

## Comparing Geology and Well Completions to Production in the Unconventional Cardium Formation, Northern Pembina Field, Alberta, Canada

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### Introduction

Drilling of horizontal wells in the Cardium Formation in the Pembina Field has increased at a prodigious rate since the successful completion of Bonterra Nexstar 4-25-47-03W5/1-25-47-03W5 in 2008. New Cardium Formation wells are targeting thinner lower quality reservoir intervals and are subject to complex and varied completion techniques (Viau, 2010; Clarkson and Pederson, 2011). Evaluating the impact of these ongoing developments on well production is timely, necessary and requires a multidisciplinary approach.

### Purpose

The purpose of this study is to compare reservoir quality, net pay mapping and completion techniques to production data to evaluate the successes and failures of geologic characterization and completion strategies for the unconventional portions of the Cardium Formation in the Northern Pembina region.

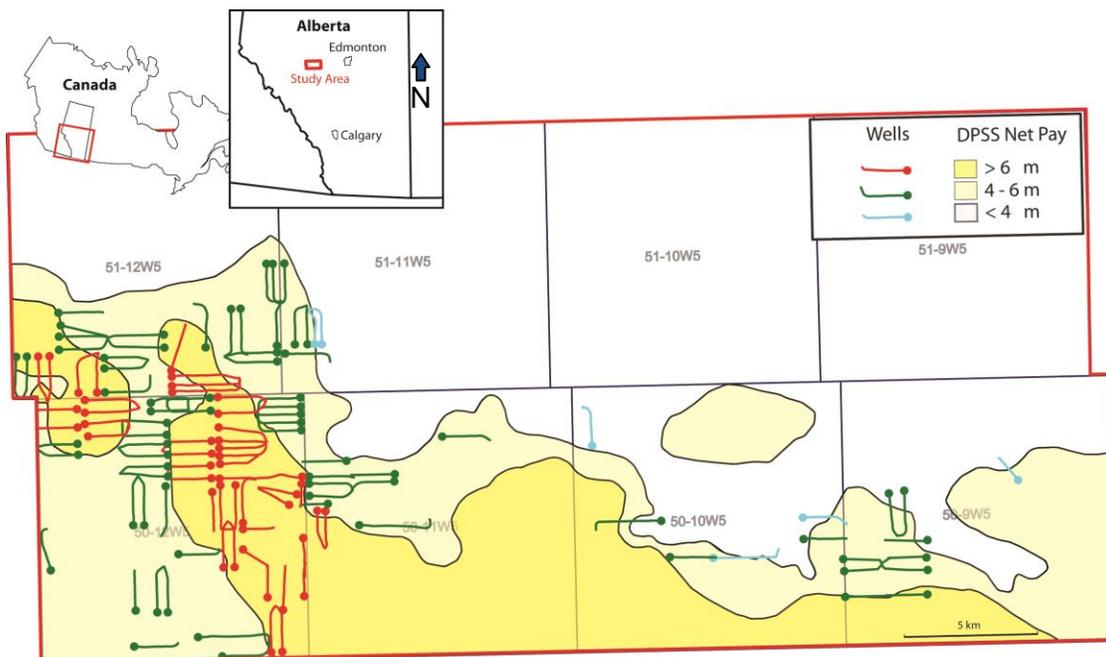


Figure 1: Sandstone density porosity (DPSS) Net Pay map with 125 horizontal wells. Colored contours are based on DPSS net pay thicknesses from 347 wells.

## **Methods**

Geologic characterization was completed using well log data from over 800 wells, routine core analyses data from 440 wells, XRD analyses of clays, and roller oven shale stability testing for fluid sensitivity. Production data from a 125 horizontal wells was compared based on the following: 1. presence of conglomerate, 2. well bore orientation, 3. sandstone density porosity (DPSS) net pay thickness, 4. number of fractured sages, 5. frac spacing, and 6. base frac fluid.

## **Conclusions**

In the Northern Pembina region, accurate evaluation of horizontal well production based on net pay mapping and reservoir quality requires that completion techniques be considered. Conversely, reservoir thickness and quality must be considered to accurately evaluate the success of different completion techniques. DPSS net pay mapping can only be shown to be effective if completion strategies are considered. Well bore orientation displays a limited influence on well performance, while the number of fractured stages has the largest impact on well performance.

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## **References**

- Clarkson, C.R. and Pedersen, P.K. 2011. Production Analysis of Western Canadian Unconventional Light Oil Plays. Paper CSUG/SPE 149005 presented at the Canadian Unconventional Resources Conference held in Calgary, Alberta, Canada 15-17 November
- Viau, C., and Nielsen, K. S. 2010. Unconventional Oil Production in the Cardium Formation, East Pembina Area, Alberta, Canada. Presented at CSPG core conference held in Calgary, Alberta, Canada 16-17 September