Quaternary Fault and Fold Database of the United States

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Garlock fault zone, Central Garlock section (Class A) No. 69b

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Synopsis	**General:** Major Holocene active, east to northeast-striking sinistral strike-slip fault that forms the boundary between the Tehachapi Mountains, Sierra Nevada, and Basin and Range province on the north and the Mojave Desert province to the south. Aseismic fault creep has been reported along the westernmost 60 km of the Garlock fault zone (Rodgers, 1979 #6071; Snay and Cline, 1980 #6070; Louie and others, 1985 #5731). However, U.S. Geological Survey quadrilateral sites spaced at 15 km intervals along this part of the fault zone have not detected evidence of fault creep (M. Clark, personal communication in McGill, 1992). There are seven paleoseismic study sites involving trenching along the western and central Garlock fault sections described in this compilation, with additional slip rate sites involving geomorphic analysis (Burke, 1979 #2985; Carter, 1980 #6043; LaViolette, 1981 #6051;

Roquemore and others, 1982 #2993; McGill and Sieh, 1991 #6062; McGill, 1992 #6053; McGill and Sieh, 1993 #6063; McGill, 1994 #6056; McGill and Rockwell, 1998 #6064; McGill, 1999 #6060; McGill, in preparation #6061). A Holocene slip rate for the western Garlock fault section of 1.6–3.3 mm/yr was reported by LaViolette (1981 #6051) for the Oak Creek Canyon site. McGill and others (in preparation #6061) reported a preferred minimum Holocene slip rate of at least 6.8±1.5 mm/yr at the Lone Tree Canyon site. Clark and others (1984 #2876), based on data reported by Carter (1980 #6043), calculated a preferred long-term sinistral slip rate of 11 mm/yr near Mesquite Canyon. Near Koehn Lake a sinistrally offset 11- to 15-ka lake bar indicates a slip rate of 5–8 mm/yr (radiocarbon years) (Clark and others, 1984 #2876). McGill and Sieh (1991 #6062), using the calibration of Bard and others (1990 #6042), re-calculated the slip rate reported by Clark and others (1984 #2876) at Koehn Lake to be 4–7 mm/yr. McGill and Sieh (1993 #6063) reported a slip rate of 5–11 mm/14Cyr or 4–9 mm/yr after calibration of the radiocarbon dates. Their preferred slip rate was 6–8 mm/14Cyr (or 5–7 mm/yr in calibrated years) calculated from the southern Searles Valley site. McGill and Sieh (1991 #6062) and McGill (1992 #6053) concluded that some sinistral slip is transferred to the Owl Lake fault [70]. The slip rate of the Garlock fault east of its intersection with the Owl Lake fault [70] is not known with any certainty. Recurrence intervals for the Garlock fault zone are 800–2,700 yr for the western Garlock fault section (McGill, 1994 #6056); 190–3,405 yr for the central Garlock fault section (McGill and Rockwell, 1998 #6064); and 200–3,000 yr for the eastern Garlock fault section (McGill and Sieh, 1991 #6062). McGill and Rockwell (1998 #6064) noted that recurrence intervals are irregular at the El Paso Peaks site and reported preferred average recurrence intervals of 1,230 yr assuming 5 events or 700 yr assuming 8 events. In a deeper re-excavation at the El Paso Peaks site, Dawson (2000 #6047) confirmed the irregular nature of recurrence, but eliminated one of McGill and Rockwell's events, and added an older event that was not exposed in the original trench.

Sections: This fault has 3 sections. Garlock fault zone is divided based on McGill (1992 #6053). The western Garlock fault section extends from the complex intersection with the San Andreas fault [1g] near Frazier Park east-northeast to a 3-km-wide left-releasing step-over in the vicinity of Koehn Lake. The central Garlock section extends from the left-releasing step-over near Koehn Lake

