

Spring Coulee, Alberta: Geology, Production and Potential Hydrocarbon Bearing Zones*

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Abstract

The University of Calgary holds the mineral rights to sections 14 and 23, township 4, range 23 west of the fourth meridian in the Spring Coulee area in southern Alberta. The CREWES Project is examining the hydrocarbon potential of the area and has recently shot an extensive 3C-2D seismic survey in the area. Across southern Alberta, gravity surveys have observed anomalies and deep seismic data has indicated that pre-Cambrian faulting is present on a large scale, which is then reflected in the younger Cretaceous sediments (Paukert, 1982). A very preliminary investigation into how the large-scale faulting occurs in the Spring Coulee area with respect to the University of Calgary land has been undertaken.

Introduction

The University of Calgary has mineral rights to two sections of land in Southern Alberta (14 and 23-004-23W4; [Figure 1](#)). For research and exploration purposes, CREWES at the University of Calgary, in conjunction with Outsource Seismic Consultants and CGGVeritas has undertaken a 3C-2D seismic survey across the University land in January 2008. The producing zones in the area are the Bow Island formation, glauconitic sand channels, and the Mississippian carbonates. As illustrated in [Figure 2](#), there is an extremely low well density in the area. The Spring Coulee, Alberta project is in the early stages and so far the proximal well logs ([Figure 3](#)), structure of the area ([Figure 4](#)) and hydrocarbon production potential ([Figure 2](#)) have been studied.

Theory and/or Method

As illustrated in [Figure 2](#), there are only seven wells in Township 4, Range 23 west of the fourth meridian; this indicates that the Spring Coulee area is relatively unexplored. There are various pools in the area surrounding the University of Calgary's sections, which indicate that there is a potential for hydrocarbons to be located on the two sections. With a little imagination, we might note a modest production trend across the University sections ([Figure 2](#)).

Figure 2 illustrates the University of Calgary land in red cross-hatch and on the left, the proximal producing zones are shown with current production. The producing zones in the area are the Bow Island, the Base of Fish Scale, the Barons, the Rundle, the Livingstone/Madison and the Banff formations as illustrated in the pool map on the right.

Examples

Potential hydrocarbon bearing zones in the Spring Coulee area are the Bow Island, Base of Fish Scale, Sawtooth, Sunburst, Madison and Livingstone formations. Figure 2 shows that most of the Bow Island and Base of Fish Scale production is to the northeast of the University sections, but that there are Rundle and Livingstone pools in close proximity to sections 14 and 23-004-23W4 (with a Rundle pool boundary two miles to the south).

A few miles east of the University of Calgary's Spring Coulee land there is production in the Sunburst, Sawtooth and Madison formations. Figure 3 is a cross section of the Sunburst, Rierdon, Sawtooth and Madison formations (from top to bottom) across the University of Calgary's land.

Figure 4 illustrates the structure of the Base of Fish Scale (top surface) and the Madison formations (bottom surface). The structure dips towards the west-southwest. It is important to note that there is very little well control in the area, which causes the 'bull's-eye' effects (or bumps and troughs) in the image.

Conclusions

There is a potential of finding hydrocarbon bearing zones within the Bow Island, Base of Fish Scale, Sawtooth, Sunburst, Madison and Livingstone formations around the University of Calgary land in the Spring Coulee area. The preliminary processing has begun on the 3C-2D data, which was shot in January 2008. The Geoscience Department at the University of Calgary is also hopeful that the two sections at Spring Coulee will be used as a potential field school area for undergraduate geophysics study.

As this is a preliminary study, future work in the Spring Coulee area involves processing and interpreting the recently acquired seismic data, comparing large-scale basement faulting systems to our seismic data and doing petrophysical and fluid replacement analyses of the area.

Acknowledgements

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Reference Cited

Paukert, G.W., 1982, Geophysical Study of Precambrian Basement Fault Structure and Related Cretaceous Stratigraphic Variation in Southern Alberta: University of Calgary Master of Science Thesis.



Figure 1. Topography Map of the Spring Coulee area (red box) in Southern Alberta.

