



# Forge

Newsletter

March 2017



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## Global activities

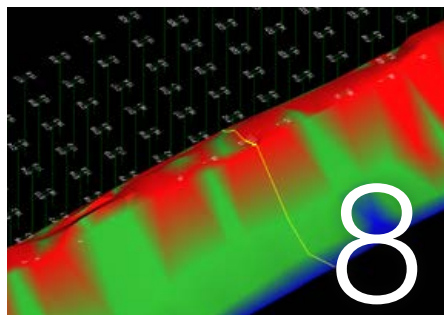
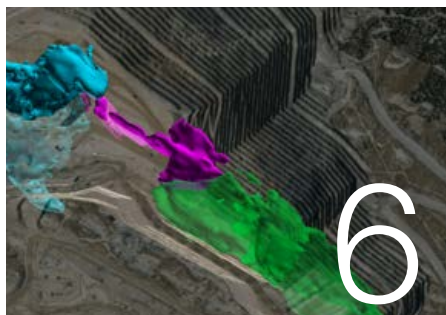
Global staff and resellers gathered in Adelaide, South Australia in early February to prepare for the launch of the latest Maptek spatial imaging systems.

Third generation laser scanners - the I-Site XR3 and LR3 - were previewed alongside the impressive Sentry DMS (Deployable Monitoring System).

The new I-Site XR3 and LR3 laser scanners are smaller, lighter and faster, and feature the same streamlined workflow to increase survey productivity.

The I-Site XR3 achieves the longest range at 2400m with its sister model at 1200m. A unit targeting underground applications will be released mid 2017.

A field trip to an Adelaide Hills copper mine allowed visitors to see Sentry in action. The system has been actively monitoring operations here from the prototype stage in 2014. This has been a particularly worthwhile proving ground for continual system enhancements.



This year will be an exciting one for Maptek as we continue to push the boundaries in innovation, helping mines to operate more productively, safely and sustainably.

The third generation of our 3D laser imaging systems has delivered on the promise of adding built-in value to spatial sensing technology. The new I-Site XR3 and LR3 units are smaller, lighter and faster with improved workflow for the accustomed high standard survey results.

At the same time we have developed a new Sentry deployable monitoring system. Drive to location, unpack and start monitoring in minutes. No targets or dangerous ground access required.

New releases of Vulcan, Evolution, Eureka, BlastLogic, PerfectDig and I-Site Studio are on schedule for delivery this year.

We look forward to the development of further smart systems that extract the most value from mine process data. This will enhance the technological preparedness of our customers.

We hope you enjoy this issue and welcome feedback at [forge@maptek.com](mailto:forge@maptek.com)

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New I-Site laser scanners unveiled



# New I-Site laser scanners

Maptek™ I-Site™ systems are well known for ease of use, accurate results and efficient field to finish processing. New features abound on the latest models.

The Maptek™ I-Site™ XR3 laser scanner is an extra long range survey system combining fast accurate sensing, high resolution digital imagery and powerful modelling software for improving overall productivity and site safety.

The I-Site XR3 is 30% smaller and 25% lighter, with 2.5 times faster data acquisition than the earlier I-Site 8800 series. The scanner has a maximum range of 2400m. The system is protected to IP65 for reliable operation in rugged environments.

The system includes a new, improved high dynamic range panoramic camera for better digital imagery. This produces high resolution images for geotechnical analysis and visualisation. Snapshot imagery is a new feature.

The new I-Site XR3 laser scanner possesses the hallmark automated mine survey workflow favoured by surveyors, geotechnical engineers, geologists and mining engineers. Integrated software and hardware provide the optimal workflow.

Hardware and software have been developed concurrently, so the latest technology keeps step with advanced applications. Specialised geotechnical analysis is available through an optional I-Site Studio geotechnical module.

Streamlined setup and scan preparation makes the entire process faster. Geotechnical engineers and geologists require less time in the field collecting data to undertake geological mapping and geotechnical analysis.

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Maptek I-Site laser scanning solutions are developed by people who understand survey needs.

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I-Site laser scanners can be set up on a tripod or mounted on a vehicle for stop-go or continuous survey. The I-Site XR3 laser scanner is ideal for surface monitoring and design conformance.

The system is compatible with I-Site Drive, Maptek Sentry and Maptek PerfectDig.

**SMALLER  
LIGHTER  
FASTER**



I-Site XR3

I-Site 8820





I-Site scanners provide the fastest field to finish performance. Acquired scans can be reviewed in the field, so there is no need to repeat work to fill in gaps. Surface, point and global scan registration ensure accurate results. Multiple scans can be queued for maximum field efficiency.

Another new scanner has been developed at the same time as the I-Site XR3. The I-Site LR3 laser scanner has the same new features. The scanning range of 1200m makes it the system of choice for survey of small to medium pits and quarries, as well as indoor stockpile volumetrics.

Dedicated software also generates accurate survey deliverables for civil, forensic, architectural and infrastructure applications.

Modular design in both units allows sites to order a configuration to suit their particular application.

