

An Evaluation of the Hydrocarbon Potential of the Mississippian Banff Formation

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Two distinct oil families have been identified in Jurassic to Lower Cretaceous reservoirs in southern Alberta. One of these oil families, designated as oil Family E, is known to have been derived from the latest Devonian to earliest Mississippian Exshaw Formation. The source rock for the other oil family, designated oil Family M, has not yet been confirmed.

This study was initiated to evaluate the hydrocarbon source rock potential of the earliest Mississippian lower Banff Formation and determine if it is a viable hydrocarbon source rock for oil Family M oils. The study examines the lateral and vertical distribution of the lower Banff Formation in the subsurface and at outcrop. Correlations are made from the outcrop belt into the subsurface using lithologic comparisons, outcrop gamma ray profiles, and geophysical well logs. Samples from outcrop sections and subsurface drill core were collected for geochemical analysis (Rock-Eval/TOC pyrolysis).

At outcrop, the lower Banff Formation comprises overmature shales that vary in thickness from three to four metres or less in the eastern Front Range exposures (e.g. Jura Creek), to greater than 20 in westernmost exposures (e.g. near Fortress Mountain), with total organic carbon (TOC) values up to 14 wt.%. In the subsurface this shale member of the Banff Formation is somewhat thinner than at outcrop (commonly less than 10 m thick), with TOC values that exceed 13 wt.% at some locations. These data indicate significant hydrocarbon source rock potential in the lower Banff Formation in southern Alberta.