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STRONG-MOTION DATA FROM THE JULY 8, 1986 NORTH PALM SPRINGS EARTHQUAKE AND AFTERSHOCKS

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STRONG-MOTION DATA FROM THE JULY 8, 1986 NORTH PALM SPRINGS EARTHQUAKE AND AFTERSHOCKS

INTRODUCTION

A magnitude 5.9 (M_L) earthquake occurred approximately 15 km north of Palm Springs, California on July 8, 1986 at 0920:44.0 G.m.t. This event reportedly caused more than $5 million in damage, injured 29 people, and destroyed or damaged 51 homes; it was felt throughout much of southern California and was given a maximum MMI rating of VI (USGS, 1986). Preliminary studies located rupture on the Banning fault, with the middle of the hypocentral distribution at an approximate depth of 11 km; surface fractures were located along more than 6 km of the fault trace immediately west of the town of North Palm Springs (EERI, 1986). The epicenter was located at 33.97°N lat. and 116.61°W long.

The main shock triggered accelerographs at more than 45 strong-motion stations operated by the U.S. Geological Survey (USGS) in the southern California region (fig. 1). These stations include 30 ground sites, nine buildings, seven dams, and one freeway interchange. Additionally, accelerographs at more than 30 stations operated by the California Division of Mines and Geology were triggered, including instruments located at 21 ground sites, eight buildings, two dams, and one power plant (OSMS, 1986). Low-level accelerations were recorded at 18 stations in the Los Angeles area operated by the University of Southern California and at one station operated by Kinemetrics, Inc., in Pasadena (EERI, 1986).

This report contains station-location information, trigger times, and maximum acceleration and strong-duration data for all USGS-operated accelerographs triggered during the July 8 main shock and all aftershocks that occurred through October 15, 1986 (tables 1 and 2).

MAIN-SHOCK DATA

Table 1 contains station information and record data from 46 USGS strong-motion stations that recorded the July 8 main shock; epicentral distances range between 5 and 180 km.

Nineteen stations, within 50 km of the epicenter, produced peak horizontal ground accelerations ranging between 0.045 and 0.704 g. Peak vertical ground accelerations of 0.038 to 0.778 g were recorded at these stations and surpassed corresponding peak horizontal maxima at three of the four closest stations (Morongo Valley, N. Palm Springs, and Cabazon). Strong durations (acceleration greater than 0.10 g) exceed 3 seconds at five of the six stations within 30 km of the epicenter (table 1, fig. 2).

Figure 3 shows copies of all main-shock accelerograms with peak horizontal ground motions greater than 0.05 g and structure motions greater than 0.10 g; 21 contain good WWVB time codes. Note the contrast in prominent frequencies on the Morongo Valley record with relatively long-period horizontal motion on both the north-south and east-west components, compared to the higher frequencies on the vertical component. Similar response characteristics are not seen on aftershock records or on numerous minor records obtained at this station after previous earthquakes. Relatively high-frequency motions can be seen on main-shock records from the Keenwild, Cranston, and Santa Rosa Mountain stations (fig. 3).

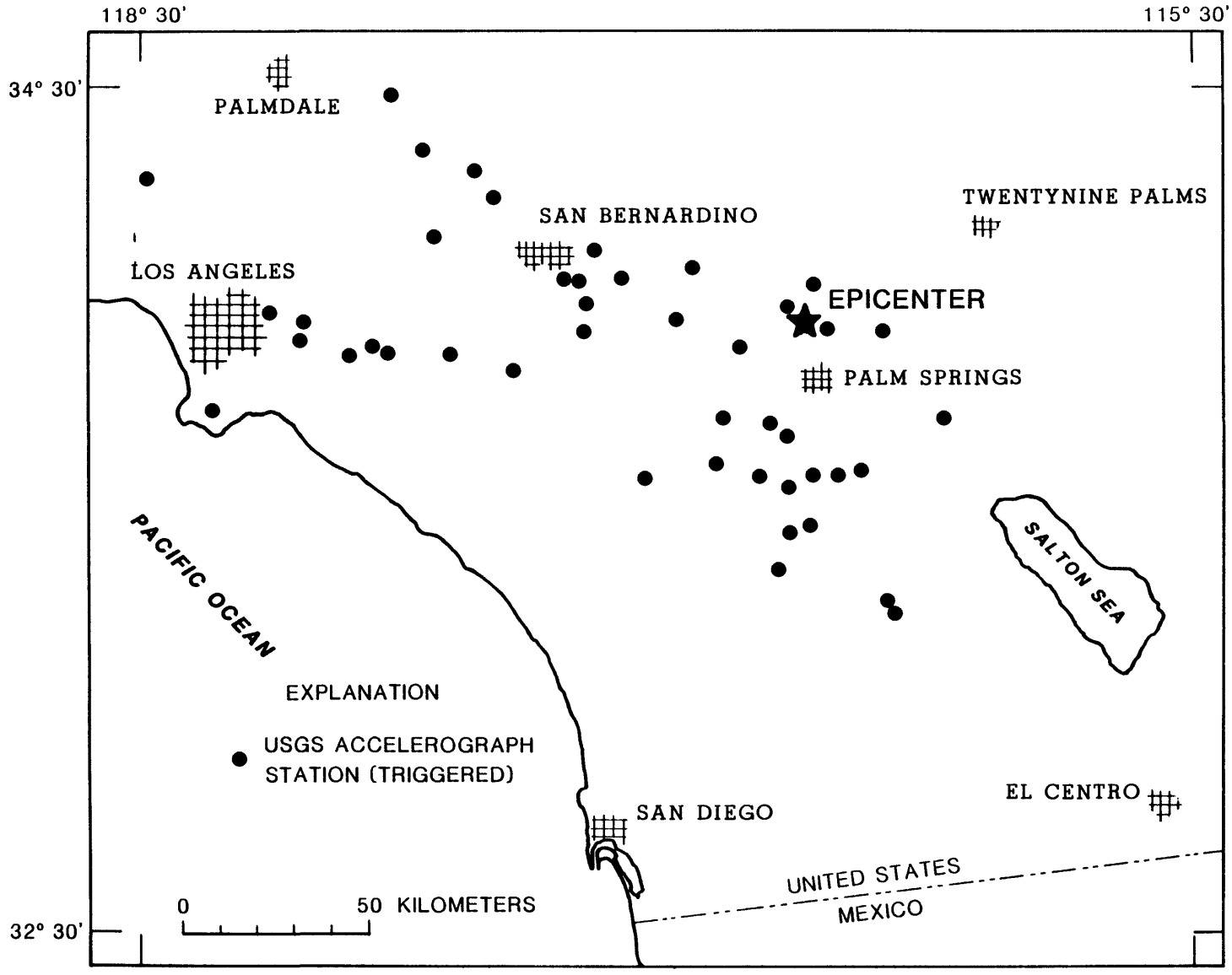


Figure 1.--USGS accelerograph stations in the southern California region that triggered during the main shock.

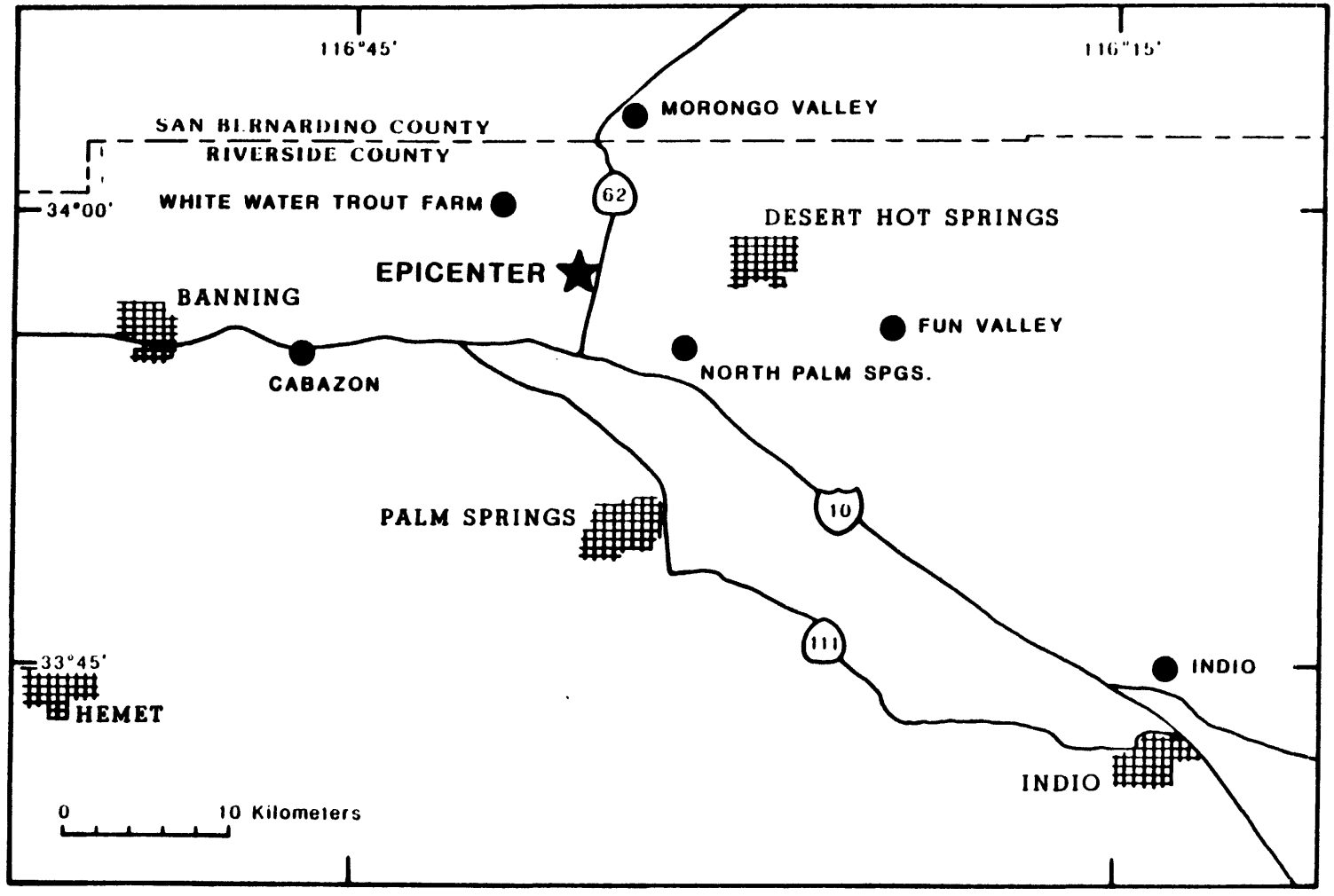


Figure 2.--Close-in USGS stations that triggered during the main shock.

AFTERSHOCK DATA

Table 2 contains station information and record data from 23 USGS stations that recorded 120 aftershocks during the period July 8 through October 15 (Julian day numbers 189 through 288), 1986. These stations include 4 temporary aftershock stations that were established during the first 24 hours after the main shock, and are designated Desert Hot Springs, Mission Lakes; West Palm Springs Village; Millard Canyon; and Canyon House, Morongo Valley (table 2). Only 82 of these records (68 percent) contain good WWVB radio times, largely due to near-total failure of the radio receiver at the Whitewater Trout Farm station, where 33 aftershocks were recorded. Additional stations where significant numbers of aftershocks were recorded include Morongo Valley (16), North Palm Springs (26), Cabazon (5), and Desert Hot Springs, Mission Lakes (13). Figure 4 contains copies of the 23 aftershock accelerograms that contain peak horizontal ground motions greater than 0.05 g. About 80 percent of the identifiable aftershocks were recorded within one hour of the main shock. The maximum acceleration recorded during any aftershock is 0.168 g recovered from the North Palm Springs station and is related to the magnitude 4.2 event that occurred approximately 49 minutes after the main shock.

ACKNOWLEDGEMENTS

The USGS is grateful to the many property owners who have provided space for the long-term operation of accelerographs, and to those organizations that have cooperated with the USGS in the strong-motion program, including the Metropolitan Water District of Southern California, the Army Corps of Engineers, the Veterans Administration, the California Dept. of

Transportation and Bechtel Power Corporation. The strong-motion network in this region was maintained by John Nielson and Frank Risavich. Arnie Acosta, Dennis Johnson and Marion Salsman assisted in the collecting and processing of records.

REFERENCES

U.S. Geological Survey, 1986, Preliminary determination of epicenters: U.S. Department Of The Interior, Geological Survey, Washington, D.C. 20402.

E.E.R.I., 1986, Report on the North Palm Springs, California, earthquake - July 8, 1986: Special Report, Earthquake Engineering Research Institute, El Cerrito, Calif. 94530, 12 p.

O.S.M.S., 1986, CSMIP strong-motion records from the Palm Springs, California earthquake of 8 July 1986: Office of Strong-Motion Studies Report OSMS 86-05, 74 p.