Email [isite.sales@maptek.com.au](mailto:isite.sales@maptek.com.au)

## Applications

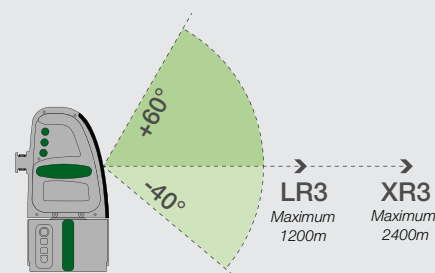
- > Large and medium open pit survey
- > Topographic survey
- > Stockpile volumetrics
- > Monitoring and rockfall analysis
- > Design conformance
- > Pre/post blast analysis
- > Geological mapping
- > Geotechnical/kinematic analysis
- > Erosion and deformation studies
- > Civil engineering survey
- > Architecture/facade mapping
- > Agricultural and erosion studies

## New features

- > 25% improved range
- > 25% lighter
- > 30% smaller
- > I-Site XR3 maximum range 2400m
- > I-Site LR3 maximum range 1200m
- > 200kHz, 100kHz and 50kHz acquisition rates
- > High dynamic range panoramic camera
- > Snapshot imagery
- > Selectable multi-point returns

## Hallmark features

- > Range accuracy of 5mm
- > Repeatability of 4mm
- > IP65 protected for tough conditions
- > Automated, streamlined survey registration
- > Ergonomic industrial design
- > Integrated standard controls
- > Flexible system configuration
- > Quality certified under ISO 9022



# New Sentry deployable monitoring system

Maptek™ Sentry supports constant surface monitoring required by geotechnical teams and mine management for managing risk.



Maptek™ has unveiled the Sentry DMS (Deployable Monitoring System) alongside the third generation Maptek™ I-Site™ laser scanners.

Sentry was first released in November 2014 in response to industry demand for a cost effective, flexible system to detect movement. Taking advantage of I-Site spatial imaging technology, Sentry provided an ideal solution.



Sentry has now been re-launched as a fully transportable monitoring system. Deployed in a custom trailer, the system offers a power and communications module, cellular and wifi networking, a dedicated, stable bollard for an I-Site laser scanner and proven Sentry software.

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The operator can unpack the system and start monitoring in 15 minutes!

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Sentry helps site personnel monitor and report on movements caused by surface instability that have the potential to interrupt operations. Examples are mining and civil engineering projects, including road cuttings, land slips, dam walls and tunnel openings.

Sentry monitors multiple areas within a scene without the need for targets or reference points. Movement can be detected down to 1mm per hour. While radar systems can monitor even smaller movements, they have limitations when there are large movements.

Sentry is most cost effective when used to scan and monitor several zones concurrently. Visualisation and analysis tools can be readily deployed for monitoring on a broader scale before using radar assets if required.

Timelapse capability allows users to see changes and use this information to predict movement in other areas. Heatmaps coloured by displacement or velocity provide an overview of surface movement.

Alert levels and rules are easily defined, allowing critical information to be sent direct to geotechnical staff or mine managers so they can decide on action to be taken.

The laser scanner can be moved for other tasks, and monitoring history is maintained when the unit is returned to the same monitoring position.

Combining 3D photographs with true 3D measurement, Sentry provides operations with an accurate, reliable monitoring tool. A key advantage is the generation of 3D surfaces which can be animated to show morphology of terrain changes over time.

*Email [solutions@maptek.com](mailto:solutions@maptek.com)*



*The Sentry transportable monitoring system can be ordered in various configurations to suit site requirements.*



# MinLog information management

A South African colliery has partnered with MinLog in a strategic drive to improve information management for guiding operational decisions.

The colliery sends its entire yield of underground coal to the nearby power station. Since 2008, it has partnered with MinLog in a strategic drive to improve information management. A predominantly manual data capture system was limited in application and not aligned with best practice. Implementing MineSuite has brought structure and improved understanding of what data is available, and how and when measurements are recorded.

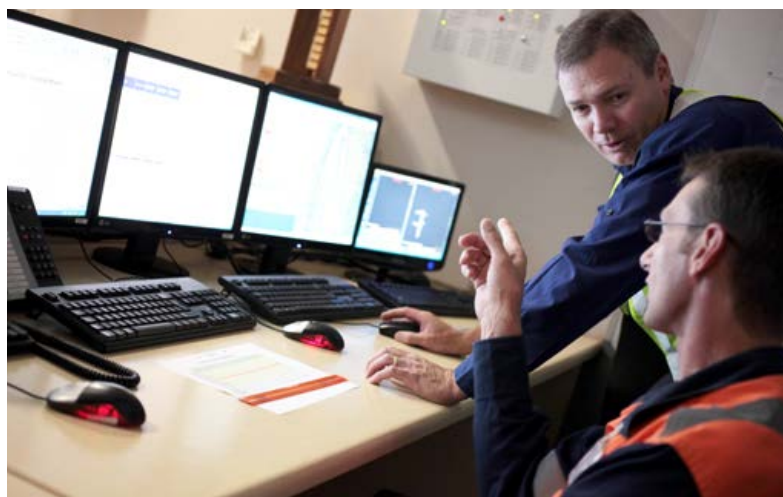
A strong partnership with the operation has allowed MinLog to develop a deep understanding of current and future requirements.

The initial requirement was to capture and formalise production and engineering data for continuous miners, section conveyors, feeder breakers, trunk conveyors and surface conveyors. Production and engineering measuring points included production volume and material movement, as well as time accounting and process performance from the continuous miners and conveyors.

MineSuite also provided Surface Control Room operators with tools to capture and adjust planned and unplanned equipment stoppages.

As confidence in MinLog and MineSuite increased, additional data was brought into the system. This included data from the underground diesel fleet, comprising auxiliary equipment such as tractors, graders and LDVs. Central Control Room operators manually entered unplanned stoppages and equipment downtime into MineSuite.

The new approach made it possible to replace legacy spreadsheet monthly maintenance reports.



For the first time, daily, weekly, monthly reports were automated and available at the appropriate time for efficient decision making.

The system also handles the need to issue work permits and work permissions, and capture environmental health and safety data. This includes underground conditions, road surface conditions and lighting and ventilation in some sections. MinLog customised MineSuite to address this.

A need for a structured data management environment was met with a range of MineSuite reports aligning key performance indicators for supervisors, middle management and senior management to streamline operational decision making.

