

The similar fresh wet gamma responses of coal to lithic sandstone and IDC to mudstone are regarded to be a function of unit thickness, depositional setting, and log resolution.

In Sequence 1, $\approx 40\%$ of coal seams are $\leq 0.5\text{m}$ wide, compared to $\approx 75\%$ in both Sequences 2 and 3. All sequences are characterised by mudstone floors (and often roofs) to the coal seams, and these features, along with a resolution of 21 - 24cm, would cause coal seams $\leq 48\text{cm}$ to have generally smoothed (elevated API) responses.

In contrast, the more massive sandstone units are not as resolution sensitive, and the gamma responses shown in the table are considered representative.

However, the lithic sandstones have a clayey matrix with a variable gamma response, thus reducing the contrast with adjacent rock units.

The convention of drawing "sand" and "shale" lines on natural gamma logs has little relevance in the areas investigated, chiefly because the muddy matrix in the lithic sandstones appears similar to the interbedded mudstones; this situation is exacerbated when a kaolinitic mudstone is interbedded with an illitic clay matrixed lithic sandstone.

The reasons for the more definitive NN signatures of coal, IDC, mudstone and lithic sandstone are not fully understood, but probably include the type of clay minerals e.g. kaolinitic claystone bands in the coals compared to illitic mudstone beds and matrices to the lithic sandstones.

Although NN logs are a reflection of H content, only a few samples of aquifer properties were identified, mainly in quartz sandstone, quartz rich lithic sandstone and to a lesser extent in siltstones. The cause of these anomalously high neutron porosities as being either intergranular or fracture porosity was not established.

Complicating factors in such an appraisal include the presence of several species of clay minerals, chiefly kaolinite, illite and mixed layer illite - smectite, with minor micas and chlorites.

Using the simplest approach whereby it is assumed that the background neutron