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Controlling vibration
Analysing slope failure
Preparing for scheduling
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Users meet in Peru

Maptek began operations in Peru in early 2000. The country has a sustainable growth rate which encourages companies to invest in new large-scale mining projects.

Maptek technology helps customers over the full range of mining activities, from exploration through to mine closure. Our products have attained a substantial position in Peruvian mining, with Vulcan and I-Site holding the greater share of the market.

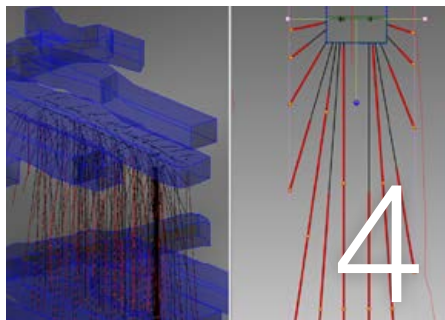
Maptek Vicepresident South America, Marcelo Arancibia, commented on the recent users workshop held in Lima.

'We organise these events for our users to network. And they are keen to learn more about our current and future technology developments.'

'We are proud of our after-sales service, with expert support 24 hours a day, 365 days a year. Our team works shifts corresponding to the mines, and response time averages no more than 15 minutes, even in complex cases. We use remote assistance to deliver solutions quickly.'

'We appreciate the presence of all our users who responded to our invitation. We commit to continuing to deliver the service they deserve. Thanks for trusting in Maptek.'





In this issue

If there's anything that is certain about mining, it's uncertainty. For this reason miners welcome a degree of certainty when it comes to investing in technology.

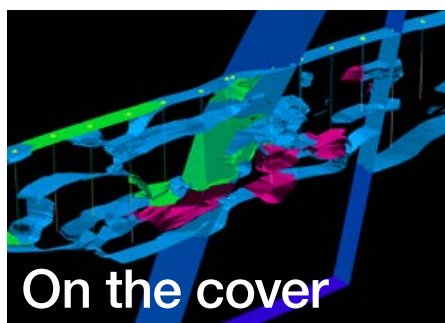
Trusting that your technology is reliable, like I-Site IP65 rated laser scanners and Sentry monitoring systems working 24/7. Trusting that if you aren't getting the results you expect, a Maptek expert is on hand to troubleshoot software routines and implement an effective approach. Trusting that if a solution does not exist Maptek will customise or develop tools that meet your needs.

The Maptek roadmap defines the direction of our technology. We look forward to sharing that journey with you.

We hope you enjoy this issue, and we welcome feedback at forge@maptek.com

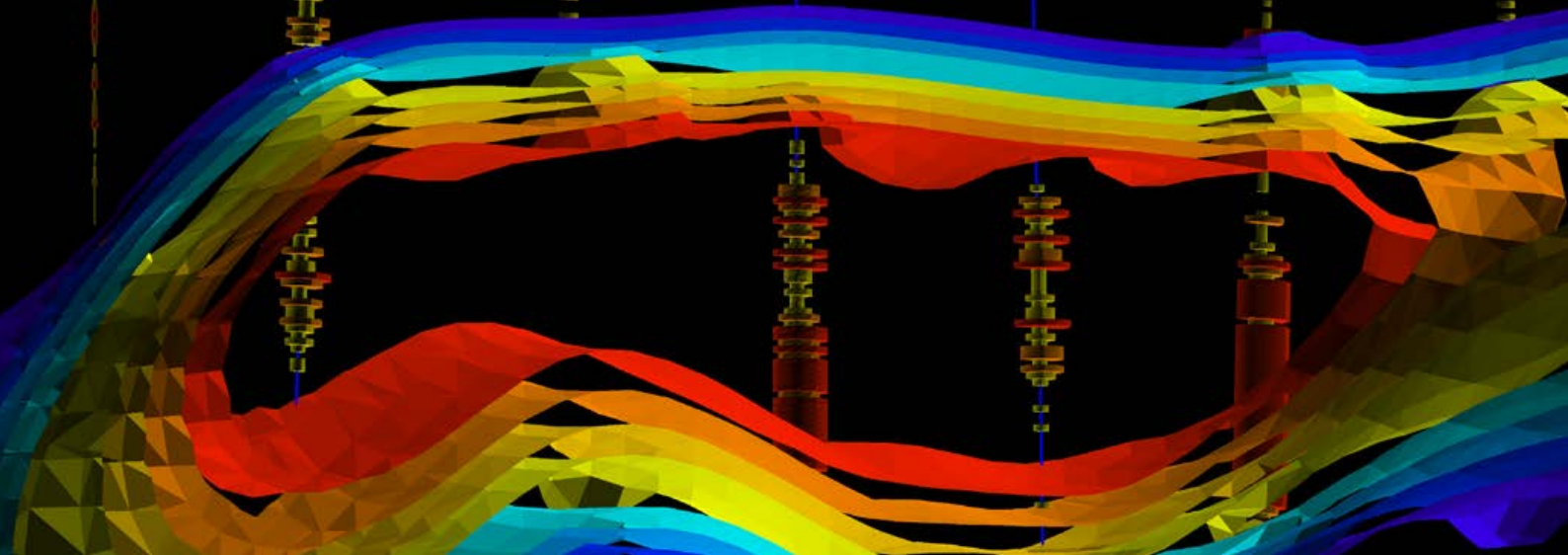
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On the cover

Vulcan implicit modelling gives ultimate control over your geological model.



Vulcan offers ultimate geological control

The latest Implicit Modelling tools in Maptek™ Vulcan™ provide even greater control over the geological modelling process to ensure robust, accurate results.

