

Outcrop Gamma Ray and Rock Properties of the Tumblagooda Sandstone, Western Australia – a Fluvio-Deltaic Reservoir Analogue

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Outcrop of the Ordovician Tumblagooda Sandstone, Western Australia, shows internal heterogeneity typical of fluvial and deltaic systems. Gamma ray (GR) logs measured along a 50 m x 6.5 km coastal section reveal sandbody architectures at reservoir scale in these braided river and deltaic deposits. Reconnaissance spectral GR and rock property (core plug) data were gathered from a 30 m thick representative section to examine reservoir heterogeneity.

GR profiles for the braided river deposits are smooth to ratty and highly variable in shape, making lateral correlation difficult. The overbank/interdistributary deposits contain metre to sub-metre scale sheet-like interbeds of very-fine and coarser grained sandstones, which stack together as broadly coarsening-upward cycles; however their GR character allows lateral correlation for just a few hundred metres. Finer grained overbank/interdistributary deposits show high total counts and elevated K, U and Th values compared to crevasse-splay and distributary channels facies.

The helium porosity and Klinkenberg corrected permeability data range between 6–26% and 0.003–3726 mD, respectively. The braided river and distributary channel facies display the highest porosity (12–26%) and permeability values (50–3700 mD). Similar readings are found in the crevasse-splay and overbank sandstone facies, but these are more frequently well-cemented, reducing permeabilities to below 10 mD. Overbank/interdistributary bay fines are extremely poorly sorted, with porosities and permeabilities typically below 8% and 1 mD, respectively. Fine-grained sediments are commonly interbedded with overbank sandstones, and less commonly within fluvio-deltaic channel deposits. These essentially tight units represent significant baffles and barriers to fluid flow.