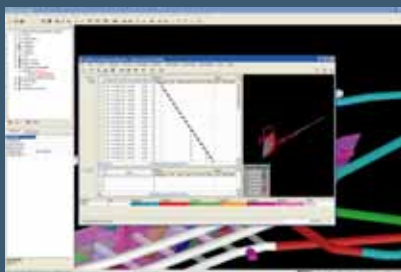
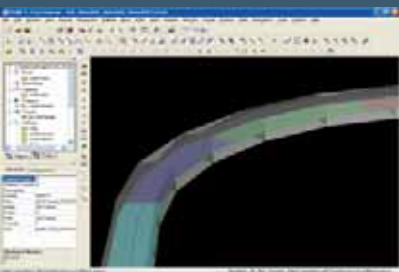


GEMS Configurations



GEMCOM
Mine Production Management Solutions





Mine Production Management Solutions

“At Gemcom, we help our clients create the most efficient mining operations in the world. We do this by partnering with our clients to build innovative and comprehensive Mine Production Management Solutions.”

– Rick Moignard, President and CEO



Gemcom’s mandate is to understand mining inside and out, so clients can improve their business. Working closely with each client, Gemcom’s team combines mining domain knowledge, information technology and process improvement to implement a solution that enables the site to meet consistently high operational performance objectives. It does that by:

- ▶ Improving every-day efficiency by introducing best practices into mining operations and supporting them with management tools, information systems and reliable IT infrastructure.
- ▶ Delivering timely full-value chain analysis and effective support for predictable output.
- ▶ Linking planning and operational data and providing reconciliation and other analytical tools to enable production budgets to be defined and achieved consistently.



Find out how we can help you add measurable value to your mining operation by contacting us at MPMS@gemcomsoftware.com.



GEMS

At Gemcom, we see your operation as a series of linked activities – from drillhole data entry in the exploration phase, through mine design and planning, and on to mine operations and production management. Our goal is to help you maximise value from your operations by providing you



with the right tools and services to carefully manage these activities. Gemcom provides these offerings through its advanced Mine Production Management Solutions, which include GEMS, a

system that offers a broad range of technical applications built to address your mine's planning and production requirements.

GEMS is designed to manage and optimise the identification, quantification and extraction of your orebodies. The system is built around open, industry-standard databases that support both client-server and single-use modes of operation.

With its scalable architecture, GEMS easily fits into your computing environment, interacting with your existing Microsoft applications and enabling you to achieve unprecedented levels of integration and information sharing.

GEMS has a modular architecture that allows you to select the appropriate functionality for your specific operation. Gemcom has created a selection of pre-configured systems, known as GEMS configurations, that encompass a wide variety of common activities. Each configuration is described in this brochure.

At Gemcom, we understand that no two mining operations are the same; each mine presents a unique set of challenges and opportunities. That is why we work with you to tailor a solution that is specific to your requirements. If the examples described do not fit the exact criteria of what you're looking for, rest assured that Gemcom's sales and support professionals will configure a

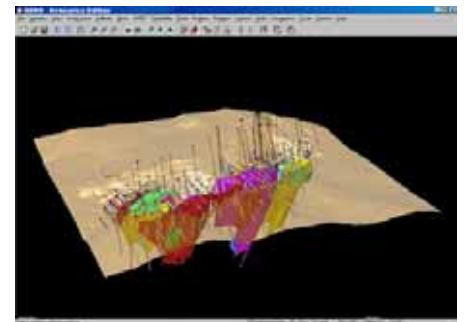
system that is suited directly to meet the requirements of your mining operation.

GEMS ensures that all of the activities in your operation are tightly linked together, giving you a powerful competitive advantage, improved decision-making and ultimately, increased profitability.

GEMS Exploration Configurations

Exploration requires extensive investments in terms of both time and money. The Exploration configuration is designed to help you make the most of that investment by providing you with secure, effective data management, display and analysis. Ultimately, GEMS helps you turn information into opportunity.

