APPENDIX D

OTHER FAULT PARAMETER DATABASE

By

William R. Lund and Susan Olig

Table D-1. Parameters for Other Wasatch Front Faults

Fault Name	Rupture Model[1]	Probability of Activity[2]	Fault Category[3]	SRL (km)[4]	Dip Degrees)[5]	Seismogenic Depth (km)[6]	M_{char}[7]	Vertical Slip Rate (mm/yr)	Recurrence Interval (yr)	Comments
Bear River fault zone (Holocene)	Independent (1.0)	1.0	C	35	50±15	15±3 (E)	6.96	—	1000 (0.2) 2300 (0.6)[8] 3500 (0.2)	Detailed trenching and mapping by West (1994) revealed evidence for two large, late Holocene surface-faulting earthquakes on this apparently geologically young normal fault with no associated range front. This west-dipping fault may merge into a ramp of the Laramide-age Darby-Hogsback thrust fault at a depth of about 5-7 km (West, 1994). There is no evidence, at this time, that the fault zone has discrete rupture segments.
Carrington fault (Latest Quaternary)	Independent (1.0)	1.0	C	~30[9]	50 ± 15	15 ± 3 (W)	6.89	—	1800 (0.2)[10] 4200 (0.6) 6600 (0.2)	Dinter and Pechmann (2005) first identified the Carrington fault based on displacements observed in high-resolution seismic reflection profiles in the Great Salt Lake. The northeast-striking, ~30-km-long, down-to-the-northwest normal fault, which is northwest of Carrington Island, is clearly visible on a recent bathymetry map of Great Salt Lake (Baskin and Allen, 2005). This scarp is as high as 1.5 m, and likely has experienced multiple Holocene surface-faulting events, similar to the Antelope and Fremont Island segments of the Great Salt Lake fault zone. However, earthquake times remain unconstrained (D. Dinter, University of Utah, written communication, 2010). Based on the apparent similarities of the lakebed scarps, we assigned a recurrence interval distribution similar to the Antelope Island segment of the Great Salt Lake fault zone.
Crater Bench faults and Drum Mountains fault zone (Latest Quaternary and Holocene)	Linked (1.0)	0.5	C	Drum Mountains fault zone - 52 Crater Bench faults - 16 The two fault zones completely overlap	50 ± 15	15 ± 3 (W)	7.13	0.01 (0.2) 0.04 (0.6) 0.2 (0.02)	—	Comments from Tony Crone (U.S. Geological Survey [USGS]): "In the absence of better data, I'd favor leaving the linked Drum Mountains/Crater Bench fault zone in their current low slip rate category (<0.2 mm/yr) for two reasons. First our knowledge of the actual net slip across the entire complex zone is imperfect. The net slip could actually be very small. With current Global Positioning System technology we have an opportunity to efficiently and

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										accurately measure profiles several kilometers long; so we could obtain the net slip. However, this work hasn't been done yet, so we don't have a basis for saying the slip rate across the entire zone should be higher. Second, I'm not totally convinced about the seismogenic potential of the Drum Mountains/Crater Bench faults. The complex, widely distributed zone of scarps is unusual for tectonic faults, and the scarps are spread out a fair distance east of the Drum Mountains range front, which lacks the morphology of a classic active range front. A possible issue is the role of subsurface evaporite deposits in forming the Drum Mountain/Crater Bench scarps. Deep wells in the region report [thick accumulations of] subsurface salt and gypsum. Considering the complex pattern of the scarps and the possible presence of significant amounts of subsurface evaporites, the possibility that the Drum Mountain/Crater Bench scarps could be halokinetic features related to salt/evaporite movement cannot be ruled out. If this is the case, then they would not be seismogenic, and would not be a factor in a seismic-hazard assessment. I think that this possibility needs to be considered carefully when assigning some level of seismic hazard to these faults." There is also a possible connection of these two fault zones with the Sevier detachment fault at shallow depth (3-5 km).
Crawford Mountains (west side) fault (Late Quaternary)	Independent (1.0)	1.0	C	25	50 ± 15	15 ± 3 (W)	6.81	0.01 (0.3) 0.02 (0.4) 0.04 (0.3)	—	Although Everitt (1995) included scarps on alluvium south of the Bear River, Black and others (2003) included those with the Saleratus Creek fault (not included in this database) to the south, and we follow that convention here. Further study is required to resolve the relation between the Crawford Mountains (west side) and Saleratus Creek faults. Due to a lack of data, a slip-rate distribution similar to the Morgan fault (Lund [2005] see below) was assigned to the Crawford Mountains fault.
Curlew Valley faults (Latest Quaternary)	Independent (1.0)	1.0	C	20	50 ± 15	15 ± 3 (W)	6.71	0.1 (0.4)[11] 0.3 (0.4) 0.8 (0.2)	—	These post-Bonneville northeast-trending en echelon faults mapped along the eastern margin of Curlew Valley by Allmendinger (1983) are

