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GEOLOGY AND GEOCHEMISTRY OF A DEEP AQUIFER SYSTEM, RUIDOSO, NEW MEXICO

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ABSTRACT: Two deep exploratory wells were drilled in the Sacramento Mountains near Ruidoso, New Mexico to depths greater than 2,500 feet below ground surface. The New Mexico Office of the State Engineer administers water rights in the Upper Rio Hondo Basin where aquifers are hosted primarily in Cretaceous and Paleozoic age rocks. Water sources are considered to be fully appropriated and proposed changes in use and points of diversion are often difficult to secure. However, non-potable groundwater (greater than 1,000 mg/L total dissolved solids concentration) present below 2,500 feet offers a development opportunity that does not require transfer of existing rights. Although appropriation of deep water sources may be possible in the basin, existing water right holders can challenge the appropriation in District court. The deep aquifer system consists of poorly characterized Paleozoic San Andres Limestone and Tertiary intrusive rocks. An important feature of the deep aquifer system is the stratigraphic relationship and lithologic characteristic of limestone and dolomite units relative to the 2,500 foot depth. During the subject project, the deep aquifer system was characterized through the use of borehole geophysics, lithologic descriptions, and water quality analyses. A full suite of geophysical methods were used to characterize rock types. Lithology was described from drill cuttings with additional examination using microscope and microprobe analyses. Water quality analyses included major ions, stable isotopes of oxygen and hydrogen, carbon-14 and tritium. Water quality samples were also collected from nearby wells completed in the Cretaceous and Paleozoic aquifers. Results of the data collection effort were integrated to determine geologic units encountered during drilling and their regional hydrogeological context. The chemistry of collected samples reflects water-rock interactions along flow paths, for example, the Ca-Mg-HCO3 type water is associated with the limestone and dolomites of the San Andres Formation, and the Na-Ca-SO4 water is derived from anhydrite dissolution and cation-exchange reactions. The proposed presentation will provide a review of the exploratory drilling program and interpretation of the data collection efforts described above.

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