The activities undertaken in the exploration process are the most varied and the most subject to change, as projects mature from grassroots exploration to detailed resource evaluation.



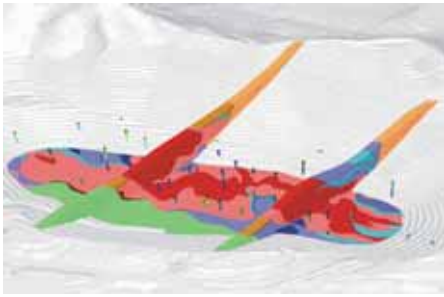
In order for you to secure the right application that will meet your specific needs, GEMS offers scalable options geared towards different levels of exploration as it builds upon the previous system. Spanning a range from basic to advanced, all systems harness GEMS' powerful 3D graphics environment.

The **GEMS Field Unit** is a data manager and graphics display system. The Field Unit offers the on-site geologist or geoscientist a simple, inexpensive way to enter data, print reports and plot sections and plans that show exploration sampling data.

GEMS Essentials allows you to merge your exploration information into a single database, conduct statistical analyses to assess and manipulate your data, and plot maps and sections. GEMS Essentials features 3D-rendered viewing capabilities for topographic, drillhole, traverse, polyline and point data.



When you need to calculate reserves, you need the tools in **GEMS Exploration** for a more in-depth analysis of your deposit. You can composite sample intervals, interpolate lithological outlines using GEMS' powerful polygon tools, and perform classic polygonal resource generation and reporting.



GEMS Advanced Exploration caps the Exploration series. This is a fully-integrated data management, analysis and 3D geological

modelling software system that contains state-of-the-art 3D modelling tools combined with visualisation and analytical volumes. GEMS Advanced Exploration lets you actually see the ore deposit and determine, with confidence, the extent of your orebody.

When the time comes to do a feasibility study or a long-term mine plan, **Resource Evaluation** provides the tools that you need. With its full range of block model creation and estimation techniques, this configuration makes it both easier and faster to assess economic potential of either open pit or underground mines. Resource Evaluation also includes all the features of GEMS Exploration and can be customised for any metal or mineral.

At Gemcom, we understand the importance of accurate, unbiased block models of your ore deposit. That's why we offer the most powerful and flexible geological and grade modelling system available today.

Using a variety of methods, from simple polygons to highly sophisticated 3D solids modelling, GEMS allows you to create the best possible geological model. To model grade values, choose from block models or grid models for the solution that best suits your deposit. Next, take advantage of the complete set of grade estimation methods, such as inverse distance and ordinary or indicator kriging to interpolate multi-element values. You have full control of the interpolation process to account for anisotropy, geological domains and anomalous grade values.

Gemcom's unique, volumetric process, known as

"needling," gives your project an immediate advantage. Needling differentiates the proportion of each solid as it intersects the blocks of a block model, providing you with weighted tonnage and grade estimates for each rock type. In almost no time at all, you can produce accurate and comprehensive reports of your modelled resource.

For open pit design, GEMS also interfaces seamlessly with **Whittle** pit optimisation systems, allowing you to determine the most strategic design for the highest return on your investment.

Providing the foundation for this power, GEMS' multi-user open database makes data management and analysis easy and efficient. Everyone on your team has simultaneous access to project information, no matter

where they are. Because you are always working with the most current data, you can rely on your output and analyses for complete accuracy, every time. For ultimate flexibility, you can access the open database through any other Windows-based program, making reporting, graphing and information-sharing simple and effortless.



GEMS makes it easy to bring your 3D graphics into any Windows document, enabling you to create reports and presentations with both detail and impact.

GEMS Mine Design Configurations

Gemcom knows your primary concerns when it comes to mine design work: profitability and safety. The mine design configurations available in GEMS, each extensions to the powerful Resource Evaluation configuration, help you to protect both your investment and your people. All data is stored and linked in the database to ensure a secure and organised IT infrastructure for your entire mining operation.



