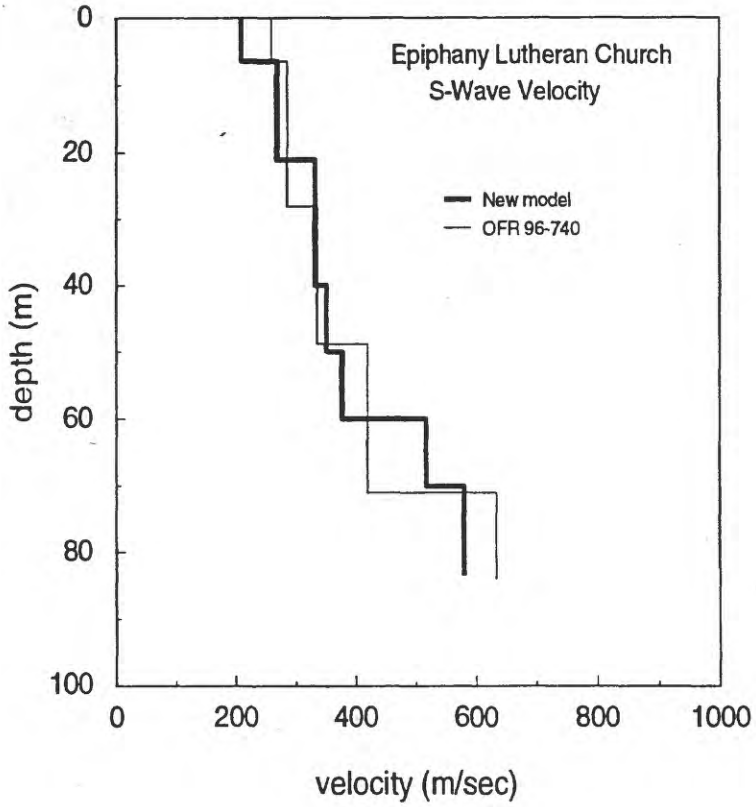
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

SEISMIC VELOCITIES AND GEOLOGICAL CONDITIONS AT TWELVE SITES SUBJECTED TO STRONG GROUND MOTION IN THE 1994 NORTHRIDGE, CALIFORNIA, EARTHQUAKE: A REVISION OF OFR 96-740

by

James F. Gibbs, John C. Tinsley, David M. Boore, and William B. Joyner[1]



U.S. Geological Survey Open-File Report 99-446

[1]Menlo Park, CA 94025

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INTRODUCTION

The Northridge, California, earthquake of January 17, 1994 (moment magnitude 6.7) was perhaps the best recorded earthquake in history from the standpoint of strong ground motion. As part of the U.S. Geological Survey's ongoing program for documenting the relationship between strong ground motion and geologic and seismic site conditions, 12 boreholes, each approximately 100 meters deep, were drilled at sites affected by the Northridge earthquake. Ten of the boreholes were located at strong-motion recording sites; the other two were located at sites in the Sherman Oaks district of Los Angeles to evaluate an apparent relationship between site conditions and building damage noted there. At each site lithologic descriptions were compiled from observations of drill cuttings and cored samples. Four different types of electric logs were made, and downhole P- and S-wave velocities were measured. The results of the logging were reported earlier in Open-File Report 96-740 (Gibbs, et al., 1996). A revision of those results is presented in this report. The sites are geographically shown in Figure 1 and listed in Table 1, which gives references to information regarding the strong-motion data. Appendix A contains for each site: a location map, S- and P-wave time-series records, a time-depth plot, velocity profiles with a generalized geologic log, and tables giving arrival times and velocity values. Appendix B contains tables of P- and S-wave velocity models and the Poisson's ratios obtained from those models, and Appendix C contains figures comparing the velocity profiles from the original open-file report, the revised models, and where available, velocities models computed from suspension logging.

REVISION OF OPEN FILE REPORT 96-740

We have made a number of changes to the borehole velocity models previously

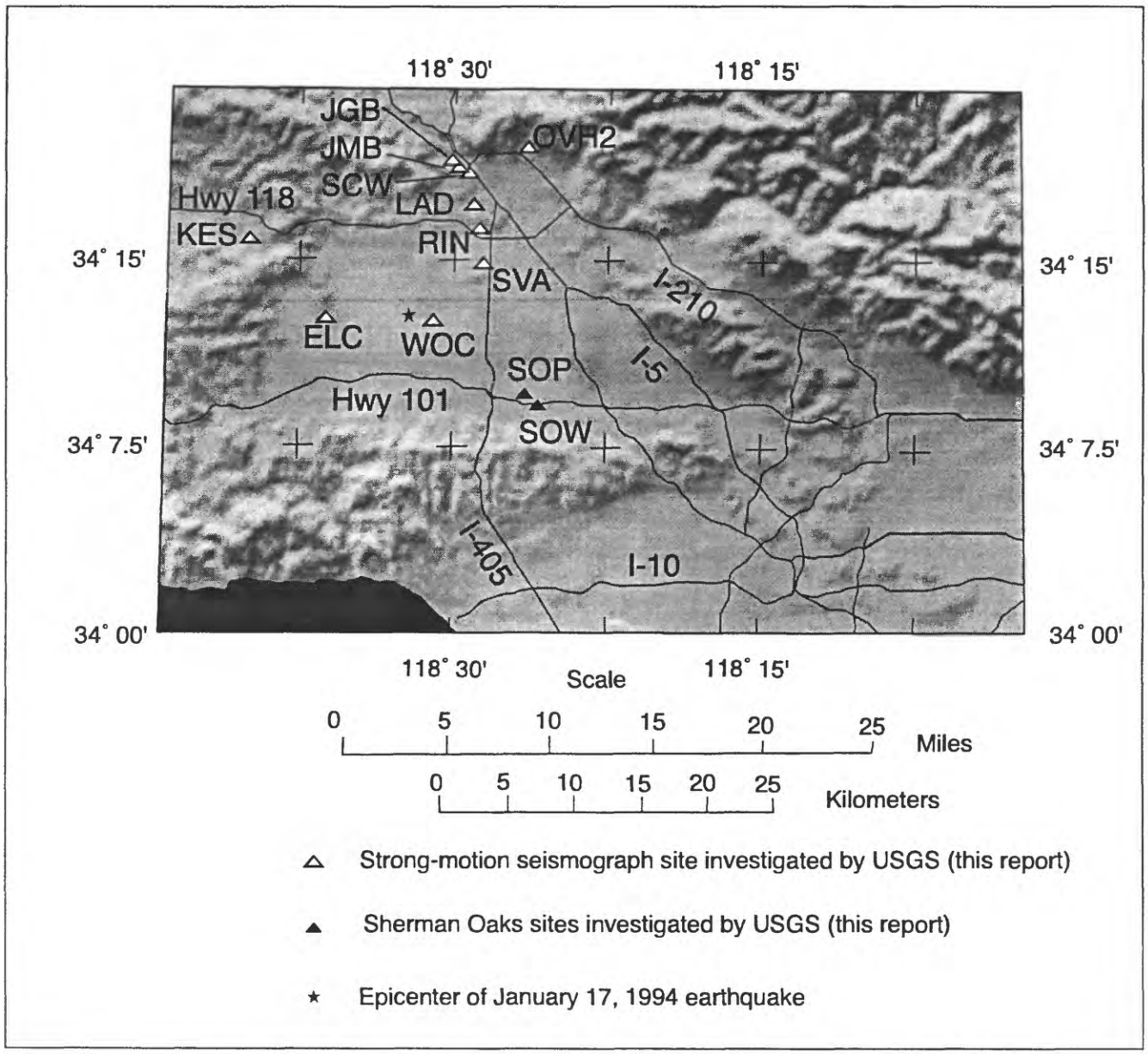


Figure 1. Regional map showing the locations of boreholes (triangles) included in this report. The epicenter of the January 17, 1994, Northridge, California, earthquake is indicated by the star.

TABLE 1. Site Location and peak acceleration data.

Site No	STATION NAME	Borehole LATITUDE	Borehole LONGITUDE	SMA LATITUDE	SMA LONGITUDE	USGS SITE CODE	PEAK ACCEL (g) HORIZ.	PEAK ACCEL (g) VERT.	SOURCE, PEAK ACCEL. VALUES
1	Epiphany Lutheran Church	34.2117	118.6051	34.2117	118.6059	ELC	0.46	0.63	Trifunac et al, 1994
2	Jensen Generator Building	34.3130	118.4983	34.3130	118.4979	JGB	0.98	0.52	Porcella et al, 1994
3	Jensen Main Building	34.3111	118.4957	34.3115	118.4955	JMB	0.62	0.40	Porcella et al, 1994
4	Knolls Elem. School	34.2633	118.6664	34.2636	118.6663	KNO	0.94	0.43	Trifunac et al, 1994
5	Los Angeles Dam	34.2931	118.4839	34.2927	118.4839	LAD	0.43	0.32	LRB, 1994
6	Olive View Hospital	34.3281	118.4442	34.3276	118.4443	OVH2	0.91	0.60	Shakal et al, 1994
7	Rinaldi Receiving Station	34.2810	118.4771	34.2810	118.4771	RIN	0.84	0.85	LRB, 1994
8	Sepulveda VA Hospital	34.2490	118.4772	34.2490	118.4778	SVA	0.94	0.48	Porcella et al, 1994
9	Sherman Oaks Park	34.1607	118.4394	N/A	N/A	SOP	N/A	N/A	Not an accelerograph site
10	Sherman Oaks Woodman	34.1543	118.4307	N/A	N/A	SOW	N/A	N/A	Not an accelerograph site
11	Sylmar Converter West	34.3117	118.4893	34.3119	118.4894	SCW	0.90	0.64	LRB, 1994
12	White Oak Church	34.2081	118.5171	34.2086	118.5171	WOC	0.51	xx	Trifunac et al, 1994

published in OFR 96-740. The need for these changes was partially motivated by our discovery that the distance from the geophone to the first depth marker (molded to the stress cable) was 4.5 meters instead of 5 meters as assumed in the analysis reported in OFR 96-740. As a consequence, all depth measurements in OFR 96-740 are in error by 0.5 meter. This difference in depth affects only the velocities of the shallow layers, changing the velocities by $5 - 10\%$; it had little or no effect on the velocities of layers below 10 meter depth. The measurement depths and velocity models have been corrected in this revision.

Another reason for this revision is that when using the ratio of P- and S-wave velocities in OFR 96-740 for the calculation of the dynamic Poisson's ratio σ, some results were out of the accepted range of values (0.0–0.5). The out-of-range Poisson's ratios usually occurred in the top 10 meters where source offset from the borehole (usually 4 meters) is comparable to layer thickness. We will explain some of the possible reasons for the out-of-range values.

1. In OFR 96-740 the velocities reported were determined from P- and S-wave measurements that were made independently, using source locations at different azimuths to the borehole and thus different source-to-receiver paths. The computation of Poisson's ratio, however, assumes the same path for P- and S-waves. Lateral heterogeneities will be particularly important for velocities at shallow depths, and therefore the Poisson's ratios computed assuming a common path may have unacceptable values, even though the P- and S-wave velocities may be well determined for the individual paths. We expect these affects to be most important at shallow depths.
2. Because of the short travel times, errors in picking the arrival times have more influence on the shallow velocities than the deep velocities (especially for P waves). In addition, for some of the models the velocity of the top layer is constrained by a single data point. For these reasons, Poisson's ratios for the shallow layers are more likely to be less well determined than those for the deeper layers.

The influence of these factors may result in a Poisson's ratio that is out of the accepted range of 0.0–0.5. This will occur if $\frac{V_p}{V_s} < 1$ or if $1 < \frac{V_p}{V_s} < \sqrt{2}$, in which case $\sigma \geq 1.0$ or $\sigma < 0$, respectively. Although $\sigma < 0$ is theoretically possible (e.g. Fung, 1968), we decided that our P- and S- velocities should yield σ between 0.0 and 0.5. We made corrections to the velocities using one or more of the following procedures: repicking shallow arrivals

(usually P arrivals because small changes in P travel-times have greater effect on σ), adding a shallow layer, and/or adjusting layer thickness to ensure that Poisson's ratio was in the range 0.0–0.5. In most cases the greatest changes (compared to determination of velocity without consideration of σ) were in the P-wave velocities at shallow depths. Overall, the changes in velocity required to produce acceptable values of σ were small and were only in a few layers. Calculations of Poisson's ratios for the preferred models are contained in Appendix B. Because of items 1 and 2 discussed above, the values in Appendix B may not represent the true Poisson's ratios of the materials at shallow depths.

Finally, we have reassessed layer interfaces on the bases of residuals to the travel-times and correlations with geological and geophysical logs.

The models presented here have been corrected for the refraction effects of the wave-path caused by soil layering. The program takes depths to layer interfaces and observed travel-times and uses an iterative process that accounts for the wave refractions at the layer boundaries for each measurement depth. The differences between the velocities computed in this way and those computed from times corrected to vertical (with no correction for refraction at layer boundaries) are small.

Although the changes to the earlier velocity models are minor, we believe the current models are an improved representation of the borehole data. Appendix C contains figures comparing the new velocity profiles to the previously published results as well as comparing those results to velocity profiles computed from suspension logging for a number of sites. The plots of the suspension logging results include both the "point" measurements (velocities averaged over 1 meter intervals) and averages of those measurements over the depth range of the layers in revised models, where the averages are computed by dividing the depth range by the travel-time over that depth range. For convenience of the reader the material in OFR 96-740 has been included here, so that this report supersedes and replaces OFR 96-740.

REGIONAL GEOLOGIC SETTING

The San Fernando Valley (Figure 2) is one of several east-west-trending, deep, alluviated basins situated within the Transverse Ranges structural province of southern

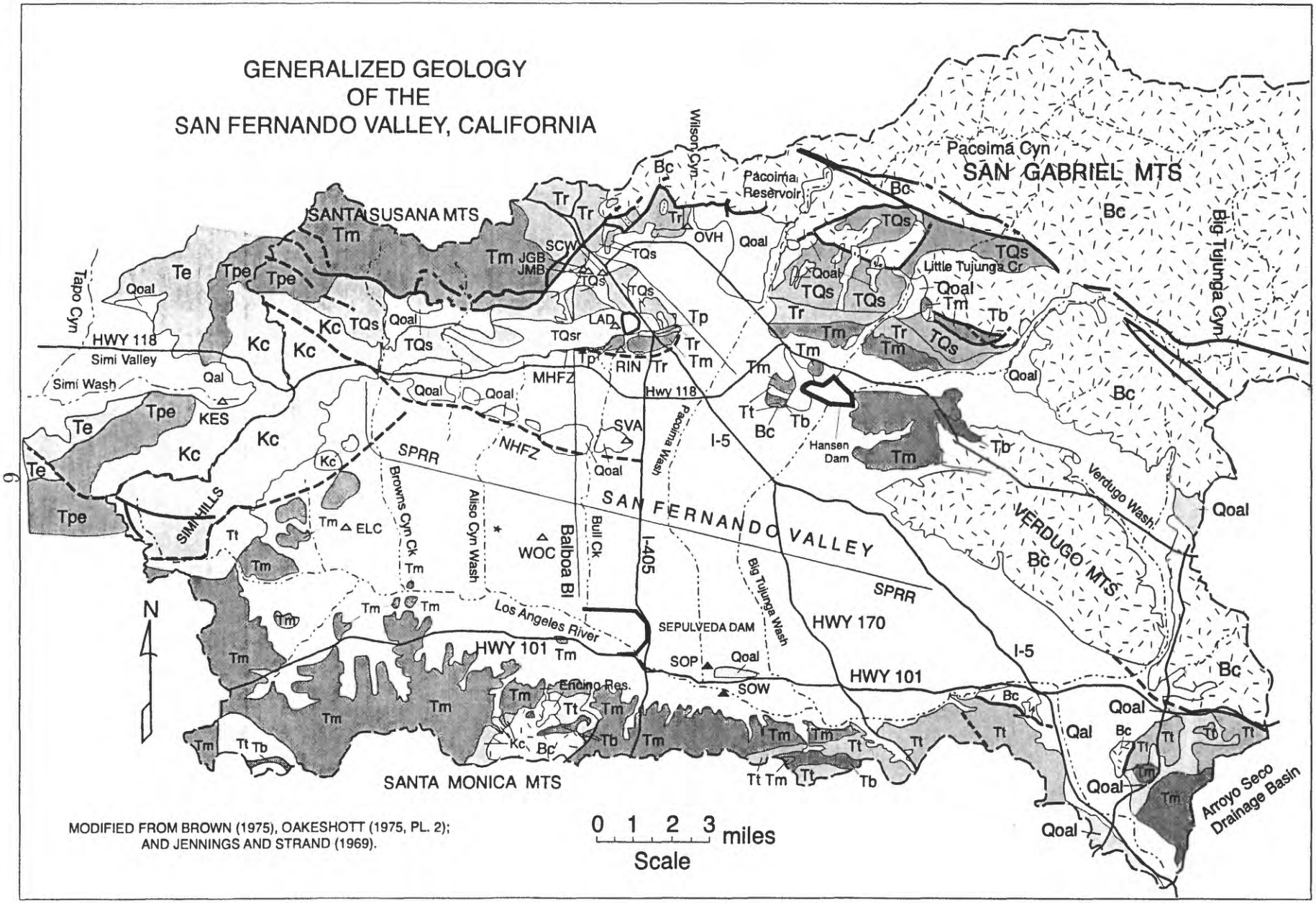
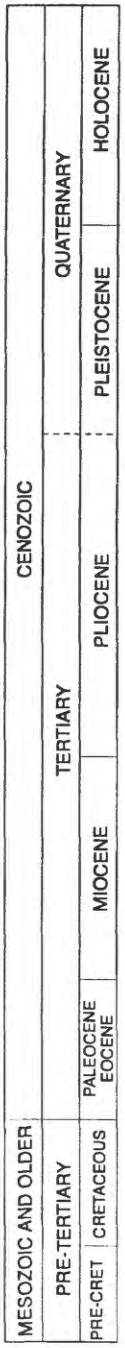


Figure 2. Generalized geologic map of San Fernando Valley. Triangles are borehole locations.



Qal — Alluvium, unconsolidated, poorly sorted alluvial fan deposits of gravel and sand east half of SF Valley and rather soft, fine sand, silt, and clay in west half of SF Valley.

Qls — Landslide deposits, not differentiated; arrows show direction of relative displacement of slide mass.

Qoal — Older alluvium, terrace deposits, plus Pacoima Formation of Oakeshott (1958). Poorly consolidated alluvial deposits of gravel, sand, silt, and clay. Noticeably deformed at ground surface. Weathering includes red and strong brown oxides.

TQs / TQsr — Saugus Formation (undifferentiated, or upper member) lower member (Qsr) is Sunshine Ranch member of Oakeshott (1950). Upper member continental folded conglomerate; lower member in part marine; Lower Saugus strata better consolidated than upper Saugus strata.

Tp — Pico Formation: blue, sandy shale, siltstone with sandstone and conglomerate lenses; mainly marine, often slightly cemented and consolidated.

Tr — Repetto: Blue and brown mudstone, siltstone, sandstone, and conglomerate; marine, arkosic.

Tm — Modelo (Puente) Formation: arkosic conglomerate, sandstone, and diatomaceous and silicious shales; marine.

Tt — Topanga Formation: Brown, tan and gray sandstone and conglomerate; marine. Includes interbedded andesite and basalt flows as map unit Tb.

Te / Tpe — Martinez, Domengine, and Las LLajas formations: Sandstone, dark shale, and conglomerate; marine, greenish-black. Includes marine deposits of Paleocene (Tpe) and Eocene (Te) age.

KTc — Chico Formation: Massive brown sandstone with subordinate thin beds of shale; marine. Locally known as Chatsworth Formation and is of late Cretaceous age.

Bc — Basement Complex: Includes undifferentiated metamorphic and granitic rocks of eastern basement complex of Yerkes (1965) and in Santa Monica Mountains, the Santa Monica Slate (western basement complex of Yerkes (1965); these suites have continental and oceanic crustal protoliths, respectively.

Freeway linework scanned from aerial photography, positioning is not precise.

Fault, dashed where location is approximate, dotted where concealed. Note: faults shown are schematically depicted and are not comprehensively mapped. NHFZ = Northridge Hills Fault Zone; MHFZ = Mission Hills Fault Zone;

SPRR = Southern Pacific Railroad

Red (light) triangle is USGS study site at an accelerograph location; black (dark) triangle is USGS study site that does not correspond to an accelerograph site.

Epicenter of 1/17/94 Northridge, California, earthquake

Figure 2. Explanation.

California, a region noted for its intense and relatively young deformation and its locally complex structural setting. The regional geology has received recent intense scrutiny and reevaluation of its neotectonic setting, chiefly owing to the San Fernando earthquake of 2/9/71 (Wentworth et al., 1971) and the Northridge earthquake of 1/17/94. The San Fernando Valley encompasses more than 300,000 acres below its drainage divides and above the confluence of the Los Angeles River with the Arroyo Seco. Of these, about 120,000 acres comprise the relatively gently sloping, alluviated basin floor, now very densely populated with homes and businesses (Brown, 1975; California State Water Rights Board, 1962). The valley fill strongly reflects the geology of the surrounding mountains and foothills, a characteristic with implications for regional interpretations of shear-wave velocity profiles. Consequently, conspicuous differences in sediment supply distinguish the eastern from the western portions of the San Fernando Valley, with the dividing line being the Bull Creek drainage, which is situated between Balboa Blvd. and Interstate 405.

The eastern half of the alluviated San Fernando Valley receives sediment from steep drainages characteristic of the rugged San Gabriel and Verdugo mountains. These mountainous terranes expose mainly crystalline granitic and metamorphic rocks of the eastern basement complex of Yerkes (1965). Consequently, the valley fill deposits located east of Interstate 405 are relatively coarse-textured and are comprised mainly of sand, gravel, and cobbles deposited by the powerful high-gradient streams draining such principal watercourses as Big Tujunga, Little Tujunga, and Pacoima canyons. These sediment transport systems have shunted the Los Angeles River southward nearly to the Santa Monica mountains, thereby limiting the areal extent of the sediment eroded from the Santa Monica mountains.

The western half of the San Fernando Valley receives alluvial sediment from numerous drainages dissecting the Santa Monica mountains, the Santa Susana mountains, and the Simi Hills. These drainage basins are smaller than those of the San Gabriel mountains, and are eroding uplands comprised mainly of Mesozoic, Tertiary, and early Quaternary uplifted marine and nonmarine sandstones, siltstones, and mudrocks (Winterer and Durham, 1958, 1962). A small area of the Santa Monica mountains exposes rocks of the western basement complex of Yerkes *et al.* (1965) locally represented by the Santa Monica slate. The alluvial

deposits thus are significantly more fine-textured at most localities west of Interstate 405 compared to those east of Interstate 405. The western portion of the valley contains significant occurrences of very shallow ground water (California State Water Rights Board (1962); Tinsley *et al.* (1985), Tinsley and Fumal (1985)). Areas characterized by high sedimentation rates owing to persistent overbank flooding and fine-grained debris-flows (relatively common events prior to implementation of flood control measures in the western San Fernando Valley [King *et al.*, 1981]) and a persistence of shallow ground water are distinguished by relatively low values of shear strength and contained the lowest shear-wave velocities we measured in this study.

ACCELEROGRAPH SITES AND AREAL GEOLOGY

The sites we investigated and herein report comprise a relevant set of data for exploring aspects of site dependent effects of the Northridge earthquake. However, we caution that these sites do not encompass a complete sampling of the region's varied geology. Six sites occur on recent alluvium deposited by streams draining Cretaceous and Tertiary marine sediments. Of these, five sites are located on relatively fine-textured surficial deposits (chiefly well-bedded sequences composed of poorly consolidated, loose to slightly dense silty sand, sandy silt, silt, and clayey silt) in the western half of the San Fernando Valley (ELC, RIN, WOC), and in the south-central San Fernando Valley (SOP, SOW), and one site is located in southeasternmost Simi Valley (KES) on sand and silt deposits derived from the Cretaceous Chatsworth Formation, (the sedimentary rock that forms the visually impressive brown-weathering sandstone that crops out in the northwestern San Fernando Valley and eastern Simi Valley areas). About 12 meters of Quaternary sediment overlies the Cretaceous bedrock at this point in Simi Valley. At one site (SVA), Pleistocene sandy and silty alluvial deposits overlie strata of the Saugus Formation or its stratigraphic equivalent.

Boreholes drilled at three sites (JMB, JGB, SCW) penetrated various thicknesses of fill and soft Holocene alluvial deposits before encountering the Saugus Formation of Winterer and Durham (1962). The Los Angeles Dam (LAD) site is the only site we investigated that was within the lower (Sunshine Ranch) member of the Saugus Formation; shear-wave velocities for the LAD site are higher than those measured in the other Saugus Formation

sites. The 12th site was located at Olive View Hospital (OVH2), in coarse, gravelly alluvial fan deposits derived from Wilson Canyon, which drains granitic and metamorphic rocks of the San Gabriel mountains. This site is the only site on deposits typical of much of the eastern half of the San Fernando Valley.

GEOLOGIC AND GEOPHYSICAL LOGS

Generalized logs of earth materials underlying the drill sites were prepared from (1) mud logs of cuttings that were noted during drilling, (2) "undisturbed" samples obtained using a Pitcher sampler (which provided glimpses of the materials encountered at depth), and (3) a suite of geophysical logs (spontaneous potential, resistivity, caliper, and natural gamma ray logs; these logs are not included here, but will appear in a later report) obtained prior to installing and grouting the casing in the borehole. From these logs we can delineate the thickness and character of basin alluvial deposits and underlying bedrock. Electric logs enable findings to be extrapolated to other parts of the basin and to other basins in southern California. Physical properties noted in the abbreviated descriptions include; depth, color, texture or lithology of alluvial deposits, probable geologic age, and correlation with regionally mapped geologic units.

P- AND *S*-WAVE TRAVEL-TIME DATA

Shear waves were generated at the ground surface by an air-powered horizontal ram (Liu, *et al.*, 1988) striking an anvil at either end of an aluminum channel 2.3 m long. The ram was driven first in one direction and then in the other to generate pulses of opposite polarity. A switch attached to the shear source triggered the recorder and established the reference for the timing of arrivals. *P*-waves were generated by striking a steel plate with a sledge hammer. The recorder was triggered by a switch attached to the handle of the sledge hammer. *P*- and *S*-wave sources were offset from the borehole (same horizontal distance but different locations) to minimize the effect of waves traveling down the grout surrounding the casing. The offset was 4 m at all sites except Jensen Main Building, where it was 5 m.

Downhole measurements were made at 2.5 m intervals (starting at 2 meters depth) with a three-component geophone clamped to the casing by an electrically-activated lever

arm. A second three-component geophone was placed on the surface 5 to 10 m from the shear source for recording an on-scale reference trace (useful for amplitude studies and timing verification). The data were recorded on diskettes using a 12-channel recording system.

DETERMINING VELOCITY PROFILES

The procedure for determining velocities is summarized in Figure 3. Because the orientation of the downhole geophone could not be controlled when moving from one depth to the next, the azimuth of the horizontal geophones relative to the source was unknown and changed with depth. To minimize the effects of those changes, the horizontal components were rotated to the direction that maximized the integral square amplitude within a time interval containing the shear wave (Boatwright *et al.*, 1986). *P*- and *S*-wave arrival-times were determined from the time series displayed at each depth on a 20-inch computer screen. The *P*-wave arrival-time was obtained from the vertical trace, and the *S*-wave arrival-times were obtained from the average of the rotated horizontal traces for ram strikes in opposite directions. The arrivals were timed to the nearest millisecond, probably a realistic precision for clear arrivals uncontaminated by noise.

A trial set of layer boundaries was chosen for the S-wave model, based on the lithologic descriptions and geophysical logs. The travel-time data were fit in a least-squares sense by a model made up of constant velocity layers, taking into account refraction across the interfaces between layers (program VELSLANT, available on request from the authors). The travel times were weighted by the inverse of an assigned normalized variance. A normalized standard deviation of 1 was assigned to the clear arrivals and values up to 5 were assigned to the others. The residuals were examined, and layer boundaries were added, if necessary, to reduce large residuals or to remove systematic trends in the residuals. This was an iterative process conducted by the team of authors of this report. The process continued until the team was satisfied that the interfaces were consistent with the borehole seismic data as well as the geological and geophysical logs. The *P*-wave travel time data were analyzed initially with the set of layer boundaries finally determined for the *S*-wave data. Layer boundaries were then added if needed to fit the data and deleted if not needed.

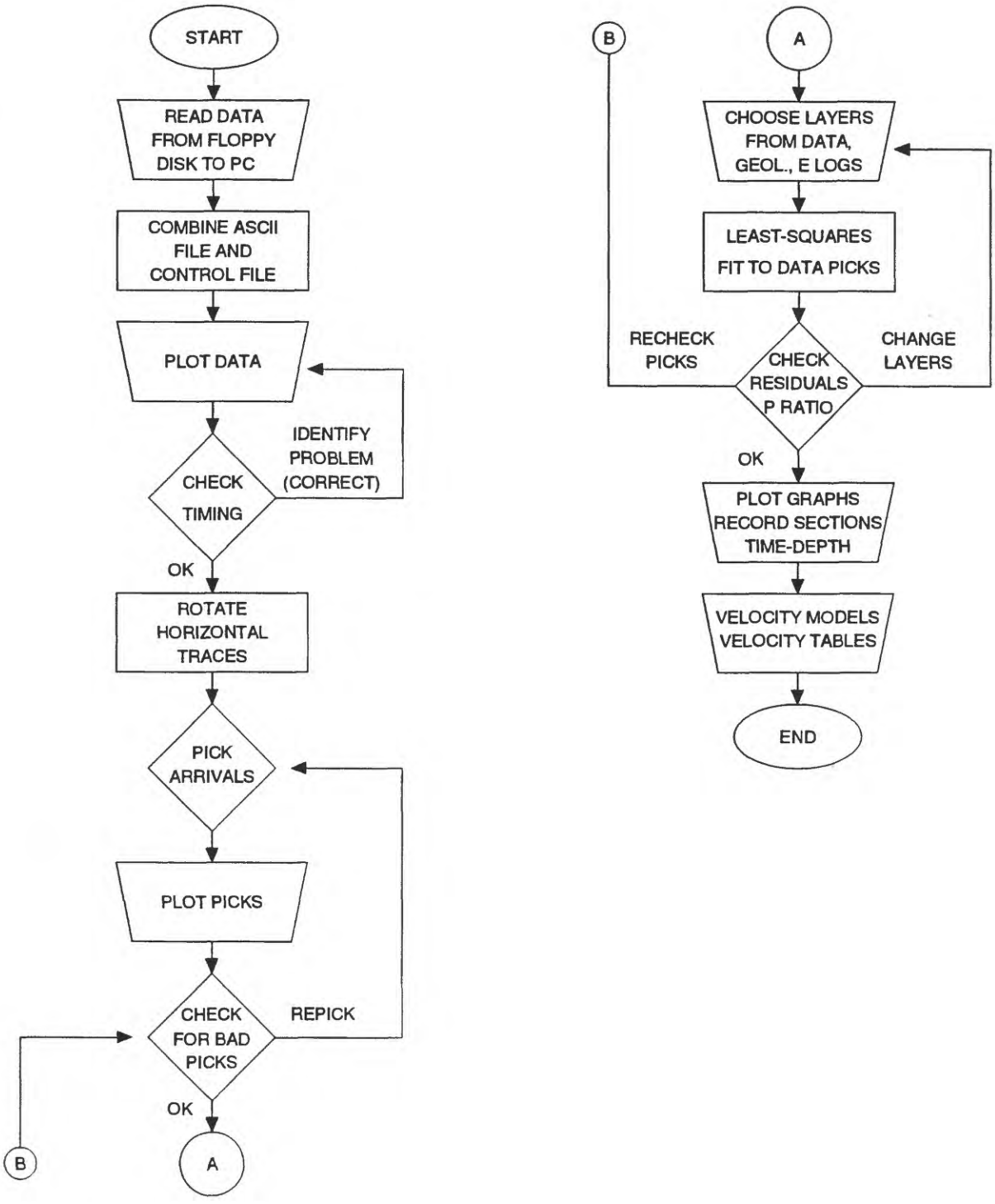


Figure 3. Flow-chart outlining the data processing and steps in the interpretation.

Commonly, an additional layer boundary corresponding to the top of the zone of water saturation was needed to fit the P-wave data. P- and S-wave profiles for all twelve holes are plotted in Appendix A. The upper and lower bounds on the plots show approximate 68 percent confidence limits. The bounds are not symmetrical because they are based on the inverse velocities in the layers.

SUMMARY VELOCITY PROFILES

Figures 4-6 show the S-wave velocity profiles determined from the borehole measurements at the twelve sites. The velocity profiles are plotted at the same scale for ease of comparison. Figures 7-9 show the P-wave velocity profiles for the same sites as Figures 4-6, respectively.

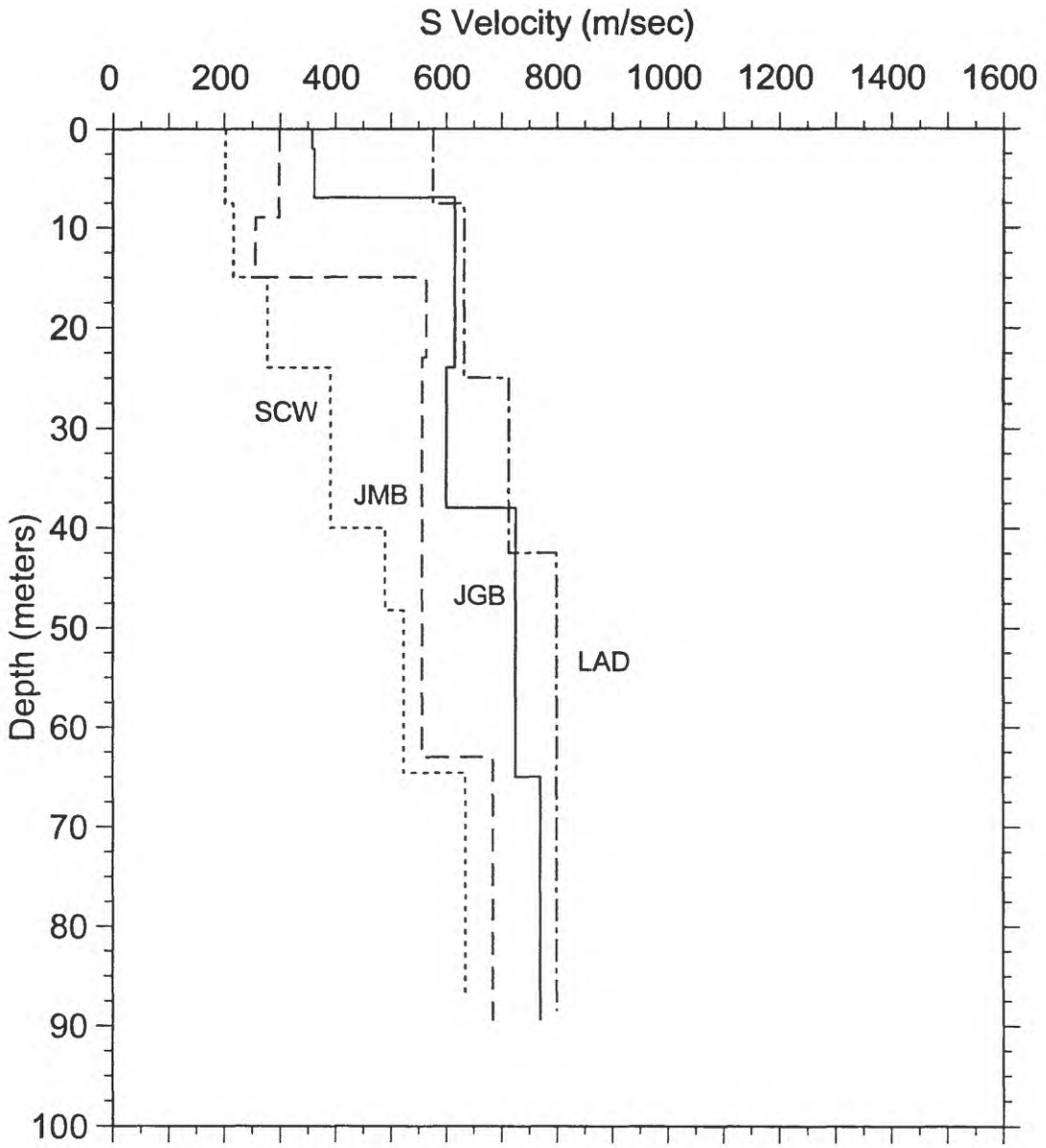


Figure 4. S-wave velocity models shown on the same figure for comparison. Sites JMB, JGB and SCW have various thicknesses of fill and soft Holocene alluvial deposits above the Saugus Formation. LAD is the only site we investigated within the lower (Sunshine Ranch) member of the Saugas Formation.

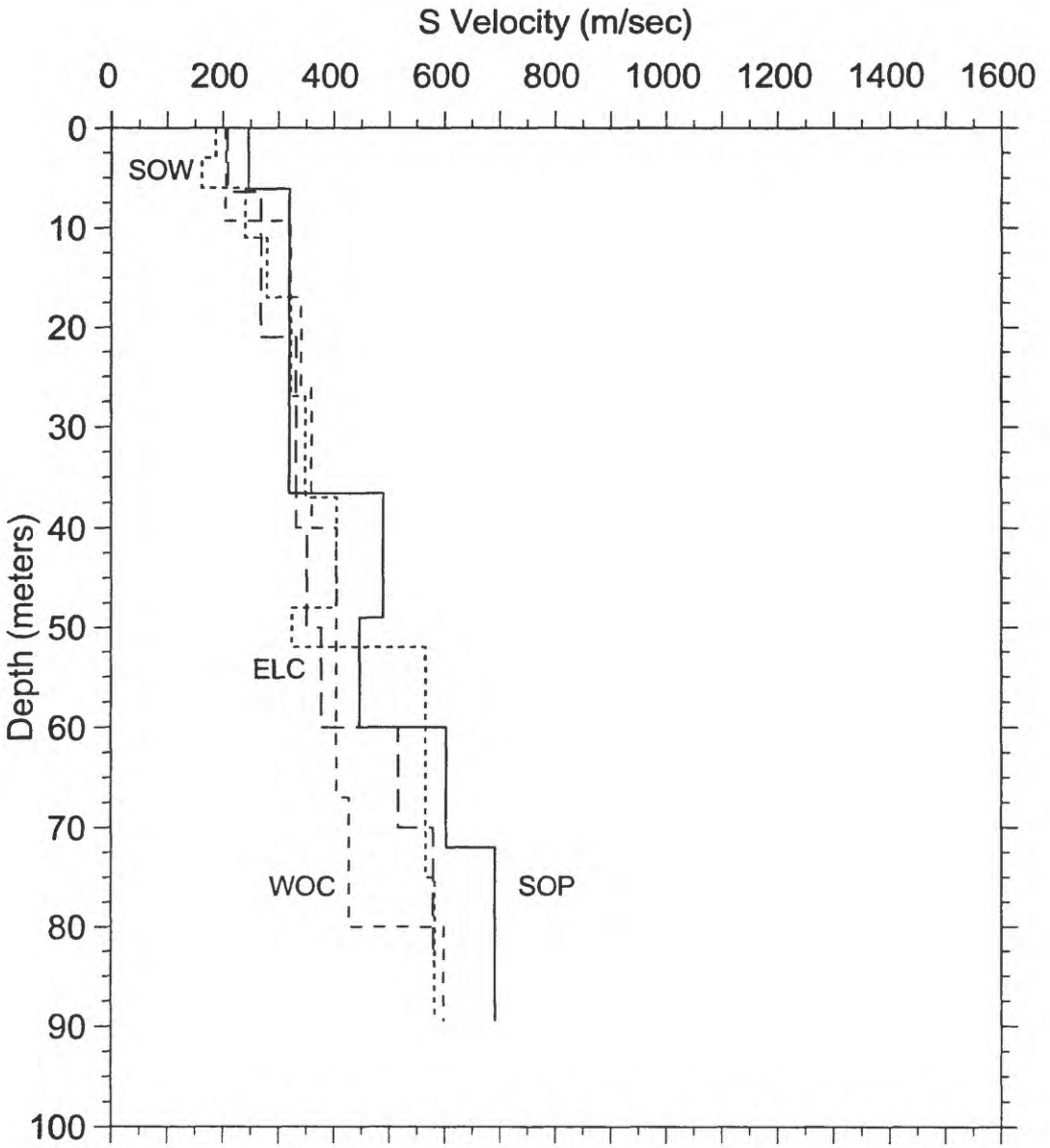


Figure 5. S-wave velocity models shown on the same figure for comparison. These sites all start in relatively soft, fine-textured Holocene alluvial deposits of the Los Angeles River and its tributaries in the San Fernando Valley. Drill holes apparently bottomed in Tertiary marine sedimentary rock (shales, siltstones).

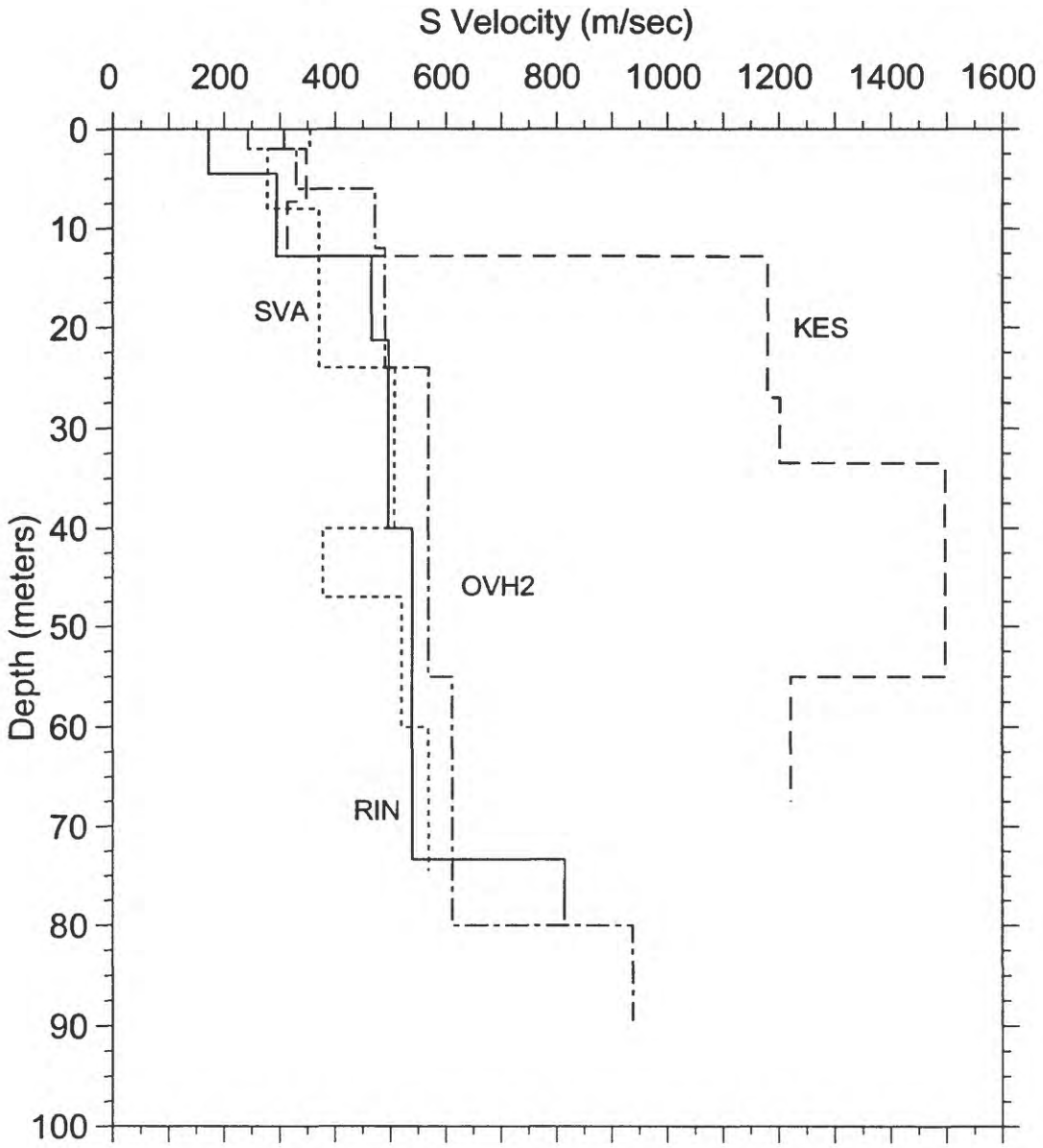


Figure 6. S-wave velocity models for sites KES, OVH, RIN and SVA. All sites are drilled in sandy or coarser-textured alluvium. At RIN, the drillhole bottomed in marine Tertiary mudstone; at KES, in Cretaceous marine sandstone; at OVH2 and SVA, in nonmarine Saugus(?) Formation or its possible equivalent.

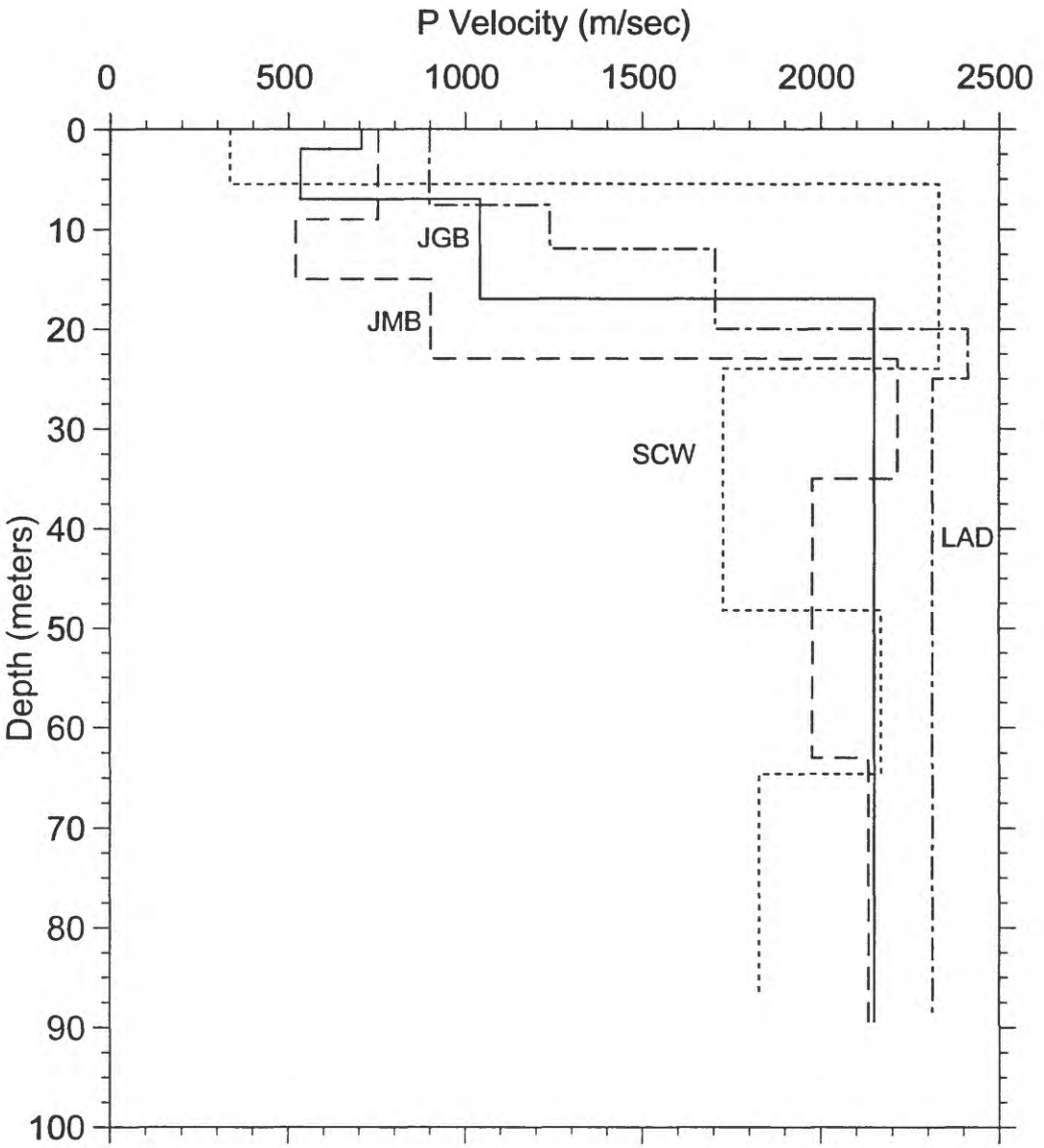


Figure 7. P-wave velocity models shown on the same figure for comparison.

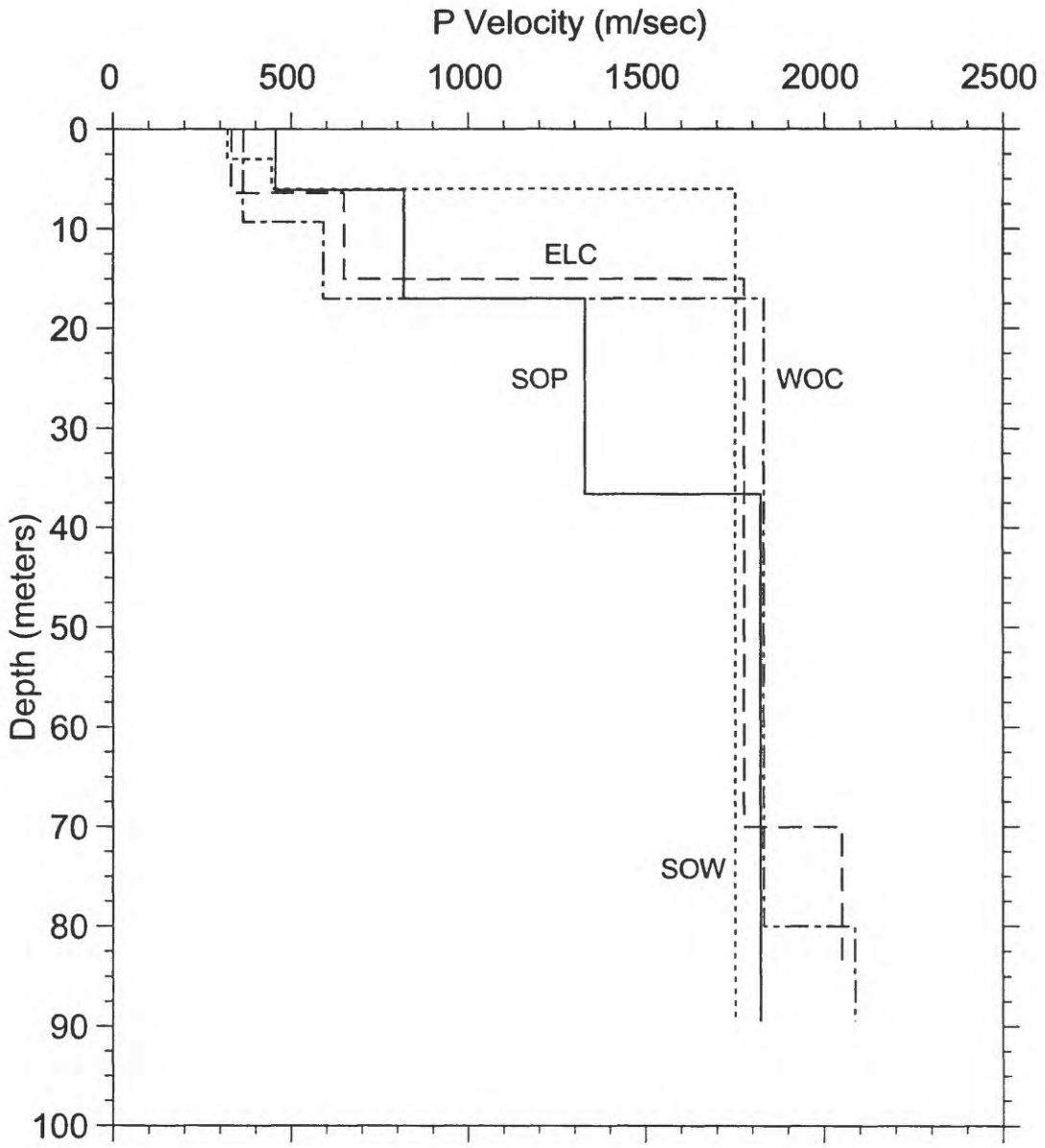


Figure 8. P-wave velocity models shown on the same figure for comparison.

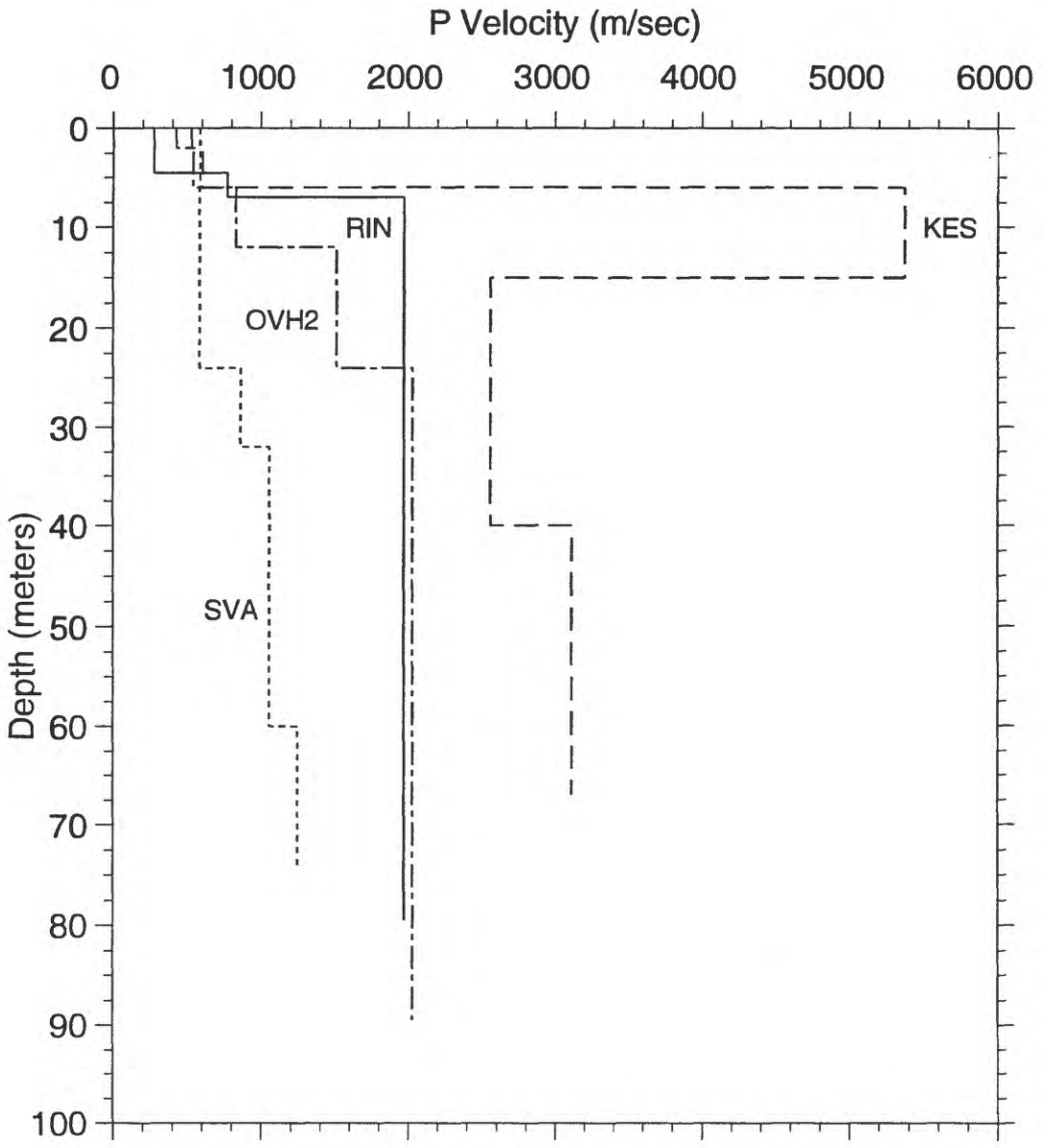


Figure 9. P-wave velocity models shown on the same figure for comparison.

