COMPARISON OF HEAVY OIL RESERVOIRS: THE LLOYDMINSTER FORMATION, LLOYDMINSTER AREA, AND THE CLEARWATER FORMATION, COLD LAKE AREA

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Lithostratigraphy and sandstone composition of the middle Mannville Group in the Lloydminster and Cold Lake regions differ markedly, reflecting differences in depositional history and provenance. The Lloydminster Formation is one of the most consistently mappable units of the Mannville Group in the Lloydminster area. Yet when this sequence is compared to the laterally equivalent Clearwater Formation of the Cold Lake area, 100 km to the north along the Saskatchewan-Alberta border, the character of the sequence changes markedly. This indicates that at least two distinct depositional systems were operating in this region in Lower Cretaceous Middle Albian time.

The Clearwater Formation of the Cold Lake area consists predominantly of mineralogically immature, fine to medium-grained litho-feldspathic sandstones in large scale (up to 60 m) fining-upward sequences, with thick crossbed sets and abundant intraformational breccia. A river dominated delta system with thick bar-finger sands is the suggested depositional environment. The source area is believed to have been directly to the west in the Cordillera of central and eastern British Columbia.

The Lloydminster Formation, in contrast, is typically a coarsening-upward sequence (0 to 25 m thick), with marine mudstone at the base, with progressively more silt and wave or current-rippled fine-grained sandstone upward, and commonly capped by a coal seam. Sandstones range in composition from quartz-arenites to litharenities and are generally more mature than those at Cold Lake. Two ultimate source areas are postulated; the Precambrian Shield to the east and the Cordillera to the southwest, although much recycling may have occurred. A wave-dominated, tidally-influenced coastal plain is the inferred depositional environment. Continuity of the coarsening-upward Lloydminster sequence is occasionally broken up by thick (up to 24 m), crossbedded, fining-upward, coarse to very fine-grained, quartzose sandstones, interpreted as fluvial or distributary channels.

Both sequences form major oil reservoirs in their respective areas, and both are being actively explored and exploited at present.

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