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^{PS}The Ells River SAGD Oil Sands Reservoir: A Wave-Dominated Shoreface Shelf Deposit, Athabasca Basin, Alberta*

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Abstract

Development of the multi-billion barrel Ells River SAGD oil sands project is a joint venture between Chevron Canada Resources, Shell Canada and Marathon Oil Canada Corporation. The project area in the northwest Athabasca Basin is 20 miles west of the Fort McMurray mining area. The Athabasca Basin is the largest of several contiguous Cretaceous clastic catchments across northeastern Alberta that infill large flexures in the Devonian carbonate strata forming the eastern limb of the Western Canadian Sedimentary Basin. The McMurray Formation hosts the widespread bitumen saturated unconsolidated sands. The Ells River bitumen pool consists of two to three superimposed wave-dominated shoreface sands trending northwest across approximately 100 sq miles. This embayment-filling shelf deposit at Ells River contrasts with most Athabasca bitumen pools that developed as point bar sands infilling fluvial and tidal channels along the main fluvio-estuarine bitumen fairway. This northward flowing trunk system, entrenched into the underlying Devonian paleo-surface, emptied into a tide-dominated delta front that now hosts minable deposits at Fort McMurray.

Significant bitumen pools have been discovered in recent years where McMurray clastic deposition sites accumulated within secondary paleo-valleys, as tributaries to the main northward flowing trunk system; and as offset secondary paleo-valleys. The Middle and Upper McMurray bitumen sands at Ells River, for example, accumulated as wave-dominated tidal shelf sands at the mouth of a

smaller north-trending paleo-valley that formed an embayment on the Devonian paleo-surface west of the main fairway. These Ells River clastics were sourced from the east by long-shore drift emanating from the tide-dominated delta fronting the Wabiskaw Sea, north of the Fort McMurray mining area. The Ells River SAGD bitumen reservoir is 15-35 m thick with 8-13% bulk oil weight.

A partially muddy MFS interval, strongly burrowed by Thalassinoides, separates the Middle McMurray lower SAGD reservoir from the overlying Upper McMurray reservoir. It may impair vertical reservoir communication between the lower and upper chambers for some areas of the Ells River deposit. Other operational challenges are thin lean bitumen zones (BOW 6%) overlying this mid-reservoir SAGD baffle. Calcite nodules are also widespread in the upper reservoir. The current top gas pressure is at 500 Kpa-a and the bitumen is at 900 Kpa-a.