



GUSSOW 2026

CRACKING THE CRETACEOUS CODE

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Cold Lake Clearwater Reloaded: There is a Difference Between Knowing the Reservoir and Seeing it Evolve.

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ABSTRACT

The Clearwater Formation in northeastern Alberta is a world-class oil sands deposit developed by using thermal in-situ processes such as cyclic steam stimulation (CSS) in the mid-1980s and more recently with steam assisted gravity drainage (SAGD) recovery technologies. Strathcona Resources Ltd (SRC) currently owns and operates the Orion and Tucker projects in the Cold Lake region that have produced bitumen from the Clearwater Formation utilizing SAGD for over 20 years. The reservoir is comprised of excellent porosity (33–35%) and oil saturation (55–65%) with total net pay thickness across the producing pads of the SRC assets ranging from 25 to 50 metres. The region has thousands of wells approximately 500 m apart, with hundreds of cores and multiple regional high-resolution 3D seismic surveys, but new reservoir challenges emerge when integrating post-production subsurface monitoring and assessing future development opportunities.

The Albian Clearwater Formation deposited in the Western Interior Basin and is currently interpreted as a large (>50 km) fluvial-deltaic system with drainage north towards the Cretaceous Boreal Ocean. Initial deposition consisted of a series of unconfined, prograding, and stacked deltaic lobes with overlying marine shoreface or abandonment surfaces. Subsequent incision and degradation led to confined fluvial terrace deposition followed by transgression and aggradational fill from fluvial-estuarine units. The prevalence of non-unique, high-energy, feldspar-rich sand-prone facies makes it difficult to recognize diagnostic stacking patterns in core and consistently link to a muted well log signature for correlation of key surfaces and mapping of stratal geometries.

Post-production subsurface surveillance at Orion and Tucker is a critical component of the SAGD operations to understand the dynamic performance of the reservoir. Integrating post-steam cores, repeat reservoir saturation logs and time lapse (4D) seismic has proven essential for evaluating steam conformance, fluid distribution, and reservoir heterogeneities. The Clearwater Formation is dominated by high-quality reservoir units, but steam chamber development and production efficiency appears to be impacted by the different sand facies and subtle lithological heterogeneities separated by key time surfaces. Any interpretation uncertainty is further amplified away from stratigraphic well control when trying to understand performance differences between kilometre-long horizontal wells spaced less than 100 m apart. Revised reservoir knowledge integrating the evolution of time-lapse analyses have delivered better inputs to reservoir simulations leading to an improved understanding of well pair production and enabling better economic decisions on executing enhanced recovery strategies or developing future pads.