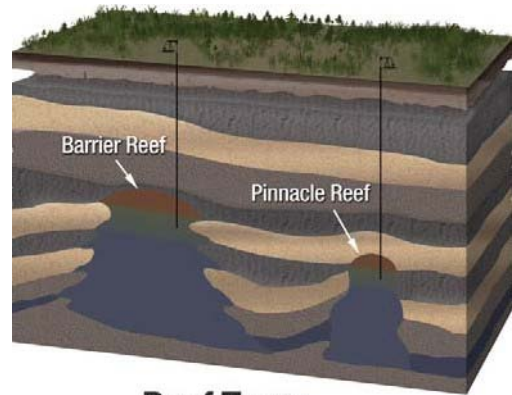


## QuantumRD<sup>®</sup> Strawn Case Study

### Improving the Odds for the Petroleum Industry

**OBJECTIVE:** To detect, validate and characterize reservoir size and depth for an 11,000 feet deep Wolfberry Strawn (limestone reef) formation prospect located in the Midland Permian Basin. To map formation porosity and recommend drilling locations for maximum net pay.

**PROSPECT DESCRIPTION:** The Wolfberry is currently one of the most active plays in the Permian Basin. According to the client's Chief Geophysicist, "The Strawn formation is one of the more enigmatic hydrocarbon producing stratigraphic formations, as production rates can vary significantly over small regions. Well completion costs are high and we need more innovative computational approaches to characterize the subsurface and develop drilling targets. We are looking forward to ViaLog's QuantumRD technology to assess subtle porosity variations and size hydrocarbon deposits on our block to mitigate risk."



Reef Traps

All the more significant is the fact that over the last 50 years only three of 18 attempted Strawn wells in the prospect area showed production. Of the 15 remaining, seven were completed to produce oil from shallower zones in the Wolfcamp formations, no porosity having been found in the Strawn. Eight were declared as dry holes. Additionally, preliminary work showed that the ViaLog technology can increase the ability to detect hydrocarbon presence directly using seismic data to accurately characterize Wolfcamp carbonates.

ViaLog collaborated on this project with the Bureau of Economic Geology (BEG) at the University of Texas at Austin. ViaLog's deliverables included characterization of hydrocarbon reservoir boundaries, subsurface formations, lithology, and depth, as well as porosity estimates, and ultimately to recommend drill locations. Strawn limestone porosities are typically very low. Strawn targets are typically found at depths greater than 9000 feet and with 3% porosities or less are deemed non-productive. For this formation to be economically viable porosity must reach at least 4%. One of ViaLog's key challenges was to locate this porosity and to quantify its areal extent.

**QuantumRD<sup>®</sup> ANALYSIS:** QuantumRD<sup>®</sup> was used to analyze 3-D and multi-component seismic data, well logs, and geological records to locate well sites in the 10 square mile Permian Basin acreage block. In addition to raw 3C data and moved-out preprocessed shot records, the customer provided attribute information including: P-wave reflectivity, impedance inversion, azimuth sectored migrations (0°, 45°, 90°, 135°), CCP converted wave reflectivity, CCP converted wave reflectivity for slow velocity. ViaLog subsequently generated additional attribute volumes including: Semblances on migrated P and CCP volumes, Azimuthal intensity and phase angle from sectored migrations, Azimuthal intensity and phase angle from semblances of sectored migrations, AVO attributes from NMO-ed gathers (intercept, gradient, fluid factor, etc.), waveform clustering on migrated P and CCP, waveform distance maps, adaptive subtraction CCP fast-minus-slow, scattered energy P-wave migration, attenuation Q and instantaneous amplitudes on various volumes. QuantumRD<sup>®</sup> was used to fuse the various geoseismic and geological input data sets in order to better characterize the lithology, reservoir boundaries, fluid capacity sizing, and to develop porosity profiles for potential prospects. QuantumRD<sup>®</sup> enables prediction and quantification of porosity (see figure below) - a key reservoir net-pay indicator - by exploiting subtle changes in seismic noise across the underlying lithology.

