

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

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DATA REPORT FOR THE VERTICAL-COMPONENT SEISMIC REFRACTION DATA  
OBTAINED DURING THE 1986 PASSCAL BASIN AND RANGE LITHOSPHERIC  
SEISMIC EXPERIMENT, NORTHERN NEVADA

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OPEN-FILE REPORT 87-415

**This report (map) is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards (and stratigraphic nomenclature). Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S.G.S.**

*Menlo Park, California*

*1988*

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DEAN WHITMAN AND R. D. CATCHINGS<sup>1</sup>

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1987

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## Introduction

In July, 1986, the United States Geological Survey (USGS) conducted a seismic refraction/reflection survey in northern Nevada as part of the Program for Array Seismic Studies of the Continental Lithosphere (PASSCAL) Basin and Range Lithospheric Seismic Experiment. The major purposes of the experiment were to investigate the uncertainties in the crustal and upper-mantle velocity structure (reviewed by Catchings, 1987), to investigate differences between the interpretations of previous wide-angle (Eaton, 1963) and vertical-incident (Klemperer and others, 1986) seismic studies, and to enhance existing reflection and refraction data in that region.. Explosions fired on the nights of July 22, 25, and 29, were recorded by 120 vertical-component USGS seismic cassette recorders (SCR's), 40 three-component recorders, and a 396 channel seismic reflection array by participants from 17 universities and government institutions. This report is a compilation of the vertical-component seismic refraction data collected by the USGS during this survey.

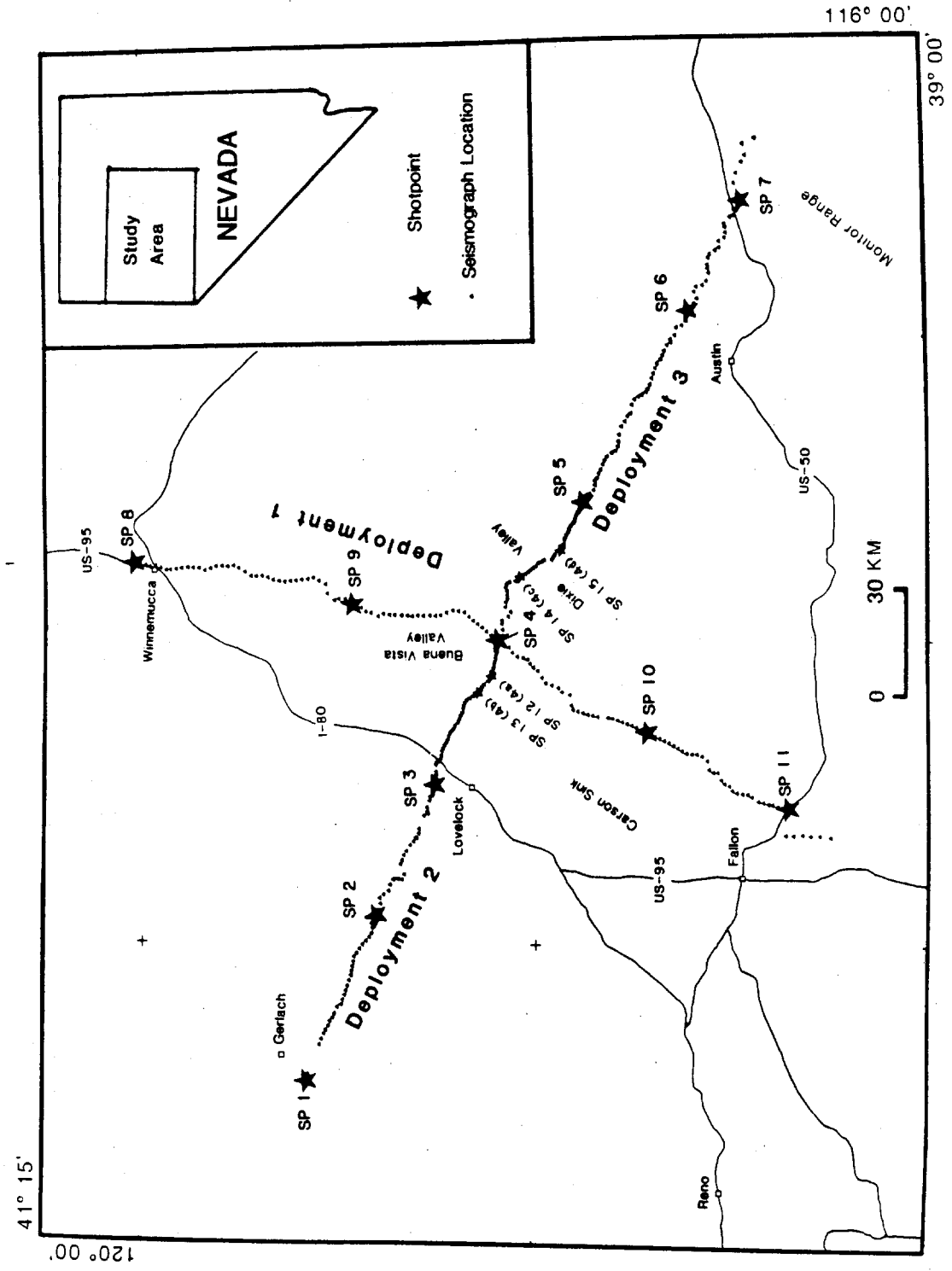
### Description of the Survey

The survey consisted of a 200-km-long NE-SW trending strike profile and an intersecting 280-km-long NW-SE trending cross profile (Fig. 1). Seismic sources were generated by a total of 26 explosions, which were detonated in 20-cm diameter boreholes at depths ranging from 45 to 70 meters. Explosions were generated by 225 to 2700 kg of ammonium nitrate explosive. Shot times, locations, sizes are listed in Table 1. Seismic recorder sites, shown in map view on figure 1, are also listed by latitude and longitude on Table 2.

The vertical-component data from the NE-SW profile were recorded in one deployment (deployment 1), which extended from Winnemucca, Nevada to southeast of Fallon, Nevada. A total of 130 vertical-component recorder sites were occupied (locations 101-230, Table 2) with an average spacing of 1.5 km. For deployment 1, in-line shots were fired from shotpoints 4, 8, 9, 10, and 11. In addition, a fan shot was fired from shotpoint 1. Shotpoints 8 and 11 were each fired twice.

Vertical-component data from the NW-SE profile were recorded in two separate deployments (deployments 2 and 3; locations 301-412, 501-618, Table 2). The entire profile extends from near Gerlach, Nevada to the Monitor Range with seismic recorder spacing ranging from 0.9 to 1.4 km. The westernmost deployment, deployment 2, extended from shotpoint 1 (Gerlach) to shotpoint 4 (Buena Vista Valley) and consisted of six in-line shots (shotpoints 1, 2, 3, 4, 12 (4a), and 13 (4b)) over the recording array, two offset shots (shotpoints 5 and 7), and a fan shot (shotpoint 8). The easternmost deployment, deployment 3, extended from shotpoint 4 to shotpoint 7 (Monitor Valley) and also consisted of six in-line shots (shotpoints 4, 5, 6, 7, 14 (4c), and 15 (4d)) over the seismic array, two offset shots (shotpoints 1 and 3), and a fan shot (shotpoint 8).

Figure 1: Index map of the study area showing shotpoint and recorder locations. Stars denote shotpoint locations; small triangles denote recorder locations.



## Instrumentation and Field Operations

Prior to the data acquisition phase of the experiment, vertical-component recorder sites (Table 2) were surveyed using USGS (1:24000) orthophotographs and (1:24000 and 1:62500) topographic maps. During each deployment, station locations were resurveyed by the observer crew for accuracy. Combined errors in elevation and geographic locations are estimated to no more than +25 meters.

Explosive sources were detonated by automated shooting systems, described by Healy and others, 1982, on the night of each deployment. The blasting cap-break, WWVB time code, and IRIG E time code from a USGS master clock were recorded on a Kiowa<sup>TM</sup> paper strip chart recorder. Because the master clocks drift about 1 millisecond per week, they were synchronized in the field to National Bureau of Standards clocks with a Kinematics Truetime<sup>TM</sup> portable satellite receiver/clock, accurate to 1.5 milliseconds. Shot times were picked from the paper record to within an estimated accuracy of 2 milliseconds.

Prior to each set of shots, USGS observers deployed 120 SCR's (Healy and others 1982) and 20 3-component GEOS (General Earthquake Observation System) recorders (Borcherdt and others, 1985). Each SCR contained a 2-Hz vertical-component velocity transducer geophone, which was oriented and buried during deployment of the recorder. Output from the geophone was sent through three parallel amplifiers, each with an adjustable attenuation setting. The three amplified seismic signals, a fixed reference frequency, and an internally generated time code were recorded as a multiplexed signal in analog form on a 30-minute cassette tape (Fig. 2). Each SCR contained a USGS time code generator and memory board, which is programmable for up to ten separate recording times. Prior to each recording time, a pre-programmed microprocessor in the seismic recorder performed a geophone release test, an amplification check, and a calibration sequence consisting of a 10-Hz sine wave with amplitudes of 1, 10, 100, and 1000 microvolts RMS. The input signal results in a recording system with a displacement response peak of about 26 Hz and velocity response peak of about 6 Hz (Fig. 3; Dawson and Stauber, 1986).

Before each deployment, recording times were programmed into the SCR's, amplifier attenuations were set, and the SGR chronometer was set with a master reference clock. After the SGR's were retrieved, chronometer drifts were measured relative to the master clock.

## Data Reduction

Information pertaining to shot times, SCR locations, amplifier attenuation settings, chronometer drifts, and SCR performance was entered into a microcomputer and stored on a floppy disk. Chronometer drifts were calculated assuming a linear drift between the time the chronometer was set and the shot time. The analog seismic data were digitized for a total of 20 seconds at a sampling rate of 200 samples/second. Digitization began at time:  $T = \text{shot time} - T_{\min} + \text{distance}/6.0 \text{ km/s}$ .

A list of  $T_{\min}$  (in seconds) is given below for each shot.

Shot	$T_{\min}(\text{s})$	Shot	$T_{\min}(\text{s})$	Shot	$T_{\min}(\text{s})$
1	-2	9	-2	18	-2
2	-2	10	-3	19	-2
3	-3	11	-2	20	-2
4	-3	12	-6	21	-6
5	-3	13	-2	22	-2
6	-3	14	-2	23	-2
7	-3	15	-2	24	-3
8	0	16	-2	25	-2
		17	-2	26	-2

Amplifier calibrations for each recorder were digitized and data from the highest gain, non-clipped channel were selected. The digitized data were checked for errors in the timing, station location, and attenuation settings before a final version of the data was stored on 9-track magnetic tape. Information pertaining to instrument location, distance, azimuth, attenuation, and SCR performance for each shot is given in Appendix A.

For deployment 1, vertical-component GEOS data (Appendix B) were merged with the SCR data. Prior to merging, the GEOS data were filtered by a 50-Hz low pass filter and decimated to 200 samples/second, the sampling rate used for the SCR's. A complete presentation of the GEOS data for the PASSCAL experiment is given in a separate report (Dietel and Borchardt, 1987). A comparison of the amplitude response of the SCR data and the GEOS data is given in Appendix C.

### Record Sections

Record sections for each shot (Figures 4 through 29) are plotted with amplitudes normalized to a common value for each trace and at a reduction velocity of 6.0 km/s. Negative distances indicate recorder sites south of each shotpoint along the NE-SW profile and east of each shotpoint along the NW-SE profile. Traces for the fan shots are plotted at distances relative to shotpoint 11 for the NE-SW profile (shot 4), and shotpoint 1 for the NW-SE profile (shots 15 and 19).



## Archive Tape

Data included in this report are available on SEGY-formatted magnetic tapes (1600 BPI density; see Appendix D) from the following:

IRIS, Data Management Center  
 Incorporated Research Institutions for Seismology  
 1616 N. Ft. Myer Drive, Suite 1440  
 Arlington, Virginia 22209

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## References cited

- Barry, K. M., Cravers, D. A., and Kneale, C. W., (1975), Recommended standards for digital tape formats: *Geophysics* 40, 344-352.
- Borcherdt, R. D., Fletcher, J. B., Jensen, E. G., Maxwell, G. L., VanSchaack, J. R., Warrick, R. E., Cranswick, E., Johnston, M. J. S., and McClearn, R., (1985), A General Earthquake-Observation System (GEOS), *Bull. Seismological Society of America*, 75, 1783-1825
- Catchings, R. D. (1987) *Crustal Structure of the Northwestern United States*, Ph.D. Thesis, Stanford University, Stanford, California, 185pp.
- Dawson, P. B., and Stauber, D. A., (1980), Data Report for a Three-dimensional High-resolution P-velocity Structural Investigation of Newberry Volcano, Oregon, using Seismic Tomography, U.S. Geological Survey Open-File Report USGS-OF-86-352, 45 pp. plus plates.
- Dietel, C., and Borcherdt, R. D., (1987), GEOS Data Summary for Active and Passive Seismic Experiments Conducted in Support of Northern Nevada Lithospheric Experiments - PASSCAL, U.S. Geological Survey Open-File Report USGS OF 87-326, 22 pp. plus tables and figures.
- Eaton, J. P., (1963), Crustal structure from San Francisco, California, to Eureka, Nevada, from seismic refraction measurements, *Journal of Geophysical Research*, 68, 5789-5806.
- Healy, J. H., Mooney, W. D., Blank, H. R., Gettings, M. E., Kohler, W. M., Lamson, R. J., and Leone, L. E., (1982), Saudi Arabian Seismic Deep-refraction Profile: Final Project Report, U.S. Geological Survey Open-File Report USGS-OF-02-37, 429 pp.
- Klemperer, S. L., Hauge, T. A., Hauser, E. C., Oliver, J. E., Potter, C. J., (1986), The Moho in the northern Basin and Range province, Nevada, along the COCORP 40°N seismic-reflection transect, *Bull. Seismological Society of America*, 97, 603-611.

Table 1: Master Shot List. Includes the shot number, shotpoint number, date (calendar and Julian), shot time (GMT), latitude (degrees, minutes), longitude (degrees, minutes), charge size (lbs), and notes pertaining to each shot.

DEPLOYMENT 1 JULY 22, 1986

Shot Number	Shot Point	Date Shot Time	Latitude Longitude	Size (lbs)	Notes
1	8	JUL 22, 1986 204 5 0 0.016	41 1.1660 117 43.0850	3000	Winnemucca
2	10	JUL 22, 1986 204 5 4 0.009	39 43.3254 118 17.6982	2000	Carson Sink
3	11	JUL 22, 1986 204 5 6 0.010	39 21.6223 118 32.8783	3000	Fallon
4	1	JUL 22, 1986 204 5 8 0.008	40 34.9624 119 27.5166	3000	Gerlach (Far Shot)
5	9	JUL 23, 1986 204 7 0 0.008	40 27.9109 117 51.7158	2000	East Range
6	8	JUL 23, 1986 204 7 2 0.011	41 1.1660 117 43.0850	3000	Winnemucca
7	11	JUL 23, 1986 204 7 5 55.966	39 21.6223 118 32.8783	2200	Fallon
8	4	JUL 23, 1986 204 7 8 0.009	40 5.7737 117 59.4604	2000	Buena Vista Valley

## DEPLOYMENT 2 JULY 25, 1986

Shot Number	Shot Point	Date Shot Time	Latitude Longitude	Size (lbs)	Notes	Shot Number	Shot Point	Date Shot Time	Latitude Longitude	Size (lbs)	Notes
9	4	JUL 25, 1986 207 5 0 0.010	40 5.7737 117 59.4604	3000	Buena Vista Valley	18	7	JUL 29, 1986 211 5 0 0.008	39 28.2034 116 32.5405	3000	Monitor Valley
10	5	JUL 25, 1986 207 5 2 0.009	39 52.5652 117 31.8740	4000	Augusta Mtns. (Offset Shot)	19	8	JUL 29, 1986 211 5 2 0.012	41 1.1660 117 43.0850	1500	Winnemucca (Fan Shot)
11	1	JUL 25, 1986 207 5 4 0.130	40 34.9624 119 27.5166	3000	Gerlach	20	14	JUL 29, 1986 211 5 4 0.012	40 2.4484 117 46.5786	500	Shotpoint 4C Dixie Valley
12	3	JUL 25, 1986 207 5 6 5.848	40 15.5601 118 28.4468	2000	Lovelock	21	1	JUL 29, 1986 211 5 6 0.012	40 34.9624 119 27.5166	6000	Gerlach (Offset Shot)
13	7	JUL 25, 1986 207 5 8 0.012	39 28.2034 116 32.5405	6000	Monitor Range (Offset Shot)	22	15	JUL 29, 1986 211 5 8 0.011	39 56.2168 117 41.2944	500	Shotpoint 4D Dixie Valley
14	12	JUL 26, 1986 207 7 0 0.008	40 6.8945 118 6.2925	600	Buena Vista Val. Shotpoint 4A	23	4	JUL 30, 1986 211 7 0 0.008	40 5.7737 117 59.4604	3000	Buena Vista Valley
15	8	JUL 26, 1986 207 7 6 0.096	41 1.1660 117 43.0850	2000	Winnemucca (Fan shot)	24	3	JUL 30, 1986 211 7 2 0.012	40 15.5601 118 28.4468	4000	Lovelock (Offset Shot)
16	13	JUL 26, 1986 207 9 0 0.010	40 8.8538 118 9.7485	500	Humboldt Range Shotpoint 4B	25	6	JUL 30, 1986 211 7 6 0.008	39 36.4834 116 54.4380	1000	Toiyabe Range
17	2	JUL 26, 1986 207 9 4 0.320	40 24.5386 118 54.6162	2000	Bluewing Mtns.	26	5	JUL 30, 1986 211 7 8 0.009	39 52.5652 117 31.8740	2000	Augusta Mtns.

## DEPLOYMENT 3 JULY 29, 1986

Table 2: Seismic Recorder Locations. Includes location number, latitude, longitude, and elevation.

### Deployment 1

Location number	Latitude (deg,min,sec)	Longitude (deg,min,sec)	Elev (m)	Location number	Latitude (deg,min,sec)	Longitude (deg,min,sec)	Elev (m)
101	41 1 7.7	117 43 6.2	1310	151	40 18 58.3	117 54 20.8	1258
102	41 0 30.4	117 43 23.8	1310	152	40 18 7.7	117 54 11.7	1255
103	40 59 40.3	117 43 42.6	1316	153	40 17 17.0	117 54 15.1	1255
104	40 59 3.2	117 44 3.8	1316	154	40 16 18.6	117 54 12.4	1249
105	40 58 8.3	117 43 49.1	1325	155	40 15 25.2	117 54 17.5	1249
106	40 57 19.8	117 44 19.6	1325	156	40 14 32.3	117 54 10.3	1249
107	40 56 32.3	117 44 48.1	1325	157	40 13 43.8	117 53 39.1	1267
108	40 55 50.2	117 44 45.1	1341	158	40 12 47.0	117 53 13.2	1280
109	40 54 58.2	117 44 38.2	1356	159	40 11 54.7	117 53 21.3	1280
110	40 54 7.7	117 44 25.9	1371	160	40 11 7.1	117 53 38.0	1267
111	40 53 11.9	117 44 16.0	1371	161	40 10 18.3	117 54 28.3	1249
112	40 52 21.1	117 44 20.2	1365	162	40 9 35.9	117 55 15.8	1252
113	40 51 29.6	117 44 25.7	1365	163	40 9 53.3	117 55 56.3	1255
114	40 50 36.5	117 44 57.7	1341	164	40 8 17.3	117 56 39.7	1255
115	40 49 42.0	117 44 31.9	1359	165	40 7 37.5	117 57 29.1	1249
116	40 48 50.4	117 44 4.9	1389	166	40 6 55.9	117 58 15.0	1249
117	40 47 56.1	117 44 3.0	1389	167	40 6 17.4	117 58 58.8	1249
118	40 47 4.5	117 44 7.9	1377	168	40 5 48.9	117 59 20.8	1264
119	40 46 13.1	117 43 58.4	1371	169	40 5 2.7	118 0 18.3	1267
120	40 45 24.1	117 44 28.3	1356	170	40 4 12.6	118 0 38.1	1316
121	40 44 26.9	117 45 18.5	1341	171	40 3 42.8	118 1 39.5	1310
122	40 43 32.3	117 46 10.5	1341	172	40 2 57.7	118 2 29.0	1316
123	40 42 45.7	117 46 14.6	1347	173	40 2 1.2	118 2 47.8	1389
124	40 41 51.3	117 46 7.1	1386	174	40 1 20.4	118 3 7.8	1432
125	40 40 57.8	117 46 29.0	1386	175	40 0 56.9	118 3 58.0	1402
126	40 40 7.8	117 46 58.9	1420	176	40 0 25.3	118 4 41.8	1402
127	40 39 15.0	117 47 11.2	1447	177	39 59 47.3	118 5 21.0	1456
128	40 38 23.2	117 47 21.7	1450	178	39 59 8.0	118 6 45.1	1389
129	40 37 31.1	117 47 14.2	1463	179	39 58 34.7	118 7 49.5	1341
130	40 36 40.4	117 47 7.7	1469	180	39 57 37.7	118 8 15.6	1365
131	40 35 48.8	117 46 56.6	1475	181	39 56 40.0	118 8 44.6	1432
132	40 34 53.6	117 46 52.1	1469	182	39 56 5.4	118 9 34.3	1356
133	40 34 2.5	117 46 34.1	1481	183	39 54 54.1	118 10 9.3	1371
134	40 33 10.9	117 47 11.5	1524	184	39 54 40.5	118 12 13.7	1219
135	40 32 10.5	117 47 54.0	1584	185	39 54 24.1	118 13 2.7	1203
136	40 31 54.3	117 49 42.6	1682	186	39 53 39.8	118 13 22.7	1203
137	40 30 50.9	117 51 5.5	1859	187	39 52 51.7	118 13 38.5	1219
138	40 30 9.4	117 50 48.1	1859	188	39 52 9.0	118 13 56.8	1219
139	40 29 10.8	117 50 50.8	1615	189	39 51 23.1	118 14 8.1	1219
140	40 28 15.4	117 51 36.3	1524	190	39 50 37.9	118 14 22.2	1219
141	40 27 34.3	117 51 59.4	1493	191	39 49 5.5	118 14 33.5	1213
142	40 26 45.8	117 52 35.1	1438	192	39 48 23.4	118 14 43.2	1210
143	40 26 3.2	117 53 23.4	1414	193	39 47 37.9	118 15 7.8	1210
144	40 25 17.2	117 53 37.9	1377	194	39 46 54.8	118 15 33.8	1202
145	40 24 10.1	117 54 19.7	1310	195	39 46 8.6	118 15 56.5	1205
146	40 23 22.4	117 53 47.8	1304	196	39 45 25.2	118 16 20.4	1214
147	40 22 26.8	117 54 0.5	1274	197	39 44 43.8	118 16 46.8	1213
148	40 21 38.9	117 54 4.0	1267	198	39 44 1.1	118 17 13.2	1203
149	40 20 34.0	117 54 8.8	1264	199	39 43 18.9	118 17 39.7	1203
150	40 19 41.8	117 54 11.5	1264	200	39 42 36.7	118 18 5.5	1207

Location number	Latitude (deg,min,sec)	Longitude (deg,min,sec)	Elev (m)
201	39 41 54.0	118 18 31.6	1213
202	39 41 12.1	118 18 56.9	1203
203	39 40 30.1	118 19 23.0	1203
204	39 39 47.4	118 19 47.9	1203
205	39 39 6.6	118 20 18.2	1203
206	39 38 25.9	118 20 48.7	1203
207	39 37 45.5	118 21 19.5	1197
208	39 37 4.3	118 21 49.6	1197
209	39 36 17.0	118 22 0.3	1197
210	39 35 29.3	118 22 0.9	1194
211	39 34 44.5	118 22 24.8	1194
212	39 33 55.6	118 23 20.2	1200
213	39 33 39.6	118 25 2.8	1200
214	39 33 0.7	118 25 38.6	1213
215	39 32 17.3	118 25 39.9	1234
216	39 31 46.2	118 27 10.1	1231
217	39 31 14.9	118 27 56.1	1200
218	39 30 31.8	118 28 25.6	1200
219	39 30 4.5	118 29 17.1	1203
220	39 29 21.5	118 29 46.0	1203
221	39 28 31.8	118 29 57.1	1213
222	39 27 43.2	118 30 1.7	1213
223	39 27 5.2	118 30 33.7	1219
224	39 26 5.4	118 31 24.2	1264
225	39 25 20.3	118 31 38.5	1264
226	39 24 34.7	118 31 58.4	1280
227	39 23 56.4	118 32 6.7	1249
228	39 23 10.8	118 32 29.7	1234
229	39 22 29.3	118 32 58.7	1203
230	39 21 40.5	118 32 57.0	1197
231	39 21 52.4	118 38 6.7	1203 *
232	39 20 42.6	118 38 9.7	1213 *
233	39 19 21.2	118 37 59.7	1203 *
234	39 18 6.4	118 38 14.4	1203 *
235	39 16 43.1	118 38 12.2	1197 *
236	39 15 3.4	118 38 29.8	1200 *

\* Sites not occupied by the USGS

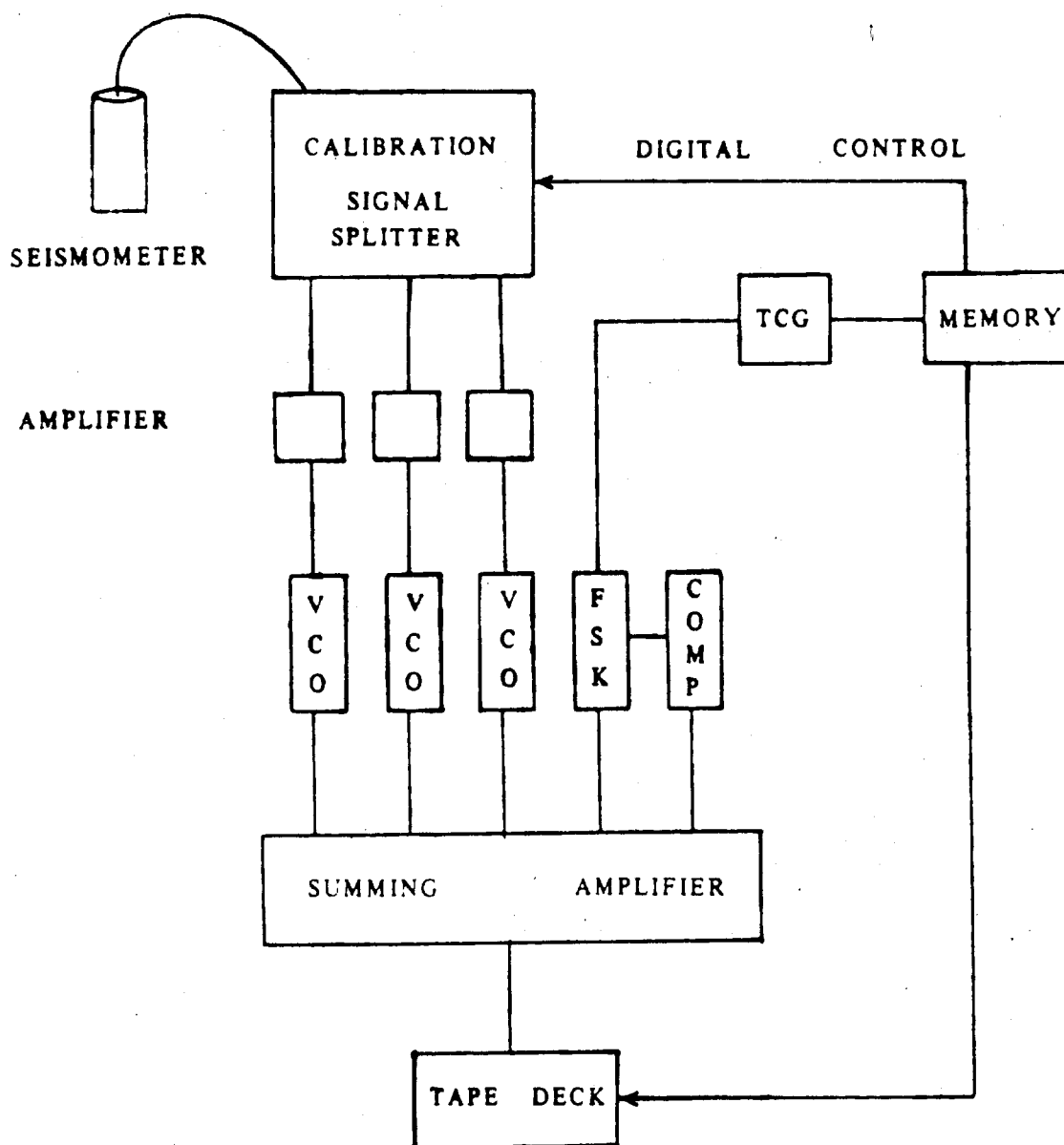
# Deployment 2

Location number	Latitude (deg,min,sec)	Longitude (deg,min,sec)	Elev (m)	Location number	Latitude (deg,min,sec)	Longitude (deg,min,sec)	Elev (m)	Location number	Latitude (deg,min,sec)	Longitude (deg,min,sec)	Elev (m)
301	40 34 56.7	119 27 25.0	1188	351	40 18 21.5	118 38 50.0	1636	401	40 7 10.5	118 6 50.0	1283
302	40 34 34.4	119 26 4.1	1188	352	40 17 53.0	118 37 59.3	1679	402	40 6 54.5	118 6 18.3	1258
303	40 32 47.1	119 20 15.9	1280	353	40 17 51.1	118 37 4.6	1615	403	40 6 46.8	118 5 49.2	1246
304	40 32 30.3	119 19 12.5	1353	354	40 17 5.9	118 34 28.9	1533	404	40 6 40.8	118 5 12.2	1240
305	40 32 9.0	119 18 5.0	1463	355	40 16 29.7	118 34 4.6	1475	405	40 6 34.3	118 4 35.3	1234
306	40 31 52.0	119 17 16.2	1584	356	40 16 35.9	118 33 41.7	1490	406	40 6 29.0	118 3 56.0	1234
307	40 31 27.9	119 16 26.9	1767	357	40 16 38.7	118 32 50.5	1469	407	40 6 22.7	118 3 19.7	1234
308	40 31 14.8	119 15 32.0	1828	358	40 16 16.3	118 31 30.4	1402	408	40 6 17.1	118 2 43.4	1234
309	40 30 47.5	119 14 49.6	1624	359	40 16 12.6	118 30 46.1	1356	409	40 6 11.5	118 2 7.2	1234
310	40 30 32.5	119 14 1.1	1548	360	40 15 47.5	118 30 24.4	1298	410	40 6 5.4	118 1 30.8	1237
311	40 30 8.4	119 12 43.4	1493	361	40 15 41.8	118 29 37.4	1274	411	40 6 0.5	118 0 55.3	1240
312	40 29 30.6	119 12 11.4	1469	362	40 15 44.5	118 29 17.3	1249	412	40 5 54.1	118 0 18.6	1246
313	40 29 19.5	119 11 15.9	1447	363	40 15 31.7	118 28 40.9	1231				
314	40 29 2.6	119 10 18.4	1432	364	40 15 33.8	118 28 26.8	1225				
315	40 28 49.6	119 9 23.1	1411	365	40 15 16.9	118 27 41.7	1222				
316	40 28 36.5	119 8 27.6	1402	366	40 15 16.6	118 26 59.4	1222				
317	40 28 20.4	119 7 21.6	1392	367	40 15 16.8	118 26 18.2	1222				
318	40 28 3.0	119 6 19.4	1383	368	40 15 17.3	118 25 38.6	1222				
319	40 27 57.5	119 5 28.7	1380	369	40 15 19.8	118 24 16.1	1225				
320	40 27 51.5	119 4 34.1	1379	370	40 15 13.5	118 23 46.4	1231				
321	40 27 45.3	119 3 36.7	1374	371	40 14 56.0	118 23 32.4	1231				
322	40 27 38.4	119 2 36.0	1371	372	40 14 34.0	118 23 2.0	1243				
323	40 27 14.5	119 1 51.7	1365	373	40 14 31.2	118 22 21.4	1255				
324	40 26 47.8	119 1 1.1	1356	374	40 14 25.0	118 21 29.0	1298				
325	40 26 21.4	119 0 10.3	1322	375	40 14 12.6	118 20 55.2	1328				
326	40 25 49.0	118 59 26.4	1356	376	40 13 58.9	118 20 17.6	1371				
327	40 25 17.3	118 58 40.3	1365	377	40 13 43.1	118 19 46.6	1402				
328	40 24 55.3	118 57 52.3	1350	378	40 13 32.4	118 19 14.5	1463				
329	40 24 53.0	118 56 49.4	1322	379	40 13 22.3	118 18 30.6	1463				
330	40 24 59.1	118 55 54.3	1301	380	40 13 8.5	118 17 49.7	1493				
331	40 24 42.4	118 54 59.9	1274	381	40 12 52.0	118 17 26.7	1524				
332	40 24 32.5	118 54 37.0	1267	382	40 12 35.5	118 16 59.9	1524				
333	40 24 25.1	118 54 0.7	1274	383	40 12 25.4	118 16 24.0	1554				
334	40 24 2.2	118 53 18.7	1267	384	40 12 0.3	118 15 54.4	1524				
335	40 23 39.5	118 52 2.7	1325	385	40 11 54.0	118 15 19.5	1463				
336	40 23 45.0	118 50 55.3	1429	386	40 11 44.4	118 14 44.8	1493				
337	40 23 9.6	118 50 15.3	1648	387	40 11 33.6	118 14 9.6	1402				
338	40 22 26.0	118 49 30.3	1371	388	40 11 18.4	118 13 36.8	1374				
339	40 22 12.2	118 48 16.6	1286	389	40 11 9.7	118 12 47.5	1399				
340	40 21 42.6	118 47 11.5	1307	390	40 11 4.7	118 12 13.2	1444				
341	40 21 1.7	118 47 2.4	1316	391	40 10 55.6	118 11 40.1	1499				
342	40 20 23.6	118 47 11.0	1319	392	40 10 37.8	118 11 6.3	1536				
343	40 20 2.9	118 46 8.4	1386	393	40 10 7.0	118 10 50.4	1615				
344	40 20 38.1	118 44 7.0	1423	394	40 9 33.8	118 10 24.6	1536				
345	40 20 24.0	118 43 21.0	1432	395	40 9 9.5	118 10 19.4	1463				
346	40 20 8.9	118 42 21.6	1524	396	40 8 52.4	118 9 50.1	1463				
347	40 19 45.1	118 41 33.6	1527	397	40 8 31.6	118 9 4.0	1402				
348	40 19 11.1	118 40 20.1	1563	398	40 8 17.5	118 8 31.9	1365				
349	40 18 39.3	118 39 36.6	1600	399	40 7 58.1	118 8 3.1	1344				
350	40 18 10.3	118 38 56.5	1603	400	40 7 26.1	118 7 21.6	1306				