The structured data management environment and confidence in MineSuite reporting led to a request for a data analysis environment. This data cube now enables identification of trends that may require further investigation, and opportunities for improvement.

In 2016, in the final stages of establishing an open pit, expanding the MineSuite offering was a natural progression. MinLog proceeded

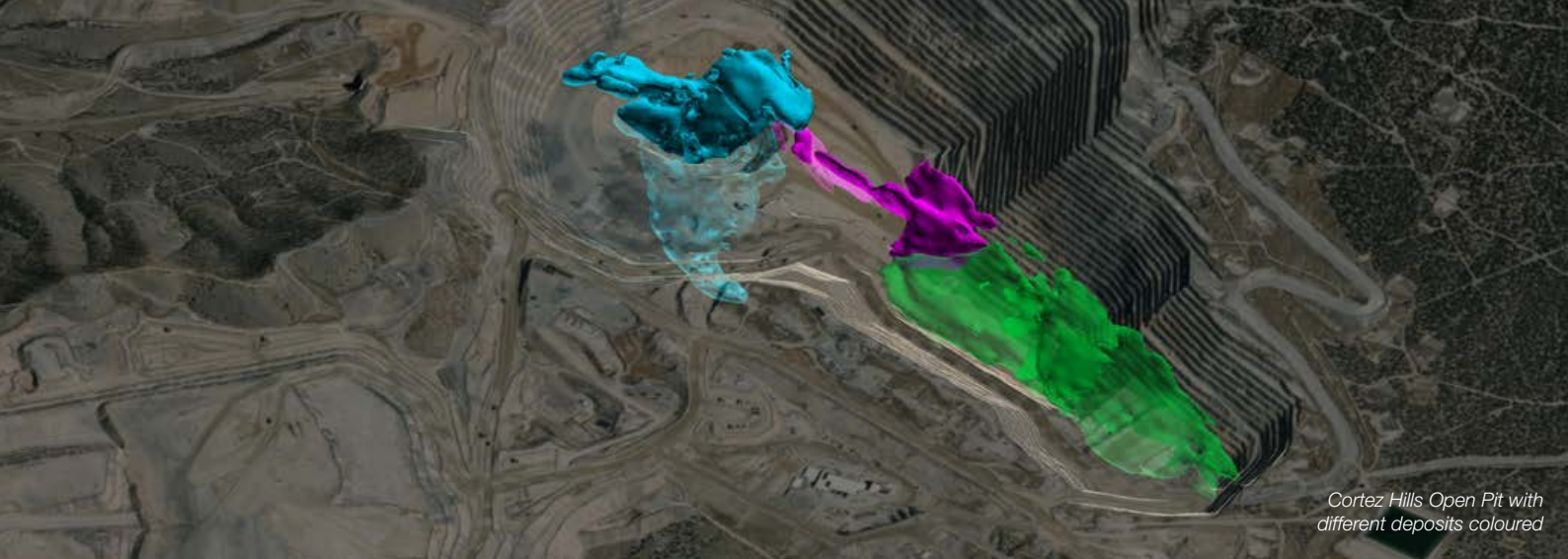
to scope, design, configure and implement the additional requirement with a dedicated set of Management Information Reports.

Recently, the colliery became the first beta site in southern Africa for the latest MinLog MineSuite application server. In a radical departure from the traditional 'data warehousing' approach, the application server provides a platform that will service the site from a big data perspective for the decade ahead.

It provides for a service bus messaging layer, full tractability on the sequence, timing and versioning of events, lossless data retention in a data lake, replaying of all events and seamless routing of information between internal and external applications.

The colliery uses MineSuite as the only reliable data source offering one version of the truth, streamlining decision making and reducing effort.

*Thanks to MinLog*



Cortez Hills Open Pit with different deposits coloured

# Grade control in open pit gold mine

Maptek™ Vulcan™ is used for grade control in a bulk mineable Carlin-type gold system at Cortez Hills Mine in Nevada.

Located on the Battle Mountain-Eureka Trend, the Cortez Hills Mine (operated by Barrick Gold) is a uniquely mineralised Carlin-type deposit. Carlin-type deposits are sediment hosted, disseminated gold systems associated with arsenic and thallium. Typically, these structurally complex deposits are located along range-front faults and are silicified; alteration at Cortez is decalcification.

Cortez Hills has several related, but geometrically distinct orebodies being mined via both open pit and underground operations. Within the open pit operation, there are three distinct areas of mineralisation in one pit; continuous mining occurs across the deposit boundaries. Each deposit has its own structural orientation (attitude) and thus requires specific estimation parameters for ore routing.

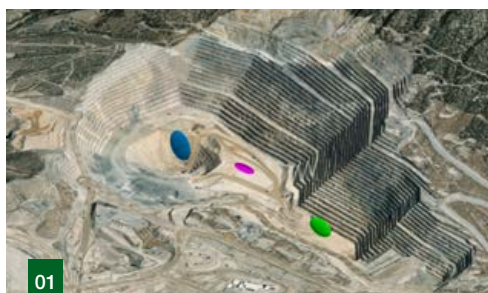
The loaded blastholes are colour coded into pre-designated bins based on grade and other criteria. The blasthole grades are then estimated into a block model which ultimately helps determine final block outs for mining.

Cortez Hills Open Pit contains three deposits in one pit, each with a unique search orientation. Blasthole samples falling within a specific region are flagged by the ore reserve model and then estimated along the pre-defined attitude for that region. These models allow for geologically precise ore cuts used for routing material into grade bins.

