



Engineering and Applied Science

July 31, 1998

L. Bruce Triplett
Westinghouse Savannah River Company
Building 730-2B, Rm. 1086
Aiken, SC 29808

Dear Mr. Triplett:

Attached is the cone penetrometer data from the 40 test locations conducted as part of the F-Area Expansion Investigation at the Savannah River Site, performed under WSRC subcontract AA82276N, task 10. The tests conducted under this task are summarized in table 1.1.

The information provided for each cone penetration test includes: corrected tip stress, sleeve stress, friction ratio, pore pressure, soil classification based on friction ratio and estimated blow counts. Information provided for the seismic tests include: the recorded compression and shear wave forms, the summary distance versus time of peak graphs for the shear waveforms, and the summary wavespeeds versus depth graphs for the compression and shear waveforms. The computer disks provides the ECP files which contain the plotted data in ASCII format and the seismic velocity files (*.vel).

This data presented on the attached sheets was obtained and interpreted by qualified ARA personnel in accordance with the requirements of SRS Subcontract No. AA82276N and contained in Specification K-SP-G-00005, Rev. 0. Any special data considerations that should be brought to your attention are summarized in table 1.2. All information contained on the data sheets and computer disks shall be considered as final and correct.

Please feel free to call us if you have any questions regarding the enclosed information.

Sincerely,

David A. Timian, P.E.
Principal Engineer

DAT:bef
d:\4569\Task reports\4569_10_ltr_rpt2.doc

Table 1.1 Summary of Cone Penetrometer at the F Area, Task 10.

Test Id.	Filename	Type of Test	Date of Test	Maximum Depth (ft)	Northing (ft)	Easting (ft)	Elevation (ft)	GWT Depth (ft)
CPT-53	404M801.DAT 404M802.DAT	P/S-CPT	3/4/98	149.9	79180.00	54845.00	289.9	66
CPT-103	423F801.DAT 423F802.DAT	P/S-CPT	2/23/98	156.0	79915.18	55260.95	271.7	80
CPT-104	420F802.DAT	P/S-CPT	2/20/98	131.4	79915.04	55385.03	274.2	80
CPT-113	519F801.DAT 519F802.DAT	P/S-CPT	2/19/98	145.7	79781.00	54825.10	276.7	80
CPT-114	519F804.DAT 519F805.DAT	P/S-CPT	2/19/98	145.5	79781.01	54975.05	273.6	80
CPT-115	520F801.DAT	P/S-CPT	2/20/98	144.0	79780.85	55125.05	272.0	80
CPT-116	520F803.DAT	P/S-CPT	2/20/98	132.6	79781.17	55261.01	270.1	80
CPT-126	524F805.DAT 524F806.DAT	P/S-CPT	2/24/98	153.0	79650.07	54825.03	278.9	80
CPT-127	524F802.DAT 524F803.DAT	P/S-CPT	2/24/98	164.7	79650.01	54975.00	279.3	80
CPT-128	523F804.DAT 523F805.DAT	P/S-CPT	2/23/98	147.4	79650.01	55124.95	279.3	80
CPT-129	523F801.DAT 523F802.DAT	P/S-CPT	2/23/98	148.2	79650.00	55261.00	277.2	80
CPT-143	525F804.DAT 525F805.DAT	P/S-CPT	2/25/98	156.1	79442.50	55195.00	286.1	80
CPT-147	424F801.DAT 424F802.DAT	P/S-CPT	2/24/98	157.5	79372.00	55261.00	284.8	61
CPT-148	427F801.DAT 427F802.DAT	P/S-CPT	2/27/98	157.5	79372.07	55385.00	284.1	80
CPT-149	404M804.DAT 405M803.DAT	P/S-CPT	3/4/98	143.3	79372.04	55517.96	274.8	80
CPT-151	424F804b.DAT 424F805b.DAT	P/S-CPT	2/24/98	156.1	79305.00	55195.00	290.1	80
CPT-155	518F801.DAT 518F802.DAT	P/S-CPT	2/18/98	162.0	79245.00	55261.00	289.1	80
CPT-156	518F804.DAT 518F805.DAT	P/S-CPT	2/18/98	161.0	79244.97	55384.98	289.2	80
CPT-157	405M804.DAT 405M805.DAT	P/S-CPT	3/5/98	152.4	79244.98	55517.98	283.1	80
CPT-159	417F801.DAT 417F802.DAT	P/S-CPT	2/17/98	164.8	79171.10	55195.00	293.7	80
CPT-163	525F801.DAT 525F802.DAT	P/S-CPT	2/25/98	165.0	79095.10	55261.00	293.9	80
CPT-167	411M801b.DAT	P/S-CPT	3/11/98	116.0	79029.91	55330.05	196.7	80
CPT-171	419M804.DAT 419M805.DAT	P/S-CPT	3/19/98	132.6	78900.00	55385.00	298.5	80
CPT-172	325M801.DAT 325M802.DAT	P/S-CPT	3/25/98	162.5	78900.00	55518.00	295.4	80

Table 1.1 Summary of Cone Penetrometer at the F Area, Task 10.

Test Id.	Filename	Type of Test	Date of Test	Maximum Depth (ft)	Northing (ft)	Easting (ft)	Elevation (ft)	GWT Depth (ft)
CPT-173	327M804.DAT 327M805.DAT	P/S-CPT	3/27/98	150.3	78900.00	55650.00	297.6	80
CPT-174	410M804b.DAT 410M805b.DAT	P/S-CPT	3/10/98	171.5	78770.00	55330.00	301.5	80
CPT-175	320M801.DAT 320M802.DAT	P/S-CPT	3/20/98	167.0	78770.00	55451.00	303.1	80
CPT-176	326M805.DAT 326M806.DAT	P/S-CPT	3/26/98	146.8	78770.00	55583.00	297.6	80
CPT-177	327M801.DAT 327M802.DAT	P/S-CPT	3/27/98	132.6	78770.00	55715.00	301.7	80
CPT-178	419M801.DAT 419M802.DAT	P/S-CPT	3/19/98	168.5	78640.00	55385.00	305.6	80
CPT-179	324M804.DAT 324M805.DAT	P/S-CPT	3/24/98	124.4	78640.00	55518.00	301.4	80
CPT-180	326M802.DAT 326M803.DAT	P/S-CPT	3/26/98	120.1	78640.00	55650.00	302.3	80
CPT-181	410M801.DAT 410M802.DAT	P/S-CPT	3/10/98	138.7	78510.00	55330.00	304.9	80
CPT-182	323M801.DAT 323M802.DAT	P/S-CPT	3/23/98	140.1	78510.00	55451.00	304.8	80
CPT-183	325M804.DAT 325M805.DAT	P/S-CPT	3/25/98	115.0	78510.00	55583.00	301.7	80
CPT-185	418M807.DAT 418M808.DAT	P/S-CPT	3/18/98	136.8	78380.00	55385.00	223.7	80
CPT-186	324M801.DAT 324M802.DAT	P/S-CPT	3/24/98	155.0	78380.00	55518.00	304.5	80
CPT-188	409M801.DAT 409M802.DAT	P/S-CPT	3/9/98	142.0	78250.00	55330.00	310.4	66
CPT-189	323M804.DAT 323M805.DAT	P/S-CPT	3/23/98	134.2	78250.00	55451.00	309.2	80
CPT-196	314A801.DAT 314A802.DAT	P/S-CPT	4/14/98	122.1	79330.00	55135.00	290.1	66

Table 1.2 Special Analysis Considerations

Task 10 –
Addendum to Cover Letter
Special Analysis Considerations

Test Id.	Date	Special Analysis Considerations
CPT-53	3/4/98	The compression wave trace of this particular test displays shear wave noise. The compression wave "time of arrival" was chosen for analysis rather than the "time of peak".
CPT-103	2/23/98	Shear wave traces not reported due to broken source hammer. Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-24.4 ft (distance). Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-104	2/20/98	One of the two opposing shear wave traces was omitted from the analysis. The source hammer was partially broken on one side causing unreliable data gathered on one of the traces. Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale.
CPT-113	2/19/98	Compression wave time histories contain background noise that could not be filtered. Note that the background noise has no effect on the resultant wavespeed.
CPT-114	2/19/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 110.3-113.2 ft (distance). Compression wave time histories contain background noise that could not be filtered. Note that the background noise has no effect on the resultant wavespeed.
CPT-115	2/20/98	Compression wave time histories contain background noise that could not be filtered. Note that the background noise has no effect on the resultant wavespeed.
CPT-116	2/20/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 65.4-68.4 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-24.1 ft (distance).
CPT-126	2/24/98	Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-127	2/24/98	Compression wave time histories contain background noise that could not be filtered. Note that the background noise has no effect on the resultant wavespeed.
CPT-128	2/23/98	Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-21.2 ft (distance).
CPT-129	2/23/98	Due to the evolution of the compression wave form, the time of peak selection was changed between 15.5-19.3 ft (distance).
CPT-143	2/25/98	Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-147	2/24/98	Shear wave traces not reported due to broken source hammer. Due to the evolution of the compression wave form, the time of peak selection was changed between 21.2-24.0 ft (distance).

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Test Id.	Date	Special Analysis Considerations
CPT-148	2/27/98	<p>Due to the evolution of the shear wave form, the time of peak selection was changed between 35.6-38.6 ft (distance).</p> <p>Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-21.1 ft (distance).</p> <p>Only one shear trace was saved at 41.5 ft (distance).</p>
CPT-149	3/4/98 3/5/98 3/30/98	<p>Due to the evolution of the shear wave form, the time of peak selection was changed between 77.4-80.4 ft (distance).</p> <p>Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.</p> <p>The shear traces and profile were recorded on two separate dates, combining the files at 77.4/80.4.</p> <p>The compression test was re-pushed on a later date.</p>
CPT-151	2/24/98	<p>Shear wave traces not reported due to broken source hammer.</p> <p>Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-21.2, 27.0-29.9 ft (distance).</p>
CPT-155	2/18/98	<p>Missing 2-3 sets of shear wave seismic traces due to full computer memory. (131-137 ft, distance)</p> <p>Only one shear trace was saved at 113.4 ft (distance).</p>
CPT-156	2/18/98	<p>Due to the evolution of the compression wave form, the time of peak selection was changed between 21.2-24.1 ft (distance).</p>
CPT-157	3/5/98	<p>Due to the evolution of the shear wave form, the time of peak selection was changed between 26.6-29.6, 68.6-71.7, 128.4-131.4 ft (distance).</p> <p>Only one shear trace was saved at 80.4, 146.4 ft (distance).</p> <p>A portion of the compression wave at 10.3 ft (distance) exhibits the recorded signal exceeding its maximum. The analysis is not effected.</p>
CPT-159	2/17/98	<p>Due to the evolution of the shear wave form, the time of peak selection was changed between 68.4-74.4 ft (distance).</p> <p>Due to the evolution of the compression wave form, the time of peak selection was changed between 24.1-27.0 ft (distance).</p> <p>One of the two shear wave traces was omitted at the following distances : 14.9 - 23.7, 56.5, 74.4, 158.3, 164.1 ft. Symptoms of a partially broken source hammer were evident on the traces that were omitted.</p>
CPT-163	2/25/98	<p>Due to the evolution of the compression wave form, the time of peak selection was changed between 15.5-18.3 ft (distance).</p> <p>Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.</p>
CPT-167	3/11/98	
CPT-171	3/19/98	<p>Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale.</p>

Table 1.2 Special Analysis Considerations

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Test Id.	Date	Special Analysis Considerations
CPT-172	3/25/98	Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Only one shear trace was saved at 110.4, 140.4 ft (distance).
CPT-173	3/27/98	Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale. Due to the evolution of the compression wave form, the time of peak selection was changed between 33.1-39.1 ft (distance).
CPT-174	3/10/98	Due to the evolution of the wave form, the shear wave time of peak selection was changed between 83.5-86.4, 140.4-143.4 ft (distance). Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Due to the evolution of the compression wave form, the time of peak selection was changed between 15.9-18.7 ft (distance).
CPT-175	3/20/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 143.3-146.4, 149.4-152.4 ft (distance). Due to the evolution of the wave form, the compression wave time of peak selection was changed between 18.7-21.6 ft (distance).
CPT-176	3/26/98	Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-177	3/27/98	Due to the evolution of the compression wave form, the time of peak selection was changed between 18.8-21.5 ft (distance).
CPT-178	3/19/98	Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-179	3/24/98	Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Due to the evolution of the shear wave form, the time of peak selection was changed between 110.4-113.4 ft (distance).
CPT-180	3/26/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 74.5-80.5 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 16.0-18.8 ft (distance).
CPT-181	3/10/98	The compression wave trace of this particular test displays shear wave noise. The compression wave "time of arrival" was chosen for analysis rather than the "time of peak".
CPT-182	3/23/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 80.4-83.4, 107.4-110.4 ft (distance). Only one shear trace was saved at 128.4 ft. (distance). Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.

Table 1.2 Special Analysis Considerations

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Test Id.	Date	Special Analysis Considerations
CPT-183	3/25/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 104.7-107.4 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 18.8-21.5 ft (distance).
CPT-185	3/18/98	Only one shear trace was saved at 23.8, 122.5, 131.4 ft (distance). Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-186	3/24/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 116.4-119.4, 128.4-131.4 ft (distance). Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Only one shear trace was saved at 140.4 ft. (distance).
CPT-188	3/9/98 3/26/98	The compression test was re-pushed on a later date.
CPT-189	3/23/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 50.4-53.5, 65.5-68.5 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 16.0-18.7 ft (distance).
CPT-196	4/14/98	Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale.

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CPT-53

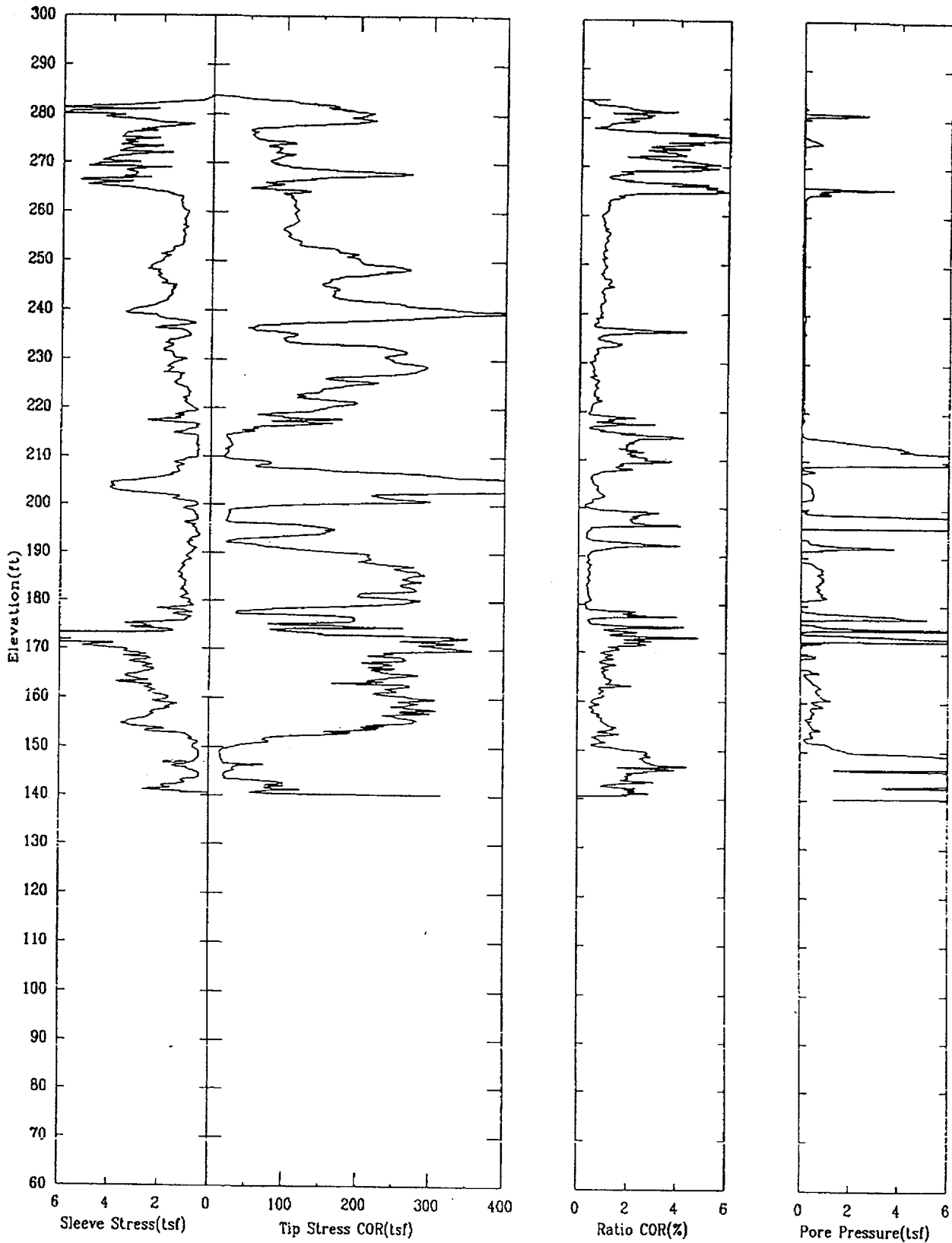
APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

North 79180.0

East 54845.0

Elevation 289.9



CPT-53

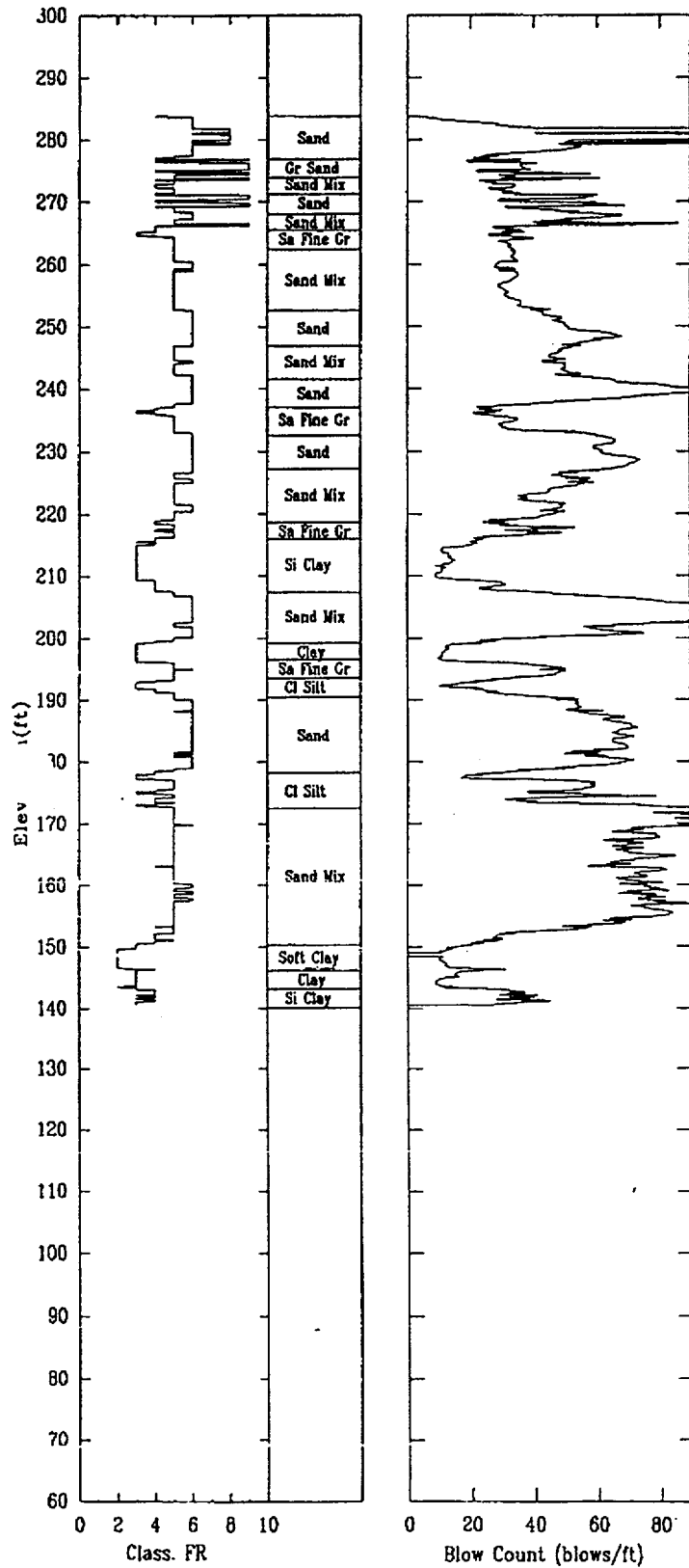
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03/04/98

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East 54845.0

Elevation 289.9

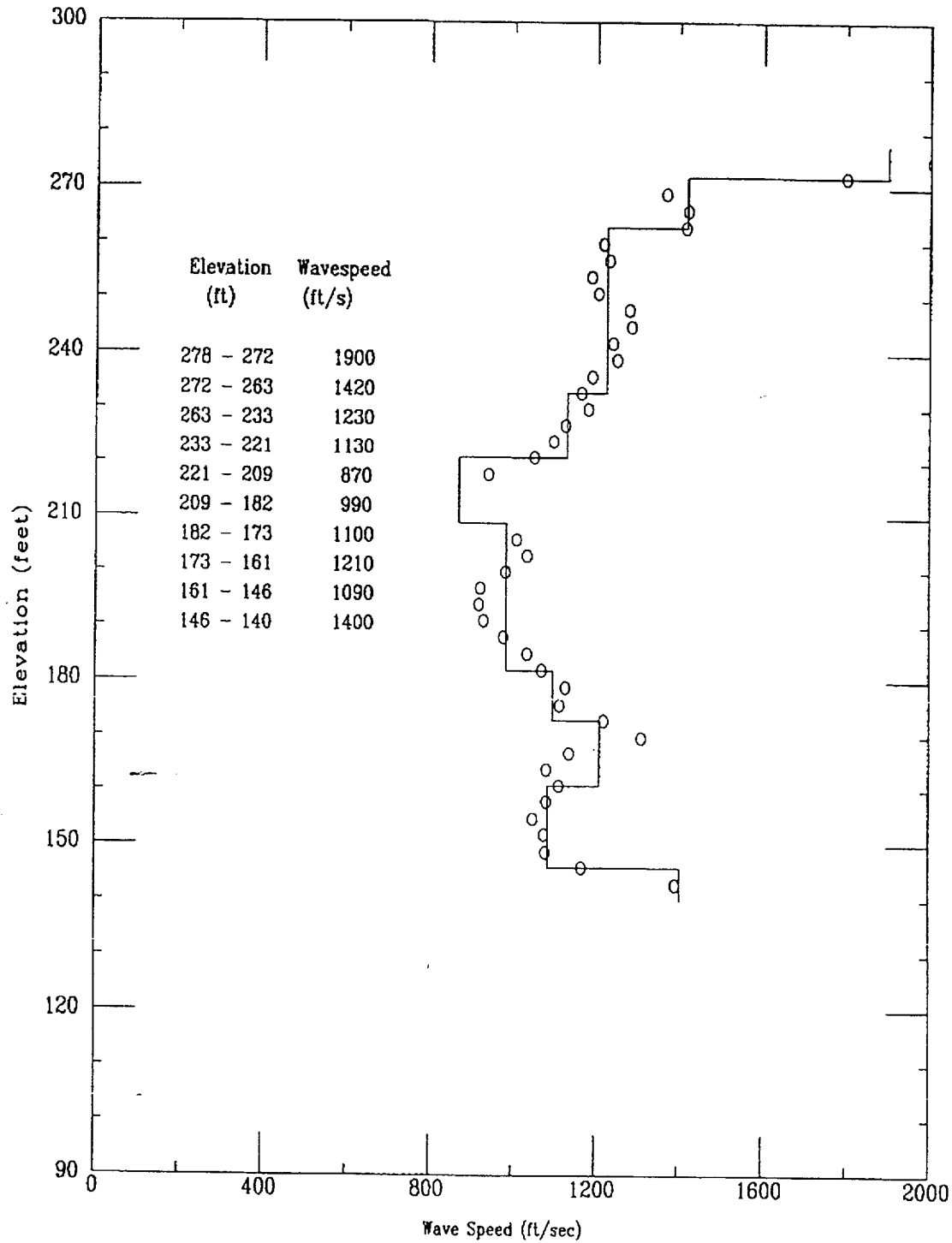


CPT-53

APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

Shear Wave Speeds



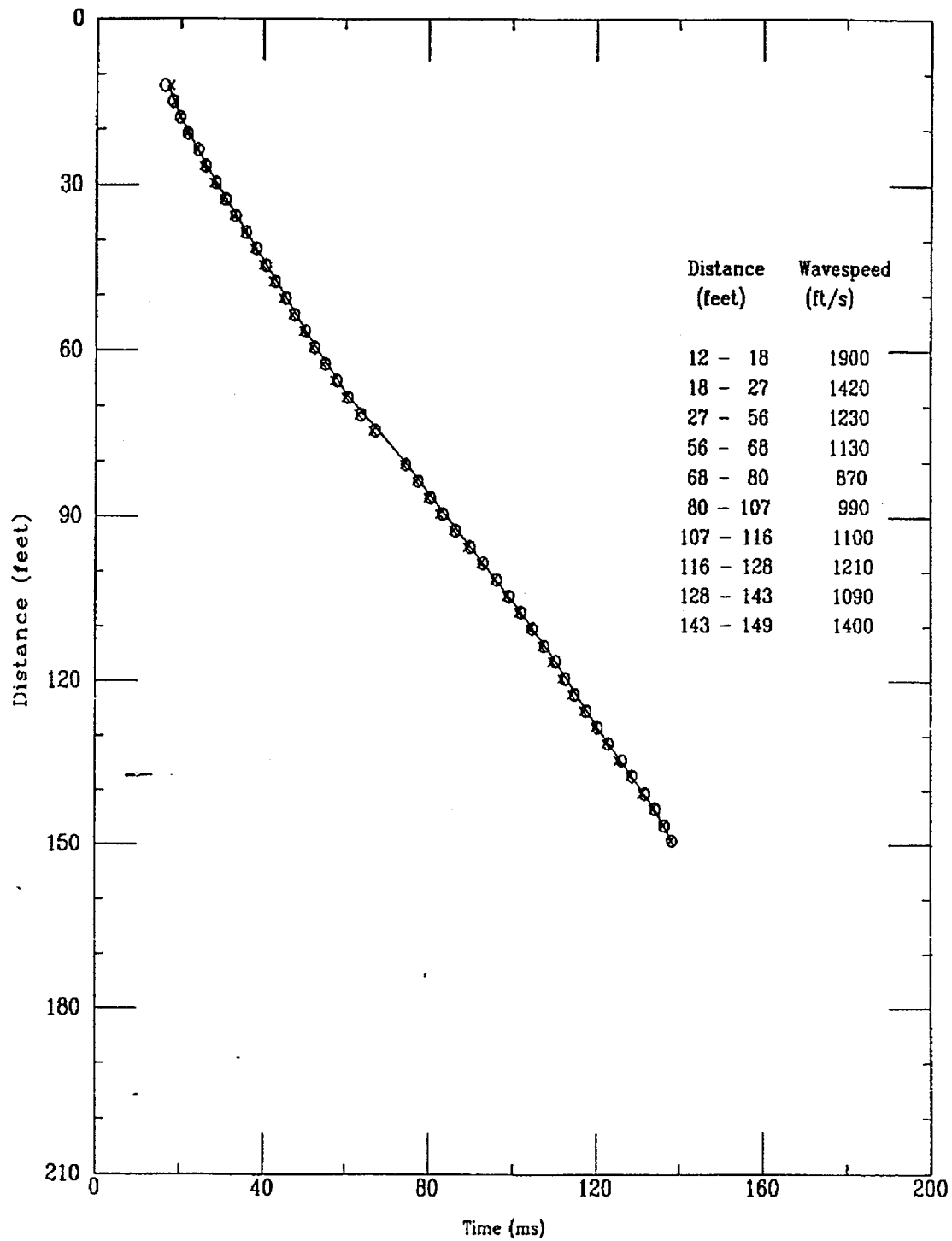
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CPT-53

APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

Shear Wave Time of Peak

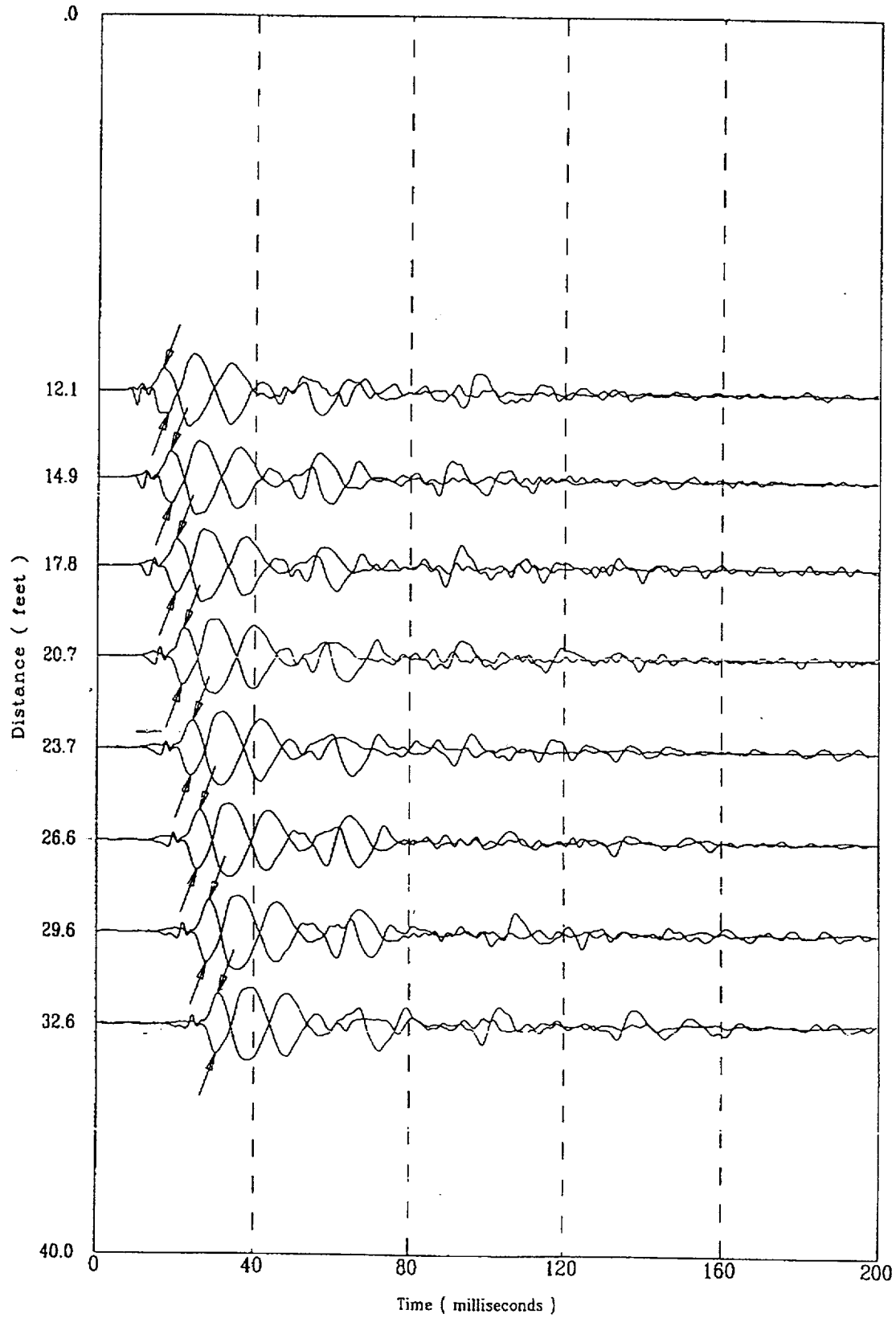


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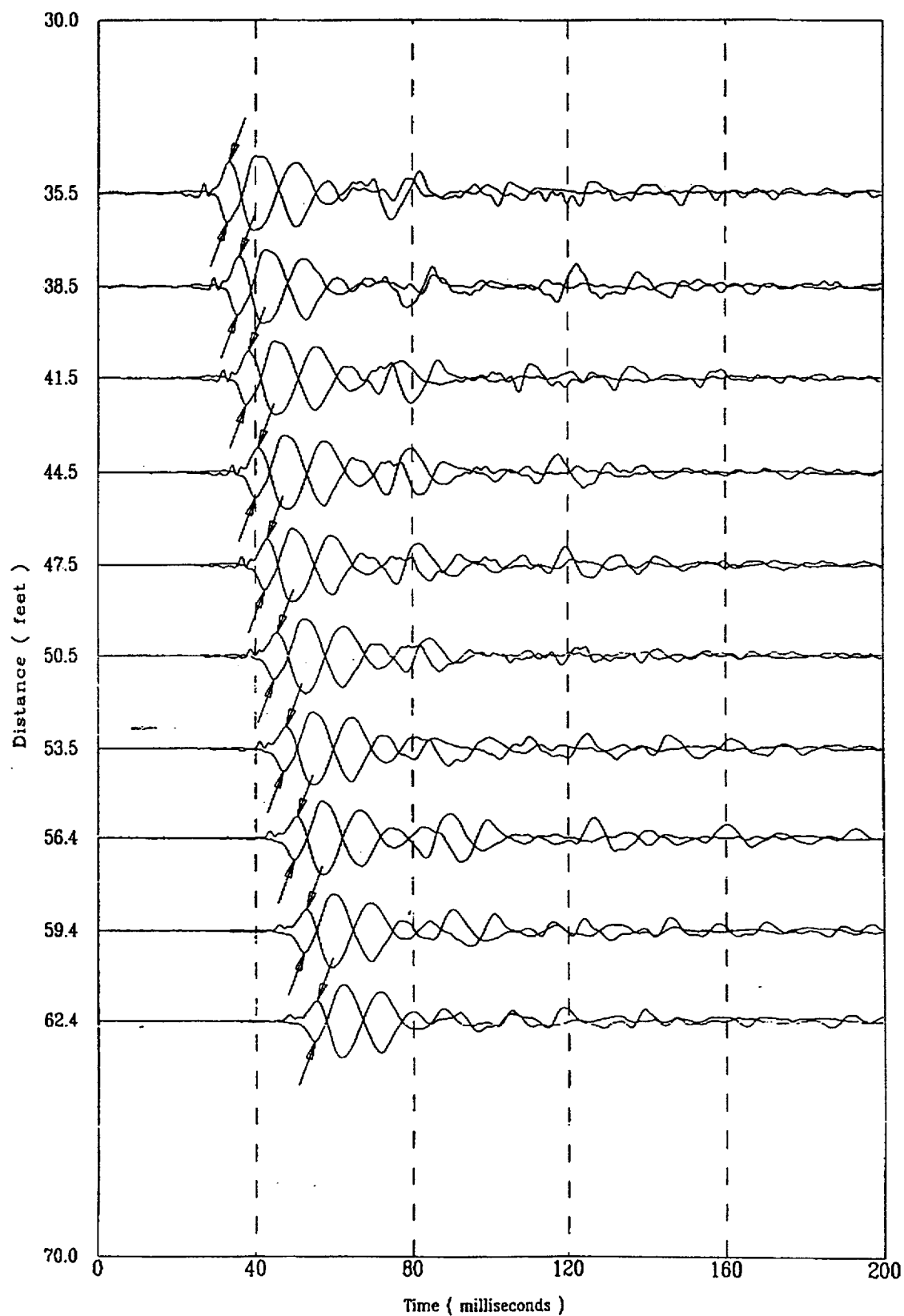
Applied Research Associates, Inc.
CPT-53

S Wave
03/04/98



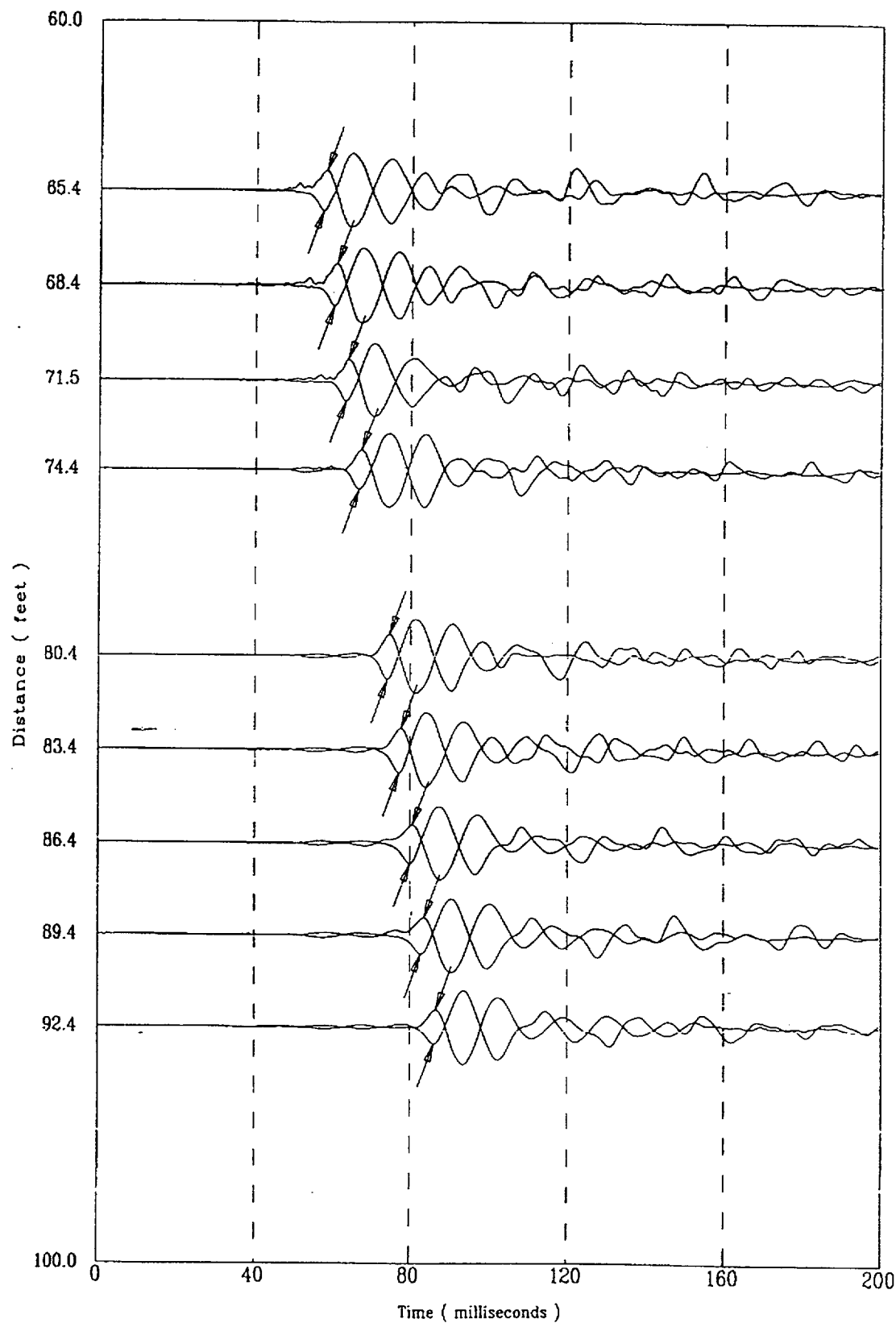
Applied Research Associates, Inc.
CPT-53

S Wave
03/04/98



Applied Research Associates, Inc.
CPT-53

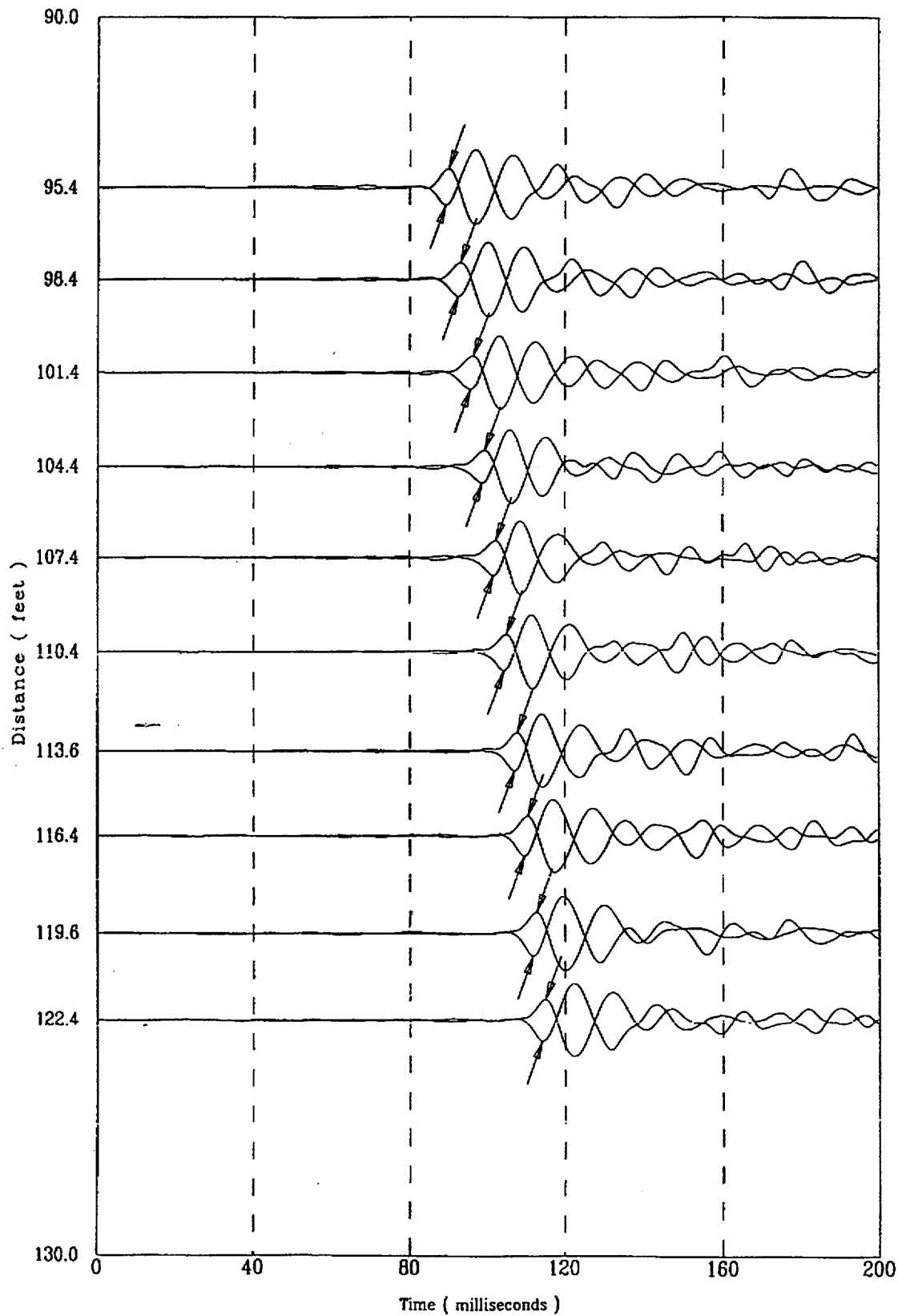
S Wave
03/04/98



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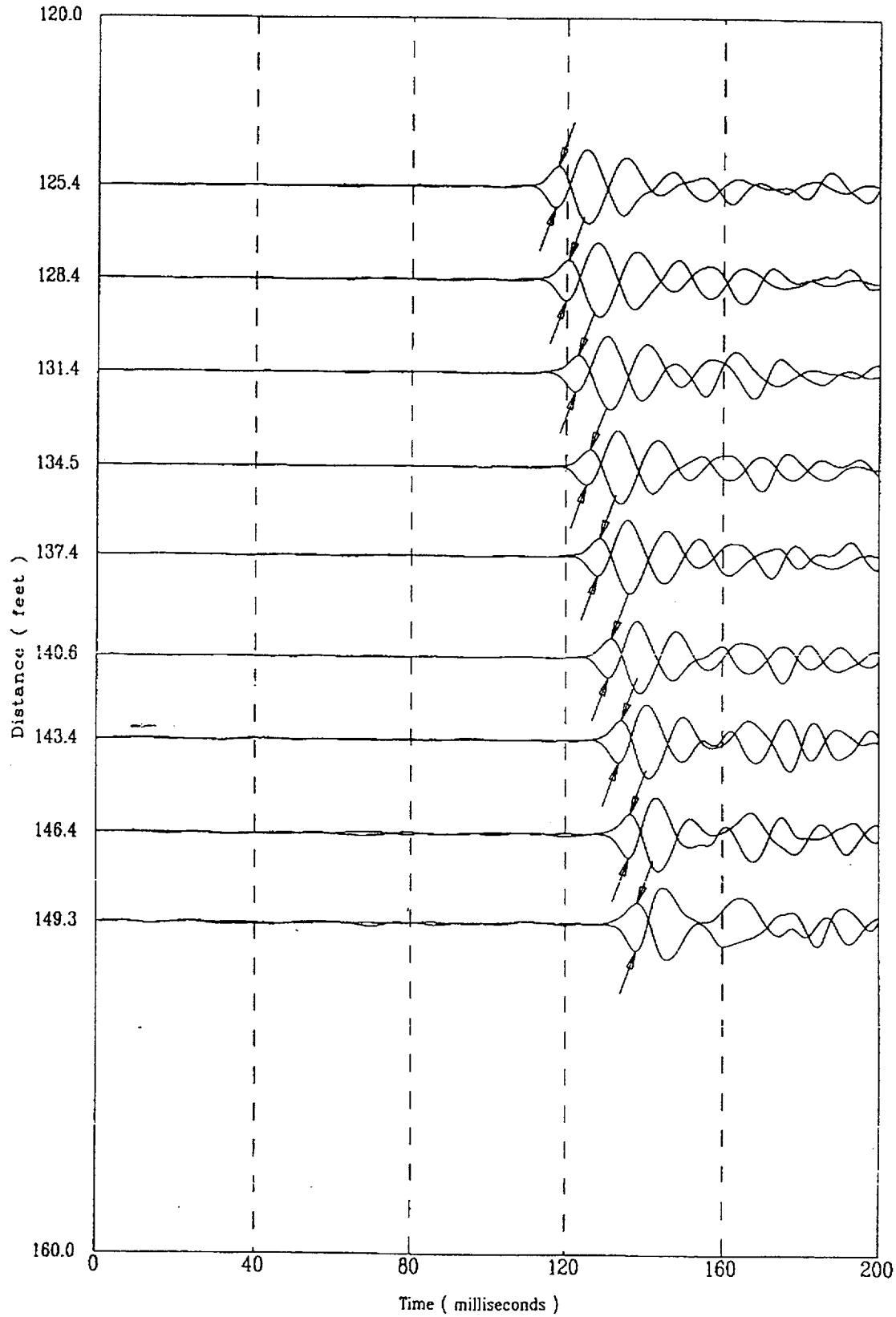
Applied Research Associates, Inc.
CPT-53

S Wave
03/04/98

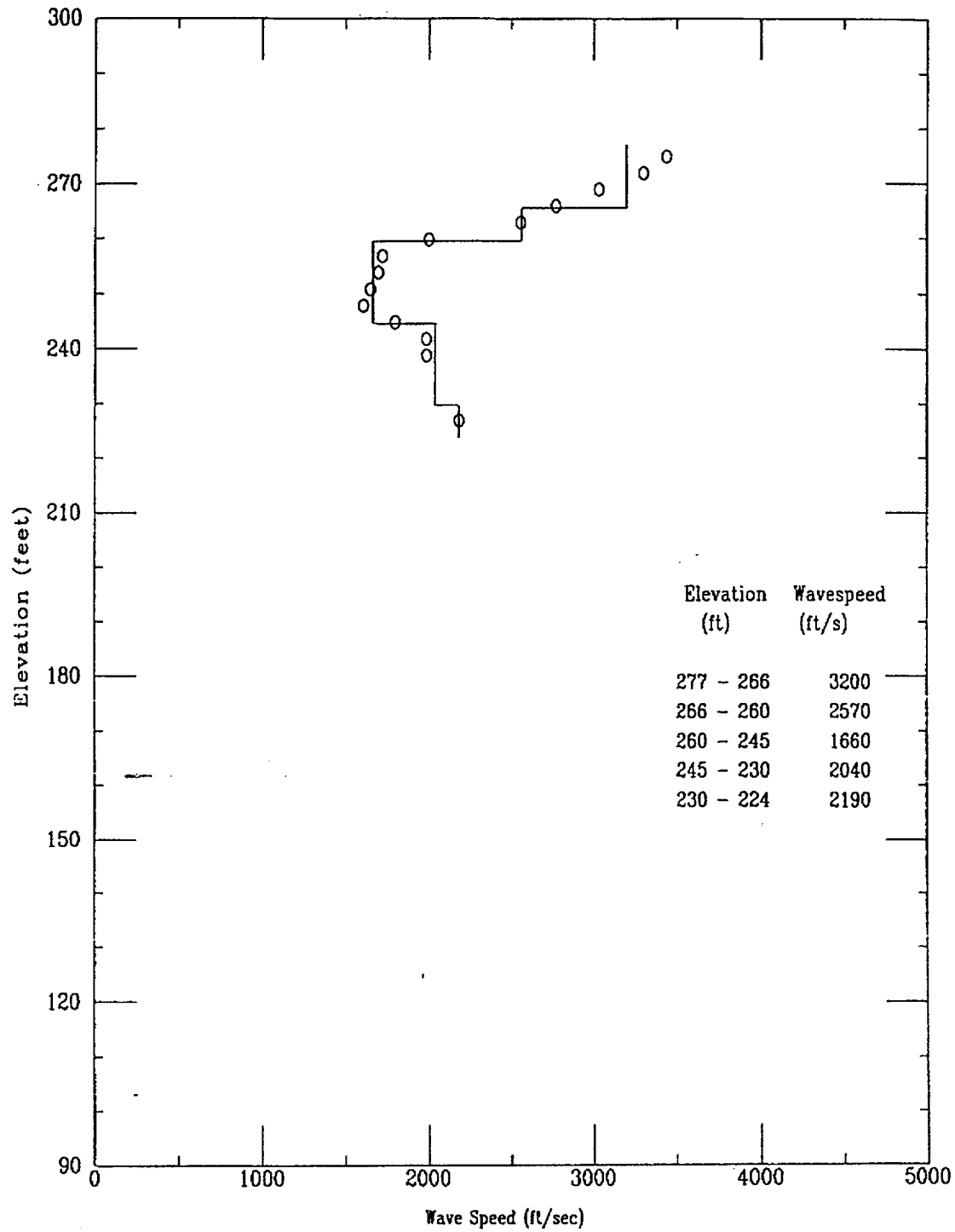


Applied Research Associates, Inc.
CPT-53

S Wave
03/04/98



Compression Wave Speeds

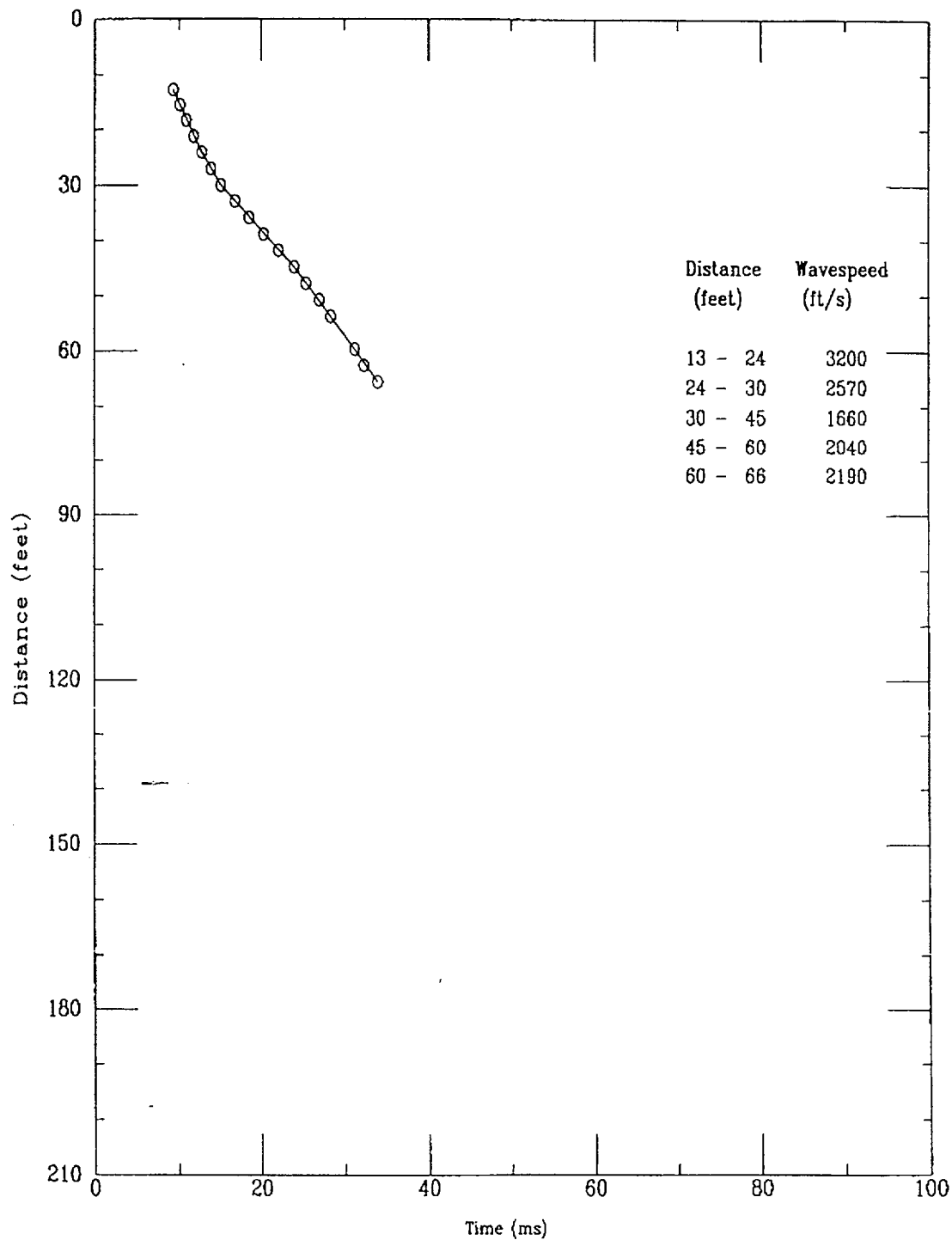


CPT-53

APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

Compression Wave Time of Peak



File 404m801S

CPT-103

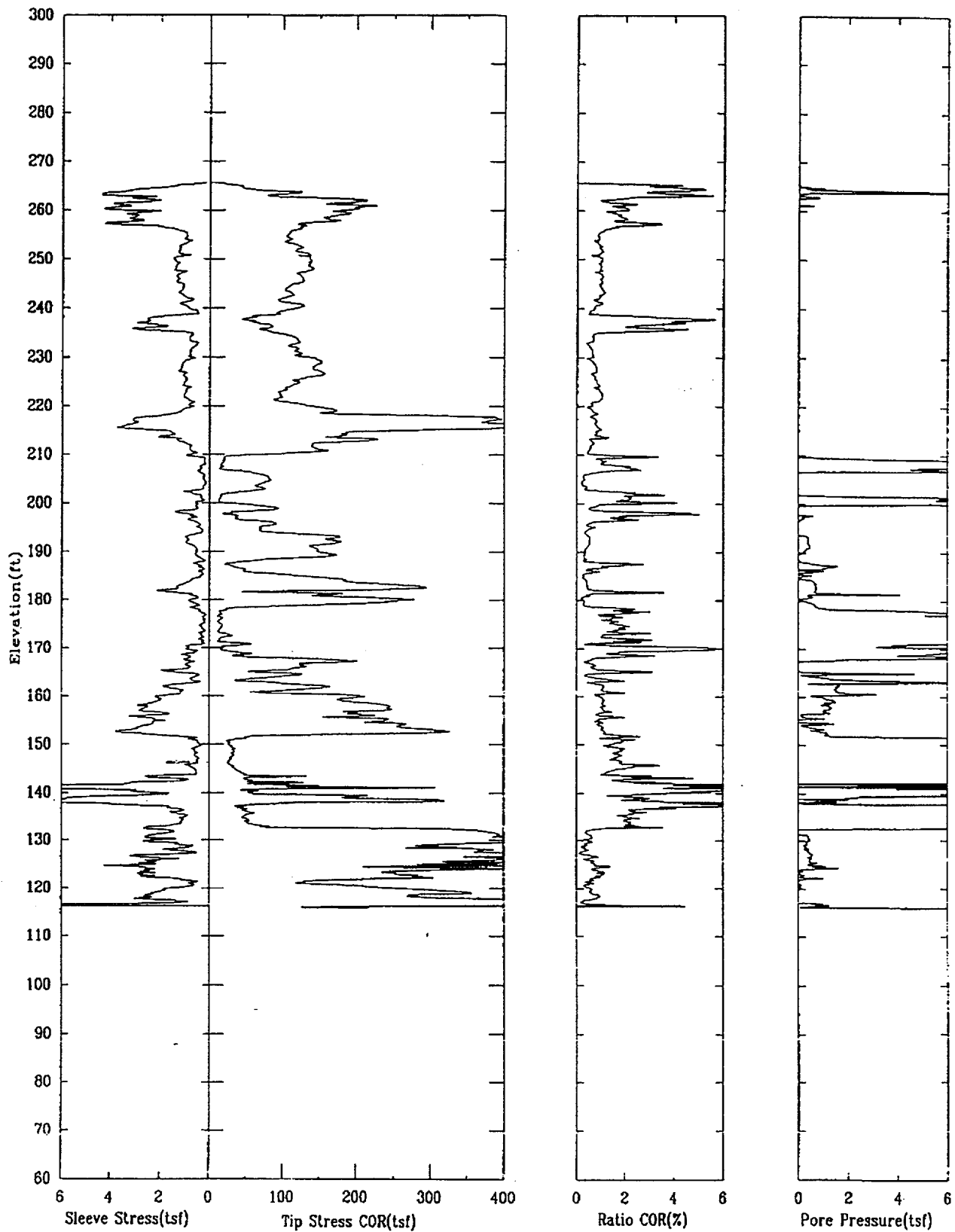
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02/23/98

North 79915.18

East 55260.95

Elevation 271.7



CPT-103

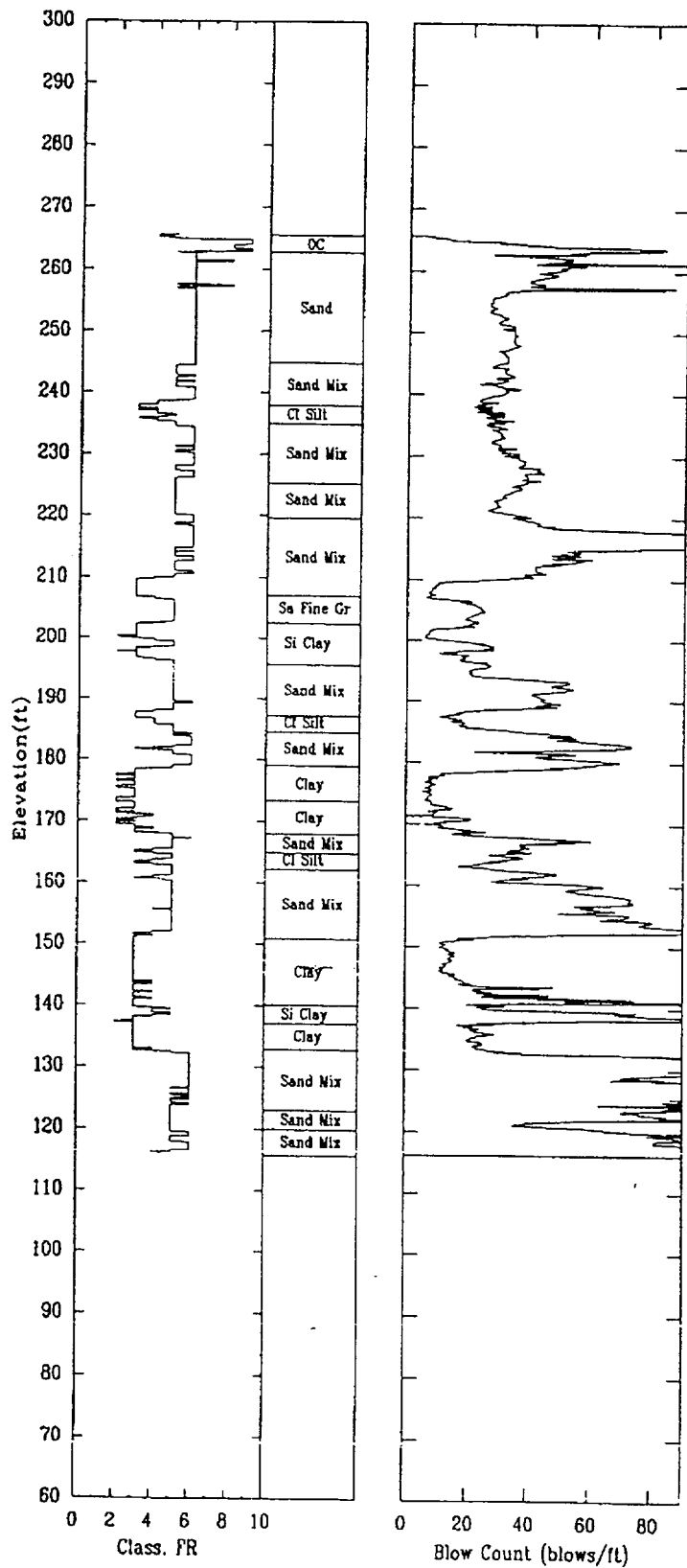
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02/23/98

North 79915.18

East 55260.95

Elevation 271.7

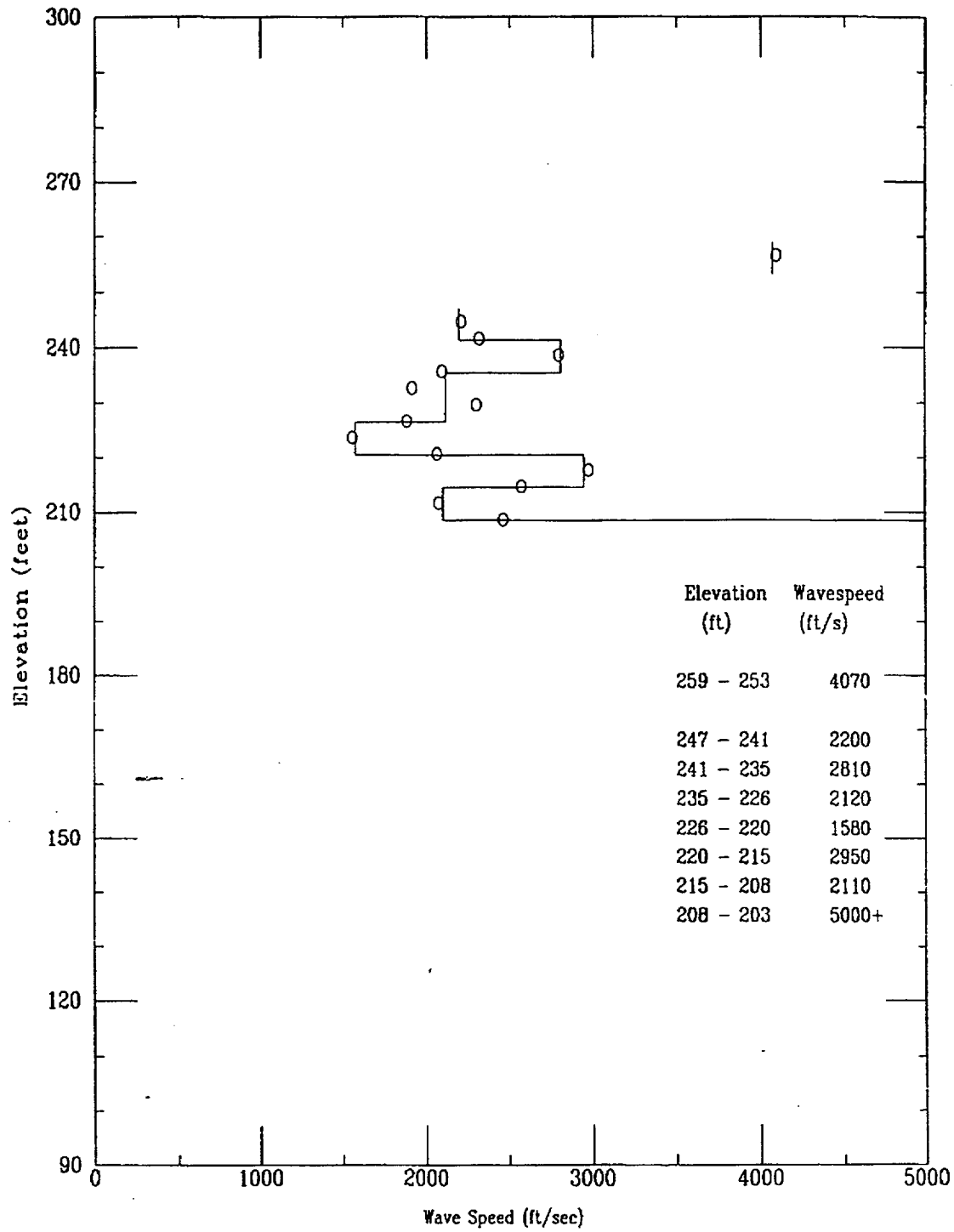


cpt-103

APPLIED RESEARCH ASSOCIATES, INC.

02/23/98

Compression Wave Speeds

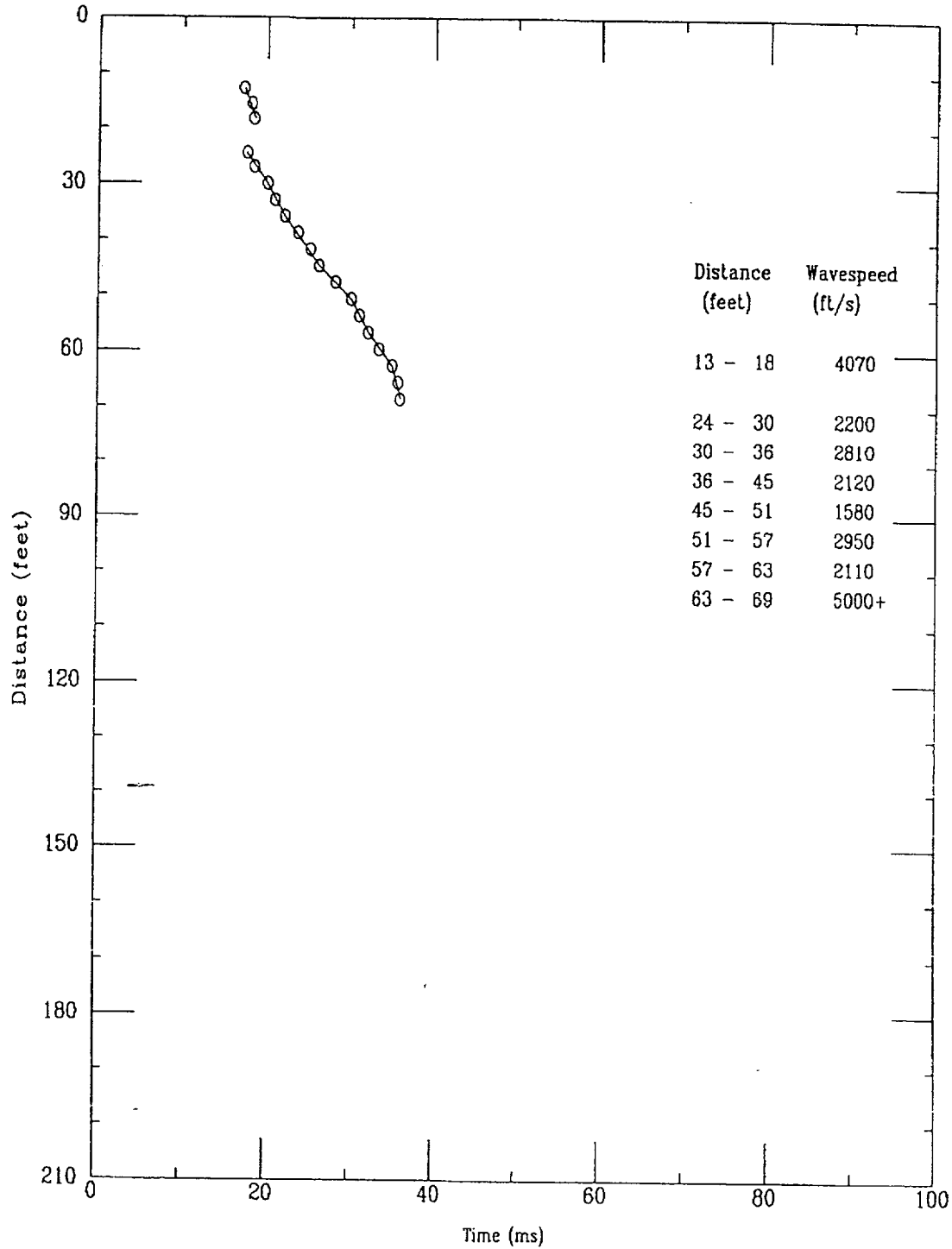


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cpt-103

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Compression Wave Time of Peak

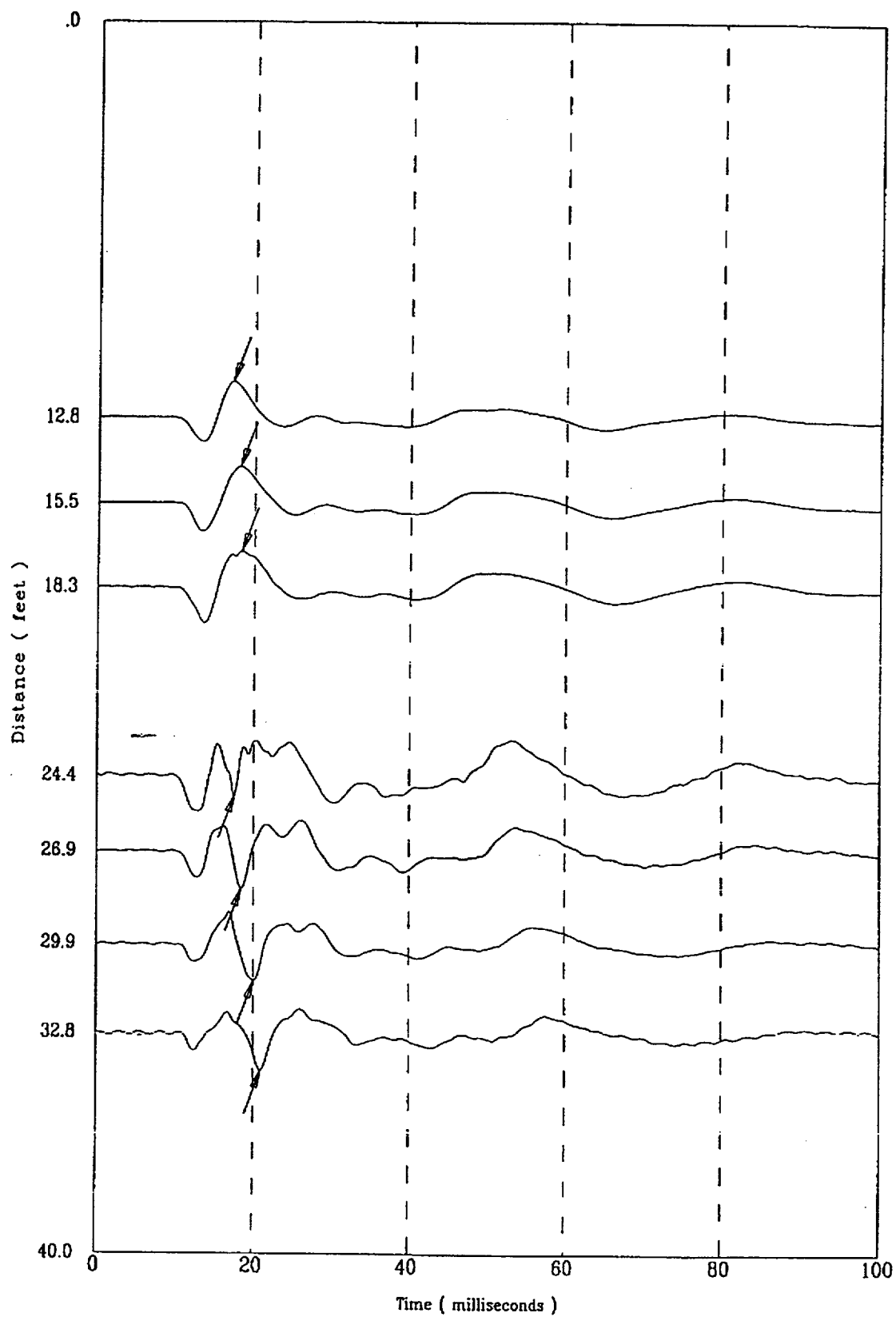
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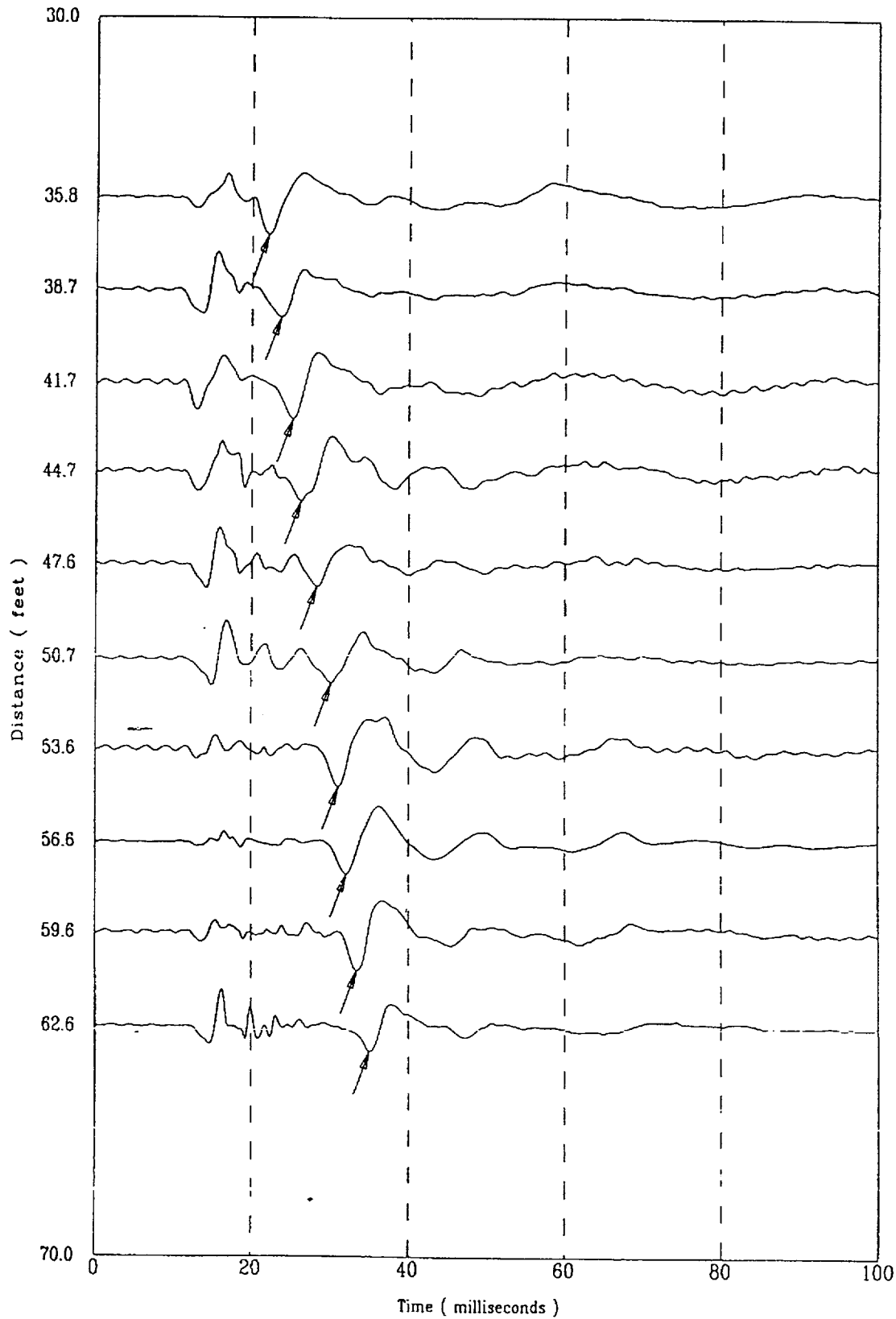
Applied Research Associates, Inc.
CPT-103

P Wave
02/23/98



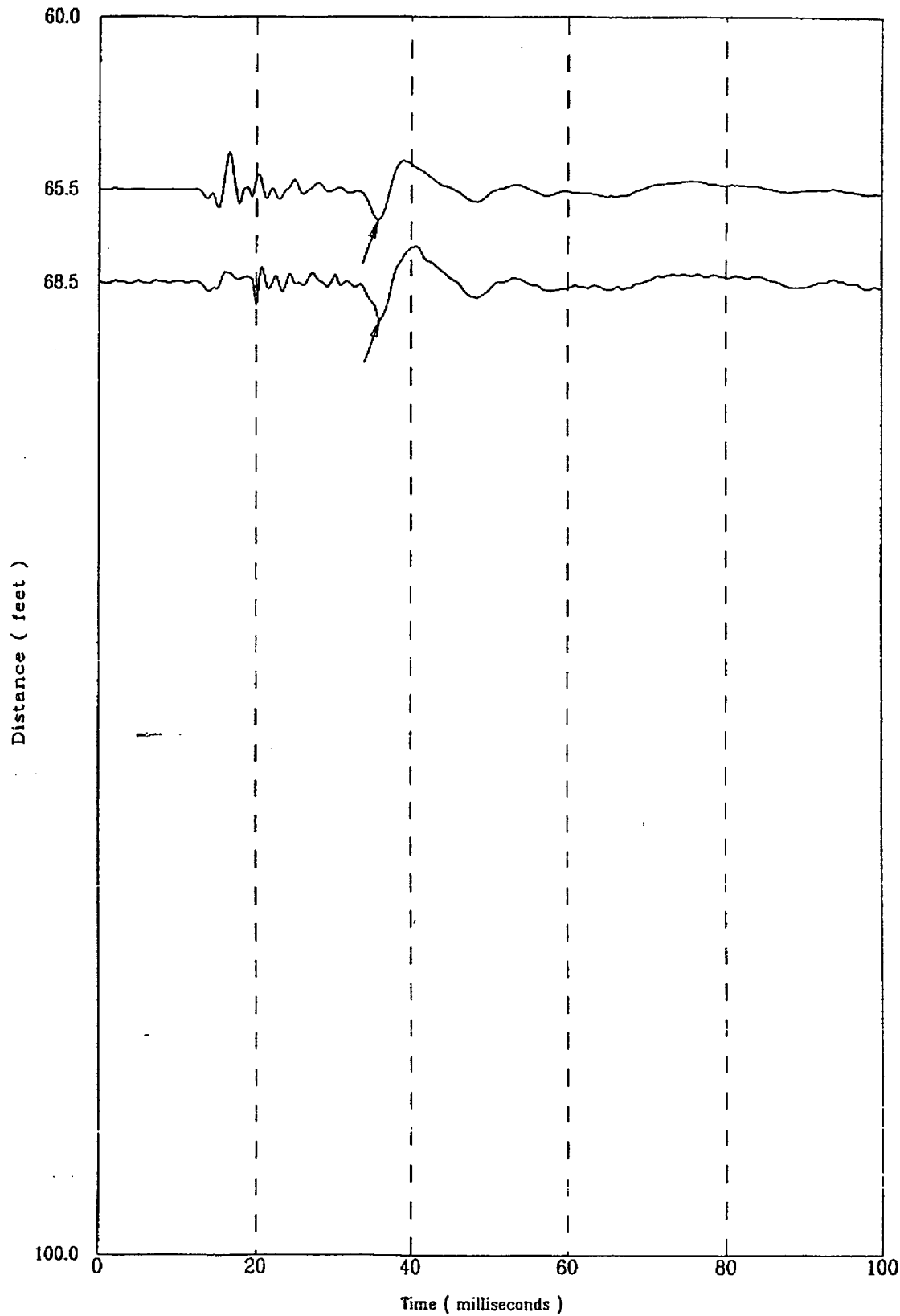
Applied Research Associates, Inc.
CPT-103

P Wave
02/23/98



Applied Research Associates, Inc.
CPT-103

P Wave
02/23/98



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CPT-104

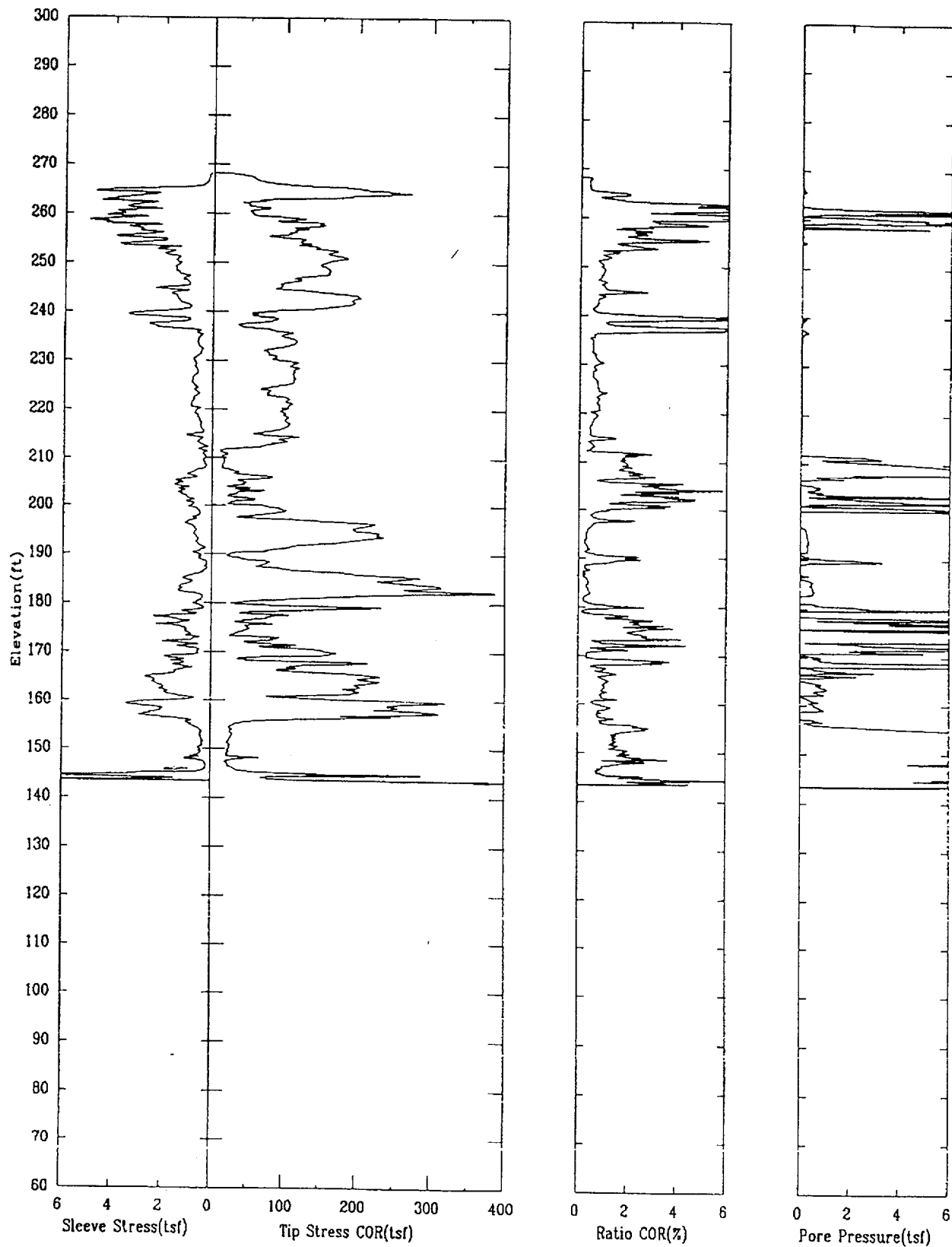
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02/20/98

North 79915.04

East 55385.03

Elevation 274.2



CPT-104

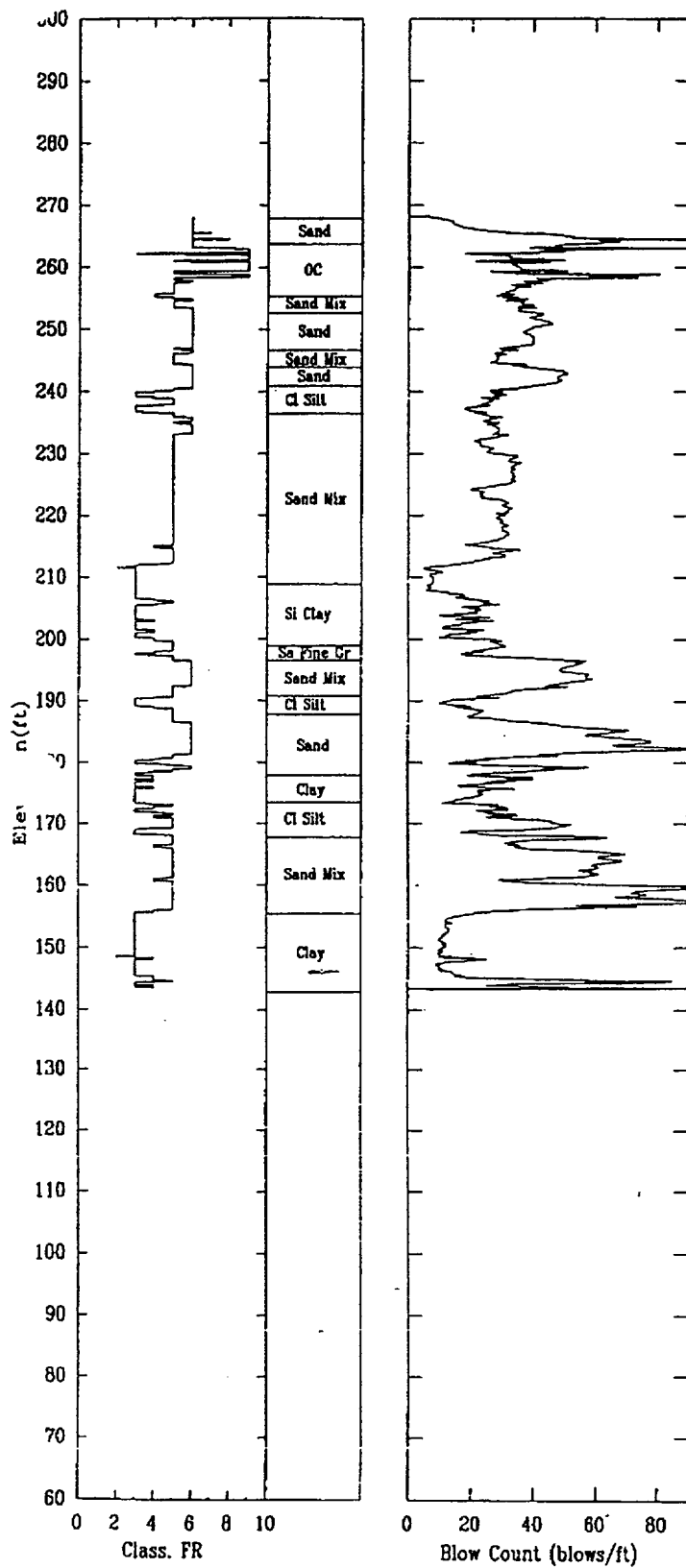
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02/20/98

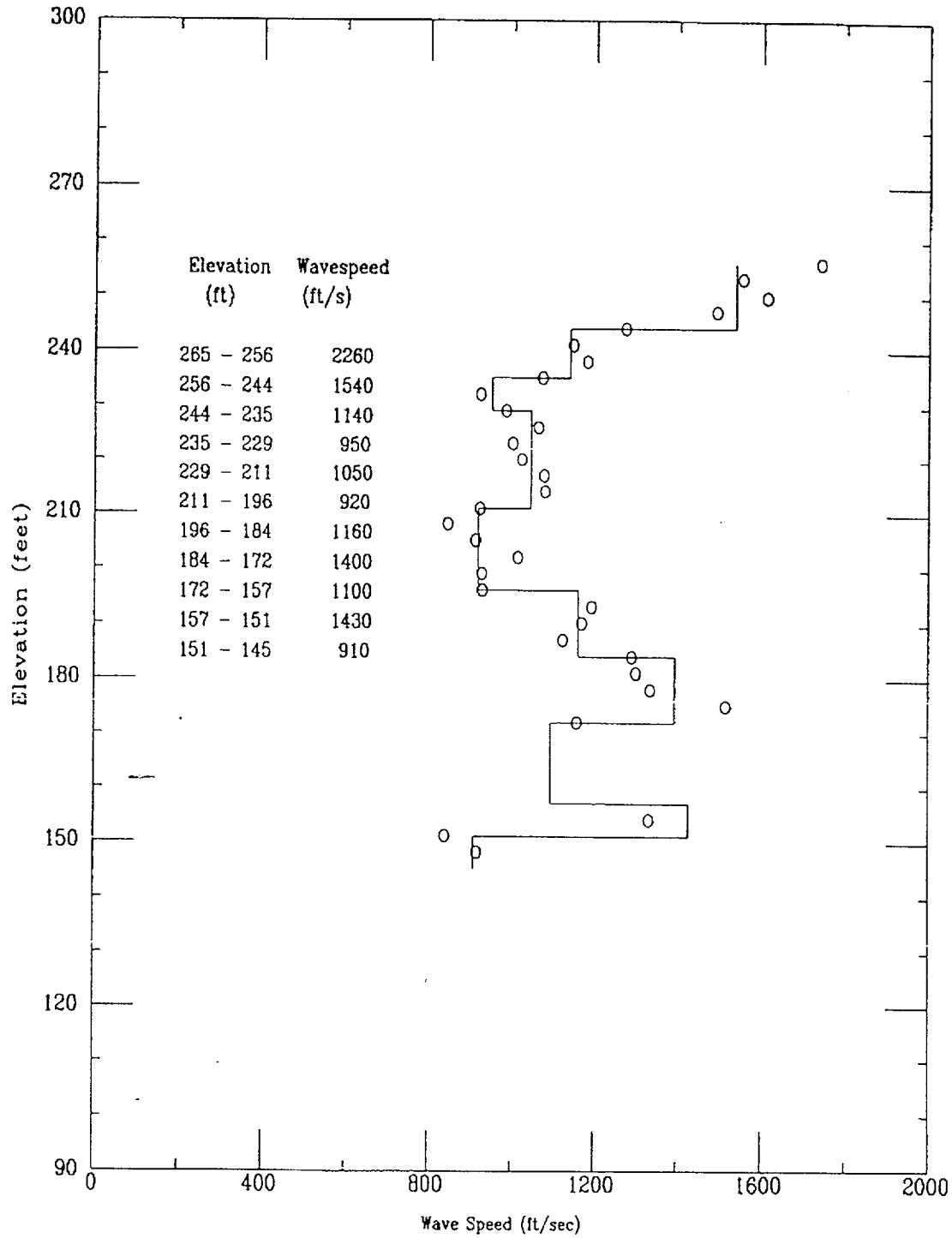
North 79915.04

East 55385.03

Elevation 274.2



Shear Wave Speeds

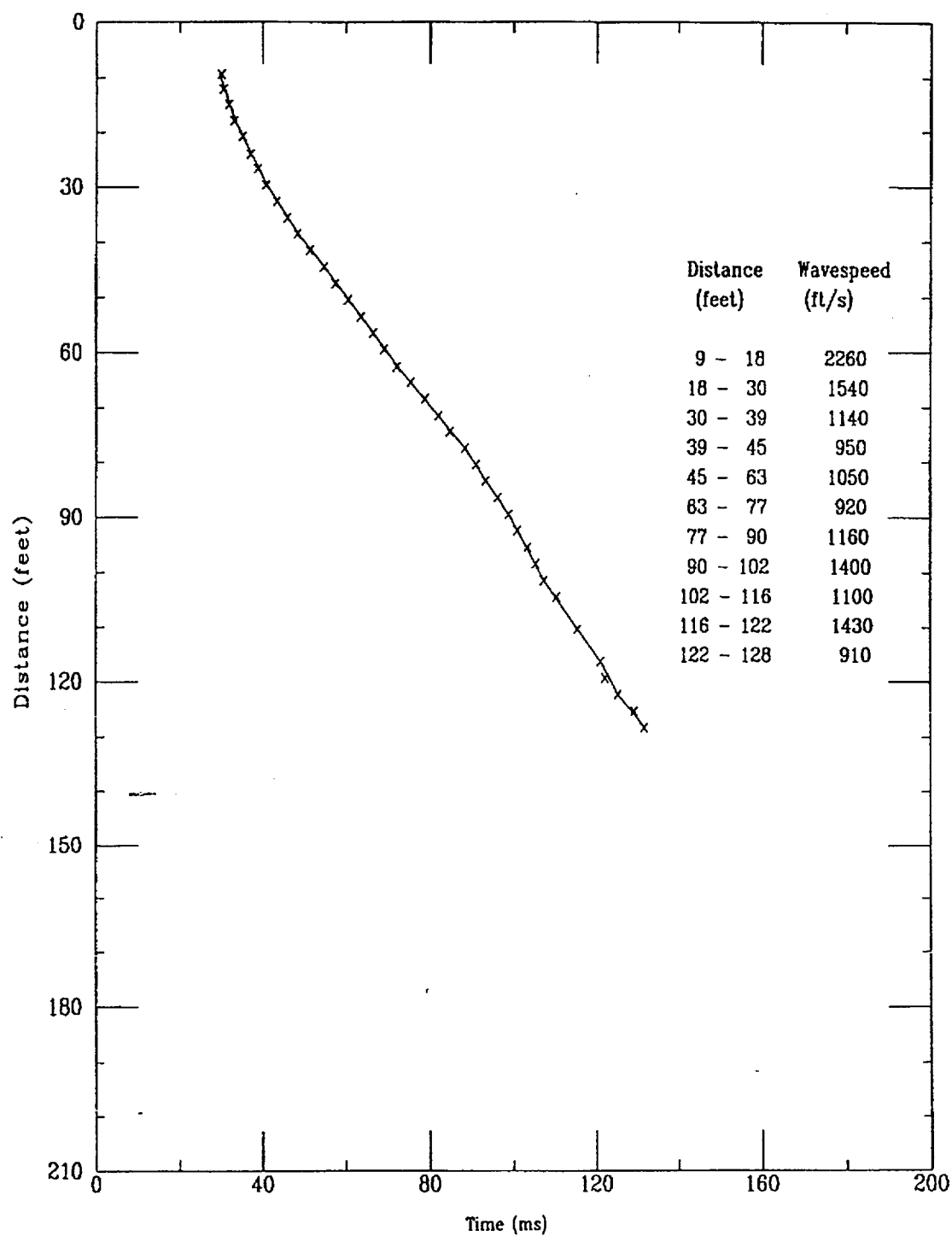


CPT-104

APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

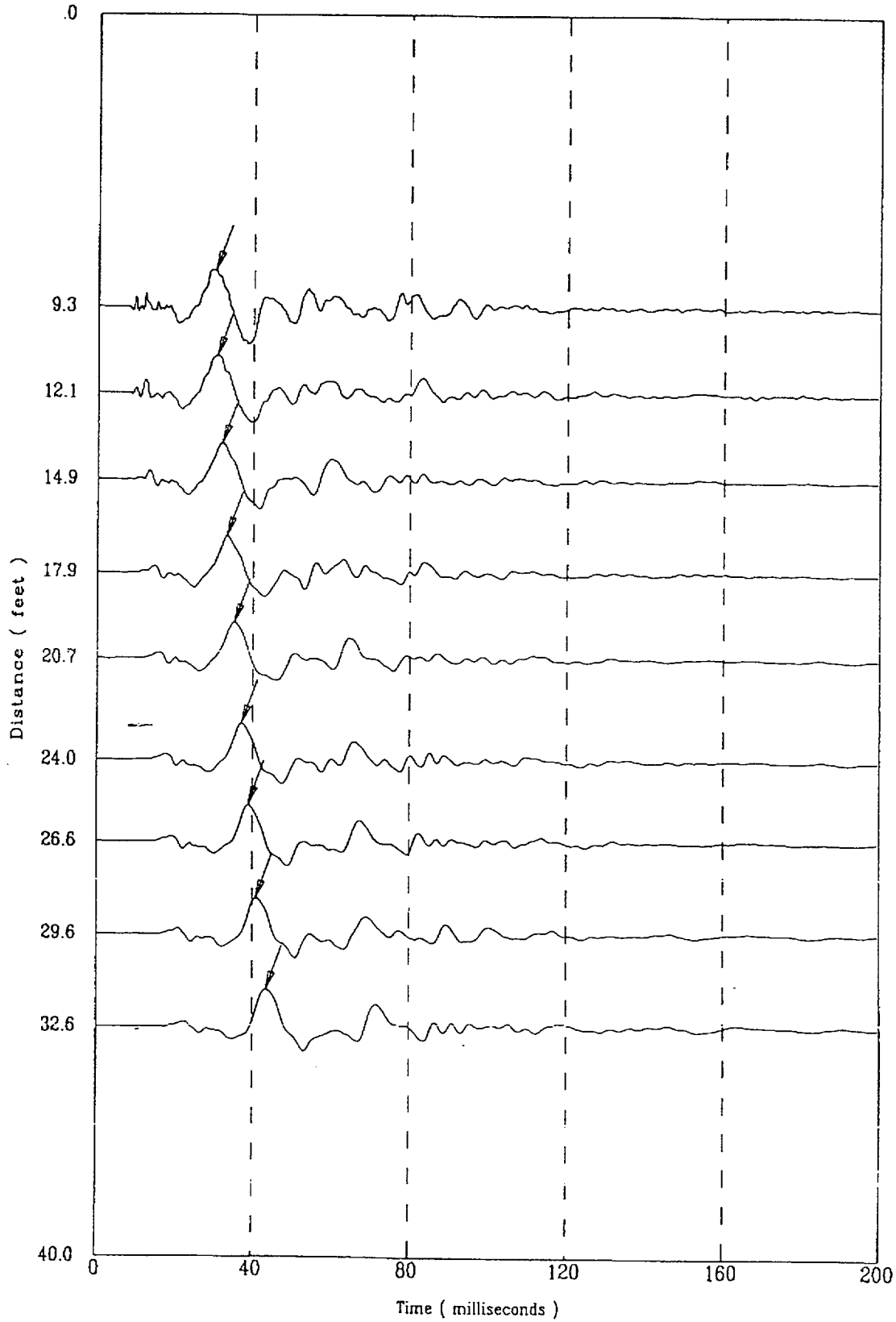
Shear Wave Time of Peak

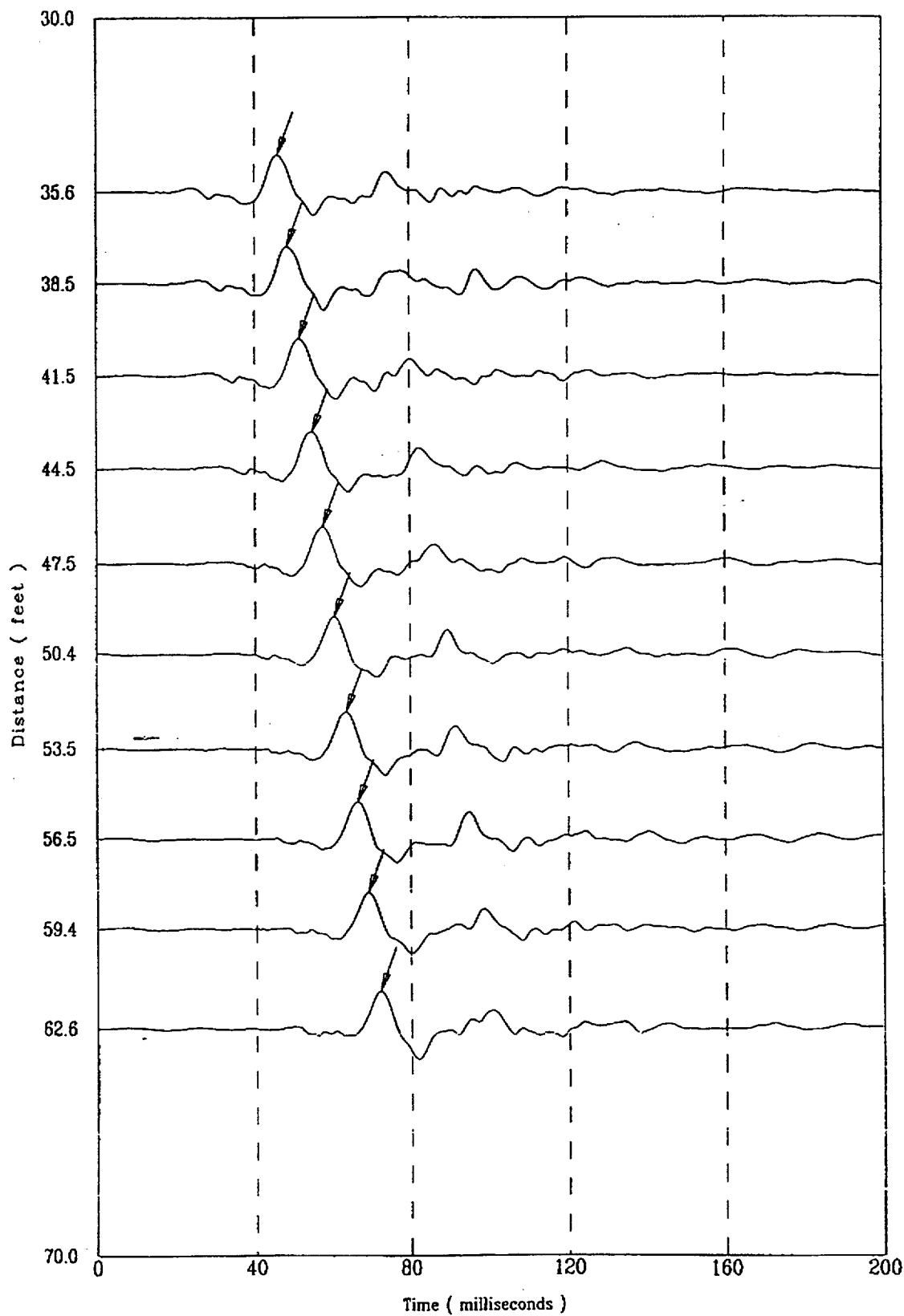


File 420F8025

Applied Research Associates, Inc.
CPT-104

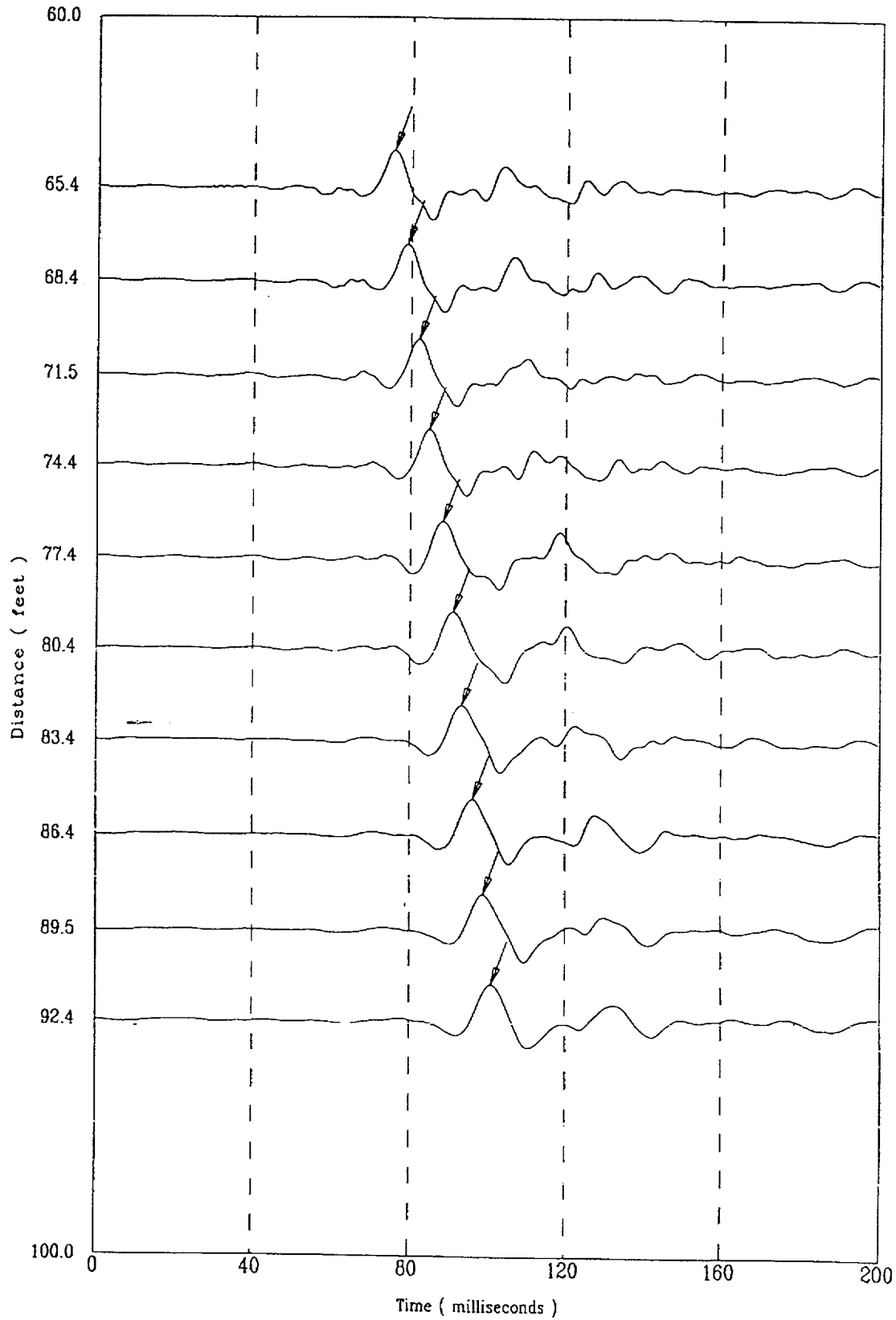
S Wave
02/20/98





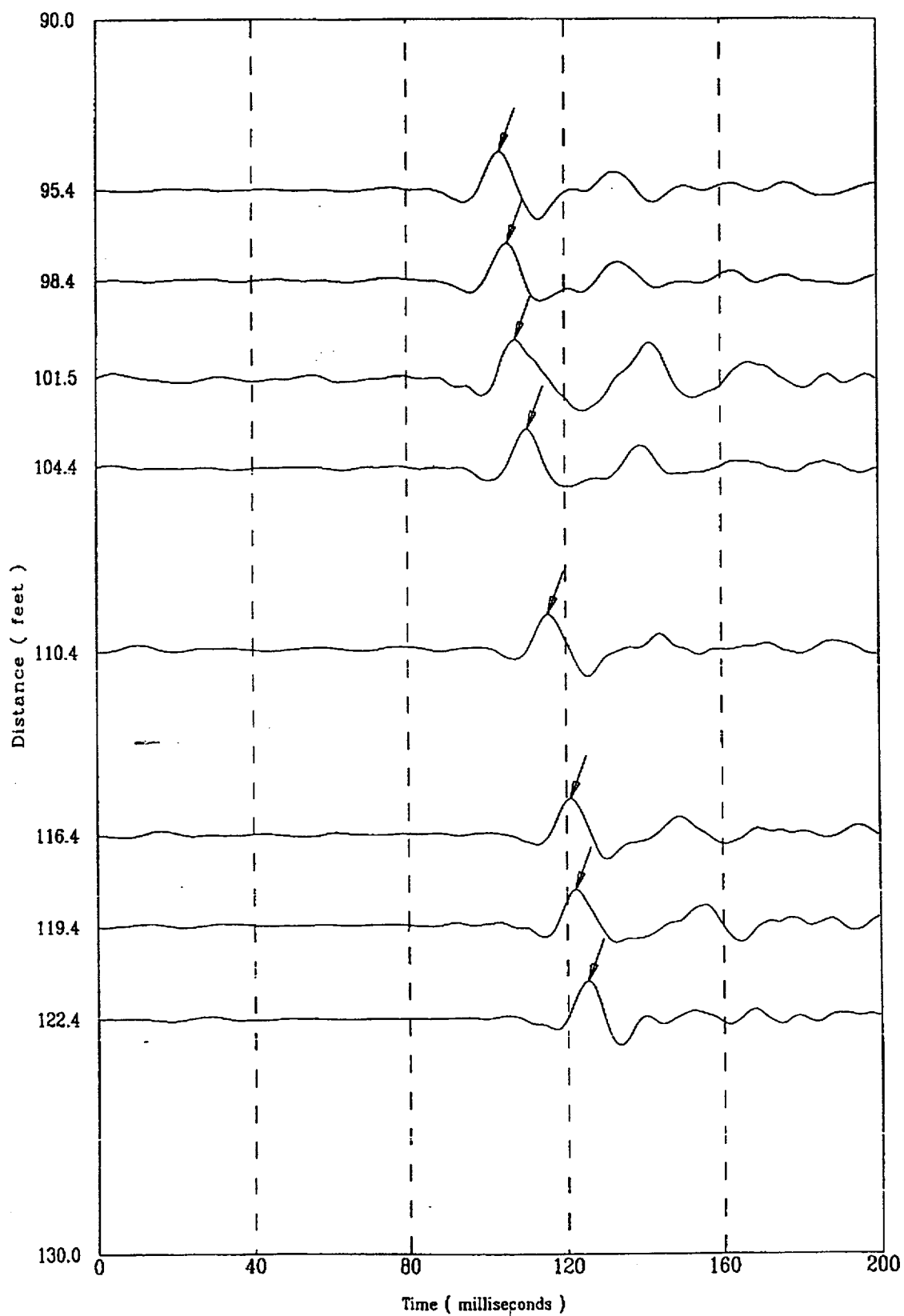
Applied Research Associates, Inc.
CPT-104

S Wave
02/20/98



Applied Research Associates, Inc.
CPT-104

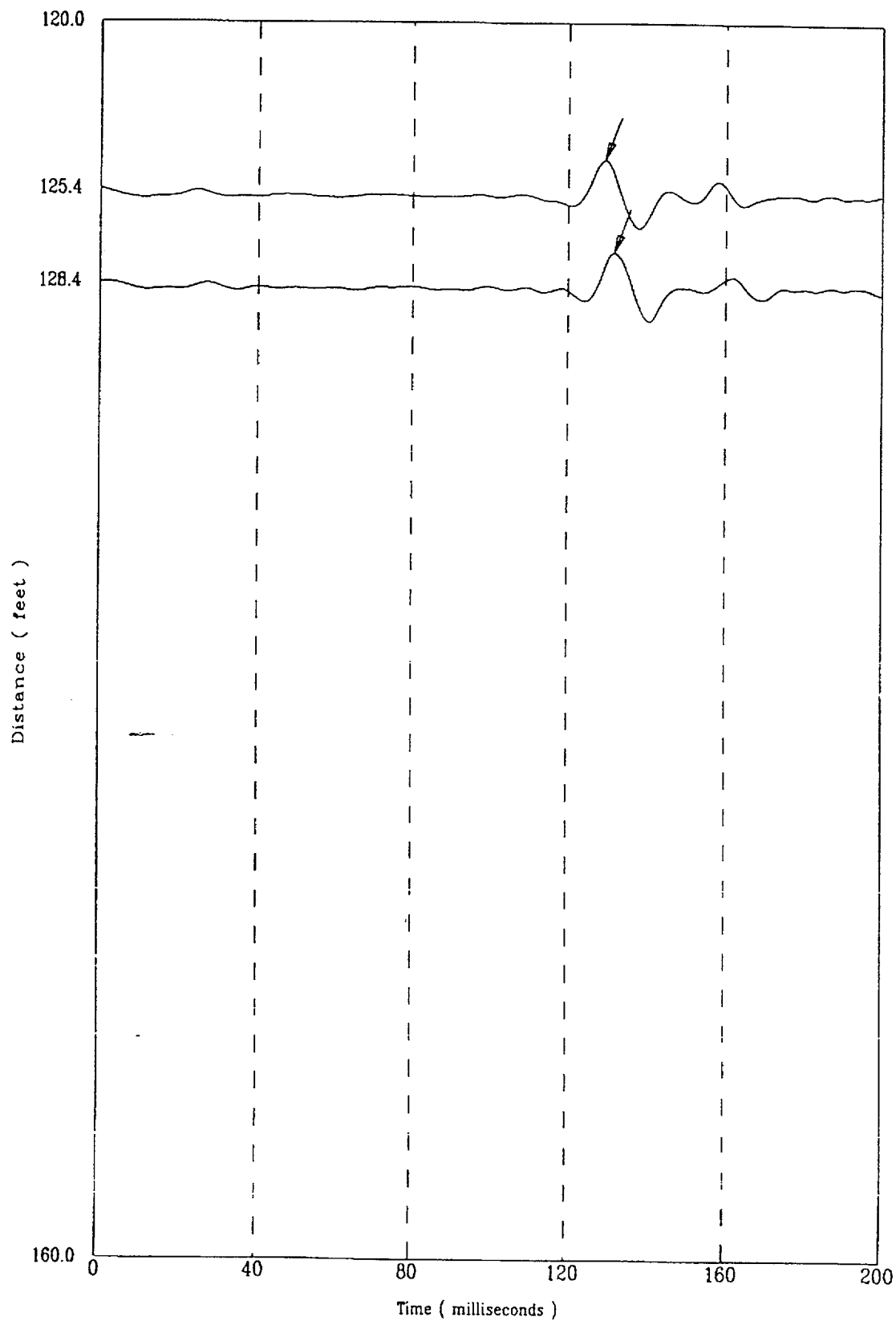
S Wave
02/20/98



File 20F802S

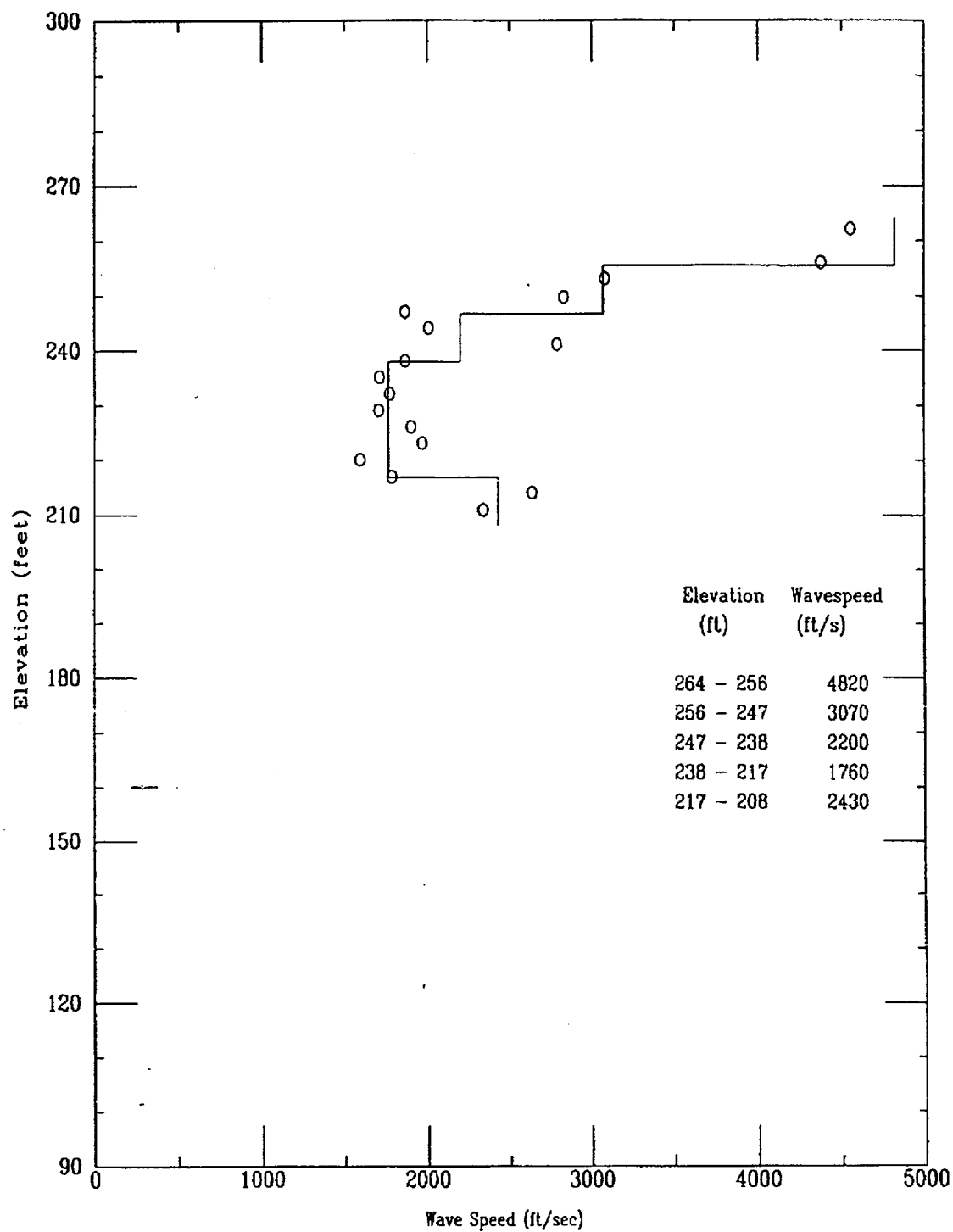
Applied Research Associates, Inc.
CPT-104

