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San Gabriel fault zone, Honor Rancho section (Class A) No. 89b

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Synopsis	**General:** Quaternary to late Quaternary active dextral normal fault zone that locally exhibits evidence of Holocene displacement. The fault zone extends for about 135 km from the Frazier Mountain area southeast to the Saugus/Castaic area where the fault's strike changes to an east-west trend through the southern San Gabriel Mountains. The fault apparently either dies out or is truncated by the San Antonio fault [328] in the eastern San Gabriel Mountains (Ehlig, 1973 #7867; Weber, 1982 #7881, 1986 #7882; Powell, 1993 #5753; Matti and Morton, 1993 #5737). **Sections:** This fault has 5 sections. There is insufficient data to delineate seismogenic segments. Weber (1982 #7881) described 5 segments that delineate the San Gabriel fault zone, and his nomenclature is adopted in this compilation, although section

	boundaries are slightly modified. From north to south they included the Palomas [89a], Honor Rancho [89b], Newhall [89c], San Gabriel River [89d], and Big Tujunga [89e] sections. Crowell (1982 #7857) suggested that dextral offset on the San Gabriel fault began in late Miocene (about 10 Ma) and mostly ceased by the end of Miocene time and concluded that dextral slip within the San Andreas transform system switched from the San Gabriel to the San Andreas fault [1] about 5 Ma. Weber (1982 #7881), however, questioned this interpretation, and noted that Pliocene Hungry Valley Formation is disrupted by the San Gabriel fault and that a few kilometers of dextral offset occurred after deposition of the Hungry Valley Formation. Weber (1982 #7881) presented geomorphic and stratigraphic evidence of late Quaternary dextral normal offset. Cotton (1986 #7848, 1987 #7854) documented evidence of Holocene strike-slip displacement along the Honor Rancho section [89b] of the San Gabriel fault at the Rye Canyon [89-1a] and Trench A [89-1b] paleoseismic sites. Alluvial package mismatches across faults exposed at the Rye Canyon site [89-1a] indicate significant strike-slip offset. Cotton (1986 #7848, 1987 #7854) reported a preliminary Holocene dextral slip rate of about 0.6 mm/yr, based on dextrally offset paleochannel and fold axis exposed at the Trench A site [89-1b]. Uncertainty values were not reported in Cotton (1987 #7854).
Name comments	**General:** Fault first mapped and named by Kew (1924 #6014) for northwest striking fault extending from Tujunga Canyon northwest to the vicinity of Holser Canyon. Kew (1924 #6014) named the fault based on exposures in the western San Gabriel Mountains. Additional named faults forming the San Gabriel fault zone include: Canton, Castaic Valley, Daisy, De Mille, Dillon, Gold Creek, Piru, Placerita, and Ybarra faults. The San Gabriel fault zone bifurcates near Big Tujunga Creek and strands here have been referred to as the Vasquez or Vasquez Creek fault (Miller, 1928 #5961; Jahns and Proctor, 1975 #6093, Crook and others, 1987 #5956), the Sierra Madre fault (Eckis, 1934 #6087; Ehlig, 1968 #7865), or the South Branch of the San Gabriel fault (Crowell, 1962 #7855, 1981 #7856; Ehlig, 1973 #7867, 1975 #7868, 1981 #7869, 1982 #7870; Weber, 1982 #7881). **Section:** Honor Rancho section principally established based on geomorphic and trench evidence of Holocene displacement. Generally based on Honor Rancho segment proposed by Weber (1982 #7881). Honor Rancho section extends southeast from the Castaic Valley area to about 1.5 km southeast of the fault's

	junction with Highway 14. Named faults include Placerita and San Gabriel faults. **Fault ID:** Refers to numbers 316 (San Gabriel fault - Western Part) and 384 (San Gabriel fault – Eastern Part) of Jennings (1994 #2878), and number 63 (San Gabriel fault – Central part) of Ziony and Yerkes (1985 #5931).
County(s) and State(s)	LOS ANGELES COUNTY, CALIFORNIA
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:24,000 and unspecified 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 1:24,000 scale map by Weber (1982 #7881), and Kahle (1986) and Cotton (1986) mapped at unspecified scale.
Geologic setting	San Gabrie fault zone is one of the principal structural elements of the Transverse Ranges. The San Gabriel fault zone consists of steeply dipping faults that extend for about 135 km from the eastern San Gabriel Mountains along a generally east-west strike, through the Saugus/Castaic area where the fault zone is characterized by a northwest strike. Near Big Tujunga Canyon the South Branch San Gabriel fault branches off southeast of the east-striking San Gabriel fault. The South Branch San Gabriel (Vasquez Creek) fault may have up to 5 km of cumulative dextral displacement as reported by Powell (1993 #5753), but other workers interpret 22–38 km of dextral offset (Matti and Morton, 1993 #5737; Ehlig, 1968 #7866). Beyer and others (2009#7849) suggested that as much as 12.2 km of post Miocene dextral separation. Farther southeast the South Branch San Gabriel fault dips to the northeast at a shallow angle and is characterized by an unknown amount of reverse or thrust displacement (Smith, 1986 #7880). Northwest of the Saugus area the fault zone forms the southwestern edge of the Ridge basin and terminates near Frazier Mountain (Yeats and others, 1994 #7883). Principal sense of displacement is dextral strike-slip, although there is a down-to-north component of normal stratigraphic separation (Yeats and others, 1994 #6114; Powell, 1993 #7883). Maximum cumulative