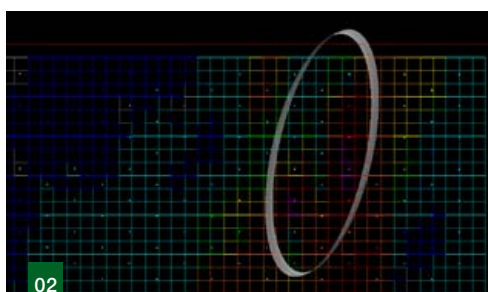
The ability to use multiple structural orientations in a single pit to determine grade delineation is vital to limiting dilution and maximising ore potential.

Mine to mill reconciliations have improved since the implementation of distinct regions. Cortez Hills is looking forward to continuing to improve reconciliations with the upcoming grade control optimiser currently being developed by Maptek.

Thanks to  
Jennifer Baar, Senior Ore Control Geologist  
Patrick Ruffridge, Resource Geologist  
Cortez Hills Open Pit



01



02

01 Ellipsoids represent search orientations for each deposit

02 Plan view of grade control model where each dot represents a drillhole and each block represents destination based on search orientation

Cortez is a historic silver mining district dating back to the 1860s. Gold mining in the district began in the 1960s on a small scale and in the 1990s moved into large scale, bulk gold mining with Placer Dome. Barrick acquired Cortez in 2006.

Since around 2009 Cortez Hills has used Maptek™ Vulcan™ for daily grade control processes. In 2016 the Ore Control group upgraded from Vulcan 9 to Vulcan 10 and began seeing immediate results in block outs.

Cortez Hills Open Pit engineers and geologists import blasthole samples from the acQuire database interface into Vulcan by blast pattern name. Each pattern has a unique ID and contains around 75-120 off-set drillholes. Once imported, blastholes are compared to a preset grade control classification using a grade control scheme file.



# Eureka data interoperability

Users will greatly benefit from product integration and new functionality in the release of Maptek™ Eureka™ 3.

Maptek™ Eureka™ provides a unique platform for analysing spatially located data. Viewing the data at different scales allows users to see the big picture as well as complex details in areas of interest. Inter-connecting relationships can be made between disparate information.

Eureka 3 adopts the latest database technology and ships with new dynamic smart CAD tools, geodesy and visualisation capabilities, as well as line style enhancements and improved geotechnical features.

Performance optimisation features such as level of detail rendering get more out of hardware by only showing what you need to see - when you need to see it.

New Action Plane definition and viewing tools are standard, giving unparalleled control over the working space within complex 3D datasets for CAD and sectioning options.

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Data interoperability between Eureka and other Maptek products such as I-Site Studio has been greatly enhanced.

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## Enhancements

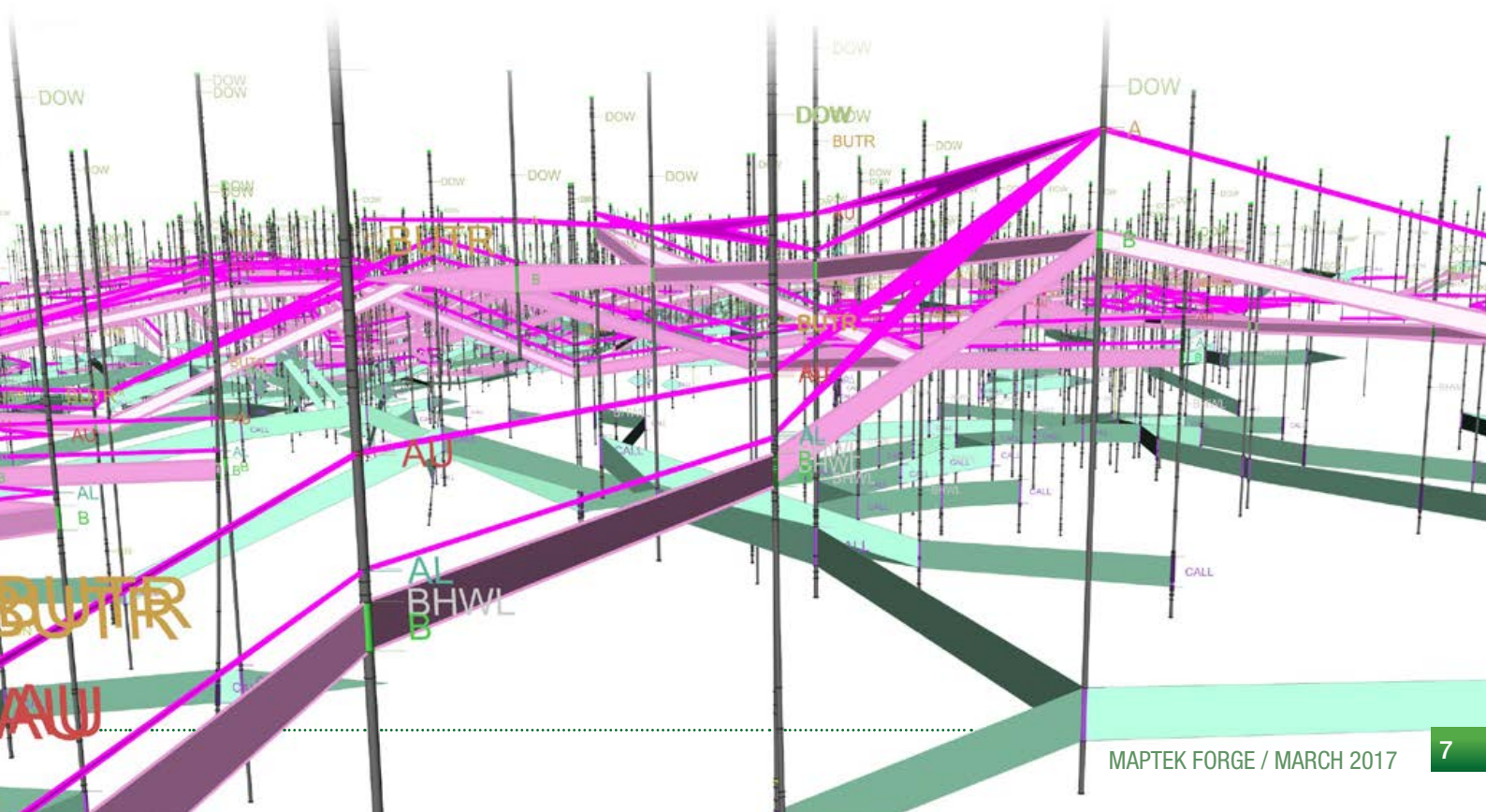
Enhancements include greatly improved drillhole database performance and the ability to use multiple drilling databases simultaneously for viewing, correlation and modelling.

