6

Quarterly Technical Report 76 - D

for

Hanford Seismic Network

October 1, 1976 through December 31, 1976

Geophysics Program

University of Washington

February 1, 1977

PREPARED FOR THE U.S. ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION UNDER CONTRACT NO. E(45-1)-2225, TASK NO. 39.

OPERATIONAL STATUS

During this quarter the horizontal seismometers at VTG and ODS were removed and reinstalled as verticals at two new stations south of Lake Chelan.

Some problems were encountered with one of the telephone lines from the Hanford region. The problem has been worked out with the telephone company and we feel no earthquakes larger than $M_L = 2$ were missed because of this problem.

PUBLICATIONS

There were no Geophysics Program publications during the fourth quarter of 1976 pertaining to Eastern Washington.

DATA

As can be seen in the accompanying epicenter map the seismicity pattern of the past year has continued. Most earthquake activity is concentrated to the north of the Hanford area between Wenatchee and Lake Chelan. Other than several very small events in the Wooded Island swarm area no earthquakes were located on or adjacent to the Hanford reservation.

Two unusual earthquakes did occur to the west-southwest of Hanford in the foothills of the Cascades. These two magnitude 3 1/4 earthquakes occurred on November 1st, in the Simcoe mountains.

OTHER ONGOING STUDIES

Lake Chelan - Two new stations have been installed in the Lake Chelan-Wenatchee area (ENT and WAT) during this quarter. Using these and the other

stations in the area higher precision locations of the earthquakes in this area are possible along with the possibility of determining focal mechanisms. Nine stations in the Northern part of the array are presently being recorded on tape to allow for better timing and to provide data for the regional attenuation and magnitude calibration study.

Velocity model - Using quarry blasts in the Northern area a revised velocity model is being constructed, The basic difference between this one and the one applicable to the Hanford area is the lack of the flood basalt layer (5.1 km/sec). Details of this new model and the resulting change in earthquake locations will be covered in more detail in the next quarterly report.

Cascade Seismicity - A systematic search of both Western and Eastern Washington data is being made to see if any minor activity in the Cascades between the two arrays can be found. There appear to be a few events with magnitudes generally less than 2 1/2 which are not routinely located by either array alone. By combining the data from both arrays we hope to be able to crudely locate the small Cascade earthquakes which do not appear in either catalogue now.

Wooded Island Swarm Study - Relocation of hypocenters for the 1975 Wooded Island micro-earthquake swarm has revealed some interesting details. This swarm was composed of several sub-swarms (minor groupings of events in time and space). Composite focal mechanisms for events occurring during each of the sub-swarms are basically oblique thrusts striking NW, but differ in their strike slip component.

We are examining the effect of layering of the basalts (anisotropy) on seismic wave velocities. Elastic parameters for competent basalt and