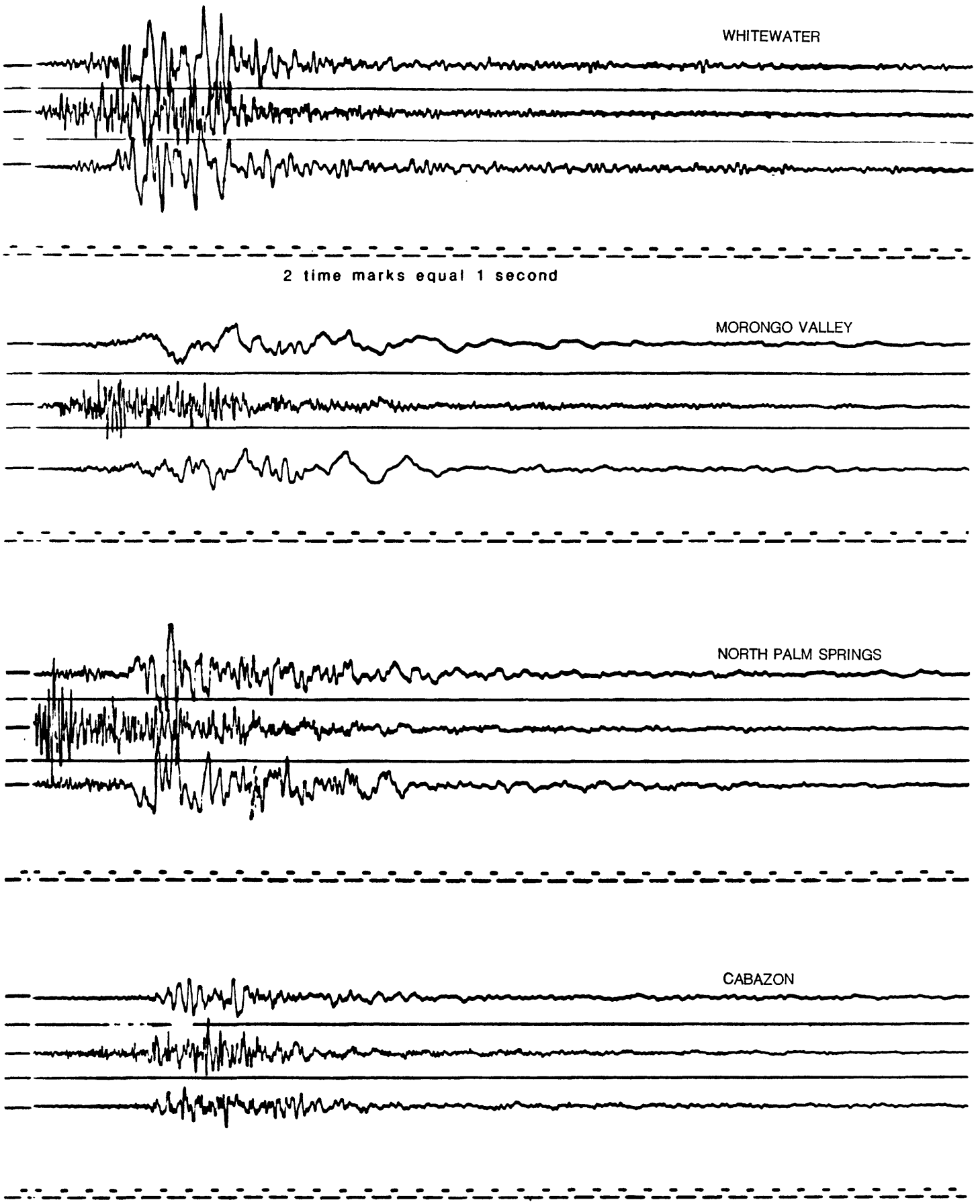
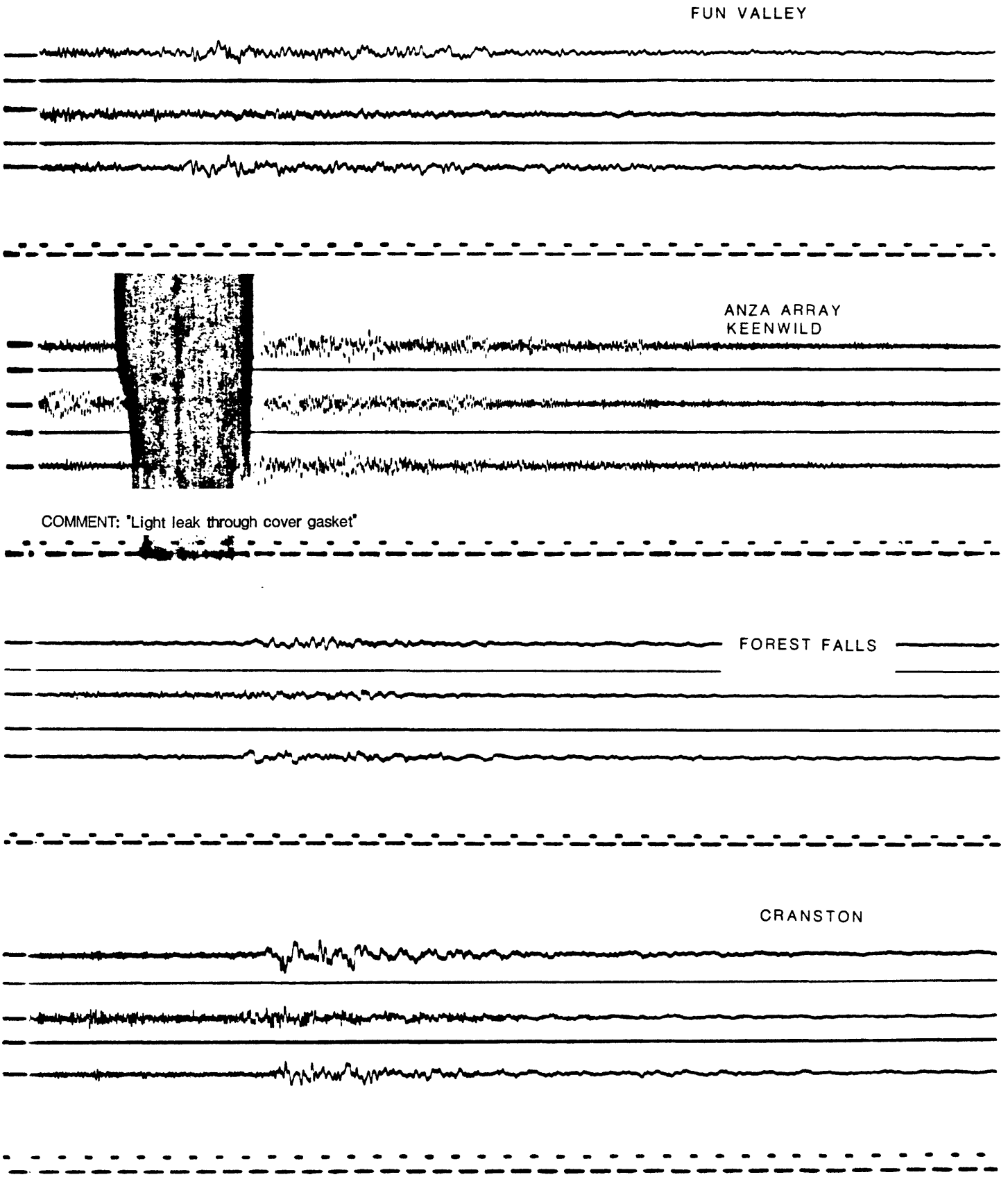


Figure 3.--Main-shock accelerograph records that contain peak ground motions greater than 0.05 g and peak structure motions greater than 0.10 g.



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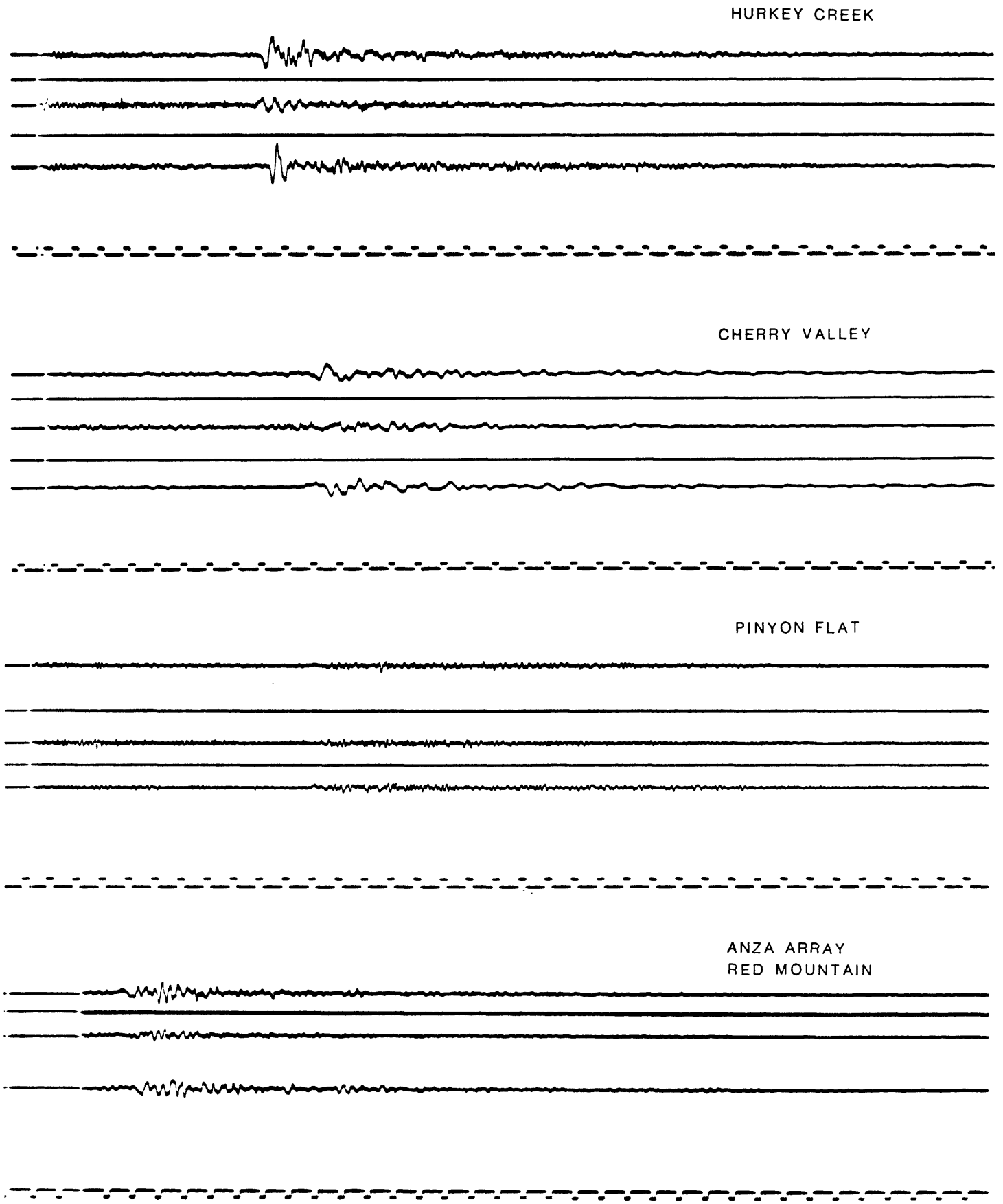

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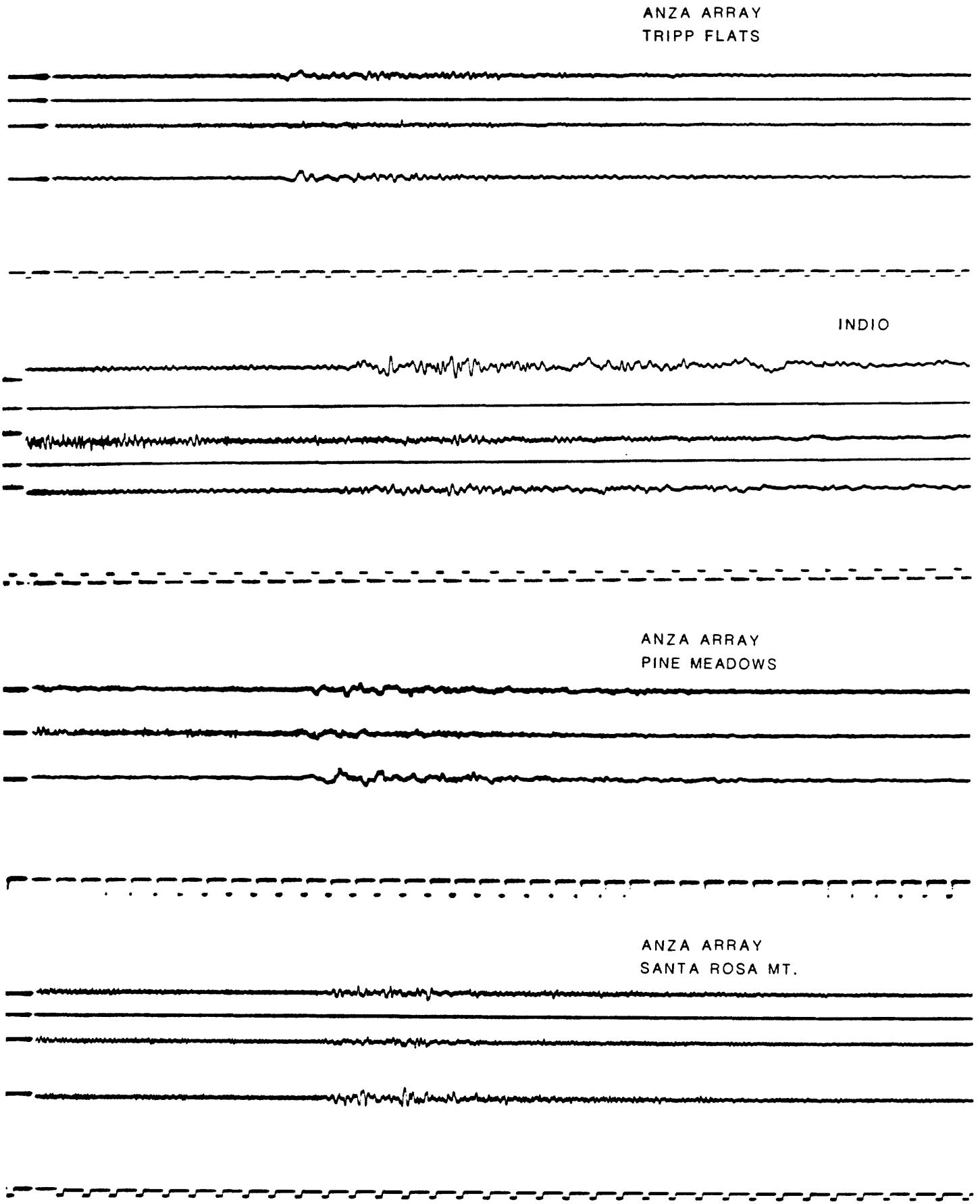

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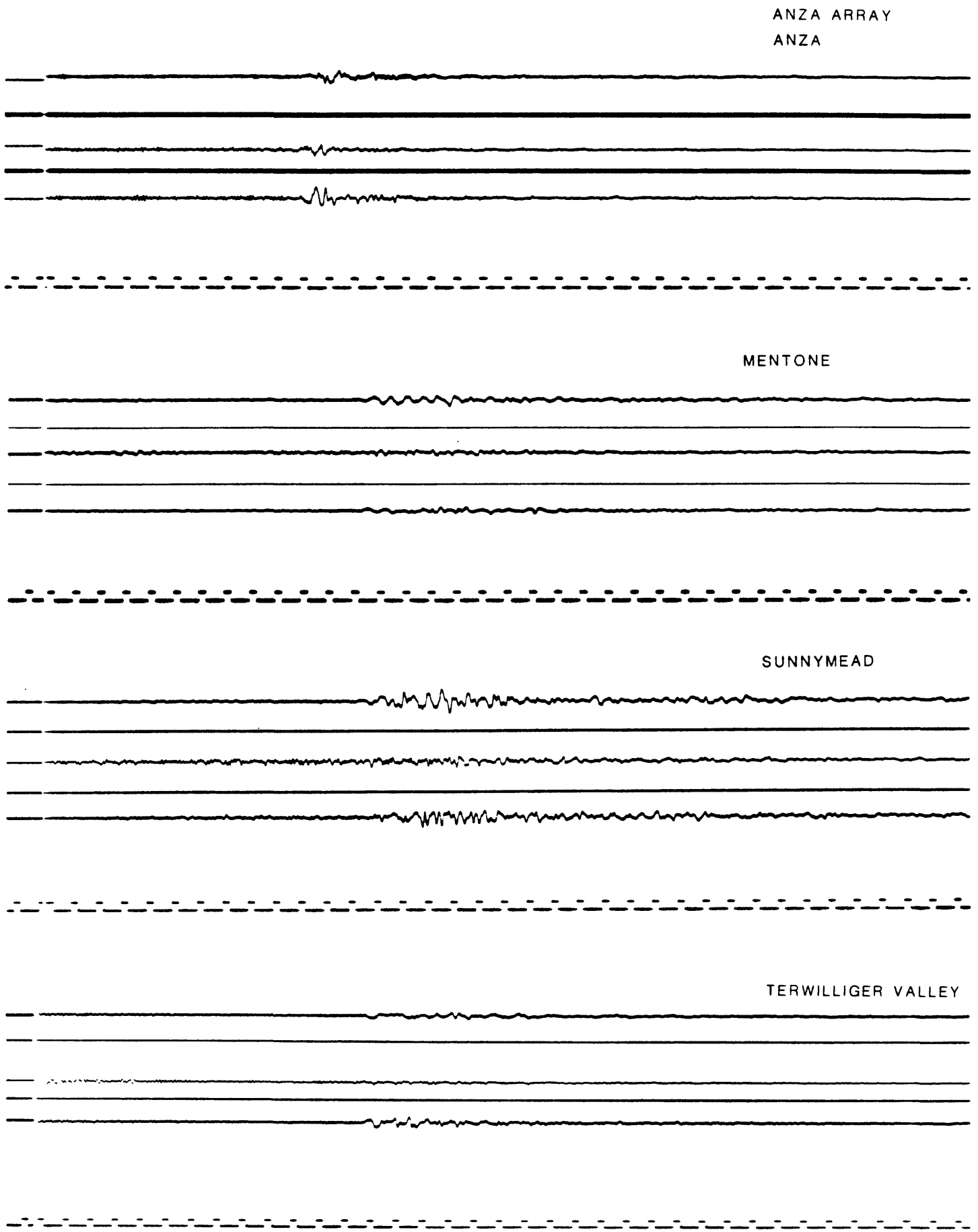

