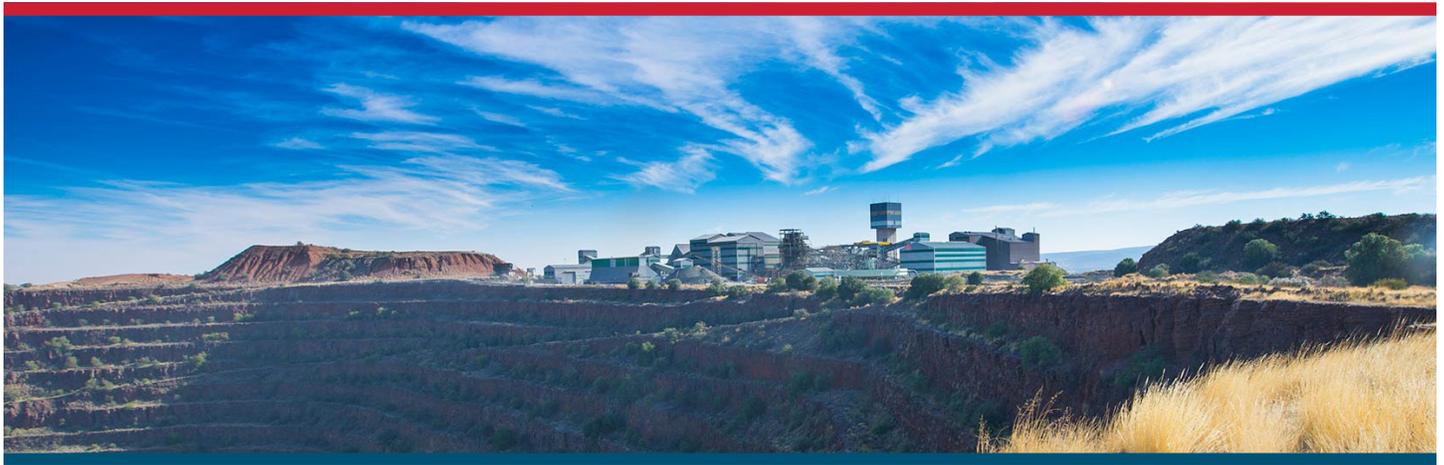


Case Study



Petra taking the next cut



In 1902, the Cullinan Kimberlite pipe was discovered. Shortly afterwards (in 1903), open pit mining commenced at this 'Premier' mine site (as it was then known). Since 1946 ore was extracted by means of underground mining. Ore varied between 2 and 5 Mt per annum and ore treatment between 2 and 7 Mt per annum. Cullinan boasts world-class diamond resource of 199.6 mcts .

Marking the mines centenary celebrations, the Premier mine was renamed to Cullinan, linking it to the illustrious heritage of the Cullinan diamond.

Discovered here in 1905, the Cullinan diamond provided the two main polished diamonds of the British Crown Jewels, the 530 carat Great Star of Africa and the 317 carat Lesser Star of Africa.

In July 2008, Petra Diamonds led a consortium which acquired the Cullinan diamond mine from De Beers Consolidated Mines. Petra Diamonds embarked on an expansion program at Cullinan mine to take annual production from 0.8 to 2.2 mcts by FY 2019 .

The company started ramping its Run of Mine (ROM) tonnage in 2014 and is expected to be in full production, reaching an excess of 50 cpht in 2019.

OVERVIEW

Challenge

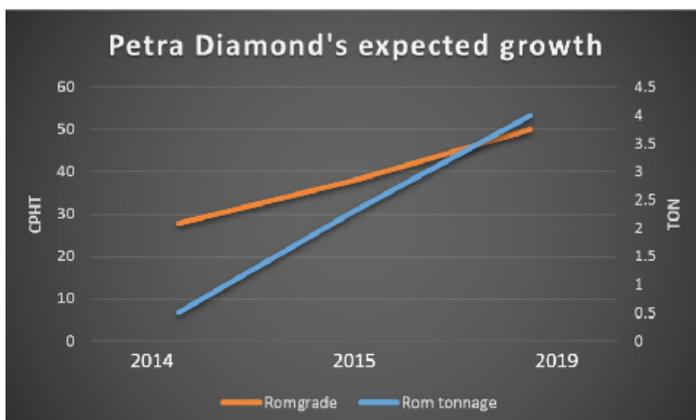
- The inability to predict the impact of mining and development on existing mine infrastructure.
- The effective implementation of technologies designed to simulate the stress effect of scheduled mining activities.

