DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
Michael DiBerardinis, Secretary

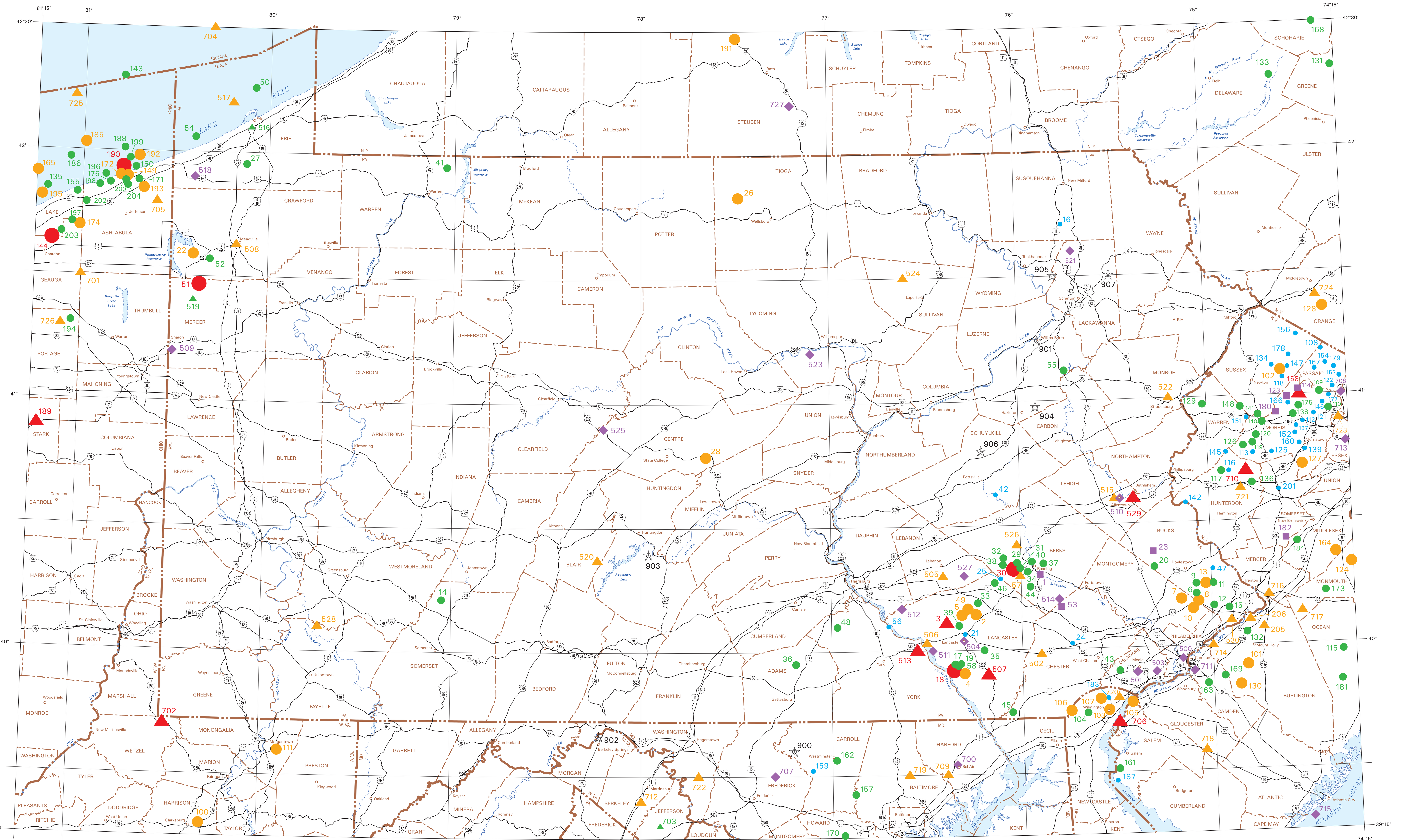
COMMONWEALTH OF PENNSYLVANIA
Edward G. Rendell, Governor

BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
Jay B. Parrish, Director

MAP 69

EARTHQUAKE EPICENTERS IN AND NEAR PENNSYLVANIA

COMPILED BY
RODGER T. FAILL
2004



LIST OF EARTHQUAKES BY MAP NUMBER

Instrumental (post-1965), Inside Pennsylvania (1–58)[1]

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
1	1972/06/25				
1	1973/08/12				
2	1972/12/08	3			3.5
3	1800/11/20	10			4.1
3	1995/03/11a	21	10	16.03	2.7
4	1865/09/17				
4	1978/07/16	6	39	42.3	3.1
5	1978/10/06	19	25	47.4	3.0
6	1980/03/02	11	54	47.9	2.8
7	1980/03/05a	17	6	56.3	3.5
8	1980/03/05b	17	20	32.8	3.1
9	1980/03/05c	17	20	33.2	2.5
10	1980/03/11a	6	0	26.8	3.3
11	1980/03/11b	16	16	5.5	2.8
12	1980/05/02a	15	23	23.5	2.8
13	1980/05/02b	19	2	24.4	3.0
14	1982/02/03	4	28	20.6	2.6
15	1982/05/12	17	1		2.4
16	1982/08/14	0	11	34.5	1.8
17	1984/04/19	4	54	55.1	2.9
17	1986/05/02a	13	53	52.62	2.5
18	1984/04/23a	1	36	2.1	4.2
19	1984/04/23b	2	46	0.5	2.5
19	1984/05/17	10	15	22.5	2.3
20	1984/05/10	10	14	52.3	2.2
21	1984/09/19	8	20		
21	2000/03/22	20	48	0	1.8
22	1985/04/14	11	39	54	3.2
23	1989/02/02	20	24	17.7	
24	1990/03/30	8	31	32.8	1.8
25	1990/07/03	3	32	58.8	1.7
26	1990/12/14	19	38	7.1	3.0

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
27	1990/12/17	7	22	48.5	2.5
28	1991/08/15	7	16	7.15	3.0
29	1993/05/10	9	15	8.6	2.8
29	1993/05/11a	2	36	16.2	2.0
29	1993/05/11b	2	41	47.6	2.3
29	1993/05/11c	2	42	32.5	1.6
29	1993/05/11d	2	43	57.4	2.2
29	1993/05/13	7	3	3	
29	1993/05/18b	9	45	24.39	2.1
29	1996/02/03	2	31	14	2.3
30	1994/01/16a	0	42	43.2	4.0
30	1994/01/16b	1	49	16.21	4.6
30	1994/05/07	5	31	35.97	2.5
31	1994/01/16c	5	14	32.3	2.9
31	1994/05/31	5	43	20.1	2.4
32	1994/01/17a	4	42	25.7	2.7
32	1994/01/17b	21	7	47.6	2.4
32	1994/03/24	5	20	59.6	2.0
33	1994/01/18	1	43	31.81	2.6
34	1994/04/16	0	53	57.9	2.3
34	1999/04/18	9	44	55.7	1.9
35	1994/05/18	5	18	55	2.4
36	1994/05/26	17	21	58.2	2.8
37	1994/07/03a	3	28	26.3	2.0
38	1994/07/03b	3	59	4.6	2.3
38	1995/04/08	20	9	23.8	2.6
39	1995/03/11b	22	49		2.0
40	1937/06/09	0	4		
40	1995/06/04	4	35	12.5	2.7
40	1999/10/22	14	37	33	1.9
41	1995/07/08	22	19	23.6	2.4
42	1995/08/17	21	9	52.2	1.8