# Deployment 3

Location number	Latitude (deg,min,sec)	Longitude (deg,min,sec)	Elev (m)	Location number	Latitude (deg,min,sec)	Longitude (deg,min,sec)	Elev (m)	Location number	Latitude (deg,min,sec)	Longitude (deg,min,sec)	Elev (m)
501	40 5 41.3	117 59 17.1	1264	551	39 52 15.0	117 30 17.5	1478	601	39 33 36.1	116 48 31.2	2145
502	40 5 24.4	117 58 17.6	1295	552	39 51 42.8	117 30 0.4	1493	602	39 33 13.9	116 46 56.0	2682
503	40 5 10.1	117 57 4.6	1341	553	39 51 5.9	117 29 19.3	1591	603	39 33 24.0	116 46 4.5	2700
504	40 5 17.0	117 55 55.7	1402	554	39 50 54.3	117 28 18.7	1554	604	39 33 24.2	116 45 20.0	2468
505	40 5 15.2	117 55 12.3	1450	555	39 50 56.8	117 27 27.7	1615	605	39 33 15.9	116 43 54.9	2651
506	40 4 18.0	117 54 23.1	1554	556	39 50 36.7	117 26 55.8	1615	606	39 32 58.9	116 43 9.8	2255
507	40 3 55.8	117 53 32.2	1615	557	39 50 20.1	117 25 58.5	1609	607	39 32 8.6	116 42 29.9	2072
508	40 4 43.7	117 52 33.0	1584	558	39 50 0.1	117 25 9.3	1597	608	39 31 33.2	116 41 57.6	1978
509	40 4 39.5	117 51 36.3	1706	559	39 49 42.6	117 24 12.4	1597	609	39 31 33.2	116 40 40.8	1938
510	40 4 23.3	117 50 49.9	1783	560	39 49 25.1	117 23 21.2	1601	610	39 30 42.1	116 39 58.1	1914
511	40 4 26.1	117 50 7.5	1859	561	39 49 3.3	117 22 37.9	1612	611	39 30 31.8	116 38 57.9	1908
512	40 4 27.8	117 49 18.4	1859	562	39 48 19.6	117 21 58.1	1615	612	39 30 35.8	116 37 53.1	1905
513	40 4 40.0	117 48 39.0	1584	563	39 47 43.8	117 21 33.6	1639	613	39 30 44.4	116 37 10.3	1901
514	40 4 33.2	117 47 57.7	1264	564	39 47 24.2	117 20 39.9	1658	614	39 29 50.1	116 35 53.6	1901
515	40 4 5.0	117 47 34.8	1146	565	39 47 19.5	117 19 42.2	1682	615	39 29 19.2	116 35 37.1	1914
516	40 3 11.1	117 47 23.8	1078	566	39 47 11.7	117 18 22.2	1752	616	39 29 7.3	116 34 26.9	1914
517	40 2 49.5	117 47 7.1	1069	567	39 46 51.4	117 16 49.0	1874	617	39 28 10.8	116 33 36.6	1932
518	40 2 24.3	117 46 42.8	1071	568	39 46 17.4	117 15 49.2	1700	618	39 28 10.6	116 32 35.7	1932
519	40 2 1.1	117 46 20.7	1069	569	39 45 54.0	117 14 47.4	2072	619	39 28 43.3	116 29 14.2	1944 *
520	40 1 33.7	117 45 59.3	1071	570	39 45 23.3	117 14 13.7	1920	620	39 28 43.3	116 27 16.1	1984 *
521	40 1 11.2	117 45 34.2	1071	571	39 45 13.1	117 12 35.9	1773	621	39 27 53.5	116 25 1.7	1950 *
522	40 0 48.6	117 44 9.7	1071	572	39 44 48.2	117 11 33.6	1728	622	39 27 20.9	116 23 45.0	1950 *
523	40 0 24.8	117 44 43.7	1071	573	39 44 12.1	117 11 0.2	1667	623	39 27 41.8	116 21 28.7	1914 *
524	40 0 2.0	117 44 23.1	1071	574	39 43 37.5	117 10 37.4	1673	624	39 25 50.8	116 20 25.3	1914 *
525	39 59 39.0	117 43 44.6	1078	575	39 42 59.6	117 10 5.1	1694				
526	39 59 10.2	117 43 30.9	1085	576	39 42 44.1	117 9 25.4	1709				
527	39 58 45.0	117 43 11.3	1097	577	39 42 25.8	117 8 35.4	1733				
528	39 57 37.5	117 43 6.2	1115	578	39 42 6.8	117 7 26.9	1804				
529	39 57 19.4	117 42 33.5	1127	579	39 41 53.9	117 6 29.4	1828				
530	39 57 5.9	117 42 3.0	1133	580	39 41 35.5	117 5 29.2	1862				
531	39 56 20.9	117 41 14.0	1158	581	39 41 18.5	117 4 32.2	1898				
532	39 56 9.0	117 40 48.5	1158	582	39 40 45.7	117 3 47.8	1920				
533	39 55 56.4	117 40 21.6	1170	583	39 40 27.9	117 2 59.2	1944				
534	39 55 43.1	117 39 55.6	1176	584	39 40 13.1	117 2 7.2	1981				
535	39 55 40.1	117 39 5.8	1219	585	39 39 47.3	117 1 3.1	2039				
536	39 55 31.2	117 38 40.5	1219	586	39 39 12.2	117 0 30.7	2075				
537	39 55 19.9	117 38 6.5	1219	587	39 39 15.5	116 59 55.1	2133				
538	39 55 2.5	117 37 33.0	1231	588	39 38 35.5	116 59 7.4	2438				
539	39 54 53.8	117 36 55.1	1234	589	39 38 21.3	116 57 39.2	2560				
540	39 54 38.8	117 36 16.7	1249	590	39 37 26.4	116 57 13.1	2499				
541	39 54 14.7	117 35 47.9	1280	591	39 36 43.7	116 56 20.5	2438				
542	39 54 1.7	117 35 24.2	1280	592	39 36 40.2	116 55 26.9	2255				
543	39 53 53.9	117 34 48.3	1295	593	39 36 29.5	116 54 28.9	2090				
544	39 53 44.3	117 34 10.9	1304	594	39 36 23.8	116 54 7.5	2103				
545	39 53 30.8	117 33 37.3	1328	595	39 35 54.4	116 53 43.8	2011				
546	39 53 17.1	117 33 4.8	1341	596	39 35 34.1	116 52 57.3	1981				
547	39 52 52.1	117 32 35.0	1356	597	39 35 5.5	116 52 0.0	1856				
548	39 52 37.9	117 32 5.3	1386	598	39 35 31.3	116 50 37.1	2026				
549	39 52 34.5	117 31 32.8	1402	599	39 35 8.8	116 49 35.8	2005				
550	39 52 34.5	117 30 43.2	1463	600	39 34 13.0	116 49 13.0	2042				

\* Sites not occupied by the USGS



COMP = COMPENSATION  
 FSK = FREQUENCY SHIFT KEYING  
 TCG = TIME CODE GENERATOR  
 VCO = VOLTAGE-CONTROLLED OSCILLATOR

Figure 2. Schematic diagram of the seismic cassette recorders.

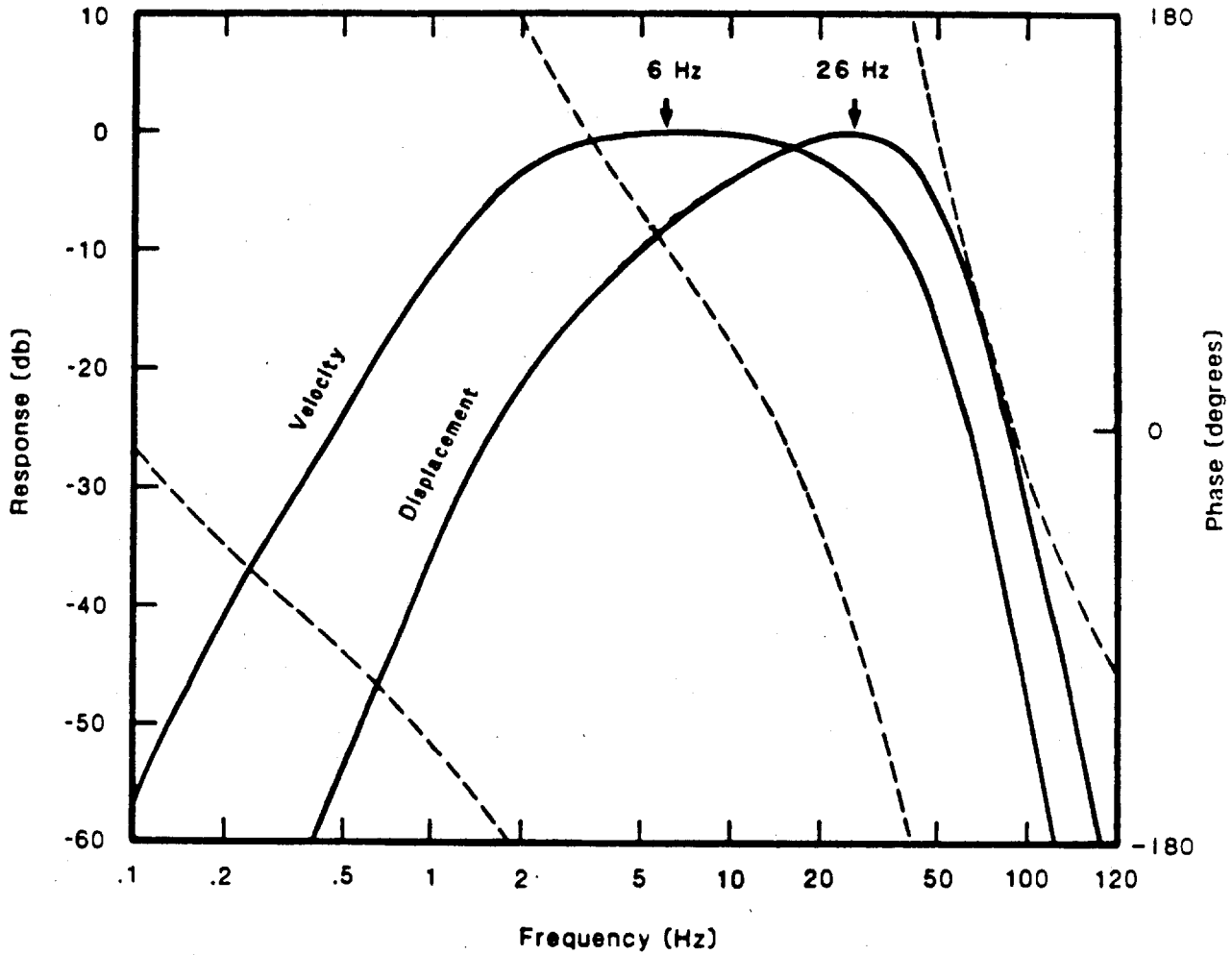
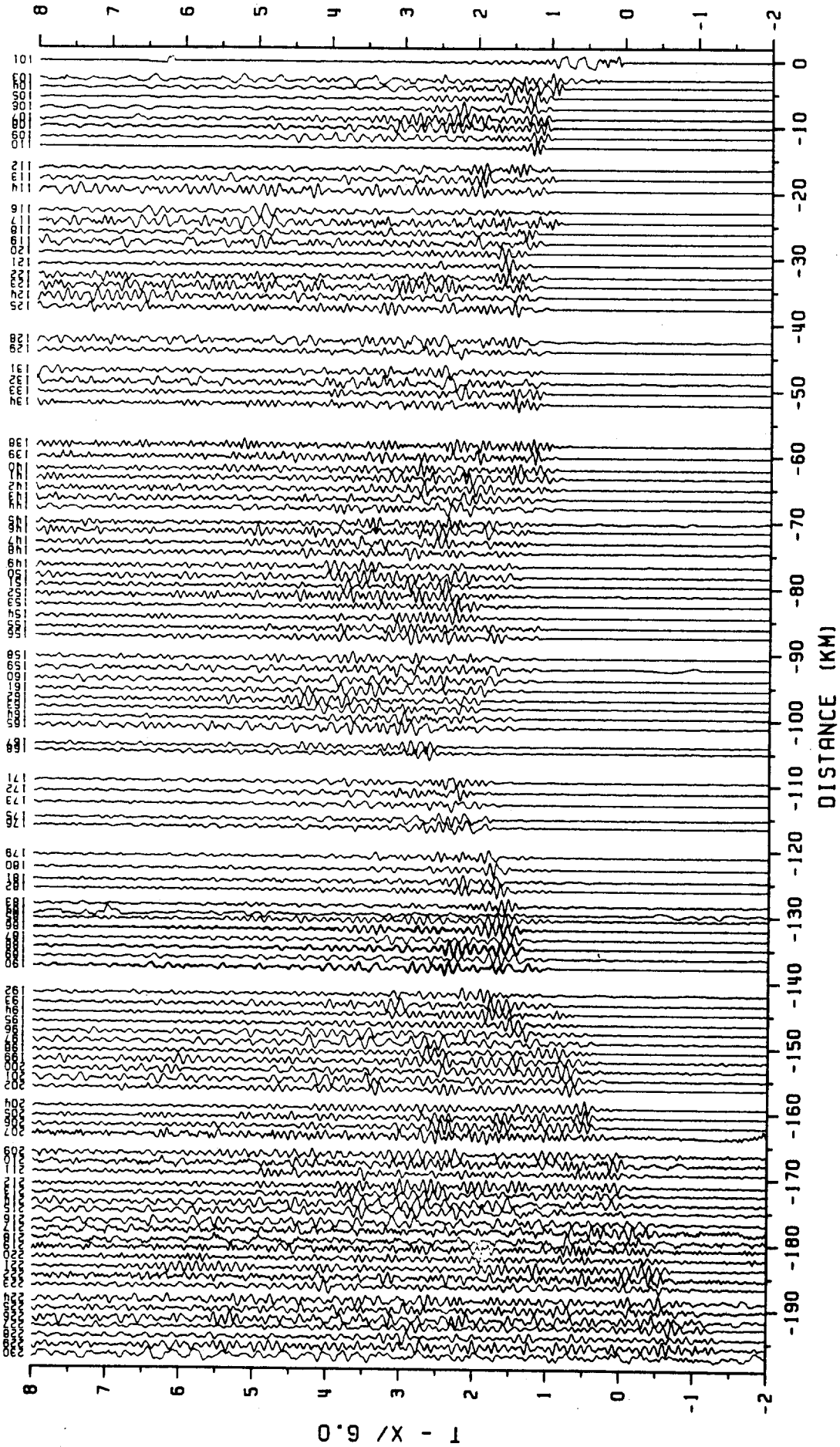


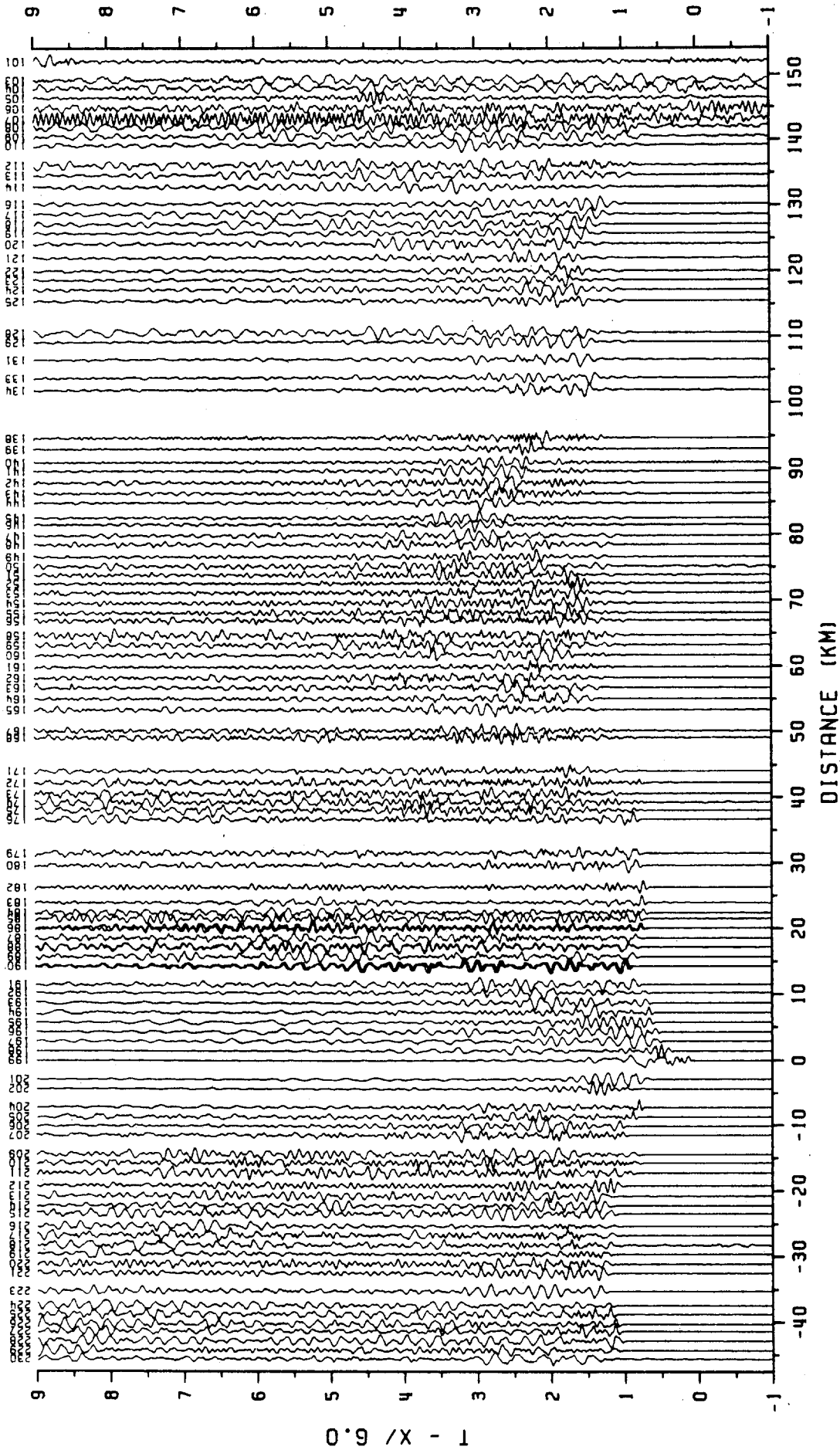
Figure 3. Theoretical transfer-function curves for the USGS seismic cassette recorders. Solid line: displacement and velocity normalized amplitude; dashed line: phase (displacement). Maximum velocity response is at 6 Hz; maximum displacement response is at 26 hz (after Dawson and Stauber, 1986).





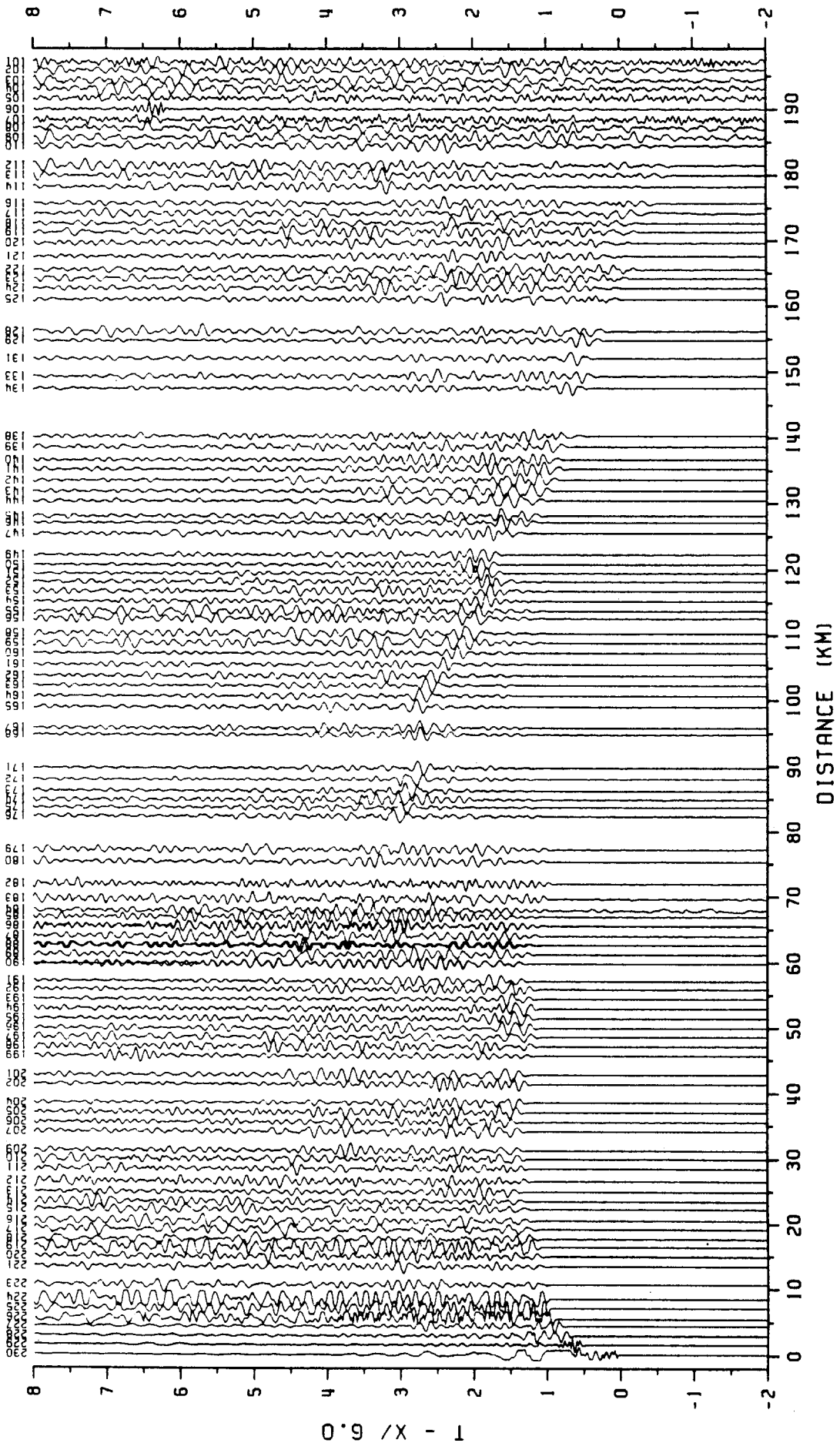
Shot 1, Shotpoint 8

Figure 4: Record Section from Deployment 1



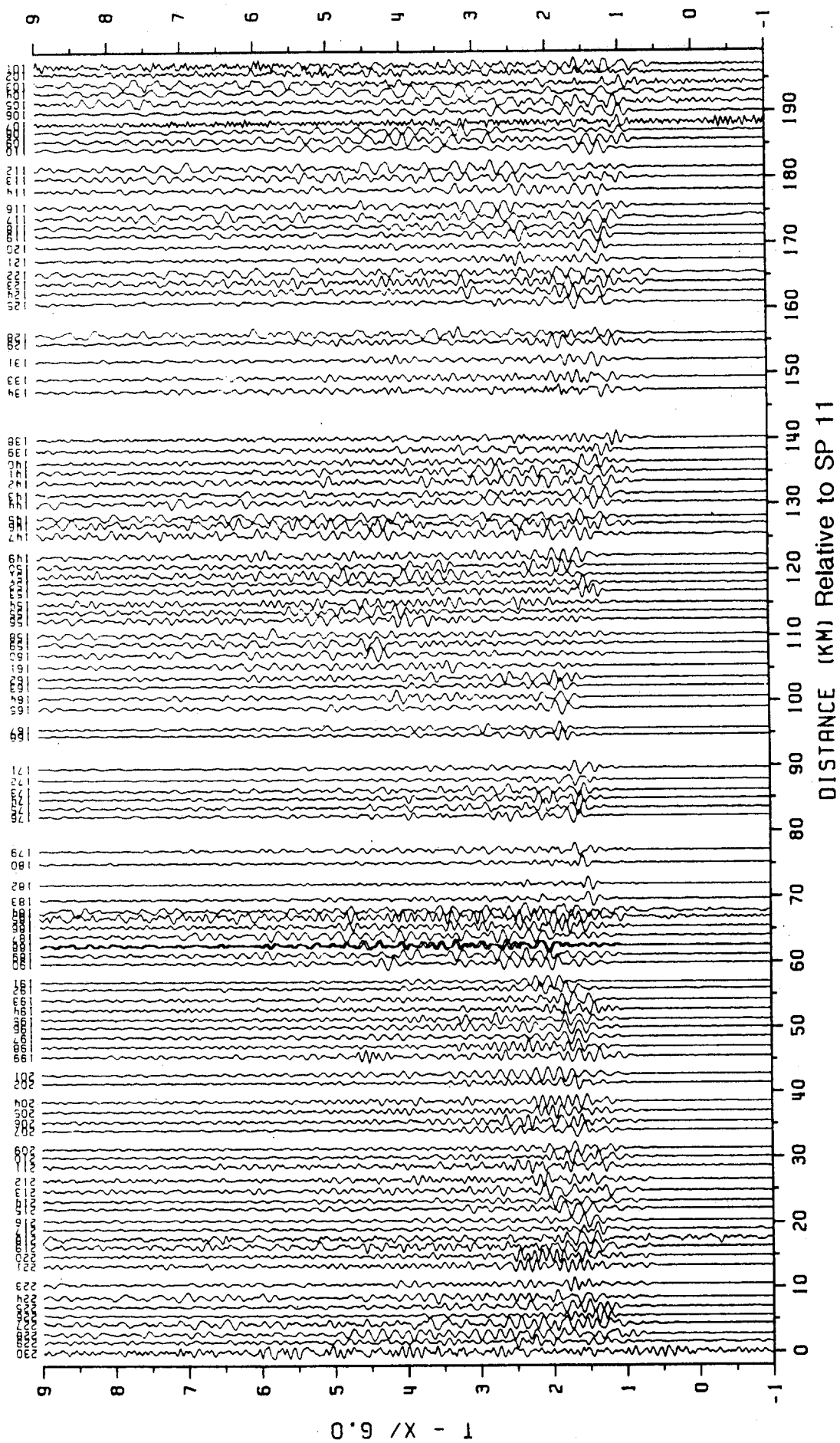
Shot 2, Shotpoint 10

Figure 5: Record Section from Deployment 1



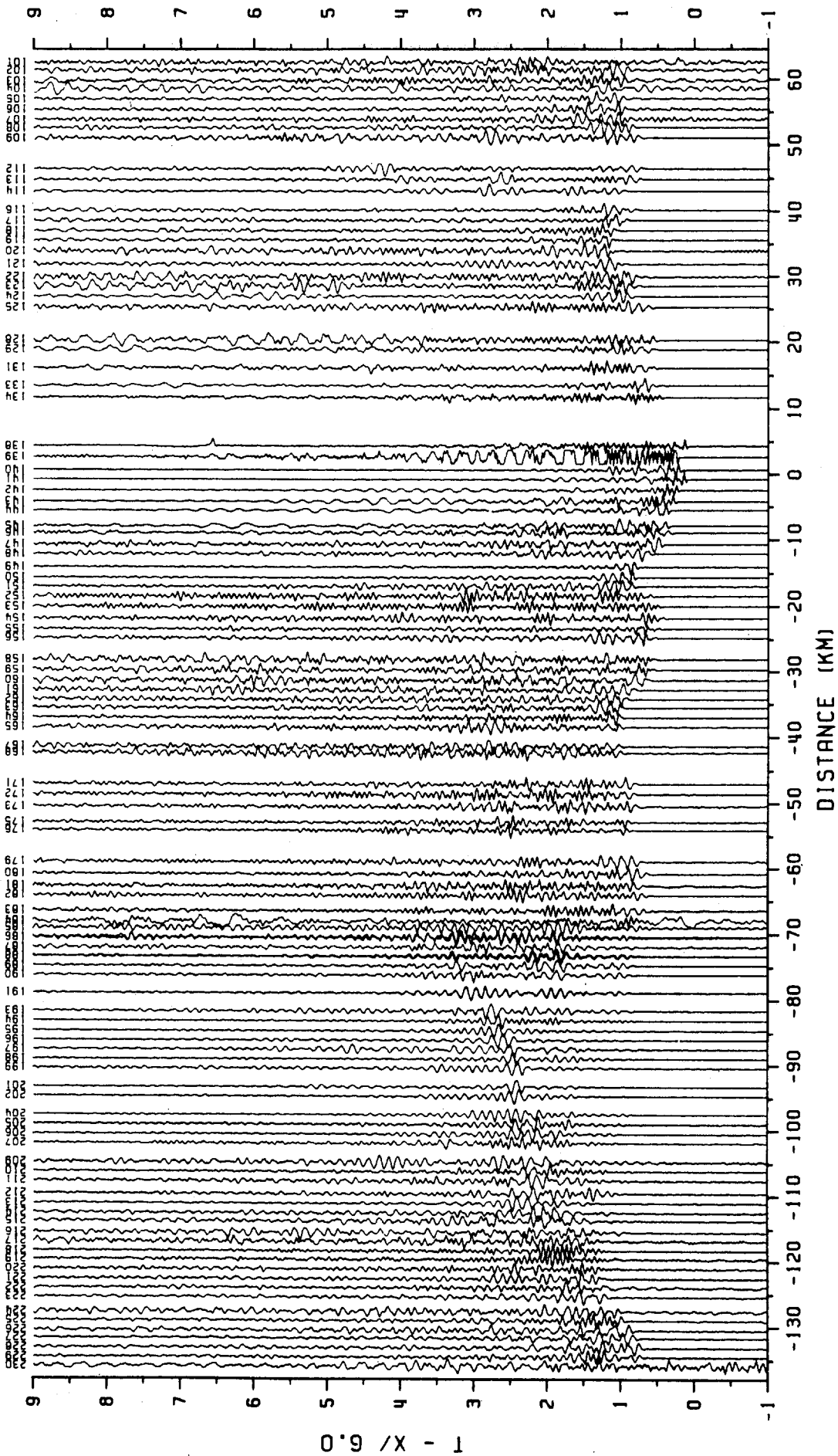
Shot 3, Shotpoint 11

Figure 6: Record Section from Deployment 1



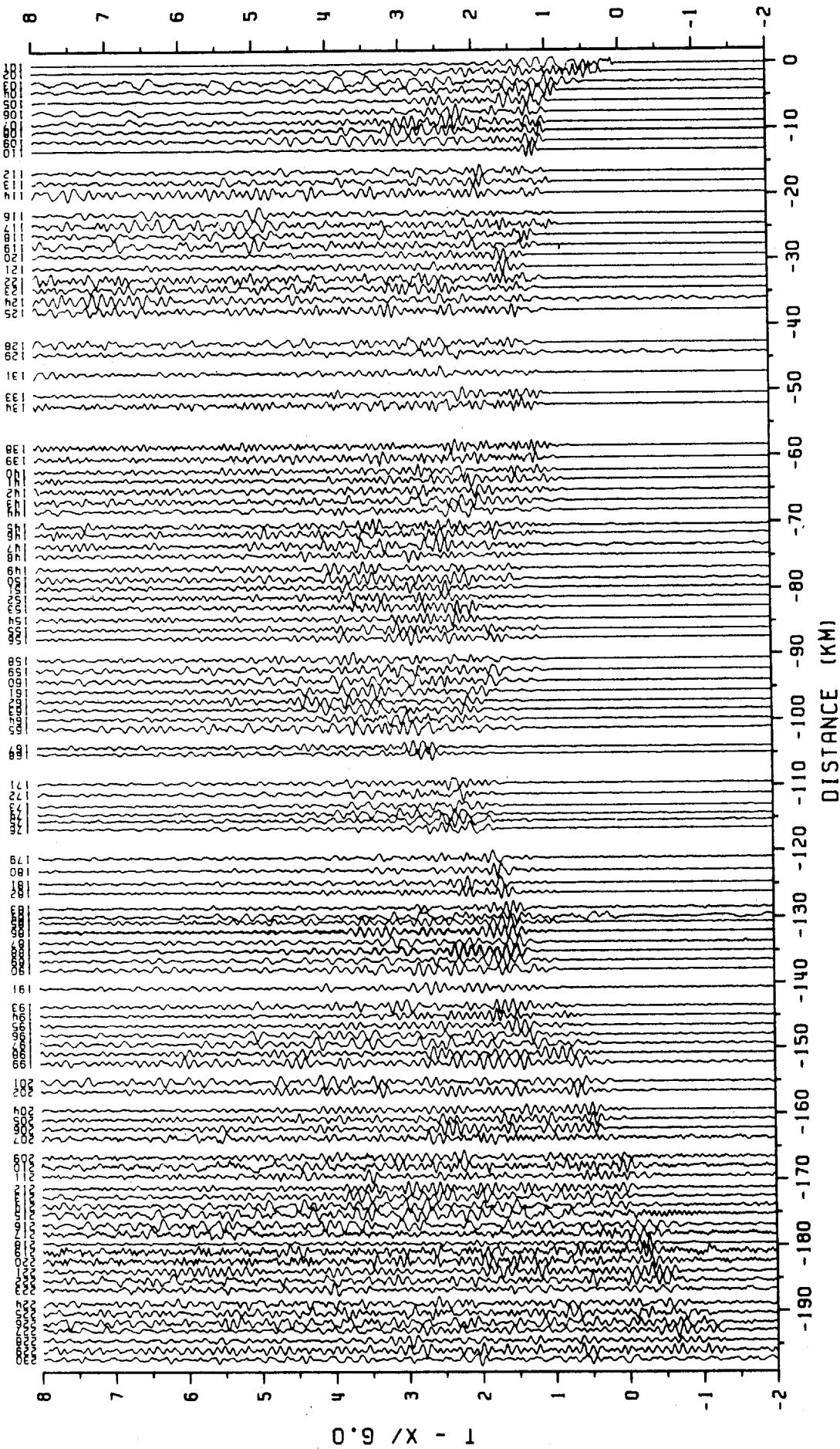
Shot 4, Shotpoint 1 (Fan Shot)

