DT #45003
QA: NIA
7/11/05

Natural Analog Studies at Peña Blanca, Mexico

Ardyth M. Simmons, Los Alamos National Laboratory

The significance of the Peña Blanca uranium deposits in the State of Chihuahua, Mexico as potential natural analogs for a nuclear waste repository in unsaturated welded tuff was first recognized in the 1980s. In the 1970s, the Peña Blanca region was a major target of uranium exploration and exploitation by the Mexican government. Since then the Nopal I uranium deposit has been studied extensively by researchers in the U.S., Mexico, and Europe. The Nopal I deposit represents an environment similar to that of the proposed high-level radioactive waste repository at Yucca Mountain in many ways. Both are located in semi-arid regions. Both are located in Tertiary rhyolitic tuffs overlying carbonate rocks that have been subjected to basin and range-style tectonic deformation. Both are located in a chemically oxidizing, unsaturated zone 200 m or more above the water table. The alteration of uraninite to secondary minerals at Nopal I may be similar to the alteration of uranium fuel rods in this type of setting. Investigations at Nopal I and in the surrounding Sierra Peña Blanca have included detailed outcrop mapping, hydrologic and isotopic studies of flow and transport, studies of mineral alteration, modeling, and performance assessment.