	eastward to the Quail Mountains where the Owl Lake fault [70] intersects the Garlock fault zone. The eastern Garlock fault section extends from the Owl Lake fault [70] eastward to the complex intersection with the southern extent of the Southern Death Valley fault zone [143b].
Name comments	**General:** **Section:** Name and section boundaries proposed by McGill (1992 #6053). Section extends from the large left-releasing step-over in the vicinity of Koehn Lake eastward to the intersection of the Central Garlock fault zone and east-northeast-striking Owl Lake fault [70]. This section includes the Quaternary active El Paso fault, a fault with primarily down-to-south dip-slip offset first mapped and named by Dibblee (1952 #6048). **Fault ID:** Includes 270 (Garlock fault zone), 272 (ground breaks in Fremont Valley), 274 (triggered slip associated with 1952 Arvin-Tehachapi earthquake), and 310 (South Branch Garlock fault) of Jennings (1994 #2878).
County(s) and State(s)	SAN BERNARDINO COUNTY, CALIFORNIA KERN COUNTY, CALIFORNIA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Locations based on digital revisions to Jennings (1994 #2878) using original mapping by Hulin and Smith and others (1968 #6456) at 1:62,500; mapping by Smith (1964 #6067), Clark (1973 #483) and Wills (1989 #6077; 1989 #6078) at 1:24,000.
Geologic setting	The Garlock fault zone, one of the principal Holocene active faults of California, is an east-northeast striking sinistral strike-slip fault that separates the Tehachapi-Sierra Nevada and Basin and Range provinces on the north against the Mojave Desert province on the south. The Garlock fault extends from its complex intersection with the San Andreas fault zone [1g] at its western end northeastward, curves to a more easterly strike east of the Koehn Lake area and extends to the Avawatz Mountains near the south end of Death Valley. Maximum cumulative sinistral strike-slip displacement of 48 km to 64 km has been documented (Smith, 1962 #6066; Smith and Ketner, 1970 #6069; Davis and

	Burchfiel, 1973 #1492; Carr and others, 1993 #6452). Hill and Dibblee (1953 #923) suggested that the sinistral Garlock and Big Pine [86] faults and the dextral San Andreas fault [1] are conjugate shears resulting from a north-south oriented regional contractional strain pattern. Later workers (Hamilton and Myers, 1966 #1531; Troxel and others, 1972 #6075; Davis and Burchfiel, 1973 #1492) considered the Garlock fault to be an intracontinental transform fault accommodating extension in the Basin and Range province to the north relative to the more stable Mojave block to the south. However, McGill (1992 #6053) stated that a simple transform model is inadequate to explain this relationship because the extension direction of the portion of the Basin and Range province north of the Garlock fault is not parallel to the fault (Stewart, 1983 #1653; Burchfiel and others, 1987 #1454; Minster and Jordan, 1987 #3288; Jones, 1987 #6050; Wernicke and others, 1988 #1686). It is possible that the extension component parallel to the Garlock fault is driving sinistral slip on the fault and the component normal to the fault has rotated the central and eastern Garlock fault clockwise (Carter and others, 1987 #6045; Jones, 1987 #6050; Dokka and Travis, 1990 #3188). (Smith and others, 1968 #6456) (Clark and Lajoie, 1974 #6046)
Length (km)	This section is 107 km of a total fault length of 257 km.
Average strike	N64°E (for section) versus N68°E (for whole fault)
Sense of movement	Left lateral *Comments:* Central Garlock fault zone is delineated by geomorphic features indicative of sinistral strike-slip offset (Clark, 1973 #483; McGill and Sieh, 1991 #6062). Late Cenozoic sinistral displacement has been documented by Carter (1980 #6043; 1994 #6044), Smith (1962 #6066), Smith and Ketner (1970 #6069), and Davis and Burchfiel (1973 #1492). A large left-releasing step-over near Koehn Lake is delineated by fault traces characterized by sinistral normal and normal displacement (Clark, 1973 #483; Pampeyan and others, 1988 #1211; Wills, 1989 #6077).
Dip Direction	V
Paleoseismology studies	69-1 by Burke (1979 #2985) involved the excavation of 1 fault-normal trench across traces of the Central Garlock section just east of Koehn Lake. The trench exposed a 10- to 14-m-wide fault

zone that offsets latest Pleistocene and Holocene lacustrine deposits and alluvium. Fossil shells from the oldest group of lake beds yielded a 14C date of 14,700±130 yr BP Younger units lacked dateable material. Burke interpreted between 9 (?) and 17 unconformities in the exposed section and concluded that most indicate discrete fault-rupture events.

69-5 by Roquemore and others (1982 #2993) involved the excavation of 1 fault-normal trench in Christmas Canyon. The trench exposed near-shore lacustrine sand and gravel deposits truncated against lacustrine silt. Roquemore and others (1982 #2993) identified 6 Holocene faulting events. Dateable material was not available, but relative age assessments were made based on stratigraphic correlations.

