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Sargent fault zone, northwestern section (Class A) No. 58a

Last Review Date: 2000-08-10

Compiled in cooperation with the California Geological Survey

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Synopsis	**General:** Holocene active reverse-oblique and dextral strike-slip fault zone in the Santa Cruz Mountains, located between the Calaveras [54] and San Andreas [1] fault zones. For this compilation the fault is zone divided into two sections based on the geometry and style of displacement. The northwestern section is characterized by late Quaternary contractional deformation with a dextral strike-slip component. Traces of the southeastern section of the Sargent fault are characterized by predominantly Holocene dextral strike-slip displacement and locally exhibit evidence of dextral fault creep at a rate of about 3 mm/yr

	(Prescott and Burford, 1976 #5437). Geomorphic evidence of Holocene dextral strike-slip displacement characterizes the Castro fault (included with the southeastern section) from the vicinity of Castro Valley southeast to the Pajaro River (Bryant, 1980 #5428); (Bryant and others, 1981 #4805). A paleoseismic study, conducted by Nolan and others (1995 #5436)resulted in a preliminary Holocene dextral displacement rate of 0.6 mm/yr based on apparent vertical separation of offset alluvium and assumptions of the ratio of horizontal to vertical components of displacement. Nolan and others (1995 #5436) acknowledged that the rate is less than the measured fault creep and speculated that slip is transferred to other faults between their trench site and the geodetic site, which is located about 13 km to the northwest. Nolan and others (1995 #5436) reported a preliminary recurrence interval of 1,200–1300 years for 0.7- to 0.8-m slip events. They interpreted four events in the past 5,940 yr, indicating an average recurrence interval of roughly 1,485 years. **Sections:** This fault has 2 sections. There is insufficient data to document seismogenic segments for the Sargent fault zone. Based on geometry and style of offset, the Sargent fault zone is divided into sections for this compilation. The northwestern section extends from the complex junction with the San Andreas fault zone [1] near Lake Elsman southeast to the vicinity of Hecker Pass (Highway 152). This section is characterized by predominantly southwest-dipping reverse faults with an unknown component of dextral strike-slip offset. The southeastern section of the Sargent fault zone extends from the Hecker Pass area southeast to near Hollister. This section is characterized by predominantly dextral strike-slip displacement as evidenced by geomorphic expression (Bryant, 1980 #5428; 1981 #4805), abundant microseismicity (*e.g.*, Bakun and McLaren, 1984 #5427), and geodetic evidence of 3 mm/yr dextral creep (Prescott and Burford, 1976 #5437). The southeastern section is comprised by the Sargent, Castro, Flint Hills East, and Flint Hills West faults.
Name comments	**General:** **Section:** Informal name proposed in this compilation for the section of the Sargent fault zone that extends from its junction with the San Andreas fault [1] near Lake Elsman southeast to near Hecker Pass (Highway 152). Traces of the northwestern section are characterized predominantly by down-to-northeast reverse displacement with an unknown component of dextral strike-slip

	offset. **Fault ID:** Refers to number 222 (Sargent fault) of Jennings (1994 #2878) and A6 (Sargent fault) of Working Group on Northern California Earthquake Potential (1996 #1216).
County(s) and State(s)	SANTA CLARA COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* Locations based on digital revisions of Jennings (1994 #2878) using original mapping by McLaughlin and others (1991 #5433), Clark and others (1989 #4811), McLaughlin and others (1988 #5388), and Dibblee (1973 #4827), (1980 #4838) at 1:24,000 scale.
Geologic setting	The Sargent fault zone is located in an extremely complex contractional system of generally northeast-vergent thrust and reverse faults bounding the eastern side of the Santa Cruz Mountains (Schwartz and others, 1990 #5441; McLaughlin and others, 1997 #5435). This thrust system has been described by McLaughlin and others (1997 #5435) as an eastward-propagating, half-flower structure which roots toward the larger San Andreas fault zone [1]. The Sargent fault zone extends from its complex junction with the San Andreas fault [1] near Lake Elsman southeast through the Santa Cruz Mountains, crosses the Pajaro River floodplain and extends near the northeastern front of the Lomerias Muertas and Flint Hills. The mapped surface traces ends a few kilometers east of Hollister and it is not known if the fault extends farther south-southeast to join the Calaveras fault zone [54]. The Sargent fault zone has been associated with the Berrocal fault zone [57] and has been referred to as the Sargent-Berrocal fault zone. The Sargent fault zone is divided herein into two sections based on style of displacement. Northwest of Hecker Pass, the fault exhibits primarily southwest-dipping reverse-oblique slip with an unknown component of dextral slip and southeast of Hecker Pass the fault zone has principally dextral strike slip. McLaughlin and others (1996 #5434) stated that prominent strike-slip displacement on steeply dipping strands of the fault zone are younger than the lower-angle thrust faults,