In order for any mine design to satisfy the strategic goals of your company, you have to be confident that the systems you are implementing provide a worthy investment. Let GEMS' seamless interfaces with optimised Whittle pits and block models guide your designs as you go. You'll find that our rigorously tested, tried-and-true blend of manual processes and appropriate automation give you the freedom to quickly and easily design and evaluate many variations of the mine. Even the most complex mine design project becomes a manageable task with our powerful CAD tools, and our flexible reporting lets you know you're on the right track.



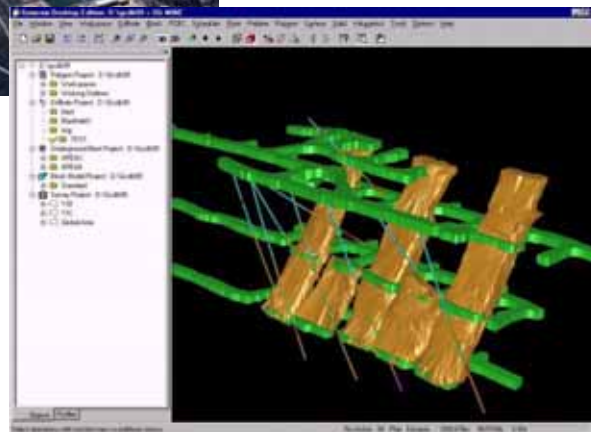
GEMS Mine Design configurations for open pit mines

add powerful graphical pit design tools and mine planning features to an already outstanding system. Using optimised pit shells from Whittle or quick pits from GEMS' design tool, you can easily create detailed pit designs.

Once you incorporate your pit designs into surface topographies and evaluate them for mining reserves, you can use the common options, such as short-term and long-term planning tools, to map out your mining strategy. To ensure that your plan is practical to mine, use the optional Go Simulator application, which comes complete with equipment fleets, to simulate actual mining. In addition, Go Simulator works closely with the grade control tools, making information flow in a streamlined, straightforward path.

GEMS Mine Design configurations for underground operations

eliminate the hassles that can often arise when laying out underground mine designs in complex 3D formats. For underground mines, you can use the powerful 3D solids modelling tools to create comprehensive development layouts and stope designs.



GEMS includes polyline creation and editing tools ideal for positioning development centre lines, while its solid modelling tools make it simple to convert them to a complete 3D model of your mine. Following these actions, you can then use the solid modelling Boolean operations for creating accurate stope designs and layouts. The needling process in volumetrics and resource reporting will efficiently and accurately determine stope volumes, dilution and mineable reserves.

When it comes to safety, there is too much at stake to take costly gambles. You need to be able to know how your designs will interact with previously mined out areas, and easily spot any potential problems. You need to identify the areas of structural weakness, know the limits of pit wall slope angles and ramp gradients, know when excavations are dangerously close to each other, or when drilling comes perilously close.

Both GEMS Mine Design Editions are built around a fully-integrated 3D graphical environment that allows you to see what you need to make such vital decisions regarding your operation's safety.

GEMS Mine Production Configurations

In the production environment, GEMS lets you control the essential processes that make the difference between a cost-effective, productive operation and one that under-performs and is expensive. Using the power of our two GEMS Mine Production Editions and the computer network, you can accurately plan and monitor the day-to-day progress of all aspects of ore extraction.

Gemcom recognises that your production data is the key to a successful operation, and that the collective value of your production data is greater than the sum of its parts. That's why GEMS offers your staff the ability to easily and reliably share data throughout your network, greatly enhancing the validity of your information.



Additional controls and functionality can be achieved by employing a Gemcom mine production management solution that delivers the production information you need—when you need it—in order to make sound business decisions. This solution can be easily integrated with all of the other mine production tools available in GEMS, and can be tailored to meet your specific mine requirements.

