

SAFETY AND EFFICIENCY

The importance of balancing efficiency and safety aspects of mining operations at the planning stage should not be underestimated.

In the international mining environment large mining entities are competing to win lucrative global supply contracts, while smaller companies compete in more localised arenas but with comparatively fewer resources. Both situations result in pressure on operations to be more effective and efficient, and for the value chain to be technically and economically optimised.

The accusation is often made that economic or production pressures compete with the need to work safely. Safety, health and environmental (SH&E) aspects are increasingly scrutinised by society and by the communities in which mines operate. Public scrutiny of the performance of mines is often a rallying point for interest groups and labour organisations. This also has political implications and can put great pressure on governments.

'IMPROVING EFFICIENCY AND SAFETY, AND HENCE IMPROVING COMPETITIVENESS, IS IN ALMOST ALL RESPECTS A PEOPLE ISSUE.'

Gys Landman, President Elect SAIMM

The cost of accidents at an operation can be considerable in terms of equipment damage, lost production and recovery time.

Planning for safety

In reality, SH&E and economic factors are not opposing forces. At the mine planning and evaluation stage, SH&E aspects are as important as other factors for determining a project's viability.

During the implementation and execution of mine operations, SH&E outlay should simply be viewed as a necessary cost of compliance, since the cost of non-compliance in today's world is too high.

Many opportunities do exist for improving SH&E performance. For example, large trucks operate in open pit mines around the world. Many small vehicles are involved in accidents with these bulk carrying vehicles. Production losses can amount to huge sums as a result of such incidents.

This risk could be mitigated by adding an extra access ramp or providing alternative services for transportation of men and material, something to be considered when planning a potential operation.

The value of having a good safety and environmental record is not just in its ability to appease society; it makes good economic sense as well.


If the costs of operational risks were dimensioned at the planning stage, it would make sense to add in a capital and operational cost to install a real time fleet monitoring and positional system.

A good safety performance is not managed - it is a consequence of effective management.

Improving efficiency

Improving efficiency on an industry-wide basis becomes an interplay of many factors. Key challenges include improving the competitiveness of the mineral resource base itself, gaining administrative and policy backing of the industry, and access to the right technology.

Investment in training and supporting the human resource which serves the mining industry is key to success.

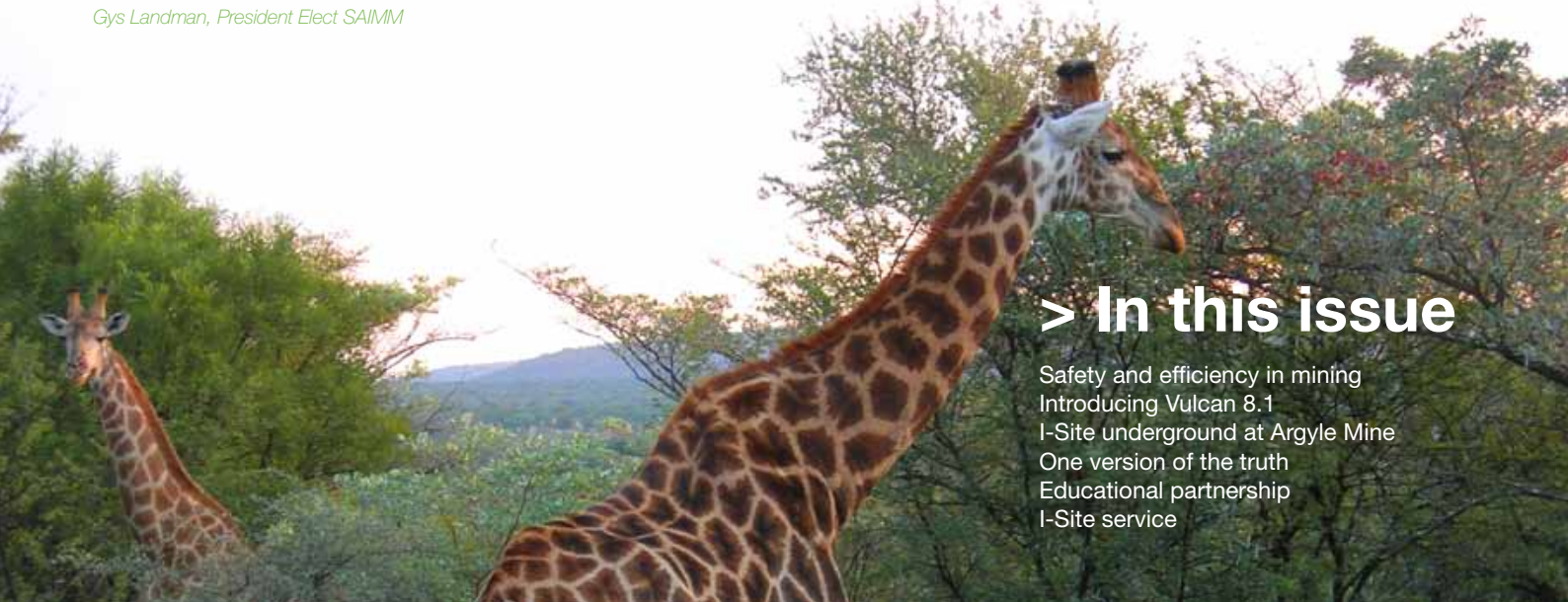
People involved at all levels must be correctly equipped with respect to knowledge and skills. Motivated people, people with a spirit of innovation and people who are entrepreneurial will ensure more exploration for mineral riches, sound investment, good governance, and a profitable mining industry. 