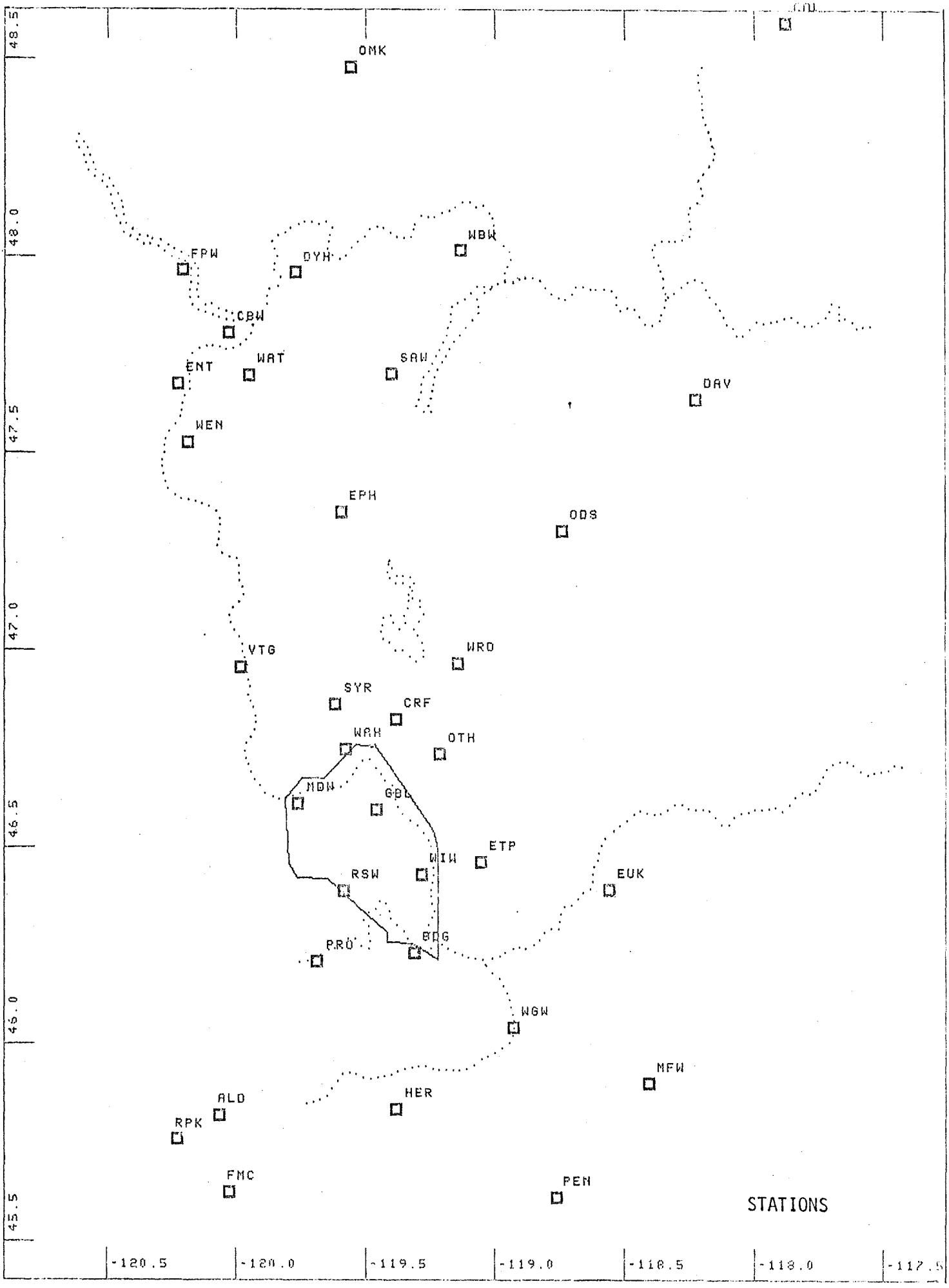
interflow material are obtained from a log from well DC-1 on the reservation. Using elastic wave theory we have shown that the velocity of compressional and shear waves is highly dependent on angle of incidence to the layering. This discovery is being applied to the relocation of hypocenters for the 1975 Wooded Island Swarm and is expected to yield better resolution. This effect of directional dependence of velocity should have little effect on regional network locations since most ray paths are nearly all horizontal.

Tiltmeter Telemetry - One telemetry set, i.e. transmitter and receiver, has been built and is near the end of environmental testing. The second telemetry set has been built and tested for functional working. However, it is waiting the delivery of an A to D converter. Enclosures for the telemetry transmitter are being built.

Magnitude Study - We are presently gathering data from the installed Wood-Anderson instruments installed at Entiat. We are encountering some drift problems which we hope to rectify in the near future.