Maptek™ Vulcan geological modelling tools support geologists to interpret their project data by quickly providing working models which can be analysed and refined for final quality output.

Implicit Modelling has matured since introduction in Vulcan 9. Tools now handle complex metamorphic terrains with faulting, brecciation and veins.

The fully integrated implicit modelling process manages drilling database, compositing files, implicit models and variography in one program.

Geologists are actively engaged in the whole modelling process – controlling compositing intervals, treatment of missing data, smoothing options and influence over surrounding information. Various algorithms run the automatic processes.

Generation of models is fast, leaving time to analyse output before changing parameters.

It is useful to be able to change one parameter at a time to test for different sensitivities.

With the Vulcan block model as the base for modelling, multi-domain variables provide ultimate control. Bringing more data into the process improves the results.

Shared boundaries are always preserved, providing confidence with regards to overlap, double counting or missed holes.

Modelling runs in the background, leaving full access to Vulcan menus during calculations.

Fault blocking is new in Vulcan 10, allowing users to treat lithology or grade data within domains or faults differently, building up a composite model with accurate fault blocks. Users can set up a global control for all fault blocks, or treat each fault block separately.

Vulcan allows grade variables to be used in implicit modelling, bringing project assay and grade data into the process. Users simply define the cut-off and dimension parameters and run the model, then change the cut-off grade and generate new results for comparison.

The new RBF approach runs a different algorithm for different results; geologists can choose the best-fit interpretation for their data.

With kriging, variogram data from the new Vulcan Data Analyser can be used to interactively populate panels for implicit modelling. Vulcan variogram and trending data is easily brought into the geological interpolation process.

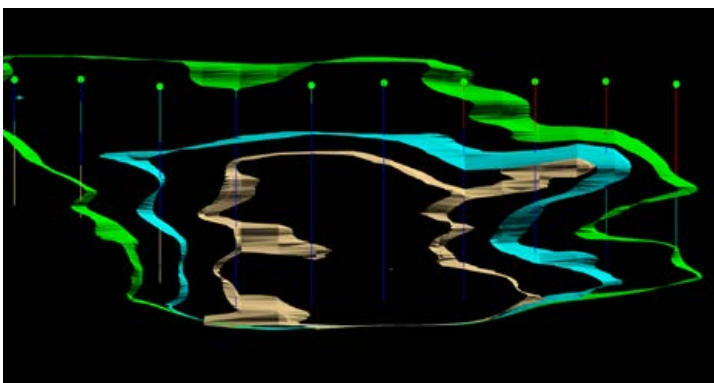
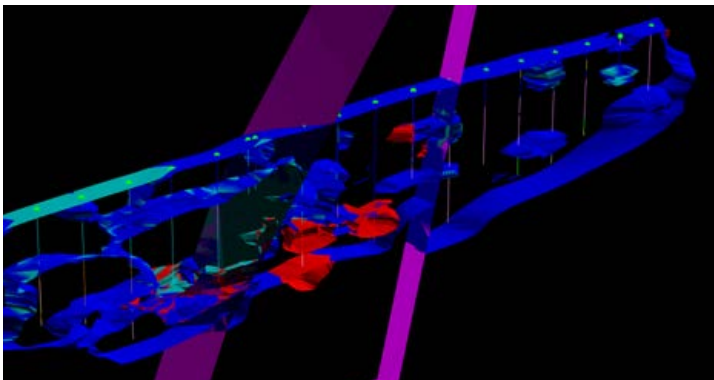
Specification files ensure that Vulcan implicit modelling is repeatable and auditable. Models are generated in less time than it would take to digitise a single section. A quick first run over the entire orebody can be a basis for further assessment. Multi-domain models are accurately generated with consistent shared boundaries.

Ongoing development includes finding better algorithms for improved processing speed and data smoothing. Combining and filtering multiple databases before starting the implicit modelling process is also on the roadmap.

Vulcan implicit modelling allows you to be a geologist, not just a spectator in the modelling process.

Geologists know that while their primary data does not change, interpretations can. Checking against the original data ensures the best results.

For more information on Vulcan 10 see www.maptek.com/vulcan10



Technology roadmap

When technology is changing fast, strategic agility matters. Add a volatile market and miners may be justified in feeling uncertain about the future. Being able to rely on technology partners offers a welcome degree of certainty.

Maptek has recently defined a new roadmap which sets the direction for our individual product capabilities. This complements plans for how the products will be used and how we will leverage technology to create an integrated, connected and flexible technical work environment for users.

Maptek will be able to deliver huge gains in productivity, accuracy and quality across the whole mine planning and execution space. Workflows and data integration will be enabled throughout geological modelling, design, planning, execution and production management and reporting.

Access to a wider selection of data, including third party, will ultimately enable Maptek solutions to be connected in a service bus approach to an event driven operational environment.

Our roadmap defines where we see opportunities to leverage technologies and how we intend to deliver these to our customers.

The Maptek roadmap also summarises the major development and research projects planned in all solution areas to ensure that all of our products remain at the forefront of capability for miners.

User efficiency and productivity will soar. Mines will gain a focal point for technical analysis and operational planning and execution. Multi-disciplinary workflows and product functionality will combine to work on one common data model. Connections across event horizons to execution stages and enterprise and resource planning levels will allow miners to manage operations holistically.

The single source of mining truth will finally be a reality, becoming a valuable and strategic component of integrated mine performance.

Peter Johnson
Managing Director

Blasting in vibration sensitive areas

Maptek™ BlastLogic™ allows engineers to optimise blast performance while solving blast vibration concerns.