*Gys Landman, President Elect
Southern African Institute of Mining & Metallurgy*

*Extract from keynote address at
Maptek Users Conference, March 2010*

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INTRODUCING VULCAN 8.1

Eric González, Vulcan Product Manager, discusses upcoming improvements that were directly requested by customers, as well as planned upgrades.

How does this release differ from other Vulcan releases?

Using a more agile development has allowed us to add to our planned roadmap as customer feedback is received. We can leave space to be more responsive to customers' needs, and are able to work on upgrades in a shorter time frame.

Obviously we cannot do that with some of the bigger projects which require a longer lead time, but we're very excited about some of the relatively smaller upgrades which will provide value to our users.

What are some of the upgrades that customers have helped to drive?

Customers indicated that they wanted to work a lot faster within **grade control**, and to interact with elements on screen more efficiently. A new toolbar provides quick single-click access to the tools. The result is a faster grade control process.

Ramp design is integral to underground mine design. Customers reported that it would be useful to unfold a ramp. A new tool creates a **section through a line**, which is useful for not only unfolding ramps but also other 3D design work.

What else is new?

New **underground grade control** tools build on the easy workflow of our traditional open pit framework. Grade control engineers or geologists will now be able to apply an automated process to generate accurate, reliable results for underground operations.

The **stope optimiser** is the first tool arising from Maptek's involvement in the

PRIMO project, which brings together companies willing to invest in researching optimisation tools for the underground mine environment. These partnerships help to develop more productive and efficient tools for day-to-day operations.

Explain the new scheduling options?

New **scheduler** bundles work for open pit mines which are not necessarily designed or created in Vulcan. Flexible tools can be used with 3rd party data. Using Vulcan however, you can add more modules - start with a scheduling application and expand to a more feature-rich Vulcan configuration.

It also performs as a stand-alone scheduler - it's really a comprehensive general scheduling package.

The **Short Term Planner** works with the existing Vulcan MineModeller or equivalent configuration. It follows the Vulcan framework, and uses and outputs Vulcan data for short to medium term planning. This is another example of partnering with customers to extend development.

SHORT TERM SCHEDULING

The Vulcan Short Term Planner offers speed, precision and flexibility at the planning stage, delivering productivity increases never achieved before in the important task of short and medium term planning.

