the presence of higher frequency P-wave energy at the beginning of the record, and distortion of the lower frequency S_H-wave by residual P-wave signal.

Caliper / Natural Gamma Analysis

No analysis is required with the caliper or natural gamma data; however depths to identifiable boring features were compared to verify compatible depth readings on all logs. Using Robertson Geologging Winlogger software version 1.5, build 401J, these data were combined with the resistivity, ELOG based natural gamma and spontaneous potential (SP) logs, and converted to LAS 2.0 and PDF formats for transmittal to the client.

Resistivity / Spontaneous Potential / Natural Gamma Analysis

No analysis is required with the resistivity, natural gamma or spontaneous potential data; however depths to identifiable boring features were compared to verify compatible depth readings on all logs. Using Robertson Geologging Winlogger software version 1.5, build 401J, these data were combined with the caliper and caliper-based natural gamma logs, and converted to LAS 2.0 and PDF formats for transmittal to the client.

Boring Deviation Analysis

The collected Acoustic Televiewer data were processed with Robertson Geologging's RGLDIP program, version 6.2, to extract the deviation data and produce an ASCII file and plots of deviation data as presented in the boring specific sub-directories in the data directory on the data disk (CD-R) labeled Report 7534-02 that accompanies this report, and summarized in Table 5.

RESULTS

Suspension Results

Suspension R1-R2 P- and S_H-wave velocities are plotted in Figures 5, 7, 9, 12, 15, 18, 21, 24, 26, 29, 32, 35, 38, 41, 44, 46 and 49. The suspension velocity data presented in these figures are presented in Tables 6 – 22. The PSLOG and EXCEL analysis files for each boring are included in the boring specific directories on the data disk (CD-R) labeled Report 7534-02 that accompanies this report, along with the raw and filtered waveforms.

P- and S_H-wave velocity data from R1-R2 analysis and quality assurance analysis of S-R1 data are plotted together in Figures A-1 through A-17 to aid in visual comparison. It should be noted that R1-R2 data are an average velocity over a 3.3 foot segment of the soil column; S-R1 data are an average over 6.3 feet, creating a significant smoothing relative to the R1-R2 plots. S-R1 data are presented in Tables A-1 through A-17, and included in the EXCEL analysis files for each boring on the data disk (CD-R) labeled Report 7534-02 that accompanies this report.

Calibration procedures and records for the suspension PS measurement system are presented in Appendix C, and **GEO***Vision* standard field log sheets for all borings are reproduced in Appendix D.

The **GEO***Vision* standard field procedures are reproduced in Appendix E.

Caliper/ Natural Gamma Results

Caliper and natural gamma data are presented in combined log plots with resistivity and spontaneous potential as single page logs in Figures 6, 8, 10, 13, 16, 19, 22, 25, 27, 30, 33, 36, 39, 42, 45, 47 and 50, as well as multi-page logs in Appendix B. On these plots, the following acronyms are used:

- NGAM: Natural gamma data collected with the ELOG probe.
- SP: Spontaneous (self) potential.

- CNGA: Natural gamma data collected with the caliper probe.
- CALP: Caliper (borehole diameter)
- SHN: Short normal resistivity (16 inch resistivity)
- LON: Long normal resistivity (64 inch resistivity)
- SPR: Single point resistance

LAS 2.0 data and Acrobat files of the plots for each boring are included in the boring specific sub-directories in the data directory on the data disk (CD-R) labeled Report 7534-02 that accompanies this report.

Resistivity / Spontaneous Potential / Natural Gamma Results

Resistivity and spontaneous potential data are presented in combined log plots with caliper and natural gamma data as single page logs in Figures 6, 8, 10, 13, 16, 19, 22, 25, 27, 30, 33, 36, 39, 42, 45, 47 and 50, as well as multi-page logs in Appendix B. LAS 2.0 data and Acrobat files for each boring are included in the boring specific sub-directories in the data directory on the data disk (CD-R) labeled Report 7534-02 that accompanies this report.

Boring Deviation Results

Boring deviation data are presented graphically in Figures 11, 14, 17, 20, 23, 28, 31, 34, 37, 40, 43, 48 and 51, and summarized in Table 5. Deviation data plots in Acrobat format and deviation data at 1.0 foot stations are presented in ASCII format in the boring specific sub-directories of the data directory on the data disk (CD-R) labeled Report 7534-02 that accompanies this report.

SUMMARY

Discussion of Suspension Results

Suspension PS velocity data are ideally collected in an uncased fluid filled boring, drilled with rotary mud (rotary wash) methods. The borings at this site were ideal for collection of suspension PS velocity data, as they were drilled specifically for geophysical logging immediately before the logs were performed. This approach provided clean borings with a minimum of slough, squeezing and washouts.

Suspension PS velocity data quality is judged based upon 5 criteria:

1. Consistent data between receiver to receiver (R1 – R2) and source to receiver (S – R1) data.
2. Consistent relationship between P-wave and S_H -wave (excluding transition to saturated soils)
3. Consistency between data from adjacent depth intervals.
4. Clarity of P-wave and S_H-wave onset, as well as damping of later oscillations.
5. Consistency of profile between adjacent borings, if available.

All of these data show excellent correlation between R1 – R2 and S – R1 data, as well as excellent correlation between P-wave and S_H-wave velocities. The upper 50 feet of B-2174A OFFSET did not provide interpretable P-wave data, due to washouts over 10 inches, as indicated on the caliper log, and high ambient noise from adjacent drill rigs operating at the time of the log. Below this zone, P-wave and S_H-wave onsets are very clear, and later oscillations are well damped. There is local variation between the profiles from all these borings, but the generally velocity trends are similar.

Discussion of Caliper / Natural Gamma Results

Caliper and natural gamma data were collected for the entire depth of each boring, as natural gamma data can be collected through PVC casing without attenuation, and through steel casing with some attenuation. The caliper logs for these borings generally show diameter of less than 6 inches below 20 feet, with the exception of B-2174A OFFSET which was eroded out almost 12 inches. Natural gamma data were collected with this tool in all the borings, as well as with the ELOG probe, and the comparison between the two data sets provides an almost exact match, verifying the performance of the natural gamma measuring systems.

Discussion of Resistivity / Spontaneous Potential / Natural Gamma Results

These electrical methods provide fair demarcation of different lithologic units at this site, though there appears to be some influence of salt water intrusion. All three resistivity logs show similar structure, and match closely with the structure indicated by the natural gamma logs. The electrical data are not valid above 40 feet, as the upper yoke electrode moves out of the boring fluid at this depth. This natural gamma data agrees well with the natural gamma data collected with the caliper probe. The comparison between the two data sets provides an almost exact match, verifying the performance of the natural gamma measuring systems.

Discussion of Boring Deviation Results

The thirteen borings in which deviation data was collected were inclined at 1.8 degrees or less from vertical, and the maximum error in depth value was 0.2 feet in 303 ft, or 0.07 percent, as presented in Table 5. This error is less than depth errors from other causes, and no adjustment of log depth is indicated.

Quality Assurance

These boring geophysical measurements were performed using industry-standard or better methods for measurements and analyses. All work was performed under **GEO***Vision* quality assurance procedures, which include:

- Use of NIST-traceable calibrations, where applicable, for field and laboratory instrumentation
- Use of standard field data logs
- Use of independent verification of velocity data by comparison of receiver-to-receiver and source-to-receiver velocities
- Independent review of calculations and results by a registered professional engineer, geologist, or geophysicist.

Suspension Data Reliability

P- and S_H-wave velocity measurement using the Suspension Method gives average velocities over a 3.3 foot interval of depth. This high resolution results in the scatter of values shown in the graphs. Individual measurements are very reliable with estimated precision of +/- 5%. Standardized field procedures and quality assurance checks contribute to the reliability of these data.

