How Good is your Geophysicist's Well Prognosis?

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Summary

Team members are sometimes surprised when a well prognosis calculated from high quality seismic data does not always accurately predict the structural depth of the target formation. This may be an indication that the geophysicist has not portrayed to co-workers the contributing factors that affect depth estimates and the resulting potential error in this depth estimate.

In this case history, we have the luxury of 50 km^2 of good quality 3D data located on the Alberta side of the Peace River Arch that is calibrated by >150 penetrations of the target formation. The last 70 well prognoses in this area have an impressive median error of only 0.7m but included in this have been some prognosis errors in the 4-5m range.

The process to convert seismic travel times to a depth value requires understanding the velocity of the rocks above the target formation and applying this velocity field to the seismic data. This database will demonstrate that an accurate depth estimate is contingent on adequately sampling the velocity field to recognise changes in the velocity field and will also attempt to quantify the expected error in a well prognosis for this area given the existing velocity field sampling due to near by well control. An examination will be made to determine the type of features in our study area that can cause perturbations in the velocity field and lead to these depth errors. And finally, what is the necessary well spacing to identify these perturbations adequately for accurate depth estimates?

A geophysicist's well prognosis is as accurate as the existing well and seismic database permit. It is important that geophysicists, geologists, engineers, etc. understand the problems and power of converting seismic data into depth estimates for the drill bit.

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