The new decision tool allows users to analyse various scenarios in advance, and is adaptable to each operation. The Vulcan Short Term Planner is a collection of scheduling modules. One of these is the **Sequence Accumulation Reporting**

tool, which allows users to interact directly with block models to generate the amount of product required. Multiple variable cut-off grades can be applied, without having to pre-calculate them.

Scheduling of the blocks is accomplished interactively and quickly across solids, without establishing predefined cutoffs, using linear and radial accumulation techniques. This accumulation is restricted to each period of the plan across the mine and plant targets. **It is fully user configurable.**

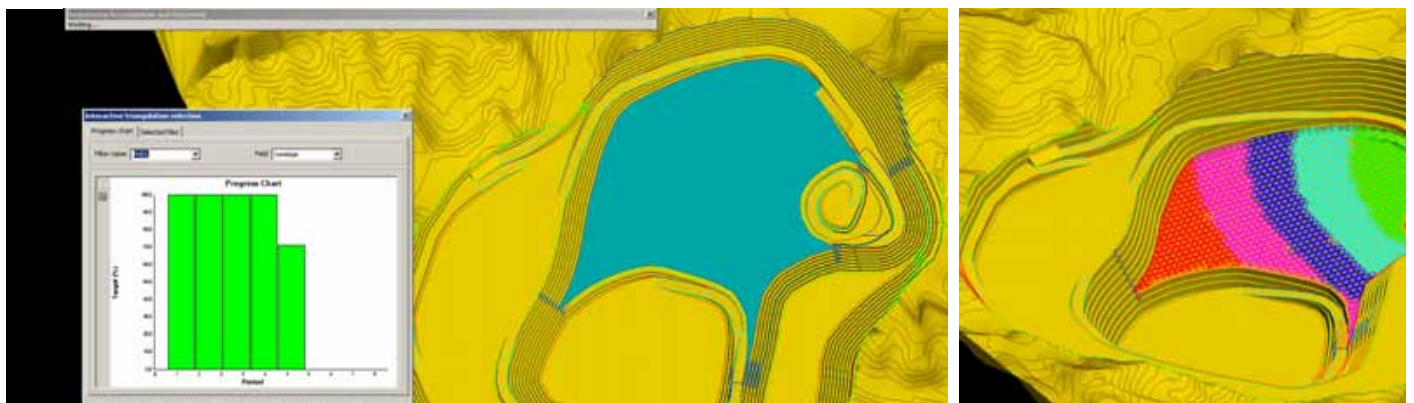
Restrictions can be applied for capacities, hours of crushing, product quantity or any variable in the block model which can be accumulated. The fact that it does not need predefined cutoffs, and interacts

with the block model, leads to reduced data preparation time, allowing users to focus on the generation of plans and analysis of results.

Users can define stockpiles for multiple products, modify targets, change cutoffs and alter equipment positions easily. It is also possible to configure initial stockpiles and their extraction sequence to simulate various scenarios for material rehandling.

Reporting is based on spreadsheets and can be visualised within the Vulcan environment. It is fully integrated with statistics and other Vulcan tools.

Clients using the Vulcan Short Term Planner include Cía Minera Doña Inés de Collahuasi and Minera Esperanza.



Vulcan short term planner focuses on short and medium term planning for generating mine schedules. These images show the blocks programmed by period using radial accumulation plans [left] and the progress by period [right].

MOVING UNDERGROUND AT ARGYLE

The I-Site laser scanner has provided Argyle Diamond Mine with vital survey data for underground design.

Located in the East Kimberley region of Western Australia, the Rio Tinto Argyle Diamond Mine is the world's largest supplier of diamonds, historically accounting for approximately one-quarter of the natural diamond production.

As the current open pit approaches the end of its life, a new underground mine below the open pit is underway, due for completion in 2013.

To create an economically viable underground mine, Argyle chose the safest and lowest cost underground mining method available. Block caving involves undercutting the orebody and allowing it to break up or 'cave' under its own weight, removing the need for blasting.

Underground project

The Argyle project requires excavation of several large chambers to construct the underground facilities associated with the block cave operation. These include pump station chambers, crusher chambers and transfer chambers.