BORING DESIGNATION	DATES LOGGED	COORDINATES (FEET) [1]		ELEVATION [1] (FEET)
		NORTHING	EASTING	
B-11	10/23/07	13,411,479.49	2,607,866.27	74.47
B-12	10/24/07	13,418,446.37	2,606,546.46	76.70
B-2162A OFFSET	11/14/07	13,412,378.65	2,599,792.16	80.05
B-2174A OFFSET	11/9-12/07	13,412,316.51	2,599,991.79	79.28
B-2176A OFFSET	11/13/07	13,412,522.55	2,600,178.10	79.99
B-2182A OFFSET	11/12/07	13,412,209.92	2,600,137.01	79.70
B-2262A OFFSET	11/13-14/07	13,413,146.80	2,600,433.53	80.57
B-2274A OFFSET	11/10/07	13,413,070.52	2,600,633.47	80.34
B-2276A OFFSET	11/10/07	13,413,289.36	2,600,817.99	80.63
B-2282A OFFSET	11/11/07	13,412,962.40	2,600,766.39	80.46
B-2301	11/17/07	13,414,414.60	2,596,251.62	80.79
B-2302	11/15/07	13,407,401.61	2,598,386.93	80.00
B-2303	11/17/07	13,402,314.55	2,600,497.11	75.56
B-2304	11/17/07	13,396,541.80	2,608,710.01	68.12
B-2305	11/18/07	13,406,649.21	2,621,680.51	65.58
B-2306	11/16/07	13,411,472.15	2,615,253.02	64.68
B-2307	11/18/07	13,420,917.89	2,603,184.91	76.38

[1] Survey data and elevation provided by MACTEC

Table 1. Boring locations and logging dates

Winch GEOVision 4-conductor
Sheave - Measuring wheel GEOVision S/N 101, S/N 102
Robertson Suspension PS telemetry unit M/N 3403 S/N 160023, 160024
Robertson Micrologger II S/N 5310
OYO Suspension PS Logging recorder M/N 170 S/N 19029
OYO Suspension PS Logger Borehole Probe, includes:
Receiver/Sensor S/N 30086, S/N 12008, S/N 20042, S/N 30086
Isolation tube, 1m M/N 3387B S/N 280068, S/N 24053
OYO PS 170 Source M/N 3304 S/N 19043, S/N 21050
Driver M/N 3386A S/N 27073, S/N 490157
Weight M/N 3302W S/N 12007, S/N 470150

Table 2. Suspension PS Logging Equipment

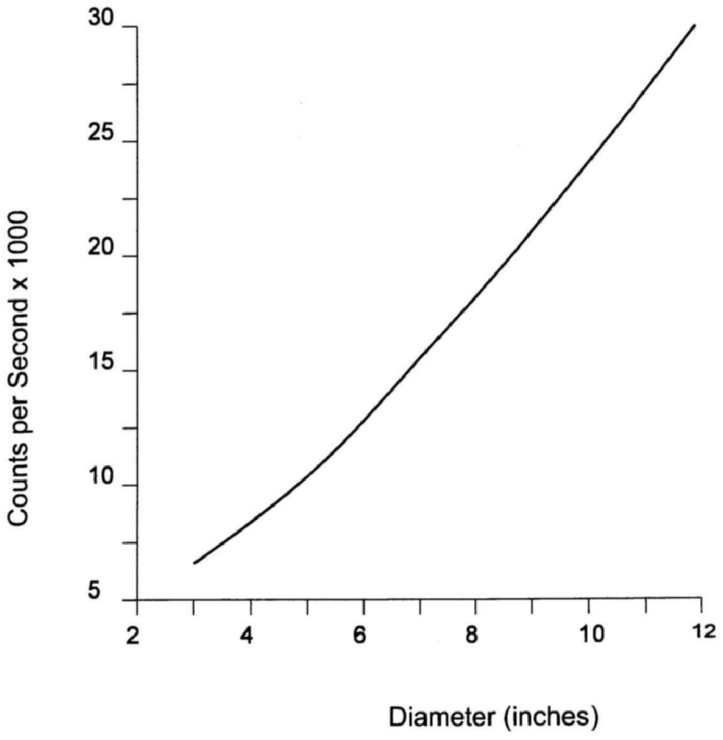

Figure 1. Example Calibration Curve for Caliper Probe

BORING NUMBER	TOOL AND RUN NUMBER	DEPTH RANGE (FEET)	OPEN HOLE (FEET)	DEPTH TO BOTTOM OF CASING (FEET)	SAMPLE INTERVAL (FEET)	DATE LOGGED
B-11	ELOG/GAMMA 1		-	NONE	0.05	10/23/07
B-11	SUSPENSION PS 1		-	NONE	1.6	10/23/07
B-11	CALIPER/GAMMA 1		-	NONE	0.05	10/23/07
B-12	ELOG/GAMMA 1		-	NONE	0.05	10/23/07
B-12	SUSPENSION PS 1		-	NONE	1.6	10/23/07
B-12	CALIPER/GAMMA 1		-	NONE	0.05	10/23/07
B-2162A OFFSET	ELOG/GAMMA 1	208.0 – 40.2	208.0	NONE	0.05	11/14/07
B-2162A OFFSET	SUSPENSION PS 1	8.5 – 195.2	-	NONE	1.6	11/14/07
B-2162A OFFSET	CALIPER/GAMMA 1	202.2 – 5.9	-	NONE	0.05	11/14/07
B-2162A OFFSET	DEVIATION 1	204.7 – 3.1	-	NONE	0.04	11/14/07
B-2174A OFFSET	ELOG/GAMMA 1	609.8 – 37.8	609.8	NONE	0.05	11/9/07
B-2174A OFFSET	SUSPENSION PS 1	8.5 – 305.1	-	NONE	1.6	11/9/07
B-2174A OFFSET	CALIPER/GAMMA 1	317.6 – 4.8	317.6	NONE	0.05	11/9/07
B-2174A OFFSET	DEVIATION 1	317.0 – 3.8	-	NONE	0.04	11/9/07
B-2174A OFFSET	SUSPENSION PS 2	295.3 – 600.4	612.5	NONE	1.6	11/12/07
B-2174A OFFSET	CALIPER/GAMMA 2	599.6 – 295.8	-	NONE	0.05	11/12/07
B-2174A OFFSET	DEVIATION 2	604.8 – 297.0	-	NONE	0.04	11/12/07
B-2176A OFFSET	SUSPENSION PS 1	8.2 – 195.2	-	NONE	1.6	11/13/07
B-2176A OFFSET	ELOG/GAMMA 1	209.0 – 37.0	209.0	NONE	0.05	11/13/07
B-2176A OFFSET	CALIPER/GAMMA 1	205.0 – 6.0	-	NONE	0.05	11/13/07
B-2176A OFFSET	DEVIATION 1	208.0 – 5.0	-	NONE	0.04	11/13/07
B-2182A OFFSET	ELOG/GAMMA 1	407.9 – 40.2	407.9	2.0 FT PVC	0.05	11/12/07
B-2182A OFFSET	SUSPENSION PS 1	8.5 – 398.9	-	2.0 FT PVC	1.6	11/12/07
B-2182A OFFSET	CALIPER/GAMMA 1	404.9 – 4.5	-	2.0 FT PVC	0.05	11/12/07
B-2182A OFFSET	DEVIATION 1	405.8 – 3.8	-	2.0 FT PVC	0.04	11/12/07
B-2262A OFFSET	ELOG/GAMMA 1	209.9 – 39.2	209.9	NONE	0.05	11/13/07
B-2262A OFFSET	CALIPER/GAMMA 1	207.6 – 5.6	-	NONE	0.05	11/13/07
B-2262A OFFSET	DEVIATION 1	201.2 – 3.2	-	NONE	0.04	11/13/07
B-2262A OFFSET	SUSPENSION PS 1	8.5 – 193.6	-	NONE	1.6	11/13/07
B-2274A OFFSET	ELOG/GAMMA 1	617.9 – 39.1	617.9	NONE	0.05	11/7/07
B-2274A OFFSET	SUSPENSION PS 1	8.5 – 600.4	-	NONE	1.6	11/7/07
B-2274A OFFSET	CALIPER/GAMMA 1	604.6 – 4.9	-	NONE	0.05	11/7/07
B-2276A OFFSET	ELOG/GAMMA 1	208.4 – 39.6	208.4	1.5 FT PVC	0.05	11/10/07
B-2276A OFFSET	SUSPENSION PS 1	6.9 – 196.9	-	1.5 FT PVC	1.6	11/10/07
B-2276A OFFSET	CALIPER/GAMMA 1	206.8 – 4.1	-	1.5 FT PVC	0.05	11/10/07
B-2276A OFFSET	DEVIATION 1	202.8 – 2.6	-	1.5 FT PVC	0.04	11/10/07

