DATAMINE

MINESCAPE GEOLOGY

MineScape 2021

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WHO USES MINESCAPE GEOLOGY:

- ✓ Exploration Geologists
- ✓ Modelling Geologists
- ✓ Pit Geologists
- ✓ QA Geologists

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The Industry Challenges

Many mining companies are reducing their capital investment and spending on exploration projects driven by the unstable mining commodity prices coupled with exploration output that doesn't meet their expectations. Moreover, the increasingly competitive mining business growth has forced them to discover resources even in complex geological conditions. However, with all the limitations, acquiring accurate and verified geological data is a perfect start to begin the mining process.

The Solution

MineScape Geology is the robust solution to help you meet these challenges. With its reliable geological database, powerful Geostatistics, an advanced Stratmodel, and the new sophisticated feature of Block Model, MineScape Geology lets you have total control in a geology project.

Incorporating many features, **MineScape Geology** offers exceptional ease-of-use through:
- Intuitive Microsoft-like familiar working environment
- True simultaneous multi-user access to all 3D data and models
- Quick designs with advanced RapidCAD 3D capabilities
- Simple data management with MineScape Explorer to browse projects and manipulate data
- Data integrity through integration of the geological database with modelling and the 3D graphics environment
- A powerful Geostatistics to classify, estimate, and control your mineral resource
- A straightforward process to set up the stratigraphic order through user-intuitive correlation tools
- Accurate complex stratigraphic modelling functionality including reverse faulting and steep dip modelling
- Accurate interpolation through surface-following estimation for block model
- Accurate, fast resource and reserve calculation

MineScape Geology is the world's leading complex stratigraphic modelling capabilities, including reverse faulting, seam splitting, washouts, weathering zones, and more. **MineScape Geology** empowers you to achieve optimal efficiency in your mining business through:
- Allowing input of large data and safely stored in a reliable geological database
- The only solution on the market that utilizes the finite element method (FEM) to model stratigraphic units quickly and accurately
- Seamlessly integrates information flows between geological data base, resource statistical, and modelling process through smarter use of technology and information management systems

MineScape Geology covers
- **Geological Database (GDB)**
- **Geostatistics**
- **StratModel**
- **Block Model**

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MINESCAPE GDB

MineScape GDB is designed to store any drill hole related information, from drilling logs to geotechnical and geophysics data. It is fully scalable, supports remote server locations as well as on individual PC/laptops. GDB provides comprehensive correlation capabilities and contains specialised compositing and washability functions.

KEY BENEFITS

No Hidden Cost

Standard CoalLog database structure and dictionary are available out of the box. The database does not require any implementation time with expensive consultants. Simple data table modifications, such as adding a column or changing validation parameters, are performed via a user interface without the need to call database administrator.

Comprehensive

GDB stores any type of data from multiple projects in a single database. The out of box structure is flexible enough to suit any data storage requirements. It covers drilling data, lithology, quality analysis results, field testing, gas analysis, water flow, geotechnical and geophysical data.

Data Integrity

Validates extensively against dictionaries to ensure the integrity of the database, maintaining uniform corporate and/or statutory standards including CoalLog. The data that does not meet validation criteria is not allowed into the database and is instead stored in a "raw" table that can be reviewed and fixed later. This removes the need of repetitive loading attempts after each data correction.

Data Security

GDB ensures that unauthorized users cannot update the database through an extensive system of user roles, logins and passwords.

Audibility

GDB validates the database against a code dictionary and tracks changes to the database including dictionary and third-party applications. These changes can then be rectified, reinstated or undone.

Graphical Correlation

A comprehensive visual correlation tool that works with data directly stored in the database. Downhole depths are updated graphically using any information stored in the database (geophysics, quality, structural etc.) either for single or multiple holes in sectional view.
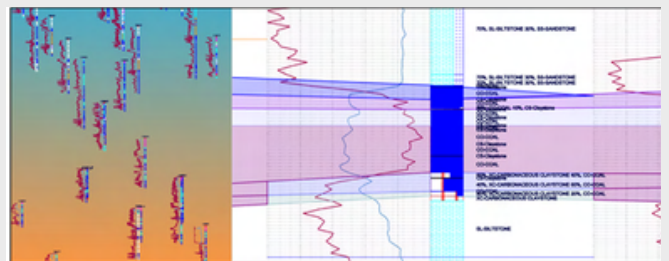
Powerful 3D Visualization