S Wave
02/20/98



File 420F802S

Compression Wave Speeds

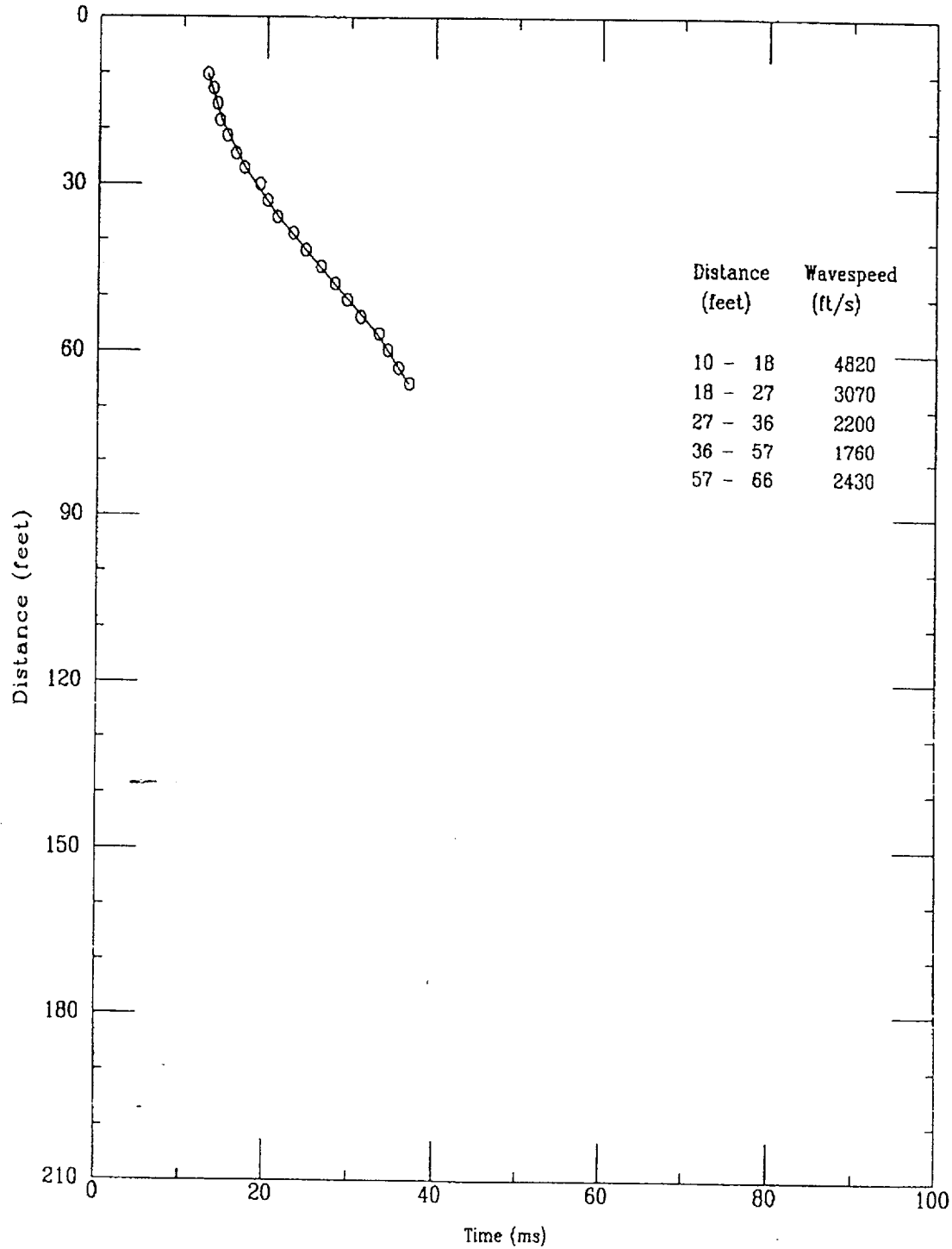


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APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

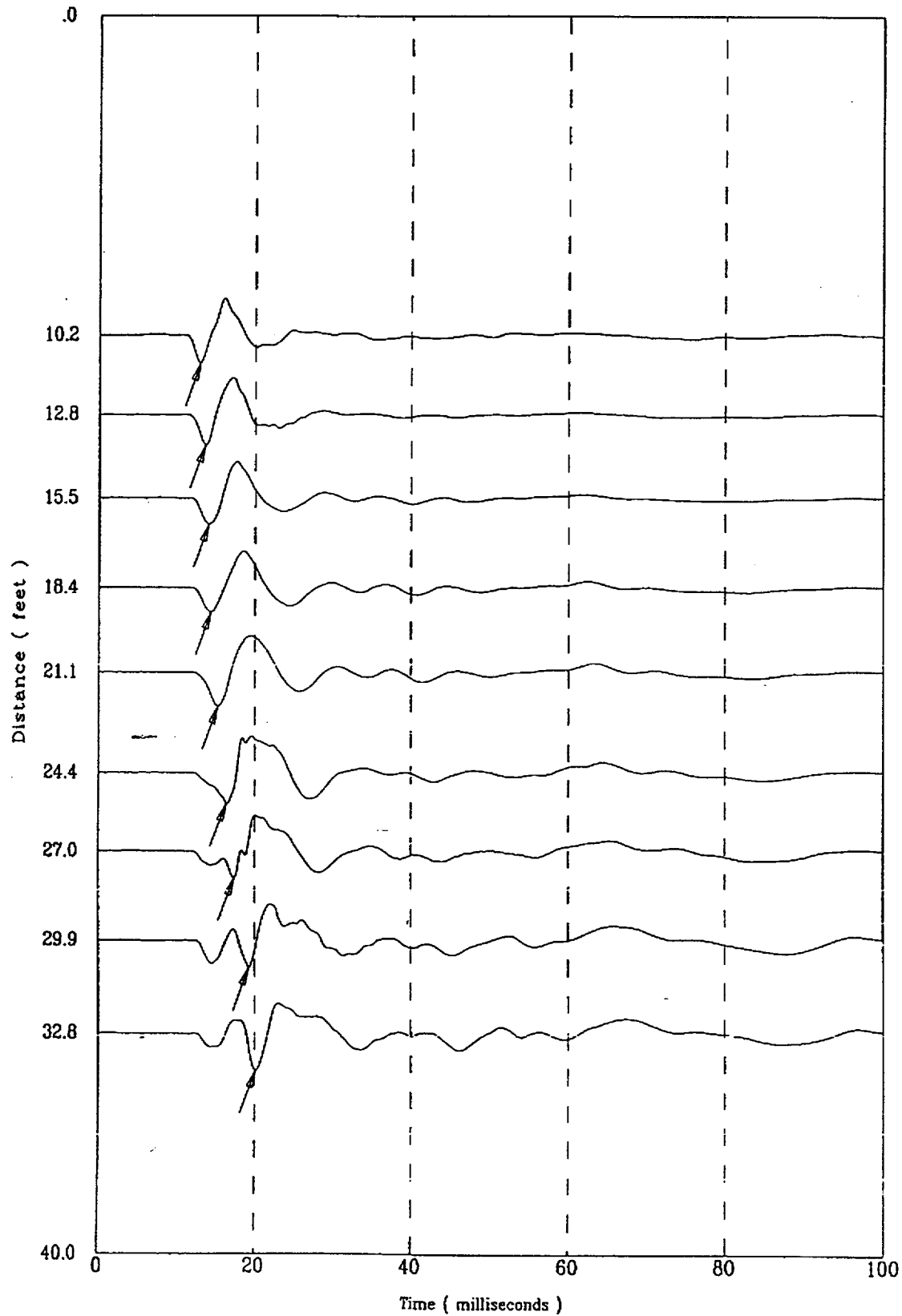
Compression Wave Time of Peak



File 420f8025

Applied Research Associates, Inc.
CPT-104

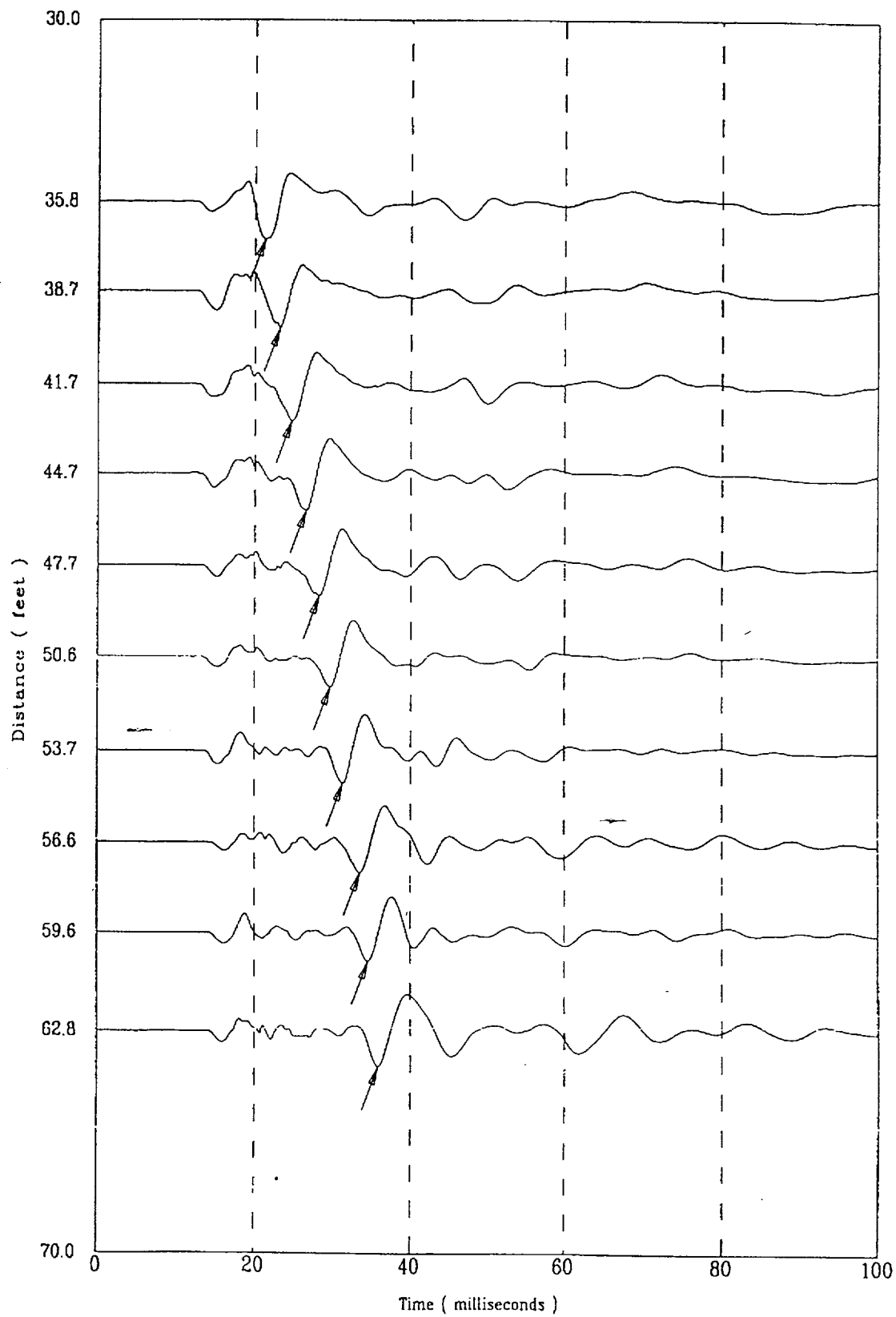
P Wave
02/20/98



File 42018025

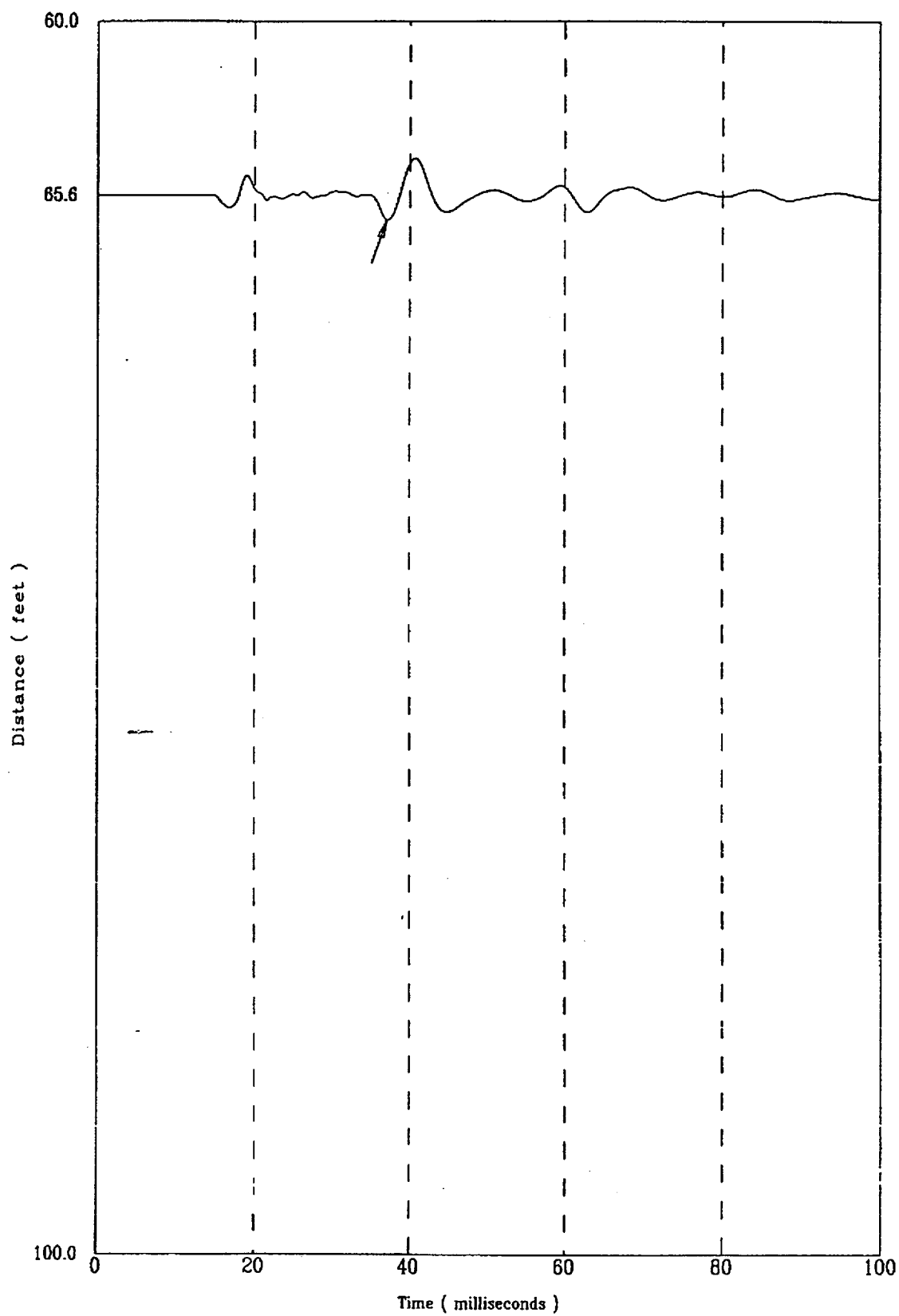
Applied Research Associates, Inc.
CPT-104

P Wave
02/20/98



Applied Research Associates, Inc.
CPT-104

P Wave
02/20/98



File 420f802S

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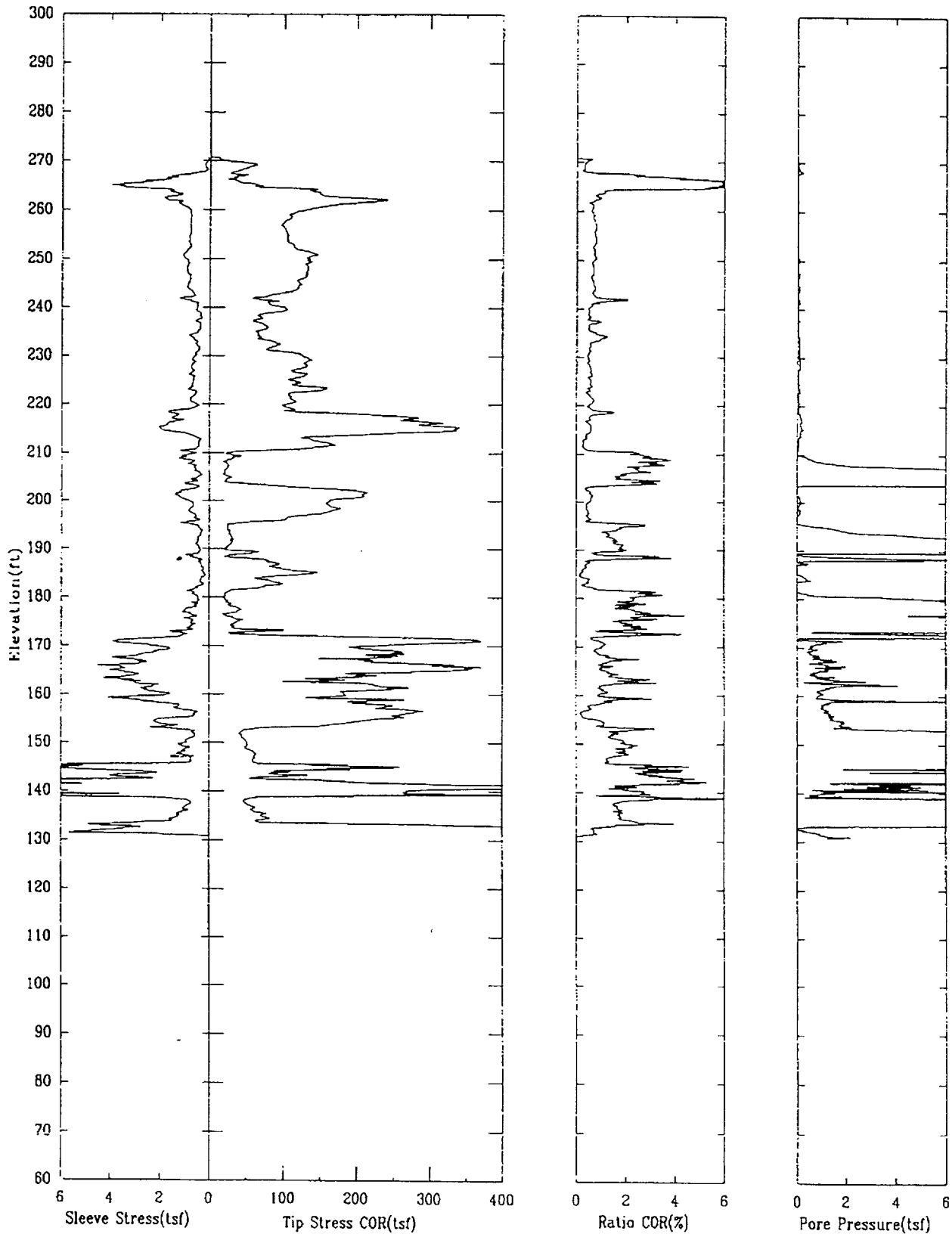
APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

North 79781.00

East 54825.10

Elevation 276.7



CPT-113

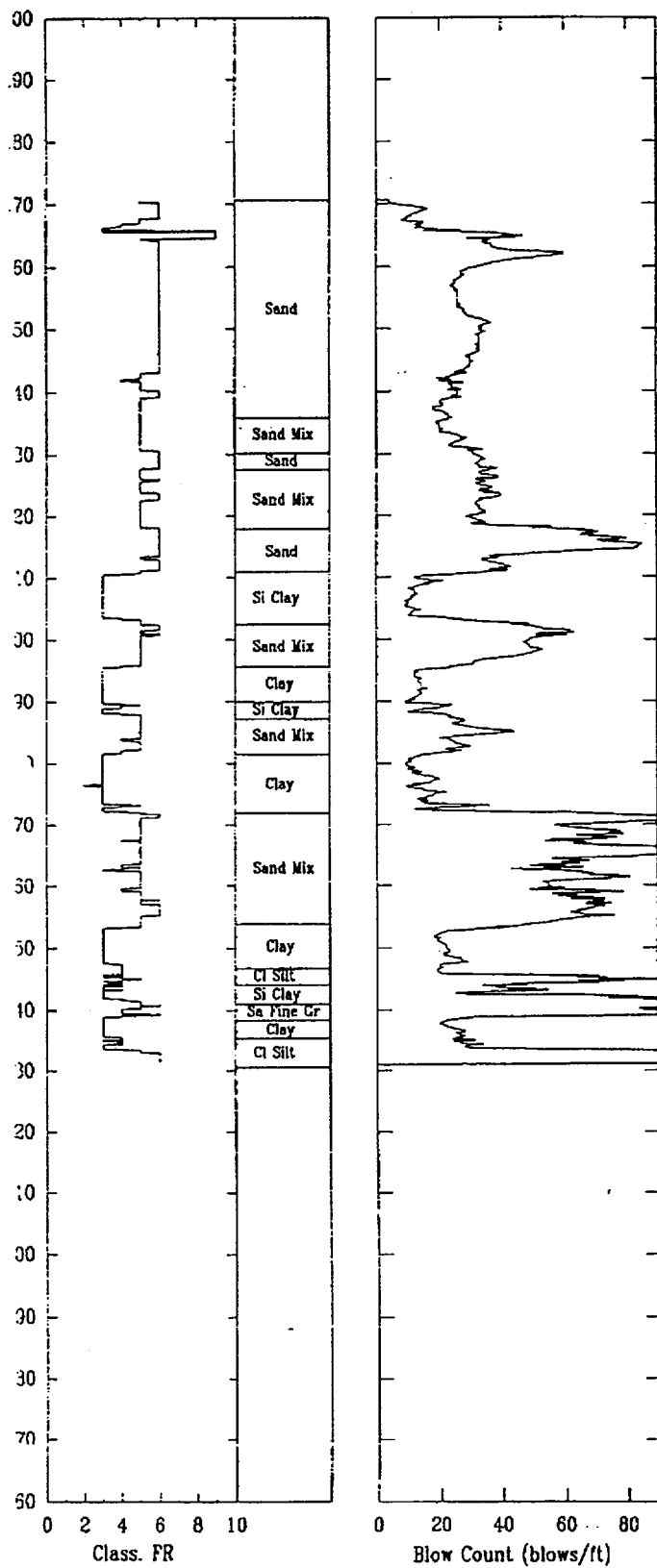
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02/19/98

North 79781.00

East 54825.10

Elevation 276.7

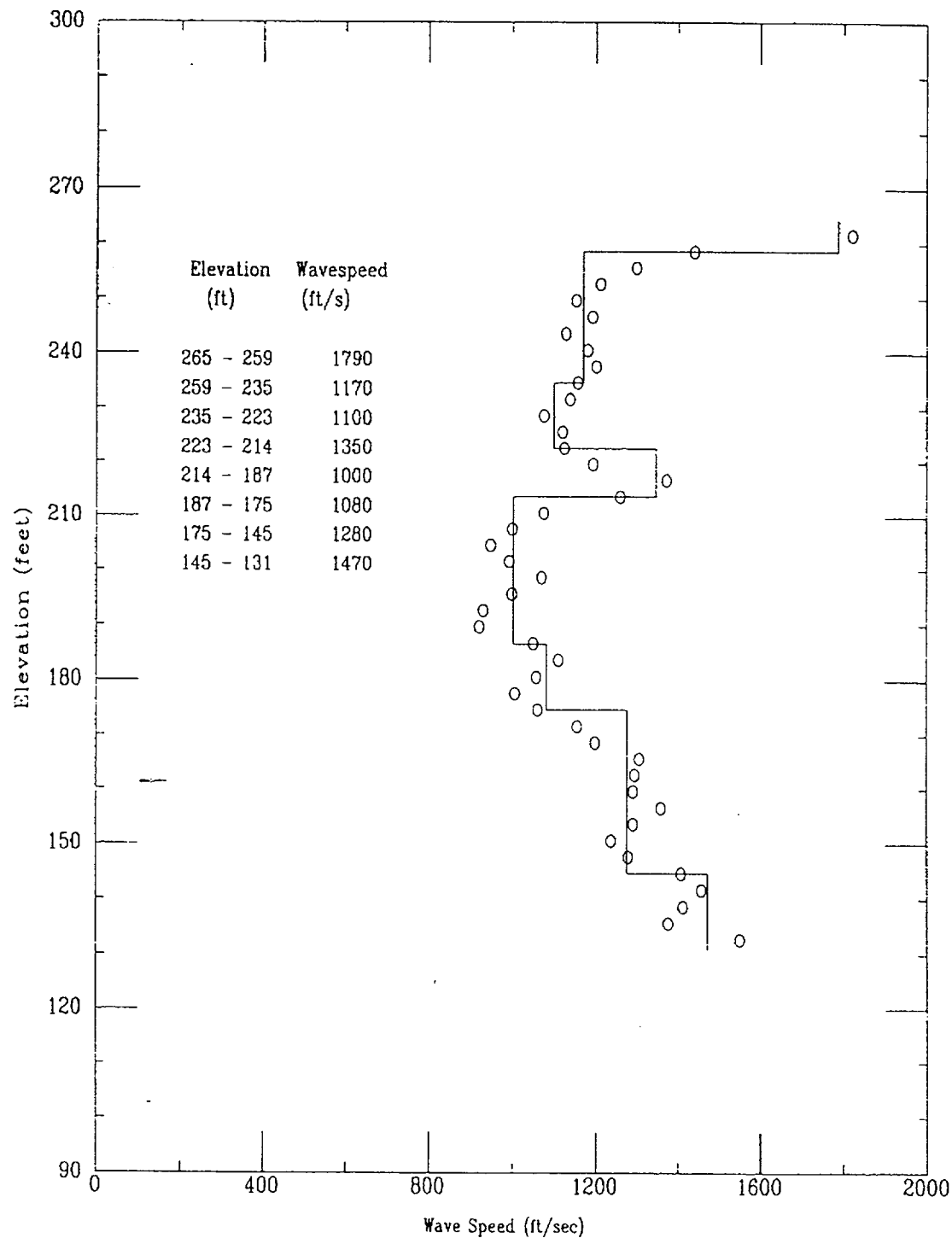


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APPLIED RESEARCH ASSOCIATES, INC.

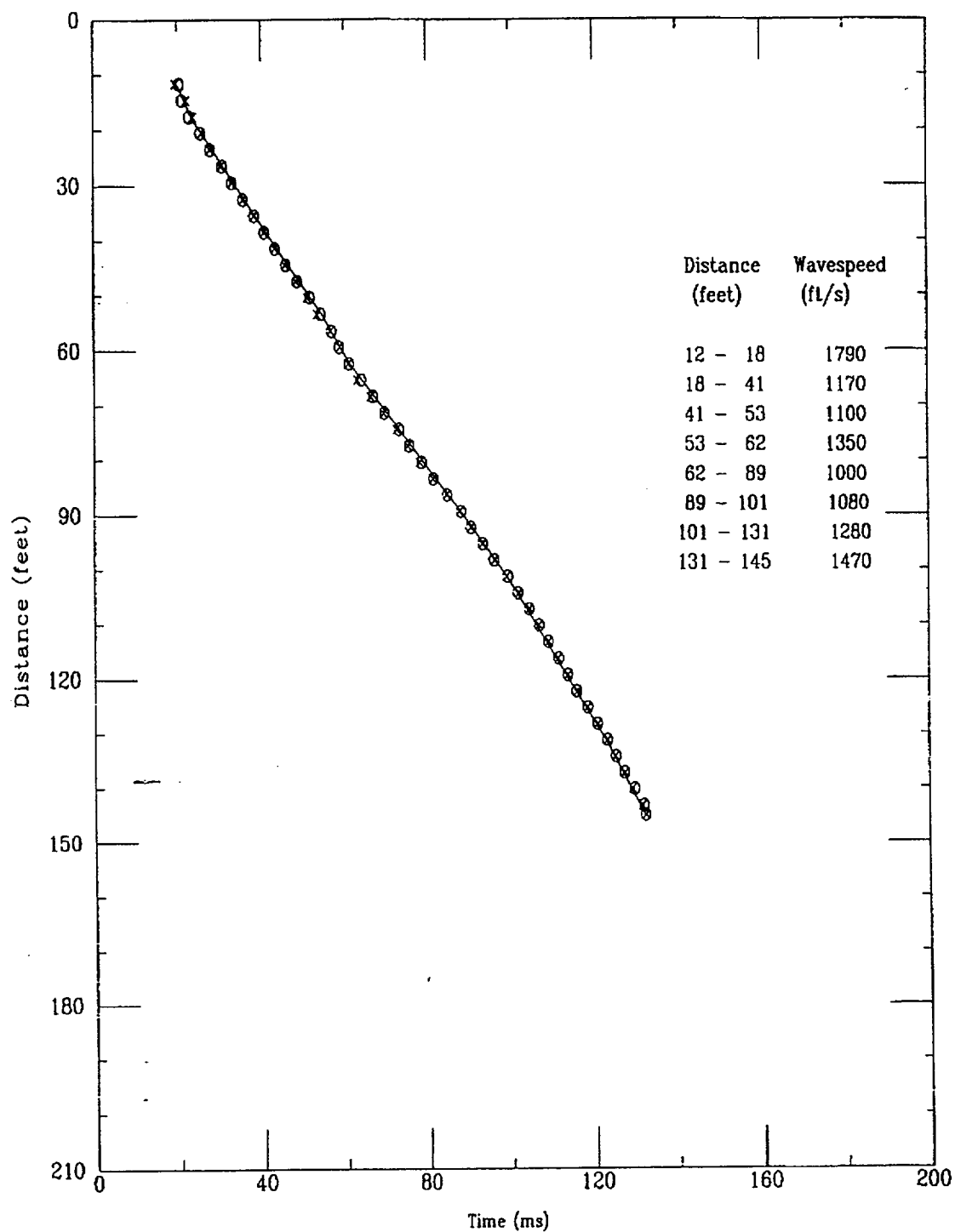
02/19/98

Shear Wave Speeds



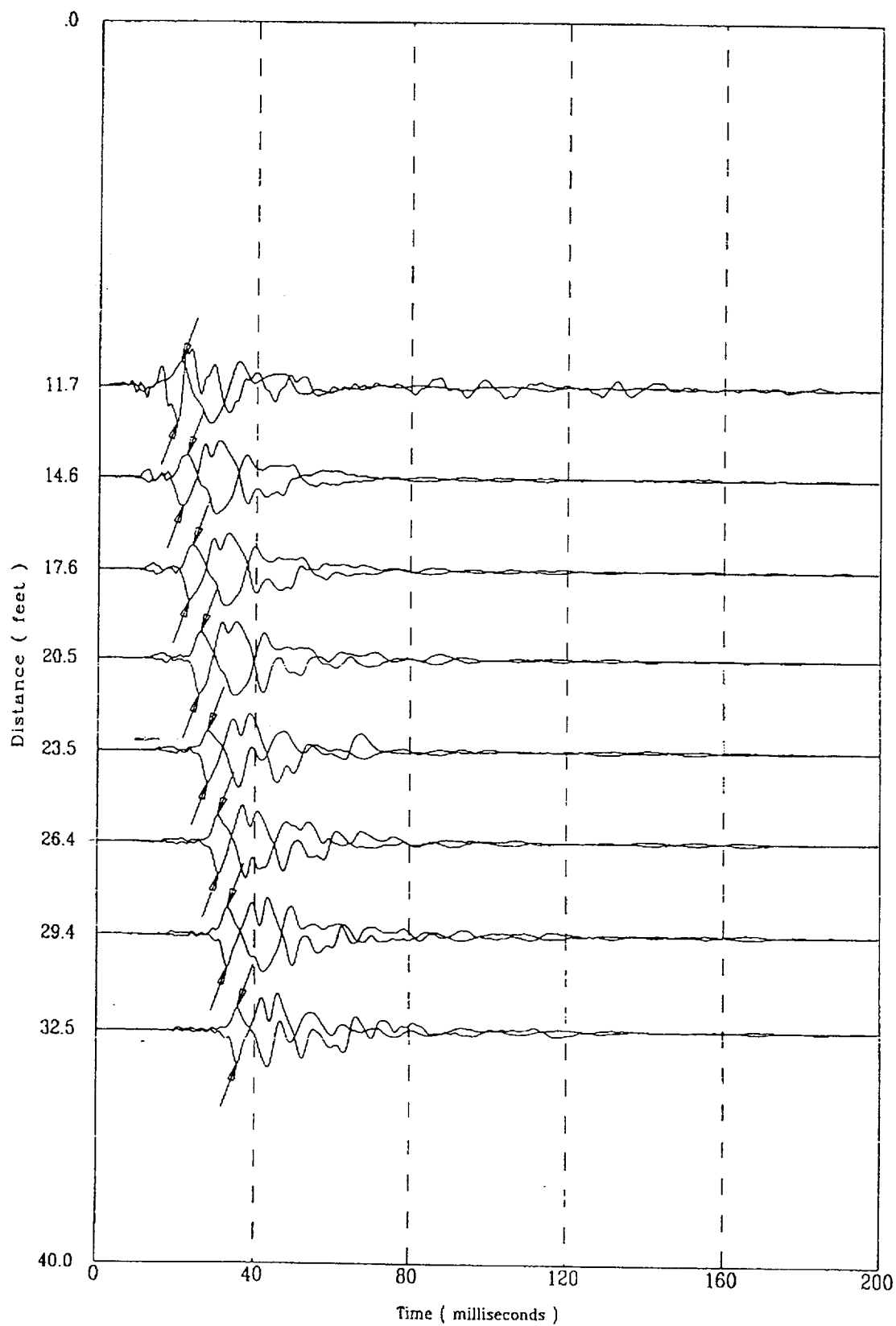
File 519f801S

Shear Wave Time of Peak



Applied Research Associates, Inc.
CPT-113

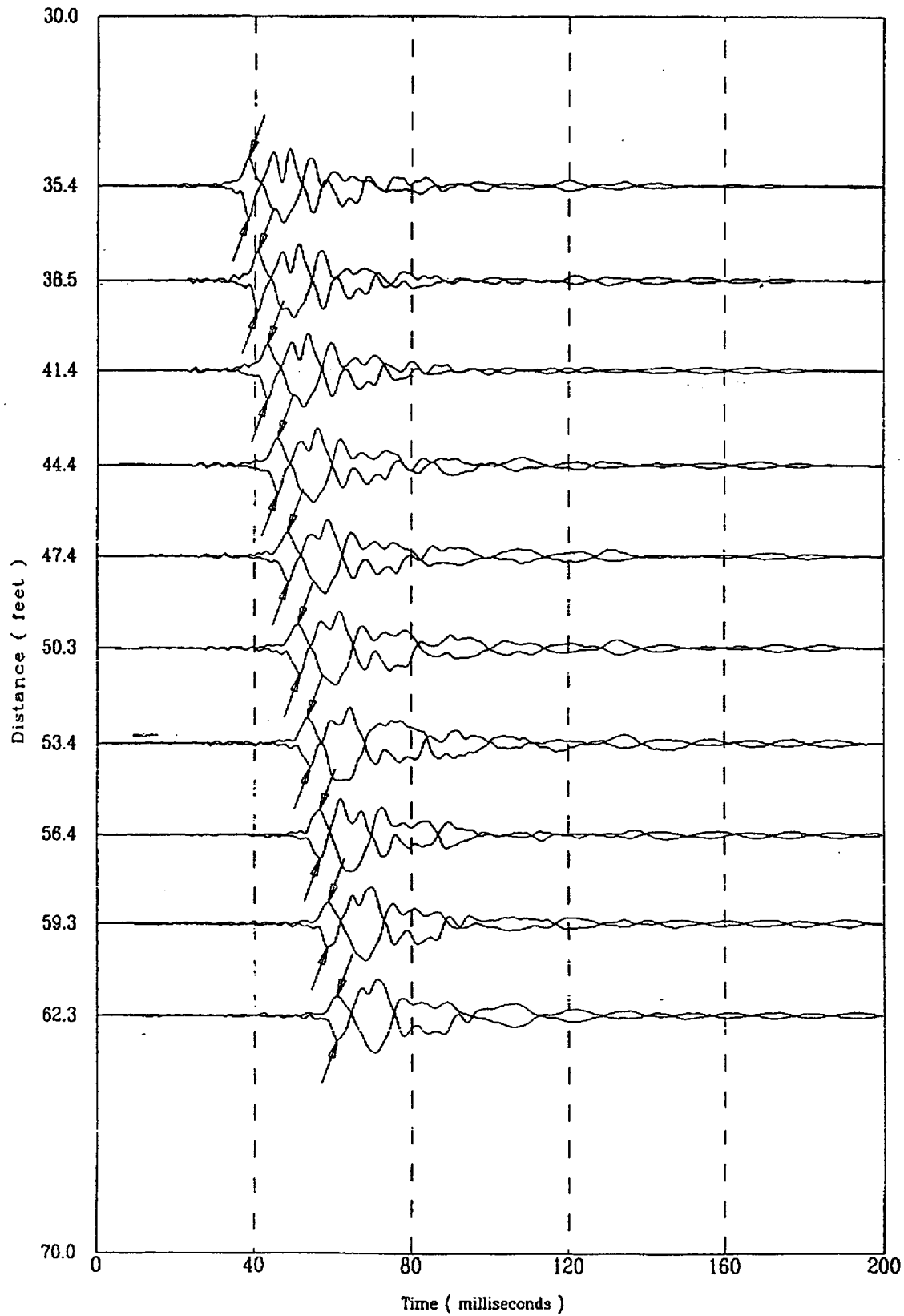
S Wave
02/19/98



5197801S

Applied Research Associates, Inc.
CPT-113

S Wave
02/19/98

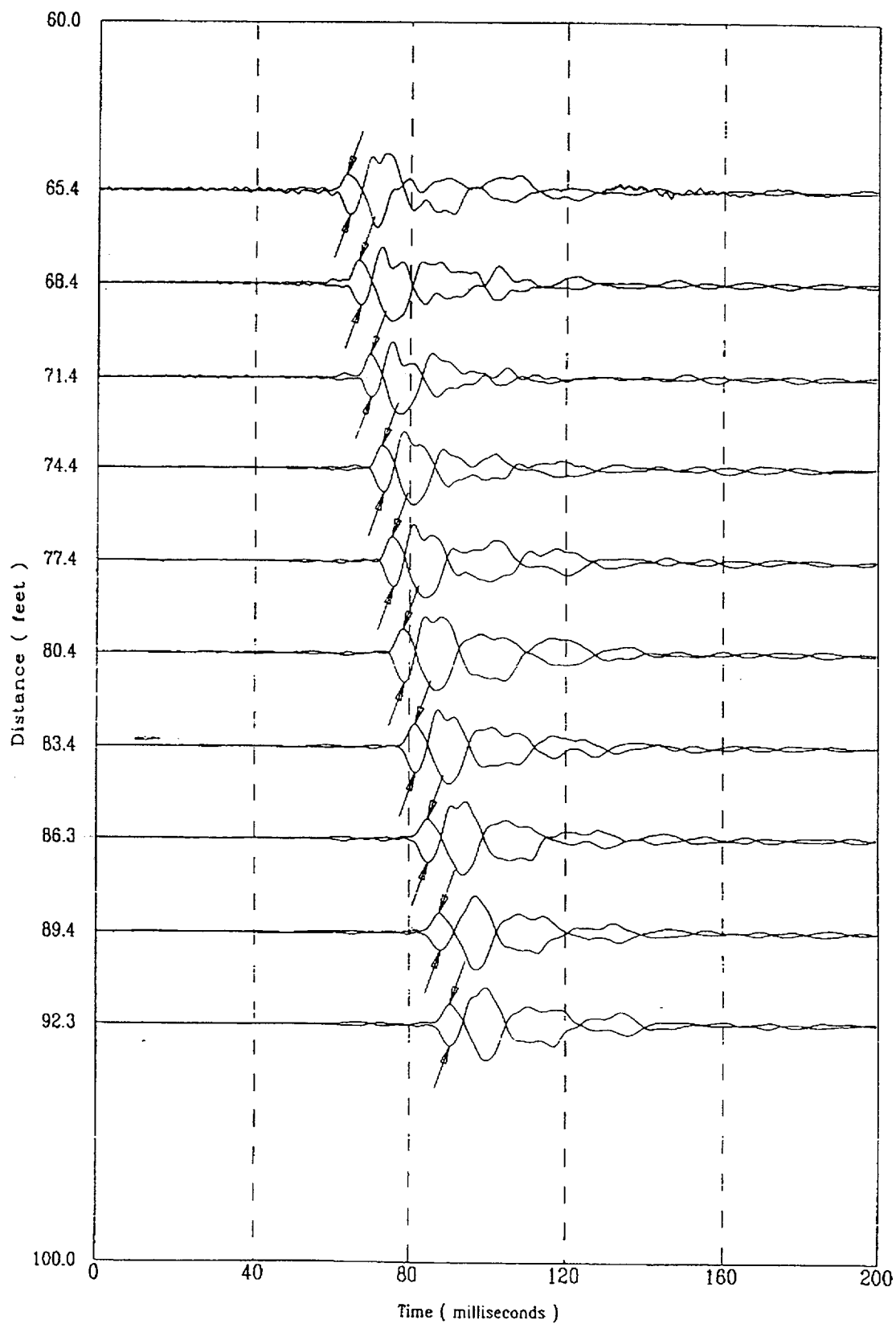


5197801S

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Applied Research Associates, Inc.
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S Wave
02/19/98

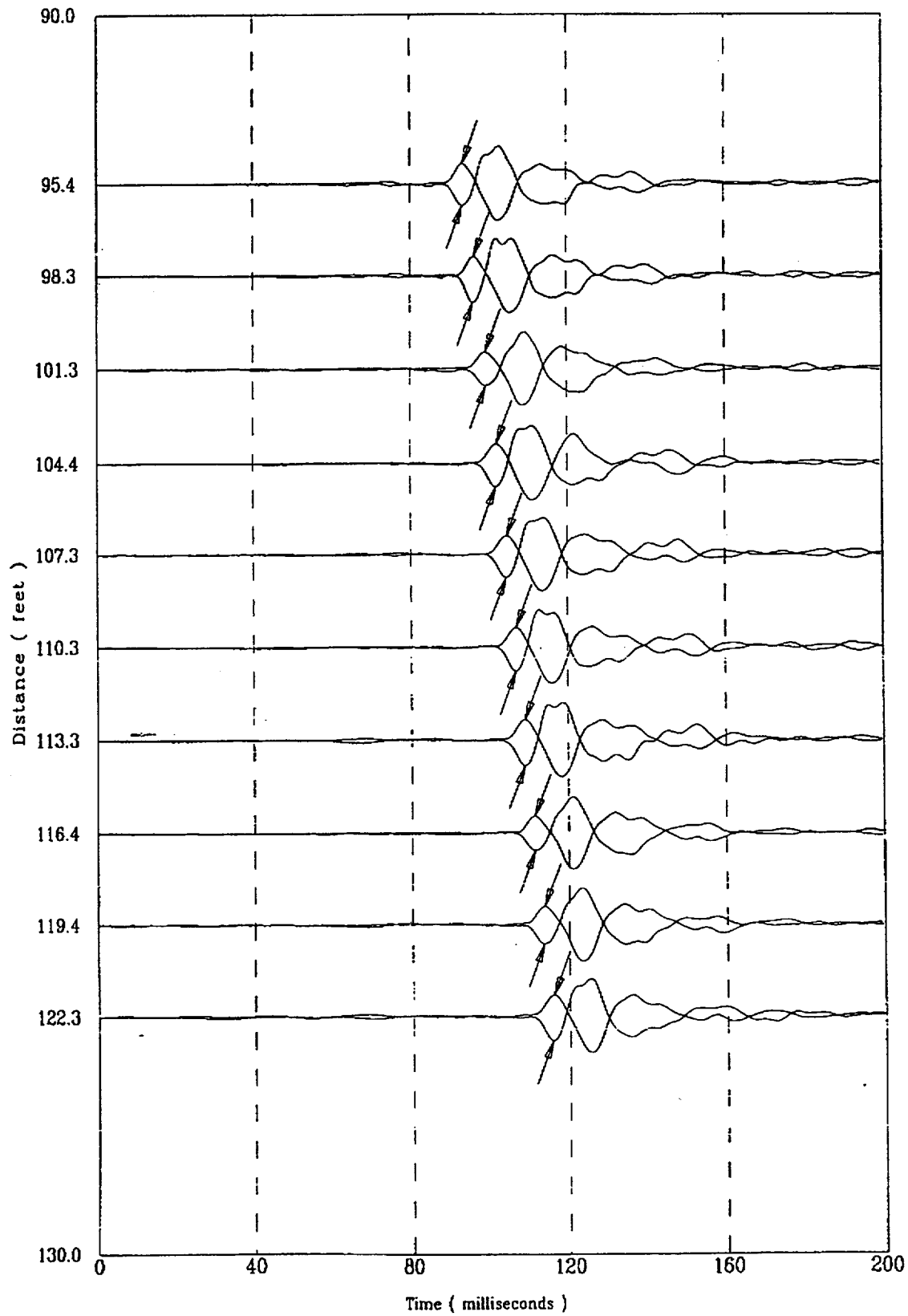


5191801S

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Applied Research Associates, Inc.
CPT-113

S Wave
02/19/98

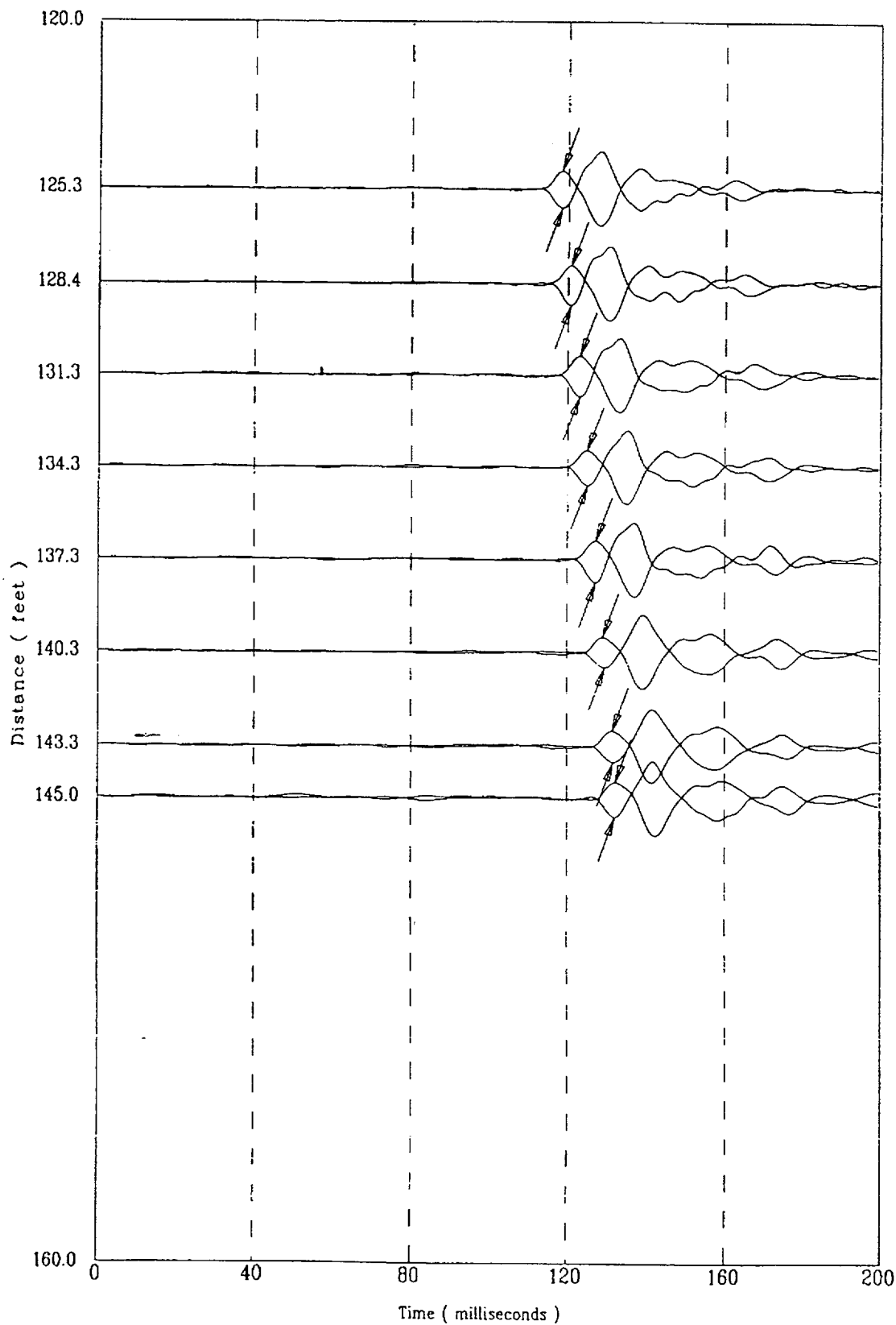


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Applied Research Associates, Inc.
CPT-113

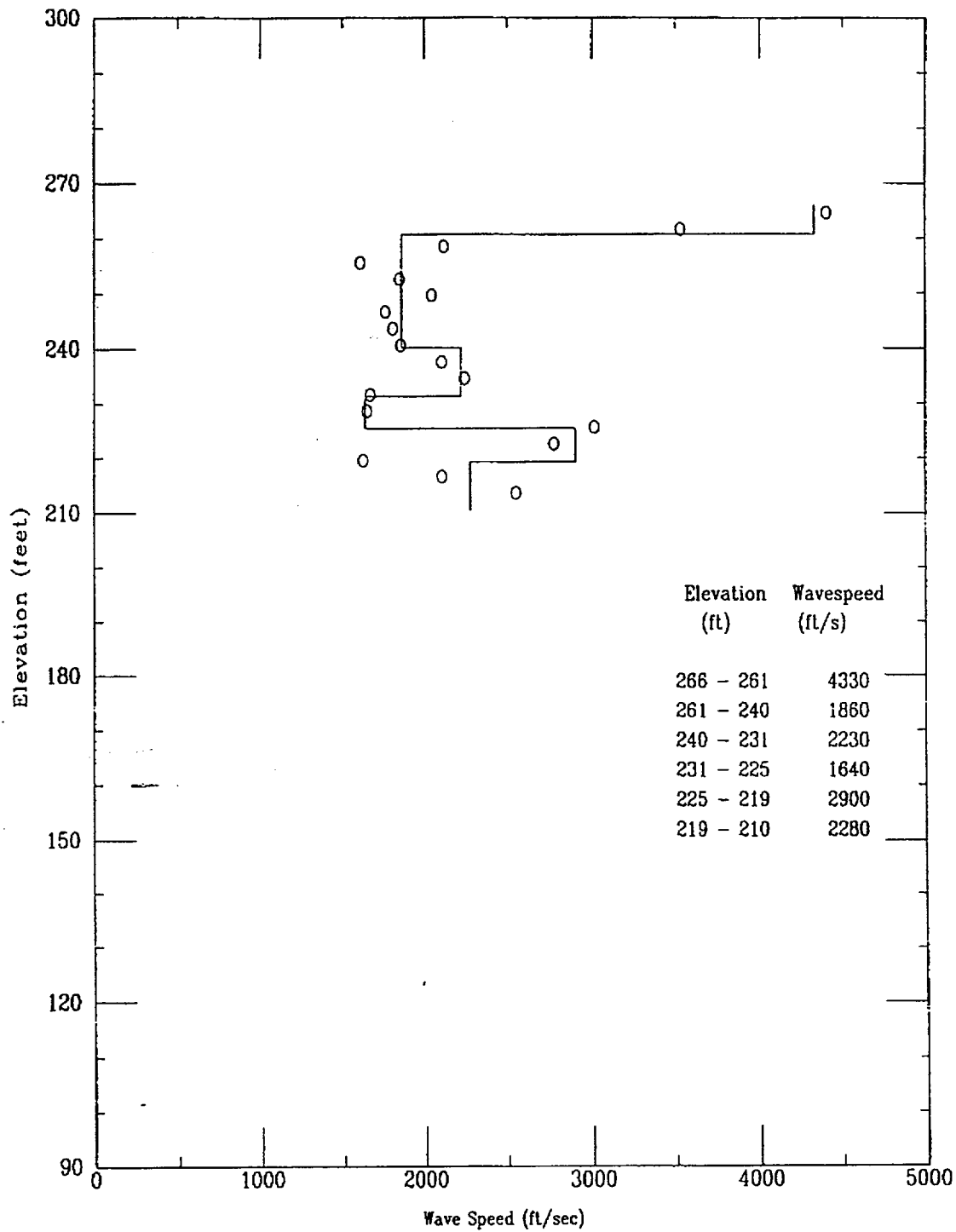
S Wave
02/19/98



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Compression Wave Speeds



-
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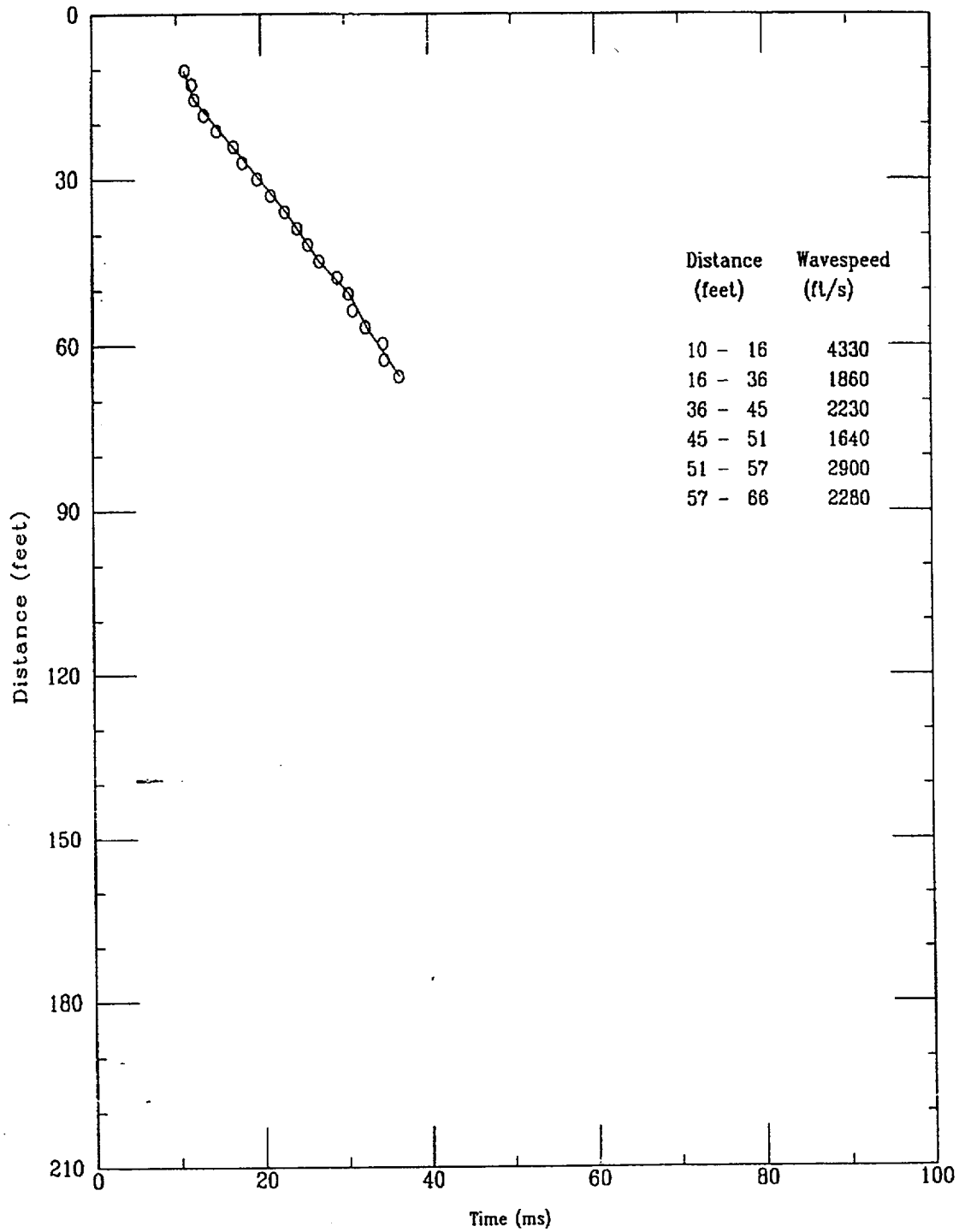
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CPT-113

APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

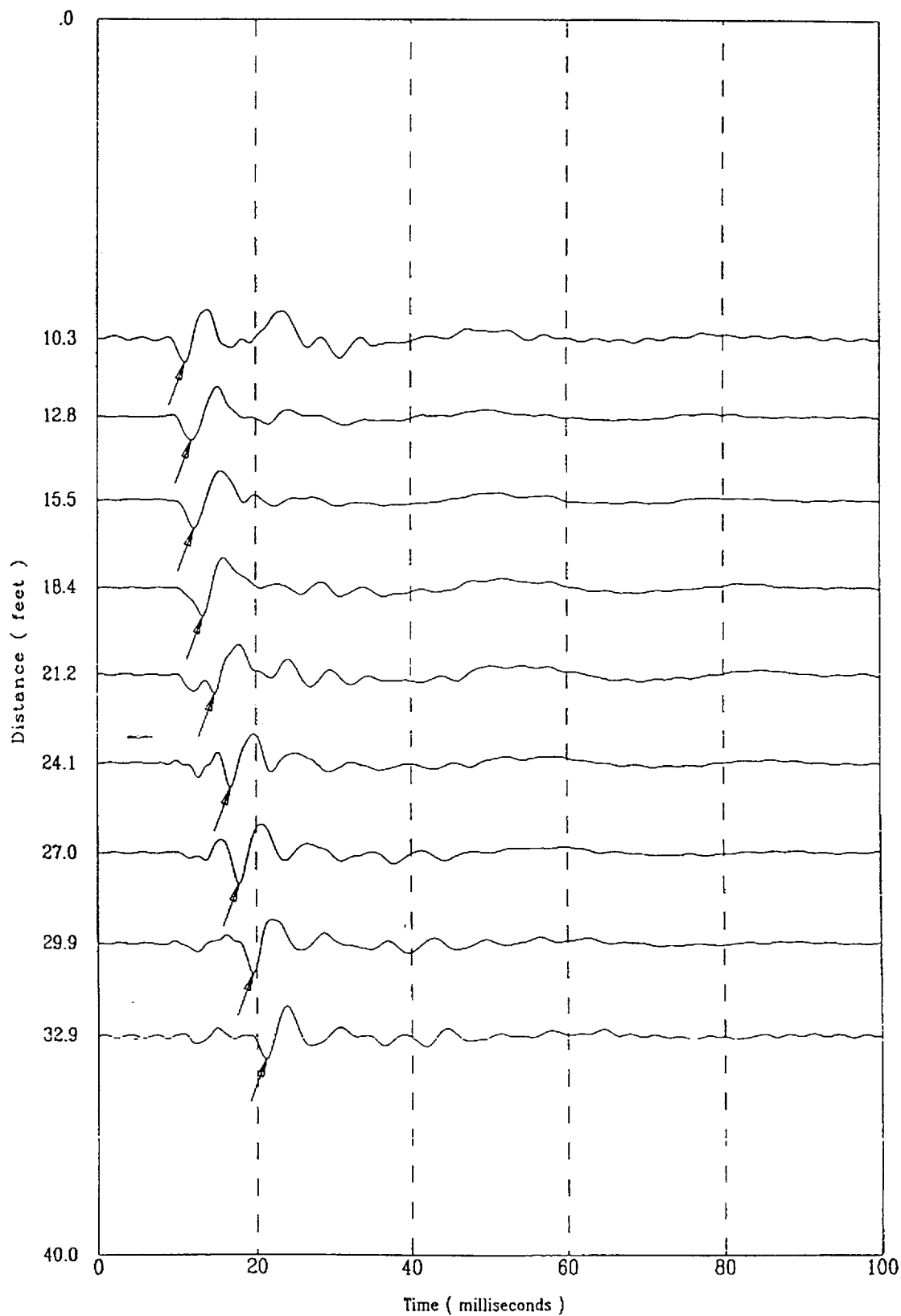
Compression Wave Time of Peak



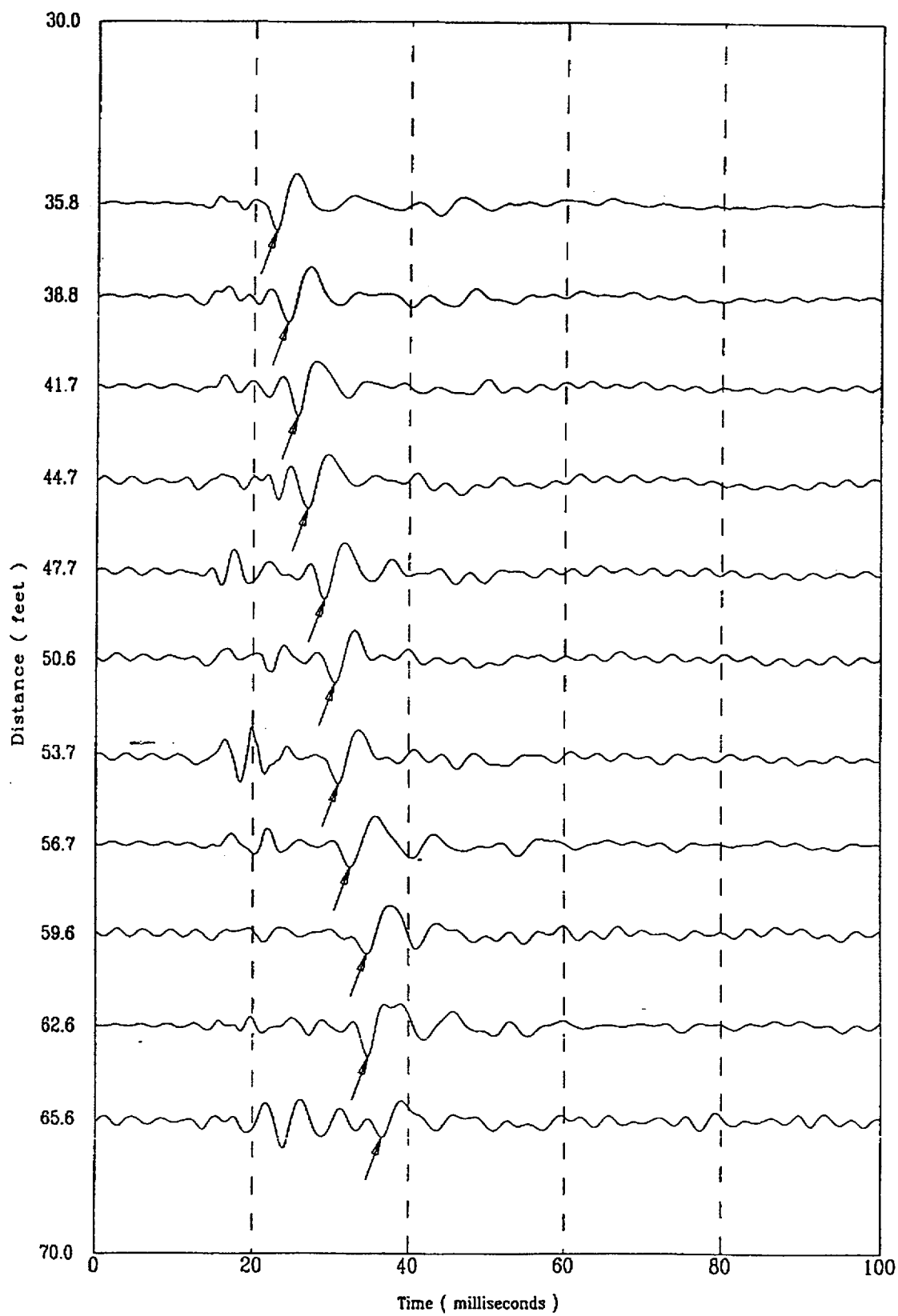
File 519/801S

Applied Research Associates
CPT-113

P Wave
02/19/98



51978015



.1801S

CPT-114

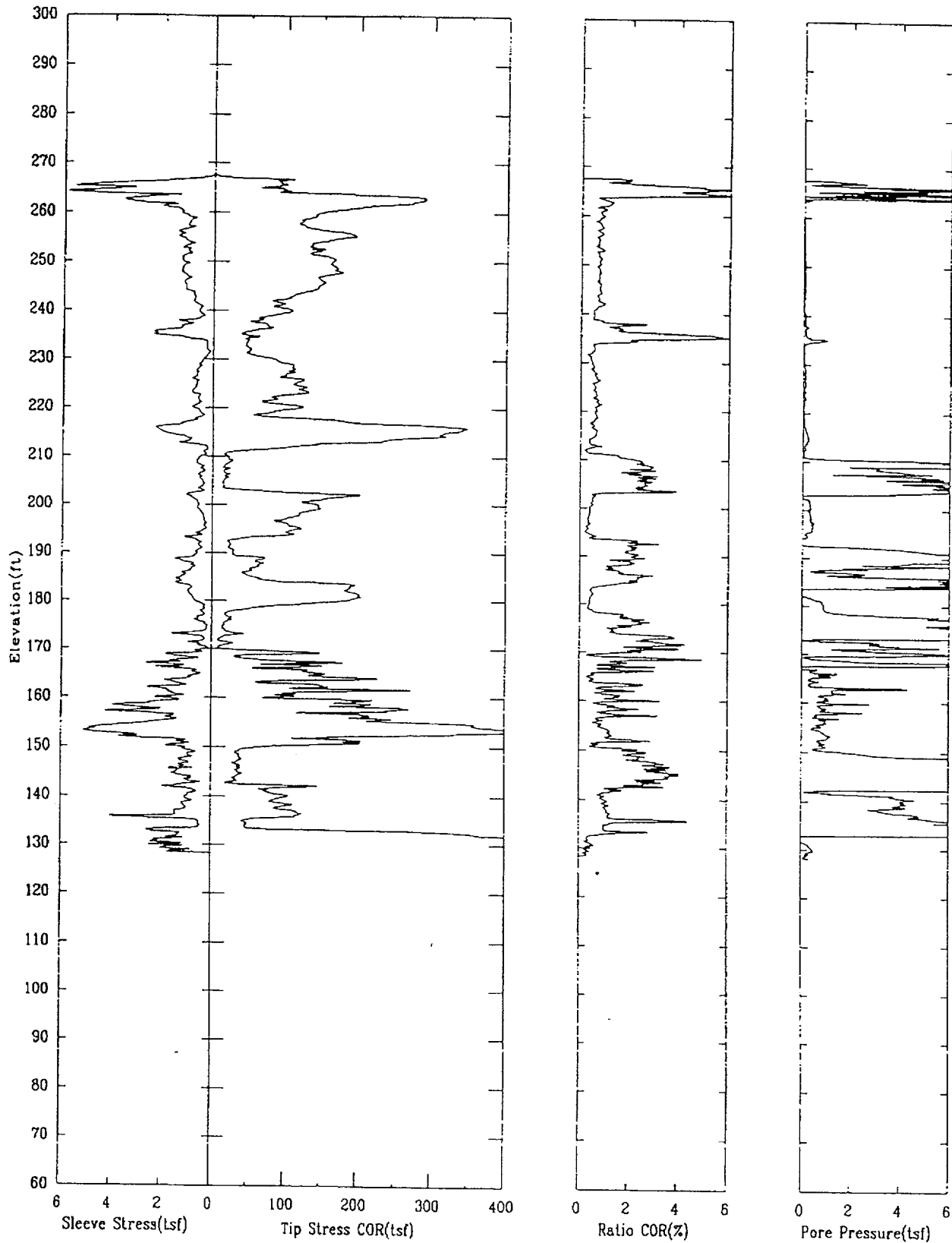
APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

North 79781.01

East 54975.05

Elevation 273.6



CPT-114

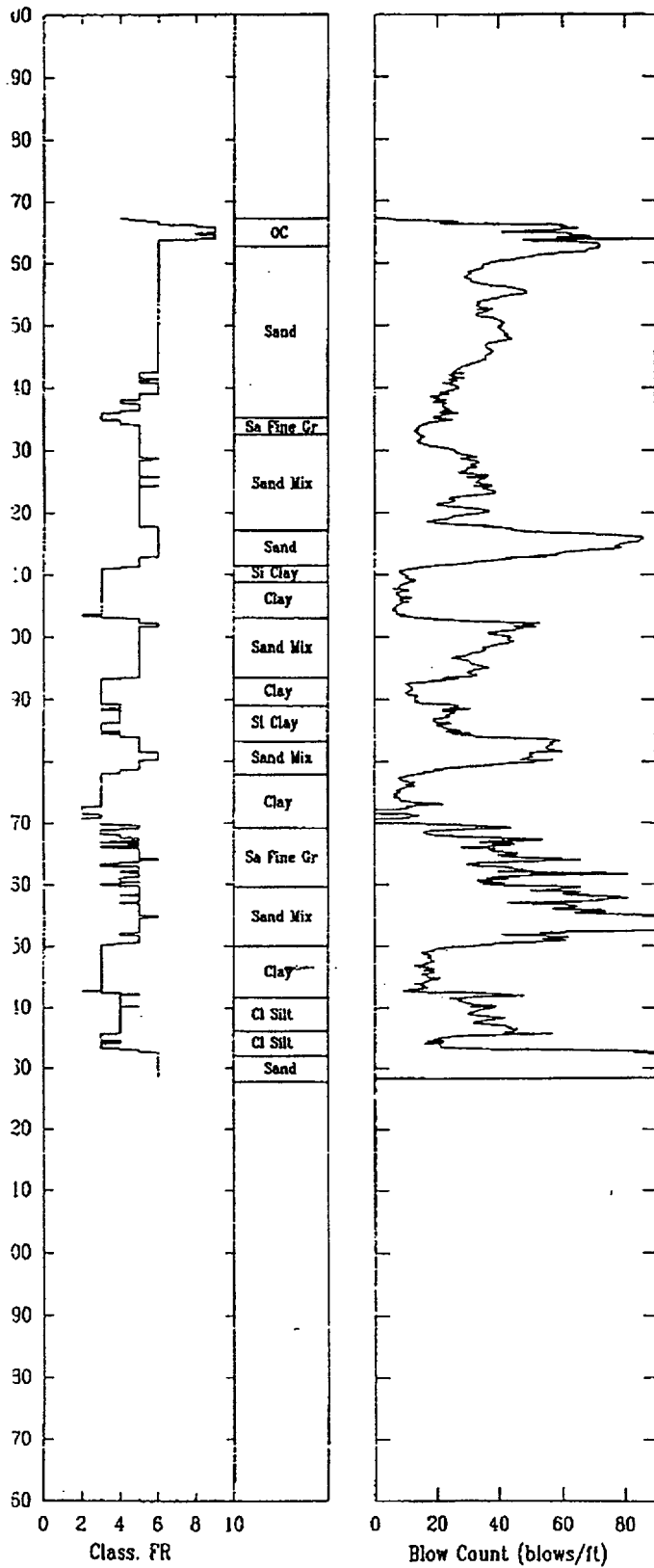
APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

North 79781.01

East 54975.05

Elevation 273.6

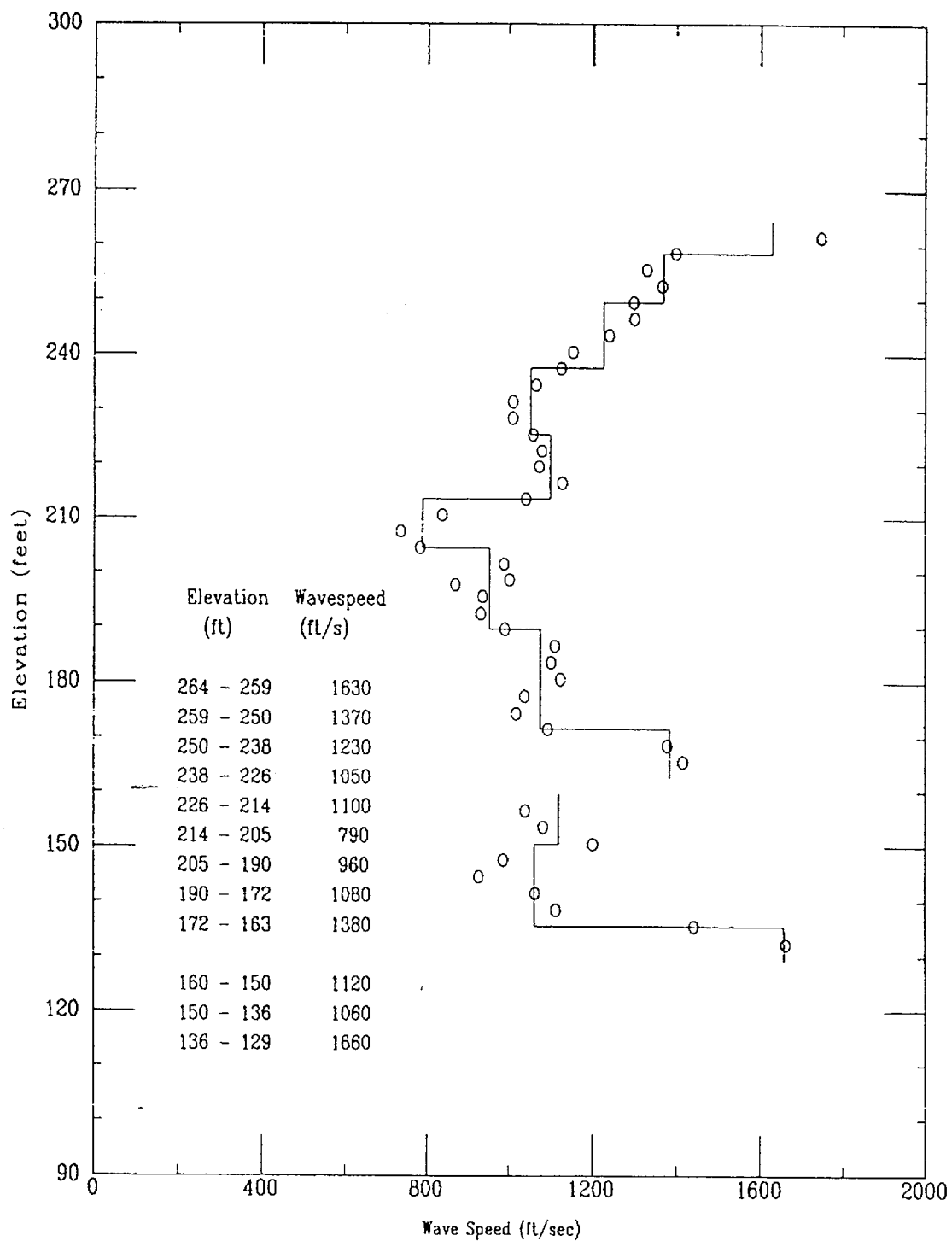


CPT-114

APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

Shear Wave Speeds



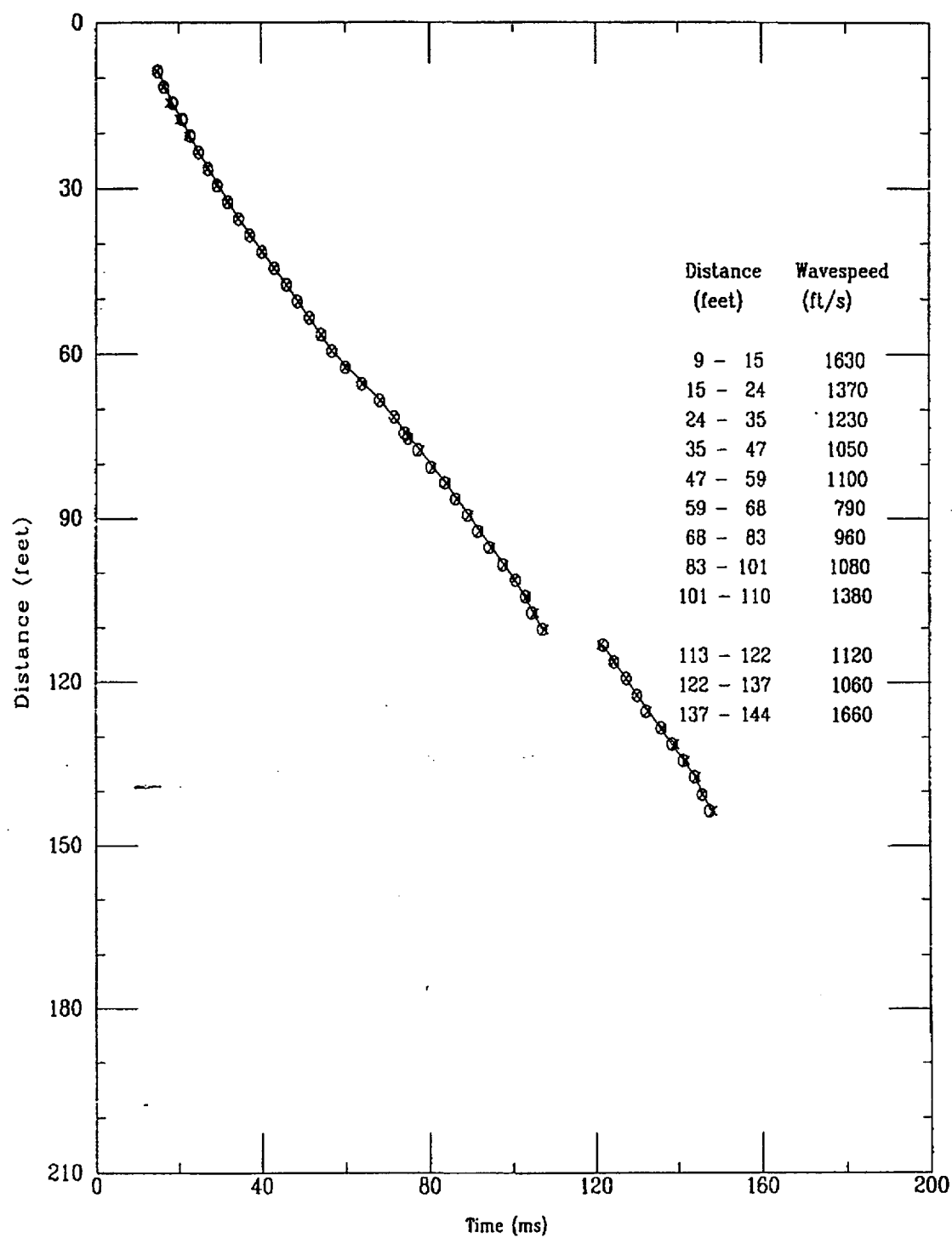
File 519/B04S

CPT-114

APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

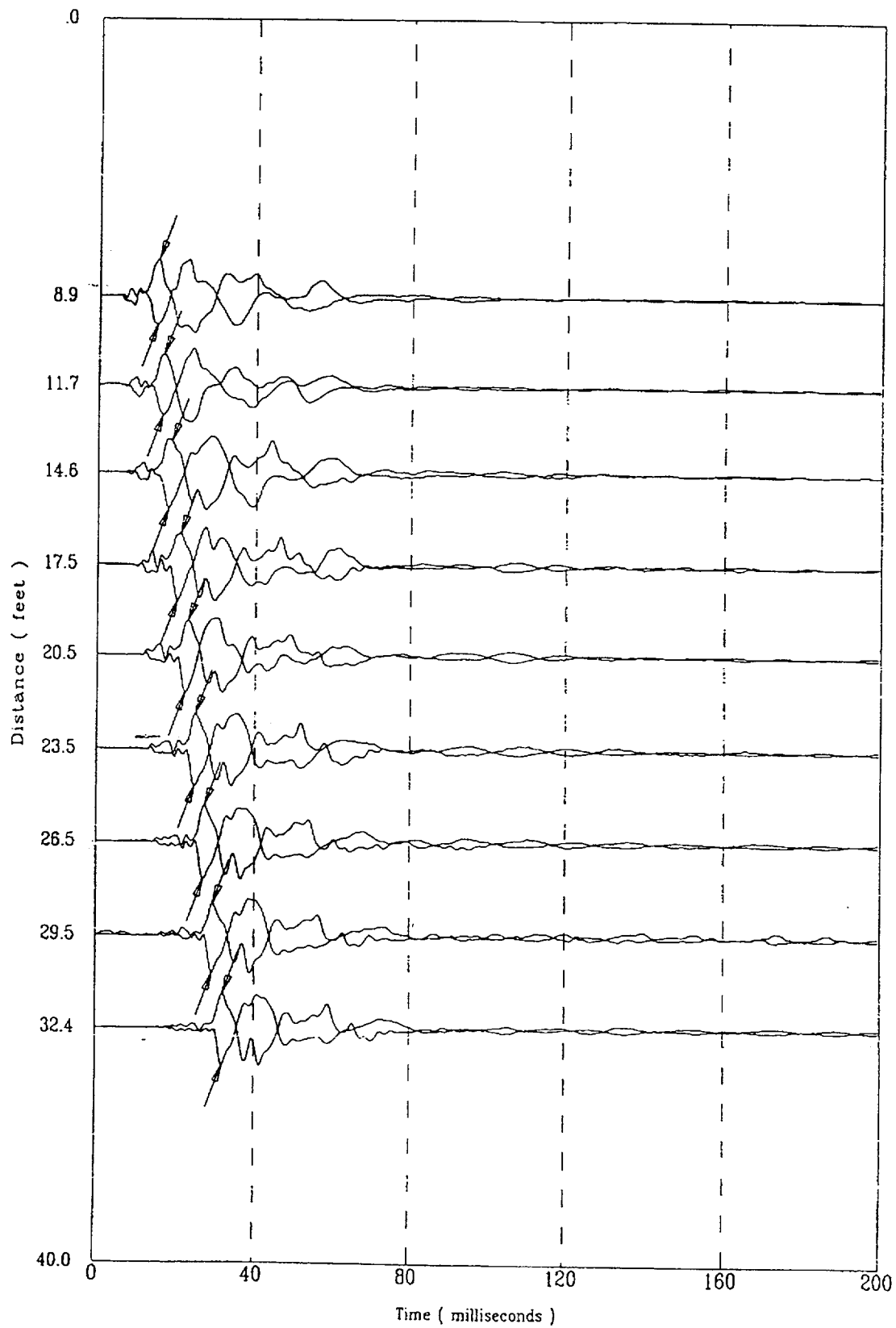
Shear Wave Time of Peak



File 519/804S

Applied Research Associates, Inc.
CPT-114

S Wave
02/19/98

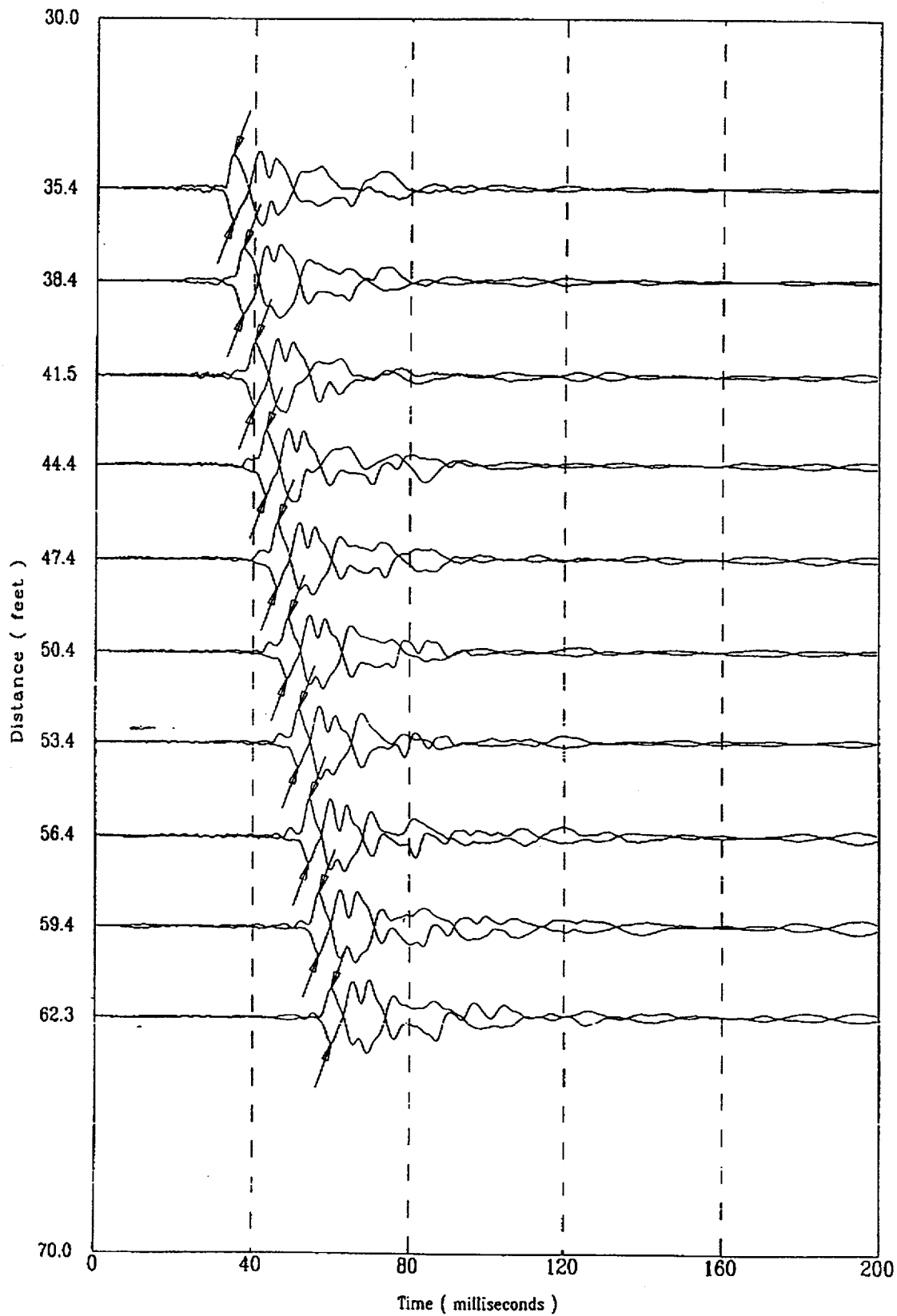


519f804S

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Applied Research Associates, Inc.
CPT-114

S Wave
02/19/98

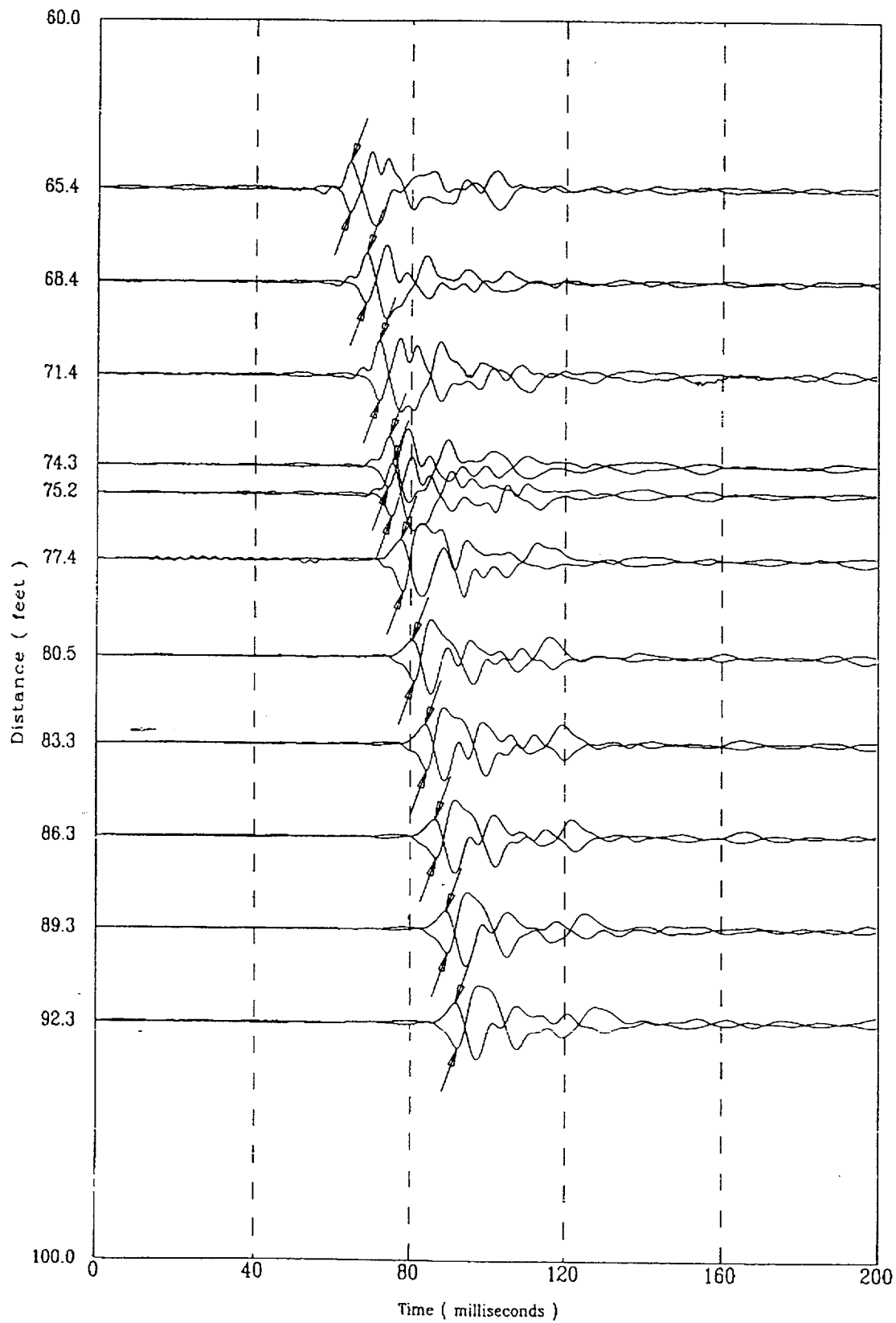


5197804S

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Applied Research Associates, Inc.
CPT-114

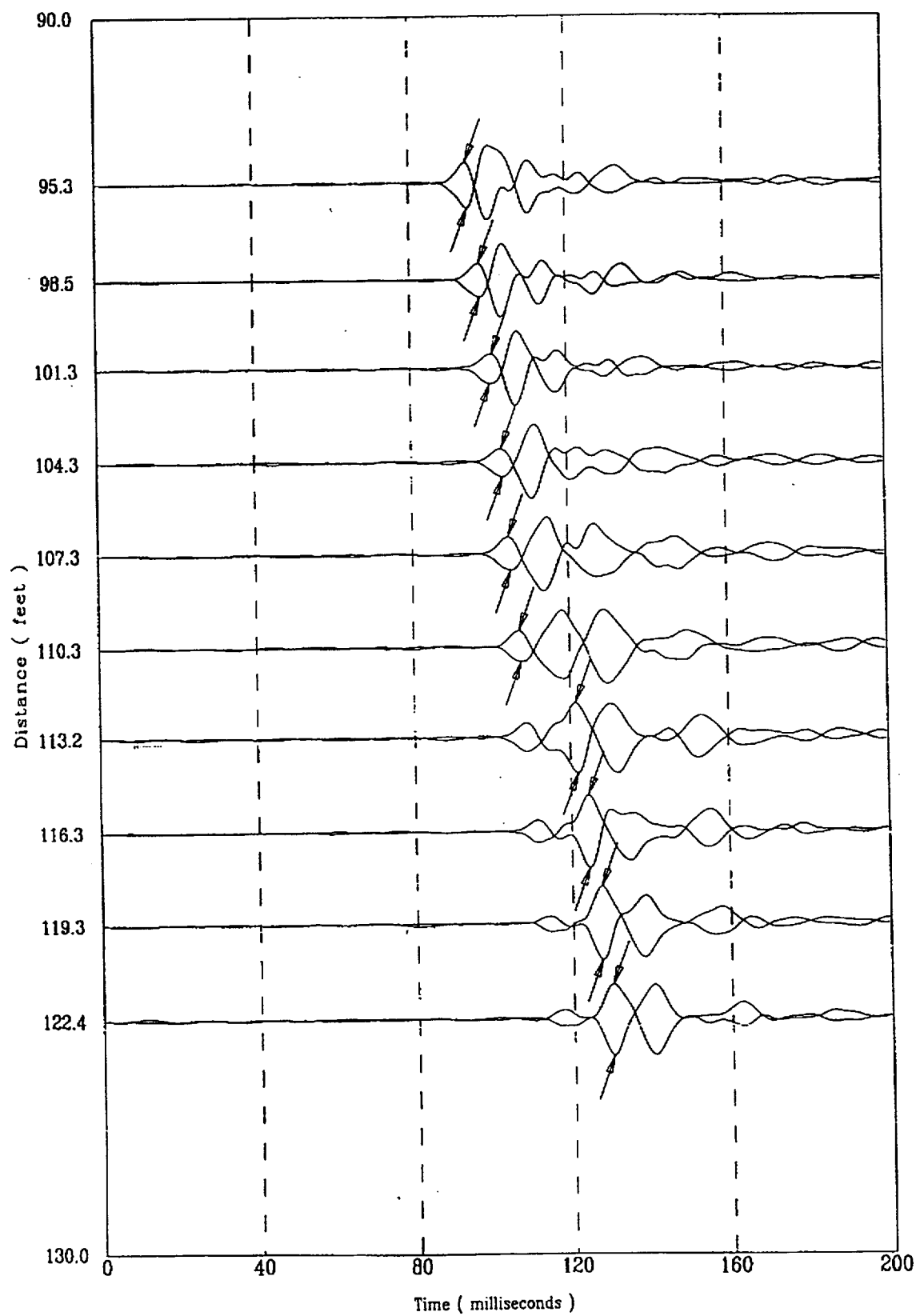
S Wave
02/19/98



519/804S

Applied Research Associates, Inc.
CPT-114

S Wave
02/19/98

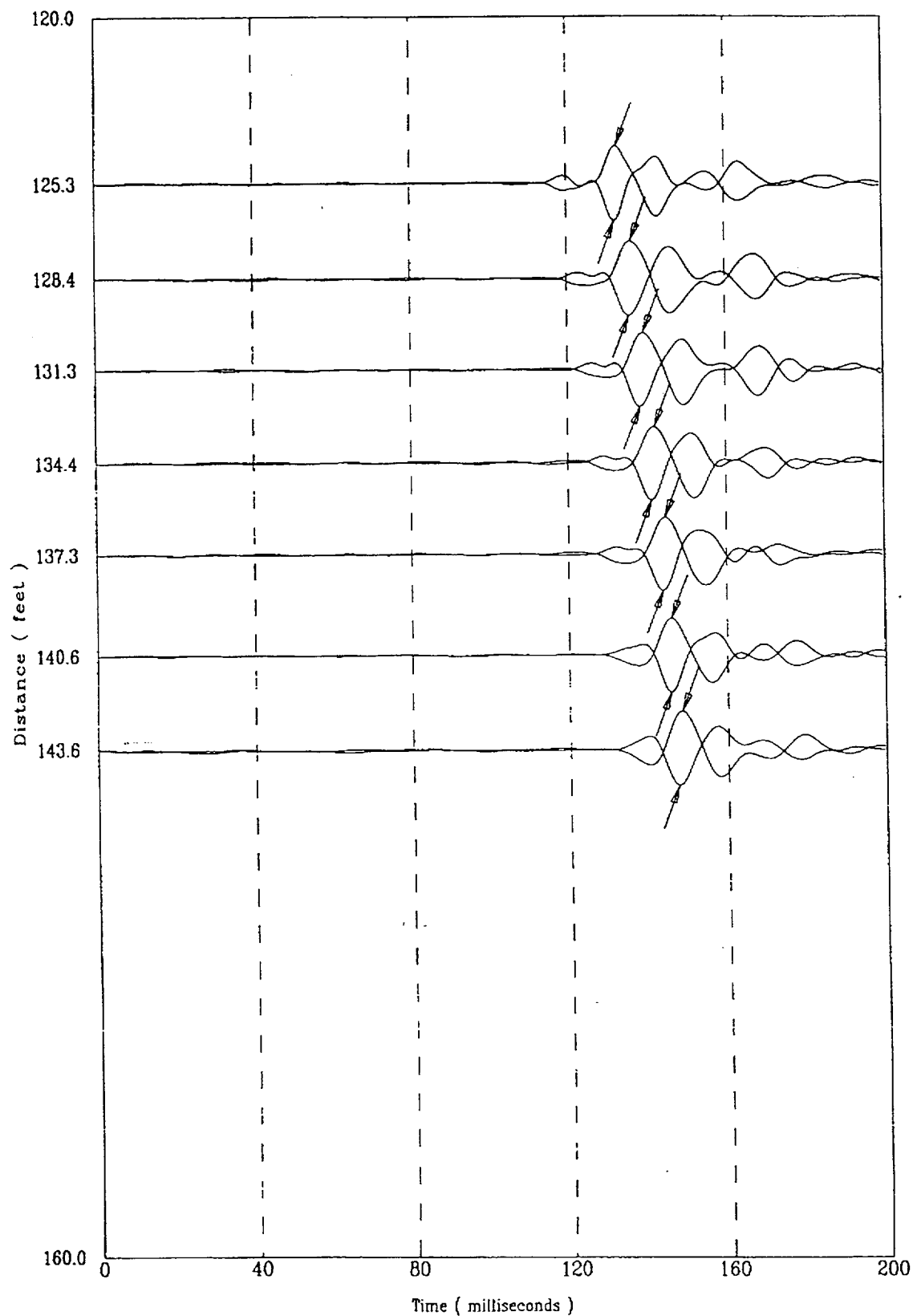


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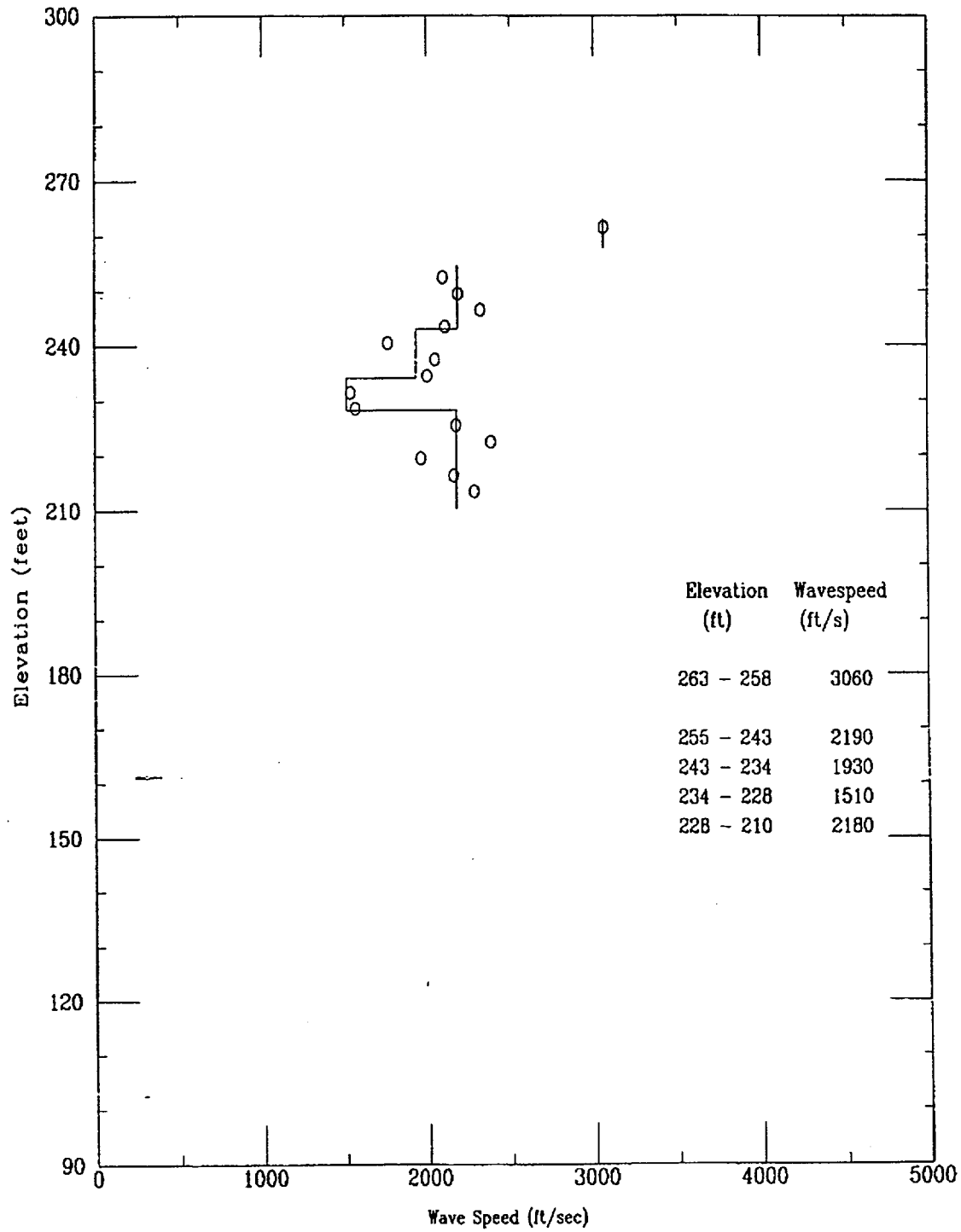
Applied Research Associates, Inc.
CPT-114

S Wave
02/19/98



5197804S

Compression Wave Speeds

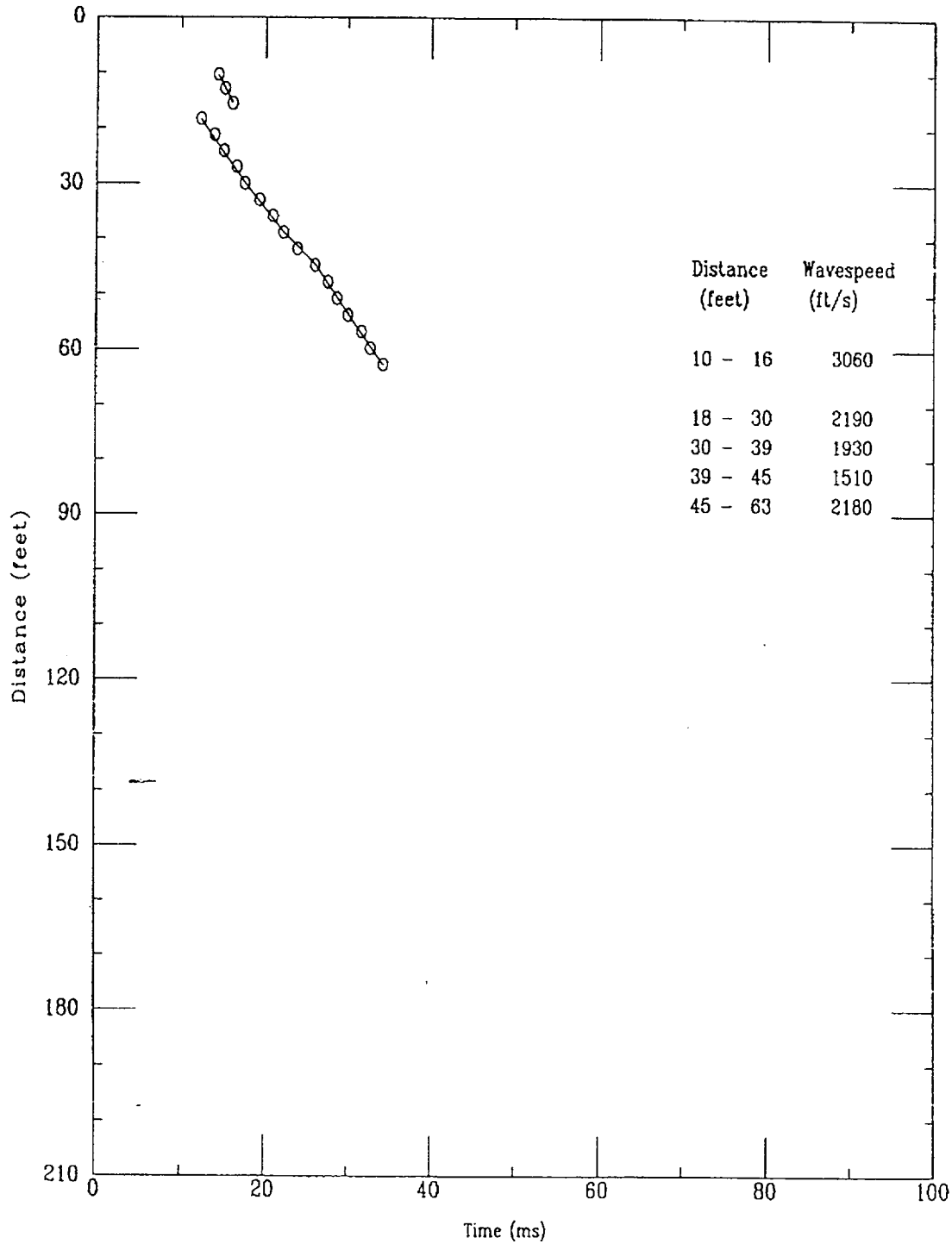


CPT-114

APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

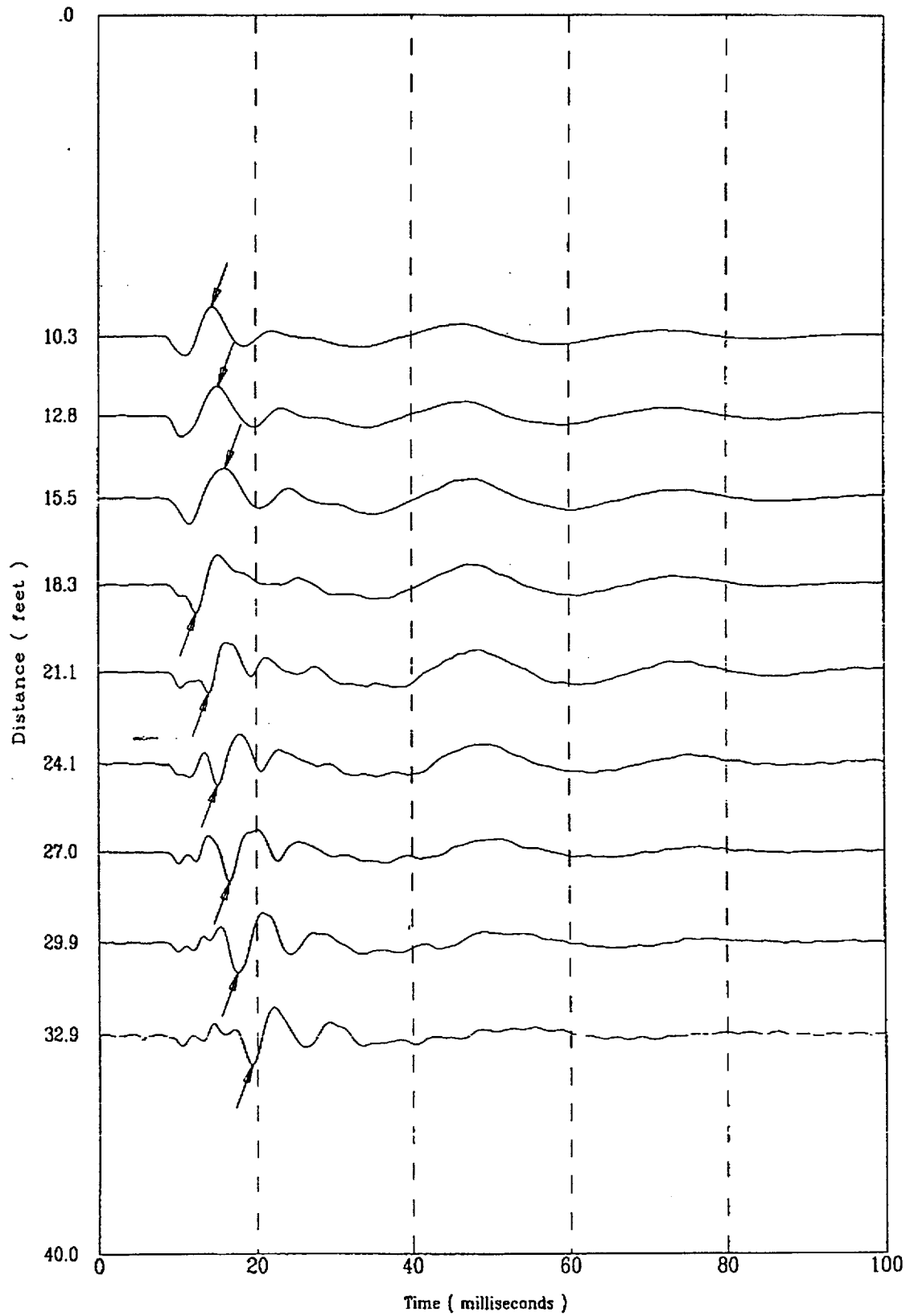
Compression Wave Time of Peak



File 519/0045

Applied Research Associates
CPT-114

P Wave
02/19/98

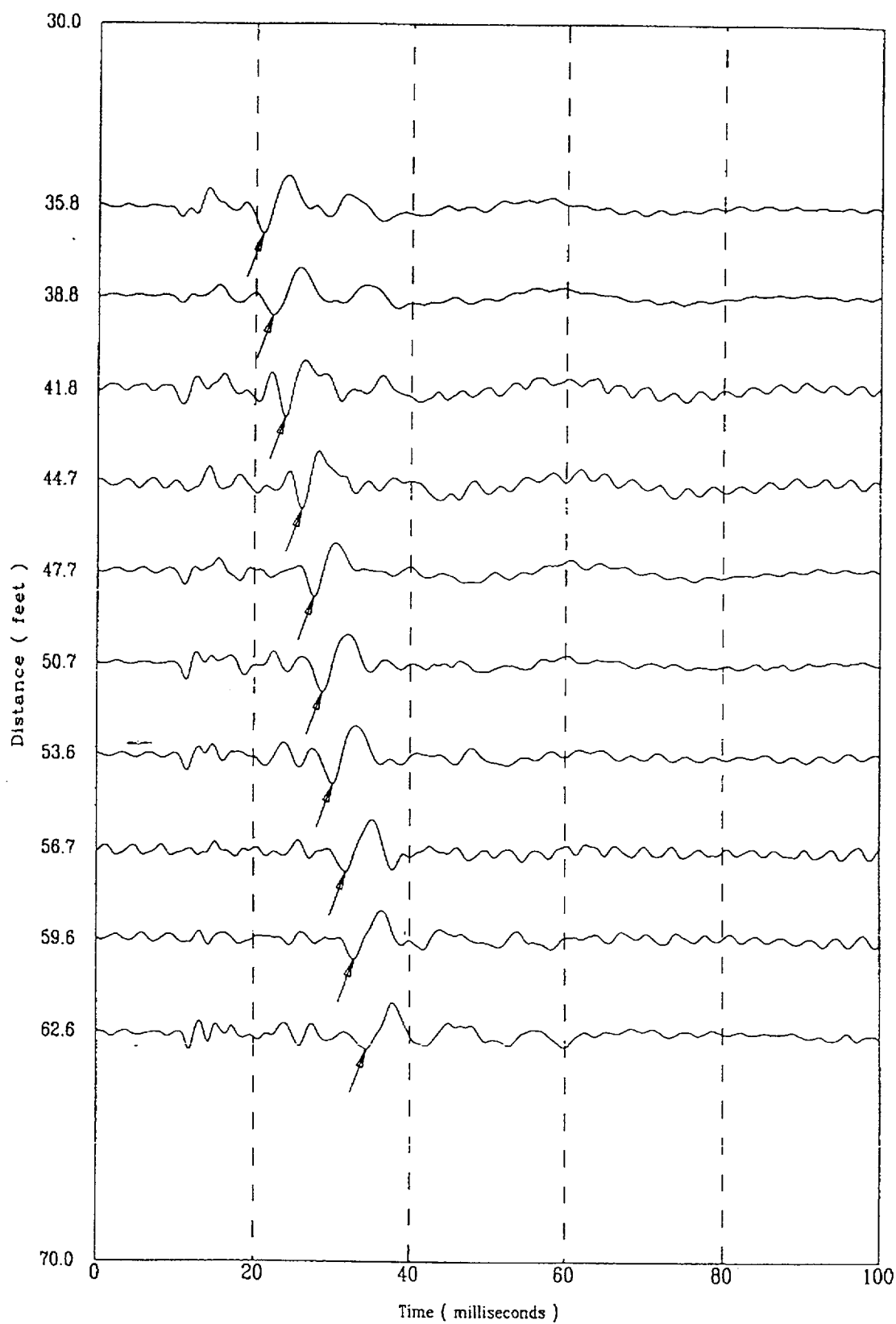


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P Wave
02/19/98



- 5191804S

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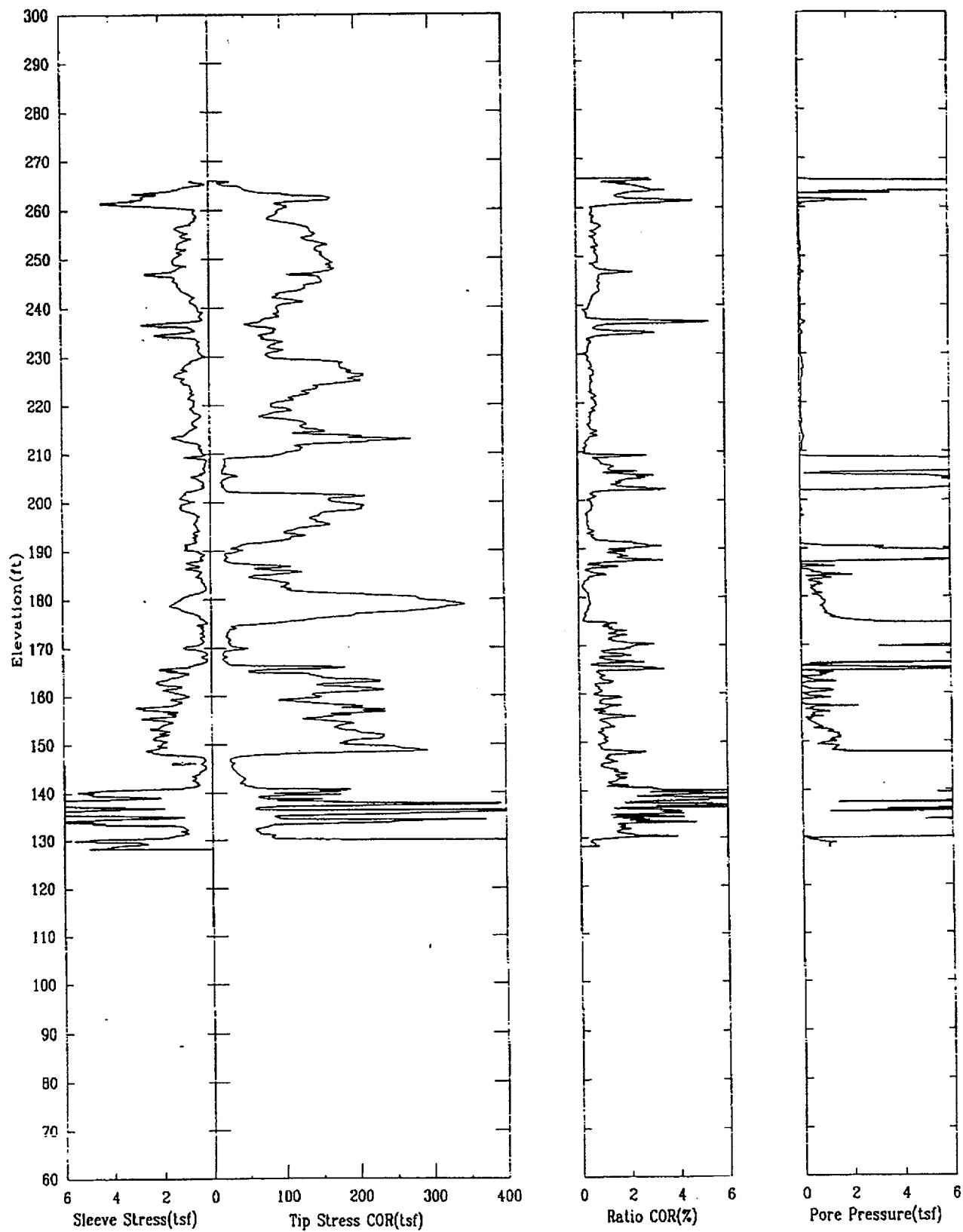
APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