GEMS Production Configurations for open pit mines manage every aspect of production from blasthole data management to surveying grade control, and reconciliation. The powerful database handles single and multiple bench blastholes with ease, with tools for importing sample data from multiple sources. The standard polygonal and block modelling tools in GEMS form the key components of a flexible grade control system designed to maximise your extraction of ore. This configuration also interfaces with Whittle.

Underground Production configurations are customized for production and provide detailed stope design tools and surveying facilities



The underground *Blast Ring Design* tool has been written in conjunction with several major underground mining operations to provide your engineers with state-of-the-art ring blast pattern planning and layout tools. The Blast Ring design integrates tightly with our stope design and 3D solids modelling, ensuring that your designs are accurate and up to date.

Mine Production configurations are thoroughly integrated with all the other Gemcom configurations. Because

Gemcom recognises the benefits of shared information, and reconciliation of your mine plans against actual mining progress, the ease of information flow throughout your organisation is always at the core of our system design. Your ability to react quickly to changing situations, based on current and reliable information, is greatly enhanced with the use of Gemcom's mine production management solutions.



Some Specific GEMS Tools

Up-to-date data is vital to the successful performance of production and planning departments. It is equally important to be confident that your data will reach its destination

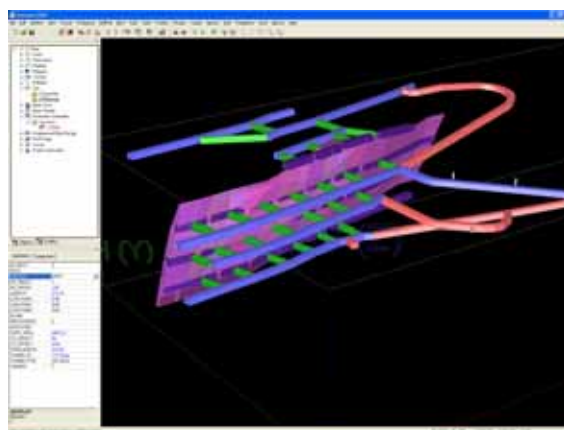
in a reliable and timely manner. Using GEMS' **Survey** application, you can transfer data directly between GPS or Total Station data recorders, making downloading the latest survey information a simple task.

GEMS' status map management and data reduction facilities fit seamlessly with the mine planning and modelling features, so reconciliation of as-mined against planned designs is quick and easy.

To help you measure underground mining progress, GEMS provides a comprehensive survey toolbox, and the best interface to the **Optech Cavity Monitoring**

System (CMS), an advanced laser-based autoscanning system that provides efficient and accurate measurements of dangerous and inaccessible cavities.

Gemcom's suite of software has been extended to cover production scheduling of all mining equipment and associated activities. With the introduction of new production scheduling capabilities available in the GEMS **Go Simulator** application, Gemcom has linked the





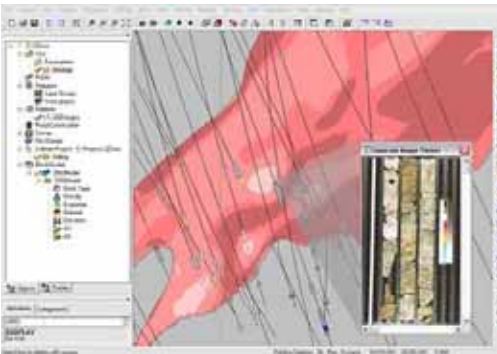
mine planning and scheduling processes within a single package. With this tool, you'll be able to eliminate the frequent need to transfer data between short-term planning and scheduling applications, reducing the risk of errors and increasing your engineering productivity. Go Simulator also comes complete with a new setup wizard, improved workflows, and on-screen animation, all designed to help improve your scheduling processes.

other mine departments, meaning that nothing is overlooked, and that you can plan your blastholes accurately and with confidence.

Gemcom's recent integration with elements of **GDM** technology, developed by France-based Bureau de Recherches Géologiques et Minières (BRGM), allows users to create detailed strip logs from the GEMS drillhole data.