Displays graphical results limitlessly, providing powerful 3D visualisation for presentation to anyone from geologists to mine planners to mine managers.
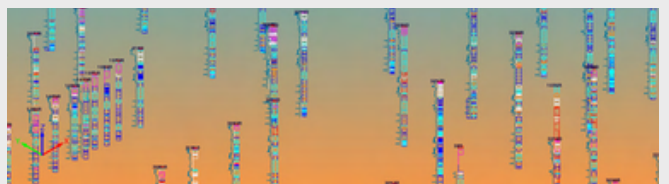
Seamless Interface

Allows true seamless interfacing to other MineScape aps such as Stratmodel, Block Model and Geostatistics, eliminating the need to import data from spreadsheets. Neither an ODBC connection setup or mapping is required. The drill hole data is stored in the database is modelled directly from the database.

Total Reporting Solution

Caters for the widest range of reporting requirements from simple user reports to full statutory formats of accurate and presentable results.

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KEY FEATURES

☑ **Input data -** includes drill hole collar and downhole survey, detailed downhole lithology logs, geophysical and geotechnical data, sample dispatch, coal quality and washability and assay data. Standard CoalLog files import is supported.

☑ **Data validation** - provides extensive validation tools including numeric range, dictionary code, downhole and stratigraphic and rule checking. Modification of data is checked for interval consistency and validity before being applied.

☑ **Audit trail** - provides a full audit trail that tracks database changes and edits as required.

☑ **Graphical log display** - allows the rapid generation of graphical logs, sections and profiles in either a 2D or 3D space.

☑ **Quality compositing** - allows compositing of ply samples across a geological unit, such as a coal seam or a user-defined working section.

☑ **3D cross-plots** - simultaneously displays three analytical values. Cross-plot graphics can be analyzed in MineScape, plotted, or transferred to Microsoft Word or PowerPoint.
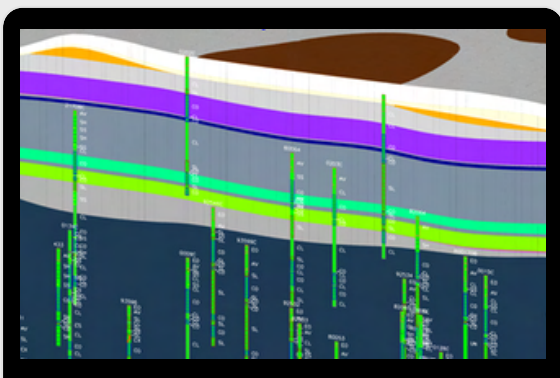
> " In my opinion, GDB is one of the best tools for Coal Geologists. Its validation settings mean that the data can't be uploaded unless it's clean, which means that it can be relied upon in the development of the geological model. I 100% agree that it's a time saver! It also integrates with Stratmodel to allow for stratigraphic and coal quality models to be constructed without the need to import data from spreadsheets and other sources. Everything from exploration planning through to mine planning can be done and stored in MineScape, therefore it has to be one of the most robust solutions for using and interrogating geological data for decision-making in mining.
>
> *- Danique Gerber, Senior Coal Geologist, RPMGlobal*

MINESCAPE GEOSTATISTICS

MineScape Geostatistics provides a set of powerful statistical estimating tools specifically designed for coal geologists.

Users are guided by a wizard through the geostatistical study process to perform classical statistics, experimental variograms, theoretical variograms and Kriging validation. MineScape Geostatistics is integrated into the MineScape Stratmodel and GDB (Geological Database) apps to streamline processes.

KEY BENEFITS

Ease of Use

MineScape Geostatistics workflow is specifically designed to provide a simple and convenient tool for coal geologists, when there are multiple seams and coal qualities at hand to analyse. The wizard interface efficiently guides users through the process, minimizing the time to complete a geostatistical study.
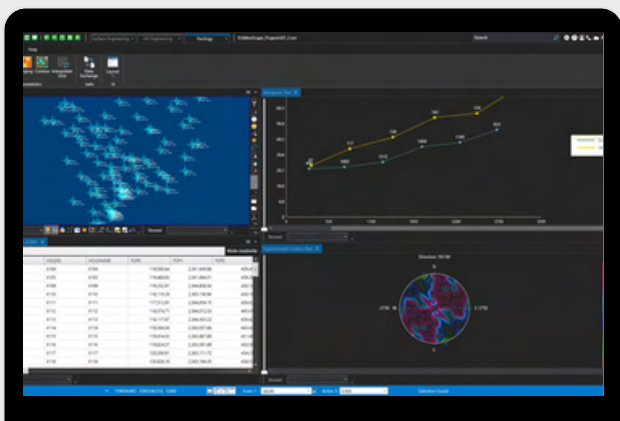
Interoperatability

Integrated with the other MineScape apps to streamline process flow. Integrated graphics allow users to instantly visualize and understand data relationships and check for anomalies and trends.