- PROBE DID NOT TOUCH BOTTOM OF BORING

Table 3. Logging dates and depth ranges

B-2282A OFFSET	ELOG/GAMMA 1	406.1 – 17.6	406.1	2.0 FT PVC	0.05	11/11/07
B-2282A OFFSET	SUSPENSION PS 1	8.5 – 395.3	-	2.0 FT PVC	1.6	11/11/07
B-2282A OFFSET	CALIPER/GAMMA 1	401.5 – 3.0	-	2.0 FT PVC	0.05	11/11/07
B-2282A OFFSET	DEVIATION 1	401.3 – 3.7	-	2.0 FT PVC	0.04	11/11/07
B-2301	ELOG/GAMMA 1	305.6 – 35.7	305.6	3.5 FT PVC	0.05	11/17/07
B-2301	SUSPENSION PS 1	6.6 – 295.3	-	3.5 FT PVC	1.6	11/17/07
B-2301	CALIPER/GAMMA 1	306.1 – 1.0	-	3.5 FT PVC	0.05	11/17/07
B-2301	DEVIATION 1	303.2 – 3.1	-	3.5 FT PVC	0.04	11/17/07
B-2302	ELOG/GAMMA 1	315.1 – 39.7	315.1	NONE	0.05	11/15/07
B-2302	SUSPENSION PS 1	8.5 – 300.2	-	NONE	1.6	11/15/07
B-2302	CALIPER/GAMMA 1	302.1 – 5.2	-	NONE	0.05	11/15/07
B-2302	DEVIATION 1	303.5 – 2.8	-	NONE	0.04	11/15/07
B-2303	ELOG/GAMMA 1	309.0 – 39.6	309.0	NONE	0.05	11/15/07
B-2303	SUSPENSION 1	6.6 – 293.6	-	NONE	1.6	11/15/07
B-2303	CALIPER/GAMMA 1	305.0 – 0	-	NONE	0.05	11/15/07
B-2303	DEVIATION 1	305.0 – 3.6	-	NONE	0.04	11/15/07
B-2304	DEVIATION 1	308.0 – 3.2	308.0	NONE	0.04	11/17/07
B-2304	SUSPENSION 1	8.2 – 295.3	-	NONE	1.6	11/17/07
B-2304	ELOG/GAMMA 1	309.0 – 37.0	309.0	NONE	0.05	11/17/07
B-2304	CALIPER/GAMMA 1	305.0 – 5.7	-	NONE	0.05	11/17/07
B-2305	ELOG/GAMMA 1	235.4 – 40.0	235.4	NONE	0.05	11/18/07
B-2305	SUSPENSION 1	6.6 – 219.8	-	NONE	1.6	11/18/07
B-2305	CALIPER/GAMMA 1	230.0 – 5.1	-	NONE	0.05	11/15/07
B-2306	ELOG/GAMMA 1	308.9 – 39.9	308.0	2.0 FT PVC	0.05	11/16/07
B-2306	SUSPENSION 1	6.9 – 296.9	-	2.0 FT PVC	1.6	11/16/07
B-2306	CALIPER/GAMMA 1	306.3 – 5.8	-	2.0 FT PVC	0.05	11/16/07
B-2306	DEVIATION 1	307.1 – 3.5	-	2.0 FT PVC	0.04	11/16/07
B-2307	ELOG/GAMMA 1	309.4 – 39.5	309.5	2.0 FT PVC	0.05	11/18/07
B-2307	CALIPER/GAMMA 1	304.2 – 5.6	-	2.0 FT PVC	0.05	11/18/07
B-2307	SUSPENSION 1	6.6 – 296.9	-	2.0 FT PVC	1.6	11/18/07
B-2307	DEVIATION 1	303.2 – 3.5	-	2.0 FT PVC	0.04	11/18/07

- PROBE DID NOT TOUCH BOTTOM OF BORING

Table 3, continued. Logging dates and depth ranges

BORING NUMBER	TOOL AND RUN NUMBER	TOOL HIT BOTTOM DEPTH (FEET)	DRILLER DEPTH (FEET)	STARTING DEPTH REF. (FEET)	ENDING DEPTH REF. (FEET)	ASDE (FEET)
B-11	ELOG/GAMMA 1					
B-11	SUSPENSION PS 1					
B-11	CALIPER/GAMMA 1					
B-12	ELOG/GAMMA 1					
B-12	SUSPENSION PS 1					
B-12	CALIPER/GAMMA 1					
B-2162A OFFSET	ELOG/GAMMA 1	208.0	210	41.0	41.0	0.0
B-2162A OFFSET	SUSPENSION PS 1	-	210	8.1	8.2	0.1
B-2162A OFFSET	CALIPER/GAMMA 1	-	210	6.8	6.8	0.0
B-2162A OFFSET	DEVIATION 1	-	210	4.7	4.7	0.0
B-2174A OFFSET	ELOG/GAMMA 1	609.8	617	41.0	41.0	0.0
B-2174A OFFSET	SUSPENSION PS 1	305.1	OBSTRUCTED	8.1	8.2	0.1
B-2174A OFFSET	CALIPER/GAMMA 1	317.6	OBSTRUCTED	6.8	6.9	0.1
B-2174A OFFSET	DEVIATION 1	317.0	OBSTRUCTED	4.7	4.6	-0.1
B-2174A OFFSET	SUSPENSION PS 2	612.5	617	8.1	8.3	0.2
B-2174A OFFSET	CALIPER/GAMMA 2	-	617	6.8	6.7	-0.1
B-2174A OFFSET	DEVIATION 2	-	617	4.7	5.1	0.4
B-2176A OFFSET	SUSPENSION PS 1	207.3	210	8.5	8.5	0.0
B-2176A OFFSET	ELOG/GAMMA 1	209.0	210	41.0	40.9	-0.1
B-2176A OFFSET	CALIPER/GAMMA 1	-	210	6.8	6.8	0.0
B-2176A OFFSET	DEVIATION 1	-	210	4.7	4.7	0.0
B-2182A OFFSET	ELOG/GAMMA 1	407.9	410	39.9	39.9	0.0
B-2182A OFFSET	SUSPENSION PS 1	409.1	410	7.0	7.2	0.2
B-2182A OFFSET	CALIPER/GAMMA 1	-	410	5.7	5.7	0.0
B-2182A OFFSET	DEVIATION 1	-	410	3.6	3.8	0.2
B-2262A OFFSET	ELOG/GAMMA 1	209.9	211	41.0	41.0	0.0
B-2262A OFFSET	CALIPER/GAMMA 1	-	211	6.8	6.8	0.0
B-2262A OFFSET	DEVIATION 1	-	211	4.7	4.7	0.0
B-2262A OFFSET	SUSPENSION PS 1	-	211	7.6	7.7	0.0
B-2274A OFFSET	ELOG/GAMMA 1	617.9	620	41.0	40.7	-0.3
B-2274A OFFSET	SUSPENSION PS 1	-	620	8.1	8.1	0.0
B-2274A OFFSET	CALIPER/GAMMA 1	-	620	6.8	6.5	-0.3

- PROBE DID NOT TOUCH BOTTOM OF BORING

Table 4. Boring Bottom Depths and After Survey Depth Error (ASDE)

B-2276A OFFSET	ELOG/GAMMA 1	208.6	210	39.7	39.6	-0.1
B-2276A OFFSET	SUSPENSION PS 1	208.9	210	6.8	6.8	0.0
B-2276A OFFSET	CALIPER/GAMMA 1	-	210	5.5	5.5	0.0
B-2276A OFFSET	DEVIATION 1	-	210	3.4	3.4	0.0
B-2282A OFFSET	ELOG/GAMMA 1	406.1	410	39.9	39.7	-0.2
B-2282A OFFSET	SUSPENSION PS 1	407.4	410	7.0	7.2	0.2
B-2282A OFFSET	CALIPER/GAMMA 1	-	410	5.7	5.7	0.0
B-2282A OFFSET	DEVIATION 1	-	410	3.6	3.6	0.0
B-2301	ELOG/GAMMA 1	305.6	310	39.3	39.4	0.1
B-2301	SUSPENSION PS 1	307.4	310	4.9	4.7	-0.2
B-2301	CALIPER/GAMMA 1	306.1	310	5.2	5.4	0.2
B-2301	DEVIATION 1	-	310	3.1	3.2	0.1
B-2302	ELOG/GAMMA 1	315.1	315	41.0	41.4	0.4
B-2302	SUSPENSION PS 1	-	315	8.1	8.6	0.5
B-2302	CALIPER/GAMMA 1	-	315	6.8	6.8	0.0
B-2302	DEVIATION 1	-	315	4.7	4.7	0.0
B-2303	ELOG/GAMMA 1	309.0	310	39.9	39.8	-0.1
B-2303	SUSPENSION 1	-	310	7.1	7.3	0.2
B-2303	CALIPER/GAMMA 1	-	310	5.7	5.7	0.0
B-2303	DEVIATION 1	-	310	3.6	3.8	0.2
B-2304	DEVIATION 1	308.0	310	3.7	3.5	-0.2
B-2304	SUSPENSION 1	-	310	7.1	6.9	-0.2
B-2304	ELOG/GAMMA 1	309.0	310	39.9	39.9	0.0
B-2304	CALIPER/GAMMA 1	-	310	5.7	5.7	0.0
B-2305	ELOG/GAMMA 1	235.4	305	39.3	39.2	-0.1
B-2305	SUSPENSION 1	231.9	OBSTRUCTED	6.6	6.3	-0.3
B-2305	CALIPER/GAMMA 1	230.0	OBSTRUCTED	5.1	5.1	0.0
B-2306	ELOG/GAMMA 1	308.9	310	39.8	39.9	0.1
B-2306	SUSPENSION 1	309.0	310	6.9	6.9	0.0
B-2306	CALIPER/GAMMA 1	-	310	5.6	5.7	0.1
B-2306	DEVIATION 1	-	310	3.5	3.5	0.0
B-2307	ELOG/GAMMA 1	309.4	310	39.8	39.8	0.0
B-2307	CALIPER/GAMMA 1	309.0	310	5.6	5.6	0.0
B-2307	SUSPENSION 1	-	310	5.4	5.3	-0.1
B-2307	DEVIATION 1	-	310	3.5	3.5	0.0