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APPENDIX—A

Detailed Results

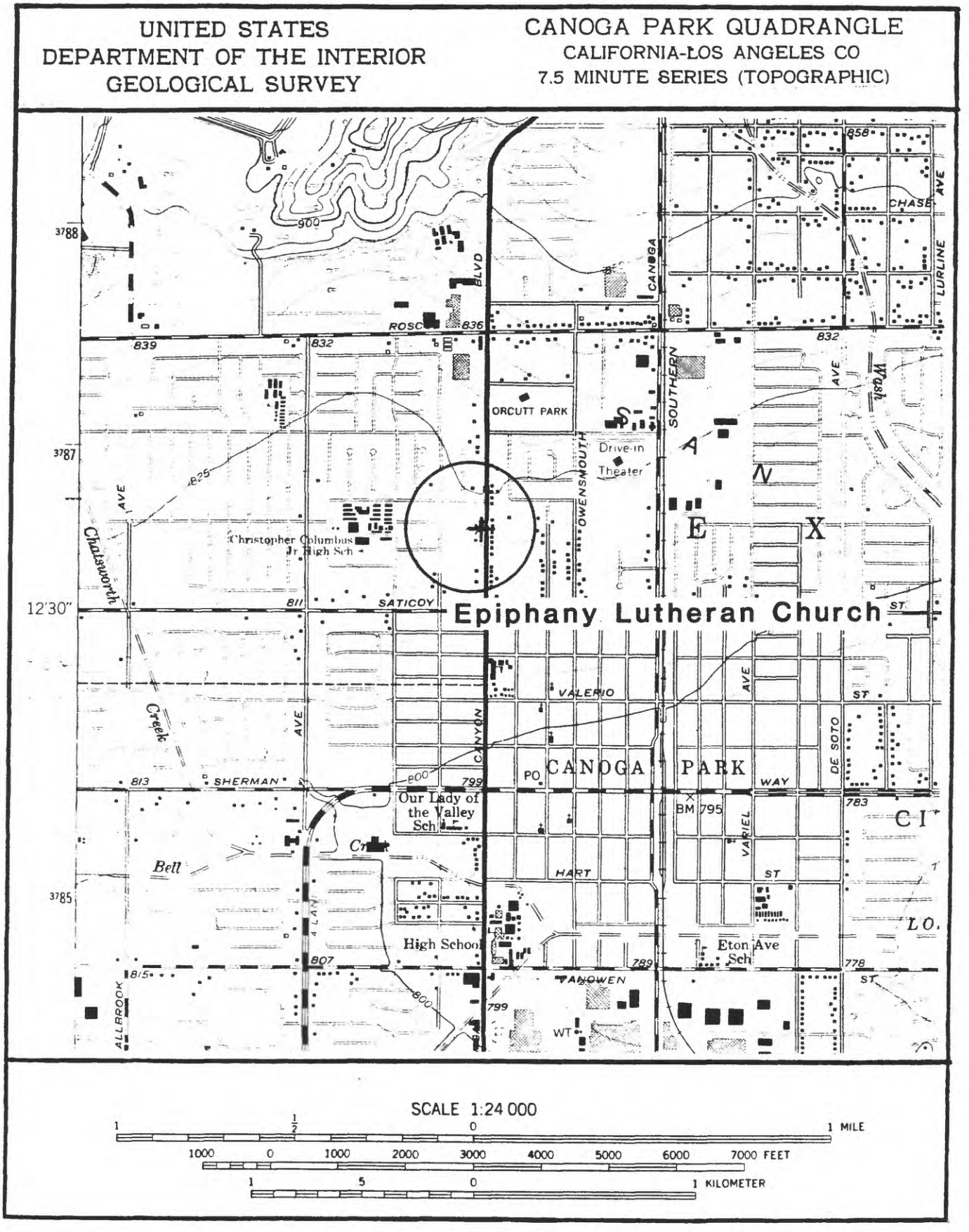

Figure A-1. Site location map for the borehole at Epiphany Lutheran Church. The accelerograph is located approximately 50 meters from the borehole.

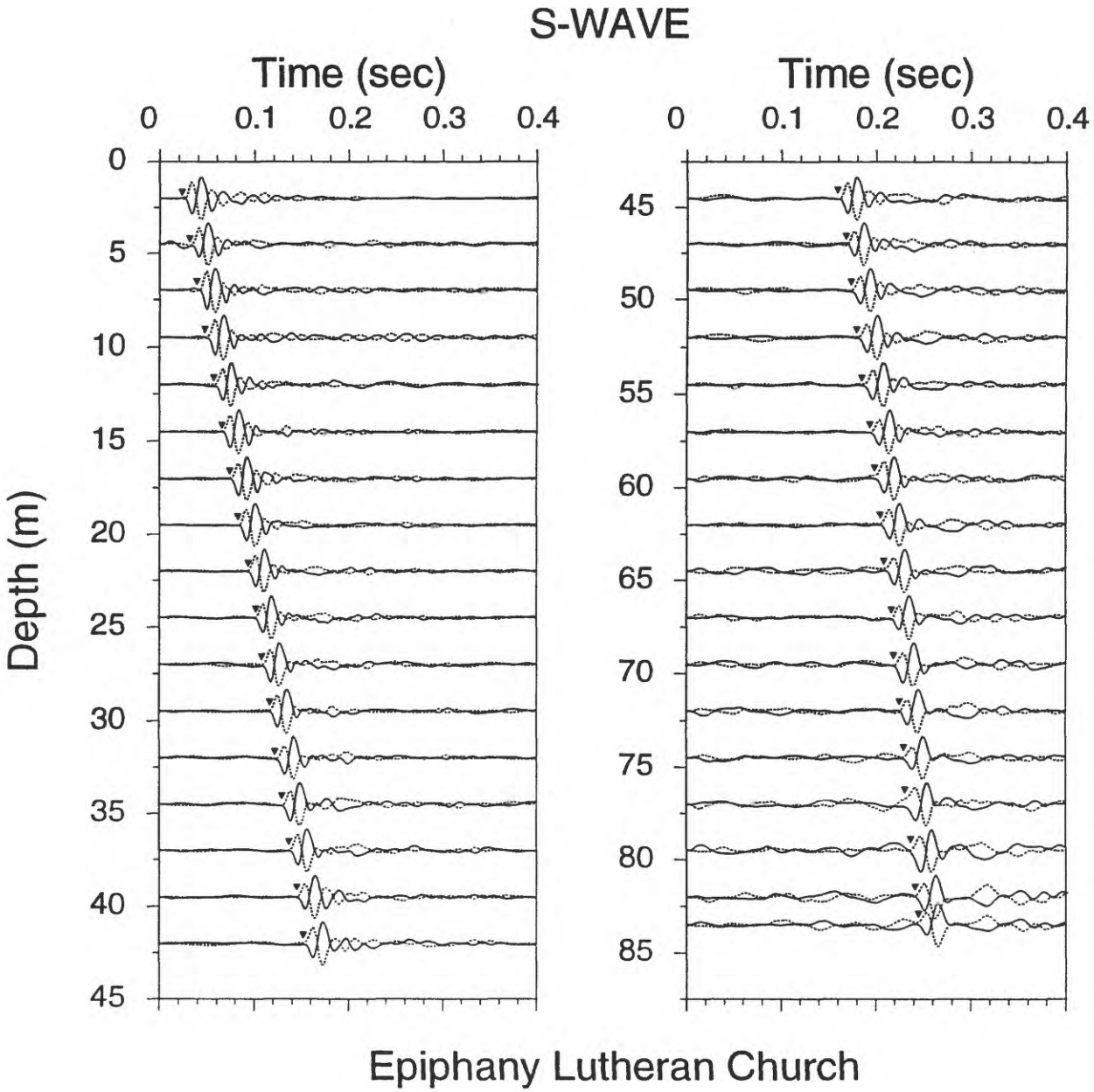

Figure A-2. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

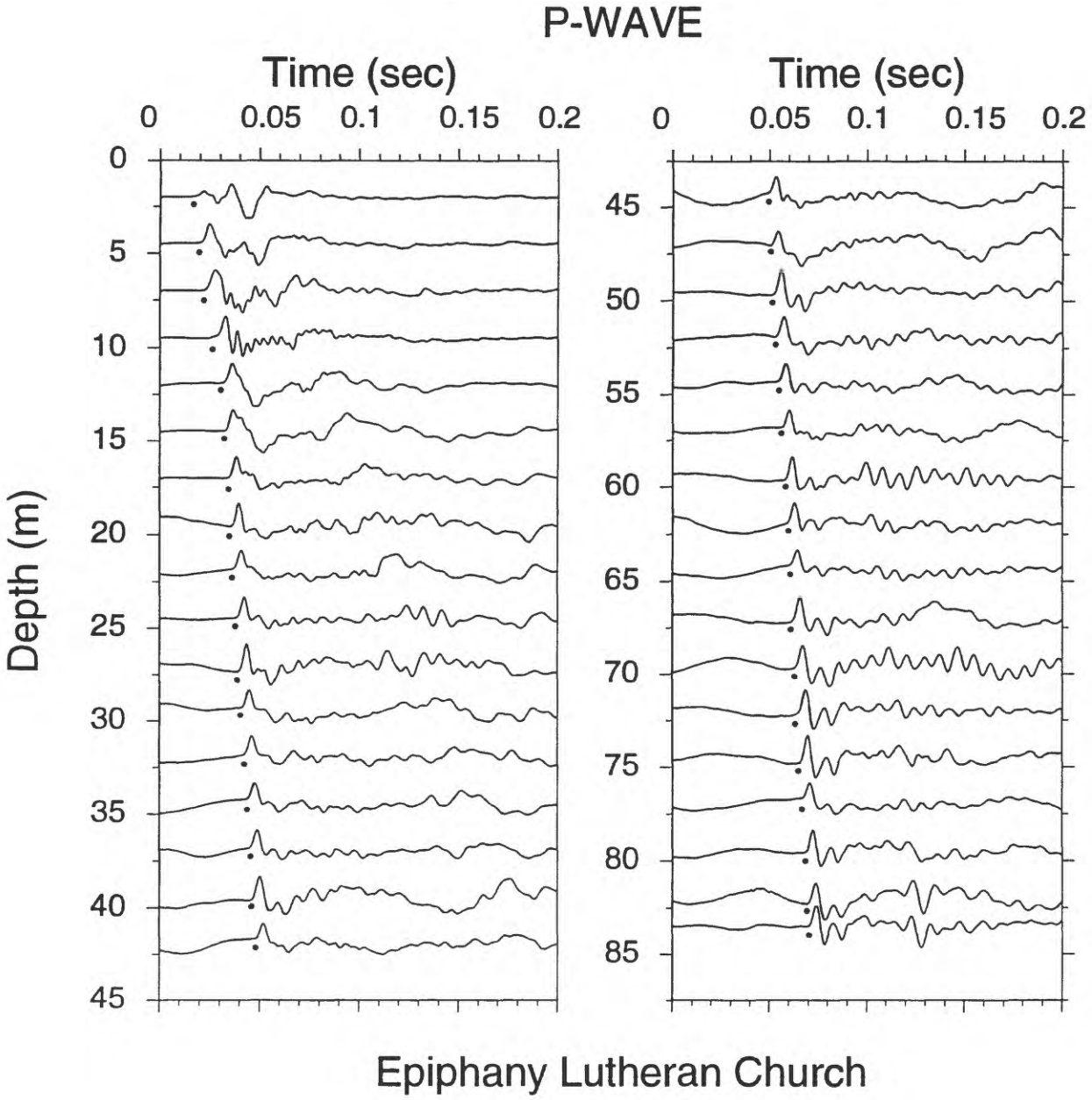

Figure A-3. Vertical component record section. Approximate P-wave arrivals are indicated by the solid circles.

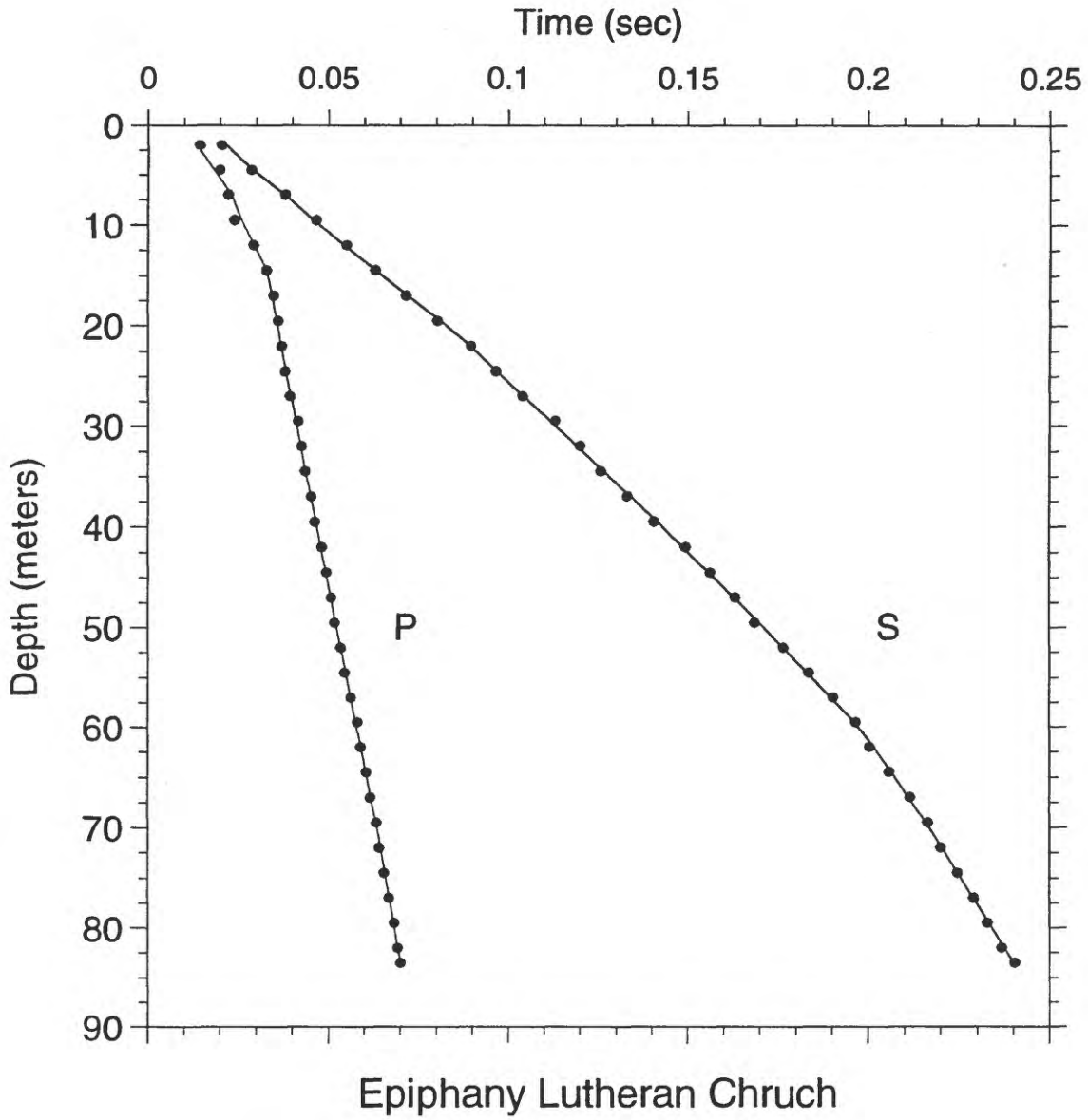

Figure A-4. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

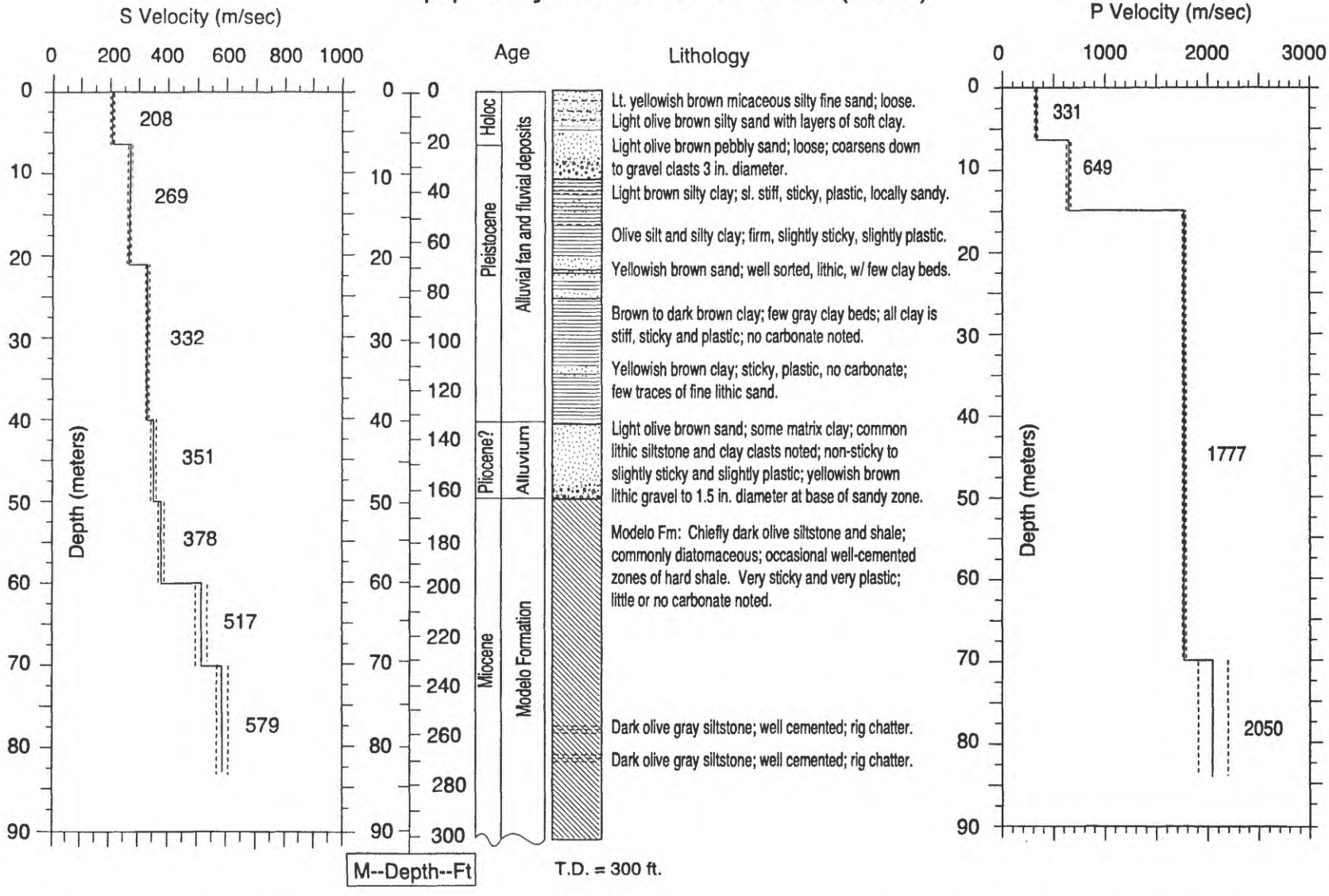

Figure A-5. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-1. S-wave arrival times and velocity summaries.

Location: Epiphany Lutheran Church Coordinates: 34.21170 118.60510 Hole_Code: 275
hoffset = 4.00 travel-time file: elcs.tt

nlayers = 7

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0204	0.0096	208	1	-0.0011	6.4	6.4	208	206	211	21.0	21.0	684	676	692
4.5	14.8	0.0286	0.0216	208	1	-0.0003	21.0	14.6	269	266	272	68.9	47.9	882	873	892
7.0	23.0	0.0380	0.0329	213	1	0.0001	40.0	19.0	332	328	335	131.2	62.3	1089	1077	1100
9.5	31.2	0.0466	0.0422	225	1	0.0008	50.0	10.0	351	343	360	164.0	32.8	1152	1126	1180
12.0	39.4	0.0550	0.0515	233	1	0.0007	60.0	10.0	378	368	389	196.9	32.8	1240	1206	1276
14.5	47.6	0.0630	0.0608	238	1	-0.0001	70.0	10.0	517	497	537	229.7	32.8	1695	1632	1762
17.0	55.8	0.0716	0.0701	242	1	-0.0004	83.5	13.5	579	560	601	274.0	44.3	1901	1836	1971
19.5	64.0	0.0802	0.0794	245	1	-0.0009										
22.0	72.2	0.0896	0.0880	250	1	0.0002										
24.5	80.4	0.0966	0.0956	256	1	-0.0002										
27.0	88.6	0.1040	0.1031	262	1	-0.0002										
29.5	96.8	0.1130	0.1106	267	1	0.0014										
32.0	105.0	0.1200	0.1182	271	1	0.0009										
34.5	113.2	0.1258	0.1257	274	1	-0.0007										
37.0	121.4	0.1332	0.1332	278	1	-0.0008										
39.5	129.6	0.1406	0.1408	281	1	-0.0009										
42.0	137.8	0.1494	0.1480	284	1	0.0008										
44.5	146.0	0.1562	0.1551	287	1	0.0005										
47.0	154.2	0.1632	0.1622	290	1	0.0004										
49.5	162.4	0.1686	0.1693	292	1	-0.0013										
52.0	170.6	0.1766	0.1760	295	1	0.0001										
54.5	178.8	0.1836	0.1827	298	1	0.0005										
57.0	187.0	0.1904	0.1893	301	1	0.0007										
59.5	195.2	0.1966	0.1959	304	1	0.0003										
62.0	203.4	0.2004	0.2011	308	1	-0.0011										
64.5	211.6	0.2058	0.2059	313	1	-0.0005										
67.0	219.8	0.2116	0.2108	318	1	0.0005										
69.5	228.0	0.2164	0.2156	322	1	0.0005										
72.0	236.2	0.2200	0.2200	327	1	-0.0003										
74.5	244.4	0.2246	0.2243	332	2	0.0000										
77.0	252.6	0.2290	0.2286	337	2	0.0001										
79.5	260.8	0.2328	0.2330	341	2	-0.0004										
82.0	269.0	0.2368	0.2373	346	2	-0.0007										
83.5	274.0	0.2404	0.2399	348	1	0.0003										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-2. P-wave arrival times and velocity summaries.

Location: Epiphany Lutheran Church Coordinates: 34.21170 118.60510 Hole_Code: 275
hoffset = 4.00 travel-time file: ELCP.TT
nlayers = 4

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0144	0.0060	331	1	0.0009	6.4	6.4	331	325	337	21.0	21.0	1086	1067	1106
4.5	14.8	0.0198	0.0136	331	1	0.0016	15.0	8.6	649	629	671	49.2	28.2	2130	2063	2202
7.0	23.0	0.0222	0.0203	346	1	-0.0009	70.0	55.0	1777	1757	1798	229.7	180.4	5830	5763	5899
9.5	31.2	0.0240	0.0241	394	1	-0.0019	83.5	13.5	2050	1919	2200	274.0	44.3	6726	6297	7218
12.0	39.4	0.0292	0.0280	429	1	-0.0001										
14.5	47.6	0.0328	0.0318	456	1	-0.0001										
17.0	55.8	0.0348	0.0337	504	1	0.0004										
19.5	64.0	0.0360	0.0351	555	1	0.0004										
22.0	72.2	0.0370	0.0365	603	1	0.0001										
24.5	80.4	0.0380	0.0379	646	1	-0.0002										
27.0	88.6	0.0394	0.0393	687	1	-0.0002										
29.5	96.8	0.0416	0.0407	724	1	0.0006										
32.0	105.0	0.0426	0.0421	759	1	0.0003										
34.5	113.2	0.0436	0.0435	792	1	-0.0001										
37.0	121.4	0.0452	0.0450	823	1	0.0001										
39.5	129.6	0.0462	0.0464	852	1	-0.0003										
42.0	137.8	0.0482	0.0478	879	1	0.0003										
44.5	146.0	0.0494	0.0492	905	1	0.0001										
47.0	154.2	0.0508	0.0506	929	1	0.0001										
49.5	162.4	0.0518	0.0520	952	1	-0.0003										
52.0	170.6	0.0536	0.0534	974	1	0.0001										
54.5	178.8	0.0546	0.0548	994	1	-0.0003										
57.0	187.0	0.0564	0.0562	1014	1	0.0001										
59.5	195.2	0.0582	0.0576	1033	1	0.0005										
62.0	203.4	0.0590	0.0590	1050	1	-0.0001										
64.5	211.6	0.0606	0.0604	1067	1	0.0001										
67.0	219.8	0.0618	0.0618	1084	1	-0.0001										
69.5	228.0	0.0634	0.0632	1099	1	0.0001										
72.0	236.2	0.0642	0.0645	1116	1	-0.0004										
74.5	244.4	0.0656	0.0657	1134	1	-0.0002										
77.0	252.6	0.0670	0.0669	1150	1	0.0000										
79.5	260.8	0.0684	0.0682	1166	1	0.0002										
82.0	269.0	0.0694	0.0694	1182	1	0.0000										
83.5	274.0	0.0702	0.0701	1191	1	0.0000										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

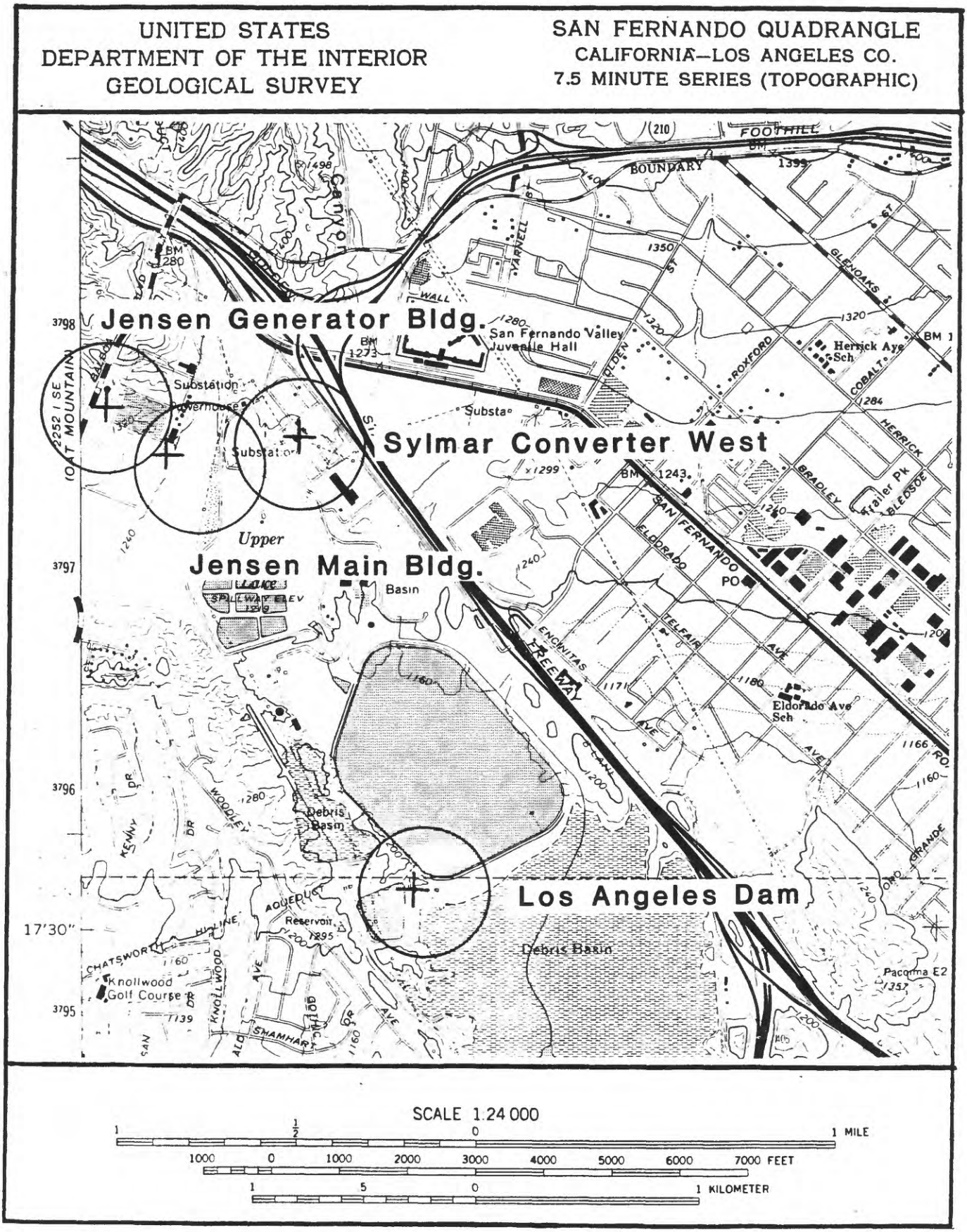

Figure A-6. Site location map for the borehole at Jensen Generator Building. The accelerograph is located approximately 25 meters from the borehole.

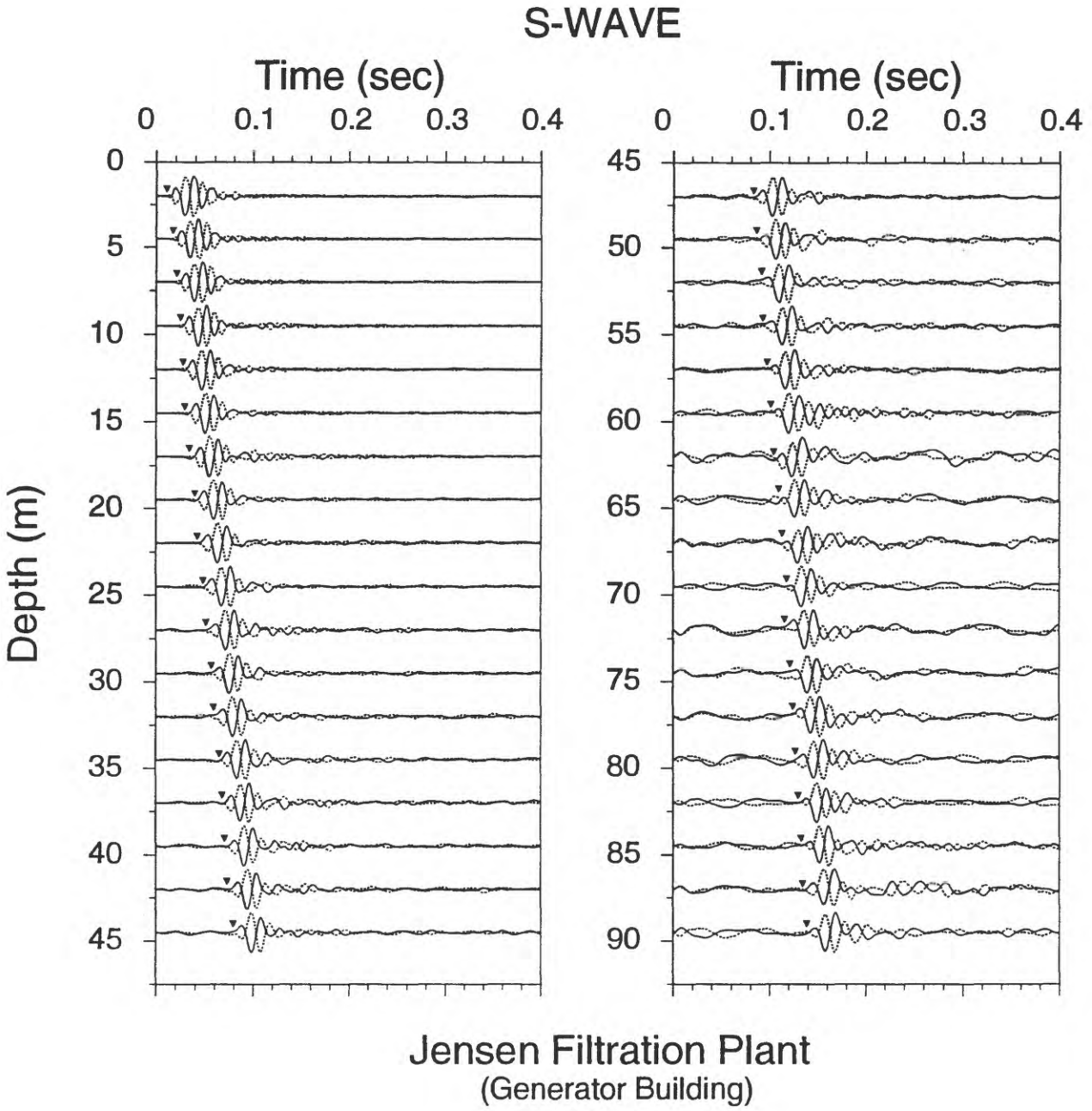

Figure A-7. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

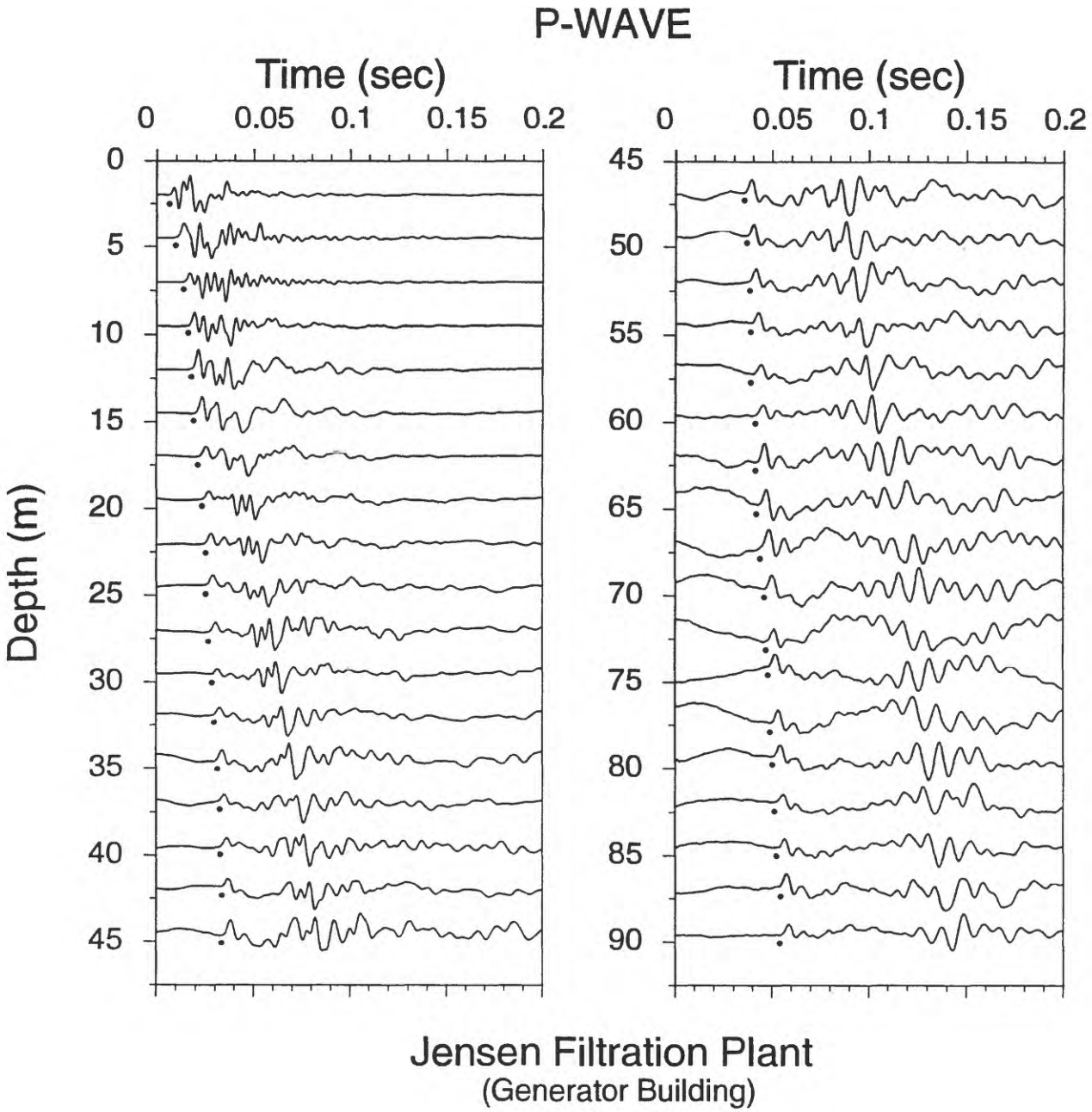

Figure A-8. Vertical component record section. Approximate P-wave arrivals are indicated by the solid circles.

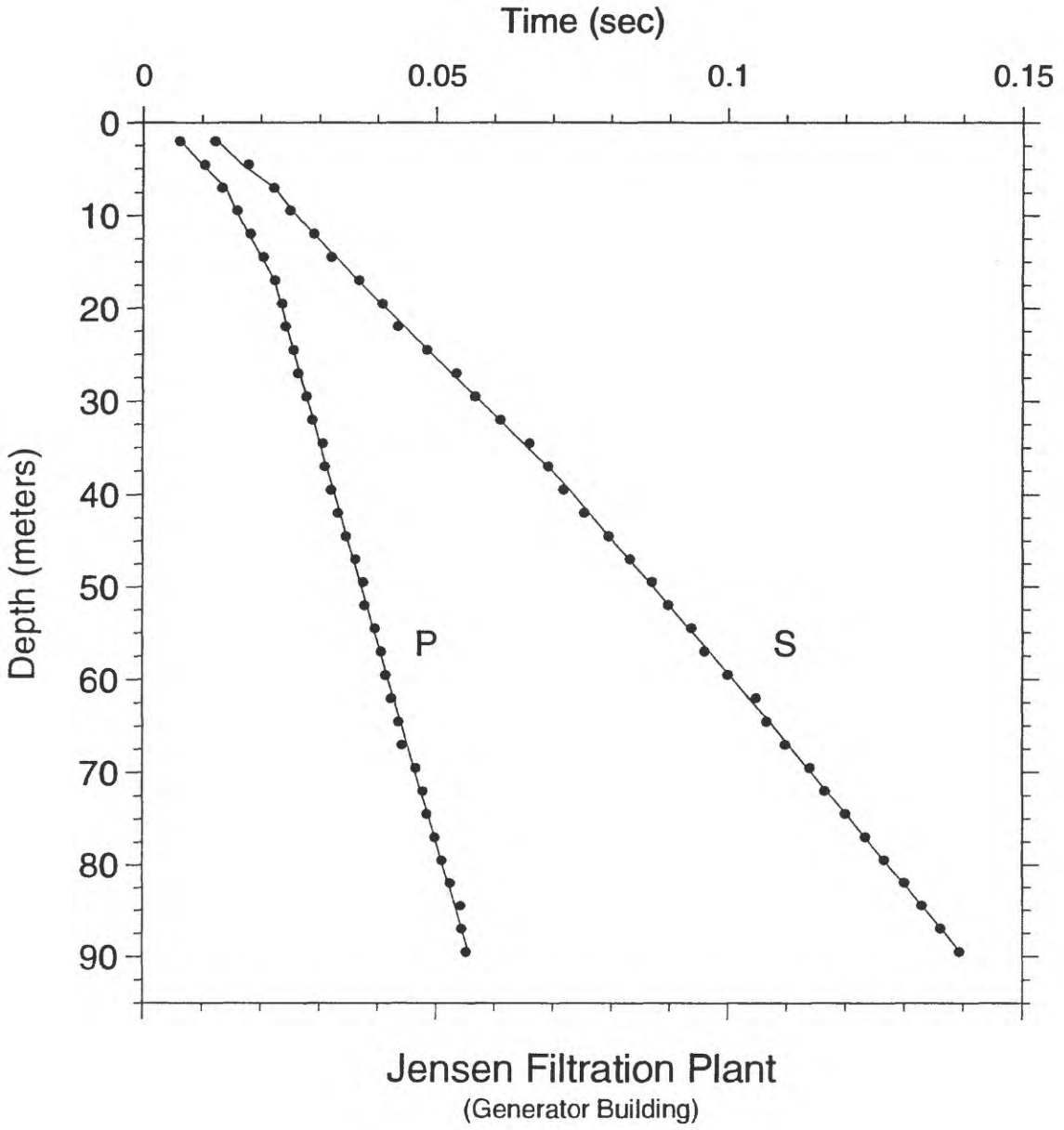

Figure A-9. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

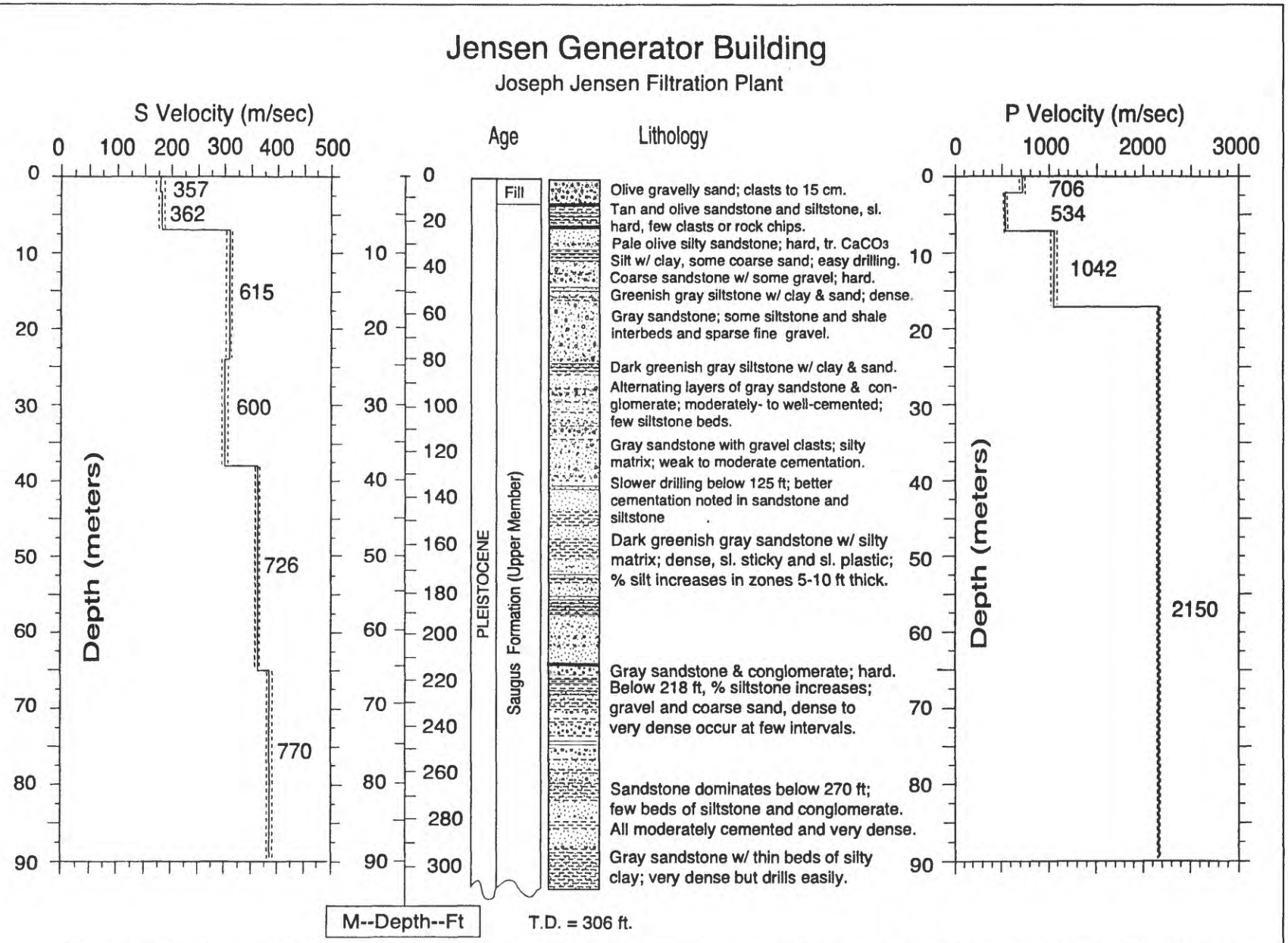

Figure A-10. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-3. S-wave arrival times and velocity summaries.

Location: Jensen Generator Building Coordinates: 34.31300 118.49830 Hole_Code: 278
hoffset = 4.00 travel-time file: jgbs.tt

nlayers = 6

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)
2.0	6.6	0.0122	0.0056	357	1	-0.0003
4.5	14.8	0.0178	0.0125	360	1	0.0011
7.0	23.0	0.0222	0.0194	361	1	-0.0001
9.5	31.2	0.0250	0.0235	405	1	-0.0003
12.0	39.4	0.0290	0.0275	436	1	0.0001
14.5	47.6	0.0320	0.0316	459	1	-0.0007
17.0	55.8	0.0368	0.0357	477	1	0.0002
19.5	64.0	0.0408	0.0397	491	1	0.0003
22.0	72.2	0.0434	0.0438	503	1	-0.0011
24.5	80.4	0.0484	0.0479	512	1	-0.0001
27.0	88.6	0.0534	0.0520	519	1	0.0008
29.5	96.8	0.0566	0.0562	525	1	-0.0001
32.0	105.0	0.0610	0.0604	530	1	0.0002
34.5	113.2	0.0660	0.0645	535	1	0.0011
37.0	121.4	0.0692	0.0687	539	1	0.0001
39.5	129.6	0.0718	0.0724	545	1	-0.0010
42.0	137.8	0.0754	0.0759	554	1	-0.0008
44.5	146.0	0.0796	0.0793	561	1	0.0000
47.0	154.2	0.0832	0.0828	568	1	0.0002
49.5	162.4	0.0870	0.0862	574	1	0.0005
52.0	170.6	0.0898	0.0896	580	1	-0.0001
54.5	178.8	0.0938	0.0931	585	1	0.0005
57.0	187.0	0.0960	0.0965	590	1	-0.0008
59.5	195.2	0.1000	0.1000	595	1	-0.0002
62.0	203.4	0.1048	0.1034	599	1	0.0012
64.5	211.6	0.1066	0.1069	604	1	-0.0005
67.0	219.8	0.1098	0.1102	608	1	-0.0005
69.5	228.0	0.1140	0.1134	613	1	0.0004
72.0	236.2	0.1166	0.1166	617	1	-0.0002
74.5	244.4	0.1200	0.1199	621	1	-0.0001
77.0	252.6	0.1234	0.1231	625	1	0.0001
79.5	260.8	0.1266	0.1264	629	1	0.0001
82.0	269.0	0.1300	0.1296	633	1	0.0002
84.5	277.2	0.1330	0.1329	636	1	0.0000
87.0	285.4	0.1362	0.1361	639	1	-0.0001
89.5	293.6	0.1394	0.1394	642	1	-0.0001

dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	2.0	357	342	374	6.6	6.6	1173	1123	1227
7.0	5.0	362	351	374	23.0	16.4	1188	1153	1226
24.0	17.0	615	604	627	78.7	55.8	2019	1983	2056
38.0	14.0	600	589	612	124.7	45.9	1970	1934	2008
65.0	27.0	726	718	734	213.3	88.6	2380	2354	2407
89.5	24.5	770	759	781	293.6	80.4	2527	2491	2564

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-4. P-wave arrival times and velocity summaries.

Location: Jensen Generator Building Coordinates: 34.31300 118.49830 Hole_Code: 278
hoffset = 4.00 travel-time file: jgbp.tt

nlayers = 4

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)
2.0	6.6	0.0062	0.0028	706	1	-0.0001
4.5	14.8	0.0104	0.0075	598	1	0.0004
7.0	23.0	0.0134	0.0122	574	1	-0.0006
9.5	31.2	0.0160	0.0146	651	1	0.0003
12.0	39.4	0.0182	0.0170	706	1	0.0004
14.5	47.6	0.0204	0.0194	747	1	0.0003
17.0	55.8	0.0224	0.0218	780	1	0.0001
19.5	64.0	0.0236	0.0230	849	1	0.0002
22.0	72.2	0.0242	0.0241	912	1	-0.0002
24.5	80.4	0.0256	0.0253	969	1	0.0001
27.0	88.6	0.0264	0.0265	1021	1	-0.0003
29.5	96.8	0.0278	0.0276	1068	1	0.0000
32.0	105.0	0.0288	0.0288	1112	1	-0.0002
34.5	113.2	0.0306	0.0299	1152	1	0.0005
37.0	121.4	0.0310	0.0311	1189	1	-0.0002
39.5	129.6	0.0320	0.0323	1224	1	-0.0004
42.0	137.8	0.0332	0.0334	1256	1	-0.0004
44.5	146.0	0.0346	0.0346	1286	1	-0.0001
47.0	154.2	0.0362	0.0358	1314	1	0.0003
49.5	162.4	0.0376	0.0369	1341	1	0.0006
52.0	170.6	0.0378	0.0381	1365	1	-0.0004
54.5	178.8	0.0396	0.0392	1389	1	0.0003
57.0	187.0	0.0406	0.0404	1410	1	0.0001
59.5	195.2	0.0414	0.0416	1431	1	-0.0002
62.0	203.4	0.0424	0.0427	1451	1	-0.0004
64.5	211.6	0.0436	0.0439	1469	1	-0.0004
67.0	219.8	0.0442	0.0451	1487	1	-0.0009
69.5	228.0	0.0466	0.0462	1503	1	0.0003
72.0	236.2	0.0478	0.0474	1519	1	0.0004
74.5	244.4	0.0484	0.0486	1534	1	-0.0002
77.0	252.6	0.0498	0.0497	1549	1	0.0000
79.5	260.8	0.0510	0.0509	1563	1	0.0001
82.0	269.0	0.0524	0.0520	1576	1	0.0003
84.5	277.2	0.0542	0.0532	1588	1	0.0009
87.0	285.4	0.0544	0.0544	1600	1	0.0000
89.5	293.6	0.0552	0.0555	1612	1	-0.0004

dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	2.0	706	666	750	6.6	6.6	2315	2186	2460
7.0	5.0	534	515	553	23.0	16.4	1751	1690	1816
17.0	10.0	1042	1010	1076	55.8	32.8	3418	3312	3531
89.5	72.5	2150	2135	2164	293.6	237.9	7052	7004	7101

Explanation:

d(m) = depth in meters
d(ft) = depth in feet
tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
tvrt(s) = vertical travel time computed from the model
vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
sig = sigma, standard deviation normalized to the standard deviation of best picks
rsdl(sec)= residual (observed - fitted travel time), in secs
dtb(m) = depth to bottom of layer in meters
thk(m) = thickness of layer in meters
v(m/s) = velocity of layer in meters per second
vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
vu(m/s) = upper limit of velocity in meters per second
dtb(ft) = depth to bottom of layer in feet
thk(ft) = thickness of layer in feet
v(ft/s) = velocity of layer in feet per second
vl(ft/s) = lower limit of velocity in feet per second
vu(ft/s) = upper limit of velocity in feet per second

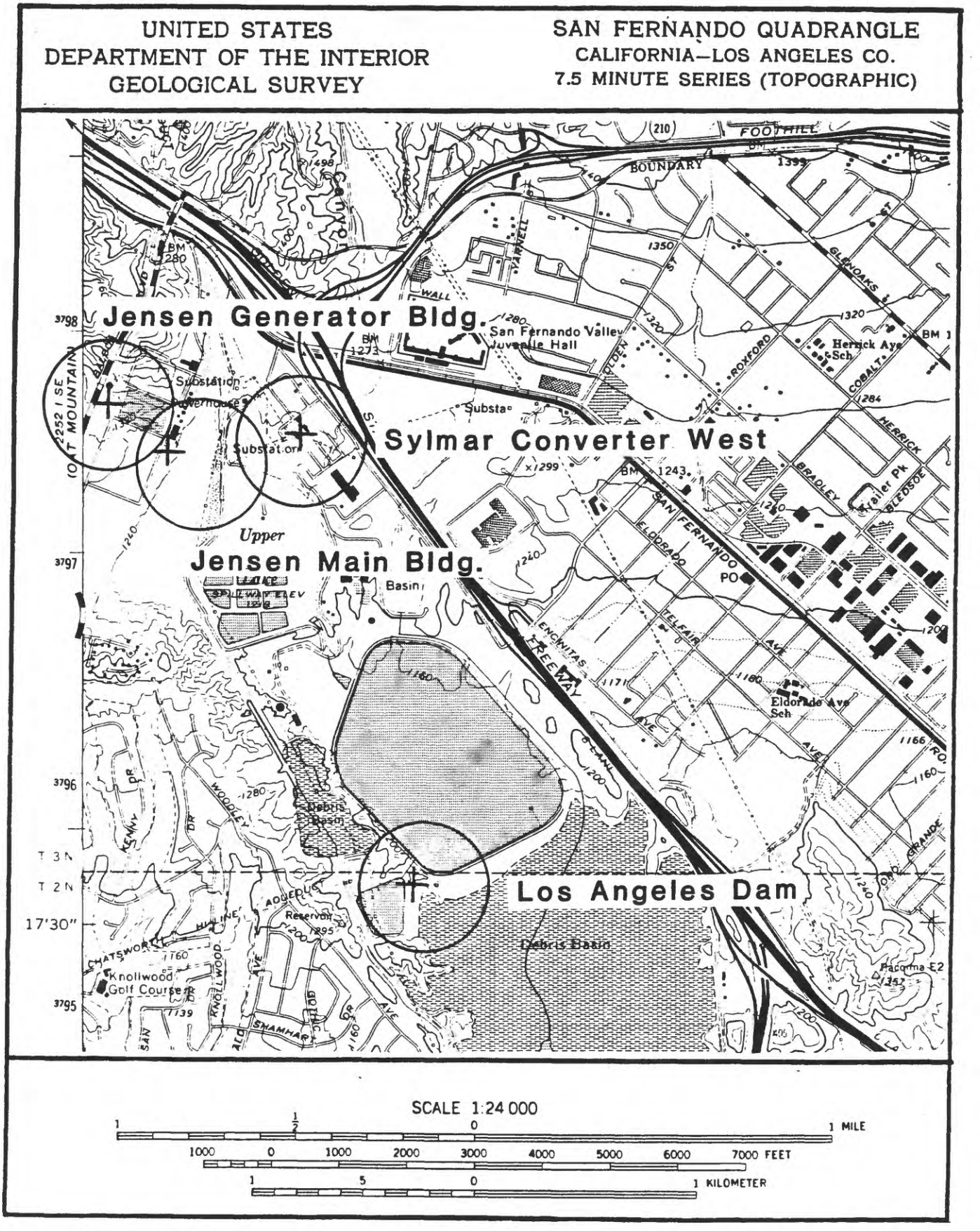

Figure A-11. Site location map for the borehole at Jensen Main Building. The accelerograph is located approximately 40 meters from the borehole.

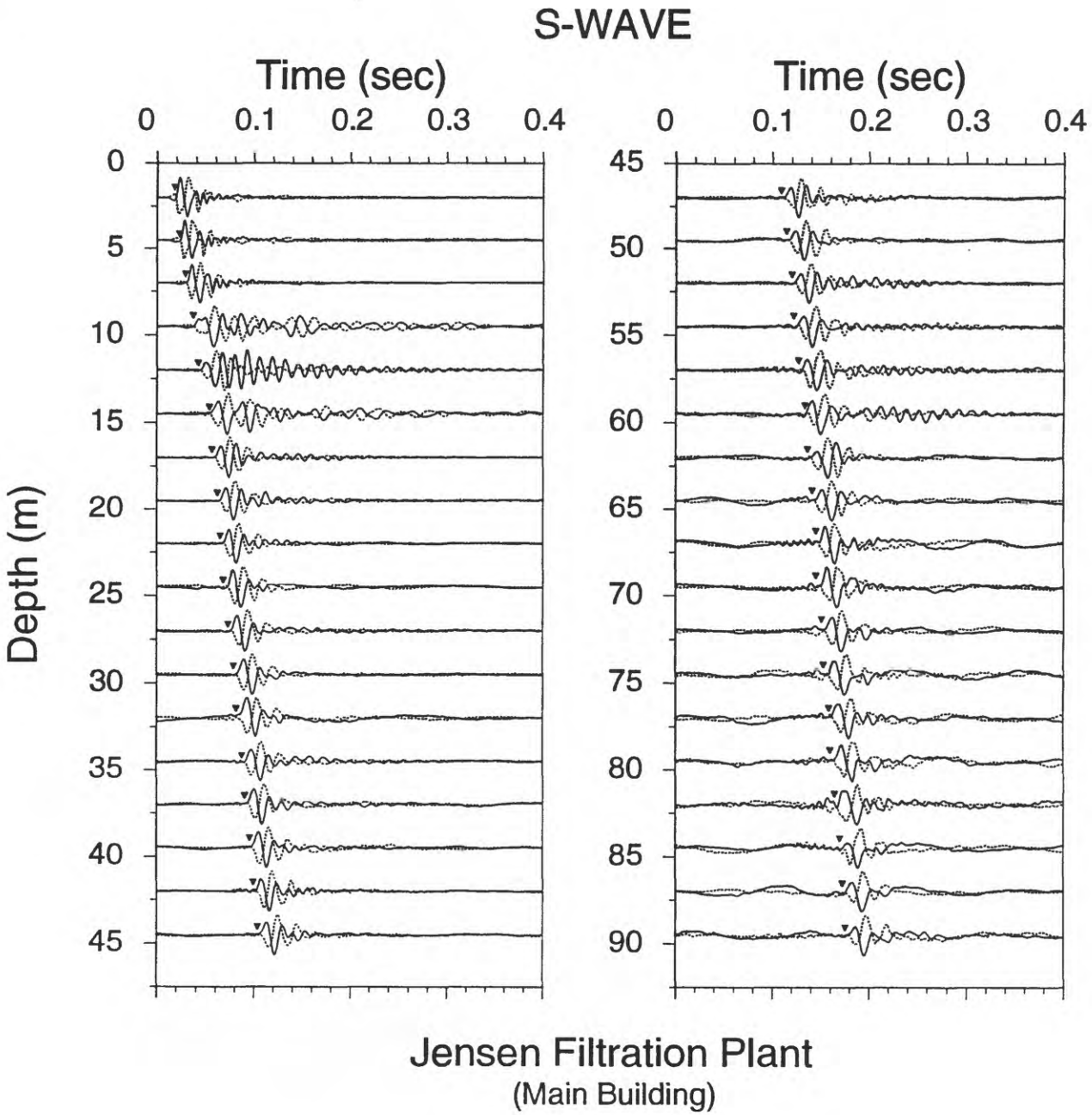

Figure A-12. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

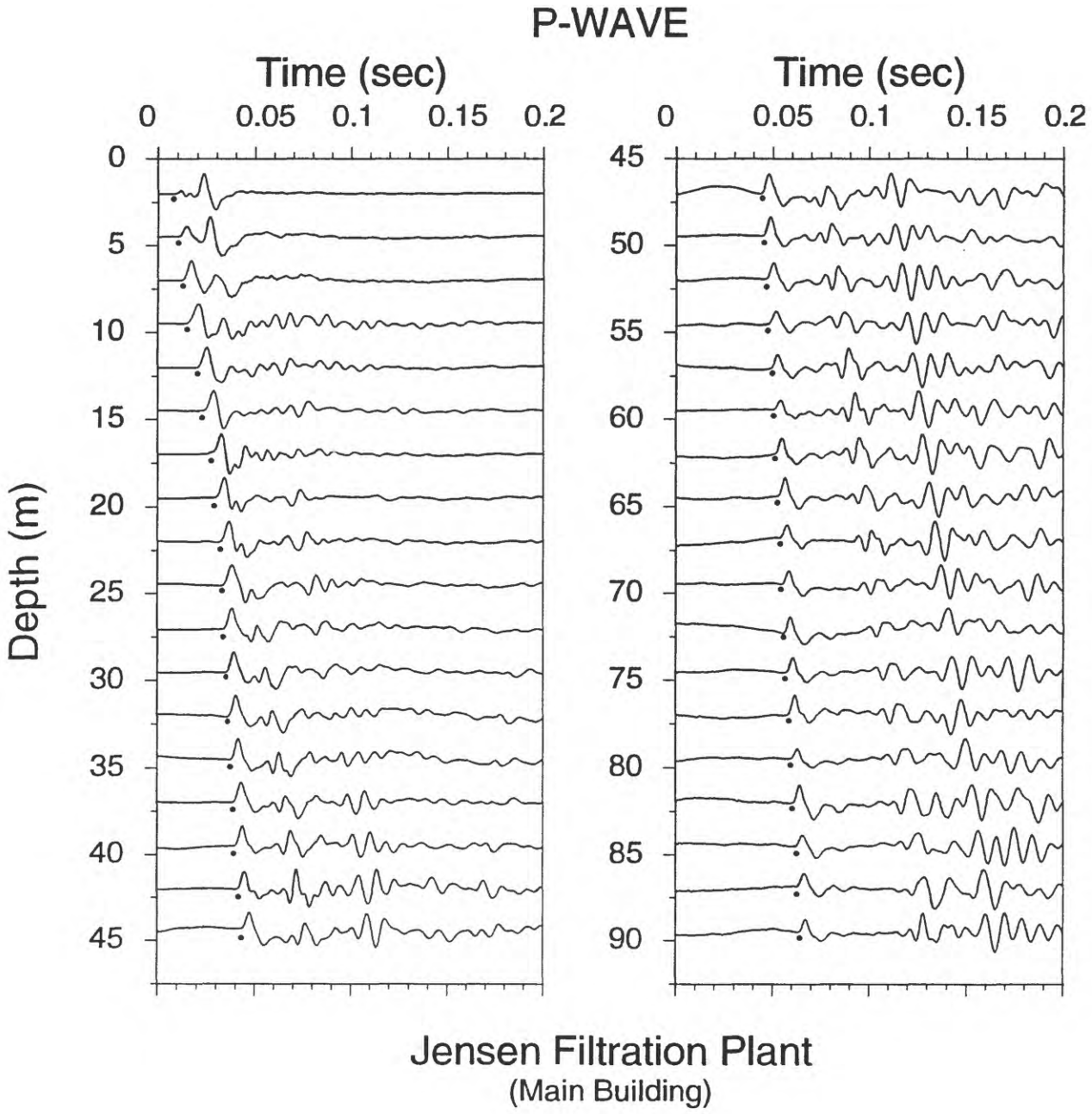

Figure A-13. Vertical component record section. Approximate P-wave arrivals are indicated by the solid circles.

