Jump to Navigation

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Rock Valley fault zone (Class A) No. 1065

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Synopsis	The Rock Valley fault zone extends from Amargosa Valley northeast to Frenchman Flat, within the Nevada Test Site. This complex zone of deformation consists of several east-northeast-striking mainly left-lateral faults and numerous interconnecting faults. In the central part of the zone, southeast of Skull Mountain, three main strands (northern, medial, and southern) are recognized and each is a composite, consisting of several subparallel inter-linked strands and splays. On each of these strands, nonuniform or localized displacement has resulted in uneven and discontinuous expression on surfaces developed on surficial deposits. The main part of the fault zone occupies two alluvial valleys separated by a transverse divide; the western part is in Rock Valley Wash and the eastern part in Hampel Wash. These valleys are, in part, erosional features, but are also structurally controlled by strike-slip motion on the faults. The valleys are not underlain by sediment-filled basins and, thus,

	differ from the normal-fault-bounded structural basins of the Basin and Range province. The eastern and western parts of the Rock Valley fault zone extend into broad structural basins: Frenchman Flat on the east and Amargosa Valley on the west. Quaternary fault scarps are preserved in several places, particularly in the central part where scarp heights range from less than 1.0 m to as much as 2.5 m. In that area, the fault zone is about 3 km wide. The Quaternary history has been studied extensively in order to provide a basis for seismic hazards assessments at the potential nuclear waste repository at Yucca Mountain about 27 miles to the northwest. Ten trenches were dug and investigated to provide such a basis, and each of the three main strands were trenched. The locations of seven trenches are shown on maps associated with this fault description. On the basis of these and other paleoseismic studies, displacements per event range from about 3 m on the northern strand to 0.3 m on the southern strand, slip rates range from 0.05 to <0.002 mm/yr, but 0.02 mm/yr was estimated for the slip rate for the medial fault strand Estimates of preferred recurrence intervals made for a formal seismic-hazard elicitation range from 50 k.y. to 100 k.y., although a recurrence interval of 5-10 k.y. has been estimated for the southern strand in the central part of the fault zone. The most recent surface-faulting event is estimated to have occurred between 6 ka and 12 ka on each of the three strands in the central part of the fault zone.
Name comments	Referred to as the Rock Valley fault by Frizzell and Zoback (1987 #3174), Piety (1992 #538) and (Keefer and Pezzopane, 1996 #3428), and as the Rock Valley fault zone and Rock Valley fault system by Coe and others (1996 #3423). The name Rock Valley fault zone is used herein because several major fault strands form a zone within the general trend of Rock Valley, its namesake. **Fault ID:** Referred to as fault DV6 dePolo (1998 #2845).
County(s) and State(s)	NYE COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Southwest part of fault zone is compiled from

	1:100,000-scale mapping by Reheis and Noller (1991 #1195). The main central part is compiled from Coe and others (1996 #3423) using their page-size illustration at scale of about 1:130,000. The eastern part is compiled from 1:100,000-scale mapping by Guth and Yount, (1999, written commun., unpublished geologic map of the Indian Springs 1:100,000 quadrangle, Clark, Lincoln, and Nye Counties, Nevada). Original mapping of the fault traces was done from aerial photographs ranging in scale from 1:80,000 (Reheis and Noller, 1991 #1195) to 1:12,000 (low-sun angle) (Donovan, 1991 #1498; Piety and others, 1992 #538).
Geologic setting	The Rock Valley fault zone is reported to be part of a northeast-striking, 55-km-long, dominantly left-lateral structural zone called the Spotted Range-Mine Mountain structural zone (SRMM) (Carr, 1984 #1472; Donovan, 1991 #1498). This structural zone cuts across the larger northwest-trending Walker Lane belt. Other faults in the structural zone include the Mine Mountain fault [1066], the Cane Spring fault [1067], and the Wahmonie fault [1068]. The Rock Valley is the southern fault of the SRMM.
Length (km)	62 km.
Average strike	N58°E
Sense of movement	Left lateral *Comments:* Total sinistral displacement is estimated to be a few kilometers (Barnes and others, 1982 #1441), and vertical displacement varies in direction and amount, but is generally small. Interpretation of a reflection seismic profile perpendicular to the fault-zone trend indicates almost 200 m of total throw (Coe and others, 1996 #3423). A shallow graben about 3 km wide is suggested in the western part of Rock Valley (Keefer and Pezzopane, 1996 #3428). Rake angles are estimated at 22? from a nearby bedrock surface and about 5? from a trench exposure (Coe and others, 1996 #3423).
Dip	70°-90° N *Comments:* Faults observed in trenches dip mostly vertical, whereas those interpreted from seismic-reflection data dip 70? -90?.
Paleoseismology	Twelve trenches have been dug and investigated along the Rock