Comprehensive

MineScape Geostatistics includes exploratory data analysis functionality, experimental and theoretical variograms, kriging estimators, cross-validation and estimation errors reporting.

KEY FEATURES

- ✓ **Integrated -** access data from MineScape GDB and MineScape tables.

- ✓ **Variograms** - develop experimental and theoretical variograms. Adjust variograms through fit operations.

- ✓ **Kriging validation** - perform ordinary Kriging validation with a search ellipse rotated at any angle with standard, quadrant or octant search parameters.

- ✓ **Graphics** - easily produce histograms, Normal Quantile plots, scatter plots, QQ plots and contours of experimental variograms.

- ✓ **Surface grids** - update surface grid values using ordinary or universal Kriging.

MINESCAPE STRATMODEL

MineScape Stratmodel makes mining of complex stratigraphic deposits simple.

KEY BENEFITS

Minimises Loss and Dilution

Just in Australia, damage to the top of coal seams caused by incorrect blast stand-off distances costs coal industry around $3.2 billion a year in lost production. Stratmodel's FEM interpolation provides second to none accuracy in modelling coal surfaces. Geologists have total control over the number of stratigraphic units and horizons, pinchouts, splitting relationships, weathering zones, washouts, and burns.

All Fault Types in One Package

Whether it is a normal or reverse fault, MineScape Stratmodel models them all in one go. No need to spend time on splitting the model into domains and model each domain individually. No matter how many faults there are, Stratmodel will process all faults in one go.

Comprehensive

Uses ALL available information, including vertical or inclined drill holes, digital terrain data, faults and areas defining washouts. Interpreted control can be superimposed in areas of structural complexity that are not well represented by data. In addition to drill holes, the model can use production survey information to ensure the model is always up to date with the production.
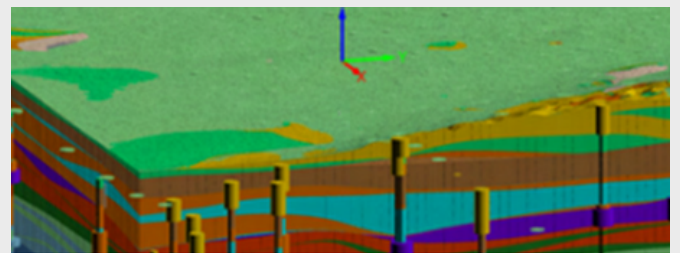
Time-efficient

Enables automatic (one-step) model generation, producing results quickly and efficiently.

Collaboration

Once the model is completed, it can be shared in a true multi-user environment, where everyone in the team can view the model and use it for downstream reserving and mine planning.
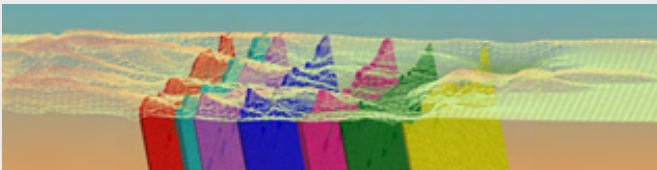
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According to a study conducted by the Australian Institute of Geoscience (AIG), MineScape with its flagman Finite Element Method (FEM) interpolator is the most popular method for modelling coal surfaces. It was used in over 50% of the reported resource statements for 30 biggest ASX listed companies (2013-2019).

KEY FEATURES

- **Stratigraphic rules (schemas) -** based on user- defined "elemental stratigraphy." From these basic units, the most complex stratigraphy, including seam splits and pinchouts, can be progressively defined and updated as deposit knowledge advances.

- **Modelling parameters -** includes a choice of interpolators and modelling parameters, such as search radius, seam thickness parameters both for gently or steeply dip stratigraphy.


- **Drill holes -** stores and displays drill holes as graphical 3D objects or optionally accesses them directly from MineScape GDB (Geological Database). A range of graphical and non-graphical functions allows editing and manipulation of the drill hole data. Drill holes can be vertical or inclined. A direct link to the GDB app is provided.

- **Structural data -** models normal and reverse faults. Faults are stored as graphical 3D objects and supported by graphical functions to assist in the interpretation and positioning of the faults.