Data validation is improved, with the ability to set defaults, field limits and null values on input drilling data. The Lithology Targeting option has benefited from user feedback. Several functionality upgrades now allow quicker selection of modelling targets.

Attributes associated with CAD entities or surface models can now be imported from packages such as Maptek™ Vulcan™ or created within Eureka. Tools are provided to search, filter and highlight objects for more detailed analysis based on available attributes.

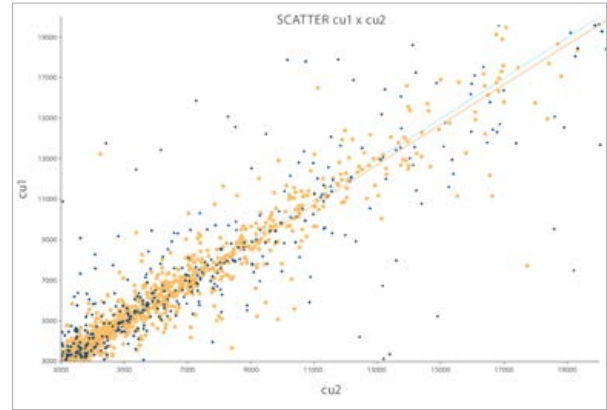
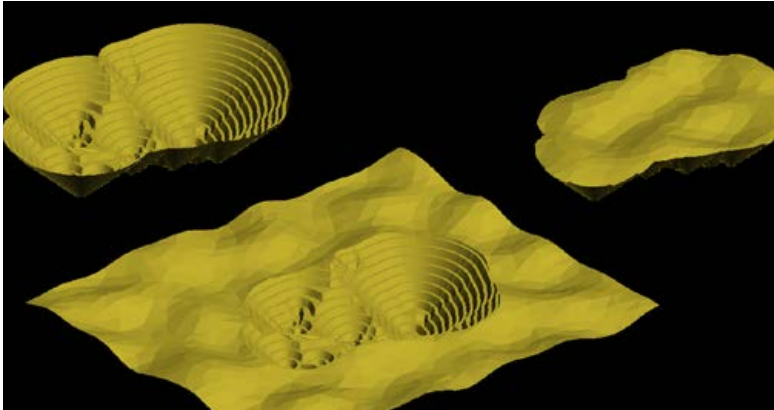
New coordinate system options further enhance Eureka's power to efficiently bring all disparate data types into a common coordinate system.

The latest Eureka functionality provides new tools and enhances user experience, substantiating the claims of a compact package with huge capabilities!



# Vulcan 10.1 preview

Maptek™ Vulcan™ 10.1, set for release next quarter, includes features to streamline mine design and planning, optimise drill & blast and improve reporting and analysis.



## Automated pit design

Automated Pit Designer facilitates high level, long term mine planning analysis and integrates with other pit design options. Updated workflow makes it easier to use, with flexibility for further engineering studies.

Major enhancements in Maptek™ Vulcan™ 10.1 see additional output triangulations, reserves run directly from the panel, and an external executable.

Additional triangulation modes remove the manual Boolean step of topography and pit design triangulations. Visualisation and analysis is improved.

New live reserving functionality allows faster iteration when evaluating different parameters. Change a design parameter and updated tonnage and contained metal can be calculated in a single click.

The new executable facilitates scripting and sensitivity analysis, allowing more elaborate engineering studies on the impact of different design considerations.

Instead of only a few manual pit designs, hundreds of different pits can be generated for hundreds of different parameter sets.

## Vulcan data analysis

The first step in solving a problem is understanding the data. Good statistical analysis allows mine planners and engineers to make informed decisions about the holistic mine planning process.

In Vulcan 10.1 the Vulcan Data Analyser receives a major set of new functionality. General statistics, histogram, cumulative frequency, scatter, P-P and Q-Q charts are now available with a single click.

Users can display statistics superimposed on graphical representations. Support for block models allows analysis of mine planning data. The new caching system makes analysing data sets with different charts almost instantaneous.

Users can find outliers, compare distributions and perform other tasks by simply picking the data and the analysis to perform.

## Drill & blast

Open cut drill & blast upgrades in Vulcan 10.1 enhance manual drill design and significantly reduce the time to create or update a design.

