



# Mira Geoscience

...modelling the earth

GOCAD® Mining Suite

## Geohazmap Workflow

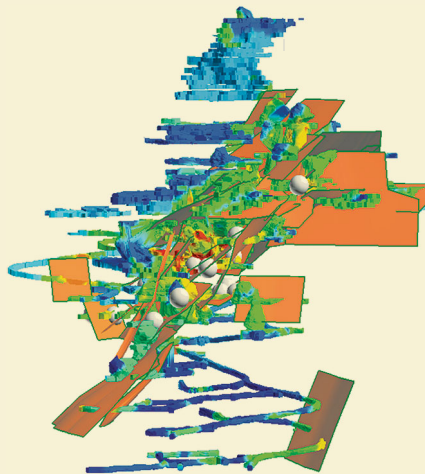
### Earth Modelling Solutions for Mining

#### Summary

Geohazmap Workflow provides a powerful solution for geotechnical hazard estimation and monitoring. Multiple criteria can be combined using a variety of knowledge-driven and data-driven methods to highlight hazardous ground. The workflow interface guides the user through the construction of a hazard model for either underground or open pit operations, and then applies it in either a standard or real-time monitoring mode. Hazard definitions, normalizations, and weightings under the main categories of geology, rock quality, mine seismicity, structure, stress, and geometry are completely user-defined.

The standard workflow interface is supplemented by a new, powerful "dashboard" interface. Geohazmap Workflow works closely in conjunction with Targeting Workflow for both 4D back-analysis and forecast of geotechnical hazard.

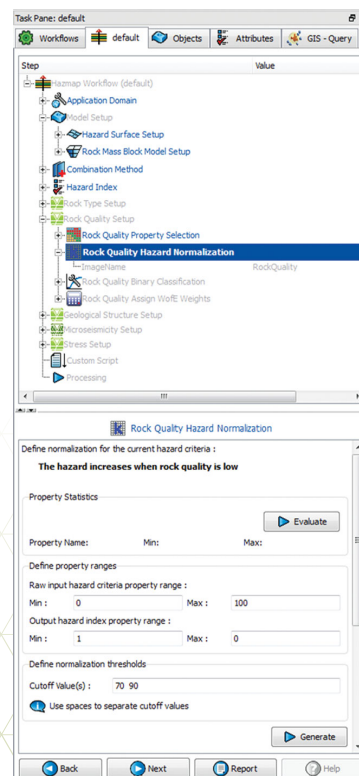
GOCAD Mining Suite Geohazmap Workflow is an extension of Paradigm™ GOCAD, the world's most sophisticated geological modelling platform, adapted specifically for the mining industry and available exclusively from Mira Geoscience.



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**The workflow is designed to guide users through the specification of a quantitative geotechnical hazard model for their site.**

1. Choose the application domain as underground or open pit
2. Select where the hazard is to be evaluated
3. Specify the engineering rock mass block model
4. Choose a knowledge-driven or data-driven approach to combining individual hazard criteria into a total estimation of hazard
5. Select major categories of hazard to include in the model: geology, rock quality, major geological structure, structural fabric (jointing), seismicity, stress, geometry, and support
6. Define or select any number of pre-defined hazard criteria within each category
7. Specify or import normalizations and weightings for each criteria
8. Calculate individual hazard criteria and combine into overall spatial hazard forecast



## Key Features

### Geotechnical Hazard Modelling

- » Modelling of mine infrastructure, geology, structure, and geotechnical rock mass block models make full use of GOCAD's intrinsic 3D surface modelling, solid modelling, and geostatistical functionality
- » Complex relationships amongst geology, structure, stress, and seismic data are handled by the underlying power of object data structures and modelling engine
- » Handles any type of ground failure or hazard for which objective criteria can be developed
- » User defines how criteria are spatially, temporally, and quantitatively related to hazard

### Modelling Approaches

- » Knowledge-driven (fuzzy logic) and data-driven (spatial weights-of-evidence) approaches to combining hazard criteria
- » User-specified hazard criteria, normalization, and combination strategies
- » Quantitative spatial estimation of ground failure probability

### Pre-defined and Custom-defined Hazard Measures

- » Selection of pre-defined hazard criteria such as rock type, rock quality, proximity to structure and structural intersections, fault slip tendency, kinematic planar and wedge failure, microseismic event density and source parameters, stress models
- » Any number of user-specified hazard criteria can be added

### Site Customization

- » A plug-in to GOCAD® that can be rapidly prototyped, developed, and modified on a site-specific basis
- » User interface and computation customization controlled by editable xml and script files

### Powerful User Interface

- » 3D visualization of mine model and hazard linked to tabular and statistical data displays
- » Simple visual and quantitative examination of individual hazard criteria and overall hazard estimation
- » Standard GOCAD® workflow interface and independent dashboard interface provide intuitive and logical user interaction without confusing menus and dialog boxes

### Back-Analysis

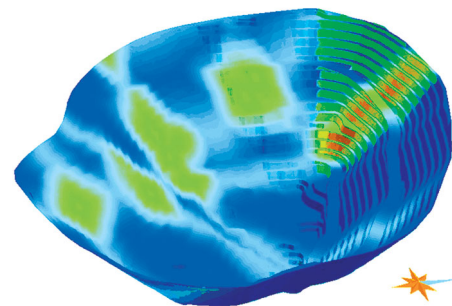
- » Rapid, practical, and quantitative back-analysis of ground failure and other geotechnical hazard has been made possible for the first time
- » Operates in conjunction with the Targeting Workflow module to provide a functional 4D hazard back-analysis and forecasting capability

### Real-Time Monitoring

- » All inputs can be specified as dynamic: availability of new data automatically triggers recomputation and display of the hazard estimate

### Workflow Benefits

- » Increased productivity
- » Ease of use
- » Repeatability
- » Knowledge transfer
- » Audit trail via automatic report generation



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