Solution

The MineRP in One solution allows for the amalgamation of data created or recorded by the various mining technical disciplines in disparate solutions into a single, spatially enabled database (SpatialDB). SpatialDB empowers the user to turn the amalgamated data into information through analysis and 3D visualisation.

Key benefits

Through plan versus actual & exception reporting, MineRP in One allows Petra Diamonds to actively respond & implement remedial actions to stay on course. The solution provides for planning, survey and geology data to be accessed and utilized in a simple spatially integrated environment.



Petra Diamond's Portfolio

Petra Diamonds' portfolio consists of four underground kimberlite mines and a large, high-volume open cast kimberlite mine. Cullinan contains a world-class diamond resource of 199.6 Mcts.

Petra Diamonds has embarked on a capitalexpansion program to open up new mining developments. The aim of these programs in underground operations is to take the next 'cut' by deepening and establishing new block/sub-level caves in undiluted kimberlite.

Before	After
12 fragmented Mining Technical Solutions	1 integrated reporting solution
No 3D Visualization capabilities	3D Visualization capabilities
Fragmented data from various the disciplines and sources	Amalgamated Data allows for "one source of the Truth"
Laborious data gathering exercise for reporting of Key Performance Indicators	Automated, Targeted, In time, Visual, Discipline, and Line Management specific reporting of Key Performance Indicators
Limited Collaboration between disciplines	Access to relevant data "in time data" better informs all the disciplines



PetraDiamonds

The C-Cut Phase 1 expansion program at Cullinan is designed to develop a new block cave on the Western side of the orebody to access the higher grade BAW and AUC south areas of the orebody. (See the diagram on the next page) This expansion will also involve a large tailings operation. Although the current life of mine plan extends to 2030, the major residual resources at the mine indicates an actual life of mine with a 50 year excess.

It is widely known that using standard rules of thumb to design a sub-level or block cave at depth might yield great results on paper, yet the industry track record in terms of delivering these plans is poor. One of the reasons for this phenomenon is the inability to predict the impact of mining and development on existing mine infrastructure.

New technology has been developed to simulate the geotechnical effect of planned mining activities on existing mine infrastructure, allowing mines to create more stable mine designs. Given the potentially disastrous effect of geotechnical instabilities associated with inappropriate mine designs, it is crucial that these designs are accurately implemented.

