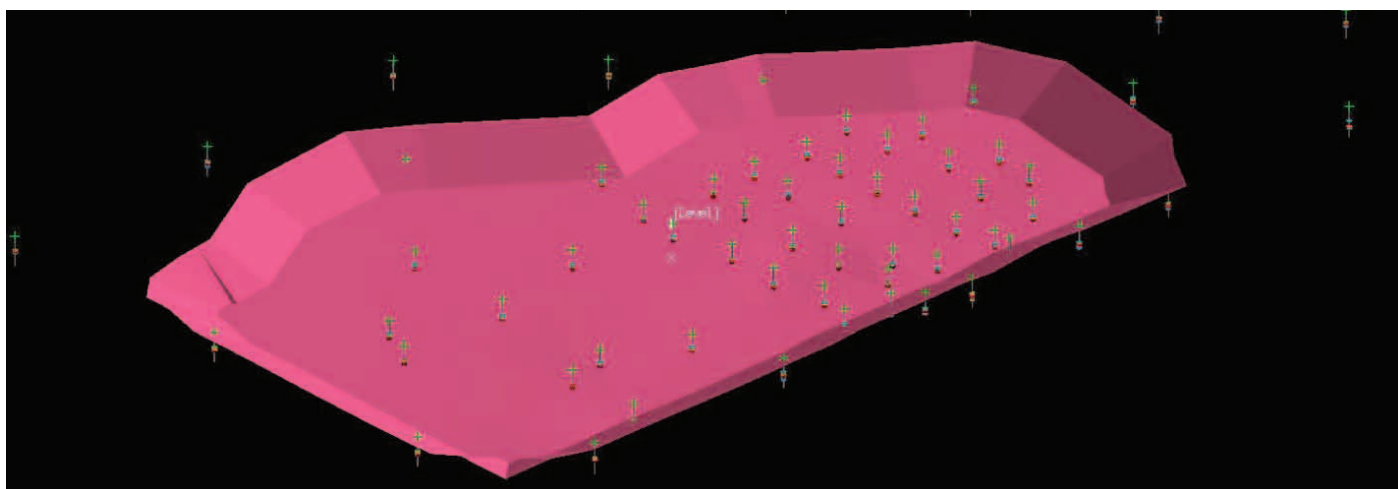# MAPTEK™ Vulcan™

THAR LIGNITE FEASIBILITY PROJECT

**This case study describes how an SRK geologist used Maptek Vulcan™
for resource estimation and integrated technical studies of layered deposits.**

Pit design tools are used for projection of strip ratio thresholds to the base of seam, creating a pit outline for reporting through the Vulcan advanced reserves editor
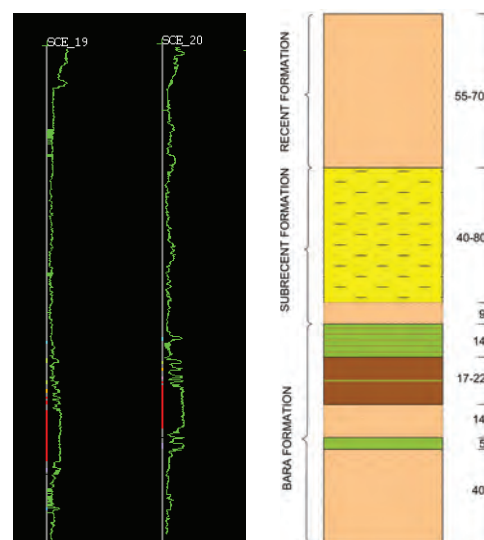
The Thar lignite deposit in Pakistan is a sequence of thin and thick coal seams in a 40 metre envelope within a greater sequence of silts and sands. The horizons are sub-horizontal with a maximum slope of 3°.