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
43	1996/07/05	16	11	23.35	2.6
44	1996/07/07	5	38	28.6	2.3
45	1996/10/17	11	43	27.98	2.2
46	1996/10/28	6	59	40.45	2.5
47	1997/03/11b	18	58	58.3	1.6
48	1997/06/16	5	43	16.63	2.4
48	1997/06/17	2	4		1.6
49	1997/11/14	3	44	11.05	3.0
49	1997/11/16	10	58		1.8
50	1998/08/30	3	33	50	2.1
51	1998/09/25	19	52	52.3	5.1
51	1998/10/09	8	41	45.78	2.0
51	1998/10/16	2	56	14.74	
51	1998/10/22	19	56	58.47	
51	1998/10/23	16	2	3.55	
51	1998/10/27b	13	9	44.95	
51	1998/11/01	7	19	12.25	
52	1998/11/07	2	17	12	2.3
53	1999/07/27	13	22	43	
54	1999/10/30	8	2	48	2.5
55	2000/02/24	14	47	19	2.3
56	2000/08/24	7	38		1.9
57	1954/01/07b	8			
57	1954/01/24	3	30		
57	1954/08/11	3	40		3.3
57	1954/09/24	11			
57	1955/01/20	3			
57	1993/05/18a	9	5	34.5	2.0
57	1995/01/08	5	8	2.9	2.5
58	2000/10/05	23	33	59	2.1
58	2001/07/17	14	41	20	1.8

Instrumental (post-1965), Outside Pennsylvania (100–206)[1]

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
100	1966/09/28				3.1
101	1968/12/10	9	12	48	3.0
102	1969/10/06				3.3
103	1971/07/14				3.3
103	1971/12/29				3.3
103	1972/01/02	7	8		2.4
103	1972/01/03				2.4
103	1972/01/07	3	45		2.4
103	1972/01/22	6	40		2.4
103	1972/01/23a	1	35		2.4
103	1972/01/23b	7	22		2.4
103	1972/02/11a	0	16	30	3.2
103	1972/08/14	1	9		3.3
103	1972/11/26	4	15	0	2.4
103	1972/11/27	13	46	0	2.4
103	1972/11/29	13	0	0	
103	1975/03/11	3	3	47	2.0
103	1977/02/10	19	14	25	2.6
103	1983/11/17	19	55	6.58	2.9
103	1983/12/12	5	15	9.5	2.4
103	1984/01/19	23	3	34.06	2.5
103	1984/01/20	0	46	13	1.8
103	1984/02/15	12	17	54	1.5
103	1984/10/20	8	55	27	1.7
103	1985/10/11	2	47	51	1.9
103	1985/10/20	7	55	26.6	1.7
103	1993/11/08	18	47		1.7
103	1994/02/11	15	46		1.9
103	1994/04/23	9	9	42.5	2.0
103	1995/10/17a	2	12	28.6	2.0
103	1995/10/17b	8	51	43.2	2.0
103	1995/12/20	16	32	2.7	1.4
103	1996/06/14	3	52	11.37	2.1
103	1996/06/23	19	53	11.22	1.7
103	1997/01/29	3	12	28.8	1.4
103	1998/03/15	19	25	52.4	1.8
103	1998/03/19a	5	37	26.3	1.7
103	1998/03/19b	6	27	55	1.0
104	1972/02/11b	15	30	0	2.9
104	1986/05/02b	13	54	2	2.5
105	1973/02/28	8	21	32.3	3.8
106	1973/07/10	4	38	2	3.3
107	1895/11/20	8			
107	1974/04/28	14	19	20	3.3
107	1998/10/27a	6	41	17.7	1.5
108	1975/11/10	3	2	29.2	1.8
109	1976/03/11	21	7	20.7	2.8
109	1984/06/03	7	4	33.9	1.3
110	1976/03/12	10	28	56.8	2.2
110	1981/03/19	8	51	35.2	2.0
110	1991/07/05	16	26	40.3	1.3
111	1972/09/12	15	17	13.7	
111	1976/05/06	18	46	8	3.1
112	1976/10/28a	1	10		1.0
112	1976/10/28b	1	13	31.7	1.0
112	1976/10/28c	6	47		1.0
113	1976/12/05	16	21	6.9	1.8
113	1976/12/07	4	55	7.2	1.7
114	1977/01/07	0	5	12.8	
115	1977/01/21	20	50	44.5	2.7
116	1977/06/10	12	48	4.8	1.1
117	1977/07/02	11	13	21.6	2.3
118	1977/10/27	9	22	10.9	1.5
118	1981/06/21	5	4	8.7	1.8
119	1977/12/04a	23	50	44	1.8
119	1977/12/04b	23	50	56	2.1
119	1977/12/06	17	51		1.6
119	1977/12/07	8	34		1.7
119	1977/12/23a	4	55	11	2.3
119	1977/12/23c	16	20	22	1.4
119	1977/12/24	10	25		1.6
119	1977/12/25	15	39	34	1.5
119	1977/12/26	16	54	46	1.7
120	1977/12/23b	4	55	12.3	2.2
121	1978/02/15	5	28	41	1.6
122	1978/05/18	1	29	37.9	1.5
122	1991/05/12	9	36	10.3	1.3

