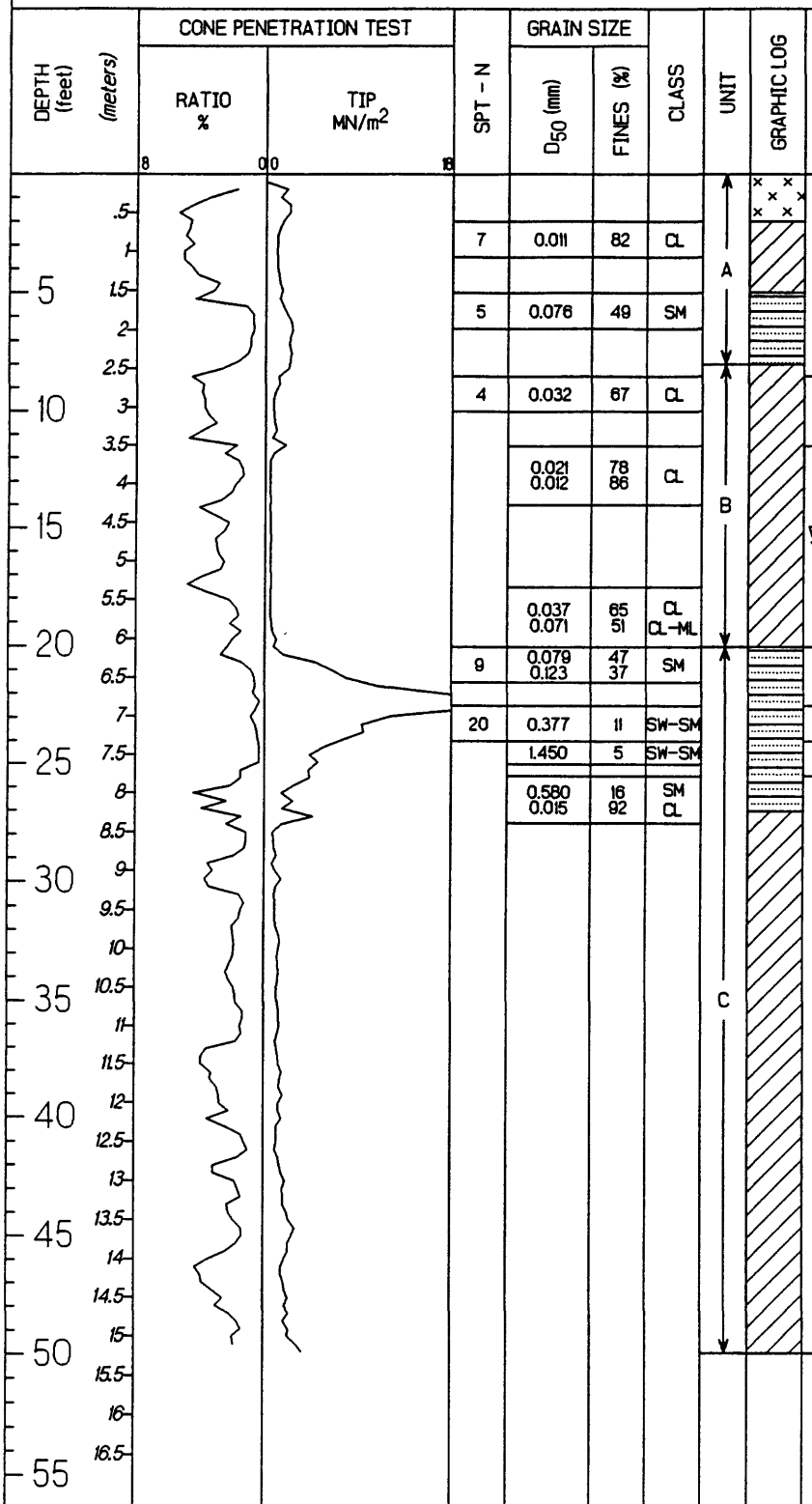
REMARKS: On Cantara St. between Corbin and Shirley in line with Melvin.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 1
PROJECT Northridge Ground Deformation Studies
LOCATION Wynne Avenue (WYN)
COORDINATES X: 359125.3, Y: 3787490.7
DATE DRILLED CPT: 4-6-95; SPT: 4-29-95
GROUNDWATER 15.5 ft.; 4.7 m
PERSONNEL L: Tinsley; D: Bennett/Criley
ELEVATION 766.9 ft.; 233.8 m MSL



Lean CLAY with sand, olive brown 2.5Y4/4, 2-4 mm laminae, slightly hard, sticky and plastic, disseminated carbonate in bedding and pores

Silty SAND, fine, olive brown 2.5Y4/4, slightly firm and friable, massive, poorly bedded and poorly sorted, occassional 5 mm pebbles of limestone and shale, pp=1-1.25 ksc

Sandy lean CLAY, olive brown 2.5Y4/4, soft, sticky and slightly plastic, flat gravel clasts, massive, occassional 2 mm laminae, no roots or pores, strongly effervescent, no organics, pp=1.5 ksc

Lean CLAY with sand, olive brown 2.5Y4/4, soft, many fine pores, few fine roots, disseminated carbonate, pp=<0.3 ksc

Sandy lean CLAY, olive brown 2.5Y4/4, soft in top, firmer at bottom, no roots, common tubular pore, pp=0.2-1.8 ksc

Silty SAND, olive brown 2.5Y4/4, well bedded, dense, ucs=2.2 ksc, in lower 1/3, soft and loose in upper 2/3, fines upward from basal gravely sand, disseminated carbonate, no pores

SAND with silt, light yellowish brown 2.5Y6/4, medium dense, friable, well stratified, fines upward, slightly effervescent, poorly sorted, gravelly

SAND with silt and gravel, light olive brown 2.5Y5/4, gravel to 40 mm

Lean CLAY grades downward to silty SAND, Well defined upward coarsening sequence: silty SAND and sandy SILT are also present

End of sounding, 49.9 ft., 15.2 m

REMARKS: At the north end of Wynne Avenue.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 2

LOCATION Wynne Avenue (WYN)

DATE DRILLED CPT: 4-6-95

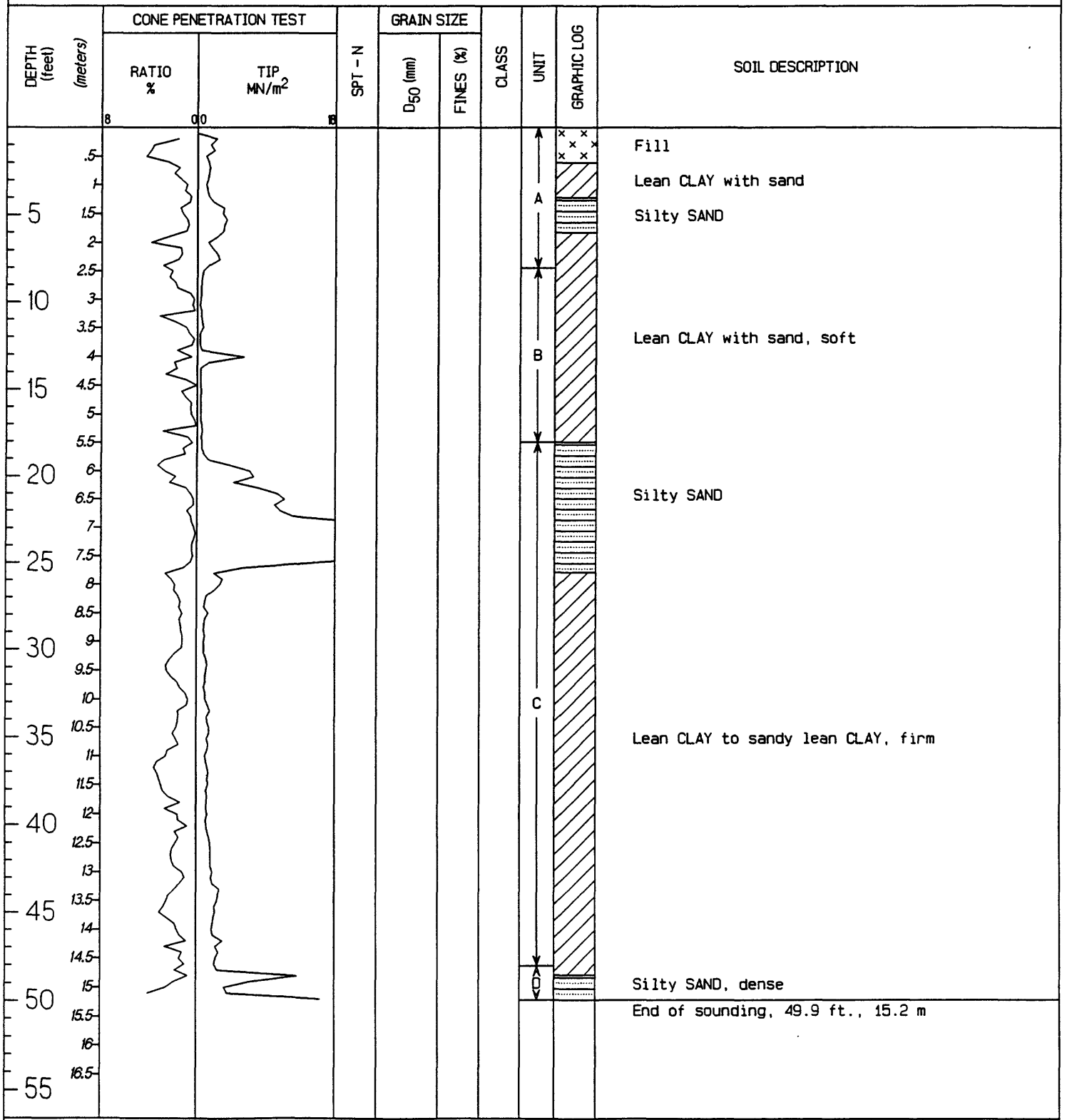
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 359123.3, Y: 3787434.8

GROUNDWATER

ELEVATION 764.7 ft.; 233.1 m MSL



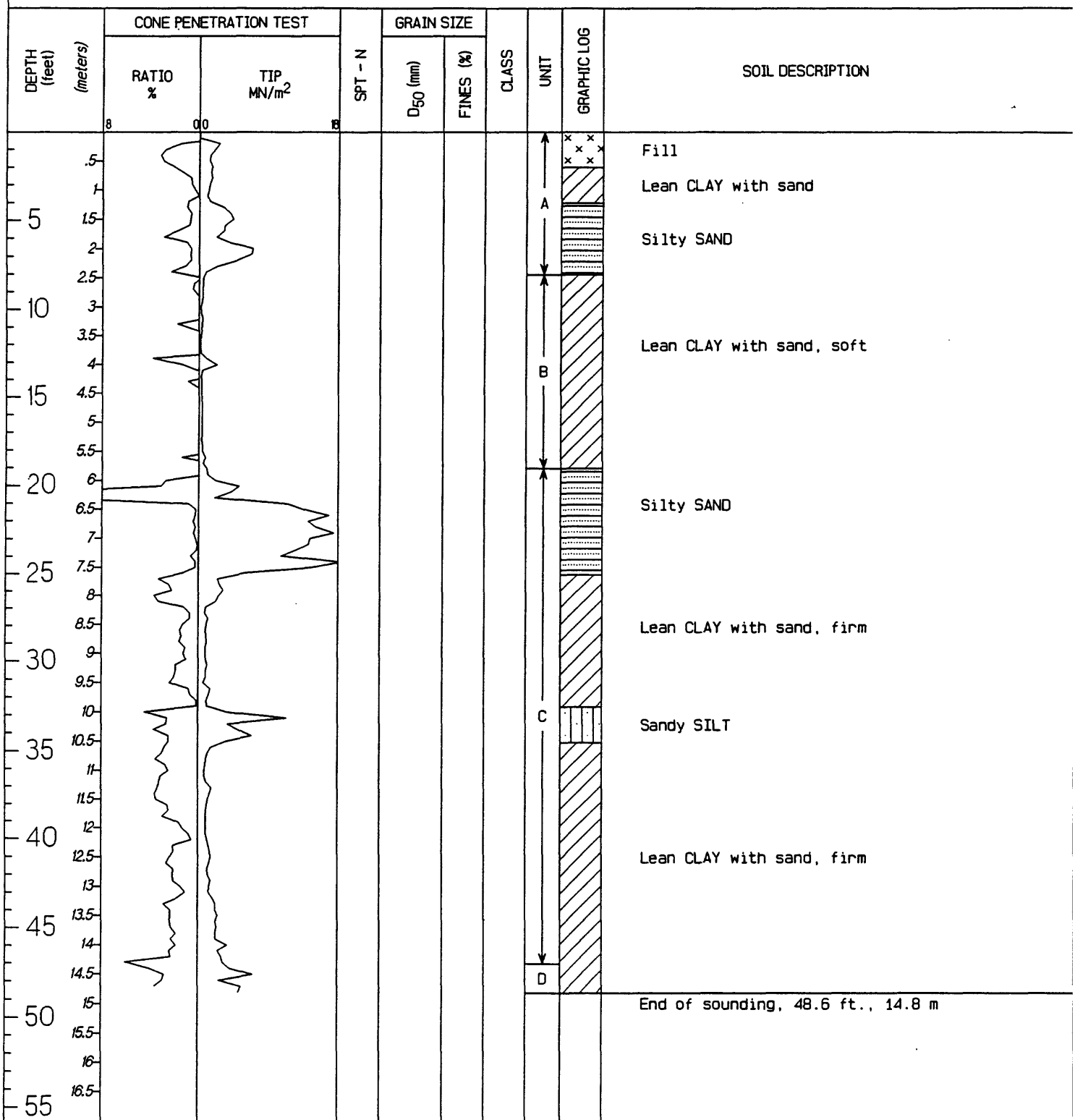
REMARKS:

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 3
PROJECT Northridge Ground Deformation Studies
LOCATION Wynne Avenue (WYN)
COORDINATES X: 359123.2, Y: 3787428.8
DATE DRILLED CPT: 4-11-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 764.3 ft.; 233.0 m MSL



REMARKS:

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 4

LOCATION Wynne Avenue (WYN)

DATE DRILLED CPT: 4-11-95

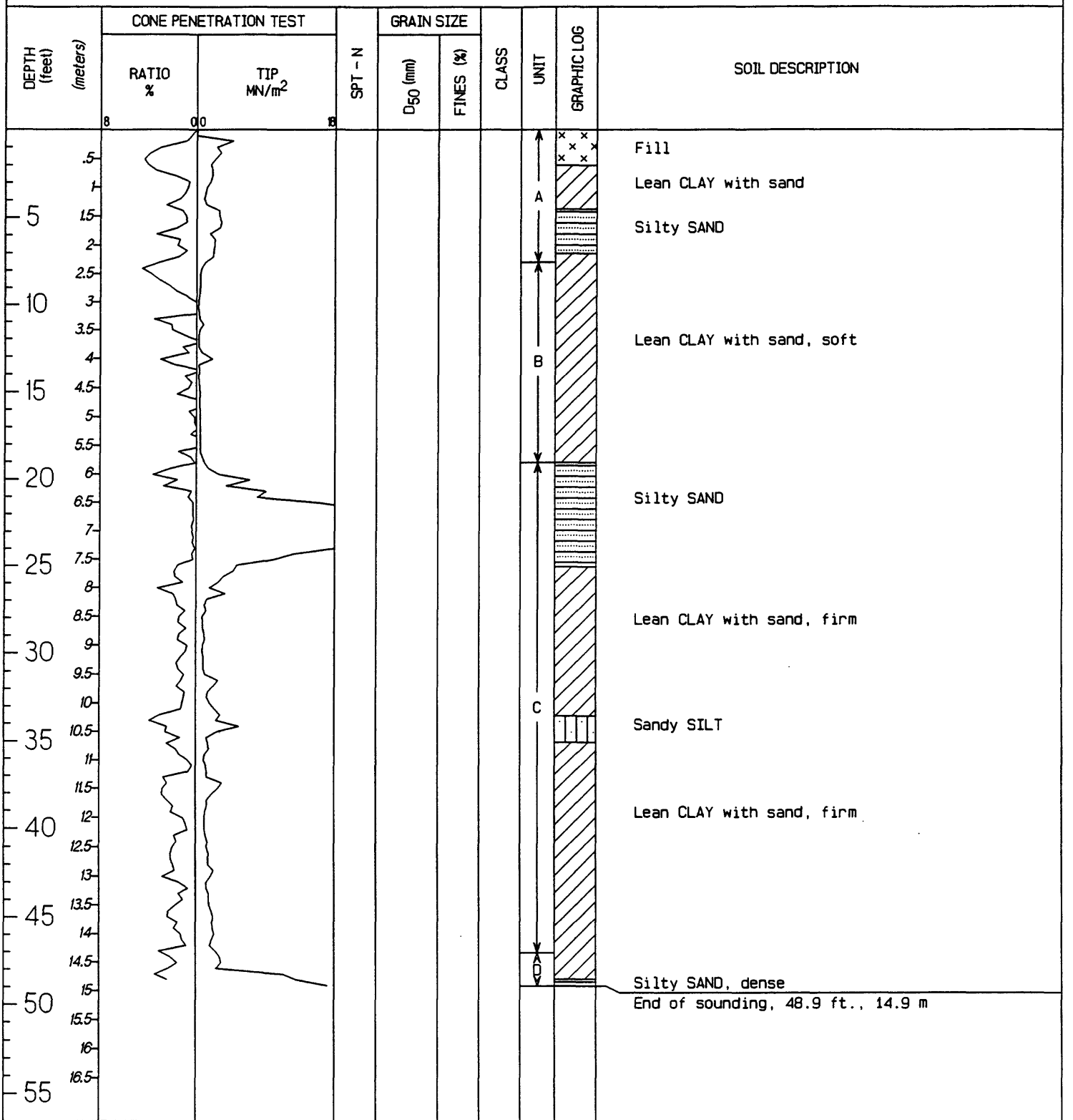
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 359123.0, Y: 3787420.6