- **Geologic interpretation** - controls the occurrence of crop holes and holes not drilled deep enough on a hole-by-hole basis.
Burn and washout - designates interpreted areas on non-occurrence.

- **Model validation** - an array of comprehensive reporting and model validation tools. Displays borehole data versus modelled horizons and includes reporting tools for model accuracy.

- **Modelling** - incorporates an automated process, allowing you to produce results quickly and efficiently. Modelling rules are stored permanently, so the addition of new data makes remodelling merely a push-button process.

- **Graphical output** - stores sections, contour and shaded maps in CAD using real-world coordinates. Output is stored in the same context as input data allowing the model to be directly compared to the source data.

- **Quality/washability** - interpolates quality or grade information into geological or mining units to produce a complete deposit model. Such information can be in situ assays, simulated product assays or "process assay" tables. Product values for different processing options, including coal washability and froth recoveries, can subsequently be determined from these tables. Quality parameters can also be displayed graphically as traces or histograms and contoured.

- **Reserves** - using the Reserves subsystem, stratigraphic and quality models, as well as any MineScape surface, can be accessed directly. Volumes and reserves are calculated for any mining scenario, including dilution and/or losses. These calculations can be used in other MineScape apps.
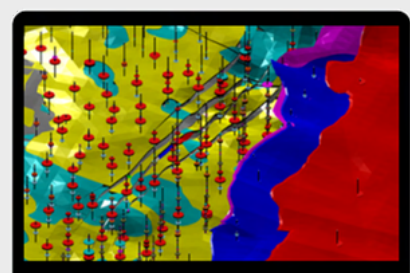
MINESCAPE BLOCK MODEL

The geological bock model is built by progressively introducing geological elements through the loading of physical interpreted shapes or interpolation using material associations and/or zones following with a selection of algorithms. The model can be displayed at any time to validate the model construction process. The completed model becomes the base for reserves and other mine planning work.
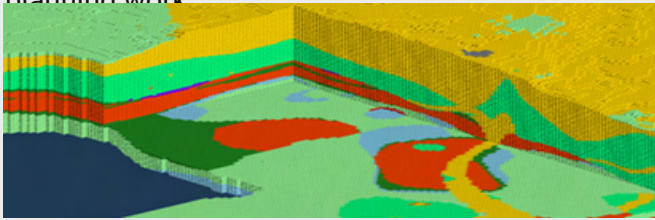
KEY BENEFITS

Accurate
Delivers total control over the model orientation, construction and interpolation, allowing the deposit to be accurately defined and estimated in 3D space.

Comprehensive
Enables you to use all available information, including vertical or inclined drill holes, pit survey, digital terrain data, faults and areas defining washouts. Interpreted control can be superimposed in areas of structural complexity that are not well represented by the data.

Powerful Visualization
Displays graphical results limitlessly, providing powerful visualization for presentation to anyone from geologists to mine planners to mine mangers.

Fully Integrated
Accesses and uses any other MineScape app, including Pit Optimization. Export to third-party optimization tools, such as WHITTLE 4D, is also supported.

Stratigraphic Model to the Next Level
A natural extension of MineScape Stratmodel. Users can easily convert a stratigraphic model into a block model, whenever vertical quality variability requires sophisticated estimation technique.

KEY FEATURES

✓ **User control** - allows user definition of parent block and sub-block creation against any surface, interval (including those produced from MineScape Stratmodel) or wireframe to define geological, quality and mine planning entities. Model construction allows orientation in any X, Y or Z direction (rotate, dip and plunge), block size and shape.

✓ **Construction efficient** - efficiently interrogates the customization of block storage through a unique user-defined index. Sub-celling of models allows economic storage, interrogation and processing of model files.

✓ **User interaction** - provides a model data structure that allows MXL (MineScape Expression Language) and MPL (MineScape Programming Language) to process or calculate block attributes, e.g. products and grade equivalents.

✓ **Interpolation** - incorporates a full suite of industry- standard interpolators including inverse distance, ordinary and universal Kriging (absolute and indicator) and nearest neighbor for block estimation. User-defined sample and block selection parameters are provided as well as trend or surface following interpolation controls

✓ **Interrogation** - fully accessible for interactive graphical interrogation and viewing capability. Models can be sliced and intersected in any orientation to reveal graphical depiction of ore zones, dilution and grade trends against any block attribute. Reports, bar/frequency charts and grade tonnage curves can also be generated.

✓ **Reserving** - classifies reserves by level, material type, polygon, wireframe, and any block model attribute. Fully integrated with MineScape's mine design functionality.

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