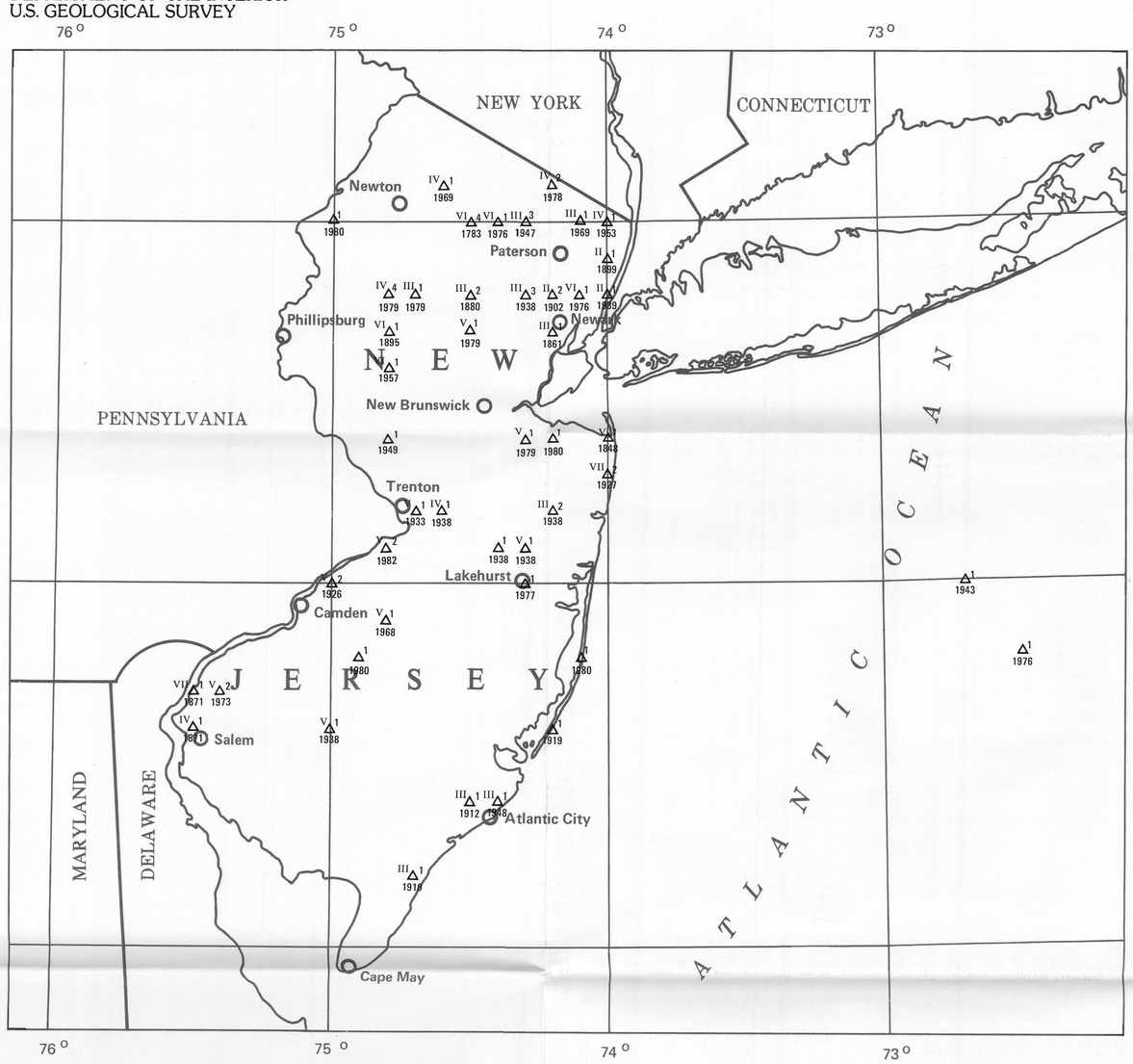

SCALE 1:1 000 000

25 0 25 50 MILES

25 0 25 50 KILOMETERS

INTRODUCTION

This map is one of a series of seismicity maps produced by the U. S. Geological Survey that show earthquake data of individual states or groups of states at the scale of 1:1,000,000. This map shows only those earthquakes with epicenters located within the boundaries of New Jersey, even though earthquakes in nearby states may have been felt or may have caused damage in New Jersey.

