

Facies Architecture and High-resolution Sequence Stratigraphy of the Falher “C” Member, Spirit River Formation, Deep Basin, West-central Alberta, Canada

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Within the Deep Basin of west-central Alberta, the Spirit River Formation is comprised of eight major transgressive-regressive sequences that prograded into the Clearwater Sea during the Lower Cretaceous. The Falher “C” member is one such transgressive-regressive sequence containing mixed coarse-grained sandstone and conglomerate reservoirs that are estimated to contain 3.5 bcf of recoverable gas and natural gas liquids. The Falher “C” member is further subdivided into units C1, C2, C3 and C4 through recognition of key sequence stratigraphic surfaces that bound five facies associations representative of fully and marginal marine environments. Two of the five facies associations, termed FA2 and FA3, contain facies successions of greatest reservoir potential. Facies that constitute FA2 are readily observed within the C2 unit, and were deposited in wave-dominated upper shoreface and foreshore settings during a forced regression. Facies comprising FA3 represent sequential infilling of tidal channels and lateral accretion of a barrier spit-platform during the ensuing transgression and deposition of the Falher C3 unit. Facies slice maps and net conglomerate isopach thickness maps show that the regressional C2 unit is confined to an east-west trend within the Wapiti Field. Mapping has also shown that the distribution of reservoir facies deposited during the C3 transgression was strongly influenced by antecedent topographic elements within the C2 interval. Delineation of the facies architecture of coarse-grained reservoirs within the Falher “C” member and extrapolation of these trends using key bounding sequence stratigraphic surfaces has contributed toward a refined exploration strategy in the Deep Basin of west-central Alberta.