Fully integrated into the GEMS 3D graphical environment, the **Advanced Pit Design** application uses polyline editing tools and several specialised operations for the creation of detailed pit designs. You can watch in 3D as the application creates the pit to your exact specifications. It will then analyse the pit to detect any problems with the design, showing



you exactly where they occurred so that you can make any necessary changes. In many cases, Pit Design will correct the errors for you, simplifying the process and improving the accuracy of your designs.

Using the **Surface Blast Design** tool, users can specify blast pattern layouts and easily convert the layout to drillholes. The drilling depth can be controlled by pre-defined surfaces, and the hole collars can be "pressed" onto existing surfaces for elevation control.

The **Ore Control** tool allows grade control engineers to effectively use blasthole assay data and polygons to manage the daily operational grade control requirements of their open pit mine.

Included in all of the GEMS configurations, **PlotMaker** offers an intuitive interface with dockable toolbars and an "Object Properties" feature that lets you customise the properties of any object. PlotMaker is compatible with standard Windows-compliant objects, allowing you to embed simple objects, such as text blocks and Bitmaps, through to more complex files, such as Excel spreadsheets and Word documents, in your plot. PlotMaker will provide you with the right tools to quickly and professionally annotate your plots.

The **Short-term Planning and Grade Control** application, users are provided with a set of simple, quick, and flexible methods that allow them to design mining plans to meet their volumetric and grade objectives. By providing access to up-to-date survey and grade control data, this application provides users with the utmost control of their daily production activities.



Overlooked intersections between drillholes and excavations, like crosscuts or raises, can lead to hazardous blasting effects. The **Drillhole Excavation Warning System (DEWS)** helps planning engineers identify such potential hazards *before* they occur. Completely integrated into GEMS' central SQL database, DEWS allows for real-time integration with data from

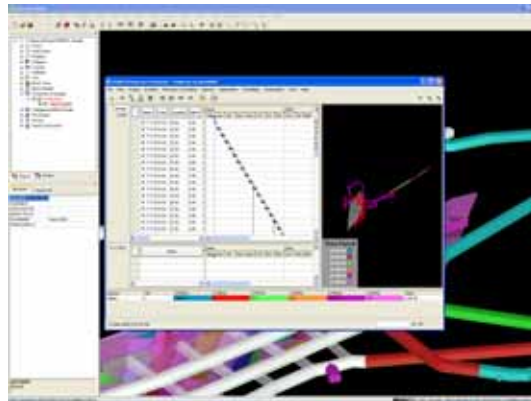
G E M S ' **W e b - Enabled Reconciliation** brings together all of the information from your short-term planning, long-term



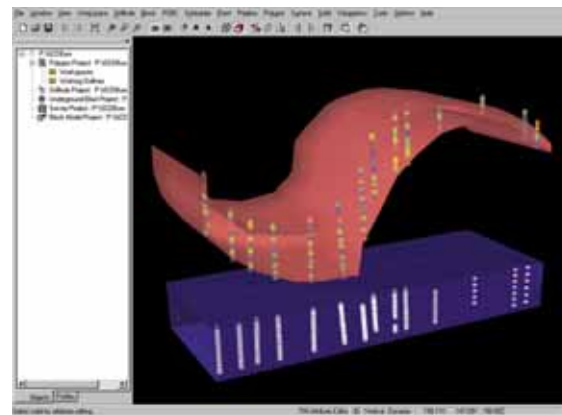
planning and actual production, allowing you to compare your planned to as-mined results. What's more, GEMS' Reconciliation tool can be used wherever you have an Internet connection, bringing greater convenience to your reconciliation processes.

Long-Term Planning

tools allow mine planners to first set mining targets, and then test scenarios to find the best way to mine over multiple working periods. Using both 2D and 3D functionality to interpret block model values or mining areas, planning becomes fast and easy.