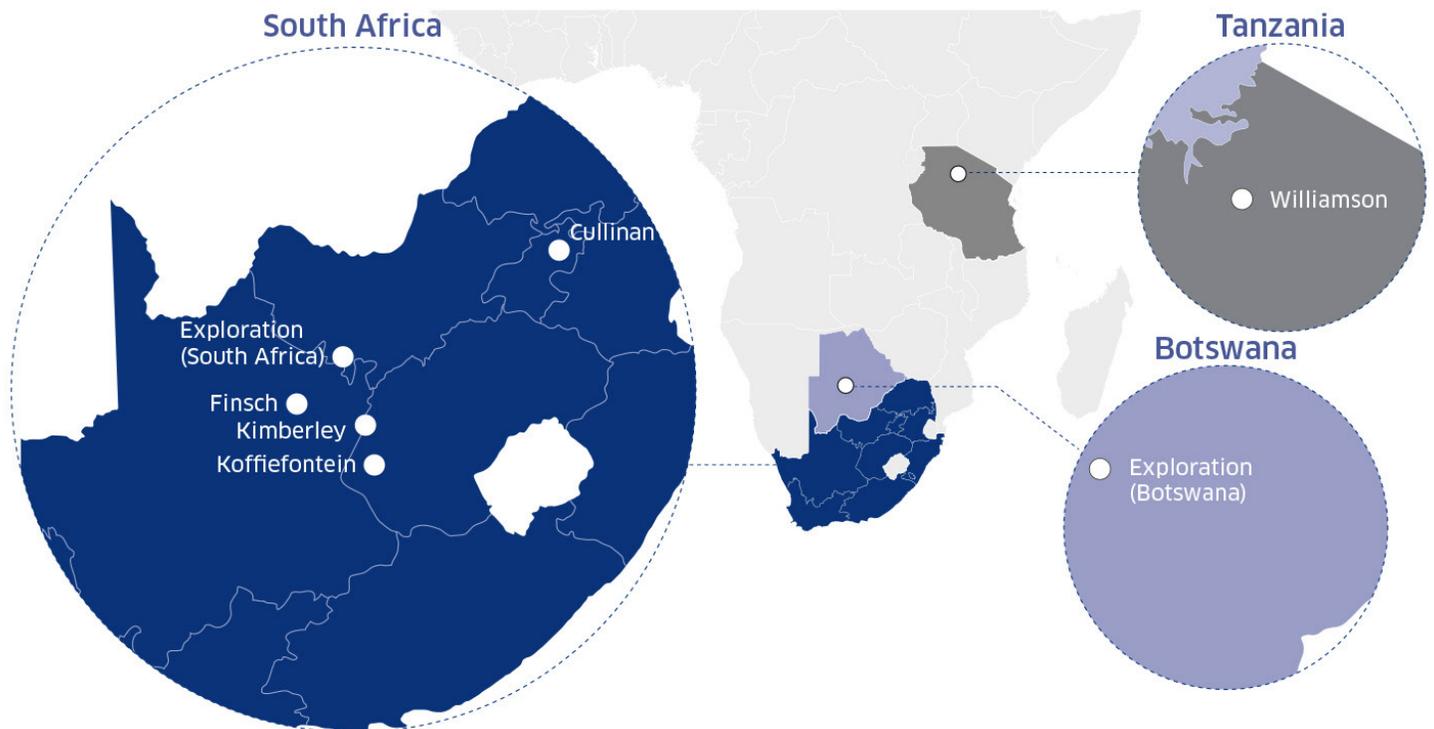
Petra Diamond's group Technical Services Manager, Alex Holder, recognized the need for an integration solution to successfully address this problem. The need to track multiple mining activities, sequenced on various elevations, necessitated the company the use of specialized tools and systems in order to implement their stable mine designs flawlessly.

After evaluating different integration Mining Technical Systems (MTS), Alex decided to implement the MineRP in One Solution to plan and monitor the design and execution of the new underground development.

The MineRP in One solution integrates data from disparate technical solutions assisting the company to monitor and measure the mine plan.

The key solution features that convinced Alex were:

1. Open Standard Spatial Database
2. Ability to analyse all Mining Technical data and the 3D visualization thereof.
3. Ability to bridge the gap between Mining Technical commercial information domains.