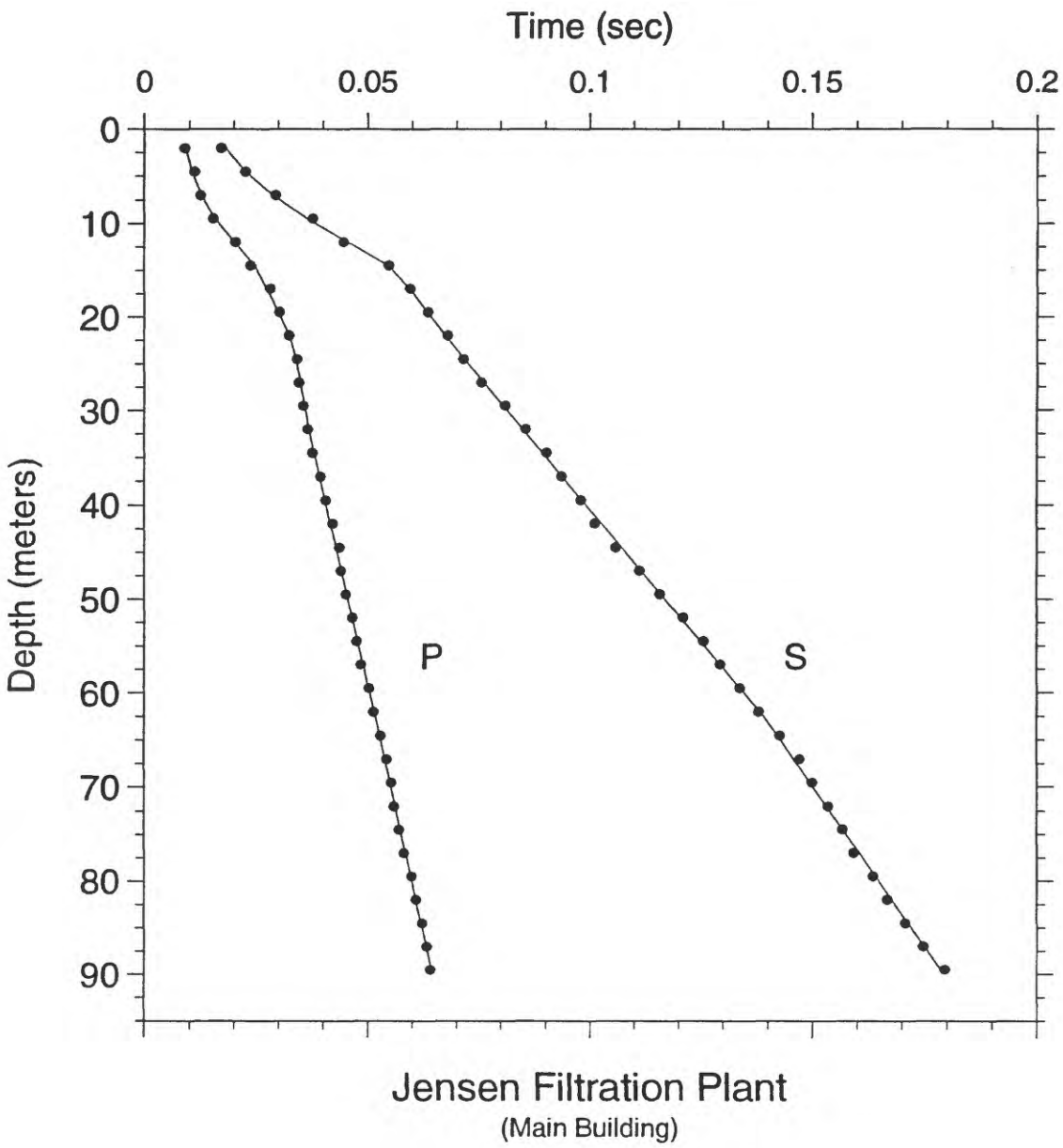

Figure A-14. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

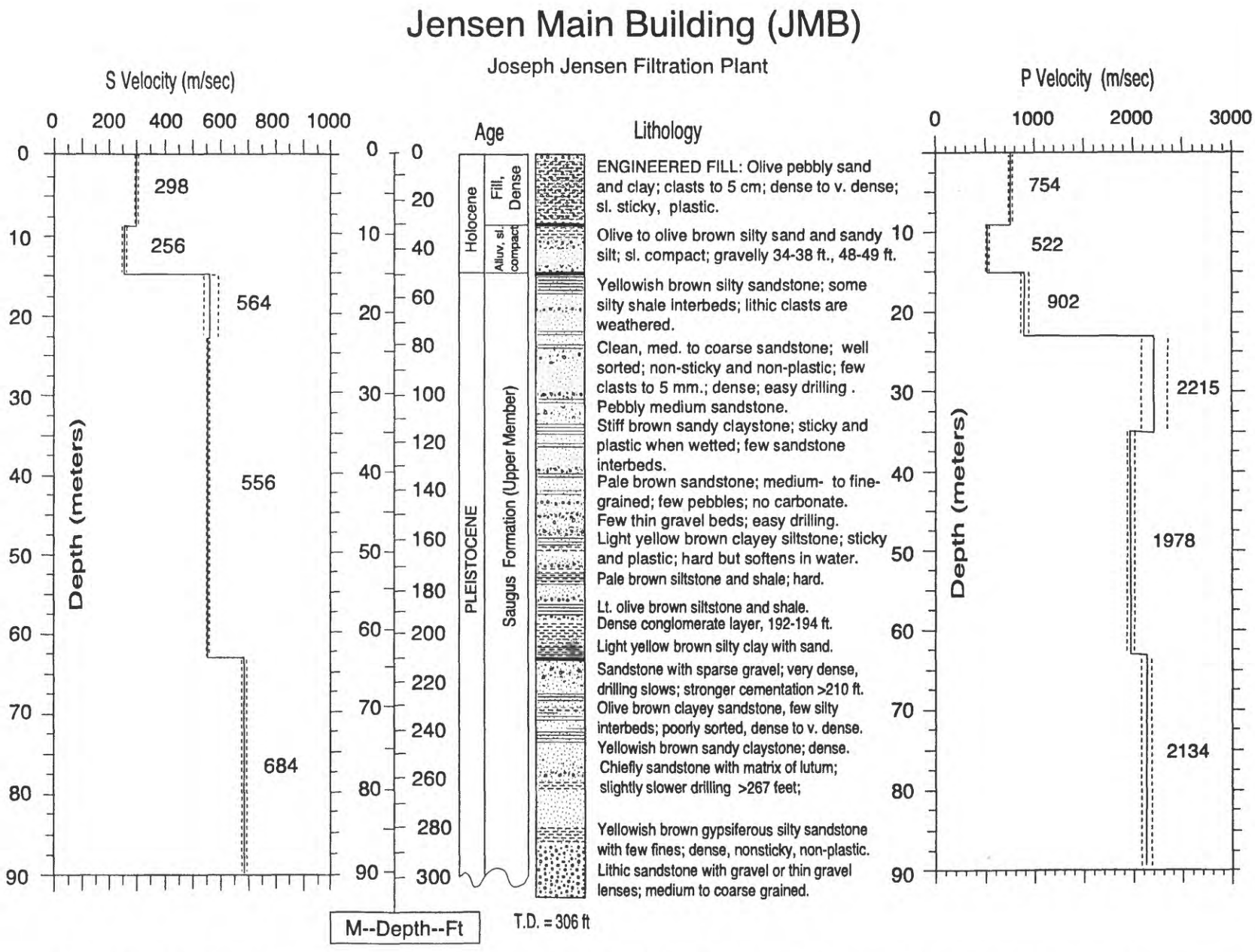

Figure A-15. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-5. S-wave arrival times and velocity summaries.

Location: Jensen Main Building Coordinates: 34.31110 118.49570 Hole_Code: 277
hoffset = 5.00 travel-time file: JMBS.TT
nlayers = 5

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0172	0.0067	298	1	-0.0009	9.0	9.0	298	294	303	29.5	29.5	979	965	993
4.5	14.8	0.0226	0.0151	298	1	0.0000	15.0	6.0	256	248	264	49.2	19.7	839	814	865
7.0	23.0	0.0294	0.0235	298	1	0.0006	23.0	8.0	564	541	588	75.5	26.2	1850	1776	1931
9.5	31.2	0.0376	0.0321	296	2	0.0013	63.0	40.0	556	553	560	206.7	131.2	1826	1814	1838
12.0	39.4	0.0446	0.0419	286	1	-0.0008	89.5	26.5	684	675	695	293.6	86.9	2246	2213	2279
14.5	47.6	0.0548	0.0517	281	1	0.0002										
17.0	55.8	0.0596	0.0572	297	1	0.0001										
19.5	64.0	0.0636	0.0616	317	1	0.0002										
22.0	72.2	0.0680	0.0660	333	1	0.0005										
24.5	80.4	0.0716	0.0705	347	1	-0.0002										
27.0	88.6	0.0756	0.0750	360	1	-0.0005										
29.5	96.8	0.0810	0.0795	371	1	0.0005										
32.0	105.0	0.0856	0.0840	381	1	0.0007										
34.5	113.2	0.0902	0.0885	390	1	0.0009										
37.0	121.4	0.0936	0.0930	398	1	-0.0001										
39.5	129.6	0.0980	0.0975	405	1	-0.0002										
42.0	137.8	0.1012	0.1020	412	1	-0.0014										
44.5	146.0	0.1058	0.1065	418	1	-0.0013										
47.0	154.2	0.1112	0.1109	424	1	-0.0003										
49.5	162.4	0.1158	0.1154	429	1	-0.0002										
52.0	170.6	0.1210	0.1199	434	1	0.0006										
54.5	178.8	0.1256	0.1244	438	2	0.0007										
57.0	187.0	0.1294	0.1289	442	2	0.0000										
59.5	195.2	0.1338	0.1334	446	2	0.0000										
62.0	203.4	0.1380	0.1379	450	1	-0.0003										
64.5	211.6	0.1428	0.1419	455	1	0.0005										
67.0	219.8	0.1472	0.1455	460	1	0.0013										
69.5	228.0	0.1500	0.1492	466	2	0.0005										
72.0	236.2	0.1536	0.1528	471	1	0.0004										
74.5	244.4	0.1568	0.1565	476	1	0.0000										
77.0	252.6	0.1592	0.1602	481	1	-0.0013										
79.5	260.8	0.1636	0.1638	485	1	-0.0005										
82.0	269.0	0.1668	0.1675	490	3	-0.0009										
84.5	277.2	0.1708	0.1711	494	3	-0.0006										
87.0	285.4	0.1748	0.1748	498	1	-0.0002										
89.5	293.6	0.1796	0.1784	502	1	0.0009										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-6. P-wave arrival times and velocity summaries.

Location: Jensen Main Building Coordinates: 34.31110 118.49570 Hole_Code: 277
hoffset = 6.60 travel-time file: jmbp.tt
nlayers = 6

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0090	0.0027	754	1	-0.0002	9.0	9.0	754	742	766	29.5	29.5	2473	2433	2514
4.5	14.8	0.0112	0.0060	754	1	0.0006	15.0	6.0	522	505	540	49.2	19.7	1712	1656	1771
7.0	23.0	0.0126	0.0093	754	1	-0.0002	23.0	8.0	902	861	948	75.5	26.2	2961	2826	3109
9.5	31.2	0.0154	0.0129	736	1	-0.0003	35.0	12.0	2215	2088	2357	114.8	39.4	7266	6852	7734
12.0	39.4	0.0204	0.0177	678	1	0.0003	63.0	28.0	1978	1940	2016	206.7	91.9	6488	6366	6614
14.5	47.6	0.0238	0.0225	645	1	-0.0008	89.5	26.5	2134	2083	2186	293.6	86.9	7000	6835	7173
17.0	55.8	0.0282	0.0257	663	1	0.0008										
19.5	64.0	0.0302	0.0284	686	1	0.0003										
22.0	72.2	0.0324	0.0312	705	1	-0.0001										
24.5	80.4	0.0342	0.0330	743	1	0.0002										
27.0	88.6	0.0346	0.0341	791	1	-0.0003										
29.5	96.8	0.0356	0.0352	837	1	-0.0003										
32.0	105.0	0.0366	0.0364	880	1	-0.0003										
34.5	113.2	0.0376	0.0375	920	1	-0.0004										
37.0	121.4	0.0394	0.0387	955	1	0.0002										
39.5	129.6	0.0406	0.0400	987	1	0.0002										
42.0	137.8	0.0422	0.0413	1018	1	0.0006										
44.5	146.0	0.0436	0.0425	1046	1	0.0007										
47.0	154.2	0.0440	0.0438	1073	1	-0.0001										
49.5	162.4	0.0452	0.0451	1099	1	-0.0002										
52.0	170.6	0.0466	0.0463	1123	1	0.0000										
54.5	178.8	0.0476	0.0476	1145	1	-0.0002										
57.0	187.0	0.0486	0.0489	1167	1	-0.0005										
59.5	195.2	0.0504	0.0501	1187	1	0.0001										
62.0	203.4	0.0514	0.0514	1207	1	-0.0002										
64.5	211.6	0.0530	0.0526	1227	1	0.0002										
67.0	219.8	0.0544	0.0538	1246	1	0.0004										
69.5	228.0	0.0554	0.0549	1265	1	0.0003										
72.0	236.2	0.0560	0.0561	1283	1	-0.0003										
74.5	244.4	0.0572	0.0573	1301	1	-0.0002										
77.0	252.6	0.0582	0.0584	1317	1	-0.0004										
79.5	260.8	0.0600	0.0596	1334	1	0.0002										
82.0	269.0	0.0610	0.0608	1349	1	0.0001										
84.5	277.2	0.0624	0.0620	1364	1	0.0003										
87.0	285.4	0.0634	0.0631	1378	1	0.0001										
89.5	293.6	0.0642	0.0643	1392	1	-0.0002										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

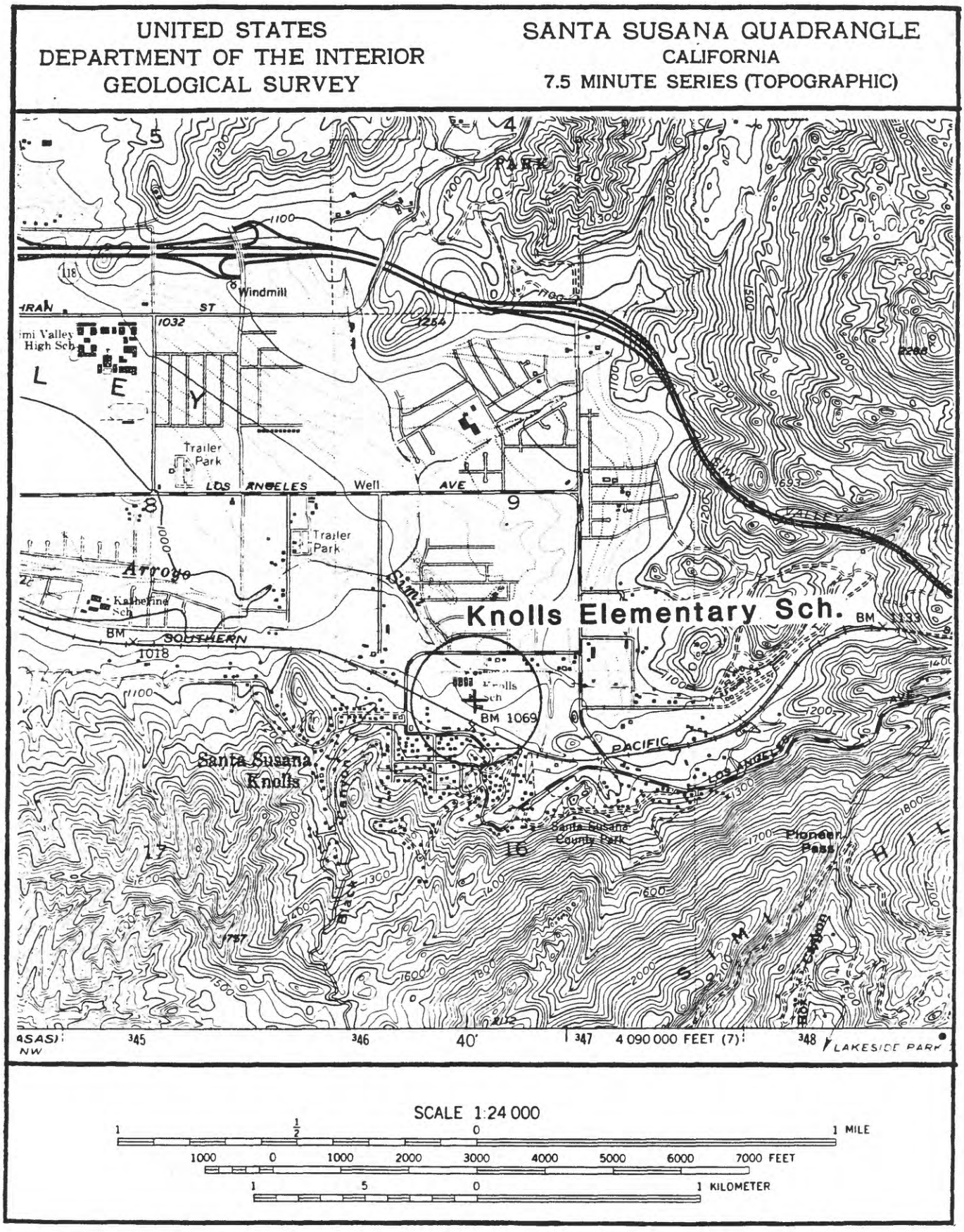

Figure A-16. Site location map for the borehole at Knolls Elementary School. The accelerograph is located approximately 25 meters from the borehole.

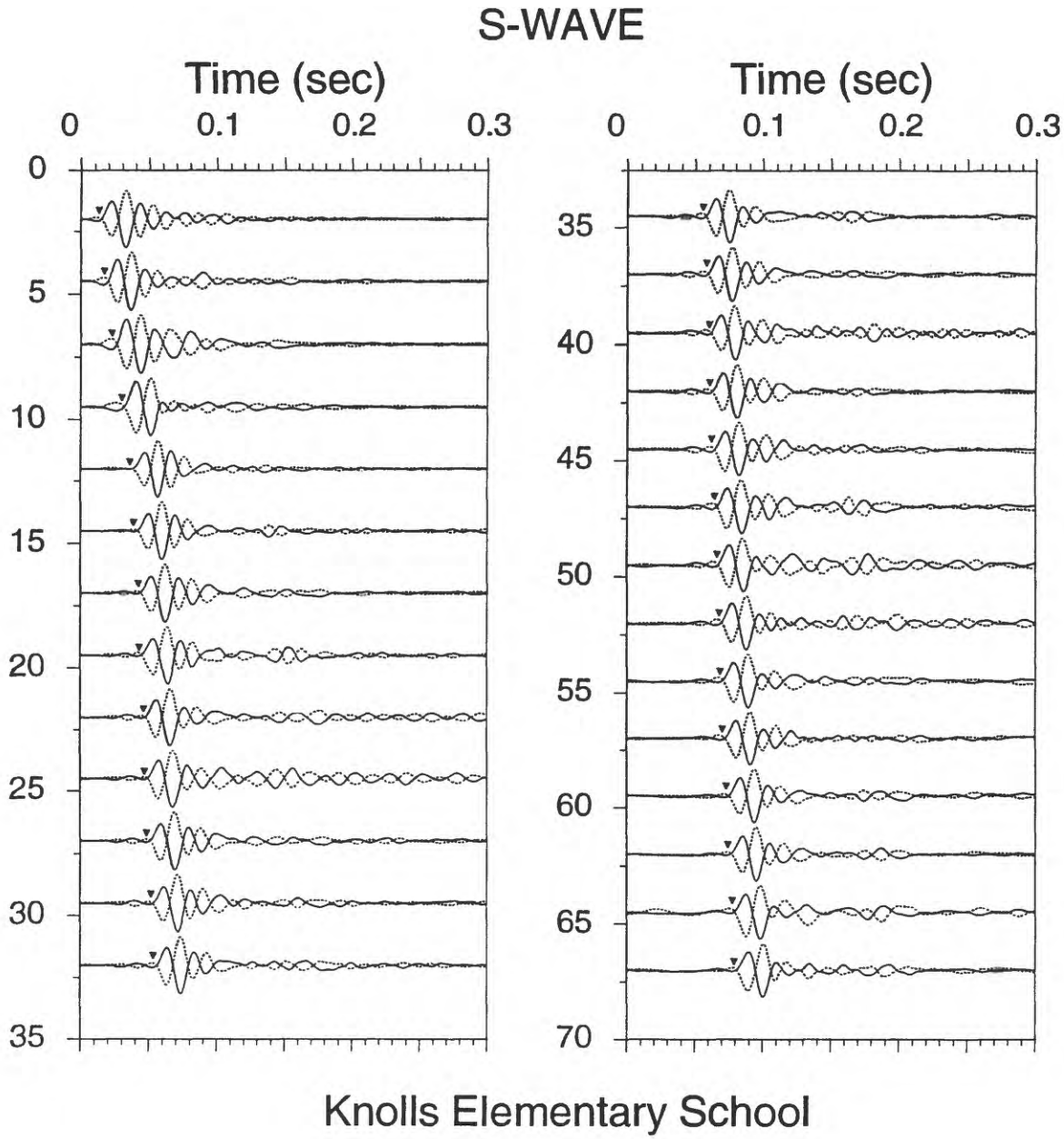

Figure A-17. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

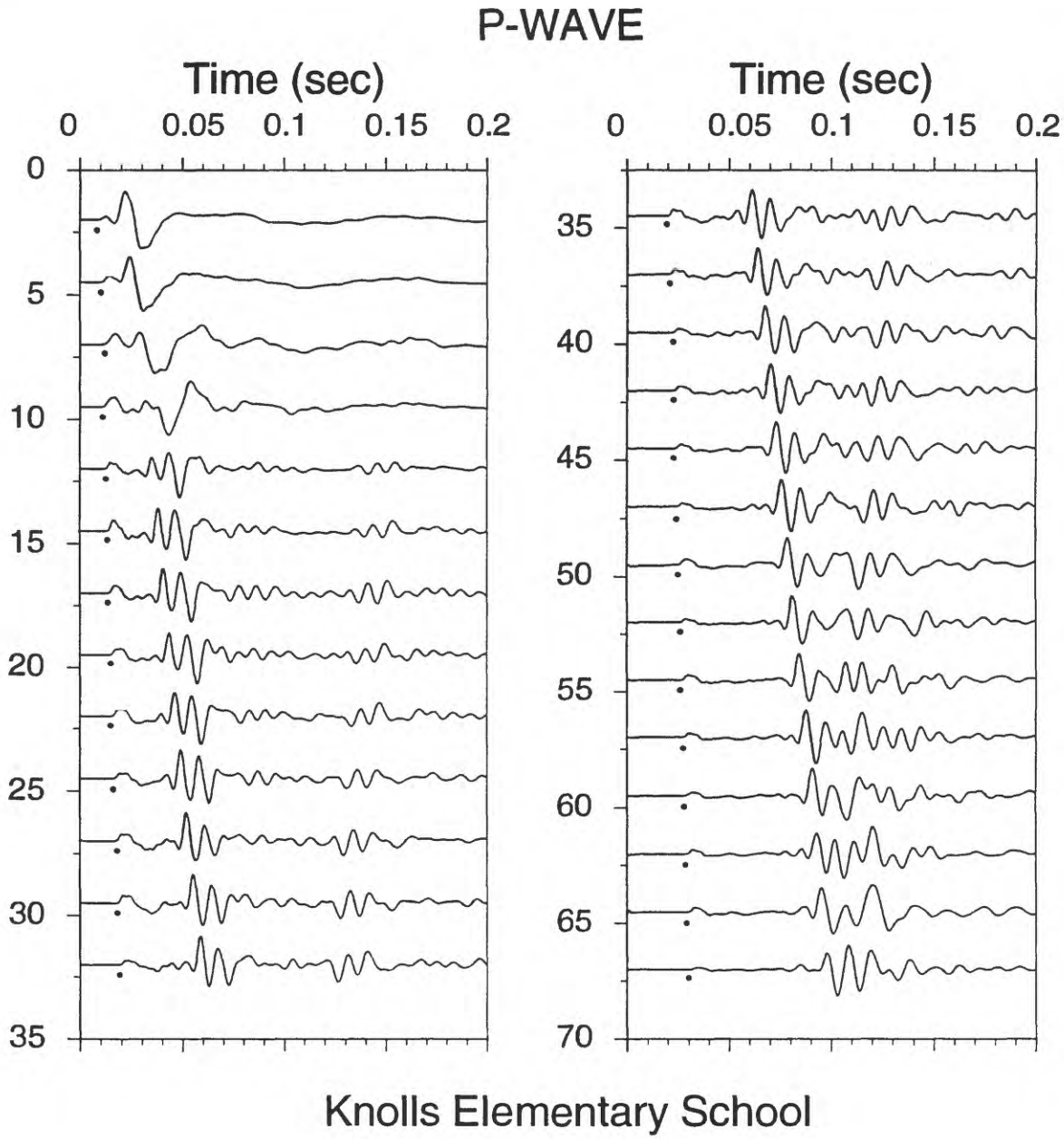

Figure A-18. Vertical component record section. Approximate P-wave arrivals are indicated by the solid circles.

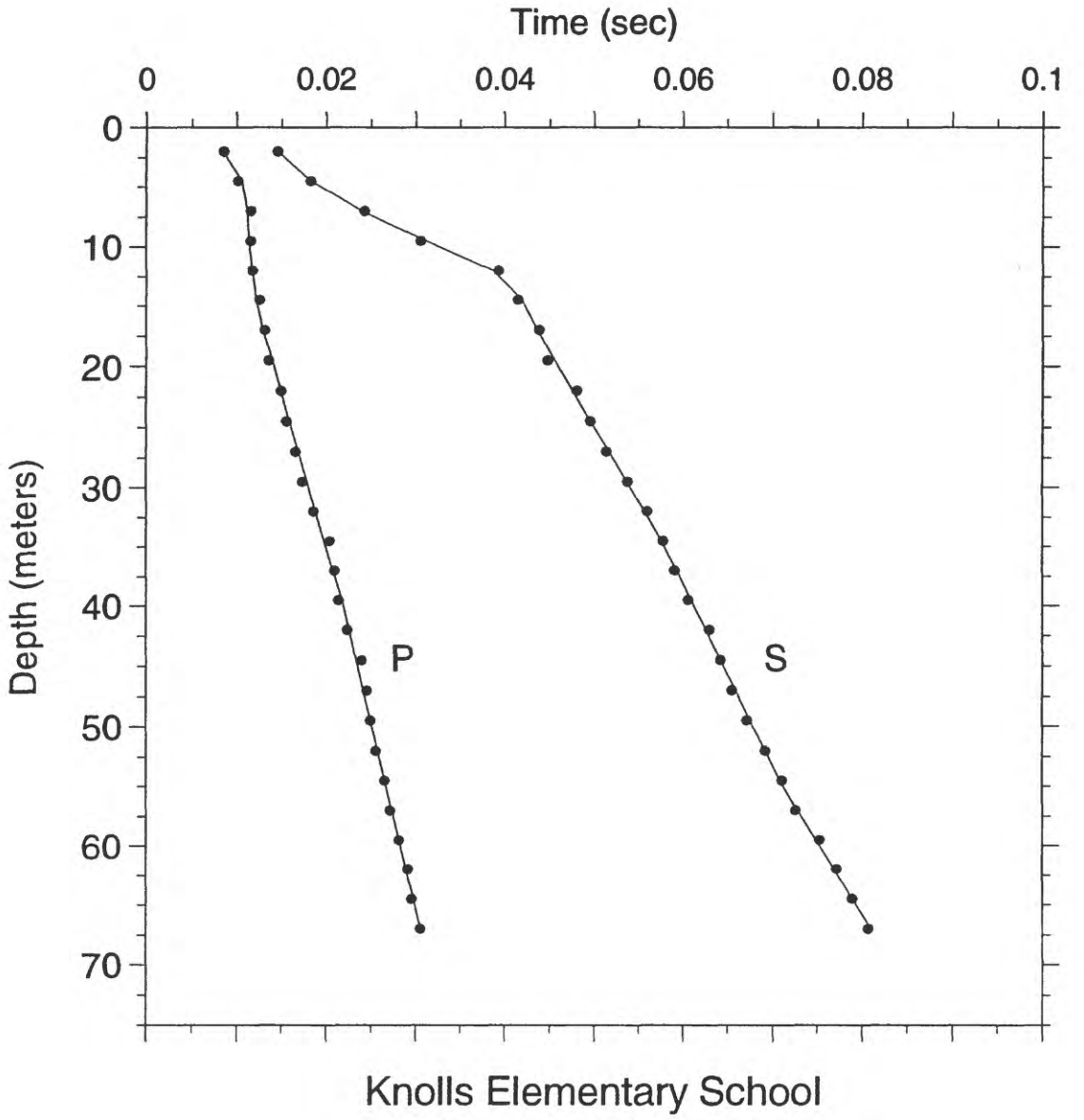

Figure A-19. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

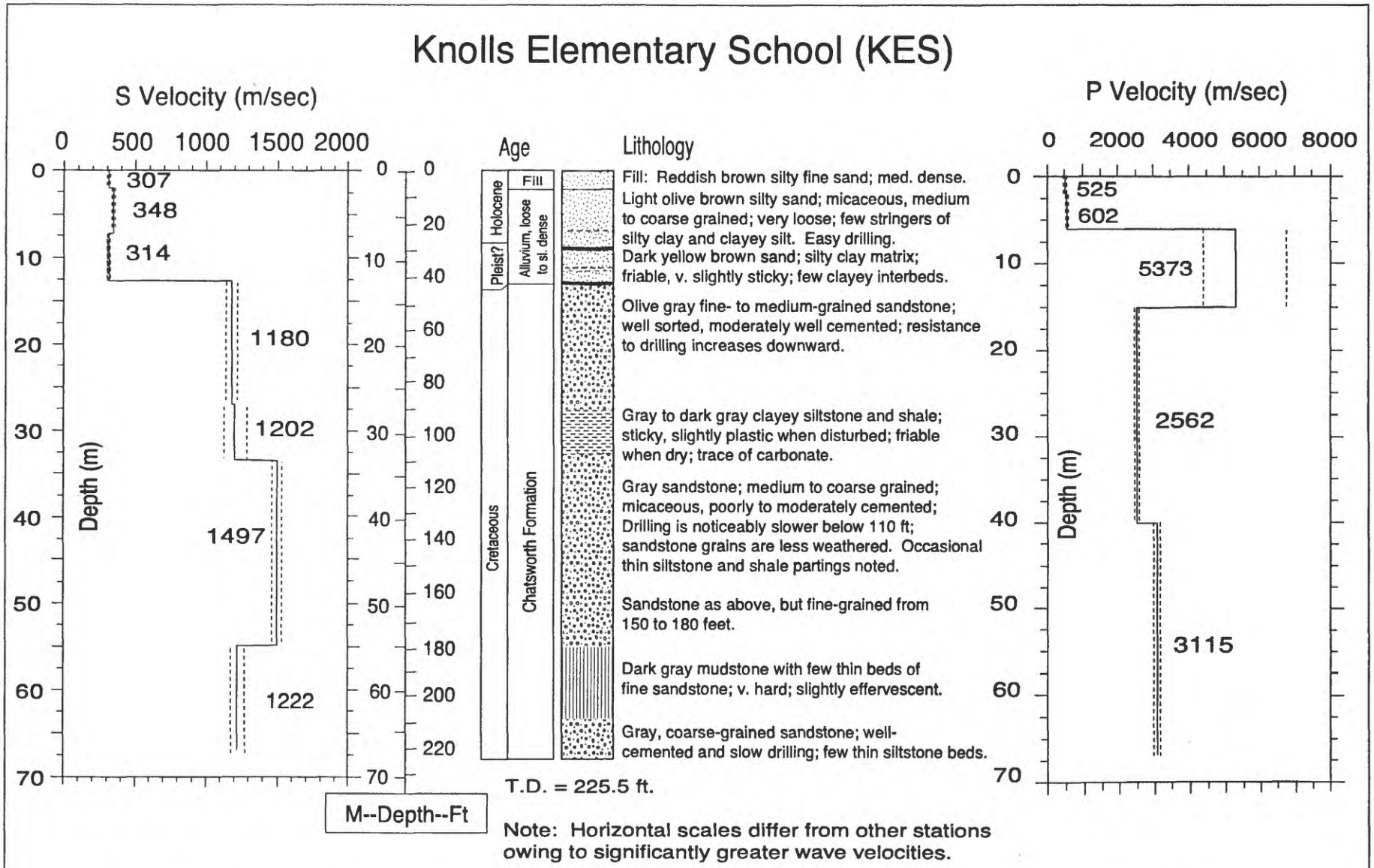

Figure A-20. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-7. S-wave arrival times and velocity summaries.

Location: Knolls Elementary School Coordinates: 34.26330 118.66640 Hole_Code: 274
hoffset = 4.00 travel-time file: KESS.TT
nlayers = 7

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0146	0.0065	307	1	0.0000	2.0	2.0	307	300	316	6.6	6.6	1009	983	1035
4.5	14.8	0.0183	0.0137	329	1	0.0000	7.3	5.3	348	340	356	24.0	17.4	1141	1116	1167
7.0	23.0	0.0243	0.0209	335	1	0.0003	12.8	5.5	314	307	322	42.0	18.0	1030	1006	1056
9.5	31.2	0.0306	0.0288	330	1	-0.0006	27.0	14.2	1180	1141	1222	88.6	46.6	3872	3743	4009
12.0	39.4	0.0393	0.0367	327	1	0.0006	33.5	6.5	1202	1130	1285	109.9	21.3	3945	3708	4215
14.5	47.6	0.0415	0.0407	356	1	-0.0004	55.0	21.5	1497	1462	1534	180.4	70.5	4911	4795	5033
17.0	55.8	0.0439	0.0428	397	1	0.0003	67.5	12.5	1222	1176	1272	221.5	41.0	4008	3857	4172
19.5	64.0	0.0448	0.0449	434	1	-0.0007										
22.0	72.2	0.0481	0.0471	468	1	0.0006										
24.5	80.4	0.0496	0.0492	498	1	0.0000										
27.0	88.6	0.0514	0.0513	526	1	-0.0002										
29.5	96.8	0.0538	0.0534	553	1	0.0001										
32.0	105.0	0.0560	0.0555	577	1	0.0002										
34.5	113.2	0.0578	0.0574	601	1	0.0001										
37.0	121.4	0.0591	0.0590	627	1	-0.0002										
39.5	129.6	0.0606	0.0607	651	1	-0.0003										
42.0	137.8	0.0630	0.0624	673	1	0.0004										
44.5	146.0	0.0642	0.0640	695	1	0.0000										
47.0	154.2	0.0655	0.0657	715	1	-0.0003										
49.5	162.4	0.0672	0.0674	735	1	-0.0003										
52.0	170.6	0.0692	0.0691	753	1	0.0000										
54.5	178.8	0.0711	0.0707	771	1	0.0002										
57.0	187.0	0.0726	0.0727	784	1	-0.0002										
59.5	195.2	0.0753	0.0747	796	1	0.0004										
62.0	203.4	0.0772	0.0768	807	1	0.0003										
64.5	211.6	0.0789	0.0788	818	1	0.0000										
67.0	219.8	0.0807	0.0809	828	1	-0.0003										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-8. P-wave arrival times and velocity summaries.

Location: Knolls Elementary School Coordinates: 34.26330 118.66640 Hole_Code: 274
hoffset = 4.00 travel-time file: KESP.TT
nlayers = 5

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)
2.0	6.6	0.0086	0.0038	525	1	0.0001
4.5	14.8	0.0102	0.0080	565	1	-0.0004
7.0	23.0	0.0116	0.0106	658	1	0.0004
9.5	31.2	0.0116	0.0111	855	1	0.0002
12.0	39.4	0.0118	0.0116	1037	1	0.0000
14.5	47.6	0.0126	0.0120	1205	1	0.0004
17.0	55.8	0.0132	0.0129	1317	1	0.0002
19.5	64.0	0.0136	0.0139	1404	1	-0.0004
22.0	72.2	0.0150	0.0149	1480	1	0.0000
24.5	80.4	0.0156	0.0158	1547	1	-0.0003
27.0	88.6	0.0166	0.0168	1606	1	-0.0003
29.5	96.8	0.0174	0.0178	1658	1	-0.0005
32.0	105.0	0.0186	0.0188	1705	1	-0.0002
34.5	113.2	0.0204	0.0197	1748	1	0.0006
37.0	121.4	0.0210	0.0207	1786	1	0.0002
39.5	129.6	0.0214	0.0217	1821	1	-0.0004
42.0	137.8	0.0224	0.0225	1864	1	-0.0002
44.5	146.0	0.0240	0.0233	1907	1	0.0006
47.0	154.2	0.0246	0.0241	1948	1	0.0004
49.5	162.4	0.0250	0.0249	1985	1	0.0000
52.0	170.6	0.0256	0.0257	2020	1	-0.0002
54.5	178.8	0.0266	0.0265	2053	1	0.0000
57.0	187.0	0.0272	0.0273	2085	1	-0.0002
59.5	195.2	0.0282	0.0281	2114	1	0.0000
62.0	203.4	0.0292	0.0289	2142	1	0.0002
64.5	211.6	0.0296	0.0298	2168	1	-0.0002
67.0	219.8	0.0306	0.0306	2193	2	0.0000

dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	2.0	525	505	546	6.6	6.6	1722	1657	1793
6.0	4.0	602	572	635	19.7	13.1	1975	1878	2083
15.0	9.0	5373	4440	6804	49.2	29.5	17629	14566	22324
40.0	25.0	2562	2500	2628	131.2	82.0	8407	8202	8622
67.0	27.0	3115	3014	3222	219.8	88.6	10219	9889	10572

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

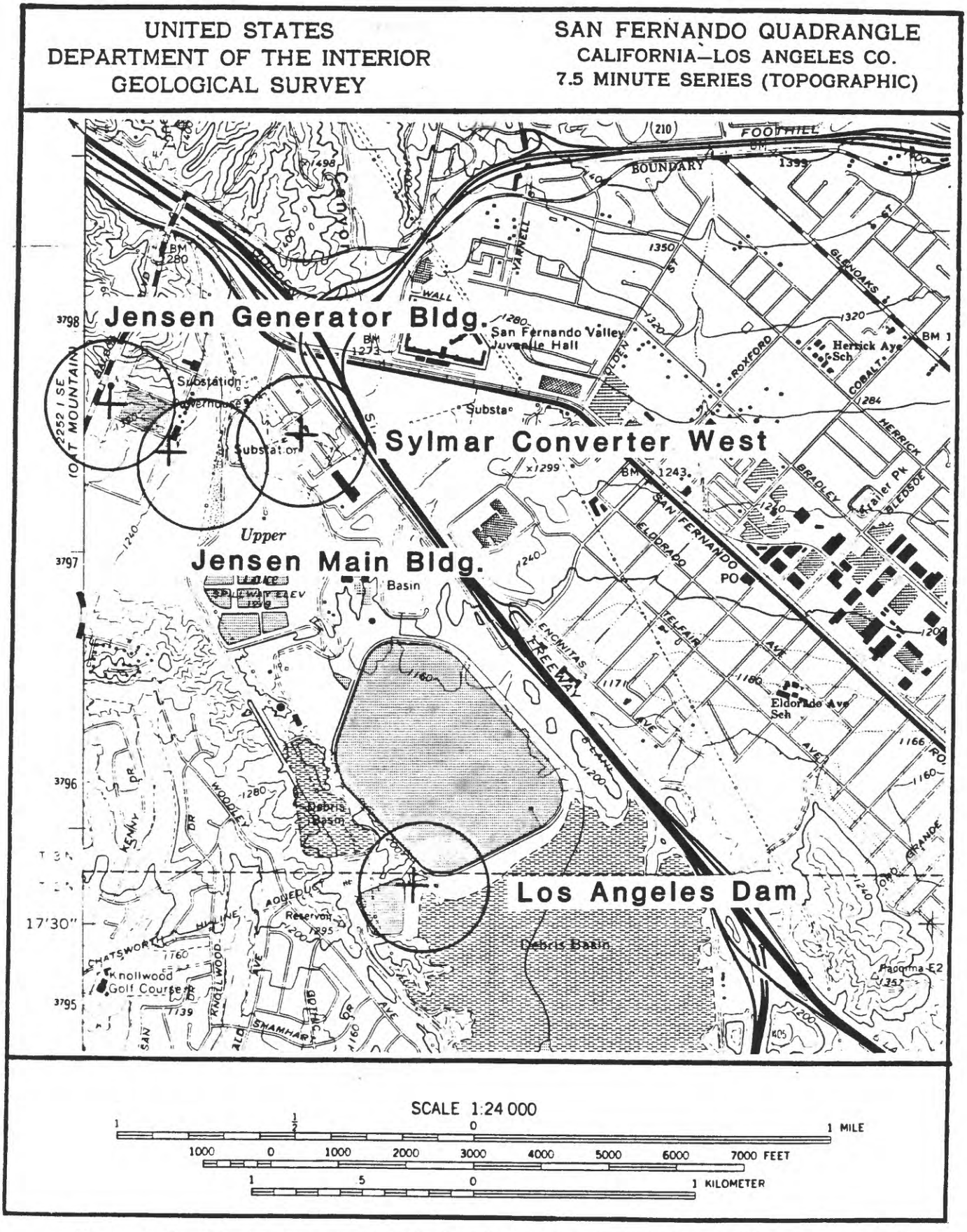

Figure A-21. Site location map for the borehole at Los Angeles Dam. The accelerograph is located approximately 35 meters from the borehole.

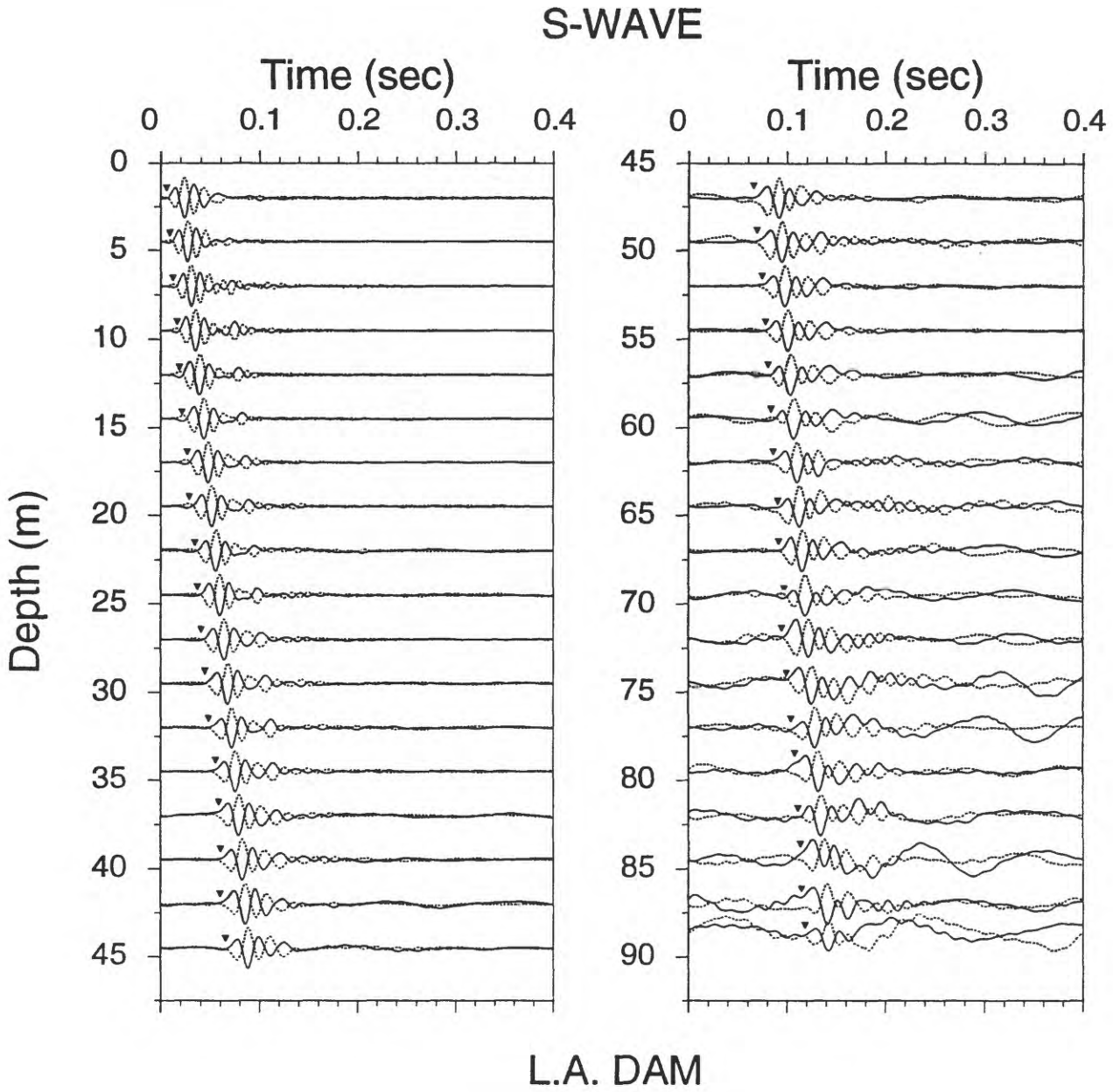

Figure A-22. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

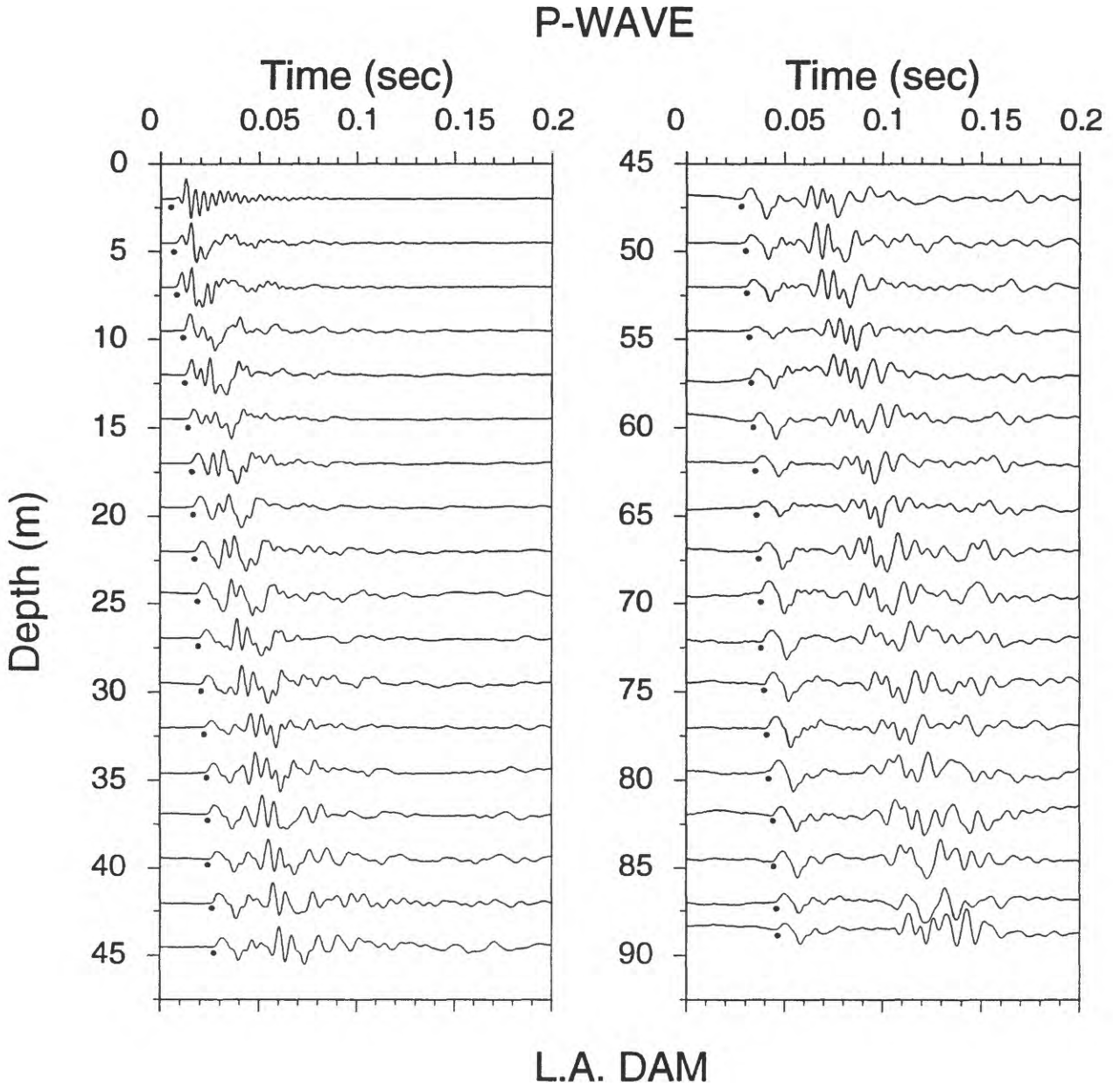

Figure A-23. Vertical component record section. Approximate P-wave arrivals are indicated by the solid circles.

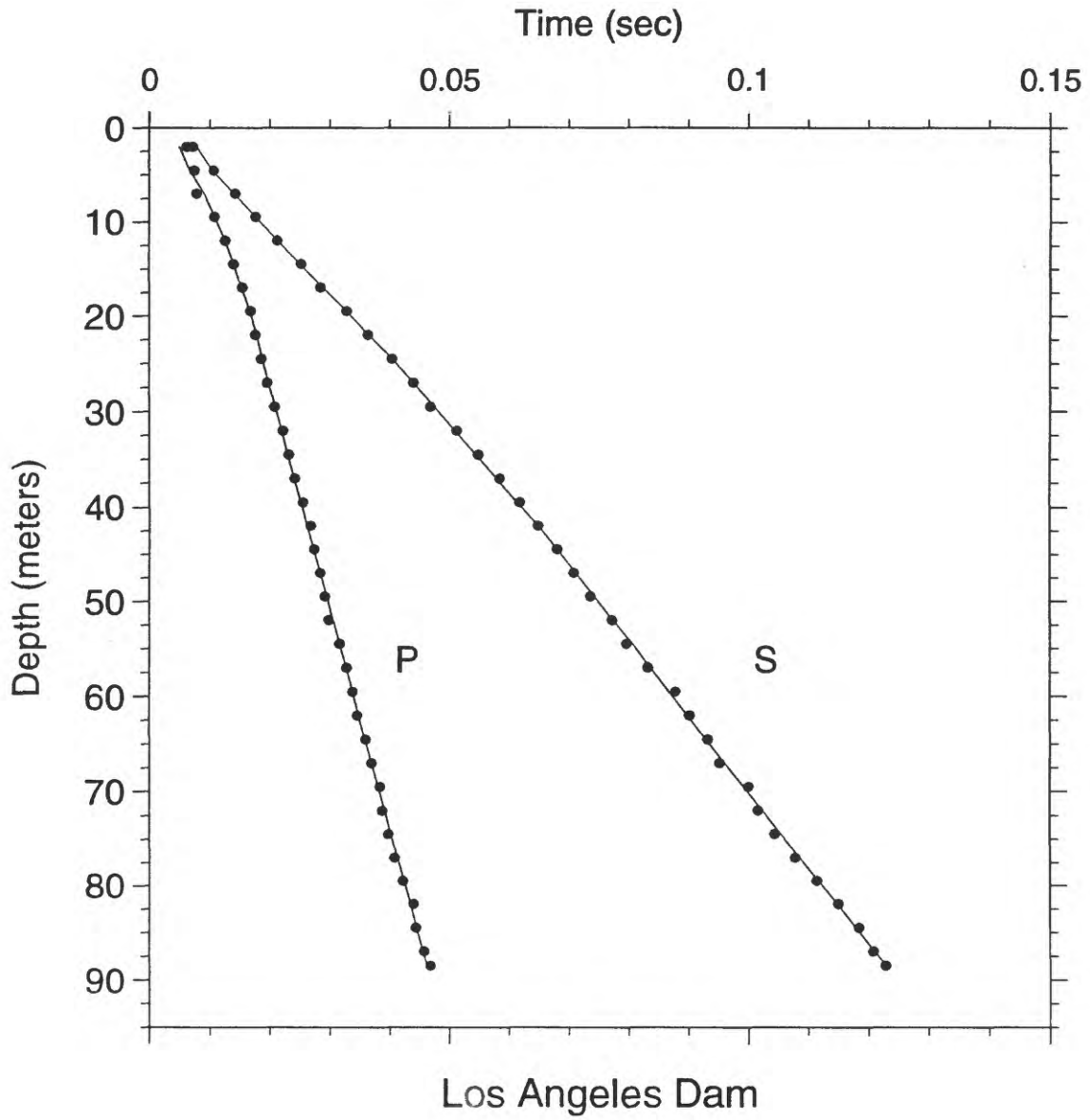

Figure A-24. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

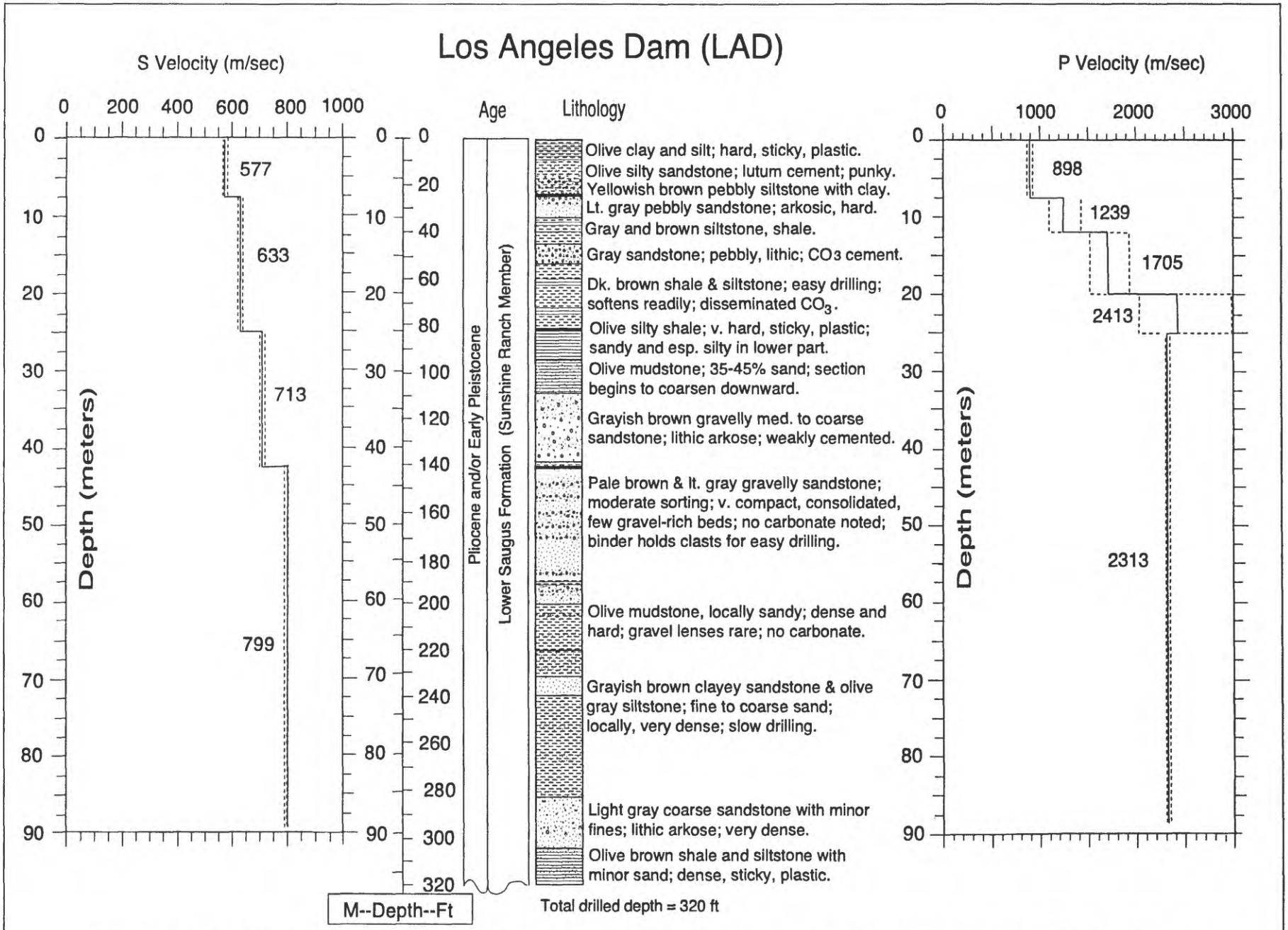

Figure A-25. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-9. S-wave arrival times and velocity summaries.