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
122	2000/02/16	17	42	13	
123	1978/06/16	4	59	50.6	
124	1979/01/30	16	30	52.1	3.3
125	1979/02/02	2	26	13.3	1.9
126	1979/02/23	10	23	57.2	2.9
127	1979/03/10	4	49	39.7	3.1
128	1979/06/20	19	21	47.8	3.0
128	1979/12/01	16	14	6.9	2.0
128	1980/04/25	0	23	35	2.4
128	1980/05/20	21	33	23	2.6
128	2003/04/20	12	24	43.79	2.3
129	1980/03/25	18	54	35.7	2.8
130	1980/08/30	9	19	9	3.0
131	1981/08/18	0	25	8.4	2.1
132	1982/04/12	22	14	32.05	2.8
133	1982/06/12	19	26	3.6	2.4
134	1982/09/16	6	36	28.6	1.6
135	1983/01/22	7	46	57.93	2.7
136	1983/02/19	5	45	45.13	2.7
137	1983/06/01	9	50	47.9	1.5
138	1984/05/13	3	18	27.6	2.1
139	1984/06/06	17	44	32.8	1.7
140	1984/08/02	1	3	49.1	1.7
140	1984/10/25	7	18	53.7	2.0
140	1984/12/15	14	2	0.5	1.8
140	1986/02/08	9	18	14.4	1.7
140	1988/08/20	11	46	32	1.0
141	1984/08/12a	21	3	27	2.4
141	1984/08/12b	21	12	58.9	2.1
141	1984/12/03	1	52	49.6	1.5
141	1984/12/13	20	13	0.35	1.7
141	1984/12/17	6	52	53.7	1.6
141	1987/04/24	7	7	41.1	1.9
142	1984/12/14	1	0	56.5	1.7
142	1992/05/15	8	6	51.5	1.6
143	1985/07/11	10	13	19	2.7
144	1986/01/31	16	46	43.33	5.0
144	1986/02/07	18	36	22.34	2.5
144	1988/12/28	23	28	54.7	2.8
145	1986/02/23	4	3	28.3	1.8
146	1986/06/29	6	32	16.5	1.5
146	1992/03/04	10	31	14.1	1.4
146	2001/07/14	20	8	29.39	1.9
147	1986/07/15	4	22	12.6	1.5
148	1986/11/23	21	29	38.83	2.8
149	1987/07/13a	5	49	17.43	3.8
149	1987/07/13e	18	25	11.98	2.3
149	1987/07/13f	19	0	8.5	2.3
149	1987/07/13g	19	39	19.44	2.1
149	1987/07/13h	20	53	5.46	2.2
149	1987/07/14a	7	47	27.23	2.4
149	1987/07/16b	6	2	25.54	2.4
149	1989/08/01a	16	12	48.75	2.8
149	1989/08/01b	16	50	30.74	2.9
149	1989/08/03	4	7	48.64	2.2
149	1990/09/26	6	13	4.89	2.3
150	1987/07/13i	23	49	18	2.7
150	2001/01/26c	3	11	30	2.0
150	2001/01/26d	3	45	25	2.2
150	2001/01/26e	5	11	5	2.0
150	2003/02/10	5	34	43.07	2.4
151	1987/08/05	4	47	40.4	1.7
151	1987/08/06a	0	7	23.3	1.1
151	1987/08/06b	0	25	37	1.1
152	1988/04/13	9	48	33.3	1.4
153	1988/12/22	7	44	28.9	1.0
153	1996/02/18	13	23	57.8	1.5
153	1996/02/19a	13	1	55.3	1.7
154	1988/12/23	2	30	54.1	1.1
155	1988/12/25	2	11	34.9	2.5
156	1989/01/27	3	9	59.7	1.1
157	1990/01/13	20	47	55.33	2.5
158	1783/11/30a	2			
158	1783/11/30b	3	50		4.7
158	1783/11/30c	7			
158	1990/01/26	4	27	29.5	1.0
159	1990/04/04	16	15	1.7	1.7

