ABSTRACT

The coal-bearing Permian Vryheid Formation of the Ecca Group (Karoo Supergroup) was investigated at New Denmark Colliery, situated in the north east section of the Karoo Basin, South Africa. The lithostratigraphy of the sequence is defined in terms of conventional lithostratigraphic terminology but also by applying detailed genetic stratigraphic schemes that have previously been proposed for the adjacent coalfields. The succession is divided up into depositional sequences named after the underlying and overlying coal seams, the No. 2, 3, 4 and 5 seam sequences.

The sedimentary succession was divided up into five facies, namely: conglomerate facies, sandstone facies, interlaminated sandstone-siltstone facies, siltstone facies and coal facies. These were interpreted hydrodynamically. Facies assemblages were then interpreted palaeoenvironmentally. Glacial, fluvial, deltaic and transgressive marine sequences were responsible for forming this sedimentary succession. Attention was then focussed on the main economic No. 4 seam, which is mined underground at the colliery.

Detailed subsurface geological cross-sections, core sequences and isopach maps of the No. 4 seam coal and the lithologies above, were used to determine specific aspects of the depositional environment that could contribute to unstable roof conditions above No. 4 seam. Coarsening-upward deltaic cycles, fining-upward bedload fluvial cycles, glauconite sandstone marine transgressions and crevasse-splay deposits are recognized in the overlying strata. Poor roof conditions occur parallel to palaeochannel margins because the interbedded channel sandstone and adjacent flood plain argillites cause collapsing along bedding plane surfaces. Rider coals overlying thin crevasse-splay sequences in close proximity to the No. 4 seam, create one of the most serious roof conditions; complete collapse occurs along the rider coal contact

with the underlying splay deposits. Differential compaction of mudrock/shale/siltstone over more competent sandstone causes slickensided surfaces that weaken the roof lithologies. Correct identification of these sedimentological features will enable the prediction of potential poor roof conditions during mining operations and mine planning.

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