A PRELIMINARY SEISMICITY STUDY OF THE SOUTHERN NEVADA REGION
FOR THE MONTH OF JULY 1972

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
EARTH SCIENCES LABORATORIES

SEPTEMBER 1972

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NEVADA OPERATIONS OFFICE
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FOR THE MONTH OF JULY 1972

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A PRELIMINARY SEISMICITY STUDY OF THE SOUTHERN NEVADA REGION FOR THE MONTH OF JULY 1972

Kenneth C. Bayer

A cooperative network of 21 seismic velocity sensitive stations is operated in the southern Nevada area; the stations are monitored by the NOAA/ESL Nevada Special Projects Party located in Las Vegas, Nevada.

There was no significant earthquake pattern that developed during the month of July 1972. Two seismicity maps are included; one of the southern Nevada region and the second of the seismicity on the Nevada Test Site (NTS).

This is the initial monthly seismic bulletin in which the entire data analysis (including the computer programming) has been accomplished in Las Vegas by the Nevada Special Projects Party. The output is listed in the Hypocenter Summary. The listing is the result of data scaled only from the local network and solutions determined by a local epicenter program. A total of 47 epicenters is listed.

1. INTRODUCTION

This report contains a summary of earthquakes recorded by a network of 19 seismograph stations in the southern Nevada region, and 2 stations in central Nevada, for the month of July 1972. It is the initial monthly seismicity report embracing southern Nevada and the border zones of Arizona, California, and Utah.

The southern Nevada seismic network station locations are shown in figure 1. All stations are located in Nevada with the exception of Leeds (LEE) in Utah, and Darwin (DAC) in California. This net is operated by the three cooperating agencies listed in table I. The data from all of the stations are recorded on 16 mm film and magnetic tape by the Nevada Special Projects Party (NSPP) of the National Oceanic and Atmospheric Administration/Earth Sciences Laboratories (NOAA/ESL), Las Vegas, Nevada. The Hypocenter Summary (appendix A) utilizes only data from the Nevada network to compute earthquake locations.

TABLE I

SEISMIC STATION CONSTANTS

Code	* Station Name	Latitude (North)	Longitude (West)	Elev. (Meters)	Inst. Comp.	Approx. Magnification @ 1 Hz
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NOAA/ESL/NEVADA SEISMOGRAPH STATIONS

BTY	Beatty	36°53.63'	116°45.88'	1008	SPZ	100K
CPX	CP-1 (Control Point #1)	36°55.92'	116°03.33'	1285	SPZ	110K
ETS	Engine Test Stand	36°49.95'	116°18.50'	1158	SPZ	0.1K
LSM	Little Skull Mountain	36°44.32'	116°16.68'	1146	SPZ	220K
LVW	Las Vegas (West)	36°10.20'	115°11.25'	654	SPZ	3.3K
MCV	Mercury	36°38.01'	115°59.99'	1158	SPZ	100K
PRN	Pahroc Range	37°26.50'	115°04.00'	1524	SPZ	105K
SMN	Sleeping Mountain	37°08.60'	116°46.00'	1246	SPZ	100K
TSV	Twin Springs	38°12.10'	116°10.50'	1585	SPZ	105K

SANDIA LABORATORIES STATIONS

BMN	Battle Mountain	40°25.90'	117°13.30'	1524	SPZ	Variable
DAC	Darwin, California	36°16.62'	117°35.62'	1432	SPZ	
ELY	Ely	39°07.88'	114°53.52'	2012	SPZ	
LEE	Leeds, Utah	37°14.58'	113°22.60'	1067	SPZ	
NEL	Nelson	35°42.74'	114°50.61'	1052	SPZ	
TPH	Tonopah	38°04.29'	117°13.21'	1890	SPZ	

U. S. GEOLOGICAL SURVEY, YUCCA FLATS NEVADA STATIONS

NYC	Charley	37°09.30'	116°09.32'	1574	SPZ	1000K (20X Viewer)
NYJ	Joshua Tree	37°00.48'	115°58.48'	1195	SPZ	
NYM	Climax Mine	37°13.88'	116°03.14'	1489	SPZ	
NYR	Receiver Site	37°03.32'	116°05.50'	1188	SPZ	
NYS	Syncline Ridge	37°01.95'	116°10.13'	1402	SPZ	
NYV	Vern	37°06.77'	115°59.40'	1340	SPZ	

* Location in Nevada, unless otherwise specified.

2. DISCUSSION

The principal objective of this monthly report is to distribute preliminary seismic data acquired from the Southern Nevada Network of Seismograph Stations. A more comprehensive bi-annual seismicity report similar to (Bayer, 1972), is planned for publication at a later time.

