

Hydrocarbon Trapping at the Mannville Group – Lower Colorado Sequence Boundary in West-central Saskatchewan

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The Mannville Group – Lower Colorado Group unconformity is a profound depositional break encompassing much of the Middle Albian, a time gap of a few million years. To use sequence stratigraphic jargon the unconformity is a Type 1 sequence boundary; a high amplitude erosional surface characterized by deeply incised fluvial channels. The complex stratigraphic relationships resulting from high amplitude erosion and subsequent deposition on this uneven surface results in a variety of stratigraphic traps for both gas and oil in west-central Saskatchewan.

Reservoir sands below the Middle Albian subareal exposure contains hydrocarbons trapped by updip truncation against impermeable incised valley fill sediments. Beyond paleovalley margins gas is trapped in erosional remnants of uppermost Mannville strata. Above the sequence boundary two ages of incised valley fills occur although sedimentary filling was probably simultaneous during the Lower Colorado transgression. Early post Mannville paleovalleys, cut during a Late Early Albian relative sea level fall, supplied sediment to lowstand deposits north of the Peace River Arch. Late stage (probably late Middle Albian) paleovalleys are of limited areal extent and acted as conduits for sediments shed southward to the Pense/Basal Colorado Basin (an embayment of the Boreal sea created by differential loading in the central portion of the western interior of North America). Fluvial/estuarine sands filling early stage paleovalleys are reservoir for both gas and oil. Late stage paleovalley fill sands are largely gas bearing reservoirs. Regional Mannville strata and both ages of incised valley fills are truncated by a ravinement surface at the base of the Lower Colorado. Locally shallow shelf sands (presumably shoreface sediments reworked by shelf processes) form limited reservoirs above the ravinement surface.