

## **Reservoir Characterization in a Mature Reef Trend**

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The Upper Pennsylvanian Canyon reef trend associated with the Kirkland Field was discovered in approximately 1960 by Gunn Oil Company, utilizing 2D seismic data. The trend was extended over the next 48 years by drilling on 2D and 3D seismic data. In the last three years, the reservoir characterization was significantly enhanced by improvements in prestack seismic data conditioning, resulting in seismic images of interpreted tidal channels which were not detectable on prior versions of data processing. These tidal cuts clearly separate the reef into isolated reservoir compartments. Structure maps on the top reef and the top of porosity underlying the tight lime cap were made from an integrated interpretation of well tops and prestack conditioned 3D seismic data followed by cokriging the seismic depth interpretation with the well tops.

Two wells were completed as oil producers in 2008. These wells were tested, primarily on the strength of the integrated structure map and favorable petrophysical and DST analysis in the planned reentry well. Rigorous multimineral petrophysical analysis and cased hole interpretations were combined with DST data, mudlogs, and sequential testing in the evaluation and completion of these two wells. This work resulted in the observations that there was water above oil in one of the wells and that drilling-induced fracturing in the lime cap was not ubiquitous.

Statistical treatment of gas chromatograph geochemical analysis demonstrates clear evidence of measurement repeatability, but significant differences in the oil composition between wells. These differences between wells may result from reservoir compartmentalization.