THE PROJECT

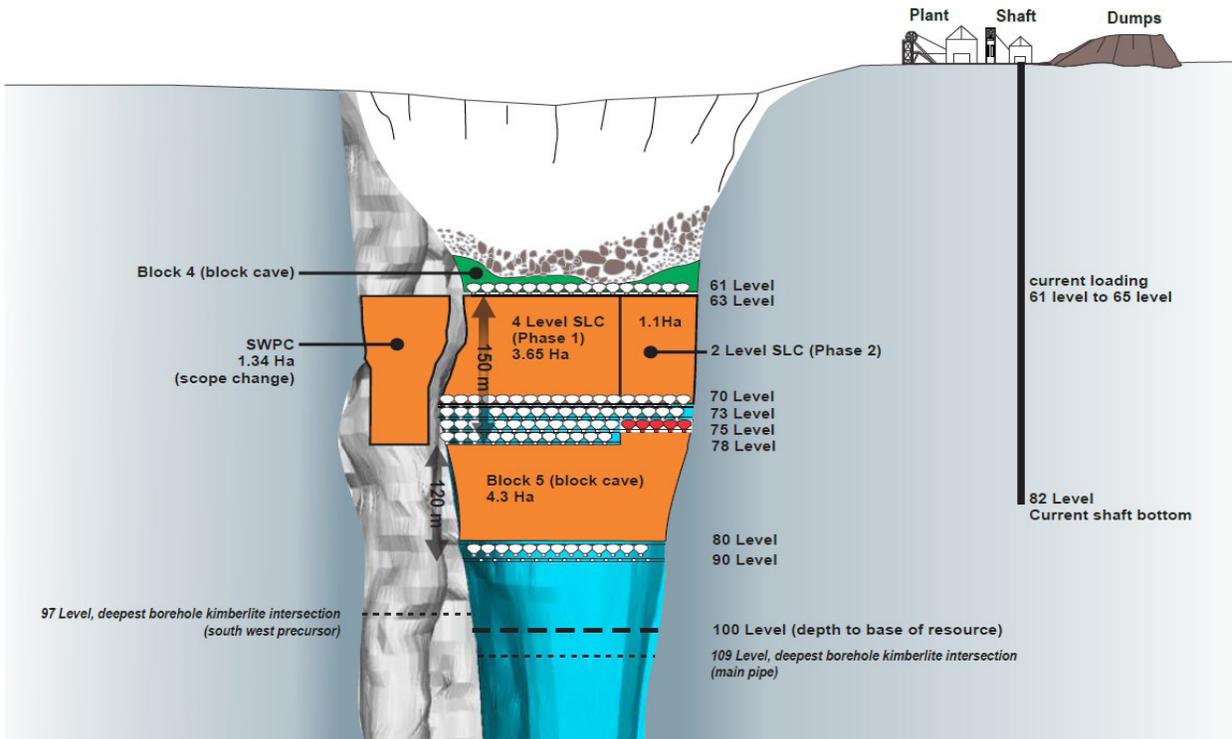
The project was structured to deliver short-term valuable phased deliverables that could be used by the client upon delivery of each stage/phase. This approach meant that the client did not have to wait for the completion of the whole system implementation before benefiting from the value offered by phased deliverables.

In conjunction with Petra Diamonds these deliverables were listed, prioritized and assigned to work packages.

Over a period of 3 months various work packages was assigned, each taking two weeks to complete. After every work package completion, the deliverables were demonstrated in a live environment to management and users.

Throughout the life of the project the MineRP team worked closely with users to clean up old datasets to conform to a newly produced book of standards.