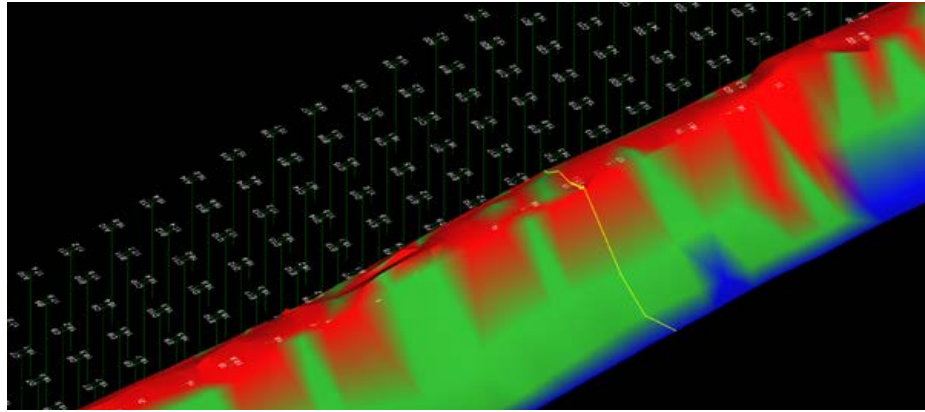
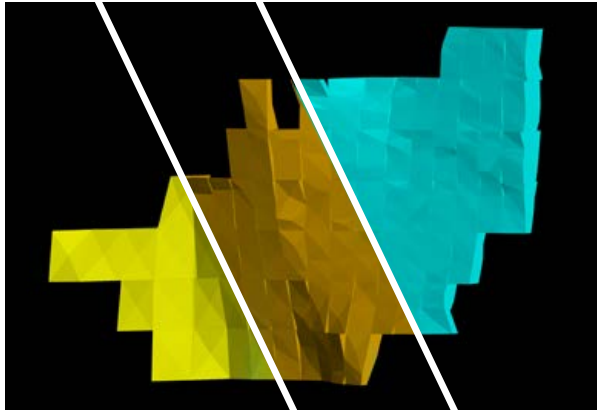
Several new options have been added to the drill & blast menu. Create Holes to Free Face creates rows which merge from a straight back row to fit a curved free face.

Merge Blasts allows for sequential row/echelon joining and continuous naming when combining separate blasts.

Minimum Burden Adjustment enables minimum burden checks, calculations and adjustments. This new tool colours triangulations to reflect face burden based on user-defined parameters to easily identify areas where minimum face burden has not been met.

Viewing options for triangulations and blast rows have been updated, as have tools for selecting and adjusting holes. Vulcan 10.1 also includes new graph options for profiles and minimum burdens.





## Stope Optimiser

The third Stope Optimiser version, available in Vulcan 10.1, gives greater flexibility and control in defining stope shapes. New features help to create more accurate and closer to desired final stope shapes for mine planning and scheduling.

The resultant shape can now be defined by 6 or 8 points on section. Users can specify true dip and width, work better with narrow ore regions, handle variable dilution and use the prism method for defining stope shapes.

Simulation data can now be incorporated in the optimisation using risk options.

Faster optimisation, greater control over stope output and the ability to handle irregular stope shapes are highlights.

## Attributes

Attributes on data are important for passing critical information downstream. Changes in Vulcan 10.1 make it easier for users to create, assign and view attributes.

Attributes produced during the reserving process and assigned to design data and triangulations can be automatically made available to the scheduler. Users can now visualise the attributes of a group of triangulations and apply bulk changes within Vulcan.

Changes to Templated Attributes give more control over which attributes users are updating, how they view those attributes, and more guidance when creating expression type attributes.

## CAD polygon tools

Fast, robust and flexible CAD tools for handling polygons are extremely important for mine design and planning. Users will appreciate the improved performance and results in day to day drafting work.

Vulcan 10.1 includes new options for manipulating polygons, as well as overall improvements.

Improved speed and accuracy mean that many edge cases previously ignored are now correctly handled. Live preview allows users to 'select' data up front, and preview the results while changing parameters.

## Drafting sheet enhancements

The ability to quickly create and modify custom drafting sheets will greatly improve plotting. Users can create better looking and more standardised plots regardless of the plotting method employed.

Vulcan 10.1 Drafting Sheet Editor allows users to add images to drafting sheets, set up user-defined page sizes and use new scale bars and additional north arrow styles.

Users can save and import title blocks between drafting sheets and move and resize the title blocks and all associated data.

More new functionality will be covered in the June issue. Vulcan 10.1 is set for release next quarter.

# Understanding shear zones

Maptek™ I-Site™ laser scanning was conducted to extract detailed geotechnical information on shear zones within a quarry in southeastern Victoria.

In 2016 AECOM contracted Maptek™ to undertake laser scanning of a Holcim (Australia) Pty Ltd quarry in Victoria for a geotechnical study. Holcim operates several hard rock, sand and gravel quarries in Australia to extract materials for the manufacture of construction materials.

The task was to scan the entire quarry and extract detailed geotechnical information such as geological features and discontinuities for kinematic analysis.

The Maptek™ I-Site™ 8820 laser scanner was set up on a tripod. As the data was registered using the on-board GPS, each setup involved collecting a 360° lower resolution scan and a defined window at a far higher resolution.

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A total of 34 scans in four hours acquired 53 million 3D spatially accurate points.

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The higher resolution data provides the detail for geotechnical extraction, with 87mm point spacing at 100m.

## Geotechnical analysis

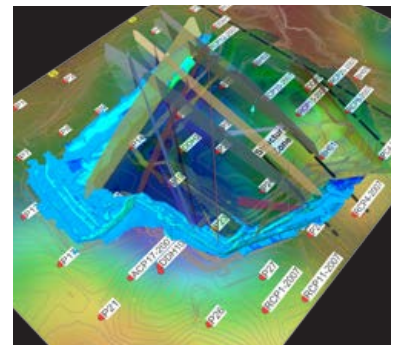
Before extracting any discontinuities the major visible shear zones were mapped. I-Site Studio software allows the user to extend discontinuities to visualise intersections across a pit or quarry.