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										the southern portion of the much longer East Side of Arbon Valley fault of Witkind (1975), which included faults with pre-Quaternary movement to the north. Cress (1983) observed fault scarps as high as 24 m on undifferentiated lacustrine sediments, which may be associated with the Little Valley lake cycle (> 130 ka) or the Bonneville lake cycle (12 to 30 ka). The maximum slip rate assumes 24 m of vertical displacement since 30 ka, whereas the other rates assume 20 m since 60 and 150 ka (20 m accounts for some likely antithetic faulting and backtilting).
East Cache fault zone (Southern segment includes the James Peak and Broadmouth Canyon faults)	Unsegmented (0.2) Segmented (0.8)	1.0	B	Unsegmented – 86[12] (floating rupture length = 43.5)	50 ± 15	15 ± 3 (E)	7.15	0.04 (0.2)[13] 0.2 (0.6) 0.4 (0.2)	—	Paleoseismic trench data are only available for the Central segment (McCalpin, 1994) and the James Peak fault (Nelson and Sullivan, 1992), which at the recommendation of the Utah Quaternary Fault Parameters Working Group (UQFPWG; Lund, 2005) is included as part of the Southern segment along with the Broadmouth Canyon fault.
				Northern segment - 41 (Quaternary)			7.12	0.04 (0.3)[14] 0.1 (0.4) 0.2 (0.3)	—	
				Central segment - 17 (Holocene)			6.71	**0.8** 0.04 (0.2)[15] 0.2 (0.6) 0.4 (0.2)	**0.2** 4000 (0.3)[15] 10,000 (0.4) 15,000 (0.3)	
				Southern segment - 29 (Late Quaternary)			6.96	**0.8** 0.01 (0.3)[16] 0.03 (0.4) 0.07 (0.3)	**0.2** 10,000 (0.3)[16] 50,000 (0.4) 100,000 (0.3)	
East Dayton - Oxford faults (Late Quaternary)	Independent (1.0)	1.0	C	23	50 ± 15	15 ± 3 (E)	6.77	0.01 (0.3)[17] 0.05 (0.6) 0.1 (0.1)	—	This north-trending, down-to-east, normal fault bounds the eastern margin of the Bannock Range, and is considered by some to be a northward extension of the West Cache fault zone, which is known to displace Quaternary-age Lake Bonneville sediments farther south in Utah. There is no documented evidence of late Quaternary fault scarps. Mapping by Carney *et al*. (2002) shows the trace of the fault as entirely covered, but adjacent to the abrupt mountain front termination of various Quaternary deposits suggests, but does not prove, Quaternary deformation.
Eastern Bear Lake fault	Segmented (0.7)	1.0	B	Unsegmented - 78 (floating	50 ± 15	15 ± 3 (E)	7.10	0.2 (0.2) 0.6 (0.6)	—	Central segment and unsegmented scenario assigned the same slip-rate distribution as the

