

Turner Halo Play, Crossbow Field Area, Powder River Basin, Wyoming

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Abstract

The Turner Sandstone is a prolific reservoir in the Crossbow field area of the Powder River Basin. The field is being developed with horizontal wells at vertical depths of 9400 to 12000 feet. Initial production from horizontal wells ranges from 500 to 1700 BOPD and 1000 to 4000 MCFGPD. The halo play is downdip and an extension from older vertical Turner production in the School Creek, Porcupine, and Tuit Draw fields. The Crossbow field area is overpressured and no known water contacts occur in the area of the field. The Crossbow field area includes Crossbow, K bar, Mary Draw and Horse Creek fields. The producing sandstones are interpreted to be shallow shelf sandstones based on trace fossils and primary sedimentary structures. The sands are fine to medium grained and form multiple coarsening upwards cycles (20-30 feet thick). The sands are bioturbated in the lower parts of the coarsening upward cycles and massive to cross bedded in the upper parts. The entire cycle is hydrocarbon saturated. Log porosities range from 6-10%. Total Turner thickness is approximately 120 feet. Oil gravity is 43o API and GOR is 750 to 1500 cubic feet per barrel oil. Horizontal laterals are generally oriented north-south and are generally one mile in length. Multistage hydraulic fracture stimulation for one mile laterals consist of 13 to 20 fracture stages. Each fracture stage consists of approximately 3000 BW and 185,000 pounds of sand. Source beds are thought to be the Mowry (primary), Belle Fourche, Greenhorn shales, and Niobrara Formation marls. T_{max} data from source rock analysis and R_o data from vitrinite reflectance indicate that the source rocks are thermally mature in the field area. Key criteria for this halo play include: overpressure, pervasive hydrocarbon saturation, light oil, moderate drilling depths, thick Turner section, and mature source rocks.