

Karst Breccia and Bank Collapse Breccia; Implications for Reservoir Characterization of the McMurray Formation, Alberta, Canada

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ABSTRACT

The Athabasca Oil Sands, hosted by the Lower Cretaceous (Aptian/Albian) McMurray Formation, is the largest of several related oil sands deposits in northeastern Alberta, Canada. Together these constitute the world's largest accumulation of hydrocarbons, with estimated reserves of over 1.3 trillion barrels of bitumen in-place. The stability of the oil and gas industry of Alberta increasingly relies on the exploitation of this resource.

The McMurray Fm. consists dominantly of unconsolidated sand and semi-indurated shales, which become brecciated when disturbed. In northeast Athabasca, karstification of Devonian carbonates that subcrop beneath the McMurray Fm. has resulted in collapse structures infilled with typically unstratified and often chaotic McMurray sediments. This variability is a complicating factor in identifying hydrocarbon reservoir potential. Karst infill dominated by sand is identified as a potential future exploration play in the McMurray Fm.

Bank collapse breccias may nevertheless possess good bitumen saturation in the sand matrix. Incorporated shale clasts increase the gamma ray response and lower the resistivity response on geophysical well logs. Therefore localized bank collapse breccias cannot be reliably distinguished from regionally continuous stratified shale intervals using standard well logs alone. This can result in downgrading potential pay. Only visual examination of core (or an FMI log) can differentiate the two facies.

Karst collapse structures infilled by McMurray sediments have been well documented, but their reservoir potential has not been critically evaluated due to limits of current technology. Bank collapse breccias are recognized as a

significant component of McMurray deposition, but the mechanisms generating the facies have not been well studied.