Jump to Navigation

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, Del Rey Oaks section (Class A) No. 145a

Last Review Date: 2001-06-07

citation for this record: **Bryant, W.A., compiler, 2001, Fault number 145a, Chupines fault zone, Del Rey Oaks 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 consists of the Chupines, Ord Terrace, and Seaside faults. The Seaside fault may connect with a strand of the Monterey Bay fault zone [62] offshore north of the Seaside area. The Del Rey Oaks section extends from the southern side of Monterey Bay southeast to the Canyon Del Rey area where strands of the Chupines fault change from a northwest strike to a more E-W strike. Traces of the Seaside and Chupines faults merge at the southern extent of the Del Rey Oaks section. **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 (1974 #6136), Rosenberg and Clark (1994 #6144)), and Clark and others (1997 #6137) 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 36 km of a total fault length of 50 km.
Average strike	N38°W (for section) versus N44°W (for whole fault)
Sense of movement	Right lateral *Comments:* Rosenberg and Clark (1994 #6144) considered major component of late Quaternary displacement to be dextral strike-slip, based on trench exposures of the Chupines fault reported by Vaughn and others (1991 #6147), and geomorphic features suggestive of dextral strike-slip offset.
Dip Direction	V; NW; SE *Comments:* Vaughn and others (1991 #6147) reported a vertically dipping fault exposed in 2 trenches and a road cut exposure.
Paleoseismology studies	
Geomorphic expression	Vaughn and others (1991 #6147) reported that Chupines fault is delineated by geomorphic evidence of late Pleistocene to Holocene dextral strike-slip displacement such as aligned saddles, linear drainages, and a dextrally deflected drainage. Rosenberg and Clark (1994 #6144) suggested that some of these geomorphic features may be due to massive landsliding. Much of the Del Rey Oaks section of the Chupines fault is concealed by Holocene alluvium (Clark and others, 1974 #6136; Rosenberg and Clark, 1994 #6144).
Age of faulted surficial deposits	Fault offsets Miocene Monterey Formation, Plio-Pleistocene Paso Robles Formation, and late Pleistocene terrace deposits (Dibblee, 1974 #4829; Clark and others, 1974 #6136; Vaughn and others, 1991 #6147).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Timing of the most recent paleoevent is not well constrained. Vaughn and others (1991 #6147) reported late Pleistocene and possible Holocene displacement based on soil stratigraphic relationships observed in trenches and roadcut exposures. Rosenberg and Clark (1994 #6144), citing Vaughn and others (1991 #6147) and McCulloch and Greene (1990 #5406),

	concluded that stratigraphic evidence indicates minor post-Pleistocene displacement.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Slip rate of 0.14 mm/yr reported by Rosenberg and Clark (1994 #6144), based on report by Staal, Gardner and Dunne, Inc. (1988 #6146), this is vertical component only and is based on 150 m vertical offset of 1.1 Ma Paso Robles Formation. Vaughn and others (1991 #6147) estimated a maximum Holocene dextral slip rate of 2 mm/yr, based on a dextrally deflected drainage that aligns with trench exposures of near vertical fault.
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. #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.

#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.

#5406 McCulloch, D.S., and Greene, H.G., 1990, Geologic map of the central California continental margin, Map No. 5A (Geology), *in* Green, H.G., and Kennedy, M.P., eds., Geology of the central California continental margin: California Division of Mines and Geology California Continental Margin Geologic Map Series, Area 5 of 7, scale 1:250,000.

#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.

#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.

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