Location: Los Angeles Dam Coordinates: 34.29310 118.48390 Hole_Code: 273
hoffset = 4.00 travel-time file: lads.tt
nlayers = 4

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0072	0.0035	577	1	-0.0006	7.6	7.6	577	567	587	24.9	24.9	1891	1859	1925
4.5	14.8	0.0106	0.0078	577	1	0.0002	25.0	17.4	633	624	641	82.0	57.1	2075	2048	2103
7.0	23.0	0.0142	0.0121	577	1	0.0002	42.5	17.5	713	704	723	139.4	57.4	2340	2310	2371
9.5	31.2	0.0176	0.0162	587	1	0.0000	88.5	46.0	799	794	805	290.4	150.9	2623	2604	2642
12.0	39.4	0.0212	0.0201	596	1	0.0000										
14.5	47.6	0.0252	0.0241	602	1	0.0002										
17.0	55.8	0.0284	0.0280	606	1	-0.0004										
19.5	64.0	0.0328	0.0320	609	1	0.0001										
22.0	72.2	0.0364	0.0359	612	1	-0.0001										
24.5	80.4	0.0404	0.0399	614	1	0.0000										
27.0	88.6	0.0440	0.0435	621	1	0.0000										
29.5	96.8	0.0468	0.0470	628	1	-0.0006										
32.0	105.0	0.0512	0.0505	634	1	0.0003										
34.5	113.2	0.0548	0.0540	639	1	0.0004										
37.0	121.4	0.0584	0.0575	643	1	0.0005										
39.5	129.6	0.0618	0.0610	647	1	0.0005										
42.0	137.8	0.0648	0.0645	651	1	0.0000										
44.5	146.0	0.0680	0.0677	657	1	0.0000										
47.0	154.2	0.0708	0.0709	663	1	-0.0003										
49.5	162.4	0.0736	0.0740	669	1	-0.0006										
52.0	170.6	0.0772	0.0771	674	1	-0.0001										
54.5	178.8	0.0796	0.0802	679	1	-0.0009										
57.0	187.0	0.0832	0.0834	684	1	-0.0004										
59.5	195.2	0.0878	0.0865	688	1	0.0011										
62.0	203.4	0.0902	0.0896	692	1	0.0004										
64.5	211.6	0.0932	0.0927	695	1	0.0003										
67.0	219.8	0.0952	0.0959	699	1	-0.0008										
69.5	228.0	0.1000	0.0990	702	1	0.0008										
72.0	236.2	0.1016	0.1021	705	2	-0.0007										
74.5	244.4	0.1044	0.1053	708	2	-0.0010										
77.0	252.6	0.1078	0.1084	710	2	-0.0007										
79.5	260.8	0.1114	0.1115	713	2	-0.0002										
82.0	269.0	0.1150	0.1146	715	1	0.0002										
84.5	277.2	0.1184	0.1178	718	3	0.0005										
87.0	285.4	0.1208	0.1209	720	3	-0.0002										
88.5	290.4	0.1228	0.1228	721	3	-0.0001										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-10. P-wave arrival times and velocity summaries.

Location: Los Angeles Dam Coordinates: 34.29310 118.48390 Hole_Code: 273
hoffset = 4.00 travel-time file: ladp.tt
nlayers = 5

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)
2.0	6.6	0.0062	0.0022	898	1	0.0012
4.5	14.8	0.0074	0.0050	898	1	0.0007
7.0	23.0	0.0078	0.0078	898	1	-0.0012
9.5	31.2	0.0108	0.0100	950	1	0.0000
12.0	39.4	0.0126	0.0120	999	1	0.0000
14.5	47.6	0.0140	0.0135	1076	1	0.0000
17.0	55.8	0.0154	0.0149	1137	1	0.0001
19.5	64.0	0.0168	0.0164	1188	1	0.0001
22.0	72.2	0.0176	0.0175	1255	1	-0.0002
24.5	80.4	0.0186	0.0186	1319	1	-0.0002
27.0	88.6	0.0196	0.0196	1374	1	-0.0002
29.5	96.8	0.0208	0.0207	1423	1	-0.0001
32.0	105.0	0.0222	0.0218	1468	1	0.0002
34.5	113.2	0.0232	0.0229	1507	1	0.0002
37.0	121.4	0.0242	0.0240	1544	1	0.0001
39.5	129.6	0.0256	0.0250	1577	1	0.0004
42.0	137.8	0.0268	0.0261	1607	1	0.0006
44.5	146.0	0.0274	0.0272	1635	1	0.0001
47.0	154.2	0.0284	0.0283	1661	1	0.0000
49.5	162.4	0.0292	0.0294	1685	1	-0.0003
52.0	170.6	0.0298	0.0305	1708	1	-0.0007
54.5	178.8	0.0316	0.0315	1728	1	0.0000
57.0	187.0	0.0328	0.0326	1748	1	0.0001
59.5	195.2	0.0338	0.0337	1766	1	0.0000
62.0	203.4	0.0346	0.0348	1783	1	-0.0002
64.5	211.6	0.0360	0.0359	1799	1	0.0001
67.0	219.8	0.0370	0.0369	1814	1	0.0000
69.5	228.0	0.0384	0.0380	1828	1	0.0003
72.0	236.2	0.0388	0.0391	1841	1	-0.0004
74.5	244.4	0.0398	0.0402	1854	1	-0.0004
77.0	252.6	0.0408	0.0413	1866	1	-0.0005
79.5	260.8	0.0422	0.0423	1878	1	-0.0002
82.0	269.0	0.0440	0.0434	1888	1	0.0005
84.5	277.2	0.0444	0.0445	1899	1	-0.0001
87.0	285.4	0.0458	0.0456	1909	1	0.0002
88.5	290.4	0.0468	0.0462	1914	1	0.0005

dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
7.6	7.6	898	868	929	24.9	24.9	2946	2849	3049
12.0	4.4	1239	1098	1422	39.4	14.4	4066	3604	4664
20.0	8.0	1705	1532	1921	65.6	26.2	5593	5027	6303
25.0	5.0	2413	2032	2969	82.0	16.4	7915	6667	9740
88.5	63.5	2313	2290	2337	290.4	208.3	7589	7512	7666

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

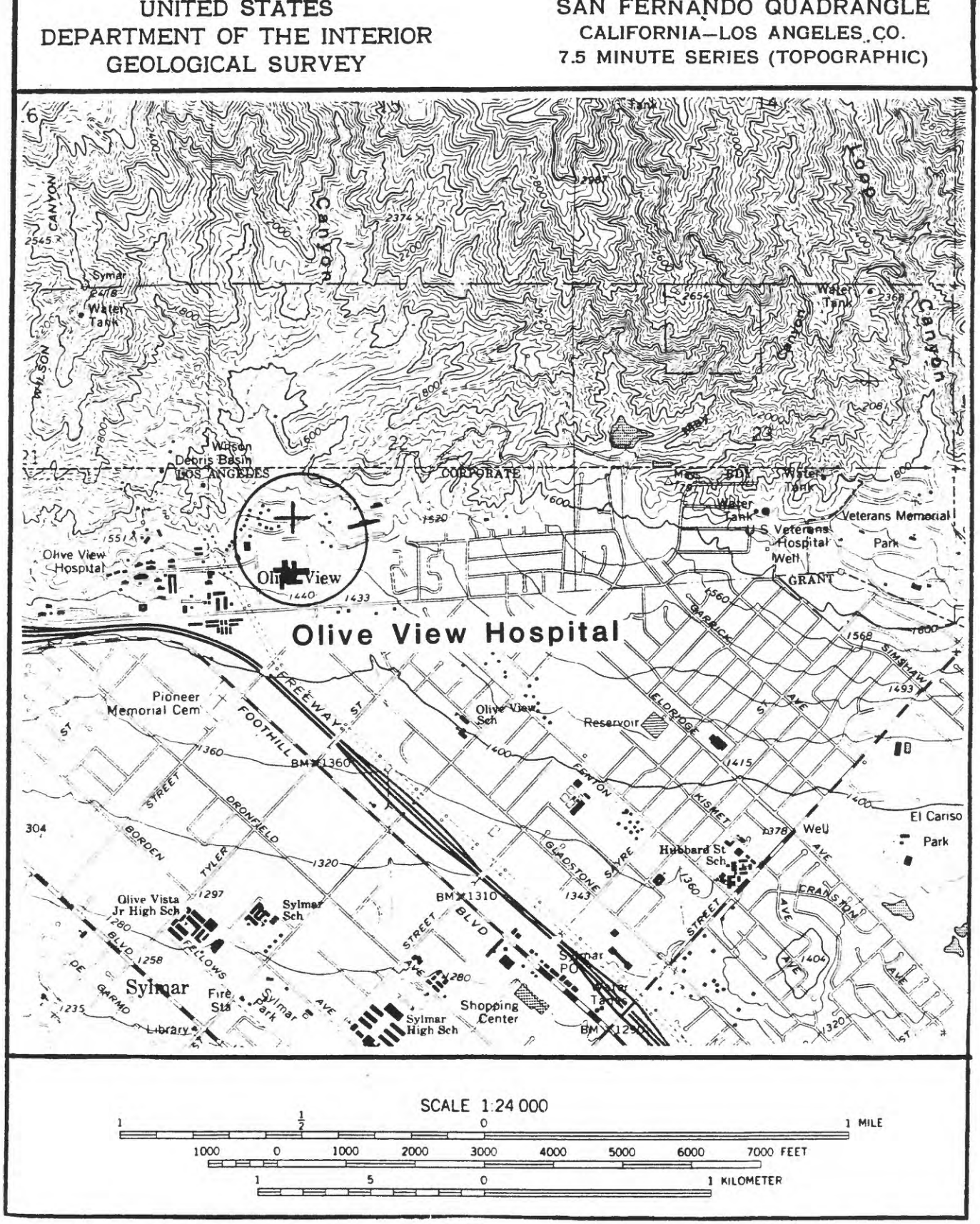

Figure A-26. Site location map for the borehole at Olive View Hospital. The accelerograph is located approximately 30 meters from the borehole. Another borehole near this site, "Oliveview" was published in USGS Open-File Report 82-833 and was located $\frac{1}{2}$ kilometer southwest from the Olive View Hospital site shown above.

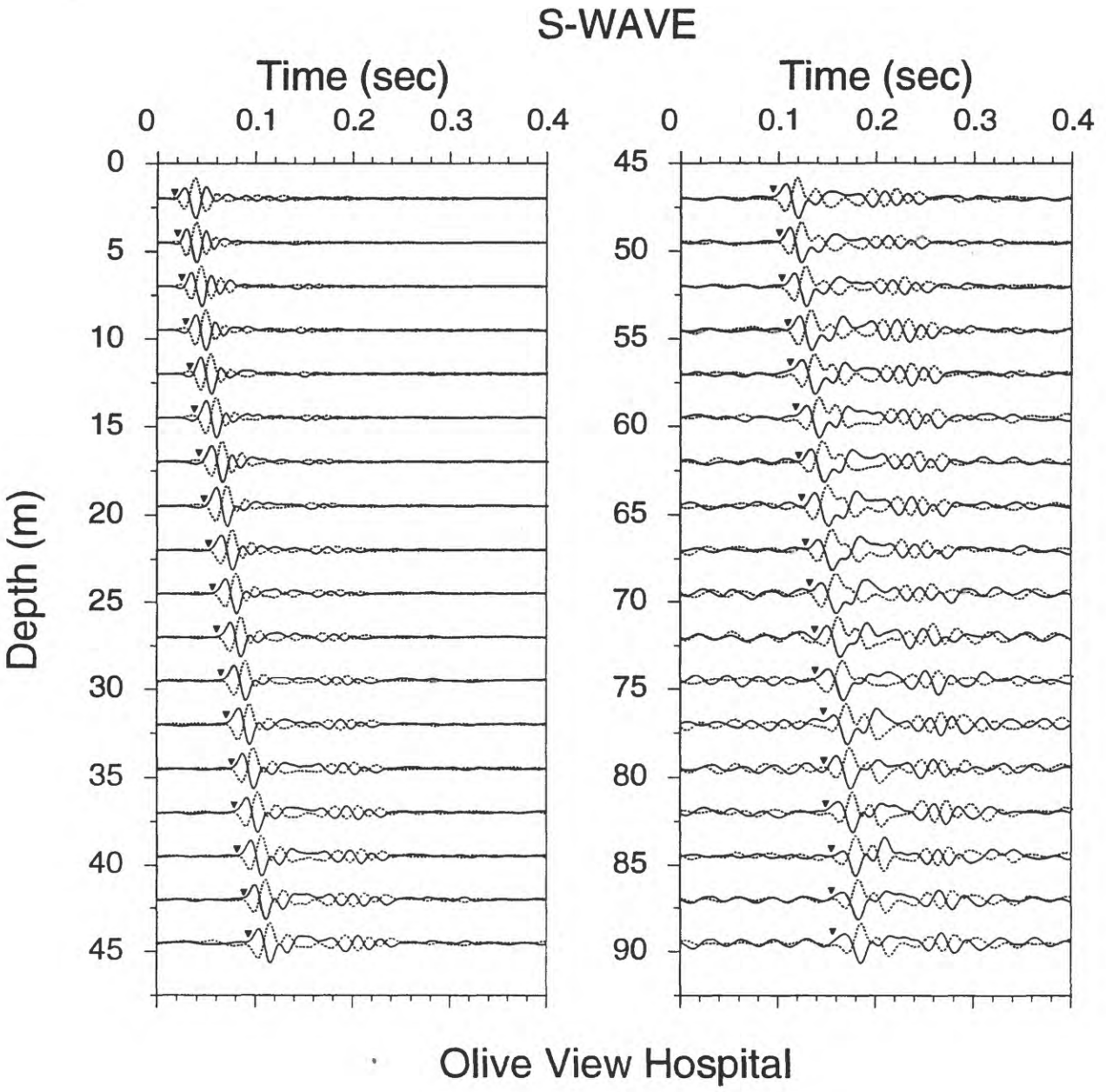

Figure A-27. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

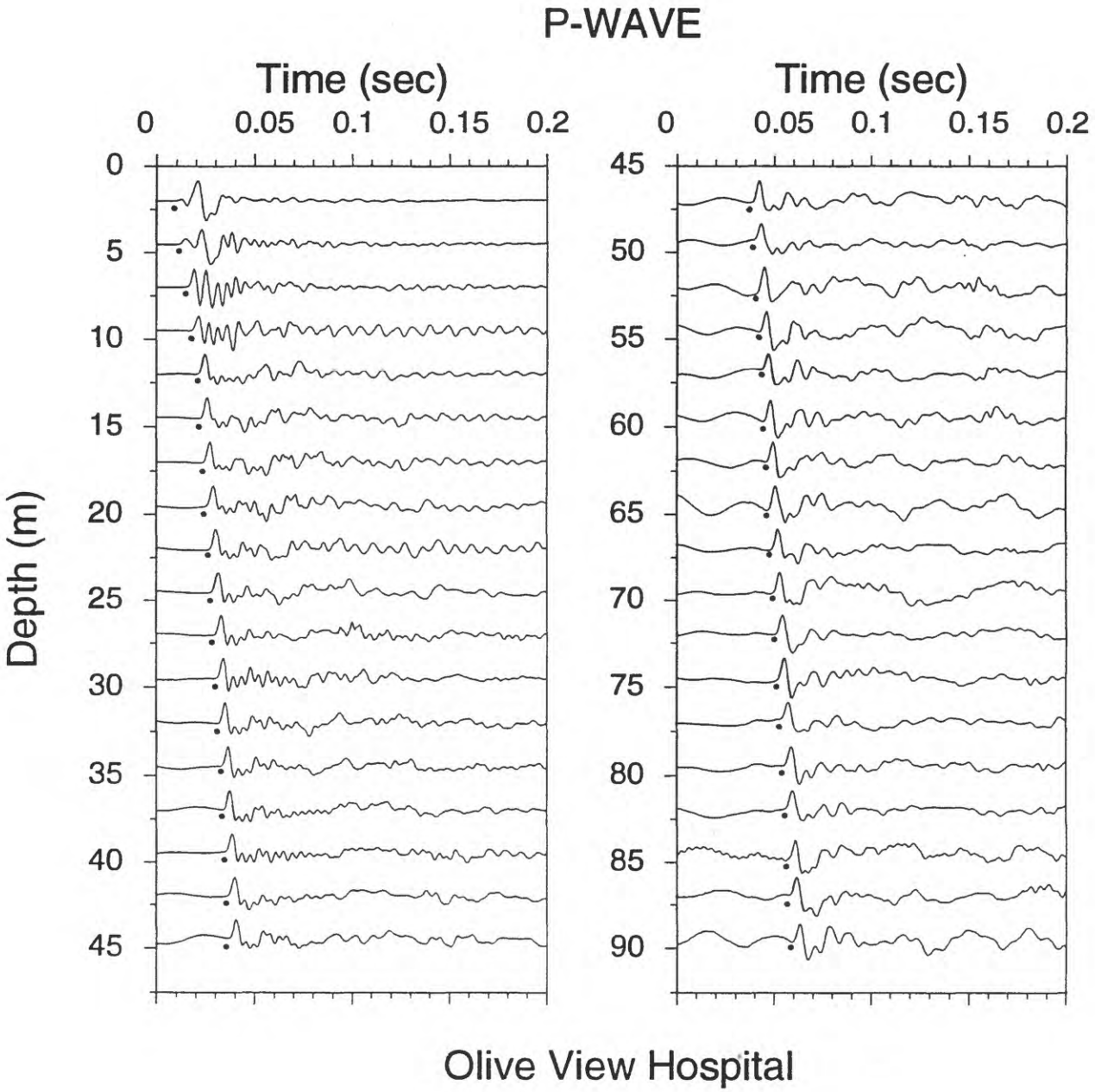

Figure A-28. Vertical component record section. Approximate P-wave arrivals are indicated by the solid circles.

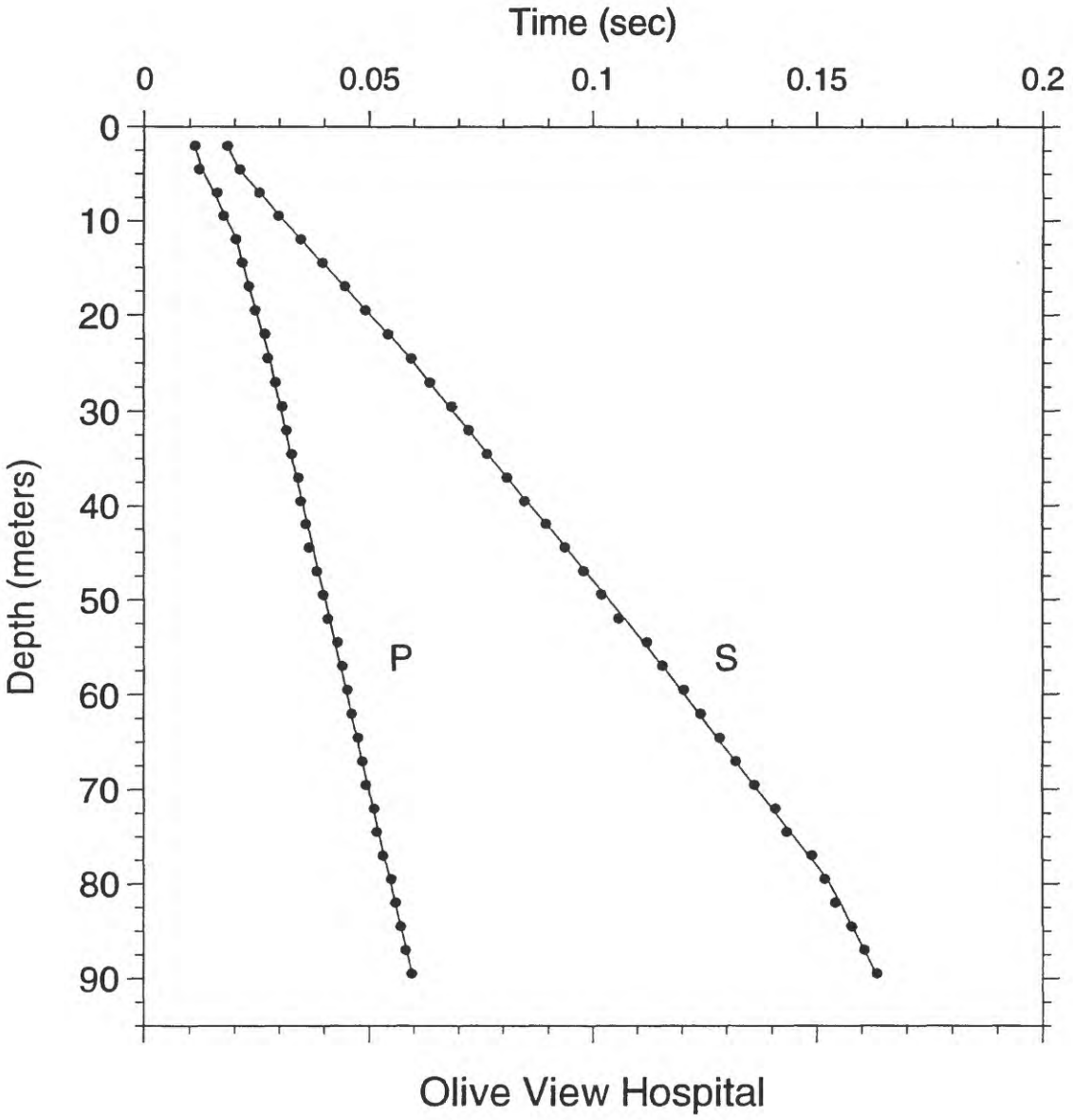

Figure A-29. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

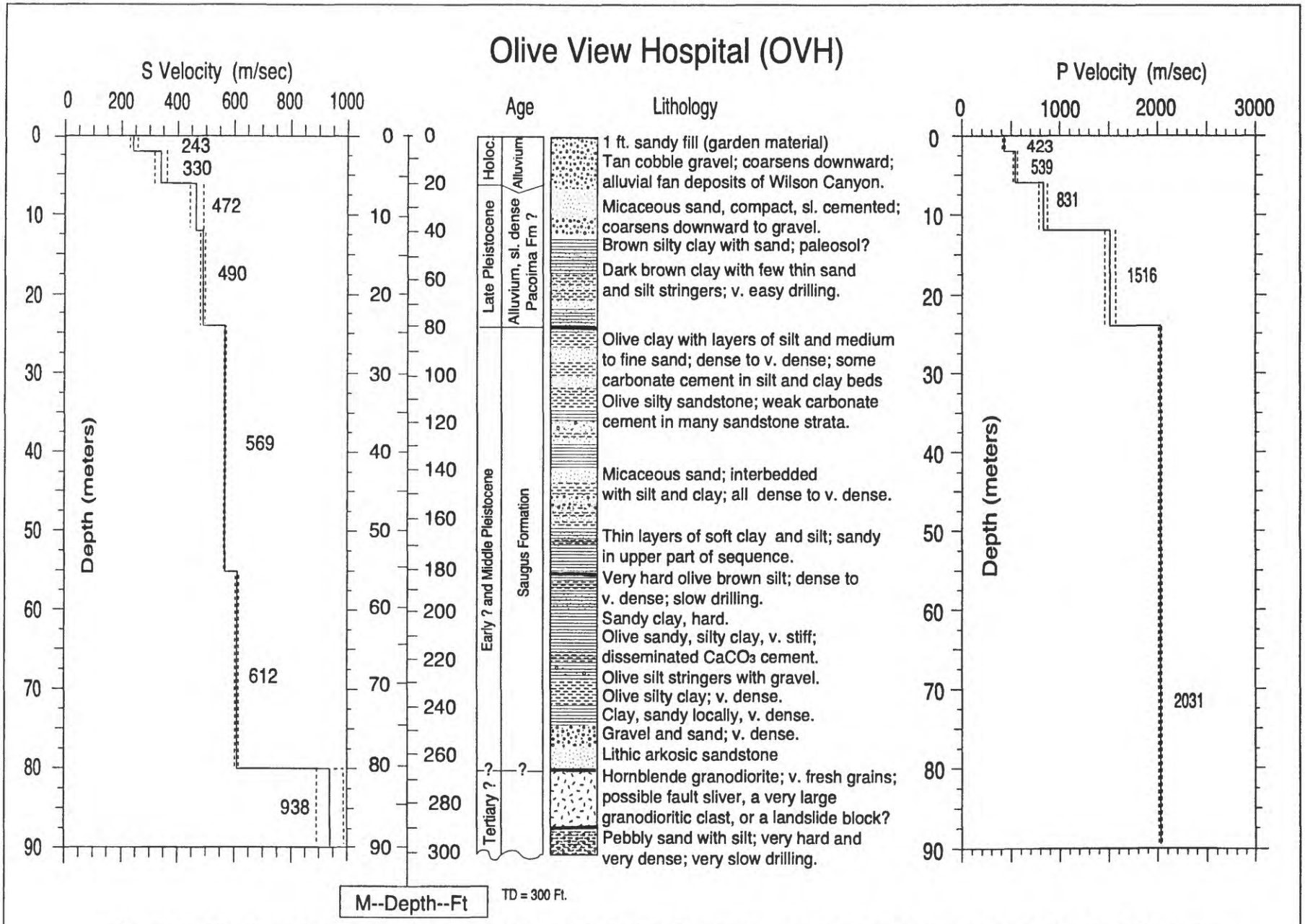

Figure A-30. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-11. S-wave arrival times and velocity summaries.

Location: Olive View Hospital Coordinates: 34.32810 118.44420 Hole_Code: 276
hoffset = 4.00 travel-time file: ovh2s.tt
nlayers = 7

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)
2.0	6.6	0.0184	0.0082	243	1	0.0000
4.5	14.8	0.0212	0.0158	284	1	0.0002
7.0	23.0	0.0256	0.0225	311	1	-0.0001
9.5	31.2	0.0298	0.0278	342	1	-0.0002
12.0	39.4	0.0348	0.0331	363	1	0.0000
14.5	47.6	0.0396	0.0382	380	1	0.0001
17.0	55.8	0.0446	0.0433	393	1	0.0002
19.5	64.0	0.0492	0.0484	403	1	-0.0001
22.0	72.2	0.0542	0.0535	411	1	-0.0001
24.5	80.4	0.0594	0.0585	419	1	0.0002
27.0	88.6	0.0636	0.0628	430	1	0.0001
29.5	96.8	0.0684	0.0672	439	1	0.0006
32.0	105.0	0.0722	0.0716	447	1	0.0000
34.5	113.2	0.0764	0.0760	454	1	-0.0001
37.0	121.4	0.0808	0.0804	460	1	-0.0001
39.5	129.6	0.0848	0.0848	466	1	-0.0004
42.0	137.8	0.0896	0.0892	471	1	0.0000
44.5	146.0	0.0938	0.0936	475	1	-0.0002
47.0	154.2	0.0980	0.0980	480	1	-0.0003
49.5	162.4	0.1020	0.1024	483	1	-0.0007
52.0	170.6	0.1058	0.1068	487	1	-0.0013
54.5	178.8	0.1122	0.1112	490	1	0.0007
57.0	187.0	0.1156	0.1153	494	1	0.0000
59.5	195.2	0.1204	0.1194	498	1	0.0007
62.0	203.4	0.1242	0.1235	502	1	0.0004
64.5	211.6	0.1284	0.1276	506	1	0.0006
67.0	219.8	0.1320	0.1317	509	1	0.0001
69.5	228.0	0.1362	0.1358	512	1	0.0002
72.0	236.2	0.1408	0.1398	515	1	0.0007
74.5	244.4	0.1434	0.1439	518	1	-0.0007
77.0	252.6	0.1490	0.1480	520	1	0.0008
79.5	260.8	0.1518	0.1521	523	1	-0.0005
82.0	269.0	0.1542	0.1550	529	1	-0.0010
84.5	277.2	0.1578	0.1577	536	1	-0.0001
87.0	285.4	0.1606	0.1604	542	1	0.0001
89.5	293.6	0.1634	0.1630	549	1	0.0002

dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	2.0	243	236	250	6.6	6.6	797	775	819
6.0	4.0	330	317	343	19.7	13.1	1081	1041	1124
12.0	6.0	472	453	493	39.4	19.7	1549	1485	1618
24.0	12.0	490	482	499	78.7	39.4	1608	1580	1637
55.0	31.0	569	565	573	180.4	101.7	1866	1854	1879
80.0	25.0	612	606	618	262.5	82.0	2008	1990	2027
89.5	9.5	938	892	988	293.6	31.2	3077	2927	3242

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-12. P-wave arrival times and velocity summaries.

Location: Olive View Hospital Coordinates: 34.32810 118.44420 Hole_Code: 276
hoffset = 4.25 travel-time file: ovh2p.tt
nlayers = 5

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)
2.0	6.6	0.0112	0.0047	423	1	0.0001
4.5	14.8	0.0122	0.0094	481	1	-0.0006
7.0	23.0	0.0162	0.0133	524	1	0.0007
9.5	31.2	0.0176	0.0164	581	1	-0.0002
12.0	39.4	0.0204	0.0194	620	1	-0.0001
14.5	47.6	0.0218	0.0210	690	1	0.0000
17.0	55.8	0.0232	0.0227	750	1	0.0000
19.5	64.0	0.0246	0.0243	802	1	-0.0002
22.0	72.2	0.0268	0.0260	847	1	0.0005
24.5	80.4	0.0274	0.0275	890	1	-0.0005
27.0	88.6	0.0292	0.0288	939	1	0.0002
29.5	96.8	0.0306	0.0300	984	1	0.0004
32.0	105.0	0.0316	0.0312	1025	1	0.0002
34.5	113.2	0.0328	0.0325	1063	1	0.0002
37.0	121.4	0.0342	0.0337	1098	1	0.0003
39.5	129.6	0.0348	0.0349	1131	1	-0.0003
42.0	137.8	0.0360	0.0361	1162	1	-0.0003
44.5	146.0	0.0366	0.0374	1191	1	-0.0009
47.0	154.2	0.0384	0.0386	1217	1	-0.0003
49.5	162.4	0.0398	0.0398	1243	1	-0.0002
52.0	170.6	0.0408	0.0411	1266	1	-0.0004
54.5	178.8	0.0430	0.0423	1288	1	0.0006
57.0	187.0	0.0440	0.0435	1309	1	0.0004
59.5	195.2	0.0452	0.0448	1329	1	0.0003
62.0	203.4	0.0462	0.0460	1348	1	0.0001
64.5	211.6	0.0476	0.0472	1366	1	0.0003
67.0	219.8	0.0486	0.0485	1383	1	0.0001
69.5	228.0	0.0494	0.0497	1399	1	-0.0004
72.0	236.2	0.0512	0.0509	1414	1	0.0002
74.5	244.4	0.0518	0.0521	1429	1	-0.0004
77.0	252.6	0.0532	0.0534	1443	1	-0.0002
79.5	260.8	0.0550	0.0546	1456	1	0.0003
82.0	269.0	0.0560	0.0558	1468	1	0.0001
84.5	277.2	0.0572	0.0571	1481	1	0.0001
87.0	285.4	0.0582	0.0583	1492	1	-0.0002
89.5	293.6	0.0596	0.0595	1503	1	0.0000

dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	2.0	423	409	437	6.6	6.6	1388	1343	1435
6.0	4.0	539	516	564	19.7	13.1	1769	1694	1852
12.0	6.0	831	788	878	39.4	19.7	2725	2586	2880
24.0	12.0	1516	1465	1571	78.7	39.4	4974	4807	5153
89.5	65.5	2031	2017	2045	293.6	214.9	6664	6618	6711

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

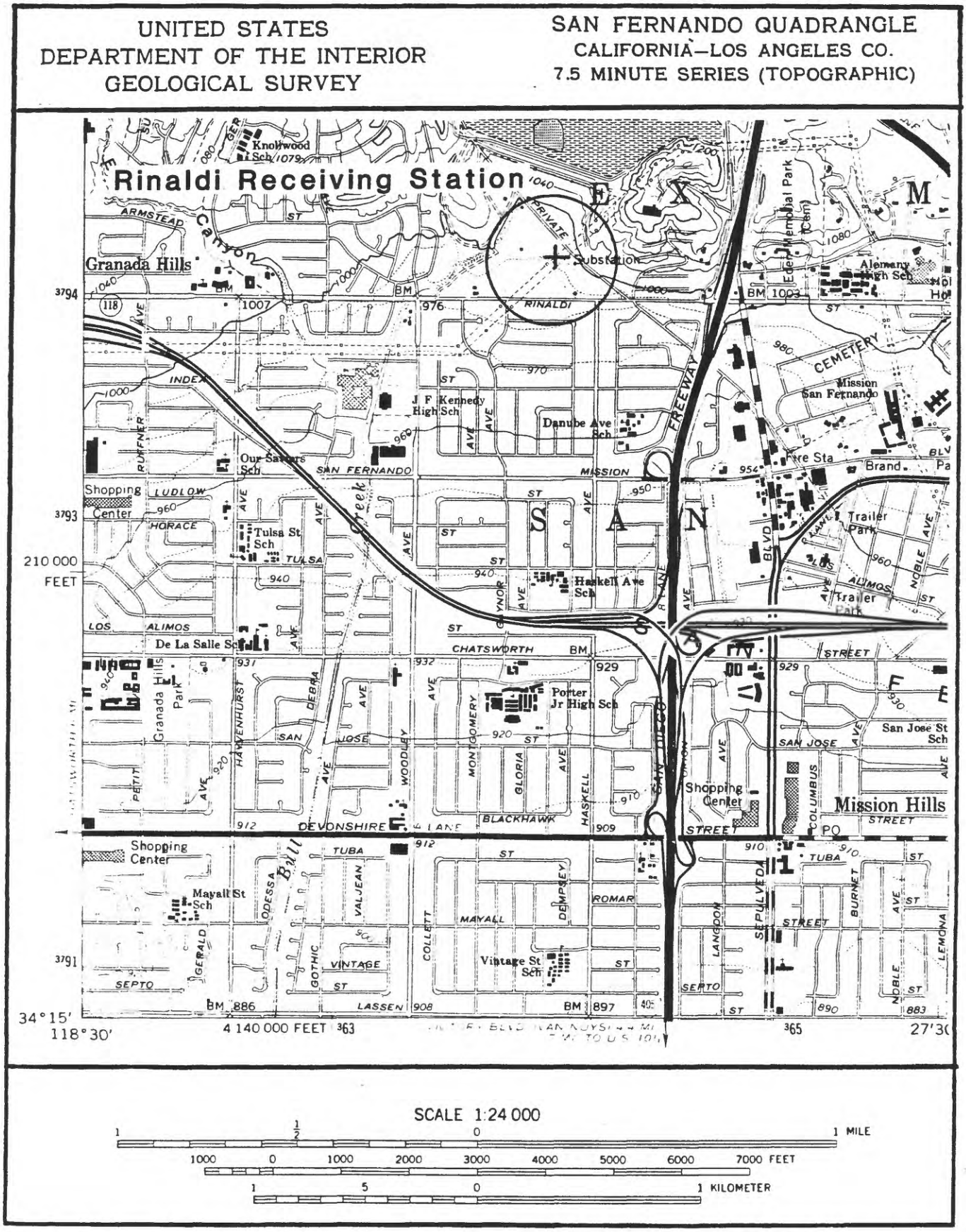

Figure A-31. Site location map for the borehole at Rinaldi Receiving Station. The accelerograph is located approximately 10 meters from the borehole.

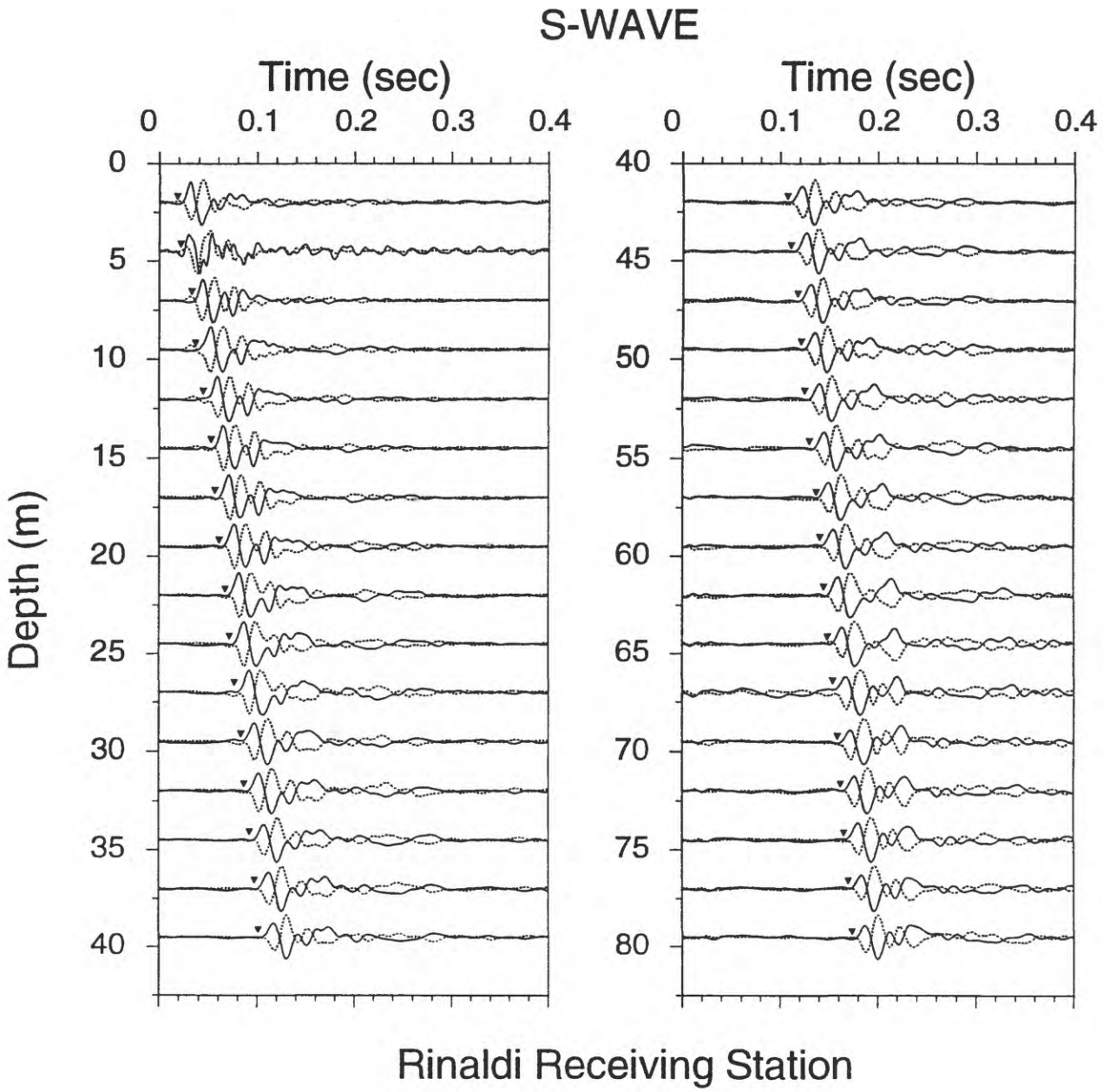

Figure A-32. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

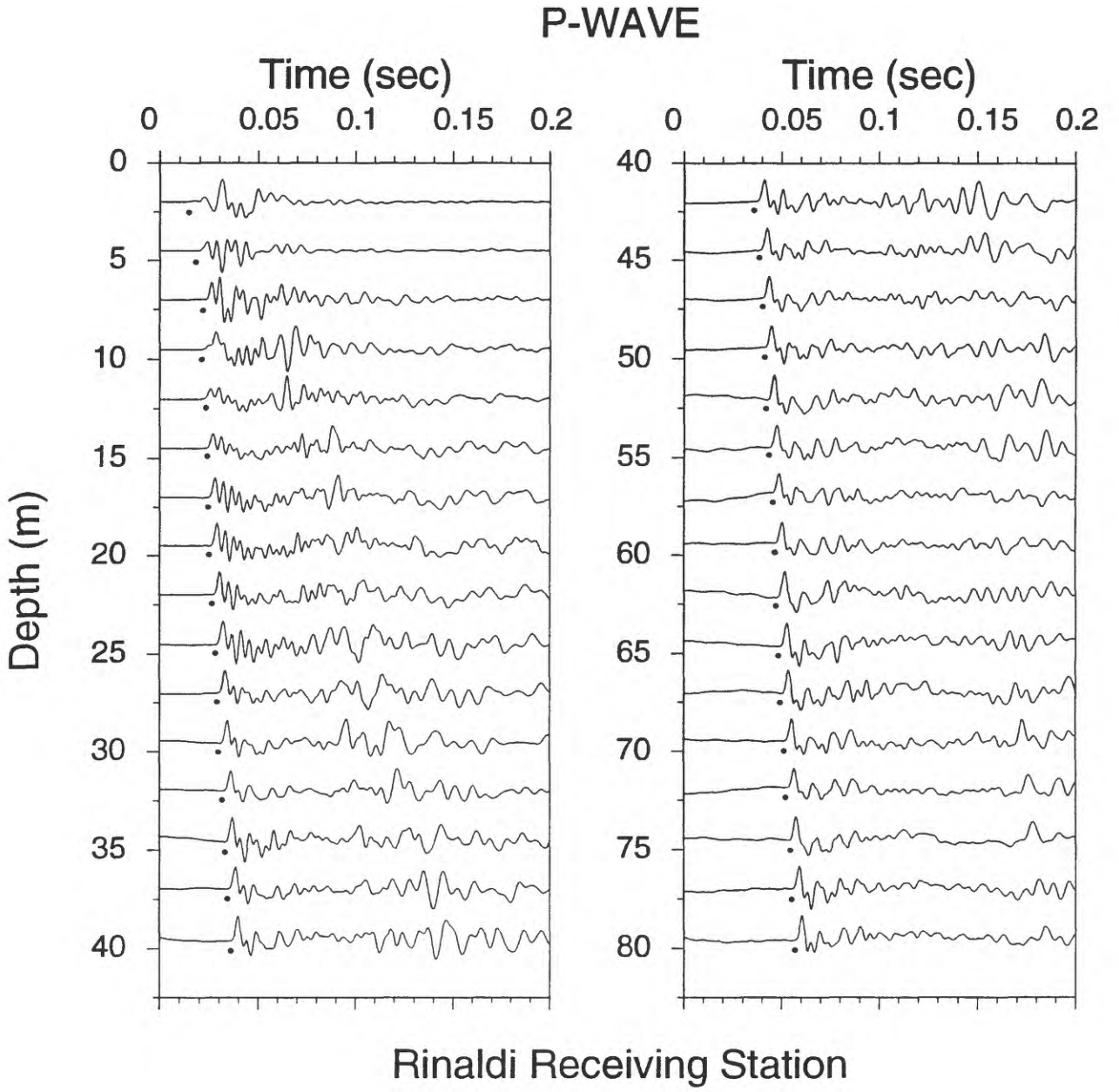

Figure A-33. Vertical component record section. P-wave arrivals are indicated by the solid circles.

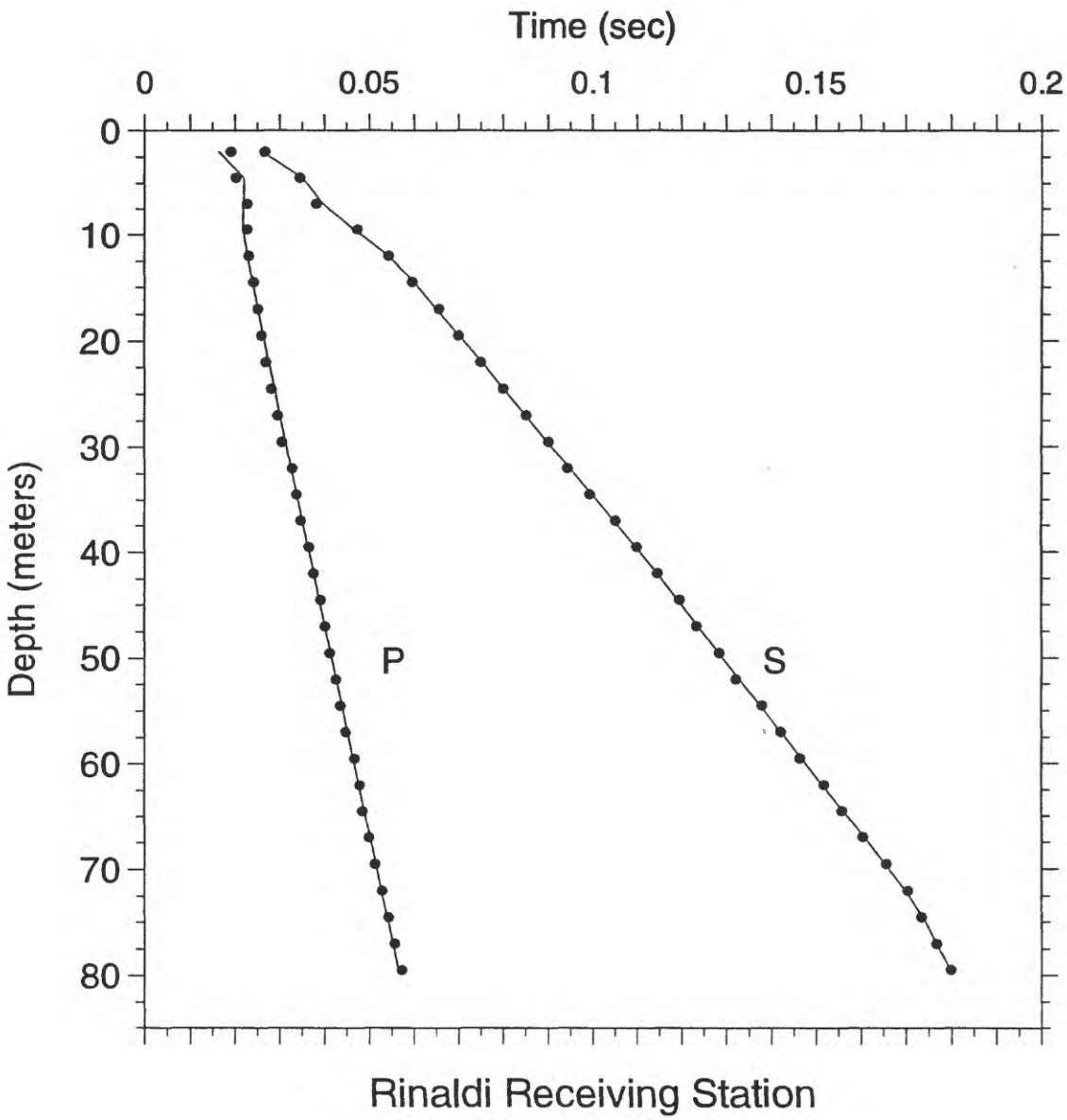

Figure A-34. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

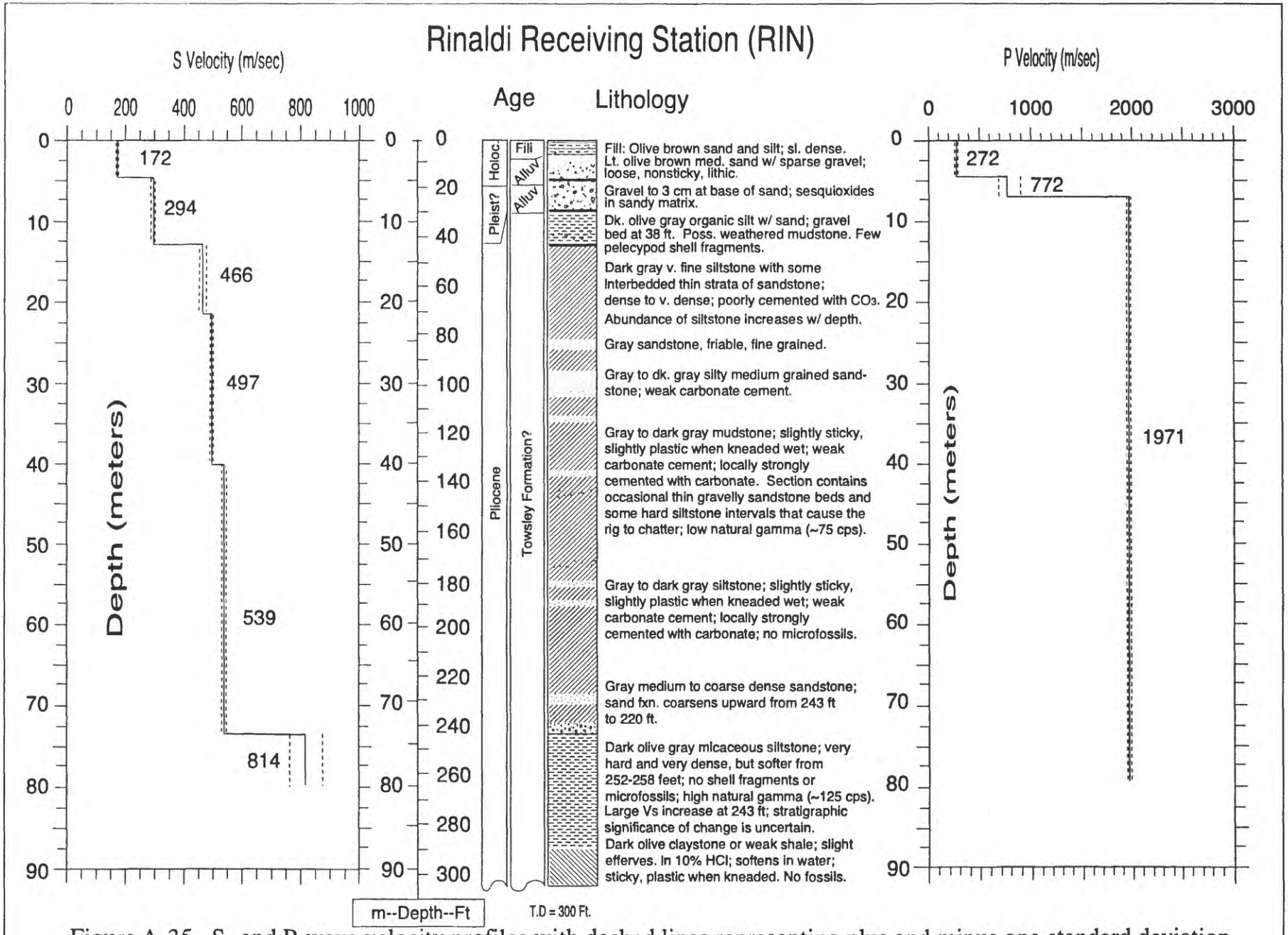

Figure A-35. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-13. S-wave arrival times and velocity summaries.

Location: Rinaldi Receiving Station Coordinates: 34.28100 118.47710 Hole_Code: 267
hoffset = 4.00 travel-time file: rins.tt
nlayers = 6

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0268	0.0117	172	1	0.0007	4.5	4.5	172	169	174	14.8	14.8	563	555	571
4.5	14.8	0.0346	0.0262	172	3	-0.0005	12.8	8.3	294	288	300	42.0	27.2	965	946	985
7.0	23.0	0.0382	0.0347	202	1	-0.0014	21.3	8.5	466	454	478	69.9	27.9	1528	1490	1567
9.5	31.2	0.0474	0.0432	220	1	0.0008	40.0	18.7	497	492	502	131.2	61.4	1629	1613	1646
12.0	39.4	0.0544	0.0517	232	1	0.0001	73.3	33.3	539	536	543	240.5	109.3	1770	1759	1781
14.5	47.6	0.0596	0.0581	250	1	-0.0004	79.5	6.2	814	763	874	260.8	20.3	2672	2502	2866
17.0	55.8	0.0656	0.0635	268	1	0.0006										
19.5	64.0	0.0700	0.0688	283	1	-0.0001										
22.0	72.2	0.0750	0.0741	297	1	-0.0002										
24.5	80.4	0.0800	0.0791	310	1	0.0000										
27.0	88.6	0.0852	0.0842	321	1	0.0002										
29.5	96.8	0.0902	0.0892	331	1	0.0003										
32.0	105.0	0.0944	0.0942	340	1	-0.0005										
34.5	113.2	0.0994	0.0993	348	1	-0.0005										
37.0	121.4	0.1052	0.1043	355	1	0.0004										
39.5	129.6	0.1100	0.1093	361	1	0.0002										
42.0	137.8	0.1146	0.1141	368	1	0.0001										
44.5	146.0	0.1196	0.1187	375	1	0.0005										
47.0	154.2	0.1234	0.1233	381	1	-0.0003										
49.5	162.4	0.1284	0.1280	387	1	0.0001										
52.0	170.6	0.1322	0.1326	392	1	-0.0007										
54.5	178.8	0.1380	0.1372	397	1	0.0004										
57.0	187.0	0.1422	0.1419	402	1	0.0000										
59.5	195.2	0.1464	0.1465	406	1	-0.0004										
62.0	203.4	0.1518	0.1511	410	1	0.0004										
64.5	211.6	0.1558	0.1558	414	1	-0.0002										
67.0	219.8	0.1604	0.1604	418	1	-0.0003										
69.5	228.0	0.1656	0.1650	421	1	0.0003										
72.0	236.2	0.1704	0.1697	424	1	0.0005										
74.5	244.4	0.1734	0.1736	429	1	-0.0004										
77.0	252.6	0.1768	0.1766	436	1	0.0000										
79.5	260.8	0.1800	0.1797	442	1	0.0001										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-14. P-wave arrival times and velocity summaries.

Location: Rinaldi Receiving Station Coordinates: 34.28100 118.47710 Hole_Code: 267
hoffset = 4.00 travel-time file: rinp.tt
nlayers = 3

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0192	0.0074	272	1	0.0027	4.5	4.5	272	265	279	14.8	14.8	892	869	916
4.5	14.8	0.0204	0.0165	272	1	-0.0017	7.0	2.5	772	674	902	23.0	8.2	2531	2212	2959
7.0	23.0	0.0228	0.0198	354	1	0.0008	79.5	72.5	1971	1948	1994	260.8	237.9	6466	6391	6544
9.5	31.2	0.0228	0.0211	451	1	0.0009										
12.0	39.4	0.0232	0.0223	538	1	0.0003										
14.5	47.6	0.0242	0.0236	615	1	0.0002										
17.0	55.8	0.0252	0.0249	684	1	0.0000										
19.5	64.0	0.0260	0.0261	746	1	-0.0004										
22.0	72.2	0.0270	0.0274	803	1	-0.0006										
24.5	80.4	0.0282	0.0287	855	1	-0.0007										
27.0	88.6	0.0296	0.0299	902	1	-0.0005										
29.5	96.8	0.0306	0.0312	945	1	-0.0008										
32.0	105.0	0.0328	0.0325	985	1	0.0002										
34.5	113.2	0.0338	0.0337	1023	1	-0.0001										
37.0	121.4	0.0348	0.0350	1057	1	-0.0003										
39.5	129.6	0.0366	0.0363	1089	1	0.0002										
42.0	137.8	0.0376	0.0375	1119	1	-0.0001										
44.5	146.0	0.0392	0.0388	1147	1	0.0003										
47.0	154.2	0.0402	0.0401	1173	1	0.0000										
49.5	162.4	0.0412	0.0414	1197	1	-0.0002										
52.0	170.6	0.0426	0.0426	1220	1	-0.0001										
54.5	178.8	0.0436	0.0439	1242	1	-0.0004										
57.0	187.0	0.0448	0.0452	1262	1	-0.0004										
59.5	195.2	0.0468	0.0464	1282	1	0.0003										
62.0	203.4	0.0480	0.0477	1300	1	0.0002										
64.5	211.6	0.0486	0.0490	1317	1	-0.0004										
67.0	219.8	0.0500	0.0502	1334	1	-0.0003										
69.5	228.0	0.0514	0.0515	1350	1	-0.0002										
72.0	236.2	0.0530	0.0528	1364	1	0.0002										
74.5	244.4	0.0544	0.0540	1379	1	0.0003										
77.0	252.6	0.0558	0.0553	1392	1	0.0004										
79.5	260.8	0.0574	0.0566	1405	1	0.0008										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

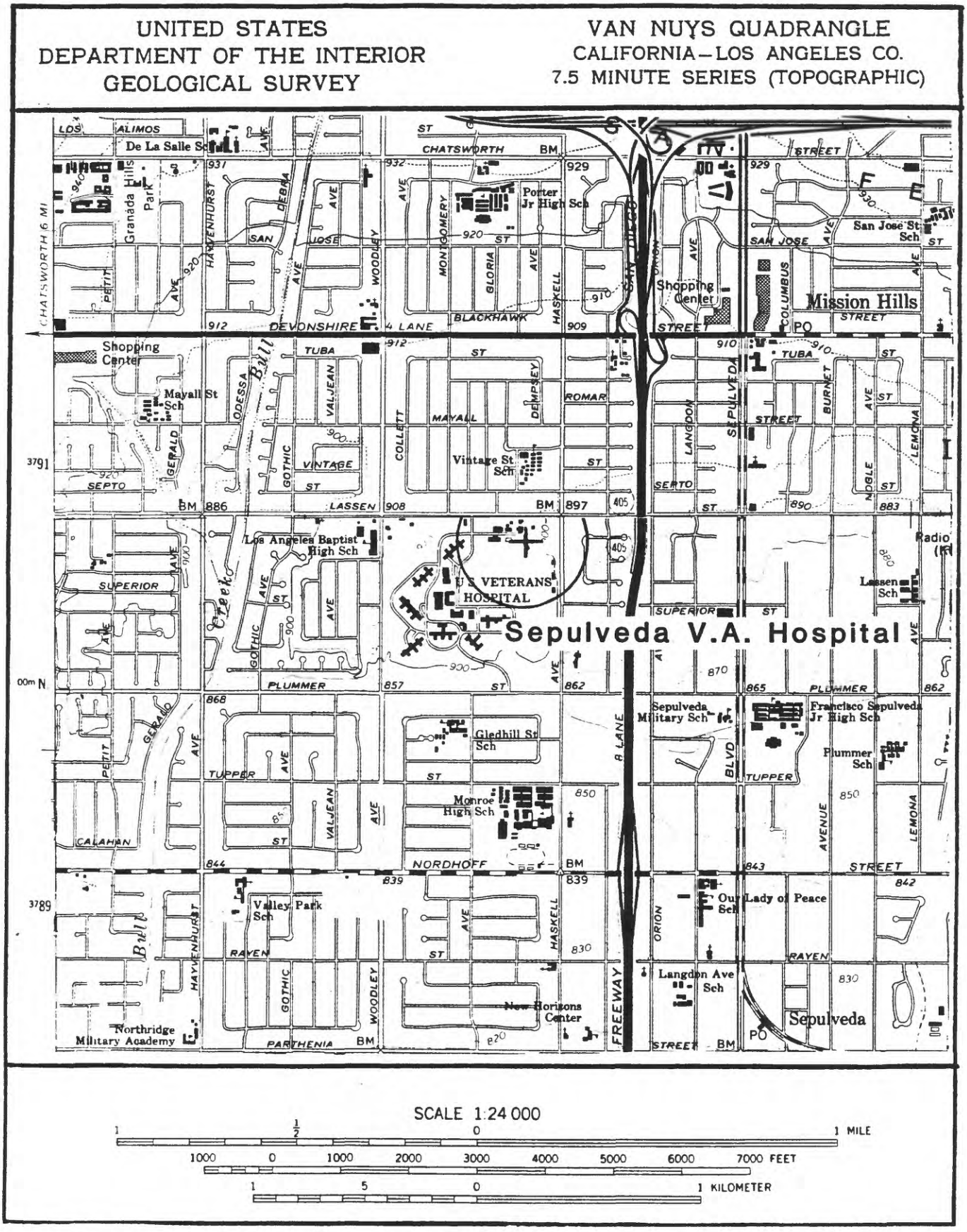

Figure A-36. Site location map for the borehole at Sepulveda V.A. Hospital. The accelerograph is located approximately 30 meters from the borehole.