- PROBE DID NOT TOUCH BOTTOM OF BORING

Table 4, continued. Boring Bottom Depths and After Survey Depth Error (ASDE)

BORING NUMBER	MEAN DEVIATION AND AZIMUTH (DEGREES TN)	SURVEY DEPTH (FEET)	VERTICAL DEPTH (FEET)	DEPTH ERROR (FEET)	HORIZONTAL OFFSET (FEET)
B-2162A OFFSET	1.8 – N120.5	204.8	204.6	0.2	6.3
B-2174A OFFSET	0.5 – N112.1	604.8	604.6	0.2	4.7
B-2176A OFFSET	0.7 – N239.9	208.0	208.0	0.0	2.4
B-2182A OFFSET	1.2 – N43.2	405.8	405.6	0.2	8.7
B-2262A OFFSET	0.8 – N61.8	201.3	201.2	0.1	2.7
B-2276A OFFSET	0.5 – N242.5	202.8	202.7	0.1	1.9
B-2282A OFFSET	0.9 – N80.1	401.2	401.2	0.0	6.2
B-2301	0.7 – N20.8	303.2	303.0	0.2	3.7
B-2302	0.2 – N230.8	303.5	303.5	0.0	1.2
B-2303	0.5 – N85.4	304.9	304.9	0.0	2.4
B-2304	0.6 – N116.4	307.8	307.7	0.1	3.1
B-2306	0.7 – N155.1	307.6	307.6	0.0	3.6
B-2307	1.5 – N24.7	303.2	303.1	0.1	8.1

