UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

IN-SITU MEASUREMENTS OF SEISMIC VELOCITY AT 19 LOCATIONS IN THE LOS ANGELES, CALIFORNIA REGION

by

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Open-File Report
81-399

This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature

CONTENTS

INTRODUCTION

Studies conducted in the San Francisco Bay Region (Gibbs, Fumal and Borcherdt, 1980) have shown that average shear-wave velocity can be related to quantitative estimates of ground motion such as amplification from nuclear explosions and earthquake intensity. Furthermore, when certain physical properties of the geologic materials such as texture, hardness and fracture spacing are described during geologic mapping, a method can be used to predict shear-wave velocity from descriptions of geologic units, (Fumal, 1978). By measuring shear-wave velocities in representative geologic units, regional maps depicting the earthquake hazard can be compiled.

These studies are presently being extended to the Los Angeles Basin and Oxnard-Ventura, California, areas. To date, shear and compressional waves have been measured in boreholes at 46 locations. A previous report (Gibbs, Fumal and Roth, 1980) summarized seismic and geologic data at sites 1-27. This report presents the data for sites 28-46. At each location seismic travel times are measured in drill holes, normally at 2.5 m intervals to a depth of 30 m. Geologic logs are compiled from drill cuttings, undisturbed samples and penetrometer samples. The data provide a detailed comparison of geologic and seismic characteristics and parameters for estimating strong earthquake ground motions quantitatively at each of the sites.

SELECTION AND LOCATION OF SITES

The selection of sites 28-46 (fig. 1) in this study was guided by the availability of other data in the Los Angeles area that are applicable to the overall problem of estimating earthquake ground motions. These data are (1) strong motion records from the 1971 San Fernando earthquake, (2) ground motion recorded from nuclear explosions and (3) geologic mapping (in progress). Sites are selected on the basis of each data set with priority given to the order listed.

DRILLING AND SAMPLING PROCEDURES

At each site selected, a hole 12.4 cm in diameter is drilled to a depth of 30 m using a truck-mounted drill and a rock bit with mud and water circulation. The boring is then cased with 7.6 cm diameter PVC plastic pipe and backfilled with drill cuttings and "pea" gravel. Casing insured accessibility of the hole and provided a secure clamping surface for the seismic probe.

Samples are taken in each of the holes at depths of approximately 3 m, 7.5 m, 30 m, and at boundaries defined by continuously monitoring the drill cuttings and the drill reaction. The type and number of samples taken at each site is determined by the type of material, the number of significant lithologic boundaries, and variations in weathering.

In soils, standard penetration measurements are made and undisturbed samples are taken using a "Pitcher" core barrel and a "Shelby" thin tube liner. Pitcher barrel samples are also taken in soils with large amounts of hard rock fragments and in firm rock. Samples are obtained in hard rock using a core barrel with a diamond core bit.

RECORDING PROCEDURES

Compressional waves are generated at each site by the vertical impact of a sledge hammer on a steel plate. A signal produced by the opening of a switch attached to the hammer is recorded for determining origin time.

Shear waves are generated using the horizontal traction source introduced by Kobayashi (1959) and discussed by Warrick (1974). Briefly, the method consists of applying a horizontal impact to a large timber (244 x 30 x 18 cm). The timber is placed on a flattened soil surface and held firmly in place by the front wheels of a truck. A steel pipe extends through the timber and supports a 30 kg hammer to which is attached an impact switch. The specially constructed hammer rolls on bearings and moves a distance of 45 cm along the pipe before impacting the timber. The "horizontal traction" source generates a high proportion of S- and P-wave energy. The timber is struck twice, once in each direction. The two impacts reverse the polarity of the S-waves but not the polarity of the smaller amounts of P-wave engery. Comparison of the two signals provides an important tool for identifying the onset of the S-wave.

The timber is offset 2.0 m from the hole and a three-component geophone package (natural frequency 14 Hz) is placed within 9 cm of its center. The signals recorded from the surface geophones are used to monitor the input signals and determine the origin time for the generated S-waves. The arrangement of timber, steel plate, and surface geophone package is illustrated in figure 2.

The P-waves generated by a vertical impact on the steel plate and the S-waves generated by striking the timber in both directions are recorded separately. This procedure is repeated for each 2.5 m interval (closer spacing is sometimes used to obtain a velocity in thin layers) in the drill hole.

Two downhole geophones were used in this study. One has an inflatable diaphragm and a declinometer which under most circumstances permits orientation of the horizontal geophones from the surface. Proper orientation (parallel and perpendicular to the source) aids in identifying the onset of the S-wave. A second downhole geophone was used as a backup instrument in several holes in this study. This geophone has a spring clamping mechanism and cannot be oriented from the surface. Both instruments detect three components of motion.

The signals from the downhole and surface seismometers and the impact switches are recorded on photographic paper. The velocity unit-impulse response of the recording system is essentially flat from 2 Hz to above 100 Hz. A detailed description of the recording instrumentation is presented by Warrick and others (1961). The recording oscillograph is modified for this project by adding 500 Hz galvanometers and increasing the paper speed to 46 cm/sec.

REDUCTION OF GEOLOGIC DATA

Description of Samples

Portions of each of the samples are examined and described in the laboratory. The terms used for the descriptions are summarized on figure 3. The sample descriptions are presented in the left-hand columns of figures .

The soil samples are described using the field techniques of the Soil Conservation Service and those specified for the Unified Soil Classification System. Descriptions include soil texture, color, amount and size of coarse grains, plasticity, dry and wet consistency, and moisture condition. Texture refers to the relative proportions of clay, silt, and sand particles less than 2 mm in diameter. The dominant color of the soil and prominent mottles are determined from the Munsell soil color charts.

Descriptions of rock samples include rock name, weathering condition, color, grain size, hardness, and fracture spacing. Classifications of rock hardness and fracture spacing are those used by Ellen and others (1972) in describing hillside materials in San Mateo County, CA. The weathering classification is modified from that used by Aetron-Blume-Atkinson (1965) in describing Tertiary sedimentary rocks in the foothills of the Santa Cruz Mountains, CA.

Geologic Log

Geologic logs are compiled for each hole using the field log descriptions of the samples (figures 19-37). The field log is based on the reaction of the drill rig, a continuous record of drill cuttings, preliminary on-site inspection of samples, and inspection of nearby roadcuts and gullies.

Most information needed for describing relatively well-sorted soils and such properties of rock as lithology, color, and hardness are readily obtained from cuttings. Inspection of samples and nearby outcrops is also necessary to determine the nature of poorly sorted materials and to determine fracture spacing. Reaction of the drill rig is also useful in determining degree of fracturing as the rate of penetration in rock is highest for very closely fractured and crushed materials and drilling roughness generally is at a maximum in closely to moderately fractured rock. In-situ consistency of soil is determined largely from standard penetration measurements and rate of drill penetration.

Density Measurements

Values for density are required to calculate elastic moduli from measurements of seismic velocity. Densities were measured for the diamond core samples and most of the penetration samples by weighing a small piece of sample and obtaining its volume by the mercury displacement method. A different procedure was used for very friable materials such as grus or poorly-sorted materials which necessitated using a large sample. A section was cut from the Shelby tube containing the sample, its height and diameter measured and the sample extruded for weighing.

While the accuracy of the density measurements is generally sufficient for calculation of elastic moduli, a number of the samples used to obtain densities were not entirely representative of the material in-situ. Penetration samples were somewhat disturbed and many had dried out before measurements could be made. Densities of hard rock obtained using intact fragments may be higher than in-situ densities by approximately 0.1 - 0.2 gm/cc, depending on the amount and openness of fractures.

REDUCTION OF SEISMIC DATA

Identification of Shear Wave Onset

To aid in the identification of the shear wave arrivals, the signals recorded in the drill hole from impacting the timber in opposite directions are superimposed and drafted on a common time base (figs. 38-56). The S-wave group is easily identified when displayed in this manner, by a 180° phase inversion. The onset of the S-wave is chosen as the start of the first clearly inverted phase in the group. The interpretation proceeds from the bottom record, to the top using phase correlation at each recording depth. The onset of the S-wave arrival (arrows) and the first peak of the S-wave arrival (dots) are identified for each depth and are indicated on figures 38-56 for each site.

It was not possible at every site to control orientation of the downhole seismometer package because of high viscosity drilling mud left in the hole; hence, the relative amounts of S-wave energy recorded on the two horizontal seismometers vary with depth. The S-wave arrival is generally most easily identified on the horizontal seismogram with the largest amplitudes. Comparison of the signals recorded on the horizontal sensors with that recorded on the vertical sensor shows that the S-wave energy generated by the horizontal traction source is at least twice as large as the P-wave energy.

On many of the horizontal seismograms some P-wave energy prior to the onset of the S-wave is apparent. Some P-wave energy is generated by the horizontal traction source and some probably results from conversion of S to P at seismic boundaries. In some cases the polarity of this P-wave energy is reversed and careful consideration of the entire record section is required to identify the S-arrival. In general, the onset of the S-wave is easier to identify at sites underlain by the various types of soil than for sites underlain by the more consolidated rock units.

Travel Times and Average Velocities

To determine the travel time for the S-wave onset identified from the record sections (figures 38-56), the following times are measured with respect to a 100 Hz time code signal recorded on the records:

1) t_1 time of break in signal from impact switch

2) t_2 onset time of S-wave arrival on inline uphole geophone

3) t_3 onset time of identified S-wave arrival on downhole sensors

The time considered to be the origin time for the S-wave recorded on the downhole sensor is the onset time of the S-arrival on the uphole inline sensor. To reduce the uncertainties in determining this origin time, an average travel time from the source to the uphole geophone (t_A) is determined from the set of values, $t_2 - t_1$, measured at each depth.

The travel time for the first S-arrival is given by

$$t_s \quad (t_3 - t_1) - t_A.$$

A corrected S-wave travel time (t_s), corresponding to the travel time for a vertical ray path, is computed from $t_{s_c} \equiv t_s + t_c$ where t_c corresponds to a timing correction (cosign of the angle of ray incidence) due to the distance the plank is offset from the center of the hole (usually 2.0 m). Average velocities from the surface are determined by dividing the corrected travel time by the corresponding depth. The travel time for the first S-peak is determined similarly. The origin corrections ($t_2 - t_1$), the travel times of the first S-arrival and the first S-peak (t_s), the corrected travel times for the first S-arrival and the first S-peak (t_{s_c}), and the average corresponding velocities computed at each site are presented in tables 1-19.

The travel times for the P-waves generated by a vertical impact on a steel plate are determined in the same way as for the S-waves, except that the origin time for the P-wave is given by the impact switch and no origin correction is necessary. The travel times, the corrected travel times, and the average velocities for the P-waves are also presented in tables 1-19.

Interval Velocities and Elastic Moduli

Calculation of interval velocities and elastic moduli requires determination of depth intervals over which the velocity is approximately constant within the uncertainty of the travel-time measurements. To determine these depth intervals, the travel time data (tables 1-19) are plotted as a function of depth (figs. 57-75) and the geologic logs (figs. 19-37) are simplified and displayed graphically on the travel time curves (figs. 57-75). Depth intervals for velocity determinations are selected on the basis of distinct changes in slope of the travel time plots and evidence for lithologic boundaries. For those geologic materials with S-velocities greater than 350 m/sec, the intervals are required to contain at least four travel time

measurements to avoid determining a velocity from a travel time differential due in large part to measurement error.

Velocities are calculated for each of the selected intervals (tables 20-38) from the slope of the linear regression line which best fits the travel time data in a least squares sense (Borcherdt and Healy, 1968, eqs. 3.1-3.5). The equation of the linear-regression line which best fits, in a least-squares sense, a sample of n pairs of time-depth coordinates $(x_1,t_1),....(x_n,t_n)$ is

$$t(x) = a + b\,(x - \bar{x})$$

where $$\bar{x} \cong \frac{1}{n} \sum_{i=1}^{n} x_i \ , \quad a \cong \frac{1}{n} \sum_{i=1}^{n} t_i ,$$

the intercept is $$INCPT \cong \frac{1}{n} \sum_{i=1}^{n} t_i - b\bar{x} \ , \text{ and}$$

the slope is $$b \cong \sum_{i=1}^{n} w_i t_i$$

with $$w_i = (x_i - \bar{x})/D \text{ and } D \cong \sum_{k=1}^{n} (x_k - \bar{x})^2$$

The desired velocity (VEL) is given by V - 1/b. Assuming the standard statistical model (Borcherdt and Healy, 1968), the 68.3 confidence level, uncertainty interval (UNC INT) for the velocity is estimated by

$$\frac{1}{b+S_b} \ , \ \frac{1}{b-S_b} \ ,$$

where $$S_b \cong \frac{1}{(n-2)D} \sum_{i=1}^{n} (t_i - t(x_i))^2$$

is the standard error of the regression coefficient.

For these depth intervals with measurements f density (p), the shear modulus (SHEAR MOD, M) and bulk modulus (BULK MOD, K) is calculated (tables 20-38) using

$$M = \rho V_s^2$$

and

$$K = \rho V_p^2 - \frac{4}{3} M$$

Poisson's ratio (σ) is calculated (tables 20-38) using

$$\sigma = \frac{\left(\frac{V_p}{V_s}\right)^2 - 2}{2\left(\frac{V_p}{V_s}\right)^2 - 2}$$

SUMMARY

This report summarizes seismic velocities measured in the near surface geologic materials at 19 locations in the Los Angeles and Oxnard Ventura, California, areas. S-wave and P-wave measurements were made at 2 1/2 m intervals in drill holes to a depth of 30 m. Geologic logs were compiled by continuously monitoring drill cuttings and by analysis of cored samples. Density measurements were made from samples for the calculation of elastic moduli.

Previous studies in the San Francisco Bay region (Gibbs et al., 1980) have shown that average shear velocity can be correlated with ground motion amplification recorded from nuclear explosions and with observed intensities from the 1906 earthquake. A detailed study using shear velocity data from 59 locations (Fumal, 1978) has shown that certain physical properties of the near surface geologic materials can be used to predict velocity. Measurements of shear velocity at a number of strategic locations will permit a regional classification of seismically distinct velocity units which may be useful for seismic zonation.

ACKNOWLEDGEMENTS

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REFERENCES

Aetron-Blume-Atkinson, 1965, Geologic site investigations for Stanford Linear Accelerator Center: Report No. ABA-88.

Borcherdt, R. D., and Healy, J. H., 1968, A method of estimating the uncertainty of seismic velocities measured by refraction techniques: Bull. Seism. Soc., Am., 58, p. 1769-1790.

Ellen, S. D., Wentworth, C. M., Brabb, E. E., and Pampeyan, E. H., 1972, Description of geologic units, San Mateo County, California: Accompanying U.S. Geol. Survey Miscellaneous Field Studies Map, MF-328

Fumal, T. E. 1978, Correlations between seismic wave velocities and physical properties of near-surface geologic materials in the southern San Francisco Bay region: U.S. Geological Survey Open-File Report 78-1067.

Gibbs, J. F., Fumal, T. E., and Borcherdt, R. D., 1981, In-situ measurements of seismic velocities for seismic zonation in the San Francisco Bay Region: Bull. Seism. Soc. of Am., in press.

Gibbs, J. F., Fumal, T. E. and Roth, E. F., 1980, In-situ measurements of seismic velocities at 27 locations in the Los Angeles, California region: U.S. Geological Survey Open-File Report 80-378.

Kobayaski, N., 1959, A method of determining the underground structure by means of SH waves: Zisin, ser. 2, v. 12, p. 19-24.

Soil Survey Staff, 1951, Soil Survey Manual: U.S. Department of Agriculture Handbook 18.

Sowers, G. B., and Sowers, G. F., 1970, Introductory Soil Mechanics and Foundations: MacMillan, New York.

Terzaghi, K., and Peck, R. B., 1967, Soil Mechanics in Engineering Practice: John Wiley and Sons, New York.

U.S. Army Corps of Engineers, 1960, the unified soil classification system: Tech. Menorandum No. 3-357, Waterway Experiment Station, Vicksburg, Mississippi.

Warrick, R. E., 1974, Seismic investigation of a San Francisco Bay mud site: Bull. Seism. Soc. Am., v. 64, p. 375-385.

Warrick, R. E., Hoover, D. B., Jackson, W. H., Pakiser, L. C., and Roller, J. C., 1961, The specifications and testing of a seismic-refraction system for crustal studies: Geophysics, v. 26, p. 820-824.

FIGURES

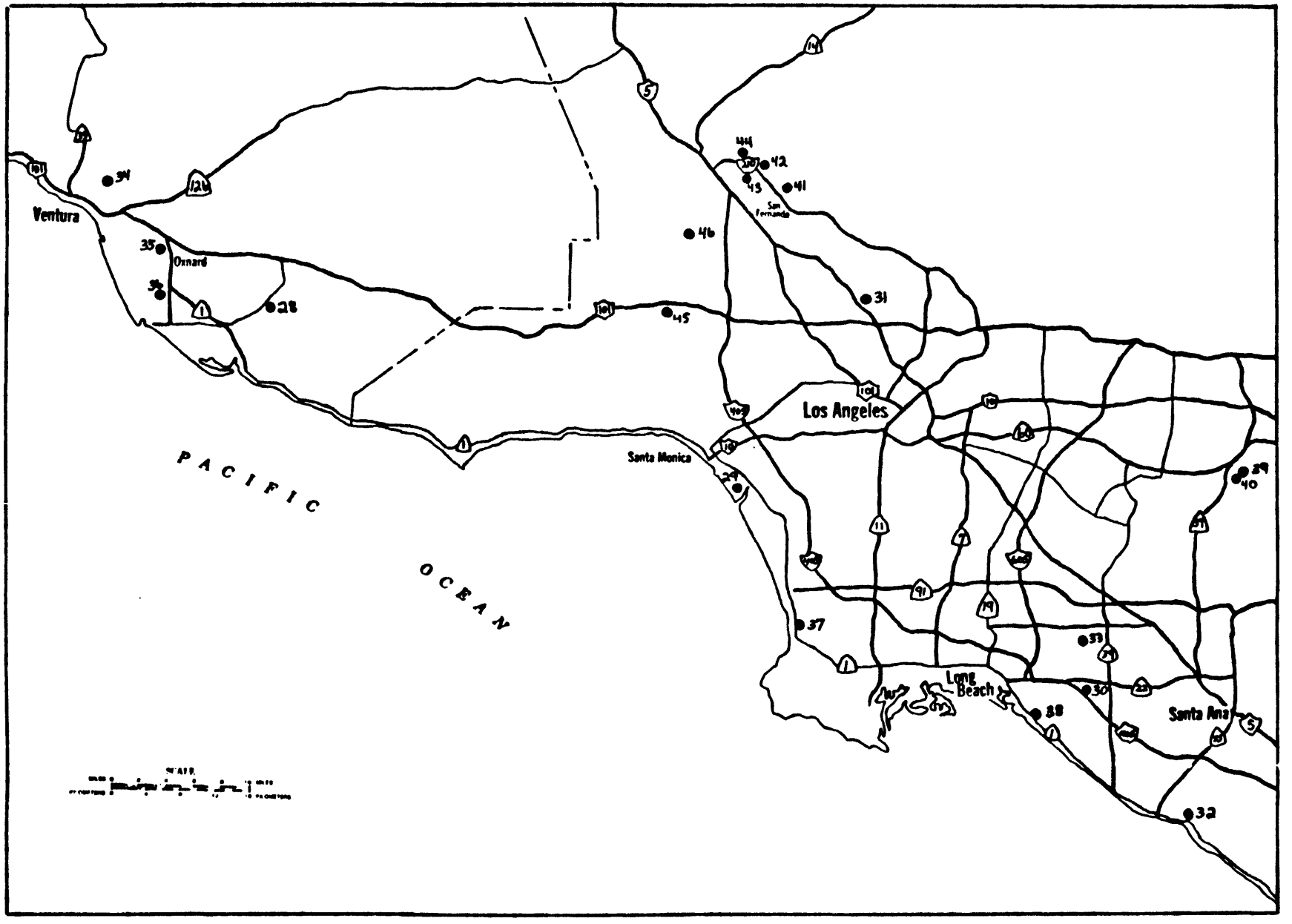


Figure 1. Generalized map of the Los Angeles region showing the approximate locations of shear-wave sites. Detailed locations are shown in figures 4-18.

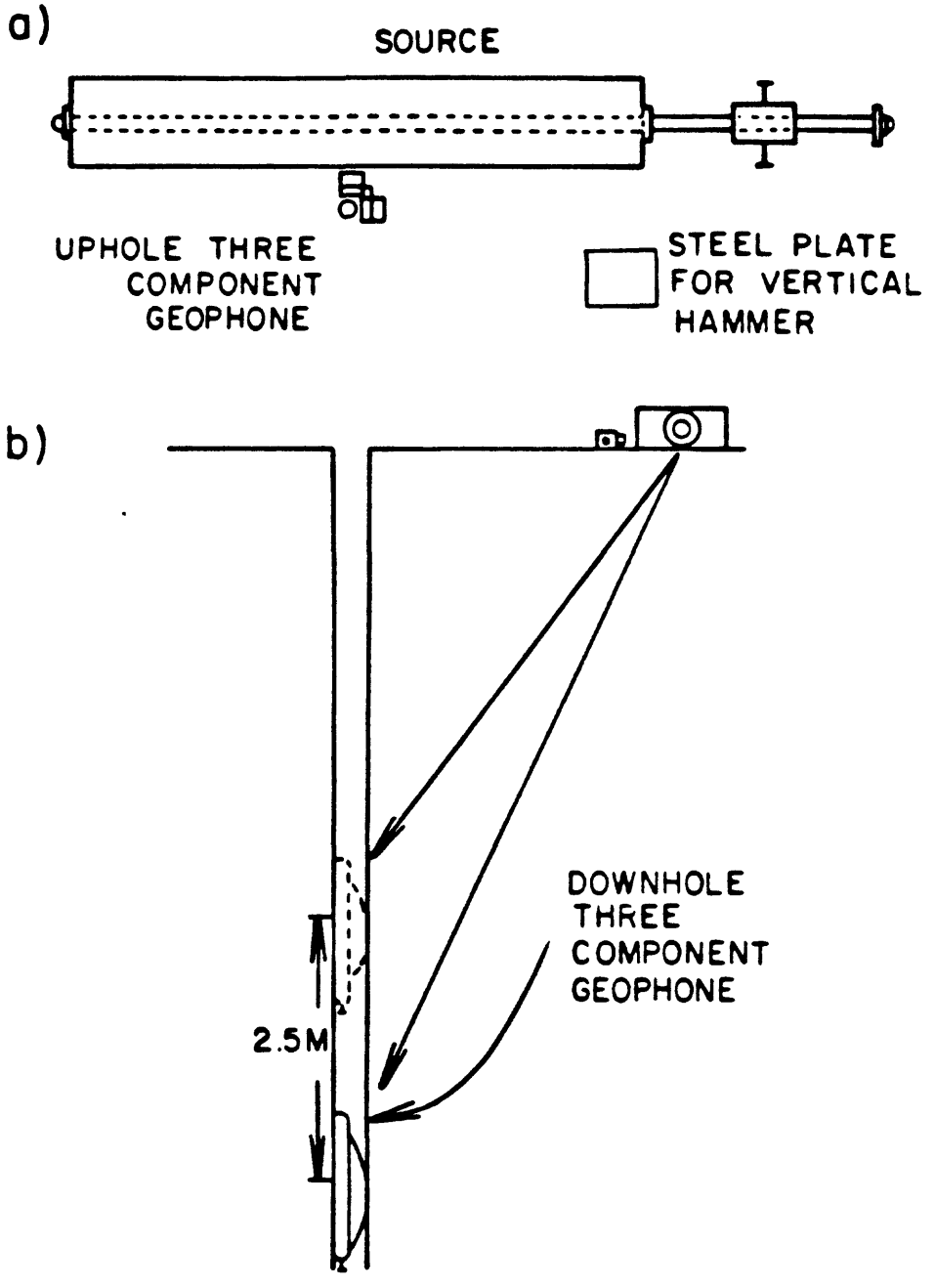
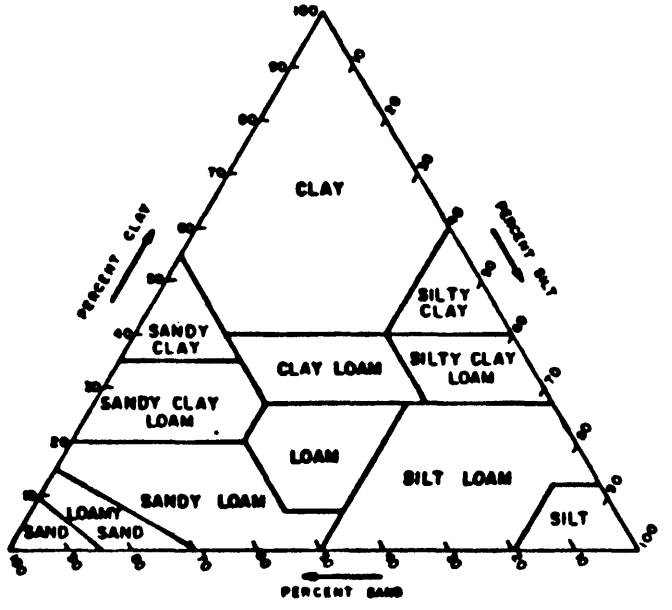


Figure 2. Details of field apparatus, (a) hammer and plank and (b) section showing three-component downhole geophone.

DESCRIPTION

Texture: the relative proportions of clay, silt, and sand below 2 mm. Proportions of larger particles are indicated by modifiers of textural class names. Determination is made in the field mainly by feeling the moist soil (Soil Survey Staff, 1951).



Color: Standard Munsell color names are given for the dominant color of the moist soil and for prominent mottles.

Plasticity: estimated from the strength of air dried sample and toughness of thread formed when soil is rolled at the plastic limit (Sowers and Sowers, 1970).

plasticity	dry strength	field test
non plastic	v. low	falls apart easily
slightly	slight	easily crushed
medium	medium	friable with difficulty
highly	high	cannot crush with fingers

DESCRIPTION

Relative density of sand and consistency of clay is correlated with penetration resistance: (Terzaghi and Peck, 1948)

blows/ft.	relative density	blows/ft.	consistency
0-4	v. loose	<2	v. soft
4-10	loose	2-4	soft
10-30	medium	4-8	medium
30-50	dense	8-15	stiff
>50	v. dense	15-30	v. stiff
		>30	hard

CL, MH, etc.: Unified Soil Classification Group Symbol (U. S. Army Corps of Engineers, 1960)

Rock hardness: response to hand and geologic hammer: (Ellen et al., 1972)

hard - hammer bounces off with solid sound
firm - hammer dents with thud, pick point dents or penetrates slightly
soft - pick point penetrates
friable material can be crumbled into individual grains by hand.

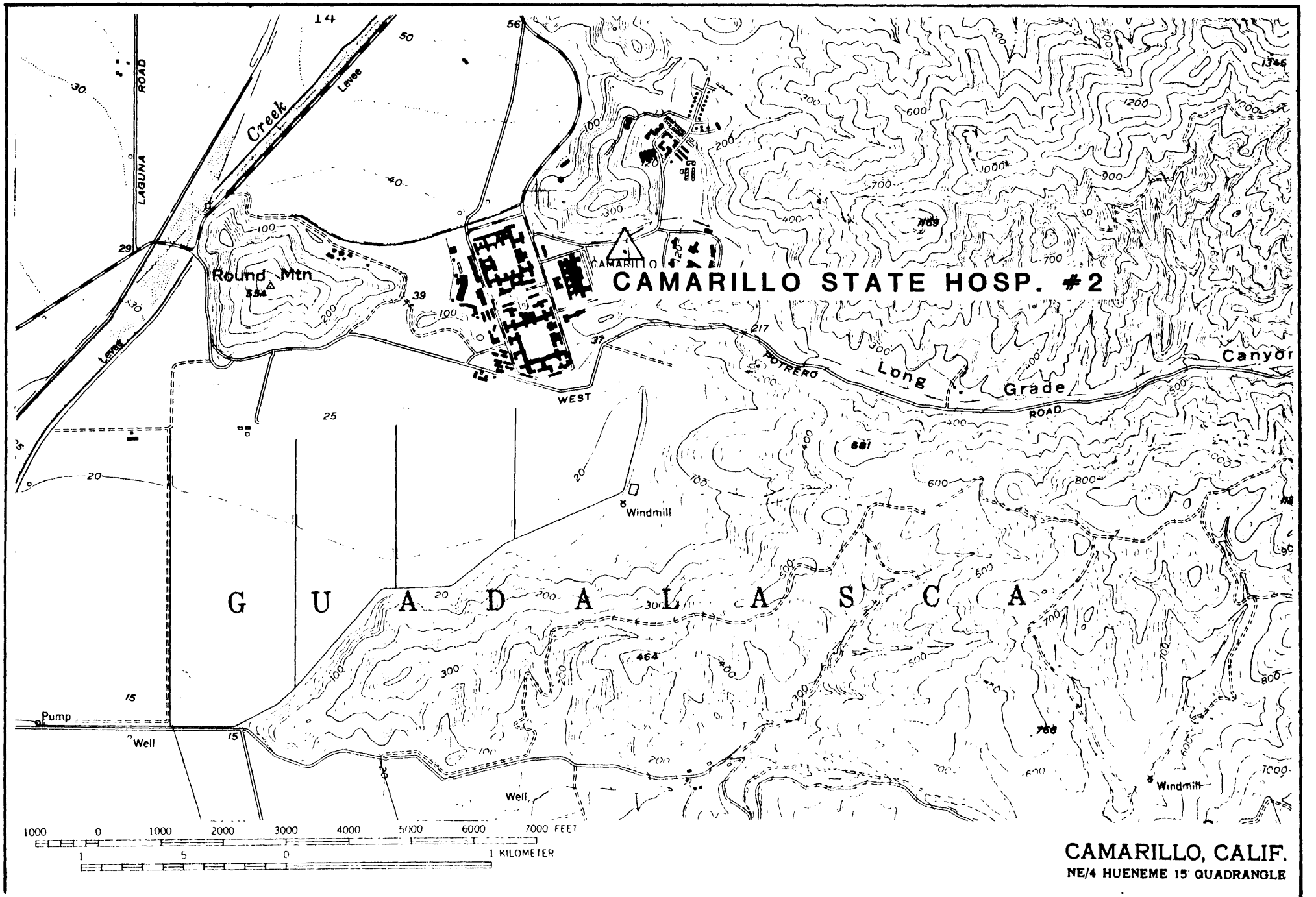
Fracture spacing: (Ellen et al., 1972)

cm	in	fracture spacing
0-1	0-1/2	v. close
1-5	1/2-2	close
5-30	2-12	moderate
30-100	12-36	wide
>100	>36	v. wide

Weathering: (Actron-Blume-Atkinson, 1965)
Fresh: no visible signs of weathering
Slight: no visible decomposition of minerals, slight discoloration
Moderate: slight decomposition of minerals and disintegration of rock, deep and thorough discoloration
Decomposed: extensive decomposition of minerals and complete disintegration of rock but original structure is preserved.

Figure 3. Definitions of terms used for descriptions of sedimentary deposits and bedrock materials.