Drill and blast engineers understand the challenge of staying within recommended vibration limits during a blast while optimising blast performance. This process is time consuming. In addition, errors are costly and can result in infrastructure damage, poor digging rates and delays.

This means that most sites adopt conservative figures when creating plans, by assuming a single MIC (maximum instantaneous charge) mass for every hole in the blast or by reducing blast size.

Maptek™ BlastLogic™ allows engineers to optimise blast performance while solving blast vibration concerns.

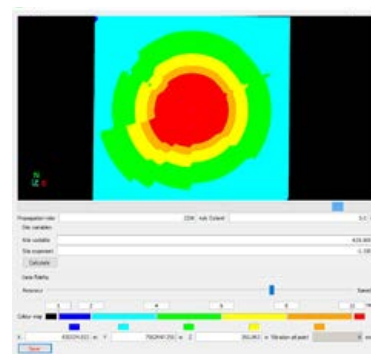
BlastLogic charge rules combine with timing and analytics tools to facilitate creation of design plans, allowing users to automate parts of the process, view resulting vibration levels and easily make adjustments.

Advanced charge deck placement options in BlastLogic allow users to automatically calculate each hole MIC, based on its location, from many vibration monitoring points and create charge plans.

Users can specify if decking is required, what product to use in the bottom or upper decks, length of stemming between decks, and create design charge plans in a few clicks.

The charge rule will determine the optimum number of decks required, even weighting the charges for better energy distribution. After dip data has been collected, dry hole explosive products are replaced with water resistant products when water is detected in a deck.

Once charge and timing plans have been created, engineers have a set of tools at their disposal to assess the overall blast performance and ensure that vibration estimates, calculated in PPV (peak particle velocity), are within limits using the vibration model.



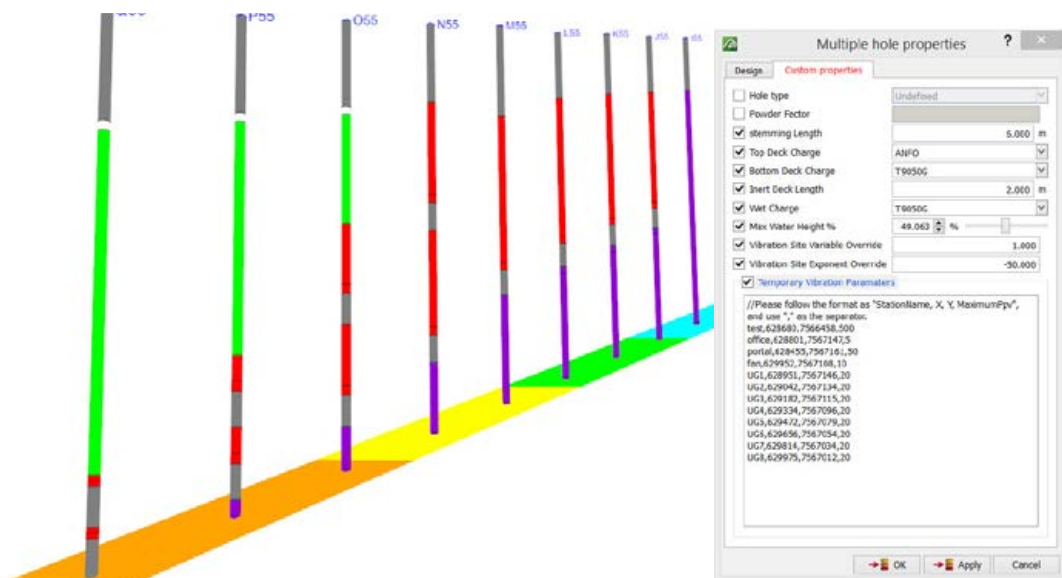
Another key tool is the timing envelope which allows engineers to view the number of detonations and total charge mass detonating within a specified timing window.

Adjustments can be easily made by varying one of the parameters, such as a connector in the tie-up or the charge placement for a few holes; the models will dynamically update to display the changes. This enables engineers to easily compare multiple scenarios.

With BlastLogic, initial charge plans are automatically updated on the field tablets once drilling data is available or as QA/QC data information is collated. Charge plans are therefore accurate and created on the latest available information.

Engineers can now push through updated designs at any time without interruption to workflow.

More information can be found at www.maptek.com/blastlogic



Enhancing underground drill and blast

Maptek™ offers Aegis advanced underground drill and blast design for rapidly modelling, analysing and comparing blasts to optimise performance.

Maptek™ continues to deliver advanced technology solutions across the mining value chain. The introduction of Aegis strengthens our underground drill and blast capability, enabling users to create patterns for an entire stope in seconds, even for complex narrow vein situations.

Traditional ring design applications require intensive engineering effort to generate a design, and are not optimised for comparing alternative scenarios. Given the production and operational pressures, it is common for designs to be created 'just in time'.

This makes it inherently difficult for engineers using the traditional approach to balance the various controllable and fixed factors that impact drill and blast to achieve the blast objective safely and efficiently.

Smart analytical tools and real-time costing allow for a results oriented approach to blast design.

Aegis provides a unique automated-interactive workflow that allows engineers to rapidly produce drill and blast designs complete with slot raises, charge placement, blast sequence, priming, timing and cost.

When the time comes to issue the layout for drilling, customisable plot templates with drag-drop viewports and report tables are automatically populated from the layout. IREDES export is also supported to upload the plan to compatible drill rigs and then download the actual drilling results back into Aegis.

Designs are archived together with all associated blast geometry to enable reconciliation of actual to plan. Users can quickly recall and review information to advance improvements in design and process for future blasts.