North 79780.85

East 55125.05

Elevation 272.0



CPT-115

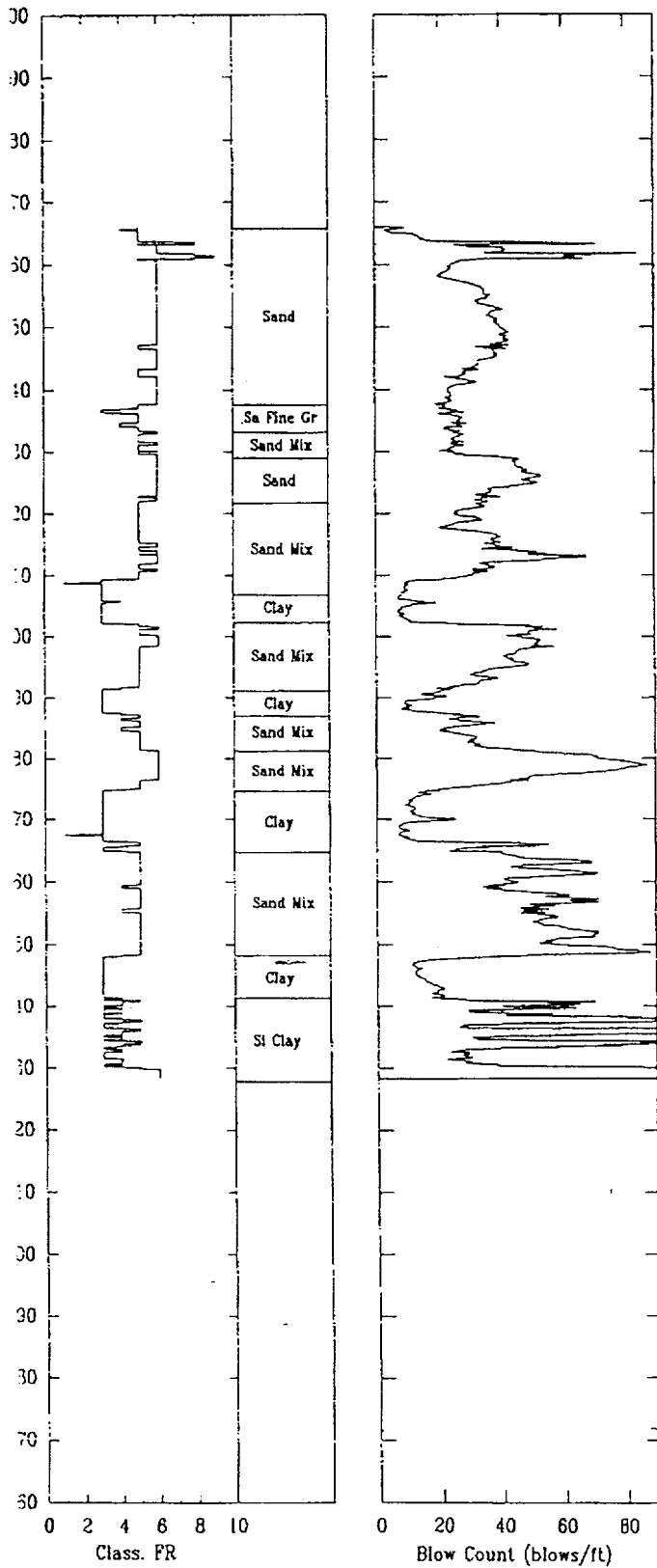
APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

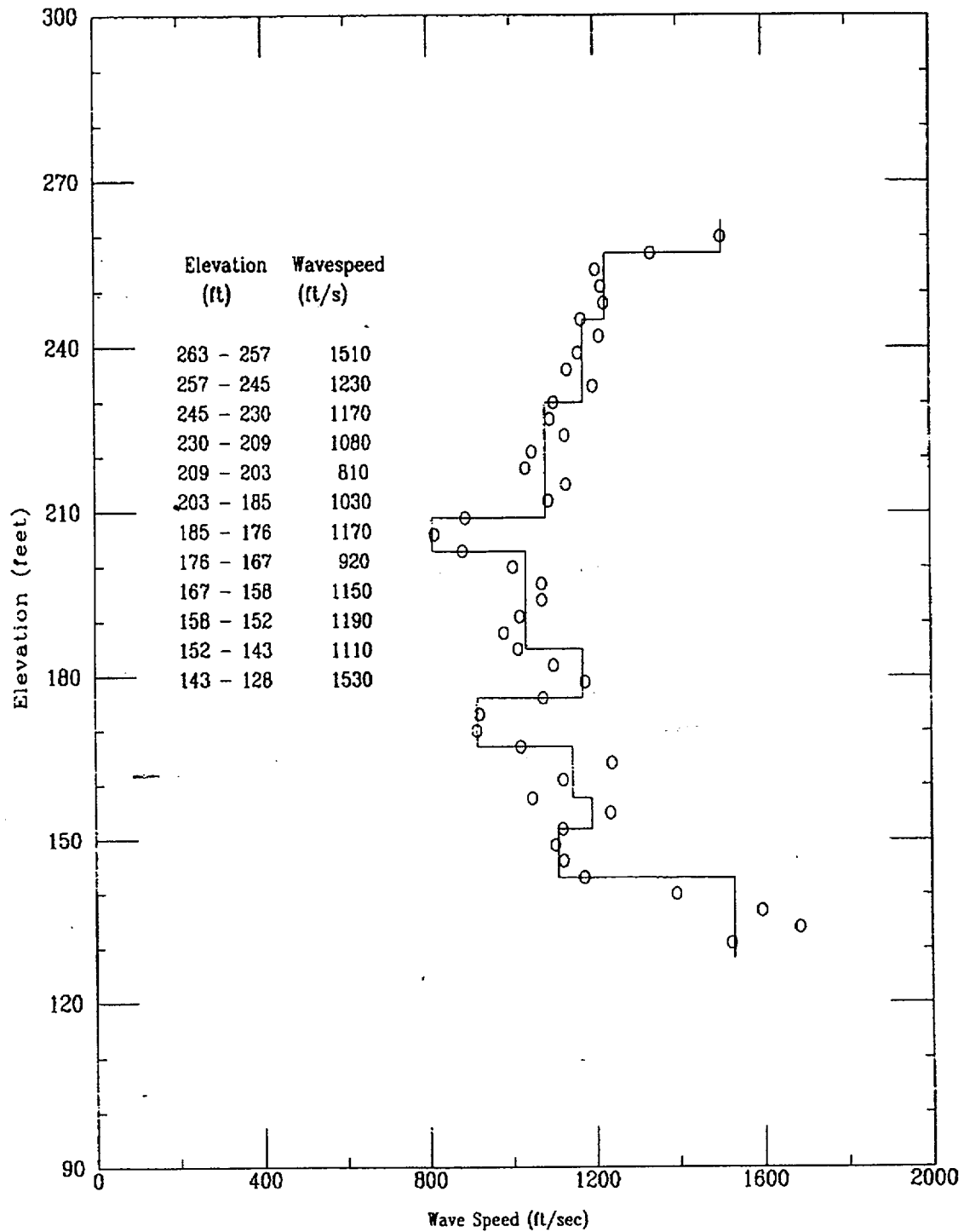
North 79780.85

East 55125.05

Elevation 272.0



Shear Wave Speeds

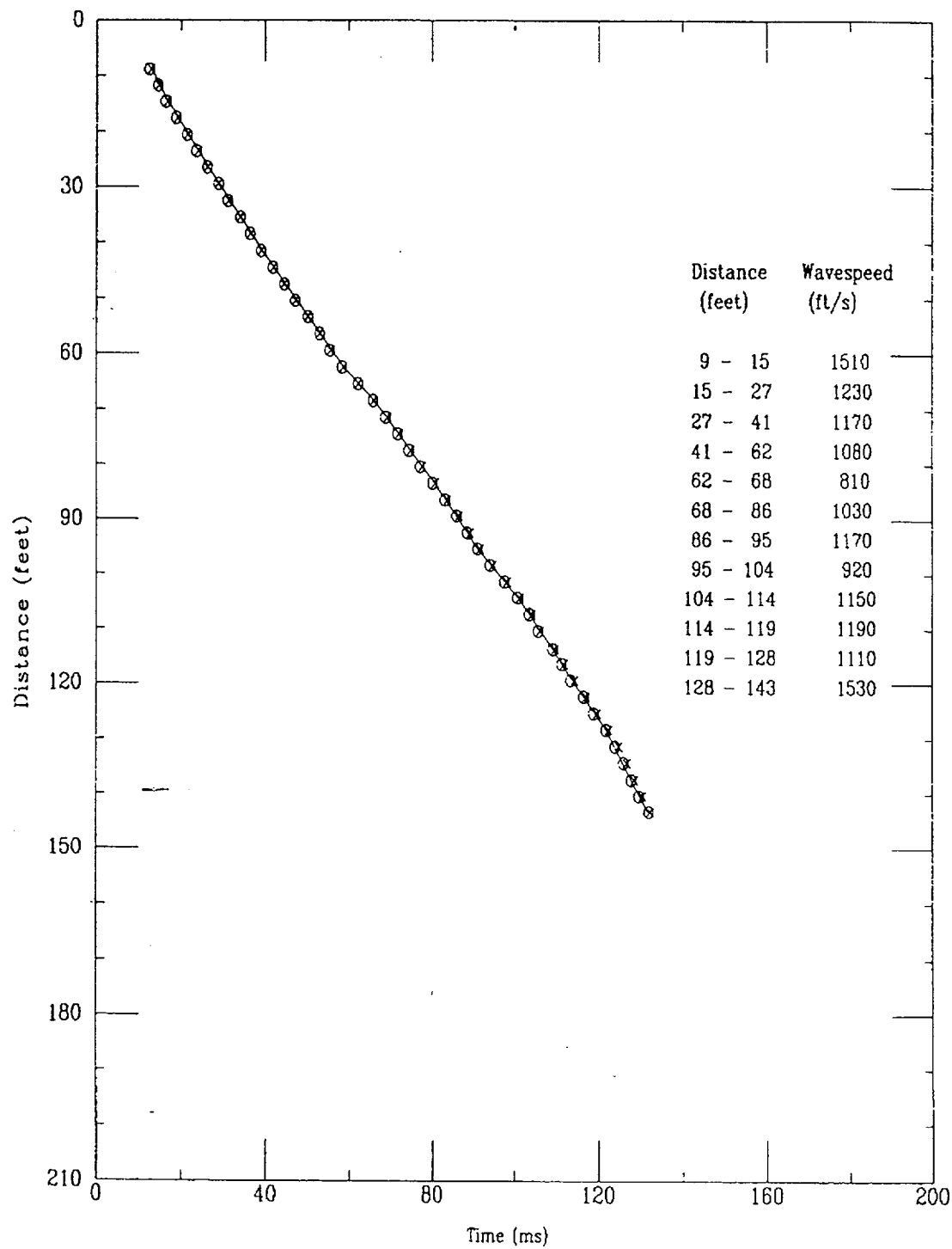


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APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

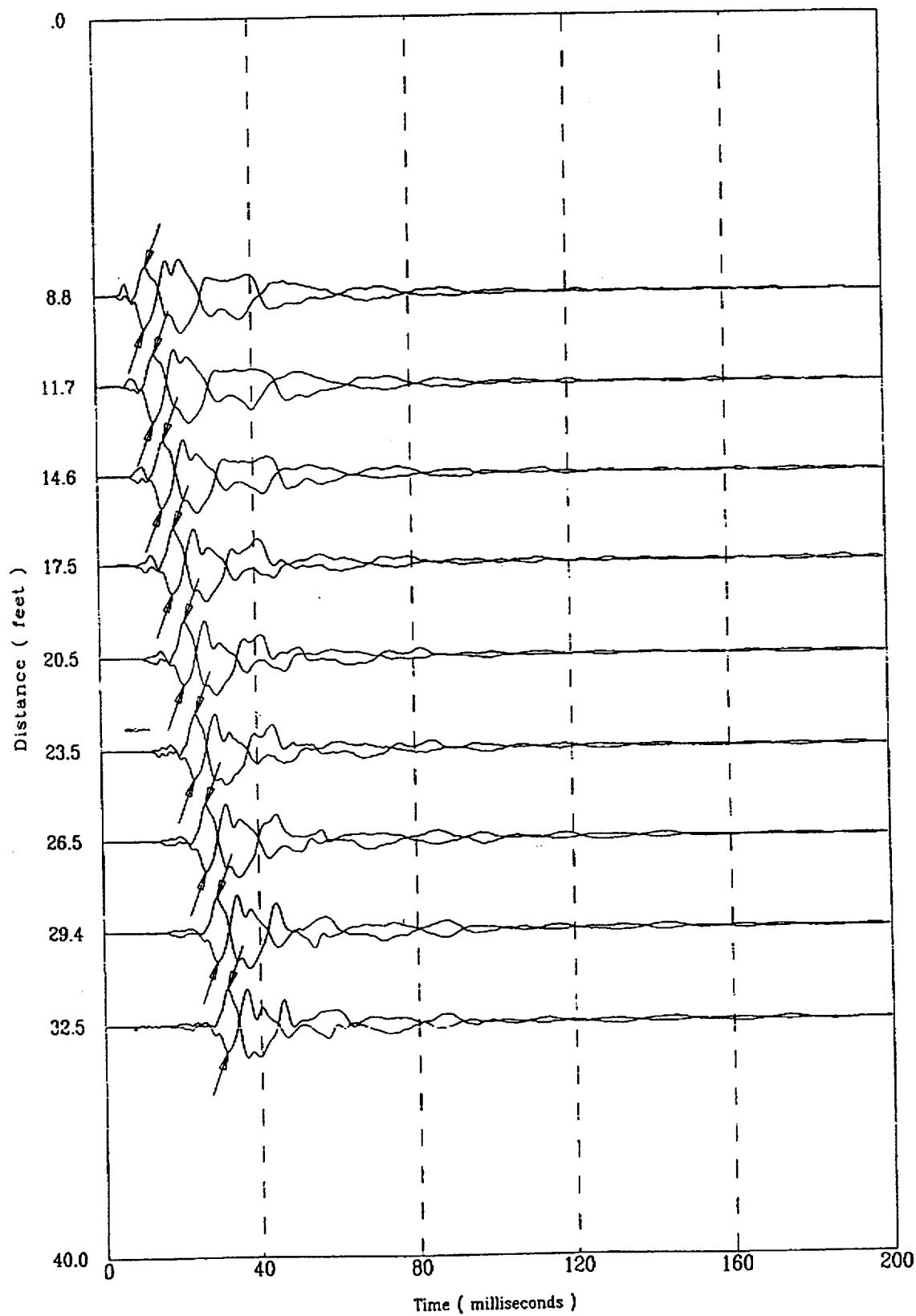
Shear Wave Time of Peak



File 520f801S

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CPT-115

S Wave
02/20/98

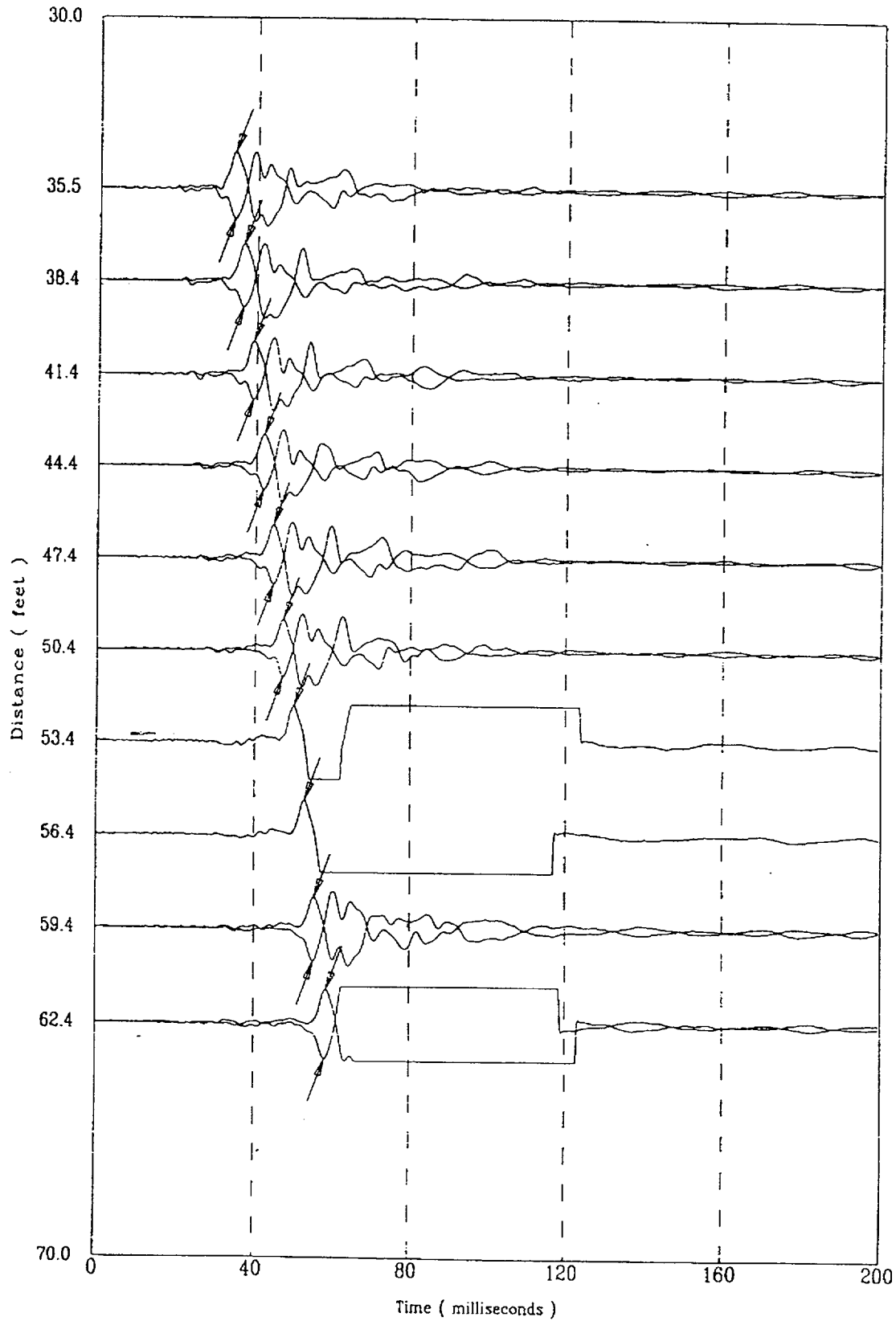


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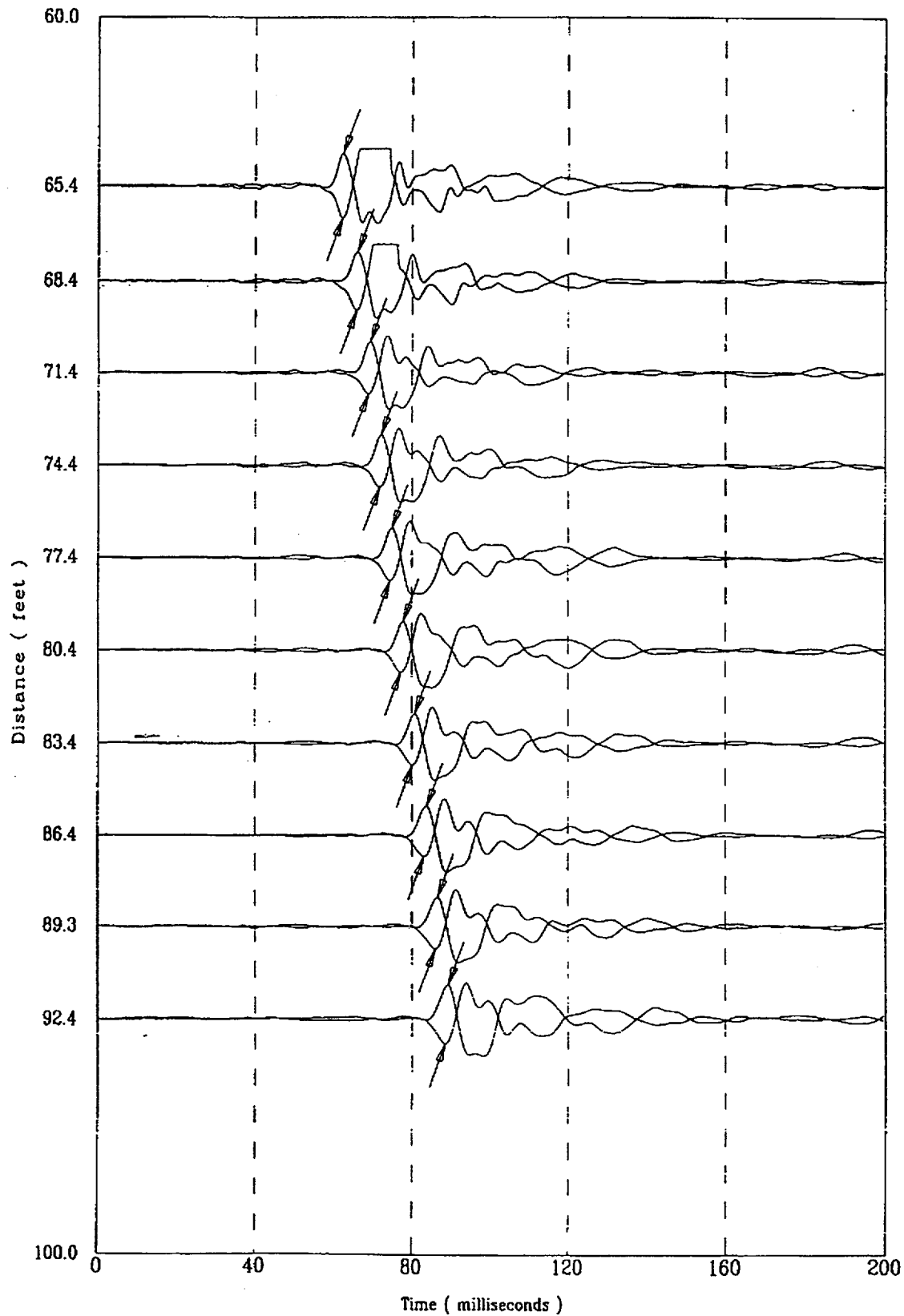
S Wave
02/20/98



5201801S

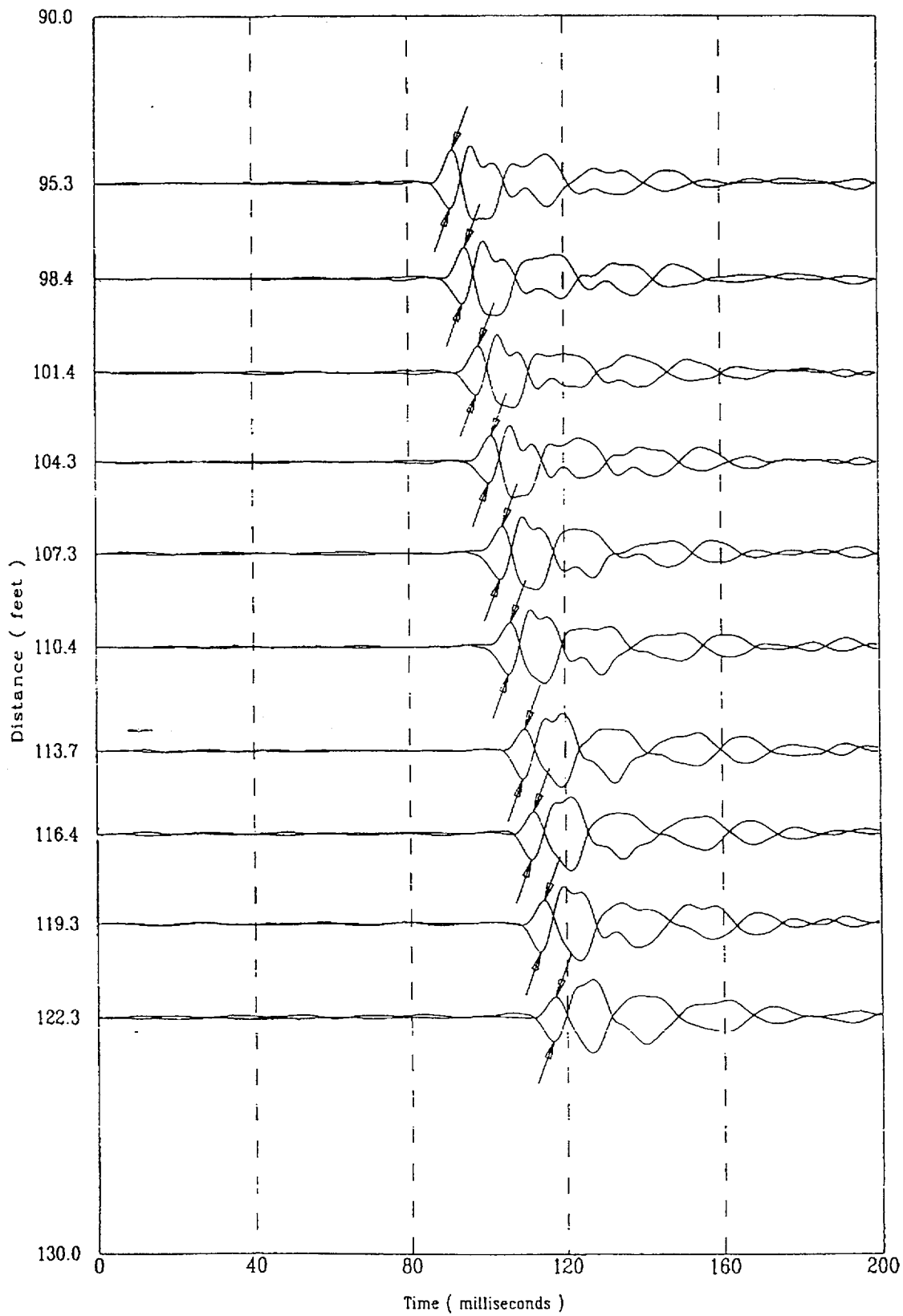
Applied Research Associates, Inc.
CPT-115

S Wave
02/20/98



Applied Research Associates, Inc.
CPT-115

S Wave
02/20/98

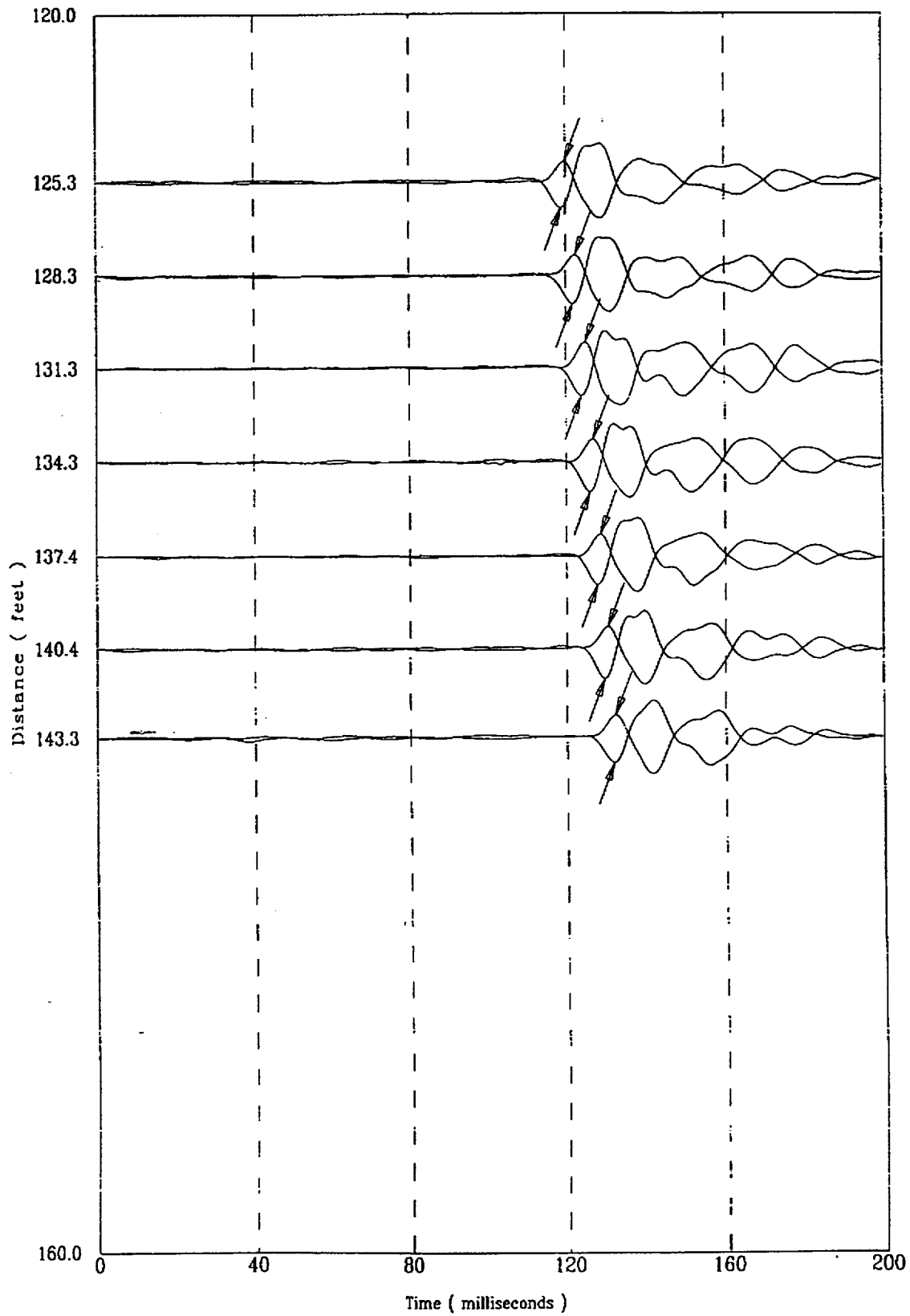


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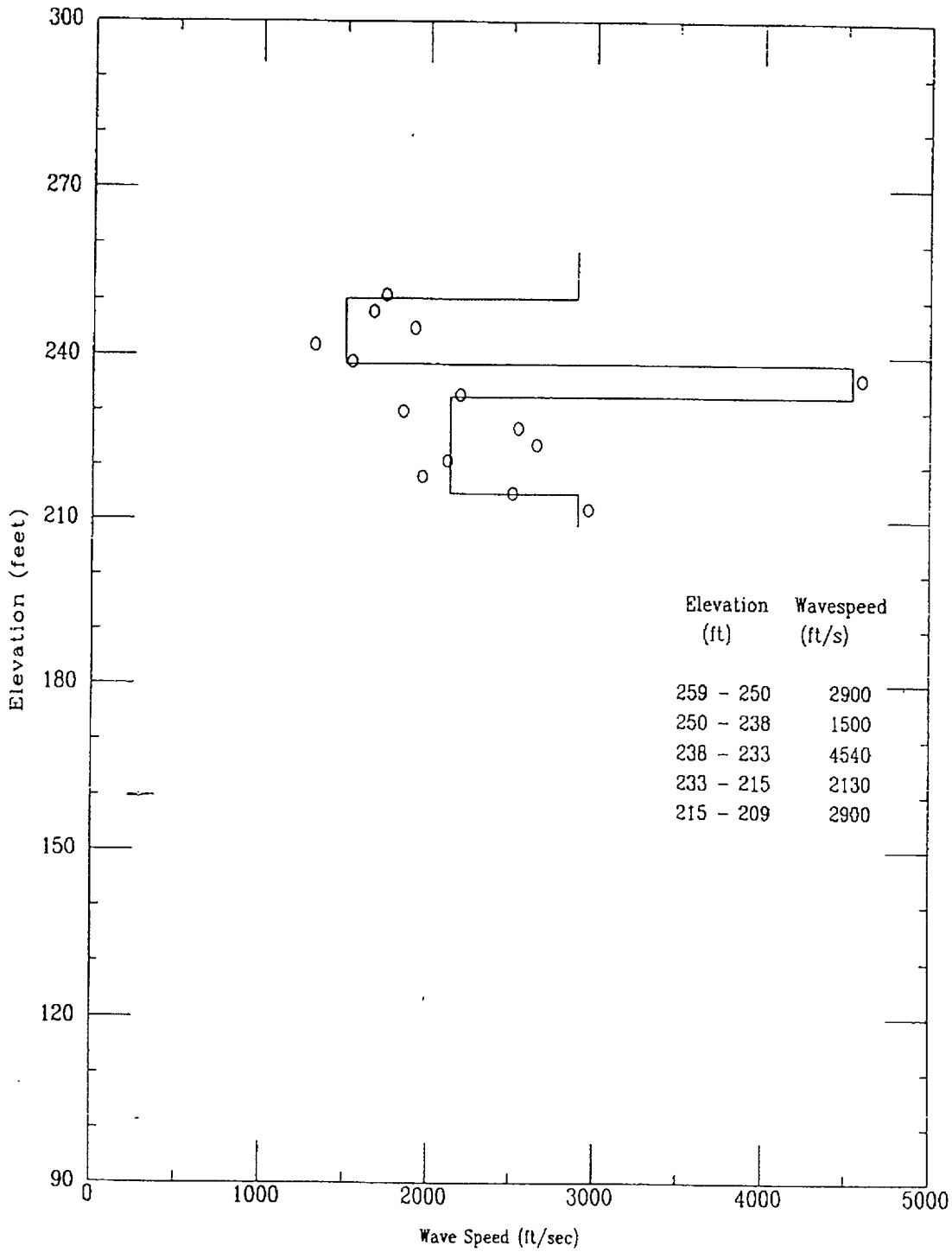
Applied Research Associates, Inc.
CPT-115

S Wave
02/20/98



5201801S

Compression Wave Speeds

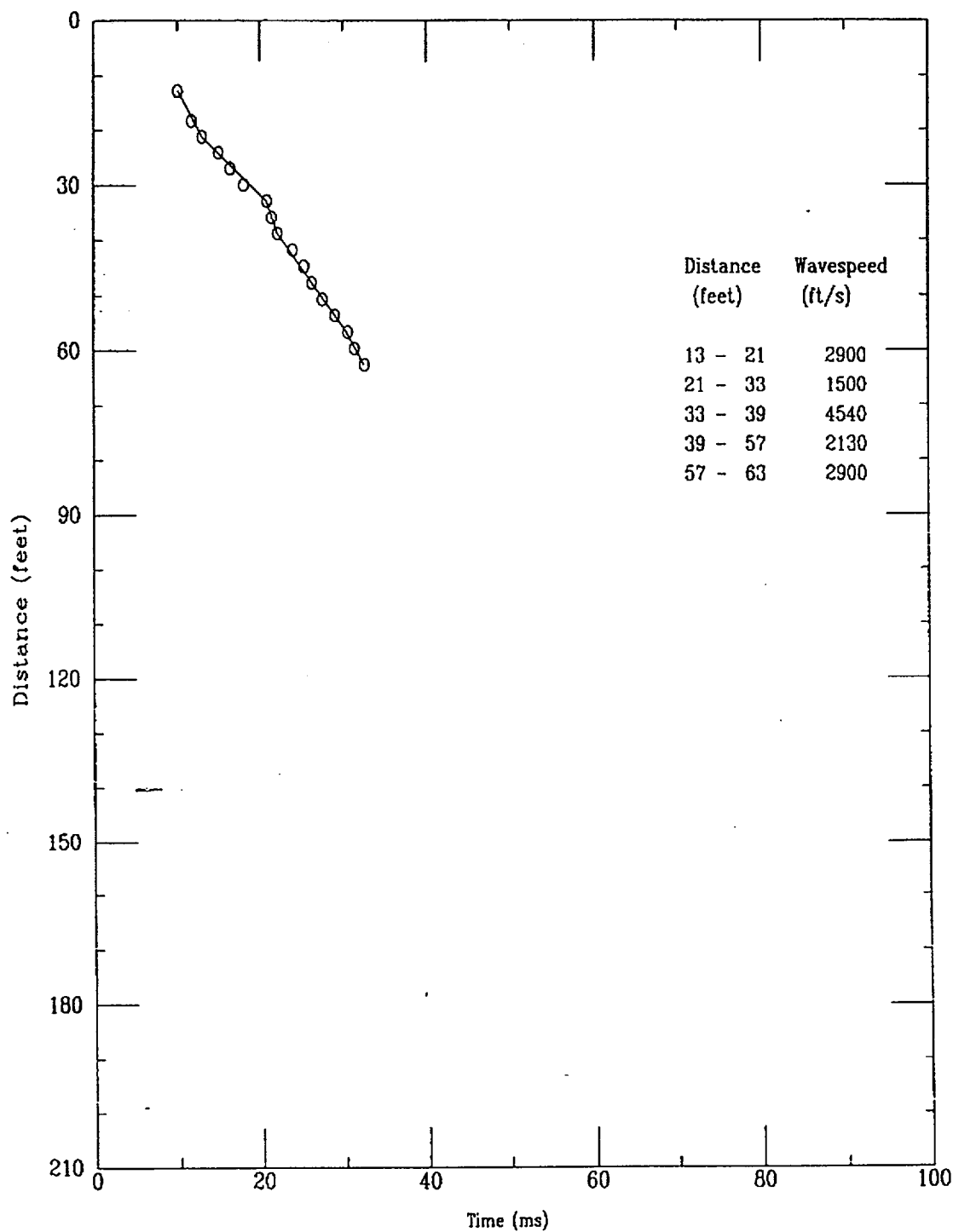


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APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

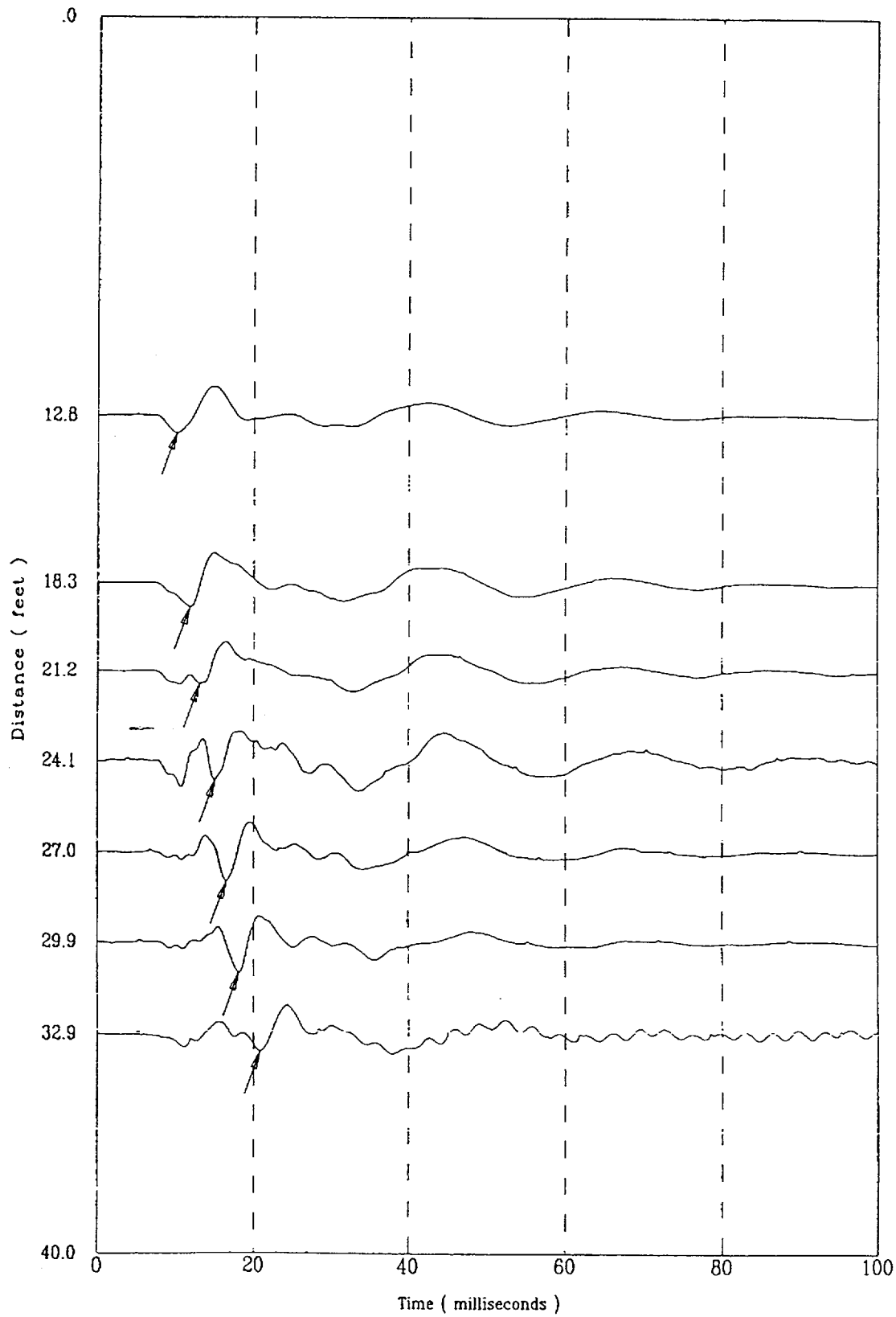
Compression Wave Time of Peak



Distance (feet)	Wavespeed (ft/s)
13 - 21	2900
21 - 33	1500
33 - 39	4540
39 - 57	2130
57 - 63	2900

Applied Research Associates
CPT-115

P Wave
02/20/98



5201801S

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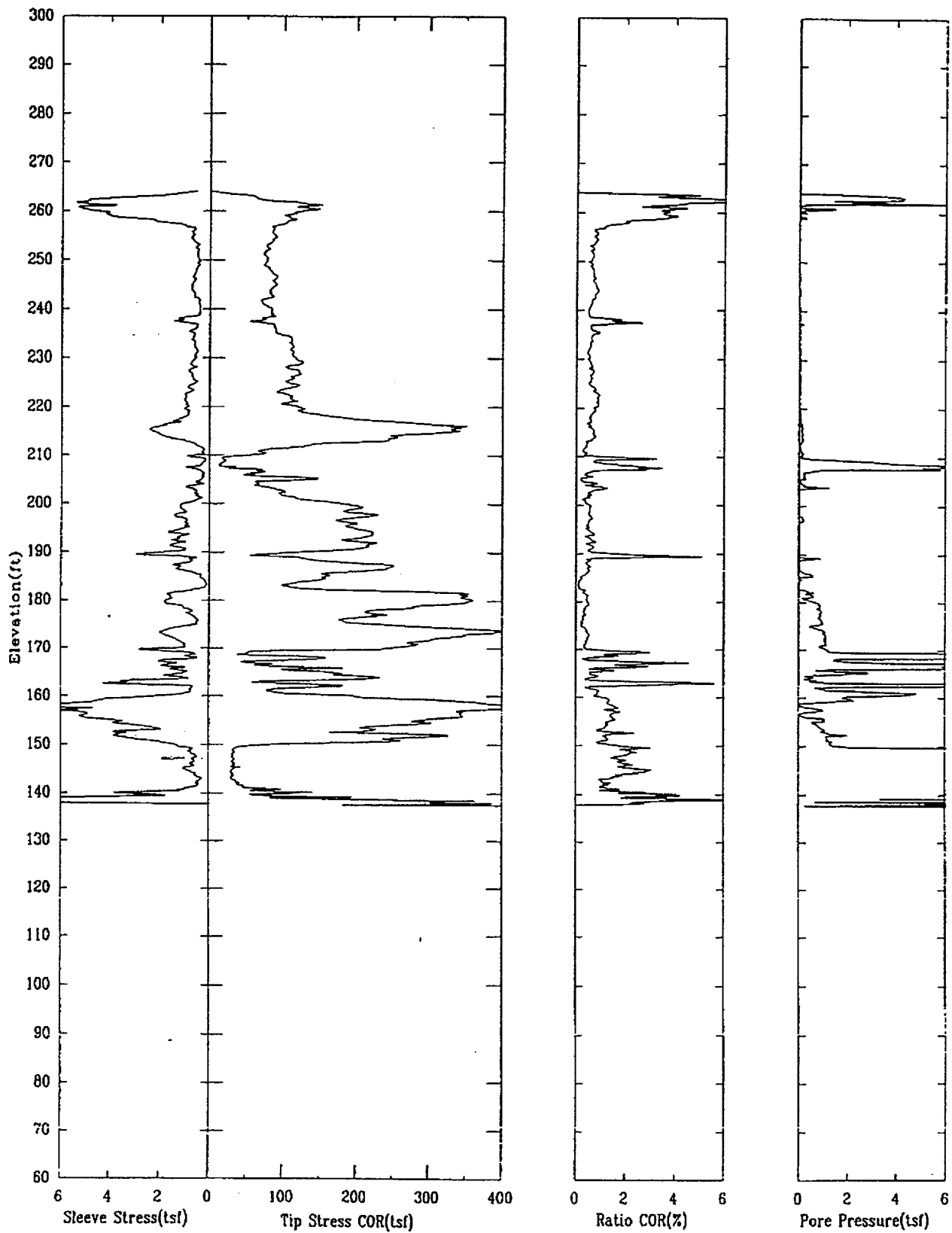
APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

North 79781.17

East 55261.01

Elevation 270.1



CPT-116

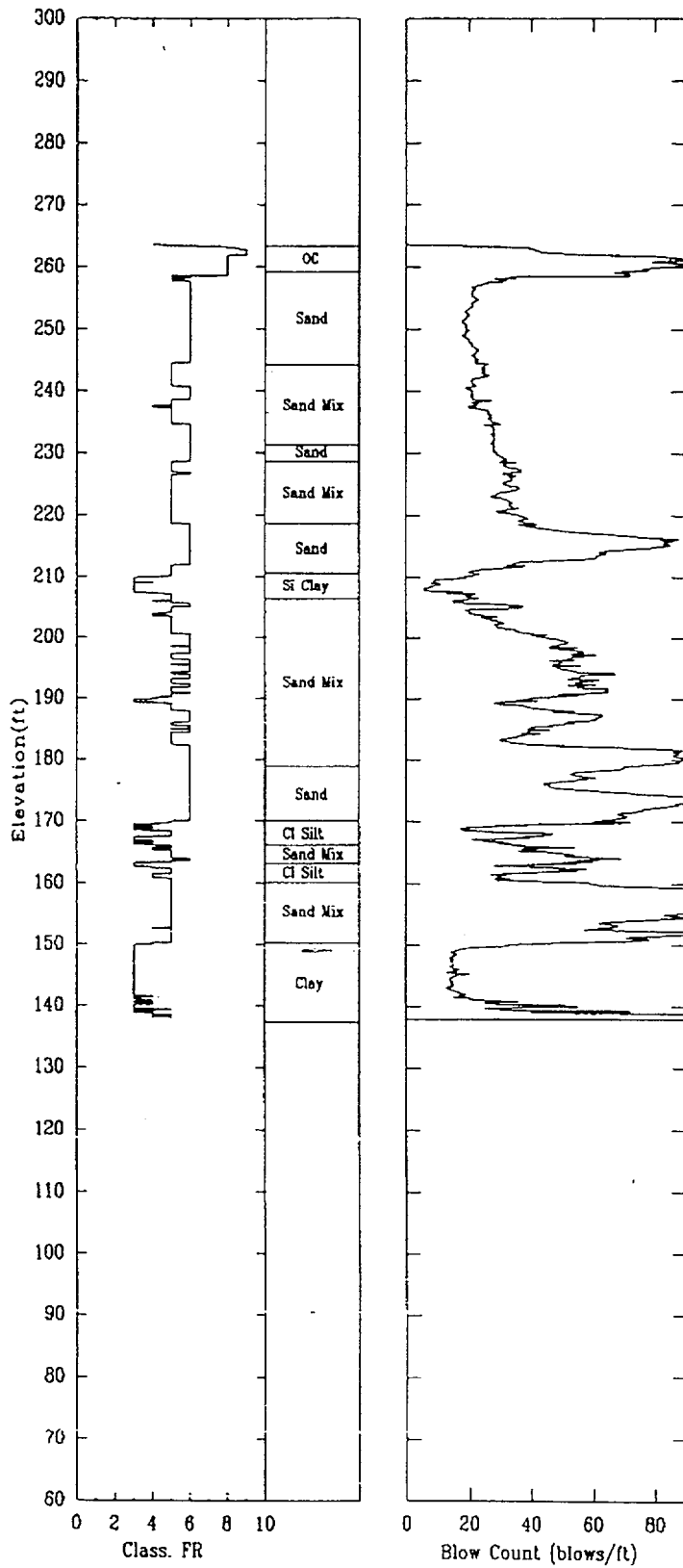
APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

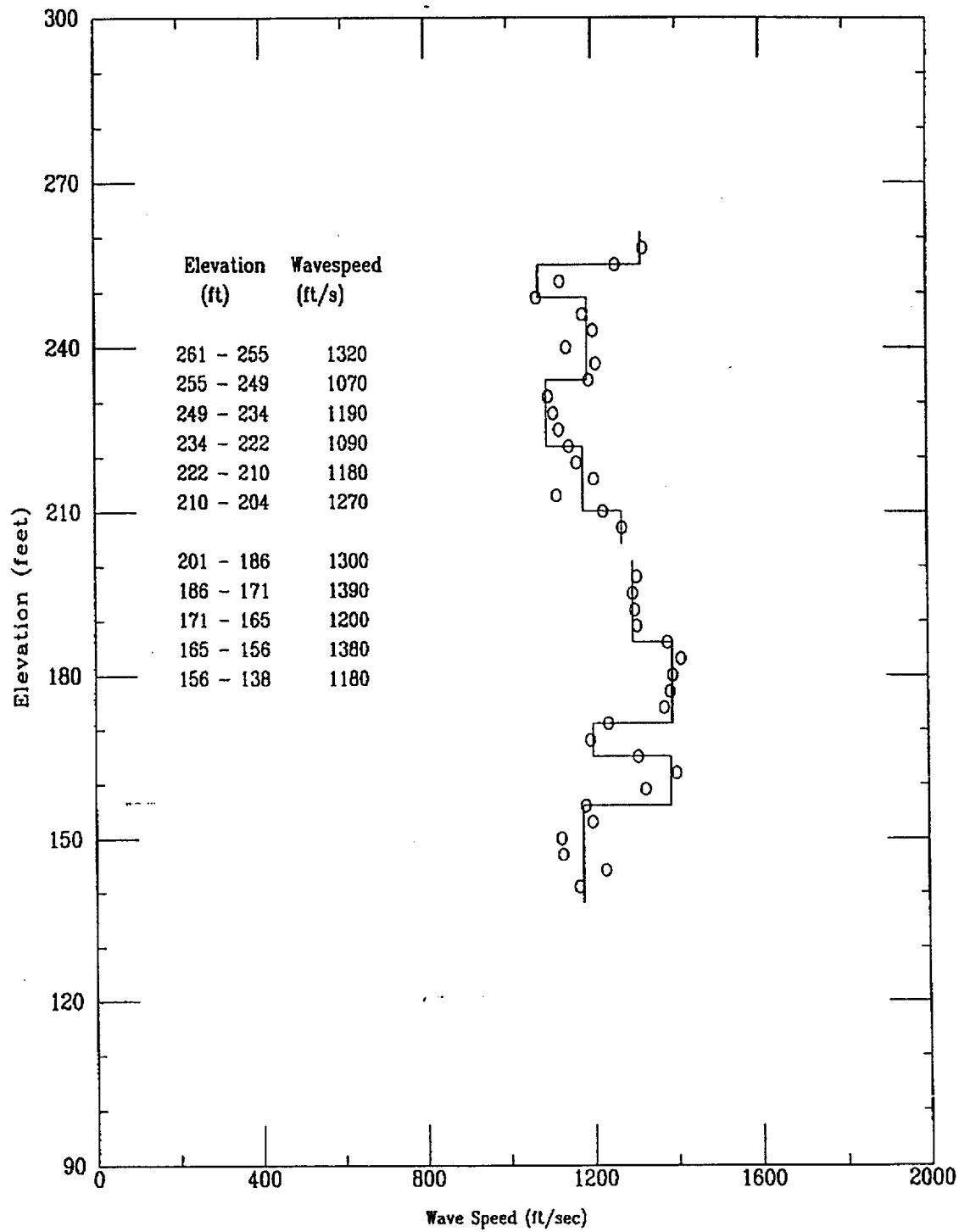
— North 79781.17

East 55261.01

Elevation 270.1



Shear Wave Speeds

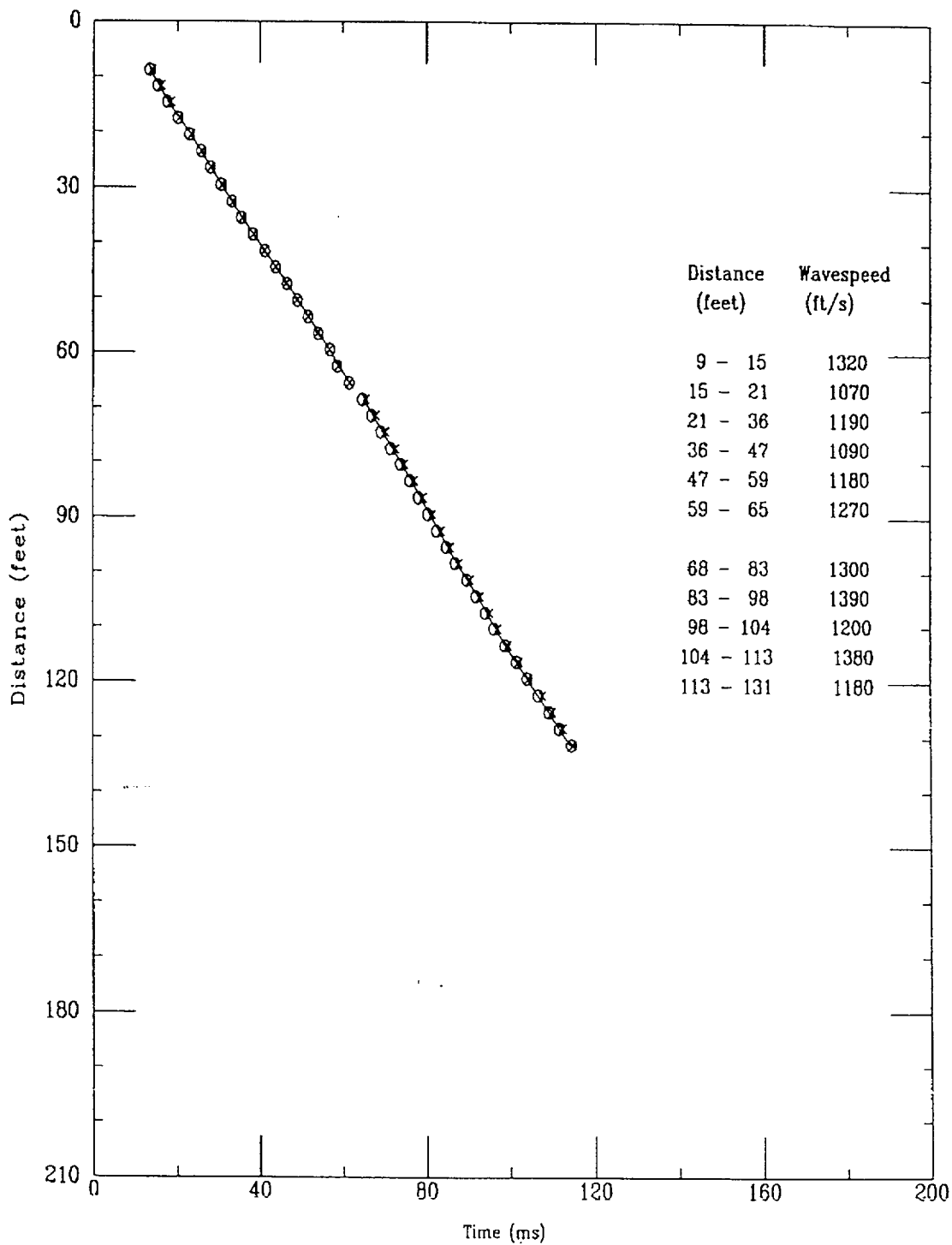


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APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

Shear Wave Time of Peak

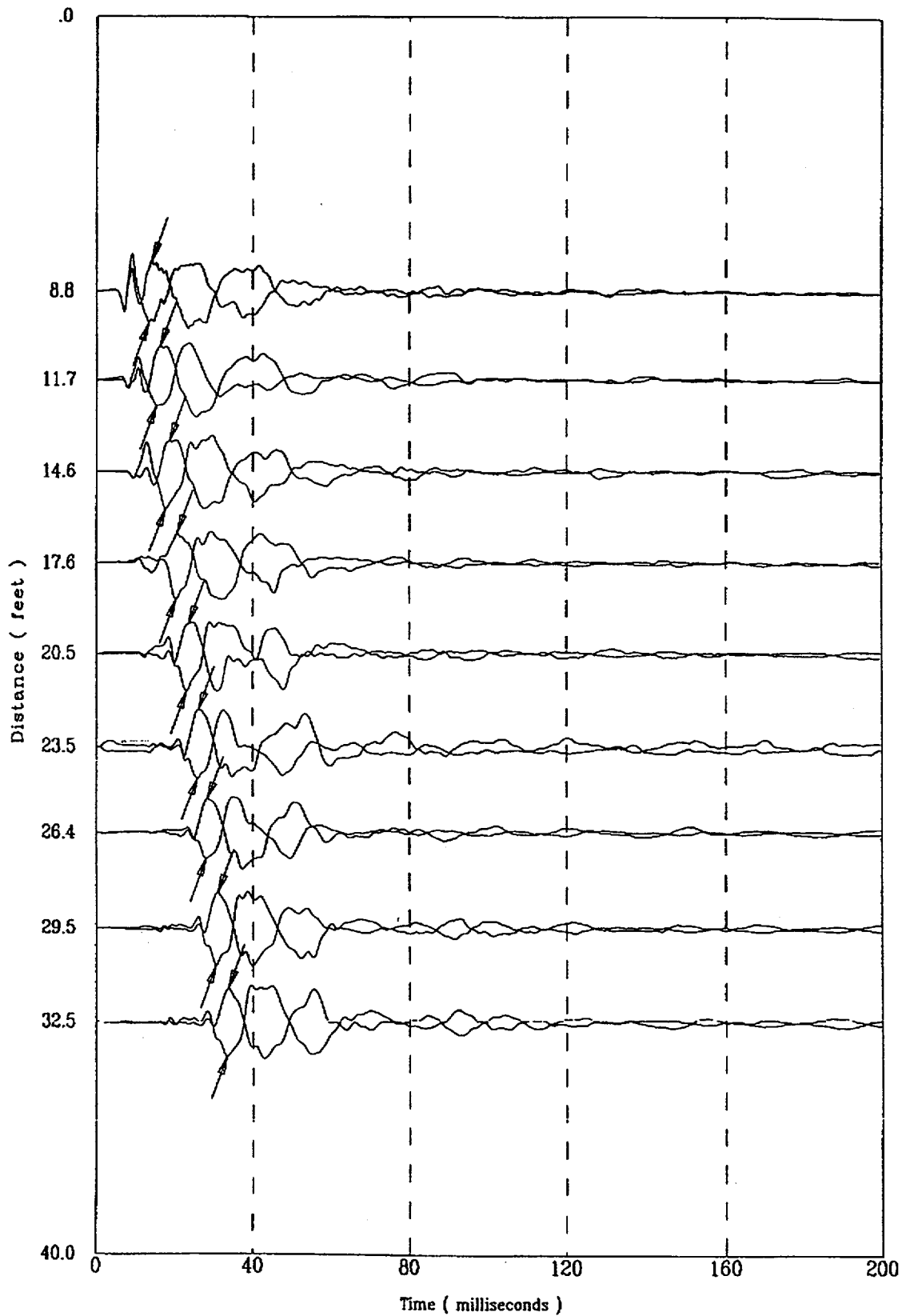


File 520r803S

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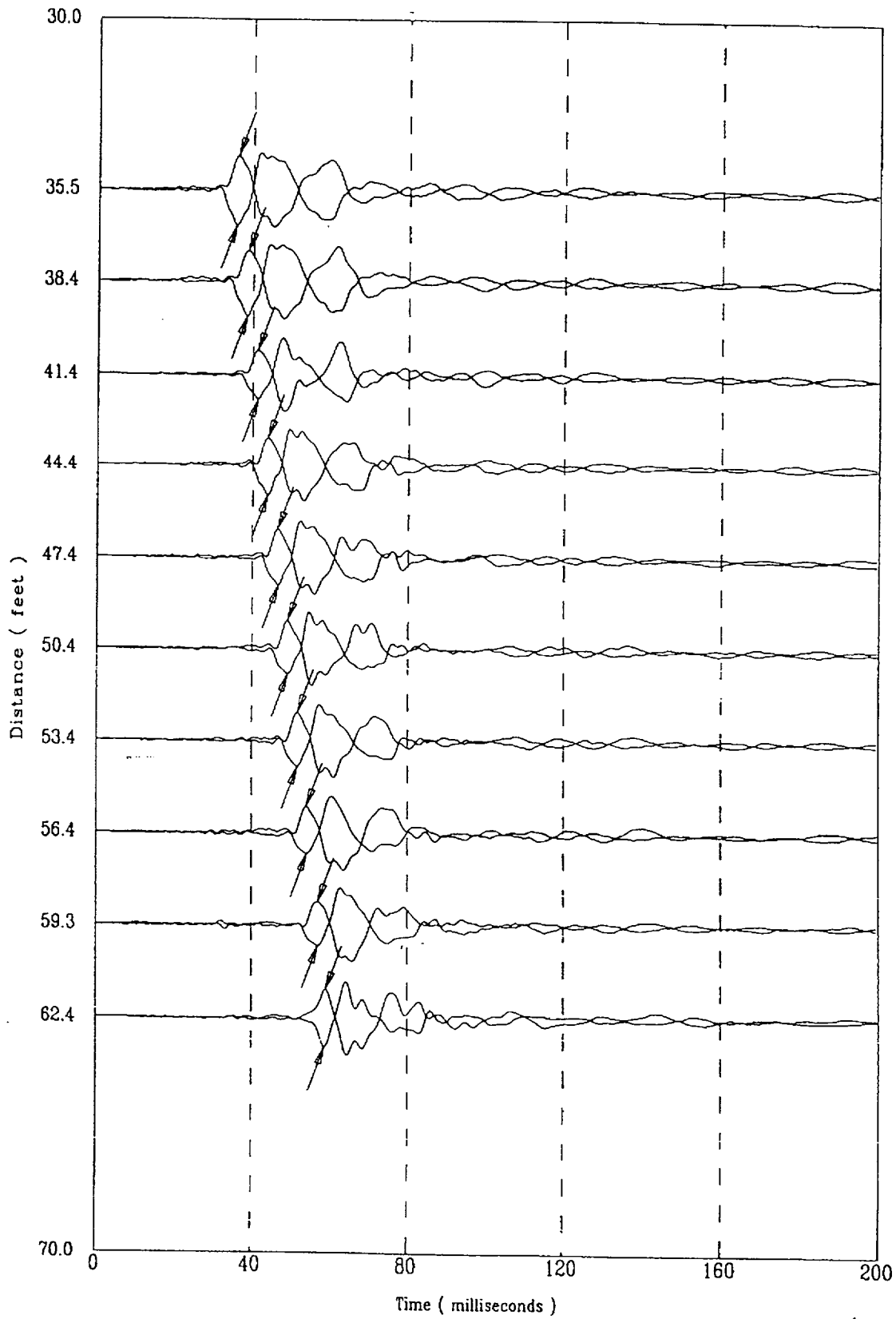
Applied Research Associates, Inc.
CPT-116

S Wave
02/20/98



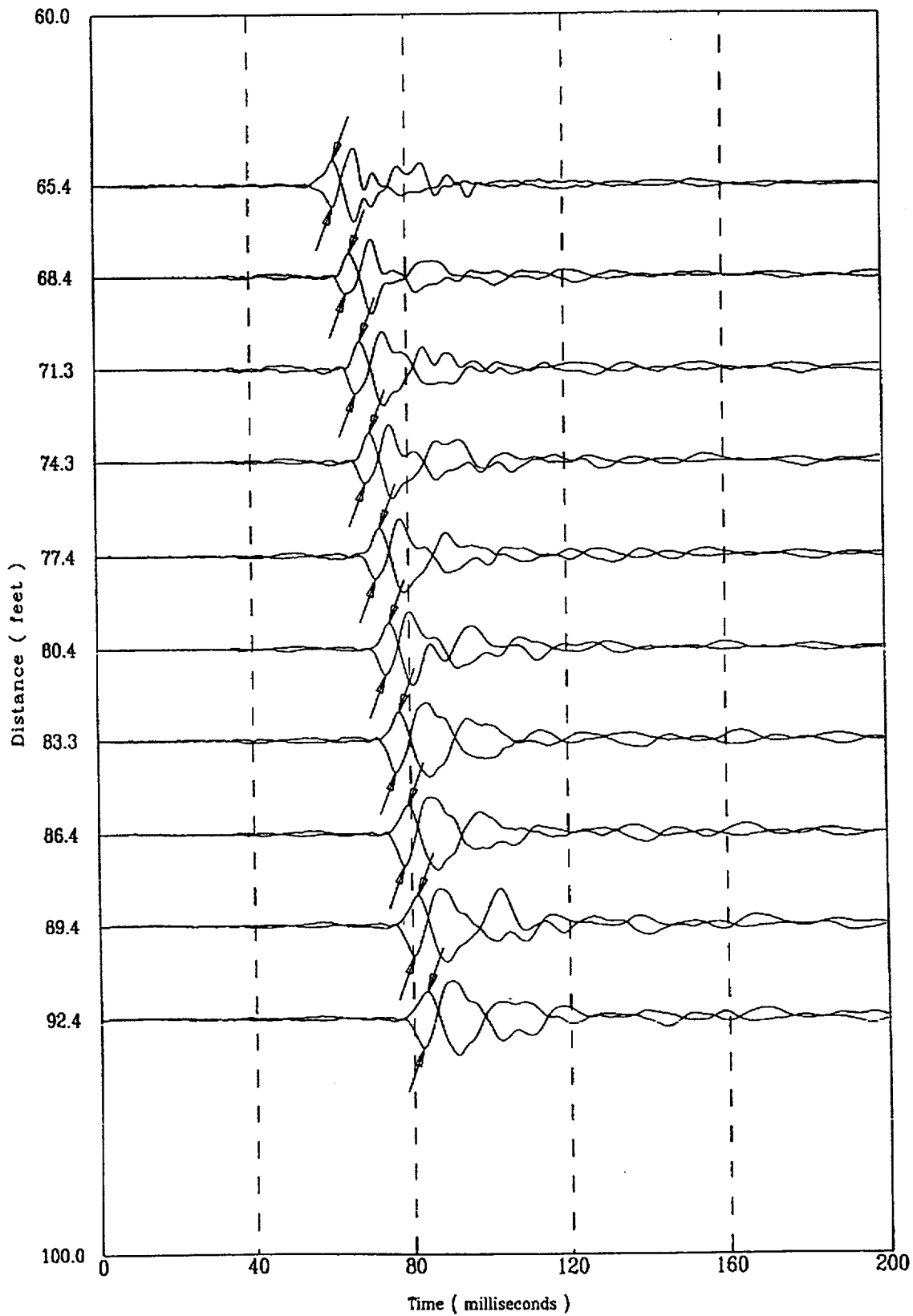
File 520f803S

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S Wave
02/20/98

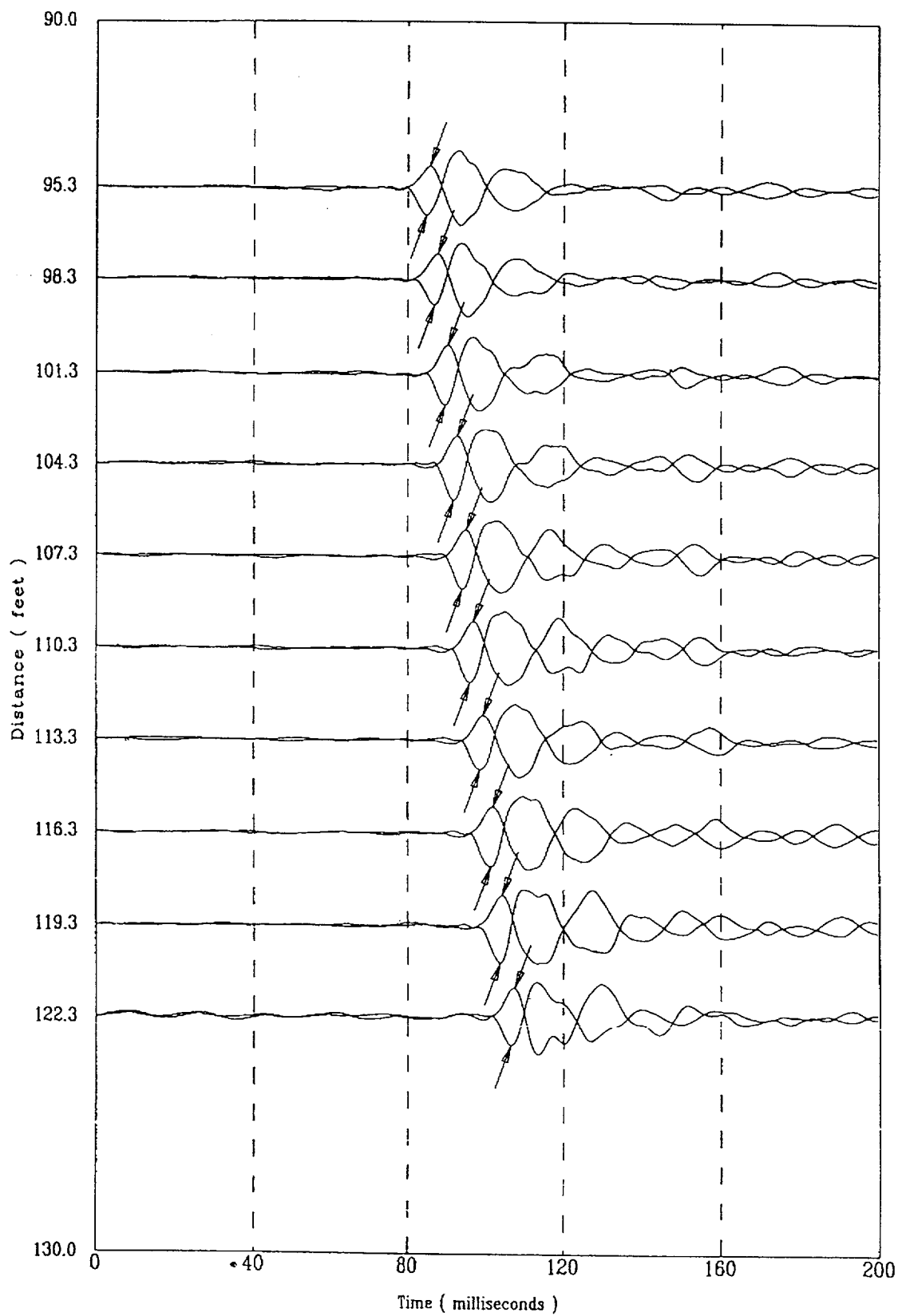


File 5201803S

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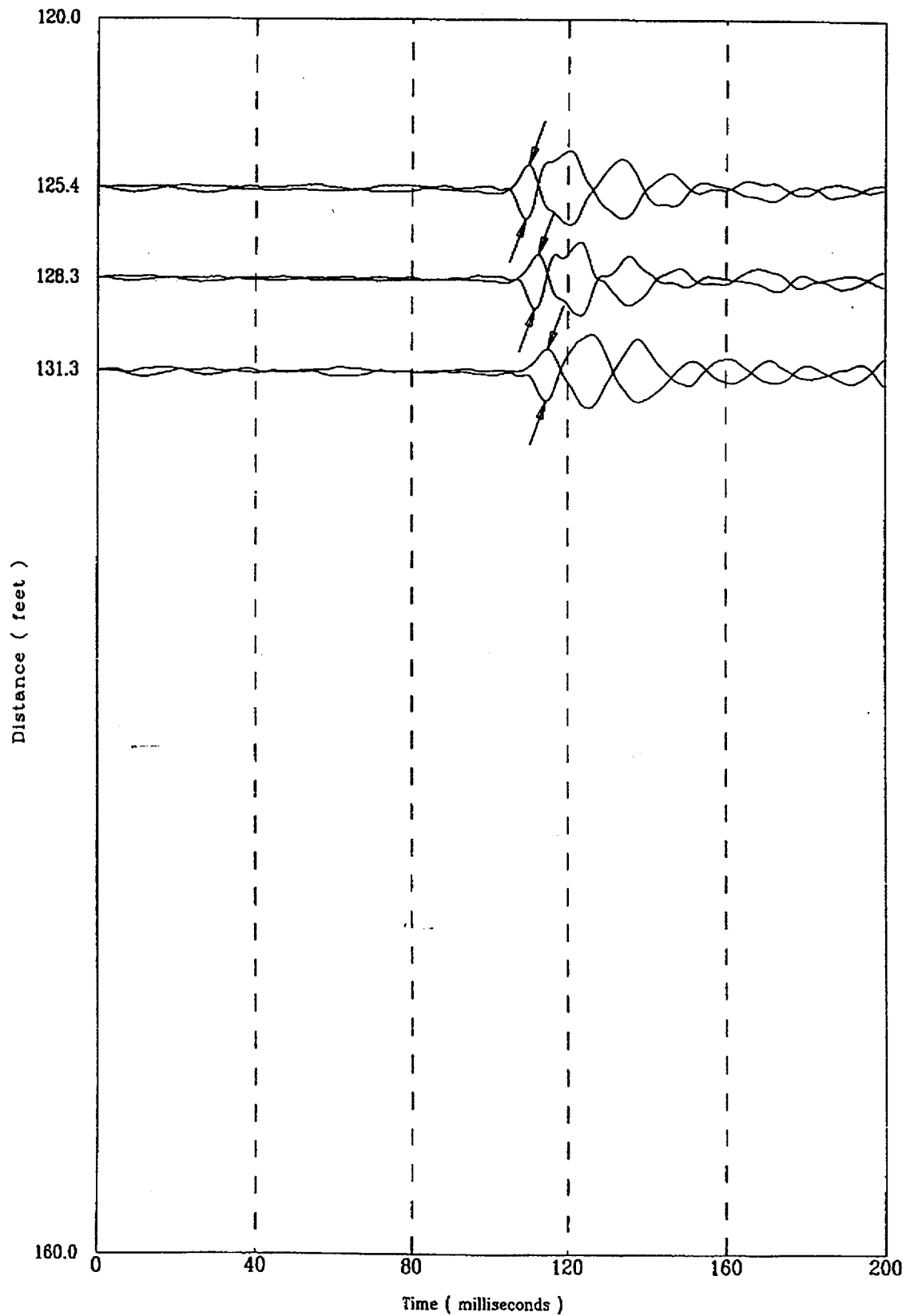
Applied Research Associates, Inc.
CPT-116

S Wave
02/20/98



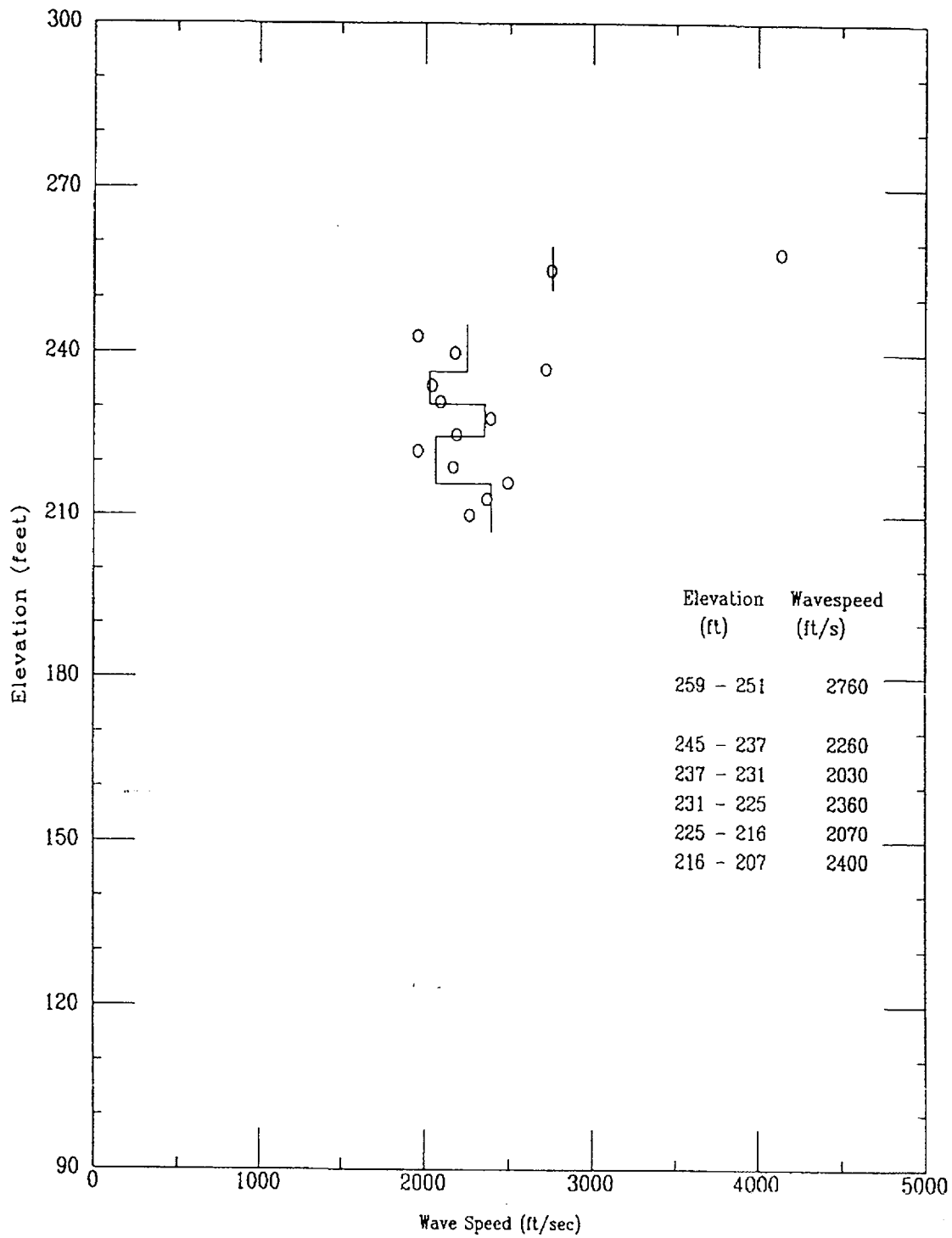
Applied Research Associates, Inc.
CPT-116

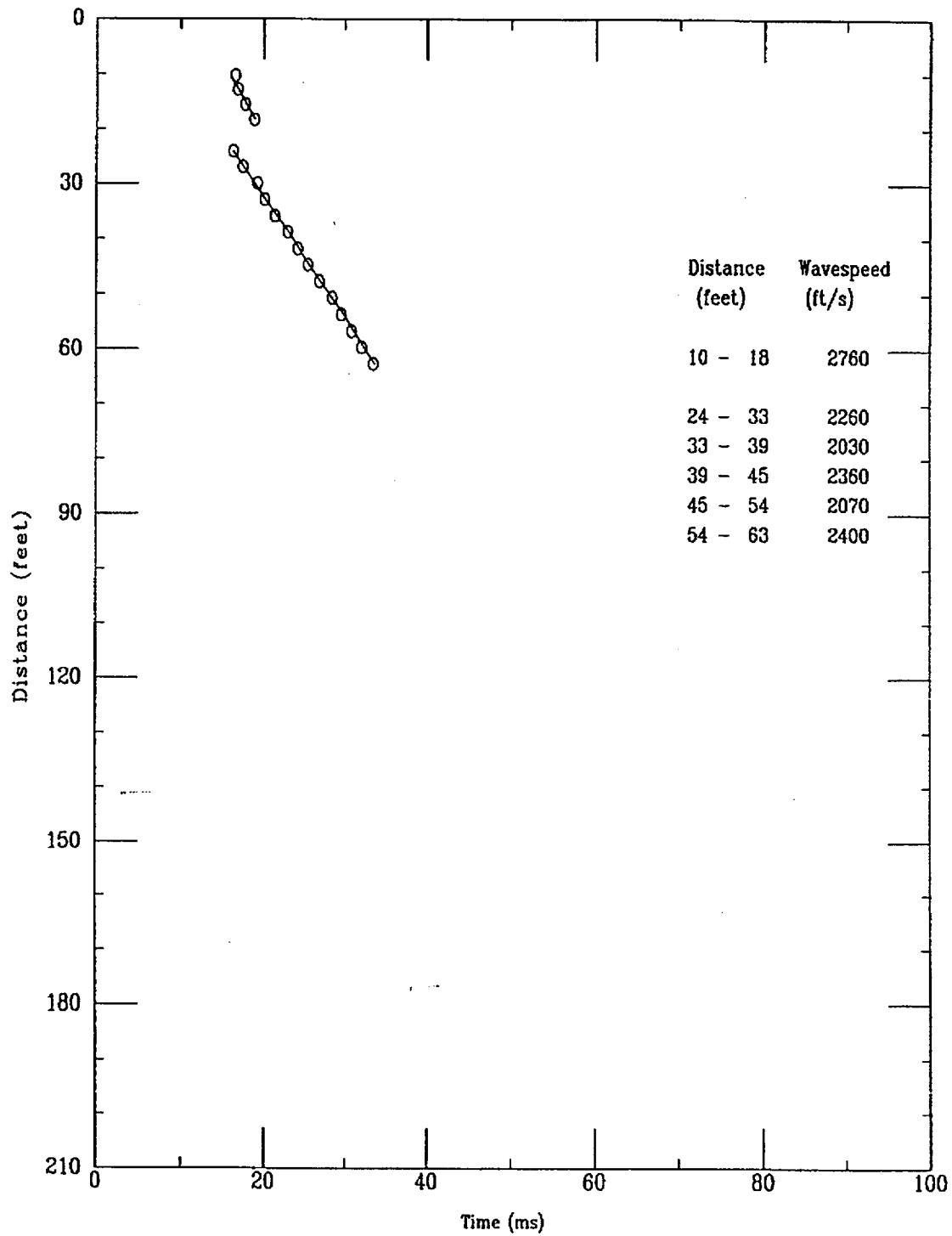
S Wave
02/20/98



File 0201803S

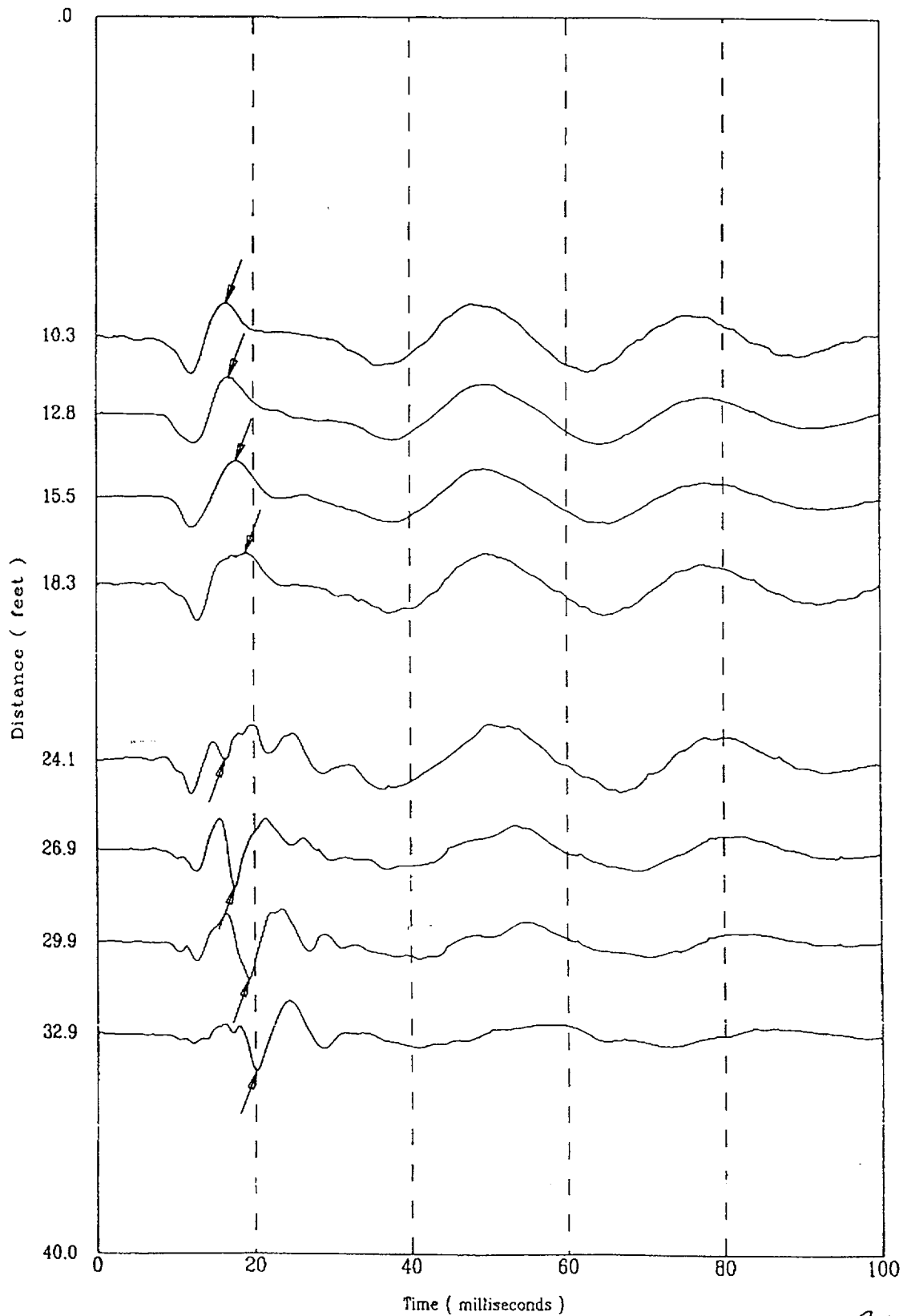
Compression Wave Speeds

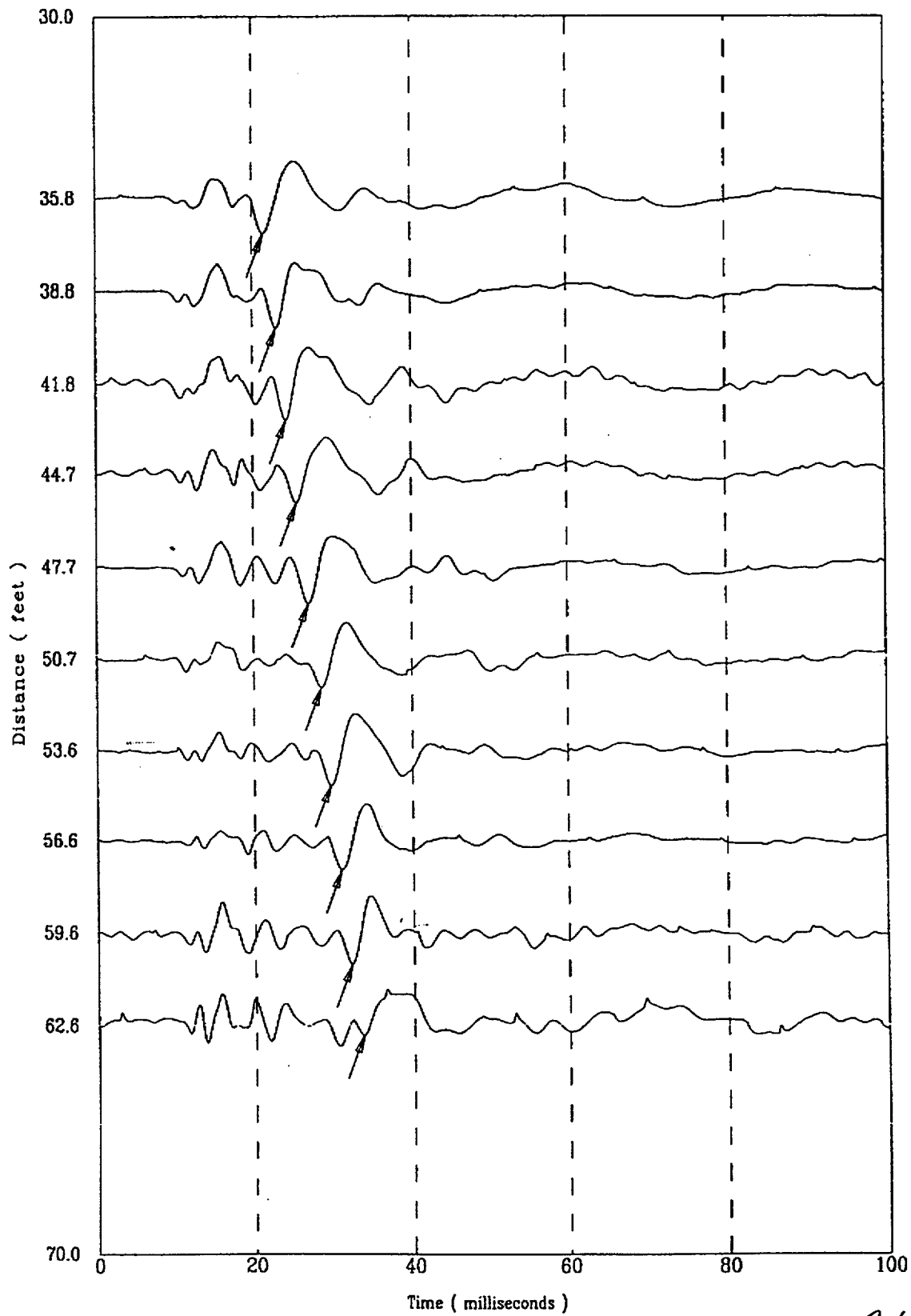




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CPT-116

P Wave
02/20/98





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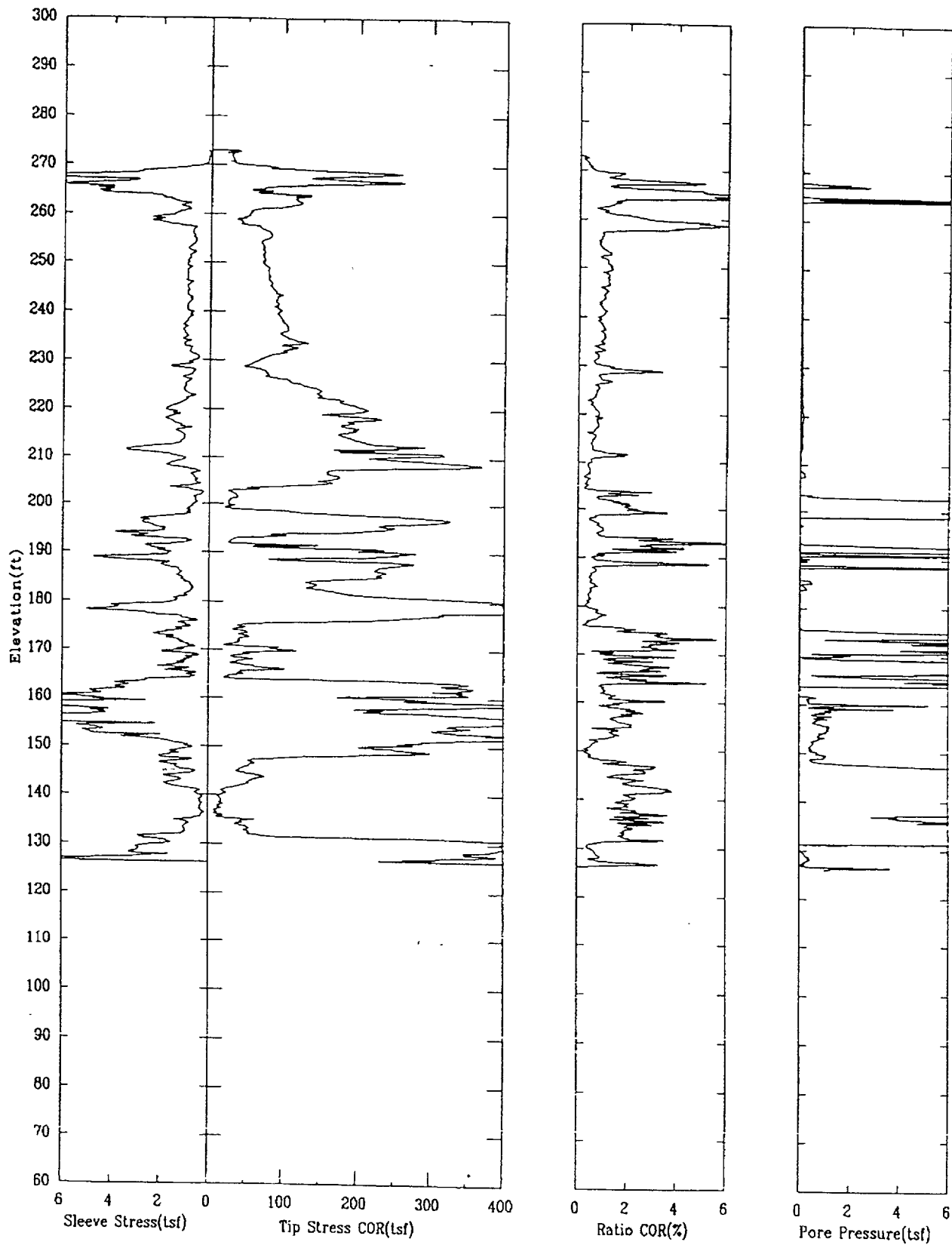
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

North 79650.07

East 54825.03

Elevation 278.9



CPT-126

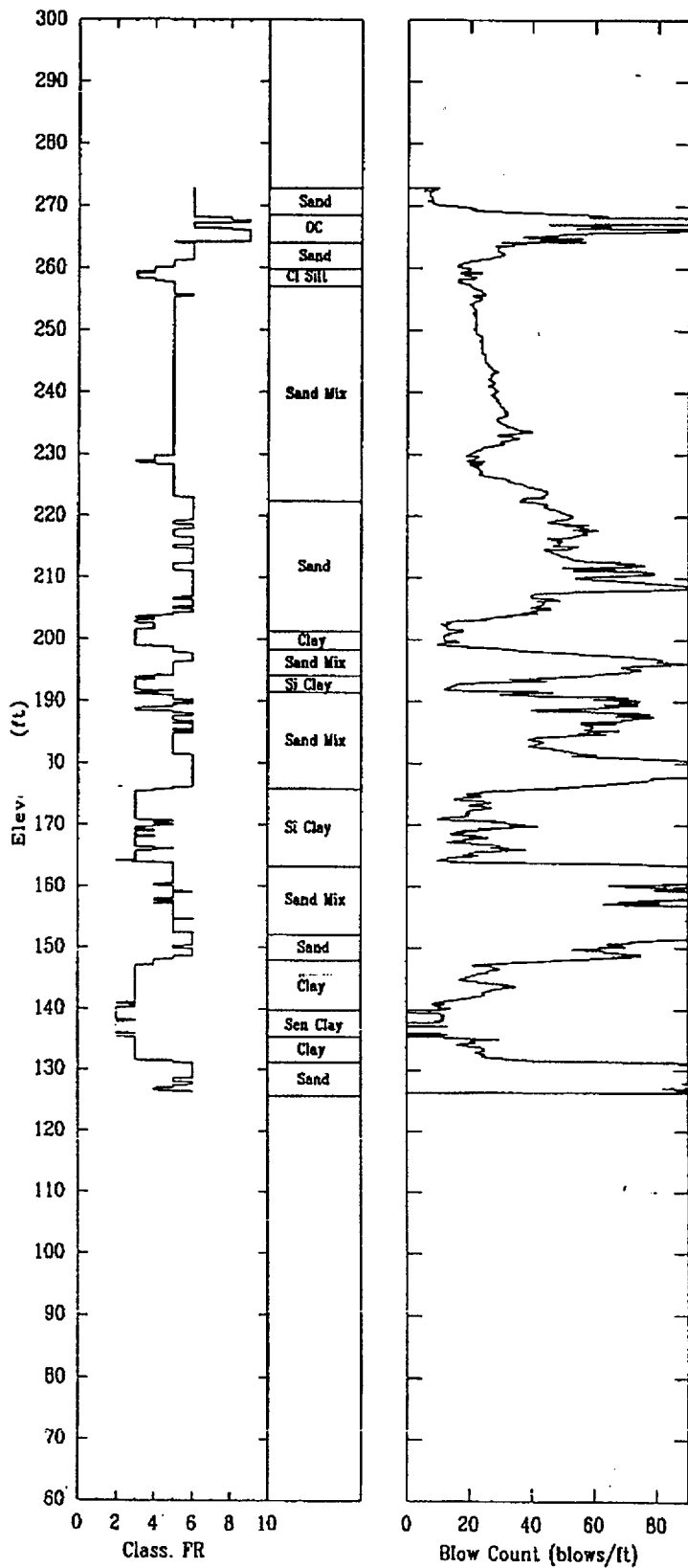
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

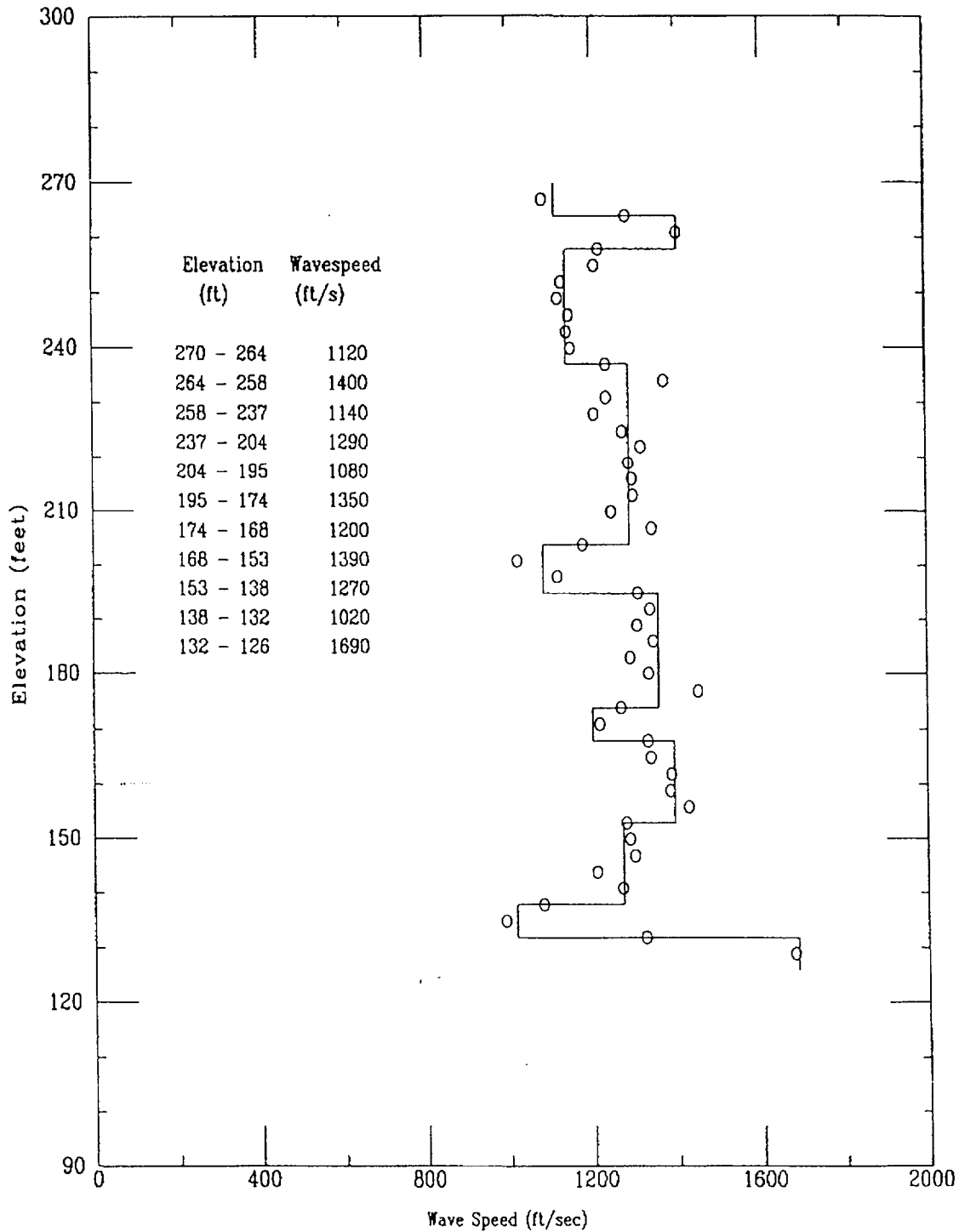
North 79650.07

East 54825.03

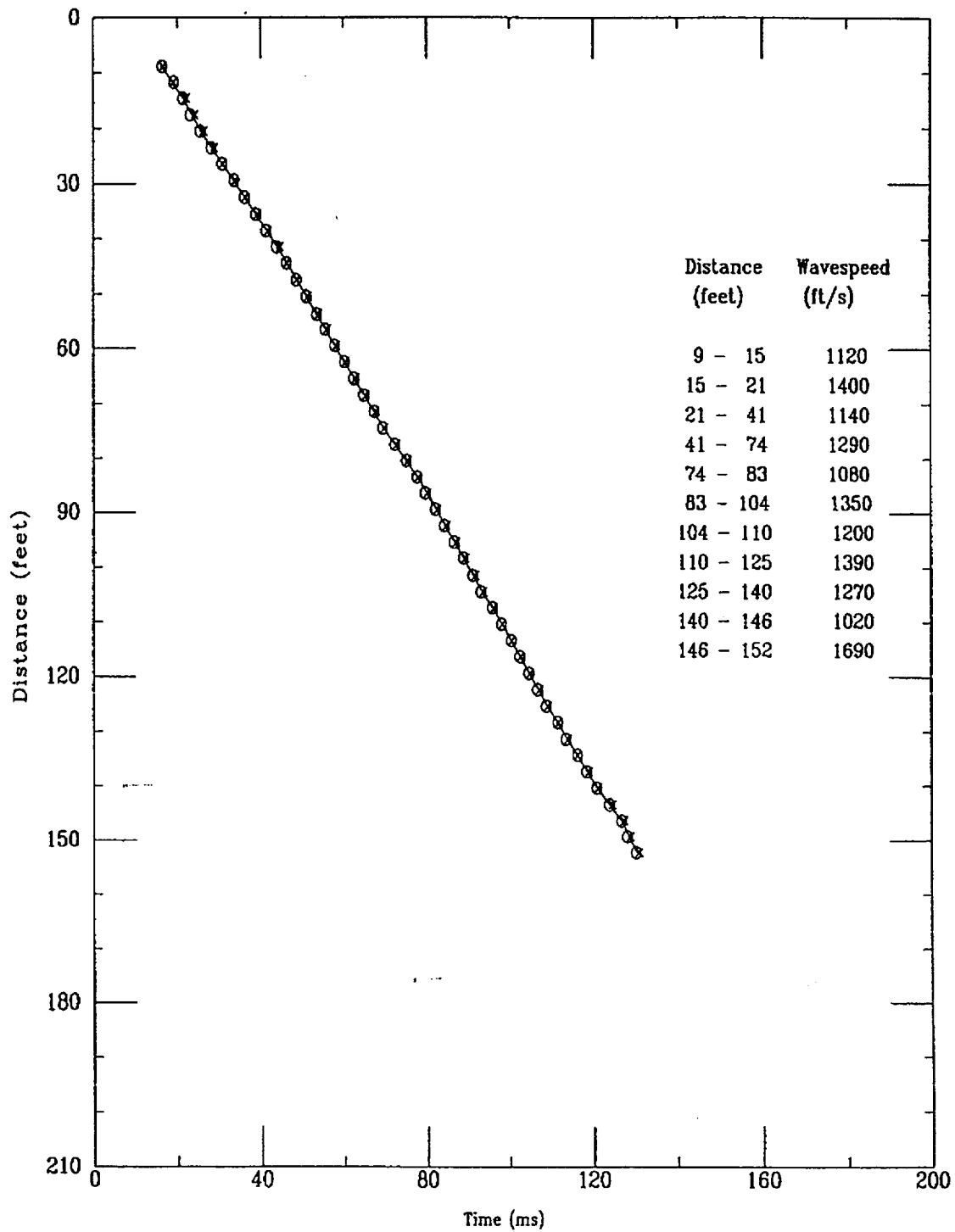
Elevation 278.9



Shear Wave Speeds

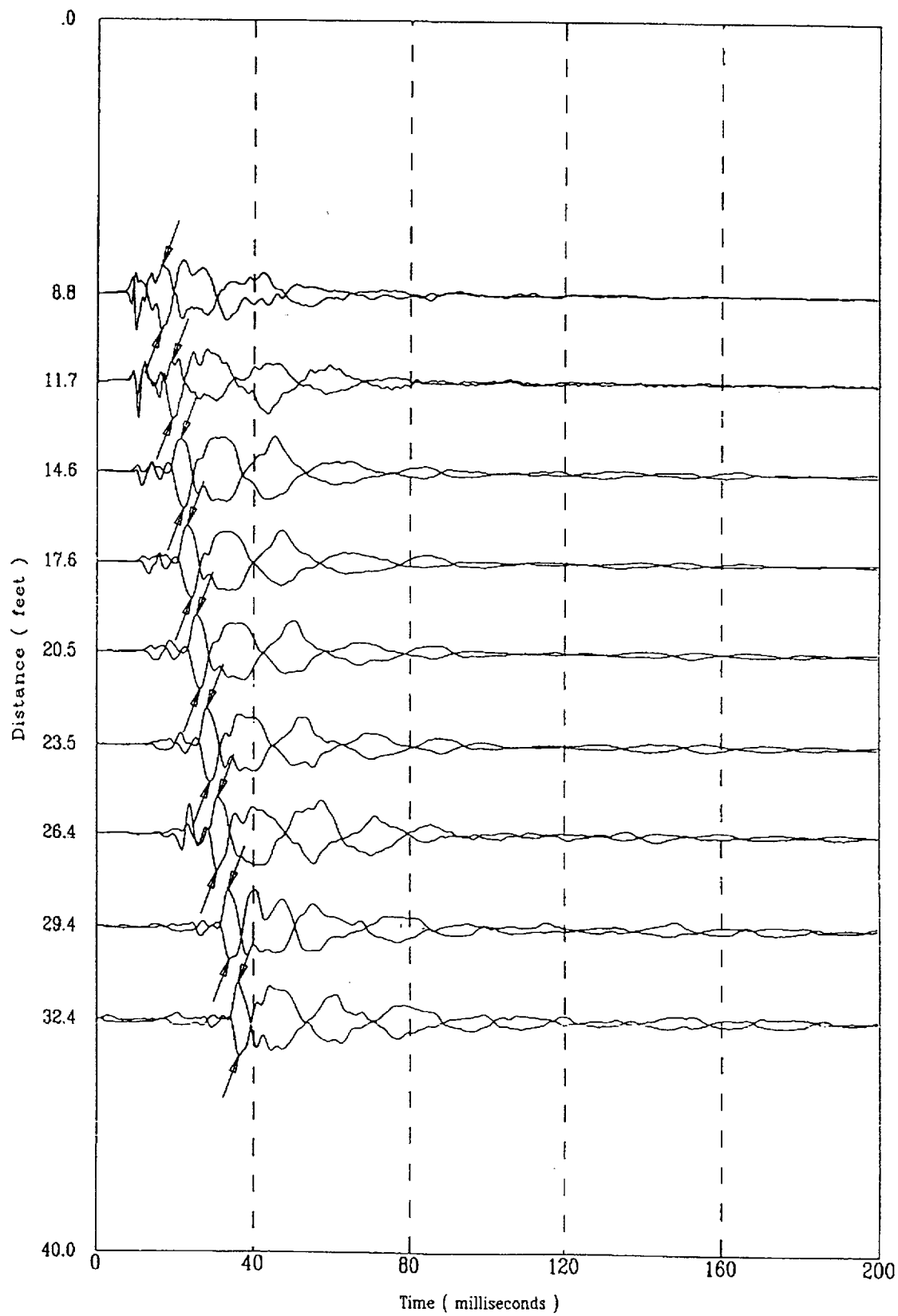


Shear Wave Time of Peak



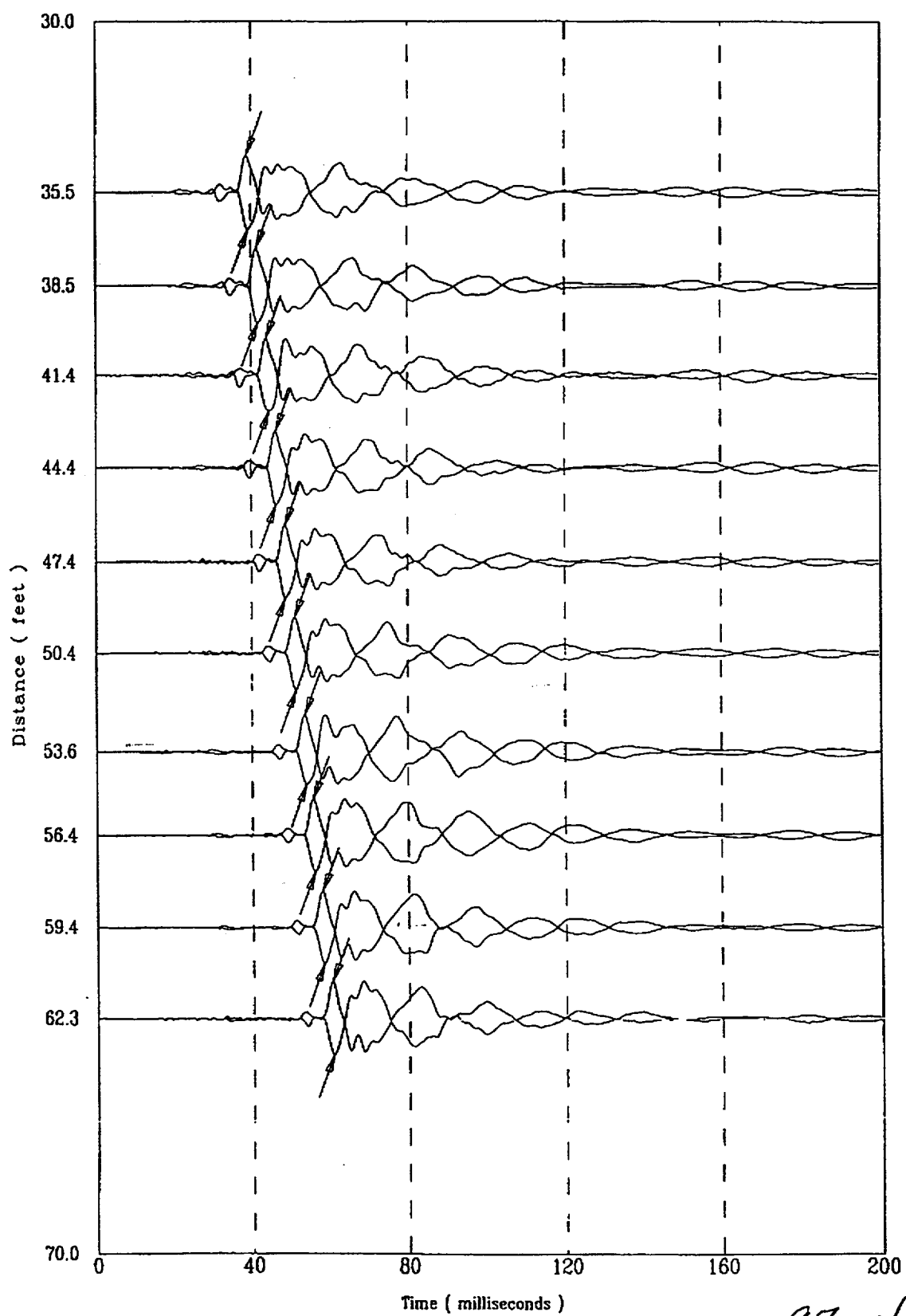
Applied Research Associates, Inc.
CPT-126