Figure 4


CAMARILLO STATE HOSP. #2
G U A D A L A S C A
Round Mtn
554
Creek
Levee
LAGUNA ROAD
POTRERO
Long Grade
ROAD
WEST
Windmill
Pump
Well
Well
Windmill
CAMARILLO
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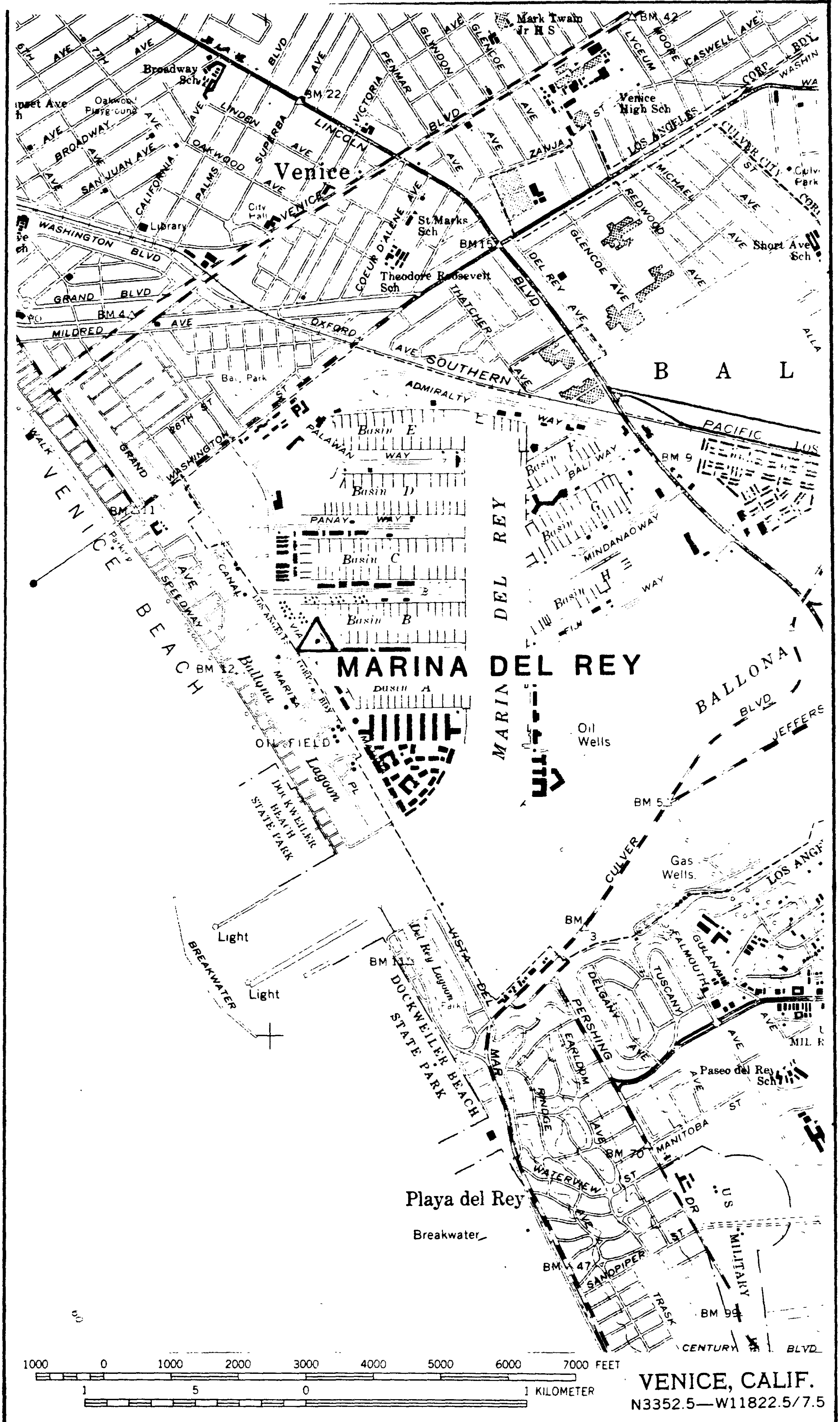
CAMARILLO, CALIF.
NE/4 HUENEME 15' QUADRANGLE

20



Venice
MARINA DEL REY
Playa del Rey
Basin A
Basin B
Basin C
Basin D
Basin E
Ballona Lagoon
Del Rey Lagoon
DOCKWEILER BEACH STATE PARK
VENICE BEACH
OIL FIELD
Oil Wells
Gas Wells
Light
Breakwater
Venice High Sch
Mark Twain Jr H S
Broadway Sch
Library
St Marks Sch
Theodore Roosevelt Sch
Short Ave Sch
Paseo del Rey Sch
LINCOLN BLVD
WASHINGTON BLVD
CULVER BLVD
VISTA DEL MAR
ADMIRALTY WAY
MINDANAO WAY
PANAY WAY
PALAWAN WAY
BALI WAY
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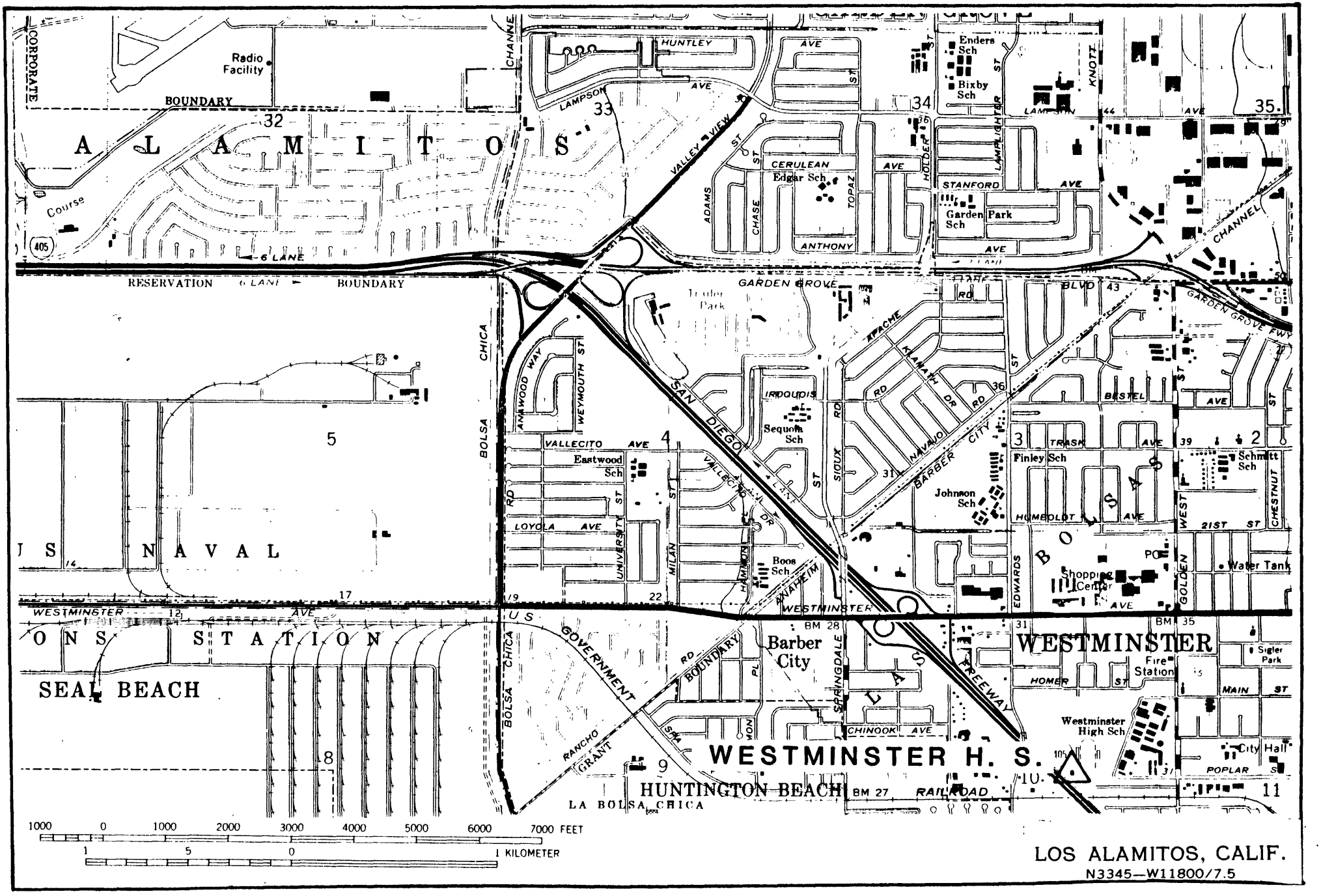
VENICE, CALIF.
N3352.5—W11822.5/7.5

Figure 5



LOS ALAMITOS, CALIF.
N3345—W11800/7.5

Figure 6

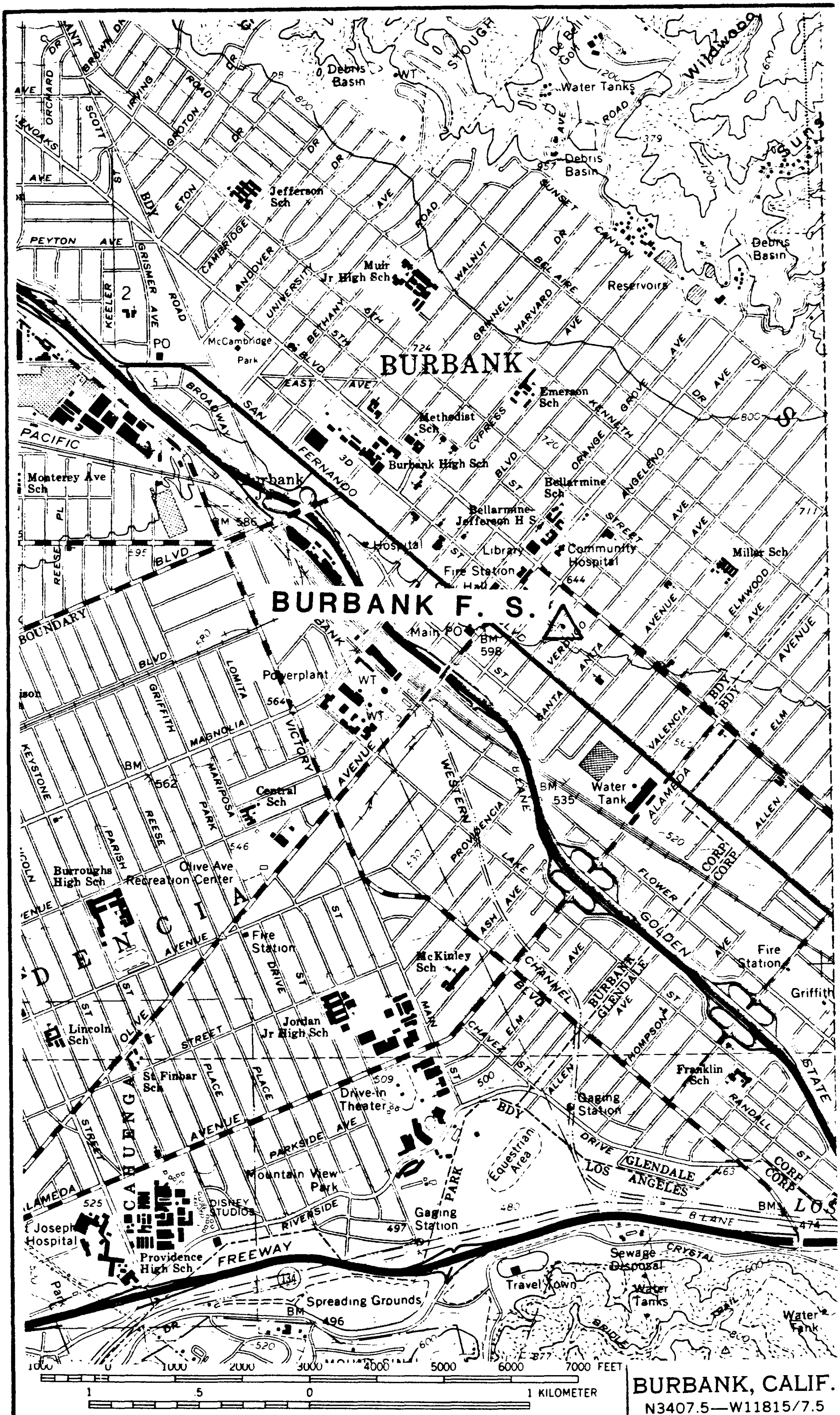

BURBANK F. S.
BURBANK
BURBANK, CALIF.
N3407.5—W11815/7.5
Jefferson Sch
Muir Jr High Sch
Burbank High Sch
Methodist Sch
Emerson Sch
Bellarmine Sch
Bellarmine-Jefferson H S
Community Hospital
Library
Fire Station
Miller Sch
Main PO
Powerplant
Central Sch
Olive Ave Recreation Center
Burroughs High Sch
McKinley Sch
Jordan Jr High Sch
Lincoln Sch
St Finbar Sch
Drive-in Theater
Mountain View Park
Disney Studios
Providence High Sch
Joseph Hospital
Gaging Station
Equestrian Area
Spreading Grounds
Travel Town
Sewage Disposal
Water Tanks
Water Tank
Franklin Sch
Monterey Ave Sch
Debris Basin
Reservoirs
McCambridge Park
Hospital
FREEWAY
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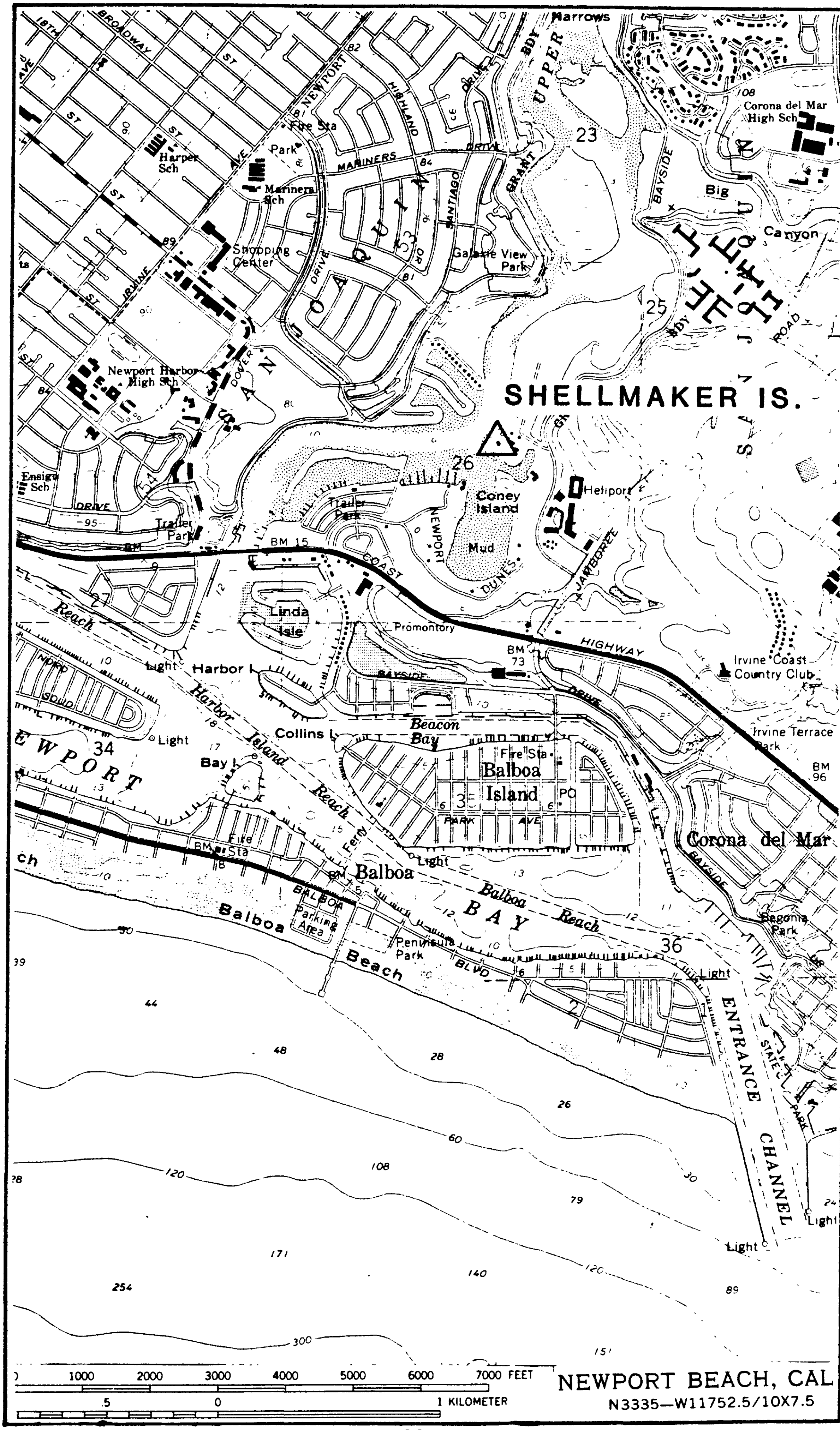
Figure 7



SHELLMAKER IS.
Narrows
UPPER
Corona del Mar High Sch
Big Canyon
BAYSIDE
Fire Sta
Park
Harper Sch
Mariners Sch
MARINERS
HIGHLAND
SANTIAGO
GRANT
Shopping Center
Galaxie View Park
IRVINE
BROADWAY
NEWPORT
DOVER
Newport Harbor High Sch
Ensign Sch
DRIVE
Trailer Park
Coney Island
Mud
Heliport
NEWPORT
DUNES
JAMBOREE
COAST
HIGHWAY
Linda Isle
Promontory
Irvine Coast Country Club
Light
Harbor I
Harbor Island Reach
Collins I
Beacon Bay
Bay I
Irvine Terrace Park
Fire Sta
Balboa Island
PO
PARK AVE
Corona del Mar
BAYSIDE
NEWPORT
Reach
Fire Sta
Ferry
Balboa
BALBOA
Parking Area
Balboa Beach
Balboa Reach
BAY
Peninsula Park
BLVD
Begonia Park
ENTRANCE CHANNEL
STATE PARK
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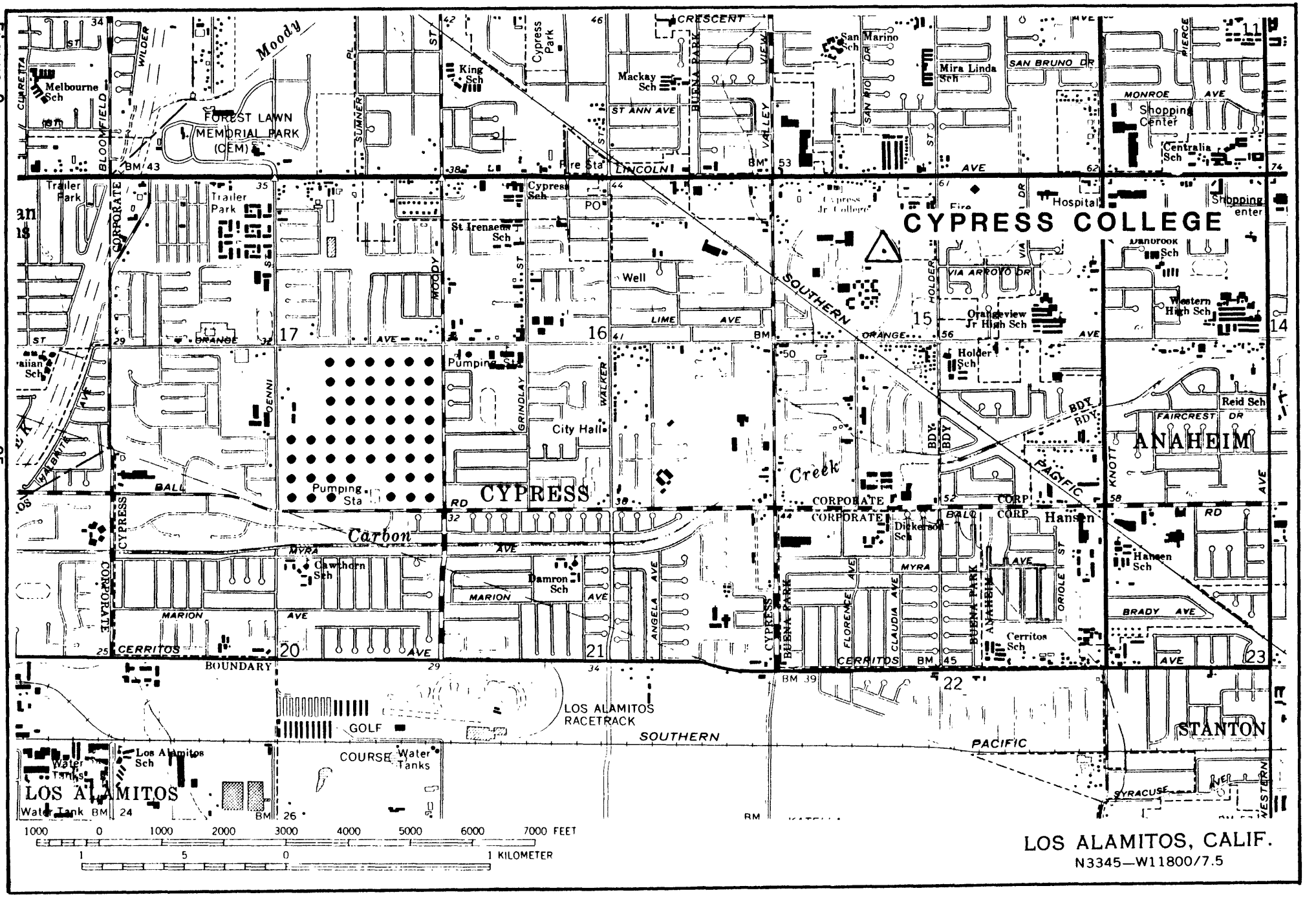
Figure 8

Figure 9



LOS ALAMITOS, CALIF.
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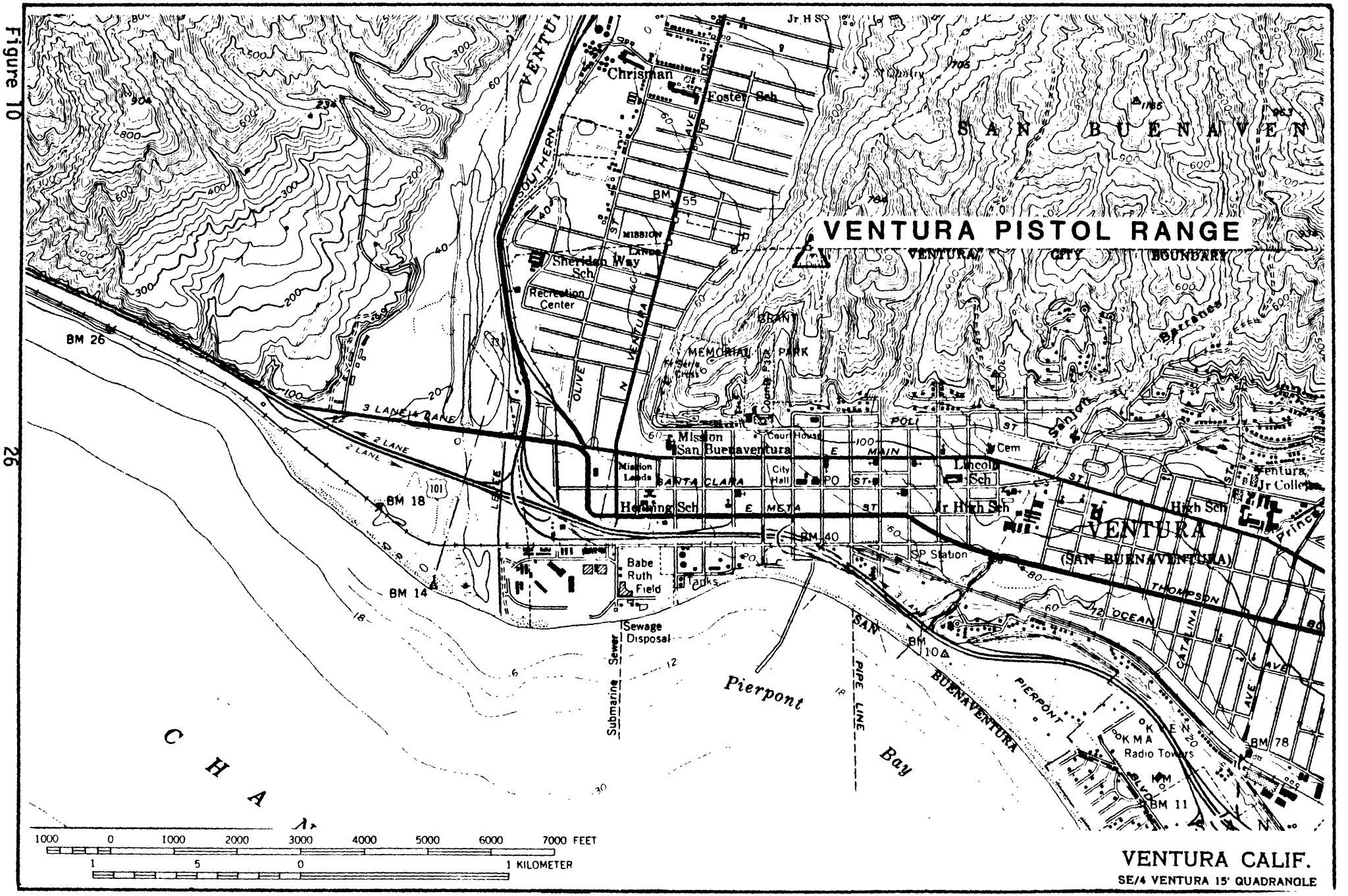
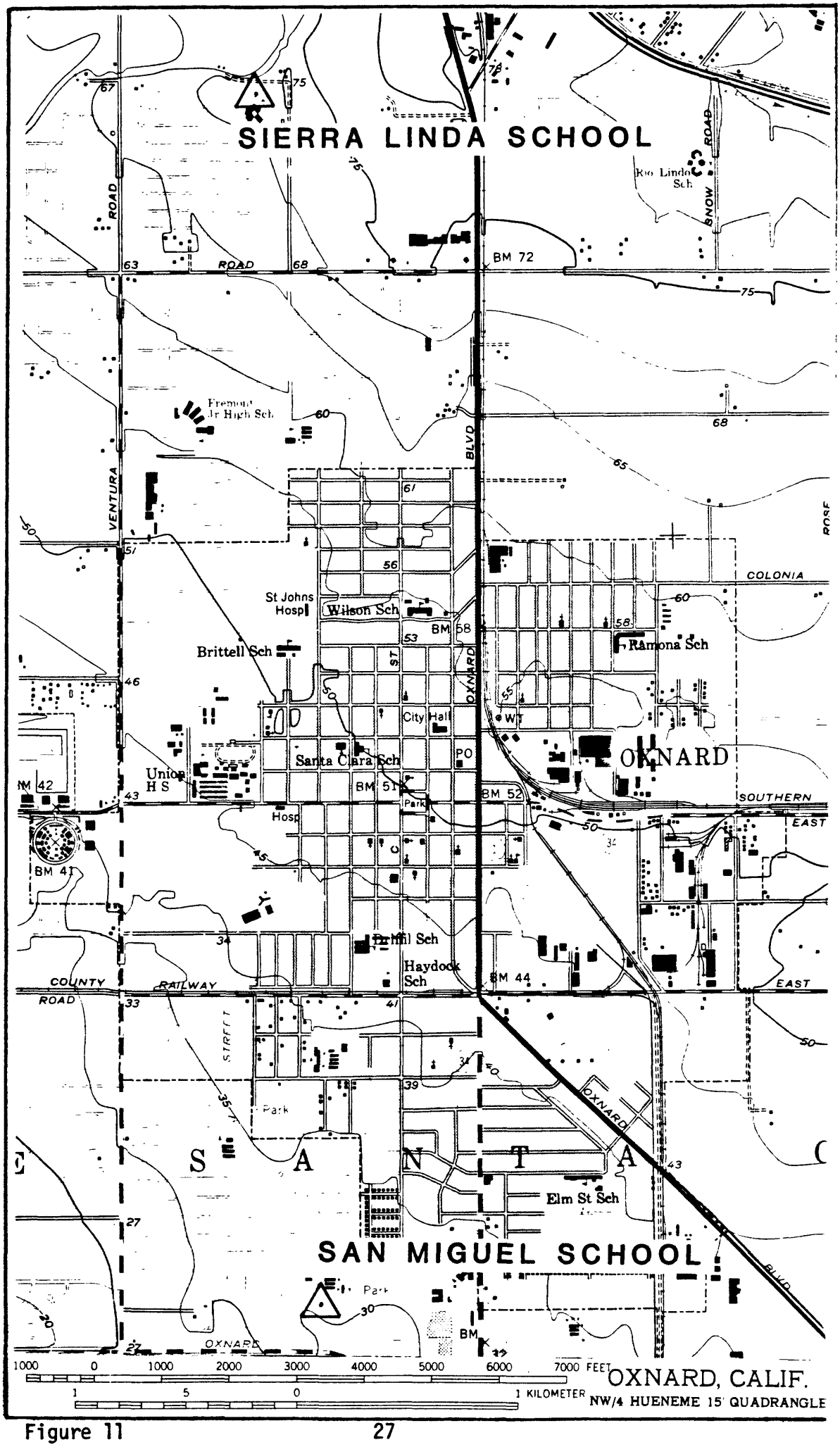
Figure 10



VENTURA CALIF.
SE/4 VENTURA 15' QUADRANGLE


SIERRA LINDA SCHOOL
SAN MIGUEL SCHOOL
OXNARD
SANTA
Rio Linda Sch
Fremont Jr High Sch
St Johns Hospl
Wilson Sch
Brittell Sch
Ramona Sch
City Hall
Santa Clara Sch
Union H S
Hosp
Park
Elm St Sch
Haydock Sch
BM 72
BM 58
BM 51
BM 52
BM 44
BM 41
BM 42
VENTURA ROAD
ROAD 63
ROAD 68
SNOW ROAD
OXNARD BLVD
COLONIA
SOUTHERN PACIFIC RAILWAY
COUNTY ROAD 33
EAST
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1 5 0 1 KILOMETER
OXNARD, CALIF.
NW/4 HUENEME 15' QUADRANGLE

Figure 11

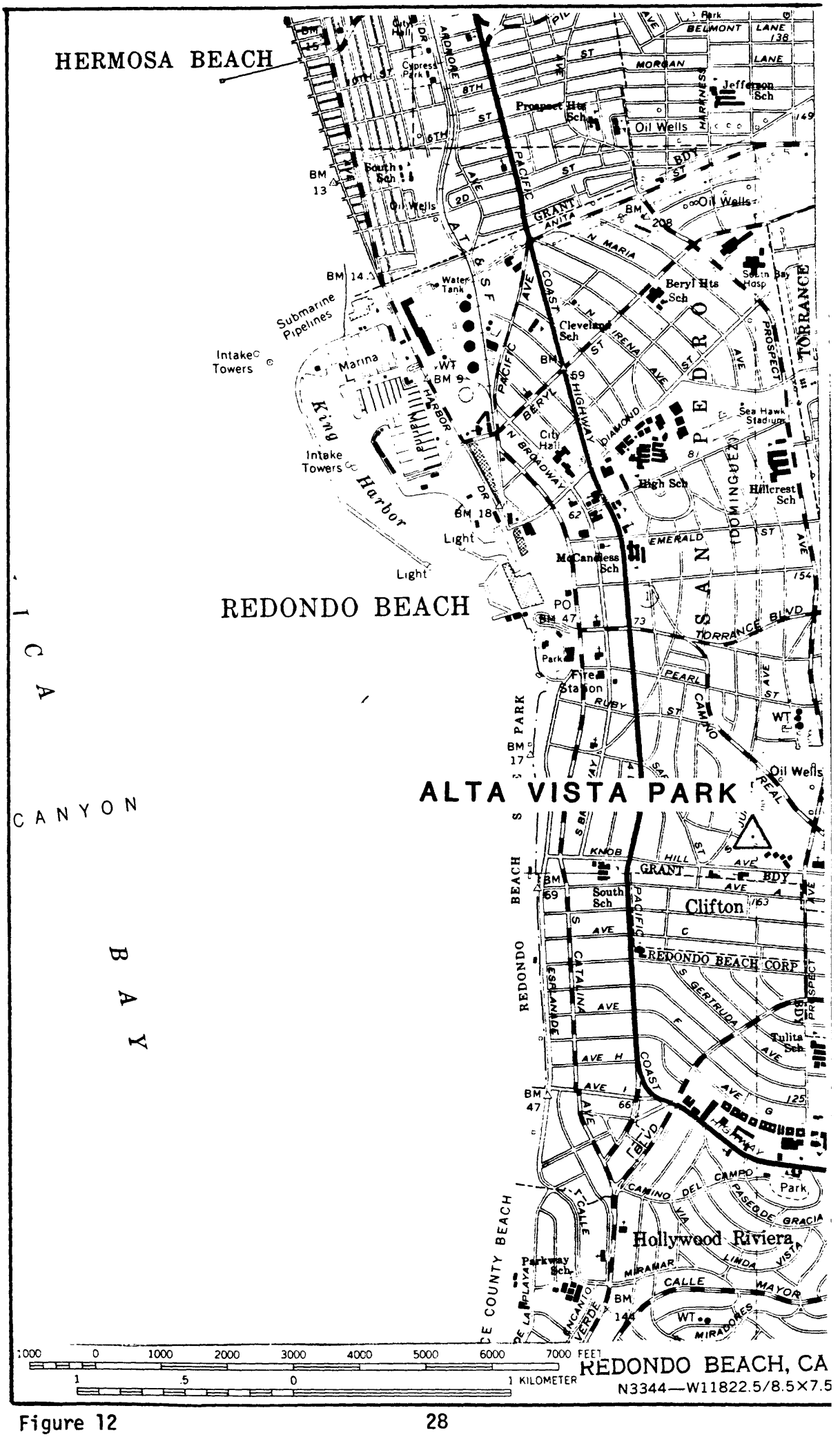

HERMOSA BEACH
REDONDO BEACH
ALTA VISTA PARK
SANTA MONICA BAY
CANYON
Harbor
Marina
Intake Towers
Submarine Pipelines
Water Tank
City Hall
Sea Hawk Stadium
High Sch
Hillcrest Sch
McCandless Sch
Fire Station
Park
Oil Wells
Jefferson Sch
Prospect Hts Sch
South Sch
Cleveland Sch
Beryl Hts Sch
South Bay Hosp
Clifton
Tulita Sch
Parkway Sch
Hollywood Riviera
Park
PACIFIC COAST HIGHWAY
TORRANCE BLVD
PCH
REDONDO BEACH, CA
N3344—W11822.5/8.5X7.5
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

Figure 12

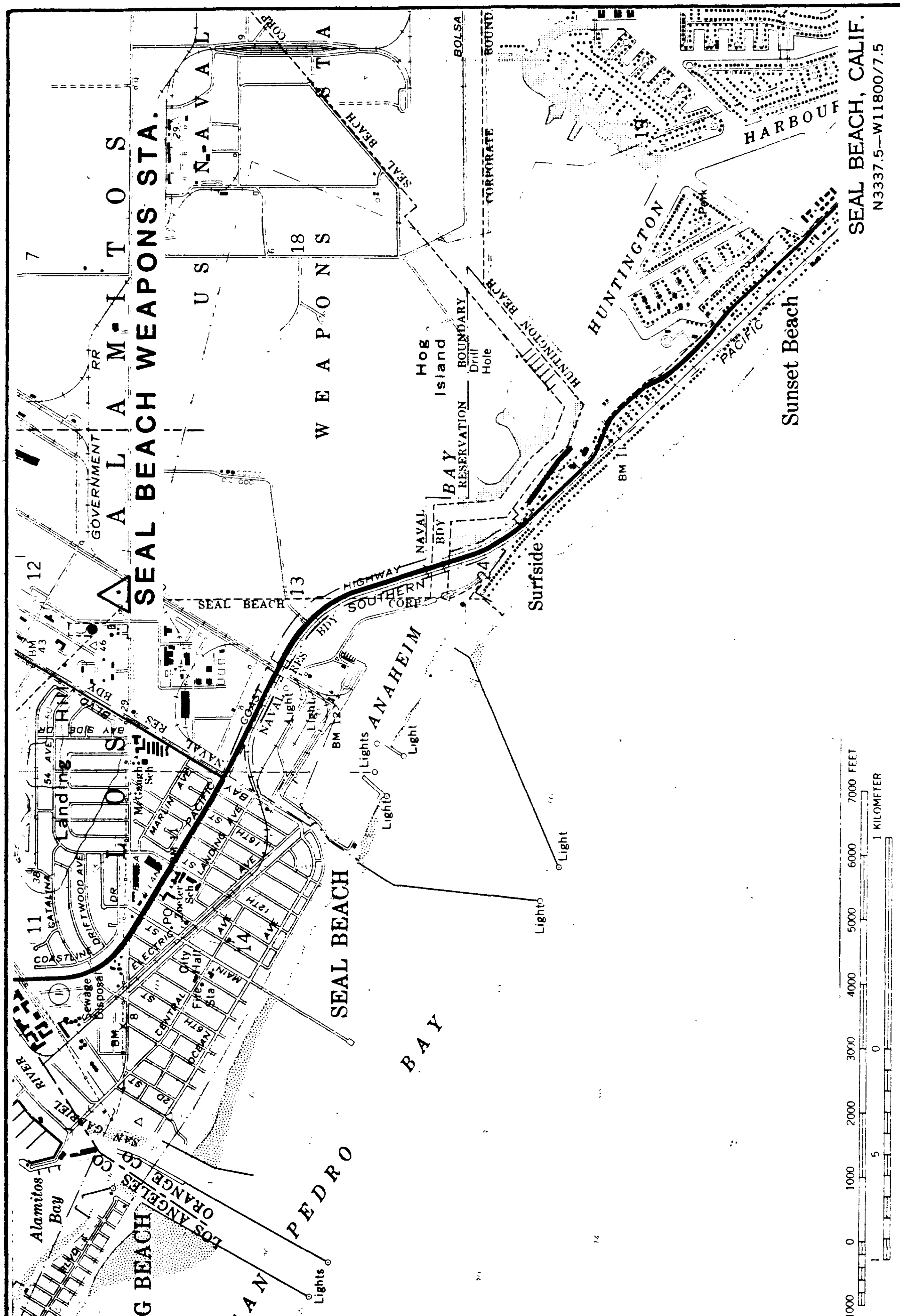

SEAL BEACH WEAPONS STA.
LOS ALAMITOS
US NAVAL WEAPONS STA
SEAL BEACH
ANAHEIM BAY
SAN PEDRO BAY
Alamitos Bay
Hog Island
Surfside
Sunset Beach
HUNTINGTON HARBOUR
LOS ANGELES CO
ORANGE CO
PACIFIC COAST HIGHWAY
NAVAL RESERVATION BOUNDARY
SEAL BEACH, CALIF.
N3337.5—W11800/7.5
7000 FEET
1 KILOMETER