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Eastern Bear Lake fault	Unsegmented (0.3)	1.0	B	rupture length = 39)	50 ± 15	15 ± 3 (E)	7.10	1.6 (0.2)	—	Southern segment (Lund, 2005) due to the presence of large scarps on likely Holocene and latest Pleistocene deposits. The Northern segment lacks compelling evidence for latest Quaternary movement and consequently is assigned a lower slip rate (one half the UQFPWG's Southern segment consensus value).
				Northern segment - 19 (Middle - Late Quaternary)			6.76	0.1 (0.2) 0.3 (0.6) 0.8 (0.2)	—	
				Central segment - 24 (Latest Quaternary)			6.87	0.2 (0.2) 0.6 (0.6) 1.6 (0.2)	—	
				Southern segment - 35 (Holocene)			7.05	**0.8** 0.2 (0.2)[15] 0.6 (0.6) 1.6 (0.2)	**0.2** 3000 (0.2)[15] 8000 (0.6) 15,000 (0.2)	
Faults along the western edge of Scipio Valley and eastern base of the Pavant Range (from south to north includes the Red Canyon fault scarps, Maple Grove faults, Pavant Range fault, Scipio fault zone, and Scipio Valley faults). (Latest Quaternary to Late Quaternary)	Linked (1.0)	1.0	C	Total length - 45	50 ± 15	15 ± 3 (W)	7.06	0.02 (0.2)[18] 0.1 (0.6) 0.4 (0.2)	—	Several north-striking, individually short faults along the north side of the Pavant Range and the western side of Scipio Valley that are in close alignment and show evidence for late Quaternary surface faulting (Anderson and Bucknam, 1979; Bucknam and Anderson, 1979). Therefore, we link these faults to form a single unsegmented fault zone. Scarps vary from 2 to 11 m on unconsolidated deposits, but ages are not well constrained. The preferred slip rate assumes 3 to 4 m of slip since 30 ka, whereas the minimum slip rate assumes 2 m of slip since 130 ka, and the maximum rate assumes 11 m of slip since 30 ka.
Gunnison fault (Latest Quaternary)	Independent (1.0)	0.8	C	42	50 ± 15	15 ± 3 (W)	7.04	0.02 (0.2) 0.1 (0.6) 0.4 (0.2)	—	Little is known about rates of activity, but scarps and location are similar to the faults along the north side of the Pavant Range and the western side of Scipio Valley. Therefore a slip-rate distribution similar to the Scipio Valley faults was assigned to this fault. This structure may be related to salt tectonics and therefore was given a reduced probability of activity.
Hansel Valley fault (includes Hansel Mountains [east side] faults and Hansel Valley [valley floor] faults) (Historic - Mid- to	Linked (1.0) Independent (0.6) Coseismic (0.4)	1.0	AFP	30	50 ± 15	Antithetic fault truncated against the North Promontory fault.	6.49	0.06 (0.2)[15] 0.1 (0.6) 0.2 (0.2)	—	Both the number and timing of surface-faulting earthquakes on the Hansel Valley fault(s) are unknown. The fault exhibits an irregular pattern of surface faulting with inter-event intervals ranging from possibly as little as 1-2 kyr to more than 30 kyr, indicating that earthquake recurrence has been highly variable through

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Late Quaternary)										time (McCalpin and others, 1992). The 1934 historical surface-faulting earthquake may have been a strike-slip event on a different, unrecognized fault, which implies that the historical scarps and lineaments are not primary tectonic features
Joes Valley fault zone (Latest Quaternary) (combined East, West, and Intragraben faults)	Linked (1.0) Shallow (4 km) (0.6) Deeply penetrating (0.4)	Shallow (0.4) Deep (1.0)	AFP (shallow) C (deep)	37 (Length restricted to that part of fault that shows Latest Quaternary < 15 ka displacement - overall length 84 km)	70 ± 15[19]	Available geologic and geophysical evidence is inconclusive regarding whether the Joes Valley faults penetrate to seismogenic depth (15±3 km; deep) or become listric and sole into a detachment fault at a depth of about 4 km (shallow).	6.67	—	5000 (0.2)[15] 10,000 (0.6) 50,000 (0.2)	As per the UQFPWG (Lund, 2005), this zone of faults is linked into a single source due to the geometry of the individual faults and their proximity to each other. A low probability of activity was assigned to the shallow-fault scenario based on arguments that these faults may not be seismogenic structures as summarized in the "Discussion" section of p. 61 in Lund (2005). These arguments include the lack of significant net displacement across the entire Joes Valley graben (Foley *et al*., 1986), and the fault zone's spatial association with the crest of the Wasatch Plateau monocline, suggesting that the faults may be a keystone graben that is not seismogenic. Additionally, recent interpretation of seismic lines suggests that offsets do not extend below a few kilometers depth (Coogan, 2008).
Little Valley faults (Latest Quaternary)	Independent (1.0)	1.0	C	20	50 ± 15	15 ± 3 (W)	6.72	0.02 (0.2) 0.1 (0.6) 0.4 (0.2)	—	Little is known about rates of activity, but scarps and location are similar to the faults along the western side of Scipio Valley. Therefore a slip-rate distribution similar to the Scipio Valley faults was assigned to the Little Valley faults.
Main Canyon fault (formerly East of East Canyon fault) (Holocene)	Independent (1.0)	1.0	C	26	50 ± 15	15 ± 3 (E)	6.83	0.01(0.3)[20] 0.02 (0.4) 0.04 (0.3)	—	Although identified and mapped by Bryant (1990) and Coogan and King (2001), this fault is not included in Black and others (2003), and was only recently included in the *Quaternary Fault and Fold Database of the United States* (USGS, 2013). The Main Canyon fault bounds the east side of East Canyon Valley and the East Canyon fault bounds the west side. A previous study (Sullivan *et al*., 1988) considered the East Canyon fault to be the more active and dominant fault primarily based on thicker late Cenozoic deposits along the west side of the

