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Quaternary Fault and Fold Database of the United States

As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.

Chupines fault zone, Laguna Seca section (Class A) No. 145b

Last Review Date: 2001-06-07

citation for this record: **Bryant, W.A., compiler, 2001, Fault number 145b, Chupines fault zone, Laguna Seca 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 02:05 PM.**

Synopsis	**General:** Late Quaternary active dextral-reverse slip fault with generally up-on-north vertical component of displacement. Detailed reconnaissance level of mapping for fault, based on geological mapping by Herold (1935 #6142), Fiedler (1944 #6140), Bowen (1969 #6133), Dibblee (1974 #4829), Clark and others (1974 #6136), and Rosenberg and Clark (1994 #6144). Vaughn and others (1991 #6147) reported a maximum late Pleistocene dextral slip-rate of 2 mm/yr. Rosenberg and Clark (1994 #6144) reported a Quaternary vertical slip rate of 0.14 mm/yr. No detailed site studies have been conducted. **Sections:** This fault has 3 sections.
Name comments	**General:**

	Section: Section name proposed in this compilation. Section extends from the bifurcation of Chupines fault near Canyon Del Rey where the fault changes to a more east-west strike southeast to its intersection with Laureles Grade Road where the fault changes to a more northwesterly strike. **Fault ID:** Refers to numbers 235 (Chupines fault) and 233 (Ord Terrace fault) of Jennings (1994 #2878).
County(s) and State(s)	MONTEREY COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Location based on digital revisions to Jennings (1994 #2878) using original mapping by Bowen (1969 #6133) and Dibblee (1974 #4829) at 1:62.500; mapping by Clark and others (1997 #6137; 2000 #6138) at 1:24,000.
Geologic setting	Generally northwest-striking zone of discontinuous faults located in the complexly deformed Salinian block bounded by the San Andreas fault zone [1] to the northeast and the San Gregorio fault [60] zone to the southwest. Quaternary and late Quaternary traces of the Chupines fault zone extend for about 18 km from the southern side of Monterey Bay southeast to the vicinity of Calera Canyon. Traces of the Chupines fault zone extend about 16 km farther to the southeast toward the crest of the Sierra de Salinas, but this 16 km section lacks documented Quaternary displacement (Jennings, 1994 #2878). Cumulative dextral and vertical displacement is not known. Reports of vertical displacement range from 150 m of Plio-Pleistocene Paso Robles Formation (Staal Gardner and Dunne Inc., 1988 #6146), to about 300 m of vertical displacement of granitic basement rocks. Clark and others (1974 #6136) speculated that either post-Miocene faulting is minor or deformation has been manifested primarily as folding rather than faulting.
Length (km)	This section is 18 km of a total fault length of 50 km.
Average strike	N73°W (for section) versus N44°W (for whole fault)
Sense of	Right lateral

movement	*Comments:* Displacement not well documented. Bowen (1969 #6133), Greene and others (1973 #1323), Greene (1977 #6141), and Dibblee (1974 #4829) characterized displacement as down-to-north vertical whereas Clark and others (1974 #6136) depict down-to-south vertical offset. Sieck (1964 #6145) postulated about 300 m of down-to-north vertical displacement of granitic basement rocks. Dextral strike-slip displacement has not been documented.
Dip Direction	V; N; S *Comments:* Clark and others (1974 #6136) reported dips that range from 70?N to 63?S. Bowen (1980 #6134) reported vertical fault with E-W strike exposed in trench.
Paleoseismology studies	
Geomorphic expression	Bowen (1969 #6133) reported that the Laguna Seca section of the Chupines fault is delineated by sidehill ridges, a linear trough, and closed depressions. However, Bryant (1985 #6135) interpreted these features as landslide-related.
Age of faulted surficial deposits	Fault offsets Miocene Monterey and Santa Margarita Formation, Plio-Pleistocene Paso Robles Formation
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Evidence of late Quaternary offset is poorly documented. Bowen (1969 #6133) mapped late Pleistocene terrace deposits as concealing traces of the Chupines fault. Geomorphic features suggest late Quaternary offset (Bowen, 1969 #6133). Buchanan-Banks and others (1978 #1244) reported Quaternary offset along this section of the Chupines fault
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr

	Comments: Geomorphic expression of fault and association with traces to the northwest (Quaternary vertical component slip rate estimate of 0.14 mm/yr) suggest slip rate of less than 0.5 mm/yr.
Date and Compiler(s)	2001 William A. Bryant, California Geological Survey
References	#6133 Bowen, O.E., Jr., 1969, Geologic map of the Monterey quadrangle: California Division of Mines and Geology open-file map, scale 1:62,500. #6134 Bowen, O.E., Jr., 1980, Report of fault investigation at Mesa Hills West subdivision, Monterey County, California: Unpublished consulting report, 3 p. #6135 Bryant, W.A., 1985, Faults in the southern Monterey Bay area, Monterey County, California: California Division of Mines and Geology Fault Evaluation Report 167 (microfiche copy in California Division of Mines and Geology Open-File Report 90-11). #1244 Buchanan-Banks, J.M., Pampeyan, E.H., Wagner, H.C., and McCulloch, D.S., 1978, Preliminary map showing recency of faulting in coastal south-central California: U.S. Geological Survey Miscellaneous Field Studies Map MF-910, 11 p. pamphlet, 3 sheets, scale 1:250,00. #6138 Clark, J.C., Brabb, E.E., and Rosenberg, L.I., 2000, Geologic map of the Spreckels 7.5-minute quadrangle: U.S. Geological Survey Miscellaneous Field Studies Map MF-2349, scale 1:24,000. #6136 Clark, J.C., Dibblee, T.W., Jr., Greene, H.G., and Bowen, O.E., Jr., 1974, Preliminary geologic map of the Monterey and Seaside 7.5-minute quadrangles, Monterey County, California, with emphasis on active faults: U.S. Geological Survey Miscellaneous Field Studies Map MF-577, scale 1:24,000. #6137 Clark, J.C., Dupre, W.R., and Rosenberg, L.I., 1997, Geologic map of the Monterey and Seaside 7.5-minute quadrangles, Monterey County, California—A digital database: U.S. Geological Survey Open-File Report 97-30, map scale, scale 1:24,000. #4829 Dibblee, T.W., Jr., 1974, Geologic maps of the Monterey,

Salinas, Gonzales, Point Sur, Jamesburg, Soledad, and Junipero Serra 15-minute quadrangles, Monterey County, California: U.S. Geological Survey Open-File Report 74-5021, 7 sheets, scale 1:62,500.

#6140 Fiedler, W.M., 1944, Geology of the Jamesburg quadrangle, Monterey County, California: California Journal of Mines and Geology, Report XL of the State Mineralogist, v. 40, no. 2, p. 177-250, scale 1:62,500.

#6141 Greene, H.G., 1977, Geology of the Monterey Bay region: U.S. Geological Survey Open-File Report 77-718, 347 p., 9 pls.

#1323 Greene, H.G., Lee, W.H.K., McCulloch, D.S., and Brabb, E.E., 1973, Faults and earthquakes in the Monterey Bay region, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-518 (U.S. Department of the Interior and U.S. Department of Housing and Urban Development Basic Data Contribution 58), 14 p. pamphlet, 4 sheets.

#6142 Herold, C.L., 1935, Preliminary report on the geology of the Salinas quadrangle, California: Berkeley, University of California, unpublished M.S. thesis, 143 p., scale 1:62,500.

#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.

#6143 Newcomb, R.C., 1941, IX zone constructing quartermaster project of the Fort Ord water supply problem—A summary of some geological features prepared during the period of inspection of test well program, June 26 to August 10, 1941:U.S. Geological Survey, Water Resources Branch, report, 7 p.

#6144 Rosenberg, L.I., and Clark, J.C., 1994, Quaternary faulting of the greater Monterey area, California: Technical report to U.S. Geological Survey, under Contract 1434-94-G-2443, 27 p., scale 1:24,000.

#6145 Sieck, H.C., 1964, Gravity investigation of the Monterey-Salinas area, California: Stanford, California, Stanford University report on student research project, 32 p., 7 sheets, scale 1:62,500.

	#6146 Staal Gardner and Dunne Inc., 1988, Phase II hydrogeologic investigation, Laguna Seca subarea, Monterey County, California: County of Monterey Department of Health open-file report, 33 p., 8 sheets, scale 1:12,000. #6147 Vaughn, P.R., Allwardt, A.O., and Crenna, P.C., 1991, Late Quaternary activity on the Berwick Canyon fault and Chupines fault near Monterey, coastal central California: Geological Society of America Abstracts with Programs, Cordilleran Section, v. 23, no. 2, p. 105.