Figure 13

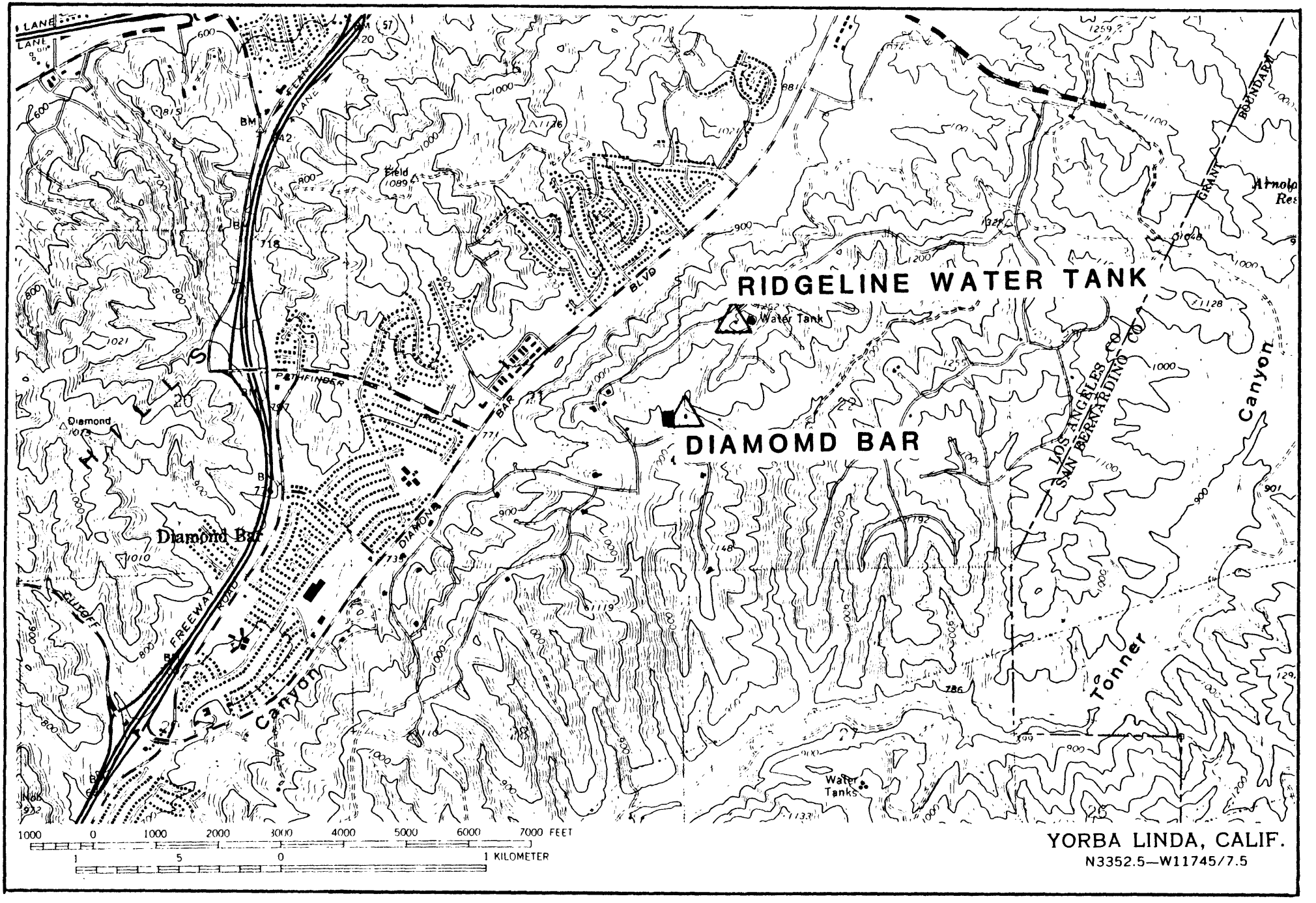

RIDGELINE WATER TANK
Water Tank
DIAMOMD BAR
Diamond Bar
Canyon
Tonner
Canyon
Water Tanks
LOS ANGELES
SAN BERNARDINO
GRANT
BOUNDARY
FREEWAY
ROAD
BLVD
PATHFINDER
DIAMOND
BAR
Field
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 5 0 1 KILOMETER
YORBA LINDA, CALIF.
N3352.5—W11745/7.5

Figure 14

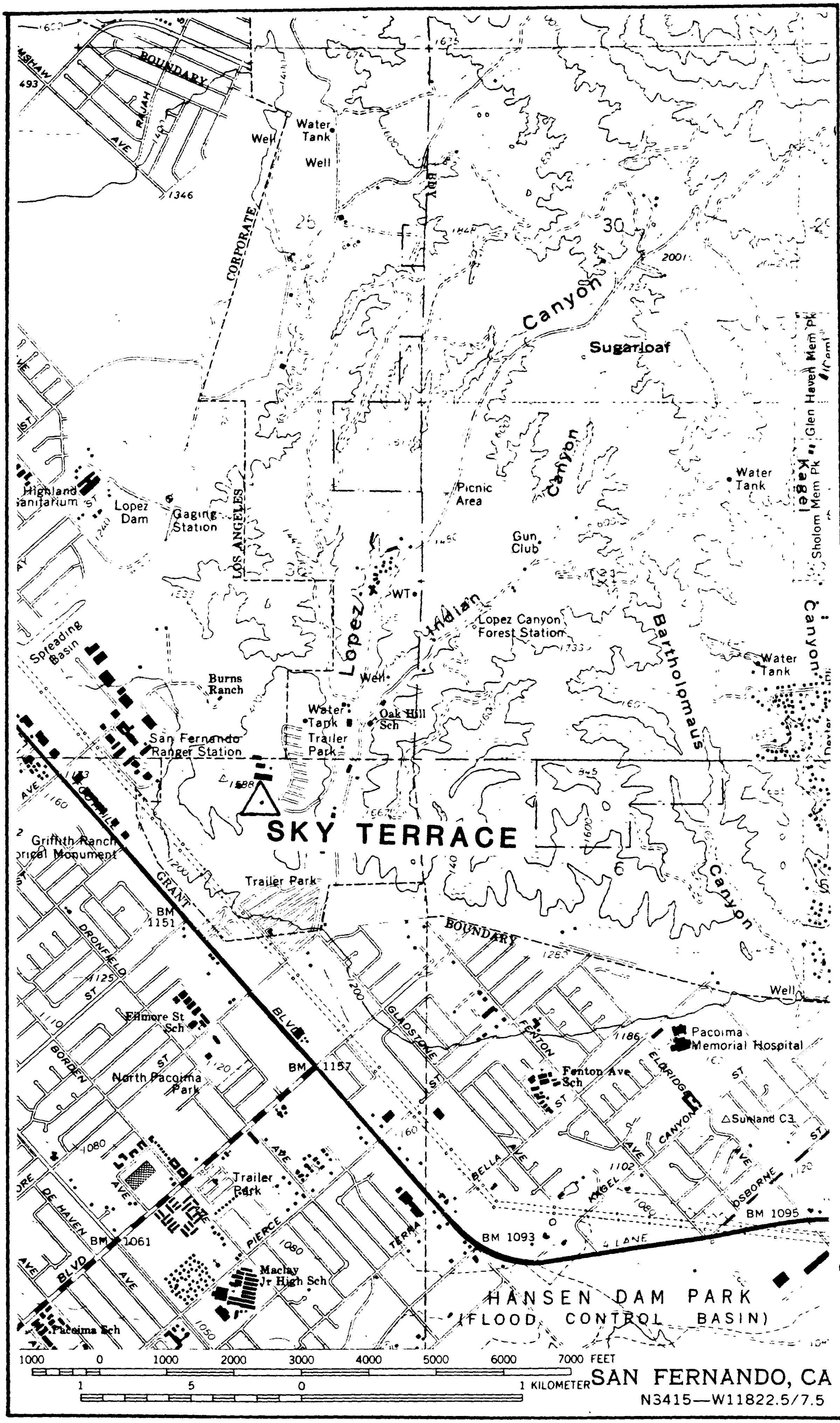
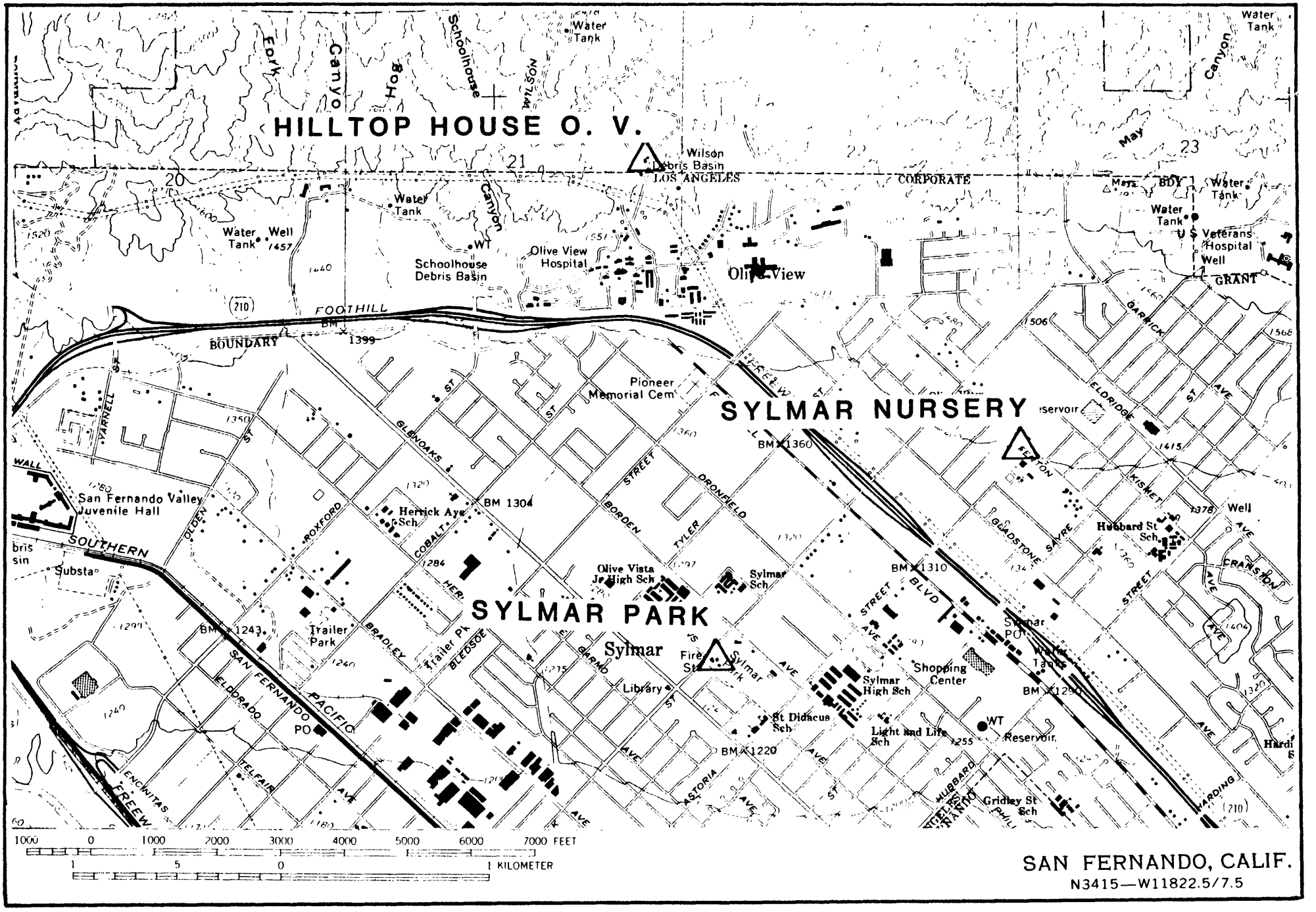

SKY TERRACE
BOUNDARY
CORPORATE
LOS ANGELES
Water Tank
Well
Canyon
Sugarloaf
Lopez Canyon
Picnic Area
Water Tank
Kagel Canyon
Highland Sanitarium
Lopez Dam
Gaging Station
Gun Club
WT
Indian
Lopez Canyon Forest Station
Bartholomaus Canyon
Spreading Basin
Burns Ranch
Water Tank
Oak Hill Sch
Trailer Park
San Fernando Ranger Station
Griffith Ranch
Monument
Trailer Park
GRANT
BM 1151
DRONFIELD
BLVD
Ellmore St Sch
North Pacoima Park
BM 1157
GLADSTONE
FENTON
Pacoima Memorial Hospital
Fenton Ave Sch
ELDRIDGE
△Sunland C3
Trailer Park
PIERCE
BM 1061
Maclay Jr High Sch
Pacoima Sch
BM 1093
BM 1095
4 LANE
OSBORNE
HANSEN DAM PARK
(FLOOD CONTROL BASIN)
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER
SAN FERNANDO, CA
N3415—W11822.5/7.5

Figure 15



SAN FERNANDO, CALIF.
N3415—W11822.5/7.5

Figure 16

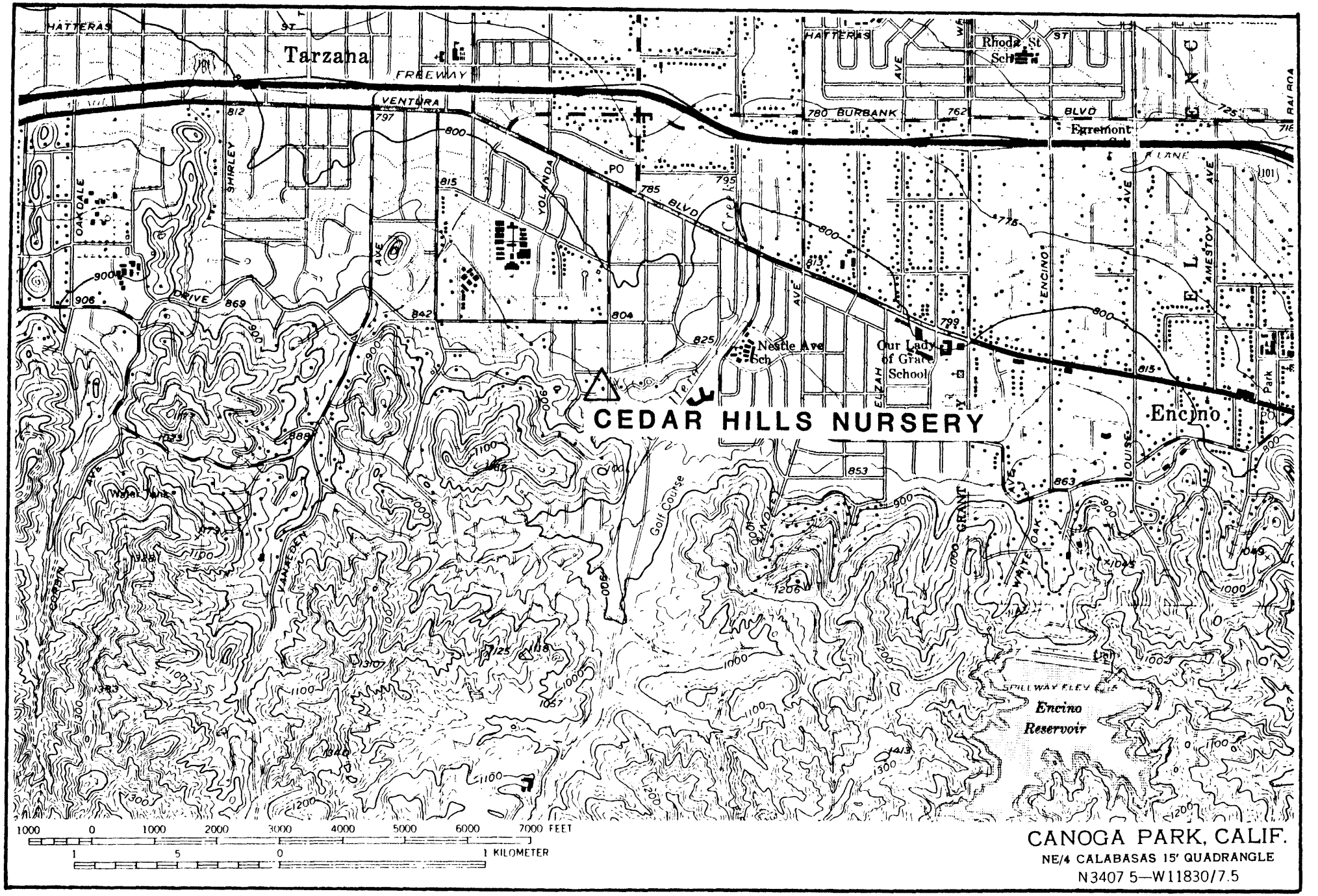

CEDAR HILLS NURSERY
Tarzana
Encino
Encino Reservoir
Nestle Ave Sch
Our Lady of Grace School
Rhoda St Sch
Golf Course
HATTERAS ST
VENTURA FREEWAY
BURBANK BLVD
YOLANDA AVE
OAKDALE
SHIRLEY
ENCINO AVE
AMESTOY AVE
LOUISE AVE
GRANT
WHITE OAK
VANALDEN
CORBIN
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 5 0 1 KILOMETER
CANOGA PARK, CALIF.
NE/4 CALABASAS 15' QUADRANGLE
N3407 5—W11830/7.5

Figure 17

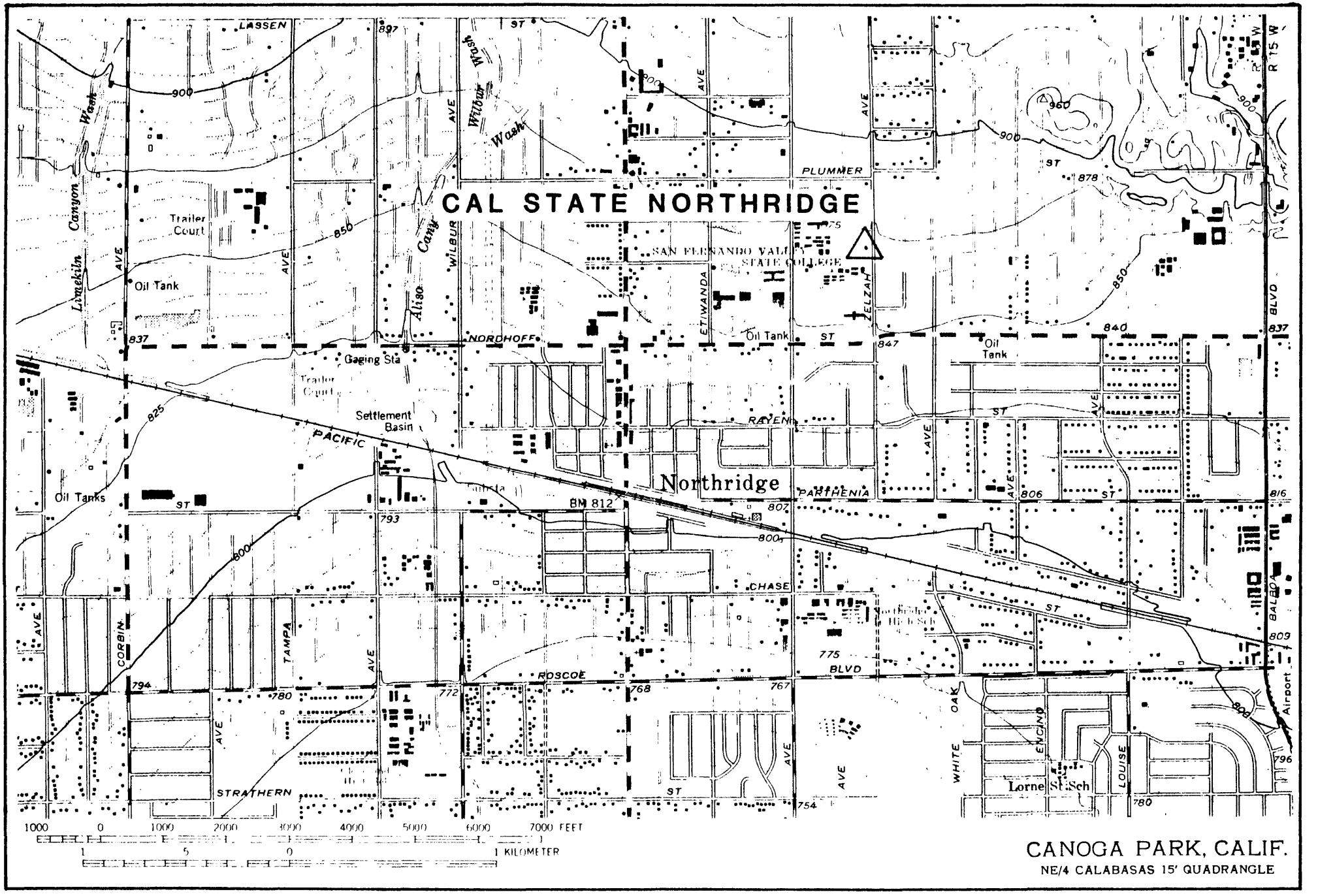

CAL STATE NORTHRIDGE
SAN FERNANDO VALLEY STATE COLLEGE
Northridge
LASSEN
PLUMMER
NORDHOFF
RAYEN
PARTHENIA
CHASE
ROSCOE
STRATHERN
PACIFIC
Limekiln Canyon Wash
Wilbur Wash
Aliso Canyon
Trailer Court
Oil Tank
Oil Tanks
Gaging Sta
Settlement Basin
BM 812
Lorne St. Sch
Airport
CANOGA PARK, CALIF.
NE/4 CALABASAS 15' QUADRANGLE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Figure 18

ALTITUDE: 98'	**LOCATION:**	**HOLE No.** 28
	Lat. 34°09'50"	**SITE:** CAMARILLO STATE HOSPITAL II
DATE: 7/19/79	**Long.** 119°02'16"	**GEOLOGIC MAP UNIT:** Qal
	QUADRANGLE: CAMARILLO, CA	Holocene alluvium

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SANDY CLAY LOAM, dk. brown, poorly sorted, sand is mostly less than medium size, some v. coarse sand ar basalt gravel to 20 mm, high plasticity, stiff.
SANDY CLAY LOAM, dk. brown, poorly sorted, sand is mostly less than medium size, some v. coarse sand and gravel to 20 mm, high plasticity, stiff.	1.81	14	S		5	GRAVELLY SAND, dk. brown, v. poorly sorted, dense to v. dense. Contain lenses of SANDY LOAM and SANDY GRAVEL.
GRAVELLY SAND, dk, brown, v. poorly sorted, 25% gravel to 30 mm, subrounded to sub-angular, dense.		45			10	
SANDY LOAM, dk. brown, v. poorly sorted, 20% sub-angular gravel to 30 mm, medium plasticity, v. dense.	2.06	70	P		15	
					20	
					25	SANDY GRAVEL, most is less than 10
LOAM, brown, moist, medium plasticity, dense.		44			30	LOAM, brown, moist, medium plastic dense.

COMMENTS:
Figure 19

LOGGED BY: T. Fumal

ALTITUDE: 5'	LOCATION: Lat. 33°58'26" Long. 118°27'21" QUADRANGLE: VENICE, CA	HOLE No. 29 SITE: MARINA DEL REY GEOLOGIC MAP UNIT: Qal Holocene alluvium
DATE: 8/2/79		

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SAND, dk. grey, well-sorted, fine grained.
SILTY CLAY LOAM, v. dk. greenish grey, medium plasticity, soft, wet.						
	1.86		S			V. FINE SANDY LOAM, v. dk. grey, common shell fragments to 60 mm long. Slight plasticity, quick, wet, medium dense.
V. FINE SANDY LOAM, v. dk. grey, common shell fragments to 60 mm long. Slight plasticity, quick, wet.					5	
V. FINE SANDY LOAM, black, some shell fragments, low plasticity, quick, wet, medium dense.	1.85	14			10	
					15	SAND, olive grey, well-sorted, v. coarse grained, some gravel to 10 m
SAND, olive with common mottles of dk. yellowish brown, well-sorted v. fine to fine grained, quick, wet, dense.		37				grading to fine to v. fine SAND olive mottled yellowish brown, quick, wet, dense.
					20	
					25	SILT LOAM, v. dk. greenish grey quick, moist, v. slight plasticity some organic material.
SILT LOAM, v. dk. greenish grey, quick, moist, v. slight plasticity, some organic material.	1.98		S			
					30	CONTINUED ON FOLLOWING FIGURE

COMMENTS: Figure 20	LOGGED BY: T. Fumal

ALTITUDE:	LOCATION: Lat. Long. QUADRANGLE:	HOLE No. 29 SITE: MARINA DEL REY GEOLOGIC MAP UNIT:
DATE:		

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					30	
						FINE SANDY LOAM, dk. grey.
					35	
						LOAM, black, sand is v. fine grained, slightly plastic, quick, wet.
					40	
					45	
					50	

COMMENTS:
Figure 20 continued

LOGGED BY: T. Fumal

ALTITUDE: 26' **DATE:** 8/8/79	**LOCATION:** **Lat.** 33°45'07" **Long.** 118°00'43" **QUADRANGLE:** LOS ALAMITOS, CA	**HOLE No.** 30 **SITE:** WESTMINSTER H.S. **GEOLOGIC MAP UNIT:** Qac Holocene alluvium

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SAND, dk. greyish brown, well-sorted v. fine to fine grained, quick, moist, loose.
SILTY CLAY LOAM, dk. greyish brown, medium plasticity, wet, micaceous, soft.		3				SILTY CLAY LOAM, dk. greyish brown, medium plasticity, wet soft.
					5	SAND, fine to medium grained.
						SILTY CLAY LOAM and SILT LOAM, olive grey to dk. greenish grey, high to medium plasticity, wet, stiff.
SILTY CLAY LOAM, olive grey, occasional small calcareous concretions, high plasticity wet.	1.95		S		10	
					15	
SILT LOAM, dk. greenish grey, medium plasticity, slightly quick, wet, stiff.		24				
						SAND, grey, to v. coarse grained.
					20	fine gravel to 10 mm.
						SANDY CLAY, brown
						SAND, to v. coarse size.
SANDY LOAM, dk. greyish brown, sand up to v. coarse size, poorly sorted, medium plasticity, moist.	2.08		P		25	SANDY LOAM, dk. greyish brown, poorly sorted, sand mostly less than medium size, some up to v. coarse, medium plasticity, moist.
						SANDY CLAY, yellowish brown
					30	

COMMENTS:
Figure 21

LOGGED BY: T. Fumal

ALTITUDE: 610'	**LOCATION:**	**HOLE No.** 31
	Lat. 34°10'50"	**SITE:** BURBANK FIRE STATION
DATE: 8/1/79	**Long.** 118°18'15"	**GEOLOGIC MAP UNIT:** Qc Pleistocene alluvium
	QUADRANGLE: BURBANK, CA	

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	FINE SANDY LOAM, dk. brown, some coarse sand and fine gravel, medi plasticity, moist, loose.
FINE SANDY LOAM, dk, brown, occasional v. coarse sand and gravel, medium plasticity, moist, loose.		10			5	
						grading coarser to SANDY LOAM, v. dense.
SANDY LOAM, brown, poorly sorted, mostly finer than coarse sand, some granitic gravel, v. dense.		40/6"			10	
					15	GRAVELLY SAND, granitic.
SANDY LOAM and LOAMY SAND, dk. brown, poorly sorted, slight plasticity, quick, moist, occasional fine gravel to 5 mm.	2.16		P		20	SANDY LOAM and LOAMY SAND, dk. brown, poorly sorted, slight plasticity, quick, moist, occasio fine gravel to 5 mm.
					25	
					30	

COMMENTS:
Figure 22

LOGGED BY: T. Fumal

ALTITUDE: 10'	**LOCATION:** Lat. 33°37'15" Long. 117°53'30"	**HOLE No.** 32
DATE: 8/10/79	**QUADRANGLE:** NEWPORT BEACH, CA	**SITE:** SHELLMAKER ISLAND
		GEOLOGIC MAP UNIT: Qac/Tm Holocene alluvium/Monterey

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SAND, greyish brown, well-sorted, fine grained, common shells, dry.
V. FINE SANDY LOAM, dk. bluish grey mottled black, common organic matter, medium plasticity, slightly quick, wet, loose.		7			5	V. FINE SANDY LOAM, dk. bluish grey mottled black, common organic matter, medium plasticity, slightly quick, wet, loose.
SHELLS with v. fine sand matrix, 80% small shell fragments, grey, wet, loose.		13			10	SHELLS with v. fine sand matrix, grey, wet, loose.
					15	SILTY CLAY, mottled dk. grey and pale olive, high plasticity, wet, some sand sized calcareous concretions. V. stiff.
SILTY CLAY, mottled dk. grey and pale olive, high plasticity, wet, 10% sand sized calcareous concretions.	1.97		S		20	SHALE, grey to black, firm to soft, close to v. close fracture spacing, occasional v. fine sand laminations inclined 30°.
SHALE, black, firm to soft, close to v. close fracture spacing, occasional v. fine sand laminations inclined 30°.	2.15		P		25	
					30	

COMMENTS:
Figure 23

LOGGED BY: T. Fumal

ALTITUDE: 53'	**LOCATION:**	**HOLE No.** 33
	Lat. 33°49'41"	**SITE:** CYPRESS COLLEGE
DATE: 8/7/79	**Long.** 118°01'20"	**GEOLOGIC MAP UNIT:** Qac Holocene alluvium
	QUADRANGLE: LOS ALAMITOS, CA	

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SAND, dk. greyish brown, v. well-sorted, fine grained, loose, dry.
SILT LOAM, olive grey, medium plasticity, quick, wet, soft.		4				SILTY CLAY LOAM to LOAM, olive grey to v. dk. grey, medium to slight plasticity, wet, soft.
LOAM, v. dk. grey, sand is v. fine grained slightly plastic, wet, contains lenses of well-sorted fine sand.					5	
SAND, dk. greyish brown, well-sorted fine to medium grained, angular to sub-rounded, quick, wet, v. dense.		40/6"			10	SAND, dk. greyish brown, well-sorted fine to medium grained, angular to subrounded, quick, wet, v. dense.
						SILTY CLAY, olive.
					15	SAND, v. dk. greenish grey, poorly sorted, mostly medium to v. coarse sand, some rounded gravel to 25 mm. Contains thin lenses of SANDY LOAM.
V. FINE SANDY LOAM	2.00		P		20	
SAND, v. dk. greenish grey, poorly sorted, mostly medium to coarse sand, some rounded gravel to 25 mm., v. quick, wet.					25	
					30	

COMMENTS:
Figure 24

LOGGED BY: T. Fumal

ALTITUDE: 500' **DATE:** 7/18/79	**LOCATION:** **Lat.** 34°17'23" **Long.** 119°17'24" **QUADRANGLE:** VENTURA, CA	**HOLE No.** 34 **SITE:** VENTURA PISTOL RANGE **GEOLOGIC MAP UNIT:** Qs San Pedro Formation

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/ Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
CLAY LOAM, v. dk. greyish brown, sand is fine grained, high plasticity, moist, v. stiff.		22			0	CLAY LOAM, dk. greyish brown, v. stiff, and LOAMY FINE SAND, yellowish brown, medium dense to v. dense. Contains lenses of angular reddish brown v. coarse sand and fine gravel.
					5	
					10	
CLAY LOAM, dk. greyish brown, high plasticity, moist, v. stiff.	2.06	22				
LOAMY FINE SAND, yellowish brown, medium dense.					15	
					20	GRAVELLY SANDY LOAM and GRAVELLY SAND, dk. yellowish brown, poorly sorted, v. dense. Contains boulders to 60 cm.
GRAVELLY SANDY LOAM, dk. yellowish brown, poorly sorted, 30% is greater than 4 mm, most is finer than medium sand, v. dense.	2.10	50/6"			25	
						SILTY CLAY LOAM, yellowish brown high plasticity, moist, hard.
SILTY CLAY LOAM, yellowish brown, high plasticity, moist, hard.		93			30	

COMMENTS:
Figure 25

LOGGED BY: T. Fumal

ALTITUDE: 72' **DATE:** 7/16/79	**LOCATION:** **Lat.** 34°13'33" **Long.** 119°11'14" **QUADRANGLE:** OXNARD, CA	**HOLE No.** 35 **SITE:** SIERRA LINDA SCHOOL **GEOLOGIC MAP UNIT:** Qd Deltaic deposits

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	LOAM, greyish brown to yellowish brown, sand is v. fine grained, high plasticity, moist, stiff.
LOAM, greyish brown, with common mottles of yellowish brown, sand is v. fine grained, high plasticity, moist, stiff.		10			5	
						GRAVELLY SAND, lt. olive brown, poorly sorted, up to 50% flat shale fragments to 50 mm., v. dense. Contains lenses of SILTY CLAY, greyish brown.
GRAVELLY SAND, lt. olive brown, poorly sorted, 30% flat shale fragments to 20 mm, moist, quick, v. dense.	2.04	45/5"			10	
					15	
					20	
					25	SAND, mostly medium grained with lenses of silty clay.
					30	

COMMENTS:
Figure 26

LOGGED BY: T. Fumal

ALTITUDE: 31' **DATE:** 7/17/79	**LOCATION:** **Lat.** 34°10'37" **Long.** 119°11'05" **QUADRANGLE:** OXNARD, CA	**HOLE No.** 36 **SITE:** SAN MIGUEL SCHOOL **GEOLOGIC MAP UNIT:** Qd Deltaic deposits

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	FINE SANDY LOAM, v. dk. greyish brown, medium plasticity, moist.
SAND, greyish brown, mostly medium to v. coarse sand, v. dense.		57			5	SAND, greyish brown, mostly medium to v. coarse sand, v. dense.
						SILTY CLAY, dk. grey.
NO RECOVERY		18			10	
						SANDY GRAVEL
						SAND, well-sorted, medium to coarse grained.
					15	grading finer to fine to medium grained SAND.
						some gravel to 25 mm.
					20	
					25	
						grading finer to V. FINE SANDY LOAM.
V. FINE SANDY LOAM, dk. greenish grey, slight plasticity, quick, wet, dense.	1.95	40			30	

COMMENTS:
Figure 27

LOGGED BY: T. Fumal

ALTITUDE: 50'	**LOCATION:** Lat. 33°49'46" Long. 118°22'43"	**HOLE No.** 37
DATE: 8/6/79	**QUADRANGLE:** REDONDO BEACH, CA	**SITE:** ALTA VISTA PARK
		GEOLOGIC MAP UNIT: Qso Older dune sand

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SILTY CLAY, white.
						SAND, greyish brown, well-sorted, fine grained, medium dense.
NO RECOVERY		15				
					5	SAND, yellowish brown, well-sorted, mostly fine to medium grained, v. dense.
					10	grading to coarse SAND.
SAND, yellowish brown, well-sorted, coarse grained, rounded to subrounded, v. dense.		50/3"				
					15	grading to v. fine to fine SAND.
					20	
SAND, yellowish brown with mottles of strong brown, well-sorted, fine to v. fine grained, subrounded to subangular, moist.	1.97		P			
					25	
					30	

COMMENTS: Finer grained and better sorted than at Hyperion site.