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										basin, and the geomorphic expression of the bedrock scarp. However, stratigraphic and structural relations, and radiocarbon and luminescence ages provide evidence for two surface-faulting earthquakes during the past 30 to 38 kyr on the Main Canyon fault (Piety *et al.*, 2010). The most recent event likely occurred shortly before 5 to 6 ka, but could be as old as 12 to 15 ka. There was also limited evidence for an unknown number of surface-faulting earthquakes older than 38 ka. Differences in stratigraphic units on opposite sides of the fault in the trench prevented the determination of either the amount of offset or slip rate of the fault.
Morgan fault (includes linked northern, central, and southern sections) (Holocene - Late Quaternary)	Linked (1.0)	1.0	C	17	50 ± 15	15 ± 3 (E)	6.64	**0.8** 0.01(0.3)[15] 0.02 (0.4) 0.04 (0.3)	**0.2** 25,000 (0.5)[15] 100,000 (0.5)	The northern, central, and southern sections as defined by Sullivan and Nelson (1992) are grouped together based on: (1) short section lengths; (2) along-strike patterns of topographic profiles; and (3) similar geomorphic expression (Sullivan and others, 1988).
North Promontory fault (Holocene - Latest Pleistocene)	Independent (1.0)	1.0	C	26	50±15	15±3 (W)	6.83	0.1 (0.3)[15] 0.2 (0.4) 0.5 (0.3)	—	Range-front fault bounding eastern Hansel Valley showing evidence for Holocene movement and multiple late Pleistocene events (McCalpin, 1985; McCalpin and others, 1992).
Porcupine Mountain faults (Late Quaternary - Quaternary)	Independent (1.0)	1.0	C	35	50 ± 15	15 ± 3 (E)	6.96	0.01 (0.3)[20] 0.02 (0.4) 0.04 (0.3)	—	This fault offsets apparently young (Holocene-latest Pleistocene?) alluvial fans (Jon King, Utah Geological Survey, written communication, 2000). Due to a lack of data, a slip-rate distribution similar to the Morgan fault is assigned to this fault.
Rock Creek fault (Holocene)	Independent (1.0)	1.0	C	41	50 ± 15	15 ± 3 (E)	7.02	**0.8** 0.2 (0.1) 0.6 (0.6) 1.0 (0.3)	**0.2** 600 [21] (0.1) 4000 (0.6) 10,000 (0.3)	The Rock Creek fault is a high-angle, down-to-west normal fault within the Tunp Range; it may sole into the Laramide-age Tunp thrust fault. Most of the fault's length is characterized by scarps on steep colluvial slopes. McCalpin (1993) stated that some scarps are as much as 25 m high. He excavated one trench across the fault. The most recent event is bracketed by radiocarbon ages of 3280 ± 70 and 3880 ± 60 ^{14}C yr BP (McCalpin and Warren, 1992), or roughly 3.6 ± 0.3 ka, whereas the penultimate (older) event is about 4.6 ± 0.2 ka. This equates to a permissible recurrence interval of about 0.6-1.5 kyr. However, the late Quaternary

