Comparison of Quality of Well Water Provided by a Jesuit Mission with Traditional Water Sources of the Tarahumara Indians, Sierra Tarahumara, Chihuahua, Mexico

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Abstract. In 1994 the Jesuit Mission in Creel, Chihuahua, Mexico, began a project of drilling wells into the volcanic tuff of the Sierra Tarahumara on behalf of the Tarahumara Indians. As sites for shallow wells (visible seeps) have been exhausted, wells have become deeper (50 m) and more expensive (USD 4500), and about 50% of newer wells never produce any water. The objective of this study was to compare the quality of water from the deeper wells with the traditional water sources (developed springs) and to provide recommendations for increasing the success rate of well drilling. Two Utah Valley University expeditions in 2008 and 2009 located and collected water samples from three developed perennial springs, 29 developed ephemeral springs, 16 undeveloped springs, 19 drilled wells, 19 streams, four hot springs, two reservoirs and three cisterns, and located 12 dry wells. Only two developed springs had arsenic concentrations exceeding the Mexican Arsenic Standard (As = 0.025 mg/L) with geometric mean concentration As = 0.015 mg/L, while all but two drilled wells exceeded the Mexican Arsenic Standard with geometric mean concentration As = 0.052 mg/L. The average distances from fracture traces observable on aerial photos for developed springs, producing wells and dry wells were 305 m, 701 m, and 1275 m, respectively. Our recommendations are (1) wells should be drilled close to fracture traces rather than wherever there is a need for a well (2) more attention should be paid to storage of water from traditional water sources.

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