Aegis Analyser provides advanced tools for modelling blast energy and cavity break, as well as managing fragmentation. The ability to calibrate the analysis using actual blast results enables engineers to improve blast outcomes and reduce downstream handling costs.

Aegis is a very intuitive and powerful tool with a rich 3D design environment for engineers to design and assess drill and blast layouts for cost and outcome. It is ideal for underground metalliferous mines using longhole mining

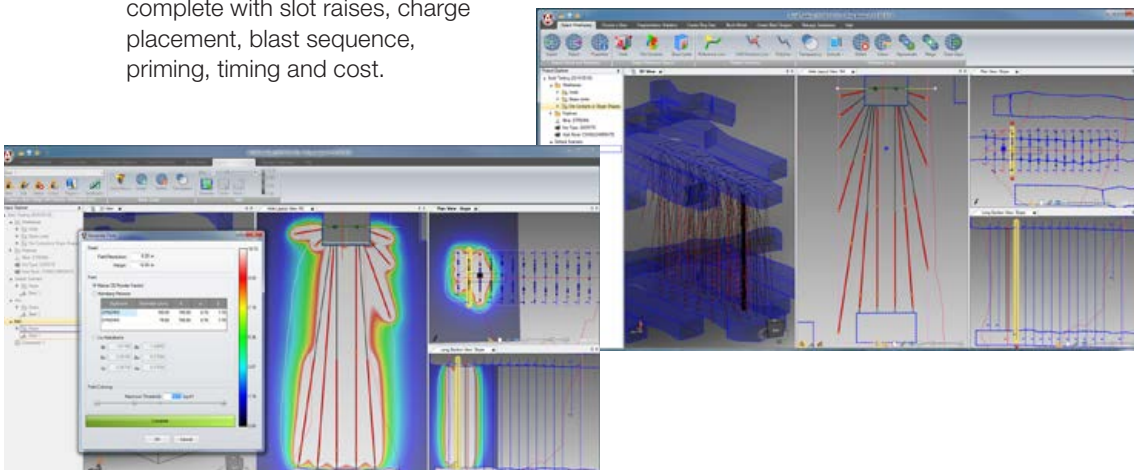
Benefits of Aegis

- > Accelerate and optimise blast designs
- > Rapid creation, iteration and comparison of multiple plans and ore grades
- > Intuitive plotting and reporting tools, IREDES data transfer
- > Early ROI by simultaneously reducing costs and increasing production
- > Track and analyse drill and blast performance

methods including sublevel stoping, block caving and panel caving. Contractors who perform longhole drilling services can quickly recover costs. New tools for drift advance and shaft sinking are currently under development.

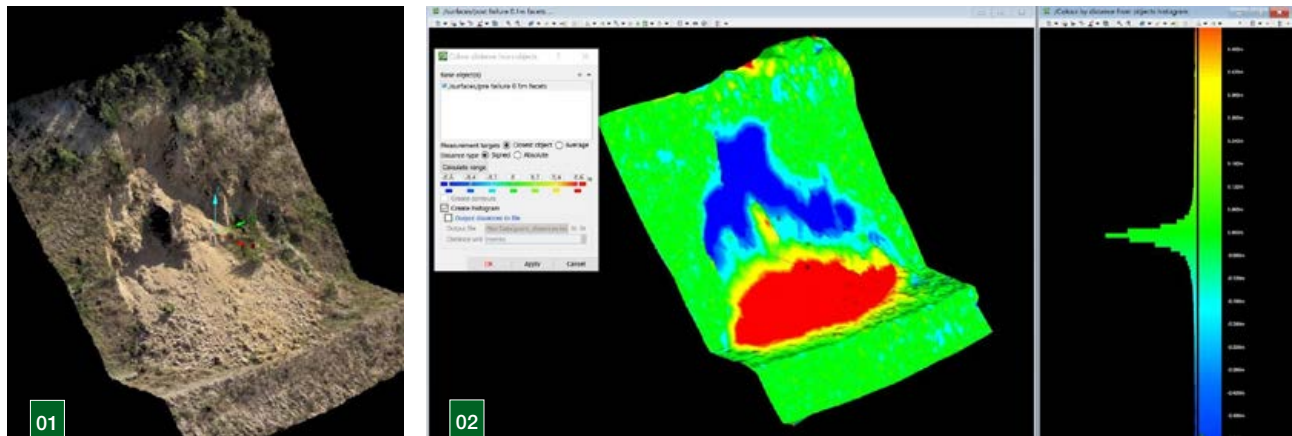
Maptek™ BlastLogic™ is used by surface mines for advanced design, modelling and management of drill and blast. Aegis supports the same applications underground and can be used with Maptek Vulcan, I-Site, Evolution and Eureka.

More information at www.maptek.com/partners/aegis/



Analysis of shallow slope failure

Maptek™ I-Site™ Studio software contributed to workflow for analysing slope failure in weathered rock in a quarry in New Zealand.



In May 2016, TAGA Engineering Software Ltd flew an unmanned aerial vehicle (UAV) over part of Winstone Aggregates' Belmont Quarry in the Lower Hutt province to record detailed photographs of localised bench failures.

The aim was to develop a workflow starting with drone photography and concluding with back analysis of the slope failure using their 3D slope analysis program, TSLOPE.

A subset of the large number of UAV images was processed using Pix4D software to generate an ortho-mosaic photograph. A cloud of 1,033,537 points with xyz and rgb values was also generated by Pix4D and loaded into TSLOPE for visualisation.

Slope failure

The quarry produces aggregate for the construction industry from a highly indurated quartzofeldspathic sandstone with interbedded siltstone, known locally as a greywacke. The rock in the upper levels is variably weathered.

