

# 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](#).

## Hosgri fault zone (Class A) No. 81a

Last Review Date:

*citation for this record:* Hanson, K.L., and Bryant, W.A., compilers, 2016, Fault number 81a, Hosgri fault zone, 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 01:59 PM.

### Synopsis

**General:** Fault lies entirely offshore, extensive data set including geophysical, seismological, and geologic data was compiled and reviewed for seismic hazard source characterization studies conducted by Pacific Gas and Electric Company (PG&E, 1988 #7833) as part of the Long Term Seismic Program for the Diablo Canyon Power Plant; the results of the multi-disciplinary study were extensively reviewed by the Nuclear Regulatory Commission and their consultants (Nuclear Regulatory Commission, 1991).

**Sections:** This fault has 2 sections. Based primarily on geophysical data the Hosgri fault zone is subdivided into five sections (referred to as reaches) characterized by distinct variations in strike, down-dip geometry, trace geometry, amount and sense of vertical separation, and adjacent structural trends that occur along the fault zone (PG&E, 1988 #7833; Rietman and

	<p>others, in review #7896; Hanson and others, 2004 #7890). Northern section. San Simeon/Hosgri step-over south to intersection with Los Osos [79] fault– 20–22 km San Luis-Pismo section. Intersection of Los Osos [79] fault south to intersection of Pecho fault – 20–22 km San Luis Obispo section. Intersection of Pecho [82] fault south to intersection with Casmalia [84] fault – 23 km. Includes re Point Sal section. Intersection of Casmalia [84] fault zone to southern limit of Lion’s Head [83] fault zone – 14–18 km Southern reach. Lion’s Head [83] fault zone south to Point Pedernales – 24–26 km</p>
<p><b>Name comments</b></p>	<p><b>General:</b></p> <p><b>Section:</b> Recognized as significant structure by Wolf and Wagner (1970 #7900) and Hoskins and Griffiths (1971 #7892); named the Hosgri fault by Wagner (1974 #7899) after Hoskins and Griffiths (1971 #7892).</p> <p><b>Fault ID:</b> Refers to number 287 (Hosgri fault zone) of Jennings (1994 #2878).</p>
<p><b>County(s) and State(s)</b></p>	<p>SAN LUIS OBISPO COUNTY, CALIFORNIA SANTA MARIA COUNTY, CALIFORNIA</p>
<p><b>Physiographic province(s)</b></p>	<p>PACIFIC BORDER</p>
<p><b>Reliability of location</b></p>	<p>Good Compiled at 1:40,000 and 1:250,000 scale.</p> <p><i>Comments:</i> (1) Original compilation of offshore geophysical and bathymetric data at 1:48,000 scale (PG&amp;E, 1988 #7833); photographically reduced to scale of 1:250,000 and published by Lettis and others (2004 #7844). Traces of Shoreline fault mapped by PG&amp;E (2014 #7833) at scale of 1:40,000.</p>
<p><b>Geologic setting</b></p>	<p>Contemporary tectonic setting: Convergent right-slip (transpressional) fault (PG&amp;E, 1988 #7833; Hanson and others, in review).</p> <p>Various alternative models for the style, amount, and timing of displacement have been proposed as follows: Right-slip (major displacement) – Neogene displacement &gt; 100 km – Hall (1975 #7825), Graham and Dickinson (1978 #7887); Quaternary slip rates of 5–19 mm/yr (Weber, 1983 #7834). Right-slip (minor displacement) – Neogene displacement 5 km in 5 Ma (Hamilton</p>

and Willingham, 1979 #7889; Hamilton, 1982 #7888, 1984 #5402; Sedlock and Hamilton, 1991 #7897); late Quaternary slip rate of 1–3 mm/yr (Hanson and others, 2004 #7890). Reverse fault – Interpreted as a steep east-dipping basin margin reverse fault (Hoskins and Griffiths, 1971 #7892).

Thrust-fault – One of several listric coastal thrusts that root in an aseismic detachment zone (Crouch and others, 1984 #7885; Crouch and Suppe, 1993 #7886). Alternative model of detachment faulting proposed by Namson and Davis (1988 #7893; 1990 #7845) in which the Hosgri fault is a former basin-normal fault that has been rotated and reactivated as a reverse fault. In both models, the Hosgri fault is interpreted to be reactivated by Pliocene and younger northeast-southwest shortening.

Oblique slip (right-normal) – complex, extensional (southwest-dipping) Tertiary basin-margin tectonic boundary along which some strike slip has also occurred (McCulloch, 1987 #4880).

Oblique slip (right reverse) – contemporary style of faulting is interpreted to be a right oblique slip at rate of about 5 mm/yr (Brown, 1990 #7884).

