A New Sequence Stratigraphic Framework for the Wolf Camp Hills: Tying the Outcrop to the Subsurface

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ABSTRACT

The Lower Permian Wolfcamp Formation was defined at its type locality in the Wolf Camp Hills at the foot of the Glass Mountains in northern Brewster County, west Texas. Early hydrocarbon production in the Permian Basin was dominated by carbonate reservoirs, so operators largely ignored fine-grained mudrocks - including those in the Wolfcamp Formation. The widespread application of horizontal drilling in tandem with hydraulic fracturing transformed previously uneconomic mudrocks into viable hydrocarbon plays. The Wolfcamp play in Midland Basin began its exponential growth in 2012. Mudrocks, once ignored, became the reservoirs of the 21rst century and while originally thought to be homogeneous, lateral and vertical heterogeneity at all scales is the norm.

In order to better understand the heterogeneity of the Wolfcamp Formation, this study will produce a new high-resolution sequence stratigraphic framework at its type locality at the southern margin of Delaware Basin. This will involve walking out the 3D exposures in the Wolf Camp Hills and mapping the lateral extent and spatial variability of the constituent facies (e.g. carbonate debris flows, turbidites, grainflows, and intervening mudrocks). The proposed study has permission to access the private land containing these exposures and will include measuring and sampling high-resolution sections, constructing handheld gamma-ray profiles, and mapping lateral and vertical continuity of beds with drone photography. These data will be compared with nearby core and wireline log data to correlate and carry outcrop interpretations into the subsurface to provide a better and more predictive understanding of Wolfcamp Formation heterogeneity.

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