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										recurrence interval must be quite variable: elapsed time since the last surface-faulting earthquake has been about 3.6 ± 0.3 kyr, and at least 10 kyr before the penultimate event (15 ka is the inferred time of deposition of older faulted deposits at the trench site).
Skull Valley (mid valley) faults (Latest Quaternary)	Independent (1.0)	0.9	C	34	50 ± 15	15 ± 3 (W)	6.91	0.05 (0.2) 0.3 (0.6) 0.5 (0.2)	—	Includes only that portion of the Skull Valley fault referred to in the Quaternary Fault and Fold Database as "northwest-trending normal faults in southern Skull Valley," and identified as Holocene-latest Pleistocene in age. A northeast-trending normal fault in northern Skull Valley of questionable Quaternary age is now identified in the Quaternary Fault and Fold Database as part of the Skull Valley fault system, but was formerly referred to as the "Springline fault." Because of its age and general lack of surface expression, that portion of the Skull Valley fault is not considered here. The activity of these faults may be dependent on the Stansbury fault; therefore, a lower probability of activity was assigned, although Geomatrix Consultants (1999) found definite evidence for repeated late Pleistocene offsets. Slip-rate distribution is based on late Pleistocene vertical slip rates of 0.3 (± 0.1) and 0.05 (± 0.01) mm/yr for the East and West faults, respectively (Geomatrix Consultants, 1999).

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Snow Lake Graben[21] (Latest Quaternary)	Linked (1.0) Deeply penetrating (0.4) Shallow (4 km) (0.6)	0.4 (shallow) 1.0 (deep)	AFP (shallow) C (deep)	26	70 ± 15	Available geologic and geophysical evidence is inconclusive regarding whether the Snow Lake graben faults penetrates to seismogenic depth (15 ± 3 km; deep) or become listric and sole into a detachment fault at a depth of about 4 km (shallow).	6.83	—	5000 yrs (0.2) 10,000 yrs (0.4) 50,000 yrs (0.4)	These prominent north-south striking fault scarps in bedrock trend along the crest of the Wasatch Plateau and form a narrow graben similar to the Joes Valley fault zone. However, far less is known about these poorly studied faults, so we assumed rates of activity similar to the Joes Valley fault zone, but give heavier weight to longer recurrence intervals based on less extension and less prominent scarps. A low probability of activity was assigned to the shallow-fault scenario based on the argument that like the Joes Valley fault zone, these faults may not be seismogenic structures. Evidence for a nonseismogenic origin includes the lack of significant net displacement across the graben, and the fault zone's spatial association with the crest of the Wasatch Plateau monocline, suggesting that the faults may form a keystone graben that is not seismogenic.
Stansbury fault	Unsegmented (0.3)	1.0	B	70 (Straight line distance from the north end Geomatrix Section A to the south end of Section D) (floating rupture length = 35)	50±15	15±3 (W)	7.05	0.07 (0.2)[18] 0.4 (0.6) 1.0 (0.2)	—	Segmentation model modified from Helm (1995) and Geomatrix Consultants (1999). Maximum rupture lengths measured on plate 6 of Geomatrix Consultants (1999). Slip-rate distribution based on long-term (Miocene) vertical slip rates of 0.07 (0.02) mm/yr (Helm, 1995), late Pleistocene vertical slip rates of 0.4 (0.1) mm/yr (Geomatrix Consultants, 1999), and comparison with the Oquirrh and Great Salt Lake fault zones for the maximum slip value. The surface trace of the Stansbury fault is simple south of Pass Canyon, but complex to the north, suggesting the fault may consist of two independent sections. A down-to-the-south cross-fault at Pass Canyon forms the boundary between the sections (Helm, 1994). In the south, a single fault strand consisting of a main fault and a subsidiary antithetic fault cuts Quaternary alluvial fans and forms a narrow (about 20-m-wide) graben along most of the fault trace (Helm, 1994). North of Pass Canyon, the trace is a complex fault zone consisting of multiple synthetic and antithetic fault traces showing evidence of Quaternary movement. Based on
	Segmented (0.7) Northern Segment (Section A of Geomatrix Consultants, 1999) (Latest Quaternary)			24			6.87	0.07 (0.2)[18] 0.4 (0.6) 1.0 (0.2)		
	Central Segment (Sections B and C of Geomatrix			33			6.96	0.07 (0.2)[18] 0.4 (0.6) 1.0 (0.2)		