LOGGED BY: T. Fumal

ALTITUDE: 10'	**LOCATION:**	**HOLE No.** 38
	Lat. 33°44'44"	**SITE:** SEAL BEACH WEAPONS STATION
DATE: 8/9/79	**Long.** 118°05'06"	**GEOLOGIC MAP UNIT:** Qac Holocene alluvium; Qtm Marine terrace deposi
	QUADRANGLE: SEAL BEACH, CA	

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SAND, well-sorted, medium grained.
						SILTY CLAY LOAM and CLAY LOAM, dk. greenish grey mottled strong brown, high plasticity, medium stiff, wet.
CLAY LOAM, dk. greenish grey mottled strong brown, sand is mostly v. fine grained, high plasticity, wet, medium stiff.		6				
					5	SAND, yellowish brown to strong brown, well-sorted, medium to coarse grained.
						grading finer to v. fine SAND, olive brown.
LOAMY V. FINE SAND, olive brown mottled yellowish brown, slightly plastic, moderately quick, moist.	2.10		P		10	
						SAND, grey fine grained.
					15	
						grading coarser to coarse SAND.
					20	Interbedded SILTY CLAY LOAM, dk. greenish grey, and SAND, dk. grey, fine grained.
SILTY CLAY LOAM, dk. grey, slightly plastic, wet, indistinct dk. brown organic laminations inclined 20-30°.	1.98		P			
					25	
SILTY CLAY LOAM, dk. greenish grey, medium plasticity, wet. Contains v. thin lenses of well-sorted v. fine sand - ripples and burrows.	2.03		P		30	

COMMENTS:
Figure 29

LOGGED BY: T. Fumal

ALTITUDE: 1200'	**LOCATION:** Lat. 33°59'12" Long. 117°48'57"	**HOLE No.** 39
DATE: 8/15/79	**QUADRANGLE:** YORBA LINDA, CA	**SITE:** RIDGELINE WATER TANK
		GEOLOGIC MAP UNIT: Tps Puente Fm - Soquel member

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
GRAVELLY CLAY LOAM, mottled v. dk. grey, dk. olive grey, dk. yellowish brown.		21			0	SHALE, olive to dk. greyish brown with some laminations of strong brown fine sandstone, slakes to GRAVELLY CLAY LOAM, moderately to deeply weathered firm to soft, close to v. close fracture spacing.
					5	
SHALE, olive, with laminations of strong brown fine sandstone, slakes to gravelly clay loam, moderately to deeply weathered, firm to soft, close to v. close fracture, moist.	1.99		P		10	
					15	
SHALE, dk. greyish brown, strong brown fracture surfaces, moderately to deeply weathered, firm to soft, close to v. close fracture.	1.97		P		20	
						SANDSTONE, olive brown, some dk. grey shale, moderately to deeply weathered, firm to soft and friable, closely to moderately fractured.
SANDSTONE, olive brown, some dk. grey shale, moderately to deeply weathered, firm to soft and friable, v. fine grained, closely to moderately fractured.	2.19		P		25	
					30	

COMMENTS:
Figure 30

LOGGED BY: T. Fumal

ALTITUDE: 1030'	LOCATION: Lat. 33°58'55" Long. 117°49'07"	HOLE No. 40
DATE: 8/14/79	QUADRANGLE: YORBA LINDA, CA	SITE: DIAMOND BAR GEOLOGIC MAP UNIT: Tps Puente Fm - Soquel memb

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SANDY CLAY LOAM, yellowish brown mottled v. dk. greyish brown, mec plasticity, stiff.
SANDY CLAY LOAM, yellowish brown mottled v. dk. greyish brown, sand is mostly finer than medium sand, medium plasticity, stiff.		21			5	
SHALE, dk. olive brown, moderately to deeply weathered, soft, closely to v. closely fractured.						SHALE, dk. olive brown, moderate to deeply weathered, soft, close to v. closely fractured. Contai beds of SANDSTONE, lt. olive bro soft to firm, moderately fractur
	2.07		P		10	
SANDSTONE, lt. olive brown, moderately to deeply weathered, soft to firm, moderately fractured.						SHALE, black, with occasional la ations of fine to medium grained SANDSTONE, fresh, firm to hard, closely to closely fractured.
					15	
SHALE, black, with occasional laminations fine to medium grained SANDSTONE, fresh, firm to hard, v. closely to closely fractured.	2.06		P		20	
					25	
					30	

COMMENTS:

LOGGED BY: T. Fuma

ALTITUDE: 1450'	LOCATION: Lat. 34°17'29" Long. 118°24'15" QUADRANGLE: SAN FERNANDO, CA	HOLE No. 41 SITE: SKY TERRACE GEOLOGIC MAP UNIT: Tm Modelo Fm.
DATE: 7/31/79		

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	Interbedded CONGLOMERATE and V. COARSE SANDSTONE, wide variety of rock types: sandstone, volcanic and granitic, moderately to deeply weathered firm to soft, moderate and wider fracture spacing. Contains some beds of SILTSTONE.
SANDSTONE, yellowish brown, v. coarse grained, some gravel to 20 mm, moderately to deeply weathered.		50/4"			5	
Interbedded CONGLOMERATE, dk. yellowish brown, 80% v. coarse sand to fine gravel, some to 60 mm subrounded to subangular, SILTSTONE, dk. brown with strong brown laminations and SANDSTONE lt. brownish grey, fine grained, moderately weathered firm to soft, moderate and wider fracture spacing, beds inclined 45°.	2.03		P		10	
					15	
					20	CONGLOMERATE, yellowish brown to greyish brown, mostly v. coarse sand and fine gravel, angular to subangular, firm to hard, moderate and wider fracture spacing, moderately weathered to fresh. Contains some beds of FINE SANDSTONE.
					25	
					30	

COMMENTS: Stopped drilling at 27.8 m because drilling rate was very slow in hard formation.

LOGGED BY: T. Fumal

Figure 32

ALTITUDE: 1400'	**LOCATION:**	**HOLE No.** 42
	Lat. 34°19'05"	**SITE:** SYLMAR NURSERY
DATE: 7/26/79	**Long.** 118°25'52"	**GEOLOGIC MAP UNIT:** Qal
	QUADRANGLE: SAN FERNANDO, CA	Holocene alluvium

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SANDY LOAM, dk. brown, sand is mostl medium grained, some granitic gravel to 40 mm, slightly plastic, medium dense to dense. Contains lenses of well-sorted coarse to v. coarse SANI
SANDY LOAM, dk. brown, sand is mostly medium grained, some granitic gravel to 40 mm is soft and friable, slightly plastic, dry, medium dense.		27			5	
SANDY LOAM, dk. brown, sand is mostly medium grained, some granitic gravel to 15 mm, dense.	2.10	43			10	
					15	SAND, brown, mostly coarse to v. coarse grained, rounded to sub-angular, v. dense. Contains lenses of GRAVELLY SAND.
					20	
					25	
					30	

COMMENTS:
Figure 33

LOGGED BY: T. Fumal

ALTITUDE: 1260'	**LOCATION:**	**HOLE No.** 43
	Lat. 34°18'34"	**SITE:** SYLMAR PARK
DATE: 7/29/79	**Long.** 118°26'49"	**GEOLOGIC MAP UNIT:** Qal
	QUADRANGLE: SAN FERNANDO, CA	Holocene alluvium

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/ Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SANDY LOAM, v. dk. greyish brown, micaceous, slightly plastic, dry, medium dense.
SANDY LOAM, v. dk. greyish brown, micaceous, slightly plastic, dry, medium dense.		18			5	SAND, brown, well-sorted, medium to coarse grained, some gravel to 15 mm, angular to subrounded.
SANDY LOAM, dk. brown, sand is mostly finer than fine sand, some gravel to 4 mm, micaceous, slightly plastic, quick, moist, v. dense.	2.02	55			10	SANDY LOAM, dk. brown, sand is mostly finer than fine sand, some gravel to 4 mm, moist, v. dense.
						SAND, well-sorted coarse to v. coarse, some granitic gravel
					15	GRAVELLY SAND.
					20	COBBLE GRAVEL, granitic.
						SANDY LOAM, brown, v. dense.
					25	
					30	
NO RECOVERY		60/6"				

COMMENTS:
Figure 34

LOGGED BY: T. Fumal

ALTITUDE: 1620'	**LOCATION:** Lat. 34°19'49" Long. 118°27'05"	**HOLE No.** 44
DATE: 7/30/79	**QUADRANGLE:** SAN FERNANDO, CA	**SITE:** HILLTOP HOUSE
		GEOLOGIC MAP UNIT: Te Elsmere member of the Repetto Fm.

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SAND, strong brown, mostly fine to medium grained, some gravel to 15 loose, dry, deeply weathered SANDSTONE.
NO RECOVERY		48/6"			5	
						SANDSTONE, yellowish brown to strong brown, medium to v. coarse grained substantial gravel to 30 mm, soft firm, deeply to moderately weathered
SANDSTONE, yellowish brown, medium to coarse grained, substantial gravel some to 30 mm, soft, deeply weathered.	2.05		P		10	
					15	
SANDSTONE, greyish brown to strong brown, poorly sorted, mostly medium to v. coarse grained, some fine gravel, soft.	2.17		P		20	
						SANDSTONE, lt. grey, medium to coarse grained, slightly weathered to fresh, firm to soft, moderate a wider fracture spacing.
					25	
					30	

COMMENTS:
Figure 35

LOGGED BY: T. Fumal

ALTITUDE: 860'	**LOCATION:** Lat. 34°09'58" Long. 118°33'07"	**HOLE No.** 45
DATE: 7/23/79	**QUADRANGLE:** CANOGA PARK, CA	**SITE:** CEDAR HILLS NURSERY
		GEOLOGIC MAP UNIT: Tm Modelo Fm

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	SILTY CLAY LOAM, yellowish brown to olive, v. stiff, slight plasticity. Deeply to moderately weathered SHALE.
SILTY CLAY LOAM, olive, v. stiff, slight plasticity, deeply weathered shale (shale parting visible).		24			5	
						SHALE, black, soft to firm, v. close horizontal parting, close to v. close fracture spacing, fresh.
SHALE, black, firm to soft, v. close horizontal parting, close to v. close fracture spacing, fresh.	1.90		P		10	
					15	
					20	
					25	
					30	

COMMENTS: Rapid fluid loss at 24.5 m.

LOGGED BY: T. Fumal

ALTITUDE: 870' **DATE:** 7/24/79	**LOCATION:** **Lat.** 34°14'22" **Long.** 118°31'21" **QUADRANGLE:** CANOGA PARK, CA	**HOLE No.** 46 **SITE:** CAL STATE NORTHRIDGE **GEOLOGIC MAP UNIT:** Qal Holocene alluvium

SAMPLE DESCRIPTION	Density (gm/cc)	Blows/Foot	Sampling	Graphic Log	Depth (meters)	DESCRIPTION
					0	GRAVELLY SAND, brown, v. poorly sorted, v. dense. Contains lenses of SANDY LOAM, yellowish brown.
GRAVELLY SAND, brown, v. poorly sorted, 30% gravel to 30 mm subangular, v. dense.		30/11			5	FINE SANDY LOAM and LOAM, yellowish brown to brown, occasional gravel to 30 mm. Contains lenses of SAND, well-sorted, fine to medium grained, dense to v. dense.
FINE SANDY LOAM, yellowish brown, and SAND, well-sorted, fine to medium grained, rounded to subangular moist, dense.		43			10	
					15	
LOAM, brown, sand is v. fine grained, occasional gravel to 30 mm, medium plasticity, moist, v. dense.	2.00	66	P		20	
					25	
					30	

COMMENTS:

Figure 37

LOGGED BY: T. Fumal

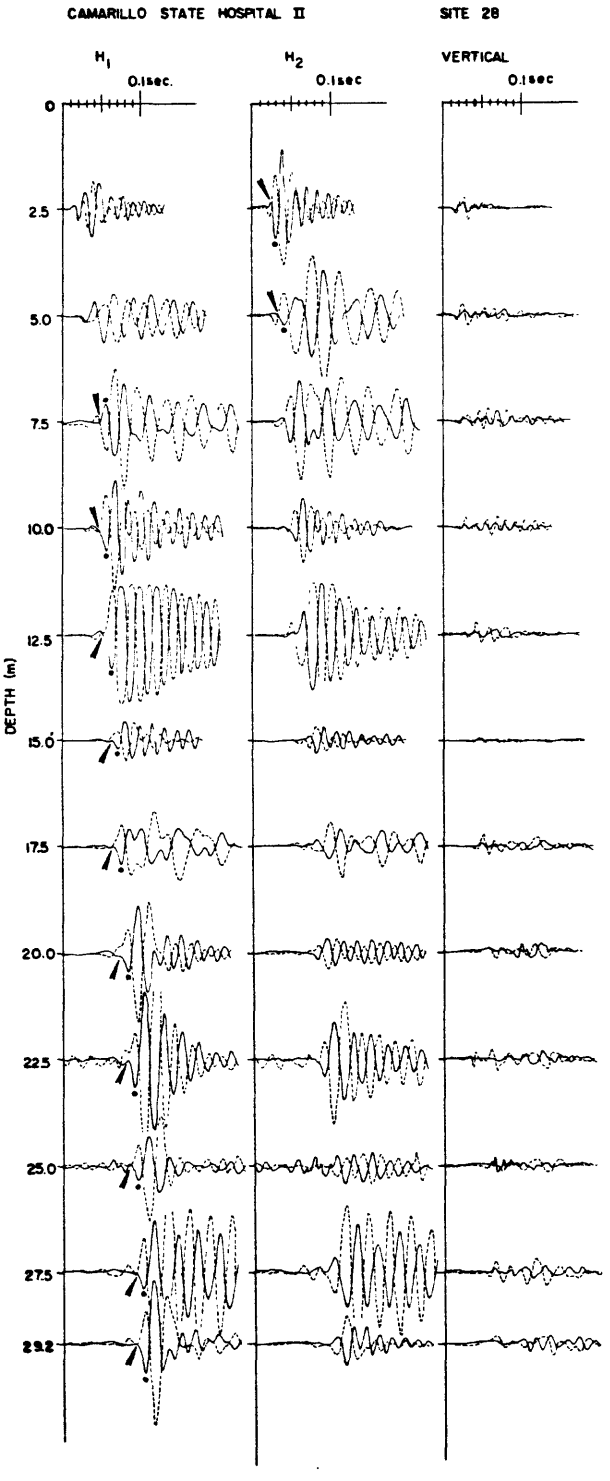


Figure 38

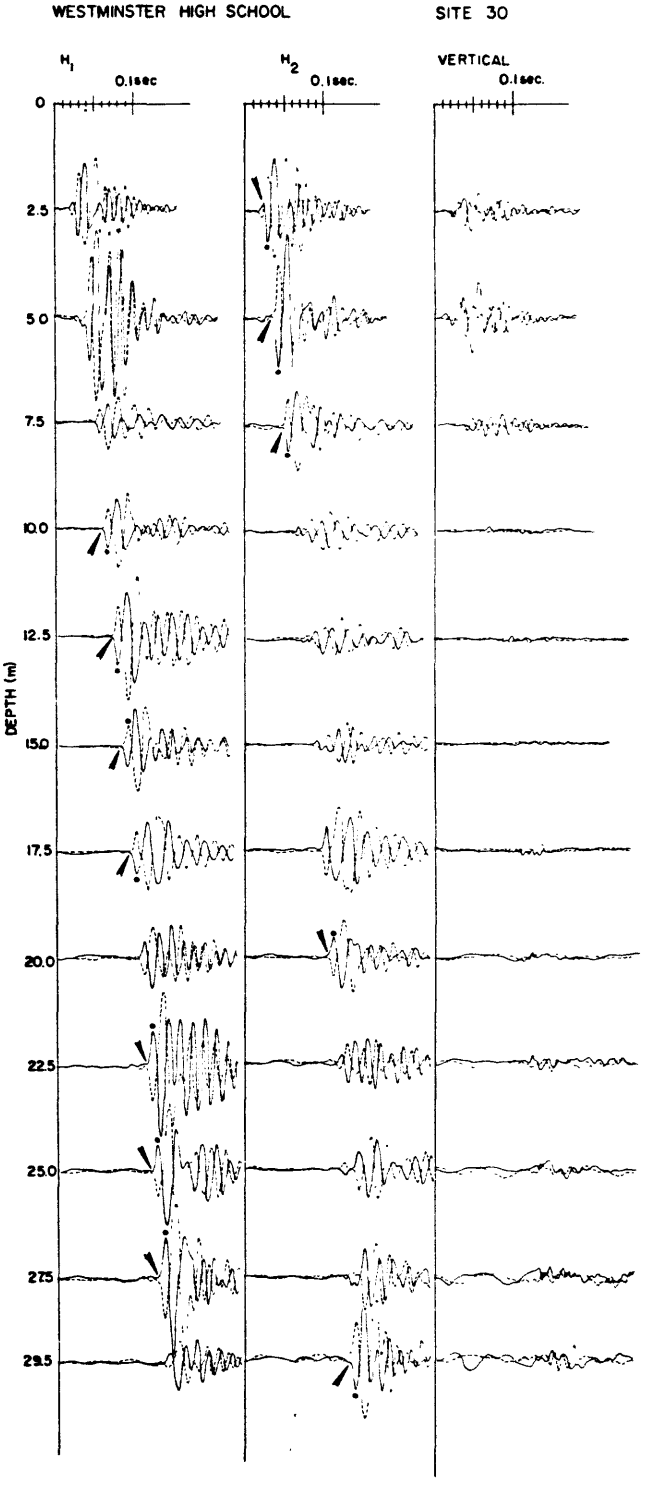


Figure 40

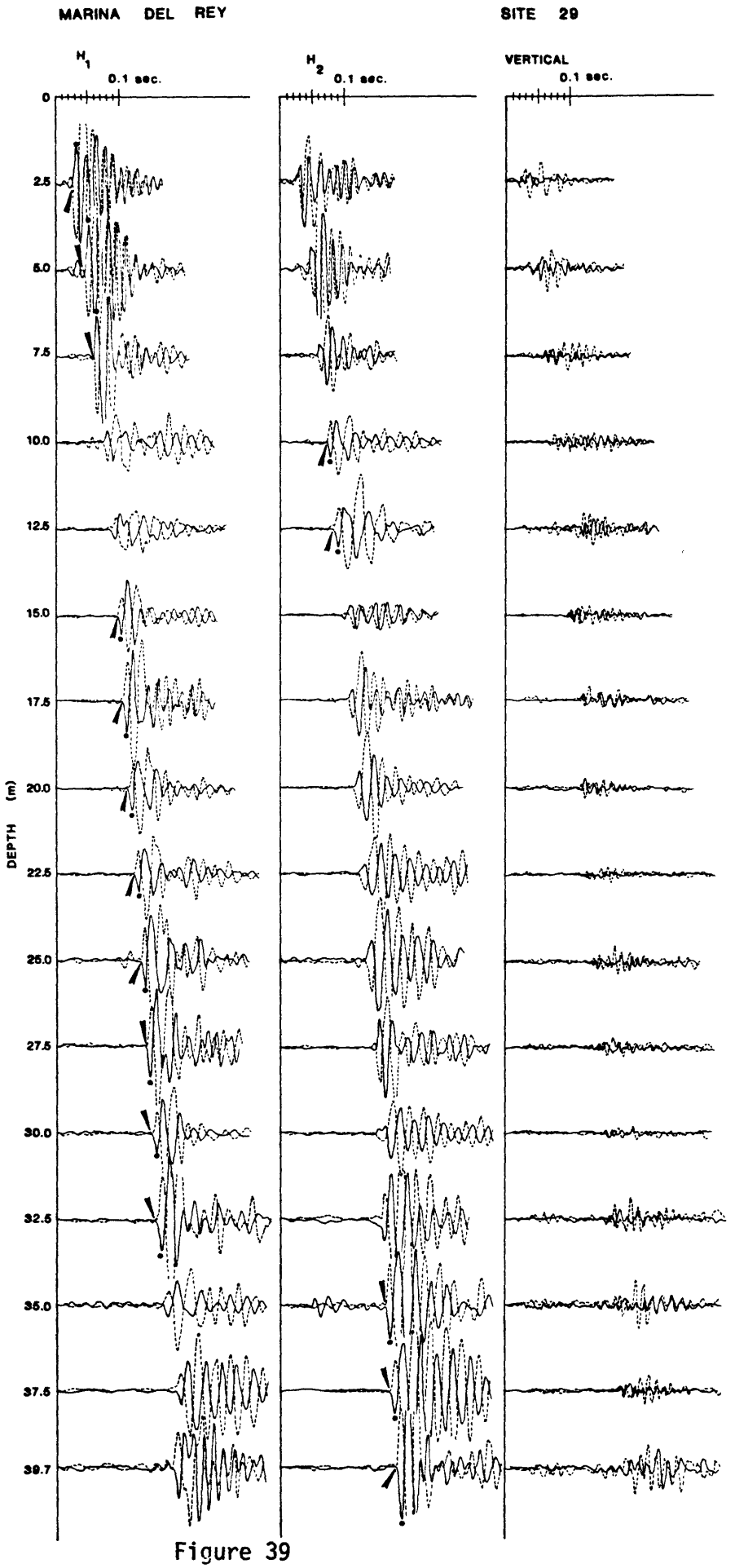

MARINA DEL REY
SITE 29
H1
0.1 sec.
H2
0.1 sec.
VERTICAL
0.1 sec.
DEPTH (m)
0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0
32.5
35.0
37.5
39.7

