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Elsinore fault zone, Julian section (Class A) No. 126e

Last Review Date: 1998-12-01

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Synopsis	**General:** A major dextral strike-slip fault zone that is part of the San Andreas fault system. Research studies have been done to assess faulting on most of the sections, and have documented Holocene activity for the length of the fault zone with a slip rate around 4–5 mm/yr. Multiple events have only been dated on the Whittier fault and Glen Ivy North fault strand, so interaction between faults and adjacent sections is not well-known. Multiple strands within several sections mean that the studies are not always fully representative of the whole section. Numerous consulting reports (not summarized herein) that have addressed location and recency of faulting are on file with the State of California, California Geological Survey, as part of the records of their Alquist-Priolo Earthquake Fault Zoning Program. **Sections:** This fault has 7 sections. Sections are selected

	following the segmentation from Working Group on California Earthquake Probabilities (1995 #4945) from north to south: Whittier section [126a], Chino section [126b], Glen Ivy section [126c], Temecula section [126d], Julian section [126e], Coyote Mountain section [126f], with addition of Laguna Salada section [126g] as used by Petersen and others (1996 #4860) and Chino fault (paired with the Whittier fault by Rockwell and others, 1992 #6431).Anderson and others (1989 #6372) also identified same segments, with addition of Chupamiertos and Sierra Mayor segments in Baja California (not included in this summary); Wesnousky (1986 #5305) defined four segments, combining the Whittier, Chino and Glen Ivy into his segment A, Temecula into segment B, Julian into segment C, and the Coyote Mountain and Laguna Salada sections into segment D.
Name comments	**General:** **Section:** Section is double stranded and includes Earthquake Valley fault (#482), Elsinore fault (#483) and unnamed faults (#470) of Jennings (1994 #2878). Northwestern extension of the Earthquake Valley fault is the Agua Tibia fault; northern end of section is at change in strike between Agua Tibia Mountain and Pala Mountain; southern end is at left-step at Tierra Blanca Mountain; portion of Earthquake Valley fault in San Felipe Valley was shown by Ellis and Lee (1919), called San Felipe fault by Merriam (1958 #6422) and referred to as San Felipe Valley fault by Smith (1979 #6435), probably to avoid confusion with the separately named pre-Quaternary San Felipe fault about 5 km to the east as shown by Jennings (1994 #2878);"Earthquake Valley fault" appears in Dibblee (1954 #6376) and Jahns (1954 #6417) and probably has earlier origins. **Fault ID:** Refers to numbers 431 (Chino fault), 444 (Whittier fault), 446 (Fresno, Tin Mine and Main Street faults), 460 (Wildomar fault), 461 (Glen Ivy North fault), 462 (Glen Ivy South fault), 467 (Willard fault), 469 (Wolf Valley fault), 470 (unnamed faults flanking Agua Tibia Mountain), 482 (Earthquake Valley), 483 & 496 (Elsinore fault), and 511 (Laguna Salada fault) of Jennings (1994 #2878); and numbers 10 (Chino fault), 12 (Whittier fault), 13 (Main Street fault), 14 (Fresno-Eagle fault), 15 (Tin Mine fault), 16 (Glen Ivy North fault), 17 (Glen Ivy South fault), 18 (Wildomar fault), 19 (Willard fault), 20 (Wolf Valley fault) of Ziony and Yerkes (1985 #5931).
County(s) and	SAN DIEGO COUNTY, CALIFORNIA

