

## **Case Study 2**

### **Design and installation of a 'Real-time Strata Monitoring System' in both the P&E and Conveyor Drifts at Moranbah North Coal Mine (Anglo American Metallurgical Coal Australia) - 2012**

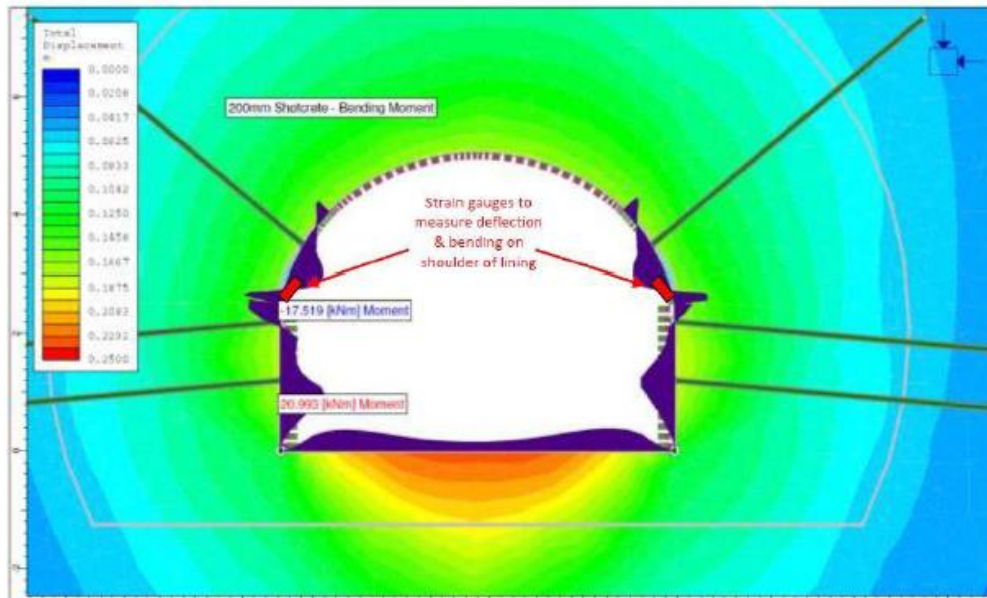
Due to a number of roof falls in the Conveyor Drift at Moranbah North Coal Mine (MNC) between the 18th of January 2009 and the 7th of November 2011, an independent review of the existing support was conducted by GHD. The outcome of this review was to initiate a remediation program, which included two stages are rehabilitation. The first was to re-open the means of secondary egress, where the fall of ground happened in the Conveyor Drift, and the second stage of the remediation programme was, through numerical modelling and a number of empirical analysis techniques, to bring the support in the P&E and Conveyor Drifts up to a required Factor of Safety (FoS) of >2. This FoS is designed to encompass the 'Life of Mine' for both drifts.

The installation of a monitoring initiative was also recommended within this independent review and designed to be able to monitor for any pre-cursors that could lead to additional failure in the drifts. Blackrock Mining Solutions were approached to design and implement a 'fit-for-purpose' real-time monitoring system that could be continually monitored for any pre-cursor signs of movement.

The designed monitoring program is a real-time remote reading monitoring system which links the UG monitoring instrumentation to a designated computer in the surface control room. This computer is set up with several alarm systems so that if a displacement trigger level is reached, mine management will be notified and an appropriate response plan put into place. The Trigger Action Response Plan (TARPs) was set up in such a way as to reflect the varying degree of risk/hazard posed from various potential levels of movement.

The monitoring system was designed and installed so that the shotcrete and concrete lining of the P&E and Conveyor Drifts respectively were monitored with purpose-built real-time strain gauges. These strain gauges are able to monitor for any mobilisation of ground behind the lining, within the softer material close to the surface. Within the more competent material, in the lower half of the drifts, real-time extensometers were used to measure for any strata/rock movement. A snap-shot from the detailed design work involved with the location and density of instrumentation can be seen in the following numerical modeling schematics.

The strain gauges were designed to be installed in the shoulders of the lining to be able to measure for any sign of pressure/flexure in the lining, which would be indicative of possible strata mobilisation behind the lining.



The extensometers were designed to be installed in the ribs/walls of the entrance drifts, so as to pick up the first signs of block movement and therefore be able to act as a pre-cursor alarm for future potential failure. From the numerical modeling analysis, the ribs are where the most deflection is measured and hence where the first signs of movement will be noticeable.