Figure 7: Record Section from Deployment 1



Shot 5, Shotpoint 9

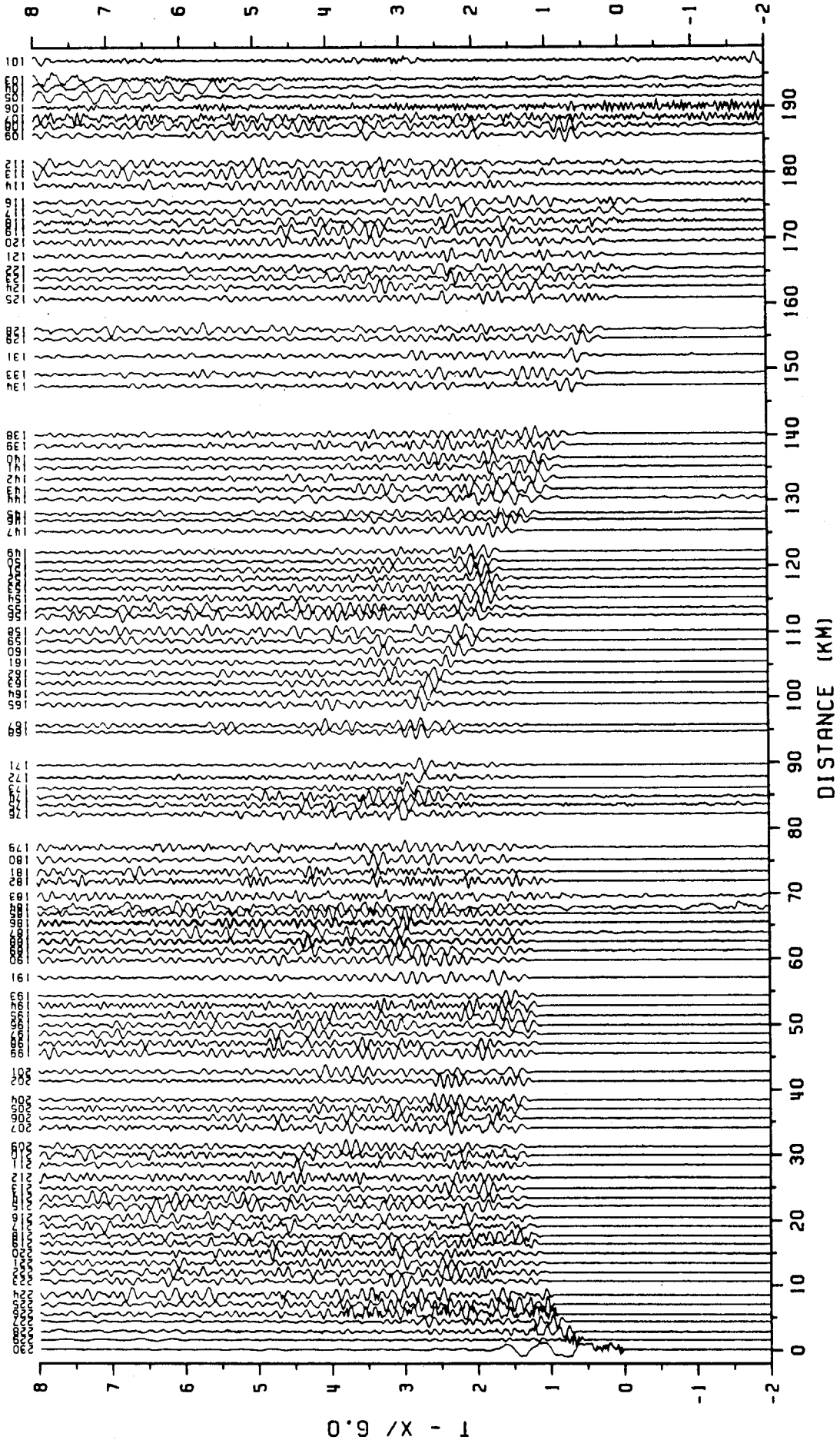
Figure 8: Record Section from Deployment 1



Shot 6, Shotpoint 8

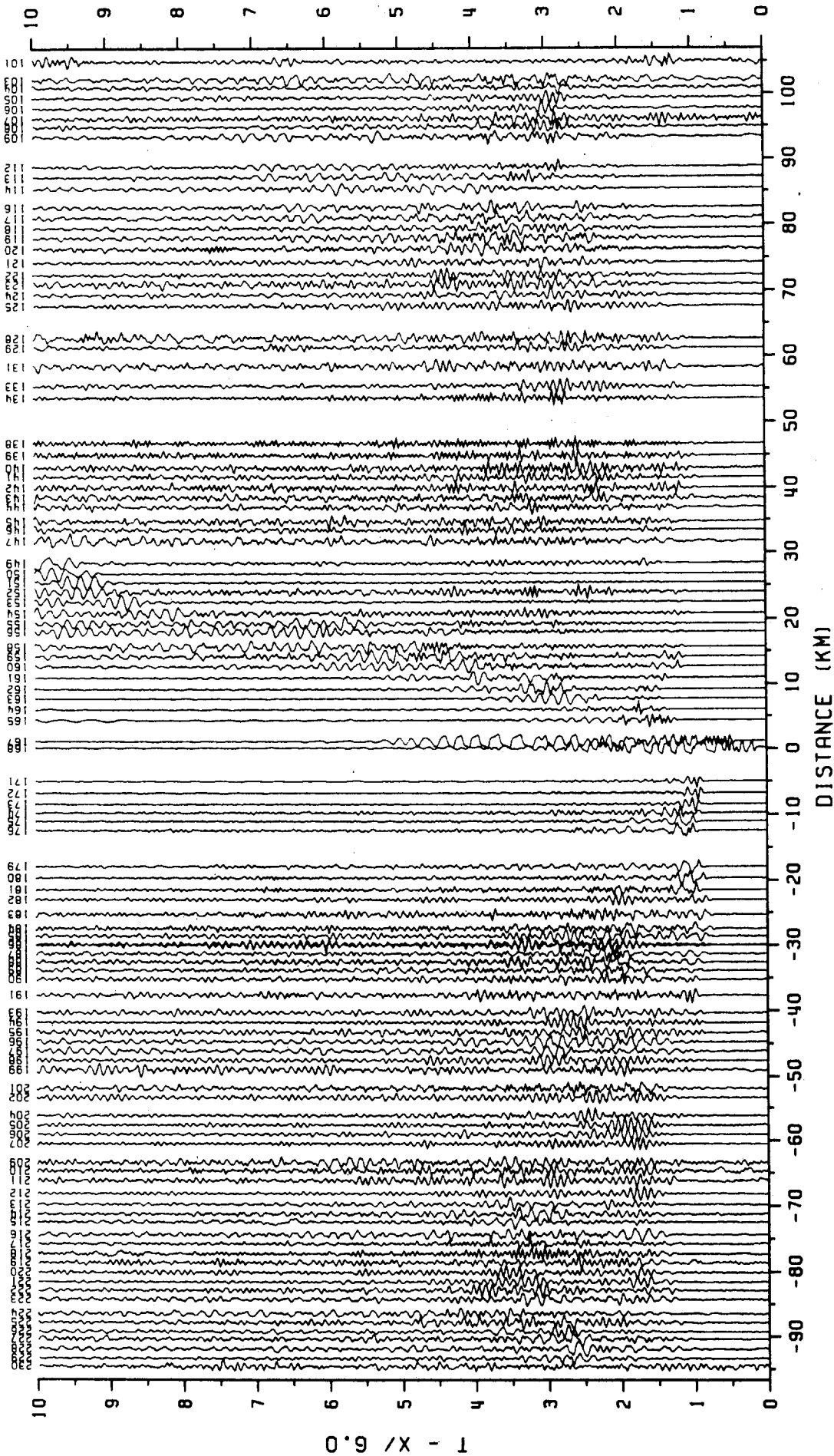
Figure 9: Record Section from Deployment 1

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Shot 7, Shotpoint 11

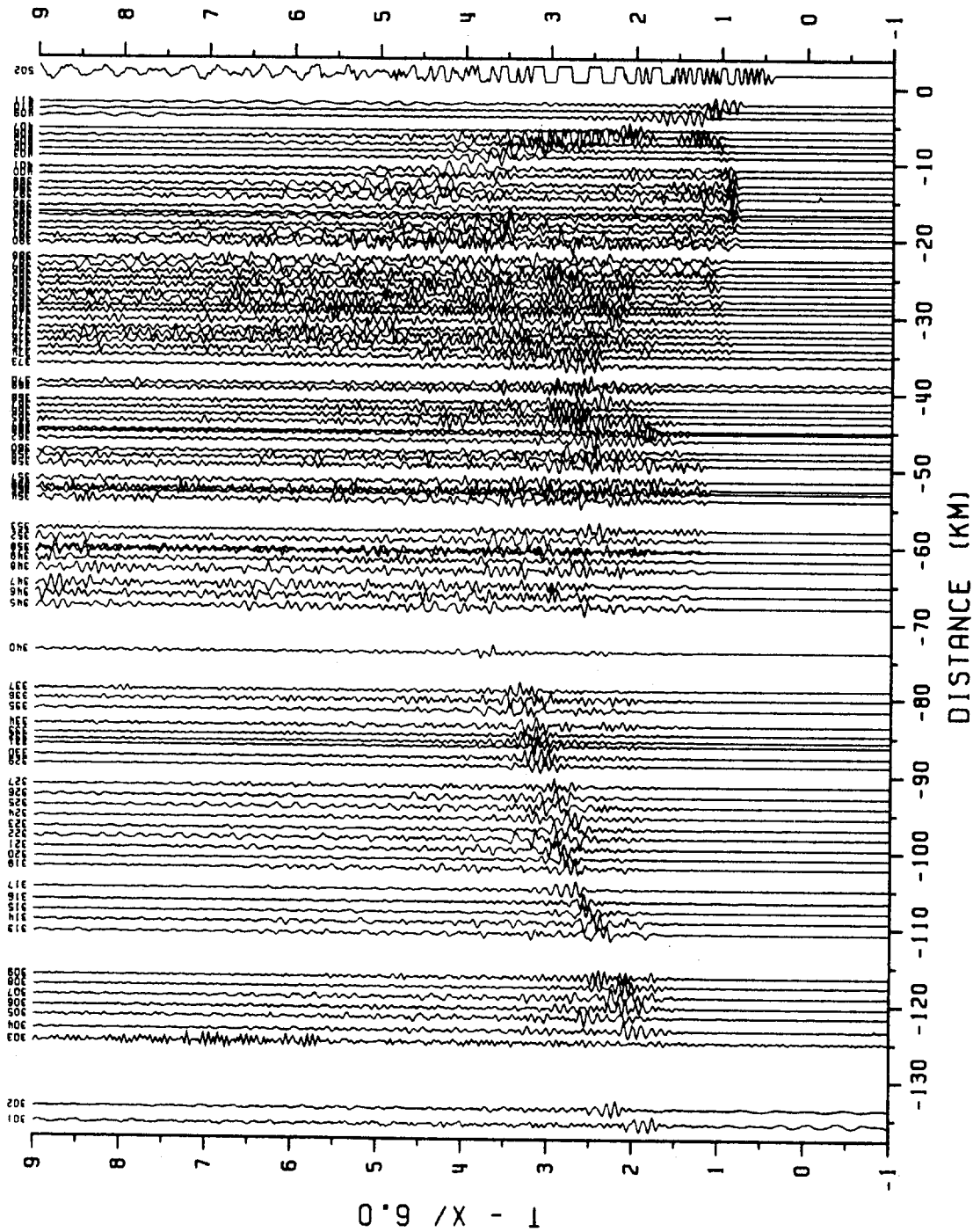
Figure 10: Record Section from Deployment 1



Shot 8, Shotpoint 4

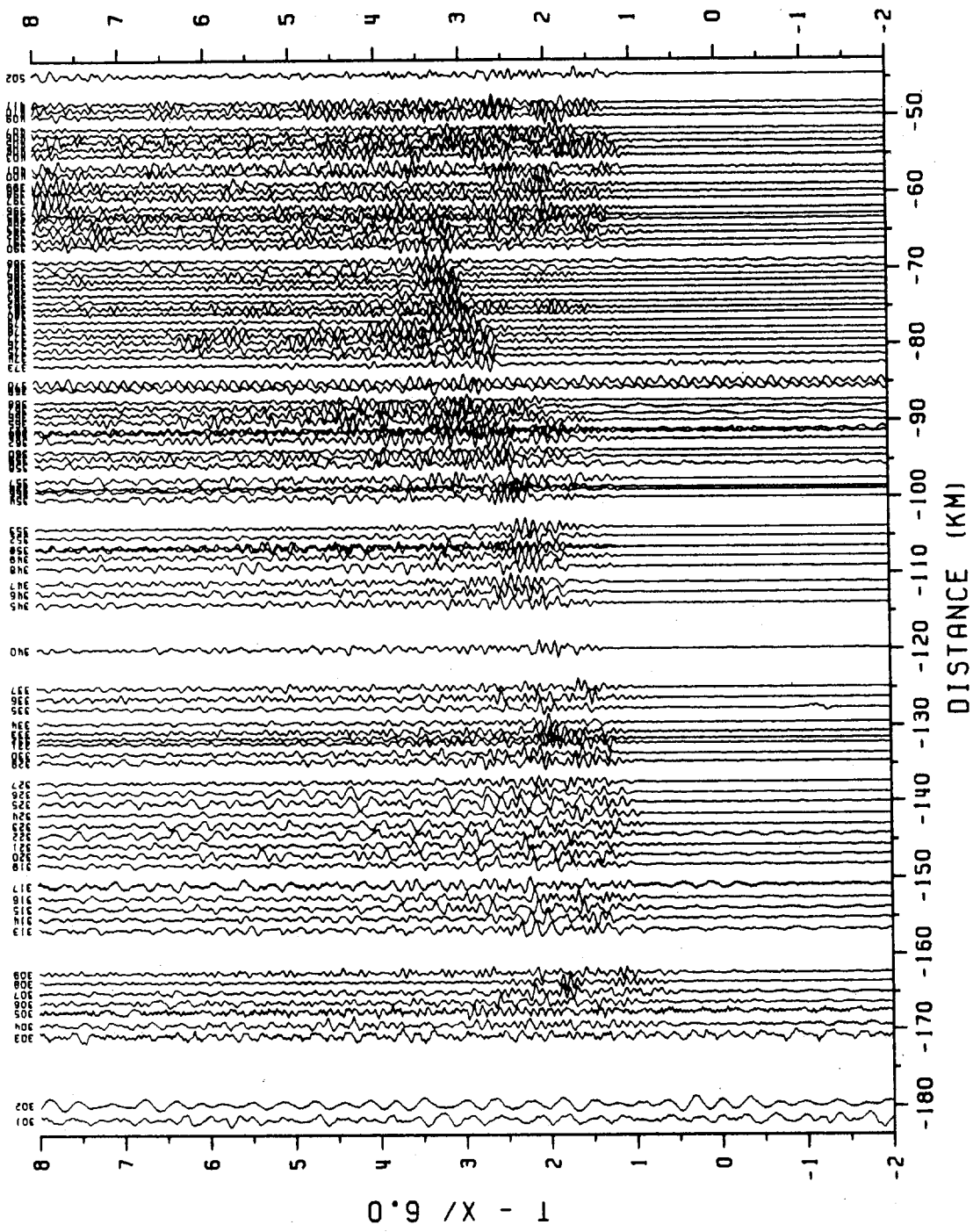
Figure 11: Record Section from Deployment 1





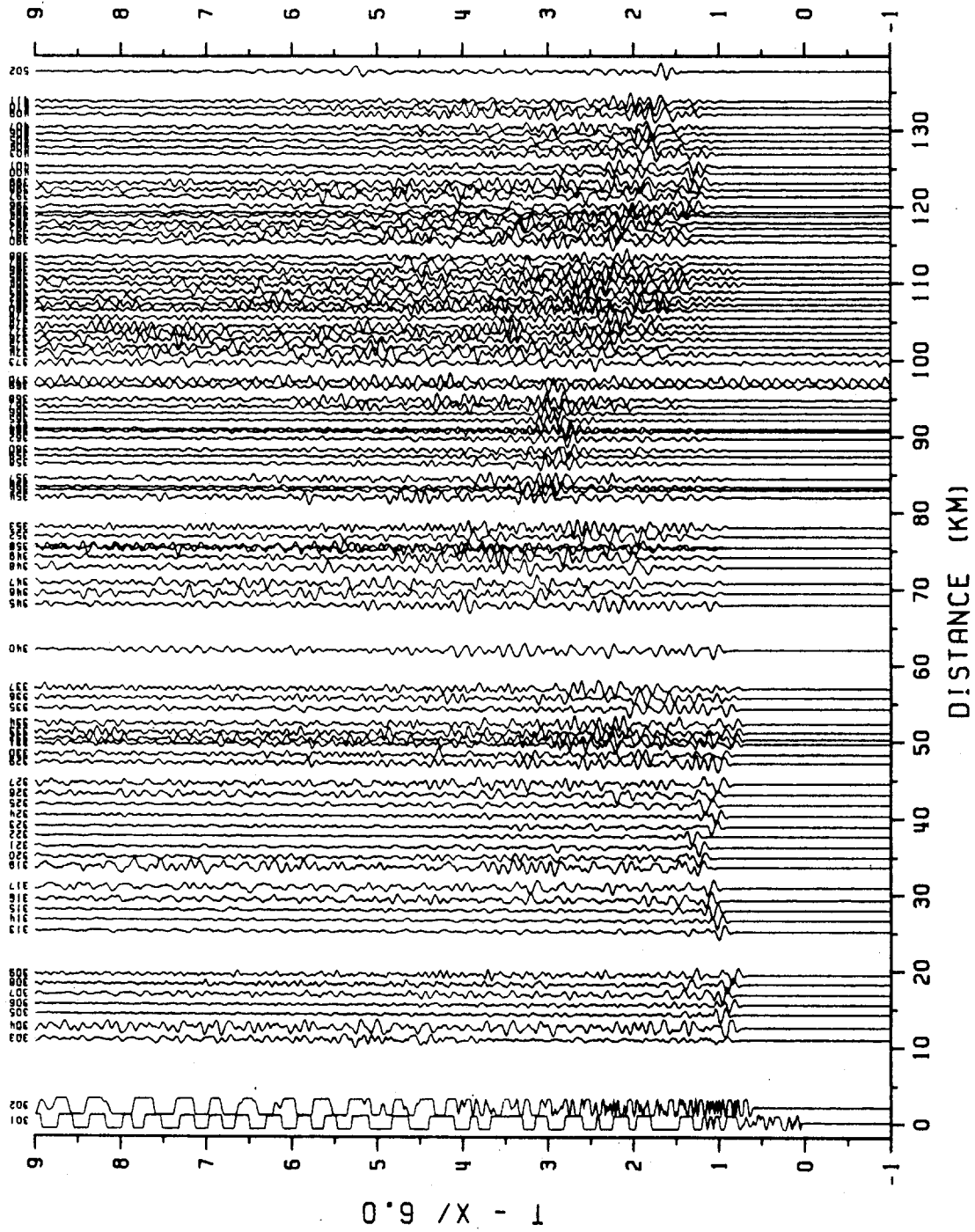
Shot 9, Shotpoint 4

Figure 12: Record Section from Deployment 2



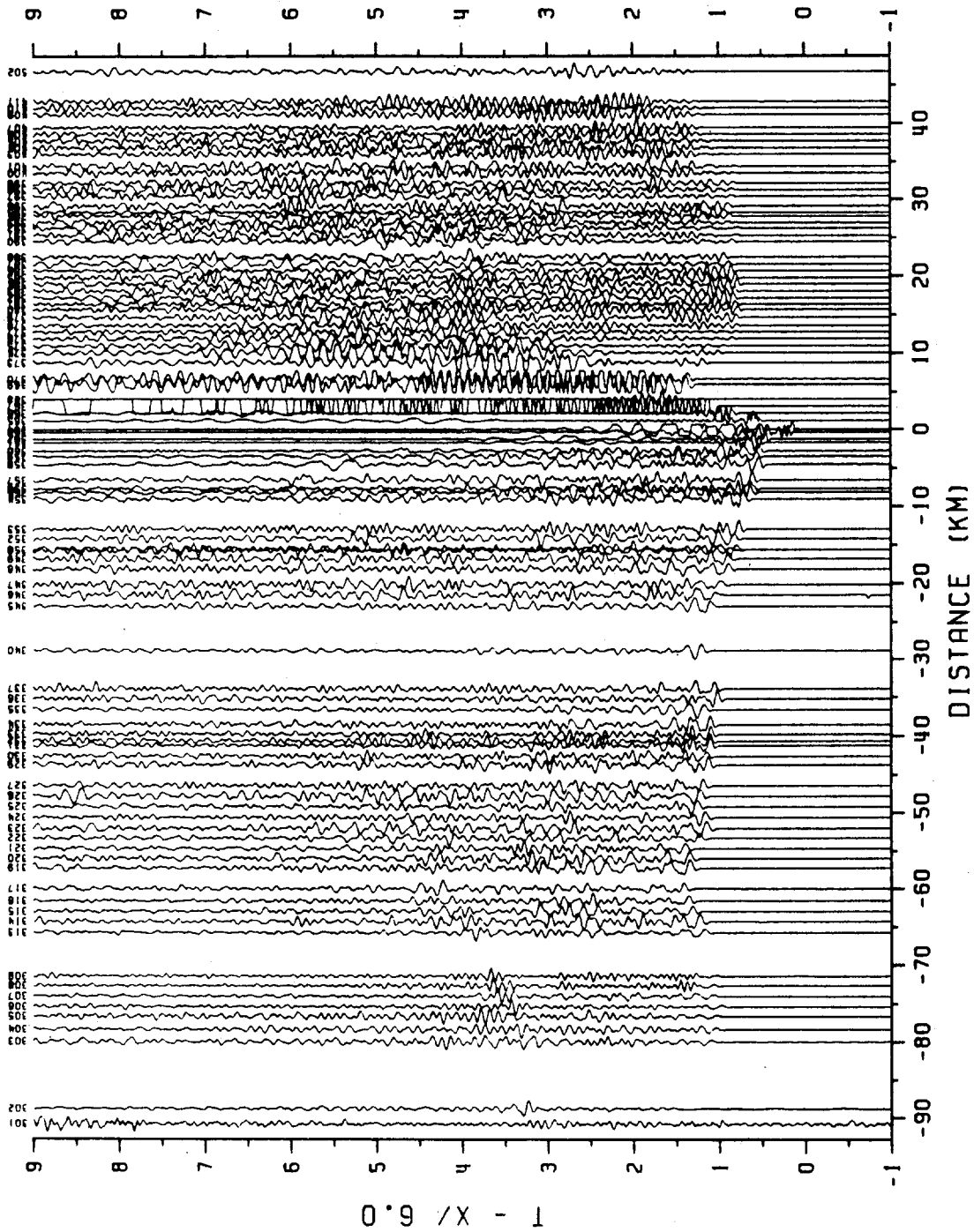
Shot 10, Shotpoint 5 (Offset Shot)

Figure 13: Record Section from Deployment 2



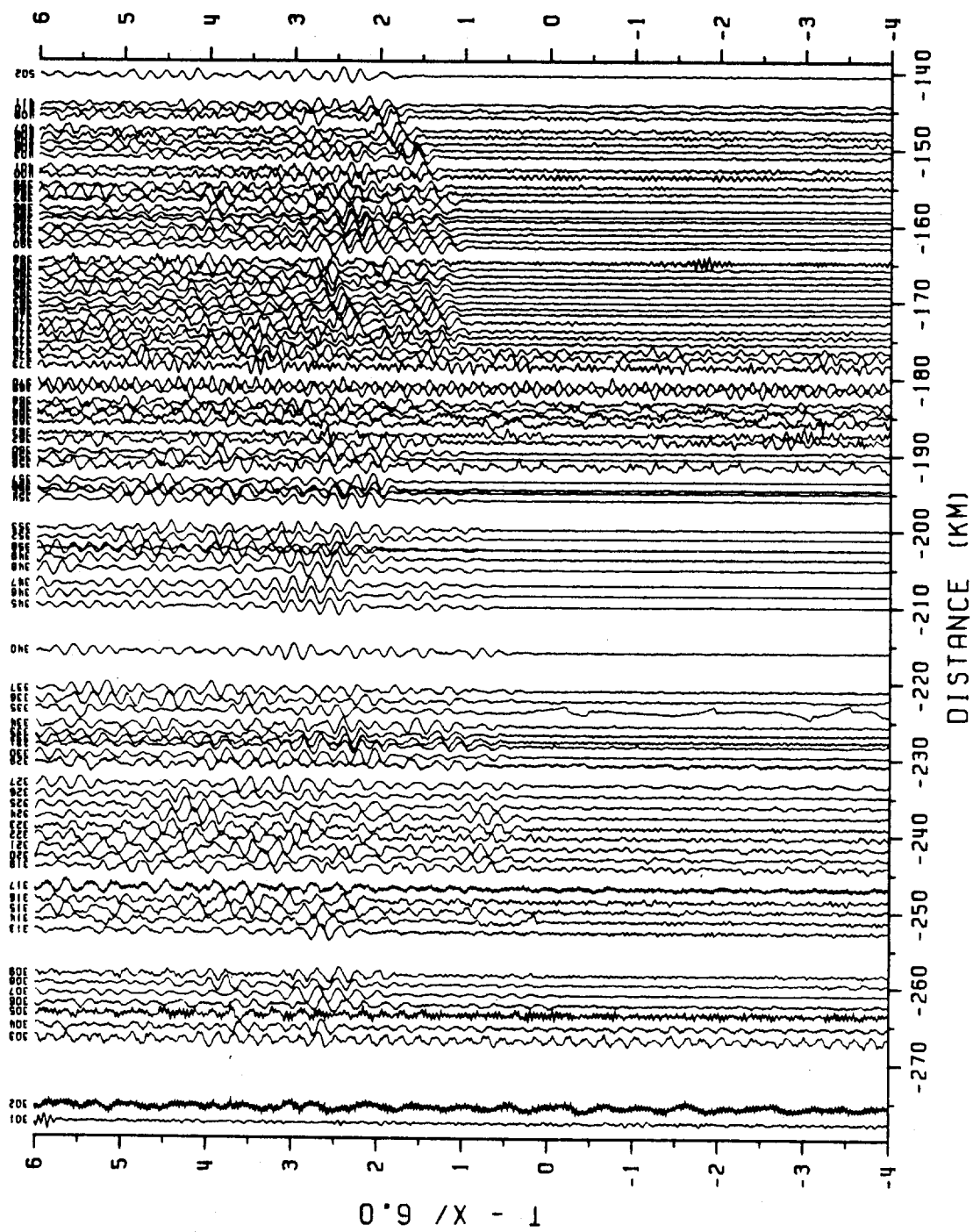
Shot 11, Shotpoint 1

Figure 14: Record Section from Deployment 2



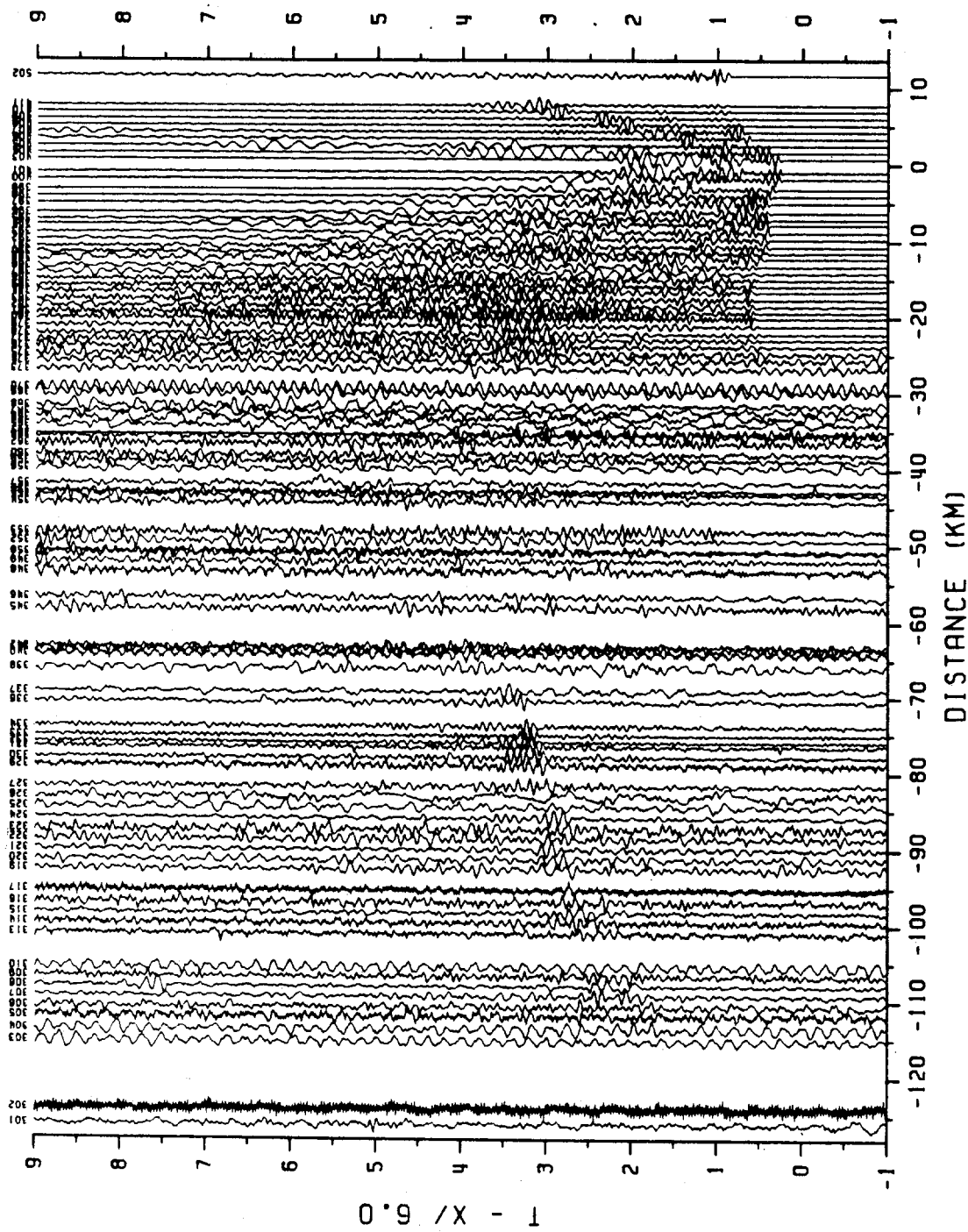
Shot 12, Shotpoint 3

Figure 15: Record Section from Deployment 2



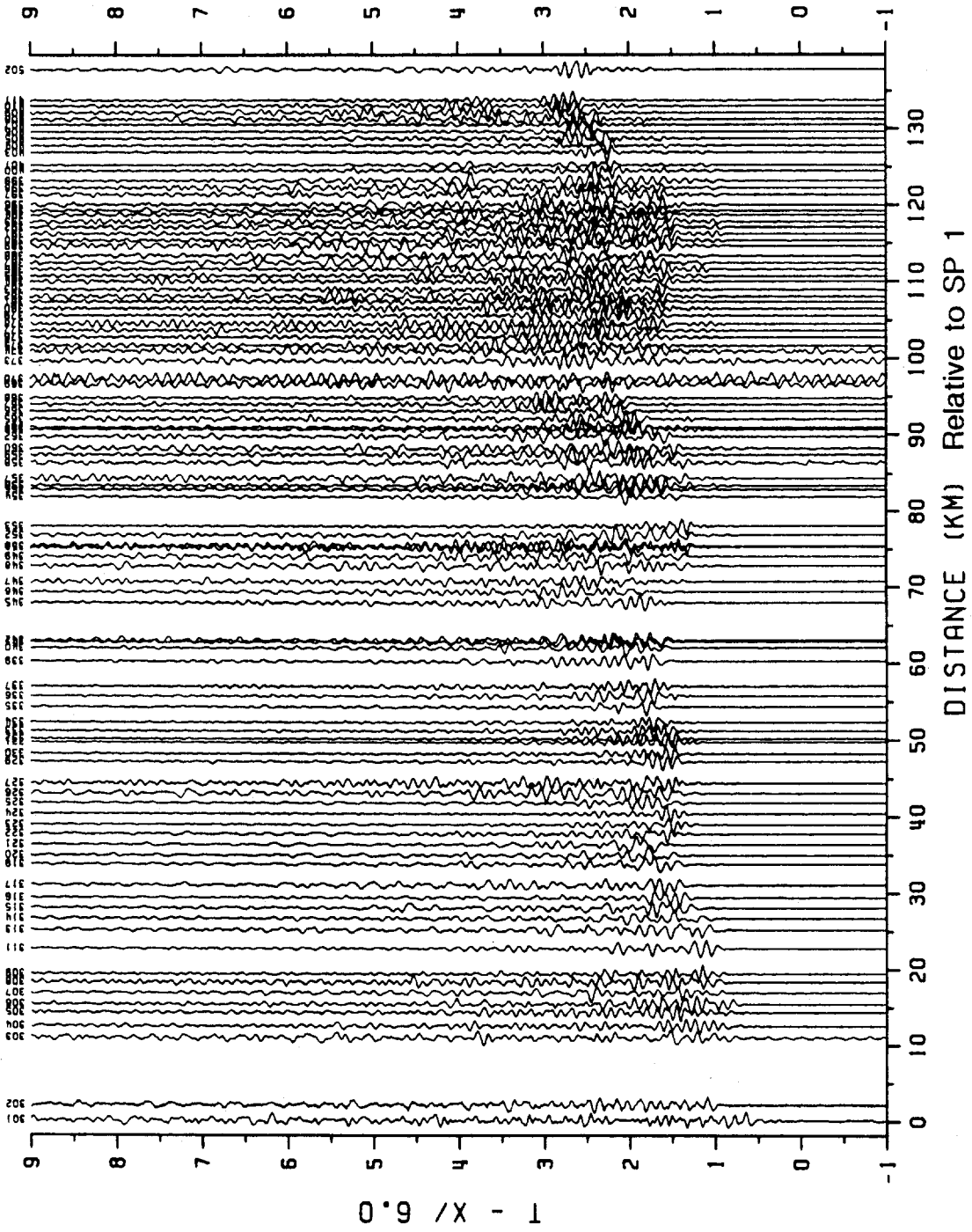
Shot 13, Shotpoint 7 (Offset Shot)

