

## Integrated approach to identify internal stratigraphic packages of the McMurray oil sand reservoirs in Foster Creek and Christina Lake, Alberta, Canada

Pauline Chung\*, ConocoPhillips Canada, 401 9<sup>th</sup> Ave. SW, Calgary, AB, Canada  
pauline.c.chung@conocophillips.com

and

Corina E. Irvine, ConocoPhillips Canada, 401 9<sup>th</sup> Ave. SW, Calgary, AB, Canada  
Maria F. Quijada, ConocoPhillips Canada, 401 9<sup>th</sup> Ave. SW, Calgary, AB, Canada  
John R. Suter, ConocoPhillips Canada, 401 9<sup>th</sup> Ave. SW, Calgary, AB, Canada

### Summary

The Athabasca Basin of Western Canada contains an enormous volume of bitumen and heavy oil in Paleozoic and Mesozoic Strata, with the in-place resource estimated at over 2 trillion barrels. The McMurray-Wabiskaw formations comprise stacked, laterally and vertically amalgamated fluvial, tidal, and tidal-fluvial channel-bar successions, found within multiple generations and scales of incised valleys (Figure 1). These valleys incised into and removed pre-existing shoreline, estuarine, and marginal marine deposits, which can act as bitumen or heavy oil reservoirs.

Detailed understanding of stratigraphic architecture at multiple scales is crucial to optimize pad locations, horizontal well placement, and ultimately well pair performance. Thickness, grain size, permeability, porosity, mineralogy, sand-body geometry and continuity are all major factors in how a steam chamber grows (in a steam-assisted gravity drainage (SAGD) process). However, separation of the different packages based on log motifs has proven to be difficult.

In view of the complex nature of the McMurray deposits, several complementary techniques were used to identify internal stratigraphic packages of the McMurray Oil Sand reservoirs in the Foster Creek and Christina Lake area which are located between Township 69, Range 3W4 and Township 77, Range 7W4. The Foster Creek and Christina Lake projects (FCCL) is a 50/50 joint venture partnership between Cenovus Energy Inc. and ConocoPhillips Inc, and is among the oldest steam-assisted gravity drainage (SAGD) operations in the Athabasca Basin, with commercial development started in 2001. This presentation will focus on the results from palynology, chemostratigraphy and Qemscan analyses. These data were interpreted and integrated with well information, fluid properties and seismic to fully characterize the depositional fabrics, lithologies and mineralogies of the reservoir section. The resulting characterization serves as the foundation for building a definitive depositional model of the McMurray interval in Foster Creek and Christina Lake.

Using an integrated approach, this work successfully developed a recognizable internal stratigraphic framework within the McMurray in FCCL that can be measured by analytical

techniques. Several geochemically unique packages were identified and mapped, allowing insights into the reservoir quality, geometry, continuity and distributions.

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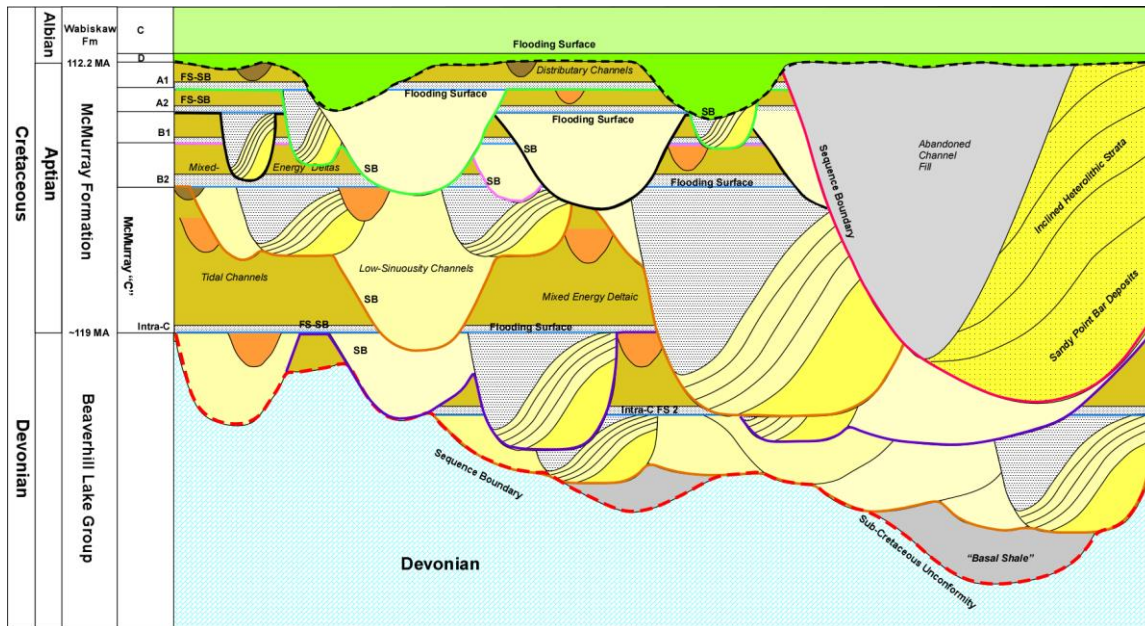


Figure 1: Schematic Sequence Stratigraphy of the McMurray-Wabiskaw bitumen interval in the Athabasca Basin (Suter, J. R., 2012, unpublished)