

Kingdom Lower Clearfork
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The Lower Clearfork of the northern Midland Basin in Terry County, Texas has been very difficult to explore using traditional exploration methods because of complex geology. The Kingdom Lower Clearfork is in a region comprised of a series of Permian shelf margins (Figure 1). The Lower Clearfork is a shoaling upward sequence of porous and permeable dolomite overlain by dense anhydrite and dolomite. Using traditional exploration methods, such as subsurface data, the shelf margins are difficult to interpret, thereby making it difficult to develop Lower Clearfork fields. Once 3D seismic was initiated in the Lower Clearfork, a better understanding of the locations of shelf margins could be determined. The net effect was an increase in production, and better development of the field.

History of Lower Clearfork Exploration

Historically, using subsurface data in the Lower Clearfork production has been sporadic (Figure 2). As an example, a 300 KBO well has been offset by two good wells, and four marginal wells. These wells are located one section northeast of our Helen lease. Initially, the trend was setup by drilling of a marginal well in the SENE corner of the section. Fuller operating offset the marginal well, and made a 300 KBO well. This well was further offset to the north by two 100 BO wells. After these three good wells, the rest of the wells have been disappointments. As an example, a well southwest of the 300 KBO well cum 215 BO.

Another problem in the Lower Clearfork has been the lack of direct relationship between structure and quality of production. As an example, two 100 KBO wells are updip from the 300 KBO well. Conversely the 300 KBO well is flat, and on strike with the marginal wells. Therefore, structure plays only a minor role in the quality of production.

Seismic Exploration

With no definitive relationship with the quality of production to subsurface data, 3D seismic has provided the best tool for exploration. The method involved comparing amplitudes of pay zones in good and bad wells. The pay zone is the trough below the top of Lower Clearfork (Figure 3). The good producer is the Trail Mountain Inc. Helen #2, and the poor producer is the Midland Resources Unit #1 located two miles southwest of the Helen #2. The amplitudes of the Helen #2 are higher than the Midland Resources well, which correlate to quality of production. The next step involved creating an isochron from the top of Lower Clearfork to 25ms. Below top of Lower Clearfork (Figure 4). After the isochron was created, the amplitudes of the Helen #2 and the Midland Resources well were used as endpoints for an amplitude map. The best production should lie in the highest amplitudes, which in this case correspond to the darker colors.

This map best explains the variations in Lower Clearfork production. The 300 KBO well northeast of the Helen #2 is in a Lower Clearfork anomaly, and the poor producer southwest of this well is located outside of the anomaly (Figure 4). Also, the TMI Helen #2 is in another anomaly, and a dry hole west of this well in the same section is out of the anomaly. Until this map was created, it was difficult to explain why this well was a dry hole, and the rest of the wells in the section were producers.