S Wave
02/24/98



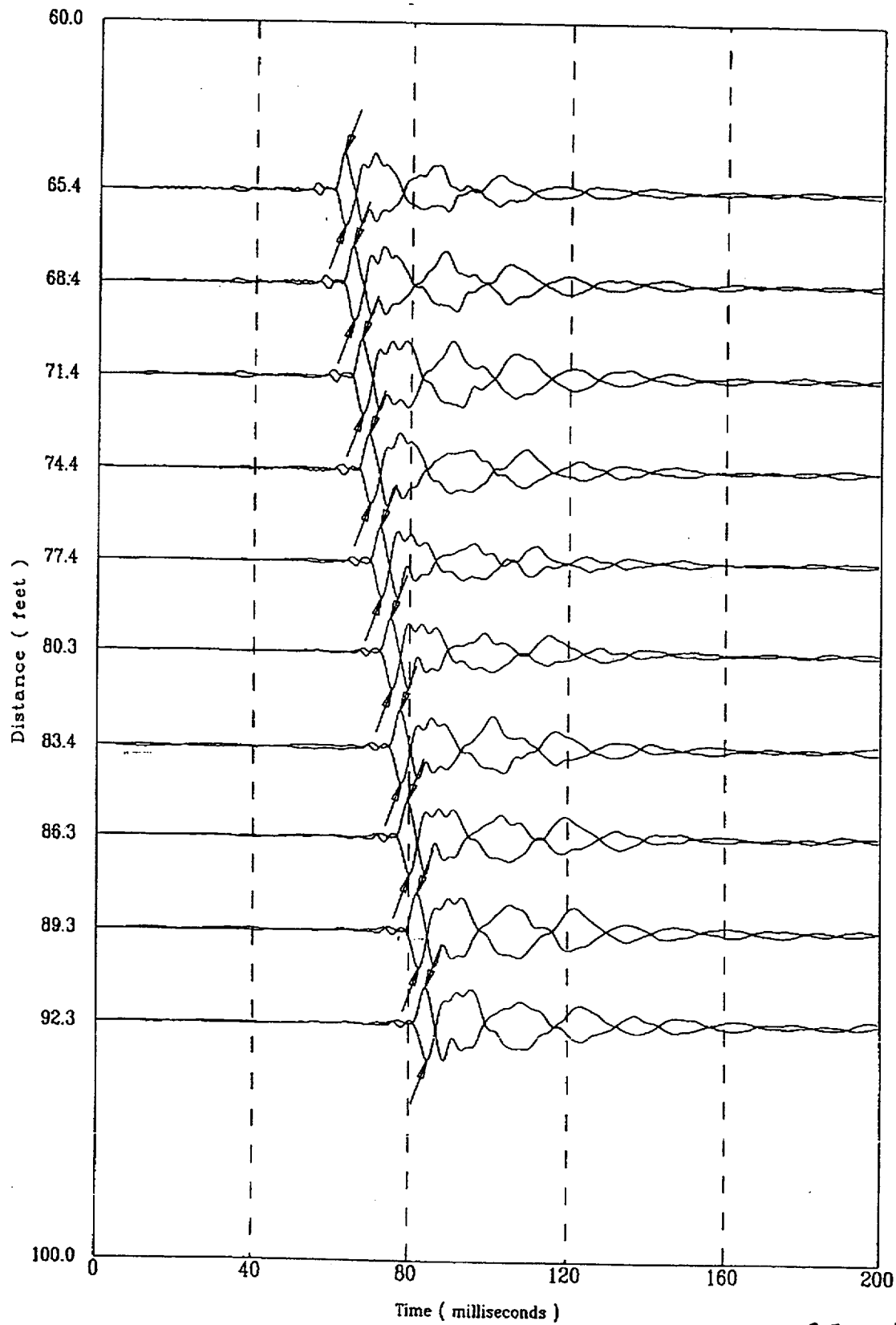
Applied Research Associates, Inc.
CPT-126

S Wave
02/24/98



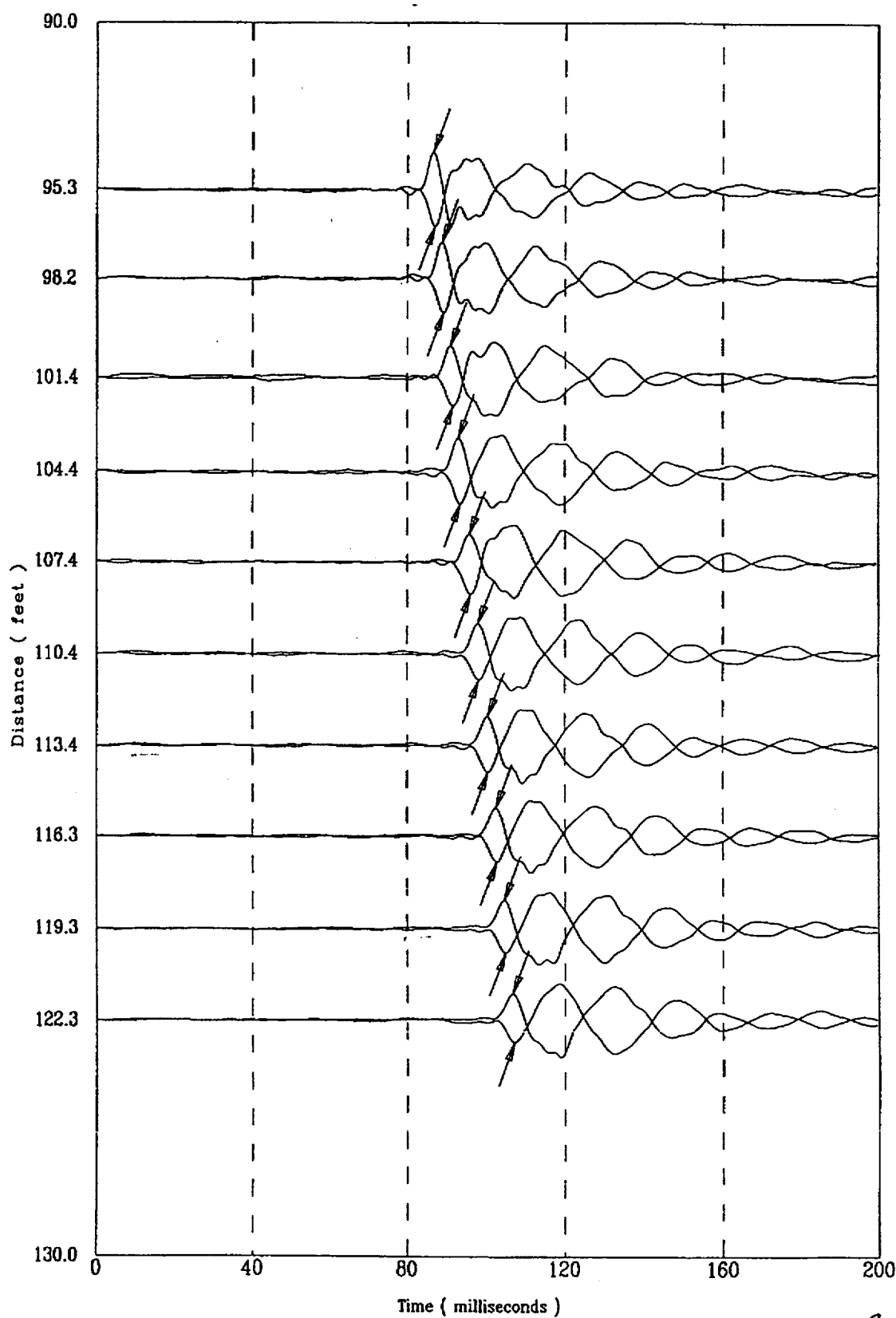
Applied Research Associates, Inc.
CPT-126

S Wave
02/24/98



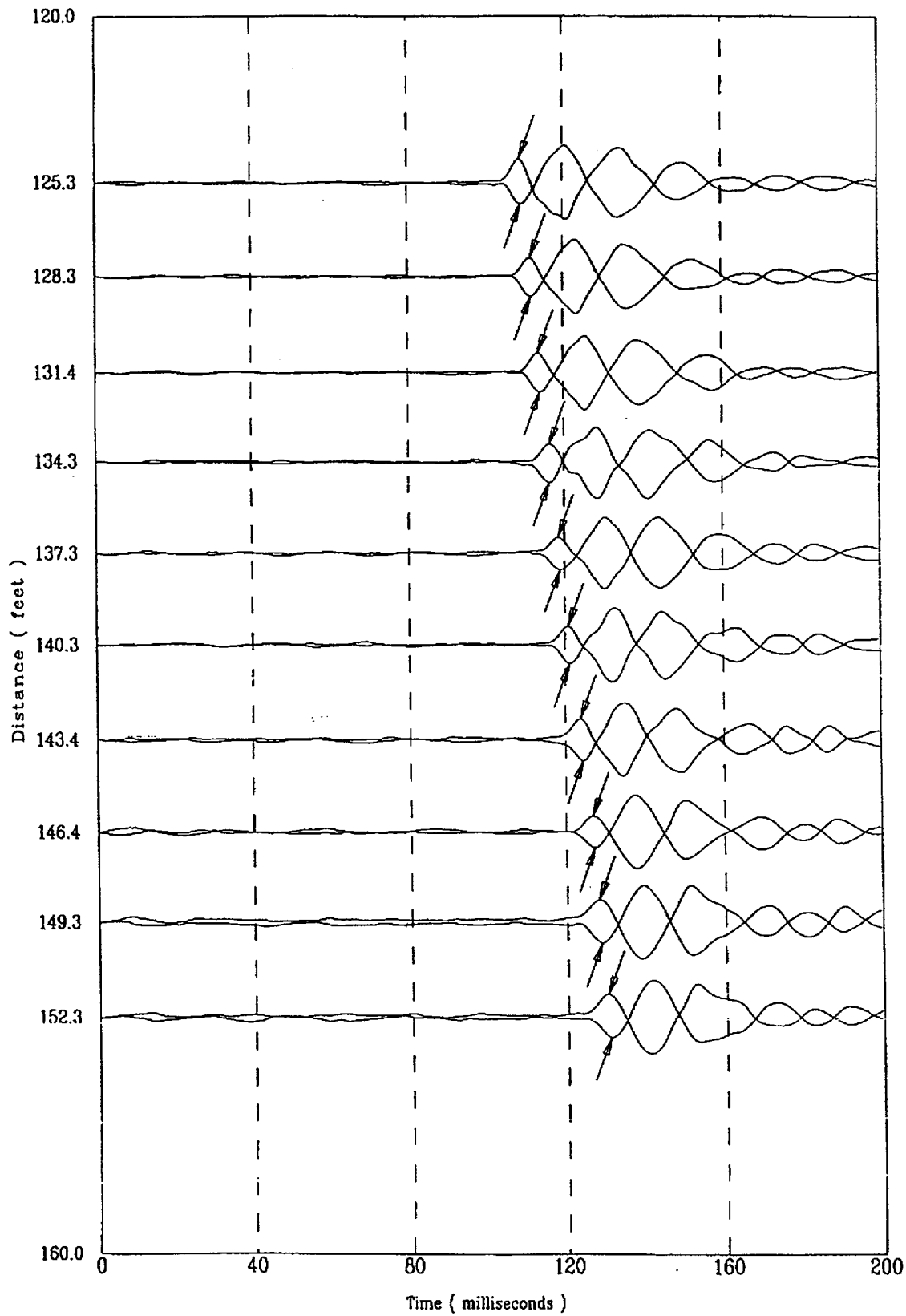
File 5241805S

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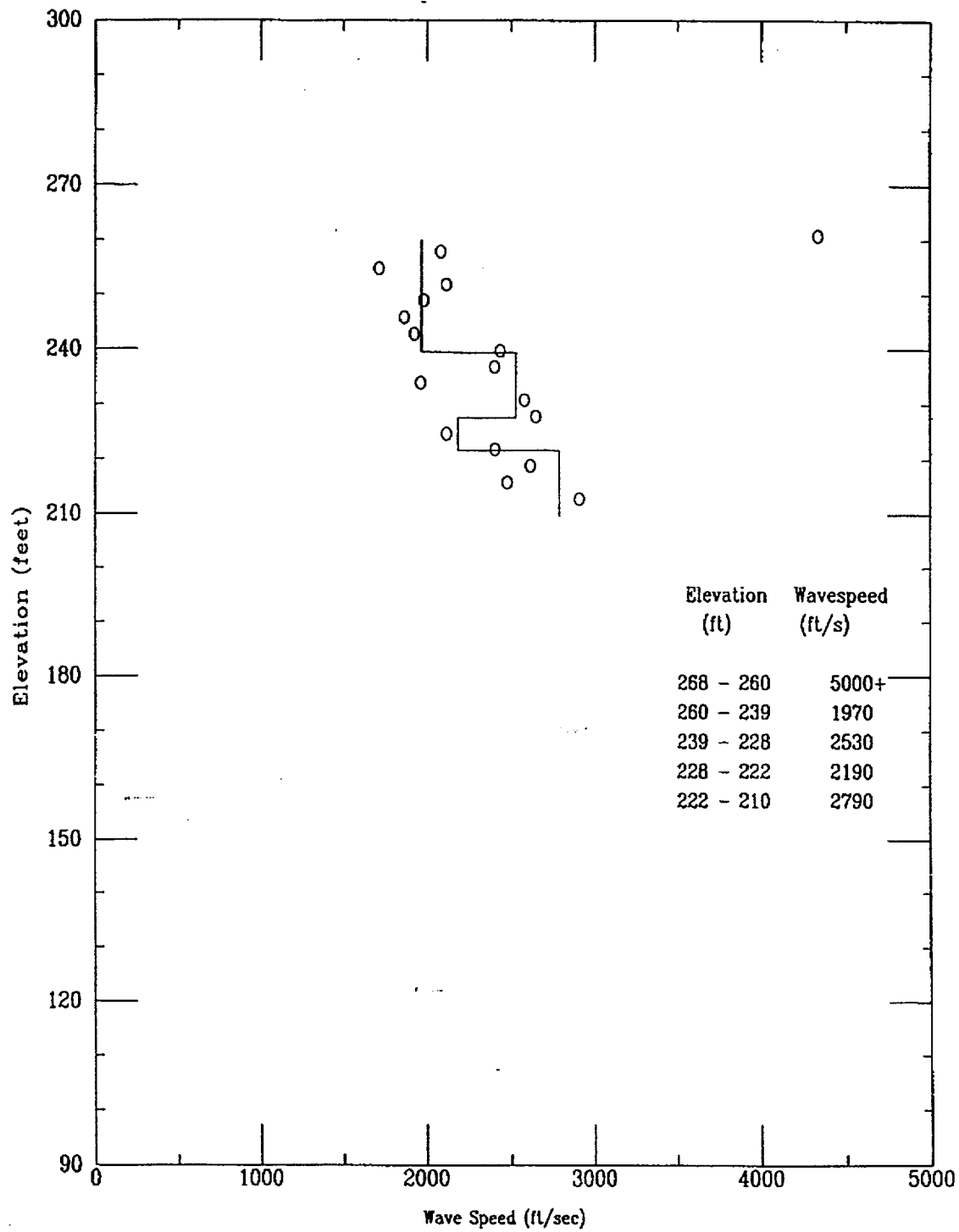


Applied Research Associates, Inc.
CPT-126

S Wave
02/24/98



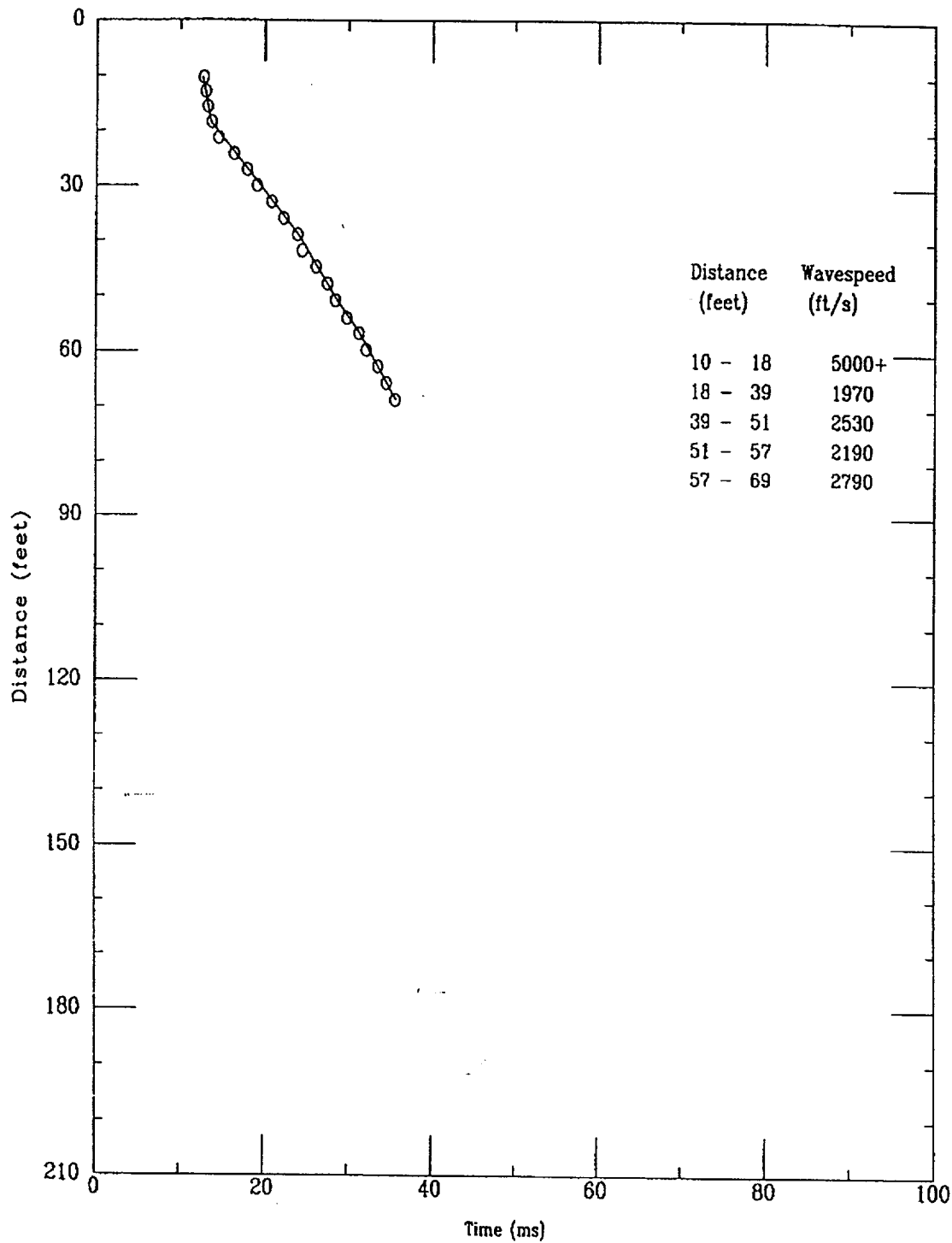
Compression Wave Speeds



CPT-126

APPLIED RESEARCH ASSOCIATES, INC.
Compression Wave Time of Peak

02/24/98

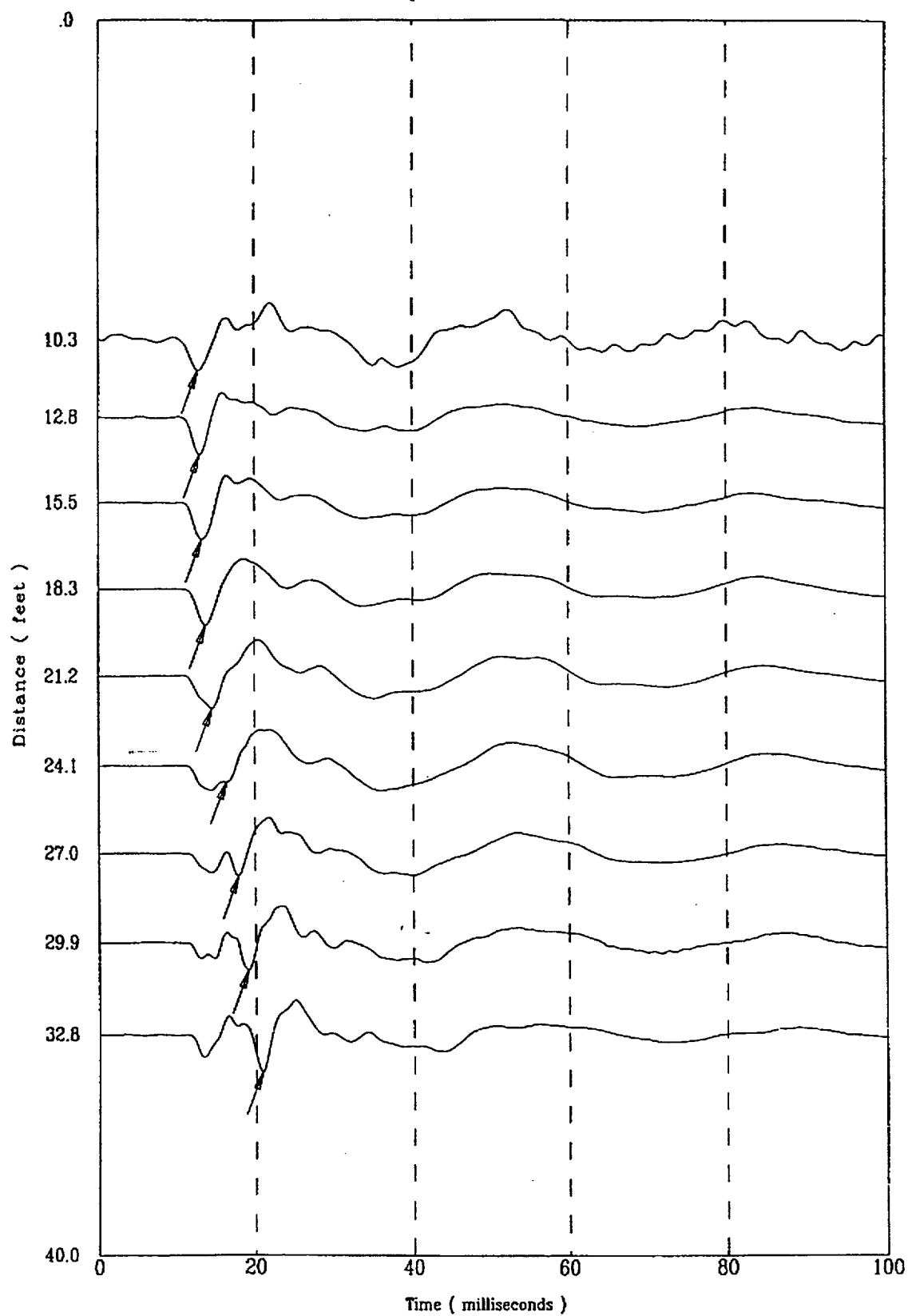


File 5247805S

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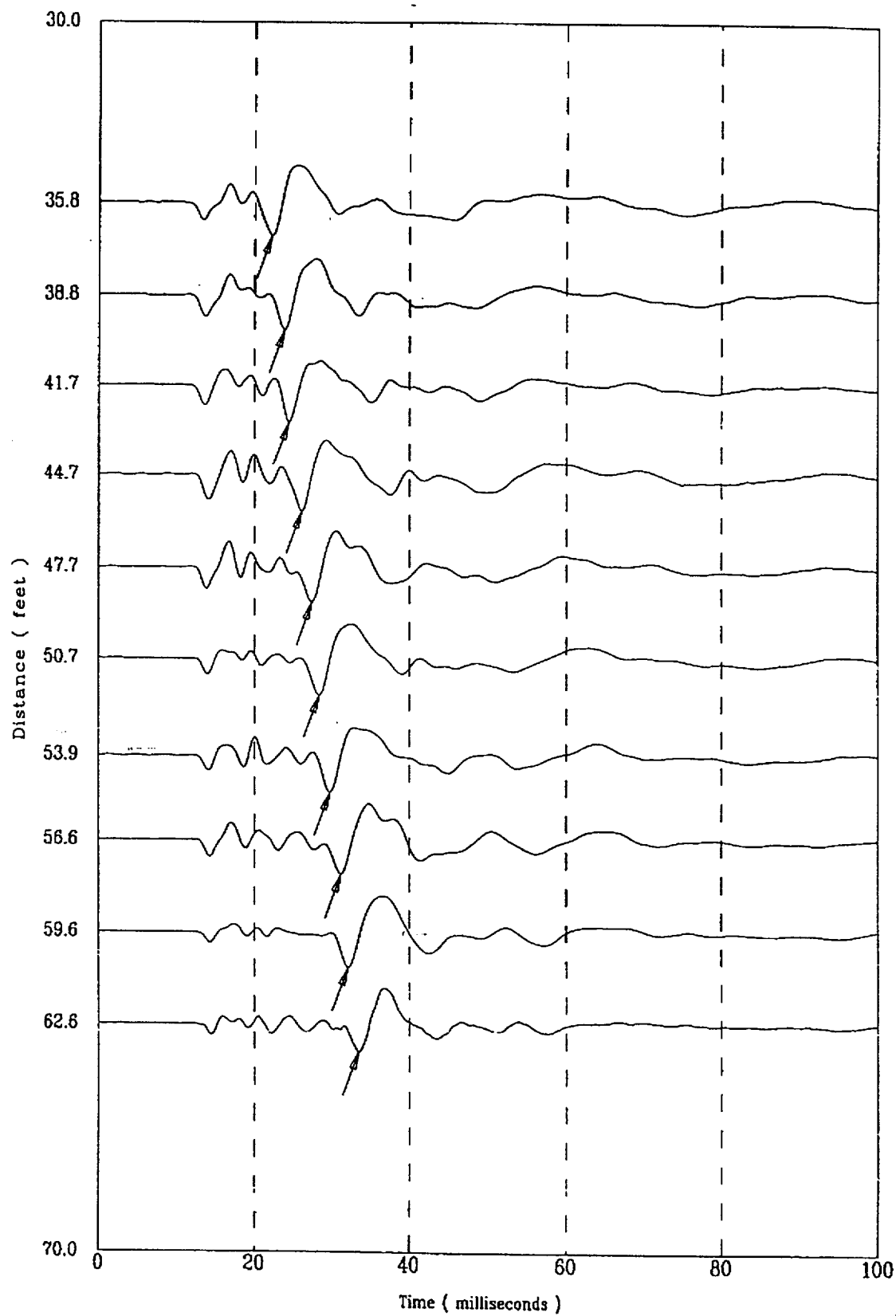
Applied Research Associates, Inc.
CPT-126

P Wave
02/24/98



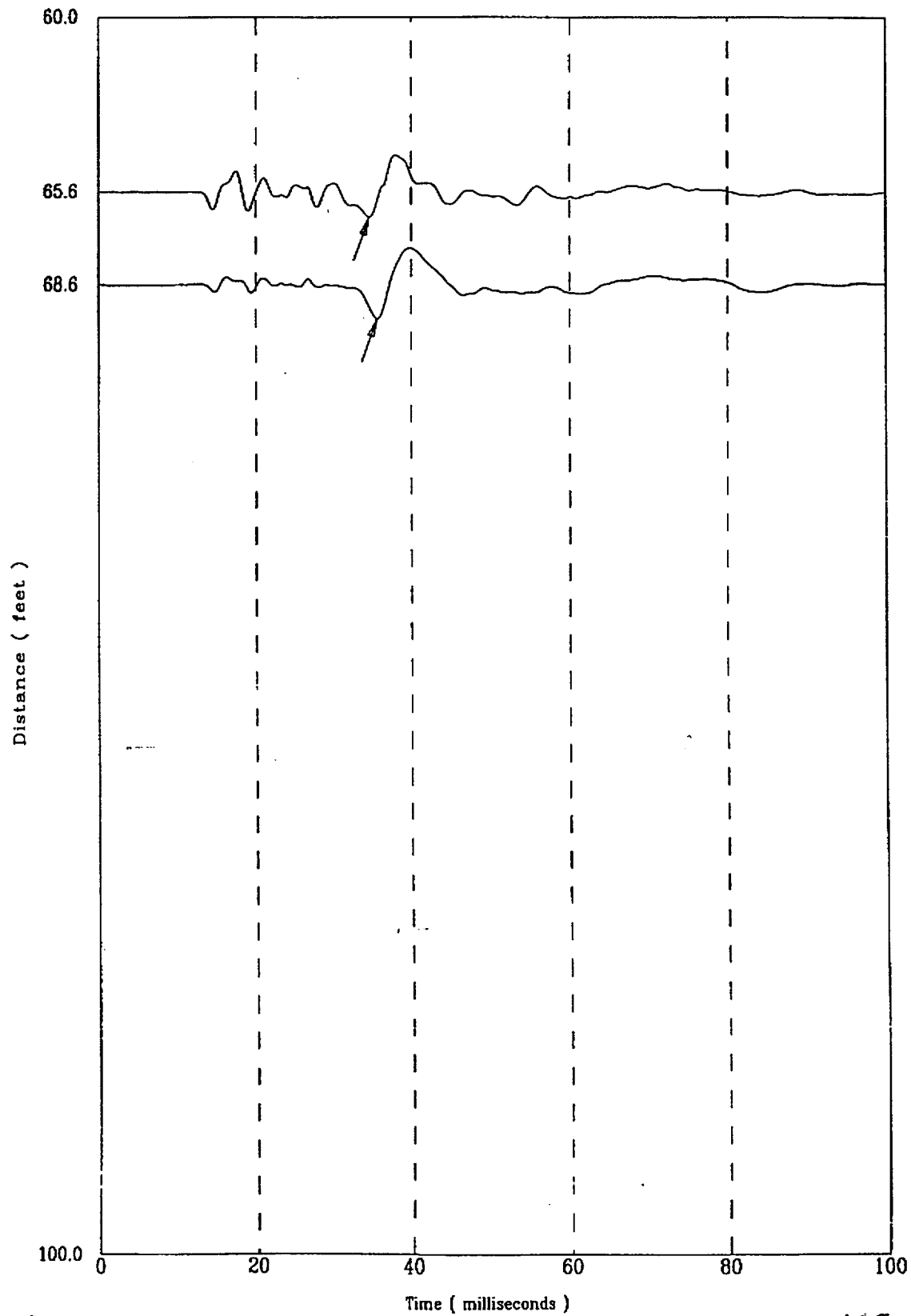
Applied Research Associates, Inc.
CPT-126

P Wave
02/24/98



Applied Research Associates, Inc.
CPT-126

P Wave
02/24/98



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CPT-127

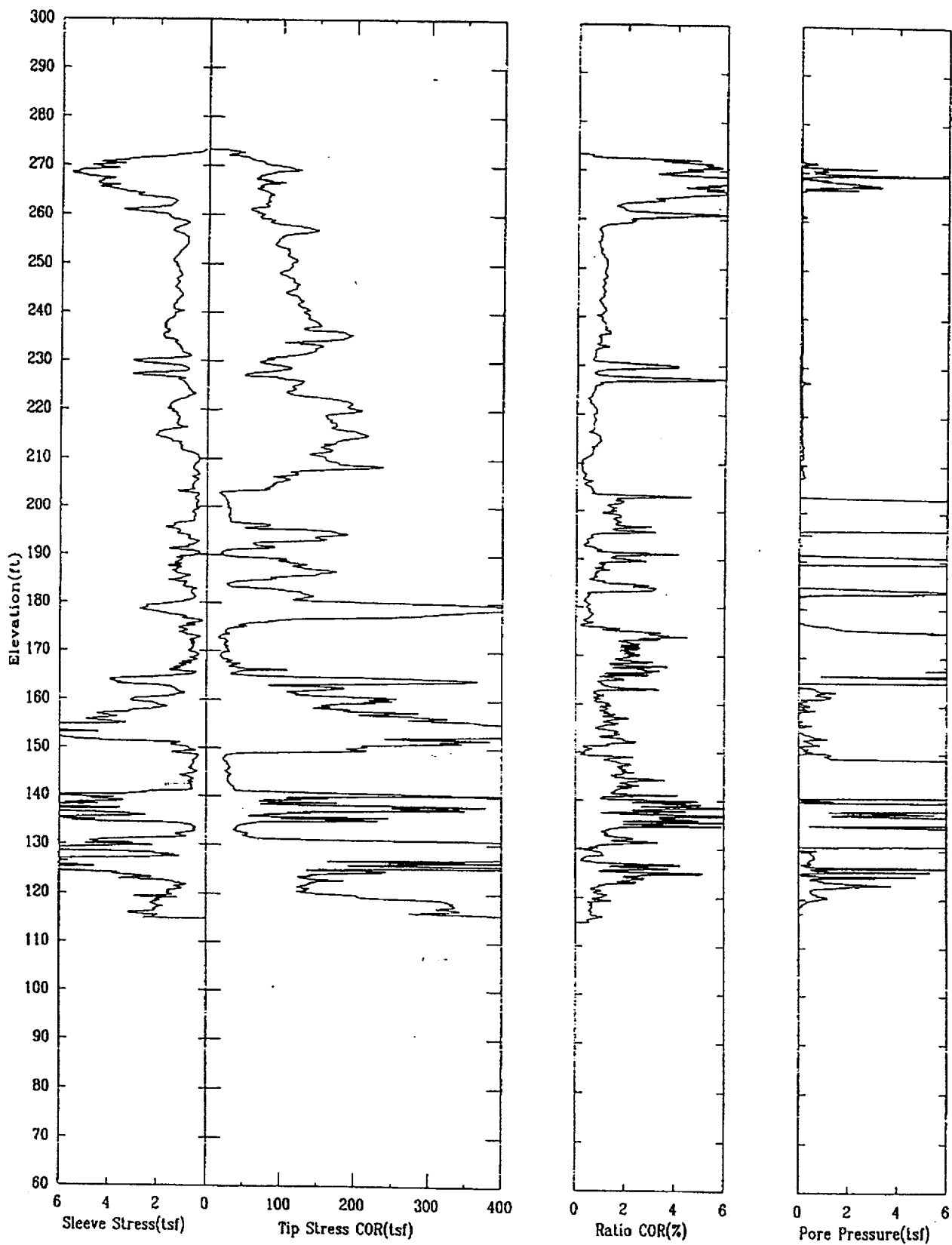
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

North 79650.01

East 54975.00

Elevation 279.3



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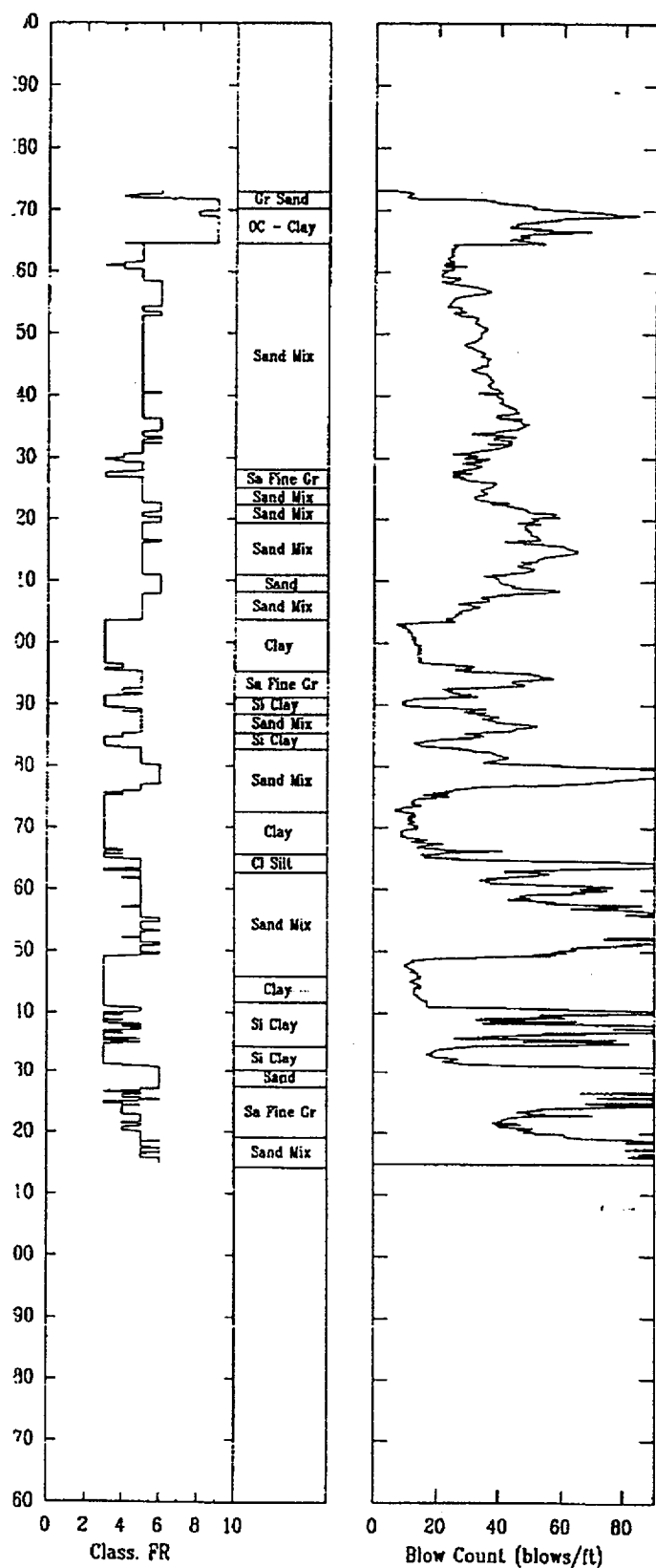
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

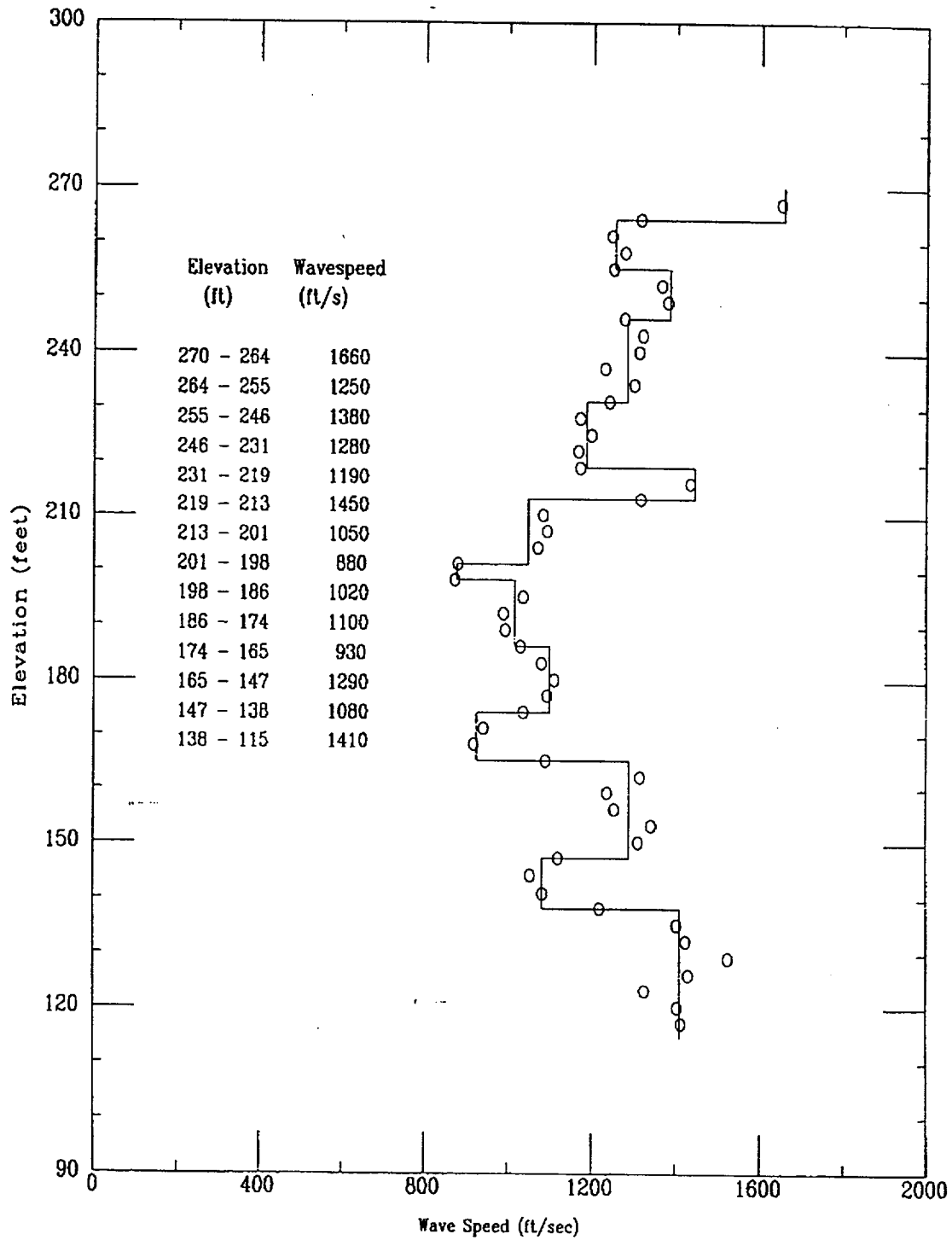
North 79650.01

East 54975.00

Elevation 279.3



Shear Wave Speeds

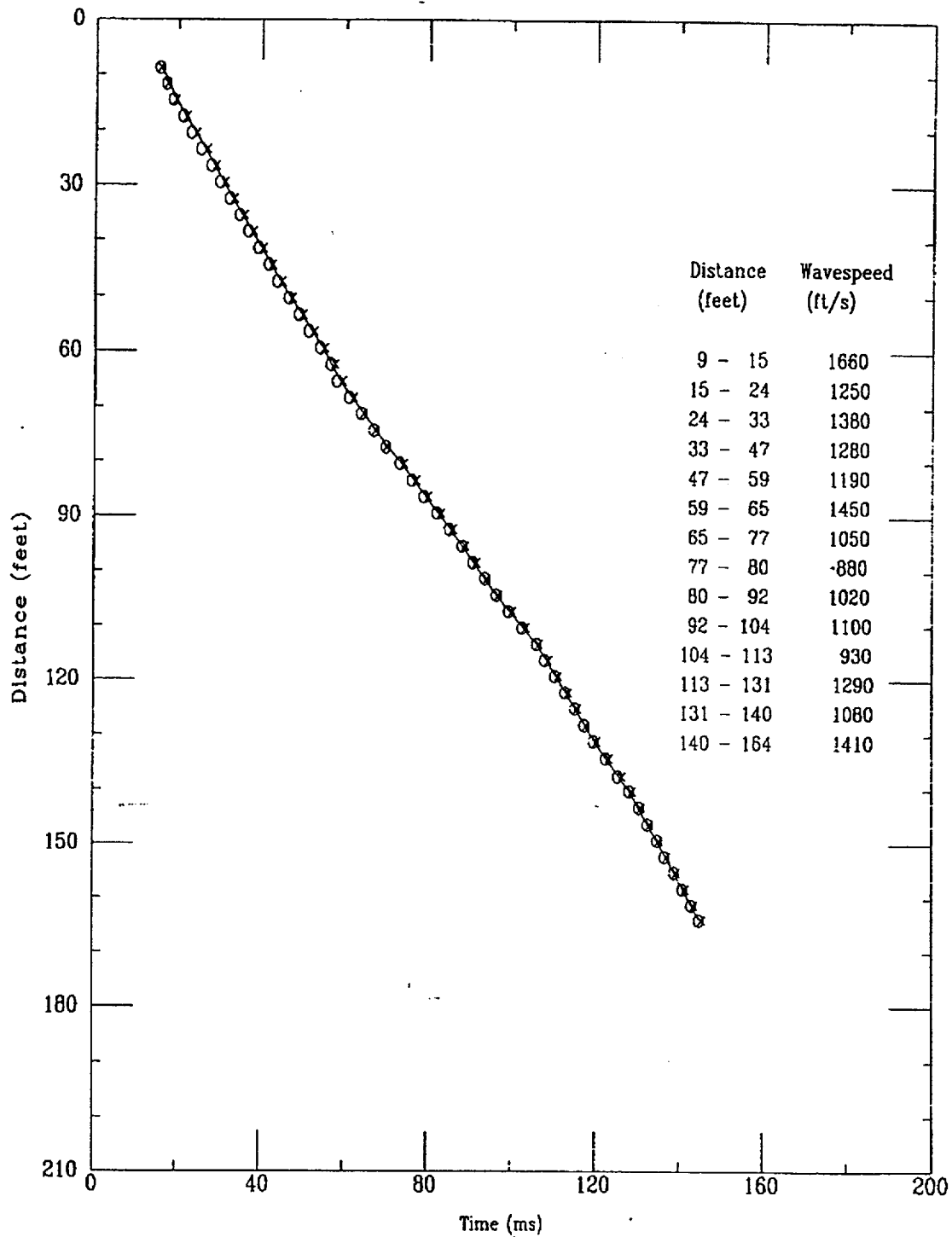


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Shear Wave Time of Peak

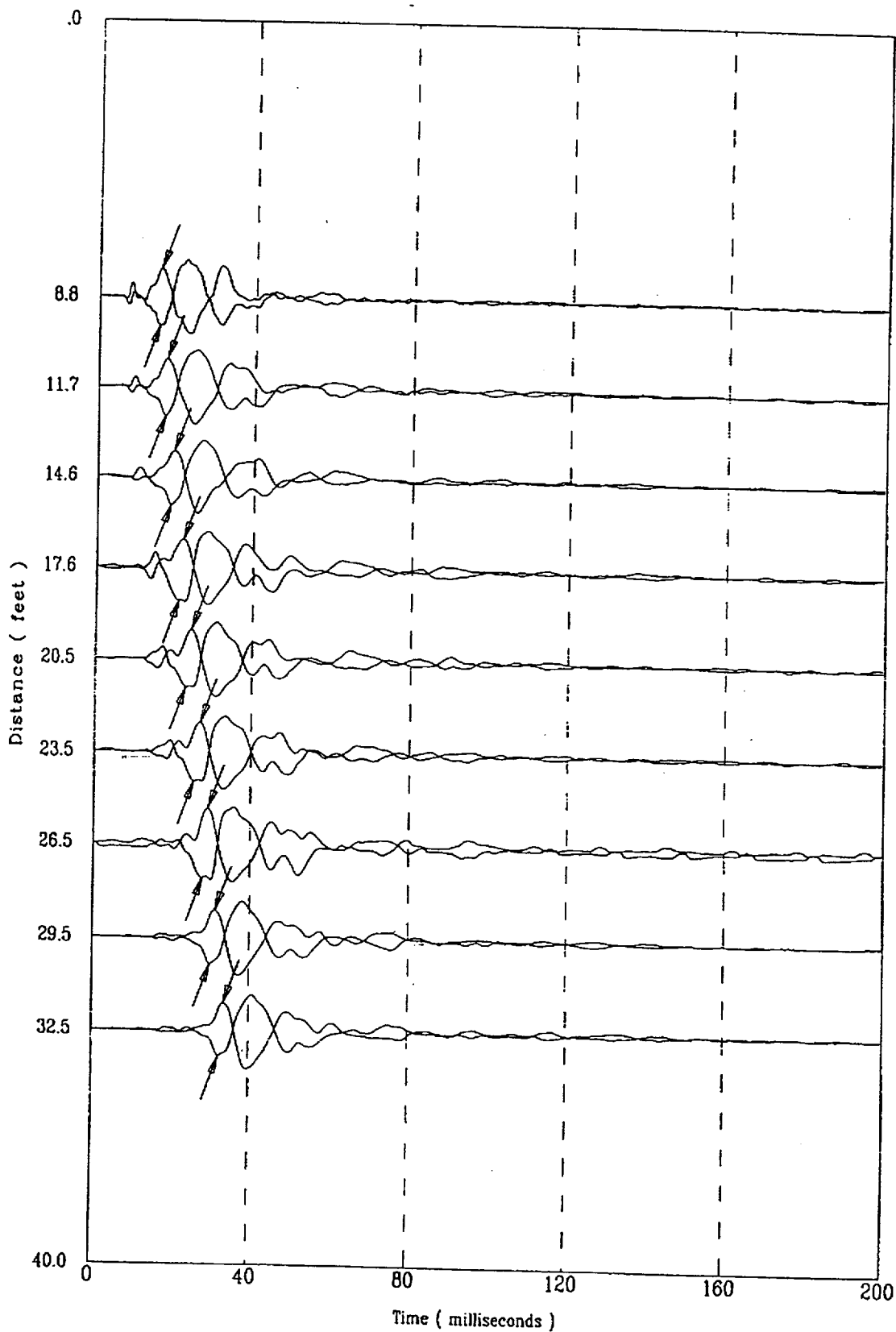


File 5247802S

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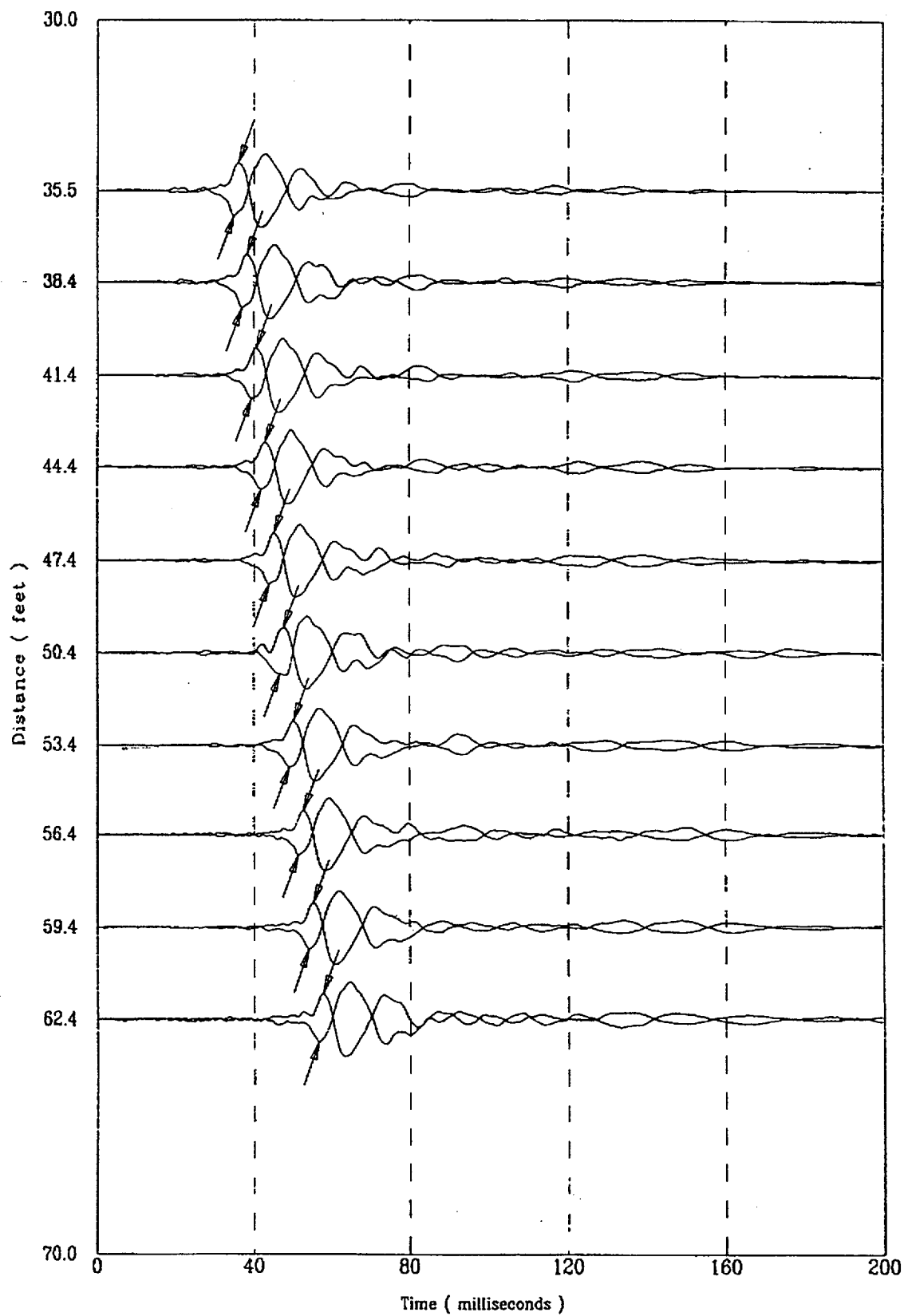
Applied Research Associates, Inc.
CPT-127

S Wave
02/24/98



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S Wave
02/24/98

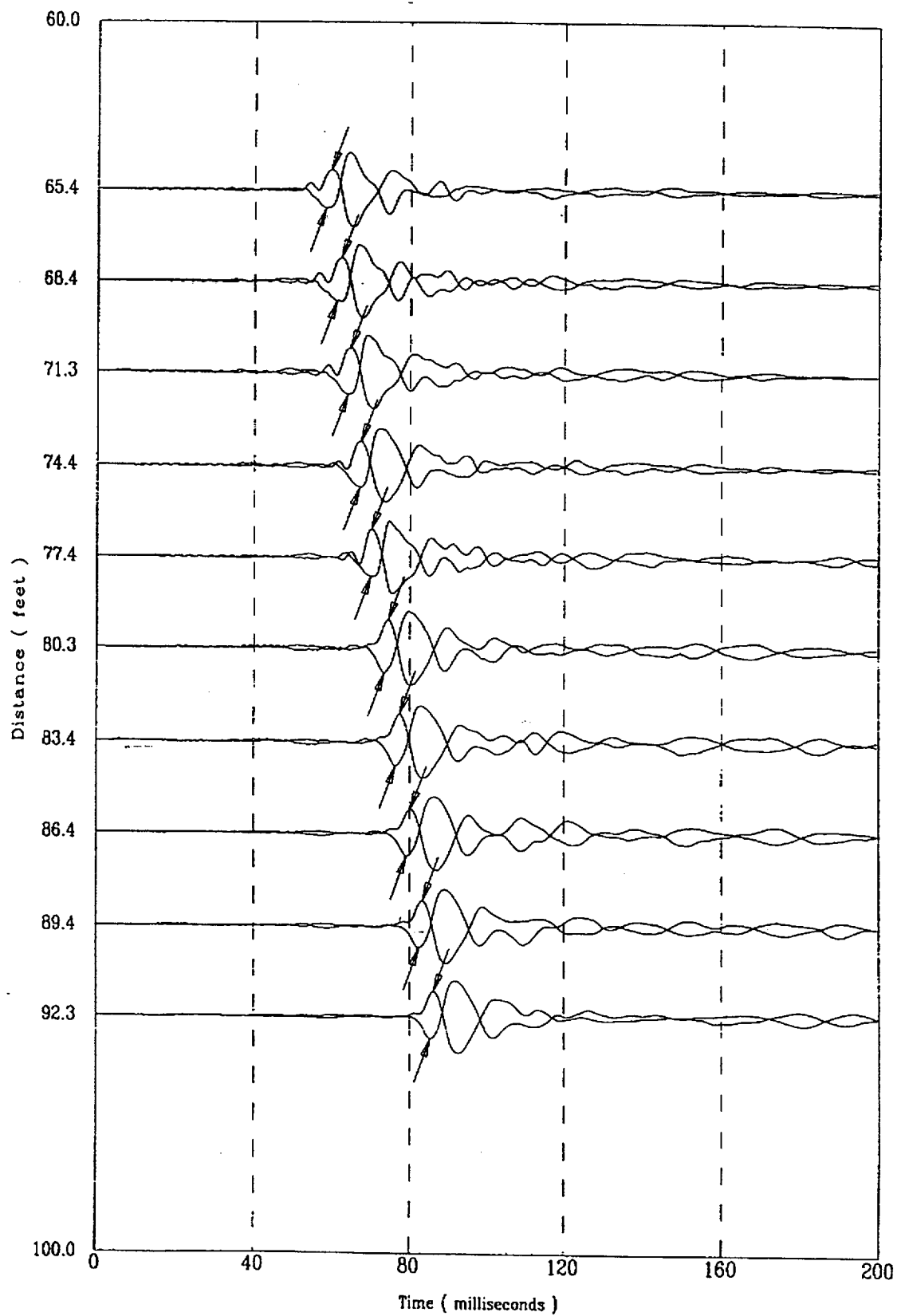


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Applied Research Associates, Inc.
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S Wave
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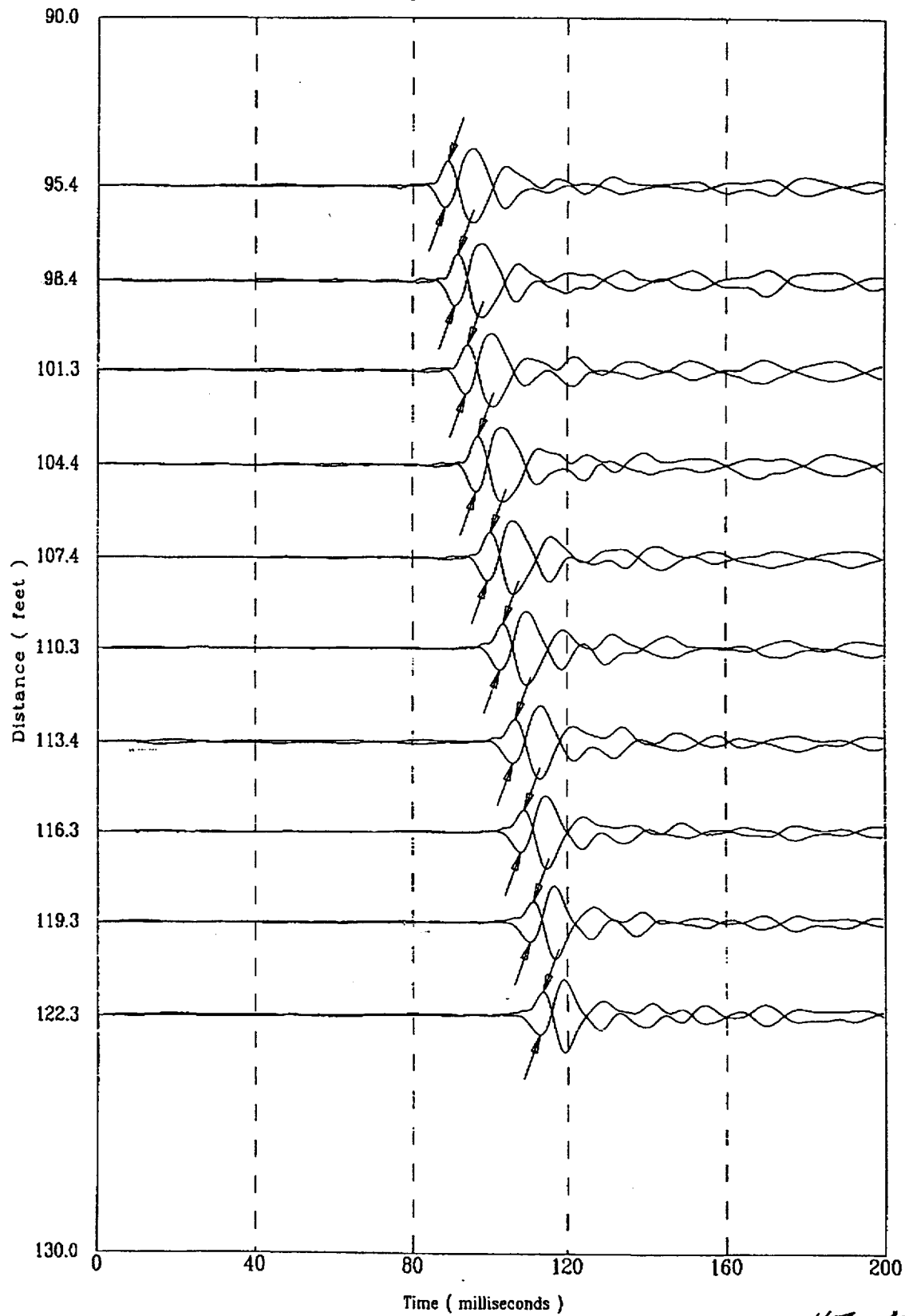


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S Wave
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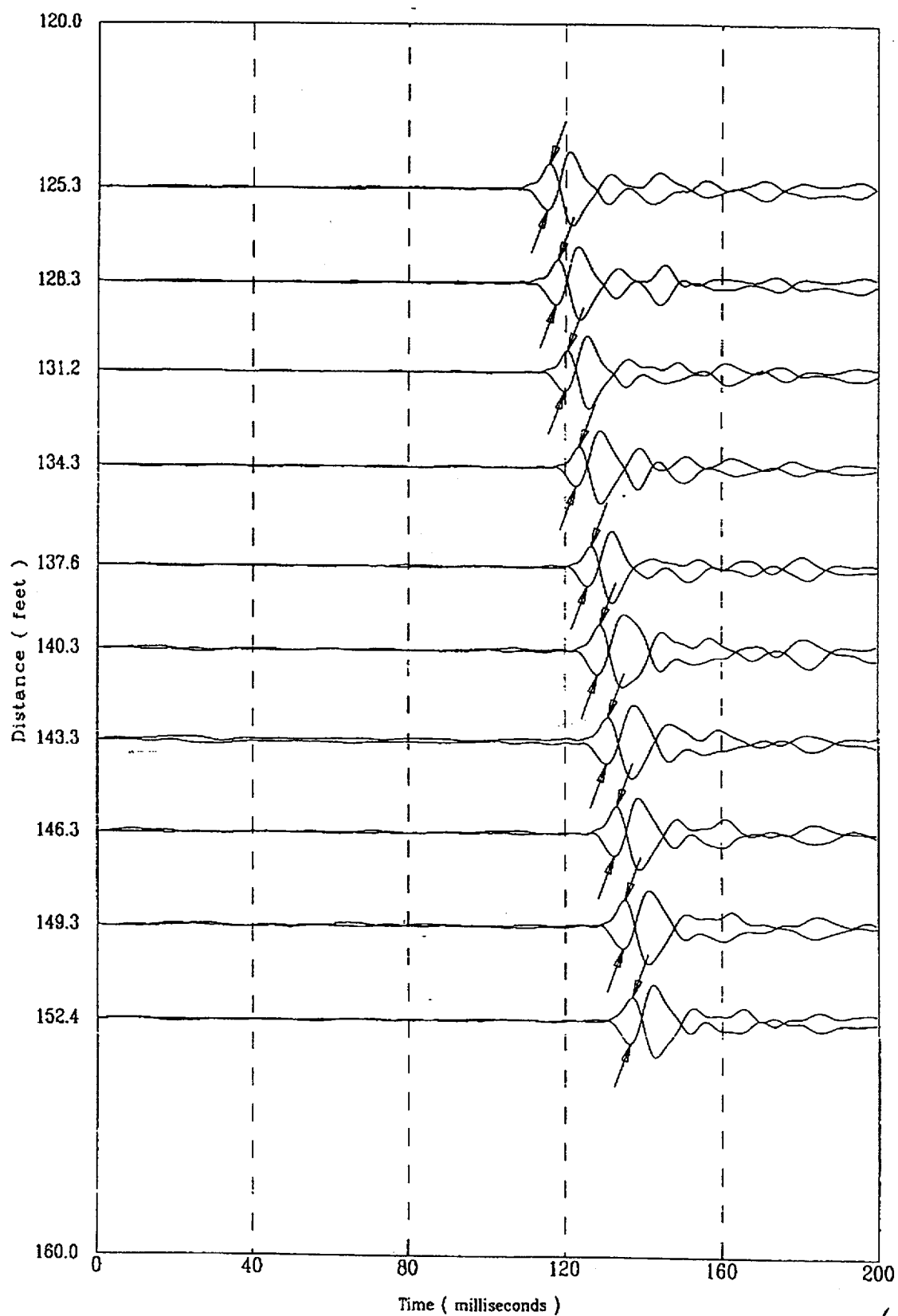


J241802S

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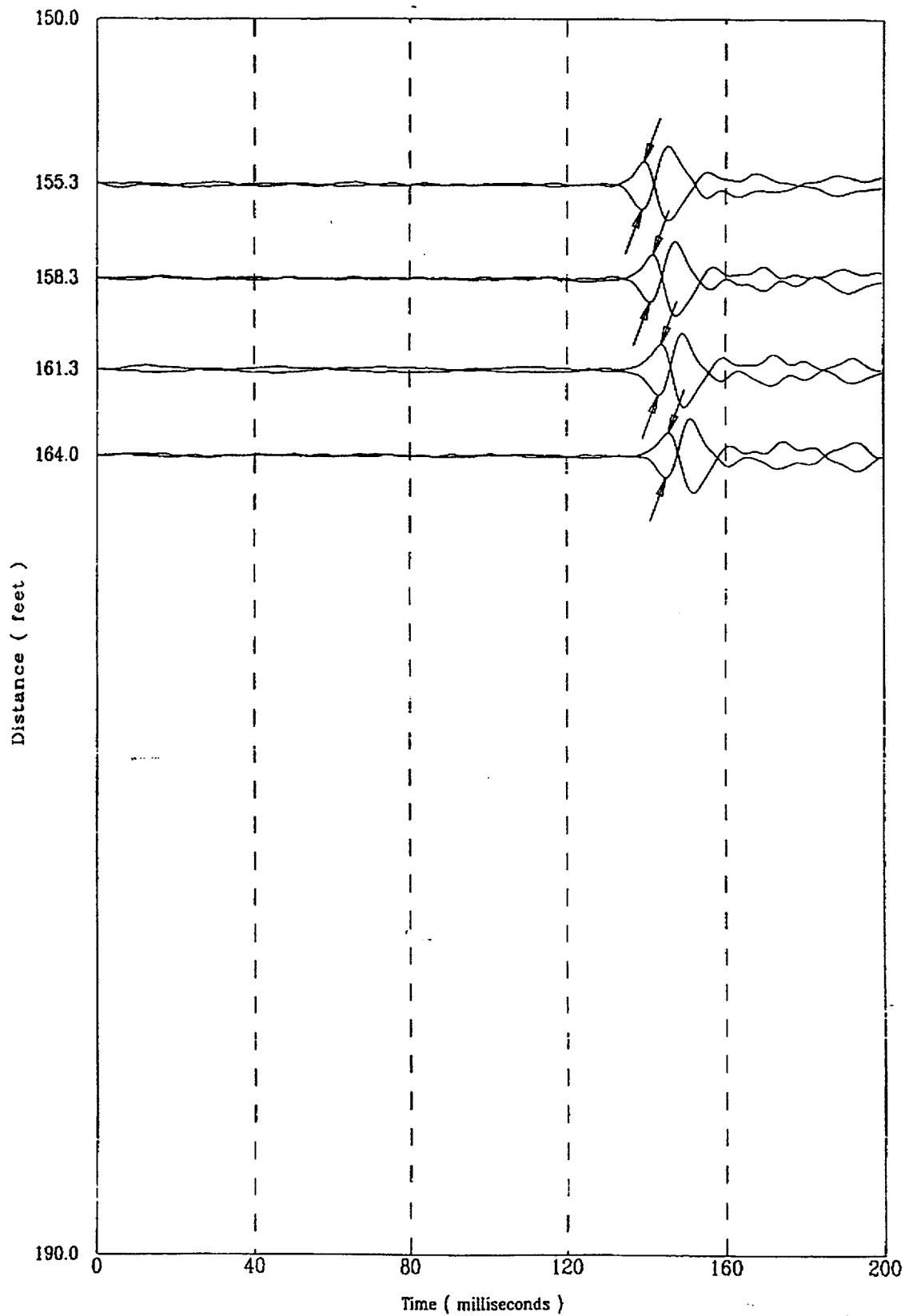
Applied Research Associates, Inc.
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S Wave
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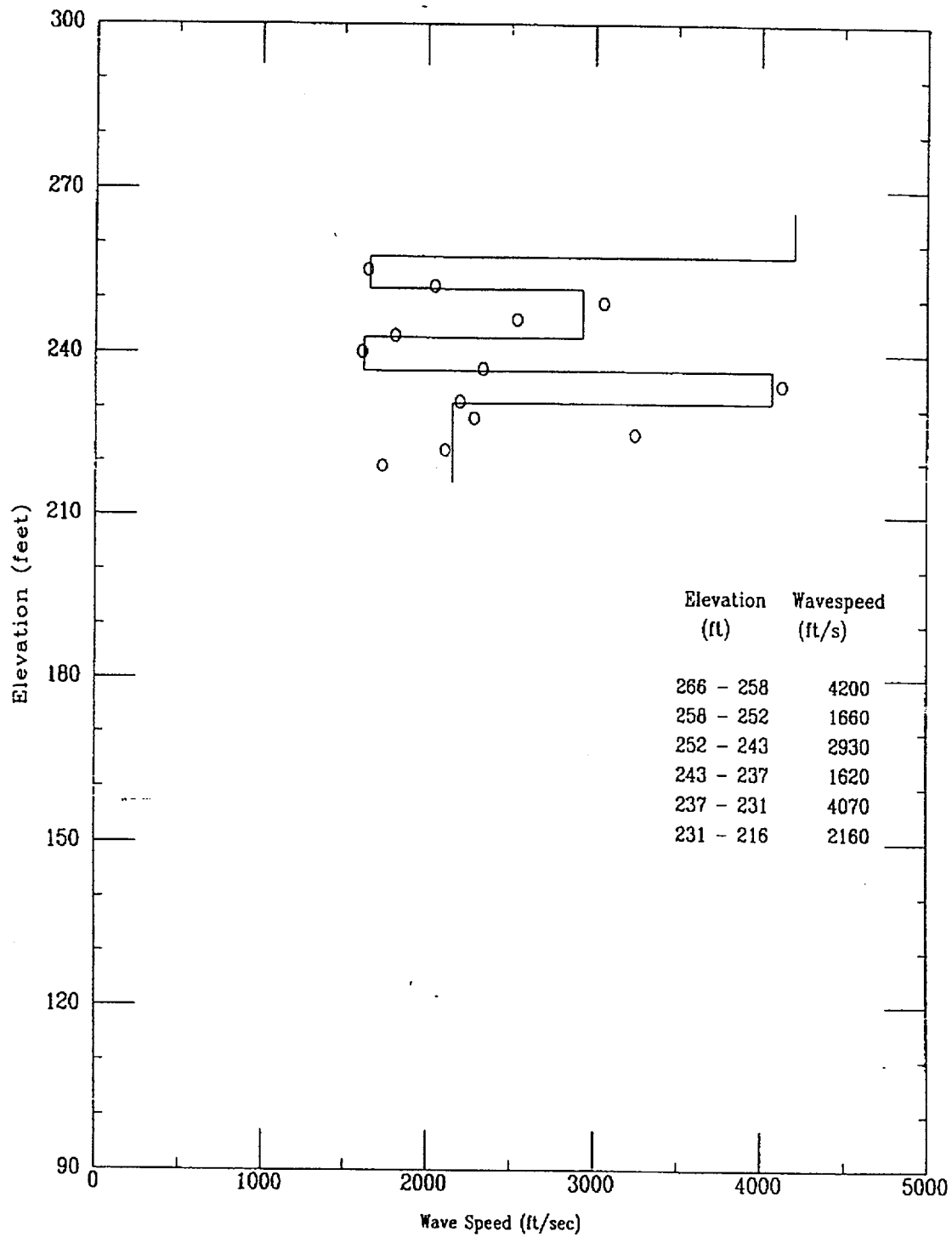
Applied Research Associates, Inc.
CPT-127

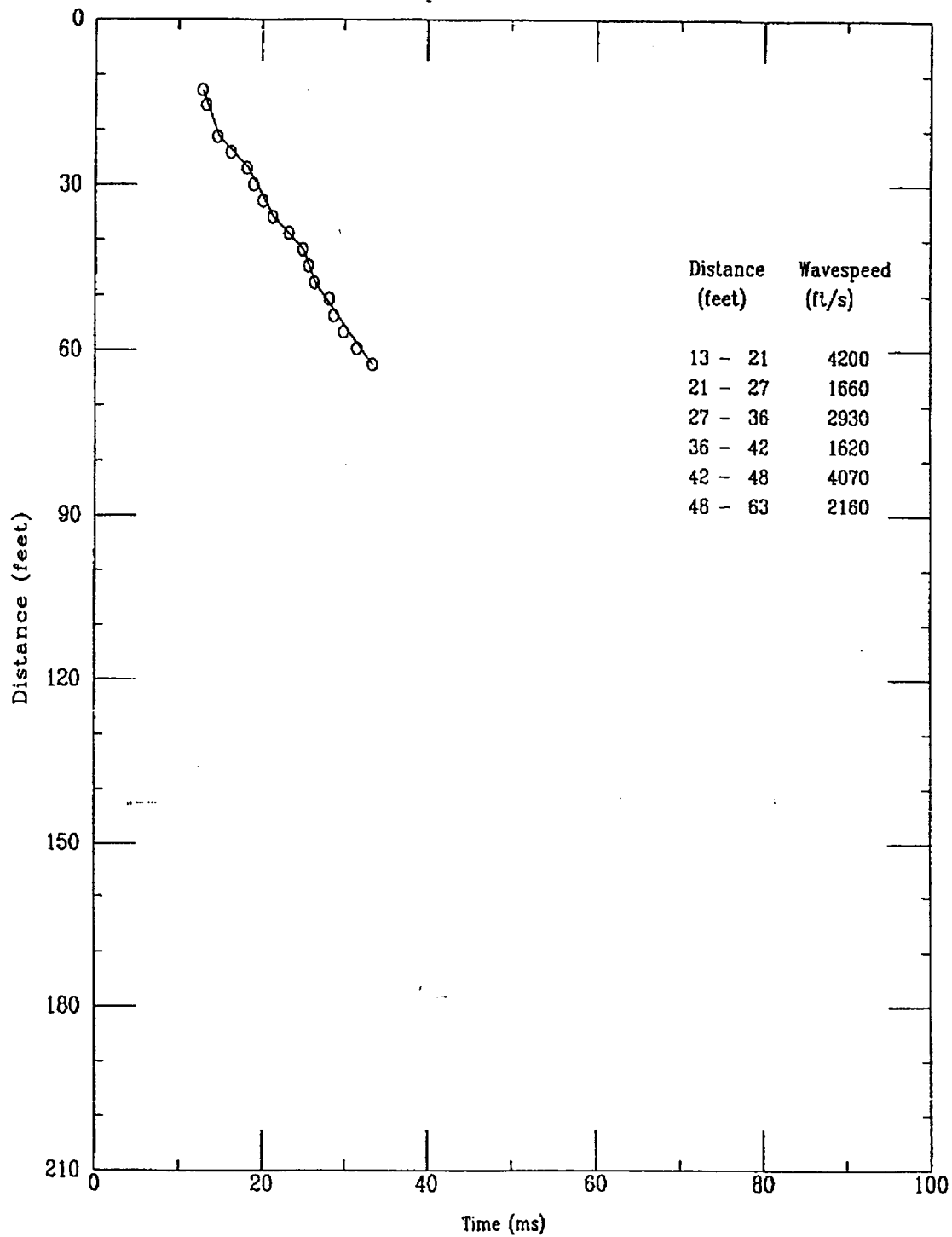
S Wave
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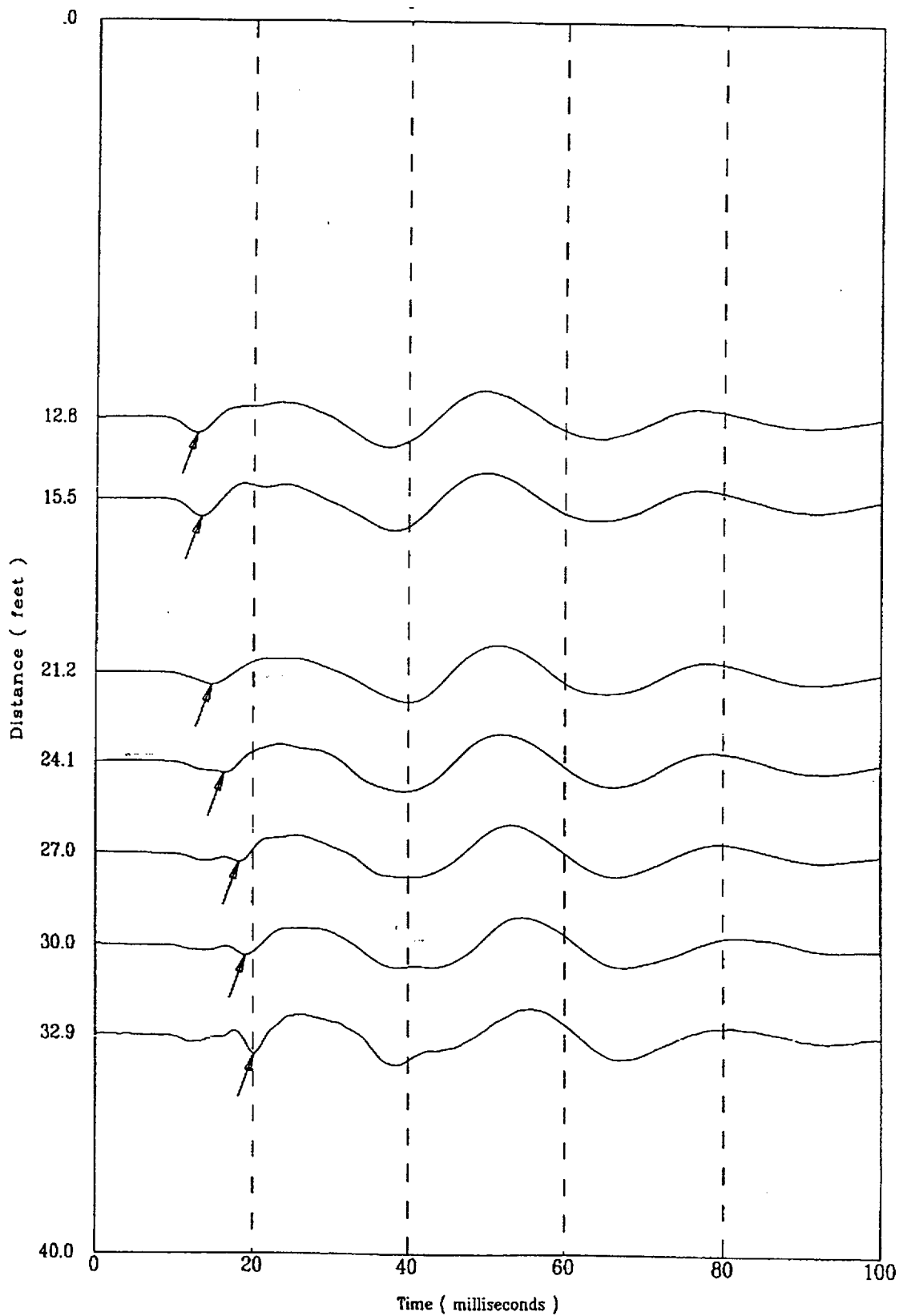
Compression Wave Speeds





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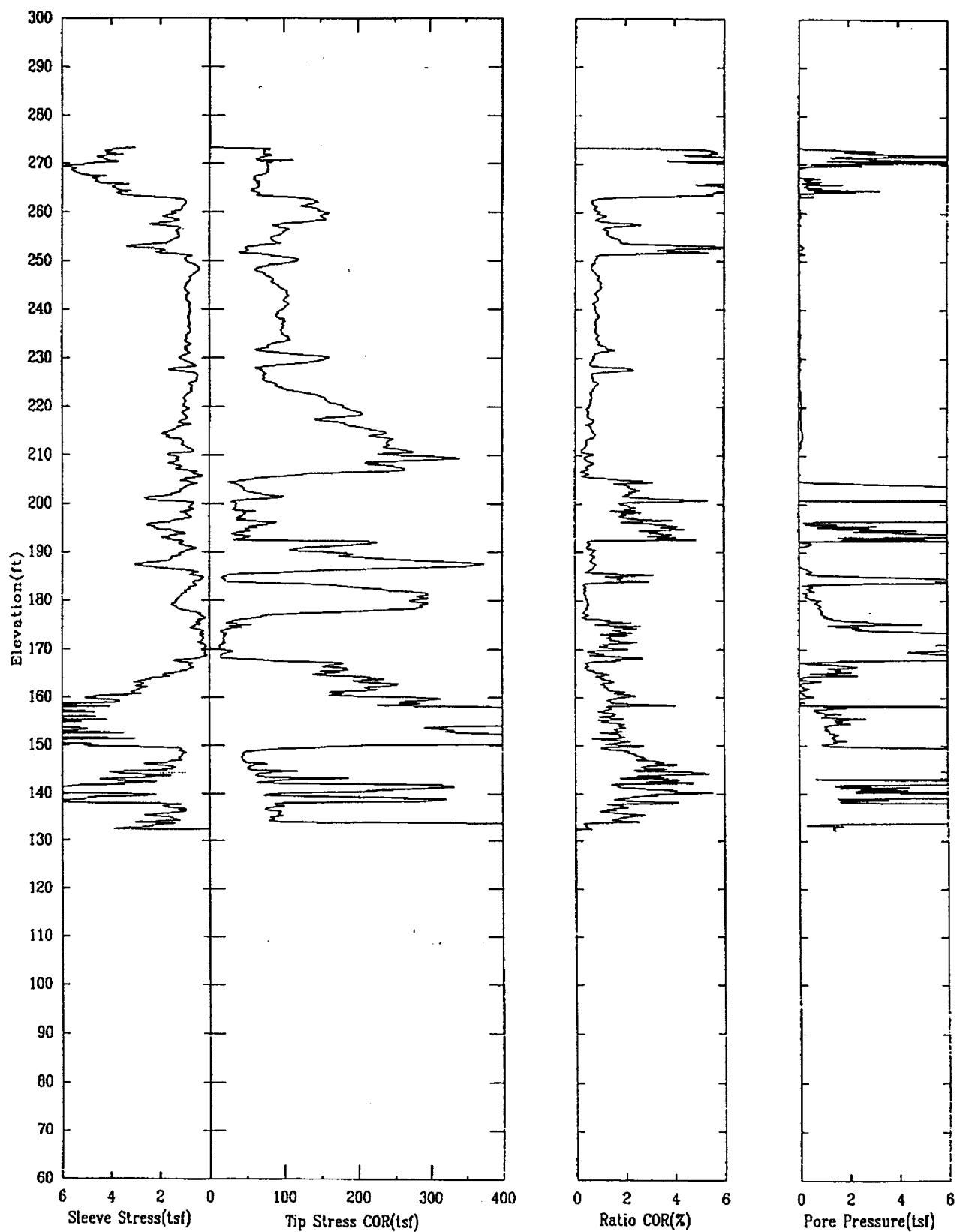
APPLIED RESEARCH ASSOCIATES, INC.

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North 79650.01

East 55124.95

Elevation 279.3



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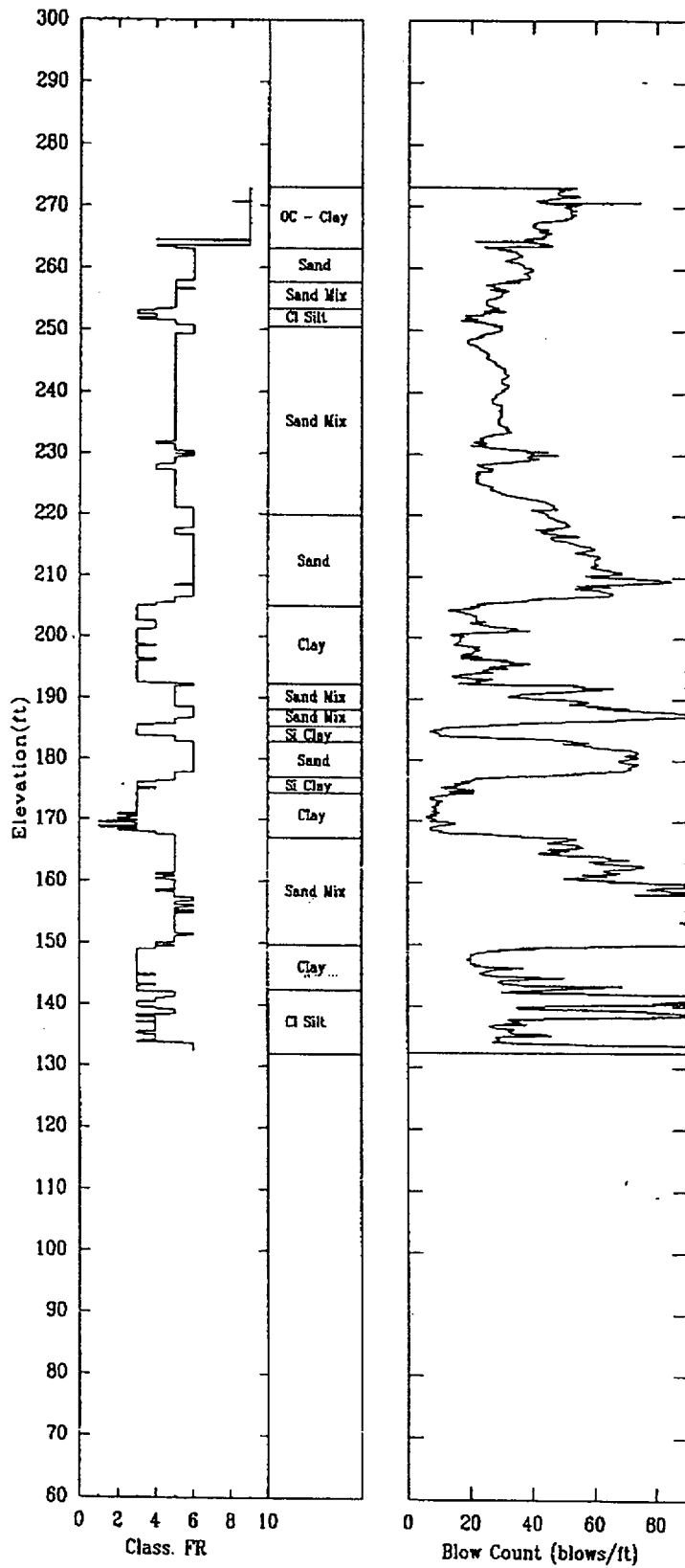
APPLIED RESEARCH ASSOCIATES, INC.

02/23/98

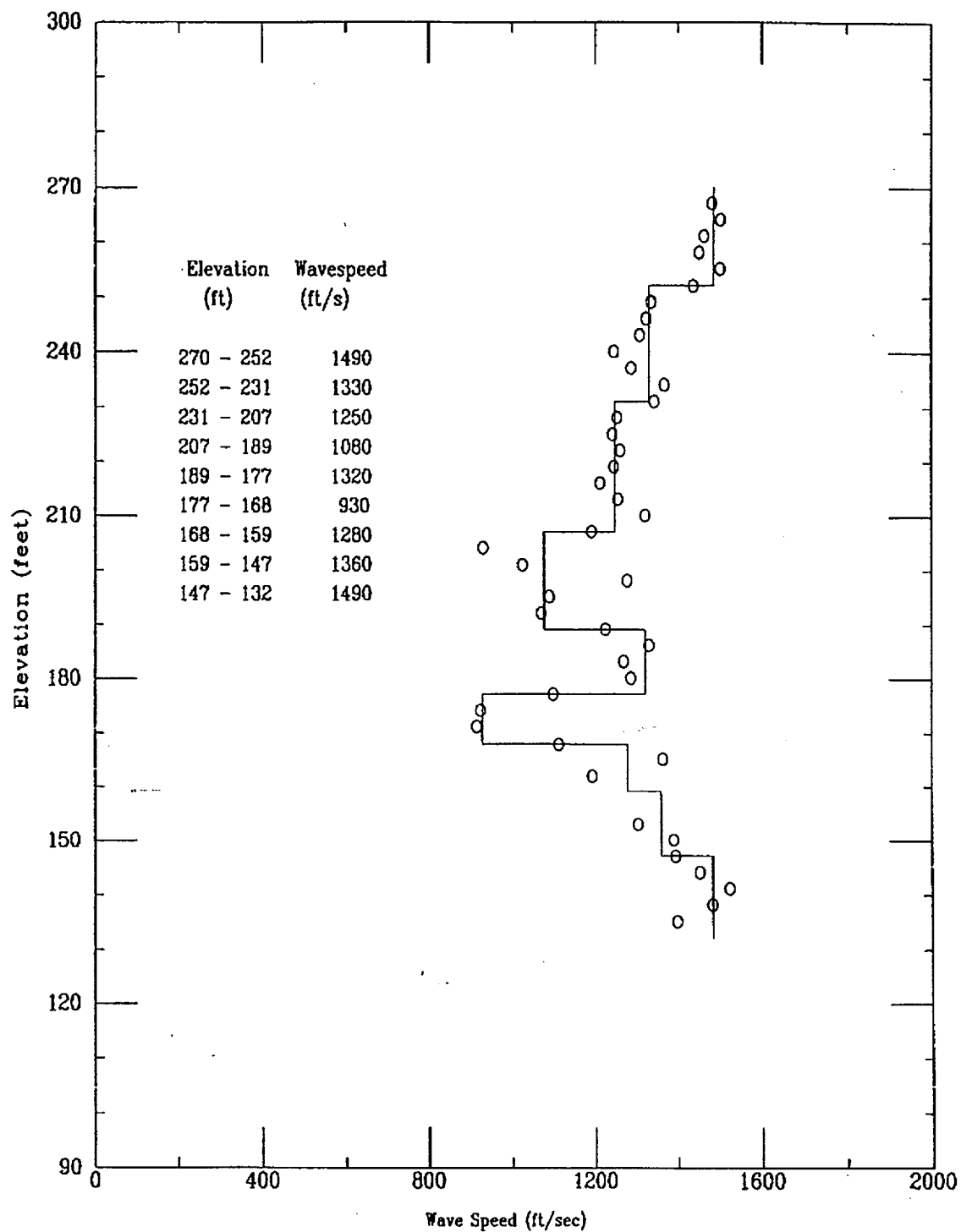
North 79650.01

East 55124.95

Elevation 279.3



Shear Wave Speeds

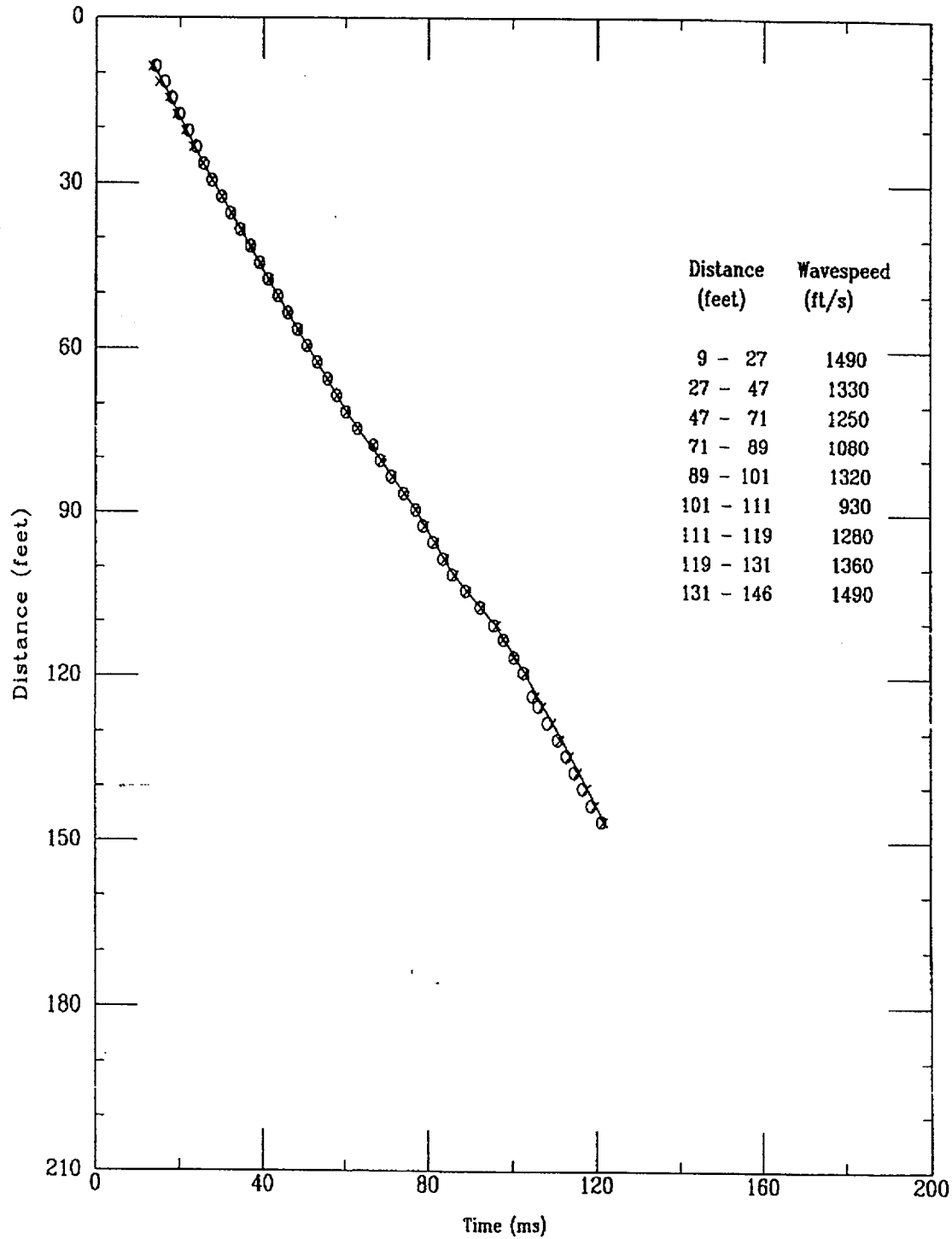


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APPLIED RESEARCH ASSOCIATES, INC.

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Shear Wave Time of Peak

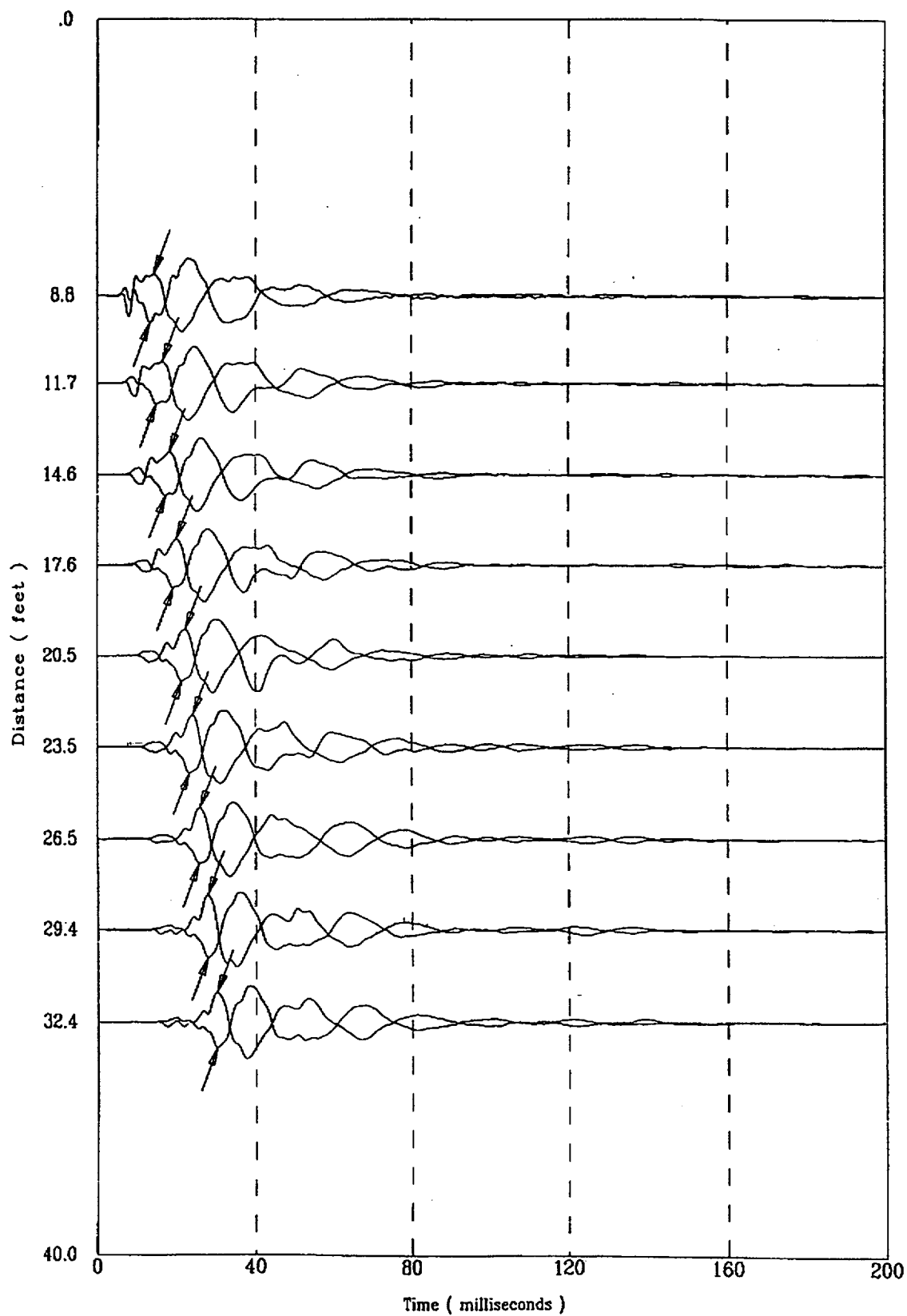


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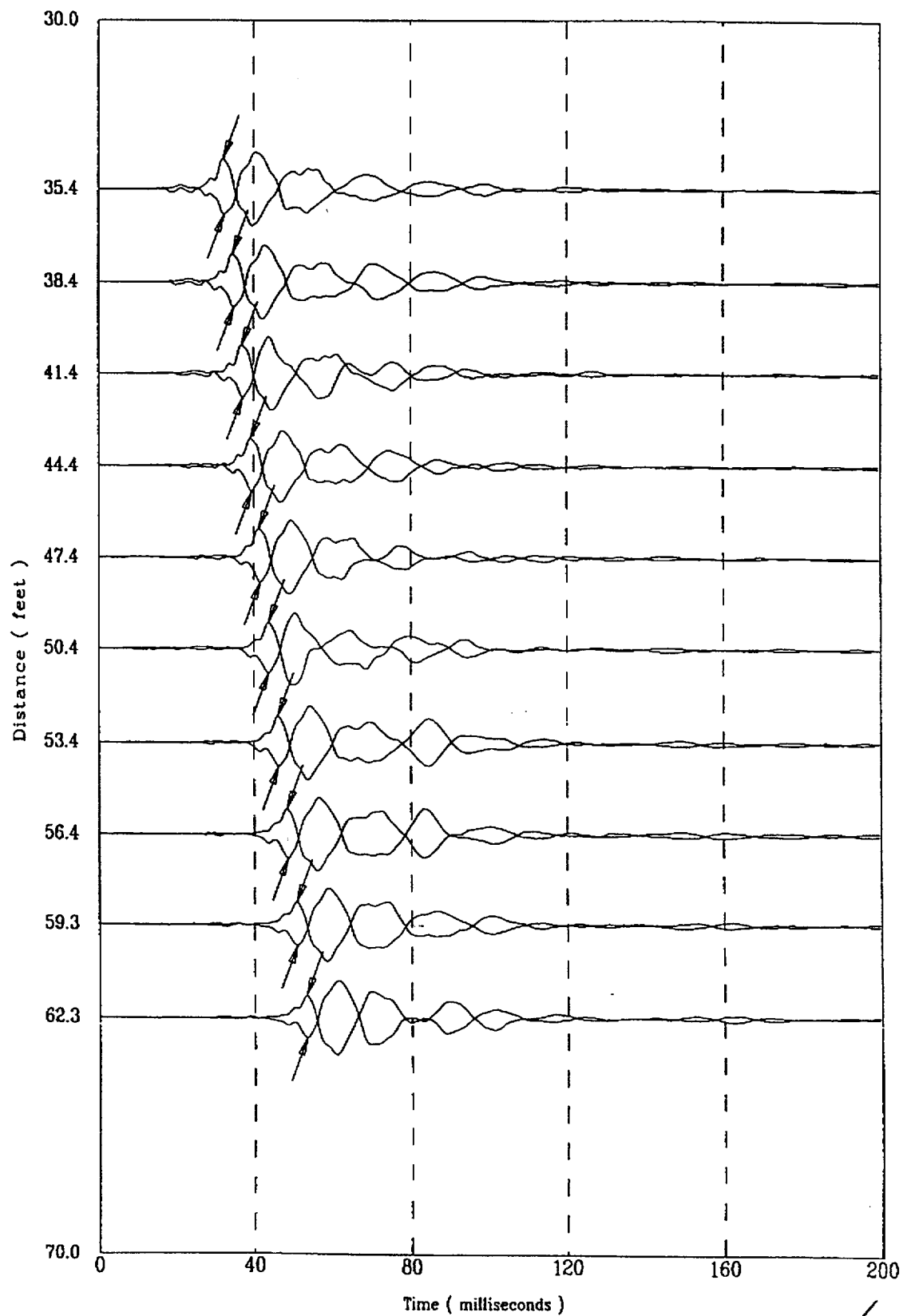
Applied Research Associates, Inc.
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S Wave
02/23/98



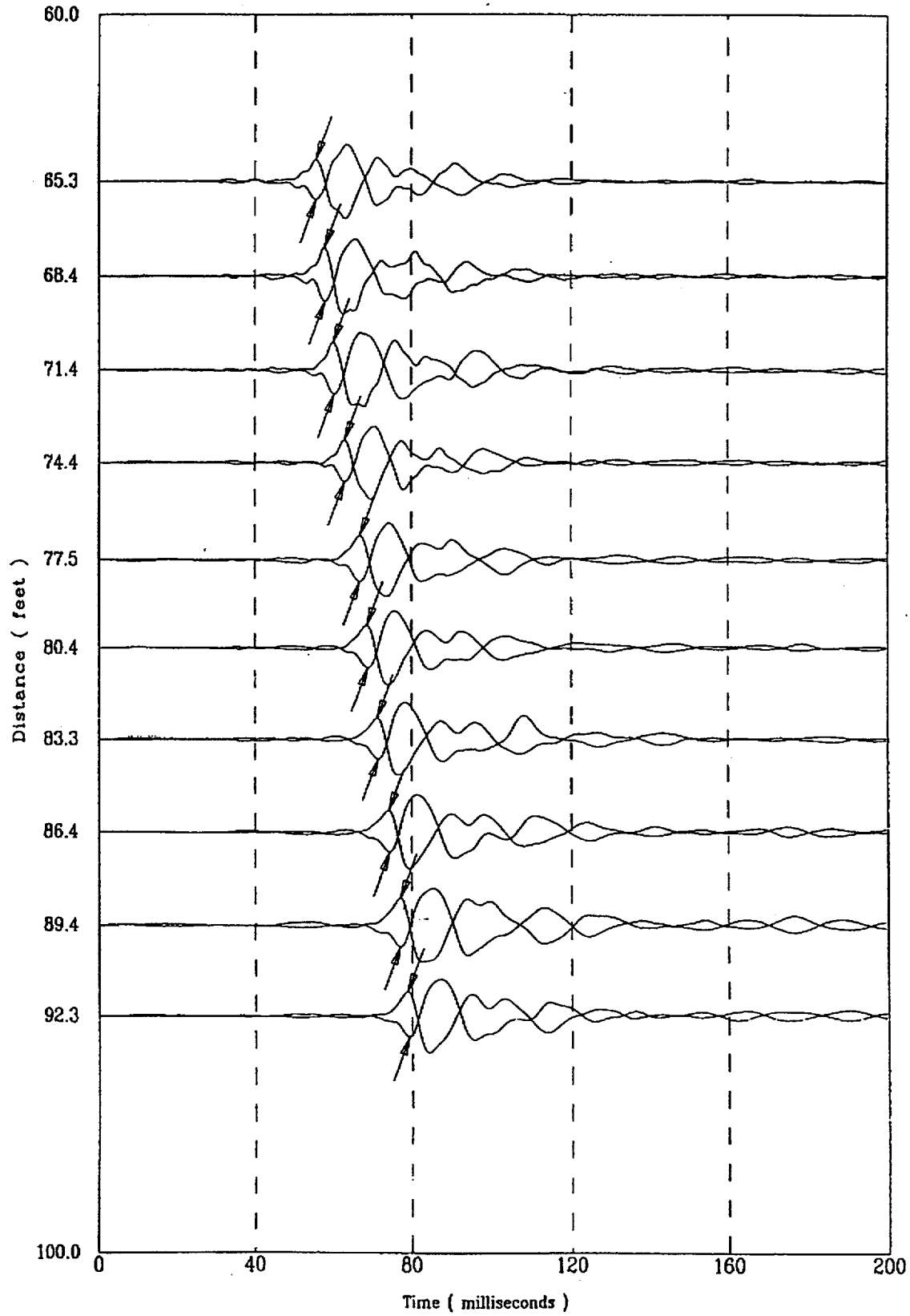
Applied Research Associates, Inc.
CPT-128

S Wave
02/23/98



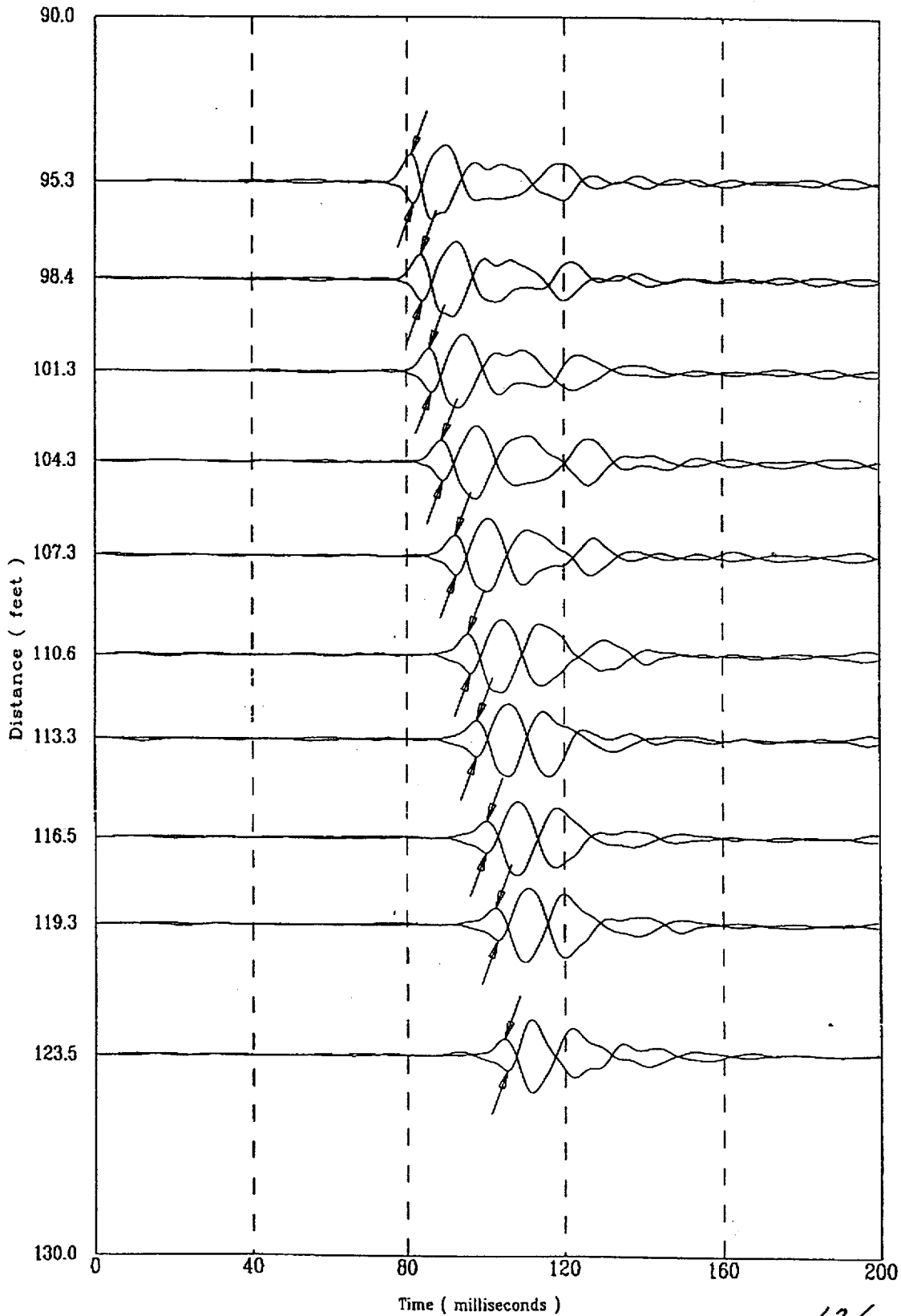
Applied Research Associates, Inc.
CPT-128

S Wave
02/23/98



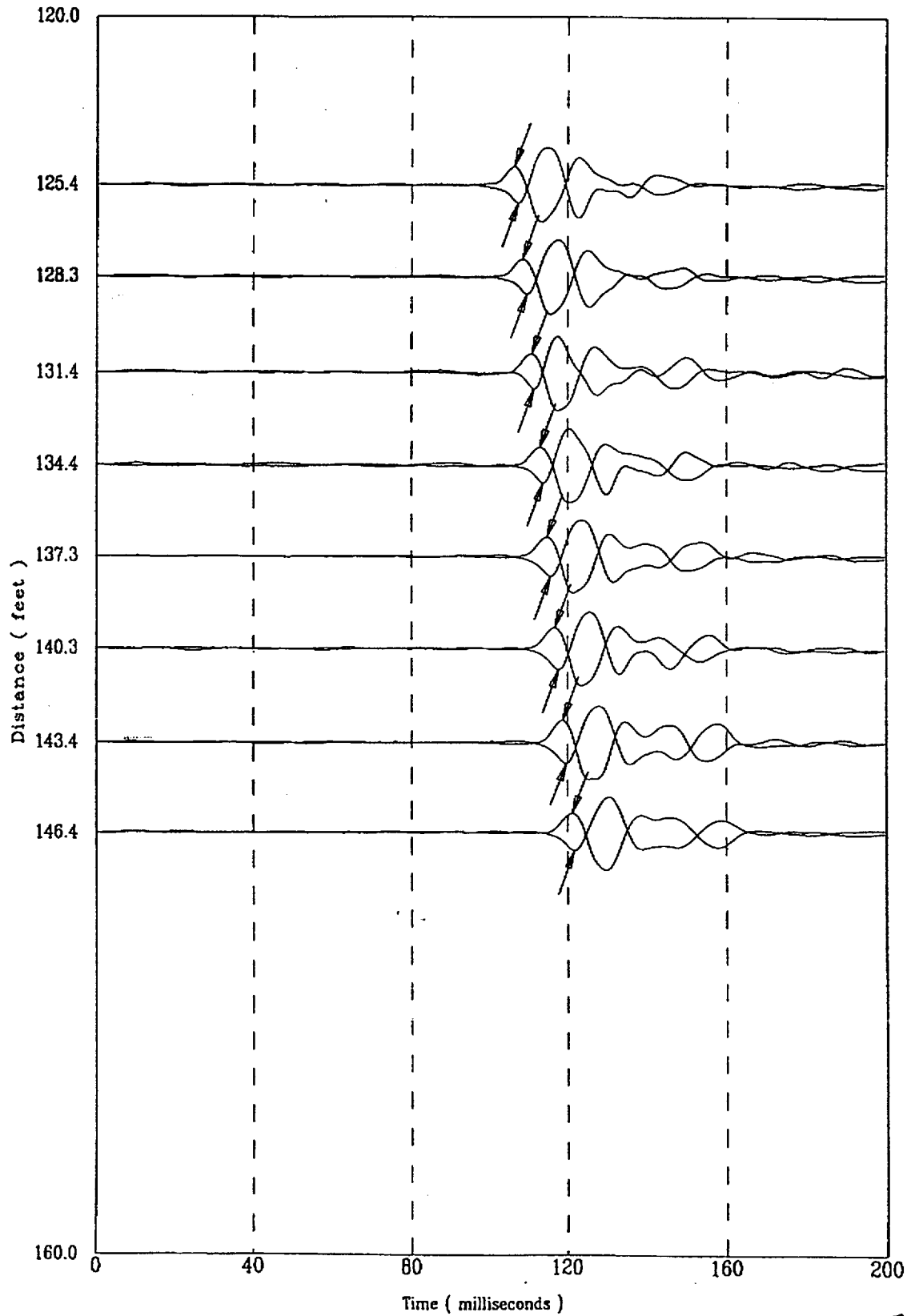
Applied Research Associates, Inc.
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S Wave
02/23/98



Applied Research Associates, Inc.
CPT-128

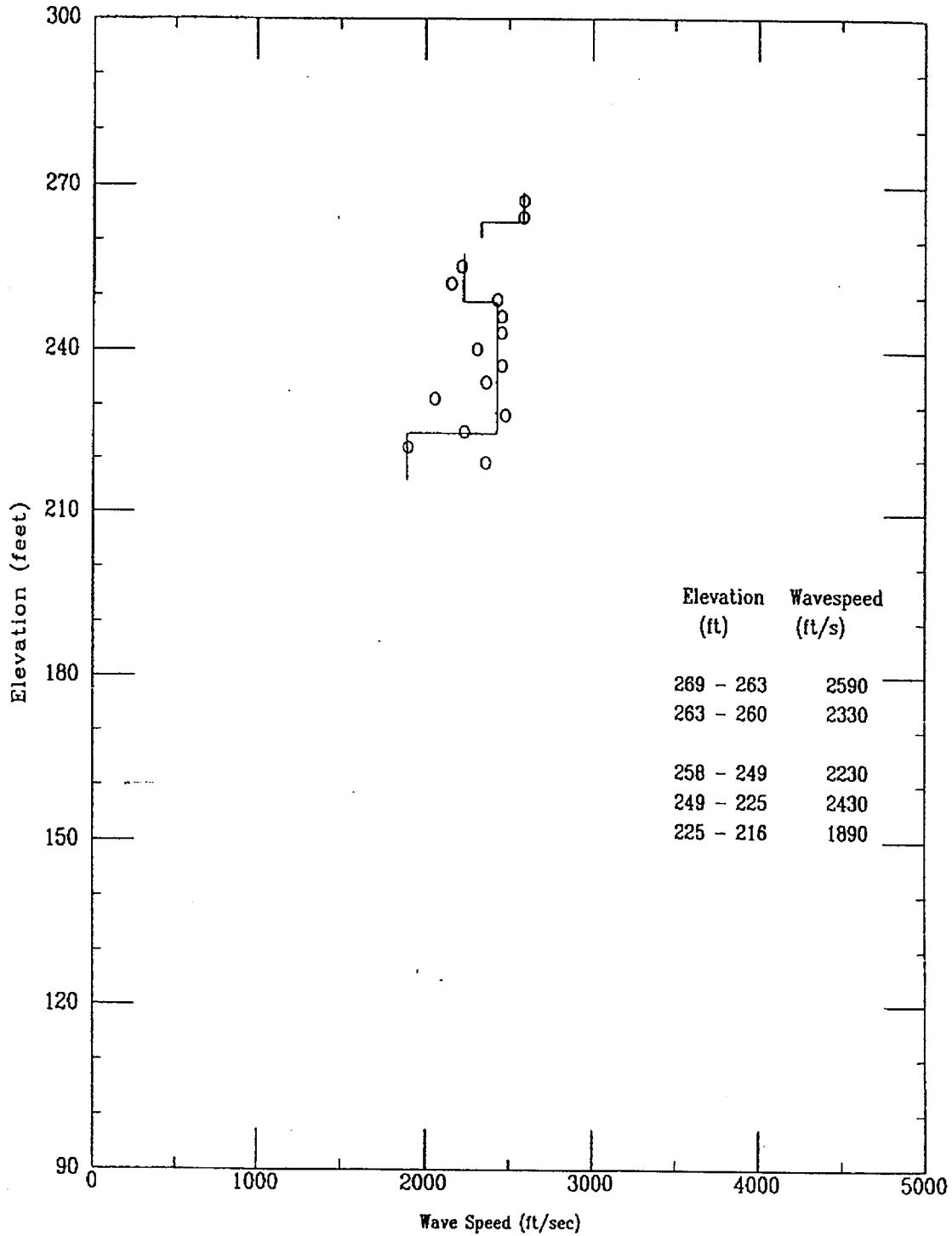
S Wave
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Compression Wave Speeds

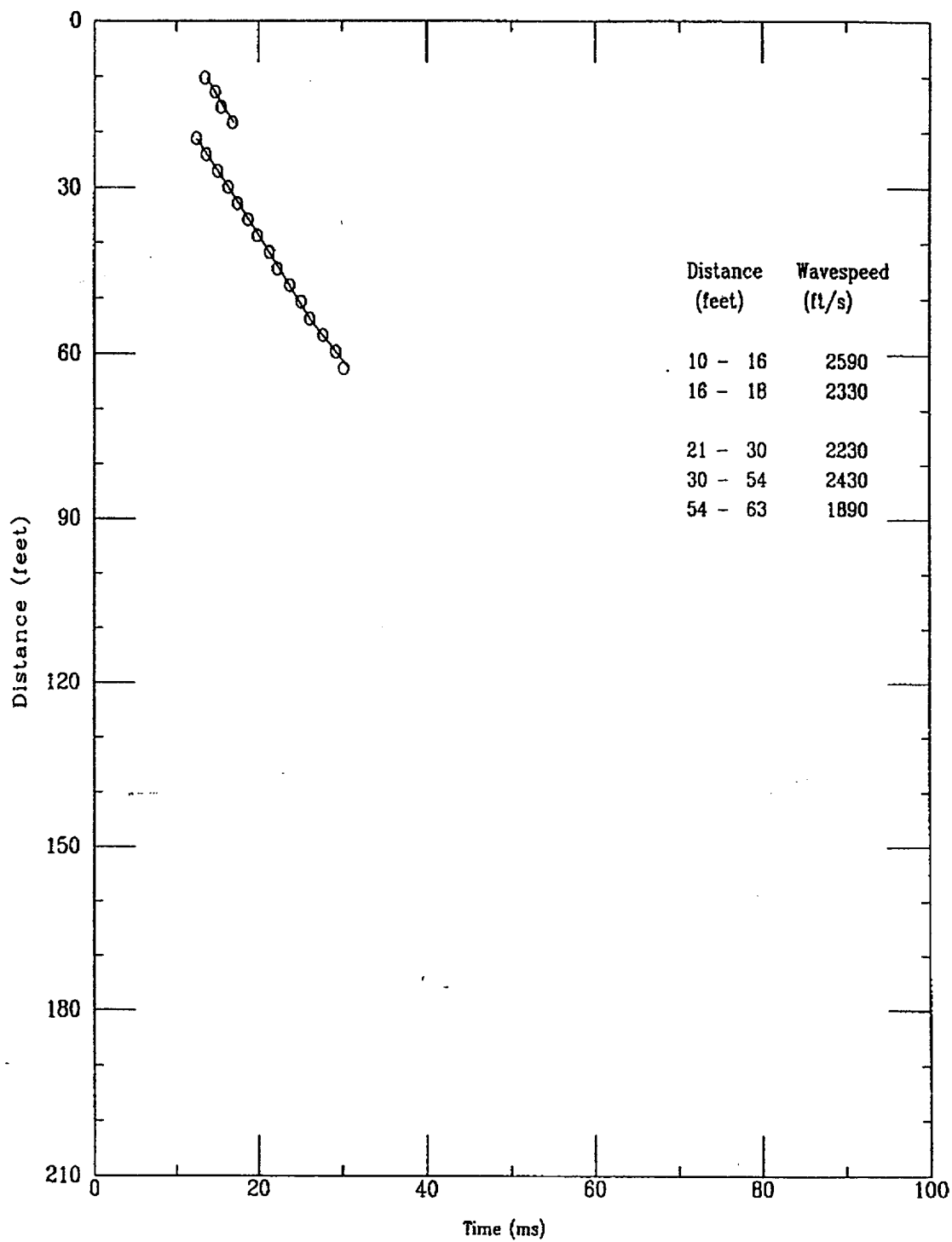


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APPLIED RESEARCH ASSOCIATES, INC.

