

Examination of Middle Three Forks Co-development on Upper Three Forks Well Performance in North-Central McKenzie County, Western North Dakota

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Abstract

The Middle Bakken and upper Three Forks comprise the primary two reservoir targets of the Bakken-Three Forks Petroleum System across western North Dakota. Additionally, some operators have been co-developing the middle Three Forks as a third hydrocarbon-charged reservoir within the central, deeper portions of the basin. To date, more than 300 horizontal wells have been drilled and completed in the middle Three Forks with cumulative production of more than 57 million barrels of oil and 120 billion cubic feet of gas. However, questions remain regarding the extent of the middle Three Forks hydrocarbon-charged area as well as the impacts of co-developing the middle and upper Three Forks reservoirs. Located along north-central McKenzie County of western North Dakota, the Twin Valley Field area represents a case study location to examine the effects of middle Three Forks co-development on upper Three Forks well performance near the central, deepest portions of the basin. Drilling records were reviewed and reverse geo steering was completed on select horizontal wells in the study area to determine/confirm the reservoir target of each lateral (87 total Middle Bakken and Three Forks horizontal wells). Additionally, production records were compiled and evaluated for every well drilled and completed in both the upper and middle Three Forks reservoirs (42 wells). Two contiguous 1280-acre spacing units (Sec. 3, 4, 9, 10, T152N, R97W) within the study area were co-developed for Middle Bakken, upper Three Forks, and middle Three Forks resources with 3 or more horizontal wells per reservoir horizon/spacing unit. Examining cumulative production at the 3-year and 5-year marks, upper Three Forks wells with co-middle Three Forks well development average 416k and 465k barrels of cumulative oil production per well (10 wells). Additionally, middle Three Forks wells in the same contiguous spacing units have averaged 341k and 399k barrels of cumulative oil production at the 3-year and 5-year marks (10 wells). Meanwhile, several surrounding 1280-acre spacing units have been developed with similar well spacing/density but with horizontal wells in only the Middle Bakken and upper Three Forks to date. The surrounding upper Three Forks wells without any middle Three Forks co-development have averaged only 202k and 251k barrels of cumulative oil production at the 3-year and 5-year marks (22 wells). These preliminary findings indicate that middle Three Forks co-development in the study area does not negatively impact upper Three Forks horizontal well production. Instead, lateral placement seems to be at least one key component for upper Three Forks well performance, in which laterals positioned closer to the base of the upper Three Forks reservoir appear to outperform wells with more shallowly positioned laterals. Furthermore, study results indicate that substantial additional resource has yet to be developed within the middle Three Forks reservoir of western North Dakota.