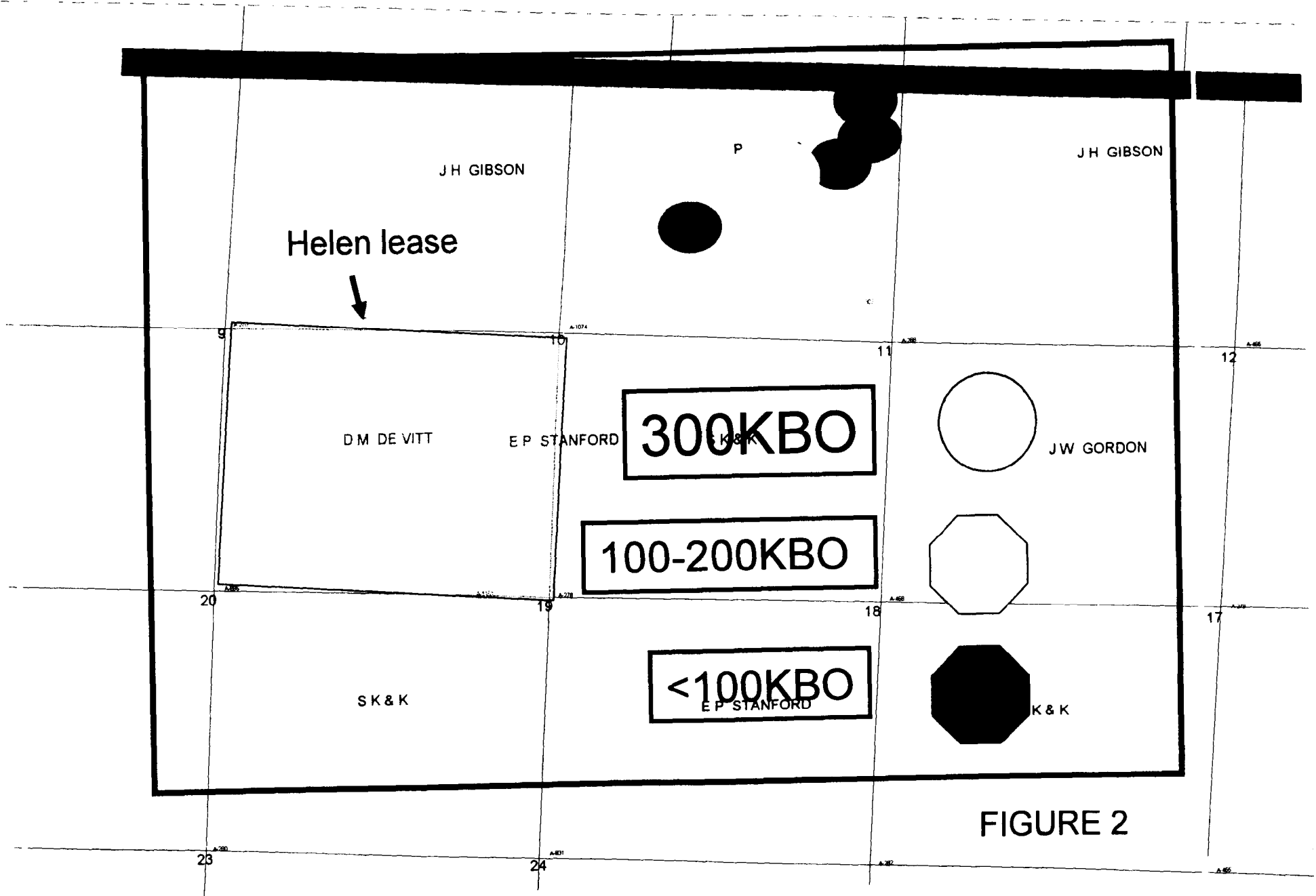
Conclusions

Subsurface data is inadequate for most shelf margin trends in the Permian Basin. Variation in production cannot be easily explained with sparse subsurface data. With the aid of 3D seismic data, variations in the quality of reservoirs, and hence production can now be determined comparing the amplitudes of the 3D seismic of the Lower Clearfork in good and poor wells was the best production analog, and aided in exploration and development.

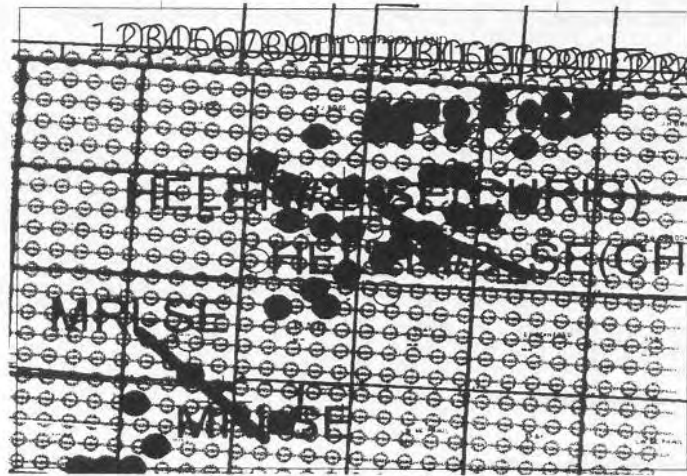
Acknowledgements

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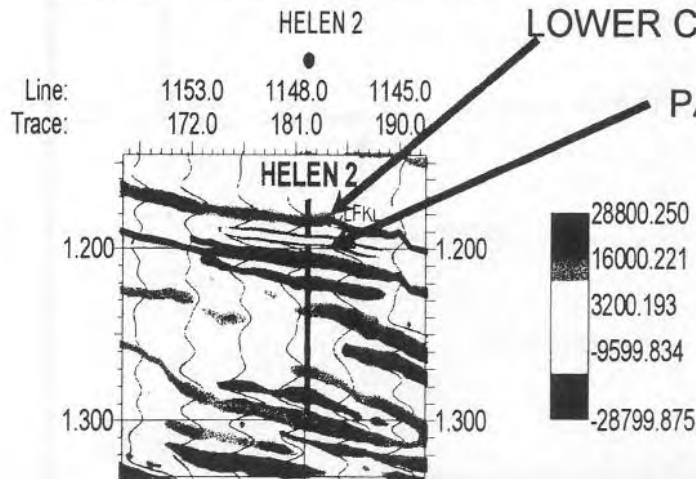
LOWER CLEARFORK PRODUCTION