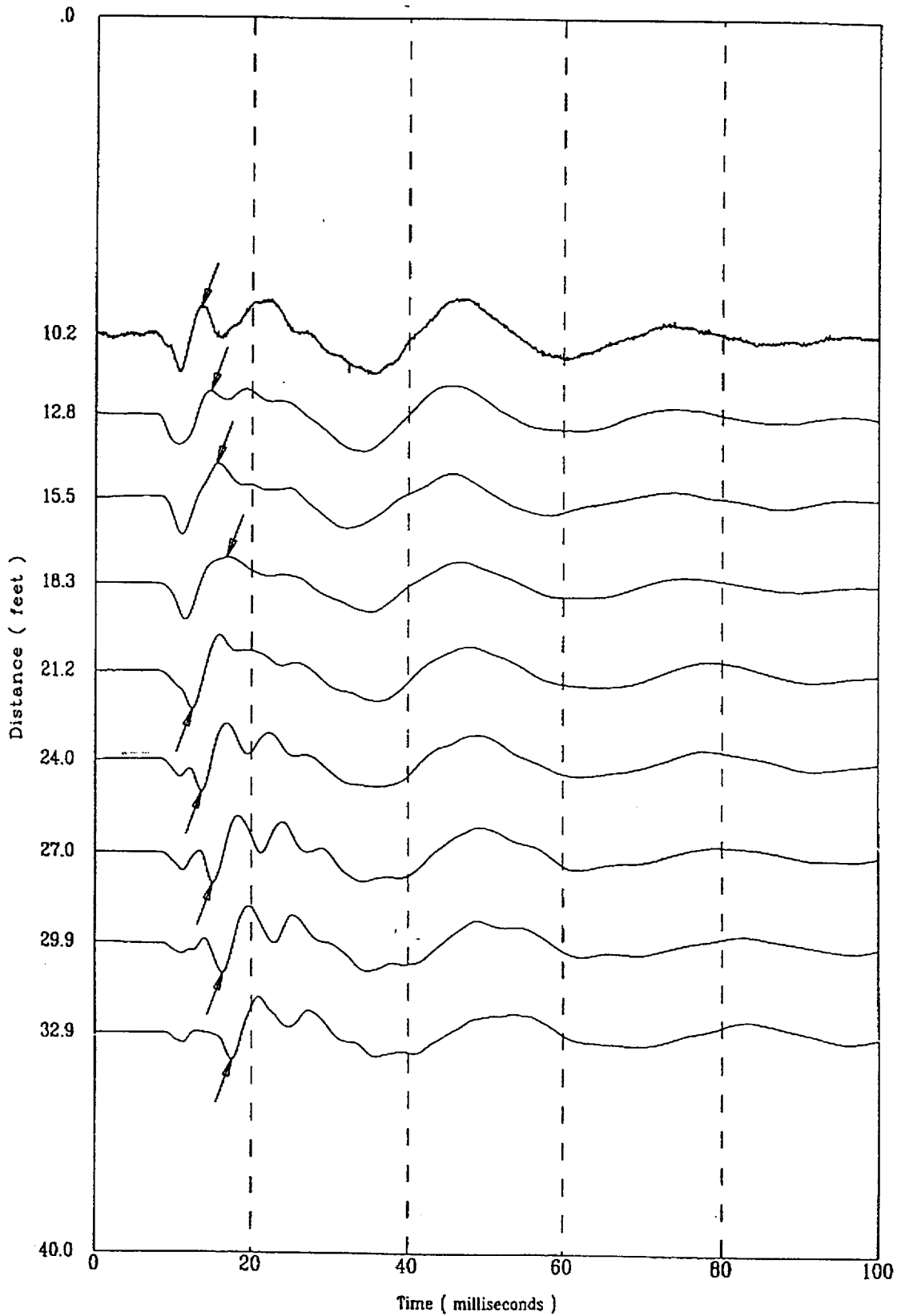
02/23/98

Compression Wave Time of Peak



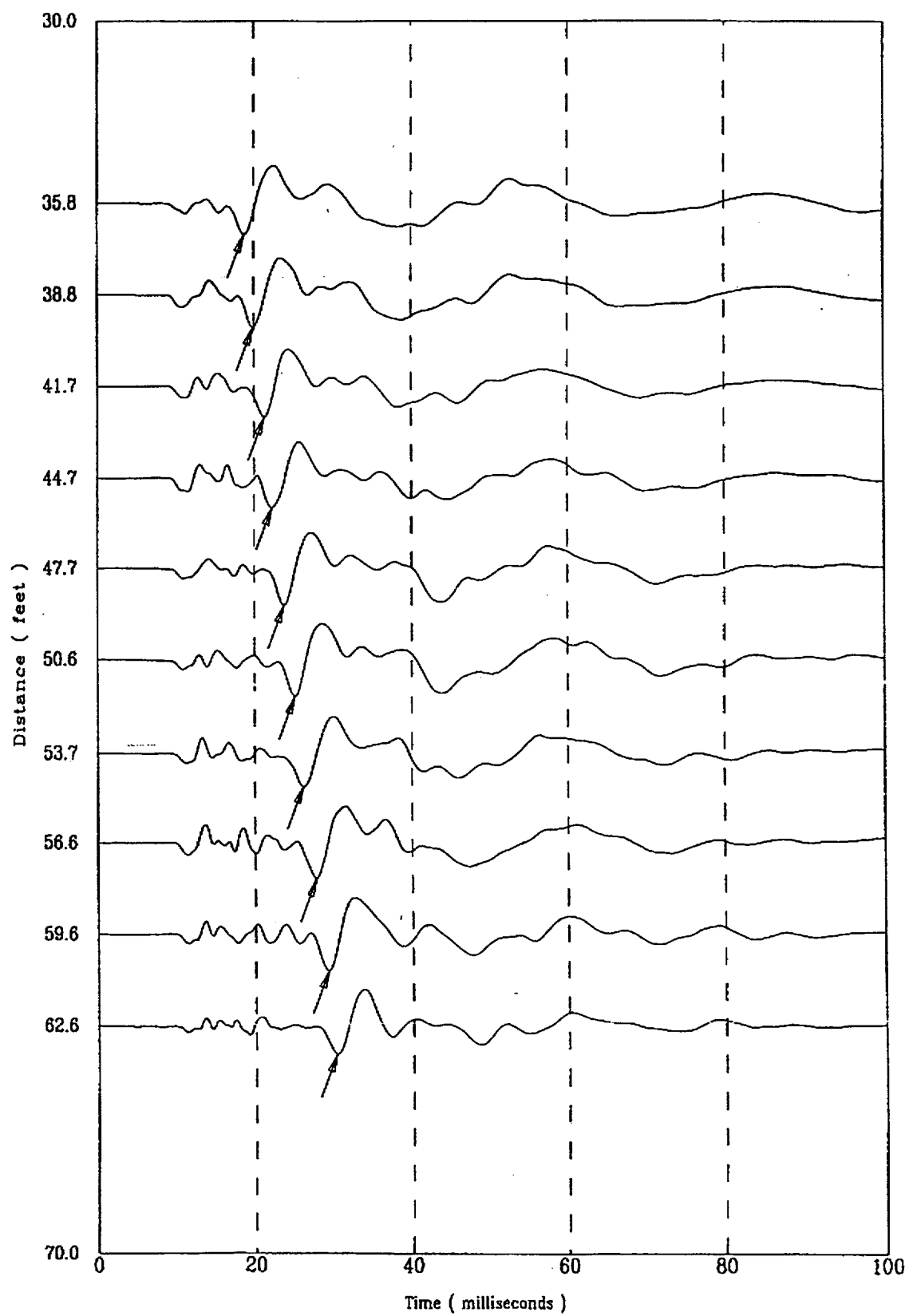
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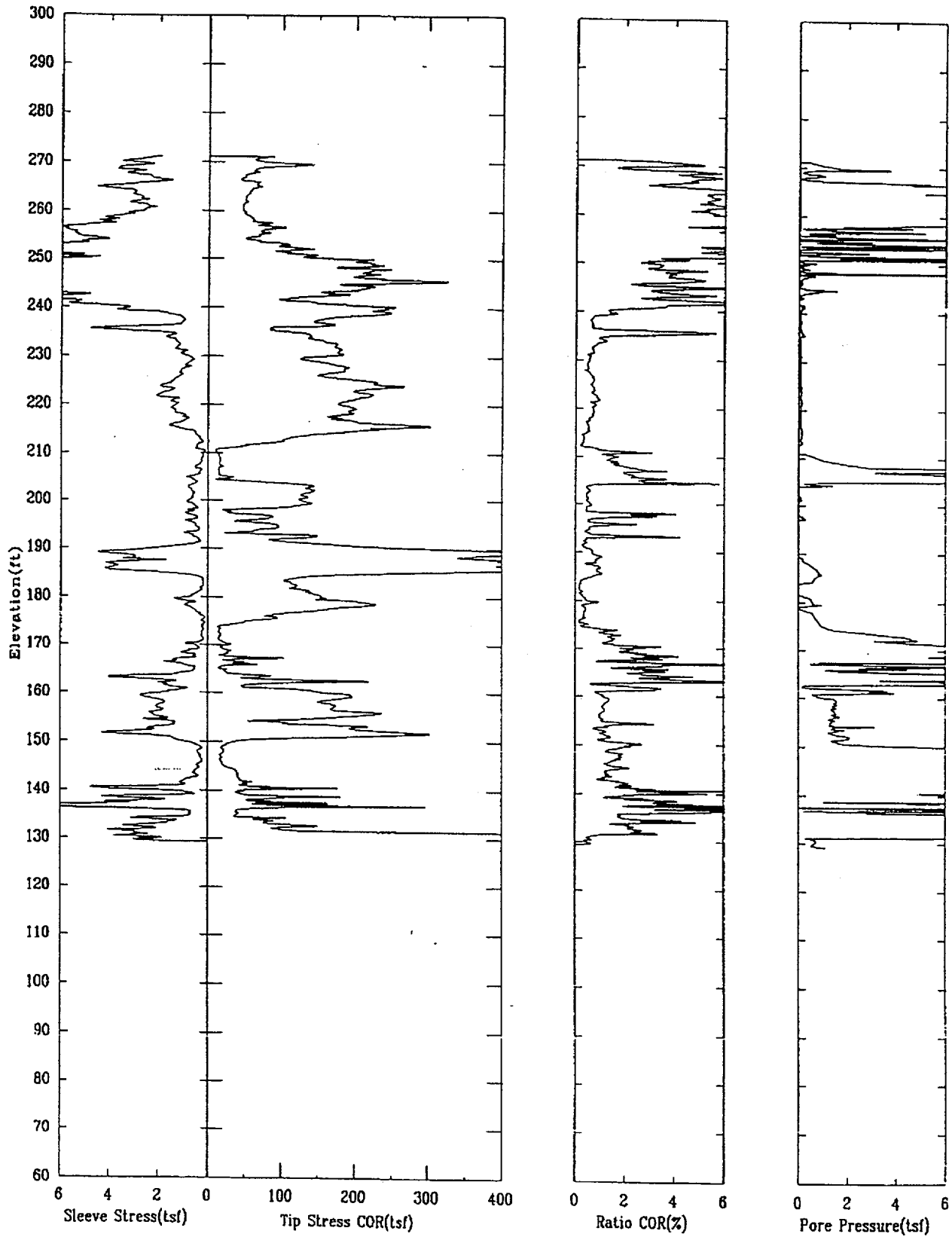
APPLIED RESEARCH ASSOCIATES, INC.

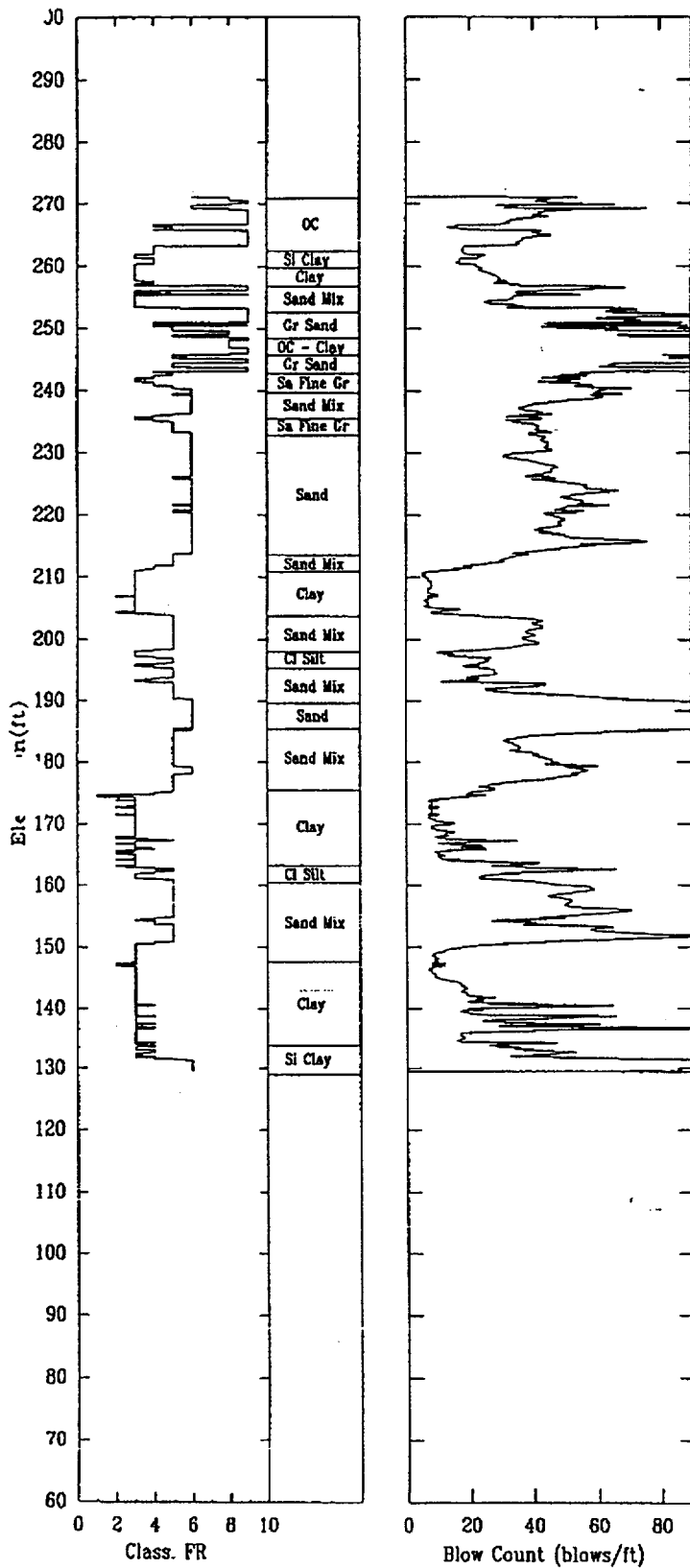
02/23/98

North 79650.00

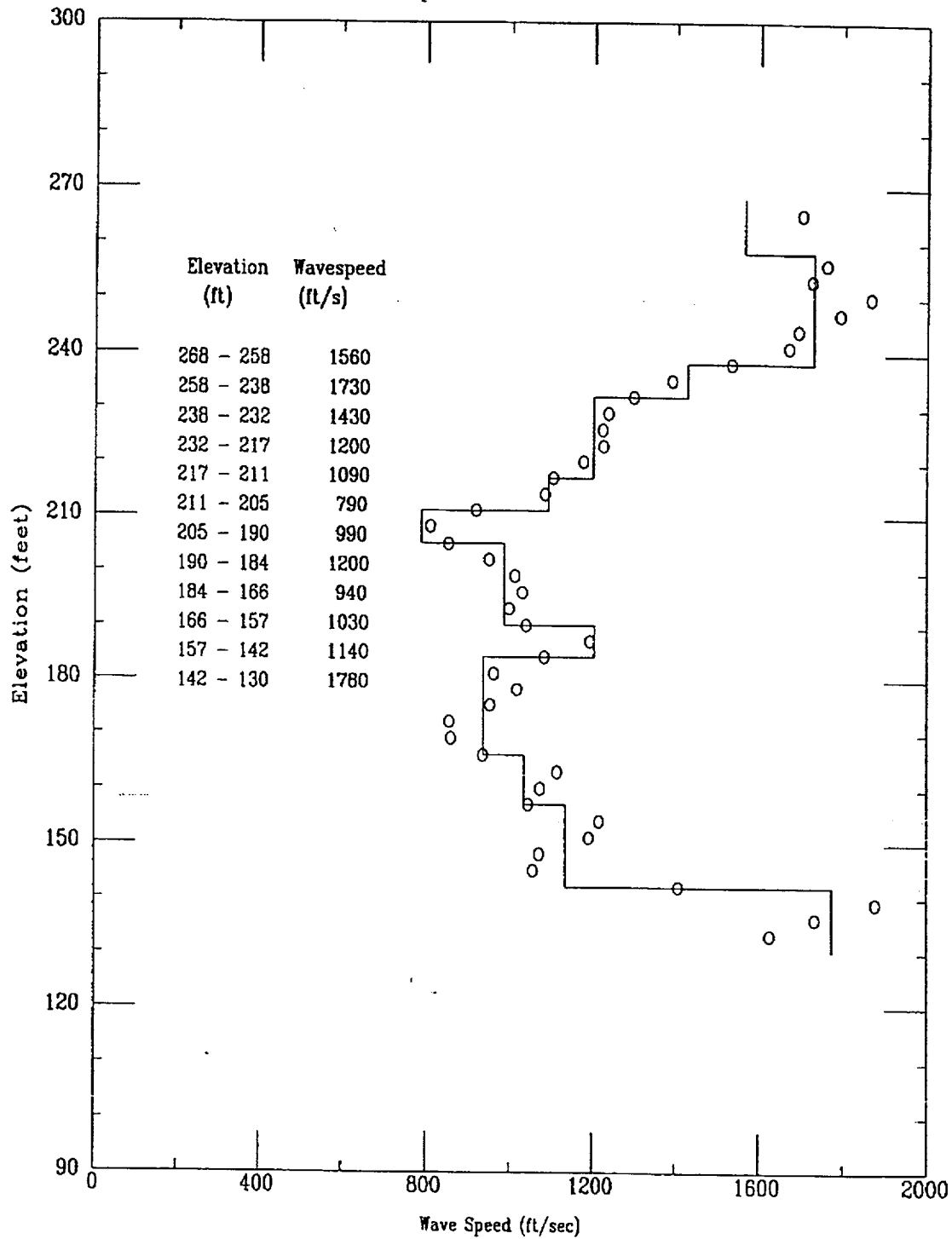
East 55261.00

Elevation 277.2

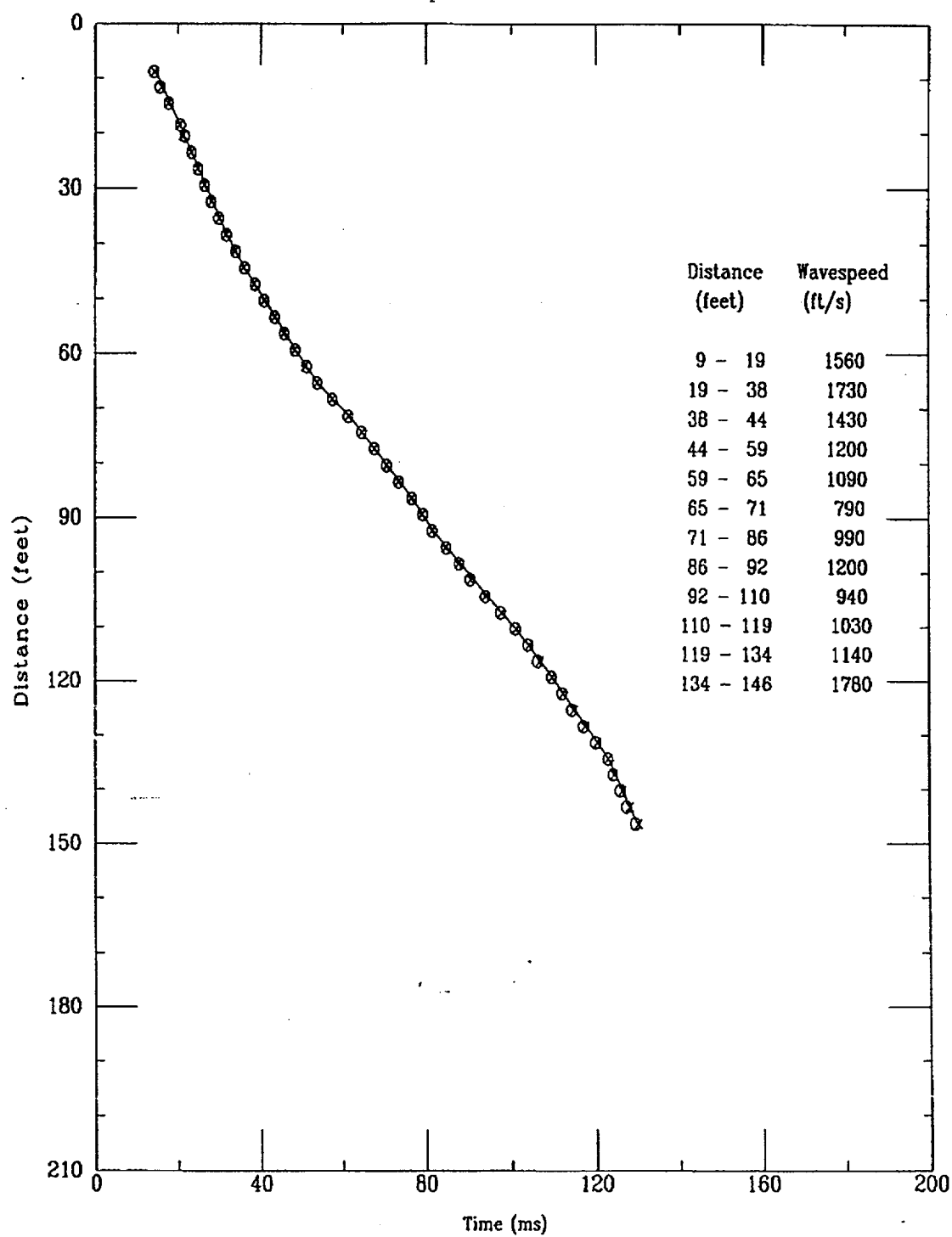




Shear Wave Speeds

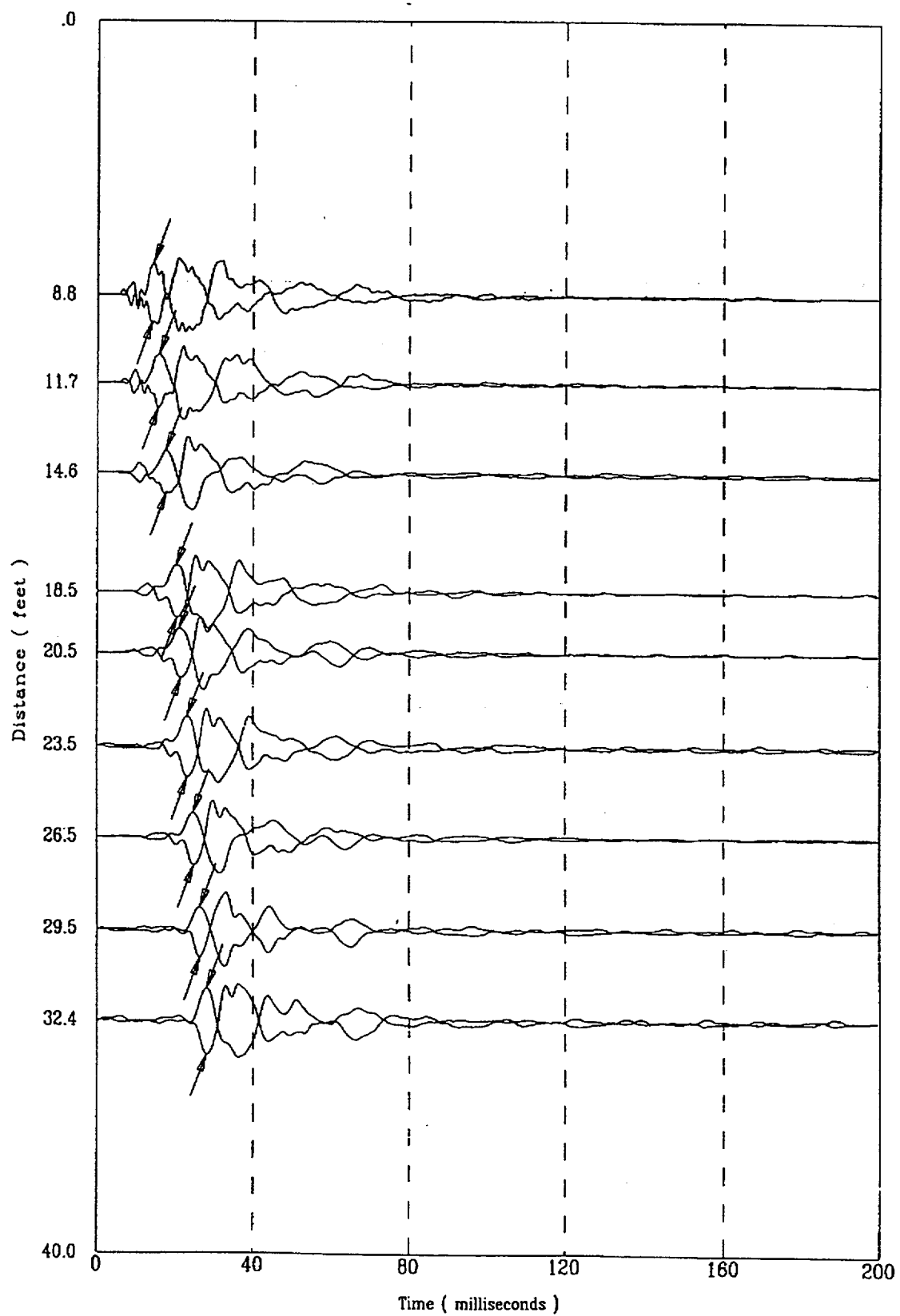


Shear Wave Time of Peak



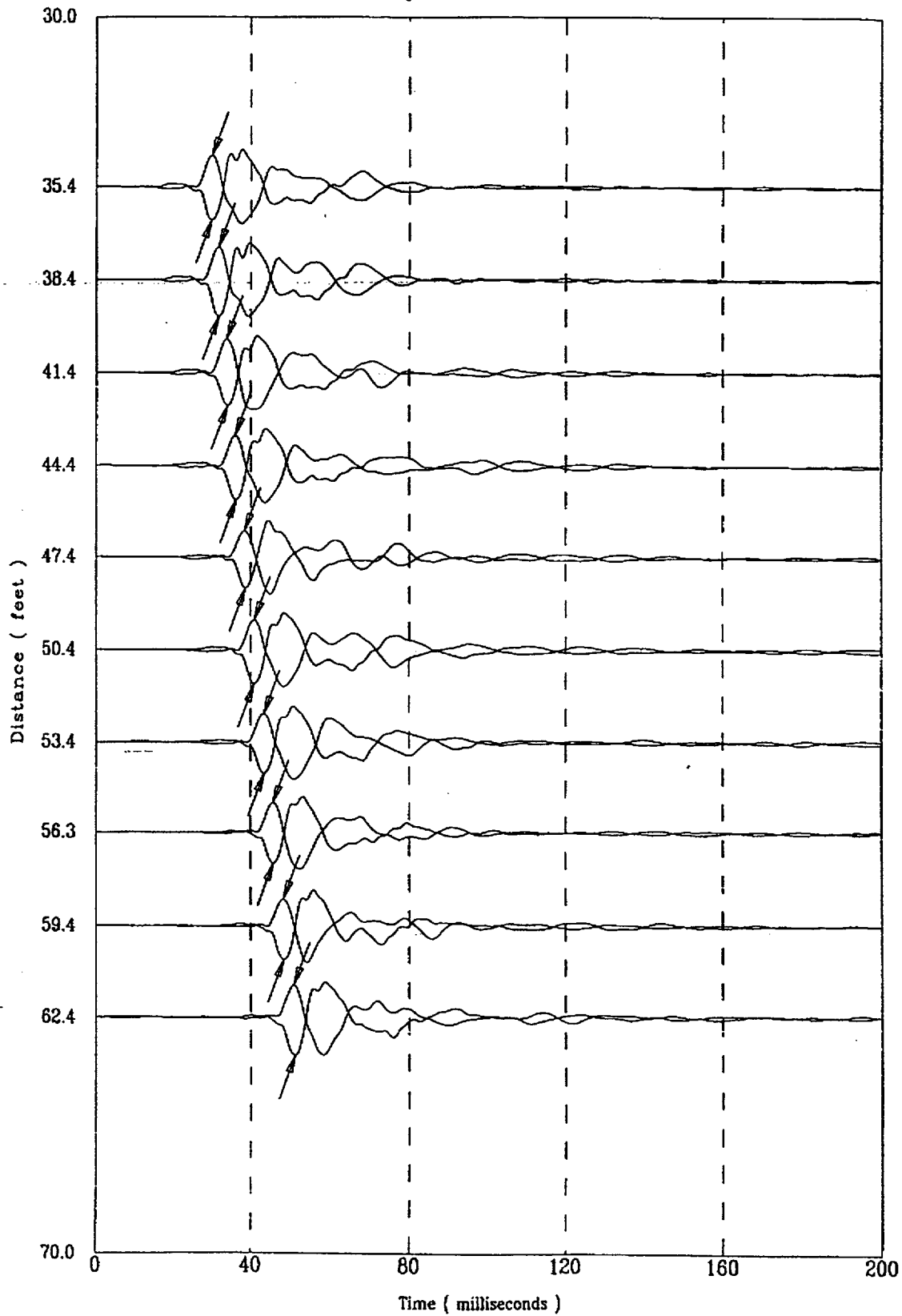
Applied Research Associates, Inc.
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S Wave
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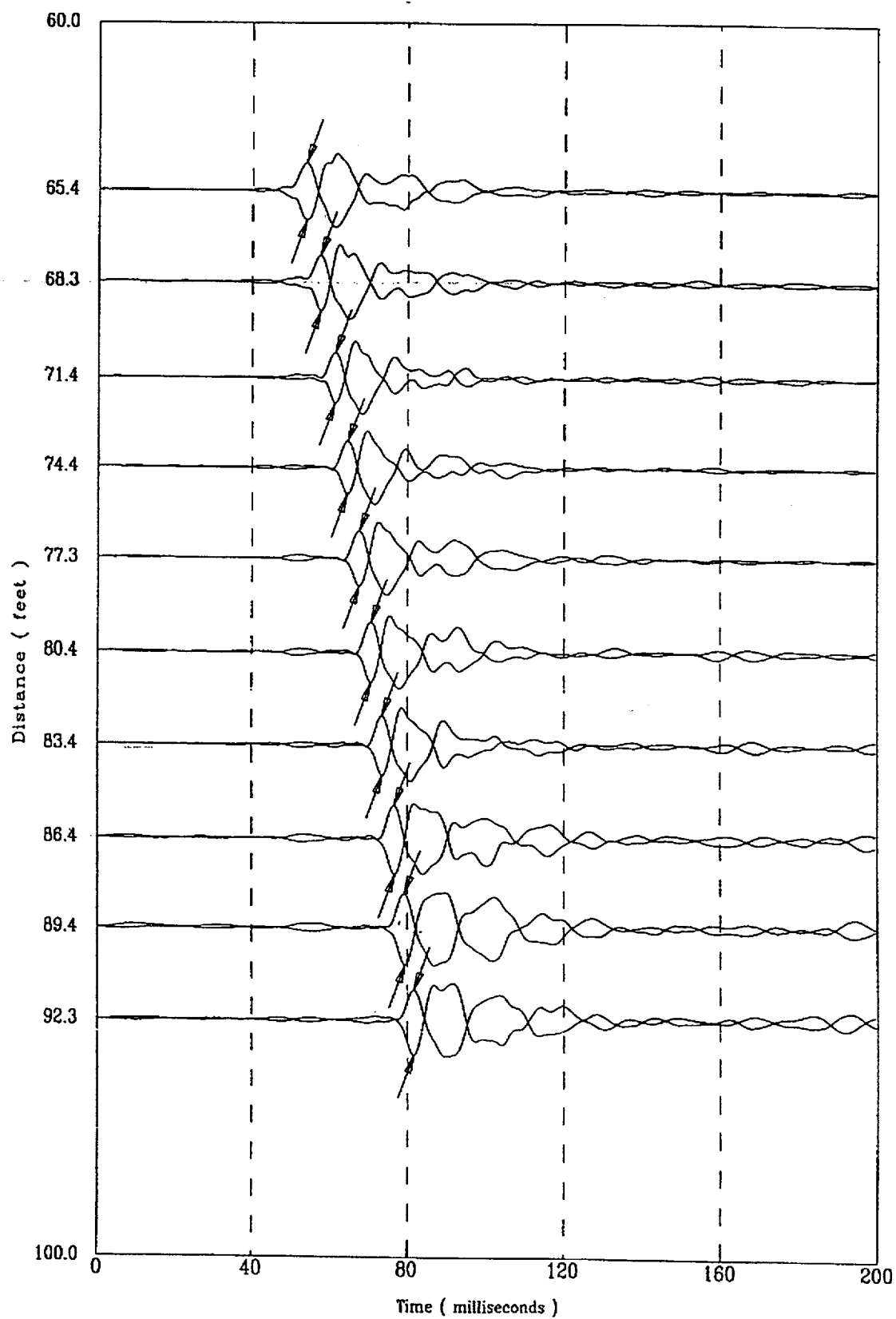
S Wave
02/23/98



023F801S

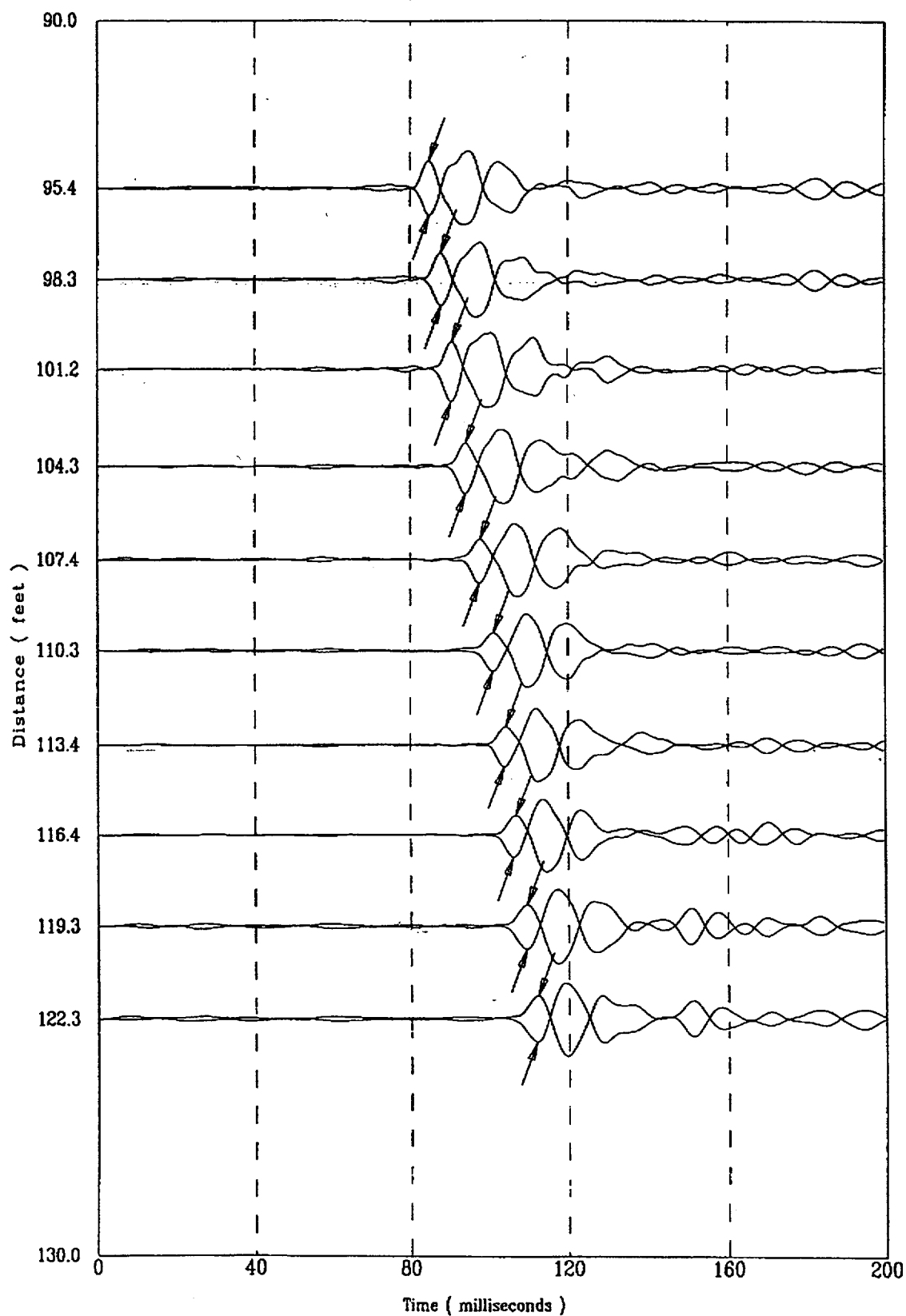
Applied Research Associates, Inc.
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S Wave
02/23/98



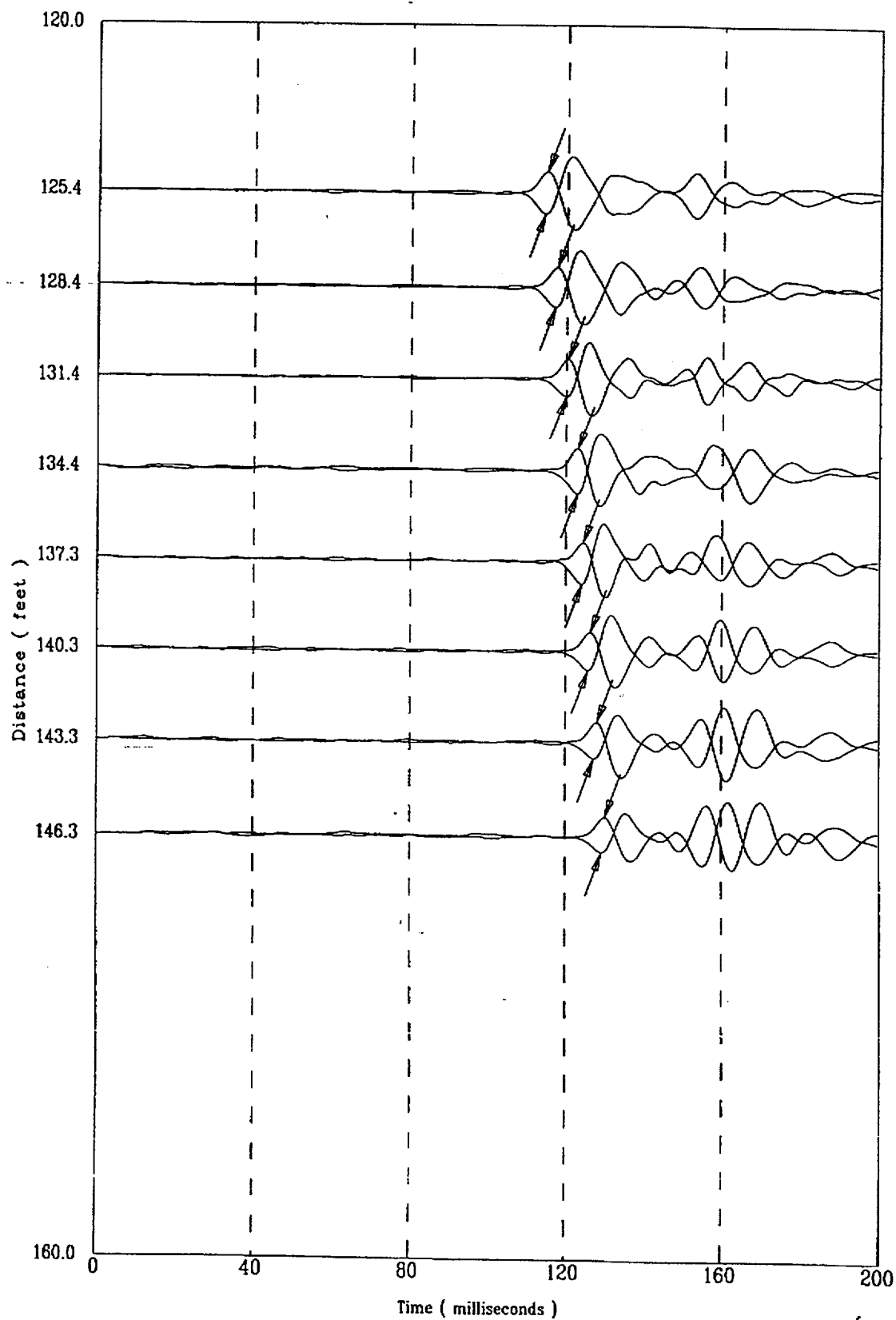
File 523F801S

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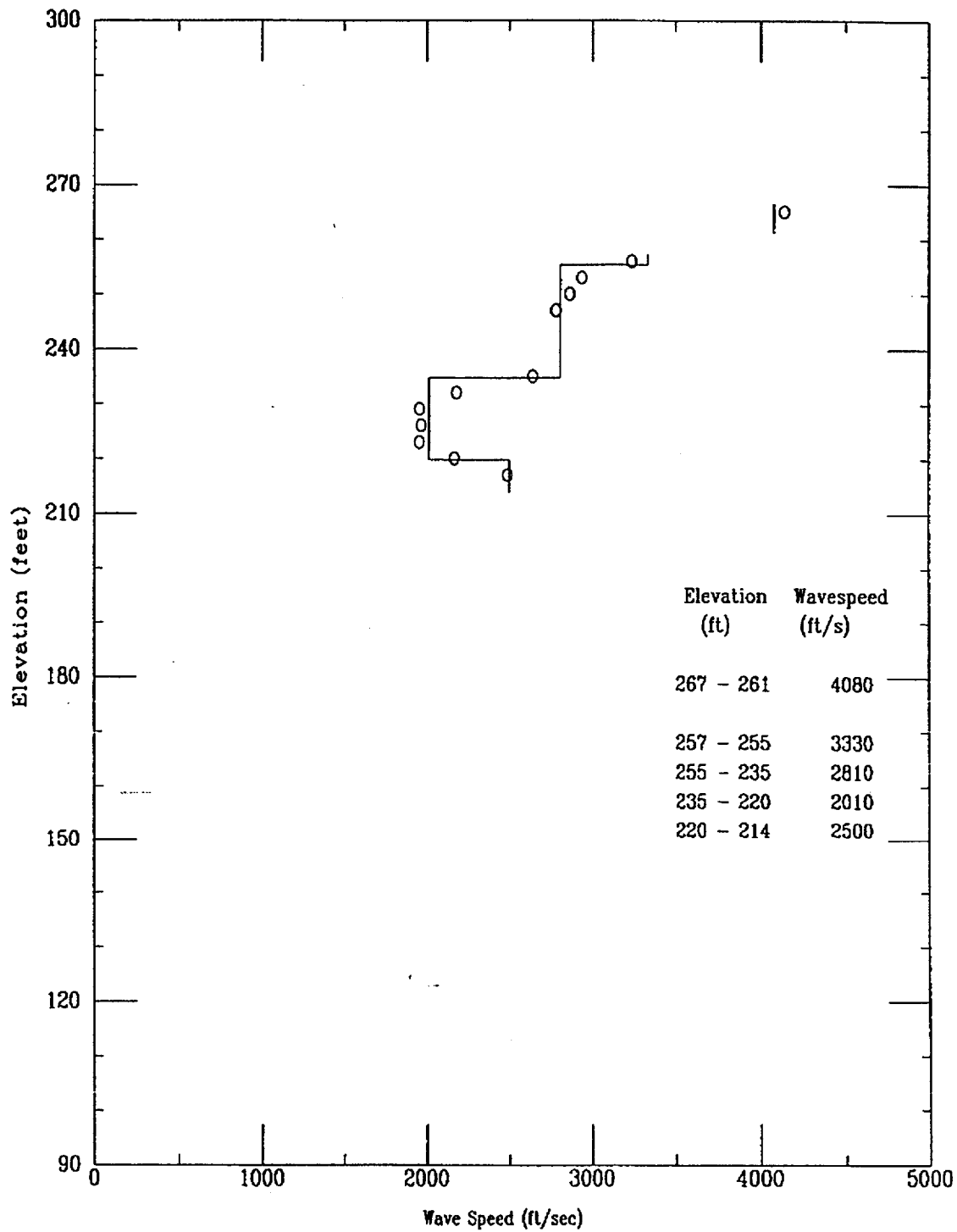
S Wave
02/23/98

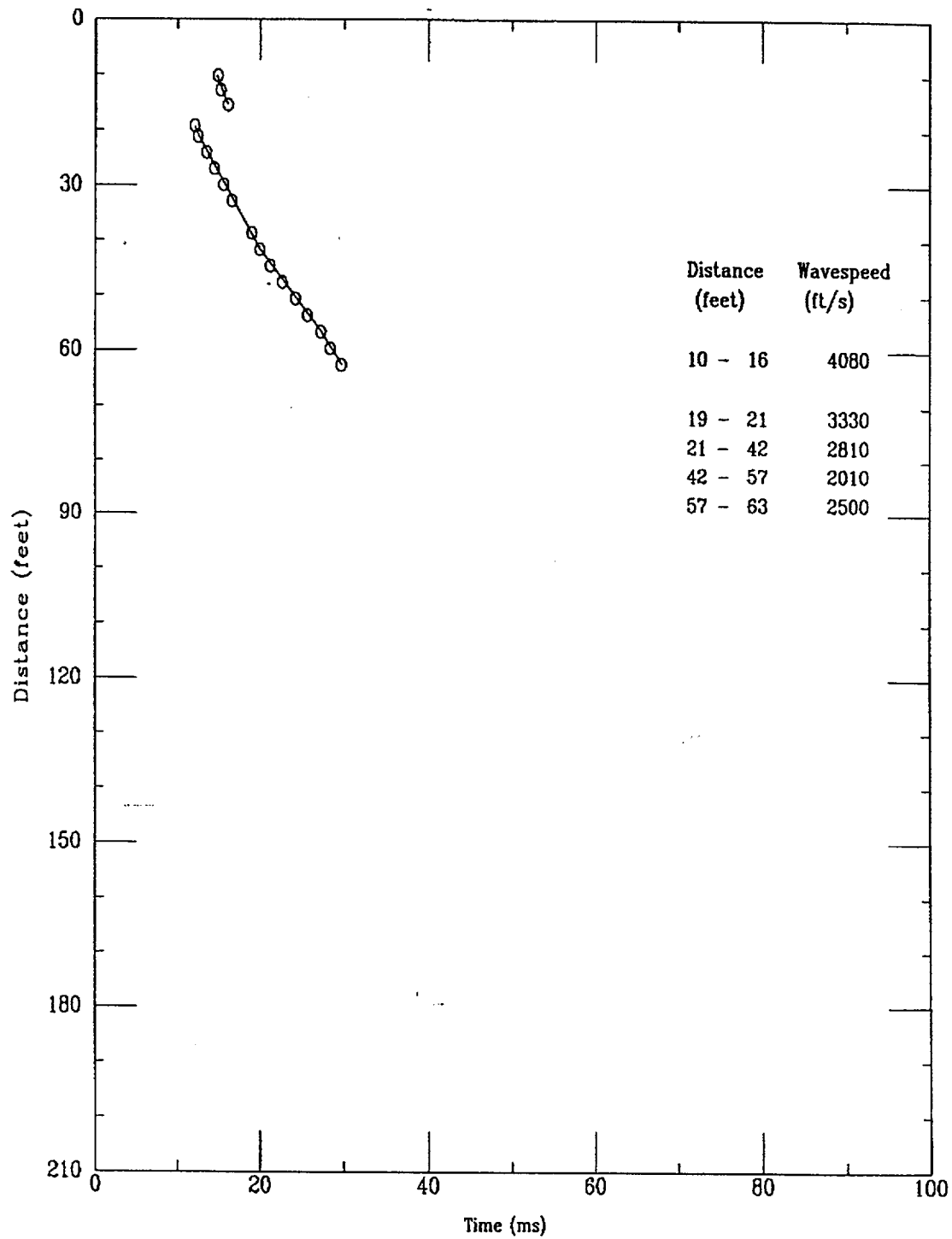


File 523F801S

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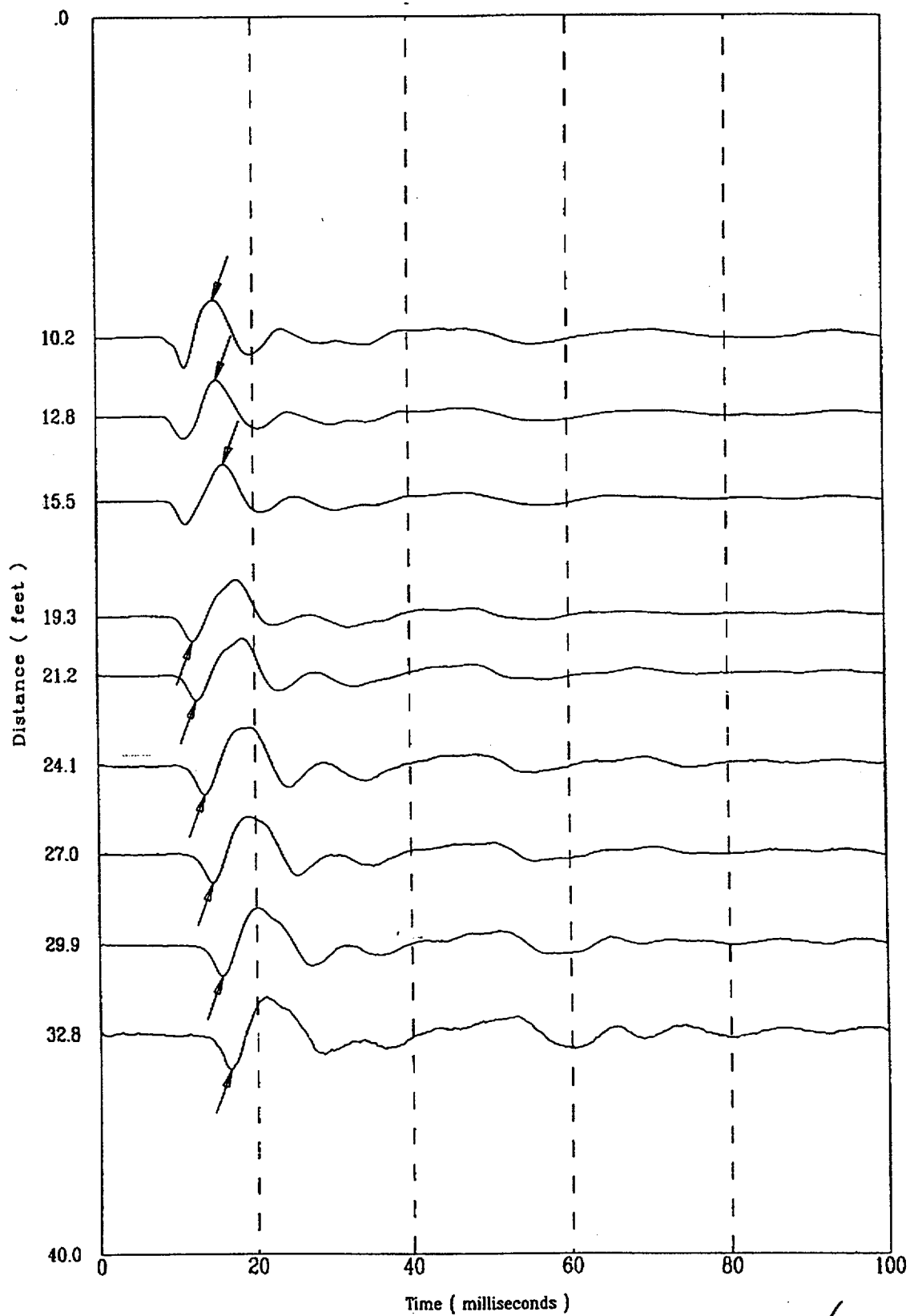
Compression Wave Speeds





Applied Research Associates, Inc.
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P Wave
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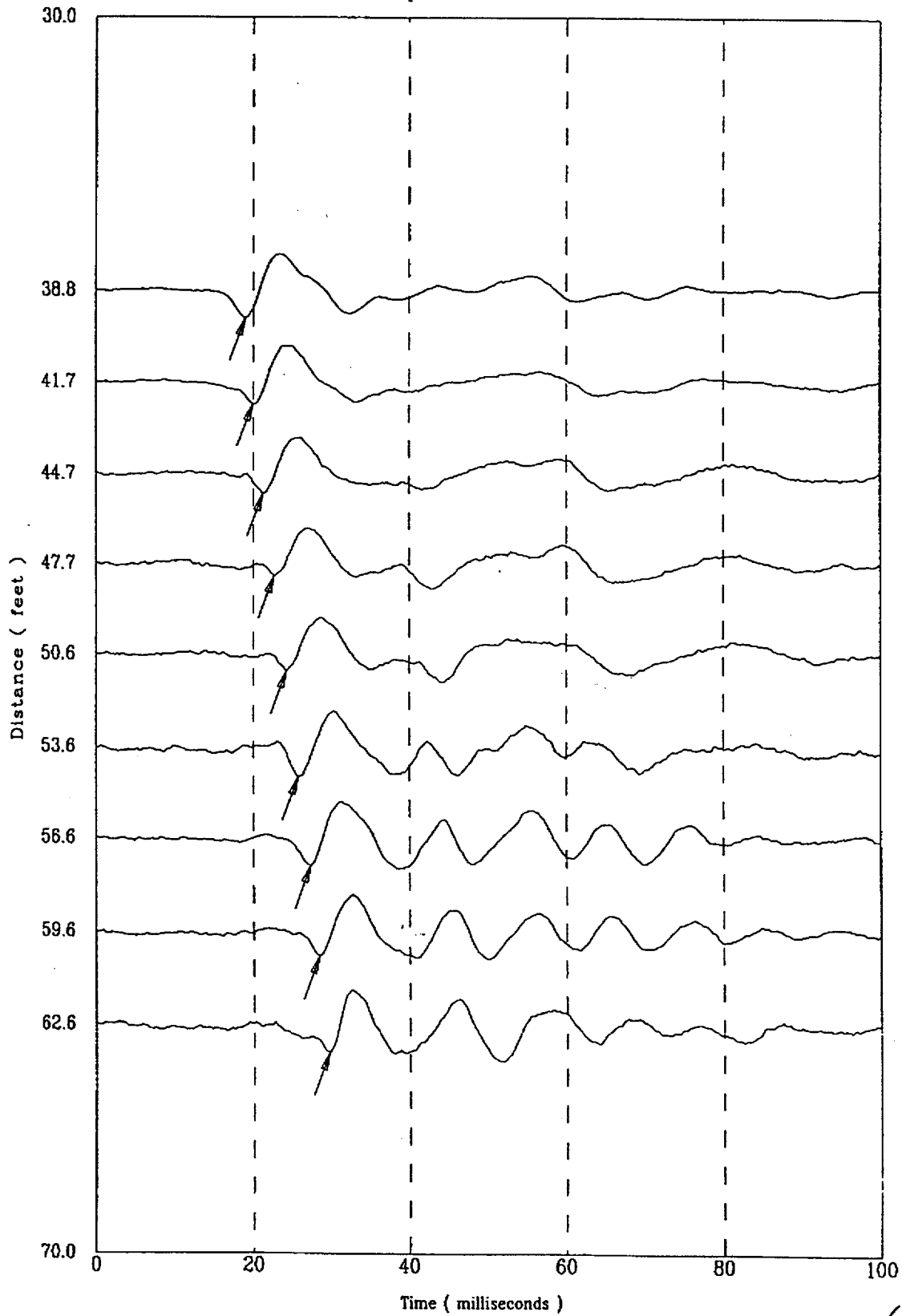


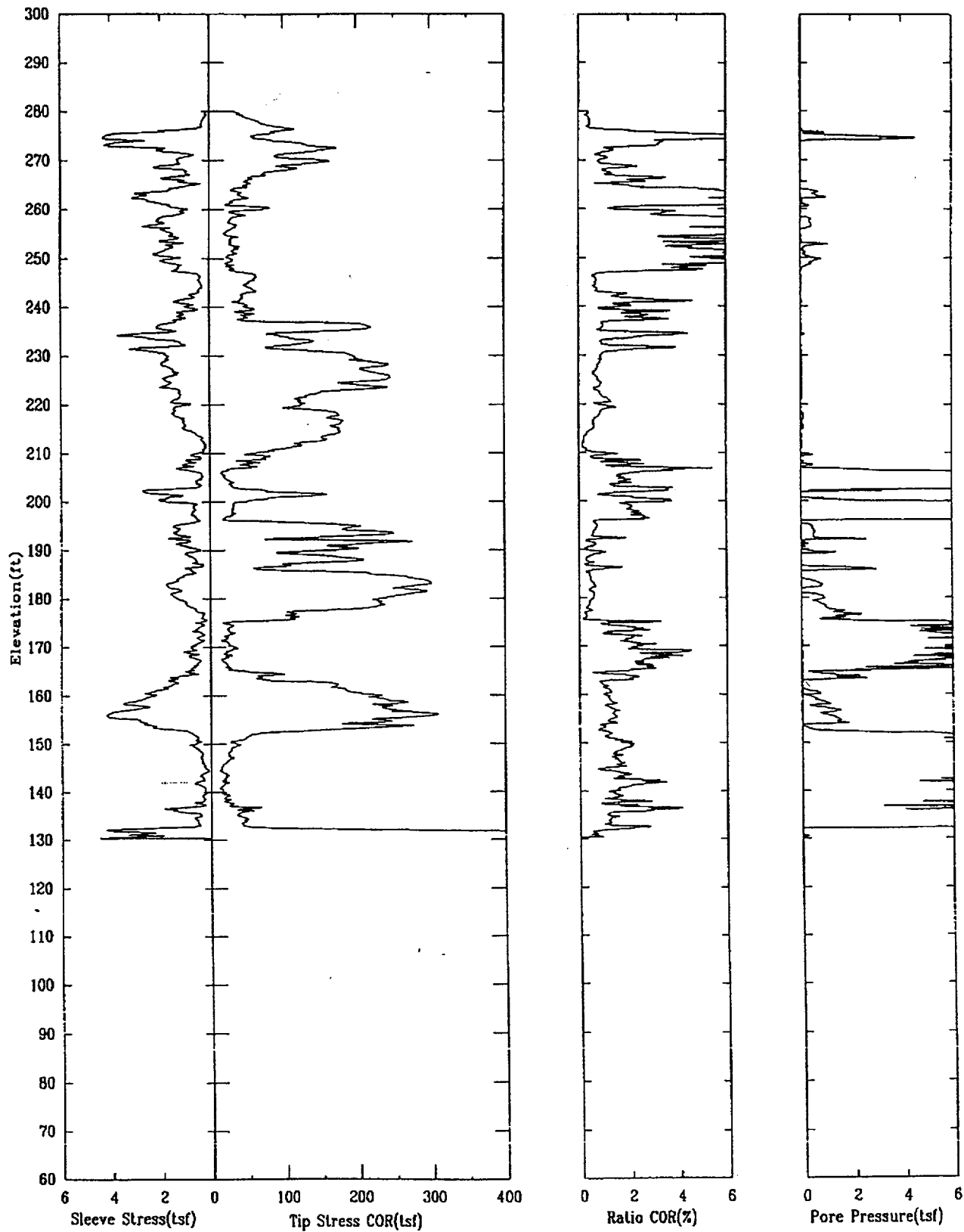
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P Wave
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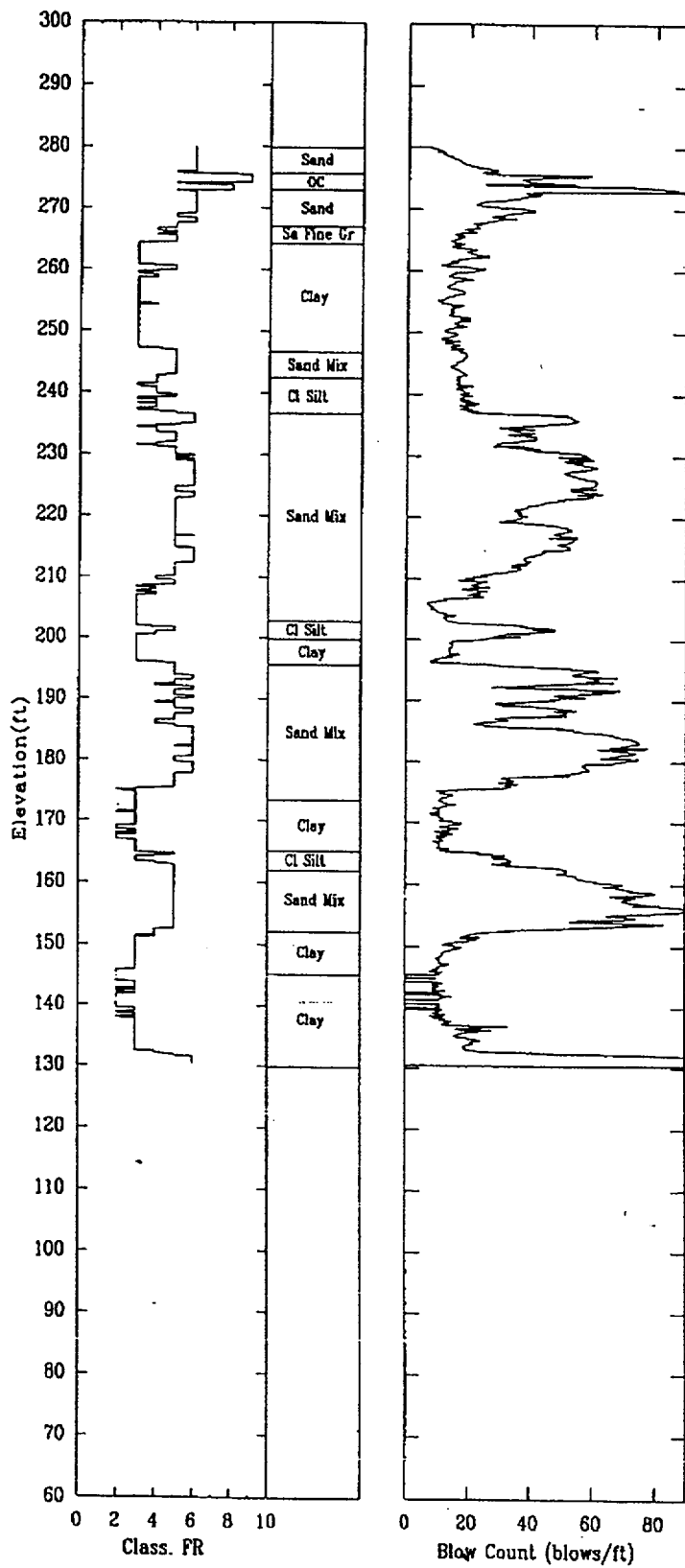
APPLIED RESEARCH ASSOCIATES, INC.

02/25/98

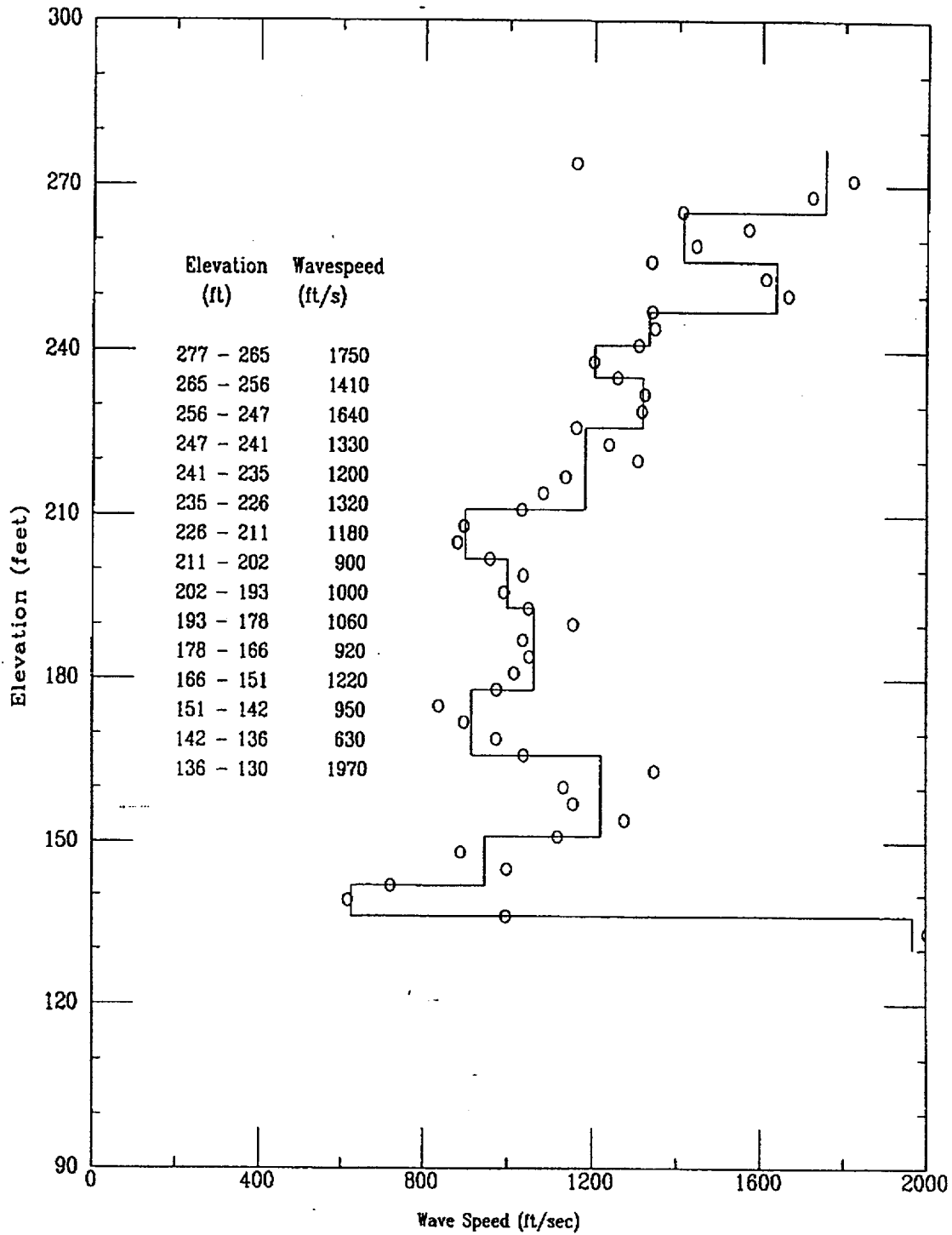
North 79442.5

East 55195

Elevation 286.1



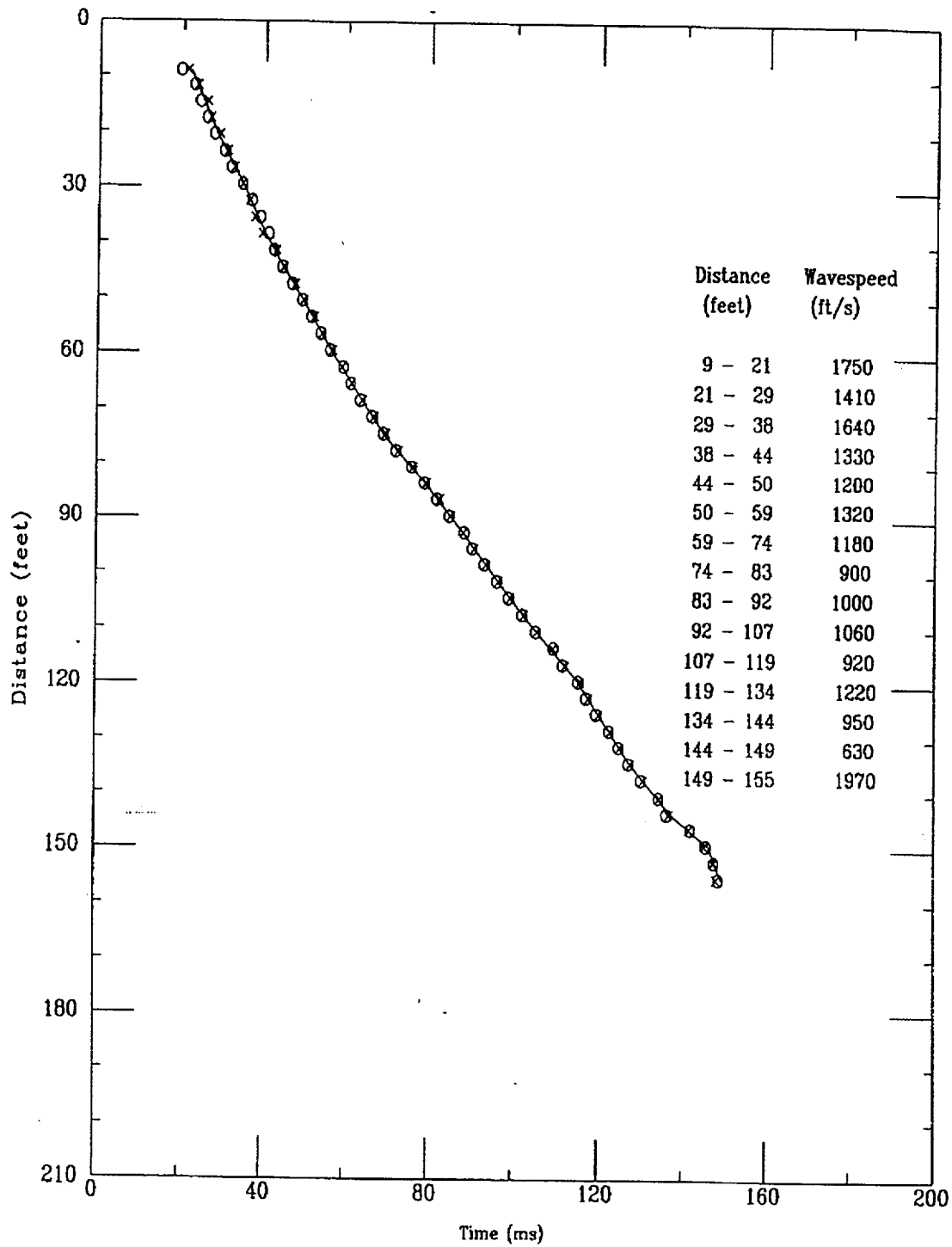
Shear Wave Speeds



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APPLIED RESEARCH ASSOCIATES, INC.
Shear Wave Time of Peak

02/25/98

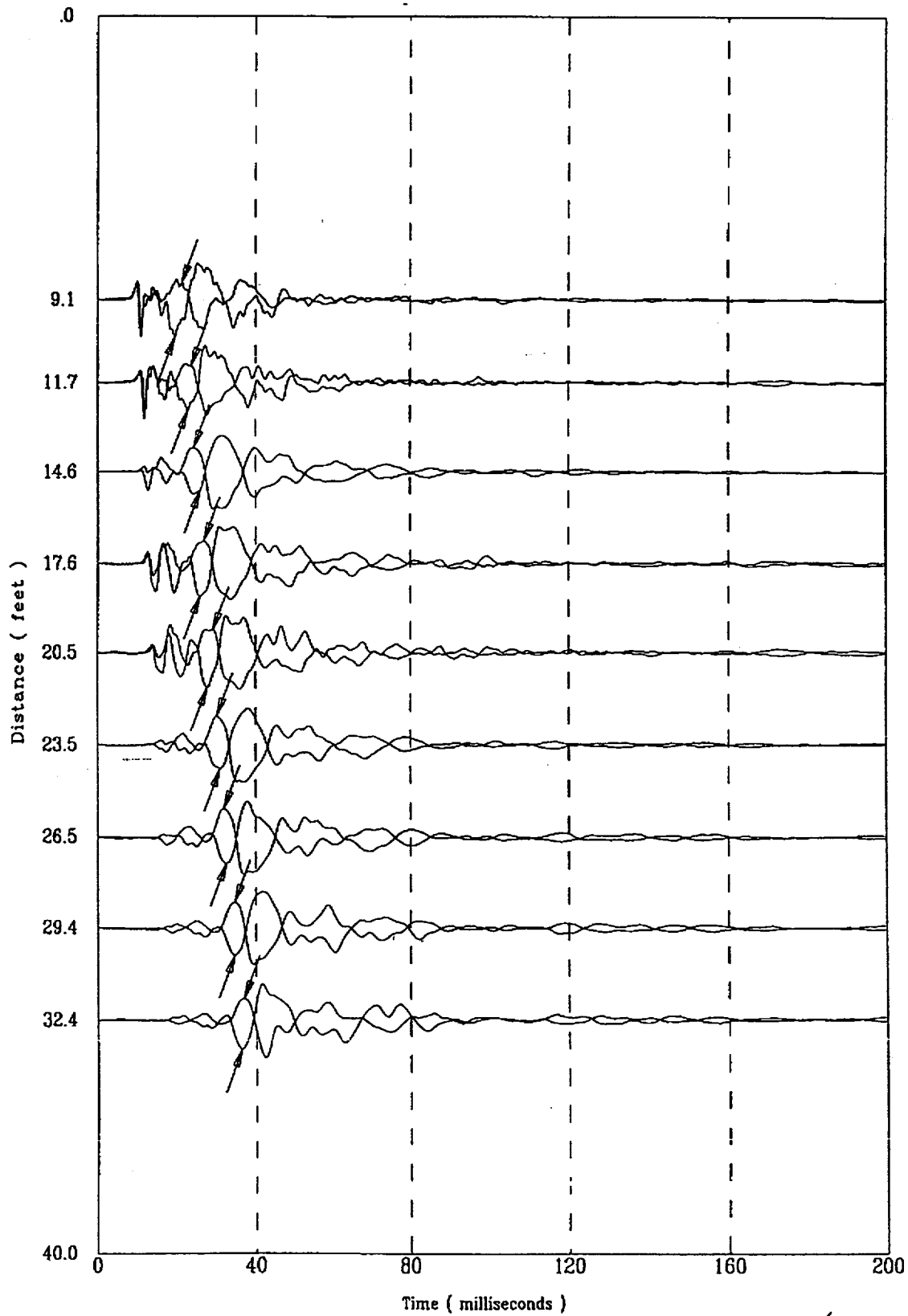


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S Wave
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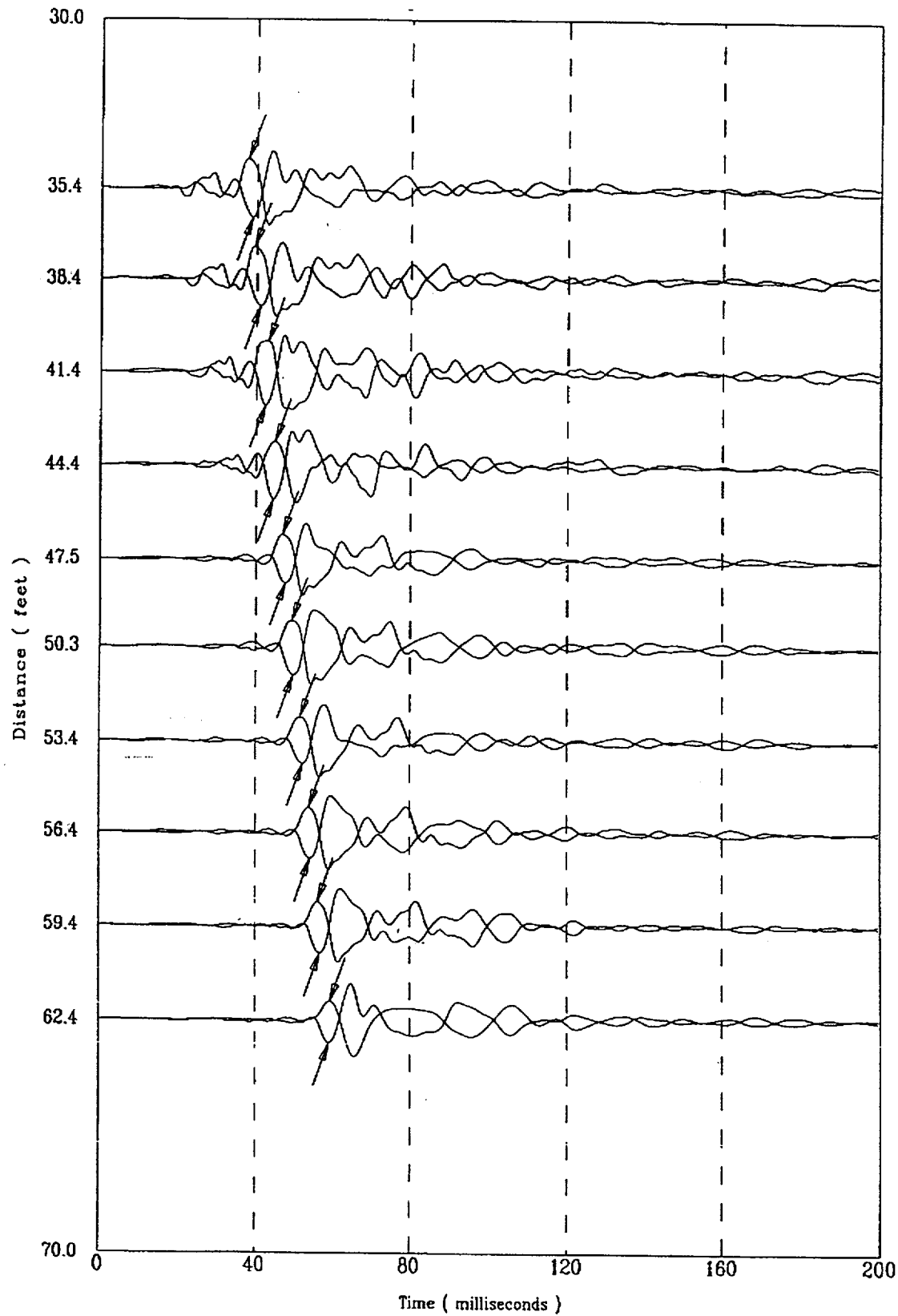


325f804S

149 A 522

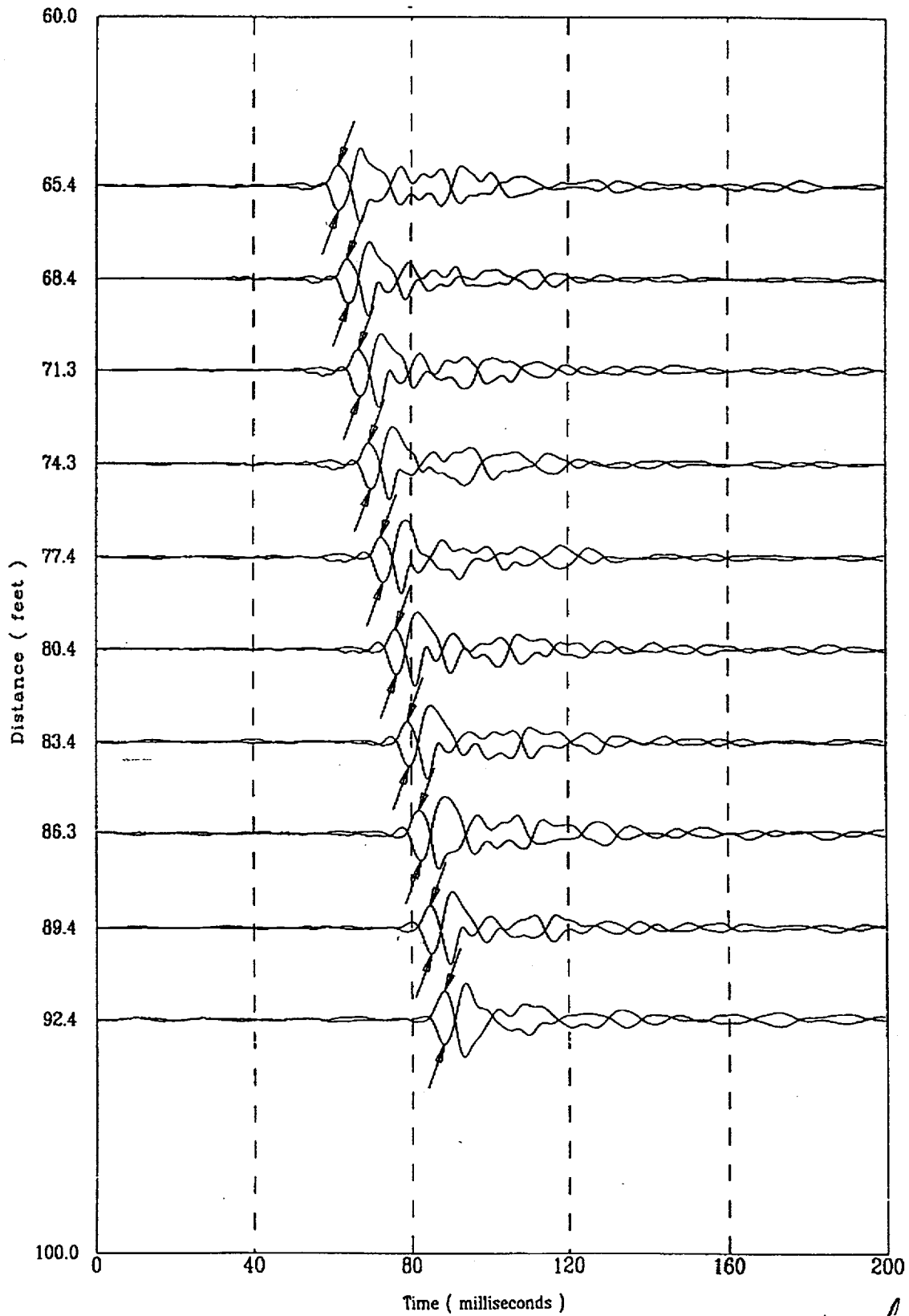
Applied Research Associates
CPT-143

S Wave
02/25/98



Applied Research Associates
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S Wave
02/25/98

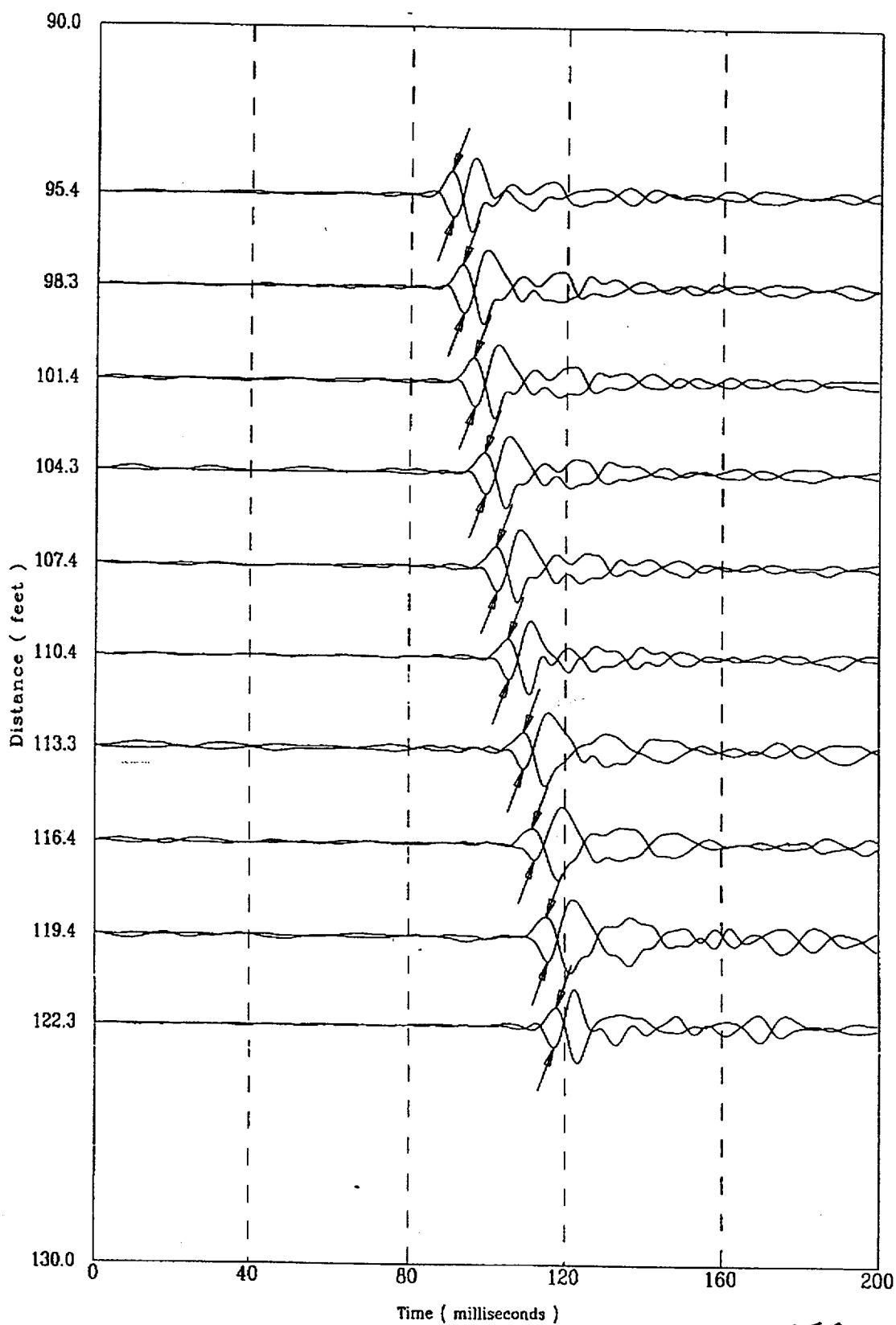


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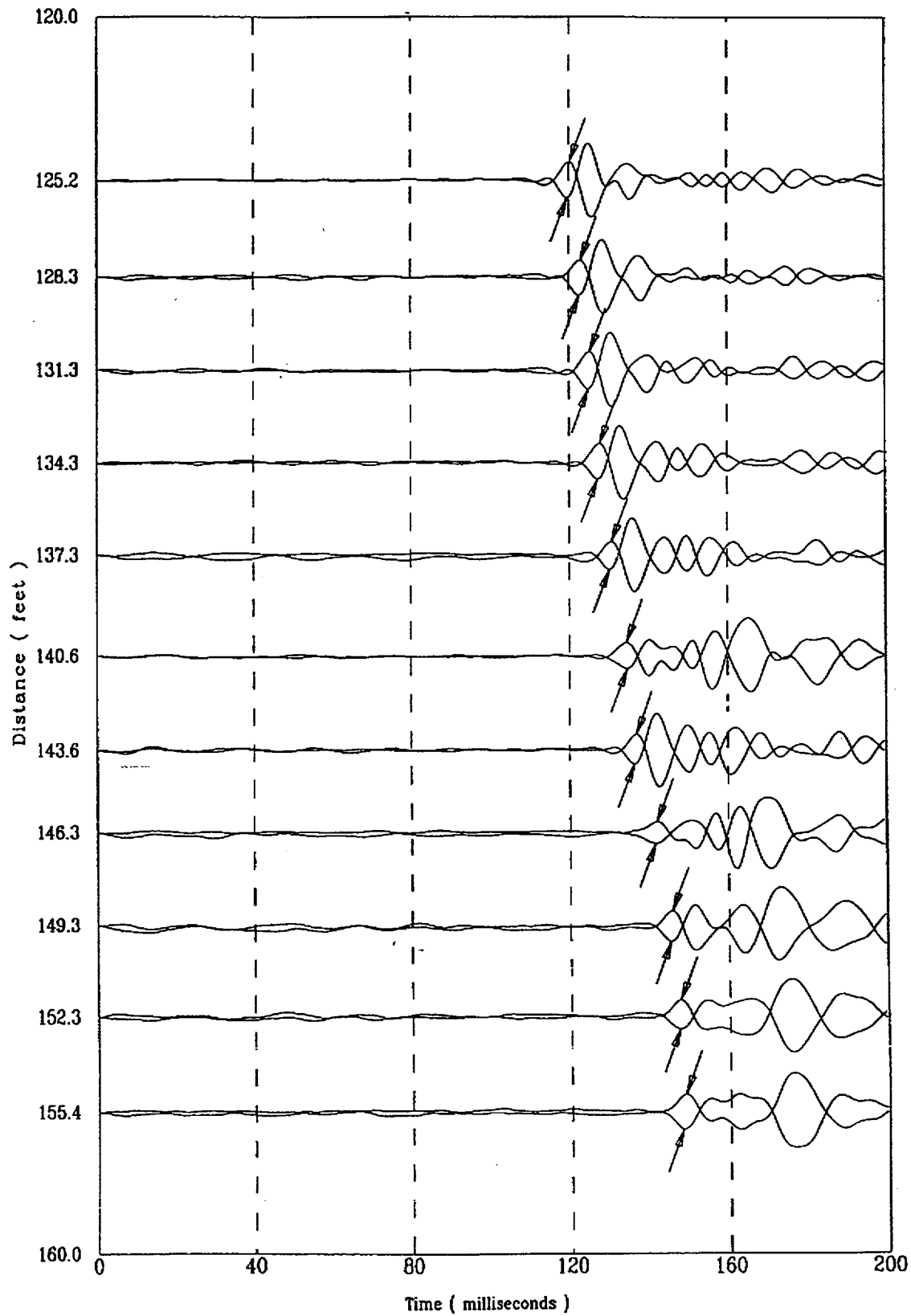
Applied Research Associates
CPT-143

S Wave
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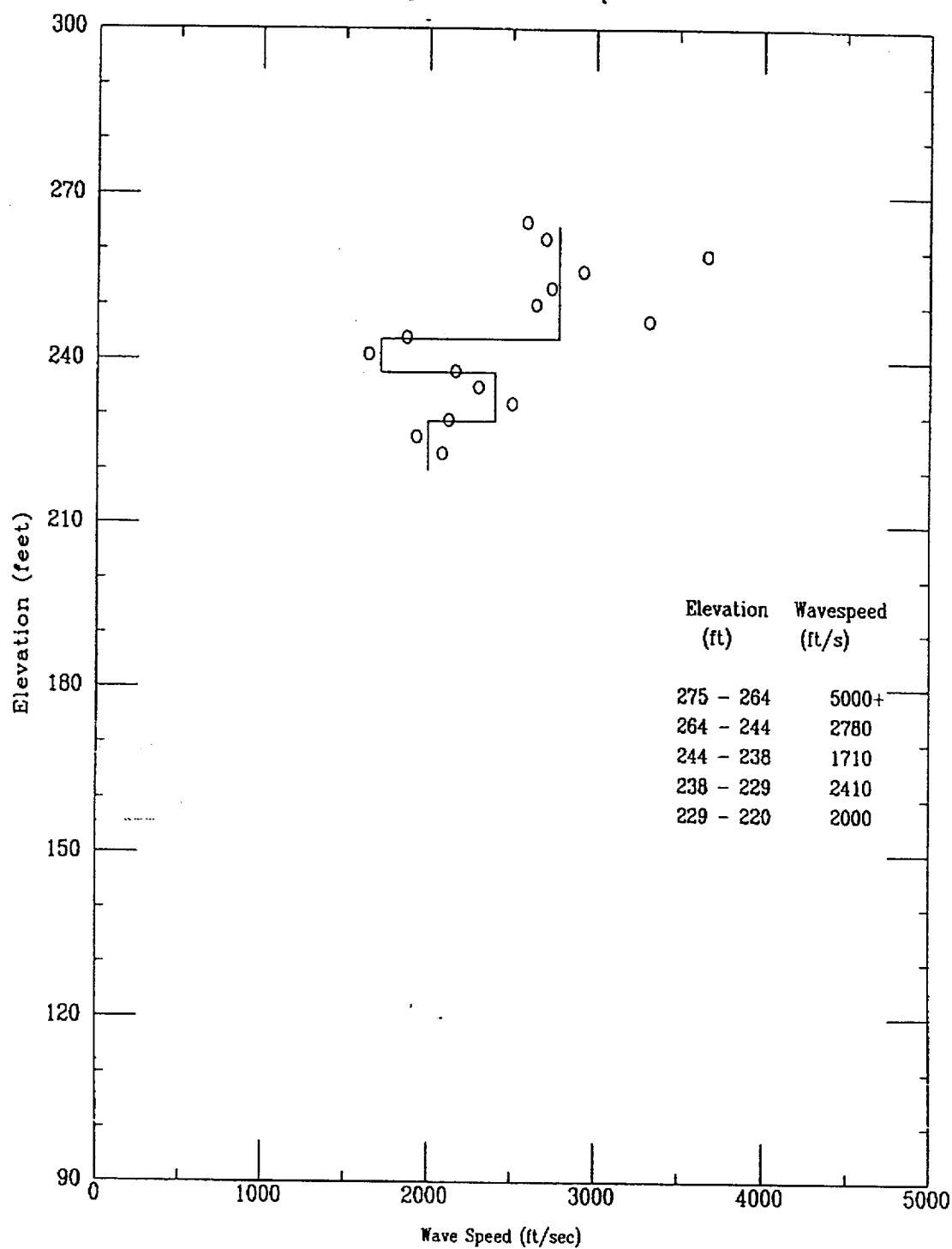
S Wave
02/25/98



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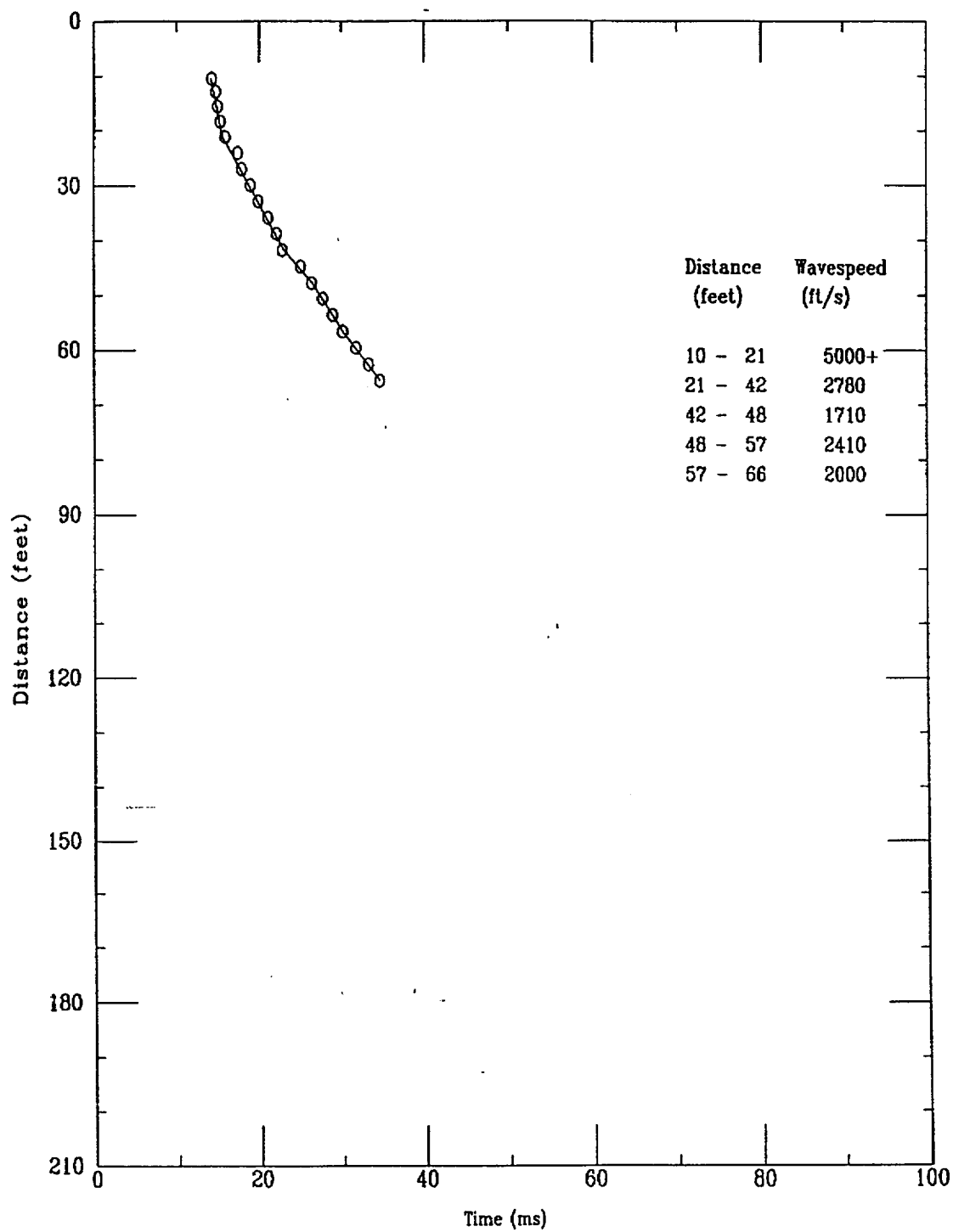
Compression Wave Speeds



CPT-143

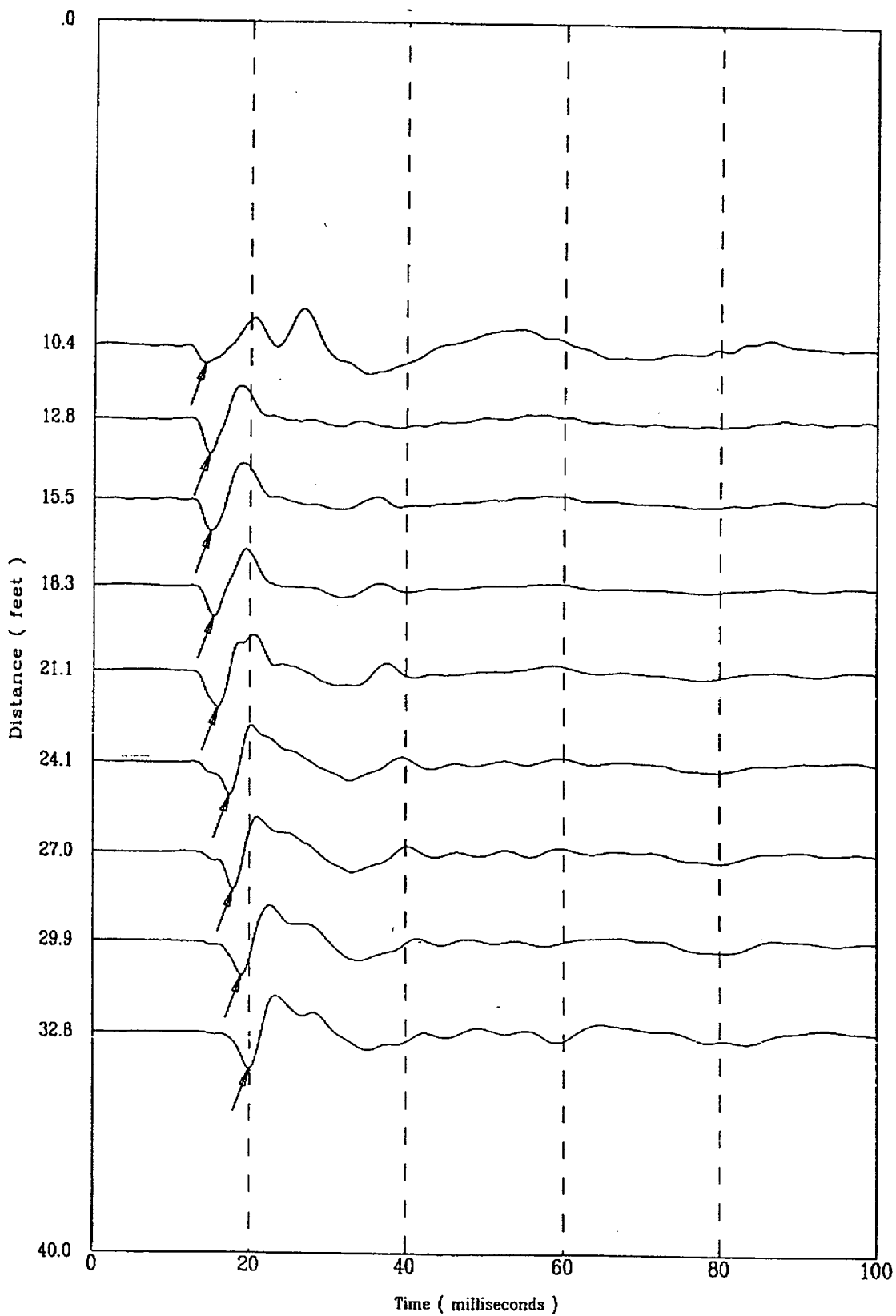
APPLIED RESEARCH ASSOCIATES, INC.
Compression Wave Time of Peak

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Applied Research Associates
CPT-143

P Wave
02/25/98

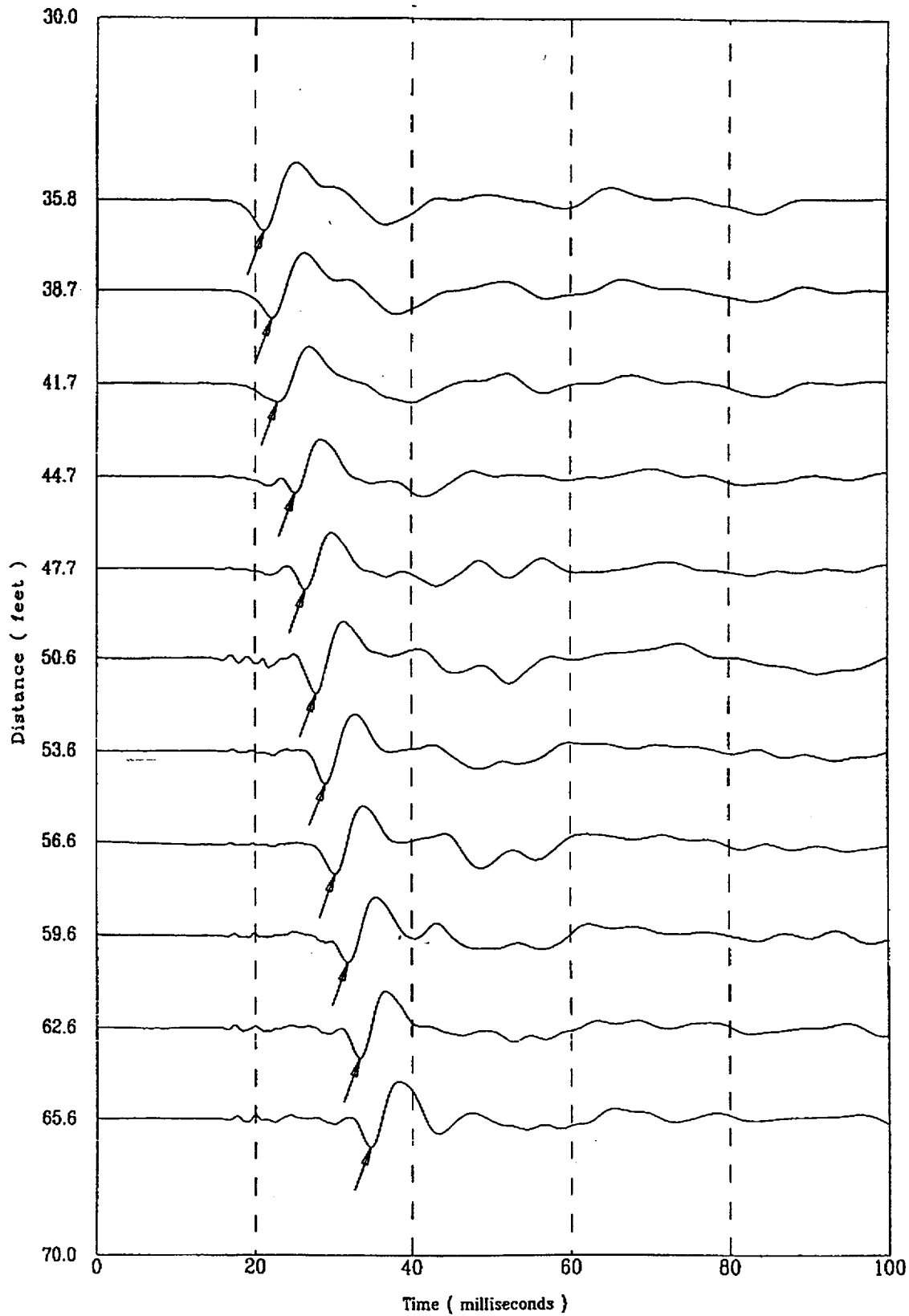


File 525f804S

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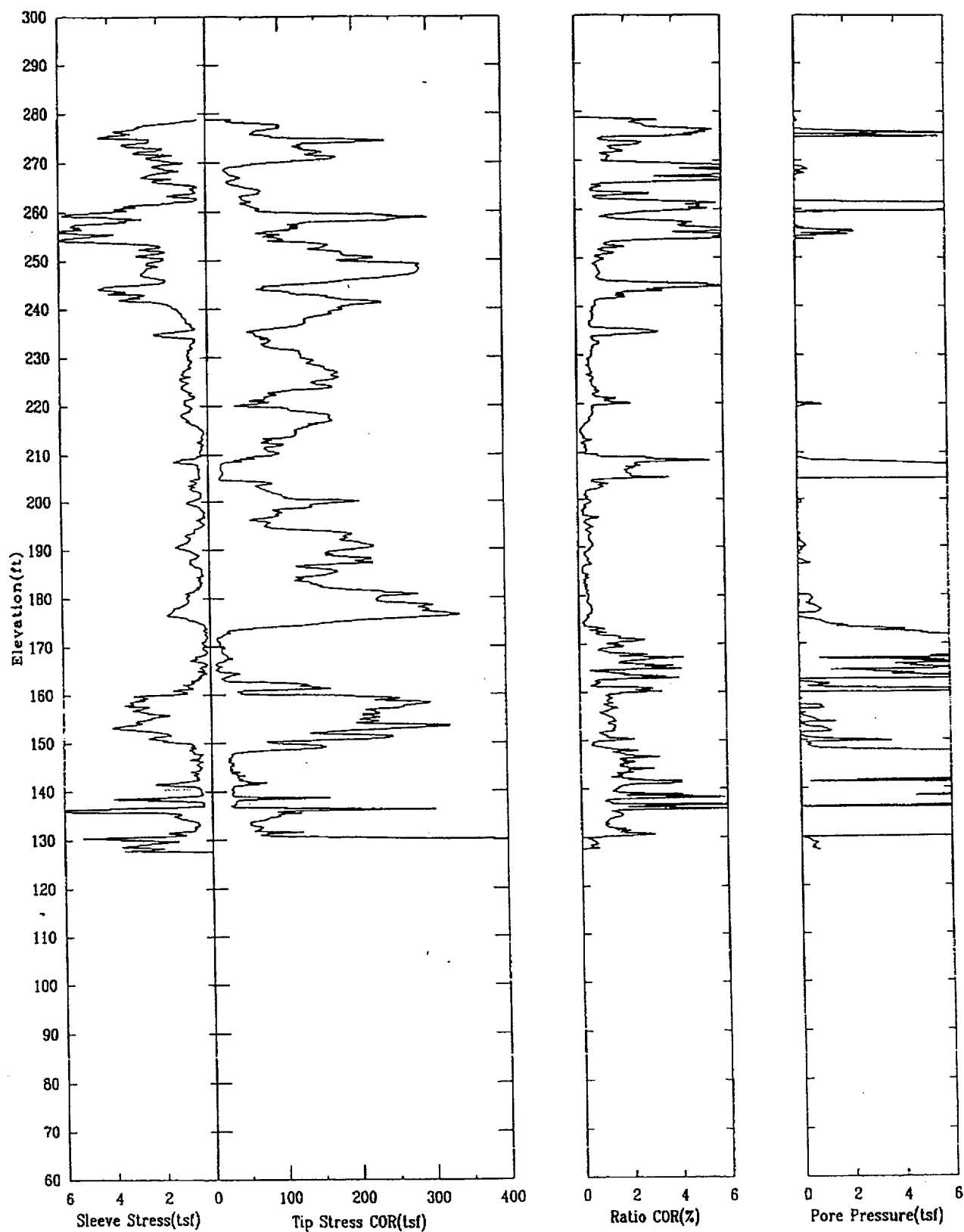
Applied Research Associates
CPT-143

