



3DEXPERIENCE®

GEOVIA WHITTLE

THE WORLD'S MOST TRUSTED STRATEGIC
MINE PLANNING SOFTWARE



TRUSTED RESULTS YOU CAN BANK ON

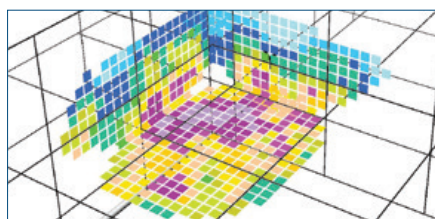
BENEFITS

- Understand the potential value of the deposit.
- Establish the economic viability of the deposit and options for capital investment and development strategies.
- Identify preferred development strategy, capital investment, expected NPV and optimal extraction sequence.
- Easily evaluate different scenarios, options and tradeoffs to produce robust and value-driven strategic plans.
- Determine strategic direction for the mine; cut-off grade and optimized cut-off grade; mining areas and extraction sequence per period; and development strategies for new mines and push backs.
- One stop shop: Integrated toolset across pit optimization, strategic mine planning and end-to-end mining value chain optimization.

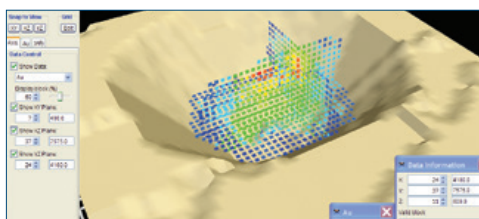
When exploration and mining companies need to evaluate the financial viability and the optimal mine strategy for a deposit, they turn to the industry leading strategic mine planning solution—GEOVIA Whittle. Companies depend on Whittle to help them determine their investment strategy and to deliver robust mine plans that maximize profitability by taking into account real mining constraints. Delivering trusted results, the software is used across the mine value chain in scoping, feasibility, life-of-mine scheduling, and in the ongoing re-evaluation of mine plans throughout the production phase to closure.

Pit optimization is the vital first step in unlocking the full economic potential of your open pit operation. Beyond that though, Whittle provides a complete and integrated suite of tools for mining value chain optimization, tools which enable significant increases in project value over and above pit optimization. With Whittle, you have all the strategic mine planning capabilities you need to achieve holistic mining optimization: strategic scheduling; detailed cost, price and recovery modelling; stockpiles; multiple mines; blending and cut-off optimization; and most recently simultaneous optimization, a ground breaking tool and methodology that delivers a step-change in NPV improvement over previous approaches.

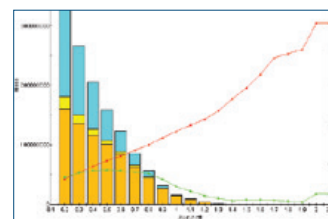
PROJECT PHASE	USAGE	BENEFITS
Exploration	Economic evaluation	<ul style="list-style-type: none"> • Understand the potential value of the deposit. • Target areas for future drilling.
Scoping	Economic evaluation	<ul style="list-style-type: none"> • Establish the economic viability of the deposit and options for capital investment and development strategies. • Examine sensitivities and assign resources accordingly for future studies.
Pre-feasibility, feasibility	Economic evaluation/ Strategic mine planning	<ul style="list-style-type: none"> • Identify preferred development strategy, capital investment, expected NPV and optimal extraction sequence. • Calculate sensitivities to develop risk reduction strategy. • Ascertain final reserve statement for the deposit.
Bankable feasibility study	Economic evaluation/ Strategic mine planning	<ul style="list-style-type: none"> • Analyze expected return on investment. • Analyze sensitivities and investment risk. • Consider multiple scenarios for reducing risk.
Production	Strategic mine planning/ Economic re-evaluation	<ul style="list-style-type: none"> • Determine strategic direction for the mine; cut-off grade and optimized cut-off grade; mining areas and extraction sequence per period; development strategies for new mines and push backs; and assess alternative processing strategies. • Re-evaluate mine plans in response to changing conditions. • Calculation of annual reserve statement.



Block model showing copper grades.



3D viewer enables validation of results and querying of individual block attributes.



Maximize NPV across your operations.