Recorded arrival times and amplitudes are scaled in Las Vegas. Periodically, the properly formatted data are keypunched at the Las Vegas office and run through a local earthquake program described by (Bolt, et al . 1964), using a three-layer model. In order to obtain a hypocenter solution with the local station program, P-phase arrival times from at least three stations and one S-phase arrival time for a given earthquake must be present. This compilation is preliminary and may be subject to later revision on the basis of current research.

The individual station readings, from which the hypocenter summary has been derived, are available upon request from the ESL Nevada Special Projects Party, 3060 South Highland Drive, Las Vegas, Nevada 89109. The phase times are also sent to the National Earthquake Information Center (NEIC), Boulder, Colorado, on punch cards in the NEIC format. The area monitored by the NSPP (for hypocenter locations), is from 35 to 39 degrees north and 113 to 119 degrees west. Seismic body wave phases from earthquakes which fall in the regional and teleseismic range are also scaled and mailed to the NEIC.

In the Hypocenter Summary a D following the depth indicates it is a fixed depth solution obtained by choosing the 5 kilometer depth interval that optimized the travel time residuals and standard error. An F following the depth indicates the computer found a convergent solution in seven or less iterations by permitting the depth to move freely.

A crustal model research project is underway in an attempt to obtain an idealized velocity/depth model for the southern Nevada seismic region. Future seismicity reports will reflect the outcome of this study.

The Atomic Energy Commission's (AEC) announced Nevada Test Site (NTS) event is given in appendix B and plotted on figure 3.

3. GENERAL SEISMICITY

There was no significant earthquake pattern development in the southern Nevada region during the month of July 1972. A total of 47 earthquakes were located by the Nevada Special Projects Party. All earthquakes plotted on the seismicity map (fig. 2) occurred in the earth's crust (< 38 km.). Magnitudes were in the microearthquake range, ($1.0 \leq M \leq 3.0$).

Four earthquakes occurred in the Kawich Range approximately 25 km. southwest of the Twin Springs (TSV) seismic station.

A second active area was the Pahroc Range northeast of Alamo. Three earthquakes occurred in the south Pahroc Range within a few kilometers of station PRN. Numerous ultra-microearthquakes ($M < 1.0$), are recorded by station PRN intermittently each month.

Three earthquakes were located on the west flank of the Desert Game Range about 80 km. northwest of the city of Las Vegas.

Four earthquakes were located in the Bull Valley Mountain area in the southwest corner of Utah (~ 30 km. northwest of St. George).

The remainder of the monthly activity was scattered throughout the region. Most of the earthquakes in the California sector were located in the Owens Valley (near Bishop), and the Indian Wells Valley (southwest of Darwin).

There were 6 microearthquakes recorded on the Nevada Test Site during July (fig. 3). There is no apparent correlation of these data to the fault pattern shown on the map; nor was there any correlation on the NTS of man-made seismic events to earthquakes.

4. ACKNOWLEDGMENTS

The entire staff of the Nevada Special Projects Party participated in the operation and coordination of the NOAA/ESL seismograph network. Without the cooperation of the Sandia Laboratories and the U. S. Geological Survey a large portion of the data that went into this report would not be available. The author expresses grateful acknowledgment to Kenneth W. King, Chief of Party, for administrative support, to Stanley R. Brockman for the computer processing, and to Bruce R. Bradley for data plotting and map compilation.

The operation of all the seismograph stations and the interpretations of the data from these stations are made possible through the financial support of the Nevada operations Office of the United States Atomic Energy Commission (NVO/AEC), under Contract (AT(29-2)-746.

5. REFERENCES

Bayer, K. C. (1972), Seismicity of the Southern Nevada Region, December 22, 1971 to July 1, 1972, NVO-746-3, July.

Bolt, B. A., and T. Turcotte (1964), Computer Location of Local Earthquakes Within the Berkeley Seismographic Network, Computers in the Mineral Industries, Stanford University, 561.