The image right shows these shears and how they line up in comparison to a magnetic survey. I-Site Studio easily renders the magnetic survey image over the laser scan data for interpretation of mapped shears compared to magnetic anomalies.

Shear zones can be easily identified in the scan data and digitised in 3D to define the extents.

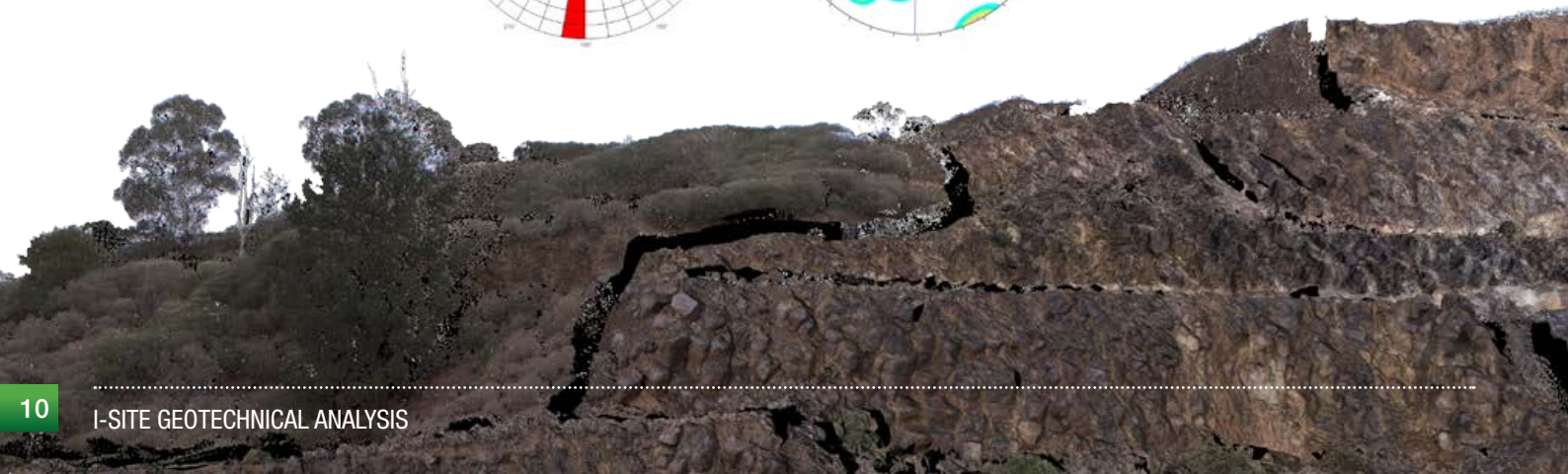
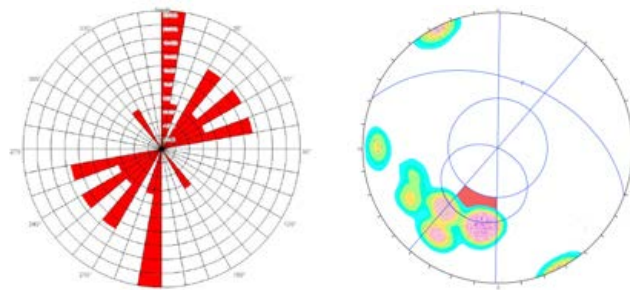
The software automatically extracts common discontinuity sets from the scan data, which can be plotted onto a stereonet for kinematic analysis.

While the stereonet plot provides better understanding of the shears, generating a rose diagram helps to understand their major persistence.



Expertise is needed to extract the discontinuities correctly, avoiding bias from the basalt columns. Once accurate data is extracted, it can be exported as Maptek™ Vulcan™ surfaces or images in ired format. Geotechnical information can be exported in Vulcan-compatible formats for further analysis.

*Thanks to  
Chris Huddy, AECOM*





# Measuring mud flow

Maptek™ I-Site™ provided a solution for measuring mud movement over time in a physically unstable area of Indonesia.

The subdistrict of Porong, Sidoarjo in East Java is considered to have the biggest mud volcano in the world. An incident in 2006 highlighted the dangers.

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Mud flows have the potential to become a natural disaster.

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Land stability in the mud flow area is unpredictable, and it is dangerous for surveyors to set up instruments and to walk around.

When the tripod is set up on dry land there is no guarantee that it will stay stable and level as the land could suddenly sink. A similar risk faces surveyors walking around on the dry mud. The mud flow area is quite extensive and relatively flat.

Currently a reinforced earth dam contains the area, covering around 2km x 2.6km. Movement was previously measured by GNSS and Total Station. This approach provided too little data sampling, and therefore did not adequately represent movement over time.

The Maptek™ I-Site™ approach provides comparable data over time with high accuracy and greater density.

Several factors influence the overall contour of the continuous mud flow, characterised by unpredictable timing and volume.

Periods of heavy rain at certain times exacerbate the flow. Water from below the flow, or from rain above, could take any path. Predicting drainage patterns is not possible.

## I-Site solution

Since 2016 the I-Site 8820 laser scanner has been used to successfully scan the mud flow area every four months.

Some survey points already existed around the location. The I-Site 8820 laser scanner was set up on a tripod, with coordinate location derived by GNSS.

The vehicle mounted stop-go method is also used to collect survey data. The elevated position provides greater coverage of the scene.

Electromagnetic anomalies led to unexpected challenges during scanning. Since GPS/compass was unreliable, all registration was conducted within I-Site Studio to correct for anomalies and provide accurate data.

Conducting surveys with I-Site Drive would provide another boost in survey productivity.

