

## **Predicting Total Dissolved Solid Concentrations in Appalachian Basin Formation Waters from Spontaneous Potential Logs**

Doolan, Colin<sup>1</sup>

<sup>1</sup>U.S. Geological Survey, 12201 Sunrise Valley Dr., MS 956, Reston, VA 20192,  
cdoolan@usgs.gov

A preliminary methodology is presented for predicting total dissolved solid (TDS) concentrations in formation waters within the Appalachian basin using spontaneous potential (SP) log responses. The methodology draws from previous studies that have determined the areal distribution of formation water salinity values in the offshore U.S. Gulf of Mexico and the onshore North Slope of Alaska. A series of wells within the Appalachian basin were selected for the study based on the availability of relevant header information, such as bottom-hole temperatures and mud filtrate information, and quality of the SP traces. The wells used in this study form a northwest to southeast transect across the strike of the Appalachian basin through parts of Ohio, West Virginia and Pennsylvania. TDS concentrations based on SP logs from the wells are expected to show the lateral variation of formation water salinities for specific formations from the basin margin to the basin center.

TDS concentrations are first calculated for wells that have associated produced water samples from the target formations. The measured TDS values from the produced water samples are used for quality control of the values calculated from SP response. Once quality assurance of the methods is established, calculations of TDS values are made using logs from areas where there are no corresponding water chemistry data. For this technique, the calculations are dependent on accurate borehole temperature measurements and the availability of mud filtrate resistivity values for individual wells.

Ultimately, TDS concentrations will be calculated for wells forming a grid across the entire basin. Contour maps based on the well grid will show the spatial and vertical extent of formation water TDS concentrations for specific formations within the basin. These studies will aid in predicting the salinity of produced waters in the Appalachian basin and will serve as a base for identifying and mapping paleoflow regimes.