

## Grade control tools underground

Eagle Mine has developed an efficient and accurate method for estimating stope grades by innovative application of Maptek™ Vulcan™ grade control tools.

Lundin Mining is a diversified base metals mining company with operations and projects in Chile, Portugal, Sweden, Spain, Finland, DRC and the USA, producing copper, zinc, lead and nickel.

One of their mines, located in Michigan's Upper Peninsula, Eagle Mine is an underground, high grade nickel and copper mine employing long-hole stoping techniques to recover the ore.

Eagle Mine is the first mine to be permitted under Michigan's *Part 632 Non Ferrous Mineral Mining Law*. Maptek™ Vulcan™ has been used at Eagle Mine since the start of operation in 2014. Vulcan is being used by all technical services departments including engineering and geology.

The greatest challenge for the technical services team was to accurately estimate stope grades using the life of mine model for short range planning. A short range model was not available to help predict grades that included production sample data.

The mine needed to produce an on the fly block model outlining higher grade zones as well as lithology changes within a single stope. Engineers also wanted to determine mineable stope shapes based on current metal prices.

Instead of trying to build a short range model, Eagle Mine decided to adapt Vulcan grade control tools. This approach allowed use of the most current production and exploration data to build a model.

Advanced preferences allow the mine to combine lithological domains with block estimation files to provide more options when estimating blocks. The use of Lava scripting is also very beneficial within grade control, allowing the process to be more automated when generating the block models.

As mining and infill drilling progress, the massive and semi-massive sulphide zones of a stope may change. Importing all of the new data as it is collected allows results to be calculated immediately.

Once a model is generated for a stope, several reports can be created for storing grade block data in output databases.

The material report tool is most useful. Reports can be produced immediately after grade block creation and customised for managers, metallurgists, engineers and geologists. The classification report summarises tonnes and grade for each stope.

Dilution summaries report the main material type and separate the waste with a grade-tonnage report.

Dilution reports help Eagle Mine plan for metallurgical and lithological changes within a stope, which in turn helps the mill prepare for different product.

Stope blasts and corresponding models can be saved to a database which stores all grade block statistics. This database is then exported to Microsoft® Excel and incorporated into end of month reporting or added to stope reports.

Point locations for each grade block are also stored in the output database so that the grade block can be viewed at any time. This helps resolve questions that may arise about individual stopes.

Vulcan grade control tools provide Eagle Mine with a practical and reliable method for identifying ore and waste, and managing production effectively.

*Thanks to  
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Mine Geologist  
Eagle Mine*

