Arsenic and sodium in ground water of the southern Espanola Basin, New Mexico—indicators of deep sources, and aquifer compartments

P. S. Johnson¹, S. Timmons¹, D. Koning¹, J. Whiteis¹ and L. Gillard¹

¹New Mexico Bureau of Geology and Mineral Resources, 801 Leroy Place, Socorro, NM, 87801, peggy@gis.nmt.edu

Chemistry and isotopic data from groundwater in the southern Español Basin are used to refine a conceptual model of groundwater flow and evaluate sources of water and aquifer compartmentalization. Data include ion and trace element chemistry, oxygen-18 and deuterium, temperature and conductivity from streams, springs, and wells, including State Engineer multi-level piezometers. Calcium bicarbonate water dominates the basin, but calcium-depleted, sodium-rich water occurs in limited areas. In the Buckman well field, Las Dos and Jacona fault systems, and at depths greater than 1000 ft in the Tesuque Formation, sodium-rich waters are associated with a Pleistocene (?) stable isotope signature. West of Santa Fe adjacent to the Cerros del Río volcanic field and the synclinal axis of the basin, sodium-rich, high temperature waters coincide with an arsenic plume. Logs from the exploration hole Yates La Mesa #2 indicate the plume also overlies deeply buried volcanic flows possibly associated with a buried eruptive center. Three-dimensional imaging of the arsenic plume indicates that concentrations exceeding 10 µg/L are independent of well depth and range across the upper 1700 ft of saturated aquifer. Other results indicate mountain-block aquifers are associated with chloride- and sulfate-rich waters, and relatively elevated total dissolved solids (TDS), calcium, and bromide, which decrease west from the mountain front. Groundwater in the vicinity of the Santa Fe River and Arroyo Hondo, has the lowest concentrations of TDS and major ions. Elevated chloride and chloride:bromide ratios in shallow wells beneath urban Santa Fe suggest anthropogenic sources.

Keywords:
chemistry, stable isotopes, oxygen isotopes, deuterium isotopes, aquifers, ground water, arsenic, sodium, water quality, Español Basin,


2007 New Mexico Geological Society Annual Spring Meeting
April 21, 2006, Macy Center, New Mexico Tech, Socorro, NM
Online ISSN: 2834-5800