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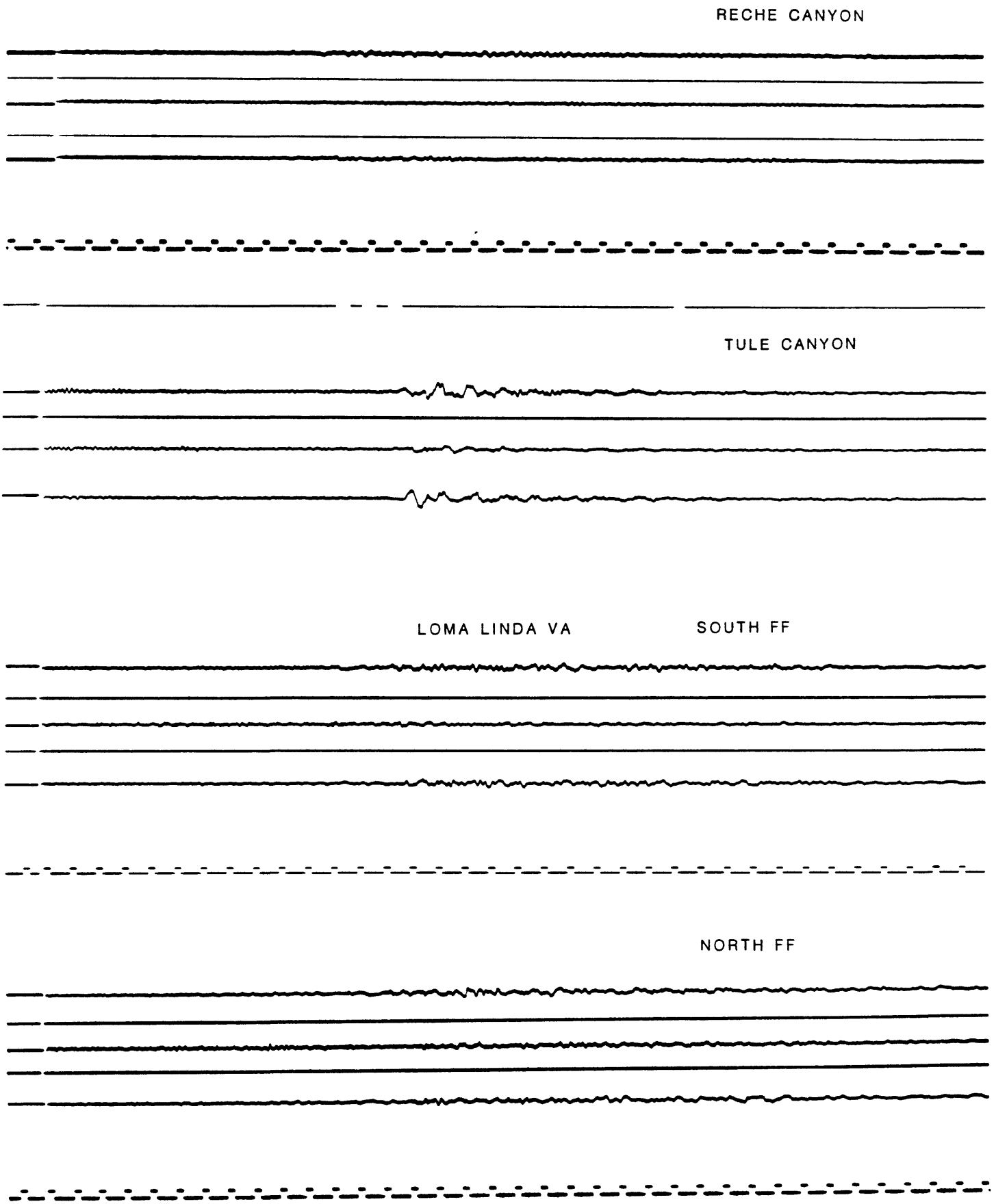

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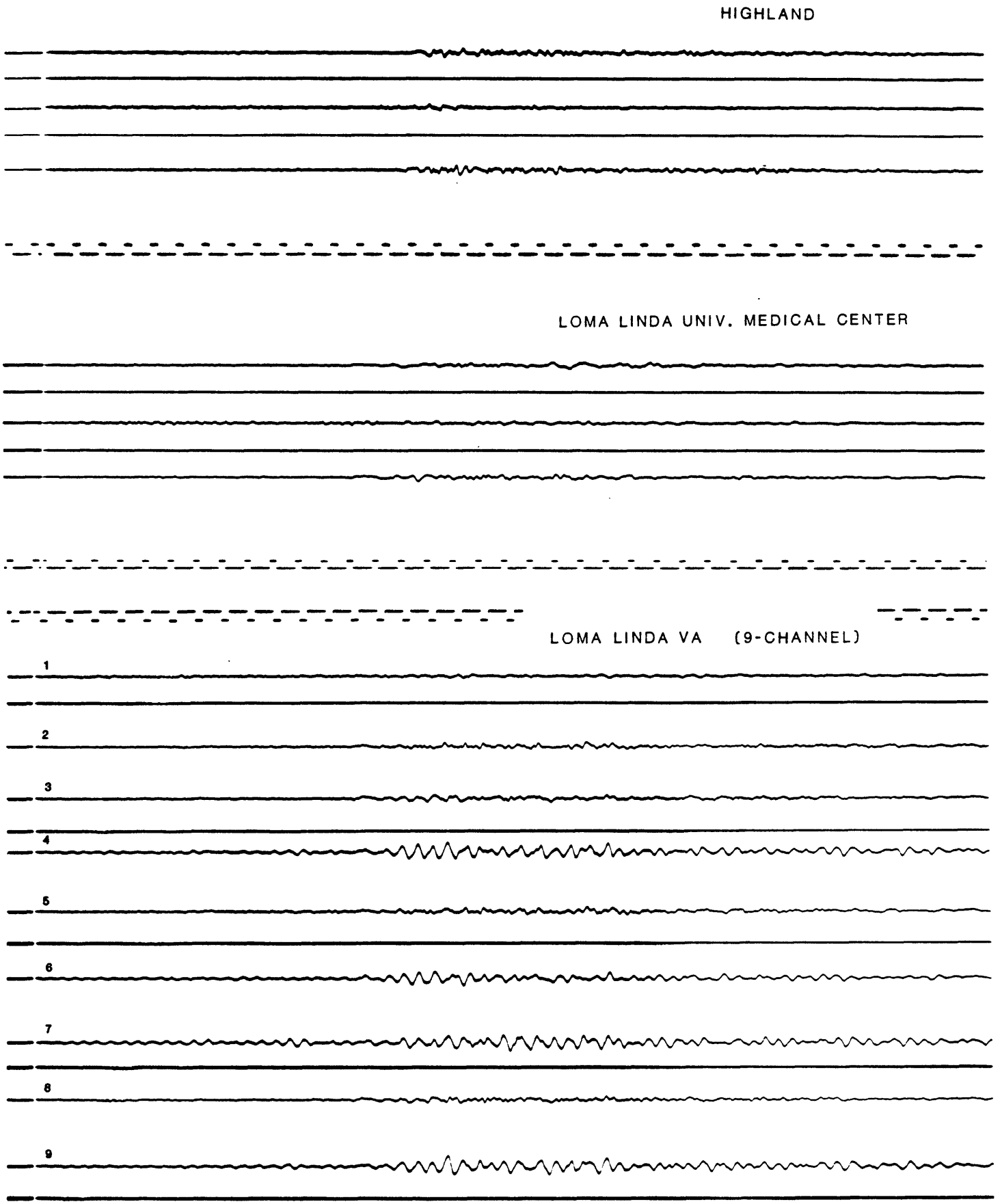

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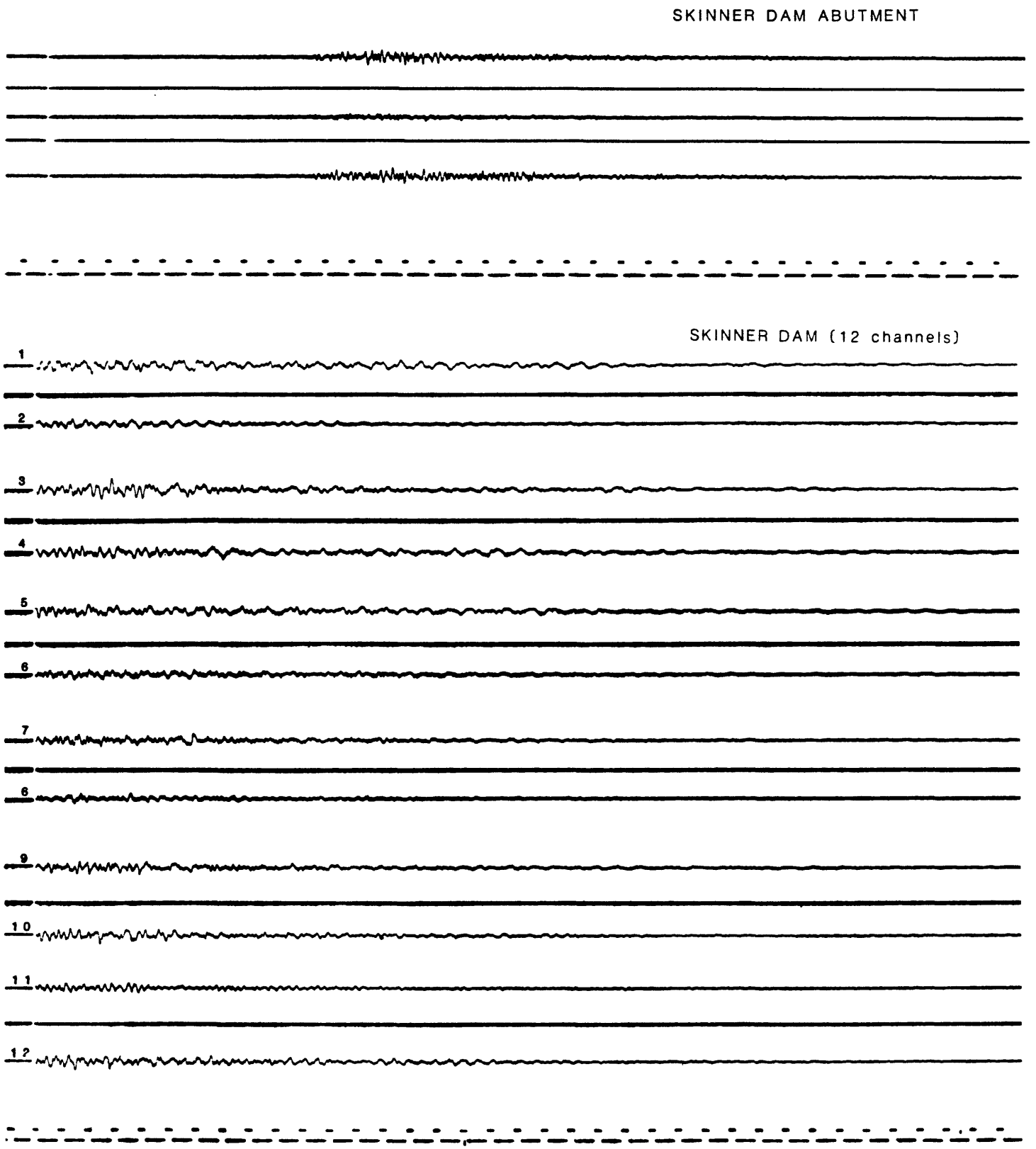

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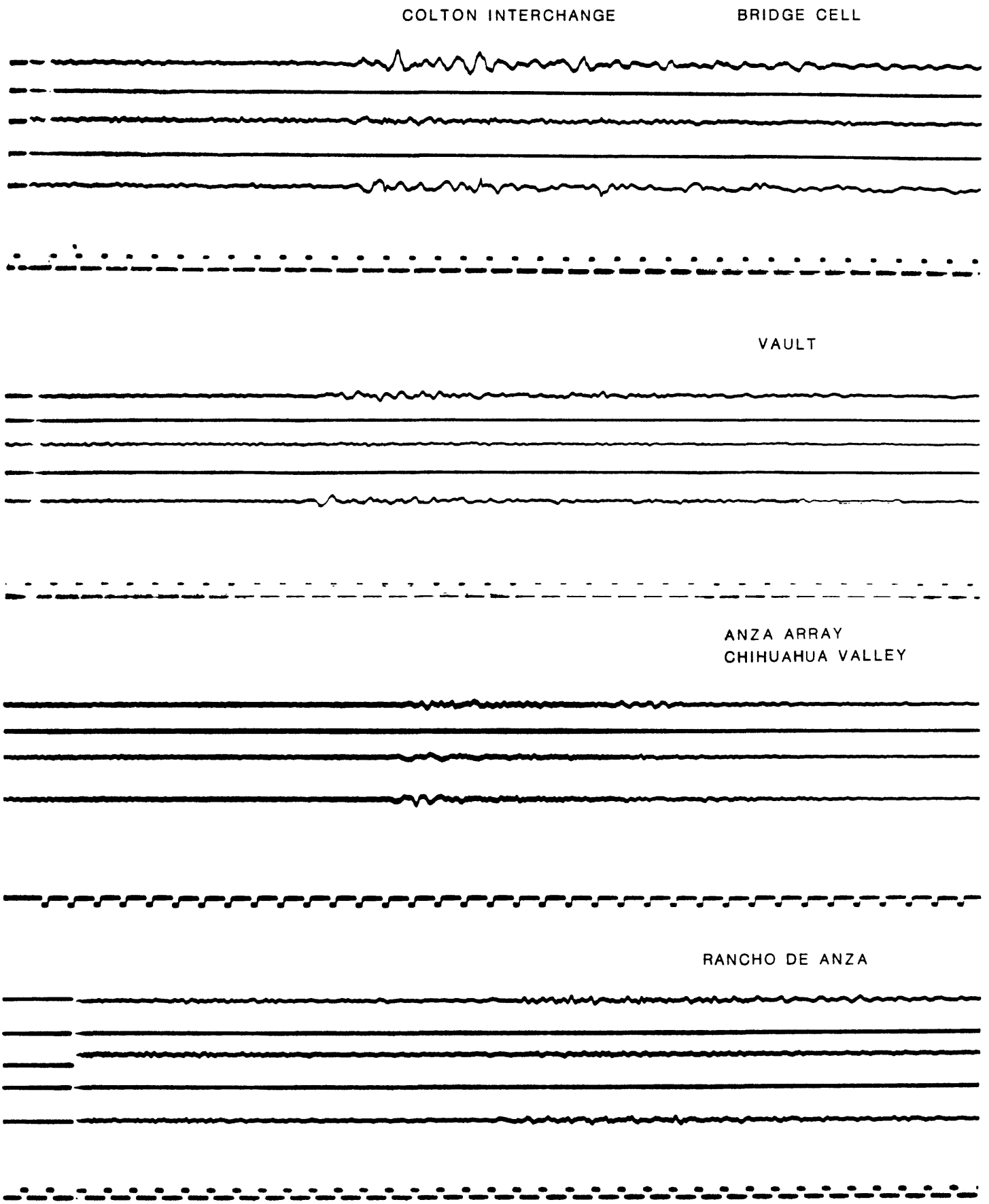