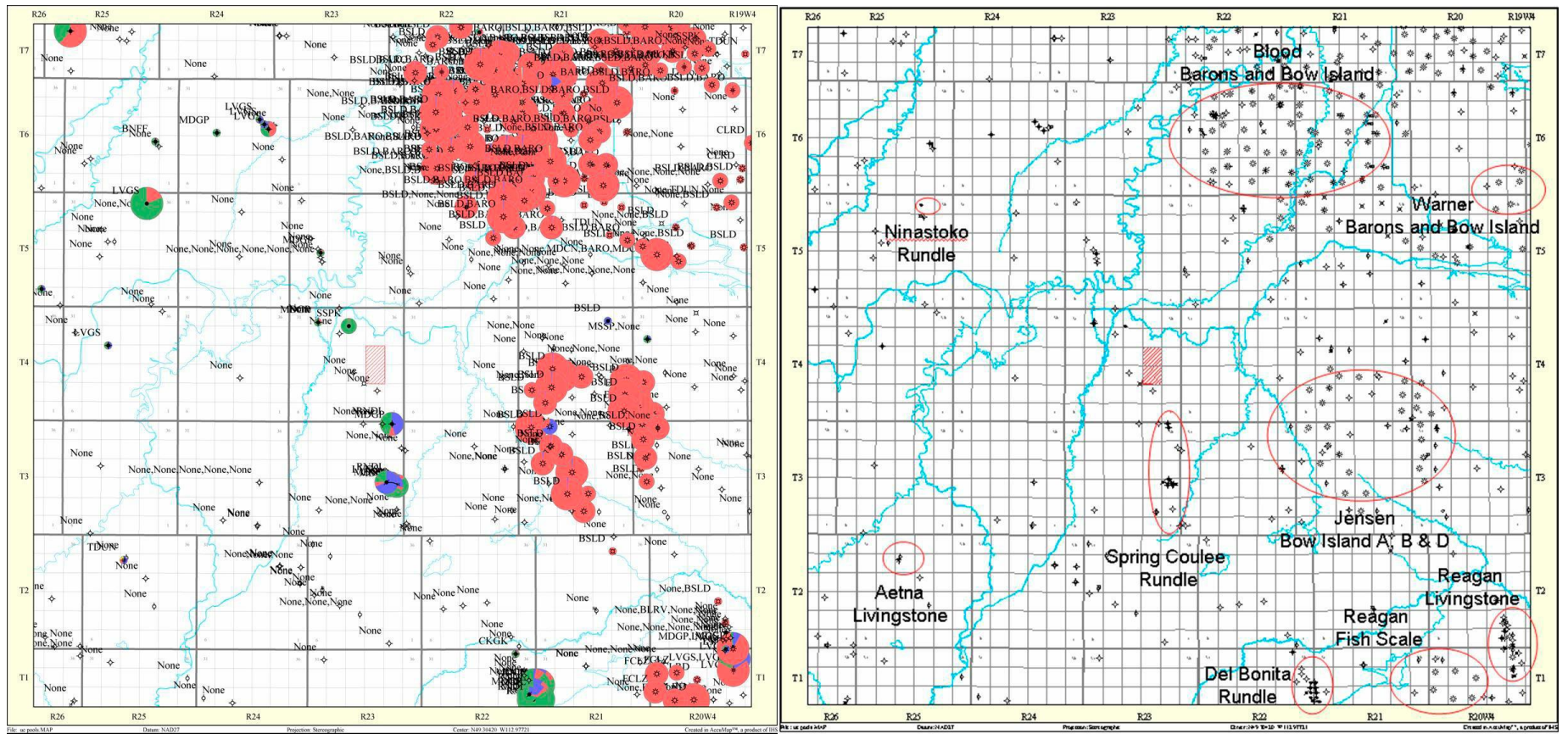


Figure 2. Production map (left) and a pool boundary map (right) with the University of Calgary land in red cross-hatch. Note the Mississippian production on the left, trending from NNW to SSE, possibly across the University of Calgary land.