Figure 16: Record Section from Deployment 2



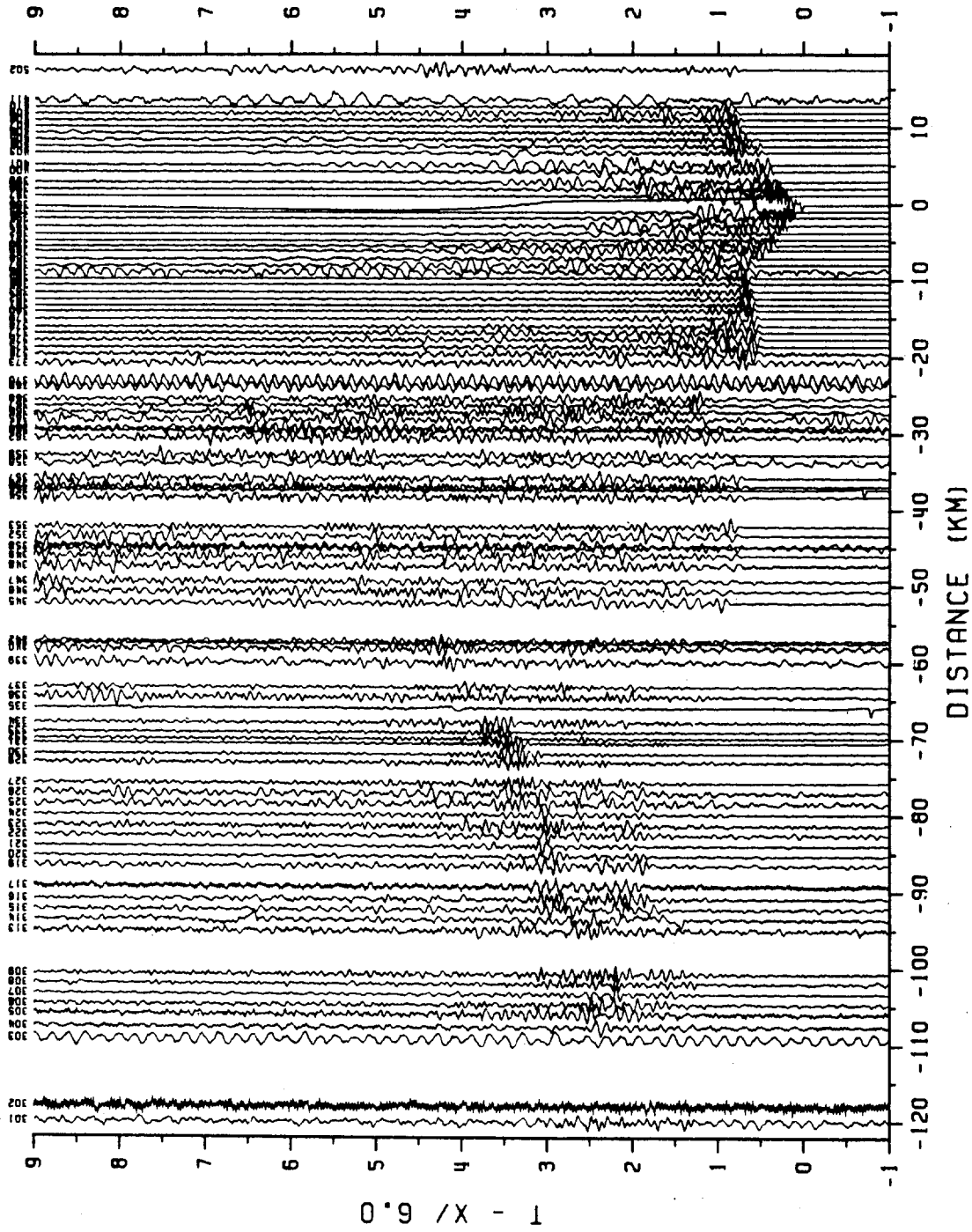
Shot 14, Shotpoint 12

Figure 17: Record Section from Deployment 2



Shot 15, Shotpoint 8 (Fan Shot)

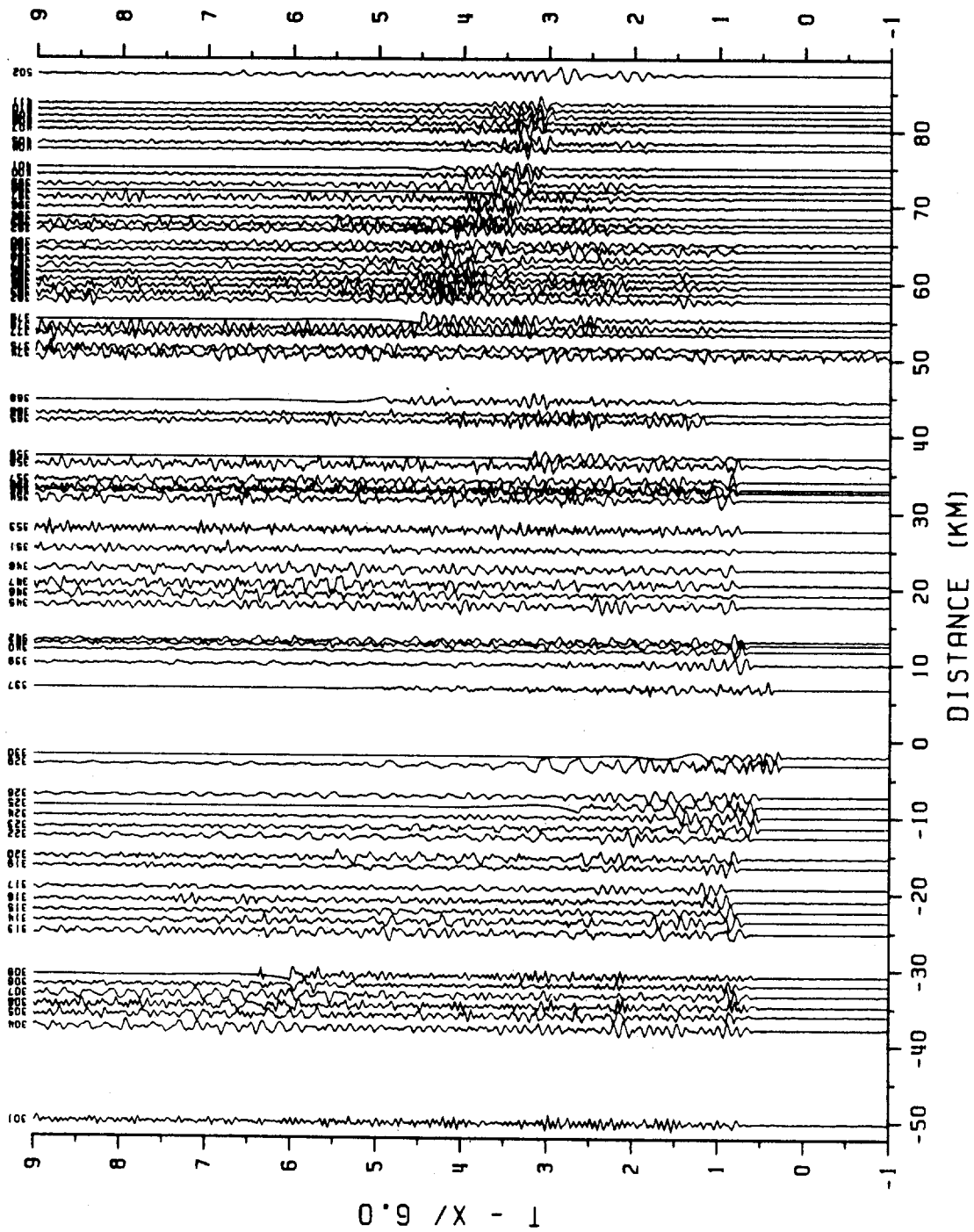
Figure 18: Record Section from Deployment 2



Shot 16, Shotpoint 13

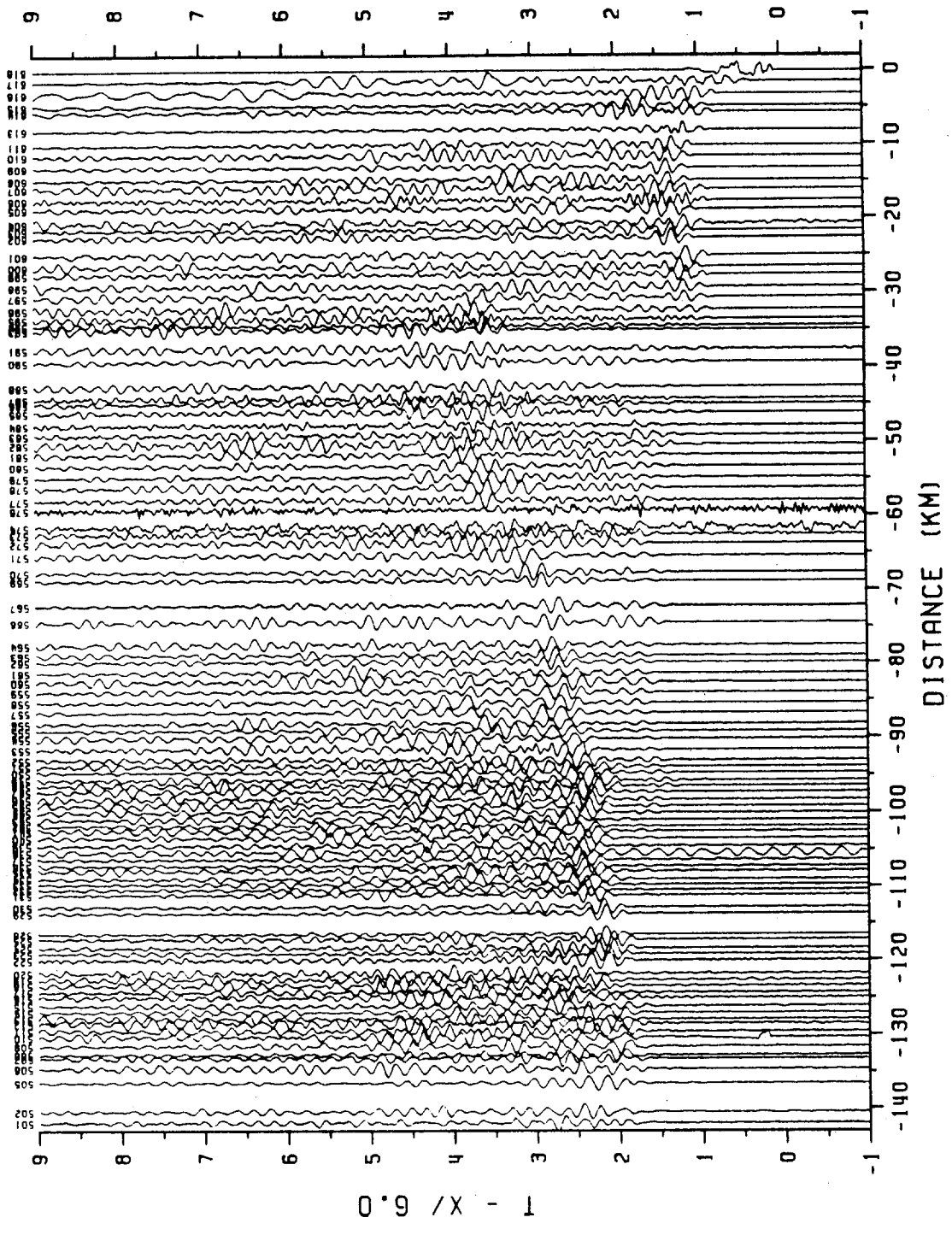
Figure 19: Record Section from Deployment 2





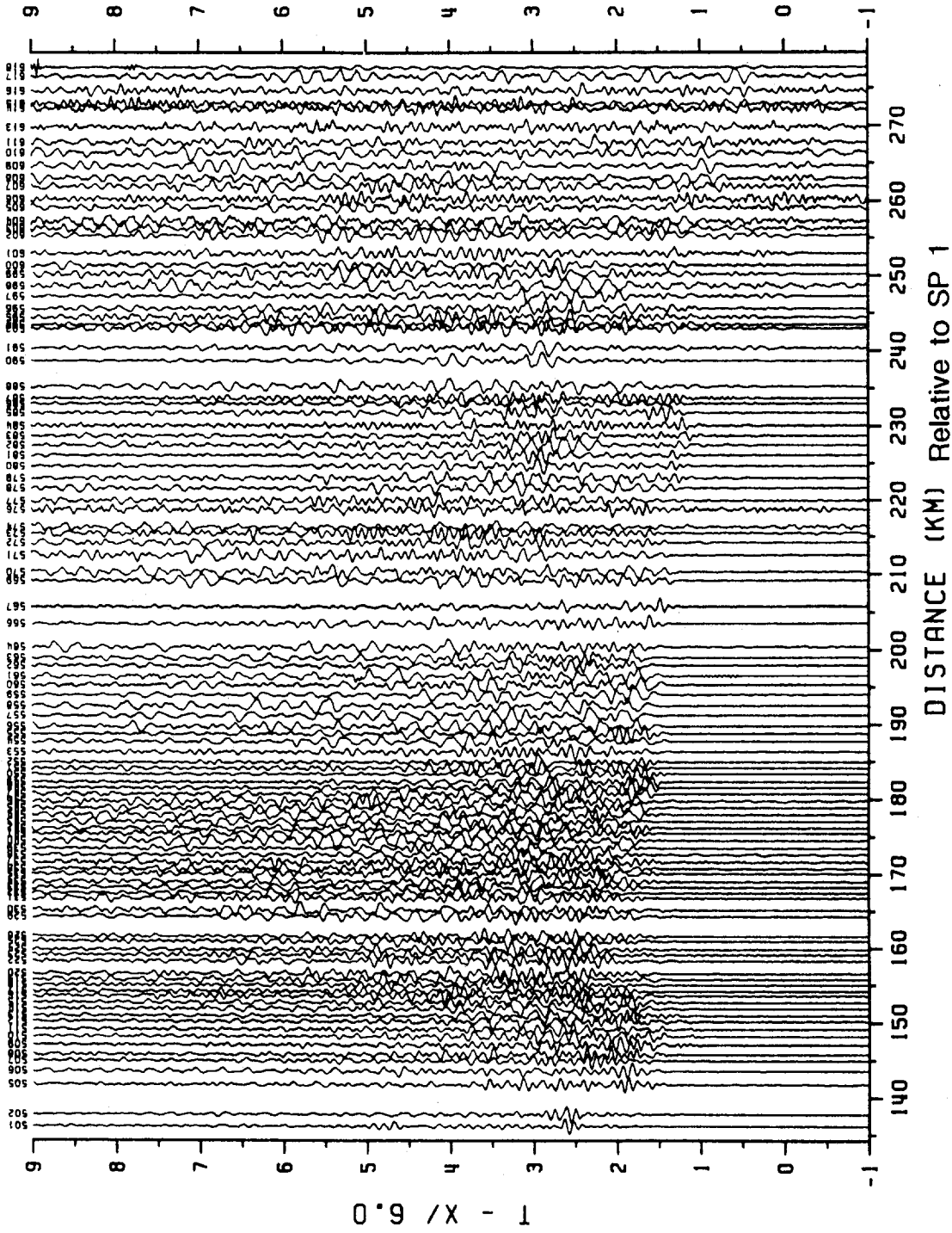
Shot 17, Shotpoint 2

Figure 20: Record Section from Deployment 2



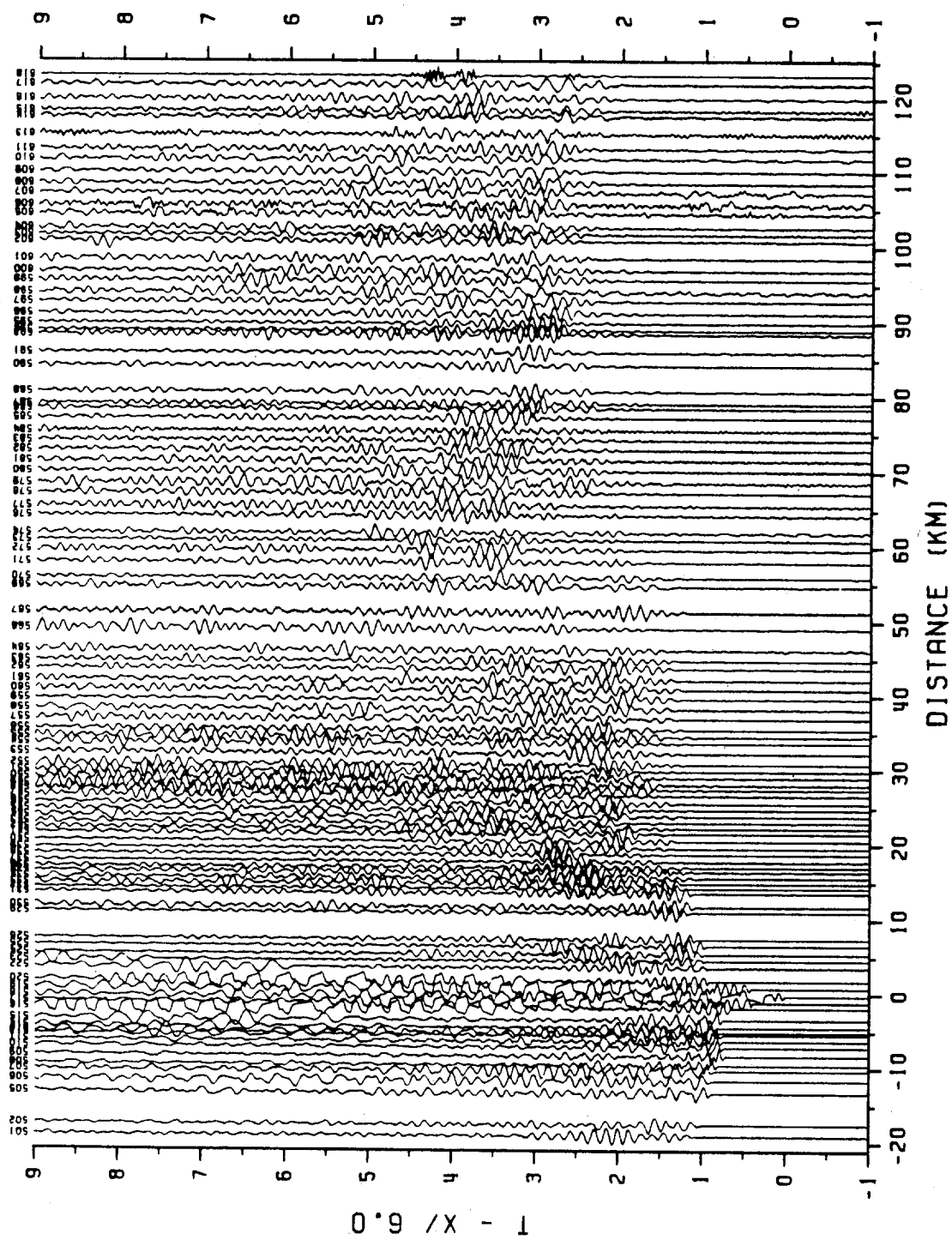
Shot 18, Shotpoint 7

Figure 21: Record Section from Deployment 3



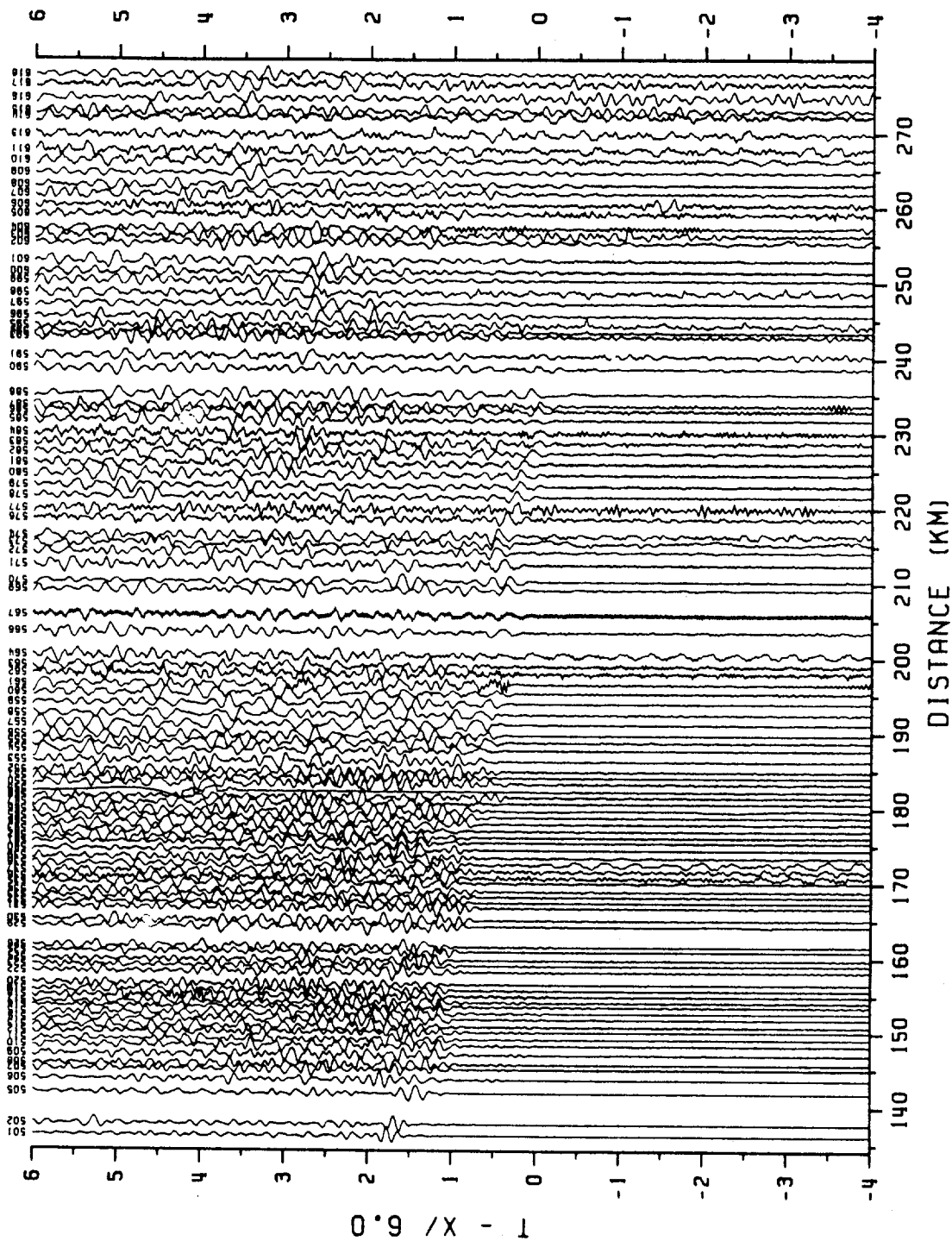
Shot 19, Shotpoint 8 (Fan Shot)

Figure 22: Record Section from Deployment 3



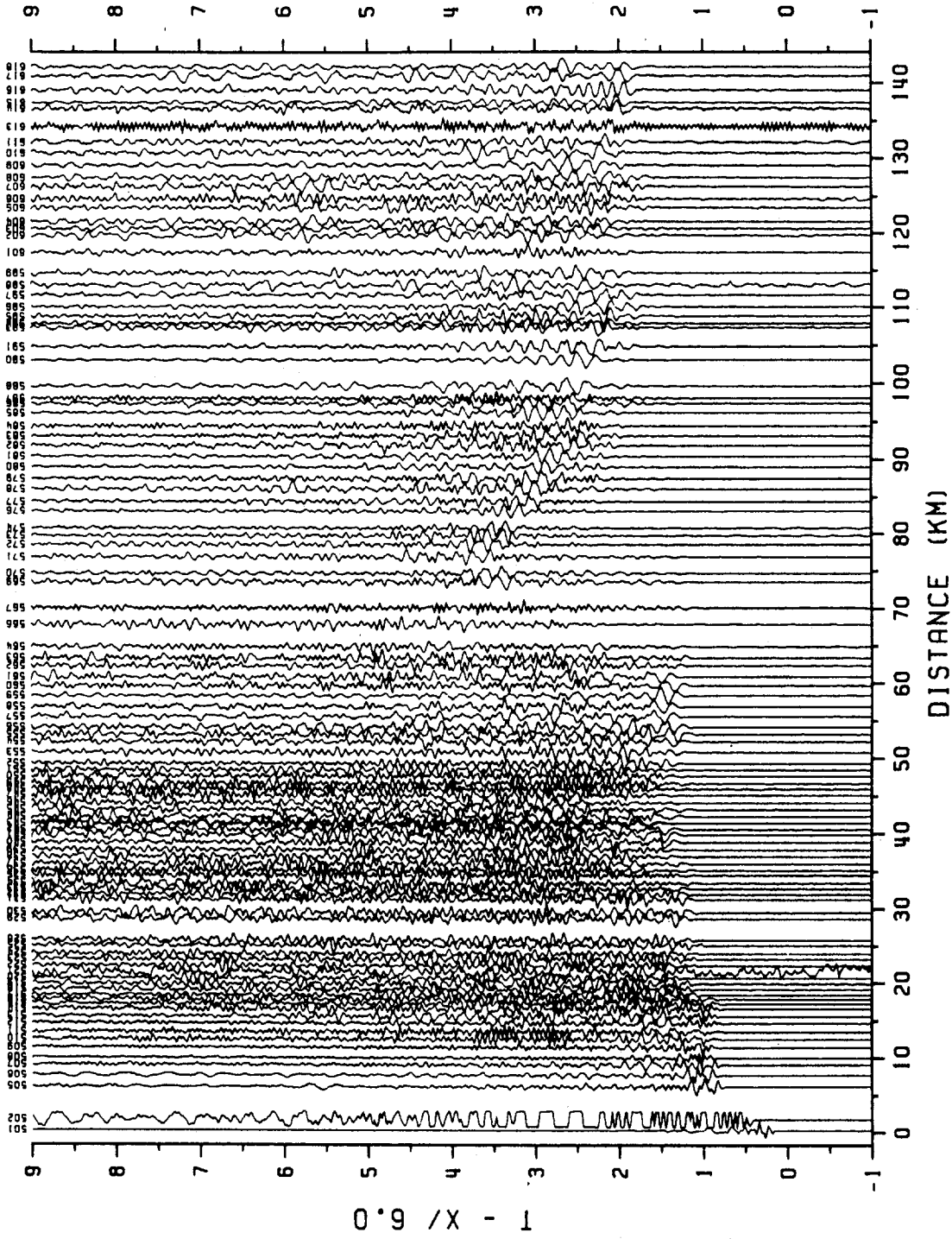
Shot 20, Shotpoint 14

Figure 23: Record Section from Deployment 3



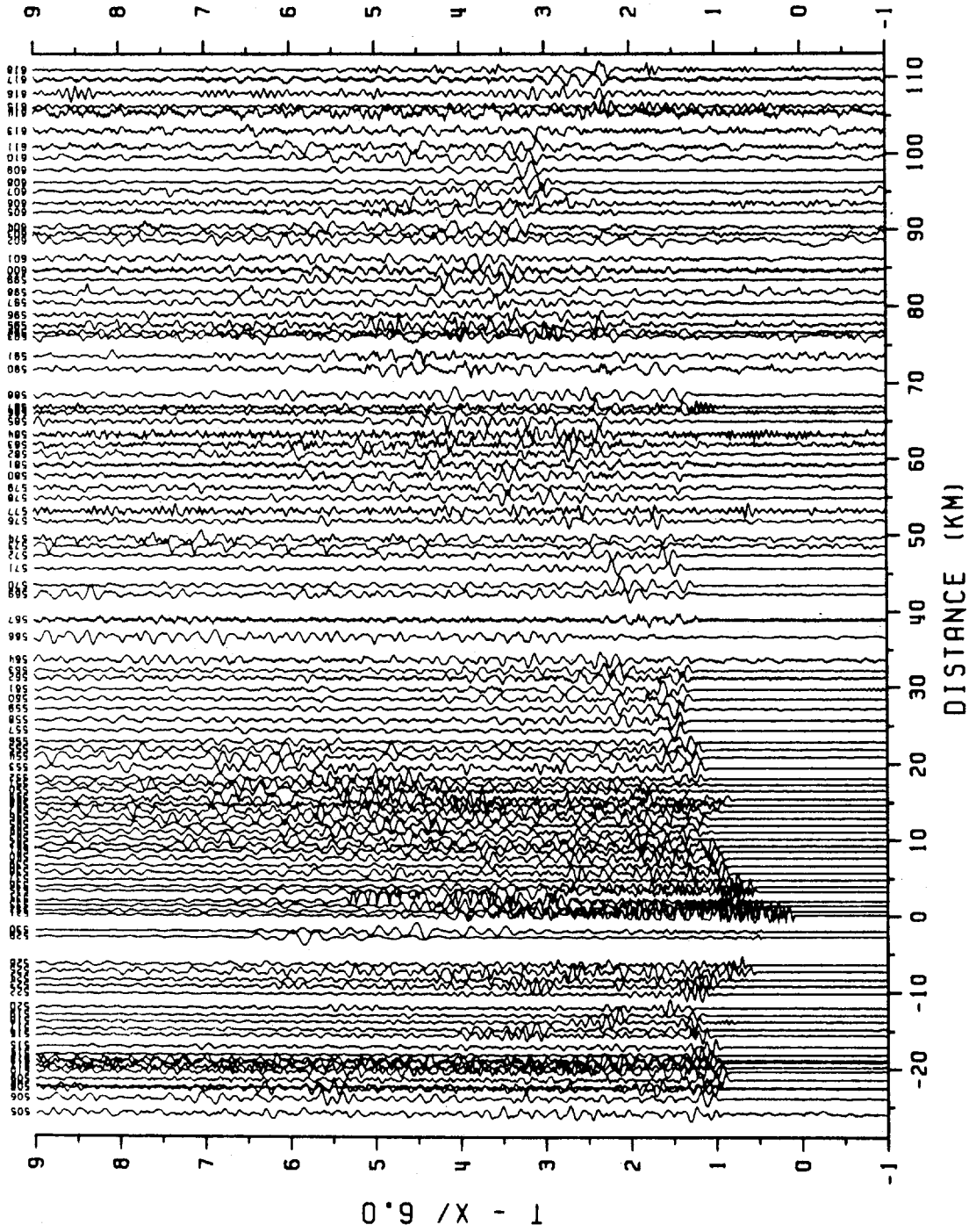
Shot 21, Shotpoint 1 (Offset Shot)