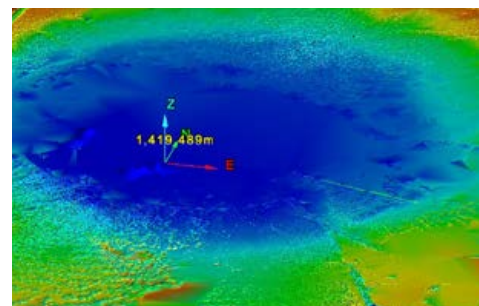
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Mounting the I-Site laser scanner on top of the vehicle reduces the safety risk to operators.

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The I-Site 8820 makes a huge difference to the survey process, especially in terms of time. It is more efficient for collecting data and is much safer for the surveyor. The laser scanning approach also ensures proper data coverage of the entire area.

*Thanks to  
Bapel-BPLS, PT ASABA*



# University partnerships

Students from universities across Australia used Maptek™ Vulcan™ software to learn about 3D orebody modelling for exploration projects.



*Dr Gavin Springbett instructing NExUS students in 3D orebody modelling using Vulcan*

The NExUS Program involved a three week intensive mineral exploration summer school at the University of Adelaide and was funded by the Minerals Council of Australia.

The program exposed third year undergraduates, honours students and recent graduates to the opportunities and challenges facing exploration as search areas move increasingly under cover.

Participants were selected from every state and territory of Australia with 13 different universities being represented.

The 3D orebody modelling component of NExUS was held in week three following the intensive presentations, workshops and field practicals into issues relevant to undercover exploration.

The NExUS program thus facilitated full circle exposure of course participants from conceptual exploration through to orebody modelling and resource/reserve evaluation.

NExUS students were provided with Maptek™ Vulcan™ 10 and instructed by Dr Gavin Springbett of G&S Resources.

The one day modelling program in December covered geological databases, data appraisal and validation, database compositing, orebody boundary definition (implicit and explicit), geostatistics, surface and block modelling, grade estimation, model visualisation/ validation and resource/reserve estimation.

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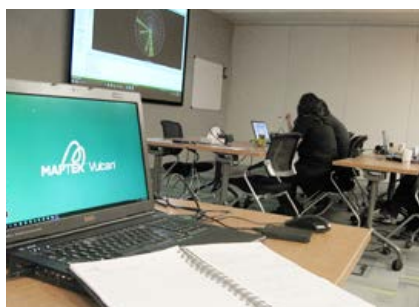
The practical session provided participants with a valuable understanding of the modelling process, the stages involved and tools available.

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Another NExUS program is planned for late 2017. Maptek has a long association with the final year mining engineering design project at the University of Adelaide, and is pleased to support courses such as NExUS that contribute to the future of the mining industry.

*Thanks to  
NExUS National Exploration Undercover School  
and Dr Gavin Springbett, G&S Resources*





Maptek™ hosted educators from across North America's top colleges and technical universities in Denver.

A 'Train the Trainers' workshop in January was offered to university professors, researchers and teaching assistants to strengthen Maptek product skills and enhance their current curriculum.

Advanced training was also given in open pit and underground mine design, geostatistics, geotechnical and geology tools in Vulcan. Representatives from New Mexico Tech, Colorado School of Mines, Virginia Tech and University of Akron participated in the hands-on sessions, and a professor from University of Wisconsin - Eau Claire attended remotely.

The annual free course included Vulcan case studies and classroom examples to help professors develop a solid cross-disciplinary foundation that will shape the next generation of mining minds. A student-led learning approach followed the various Vulcan workflows and practical case studies.

The workshop has provided me with a skill set that has opened up new opportunities for my thesis. I'm excited to test the capability of your laser scanning instruments.

*Hunter Campbell, Research/Teaching Assistant, University of Akron - Ohio*

The new skills were applied during the one-on-one curriculum development and lesson writing sessions.

It is often challenging for universities to obtain real world data for use in course work. Maptek provided a variety of pre-approved data sets, lessons and case studies that can be implemented directly into their courses and senior projects, leveraging off the work done by Maptek technical staff over the last few decades.

This training and resulting work supports the Maptek academic partnerships program, alongside the Senior Design LinkedIn group. We aim to ensure that future mining professionals understand and can best apply the available technology, by providing a solid foundation of geological and mining concepts connected to real world challenges.

I was impressed by the quality of training and by the graphic capabilities of the latest Vulcan. I wish more academic professionals could take advantage of this opportunity.

*Dr Sekhar Bhattacharyya, Professor of Mining Engineering, New Mexico Tech*

## Maptek Calendar

### 2017

#### March 6-31

XVI Citation Program in Applied Geostatistics 2017  
Lima, Peru – Maptek Office

#### April 4-6

Discoveries 2017 Mining Conference  
Hermosillo, Sonora, Mexico – Booth 26

#### April 25-27

Mining World Russia  
Moscow, Russia

#### April 30-May 3

CIM Expo 2017  
Montréal, Quebec, Canada – Booth 1500

#### May 15-19

Exponor 2017  
Antofagasta, Chile  
USA Pavilion – Booth 413

#### May 22-24

AUSTMINE 2017  
Perth, Western Australia – Booth 16

#### July 24-26

Iron Ore 2017  
Perth, Western Australia

#### September 2-7

IAMG International Association for Mathematical Geosciences  
Perth, Western Australia

#### September 18-21

Exposibram 2017  
Belo Horizonte, Brazil

#### September 18-22

Perumin-Extemin  
Arequipa, Peru

#### September 20-22

Tenth International Geology Congress  
Hobart, Tasmania, Australia

#### October 17-19

XVIII Maptek Users Conference 2017  
Viña del Mar, Chile

#### October 25-28

XXXII Conferencia Internacional de Minería  
Guadalajara, Jalisco, Mexico – Booth 679

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