The chambers must be mined exactly to design, or slightly larger, for construction to be able to proceed within them. Quality control requires no underbreak whatsoever. Therefore, accurate and high detail surveys must be performed in these chambers once mining is finished.

Argyle tried a number of ways to do this including photogrammetry, which proved too time consuming, and CMS. The latter was not detailed enough, and it was hard to filter unwanted data such as rock bolt tails with no post-processing package.

Neil Vucak, Argyle's Surveying Specialist, involved Maptek in the underground project. Luke Holdcroft, Maptek I-Site Consultant, suggested that the I-Site 4400CR could achieve what Argyle required in a much quicker time frame.

I-Site at work

The crusher chamber measures nearly 50m long, 12m wide and about 14m high; survey was required upon completion of mining. Three surveyed, standard resolution scans were performed from the bottom of the chamber, including one in the CWA drive, and an unsurveyed scan from the top of the chamber.

A total scanning time of about 30 to 45 minutes allowed other underground work to be completed, with no time or productivity loss.

Post-processing was quick and easy. A loop model was generated in less than half an hour and brought straight into Vulcan, then put in section view and compared to the design envelope.

The speed of the system was the greatest benefit to Argyle. An accurate, usable result was generated quickly and without impeding any of the normal work flows.

The result was positive, with Argyle acquiring an accurate model of the crusher chamber that can be compared to the design envelope for determining any problem areas. Total time spent scanning and post-processing was in the range of 1 to 1.5 hours. It is Maptek's opinion that no other method can achieve those results in that time frame.

Argyle currently uses I-Site Voidworks to process CMS data. As more chambers come on line it is planned that the Maptek method will be chosen to perform these surveys again. *∞*

*Thanks to
Neil Vucak, Surveying Specialist
Argyle Diamond Mine*

'I-SITE GAVE US THE REQUIRED RESULTS QUICKLY, SAFELY AND WITH NO FUSS.'

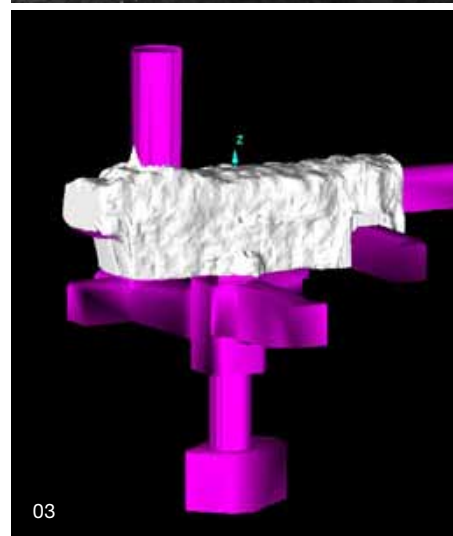
Neil Vucak, Argyle Diamond Mine



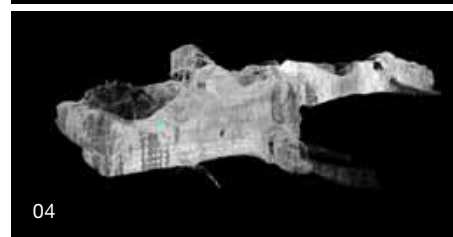
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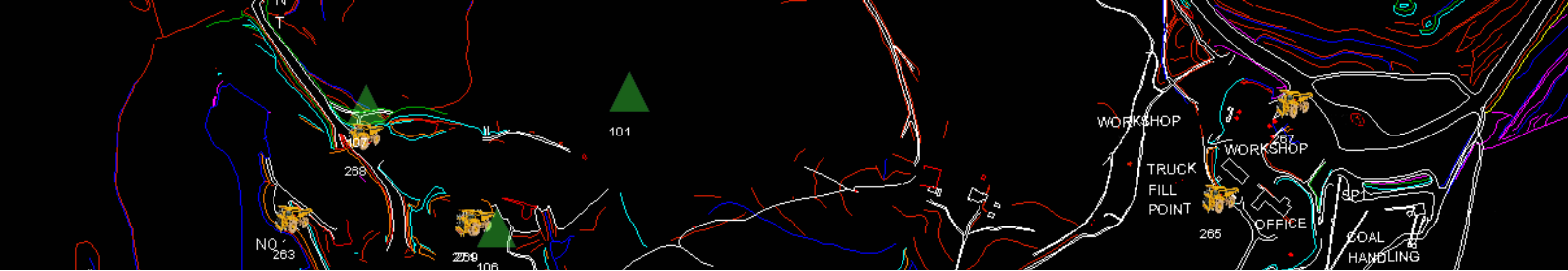