GROUNDWATER

ELEVATION 764.1 ft.; 232.9 m MSL



REMARKS: In the graben.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 5a

LOCATION Wynne Avenue (WYN)

DATE DRILLED CPT: 4-11-95; SPT: 4-27-95

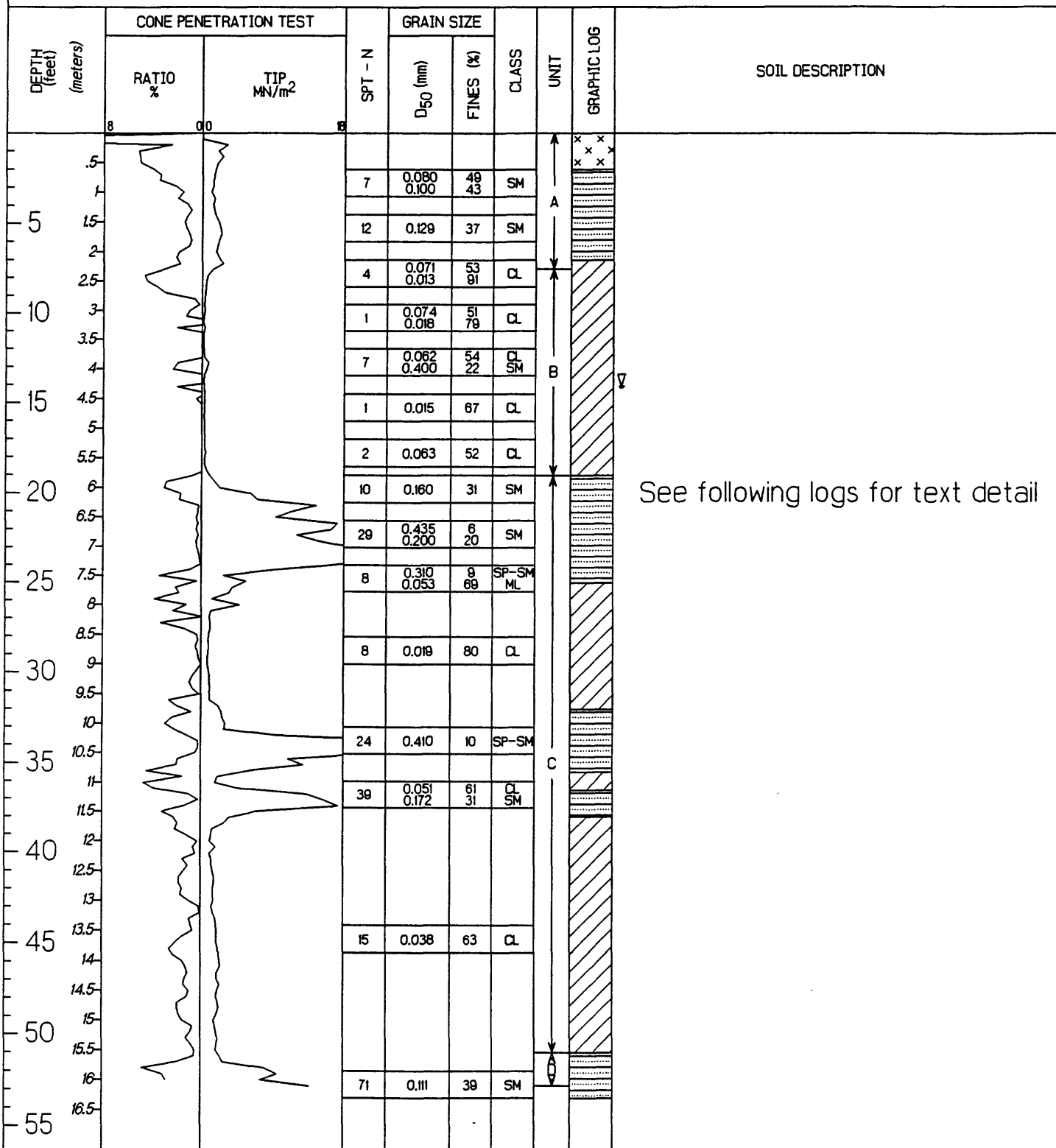
PERSONNEL L: Tinsley; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 359123.1, Y: 3787416.5

GROUNDWATER 14 ft.; 4.3 m

ELEVATION 763.9 ft.; 232.8 m MSL



REMARKS: In failure-zone graben.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 5a

LOCATION Wynne Avenue (WYN)

DATE DRILLED CPT: 4-11-95; SPT: 4-27-95

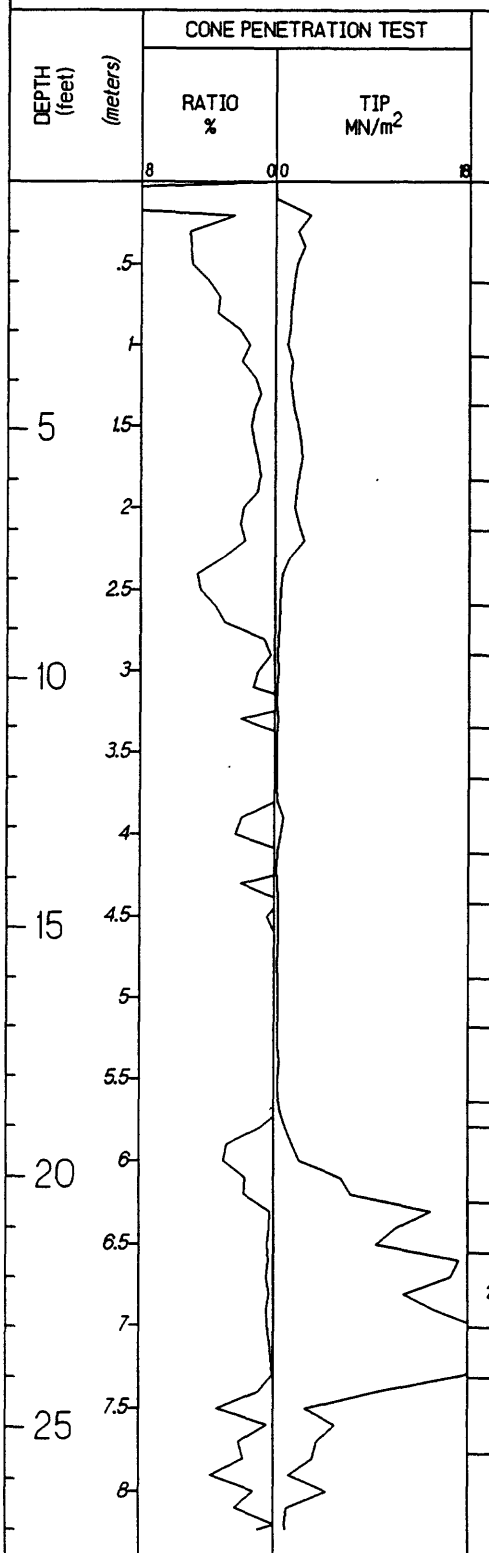
PERSONNEL L: Tinsley; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 359123.1, Y: 3787416.5

GROUNDWATER 14 ft.; 4.3 m

ELEVATION 763.9 ft.; 232.8 m MSL



SPT - N	GRAIN SIZE D_{50} (mm)	GRAIN SIZE FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
				A		Fill
7	0.080 0.100	49 43	SM			Silty SAND, dark yellowish brown 10YR4/4 to 5/4, massive, soft, gravel to 20 mm, strongly effervescent throughout, weak fine angular blocky structure some pores with carbonate, pp=1.5 ksc
12	0.129	37	SM			Silty SAND, olive brown 2.5Y5/6, loose, poorly bedded, few single sub silic shale and limestone pebbles to 5 mm, slightly effervescent, no organics, few very fine roots and tube pores
4	0.071 0.013	53 91	CL			Sandy lean CLAY, light olive brown 2.5Y5/4, one large gravel stringer with clasts to 20 mm, very friable, not sticky or plastic; lean CLAY, soft, well stratified, one fine root, few tubes and pores, slight disseminated carbonate pp=0.7 ksc
1	0.074 0.018	51 79	CL			Lean CLAY with sand, olive brown 2.5Y4/4, massive, soft, slightly sticky and plastic, disseminated carbonate, few tube pores, pp=0.09 ksc; sandy lean CLAY, light olive brown 2.5Y5/4, 50 mm gravel stringer, very friable, loose; lean CLAY with sand, olive brown 2.5Y4/4, soft, moderate disseminated carbonate
7	0.062 0.400	54 22	CL SM	B		Sandy lean CLAY, olive brown 2.5Y4/4, loose, very friable, slightly plastic, pp=0.06 ksc, disseminated carbonate, few tubular pores; silty SAND with gravel, olive brown 2.5Y4/4, loose to slightly dense
1	0.015	67	CL			Sandy lean CLAY, olive brown 2.5Y4/4, soft, slightly sticky and plastic, laminated 2-3 mm thick, slightly effervescent with disseminated CO_3, no organics or fossils, few fine horizontal modern roots, few fine vertical tubular pores, pp=0.2 ksc
2	0.063	52	CL			Sandy lean CLAY, dark yellowish brown 10YR4/4, slightly sticky, not plastic, occassional pebbles in bottom 10 cm, strongly effervescent, disseminated carbonate, few fine horizontal roots, pp=0.23 ksc
10	0.160	31	SM			Silty SAND, olive brown 2.5Y4/4, massive to poorly bedded, soft to firm, slightly sticky and plastic, slight effervescent, disseminated carbonate, few vertical roots, very fine tubular pores
29	0.435 0.200	6 20	SM	C		SAND with silt to silty SAND, light brownish gray 2.5Y6/2, not sticky or plastic, disseminated carbonate
8	0.310 0.053	9 69	SP-SM ML			SAND with silt to sandy SILT, olive brown 2.5Y5/4 to yellowish brown 10YR4/4, well sorted, very thinly laminated

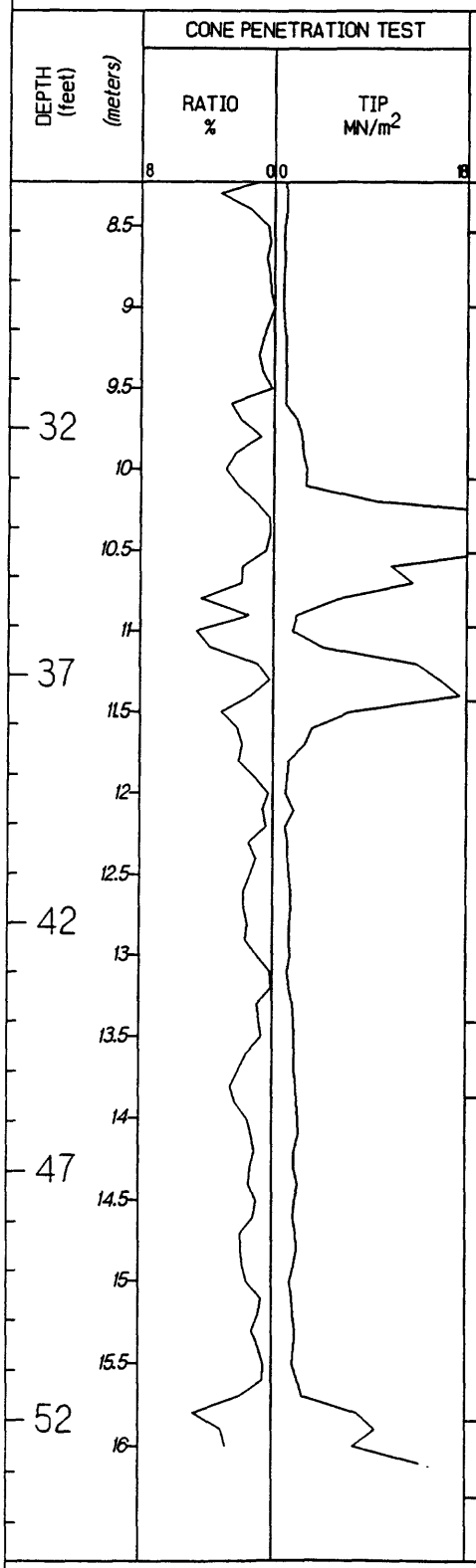
REMARKS: In failure-zone graben.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 5a
PROJECT Northridge Ground Deformation Studies
LOCATION Wynne Avenue (WYN)
COORDINATES X: 359123.1, Y: 3787416.5
DATE DRILLED CPT: 4-11-95; SPT: 4-27-95
GROUNDWATER 14 ft.; 4.3 m
PERSONNEL L: Tinsley; D: Bennett/Criley
ELEVATION 763.9 ft.; 232.8 m MSL



SPT - N	D_{50} (mm)	FINES (%)	CLASS	UNIT	SOIL DESCRIPTION
8	0.019	80	CL		Lean CLAY with sand, dark brown 10YR3/3, thinly laminated, soft, slightly sticky and plastic, abundant detrital charcoal
24	0.410	10	SP-SM		SAND with silt, light yellowish brown 2.5Y6/4, well stratified, well sorted, loose to slightly dense, not sticky or plastic, no roots, pores
39	0.051 0.172	61 31	CL SM	C	Sandy lean CLAY, olive brown 2.5Y4/4; and silty SAND, mottled, clasts to 20 mm, medium dense, very poor sorting, abundant gravel
15	0.038	63	CL		Sandy lean CLAY, light olive brown 2.5Y5/4, very plastic and sticky, massive, many fine distinct mottles, many tubular vertical pores, locally strongly effervescent
71	0.111	39	SM	D	Silty SAND, light olive brown 5Y5/4, very dense, well bedded, not sticky or plastic, some silt partings, some mottles, no soil development
					End of sounding, 53.5 ft., 16.3 m

Magnitude= 6.8
Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 5b

LOCATION Wynne (WYN)

DATE DRILLED CPT: 4-11-95; SPT: 5-1-95

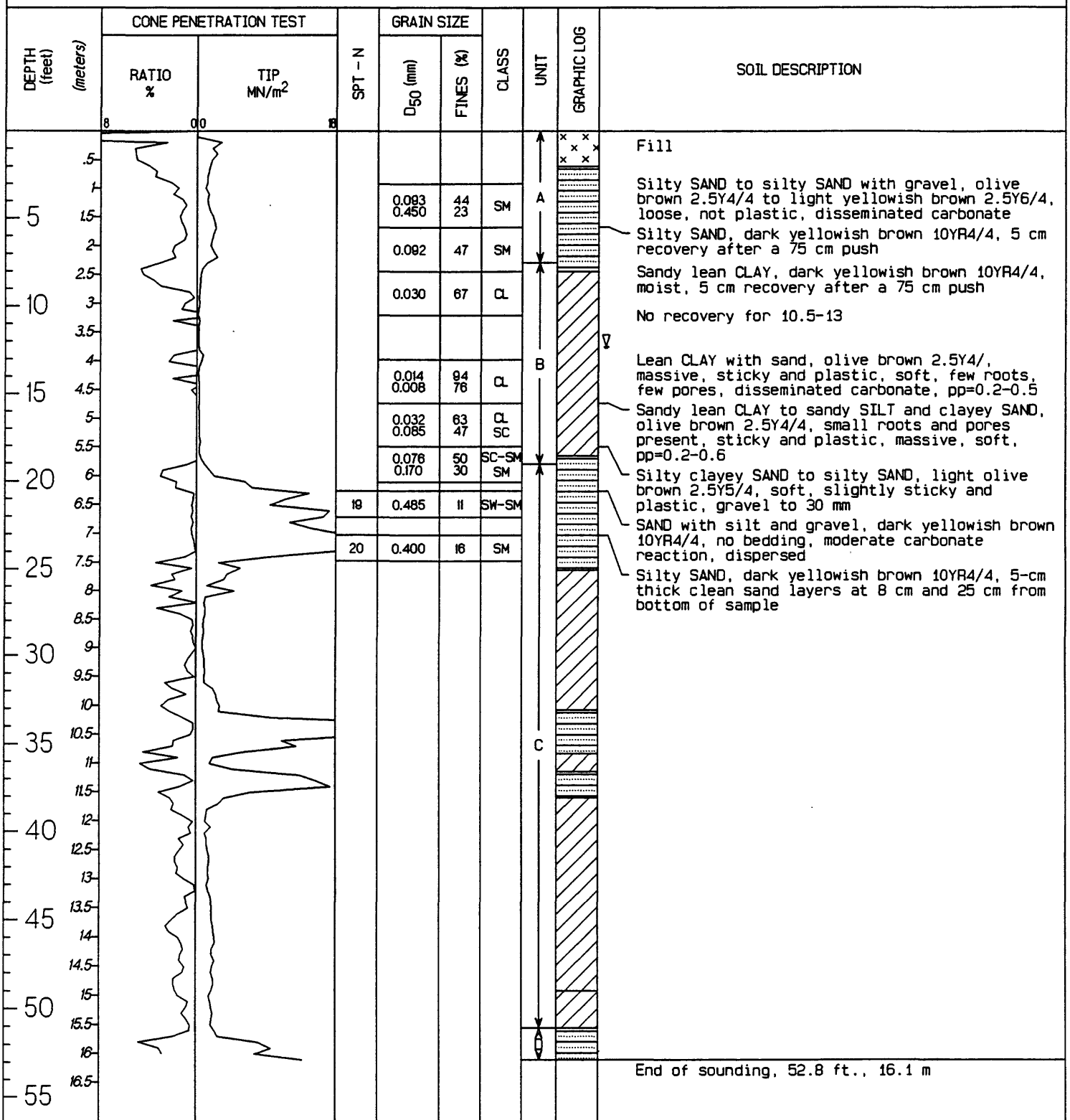
PERSONNEL L: Bennett; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 359123.1, Y: 3787415.8