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
160	1990/05/10	3	39	26.9	1.8
161	1990/10/23	1	34	48.27	2.9
162	1991/09/28	11	27	34.87	2.4
163	1991/09/29	12	21	35	2.2
164	1992/01/09	8	50	45.22	3.1
165	1992/03/15	6	13	55.22	3.5
166	1992/06/07	23	51	14.8	0.4
167	1992/10/13	16	11	49.5	1.0
168	1993/01/21	1	30	53.4	2.2
169	1993/02/26	21	13	33.81	2.5
170	1993/03/10	14	32	22	2.5
171	1987/07/13b	5	58	52.31	2.2
172	1987/07/13c	7	52	12	3.0
172	1987/07/13d	13	5	22	2.9
172	1987/07/14b	14	51	10	2.8
172	1987/07/16a	4	49	40	2.7
172	1990/01/01	23	3	4.89	2.2
172	1990/11/18	9	20	52.81	2.3
173	1993/05/15	16	2	44.4	2.6
174	1993/10/16	6	30	5.32	3.4
175	1994/05/23	0	45	20.6	1.6
175	1995/01/27	2	37	7.4	2.3
175	1995/04/01	5	50	59.5	1.5
175	1997/06/27	20	58	25	1.6
176	1992/03/26	3	43	15.27	2.5
176	1992/03/31	1	54	52.11	2.5
176	1992/04/07	1	35	22.12	2.0
176	1995/02/23	9	32	13	2.9
177	1995/05/26	5	24	7.6	1.5
177	1998/06/20	12	54	6.6	1.2
177	1998/06/30	6	18	37.6	1.9
177	1999/08/19	15	14	55	
178	1995/10/27a	1	46	45.6	1.3
178	1995/10/27b	6	52	54.2	1.4
178	1996/11/12a	6	37	21.7	1.3
178	1996/11/12b	11	23	36.6	0.8
179	1996/02/19b	17	8	10.9	0.8
179	1996/02/23	8	30	29.3	0.8
180	1996/02/26	16	0	5.1	
181	1996/10/24	6	44	18.93	2.0
182	1997/03/11a	18	31	46.3	
183	1997/04/16	1	29	44.5	1.6
184	1997/07/15	17	29	48.9	2.3
185	1998/01/27	0	38	30	3.0
186	1998/01/30	4	59	18	2.4
187	1998/03/25	7	13	6.7	1.9
188	2000/06/07a	6	19	18	2.0
188	2000/06/07b	6	55	9	2.4
189	1927/10/29				4.2
189	2000/08/07	2	2	32	3.2
190	2000/10/20	23	26	28	2.5
190	2001/01/26b	3	3	19.7	4.3
191	2001/01/22	12	5	40	2.4
191	2001/01/25	14	19	23	2.5
191	2001/02/03	20	15	15	3.2
192	2001/01/26f	5	36	53	3.2
193	2001/06/03	22	36	46.46	3.4
194	1988/03/31	16	30	3.87	2.8
195	1988/06/27	4	46	31.34	2.7
195	1992/03/15	14	49	40.02	2.2
195	2003/06/30	19	21	17.2	3.4
196	1990/07/24	23	4	38.01	2.3
197	1991/10/13	2	26	38.47	2.0
198	1992/03/08	8	22	44.06	2.9
199	1995/04/09	11	37	29.01	2.4
200	2001/01/20	2	5	7.5	2.6
200	2001/01/26a	2	5	7	2.6
200	2001/06/05	8	27	15	2.2
201	2002/08/09	14	59	56	1.5
202	2002/08/17	8	26	31.89	2.0
203	2003/05/02	15	59	7	2.0
204	2003/07/17	0	44	10	2.5
205	1857/02/10	23	30		3.1
205	1987/12/06	8	36	3.7	2.1
205	1999/05/31	1	16	31	2.3
206	1877/09/10	14	59		3.2
206	1986/09/15b	22	45	16.1	1.9