03



04

- 01 Photograph of chamber
- 02 Scan of crusher chamber
- 03 Underground chamber plus design work
- 04 Raw I-Site scan of underground chamber



ONE VERSION OF THE TRUTH

Maptek's understanding of the mining execution value chain allows us to apply and build on the technology in production information systems such as MineSuite to address our customers' challenges.

Data, 'a body of facts', and **information**, 'knowledge communicated or received concerning a particular circumstance', are often used interchangeably to support the decision making process.

Truth, 'a verified or indisputable fact', is hard to achieve in a multi-discipline environment such as mining. Many parties to the decision making process gather data independently using their own specialised tools. In the information age we should be able to bring all the relevant data

together, forming a common information resource to build 'one version of the truth'.

The current state of the mine is usually communicated at the daily operations or shift hand-over meeting. Agreement on a short term action plan can be hijacked by differing versions of the truth from each stakeholder. When data is gathered manually, through operator PLOD sheets, in-house spreadsheets and word of mouth, it is difficult to achieve consensus.

This is exacerbated by information which is out of date as soon as it is recorded. Consider an underground operation where the shift supervisor returns to the surface before the end of shift. The state of the active mining face will have changed by the time the next crew is due to go underground, even if the information was up to date when the supervisor left.

Without real-time automated data capture, the state of the fleet is hard to know, except at some arbitrary point in the past. Installing proximity awareness or collision avoidance systems is part of the

continuous drive to improve safety. **It is possible to achieve proximity awareness and near real time fleet positioning from the same base technology.**

Most systems include vehicle to person interactions so that the real time location of all personnel in the mine can be tracked. Minor additional investment allows vehicle health sensors to be connected, so data can be transmitted to a central application, communicating breakdowns to maintenance as soon as they occur.

The diesel particulate matter and ventilation system can now be managed from current information. As vehicles and personnel move about the mine, emissions can be monitored by ventilation zone.

The total head count compared to refuge chamber availability can then be managed to ensure that all personnel have access in case of emergency.

This example shows how the secondary benefits of technology can be integrated into a high quality decision support tool.

APPLIED GEOSTATISTICS

Maptek's Viña del Mar office hosted a group of mining students under difficult conditions earlier this year.

Despite the effects of a magnitude 8.8 earthquake in late February-March, the Citation in Applied Mining Geostatistics, which gathers professionals from all over South America, went ahead for the 9th consecutive year.

The program has been taught annually at the University of Alberta, Canada since 1999. Maptek partnered with the University in 2002 to host the course in Chile, which has been taken by more than 100 people.

This intensive training requires 1 month of classes, with 20-plus exercises, as well as a project that demonstrates independent application of the latest tools in resource

estimation and geostatistics. Students exceeding the minimum 80% pass average are granted a Citation from the University of Alberta.

Professor Clayton Deutsch, Director of the School of Mining & Petroleum Engineering, Department of Civil & Environmental Engineering at the University of Alberta, who runs the program, says:

'This training is unique because it fills an important gap between the conventional short course format and the Master or Doctorate degree. A short course is inadequate and a graduate degree takes a long time.'

'The Citation program was quite informal in the early years. Students would come to the University and study geostatistics for 2 to 3 months.' The program was formalised to provide a consistent high standard in teaching resource estimation professionals the theoretical foundation of geostatistical tools, the complexities of implementation and the place of modern techniques.'