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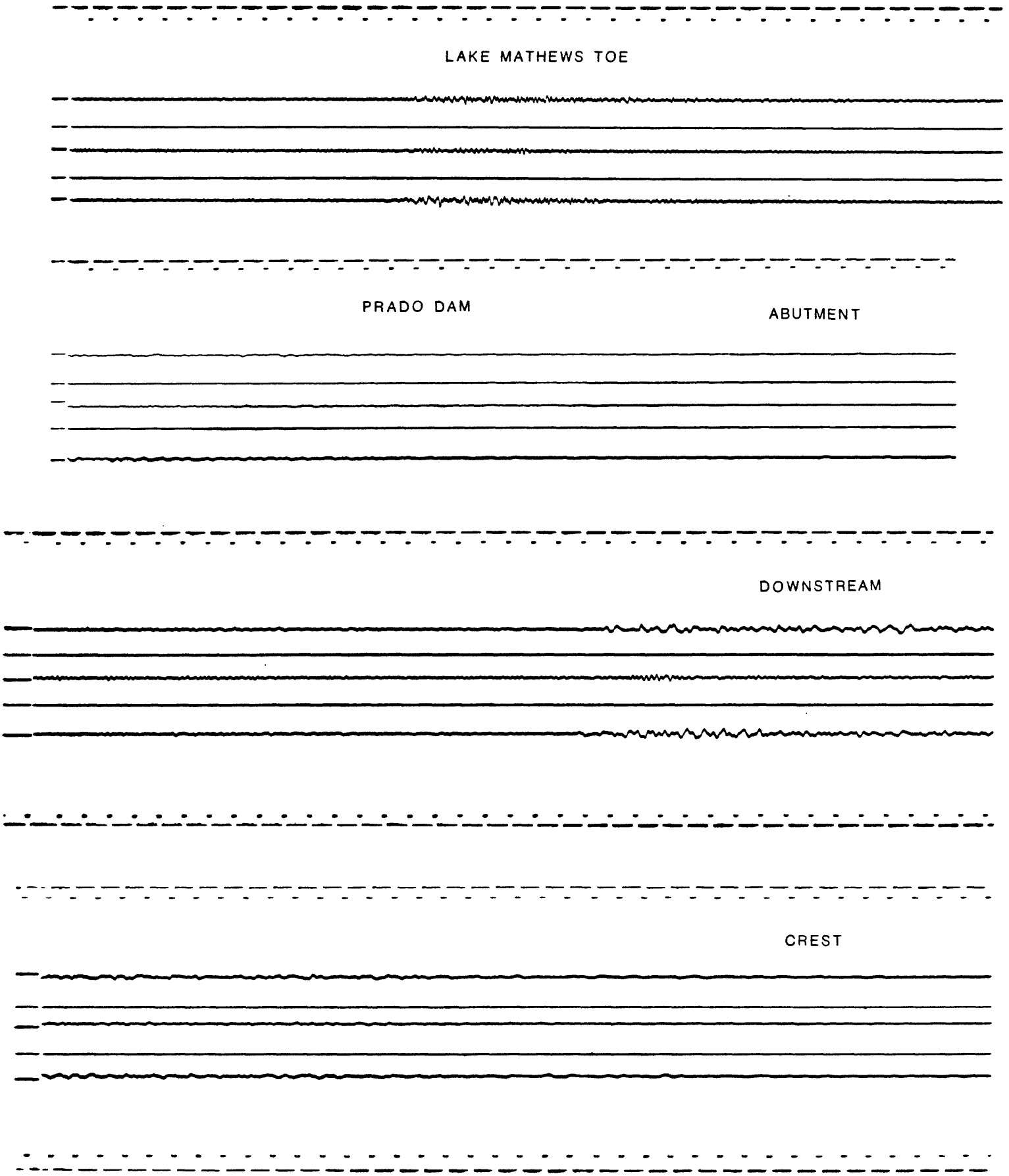

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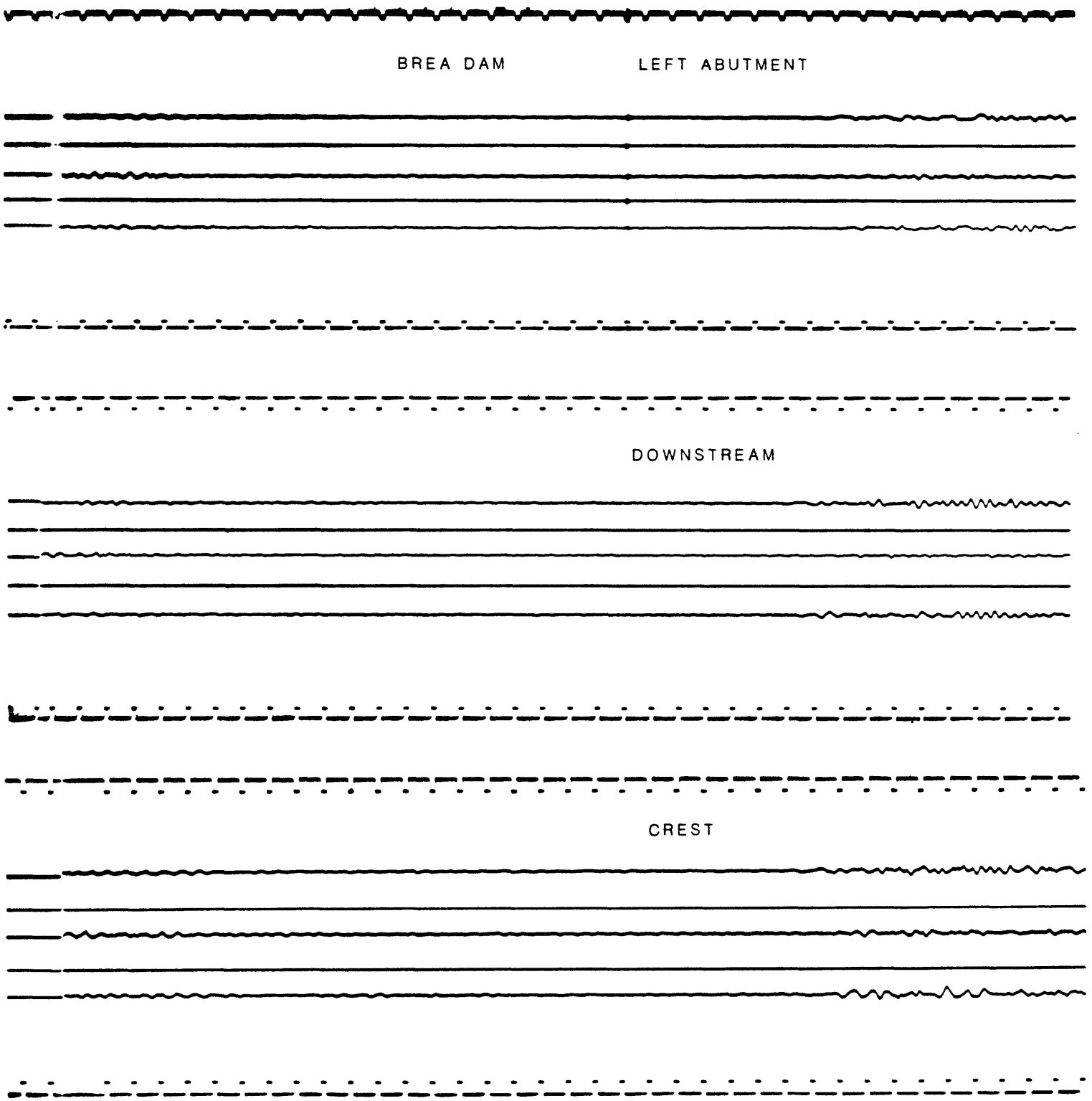

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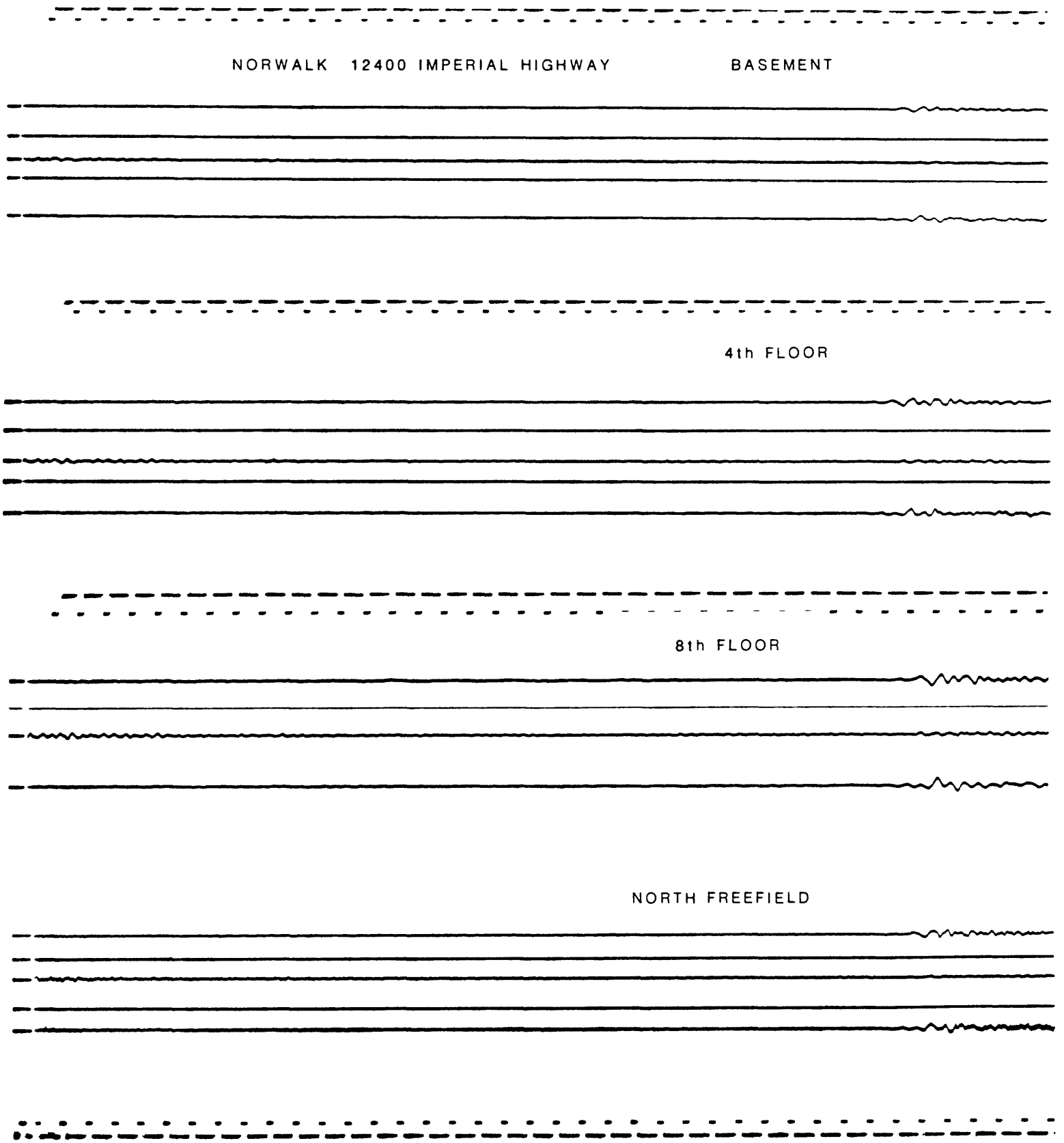

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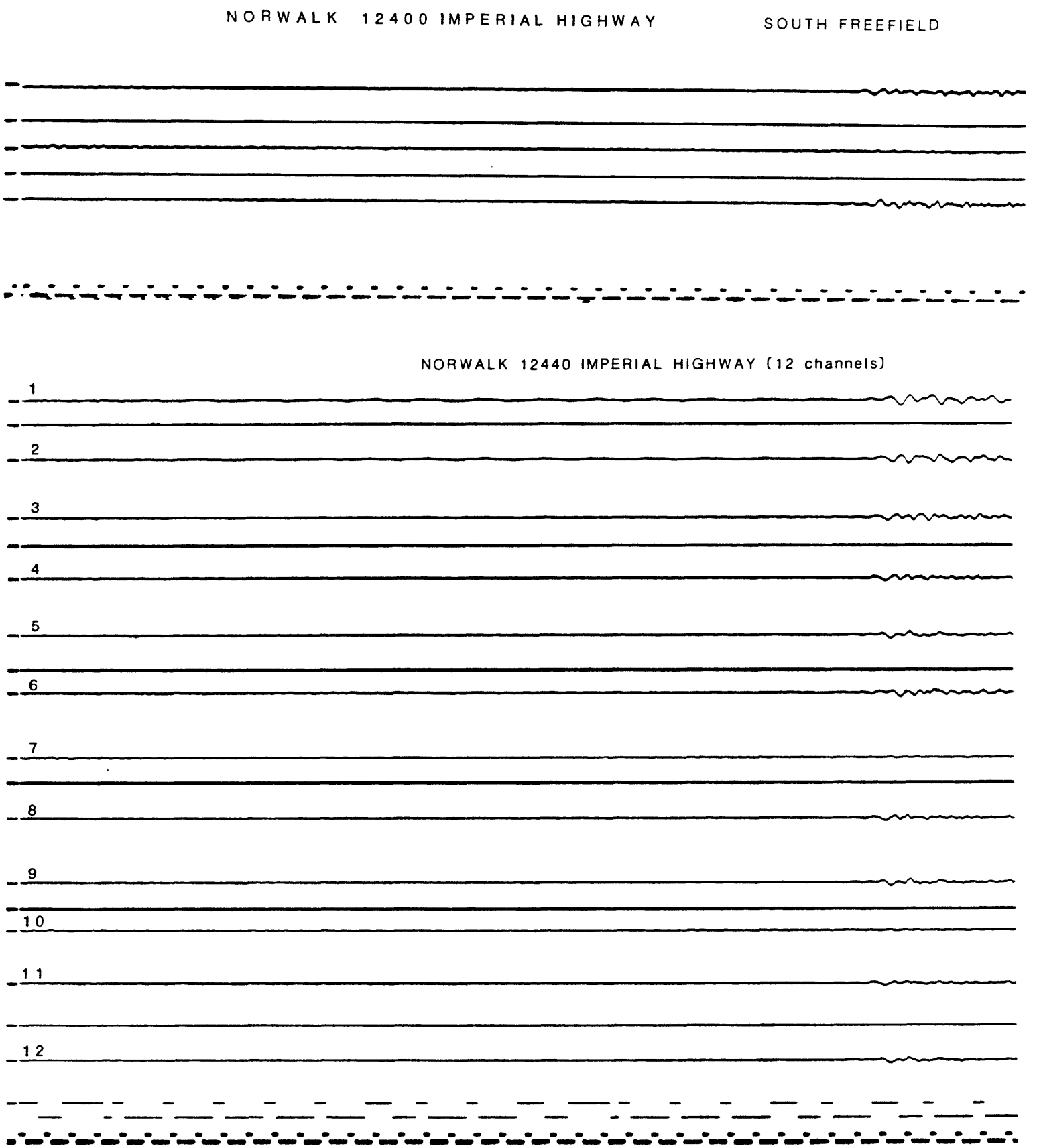