Figure 39

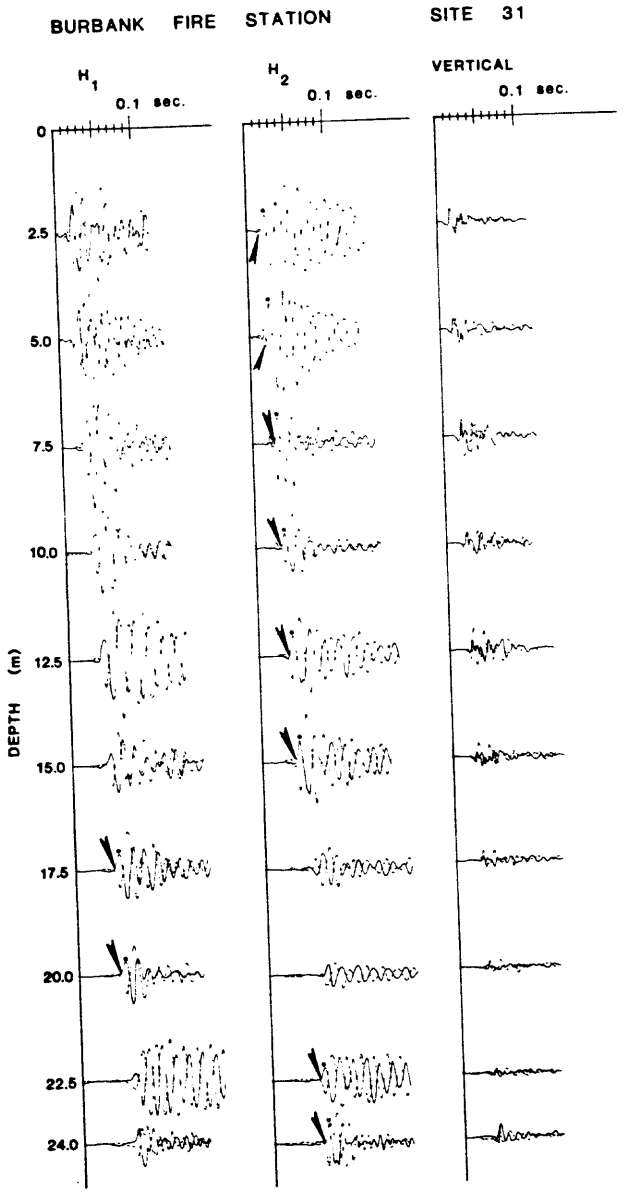


Figure 41

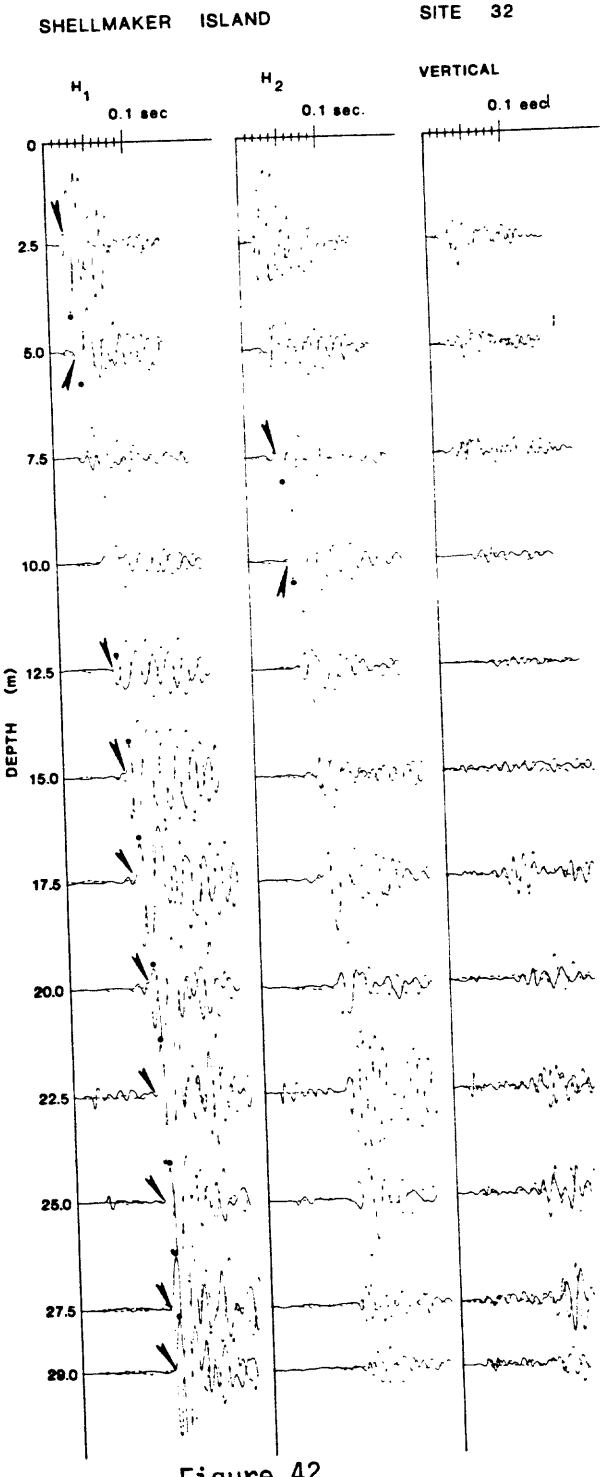


Figure 42

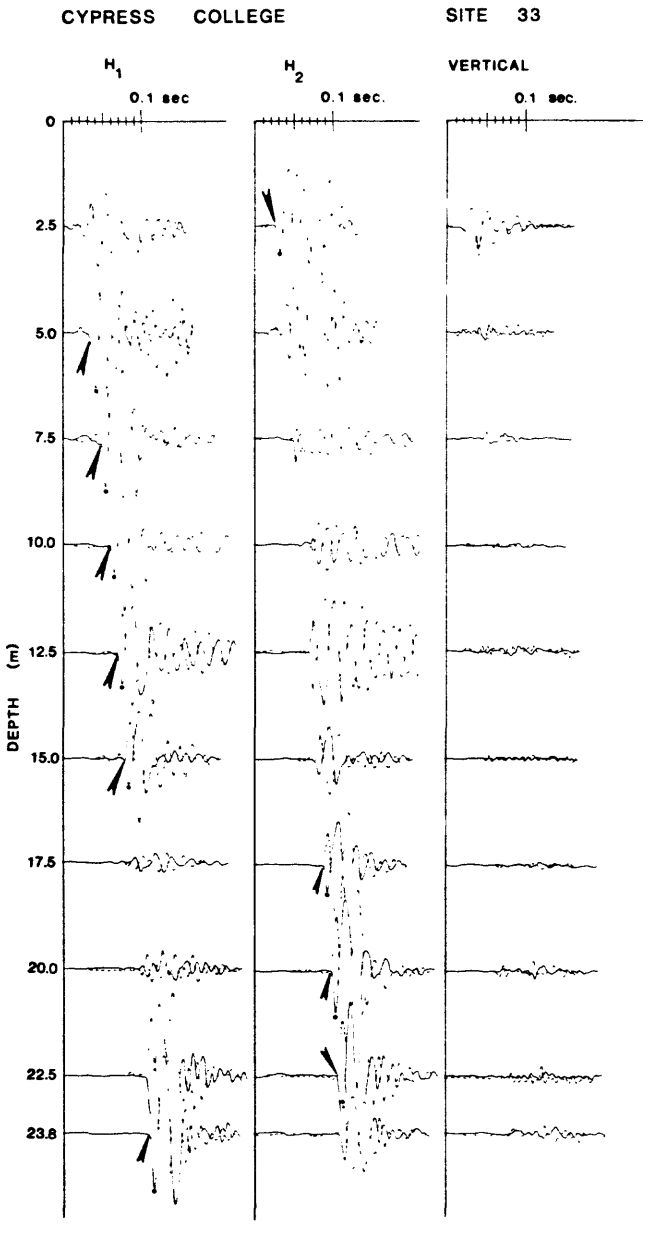


Figure 43

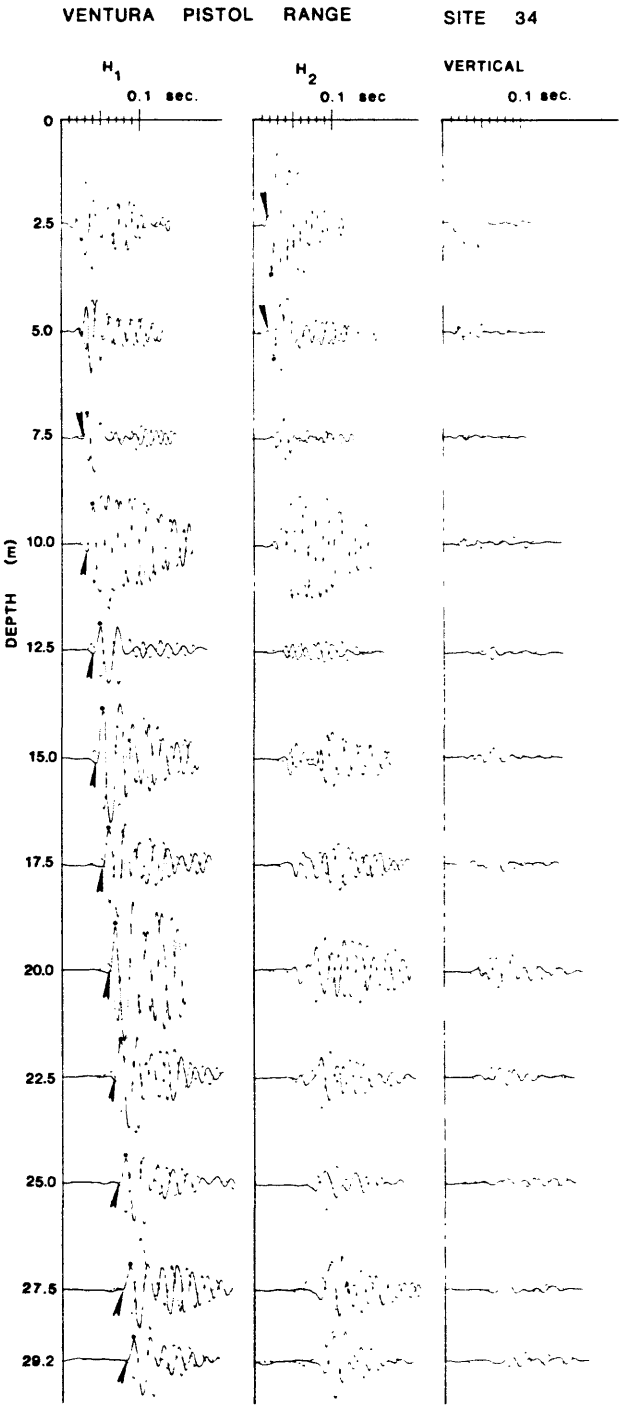


Figure 44

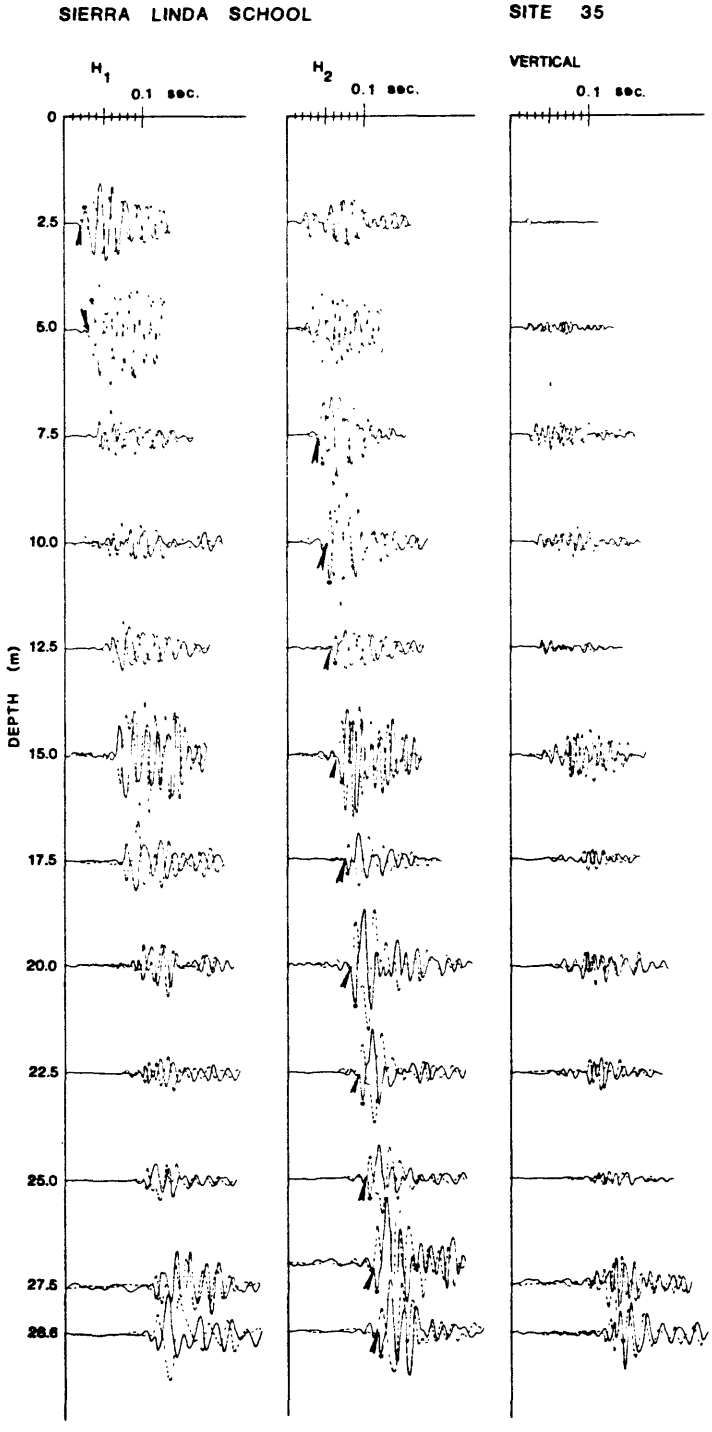


Figure 45

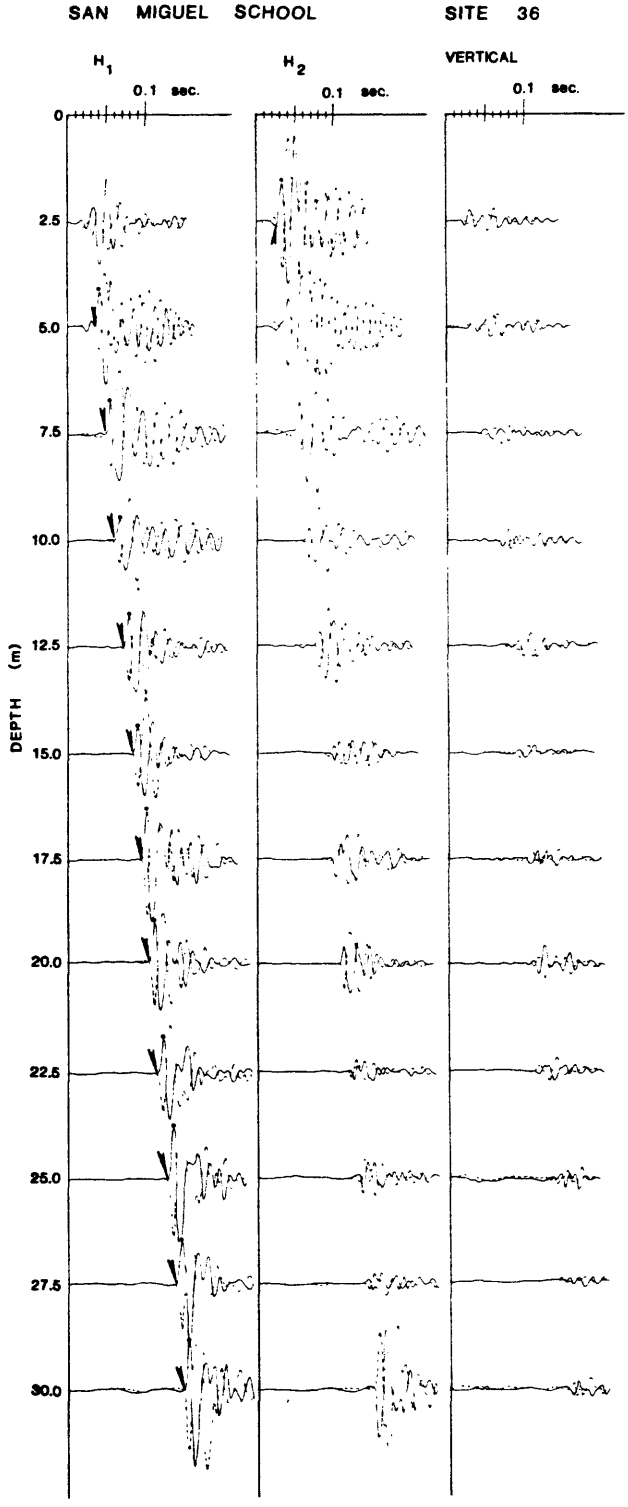


Figure 46

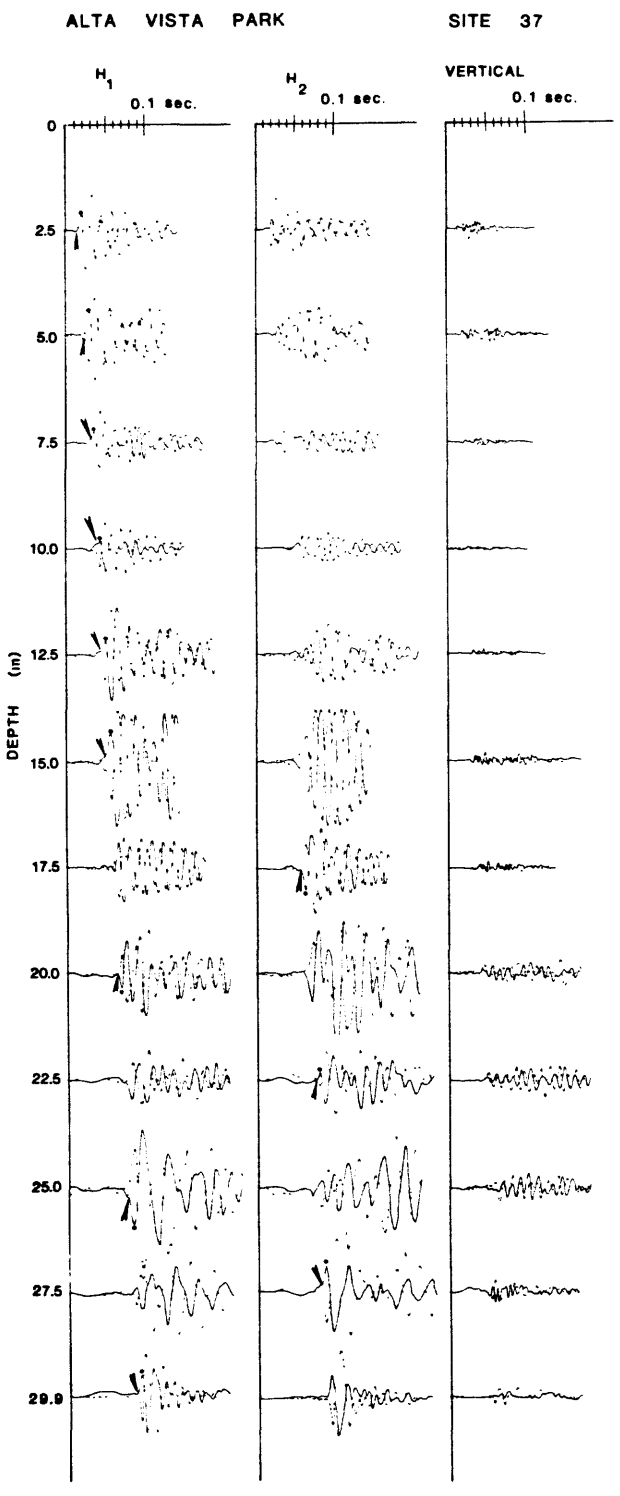


Figure 47

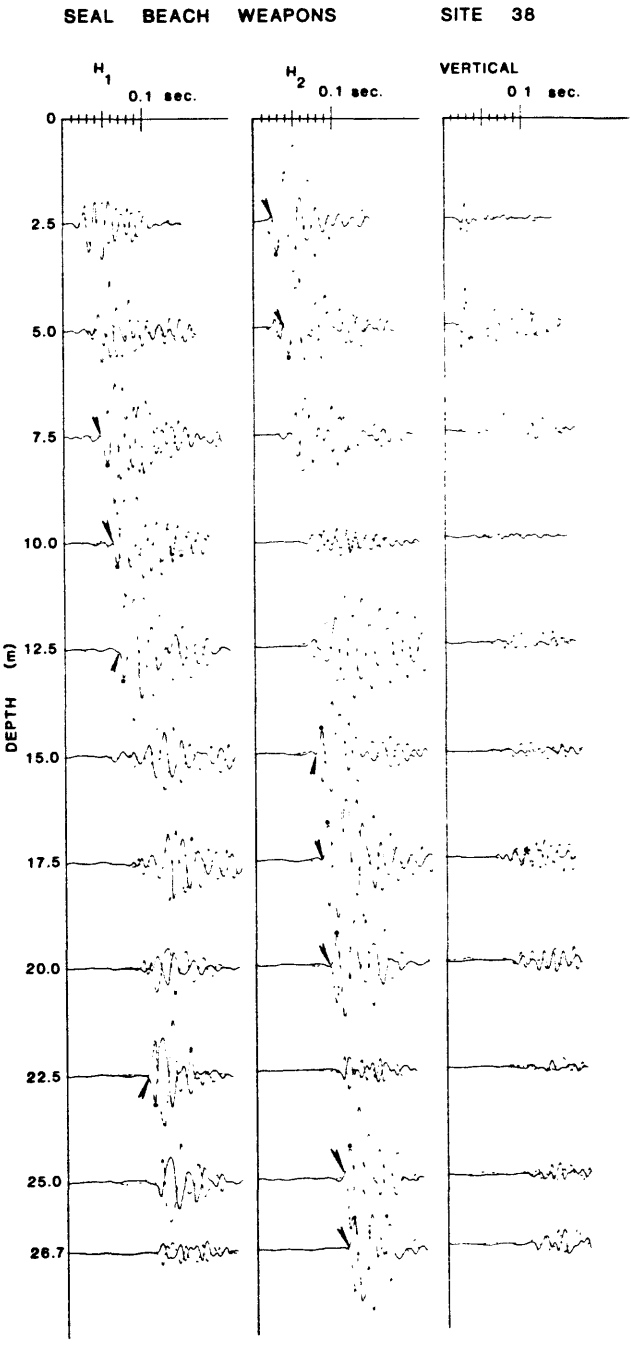


Figure 48

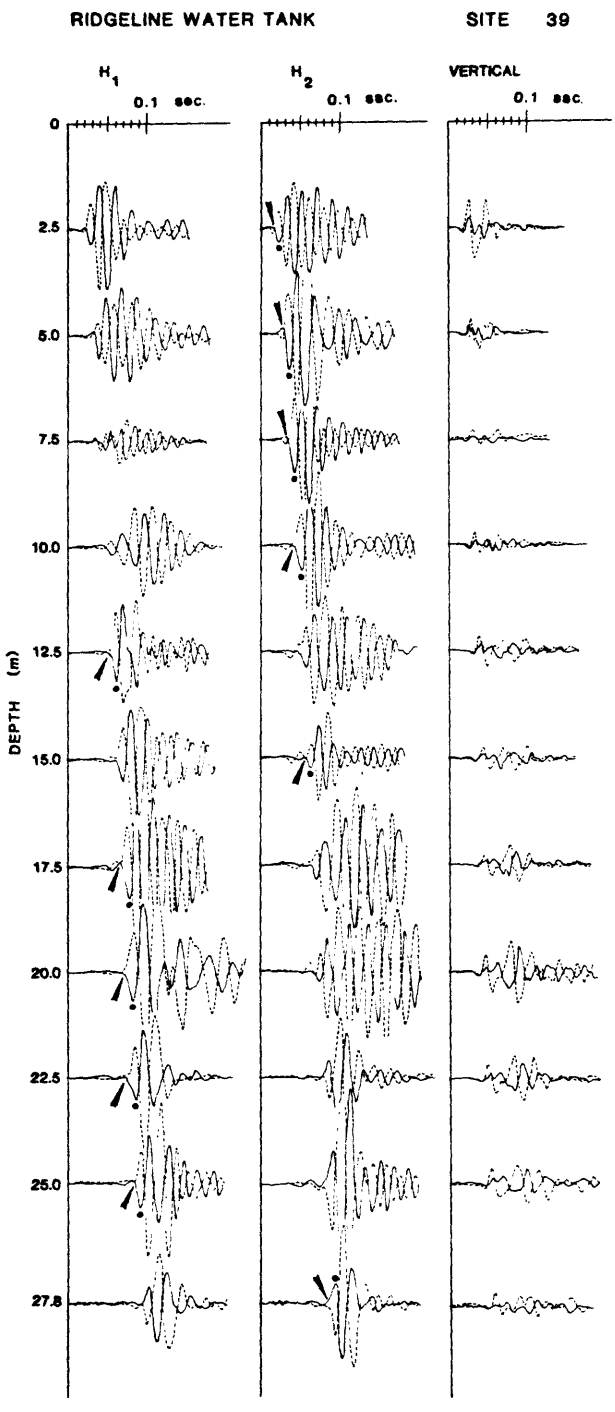


Figure 49

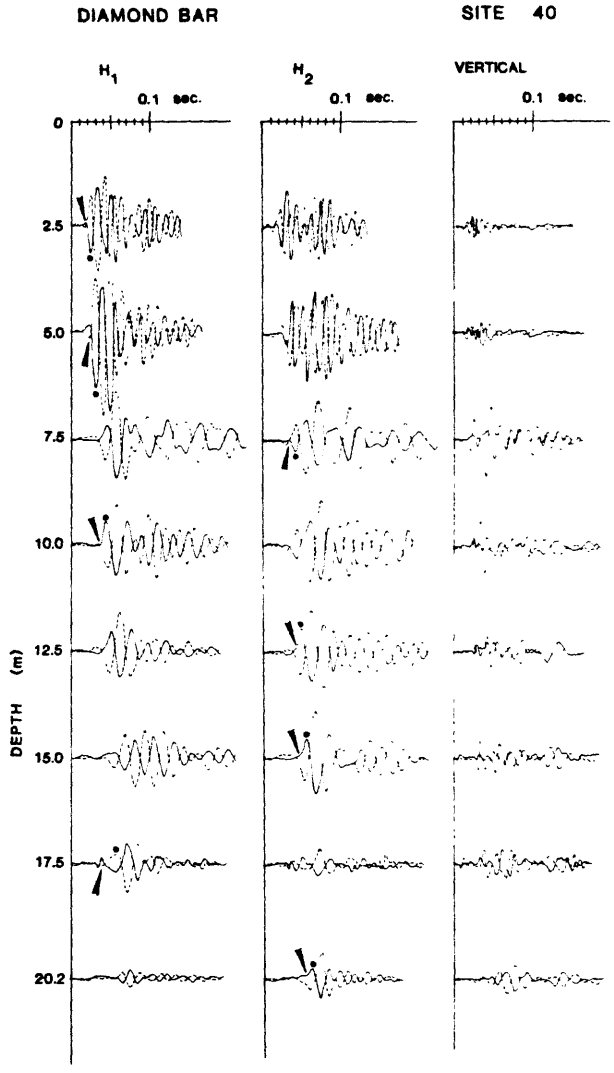


Figure 50

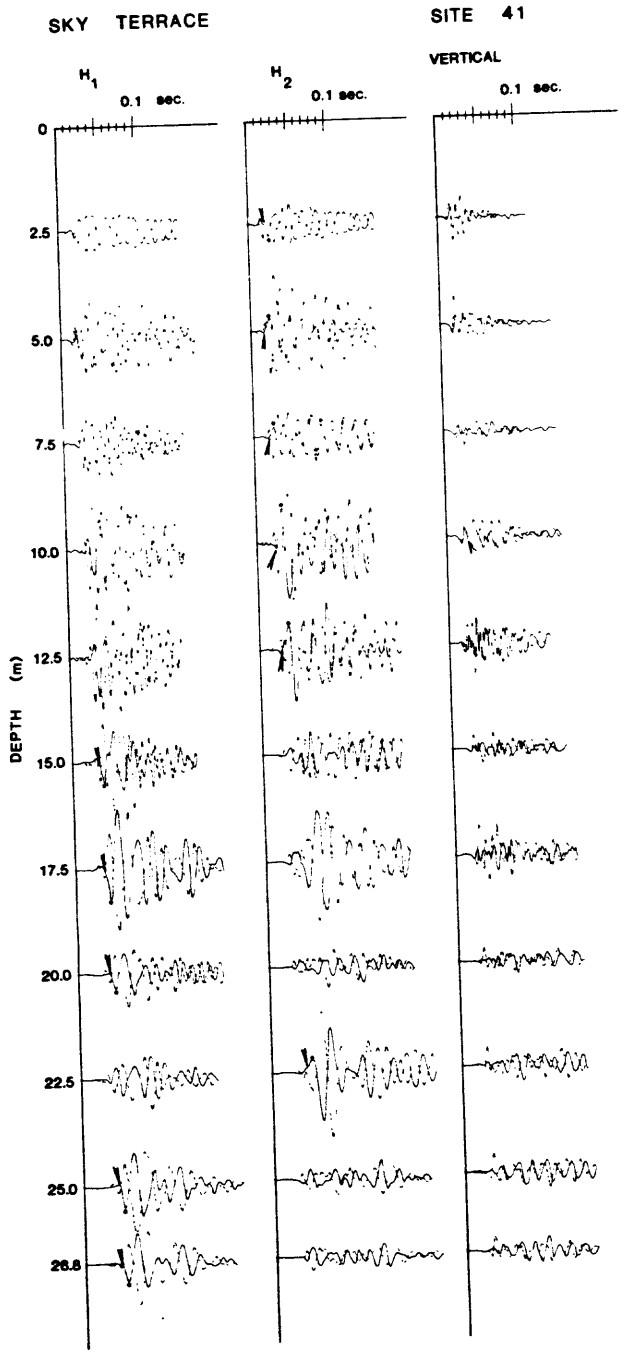


Figure 51

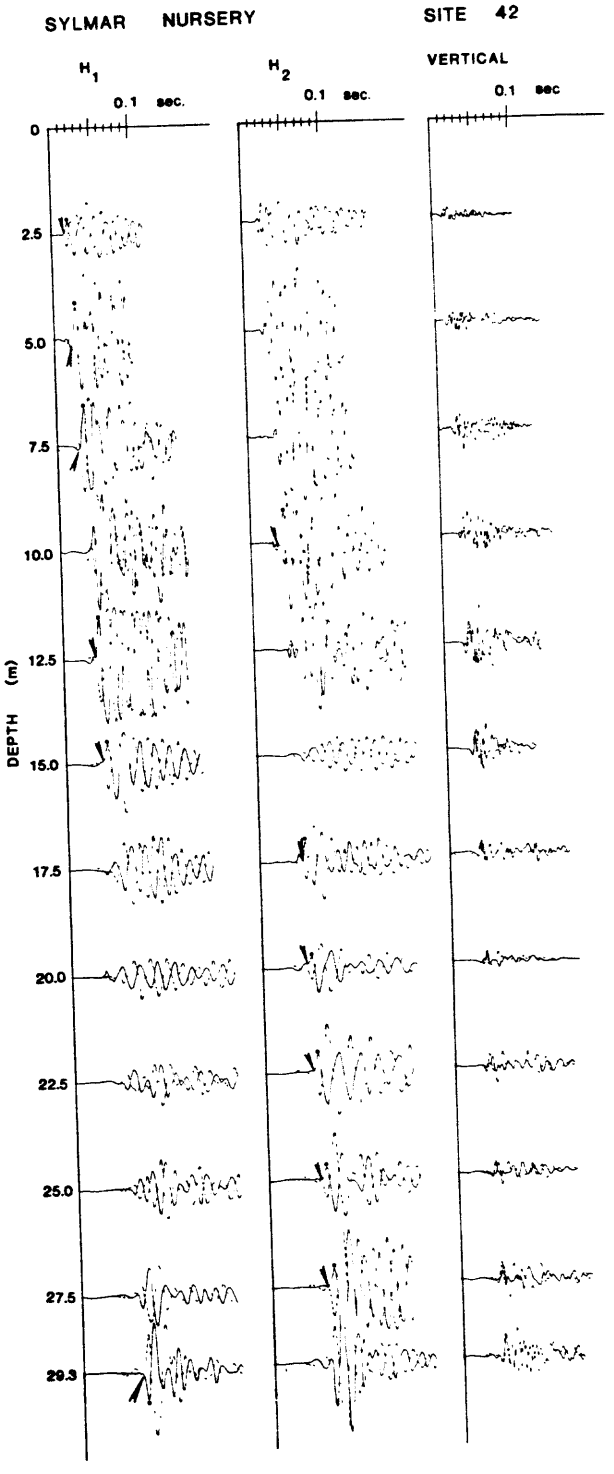


Figure 52

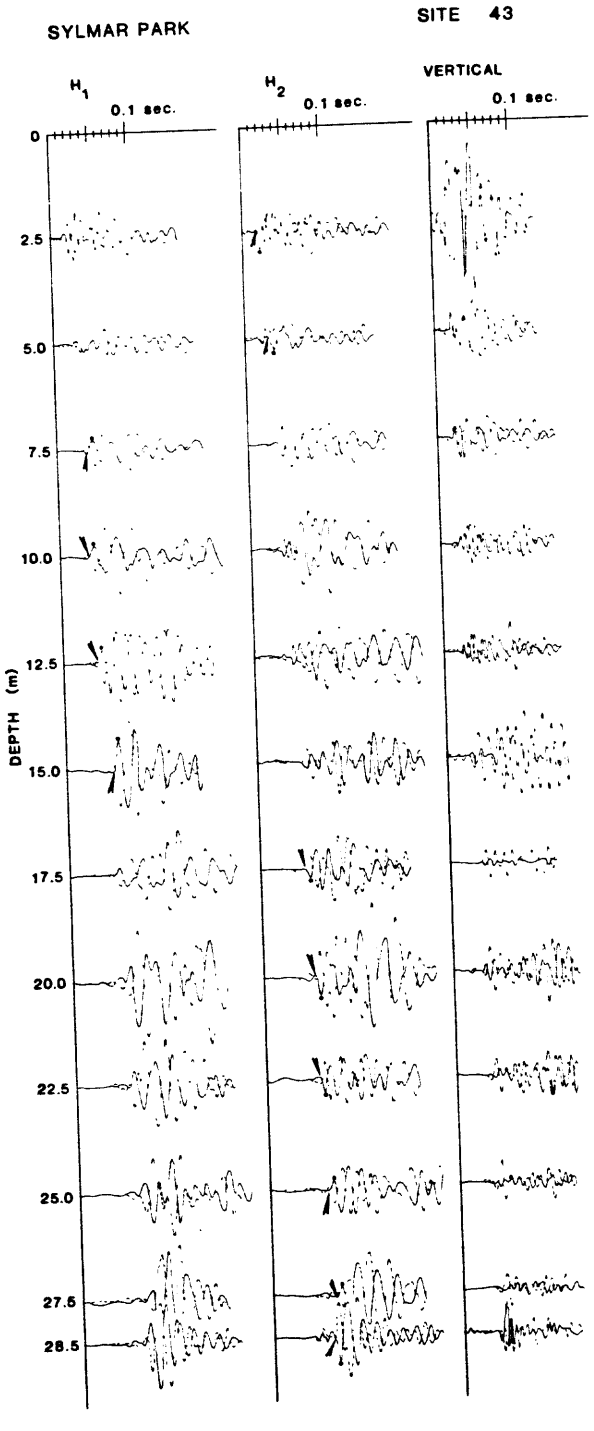


Figure 53

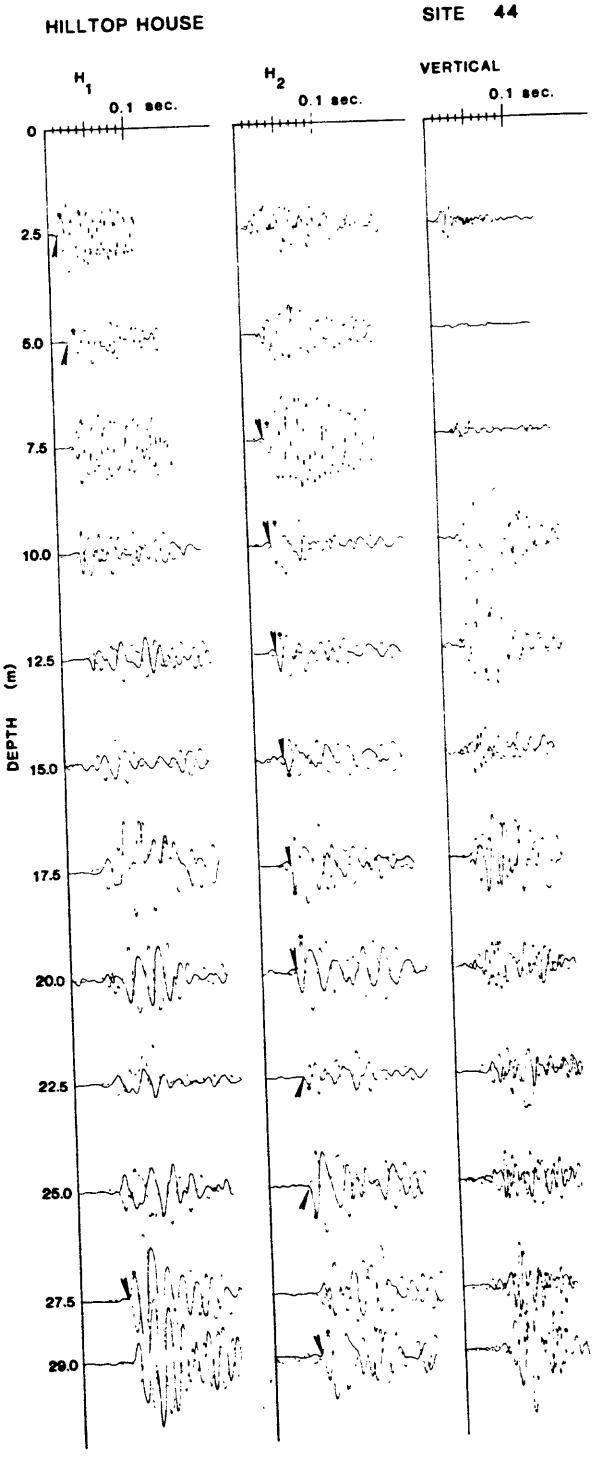


Figure 54

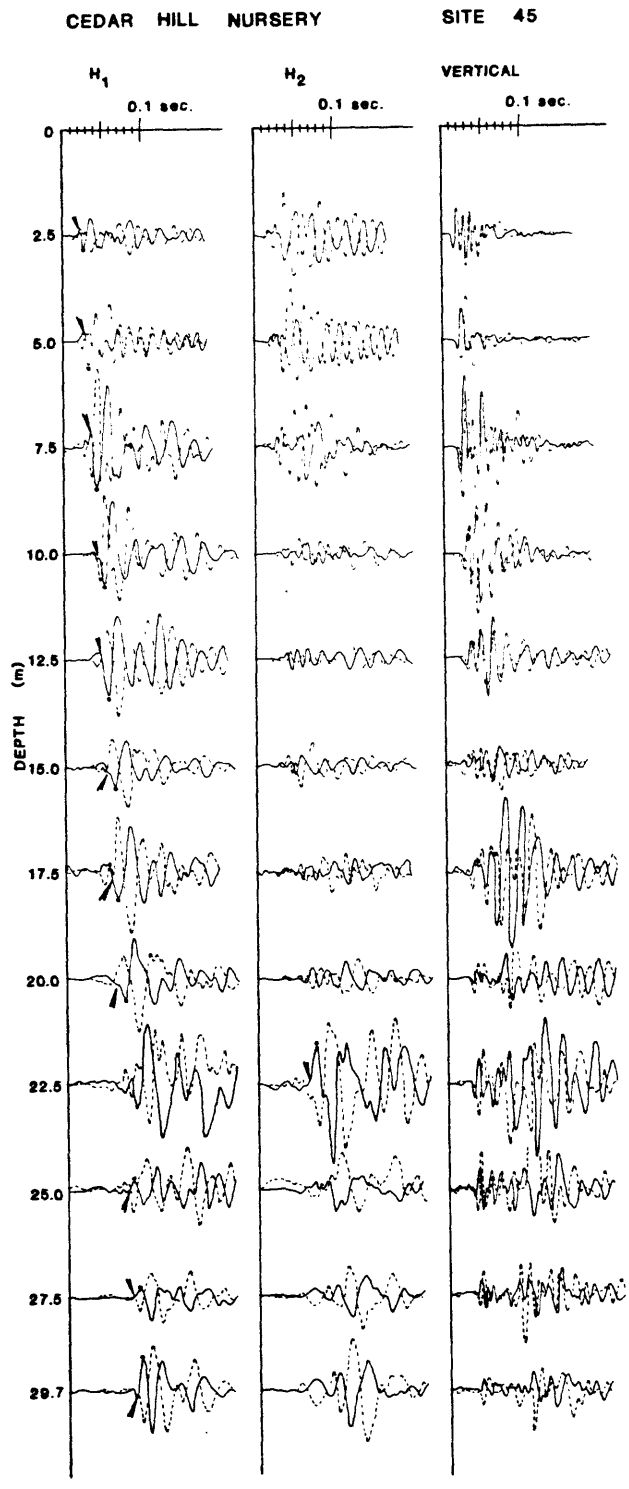


Figure 55

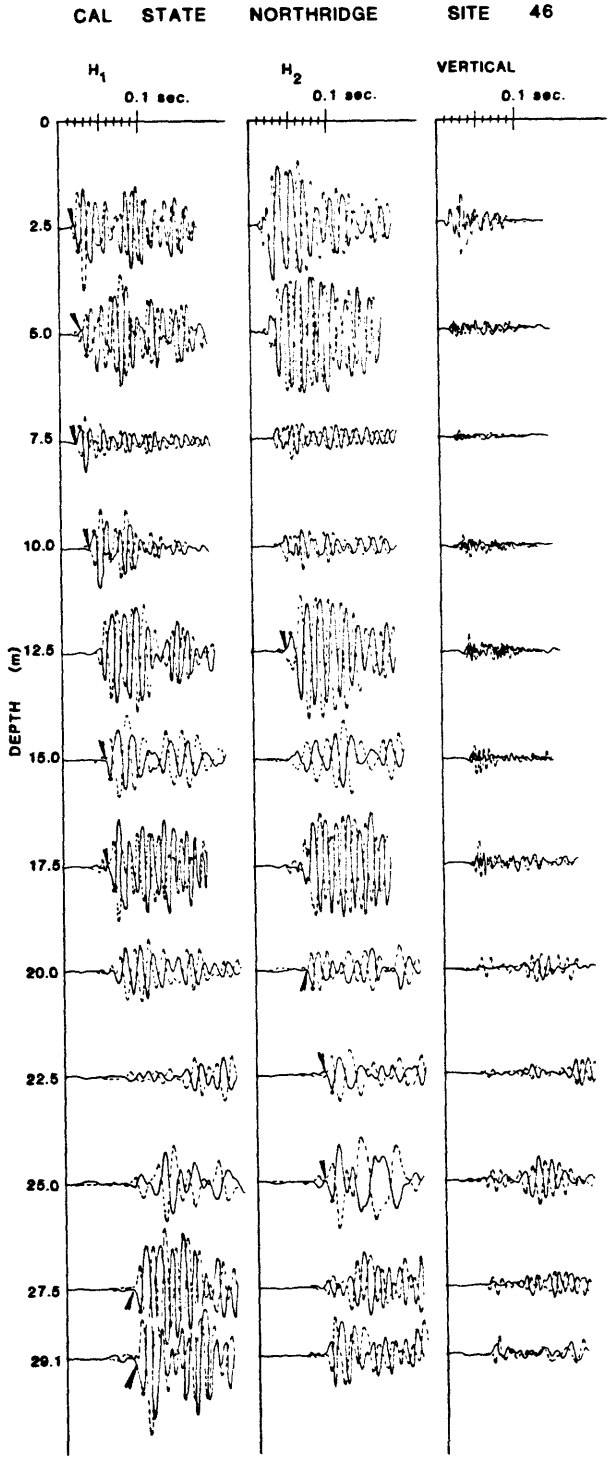


Figure 56

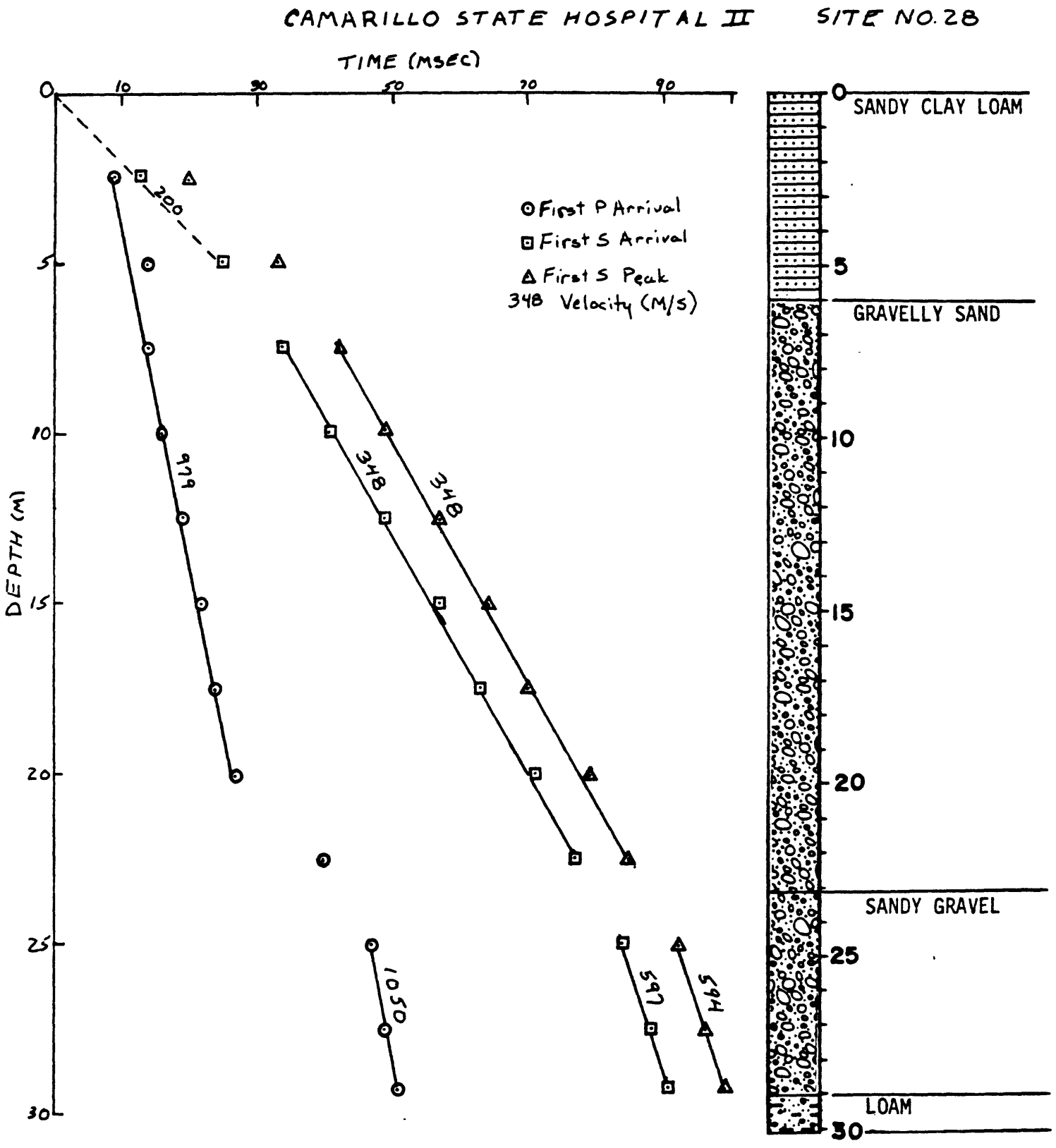

CAMARILLO STATE HOSPITAL II SITE NO. 28
TIME (MSEC)
0
10
30
50
70
90
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
348 Velocity (M/S)
200
979
348
348
1050
597
594
SANDY CLAY LOAM
GRAVELLY SAND
SANDY GRAVEL
LOAM

Figure 57

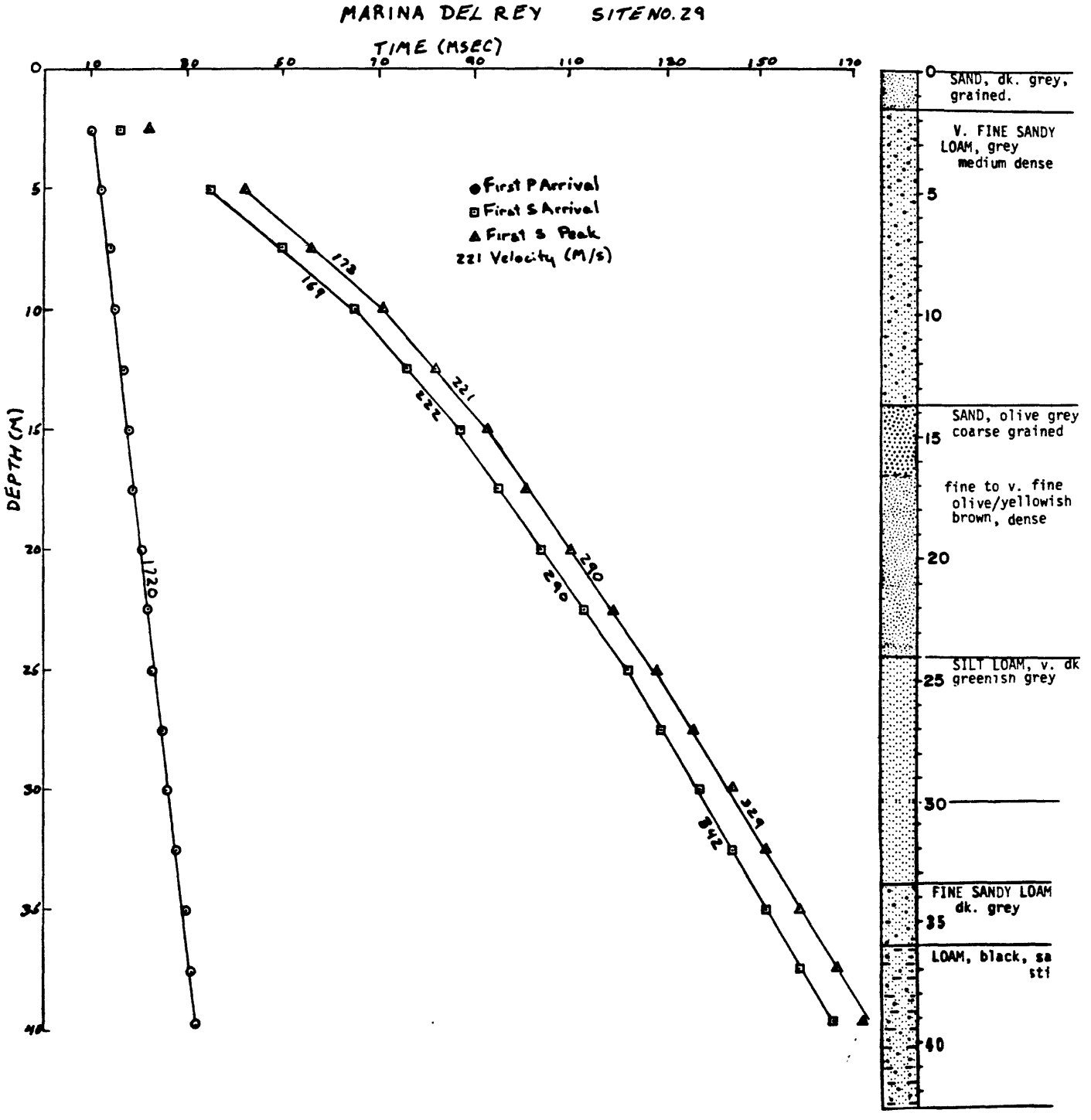

MARINA DEL REY SITE NO. 29
TIME (MSEC)
10
30
50
70
90
110
130
150
170
DEPTH (M)
0
5
10
15
20
25
30
35
40
First P Arrival
First S Arrival
First S Peak
221 Velocity (M/s)
178
169
221
222
290
290
329
342
1229
SAND, dk. grey, grained.
V. FINE SANDY LOAM, grey medium dense
SAND, olive grey coarse grained
fine to v. fine olive/yellowish brown, dense
SILT LOAM, v. dk greenish grey
FINE SANDY LOAM dk. grey
LOAM, black, sa sti

