Controls on Bitumen Distribution in Northwestern Saskatchewan's Lower Cretaceous Dina Member (Mannville Group)

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Summary

Recent research in the extreme northwestern segment of Saskatchewan's portion of the Western Canadian Sedimentary Basin has been carried out to understand the bitumen trapping mechanisms and bitumen distribution controls in Lower Cretaceous Mannville Group deposits.The study area is located directly adjacent to the Alberta-Saskatchewan border and north of the Clearwater River Valley in Townships 94 and 95, Ranges 24 and 25W3M.

The recently completed work has shown that bitumen trapping in the study area is primarily controlled by stratigraphic pinch-out of the Lower Cretaceous Mannville Group's Dina Member (McMurray equivalent). The Dina Member on-laps Devonian carbonates and was presumably overlain by a relatively expansive Cummings Member shale. When the oil migrated from the southwest to the northeast into Dina Member sandstones, it was trapped where the sandstones pinch-out between the impermeable Devonian carbonates and a Cummings Member shale. Unfortunately, the presence of a Cummings Member shale is only presumed to have been present since it is no longer preserved in the study area due to Quaternary erosion.

A secondary trapping mechanism in the study area is related to lateral and vertical facies changes. A relationship can be identified between the facies architecture within the Dina Member and the distribution of bitumen in the study area. In general, areas coincident with sandstone rich facies result in higher bitumen saturation while those areas up-dip of mud filled abandoned oxbow lakes and inclined heterolithic stratification (IHS) deposits tend produce areas with multiple oil-water contacts and/or significant water saturated sandstones.

The combination of stratigraphic pinch-out and internal facies changes, once understood, produce a predictable trapping model for the study area and for further exploration.