“Whittle allowed us to find scenarios that showed a clear improvement over the base cash flow and also to see where production targets may be reducing cash flow. We were able to quickly select and re-evaluate internal cutbacks.”

— Lucette Hugo, Chief Strategic Planning Engineer, Gold Fields Ghana

Whittle provides the ability to rapidly evaluate many alternatives to ensure that variations from the expected are considered and potential deposit value is uncovered.

By choosing Whittle, you are aligning with the industry leader: the world's top open pit mines use the software because it delivers results they can bank on. For over 30 years, Whittle customers have extracted maximum value from their deposits by using trusted mine planning processes to optimize and plan open pit mines.

WHITTLE: SOLUTIONS TAILORED FOR YOUR NEEDS

As a Whittle customer, you can select the capabilities relevant to your use case and needs whether that be primarily around pit optimization and economic evaluation or strategic mine planning and scheduling.

The unique structure of projects in Whittle promotes the analysis of alternatives to attain the best possible strategy for your mine. Whittle projects are easy to manage as you are guided through key planning functions, starting at pit optimization through life-of-mine scheduling, to sensitivity analysis and final NPV calculations, all in an integrated workflow.

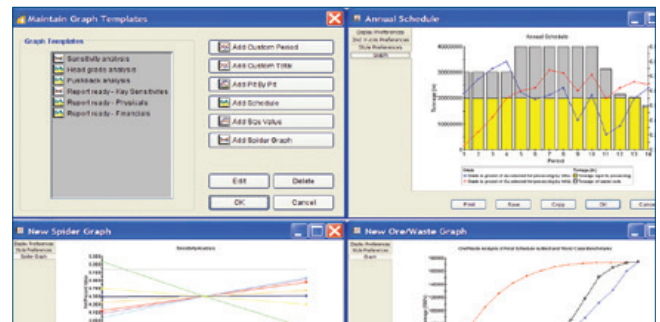
Unique ability to organize multiple analyses within a single project, saving time, promoting repeatability of processes and ensuring all information is easily accessible.

Pit optimization and economic evaluation

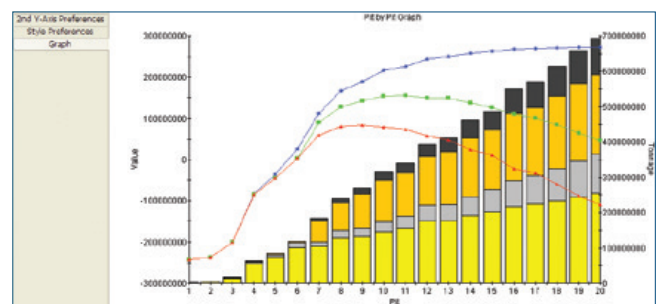
GEOVIA Whittle, the de-facto standard and world leading pit optimizer, generates optimized pit shapes (nested pit shells) using the Lerchs-Grossman (LG) or the Pseudoflow algorithm considering physical characteristics of the mineral deposit (resource block model), cost/price scenarios, geotechnical constraints (maximum pit slope angles) and other operational constraints.

Whittle offers an unparalleled toolkit for high level economic evaluation of new projects and operating open pit mines through an easy-to-use project management framework. This framework provides a complete audit trail of the design process and a unique means of communicating the details of the design amongst peers, and throughout the mine organization.

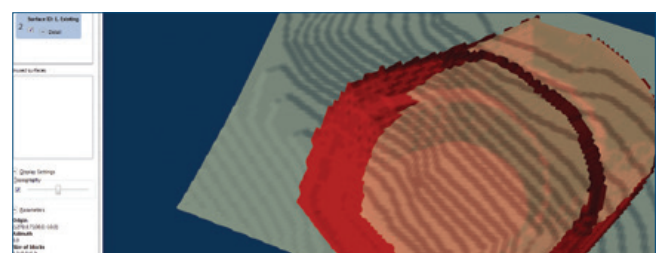
Whittle provides essential functionality for pit optimization and benchmark scheduling, including: model import; reblocking functionality; slope modelling; best and worst case schedules and visualization; reporting; and export of results.