Figure 58

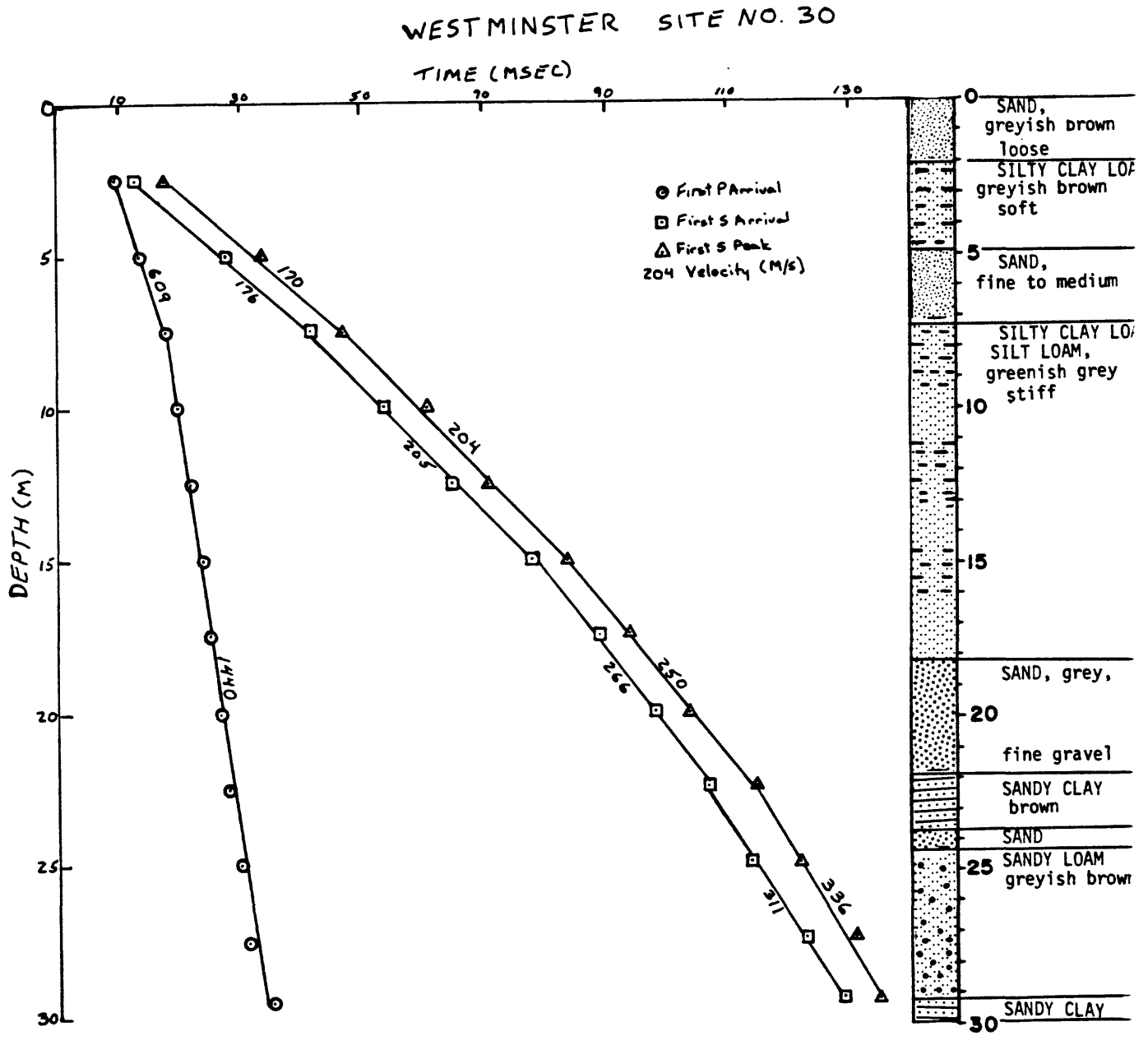

WESTMINSTER SITE NO. 30
TIME (MSEC)
10
30
50
70
90
110
130
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
204 Velocity (M/s)
609
176
170
204
205
1440
266
250
311
336
SAND, greyish brown loose
SILTY CLAY LOA greyish brown soft
SAND, fine to medium
SILTY CLAY LO
SILT LOAM, greenish grey stiff
SAND, grey,
fine gravel
SANDY CLAY brown
SAND
SANDY LOAM greyish brown
SANDY CLAY

Figure 59

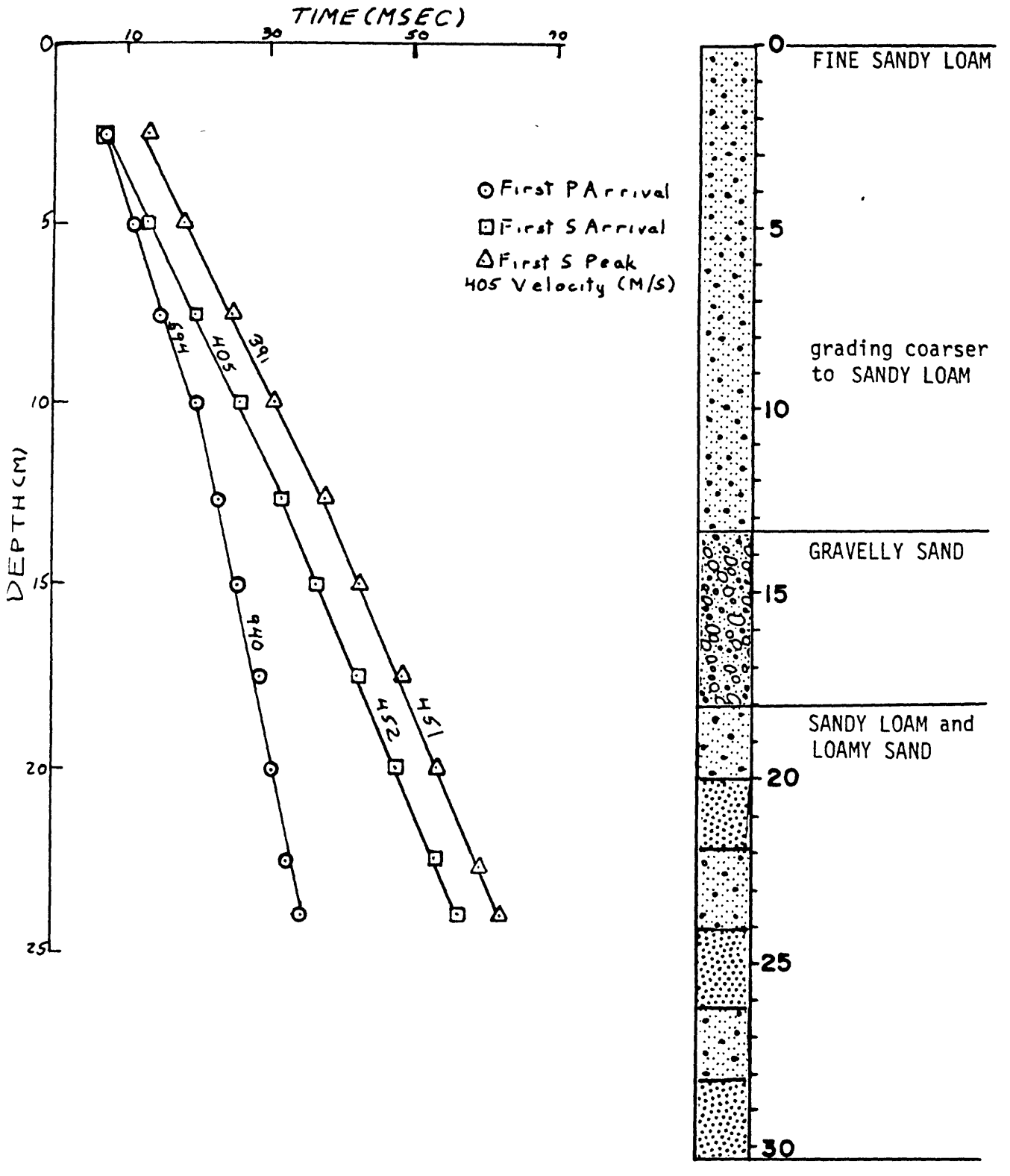

BURBANK FIRE STATION SITE NO. 31
TIME (MSEC)
0
10
30
50
70
DEPTH (M)
0
5
10
15
20
25
First P Arrival
First S Arrival
First S Peak
405 Velocity (M/s)
694
405
391
940
452
451
FINE SANDY LOAM
grading coarser to SANDY LOAM
GRAVELLY SAND
SANDY LOAM and LOAMY SAND
0
5
10
15
20
25
30

Figure 60

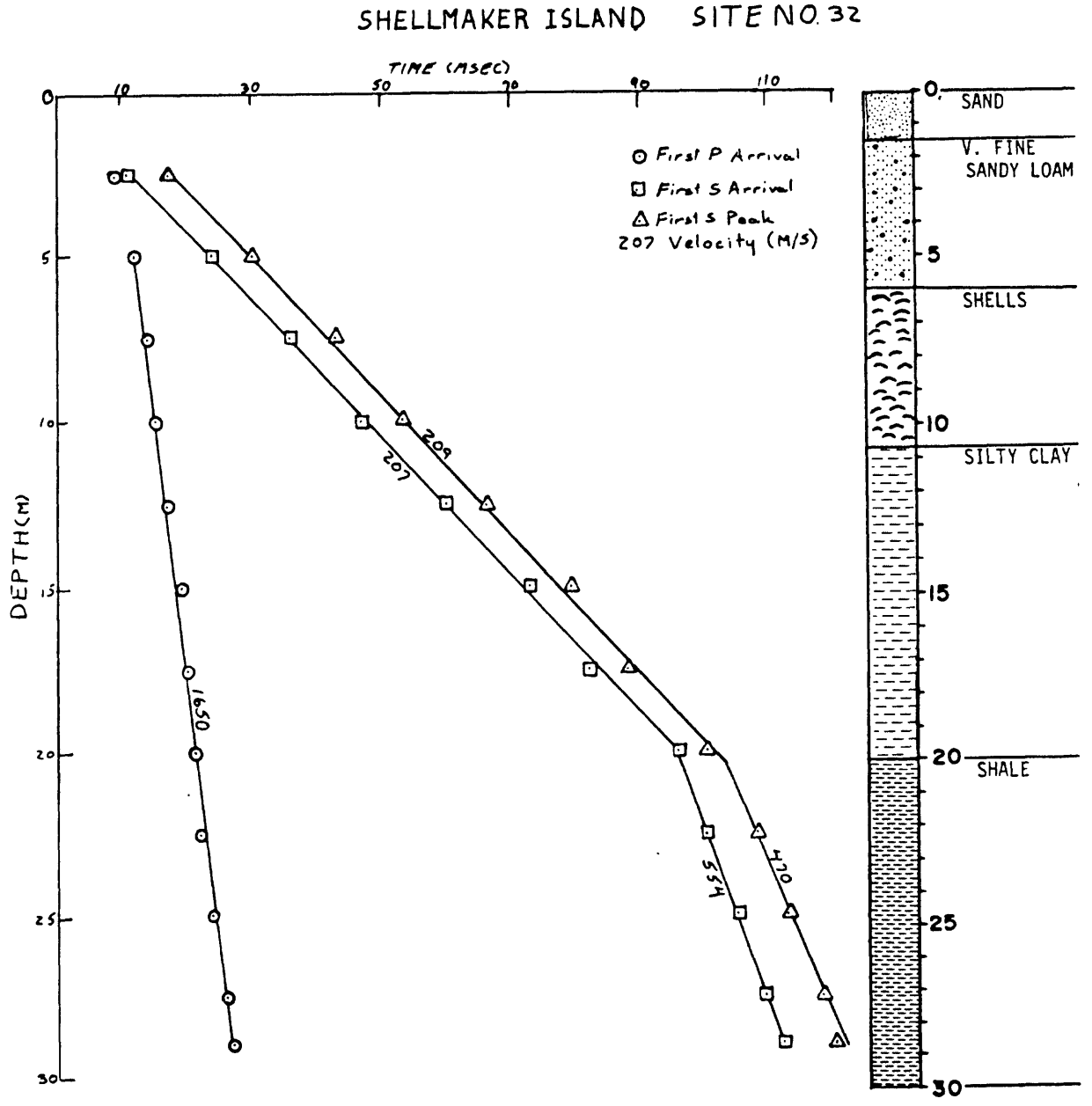

SHELLMAKER ISLAND SITE NO. 32
TIME (MSEC)
10
30
50
70
90
110
0
5
10
15
20
25
30
DEPTH(M)
First P Arrival
First S Arrival
First S Peak
207 Velocity (M/S)
209
207
1650
554
420
SAND
V. FINE SANDY LOAM
SHELLS
SILTY CLAY
SHALE

Figure 61

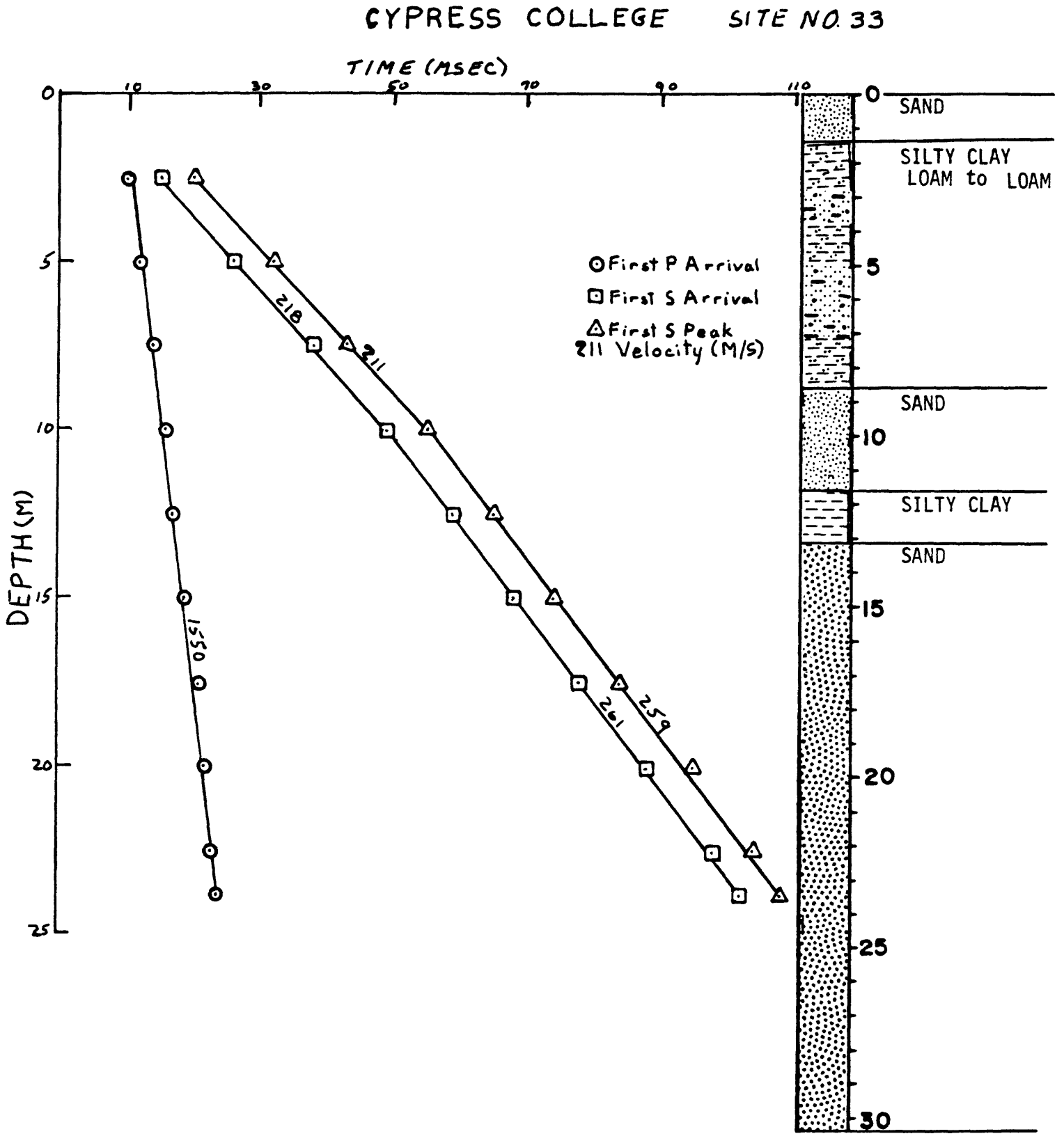

CYPRESS COLLEGE SITE NO. 33
TIME (MSEC)
0
10
30
50
70
90
110
DEPTH (M)
0
5
10
15
20
25
First P Arrival
First S Arrival
First S Peak
211 Velocity (M/S)
218
211
1550
259
261
SAND
SILTY CLAY LOAM to LOAM
SAND
SILTY CLAY
SAND
0
5
10
15
20
25
30

Figure 62

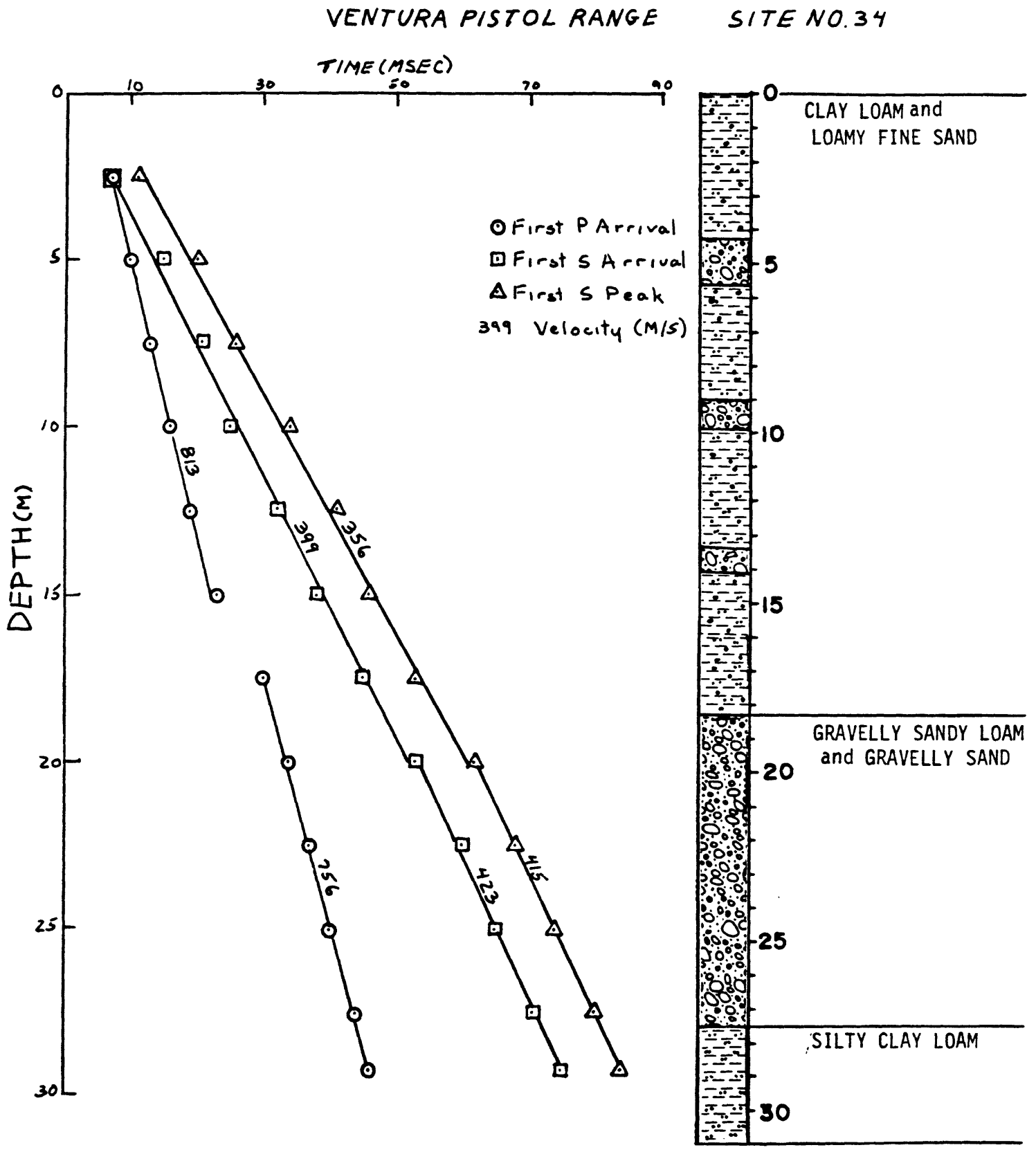

VENTURA PISTOL RANGE SITE NO. 34
TIME (MSEC)
0
10
30
50
70
90
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
399 Velocity (M/S)
813
399
356
256
423
415
CLAY LOAM and
LOAMY FINE SAND
GRAVELLY SANDY LOAM
and GRAVELLY SAND
SILTY CLAY LOAM

Figure 63

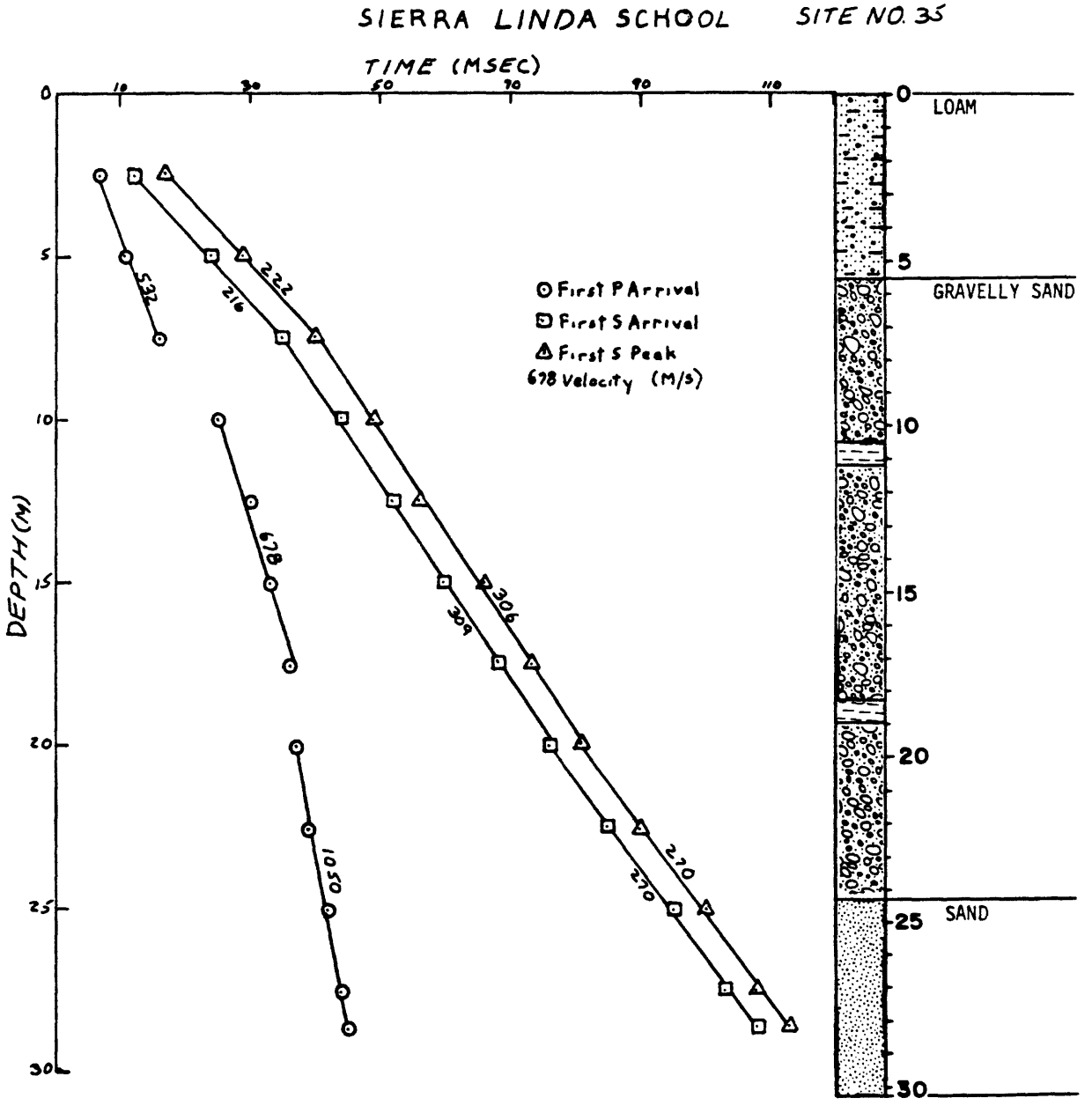

SIERRA LINDA SCHOOL SITE NO. 35
TIME (MSEC)
10
30
50
70
90
110
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
678 Velocity (M/s)
532
216
222
678
306
309
1050
270
270
LOAM
GRAVELLY SAND
SAND

Figure 64

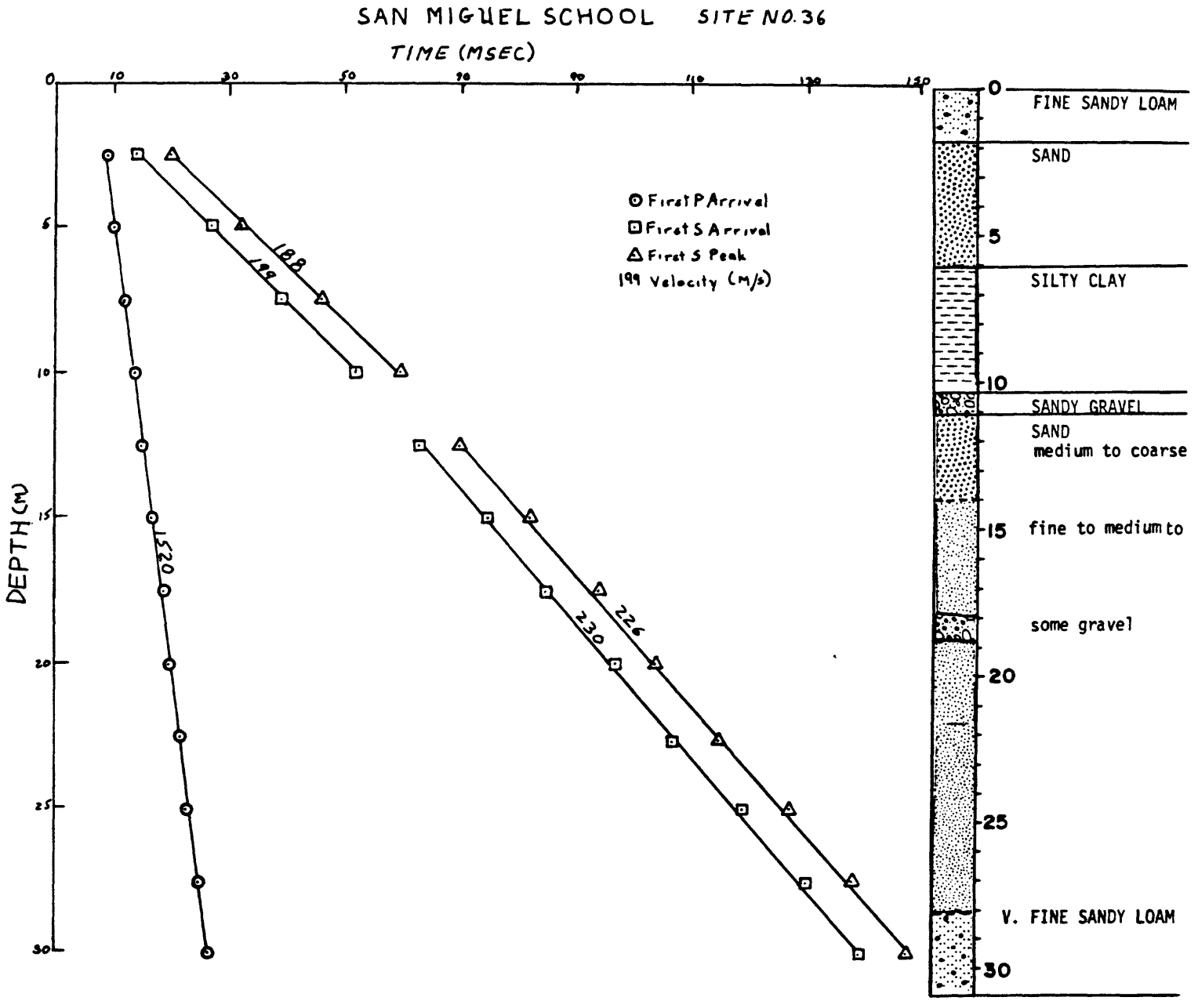

SAN MIGUEL SCHOOL SITE NO. 36
TIME (MSEC)
0
10
30
50
70
90
110
130
150
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
199 Velocity (M/s)
188
199
1520
226
230
FINE SANDY LOAM
SAND
SILTY CLAY
SANDY GRAVEL
SAND
medium to coarse
fine to medium to
some gravel
V. FINE SANDY LOAM

Figure 65

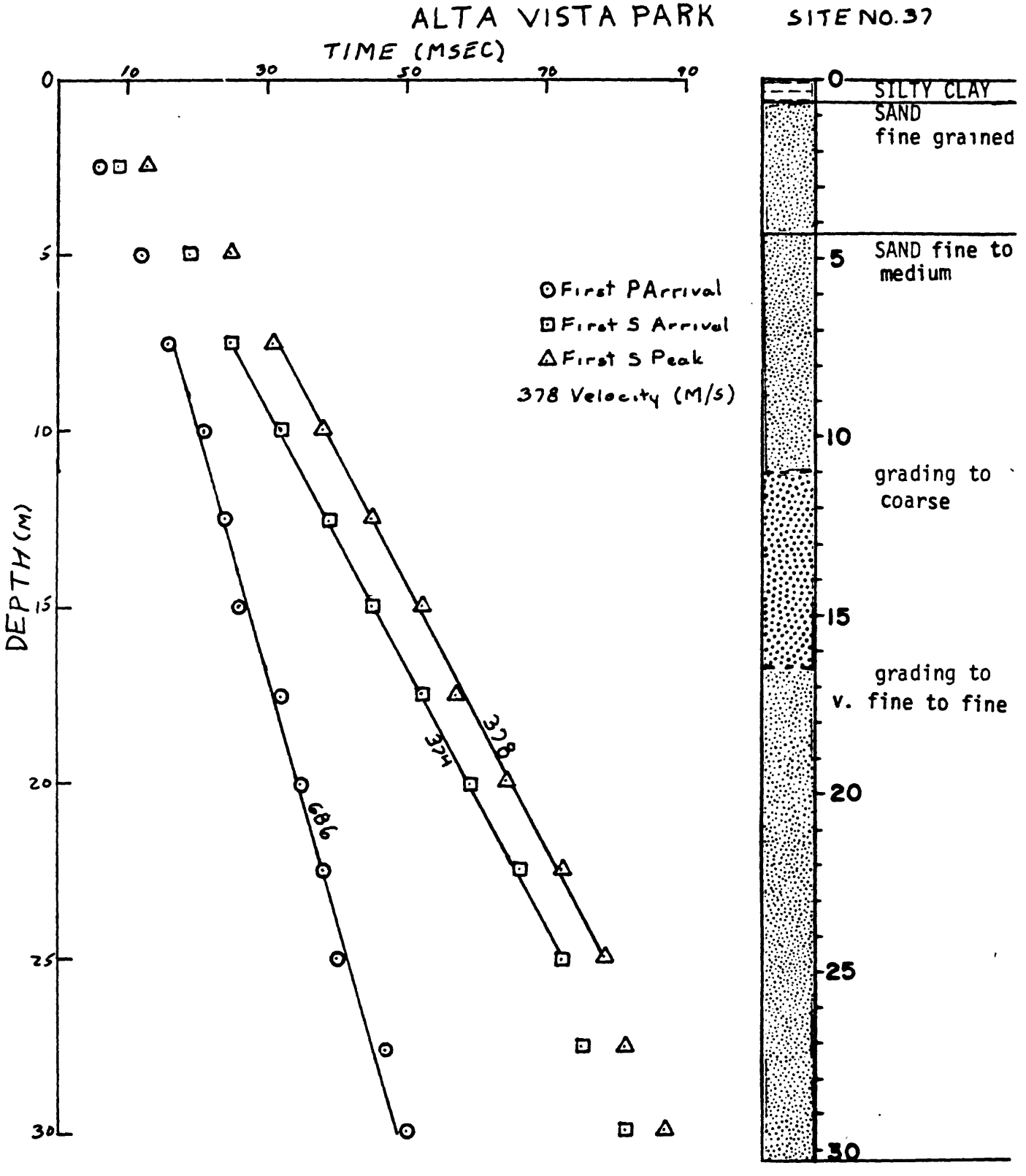

ALTA VISTA PARK
SITE NO. 37
TIME (MSEC)
10
30
50
70
90
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
378 Velocity (M/s)
328
374
686
SILTY CLAY
SAND
fine grained
SAND fine to
medium
grading to
coarse
grading to
v. fine to fine