<b>Length (km)</b>	km.
<b>Average strike</b>	
<b>Sense of movement</b>	<p>Right lateral</p> <p><i>Comments:</i> Evaluation of components of slip indicate ratios of horizontal to vertical slip of 2:1 to 30:1; based on the rake angles implied by these horizontal to vertical ratios, together with an estimate of fault dip, the Hosgri fault zone is classified as a strike-slip fault along most, if not all, of its length. The uncertainties allow for the possibility that the fault may have oblique slip south of Point Sal (Hanson and others, 2004 #7890).</p>
<b>Dip</b>	<p>&gt;60° E. to vertical</p> <p><i>Comments:</i> Assessment of down-dip geometry from both high-resolution and common-depth-point seismic reflection data, retrodeformable structural modeling and seismologic data show a high angle (&gt;60° E.) down-dip geometry for the primary strands (PG&amp;E, 1988 #7833; Rietman and others, in review #7896); the</p>

	<p>down-dip distribution of microearthquakes having strike-slip mechanisms that have occurred along the fault zone near Point Buchon suggests a steeply-dipping to near vertical fault to a depth of at least 12 km (Hanson and others, 2004 #7890).</p>
<b>Paleoseismology studies</b>	
<b>Geomorphic expression</b>	<p>Topographic expression varies along strike among sections; inflections, steps, and scarps in the seafloor, disruptions of the post-late Wisconsin unconformity (18 ka), and mismatched post-late Wisconsin sediment thicknesses across the fault along all sections demonstrate late Pleistocene to Holocene activity along the zone (Wagner, 1974 #7899; Leslie, 1981 #7830; Niemi and others, 1987 #7894, PG&amp;E, 1988 #7833).</p>
<b>Age of faulted surficial deposits</b>	<p>Post-late Wisconsin (18 ka) sediments (locally observed along entire fault zone).</p>
<b>Historic earthquake</b>	
<b>Most recent prehistoric deformation</b>	<p>latest Quaternary (&lt;15 ka)</p> <p><i>Comments:</i> Timing of most recent paleoevent is not known; offshore location precludes conventional paleoseismic investigations, such as trenching, interpretation of high-resolution seismic data and reconnaissance by diver geologists demonstrate post-late Wisconsin (18 ka) activity.</p>
<b>Recurrence interval</b>	
<b>Slip-rate category</b>	<p>Between 1.0 and 5.0 mm/yr</p> <p><i>Comments:</i> There are no recognized marker horizons or features (piercing points) that can be correlated across the Hosgri fault zone for direct measurement of the lateral component of slip. Slip rates estimated for the Hosgri fault zone include cumulative lateral and vertical components of slip across the entire fault zone, encompassing high- and low-angle fault strands and structural relief due to folding proximal to the fault zone. The rate of horizontal slip is judged to be 1–3 mm/yr based on paleoseismic and Quaternary mapping studies conducted along the San Simeon</p>

[80] fault zone, evaluation of the transfer of slip across the San Simeon/Hosgri pull-apart basin, and consideration of regional tectonics and geodetic rates of crustal shortening in south-central California (Hanson and others, 2004 #7890). Post middle-Pliocene vertical slip rates across the fault zone range from 0.1 to 0.4 mm/yr, with a maximum value of 0.44 mm/yr (Hanson and others, 2004 #7890).

**Date and  
Compiler(s)**

2016  
Kathryn L. Hanson, AMEC Environment & Infrastructure  
(AMEC E&I)  
William A. Bryant, California Geological Survey

**References**

#7884 Brown, R.D., Jr., 1990, Quaternary deformation, *in* Wallace, R.E., ed., The San Andreas fault system, California: U.S. Geological Survey Professional Paper 1515, p. 83–114.

#7885 Crouch, J., Bachman, S.B., and Shay, J.T., 1984, Post-Miocene compressional tectonics along the central California margin, *in* Crouch, J., and Bachman, S.B., eds., Tectonics and sedimentation along the California margin: Pacific Section, S.E.P.M., Field trip guidebook, v. 38, p. 37–54.

#7886 Crouch, J.K., and Suppe, J., 1993, Late Cenozoic tectonic evolution of the Los Angeles basin and inner California borderland—A model for core complex-like crustal extension: Geological Society of America, v. 105, p. 1415–1434.

#7887 Graham, S.A., and Dickinson, W.R., 1978, Evidence for 115 kilometers of right-slip on the Gregorio-Hosgri fault trend: Science, v. 199, p. 179–181.

#7825 Hall, C.A., Jr., 1975, San Simeon-Hosgri fault system, coastal California—Economic and environmental implications: Science, v. 190, p. 1291–1294.

#7888 Hamilton, D.H., 1982, The proto-San Andreas fault and the early history of the Rinconada, Nacimiento, and San Gregorio-Hosgri faults of coastal central California: Geological Society of America Abstracts with Programs, v. 63, p. 1124.

#5402 Hamilton, D.H., 1984, The tectonic boundary of coastal central California: Palo Alto, Stanford University, unpublished Ph.D. dissertation, 290 p.

#7889 Hamilton, D.H., and Willingham, C.R., 1979, The coastal boundary zone of central California: Geological Society of America Abstracts with Programs, Cordilleran Section Meeting, v. 11, no. 3, p. 81.

