

***Petrophysical Properties of the Fort Payne Formation (Mississippian),
Tennessee and Kentucky***

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The Fort Payne Formation is a Middle Mississippian unit that outcrops in north-central Tennessee and south-central Kentucky. Two study locations are presented in this research: an outcrop south of Celina, Tennessee on TN 52 and an outcrop south of Burkesville, Kentucky on KY 61. In these locations, the formation consists of primarily mixed carbonate and siliciclastic shale lithologies. The most common facies observed in the Fort Payne are crinoidal grainstones and interbedded siliciclastic and carbonate mudstones. The purpose of this work is to characterize petrophysical properties of the Fort Payne Formation to assist with hydrocarbon exploration in the region.

A handheld gamma ray scintillometer was used to collect data from both study areas. In the Celina location, paleochannels are incised into carbonate and siliciclastic mudstones. The Burkesville site has been interpreted as a Waulsortian-type carbonate mound. In addition to measured stratigraphic sections, the scintillometer provides information on potassium, uranium, and thorium content as well as total gamma ray response. All data are plotted against rock type, allowing for stratigraphic analysis of the Fort Payne Formation using petrophysical properties (i.e. gamma ray response).

Radioactive elements (potassium, uranium, and thorium) increase when analyzing finer clay-rich siliciclastic and carbonate mud, and decrease when analyzing coarser grainstones. This likely reflects an increase in siliciclastic material into the system during periods of quiescence on the Mississippian slope. Given that the Fort Payne is a mixed carbonate-clastic system, analysis of petrophysical properties will allow calibration with drilling results in Tennessee and Kentucky, as well as provide a model for similar systems globally.