The data in table 1 were used to compile the seismicity map; these data are a corrected, expanded, and updated (through 1983) version of the data used by Algermissen (1969) for a study of seismic risk in the United States. The locations and intensities of some earthquakes were revised and intensities were assigned where none had been before. Many earthquakes were added to the original list from new data sources as well as from some old data sources that had not been previously used. The data in table 1 represent best estimates of the location of the epicenter, magnitude, and intensity of each earthquake on the basis of historical and current information. Some of the aftershocks from large earthquakes are listed, but not all, especially for earthquakes that occurred before seismic instruments were universally used.

The latitude and longitude coordinates of each epicenter were rounded to the nearest tenth of a degree and sorted so that all identical locations were grouped and counted. These locations are represented on the map by a triangle. The number of earthquakes at each location is shown on the map by the arabic number to the right of the triangle. A Roman numeral to the left of a triangle is the maximum Modified Mercalli intensity (Wood and Neumann, 1931) of all earthquakes at that geographic location. The absence of an intensity value indicates that no intensities have been assigned to earthquakes at that location. The year shown below each triangle is the latest year for which the maximum intensity was recorded.

EXPLANATION OF THE TABLES

The data in table 1 are listed chronologically in the following categories: date, origin time in Coordinated Universal Time (UTC), N. latitude, W. longitude, depth, hypocenter quality and reference, magnitude, intensity (Modified Mercalli), and intensity reference. The letter F is recorded in the intensity column if an earthquake was felt but not enough information was available to assign an intensity. Table 1 has some basic limitations in terms of the size (magnitude or intensity) of the earthquakes listed. All felt earthquakes or those with computed magnitudes greater than 2.5 are listed. If no magnitude was computed and the earthquake was felt or an epicenter published, it was included in the earthquake list. The low-magnitude events located in recent years with data from dense seismograph networks have not been included.

Listed below is an explanation of the symbols and codes used in table 1:

1. Leaders (..) indicate information not available.
2. Latitude and longitude are listed to a hundredth of a degree if they have been published with that degree of accuracy or greater; however, most historical events have assigned locations based on felt or damage information and are listed in table 1 only to the nearest degree or tenth of a degree. An asterisk (*) to the right of the longitude indicates that the latitude and longitude were not given in the source reference but were assigned by the compilers of the data file. An x to the right of the longitude indicates that the event is an explosion, a suspected explosion, a rockburst, or some other nontectonic event; these have not been plotted on the map. A question mark (?) to the right of the longitude indicates that published descriptions of the event are inconclusive and it may or may not be an earthquake.
3. The letter code in the HYPOCENTER, QUAL column is defined below:
   a. Determinations of instrumental hypocenters are estimated to be accurate within the ranges of latitude and longitude listed below; each range is letter coded as indicated:

A	0.0°-0.1°
B	0.1°-0.2°
C	0.2°-0.5°
D	0.5°-1.0°
E	1.0° or larger

   b. Determinations of noninstrumental epicenters from felt data are estimated to be accurate within the ranges of latitude and longitude listed below; each range is letter coded as indicated:

F	0.0°-0.5°
G	0.5°-1.0°
H	1.0°-2.0°
I	2.0° or larger

4. The reference identification numbers in the HYPOCENTER, REF and INTENSITY, REF columns indicate the sources of the hypocenter and intensity data. They are listed in numerical order in the list of data sources.
5. The magnitudes listed under USGS are mb (modified from Gutenberg and Richter, 1956) or Ms (Bath, 1966) values published in the Preliminary Determination of Epicenters (PDE) by the National Earthquake Information Center, U. S. Geological Survey and predecessor organizations. Associated with the magnitude values listed under OTHER are the source code and type. Type is defined by mb (Gutenberg and Richter, 1956), MD (duration or coda length), Mfa (magnitude based on felt areas or attenuation), ML (Richter, 1958), Mn (Nuttli, 1973), and Ms (Bath, 1966 or Gutenberg, 1945). Magnitudes computed solely from epicentral intensity have not been included. Moment magnitudes (Mw) are listed by value and source. The value was computed using the formula by Hanks and Kanamori (1979). The source codes are listed below:

DG - Dewey, J. W., and Gordon, D. W., 1984, U. S. Geological Survey, Miscellaneous Field Studies Map MF-1699 Phamphlet, 39 p.
OTT - Earth Physics Branch, Seismological Service of Canada, Ottawa.
PAL - Lamont-Doherty Geological Observatory, Palisades, N.Y.
SLM - St. Louis University, St. Louis, Mo.
ST - Street, R. L., and Turcotte, F. T., 1977, Seismological Society of America Bulletin, v. 67, no. 3, p.599-614.
XXX - Published magnitudes of unknown source.