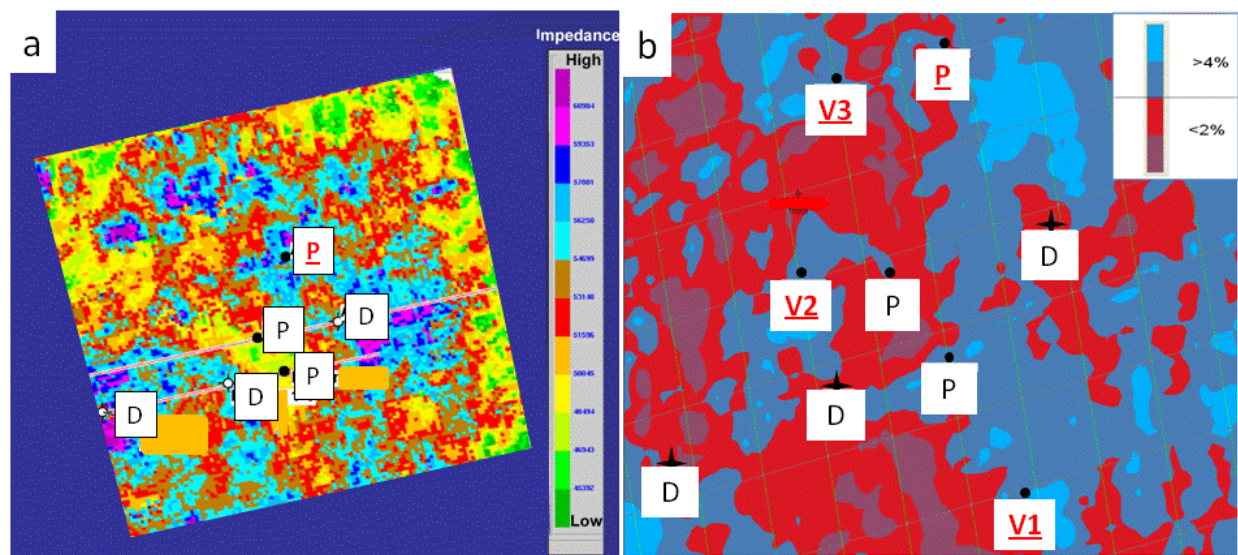


Figure 1. ViaLog's QuantumRD<sup>®</sup> analysis solved an apparent anomaly in the impedance map (a) derived by the client in the vicinity of dry and productive wells. One of the productive wells marked by **P** was located in an area of high impedance whereas, as expected, the other productive wells (marked P) were located in areas of low impedance, and the dry wells (marked D) were located in regions of high impedance. ViaLog's QuantumRD<sup>®</sup> analysis showed that, in reality, **P** was just fortunately located in an area of high porosity. ViaLog's analysis also resulted in the prediction of three suitable locations, **V1**, **V2**, and **V3**, for drilling new wells. Drilling conducted on location **V1** resulted in the discovery of lithology with the precise porosity and reservoir size predicted by QuantumRD<sup>®</sup> analysis.

**RESULTS:** Based on the results of the QuantumRD<sup>®</sup> analysis, ViaLog recommended three potential locations for drilling wells. Drilling at the first ViaLog-designated location reached a prescribed total depth of 11,241 feet. Initial well log analysis showed potential for multiple zones that could be high-graded, highlighted by a net interval of over 50' feet of significant porosity in the Strawn formation alone. The QuantumRD<sup>®</sup> technology succeeded in locating large continuous zones of 6% plus porosity, a major achievement. Detailed volumetrics will be computed in the near-term.

Reviewing the drilling results, Dr. Bob Hardage, one of the principals at the Bureau of Economic Geology and currently the President of the SEG commented, "The prediction of a higher porosity zone within the Strawn is impressive and appears to validate the advantages of the weak signal processing capability underlying QuantumRD<sup>®</sup> to see subtle changes in the data. Porosity variations in Strawn stratigraphy are difficult to amplify using conventional geophysical processing." Despite advances in 3D seismic acquisition and processing, the exploration industry has faced a major challenge in characterizing porosity in complex stratigraphic formations known to exhibit fracture and structural changes below acquisition resolution.

According to the client firm's Chief Geophysicist, "We are impressed by the accuracy of ViaLog's predictions, and especially pleased with QuantumRD's capability to use seismic data to accurately detect porosity zones within the Strawn formation. This was a very difficult problem. Significant undeveloped acreage still exists in the Midland Basin. The introduction of a technology that can characterize porosity in deeper carbonate intervals could make a substantial difference." He added, "This well demonstrated to us QuantumRD's potential to determine drilling locations based on our exploration criteria. We look forward to working closely with ViaLog to discover and develop deeper formations on our acreage including the Strawn, Devonian, and Ellenburger."

Contact one of our technical specialists for more information:

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