studies	Valley fault zone. The locations of nine trenches that yielded paleoseismic data are shown on maps associated with this fault description; the remaining three trenches were not logged or described in any detail. Age constraints for faulted materials and surfaces are based on surficial geologic mapping covering areas surrounding trenches and on an extensive set of uranium-series and thermoluminescence determinations that were made on samples taken from trenches (Coe and others, 1996 #3423). Sites 1065-1, -2, -3; northern strand. Three trenches were excavated across the western part of the northern strand in 1995. Results of two fault perpendicular trenches [1065-1 (RV3) and 1065-3 (RV3a)] and one fault parallel trench [1065-2 (RVCT)] were logged in detail by Coe and others, (1996 #3423). Sites 1065-4, -5; medial strand. Two fault perpendicular trenches [1065-4 (RV1) and 1065-5 (RV2)] were excavated across the central part of the medial strand in 1978 and logged in detail by Yount and others (1987 #1703). Sites 1065-6, -7, -8; southern strand. Three fault perpendicular trenches [1065-6 (RV5), 1065-7 (RV4), 1065-8 (RV4a)] were excavated across the northern of two traces that comprise the southern strand in 1995 and were logged in detail Coe and others (1996 #3423). Site 1065-9; main strand in Frenchman Flat. A fault perpendicular trenches [1065-9] was excavated across the main strand and logged in the mid 1980s by Jim Yount and others. These data are included in the report by Coe and others (1996 #3423). On the basis of these trenches and other paleoseismic studies, Coe and others (1996 #3423) reported displacements per event range from about 3 m on the northern strand to 0.3 m on the southern strand, slip rates range from 0.05 to <0.002 mm/yr, but 0.02 mm/yr was estimated for the slip rate for the medial fault strand. A recurrence interval of 5-10 k.y. was estimated for the southern strand. The most recent surface-faulting event is estimated to have occurred between 6 ka and 12 ka based on interpretations of trenches on each of the three strands in the central part of the fault zone.
Geomorphic expression	Faults in the Rock Valley zone are expressed by discontinuous low scarps and lineaments which, in the central part, form three

	main strands each of which can be speculatively extended to a total trace length of about 20 km, but is mainly continuous for distances less than 10 km. Individual scarp heights range from less than 1.0 m to as much as 2.5 m. The lack of continuous expression along individual strands probably results from erosion and the tendency toward subdued expression from predominantly strike-slip displacements. Erosion is particularly aggressive along Hampel Wash, possibly obliterating surface expression along large portions of the faults trace. Large gaps in surficial expression over the approximately 65 km of the Rock Valley fault zone probably reflects the aggregation of separate faults and sections of fault into a single complex fault zone.
Age of faulted surficial deposits	Pleistocene and Holocene. Age constraints for faulted materials and surfaces are based on surficial geologic mapping covering areas surrounding trenches and on an extensive set of uranium-series and thermoluminescence age estimates that were made on samples taken from trenches (Coe and others, 1996 #3423). To the extent possible, geomorphic surfaces and surficial materials shown on the detailed maps were correlated with those established for the general area (Swadley and Huckins, 1989 #1665).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* The most recent surface-faulting event is estimated to have occurred between 6 ka and 12 ka based on interpretations of trenches on each of the three strands in the central part of the fault zone.
Recurrence interval	5-10 k.y., 50-100 k.y *Comments:* Estimated for the southern strand on the basis of two faulting events identified in trenches (Coe and others, 1996 #3423). Estimates of preferred recurrence intervals made by three three-member teams comprising a formal seismic-hazard elicitation panel are 50 k.y., 58 k.y., and 100 k.y. (Arabasz and others, 1998 #3908). These estimates are probably more representative of the entire fault zone than the 5-10 k.y. estimate from the trench study of a singular fault strand.
Slip-rate	Less than 0.2 mm/yr

category	*Comments:* The best estimate of the slip rate is estimated at 0.02 mm/yr from a site where there is evidence (albeit indirect) of the slip direction on the medial strand (Coe and others, 1996 #3423). However, this rate should not be considered characteristic of the entire fault zone. The range of preferred slip rate resulting from a formal seismic-hazard elicitation involving six separate teams (three experts each) is 0.10 to 0.02 mm/yr (Arabasz and others, 1998 #3908). This range applies to the central part of the zone where trenching was done. Little is known of either the slip sense or the Quaternary history of fault displacement in the parts of the zone extending east into Frenchman Flat and west into Amargosa Valley. Accordingly, the less than 0.2 mm/yr slip-rate category has been assigned to this fault zone.
Date and Compiler(s)	1998 R. Ernest Anderson, U.S. Geological Survey, Emeritus
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