

**AAPG Annual Meeting
March 10-13, 2002
Houston, Texas**

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The Integration of Seismic Attributes and Rock Properties for Mapping Porosity Thickness in the Heterogeneous Grayburg Carbonate Reservoir, Corrigan Cowden Unit West Texas

3D seismic attributes were integrated with well derived porosity feet (PhiH) from neutron-density cross plots to predict PhiH away from well control for the Permian Grayburg reservoir within the Corrigan Cowden Unit. The Grayburg is a heterogeneous reservoir consisting of outer and inner ramp dolostones and transgressive, reworked sandstones with an average porosity of 12% and permeability of 5 md. The 3D seismic was reprocessed to improve the signal to noise ratio and frequency content over the Grayburg reservoir interval resulting in improved vertical resolution necessary for seismic attribute extraction. Seven seismic attributes were extracted from the seismic interval representing the Grayburg reservoir and include relative amplitude, average peak amplitude, rms amplitude, arc length, energy half time, instantaneous frequency, and instantaneous phase. The well-derived PhiH > 5% for the Grayburg reservoir from thirty-one wells were cross plotted against the seven seismic attributes extracted at each well and analysed using a linear regression. A correlation coefficient of 81.4% was obtained when comparing the relative amplitude seismic attribute to the PhiH > 5% and was statistically significant enough to predict PhiH of Grayburg reservoir away from well control. A map of PhiH for the Grayburg reservoir was generated by integrating the well-derived and seismic amplitude computed values of PhiH, identifying areas of higher PhiH not penetrated by existing wells. Eight lateral wells were drilled in 1999 and 2000 from existing vertical well bores targeting mapped areas of higher PhiH, resulting in an increase of 306 bopd in incremental production.