3D SEISMIC ACQUISITION
CASE STUDY

Terra Nova Energy - PEL444 & AAL 193

Cooper Basin, Australia

AWT DISCIPLINES

Geology

Geophysics

Project Management

GIS

PROJECT BACKGROUND

From August 2013 to November 2013, AWT supervised Dolphin Geophysical to process approximately 80 square kilometres of 3D land data for Terra Nova Energy in PEL 444 and AAL 193, located in the Cooper Basin, Australia.

Location:

Cooper Basin,

Australia

AWT WORKSCOPE

The two-way-time to the primary target was from 800 ms to 1800 ms to image low-relief structural and stratigraphic traps at the Cadna-owie and Birkhead Formations that had been predicted from various previous 2D surveys. Both the Namur and Hutton Sandstones were secondary targets.

AWT VALUE ADDED

The dataset was passed through a processing sequence that included refraction and residual statics, predictive deconvolution and pre-stack time migration, with post-migration spectral weighting and uphole calibration of statics.

The fairly large line spacing made for poor near-to mid-offset coverage in the shallow formations, leading to poor resolution of fine structures above 400 ms, and the presence of artefacts in that range. The initial refraction statics from seismic data had significant lateral changes of up to 45 ms across the data set and, applied to the data, led to broad variations in the dataset not apparent in the 2D data. The 2D data had been reprocessed in 2005 along with the acquisition of the Maryborough 2D data and data processing paid particular attention to uphole data calibration along the lines. From this it was clear that careful integration of uphole data was needed to calibrate the final statics.

Uphole control of statics proved to be a crucial issue in this dataset. There was some uncertainty about whether all of the statics derived from uphole values were valid, particularly in the dune-dominated area of the south eastern part of the survey. Ultimately it was determined that UH 7428 was unreliable and it was not used in the final uphole tying. No uphole control existed in the north western part of the survey.

Uphole data were provided by the client for over 100 locations, but only 33 of these were close enough to the "live" data area to be of use in this set.

Of these, one uphole (UH 7428) was deemed to have a static value that was suspiciously high, and was excluded in the final calibration.

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The methodology employed was to calculate the one way travel time to datum (MSL) from surface for each of the upholes and use this as the estimate of final static to be tied. After refraction, statics were created and summed with elevation statics.

These values were smoothed somewhat. The difference between the smoothed combined elevation and refraction static and the uphole statics were calculated at the various uphole locations. This provided shift values that were kriged to create a smooth shift statics function. This shift statics function was applied in order to constrain the overall refraction and elevation statics model to the uphole values.

Due to the paucity of uphole control in the north-west of the survey, three "padded" upholes (ie extrapolated upholes) were included to further constrain the system and avoid anomalous gridding artefacts in this area.

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