APPENDIX A
HYPOCENTER SUMMARY

APPENDIX A
HYPOCENTER SUMMARY

July 1972	Origin Time GMT	Latitude North	Longitude West	Depth* (km)	Geographic Region
01	13 34 53.30	38.02 °	116.21 °	0.0 D	Warm Springs
01	23 45 35.84	37.12	113.54	15.0 D	St. George
02	10 52 24.72	37.97	116.24	18.2 F	Quartzite Mtn.
02	13 29 43.96	37.54	118.92	0.0 D	Glass Mtn.
02	14 34 21.17	37.27	113.84	11.6 F	St. George
02	20 07 01.19	37.34	113.83	0.0 D	St. George
04	03 51 42.30	38.21	117.72	25.0 D	Pilot Peak
04	05 12 16.28	37.98	116.23	0.0 F	Quartzite Mtn.
04	08 19 59.62	35.63	117.80	5.0 D	Little Lake
04	08 26 06.82	35.56	117.82	5.5 F	Little Lake
04	13 44 14.39	37.40	118.46	10.0 D	Blanco Mtn.
05	02 37 18.36	37.70	116.08	14.0 F	Quartzite Mtn.
05	04 38 51.11	37.15	116.29	0.0 F	Silent Canyon
06	09 39 12.79	36.36	117.52	5.0 D	Darwin
08	03 06 31.50	37.52	118.57	0.0 D	Glass Mtn.
08	07 30 12.84	36.82	115.34	14.5 F	Hayford Peak
08	08 08 47.33	36.79	115.37	10.0 D	Hayford Peak
08	09 50 41.79	36.79	115.37	15.0 D	Hayford Peak
08	18 41 09.44	37.35	118.35	0.0 D	Blanco Mtn.
08	19 59 48.91	36.37	116.73	0.0 F	Furnace Creek
08	20 04 47.45	37.23	114.80	15.0 F	Delamar Mts.
09	03 19 53.68	37.42	117.37	5.0 D	Mt. Jackson
09	06 45 16.47	37.46	117.47	5.0 D	Mt. Jackson
10	14 54 25.62	36.45	115.79	10.0 D	Charleston Peak
13	21 35 19.46	35.58	115.50	0.0 F	Clark Mt. /Goodsprings
16	02 52 29.90	35.93	114.99	0.0 F	Boulder City
18	15 49 27.75	37.37	113.70	15.0 D	St. George
18	15 52 58.09	37.24	113.82	0.0 D	St. George
19	08 05 26.72	37.18	117.46	18.8 F	Mt. Jackson
19	14 34 31.22	37.15	117.41	15.8 F	Mt. Jackson
19	17 01 34.23	36.77	116.28	0.0 F	Lathrop Wells
20	12 40 37.63	38.26	116.13	5.0 D	Warm Springs
23	07 40 52.07	35.79	117.69	10.4 F	Little Lake
23	14 14 54.79	37.31	117.46	5.0 D	Mt. Jackson

APPENDIX A
HYPOCENTER SUMMARY (cont'd)

July 1972	Origin Time GMT	Latitude North	Longitude West	Depth* (km)	Geographic Region
26	21 14 46.17	36.32°	114.90°	13.9 F	Hoover Dam
27	20 18 16.34	37.45	115.64	5.0 D	Groom Lake
28	01 37 45.57	37.24	116.13	5.0 D	Silent Canyon
28	23 22 06.75	37.25	116.22	5.0 D	Silent Canyon
29	04 45 03.76	35.95	117.35	0.0 D	Searles Lake
29	22 40 16.50	37.77	117.89	12.3 F	Silver Peak
29	23 54 09.35	37.10	116.19	0.0 F	Silent Canyon
30	06 40 07.62	37.46	114.99	0.0 F	Delamar Mts.
30	06 41 46.45	37.46	115.00	0.0 F	Alamo/Delamar Mts.
30	09 04 38.69	37.45	115.00	0.0 F	Alamo/Delamar Mts.
30	21 17 00.52	35.67	118.11	15.0 D	Lamont Peak
30	23 17 53.53	37.10	116.21	0.0 F	Silent Canyon
31	04 27 29.16	38.03	116.24	0.0 F	Warm Springs

* D = Fixed Depth Solution
F = Free Depth Solution

APPENDIX B
AEC ANNOUNCED EVENTS

APPENDIX B

ANNOUNCED AEC TEST

(JULY 1972)

<u>Event</u>	<u>Date</u> <u>(1972)</u>	<u>Type</u>	<u>Time</u> <u>(GMT)</u> h m s	<u>Latitude</u> <u>(North)</u>	<u>Longitude</u> <u>(West)</u>	<u>Elev.</u> <u>of Shot</u> <u>(meters)</u>	<u>Magnitude</u>
*Diamond Skulls	July 20	Nuclear	17 16 00.16436	37° 12' 52.3202"	116° 11' 00.1394"	1715.7	**M _L = 4.47

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* See Figure 3 for location

** M_L = NSPP, Wood Anderson, Magnitude

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