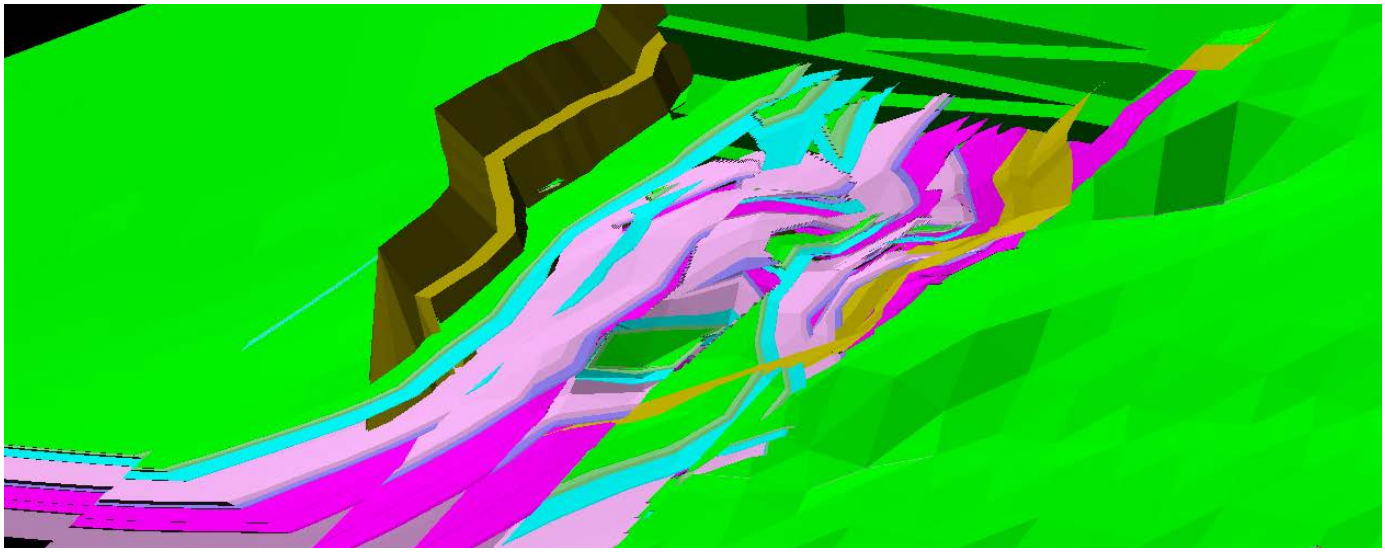
Pit Optimiser adds third dimension

Maptek™ Vulcan™ Pit Optimiser was the ideal solution for assessing the economic value for a coal project and providing the basis for detailed design and scheduling work.



When MEC Mining was asked to complete a feasibility study for a steeply dipping resource in a complex metallurgical coal project, Vulcan Pit Optimiser provided the solution.

The deposit contained 5 seam groups, 3 major overthrust faults and shears, and normal faults in a single pit. Information supplied included a block model, economic assumptions and a geotechnical assessment. Margin rankings provided some clarity on basal seam and economics.

The primary goals were to define the location of the final highwall, low wall and basal seam. In this instance of multiple occurrences of single overlapping seams, Pit Optimiser provided a 'shortcut' to the basal seam. Running advanced reserves in Vulcan validated the volumes and the final block model.

Assigning variables

Variables for cost and revenue were assigned in the block model, such as volume of coal recovered after mining losses, and mining coal to ROM, product tonnes, processing and rail costs.

A variable was created for each price point before haul roads were digitised to derive a waste cost per block, a critical requirement when mining waste at depth.

Six price thresholds were set and profit was assigned to each block. Vulcan Pit Optimiser was run on a 30 x 30 x 5 metre block size.

By flagging the variable 'Pit', grade shells could be run to generate a shell for each price increment to guide staging for early mining and final shell extent.

Mining stages were designed based on the Vulcan Pit Optimiser shell sequence which delivers optimum NPV.

Pit Optimiser delivers superior results to margin ranking by adding the third dimension. With outputs provided as images, the tool promotes instant acceptance and confidence in the results.

Better coal recovery

In this project Pit Optimiser showed the low wall changing dynamically between seams as mining moved along strike. Duplicates which might not otherwise have been recovered using margin ranking were included in the optimisation.

Following the staged mining shells, MEC incorporated haulage and in-pit dumping considerations into the sequence to ensure the most profitable coal recovery.