Figure 66

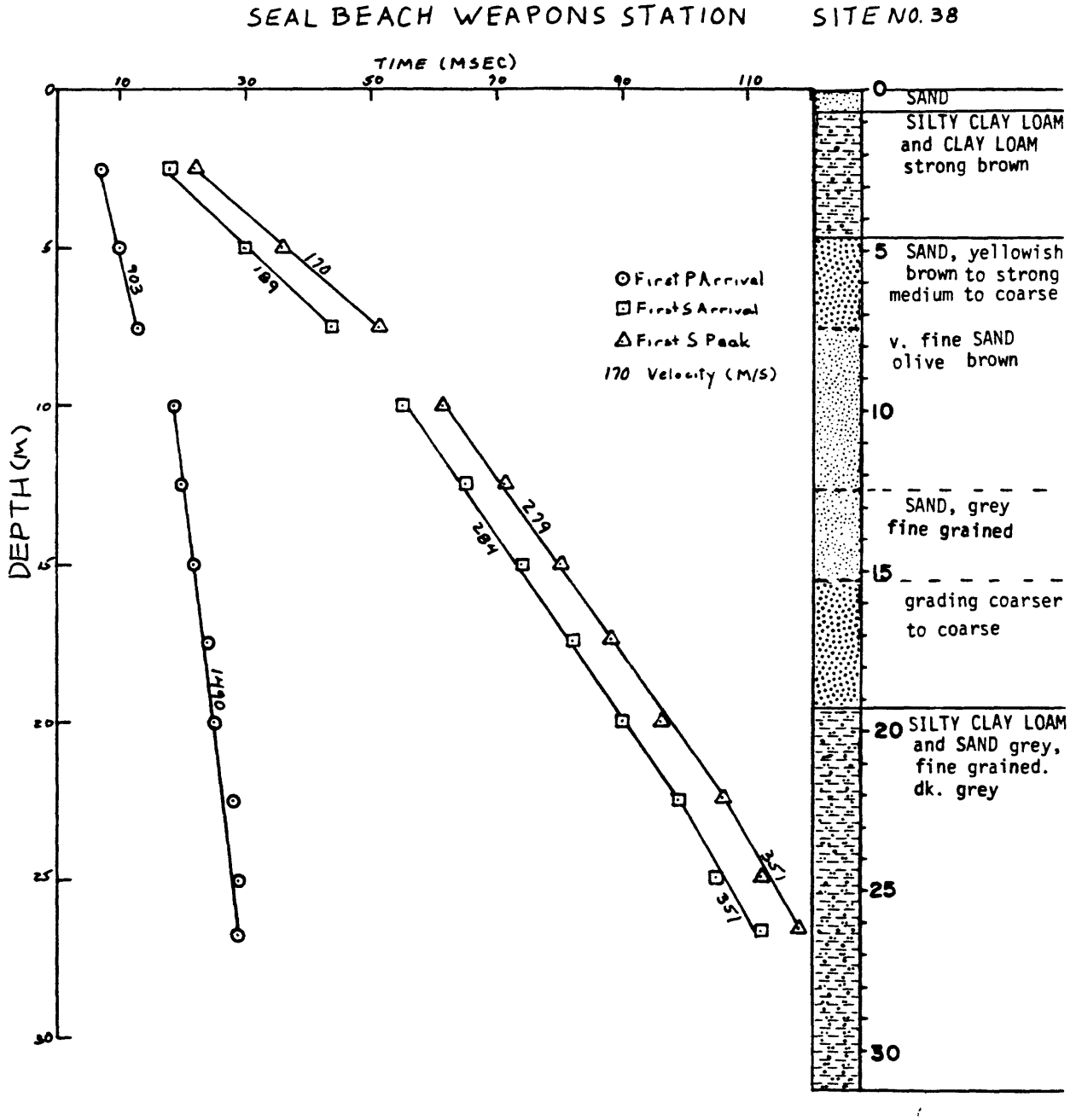

SEAL BEACH WEAPONS STATION SITE NO. 38
TIME (MSEC)
10
30
50
70
90
110
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
170 Velocity (M/S)
203
189
170
1420
279
284
351
351
0 SAND
SILTY CLAY LOAM and CLAY LOAM strong brown
5 SAND, yellowish brown to strong medium to coarse
v. fine SAND olive brown
10
SAND, grey fine grained
15
grading coarser to coarse
20 SILTY CLAY LOAM and SAND grey, fine grained. dk. grey
25
30

Figure 67

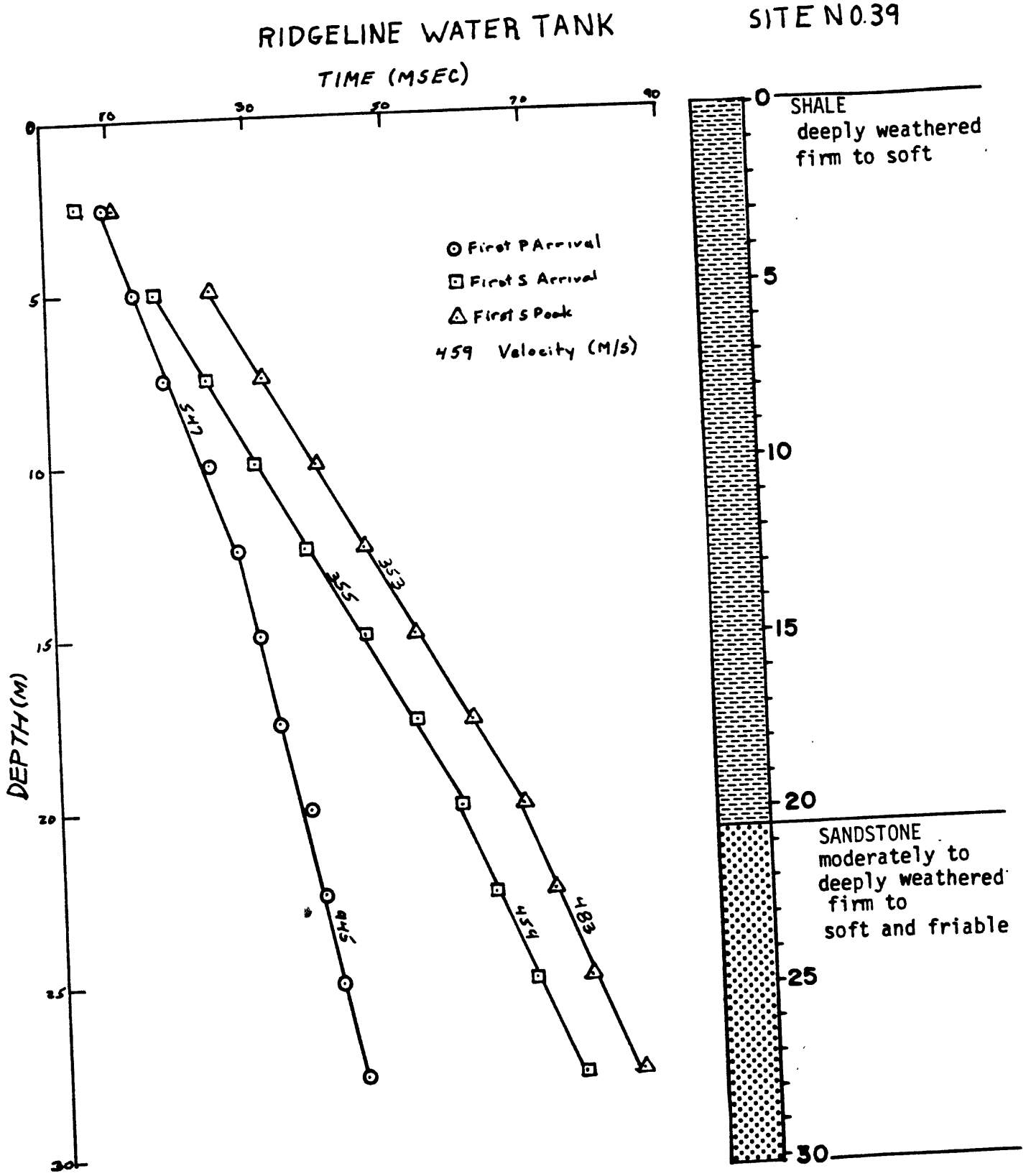

RIDGELINE WATER TANK
SITE NO.39
TIME (MSEC)
10
30
50
70
90
0
5
10
15
20
25
30
DEPTH (M)
First P Arrival
First S Arrival
First S Peak
459 Velocity (M/s)
547
353
355
483
454
445
SHALE
deeply weathered
firm to soft
SANDSTONE
moderately to
deeply weathered
firm to
soft and friable

Figure 68

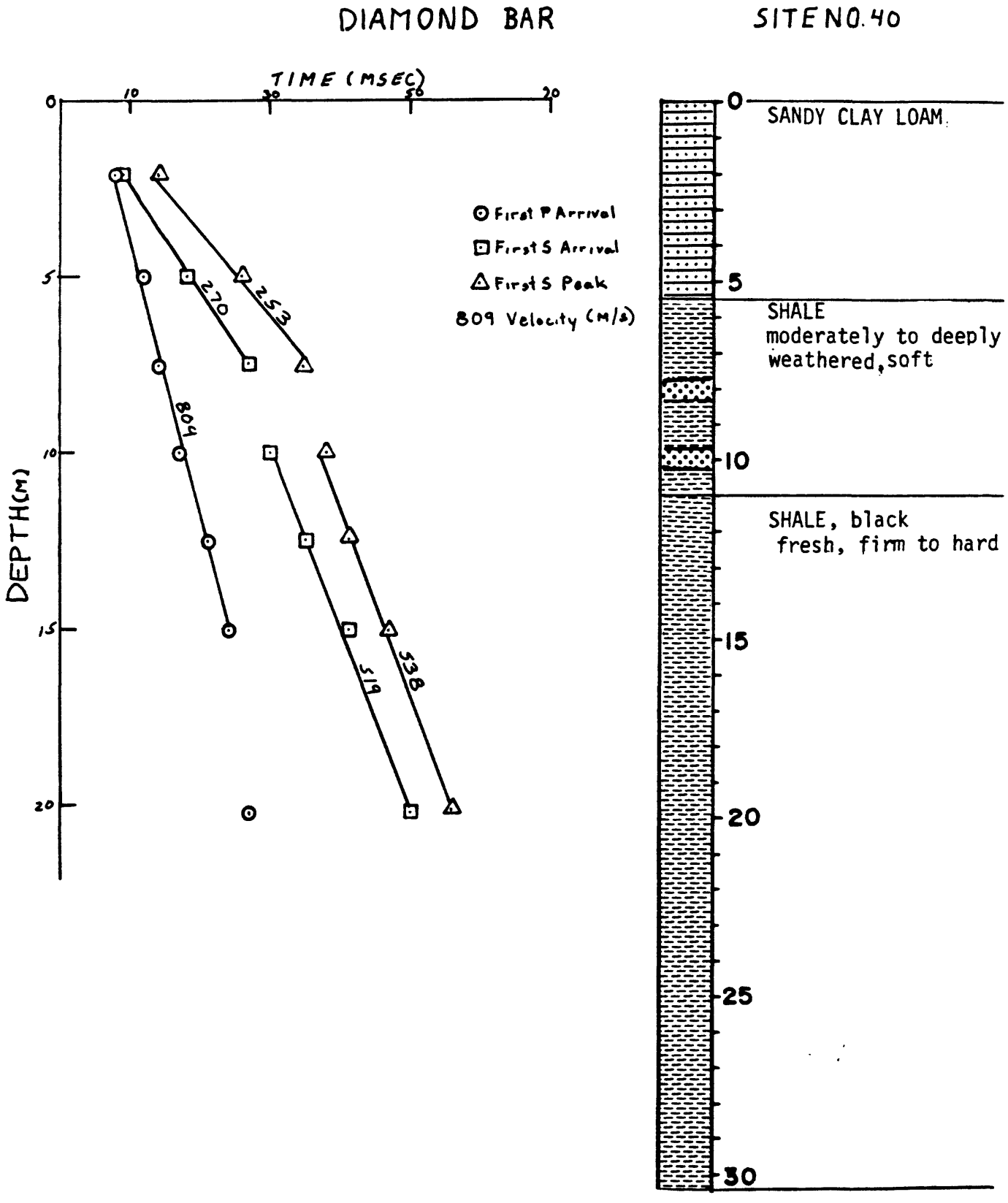

DIAMOND BAR
SITE NO. 40
TIME (MSEC)
0
10
30
50
70
DEPTH(M)
5
10
15
20
First P Arrival
First S Arrival
First S Peak
809 Velocity (M/s)
270
253
809
519
538
0
SANDY CLAY LOAM
5
SHALE
moderately to deeply
weathered, soft
10
SHALE, black
fresh, firm to hard
15
20
25
30

Figure 70

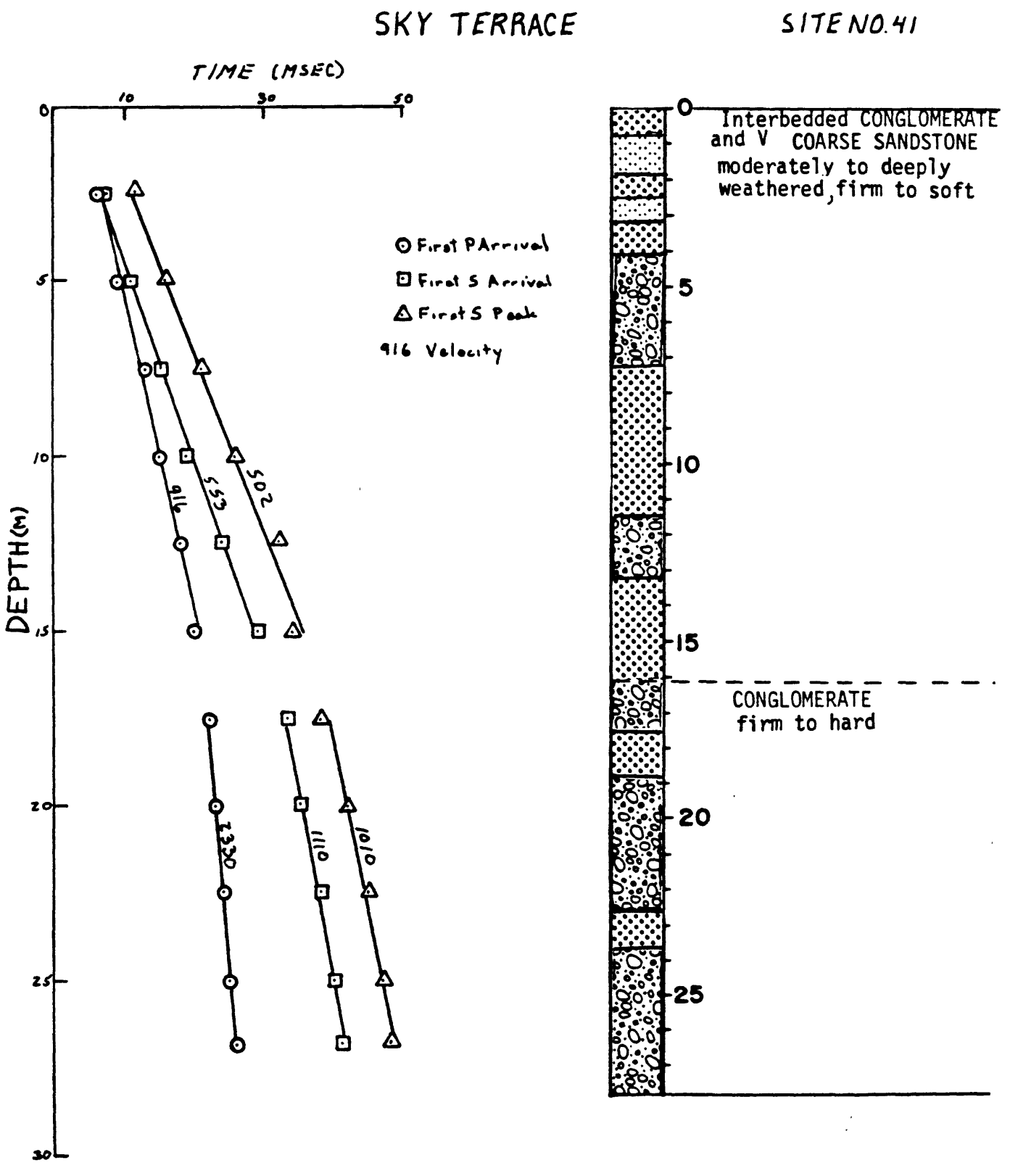

SKY TERRACE
SITE NO. 41
TIME (MSEC)
10
30
50
0
5
10
15
20
25
30
DEPTH(M)
First P Arrival
First S Arrival
First S Peak
916 Velocity
916
553
502
2330
1111
1010
Interbedded CONGLOMERATE
and V COARSE SANDSTONE
moderately to deeply
weathered, firm to soft
CONGLOMERATE
firm to hard

Figure 70

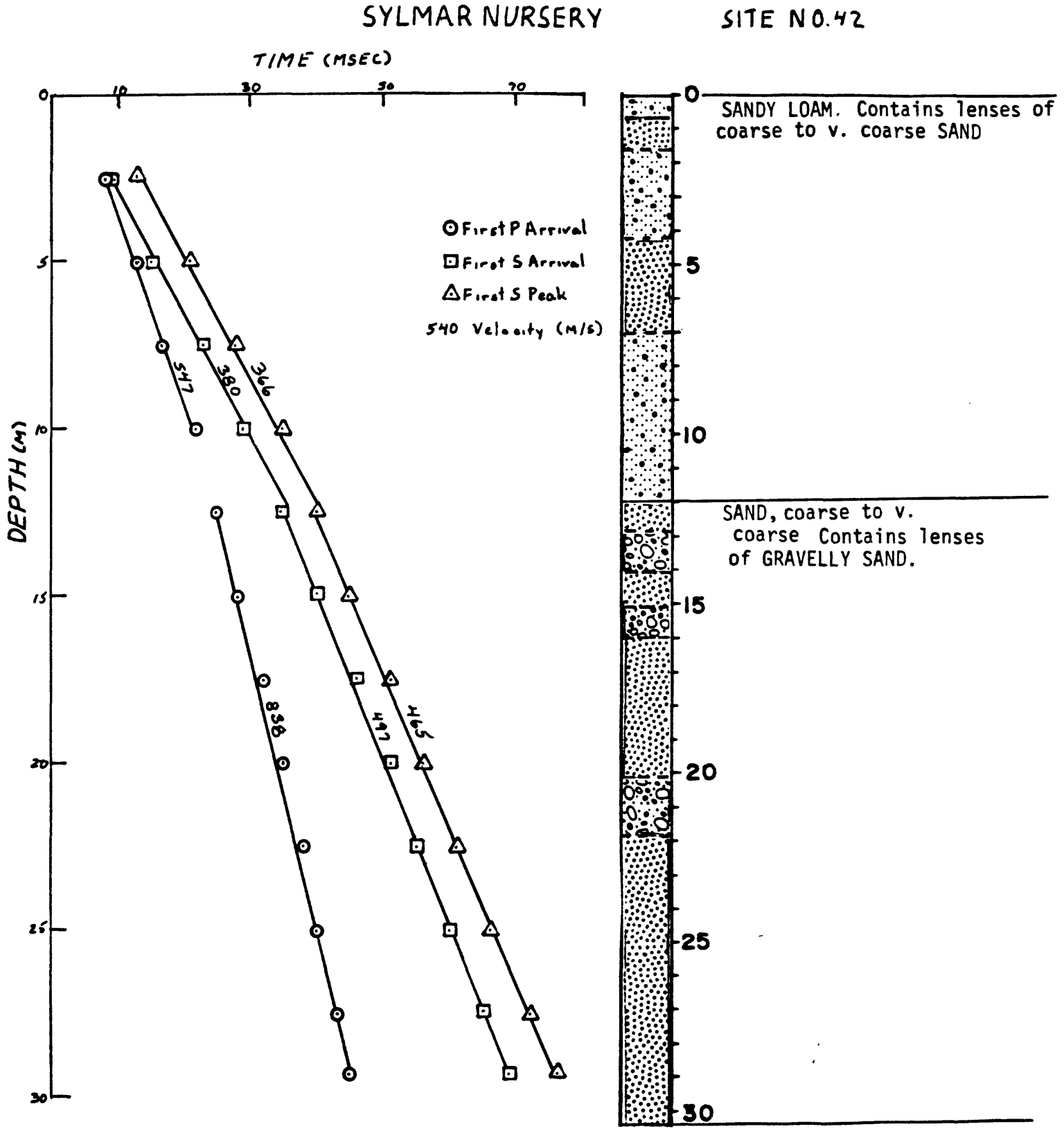

SYLMAR NURSERY
SITE NO.42
TIME (MSEC)
0
10
30
50
70
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
540 Velocity (M/S)
547
380
366
838
497
465
SANDY LOAM. Contains lenses of coarse to v. coarse SAND
SAND, coarse to v. coarse Contains lenses of GRAVELLY SAND.

Figure 71

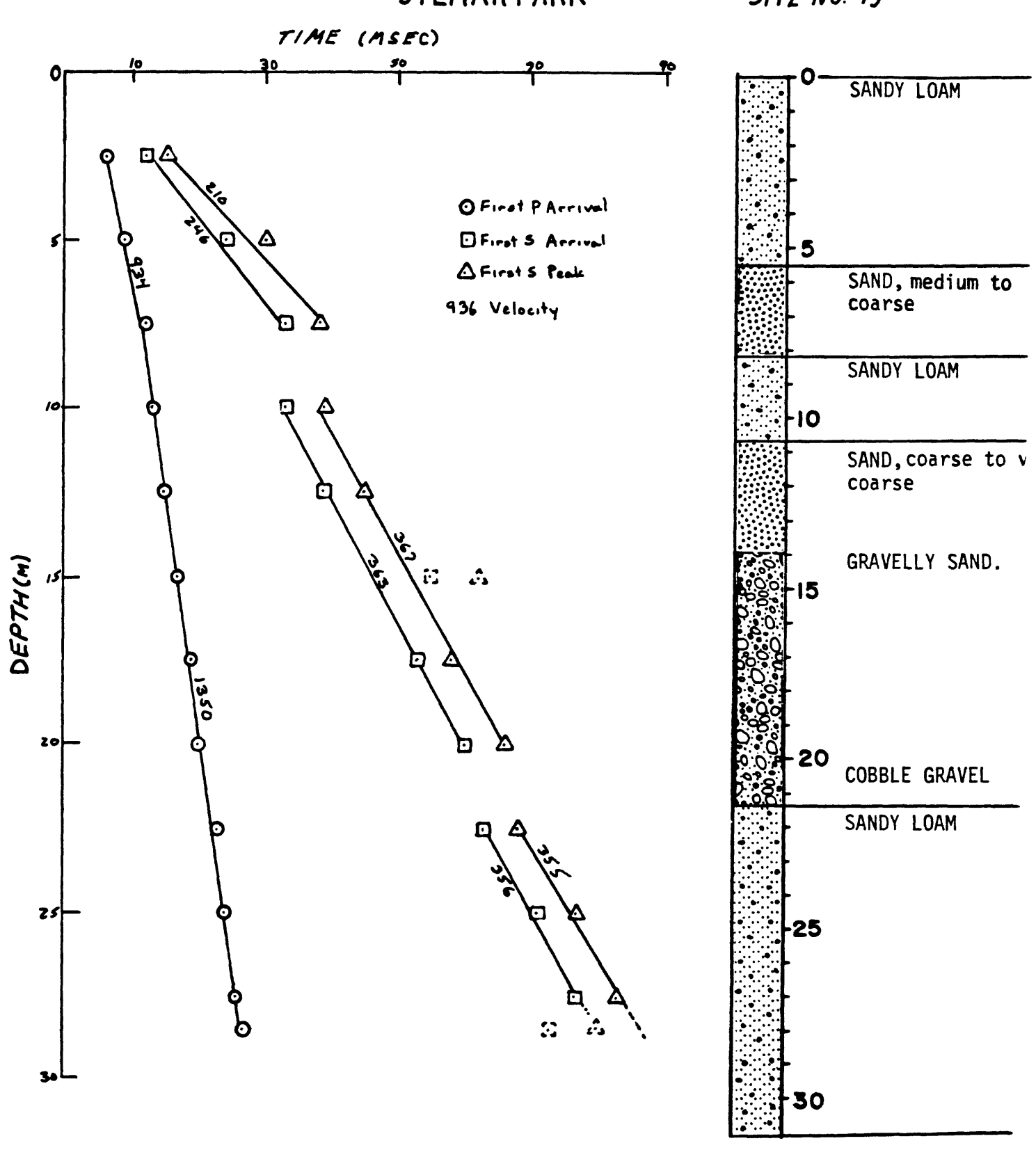

SYLMAR PARK
SITE NO. 43
TIME (MSEC)
0
10
30
50
70
90
DEPTH(M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
936 Velocity
210
246
924
362
363
1350
355
356
SANDY LOAM
SAND, medium to coarse
SANDY LOAM
SAND, coarse to v coarse
GRAVELLY SAND.
COBBLE GRAVEL
SANDY LOAM

Figure 72

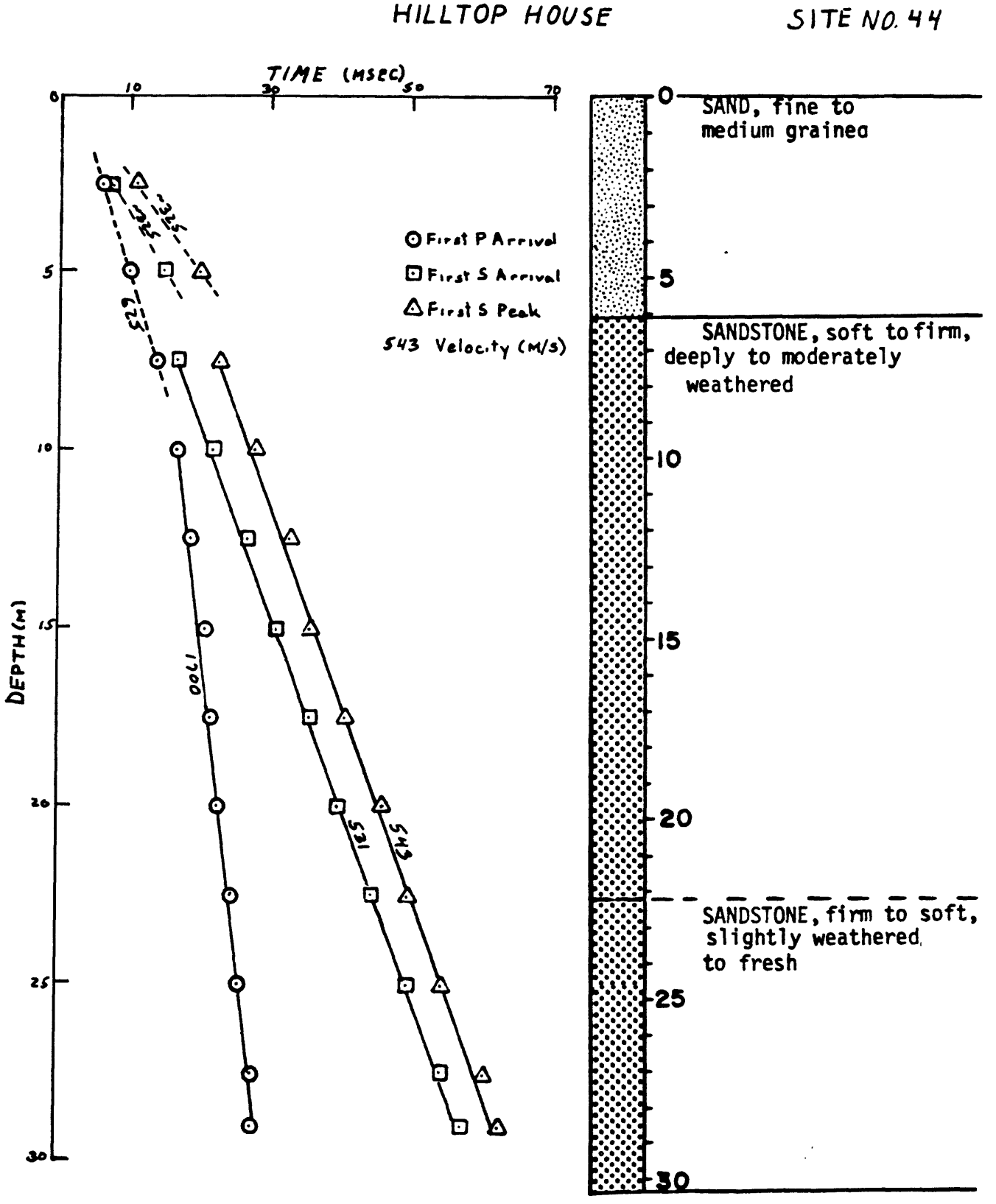

HILLTOP HOUSE
SITE NO. 44
TIME (MSEC)
0
10
30
50
70
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
543 Velocity (M/S)
325
325
325
1700
531
543
SAND, fine to medium grained
SANDSTONE, soft to firm, deeply to moderately weathered
SANDSTONE, firm to soft, slightly weathered to fresh

Figure 73

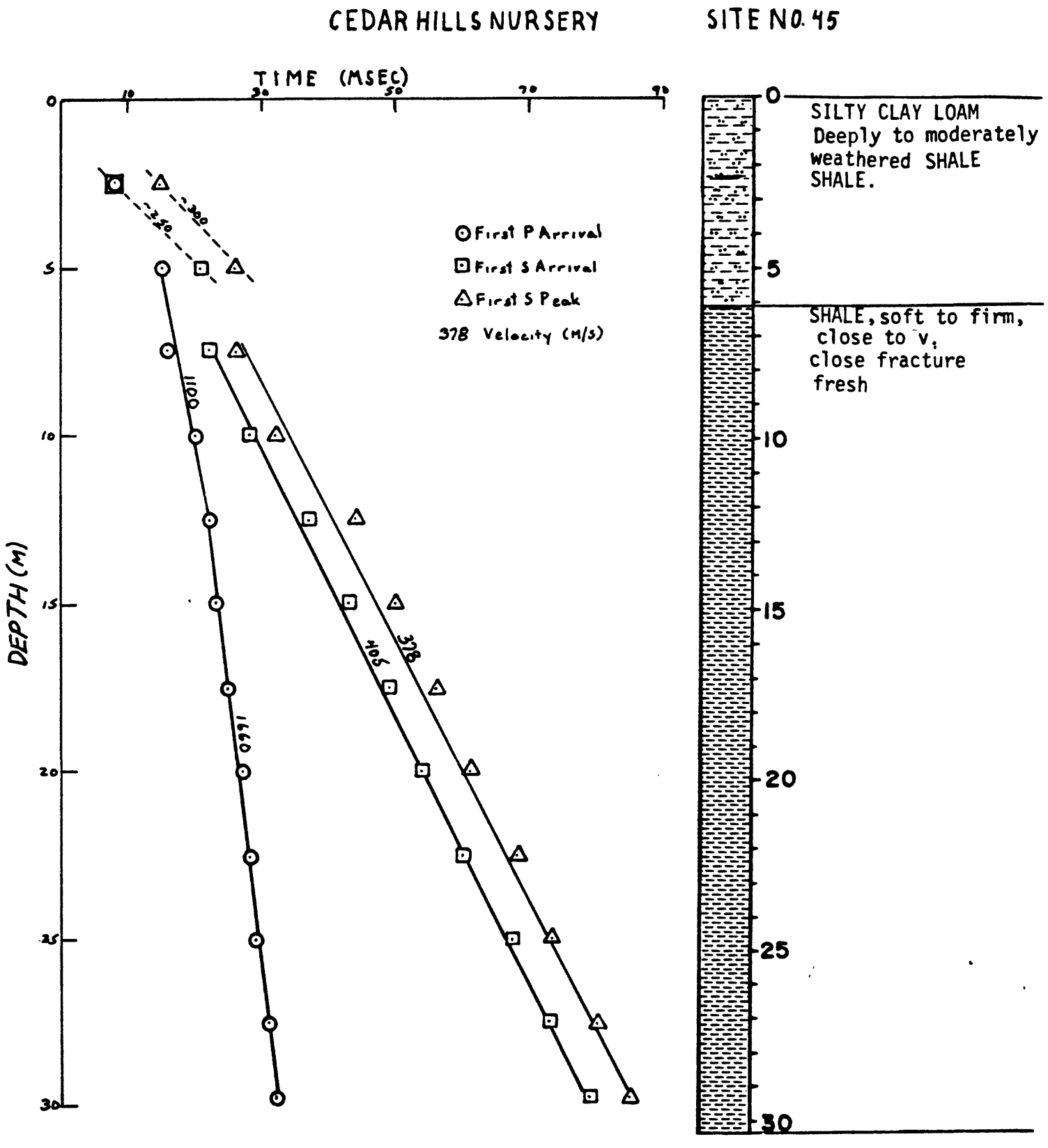

CEDAR HILLS NURSERY
SITE NO. 45
TIME (MSEC)
DEPTH (M)
First P Arrival
First S Arrival
First S Peak
378 Velocity (M/S)
1100
906
378
1660
SILTY CLAY LOAM
Deeply to moderately weathered SHALE
SHALE.
SHALE, soft to firm, close to v, close fracture fresh

Figure 74

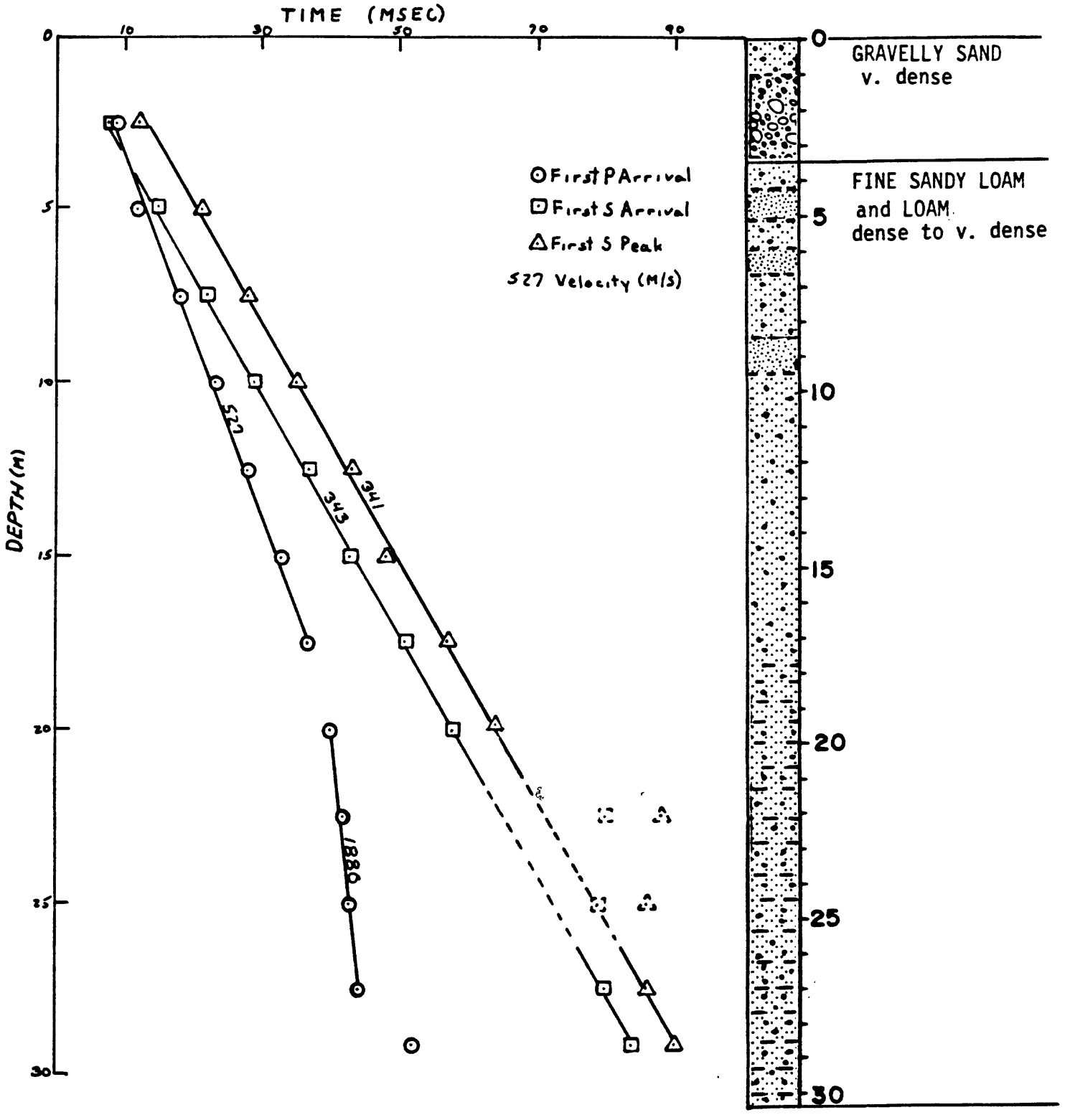

CAL STATE NORTHRIDGE
SITE NO. 46
TIME (MSEC)
0
10
30
50
70
90
DEPTH (M)
0
5
10
15
20
25
30
First P Arrival
First S Arrival
First S Peak
527 Velocity (M/S)
522
343
341
1880
GRAVELLY SAND
v. dense
FINE SANDY LOAM
and LOAM
dense to v. dense

