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# Mineralogic Analysis of a Carbonate Oil field, Central Alberta, Canada

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### Summary

In this study we have analyzed the Highvale Oil pool, located in Central Alberta, Canada, which produces light oil from dolomitized carbonates of the Mississippian Banff Formation. To gain a clear definition of the subsurface, we employed a systematic approach to integrate outcrop data, core description and mineralogical measurements, a pre-existing 3D seismic survey and petrophysical log data. This integrative approach created zone internal stratigraphic correlations within the erosional remnants of the Banff Formation, identified fluid contacts, estimated saturations and porosity and mineral identification. The integration of recently developed 5D interpolation for 3D seismic data to regularize and fill in data gaps, increase the fold and create common depth point gathers more suited to pre-stack time migration (PSTM) helped immensely.

The generated hybrid mineralogical interpretation is then used to generate reservoir characterization, in conjunction with area seismic interpretation and well log petrophysical analysis. The model is cross-corelated with well production data to determine what attributes drive production in the play.

### Introduction

A multi-pronged view was adopted in this study which includes: production data, seismic attributes, petrophysical parameters of well logs and geochemical analysis of cores.
Core calibrated petrophysical log characterization was provided by NuTech and the output parameters include, effective porosity, BVI, free water, hydrocarbon pore volume, clay volume, and permeability.

The resulting reservoir analytics take in account all four data sets and approaches, with the purpose of identifying factors that drive production performance.

## Methods

The geochemical analysis consists of XRD and XRF readings on available cores. A Bruker D8 Discover with GADDs area detector was utilized to map the spectrum of the core samples. Chinook's unique approach entails a large amount of XRF readings, calibrated to a few high definition quantitative XRD analyses applied to each core at key depths. The fast and frequent elemental readings provided by XRF were then aligned with the more labour intensive (and sample destructive) XRD readings. As such, a large amount of data collected with XRF has given way to the high quality of interpretation determined by XRD readings, and the calibration of elemental to mineralogical determination is done on a well level.

The generated hybrid mineralogical interpretation was then used to generate reservoir characterisation, in conjunction with area seismic interpretation and well log petrophysical analysis. The model is cross-corelated with well production data to determine what attributes drive production in the play.

## Conclusions

This study highlights mineralogical characterization across the entire field and the use of multivariate analysis to integrate this data to quantify well performance. Well performance has been normalized by lateral length, completion type and time on production. With normalized well production, we have analyzed productivity and comment on best practices concerning drilling and completions along with key reservoir parameters and subsequent economic performance.