

Lower to Middle Paleozoic Petroleum Exploration Plays, Peel Plateau and Plain, Northern Mackenzie Corridor

Leanne J. Pyle*
Geological Survey of Canada, Sidney, BC, Canada
lpyle@nrcan.gc.ca

and

Len P. Gal
Northwest Territories Geoscience Office, Yellowknife, NT, Canada

A reliable future supply of oil and gas is a current priority of territorial and federal governments. Peel Plateau and Plain has widespread hydrocarbon potential (more than 70 exploratory wells drilled). Peel Plateau and Plain is part of the Interior Plains exploration region of the Northern Mainland Sedimentary Basin in the Northwest Territories and Yukon, and is bordered to the south by the deformation front of the northern Mackenzie Mountains. A four-year project (2005-2009) entitled "Regional Geoscience Studies and Petroleum Potential, Peel Plateau and Plain, Northwest Territories and Yukon" is a collaborative study among the Northwest Territories Geoscience Office, Yukon Geological Survey, and Geological Survey of Canada. The project objective is to improve and update knowledge of regional geology, including stratigraphic relationships, depositional and tectonic histories, basin evolution, and petroleum potential of several plays throughout the Phanerozoic succession.

Lower to Middle Paleozoic studies in Peel Plateau and Plain and the northern Mackenzie Mountains focus on several conceptual petroleum plays within Mackenzie-Peel Shelf (or Mackenzie Plain Depocentre in the Cambrian). Plays include basal Cambrian siliciclastics, Lower Paleozoic platform, Arnica/Landry platform, Hume platform, and Kee Scarp reefs or Ramparts platform. Field work on potential reservoir rocks, source rocks, and seals, as well as unit thicknesses provides new data for hydrocarbon resource assessment.

Initial analyses of outcrop samples collected indicate good porosity in several units including Mount Cap sandstone (basal Cambrian siliciclastics play), dolostone of Franklin Mountain and Mount Kindle formations (Lower Paleozoic platform play), fractured and brecciated dolostone of the Arnica Formation (Arnica/Landry platform play), and reefal limestone of the Ramparts Formation (Kee Scarp play). Oil staining was noted in the Hume Formation and in the Bear Rock Formation, a facies equivalent to the Arnica Formation in the eastern part of the study area. Rock-Eval 6 / total organic carbon (TOC) analyses from outcrop samples ranged from poor to excellent. Cambrian shale samples yielded poor source rock potential values (0.16 to 0.21% TOC), while Middle and Upper Devonian shales (Canol Formation, Bluefish Member, and "Carcajou" facies of Ramparts Formation) had excellent source rock potential (8.3 to 13.3 % TOC). Although only a

few Lower Paleozoic samples were collected, these indicate some gas-generating potential in Cambrian shale. Maturity in Middle and Upper Devonian shales varies across the study area, but samples are mainly from the upper part of the oil window. Petroleum system work is ongoing. Another field season is planned for 2007 to improve data for regional correlation between the surface and subsurface.