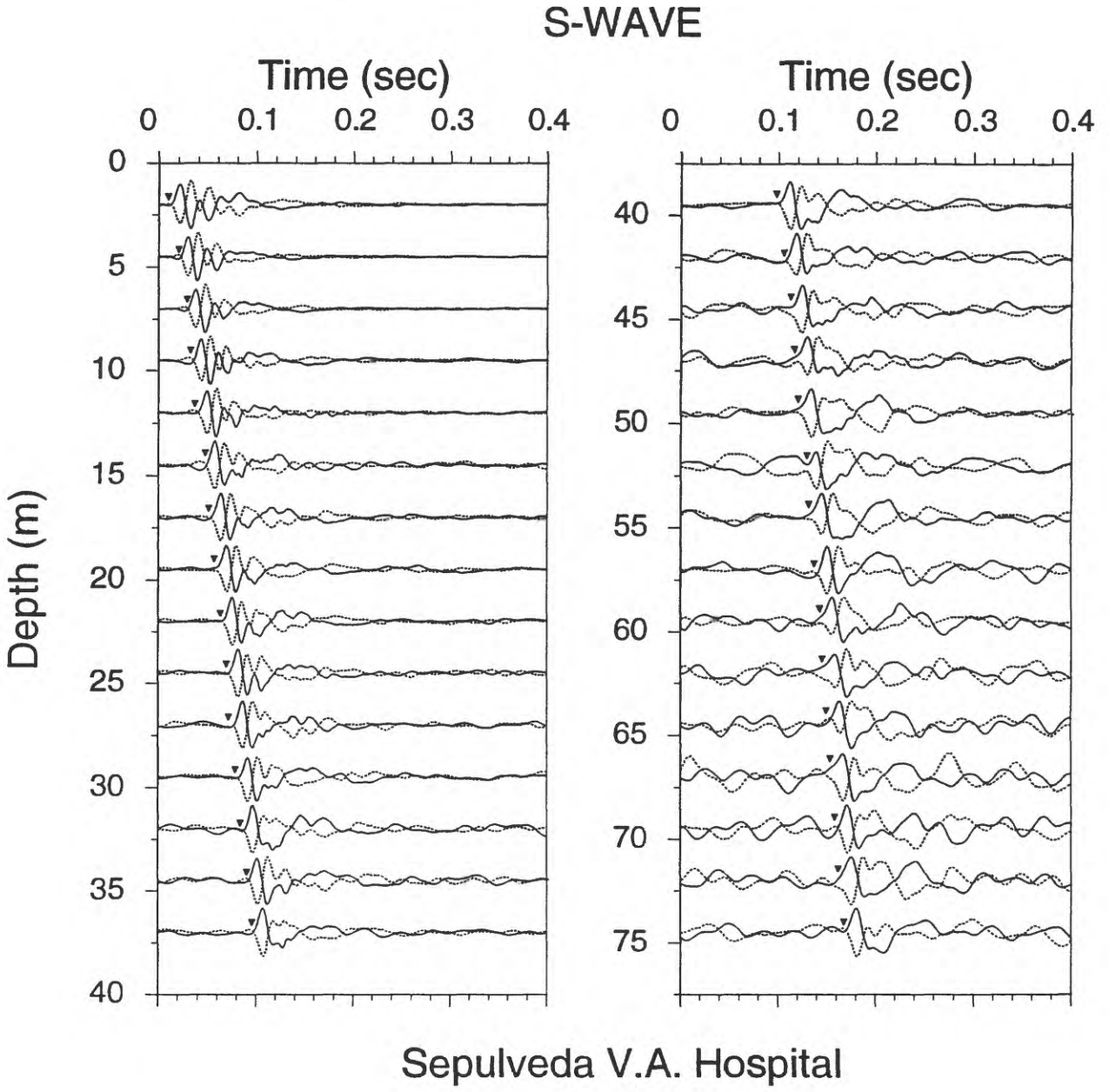

Figure A-37. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

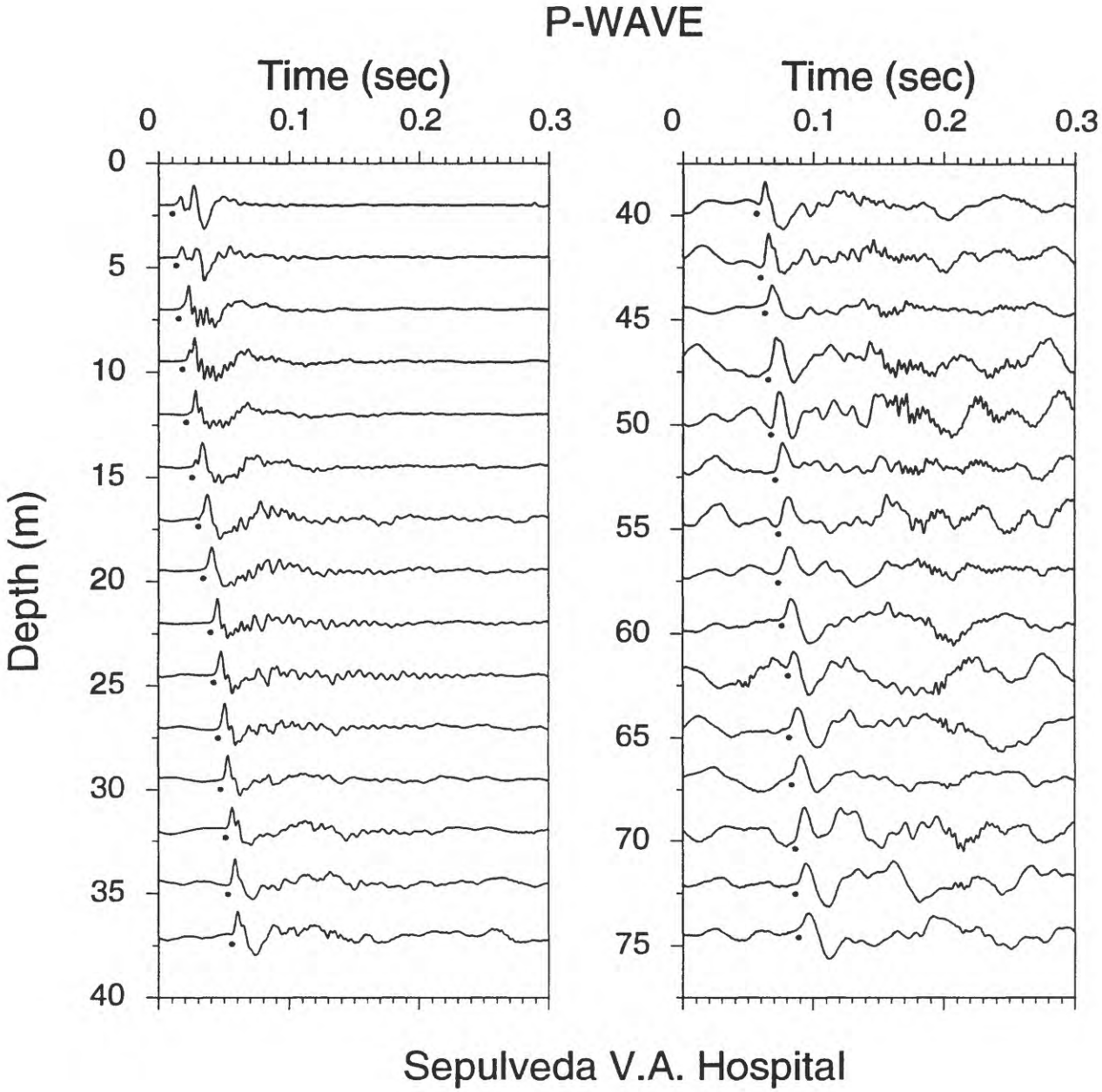

Figure A-38. Vertical component record section. P-wave arrivals are indicated by the solid circles.

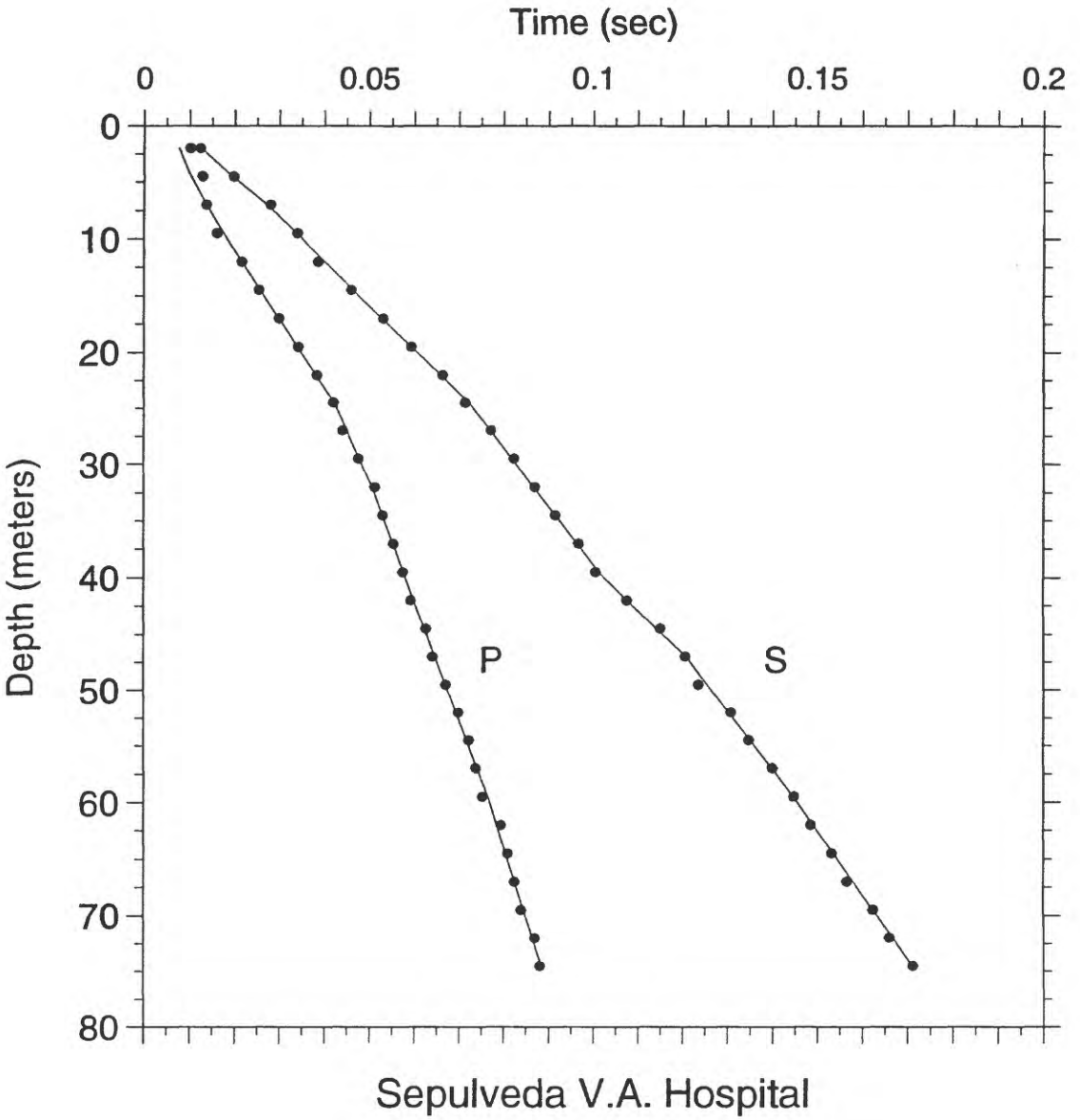

Figure A-39. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

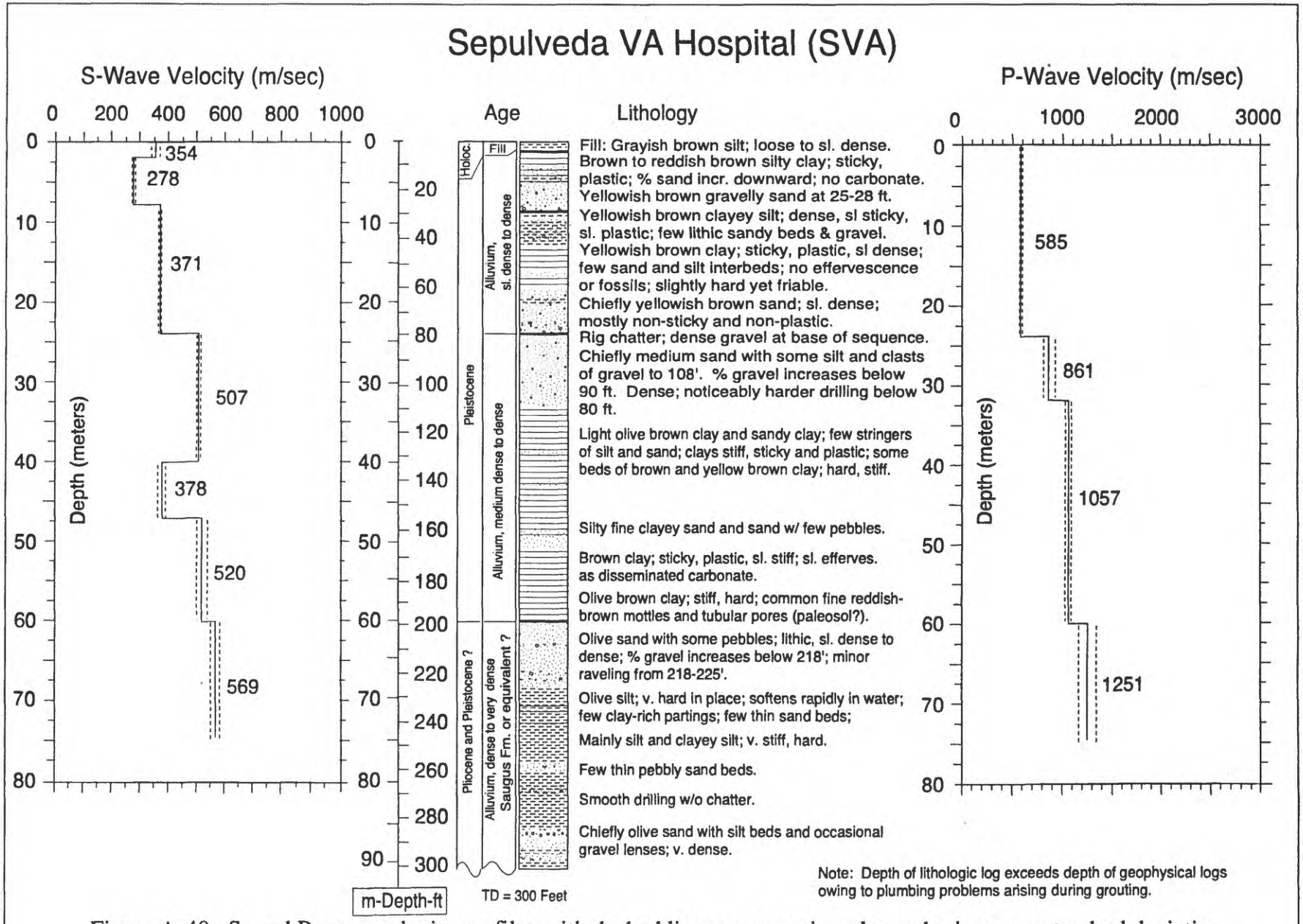

Figure A-40. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-15. S-wave arrival times and velocity summaries.

Location: Sepulveda VA Hospital Coordinates: 34.24900 118.47720 Hole_Code: 270
hoffset = 4.00 travel-time file: svas.tt
nlayers = 7

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0124	0.0056	354	1	-0.0002	2.0	2.0	354	340	369	6.6	6.6	1162	1117	1210
4.5	14.8	0.0198	0.0146	307	1	0.0003	8.0	6.0	278	273	284	26.2	19.7	912	895	931
7.0	23.0	0.0280	0.0236	296	1	0.0008	24.0	16.0	371	367	376	78.7	52.5	1218	1205	1233
9.5	31.2	0.0340	0.0313	304	1	0.0001	40.0	16.0	507	499	516	131.2	52.5	1665	1639	1692
12.0	39.4	0.0386	0.0380	316	1	-0.0014	47.0	7.0	378	364	394	154.2	23.0	1241	1194	1292
14.5	47.6	0.0460	0.0447	324	1	-0.0004	60.0	13.0	520	501	541	196.9	42.7	1707	1645	1774
17.0	55.8	0.0532	0.0515	330	1	0.0004	74.5	14.5	569	552	587	244.4	47.6	1867	1813	1924
19.5	64.0	0.0594	0.0582	335	1	0.0000										
22.0	72.2	0.0664	0.0649	339	1	0.0004										
24.5	80.4	0.0714	0.0713	344	1	-0.0008										
27.0	88.6	0.0772	0.0762	354	1	0.0002										
29.5	96.8	0.0824	0.0811	364	1	0.0005										
32.0	105.0	0.0870	0.0861	372	1	0.0003										
34.5	113.2	0.0916	0.0910	379	1	0.0000										
37.0	121.4	0.0968	0.0959	386	1	0.0003										
39.5	129.6	0.1006	0.1008	392	1	-0.0007										
42.0	137.8	0.1076	0.1071	392	1	0.0000										
44.5	146.0	0.1150	0.1137	391	2	0.0008										
47.0	154.2	0.1206	0.1203	391	2	-0.0002										
49.5	162.4	0.1236	0.1251	396	2	-0.0019										
52.0	170.6	0.1308	0.1299	400	1	0.0005										
54.5	178.8	0.1348	0.1348	404	2	-0.0003										
57.0	187.0	0.1400	0.1396	408	1	0.0001										
59.5	195.2	0.1448	0.1444	412	2	0.0001										
62.0	203.4	0.1486	0.1488	417	3	-0.0005										
64.5	211.6	0.1532	0.1532	421	2	-0.0003										
67.0	219.8	0.1566	0.1576	425	3	-0.0013										
69.5	228.0	0.1624	0.1620	429	1	0.0001										
72.0	236.2	0.1660	0.1664	433	2	-0.0007										
74.5	244.4	0.1712	0.1708	436	1	0.0002										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-16. P-wave arrival times and velocity summaries.

Location: Sepulveda VA Hospital Coordinates: 34.24900 118.47720 Hole_Code: 270
hoffset = 4.00 travel-time file: svap.tt
nlayers = 4

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0102	0.0034	585	1	0.0025	24.0	24.0	585	579	591	78.7	78.7	1919	1899	1939
4.5	14.8	0.0129	0.0077	585	1	0.0026	32.0	8.0	861	805	925	105.0	26.2	2825	2642	3036
7.0	23.0	0.0138	0.0120	585	1	0.0000	60.0	28.0	1057	1030	1086	196.9	91.9	3469	3379	3565
9.5	31.2	0.0162	0.0162	585	1	-0.0014	74.5	14.5	1251	1169	1346	244.4	47.6	4106	3835	4417
12.0	39.4	0.0216	0.0205	585	1	0.0000										
14.5	47.6	0.0255	0.0248	585	1	-0.0002										
17.0	55.8	0.0300	0.0291	585	1	0.0001										
19.5	64.0	0.0342	0.0333	585	1	0.0002										
22.0	72.2	0.0384	0.0376	585	1	0.0002										
24.5	80.4	0.0420	0.0416	589	1	-0.0002										
27.0	88.6	0.0441	0.0445	606	1	-0.0009										
29.5	96.8	0.0477	0.0474	622	1	-0.0001										
32.0	105.0	0.0513	0.0503	636	1	0.0006										
34.5	113.2	0.0531	0.0527	655	1	0.0001										
37.0	121.4	0.0555	0.0551	672	1	0.0001										
39.5	129.6	0.0576	0.0574	688	1	-0.0001										
42.0	137.8	0.0594	0.0598	703	1	-0.0006										
44.5	146.0	0.0627	0.0621	716	1	0.0003										
47.0	154.2	0.0642	0.0645	729	1	-0.0005										
49.5	162.4	0.0672	0.0669	740	1	0.0001										
52.0	170.6	0.0699	0.0692	751	1	0.0005										
54.5	178.8	0.0723	0.0716	761	1	0.0005										
57.0	187.0	0.0738	0.0740	771	1	-0.0003										
59.5	195.2	0.0753	0.0763	779	1	-0.0012										
62.0	203.4	0.0795	0.0784	791	1	0.0009										
64.5	211.6	0.0810	0.0804	802	1	0.0005										
67.0	219.8	0.0825	0.0824	813	1	0.0000										
69.5	228.0	0.0840	0.0844	823	1	-0.0005										
72.0	236.2	0.0870	0.0864	833	1	0.0005										
74.5	244.4	0.0882	0.0884	843	1	-0.0003										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

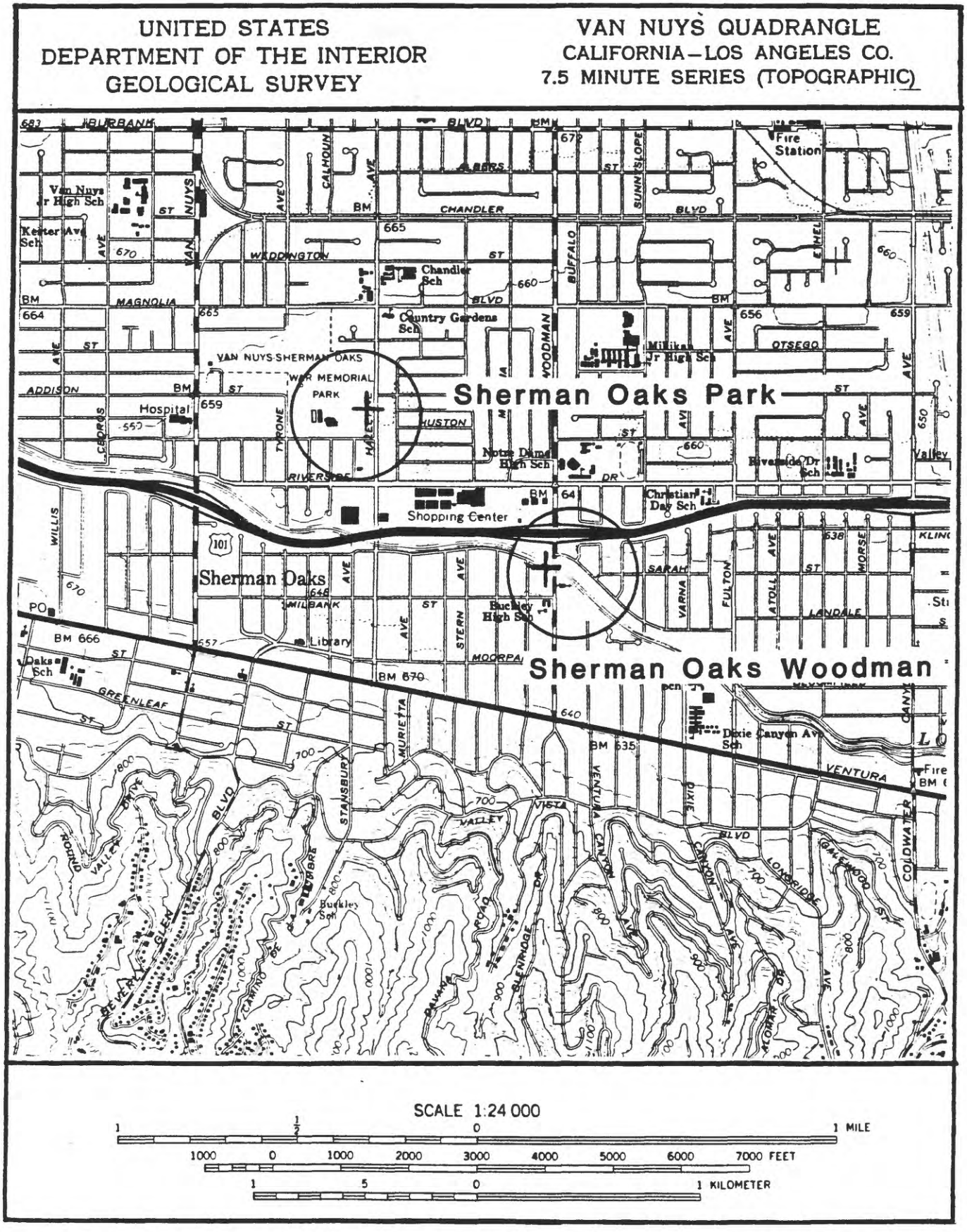

Figure A-41. Site location map for the borehole at Sherman Oaks Park. No accelerograph is located at this site.

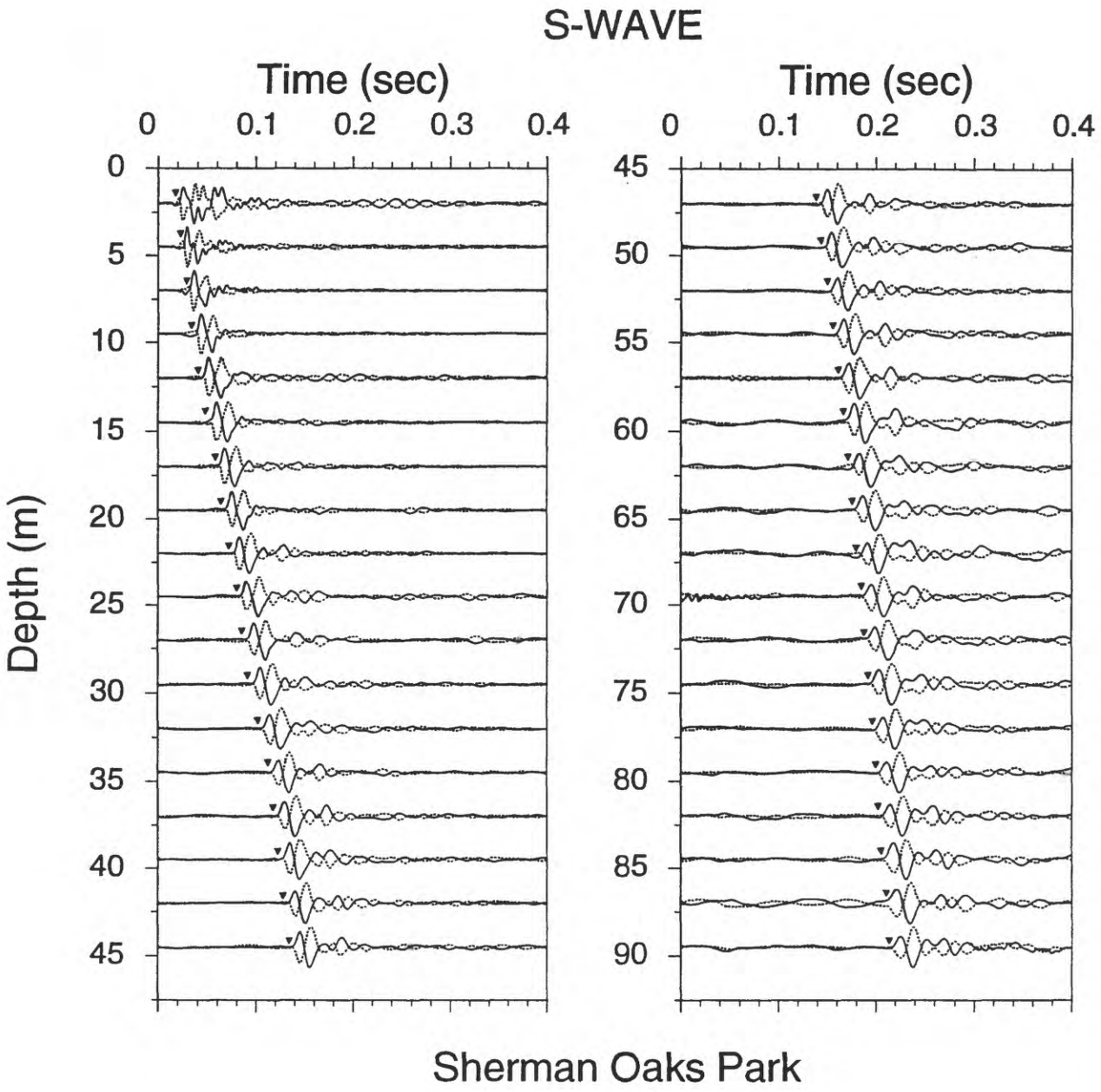

Figure A-42. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

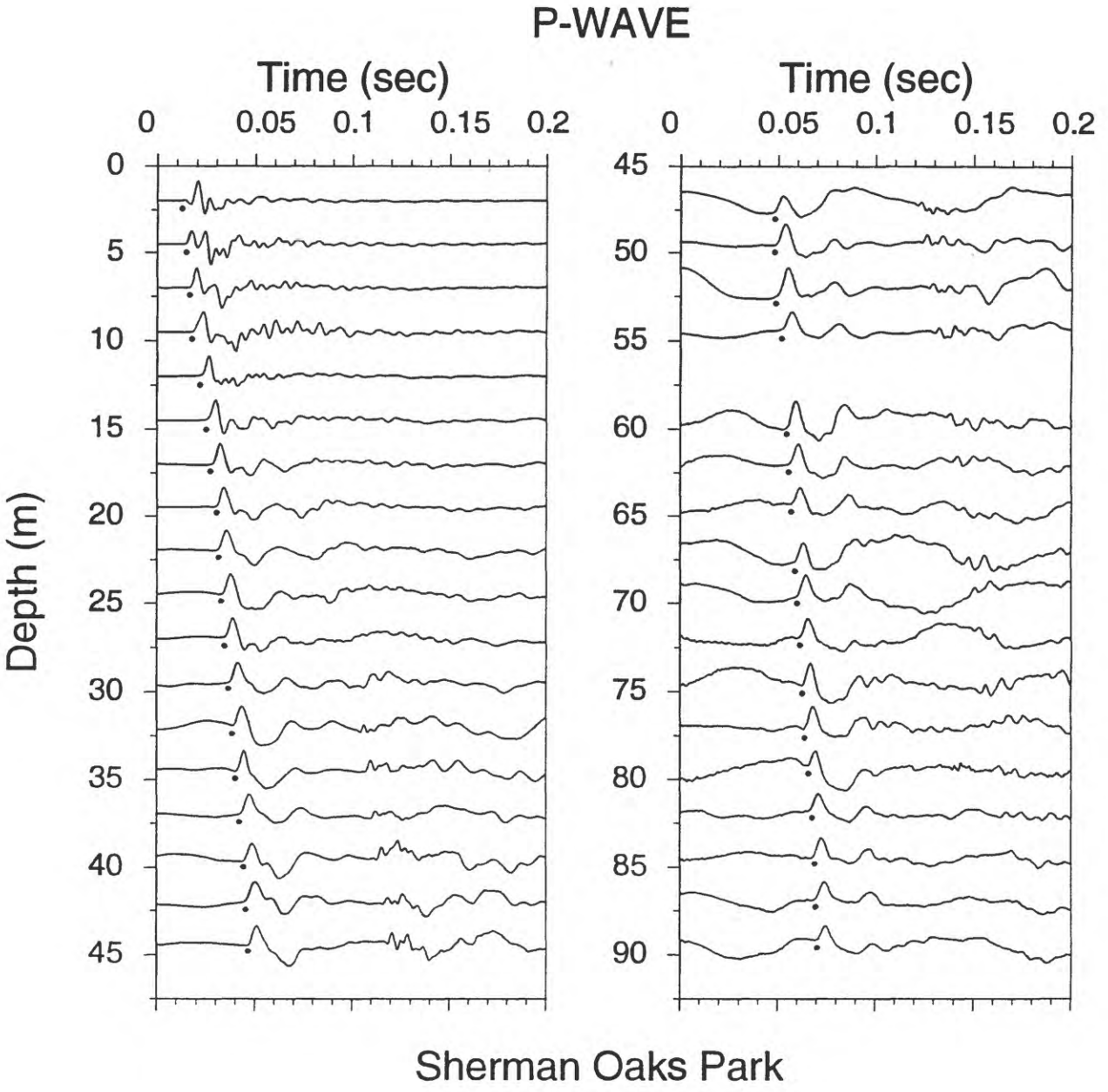

Figure A-43. Vertical component record section. P-wave arrivals are indicated by the solid circles.

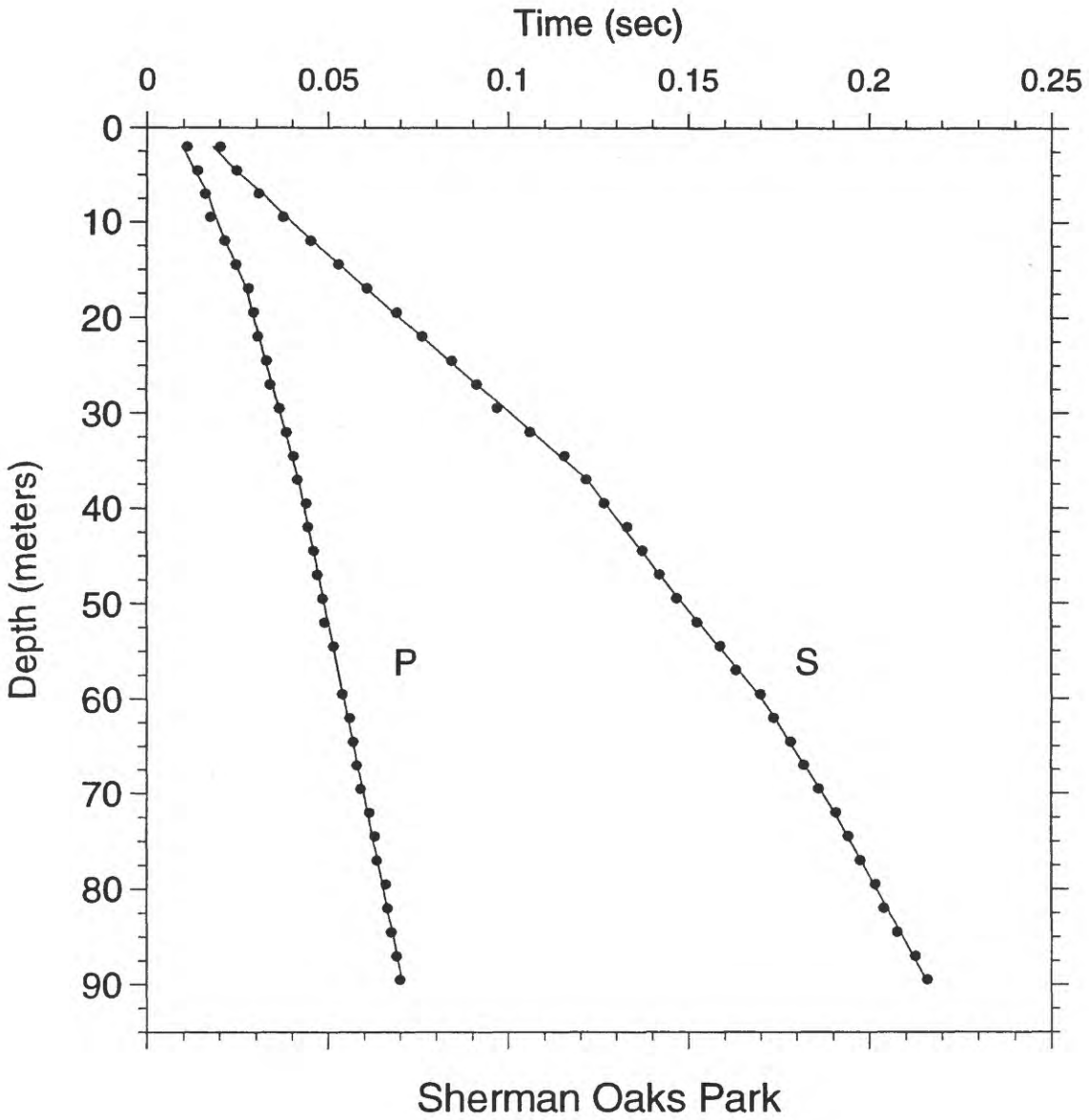

Figure A-44. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

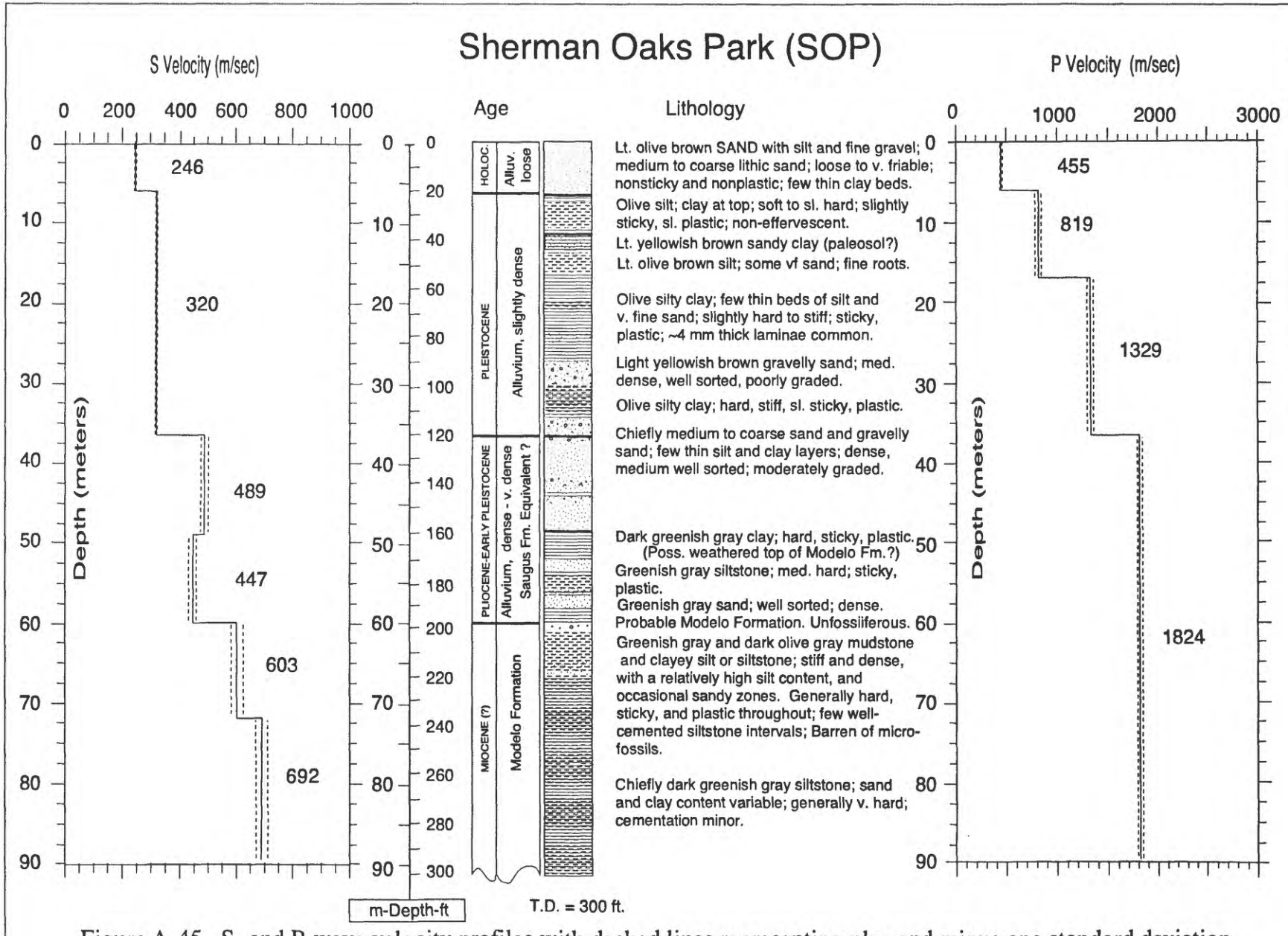

Figure A-45. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-17. S-wave arrival times and velocity summaries.

Location: Sherman Oaks Park Coordinates: 34.16070 118.43940 Hole_Code: 269
hoffset = 4.00 travel-time file: SOPS.TT
nlayers = 6

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0202	0.0081	246	1	0.0020	6.1	6.1	246	242	249	20.0	20.0	806	795	818
4.5	14.8	0.0248	0.0183	246	1	0.0003	36.6	30.5	320	318	322	120.1	100.1	1048	1042	1055
7.0	23.0	0.0308	0.0276	253	1	-0.0010	49.0	12.4	489	477	502	160.8	40.7	1604	1564	1646
9.5	31.2	0.0376	0.0355	268	1	-0.0008	60.0	11.0	447	434	461	196.9	36.1	1466	1423	1513
12.0	39.4	0.0452	0.0433	277	1	-0.0004	72.0	12.0	603	582	626	236.2	39.4	1979	1910	2054
14.5	47.6	0.0528	0.0511	284	1	-0.0002	89.5	17.5	692	671	713	293.6	57.4	2269	2202	2340
17.0	55.8	0.0608	0.0589	288	1	0.0003										
19.5	64.0	0.0690	0.0668	292	1	0.0009										
22.0	72.2	0.0760	0.0746	295	1	0.0002										
24.5	80.4	0.0842	0.0824	297	1	0.0007										
27.0	88.6	0.0912	0.0902	299	1	0.0000										
29.5	96.8	0.0968	0.0980	301	1	-0.0021										
32.0	105.0	0.1060	0.1059	302	1	-0.0007										
34.5	113.2	0.1156	0.1137	303	1	0.0012										
37.0	121.4	0.1216	0.1211	306	1	-0.0002										
39.5	129.6	0.1266	0.1262	313	1	-0.0002										
42.0	137.8	0.1330	0.1313	320	1	0.0011										
44.5	146.0	0.1372	0.1364	326	1	0.0003										
47.0	154.2	0.1420	0.1415	332	1	0.0000										
49.5	162.4	0.1468	0.1467	337	1	-0.0004										
52.0	170.6	0.1524	0.1523	341	1	-0.0004										
54.5	178.8	0.1588	0.1579	345	1	0.0005										
57.0	187.0	0.1632	0.1635	349	1	-0.0007										
59.5	195.2	0.1700	0.1691	352	1	0.0005										
62.0	203.4	0.1736	0.1735	357	1	-0.0003										
64.5	211.6	0.1784	0.1777	363	1	0.0004										
67.0	219.8	0.1820	0.1818	368	1	-0.0001										
69.5	228.0	0.1860	0.1860	374	1	-0.0003										
72.0	236.2	0.1908	0.1901	379	1	0.0004										
74.5	244.4	0.1942	0.1937	385	1	0.0002										
77.0	252.6	0.1974	0.1974	390	1	-0.0002										
79.5	260.8	0.2016	0.2010	396	1	0.0004										
82.0	269.0	0.2040	0.2046	401	1	-0.0008										
84.5	277.2	0.2076	0.2082	406	1	-0.0008										
87.0	285.4	0.2126	0.2118	411	1	0.0006										
89.5	293.6	0.2160	0.2154	415	1	0.0004										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-18. P-wave arrival times and velocity summaries.

Location: Sherman Oaks Park Coordinates: 34.16070 118.43940 Hole_Code: 269
hoffset = 4.00 travel-time file: SOPP.TT

nlayers = 4

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0110	0.0044	455	1	0.0012	6.1	6.1	455	444	466	20.0	20.0	1493	1457	1530
4.5	14.8	0.0140	0.0099	455	1	0.0008	17.0	10.9	819	790	849	55.8	35.8	2686	2592	2787
7.0	23.0	0.0160	0.0145	482	1	-0.0006	36.6	19.6	1329	1295	1366	120.1	64.3	4361	4248	4481
9.5	31.2	0.0175	0.0176	541	1	-0.0014	89.5	52.9	1824	1801	1847	293.6	173.6	5983	5908	6060
12.0	39.4	0.0215	0.0206	582	1	-0.0001										
14.5	47.6	0.0245	0.0237	613	1	0.0000										
17.0	55.8	0.0280	0.0267	636	1	0.0006										
19.5	64.0	0.0295	0.0286	682	1	0.0004										
22.0	72.2	0.0305	0.0305	722	1	-0.0004										
24.5	80.4	0.0330	0.0324	757	1	0.0003										
27.0	88.6	0.0340	0.0342	788	1	-0.0006										
29.5	96.8	0.0365	0.0361	817	1	0.0001										
32.0	105.0	0.0385	0.0380	842	1	0.0002										
34.5	113.2	0.0405	0.0399	865	1	0.0004										
37.0	121.4	0.0415	0.0417	888	1	-0.0004										
39.5	129.6	0.0440	0.0431	917	1	0.0008										
42.0	137.8	0.0445	0.0444	945	1	-0.0001										
44.5	146.0	0.0460	0.0458	972	1	0.0000										
47.0	154.2	0.0470	0.0472	996	1	-0.0003										
49.5	162.4	0.0485	0.0485	1020	1	-0.0002										
52.0	170.6	0.0490	0.0499	1042	1	-0.0010										
54.5	178.8	0.0515	0.0513	1063	1	0.0001										
59.5	195.2	0.0540	0.0540	1101	1	-0.0001										
62.0	203.4	0.0560	0.0554	1119	1	0.0005										
64.5	211.6	0.0570	0.0568	1136	1	0.0001										
67.0	219.8	0.0580	0.0581	1152	1	-0.0002										
69.5	228.0	0.0590	0.0595	1168	1	-0.0006										
72.0	236.2	0.0615	0.0609	1183	1	0.0005										
74.5	244.4	0.0630	0.0622	1197	1	0.0007										
77.0	252.6	0.0635	0.0636	1210	1	-0.0002										
79.5	260.8	0.0660	0.0650	1223	1	0.0009										
82.0	269.0	0.0665	0.0664	1236	1	0.0001										
84.5	277.2	0.0675	0.0677	1248	1	-0.0003										
87.0	285.4	0.0690	0.0691	1259	1	-0.0002										
89.5	293.6	0.0700	0.0705	1270	1	-0.0005										

Explanation:

- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

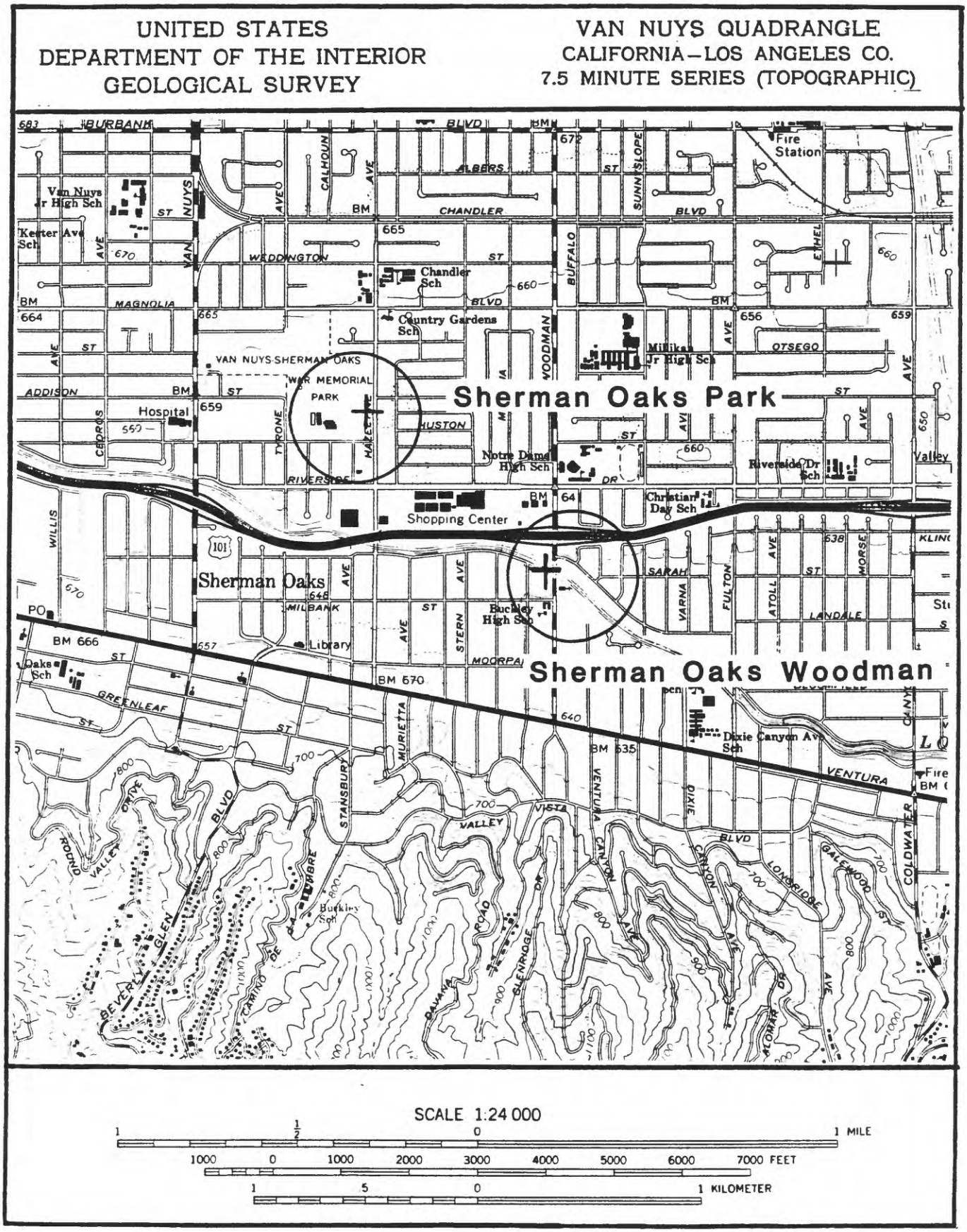

Figure A-46. Site location map for the borehole at Sherman Oaks Woodman. No accelerograph is located at this site.

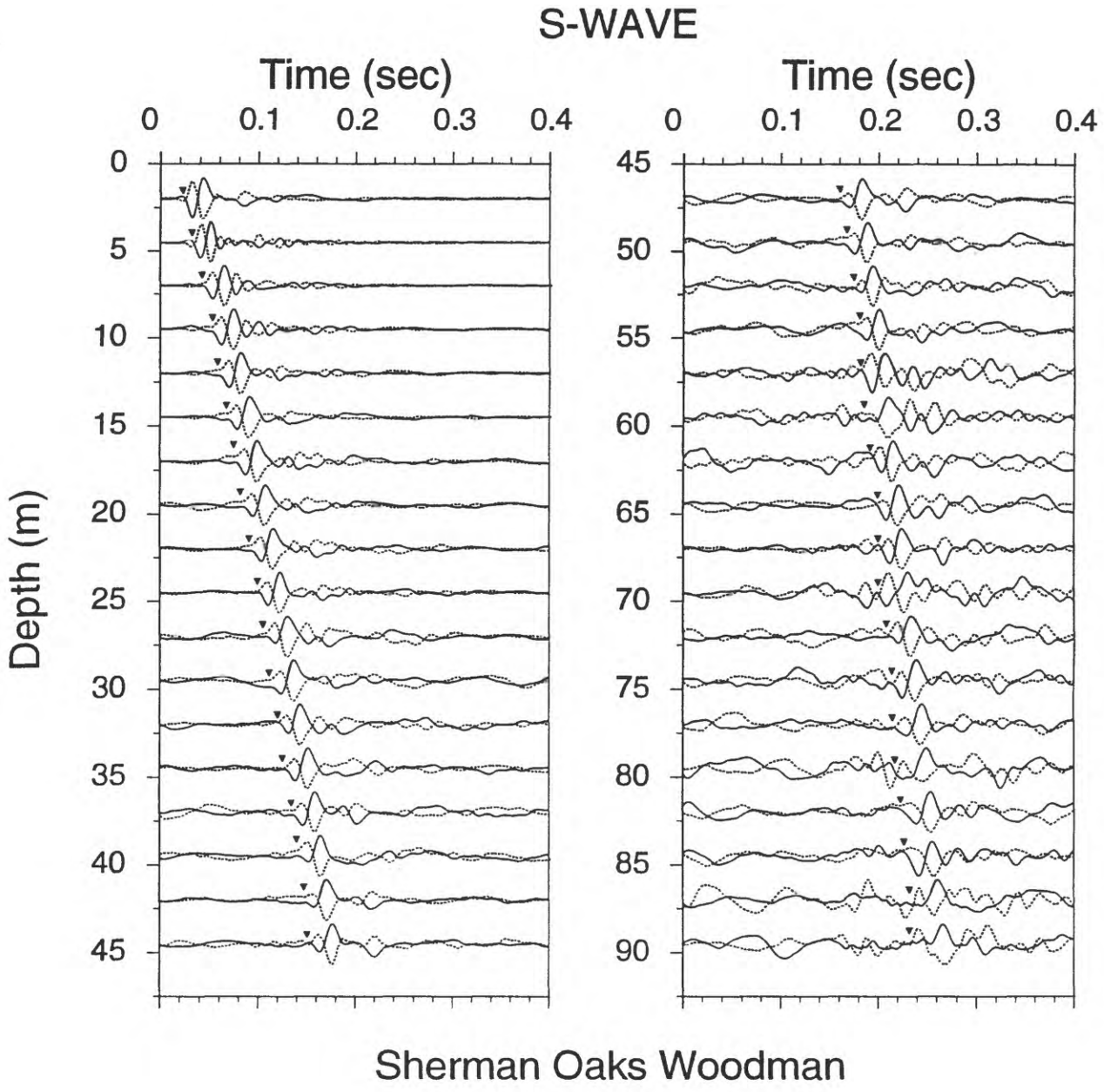

Figure A-47. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

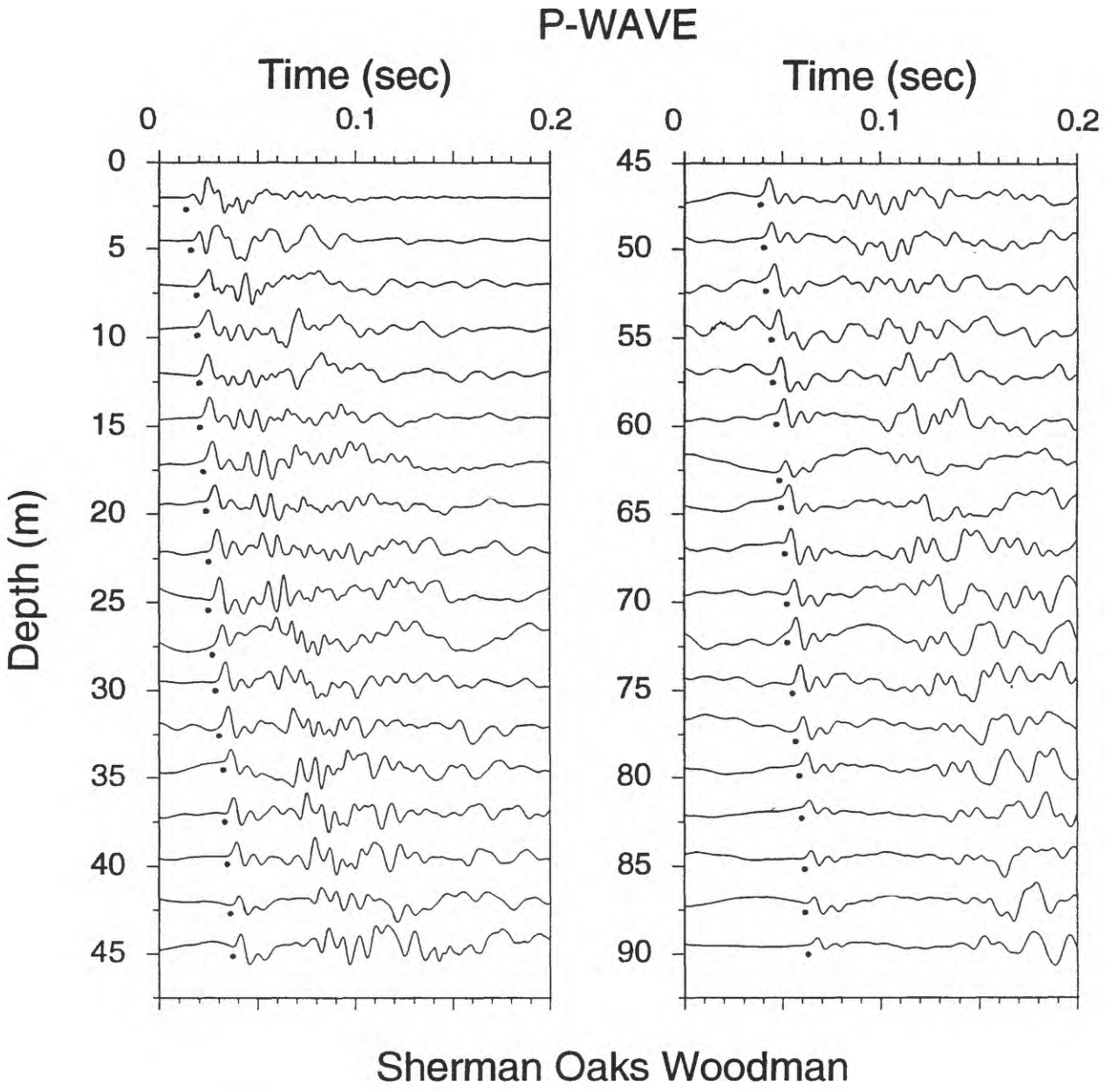

Figure A-48. Vertical component record section. P-wave arrivals are indicated by the solid circles.