69-6 by McGill (1992 #6053) involved the excavation of 2 fault-normal trenches at the Searles Valley site, located about 1.9 km west of Christmas Canyon. Trenches exposed faulted Holocene alluvial fan sediments and late Pleistocene lacustrine deposits of Searles Lake. Trench 1 exposed evidence of 3 to 4 surface-rupturing earthquakes. A radiocarbon date on detrital charcoal constrains the most recent faulting event to have occurred within the past 530 yr.

69-7 by McGill and Sieh (1993 #6063) involved the excavation of 20 backhoe trenches at the Southern Searles Valley site in order to expose faults and shoreline features. Trenches exposed late Pleistocene alluvium, latest Pleistocene to early Holocene beach deposits and colluvium. A sinistrally offset shoreline angle allowed the Holocene slip rate to be calculated.

69-11 by McGill and Rockwell (1998 #6064) involved the excavation of 1 fault-normal trench at the El Paso Peaks site. This trench (site 69-12) was later deepened and widened and additional exposures were logged by Dawson (2000 #6047). The site is characterized by a small playa/alluvial fan complex south of the El Paso Mountains. The trench exposed faulted playa sediments that interfinger with Holocene alluvial fan gravels to the north and colluvial gravels derived from a shutter ridge to the south. Buried fissures and fault scarps document 5 to 8 surface-rupturing earthquakes in the past 5 ka (McGill and Rockwell, 1998 #6064). Radiocarbon dates on detrital charcoal, wood, and shells constrain the ages of the individual faulting events. Further study at this site by Dawson (2000 #6047) eliminated one of McGill and Rockwell's events (event Y) and added two new events (events R

	and F).
Geomorphic expression	Traces of the Central Garlock fault zone are delineated by moderately to well defined geomorphic features indicative of Holocene sinistral strike-slip offset (Clark, 1973 #483; Wills, 1989 #6078). Geomorphic features include linear scarps and linear tonal contrasts on Holocene alluvium, sinistrally offset drainages and ridges, shutter ridges, closed depressions, ponded alluvium, sinistrally offset alluvial fans and terraces, swales, sidehill benches, linear troughs and linear ridges (Clark, 1973 #483; Wills, 1989 #6078; McGill and Sieh, 1991 #6062; McGill, 1992 #6053).
Age of faulted surficial deposits	Traces of the Central Garlock fault offset latest Pleistocene and Holocene lacustrine deposits in the Koehn Lake area. Burke (1979 #2985) reported that the oldest lake beds exposed in a fault normal trench were 14,700±130 14Cyr BP A shoreline angle of Searles Lake offset along the Garlock fault has a preferred age of 11,200 14Cyr BP (McGill and Sieh, 1993 #6063). McGill and Rockwell (1998 #6064) and Dawson (2000 #6047) established ages of offset playa sediments and alluvial fan deposits near El Paso Peaks. Radiocarbon dates here range from about 7,000 14Cyr BP to less than 300 14Cyr BP
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* McGill (1992 #6053; 1994 #6055) reported that the most recent paleoevent occurred less than 530 yr BP, based on radiocarbon date of charcoal. The lack of historically recorded large earthquakes on the Garlock fault indicates this event occurred between 1460 AD and 1900 AD.
Recurrence interval	190 yr to 3,405 yr (7 ka) *Comments:* McGill and Rockwell (1998 #6064) reported that recurrence intervals are irregular at the El Paso Peaks site. Here they identified between 5 and 8 surface rupturing earthquakes in the past 5 ka. The average maximum recurrence interval, assuming 5 events, is 1,230 yr (190 yr to 3,405 yr). The average minimum recurrence interval, assuming 8 events, is 700 yr (190 yr to 1,545 yr). Dawson (2000 #6047) re-excavated the El Paso