The shallow slope failure occurred on an upper level bench slope, and measured about 14m high and 20m wide at the toe.

Slope failures are controlled by rock structure. Intersecting rock fractures form the failure surface exposed towards the top part of the slope face. The failure surface is then assumed to continue towards the toe of the slope, where it is covered by debris.

Surface modelling

TAGA needed models of the original topographic surface and the failure surface to back calculate insitu strengths that applied at the time of the failure.

Since TSLOPE cannot produce surfaces from point clouds, TAGA used the specialised Maptek™ I-Site™ Studio tools. The raw UAV data was loaded into I-Site Studio and viewed in 3D (Figure 1).

I-Site can distinguish vegetation and remove selected points from the scene. A user-defined panel

indicates a filter direction and a search size parameter to define the underlying ground.

I-Site was then used to construct the two surfaces needed for import into TSLOPE. First, the pre-failure topography was built by removing points involved with the slope failure and constructing a continuous surface across the remaining points.

Further data manipulation allowed modelling of the failure surface, with an assumption that the base of the shear surface intersected the toe of the slope. Figure 2 compares pre and post-slide topography.

From import of point cloud data to production of final modelled surfaces took about two minutes.

The original topography modelled using I-Site Studio was loaded into TSLOPE as the top surface, and the shear failure as the basal surface.

Greywacke material properties were entered, with unit weight (unsaturated) of 20 kN/m³, and Mohr Coulomb parameters – cohesion of 4 kPa and angle of friction of 30°. These estimated numbers reflect the low stresses acting on the failure surface. A three dimensional slope case was then defined, with an assumption that no groundwater pressures applied.

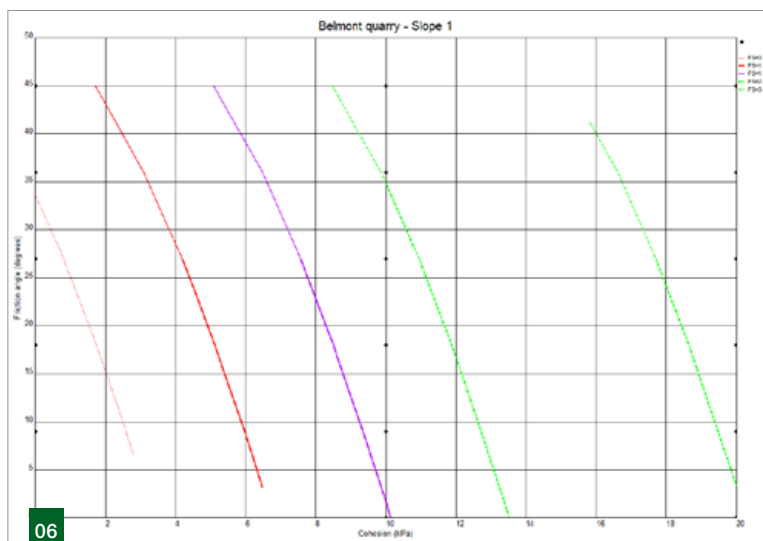
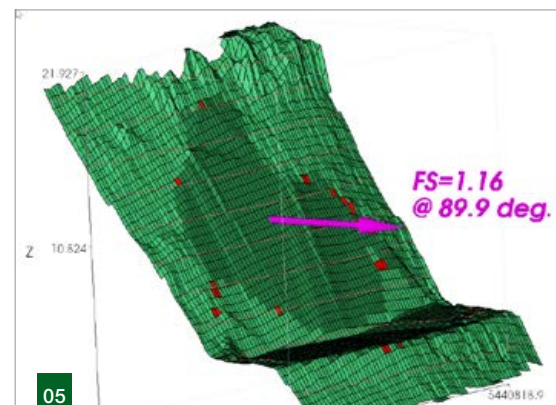
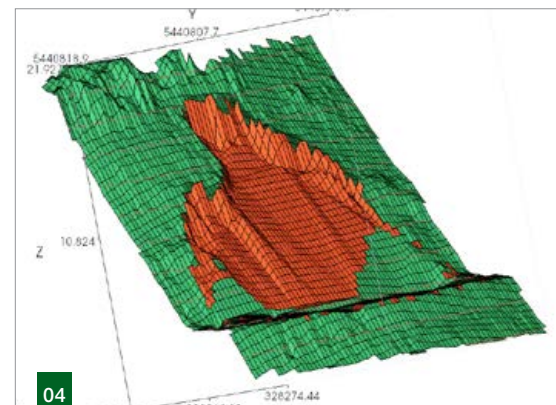
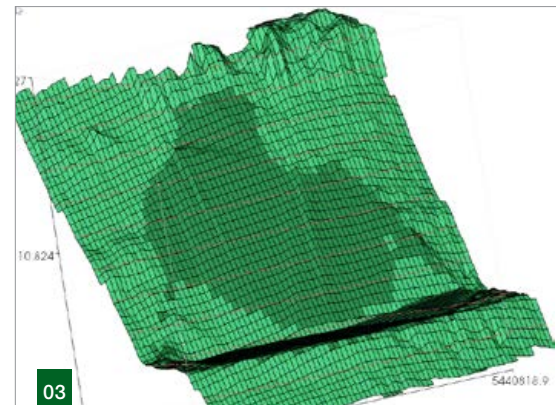
The slope case discretises the model into vertical columns overlying the basal surface, in this case 100 columns across the width (Figures 3 and 4). The darker colour shows the active columns involved in the slope stability calculations.

TSLOPE then provided a solution using Spencer's method, with a calculated factor of safety of 1.16 (Figure 5). This suggests that the strengths used in the model are a little higher than would have applied at the time of failure.

