

# Devonian Horn River Group in Mackenzie Plain Area, Northwest Territories

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### Summary

Shale gas and oil shale potential of the Devonian Horn River Group in Mackenzie Plain is the focus of a five-year study (2009-2014) being conducted through the Northwest Territories Geoscience Office. Mackenzie Plain is a petroleum producing and exploration area in the Central Mackenzie Valley of the Northwest Territories. More than 250 million barrels of oil have been recovered from the conventional oil field at Norman Wells, NWT from a Middle Devonian reef within the Ramparts Formation. The Ramparts Formation, where present in the region, lies between two units of organic-rich, fine-grained siliciclastics called the Hare Indian Formation (Bluefish Member) and Canol Formation. The objective of new field and subsurface studies is to examine the potential for conventional and unconventional petroleum plays within these three formations that make up the Horn River Group in Mackenzie Plain area.

Petroleum potential data are being compiled from chip samples collected in 2010 and 2011 from more than 20 outcrop sections and stations. Sections have been measured and described and spectral gamma ray measurements were collected with a hand-held scintillometer. Analyses include: 1) evaluation of organic rich shale for source rock potential (Rock-Eval, total organic carbon, kerogen type, thermal maturity, and reflectance); 2) mineralogy (semi-quantitatively, using X-ray diffraction); and 3) whole rock geochemistry. Analyses are underway from 26 wells that penetrate the Horn River Group. These wells form five east-to-west transects across Mackenzie Plain and their datasets will be integrated with results from outcrop studies.

Preliminary results from Rock-Eval and total organic carbon (TOC) analyses of outcrop samples confirm that the Canol Formation shale is a good to excellent quality source rock (TOC averages 5-6%) across Mackenzie Plain. The Canol Formation ranges from less than 20 m thick to more than 130 m thick. Type II (oil-prone) kerogen is indicated, with a contribution from Type III kerogen. The Canol Formation is mature (within the oil window) through much of Mackenzie Plain, but more data are required to determine a regional maturity trend. The Canol Formation contains 82-90% average modal quartz. The Bluefish Member of Hare Indian Formation and Carcajou facies of Ramparts Formation are equally rich potential source rocks (average TOC of 6.92% and 4.05%, respectively). The Bluefish Member is typically less than 10 m thick in outcrop sections and the shale ramp or Carcajou facies of the Ramparts Formation is up to 40 m thick.