Use of Vulcan Computer Software for Production Mining on the J-M Reef, East Boulder Mine, Montana

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The Technical Services group at the East Boulder Mine uses the Vulcan software from Maptek for all aspects of mine design, from geologic data interpretation to stope reconciliation. Since start-up of the East Boulder Project, now the East Boulder Mine, Vulcan software has been the software of choice. To get Vulcan up and running required integrating existing data collection systems and the creation of a new Access geologic database.

Diamond drill hole data is collected from drill fans spaced 50 feet apart. The data collected is entered into Datcol®, a computerized barcode core logging system. Geologic and geotechnical data is transferred from Datcol® to the Access database. The grade control geologists enter data collected from sill cut mining into the Access database at the end of each shift. This data includes all the face mark-up data, as well as channel and muck sample information. After this data is certified, it is downloaded to Vulcan from the Access database. Presently, assay data from Stillwater Mining Company's analytical laboratory in Columbus, Montana is sent to the mine site via e-mail, downloaded into an Excel spreadsheet, and then loaded into the Access database.

Within Vulcan, the data is quality assured and then 3-D models, called triangulations, of the various rock units are constructed. The triangulations are made for correlatable units including the Reef Package and the J-M Reef; the hanging-wall peridotite/dunite "buckshot" olivine unit; the footwall mafic unit which is made up of norites, melano-norites and bronzite cumulates; several anorthosite units; and mafic dikes. The J-M Reef triangulation is delineated based on visible sulfide and assay results. A >0.3 opt platinum plus palladium (Pt + Pd) triangulation is also created based on drill core assays. A block model based on this ore triangulation is constructed, and combined Pt and Pd assay values are estimated into this block model using ordinary kriging. The estimated grade, tons, and ounces in this model are located in 3-D space and are used to determine the proven minable stope ore reserves.

The model is used extensively to keep the mine headings in the ore zone since it can predict the inflections, structural offsets, ore width, and overall azimuth of the Reef Package. In general, the J-M Reef strikes east-west on the Stillwater Mine grid. However, locally the Reef Package can vary 20-30 degrees from this general azimuth. Using the triangulations, diamond drill hole lithology, and assay data, geologic cross sections are constructed on 50-foot westing intervals. The cross sections are quality assured and some minor handwork is completed to add more detail. Plan maps are constructed for the elevations at which the sill drives are being driven. The 3-D triangulation of the ore zone is placed on the working 1"=20' geologic plan maps ahead of the current mining faces. The grade control geologists use this modeled ore shape as a guide in directing the mining.

After completion of the sill drives on 43 foot vertical intervals, blue lines are painted on the back and ribs of the sill drives to show the hanging-wall and footwall contacts of the J-M Reef ore zone in the sill drives. These lines are surveyed and loaded into Vulcan. Assays from channel samples, taken at each face during the advance of the sill drive, are loaded into Vulcan, and are used in the grade estimation. A new 3-D triangulation of the ore and a new block model are created based on this detailed information. The blueline-based triangulation and corresponding block model are used to design the location of longhole sublevel stopes, based on the Pt + Pd ore grade and geotechnical conditions. This information is also used for the design of drill rings and cable bolt supports for the (sublevel) panels.

When panel extraction of the ore is completed, the longhole stope is surveyed using a cavity monitor survey instrument (CMS). A muck sample is collected from every fifth mucker scoop, or approximately one sample per 15 tons of muck. The mean of these samples is compared with the original modeled grade and adjusted accordingly. Reconciliation incorporating this CMS information and production scoop tracking is then used to determine the tonnage mined from the longhole

panel. The cavity that was surveyed is also reconciled with the designed stope outline from the Vulcan model and any dilution or ore loss is calculated.