Reservoir Characterization of a Tight Oil Play of the Middle Jurassic Upper Shaunavon Formation Member in the Whitemud and Eastbrook Pools – SW Saskatchewan

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Summary

The Upper Member of the middle Jurassic Shaunavon Formation was deposited in a mixed siliciclastic/carbonate facies succession is characteristic of a marine shoreface environment. This study investigates the reservoir characteristics and factors controlling production in the Upper Shaunavon B sandstone, one of four shoreface sequences within the Upper Shaunavon Member in the Whitemud and Eastbrook pools in southwest Saskatchewan. The Upper Shaunavon B sandstone is the thickest and the most productive interval within the oil pools, this reservoir rock has cumulative production of 363 MMBbls from linear northeast-southwest trending sandstone bodies (Marsh, 2010).

The Upper Shaunavon B shoreface is subdivided into two facies, an upper shoreface sandstone with permeabilities in the 0.1-10md range and a lower coquina facies with permeabilities in the 10-1000md range. Operators initially targeted the high permeability coquina for its high production rates and as a means to drain the overlying, lower permeability reservoir shoreface sandstones of the Upper Shaunavon B. This study seeks to investigate whether the overlying, lower permeability shoreface sandstone facies were adequately drained by the underlying coquina facies, or whether a significant volume of recoverable oil remains in the sandstone. This was evaluated by examining the reservoir properties, heterogeneity, connectivity, and volumetrics of the flow units based on data from core and petrophysical logs. Comparison of production data from wells intersecting both facies of the Upper Shaunavon B versus wells where the underlying high permeability coquina facies is absent will shed light on how the coquina unit influences the recovery factor from both pools.

Integration of geophysical well-logs, detailed core descriptions, thin sections and core analysis data provide insight to the facies interpretation, reservoir distribution and lateral extent of depositional fairways for both units. Accurate reservoir characterization of the ‘unconventional’ siliciclastic facies at the Whitemud and

Eastbrook Pools, coupled with recent advancements in horizontal drilling and completion technology create additional drilling opportunities and improve existing production rates from these pools.

Application of a similar approach to reservoir characterization of unconventional, low permeability, offshore sandstone deposits of the Cardium Formation at the giant Pembina field may provide access to large untapped oil reserves.