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Quaternary Fault and Fold Database of the United States

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Greenville fault zone, San Antonio Valley section (Class A) No. 53d

Last Review Date: 2002-06-25

Compiled in cooperation with the California Geological Survey

citation for this record: **Bryant, W.A., and Cluett, S.E., compilers, 2002, Fault number 53d, Greenville fault zone, San Antonio Valley section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 03:05 PM.**

Synopsis	**General:** Historically active dextral strike-slip faults located in the Diablo Range. Minor surface fault rupturing was associated with the January 1980 Livermore Valley earthquakes (Bonilla and others, 1980 #5366; Hart and others, 1980 #5376; Bolt and others, 1981 #5365). Most of the fault trace is based on geologic and geomorphic evidence from detailed reconnaissance-level mapping by Herd (1977 #5364), Dibblee (1980 #5335, 1980 #5370, 1980 #5371, 1980 #5372), Hart (1981 #5375), and Earth Sciences Associates (1982 #5374) as reported in Wright and others (1982 #5357). Trench investigations along the Marsh Creek-Greenville

	section [53b] document latest Pleistocene and Holocene displacement. Partial late Quaternary slip rates of 0.1–0.7 mm/yr have been reported by Wright and others (1982 #5357) and Sweeney (1982 #5361). Unruh and Sawyer (1995 #5339, 1998 #5360) suggested that the late Quaternary slip rate might be as high as 3 mm/yr on the basis of structural modeling. Sawyer and Unruh (2002 #5362) calculated a Holocene dextral slip rate of 4.1±1.8 mm/yr at the Laughlin Road site. **Sections:** This fault has 4 sections. Wright and others (1982 #5357) defined three segments based on differences in geomorphic expression of the fault zone and different apparent ages of activity. From north to south these segments include the Clayton, Marsh Creek-Greenville, and Arroyo Mocho segments. Unruh and Sawyer (1998 #5360) defined four sections based on differences in geomorphic expression and structural character of the fault zone. From north to south their sections are named Livermore, Arroyo Mocho, San Antonio Valley, and Coyote Creek. The Livermore section of Unruh and Sawyer (1998 #5360) mostly corresponds with the southern Marsh Creek-Greenville segment of Wright and others; the Arroyo Mocho section of Unruh and Sawyer (1998 #5360) generally corresponds with the Arroyo Mocho segment of Wright and others (1982 #5357). The Coyote Creek section of Unruh and Sawyer (1998 #5360) is not considered here because Quaternary displacement has not been demonstrated.
Name comments	**General:** The fault was first mapped by Vickery (1925 #5359), who named it the Riggs Canyon fault. Huey (1948 #5363) was the first to use the name Greenville fault for traces along the eastern side of the Livermore Valley. The Greenville fault zone includes traces of the Marsh Creek and Clayton faults, which were first mapped by Colburn (1961 #5369) and named by Brabb and others (1971 #5368). Colburn (1961 #5369) named the structure along the northeastern side of Mount Diablo the Mount Diablo fault. **Section:** Defined as San Antonio Valley section by Unruh and Sawyer (1998 #5360). This section extends from the Arroyo Mocho section along a right-releasing step south to the southern margin of San Antonio Valley.
County(s) and State(s)	SANTA CLARA COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER

Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Location based on is digital revisions to Jennings (1994 #2878) at 1:750,000 using original mapping by Cotton (1972 #5348) at 1:62,500 scale and by Unruh and Sawyer (1998 #5360) at 1:24,000 scale.
Geologic setting	This dextral strike-slip fault zone borders the eastern side of Livermore Valley and is considered to be part of the larger San Andreas fault system in the central Coast Ranges. The fault zone extends from northwest of Livermore Valley along the Marsh Creek and Clayton faults towards Clayton Valley. Unruh and Sawyer (1995 #5339, 1998 #5360) suggested that slip from the Greenville fault is transferred to the Concord fault [38] along the Mt. Diablo fold and thrust belt and that only minimal slip continues to the Clayton fault [53a]. The fault zone extends southeastward into San Antonio Valley, offsets late Mesozoic rocks of the Franciscan Complex. Southeast of Livermore Valley the fault is located within the uplifted Diablo Range and controls the generally linear drainage course of Arroyo Mocho, Colorado, and Sweetwater Creeks. Maximum dextral displacement along the Greenville fault zone is about 8.5–9 km, based on 9 km of dextral offset of a late Mesozoic serpentinite body and about 8.5 km dextral offset of the Tesla fault (Cotton, 1972 #5348; Sweeney, 1982 #5361).
Length (km)	This section is 24 km of a total fault length of 91 km.
Average strike	N20°W (for section) versus N30°W (for whole fault)
Sense of movement	Right lateral *Comments:* Geomorphic expression of the fault zone is indicative of dextral strike-slip offset (Unruh and Sawyer, 1998 #5360).
Dip Direction	V *Comments:* Vertical to near vertical dip is assumed based on dextral strike-slip nature of faulting.
Paleoseismology studies	

Geomorphic expression	The San Antonio Valley section is characterized by a 2- to 3-km-wide zone of discontinuous faults marked by scarps on bedrock, linear stream valleys, dextrally deflected drainages and bedrock ridges, and linear vegetation contrasts (Unruh and Sawyer, 1998 #5360).
Age of faulted surficial deposits	Fault offsets rocks of the Mesozoic Franciscan Complex. In addition, geomorphic features in San Antonio Valley suggest offset of late Cenozoic or Quaternary deposits, but the age of the Quaternary units has not been determined (Cotton, 1972 #5348; Unruh and Sawyer, 1998 #5360).
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Age of most recent paleoevent not determined. Quaternary age is assumed based on geomorphic features observed by Unruh and Sawyer (1998 #5360) in San Antonio Valley.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Unruh and Sawyer (1998 #5360) postulate that the Arroyo Mocho [53c] and Greenville-Marsh Creek [53b] (their Livermore section) sections are more active than sections to the south, based on the lack of well defined Holocene active geomorphic expression. Therefore we categorize this section as probably having a slip rate of 0.2–1 mm/yr. An undetermined amount of slip may be transferred from the Arroyo Mocho section to the Ortigalita fault [52] across the Mt. Osos anticline.
Date and Compiler(s)	2002 William A. Bryant, California Geological Survey Sereyna E. Cluett, California Geological Survey
References	#5365 Bolt, B.A., McEvilly, T.V., and Uhrhammer, R.A., 1981, The Livermore Valley, California, earthquake sequence of January 1980: Bulletin of the Seismological Society of America, v. 71, no. 2, p. 451-463. #5366 Bonilla, M.G., Lienkaemper, J.J., and Tinsley, J.C., 1980,

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#5362 Sawyer, T.L., and Unruh, J.R., 2002, Paleoseismic investigation of the Holocene slip rate on the Greenville fault, eastern San Francisco Bay area, California: U.S. Geological Survey Final Technical Report for the National Earthquake Hazards Reduction Program, Award # 00HQGR0055, 24 p., 1 pl.

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