

# **The Science and Art of Cline Commercialization**

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Horizontal drilling activity targeting the Pennsylvanian Cline Shale was initiated in 2010 in Glasscock County along the eastern flank of the Midland Basin. The interest in this shale interval was derived from the abundance of excellent hydrocarbon shows exhibited while drilling through the section in vertical wells targeting deeper conventional objectives to Strawn & Fusselman targets (Wolfwood Play). Apache Corporation became involved in the play in late 2010 after the Mariner and BP acquisitions in the Deadwood Area of Glasscock County. Nearly all of the 400 or more vertical Wolfwood wells drilled in Deadwood and completed in up to eight separate formations, have been completed in the Cline. Apache's first Cline horizontal well was drilled in March of 2011 and five additional science wells were drilled throughout 2012. Apache Corporation has >100,000 gross acres in the Deadwood Area and over 500 horizontal locations identified for the Cline shale.

This presentation will describe the technical tools utilized to identify (1) the best locations to drill, (2) the optimum landing zone within the Lower Cline section, (3) the expected reserves, (4) the appropriate well spacing, (5) the drilling parameters required for the lateral, (6) the most effective frac design, and (7) the proper production procedure. Examples of (1) mudlog show quality mapping, (2) petrophysical analysis, (3) OOIP/THIP calculation and mapping, (4) shear stress analysis and frac modeling, (5) LWD/MWD used in geosteering, (6) lateral borehole stability analysis, and (7) microseismic monitoring during completion will be presented in support of our process.

Also included will be an up to date industry activity summary (# of wells, typical D&C costs, EUR's, etc.) as well as additional unconventional opportunities in the area that Apache has tested to date.