Table 5. Boring Deviation Data Summary

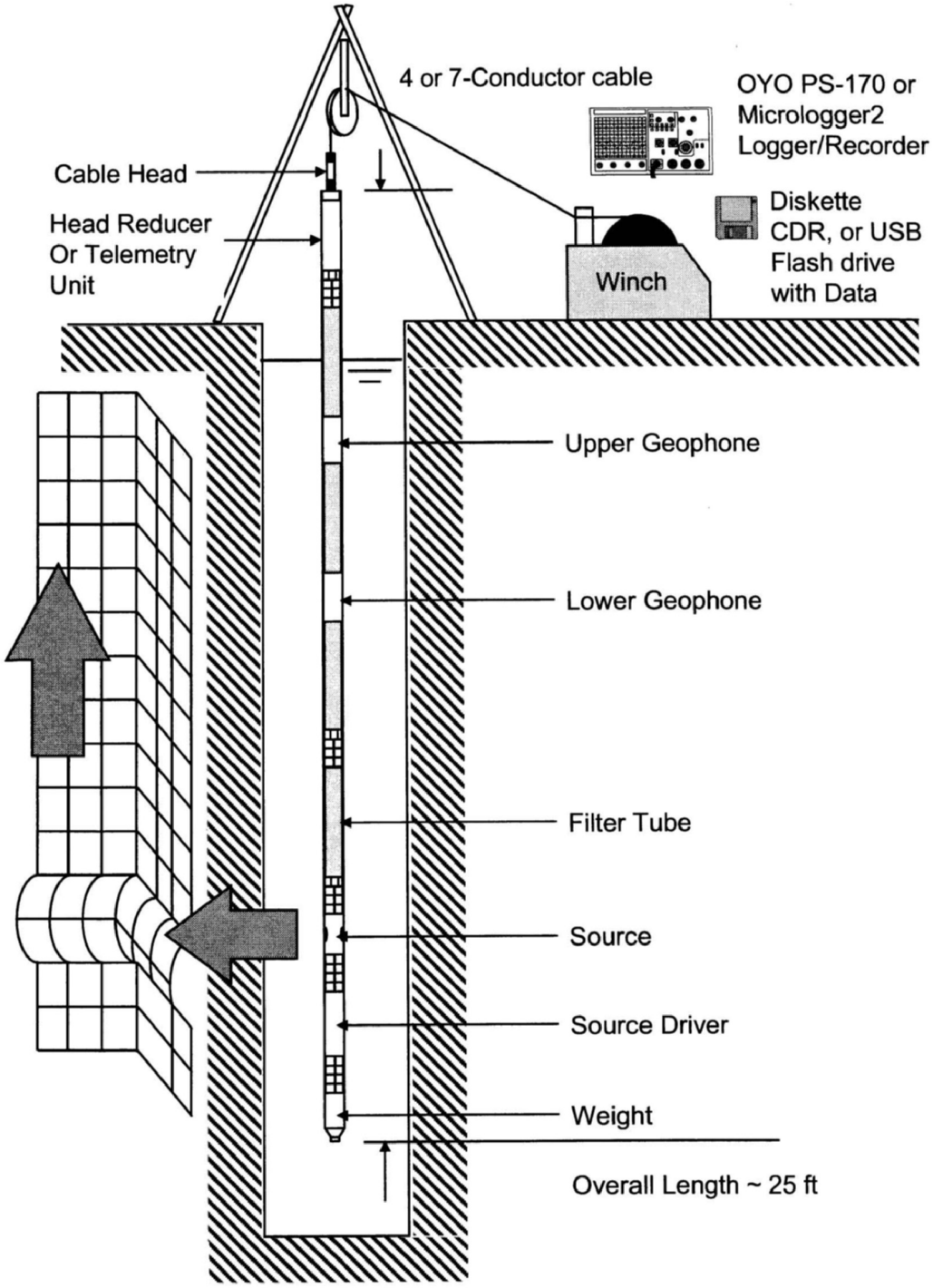

Figure 2: Concept illustration of P-S logging system

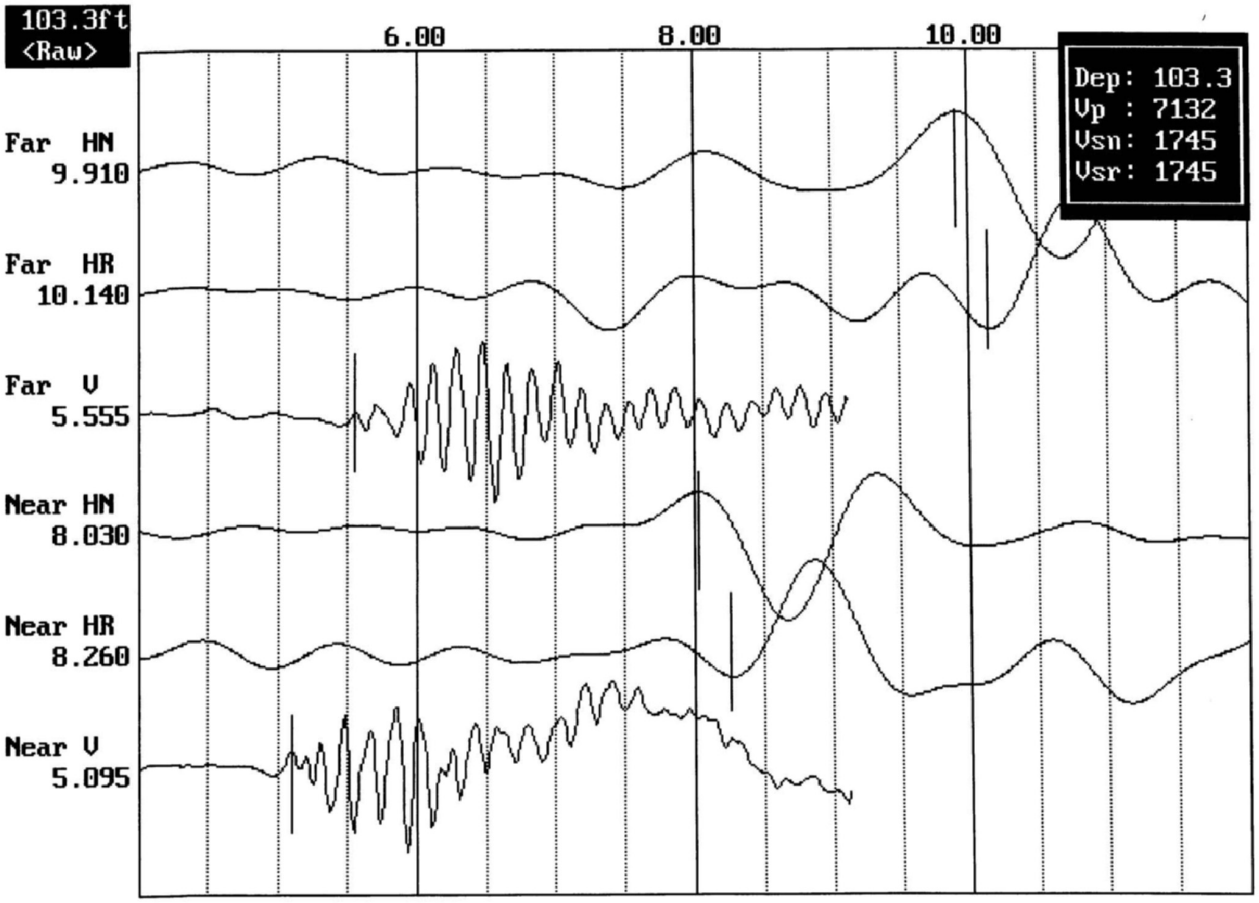

Figure 3: Example of filtered (1400 Hz lowpass) record

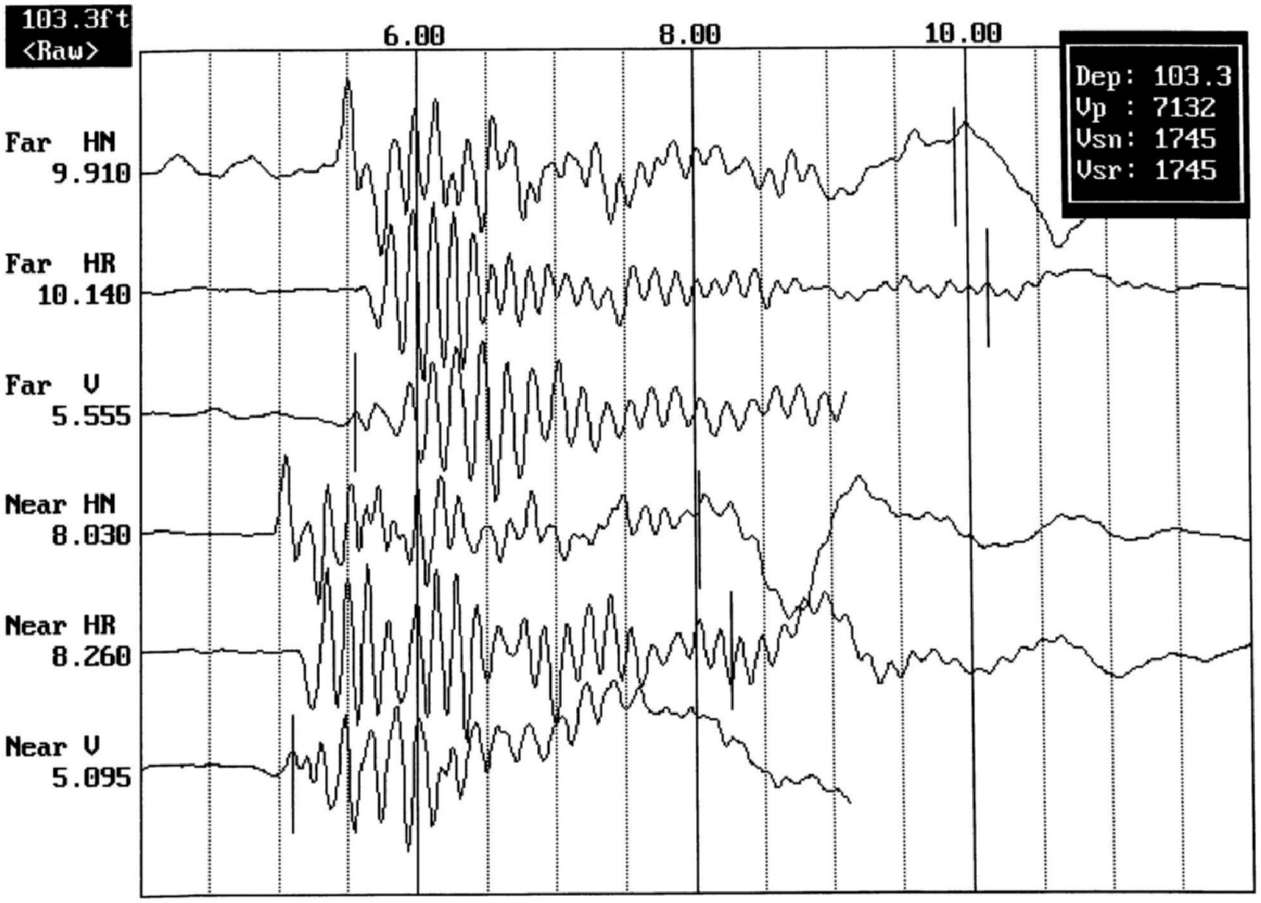

Figure 4. Example of unfiltered record

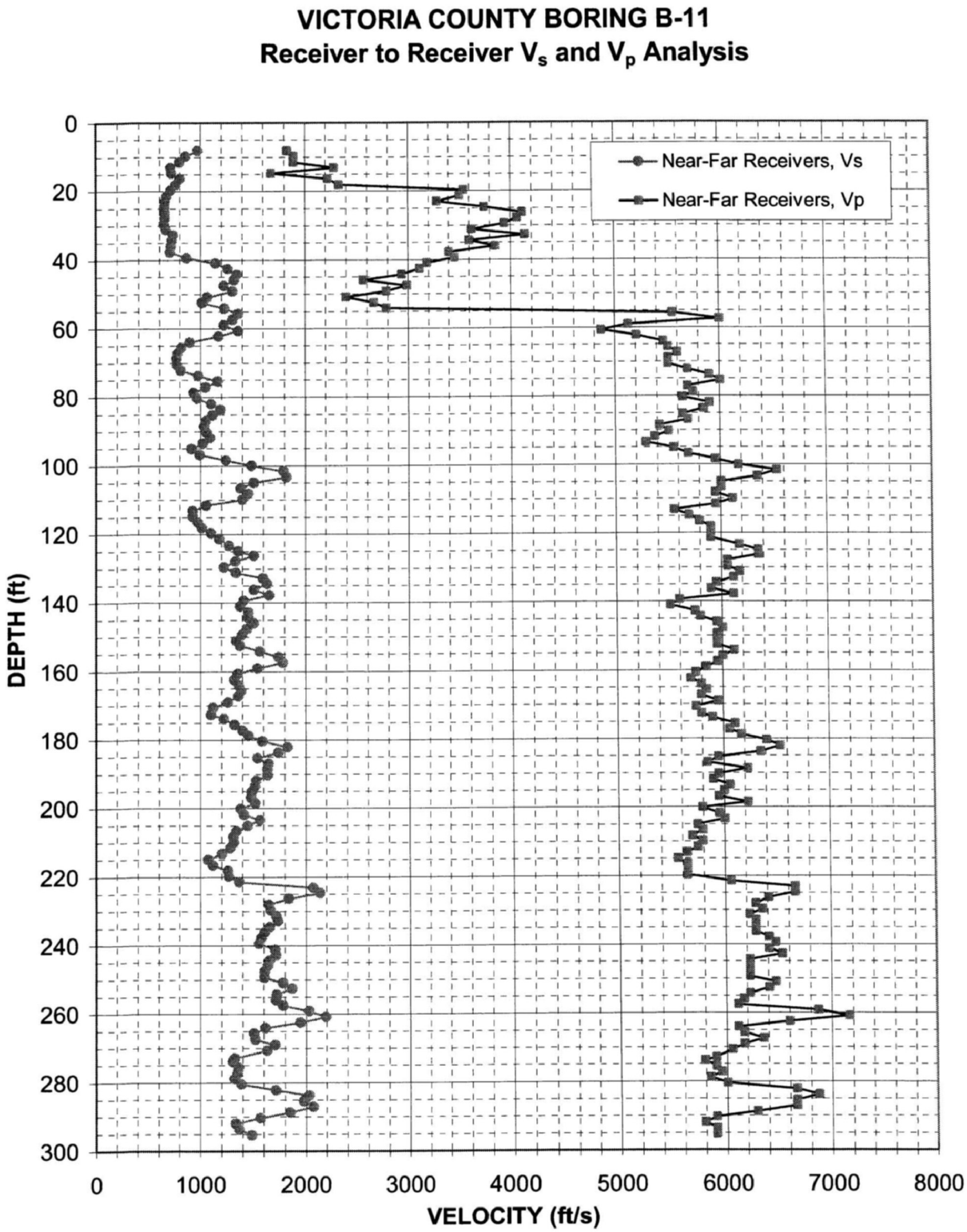

Figure 5: Boring B-11, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
8.2	970	1830
9.8	850	1890
11.5	790	1890
13.1	710	2280
14.8	720	1680
16.4	800	2220
18.0	760	2330
19.7	710	3550
21.3	670	3510
23.0	650	3280
24.6	650	3750
26.3	650	4120
27.9	650	4070
29.5	650	3940
31.2	660	3620
32.8	730	4140
34.5	720	3600
36.1	710	3850
37.7	700	3400
39.4	860	3450
41.0	1140	3190
42.7	1260	3120
44.3	1350	2940
45.9	1320	2560
47.6	1220	2990
49.2	1300	2790
50.9	1060	2400
52.5	1010	2670
54.1	1230	2790
55.8	1360	5560
57.4	1300	6010
59.1	1220	5130
60.7	1360	4870
62.3	1170	5210
64.0	900	5460
65.6	810	5510
67.3	780	5600
68.9	770	5510
70.5	770	5510
72.2	810	5700
73.8	980	5900
75.5	1170	6010
77.1	1040	5700
78.7	930	5750
80.4	970	5650
82.0	1100	5900
83.7	1190	5850
85.3	1110	5650
86.9	1050	5700
88.6	1030	5420

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
90.2	1050	5510
91.9	1090	5380
93.5	1020	5290
95.1	910	5560
96.8	990	5700
98.4	1240	5950
100.1	1490	6170
101.7	1790	6540
103.4	1820	6350
105.0	1510	6010
106.6	1380	6010
108.3	1460	5950
109.9	1400	6120
111.6	1050	5950
113.2	920	5560
114.8	930	5700
116.5	970	5800
118.1	1010	5900
119.8	1100	5900
121.4	1180	5900
123.4	1270	6170
125.0	1360	6350
126.3	1510	6350
128.0	1330	6060
129.6	1220	6060
131.2	1340	6170
132.9	1590	6120
134.5	1630	5950
136.2	1510	5900
137.8	1660	6120
139.4	1410	5600
141.1	1380	5510
142.7	1460	5750