CRUSTAL MODEL Table 1

Velocity in km./sec.	Depth in km.
3.7	0.0
4.7	0.8
5.1	1.5
6.1	7.5
6.8	15.0
8.0	28.0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DYH
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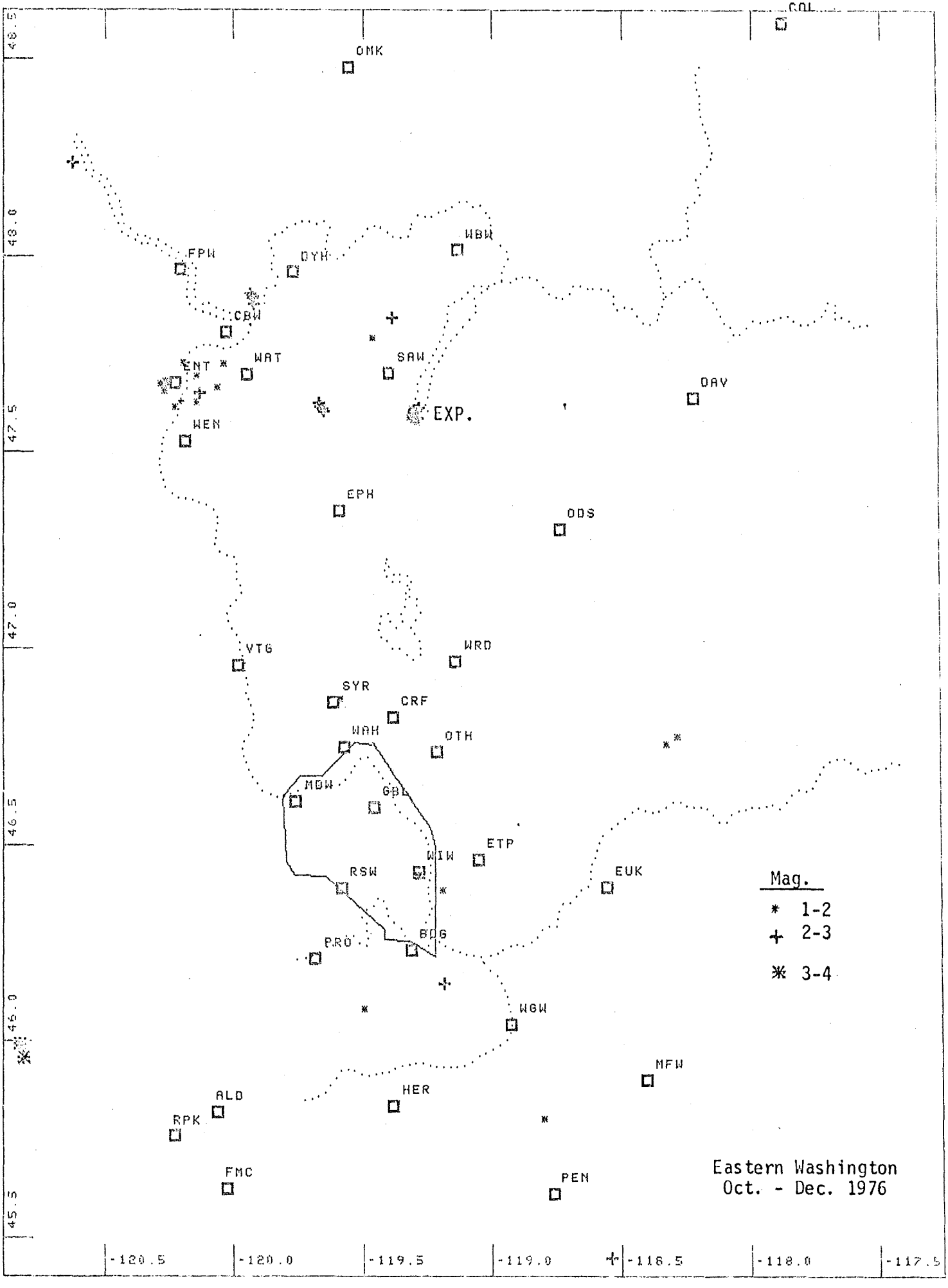
WAH
OTH
MDW
GBG
ETP
WIW
RSW
EUK
PRO
BDG
WGW
MFW
ALD
HER
RPK
FMC
PEN
STATIONS
48.5
48.0
47.5
47.0
46.5
46.0
45.5
-120.5
-120.0
-119.5
-119.0
-118.5
-118.0
-117.5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WIW
RSW
EUK
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BDG
WGW
MFW
ALD
HER
RPK
FMC
PEN
Mag.
* 1-2
+ 2-3
* 3-4
Eastern Washington
Oct. - Dec. 1976
48.5
48.0
47.5
47.0
46.5
46.0
45.5
-120.5
-120.0
-119.5
-119.0
-118.5
-118.0
-117.5