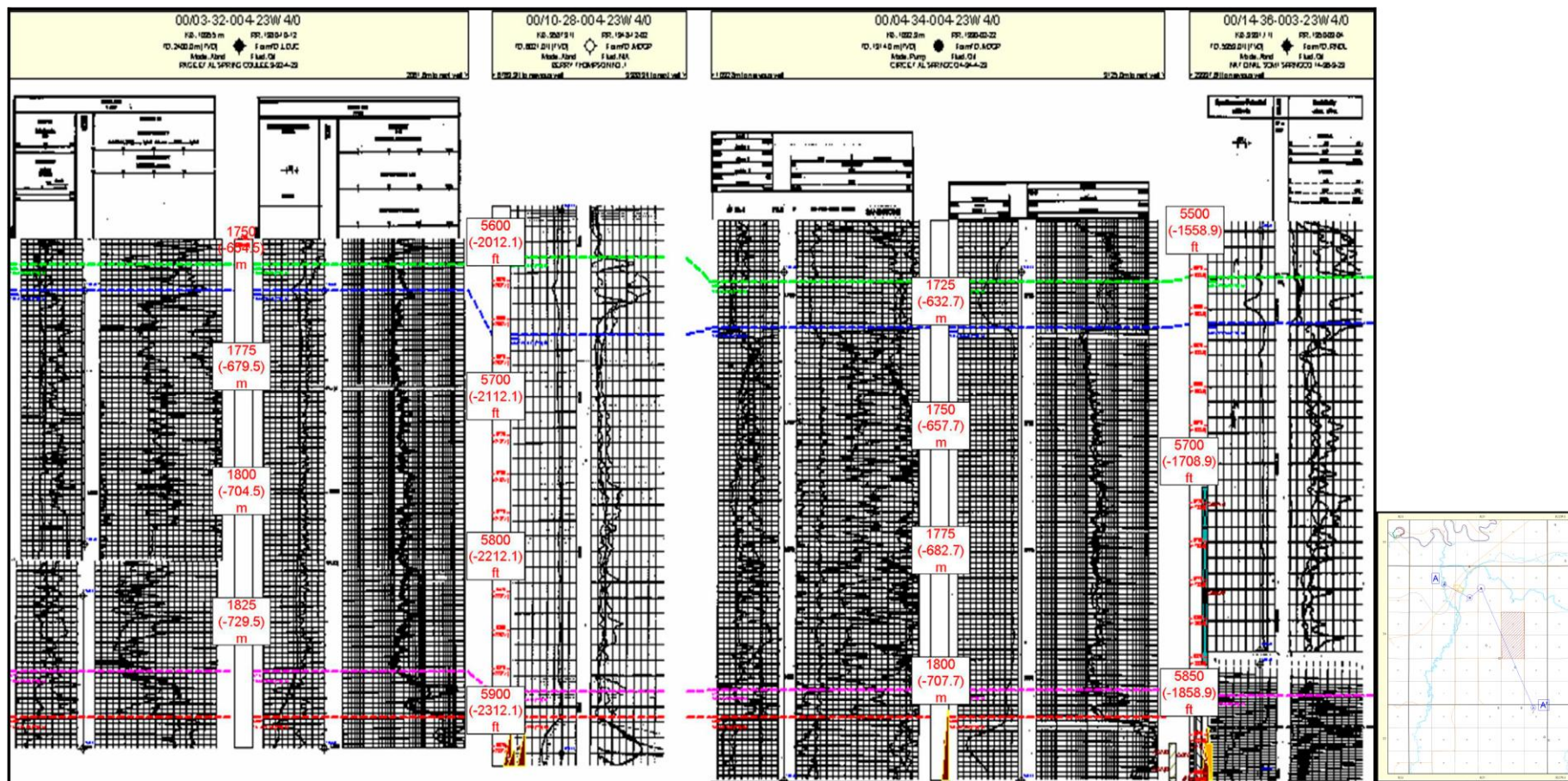


Figure 3. A cross section across the University of Calgary's land in the Spring Coulee area, illustrating the Sunburst, Rierdon, Sawtooth and Madison formations (from top to bottom). The locations of the wells on the cross section are illustrated on the small map on the right.

