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Quaternary Fault and Fold Database of the United States

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Graben near Golden (Class B) No. 2326

Last Review Date: 1998-04-24

Compiled in cooperation with the Colorado Geological Survey

citation for this record: **Kirkham, R.M., compiler, 1998, Fault number 2326, Graben near Golden, 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 03:00 PM.**

Synopsis	The graben near Golden is a localized structure along the east side of the Front Range, just north of Golden, Colorado. The graben does not have any geomorphic expression. It was first described by Scott (1970 #1141) based on an exposure in a clay exploration trench. The graben was trenched by Kirkham (1977 #2706) and Kirkham and Rogers (1981 #792) who inferred it was related to the Golden fault [2324], and by Dames & Moore (1981 #2683) who concluded it was not a tectonic feature and was very short in length. Displacement has occurred twice since deposition of Verdos Alluvium (ca. 500 ka), but prior to development of a Sangamon(?) or perhaps younger soil. Since there is controversy about the origin of this structure, it is herein considered to be a

	Class B fault.
Name comments	The graben near Golden is about 1.2 km northwest of downtown Golden. It is about 210 m east of the mapped trace of the Golden fault (Kirkham and Rogers, 1981 #792). The graben includes several short, small-offset Quaternary faults, but due to their very close spatial proximity they are shown as a single fault on the map that accompanies this database. Dames & Moore (1981 #2683) mapped the graben in detail. **Fault ID:** The graben near Golden was previously included as part of the Golden fault (fault 166) by Kirkham and Rogers (1981 #792), and is fault number Q76 of Widman and others (1998 #3441).
County(s) and State(s)	JEFFERSON COUNTY, COLORADO
Physiographic province(s)	SOUTHERN ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* The fault trace is from Van Horn (1972 #2780; scale 1:24,000). The graben is also shown by Scott (1970 #1141) and Kirkham (1977 #2706; scale about 1:32,700), and by Kirkham and Rogers (1981 #792; scale about 1:29,500). Trace recompiled on topographic base map at 1:250,000 scale.
Geologic setting	The graben near Golden is a localized structure along the east flank of the Front Range near Golden, Colorado. The graben lies about 210 m east of the trace of the Golden fault [2324] mapped by Van Horn (1972 #2780), and is within the structural hinge zone that bounds the east flank of the Front Range. The graben is a bedding-plane structure. Verdos Alluvium is offset as much as 5.5 m by the graben, but there is no overall (net) displacement of these gravel deposits across the graben (Kirkham, 1977 #2706). The 620 ka Lava Creek B ash from the Yellowstone Caldera is also cut by the graben. Relationships between the graben and the Golden fault are poorly understood. Kirkham (1977 #2706) and Kirkham and Rogers (1981 #792) associated the graben with the Golden fault [2324]. Subsequent investigations by Dames & Moore (1981 #2683) concluded the graben was non-tectonic in origin (Class B).

Length (km)	1 km.
Average strike	N9°W
Sense of movement	Normal *Comments:* Individual faults within the graben are primarily normal, but reverse movement occurred on one fault. Interestingly, there is no overall (net) displacement of the Verdos Alluvium across the graben.
Dip	70° - 83° SW *Comments:* Trenching investigations by Kirkham and Rogers (1981 #792) revealed that the faults bounding the graben dip 83? SW. Dames & Moore (1981 #2683) reported dips of 70? to 75? on the east-bounding fault of the graben in trenches excavated during their investigation.
Paleoseismology studies	Two trenches were excavated across the graben by Kirkham (1977 #2706) and Kirkham and Rogers (1981 #792). Dames & Moore (1981 #2683) excavated several more trenches in this vicinity, including three initial exploratory trenches and eight more comprehensive trenches. Locations of these trenches are not depicted on the map accompanying this database because of the close spacing of the trenches and the small scale of the map. They are collectively shown as site 2326-1. Site 2326-1. The east-bounding fault was exposed in several trenches. It consisted of a shear zone in bedrock (Cretaceous Laramie Formation) and a zone of shingled or rotated gravel clasts within Kansan outwash gravel. The overlying Verdos Alluvium (ca. 500 ka) is offset as much as 5.5 m across the east-bounding fault. The west-bounding fault was encountered in only a few trenches but was well-exposed only in the Colorado Geological Survey trench, where it consisted of a series of parallel, west-dipping reverse faults. Dames & Moore (1981 #2683) suggested that the graben is of limited lateral extent and of non-tectonic origin. Stratigraphic evidence of the graben was recently removed by earthwork activities associated with the construction of the Colorado Highway 92 by-pass west around Golden.
Geomorphic	Geomophic features indicative of late Cenozoic or Quaternary

expression	faulting on the graben or the nearby Golden fault [2324] are absent in this area.
Age of faulted surficial deposits	Kansan or Yarmouth Verdos Alluvium, the 0.62 Ma Lava Creek B ash, and a middle Pleistocene colluvial deposit are displaced by the graben (Kirkham, 1977 #2706; Kirkham and Rogers, 1981 #792; Dames & Moore, 1981 #2683). The volcanic ash was originally described by Kirkham (1977 #2706) and Kirkham and Rogers (1981 #792) as being 0.6 to 0.7 Ma. Subsequent work by Izett and Wilcox (1982 #1708) correlated the ash with the Lava Creek B ash, which is generally considered to be 0.62 Ma.
Historic earthquake	
Most recent prehistoric deformation	middle and late Quaternary (<750 ka) *Comments:* The most recent prehistoric event occurred after deposition of the 620 ka Lava Creek ash and a middle Pleistocene colluvial deposit, and prior to development of a soil considered to be Sangamon in age by Kirkham (1977 #2706) and Kirkham and Rogers (1981 #792). Dames & Moore (1981 #2683) reported that no discernable offset has occurred on the graben for at least 35-40 ka.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Inasmuch as the structure does not have any noticeable or youthful expression of activity and has not been active in the past 35-40 k.y., Widmann and others (1998 #3441) placed this gravben in the <0.2 mm/yr slip-rate category.
Date and Compiler(s)	1998 Robert M. Kirkham, Colorado Geological Survey
References	#2683 Dames and Moore, 1981, Geologic and seismologic investigations for Rocky Flats Plant: Unpublished report prepared for U.S. Department of Energy. #1708 Izett, G.A., and Wilcox, R.E., 1982, Map showing localities and inferred distributions of the Huckleberry Ridge, Mesa Falls, and Lave Creek ash beds (Pearlette family ash beds) of Pleistocene age in the Western United States and southern

	Canada: U.S. Geological Survey Miscellaneous Investigations Map I-1325, 1 sheet, scale 1:4,000,000. #2706 Kirkham, R.M., 1977, Quaternary movements on the Golden fault, Colorado: Geology, v. 5, p. 689-692. #792 Kirkham, R.M., and Rogers, W.P., 1981, Earthquake potential in Colorado: Colorado Geological Survey Bulletin 43, 171 p., 3 pls. #1141 Scott, G.R., 1970, Quaternary faulting and potential earthquakes in east-central Colorado: U.S. Geological Survey Professional Paper 700-C, C11-C18 p. #2780 Van Horn, R., 1972, Surficial and bedrock geologic map of the Golden quadrangle, Jefferson County, Colorado: U.S. Geological Survey Miscellaneous Geologic Investigations I-761-A. #3441 Widmann, B.L., Kirkham, R.M., and Rogers, W.P., 1998, Preliminary Quaternary fault and fold map and database of Colorado: Colorado Geological Survey Open-File Report 98-8, 331 p., 1 pl., scale 1:500,000.