To understand the range of strengths that would apply at a factor of safety of 1.0, a back analysis of the slope failure was carried out using different combinations of Mohr Coulomb parameters. The cross plot in Figure 6 shows the range of strengths corresponding to different factors of safety.

To further understand shallow slope failures, similar systematic studies are recommended. By aggregating the cross plots, it will be possible to show the range of strengths that should apply to weathered greywacke at shallow depth below ground surface.

*Thanks to
Ian Brown, TAGA Engineering Software Ltd
Geoff Cooke, Belmont Quarry*



- 01 Raw cloud of points viewed in I-Site Studio
- 02 Comparison of pre and post-slide topography
- 03 Slope stability model showing arrangement of vertical columns
- 04 View from behind the slope model, showing the basal shear surface
- 05 Result of 3D analysis using Spencer's method
- 06 Cross plot of friction angle and cohesion with calculated factor of safety (red line represents FS = 1)

Pre-scheduling for Evolution

A new option in Maptek™ Vulcan™ 10 delivers an easy to use, auditable and repeatable workflow to prepare blocks for scheduling in Maptek™ Evolution.

Maptek™ Evolution uses a single block model to generate dynamic strategic to life of mine production schedules. It handles holistic scheduling across multiple pits, sites with automatic waste haulage route allocation and waste landform optimisation.

An intuitive new approach eliminates multiple processes for creating scheduling blocks and produces consistent validated tonnage and grade calculations. Possibilities for making mistakes are minimised.

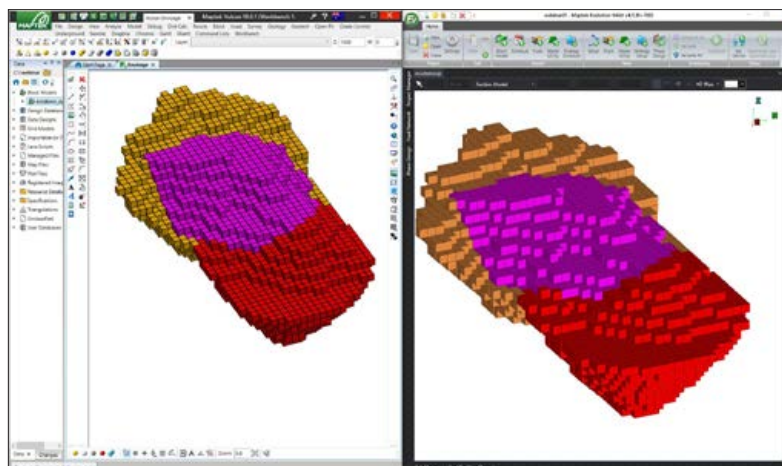
The base information for Evolution is either a Vulcan block model containing the mining stages flagged in each block or a .csv file. The stages are represented in the mine design as solids or surfaces.

The smart Vulcan 10 interface recognises the input data and turns on/off relevant parameters for data types. Saving the temporary block model variables with the proportion of each stage makes it easy to check the flagging process.

Flagging blocks by majority volume ensures a close match of ore tonnage against the solids. Users can select a break-even cut-off grade; for more complex scenarios this can be adjusted later in Evolution using any of the attributes in the block model.

One important feature of the new interface is the ability to perform some calculations on the fly. For instance, entering the variable cost at this stage is useful for the scheduling step in Evolution.

Users can calculate the incremental mining cost by inputting figures including reference bench, or choose an existing script for Vulcan to run the calculation.



A user-defined tab allows unique measurements and mining costs to be entered for each bench.

Importantly, the reporting option allows users to check tonnage and grade calculations for each pushback and by lithology, providing confidence in the data moving into the scheduling step.

Viewing the Vulcan block model dynamically verifies that blocks included in more than one pushback have been automatically assigned to the correct stage. This process is made even easier by writing a macro aided by the new integrated tshell editor. Using BTOEVO, an external program, plus the specification file runs the process in the tshell environment.

The block model is opened in Evolution simply by browsing to the file in an explorer window or reading a .csv file.

Users can perform some transformations on the fly. For example, if not all blocks are required for scheduling, those lacking a stage value can be filtered out. Variables that will not be used in scheduling can also be filtered.

Evolution reads the input block model, applies the filter and creates blocks in the Evolution block model.

Vulcan allows display of multiple values at the same time, and in Vulcan 10 a vast number of blocks can be viewed at once. The Workbench Property Editor allows users to interrogate different values and filter dynamically.

Running Evolution and Vulcan side by side in the Workbench allows drag and drop of a Vulcan triangulation (surface or solid), such as topography, into Evolution to see the blocks or stages in context.

Testing multiple customer datasets has verified the accuracy of calculations.

Users now have a streamlined repeatable process for adding stage information block by block. They can execute useful calculations on the fly, replacing the multiple steps and scripts previously required. Consistency between solids and blocks is maintained.

For more information on Evolution see www.maptek.com/evolution

Coordinate system tools

Maptek™ I-Site™ Studio 6.1 includes new tools that streamline management of survey data, avoiding the need for scan transformations before processing.

The latest Maptek™ I-Site™ Studio software release focuses on new geodesy functionality that allows users to easily register data to coordinate systems, including local mine grid coordinates.

Scans are brought into I-Site Studio ready for processing, saving substantial time.

Users can also easily change between systems by choosing from pre-defined grid coordinate systems or the stored mine grid system.

Other upgrades in I-Site Studio 6.1 include improved support for I-Site Drive scans to identify, store and manage scan files.

Maptek continues to support surveyors through workflow improvements.

