

3D surface seismic, a tool to help resource evaluation for a PGM mine project

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African Platinum Plc (AFPLATS) flagship project is the Leeuwkop farm situated approximately 15 kilometres west of the town of Brits in the North West Province of South Africa down-dip of Lonmin's Eastern platinum mine.

AFPLATS exploration programme identified two reef horizons within the property that contains economic concentrations of PGM: the UG2 reef as primary economic target, with the more variable Merensky reef as a secondary upside target.

These reefs dip towards the north at an average 8-10° and lie between 800 to 2300m below surface. The UG2 is some 200m below the Merensky.

A surface drilling campaign based on a 600m spacing grid had already delineated an indicated UG2 resource over the southern part of the farm. In order to further upgrade the confidence of this resource by demonstrating structural continuity between boreholes, AFPLATS could either undertake a much more closely spaced drill campaign, or undertake a seismic survey. After assessing the time, cost and quality of data required, AFPLATS decided to commission a seismic survey.

CGG designed, conducted and processed a 3D seismic survey in May/June 2005. Interpretation was carried out by Geoscience solution.

The goal of the seismic survey was to have the best seismic image of the reefs.

Several challenges were to be overcome in order to meet the initial goal

- Proper survey design
- Have a high resolution data set
- Overcome the effect of a rough topography such as the numerous "koppies", which could distort the shape of main geological events

Using CGG experience from a nearby survey and by doing some simple ray tracing modelling, a suitable design was arrived at. Resolution criteria were achieved by using new 'Nomad' vibrators as the seismic source, which are able to generate an undistorted signal up to 200 Hz.

Finally the surface topography effect was addressed by processing the data on site, and removing the near surface perturbations by computing a proper set of time corrections called "primary statics solutions"

Interpretation of the seismic data used the initial field seismic data to provide a coarse overall structural model soon after the seismic acquisition campaign was complete. This confirmed a high level of structural continuity, with several discrete dykes and faults identified at the edges of the project area, and to the north. Planned boreholes were compared to this data in order to ensure positional accuracy.

Processing of the seismic data was conducted in Paris, and delivered a high-resolution dataset about 3 months after acquisition was finished. This dataset re-confirmed the high level of geological continuity in the project area, and identified several potholes, faults and dykes to the north, which had not been seen in the field data. Depth converted UG2 results were combined with the borehole control to upgrade much of the project area to the 'measured' category.

In conclusion , the 3D seismic survey and interpretation was completed in 8 months at a cost of 12,500 ZAR per hectare of ground covered. To achieve the same level of data from a drill program would have required an additional 250 holes averaging 1,400m depth at a cost of 70,000 ZAR per hectare. The quality of the data allowed the conversion of Indicated Resources to Measured Resources which have formed the basis for the Leeuwkop Bankable Feasibility Study and its targeted 2 billion rand raising.