GROUNDWATER 12.2 ft.; 3.7 m

ELEVATION 763.8 ft.; 232.8 m MSL



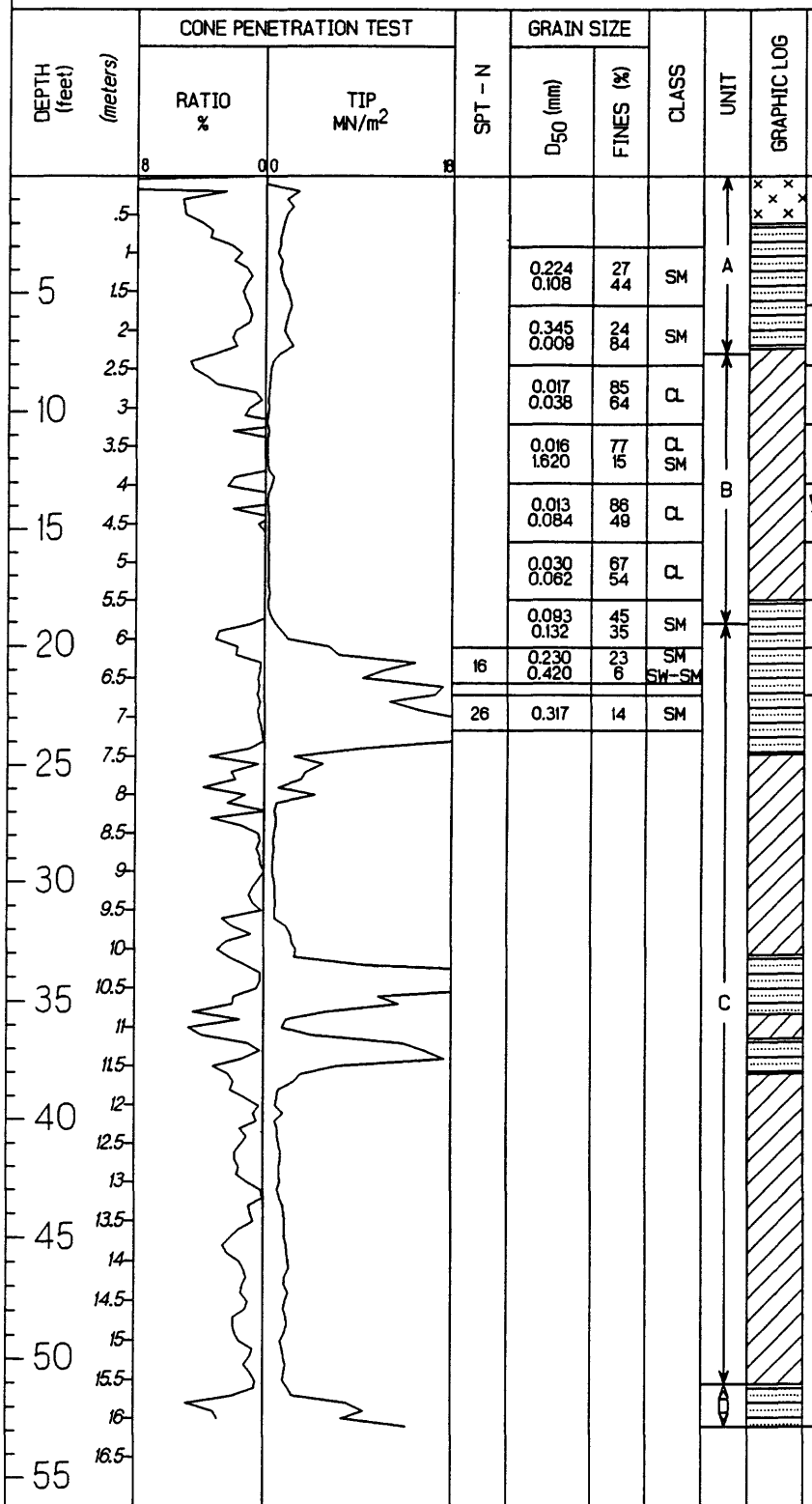
REMARKS: In failure zone.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 5C
PROJECT Northridge Ground Deformation Studies
LOCATION Wynne (WYN)
COORDINATES X: 359123.0, Y: 3787414.7
DATE DRILLED CPT: 4-11-95; SPT: 5-11-95
GROUNDWATER 14.1 ft.; 4.3 m
PERSONNEL L: Bennett; D: Bennett/Criley
ELEVATION 763.8 ft.; 232.8 m MSL



REMARKS: In failure zone.

Magnitude= 6.8

Acceleration= 0.51

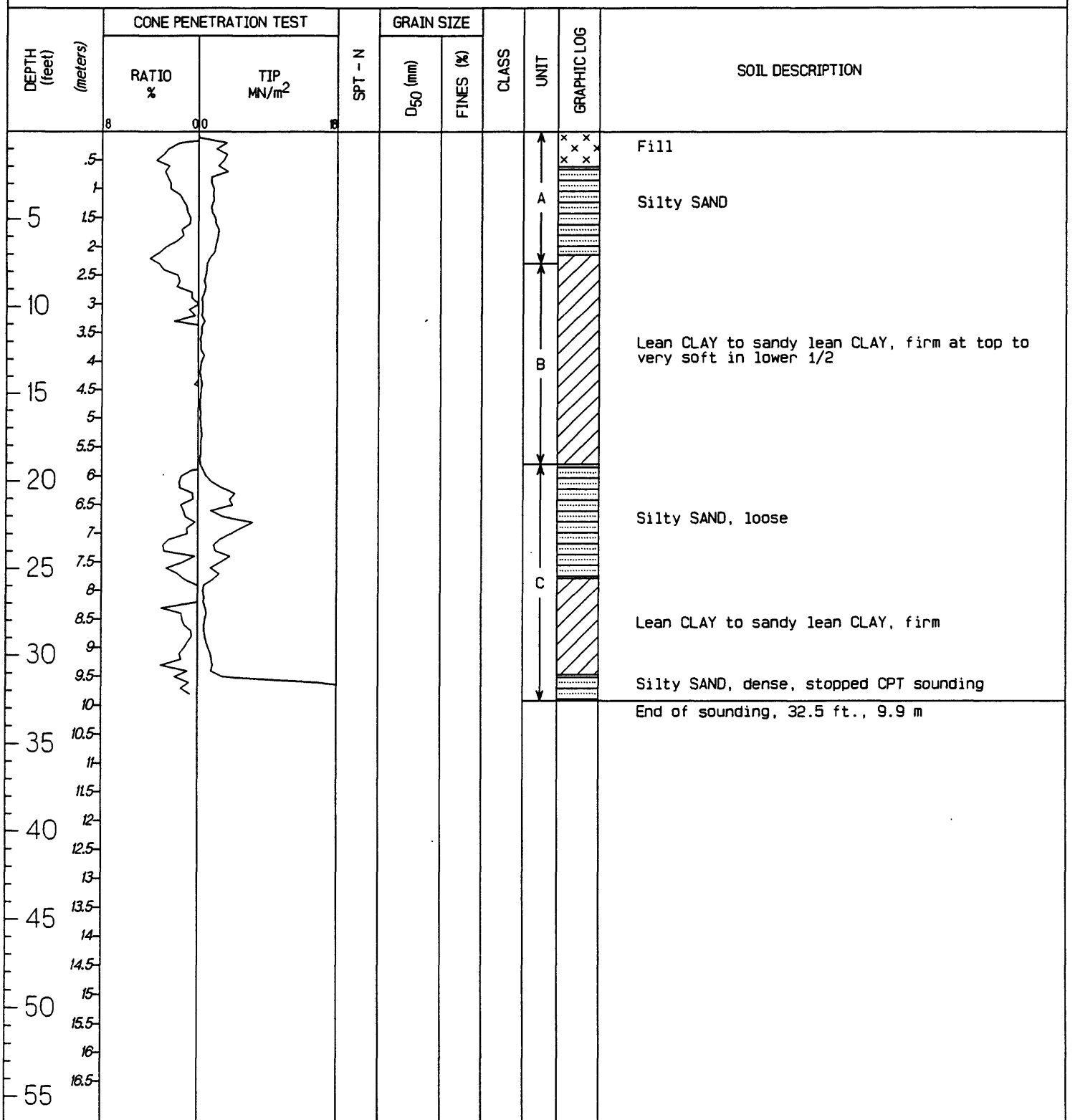
USGS GEOTECHNICAL LOG

HOLE NUMBER 6 | PROJECT Northridge Ground Deformation Studies

LOCATION Wynne (WYN) | COORDINATES X: 359122.5, Y: 3787402.6

DATE DRILLED CPT: 4-11-95 | GROUNDWATER

PERSONNEL D: Bennett/Criley | ELEVATION 763.0 ft.; 232.6 m MSL



REMARKS: Outside of graben.

Magnitude= 6.8 | Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 7a

LOCATION Wynne (WYN)

DATE DRILLED CPT: 4-11-95; SPT: 4-28-95

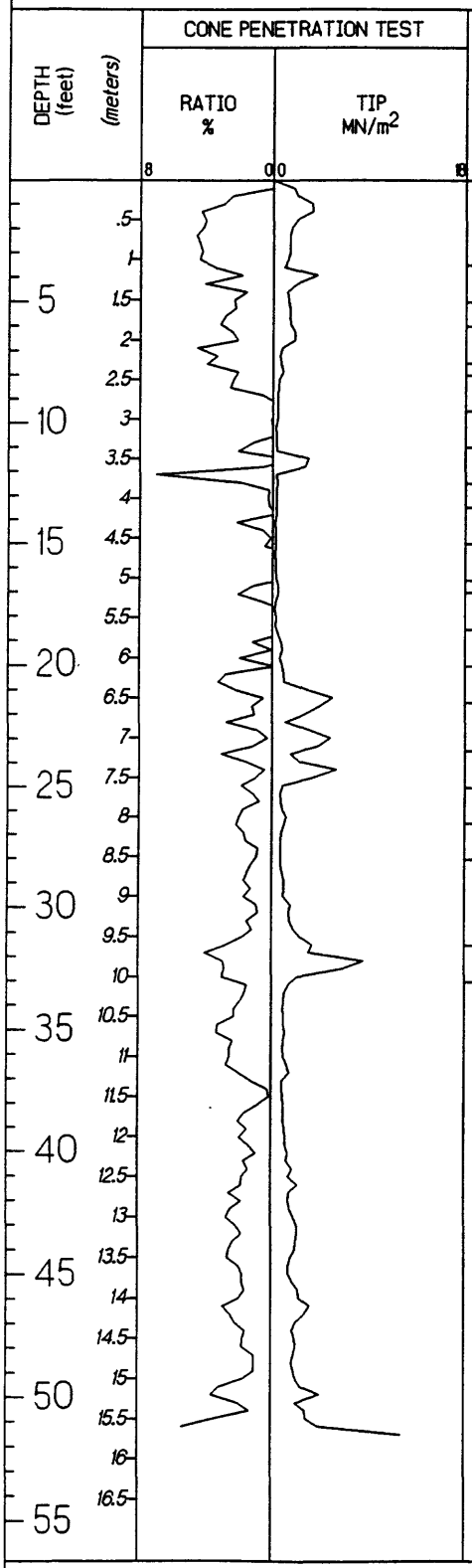
PERSONNEL L: Tinsley; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 359122.1, Y: 3787372.7

GROUNDWATER 12.5 ft.; 3.8 m

ELEVATION 761.3 ft.; 232.0 m MSL



SPT - N	D_{50} (mm)	FINES (%)	CLASS	UNIT	SOIL DESCRIPTION
				A	Fill
7	0.049	57	CL		Sandy lean CLAY, olive brown, 2.5Y4/4, slightly hard and friable, bedded 15 cm, strongly effervescent, disseminated carbonate, pp=1.5 ksc
8	0.013	85	CL		Lean CLAY with sand, yellowish brown, 10YR5/4, soft, slightly sticky and plastic, massive, few tubular pores, pp=1.25 ksc
4	0.010	79	CL		Lean CLAY with sand, olive brown, 2.5Y4/4, soft, sticky and plastic, massive, few roots and pores, abundant disseminated carbonate, pp=0.3 ksc
2	0.024	77	CL	B	Lean CLAY with sand, olive brown, 2.5Y4/4, soft, sticky and plastic, massive, few 3 mm pebbles, locally thinly laminated where not bioturbated, pp=0.18 ksc
2	0.013 0.015	71	CL		Lean CLAY with sand, olive brown, 2.5Y4/4, soft, massive, slightly sticky and plastic, carbonate in root pore, pp=0.14 ksc; and.. lean CLAY with sand, dark yellowish brown, 10YR4/4, buried A horizon
4	0.025	72	CL		Lean CLAY with sand, olive brown, 2.5Y4/4, soft to firm, slightly sticky and plastic, few tubular pores, rare roots, pp=0.3-0.5 ksc
2	0.042	61	CL		Sandy lean CLAY, olive brown, 2.5Y4/4, similar to above, pp=0.2 ksc
12	0.098	43	SM		Silty SAND, olive brown, 2.5Y4/4, well stratified, one fining upward sequence, no pedogenic features, pp=0.7 ksc
13	0.068 0.016	54 82	SM CL		Silty SAND to sandy SILT, light olive brown, 2.5Y5/4, well stratified; and...lean CLAY with sand, olive brown, 2.5Y4/4, firm, pp=0.6-0.75 ksc
8	0.008 0.018	91 75	CL		Lean CLAY to lean CLAY with sand, olive brown, 2.5Y4/4, soft, slightly plastic, disseminated carbonate, tubes filled with carbonate, pp=0.75 ksc
13	0.078 0.015	49 79	SM CL	C	Silty SAND, olive brown, 2.5Y5/4, thinly laminated, common grayish brown, 2.5Y5/2, and light olive brown, 2.5Y5/6 mottles; and lean CLAY with sand, olive brown, 2.5Y4/4, firm, many fine organic fragments, pp=1.5 ksc
				D	End of sounding, 51.5 ft., 15.7 m