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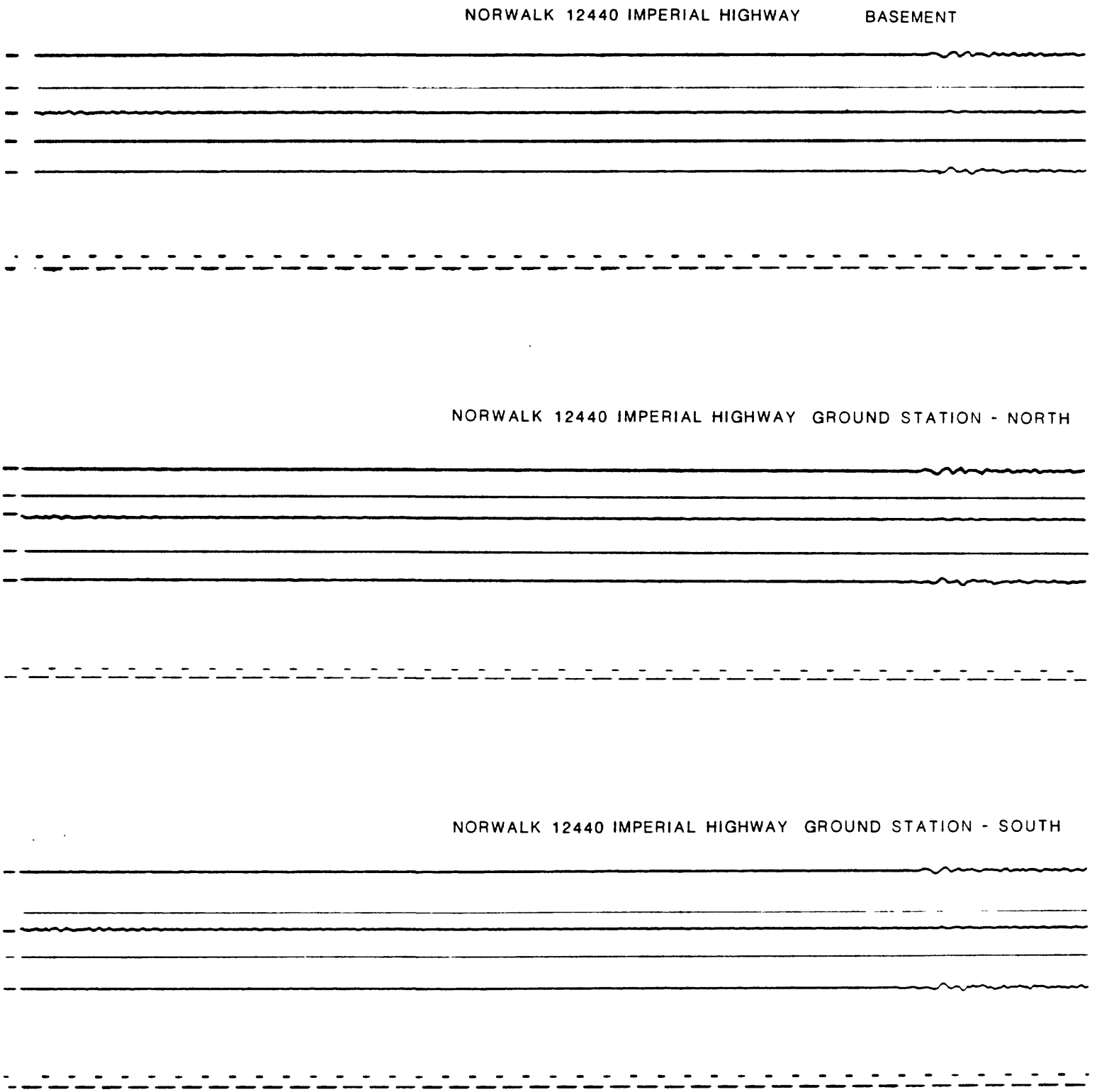

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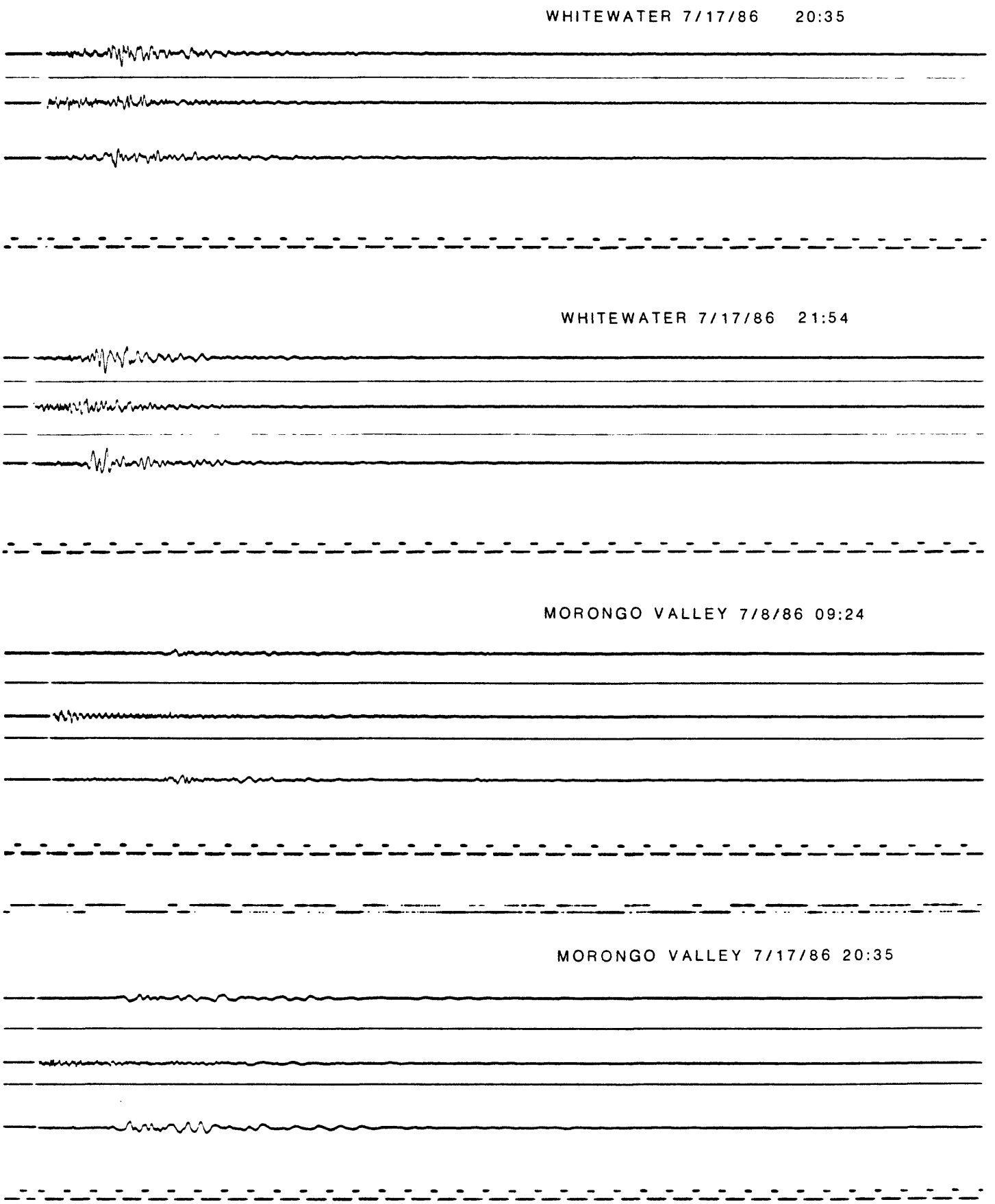
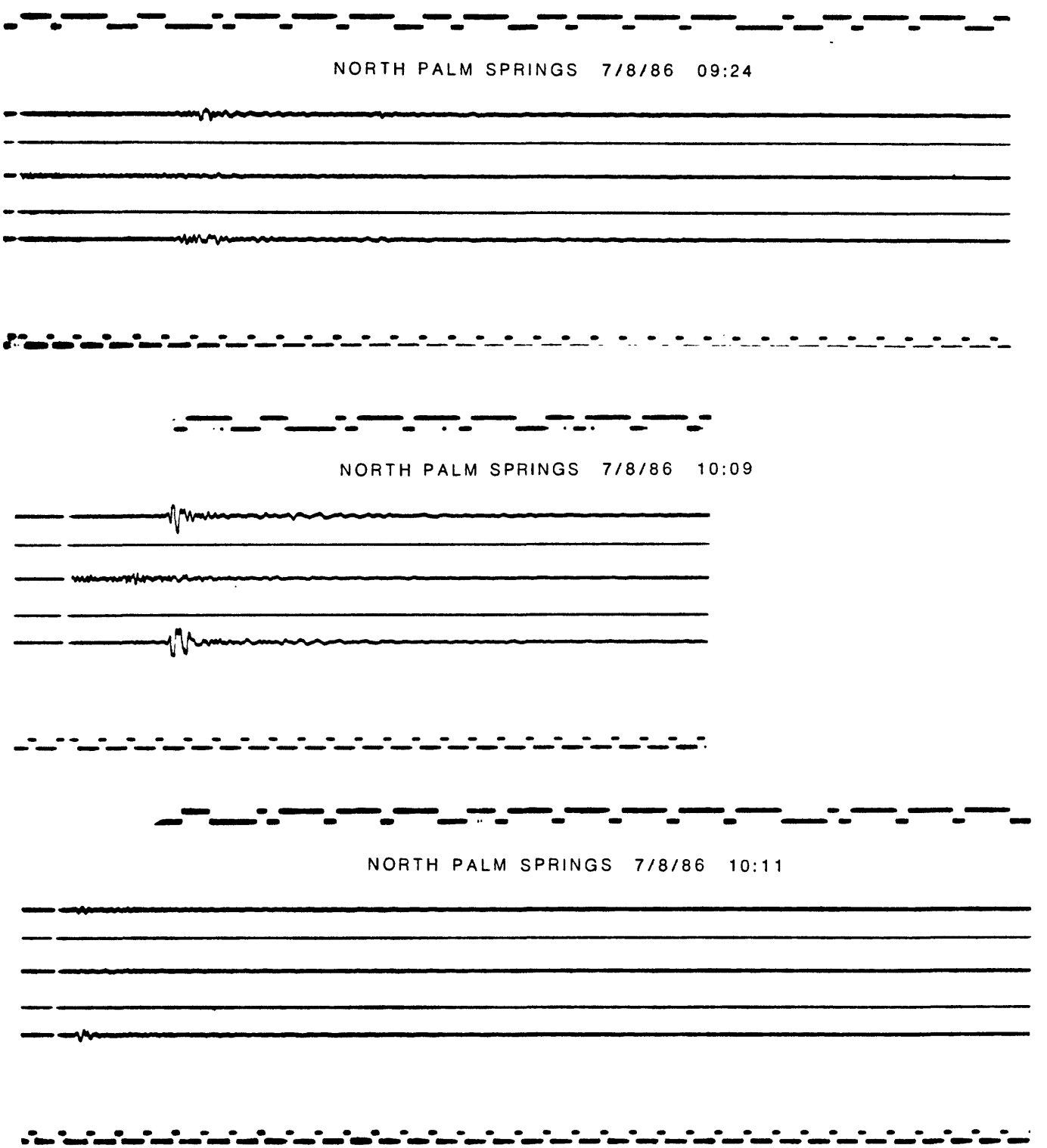


Figure 4.--Aftershock accelerograms from the Palm Springs region that contain peak ground motions greater than 0.05 g.



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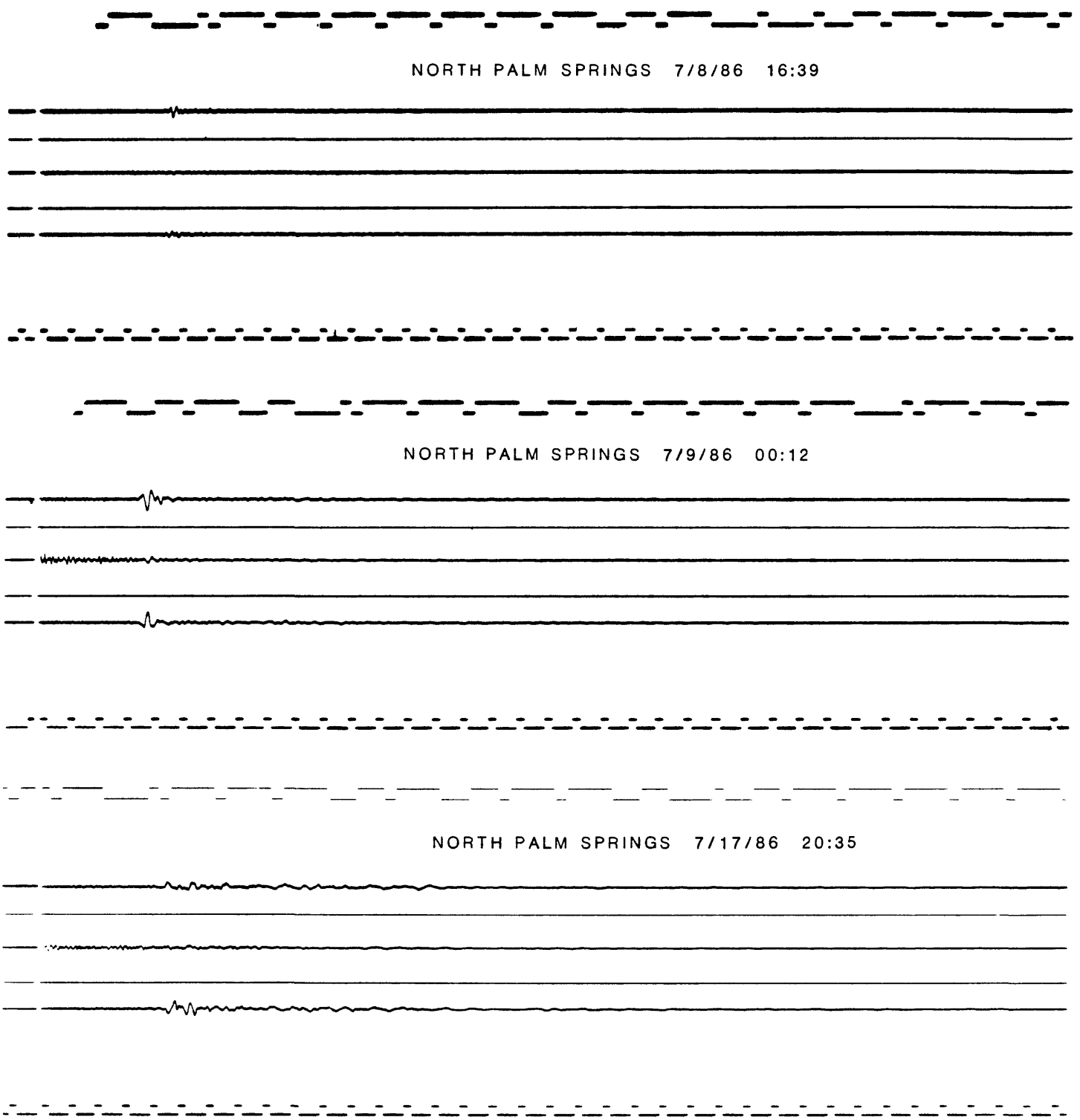