	Peaks site and eliminated one of McGill and Rockwell's events while adding two new events. The additional exposures in Dawson's trench did not provide any supporting evidence for the 3 events that McGill and Rockwell (1998 #6064) considered to be only weakly supported. Dawson (2000 #6047) confirmed the irregular nature of the recurrence intervals. He reports intervals ranging from 225 yr to 3,220 yr in his preferred interpretation of 6 events in the past 7,000 yr. McGill and Sieh (1991 #6062) reported a preliminary recurrence interval estimate of 600 yr to 1,200 yr for the El Paso Mountains site (69-11). This is based on the calibrated slip rate of 4–7 mm/yr and 4- to 7-m slip/event. At Searles Valley (69-6) McGill and Sieh (1991 #6062) reported a preliminary recurrence interval estimate of 200–750 yr, based on a calibrated slip rate of 4–9 mm/yr and 2- to 3-m slip/event. In Pilot Knob Valley, McGill and Sieh (1991 #6062) reported a preliminary recurrence interval estimate of 200–1,300 yr, based on an estimated, calibrated slip rate of 3-9 mm/yr and 2-4 m of slip per event.
Slip-rate category	Greater than 5.0 mm/yr *Comments:* Clark and others (1984 #2876) reported a preferred Holocene sinistral slip rate of 7 mm/yr (5 mm/yr minimum and 8 mm/yr maximum) near Koehn Lake. This slip rate is based on a 75 m to 85 m sinistral offset of a lake bar and 14C date of 11 ka to 15 ka, based on tufa and shells. Clark and others (1984 #2876) reported that soil profile development on the lake bar suggests older age than derived from radiocarbon dates on tufa and shells. McGill and Sieh (1991 #6062), using the calibration of Bard and others (1990 #6042), re-calculated the slip rate reported by Clark and others (1984 #2876) at Koehn lake to be 4 mm/yr to 7 mm/yr. Clark and others (1984 #2876), based on data presented in Carter (1980 #6043), reported a preferred long term sinistral slip rate of 11 mm/yr near Mesquite Canyon. This is based on a 16–20 km sinistral offset of gravels overlying Pleistocene alluvium. Age of the displacement is based on vertebrate fossils of Rancholabrean or Irvingtonian age. Offset gravels are younger, yielding minimum and maximum slip rates of 5 mm/yr and >30 mm/yr, respectively (Clark and others, 1984 #2876). McGill and Sieh (1991 #6062) reported that the vertebrate fossil could be of the genus Equus (about 2.2 Ma), and if the gravel was not significantly younger than the underlying deposits in which the fossil was sampled, then the minimum slip rate could be about 7.3 mm/yr. McGill and Sieh (1993 #6063)(1993) reported a preferred Holocene slip rate of 6–8 mm/14C yr BP, based on 68–90 m

	sinistral offset of stream channel and shoreline angle at the southern Searles Valley site. Preferred age of latest highstand of Searles Lake is 11,200 14C yr BP. Minimum slip rate is 5 mm/14C yr; maximum slip rate is 11 mm/14C yr. Their calibrated slip rate range is between 4 mm/yr and 9 mm/yr. McGill (1998 #6059) also provides a summary of slip rate estimates for the Garlock fault. Slip rate assigned to this part of the Garlock fault by Petersen and others (1996 #4860) for probabilistic seismic hazard assessment for the State of California was 7.0 mm/yr (with minimum and maximum assigned slip rates of 5.0 mm/yr and 9.0 mm/yr, respectively.
Date and Compiler(s)	2000 William A. Bryant, California Geological Survey
References	#6042 Bard, E., Hamelin, B., Fairbanks, R.G., and Zindler, A., 1990, Calibration of the C-14 timescale over the past 30,000 years using mass spectrometric U-Th ages from Barbados corals: Nature, v. 345, p. 405-410. #1454 Burchfiel, B.C., Hodges, K.V., and Royden, L.H., 1987, Geology of Panamint Valley-Saline Valley pull-apart system, California—Palinspastic evidence for low-angle geometry of a Neogene range-bounding fault: Journal of Geophysical Research, v. 92, no. B10, p. 10,422-10,426. #2985 Burke, D.B., 1979, Log of a trench in the Garlock fault zone, Fremont Valley, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-1028, 1 sheet, scale 1:125,000. #6452 Carr, M.D., Harris, A.G., Poole, F.G., and Fleck, R.J., 1993, Stratigraphy and structure of Paleozoic outer continental margin rocks in Pilot Knob Valley, north central Mojave Desert, California: U.S. Geological Survey Bulletin 2015, 33 p. #6044 Carter, B., 1994, Neogene offsets and displacement rates, central Garlock fault, California, *in* McGill, S.F., and Ross, T.M., eds., Geological investigations of an active margin: Geological Society of America, Cordilleran Section Annual Meeting, Guidebook, v. 27, p. 348-356. #6043 Carter, B.A., 1980, Quaternary displacement on the Garlock fault, California, *in* Fife, D.L., and Brown, A.R., eds., Geology and mineral wealth of the California desert: South Coast

Geological Society, Santa Ana, California, p. 457-466.

#6045 Carter, J.N., Luyendyk, B.P., and Terres, R.R., 1987, Neogene clockwise tectonic rotation of the eastern Transverse Ranges, California, suggested by paleomagnetic vectors: Geological Society of America Bulletin, v. 98, p. 199-206.