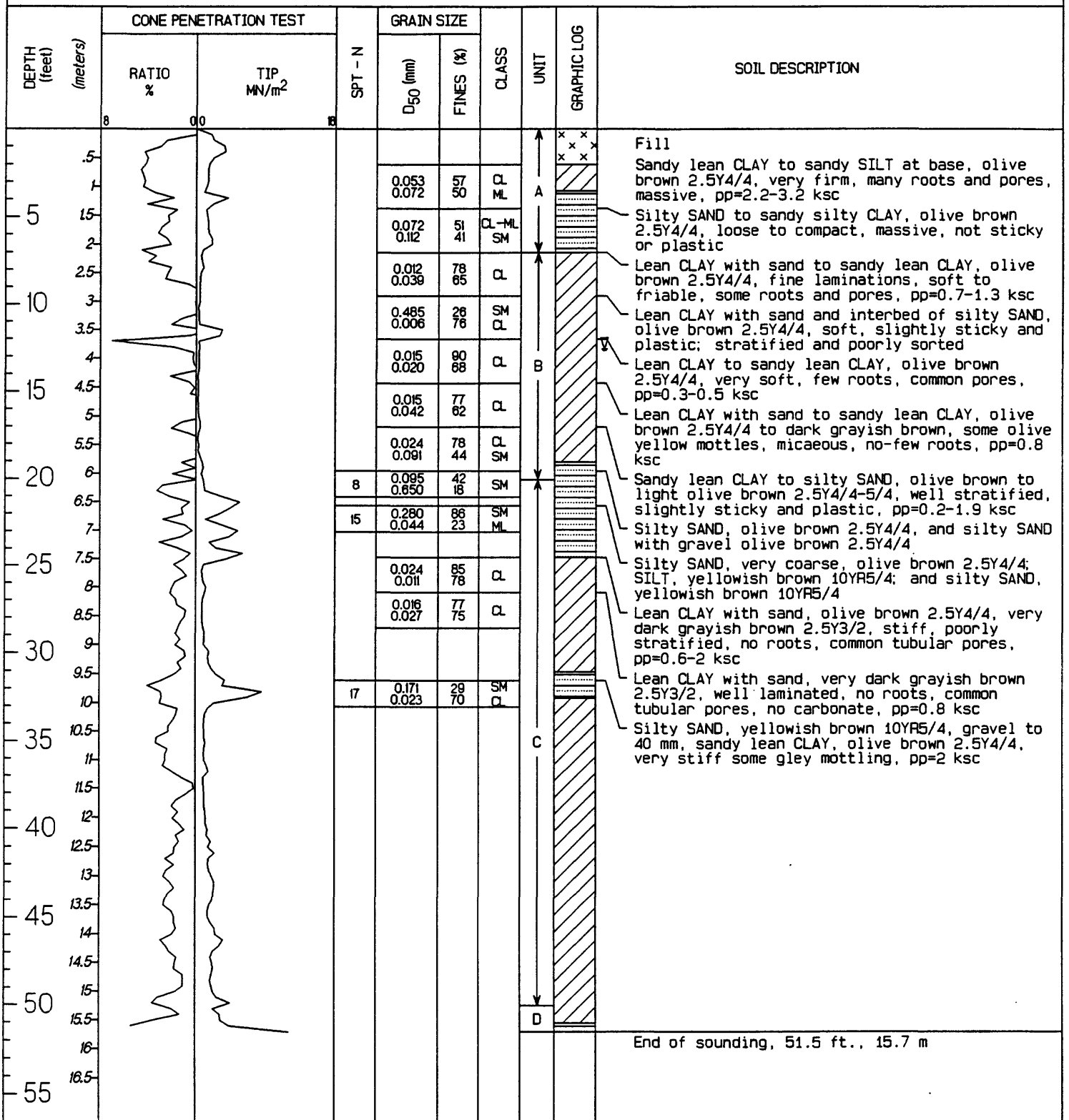
REMARKS: Outside of graben.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 7b
PROJECT Northridge Ground Deformation Studies
LOCATION Wynne (WYN)
COORDINATES X: 359122.1, Y: 3787371.6
DATE DRILLED CPT: 4-11-95; SPT: 4-30-95
GROUNDWATER 12.5 ft.; 3.8 m
PERSONNEL L: Bennett· D: Bennett/Criley
ELEVATION 761.3 ft; 232.0 m MSL



REMARKS: Outside of graben.

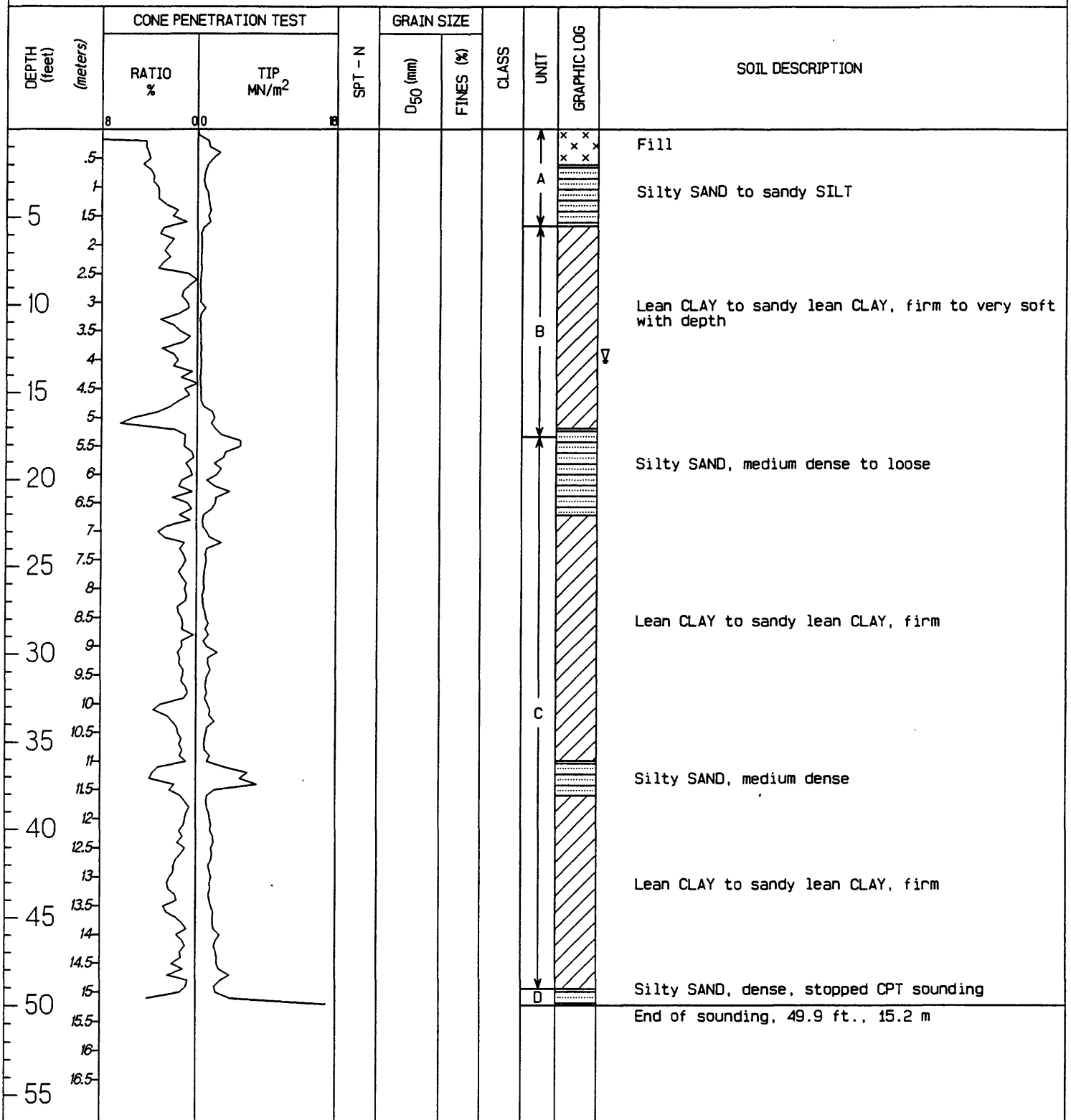
Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 8
LOCATION Wynne (WYN)
DATE DRILLED CPT: 4-11-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 359123.4, Y: 3787342.1
GROUNDWATER 13.1 ft.; 4.0 m
ELEVATION 758.4 ft.; 231.2 m MSL



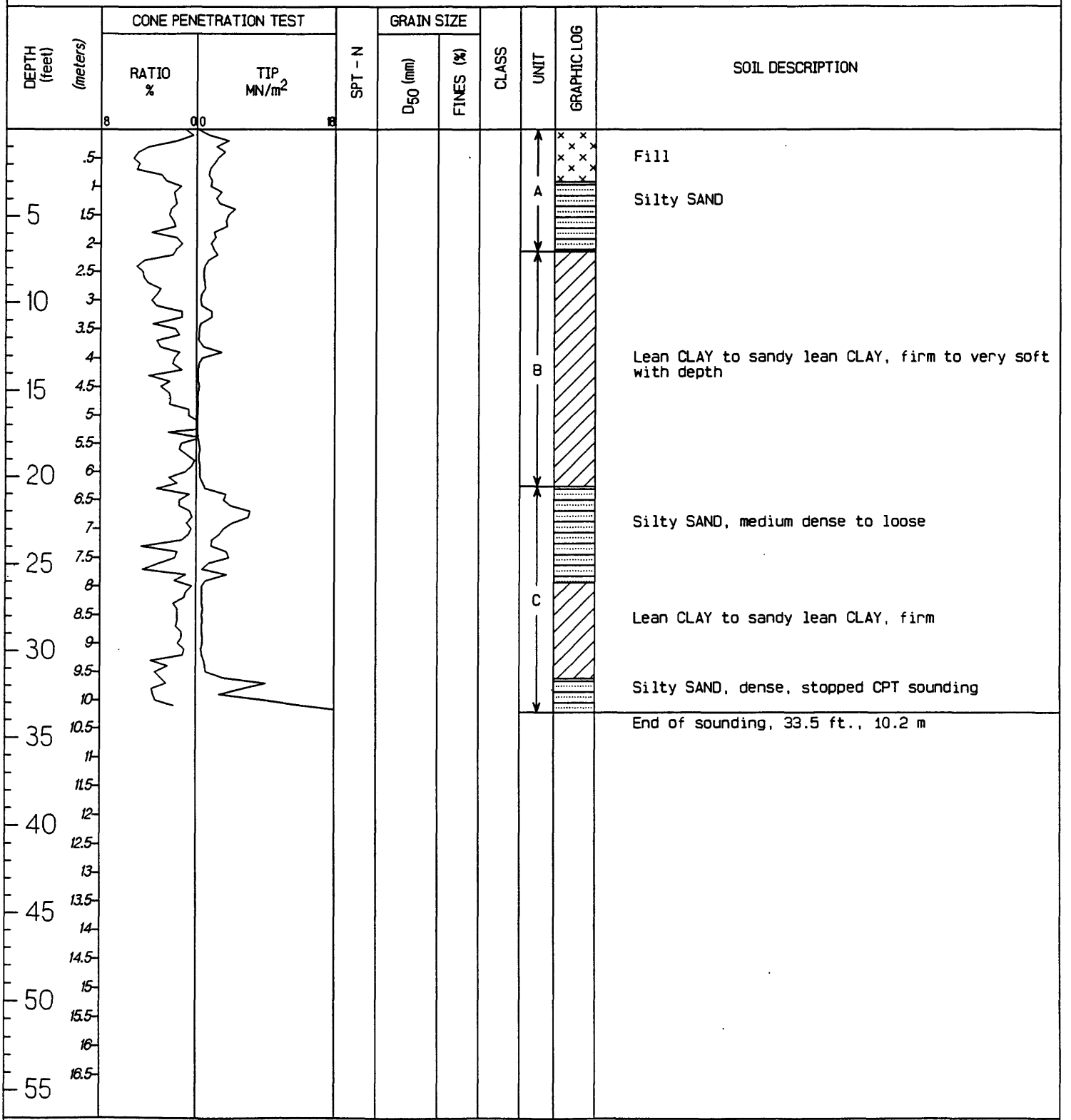
REMARKS: Outside of failure zone.
On south side of Cantara

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 9
PROJECT Northridge Ground Deformation Studies
LOCATION Wynne (WYN)
COORDINATES X: 359122.7, Y: 3787405.7
DATE DRILLED CPT: 8-2-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 763.3 ft.; 232.7 m MSL



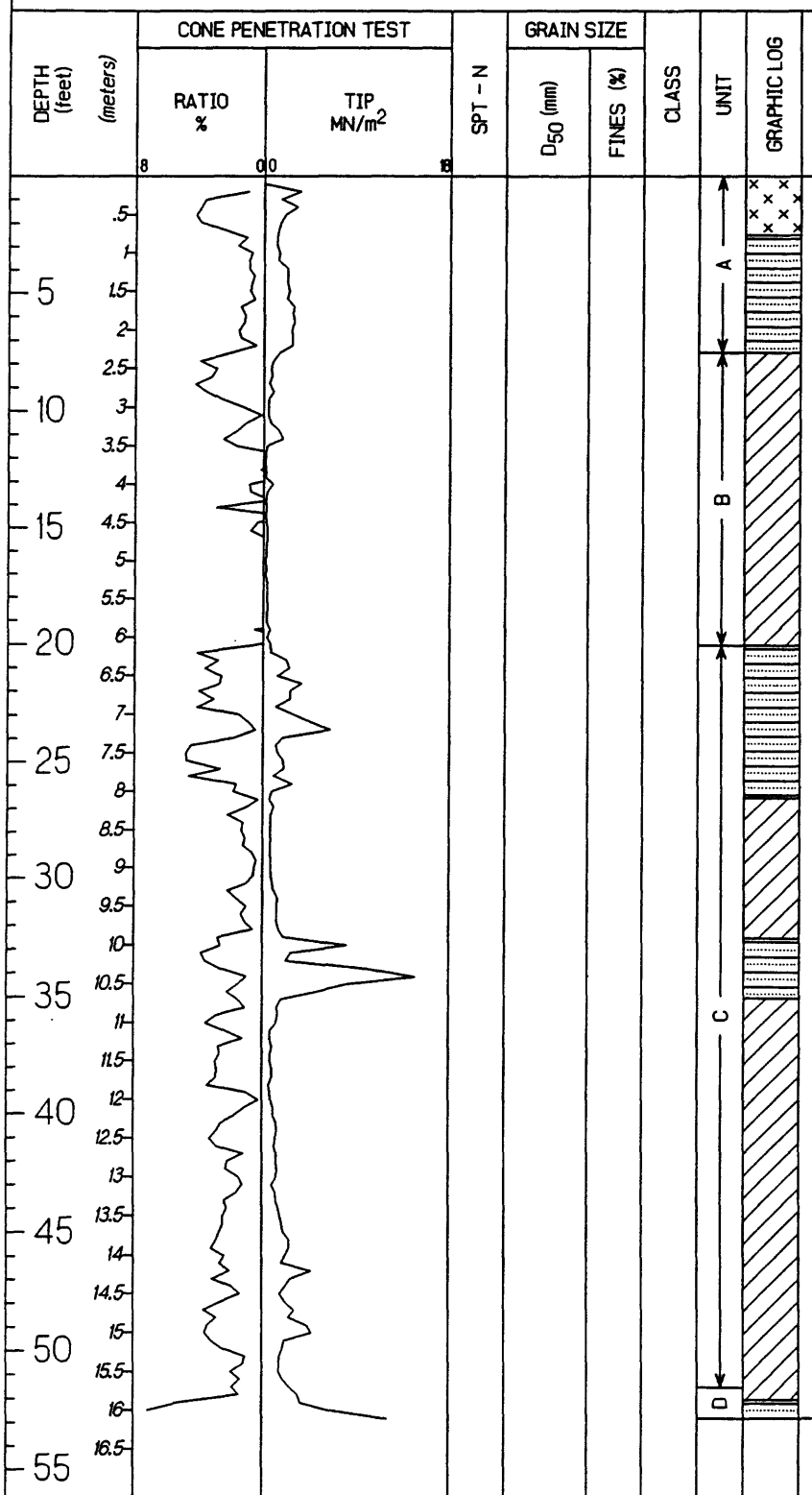
REMARKS: Outside of failure zone.
Mini line just north of #6.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 10
PROJECT Northridge Ground Deformation Studies
LOCATION Wynne (WYN)
COORDINATES X: 359122.8, Y: 3787408.9
DATE DRILLED CPT: 8-2-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 763.5 ft.; 232.7 m MSL



REMARKS: Outside of graben.
Located in middle of mini line.

