

# Sentry aids stability monitoring

The Maptek™ I-Site™ 8820 laser scanner and Sentry software have proven their value in stability monitoring during a research and development trial in South Australia.

The scanner and software system provided a critical alarm for a rock topple event at Kanmantoo Copper Mine, located about 45km east of Adelaide in the Adelaide Hills.

Hillgrove Resources Limited operates an open cut mine which produces 20,000 tpa of copper metal with associated gold and silver. In 2014 Kanmantoo had a series of three open pits.

The mine has been trialling Sentry since 2013. Sentry combines laser scan data with dedicated software to track and analyse surface movement over time. A Maptek™ I-Site™ 8820 laser scanner is connected to Sentry software installed on a ruggedised laptop.

A trial to assess the capabilities of the system in monitoring movements on an open pit wall anticipated events in ductile rocks at the site.

The Sentry system was initially set up to collect data in the Nugent Pit. Scanning was conducted from a fixed bollard at distances of 180m and 260m.

Sentry was shown to be capable of monitoring rock movements from 1.5 tonne rockfalls to a 40m high toppling wall failure.

The location, size, run out distance and time of occurrence of minor rockfalls were identified, providing precise data to be incorporated into the Hillgrove rockfall risk management program.

In the first part of the trial the scanner was used intermittently to monitor the southeastern and southern walls of Kanmantoo's small satellite pit, Nugent Pit.

Several rock movements were detected from June to October 2014, including initial rock dilation, small rockfalls and a slump failure.

A flexural topple event, in which columns of rock separated by discontinuities broke as they bent forward, occurred on November 29.

A slope stability radar was used to successfully provide alarming capabilities, allowing operations to retreat from the area on the day before the final wall collapse.

The I-Site laser scanner was used throughout the development of the toppling failure to monitor movements, starting from initial dilations through reverse scarps and to the final collapse.

In January 2015 a second laser scanner was set up in Kanmantoo's Emily Star Pit. The scanner detected rock displacement movements on an area of the near vertical eastern wall, just to the south of a stability buttress.





Inspections indicated that block toppling might eventuate so alarms were set in the Sentry system at 2mm/hr (geotechnical alarm) and 3mm/hr (critical alarm).

The failure occurred at 7am on January 29. The two alarm levels were activated at 2pm and 6pm on January 28, providing several hours notice prior to the event.

Sentry identifies movement trends as small as 1mm/day and allows analysis of the mechanism of wall failure.

Sentry allows monitoring of multiple areas of concern within a single scene. Users can set tolerances for notification and determine the monitoring frequency.

Raw laser scan data can be exported to I-Site™ Studio software for advanced modelling, including volume calculations.

The information collected can be used in rockfall databases for reducing risk in the vicinity of highwall toes.

The results of the trial were presented by Hillgrove Principal Engineer Bruce Hutchison at a slope stability conference earlier this year. He said that the Maptek solution provided a powerful analysis tool.

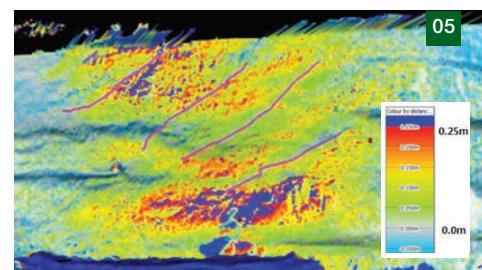
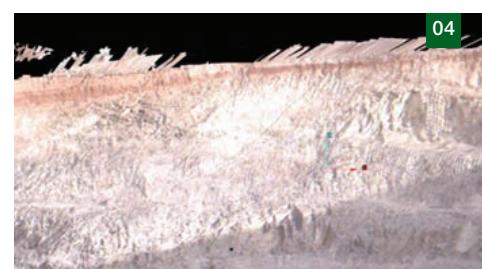
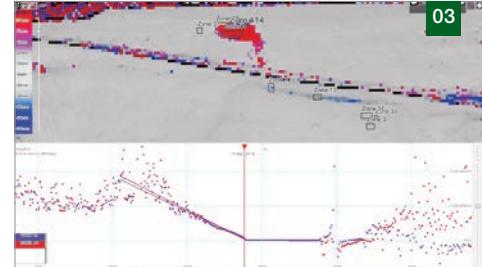
'Since all of the datasets and points are georeferenced, the total rock movement history can be compiled from the base dataset,' he added.

Hillgrove appreciated the fact that the I-Site 8820, an IP65-rated laser scanner, could be used for a wide range of mine survey applications.

'It is extremely important to retain the monitoring history. If the laser scanner is taken for use elsewhere, or needs to be moved for a blast, or experiences power failure, new data can be directly compared to the original dataset, provided the same base station and backsight are used,' Hutchison said.

The Sentry system proved to be a very important tool for monitoring rock movement at Kanmantoo.

*Thanks to Hillgrove Resources Limited  
Edited extract of paper presented at SAIMM Slope Stability Conference,  
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01 Eastern wall of the Nugent pit showing flexural toppling failure. Sentry heat map and graph clearly indicate an increased rate of movement in zones of interest

02 Sentry setup at Hillgrove Resources Kanmantoo Mine

03 Post-failure analysis of inverse velocity data shows prediction of failure 18 hours before it occurred

04 Pre-failure image of the pit wall

05 Sentry monitors movement and maps the development of scars