#7890 Hanson, K.L., Lettis, W.R., McLaren, M.K., Savage, W.U., and Hall, N.T., 2004, Style and rate of Quaternary deformation of the Hosgri fault zone, offshore south-central California, *in* Keller, M., ed., Evolution of sedimentary basins/offshore oil and gas investigations—Santa Maria Province: U.S. Geological Survey Bulletin 1995-BB, 33 p.

#7891 Hardebeck, J.L., 2013, Geometry and earthquake potential of the Shoreline fault, central California: Bulletin of the Seismological Society of America, v. 103, p. 447–462, doi:10.1785/0120120175.

#7892 Hoskins, E.G., and Griffiths, J.R., 1971, Hydrocarbon potential of northern and central California offshore, *in* Cram, I.H., ed., Future petroleum provinces of the United States and their geology and potential: American Association of Petroleum Geologists Memoir 15, p. 212–228.

#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.

#7830 Leslie, R.B., 1981, Continuity and tectonic implications of the San Simeon-Hosgri fault zone, central California: U.S. Geological Survey Open-File Report 81-430, 59 p.

#7844 Lettis, W.R., Hanson, K.L., Unruh, J.R., McLaren, M., and Savage, W.U., 2004, Quaternary tectonic setting of south-central coastal California, *in* Keller, M.A., eds., Evolution of sedimentary basins/offshore oil and gas investigations—Santa Maria province: U.S. Geological Survey Bulletin 1995-AA, 21 p., 1 plate, scale 1:250,000.

#4880 McCulloch, D.S., 1987, Regional geology and hydrocarbon potential of offshore central California, *in* Scholl, D.W., Grantz, A., and Vedder, J.G., eds., Geology and resource potential of the continental margin of western North America and adjacent ocean basins, Beaufort Sea to Baja California: Circum-

Pacific Council for Energy and Mineral Resources, Earth Science Series, v. 6, p. 353–401, scale 1:50,000.

#7893 Namson, J.S., and Davis, T.L., 1988, Seismically active fold and thrust belt in the San Joaquin Valley, central California: Geological Society of American Bulletin, v. 100, p. 257–273.

#7845 Namson, J.S., and Davis, T.L., 1990, Late Cenozoic fold and thrust belt of the southern Coast Ranges and Santa Maria Basin, California: American Association of Petroleum Geologists Bulletin, v. 74, p. 467–492.

#7894 Niemi, F., Hall, N.T., and Shiller, G.I., 1987, Seafloor scarps along the central reach of the Hosgri fault, southern Coast Ranges, California: Geological Society of America Abstracts with Program, v. 19, p. 789.

#7895 Pacific Gas and Electric Company (PG&E), 2014, Offshore low-energy seismic-reflection studies in Estero Bay, San Luis Obispo Bay, and Point Sal areas: PG&E Technical Report GEO.DCPP.RT.14.02, 178 p. Plates 1A and 1B, scale 1:40,000.

#7833 Pacific Gas and Electric (PG&E), 1988, Final report of the Diablo Canyon Long Term Seismic Program for the Diablo Canyon Power Plant: U.S. Nuclear Regulatory Commission Docket Nos. 50-275 and 50-323.

#7896 Rietman, J.D., Willingham, C.R., Shiller, G.I., Heck, R.G., and DiSilvestro, L.A., in review (2017), Seismic images of the Hosgri fault zone offshore south-central California, *in* Keller, M., ed., Santa Maria Province Project: U.S. Geological Survey Bulletin 1995, 56 p., 4 plates.

#7897 Sedlock, R.L., and Hamilton, D.H., 1991, Late Cenozoic tectonic evolution of southwestern California: Journal of Geophysical Research, v. 96, no. B2, p. 2325–2351.

#7898 U.S. Nuclear Regulatory Commission, 1991, Safety evaluation report related to the operation of Diablo Canyon Nuclear Power, Units 1 and 2, Docket Nos. 50-275 and 50-323, Pacific Gas and Electric Company: NUREG-0675, Supplement No. 34, 331 p.

#7899 Wagner, H.C., 1974, Marine geology between Cape San

Martin and Point Sal, south central California offshore: U.S. Geological Survey Open-File Report, 17 p.

#7834 Weber, G.E., 1983, Geologic investigation of the marine terraces of the San Simeon region and Pleistocene activity of the San Simeon fault zone, San Luis Obispo County, California: U.S. Geological Survey Final Technical Report, Contract No. 14-08-0001-18230, 66 p., 5 plates (map scale 1:24,000).

#7900 Wolf, S.C., and Wagner, H.C., 1970, Preliminary reconnaissance marine geology of area between Santa Lucia escarpment and Point Buchon, California: unpublished U.S. Geological Survey administrative report, 5 p.

[Questions or comments?](#)

[Facebook](#) [Twitter](#) [Google](#) [Email](#)

[Hazards](#)

[Design](#) [Ground Motions](#) [Seismic Hazard Maps & Site-Specific Data](#) [Faults](#) [Scenarios](#)

[Earthquakes](#) [Hazards](#) [Data](#) [Education](#) [Monitoring](#) [Research](#)

[Home](#) [About Us](#) [Contacts](#) [Legal](#)