Figure 75

Table 1

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 28 CAMARILLO STATE HOSP II DATE LOGGED 11-29-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.005

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.005	0.017	0.013	188
5.0	0.005	0.027	0.025	199
7.5	0.005	0.035	0.034	221
10.0	0.005	0.042	0.041	242
12.5	0.005	0.050	0.049	253
15.0	0.005	0.058	0.057	260
17.5	0.005	0.063	0.063	279
20.0	0.005	0.071	0.071	283
22.5	0.005	0.077	0.077	293
25.0	0.005	0.084	0.084	298
27.5	0.006	0.088	0.088	313
29.2	0.004	0.091	0.091	321

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.025	0.020	0.011	0.009	291
5.0	0.036	0.033	0.015	0.014	359
7.5	0.043	0.042	0.015	0.014	517
10.0	0.050	0.049	0.016	0.016	637
12.5	0.058	0.057	0.019	0.019	666
15.0	0.065	0.064	0.022	0.022	687
17.5	0.070	0.070	0.024	0.024	733
20.0	0.079	0.079	0.027	0.027	744
22.5	0.085	0.085	0.040	0.040	564
25.0	0.092	0.092	0.047	0.047	533
27.5	0.096	0.096	0.049	0.049	562
29.2	0.099	0.099	0.051	0.051	573

Table 2

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 29 MARINA DEL REY DATE LOGGED 11-26-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.005

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.005	0.020	0.016	160
5.0	0.005	0.038	0.035	141
7.5	0.005	0.052	0.050	149
10.0	0.005	0.066	0.065	154
12.5	0.005	0.077	0.076	164
15.0	0.005	0.088	0.087	171
17.5	0.005	0.096	0.095	183
20.0	0.005	0.105	0.104	191
22.5	0.005	0.113	0.113	199
25.0	0.005	0.122	0.122	205
27.5	0.005	0.129	0.129	213
30.0	0.005	0.137	0.137	219
32.5	0.005	0.144	0.144	226
35.0	0.005	0.151	0.151	232
37.5	0.005	0.158	0.158	237
39.7	0.005	0.165	0.165	240

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.028	0.022	0.013	0.010	246
5.0	0.045	0.042	0.013	0.012	414
7.5	0.058	0.056	0.014	0.014	554
10.0	0.072	0.071	0.015	0.015	679
12.5	0.083	0.082	0.017	0.017	744
15.0	0.094	0.093	0.018	0.018	840
17.5	0.102	0.101	0.019	0.019	927
20.0	0.111	0.110	0.021	0.021	957
22.5	0.119	0.119	0.022	0.022	1030
25.0	0.128	0.128	0.023	0.023	1090
27.5	0.136	0.136	0.025	0.025	1100
30.0	0.144	0.144	0.026	0.026	1160
32.5	0.151	0.151	0.028	0.028	1160
35.0	0.158	0.158	0.030	0.030	1170
37.5	0.166	0.166	0.031	0.031	1210
39.7	0.173	0.173	0.032	0.032	1240

Table 3

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 30 WESTMINSTER DATE LOGGED 11-27
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.0

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.006	0.017	0.013	187
5.0	0.006	0.030	0.028	179
7.5	0.006	0.043	0.042	180
10.0	0.006	0.055	0.054	185
12.5	0.006	0.066	0.065	191
15.0	0.005	0.079	0.078	191
17.5	0.007	0.089	0.089	197
20.0	0.006	0.098	0.098	204
22.5	0.006	0.107	0.107	210
25.0	0.006	0.114	0.114	219
27.5	0.006	0.123	0.123	224
29.5	0.005	0.129	0.129	229

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.023	0.018	0.013	0.010	246
5.0	0.037	0.034	0.015	0.014	359
7.5	0.049	0.047	0.019	0.018	408
10.0	0.061	0.060	0.020	0.020	509
12.5	0.072	0.071	0.022	0.022	575
15.0	0.085	0.084	0.024	0.024	630
17.5	0.095	0.094	0.025	0.025	704
20.0	0.104	0.104	0.027	0.027	744
22.5	0.115	0.115	0.028	0.028	806
25.0	0.122	0.122	0.030	0.030	835
27.5	0.131	0.131	0.031	0.031	889
29.5	0.135	0.135	0.035	0.035	844

Table 4

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 31 BURBANK FIRE STATION DATE LOGGED 11-18-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.005

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.005	0.009	0.007	351
5.0	0.005	0.014	0.013	381
7.5	0.005	0.021	0.020	367
10.0	0.005	0.026	0.026	390
12.5	0.005	0.032	0.032	394
15.0	0.005	0.037	0.037	407
17.5	0.005	0.043	0.043	408
20.0	0.005	0.048	0.048	417
22.5	0.005	0.054	0.054	417
24.0	0.004	0.057	0.057	421

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.016	0.013	0.009	0.007	355
5.0	0.019	0.018	0.012	0.011	448
7.5	0.026	0.025	0.016	0.015	485
10.0	0.032	0.031	0.020	0.020	509
12.5	0.038	0.038	0.023	0.023	550
15.0	0.043	0.043	0.026	0.026	582
17.5	0.049	0.049	0.029	0.029	607
20.0	0.054	0.054	0.031	0.031	648
22.5	0.060	0.060	0.033	0.033	684
24.0	0.063	0.063	0.035	0.035	688

Table 5

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 32 SHELLMAKER ISLAND DATE LOGGED 11-20-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.004

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.004	0.014	0.011	228
5.0	0.004	0.026	0.024	207
7.5	0.004	0.037	0.036	209
10.0	0.004	0.048	0.047	212
12.5	0.004	0.061	0.060	207
15.0	0.004	0.074	0.073	204
17.5	0.004	0.083	0.082	212
20.0	0.004	0.096	0.096	209
22.5	0.004	0.100	0.100	225
25.0	0.004	0.105	0.105	238
27.5	0.004	0.109	0.109	252
29.0	0.004	0.112	0.112	259

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.022	0.017	0.011	0.009	291
5.0	0.032	0.030	0.013	0.012	414
7.5	0.044	0.043	0.014	0.014	554
10.0	0.054	0.053	0.015	0.015	679
12.5	0.067	0.066	0.017	0.017	744
15.0	0.080	0.079	0.019	0.019	796
17.5	0.089	0.088	0.020	0.020	880
20.0	0.101	0.100	0.021	0.021	957
22.5	0.108	0.108	0.022	0.022	1030
25.0	0.113	0.113	0.024	0.024	1040
27.5	0.118	0.118	0.026	0.026	1060
29.0	0.120	0.120	0.027	0.027	1080

Table 6

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 33 CYPRESS COLLEGE DATE LOGGED 11-27-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.007

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.007	0.019	0.015	168
5.0	0.007	0.028	0.026	192
7.5	0.007	0.039	0.038	199
10.0	0.007	0.050	0.049	203
12.5	0.007	0.060	0.059	210
15.0	0.007	0.069	0.068	219
17.5	0.007	0.079	0.078	222
20.0	0.007	0.088	0.088	228
22.5	0.007	0.098	0.098	230
23.8	0.007	0.102	0.102	234

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.025	0.020	0.013	0.010	246
5.0	0.034	0.032	0.013	0.012	414
7.5	0.045	0.043	0.014	0.014	554
10.0	0.056	0.055	0.016	0.016	637
12.5	0.066	0.065	0.017	0.017	744
15.0	0.075	0.074	0.019	0.019	796
17.5	0.085	0.084	0.021	0.021	838
20.0	0.095	0.095	0.022	0.022	913
22.5	0.104	0.104	0.023	0.023	982
23.8	0.108	0.108	0.024	0.024	995

Table 7

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 34 VENTURA PISTOL RANGE DATE LOGGED 11-30-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.005

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.005	0.009	0.007	362
5.0	0.005	0.016	0.015	340
7.5	0.005	0.022	0.021	355
10.0	0.005	0.026	0.025	394
12.5	0.005	0.033	0.032	385
15.0	0.005	0.038	0.038	399
17.5	0.005	0.045	0.045	392
20.0	0.007	0.053	0.053	380
22.5	0.005	0.060	0.060	377
25.0	0.005	0.065	0.065	386
27.5	0.005	0.071	0.071	389
29.2	0.005	0.075	0.075	391

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.014	0.011	0.009	0.007	355
5.0	0.022	0.020	0.011	0.010	489
7.5	0.027	0.026	0.013	0.013	597
10.0	0.035	0.034	0.016	0.016	637
12.5	0.042	0.041	0.019	0.019	666
15.0	0.047	0.046	0.023	0.023	657
17.5	0.054	0.053	0.030	0.030	587
20.0	0.062	0.062	0.034	0.034	591
22.5	0.068	0.068	0.037	0.037	610
25.0	0.074	0.074	0.040	0.040	626
27.5	0.080	0.080	0.043	0.043	641
29.2	0.084	0.084	0.046	0.046	636

Table 8

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 35 SIERRA LINDA SCHOOL DATE LOGGED 11-30-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.004

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.004	0.015	0.012	213
5.0	0.004	0.026	0.024	207
7.5	0.004	0.036	0.035	215
10.0	0.004	0.045	0.044	226
12.5	0.004	0.053	0.052	238
15.0	0.004	0.061	0.060	248
17.5	0.004	0.068	0.068	259
20.0	0.004	0.076	0.076	264
22.5	0.004	0.085	0.085	265
25.0	0.004	0.095	0.095	263
27.5	0.004	0.103	0.103	267
28.6	0.004	0.108	0.108	265

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.022	0.017	0.009	0.007	355
5.0	0.031	0.029	0.012	0.011	448
7.5	0.041	0.040	0.017	0.016	456
10.0	0.050	0.049	0.025	0.025	407
12.5	0.057	0.056	0.030	0.030	421
15.0	0.067	0.066	0.033	0.033	458
17.5	0.073	0.073	0.036	0.036	489
20.0	0.081	0.081	0.037	0.037	543
22.5	0.090	0.090	0.039	0.039	579
25.0	0.100	0.100	0.042	0.042	597
27.5	0.108	0.108	0.044	0.044	626
28.6	0.113	0.113	0.045	0.045	637

Table 9

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 36 SAN MIGUEL SCHOOL DATE LOGGED 11-29-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.006

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.006	0.018	0.014	177
5.0	0.006	0.029	0.027	185
7.5	0.006	0.040	0.039	194
10.0	0.006	0.053	0.052	192
12.5	0.006	0.064	0.063	197
15.0	0.006	0.076	0.075	199
17.5	0.006	0.086	0.085	204
20.0	0.006	0.097	0.097	207
22.5	0.006	0.107	0.107	211
25.0	0.006	0.119	0.119	210
27.5	0.006	0.130	0.130	212
30.0	0.006	0.139	0.139	216

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.026	0.020	0.011	0.009	291
5.0	0.035	0.032	0.011	0.010	489
7.5	0.048	0.046	0.012	0.012	646
10.0	0.061	0.060	0.014	0.014	728
12.5	0.071	0.070	0.015	0.015	843
15.0	0.082	0.081	0.017	0.017	890
17.5	0.094	0.093	0.019	0.019	927
20.0	0.105	0.104	0.020	0.020	1000
22.5	0.115	0.115	0.022	0.022	1030
25.0	0.127	0.127	0.023	0.023	1090
27.5	0.138	0.138	0.025	0.025	1100
30.0	0.147	0.147	0.027	0.027	1110

Table 10

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 37 ALTA VISTA PARK DATE LOGGED 11-28-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.004

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.004	0.011	0.009	291
5.0	0.004	0.021	0.019	256
7.5	0.004	0.026	0.025	298
10.0	0.004	0.033	0.032	309
12.5	0.004	0.039	0.039	324
15.0	0.004	0.045	0.045	336
17.5	0.004	0.052	0.052	338
20.0	0.004	0.059	0.059	340
22.5	0.004	0.066	0.066	342
25.0	0.004	0.072	0.072	348
27.5	0.004	0.075	0.075	367
29.9	0.004	0.081	0.081	369

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.017	0.013	0.008	0.006	400
5.0	0.027	0.025	0.013	0.012	414
7.5	0.032	0.031	0.017	0.016	456
10.0	0.039	0.038	0.021	0.021	485
12.5	0.046	0.045	0.024	0.024	527
15.0	0.052	0.052	0.028	0.028	540
17.5	0.057	0.057	0.032	0.032	550
20.0	0.064	0.064	0.035	0.035	574
22.5	0.072	0.072	0.038	0.038	594
25.0	0.078	0.078	0.040	0.040	626
27.5	0.081	0.081	0.047	0.047	586
29.9	0.087	0.087	0.050	0.050	599

Table 11

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 38 SEAL BEACH WEAPONS STA DATE LOGGED 11-20-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.005

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.005	0.023	0.018	140
5.0	0.005	0.033	0.030	164
7.5	0.006	0.046	0.044	169
10.0	0.005	0.056	0.055	182
12.5	0.005	0.066	0.065	192
15.0	0.005	0.075	0.074	202
17.5	0.006	0.083	0.082	212
20.0	0.005	0.091	0.090	221
22.5	0.005	0.100	0.099	226
25.0	0.005	0.106	0.105	237
26.7	0.005	0.112	0.112	239

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.028	0.022	0.009	0.007	355
5.0	0.039	0.036	0.011	0.010	489
7.5	0.053	0.051	0.013	0.013	597
10.0	0.062	0.061	0.019	0.019	536
12.5	0.072	0.071	0.020	0.020	632
15.0	0.081	0.080	0.022	0.022	687
17.5	0.089	0.088	0.024	0.024	733
20.0	0.097	0.096	0.025	0.025	803
22.5	0.107	0.106	0.028	0.028	806
25.0	0.113	0.112	0.029	0.029	864
26.7	0.119	0.118	0.029	0.029	923

Table 12

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 39 RIDGELINE WATER TANK(WVW) DATE LOGGED 11-19-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.013

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.013	0.006	0.005	541
5.0	0.013	0.017	0.016	318
7.5	0.013	0.024	0.023	324
10.0	0.013	0.031	0.030	329
12.5	0.013	0.038	0.037	333
15.0	0.013	0.045	0.045	336
17.5	0.013	0.052	0.052	339
20.0	0.013	0.058	0.058	347
22.5	0.013	0.063	0.063	359
25.0	0.013	0.068	0.068	369
27.8	0.014	0.075	0.075	372

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.013	0.010	0.011	0.009	291
5.0	0.026	0.024	0.014	0.013	384
7.5	0.032	0.031	0.018	0.017	431
10.0	0.040	0.039	0.023	0.023	443
12.5	0.046	0.045	0.027	0.027	468
15.0	0.053	0.052	0.030	0.030	504
17.5	0.060	0.060	0.032	0.032	550
20.0	0.067	0.067	0.036	0.036	558
22.5	0.071	0.071	0.038	0.038	594
25.0	0.076	0.076	0.040	0.040	626
27.8	0.083	0.083	0.043	0.043	648

Table 13

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 40 DIAMOND BAR DATE LOGGED 11-19-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.007

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.007	0.011	0.009	291
5.0	0.007	0.019	0.018	283
7.5	0.007	0.028	0.027	277
10.0	0.007	0.031	0.030	328
12.5	0.007	0.035	0.035	361
15.0	0.007	0.041	0.041	369
20.2	0.007	0.050	0.050	405

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.018	0.014	0.010	0.008	320
5.0	0.026	0.024	0.013	0.012	414
7.5	0.035	0.034	0.015	0.014	517
10.0	0.038	0.037	0.017	0.017	599
12.5	0.041	0.040	0.021	0.021	602
15.0	0.047	0.047	0.024	0.024	630
20.2	0.056	0.056	0.027	0.027	751

Table 14

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 41 SKY TERRACE DATE LOGGED 11-17-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.005

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.005	0.009	0.007	366
5.0	0.006	0.012	0.011	459
7.5	0.005	0.016	0.015	493
10.0	0.006	0.020	0.019	516
12.5	0.005	0.025	0.024	511
15.0	0.005	0.030	0.029	509
17.5	0.006	0.033	0.033	538
20.0	0.005	0.035	0.035	578
22.5	0.005	0.038	0.038	598
25.0	0.005	0.040	0.040	631
26.8	0.005	0.041	0.041	659

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.014	0.011	0.008	0.006	400
5.0	0.017	0.016	0.010	0.009	538
7.5	0.022	0.021	0.013	0.013	597
10.0	0.027	0.026	0.015	0.015	679
12.5	0.033	0.032	0.018	0.018	703
15.0	0.035	0.034	0.020	0.020	756
17.5	0.039	0.038	0.022	0.022	800
20.0	0.042	0.042	0.023	0.023	873
22.5	0.045	0.045	0.024	0.024	941
25.0	0.047	0.047	0.025	0.025	1000
26.8	0.048	0.048	0.026	0.026	1030

Table 15

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 42 SYLMAR NURSERY DATE LOGGED 11-17-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.005

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.005	0.012	0.009	278
5.0	0.005	0.017	0.015	326
7.5	0.006	0.024	0.023	330
10.0	0.005	0.030	0.029	345
12.5	0.005	0.036	0.035	356
15.0	0.006	0.041	0.040	373
17.5	0.006	0.047	0.046	378
20.0	0.006	0.052	0.051	390
22.5	0.006	0.056	0.055	407
25.0	0.006	0.060	0.060	414
27.5	0.006	0.065	0.065	420
29.3	0.004	0.069	0.069	422

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.017	0.013	0.010	0.008	320
5.0	0.023	0.021	0.014	0.013	384
7.5	0.029	0.028	0.018	0.017	431
10.0	0.036	0.035	0.022	0.022	463
12.5	0.041	0.040	0.025	0.025	506
15.0	0.046	0.045	0.028	0.028	540
17.5	0.052	0.051	0.032	0.032	550
20.0	0.057	0.056	0.035	0.035	574
22.5	0.061	0.061	0.038	0.038	594
25.0	0.067	0.066	0.040	0.040	626
27.5	0.072	0.072	0.043	0.043	641
29.3	0.076	0.076	0.045	0.045	652

Table 16

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 43 SYLMAR PARK DATE LOGGED 11-16-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.003

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.003	0.016	0.012	203
5.0	0.003	0.026	0.024	209
7.5	0.003	0.034	0.033	229
10.0	0.003	0.034	0.033	302
12.5	0.004	0.040	0.039	318
15.0	0.003	0.056	0.055	271
17.5	0.003	0.054	0.053	327
20.0	0.003	0.061	0.060	330
22.5	0.003	0.063	0.063	359
25.0	0.003	0.071	0.071	354
27.5	0.004	0.077	0.077	359
28.5	0.004	0.073	0.073	392

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.019	0.015	0.008	0.006	400
5.0	0.033	0.030	0.010	0.009	538
7.5	0.040	0.038	0.012	0.012	646
10.0	0.040	0.039	0.013	0.013	784
12.5	0.046	0.045	0.015	0.015	843
15.0	0.063	0.062	0.017	0.017	890
17.5	0.059	0.058	0.019	0.019	927
20.0	0.067	0.066	0.020	0.020	1000
22.5	0.069	0.068	0.023	0.023	982
25.0	0.077	0.077	0.024	0.024	1040
27.5	0.083	0.083	0.026	0.026	1060
28.5	0.080	0.080	0.027	0.027	1060

Table 17

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 44 HILLTOP HOUSE O.V. DATE LOGGED 11-16-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.006

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.007	0.009	0.007	355
5.0	0.006	0.016	0.015	336
7.5	0.006	0.018	0.017	431
10.0	0.007	0.022	0.022	463
12.5	0.006	0.027	0.027	468
15.0	0.005	0.031	0.031	488
17.5	0.006	0.036	0.036	489
20.0	0.006	0.040	0.040	502
22.5	0.006	0.045	0.045	501
25.0	0.006	0.050	0.050	501
27.5	0.006	0.055	0.055	501
29.0	0.005	0.058	0.058	501

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.014	0.011	0.008	0.006	400
5.0	0.022	0.020	0.011	0.010	489
7.5	0.024	0.023	0.015	0.014	517
10.0	0.029	0.028	0.017	0.017	599
12.5	0.033	0.033	0.019	0.019	666
15.0	0.036	0.036	0.021	0.021	720
17.5	0.041	0.041	0.022	0.022	800
20.0	0.046	0.046	0.023	0.023	873
22.5	0.050	0.050	0.025	0.025	903
25.0	0.055	0.055	0.026	0.026	964
27.5	0.061	0.061	0.028	0.028	984
29.0	0.063	0.063	0.028	0.028	1040

Table 18

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 45 CEDAR HILLS NURSERY DATE LOGGED 11-15-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.010

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.010	0.011	0.009	280
5.0	0.009	0.022	0.021	240
7.5	0.009	0.022	0.022	346
10.0	0.009	0.028	0.028	358
12.5	0.010	0.037	0.037	338
15.0	0.010	0.043	0.043	348
17.5	0.009	0.049	0.049	356
20.0	0.010	0.054	0.054	369
22.5	0.010	0.060	0.060	373
25.0	0.009	0.067	0.067	372
27.5	0.010	0.073	0.073	375
29.7	0.010	0.079	0.079	374

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.019	0.015	0.012	0.009	266
5.0	0.028	0.026	0.016	0.015	336
7.5	0.026	0.026	0.018	0.017	431
10.0	0.032	0.032	0.020	0.020	509
12.5	0.044	0.044	0.022	0.022	575
15.0	0.050	0.050	0.023	0.023	657
17.5	0.056	0.056	0.025	0.025	704
20.0	0.061	0.061	0.027	0.027	744
22.5	0.068	0.068	0.028	0.028	806
25.0	0.073	0.073	0.029	0.029	864
27.5	0.080	0.080	0.031	0.031	889
29.7	0.085	0.085	0.032	0.032	930

Table 19

TRAVEL-TIMES AND AVERAGE VELOCITIES

SITE NO. 46 CAL STATE NORTHRIDGE DATE LOGGED 11-15-79
PLANK DIST= 2.0 PLATE DIST= 2.0 AVE ORIGIN CORR= 0.006

DEPTH (M)	ORIGIN CORR (S)	FIRST S ARRIVAL (S)	CORR S TIME (S)	AVE VEL S WAVE (M/S)
2.5	0.006	0.010	0.008	331
5.0	0.007	0.016	0.015	343
7.5	0.007	0.023	0.022	342
10.0	0.006	0.030	0.029	343
12.5	0.007	0.038	0.037	336
15.0	0.006	0.044	0.043	346
17.5	0.007	0.052	0.051	340
20.0	0.006	0.059	0.058	342
22.5	0.006	0.081	0.080	280
25.0	0.006	0.080	0.079	314
27.5	0.006	0.081	0.080	341
29.1	0.006	0.085	0.084	344

DEPTH (M)	FIRST S PEAK (S)	CORR S PEAK (S)	P TIME (S)	CORR P TIME (S)	AVE VEL P WAVE (M/S)
2.5	0.016	0.012	0.012	0.009	266
5.0	0.023	0.021	0.013	0.012	414
7.5	0.029	0.028	0.019	0.018	408
10.0	0.036	0.035	0.023	0.023	443
12.5	0.044	0.043	0.028	0.028	452
15.0	0.049	0.048	0.033	0.033	458
17.5	0.058	0.057	0.037	0.037	476
20.0	0.065	0.064	0.040	0.040	502
22.5	0.089	0.088	0.042	0.042	537
25.0	0.087	0.086	0.043	0.043	583
27.5	0.087	0.086	0.044	0.044	626
29.1	0.091	0.090	0.052	0.052	560

Table 20

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 28 CAMARILLO STATE HOSP II

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
7.5-22.5	7	0.013	348	(340, 357)	0.021	348	(340, 356)
25.0-29.2	3	0.042	597	(581, 613)	0.050	596	(581, 612)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
7.5-20.0	6	0.006	979	(932,1030)
25.0-29.2	3	0.023	1050	(951,1180)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
348	7.5-22.5	979	7.5-20.0	15.3	2.06	2500	16400	0.427
597	25.0-29.2	1050	25.0-29.2					0.264

Table 21

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 29 MARINA DEL REY

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
5.0-10.0	3	0.006	169	(168, 171)	0.013	173	(172, 174)
10.0-15.0	3	0.020	222	(221, 222)	0.025	221	(220, 222)
15.0-25.0	5	0.035	290	(287, 294)	0.041	290	(287, 293)
25.0-39.7	7	0.049	342	(339, 345)	0.052	329	(325, 332)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-39.7	16	0.009	1720	(1700,1740)
2.5-39.7	16	0.009	1720	(1700,1740)
2.5-39.7	16	0.009	1720	(1700,1740)
2.5-39.7	16	0.009	1720	(1700,1740)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
169	5.0-10.0	1720	2.5-39.7	9.2	1.85	533	54100	0.495
222	10.0-15.0	1720	2.5-39.7					0.492
290	15.0-25.0	1720	2.5-39.7	24.9	1.98	1680	56400	0.485
342	25.0-39.7	1720	2.5-39.7					0.479

Table 22

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 30 WESTMINSTER

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5- 7.5	3	-.001	176	(173, 180)	0.004	170	(159, 182)
7.5-15.0	4	0.005	205	(201, 209)	0.011	204	(200, 209)
15.0-22.5	4	0.022	266	(261, 271)	0.024	250	(243, 256)
22.5-29.5	4	0.034	311	(301, 322)	0.048	336	(316, 360)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5- 7.5	3	0.006	609	(582, 638)
7.5-29.5	10	0.013	1440	(1380,1520)
7.5-29.5	10	0.013	1440	(1380,1520)
7.5-29.5	10	0.013	1440	(1380,1520)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
176	2.5- 7.5	609	2.5- 7.5					0.454
205	7.5-15.0	1440	7.5-29.5	9.1	1.95	825	39500	0.490
266	15.0-22.5	1440	7.5-29.5					0.482
311	22.5-29.5	1440	7.5-29.5	24.5	2.08	2020	40600	0.476

Table 23

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 31 BURBANK FIRE STATION

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-12.5	5	0.001	405	(394, 416)	0.006	391	(381, 402)
12.5-24.0	6	0.004	452	(446, 457)	0.010	451	(445, 456)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-10.0	4	0.003	594	(590, 598)
10.0-24.0	7	0.009	940	(907, 976)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
405	2.5-12.5	594	2.5-10.0					0.065
452	12.5-24.0	940	10.0-24.0	20.0	2.16	4420	13200	0.350

Table 24

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 32 SHELLMAKER ISLAND

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-20.0	8	-.000	207	(205, 210)	0.006	209	(207, 212)
20.0-29.0	5	0.059	554	(543, 566)	0.059	470	(443, 501)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
5.0-29.0	11	0.009	1650	(1610,1690)
5.0-29.0	11	0.009	1650	(1610,1690)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
207	2.5-20.0	1650	5.0-29.0	16.7	1.97	852	52400	0.492
554	20.0-29.0	1650	5.0-29.0	24.5	2.15	6610	49600	0.436

Table 25

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 33 CYPRESS COLLEGE

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-10.0	4	0.003	218	(217, 220)	0.008	211	(209, 213)
10.0-23.8	7	0.011	261	(259, 263)	0.017	259	(256, 262)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-23.8	10	0.009	1550	(1510,1590)
2.5-23.8	10	0.009	1550	(1510,1590)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
218	2.5-10.0	1550	2.5-23.8					0.490
261	10.0-23.8	1550	2.5-23.8	20.0	2.00	1370	46100	0.485

Table 26

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 34 VENTURA PISTOL RANGE

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-20.0	8	0.001	399	(389, 410)	0.005	356	(348, 364)
20.0-29.2	5	0.006	423	(412, 435)	0.013	415	(414, 416)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-15.0	6	0.004	813	(783, 844)
17.5-29.2	6	0.007	756	(734, 779)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
399	2.5-20.0	813	2.5-15.0	12.2	2.06	3290	9230	0.341
423	20.0-29.2	756	17.5-29.2	23.2	2.10	3770	6990	0.271

Table 27

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 35 SIERRA LINDA SCHOOL

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5- 7.5	3	0.000	216	(207, 226)	0.006	222	(218, 227)
7.5-20.0	6	0.011	309	(303, 315)	0.016	306	(297, 315)
20.0-28.6	5	0.002	270	(264, 276)	0.007	270	(264, 275)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5- 7.5	3	0.002	532	(496, 573)
10.0-17.5	4	0.010	678	(619, 750)
20.0-28.6	5	0.018	1050	(1010,1090)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
216	2.5- 7.5	532	2.5- 7.5					0.401
309	7.5-20.0	678	10.0-17.5	9.5	2.04	1960	6790	0.369
270	20.0-28.6	1050	20.0-28.6					0.464

Table 28

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 36 SAN MIGUEL SCHOOL

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-10.0	4	0.002	199	(196, 202)	0.007	188	(185, 192)
12.5-30.0	8	0.010	230	(228, 233)	0.015	226	(223, 229)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-10.0	4	0.007	1490	(1400,1590)
2.5-30.0	12	0.007	1520	(1490,1540)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
199	2.5-10.0	1490	2.5-10.0					0.491
230	12.5-30.0	1520	2.5-30.0	29.5	1.95	1040	43400	0.488

Table 29

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 37 ALTA VISTA PARK

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
7.5-25.0	8	0.005	374	(370, 377)	0.012	378	(371, 385)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
7.5-29.9	10	0.006	686	(667, 707)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
374	7.5-25.0	686	7.5-29.9	20.0	1.97	2760	5610	0.289

Table 30

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 38 SEAL BEACH WEAPONS STA

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5- 7.5	3	0.004	189	(184, 193)	0.007	170	(168, 172)
10.0-22.5	6	0.021	284	(278, 290)	0.026	279	(273, 285)
22.5-26.7	3	0.035	351	(317, 394)	0.042	351	(317, 394)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5- 7.5	3	0.004	903	(831, 990)
10.0-26.7	8	0.012	1490	(1410,1570)
10.0-26.7	8	0.012	1490	(1410,1570)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
189	2.5- 7.5	903	2.5- 7.5					0.477
284	10.0-22.5	1490	10.0-26.7	20.0	1.98	1600	41500	0.481
351	22.5-26.7	1490	10.0-26.7					0.470

Table 31

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 39 RIDGELINE WATER TANK (WVW

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
5.0-20.0	7	0.002	355 (351, 359)		0.010	353 (349, 357)	
20.0-27.8	4	0.014	459 (441, 478)		0.025	493 (452, 520)	

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-12.5	5	0.004	547 (537, 557)	
12.5-27.8	7	0.014	945 (911, 982)	

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
355	5.0-20.0	547	2.5-12.5	9.2	1.99	2510	2600	0.135
355	5.0-20.0	547	2.5-12.5	16.7	1.97	2490	2580	0.135
459	20.0-27.8	945	12.5-27.8	24.7	2.19	4620	13400	0.346

Table 32

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 40 DIAMOND BAR

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5- 7.5	3	-.001	270	(267, 273)	0.004	253	(250, 256)
10.0-20.2	4	0.011	519	(497, 543)	0.018	538	(508, 572)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-15.0	6	0.005	809	(773, 849)
2.5-15.0	6	0.005	809	(773, 849)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
270	2.5- 7.5	809	2.5-15.0	7.4	2.02	1480	11300	0.437
519	10.0-20.2	809	2.5-15.0	16.7	2.06	5560	6090	0.150

Table 33

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 41 SKY TERRACE

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-15.0	6	0.002	553	(540, 567)	0.006	502	(478, 529)
17.5-26.8	5	0.017	1110	(1040,1180)	0.022	1010	(933,1090)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-15.0	6	0.004	916	(885, 949)
17.5-26.8	5	0.014	2330	(2250,2410)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
553	2.5-15.0	916	2.5-15.0	9.1	2.03	6230	8740	0.212
1110	17.5-26.8	2330	17.5-26.8					0.354

Table 34

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 42 SYLMAR NURSERY

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-12.5	5	0.002	380	(373, 387)	0.007	366	(352, 382)
12.5-29.3	8	0.010	497	(489, 505)	0.013	465	(460, 470)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-10.0	4	0.004	547	(528, 567)
12.5-29.3	8	0.010	838	(813, 865)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
380	2.5-12.5	547	2.5-10.0	9.1	2.10	3040	2240	0.033
497	12.5-29.3	838	12.5-29.3					0.228

Table 35

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 43 SYLMAR PARK

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5- 7.5	3	0.003	246	(227, 268)	0.004	210	(177, 259)
10.0-20.0	4	0.005	363	(358, 369)	0.011	367	(355, 379)
22.5-27.5	3	-.000	356	(328, 387)	0.006	355	(328, 387)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5- 7.5	3	0.004	934	(860,1010)
2.5- 7.5	3	0.004	934	(860,1010)
7.5-28.5	9	0.006	1350	(1320,1390)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
246	2.5- 7.5	934	2.5- 7.5					0.463
363	10.0-20.0	934	2.5- 7.5	10.1	2.02	2660	14100	0.411
356	22.5-27.5	1350	7.5-28.5					0.463

Table 36

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 44 HILLTOP HOUSE O.V.

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
7.5-29.0	10	0.003	531	(526, 536)	0.009	543	(533, 553)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
10.0-29.0	9	0.011	1700	(1630,1770)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
531	7.5-29.0	1700	10.0-29.0	9.1	2.05	5790	51400	0.446
531	7.5-29.0	1700	10.0-29.0	20.0	2.17	6130	54400	0.446

Table 37

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 45 CEDAR HILLS NURSERY

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
5.0-29.7	11	0.005	405	(396, 415)	0.010	392	(379, 406)
7.5-29.7	10	0.004	392	(385, 399)	0.008	378	(366, 391)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
5.0-12.5	4	0.010	1100	(1060,1130)
12.5-29.7	8	0.014	1660	(1600,1720)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
405	5.0-29.7	1100	5.0-12.5	9.1	1.90	3130	18600	0.420
392	7.5-29.7	1660	12.5-29.7	9.1	1.90	2930	48400	0.470

Table 38

INTERVAL VELOCITIES AND ELASTIC MODULI

SITE NO. 46 CAL STATE NORTHRIDGE

DEPTH INT (M)	NO MEAS	FIRST S ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)	FIRST S PEAK INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-29.7	10	0.000	343	(342, 345)	0.006	341	(338, 344)
5.0-29.7	9	0.000	343	(341, 345)	0.006	344	(340, 347)

DEPTH INT (M)	NO MEAS	FIRST P ARRIVAL INCPT (S)	VEL (M/S)	UNC INT (M/S)
2.5-17.5	7	0.004	527	(512, 542)
20.0-27.5	4	0.029	1880	(1660,2170)

S VEL (M/S)	DEPTH INT (M)	P VEL (M/S)	DEPTH INT (M)	DENSITY DEPTH (M)	DENSITY (G/CC)	SHEAR MOD (BARS)	BULK MOD (BARS)	POISSONS RATIO
343	2.5-29.7	527	2.5-17.5	20.1	2.00	2110	2750	0.195
343	5.0-29.7	1880	20.0-27.5	20.1	2.00	2080	68100	0.485