

Management of the Basal McMurray Watersand During Bitumen and Heavy Oil Extraction

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The distribution of bitumen in the McMurray Formation varies with a high degree of heterogeneity relating to facies changes throughout the deposit. Sand near the base of the McMurray tends to be coarse-grained. Locally, this sand forms a basal aquifer where the bitumen content is low. This basal aquifer tends to be thickest within the topographic depressions on the surface of the sub-cretaceous unconformity. This confined aquifer commonly displays heightened pore pressures and is locally very permeable.

The basal aquifer has become a significant management issue for both open pit bitumen extraction and insitu heavy oil production. The basal aquifer commonly requires depressurization in advance of open pit mining. This is because high pore pressures can reduce pit wall stability and seepage on to the pit floor can reduce trafficability. Tailings ponds will be founded on floor pillars consisting of oilsand and basal aquifer. The basal aquifer may therefore potentially form a groundwater flowpath for pond seepage. Steam assisted gravity drainage operations commonly do not have wastewater treatment alternatives, especially in the pilot scale stage. Wastewater injection in the basal aquifer is therefore being considered. Potential issues include pressure interference effects, fracture initiation and related seepage, and induced pressure causing increased discharge of poor quality insitu water to the Athabasca River.

It is advantageous to characterize the basal aquifer early in the mine or SAGD planning stages as the basal aquifer commonly figures prominently in risk management scenarios.