

# **Stratigraphy and Sedimentology of Cretaceous Upper Mannville Incised Valley Fills, Grand Rapids Formation, east central Alberta**

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The Lower Cretaceous Grand Rapids Formation in the Cold Lake oil sands area has an estimated resource of 108.9 billion barrels of oil in-place (Hein and Marsh, 2008). Occurring 300 to 400 m below the surface, the Grand Rapids Formation consists of approximately 80 m of deltaic to marine shoreface parasequences cut by multiple generations of valley incision. Fluvial to estuarine sandstone bodies within the incised valleys comprise the primary reservoirs in the region, however, these bodies are subject to numerous internal heterogeneities that influence reservoir size and distribution. Although the general morphology of the incised valleys is relatively well defined, the internal architecture of reservoir bodies within the valleys remains complex. Lithologic heterogeneities and highly variable lateral and vertical facies changes over distances of several hundred meters within the incised valleys create challenges for development and secondary recovery techniques.

An increase of new wells drilled into the Grand Rapids Formation over the past decade offers a relatively dense subsurface dataset of cores and well logs. The highest density of wells (e.g., over 20 wells in one section) occurs along incised valley trends providing increased stratigraphic control within the valleys; however, interwell prediction of reservoir geometries remains problematic due to rapid lateral and vertical facies changes. Through examination of nearly 2000 m of core together with stratigraphic correlation of nearly 1,300 well logs over 4 townships, depositional models are created to enhance the predictability of reservoir distribution, in turn, reducing exploration and development risks.

## **References**

Hein, F. J., Marsh, R.A., 2008. Regional geologic framework, depositional models and resource estimates of the oil sands of Alberta, Canada. In: Proceedings World Heavy Oil Congress, Edmonton 10-12 March, paper 2008-320, 9 pp.

Maynard J., Feldman H.R., and Alway R., 2010. From bars to valleys: the sedimentology and seismic geomorphology of fluvial to estuarine incised-valley fills of the Grand Rapids Formation (Lower Cretaceous), Iron River Field, Alberta, Canada. *Journal of Sedimentary Research*, v. 80, p. 611–638.

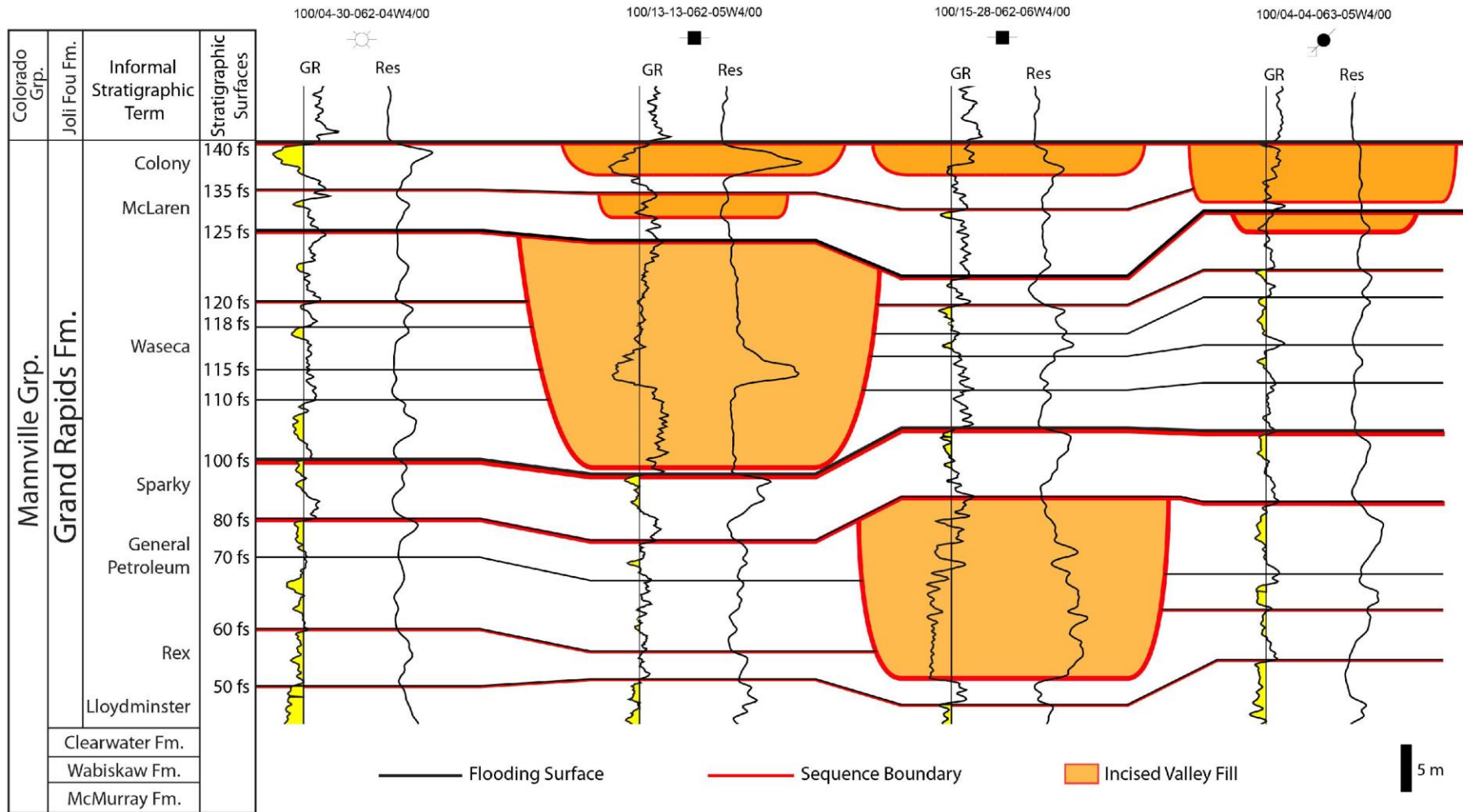


Figure 1. Stratigraphic framework of the Grand Rapids Formation after Maynard et al. (2010). The stratigraphy consists of 12 regional flooding surfaces and 8 sequence boundaries from which incised valleys have been recognized.