SCALES OF FACIES ARCHITECTURE IN TOP-TRUNCATED LOWSTAND DELTA LOBES, UPPER-CRETACEOUS WALL CREEK MEMBER, FRONTIER FORMATION, POWDER RIVER BASIN, WYOMING, U.S.A.

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ABSTRACT

The Turonian Wall Creek Member (Wall Creek) has been interpreted as being deposited as an offshore bar, as storm deposited prodelta sand-sheets, and as a wave-dominated delta. An outcrop investigation was initiated in order to evaluate these varying hypotheses. This paper outlines each hypothesis' strengths and weaknesses then compares them with recent fieldwork completed during the 2000 summer field season. Fifty-nine vertical measured sections, including outcrop gamma ray scintillometry, photographs, and video were collected over a 900 square kilometer (347 square mile) area.

The Wall Creek shows a mixture of different upward coarsening facies successions, associated with distinctly different overlapping sandstone bodies separated by mudstones. These are interpreted as different delta lobes. The south lobe grades upward from burrowed, to current rippled sandstones and mudstones, into structureless to flat stratified and ripple cross-laminated sandstones interpreted as delta front turbidites. These beds dip southeastward, the same direction as paleocurrents, suggesting they are delta front clinoforms.

Dune-scale cross-stratified sandstones cap upward coarsening facies successions to the north. The presence of double mud drapes suggests tidal influence. In the east, the Wall Creek shows sharp-based mud-free cross-bedded sandstones, which suggest a wave-influenced shore face. Pebbles occurring at the sharp base may indicate a forced regression. Pebbles occur at the tops of sandstone bodies, including the inclined beds, all of which are truncated. Therefore, we interpret the Wall Creek as representing top-truncated lowstand deltaic deposits.

We identify several scales of facies variability within the Wall Creek. Variability of different sand bodies with length scales of several kilometers to tens of kilometers represents large-scale reservoir compartments. These compartments show varying internal reservoir heterogeneity, depending on the proportion of river-, tide-, and wave-influence within lobes.

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