Pre-Instrumental, Inside Pennsylvania (500–530)

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
500	1724/08/16	9	30		
500	1755/11/27	1			
500	1758/03/23	3	30		
500	1763/10/30	21	15		
500	1772/04/25	13			
500	1777/11/22				
500	1780/11/29				
500	1800/03/17				
500	1800/11/29				
500	1801/11/12				
500	1811/12/09	1			
500	1811/12/16	8			
500	1840/11/11				
500	1840/11/14				
501	1737/12/08	3	58		
502	1752/12/17	23			3.6
503	1763/03/22				
503	1777/11/23				
504	1798/01/11	7			

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
504	1801/01/27	20	40		
504	1818/03/19	9			
504	1822/05/04				
504	1829/09/06	1	45		
504	1866/11/07				
504	1885/03/09	1			
505	1964/05/12	6	45		3.2
506	1820/08/21	13	40		3.4
507	1834/02/05	4	30		4.0
508	1852/09/15				3.7
509	1873/08/17	14			
510	1884/05/31				
511	1886/09/27	23	21		
512	1886/09/29	3			
513	1889/03/08	23	40		4.3
514	1906/05/28	22	30		
515	1908/05/31	17	42		3.1
515	1928/06/22				
515	1951/11/23	6	45		3.3

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
516	1921/09/27	4	32		2.9
517	1934/10/29	20	7		3.2
518	1934/11/05	20			
519	1890/12/15	13			2.9
519	1936/08/26	9	55		2.9
520	1938/07/15	22	46	12	3.3
521	1940/09/27				
522	1942/10/24	17	27		3.4
523	1907/01/10	9	45		
524	1946/10/28	20	36		3.6
525	1937/03/25	14	54		
526	1954/01/07a	7	25		3.2
526	1954/01/07c	19	34		
527	1885/01/15	9	10	11	
528	1965/10/08	2	17		3.3
529	1961/09/15	2	16	56	4.3
530	1961/12/27	17	6		3.3

Also see map numbers 3, 4, 40, and 57 above.

Pre-Instrumental, Outside Pennsylvania (700–727)

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
700	1820/08/27	7	30		
701	1823/05/30				3.2
702	1824/07/15	16	20		4.1
703	1846/10/19	2			2.7
704	1930/02/16	12	17		3.0
705	1857/03/01	1	40		3.3
706	1871/10/09	14	40		4.1
706	1871/10/10	5	8		
706	1937/12/03	12	15	0	2.8
707	1877/01/04	4	30		
708	1947/04/01	13	25	54	
709	1883/03/11	23	57		3.1
709	1883/03/12	5			2.7
710	1895/09/01	11	9		4.5

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
711	1900/04/29	0	7		
712	1909/04/02	7	25		3.5
713	1841/01/12	5	30		
713	1937/09/30	22	8	22	
713	1938/12/06	19	38		
714	1921/01/26	23	40		3.3
714	1926/01/26	23	40		3.5
715	1923/10/30	18			
716	1933/01/25	2			3.3
717	1938/08/23a	3	36	31	3.9
717	1938/08/23b	5	4	53	3.8
717	1938/08/23c	7	3	29	3.7
717	1986/09/15a	22	34	51.2	2.3
718	1939/11/15	2	53	48	3.8

