
Werle, J. L., and Knight, L. H., 1998, "Estimation of Maximum Surface Displacement of the Black Hills Fault, Clark County, Nevada, for Pipeline Design" in Proceedings of a Conference on Seismic Hazards in the Las Vegas Region, UNLV, Las Vegas, NV, November 14-15, 1996, Nevada Bureau of Mines and Geology Open-File Report 98-6.

NATURAL GAS PIPELINE FAULT CROSSING - INVESTIGATION OF THE POTENTIAL RUPTURE HAZARD FROM THE BLACK HILLS FAULT, CLARK COUNTY, NEVADA,

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ABSTRACT: The focus of this study has been to investigate the Black Hills fault and to determine the potential fault hazard to a proposed natural gas pipeline crossing the fault. The 24-inch pipeline began at a point approximately 6.5 miles south of Henderson, Nevada and extended southward across Eldorado Valley towards Searchlight, Nevada. After a preliminary study of the proposed alignment, a relatively well-defined fault scarp offsetting recent alluvial deposits had been observed projecting towards the northern end of proposed pipeline route, along the northern margins of Eldorado Valley. This two mile long escarpment along the base of the McCullough Range was found to trend towards the pipeline route approximately 3 miles to the southwest.

Use of morphologic dating techniques of the scarp has shown the most recent movement of the Black Hills fault to be less than 11,000 years old. Diffusion-equation modeling of the scarp profiles suggest that the age of the fault lies between 5,500 and 8,200 years before the present. Based on this, the fault was regarded as "Active" and therefore, for design purposes, had a potential for displacement within the lifetime of the proposed project.

Ground rupture along a fault poses the greatest potential hazard to an underground pipeline crossing a fault. Based on field observations of measurable past surface displacements and comparison with statistical models which relate fault rupture length with surface displacement, we have formulated an estimate for the potential maximum surface displacement for the Black Hills fault. A maximum surface displacement of 7.1 feet was derived from empirical relations following recognition of possible fault segments. In contrast, a maximum displacement of 23.1 feet was determined from measurement of existing fault heights. The latter value is believed to be greatly overestimated since the normal fault scarp is suspected to be composite or the result of multiple events. Field trenching to verify our estimates could not be performed due to restrictions imposed by the Threatened Species designation of the Mojave Desert tortoise.