EASTERN WASHINGTON OCTOBER - DECEMBER 1976

DATE	ORIGIN	LAT	LONG	DEPTH	MAG	NO	DM	LAP	RMS	ERH	ERZ	Q	1976	
76295	1729	52.1	46- 9.82	114-32.19	5.95	1.19	7	135	12.9	.03	.3	.4	B1	7/13	
76284	241	13.1	46- 9.53	114-11.45	.14	2.42	10	104	13.8	.13	.4	1.9	B1	10/10	
76284	541	6.3	46- 9.4	120-57.25	5.19	4.04	10	325	93.7	.14	7.7	7.2	D1	10/10	
76294	2343	52.5	47-53.21	119-35.04	5.00		6	190	12.3	.15	4.3	2.9	D1	10/20	EXP
76298	350	38.5	46-23.87	119-13.78	.61	1.58	5	121	9.3	.11	1.4	11.6	D1	10/24	
76300	2348	27.7	47-35.59	119-17.45	5.97	2.17	7	162	14.5	.17	1.6	1.8	C1	10/26	EXP
76301	1210	21.0	46-48.77	119-47.21	1.60	1.81	8	141	22.4	.48	3.3	3.6	C1	10/27	
76301	2246	24.9	46-47.22	119-13.47	1.50	2.22	10	239	48.7	.24	2.6	3.1	D1	10/27	Possible EXP
76305	3 7	26.1	47-54.67	121-6.39	3.00	2.52	7	332	100.4	.58	9.7	9.3	D1	10/31	
76305	559	11.5	45-57.50	120-49.21	5.51	3.32	20	208	50.7	.71	4.4	4.4	D1	10/31	
76305	2137	34.5	45-59.70	120-49.62	.13	3.39	14	158	53.3	.21	1.3	2.4	C1	10/31	
76311	1756	51.1	47-42.15	120- 7.98	5.40	1.86	7	199	13.8	.22	4.2	1.6	D1	11/06	
76315	2042	24.1	46-45.90	119-19.81	5.00	2.92	9	233	45.1	.34	4.8	7.9	D1	11/10	Possible EXP
76315	2243	39.7	47-54.23	119-55.40	7.00	2.37	5	171	12.8	.15	1.1	.8	C1	11/10	Exp
76318	1238	31.4	47-39.44	120-15.64	5.00	1.82	9	240	16.0	.16	1.7	.9	C1	11/13	
76321	2233	11.4	47-35.31	119-17.50	3.98	2.45	8	119	15.0	.19	1.3	2.1	C1	11/16	EXP
76327	2156	56.4	46- 5.56	119-29.23	.21	2.05	7	177	20.3	.13	.6	.8	B1	11/22	
76328	2047	53.5	47-35.32	119-15.70	3.00	1.39	6	154	15.7	.26	6.2	5.1	D1	11/23	EXP
76328	1928	37.2	47-35.54	119-17.47	5.42	2.12	8	164	14.2	.17	2.0	1.9	C1	11/24	EXP
76329	23 6	8.3	45-26.95	120-32.40	1.35	2.43	6	302	25.1	.21	5.6	5.6	D1	11/24	Possible EXP
76334	642	35.9	47-37.42	120-13.10	5.50	1.52	6	182	6.2	.12	2.6	2.0	D1	11/29	
76335	1135	32.5	47-38.15	120- 8.04	7.35	1.22	7	138	8.6	.15	2.2	2.6	C1	11/30	
76335	2139	42.9	47-38.24	119-18.62	5.70	2.33	5	122	13.2	.09	.7	.7	B1	11/30	EXP
76336	7 1	7.5	47-38.31	120-11.73	3.39	1.47	7	150	5.2	.18	1.5	6.2	C1	12/01	
76336	1457	7.0	47-43.47	120- 1.61	7.40	2.16	8	125	6.8	.25	1.4	.9	B1	12/03	
76336	2348	17.3	47-35.27	119-35.39	5.30	2.51	10	130	22.1	.18	.8	.9	C1	12/03	Exp
76339	3 8	42.7	47-45.01	119-27.27	5.70	2.14	8	189	11.7	.22	1.9	1.7	C1	12/04	
76341	2114	48.7	47-36.42	119-17.16	7.55	2.39	9	171	13.1	.09	.8	122.2	C1	12/06	EXP
76343	010	46.4	47-53.54	119-55.33	6.50	2.48	6	195	12.3	.18	3.4	2.0	D1	12/08	Exp
76344	050	10.4	47-37.56	119-10.53	7.20	2.41	7	127	22.3	.21	1.3	3.9	C1	12/09	Exp
76344	2354	12.5	47-36.24	119-13.07	7.00	2.50	8	113	13.2	.04	.3	.4	B1	12/09	EXP
76346	331	23.5	47-41.01	120-14.74	5.24	1.55	9	242	1.3	.20	1.5	1.6	C1	12/11	
76346	2145	4.7	47-36.70	119-35.10	5.31	2.40	11	87	21.9	.14	.6	.9	B1	12/11	Exp
76348	847	28.5	47-39.07	120- 8.35	7.20	3.12	13	97	7.5	.31	1.6	1.2	C1	12/13	
76348	1622	27.4	47-37.23	119-17.92	13.00	2.34	8	115	11.9	.17	1.2	.9	B1	12/13	EXP
76349	1741	2.1	47-40.44	120- 3.25	9.30	1.72	6	144	8.0	.17	1.4	4.0	C1	12/14	
76349	1654	42.3	46-20.63	119-16.44	2.32	1.29	5	181	1.1	.07	22.2	.3	D1	12/14	
76350	1646	24.2	47-53.85	119-55.78	6.70	2.55	9	197	12.7	.17	1.9	1.1	C1	12/15	EXP
76351	2146	46.1	47-36.21	119-15.15	7.00	2.72	10	72	13.2	.08	.4	.6	B1	12/16	EXP
76351	2313	33.0	47-37.10	119-30.02	5.10	2.44	11	109	22.0	.12	.6	.5	B1	12/16	Exp

