

# The Hydrogeology of the Mannville Group, North East Alberta

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A regional evaluation of the hydrogeology of the major Cretaceous aquifers of the Mannville Group in northeastern Alberta was conducted to evaluate the affects of topography and recharge on the flow systems. Potentiometric surface and water chemistry maps were created for all major aquifers, along with pressure versus depth (P/D) plots. Interpretation of these maps and P/D plots allowed the determination of

- 1) Impact of surface topography on subsurface flow
- 2) Horizontal and vertical flow directions within and between aquifers
- 3) Aquifer water quality
- 4) Relative strength of intervening aquitards

Hydrostratigraphically, the Mannville succession can be subdivided from the base up into the Basal McMurray, Upper McMurray-Wabiskaw, Clearwater and Grand Rapids aquifers, separated by the intervening bitumen-saturated Middle McMurray and the shaly Wabiskaw and Clearwater aquitards.

The flow of Mannville formation water results from recharge in the southeast and at the Stony Mountain upland in the center of the study area, to discharge along the valleys of the Athabasca, Clearwater and Christina rivers. In the southwest, the flow in the Basal McMurray and Upper McMurray-Wabiskaw aquifers is drawn toward the basin-scale drain formed by the underlying Devonian Grosmont aquifer. Vertical flow in the study area is downward, from the ground surface toward the pre-Cretaceous unconformity.

Groundwater chemistry in the shallowest aquifers reflects fresh meteoric recharge. Salinity increases and water quality deteriorates with increasing depth along the vertical flow path. Large losses of hydraulic head occur across the thick shales of the Joli Fou, Clearwater and Wabiskaw aquitards.