ABSTRACT

THESIS: An Investigation of the Stratigraphy and Hydrogeology Beneath the Ball State University Ground-Source Geothermal System

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PAGES: 94

Ball State University (BSU) is in the process of constructing the world’s largest ground-source, district-scale geothermal system utilizing the shallow lithology and groundwater as a thermal reservoir. Data from four research wells drilled in Phase III during 2012–2013 comprise the information for this thesis. Data include well logs and cuttings as well as gamma logs collected in collaboration with the Indiana Geological Survey. Two local cores were examined at the Indiana Geological Survey to provide correlation and aid in interpretation. Complementing these data are drilling logs for the 736 boreholes drilled to accommodate the heat exchange loops. These data were examined to construct a detailed stratigraphic log and a map of subsurface geology for the Phase 2 field. Core samples were taken at lithostratigraphic markers to measure porosity and thermal conductivity, the two key parameters in geothermal reservoir characterization. These samples were sent to Core Labs in Houston, TX to measure permeability. Although local stratigraphy is generally known, a detailed stratigraphic architecture combined with measured thermal and hydrogeological properties will aid the understanding of the true nature of the subsurface capacity to store and transport thermal energy.