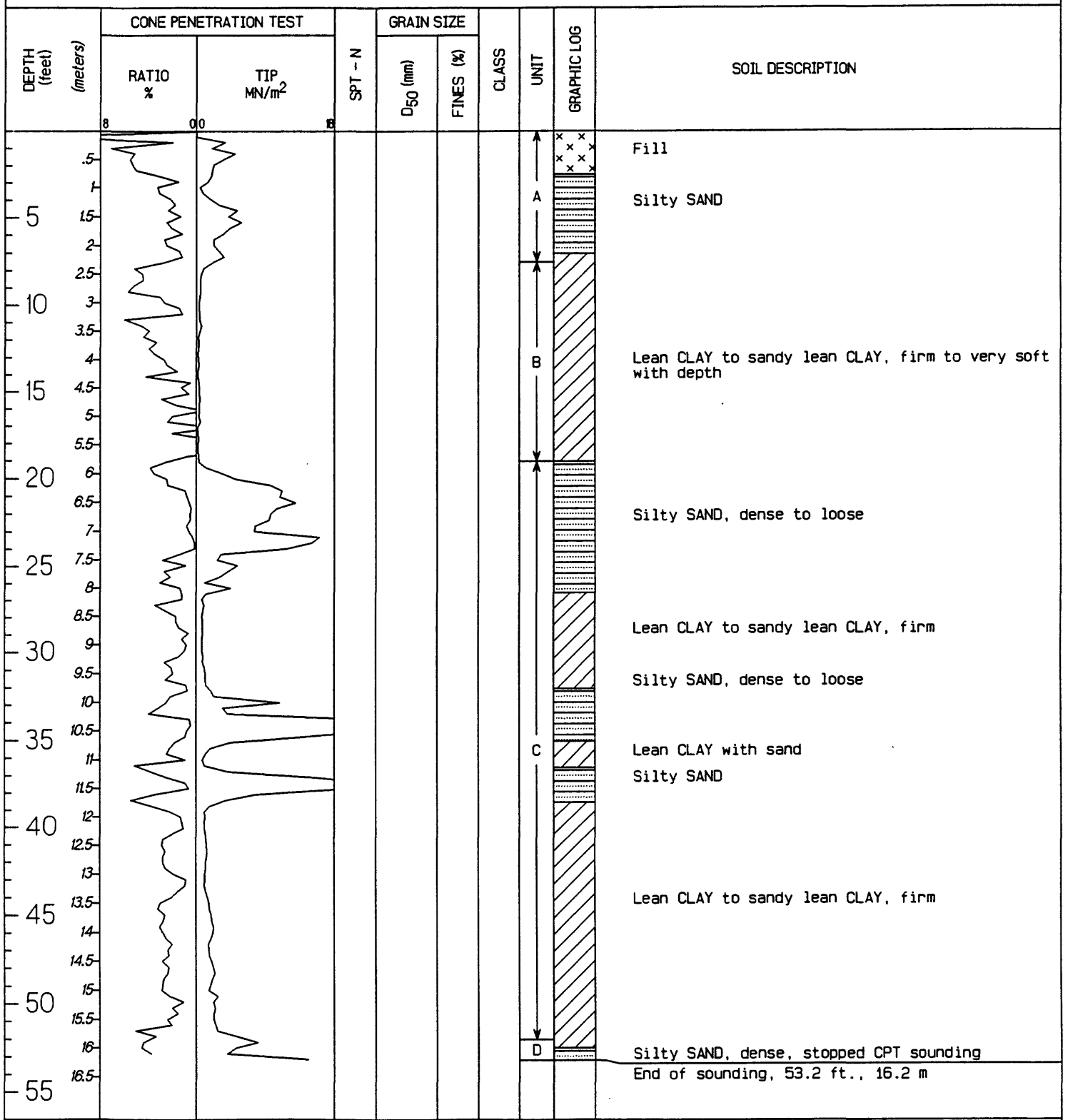
Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 11
LOCATION Wynne (WYN)
DATE DRILLED CPT: 8-2-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 359123.0, Y: 3787413.2
GROUNDWATER
ELEVATION 763.8 ft.; 232.8 m MSL



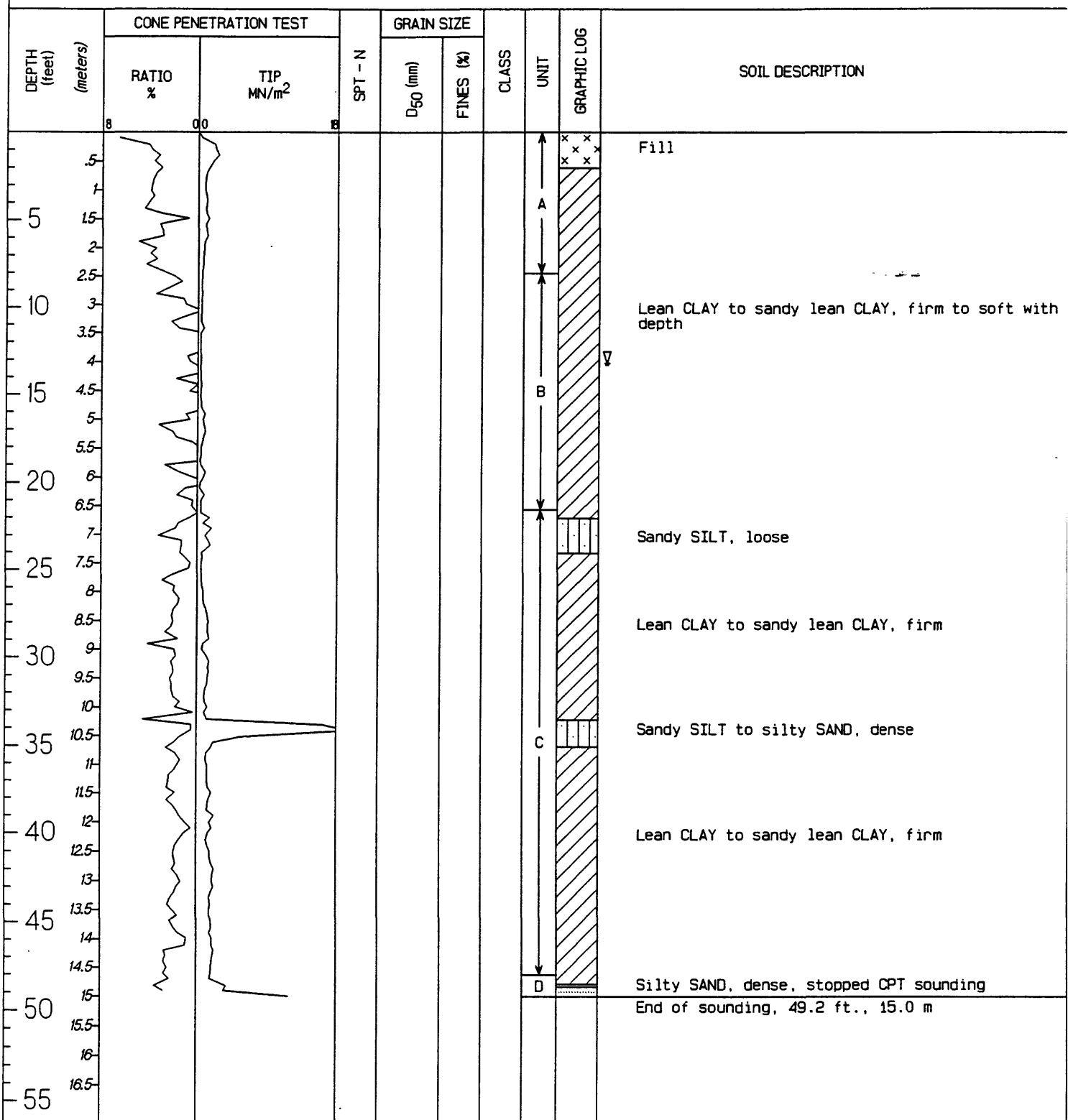
REMARKS: Outside of graben.
Located at north end of mini line next to 5.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 12
PROJECT Northridge ground deformation studeis
LOCATION Wynne (WYN)
COORDINATES X: 359118.3, Y: 3787250.0
DATE DRILLED CPT: 6-21-96
GROUNDWATER 13.1 ft.; 4.0 m
PERSONNEL D: Bennett/Conaway
ELEVATION 758 ft.; 231.0 m MSL



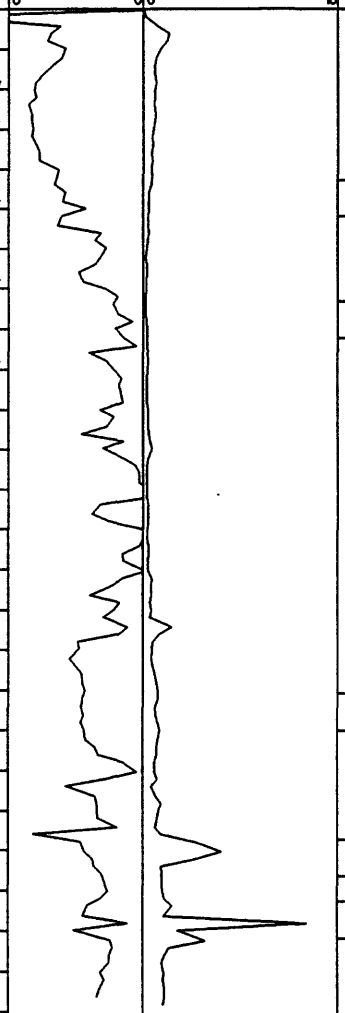
REMARKS: Outside of failure zone.
373 ft south of Cantara.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 13
PROJECT Northridge Ground Deformation Studies
LOCATION Wynne (WYN)
COORDINATES X: 359114.2, Y: 3787137.3
DATE DRILLED CPT: 6-21-96; SPT: 6-23-96
GROUNDWATER 14.1 ft.; 4.3 m
PERSONNEL L: Conaway; D: Bennett/Conaway
ELEVATION 756 ft.; 230.4 m MSL



DEPTH (feet)	(meters)	SPT - N	GRAIN SIZE D_{50} (mm)	FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
						A		Fill
		2	0.024	77	CL			Lean CLAY with sand, yellowish brown 10YR4/6, partings 5-10 mm, one root, root traces near bottom, disseminated carbonate
		2	0.015	81	CL	B		Lean CLAY with sand, brown-dark brown 7.5YR4/4, some partings near top, massive, root traces, slight disseminated carbonate, sticky, very friable moist, slightly hard dry, pp=<0.1 tsf
			0.008 0.045	93 67	CL			Lean CLAY, dark brown 10YR3/3 to light olive brown 2.5Y5/4, firm, sticky, massive, some 0.2 mm pores, sharp contact with sandy lean CLAY, olive brown 2.5Y4/4, friable, pebbles 5-10 mm
			0.025 0.041	59	CL			Sandy lean CLAY, dark brown 10YR3/3, coarse blocky structure, massive, sticky and plastic, firm, sticky 10 mm concretions
			0.017 0.036	68 53	CL			Sandy lean CLAY, olive brown 2.5Y4/4, massive, slightly plastic, friable, few 0.2-0.7 mm pores, becomes 10YR3/3 dark brown with depth, many 5-10 mm pebbles, olive brown mottles, few 5 mm concretions
			0.006 0.004	92 90	CH			Fat CLAY, dark brown 10YR3/3, angular blocky structure, irregular 15-20 mm partings, firm, disseminated carbonate, few small open pores
		15	0.019	75	CL	C		Lean CLAY with sand, dark yellowish brown 10YR4/4, massive, slight disseminated carbonate, abundant 1-mm open pores, few 5 mm pebbles, root traces
		19	0.017	82	CL			Lean CLAY with sand, brown 7.5YR4/4, some bedding 5 mm, carbonate concretions present, rusty mottles, pp=1.5 ksc, firm
		12	0.020 0.285	76 10	CL SP-SM			SAND with silt to lean CLAY with sand at bottom olive brown 2.5Y4/4, massive, firm, slight carbonate, some irregular partings, olive yellow 2.5Y6/6, loose,
								End of sounding, 40.7 ft., 12.4 m

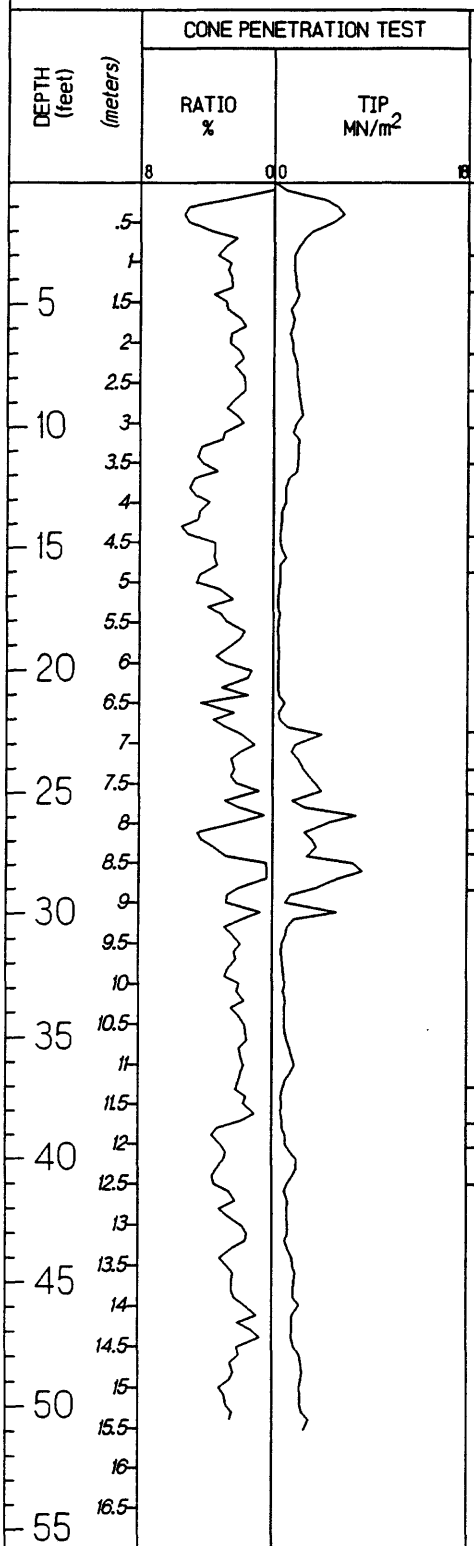
REMARKS: Outside of failure zone. 98 ft east of intersection of Wynne, Nestle, and Lorne. Southern most of all WYN.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 14
PROJECT Northridge Ground Deformation Studies
LOCATION Wynne (WYN)
COORDINATES X: 359126.7, Y: 3787643.1
DATE DRILLED CPT: 6-21-96; SPT: 6-24,5-96
GROUNDWATER 21.7 ft.; 6.6 m
PERSONNEL L: Conaway; D: Bennett/Conaway
ELEVATION 774 ft.; 235.9 m MSL



SPT - N	D_{50} (mm)	FINES (%)	CLASS	UNIT	GRAPHIC LOG	SOIL DESCRIPTION
				A		Fill
10	0.039	67	CL			Sandy lean CLAY, yellowish brown 10YR5/4, disseminated carbonate friable, many root traces, few 5 mm pebbles, bedding laminations 3-10 mm, pp=2.25 ksc
12	0.052	59	CL			Sandy lean CLAY, yellowish brown 10YR5/4, disseminated carbonate, root traces, several 3-mm-thick sandy lenses, friable, slightly sticky, pp=1.25 ksc
11	0.057	58	CL			Sandy lean CLAY, yellowish brown 10YR5/6, mica present, pebbles to 5 mm, root traces upper 1/2, sandy partings 3-5 mm, disseminated carbonate abundant
	0.021 0.020	73 77	CL	B		
10	0.026	74	CL			Lean CLAY with silt, brown 7.5YR4/4, abundant disseminated carbonate, irregular spaced partingts 5-20 mm, slightly sticky, pp=1 ksc
	0.016 0.024	76 67	CL			Lean CLAY with sand to sandy lean CLAY, dark yellowish brown 10YR4/4, few pebbles to 20 mm, massive, soft, pp<0.1 ksc
16	0.033 0.330	64 23	CL SM			Interbedded, sandy lean CLAY, silty SAND, and sandy SILT, dark yellowish brown 10YR4/4 to light olive brown 2.5Y5/6, minimum bedding 50 mm-thick, disseminated carbonate present throughout, pp=<0.1-1 ksc
21	0.113	38	SM			Silty SAND, dark yellowish brown 10YR4/6, very friable, slight carbonate, some pebbles 10 mm
12	3.000 0.026	18 86	GM CL			Silty GRAVEL with sand and lean CLAY with sand, yellowish brown 10YR5/4, carbonate present, sharp contact
	0.013 0.009	53 94	CL			Lean CLAY with sand, olive brown 2.5Y4/4, firm, holds together well
	0.008	45 82	CL			
	0.012	86	CL	C		Lean CLAY, olive brown 2.5Y4/4, uniform texture, massive, plastic and sticky, some crude blocky structure, disseminated carbonate minor to moderate
15	0.018 0.015	78	CL			Lean CLAY with sand, dark yellowish brown 10YR4/6, root traces, massive, mottled, firm, slight carbonate
25	0.011	83	CL			Lean CLAY with sand, yellowish brown 10YR5/4, abundant carbonate spots, one 6 mm concretion, firm, sticky, pp=1.75 ksc
	0.060	53	CL			Sandy lean CLAY, dark brown 7.5YR4/4, sample on tip of auger
						End of sounding, 50.9 ft., 15.5 m

