Determination of bulk permeability within the Morien Group using the forcing of ocean tides in the Sydney Basin in Cape Breton, Nova Scotia

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Since November 1992 the Lingan Colliery in the Sydney coalfield has been steadily filling with water. At the same time the water level in the previously flooded 1B region in the No 26 Colliery has been gradually decreasing. There are no direct excavated links between these two collieries but it is believed that influences of the longwall mining in the Phalen Colliery have caused damage to the barrier pillar between the Lingan and No 26 collieries, resulting in a hydrological connection.

The water levels in the workings in question have been monitored and recorded by the Cape Breton Development Corporation (CBDC) since 1986. In Lingan, water level data recorded by CBDC since 1992, shows a strong tidal signal that overprints the increasing water level signal in the mine. Comparison with regional tidal records over the same time period has confirmed this correlation between water level data and the tidal signal. It is this similarity that is key to determining the bulk permeability of the material surrounding these mines.

An analysis of the phase shift and amplitude of the tidal signal in the water level records provides a direct estimate of formation permeability, following the methods of Wang and Davis. Water level data, analyzed to remove the longer time period fluctuations in levels, are presented with tidal data. Preliminary estimates of permeability based on the tidal signal in these de-trended records are also presented.