Developed to handle deposits in which folding or faulting is relatively gentle, **Unwrinkle** temporarily "flattens" the deposit in order to maintain the correct spatial relationship between points. Based on triangulated surfaces developed from the actual data points, the application transforms the points into a regular space for analysis and interpolation purposes, and then back transforms the estimates into original space.



Deposits that are controlled by complex folding and/or faulting present unique challenges in terms of modelling, because the actual location of data points often does not reflect their true spatial relationship. Based on a flexible 3D framework construct, the **Unfold** application "unfolds" the data points into a transformed space in which the correct spatial relationship is maintained for analysis and interpolation purposes, and then back-transforms the estimates into original space.

At Gemcom, we know that block caving offers its own unique set of challenges. GEMS provides **PC-BC**, a rich set of applications that offer block-caving operations the tools they need to effectively design, plan, and

manage their daily operations. Designed specifically for block caving, PC-BC offers a computerised look at initial drawpoint coverage, mineable reserves calculations, sensitivity analyses, visualisation, and scheduling. The system is fully integrated into the GEMS suite of geological and mine design software, and provides an abundance of design tools and a powerful graphical environment.

GEMS Production Scheduler

Powered by MineMAX Technology

With this interactive Gantt-Chart based production tool, users have the ability to rapidly generate accurate mine production schedules to manage production.

GEMS Production Scheduler ensures your production plans are as accurate as possible by utilising the following information to create production schedules:

- Starting layout of voids and in-situ material
- Detailed equipment and available information
- Thorough information about the order of activities
- Specific details about the effect of activities on material movements and transformations
- Meticulous revenue and cost information

Tunnel Object

Current tunnel design techniques, regardless of the software that support them, are labour-intensive. The manual and repetitive cut-and-paste tasks required to generate tunnels can lead to economically inferior designs.

Tunnel Object automates much of this design process, ensuring your designs are as effective as they can be.

GEMS Configurations

Exploration

Mine Design

Mine Production

- Complete
- Basic

	Field Unit	Essentials	Exploration	Advanced Exploration	Resource Evaluation	Open Pit Planning	Open Pit Mine Planning	Underground Planning	UG Mine Planning	UG Production Planning	Open Pit Mining	Underground Planning	PC-BC Block Caving	Open Pit Caving	Underground Survey	Ore Control	Short/Long-term Planning	Mine Planning	Open Pit Geology	OP Production Control	UG Geology	UG Production Control
Toolbox Modules																						
Core	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Workspace	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Drillholes	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Block Modelling				○		○																
Points		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Polylines		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Polygons		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Surface Modelling			○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Solid Modelling			○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Open Pit Tools																						
Layout Operations					○					○	○		○	○	○		○	○				
Pit/Ramp Design					○	○					○						○	○				
Blasthole Design						○					○						○	○				
Whittle Interface					○	○					○						○	○	○			
Material Management (Ore Control)											○									○		
Survey Maps																						
Survey											○		○	○				○		○		
Underground Tools																						
Survey Maps																						
Survey											○											○
Blast Ring Design										○		○										
Optech CMS Interface											○											○
Drillhole Excavation Warning System										○												
Footprint Finder																						
LSQ Toolbox																						
Lindo Solver Option																						
Tunnel Object																						
Common Applications																						
Analysis	○	○	○	○	○						○	○							○	○	○	
Plane Plot Creation	○	○	○	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○	○
Volumetrics				○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○	○
Cut Evaluation					○	○	○	○	○	○	○	○					○			○		
2D Planning					○	○	○				○						○					
3D Planning					○	○		○	○	○							○					
Go Simulator						○																
Unwrinkling																						
Unfolding																						
Reconciliation Reports																						
Mine Roads																						
Volume Depletion Reporting																						
PC-BC Block Caving													○									
Multiple Grade Elements																						
Volumetrics for Multiple Surfaces																						
Production Scheduler																						
GDM Strip Log																						



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