Figure 24: Record Section from Deployment 3



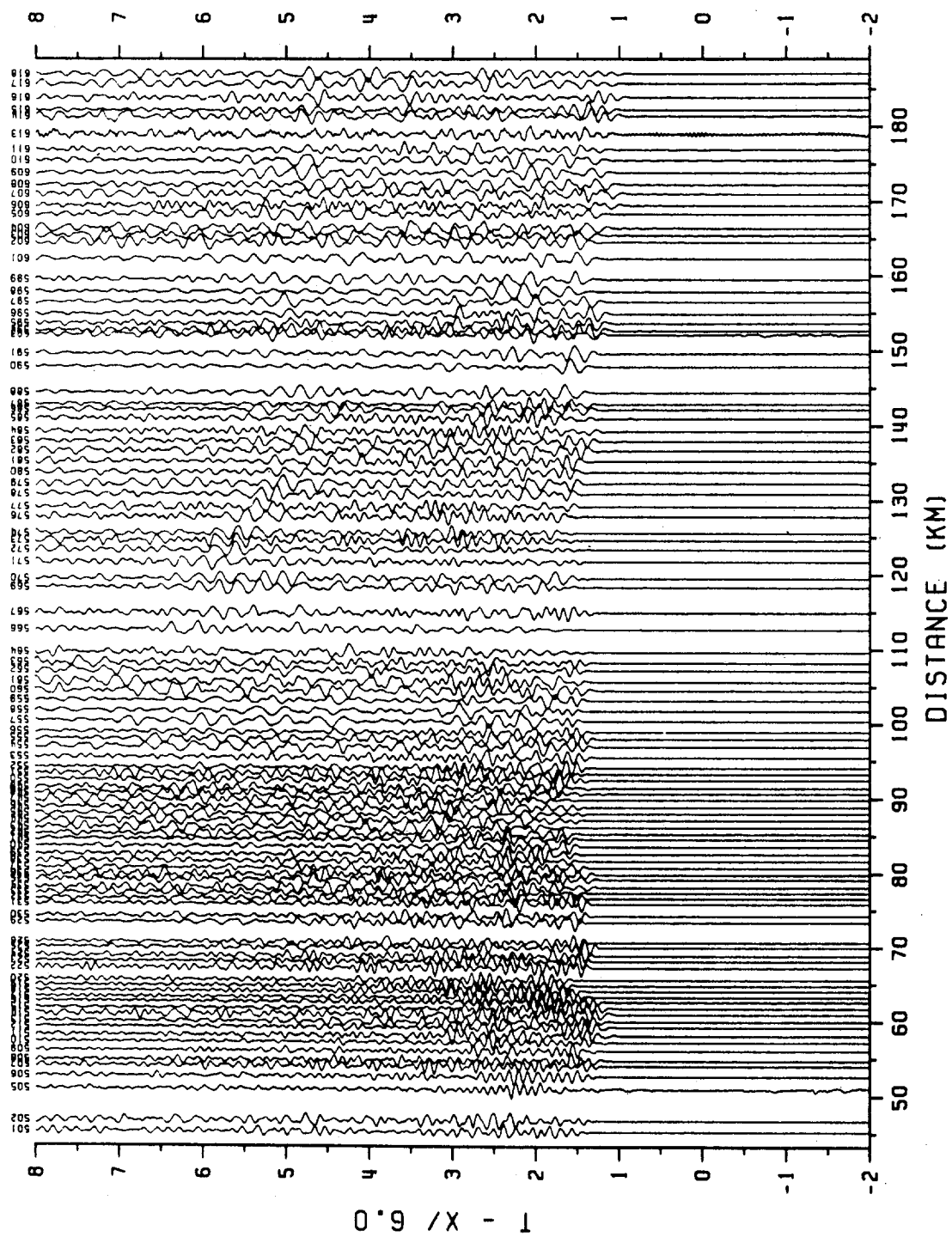
Shot 23, Shotpoint 4

Figure 26: Record Section from Deployment 3



Shot 22, Shotpoint 15

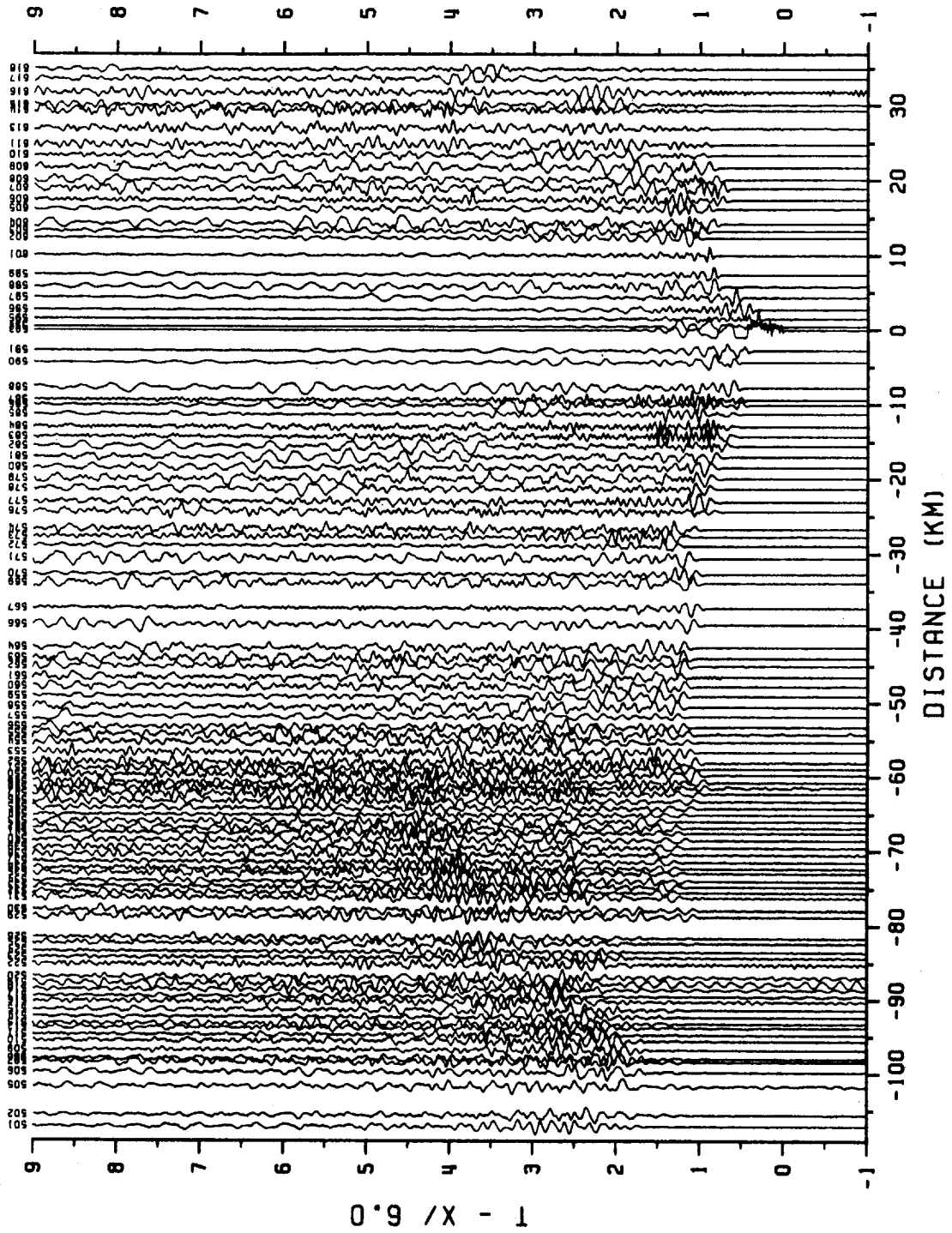
Figure 25: Record Section from Deployment 3



Shot 24, Shotpoint 3 (Offset Shot)

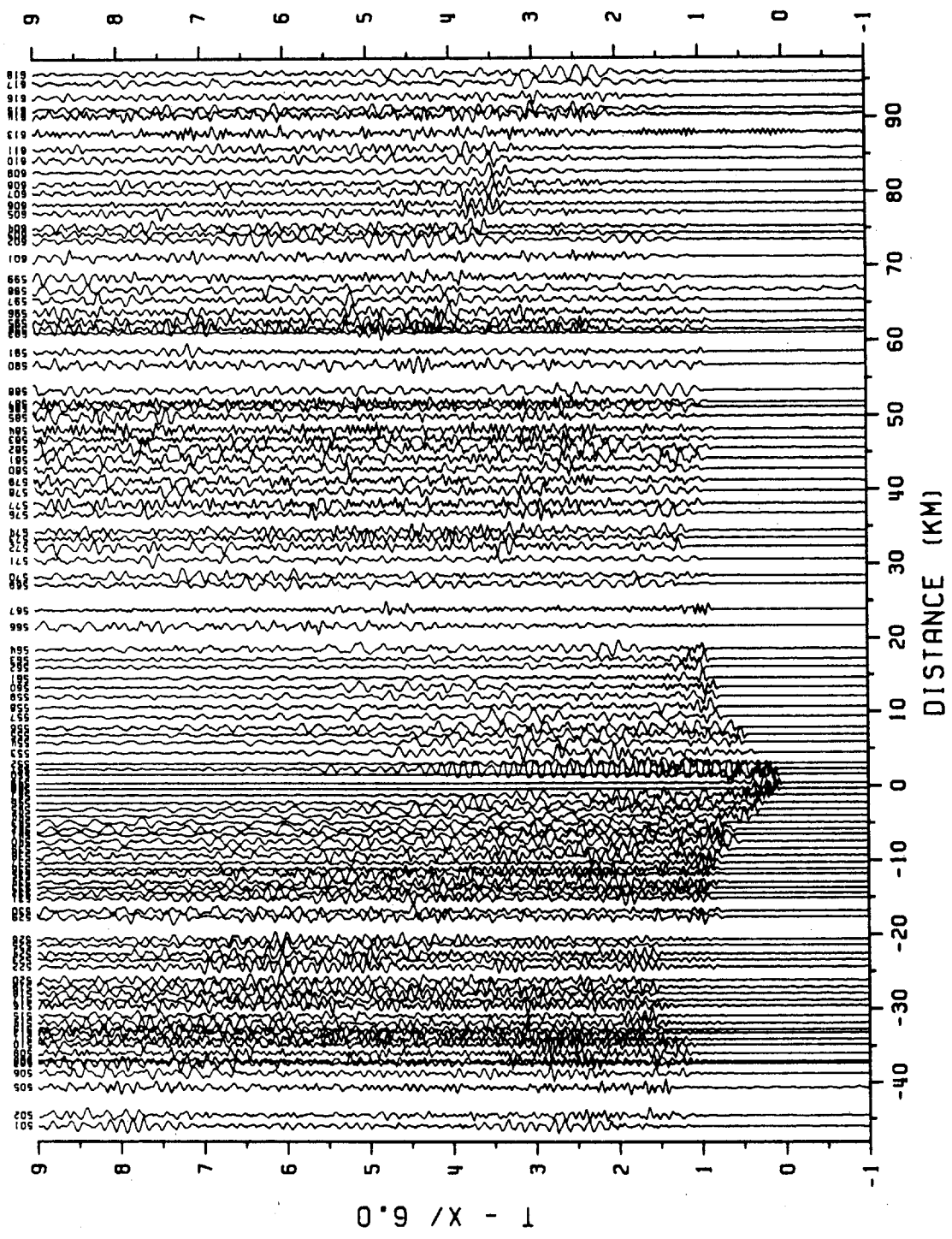
Figure 27: Record Section from Deployment 3





Shot 25, Shotpoint 6

Figure 28: Record Section from Deployment 3



Shot 26, Shotpoint 5

Figure 29: Record Section from Deployment 3

## Appendix A

Field Data Tables. These include information related to the seismic recorders. Each table contains shot number, shotpoint numbers, and shot time, given in Julian day, hour, minute, and second. Column headings for the table are explained below:

Loc	- location number of the seismic recorder (see Table 2).
Dist (km)	- distance in kilometers from the shotpoint to the recorder.
Azim (deg)	- azimuth from the shotpoint to the recorder. (in degrees clockwise from north).
Db	- amplifier attenuation setting (db) of digitized channel The gain of each channel (db) is determined by subtracting the given attenuation from a total gain of 100.6 db (see Appendix C).

## Tape Grade Scale

Scale is a listing of all tape grade numbers used on the Field Data Tables. Each number corresponds to the performance of each SCR.

0	Good, tape ran
1	Tape did not run
2	Tape ran, but no seismic signal was recorded
3	Bad time code, data was not digitized
4	Instrument skipped recording time
5	Site was not occupied
6	Digitized trace was clipped
7	High noise, trace was deleted
8	Uncertain timing error, trace was shifted by eye
9	Partial record

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 1 Shot Point 8

Shot Time (Julian day, hr, min, sec): 204:05:00:00.016

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
1	154.68	252.3	30	5	140	62.08	191.2	30	0	191	140.62	198.6		3
101	0.07	200.3	88	0	141	63.43	191.4	30	0	192	141.92	198.6	12	0
102	1.30	199.6		3	142	65.06	191.9	12	0	193	143.44	198.6	12	0
103	2.90	197.6	88	0	143	66.59	192.6	30	0	194	144.90	198.7	12	0
104	4.15	199.3	68	0	144	68.05	192.7	12	0	195	146.42	198.7	30	0
105	5.70	190.4	68	0	145	70.28	193.1	12	0	196	147.87	198.7	12	0
106	7.31	193.8	48	0	146	71.55	192.2	12	0	197	149.28	198.8	12	0
107	8.90	195.7	48	0	147	73.30	192.2	12	0	198	150.73	198.9	12	0
108	10.14	193.3	48	0	148	74.76	192.0	12	0	199	152.16	198.9	12	0
109	11.67	190.8	48	0	149	76.74	191.8	30	0	200	153.59	199.0	30	0
110	13.16	188.3	48	0	150	78.33	191.6	12	0	201	155.04	199.1	12	0
111	14.84	186.4		1	151	79.69	191.5	30	0	202	156.46	199.1	12	0
112	16.41	186.2	48	0	152	81.18	191.2	12	0	203	157.88	199.2		1
113	18.00	186.0	30	0	153	82.73	191.0	30	0	204	159.32	199.2	12	0
114	19.72	187.7	30	0	154	84.49	190.8	30	0	205	160.74	199.3	12	0
115	21.32	185.5		1	155	86.13	190.6	30	0	206	162.17	199.4	12	0
116	22.86	183.5	30	0	156	87.49	190.4	30	0	207	163.59	199.5	12	0
117	24.53	183.2	30	0	157	89.05	189.7		1	208	165.02	199.6		1
118	26.12	183.2	30	0	158	90.68	189.1	12	0	209	166.49	199.6	12	0
119	27.69	182.6	12	0	159	92.30	189.1	12	0	210	167.88	199.4	12	0
120	29.24	183.8	30	0	160	93.97	189.2	12	0	211	169.37	199.4	12	0
121	31.10	185.8	30	0	161	95.47	189.7	30	0	212	171.23	199.7	12	0
122	32.91	187.6	30	0	162	96.97	190.3	30	0	213	172.52	200.4	12	0
123	34.35	187.4	30	0	163	98.26	190.7	30	0	214	173.94	200.5	12	0
124	36.00	186.8	30	0	174	114.28	194.5		4	215	175.21	200.4	12	0
125	37.69	187.3	12	0	175	115.28	194.9		1	216	176.85	200.9	12	0
126	39.32	188.0		1	176	116.49	195.3	12	0	217	178.14	201.2	12	0
127	40.97	188.1		1	177	117.87	195.6		1	218	179.63	201.2	12	2
128	42.59	188.1	12	0	178	119.57	196.4		1	219	180.85	201.5	12	0
129	44.16	187.6	12	0	180	122.85	197.0	12	0	220	182.34	201.5	12	0
130	45.69	187.2		3	181	124.75	197.0		1	221	183.87	201.4	12	0
131	47.24	186.6	30	0	182	126.12	197.4	30	0	222	185.30	201.3	12	0
132	48.92	186.3	12	0	183	128.47	197.5	12	0	223	186.67	201.4	12	0
133	50.44	185.6	12	0	184	129.77	198.7	30	0	224	188.83	201.5	12	0
134	52.11	186.4	12	0	185	130.62	199.1	12	0	225	190.25	201.5	12	0
135	54.08	187.2		4	186	132.06	199.1	30	0	226	191.73	201.5	12	0
136	54.95	189.8		3	187	133.59	199.0	12	0	227	192.91	201.4	12	0
137	57.23	191.4		5	188	134.98	199.0	12	0	228	194.42	201.4	12	0
138	58.41	190.8	12	1	189	136.40	198.9	12	0	229	195.86	201.5	12	0
139	60.20	190.5	12	0	190	137.83	198.9	12	0	230	197.25	201.3	12	0

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 2 Shot Point 10

Shot Time (Julian day, hr, min, sec): 204:05:04:00.009

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
1	137.70	314.3	30	5	140	91.04	23.9	30	0	191	11.57	22.8	30	0
101	152.09	18.6	12	0	141	89.67	23.9	30	0	192	10.29	24.4	48	0
102	150.87	18.6		3	142	87.96	23.8	30	0	193	8.77	24.7	48	0
103	149.26	18.6	12	0	143	86.30	23.5	30	0	194	7.30	24.7	48	0
104	148.02	18.6	12	0	144	84.86	23.7	30	0	195	5.79	25.7	48	0
105	146.53	18.9	12	0	145	82.56	23.6	12	0	196	4.34	26.6	68	0
106	144.88	18.9	12	0	146	81.54	24.5	12	0	197	2.91	26.7	88	0
107	143.28	18.8	12	7	147	79.85	24.8	12	0	198	1.45	28.1	88	0
108	142.08	19.0	12	0	148	78.48	25.2	12	0	199	0.06	110.3	88	0
109	140.62	19.3	12	0	149	76.63	25.8	30	0	200	1.44	203.0		3
110	139.25	19.6	12	0	150	75.16	26.3	12	0	201	2.89	204.2	88	0
111	137.71	19.9		1	151	73.86	26.6	30	0	202	4.32	204.4	68	0
112	136.21	20.1	12	0	152	72.57	27.3	30	0	203	5.75	204.8		1
113	134.68	20.3	12	0	153	71.15	27.8	12	0	204	7.20	204.7	48	0
114	132.88	20.3	12	0	154	69.60	28.6	12	0	205	8.64	205.5	48	0
115	131.53	20.8		1	155	68.10	29.2	12	0	206	10.09	206.2	48	0
116	130.27	21.3	12	0	156	66.95	29.9	12	0	207	11.53	206.7	30	0
117	128.73	21.6	12	0	157	65.86	31.2		1	208	12.99	207.1		1
118	127.22	21.8	12	0	158	64.70	32.5	12	0	209	14.41	205.3	30	0
119	125.83	22.2	12	0	159	63.25	33.1	12	0	210	15.76	203.1	30	0
120	124.17	22.1	12	0	160	61.68	33.6	12	0	211	17.26	203.0	30	0
121	122.09	21.9	12	0	161	59.91	33.4	30	0	212	19.17	204.9	48	0
122	120.07	21.7	12	0	162	58.18	33.2	30	0	213	20.75	210.5	30	0
123	118.70	21.9	30	0	163	56.71	33.0	30	0	214	22.21	210.8	30	0
124	117.22	22.3	12	0	174	39.28	31.8	12	8	215	23.39	209.2	30	0
125	115.50	22.4	12	0	175	38.04	30.9		1	216	25.32	212.4	30	0
126	113.80	22.4		1	176	36.67	30.3	30	0	217	26.72	213.3	30	0
127	112.19	22.5		1	177	35.19	30.0		1	218	28.22	213.0	12	0
128	110.62	22.7	12	0	178	33.16	28.0		1	219	29.60	214.1	30	0
129	109.22	23.2	30	0	180	29.69	26.9	30	0	220	31.09	213.8	30	0
130	107.84	23.6		3	181	27.80	27.3		1	221	32.52	212.7	30	0
131	106.50	24.0	30	0	182	26.31	26.1	30	0	222	33.84	211.5		4
132	105.00	24.5		4	183	23.97	26.6	30	0	223	35.24	211.6	30	0
133	103.75	25.1	12	0	184	22.41	20.4	30	0	224	37.45	211.7	30	0
134	101.93	25.0	12	0	185	21.55	17.9	30	0	225	38.81	211.0	30	0
135	99.82	24.9		4	186	20.10	17.8	30	0	226	40.26	210.6	30	0
136	98.30	23.7		3	187	18.57	18.1	30	0	227	41.39	210.0	30	0
137	95.73	23.1		5	188	17.19	18.1	12	0	228	42.88	209.7	12	0
138	94.72	23.7	12	0	189	15.76	18.8	30	0	229	44.34	209.7	30	0
139	93.04	24.1	30	0	190	14.33	19.3	30	0	230	45.63	208.7	12	0

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 3 Shot Point 11

Shot Time (Julian day, hr, min, sec): 204:05:06:00.010

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
			Db	Grade				Db	Grade				Db	Grade
1	156.43	330.5	30	5	140	136.62	25.3	30	0	191	57.20	27.2	30	0
101	197.23	20.7	12	0	141	135.24	25.3	30	0	192	55.94	27.6	30	0
102	196.01	20.7	12	0	142	133.53	25.3	30	0	193	54.43	27.7	30	0
103	194.41	20.8	12	0	143	131.85	25.1	30	0	194	52.96	27.8	30	0
104	193.16	20.8	12	0	144	130.42	25.2	30	0	195	51.45	28.0	30	0
105	191.71	21.0	12	0	145	128.13	25.2	30	0	196	50.00	28.2	30	0
106	190.06	21.0	12	0	146	127.14	25.8	30	0	197	48.58	28.3	30	0
107	188.45	21.0	12	0	147	125.46	26.0	30	0	198	47.12	28.3	30	0
108	187.27	21.1	12	0	148	124.11	26.3		4	199	45.68	28.4	30	0
109	185.84	21.4	12	0	149	122.27	26.7	30	0	200	44.24	28.5		3
110	184.50	21.6	12	0	150	120.81	27.0	30	0	201	42.79	28.7	30	0
111	183.00	21.9		1	151	119.52	27.2	30	0	202	41.37	28.8	30	0
112	181.51	22.1	12	0	152	118.24	27.6	30	0	203	39.93	28.9		1
113	180.00	22.2	12	0	153	116.82	27.9	12	0	204	38.49	29.1	30	0
114	178.20	22.2	12	0	154	115.27	28.4	30	0	205	37.04	29.1	30	0
115	176.89	22.6		1	155	113.77	28.7	30	0	206	35.59	29.0	48	0
116	175.67	23.0	12	0	156	112.62	29.2	12	0	207	34.15	29.0	30	0
117	174.16	23.2	12	0	157	111.50	29.9		1	208	32.69	28.9		1
118	172.65	23.4	12	0	158	110.31	30.7	12	0	209	31.29	29.8	30	0
119	171.30	23.7	12	0	159	108.83	31.0	12	0	210	30.02	31.2	30	0
120	169.63	23.7	12	0	160	107.24	31.3	30	0	211	28.54	31.7	30	0
121	167.54	23.6	12	0	161	105.49	31.1	30	0	212	26.57	31.0	48	0
122	165.51	23.4	12	0	162	103.77	31.0	30	0	213	24.95	26.7	48	0
123	164.15	23.6	12	0	163	102.30	30.9	30	0	214	23.49	26.2	48	0
124	162.70	23.9	30	0	174	84.91	29.9	30	8	215	22.28	27.6	30	0
125	160.98	24.0	12	0	175	83.69	29.4		1	216	20.49	23.5	48	0
126	159.29	24.0		1	176	82.33	29.2	30	0	217	19.17	21.7	30	0
127	157.69	24.1		1	177	80.85	29.0		1	218	17.68	21.2	12	0
128	156.13	24.3	12	0	178	78.83	28.2		1	219	16.47	18.2	30	6
129	154.75	24.6	30	0	180	75.36	27.7	30	0	220	15.00	17.3	48	0
130	153.40	24.9		3	181	73.47	27.9		1	221	13.45	18.2	48	0
131	152.07	25.2	30	0	182	71.97	27.5	30	0	222	12.00	19.9		4
132	150.59	25.5		4	183	69.64	27.7	12	0	223	10.65	18.2	48	0
133	149.36	26.0	12	0	184	67.93	25.7	30	0	224	8.53	14.4	48	6
134	147.54	25.9	30	0	185	66.97	25.0	30	0	225	7.10	14.5	48	6
135	145.43	25.9		4	186	65.53	25.1	30	0	226	5.62	13.4	48	6
136	143.86	25.1		1	187	64.03	25.4	30	0	227	4.43	14.4	68	0
137	141.26	24.7		5	188	62.65	25.5	12	0	228	2.93	10.8	88	0
138	140.28	25.1	12	0	189	61.26	25.9	30	0	229	1.61	355.0	88	0
139	138.62	25.4	12	0	190	59.86	26.2	30	0	230	0.14	314.4	88	6

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 4 Shot Point 1

Shot Time (Julian day, hr, min, sec): 204:05:08:00.008

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	----	-----	Db	Grade	---	----	-----	Db	Grade	---	----	-----	Db	Grade
101	154.63	71.2	12	0	141	135.61	95.3	12	0	192	134.54	129.4	30	0
102	153.89	71.5	12	0	142	134.94	95.9	12	0	193	135.01	130.1	30	0
103	153.02	72.0	12	0	143	133.98	96.6	12	0	194	135.42	130.7	30	0
104	152.22	72.4	30	0	144	133.84	97.2	12	0	195	135.96	131.3	30	0
105	152.07	73.1	12	0	145	133.17	98.1	12	0	196	136.44	131.8	30	0
106	150.99	73.5	12	0	146	134.16	98.7	12	0	197	136.85	132.4	30	0
107	149.96	74.0	30	0	147	134.16	99.4	12	0	198	137.30	133.0	30	0
108	149.70	74.5	30	0	148	134.36	100.1		4	199	137.75	133.6	30	0
109	149.47	75.1	12	0	149	134.65	100.9	12	0	200	138.23	134.1		1
110	149.38	75.7	12	0	150	134.93	101.6	30	0	201	138.72	134.7	30	0
111	149.23	76.4		1	151	135.01	102.2	12	0	202	139.23	135.2	30	0
112	148.80	76.9	12	0	152	135.58	102.8	12	0	203	139.73	135.8		1
113	148.35	77.5	12	0	153	135.89	103.4	12	0	204	140.29	136.3	30	0
114	147.30	78.1	12	0	154	136.41	104.2	12	0	205	140.72	136.9	30	0
115	147.59	78.8		1	155	136.73	104.8	30	0	206	141.16	137.5	30	0
116	147.95	79.4	12	0	156	137.29	105.4	12	0	207	141.61	138.0	30	0
117	147.72	80.1	12	0	157	138.49	106.0		1	208	142.10	138.6		1
118	147.38	80.7	12	0	158	139.59	106.6	12	0	209	143.04	139.0	30	0
119	147.38	81.3	12	0	159	139.91	107.2	12	0	210	144.16	139.4	12	0
120	146.49	81.9	30	0	160	140.05	107.9	12	0	211	144.86	139.9	12	0
121	145.12	82.5	30	0	161	139.37	108.6	30	0	212	145.20	140.7	12	0
122	143.72	83.1	12	0	162	138.76	109.3	30	0	213	144.07	141.6	12	0
123	143.49	83.7	12	0	163	138.26	109.8	30	0	214	144.51	142.2	30	0
124	143.52	84.4	12	0	174	134.79	117.0	30	8	215	145.56	142.5	30	0
125	142.89	85.0	12	0	175	134.08	117.5		1	216	145.05	143.4	30	0
126	142.09	85.6		5	176	133.64	118.1	30	0	217	145.20	144.0	12	0
127	141.72	86.2		1	177	133.40	118.8		1	218	145.88	144.5	12	0
128	141.41	86.9	12	0	178	132.28	119.6		1	219	145.87	145.1	30	0
129	141.53	87.5	12	0	180	131.89	121.2	30	0	220	146.58	145.6	30	0
130	141.66	88.2		3	181	132.27	122.0		1	221	147.72	146.0	30	0
131	141.91	88.8	30	0	182	131.86	122.6	30	0	222	148.91	146.4		4
132	142.02	89.5		4	183	132.40	123.6	12	0	223	149.48	146.9	30	0
133	142.47	90.1	30	0	184	130.22	124.5	12	0	224	150.40	147.6	30	0
134	141.63	90.8	12	0	185	129.57	125.0	12	0	225	151.40	148.0	30	0
135	140.71	91.6		4	186	129.99	125.6	30	0	226	152.36	148.4	30	0
136	138.18	91.8		1	187	130.58	126.2	12	0	227	153.27	148.7	12	0
137	136.34	92.7		5	188	131.03	126.8	12	0	228	154.21	149.2	30	0
138	136.84	93.2	12	0	189	131.69	127.4	12	0	229	154.97	149.6	30	0
139	136.92	94.0	12	0	190	132.29	127.9	30	0	230	156.30	149.9	30	0
140	136.02	94.7	30	0	191	133.88	129.0	30	0	301	0.15	102.2	12	5

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 5 Shot Point 9

Shot Time (Julian day, hr, min, sec): 204:07:00:00.008

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
1	135.92	276.0	30	5	140	0.66	13.8	88	0	191	78.83	204.4	12	0
101	62.66	11.1	12	0	141	0.74	211.7	88	0	192	80.10	204.2		4
102	61.45	10.9	12	0	142	2.45	210.0	88	0	193	81.63	204.2	12	0
103	59.85	10.8	12	0	143	4.17	214.6	68	0	194	83.09	204.2	30	0
104	58.64	10.5	12	0	144	5.56	209.1	48	0	195	84.61	204.1	30	0
105	57.04	11.2	12	0	145	7.85	208.1	48	0	196	86.07	204.1	30	0
106	55.43	10.8	12	0	146	8.90	199.3	30	0	197	87.49	204.2	30	0
107	53.87	10.4	12	0	147	10.62	197.8	30	0	198	88.95	204.2	30	0
108	52.61	10.7	12	0	148	12.06	196.0	30	0	199	90.39	204.2	30	0
109	51.06	11.2	12	0	149	14.02	194.2	48	0	200	91.83	204.2		1
110	49.60	11.9	12	2	150	15.60	193.0	48	0	201	93.29	204.3	30	0
111	47.96	12.6		1	151	16.96	192.7	30	0	202	94.71	204.3	30	0
112	46.41	12.9	30	0	152	18.44	191.0	30	0	203	96.15	204.3		1
113	44.84	13.2	30	0	153	19.99	190.4	30	0	204	97.60	204.3	30	0
114	43.07	12.7	30	0	154	21.76	189.3	30	0	205	99.04	204.4	30	0
115	41.58	14.1		1	155	23.40	189.0	30	0	206	100.48	204.5	30	0
116	40.20	15.5	30	0	156	24.78	188.1	30	0	207	101.92	204.6	12	0
117	38.60	16.2	30	0	157	26.39	186.0		1	208	103.37	204.6		1
118	37.04	16.7	30	0	158	28.08	184.4	12	0	209	104.81	204.4	12	0
119	35.60	17.8	30	0	159	29.70	184.5	12	0	210	106.16	204.1	12	0
120	33.95	17.5	12	0	160	31.35	185.0	12	0	211	107.65	204.1	12	0
121	31.91	16.4	30	0	161	32.80	186.9	30	0	212	109.57	204.4	12	0
122	29.96	15.1	30	0	162	34.26	188.5	30	0	213	111.03	205.5	30	0
123	28.55	15.7	30	0	163	35.53	189.7	30	0	214	112.48	205.6	12	0
124	26.99	17.0	30	0	174	51.77	198.3		4	215	113.71	205.3	12	0
125	25.26	17.0	30	0	175	52.84	199.3		1	216	115.50	206.1	12	0
126	23.58	16.4		1	176	54.10	200.0	12	0	217	116.85	206.4	12	0
127	21.94	16.9		1	177	55.52	200.5		1	218	118.35	206.4	12	0
128	20.34	17.6	30	0	178	57.37	201.9		1	219	119.65	206.8	12	0
129	18.87	19.6	30	0	180	60.76	202.8	12	0	220	121.14	206.8	12	0
130	17.46	21.8		3	181	62.67	202.8		1	221	122.63	206.6	12	0
131	16.10	24.7	30	0	182	64.11	203.4	12	0	222	124.03	206.3	12	0
132	14.62	27.9	12	2	183	66.46	203.3	12	0	223	125.42	206.4	12	0
133	13.48	32.6	30	0	184	68.05	205.4	12	0	224	127.60	206.5	12	0
134	11.66	33.2	30	0	185	69.01	206.1	12	0	225	129.01	206.4	12	0
135	9.56	34.3		4	186	70.45	206.0	30	0	226	130.48	206.3	12	0
136	7.92	21.0		1	187	71.95	205.8	12	0	227	131.63	206.1	12	0
137	5.51	9.2		5	188	73.32	205.6	12	0	228	133.13	206.1	12	0
138	4.35	17.3	68	0	189	74.72	205.3	12	0	229	134.59	206.1	12	0
139	2.65	27.6	30	6	190	76.12	205.1	12	0	230	135.93	205.8	12	0



## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 6 Shot Point 8

Shot Time (Julian day, hr, min, sec): 204:07:02:00.011

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
			Db	Grade				Db	Grade				Db	Grade
1	154.68	252.3	30	5	140	62.08	191.2	30	0	191	140.62	198.6	12	0
101	0.07	200.3	88	0	141	63.43	191.4	30	0	192	141.92	198.6		4
102	1.30	199.6	88	0	142	65.06	191.9	12	0	193	143.44	198.6	12	0
103	2.90	197.6	88	0	143	66.59	192.6	30	0	194	144.90	198.7	12	0
104	4.15	199.3	68	0	144	68.05	192.7	30	0	195	146.42	198.7	12	0
105	5.70	190.4	68	0	145	70.28	193.1	12	0	196	147.87	198.7	12	0
106	7.31	193.8	48	0	146	71.55	192.2	12	0	197	149.28	198.8	12	0
107	8.90	195.7	48	0	147	73.30	192.2	12	0	198	150.73	198.9	12	0
108	10.14	193.3	48	0	148	74.76	192.0	12	0	199	152.16	198.9	12	0
109	11.67	190.8	48	0	149	76.74	191.8	30	0	200	153.59	199.0		1
110	13.16	188.3	12	0	150	78.33	191.6	30	0	201	155.04	199.1	12	0
111	14.84	186.4		1	151	79.69	191.5	30	0	202	156.46	199.1	12	0
112	16.41	186.2	48	0	152	81.18	191.2	12	0	203	157.88	199.2		1
113	18.00	186.0	30	0	153	82.73	191.0	12	0	204	159.32	199.2	12	0
114	19.72	187.7	30	0	154	84.49	190.8	30	0	205	160.74	199.3	12	0
115	21.32	185.5		1	155	86.13	190.6	30	0	206	162.17	199.4	12	0
116	22.86	183.5	30	0	156	87.49	190.4	30	0	207	163.59	199.5	12	0
117	24.53	183.2	30	0	157	89.05	189.7		1	208	165.02	199.6		1
118	26.12	183.2	30	0	158	90.68	189.1	12	0	209	166.49	199.6	12	0
119	27.69	182.6	30	0	159	92.30	189.1	12	0	210	167.88	199.4	12	0
120	29.24	183.8	30	0	160	93.97	189.2	12	0	211	169.37	199.4	12	0
121	31.10	185.8	30	0	161	95.47	189.7	30	0	212	171.23	199.7	12	0
122	32.91	187.6	30	0	162	96.97	190.3	30	0	213	172.52	200.4	12	0
123	34.35	187.4	30	0	163	98.26	190.7	30	0	214	173.94	200.5	12	0
124	36.00	186.8	30	0	174	114.28	194.5	12	8	215	175.21	200.4	12	0
125	37.69	187.3	12	0	175	115.28	194.9		1	216	176.85	200.9	12	0
126	39.32	188.0		1	176	116.49	195.3	12	0	217	178.14	201.2	12	0
127	40.97	188.1		1	177	117.87	195.6		1	218	179.63	201.2	12	0
128	42.59	188.1	12	0	178	119.57	196.4		1	219	180.85	201.5	12	0
129	44.16	187.6	12	0	180	122.85	197.0	30	0	220	182.34	201.5	12	0
130	45.69	187.2		3	181	124.75	197.0		1	221	183.87	201.4	12	0
131	47.24	186.6	30	0	182	126.12	197.4	30	0	222	185.30	201.3	12	0
132	48.92	186.3	12	2	183	128.47	197.5	12	0	223	186.67	201.4	12	0
133	50.44	185.6	30	0	184	129.77	198.7	12	0	224	188.83	201.5	12	0
134	52.11	186.4	12	0	185	130.62	199.1	12	0	225	190.25	201.5	12	0
135	54.08	187.2		4	186	132.06	199.1	30	0	226	191.73	201.5	12	0
136	54.95	189.8		1	187	133.59	199.0	12	0	227	192.91	201.4	12	0
137	57.23	191.4		5	188	134.98	199.0	12	0	228	194.42	201.4	12	0
138	58.41	190.8	12	0	189	136.40	198.9	12	0	229	195.86	201.5	12	0
139	60.20	190.5	12	0	190	137.83	198.9	12	0	230	197.25	201.3	30	0

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 7 Shot Point 11

Shot Time (Julian day, hr, min, sec): 204:07:05:56.986

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
1	156.43	330.5	30	5	140	136.62	25.3	30	0	191	57.20	27.2	30	0
101	197.23	20.7	30	0	141	135.24	25.3	30	0	192	55.94	27.6		4
102	196.01	20.7		3	142	133.53	25.3	12	0	193	54.43	27.7	30	0
103	194.41	20.8	12	0	143	131.85	25.1	30	0	194	52.96	27.8	30	0
104	193.16	20.8	30	0	144	130.42	25.2	30	0	195	51.45	28.0	30	0
105	191.71	21.0	12	0	145	128.13	25.2	12	0	196	50.00	28.2	30	0
106	190.06	21.0	12	0	146	127.14	25.8	12	0	197	48.58	28.3	30	0
107	188.45	21.0	12	0	147	125.46	26.0	12	0	198	47.12	28.3	30	0
108	187.27	21.1	12	0	148	124.11	26.3		4	199	45.68	28.4	30	0
109	185.84	21.4	12	0	149	122.27	26.7	30	0	200	44.24	28.5		1
110	184.50	21.6	12	2	150	120.81	27.0	30	0	201	42.79	28.7	30	0
111	183.00	21.9		1	151	119.52	27.2	30	0	202	41.37	28.8	30	0
112	181.51	22.1	12	0	152	118.24	27.6	30	0	203	39.93	28.9		1
113	180.00	22.2	12	0	153	116.82	27.9	12	0	204	38.49	29.1	30	0
114	178.20	22.2	12	0	154	115.27	28.4	12	0	205	37.04	29.1	30	0
115	176.89	22.6		1	155	113.77	28.7	12	0	206	35.59	29.0	30	0
116	175.67	23.0	12	0	156	112.62	29.2	12	0	207	34.15	29.0	30	0
117	174.16	23.2	12	0	157	111.50	29.9		1	208	32.69	28.9		1
118	172.65	23.4	12	0	158	110.31	30.7	12	0	209	31.29	29.8	30	0
119	171.30	23.7	12	0	159	108.83	31.0	12	0	210	30.02	31.2	30	0
120	169.63	23.7	12	0	160	107.24	31.3	30	0	211	28.54	31.7	30	0
121	167.54	23.6	12	0	161	105.49	31.1	30	0	212	26.57	31.0	30	0
122	165.51	23.4	12	0	162	103.77	31.0	30	0	213	24.95	26.7	48	0
123	164.15	23.6	12	0	163	102.30	30.9	30	0	214	23.49	26.2	30	0
124	162.70	23.9	12	0	174	84.91	29.9	12	8	215	22.28	27.6	30	0
125	160.98	24.0	12	0	175	83.69	29.4		1	216	20.49	23.5	30	0
126	159.29	24.0		1	176	82.33	29.2	12	0	217	19.17	21.7	30	0
127	157.69	24.1		1	177	80.85	29.0		1	218	17.68	21.2	30	0
128	156.13	24.3	12	0	178	78.83	28.2		1	219	16.47	18.2	30	0
129	154.75	24.6	12	0	180	75.36	27.7	30	0	220	15.00	17.3	48	0
130	153.40	24.9		3	181	73.47	27.9		1	221	13.45	18.2	48	0
131	152.07	25.2	12	0	182	71.97	27.5	12	0	222	12.00	19.9	48	0
132	150.59	25.5	12	2	183	69.64	27.7	12	0	223	10.65	18.2	48	0
133	149.36	26.0	12	0	184	67.93	25.7	12	0	224	8.53	14.4	48	6
134	147.54	25.9	12	0	185	66.97	25.0	30	0	225	7.10	14.5	48	6
135	145.43	25.9		4	186	65.53	25.1	30	0	226	5.62	13.4	48	6
136	143.86	25.1		1	187	64.03	25.4	12	0	227	4.43	14.4	68	0
137	141.26	24.7		5	188	62.65	25.5	12	0	228	2.93	10.8	88	0
138	140.28	25.1	12	0	189	61.26	25.9	12	0	229	1.61	355.0	88	0
139	138.62	25.4	12	0	190	59.86	26.2	12	0	230	0.14	314.4	88	0

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 8 Shot Point 4

Shot Time (Julian day, hr, min, sec): 204:07:08:00.009

Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade
1	135.90	293.9	5	140	43.07	14.9	30 0	191	37.62	214.9	12 0
101	105.02	12.6	30 0	141	41.71	14.7	30 0	192	38.82	214.1	4
102	103.80	12.5	3	142	40.05	14.0	30 0	193	40.31	213.7	12 0
103	102.20	12.5	12 0	143	38.51	12.9	30 0	194	41.77	213.4	30 0
104	100.97	12.3	12 0	144	37.05	12.9	12 0	195	43.25	213.0	12 0
105	99.40	12.8	12 0	145	34.81	12.0	12 0	196	44.69	212.6	12 0
106	97.78	12.5	12 0	146	33.55	13.8	30 0	197	46.10	212.5	12 0
107	96.21	12.3	12 0	147	31.81	14.0	30 0	198	47.55	212.2	12 0
108	94.95	12.6	12 0	148	30.36	14.6	4	199	48.99	212.1	12 0
109	93.43	12.9	12 0	149	28.40	15.4	30 0	200	50.42	211.9	1
110	91.98	13.3	12 2	150	26.83	16.1	30 0	201	51.87	211.7	12 0
111	90.36	13.7	1	151	25.48	16.5	30 0	202	53.29	211.5	12 0
112	88.81	13.8	12 0	152	24.05	18.1	30 0	203	54.71	211.4	1
113	87.24	14.0	12 0	153	22.55	19.1	30 0	204	56.15	211.2	12 0
114	85.47	13.8	12 0	154	20.88	20.9	30 0	205	57.60	211.2	12 0
115	83.99	14.5	1	155	19.30	22.3	30 0	206	59.05	211.2	30 0
116	82.61	15.2	12 0	156	18.07	24.5	30 0	207	60.50	211.1	12 0
117	81.01	15.5	12 0	157	16.88	29.2	1	208	61.96	211.1	1
118	79.45	15.7	12 0	158	15.71	34.3	30 0	209	63.34	210.6	12 0
119	77.99	16.2	12 0	159	14.29	37.3	48 0	210	64.62	210.0	12 0
120	76.34	16.0	12 0	160	12.78	40.3	30 0	211	66.11	209.8	12 0
121	74.32	15.5	12 0	161	10.99	40.1	48 0	212	68.07	210.2	30 0
122	72.38	15.0	12 0	162	9.26	40.1	48 0	213	69.74	211.7	12 0
123	70.96	15.2	12 0	163	7.77	40.1	48 0	214	71.21	211.8	12 0
124	69.39	15.7	12 0	174	9.72	212.5	48 8	215	72.38	211.3	12 0
125	67.67	15.7	12 0	175	10.99	215.7	1	216	74.32	212.3	12 0
126	65.99	15.5	1	176	12.39	217.0	30 0	217	75.72	212.6	12 1
127	64.35	15.6	1	177	13.89	217.1	1	218	77.22	212.5	12 0
128	62.74	15.8	12 0	178	16.08	220.2	1	219	78.59	213.0	12 0
129	61.24	16.3	12 0	180	19.59	219.8	30 0	220	80.08	212.9	12 0
130	59.79	16.9	3	181	21.41	218.1	1	221	81.52	212.4	12 0
131	58.35	17.6	12 0	182	22.98	218.8	30 0	222	82.85	212.0	12 0
132	56.77	18.2	48 2	183	25.23	217.2	12 0	223	84.24	212.0	12 0
133	55.41	19.2	12 0	184	27.42	221.6	30 0	224	86.45	212.0	12 0
134	53.62	18.8	12 0	185	28.58	222.6	30 0	225	87.81	211.7	12 0
135	51.53	18.5	4	186	29.91	221.5	30 0	226	89.26	211.5	12 0
136	50.29	15.9	1	187	31.28	220.3	30 0	227	90.38	211.2	12 0
137	47.90	14.3	5	188	32.57	219.4	12 0	228	91.87	211.1	12 0
138	46.76	15.2	12 0	189	33.84	218.2	30 0	229	93.32	211.1	12 0
139	45.01	15.7	12 0	190	35.16	217.2	12 0	230	94.60	210.6	30 0

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 9 Shot Point 4

Shot Time (Julian day, hr, min, sec): 207:05:00:00.010

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	105.02	12.6		5	340	73.85	293.8	30	0	379	30.49	297.6	48	0
301	135.75	293.9	30	0	341	73.16	293.0		5	380	29.43	297.7	48	0
302	133.73	294.0	30	0	342	72.91	292.0		5	381	28.71	297.3	48	0
303	124.90	294.0	30	0	343	71.30	292.0		1	382	27.92	297.0	30	0
304	123.33	294.1	30	0	344	69.06	293.7		1	383	27.02	297.2	30	0
305	121.61	294.1	30	0	345	67.89	293.7	30	0	384	26.05	296.4	30	0
306	120.34	294.1	12	0	346	66.42	293.8	30	0	385	25.22	296.8	30	0
307	118.99	294.0	30	0	347	65.09	293.6	30	0	386	24.36	297.0	30	0
308	117.64	294.0	30	0	348	63.08	293.4	30	0	387	23.46	297.2	30	0
309	116.39	293.8	30	8	349	61.76	292.9	30	0	388	22.56	297.1	30	0
310	115.16	293.9		3	350	60.54	292.5	30	0	389	21.40	297.8		4
311	113.18	293.9		4	351	60.53	292.8	30	0	390	20.61	298.5	30	0
313	110.70	293.6	30	0	352	59.09	292.5	30	0	391	19.79	298.9	30	0
314	109.25	293.6	12	0	353	57.88	292.9	30	0	392	18.82	298.6	30	0
315	107.89	293.7	30	0	354	53.94	293.1	30	0	393	18.05	296.5	30	0
316	106.53	293.7	30	0	355	52.99	292.2	30	0	394	17.14	294.9	30	0
317	104.91	293.8	30	0	356	52.56	292.6	30	0	395	16.65	292.1	48	0
319	102.18	294.0	30	0	357	51.48	293.2	30	0	396	15.82	291.3	48	0
320	100.93	294.2	30	0	358	49.46	293.3	30	0	397	14.57	290.5	48	0
321	99.61	294.4	30	0	359	48.45	293.7	30	0	398	13.71	289.9	48	0
322	98.22	294.7	30	0	360	47.68	293.0	30	0	399	12.86	288.4	48	0
323	96.97	294.5	30	0	361	46.59	293.4	12	2	400	11.64	285.4	48	0
324	95.54	294.4	30	0	362	46.19	293.7	30	0	401	10.79	283.9	48	0
325	94.12	294.2	30	0	363	45.24	293.7	30	0	402	9.95	282.2		1
326	92.77	293.9	30	0	364	44.96	293.9	30	0	403	9.23	281.7	48	0
327	91.39	293.6	30	0	365	43.77	293.9	30	0	404	8.33	281.6	48	0
328	90.08	293.5		1	366	42.86	294.4	30	0	405	7.43	281.5	48	0
329	88.69	293.8	30	0	367	41.97	294.9	30	0	406	6.49	281.7	48	6
330	87.58	294.3	30	0	368	41.13	295.5	12	0	407	5.61	281.5	68	0
331	86.19	294.3	30	0	369	39.41	296.8	48	0	408	4.74	281.6		4
332	85.58	294.2	30	0	370	38.69	297.0	48	0	409	3.86	281.6	88	0
333	84.70	294.3	30	0	372	37.21	296.1		1	410	2.98	281.4	88	0
334	83.51	294.2	30	0	373	36.31	296.6	48	0	411	2.12	281.8	88	0
335	81.59	294.2	30	0	374	35.12	297.2	48	0	412	1.23	281.1		1
336	80.20	294.8	30	0	375	34.24	297.2	48	0	501	0.29	122.2		1
337	78.90	294.3	30	0	376	33.25	297.3	30	0	502	1.79	112.3	30	6
338	77.39	293.7		1	377	32.38	297.1	48	0					
339	75.62	294.0		5	378	31.55	297.2	48	0					

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 10 Shot Point 5

Shot Time (Julian day, hr, min, sec): 207:05:02:00.009

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	127.88	352.9		5	340	119.83	297.2	12	0	379	76.69	300.4	30	4
301	181.69	296.2	12	0	341	119.08	296.7		5	380	75.64	300.5	30	0
302	179.67	296.3	12	0	342	118.76	296.1		5	381	74.92	300.3	30	0
303	170.85	296.4	12	0	343	117.15	296.1		1	382	74.11	300.2	30	0
304	169.28	296.5	12	0	344	115.05	297.2		1	383	73.22	300.4	30	0
305	167.56	296.5	12	0	345	113.88	297.3	12	0	384	72.23	300.1	12	0
306	166.30	296.5	12	0	346	112.42	297.4	12	0	385	71.42	300.3	30	0
307	164.93	296.4	12	0	347	111.08	297.3	12	0	386	70.56	300.4	12	0
308	163.59	296.5	12	0	348	109.05	297.2	12	0	387	69.67	300.5	30	0
309	162.33	296.4	12	8	349	107.70	297.0	12	0	388	68.76	300.5	30	0
310	161.10	296.4		3	350	106.46	296.8	12	0	389	67.62	300.8		4
311	159.13	296.5		4	351	106.47	297.0	12	0	390	66.84	301.0	12	0
313	156.62	296.3	12	0	352	105.01	296.9	30	0	391	66.03	301.2	12	0
314	155.17	296.3	12	0	353	103.82	297.1	12	0	392	65.06	301.1	12	0
315	153.82	296.4	12	0	354	99.91	297.4	12	0	393	64.25	300.6	12	0
316	152.47	296.5	12	0	355	98.90	296.9	12	0	394	63.31	300.2	12	0
317	150.85	296.5	12	0	356	98.50	297.2	12	0	395	62.74	299.5	12	0
319	148.15	296.7	12	0	357	97.46	297.5	12	0	396	61.88	299.4	12	0
320	146.91	296.9	12	0	358	95.46	297.7	12	0	397	60.61	299.4	12	0
321	145.61	297.1	12	0	359	94.47	297.9	12	0	398	59.74	299.4	12	0
322	144.23	297.2	12	0	360	93.66	297.6	12	0	399	58.85	299.2	12	0
323	142.97	297.2	12	0	361	92.59	297.8	12	2	400	57.51	298.8	12	0
324	141.54	297.1	12	0	362	92.21	298.0	12	0	401	56.63	298.7	12	0
325	140.10	297.0	12	0	363	91.27	298.1	12	0	402	55.73	298.6		1
326	138.74	296.8	30	0	364	91.00	298.2	12	0	403	55.01	298.7	12	0
327	137.34	296.6	12	0	365	89.82	298.2	12	0	404	54.15	299.0	12	0
328	136.02	296.6		1	366	88.93	298.5	12	0	405	53.29	299.3	12	0
329	134.65	296.8	12	0	367	88.07	298.8	12	0	406	52.40	299.6	12	0
330	133.57	297.1	12	0	368	87.25	299.1	12	0	407	51.56	299.9	30	0
331	132.19	297.2	12	0	369	85.58	299.8	30	0	408	50.73	300.2		
332	131.57	297.2	12	0	370	84.88	299.9	30	0	409	49.90	300.5	30	0
333	130.70	297.2	12	0	372	83.37	299.5		1	410	49.06	300.8	12	0
334	129.50	297.2	12	0	373	82.49	299.8	30	0	411	48.25	301.2	30	0
335	127.59	297.2	12	0	374	81.31	300.1	30	0	412	47.41	301.5		1
336	126.24	297.6	12	0	375	80.43	300.1	30	0	501	45.96	302.0		1
337	124.91	297.4	12	0	376	79.45	300.2	30	0	502	44.49	302.4	12	0
338	123.36	297.0		1	377	78.57	300.1	30	0					
339	121.61	297.2		5	378	77.75	300.2	30	0					

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 11 Shot Point 1

Shot Time (Julian day, hr, min, sec): 207:05:04:00.130

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	154.63	71.2	5		340	62.05	113.1	30	0	379	105.49	111.9	30	0
301	0.15	102.2	48	6	341	62.76	114.0	5		380	106.55	111.9	30	0
302	2.17	109.4	48	6	342	63.07	115.1	5		381	107.25	112.0	30	0
303	11.00	111.4	48	0	343	64.68	115.0	1		382	108.03	112.2	30	0
304	12.58	111.1	30	6	344	66.83	113.1	1		383	108.93	112.1	12	0
305	14.30	111.3	48	0	345	68.00	113.1	30	0	384	109.88	112.4	12	0
306	15.56	111.5	48	0	346	69.47	113.0	30	0	385	110.71	112.3	12	0
307	16.91	112.4	48	0	347	70.81	113.2	30	0	386	111.58	112.3	30	0
308	18.26	112.1	30	0	348	72.82	113.4	30	0	387	112.48	112.2	30	0
309	19.51	113.2	48	8	349	74.16	113.8	30	0	388	113.38	112.3	30	0
310	20.74	113.2	3		350	75.39	114.1	30	0	389	114.56	112.2	4	
311	22.71	113.1	4		351	75.38	113.8	30	0	390	115.37	112.1	12	0
313	25.21	114.4	48	0	352	76.84	114.0	30	0	391	116.19	112.1	12	0
314	26.66	114.2	48	0	353	78.04	113.7	30	0	392	117.15	112.2	12	0
315	28.01	113.8	30	0	354	81.96	113.5	30	0	393	117.87	112.5	12	0
316	29.37	113.5	30	0	355	82.95	114.0	30	0	394	118.76	112.8	12	0
317	30.99	113.2	30	0	356	83.36	113.8	30	0	395	119.25	113.2	12	0
319	33.72	112.5	30	0	357	84.43	113.4	30	0	396	120.10	113.3	12	0
320	34.97	112.0	30	0	358	86.44	113.3	30	0	397	121.36	113.4	12	0
321	36.30	111.4	48	0	359	87.44	113.1	30	0	398	122.23	113.4	12	0
322	37.71	110.9	48	0	360	88.22	113.4	30	0	399	123.10	113.5	12	0
323	38.95	111.4	30	0	361	89.31	113.2	12	2	400	124.40	113.7	30	0
324	40.37	111.8	48	0	362	89.71	113.0	30	0	401	125.28	113.8	30	0
325	41.78	112.3	30	0	363	90.66	113.1	30	0	402	126.17	113.9	1	
326	43.12	113.0	30	0	364	90.94	112.9	30	0	403	126.90	113.8	30	0
327	44.51	113.6	30	0	365	92.12	113.0	30	0	404	127.77	113.7	48	0
328	45.82	113.8	1		366	93.04	112.7	30	0	405	128.65	113.7	30	0
329	47.21	113.1	30	0	367	93.94	112.5	30	0	406	129.56	113.6	30	0
330	48.33	112.3	30	0	368	94.79	112.3	12	0	407	130.42	113.5	30	0
331	49.71	112.3	30	0	369	96.56	111.8	30	0	408	131.28	113.4	4	
332	50.33	112.4	30	0	370	97.28	111.7	30	0	409	132.13	113.3	30	0
333	51.20	112.2	30	0	372	98.72	112.1	1		410	132.99	113.2	30	0
334	52.39	112.5	30	0	373	99.64	112.0	30	0	411	133.82	113.1	30	0
335	54.31	112.5	30	0	374	100.86	111.8	12	0	412	134.70	113.1	1	
336	55.72	111.7	30	0	375	101.74	111.8	30	0	501	136.19	113.0	1	
337	57.01	112.3	12	0	376	102.72	111.8	30	0	502	137.69	112.9	30	0
338	58.51	113.1	1		377	103.59	111.9	30	0					
339	60.27	112.9	5		378	104.41	111.9	30	0					

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 12 Shot Point 3

Shot Time (Julian day, hr, min, sec): 207:05:06:05.848

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	105.83	36.9		5	340	28.89	293.3	48	0	379	14.66	106.0	48	0
301	90.80	293.6	30	0	341	28.22	291.1		5	380	15.71	106.5	48	0
302	88.78	293.7	30	0	342	28.02	288.7		5	381	16.38	107.7	48	0
303	79.94	293.8	12	0	343	26.41	288.4		1	382	17.14	108.6	48	0
304	78.37	293.9	30	0	344	24.11	293.0		1	383	18.05	108.7	48	0
305	76.65	293.9	30	0	345	22.94	293.1	48	0	384	18.96	110.2	30	0
306	75.39	293.9	30	0	346	21.47	293.4	48	0	385	19.81	109.9	48	0
307	74.03	293.7	30	0	347	20.14	292.7	30	0	386	20.68	109.9	48	0
308	72.68	293.8	30	0	348	18.13	291.8	48	0	387	21.58	110.0	48	0
309	71.43	293.5	30	8	349	16.83	290.0	48	0	388	22.47	110.4	48	0
310	70.20	293.5		3	350	15.64	288.1	48	0	389	23.65	110.0		4
311	68.23	293.5		4	351	15.61	289.4	48	0	390	24.47	109.7	30	0
313	65.74	293.0	30	0	352	14.19	287.7	48	0	391	25.30	109.7	30	0
314	64.29	293.1	12	0	353	12.95	289.2	48	0	392	26.24	110.3	30	0
315	62.94	293.2	30	0	354	9.02	288.4	48	0	393	26.94	111.9	30	0
316	61.57	293.3	30	0	355	8.17	282.3	48	0	394	27.82	113.0	30	0
317	59.95	293.4	30	0	356	7.68	284.5	48	0	395	28.32	114.6	30	0
319	57.23	293.8	30	0	357	6.55	287.9	48	0	396	29.17	115.0	30	0
320	55.97	294.2	30	0	358	4.53	286.9	68	0	397	30.42	115.2	30	0
321	54.66	294.6	30	0	359	3.50	290.1	68	0	398	31.30	115.3	30	0
322	53.27	295.0	30	0	360	2.81	278.7	88	0	399	32.17	115.8	30	0
323	52.01	294.7	30	0	361	1.69	278.6	12	0	400	33.49	116.6	30	0
324	50.59	294.4	30	0	362	1.24	285.7	88	0	401	34.38	116.7	30	0
325	49.16	294.1	30	0	363	0.34	259.8	88	0	402	35.27	116.9		1
326	47.82	293.6	30	0	364	0.00	0.0	88	6	403	35.99	116.7	30	0
327	46.44	293.0	30	0	365	1.18	115.7	88	0	404	36.86	116.4	30	0
328	45.13	292.7		1	366	2.13	104.3	88	0	405	37.73	116.0	30	0
329	43.73	293.4	30	0	367	3.08	99.7	30	6	406	38.64	115.6	30	0
330	42.62	294.3	30	0	368	4.01	97.2	68	0	407	39.49	115.3	30	0
331	41.24	294.4	30	0	369	5.94	94.1	48	6	408	40.34	115.0		4
332	40.62	294.3	30	0	370	6.66	95.3	48	6	409	41.19	114.7	30	0
333	39.75	294.5	30	0	372	7.89	103.4		1	410	42.06	114.5	30	0
334	38.55	294.1	30	0	373	8.85	102.5	48	6	411	42.89	114.2	30	0
335	36.63	294.3	30	0	374	10.10	102.1	48	6	412	43.76	114.0		1
336	35.26	295.6	30	0	375	10.96	103.1	48	0	501	45.25	113.7		1
337	33.94	294.6	30	0	376	11.93	104.1	48	0	502	46.75	113.5	30	0
338	32.43	293.2		1	377	12.76	105.5	48	0					
339	30.67	293.7		5	378	13.58	105.9	48	0					

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 13 Shot Point 7

Shot Time (Julian day, hr, min, sec): 207:05:08:00.012

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	198.96	330.2		5	340	215.91	298.0	12	0	379	172.72	299.5	12	0
301	277.74	297.3	30	0	341	215.15	297.7		5	380	171.67	299.5	12	0
302	275.73	297.4	12	0	342	214.82	297.4		5	381	170.95	299.5	12	0
303	266.91	297.5	12	0	343	213.21	297.5		1	382	170.15	299.4	12	0
304	265.34	297.5	12	0	344	211.12	298.1		1	383	169.25	299.5	12	0
305	263.63	297.6	12	0	345	209.96	298.1	12	0	384	168.27	299.3	12	0
306	262.36	297.6	12	0	346	208.50	298.1	12	0	385	167.45	299.4	12	0
307	261.00	297.5	12	0	347	207.15	298.1	12	0	386	166.59	299.5	12	0
308	259.66	297.6	12	0	348	205.13	298.1	12	0	387	165.70	299.5	12	0
309	258.39	297.5	12	8	349	203.77	297.9	12	0	388	164.79	299.5	12	0
310	257.16	297.5		3	350	202.53	297.8	12	0	389	163.64	299.6		4
311	255.19	297.5		4	351	202.55	297.9	12	0	390	162.85	299.7	12	0
313	252.68	297.4	12	0	352	201.08	297.9	12	0	391	162.03	299.7	12	0
314	251.23	297.5	12	0	353	199.90	298.0	12	0	392	161.07	299.7	12	0
315	249.89	297.5	12	0	354	195.99	298.1	12	0	393	160.28	299.5	12	0
316	248.53	297.6	12	0	355	194.97	297.9	12	0	394	159.35	299.3	12	0
317	246.92	297.6	12	0	356	194.57	298.0	12	0	395	158.80	299.0	12	0
319	244.22	297.7	12	0	357	193.54	298.2	12	0	396	157.94	299.0	12	0
320	242.99	297.8	12	0	358	191.54	298.3	12	0	397	156.67	299.0	12	0
321	241.69	297.9	12	0	359	190.55	298.4	12	0	398	155.80	298.9	12	0
322	240.31	298.0	12	0	360	189.74	298.3	12	0	399	154.91	298.9	12	0
323	239.05	298.0	12	0	361	188.67	298.4	12	2	400	153.59	298.7	12	0
324	237.61	297.9	12	0	362	188.29	298.5	12	0	401	152.70	298.7	12	0
325	236.18	297.9	12	0	363	187.34	298.5	12	0	402	151.81	298.6		1
326	234.81	297.8	30	0	364	187.08	298.6	30	7	403	151.08	298.7	12	0
327	233.40	297.7	12	0	365	185.89	298.6	12	0	404	150.22	298.8	12	0
328	232.09	297.7		1	366	185.00	298.7	12	0	405	149.36	298.9	12	0
329	230.73	297.8	12	0	367	184.14	298.8	12	0	406	148.46	299.0	12	0
330	229.65	298.0	12	0	368	183.32	299.0	12	0	407	147.61	299.1	12	0
331	228.27	298.0	12	0	369	181.63	299.3	30	0	408	146.77	299.2		4
332	227.65	298.0	12	0	370	180.92	299.3	30	0	409	145.93	299.3	12	0
333	226.78	298.1	12	0	372	179.42	299.2		1	410	145.08	299.4	12	0
334	225.58	298.0	12	0	373	178.53	299.3	30	0	411	144.27	299.5	12	0
335	223.66	298.1	12	0	374	177.35	299.4	12	0	412	143.42	299.6		1
336	222.32	298.3	12	0	375	176.47	299.4	12	0	501	141.95	299.7		1
337	220.98	298.1	12	0	376	175.48	299.4	12	0	502	140.46	299.8	12	0
338	219.43	297.9		1	377	174.61	299.4	12	0					
339	217.69	298.0		5	378	173.78	299.4	12	0					



## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 14 Shot Point 12

Shot Time (Julian day, hr, min, sec): 207:07:00:00.008

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	105.58	17.9		5	340	64.16	295.5	12	0	379	21.08	304.7	12	0
301	126.05	294.8	12	0	341	63.44	294.6	12	0	380	20.05	305.3	12	0
302	124.03	294.8	12	0	342	63.15	293.5	12	0	381	19.31	305.0	12	0
303	115.21	295.0	12	0	343	61.54	293.5		1	382	18.50	304.8	12	0
304	113.63	295.0	12	0	344	59.37	295.6		1	383	17.63	305.5	12	0
305	111.92	295.1	12	0	345	58.20	295.6	12	0	384	16.61	304.8	12	0
306	110.65	295.1	12	0	346	56.74	295.8	12	0	385	15.82	305.9	12	0
307	109.29	295.0	12	0	347	55.40	295.6	30	2	386	14.99	306.8	12	0
308	107.94	295.0	12	0	348	53.38	295.4	12	0	387	14.12	307.7	12	0
309	106.69	294.9	12	8	349	52.04	294.9	12	0	388	13.22	308.2	12	0
310	105.46	294.9	12	3	350	50.81	294.4	12	0	389	12.15	310.6	12	0
311	103.48	294.9		2	351	50.81	294.9	12	0	390	11.44	312.6	12	0
313	100.99	294.6	12	0	352	49.36	294.5	12	0	391	10.68	314.4	12	0
314	99.54	294.7	12	0	353	48.16	295.1	12	0	392	9.72	315.4	12	0
315	98.19	294.8	12	0	354	44.24	295.4	12	0	393	8.79	312.7	12	0
316	96.83	294.9	12	2	355	43.25	294.4	12	0	394	7.78	311.3	12	0
317	95.21	295.0	12	0	356	42.83	294.9	12	0	395	7.09	306.2	12	0
319	92.49	295.2	12	0	357	41.78	295.7	12	0	396	6.22	306.1	30	0
320	91.25	295.5	12	0	358	39.77	296.0	12	0	397	4.97	307.5	30	0
321	89.94	295.7	12	0	359	38.78	296.5	12	0	398	4.10	309.1	30	0
322	88.56	296.0	12	0	360	37.98	295.8	12	0	399	3.19	308.5	30	0
323	87.30	295.9	12	0	361	36.90	296.3	12	2	400	1.82	303.5	48	0
324	85.87	295.7	12	0	362	36.52	296.8	12	0	401	0.93	304.1	48	0
325	84.44	295.5	12	0	363	35.57	296.8	12	0	402	0.03	326.5		1
326	83.08	295.2	12	0	364	35.30	297.1	30	0	403	0.71	107.6	48	0
327	81.69	294.9	12	0	365	34.11	297.2	12	0	404	1.60	104.4	48	0
328	80.37	294.8		1	366	33.22	297.9	12	0	405	2.49	103.8	48	0
329	79.00	295.2	12	0	367	32.37	298.8	12	0	406	3.44	102.8	48	0
330	77.90	295.7	12	0	368	31.55	299.6	12	0	407	4.32	102.8	30	0
331	76.52	295.8	12	0	369	29.91	301.6	30	0	408	5.19	102.5	30	0
332	75.90	295.7	12	0	370	29.21	302.0	30	0	409	6.07	102.3	30	0
333	75.03	295.9	12	0	372	27.68	301.0	12	1	410	6.95	102.3	30	0
334	73.83	295.7	12	0	373	26.82	301.8	12	0	411	7.81	102.1	30	0
335	71.91	295.8	12	2	374	25.67	302.9	12	0	412	8.70	102.2		1
336	70.55	296.5	12	0	375	24.79	303.2	12	0	501	10.21	102.6		1
337	69.23	296.0	12	0	376	23.81	303.5	12	0	502	11.70	103.6	12	0
338	67.69	295.4		1	377	22.93	303.5	12	0					
339	65.94	295.7	12	0	378	22.12	303.8	12	0					

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 15 Shot Point 8

Shot Time (Julian day, hr, min, sec): 207:07:06:00.096

Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade
101	0.07	200.3	5	340	116.14	231.4	30 0	379	101.59	209.6	30 0
301	154.55	252.3	12 0	341	116.78	230.8	30 0	380	101.49	209.1	12 0
302	152.98	251.8	12 0	342	117.69	230.5	12 0	381	101.68	208.6	30 0
303	146.46	249.5	12 0	343	116.98	229.8	1	382	101.83	208.2	12 0
304	145.26	249.1	12 0	344	114.11	229.2	1	383	101.72	207.7	12 0
305	144.04	248.6	12 0	345	113.59	228.7	30 0	384	102.09	207.1	12 0
306	143.18	248.3	12 0	346	112.86	228.1	30 0	385	101.89	206.7	12 0
307	142.40	247.8	12 0	347	112.54	227.4	30 0	386	101.79	206.2	12 0
308	141.38	247.4	12 0	348	112.01	226.4	30 0	387	101.73	205.7	30 0
309	140.80	247.0	12 8	349	111.96	225.7	30 0	388	101.83	205.2	12 0
310	139.95	246.6	3	350	111.93	225.0	30 0	389	101.59	204.5	12 0
311	138.60	246.0	12 0	351	111.58	225.1	30 0	390	101.40	204.1	12 0
313	137.39	245.1	12 0	352	111.38	224.3	30 0	391	101.35	203.6	12 0
314	136.40	244.6	12 0	353	110.53	223.8	30 0	392	101.54	203.1	12 0
315	135.41	244.2	12 0	354	109.09	221.9	30 0	393	102.27	202.7	12 0
316	134.43	243.8	12 0	355	109.55	221.3	30 0	394	102.82	202.2	12 0
317	133.28	243.3	12 0	356	109.06	221.1	12 0	395	103.64	201.9	12 0
319	131.26	242.5	30 0	357	108.21	220.7	12 0	396	103.88	201.5	12 0
320	130.22	242.2	30 0	358	107.53	219.7	12 0	397	104.09	200.8	12 0
321	129.13	241.8	30 0	359	106.96	219.2	30 0	398	104.24	200.3	12 0
322	127.98	241.4	30 0	360	107.25	218.7	12 0	399	104.57	199.8	12 0
323	127.44	240.9	30 0	361	106.71	218.2	12 2	400	105.18	199.1	30 0
324	126.82	240.3	30 0	362	106.35	218.0	12 0	401	105.39	198.7	30 0
325	126.21	239.7	30 0	363	106.15	217.5	30 0	402	105.63	198.2	1
326	125.85	239.1	30 0	364	105.89	217.4	30 0	403	105.65	197.8	30 0
327	125.45	238.5	12 0	365	105.67	216.8	12 0	404	105.56	197.3	30 0
328	124.86	237.9	1	366	105.10	216.3	30 0	405	105.50	196.8	30 0
329	123.66	237.5	30 0	367	104.52	215.9	30 0	406	105.39	196.3	30 0
330	122.47	237.3	30 0	368	103.97	215.5	12 0	407	105.35	195.8	30 0
331	121.69	236.7	30 0	369	102.80	214.6	30 0	408	105.29	195.4	12 0
332	121.42	236.5	30 0	370	102.57	214.2	30 0	409	105.23	194.9	30 0
333	120.84	236.1	30 0	372	103.01	213.4	1	410	105.20	194.4	30 0
334	120.43	235.6	30 0	373	102.56	212.9	30 0	411	105.14	194.0	30 0
335	119.38	234.8	12 0	374	102.07	212.2	30 0	412	105.13	193.5	1
336	118.00	234.4	30 0	375	101.97	211.8	30 0	501	105.19	192.6	1
337	117.89	233.7	12 0	376	101.88	211.2	30 0	502	105.41	191.8	12 0
338	117.87	232.9	1	377	101.93	210.7	30 0				
339	116.76	232.2	30 0	378	101.83	210.2	30 0				

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

55

Shot Number 16 Shot Point 13

Shot Time (Julian day, hr, min, sec): 207:09:00:00.010

Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade
101	103.80	21.1	5	340	58.18	294.3	12 0	379	14.98	304.0	30 0
301	120.08	294.1	12 0	341	57.48	293.3	12 0	380	13.94	304.7	48 0
302	118.06	294.2	12 0	342	57.22	292.1	12 0	381	13.21	304.2	48 0
303	109.23	294.3	12 0	343	55.61	292.1	1	382	12.40	304.0	30 0
304	107.66	294.4	12 0	344	53.39	294.3	1	383	11.52	305.0	48 0
305	105.94	294.4	12 0	345	52.22	294.3	12 0	384	10.51	303.7	48 0
306	104.67	294.4	12 0	346	50.75	294.5	12 0	385	9.72	305.5	48 0
307	103.31	294.3	12 0	347	49.42	294.3	12 0	386	8.88	307.0	48 0
308	101.97	294.3	12 0	348	47.41	293.9	12 0	387	8.02	308.7	30 0
309	100.72	294.1	12 8	349	46.08	293.3	12 0	388	7.12	309.6	30 0
310	99.49	294.1	3	350	44.86	292.8	12 0	389	6.07	314.7	30 0
311	97.51	294.2	4	351	44.85	293.2	12 0	390	5.41	319.6	30 0
313	95.02	293.8	12 0	352	43.41	292.8	12 0	391	4.71	324.6	30 0
314	93.57	293.9	12 0	353	42.19	293.4	12 0	392	3.81	329.7	30 0
315	92.22	293.9	12 0	354	38.26	293.6	12 0	393	2.80	326.5	30 0
316	90.86	294.0	12 0	355	37.30	292.4	12 0	394	1.77	328.0	48 0
317	89.23	294.1	12 0	356	36.87	293.0	12 0	395	0.99	304.6	48 6
319	86.51	294.4	12 0	357	35.80	293.9	12 0	396	0.13	286.8	48 6
320	85.26	294.7	12 0	358	33.79	294.1	12 0	397	1.14	122.0	48 6
321	83.95	294.9	12 0	359	32.78	294.6	12 0	398	2.02	121.1	48 0
322	82.56	295.2	12 0	360	32.00	293.8	4	399	2.92	124.2	48 0
323	81.31	295.0	12 0	361	30.91	294.3	12 2	400	4.29	127.7	48 0
324	79.88	294.8	12 0	362	30.52	294.8	12 0	401	5.18	126.9	30 0
325	78.45	294.7	12 0	363	29.57	294.8	12 0	402	6.07	126.3	1
326	77.10	294.3	30 0	364	29.29	295.2	12 0	403	6.78	124.5	30 0
327	75.72	293.9	12 0	365	28.11	295.1	12 0	404	7.61	121.9	30 0
328	74.41	293.8	1	366	27.20	296.0	12 0	405	8.46	119.9	30 0
329	73.02	294.2	12 0	367	26.33	296.9	12 0	406	9.35	117.9	...
330	71.91	294.8	12 0	368	25.50	297.9	12 0	407	10.21	116.6	30 0
331	70.53	294.8	12 0	369	23.84	300.3	30 0	408	11.05	115.4	30 0
332	69.91	294.8	12 0	370	23.13	300.7	30 0	409	11.90	114.4	30 0
333	69.04	294.9	12 0	372	21.61	299.4	1	410	12.77	113.6	30 0
334	67.84	294.7	12 0	373	20.74	300.4	30 0	411	13.60	112.7	12 0
335	65.92	294.8	12 0	374	19.58	301.8	30 0	412	14.48	112.1	1
336	64.55	295.5	12 0	375	18.70	302.1	30 0	501	15.98	111.5	1
337	63.23	295.0	12 0	376	17.72	302.4	30 0	502	17.48	111.3	12 0
338	61.71	294.2	1	377	16.84	302.4	30 0				
339	59.95	294.5	12 0	378	16.02	302.8	30 0				

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

56

Shot Number 17 Shot Point 2

Shot Time (Julian day, hr, min, sec): 207:09:04:00.320

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	121.36	55.7		5	340	11.74	116.4	48	0	379	55.17	111.8	12	9
301	50.18	292.7	12	0	341	12.54	121.2	30	0	380	56.22	111.8		4
302	48.16	292.9		4	342	13.02	126.1	30	0	381	56.92	112.1		4
303	39.33	293.0		4	343	14.60	124.7		1	382	57.70	112.3	12	0
304	37.75	293.1	12	0	344	16.53	115.9		1	383	58.60	112.3	12	0
305	36.04	293.1	12	9	345	17.69	115.6	30	0	384	59.55	112.7	12	9
306	34.77	293.1	12	9	346	19.16	115.0	30	0	385	60.39	112.6	12	0
307	33.42	292.7	12	0	347	20.50	115.5	30	0	386	61.26	112.5	12	0
308	32.07	292.9	12	0	348	22.52	116.0	30	9	387	62.15	112.5	12	0
309	30.82	292.2	12	8	349	23.87	117.1		4	388	63.05	112.6	12	0
310	29.59	292.2		3	350	25.13	117.9	30	4	389	64.23	112.4	12	0
311	27.62	292.1		4	351	25.10	117.0	30	0	390	65.04	112.3	12	0
313	25.15	290.7	12	0	352	26.57	117.5		4	391	65.87	112.3		4
314	23.70	290.7	12	0	353	27.75	116.4	12	0	392	66.82	112.4	12	0
315	22.34	290.9	12	0	354	31.66	115.7	30	0	393	67.54	113.0	12	0
316	20.97	291.1	30	0	355	32.67	117.0	12	0	394	68.44	113.5	12	0
317	19.34	291.4	30	0	356	33.07	116.3	12	0	395	68.93	114.2		4
319	16.61	292.5	30	0	357	34.12	115.2	12	9	396	69.78	114.3	12	0
320	15.36	293.6	30	0	358	36.13	114.9	12	0	397	71.04	114.4	12	0
321	14.05	295.1		4	359	37.12	114.4	12	9	398	71.91	114.5	12	9
322	12.66	297.0	30	0	360	37.92	115.1		4	399	72.79	114.7	12	0
323	11.40	296.1	30	0	361	39.00	114.7	12	2	400	74.10	115.0	12	9
324	9.97	294.8	30	0	362	39.39	114.3		4	401	74.98	115.1	30	9
325	8.55	293.2	48	9	363	40.34	114.3		4	402	75.87	115.2		1
326	7.22	289.1	48	0	364	40.62	114.0		4	403	76.59	115.1		4
327	5.90	283.6		4	365	41.80	114.0	30	0	404	77.46	115.0	30	0
328	4.66	278.8		1	366	42.72	113.5	30	0	405	78.34	114.8	12	0
329	3.19	281.6	30	6	367	43.61	113.0		4	406	79.25	114.7		4
330	2.00	294.4	88	9	368	44.46	112.5	30	9	407	80.11	114.5	30	9
331	0.62	300.0		4	369	46.24	111.5		2	408	80.96	114.4	30	0
332	0.00	180.0		4	370	46.96	111.4		4	409	81.81	114.2	30	9
333	0.88	104.6		4	372	48.39	112.2		1	410	82.67	114.1	30	0
334	2.07	116.7		4	373	49.31	111.9		4	411	83.50	114.0	30	0
335	3.99	114.1		4	374	50.53	111.6	12	0	412	84.37	113.8		1
336	5.43	105.6		4	375	51.42	111.6	12	0	501	85.87	113.7		1
337	6.68	112.4	30	9	376	52.40	111.7		4	502	87.36	113.6	12	9
338	8.22	118.3		1	377	53.26	111.9	30	0					
339	9.96	115.7	48	0	378	54.09	111.9	12	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 18 Shot Point 7

Shot Time (Julian day, hr, min, sec): 211:05:00:00.008

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	198.96	330.2	12	5	541	102.48	298.4	12	0	581	51.84	298.1	12	0
501	141.95	299.7	12	0	542	101.79	298.3	12	0	582	50.43	297.6	12	0
502	140.46	299.8	12	0	543	100.92	298.4	12	0	583	49.15	297.7	12	0
503	138.74	300.0		3	544	100.00	298.5	12	0	584	47.84	297.8	12	0
504	137.42	300.4		1	545	99.10	298.5	12	0	585	46.12	297.8	12	0
505	136.50	300.6	12	0	546	98.22	298.5	12	0	586	44.94	297.1	12	0
506	134.61	300.2	12	0	547	97.23	298.3	12	0	587	44.23	297.7	12	0
507	133.22	300.2	12	0	548	96.41	298.3	12	0	588	42.65	296.9	12	0
508	132.74	301.0	12	0	549	95.67	298.4	12	0	589	40.58	297.7		4
509	131.51	301.3	12	0	550	94.63	298.8	12	0	590	39.27	295.9	12	0
510	130.31	301.3	12	0	551	93.81	298.6	12	0	591	37.57	294.9	12	0
511	129.49	301.6	12	0	552	92.99	298.2	12	0	592	36.37	295.6		1
512	128.52	301.9	12	0	553	91.60	297.9	12	0	593	34.98	296.1	12	0
513	127.92	302.2	12	0	554	90.15	298.1	12	0	594	34.44	296.2	12	0
514	126.98	302.4	12	0	555	89.12	298.5	12	0	595	33.54	295.3	12	0
515	126.06	302.2	12	0	556	88.16	298.3	12	0	596	32.27	295.1	12	0
516	124.98	301.6	12	0	557	86.71	298.5	12	0	597	30.66	294.7	12	0
517	124.30	301.4	12	0	558	85.39	298.5	12	0	598	29.23	297.7	30	0
518	123.41	301.2	12	0	559	83.94	298.6	12	0	599	27.61	297.8	30	0
519	122.59	301.1	12	0	560	82.61	298.6	12	0	600	26.49	294.9	30	0
520	121.73	300.9	12	0	561	81.39	298.6	12	0	601	24.99	293.6	12	0
521	120.86	300.7	12	2	562	79.92	298.0	12	0	602	22.63	294.3	30	0
522	120.01	300.6	12	0	563	78.90	297.5	12	0	603	21.65	296.4	30	0
523	119.11	300.4	12	0	564	77.49	297.5	12	0	604	20.71	297.8	30	0
524	118.34	300.2	12	0	565	76.20	297.9		1	605	18.80	299.9	30	0
525	117.20	300.1	12	0	566	74.40	298.4	12	0	606	17.61	300.2	30	0
526	116.48	299.8	12	0	567	72.15	298.8	12	0	607	16.03	297.1	30	0
527	115.70	299.6		1	568	70.40	298.6		4	608	14.86	294.7	30	0
529	113.65	298.7	12	0	569	68.76	298.7	12	0	609	13.21	298.0	30	0
530	112.82	298.7	12	0	570	67.61	298.3	12	0	610	11.61	293.5	30	0
531	111.14	298.3	12	0	571	65.41	299.0	12	0	611	10.17	295.1	48	0
532	110.44	298.3	12	0	572	63.74	299.0	12	0	612	8.85	300.1	48	1
533	109.69	298.3	12	0	573	62.51	298.5	12	0	613	8.13	305.3	48	0
534	108.95	298.2	12	0	574	61.53	297.8	12	0	614	5.68	302.1	48	0
535	107.86	298.5	12	0	575	60.32	297.2		1	615	4.87	295.1	68	0
536	107.20	298.5	12	0	576	59.26	297.2	12	0	616	3.22	301.8	68	0
537	106.33	298.5	12	0	577	57.94	297.2	12	0	617	1.53	268.4	88	0
538	105.37	298.5	12	0	578	56.22	297.4	12	0	618	0.09	236.3	88	0
539	104.45	298.6	12	0	579	54.82	297.7	12	0					
540	103.43	298.6	12	0	580	53.29	297.9	12	0					

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

58

Shot Number 19 Shot Point 8

Shot Time (Julian day, hr, min, sec): 211:05:02:00.012

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
			Db	Grade				Db	Grade				Db	Grade
101	0.07	200.3		5	541	124.28	175.2	12	0	581	157.55	159.5	12	0
501	105.19	192.6	12	0	542	124.73	175.0	12	0	582	158.86	159.3	12	0
502	105.41	191.8	30	0	543	125.04	174.6	12	0	583	159.78	159.0	12	0
503	105.50	190.9		3	544	125.42	174.2	12	0	584	160.65	158.6	12	0
504	105.00	190.0		1	545	125.92	173.8	12	0	585	161.94	158.2	12	0
505	104.88	189.5	12	0	546	126.42	173.5	12	0	586	163.23	158.1	12	0
506	106.45	188.7	12	0	547	127.27	173.2	12	0	587	163.45	157.8	12	0
507	106.95	188.0	12	0	548	127.79	173.0	12	0	588	165.02	157.6	12	0
508	105.30	187.3	12	0	549	127.99	172.6	12	0	589	166.22	157.0		4
509	105.27	186.6	12	0	550	128.14	172.1	12	0	590	168.02	157.0	12	0
510	105.65	186.0	12	0	551	128.82	171.9	12	0	591	169.72	156.8	12	0
511	105.46	185.4	12	0	552	129.86	171.7	12	0	592	170.31	156.4		1
512	105.31	184.8	12	0	553	131.13	171.4	12	0	593	171.16	156.0	12	0
513	104.86	184.3	12	0	554	131.70	170.8	12	0	594	171.53	155.9	12	0
514	105.00	183.8	12	0	555	131.82	170.3	12	0	595	172.59	155.8	12	0
515	105.84	183.5	12	0	556	132.56	170.0	12	0	596	173.61	155.6	12	0
516	107.48	183.3	12	0	557	133.30	169.4	12	0	597	174.97	155.3	12	0
517	108.13	183.0	12	0	558	134.12	169.0	12	0	598	175.07	154.6	12	0
518	108.87	182.7	30	0	559	134.91	168.5	12	0	599	176.31	154.3	12	0
519	109.56	182.4	12	0	560	135.69	168.0	12	0	600	178.04	154.4	12	0
520	110.39	182.1	12	0	561	136.56	167.7	12	0	601	179.56	154.2	12	0
521	111.06	181.8	12	2	562	138.07	167.4	12	0	602	181.15	153.6	12	0
522	111.74	181.5	12	0	563	139.28	167.3	12	0	603	181.41	153.2	12	0
523	112.46	181.2	12	0	564	140.15	166.8	12	0	604	181.87	152.9	12	0
524	113.16	180.9	12	0	565	140.61	166.3		1	605	183.02	152.4	12	0
525	113.85	180.5	12	0	566	141.29	165.5	12	0	606	183.97	152.2	12	0
526	114.74	180.3	12	0	567	142.46	164.7	12	0	607	185.79	152.1	12	0
527	115.52	180.1		1	568	143.84	164.3		4	608	187.11	152.1	12	0
529	118.16	179.6	12	0	569	144.93	163.8	12	0	609	187.96	151.6	12	0
530	118.58	179.3	12	0	570	146.07	163.6	12	0	610	189.83	151.5	12	0
531	119.99	178.7	12	0	571	147.03	162.8	12	0	611	190.78	151.2	12	0
532	120.37	178.5	12	0	572	148.20	162.3	12	0	612	191.41	150.8		1
533	120.78	178.2	12	0	573	149.50	162.1	12	0	613	191.67	150.5	12	0
534	121.21	177.9	12	0	574	150.68	162.1	12	0	614	194.02	150.2	12	0
535	121.35	177.3	12	0	575	152.03	161.9		1	615	195.04	150.3	12	0
536	121.65	177.0	12	0	576	152.77	161.6	12	0	616	196.18	149.9	12	0
537	122.04	176.7	12	0	577	153.68	161.3	12	0	617	198.29	149.8	12	0
538	122.63	176.3	12	0	578	154.76	160.8	12	0	618	199.02	149.5	12	0
539	122.95	175.9	12	0	579	155.58	160.4	12	0					
540	123.48	175.5	12	0	580	156.59	159.9	12	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 20 Shot Point 14

Shot Time (Julian day, hr, min, sec): 211:05:04:00.012

Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade
101	108.73	2.6	5	541	21.58	134.6	30 0	581	71.58	122.9	12 0
501	19.04	288.5	30 0	542	22.26	134.3	30 0	582	73.02	123.1	12 0
502	17.54	288.3	30 0	543	23.04	133.3	30 0	583	74.29	123.0	12 0
503	15.76	288.7	3	544	23.89	132.3	30 0	584	75.58	122.7	12 0
504	14.30	291.6	1	545	24.76	131.8	30 0	585	77.29	122.6	12 0
505	13.33	293.0	30 0	546	25.62	131.3	30 0	586	78.53	123.0	12 0
506	11.62	287.3	30 0	547	26.66	131.6	12 0	587	79.18	122.6	12 0
507	10.27	285.6	30 0	548	27.48	131.3	12 0	588	80.81	122.8	12 0
508	9.49	296.5	30 0	549	28.14	130.4	12 0	589	82.81	122.3	4
509	8.24	299.9	30 0	550	29.04	128.9	12 0	590	84.26	123.0	12 0
510	7.04	300.8	30 0	551	29.89	129.0	30 0	591	86.03	123.3	12 0
511	6.25	306.2	30 0	552	30.84	130.0	12 0	592	87.16	122.9	1
512	5.39	314.0	30 0	553	32.32	130.4	30 0	593	88.50	122.6	12 0
513	5.06	324.4	30 0	554	33.65	129.3	12 0	594	89.02	122.5	12 0
514	4.38	333.3	48 0	555	34.55	127.9	12 0	595	89.99	122.8	12 0
515	3.36	334.9	48 0	556	35.53	127.9	12 0	596	91.26	122.7	12 0
516	1.80	319.8	48 6	557	36.92	127.2	12 0	597	92.89	122.7	12 0
517	1.05	312.8	48 6	558	38.23	126.9	12 0	598	94.12	121.7	12 0
518	0.20	251.6	48 6	559	39.63	126.4	12 0	599	95.73	121.5	12 0
519	0.85	157.0	48 6	560	40.93	125.9	12 0	600	96.99	122.3	12 0
520	1.83	152.7	48 6	561	42.16	125.9	12 0	601	98.57	122.5	12 0
521	2.73	148.2	12 2	562	43.72	126.5	12 0	602	100.85	122.1	12 0
522	3.63	146.2	48 0	563	44.85	127.2	12 0	603	101.72	121.6	12 0
523	4.58	144.9	48 0	564	46.24	126.9	12 0	604	102.61	121.2	12 0
524	5.44	145.0	48 0	565	47.42	126.0	1	605	104.48	120.8	12 0
525	6.55	142.0	48 0	566	49.11	124.9	12 0	606	105.67	120.7	12 0
526	7.46	144.2	48 0	567	51.29	124.1	12 0	607	107.29	121.2	12 0
527	8.36	144.7	1	568	53.06	124.1	4	608	108.53	121.4	12 0
529	11.06	148.8	30 0	569	54.68	123.9	12 0	609	110.08	120.9	12 0
530	11.80	146.9	30 0	570	55.88	124.2	12 0	610	111.78	121.3	12 0
531	13.60	146.0	30 0	571	57.98	123.2	12 0	611	113.17	121.1	12 0
532	14.25	144.8	48 0	572	59.64	123.0	12 0	612	114.43	120.6	1
533	14.93	143.6	30 0	573	60.92	123.5	12 0	613	115.16	120.3	12 0
534	15.63	142.7	30 0	574	61.97	124.0	12 0	614	117.60	120.5	12 0
535	16.45	139.6	30 0	575	63.26	124.5	1	615	118.43	120.8	12 0
536	17.05	138.7	30 0	576	64.31	124.3	12 0	616	120.05	120.5	12 0
537	17.85	137.4	48 0	577	65.61	124.2	12 0	617	121.99	120.9	12 0
538	18.78	136.8	48 0	578	67.29	123.8	12 0	618	123.23	120.6	12 0
539	19.60	135.4	30 0	579	68.65	123.4	12 0				
540	20.57	134.5	30 0	580	70.16	123.1	12 0				

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 21 Shot Point 1

Shot Time (Julian day, hr, min, sec): 211:05:06:00.012

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	154.63	71.2	30	5	541	175.44	114.8	12	0	581	226.05	115.3	12	0
501	136.19	113.0	30	0	542	176.12	114.9	12	0	582	227.45	115.4	12	0
502	137.69	112.9	30	0	543	176.99	114.8	12	0	583	228.73	115.4	12	0
503	139.45	112.8		3	544	177.92	114.8	12	0	584	230.05	115.3	12	0
504	140.86	112.5		1	545	178.82	114.8	12	0	585	231.77	115.3	12	0
505	141.82	112.3	12	0	546	179.70	114.8	12	0	586	232.95	115.5	12	0
506	143.60	112.8	12	0	547	180.67	114.9	12	0	587	233.66	115.4	12	0
507	144.98	112.8	12	0	548	181.50	114.9	12	0	588	235.23	115.5	12	0
508	145.68	112.1	12	0	549	182.24	114.9	12	7	589	237.31	115.4		4
509	146.96	111.9	12	0	550	183.30	114.7	12	0	590	238.63	115.7	12	0
510	148.17	111.9	12	0	551	184.11	114.8	12	0	591	240.35	115.8	12	0
511	149.06	111.7	12	0	552	184.91	115.0	12	0	592	241.54	115.7		1
512	150.12	111.6	12	0	553	186.29	115.2	12	0	593	242.92	115.6	12	0
513	150.83	111.3	12	0	554	187.74	115.1	12	0	594	243.45	115.6	12	0
514	151.82	111.2	12	0	555	188.80	114.9	12	0	595	244.37	115.7	12	0
515	152.65	111.4	12	0	556	189.75	115.0	12	0	596	245.64	115.7	12	0
516	153.54	112.0	12	0	557	191.20	114.9	12	0	597	247.26	115.8	12	0
517	154.16	112.2	12	0	558	192.52	114.9	12	0	598	248.66	115.4	12	0
518	155.00	112.3	30	0	559	193.97	114.9	12	0	599	250.28	115.4	12	0
519	155.77	112.5	12	0	560	195.30	114.9	12	0	600	251.42	115.7	12	0
520	156.57	112.7	12	0	561	196.53	114.9	12	0	601	252.96	115.8	12	0
521	157.39	112.8	12	2	562	197.97	115.2	12	0	602	255.29	115.7	12	0
522	158.21	113.0	12	0	563	198.99	115.4	12	0	603	256.24	115.5	12	0
523	159.07	113.1	12	0	564	200.40	115.4	12	0	604	257.18	115.4	12	0
524	159.81	113.3	12	0	565	201.69	115.2		1	605	259.10	115.3	12	0
525	160.93	113.4	12	0	566	203.50	115.0	12	0	606	260.30	115.3	12	0
526	161.60	113.6	12	0	567	205.77	114.9	12	0	607	261.86	115.5	12	0
527	162.35	113.8		1	568	207.51	115.0		4	608	263.04	115.6	12	0
529	164.29	114.5	12	0	569	209.15	115.0	12	0	609	264.67	115.4	12	0
530	165.12	114.5	12	0	570	210.29	115.1	12	0	610	266.30	115.6	12	0
531	166.77	114.8	12	0	571	212.51	114.9	12	0	611	267.72	115.5	12	0
532	167.48	114.8	12	0	572	214.18	114.9	12	0	612	269.05	115.4		1
533	168.22	114.8	12	0	573	215.39	115.1	12	0	613	269.83	115.2	12	0
534	168.95	114.9	12	0	574	216.35	115.3	12	0	614	272.23	115.4	12	0
535	170.06	114.7	12	0	575	217.57	115.5		1	615	273.02	115.5	12	0
536	170.72	114.7	12	0	576	218.63	115.5	12	0	616	274.68	115.4	12	0
537	171.60	114.7	12	0	577	219.95	115.5	12	0	617	276.54	115.6	12	0
538	172.55	114.8	12	0	578	221.67	115.4	12	0	618	277.84	115.5	12	0
539	173.47	114.7	12	0	579	223.07	115.4	12	0					
540	174.50	114.7	12	0	580	224.60	115.3	12	0					



PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 22 Shot Point 15

Shot Time (Julian day, hr, min, sec): 211:05:08:00.011

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	120.16	358.8		5	541	8.64	115.0	30	0	581	59.27	117.5	12	0
501	31.02	304.5	12	0	542	9.32	115.7	12	0	582	60.68	117.9	12	0
502	29.57	305.2	12	0	543	10.19	114.9	12	0	583	61.96	117.9	12	0
503	27.91	306.5		3	544	11.13	114.3	12	0	584	63.27	117.7	12	0
504	26.74	308.9		1	545	12.02	114.5	30	0	585	64.99	117.7	12	0
505	25.91	310.3	12	0	546	12.90	114.8	30	0	586	66.18	118.2	12	2
506	23.89	308.8	12	0	547	13.88	116.5	12	0	587	66.88	117.8	12	0
507	22.52	309.4	12	0	548	14.70	116.8	12	0	588	68.47	118.2	12	0
508	22.46	314.6	12	0	549	15.44	115.8	12	0	589	70.53	117.7		4
509	21.43	316.8	12	0	550	16.51	114.0	12	0	590	71.89	118.7	12	0
510	20.32	318.1	12	0	551	17.31	115.0	12	0	591	73.63	119.1	12	0
511	19.73	320.5	12	0	552	18.12	117.3	12	0	592	74.79	118.7		1
512	19.05	323.3	12	0	553	19.52	119.0	12	0	593	76.16	118.4	12	0
513	18.82	326.2	12	0	554	20.95	117.9	12	0	594	76.69	118.3	12	0
514	18.11	328.4	12	0	555	22.00	116.2	12	0	595	77.63	118.7	12	0
515	17.09	328.5	30	0	556	22.95	116.8	12	0	596	78.90	118.7	12	0
516	15.55	326.1	30	0	557	24.40	116.4	12	0	597	80.53	118.8	12	0
517	14.77	325.9	30	0	558	25.72	116.5	12	0	598	81.88	117.6	12	0
518	13.81	326.1	30	0	559	27.18	116.2	12	0	599	83.50	117.6	12	0
519	12.92	326.2	30	0	560	28.51	116.1	12	0	600	84.67	118.5	12	0
520	11.94	326.0	30	0	561	29.73	116.4	12	0	601	86.22	118.8	12	0
521	11.03	326.5	12	2	562	31.19	117.8	12	0	602	88.54	118.4	12	0
522	10.13	327.1	30	0	563	32.23	119.1	12	0	603	89.47	117.9	12	0
523	9.18	327.8	30	0	564	33.64	118.9	12	0	604	90.40	117.5	12	0
524	8.32	328.1	30	0	565	34.91	118.0		1	605	92.32	117.1	12	0
525	7.25	331.3	12	0	566	36.71	116.9	12	0	606	93.51	117.1	12	0
526	6.31	330.0	30	0	567	38.97	116.3	12	0	607	95.08	117.6	12	0
527	5.41	330.1		1	568	40.71	116.7		4	608	96.28	118.0	12	0
529	2.73	318.7	48	0	569	42.35	116.7	12	0	609	97.89	117.5	12	0
530	1.96	326.6	48	0	570	43.50	117.3	12	0	610	99.54	118.0	12	0
531	0.26	19.8	48	6	571	45.72	116.3	12	0	611	100.96	117.8	12	0
532	0.70	100.3	48	6	572	47.38	116.3	12	0	612	102.26	117.3		1
533	1.43	111.0	48	6	573	48.60	117.1	12	0	613	103.04	116.9	12	0
534	2.16	115.3	48	6	574	49.58	117.9	12	0	614	105.44	117.2	12	0
535	3.29	107.9	48	0	575	50.81	118.6		1	615	106.24	117.6	12	0
536	3.95	109.0	48	0	576	51.87	118.6	12	0	616	107.90	117.3	12	0
537	4.83	109.8	48	0	577	53.19	118.5	12	0	617	109.78	117.8	12	0
538	5.76	112.2	30	0	578	54.90	118.2	12	0	618	111.06	117.5	12	0
539	6.70	111.4	30	0	579	56.29	117.9	12	0					
540	7.72	112.1	30	0	580	57.82	117.7	12	0					