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	Consultants, 1999) (Latest Quaternary)			33			6.96	0.07 (0.2)[18] 0.4 (0.6) 1.0 (0.2)		scarp morphology and observation of stream knickpoints a short distance from the fault trace, Everitt and Kaliser (1980) concluded that the most recent movement was during the Holocene. Helm (1994) reports maximum scarp angle versus scarp height plots suggest the Stansbury fault is generally older than the highstand of Lake Bonneville. However, Geomatrix Consultants, Inc. (1999) states that the southern section of the fault is inferred to have moved in a single event during the early to middle Holocene.
	Southern Segment (Section D of Geomatrix Consultants, 1999) (Quaternary)			17			6.71	0.07 (0.2)[18] 0.4 (0.6) 1.0 (0.2)		
Stinking Springs fault (Late Quaternary)	Independent (1.0)	1.0	C	10	50±15	15±3 (E)	6.41	0.03 (0.2)[23] 0.1 (0.6) 0.3 (0.2)	—	Slip-rate data are lacking for this poorly understood fault as much of the central portion lies underwater, so we assumed a slip-rate distribution similar to the Strawberry fault (Lund, 2005) based on a similar geomorphic expression.
Strawberry fault (Holocene)	Independent (1.0)	1.0	C	32	50±15	15±3 (E)	6.92	**0.5** 0.03 (0.2)[15] 0.1 (0.6) 0.3 (0.2)	**0.5** 5000 (0.2)[15] 15,000 (0.6) 25,000 (0.2)	Maximum rupture length includes the southernmost suspected Quaternary fault trace of Hecker (1993). Trenches across a subsidiary fault exposed evidence for two to three earthquakes displacing alluvial-fan deposits estimated to be 15 to 30 ka based on soil development (Nelson and Martin, 1982; Nelson and Van Arsdale, 1986). Note that URS Corporation (unpublished data) assigned slip-rate values of 0.04 (0.2), 0.2 (0.6), 0.5 (0.2) based on data in Nelson and Van Arsdale (1986) because they considered the UQFPWG's distribution to underestimate the large uncertainties of the limited paleoseismic data obtained from a subsidiary fault (i.e., earthquake timing constraints and estimates of total slip are lacking for the main fault).
Utah Lake faults[23] (Latest Quaternary)	Independent (0.5) Coseismic (0.5)	1.0	AFP	31	50±15	Antithetic fault zone truncated against the Provo segment of the WFZ.	6.79	0.1 (0.2) 0.4 (0.6) 0.6 (0.2)	—	The Utah Lake faults are a complex system of east and west dipping normal faults beneath Utah Lake. There are no known subaerial exposures of this fault zone. Recent (2010) high-quality seismic reflection profiles suggest that as many as eight surface-rupturing, north-striking faults displace very young lake sediments 1 to 3 meters (David Dinter, University of Utah, written communication, 2011). Because these faults occupy a similar