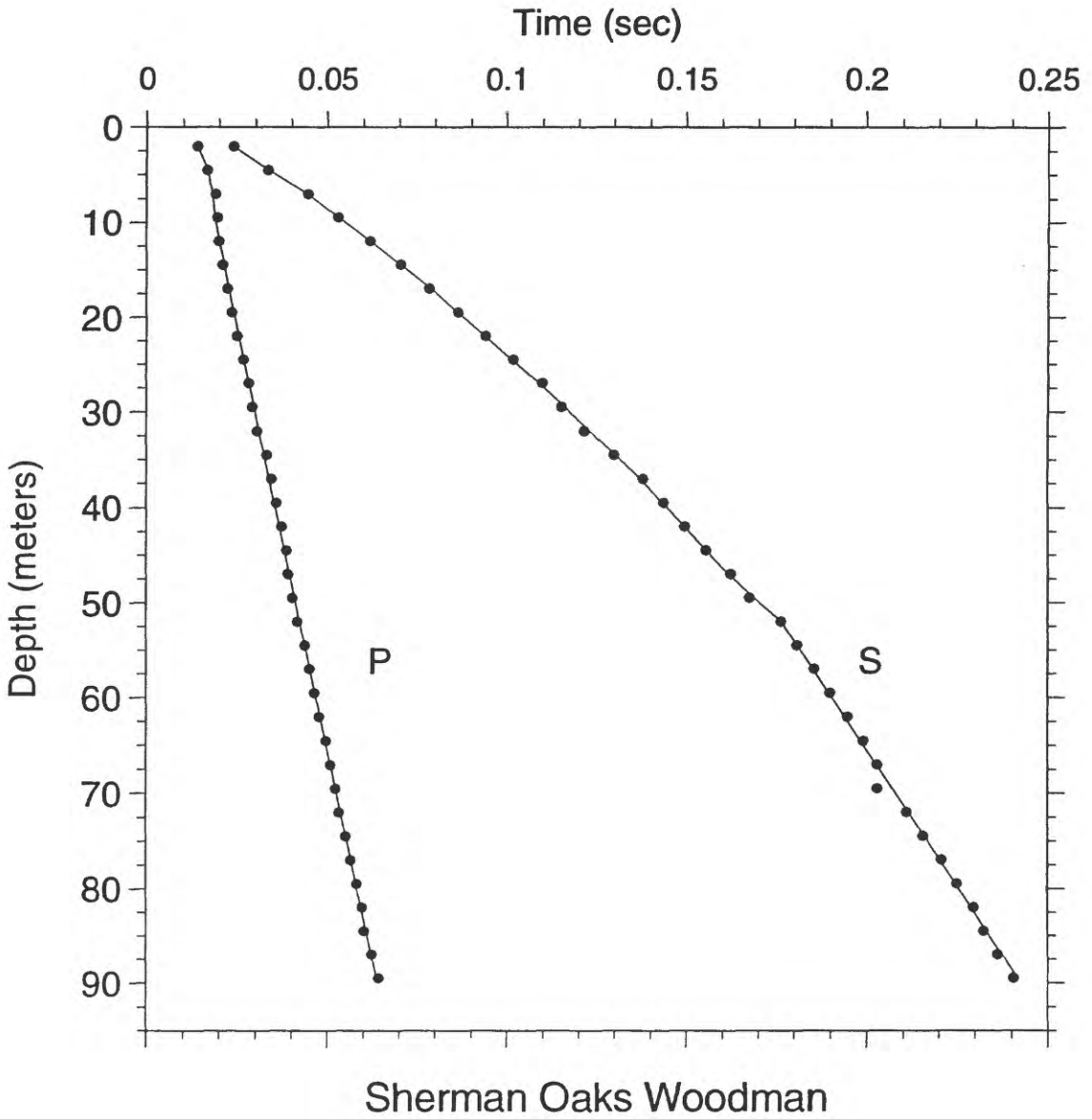

Figure A-49. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

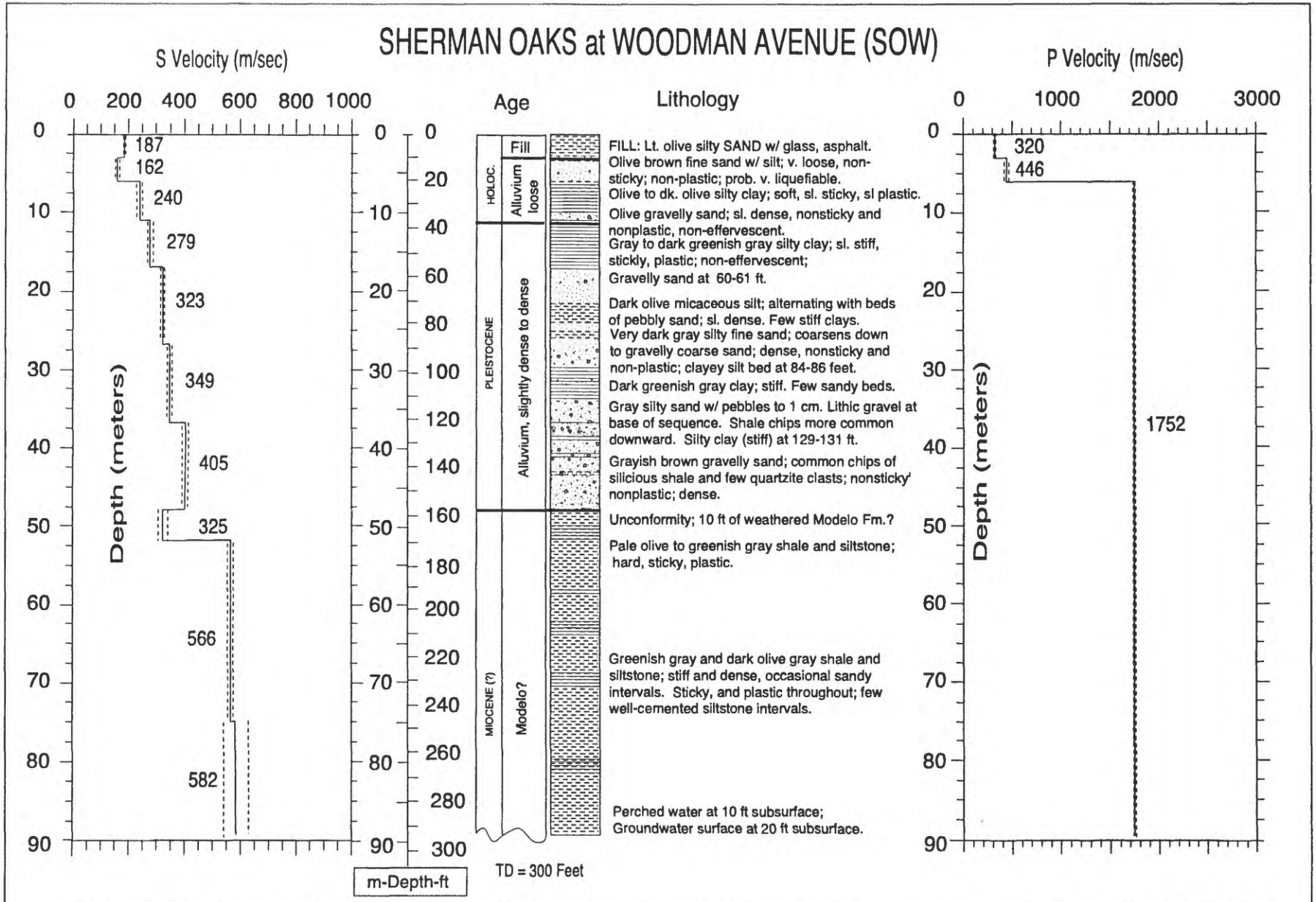

Figure A-50. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-19. S-wave arrival times and velocity summaries.

Location: Sherman Oaks Woodman Coordinates: 34.15430 118.43070 Hole_Code: 272
hoffset = 4.00 travel-time file: SOWS.TT
nlayers = 10

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0240	0.0107	187	1	0.0001	3.0	3.0	187	183	192	9.8	9.8	614	599	629
4.5	14.8	0.0336	0.0253	178	1	-0.0002	6.0	3.0	162	155	170	19.7	9.8	532	509	558
7.0	23.0	0.0446	0.0387	181	1	0.0002	11.0	5.0	240	230	252	36.1	16.4	789	755	826
9.5	31.2	0.0530	0.0491	194	1	-0.0001	17.0	6.0	279	270	289	55.8	19.7	916	885	949
12.0	39.4	0.0620	0.0589	204	1	0.0000	27.0	10.0	323	316	330	88.6	32.8	1058	1036	1082
14.5	47.6	0.0704	0.0679	214	1	0.0001	37.0	10.0	349	341	356	121.4	32.8	1143	1119	1169
17.0	55.8	0.0784	0.0768	221	1	-0.0004	48.0	11.0	405	395	416	157.5	36.1	1329	1295	1365
19.5	64.0	0.0864	0.0846	231	1	0.0002	52.0	4.0	325	308	344	170.6	13.1	1066	1011	1127
22.0	72.2	0.0940	0.0923	238	1	0.0003	75.0	23.0	566	557	575	246.1	75.5	1857	1829	1887
24.5	80.4	0.1018	0.1001	245	1	0.0005	89.5	14.5	582	542	629	293.6	47.6	1910	1777	2065
27.0	88.6	0.1098	0.1078	250	1	0.0009										
29.5	96.8	0.1152	0.1150	257	1	-0.0008										
32.0	105.0	0.1216	0.1222	262	1	-0.0015										
34.5	113.2	0.1298	0.1293	267	1	-0.0004										
37.0	121.4	0.1380	0.1365	271	1	0.0007										
39.5	129.6	0.1438	0.1427	277	1	0.0004										
42.0	137.8	0.1496	0.1489	282	1	0.0001										
44.5	146.0	0.1556	0.1550	287	1	0.0000										
47.0	154.2	0.1624	0.1612	292	1	0.0007										
49.5	162.4	0.1676	0.1683	294	1	-0.0012										
52.0	170.6	0.1764	0.1760	295	1	-0.0001										
54.5	178.8	0.1808	0.1804	302	1	0.0000										
57.0	187.0	0.1856	0.1848	308	2	0.0004										
59.5	195.2	0.1900	0.1892	314	3	0.0004										
62.0	203.4	0.1948	0.1936	320	1	0.0008										
64.5	211.6	0.1992	0.1981	326	2	0.0008										
67.0	219.8	0.2030	0.2025	331	1	0.0002										
69.5	228.0	0.2030	0.2069	336	3	-0.0042										
72.0	236.2	0.2112	0.2113	341	1	-0.0004										
74.5	244.4	0.2156	0.2157	345	1	-0.0004										
77.0	252.6	0.2208	0.2200	350	1	0.0005										
79.5	260.8	0.2250	0.2243	354	4	0.0004										
82.0	269.0	0.2296	0.2286	359	3	0.0007										
84.5	277.2	0.2324	0.2329	363	4	-0.0007										
87.0	285.4	0.2362	0.2372	367	5	-0.0012										
89.5	293.6	0.2406	0.2415	371	5	-0.0011										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-20. P-wave arrival times and velocity summaries.

Location: Sherman Oaks Woodman Coordinates: 34.15430 118.43070 Hole_Code: 272
hoffset = 4.00 travel-time file: SOWP.TT
nlayers = 3

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)
2.0	6.6	0.0140	0.0062	320	1	0.0000
4.5	14.8	0.0168	0.0127	353	1	-0.0001
7.0	23.0	0.0190	0.0167	420	1	0.0009
9.5	31.2	0.0196	0.0181	525	1	0.0007
12.0	39.4	0.0200	0.0195	615	1	-0.0001
14.5	47.6	0.0210	0.0210	692	1	-0.0004
17.0	55.8	0.0224	0.0224	760	1	-0.0003
19.5	64.0	0.0236	0.0238	819	1	-0.0005
22.0	72.2	0.0250	0.0252	872	1	-0.0005
24.5	80.4	0.0268	0.0267	919	1	-0.0001
27.0	88.6	0.0282	0.0281	961	1	-0.0001
29.5	96.8	0.0292	0.0295	1000	1	-0.0005
32.0	105.0	0.0306	0.0309	1034	1	-0.0005
34.5	113.2	0.0332	0.0324	1066	1	0.0007
37.0	121.4	0.0346	0.0338	1095	1	0.0007
39.5	129.6	0.0360	0.0352	1122	1	0.0007
42.0	137.8	0.0374	0.0366	1146	1	0.0006
44.5	146.0	0.0388	0.0381	1169	1	0.0006
47.0	154.2	0.0392	0.0395	1190	1	-0.0004
49.5	162.4	0.0404	0.0409	1210	1	-0.0006
52.0	170.6	0.0418	0.0424	1228	1	-0.0006
54.5	178.8	0.0438	0.0438	1245	1	-0.0001
57.0	187.0	0.0452	0.0452	1261	1	-0.0001
59.5	195.2	0.0466	0.0466	1276	1	-0.0001
62.0	203.4	0.0478	0.0481	1290	1	-0.0003
64.5	211.6	0.0498	0.0495	1303	1	0.0002
67.0	219.8	0.0510	0.0509	1316	1	0.0000
69.5	228.0	0.0524	0.0523	1328	1	0.0000
72.0	236.2	0.0534	0.0538	1339	1	-0.0004
74.5	244.4	0.0552	0.0552	1350	1	-0.0001
77.0	252.6	0.0566	0.0566	1360	1	-0.0001
79.5	260.8	0.0584	0.0580	1370	1	0.0003
82.0	269.0	0.0598	0.0595	1379	1	0.0003
84.5	277.2	0.0604	0.0609	1388	1	-0.0006
87.0	285.4	0.0626	0.0623	1396	1	0.0002
89.5	293.6	0.0644	0.0637	1404	1	0.0006

dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
3.0	3.0	320	310	331	9.8	9.8	1051	1018	1085
6.0	3.0	446	424	469	19.7	9.8	1462	1392	1540
89.5	83.5	1752	1743	1762	293.6	274.0	5749	5718	5781

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

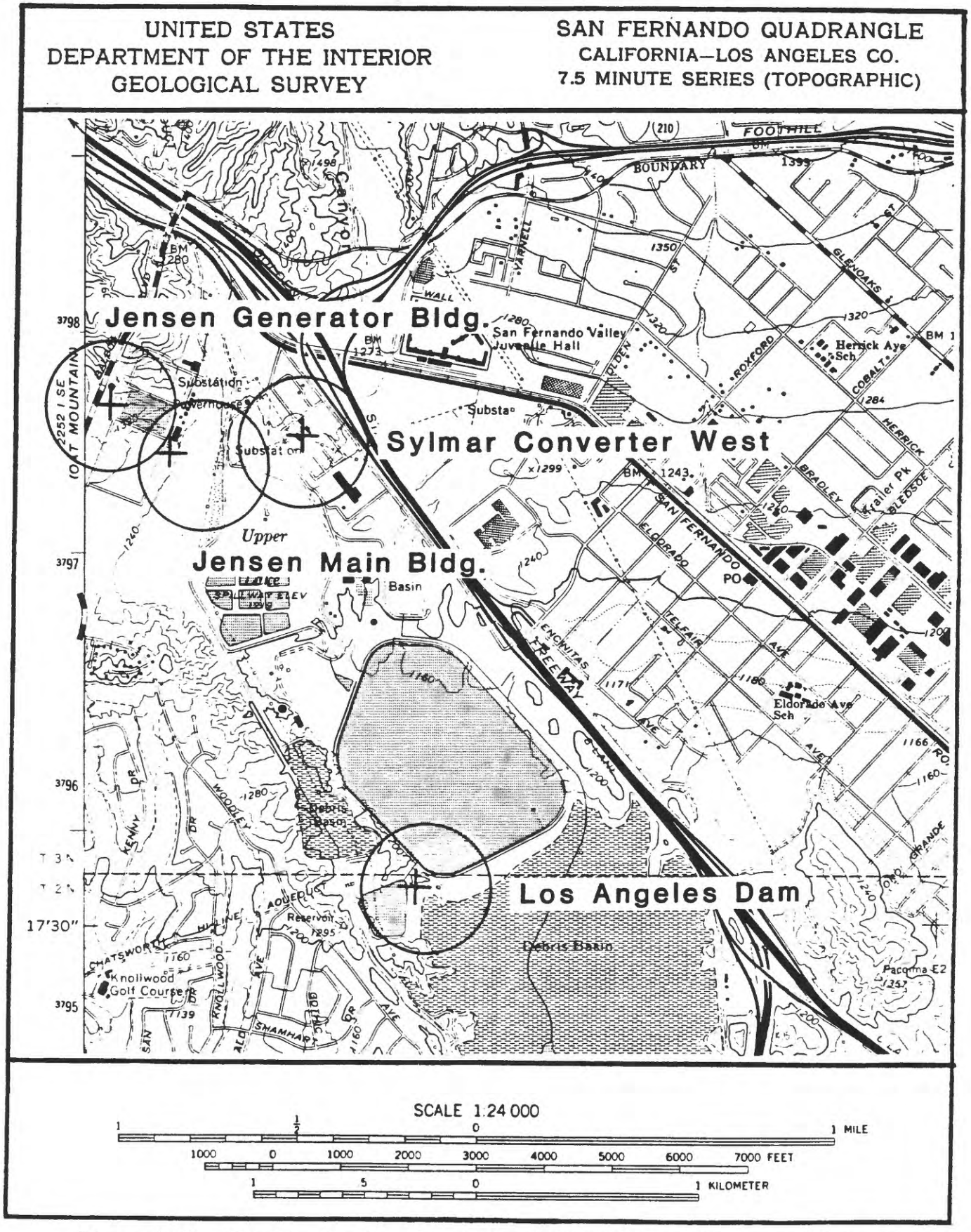

Figure A-51. Site location map for the borehole at Sylmar Converter West. The accelerograph is located approximately 10 meters from the borehole.

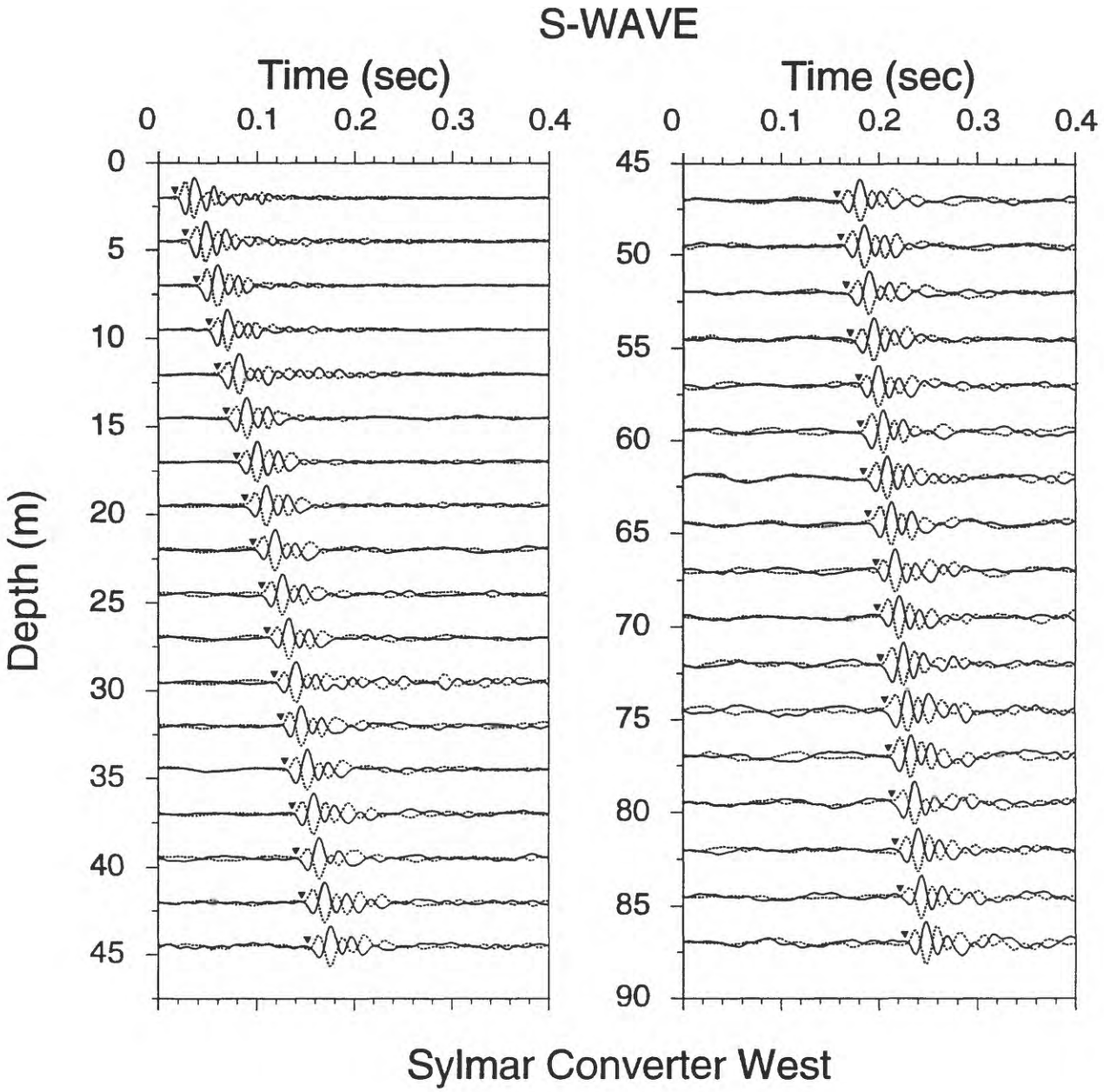

Figure A-52. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

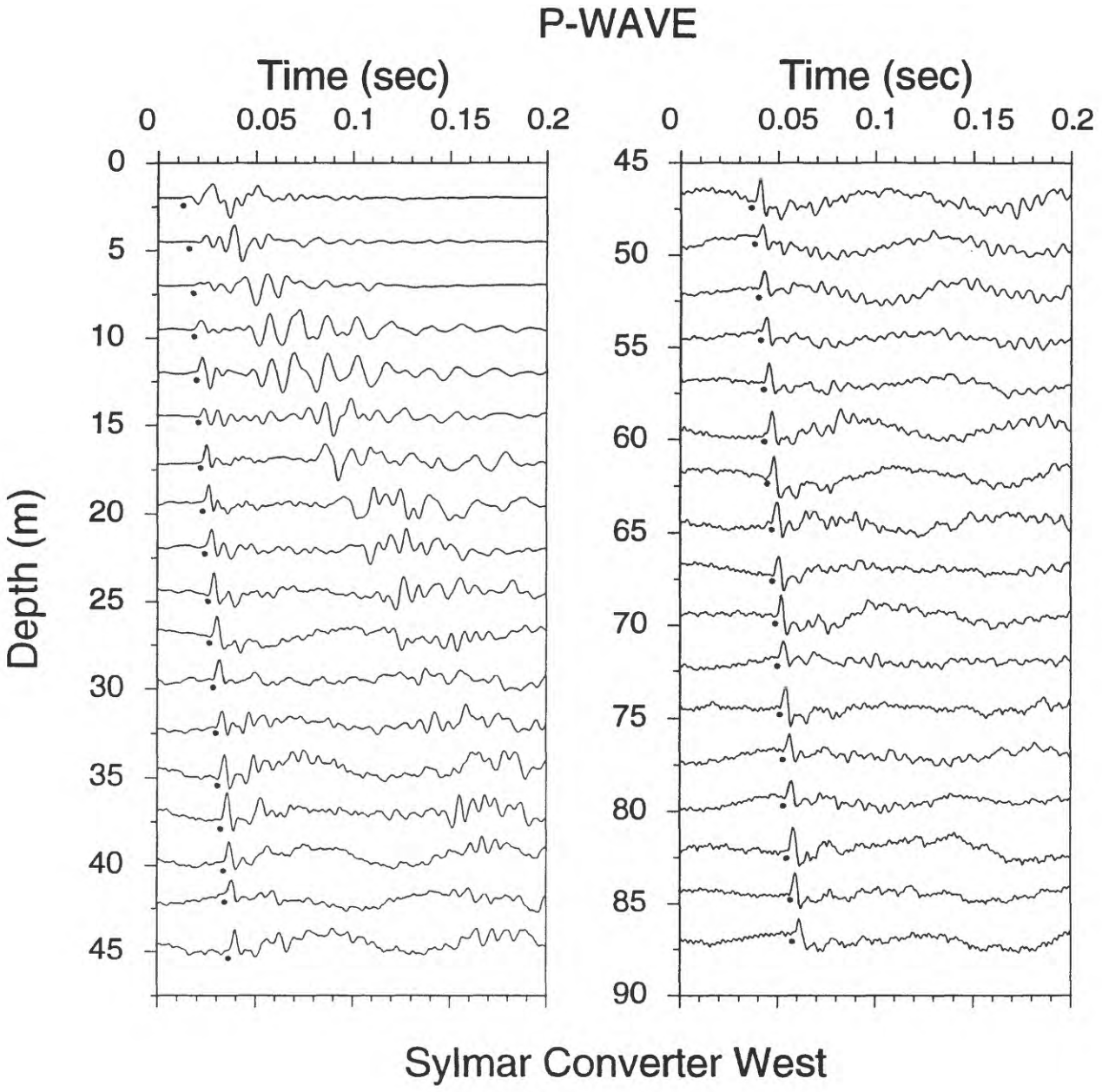

Figure A-53. Vertical component record section. P-wave arrivals are indicated by the solid circles.

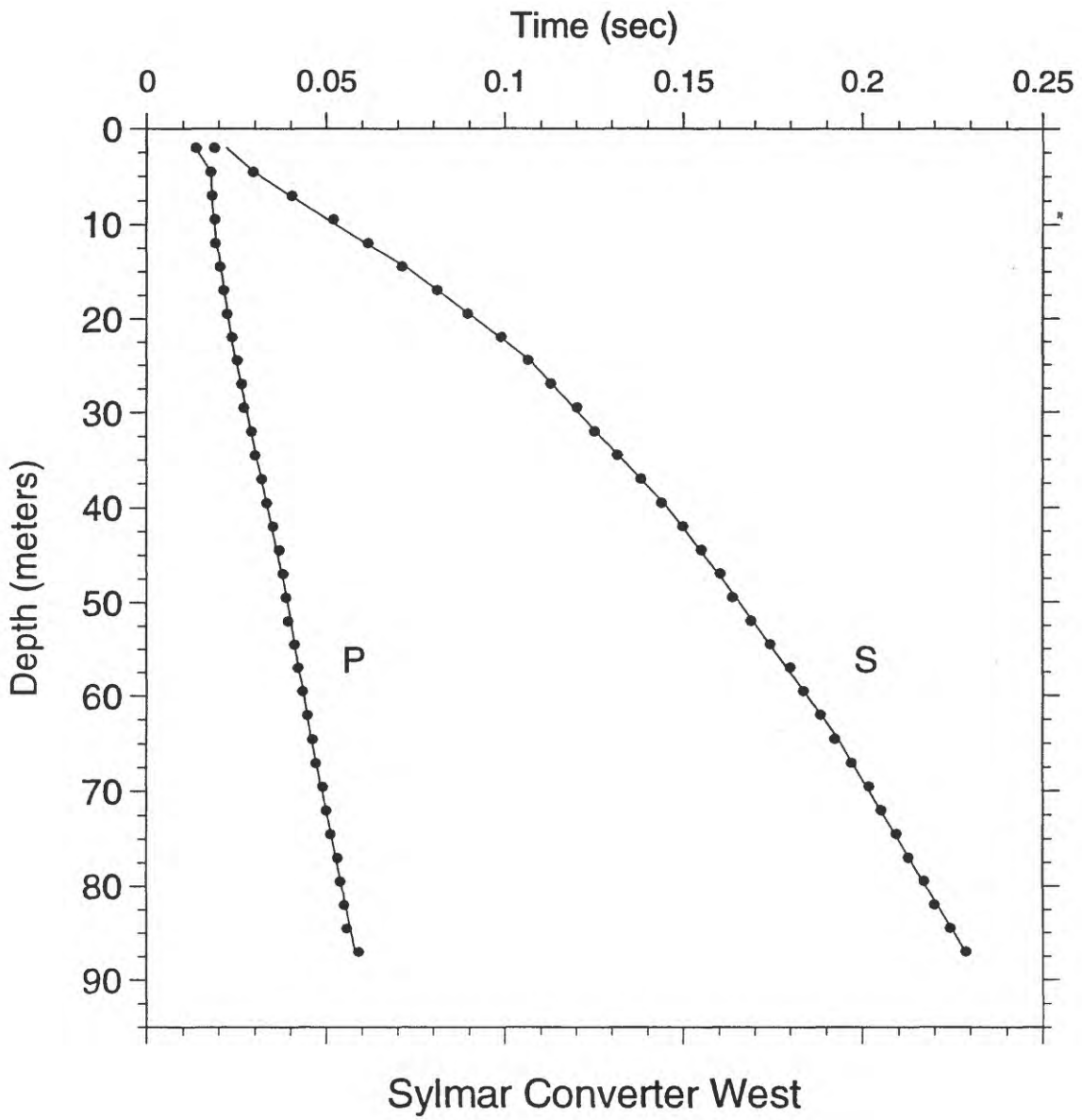

Figure A-54. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

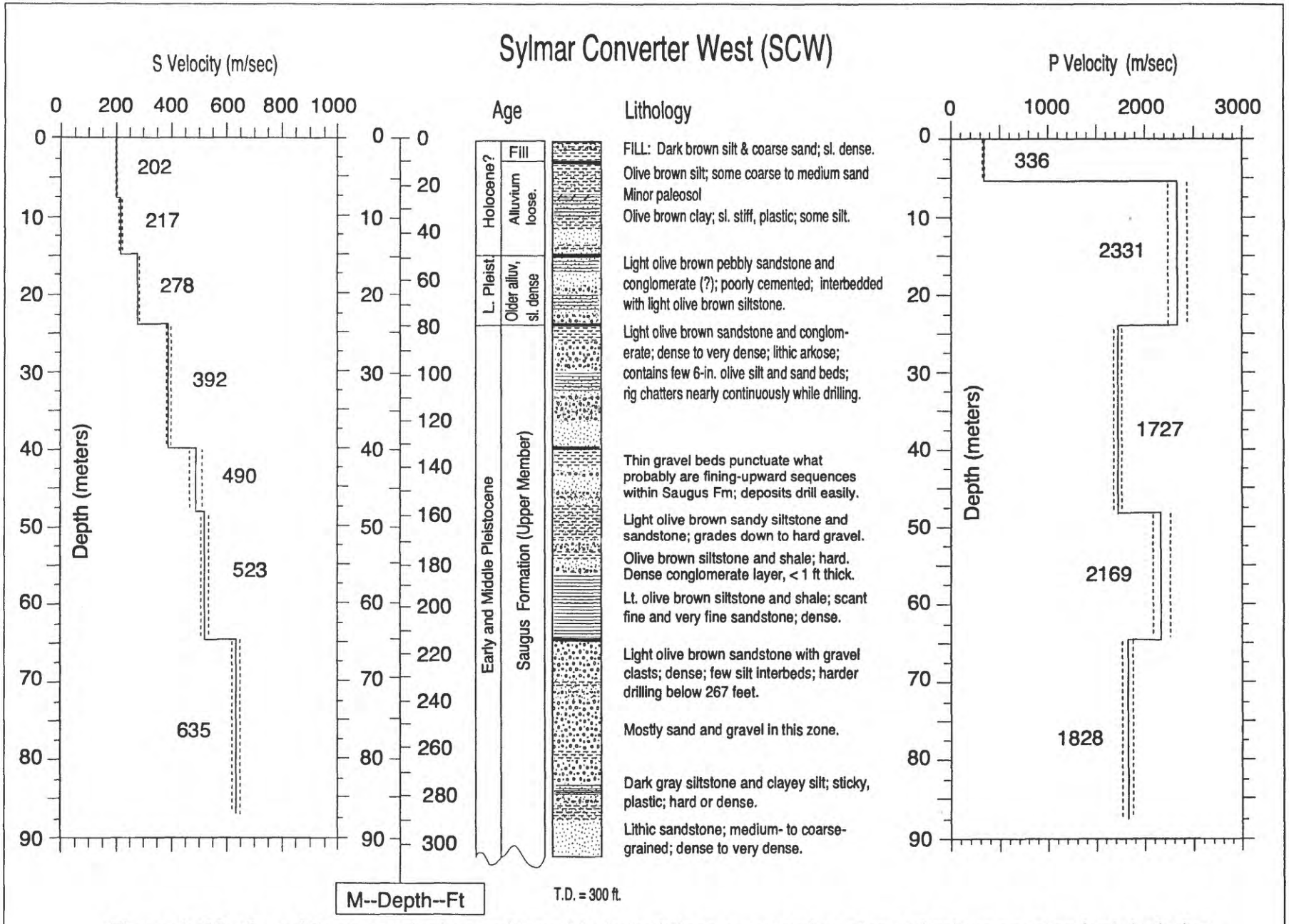

Figure A-55. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-21. S-wave arrival times and velocity summaries.

Location: Sylmar Converter West Coordinates: 34.31170 118.48930 Hole_Code: 271
hoffset = 4.00 travel-time file: scws.tt
nlayers = 7

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0188	0.0099	202	1	-0.0033	7.6	7.6	202	199	205	24.9	24.9	663	654	672
4.5	14.8	0.0296	0.0223	202	1	-0.0002	15.0	7.4	217	211	222	49.2	24.3	711	692	730
7.0	23.0	0.0404	0.0346	202	1	0.0005	24.0	9.0	278	270	286	78.7	29.5	911	887	937
9.5	31.2	0.0520	0.0464	205	1	0.0017	40.0	16.0	392	383	400	131.2	52.5	1285	1258	1312
12.0	39.4	0.0618	0.0579	207	1	0.0007	48.2	8.2	490	468	515	158.1	26.9	1608	1534	1690
14.5	47.6	0.0712	0.0695	209	1	-0.0009	64.6	16.4	523	511	537	211.9	53.8	1717	1676	1760
17.0	55.8	0.0810	0.0790	215	1	-0.0001	87.0	22.4	635	622	650	285.4	73.5	2084	2039	2131
19.5	64.0	0.0896	0.0880	222	1	-0.0002										
22.0	72.2	0.0990	0.0970	227	1	0.0004										
24.5	80.4	0.1064	0.1055	232	1	-0.0004										
27.0	88.6	0.1128	0.1119	241	1	-0.0002										
29.5	96.8	0.1202	0.1182	249	1	0.0009										
32.0	105.0	0.1252	0.1246	257	1	-0.0003										
34.5	113.2	0.1316	0.1310	263	1	-0.0002										
37.0	121.4	0.1382	0.1374	269	1	0.0001										
39.5	129.6	0.1440	0.1438	275	1	-0.0005										
42.0	137.8	0.1500	0.1491	282	1	0.0002										
44.5	146.0	0.1552	0.1542	289	1	0.0004										
47.0	154.2	0.1604	0.1593	295	1	0.0005										
49.5	162.4	0.1638	0.1643	301	1	-0.0009										
52.0	170.6	0.1690	0.1690	308	1	-0.0005										
54.5	178.8	0.1744	0.1738	314	1	0.0002										
57.0	187.0	0.1800	0.1786	319	1	0.0010										
59.5	195.2	0.1836	0.1834	324	1	-0.0001										
62.0	203.4	0.1884	0.1881	330	1	-0.0001										
64.5	211.6	0.1924	0.1929	334	1	-0.0009										
67.0	219.8	0.1970	0.1969	340	1	-0.0002										
69.5	228.0	0.2018	0.2008	346	1	0.0007										
72.0	236.2	0.2052	0.2048	352	1	0.0002										
74.5	244.4	0.2094	0.2087	357	1	0.0004										
77.0	252.6	0.2128	0.2126	362	1	-0.0001										
79.5	260.8	0.2172	0.2166	367	1	0.0004										
82.0	269.0	0.2200	0.2205	372	1	-0.0007										
84.5	277.2	0.2244	0.2244	376	1	-0.0003										
87.0	285.4	0.2288	0.2284	381	1	0.0002										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-22. P-wave arrival times and velocity summaries.

Location: Sylmar Converter West Coordinates: 34.31170 118.48930 Hole_Code: 271
hoffset = 4.00 travel-time file: scwp.tt
nlayers = 5

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0136	0.0060	336	1	0.0003	5.5	5.5	336	331	341	18.0	18.0	1102	1087	1118
4.5	14.8	0.0178	0.0134	336	1	-0.0001	24.0	18.5	2331	2237	2433	78.7	60.7	7648	7340	7984
7.0	23.0	0.0182	0.0170	411	1	0.0001	48.2	24.2	1727	1690	1767	158.1	79.4	5667	5544	5796
9.5	31.2	0.0190	0.0181	525	1	0.0003	64.6	16.4	2169	2082	2263	211.9	53.8	7116	6831	7425
12.0	39.4	0.0192	0.0192	626	1	-0.0004	87.0	22.4	1828	1774	1885	285.4	73.5	5997	5822	6183
14.5	47.6	0.0204	0.0202	717	1	-0.0002										
17.0	55.8	0.0214	0.0213	798	1	-0.0002										
19.5	64.0	0.0224	0.0224	872	1	-0.0002										
22.0	72.2	0.0238	0.0234	938	1	0.0002										
24.5	80.4	0.0252	0.0246	996	1	0.0004										
27.0	88.6	0.0264	0.0260	1037	1	0.0002										
29.5	96.8	0.0270	0.0275	1073	1	-0.0006										
32.0	105.0	0.0292	0.0289	1106	1	0.0001										
34.5	113.2	0.0302	0.0304	1135	1	-0.0003										
37.0	121.4	0.0320	0.0318	1162	1	0.0001										
39.5	129.6	0.0334	0.0333	1187	1	0.0000										
42.0	137.8	0.0352	0.0347	1209	1	0.0004										
44.5	146.0	0.0370	0.0362	1230	1	0.0007										
47.0	154.2	0.0380	0.0376	1249	1	0.0003										
49.5	162.4	0.0388	0.0389	1272	1	-0.0002										
52.0	170.6	0.0394	0.0401	1298	1	-0.0008										
54.5	178.8	0.0412	0.0412	1322	1	-0.0001										
57.0	187.0	0.0422	0.0424	1345	1	-0.0002										
59.5	195.2	0.0434	0.0435	1367	1	-0.0002										
62.0	203.4	0.0448	0.0447	1388	1	0.0001										
64.5	211.6	0.0462	0.0458	1407	1	0.0003										
67.0	219.8	0.0472	0.0472	1420	1	-0.0001										
69.5	228.0	0.0490	0.0486	1431	1	0.0004										
72.0	236.2	0.0500	0.0499	1442	1	0.0000										
74.5	244.4	0.0512	0.0513	1452	1	-0.0002										
77.0	252.6	0.0532	0.0527	1462	1	0.0005										
79.5	260.8	0.0540	0.0540	1471	1	-0.0001										
82.0	269.0	0.0550	0.0554	1480	1	-0.0004										
84.5	277.2	0.0558	0.0568	1489	1	-0.0010										
87.0	285.4	0.0592	0.0581	1497	1	0.0010										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s) = average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec) = residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

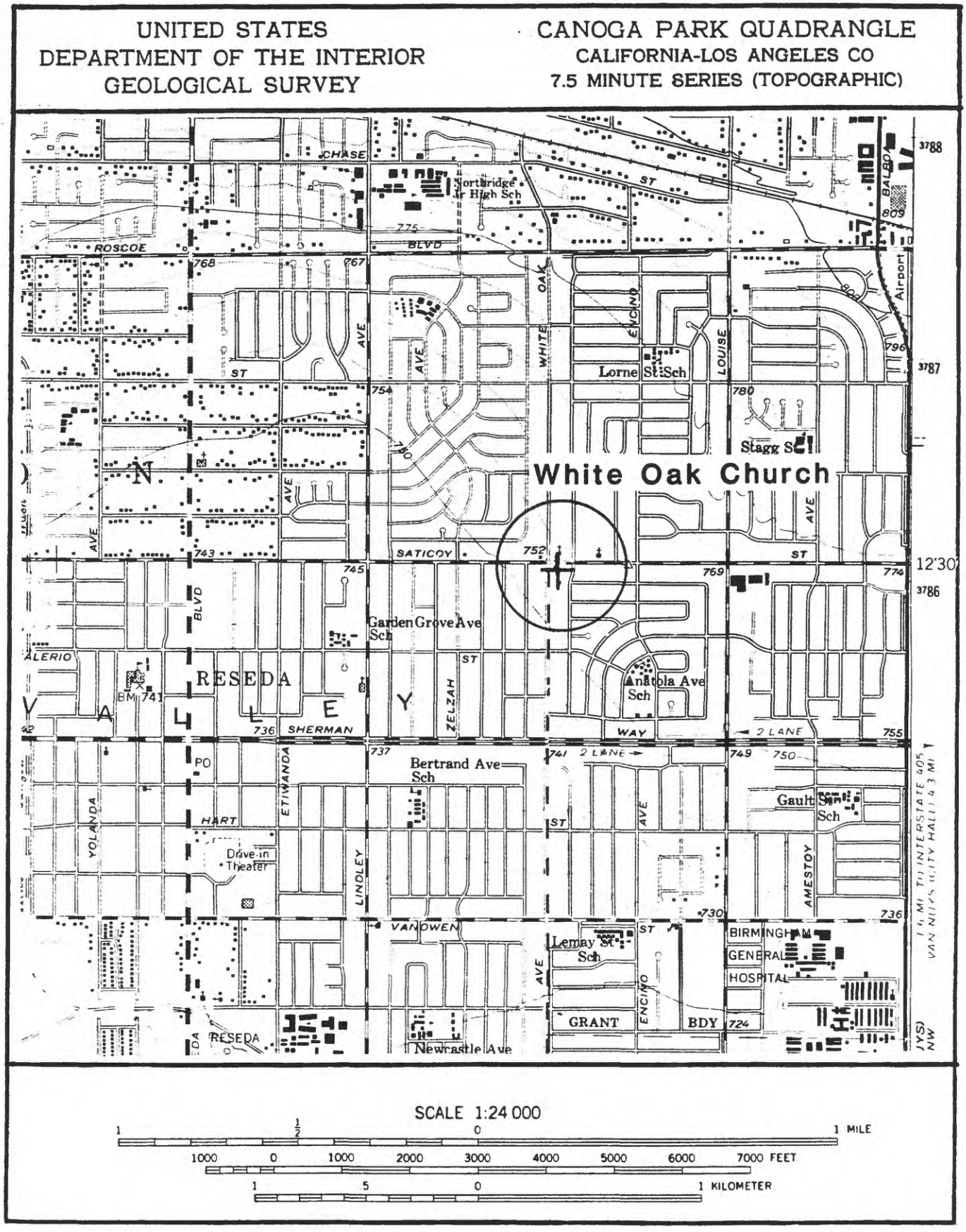

Figure A-56. Site location map for the borehole at White Oak Church. The accelerograph is located approximately 50 meters from the borehole.

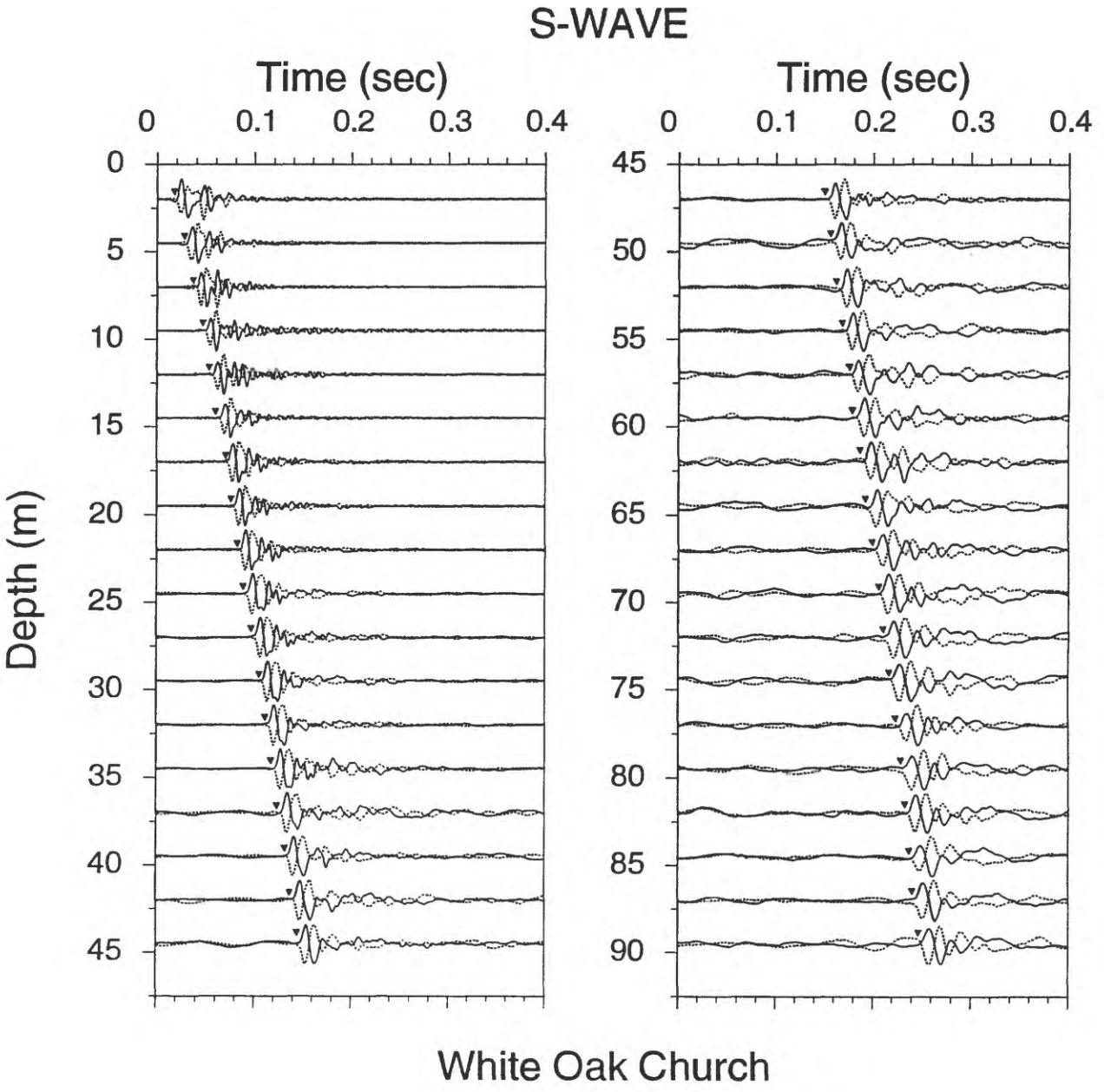

Figure A-57. Horizontal component record section (from impacts in opposite directions) superimposed for identification of S-wave onset. Approximate S-wave time picks are indicated by the inverted triangles.

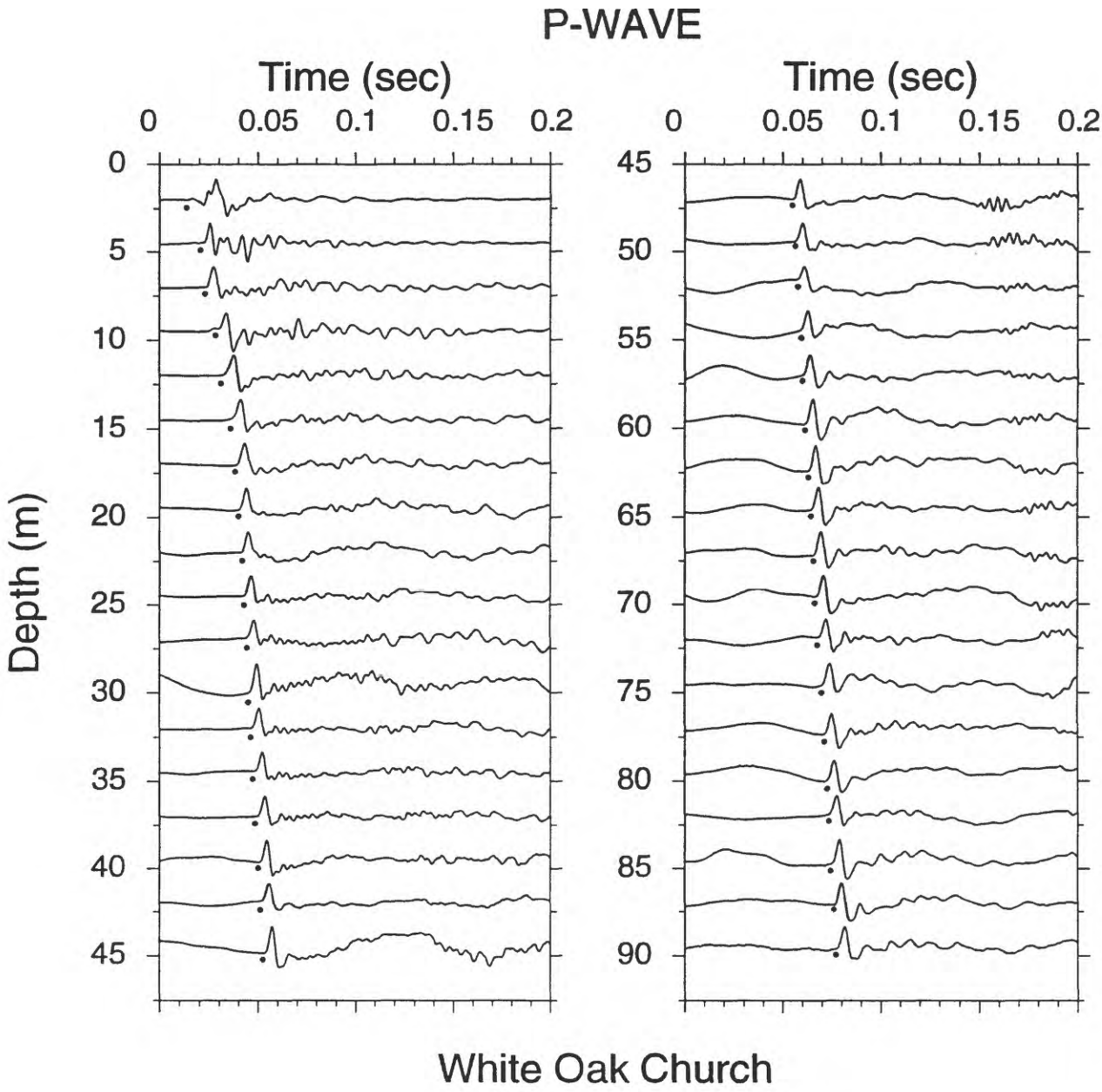

Figure A-58. Vertical component record section. P-wave arrivals are indicated by the solid circles.

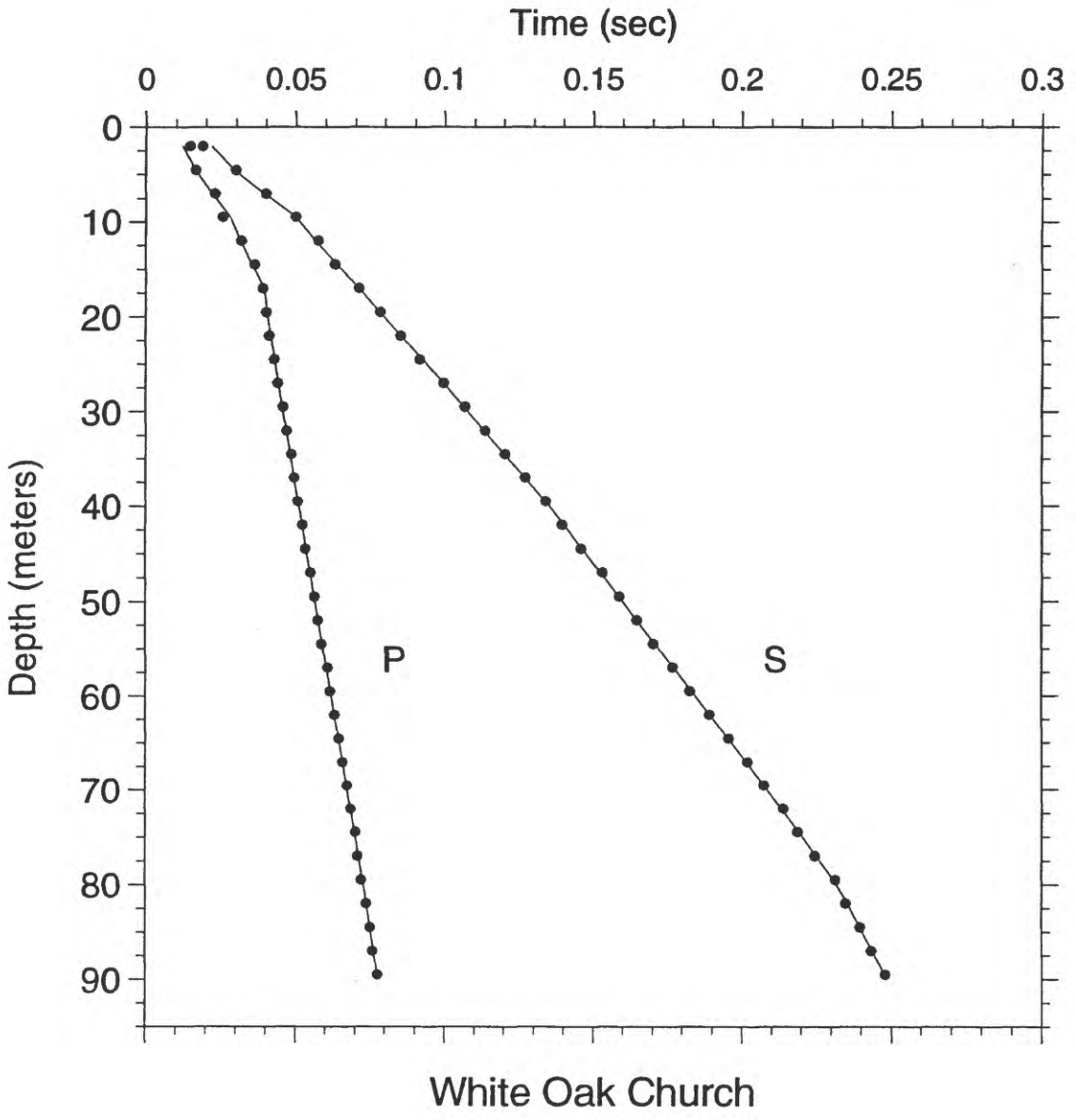

Figure A-59. Time-depth graph of P-wave and S-wave picks. Line segments show the hinged-least-squares fit to the data points.

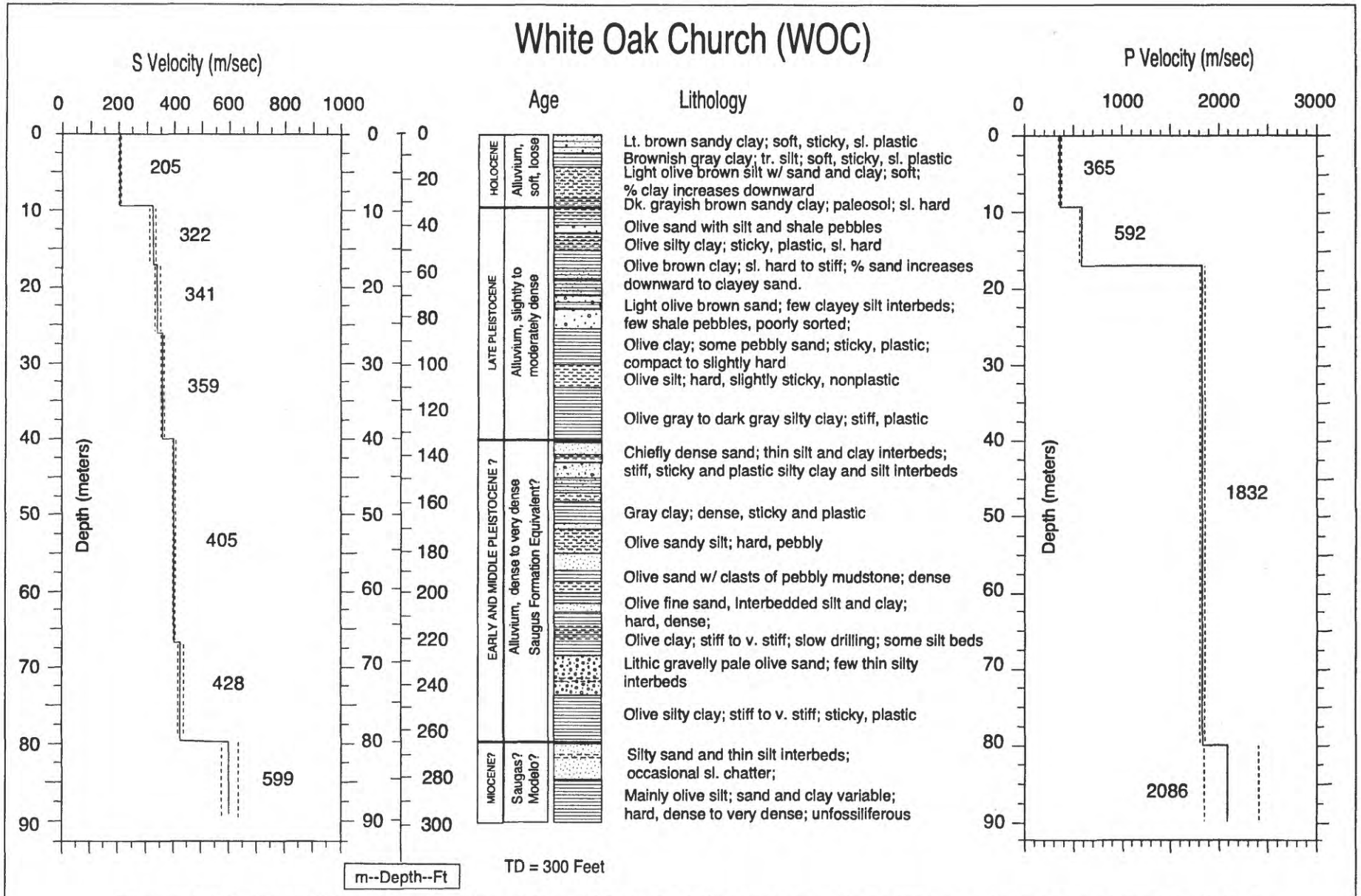

Figure A-60. S- and P-wave velocity profiles with dashed lines representing plus and minus one standard deviation. Generalized geologic log is shown for correlation with velocities.

