

## Evolution meets scheduling challenge

Dynamic optimised schedules take account of the complexity of mining a new project at Diavik Diamond Mine in the remote Northwest Territories of Canada.



Rio Tinto operates the Diavik Diamond Mine, which is built on four diamond-bearing kimberlite pipes bordering an island 220km south of the Arctic Circle.

The operation commenced open pit mining of the pipes in 2003 and began underground production in 2010.

The kimberlite pipes are located under the vast Lac de Gras. Mining is enabled by building and maintaining dikes to hold back the water until the end of mining when the lake can be restored.

A processing plant on the island separates white gem-quality diamonds from ore delivered from three kimberlite pipes named A154S, A154N and A418.

Diavik uses Maptek™ Vulcan™ and I-Site™ for mine modelling, analysis and reporting, and contacted Maptek seeking a scheduling solution for its new A21 open pit project.

The A21 project is set to begin open pit production in 2018. It involves mining a near surface kimberlite pipe off the southeastern corner of the 20km<sup>2</sup> island.

Maptek Evolution Origin provides Diavik with a solution which takes account of the challenges of the unique project. Flexible, dynamic, optimised schedules can be run over 90 monthly periods.

The strategic role of the A21 pipe is to supplement the declining feed from underground operations to fully utilise the 2.3Mt process plant capacity. In addition, operating strategy dictates that significant ore stockpiling should be avoided. Therefore any A21 schedule should target and provide specific ore quantities dictated by these criteria on a monthly basis.

Calculating the combined monthly production of A154S, A154N and A418 and comparing with the available monthly plant capacity provides production targets for the A21 project.

### Meeting the challenge

The key challenge for scheduling the A21 project to meet these targets is the need to mine the kimberlite pipe at a 5m bench height while the granite surrounding the pipe would be mined at a bench height of 10m.

Scheduling of the face advances within the open pit must take this into account, and different equipment with different rates and capacity is used to mine each material.

A customised lava script allows Diavik to process the two different bench heights and quickly produce monthly schedules covering the 90 periods.

The Evolution solution combines two 5m blocks to represent the single 10m bench height in the granite wall-rock. By combining the granite waste tonnage in the upper, or ‘crest’ block of the 10m pair, the correct tonnage can be scheduled, and the granite face can be advanced at the correct rate. The lower block of the pair is set to a total of 1 tonne, and thus has no impact on the schedule or face movement.

Only Evolution’s industry-leading genetic algorithms, combined with Maptek’s commitment to solving individual customer challenges, could handle this complex multi-bench scheduling solution.

The processing power and use of cloud-based technology allows complex schedules to be generated in minutes. Therefore mine planners can dedicate time to fine tuning constraints, rather than waiting for schedules to process.

As the Diavik mine plan is updated, new monthly targets can be created for A21 production. Copy and paste of the targets into Evolution allows fast rescheduling to account for changes in underground and process plant production plans.

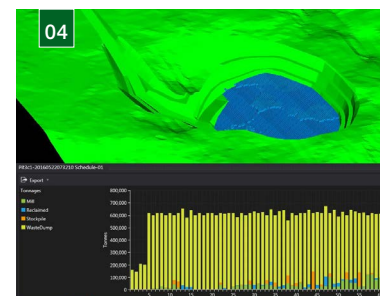
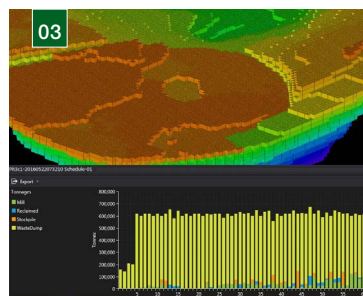
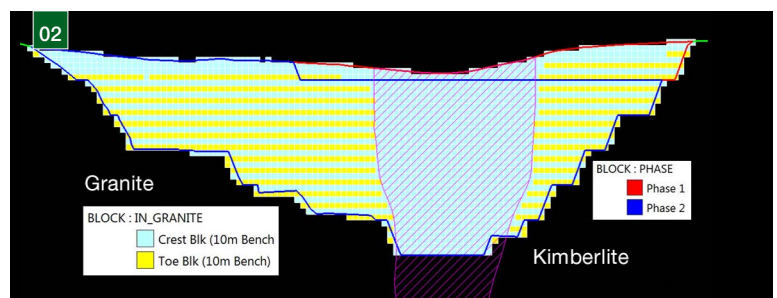
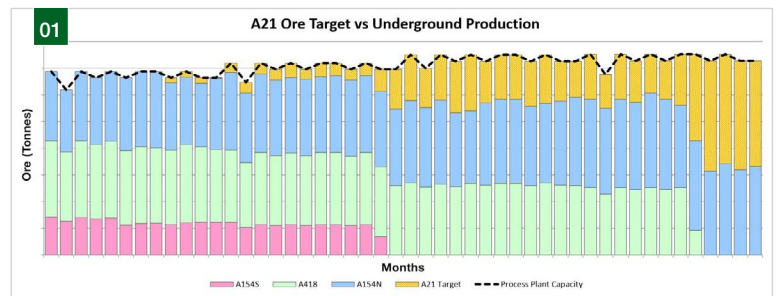
Fully attributed Vulcan block models can be imported into Evolution for scheduling, and schedules are clearly animated to enhance communication across the operation. Management, shareholders and the team on the ground can be informed where each mining block is moved at each stage of the schedule.

Evolution also allows schedules based on the available fleet haulage hours. When the plant is at capacity, decisions on long-haul versus short-haul material movement can be modelled and analysed.

Evolution advanced tactical scheduling software produces robust solutions which are easily updated to meet constraints and production goals faster than anything else available.

Diavik initially rented Evolution Origin and has purchased the product on the back of the outstanding results achieved.

Thanks to  
Erik Bellefleur  
Mining Engineer  
Diavik Diamond Mine



- 01 The A21 open pit contribution to mill processing capacity is complementary to the sum of ore tonnes sent to the mill from A154S, A154N and A418 underground production.
- 02 Materials in the open pit which are used to determine mining bench height for scheduling in Evolution.
- 03 Evolution representation of the face position in Phase 1, end of Period 8.
- 04 Vulcan topographic models viewed with the scheduled period-by-period animation in Evolution.