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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.

Alvin Canyon fault (Class A) No. 797

Last Review Date: 2002-05-17

citation for this record: **Personius, S.F., compiler, 2002, Fault number 797, Alvin Canyon 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 03:16 PM.**

Synopsis	The northwest-striking, left-lateral Alvin Canyon fault offsets accretionary wedge sediments that underlie the continental shelf and slope in the forearc of the Cascadia subduction zone [781]. The fault extends across the active deformation front of the subduction zone, offsetting the overlying sedimentary section and the underlying oceanic basalts of the subducting Juan de Fuca Plate, and may die out eastward near the inferred western limit of the Siletzia terrane on the continental shelf. The Alvin Canyon fault is marked by multiple fault traces, fault scarps, pressure ridges and pop-ups, and aligned fold axes in poorly consolidated accretionary wedge sediments on the continental shelf and slope; the fault also appears to uplift an unnamed submarine bank, a structural high on the upper continental slope. Offset of Holocene sediment on the abyssal plain indicate most recent movement in the latest Quaternary. However, as with other folds and faults located in the Cascadia forearc, it is unknown if coseismic

	displacements on this fault are always related to great megathrust earthquakes on the subduction zone, or whether some independent displacements are related to smaller earthquakes in the overriding North American Plate.
Name comments	The Alvin Canyon fault was originally mapped and named "fault C" by Goldfinger and others (1992 #446; 1992 #464). The fault was renamed the Alvin Canyon fault by Goldfinger (1994 #3972), for its proximity to a series of Alvin submersible dive sites; that name has been used in subsequent papers (Goldfinger and others, 1996 #4088; Goldfinger and others, 1997 #4090) and is retained herein. **Fault ID:** The fault is included in fault number 21 of Pezzopane (1993 #3544) and is fault number 3 of Geomatrix Consultants, Inc. (1995 #3593).
County(s) and State(s)	LINCOLN COUNTY, OREGON (offshore)
Physiographic province(s)	PACIFIC BORDER (offshore)
Reliability of location	Poor Compiled at 1:500,000 scale. *Comments:* The fault trace is from 1:500,000-scale mapping of Goldfinger and others (1992 #464).
Geologic setting	The northwest-striking, left-lateral Alvin Canyon fault offsets accretionary wedge sediments that underlie the continental shelf and slope in the forearc of the Cascadia subduction zone [781]; the fault extends across the active deformation front of the subduction zone, offsetting the overlying sedimentary section and the underlying oceanic basalts of the subducting Juan de Fuca Plate (Goldfinger and others, 1992 #446; Goldfinger and others, 1992 #464; Goldfinger, 1994 #3972; Goldfinger and others, 1996 #4088; Goldfinger and others, 1996 #4292; Goldfinger and others, 1997 #4090), and may die out eastward near the inferred western limit of the Siletzia terrane on the continental shelf (Goldfinger and others, 1997 #4090). As with other folds and faults located in the Cascadia forearc, it is unknown if coseismic displacements on this fault are always related to great megathrust earthquakes on the subduction zone, or whether some independent displacements are related to smaller earthquakes in the overriding North

	American Plate (Goldfinger and others, 1992 #446; Goldfinger, 1994 #3972; Goldfinger and others, 1997 #4090; McNeill and others, 1998 #4089).
Length (km)	71 km.
Average strike	N68°W
Sense of movement	Left lateral *Comments:* The Alvin Canyon fault is mapped as a left-lateral strike slip fault, manifested as a complicated zone of folds and multiple fault strands (Goldfinger and others, 1992 #446; Goldfinger and others, 1992 #464; Goldfinger, 1994 #3972; Goldfinger and others, 1996 #4292; Goldfinger and others, 1997 #4090).
Dip	90° *Comments:* Dip estimate based on geophysical data (Goldfinger and others, 1992 #446; Goldfinger, 1994 #3972; Goldfinger and others, 1997 #4090).
Paleoseismology studies	
Geomorphic expression	The Alvin Canyon fault is marked by multiple fault traces, pressure ridges and pop-ups, and aligned fold axes in poorly consolidated accretionary wedge sediments on the continental shelf and slope; the fault also appears to uplift an unnamed submarine bank, a structural high on the upper continental slope (Goldfinger and others, 1992 #446; Goldfinger and others, 1992 #464; Goldfinger, 1994 #3972; Goldfinger and others, 1997 #4090).
Age of faulted surficial deposits	The Alvin Canyon fault offsets Holocene sediments on the abyssal plain, west of the deformation front (Goldfinger and others, 1997 #4090).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Offsets of Holocene sediments on the abyssal plain (Goldfinger and others, 1997 #4090) indicate most recent