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
719	1939/06/22	23	10		2.7
719	1939/11/18	2	33		3.1
719	1939/11/26	5	20		3.5
720	1944/01/08				3.2
721	1957/03/23	19	2		3.5
722	1962/09/04	23	40		3.3
723	1964/06/16				3.3
724	1965/09/29	20	57		3.3
725	1857/02/27	20	30		3.9
726	1885/08/15	4	5	6	3.2
727	1929/08/12	6			

Also see map numbers 107, 158, 189, 205, and 206 above.

Quarry Blast or Mine Collapse (900–907)

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
900	1887/01/03	4	30		3.4
901	1954/02/21	20			
901	1954/02/24	3	55		
902	1962/09/07	14	0		3.3
902	1963/10/10	14	59	52.3	3.6
902	1969/05/22	14	59	51.6	3.1

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
902	1970/05/27	17	59	41.4	
902	1976/01/30	18	58	49.8	2.8
902	1978/04/26	19	30	23.3	3.1
903	1964/02/13	19	46		3.3
903	1982/05/12	18	29	33	3.0
903	1991/04/17	17	42	39	2.5

Map no.	Date yr/mo/day	hr	min	sec	Magnitude
904	1974/04/27	14	45	39.1	3.2
905	1950/03/20	22	55		3.3
905	1963/03/02	20	24		3.4
906	1944/02/05	16	22		3.7
907	1960/01/22	20	53	22	3.4

[1]Includes some pre-instrumental events where two or more events having identical or close locations have been combined.

EARTHQUAKE EPICENTER MAP OF PENNSYLVANIA

INTRODUCTION

The epicenter map of Pennsylvania is a display of the natural and artificial seismic events that have been recorded in and near Pennsylvania over the past 300 years. These events were compiled from a number of published sources and regional catalogs and are listed in detail in the database that accompanies this map. The older events (to approximately the mid-1960s) are historical, having been culled primarily from newspaper accounts. More recent events were recorded instrumentally at various seismic stations.

How well does this map represent the seismicity of Pennsylvania? Prior to instrumental recording, only those earthquakes large enough and close enough to have been felt in cities and towns that had newspapers were recorded. Thus, the preponderance of historical events recorded in populous southeastern Pennsylvania probably represents only the stronger earthquakes. Only with the more recent establishment of instrumental networks has it been possible to locate smaller earthquakes with a fair degree of accuracy.

Even recent seismicity in and near Pennsylvania is probably not accurately reflected by this map because of the uneven distribution of seismic stations. The numerous reports of small-magnitude (<3) events in eastern Pennsylvania and central New Jersey may be, in part, a function of proximity to stations of the Lamont Cooperative Seismic Network and its predecessors. Thus, this epicenter map is an imperfect representation of the true seismicity in and near Pennsylvania.

EARTHQUAKE CATALOG

The earthquake catalog that was used to prepare this map is a database of 437 events that occurred in and near Pennsylvania between 1724 and July 31, 2003. The database was prepared using Microsoft Access 2000 (version 9.0.3821) software. Each record consists of 30 fields, which contain the date and time of the event, the location (latitude and longitude, as well as county and town), and, where determined, the magnitude, intensity, and depth of focus. Foreshocks and aftershocks are listed independently of the main earthquakes, for the sake of completeness and for any special analysis. References to catalogs and publications in which an event is listed are included. A "remarks" field provides ancillary information. For further details, refer to the database and accompanying documentation.

DATASET AND DIGITAL MAP PREPARATION

The epicenters shown on the map were produced from a coverage (dataset) prepared using ESRI ArcInfo software (version 8.2). The coverage was generated from the Microsoft Access database described above and contains all the fields in the Access database.

