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.

unnamed fault zone near and offshore of Aloha (Class A) No. 586

Last Review Date: 2003-08-03

citation for this record: **McCrory, P.A., compiler, 2003, Fault number 586, unnamed fault zone near and offshore of Aloha, 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 03:04 PM.**

Synopsis	This unnamed fault zone near and offshore of Aloha, Washington, is a 3-km-wide zone of thrust and reverse faults associated with an anticlinal fold (McCrory and others, 2002 #5864). The fault zone consists of short discontinuous faults and folds that together form a zone at least 28 km long. This fault zone is part of a broader convergent zone associated with a major forearc block boundary. Quaternary activity has not been documented for the onshore portion of this fault zone (McCrory, 1997 #6323; McCrory and others, 2002 #5864). However, the onshore fault is expressed as a linear topographic ridge and similar ridges in this region are known to be anticlines that overlie or are cut by Quaternary thrust or reverse faults (McCrory, 1997 #6323).
Name	McCrory and others (2002 #5864) first mapped offshore faults of

comments	this zone, based primarily on new USGS high-resolution seismic reflection data (Cross and others, 1998 #6303; Foster and others, 1999 #6317; 1999 #6318; 2001 #6319) and sidescan-sonar data (Twichell and others, 2000 #6312; McCrory and others, 2003 #6324; 2003 #6325) collected in 1997 and 1998. The location and interpretation of recent activity on late Cenozoic faults previously mapped in the offshore area (Grim and Bennett, 1969 #6320; Wagner and others, 1986 #5670; Wolf and others, 1997 #6305) are superceded by this more recent publication (McCrory, 1997 #6323; McCrory and others, 2002 #5864). Onshore fault strand first noted by Rau and McFarland (1982 #6308) and mapped by McCrory (1997 #6323). The onshore fault strand of this zone extends to the east-southeast from Aloha, Washington; numerous offshore strands form an east-northeast-striking zone of faults directly west of the coast near Aloha, Washington.
County(s) and State(s)	GRAYS HARBOR COUNTY, WASHINGTON
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* Offshore fault-trace locations are based on mapping of McCrory and others (2002 #5864) from seismic reflection profiles with 5-km grid spacing. However, many of the offshore traces are located by only one trackline crossing, so their orientation and length are not well constrained. At least one trace appears to extend onshore (McCrory, 1997 #6323). The westward extent of the fault zone has not been determined, as high-resolution data are not available for the outer continental shelf (>70-m water depth). The onshore, eastern extent of the fault zone has not been determined.
Geologic setting	This unnamed fault zone near and offshore of Aloha, Washington, occurs north of Grays Harbor and the leading northwestern edge of the Oregon Coast Range forearc block. This forearc block traverses coastal Washington, where it abuts subduction-complex rocks of the Olympic Mountains block to the north. Block kinematics of this region predicts north-northwest-directed contraction where the boundary trends east-northeast near Grays Harbor, Washington. Crustal deformation observed near and north of Grays Harbor is consistent with north-northwestward motion of

	the Oregon Coast Range block. Deformation is localized within the more ductile subduction-complex rocks of the Olympic coast rather than the more rigid basaltic rocks that underlie the Oregon Coast Range block (McCrory and others, 2002 #5864). Seismic-reflection and sidescan-sonar data image several zones of faults and folds that trend east-northeast on the inner continental shelf between Grays Harbor and Cape Elizabeth, across an area about 40 kilometers wide from south to north. The unnamed fault zone near and offshore of Aloha, Washington is one of these east-northeast-trending zones. Some structures in these zones extend onland to the east where Quaternary reverse faults have been mapped (McCrory, 1997 #6323). The primary mode of deformation appears to be folding, however the seismic reflection data do not penetrate deeply enough (<200 m) to rule out buried thrust faults beneath the anticlines. In fact, one nearshore well that penetrated an anticline in this region, did encounter a reverse fault at depth (Rau and McFarland, 1982 #6308). Furthermore, multiple thrust or reverse faults are known to occur on the flanks of the anticlines offshore. Onshore, multiple thrust faults also occur in the upper plate of an inferred master thrust fault (McCrory, 1997 #6323). Quaternary activity is not documented for the onshore fault strand of this unnamed fault zone. However, similarity of the onshore topographic expression of the fault zone to adjacent ones and latest Quaternary activity on related offshore faults suggests that the entire zone has been active in the Quaternary (McCrory and others, 2002 #5864).
Length (km)	32 km.
Average strike	N87°E
Sense of movement	Thrust *Comments:* Seismic reflection data suggests significant, or pure, dip-slip offset along some of the offshore faults and these and other offshore faults are inferred to be thrust or reverse faults because of their association with offshore anticlines or with thrust and reverse faults and anticlines mapped onshore (McCrory and others, 2002 #5864). The actual fault planes of the offshore faults, however, cannot be resolved with available seismic reflection data.
Dip Direction	N *Comments:* Seismic reflection data implies down-to-the-south

