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PS Sequence Stratigraphy and Reservoir Characterization of Estuarine Deposits of the Glauconitic Sandstone Member, Mannville Group, Southern Alberta Basin*

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Abstract

The Lower Cretaceous Glauconitic Sandstone Member of the Mannville Group is a well-established oil and gas producer in the Alberta Basin. Recent exploration efforts in the southern part of the basin have intensified the interest in understanding the reservoir properties and high-resolution sequence stratigraphy of this system. A unique distribution of hydrocarbons within the Glauconitic Sandstone is observed in the study area. A large oil accumulation exists in the updip northeastern corner of the area whereas the rest of the downdip play is dominated by gas and condensate.

The suggested interpretation was that the Glauconitic Sandstone is a series of stacked, unconformity-bounded sequences consisting of valley-fill and interfluvial strata. The objective of this study is to revise the depositional model via: 1) detailed documentation of sedimentary facies and depositional environments in 23 cores, 2) correlation of core facies into well logs, and 3) study area-wide correlations using 376 well logs. We aim to determine what causes this hydrocarbon distribution and establish whether the Glauconitic Sandstone contains multiple incision and fill units or is a simple valley fill composed of several stories, separated by tidal ravinement surfaces. The study area is located in south-central Alberta between Townships 10-15, Ranges 25-28W4 and covers an area of 2237 sq km.

Extensive mapping suggests that stratigraphic trapping exerts a strong control on the observed hydrocarbon distribution. Two prevailing styles of incised systems are observed. The oil-bearing channels in the northeastern part of the area have depths of incision between 10 and 22 meters, are dominated by a fluvial facies association, and exhibit high reservoir quality. The lesser-incised channels, with depths of incision between 1 and 5 meters, are associated with tidally influenced migrating channels and fluvial point

bar facies with margin/overbank facies. Collectively, this facies association has lower reservoir quality. Observations suggest the two channel styles could be interpreted as multiple incision-and-fill episodes within a complex incised valley fill; or alternatively as parts of a simple valley fill, separated by tidal erosion surfaces.

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