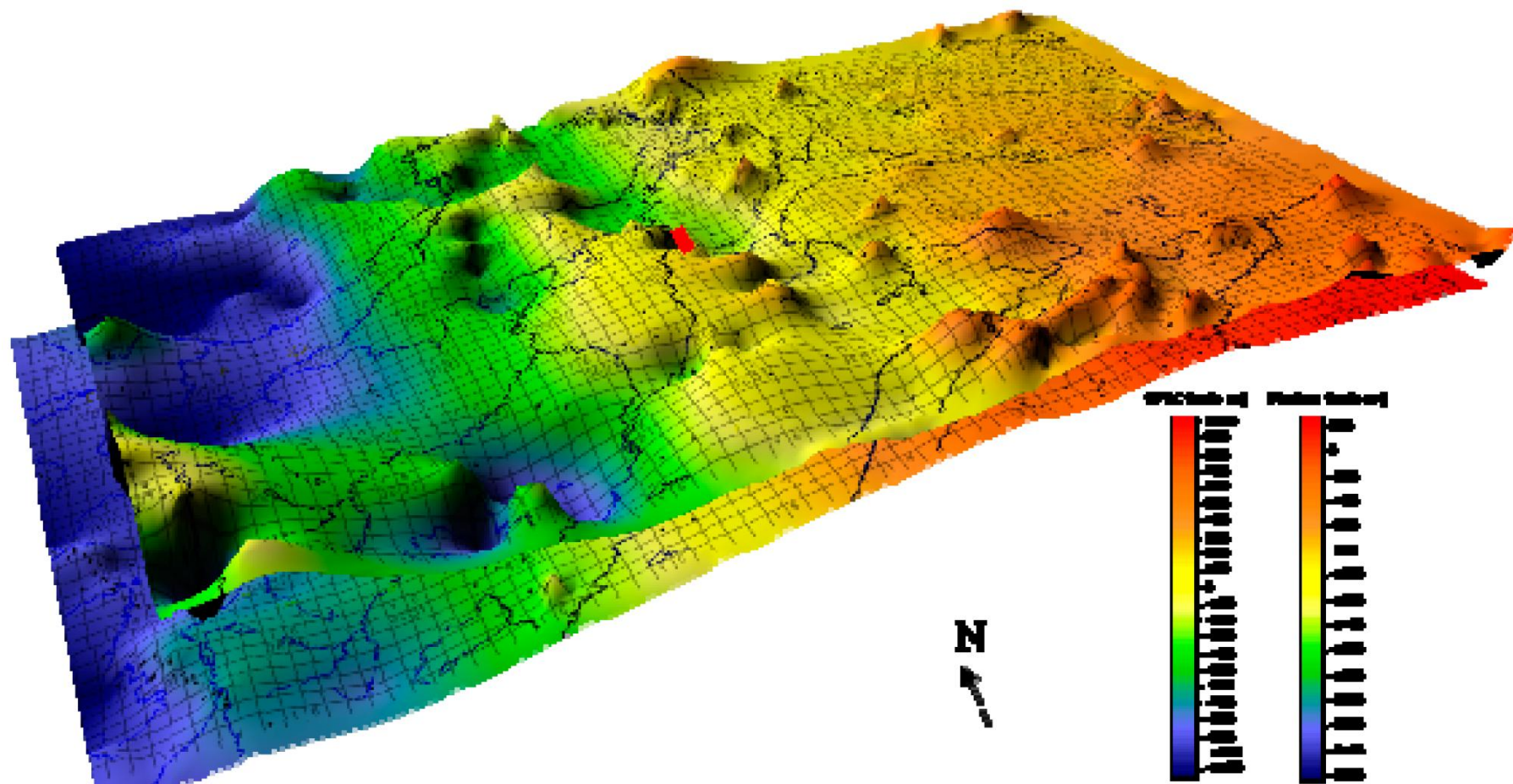


Figure 4. Structural (subsea) contour map of Spring Coulee Area, illustrating the Base of Fish Scale (BFSC) and Madison Formations. The BFSC is the top surface and the Madison is the bottom surface. The University of Calgary land is illustrated by the red rectangle in the middle of the image.