The natural seismic events are separated into four groupings based on two criteria: whether the epicenter lies inside Pennsylvania or outside (nearby) Pennsylvania; and whether the event location was determined by seismic instruments (instrumental, herein arbitrarily post-1965) or was recorded in newspaper accounts, in damage-intensity surveys, or by other noninstrumental methods (historical, herein arbitrarily pre-1966). A fifth group consists of nonnatural events (mine collapses or quarry blasts) that have been included in other, older catalogs.

A fair number of the 437 events in the coverage have identical epicenters (especially historical earthquakes with imprecise locations), or their epicenters are too close to one another to clearly display at the scale (1:750,000) of the epicenter map. These events have been combined into a single map location. For example, the symbol labeled with map number 40 in the Reading, Pa., vicinity represents three events that occurred in 1937, 1995, and 1999, which have different but close epicenters. For this location, and for the other locations that have multiple events, a mean latitude and longitude were calculated. The calculated means were used to plot the single location on the epicenter map. The 437 points in the dataset have been reduced to the 232 points shown on the map using this procedure. For combined events, the map symbol represents the event having the largest magnitude.

The table to the right of the map allows identification of all events associated with each map number. The table is subdivided into the five groupings described above. Within each group, the events are ordered first by map number, and then by date and time. Magnitudes are also listed for each event.

RELIABILITY

This regional map and the accompanying database and coverage are not intended for use in detailed or site-specific analyses. The historic events (prior to the mid-1960s) were located primarily from damage-intensity surveys and newspaper accounts. Therefore, these location estimates may be inaccurate by as much as several to even tens of kilometers. The creation of instrumental seismic stations during the 1960s and 1970s provided magnitude and timing data that have far greater location and magnitude accuracy, but even these data may have location errors of several kilometers, particularly for events that are not in close proximity to the stations.

MAP CREDITS

Earthquake epicenters are generalized from the dataset "Earthquake Catalog and Epicenter Map of Pennsylvania" included in this publication, prepared by R. T. Faill, Pennsylvania Bureau of Topographic and Geologic Survey, Department of Conservation and Natural Resources, 2004.

State and county boundaries, roads, and streams were modified and generalized by staff of the Bureau of Topographic and Geologic Survey from U.S. Geological Survey (USGS) 1:100,000-scale digital-line-graph (DLG) files for boundaries, transportation, and hydrography, respectively, 1999–2003. Roads were slightly modified and updated based mainly on Pennsylvania Department of Transportation digital files for state-maintained roadway centerlines, 2004, and Ohio and New Jersey Department of Transportation county and state road maps, 2000–2003.

Locations of cities and towns are from the 1:500,000-scale USGS topographic map of Pennsylvania, 1975, and USGS 1:100,000-scale digital-raster-graphic (DRG) files, 1977–1993.

Digital map preparation, layout, and design by C. E. Miles and R. T. Faill, Bureau of Topographic and Geologic Survey, 2003–2004. Map editing by C. E. Miles and C. E. O'Neil, 2004.

EXPLANATION

MAGNITUDES

	≥4	≥3 and <4	≥2 and <3	<2	Unknown	Quarry blast or mine collapse
POST-1965 EVENTS	51	107	48	125	23	900
PRE-1966 EVENTS	529	506	703		700	902

The numbering pattern on the map is as follows:
1 to 58—earthquakes since 1965, within Pennsylvania; 100 to 206—earthquakes since 1965, outside Pennsylvania; 500 to 530—earthquakes before 1966, within Pennsylvania; 700 to 727—earthquakes before 1966, outside Pennsylvania; 900 to 907—nonnatural seismic events (mine collapse, quarry blast). In a few cases, where two or more events have been combined, pre-1966 events have been included in the 1–58 and 100–206 groupings.

SCALE 1:750,000

10 0 10 20 30 40 50 MILES

10 0 10 20 30 40 50 60 KILOMETERS

Lambert conformal conic projection
Standard parallels 33°N and 45°N, center 78°W