Instructors and students at the Geostatistics Citation course in Chile

Maptek will host the 6th Citation Program in Applied Geostatistics in North America from July 6-30, 2010.

Presented by Dr Clayton Deutsch, in the Denver office training facility, the course covers the theory and use of modern geostatistical tools, with an emphasis on mining. Vulcan experience is not required. Register via email at info@maptek.com

This Citation will be delivered again in Chile in March 2011, and also in Perth, for Australian mining professionals.

EDUCATIONAL PARTNERSHIP

Camborne School of Mines applies a unique combination of scientific and engineering expertise in geology, mining, minerals processing and renewable energy to world-leading research and teaching.

Camborne School of Mines (CSM) is located on the Cornwall Campus of the University of Exeter, UK, and has a particular interest in responsible mining and sustainable development.

Between 100 and 200 students enrol in Bachelor and Masters degrees. Applicants for the mining program have steadily increased over the last 3 to 4 years. Up to 25 third year mining engineering students receive Vulcan training each year. Maptek has been providing software and training to CSM

since 2006, with 25 academic licences currently on campus.


In preparation for teaching Introductory Vulcan, one of the university lecturers, Dr Gareth Kennedy attended an in-depth specialised course in Edinburgh. Maptek's technical services team provides further training on underground and open pit design. At the end of the coursework, students are assessed by Maptek in conjunction with the university.

In 2008 Maptek awarded Mark Fry a prize for producing the best pit design in the class. After completing his Masters degree in 2009, Mark joined the technical services team in Edinburgh.

As well as teaching students about mine engineering, CSM prepares them for what to expect when they enter the industry. Using Vulcan and other related software will become part of their everyday working life as mining engineers. As the majority of students would not have used any 3D mine design software, the training acts as a good introduction.

CSM tries to cover as many aspects of the mining industry as possible. Lectures range from thermodynamics and fluid mechanics to geotechnical engineering and feasibility studies.

This not only gives students more employment options, but means that when working, they will be familiar with how mine departments interlink, from underground blast engineers to processing plant. Students learn that they can't just focus on their mining engineering tasks; their work will have a direct effect on the overall operation and productivity of other departments.

Third year mining engineers undertake a full feasibility study as their final project. Vulcan plays a significant role for the basis of their design work and for reserve estimations. The use of Vulcan for MSc and PhD projects is currently being considered, for example as a tool to assist in geotechnical research. 

*Thanks to
Dr Gareth Kennedy
Camborne School of Mines*



'MAPTEK'S SUPPORT WITH VULCAN TRAINING HAS BEEN INVALUABLE, NOT JUST FOR DELIVERING THE MORE ADVANCED ASPECTS OF THE SOFTWARE. IT IS GOOD FOR STUDENTS TO BE EXPOSED TO AN OUTSIDE MINING SOFTWARE COMPANY AND ITS PERSPECTIVE ON THE INDUSTRY.'

Dr Andy Wetherelt, Senior Lecturer, Camborne School of Mines



Students at the University of Adelaide, South Australia also benefit from Vulcan training given by the local Maptek technical services team.

I-SITE SERVICE

Customer service and support is an often unrecognised element of product delivery.

Maptek has established an I-Site service system that is second to none. Complex products such as I-Site laser scanners inevitably need expert attention. The Maptek advantage is in how we resolve issues that customers may experience.

I-Site scanners are supported by service centres in Adelaide, South Australia and Denver, Colorado. The teams are responsible for carrying out annual SystemCare servicing as well as ad hoc equipment and warranty repairs.

Both service centres have received major upgrades recently, and now share a synchronised database providing access to centralised data on critical scanner history.

The Adelaide centre is integrated with the I-Site production facility so is capable of all repairs and maintenance tasks. Servicing is handled by Team Leader, Tony Alfonsi and Technicians, Heath Graham and

Tibor Cser. They process an average of 5 scanners per month, with a peak of 9 scanners in December 2009.