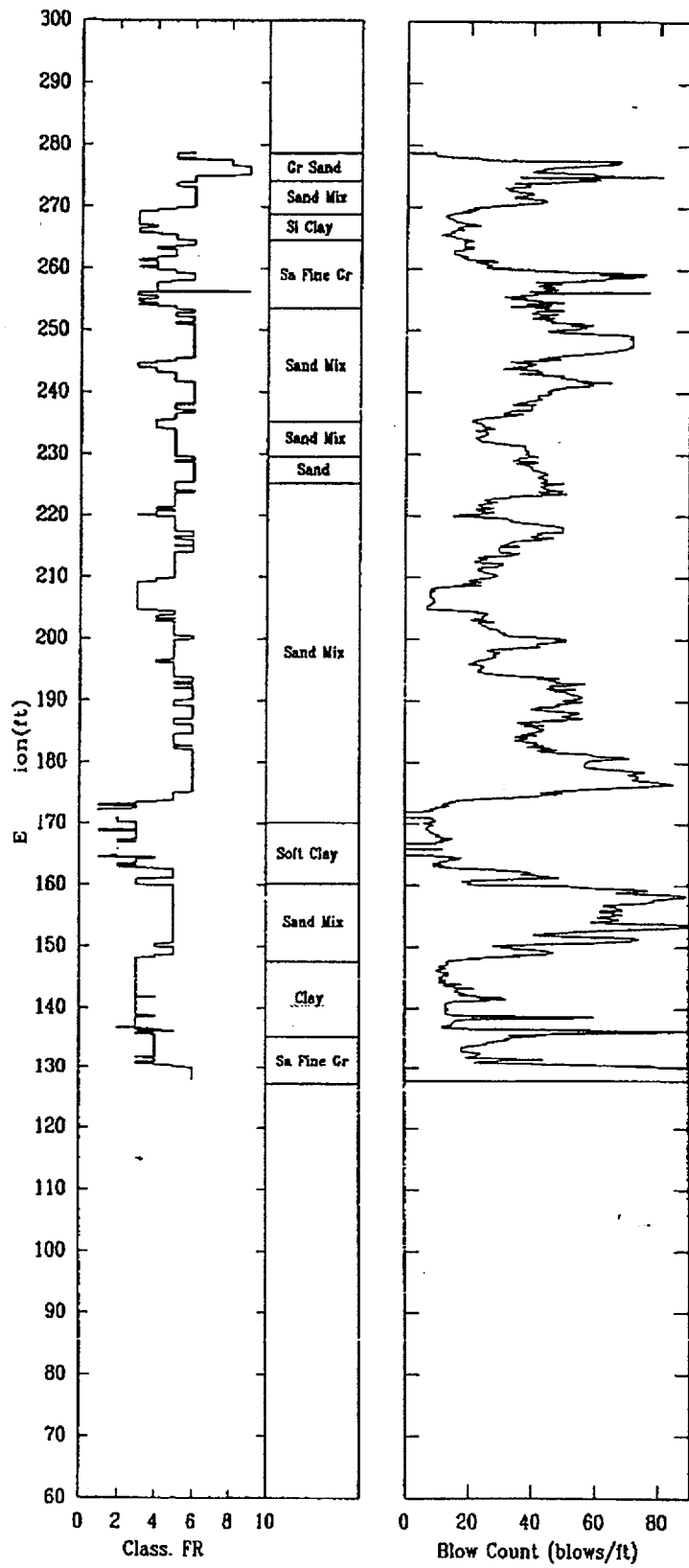
P Wave
02/25/98



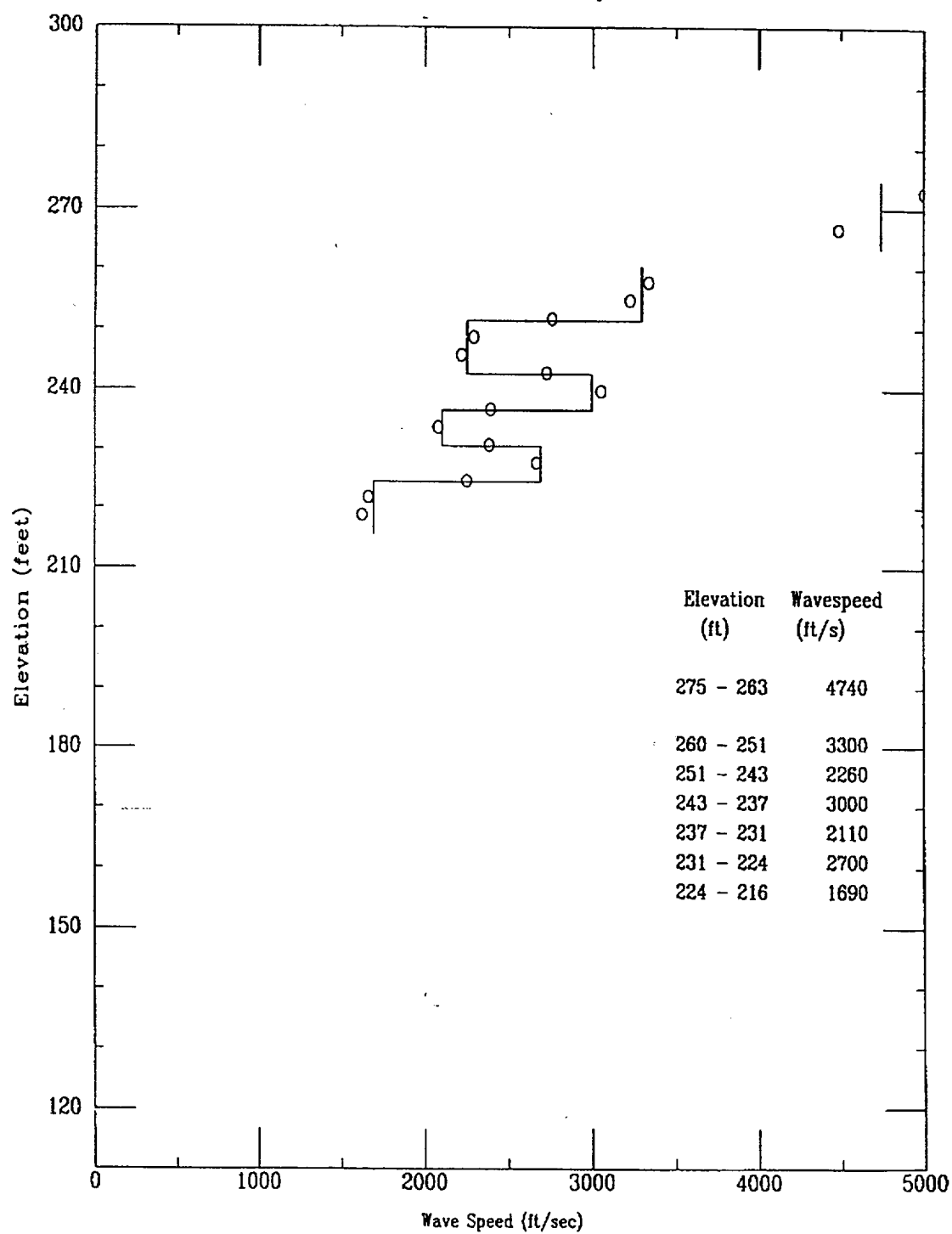
.25/804S

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Compression Wave Speeds

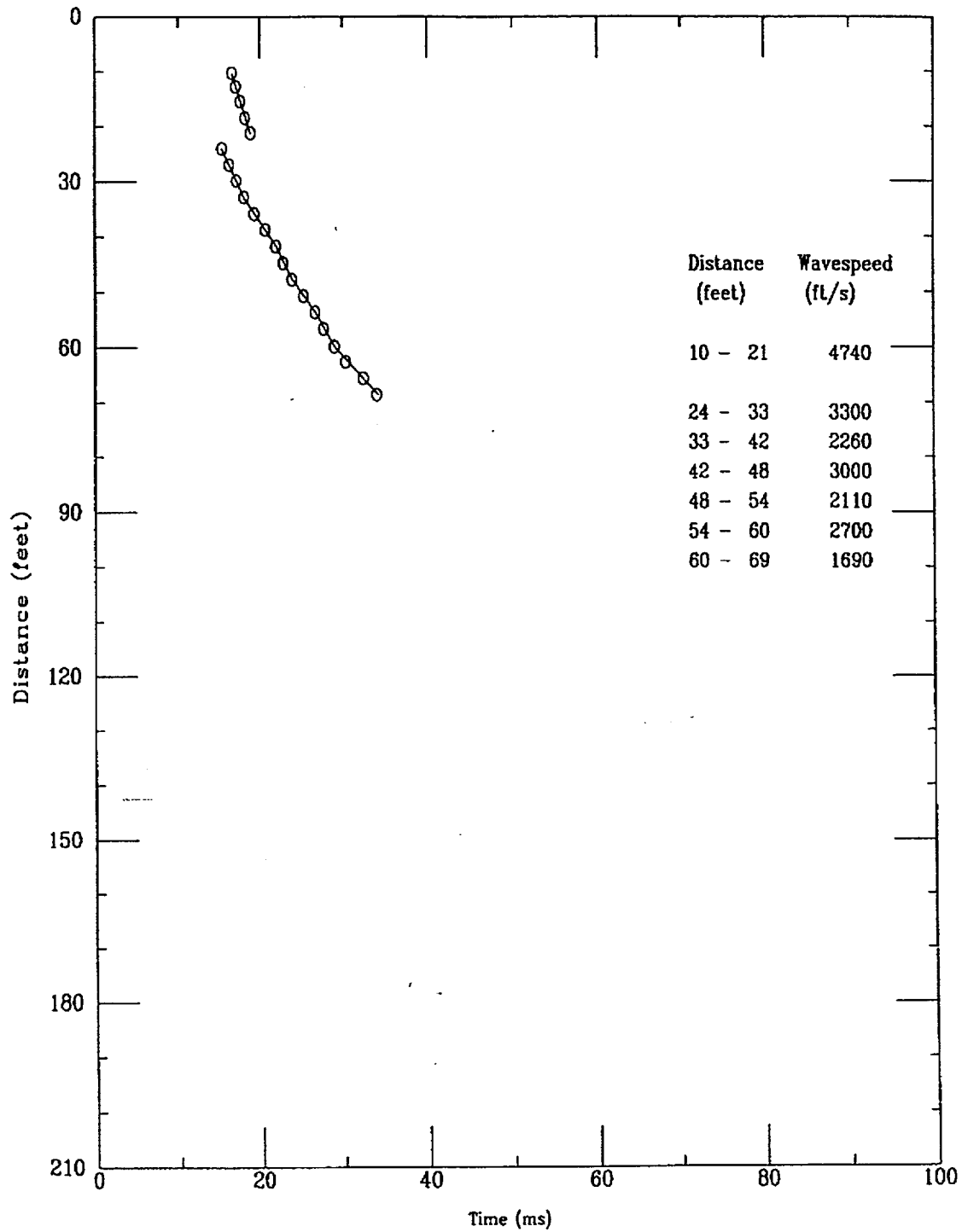


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APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

Compression Wave Time of Peak

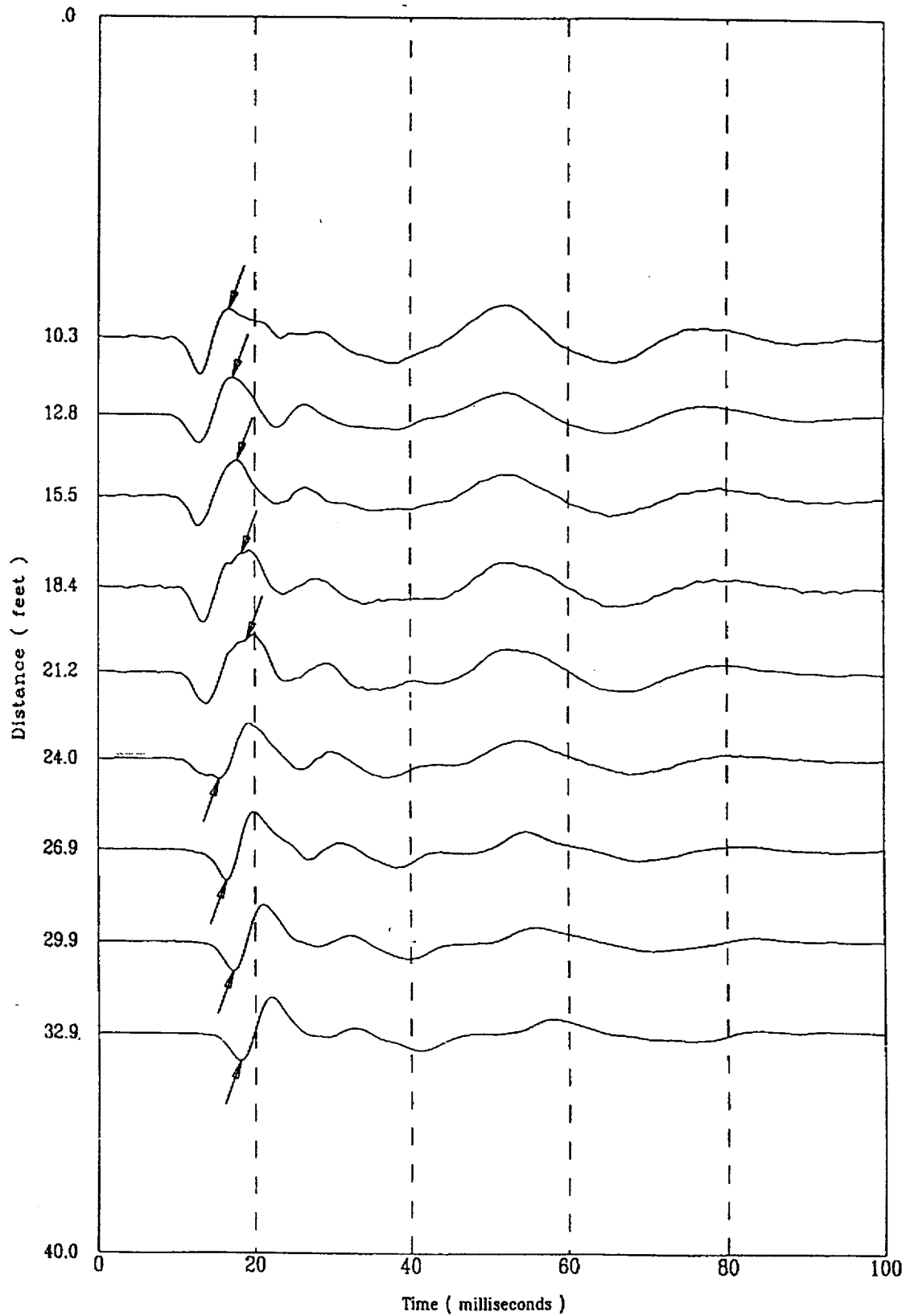


File 4247801S

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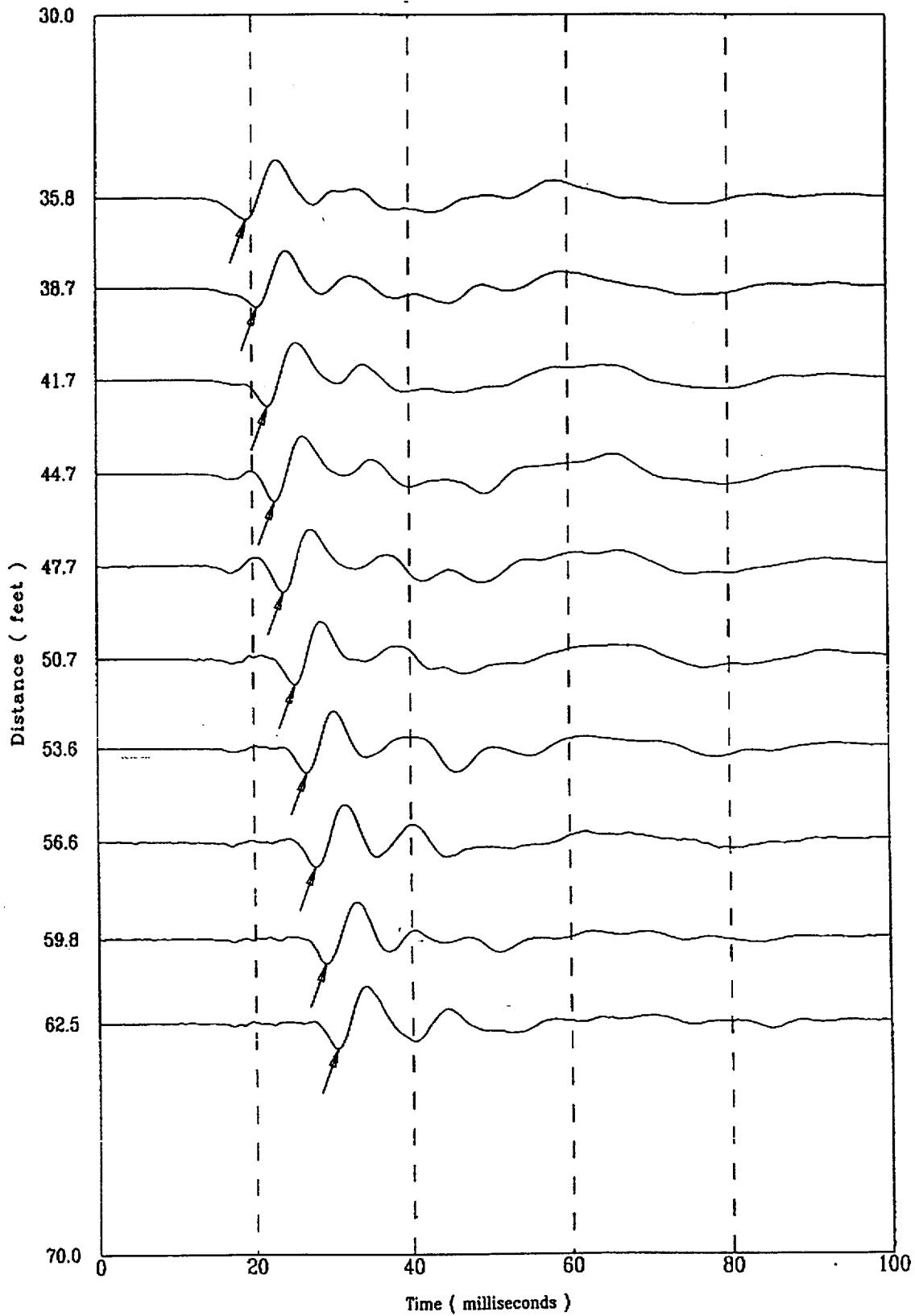
Applied Research Associates, Inc.
CPT-147

P Wave
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P Wave
02/24/98

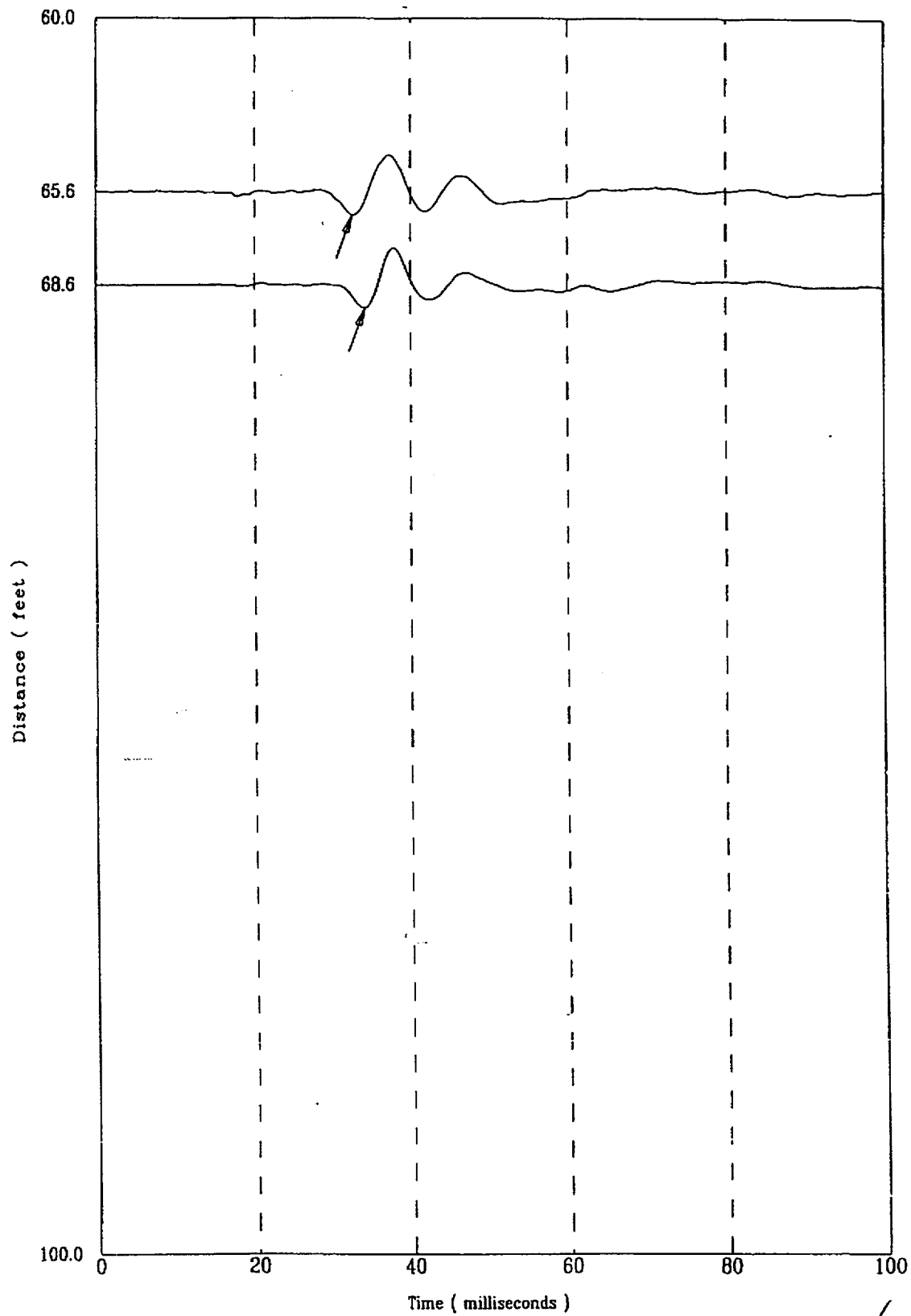


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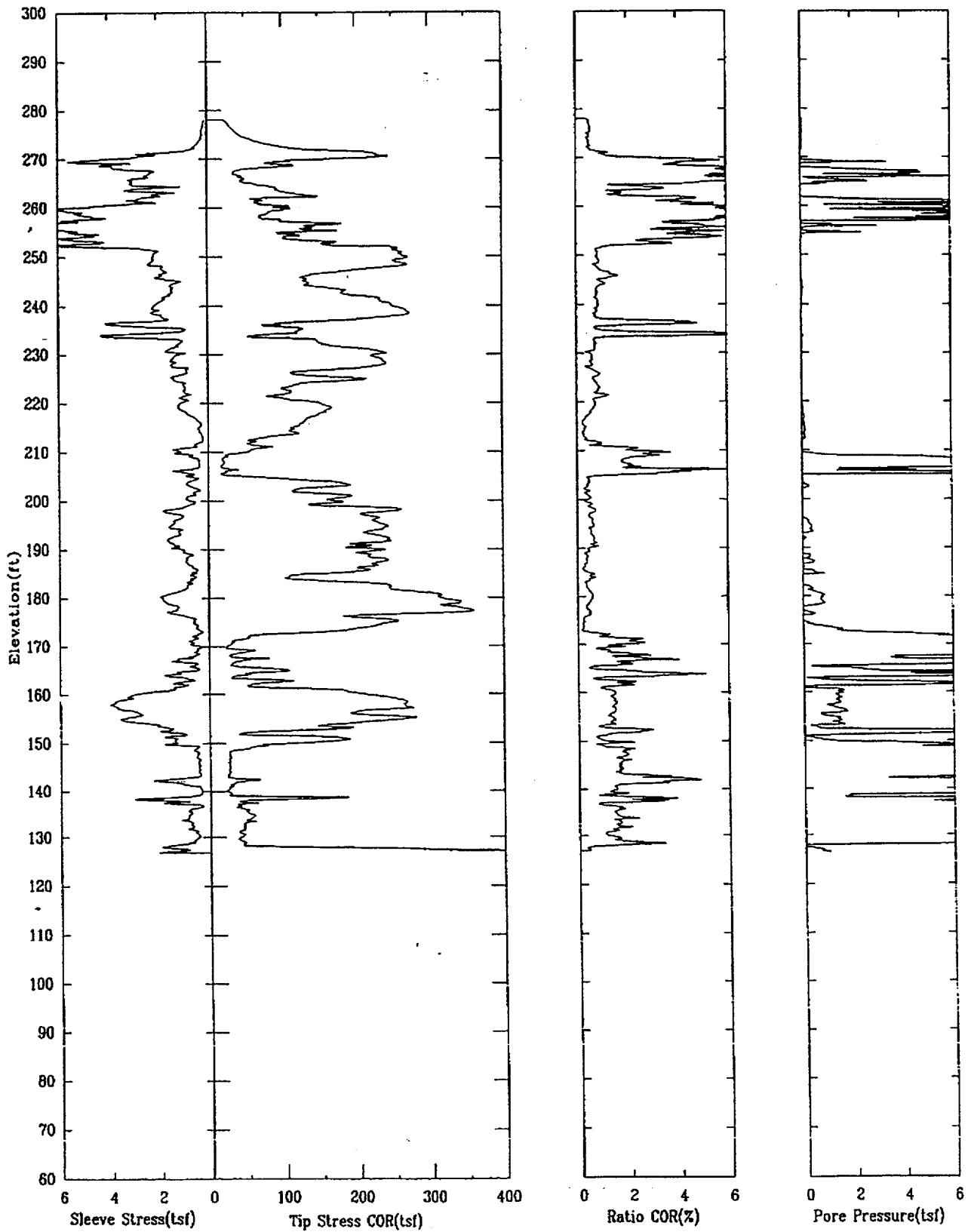
APPLIED RESEARCH ASSOCIATES, INC.

02/27/98

North 79372.07

East 55385.00

Elevation 284.1



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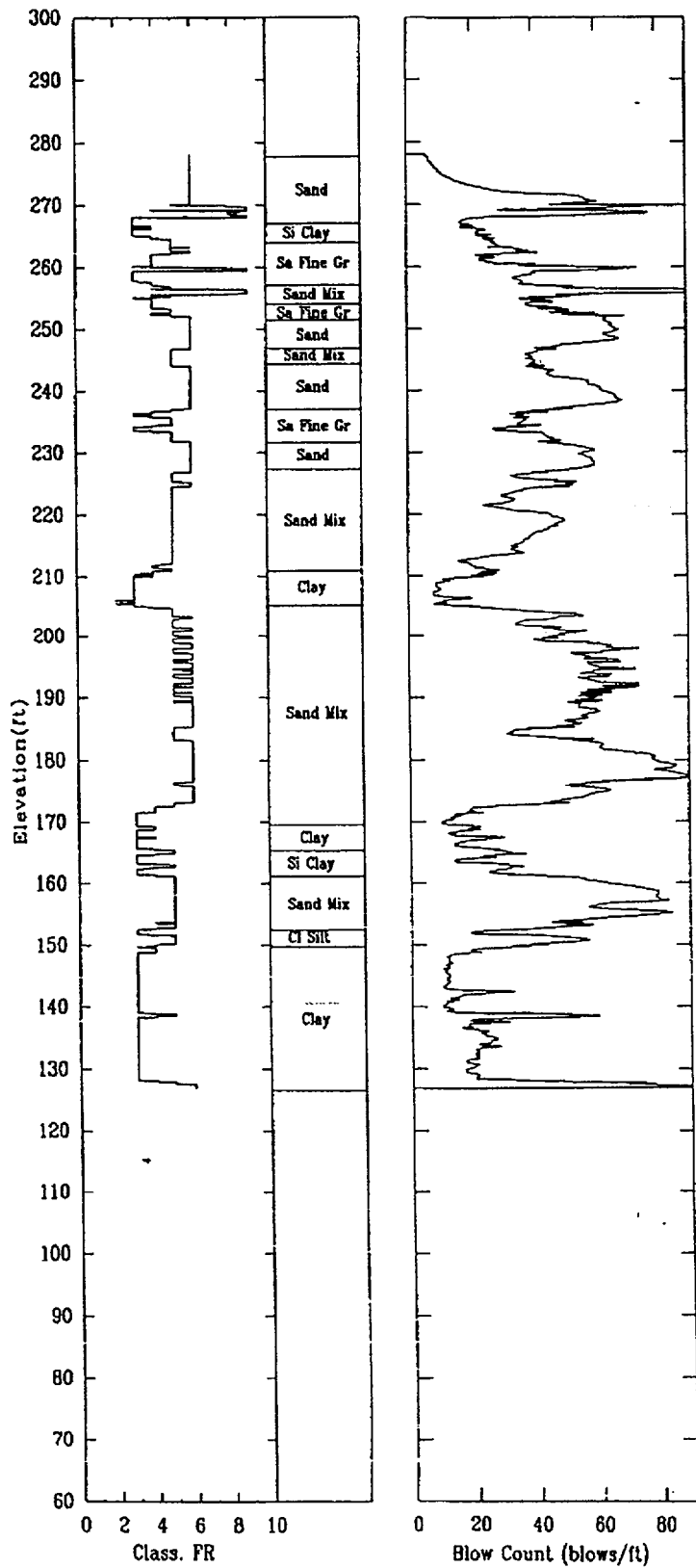
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02/27/98

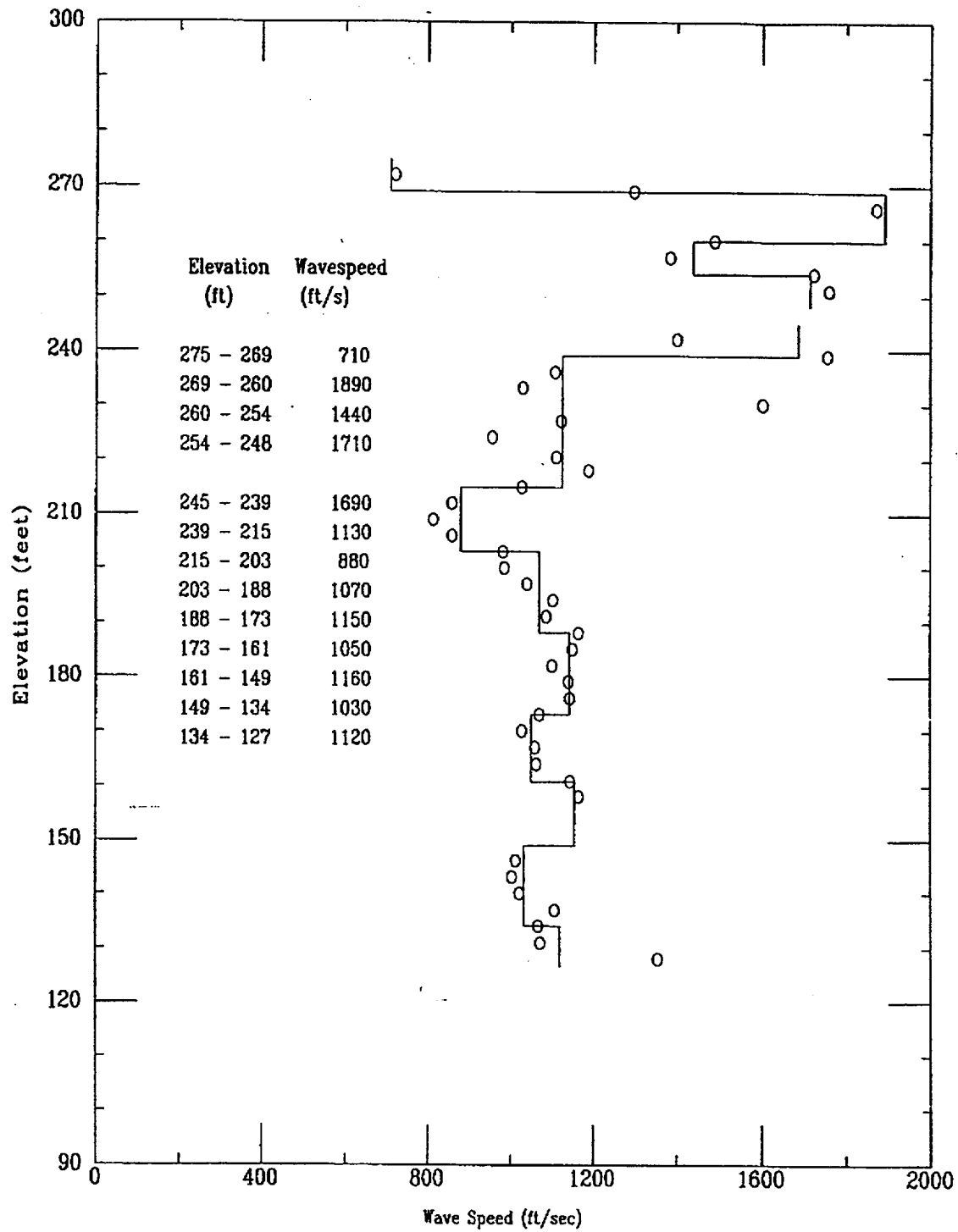
North 79372.07

East 55385.00

Elevation 284.1



Shear Wave Speeds

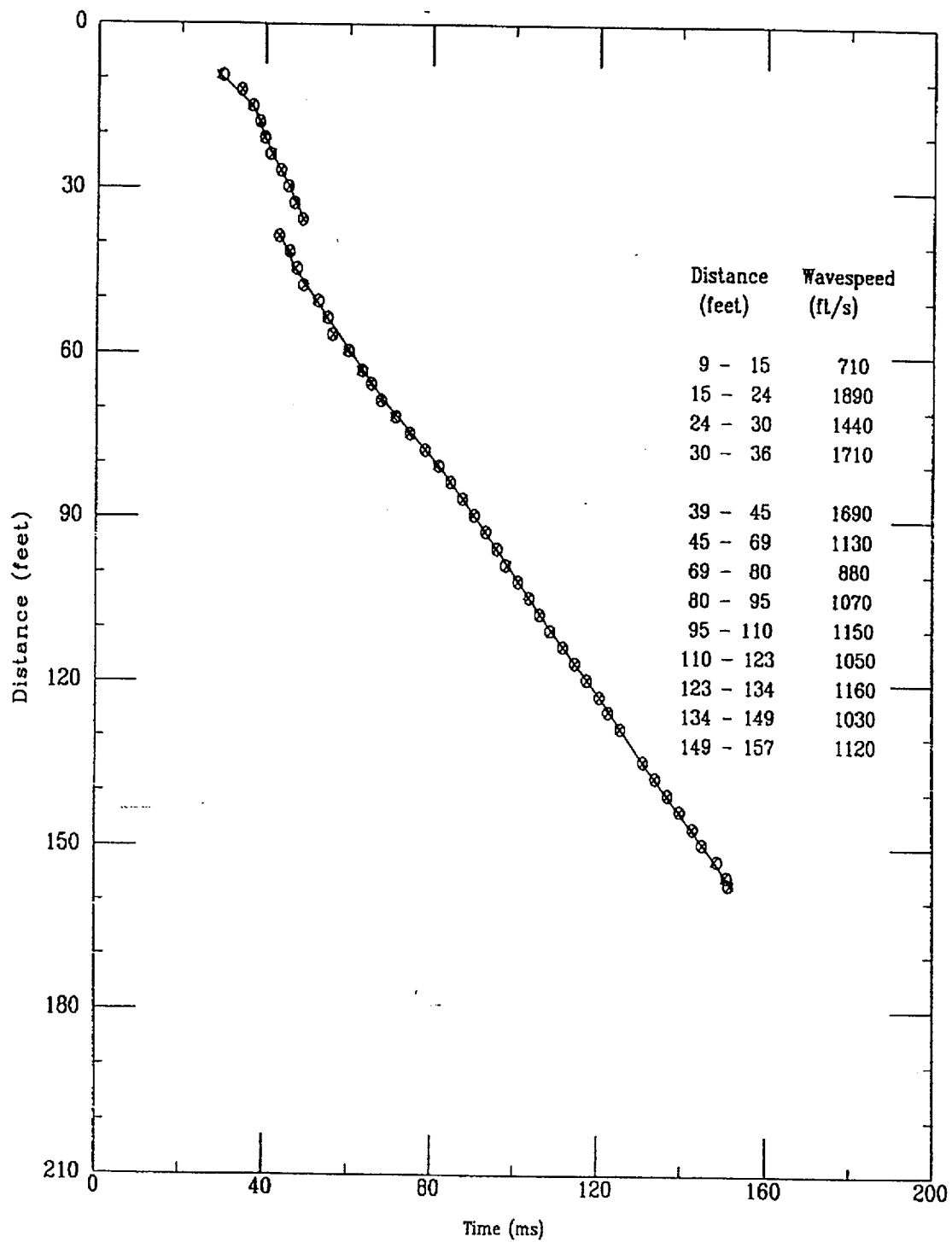


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APPLIED RESEARCH ASSOCIATES, INC.

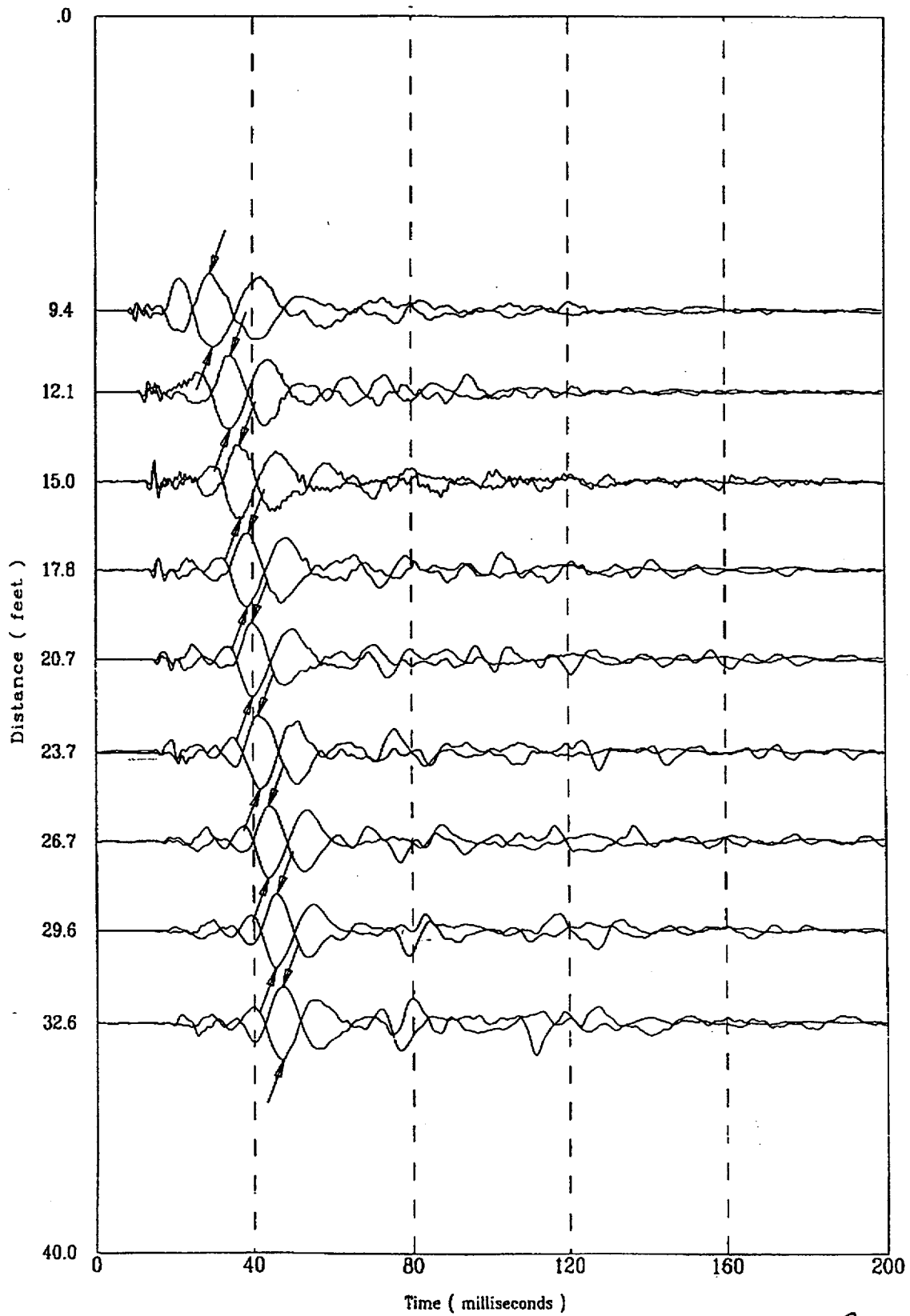
02/27/98

Shear Wave Time of Peak



Applied Research Associates, Inc.
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S Wave
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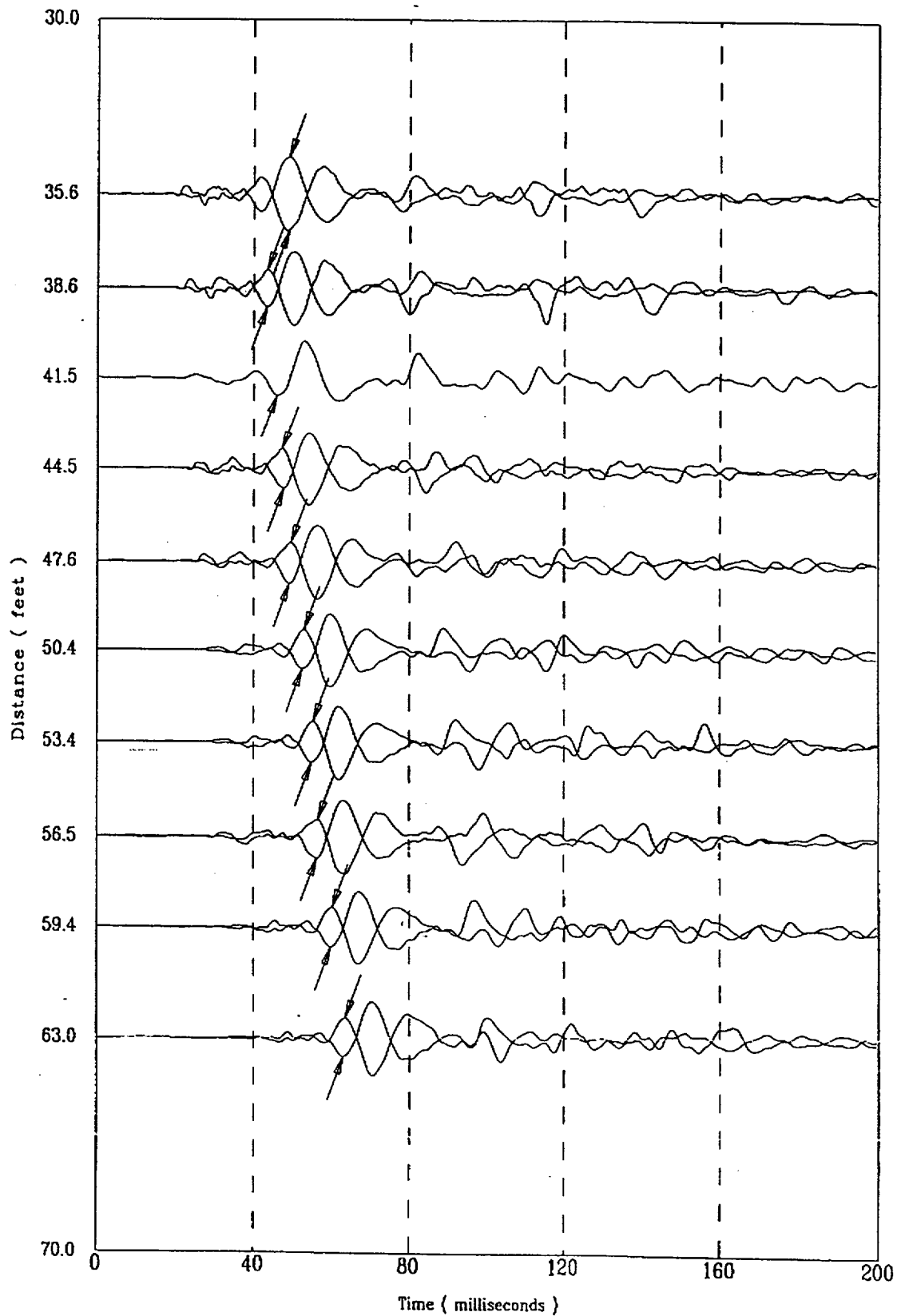


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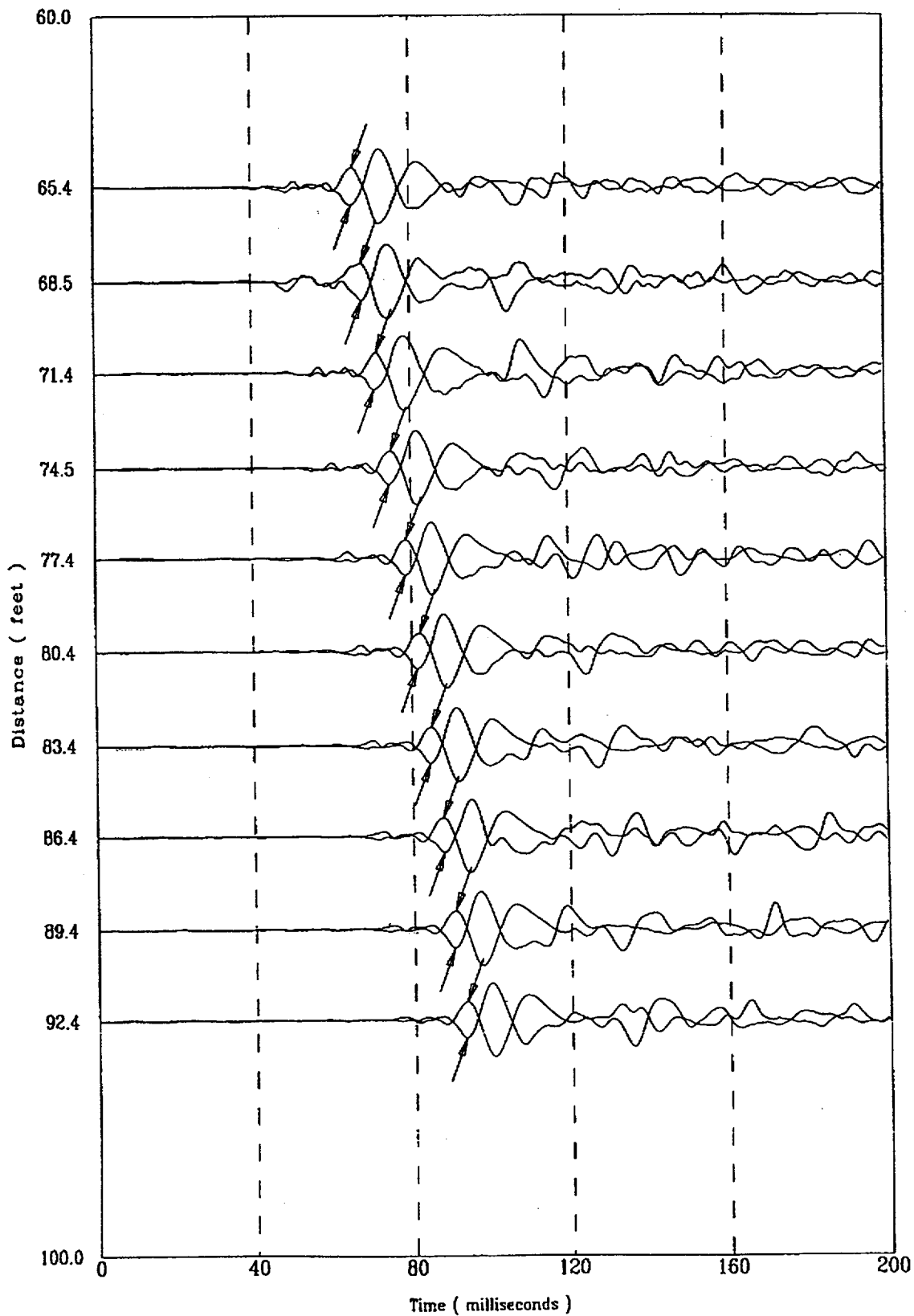
Applied Research Associates, Inc.
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S Wave
02/27/98



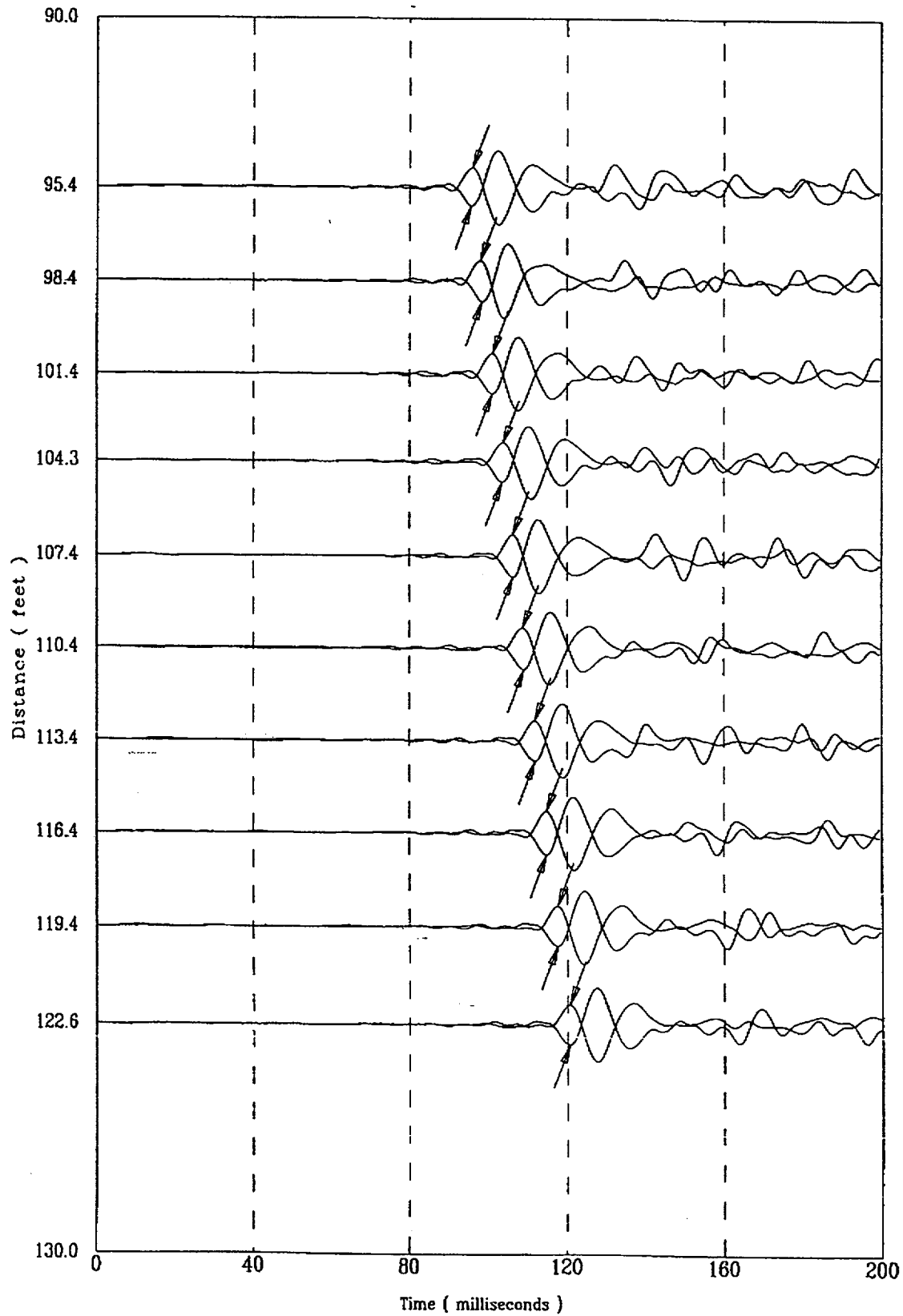
File 4271801S

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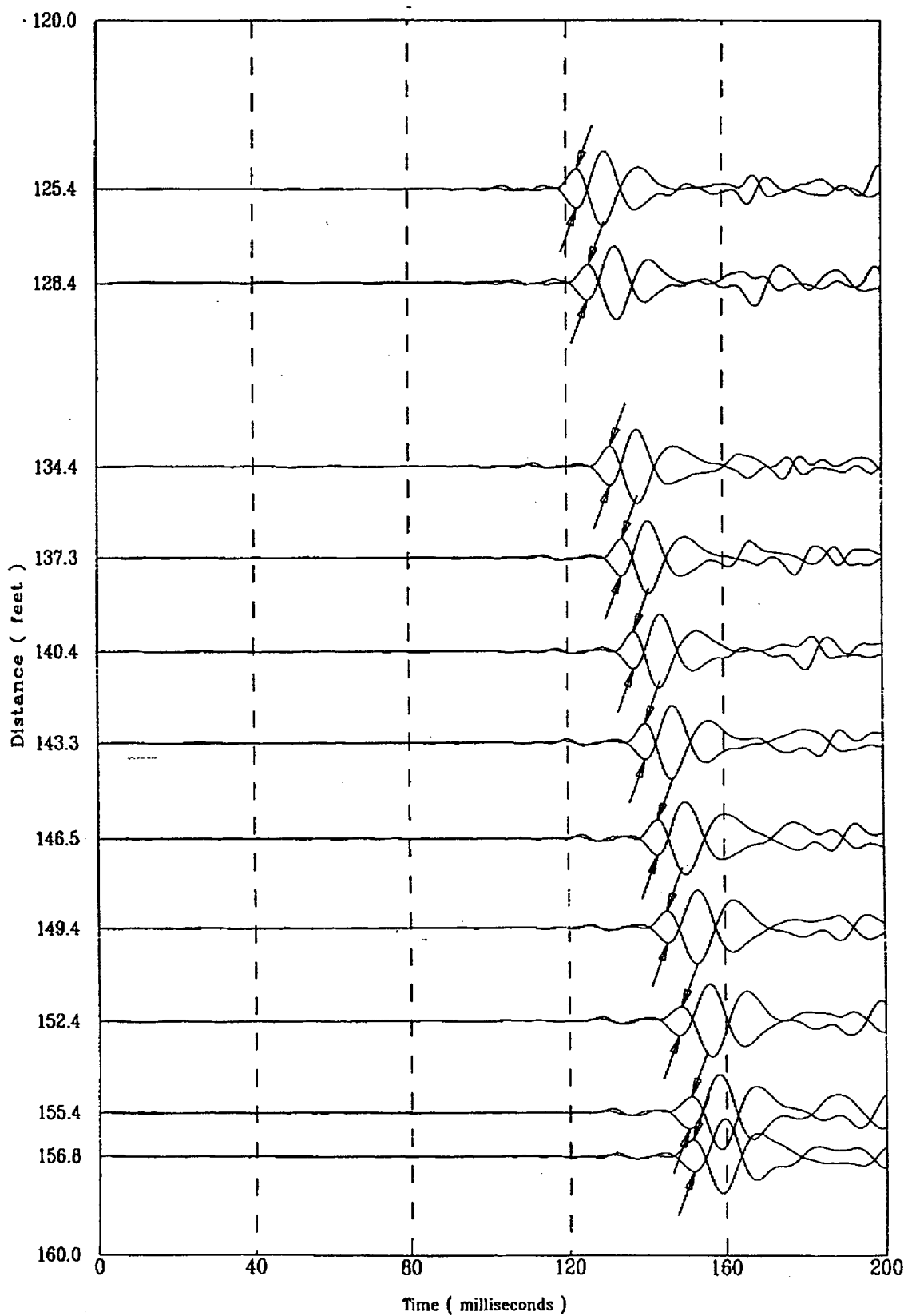
S Wave
02/27/98



File 4271801S

Applied Research Associates, Inc.
CPT-148

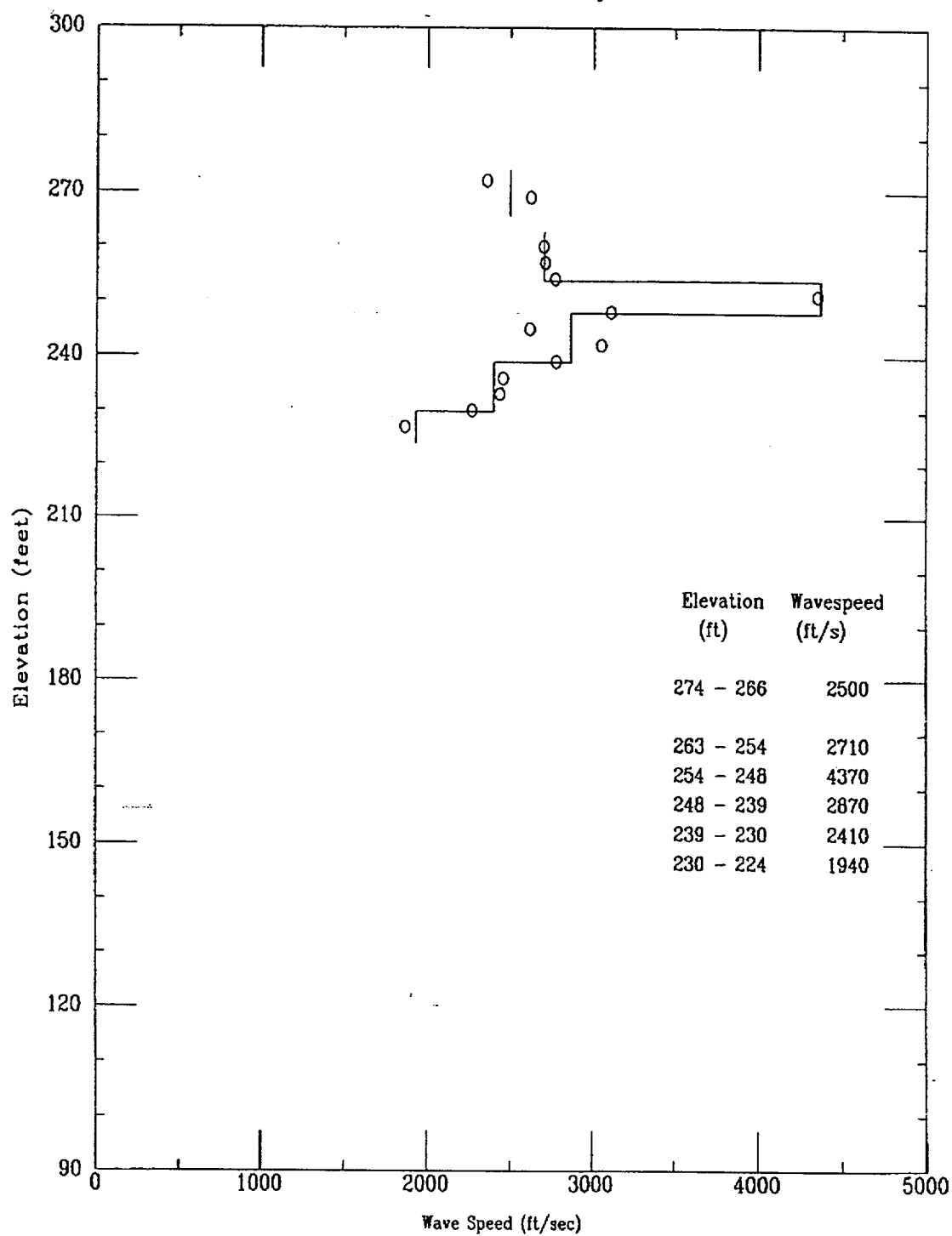
S Wave
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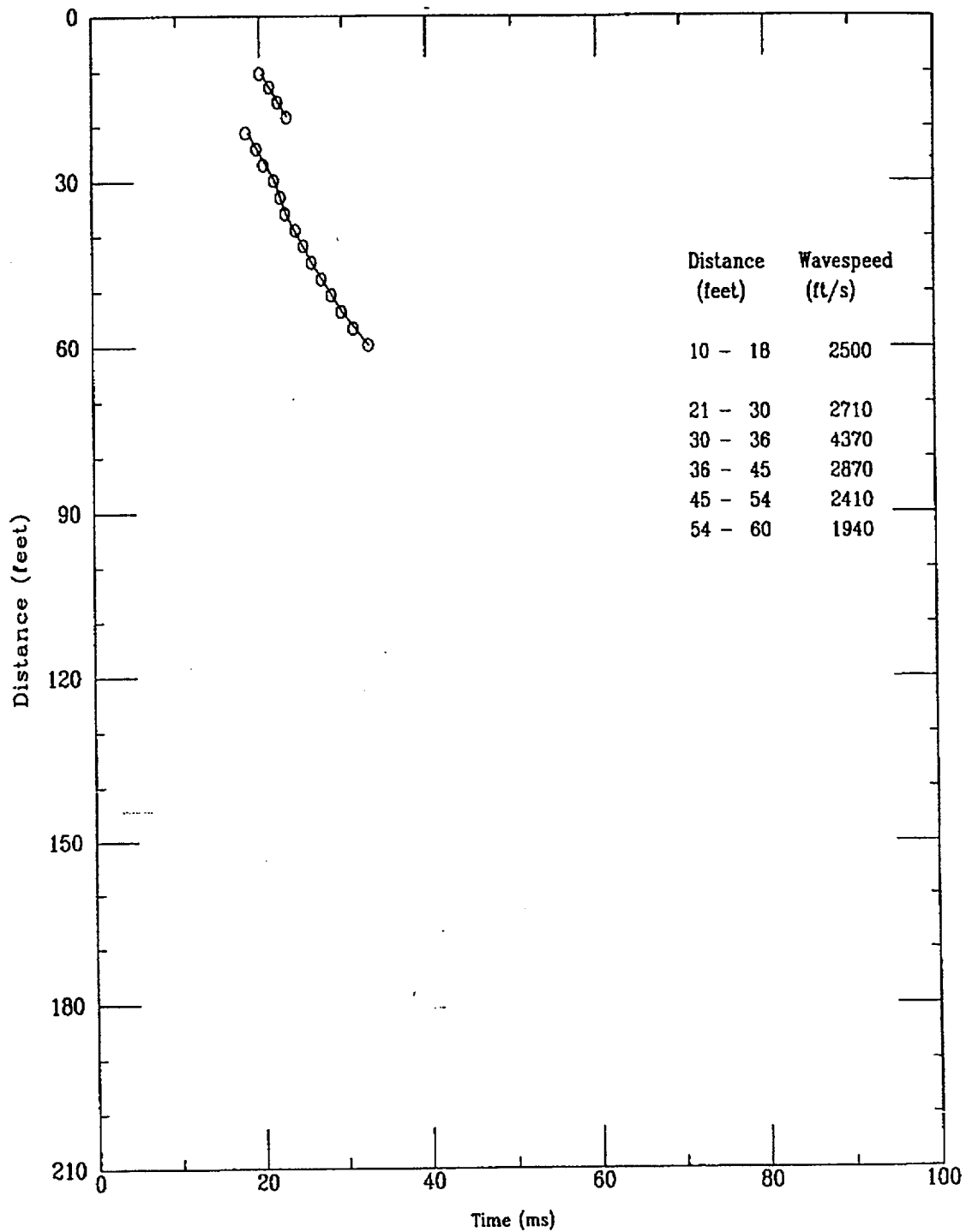
Compression Wave Speeds



CPT-148

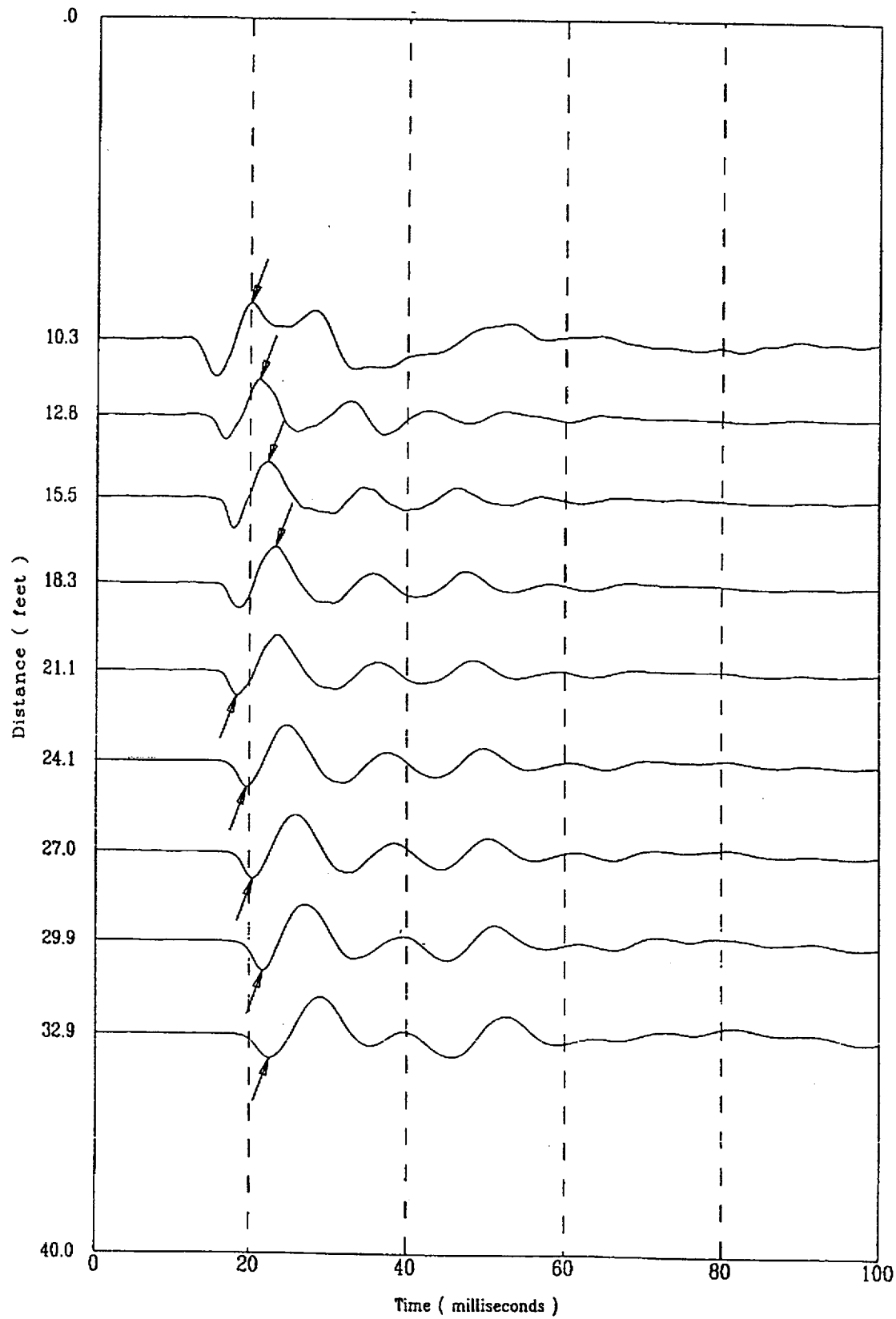
APPLIED RESEARCH ASSOCIATES, INC.
Compression Wave Time of Peak

02/27/98



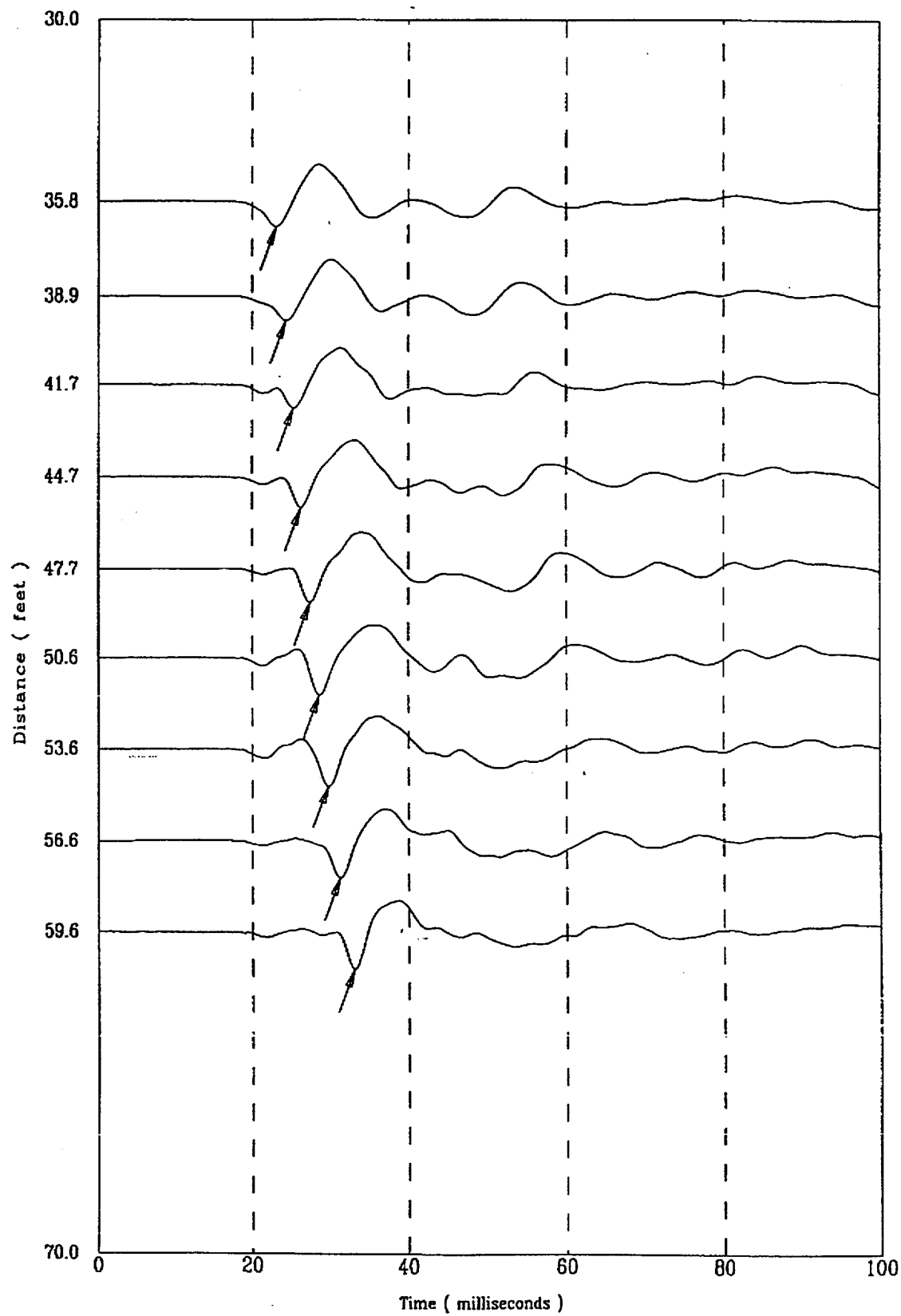
File 4271801S

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P Wave
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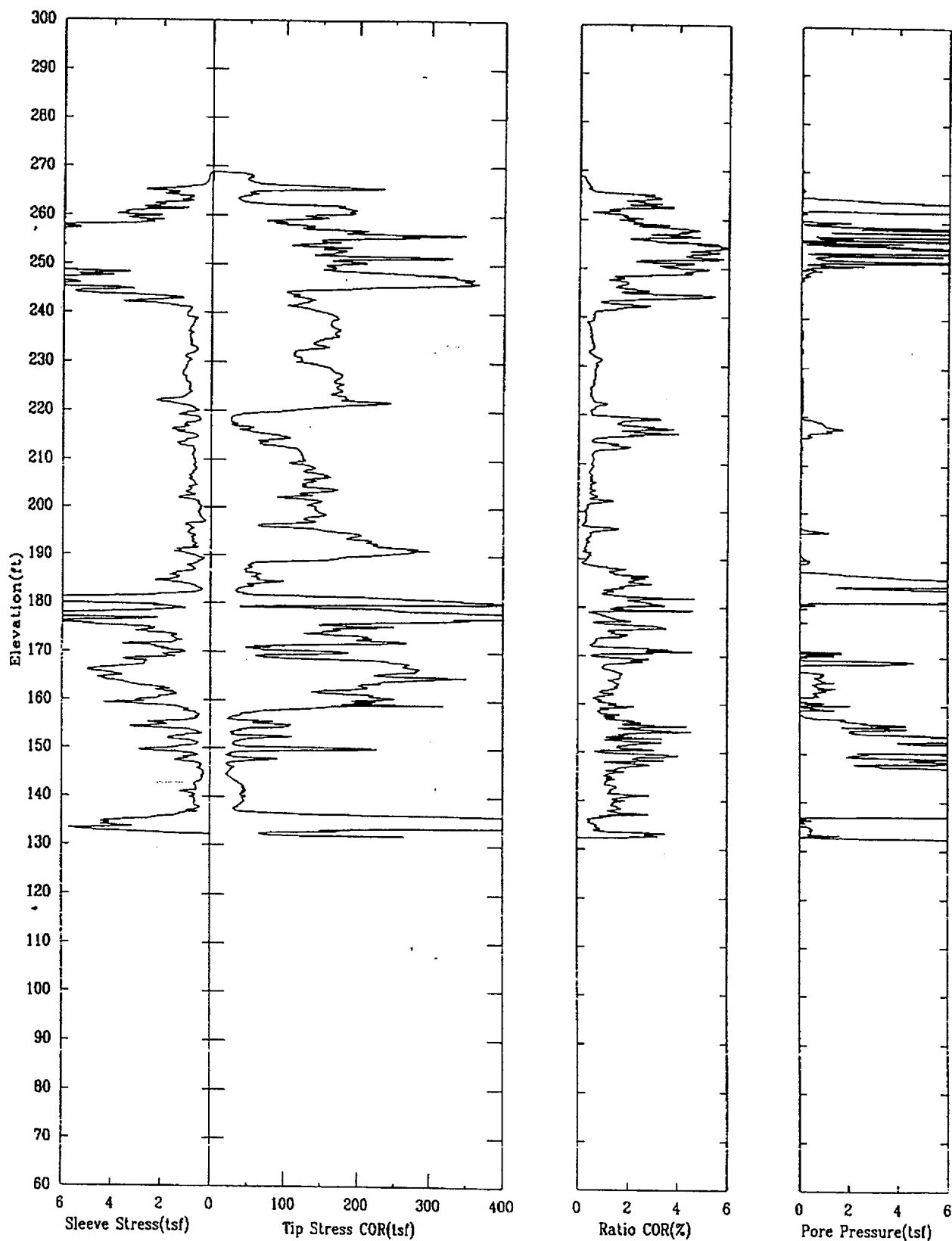
APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

North 79372.04

East 55517.96

Elevation 274.8



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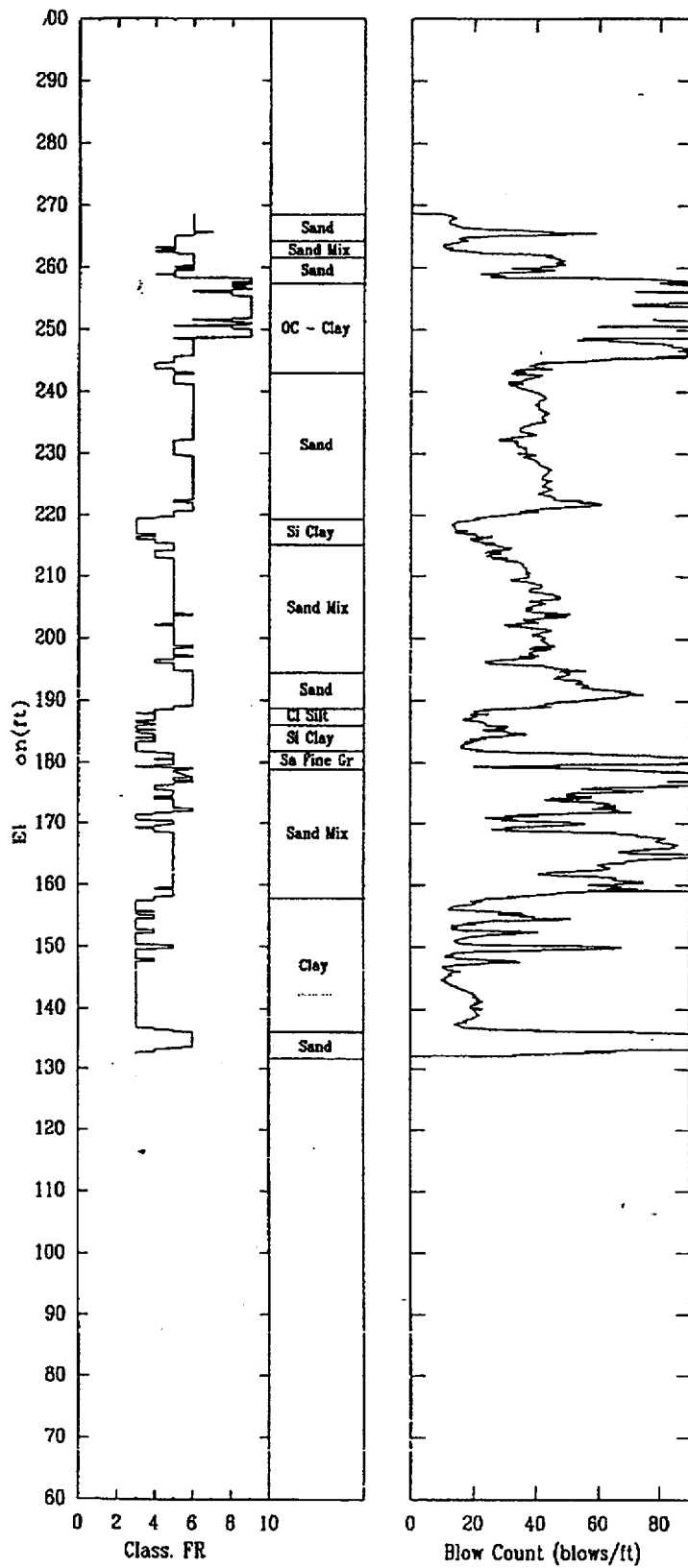
APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

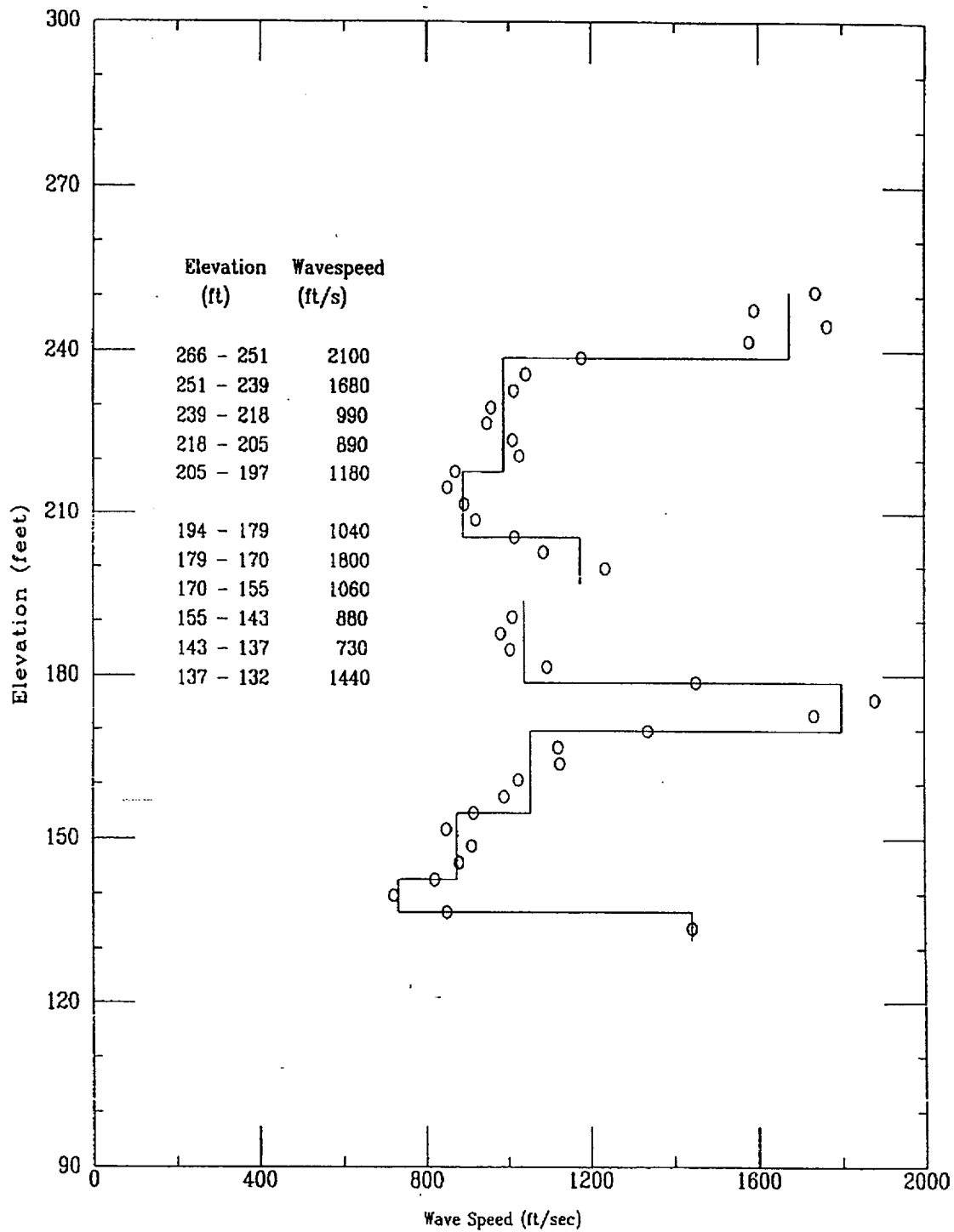
North 79372.04

East 55517.96

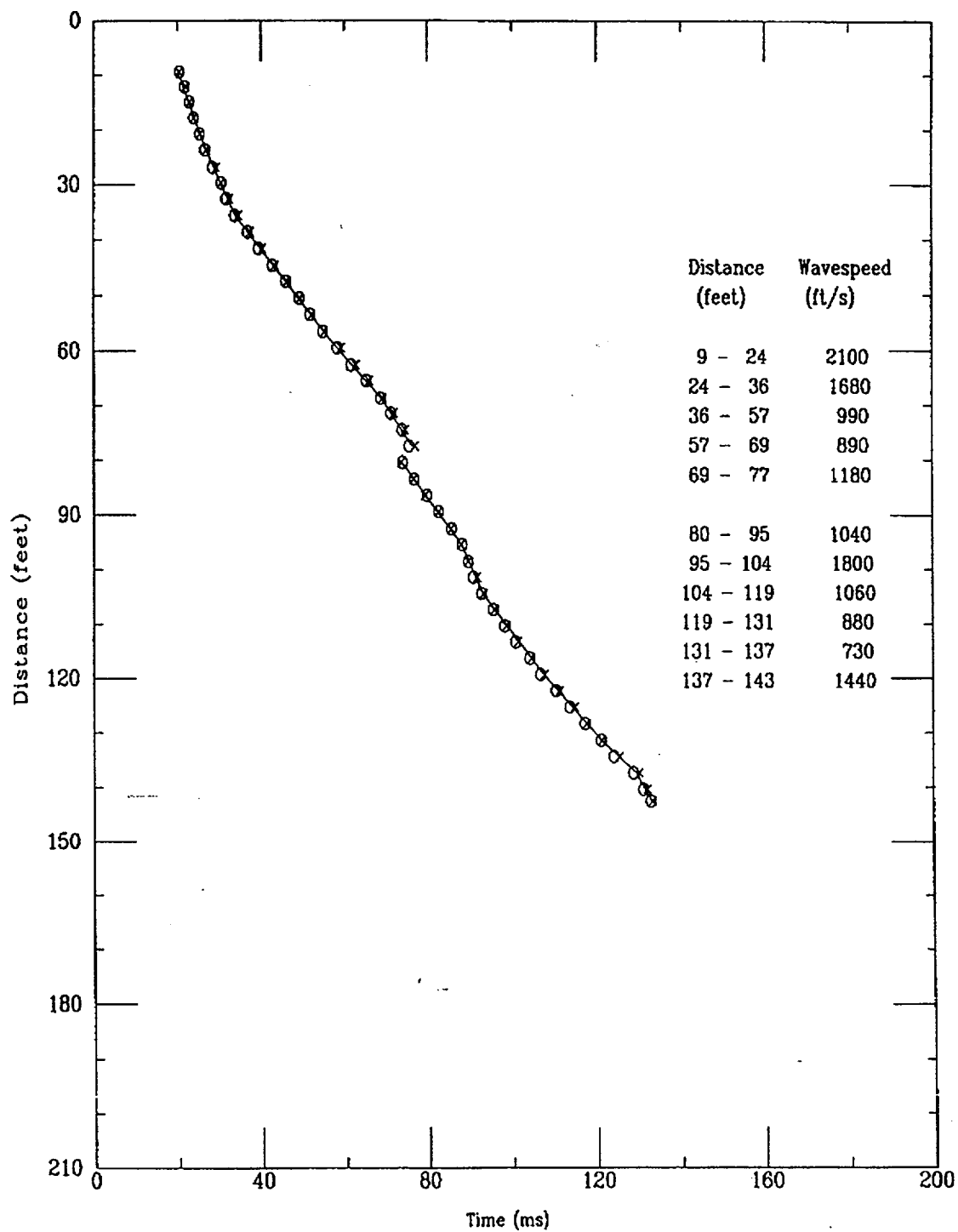
Elevation 274.8



Shear Wave Speeds

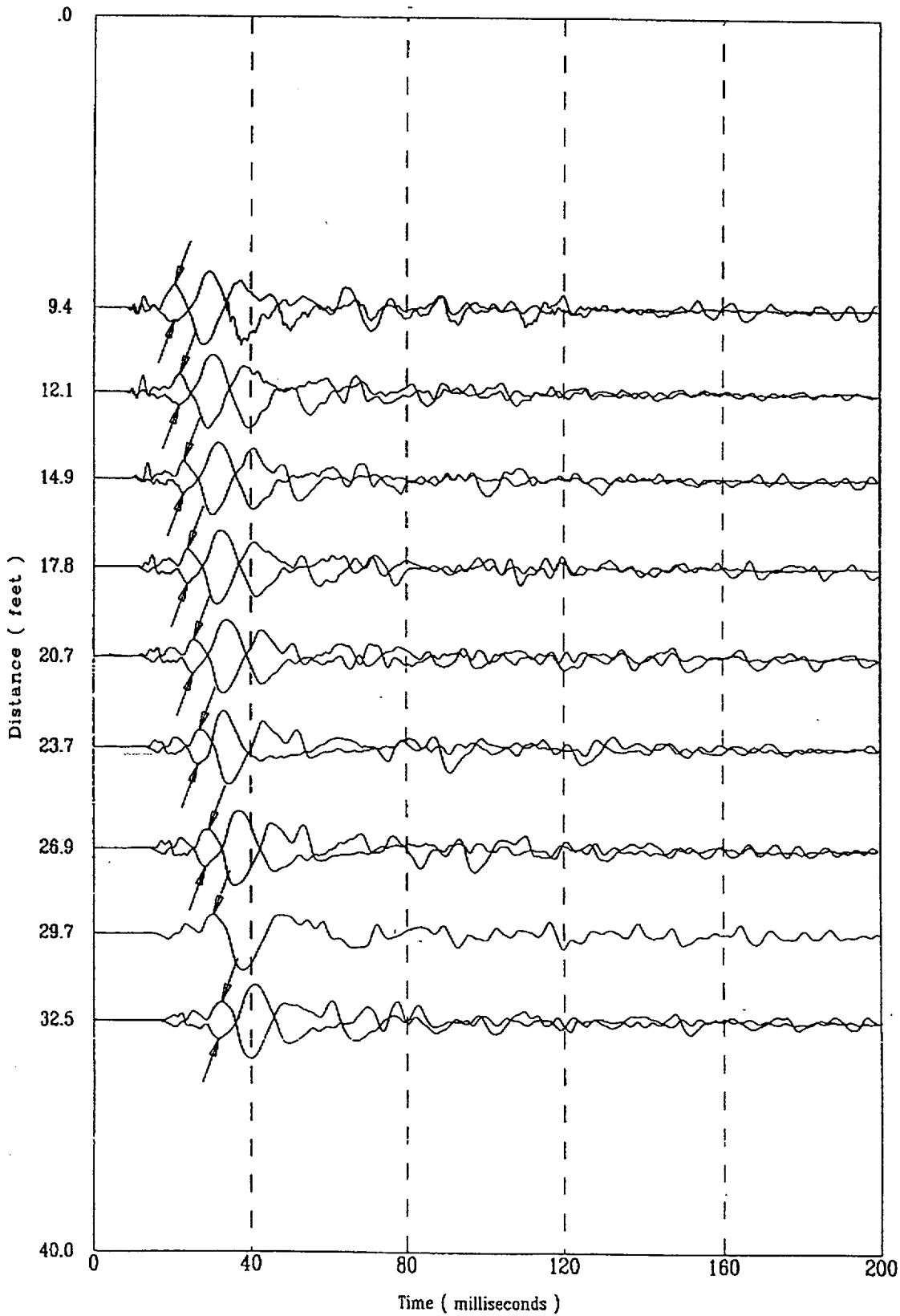


Shear Wave Time of Peak



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S Wave
03/04/98

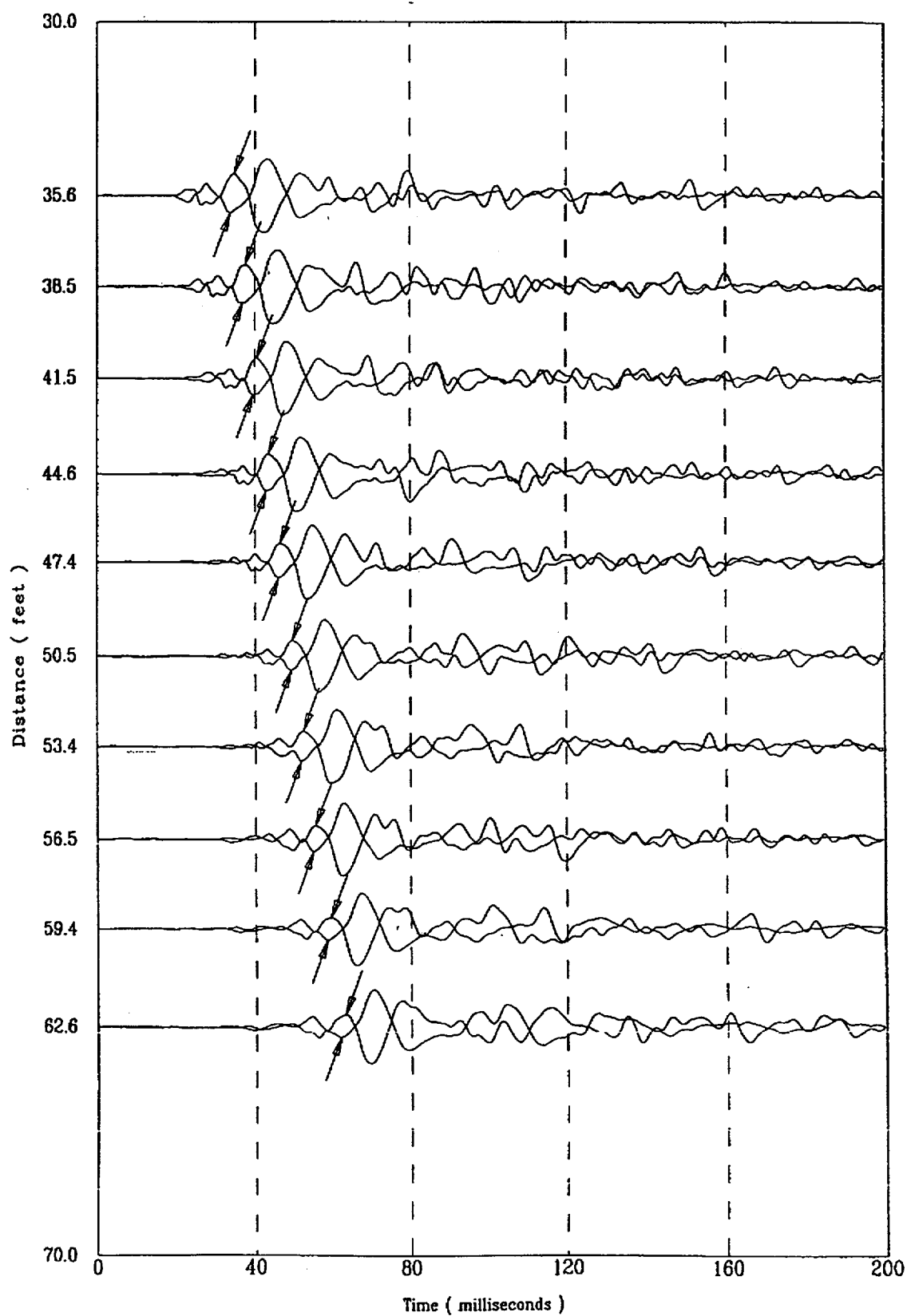


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S Wave
03/04/98

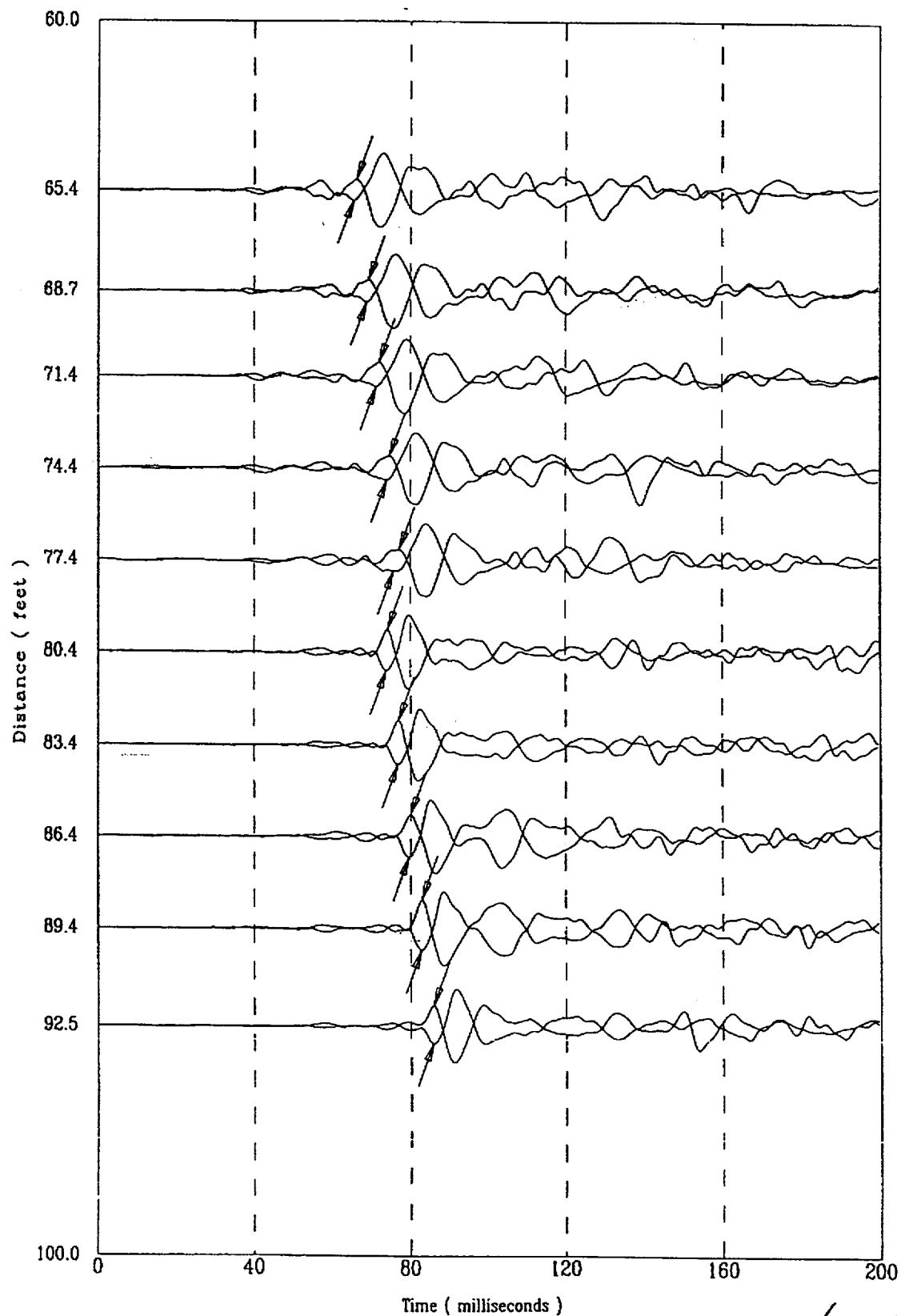


ENC 404m804S

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Applied Research Associates, Inc.
CPT-149

S Wave
03/04/98

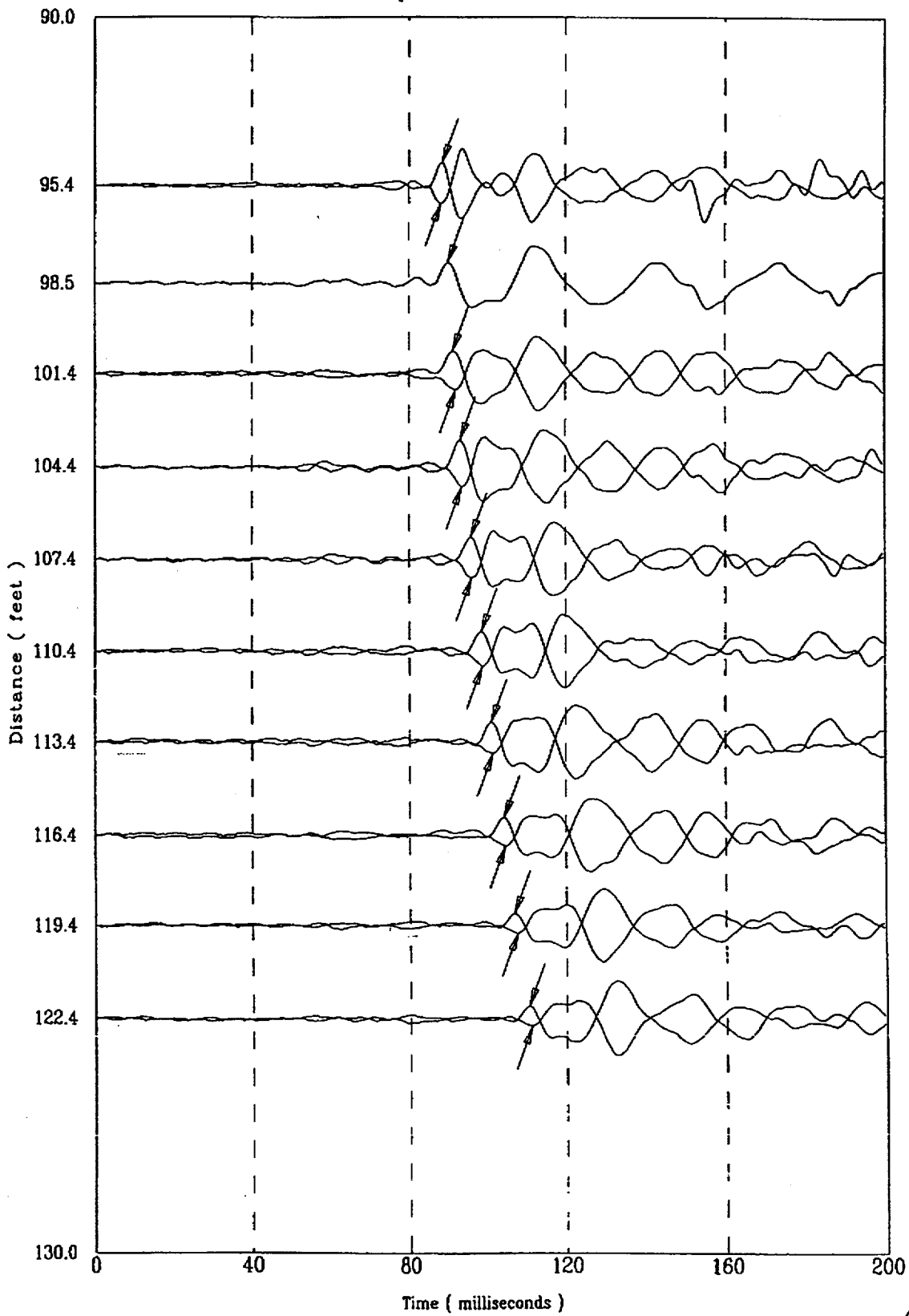


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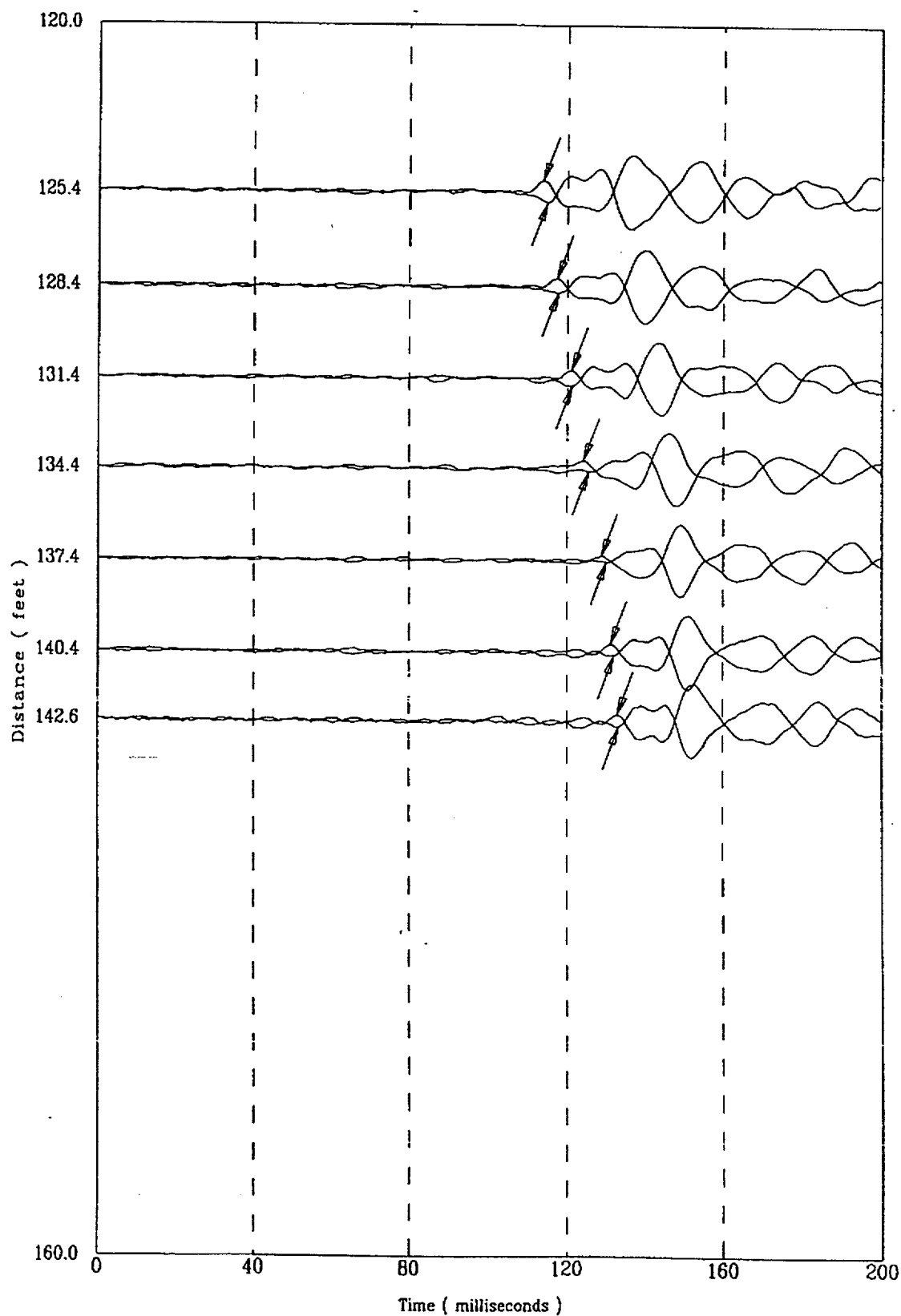
Applied Research Associates, Inc.
CPT-149

S Wave
03/05/98

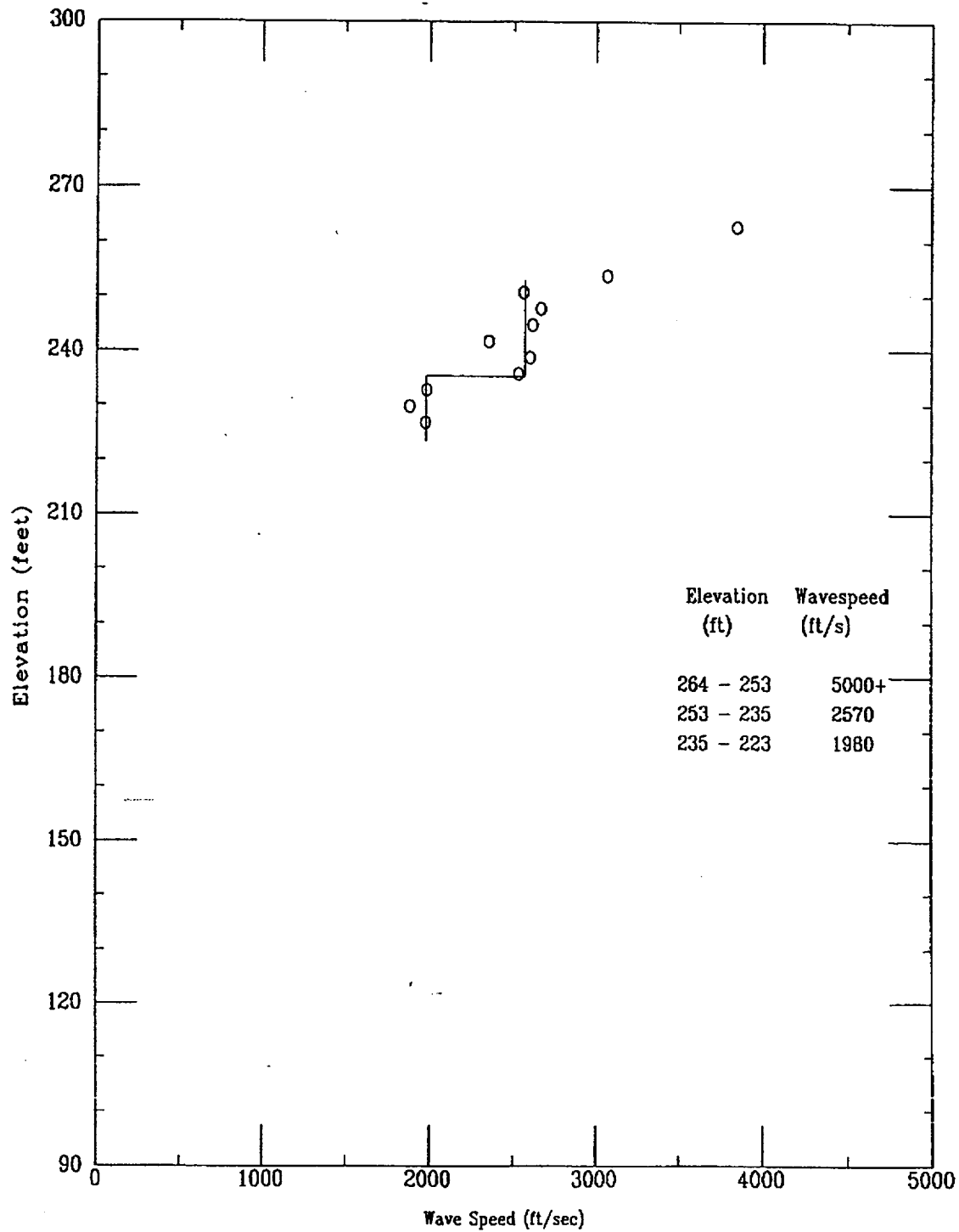


404m804S

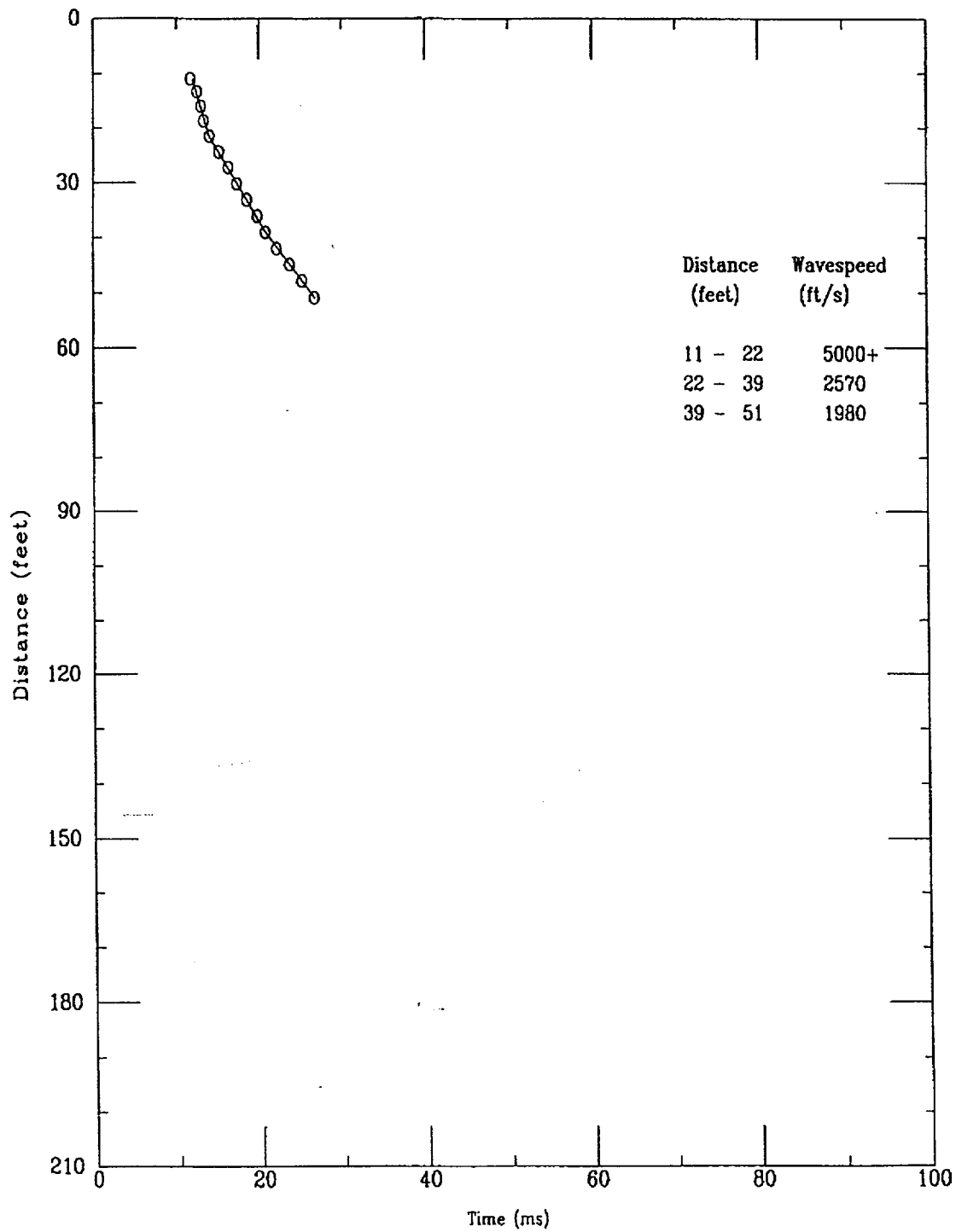
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Compression Wave Speeds