6. An asterisk (*) in the INTENSITY, MM column indicates that the intensity was assigned by the compiler on the basis of the available data at the time the catalog was compiled.

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MODIFIED MERCALLI INTENSITY SCALE OF 1931
Adapted from Sieberg's Mercalli-Cancani scale,
modified and condensed (Wood and Neumann, 1931)

I. Not felt - or, except rarely under especially favorable circumstances. Under certain conditions, at and outside the boundary of the area in which a great shock is felt: sometimes birds, animals, reported uneasy or disturbed; sometimes dizziness or nausea experienced; sometimes trees, structures, liquids, bodies of water, may sway--doors may swing, very slowly.

II. Felt indoors by few, especially on upper floors, or by sensitive or nervous persons. Also, as in grade I, but often more noticeably: sometimes hanging objects may swing, especially when delicately suspended; sometimes trees, structures, liquids, bodies of water, may sway, doors may swing, very slowly; sometimes birds, animals, reported uneasy or disturbed; sometimes dizziness or nausea experienced.

III. Felt indoors by several, motion usually rapid vibration. Sometimes not recognized to be an earthquake at first. Duration estimated in some cases. Vibration like that due to passing of light, or lightly loaded trucks, or heavy trucks some distance away. Hanging objects may swing slightly. Movements may be appreciable on upper levels of tall structures. Rocked standing motor cars slightly.

IV. Felt indoors by many, outdoors by few. Awakened few, especially light sleepers. Frightened no one, unless apprehensive from previous experiences. Vibration like that due to passing of heavy or heavily loaded trucks. Sensation like heavy body striking building or falling of heavy objects inside. Rattling of dishes, windows, doors; glassware and crockery clink and clash. Creaking of walls, frame, especially in the upper range of this grade. Hanging objects swung, in numerous instances. Disturbed liquids in open vessels slightly. Rocked standing motor cars noticeably.

V. Felt indoors by practically all, outdoors by many or most: outdoors direction estimated. Awakened many, or most. Frightened few--slight excitement, a few ran outdoors. Buildings trembled throughout. Broke dishes, glassware to some extent. Cracked windows--in some cases, but not generally. Overturned vases, small or unstable objects, in many instances, with occasional fall. Hanging objects, doors, swing generally or considerably. Knocked pictures against walls, or swung them out of place. Opened, or closed, doors, shutters, abruptly. Pendulum clocks stopped, started, or ran fast or slow. Moved small objects, furnishings, the latter to slight extent. Spilled liquids in small amounts from well-filled open containers. Trees, bushes shaken slightly.

VI. Felt by all, indoors and outdoors. Frightened many, excitement general, some alarm, many ran outdoors. Awakened all. Persons made to move unsteadily. Trees, bushes, shaken slightly to moderately. Liquid set in strong motion. Small bells rang--church, chapel, school, etc. Damage slight in poorly built buildings. Fall of plaster in small amount. Cracked plaster somewhat, especially fine cracks, chimneys is some instances. Broke dishes, glassware, in considerable quantity, also some windows. Fall of knick-knacks, books, pictures. Overturned furniture in many instances. Moved furnishings of moderately heavy kind.

VII. Frightened all--general alarm, all ran outdoors. Some, or many, found it difficult to stand. Noticed by persons driving motor cars. Trees and bushes shaken moderately to strongly. Waves on ponds, lakes, and running water. Water turbid from mud stirred up. Incaving to some extent of sand or gravel stream banks. Rang large church bells, etc. Suspended objects made to quiver. Damage negligible in buildings of good design and construction, slight to moderate in well-built ordinary buildings, considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Cracked chimneys to considerable extent, walls to some extent. Fall of plaster in considerable to large amount, also some stucco. Broke numerous windows, furniture to some extent. Shook down loosened brickwork and tiles. Broke weak chimneys at the roof-line (sometimes damaging roofs). Fall of cornices from towers and high buildings. Dislodged bricks and stones. Overturned heavy furniture, with damage from breaking. Damage considerable to concrete irrigation ditches.

VIII. Fright general--alarm approaches panic. Distrubed persons driving motor cars. Trees shaken strongly--branches, trunks, broken off, especially palm trees. Ejected sand and mud in small amounts. Changes, temporary or permanent: in flow of springs and wells; dry wells renewed flow; in temperature of spring and well waters. Damage slight in structures (brick) built especially to withstand earthquakes. Considerable in ordinary substantial buildings, partial collapse: racked, tumbled down, wooden houses in some cases; threw out panel walls in frame structures, broke off decayed piling. Fall of walls. Cracked, broke, solid stone walls seriously. Wet ground to some extent, also ground on steep slopes. Twisting, fall, of chimneys, columns, monuments, also factory stacks, towers. Moved conspicuously, overturned, very heavy furniture.