	dip-slip offsets along three offshore fault strands of this zone (plates 2A and 2C in McCrory and others, 2002 #5864). These offshore fault strands are inferred to be thrust or reverse faults that dip to the north at low angles (<45?). The sense of probable dip-slip on other offshore faults has not been specified, but they are similarly inferred to be low-angle thrust or reverse faults that dip either to the north or south. The vertical exaggeration of seismic reflection data, however, precludes accurate determination of fault dip (all strands with dips >30? appear to have vertical dips). Dip not available for onshore portion of fault.
Paleoseismology studies	
Geomorphic expression	The onshore fault strand occurs beneath a 9-km-long ridge that reaches an elevation of 120 m.
Age of faulted surficial deposits	The age of deposits at the seafloor varies across the continental shelf. The age of faulted seafloor deposits could be as young as Holocene in areas with active sediment accumulation.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Seafloor disruption along three offshore strands (plate 1A in McCrory and others, 2002 #5864) could be as young as Holocene, however the sediments exposed at the surface have not been dated directly. Late Quaternary (<150 ka) for two other offshore strands; Quaternary (<1.8 Ma) for another offshore strand (plate 1A in McCrory and others, 2002 #5864). The offshore age estimates above are based on offset or deformation of: (1) the seafloor, considered less than 20 ka; (2) a late Pleistocene erosional surface, estimated to have been cut between 150 and 20 ka; or (3) an early-middle Pleistocene unconformity cut at either 600 ka or 900 ka (McCrory and others, 2002 #5864). Herein these strands are assigned to latest Quaternary, late Quaternary, and Quaternary age categories, even though the upper age limits of these categories are <15 ka, <130 ka, and <1.6 Ma, respectively.
Recurrence interval	

Slip-rate category	Less than 0.2 mm/yr *Comments:* No information has been reported on rates of slip for these faults. Based mostly on this lack of information, a conservative rate of less than 0.2 mm/yr is tentatively assigned herein.
Date and Compiler(s)	2003 Patricia A. McCrory, U.S. Geological Survey
References	#6303 Cross, V.A., Twichell, D.C., Parolski, K.F., and Harrison, S.E., 1998, Archive of boomer seismic-reflection data collected aboard RV CORLISS cruise CRLS97007 off Northern Oregon and Southern Washington inner continental shelf: U.S. Geological Survey Open-File Report 98-351, 2 CD-ROM set. #6319 Foster, D.S., McCrory, P.A., and O’Brien, T.F., 2001, Archive of boomer subbottom data collected during USGS cruise MCAR 97013 (M1-97-WO) Washington shelf, 7-14 July, 1997: U.S. Geological Survey Open-File Report 01-048, 3 CD-ROM set. #6317 Foster, D.S., McCrory, P.A., Danforth, W.W., and O?Brien, T.J., 1999, Archive of chirp subbottom data collected during USGS cruise MCAR 98008 (M3-98-WO) Washington shelf, 24 June-5 July, 1998: U.S. Geological Survey Open-File Report 99-591, 2 CD-ROM set. #6318 Foster, D.S., McCrory, P.A., Danforth, W.W., and O?Brien, T.J., 1999, Archive of boomer and sparker subbottom data collected during USGS cruise MCAR 98008 (M3-98-WO) Washington shelf, 24 June-5 July, 1998: U.S. Geological Survey Open-File Report 99-592, 3 CD-ROM set. #6320 Grim, unpublished M.S. thesis, and Bennett, L.C., Jr., 1969, Shallow seismic profiling of the continental shelf off Grays Harbor, Washington: Seattle, University of Washington, Department of Oceanography Special Report 41, p. 72-92. #6323 McCrory, P.A., 1997, Evidence for Quaternary tectonism along the Washington coast: Washington Geology, v. 25, no. 4, p. 14-20. #6325 McCrory, P.A., Danforth, W.W., Foster, D.S., and O?Brien, T.F., 2001, Archive of the ISIS sidescan sonar and DGPS

navigation field data collected on USGS Cruise AR5-97-WO, 6 July-14 July, 1997: U. S. Geological Survey Open-File Report 01-508, 2 DVD-ROM set.

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#5864 McCrory, P.A., Foster, D.S., Danforth, W.W., and Hamer, M.R., 2002, Crustal deformation at the leading edge of the Oregon Coast Range block, offshore Washington (Columbia River to Hoh River): U.S. Geological Survey Professional Paper 1661-A, 47 p., 2 pls.

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#6312 Twichell, D.C., Cross, V.A., and Parolski, K.F., 2000, Sidescan-sonar imagery, surface sediment samples, and surficial geologic interpretation of the southwestern Washington inner continental shelf based on data collected during Corliss cruises 97007 and 98014: U.S. Geological Survey Open-File Report 00-167, 1 CD-ROM, 29 p.

#5670 Wagner, H.C., Batatian, L.D., Lambert, T.M., and Tomson, J.H., 1986, Preliminary geologic framework studies showing bathymetry, locations of geophysical tracklines and exploratory wells, sea-floor geology and deeper geologic structures, magnetic contours, and inferred thickness of Tertiary rocks on the continental shelf and upper continental slope off southwestern Washington between latitudes 46° N and 48°30'N and from the Washington coast to 125°20'W: Washington State Department of Natural Resources Open-File Report 86-1, 8 p., 6, scale 1:250,000.

#6305 Wolf, S.C., Hamer, M.R., and McCrory, P.A., 1997, Quaternary geologic investigations on the inner shelf offshore northern Oregon-southern Washington: U.S. Geological Survey Open-File Report 97-677, 4 sheets, scale 1:500,000.

Questions or comments?