- > Register scans to coordinate systems, including local mine grid coordinates
- > Avoid custom transformations after bringing scans into I-Site Studio for processing
- > Import site geoid and .dc files for correct site projections
- > Define objects and surfaces into coordinate systems
- > Easily change coordinate systems

This upgrade builds on the earlier 2016 release of I-Site Studio 6 which delivered significant new 3D CAD, geology, geotechnical and production reporting tools.

I-Site Studio 6.1 is available now.

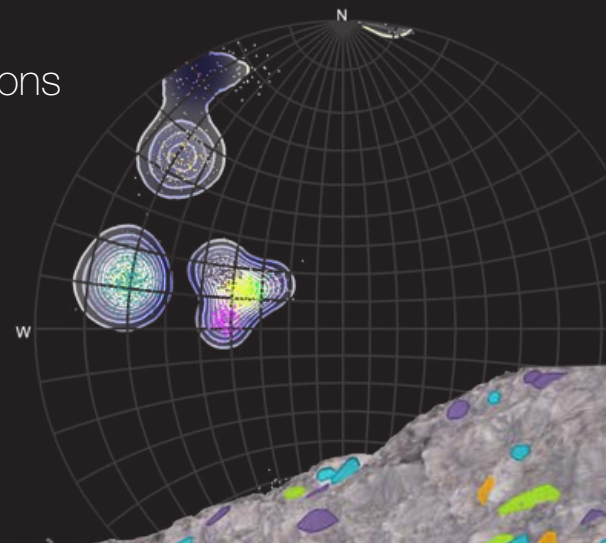


I-Site geotechnical analysis tools help minimise risk

Fast, accurate results support safe operational decisions

- Automatically extract discontinuities from laser scans
- Measure discontinuity spacing, calculate waviness, create discontinuity solids
- Manually create discontinuity sets from imported data
- Create 3D linked stereonet and rose diagrams
- Perform interactive kinematic analysis
- Measure block dimensions and calculate volumes
- Identify and map tension cracks, scarps and fissures

I-Site laser scan data and intuitive software provide an unbeatable combination for assessing geotechnical risk.





The well connected mine

Cloud storage and processing has enabled an 'Internet of Things' approach to mining production and performance information for more effective data interaction.

Mastering the complexities of the performance, efficiency and profitability of a mining operation remains a significant challenge for the industry.

This does not mean that various parameters around the execution of mining operations cannot be measured, or that analysis of the data which is available is particularly difficult. The challenge is to do this in a timely and relevant manner. The information and analysis must be leveraged and made accessible precisely when it can make a difference.

Collecting meaningful performance metrics within the mine operation and using this information to drive near term improvement and adherence to plan and schedule can be complex and expensive.

Disparate or isolated systems, and unreliable or incomplete communications infrastructure lead to expensive systems integration efforts, lack of confidence or consistency in data collection and an inability to deliver decision support results to the right people and places.

The challenge has been too difficult for many mining companies.

Maptek is solving this, partnering with Minlog to enable production management and performance data, together with mine planning and design information, to be shared across an operation.

Processes and decision support on both sides of the planning divide will benefit from real-time, validated and contextually correct data from resource model to shipping information.

The Minlog MineSuite solution has introduced enabling technologies to make this possible. MineSuite is a production management information system used in the mining industry for over 20 years. New technologies and recent data handling paradigms have led to a complete renewal of the underlying system architecture, revolutionising the possibilities in this space.

MineSuite leverages cloud data storage and processing to enable an 'internet of things' approach.

All processes, locations, systems and equipment can be modelled within the MAS (MineSuite Application Server) in the cloud.

Any connected device in the mining environment can feed data to that server, which interprets the context and relevance of each piece of data and stores it for use on demand.

Similarly, any connected device or service (such as reporting engine or dashboard) can retrieve relevant validated data by referring to the operational model within the MAS, which then returns the appropriate detail from the cloud.

The enabling architecture is more commonly used in industries such as banking, where high volumes of asynchronous transactions must be handled independently within a well-defined, secure context. With all connections via a standard interface model on a service bus, the system becomes very flexible.

MineSuite can be easily configured, maintained and adapted to model virtually any type of mining operation.



It can monitor, measure and report on any combination of fixed and mobile plant, fleet (including interaction with existing fleet management systems), laboratory and sample data, and manual data entry in the office or by equipment operators. Provided these are able to connect to the MAS, they can contribute data.

Communication and connectivity issues form another major challenge. Particularly in underground mines, complete coverage and reliable up-time for wireless communication can be prohibitively expensive, even unrealistic, expectations.

The lack of timely measurement data around the complete picture of mine performance is a key source of inefficiency and loss.

In response, MineSuite has developed DSF (distributed store and forward), an innovative technology using 802.11 wifi hardware with proprietary software to effectively create a neural network for transporting data. Fixed and mobile nodes each contribute unique information.

The result is an up-to-date full set of data for every piece of equipment being monitored, available within minutes, at a fraction of the cost of conventional communication solutions.

Real-time data, validated and referenced against an operational model, is now available for generating reports, data cubes and dashboards. The MAS can be treated as a service by other systems. Being in the cloud means it can be done anywhere.

MineSuite provides a feature-rich set of user interfaces for presentation, communication and interaction with data. Equipment operators, maintenance managers, production managers and mine managers can all interact with, and contribute to, the same set of operational data, and discern the applicability to the overall mine performance.

This system is delivering results at some of the world's largest underground mines.

Importantly, it can be delivered at a cost to suit even small miners motivated to automate data collection and gain accurate detailed performance data.

Extending this capability, Maptek will connect the planning and execution environments, and build closed loop information flows around different workflows and disciplines to allow continual improvement in operations.