144.4	1460	5800
146.0	1510	5950
147.6	1440	6010
149.3	1390	5950
151.3	1340	5950
152.6	1380	5950
154.2	1560	6120
155.8	1750	6010
157.5	1780	5950
159.1	1540	5850
160.8	1360	5750
162.4	1320	5700
164.0	1370	5800
165.7	1390	5850
167.3	1360	5800
169.0	1260	5950
170.6	1120	5750

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
172.6	1100	5800
173.9	1220	5900
175.5	1330	6120
177.2	1400	6060
178.8	1460	6170
180.5	1590	6410
182.1	1830	6540
183.7	1750	6350
185.4	1540	5950
187.0	1650	5850
188.7	1640	6230
190.3	1640	5950
191.9	1530	5900
193.6	1520	6060
195.2	1490	6010
196.9	1480	5950
198.5	1520	6230
200.1	1380	5800
201.8	1410	5950
203.4	1560	6010
205.1	1450	5750
206.7	1340	5800
208.3	1310	5700
210.0	1320	5800
211.6	1280	5750
213.3	1200	5650
214.9	1070	5560
216.5	1120	5650
218.2	1260	5650
219.8	1270	5650
221.5	1370	6060
223.1	2070	6670
224.7	2140	6670
226.4	1840	6410
228.0	1650	6290
229.7	1670	6350
231.3	1720	6230
232.9	1740	6290
234.6	1660	6290
236.2	1610	6290
237.9	1580	6410
239.5	1560	6470
241.1	1710	6410
242.8	1720	6540
244.4	1660	6230
246.1	1640	6230
247.7	1610	6230
249.3	1610	6230
251.0	1780	6470
252.6	1870	6410

Table 6. Boring B-11, Suspension R1-R2 depths and P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
254.3	1730	6230
255.9	1720	6170
257.6	1780	6120
259.2	2030	6870
260.8	2190	7170
262.5	1950	6600
264.1	1620	6120
265.8	1510	6170
267.4	1520	6350
269.0	1710	6170
270.7	1630	6060
273.0	1330	5900
274.0	1310	5800
275.6	1370	5900
277.2	1360	5950
278.9	1330	5850
280.5	1390	6010
282.2	1720	6670
283.8	2030	6870
285.4	1980	6670
287.1	2070	6670
288.7	1850	6290
290.4	1570	5900
292.0	1340	5800
293.6	1370	5900
295.3	1490	5900

Table 6, continued. Boring B-11, Suspension R1-R2 depths and P- and S_H-wave velocities

