Petrology, depositional environment, and economic potential of sandstone beds within the Horton Bluff Formation in the Windsor region, central Nova Scotia

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A petrological investigation of the Horton Bluff Formation (HBF) in the Windsor area of Nova Scotia focussed on diagenetic controls on porosity development and reservoir potential. The HBF is a sequence of latest Devonian to Tournaisian fluvial- and wave-dominated lake deposits that consist primarily of cyclic grey sandstone with interbedded shale, variable siltstone, greenish-grey mudstone and nodular dolostone.

Coal is common within finer grained units but has little lateral or vertical continuity. Hydrocarbon (as phenol) in concentrations up to 1.3 ppm is common in groundwater seeps from the middle and upper members of the HBF. In general, hydrocarbons averaged 5% to 10% of rock volume in medium- to coarse-grained sandstone, though barren beds were also observed; transport distances within beds appears to be short.

Sandstone beds in the lower and middle members are generally thin (<2 m), compositionally mature, and texturally immature with average porosities of between 6% and 9%. Burial diagenesis is complex. Authigenic clay precipitation, grain alteration, pressure dissolution, and both calcite and silica cementation have resulted in decreased primary porosity. Decarbonatization has resulted in the development of vuggy and perimeter porosity which are best developed in coarser sandstone beds. These beds also commonly show evidence of some hydrocarbon migration. Lack of lateral continuity and low porosities suggest that the lower and middle members of the HBF have reduced reservoir potential. The Hurd Creek Member contains the Glass Sand marker unit (GSmu) which is a medium- to coarse-grained, texturally and compositionally mature sandstone. The GSmu is laterally continuous and can be up to 9 m thick. Much primary porosity has been preserved which has been augmented by secondary porosity. Porosities in this unit average 20% to 25% and, together with evidence of permeability, suggest that the GSmu has enhanced reservoir potential.