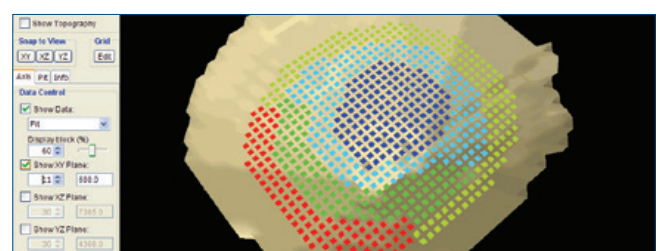
Standard graphs and templates promote analysis.



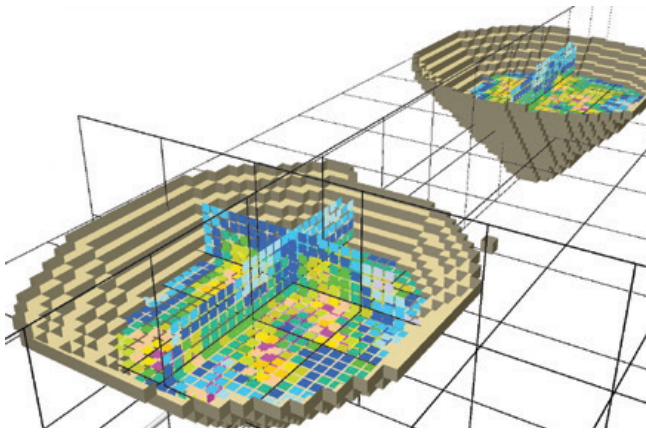
Pit-by-pit graph shows increasing ore and waste tonnages for different final pit options, along with expected NPV for different schedules.



Schedule directly from shells created in any Geology and Mine Planning System using Milawa and/or Simultaneous Optimization.



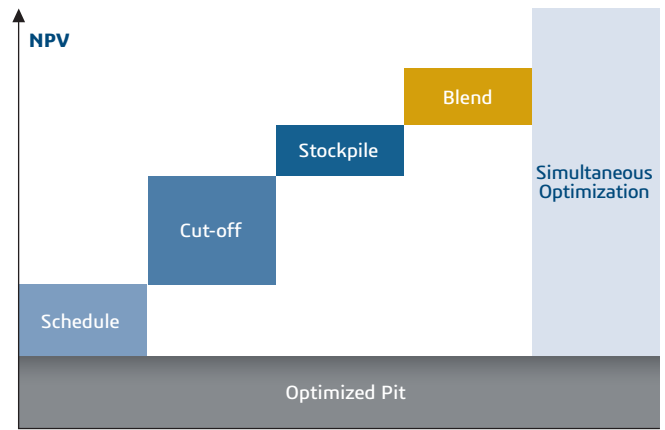
Create NPV practical push backs in a single step.



Multiple pit schedule visualization showing copper grades with the Multi-Mine module.

Strategic mine planning/Life of mine scheduling

When determining project life, ultimate pit size and extraction strategy, mining companies use NPV as a key project indicator and decision making tool. To accurately calculate NPV, realistic mine schedules need to be developed. Whittle's strategic mine planning or life-of-mine scheduling capabilities provide practical push back creation, determination of the ultimate pit and automated scheduling routines, as well as multi-mine capabilities where required to model realistic deposit scenarios.



Simultaneous Optimization achieves greater overall NPV in a single step than multiple optimization mechanisms applied sequentially.

Mining and schedule optimization—simultaneous optimization

Simultaneous optimization is the latest advancement in strategic mine planning. Simultaneous optimization determines highest NPV life of mine schedule (for a single pit or even mines with multiple pits) through simultaneous optimization of pit phases, cut-off and stockpile strategy including optimization of downstream processing paths and capital expenditure. Simultaneous optimization can unlock significant added project value over and above what has been possible previously (in GEOVIA Whittle and elsewhere), all by simultaneously optimizing a wider parameter set across the entire mine enterprise to maximize project NPV.

For more information email GEOVIA.Whittle@3ds.com or visit www.3ds.com/products-services/geovia/products/whittle

Our 3DEXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the 3DEXPERIENCE® Company, provides business and people with virtual universes to imagine sustainable innovations. Its world-leading solutions transform the way products are designed, produced, and supported. Dassault Systèmes' collaborative solutions foster social innovation, expanding possibilities for the virtual world to improve the real world. The group brings value to over 210,000 customers of all sizes in all industries in more than 140 countries. For more information, visit www.3ds.com.