	movement in the latest Quaternary. The fault is mapped as active in the Holocene or late Pleistocene by Goldfinger and others (1992 #464), Pezzopane (1993 #3544), Geomatrix Consultants, Inc. (1995 #3593), and Madin and Mabey (1996 #3575).
Recurrence interval	
Slip-rate category	Greater than 5.0 mm/yr *Comments:* Slip-rate estimates of 6.2±2 mm/yr to 6.6 mm/yr are based on offset bedrock isopachs and age estimates based on sedimentation rates (Goldfinger, 1994 #3972; Goldfinger and others, 1997 #4090). Wong and others (1999 #4073; 2000 #5137) used estimated slip rates of 4.2–8.2 mm/yr in their probabilistic seismic hazard assessment.
Date and Compiler(s)	2002 Stephen F. Personius, U.S. Geological Survey
References	#3593 Geomatrix Consultants, Inc., 1995, Seismic design mapping, State of Oregon: Technical report to Oregon Department of Transportation, Salem, Oregon, under Contract 11688, January 1995, unpaginated, 5 pls., scale 1:1,250,000. #3972 Goldfinger, C., 1994, Active deformation of the Cascadia Forearc—Implications for great earthquake potential in Oregon and Washington: Oregon State University, unpublished Ph.D. dissertation, 246 p., http://hdl.handle.net/1957/36664. #4292 Goldfinger, C., Kulm, L.D., Yeats, R.S., Appelgate, B., MacKay, M.E., and Cochrane, G.R., 1996, Active strike-slip faulting and folding of the Cascadia subduction-zone pl. boundary and forearc in central and northern Oregon, *in* Rogers, A.M., Walsh, T.J., Kockelman, W.J., and Priest, G.R., eds., Assessing earthquake hazards and reducing risk in the Pacific Northwest: U.S. Geological Survey Professional Paper 1560, v. 1, p. 223-256. #446 Goldfinger, C., Kulm, L.D., Yeats, R.S., Appelgate, B., MacKay, M.E., and Moore, G.F., 1992, Transverse structural trends along the Oregon convergent margin—Implications for Cascadia earthquake potential and crustal rotations: Geology, v. 20, p. 141-144. #4088 Goldfinger, C., Kulm, L.D., Yeats, R.S., Hummon, C.,

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#3575 Madin, I.P., and Mabey, M.A., 1996, Earthquake hazard maps for Oregon: State of Oregon, Department of Geology and Mineral Industries Geological Map Series GMS-100, 1 sheet.

#4089 McNeill, L.C., Goldfinger, C., Yeats, R.S., and Kulm, L.D., 1998, The effects of upper pl. deformation on records of prehistoric Cascadia subduction zone earthquakes, *in* Stewart, I.S., and Vita-Finzi, C., eds., Coastal tectonics: Geological Society Special Publication No. 146, p. 321-342.

#3544 Pezzopane, S.K., 1993, Active faults and earthquake ground motions in Oregon: Eugene, Oregon, University of Oregon, unpublished Ph.D. dissertation, 208 p.

#4073 Wong, I., Silva, W., Bott, J., Wright, D., Thomas, P., Gregor, N., Li, S., Mabey, M., Sojourner, A., and Wang, Y., 1999, Earthquake scenario and probabilistic ground shaking maps for the Portland, Oregon metropolitan area: Technical report to U.S. Geological Survey, under Contract 1434-HQ-96-GR-02727, 16 p., 12 pls.

#5137 Wong, I., Silva, W., Bott, J., Wright, D., Thomas, P., Gregor, N., Li, S., Mabey, M., Sojourner, A., and Wang, Y., 2000, Earthquake scenario and probabilistic ground shaking maps for the Portland, Oregon, metropolitan area: State of Oregon, Department of Geology and Mineral Industries Interpretive Map

	Series IMS-16, 16 p. pamphlet, scale 1:62,500.