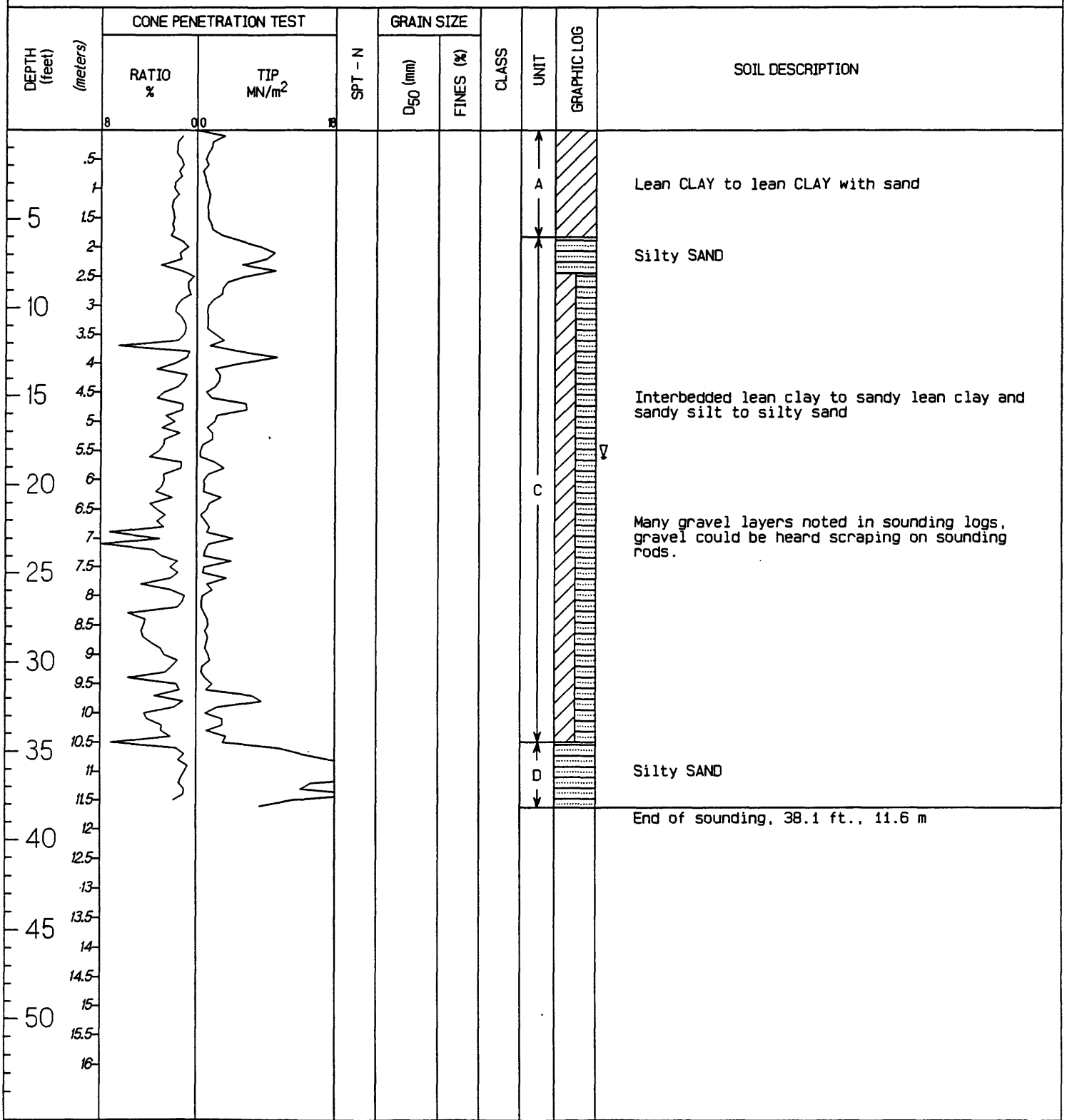
REMARKS: Outside of failure zone. 140 ft west of intersection of Garden Grove on Schoenborn, northern most of WYN.

Magnitude= 6.8

Acceleration= 0.51

USGS GEOTECHNICAL LOG

HOLE NUMBER 1
PROJECT Northridge Ground Deformation Studies
LOCATION Potrero Canyon (POT)
COORDINATES X: 347214, Y: 3806858
DATE DRILLED CPT: 5-8-95
GROUNDWATER 18.3 ft.; 5.6 m
PERSONNEL D: Bennett/Criley
ELEVATION 1025 ft.; 312.4 m MSL



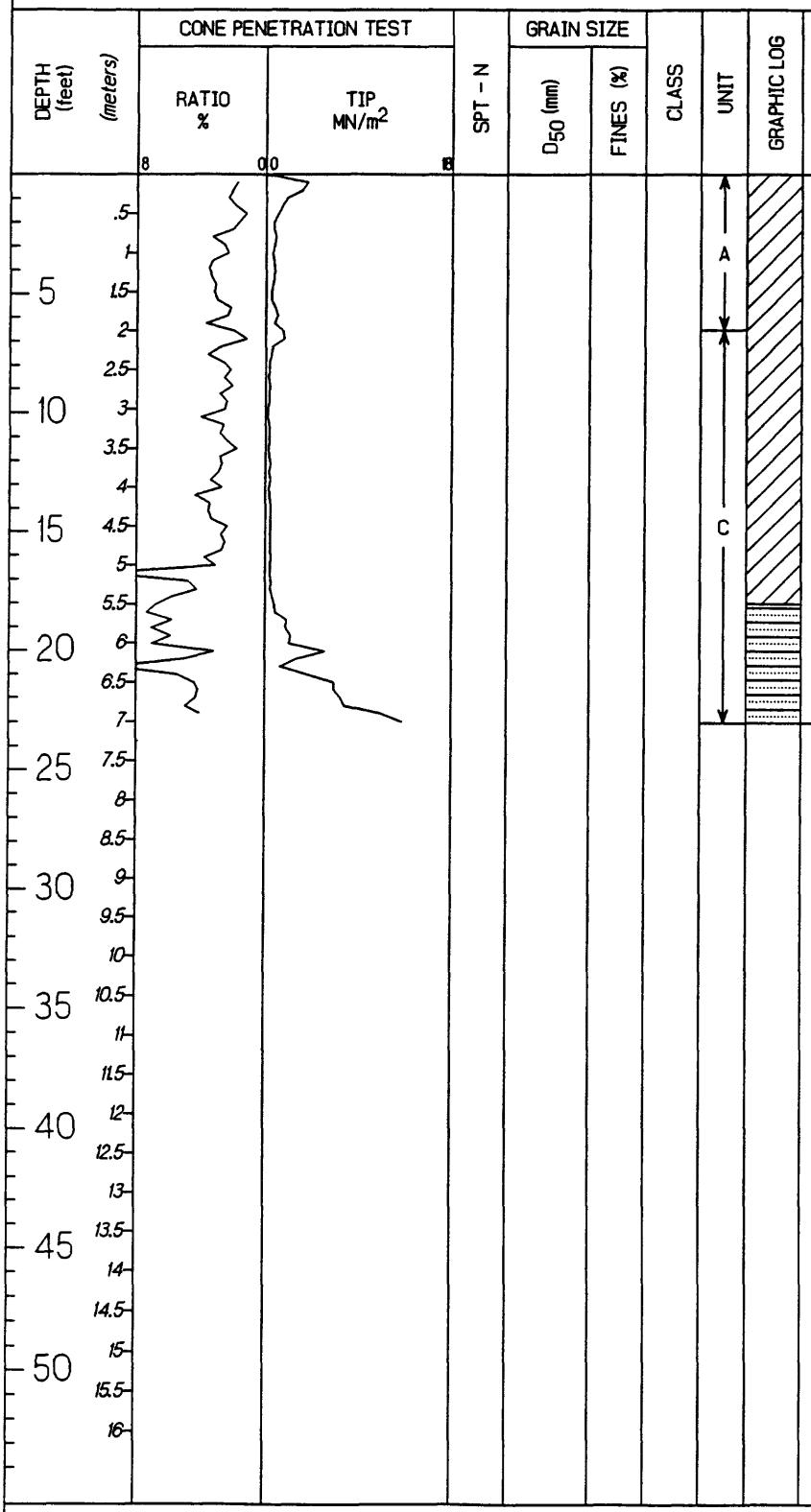
REMARKS: Southernmost along canyon axis.

Magnitude= 6.8

Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 2
PROJECT Northridge Ground Deformation Studies
LOCATION Potrero Canyon (POT)
COORDINATES X: 347266, Y: 3806894
DATE DRILLED CPT: 5-8-95
GROUNDWATER
PERSONNEL D: Bennett/Criley
ELEVATION 1020.3 ft.; 311.0 m MSL



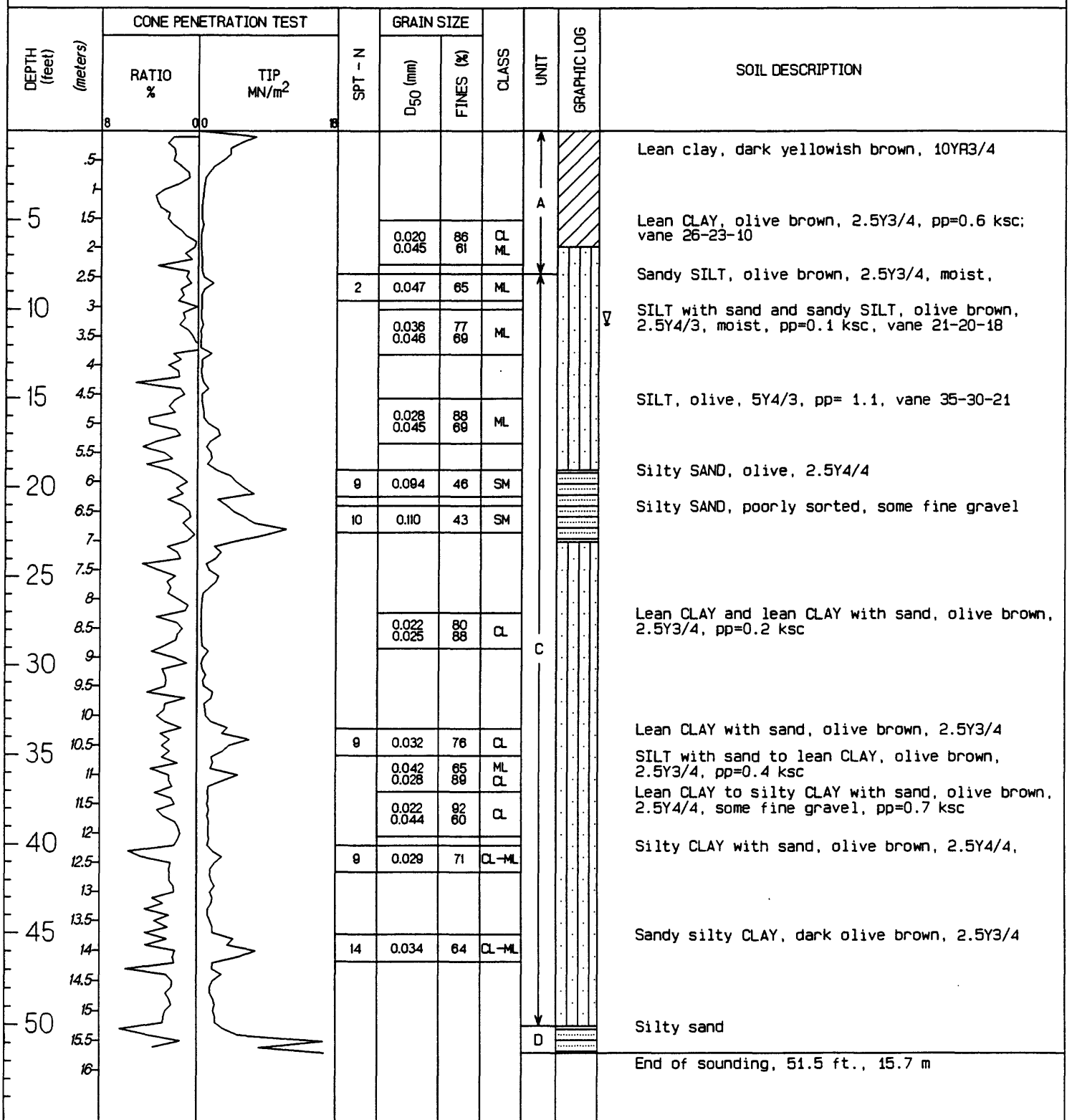
REMARKS: Southernmost along small dirt road.
Very close to bedrock hill slope.

Magnitude= 6.8

Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 3
PROJECT Northridge Ground Deformation Studies
LOCATION Potrero Canyon (POT)
COORDINATES X: 347268, Y: 3806917
DATE DRILLED CPT: 5-8-95; SPT: 7-6-95
GROUNDWATER 10.7 ft; 3.3 m
PERSONNEL L: Fumal; D: Bennett/Criley
ELEVATION 1018.5 ft.; 310.4 m MSL



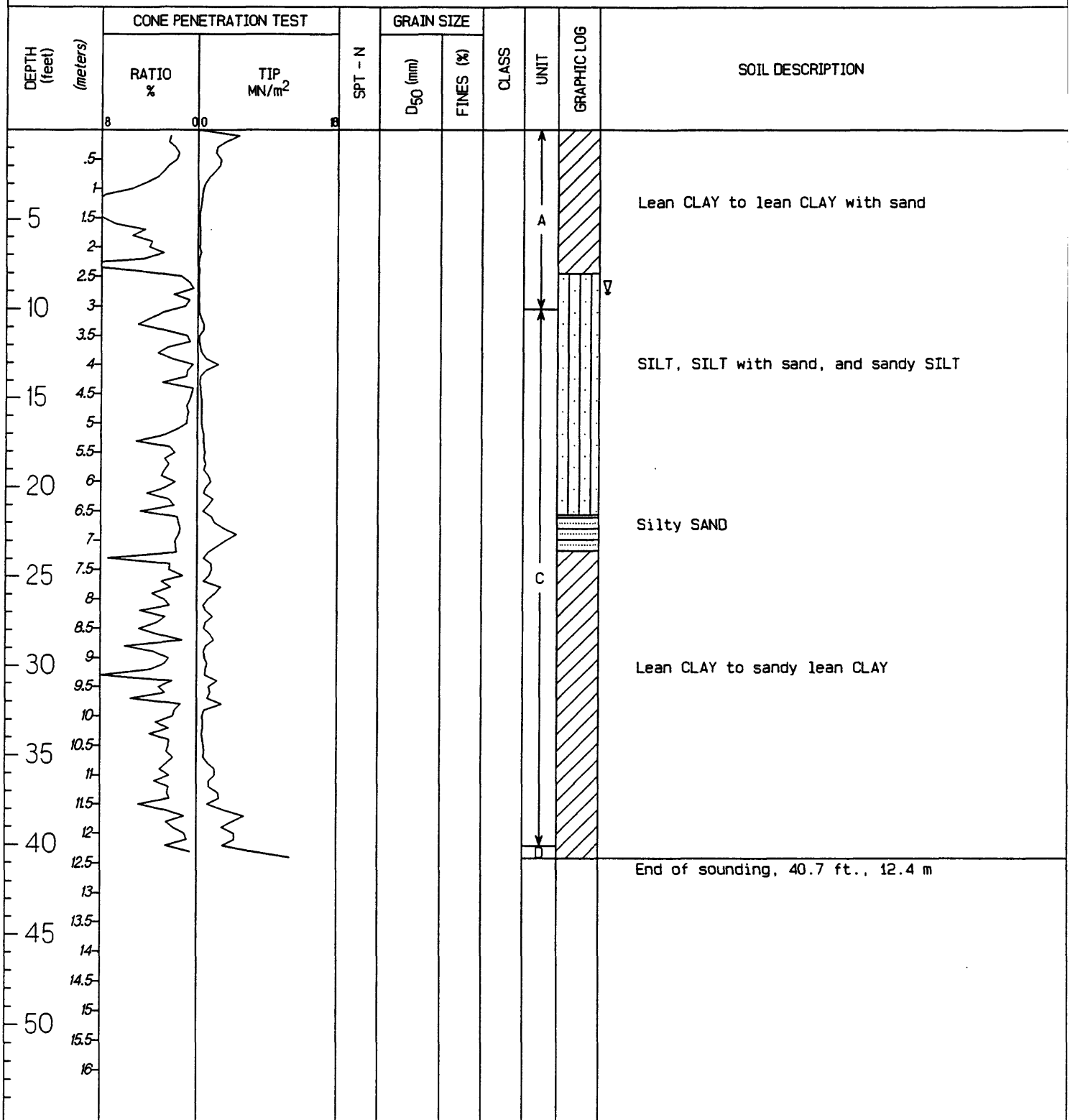
REMARKS: Along dirt road.
Vane, field vane in kn/m^2

Magnitude= 6.8

Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 4
PROJECT Northridge Ground Deformation Studies
LOCATION Potrero Canyon (POT)
COORDINATES X: 347270, Y: 3806943
DATE DRILLED CPT: 5-9-95
GROUNDWATER 9 ft.; 2.7 m
PERSONNEL D: Bennett/Criley
ELEVATION 1018.8 ft.; 310.5 m MSL



REMARKS: Along dirt road.

