Application of 3D seismic in the delineation of U bearing structures at Ranger 3 Deeps

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Energy Resources of Australia Ltd (ERA) own and operate the world class Ranger Uranium Mine located in the East Alligator Rivers Region of the Northern Territory. Over the past four years ERA has been undertaking extensive exploration in the area which in 2008 resulted in the discovery of a very significant uranium resource, called Ranger 3 Deeps (R3D), down-dip but separate from the existing Ranger #3 orebody. Evaluation drilling work highlighted the complex structural setting of the mineralisation and detailed pit mapping together with reinterpretation of historical data provided a new perspective on the importance of structural controls to the formation of the Ranger orebodies.

Indistinct physical property contrasts together with the depth and detail of investigation required rendered traditional geophysical methods including magnetics, gravity and electromagnetics relatively ineffective at defining key contact and fault locations. The seismic method was considered the only geophysical technique potentially capable of delivering the information at the required resolution. Feasibility investigations included a program of borehole and sample velocity and density measurements, synthetic modelling simulations and trial VSP and 2D traverses all of which showed that the technique had a high probability of success. In 2008, a 3D survey over the R3D area was acquired and processed by the CHDG group from Curtin University.

The final seismic cube has been compared with the results of extensive drilling throughout the area and has dramatically improved confidence in the placement of lithological boundaries and inference of steep fault controls to mineralisation. Acoustic impedance inversion processing, attempted for the first time in a hard-rock environment, is also showing promise as an aid to geological modelling, exploration targeting and potentially advanced geotechnical investigations.

Exploration in another area of ERA’s lease is now benefitting from a similar 3D survey carried out in 2008 with the expectation that similar mineralisation bearing structures may also be identified from this survey.