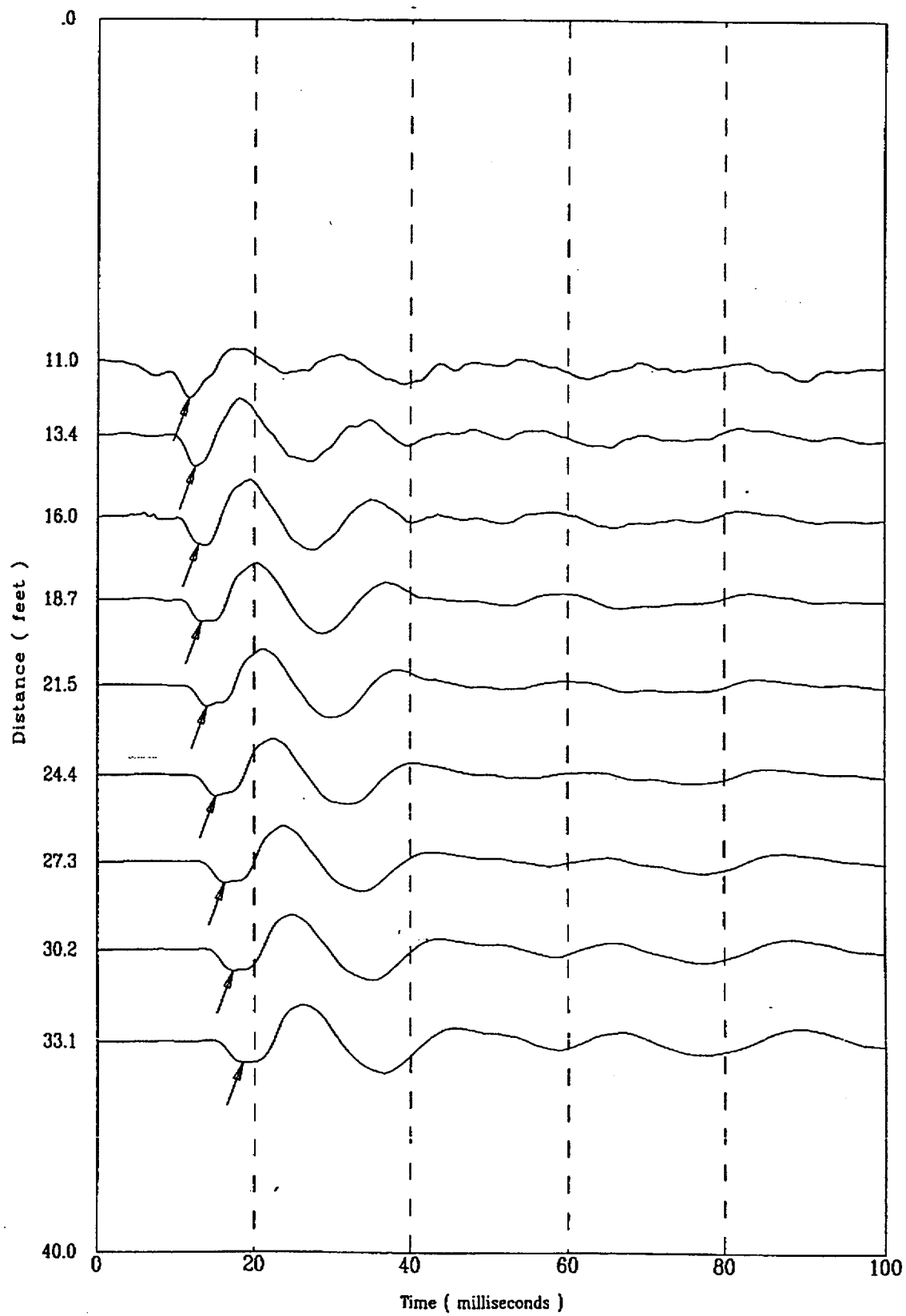


Compression Wave Time of Peak



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CPT-149

P Wave
03/30/98

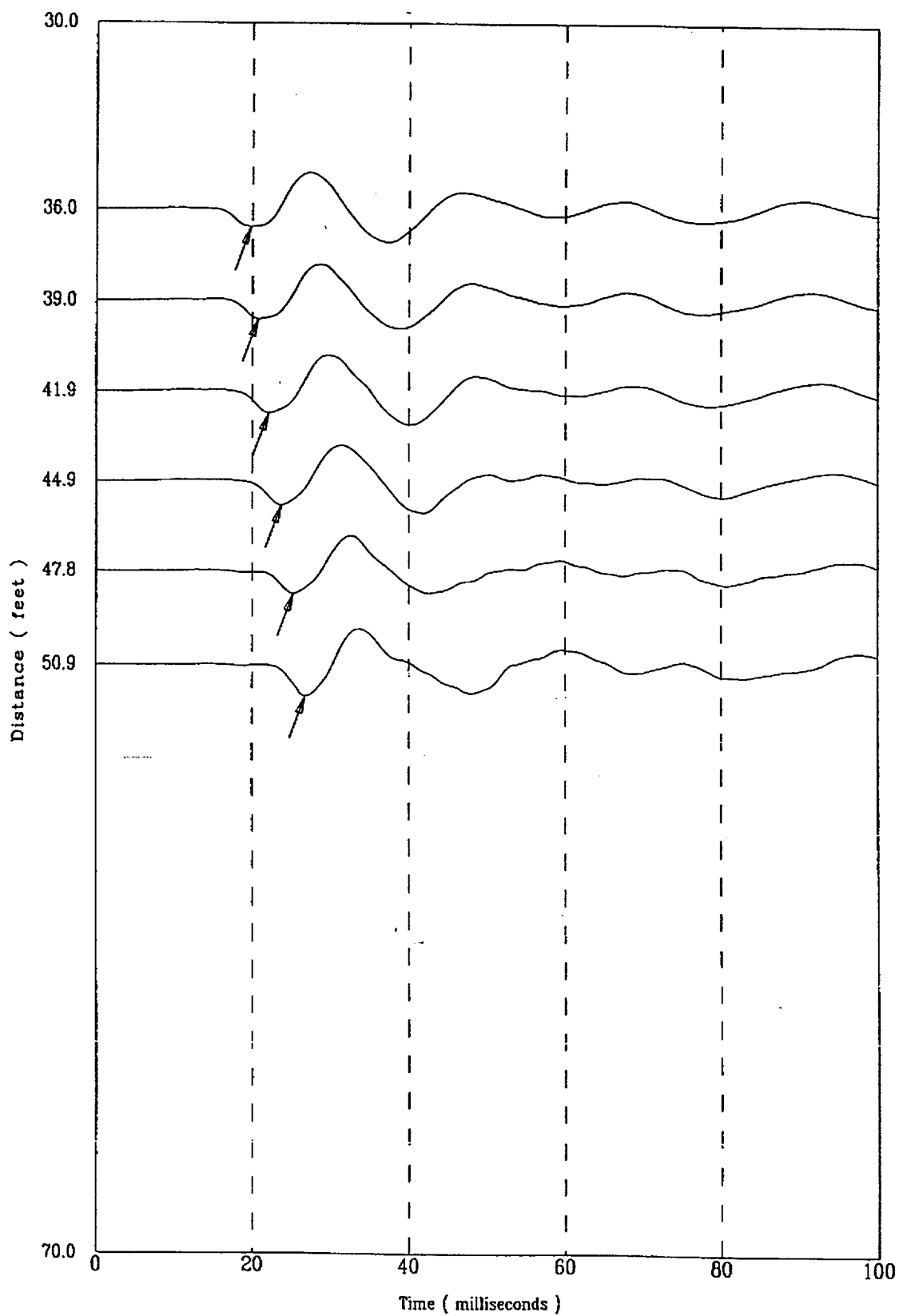


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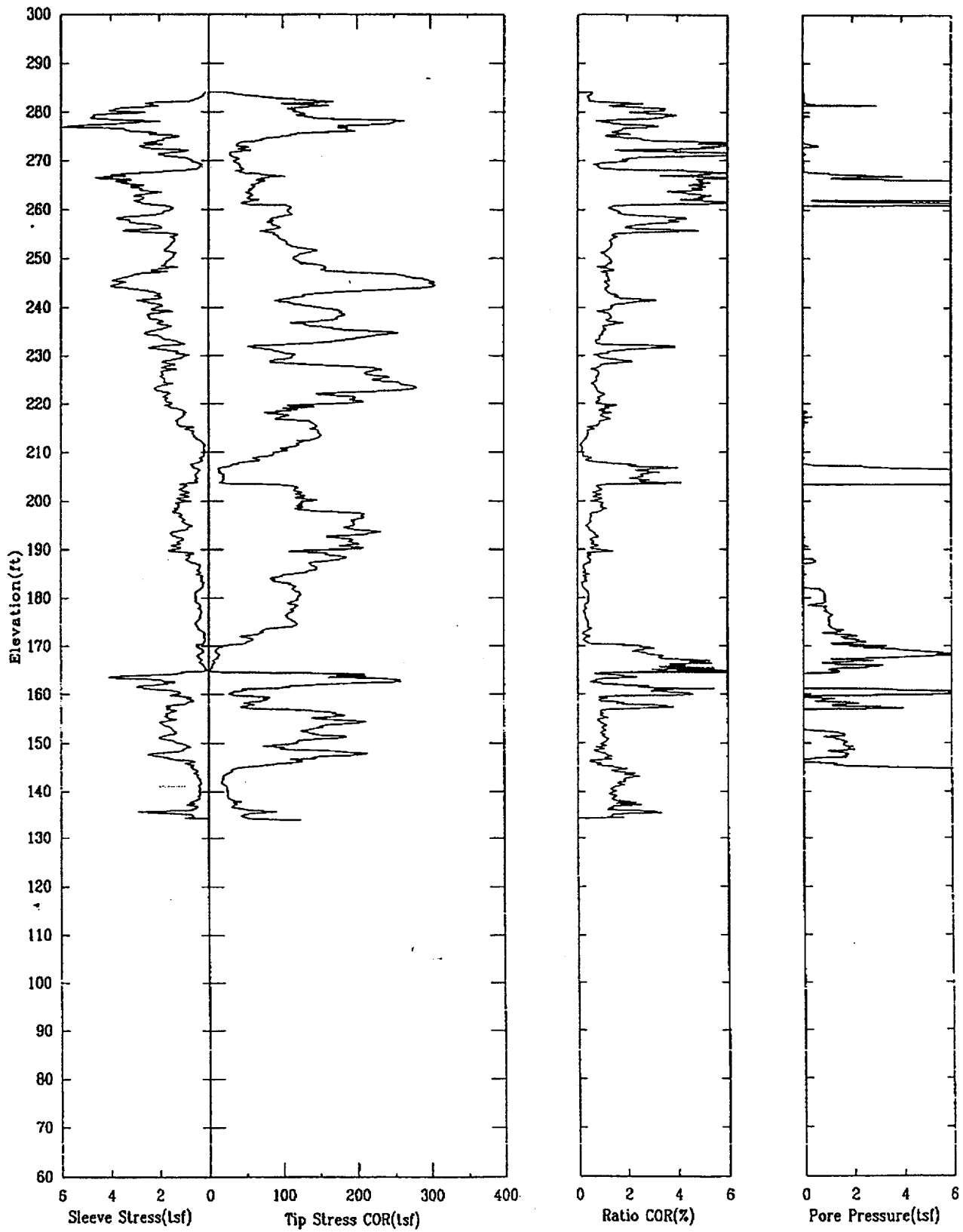
Applied Research Associates, Inc.
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P Wave
03/30/98



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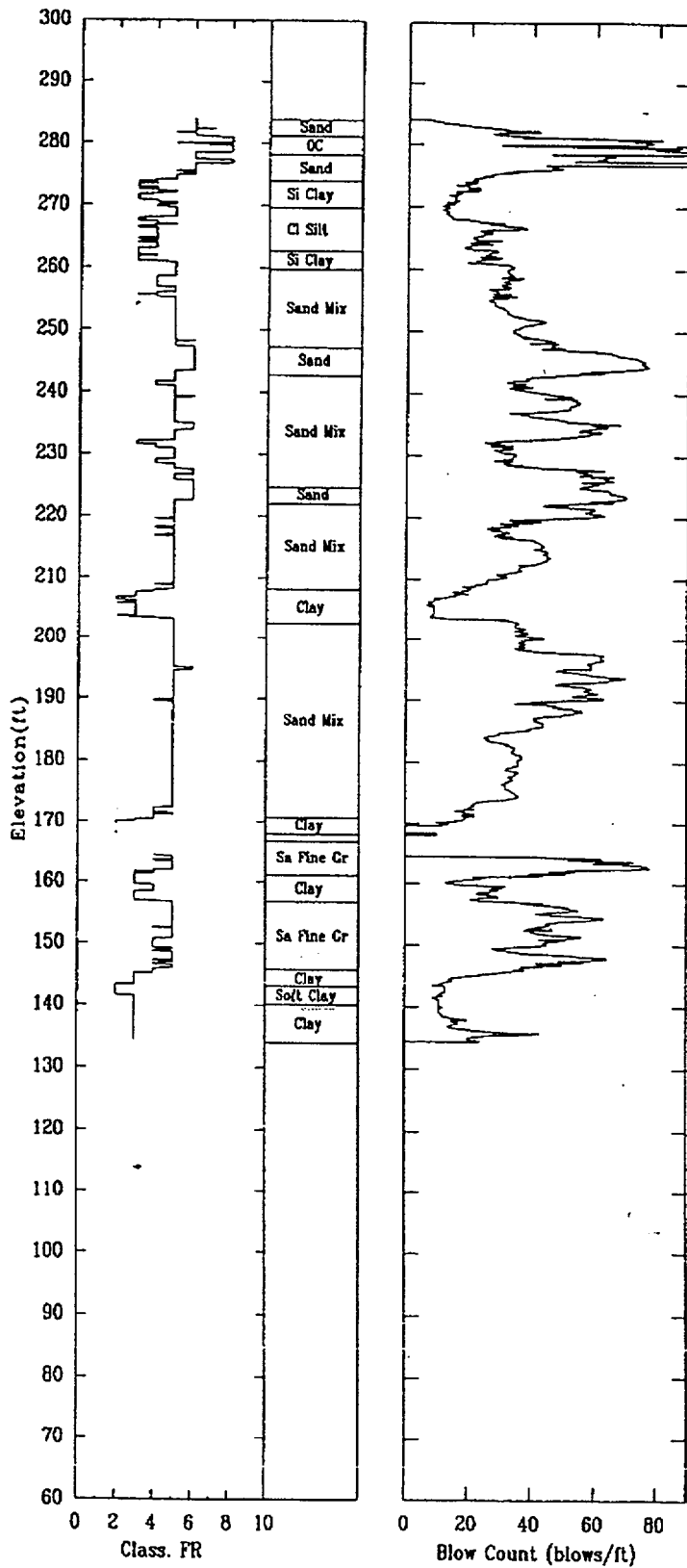
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

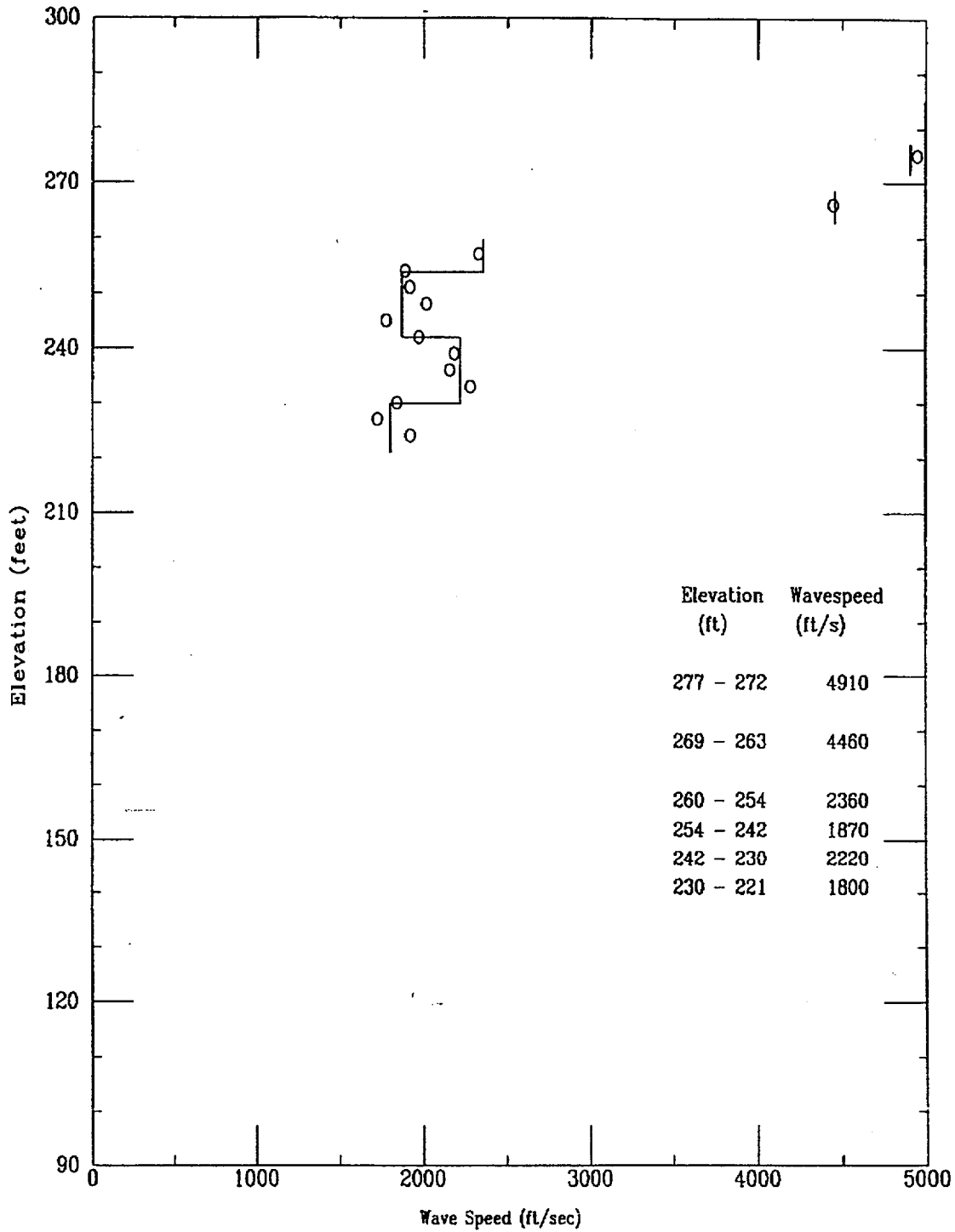
North 79305

East 55195

Elevation 290.1



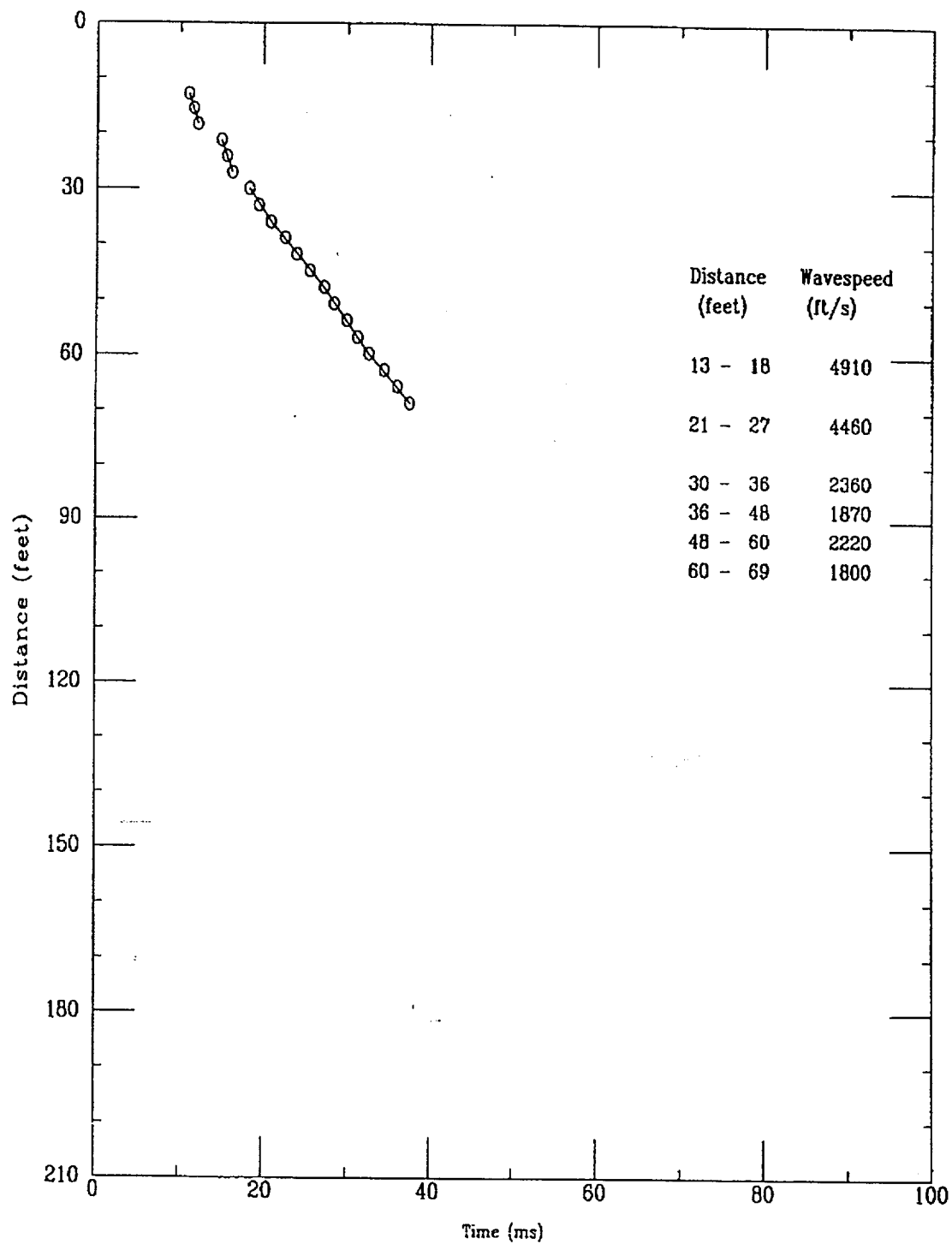
Compression Wave Speeds



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APPLIED RESEARCH ASSOCIATES, INC.
Compression Wave Time of Peak

02/24/98

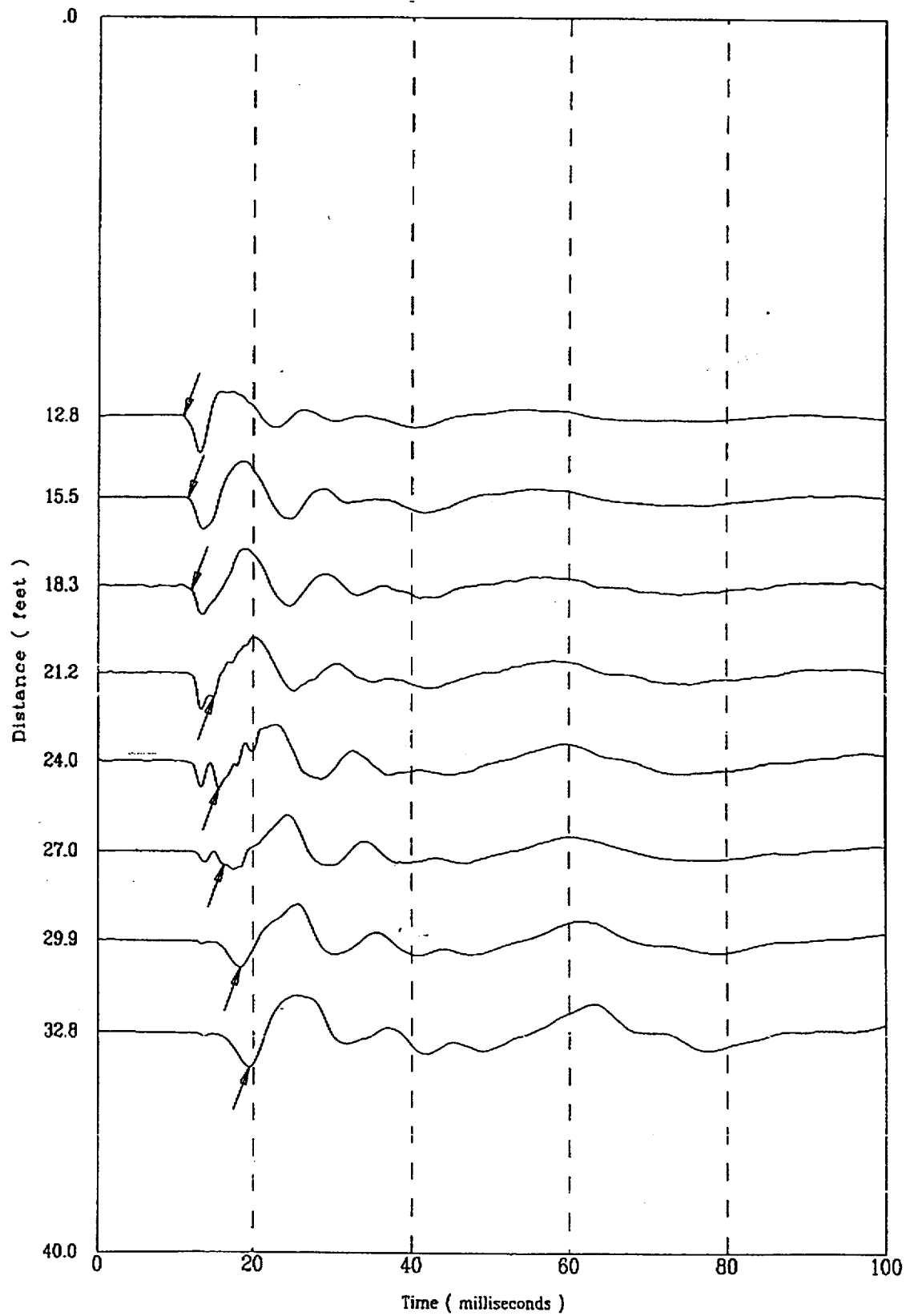


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P Wave
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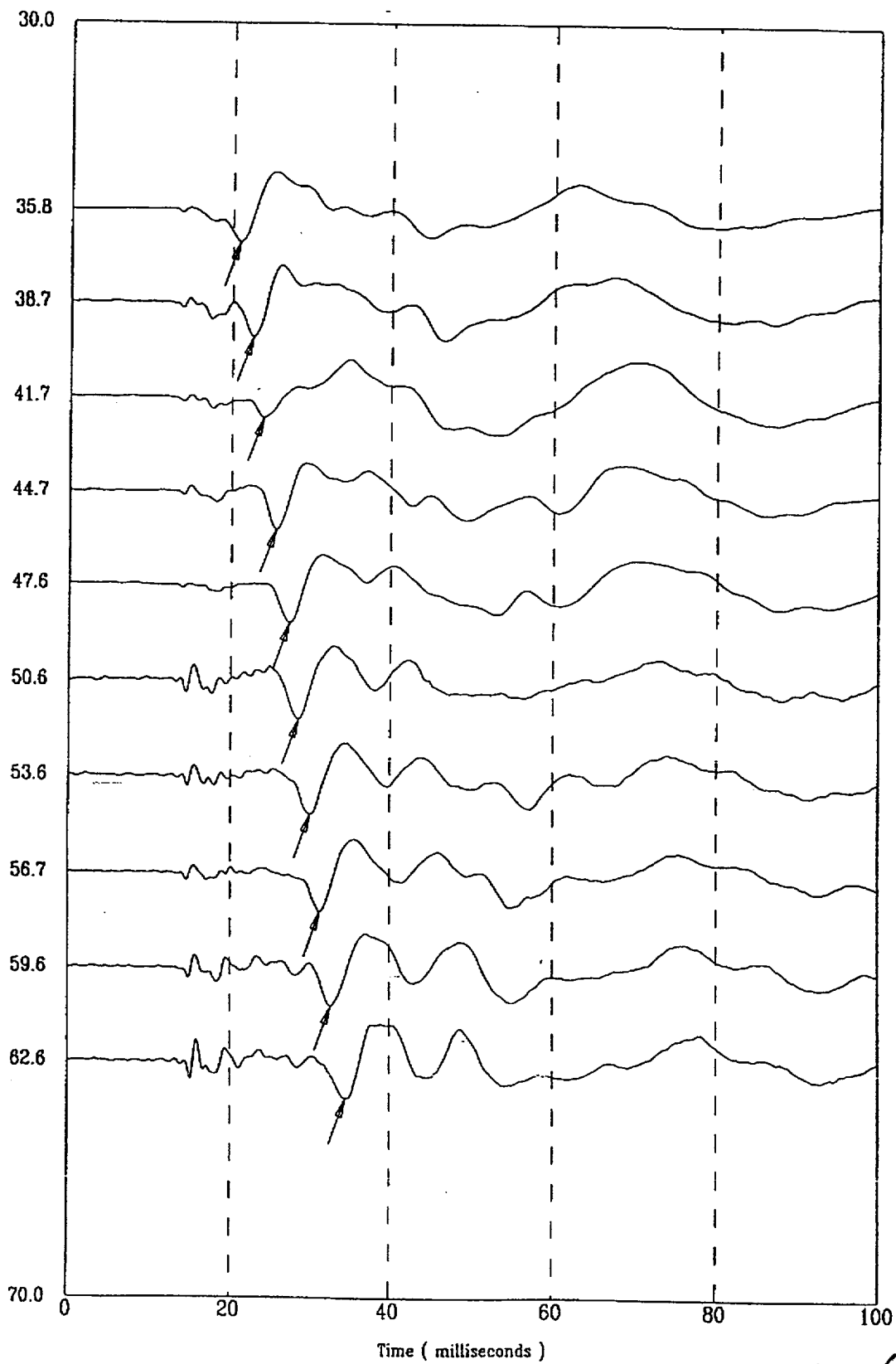


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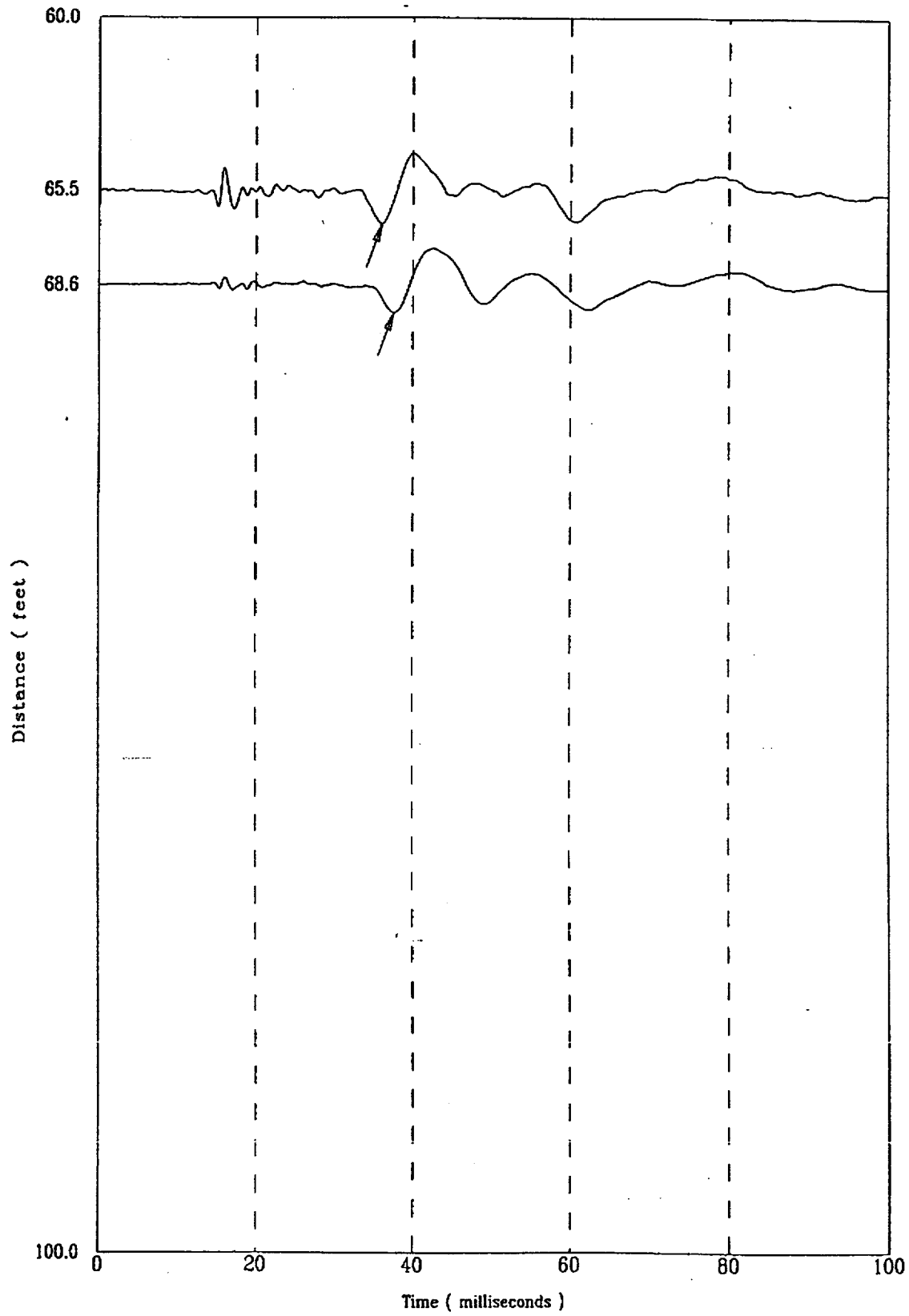
P Wave
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P Wave
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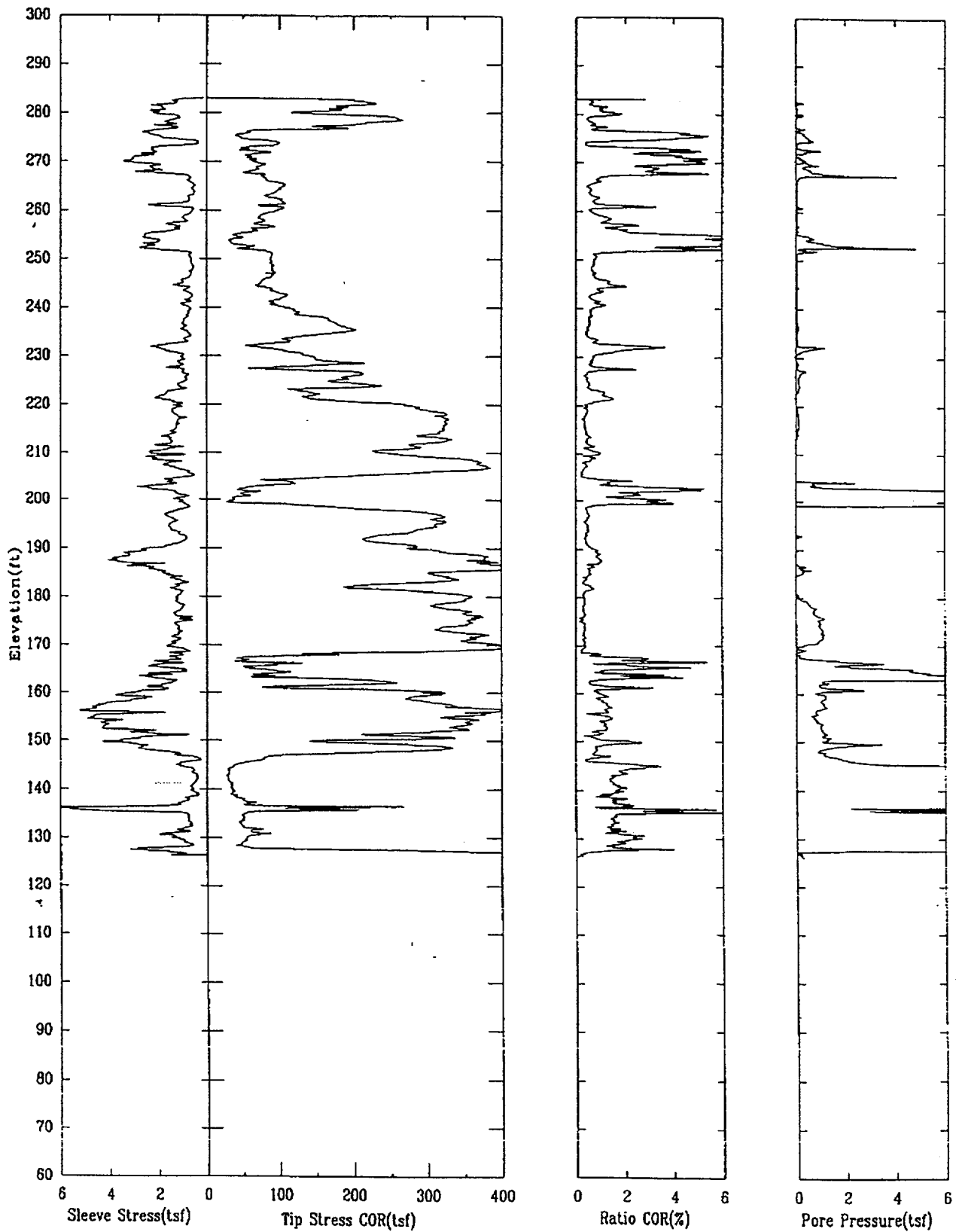
APPLIED RESEARCH ASSOCIATES, INC.

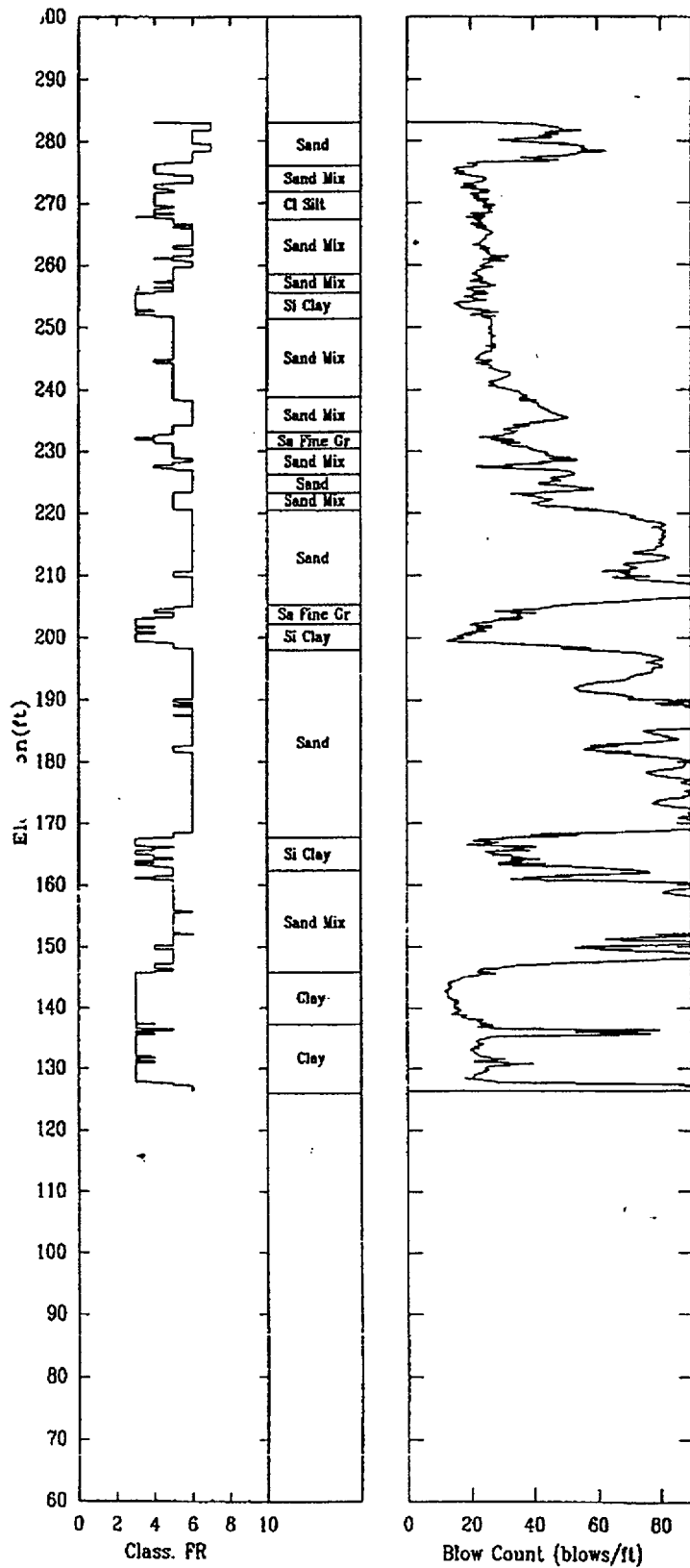
02/18/98

North 79245.0

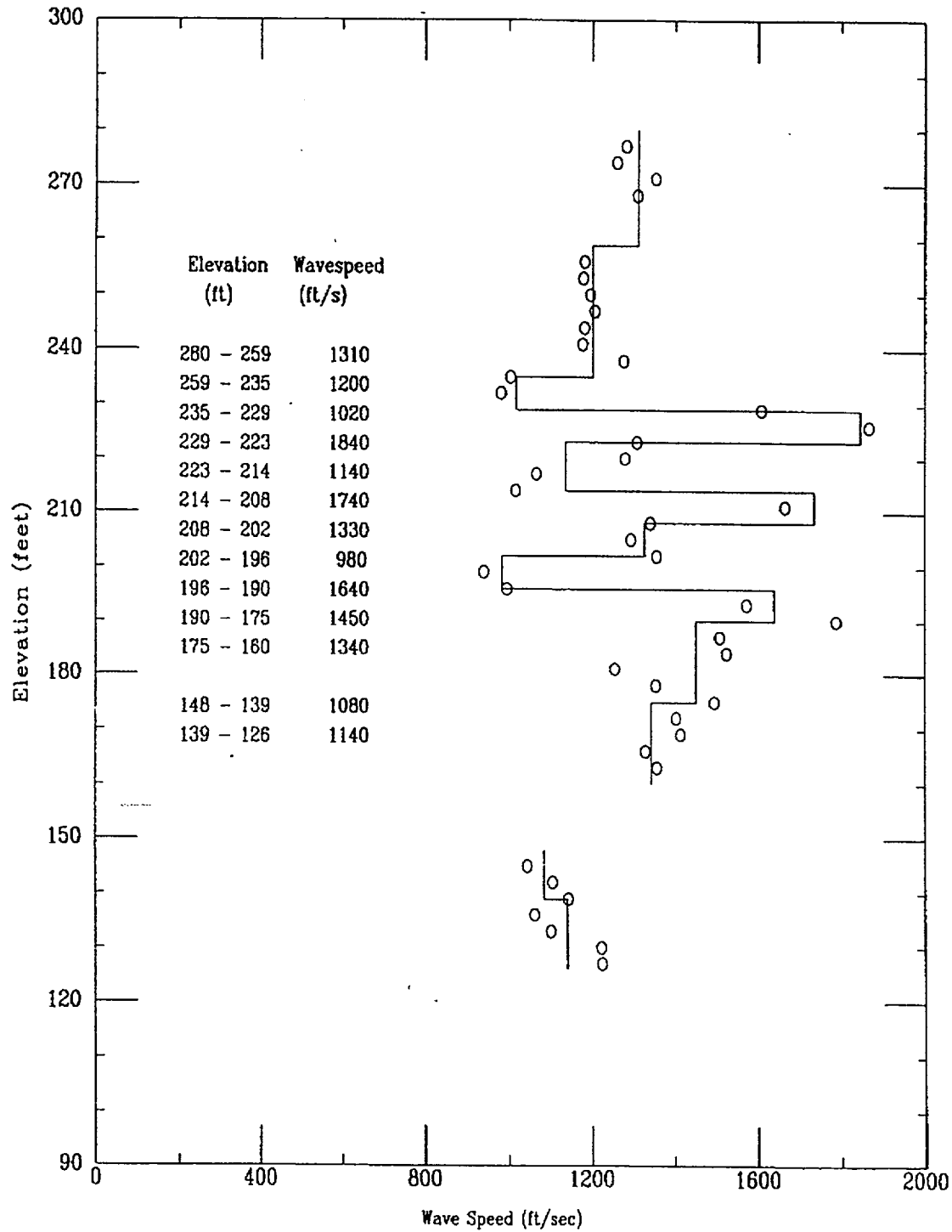
East 55261.0

Elevation 289.1

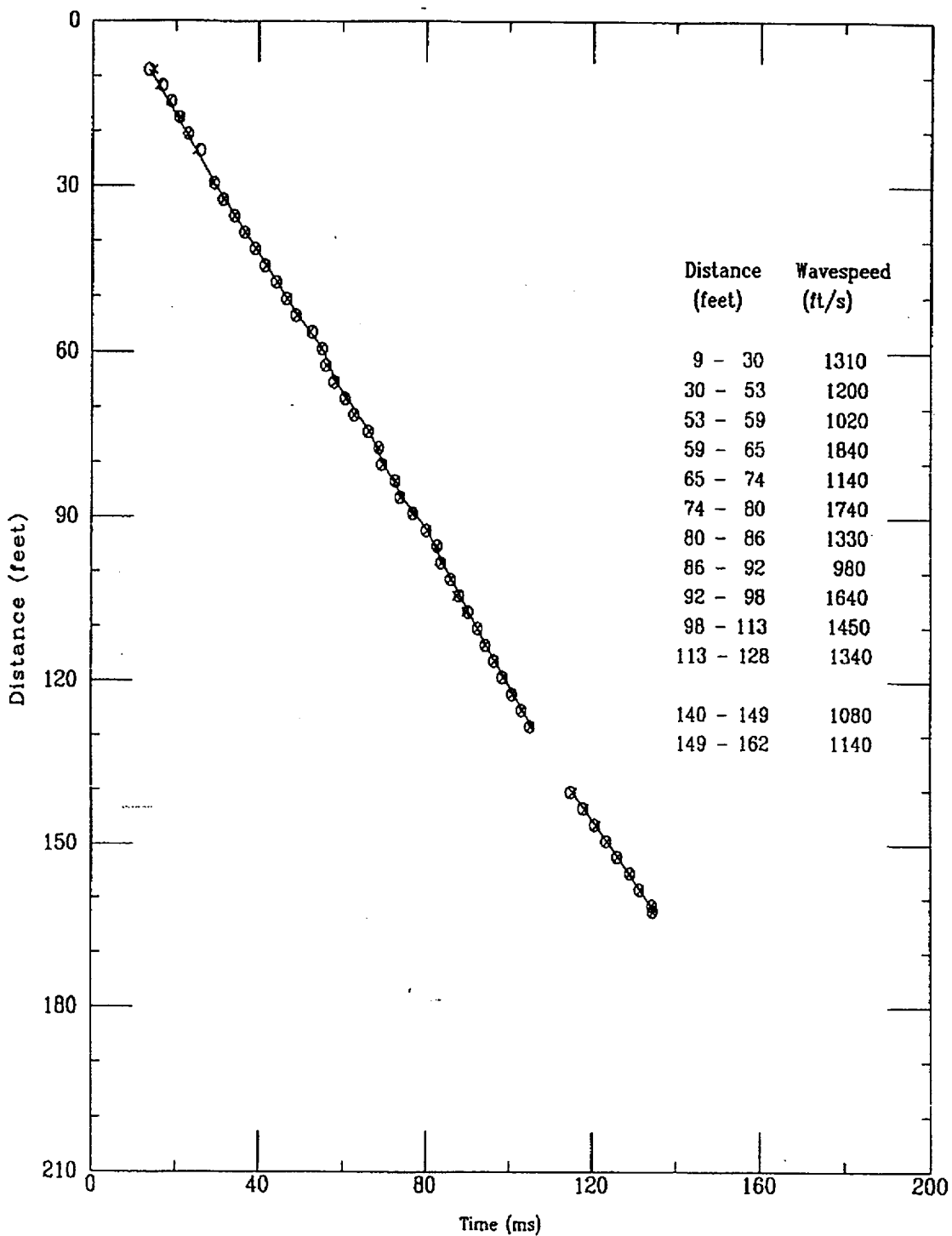




Shear Wave Speeds

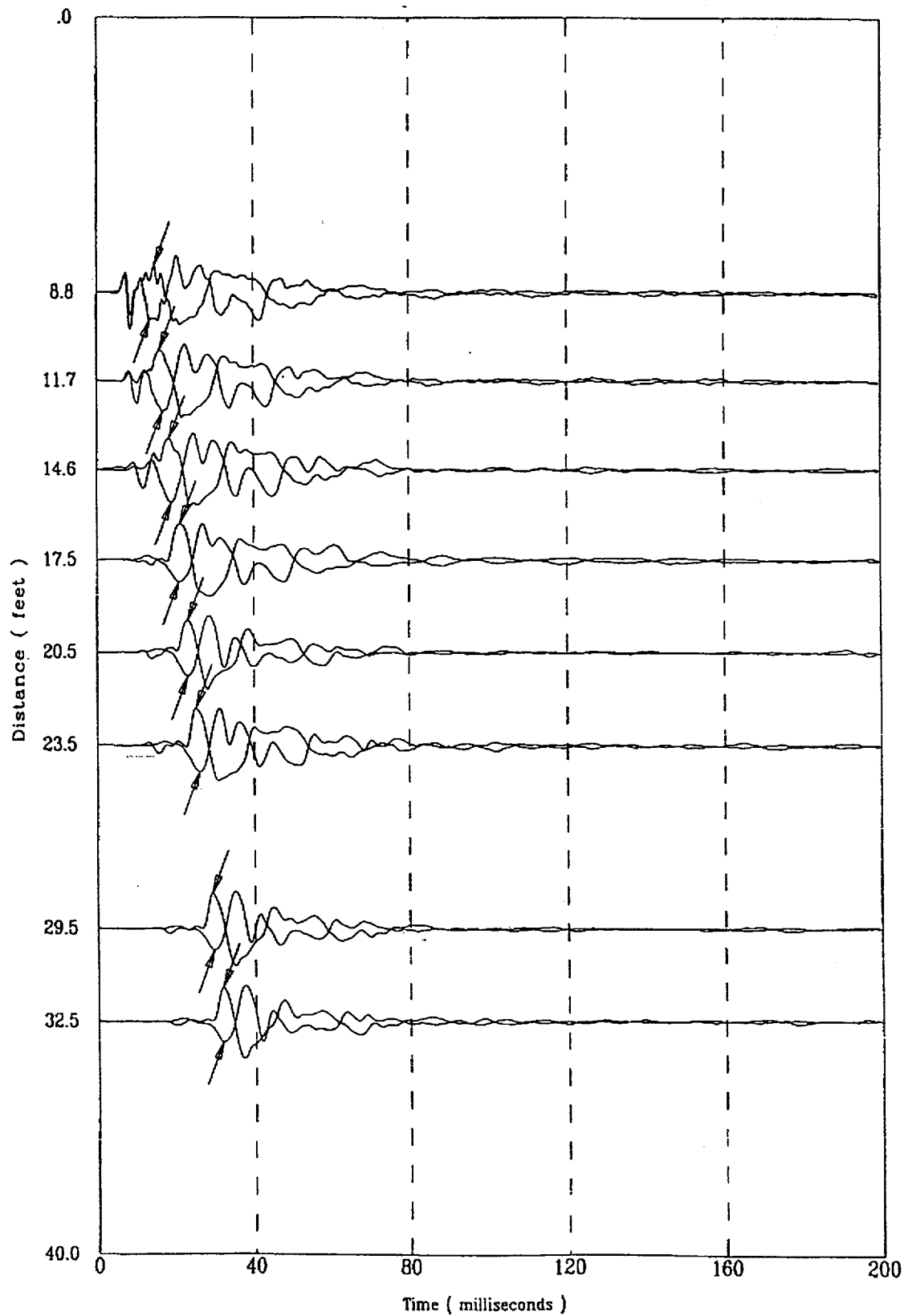


Shear Wave Time of Peak



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S Wave
02/18/98

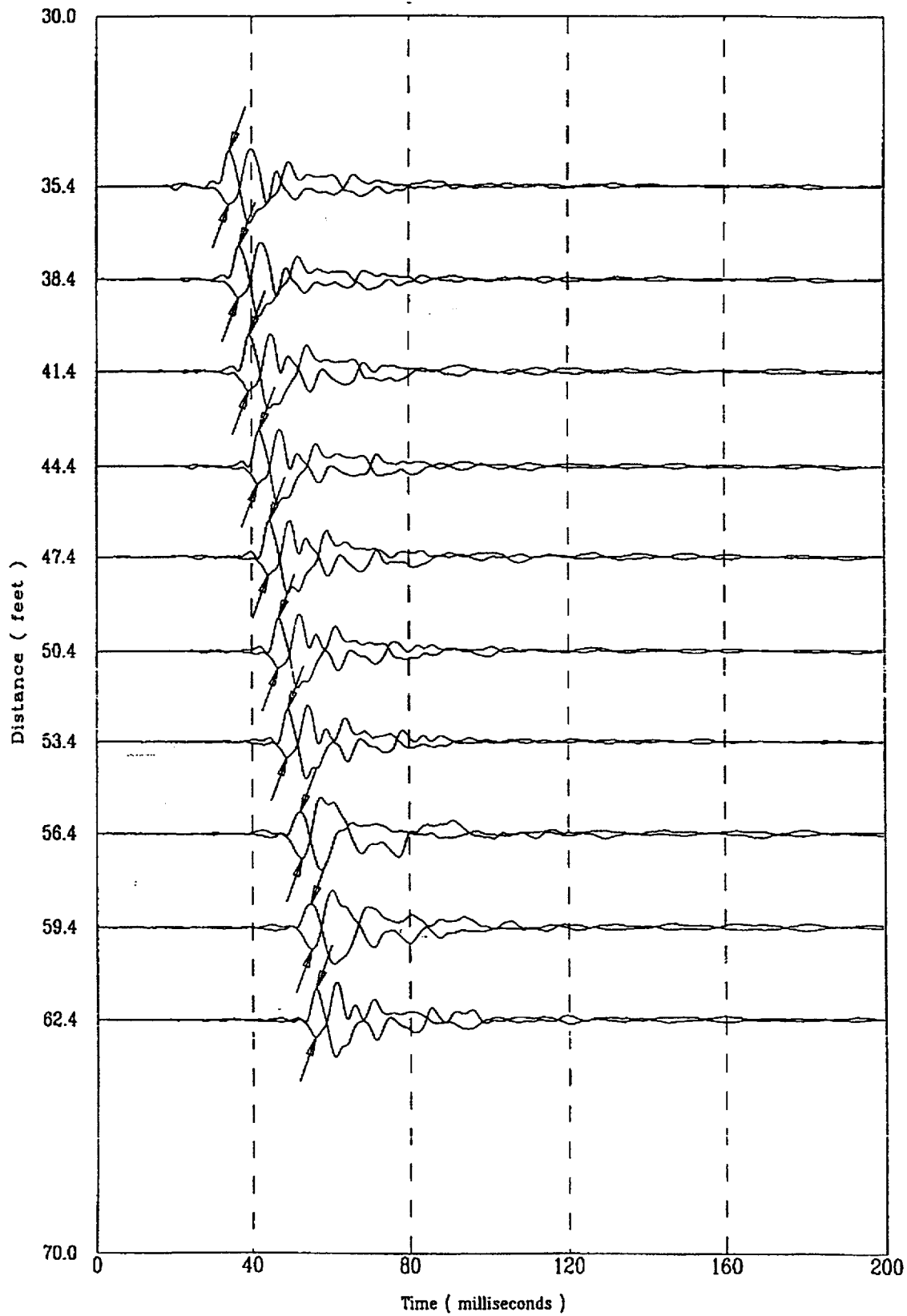


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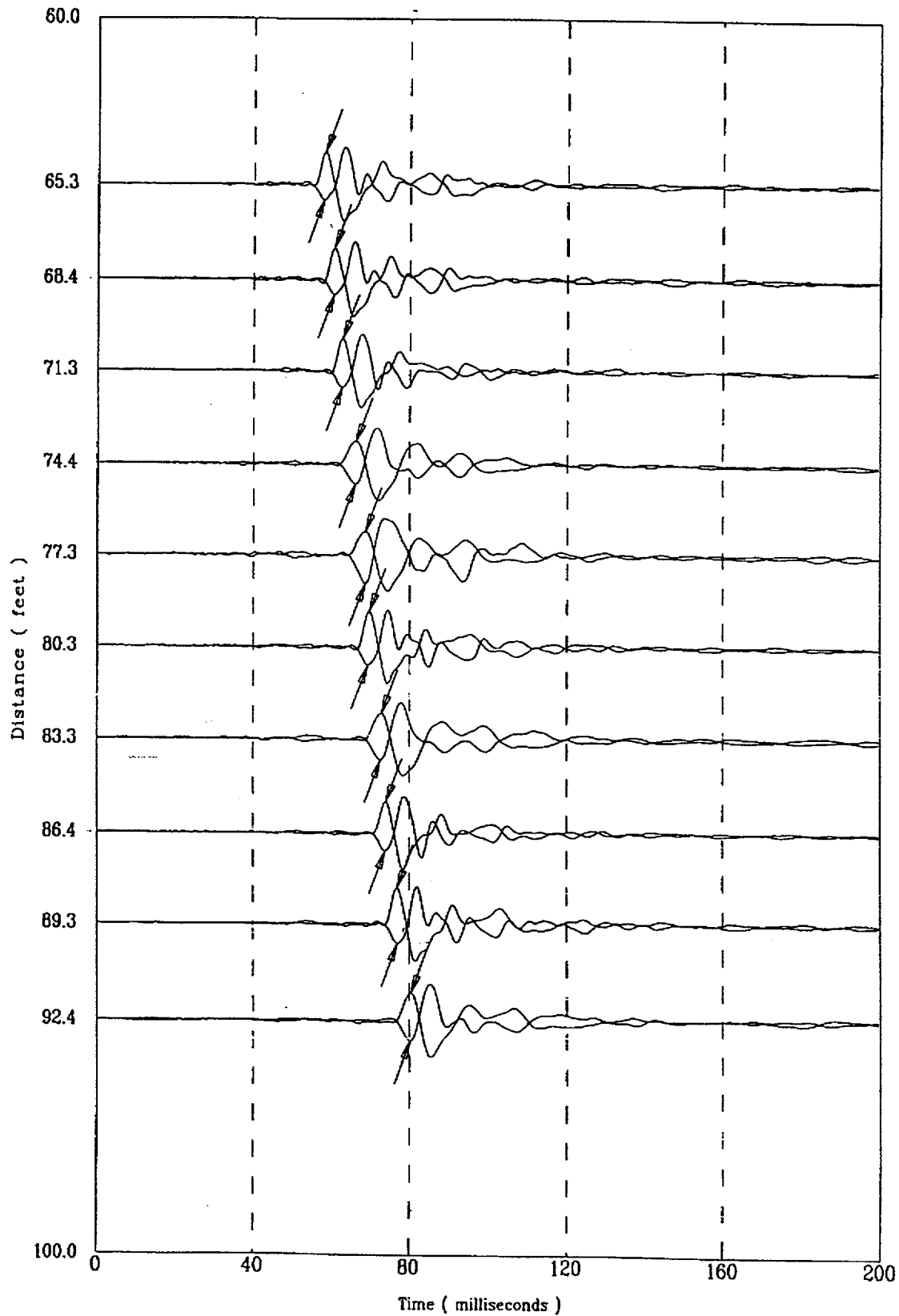
S Wave
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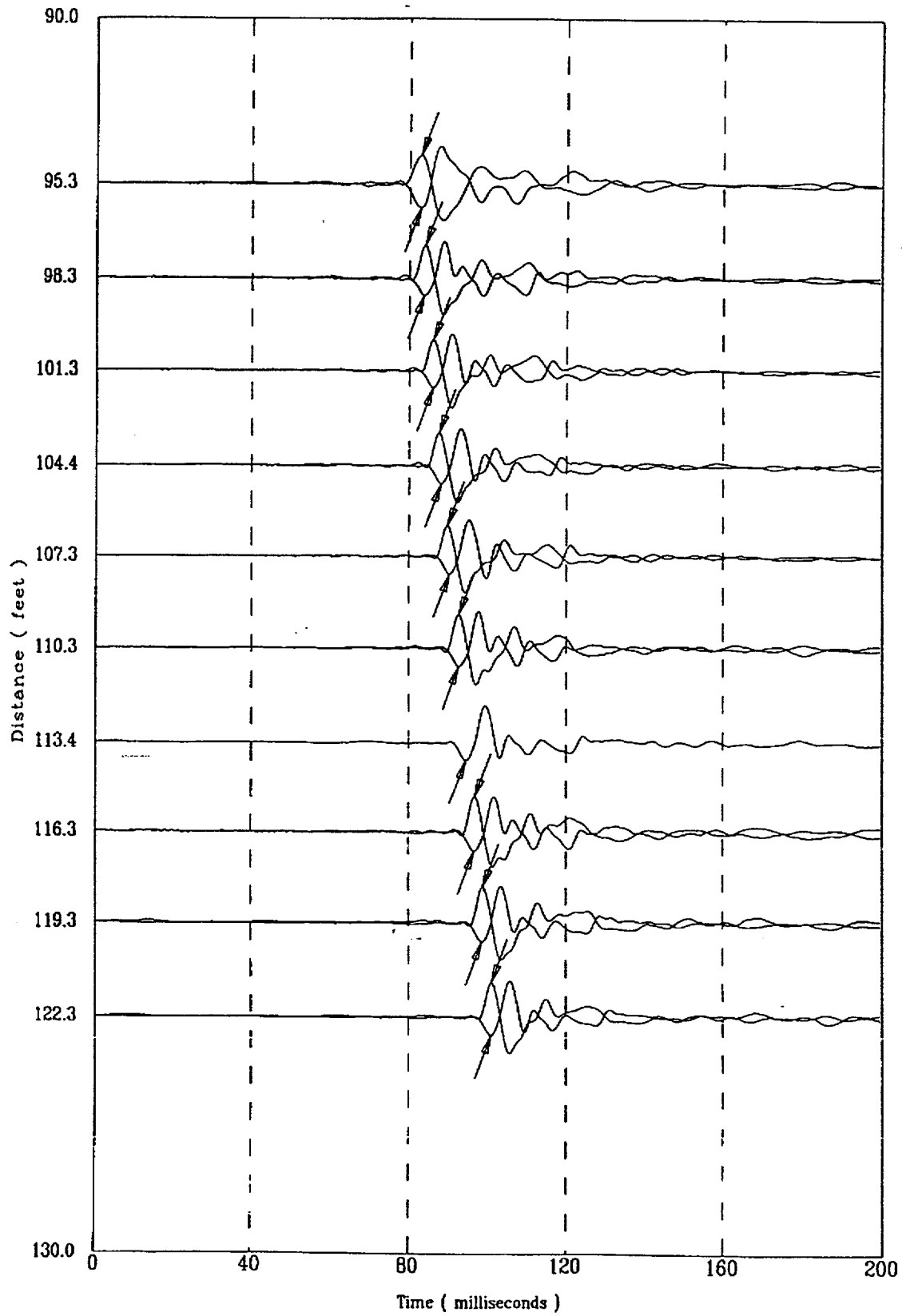
Applied Research Associates, Inc.
CPT-155

S Wave
02/18/98



Applied Research Associates, Inc.
CPT-155

S Wave
02/18/98

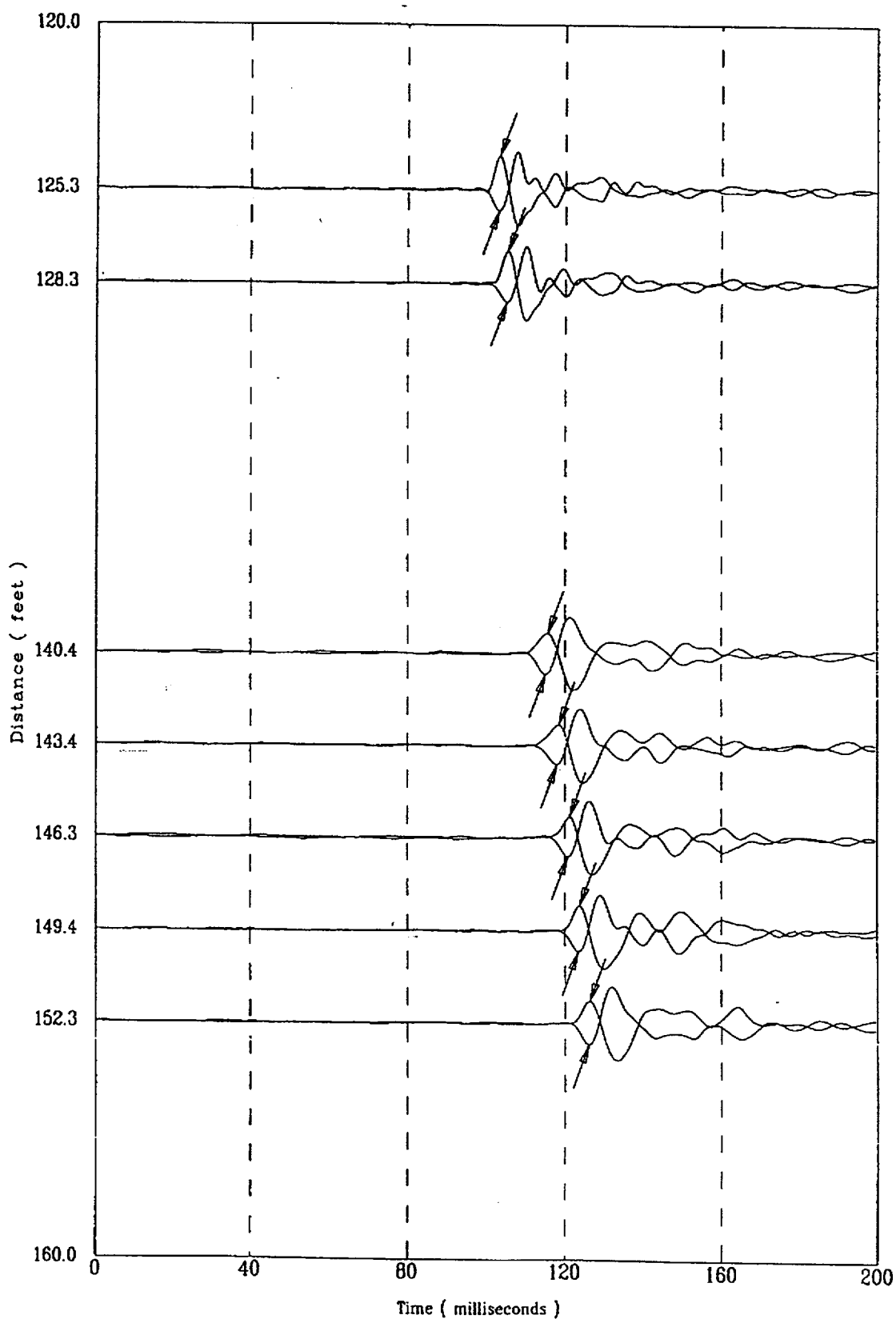


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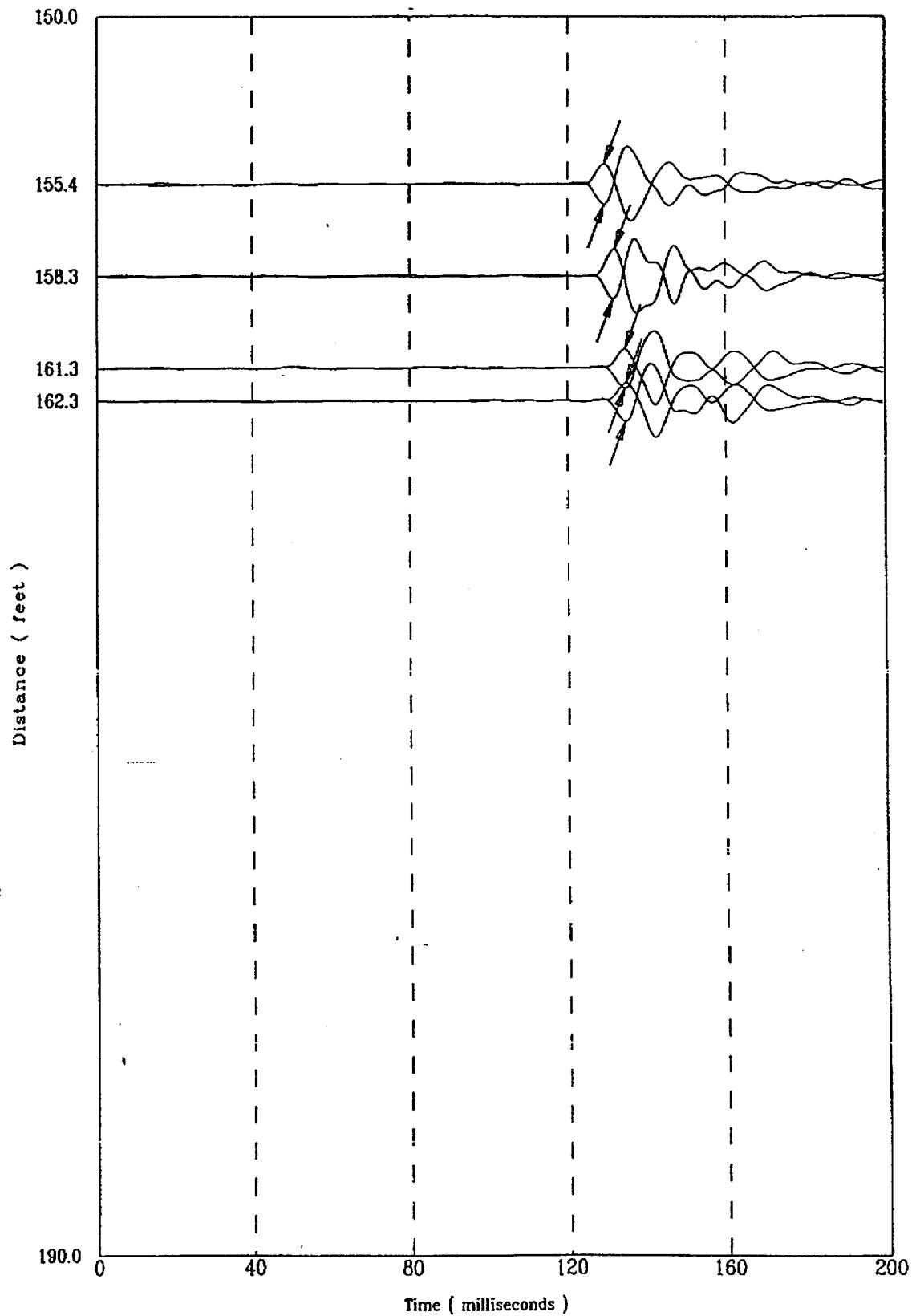
Applied Research Associates, Inc.
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S Wave
02/18/98



Applied Research Associates, Inc.
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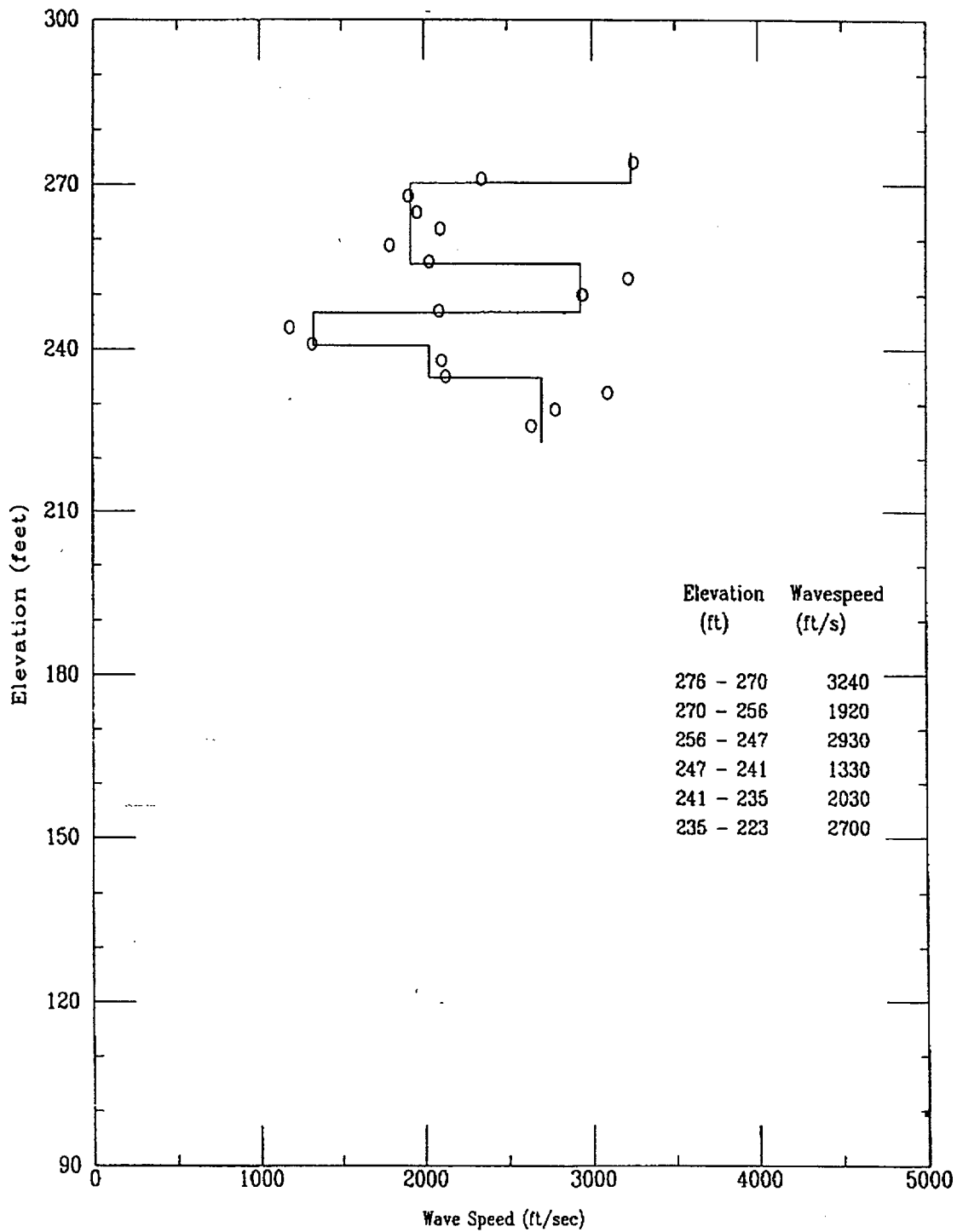
S Wave
02/18/98



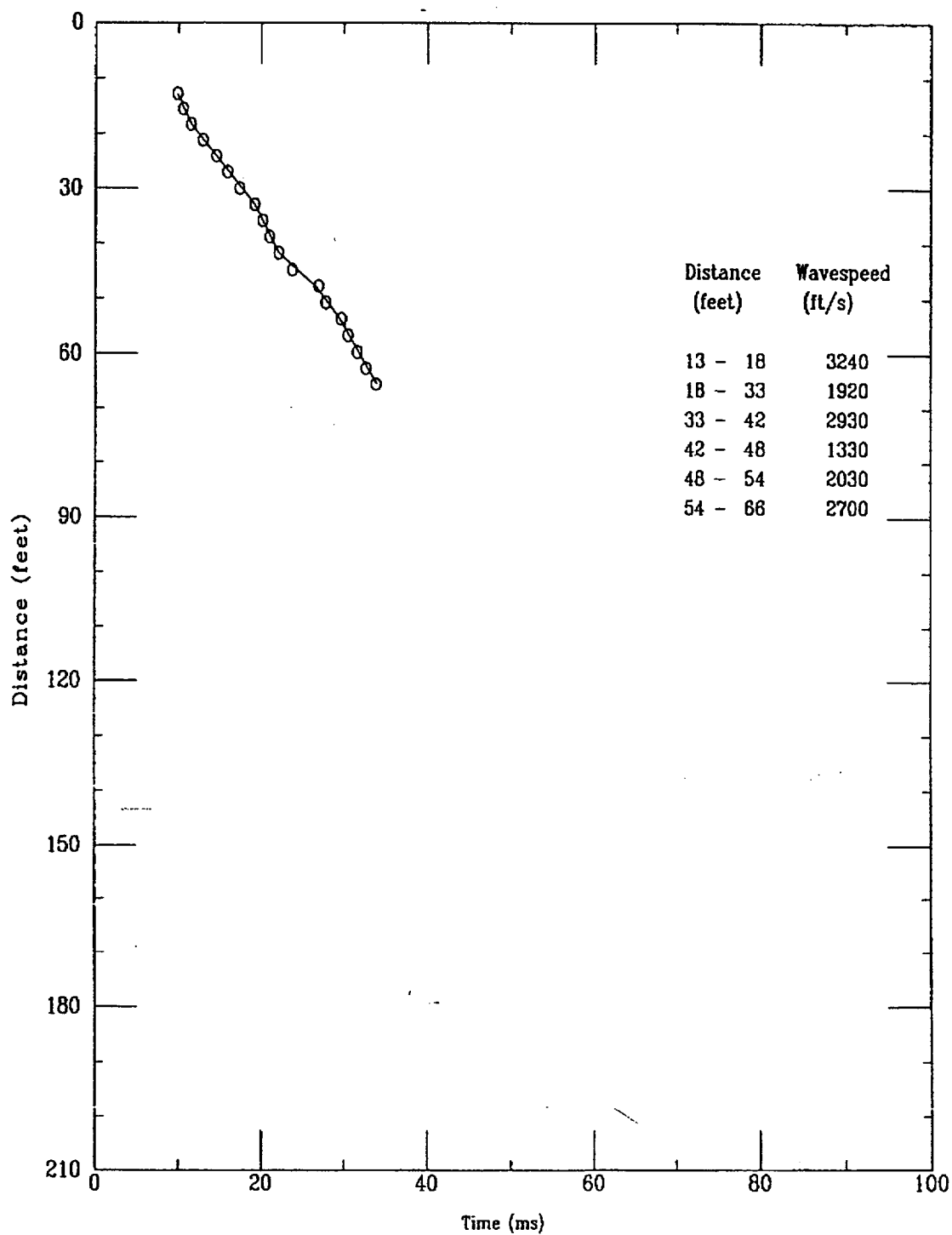
J181801S

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Compression Wave Speeds

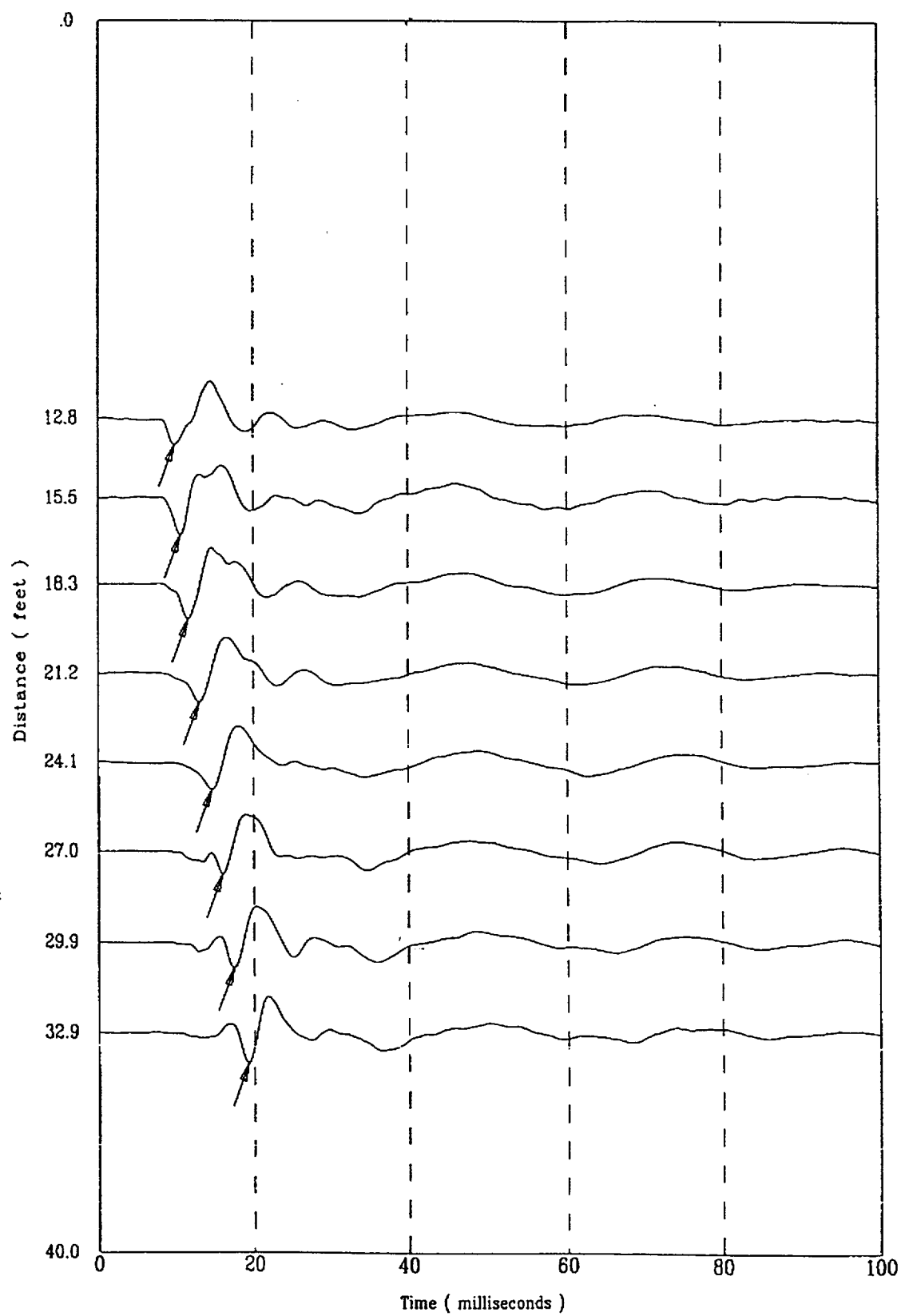


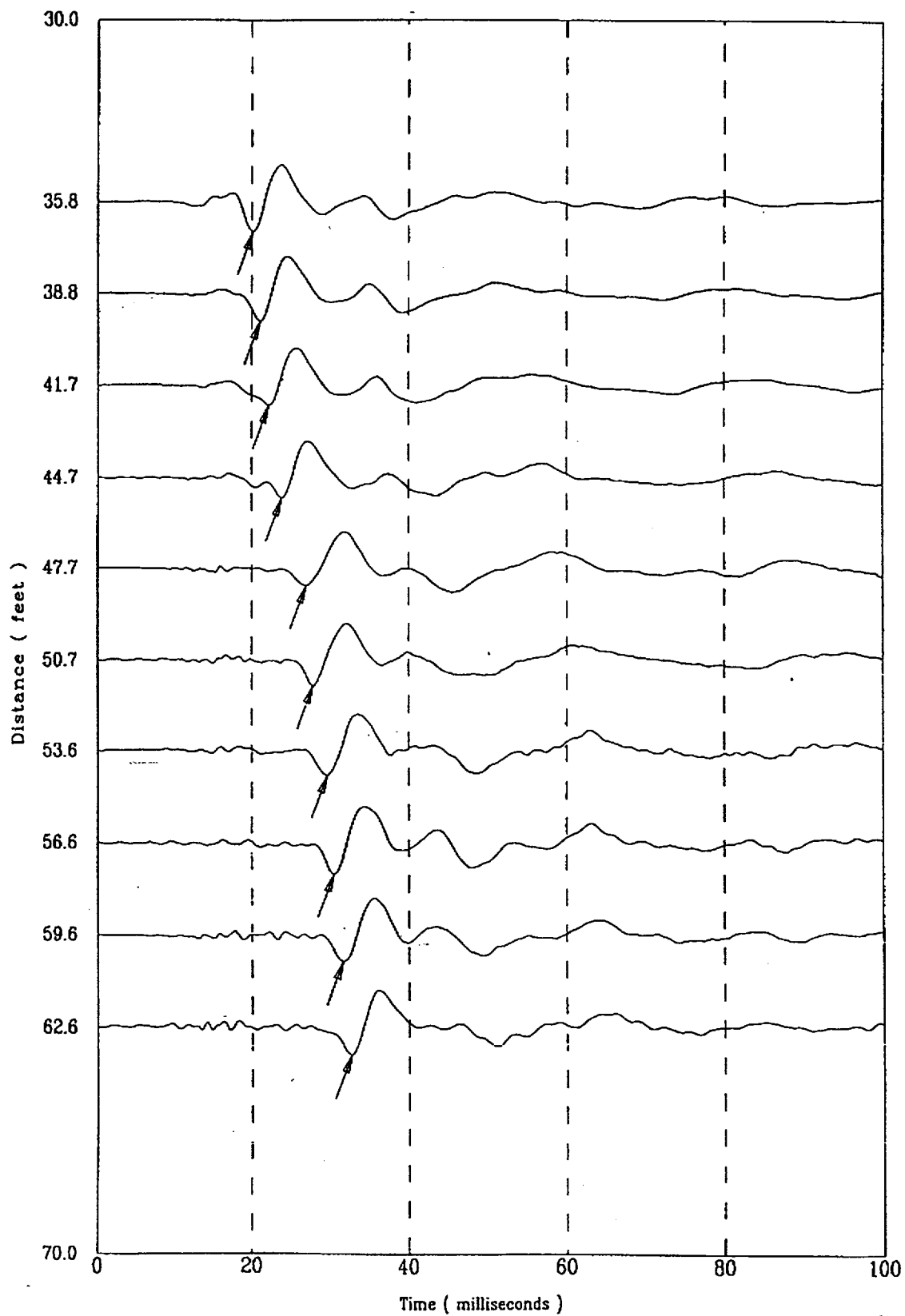
Compression Wave Time of Peak



Applied Research Associates, Inc.
CPT-155

P Wave
02/18/98

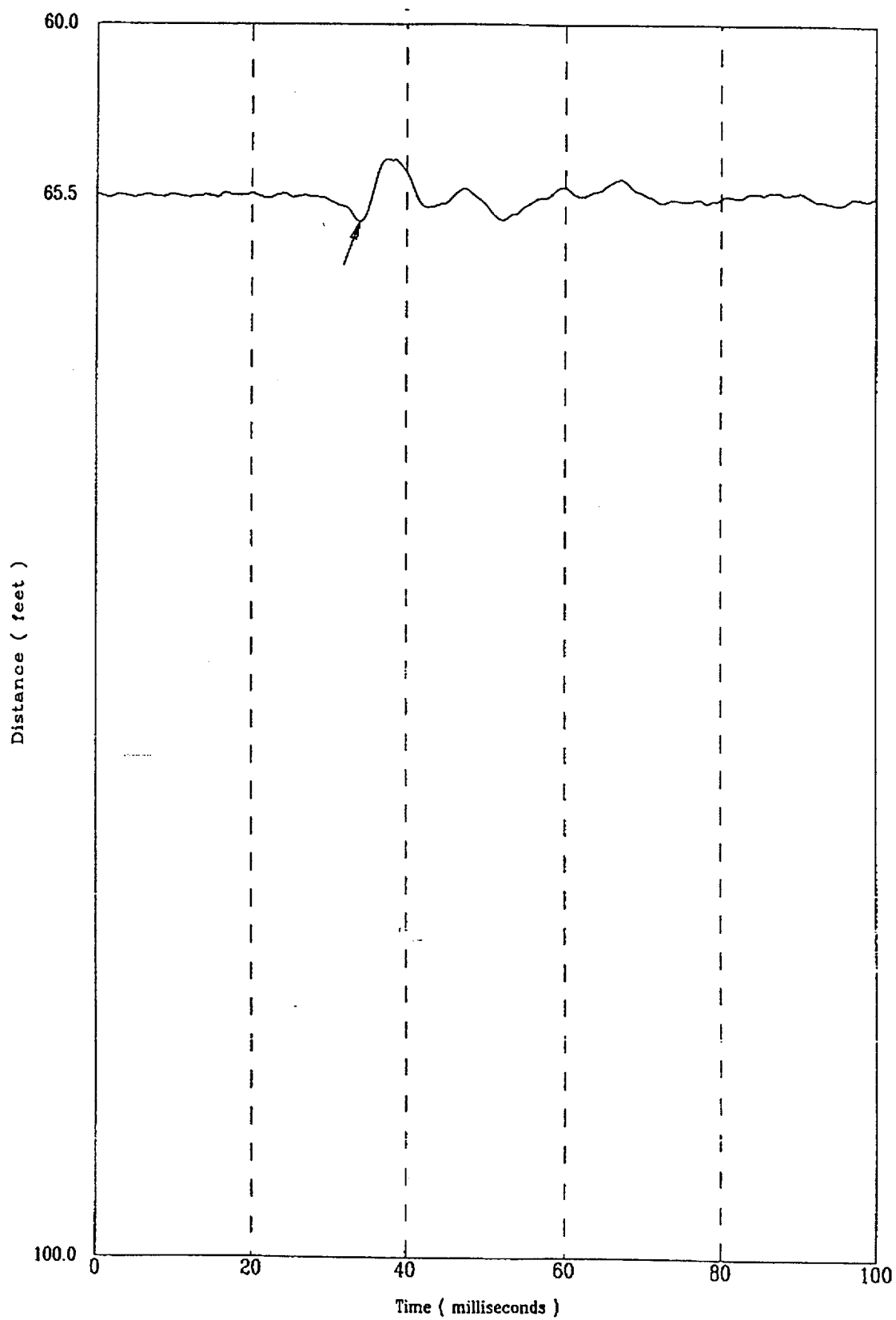




187801S

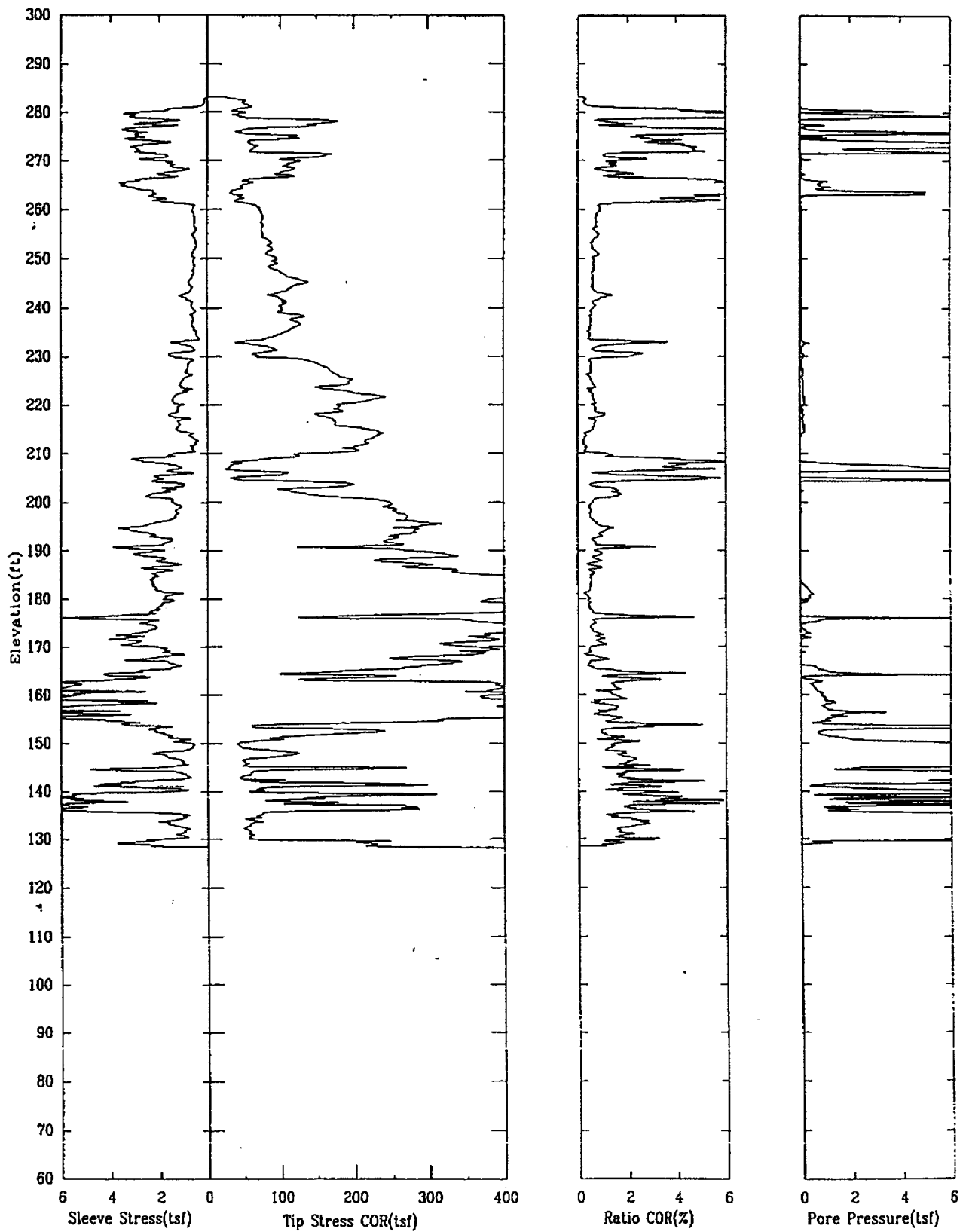
Applied Research Associates, Inc.
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P Wave
02/18/98



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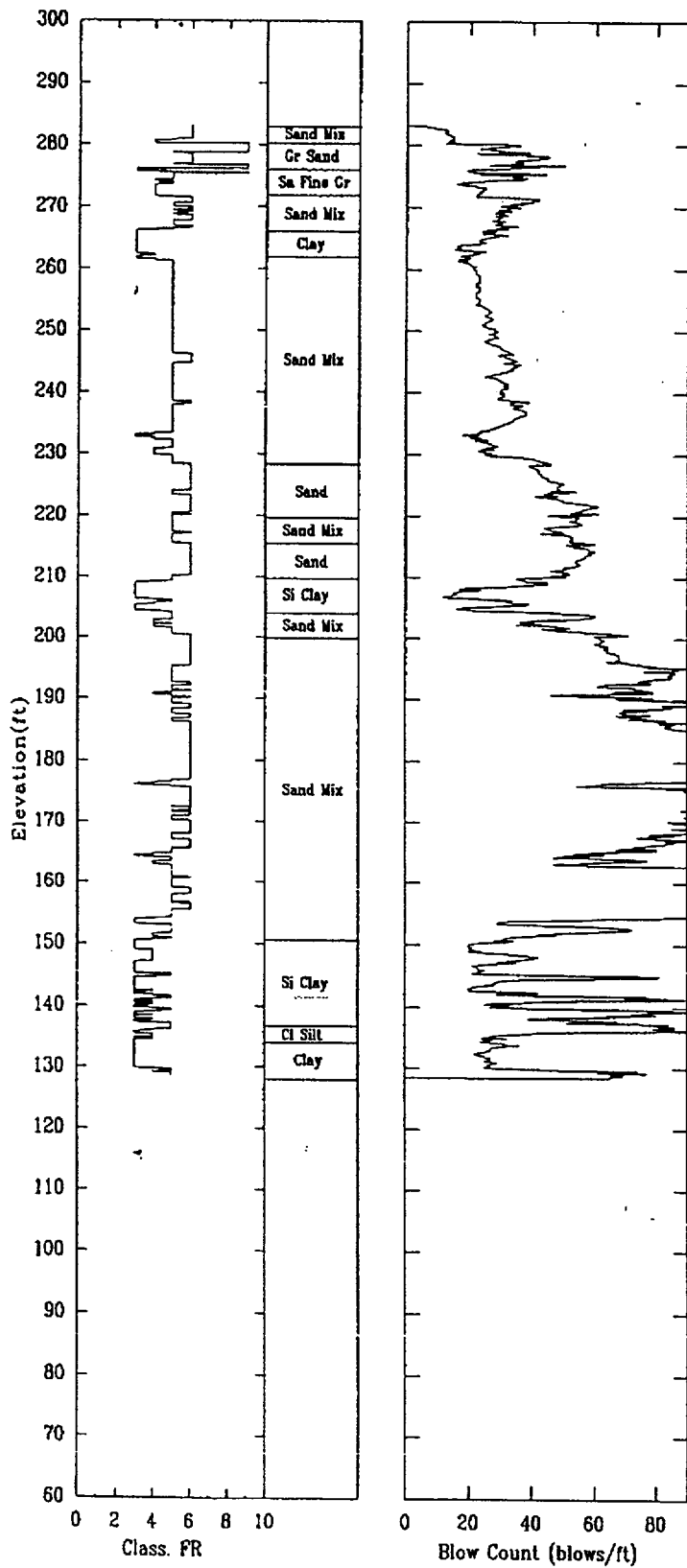
APPLIED RESEARCH ASSOCIATES, INC.

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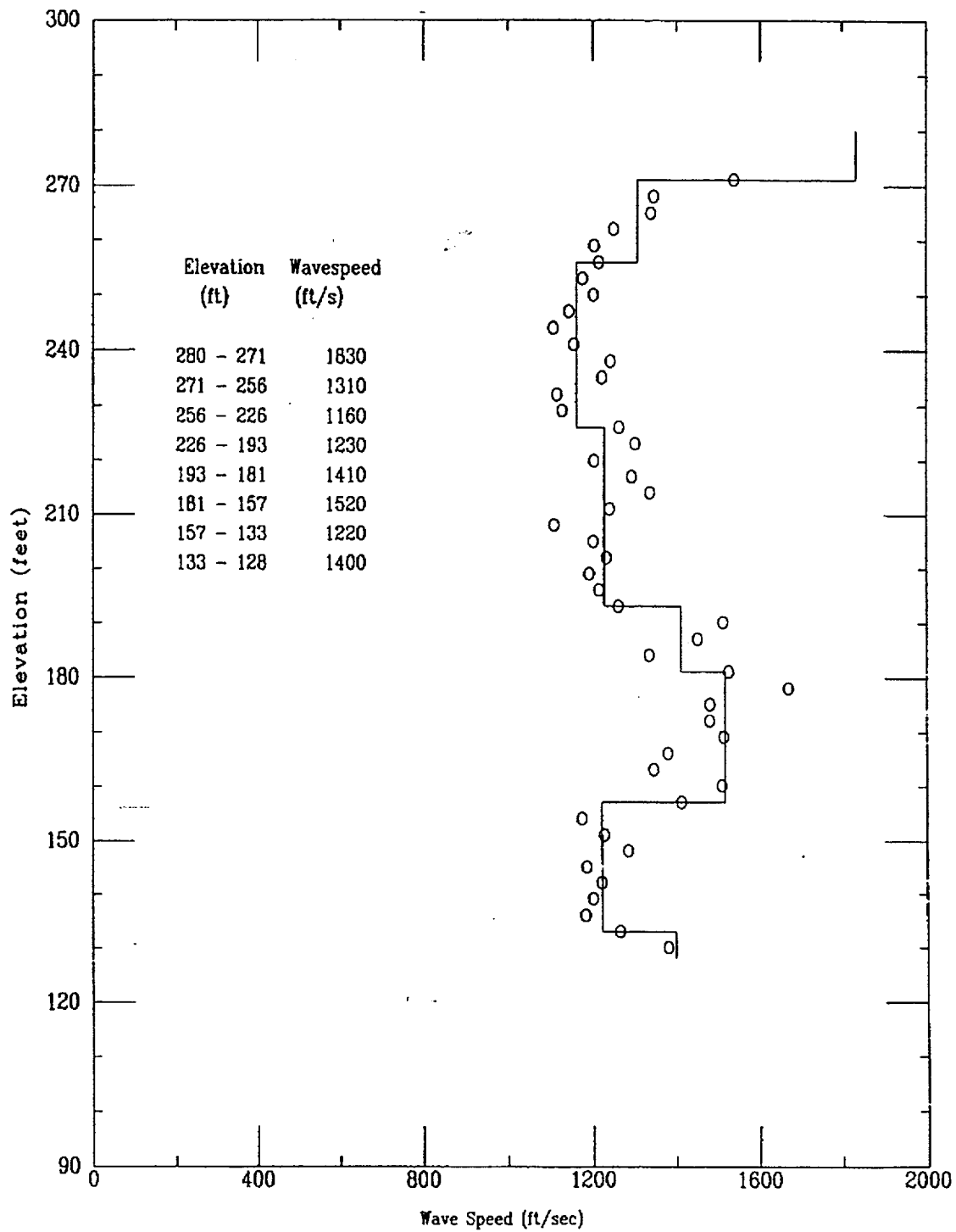
North 79244.97

East 55384.98

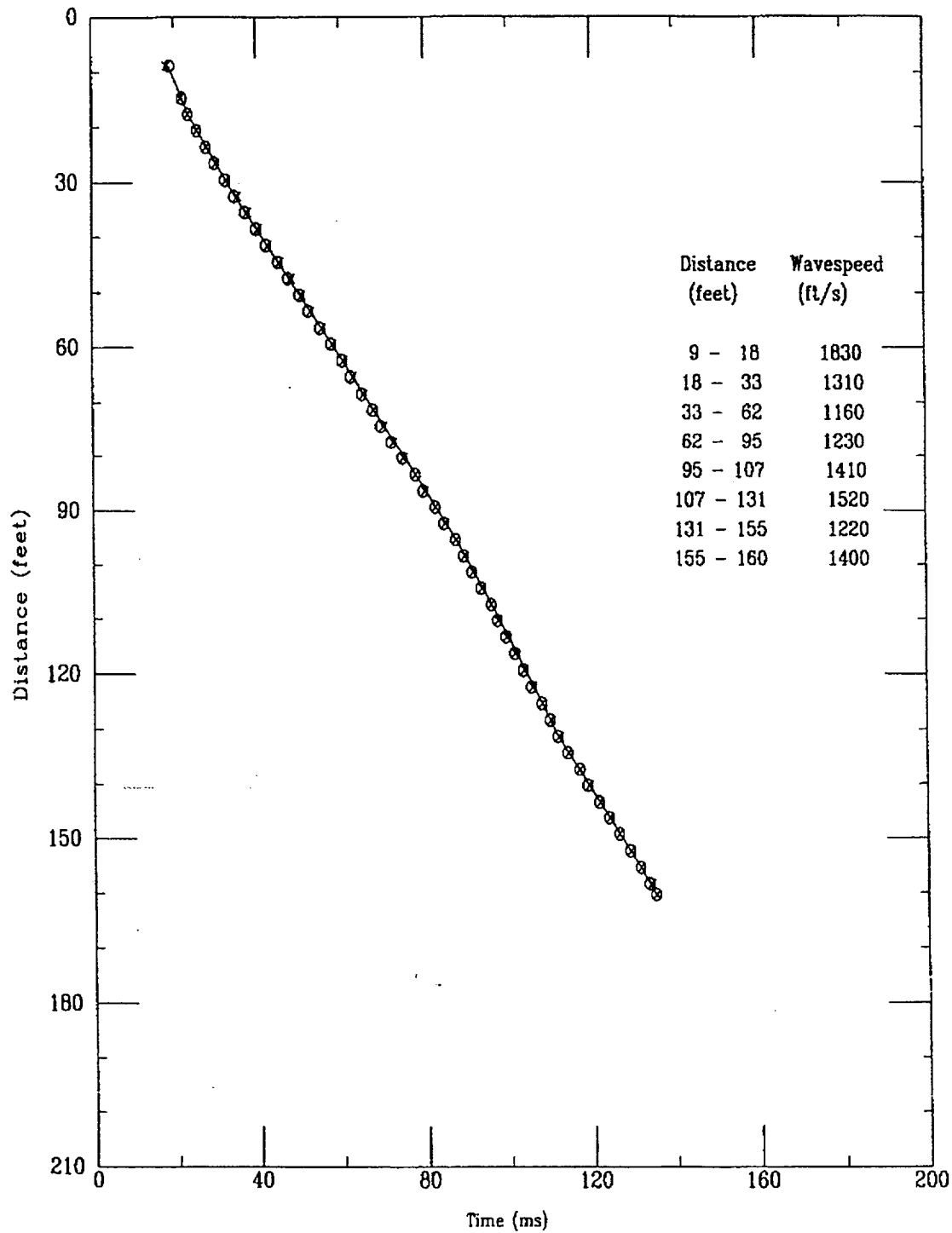
Elevation 289.2

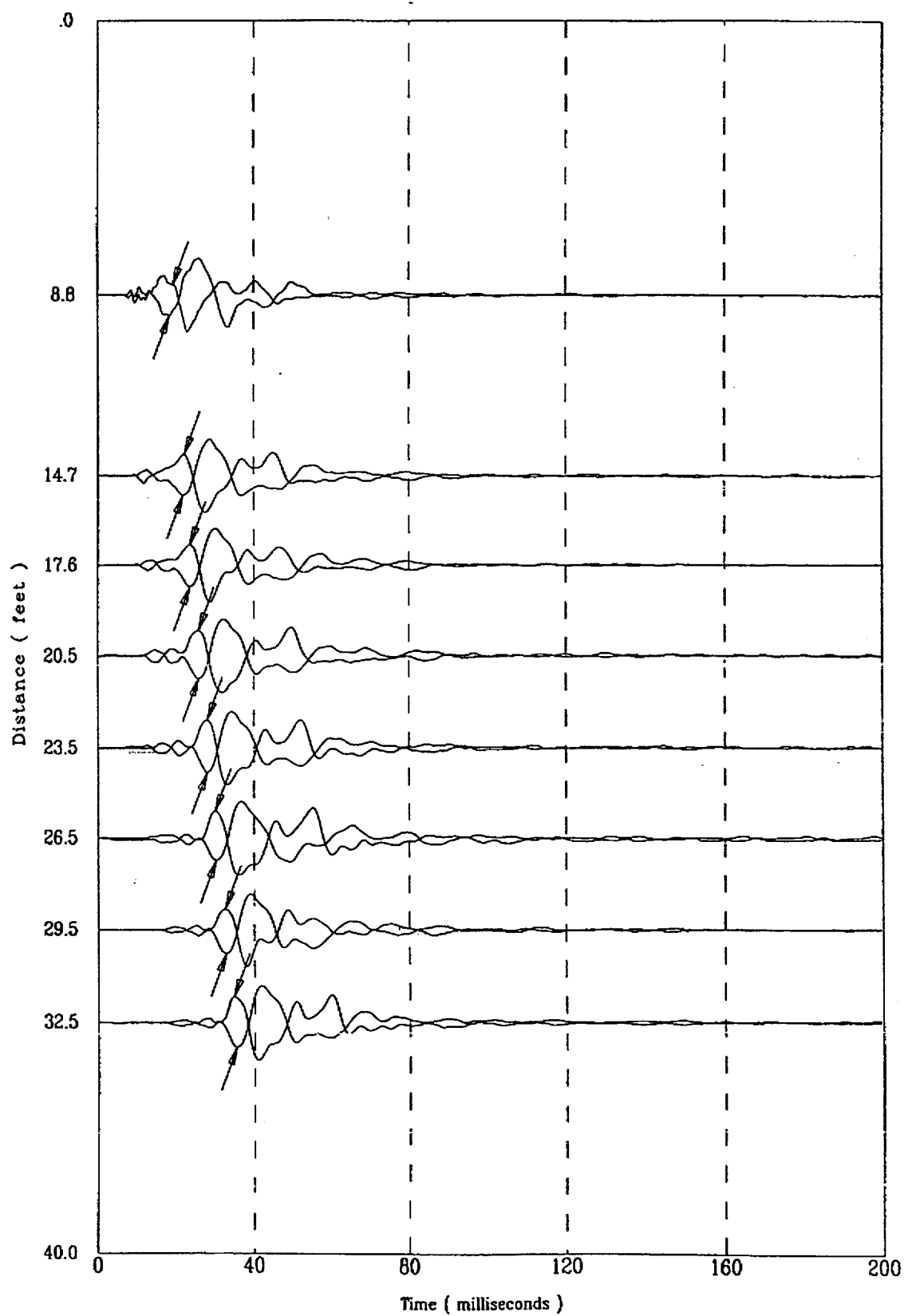


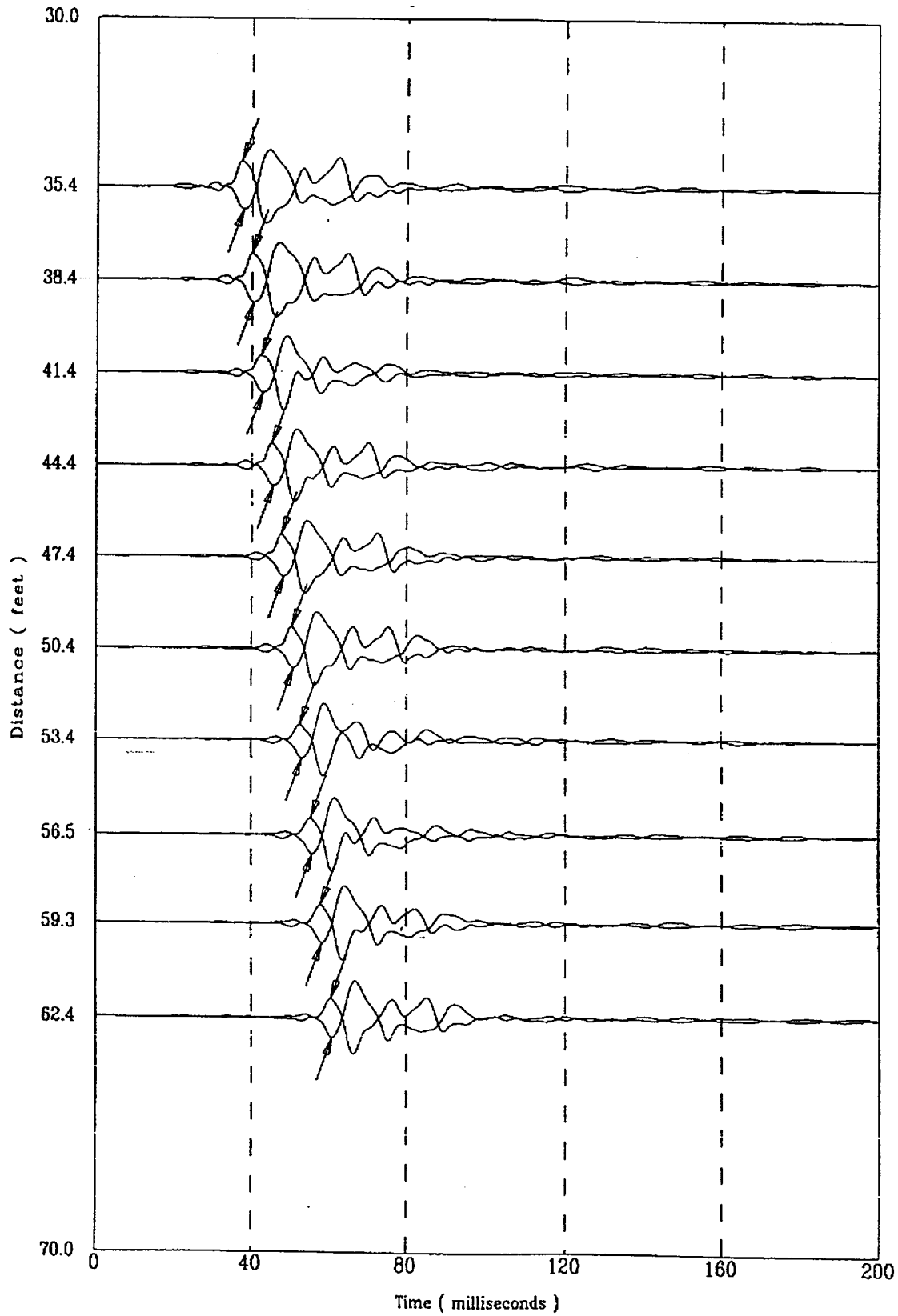
Shear Wave Speeds



Shear Wave Time of Peak

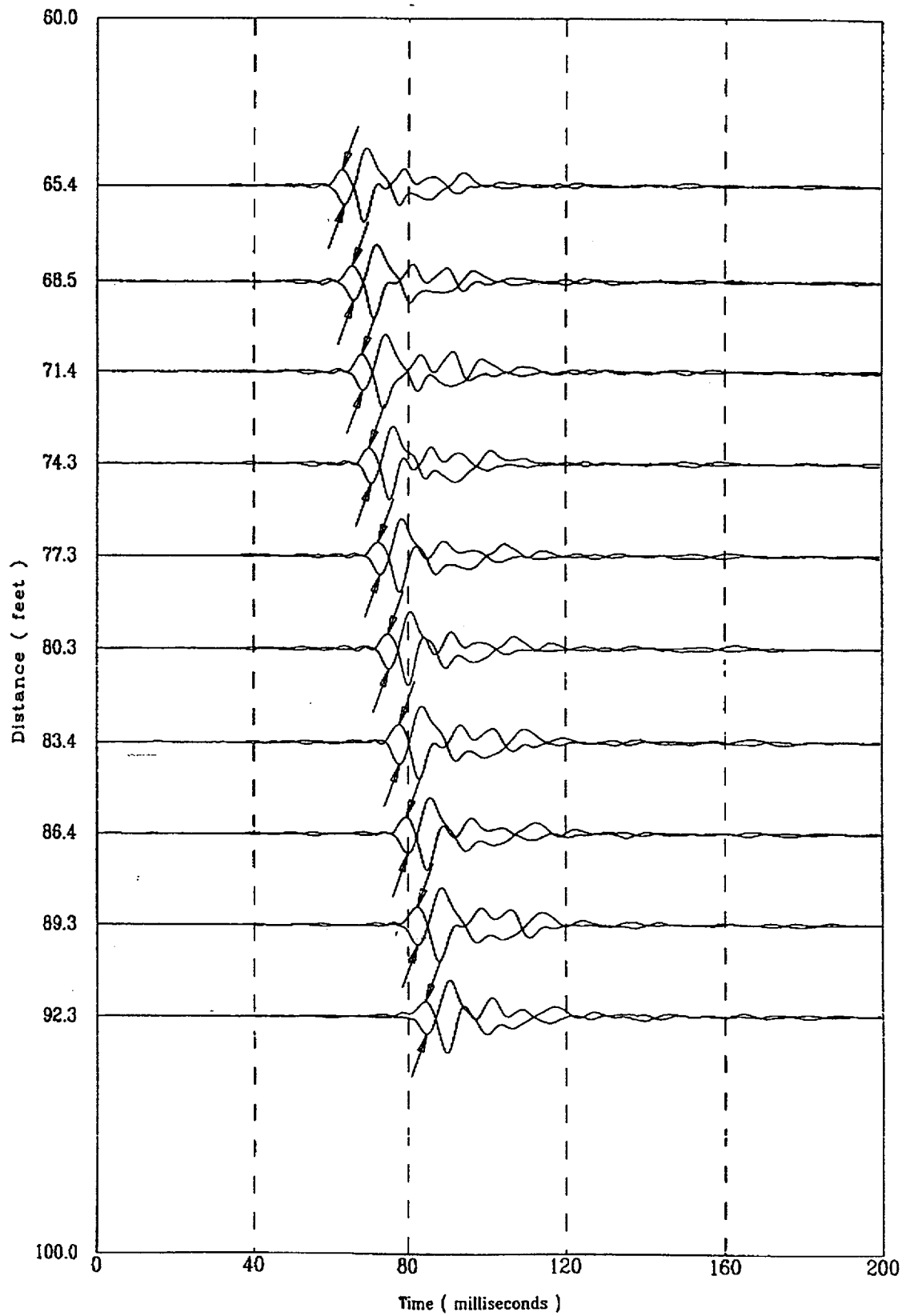






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S Wave
02/18/98

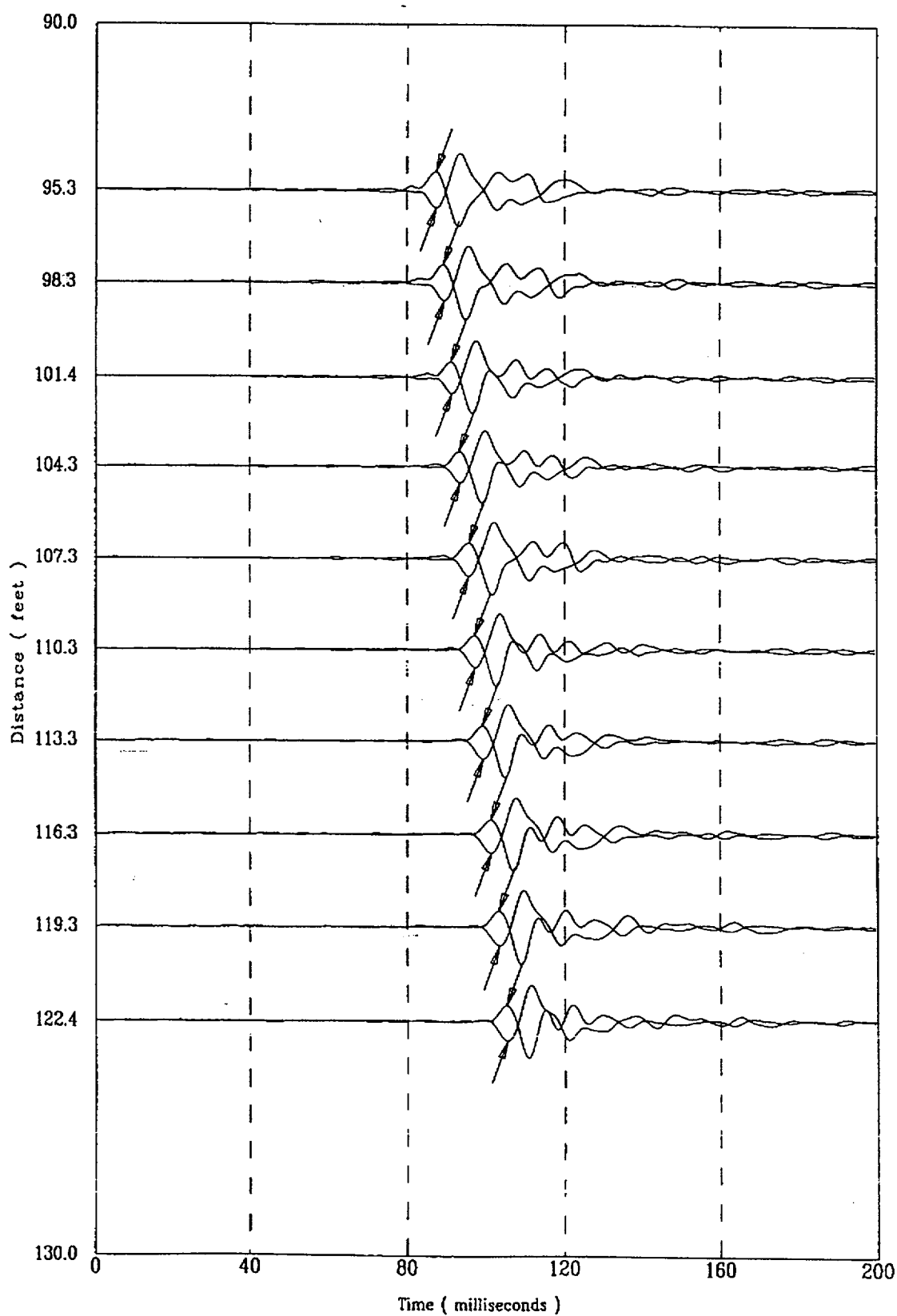


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S Wave
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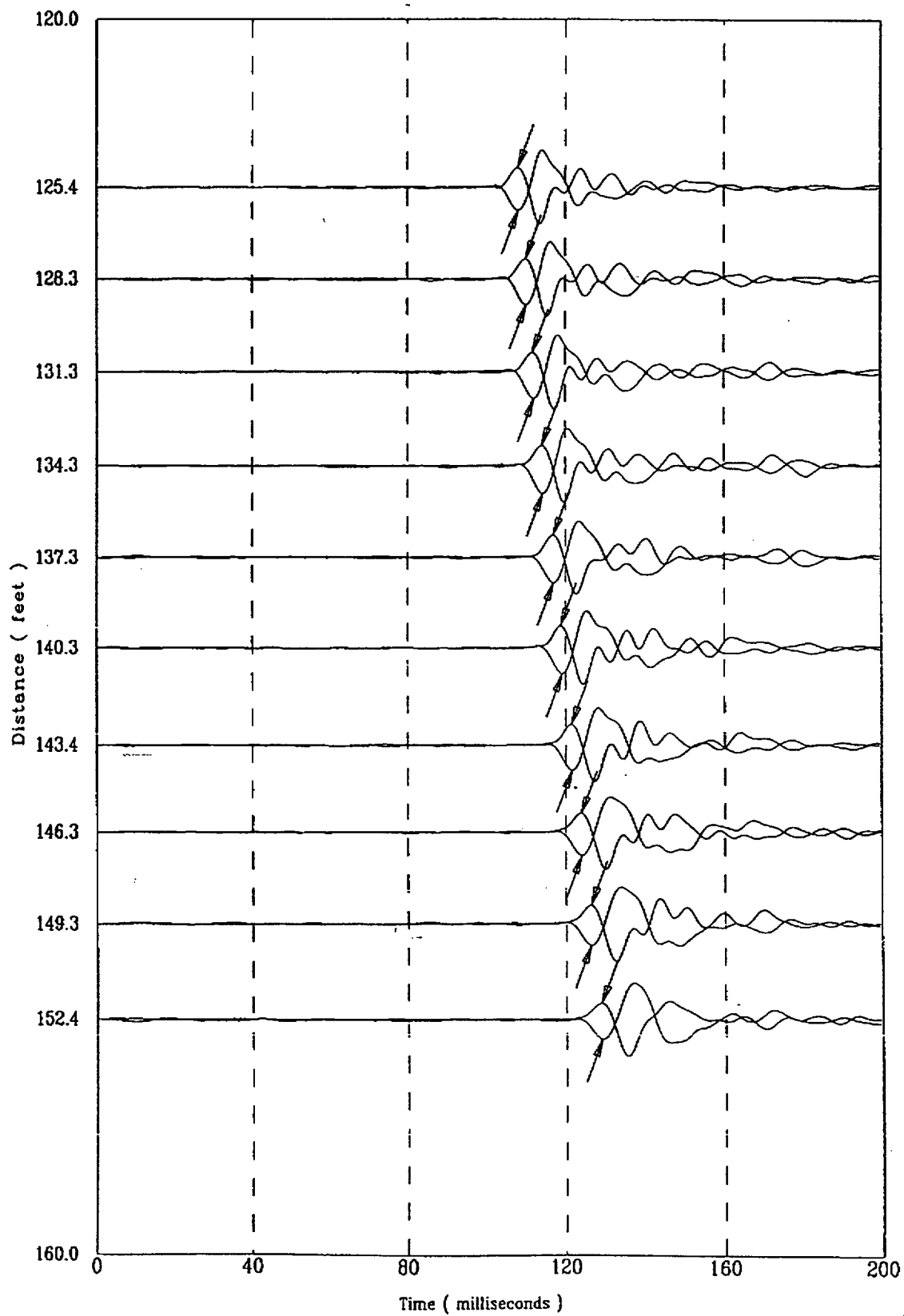


