

## Small Closed Structural Lows—Unconventional Gas Exploration Targets in Northern Missouri

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Colonial Limestone Incorporated operates a quarry in alternating limestones and shales that comprise the lower two-thirds of the Kansas City Group (Pennsylvanian System) west of Milan in Sullivan County, Missouri. These rocks dip from 9° to 16° inward toward a central low. A vertical clay-filled pipe about 125 feet in diameter occupies the center of this structure. Radial and tangential fractures, some containing calcite, goethite, and pyrite, are present in several limestone beds.

The structure covers about 40 acres centered in the NW SW sec. 4, T. 62 N., R. 20 W. It is developed along the strike of the Northeast Missouri tectonic zone, which may represent a major zone of weakness in Proterozoic continental crust. The Milan area is underlain by 600 to 700 feet of Pennsylvanian strata, which were deposited upon Mississippian carbonates. Samples from the H. V. Elwell No. 1 Taylor, NW NE sec. 12, T. 62 N., R. 21 W., suggest extensive leaching occurred in the upper 185 feet of Mississippian strata.

One interpretation of this structure is that the pipe was a hydrothermal discharge point. Solution of underlying Mississippian limestones allowed Pennsylvanian rocks to subside in the immediate vicinity of the pipe to form a small closed structural low. If hydrothermal fluids of sufficient temperature permeated the surrounding Pennsylvanian rocks, then the vicinity of this structure is a potential exploration target for unconventional gas derived from coal beds and carbonaceous shales.