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Quaternary Fault and Fold Database of the United States

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Towne Pass fault (Class A) No. 97

Last Review Date: 2002-02-07

Compiled in cooperation with the California Geological Survey

citation for this record: **Machette, M.N., Klinger, R.E., Piety, L.A., and Bryant, W.A., compilers, 2002, Fault number 97, Towne Pass fault, 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 03:11 PM.**

Synopsis	The Towne Pass fault is located along the western sides of Tucki Mountain and Pinto Peak in the Panamint Range between Death Valley on the north and Panamint Valley on the south. It strikes north-northeast and dips to the west at 45?-85?. The fault forms pronounced lineaments, bedrock escarpments, and scarps on surficial deposits that may be as young as latest Pleistocene to Holocene age, although the most recent movement on the fault (<130 ka) is not well constrained. The fault has been studied using aerial photographs at scales of 1:24,000 to 1:80,000, compilation of existing data, and limited field examination, but there have been no detailed studies of scarp morphology. No slip rate or recurrence interval data have been reported, nor have any

	paleoseismic studies been conducted owing to trenching restrictions within Death Valley National Park.
Name comments	The Towne Pass fault bounds the western sides of Tucki Mountain and Pinto Peak in the Panamint Range between Death Valley on the northeast and Panamint Valley on the southwest. The fault was named by Hall (1971 #1521) based on its proximity to Towne Pass. The fault extends from about Wildrose Canyon north along Towne Pass and Emigrant Wash, curving northeast along the north side of Tucki Mountain in Death Valley, a distance of about 38 km. Hall (1971 #1521) showed only the southern 13 km of the Towne Pass fault (that part west of long 117? 15' W). **Fault ID:** Refers to fault TP (Towne Pass) of Piety (1995 #915) and fault 245 of Jennings (1992 #473).
County(s) and State(s)	INYO COUNTY, CALIFORNIA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:62,500 and 1:100,000 scale. *Comments:* Location of fault from Qt_flt_ver_3-0_Final_WGS84_polyline.shp (Bryant, W.A., written communication to K.Haller, August 15, 2017) attributed to 1:62,500-scale map by Bryant (1989 #1459) and 1:100,000-scale map by Reheis (1991 #1602). The fault also is mapped by Piety (1995 #915) at 1:250,000 scale.
Geologic setting	The Towne Pass fault strikes north to northeast across the western flank of the Panamint Range (Reheis, 1991 #1602), east of the Cottonwood Mountains. Streitz and Stinson (1974 #1659) showed two traces of the fault that are separated by an en echelon left step near Towne Pass. Hamilton (1988 #593) and Reheis (p. 2, 1991 #1602) (citing Wernicke and others, 1986 #2390) suggested that the Towne Pass fault along the western side of Tucki Mountain may be a northern continuation of the Panamint Valley fault [67], in as much as the two faults appear to join near the mouth of Wildrose Canyon. Hall (p. 58, 1971 #1521) stated that the Towne Pass fault extends about 48 km (30 miles) south of Towne Pass, through Wildrose

	graben, and along the eastern side of Panamint Valley to the Slate Range, an extension that would include the Panamint Valley fault [67]. The north-striking Emigrant fault (EM) as shown by Reheis (1991 #1602) appears to intersect the Towne Pass fault along the northern side of Tucki Mountain. In the vicinity of Nova Canyon, the Towne Pass fault parallels the Nova fault of Hall (pl. 1, 1971 #1521). The Nova fault is about 13 km (8 miles) long, dips 45? W. to 85? W., has an estimated 610 m (2,000 ft) of west-side-down, dip-slip (normal) displacement, and displaces Pliocene through Quaternary alluvial-fan deposits (his Tf3, QTf3, and Qf1 deposits). The fault appears to be concealed by Holocene alluvium (p. 58, Hall, 1971 #1521). The structural relationships among these faults are not known.
Length (km)	58 km.
Average strike	N19°E
Sense of movement	Normal *Comments:* Displacement along the Towne Pass fault is shown by Reheis (1991 #1602) and noted by Hunt and Mabey (p. A114, 1966 #1551) and Hall (p. 57, 1971 #1521) as down to the west. Hall (p. 57, 1971 #1521) reported that he observed no evidence for lateral displacement on the Towne Pass fault. Hunt and Mabey (p. A114, 1966 #1551) reported at least 153 m (500 ft) of vertical displacement on the Towne Pass fault.
Dip	45°-80° W *Comments:* Hall (p. 57, 1971 #1521) noted dips of 45? W to 80? W on the fault near Towne Pass. Geophysical studies (MIT 1985 Field Geophysics Course and Biehler, 1987 #1582) suggest that the fault may possibly be low-angle normal at shallow depth in the crust.
Paleoseismology studies	
Geomorphic expression	Most of the Towne Pass fault is characterized by Reheis (1991 #1602) as forming prominent lineaments or west-facing scarps on surfaces of Quaternary deposits where faults in Quaternary deposits were identified from previous mapping. A 7-km-long, north-striking section south of Towne Pass is shown by Reheis