TABLE A-23. S-wave arrival times and velocity summaries.

Location: White Oak Church Coordinates: 34.20810 118.51710 Hole_Code: 268
hoffset = 4.00 travel-time file: wocs.tt
nlayers = 7

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0188	0.0098	205	1	-0.0031	9.3	9.3	205	203	207	30.5	30.5	672	665	678
4.5	14.8	0.0300	0.0220	205	1	0.0006	17.0	7.7	322	313	332	55.8	25.3	1056	1026	1088
7.0	23.0	0.0400	0.0342	205	1	0.0006	26.0	9.0	341	332	351	85.3	29.5	1119	1089	1151
9.5	31.2	0.0500	0.0460	206	1	0.0001	40.0	14.0	359	354	365	131.2	45.9	1179	1161	1199
12.0	39.4	0.0576	0.0538	223	1	0.0010	67.0	27.0	405	402	409	219.8	88.6	1329	1318	1341
14.5	47.6	0.0632	0.0616	235	1	-0.0006	80.0	13.0	428	419	437	262.5	42.7	1404	1375	1433
17.0	55.8	0.0712	0.0694	245	1	0.0001	89.5	9.5	599	569	631	293.6	31.2	1964	1868	2071
19.5	64.0	0.0784	0.0767	254	1	0.0002										
22.0	72.2	0.0852	0.0840	262	1	-0.0001										
24.5	80.4	0.0916	0.0913	268	1	-0.0009										
27.0	88.6	0.0996	0.0985	274	1	0.0001										
29.5	96.8	0.1068	0.1055	280	1	0.0004										
32.0	105.0	0.1136	0.1124	285	1	0.0004										
34.5	113.2	0.1204	0.1194	289	1	0.0003										
37.0	121.4	0.1272	0.1263	293	1	0.0002										
39.5	129.6	0.1340	0.1333	296	1	0.0001										
42.0	137.8	0.1396	0.1396	301	1	-0.0006										
44.5	146.0	0.1460	0.1458	305	1	-0.0003										
47.0	154.2	0.1532	0.1519	309	1	0.0007										
49.5	162.4	0.1588	0.1581	313	1	0.0002										
52.0	170.6	0.1648	0.1643	317	1	0.0001										
54.5	178.8	0.1704	0.1705	320	1	-0.0005										
57.0	187.0	0.1768	0.1766	323	1	-0.0002										
59.5	195.2	0.1826	0.1828	325	1	-0.0006										
62.0	203.4	0.1892	0.1890	328	1	-0.0001										
64.5	211.6	0.1956	0.1951	331	1	0.0001										
67.0	219.8	0.2020	0.2013	333	1	0.0004										
69.5	228.0	0.2076	0.2071	336	1	0.0001										
72.0	236.2	0.2140	0.2130	338	1	0.0007										
74.5	244.4	0.2188	0.2188	340	1	-0.0003										
77.0	252.6	0.2246	0.2247	343	1	-0.0004										
79.5	260.8	0.2314	0.2305	345	1	0.0006										
82.0	269.0	0.2348	0.2350	349	1	-0.0005										
84.5	277.2	0.2396	0.2392	353	1	0.0001										
87.0	285.4	0.2434	0.2434	357	1	-0.0002										
89.5	293.6	0.2480	0.2476	362	1	0.0002										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

TABLE A-24. P-wave arrival times and velocity summaries.

Location: White Oak Church Coordinates: 34.20810 118.51710 Hole_Code: 268
hoffset = 4.00 travel-time file: wocp_re.tt
nlayers = 4

d(m)	d(ft)	tsl(s)	tvrt(s)	vavg(m/s)	sig	rsdl(sec)	dtb(m)	thk(m)	v(m/s)	vl(m/s)	vu(m/s)	dtb(ft)	thk(ft)	v(ft/s)	vl(ft/s)	vu(ft/s)
2.0	6.6	0.0146	0.0055	365	1	0.0024	9.3	9.3	365	360	371	30.5	30.5	1199	1181	1218
4.5	14.8	0.0166	0.0123	365	1	0.0001	17.0	7.7	592	570	614	55.8	25.3	1941	1872	2015
7.0	23.0	0.0230	0.0192	365	1	0.0009	80.0	63.0	1832	1811	1855	262.5	206.7	6012	5940	6085
9.5	31.2	0.0256	0.0258	368	1	-0.0024	89.5	9.5	2086	1843	2402	293.6	31.2	6844	6048	7882
12.0	39.4	0.0318	0.0300	400	1	0.0002										
14.5	47.6	0.0364	0.0342	423	1	0.0010										
17.0	55.8	0.0390	0.0385	442	1	-0.0005										
19.5	64.0	0.0402	0.0398	490	1	-0.0002										
22.0	72.2	0.0412	0.0412	534	1	-0.0005										
24.5	80.4	0.0428	0.0426	576	1	-0.0001										
27.0	88.6	0.0440	0.0439	615	1	-0.0002										
29.5	96.8	0.0458	0.0453	651	1	0.0003										
32.0	105.0	0.0470	0.0467	686	1	0.0001										
34.5	113.2	0.0486	0.0480	718	1	0.0004										
37.0	121.4	0.0496	0.0494	749	1	0.0000										
39.5	129.6	0.0508	0.0507	778	1	-0.0001										
42.0	137.8	0.0524	0.0521	806	1	0.0001										
44.5	146.0	0.0534	0.0535	832	1	-0.0002										
47.0	154.2	0.0552	0.0548	857	1	0.0002										
49.5	162.4	0.0564	0.0562	881	1	0.0001										
52.0	170.6	0.0576	0.0576	903	1	-0.0001										
54.5	178.8	0.0588	0.0589	925	1	-0.0002										
57.0	187.0	0.0608	0.0603	945	1	0.0004										
59.5	195.2	0.0616	0.0617	965	1	-0.0002										
62.0	203.4	0.0632	0.0630	984	1	0.0001										
64.5	211.6	0.0646	0.0644	1002	1	0.0001										
67.0	219.8	0.0658	0.0658	1019	1	0.0000										
69.5	228.0	0.0674	0.0671	1036	1	0.0002										
72.0	236.2	0.0686	0.0685	1051	1	0.0000										
74.5	244.4	0.0702	0.0698	1067	1	0.0003										
77.0	252.6	0.0710	0.0712	1081	1	-0.0003										
79.5	260.8	0.0722	0.0726	1095	1	-0.0004										
82.0	269.0	0.0738	0.0738	1111	1	-0.0001										
84.5	277.2	0.0752	0.0750	1127	1	0.0001										
87.0	285.4	0.0760	0.0762	1142	1	-0.0003										
89.5	293.6	0.0776	0.0774	1156	1	0.0001										

Explanation:
- d(m) = depth in meters
- d(ft) = depth in feet
- tsl(s) = observed arrival time in seconds (from source to receiver, along a slant path). For the arrival times used in the S-wave model, the times are the average of picks from traces obtained from hammer blows differing in direction by 180 degrees.
- tvrt(s) = vertical travel time computed from the model
- vavg(m/s)= average velocity from the surface to each depth, computed as avg_vel = d(m)/tvrt(s)
- sig = sigma, standard deviation normalized to the standard deviation of best picks
- rsdl(sec)= residual (observed - fitted travel time), in secs
- dtb(m) = depth to bottom of layer in meters
- thk(m) = thickness of layer in meters
- v(m/s) = velocity of layer in meters per second
- vl(m/s) = lower limit of velocity in meters per second (see text for explanation of velocity limits)
- vu(m/s) = upper limit of velocity in meters per second
- dtb(ft) = depth to bottom of layer in feet
- thk(ft) = thickness of layer in feet
- v(ft/s) = velocity of layer in feet per second
- vl(ft/s) = lower limit of velocity in feet per second
- vu(ft/s) = upper limit of velocity in feet per second

APPENDIX—B

Poisson's Ratios

TABLE B-1. Poisson's ratios for the velocity models at the Epiphany Lutheran Church site.

P wave - d2bot, pvel, for file: elcp_sl.vel

6.40000	331.000
15.0000	649.000
70.0000	1777.00
83.5000	2050.00

S wave - d2bot, svel, for file: elcs_sl.vel

6.40000	208.000
21.0000	269.000
40.0000	332.000
50.0000	351.000
60.0000	378.000
70.0000	517.000
83.5000	579.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
6.400E+00	6.400E+00	6.400E+00	6.400E+00	3.310E+02	2.080E+02	0.17
1.500E+01	2.100E+01	1.500E+01	8.600E+00	6.490E+02	2.690E+02	0.40
7.000E+01	2.100E+01	2.100E+01	6.000E+00	1.777E+03	2.690E+02	0.49
7.000E+01	4.000E+01	4.000E+01	1.900E+01	1.777E+03	3.320E+02	0.48
7.000E+01	5.000E+01	5.000E+01	1.000E+01	1.777E+03	3.510E+02	0.48
7.000E+01	6.000E+01	6.000E+01	1.000E+01	1.777E+03	3.780E+02	0.48
7.000E+01	7.000E+01	7.000E+01	1.000E+01	1.777E+03	5.170E+02	0.45
8.350E+01	8.350E+01	8.350E+01	1.350E+01	2.050E+03	5.790E+02	0.46

TABLE B-2. Poisson's ratios for the velocity models at the Jensen Generator Building site.

P wave - d2bot, pvel, for file: jgbp_sl.vel

2.00000	706.000
7.00000	534.000
17.0000	1042.00
89.5000	2150.00

S wave - d2bot, svel, for file: jgbs_sl.vel

2.00000	357.000
7.00000	362.000
24.0000	615.000
38.0000	600.000
65.0000	726.000
89.5000	770.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
2.000E+00	2.000E+00	2.000E+00	2.000E+00	7.060E+02	3.570E+02	0.33
7.000E+00	7.000E+00	7.000E+00	5.000E+00	5.340E+02	3.620E+02	0.07
1.700E+01	2.400E+01	1.700E+01	1.000E+01	1.042E+03	6.150E+02	0.23
8.950E+01	2.400E+01	2.400E+01	7.000E+00	2.150E+03	6.150E+02	0.46
8.950E+01	3.800E+01	3.800E+01	1.400E+01	2.150E+03	6.000E+02	0.46
8.950E+01	6.500E+01	6.500E+01	2.700E+01	2.150E+03	7.260E+02	0.44
8.950E+01	8.950E+01	8.950E+01	2.450E+01	2.150E+03	7.700E+02	0.43

TABLE B-3. Poisson's ratios for the velocity models at the Jensen Main Building site.

P wave - d2bot, pvel, for file: jmbp_sl.vel

9.00000	754.000
15.0000	522.000
23.0000	902.000
35.0000	2215.00
63.0000	1978.00
89.5000	2134.00

S wave - d2bot, svel, for file: jmbs_sl.vel

9.00000	298.000
15.0000	256.000
23.0000	564.000
63.0000	556.000
89.5000	684.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
9.000E+00	9.000E+00	9.000E+00	9.000E+00	7.540E+02	2.980E+02	0.41
1.500E+01	1.500E+01	1.500E+01	6.000E+00	5.220E+02	2.560E+02	0.34
2.300E+01	2.300E+01	2.300E+01	8.000E+00	9.020E+02	5.640E+02	0.18
3.500E+01	6.300E+01	3.500E+01	1.200E+01	2.215E+03	5.560E+02	0.47
6.300E+01	6.300E+01	6.300E+01	2.800E+01	1.978E+03	5.560E+02	0.46
8.950E+01	8.950E+01	8.950E+01	2.650E+01	2.134E+03	6.840E+02	0.44

TABLE B-4. Poisson's ratios for the velocity models at the Knolls Elementary School site.

P wave - d2bot, pvel, for file: kesp_sl.vel

2.00000	525.000
6.00000	602.000
15.0000	5373.00
40.0000	2562.00
67.0000	3114.00

S wave - d2bot, svel, for file: kess_sl.vel

2.00000	307.000
7.30000	348.000
12.8000	314.000
27.0000	1180.00
33.5000	1202.00
55.0000	1497.00
67.5000	1222.00

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
2.000E+00	2.000E+00	2.000E+00	2.000E+00	5.250E+02	3.070E+02	0.24
6.000E+00	7.300E+00	6.000E+00	4.000E+00	6.020E+02	3.480E+02	0.25
1.500E+01	7.300E+00	7.300E+00	1.300E+00	5.373E+03	3.480E+02	0.50
1.500E+01	1.280E+01	1.280E+01	5.500E+00	5.373E+03	3.140E+02	0.50
1.500E+01	2.700E+01	1.500E+01	2.200E+00	5.373E+03	1.180E+03	0.47
4.000E+01	2.700E+01	2.700E+01	1.200E+01	2.562E+03	1.180E+03	0.37
4.000E+01	3.350E+01	3.350E+01	6.500E+00	2.562E+03	1.202E+03	0.36
4.000E+01	5.500E+01	4.000E+01	6.500E+00	2.562E+03	1.497E+03	0.24
6.700E+01	5.500E+01	5.500E+01	1.500E+01	3.114E+03	1.497E+03	0.35
6.700E+01	6.750E+01	6.700E+01	1.200E+01	3.114E+03	1.222E+03	0.41

TABLE B-5. Poisson's ratios for the velocity models at the Los Angeles Dam site.

P wave - d2bot, pvel, for file: ladp_sl.vel

7.60000	898.000
12.0000	1239.00
20.0000	1705.00
25.0000	2413.00
88.5000	2313.00

S wave - d2bot, svel, for file: lads_sl.vel

7.60000	577.000
25.0000	633.000
42.5000	713.000
88.5000	799.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
7.600E+00	7.600E+00	7.600E+00	7.600E+00	8.980E+02	5.770E+02	0.15
1.200E+01	2.500E+01	1.200E+01	4.400E+00	1.239E+03	6.330E+02	0.32
2.000E+01	2.500E+01	2.000E+01	8.000E+00	1.705E+03	6.330E+02	0.42
2.500E+01	2.500E+01	2.500E+01	5.000E+00	2.413E+03	6.330E+02	0.46
8.850E+01	4.250E+01	4.250E+01	1.750E+01	2.313E+03	7.130E+02	0.45
8.850E+01	8.850E+01	8.850E+01	4.600E+01	2.313E+03	7.990E+02	0.43

TABLE B-6. Poisson's ratios for the velocity models at the Olive View Hospital site.

P wave - d2bot, pvel, for file: ovh2p_sl.vel

2.00000	423.000
6.00000	539.000
12.0000	831.000
24.0000	1516.00
89.5000	2031.00

S wave - d2bot, svel, for file: ovh2s_sl.vel

2.00000	243.000
6.00000	330.000
12.0000	472.000
24.0000	490.000
55.0000	569.000
80.0000	612.000
89.5000	938.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
2.000E+00	2.000E+00	2.000E+00	2.000E+00	4.230E+02	2.430E+02	0.25
6.000E+00	6.000E+00	6.000E+00	4.000E+00	5.390E+02	3.300E+02	0.20
1.200E+01	1.200E+01	1.200E+01	6.000E+00	8.310E+02	4.720E+02	0.26
2.400E+01	2.400E+01	2.400E+01	1.200E+01	1.516E+03	4.900E+02	0.44
8.950E+01	5.500E+01	5.500E+01	3.100E+01	2.031E+03	5.690E+02	0.46
8.950E+01	8.000E+01	8.000E+01	2.500E+01	2.031E+03	6.120E+02	0.45
8.950E+01	8.950E+01	8.950E+01	9.500E+00	2.031E+03	9.380E+02	0.36

TABLE B-7. Poisson's ratios for the velocity models at the Rinaldi Receiving Station site.

P wave - d2bot, pvel, for file: rinp_sl.vel

4.50000	272.000
7.00000	772.000
79.5000	1971.00

S wave - d2bot, svel, for file: rins_sl.vel

4.50000	172.000
12.8000	294.000
21.3000	466.000
40.0000	497.000
73.3000	539.000
79.5000	814.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
4.500E+00	4.500E+00	4.500E+00	4.500E+00	2.720E+02	1.720E+02	0.17
7.000E+00	1.280E+01	7.000E+00	2.500E+00	7.720E+02	2.940E+02	0.42
7.950E+01	1.280E+01	1.280E+01	5.800E+00	1.971E+03	2.940E+02	0.49
7.950E+01	2.130E+01	2.130E+01	8.500E+00	1.971E+03	4.660E+02	0.47
7.950E+01	4.000E+01	4.000E+01	1.870E+01	1.971E+03	4.970E+02	0.47
7.950E+01	7.330E+01	7.330E+01	3.330E+01	1.971E+03	5.390E+02	0.46
7.950E+01	7.950E+01	7.950E+01	6.200E+00	1.971E+03	8.140E+02	0.40

TABLE B-8. Poisson's ratios for the velocity models at the Sepulveda V.A. Hospital site.

P wave - d2bot, pvel, for file: svap_sl.vel

24.0000	585.000
32.0000	861.000
60.0000	1057.00
74.5000	1251.00

S wave - d2bot, svel, for file: svas_sl.vel

2.00000	354.000
8.00000	278.000
24.0000	371.000
40.0000	507.000
47.0000	378.000
60.0000	520.000
74.5000	569.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
2.400E+01	2.000E+00	2.000E+00	2.000E+00	5.850E+02	3.540E+02	0.21
2.400E+01	8.000E+00	8.000E+00	6.000E+00	5.850E+02	2.780E+02	0.35
2.400E+01	2.400E+01	2.400E+01	1.600E+01	5.850E+02	3.710E+02	0.16
3.200E+01	4.000E+01	3.200E+01	8.000E+00	8.610E+02	5.070E+02	0.23
6.000E+01	4.000E+01	4.000E+01	8.000E+00	1.057E+03	5.070E+02	0.35
6.000E+01	4.700E+01	4.700E+01	7.000E+00	1.057E+03	3.780E+02	0.43
6.000E+01	6.000E+01	6.000E+01	1.300E+01	1.057E+03	5.200E+02	0.34
7.450E+01	7.450E+01	7.450E+01	1.450E+01	1.251E+03	5.690E+02	0.37

TABLE B-9. Poisson's ratios for the velocity models at the Sherman Oaks Park site.

P wave - d2bot, pvel, for file: sopp_sl.vel

6.10000	455.000
17.0000	819.000
36.6000	1329.00
89.5000	1824.00

S wave - d2bot, svel, for file: sops_sl.vel

6.10000	246.000
36.6000	320.000
49.0000	489.000
60.0000	447.000
72.0000	603.000
89.5000	692.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
6.100E+00	6.100E+00	6.100E+00	6.100E+00	4.550E+02	2.460E+02	0.29
1.700E+01	3.660E+01	1.700E+01	1.090E+01	8.190E+02	3.200E+02	0.41
3.660E+01	3.660E+01	3.660E+01	1.960E+01	1.329E+03	3.200E+02	0.47
8.950E+01	4.900E+01	4.900E+01	1.240E+01	1.824E+03	4.890E+02	0.46
8.950E+01	6.000E+01	6.000E+01	1.100E+01	1.824E+03	4.470E+02	0.47
8.950E+01	7.200E+01	7.200E+01	1.200E+01	1.824E+03	6.030E+02	0.44
8.950E+01	8.950E+01	8.950E+01	1.750E+01	1.824E+03	6.920E+02	0.42

TABLE B-10. Poisson's ratios for the velocity models at the Sherman Oaks Woodman site.

P wave - d2bot, pvel, for file: sowp_sl.vel

3.00000	320.000
6.00000	446.000
89.5000	1752.00

S wave - d2bot, svel, for file: sows_sl.vel

3.00000	187.000
6.00000	162.000
11.0000	240.000
17.0000	279.000
27.0000	323.000
37.0000	349.000
48.0000	405.000
52.0000	325.000
75.0000	566.000
89.5000	582.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
3.000E+00	3.000E+00	3.000E+00	3.000E+00	3.200E+02	1.870E+02	0.24
6.000E+00	6.000E+00	6.000E+00	3.000E+00	4.460E+02	1.620E+02	0.42
8.950E+01	1.100E+01	1.100E+01	5.000E+00	1.752E+03	2.400E+02	0.49
8.950E+01	1.700E+01	1.700E+01	6.000E+00	1.752E+03	2.790E+02	0.49
8.950E+01	2.700E+01	2.700E+01	1.000E+01	1.752E+03	3.230E+02	0.48
8.950E+01	3.700E+01	3.700E+01	1.000E+01	1.752E+03	3.490E+02	0.48
8.950E+01	4.800E+01	4.800E+01	1.100E+01	1.752E+03	4.050E+02	0.47
8.950E+01	5.200E+01	5.200E+01	4.000E+00	1.752E+03	3.250E+02	0.48
8.950E+01	7.500E+01	7.500E+01	2.300E+01	1.752E+03	5.660E+02	0.44
8.950E+01	8.950E+01	8.950E+01	1.450E+01	1.752E+03	5.820E+02	0.44

TABLE B-11. Poisson's ratios for the velocity models at the Sylmar Converter West site.

P wave - d2bot, pvel, for file: scwp_sl.vel

5.50000	336.000
24.0000	2331.00
48.2000	1727.00
64.6000	2169.00
87.0000	1828.00

S wave - d2bot, svel, for file: scws_sl.vel

7.60000	202.000
15.0000	217.000
24.0000	278.000
40.0000	392.000
48.2000	490.000
64.6000	523.000
87.0000	635.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
5.500E+00	7.600E+00	5.500E+00	5.500E+00	3.360E+02	2.020E+02	0.22
2.400E+01	7.600E+00	7.600E+00	2.100E+00	2.331E+03	2.020E+02	0.50
2.400E+01	1.500E+01	1.500E+01	7.400E+00	2.331E+03	2.170E+02	0.50
2.400E+01	2.400E+01	2.400E+01	9.000E+00	2.331E+03	2.780E+02	0.49
4.820E+01	4.000E+01	4.000E+01	1.600E+01	1.727E+03	3.920E+02	0.47
4.820E+01	4.820E+01	4.820E+01	8.200E+00	1.727E+03	4.900E+02	0.46
6.460E+01	6.460E+01	6.460E+01	1.640E+01	2.169E+03	5.230E+02	0.47
8.700E+01	8.700E+01	8.700E+01	2.240E+01	1.828E+03	6.350E+02	0.43

TABLE B-12. Poisson's ratios for the velocity models at the White Oak Church site.

P wave - d2bot, pvel, for file: wocp_sl.vel

9.30000	365.000
17.0000	592.000
80.0000	1832.00
89.5000	2086.00

S wave - d2bot, svel, for file: wocs_sl.vel

9.30000	205.000
17.0000	322.000
26.0000	341.000
40.0000	359.000
67.0000	405.000
80.0000	428.000
89.5000	599.000

d2bot_p	d2bot_s	d2bot	thick	pvel	svel	pssnrat
9.300E+00	9.300E+00	9.300E+00	9.300E+00	3.650E+02	2.050E+02	0.27
1.700E+01	1.700E+01	1.700E+01	7.700E+00	5.920E+02	3.220E+02	0.29
8.000E+01	2.600E+01	2.600E+01	9.000E+00	1.832E+03	3.410E+02	0.48
8.000E+01	4.000E+01	4.000E+01	1.400E+01	1.832E+03	3.590E+02	0.48
8.000E+01	6.700E+01	6.700E+01	2.700E+01	1.832E+03	4.050E+02	0.47
8.000E+01	8.000E+01	8.000E+01	1.300E+01	1.832E+03	4.280E+02	0.47
8.950E+01	8.950E+01	8.950E+01	9.500E+00	2.086E+03	5.990E+02	0.46

APPENDIX—C

Comparison of velocity models from OFR 96-740 and this report

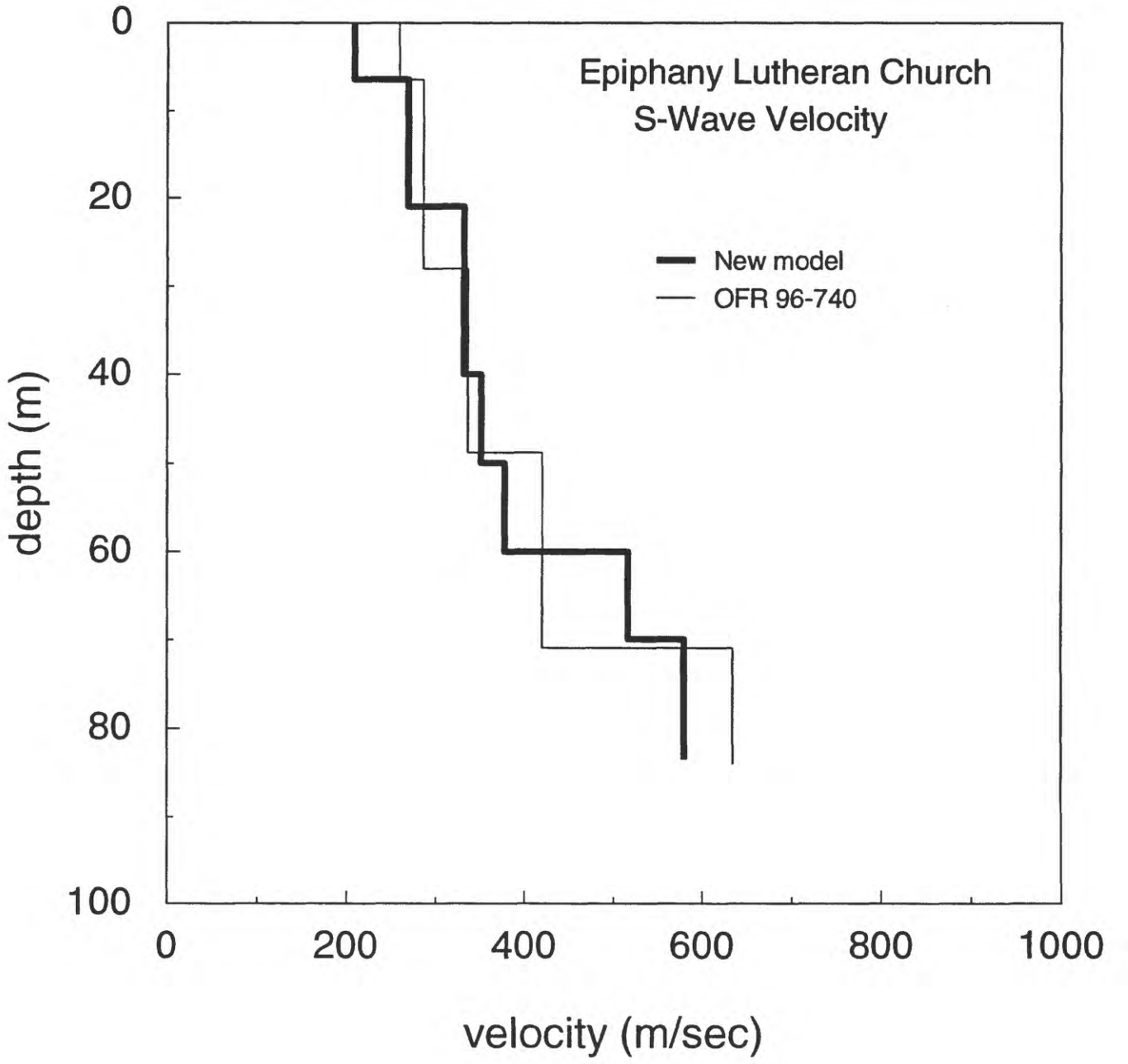

Figure C-1. Comparison of S-wave models Epiphany Lutheran Church.

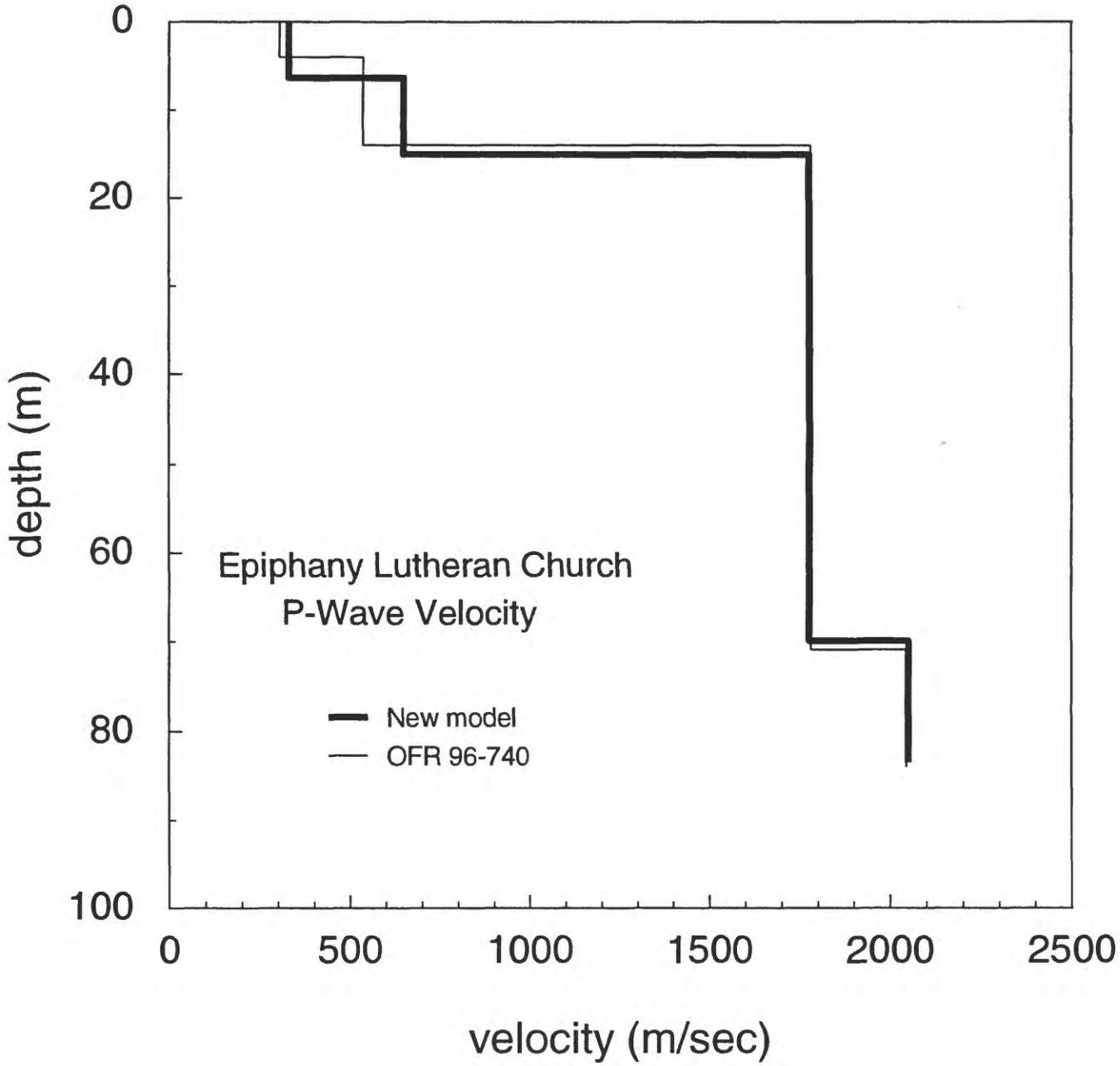

Figure C-2. Comparison of P-wave models Epiphany Lutheran Church.

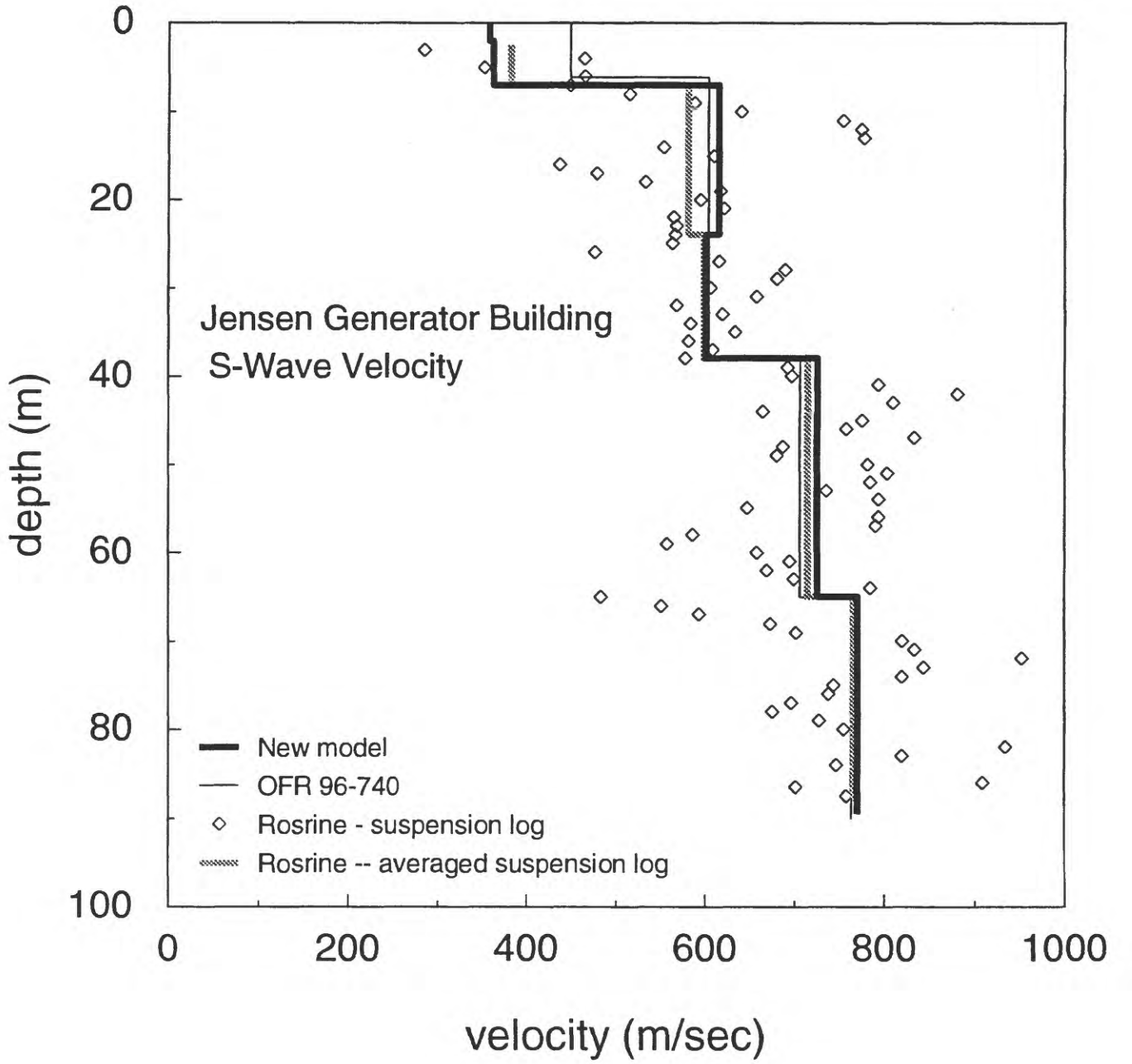

Figure C-3. Comparison of S-wave models Jensen Generator Building, and a model derived from averaging suspension data over the equivalent depth intervals of the new model.

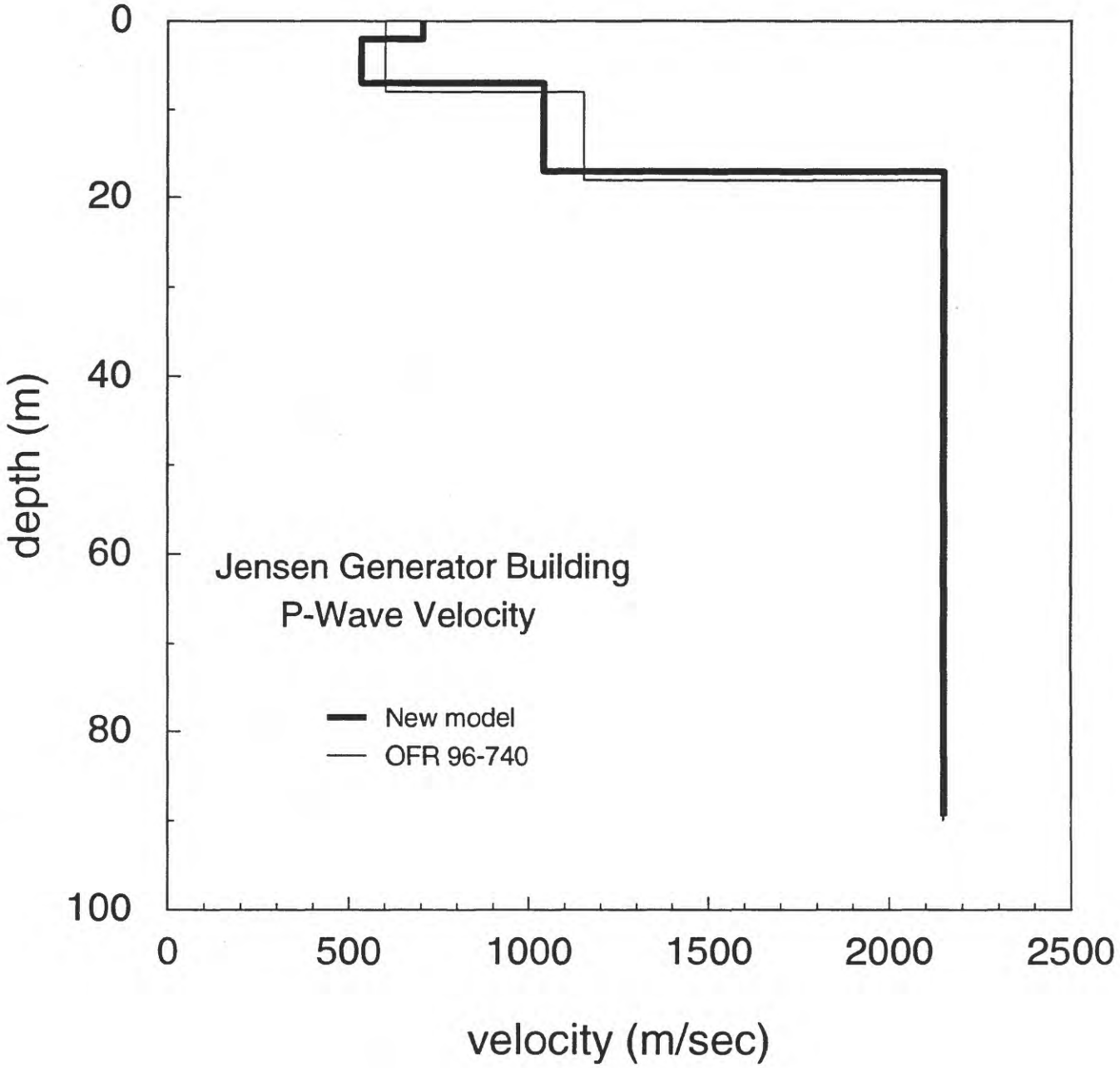

Figure C-4. Comparison of P-wave models Jensen Generator Building.

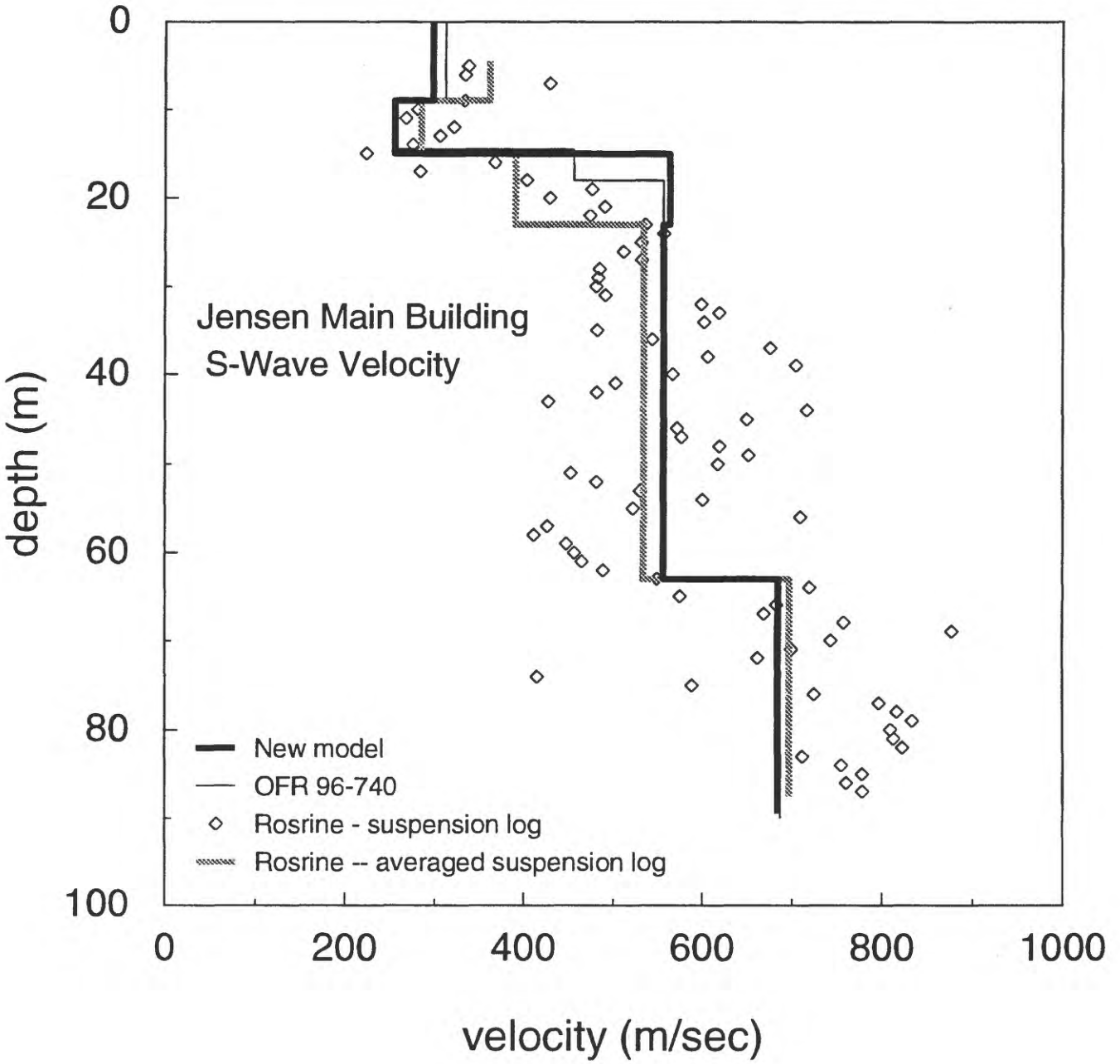

Figure C-5. Comparison of S-wave models Jensen Main Building, and a model derived from averaging suspension data over the equivalent depth intervals of the new model.

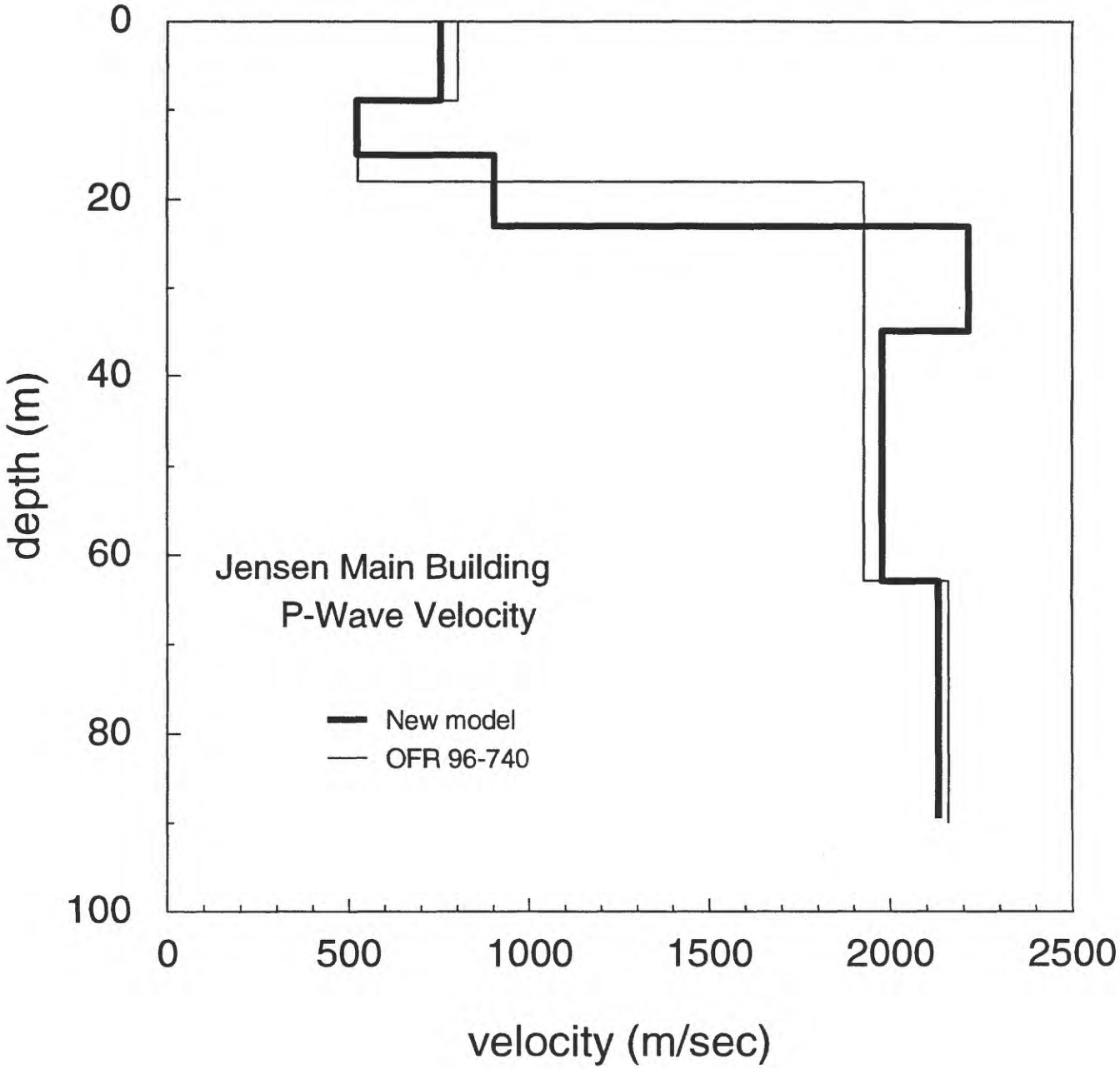

Figure C-6. Comparison of P-wave models Jensen Main Building.

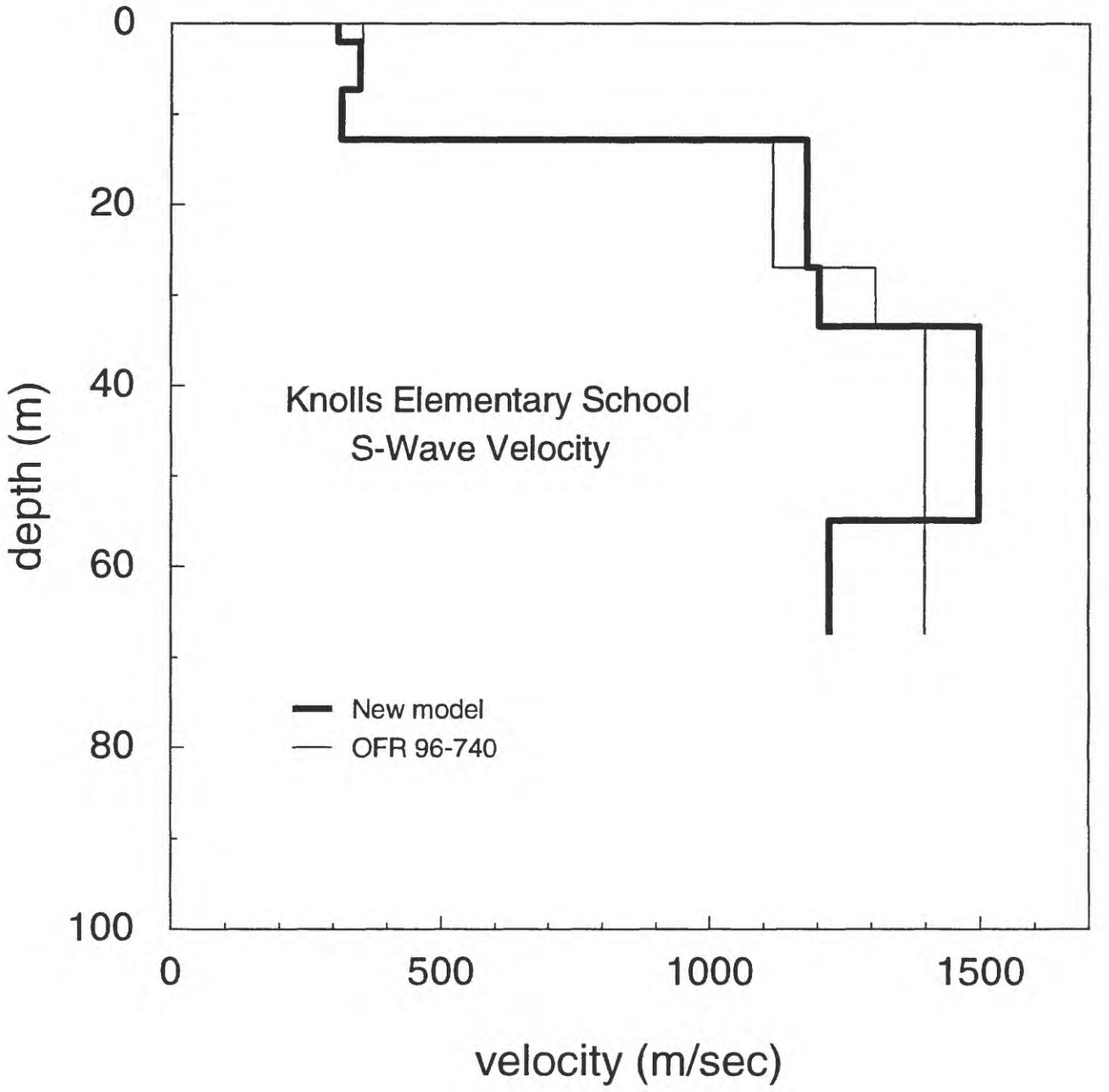

Figure C-7. Comparison of S-wave models Knolls Elementary School.

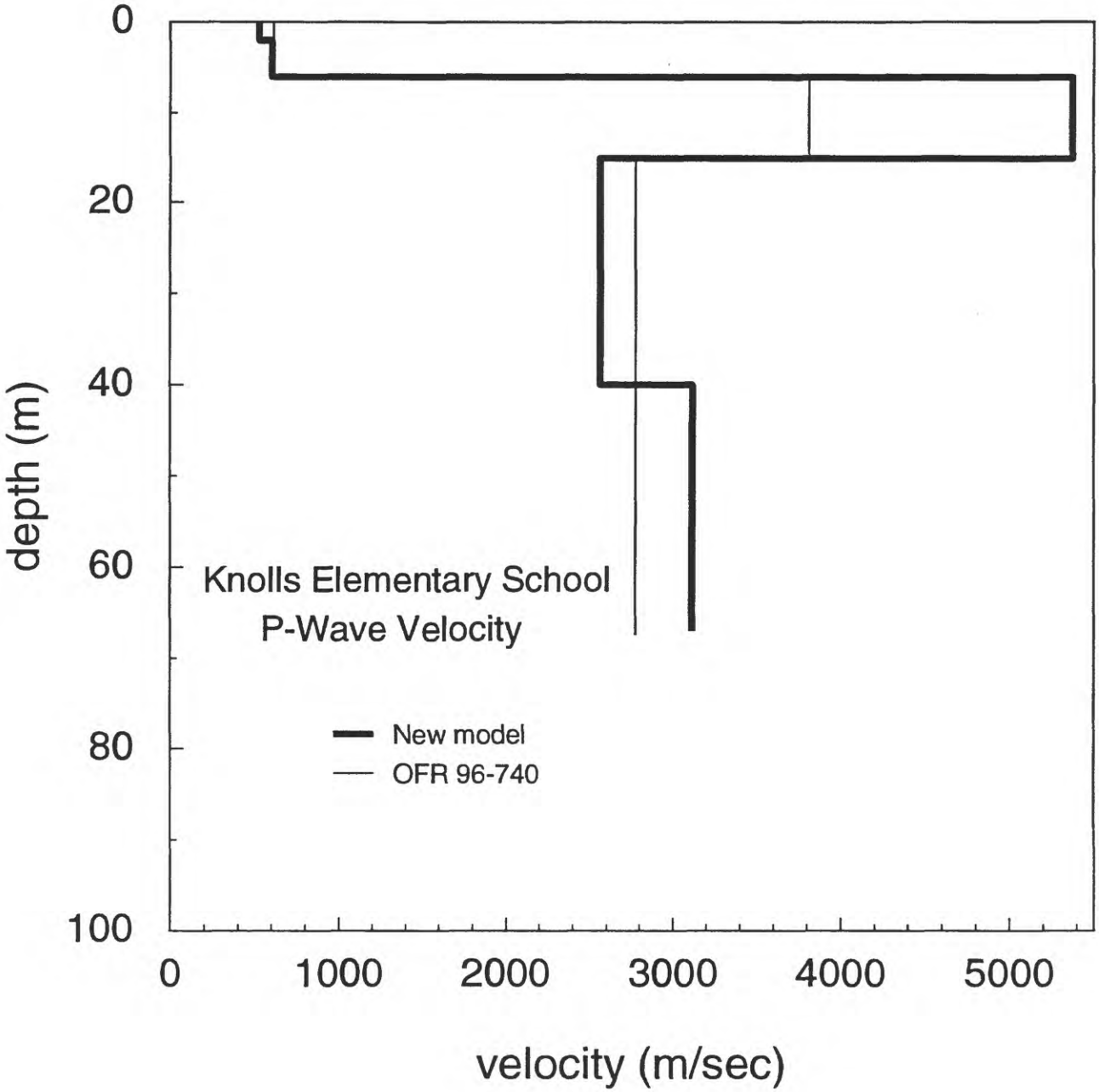

Figure C-8. Comparison of P-wave models Knolls Elementary School.

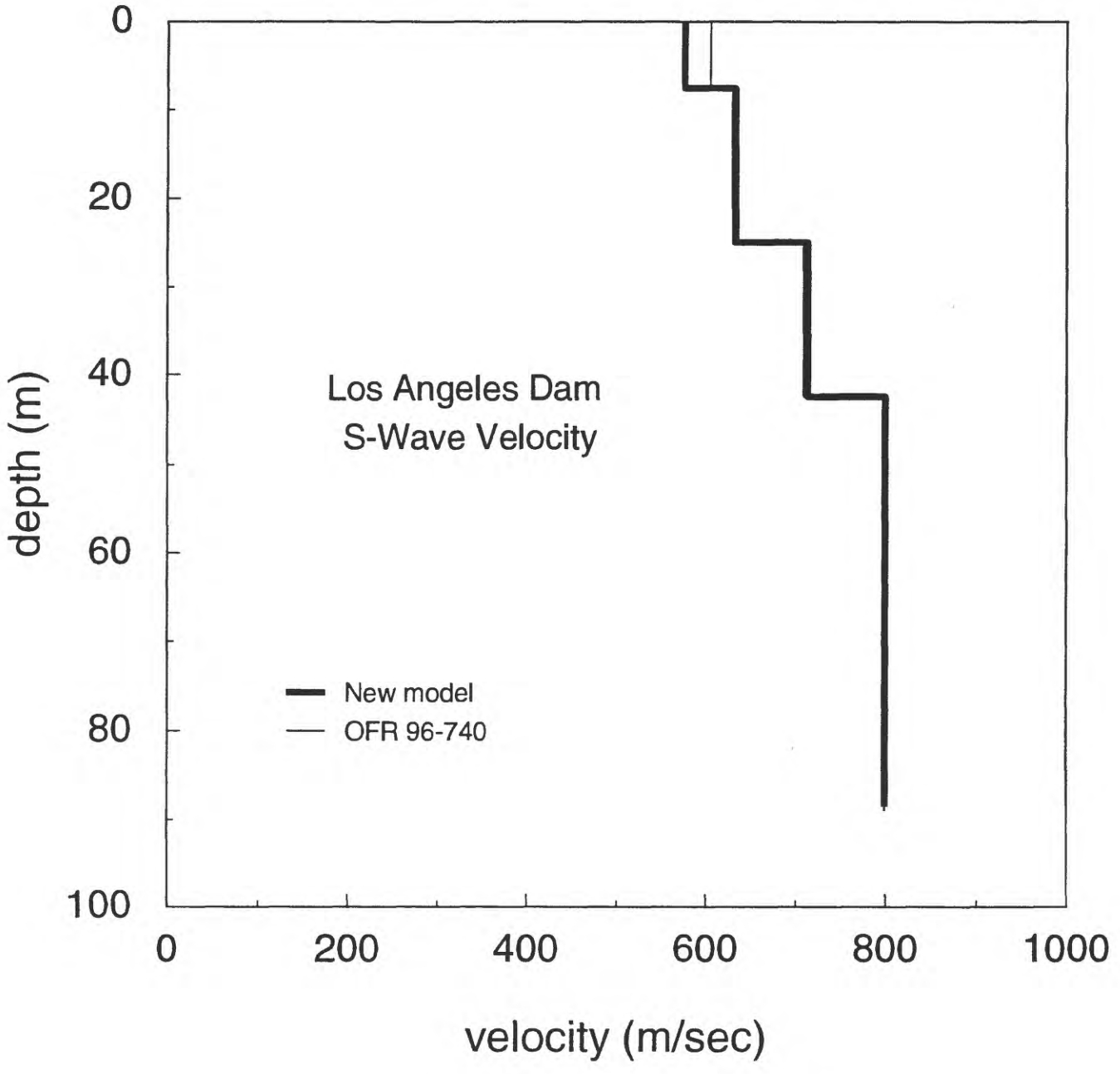

Figure C-9. Comparison of S-wave models Los Angeles Dam.