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

62

Shot Number 23 Shot Point 4

Shot Time (Julian day, hr, min, sec): 211:07:00:00.008

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	105.02	12.6	12	0	541	39.86	122.2	12	0	581	90.44	119.7	12	0
501	0.29	122.2	88	0	542	40.55	122.3	12	0	582	91.86	120.0	12	0
502	1.79	112.3	30	6	543	41.40	121.9	12	0	583	93.14	119.9	12	0
503	3.57	108.2		3	544	42.32	121.6	12	0	584	94.44	119.7	12	0
504	5.10	100.2		1	545	43.21	121.5	12	0	585	96.16	119.7	30	0
505	6.12	99.0	48	0	546	44.09	121.5	30	0	586	97.37	120.0	12	0
506	7.71	110.7	48	0	547	45.10	121.8	12	0	587	98.05	119.7	12	0
507	9.09	112.0	48	0	548	45.93	121.8	12	0	588	99.66	120.0	12	0
508	10.01	101.1	48	0	549	46.64	121.4	12	0	589	101.70	119.6		4
509	11.36	100.4	48	0	550	47.65	120.7	12	0	590	103.09	120.2	12	0
510	12.53	101.8	30	0	551	48.48	120.9	30	0	591	104.85	120.5	12	0
511	13.50	100.5	30	0	552	49.35	121.7	30	0	592	106.00	120.2		1
512	14.63	99.5	30	0	553	50.78	122.2	30	0	593	107.36	120.0	12	0
513	15.50	97.5	30	0	554	52.19	121.6	12	0	594	107.88	119.9	12	0
514	16.50	97.8	30	0	555	53.18	120.9	12	0	595	108.83	120.2	12	0
515	17.17	100.4	48	0	556	54.15	121.0	12	0	596	110.11	120.2	12	0
516	17.81	105.5	30	0	557	55.58	120.7	12	0	597	111.73	120.2	12	0
517	18.37	107.2	30	0	558	56.90	120.7	12	0	598	113.04	119.3	12	0
518	19.17	108.9	48	0	559	58.34	120.4	12	0	599	114.65	119.3	12	0
519	19.90	110.4	30	0	560	59.66	120.3	12	0	600	115.86	119.9	12	4
520	20.68	112.1	30	0	561	60.89	120.3	12	0	601	117.43	120.1	12	0
521	21.50	113.2	12	2	562	62.40	121.0	12	0	602	119.73	119.8	12	0
522	22.31	114.2	30	0	563	63.47	121.5	12	0	603	120.63	119.4	12	0
523	23.18	115.3	30	0	564	64.88	121.4	12	0	604	121.55	119.1	12	0
524	23.93	116.3	30	0	565	66.12	120.9		1	605	123.44	118.8	12	0
525	25.06	116.8	30	0	566	67.88	120.2	12	0	606	124.63	118.7	12	0
526	25.76	118.2	30	0	567	70.11	119.7	12	0	607	126.23	119.1	12	0
527	26.55	119.2		1	568	71.87	119.9		4	608	127.45	119.4	12	0
529	28.68	122.9	30	0	569	73.50	119.8	12	0	609	129.04	119.0	12	0
530	29.52	122.9	12	0	570	74.67	120.1	12	0	610	130.71	119.3	12	0
531	31.25	123.8	30	0	571	76.84	119.4	12	0	611	132.11	119.2	12	0
532	31.96	123.8	30	0	572	78.51	119.4	30	0	612	133.39	118.8		1
533	32.71	123.7	12	0	573	79.76	119.8	12	0	613	134.15	118.5	12	0
534	33.45	123.7	12	0	574	80.77	120.2	30	0	614	136.57	118.7	12	0
535	34.49	122.7	30	0	575	82.03	120.7		1	615	137.39	119.0	12	0
536	35.14	122.6	30	0	576	83.08	120.6	12	0	616	139.03	118.7	12	0
537	36.01	122.3	30	0	577	84.40	120.5	12	0	617	140.93	119.1	12	0
538	36.97	122.4	12	0	578	86.10	120.3	12	0	618	142.20	118.8	12	0
539	37.87	122.0	30	0	579	87.48	120.1	12	0					
540	38.89	121.8	12	0	580	89.00	119.9	12	0					

## PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 24 Shot Point 3

63

Shot Time (Julian day, hr, min, sec): 211:07:02:00.012

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	105.83	36.9	12	0	541	84.60	117.5	30	0	581	135.24	117.5	30	0
501	45.25	113.7	30	0	542	85.28	117.6	30	0	582	136.65	117.7	30	0
502	46.75	113.5	30	0	543	86.15	117.4	30	0	583	137.93	117.6	12	0
503	48.51	113.2		3	544	87.08	117.3	30	0	584	139.24	117.6	12	0
504	49.93	112.2		1	545	87.97	117.3	30	0	585	140.96	117.5	30	0
505	50.90	111.8	48	0	546	88.85	117.3	30	0	586	142.16	117.8	12	0
506	52.66	113.1	48	0	547	89.84	117.6	30	0	587	142.85	117.6	30	0
507	54.04	113.3	30	0	548	90.67	117.6	12	0	588	144.44	117.8	30	0
508	54.76	111.3	30	0	549	91.40	117.4	12	0	589	146.50	117.5		4
509	56.06	110.9	30	0	550	92.44	117.1	12	0	590	147.86	118.0	30	0
510	57.27	111.0	30	0	551	93.26	117.2	30	0	591	149.60	118.2	30	0
511	58.17	110.5	30	0	552	94.09	117.7	30	0	592	150.77	118.0		1
512	59.24	110.1	30	0	553	95.49	118.0	30	0	593	152.14	117.9	30	0
513	59.99	109.4	30	0	554	96.93	117.8	30	0	594	152.67	117.8	12	0
514	60.98	109.3	30	0	555	97.96	117.4	30	0	595	153.60	118.0	12	0
515	61.79	109.9	48	0	556	98.92	117.5	30	0	596	154.88	118.0	12	0
516	62.63	111.2	48	0	557	100.36	117.4	30	0	597	156.50	118.1	30	0
517	63.24	111.7	48	0	558	101.69	117.4	30	0	598	157.85	117.5	30	0
518	64.07	112.1	48	0	559	103.14	117.3	30	0	599	159.47	117.4	30	0
519	64.83	112.5	48	0	560	104.46	117.2	30	0	600	160.65	117.9		4
520	65.63	113.0	48	0	561	105.69	117.3	30	0	601	162.19	118.1	12	0
521	66.45	113.4	12	2	562	107.16	117.7	30	0	602	164.51	117.9	12	0
522	67.27	113.7	30	0	563	108.20	118.1	30	0	603	165.44	117.6	12	0
523	68.13	114.1	48	0	564	109.61	118.0	30	0	604	166.37	117.4	12	0
524	68.87	114.4	30	0	565	110.88	117.7		1	605	168.28	117.2	30	0
525	70.00	114.6	30	0	566	112.67	117.4	30	0	606	169.48	117.1	12	0
526	70.67	115.2	30	0	567	114.93	117.1	30	0	607	171.05	117.4	12	0
527	71.43	115.6		1	568	116.68	117.3		4	608	172.25	117.6	12	0
529	73.42	117.1	30	0	569	118.31	117.2	30	0	609	173.86	117.4	30	0
530	74.26	117.1	30	0	570	119.47	117.5	30	0	610	175.51	117.6	12	0
531	75.94	117.7	30	0	571	121.67	117.1	30	0	611	176.93	117.5	30	0
532	76.64	117.7	30	0	572	123.34	117.1	30	0	612	178.23	117.2		1
533	77.39	117.7	30	0	573	124.56	117.4	30	0	613	179.00	117.0	12	0
534	78.13	117.8	30	0	574	125.55	117.7	30	0	614	181.41	117.2	12	0
535	79.21	117.4	30	0	575	126.78	118.0		1	615	182.21	117.4	30	0
536	79.87	117.4	30	0	576	127.84	117.9	30	0	616	183.86	117.3	12	0
537	80.75	117.3	30	0	577	129.16	117.9	12	0	617	185.75	117.5	12	0
538	81.70	117.4	30	0	578	130.87	117.8	30	0	618	187.03	117.3	30	0
539	82.62	117.3	30	0	579	132.26	117.7	30	0					
540	83.65	117.3	30	0	580	133.80	117.6	30	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 25 Shot Point 6

Shot Time (Julian day, hr, min, sec): 211:07:06:00.008

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
			Db	Grade				Db	Grade				Db	Grade
101	171.15	336.5	12	5	541	67.60	299.3	12	0	581	16.98	301.8	30	0
501	107.12	300.6	12	0	542	66.92	299.2	12	0	582	15.55	300.7	30	0
502	105.64	300.8	12	0	543	66.05	299.4	12	0	583	14.28	301.1	30	0
503	103.92	301.0		3	544	65.13	299.6	12	0	584	12.98	302.2	30	0
504	102.63	301.6		1	545	64.23	299.6	12	0	585	11.27	302.9	48	0
505	101.72	301.9	12	0	546	63.35	299.6	12	0	586	10.04	300.1	30	0
506	99.81	301.4	12	0	547	62.36	299.3	12	0	587	9.37	303.2	48	0
507	98.42	301.4	12	0	548	61.53	299.3	12	0	588	7.76	300.2	48	0
508	98.00	302.5	12	0	549	60.80	299.5	12	0	589	5.76	307.0		4
509	96.79	302.9	12	0	550	59.78	300.1	12	0	590	4.35	294.0	48	0
510	95.59	303.0	12	0	551	58.95	299.9	12	0	591	2.76	279.4	48	0
511	94.79	303.4	12	0	552	58.11	299.2	12	0	592	1.49	283.4		1
512	93.85	303.8	12	0	553	56.71	298.7	12	0	593	0.06	283.9	88	6
513	93.27	304.3	12	0	554	55.27	299.1	12	0	594	0.48	109.9	88	0
514	92.34	304.5	12	0	555	54.25	299.7	12	0	595	1.47	136.4	88	0
515	91.41	304.3	12	0	556	53.28	299.6	12	0	596	2.72	128.6	48	0
516	90.28	303.5	12	0	557	51.84	299.8	12	0	597	4.34	126.4	48	0
517	89.59	303.2	12	0	558	50.52	299.8	12	0	598	5.75	108.0	48	0
518	88.68	303.0	12	0	559	49.08	300.1	12	0	599	7.36	109.6	48	0
519	87.86	302.8	12	0	560	47.75	300.2	12	0	600	8.45	119.7		4
520	86.98	302.5	12	0	561	46.53	300.1	12	0	601	10.01	122.2	48	0
521	86.11	302.3	12	2	562	45.04	299.3	12	0	602	12.32	119.2	48	0
522	85.24	302.1	12	0	563	44.00	298.4	12	0	603	13.26	115.4	30	0
523	84.34	301.9	12	0	564	42.59	298.5	12	0	604	14.23	113.6	30	0
524	83.55	301.7	12	0	565	41.31	299.2		1	605	16.20	111.5	48	0
525	82.40	301.6	12	0	566	39.54	300.2	12	0	606	17.40	111.8	30	0
526	81.67	301.2	12	0	567	37.31	301.1	30	0	607	18.89	115.1	30	0
527	80.87	300.9		1	568	35.55	300.8		4	608	20.06	117.0	30	0
529	78.79	299.6	12	0	569	33.92	301.0	12	0	609	21.71	114.8	30	0
530	77.95	299.6	12	0	570	32.74	300.3	30	0	610	23.32	117.2	30	0
531	76.26	299.1	12	0	571	30.58	302.0	30	0	611	24.75	116.3	30	0
532	75.56	299.0	12	0	572	28.92	302.3	30	0	612	26.09	114.6		1
533	74.81	299.0	12	0	573	27.66	301.2	30	0	613	26.92	113.2	30	0
534	74.07	299.0	12	0	574	26.65	300.0	30	0	614	29.28	114.7	30	0
535	72.99	299.3	12	0	575	25.41	298.4		4	615	30.04	116.1	30	0
536	72.33	299.4	12	0	576	24.36	298.4	30	0	616	31.71	115.3	12	0
537	71.46	299.4	12	0	577	23.04	298.6	30	0	617	33.57	117.1	12	0
538	70.50	299.4	12	0	578	21.33	299.3	30	0	618	34.87	116.0	30	0
539	69.58	299.5	12	0	579	19.94	300.2	30	0					
540	68.56	299.6	12	0	580	18.42	300.9	30	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 26 Shot Point 5  
 Shot Time (Julian day, hr, min, sec): 211:07:08:00.009

Loc	Dist (km)	Azim (deg)	Tape Db	Grade	Loc	Dist (km)	Azim (deg)	Tape Db	Grade	Loc	Dist (km)	Azim (deg)	Tape Db	Grade
101	127.88	352.9		5	541	6.40	299.1	48	0	581	44.24	117.9	12	0
501	45.96	302.0	12	0	542	5.71	298.3	48	0	582	45.65	118.4	12	0
502	44.49	302.4	12	0	543	4.85	300.6	48	0	583	46.93	118.3	12	0
503	42.79	303.2		3	544	3.94	303.4	68	0	584	48.24	118.1	12	0
504	41.55	304.6		1	545	3.05	305.2	68	0	585	49.96	118.1	12	4
505	40.68	305.4	12	0	546	2.18	307.8	88	0	586	51.16	118.7	12	0
506	38.72	304.2	12	0	547	1.16	299.0	88	0	587	51.85	118.2	12	0
507	37.33	304.4	12	0	548	0.33	291.5	88	0	588	53.45	118.8	12	0
508	37.06	307.5	12	0	549	0.47	88.0	88	0	589	55.50	118.1		4
509	35.91	308.6	12	0	550	1.64	89.4	68	0	590	56.87	119.3	12	0
510	34.75	309.1	12	1	551	2.33	104.5	48	6	591	58.61	119.8	12	0
511	34.03	310.3	12	0	552	3.09	120.6	48	0	592	59.77	119.3		1
512	33.18	311.7	12	0	553	4.54	126.7	48	0	593	61.14	118.9	12	0
513	32.74	313.2	12	0	554	5.94	121.1	48	0	594	61.67	118.8	12	0
514	31.89	314.2	12	0	555	6.97	115.4	48	0	595	62.61	119.3	12	4
515	30.89	313.7	30	0	556	7.92	117.1	30	0	596	63.88	119.3	12	0
516	29.58	311.7	30	0	557	9.37	116.1	30	0	597	65.51	119.4	12	0
517	28.84	311.3	30	0	558	10.69	116.3	30	0	598	66.85	117.9	12	0
518	27.90	310.8	30	0	559	12.15	115.8	30	0	599	68.47	117.9	12	0
519	27.03	310.4	30	0	560	13.48	115.6	30	0	600	69.65	118.9		4
520	26.10	309.7	30	0	561	14.70	116.2	30	0	601	71.20	119.3	12	0
521	25.20	309.4	12	2	562	16.16	119.0	30	0	602	73.52	118.9	12	0
522	24.31	308.9	30	0	563	17.22	121.2	30	0	603	74.44	118.2	12	0
523	23.37	308.5	30	0	564	18.63	120.8	30	0	604	75.37	117.8	12	0
524	22.55	307.9	30	0	565	19.89	119.1		1	605	77.29	117.3	12	0
525	21.40	307.9	30	0	566	21.68	117.2	30	0	606	78.48	117.2	12	0
526	20.60	306.5	30	0	567	23.94	116.1	30	0	607	80.05	117.9	12	0
527	19.77	305.4		1	568	25.68	116.8		4	608	81.25	118.3	12	0
529	17.59	300.1	30	0	569	27.32	116.7	12	0	609	82.87	117.7	12	0
530	16.75	300.1	30	0	570	28.47	117.7	12	0	610	84.51	118.3	12	0
531	15.06	297.7	30	0	571	30.68	116.2	30	0	611	85.93	118.0	12	0
532	14.36	297.6	30	0	572	32.35	116.2	12	0	612	87.23	117.5		1
533	13.61	297.4	30	0	573	33.57	117.3	12	0	613	88.01	117.0	12	0
534	12.88	297.0	30	0	574	34.55	118.5	12	0	614	90.41	117.4	12	0
535	11.79	299.2	30	0	575	35.79	119.5		1	615	91.21	117.8	12	0
536	11.13	299.5	48	0	576	36.85	119.5	12	0	616	92.87	117.5	12	0
537	10.26	300.0	48	0	577	38.16	119.3	12	0	617	94.75	118.1	12	0
538	9.30	299.6	30	0	578	39.87	118.9	12	0	618	96.04	117.7	12	0
539	8.39	301.0	48	0	579	41.27	118.4	12	0					
540	7.37	301.6	48	0	580	42.80	118.2	12	0					

## Appendix B

Merged GEOS data for deployment 1. Additional information pertaining to GEOS recorders deployed during the northern Nevada PASSCAL experiment is given in a separate report (Dietel and Borchardt, 1987). Each table contains shot number, shotpoint number, and the following column headings:

Loc	- location number of the GEOS recorder (see Table 2).
GEOS LOC	- location number of the GEOS recorder given in Dietel and Borchardt (1987).
GEOS UNIT	- unit number of the GEOS recorder.
Distance (km)	- distance in kilometers from the shotpoint to the recorder.
Azimuth (deg)	- azimuth from the shotpoint to the recorder. (in degrees clockwise from north).

GEOS 20 SECOND VERTICAL COMPONENT DATA: DEPLOYMENT 1  
 Sampling interval = 5 msec.; Tmin = -2  
 Reduction velocity = 6.0 km/sec; Gain = 54 Db

Shot Number 1					Shot Number 4					Shot Number 7				
LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)	LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)	LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)
164	G64	7	99.721	191.150	164	G64	7	137.770	110.500	164	G64	7	100.665	30.732
165	G65	22	101.154	191.667	165	G65	22	137.141	111.160	165	G65	22	99.011	30.520
167	G67	33	104.016	192.556	167	G67	33	136.117	112.470	167	G67	33	95.789	30.176
168	G68	31	104.982	192.717	168	G68	31	136.015	112.470	168	G68	31	94.779	30.188
171	G71	17	109.516	193.955	171	G71	17	134.667	114.970	171	G71	17	89.765	29.642
172	G72	4	111.150	194.371	172	G72	4	134.232	115.720	172	G72	4	87.973	29.433
173	G73	8	112.946	194.375	173	G73	8	134.624	116.470	173	G73	8	86.242	29.749
175	G75	24	115.284	194.936	175	G75	24	134.082	117.550	175	G75	24	83.691	29.444
179	G79	39	120.990	196.926	179	G79	39	131.499	120.370	179	G79	39	77.204	27.517
181	G81	12	124.755	197.036	188	G87	29	131.028	126.810	181	G81	12	73.466	27.901
186	G85	16	132.064	199.085						186	G85	16	65.529	25.100
188	G87	29	134.976	199.029						188	G87	29	62.653	25.526
190	G89	15	137.834	198.893										

Shot Number 2					Shot Number 5					Shot Number 8				
LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)	LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)	LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)
164	G64	7	55.065	32.862	164	G64	7	36.985	190.949	164	G64	7	6.121	40.489
165	G65	22	53.400	32.530	165	G65	22	38.423	192.315	165	G65	22	4.429	39.312
167	G67	33	50.161	31.992	167	G67	33	41.323	194.500	167	G67	33	1.160	34.565
168	G68	31	49.153	32.049	168	G68	31	42.948	194.854	168	G68	31	0.179	64.724
171	G71	17	44.117	31.131	171	G71	17	46.948	197.525	171	G71	17	4.929	219.355
172	G72	4	42.318	30.754	172	G72	4	48.632	198.352	172	G72	4	6.750	219.561
173	G73	8	40.600	31.475	173	G73	8	50.425	198.216	173	G73	8	8.411	214.358
175	G75	24	38.038	30.907	175	G75	24	52.838	199.264	175	G75	24	10.992	215.694
179	G79	39	31.545	26.460	179	G79	39	58.898	202.918	179	G79	39	17.857	221.836
186	G85	16	20.100	17.841	181	G81	12	62.666	202.778	181	G81	12	21.412	218.141
188	G87	29	17.187	18.139	186	G85	16	70.445	205.997	186	G85	16	29.911	221.549
190	G89	15	14.328	19.347	188	G87	29	73.320	205.616	188	G87	29	32.571	219.361
					191	G91	9	78.826	204.425					

Shot Number 3					Shot Number 6				
LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)	LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)
164	G64	7	100.665	30.732	164	G64	7	99.721	191.150
165	G65	22	99.011	30.520	165	G65	22	101.154	191.667
167	G67	33	95.789	30.176	167	G67	33	104.016	192.556
168	G68	31	94.779	30.188	168	G68	31	104.982	192.717
171	G71	17	89.765	29.642	171	G71	17	109.516	193.955
172	G72	4	87.973	29.433	172	G72	4	111.150	194.371
173	G73	8	86.242	29.749	173	G73	8	112.946	194.375
175	G75	24	83.691	29.444	175	G75	24	115.284	194.936
179	G79	39	77.204	27.517	179	G79	39	120.990	196.926
186	G85	16	65.529	25.100	181	G81	12	124.755	197.036
188	G87	29	62.653	25.526	186	G85	16	132.064	199.085
190	G89	15	59.860	26.172	188	G87	29	134.976	199.029

## APPENDIX C

## Instrument Response of Seismic Cassette Recorders and GEOS

The data set presented in this report is a combination of vertical-component data recorded by both seismic cassette recorders (Healy and others, 1982), and GEOS (Borcherdt and others, 1985) recorders. A careful comparison of the instrument response of these two different seismic recording systems is required to properly merge the data. Manufacturer's specifications and actual field calibration measurements are used to estimate the relative responses of the two recorder systems.

Seismic Cassette Recorders

Each SCR consists of a Mark Products L-4C™ 2-Hz geophone and a USGS-designed amplifier-VCO. The playback consists of a TRI-COM™ discriminator and a 12-bit DEC ADV11-C™ A/D convertor. The velocity response of the system peaks at about 6 Hz, but is relatively flat in the frequency range of 2 to 20 Hz (Figure 3; Dawson and Stauber, 1986).

For an input ground motion  $A_g(t)$ , the overall system output,  $C_{DC}(t)$ , in digital counts is:

$$C_{DC}(t) = [C_{LE} * C_{SA} * C_{VCO} * C_{DSC} * C_{A/D}]A_g(t) \quad (C-1)$$

Where,

$C_{LE}$  is the effective motor constant (V/(cm/s)) of the seismometer-L-pad combination. For the L-4C seismometer,  $C_{LE} = 1.0 \pm 0.1$  V/(cm/s).

$C_{SA}$  is the system gain (ratio of output voltage to input voltage).  $C_{SA} = 10(G - a/20)$  where "G" is the maximum gain (db) of the amplifier-VCO ( $100.6 \pm 0.7$  db), and "a" is the channel attenuation setting (usually 12, 30, 48, 68, or 88 db)

$C_{VCO}$  is the VCO sensitivity (Hz/V) For the seismic cassette recorders, the VCO sensitivity has been set to  $\pm 125$  Hz deviation for  $\pm 5.00$  V input, or  $C_{VCO} = 25.0$  Hz/V

$C_{DSC}$  is the discriminator sensitivity (V/Hz). For the USGS seismic refraction playback system, the discriminator is set to  $\pm 5.00$  V output for an input of  $\pm 125$  Hz, or  $C_{DSC} = 0.04$  Hz/V

$C_{A/D}$  is the digitizer sensitivity (counts/V). In the playback system, the DEC ADV11-C A/D board is set to 0-4095 counts output for a  $\pm 5.00$  V input, or  $C_{A/D} = 409.5$  counts/V



Prior to each recording window, each SCR performs a calibration sequence consisting of a 10-Hz sine wave with amplitudes of 1, 10, 100, and 1000 microvolts (RMS). The calibration levels for each recorder are then measured during playback. These calibration levels may then be used to determine the average maximum system gain,  $G$ , for all the SCRs. By using over 800 separate calibration measurements made during the PASSCAL experiment, we have obtained an average maximum system gain,  $G = 100.6 \pm 0.7$  db. The standard deviation of  $G$ , 0.7 db (about 8% of  $G_{SA}$ ) is a measure of the total uncertainty in output of the amplifier-VCO-discriminator-A/D combination. This 8% uncertainty combined with the uncertainty in seismometer output (about 10% of  $G_{LE}$ ) gives a total system output uncertainty of 13% (about 1.1 db).

### GEOS

GEOS is a USGS-built and -designed multipurpose digital seismic recording system (Borcherdt and others 1985). GEOS is capable of recording on 6 separate channels, but only the response of the vertical-component velocity channel will be covered here. For 1986 PASSCAL Basin and Range experiment, the recording system consisted of a Mark Products™ L-22 1-Hz geophone, a preamplifier with preprogramable gain settings ranging from 0 to 60 db at 6 db increments, and a 16-bit CMOS A/D convertor. Each channel has a total dynamic range of better than 96 db.

For an input ground motion  $A_g(t)$ , the overall system output,  $G_{DC}(t)$ , in digital counts is:

$$G_{DC}(t) = [G_{LE} * G_{SA} * G_R * G_{A/D}]A_g(t) \quad (C-2)$$

where,

$G_{LE}$  is the effective motor constant (V/(cm/s)) of the seismometer-L-pad combination. For the L-22 seismometer,  $G_{LE} = 0.5 \pm 0.05$  V/(cm/s).

$G_{SA}$  is the system gain,  $G_{SA} = 10(\text{gain}/20)$  where gain is the preset gain of the amplifier. For deployment 1, gain was set to 54 db. Gain settings for deployments 2 and 3 are given in Dietel and Borcherdt (1987).

$G_R$  is a voltage adjustment ratio in the preamplifier.  $\pm 10$  V input gives 8.191 V output. That is,  $G_R = 0.8191$

$G_{A/D}$  is the digitizer sensitivity (counts/V). The digitizer produces an output of  $\pm 32767$  counts (15 bits plus sign) for an input of  $\pm 8.191$  V, or  $G_{A/D} = 4000$  counts/V.

The system component gain parameters for both SCR and GEOS are summarized in Table C-1.

Table C-1

## System Gain Parameters

	SCR	GEOS
seismometer	: $C_{LE} = 1.0 \pm 0.1$ cm/s	$G_{LE} = 0.05 \pm 0.05$ v/(cm/s)
amplifier	: $C_{SA} = 10(G-a)/20$ $G = 100.6 \pm 0.6$ db	$G_{SA} = 10(\text{gain}/20)$ gain = 54 db for dep. 1 $G_R = 0.8191$
VCO	: $C_{VCO} = 25.0$ Hz/V	N/A
discriminator	: $C_{DSC} = 0.04$ V/Hz	N/A
A/D	: $C_{A/D} = 409.5$ counts/V	$G_{A/D} = 4000$ counts/V

To correct the SCR data for system gain, the unnormalized amplitude should be multiplied by:  $10^{a/20}$ . Attenuation values for each data trace are given in Appendix A (under the column labeled "db").

To obtain an estimate of an equivalent value of "a" for the GEOS data, we need to equate  $C_{DC}$  and  $G_{DC}$  in equations C-1 and C-2, and then solve for  $C_{SA}$ .

$$C_{SA} = \frac{G_{LE} * G_{SA} * G_R * G_{A/D}}{C_{LE} * C_{VCO} * C_{DSC} * C_{A/D}} \quad (C-3)$$

Substituting for  $C_{SA}$  and  $G_{SA}$ ,

$$10^{\frac{G-a}{20}} = \frac{10^{\frac{\text{gain}}{20}} * G_{LE} * G_R * G_{A/D}}{C_{LE} * C_{VCO} * C_{DSC} * C_{A/D}} \quad (C-4)$$

or,

$$a = G - \text{gain} - 20 \log\left(\frac{G_{LE} * G_R * G_{A/D}}{C_{LE} * C_{VCO} * C_{DSC} * C_{A/D}}\right) \quad (C-5)$$

Using the values given in Table C-1,  $a = 34.6$  db. That is, the output of a GEOS recorder set a gain = 54 db is equivalent to that of a seismic cassette recorder with attenuation set to 34.6 db.

## Appendix D

## Archive Tape Data Format

Archive data tapes are written in SEG Y standard format (Barry et al, 1975). Recording density is 1600 bpi, phase encoded (PE). In order to accommodate seismic refraction data, some minor changes have been made to the tape header fields. A complete list of header fields is provided in the card image portion of the reel identification header, shown below:

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C 1 REEL IDENTIFICATION HEADER BYTES:
C 2 3217 -3218 sampling interval (microsecs).
C 3 3221 -3222 number of samples per trace.
C 4 3225 -3226 data sample format code.
C 5 3255 -3256 measurement system (1 = meters; 2 = feet).
C 6
C 7
C 8 TRACE IDENTIFICATION HEADER BYTES:
C 9 1 - 4 trace sequence number within reel.
C10 5 - 8 trace sequence number within reel.
C11 9 - 12 station location number.
C12 29 - 30 trace ID code (1 = seismic data).
C13 37 - 40 shotpoint-receiver distance (M).
C14 41 - 44 station elevation (M).
C15 45 - 48 shotpoint elevation (M).
C16 49 - 52 source depth (M).
C17 69 - 70 scalar to be applied to all elevations.
C18 71 - 72 scalar to be applies to all coordinates.
C19 73 - 76 shotpoint coordinate - X.
C20 77 - 80 shotpoint coordinate - Y.
C21 81 - 84 receiver coordinate - X.
C22 85 - 88 receiver coordinate - Y.
C23 89 - 90 coordinate units (1 = meters; 2 = seconds of arc).
C24 115 - 116 number of samples in this trace.
C25 117 - 118 sample interval in microseconds for this trace.
C26 121 - 122 instrument attenuation in db.
C27 157 - 158 shot time - year.
C28 159 - 160 shot time - day of year.
C29 161 - 162 shot time - hour of day (24 hour clock).
C30 163 - 164 shot time - minute of hour.
C31 165 - 166 shot time - second of minute.
C32 167 - 168 time basis code (2 = GMT).
C33 181 - 182 shot time - milliseconds.
C34 183 - 184 shotpoint location number.
C35 185 - 186 recording instrument unit number.

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C36 191 - 192 distance weighting exponent (hundredths).  
 C37 193 - 194 shot sequence number (shot number).  
 C38 195 - 196 shot size (kg).  
 C39 197 - 200 shot point - station azimuth (second of arc).  
 C40 201 - 204 time of first point minus shot time (msec).

The data point format is "32 bit floating point", and the appropriate bytes (3225-3226) of the binary reel id header contain a value of 1. The trace amplitudes have not been adjusted for instrument gain, but the gain correction factor can be estimated from the instrument attenuation value (att) specified in bytes 121-122. To correct for gain, the data should be demeaned and then multiplied by:

$$\frac{(att/20)}{10}$$

The measurement system (bytes 3255-3256 of the binary reel header) is set to 1, meters.

Shotpoint and receiver coordinates are in seconds of arc (byte field 89-90). The coordinate scalar multiplier (bytes 71-72) is set to -100, so the coordinates (bytes 73-88) are in hundredths of a second of arc.

Bytes 157-166 and bytes 181-182 refer to the shot detonation time. The time of the first data sample is found by adding the shot detonation time to the time specified in bytes 201-204.

Since there is no weighting of amplitudes with distance for archive tapes, the distance weighting exponent (bytes 191-192) is not used.

Shot sequence number (bytes 193-194) refers to the order in which shots were fired during the field campaign (shot number).