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Proximity of the Seismogenic Dog Valley Fault to Stampede and Prosser Creek Dams Near Truckee, California

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Abstract Text:

The M 6.0 Truckee earthquake of 12 September 1966 caused a variety of surface effects observed over a large area, but the rupture plane of the causative fault did not displace the ground surface. The fault that generated the earthquake was named the Dog Valley fault [DVF], and its ground trace was assumed to be within a zone of subparallel drainage lineaments. The plunge and trend of the dip vector for the best fault-plane solution is 80° 134° with 0° rake, corresponding to a steep NE striking left-lateral strike-slip fault (Tsai and Aki, 1970).

The Stampede Dam was completed along the trend of the Dog Valley fault in 1970, just four years after the Truckee earthquake, and impounds almost a quarter-million acre-feet of water. Failure of Stampede Dam would compromise Boca Dam downstream and pose a catastrophic threat to people along the Truckee River floodplain to Reno and beyond. Two ~30 m long trenches excavated across a suspected DVF trend by the US Bureau of Reclamation in the 1980s did not find evidence of faulting (Hawkins et al., 1986). The surface trace of the DVF has remained unknown.

We used the Seismo-Lineament Analysis Method [SLAM] augmented with a total least squares analysis of the focal locations of known or suspected aftershocks, along with focal mechanism data from well located events since 1966, to constrain the search for the DVF ground trace. Geomorphic analysis of recently collected aerial lidar data along this composite seismo-lineament has lead to a preliminary interpretation that the DVF might extend from the Prosser Creek Reservoir near $\sim 39.396^\circ\text{N}$ 120.168°W through or immediately adjacent to the Stampede Dam structure. A second compound geomorphic lineament is sub-parallel to this line ~ 1.6 km to the northwest, and might represent another strand of the DVF. As noted by Hawkins et al. (1986), human modification of the land surface complicates structural-geomorphic analysis. Fieldwork in 2016 took advantage of drought conditions to examine the exposed shoreface of Stampede Reservoir near the dam, and exposures of steeply dipping strike-slip faults were found.

Plain-Language Summary:

The exact location of the fault that produced the M 6 Truckee earthquake (1966) is not yet known. Earthquake- and aerial-lidar data lead us to a fault-location hypothesis: passing near or through Stampede Dam and Prosser Creek Reservoir.

Session Selection:

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