	which they truncate. Cumulative vertical offset along the Sargent fault zone is principally down-to-the-northeast reverse and may have as much as 3 km of vertical displacement, 2 km of horizontal shortening and 4 km of reverse-slip since Miocene time (<5 m.y.) (McLaughlin and others, 1997 #5435). The component of dextral slip is unknown, but McLaughlin and others (1997 #5435) speculated that the Sargent fault zone could account for as much as 26 km of dextral slip. Aydin and others (1992 #5426) reported evidence of dextral-reverse slip on the Sargent fault near Lake Elsman, the result of probable secondary surface-rupture associated with the 1989 Ms 7.1 Loma Prieta earthquake.
Length (km)	This section is 29 km of a total fault length of 54 km.
Average strike	N55°W
Sense of movement	Reverse *Comments:* McLaughlin (1971 #1318; 1973 #5430; 1974 #5431; 1990 #5432) and Sorg and McLaughlin (1975 #5442) reported that displacement is principally down-to-northeast reverse with an unknown component of dextral strike-slip motion.
Dip	22°SE to 90° *Comments:* Dip varies from 22? to near vertical according to McLaughlin (1973 #5430; 1990 #5432) and McLaughlin and others (1988 #5388; 1991 #5433).
Paleoseismology studies	
Geomorphic expression	Fault follows the deep linear valley of Uvas Creek and to the northwest is expressed as a series of aligned notches the separate Upper Cretaceous conglomerate from Eocene(?) marine sandstone and shale (McLaughlin, 1990 #5432). Late Quaternary displacement is indicated by captured drainages and linear troughs (McLaughlin, 1974 #5431).
Age of faulted surficial deposits	Non-Franciscan Mesozoic rock is thrust over Miocene sedimentary rock between Loma Prieta and Mt. Madonna (McLaughlin, 1974 #5431).
Historic earthquake	

Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Timing of the most recent paleoevent is unknown. However, the geomorphic expression of the fault zone is suggestive of latest Pleistocene to Holocene displacement (Bortugno and others, 1991 #5367).
Recurrence interval	
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* Wesnousky (1986 #5305) assigned a preferred slip-rate of 1.0 mm/yr for the entire Sargent-Berrocal fault zone. Slip rate of greater than 1 mm/yr is assumed based on continuity with southeastern section [58b] and use of 3 mm/yr by Petersen and others (1996 #4860).
Date and Compiler(s)	2000 William A. Bryant, California Geological Survey
References	#5377 Allen, J.E., 1946, Geology of the San Juan Bautista quadrangle, California: California Division of Mines and Geology Bulletin 133, 57 p. #5426 Aydin, A., Johnson, A.M., and Fleming, R.W., 1992, Right-lateral-reverse surface rupture along the San Andreas and Sargent faults associated with the October 17, 1989, Loma Prieta earthquake: Geology, v. 20, p. 1063-1067. #5427 Bakun, W.H., and McLaren, M., 1984, Microearthquakes and the nature of the creeping-to-locked transition of the San Andreas fault zone near San Juan Bautista, California: Bulletin of the Seismological Society of America, v. 74, no. 1, p. 235-254. #5367 Bortugno, E.J., McJunkin, R.D., and Wagner, D.L., 1991, Map showing recency of faulting, San Francisco-San Jose quadrangle, California: California Division of Mines and Geology Regional Geologic Map Series, Map 5A, Sheet 5, scale 1:250,000. #5428 Bryant, W.A., 1980, SE segments of Sargent and Castro faults: California Division of Mines and Geology Fault Evaluation Report FER-96, microfiche copy in Division of Mines and Geology Open-File Report 90-11, 19 p., scale 1:24,000.

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#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.

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Department of the Interior and U.S. Department of Housing and Urban Development Basic Data Contribution 13), 2 sheets, scale 1:12,000.

#5430 McLaughlin, R.J., 1973, Geology of the Sargent fault zone in the vicinity of Mount Madonna, Santa Clara and Santa Cruz Counties: California State University, San Jose, unpublished M.S. thesis, 131 p., scale 1:12,000.

#5431 McLaughlin, R.J., 1974, The Sargent-Berrocal fault zone and its relation to the San Andreas fault system in the southern San Francisco Bay region and Santa Clara Valley, California: U.S. Geological Survey Journal of Research, v. 2, no. 5, p. 593-598.

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Questions or comments?