#483 Clark, M.M., 1973, Map showing recently active breaks along the Garlock and associated faults, California: U.S. Geological Survey Miscellaneous Geologic Investigations I-741, 3 sheets, scale 1:24,000.

#6046 Clark, M.M., and Lajoie, K.R., 1974, Holocene behavior of the Garlock fault: Geological Society of America, Abstracts with Programs, v. 6, p. 156-157.

#2876 Clark, M.M., Harms, K.H., Lienkaemper, J.J., Harwood, D.S., Lajoie, K.R., Matti, J.C., Perkins, J.A., Rymer, M.J., Sarna-Wojcicki, A.M., Sharp, R.V., Sims, J.D., Tinsley, J.C., III, and Ziony, J.I., 1984, Preliminary slip rate table and map of late Quaternary faults of California: U.S. Geological Survey Open-File Report 84-106, 12 p., 5 plates, scale 1:1,000,000.

#1492 Davis, G.A., and Burchfiel, B.C., 1973, Garlock fault—An intracontinental transform structure, southern California: Geological Society of America Bulletin, v. 84, p. 1407-1422.

#6047 Dawson, T.E., 2000, A 7000 year record of paleoearthquakes on the central Garlock fault, near El Paso Peaks, California: San Diego State University, unpublished M.S. thesis, 90 p.

#6048 Dibblee, T.W., Jr., 1952, Geology of the Saltdale quadrangle, California: California Division of Mines Bulletin 160, p. 1-43, scale 1:62,500.

#3188 Dokka, R.K., and Travis, C.J., 1990, Late Cenozoic strike-slip faulting in the Mojave Desert, California: Tectonics, v. 9, p. 311-340.

#1531 Hamilton, W.B., and Myers, W.B., 1966, Cenozoic tectonics of the western United States: Reviews of Geophysics, v. 4, p. 509-549.

#923 Hill, M.L., and Dibblee, T.W., Jr., 1953, San Andreas, Garlock, and Big Pine faults, California: Geological Society of America Bulletin, v. 64, p. 443–458.

#2878 Jennings, C.W., 1994, Fault activity map of California and adjacent areas, with locations of recent volcanic eruptions: California Division of Mines and Geology Geologic Data Map 6, 92 p., 2 pls., scale 1:750,000.

#6050 Jones, C.J., 1987, Is extension in Death Valley accommodated by thinning of the mantle lithosphere beneath the Sierra Nevada, California?: Tectonics, v. 6, p. 449-473.

#6051 LaViolette, J.W., 1981, Holocene and late Pleistocene displacement history of the western Garlock fault: Long Beach, California State University, unpublished M.S. thesis, 72 p.

#5731 Louie, J.N., Allen, C.R., Johnson, P.C., Haase, P.C., and Cohn, S.N., 1985, Fault slip in southern California: Bulletin of the Seismological Society of America, v. 75, no. 3, p. 811-833.

#6055 McGill, S.F., 1994, Holocene activity on the central Garlock fault, *in* McGill, S.F., and Ross, T.M., eds., Geological investigations of an active margin: Geological Society of America Cordilleran Section Guidebook, p. 356-364.

#6056 McGill, S.F., 1994, Preliminary slip rate and recurrence interval for the western Garlock fault system near Lone Tree Canyon, California: Geological Society of America Abstracts with Programs, v. 26, no. 2, p. 72.

#6059 McGill, S.F., 1998, Summary of neotectonic slip-rate studies of the Garlock and Owl Lake faults, *in* Calzia, J.P., and Reynolds, R.E., eds., Finding faults in the Mojave: San Bernardino County Museum Association Quarterly, v. 45, p. 88-90.

#6060 McGill, S.F., 1999, Slip-rate studies of the Garlock and Owl Lake faults: U.S. Geological Survey National Earthquake Hazards Reduction Program, Annual Summaries v. 40, Contract no. 1434-92-G-2210, 6 p., (electronic version on line at http://erp-web.er.usgs.gov/).

#6061 McGill, S.F., and others, in preparation, Slip rate of the western Garlock fault, rate of soil development, and paleoclimatic implications at a site near Lone Tree Canyon, Mojave Desert, California: Unpublished manuscript in preparation, 18 p.

#6064 McGill, S.F., and Rockwell, T.R., 1998, Ages of late Holocene earthquakes on the central Garlock fault near El Paso Peaks, California: Journal of Geophysical Research, v. 103, no. B4, p. 7265-7279.