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										position in relation to the Provo segment of the WFZ as does the West Valley fault zone (WVFZ) to the Salt Lake City segment of the WFZ, and because the Utah Geological Survey is in the process of developing new paleoseismic data for the WVFZ, we use the current best available information for the WVFZ as an analog for the Utah Lake faults. This assumption may change as more data become available for the Utah Lake faults. Dinter (written communication, 2011) estimates that there have been one or two surface-faulting earthquakes on the Utah Lake faults in the past 1 kyr, but he lacks the data necessary to estimate a slip rate
West Cache fault zone (Holocene)	Unsegmented (0.3) Segmented (0.7)	1.0	B	Unsegmented - 59 (floating rupture length = 32.5)	50±15	15±3 (E)	7.01	0.1 (0.2)[25] 0.4 (0.6) 0.7 (0.2)	—	Seismic reflection data indicate that the West Cache fault zone has significantly less cumulative displacement than the East Cache fault zone (Evans, 1991; Evans and Oaks, 1996), suggesting that the former is antithetic to the latter (Sullivan and others, 1988). However, subsequent detailed mapping and trenching studies have shown that the latest Quaternary behavior of the two faults is different, implying generally independent behavior (Black and others, 2000). Therefore, a probability of activity of 1.0 is assigned to the West Cache fault zone. Fault trace geometry, lengths, and segmentation model are after Black and others. (2003).
				Clarkston segment - 21			6.81	0.1 (0.2)[15] 0.4 (0.6) 0.7 (0.2)	—	
				Junction Hills segment - 24			6.87	0.05 (0.2)[15] 0.1(0.6) 0.2 (0.2)	—	
				Wellsville segment - 20			6.79	0.05 (0.2)[15] 0.1 (0.6) 0.2 (0.2)	—	
West Valley fault zone (Holocene)	Independent (0.25) Coseismic (0.75)	1.0	AFP	Granger fault - 16 Taylorsville fault - 15	50±15	Antithetic fault truncated against the Salt Lake City segment of the WFZ.	6.34	0.1 (0.2)[15] 0.4 (0.6) 0.6 (0.2)	—	Due to their proximity and similar dip, we assume that the Granger and Taylorsville faults of the WVFZ merge at a shallow depth, and that the primary moment release occurs on the Granger fault as it appears to have the greatest cumulative displacement (Keaton *et al*., 1993). The WVFZ is antithetic to, and 3 to 13 km west of the Salt Lake City segment of the WFZ. We allowed for both independent and coseismic rupture of the WVFZ with the Salt Lake City segment based on trenching results by the UGS of the Granger fault. Current slip-rate distribution is based on data in Keaton *et al.* (1993) and Hylland *et al.* (2014) for a variety of time periods. A comprehensive trenching

Fault Name	Rupture Model[1]	Probability of Activity[2]	Fault Category[3]	SRL (km)[4]	Dip Degrees)[5]	Seismogenic Depth (km)[6]	M_{char}[7]	Vertical Slip Rate (mm/yr)	Recurrence Interval (yr)	Comments
										investigation has not been performed for the Taylorsville fault, although Solomon (1998) reported limited timing and displacement information for one earthquake identified in a consultant's trench.
Western Bear Lake fault (Holocene)	Independent (0.5)[26] Coseismic (0.5)	1.0	AFP	26	50±15	Antithetic fault truncated against the East Bear Lake fault.	6.51	0.1 (0.2) 0.5 (0.6) 0.8 (0.2)	—	Maximum rupture length based on total extent of scarps on unconsolidated sediments (McCalpin, 2003). Based on kinematic and geometric relations (Skeen, 1976; McCalpin, 1990; Evans, 1991) the rupture model for this fault includes the possibility that the Western Bear Lake fault ruptures coseismically with the Eastern Bear Lake fault and is not an independent seismic source. Untrenched antithetic faults make the 1.75 m maximum displacement (McCalpin, 2003) a poorly constrained estimate. Slip rates based on McCalpin (2003); however, slip on the Western Bear Lake fault is poorly constrained.

[1] Rupture models include independent, linked, segmented, coseismic (antithetic fault pairs), and deep or shallow penetrating for the Joes Valley fault zone and Snow Lake graben.

[2] Probability of activity is the likelihood that the fault is a seismogenic source capable of generating earthquakes within the modern stress field.

[3] Fault categories are: *A* - WFZ and Oquirrh-Great Salt Lake fault zone (not included in this table); *B* - segmented faults thought to behave in a manner similar to the Wasatch fault zone; *C* - unsegmented faults and short linked faults; *AFP* - antithetic fault pairs where the secondary fault is truncated by the primary (master) fault at relatively shallow depth.

[4] Measured straight line end-to-end as reported in the *Quaternary Fault and Fold Database of the United States* (USGS, 2013) unless noted otherwise. Discrepancies between unsegmented fault length and the sum of individual segment lengths is chiefly the result of overlapping segment boundaries or gaps and stepovers at segment boundaries.