IX. Panic general. Cracked ground conspicuously. Damage considerable in (masonry) structures built especially to withstand earthquakes: Threw out of plumb some wood-frame houses built especially to withstand earthquakes; great in substantial (masonry) buildings, some collapse in large part; or wholly shifted frame buildings off foundations, racked frames, serious to reservoirs; underground pipes sometime broken.

X. Cracked ground, especially when loose and wet, up to widths of several inches; fissures up to a yard in width ran parallel to canal and stream banks. Landslides considerable from river banks and steep coasts. Shifted sand and mud horizontally on beaches and flat land. Changed level of water in wells. Threw water on banks of canals, lakes, rivers, etc. Damage serious to dams, dikes, embankments. Severe to well-built wooden structures and bridges, some destroyed. Developed dangerous cracks in excellent brick walls. Destroyed most masonry and frame structures, also their foundations. Bent railroad rails slightly. Tore apart, or crushed endwise, pipe lines buried in earth. Open cracks and broad wavy folds in cement pavements and asphalt road surfaces.

XI. Disturbances in ground many and widespread, varying with ground material. Broad fissures, earth slumps, and land slips in soft, wet ground. Ejected water in large amounts charged with sand and mud. Caused sea-waves ("tidal" waves) of significant magnitude. Damage severe to wood-frame structures, especially near shock centers. Great to dams, dikes, embankments often for long distances. Few, if any (masonry) structures remained standing. Destroyed large well-built bridges by the wrecking of supporting piers, or pillars. Affected yielding wooden bridges less. Bent railroad rails greatly, and thrust them endwise. Put pipe lines buried in earth completely out of service.

XII. Damage total--practically all works of construction damaged greatly or destroyed. Disturbances in ground great and varied, numerous shearing cracks. Landslides, falls of rock of significant character, slumping of river banks, etc., numerous and extensive. Wrenched loose, tore off, large rock masses. Fault slips in firm rock, with notable horizontal and vertical offset displacements. Water channels, surface and underground, disturbed and modified greatly. Dammed lakes, produced waterfalls, deflected rivers, etc. Waves seen on ground surfaces (actually seen, probably, in some cases). Distorted lines of sight and level. Threw objects upward into the air.

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Table 1.--Chronological listing of earthquakes for the State of New Jersey