Michael Foster looks after the service needs of scanners deployed in North America. Based in Denver, Mike is quite self-sufficient, but has a firm lifeline to Adelaide for solving difficult problems.

The standard SystemCare service includes a 37 point health check as well as system upgrades. We are currently reviewing processes and methods to reduce servicing time from an average of 2 weeks.

Software malfunctions provide novel challenges. The Adelaide team recently discovered that all the Maptek I-Site HHC software had been deleted from a returned HandHeld Controller. The various games installed somehow weren't capable of controlling a laser scanner!

The scanner service teams perform a vital role and strive to keep customers satisfied. One of the biggest challenges today is understanding the different processes that have been used since the first scanners were built 5 years ago. They persevere, with the philosophy that 'the best new customer is a happy old one'.



A recent service request included a picture of a beheaded scanner with the query 'Any chance of fixing me?' Our scanners operate in dangerous places - a rock fall in an underground mine caused this damage. >



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MAPTEK USERS CONFERENCES

AFRICA-EUROPE

Maptek hosted the first regional Africa and Europe users conference in the spectacular surroundings of a Big 5 game park near Johannesburg in South Africa in March 2010.

Duncan Lee, General Manager of Africa & Europe said that it was an excellent opportunity for both Maptek and customers - to share ideas, forge new relationships and highlight the innovations that we have to offer.

Customers gave the conference a 92% overall rating, stating that presentations had strong relevance for their business. As well as hearing about our technical applications and learning new ways to use them, attendees had the opportunity for 1 on 1 advice from Maptek experts from around the world.

'The conference allowed us to renew our commitment to be strategic partners in delivering mining solutions, not just as technology vendors. We'll continue to provide leading edge technology and

services, applying innovative thinking to help operations optimise their investment with Maptek,' Duncan Lee concluded.

'When you attend a conference you see straight away how you can do better. I've picked up a number of things, such as with optimisation of our stockpiles. I was trained in scheduling, I have the knowledge but now I can see how you can fully utilise the Vulcan software.'

Patience Ndhlovu, Murowa Diamonds

'This is one of the best conferences that I have attended. It has reminded me how important it is to mix as an industry. The optimisation and scheduling talks are very relevant for everything that we are doing now. We are a developing company and we need to ensure that our methods, our systems are in tandem with our expansion. In terms of technology, Maptek is one of the organisations that will be able to help us through our expansion program.'

Wadzanayi Mutsakanyi, Zimplats

'One benefit that I found was it deepened the confidence in my work, adding to the value that I have within my operation. Networking with other people, and understanding that they have similar frustrations and work issues has been interesting in itself. It gives you the motivation to go back to work and keep chugging along.'

Jayde Webb, Tulawaka Diamond Mine (Barrick Africa)

NORTH AMERICA

'Efficiency and Productivity' has been adopted as the theme for the users conference to be held in Denver, Colorado from September 13-15.

Examples of technology in action will allow attendees to learn about improving operational efficiency and productivity. Dr Bob Johnson, Founder of Maptek and Dr Clayton Deutsch, Professor at the University of Alberta will give keynotes.

The conference, which will be held at the Inverness Conference Center, is open to all mining professionals.

Attendees can stay on for optional forums on September 16 and 17, choosing from:

- Vulcan training
- I-Site field trip
- MineSuite workshop

Call for papers is now open, and early bird registration ends July 1!

maptek.com/north_america_2010
or **register@maptek.com**



I-Site technical services are now available in Emerald, Queensland. Jordan Herrmann has experience in laser scan site survey, data processing, training and support.

Contact isite.support@maptek.com.au

Optimise your investment in scanning

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- > I-Site installation and customised training
- > I-Site Studio processing of any scan data



NEW CUSTOMERS

VULCAN

BARRICK PASCUA-LAMA open pit silver-copper mine in Chile has acquired Vulcan and Chronos for geological modelling, resource estimation, geotechnical, grade control, mine planning and scheduling. The mine is located south of Atacama at an elevation of 5200m.

