CHARACTERIZING FRACTURED ROCK AQUIFERS OF THE BLUE RIDGE PHYSIOGRAPHIC PROVINCE USING SURFACE AND DOWNHOLE GEOPHYSICAL METHODS

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The ability to quantify flow and transport in fractured media is wrought with difficulties, but remains of fundamental interest to hydrogeologists. The need to identify fractures and characterize fracture flow is especially important in areas where the water supply is dominantly sourced by fractured or faulted systems, as is the case in much of the Blue Ridge Physiographic Province. In particular, the high country region of North Carolina (Ashe, Avery, and Watauga Counties) is experiencing a rapid population growth which could severely deplete these groundwater resources. A lack of detailed hydrogeologic information highlights the need to improve our understanding of the local groundwater conditions in this and other emergent areas of the Blue Ridge Province.

Detailed hydrogeologic studies in a similar region of Virginia (Seaton and Burbey, 2005) successfully utilized both surface and borehole geophysical methods to identify low resistivity anomalies associated with conductive fault zones. The high country of North Carolina has a similar history with repeated episodes of extensional and compressional tectonism that have resulted in a series of thrust faults in this region. A bedrock well installed in northern Watauga County encountered a flowing fracture at a depth of 256-feet, and subsequent analyses using 2D electrical resistivity profiling have been helpful in further imaging the bedrock conditions in the area surrounding the well. The resistivity profiles collected adjacent to the well indicate that the well was sited within a geologic contact, possibly a thrust fault. Additional wells installed in the area will enable further analysis through cross-borehole flow testing and geophysical logging, which together will provide an enhanced understanding of the role of thrust faults in the hydrogeology of the Blue Ridge Province

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