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S Wave
02/18/98

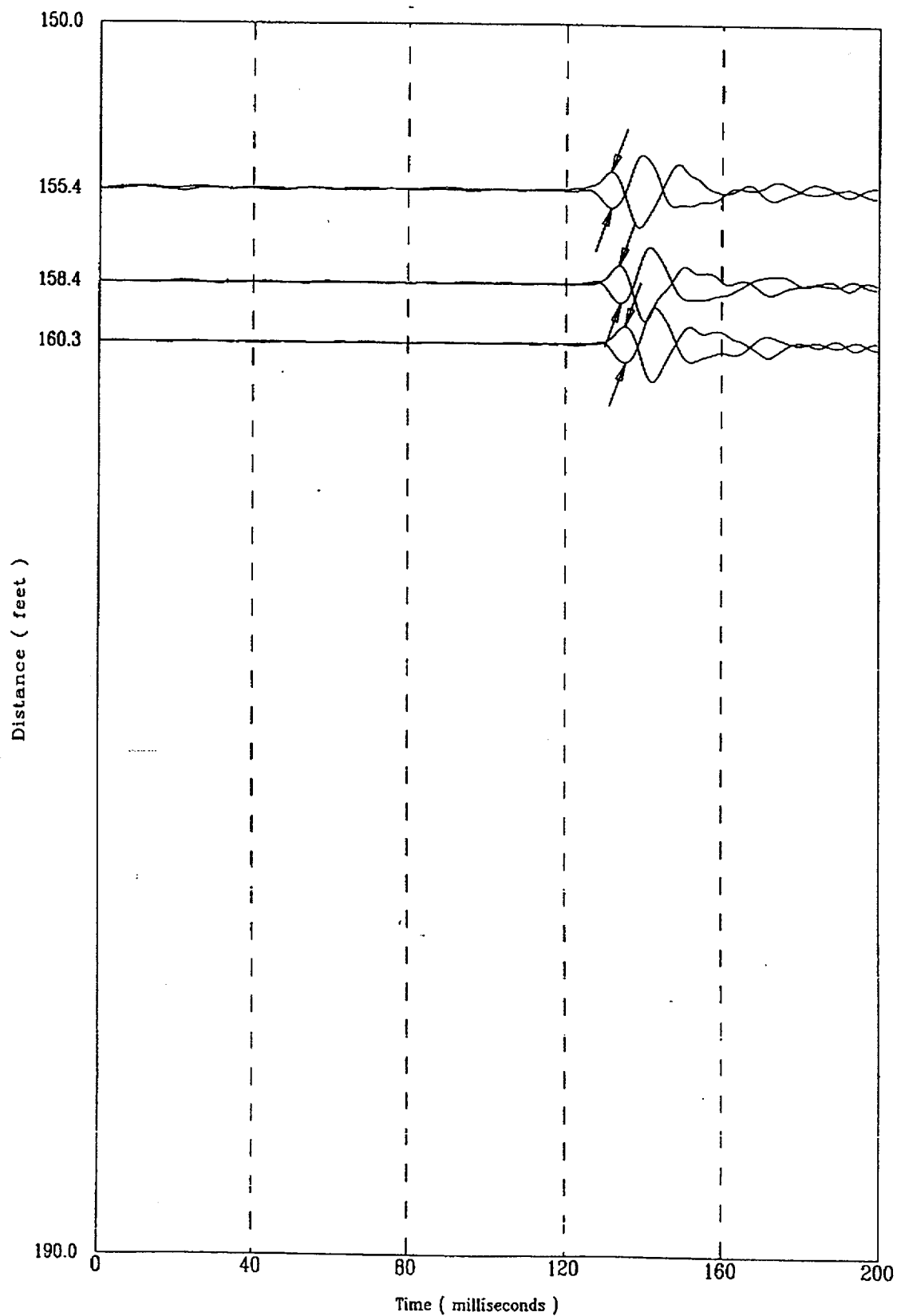


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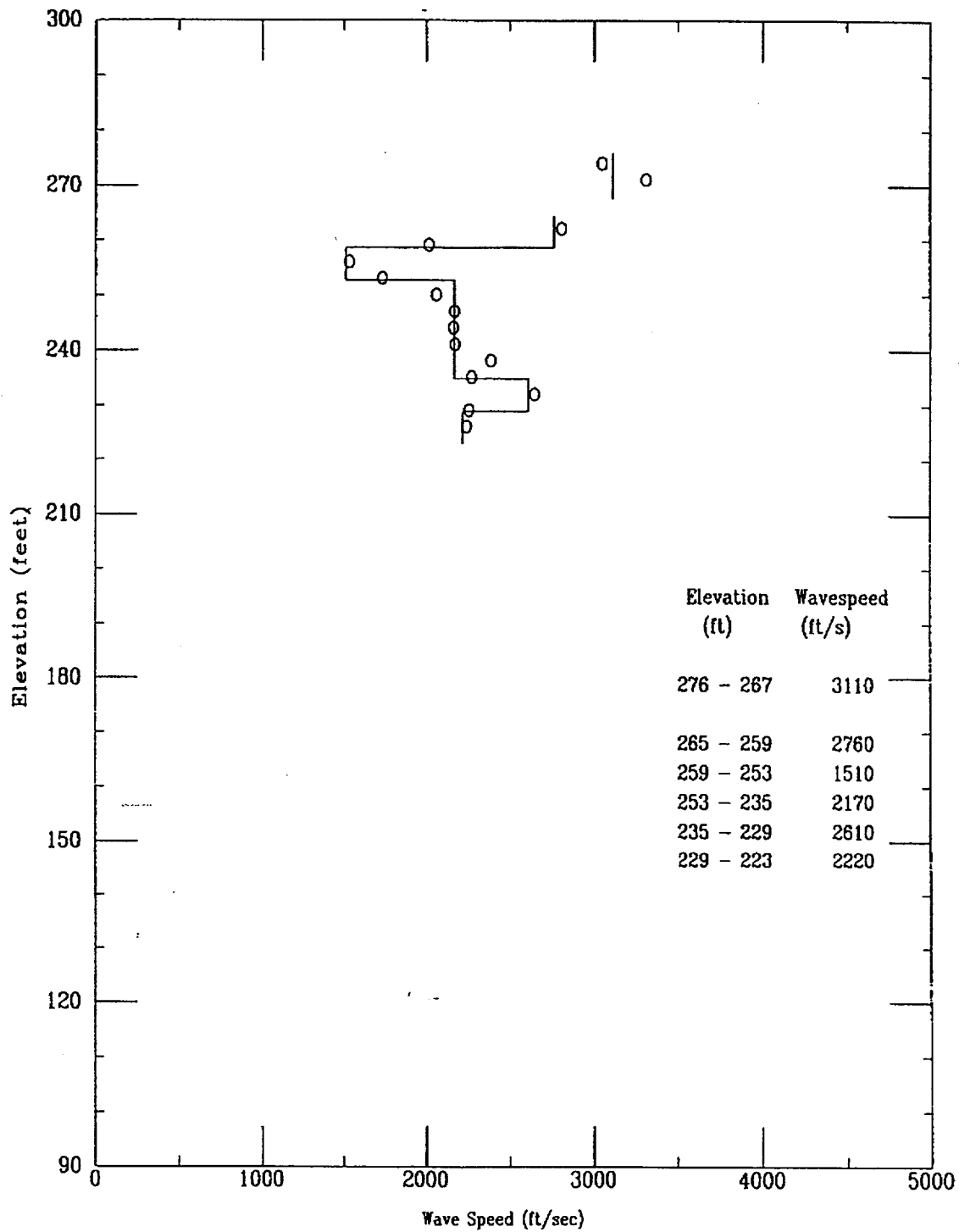
S Wave
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Compression Wave Speeds

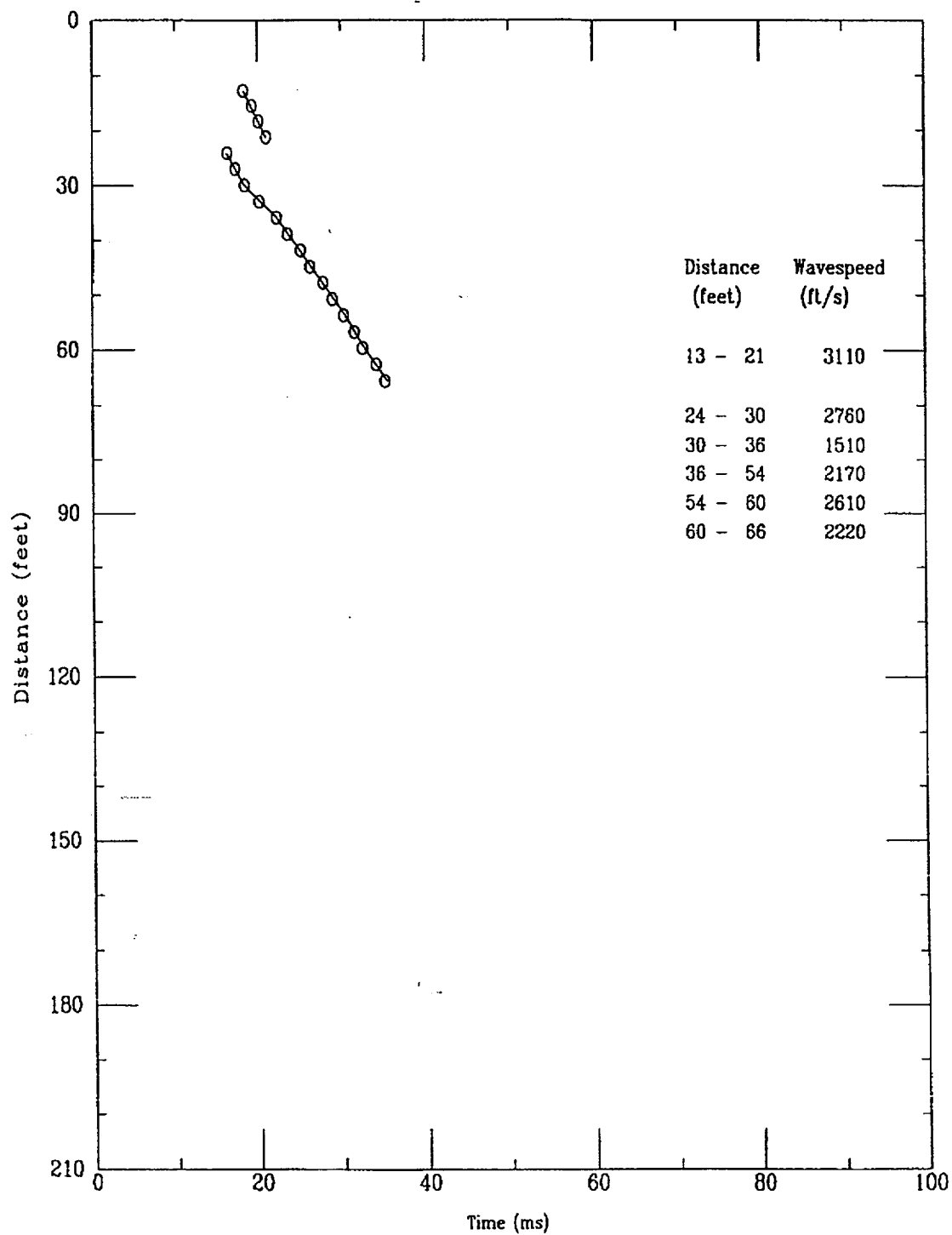


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Compression Wave Time of Peak

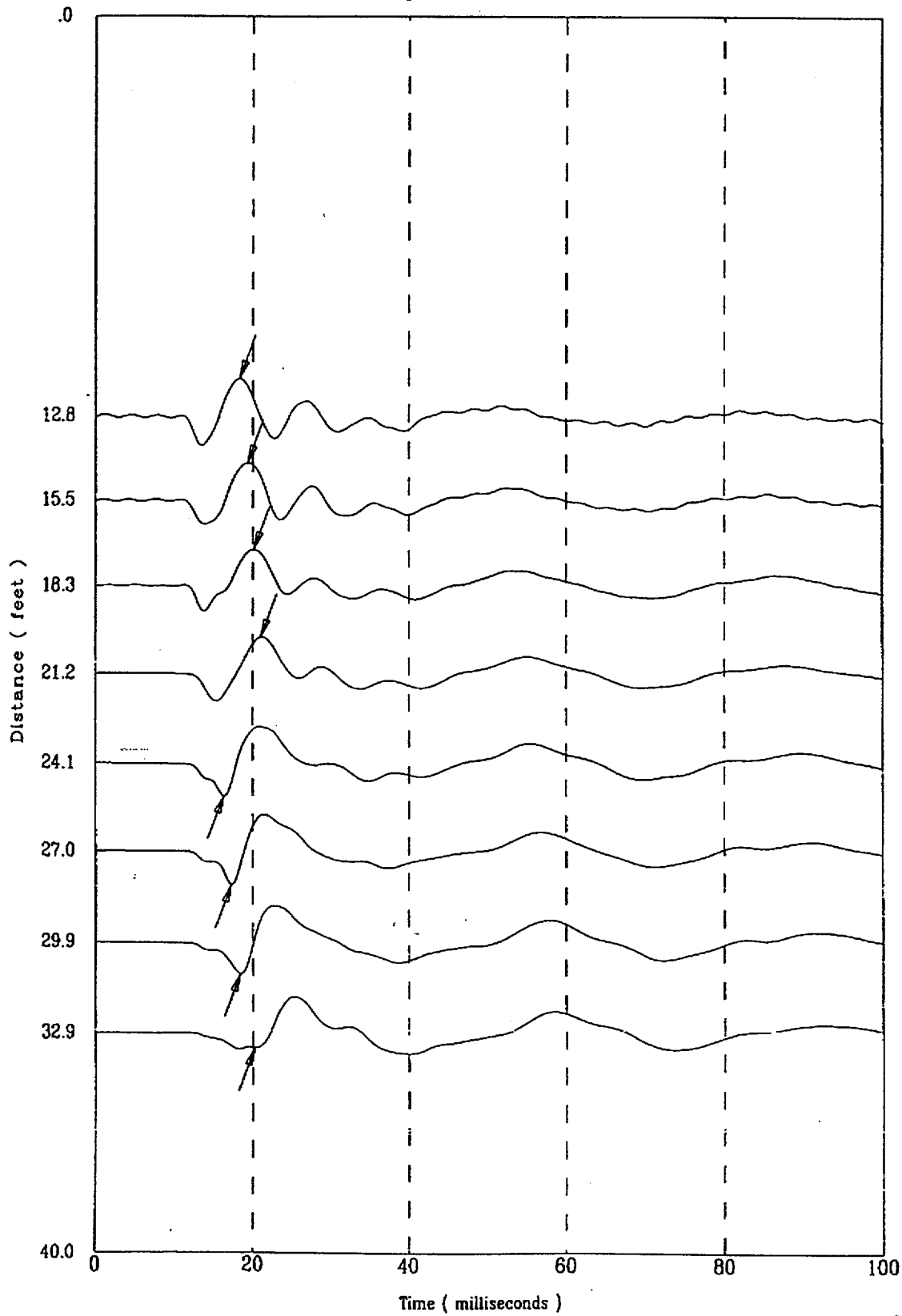


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P Wave
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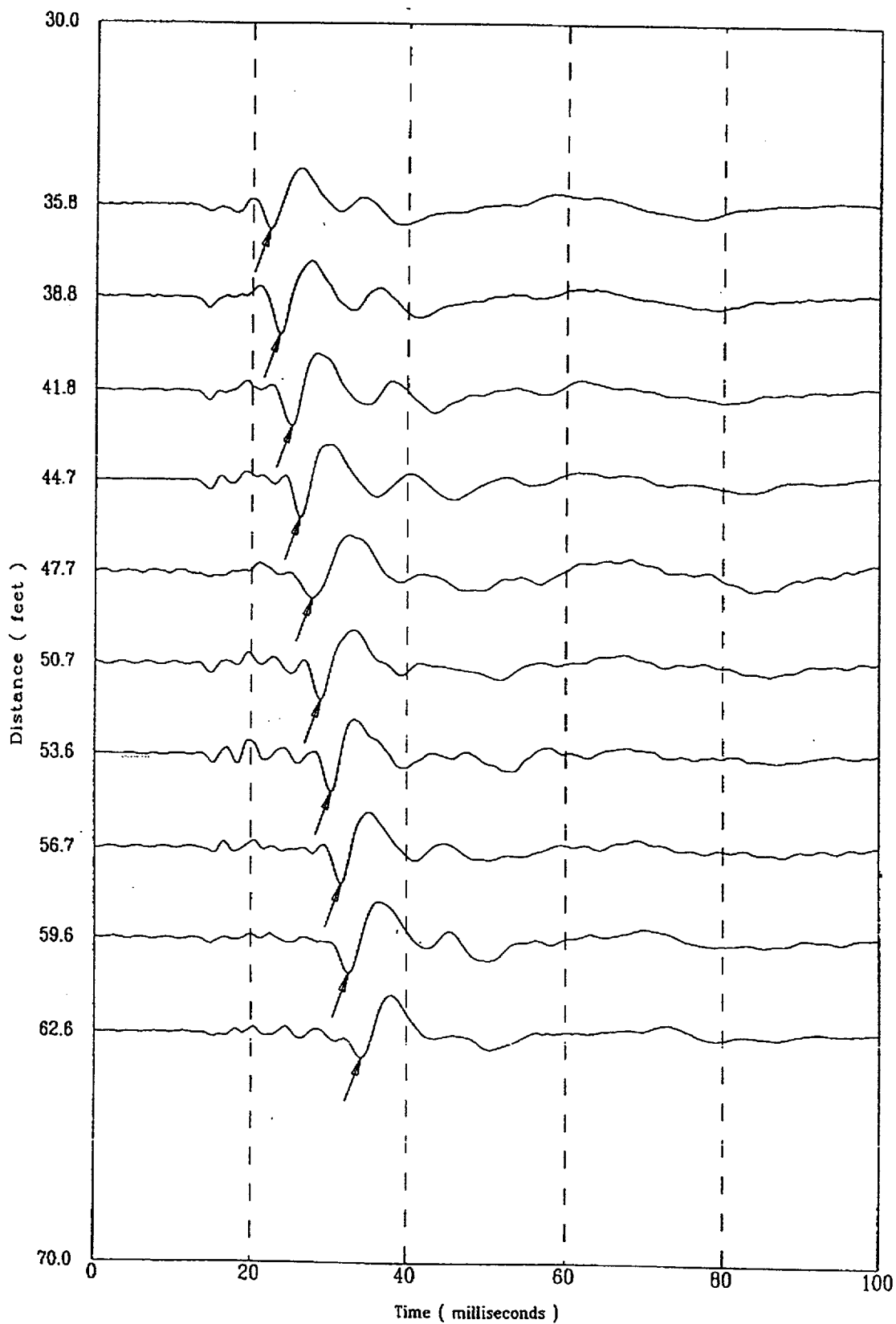


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P Wave
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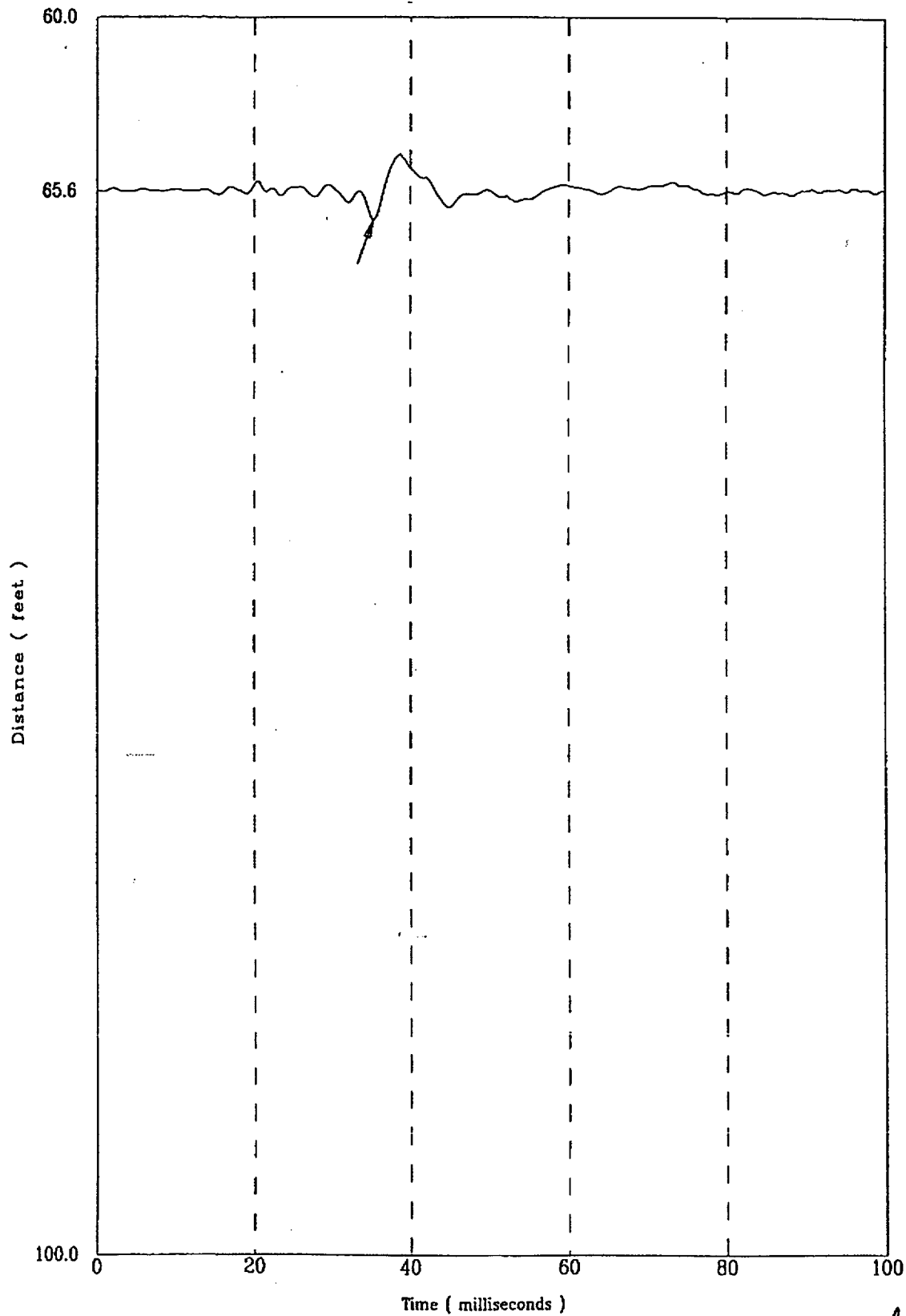


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P Wave
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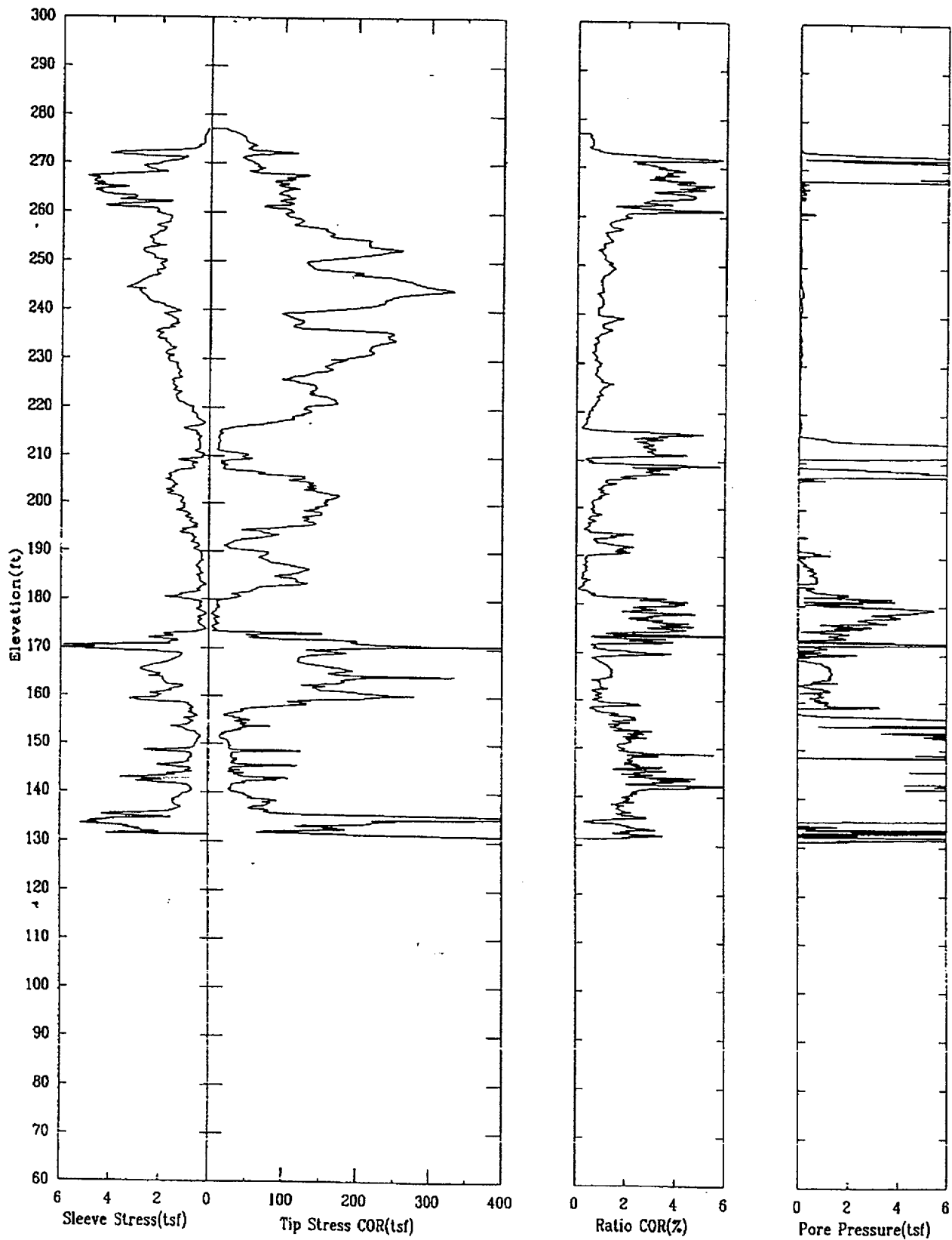
APPLIED RESEARCH ASSOCIATES, INC.

03/05/98

North 79244.98

East 55517.98

Elevation 283.1



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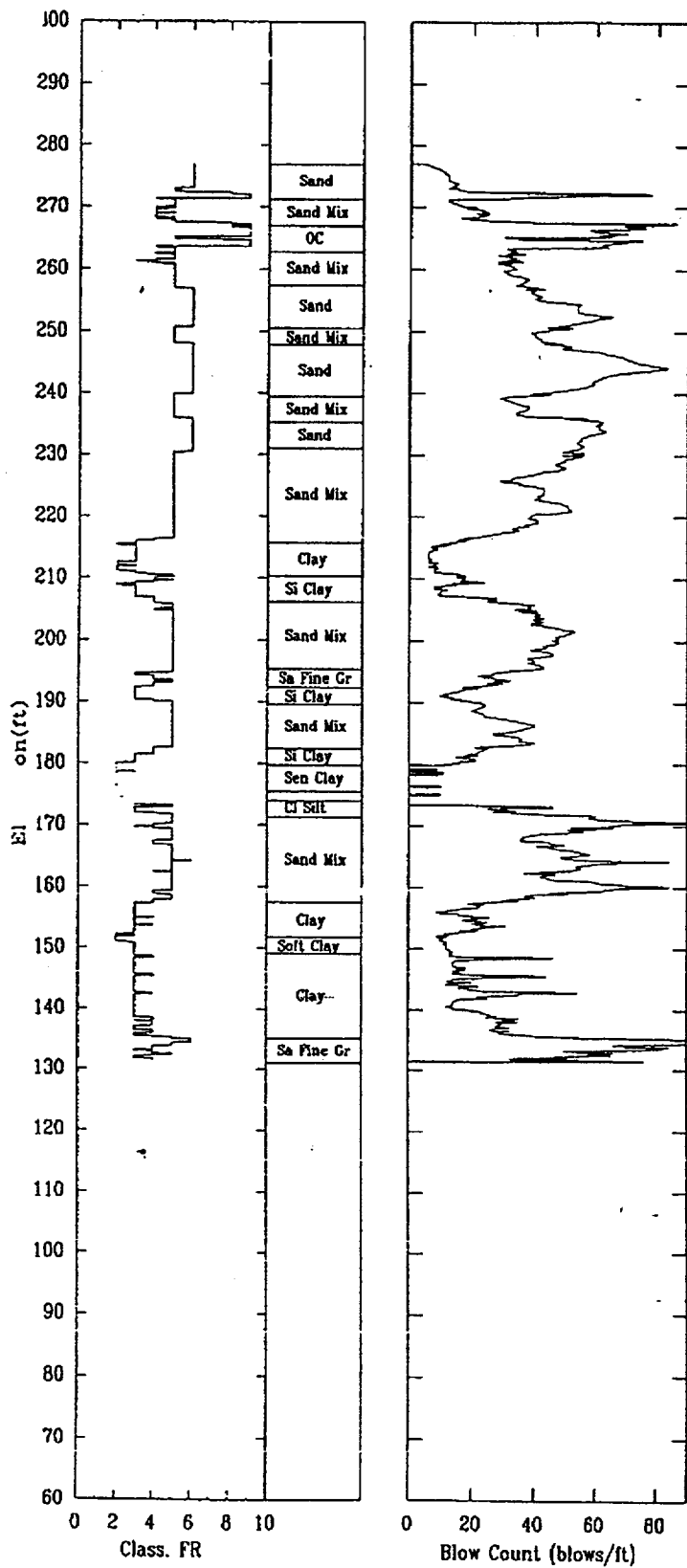
APPLIED RESEARCH ASSOCIATES, INC.

03/05/98

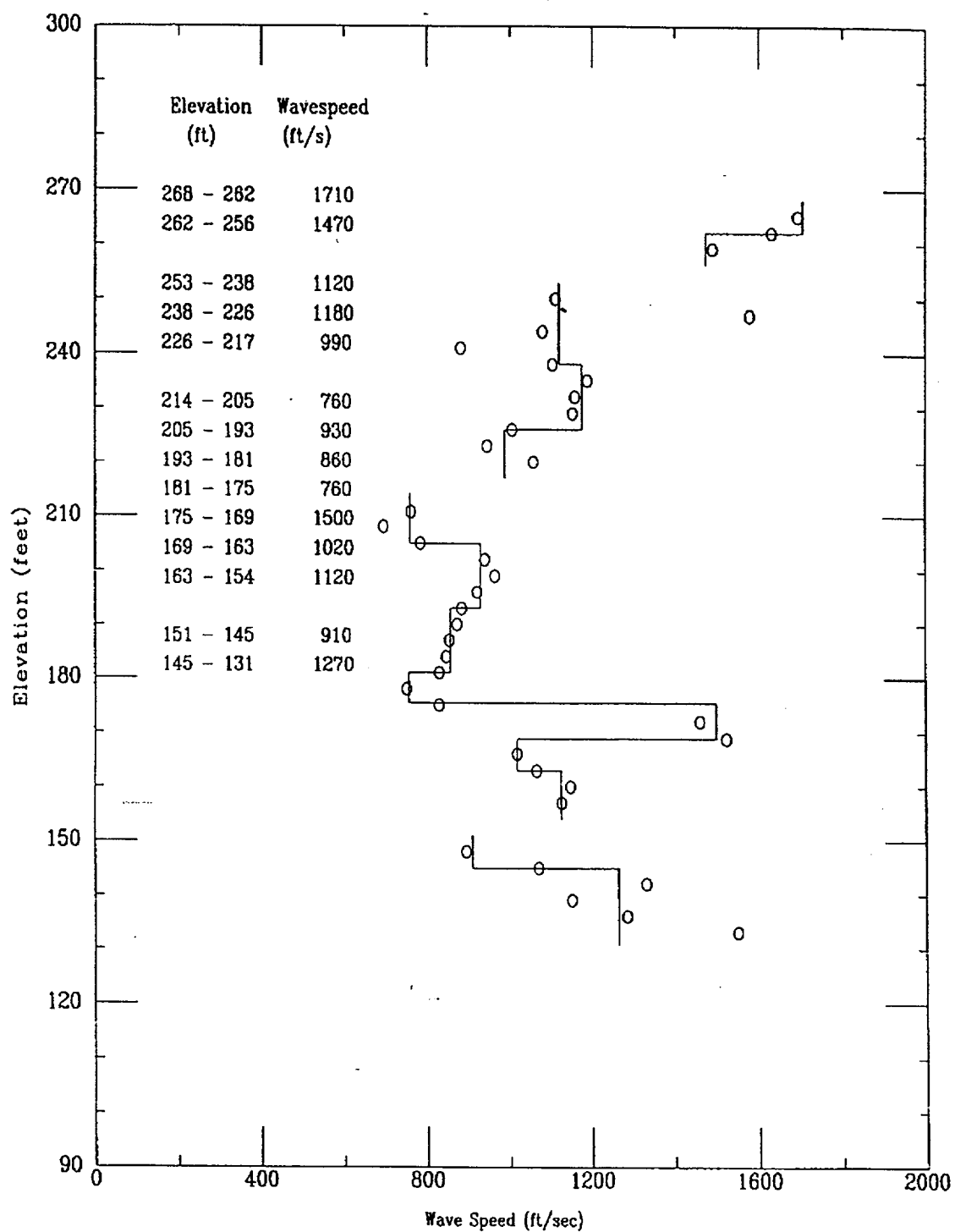
North 79244.98

East 55517.98

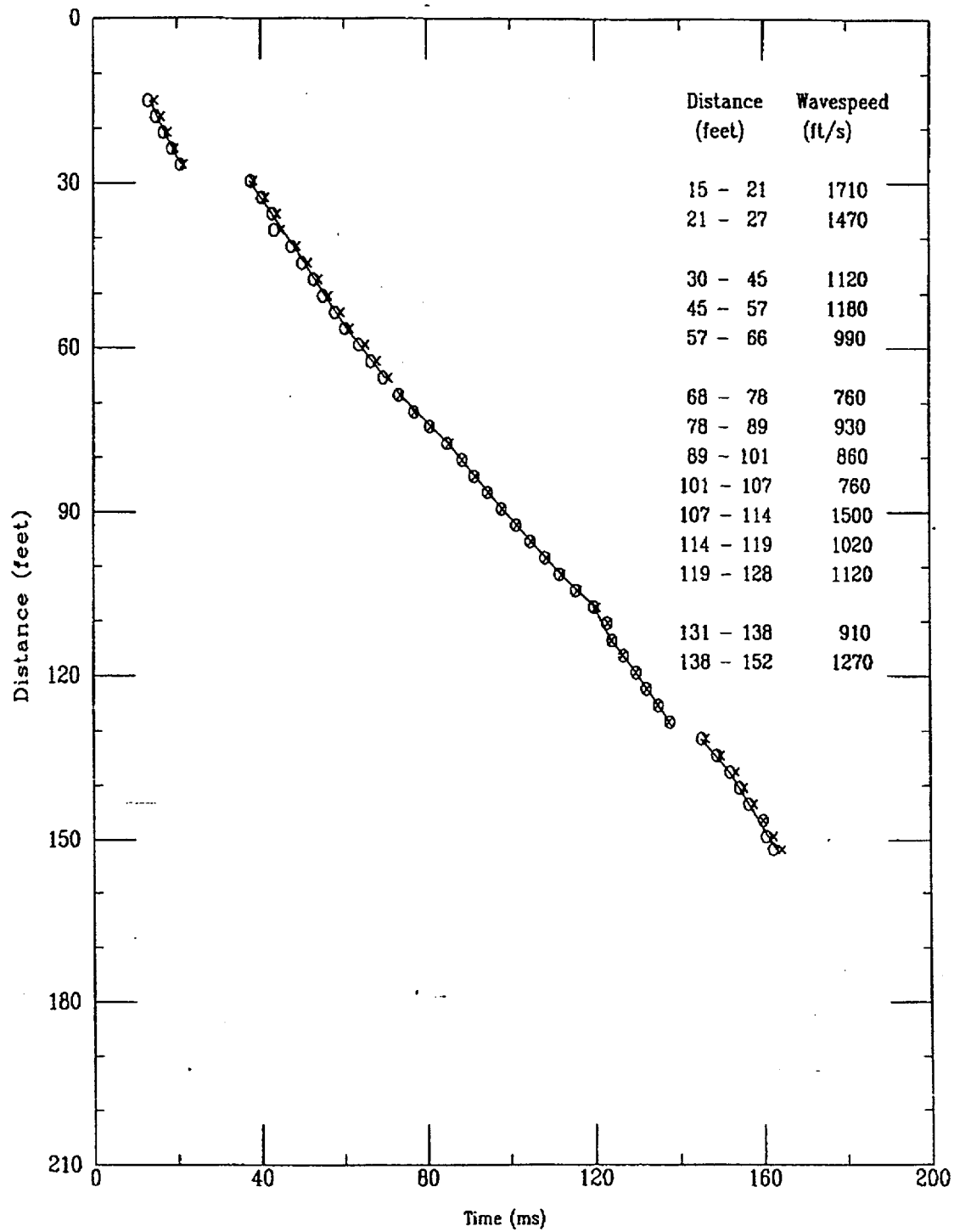
Elevation 283.1

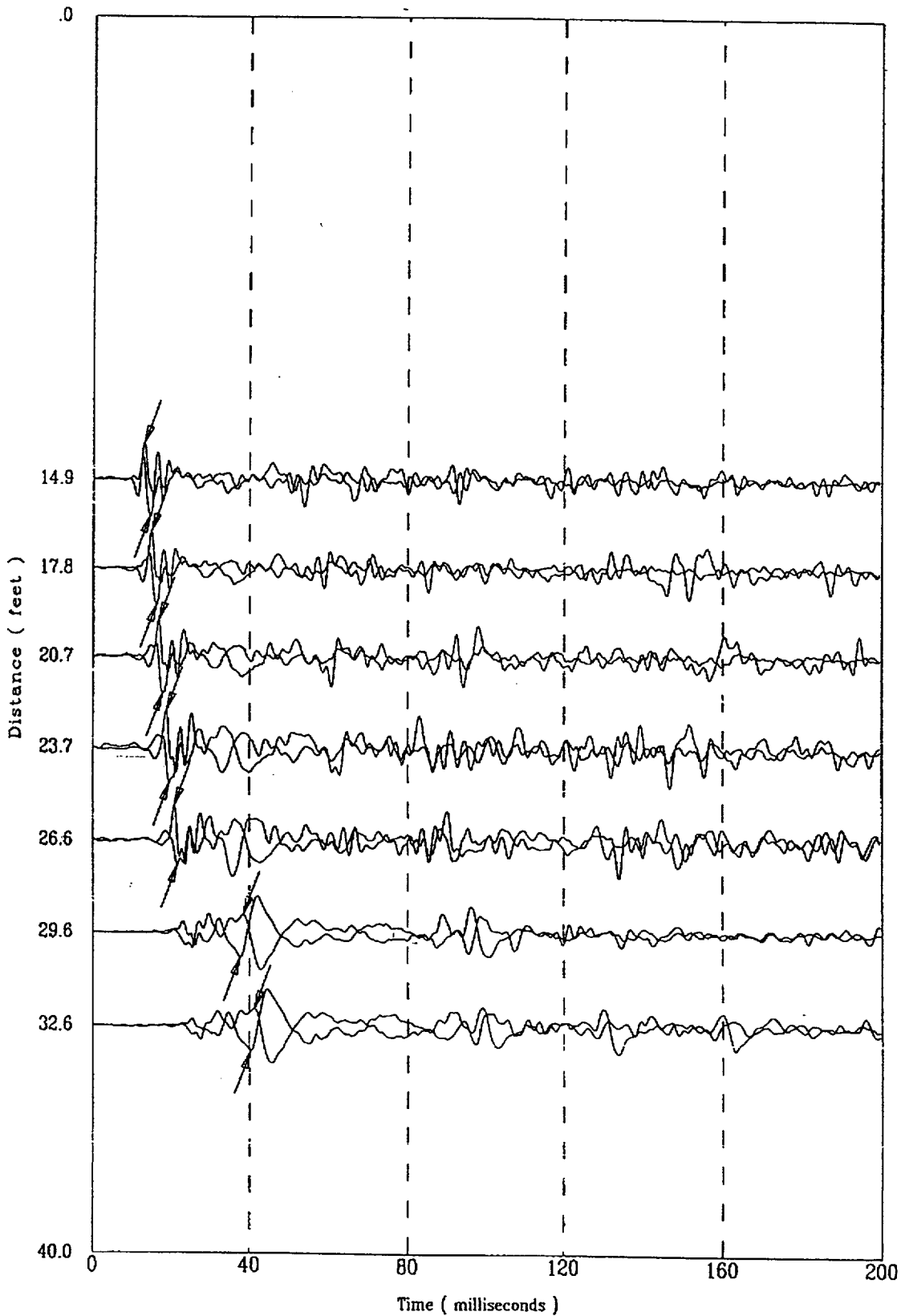


Shear Wave Speeds



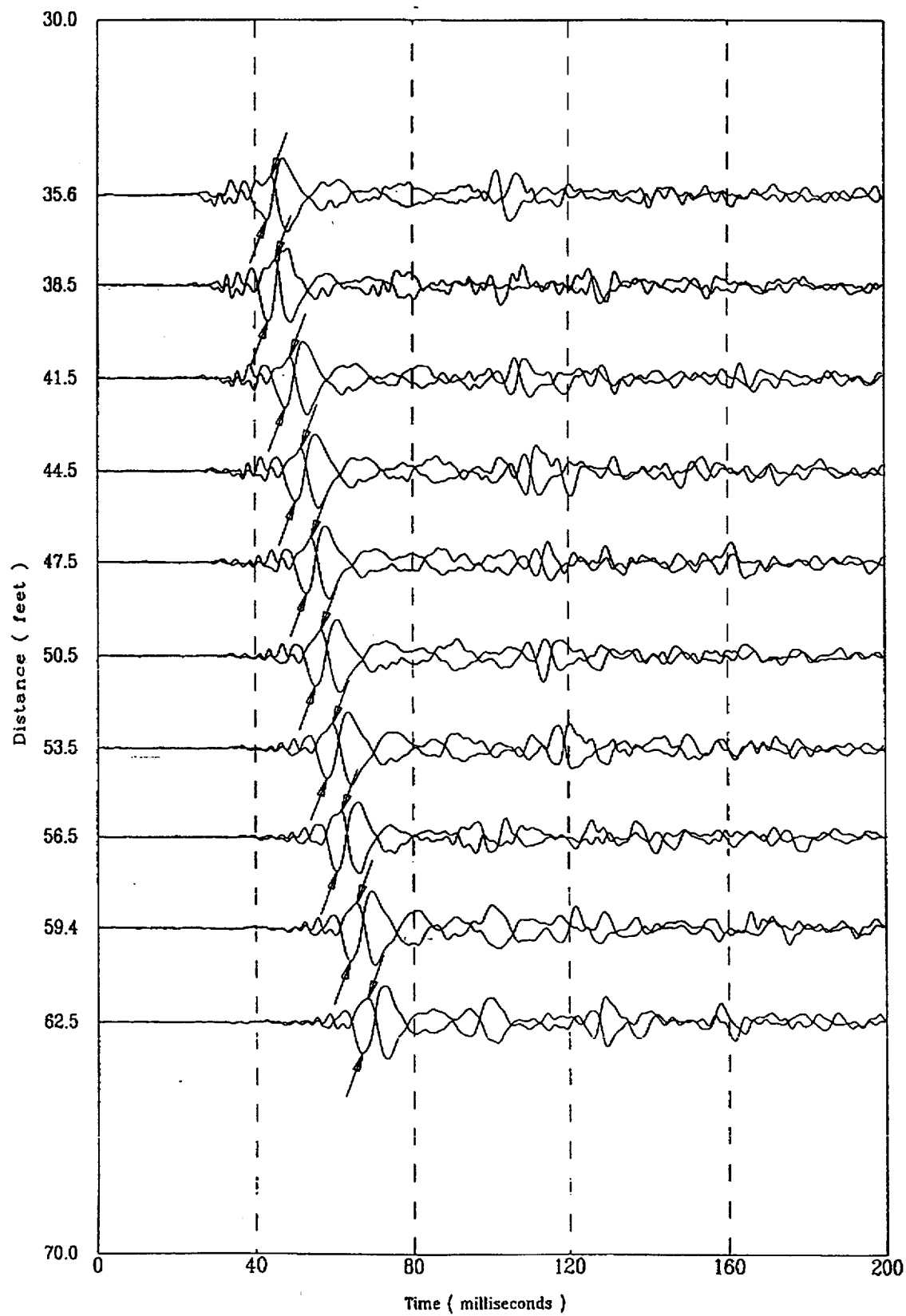
Shear Wave Time of Peak





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S Wave
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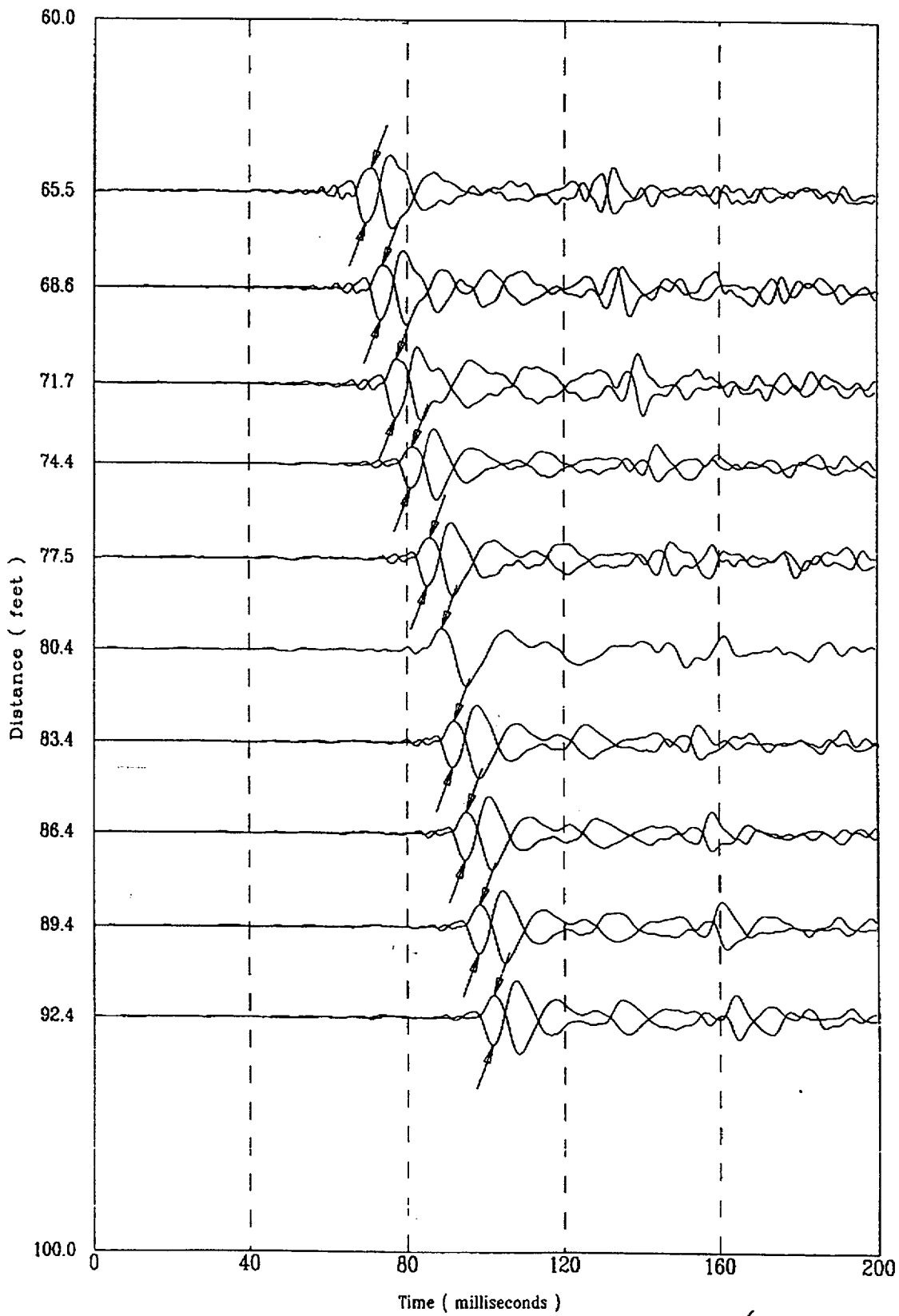


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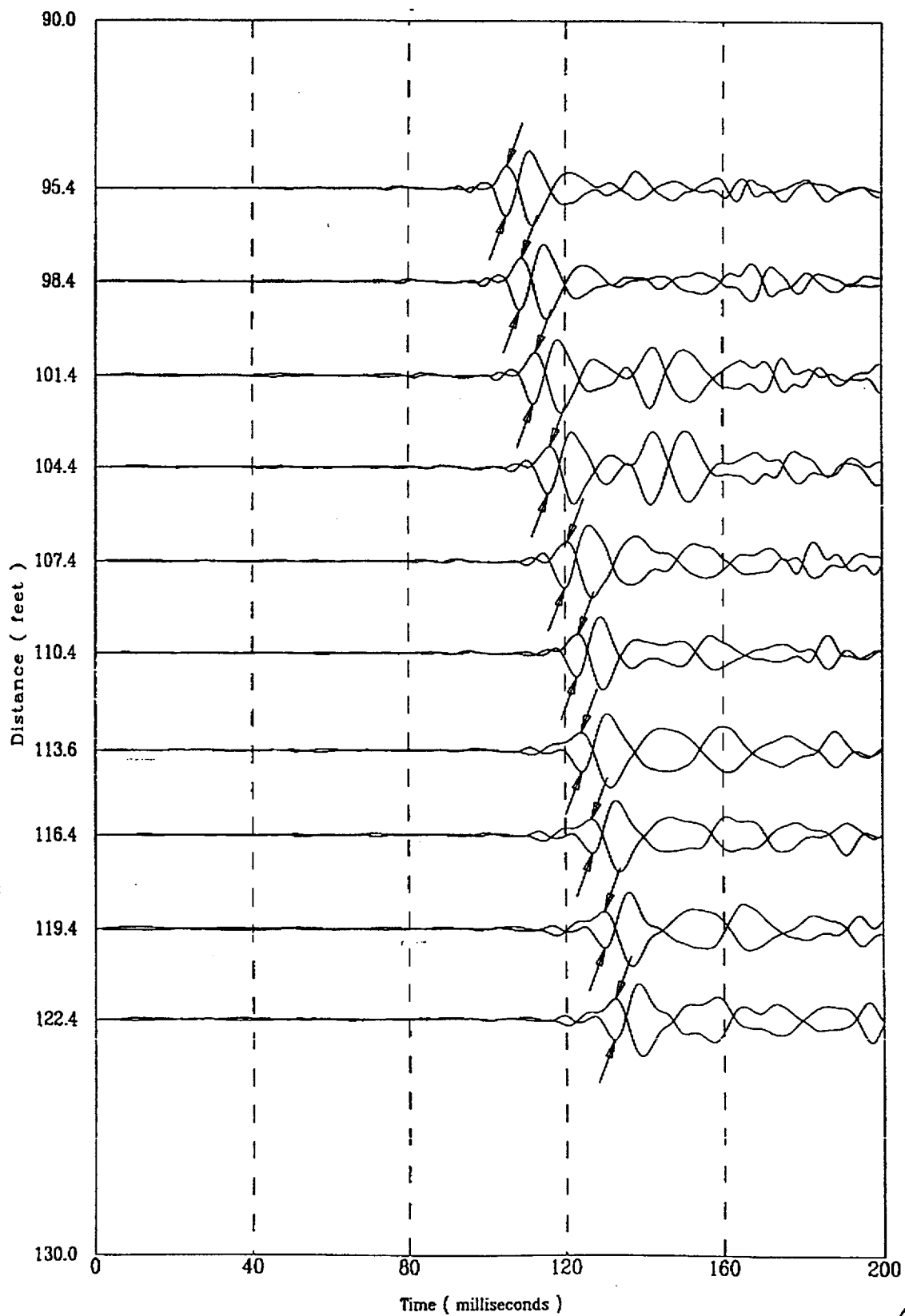
Applied Research Associates, Inc.
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S Wave
03/05/98



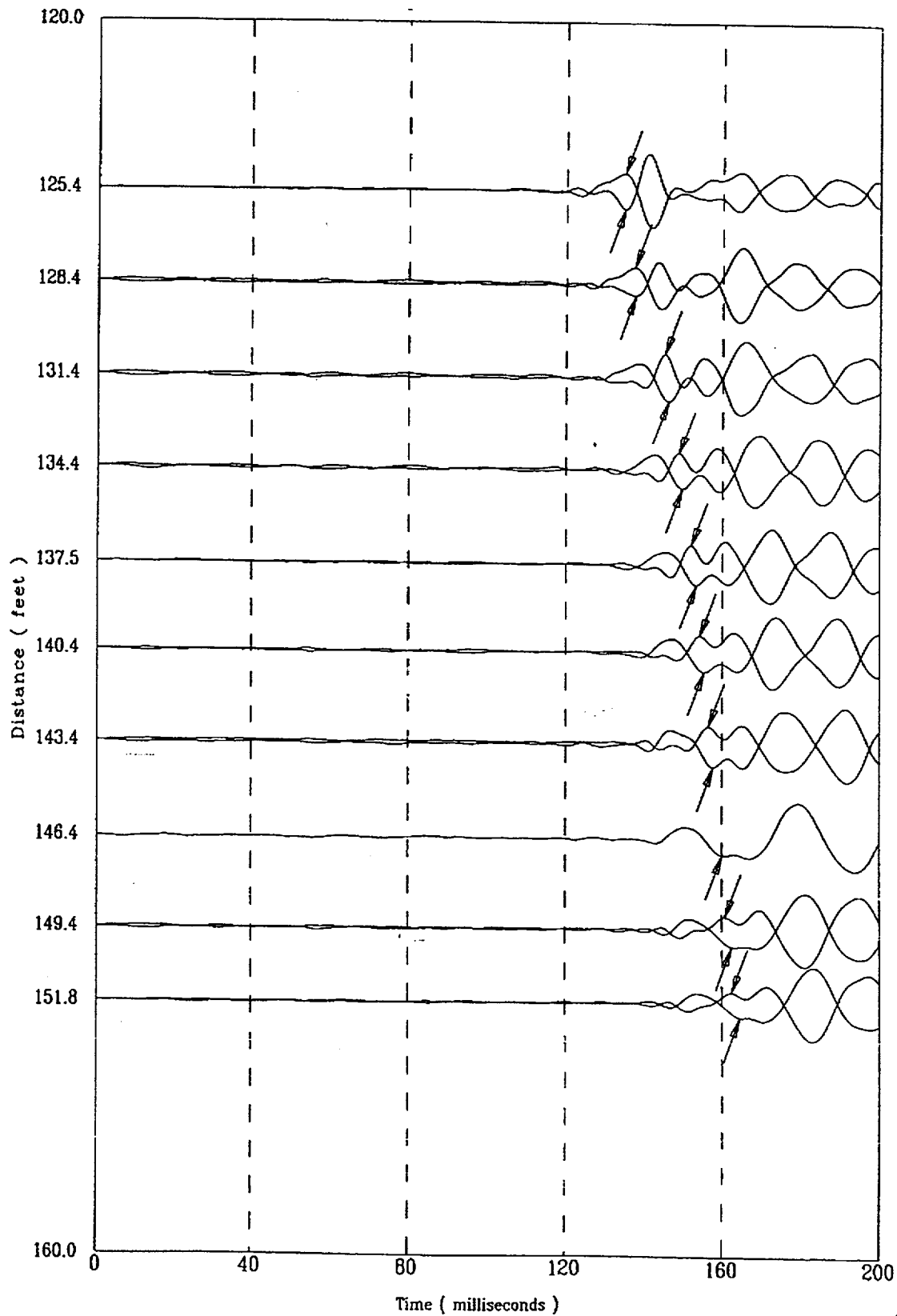
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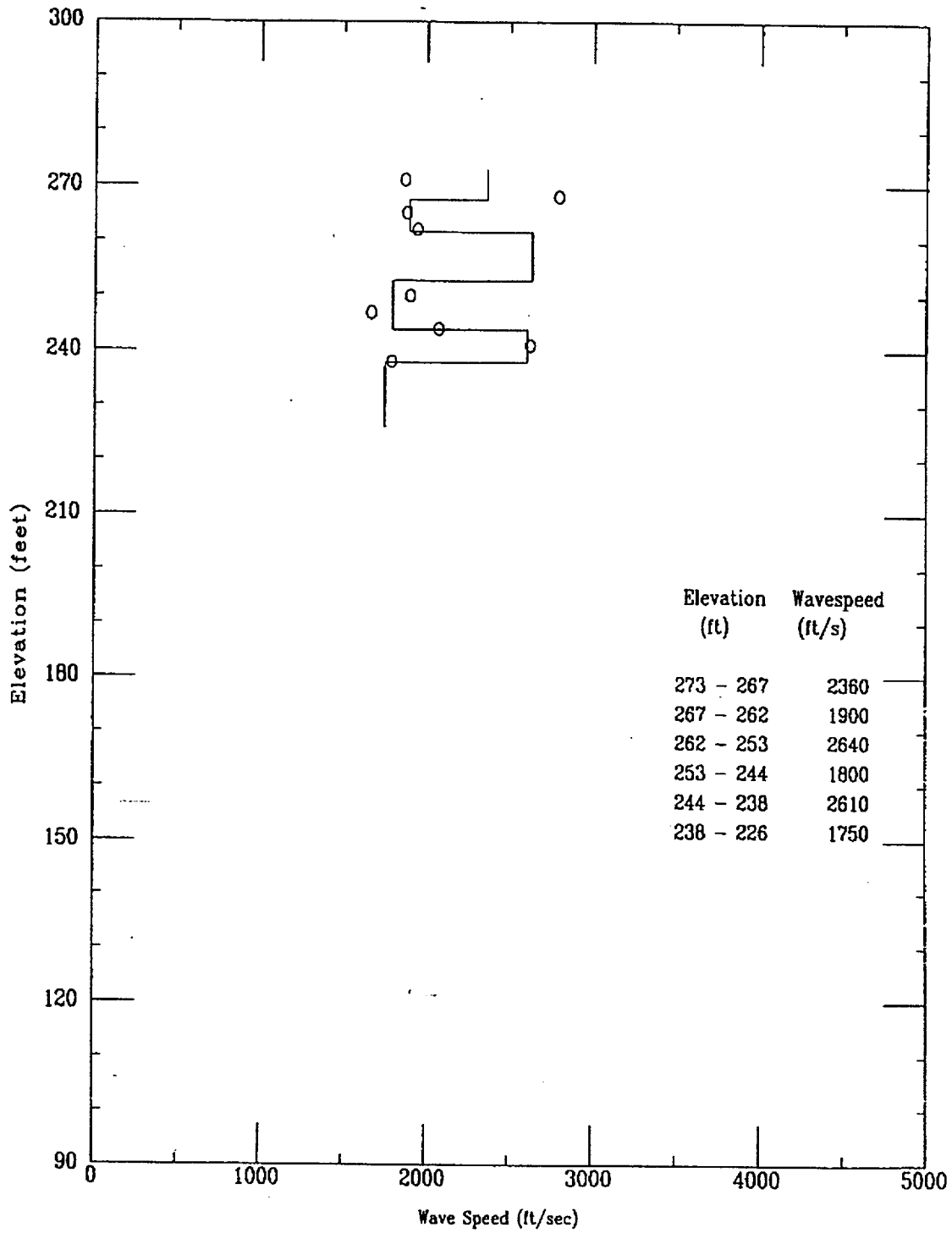
S Wave
03/05/98



File 405m804S

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Compression Wave Speeds

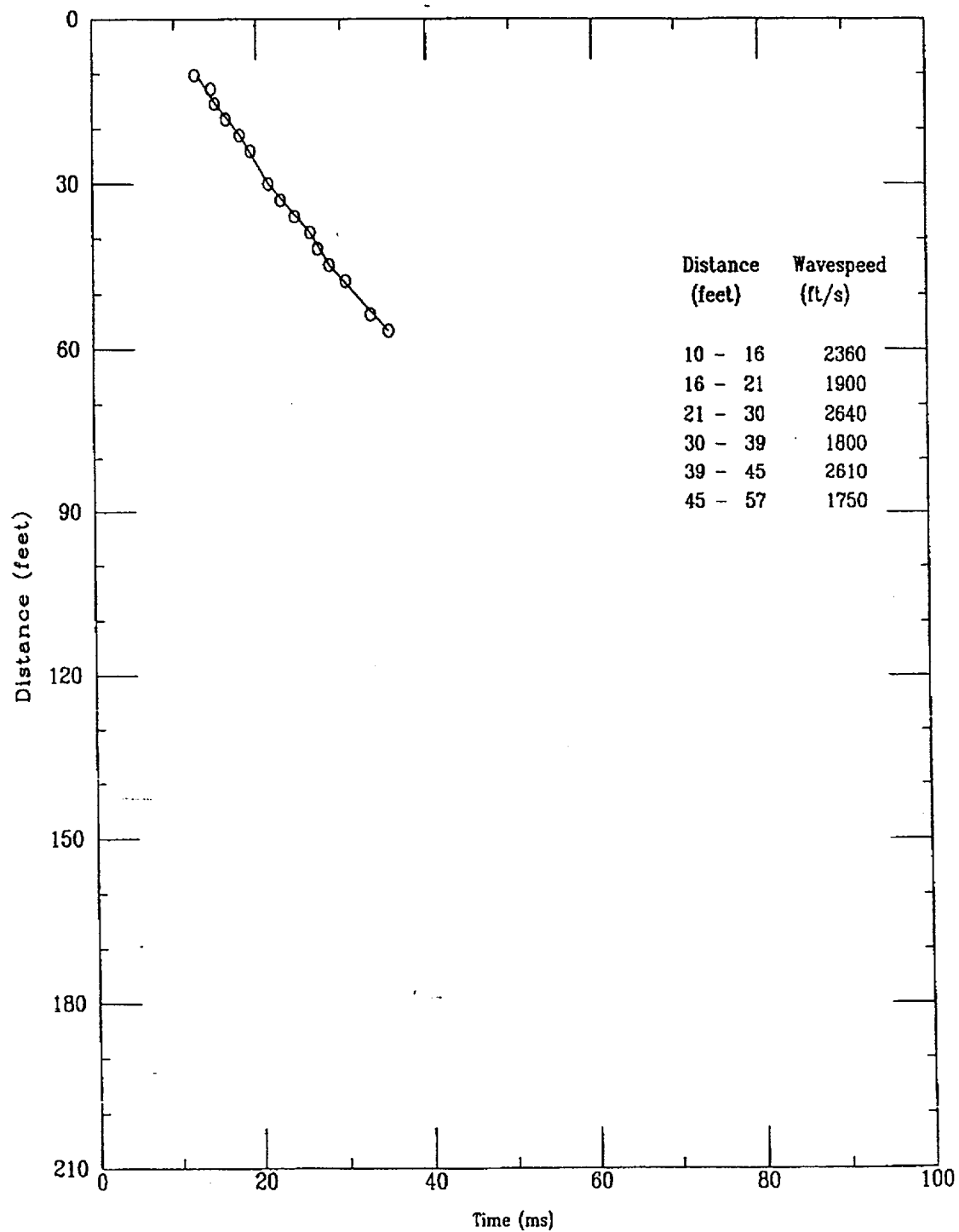


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APPLIED RESEARCH ASSOCIATES, INC.

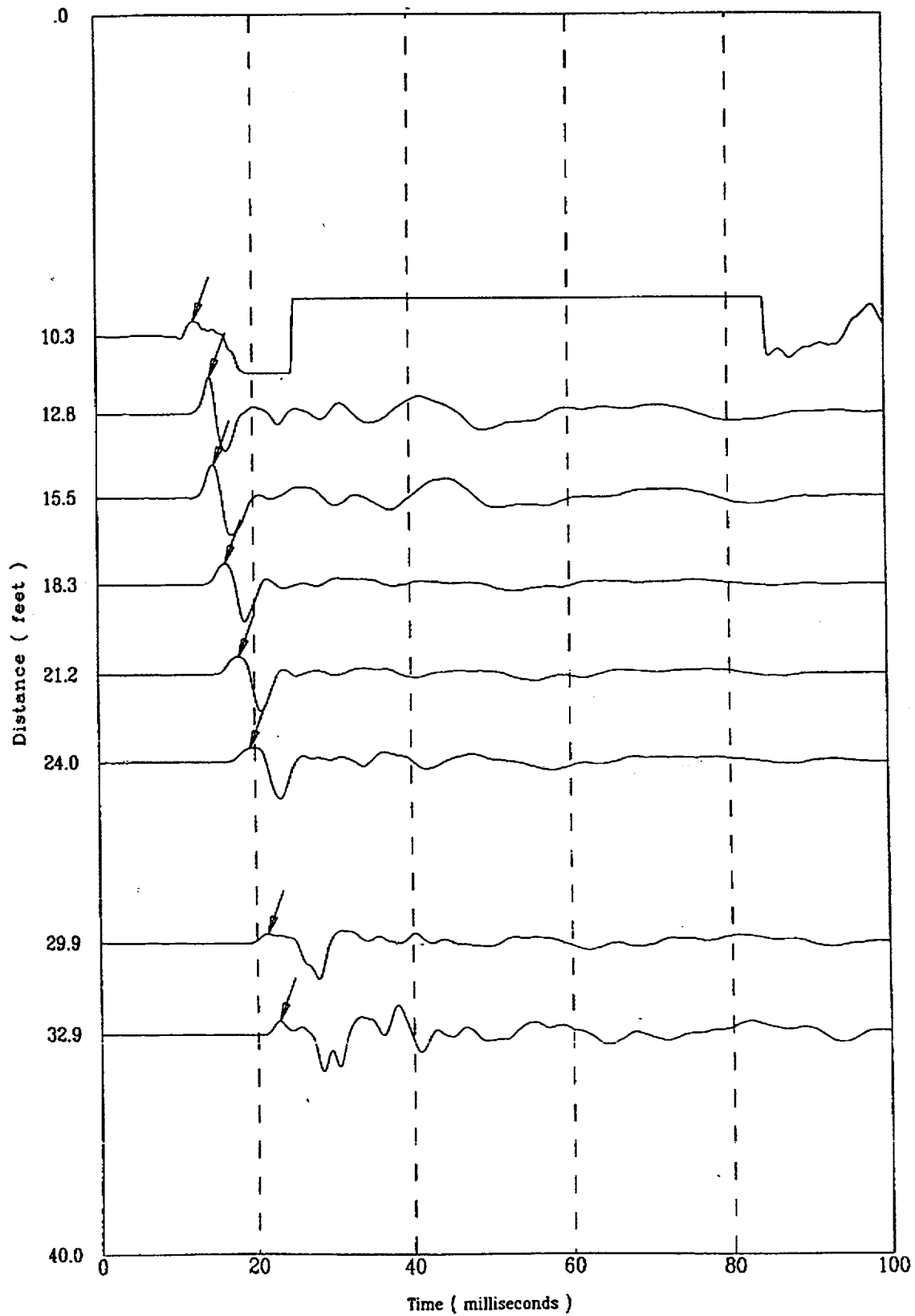
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Compression Wave Time of Peak



File 405M804S

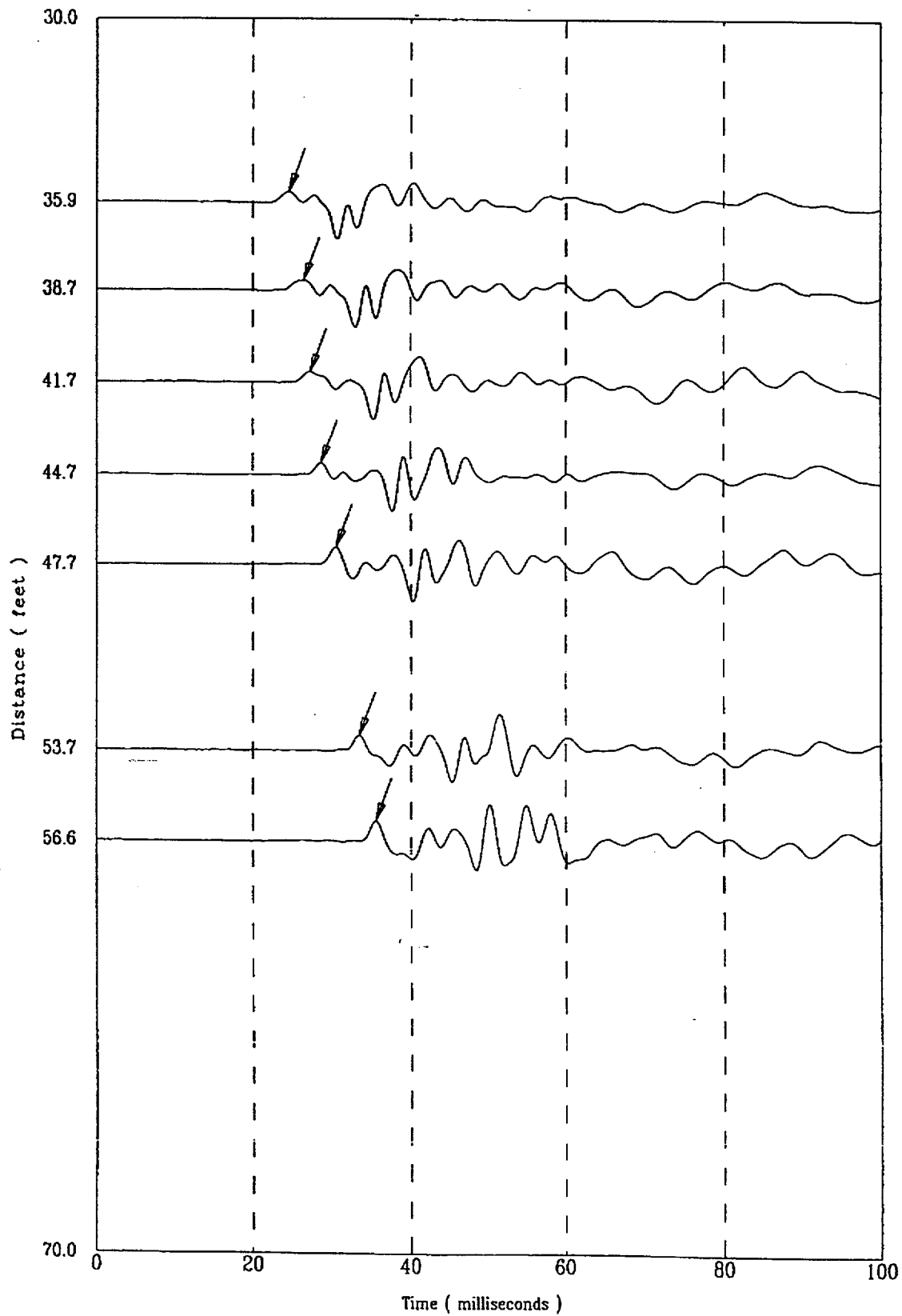
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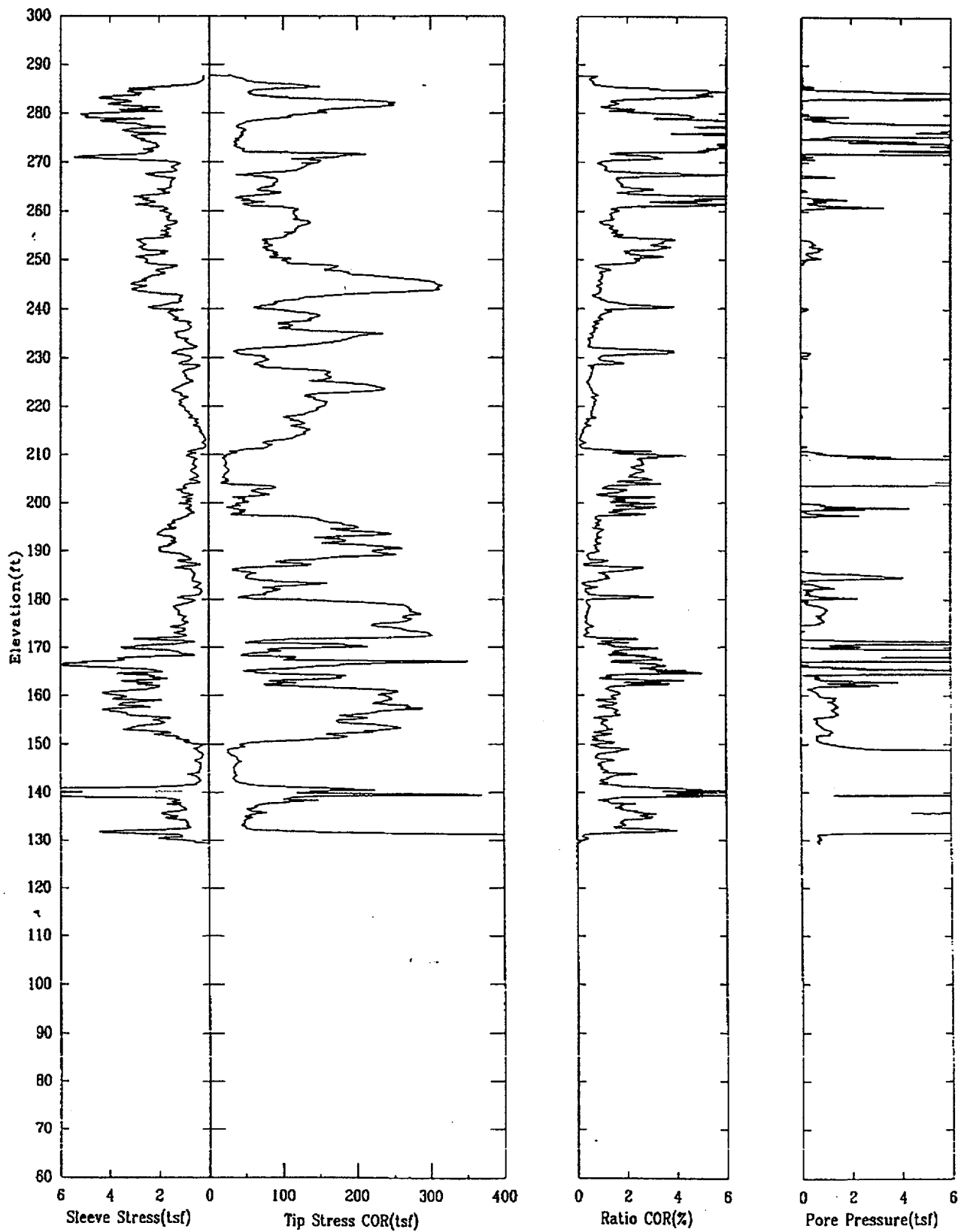
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CPT-157

P Wave
03/05/98



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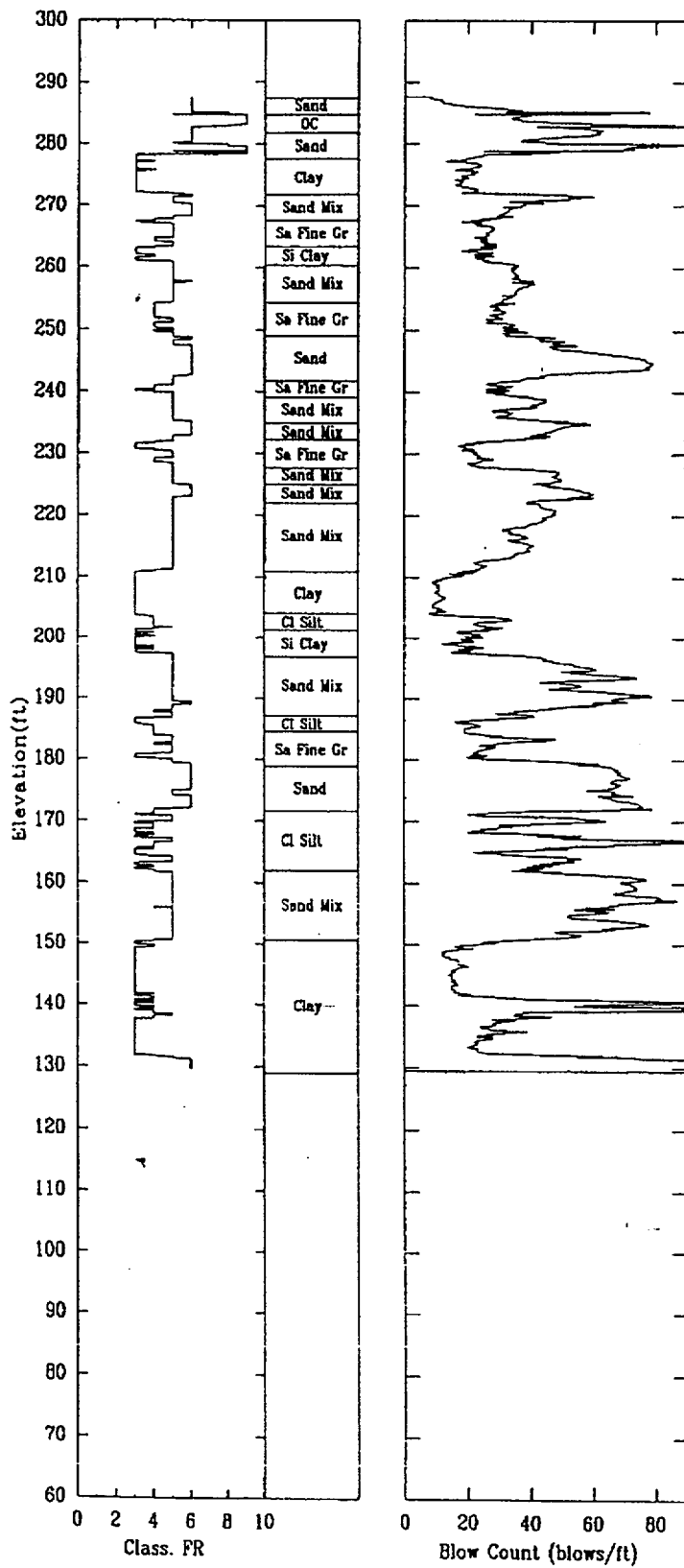
APPLIED RESEARCH ASSOCIATES, INC.

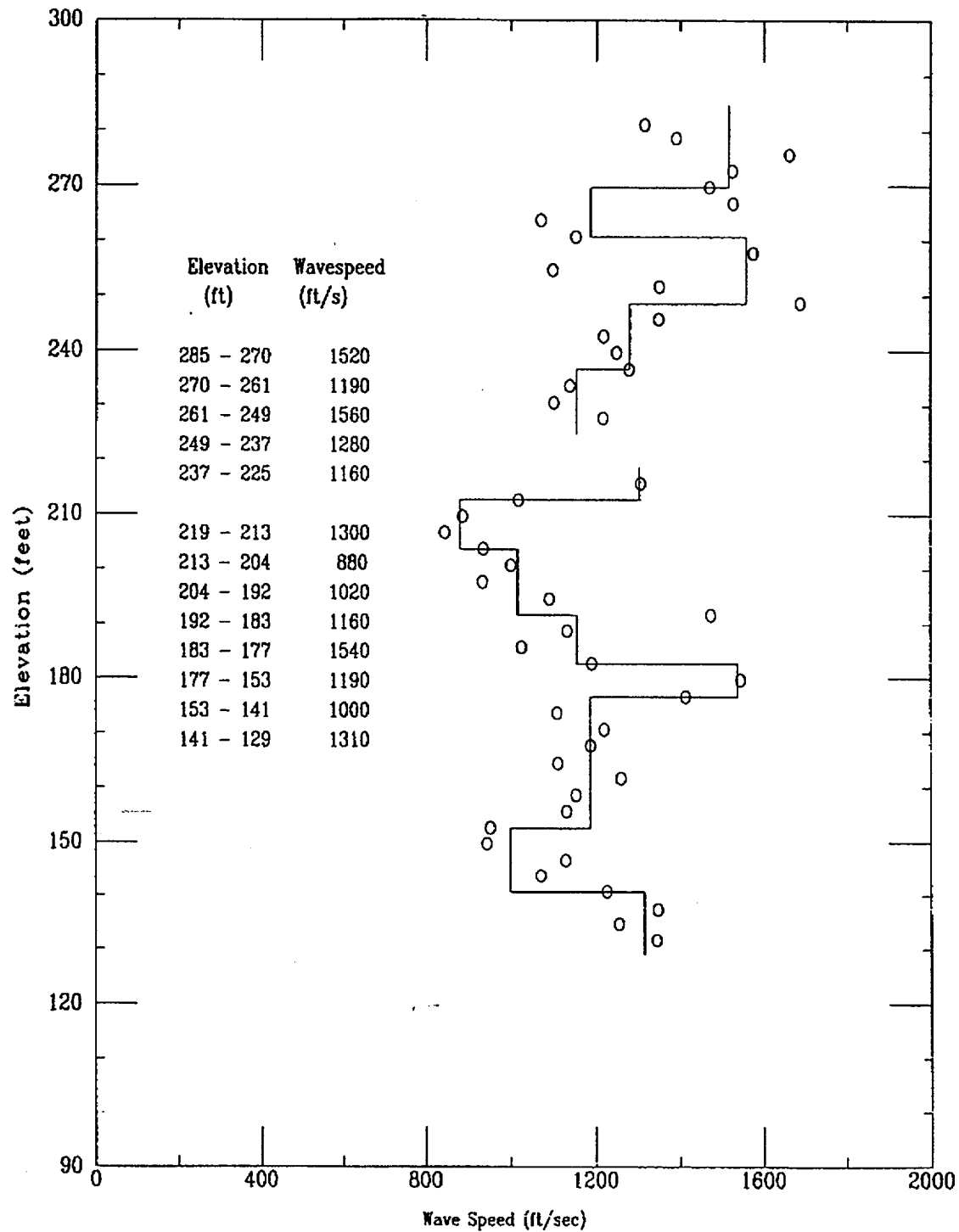
02/17/98

North 79171.1

East 55195.0

Elevation 293.7



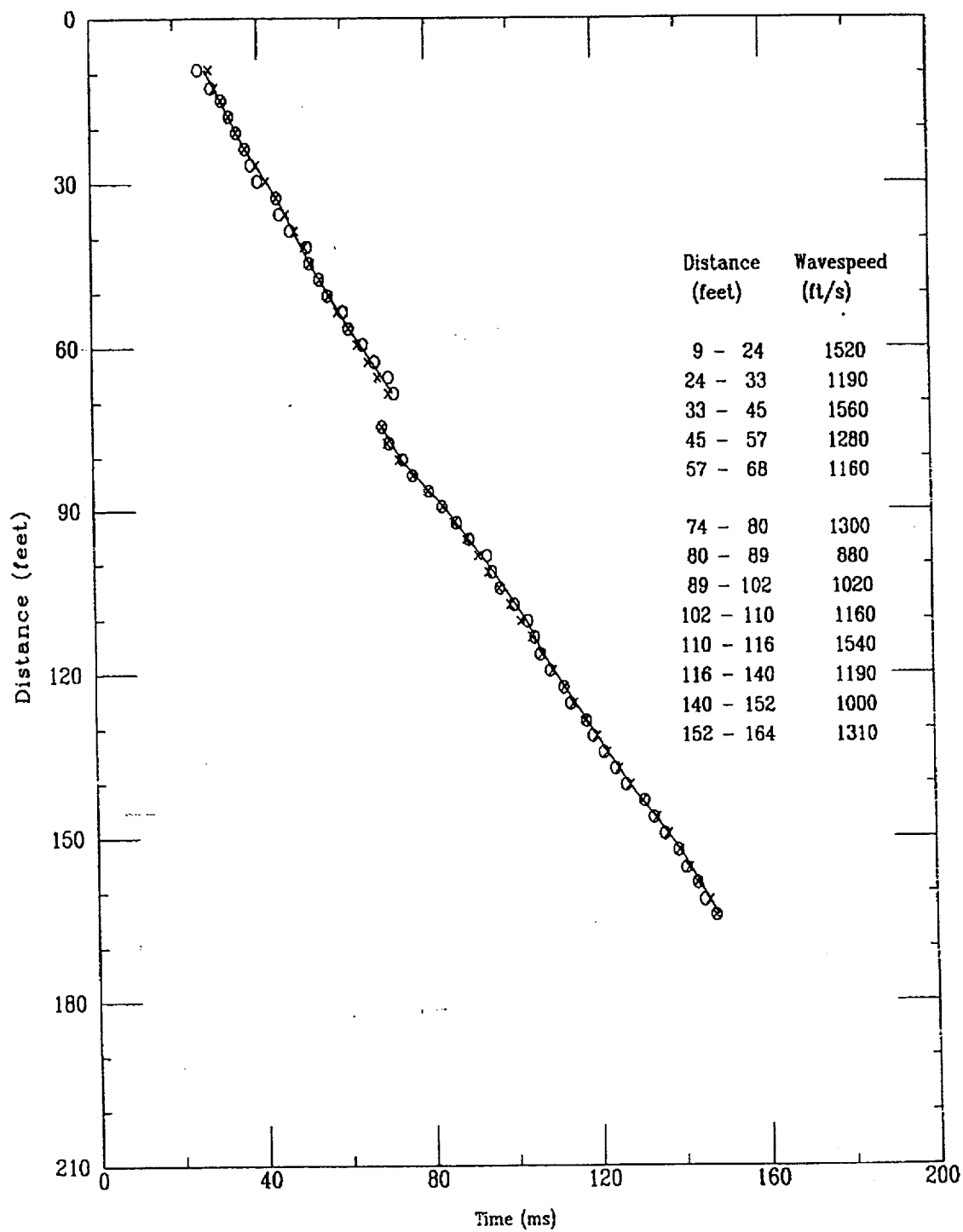


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APPLIED RESEARCH ASSOCIATES, INC.

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Shear Wave Time of Peak

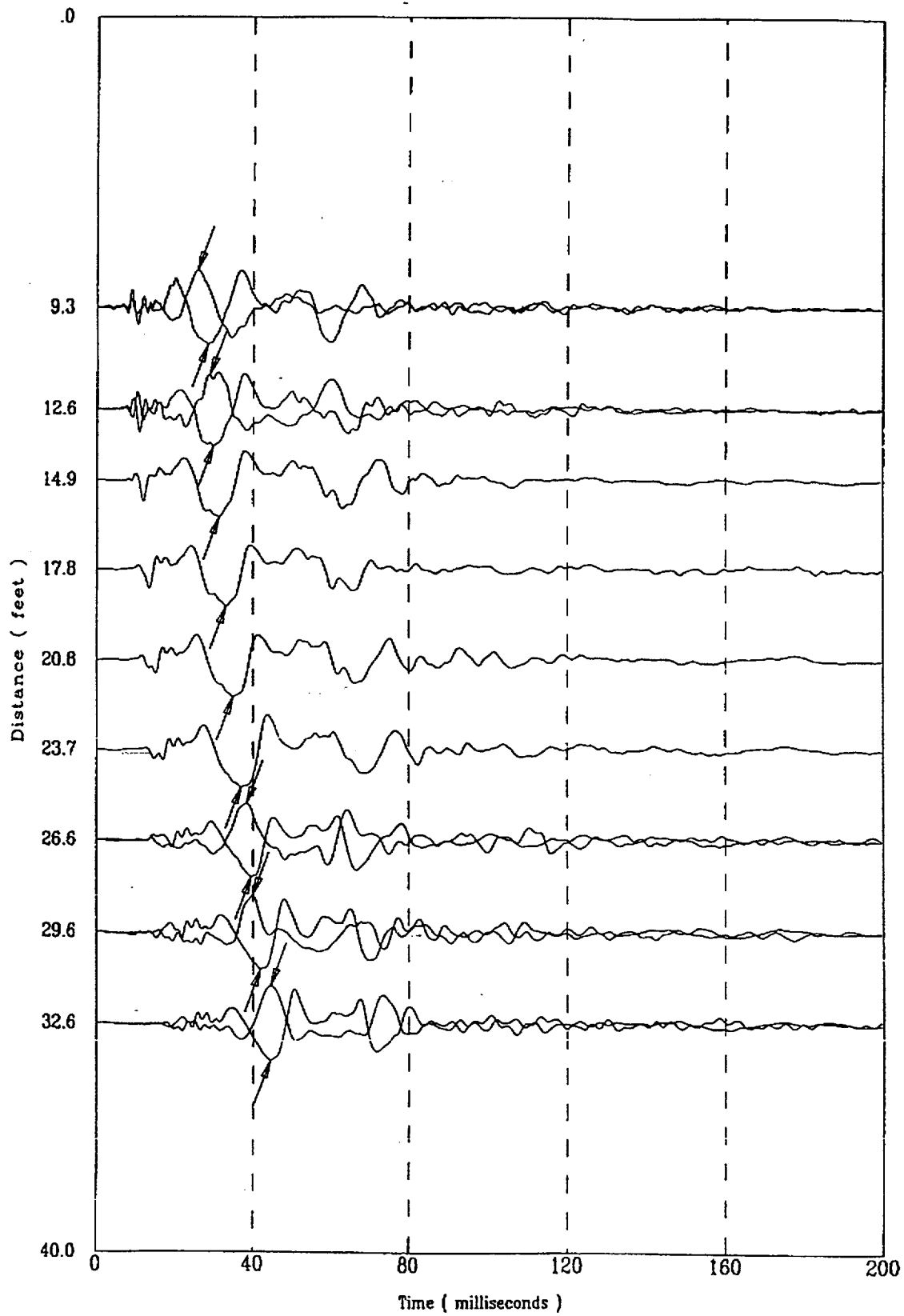


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S Wave
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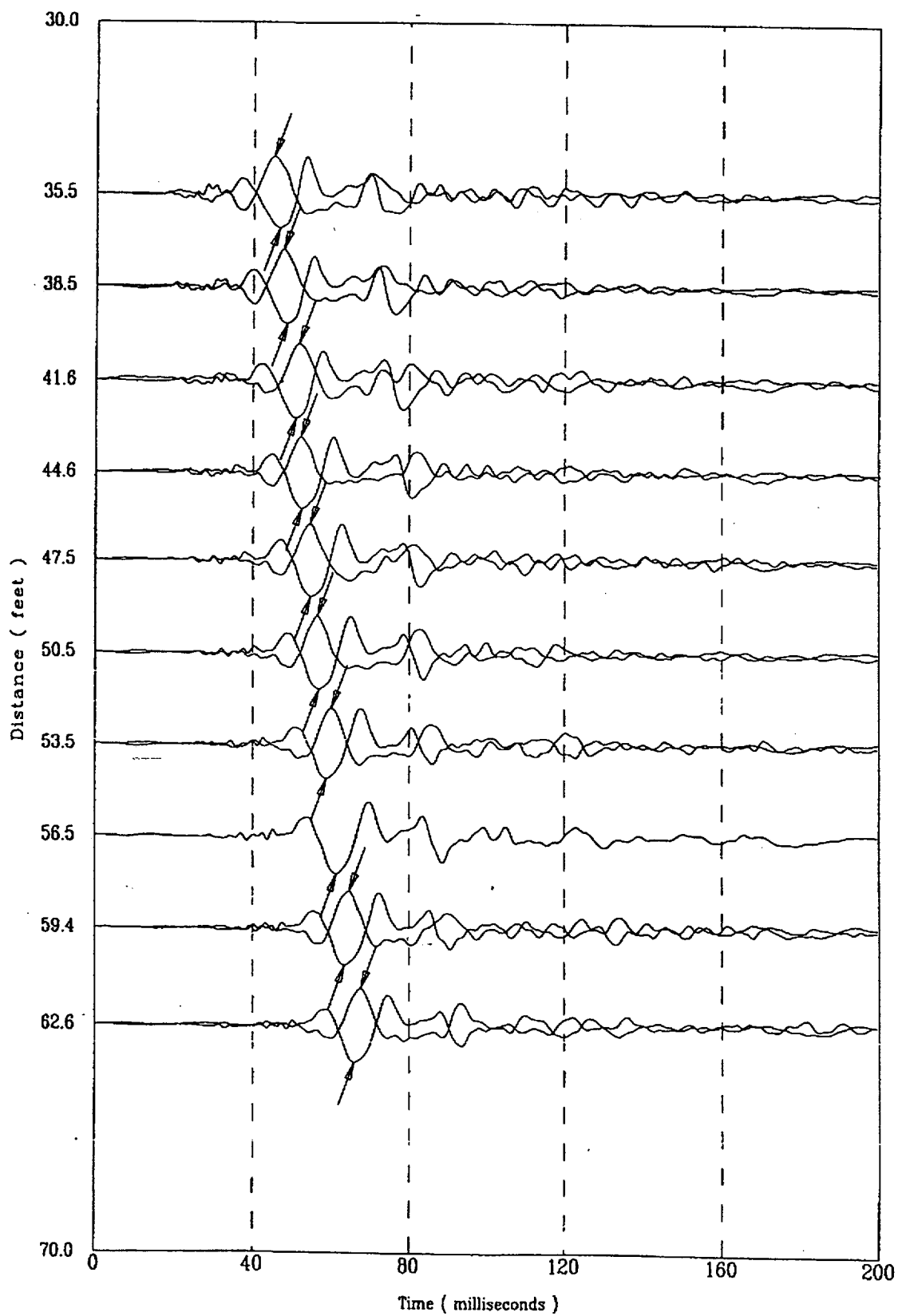


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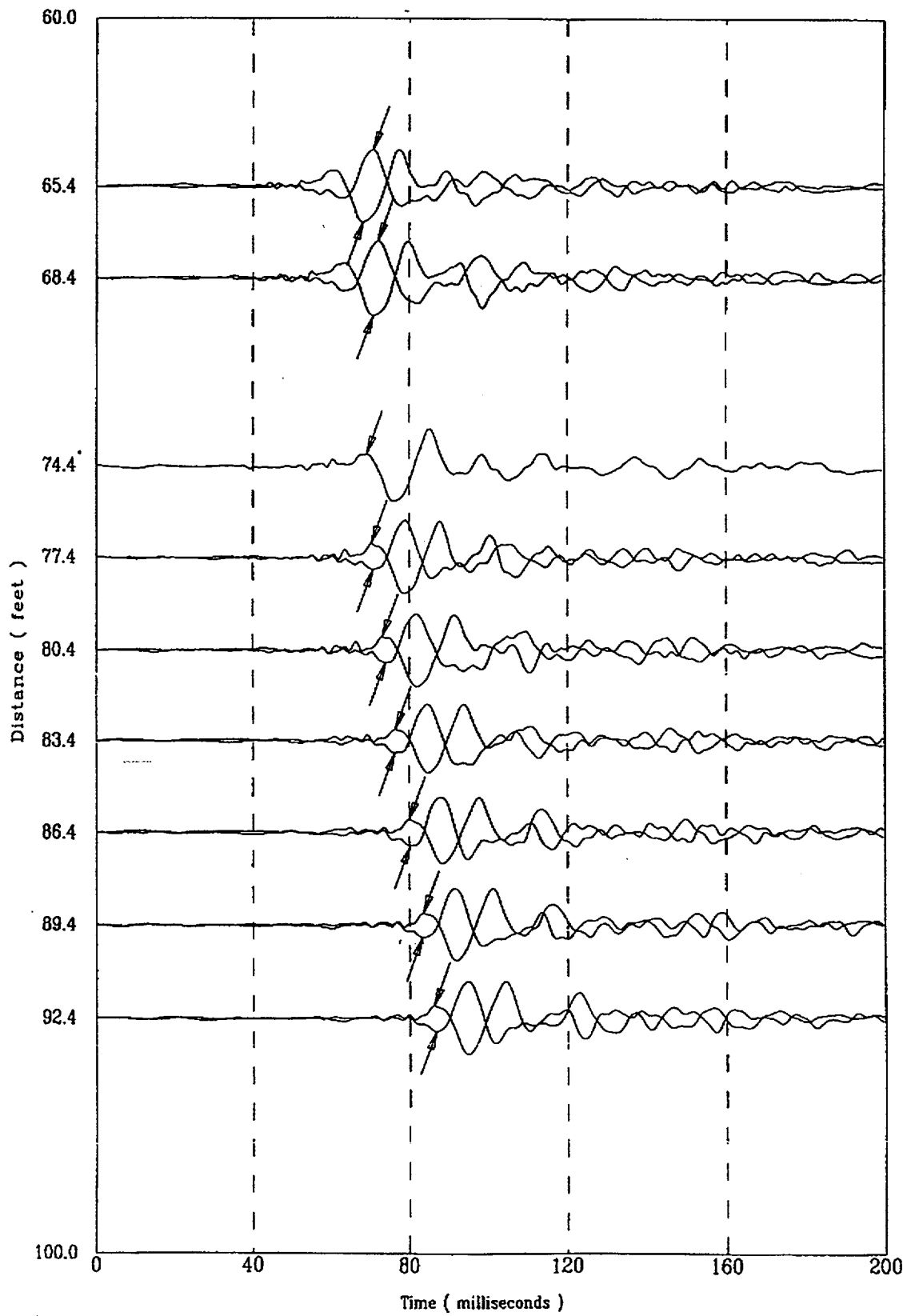
Applied Research Associates, Inc.
CPT-159

S Wave
02/17/98



Applied Research Associates, Inc.
CPT-159

S Wave
02/17/98

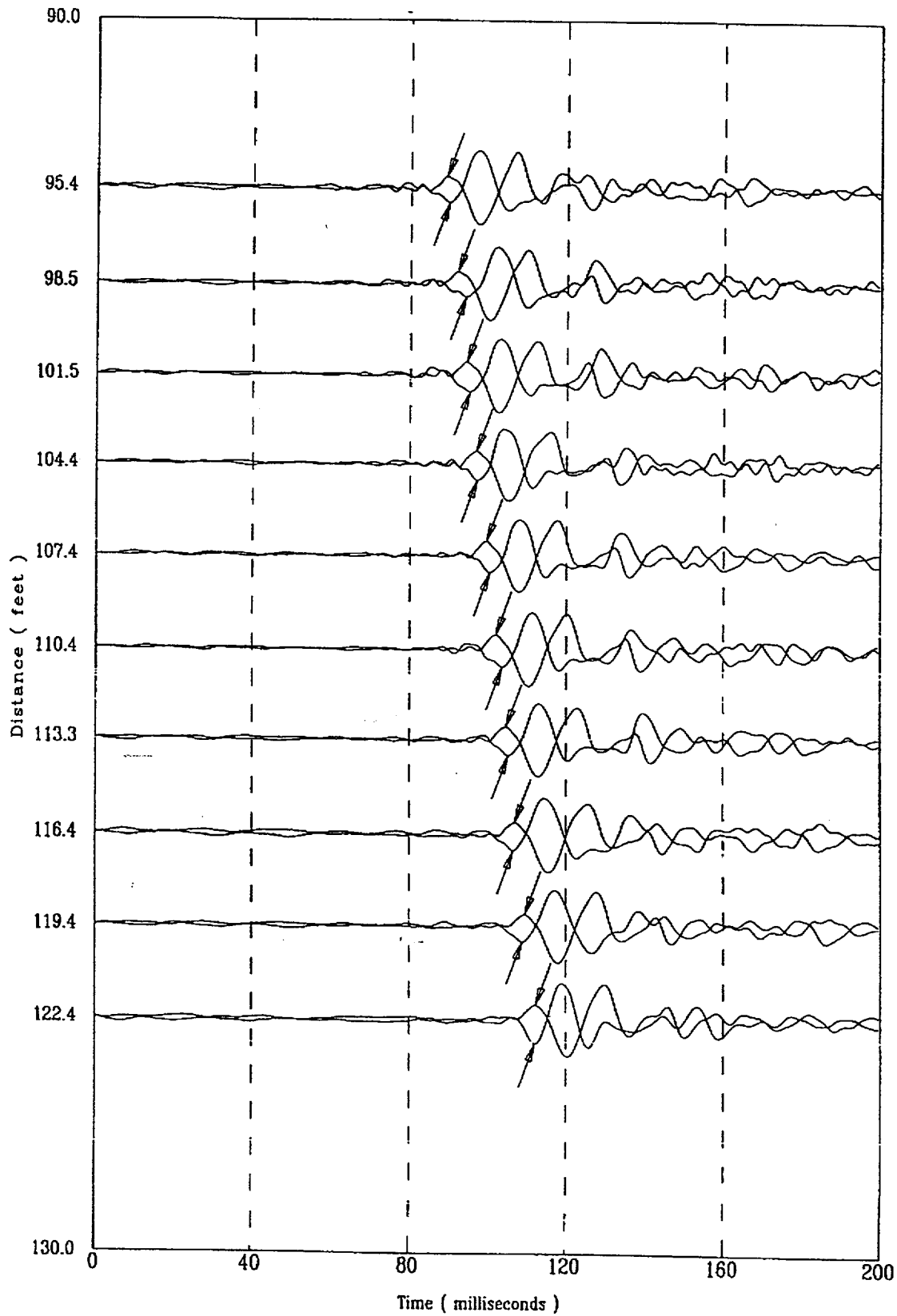


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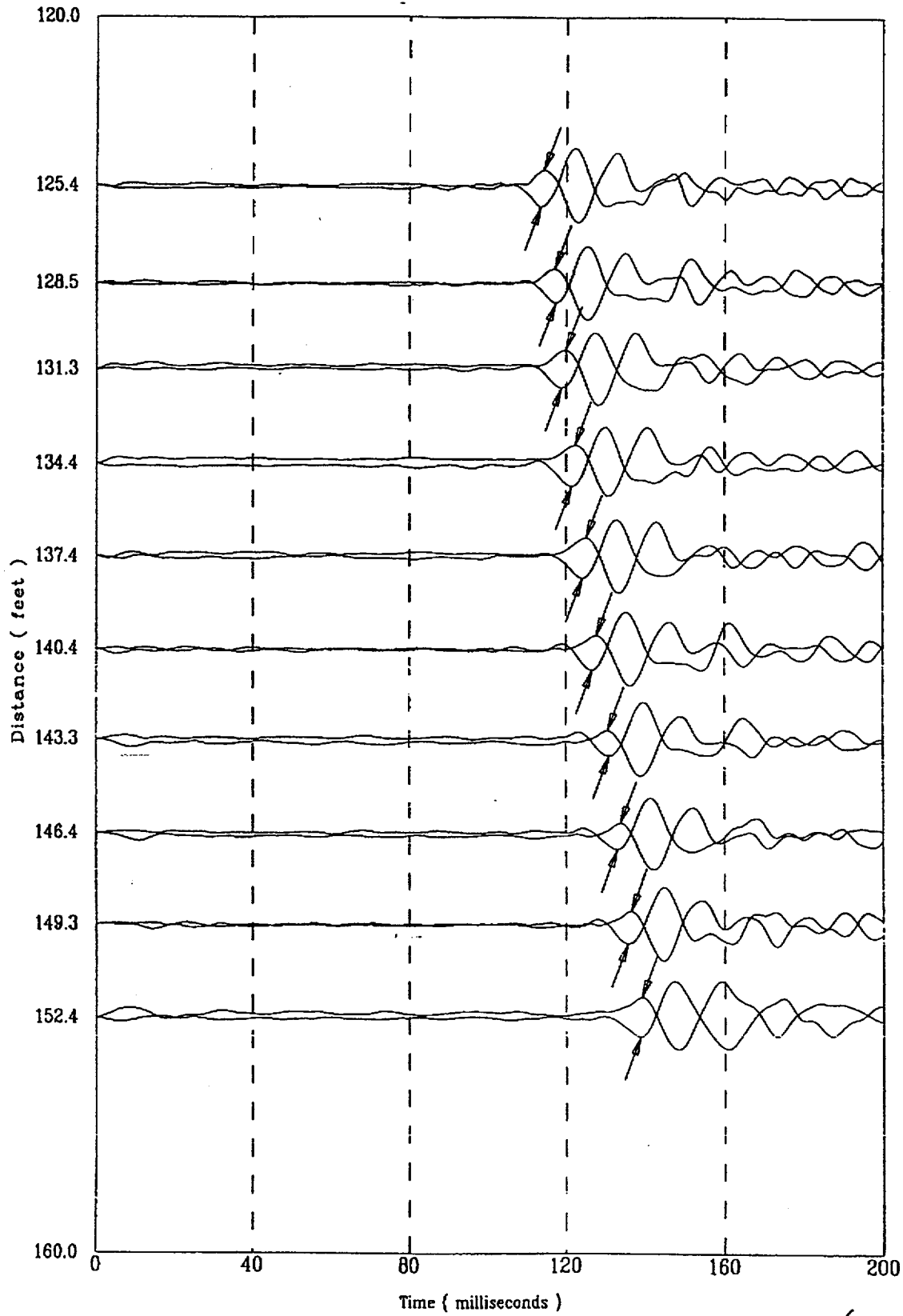
Applied Research Associates, Inc.
CPT-159

S Wave
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File 417f801S

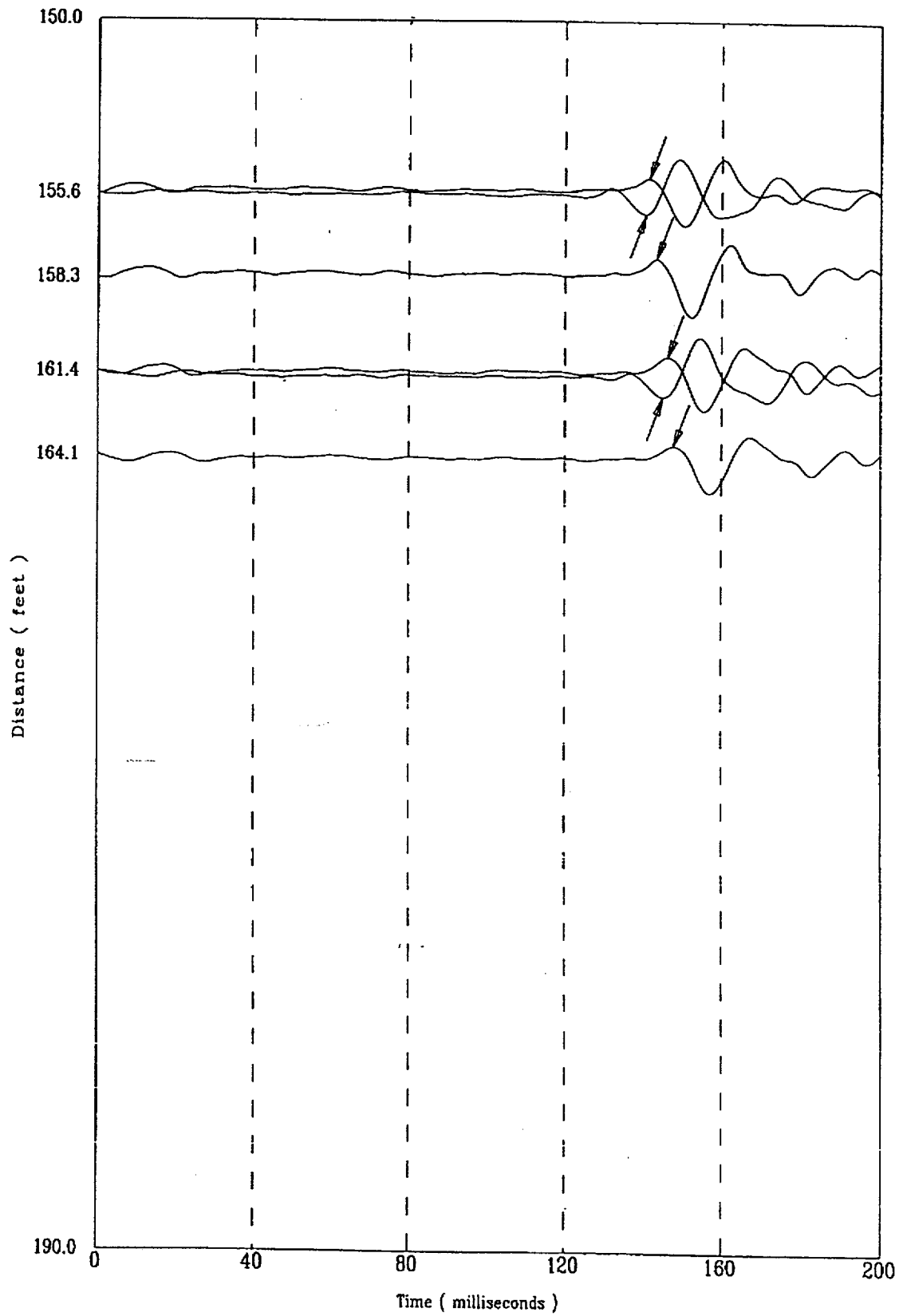
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S Wave
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File 4177801S