	dextral displacement is controversial—estimates range from 0–5 km (Weber, 1982 #7881, 1986 #7882), to a maximum of 70 km (Ehlert, 1982 #7864). Most estimates fall in the 30–45 km range. The reader is referred to Powell (1993 #5753) and Yeats and others (1994 #6114) for summaries of previous estimates of displacement along the San Gabriel fault zone.
Length (km)	km.
Average strike	
Sense of movement	Right lateral, Normal *Comments:* Cotton (1986 #7848, 1987 #7854) reported dominantly dextral strike-slip offset with a down-to-east vertical component in trenches at the Rye Canyon (site 89-1) and Trench A (site 89-2). Cotton (1987 #7854) inferred 2.7:1 horizontal to vertical (east-side-down) slip components based on striae and slickensides observed on fault planes at the Rye Canyon [89-1a] site. Yeats and others (1994 #6114) reported dominantly dextral offset with a down-to-east apparent normal stratigraphic separation.
Dip	65°–85° NE. *Comments:* Yeats and others (1994 #6114), based on oil field data.
Paleoseismology studies	Site 89-1 is the Rye Canyon site of Cotton (1985 #7853, 1986 #7848, 1987 #7854), located near the center of a broad alluvial floodplain. A total of 8 excavations at the Rye Canyon (site 89-1) and Trench A (site 89-2) exposed faulted Holocene alluvial deposits. At least 2 exploratory trenches at the Rye Canyon site exposed Holocene traces of the San Gabriel fault that extended to within 5 feet (1.5 meters) of the ground surface. Fault offsets Holocene alluvial deposits and exhibits down-to-east apparent vertical separation. Alluvial package mismatches across fault indicate significant strike-slip offset. Site 89-2 is the Trench A site of Cotton (1986 #7848). A deep excavation at Trench A site revealed about 45 feet (13.7 meters) of Holocene alluvium overlying Plio-Pleistocene Saugus Formation. Excavation revealed 80–100 foot wide (24–30.5 meter wide) zone of faulting. Most recent displacements confined to western part of fault zone. Strands of the San Gabriel fault offset early Holocene alluvium. Fault extends to within 18 feet (5.5

	meters) of ground surface, but fault is overlain by massively bedded colluvium.
Geomorphic expression	Traces of the Honor Rancho section locally exhibit geomorphic evidence of latest Pleistocene and possible Holocene dextral displacement. Weber (1982 #7881) reported that fault is delineated by aligned vegetation in young alluvium, a breached closed depression, and possible dextrally deflected drainages. In contrast, Cotton (1986 #7848) stated that geomorphic expression of fault in the Saugus/Castaic area is defined by several dextrally deflected bedrock ridges, but that, generally, surface features such as linear vegetation contrasts, tonal lineaments, and localized depressions are not unequivocally indicative of active faulting. Kahle (1986 #7879) concurred that northwest of Bouquet Junction the fault is poorly defined, but southeast of Bouquet Junction to Oakdale Canyon the fault exhibits geomorphic evidence of latest Pleistocene to Holocene dextral displacement such as linear ridges and troughs, sidehill benches, and ponded alluvium.
Age of faulted surficial deposits	Strands of the Honor Rancho section offset Plio-Pleistocene Saugus Formation, late Pleistocene terrace deposits, late Pleistocene and Holocene alluvium and colluvium (Weber, 1982 #7881; Cotton, 1986 #7848).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Cotton (1986 #7848) reported that the most recent event on the Honor Rancho section occurred between 3,500±250 and 1,500±190 yrs BP, based on radiocarbon ages of detrital charcoal recovered from alluvial stratigraphy exposed at the Rye Canyon paleoseismic site.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Cotton (1986 #7848, 1987 #7854) reported a preliminary Holocene dextral slip rate of about 0.6 mm/yr, based on dextrally offset paleochannel and fold axis exposed at the Trench A site. Uncertainty values were not reported in Cotton

	(1987 #7854).
Date and Compiler(s)	2017 William A. Bryant, California Geological Survey
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