STRATIGRAPHY, PETROGRAPHY, AND MINERALOGY OF TUFFS AT TECHNICAL AREA 21, LOS ALAMOS NATIONAL LABORATORY, NEW MEXICO

by

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ABSTRACT

A total of 86 samples was collected in three measured sections on the north wall of Los Alamos Canyon to determine the lithology, petrography, and mineralogy of tuffs at Technical Area 21 (TA-21). Methods of investigation included field observations, modal point counts, petrography descriptions, X-ray diffraction, and image analysis. These data were collected to develop conceptual models for the hydrogeology of the site, evaluate potential transport pathways and processes, and provide bounds on parameters used in numerical models to evaluate the migration of water and contaminants.

The exposed bedrock stratigraphic sequence in Los Alamos Canyon consists of, in ascending order, the Otowi Member of the Bandelier Tuff, tuffaceous and fluvial deposits of the Cerro Toledo interval, and the Tshirege Member (including the Tsankawi Pumice Bed) of the Bandelier Tuff. The exposed part of the Otowi Member is a simple ignimbrite cooling unit made up of massive, nonwelded, vitric tuff that forms non-resistant slopes in the lower part of Los Alamos Canyon; the upper 18 m to 21 m is exposed above the canyon floor. The Cerro Toledo interval is a complex sequence of well-stratified tuffs comprised of epiclastic tuffaceous sandstones and siltstones, and of ash and pumice falls; the thickness of these deposits ranges from 3 m to 9 m. The Cerro Toledo interval also contains intercalated gravels, cobbles, and boulders derived from the Tschicoma Formation; however the Cerro Toledo interval is more tuffaceous in the three stratigraphic sections investigated than within outcrops in DP canyon and in the subsurface elsewhere. The Tsankawi Pumice is a pumice fall deposit that is 0.7 m to 0.9 m thick; it has two subunits which are normally graded. The Tshirege Member is a multiple-flow ash-flow sheet that forms a series of step-like vertical cliffs and sloping ledges along the walls of Los Alamos Canyon. It is a compound cooling unit whose physical