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Abstract

Geophysical logs are used to measure various physical properties of the underlying rock formations or the fluids contained in the rocks. Probes that measure different properties are lowered into a well or borehole and the measured data are displayed by depth. The properties displayed in the geophysical log can then be correlated to known geologic formations, changes in rock type, or changes in rock or fluid properties. The two types of logs run at Mammoth Cave were natural gamma and caliper. Gamma logs record the amount of natural gamma radiation emitted by the rocks surrounding the borehole. Clay and shale-bearing rocks commonly emit relatively higher natural gamma radiation. Caliper logs record borehole diameter. Changes in borehole diameter are related to well construction, such as casing or drilling-bit size, and to fractures or openings encountered along the borehole wall.

Geophysical logs were run at the Mammoth Cave National Park to evaluate the use of geophysical logging at the park and to evaluate the condition of the wells for use in other investigations. Four wells were evaluated for geophysical logging; logs were collected in two wells and two wells could not be logged due to access or obstructions in the borehole. Geophysical logs were run in a well near Cedar Sink and in the USGS observation well near the Mt. McKinley Pumphouse. Natural gamma logs were run in both wells and a caliper log was also run in the deep observation well. The observation well is at an elevation of about 865 feet and was logged over a total depth of 492 feet, to an elevation of 373 feet. The geologic formations encountered in the observation well include the Big Clifty Sandstone Member, the Girkin Formation, the Ste. Genevieve Limestone, and into the St. Louis Formation. The Cedar Sink well, at an elevation of about 575 feet, was logged over a total depth of 140 feet to an elevation of 435 feet. The Cedar Sink well begins in the Girkin Formation at land surface and may terminate near the contact with the underlying Ste. Genevieve Limestone.

Geophysical logs can be used to correlate specific formations or features across the Mammoth Park area. Results from the logging and correlation can be used to improve the understanding of the regional geology, geologic structure, and the relation of those features to the unique groundwater hydrology of the karst and cave features of the Mammoth Cave National Park.