State(s)	SAN DIEGO COUNTY, CALIFORNIA
Physiographic province(s)	LOWER CALIFORNIAN BASIN AND RANGE PACIFIC BORDER
Reliability of location	Good Compiled at 1:24,000 scale. *Comments:* Location of Holocene traces adapted from State of California Alquist-Priolo Earthquake Fault Zone maps (1:24,000 - Agua Caliente Springs, Earthquake Valley, Julian, Mesa Grande, Monument Peak, Ranchita and Warners Ranch quadrangles) using additional information from Magistrale and Rockwell (1996 #1230), Clark (1982 #1251), and Smith (1979 #6435).
Geologic setting	The Elsinore fault zone is a major dextral shear system, parallel to the southern San Andreas fault [1], that accommodates about 5 mm/yr of the Pacific-North American Plate boundary slip. The northern elements of the fault zone, the Chino and Whittier faults, bound the Puente Hills, an uplifted block of Tertiary sediments. The Glen Ivy section forms the northeast boundary of the Santa Ana Mountains, and, together with the Temecula section, forms the Elsinore trough. To the southeast the fault zone (Temecula, Julian, and Coyote Mountain sections) cuts diagonally across various Peninsular Range batholithic and pre-batholithic metamorphic terrain until it reaches the southwestern margin of the Salton Trough as the Laguna Salada fault. Total strike-slip is reported to be as much as 40 km but is more likely only 10–15 km, and total vertical separation is about 200 m (Hull and Nicholson, 1992 #6416).
Length (km)	This section is 79 km of a total fault length of 306 km.
Average strike	N56°W (for section) versus N51°W (for whole fault)
Sense of movement	Right lateral, Reverse *Comments:* Vaughan and Rockwell (1986 #6443) note thrust component introduced at the bend in the fault zone south of Agua Tibia Mountain and Clark (1982 #1251) discusses the evidence for vertical displacements possibly overshadowing dextral offset. Todd and Hoggatt (1979 #6440) argued for principally vertical displacements on the southern part of this section. Both extensional and compressional effects are discussed in the literature, probably related to a compressional left-step at the

	northern end of the section, around Agua Tibia Mountain, and, at the south end of the section, an older extensional right-step from the Earthquake Valley fault to the Coyote Mountain section [126f] (Magistrale and Rockwell, 1996 #1230).
Dip	near-vertical to 45°, NE *Comments:* Seismicity and outcrop pattern are suggestive of a high-angle fault (Merriam, 1958 #6422; Magistrale and Rockwell, 1990 #6421; Magistrale and Rockwell, 1996 #1230); shallower northeast dip is indicated, but not quantified at northern end, south of Agua Tibia Mountain (Vaughan and Rockwell, 1986 #6443).
Paleoseismology studies	Site 126-12 at south end of Lake Henshaw: trench across low scarp exposed sediments deformed by underlying shear zone (Thorup, 1997 #6438) with evidence for at least two events.
Geomorphic expression	Geomorphic expression of the fault is weaker in this double-stranded section than sections to the north or south, but includes dextrally deflected drainages, shutter ridges, hillside benches and scarps in alluvium (Magistrale and Rockwell, 1996 #1230); some stretches are largely erosional in expression (Clark, 1982 #1251); Smith (1979 #6435; 1979 #6436) observed numerous offset and beheaded drainages, benches and scarps along both the main Elsinore fault and the Earthquake Valley fault.
Age of faulted surficial deposits	Holocene alluvium and Quaternary alluvial deposits (Smith, 1979 #6435; Smith, 1979 #6436; Thorup and others, 1997 #6439).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* 1.3- 2.2 ka at Lake Henshaw and 1.2?0.5 ka near Julian (Thorup, 1997 #6438).
Recurrence interval	3-3.5 ka *Comments:* Poorly constrained estimate from Thorup (1997 #6438) based on most recent event and previous event bracketed between 4-6.1 ka; poorly constrained interval of 340 (+290, -125) yr calculated recurrence by Working Group on California

	Earthquake Probabilities (1995 #4945); no recorded large earthquakes (1884 to 1999).
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* No data, but inferred here to be similar to sections to the north [126d] and south [126f]; Magistrale and Rockwell (1996 #1230) suggest slip rate is lower on individual strands due to distribution between Elsinore and Earthquake Valley faults; Earthquake Valley fault estimated to be 2?1 mm/yr by Petersen and others (1996 #4860) and 5.0 mm/yr (with minimum and maximum assigned slip rates of 3.0 mm/yr and 7.0 mm/yr, respectively) across the rest of the zone--this is probably incorporated as part of the Working Group on California Earthquake Probabilities (1995 #4945) slip rate for the Julian section.
Date and Compiler(s)	1998 Jerome A. Treiman, California Geological Survey
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