[5] Range of crustal fault dips (50 ± 15 degrees) recommended by the Basin and Range Province Earthquake Working Group II (Lund, 2012) to the USGS, and adopted by the WGUEP for most normal faults in the Wasatch Front Region and weighted 35 (0.3), 50 (0.4), 65 (0.3). The exceptions are the Joes Valley fault zone and Snow Lake graben, which are assigned a dip of 70 ± 15 degrees and weighted 55 (0.3), 70 (0.4), 85 (0.3).

[6] Range of seismogenic depths (15 ± 3 km) adopted by the WGUEP for normal faults in the WGUEP study; weighted 12 (0.2), 15 (0.7), 18 (0.1) west of the WFZ and 12 km (0.1), 15 km (0.7), 18 (0.2) east of the WFZ.

[7] M_{char} is the characteristic magnitude for a rupture source, which assumes full rupture of the source and is computed from magnitude relations relating length, area, or average displacement to magnitude. The “Other” faults in the WGUEP model for the Wasatch Front region (Table 4.5-1) are either category *B*, *C*, or *AFP* faults (see section 3.5.2), the magnitude relations and weights used to determine M_{CHAR} for the “Other” faults are presented in Table 3.5-2.

[8] West (1994) identified two earthquakes on the Bear River fault zone at 4620 ± 690 and 2370 ± 1050 yr. BP with resulting single closed-seismic-cycle recurrence interval of 2250 ± 1260 (rounded to nearest decade). West calendar calibrated the earthquake ages, but did not correct for the mean resident time of the carbon in the bulk soil samples from which the ages were obtained, and therefore feels the ages may be too old by several hundred years.

[9] Jim Pechmann, University of Utah Seismograph Stations, written communication, 2011 (see WGUEP Meeting #4 summary at http://geology.utah.gov/ghp/workgroups/pdf/wguep/WGUEP-2011A_Presentations.pdf).

[10] Assigned the same slip rate as the Fremont Island and Antelope Island segments of the Great Salt Lake fault zone.

[11] Modified from URS Corporation (unpublished data). USGS (2013) *Quaternary Fault and Fold Database of the United States* reports a value of < 0.2 mm/yr, higher slip rates acknowledge the presence of large scarps (24 m) on possible late Pleistocene lacustrine deposits.

[12] End-to-end straight line length of the East Cache fault zone includes the James Peak and Broadmouth Canyon faults at the so the end of the Southern segment; therefore, the unsegmented length is longer than the length reported in the *Quaternary Fault and Fold Database of the United States* (USGS, 2013)

[13] UQFPWG consensus values (Lund, 2005) for the Central segment also applied to the unsegmented model.

[14] Modified from McCalpin (1987; 1989) and URS Corporation (unpublished data).

[15] Utah Quaternary Fault Parameter Working Group (UQFPWG) consensus values (Lund, 2005)

[16] Slip-rate and recurrence-interval distributions assigned to the Southern segment are from Lund (2005) for the James Peak fault. The James Peak and Broadmouth Canyon faults are combined with the Southern segment of the East Cache fault zone to form a composite Southern segment.

[17] Assigned same slip-rate distribution as the northern segments of the WFZ.

[18] Modified from URS Corporation (unpublished data).

[19] Based on surface expression (narrow "keystone" graben with minimal displacement across it) and seismic evidence, the WGUEP assigned a steeper dip (70 ± 15) to the Joes Valley fault(s) than the dip adopted for the other normal-slip faults in the WGUEP study area; weighted 55 (0.3), 70 (0.4), 85 (0.3).

[20] Because scarps and location are similar to the Morgan fault, a similar slip-rate distribution (Lund, 2005) was assigned to this fault.

[21] McCalpin and Warren (1992); McCalpin (1993)

[22] Assigned same rupture model, fault-dip distribution, seismogenic depth, and recurrence distribution as the Joes Valley fault zone.

[23] Assigned same rupture model, fault-dip distribution, and slip-rate distribution as the Strawberry fault.

[24] Assigned the same fault rupture model and slip-rate distribution as the West Valley fault zone

[25] Unsegmented model assigned same slip rate as the Clarkston fault