

Depositional Setting of the Middle Bakken Member in Southeastern Saskatchewan.

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Summary

The Upper Devonian-Lower Mississippian Bakken Formation of South Eastern Saskatchewan has become one of the top oil plays in North America. This has primarily been a result of technological advances in horizontal well drilling combined with the ever improving multistage fracturing process. The understanding of the stratigraphic architecture within the Middle Bakken Member has also contributed significantly to the development of the play. The Middle Bakken Member has been divided into the lowermost “A”, the middle “B” and the uppermost “C” units. The distribution and relationship of these units has become critical to development of the unconventional oil resource.

Unit A conformably overlies the Lower Bakken Shale and is mainly a massive grey to greenish grey argillaceous dolomitic siltstone to silty dolostone. It is also characterized by abundant bioturbation including, but not limited to *Helminthopsis* and *Phycosyphon*. Unit A gradually coarsens upward to become a silty sandstone at its top, where the majority of hydrocarbon production is from.

Unit B overlies Unit A, usually with a sharp contact. Unit B is a fine-grained calcite-cemented sandstone ranging from massively bedded at the base, to high angle planer cross-bedded, to laminated at the top.

Unit C is the uppermost portion of the Middle Bakken and is recognized by laminated argillaceous siltstone and very fine grained sandstone. Bioturbation and other soft sediment deformation is very prevalent within Unit C and can readily be identified in core.

Mapping of the internal stratigraphy of the Middle Bakken Member has lead to the recognition of distinctive paleo-geographic distributions. Unit A’s distribution and geometry is especially important since it is the main producing unit. It has a distinct lobate areal geometry with a wedge shaped cross section. This, along with the combination of sedimentary structures, sedimentology and ichnology, suggests it represents distal prodelta sediments. These sediments are highly bioturbated mudstones and silts showing an overall coarsening upwards succession which supports a prograding interpretation, also typical of a deltaic environment.

Modern analogues of wave dominated and tidally influenced deltas will be used to further the understanding of the depositional setting and distribution of the Middle Bakken Member with a focus on the prolific oil producing Unit A. This will then aid in determining the potential for further exploration opportunities.