Magnitude= 6.8

Acceleration= 0.43

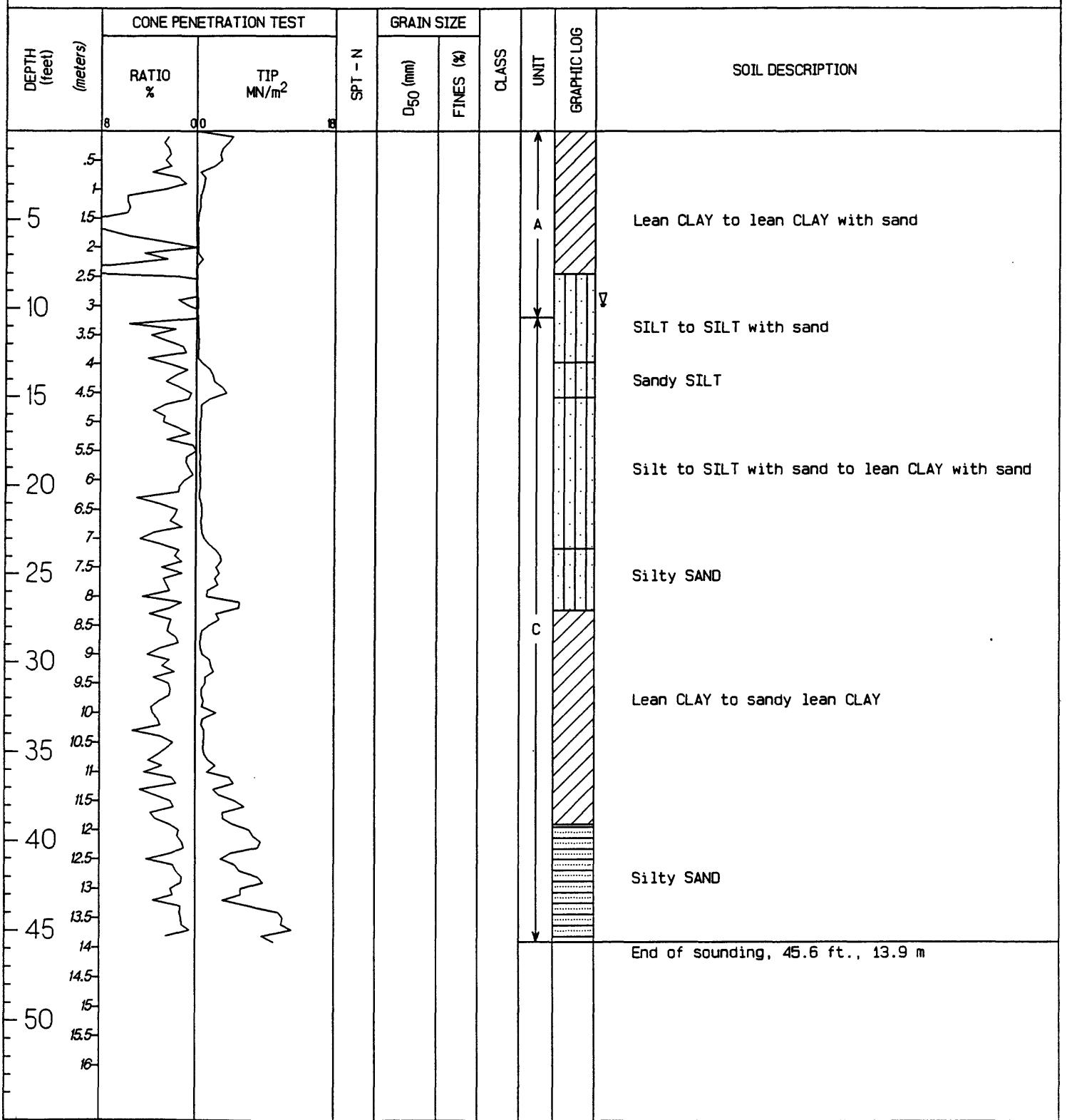
USGS GEOTECHNICAL LOG

HOLE NUMBER 5 | PROJECT Northridge Ground Deformation Studies

LOCATION Potrero Canyon (POT) | COORDINATES X: 347270 , Y: 3806971

DATE DRILLED CPT: 5-9-95 | GROUNDWATER 9.7 ft.; 3.0 m

PERSONNEL D: Bennett/Criley | ELEVATION 1018.8 ft.; 310.5 m MSL



REMARKS: Along dirt road.

Magnitude= 6.8 | Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 6

LOCATION Potrero Canyon (POT)

DATE DRILLED CPT: 5-9-95; SPT: 7-7-95

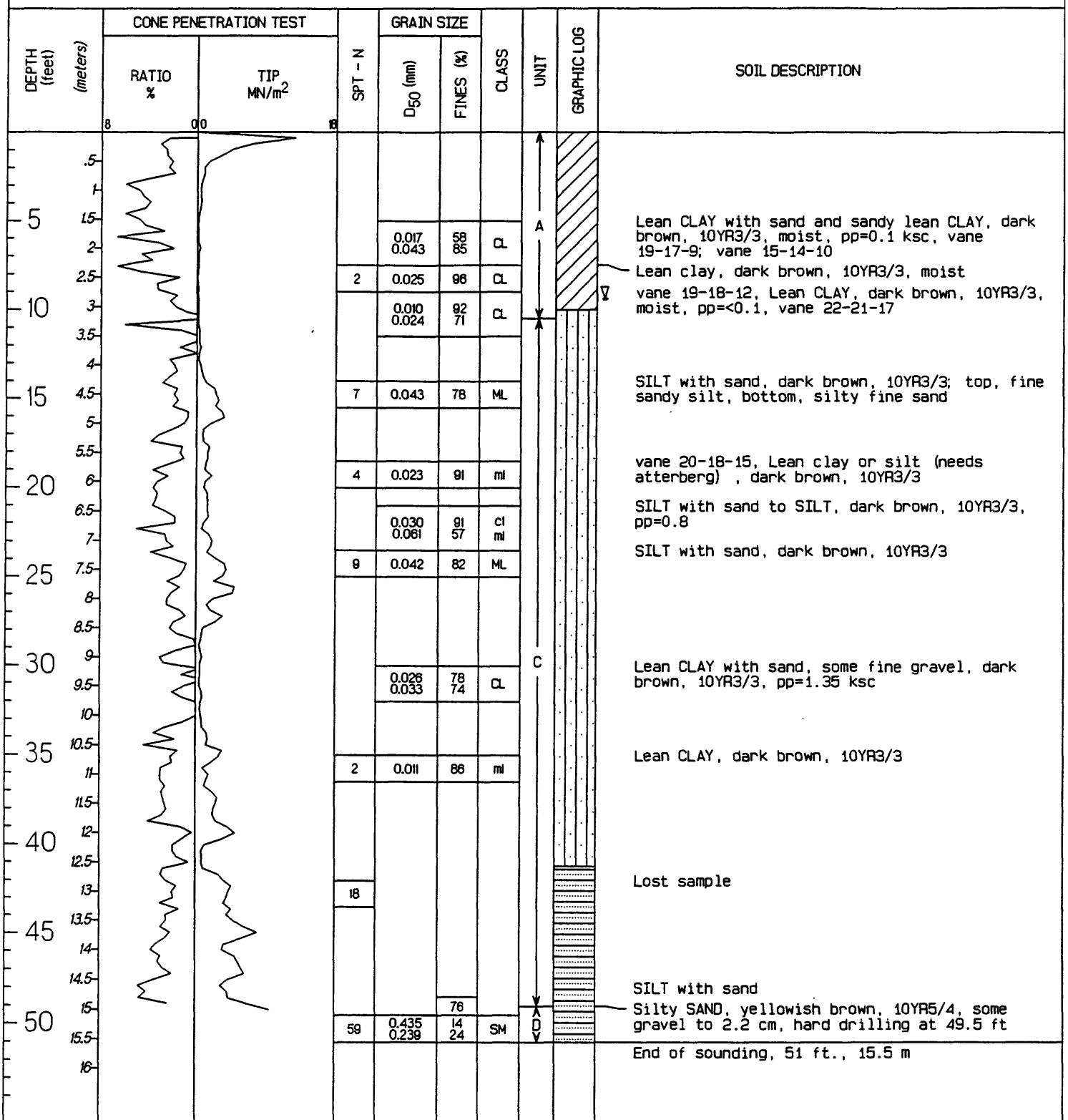
PERSONNEL L:Fumal; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 347272, Y: 3807003

GROUNDWATER 9.3 ft.; 2.8 m

ELEVATION 1018 ft.; 310.3 m MSL



REMARKS: Along dirt road.
Vane, field vane in kn/m^2

Magnitude= 6.8

Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 7

LOCATION Potrero Canyon (POT)

DATE DRILLED CPT: 5-9-95

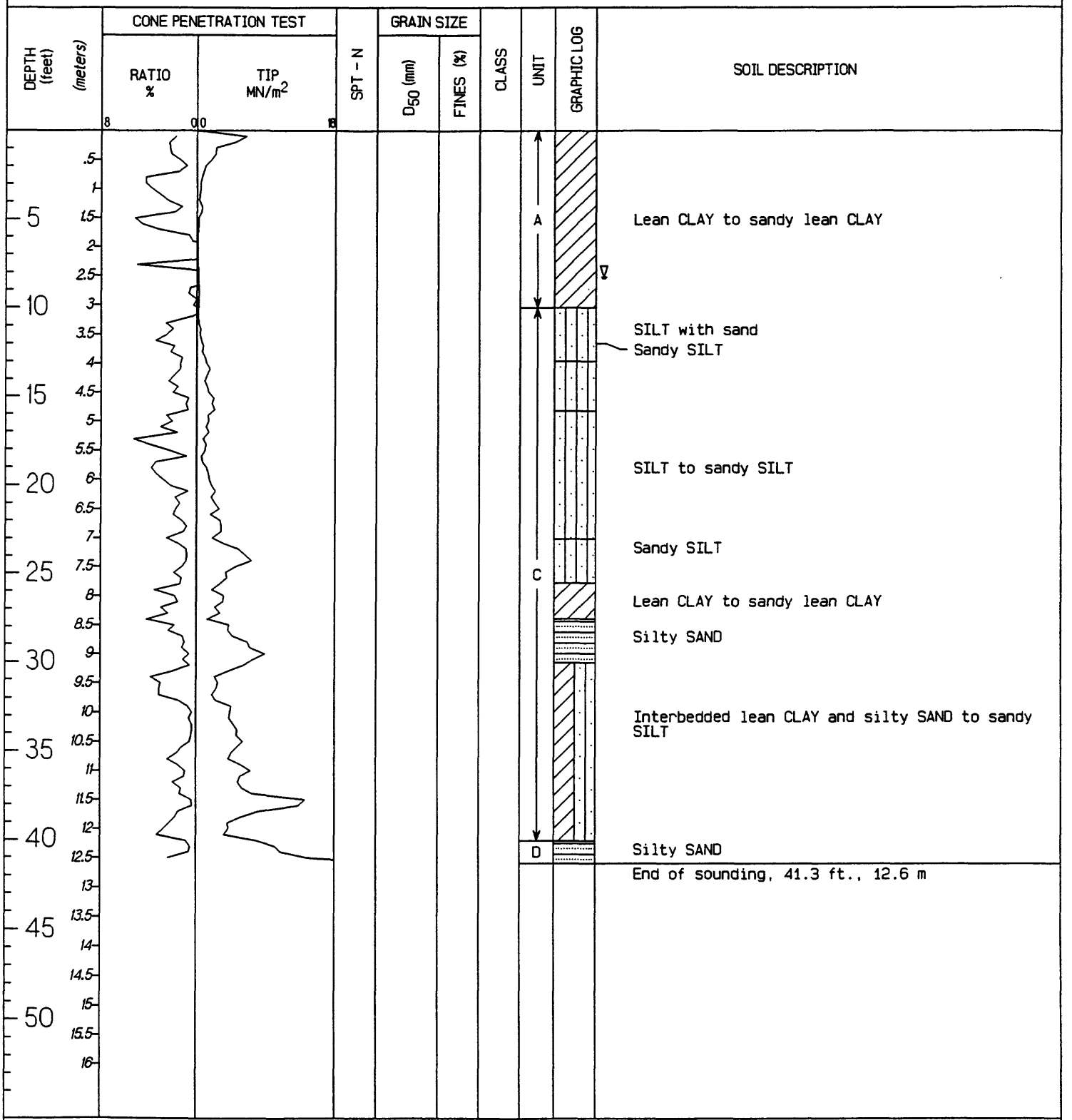
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 347274, Y: 3807033

GROUNDWATER 8.2 ft.; 2.5 m

ELEVATION 1017.3 ft.; 310.1 m MSL



REMARKS: In line of dirt road, north side main road.

Magnitude= 6.8

Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 8

LOCATION Potrero Canyon (POT)

DATE DRILLED CPT: 5-9-95; SPT: 7-8-95

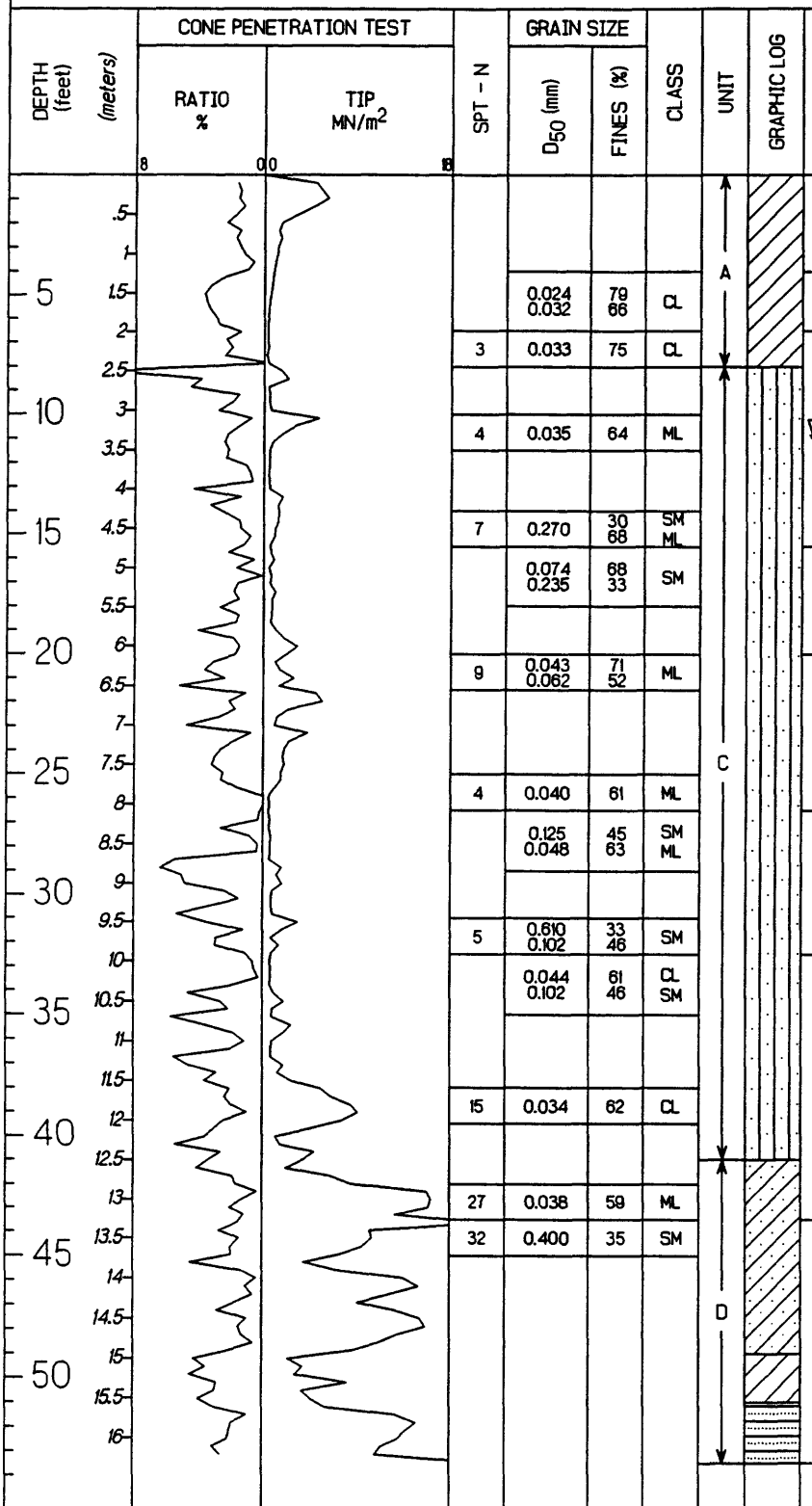
PERSONNEL L: Fumal; D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies

COORDINATES X: 347178, Y: 3806911

GROUNDWATER 10.8 ft.; 3.3 m

ELEVATION 1015.6 ft.; 309.6 m MSL



SPT - N	D_{50} (mm)	FINES (%)	CLASS
	0.024	79	CL
	0.032	66	
3	0.033	75	CL
4	0.035	64	ML
7	0.270	30	SM
		68	ML
	0.074	68	SM
	0.235	33	
9	0.043	71	ML
	0.062	52	
4	0.040	61	ML
	0.125	45	SM
	0.048	63	ML
5	0.610	33	SM
	0.102	46	
	0.044	61	CL
	0.102	46	SM
15	0.034	62	CL
27	0.038	59	ML
32	0.400	35	SM