	(pl. 2, 1991 #1602) as a topographic lineament that bounds a linear range front, which is herein considered to be a bedrock section of the Towne Pass fault. No detailed morphometric analyses has been performed on the scarps. Hart (table 1, p. 22, 1989 #1532) noted the presence of beheaded drainages along the fault, which he thought suggested latest Pleistocene to Holocene displacement on the Towne Pass fault.
Age of faulted surficial deposits	The map by Hall (pl. 1, 1971 #1521) shows a 4-km-long section of the fault near Towne Pass as juxtaposing bedrock (Ordovician or Mississippian rock) on the east against one of variety of Quaternary to Quaternary/Tertiary units on the west. Bryant (p. 13, 1989 #1459) reported that the Towne Pass fault juxtaposes Paleozoic bedrock against Pliocene-Pleistocene fanglomerates and, locally, Holocene alluvium. Streitz and Stinson (1974 #1659) showed the northern part of the Towne Pass fault as juxtaposing Holocene alluvium on the west against Pliocene and (or) Pleistocene nonmarine rocks on the east, however, we are unsure as to whether this contact represent a structural or depositional juxtaposition. The northern end of the Towne Pass fault east of Emigrant Wash along Tucki Mountain is shown by Hunt and Mabey (pl. 1, 1966 #1551) as being concealed by upper Pleistocene alluvial-fan gravel (their Qg3 deposits). Much of this portion of the fault is probably a combination of tectonic and fluvial-cut features. Streitz and Stinson (1974 #1659) indicated that the southern end of the Towne Pass fault (north of Wildrose Canyon) is concealed by Pliocene and (or) Pleistocene nonmarine rocks and juxtaposes Pliocene nonmarine rock against Pliocene and (or) Pleistocene nonmarine rocks. The very southern part of the Towne Pass fault is shown by Hall (pl. 11971 #1521) (just west of long 117? 15' W) as displacing Pliocene alluvial-fan deposits (his Tf3 unit) against Quaternary and Tertiary alluvial-fan deposits (his QTf2 deposits). In contrast, Hart (1989 #1532) portrayed the southern end of the Towne Pass fault as having Holocene displacement. Finally, the map by Hall (pl. 11971 #1521) shows additional north-northwest-striking faults near Nova Canyon west of the Panamint Range front (part of the Towne Pass fault?). These faults displace Pliocene alluvial-fan deposits (his Tf3 deposits) and Quaternary and Tertiary alluvial-fan deposits (his QTf3 deposits). Hall (p. 581971 #1521) suggested that most of the net displacement on the Towne Pass fault is older than an overlying, upper Pliocene basalt.
Historic	

earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Age-category is based on local evidence of displace Holocene alluvium (Bryant, 1989 #1459). Jennings (1992 #473) showed one short section of the Towne Pass fault as Holocene, but the remainder as having Quaternary displacement (<1.6 Ma). Bryant (p. 13, 1989 #1459) reported that the Towne Pass fault juxtaposes Paleozoic bedrock against Pliocene-Pleistocene fanglomerates and, locally, Holocene alluvium. Thirdly, Streitz and Stinson (1974 #1659) showed the northern part of the Towne Pass fault as juxtaposing Holocene alluvium against bedrock. Conversely, Hunt and Mabey (pl. 1, 1966 #1551) showed the northern end of the fault as concealed by upper Pleistocene alluvial-fan gravel (their Qg3 deposits, probably latest Pleistocene to Holocene). In general, there seems to be a consensus for Holocene movement. Less supportive is the idea that well developed scarps on unconsolidated alluvial sediment suggests movement that is probably <100 ka (Hanks and Andrews, 1989 #338), based on rates of scarp degradation in the Basin and Range. We herein consider the fault to have been active in the past 15 ka, pending further research.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* There is no published information on the size of fault scarps, age of deformed surficial deposits, or timing of net displacement along the fault. Owing to the relatively discontinuous (preserved?) nature of the fault scarps, we suspect that the slip rate is probably <0.2 mm/yr, in accord with other less active faults in the Basin and Range.
Date and Compiler(s)	2002 Michael N. Machette, U.S. Geological Survey, Retired Ralph E. Klinger, U.S. Bureau of Reclamation Lucy A. Piety, U.S. Bureau of Reclamation William A. Bryant, California Geological Survey
References	#1459 Bryant, W.A., 1989, Panamint Valley fault zone and related faults, Inyo and San Bernardino Counties, California: California Division of Mines and Geology Fault Evaluation Report FER-206, 33 p., 1 pl., scale 1:62,500.

#1521 Hall, W.E., 1971, Geology of the Panamint Butte quadrangle, Inyo County, California: U.S. Geological Survey Bulletin 1299, 67 p., 1 pl., scale 1:48,000.

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#1532 Hart, E.W., Bryant, W.A., Wills, C.J., Treiman, J.A., and Kahle, J.E., 1989, Summary report—Fault evaluation program, 1987-1988, southwestern Basin and Range region and supplemental areas: California Division of Mines and Geology Open-File Report 89-16, 31 p., 1 pl., scale 1:500,000.

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