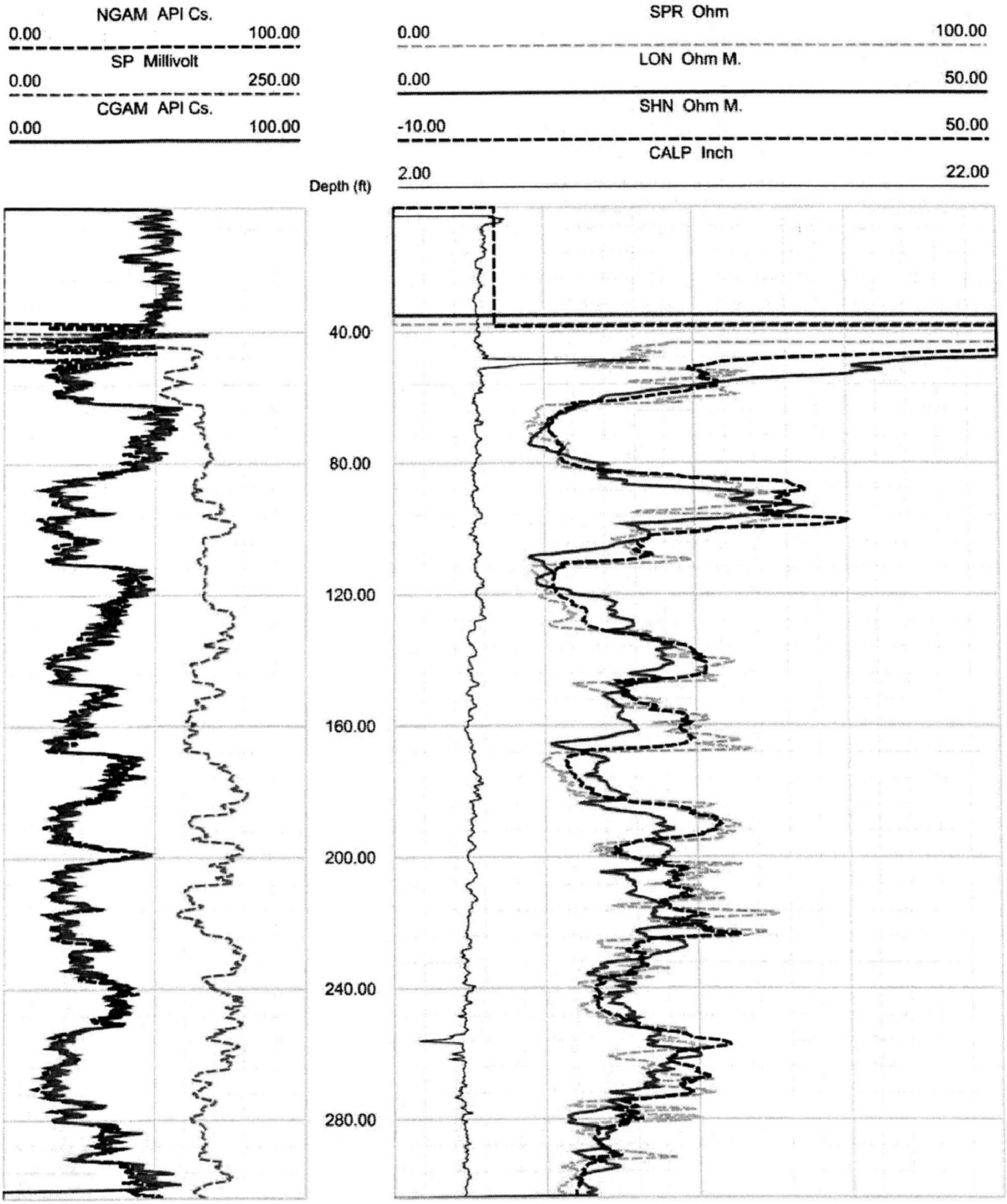

Figure 6. Boring B-11, Caliper, Natural gamma, Resistivity and SP logs

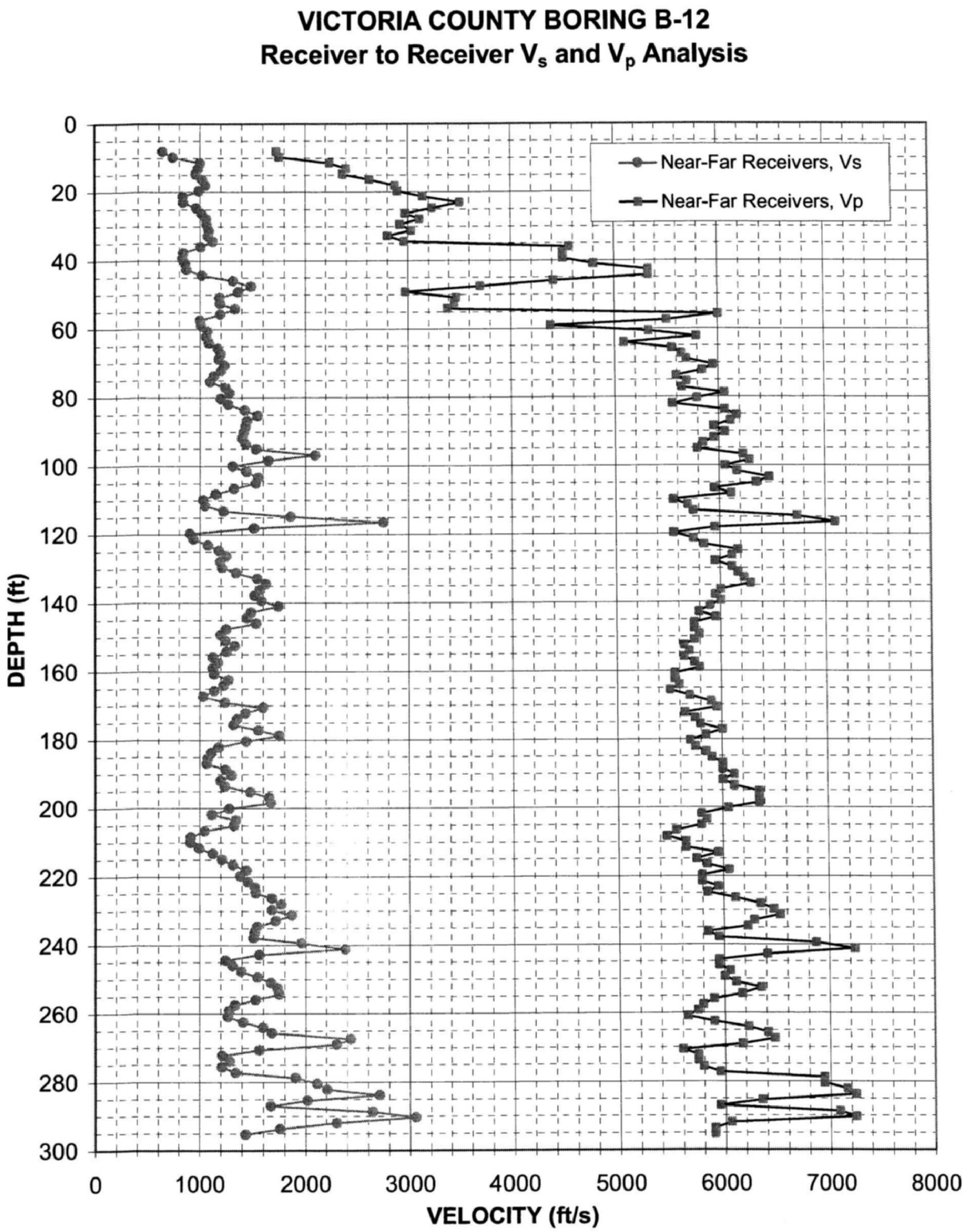

Figure 7: Boring B-12, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
8.2	640	1730
9.8	740	1750
11.5	1000	2240
13.1	980	2400
14.8	960	2360
16.4	1020	2620
18.0	1050	2870
19.7	990	2900
21.3	830	3140
23.0	840	3510
24.6	970	3240
26.3	1020	2980
27.9	1060	3120
29.5	1060	2920
31.2	1090	3030
32.8	1080	2800
34.5	1120	2960
36.1	1010	4570
37.7	840	4500
39.4	830	4500
41.0	860	4800
42.7	870	5330
44.3	1020	5330
45.9	1320	4420
47.6	1490	3700
49.2	1370	2980
50.9	1190	3470
52.5	1190	3450
54.1	1330	3380
55.8	1190	6010
57.4	1000	5510
59.1	1010	4390
60.7	1070	5330
62.3	1060	5800
64.0	1090	5090
65.6	1170	5560
67.3	1200	5650
68.9	1180	5700
70.5	1230	5950
72.2	1200	5850
73.8	1130	5600
75.5	1100	5700
77.1	1240	5650
78.7	1280	6060
80.4	1200	5800
82.0	1270	5560
83.7	1420	6060
85.3	1550	6170
86.9	1450	6120
88.6	1440	5950

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
90.2	1420	6060
91.9	1410	5950
93.5	1440	5850
95.1	1540	5800
96.8	2100	6230
98.4	1650	6290
100.1	1310	6060
101.7	1440	6170
103.4	1560	6470
105.0	1530	6350
106.6	1330	5950
108.3	1150	6120
109.9	1030	5560
111.6	1050	5700
113.2	1230	5750
114.8	1860	6730
116.5	2750	7090
118.1	1520	5950
119.8	910	5560
121.4	940	5750
123.0	1080	5850
124.7	1180	6170
126.3	1250	6120
128.0	1190	5950
129.6	1210	6120
131.2	1350	6170
132.9	1540	6230
134.5	1630	6290
136.2	1570	6010
137.8	1520	5950
139.4	1590	6010
141.1	1750	5900
142.7	1490	5800
144.4	1450	5950
146.0	1540	5750
147.6	1250	5750
149.3	1200	5800
150.9	1240	5750
152.6	1330	5650
154.2	1260	5700
155.8	1130	5650
157.5	1170	5750
159.1	1130	5800
160.8	1140	5560
162.4	1270	5560
164.0	1230	5600
165.7	1140	5510
167.3	1030	5700
169.0	1240	5900
170.6	1600	5950

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
172.2	1440	5650
173.9	1360	5750
175.5	1320	5800
177.2	1560	6010
178.8	1750	5850
180.5	1440	5700
182.1	1180	5750
183.7	1110	5850
185.4	1080	5900
187.0	1070	6010
188.7	1250	6010
190.3	1300	6120
191.9	1200	6010
193.6	1240	6120
195.2	1480	6350
196.9	1660	6350
198.5	1680	6350
200.1	1280	6060
201.8	1110	5800
203.4	1340	5850
205.1	1330	5800
206.7	1040	5560
208.3	920	5460
210.0	910	5650
211.6	1000	5650
213.3	1130	5950
214.9	1210	5750
216.5	1320	5850
218.2	1440	6060
219.8	1390	5800
221.5	1460	5800
223.1	1520	5950
224.7	1530	5850
226.4	1680	6120
228.0	1770	6350
229.7	1680	6470
231.3	1870	6540
232.9	1720	6290
234.6	1540	6230
236.2	1520	5850
237.9	1510	5950
239.5	1960	6870
241.1	2380	7250
242.8	1560	6410
244.4	1250	5950
246.1	1310	5950
247.7	1390	6060
249.3	1550	6010
251.0	1680	6120
252.6	1740	6350