BASEMAP



HELEN-SE ARB LINE



MRI ARB LINE

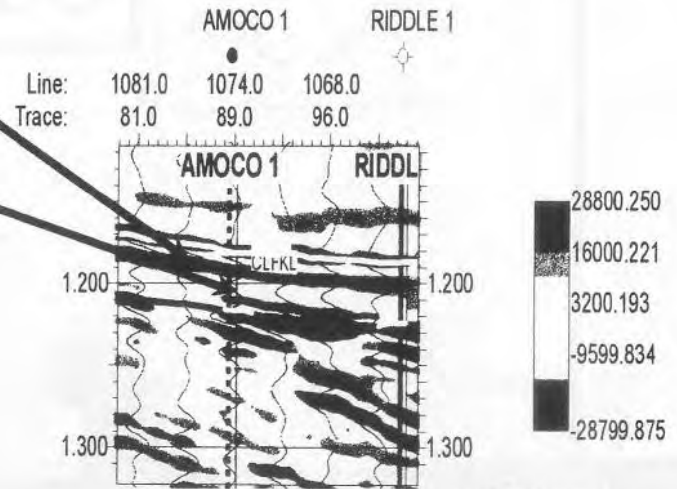


FIGURE 3

LOWER CLEARFORK POROSITY MAP

X/Y :

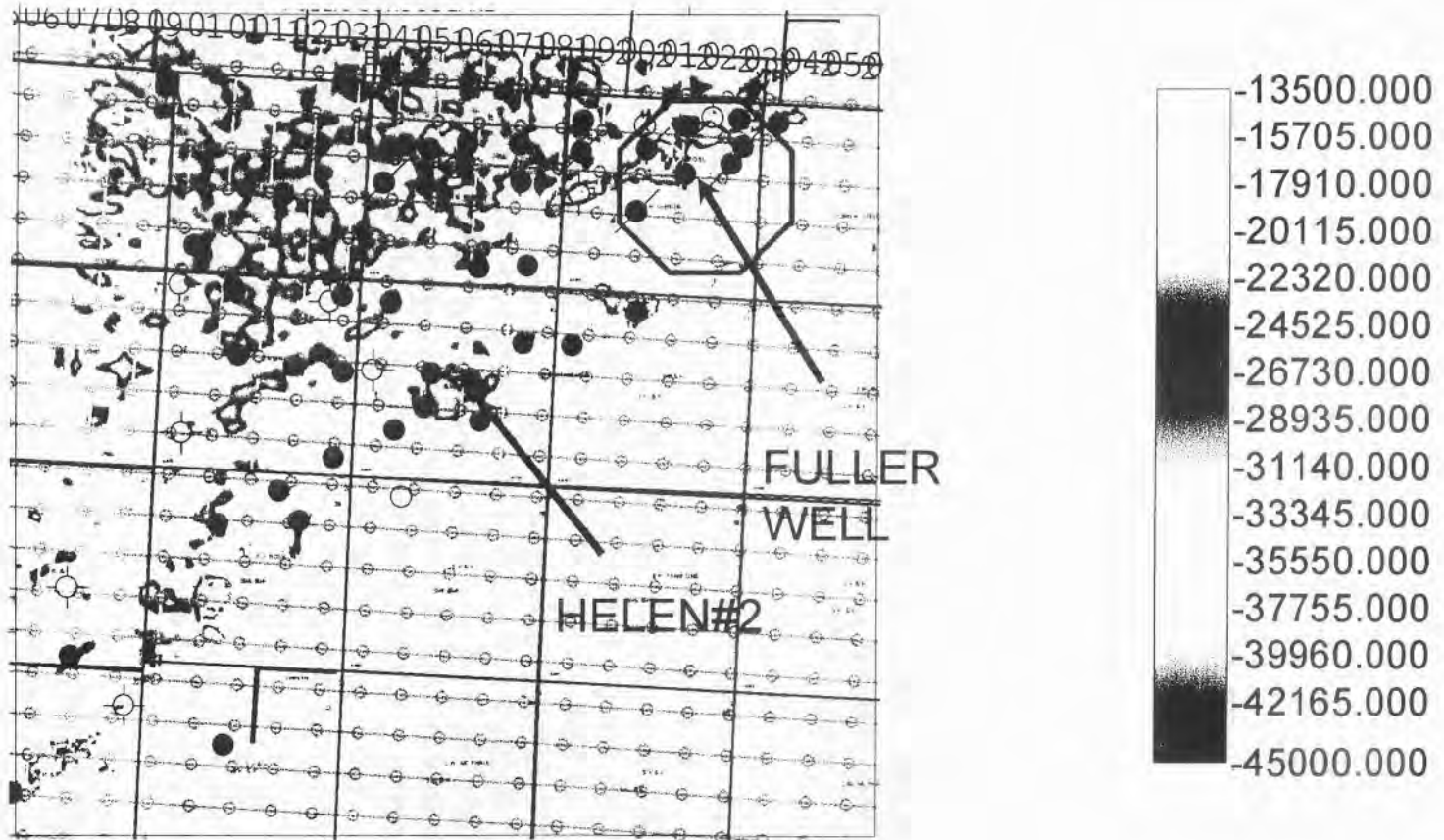


FIGURE 4