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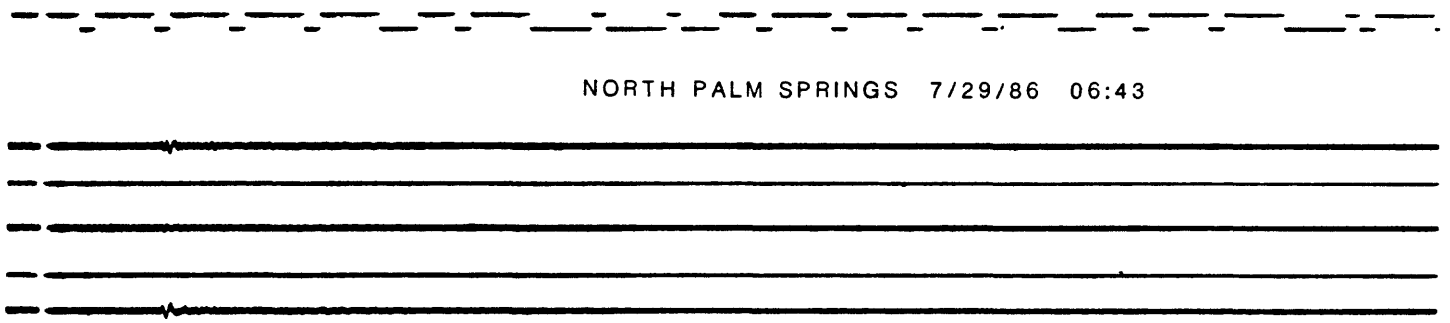

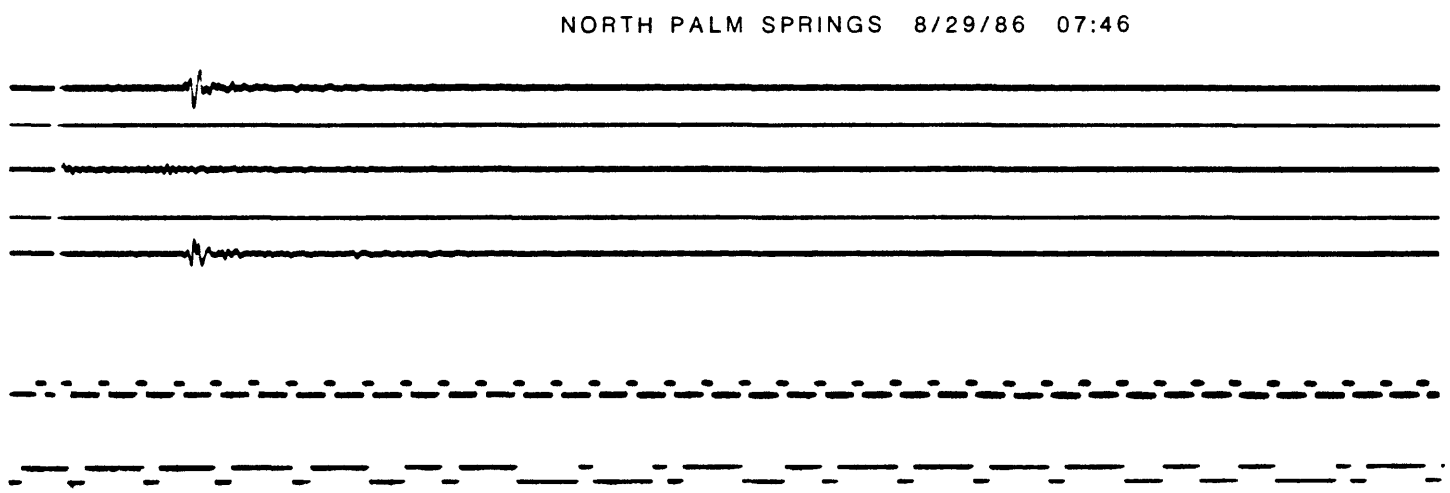

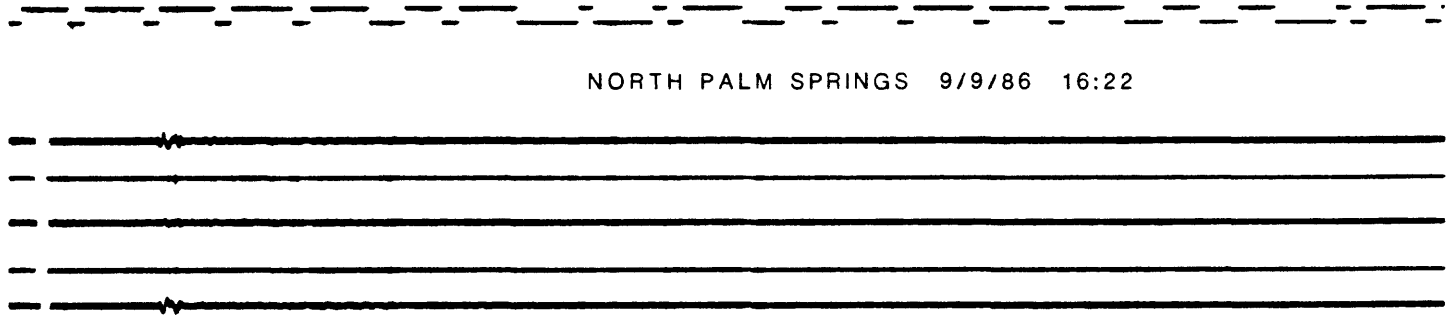

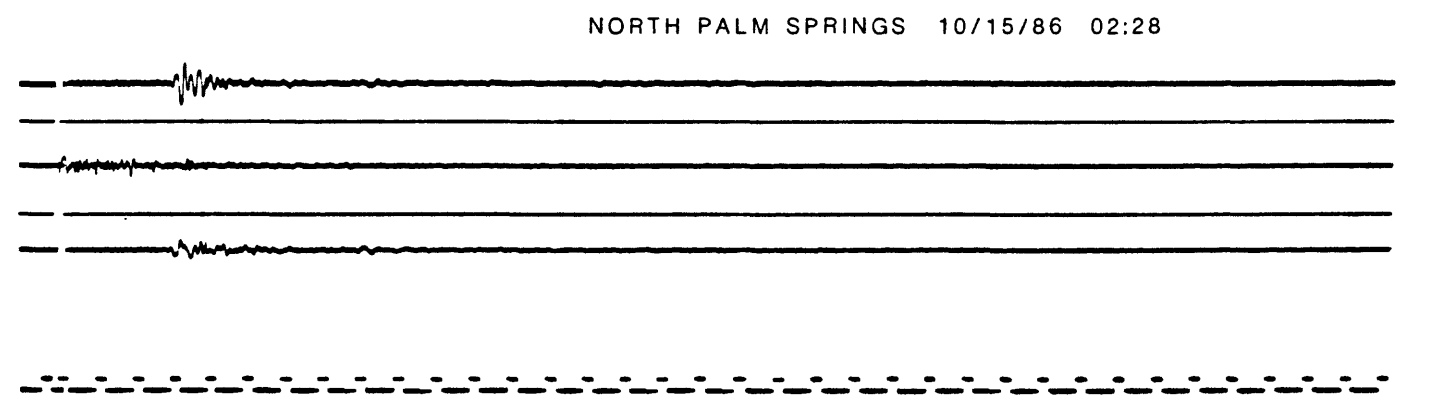

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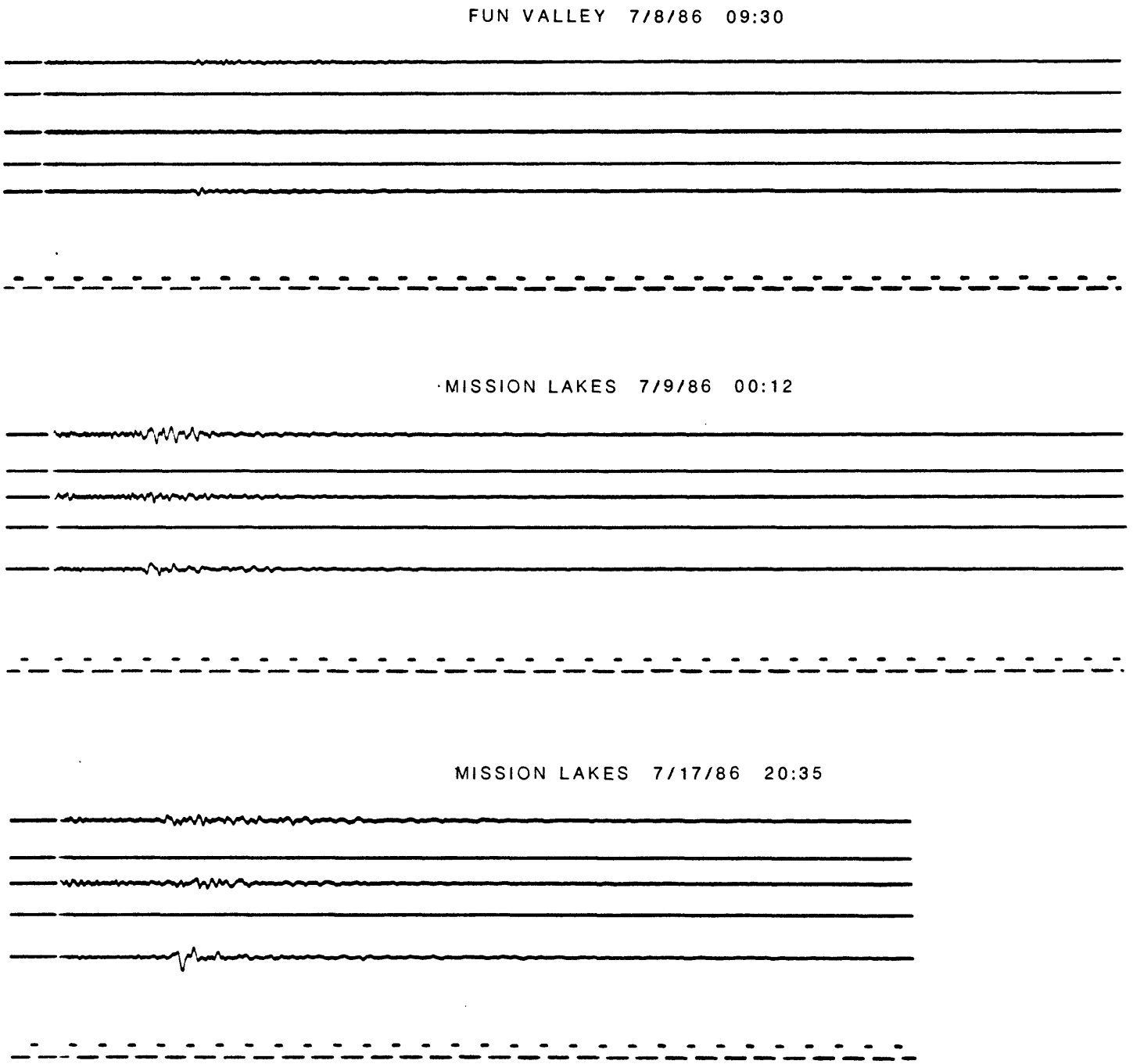

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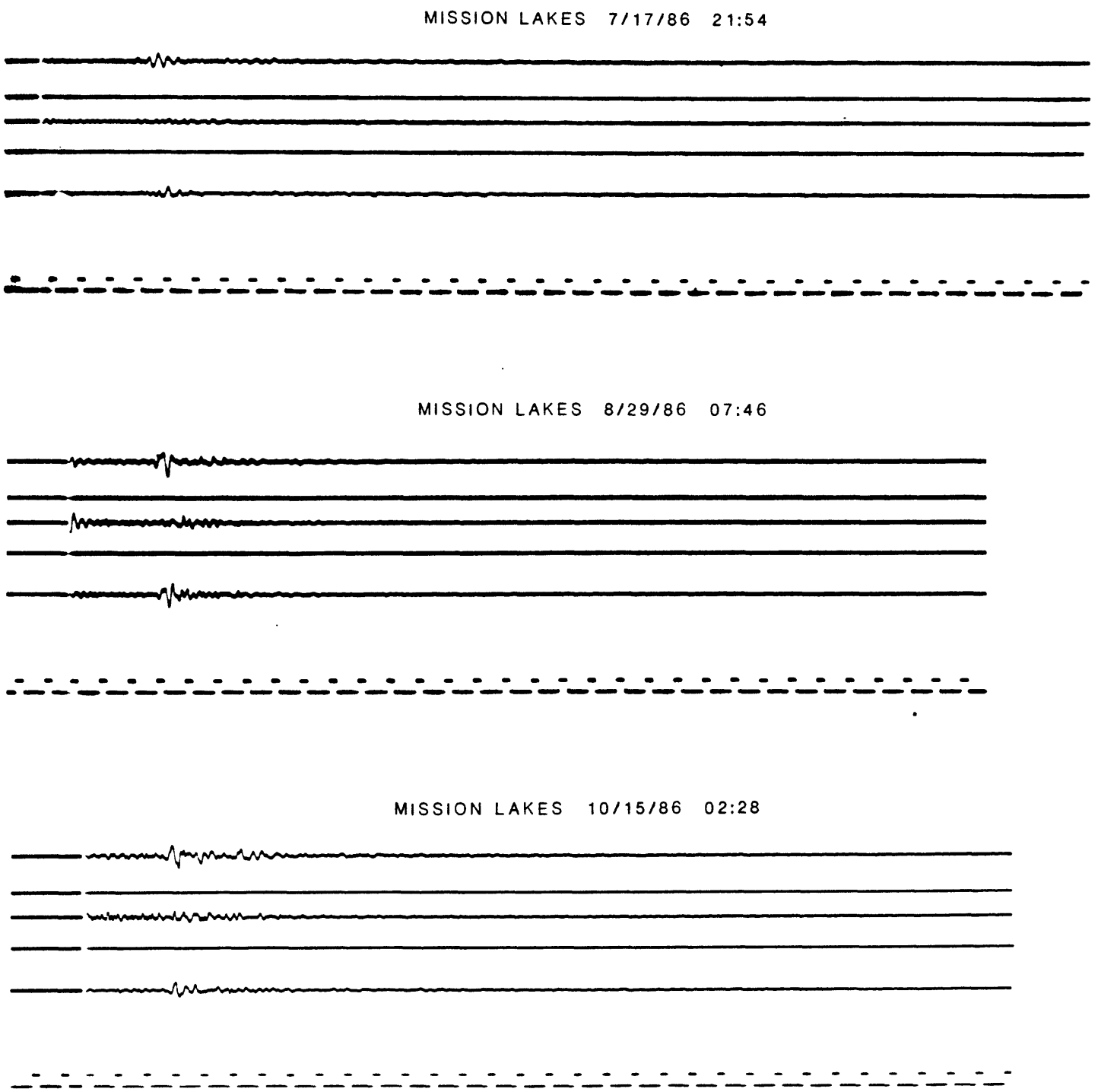