Table 7. Boring B-12, Suspension R1-R2 depths and P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
254.3	1750	6170
255.9	1530	5900
257.6	1330	5800
259.2	1280	5750
260.8	1270	5650
262.5	1410	5900
264.1	1600	6230
265.8	1680	6410
267.4	2430	6470
269.0	2300	6170
270.7	1560	5600
272.3	1220	5750
274.0	1290	5750
275.6	1210	5800
277.2	1340	5950
278.9	1900	6940
280.5	2110	6940
282.2	2210	7170
283.8	2710	7250
285.4	2020	6350
287.1	1680	5950
288.7	2650	7090
290.4	3060	7250
292.0	2300	6060
293.6	1760	5900
295.3	1440	5900

Table 7, continued. Boring B-12, Suspension R1-R2 depths and P- and S_H-wave velocities

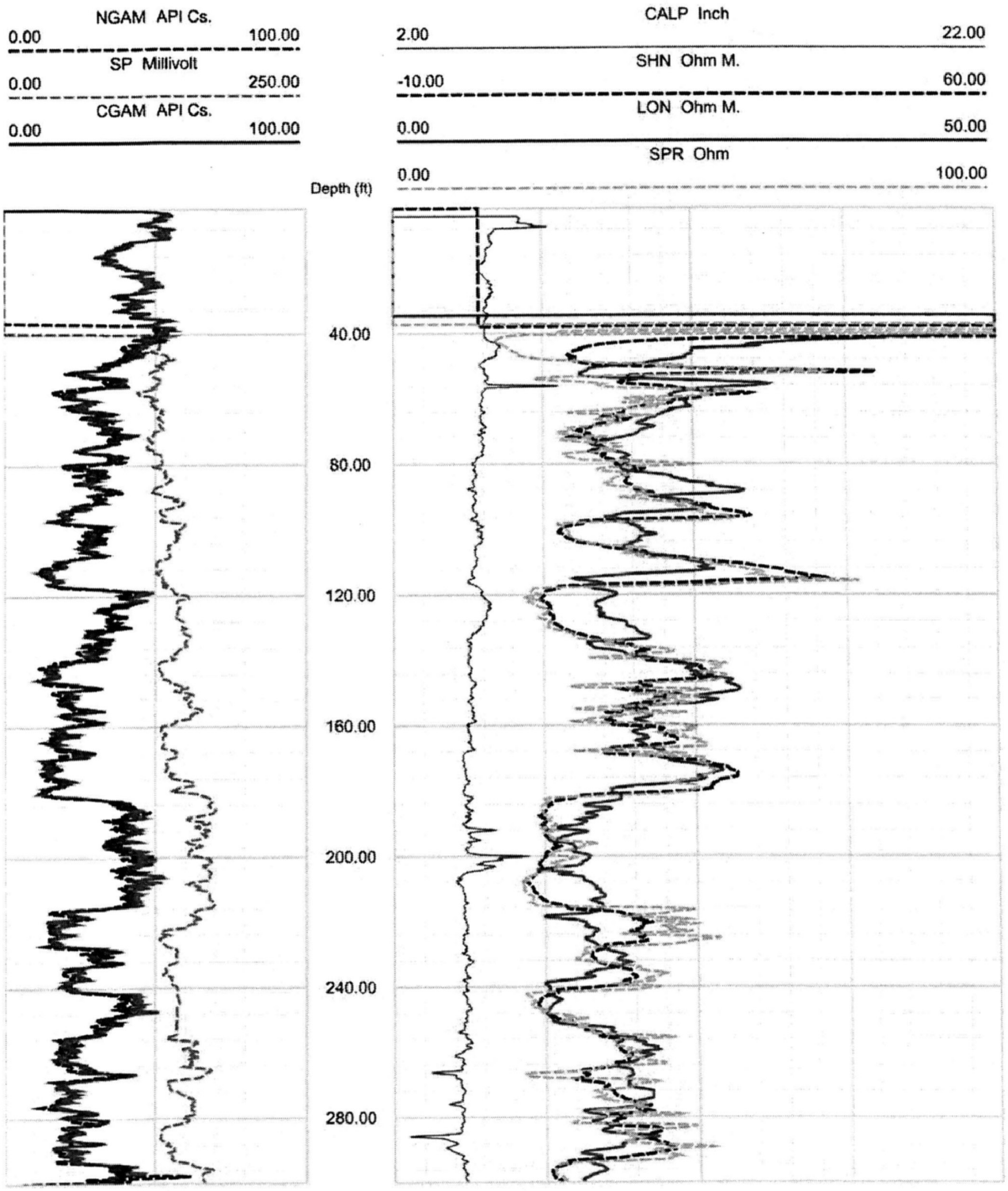

Figure 8. Boring B-12, Caliper, Natural gamma, Resistivity and SP logs

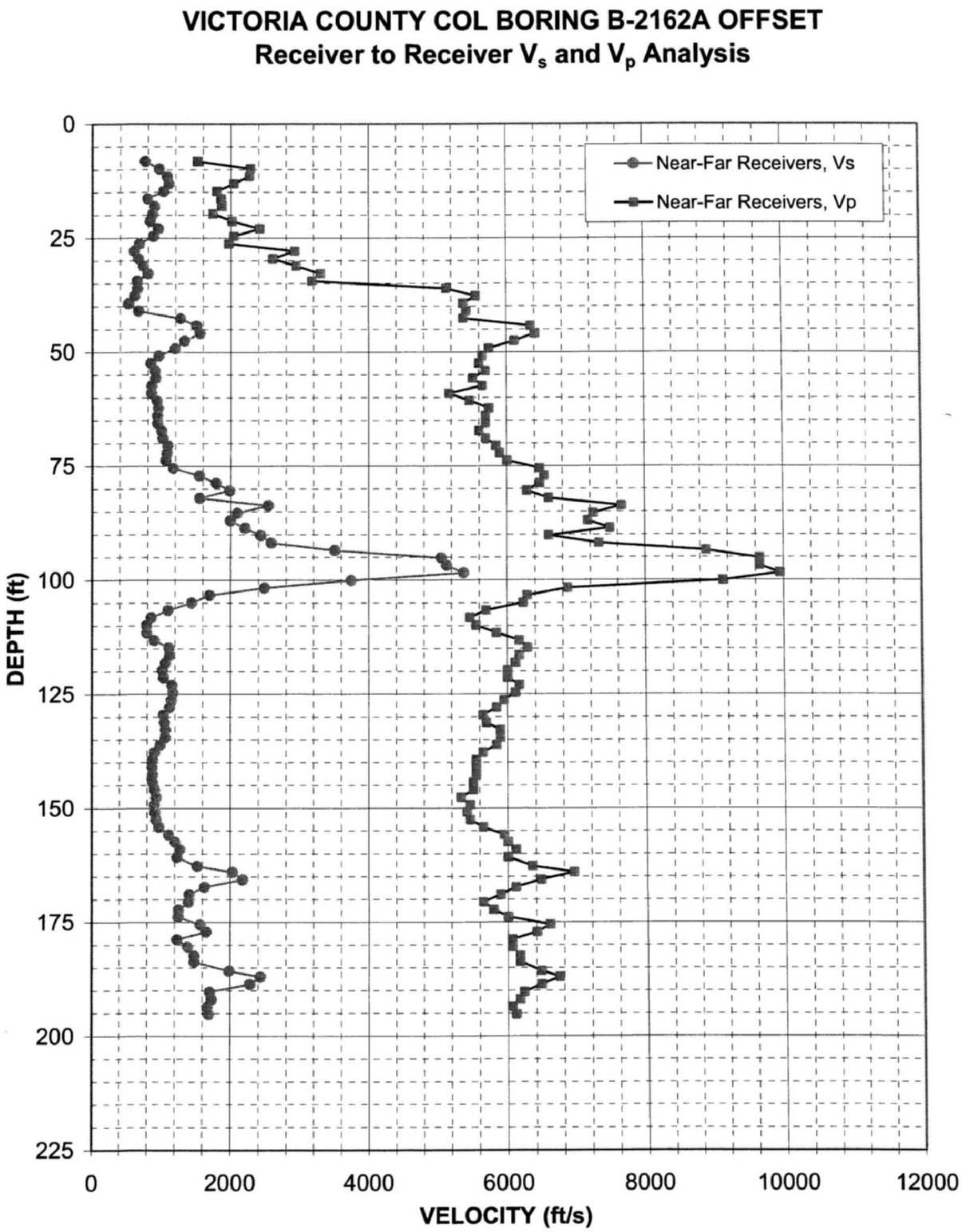

Figure 9: Boring B-2162A OFFSET, Suspension R1-R2 P- and S_H-wave velocities