CRL ENERGY LTD, a New Zealand based consultancy company, will use Vulcan for coal quality modelling.

GEOMINE, a Mackay based consulting firm, has purchased Vulcan GeoModeller for consulting to mines in the Bowen Basin of Queensland, Australia.

HATCH, which provides engineering, project and construction services to the mining industry, has bought Vulcan for underground drill & blast and mine design applications on projects managed out of Sudbury, Ontario, Canada.

IVANHOE MINES has acquired Vulcan for exploration and geological modelling of the Oyu Tolgoi mine in Ulaan Baatar, Mongolia. Construction is underway for the large copper-gold mine being planned and operated by Rio Tinto. Vulcan is also used for underground caving design at the Ivanhoe head office in Vancouver, Canada.

LINDEN MINING & CONSULTING, based in Kamloops, British Columbia, Canada, has acquired Vulcan for underground geological modelling and mine design.

PHONESACK GROUP has purchased a Vulcan licence for mine planning for the Sekong Saravan coal project in Laos.

QUANTITATIVE GROUP (QG) has begun using Vulcan for geological modelling on consulting projects. QG provides specialised geostatistical, geological and resource estimation services to the resource sector, from offices in Brisbane, Queensland and Fremantle, Western Australia.

REED RESOURCES LTD, with vanadium, lithium, iron, gold and nickel assets across Western Australia, has purchased Vulcan for resource modelling.

REY RESOURCES, with head office in Sydney, will use Vulcan for the geological modelling phase of their coal operation in the Canning Basin, Western Australia.

RIO TINTO EXPLORATION will use Vulcan for the exploration and evaluation of resources at the Bunder Diamond project in Madhya Pradesh, India.

TITAN AMERICA LLC has purchased Vulcan to generate reserves for raw materials which are turned into cement and masonry products at the Roanoke Cement plant in Virginia, USA.

VALE INTEGRA COAL is operating a project to integrate existing open cut and underground coal mines in the Hunter Valley of New South Wales. Vale has implemented Vulcan for drill & blast and mine design.

I-SITE

BHP GEMCO (Groote Eylandt Operations) has purchased an I-Site 4400LR system. GEMCO is a manganese ore supplier, and will use the system for end of month surveying, stockpiles, ROM pad surveys and highwall mapping.

NEWMONT JUNDEE has ordered an I-Site 4400LR system. Jundee will use I-Site to scan stockpiles and crusher cones, as well as for highwall mapping and general survey. A rail bracket will be used for safe acquisition of cone stockpiles from the conveyor system.

PEABODY ENERGY has bought an I-Site 4400LR laser scanning system for end of month survey, reconciliation and mapping at the North Antelope Rochelle Mine in Wyoming, USA.



VISIT THE MAPTEK BOOTH

June 8-10

Euro Mine Expo
Skellefteå, Sweden

June 22-24

Hillhead 2010
Derby, United Kingdom

June 23-25

Mine Haulage Conference
Brisbane, Queensland - Technical paper

July 27-29

Queensland Mining Expo
Mackay, Queensland - Booth 1244

August 3-5

IBRAM
Belo Horizonte, MG, Brazil

August 11-13

Australian Institute of Mine Surveyors
Surfers Paradise, Queensland

September 14-15

Oil Sands Trade Show
Fort McMurray, Alberta - Booth 2212

September 26 - October 1

Congresso Brasileiro de Geologia
Belém, Pará, Brazil

September 29 - October 1

AIG Geo-Computing Conference
Brisbane, Queensland - Booth B8

October 26-30

Expo Minera Sonora 2010
Hermosillo, Sonora, México - Booths 8 & 9

November 10-11

IMME
Kolkata, India



Alberto Ramirez (Maptek Mexico) with a visitor at the International Mining Conference in Chihuahua, Mexico in April



Maptek staff with workshop attendees Luis Alberto Guajardo (Minsa), Enrique Rivera (Gammon Gold) and Carlos Peña (Minsa)

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