

SE Delaware Basin Slope: Debrites, Turbidites, Organics, Oh My!*

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Abstract

The 2010 Wolfbone type completion of the Whiting Trainer Trust 16-2 well resulted in a 24-hour IP of 700+ BO, and a EUR of 188K+ BOE. This well initiated a comprehensive Whiting exploration program focused on the geologic province of SE Delaware Basin Slope strata. Whole core from several zones in the Brushy Canyon and Bone Spring formations was acquired from the Whiting Wolfpup 9604 well. Major lithofacies identified in core include carbonate debrite complex, carbonate and siliciclastic turbidite complex, organic-rich siltstone and shaly siltstone, med-crs siltstone, and mudstone. Except for mudstone, all lithofacies demonstrated mobile oil saturation with porosities ranging from 2-18%, and permeabilities from 100 nd to 5 μ d. These major lithofacies are the result of primarily two distinctive physical processes comprised of large mass-transport deposits and pelagic deposits, dominantly controlled by slope failure, eustasy, detrital influx, and bottom currents. A modern depositional analogy is the northeastern Sicilian margin in the Tyrrhenian Sea (Gamberi et. al., 2010).

Two unconventional play concepts using stratigraphic relationships of lithofacies and presence of migrated and in situ oil and gas are presented. The first is the relationship between the second Bone Spring highstand carbonate debrite complex underlying the siliciclastic organic-rich 1st Bone Spring lowstand siltstone. The second is the siliciclastic organic-rich Pipeline Shale underlying a lowermost Brushy Canyon carbonate debrite complex in turn overlain by interlaminated carbonate and siliciclastic turbidites and pelagic organic-rich siltstone. Prior to and during evaluation of the core, several existing vertical wells were reentered and stimulated with a Wolfbone type completion, generally resulting in sub-economic results. Assuming an insufficient amount of rock could be stimulated from a vertical completion, it was decided to drill horizontal within "reservoir" debrite complex facies juxtaposed to "source" organic-rich siltstone. Three horizontal wells were drilled within the second Bone Spring debrite complex and two horizontal wells were drilled in the lowermost Brushy Canyon debrite complex. Four of the five wells resulted in significant initial production, followed by a relatively steep decline. All five wells were completed using open hole sliding sleeve ball technology. The next "knob to turn" is to complete using cased hole plug and perf technology.

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