EASTERN WASHINGTON OCTOBER - DECEMBER 1976

DATE	ORIGIN	LAT	LONG	DEPTH	MAG	NO	DM	LAP	RMS	ERH	ERZ	Q	1976	
76352	1025 10.5	47-41.40	120-15.20	5.40	2.23	7	287	2.2	.09	1.3	.5	C1	12/17	
76352	1925 11.3	45-52.71	119-34.85	1.50	1.79	11	65	3.3	.38	.9	1.3	B1	12/17	
76353	14 7 17.2	47-50.85	119-23.47	4.90	2.39	9	110	15.9	.10	.6	.8	B1	12/18	
76354	1550 53.5	47-44.22	120-11.18	7.40	2.04	7	205	7.2	.21	5.2	5.5	D1	12/19	
76355	2220 14.3	47-36.52	119-17.37	2.20	2.56	6	160	36.3	.02	.2	.4	B1	12/20	EXP
76356	2325 44.0	47-52.70	119-35.45	7.10	2.33	7	185	11.5	.15	2.1	1.0	C1	12/21	
76357	1 2 24.9	45-25.-2	119-16.31	1.40	1.98	7	183	1.0	.15	1.0	.9	C1	12/22	
76357	14 3 51.0	46-14.41	120-37.--	2.53	2.39	18	160	65.7	.35	1.6	3.5	D1	12/22	
76357	20 0 57.2	47-36.54	119-18.03	7.30	2.42	9	114	12.8	.06	.4	.4	B1	12/22	EXP
76363	1933 28.7	47-36.46	119-17.73	7.03	2.19	8	114	13.9	.11	.6	.9	B1	12/28	EXP
76364	2112 17.9	47-36.95	119-18.08	6.20	2.11	8	113	13.7	.04	.3	.3	B1	12/29	EXP
76365	2239 59.3	47-36.18	119-18.12	7.00	2.49	7	113	13.2	.09	.7	.8	B1	12/30	EXP
76366	12 8 4.4	47-41.10	120-15.41	5.61	2.17	10	250	18.3	.10	.9	.5	C1	12/31	