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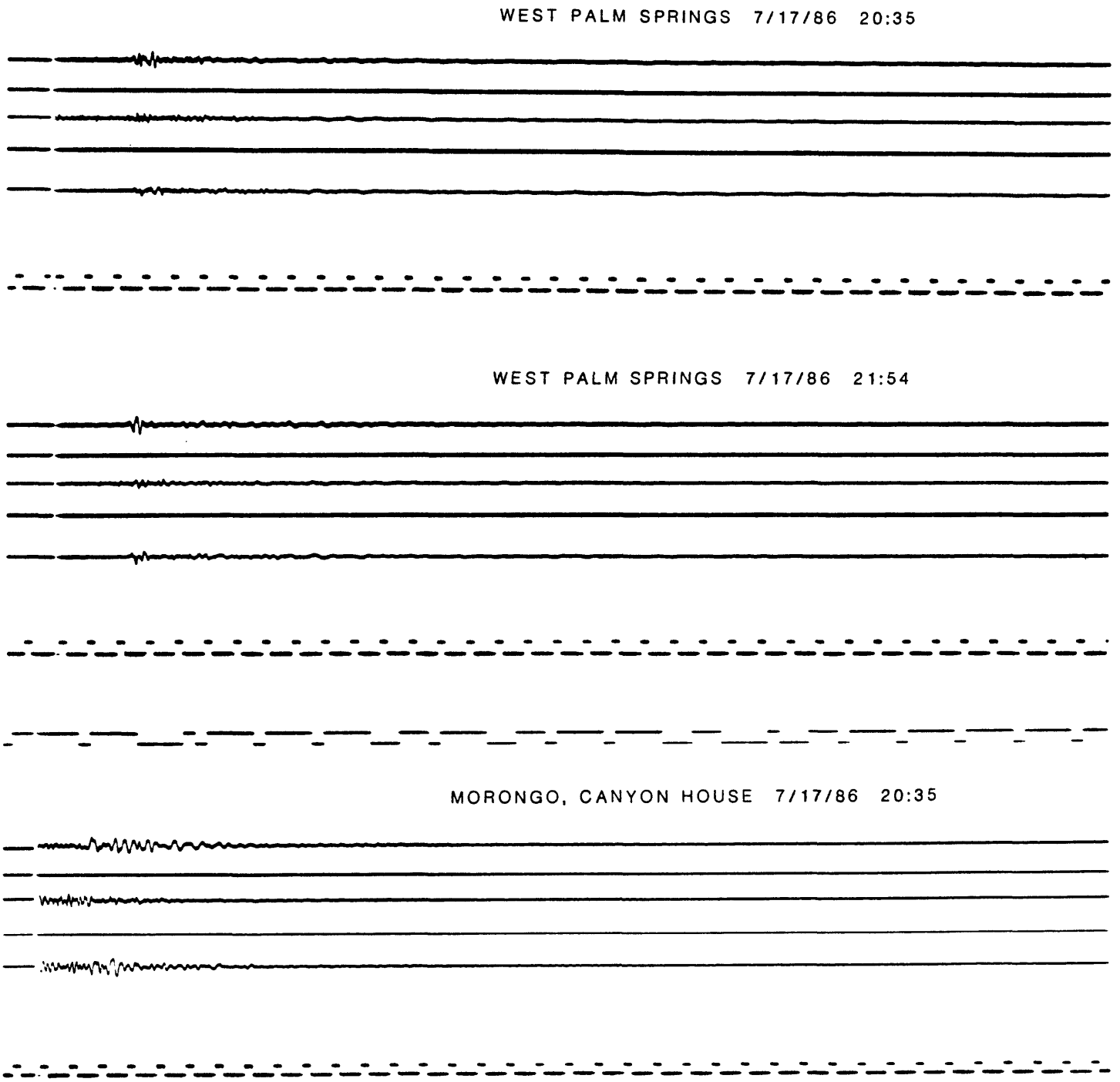

Figure 4.--Continued.

Table 1.--Main-shock accelerograph data for USGS stations in the greater Palm Springs region

[Epicentral distance and Azimuth are measured relative to epicenter at lat. 33.97°N., long. 116.61°W. Trigger times include day (July 8)/hour:minute:second. S-t interval is time between instrument triggering and arrival of S-wave motion; dash indicates interval is indeterminable. Direction of acceleration is for upward trace deflection on accelerogram; vertical-component directions are listed as "up" or "down". Duration of acceleration is time between first and last peaks of acceleration greater than 0.10 g.]

Station identification			Epicentral distance (km)	Azimuth (degrees)	Trigger time (G.m.t.)	S-t interval (s)	Acceleration		
Number	Name	Coordinates (lat.°N., long.°W.)					Direction (degrees)	Maximum (g)	Duration (s)
5072	Whitewater Trout Farm	33.989, 116.655	5	296	unknown	1.6	270	.662	4.5
							Up	.438	4.9
							180	.497	4.5
5071	Morongo Valley	34.048, 116.577	9	017	189/09:20:47.0	1.9	135	.217	4.7
							Up	.348	4.2
							045	.229	4.8
5070	N. Palm Springs Post Office	33.924, 116.543	9	131	189/09:20:47.55	2.0	300	.681	6.0
							Up	.778	5.6
							210	.704	5.3
5073	Cabazon	33.918, 116.782	17	251	189/09:20:48.50	2.4	270	.209	3.3
							Up	.376	3.2
							180	.223	2.7
5069	Fun Valley	33.925, 116.389	21	102	189/09:20:48.95	2.8	135	.139	0.6
							Up	.085	-
							045	.128	0.6
5232	Keenwild	33.71, 116.71	30	198	189/09:20:50.85	3.9	180	.327	4.7
							Up	.186	8.1
							090	.211	2.9
5075	Forest Falls Post Office	34.09, 116.92	32	295	189/09:20:50	4.0	300	.067	-
							Up	.055	-
							210	.077	-
5157	Cranston Forest Station	33.74, 116.84	33	220	189/09:20:51.40	4.55	315	.188	1.5
							Up	.126	0.4
							225	.139	1.7
5043	Hurkey Creek Park	33.67, 116.68	34	191	189/09:20:51.34	4.30	135	.185	1.0
							Up	.084	-
							045	.242	0.3
5219	Cherry Valley	33.98, 116.99	35	272	189/09:20:51.48	5.2	295	.103	1 peak
							Up	.058	-
							205	.098	1 peak
5044	Pinyon Flat Observatory	33.61, 116.46	42	161	189/09:20:52	5.4	135	.067	-
							Up	.058	-
							045	.053	-
5224	Red Mountain	33.64, 116.86	43	212	unknown	-	360	.141	0.4
							Up	.083	-
							270	.100	1 peak
5222	Tripp Flats	33.60, 116.74	43	196	189/09:20:53.98	4.5	360	.051	-
							Up	.054	-
							270	.076	-
5067	Indio	33.747, 116.214	44	123	189/09:20:53.20	6.2	315	.126	0.4
							Up	.093	-
							225	.061	-
5223	Pine Meadows	33.578, 116.589	44	177	189/09:20:52.91	5.55	360	.080	-
							Up	.078	-
							270	.101	1 peak
5230	Santa Rosa Mountain	33.57, 116.52	45	169	189/09:20:53.25	5.85	360	.088	-
							Up	.057	-
							270	.120	1 peak

Table 1.--Main-shock accelerograph data for USGS stations in the greater Palm Springs region--Continued

Station identification			Epicentral distance (km)	Azimuth (degrees)	Trigger time (G.m.t.)	S-t interval (s)	Acceleration		
Number	Name	Coordinates (lat.°N., long.°W.)					Direction (degrees)	Maximum (g)	Duration (s)
5160	Anza Fire Station	33.556, 116.673	46	187	189/09:20:54.36	5.1	315	.068	-
							Up	.066	-
							225	.114	0.2
5162	Mentone Fire Station	34.067, 117.117	48	283	189/09:20:53.02	6.2	315	.062	-
							Up	.038	-
							225	.045	-
5038	Sunnymead	33.95, 117.15	50	268	189/09:20:53.54	6.2	315	.125	0.2
							Up	.062	-
							225	.105	1 peak
5045	Terwilliger Valley	33.48, 116.59	54	178	unknown	6.5	135	.033	-
							Up	.037	-
							045	.067	-
5037	Reche Canyon Olive Dell Ranch	34.01, 117.22	56	275	189/09:20:56.78	5.5	330	.034	-
							Up	.021	-
							240	.028	-
5231	Tule Canyon	33.47, 116.64	56	183	unknown	6.9	360	.103	1 peak
							Up	.043	-
							270	.107	1 peak
5229	Loma Linda VA: South freefield	34.039, 117.227	58	280	unknown	6	360	.044	-
							Up	.027	-
							270	.049	-
	North freefield	34.059, 117.227			189/09:20:56.67	7.1	360	.052	-
							Up	.034	-
							270	.044	-
5161	Highland Fire Station	34.136, 117.213	59	289	189/09:20:54.86	7.0	315	.038	-
							Up	.045	-
							225	.056	-
0129	Loma Linda University Medical Center	34.05, 117.26	61	279	unknown	6	090	.036	-
							Up	.019	-
							360	.049	-
5229	Loma Linda VA	34.049, 117.227	61	279	unknown	6.3	1) Up-1st(C)	.017	-
							2) 360-1st(C)	.044	-
	Note:						3) 090-1st(C)	.044	-
	First floor level (1st)						4) 090-4th(C)	.097	1 peak
							5) 090-1st(N)	.044	-
	Fourth floor level (4th)						6) 360-4th(C)	.082	-
							7) 090-4th(N)	.092	-
	North (N) and South end (S)						8) 360-1st(S)	.044	-
							9) 090-4th(S)	.108	1 peak
	Center area (C)								
720	Skinner Dam Abutment	33.58, 117.07	61	225	unknown	4.9	178	.078	-
							Up	.037	-
							088	.083	-
	Note:				unknown	-	1) 180 (CC)	.087	-
	Center crest (CC)						2) Up (CC)	.053	-
	Lower crest (LC)						3) 270 (CC)	.117	1 peak
	Lower slope (LS)						4) 180 (LC)	.071	-
	Center slope (CS)						5) 270 (LC)	.065	-
	Center toe (CT)						6) 270 (LS)	.055	-
							7) 180 (CS)	.068	-
							8) Up (CS)	.059	-
							9) 270 (CS)	.080	-
							10) 180 (CT)	.097	1 peak
							11) Up (CT)	.052	-
							12) 270 (CT)	.086	-

Table 1.--Main-shock accelerograph data for USGS stations in the greater Palm Springs region--Continued

Station identification				Epicentral distance (km)	Azimuth (degrees)	Trigger time (G.m.t.)	S-t interval (s)	Acceleration		
Number	Name	Coordinates (lat.°N.,	long.°W.)					Direction (degrees)	Maximum (g)	Duration (s)
754	Colton Interchange: Bridge cell	34.06,	117.30	64	279	unknown	6.4	082	.122	1.7
								Up	.046	-
								352	.100	1 peak
	Vault					unknown	5.9	082	.058	-
								Up	.017	-
								352	.056	-
5221	Chihuahua Valley	33.38,	116.68	66	186	unknown	7.9	270	.050	-
								Up	.038	-
								180	.067	-
5047	Rancho de Anza	33.35,	116.40	72	164	unknown	8.2	135	.043	-
								Up	.027	-
								045	.050	-
0707	Lake Mathews Dike toe	33.852,	117.451	79	261	unknown	6.8	252	.056	-
								Up	.041	-
								162	.066	-
5220	Borrego Springs	33.21,	116.33	88	163	189/09:21:02.5	9.3	315	.016	-
								Up	.016	-
								225	.017	-
5035	Lytle Creek	34.26,	117.50	88	292	189/09:21:11.98	-	315	.021	-
								Up	.016	-
								225	.022	-
969	Prado Dam: Abutment	33.89,	117.64	95	265	unknown	-	090	.017	-
								Up	.010	-
								360	.023	-
	Downstream					unknown	11.0	090	.053	-
								Up	.039	-
								360	.053	-
	Crest					unknown	-	090	.025	-
								Up	.017	-
								360	.028	-
5034	Lone Pine Canyon	34.32,	117.57	96	294	189/09:21:03.65	8.7	120	.027	-
								Up	.010	-
								030	.016	-
287	San Antonio Dam: Right abutment	34.16,	117.68	101	282	unknown	-	090	.010	-
								Up	.011	-
								360	.005	-
	Crest					unknown	-	090	.017	-
								Up	.011	-
								360	.027	-
5033	Big Pines Station	34.38,	117.69	109	295	189/09:21:16.73	-	300	.021	-
								Up	.010	-
								210	.026	-
698	Diemer Filter Plant: Basement	33.91,	117.82	112	267	unknown	11.2	281	.017	-
								Up	.010	-
								191	.022	-
	Reservoir roof					unknown	11.6	281	.021	-
								Up	.022	-
								191	.034	-

Table 1.--Main-shock accelerograph data for USGS stations in the greater Palm Springs region--Continued

Station identification			Epicentral distance (km)	Azimuth (degrees)	Trigger time (G.m.t.)	S-t interval (s)	Acceleration		
Number	Name	Coordinates (lat.°N., long.°W.)					Direction (degrees)	Maximum (g)	Duration (s)
108	Carbon Canyon Dam Crest	33.92, 117.84	114	268	unknown	-	130	.026	-
							Up	.015	-
							040	.026	-
951	Brea Dam: Left abutment	33.890, 117.930	122	266	unknown	14.3	130	.026	-
							Up	.024	-
							040	.031	-
	Downstream				unknown	14.1	130	.046	-
							Up	.020	-
							040	.040	-
	Crest				unknown	14.0	130	.041	-
							Up	.032	-
							040	.070	-
5164	Weymouth Filter Plant: Ground	34.506, 117.778	123	299	unknown	9.7	017	.020	-
							Up	.011	-
							287	.021	-
	Tank				unknown	9.7	017	.064	-
							Up	.045	-
							287	.077	-
804	Whittier 7215 Bright Ave: Basement	33.977, 118.036	131	271	unknown	-	180	.017	-
							Up	.011	-
							090	.026	-
	5th floor				unknown	-	180	.042	-
							Up	.016	-
							090	.056	-
	10th floor				unknown	-	180	.042	-
							Up	.022	-
							090	.079	-
634	Norwalk, 12400 Imperial Highway: Basement	33.92, 118.07	135	268	unknown	16.8	090	.030	-
							Up	.015	-
							360	.034	-
	4th floor				unknown	16.8	090	.041	-
							Up	.020	-
							360	.048	-
	8th floor(roof)				unknown	16.9	090	.063	-
							Up	.024	-
							360	.079	-
	North freefield				unknown	16.8	090	.041	-
							Up	.024	-
							360	.048	-
	South freefield				unknown	16.6	090	.033	-
							Up	.017	-
							360	.043	-
5239	Norwalk, 12440 Imperial Highway: Basement	33.92, 118.07	135	268	unknown	16.8	090	.028	-
							Up	.027	-
							360	.041	-
	North freefield				unknown	16.8	090	.033	-
							Up	.016	-
							360	.033	-
	South freefield				unknown	16.8	090	.027	-
							Up	.016	-
							360	.041	-

Table 1.--Main-shock accelerograph data for USGS stations in the greater Palm Springs region--Continued

Station identification				Epicentral distance (km)	Azimuth (degrees)	Trigger time (G.m.t.)	S-t interval (s)	Acceleration		
Number	Name	Coordinates (lat.°N.,	long.°W.)					Direction (degrees)	Maximum (g)	Duration (s)
5239	Norwalk, 12440 Imperial Highway Bechtel Bldg. 43	33.92,	118.07	135	268	189/09:21:08.15	16.8	1) 090 (7th)	.057	-
								2) 090 (5th)	.049	-
								3) 090 (2nd)	.050	-
								4) 090 (1st)	.041	-
	Note:							5) 360(Bsmt)	.031	-
	Basement level (Bsmt)							6) 360 (5th)	.045	-
	First floor level (1st)							7) 090(Bsmt)	.010	-
	Second floor level (2nd)							8) Up (Bsmt)	.027	-
	Fifth floor level (5th)							9) 360(Bsmt)	.041	-
	Seventh floor level (7th)							10) 090 (DH)	.011	-
	30 ft. downhole level (DH)							11) Up (DH)	.021	-
								12) 360 (DH)	.026	-
5129	Los Angeles Bulk Mail Facility	33.99,	118.16	143	271	unknown	16.5	010	.033	-
								Up	.011	-
								280	.027	-
655	Jensen Filter Plant: Admin. Building basement	34.31,	118.50	175	275	unknown	18.5	025	.011	-
								Up	.006	-
								295	.012	-
	Generator room basement					unknown	18.8	025	.016	-
								Up	.005	-
								295	.011	-
	Reservoir roof					unknown	18.0	025	.011	-
								Up	.006	-
								295	.017	-
710	Palos Verdes Reservoir	33.77,	118.32	180	300	unknown	-	165	.021	-
								Up	.016	-
								075	.021	-

Table 2.--Aftershock accelerograph data for USGS stations in the greater Palm Springs region

[Trigger time includes day (beginning with July 8, day number 189)/hour:minute:second; time in parentheses indicates P-wave arrival time. S-t interval is time between instrument triggering and arrival of S-wave motion; interval in parentheses indicates time between arrivals of P- and S-wave motion; dash indicates interval is indeterminable. Direction of acceleration is for upward trace deflection on accelerogram; vertical-component directions are listed as "up" or "down". Duration of acceleration is time between first and last peaks of acceleration greater than 0.10 g.]

