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The Role Of Fluid- and Sediment-Gravity Flow Processes During Deposition of the (Subsurface) Carrot Creek Conglomerates (Cardium Formation, Upper Cretaceous), West-Central Alberta

Although not common in the geological record, conglomeratic delta deposits, like in the Cyn-Pem/Carrot Creek of west-central Alberta, form important and highly productive local hydrocarbon reservoirs. Presently, however, the spatial distribution of various depositional mechanisms and related conglomerate facies, and hence reservoir quality and related production characteristics within and between different pools, remain poorly understood. Many of these uncertainties, however, can be resolved by differentiating fluvial from delta-front conglomerates, and also appreciating the sedimentological importance of the steep depositional gradient (~20-25°) on the delta front. Fluvial and delta-front conglomerates commonly consist of interstratified matrix-rich and matrix-poor conglomerate. In fluvial conglomerates, this bipartite structure (couplet) is most likely related to the spatial variability of gravel and sand deposition on the leeward side of gravel-bed bar forms — reservoir quality in these conglomerates, however, has been significantly reduced by an infiltrated sand matrix. Marine conglomerates, on the other hand, were deposited on a steep delta-front (Gilbert-like delta) by sediment-gravity processes. Planar-based, ungraded, matrix-supported layers overlain abruptly by well-sorted fine pebble conglomerate represent, respectively, en masse deposition from high-concentration sediment-gravity-flow dispersions and grain-by-grain gravity-driven transport. Most dispersions were arrested on the delta slope, but others flowed to the base of the slope and deposited their sediment in a granular jump. Sand-sized sediment deposited at the mouths of distributary channels was winnowed and mobilized by waves and transported alongshore and away from the delta front, and thus preserved the high-reservoir quality that characterizes the delta-front - conglomerates.