#6062 McGill, S.F., and Sieh, K., 1991, Surficial offsets on the central and eastern Garlock Fault associated with prehistoric earthquakes: Journal of Geophysical Research, v. 96, p. 21,587-21,621.

#6063 McGill, S.F., and Sieh, K., 1993, Holocene slip rate of the central Garlock fault in southeastern Searles Valley, California: Journal of Geophysical Research, v. 98, p. 14,217-14,231.

#6053 McGill, S.H.F., 1992, Paleoseismology and neotectonics of the central and eastern Garlock fault, California: Pasadena, California Institute of Technology, unpublished Ph.D. dissertation, 235 p.

#3288 Minster, J.B., and Jordan, T.H., 1987, Vector constraints on western U.S. deformation from space geodesy, neotectonics, and pl. motion: Journal of Geophysical Research, v. 92, p. 4798.

#1211 Pampeyan, E.H., Holtzer, T.L., and Clark, M.M., 1988, Modern ground failure in the Garlock fault zone, Fremont Valley, California: Geological Society of America Bulletin, v. 100, p. 677-691.

#4860 Petersen, M.D., Bryant, W.A., Cramer, C.H., Cao, T., Reichle, M.S., Frankel, A.D., Lienkaemper, J.J., McCrory, P.A., and Schwartz, D.P., 1996, Probabilistic seismic hazard assessment for the State of California: California Department of Conservation, Division of Mines and Geology Open-File Report 96-08 (also U.S. Geological Open-File Report 96-706), 33 p.

#6071 Rodgers, D.A., 1979, Vertical deformation, stress accumulation and secondary faulting in the vicinity of the Transverse Ranges of southern California: California Division of Mines and Geology Bulletin 203, p. 74.

#2993 Roquemore, G.R., Smith, P.E., and Banks, E.W., 1982, Holocene earthquake activity of the eastern Garlock Fault in Christmas Canyon, San Bernardino County, California: Geological Society of America Abstracts with Programs, v. 14, no. 4, p. 228.

#6066 Smith, G.I., 1962, Large lateral displacement on the Garlock fault, California, as measured from offset dike swarm: American Association of Petroleum Geologists Bulletin, v. 46, p. 85-104.

#6067 Smith, G.I., 1964, Geology and volcanic petrology of the Lava Mountains, San Bernardino County, California: U.S. Geological Survey Professional Paper 457, p. 1-97.

#6069 Smith, G.I., and Ketner, K.B., 1970, Lateral displacement on the Garlock fault, southeastern California, suggested by offset sections of similar metasedimentary rocks: U.S. Geological Survey Professional Paper 700-D, p. 1-9.

#6456 Smith, G.I., Troxel, B.W., Gray, C.H., Jr., and von Huene, R., 1968, Geologic reconnaissance of the Slate Range, San Bernardino and Inyo Counties, California: [California] Division of Mines and Geology Special Report 96, 1 sheet, scale 1:62,500.

#6070 Snay, R.A., and Cline, M.W., 1980, Crustal movement investigations at Tejon Ranch, California: National Oceanic and Atmospheric Administration Technical Report 87.

#1653 Stewart, J.H., 1983, Extensional tectonics in the Death Valley area, California—Transport of the Panamint Range structural block 80 km northwestward: Geology, v. 11, no. 3, p. 153-157.

#6075 Troxel, B.W., Wright, L.A., and Jahns, R.H., 1972, Evidence for differential displacement along the Garlock fault zone, California: Geological Society of America Abstracts with Programs, v. 5, p. 250.

#1686 Wernicke, B., Axen, G.J., and Snow, J.K., 1988, Basin and Range extensional tectonics at the latitude of Las Vegas, Nevada: Geological Society of America Bulletin, v. 100, p. 1738-1757.

#6077 Wills, C.J., 1989, Ground cracks along the Garlock fault

	zone in Fremont Valley, Kern County, California: California Division of Mines and Geology Fault Evaluation Report FER-197, microfiche copy in California Division of Mines and Geology Open-File Report 90-14, 7 p., scale 1:24,000. #6078 Wills, C.J., 1989, Ground cracks near the Garlock fault in Searles Valley, San Bernardino County, California: California Division of Mines and Geology Fault Evaluation Report FER-198, microfiche copy in California Division of Mines and Geology Open-File Report 90-14, 6 p., scale 1:24,000.