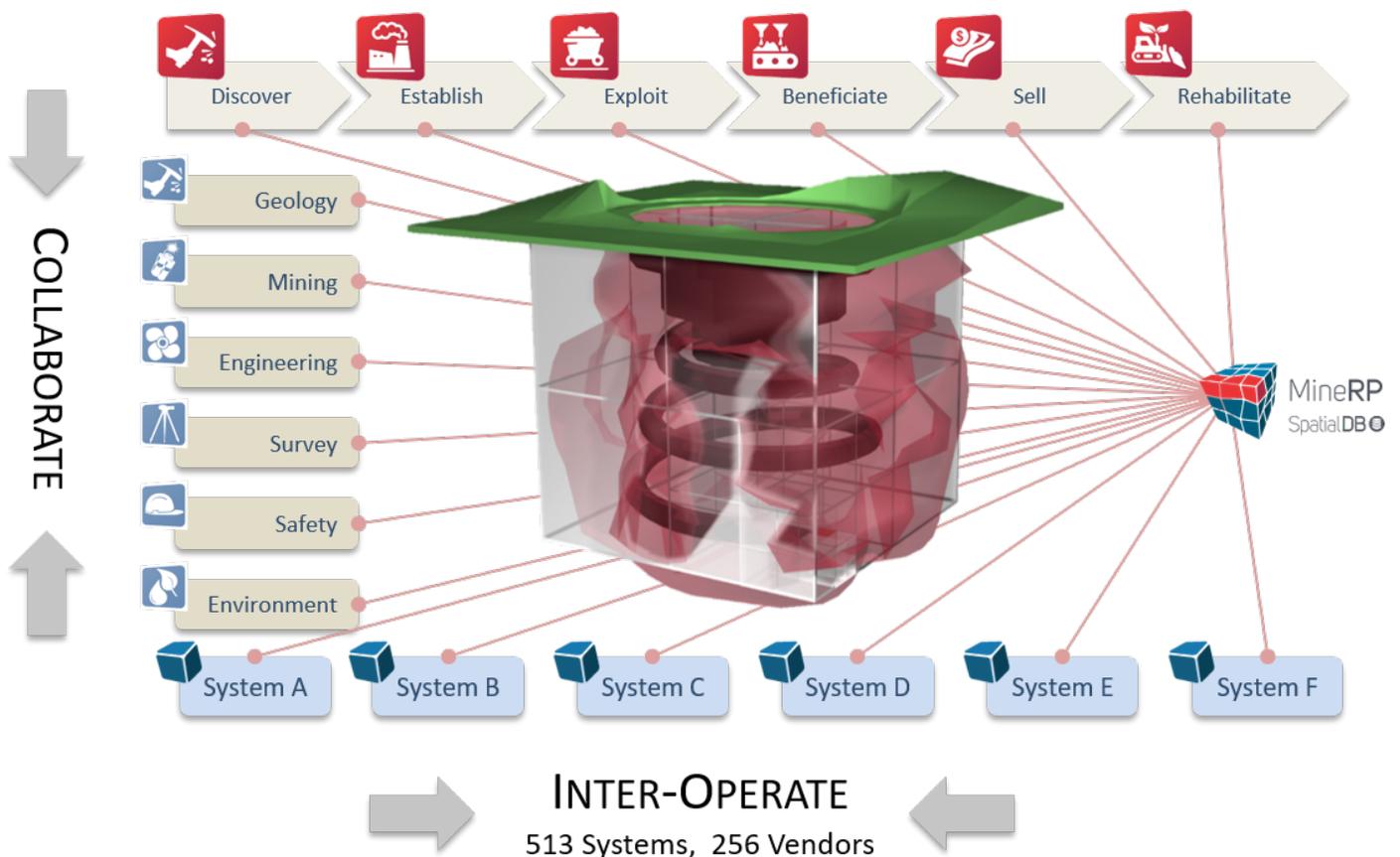
An added benefit of working on site was that the MineRP team trained data stewards on an ongoing basis. Thereby ensuring that those responsible for the data going into the system were ready to go.



MORE ABOUT MINERP

MineRP amalgamates data generated by expert applications from a large number of suppliers across mining disciplines. This approach of integrating data generated by the various disciplines in Mine Technical Services enables mines to:

1. Continue using currently implement MTS to generate data, thereby amplifying the value of investment made in such systems.
2. Establishing a reliable, robust basis of mining technical data for the purpose of optimization through descriptive, predictive and prescriptive analytics.
3. Easily visualize and analyze all MTS data in an integrated environment without the need to access any of the source systems used to create that data.



Petra Case Study



www.minerp.com

Author

Schalk Liebenberg

Unified Spatial Management Director

South Africa

Head Office: Johannesburg

First Floor, 267 West Ave, Centurion 0046
PO Box 9157, Centurion, 0046
Tel: +27 87 980 3100
Fax: +27 86 406 0117

Canada

Sudbury Office

432 Westmount Ave, Unit AB
Sudbury, Ontario, Canada, P3A 5Z8
Tel: +1 705 525 4774
Fax: +1 705 525 2629

Australia

Brisbane Office

Level 5, 182 Bay Terrace,
Wynnum, QLD, 4178
Tel: +61 (0)7 3828 2800
Fax: +61 (0)7 3828 2802

Perth Office

280 Newcastle St, Northbridge
WA 6003, Australia
Tel: +61 (0)8 6380 6800
Fax: +61 (0)8 6380 6801

Latin America

Santiago Office

Av Isidora Goyenechea 3000, piso 23
Las Condes, Santiago, Chile
Tel: +56 2 364 4258
Fax: +56 2 364 4443