REMARKS: Along canyon axis.
Vane, field vane in kn/m^2

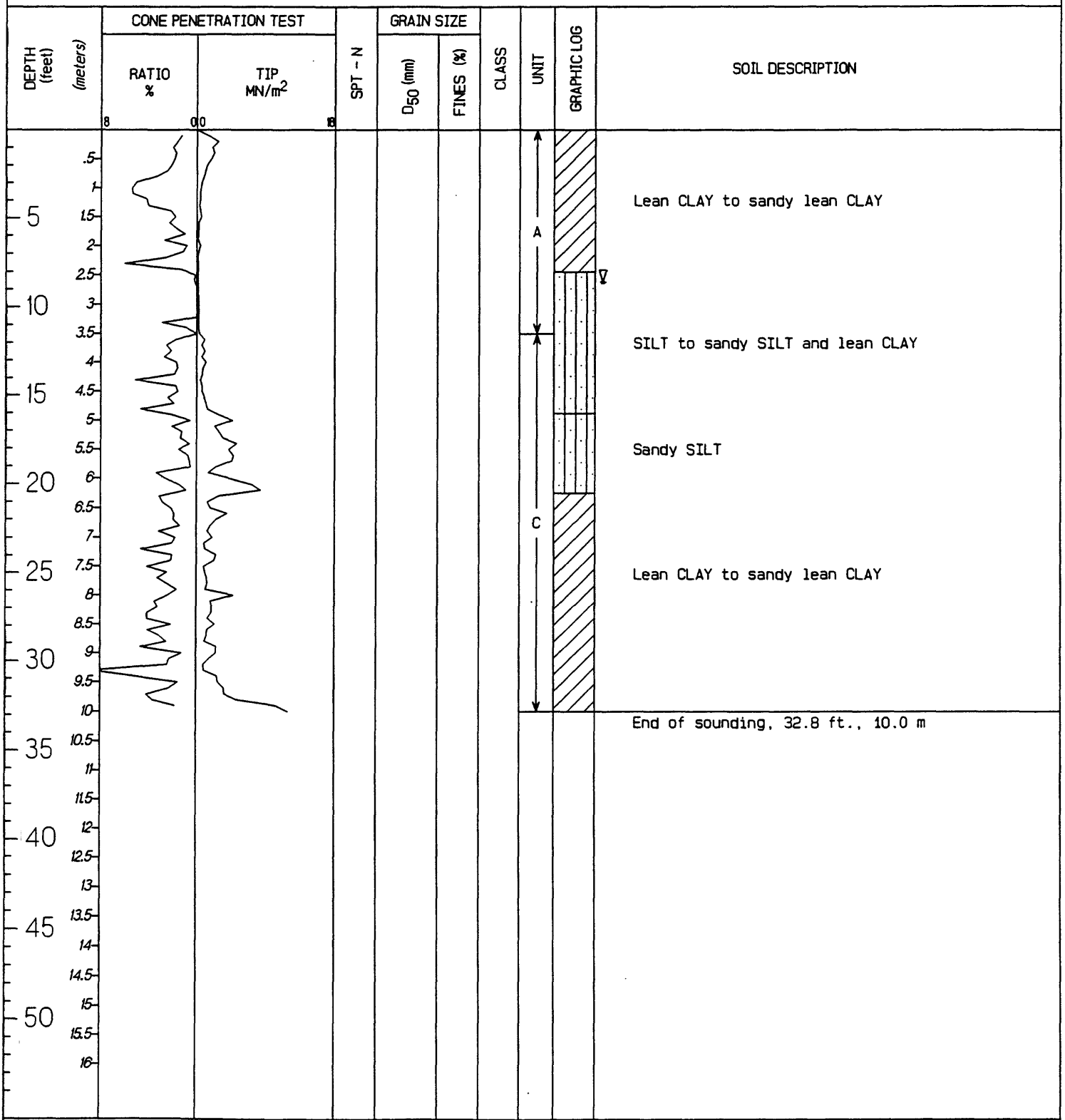
Magnitude= 6.8

Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 9
LOCATION Potrero Canyon (POT)
DATE DRILLED CPT: 5-10-95
PERSONNEL D: Bennett/Criley

PROJECT Northridge Ground Deformation Studies
COORDINATES X: 347155, Y: 3806946
GROUNDWATER 8.5 ft.; 2.6 m
ELEVATION 1012.4 ft.; 308.6 m MSL



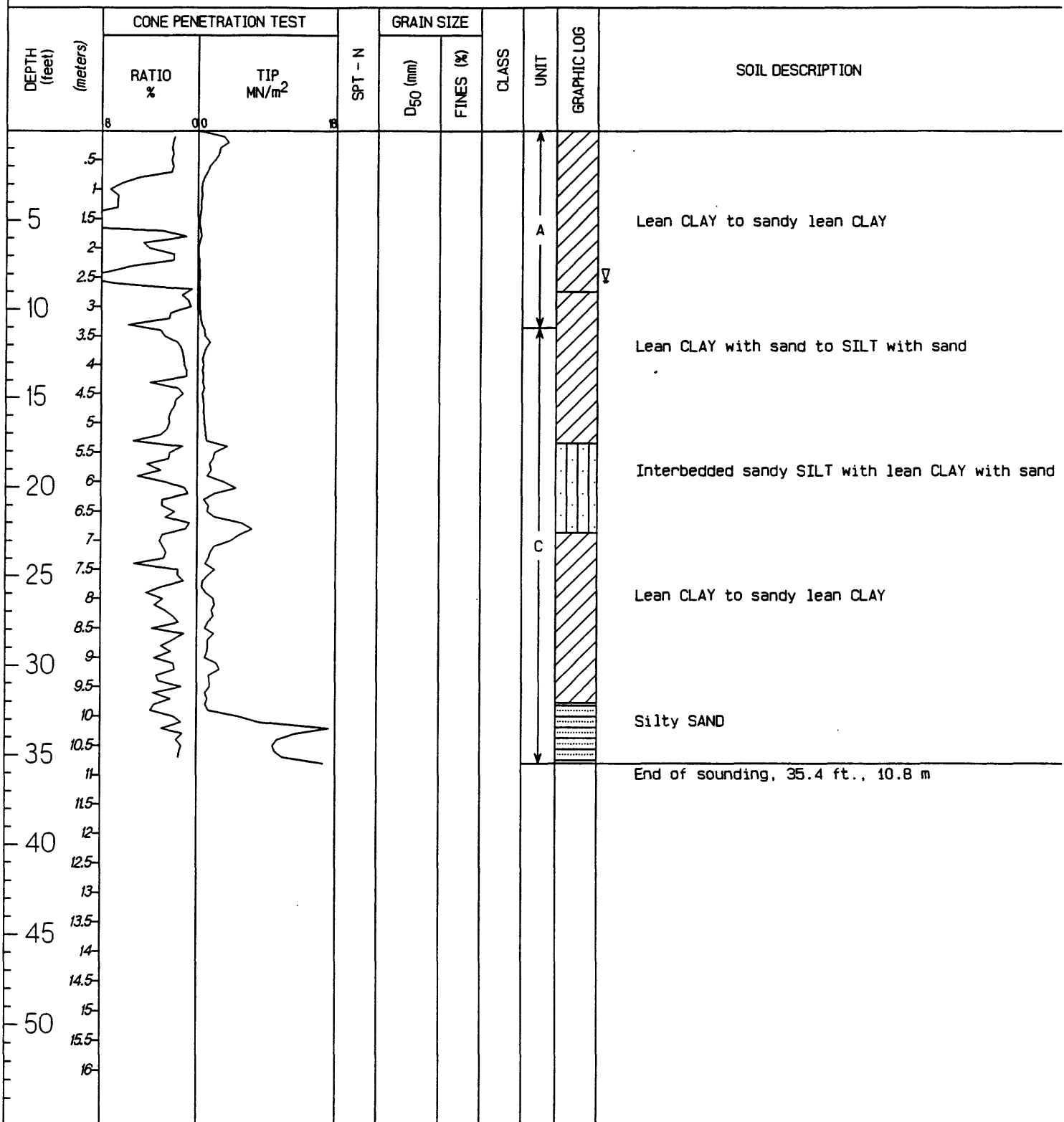
REMARKS: Along canyon axis.

Magnitude= 6.8

Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 10
PROJECT Northridge Ground Deformation Studeis
LOCATION Potrero Canyon (POT)
COORDINATES X: 347132, Y: 3806978
DATE DRILLED CPT: 5-10-95
GROUNDWATER 8.3 ft.; 2.5 m
PERSONNEL D: Bennett/Criley
ELEVATION 1010.1 ft.; 307.9 m MSL



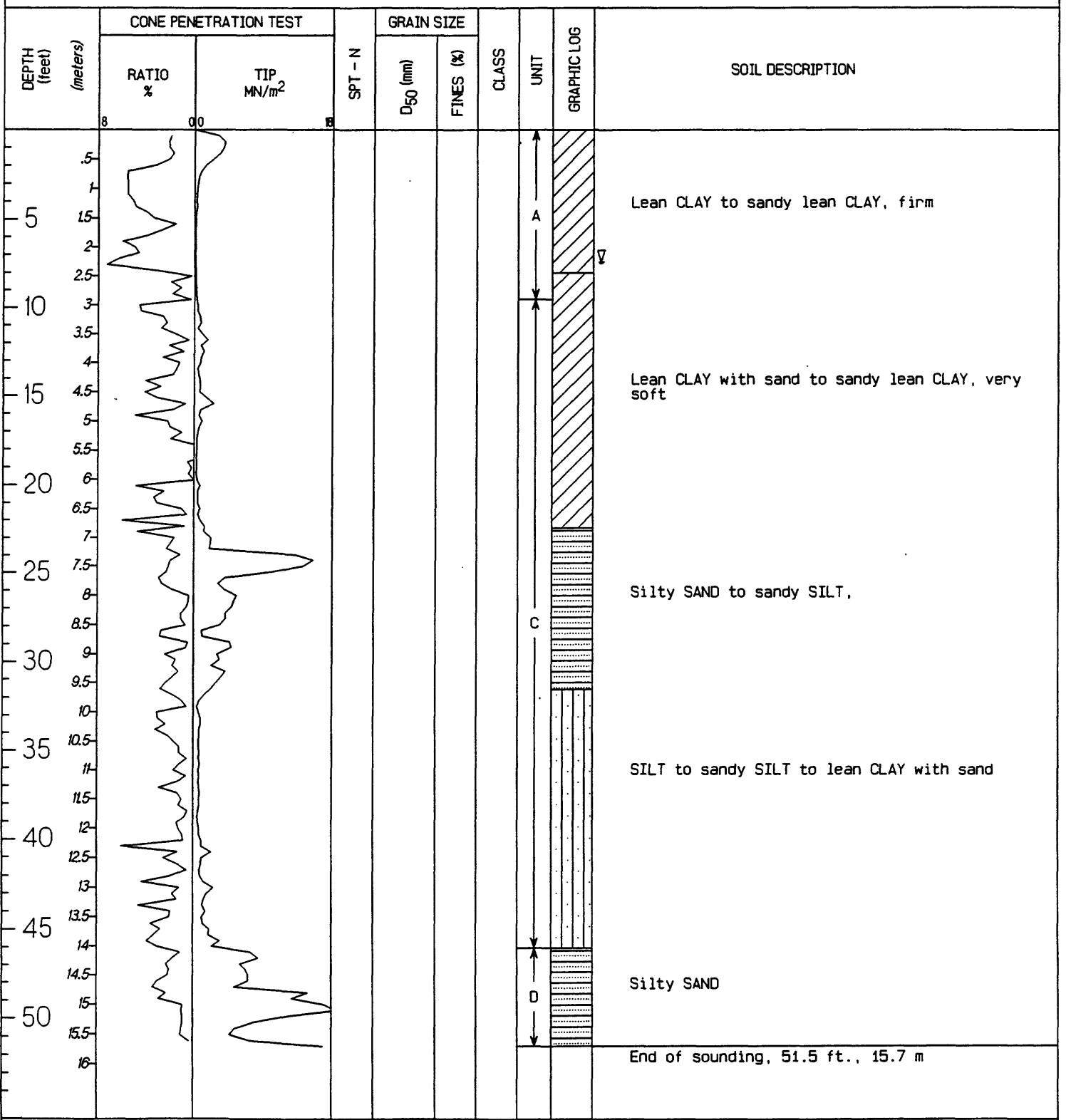
REMARKS: Along canyon axis.

Magnitude= 6.8

Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 11
PROJECT Northridge Ground Deformation Studies
LOCATION Potrero Canyon (POT)
COORDINATES X: 347114, Y: 3807003
DATE DRILLED CPT: 5-10-95
GROUNDWATER 7.3 ft.; 2.2 m
PERSONNEL D: Bennett/Criley
ELEVATION 1008.2 ft.; 307.3 m MSL



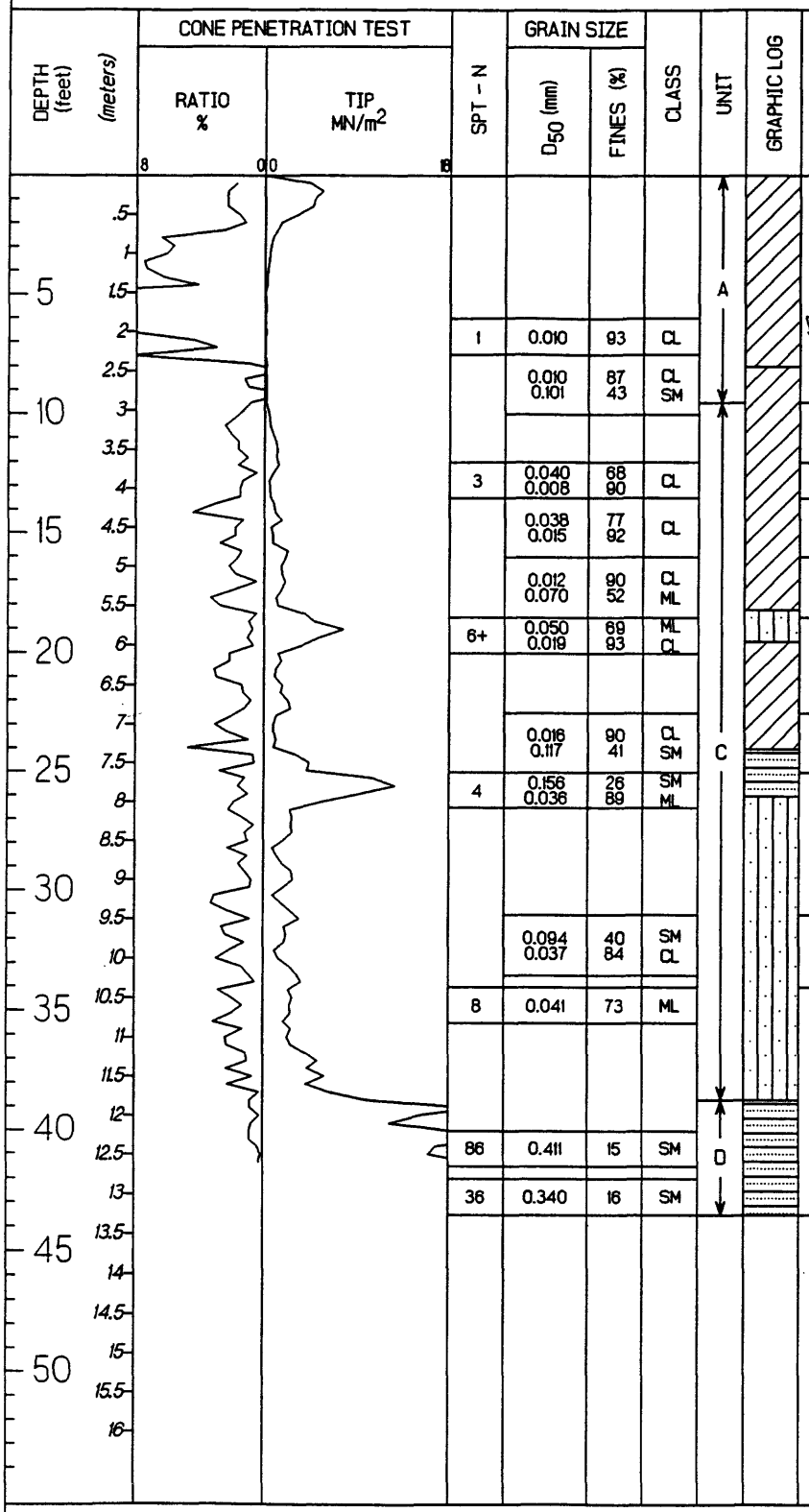
REMARKS: Along canyon axis.

Magnitude= 6.8

Acceleration= 0.43

USGS GEOTECHNICAL LOG

HOLE NUMBER 12
PROJECT Northridge Ground Deformation Studies
LOCATION Potrero Canyon (POT)
COORDINATES X: 347099, Y: 3807025
DATE DRILLED CPT: 5-10-95; SPT: 7-9-95
GROUNDWATER 6.5 ft.; 2.0 m
PERSONNEL L: Fumal; D: Bennett/Criley
ELEVATION 1007 ft.; 306.9 m MSL



REMARKS: Along canyon axis, northern most, closest to the road.

Magnitude= 6.8

Acceleration= 0.43