DATE YEAR	MONTH	DAY	ORIGIN TIME H	M	S (UTC)	LAT.		LONG.		DEPTH (KM)	HYPOCENTER QUAL	REF	MAGNITUDE USGS (mb)	(Ms)	OTHER		MOMENT (Mw)	INTENSITY MM	REF
1783	NOV	24	..	..	..	41.0	N.	74.5	W.	..	H	126	..	..	..	...	...	IV	126
1783	NOV	30	02	00	..	41.0	N.	74.5	W.	..	H	76	..	..	..	...	...	IV	126
1783	NOV	30	03	50	..	41.0	N.	74.5	W.	..	H	76	..	..	..	...	.....	VI	76
	Felt from New Hampshire to Pennsylvania. A foreshock at 02:00 and an aftershock at 07:00 on Nov. 30 were felt in New York and in Philadelphia, but not elsewhere.																		
1783	NOV	30	07	00	..	41.0	N.	74.5	W.	..	H	76	..	..	..	...	...	IV	126
1848	SEP	09	04	00	..	40.4	N.	74.0	W.	..	H	126	..	..	..	...	...	V	141
1861	MAR	05	17	00	..	40.7	N.	74.2	W.	..	H	126	..	..	..	...	...	III	76
1871	OCT	09	14	40	..	39.7	N.	75.5	W.	..	H	38	..	..	..	...	...	VII	38
	Wilmington, Delaware. Chimneys toppled and widows broke. Damage was also reported at New Castle and Oxford. Felt in New Jersey and Pennsylvania.																		
1871	OCT	10	05	08	..	39.6	N.	75.5	W.	..	H	205	..	..	..	...	...	IV*	205
1877	SEP	10	14	59	..	40.1	N.	74.8	W.	..	H	76	..	..	..	...	...	IV	76
1880	AUG	10	17	15	..	40.8	N.	74.5	W. *	..	H	136	..	..	..	...	...	III*	136
1880	SEP	01	10	10	..	40.8	N.	74.5	W. *	..	H	136	..	..	..	...	...	III*	136
1895	SEP	01	11	09	..	40.7	N.	74.8	W.	..	G	38	..	..	..	...	...	VI	38
	Centered in Hunterdon County, New Jersey, near High Bridge. Felt from Virginia to Maine-an area estimated at 35,000 sq mi. Articles fell and buildings rocked in several Hunterdon County towns. At Philadelphia, Pa., windows broke and crockery overturned. Felt at Camden, Burlington, and in all parts of the city of Newark, New Jersey. Felt area was elongated in the northeast-southwest direction.																		
1899	MAY	16	..	..	..	40.9	N.	74.0	W.	..	H	126	..	..	..	...	...	II	126
1902	MAY	27	..	..	..	40.8	N.	74.2	W.	..	H	126	..	..	..	...	...	II	126
1902	AUG	11	..	..	..	40.8	N.	74.2	W.	..	H	126	..	..	..	...	...	II	126
1910	APR	23	..	..	..	39.2	N.	74.7	W.	..	H	126	..	..	..	...	...	III	126
1912	NOV	06	18	40	..	39.4	N.	74.5	W. *	..	H	84	..	..	..	...	...	III	84
1919	AUG	05	05	..	..	39.6	N.	74.2	W.	..	H	84	..	..	..	...	...	F	84
1921	JAN	26	23	40	..	40.0	N.	75.0	W.	..	H	38	..	..	..	...	...	V	38
1926	JAN	26	23	40	..	40.0	N.	75.0	W.	..	H	76	..	..	..	...	...	V	76
1927	JUN	01	12	20	..	40.3	N.	74.0	W.	..	G	38	..	..	..	...	...	VII	38
	Asbury Park, New Jersey. Three shocks were felt along the New Jersey coast from Sandy Hook to Toms River. Highest intensities were observed from Asbury Park to Long Branch; several chimneys fell, plaster cracked, and articles were thrown from shelves. Felt area was estimated at 3,000 sq mi.																		
1933	JAN	25	02	..	..	40.2	N.	74.7	W.	..	H	38	..	..	..	...	...	V	38
1937	SEP	30	22	08	22	40.8	N.	74.3	W.	..	H	77	..	..	..	...	...	III	77
1938	MAY	16	19	25	..	40.8	N.	74.3	W.	..	H	77	..	..	..	...	...	II	126
1938	AUG	23	03	36	31.5	40.097	N.	74.336	W.	014	C	349	..	..	3.9Mn	ST	...	V	11
1938	AUG	23	05	04	53.4	40.051	N.	74.360	W.	021	C	349	..	..	4.0Mn	ST	...	...	..
1938	AUG	23	07	03	28.0	40.233	N.	74.565	W.	003	C	349	..	..	3.7Mn	ST	...	IV	126
1938	AUG	23	11	11	08	40.2	N.	74.2	W.	..	G	77	..	..	..	...	...	III	77
1938	AUG	27	22	36	25	40.2	N.	74.2	W.	..	G	77	..	..	..	...	...	III	77
1938	DEC	06	19	38	..	40.8	N.	74.3	W.	..	H	77	..	..	..	...	...	III	77
1939	SEP	13	01	22	04	40.8	N.	74.0	W.	..	G	77	..	..	..	...	...	II	77
1939	NOV	15	02	53	48.7	39.580	N.	75.046	W.	003	C	349	..	..	4.0Mfa	DG	...	V	12