Trigger time (G.m.t.)	S-t interval (s)	Acceleration		
		Direction (degrees)	Maximum (g)	Duration (s)
Whitewater Trout Farm				
(Unknown, 52.35 s. after main-shock trigger.)	(1.8)	270	.043	---
		Up	.027	---
		180	.028	---
Unknown	1.8	270	.054	---
		Up	.054	---
		180	.050	---
(Unknown)	(0.2)	270	.005	---
		Up	.011	---
		180	.006	---
Unknown	1.6	270	.032	---
		Up	.038	---
		180	.072	---
(Unknown)	(1.8)	270	.005	---
		Up	.005	---
		180	.006	---
Unknown	1.35	270	.016	---
		Up	.022	---
		180	.039	---
(Unknown)	(1.7)	270	.016	---
		Up	.016	---
		180	.011	---
Unknown	0.35	270	.032	---
		Up	.038	---
		180	.044	---
Unknown	-	270	.032	---
		Up	.016	---
		180	.028	---
Unknown	-	270	.016	---
		Up	.016	---
		180	.017	---
Unknown	-	270	.038	---
		Up	.027	---
		180	.028	---
Unknown	1.3	270	.081	---
		Up	.065	---
		180	.099	1 peak
Unknown	1.55	270	.038	---
		Up	.027	---
		180	.039	---
Unknown	0.8	270	.038	---
		Up	.032	---
		180	.028	---
Unknown	1.65	270	.022	---
		Up	.022	---
		180	.033	---
Unknown	-	270	.027	---
		Up	.016	---
		180	.028	---
Unknown	1.5	270	.043	---
		Up	.038	---
		180	.044	---
Unknown	-	270	.032	---
		Up	.027	---
		180	.066	---
Unknown	0.55	270	.027	---
		Up	.032	---
		180	.072	---
Unknown	0.65	270	.081	---
		Up	.032	---
		180	.083	---
192/08:51:33.05	-	270	.011	---
		Up	.011	---
		180	.011	---
Unknown	0.9	270	.043	---
		Up	.027	---
		180	.033	---
Unknown	1.7	270	.022	---
		Up	.022	---
		180	.017	---
Unknown	0.3	270	.011	---
		Up	.011	---
		180	.017	---
Unknown	0.4	270	.011	---
		Up	.011	---
		180	.017	---
198/20:35:16.33	1.2	270	.135	1 peak
		Up	.081	---
		180	.105	0.05
198/21:54:46.55	1.1	270	.162	0.55
		Up	.081	---
		180	.160	0.35
210/06:43:53.7	-	270	.016	---
		Up	.016	---
		180	.028	---
212/07:51:47.15	-	270	.011	---
		Up	.011	---
		180	.011	---

Table 2.--Aftershock accelerograph data for USGS stations in the greater Palm Springs region--Continued

Trigger time (G.m.t.)	S-t interval (s)	Acceleration		
		Direction (degrees)	Maximum (g)	Duration (s)
Whitewater Trout Farm--Continued				
214/05:05:05.3	-	270	.011	---
		Up	.022	---
		180	.017	---
218/11:16:32.7	-	270	.011	---
		Up	.011	---
		180	.011	---
241/07:46:57.9	-	270	.016	---
		Up	.011	---
		180	.011	---
Unknown (bet. 8/29 & 10/23/86)	0.6	270	.038	---
		Up	.027	---
		180	.033	---
Morongo Valley				
(189/09:21:39.55)	(2.2)	135	.016	---
		Up	.016	---
		045	.022	---
(189/09:22:06.15)	(2.2)	135	.005	---
		Up	.011	---
		045	.017	---
189/09:24:15.15	2.15	135	.033	---
		Up	.075	---
		045	.050	---
(189/09:25:09.0)	(2.1)	135	.005	---
		Up	.005	---
		045	.006	---
189/10:09:05.40	1.30	135	.043	---
		Up	.037	---
		045	.039	---
189/10:11:02.8	1.9	135	.011	---
		Up	.021	---
		045	.017	---
189/10:22:41.73	1.90	135	.022	---
		Up	.037	---
		045	.028	---
(189/10:22:59.0)	(1.6)	135	.003	---
		Up	.005	---
		045	.003	---
(189/10:23:02.8)	(2.1)	135	.003	---
		Up	.005	---
		045	.003	---
189/19:36:22.37	2.15	135	.022	---
		Up	.032	---
		045	.022	---
Morongo Valley--Continued				
190/00:12:34.35	1.8	135	.022	---
		Up	.048	---
		045	.022	---
193/05:45:30.9	0.9	135	.011	---
		Up	.016	---
		045	.017	---
193/17:28:33.18	2.0	135	.011	---
		Up	.011	---
		045	.011	---
198/20:35:17.30	1.5	135	.038	---
		Up	.037	---
		045	.073	---
198/21:54:47.4	1.7	135	.022	---
		Up	.027	---
		045	.039	---
288/02:28:50.15	2.0	135	.027	---
		Up	.075	---
		045	.028	---
North Palm Springs Post Office				
(189/09:21:40.7)	(3.1)	300	.016	---
		Up	.011	---
		210	.022	---
189/09:24:16.45	2.8	300	.054	---
		Up	.028	---
		210	.056	---
(189/09:25:27.9	(1.8)	300	.011	---
		Up	.006	---
		210	.006	---
189/09:28:16.95	2.1	300	.038	---
		Up	.033	---
		210	.017	---
(189/09:28:46.3)	(3.1)	300	.005	---
		Up	.006	---
		210	.006	---
(189/09:28:55.4)	(2.6)	300	.005	---
		Up	.006	---
		210	.006	---
189/09:32:22.95	1.75	300	.005	---
		Up	.006	---
		210	.006	---
(189/09:32:53.4)	(2.4)	300	.011	---
		Up	.006	---
		210	.006	---

Table 2.--Aftershock accelerograph data for USGS stations in the greater Palm Springs region--Continued

Trigger time (G.m.t.)	S-t interval (s)	Acceleration Direction (degrees)	Maximum (g)	Duration (s)
North Palm Springs Post Office--Continued				
189/09:49:52.35	2.1	300	.027	---
		Up	.022	---
		210	.028	---
(189/09:50:57.0)	(2.5)	300	.005	---
		Up	.006	---
		210	.006	---
189/10:04:55.00	1.4	300	.016	---
		Up	.011	---
		210	.011	---
189/10:09:05.13	1.7	300	.168	0.1
		Up	.061	---
		210	.140	0.3
189/10:11:06.33	0.3	300	.027	---
		Up	.017	---
		210	.056	---
189/10:22:42.95	2.4	300	.027	---
		Up	.022	---
		210	.039	---
189/13:11:44.9	-	300	.005	---
		Up	.006	---
		210	.006	---
189/16:39:46.99	2.20	300	.065	---
		Up	.011	---
		210	.028	---
189/19:36:23.32	2.55	300	.022	---
		Up	.017	---
		210	.028	---
190/00:12:34.44	1.80	300	.108	1 peak
		Up	.056	---
		210	.101	1 peak
190/09:41:23.21	1.80	300	.027	---
		Up	.011	---
		210	.022	---
194/01:41:40.98	2.1	300	.032	---
		Up	.017	---
		210	.028	---
198/20:35:17.81	2.2	300	.043	---
		Up	.033	---
		210	.078	---
198/21:54:48.08	2.2	300	.032	---
		Up	.028	---
		210	.045	---
210/06:43:52.54	1.5	300	.054	---
		Up	.022	---
		210	.050	---
North Palm Springs Post Office--Continued				
241/07:46:56.45	1.7	300	.135	0.1
		Up	.044	---
		210	.112	1 peak
252/16:22:52.7	1.5	300	.054	---
		Up	.022	---
		210	.050	---
288/02:28:49.75	1.5	300	.151	0.3
		Up	.089	---
		210	.073	---
Cabazon				
(189/09:21:40)	(-)	270	.006	---
		Up	.005	---
		180	.005	---
189/09:30:27.66	0.2	270	.023	---
		Up	.022	---
		180	.027	---
(189/09:30:47.6)	(0.4)	270	.006	---
		Up	.011	---
		180	.011	---
189/10:09:09.28	0.25	270	.011	---
		Up	.016	---
		180	.011	---
198/21:54:50.3	0.2	270	.017	---
		Up	.016	---
		180	.027	---
Fun Valley				
(189/09:21:42)	(-)	135	.003	---
		Up	.003	---
		045	.003	---
189/09:30:29.4	-	135	.039	---
		Up	.023	---
		045	.050	---
Unknown	2.6	135	.028	---
		Up	.017	---
		045	.033	---
Keenwild				
198/20:35:20.55	4.0	180	.024	---
		Up	.029	---
		090	.021	---

Table 2.--Aftershock accelerograph data for USGS stations in the greater Palm Springs region--Continued

Trigger time (G.m.t.)	S-t interval (s)	Acceleration Direction (degrees)	Maximum (g)	Duration (s)
Cranston Forest Station				
(189/09:21:43.4)	(-)	315	.006	---
		Up	.005	---
		225	.006	---
(189/09:22:10.25)	(-)	315	.003	---
		Up	.005	---
		225	.003	---
Hurkey Creek Park				
(189/09:21:43.7)	(0.15)	135	.003	---
		Up	.006	---
		045	.003	---
(189/09:22:10.5)	(0.4)	135	.003	---
		Up	.003	---
		045	.003	---
Pinyon Flat Observatory				
(189/09:21:51.85)	(0.0)	135	.011	---
		Up	.011	---
		045	.011	---
Indio				
(189/09:21:46)	(-)	315	.003	---
		Up	.003	---
		225	.003	---
Sunnymead				
(189/09:21:45)	(-)	315	.003	---
		Up	.003	---
		225	.003	---
(189/09:22:14.8)	(-)	315	.003	---
		Up	.003	---
		225	.003	---
Tule Canyon				
Unknown	-	360	.038	---
		Up	.022	---
		270	.040	---
Colton Interchange (Bridge Cell)				
(Unknown, about 50 s. after main-shock trigger)	(2.5)	082	.010	---
		Up	.011	---
		352	.011	---
Colton Interchange (Vault)				
(Unknown, about 50 s. after main-shock trigger)	(-)	082	.003	---
		Up	.006	---
		352	.003	---
Chihuahua Valley				
Unknown	-	270	.028	---
		Up	.022	---
		180	.033	---
Rancho de Anza				
Unknown	-	135	.038	---
		Up	.016	---
		045	.034	---
Diemer Filter Plant (Basement)				
Unknown	-	281	.011	---
		Up	.010	---
		191	.011	---
Diemer Filter Plant (Reservoir Roof)				
Unknown	-	281	.016	---
		Up	.011	---
		191	.017	---
Carbon Canyon Dam (Crest)				
Unknown	-	130	.015	---
		Up	.010	---
		040	.026	---
Brea Dam (crest)				
Unknown	11.5	130	.026	---
		Up	.027	---
		040	.022	---

Table 2.--Aftershock accelerograph data for USGS stations in the greater Palm Springs region--Continued

Trigger time (G.m.t.)	S-t interval (s)	Acceleration		
		Direction (degrees)	Maximum (g)	Duration (s)
Jensen Filter Plant (Admin. Bldg. Basement)				
Unknown	-	025	.006	---
		Up	.003	---
		295	.006	---
Jensen Filter Plant (Generator Room Basement)				
Unknown	-	025	.005	---
		Up	.003	---
		295	.006	---
Desert Hot Springs, Mission Lakes*				
190/00:12:34.2	1.55	360	.085	---
		Up	.049	---
		270	.075	---
190/09:41:23	1.55	360	.037	---
		Up	.025	---
		270	.023	---
190/20:10:36.9	1.55	360	.016	---
		Up	.010	---
		270	.017	---
194/01:41:41	2.2	360	.016	---
		Up	.020	---
		270	.017	---
198/20:35:18	1.9	360	.048	---
		Up	.044	---
		270	.133	0.2
198/21:54:48	1.8	360	.063	---
		Up	.020	---
		270	.069	---
199/19:58:04	1.5	360	.011	---
		Up	.010	---
		270	.012	---
210/06:43:52.25	1.6	360	.026	---
		Up	.025	---
		270	.035	---
212/07:51:44.8	1.6	360	.021	---
		Up	.015	---
		270	.017	---
Desert Hot Springs, Mission Lakes--Continued				
241/07:46:56.6	1.5	360	.132	1 peak
		Up	.089	---
		270	.116	0.1
252/16:22:52.65	1.5	360	.026	---
		Up	.044	---
		270	.029	---
271/07:06:31.7	-	360	.021	---
		Up	.010	---
		270	.012	---
288/02:28:50.0	1.5	360	.106	0.15
		Up	.049	---
		270	.087	---
West Palm Springs Village*				
198/20:35:16.6	1.3	360	.076	---
		Up	.041	---
		270	.047	---
198/21:54:46.9	1.25	360	.081	---
		Up	.041	---
		270	.068	---
Millard Canyon*				
198/21:54:50.6	-	360	.019	---
		Up	.011	---
		270	.017	---
Unknown	-	360	.006	---
		Up	.003	---
		270	.006	---
Canyon House, Morongo Valley*				
198/20:35:17.27	-	360	.079	---
		Up	.072	---
		270	.082	---

*Temporary aftershock station.