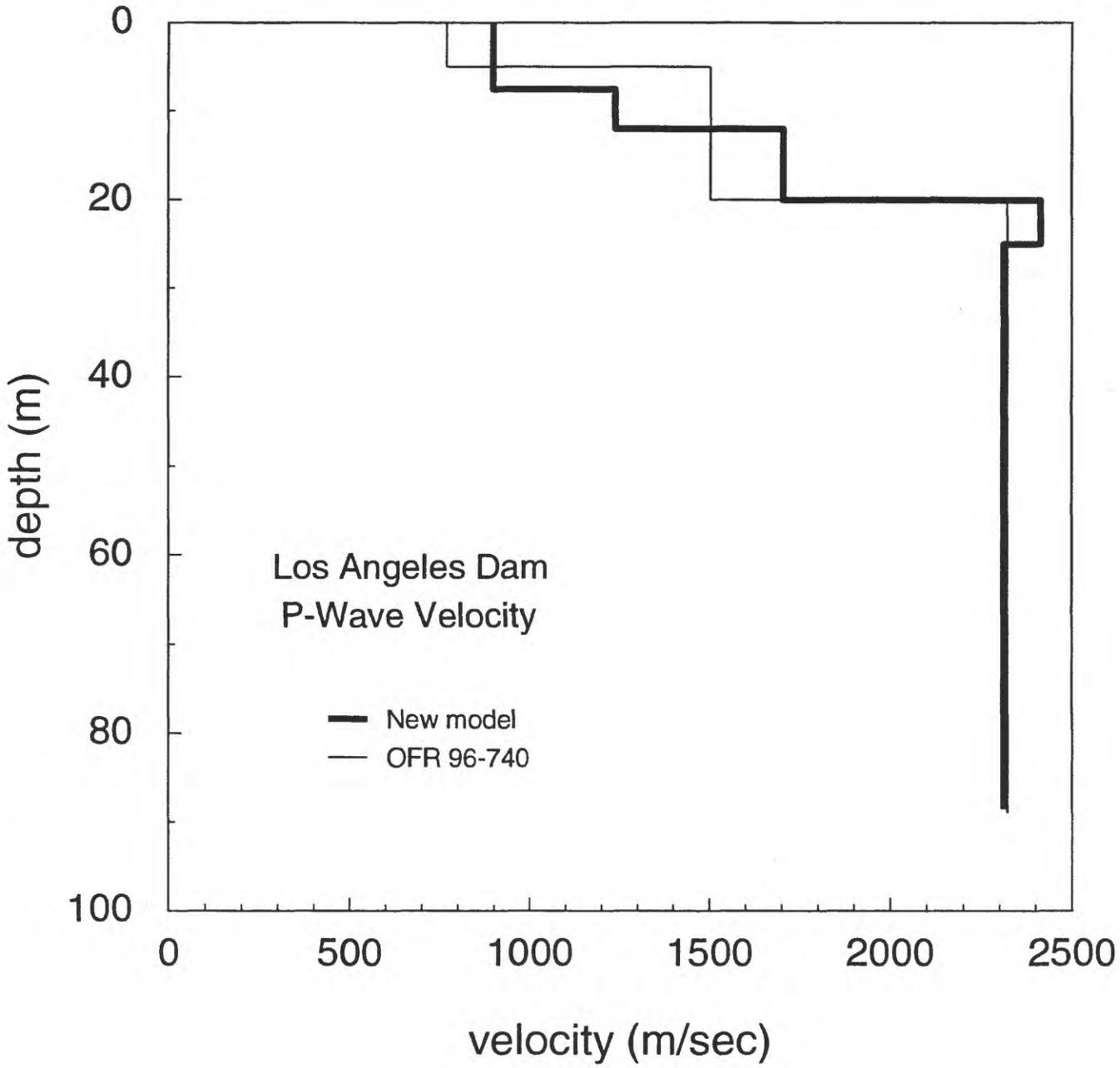

Figure C-10. Comparison of P-wave models Los Angeles Dam.

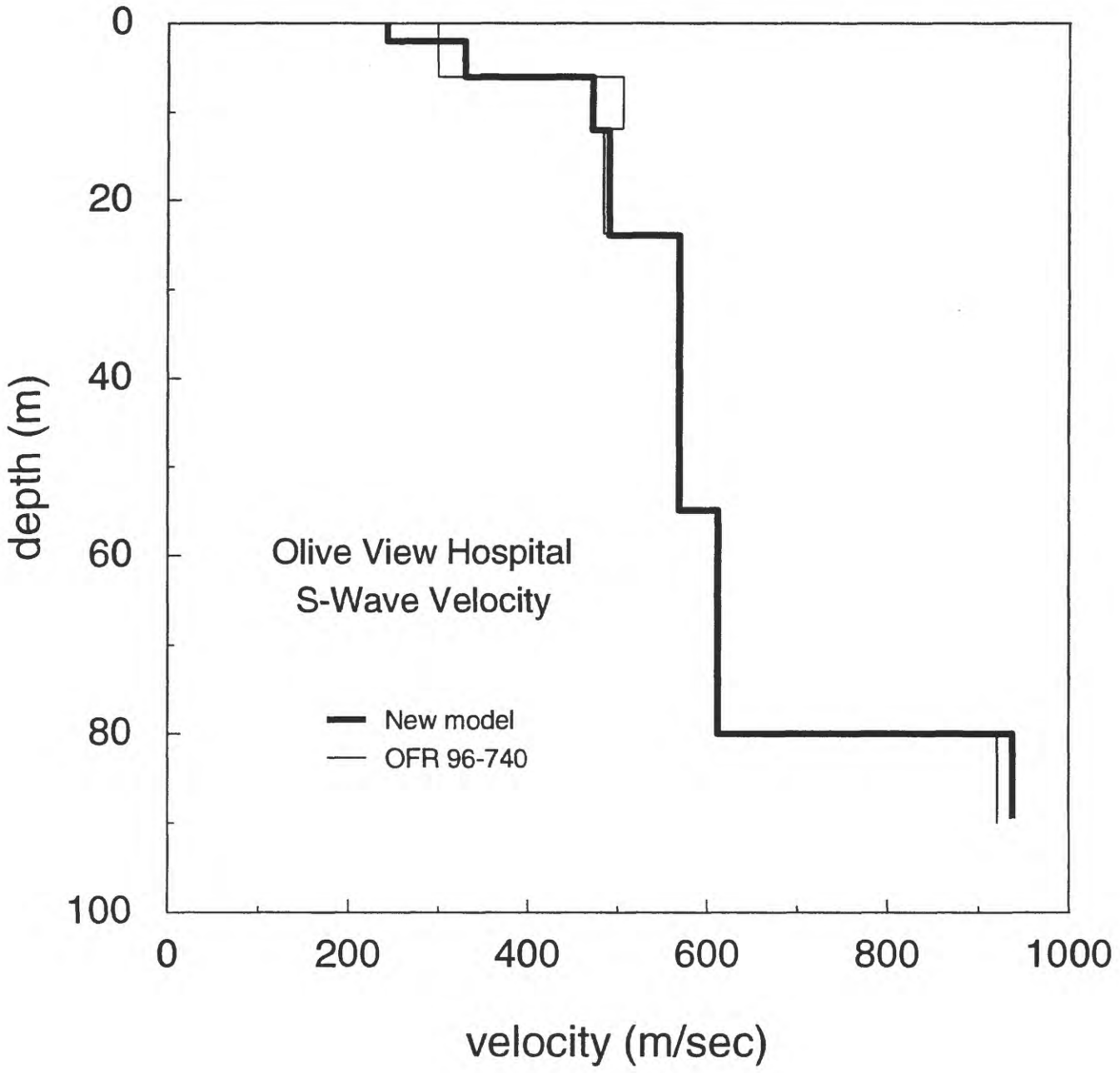

Figure C-11. Comparison of S-wave models Olive View Hospital.

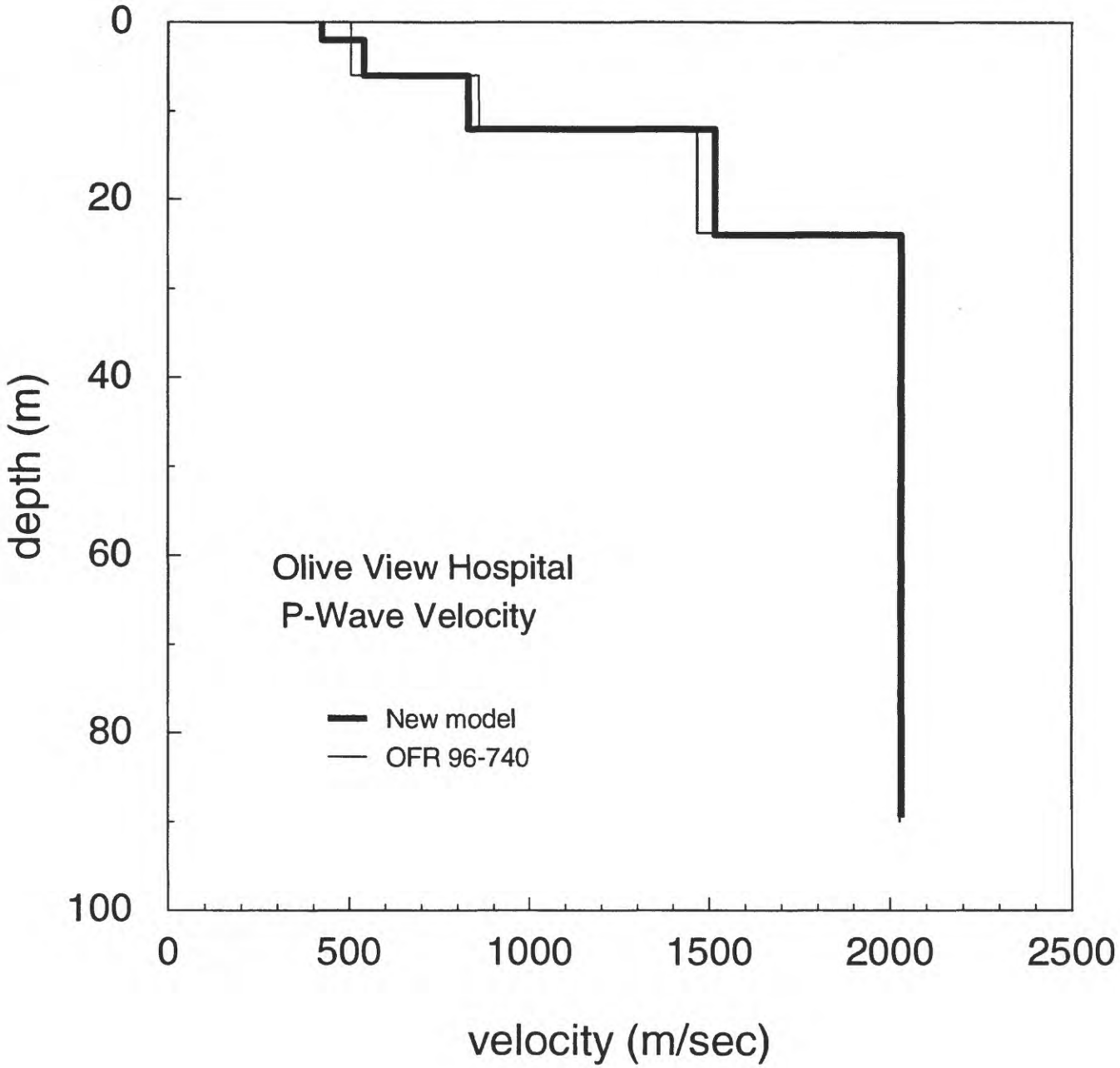

Figure C-12. Comparison of P-wave models Olive View Hospital.

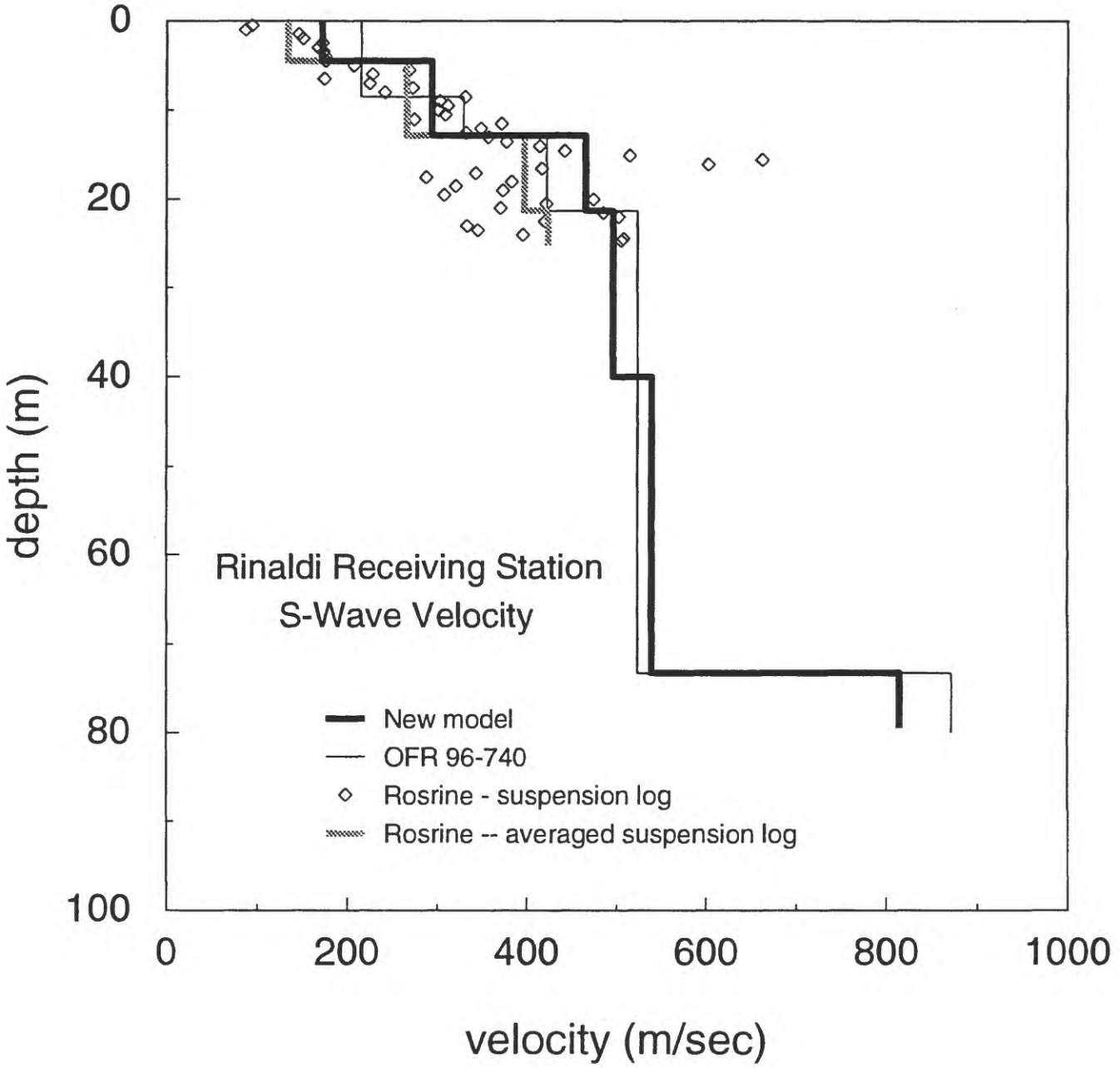

Figure C-13. Comparison of S-wave models Rinaldi Receiving Station, and a model derived from averaging suspension data over the equivalent depth intervals of the new model.

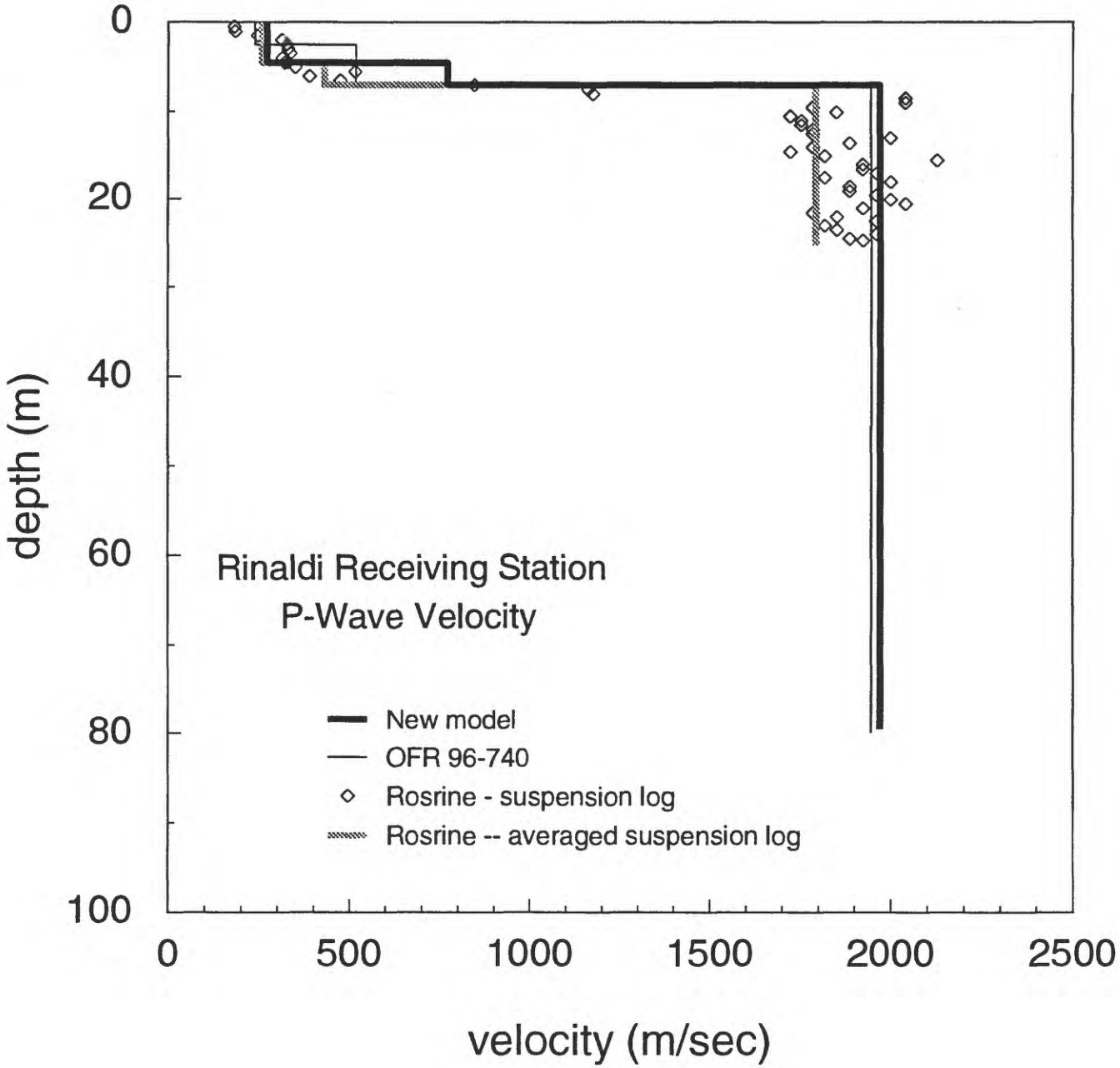

Figure C-14. Comparison of P-wave models Rinaldi Receiving Station, and a model derived from averaging suspension data over the equivalent depth intervals of the new model.

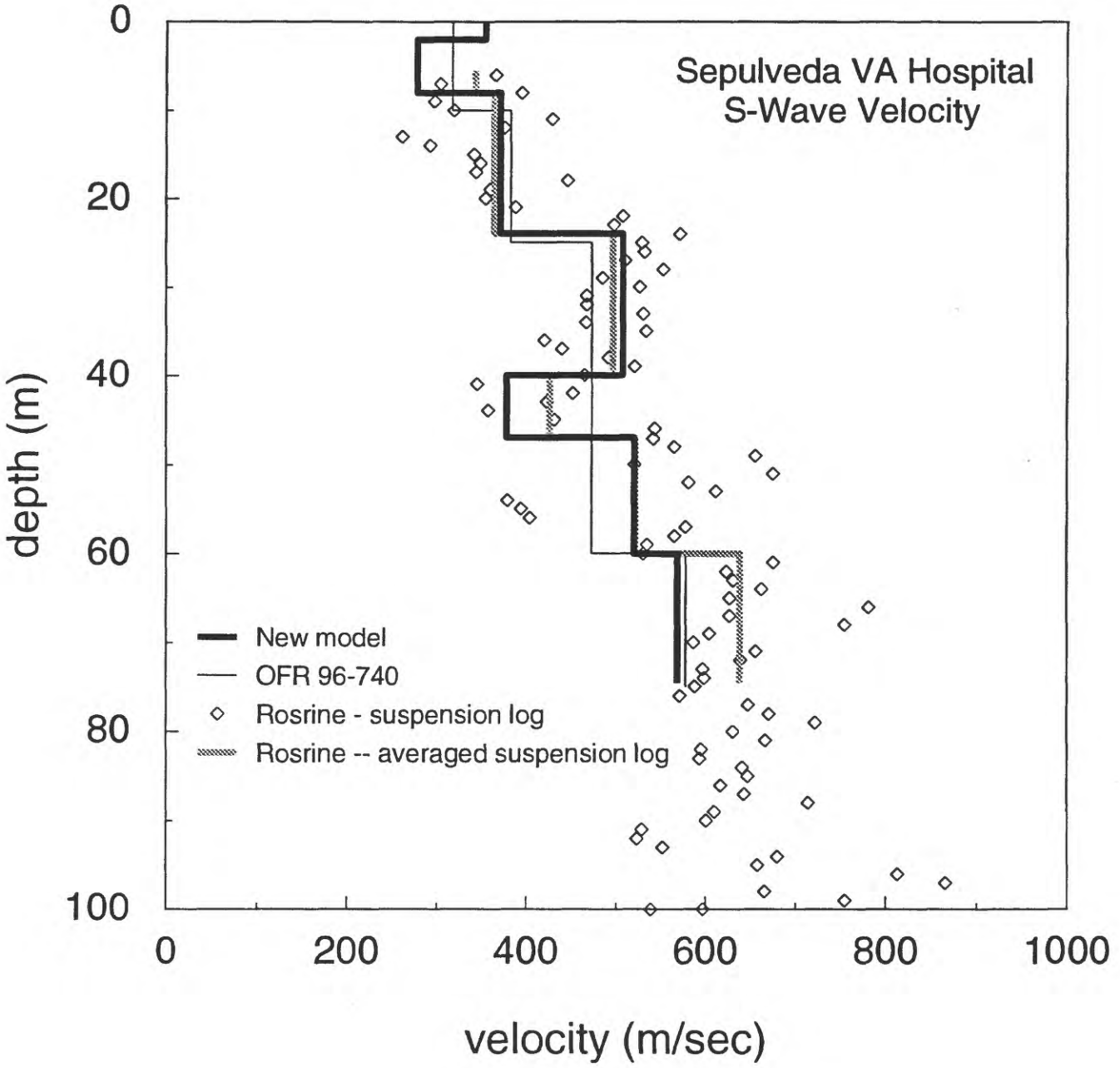

Figure C-15. Comparison of S-wave models Sepulveda V.A. Hospital, and a model derived from averaging suspension data over the equivalent depth intervals of the new model.

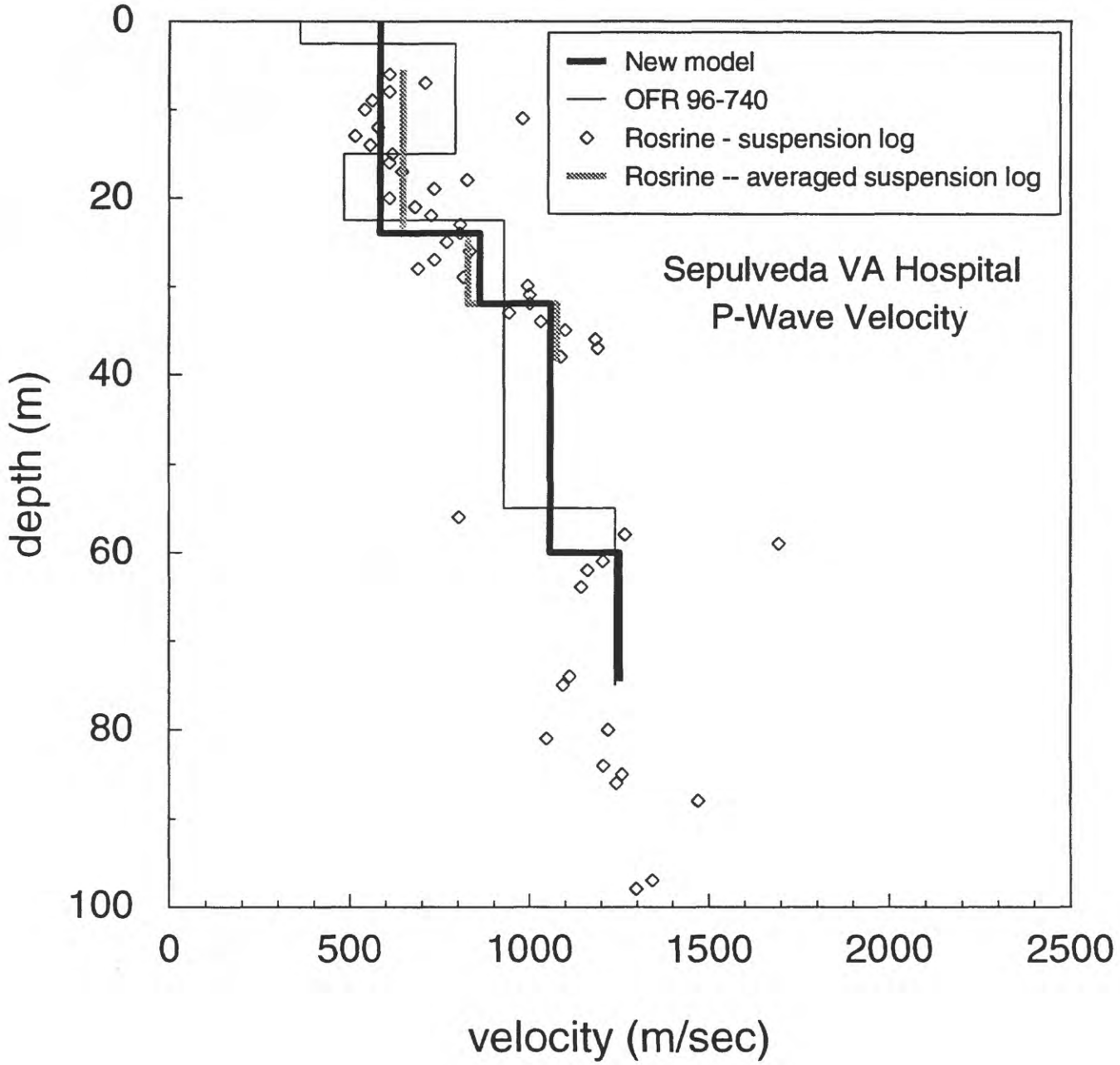

Figure C-16. Comparison of P-wave models Sepulveda V.A. Hospital, and a model derived from averaging suspension data over the equivalent depth intervals of the new model.

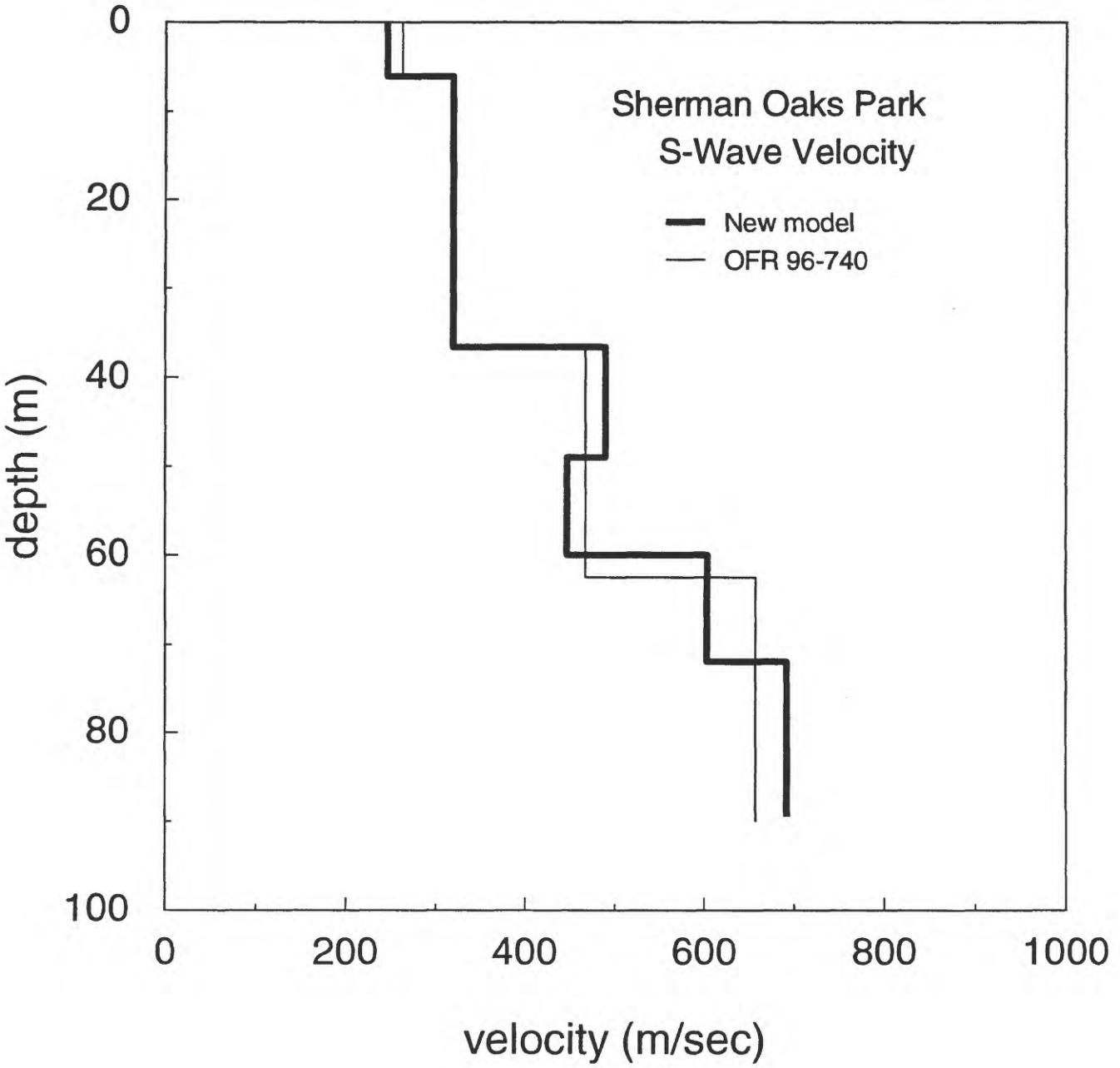

Figure C-17. Comparison of S-wave models Sherman Oaks Park.

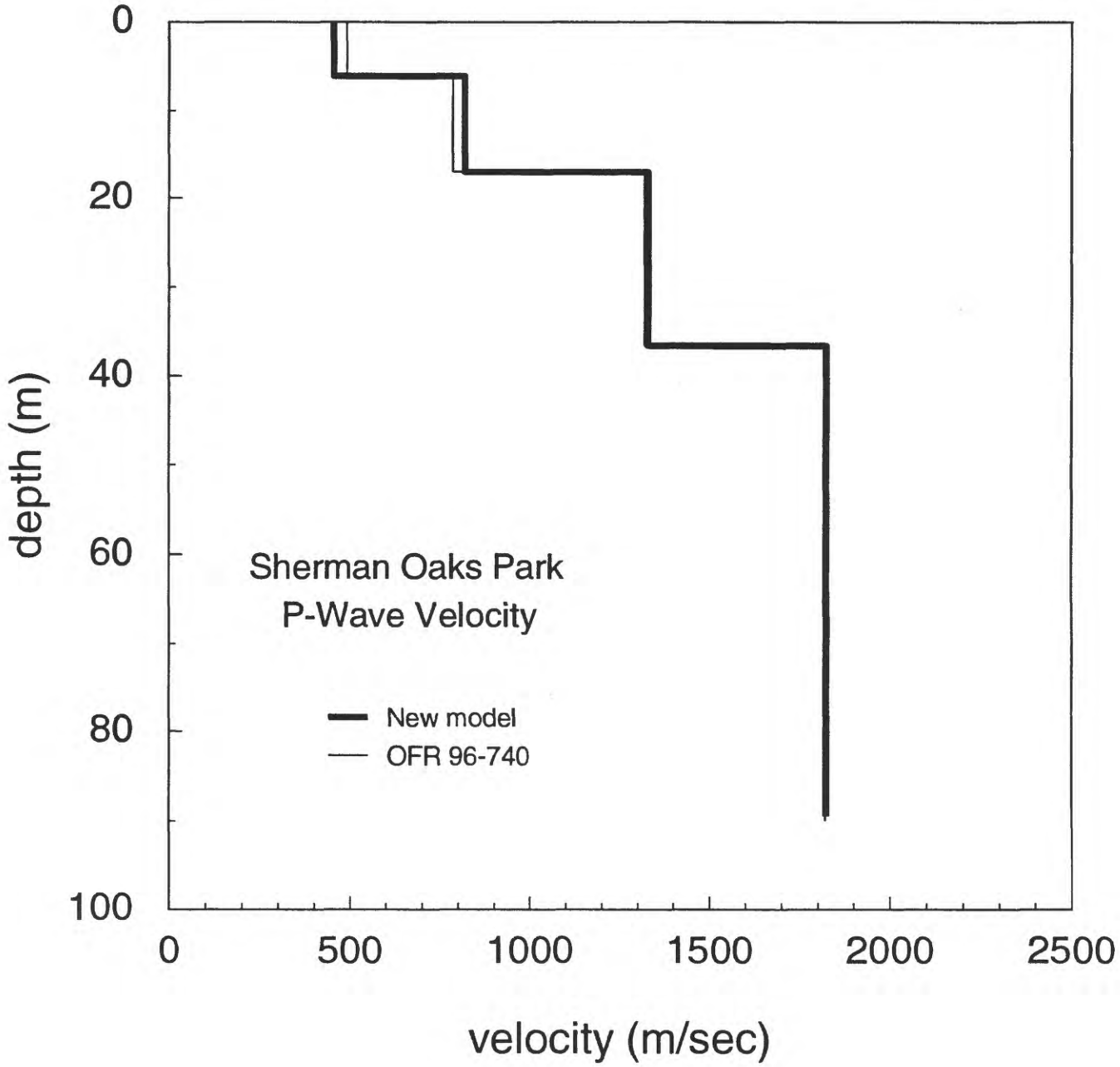

Figure C-18. Comparison of P-wave models Sherman Oaks Park.

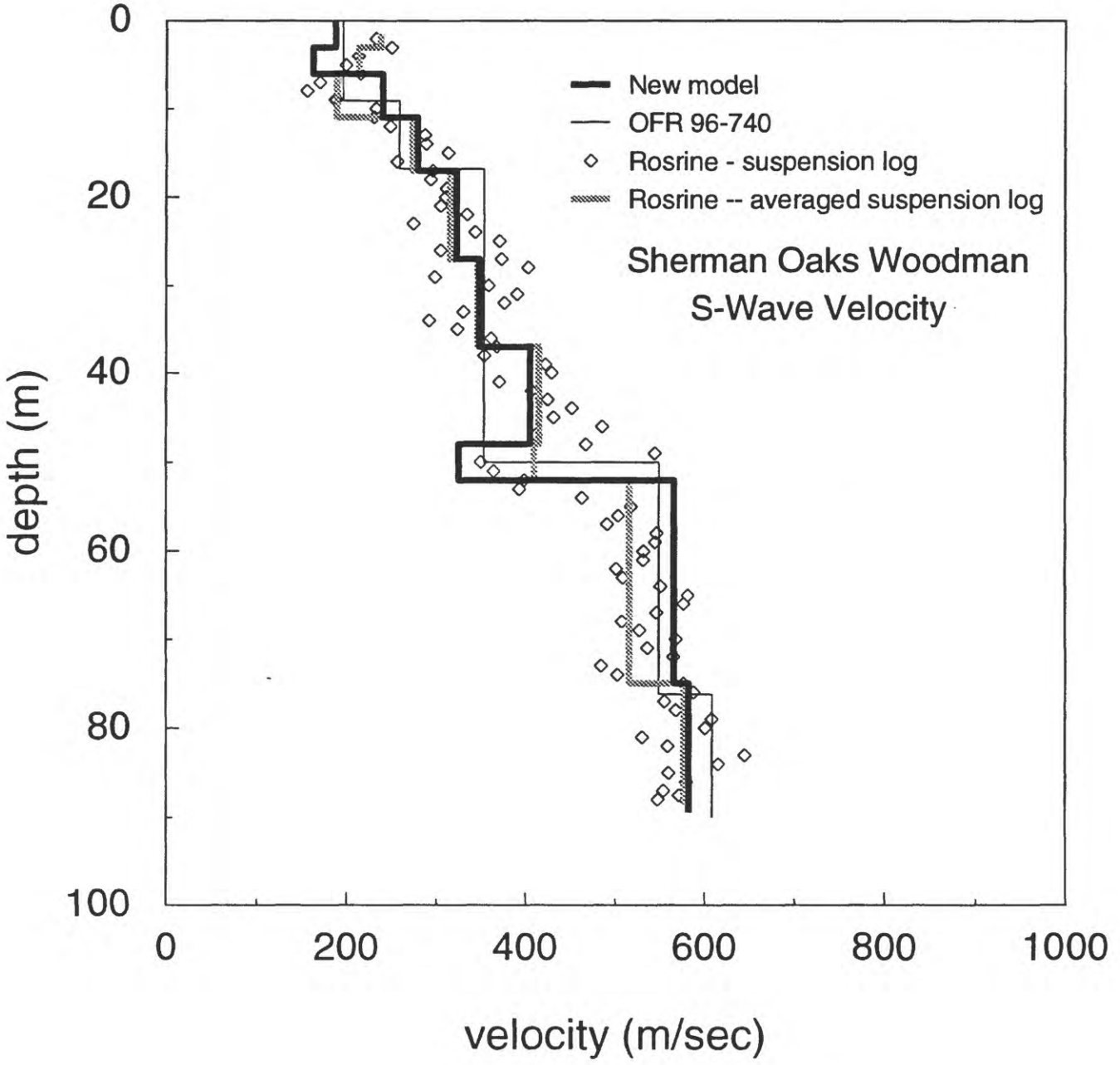

Figure C-19. Comparison of S-wave models Sherman Oaks Woodman, and a model derived from averaging suspension data over the equivalent depth intervals of the new model.

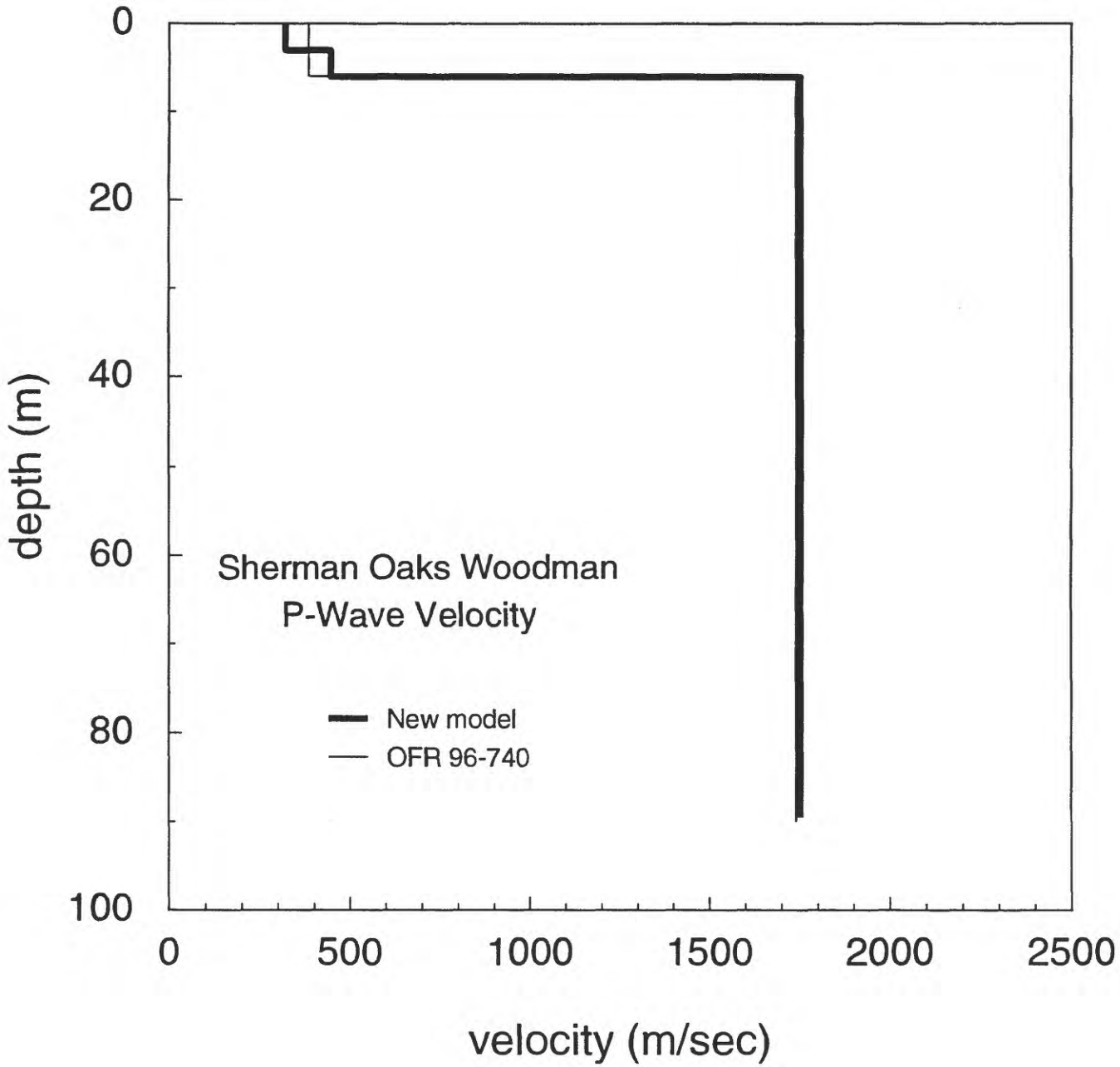

Figure C-20. Comparison of P-wave models Sherman Oaks Woodman.

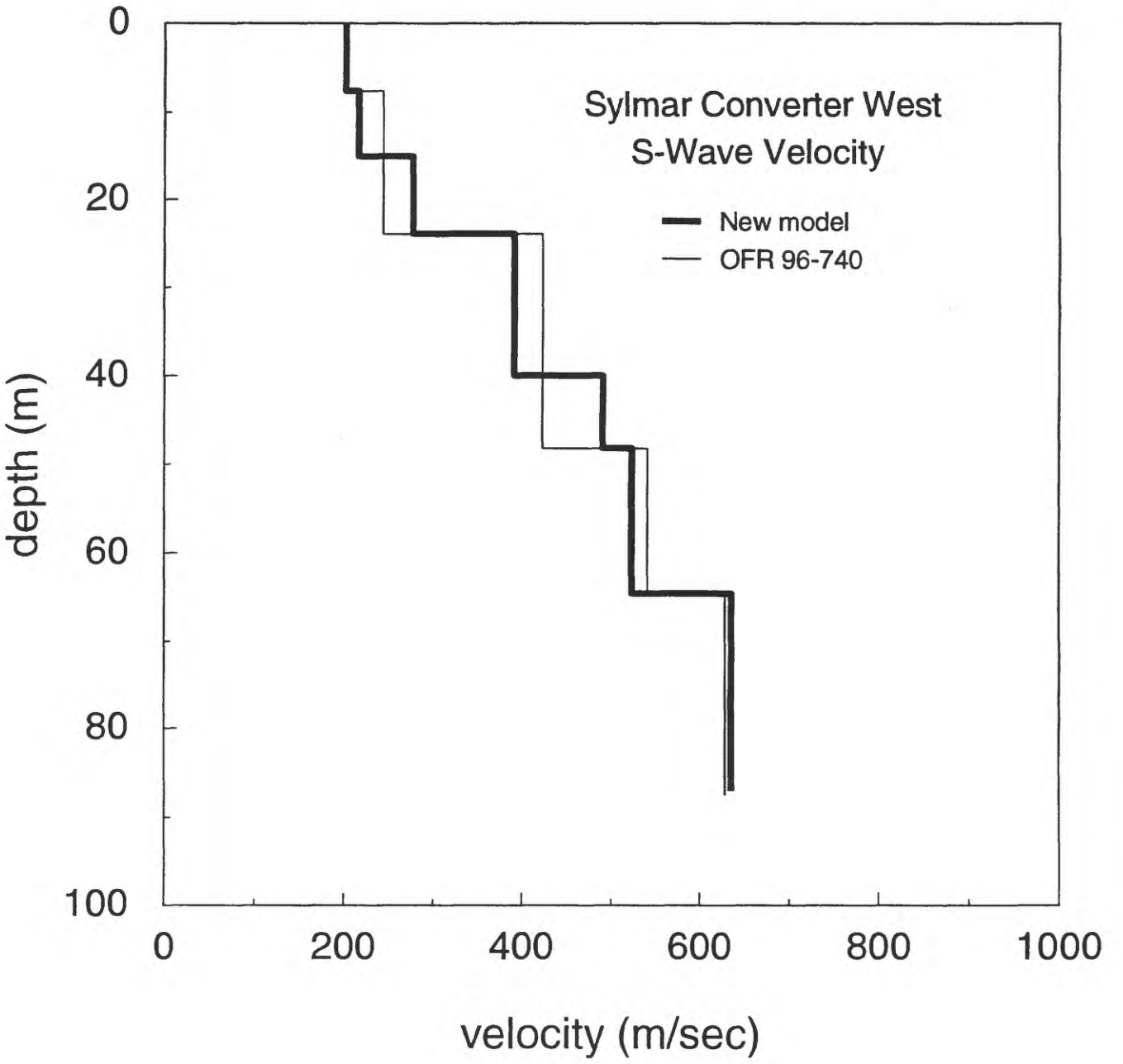

Figure C-21. Comparison of S-wave models Sylmar Converter West.

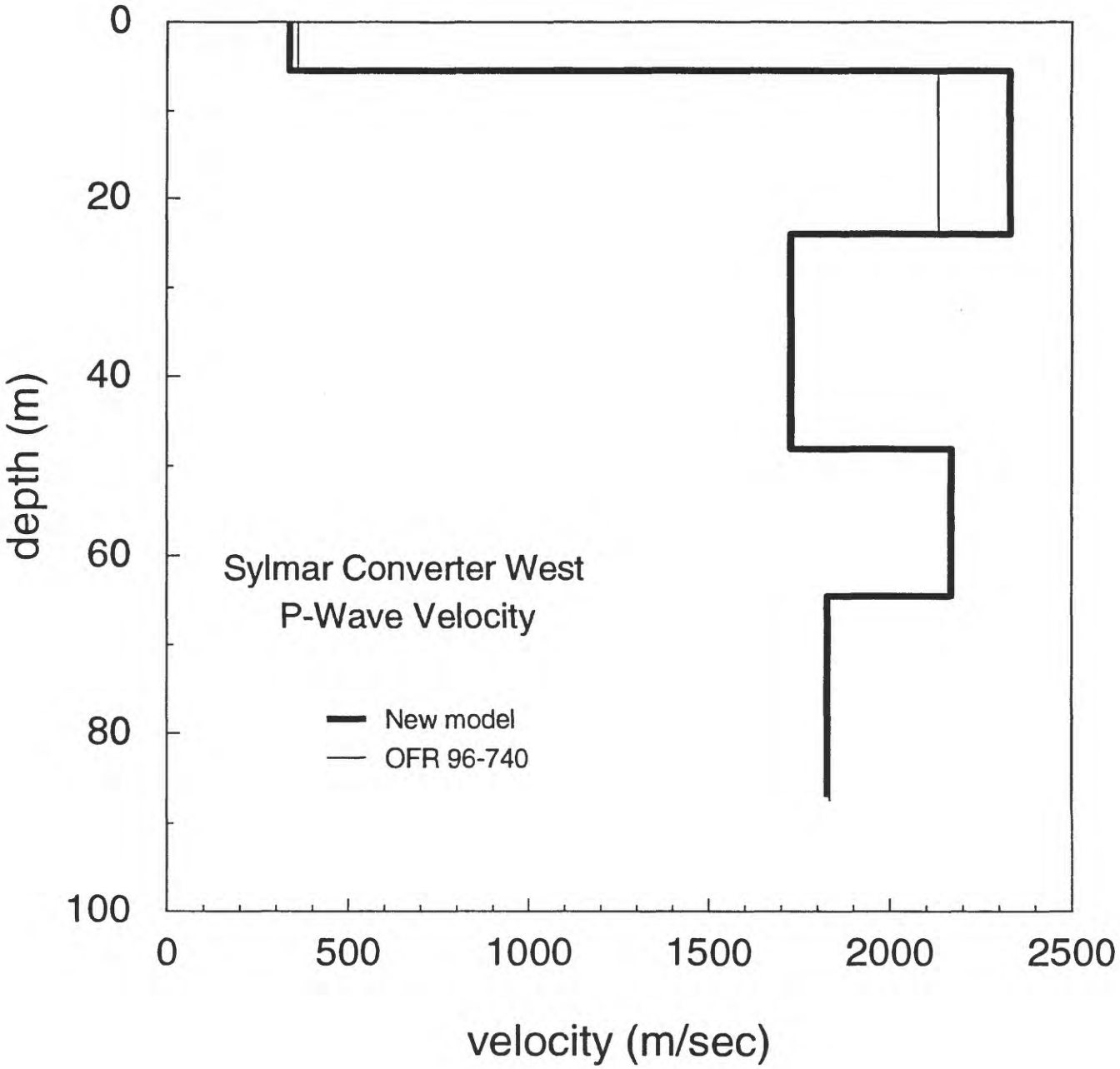

Figure C-22. Comparison of P-wave models Sylmar Converter West.

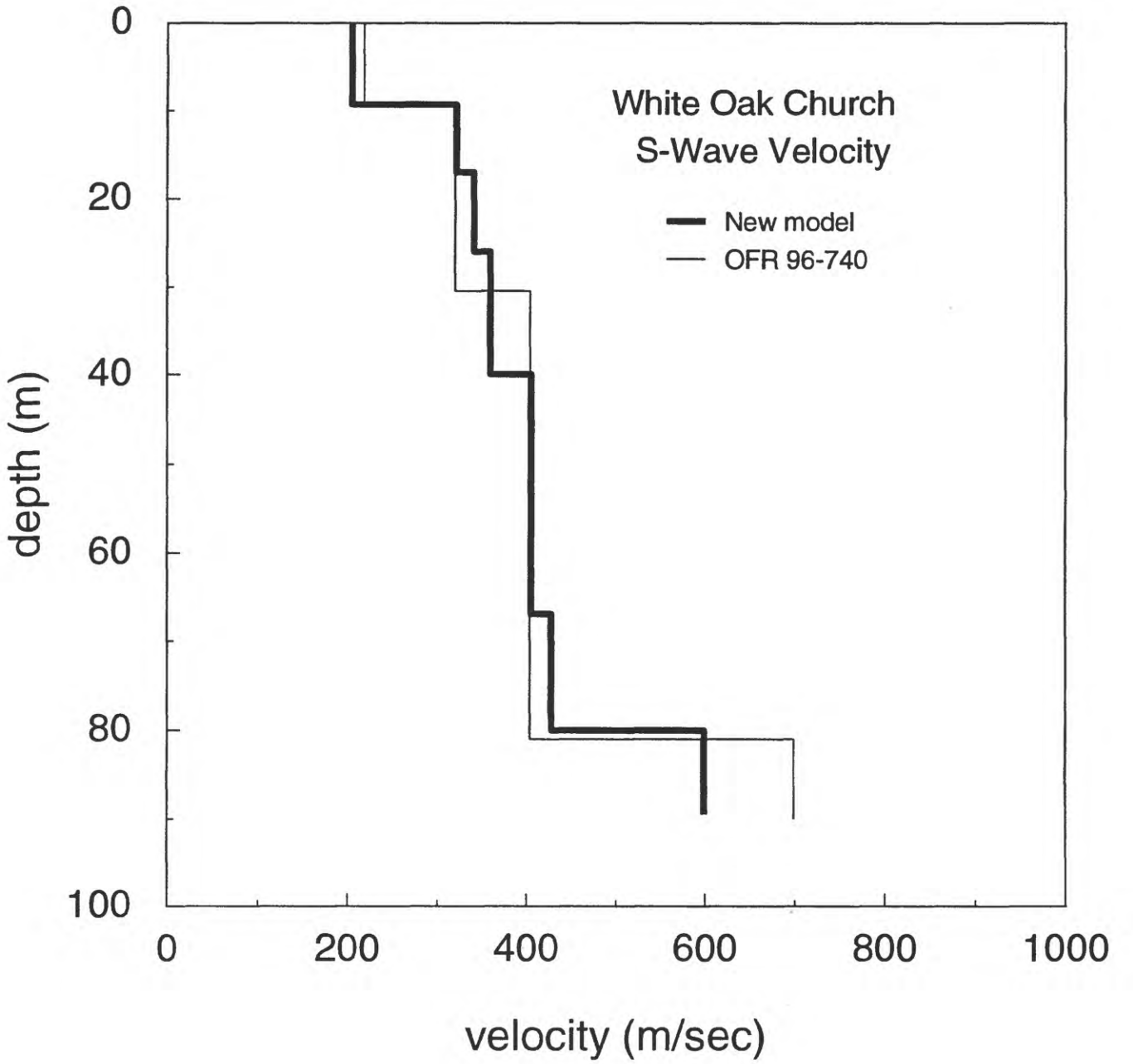

Figure C-23. Comparison of S-wave models White Oak Church.

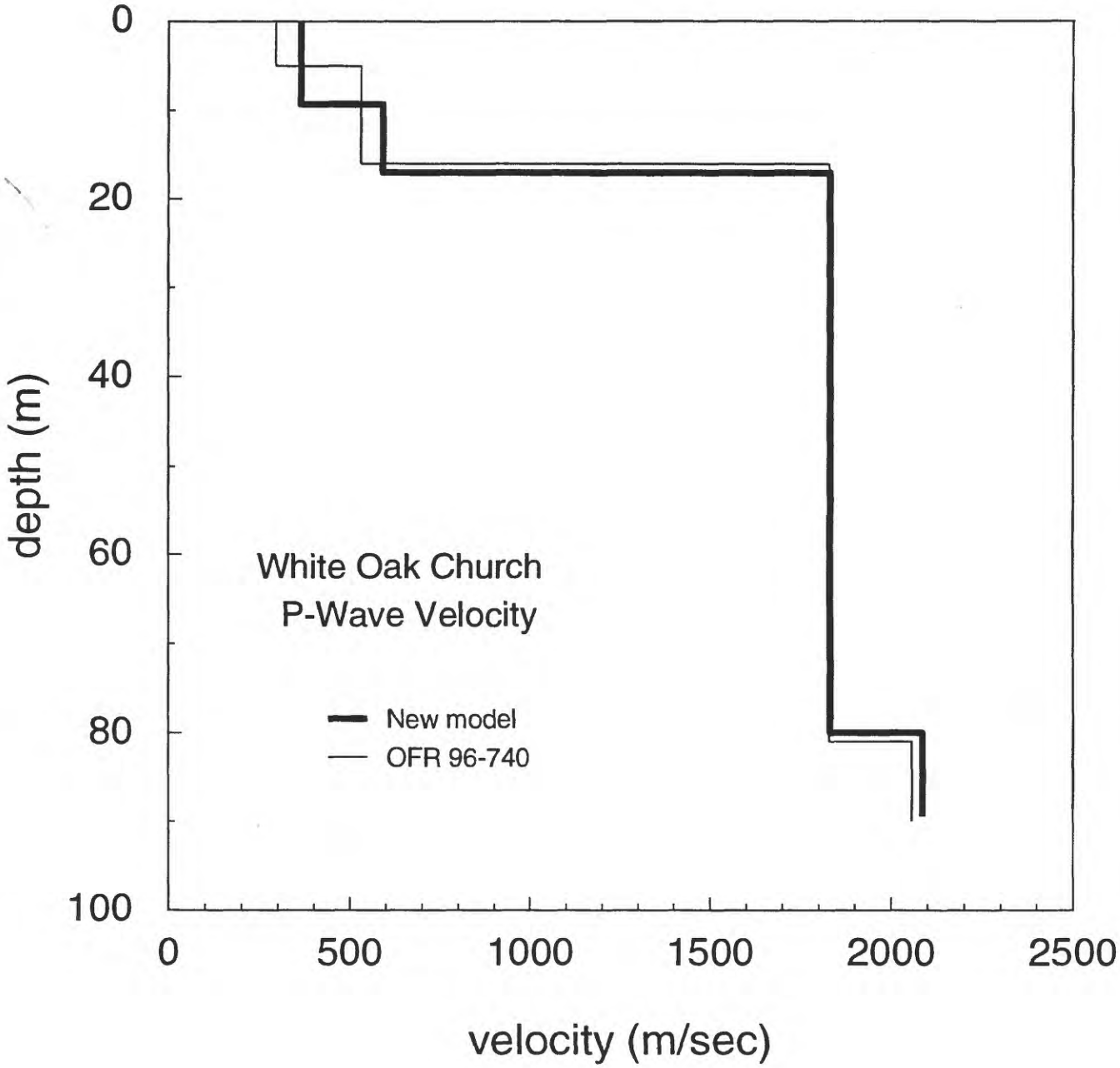

Figure C-24. Comparison of P-wave models White Oak Church.