1943	JUL	24	05	18	36	40.0	N.	72.7	W.	..	D	77	..	..	2.5ML	OTT	...	...	..
1947	APR	01	13	25	54	41.0	N.	74.3	W.	..	C	77	..	..	..	...	...	III	141
1948	AUG	03	19	04	40.0	39.4	N.	74.4	W. *	..	H	21	..	..	..	...	...	III	126
1949	OCT	16	23	33	44.8	40.4	N.	74.8	W.	..	C	74	..	..	..	...	...	...	..
1953	AUG	17	04	22	50.0	41.0	N.	74.0	W.	..	G	77	..	..	..	...	...	IV	26
1954	MAR	31	21	25	..	40.3	N.	74.0	W.	..	G	77	..	..	..	...	...	IV	27
1957	MAR	23	19	02	31	40.6	N.	74.8	W.	010	D	77	..	..	4.8ML	OTT	...	VI	30
	West-central New Jersey. Slight damage in the Lebanon-Hamden-Long Valley areas, consisting of cracked chimneys, broken windows and dishes, cracked walls and plaster, and a broken well curb (Ref. 38).																		
1962	OCT	13	..	..	..	41.0	N.	74.3	W.	..	G	126	..	..	..	...	...	II	126
1968	DEC	10	09	12	48.0	39.924	N.	74.820	W.	023	B	349	..	..	3.0Mn	DG	...	V	41
1969	APR	25	00	14	45.0	41.02	N.	74.11	W.	025	A	317	..	..	..	...	...	III*	42
1969	OCT	06	..	..	..	41.1	N.	74.6	W.	..	G	126	..	..	..	...	...	IV	126
1973	FEB	28	08	21	33.2	39.686	N.	75.435	W.	012	B	349	..	..	3.8Mn	SLM	...	V	46
1973	JUL	10	04	38	02	39.7	N.	75.4	W.	..	F	126	..	..	..	...	...	IV	46
1976	MAR	11	21	07	20.4	40.96	N.	74.37	W.	004	C	49	..	..	2.4Mn	PAL	...	VI	49
	Northeastern New Jersey. Felt in Morris and Passaic Counties and in a few towns in Bergen County in northern New Jersey. Slight damage occurred at Pompton Lakes (ceiling cracks, pictures dislodged, slight fall of plaster), Kinnelon (cracked plaster and windows), and Ridgefield (ceiling cracked).																		
1976	APR	13	15	39	13.6	40.84	N.	74.05	W.	001	A	317	..	..	3.1Mn	PAL	...	VI	49
	Northeastern New Jersey. Plaster fell at Ridgefield, New Jersey.																		
1976	JUN	26	19	45	..	39.8	N.	72.5	W.	..	C	126	..	..	2.9ML	XXX	...	...	..
1976	DEC	05	13	00	..	40.8	N.	74.8	W. *	..	F	224	..	..	..	...	...	III	224
1976	DEC	05	16	32	06.9	40.77	N.	74.76	W.	003	B	225	..	..	1.8Mn	PAL	...	III	224
1976	DEC	07	04	55	07.2	40.77	N.	74.76	W.	005	B	225	..	..	1.7Mn	PAL	...	III	224
1977	JAN	21	20	50	44.5	39.97	N.	74.33	W.	006	B	243	..	..	2.7Mn	PAL	...	...	..
1978	MAY	18	01	29	37.0	41.02	N.	74.34	W.	006	C	304	..	..	1.5Mn	PAL	...	II*	243
1978	JUN	30	20	13	43.6	41.07	N.	74.20	W.	005	A	304	..	..	2.9Mn	PAL	...	IV	240
1978	JUN	30	22	39	49.7	41.08	N.	74.20	W.	006	A	304	..	..	2.2Mn	PAL	...	III	240
1979	JAN	30	16	30	52.7	40.381	N.	74.307	W.	007	B	349	..	..	3.0Mn	PAL	...	V	262
1979	FEB	02	02	26	13.3	40.77	N.	74.66	W.	000	A	304	..	..	1.9Mn	PAL	...	III	262
1979	FEB	23	10	23	57.2	40.80	N.	74.81	W.	013	A	304	..	..	2.9Mn	PAL	...	IV	262
1979	MAR	10	04	49	39.7	40.72	N.	74.50	W.	003	A	304	..	..	3.1Mn	PAL	...	V	262
1980	MAR	25	18	54	35.8	40.98	N.	75.01	W.	005	A	304	..	..	2.8Mn	PAL	...	...	..
1980	APR	05	11	49	33.8	39.83	N.	74.05	W.	006	B	304	..	..	2.9Mn	PAL	...	...	..
1980	AUG	02	17	20	59.7	40.43	N.	74.15	W.	008	B	300	..	..	3.1Mn	PAL	...	...	..
1980	AUG	30	09	19	09.0	39.84	N.	74.86	W.	002	B	300	..	..	3.0Mn	PAL	...	...	..
1982	APR	12	22	14	31.2	40.05	N.	74.82	W.	007	B	350	..	..	2.4Mn	PAL	...	V	350
1983	FEB	19	05	45	45.1	40.649	N.	74.769	W.	006	A	360	..	..	2.7MD	PAL	...	IV	360

ISBN 0-607-80796-2
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SEISMICITY MAP OF THE STATE OF NEW JERSEY

By
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1987

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INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—REPRINTED 1998

For sale by U.S. Geological Survey Information Services
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