**DOWNHOLE GEOPHYSICAL LOGS WERE DISPLAYED IN 3D AND USED
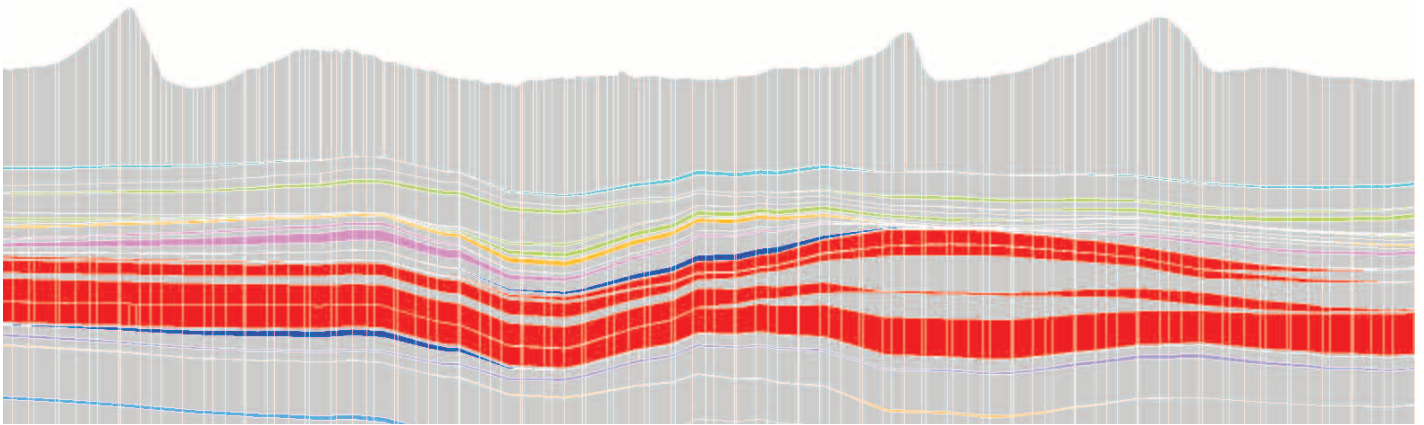TO CORRELATE THE COAL AND OVERBURDEN HORIZONS.**

While modelling the seams is important, the aquifers and overburden are the critical geology that affect the design and feasibility of the operation. Pit slopes are at a very shallow angle; assigning the correct densities and geotechnical parameters is critical to mine design and Net Present Value (NPV) of the project.

Previous work had been done in 2D, so 3D provided a new and different approach. The historical datasets, geophysical logs, hydrological data and recent drilling were all assessed and validated. Reconciliation between the drillhole collars and topographic surface had an impact on the model so the grids were modelled iteratively until a robust geological interpretation was produced.

Downhole geophysical logs were displayed in 3D and used to correlate the coal and overburden horizons.

Downhole geophysical traces aided correlation of coal horizons and seam splits, as well as highlighting changes in overburden

Stratigraphic model with waste horizons and resolution of 50m x 50m in the XY plane and a variable Z

Vulcan's interactive tools allowed interval codes to be changed, validated and written back into the database. Critical waste zones were also identified and coded, and the FixDHD process was used to interpolate missing horizons and control further interpolation.

Grids were contoured to facilitate visual checking of correlations. Obvious errors were corrected and the models were rerun iteratively until the geologist was satisfied. The process was streamlined using specification files which record each step so that it can be easily repeated.

Coal quality composites were statistically validated. Reconciliation between historical and analytical data revealed that the historical coal quality was over-reported and was not used in the high confidence areas of the geological model.

The final structural surfaces for the coal and overburden horizons and quality grids were used to create the stratigraphic model. The block size is chosen to reflect the X and Y resolution and selectivity for mining. The Z value for each block is variable.

The HARP block model holds the data in an easily accessible format. Creating multiple variables gives a lot of flexibility. HARP models can also be regularised for export into pit optimisation software. The advanced block reserving is very good, and the models handle faults and different mesh sizes for different surfaces.

Block model tools increase the flexibility of reporting and scheduling, and fed through into all parts of the feasibility study including geotech, pit design, scheduling and hydrogeological modelling.

Geotechnical design and simulation from dip and slope maps for different horizons was important to predict the angle of failure in the unconsolidated strata overlying the lignite. The thicknesses and strengths of the different waste horizons were investigated for implications on slope angles.

The aquifer core pressures were studied with respect to how the lithological thickness and porosity were going to impact mining. All of these factors were considered when developing pit designs and schedules.

In summary, the geological interpretation tools in Vulcan are some of the most powerful for visualisation, cross-section generation and 3D interpretation.

Thanks to Anna Fardell
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