Huge benefits can be realised in accessing measured data in planning cycles, and also being able to refer to planning detail at the point of execution in a production environment.

This really is an 'internet of mining things'. Maptek, with our partner Minlog, is the only company able to build and deliver this total ecosystem of mining data.

More information at www.maptek.com/partners/minesuite

Images courtesy Havilah Resources



Genetic algorithm paper wins award

A paper co-authored by Maptek™ was recognised at the Genetic and Evolutionary Computation Conference in Denver, Colorado in July.



Christie Myburgh (second left) and Kalyanmoy Deb (third left) with students from the Computational Optimization and Innovation Lab who attended GECCO 2016

Breaking the Billion Variable Barrier in Real-World Optimization Using a Customized Evolutionary Algorithm written by Christie Myburgh and Professor Kalyanmoy Deb of Michigan State University, won best paper in the genetic algorithm category.

Maptek™ Principal Research & Development Engineer Myburgh said that attending the Genetic and Evolutionary Computation Conference (GECCO), and in particular the presentation session, was a great experience.

'The session was packed and people were standing out in the hallway to listen,' Myburgh said.

The paper details a solution to a simply stated problem: A metal foundry produces different types of castings; each casting requires different volumes of metal; you have a number of total orders of various castings to fill, by pouring them from sequential heats of a crucible of known volume, typically significantly larger than any one casting. What are the pouring sequences required to (a) fill the orders and (b) minimise the number of heats?

Crucible heats are expensive because of energy costs. Every crucible pour retains material if the remaining liquid metal can only partially fill a mould, so there is either wastage or the need to reheat this residual metal.

The optimal sequence for producing the castings to minimise wastage is not obvious. Try working it out manually with pen and paper for a 10L crucible and $n=20$ random orders among a set of three 3L, 4L and 5L castings!

A population-based optimisation approach allowed the authors to develop a computationally fast method to arrive at a near-optimal solution.

Two popular softwares (glpk and cplex) are not able to handle around $n=300$ (10 orders and 30 heats) and $n=2000$ (10 orders and 200 heats) variables respectively, despite running for hours.

However, Myburgh and Deb's proposed method is able to find a near-optimal solution in less than a second on the same computer.

The highlight of the study is that the method scales in almost linear computational complexity and so can handle up to $n=1,000,000,000$ on a laptop PC, memory permitting!

Maptek Product Development Director Simon Ratcliffe said a similar class of optimisation algorithms is critical to the Maptek Evolution mine scheduling software, and the ability to scale up to large datasets is vital.

'This is the beauty of computer science,' Ratcliffe said. 'Examples are not to be taken at face value. Algorithms are abstract and can therefore often provide solutions to a huge variety of seemingly different problems in the real world.'

'One of the keys of engineering analysis in computing is spotting or knowing when a certain class of algorithm may be applicable in a new domain.'

'Customising and incorporating domain-specific knowledge in the design of an optimisation algorithm is crucial when it is applied to large scale, complicated and heavily constrained real world problems.'

University partnerships



Montana Tech, USA

Students at Montana Tech took advantage of a four-day intensive course to learn the fundamentals of Vulcan. From basics such as pan and rotate they moved on to designing line and polygon data, creating surface and solid triangulations, and viewing drillhole databases.

By the end they were also able to view block models, perform calculations on their models, run reserves, and complete a pit design.

The course was held prior to the first week of classes. The 4th year and graduate students will use the Vulcan training for the laboratory portion of their Surface Mine Design course, which pairs practical computer design methods with mine design knowledge gained through course lectures.

Students who use Vulcan for the design portion of their capstone projects will also apply their knowledge to create and evaluate a mine design.

Most of the 20 students attending the course were in the Montana Tech mining engineering program, with some from geological engineering and geoscience. A few students from Ghana and Canada joined the local cohort.

Founded in 1900 as the Montana State School of Mines with one building, Montana Tech now has 3000 students on a growing campus.

Butte, Montana, where the university is located, has a rich history of mining and continues to be an active mining area today. Though these students may not stay close to 'home' when they graduate, they will be armed with knowledge that will allow them to work anywhere in the world.

Universidad Católica del Norte, Chile

Marcelo Arancibia and Jorge García conducted a Vulcan masterclass for 48 students and two teachers in the Universidad Católica del Norte's Civil Mining Engineering faculty in August.

The four-day class focussed on the latest Vulcan tools for 3D visualisation, modelling and analysis.

Familiarisation with new technology promotes career development for the 5th and 6th year students. Topics addressed during the workshop relate directly to the complexities that they will encounter as mining professionals.



The implementation of Vulcan software in the curriculum also helps motivate students for future success in their chosen career.

Maptek Calendar

September 14-16

ExpoMina Peru 2016
Lima, Peru

September 14-16

International Mine Surveyors Conference
Brisbane, Queensland - Booth 1

September 26-28

MINExpo 2016
Las Vegas, Nevada - Booth 6028

October 7

Australian Institute of Geoscientists
Pushing the Boundaries with Technology
Macedon, Victoria

October 16-19

XVIII Geology Congress
Lima, Peru

October 25-28

XII Seminario Internacional de Minería Sonora
Hermosillo, Sonora, México - Booth 285

November 15-16

Ninth AusIMM Open Pit Operators Conference
Kalgoorlie, Western Australia

November 23-25

II Convención Mundial Energética,
Minera y Metalúrgica
Cancun, México - Booth 240



The alliance between Maptek and the university is set to continue, with plans to generate research topics applying Vulcan to modelling, design and analysis of different mining scenarios.



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