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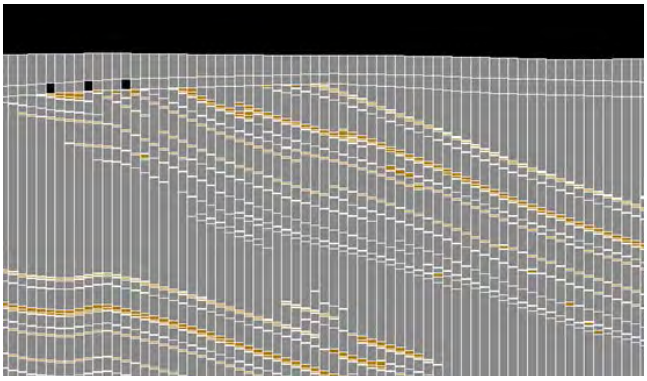
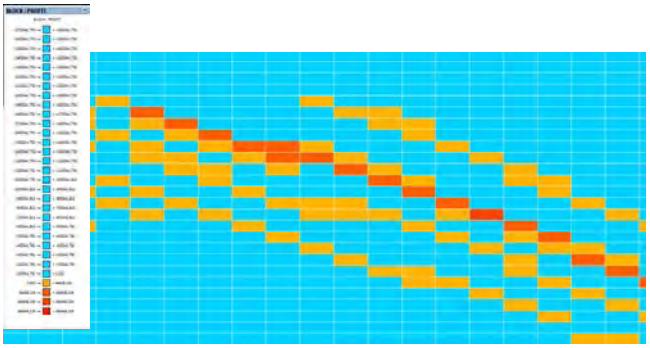
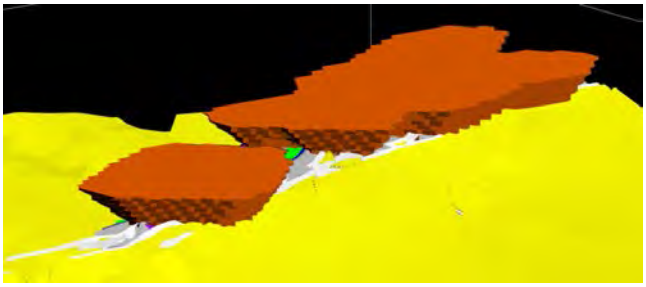
Isometric view of the steeply dipping multi-seam structurally complex deposit



Validating block model shows 'missing' blocks



Regularised block model displaying profit



Optimisation run for each profit variable

Tips and tricks

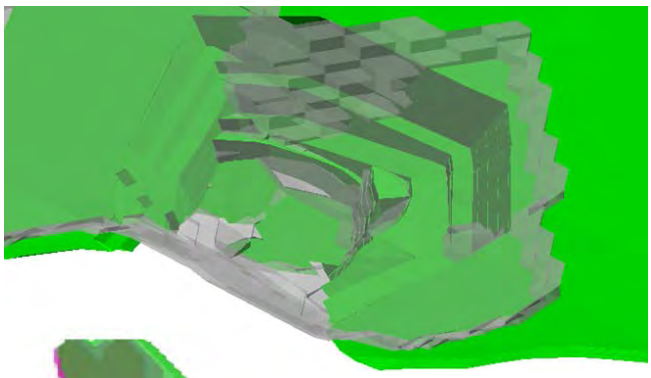
Trimming the block model to remove blocks outside the pit shell cut run time from 1.5 hours to 10 minutes (see upgrades below). Pit Optimiser setup panels allow users to enter and calculate economic value. Alternatively the economic value can be assigned through block model variables, as was the case for this project.

Pit Optimiser provided the sequence of resource development, final highwall location, basal seam and coal recovery strategy around major faults. This allowed MEC Mining to deliver accurate mining plans quickly and within budget.

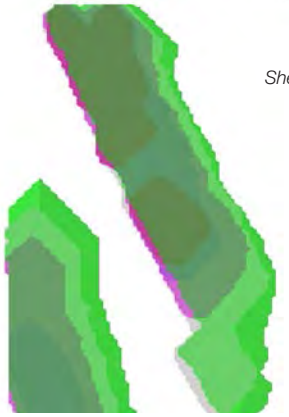
New in Vulcan 9.1!

Pit Optimiser has been significantly upgraded. In Vulcan 9.1 pit optimisations are completed considerably faster with improved analysis and animation options. More scenarios can be run with better visualisation tools for viewing the results. The ourcome is a better design based on analysis of what-if scenarios.

Rapid generation of multiple scenarios and pit shells in optimised models can be based on multiple parameters. The need for re-blocking is greatly reduced, allowing information from block models to be used without loss of resolution.



Shell stages were designed based on optimiser shell sequence to deliver optimum NPV



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