

# Mineral resources and mineral reserves cont.

## Appendix

### Reporting code

Harmony uses the South African Code for the Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC Code), which sets out the internationally recognised procedures and standards for reporting of mineral resources and ore/mineral reserves in South Africa. This code was developed by the South African Institute of Mining and Metallurgy and is the recommended guideline for reserve and resource reporting for companies listed on the JSE Limited. Harmony's reporting of its Australian and PNG mineral resources and mineral reserves also complies with the Australian Code for the Reporting of Mineral Resources and Mineral Reserves (JORC code) of the Australian Institute of Mining and Metallurgy. This code is materially the same as the SAMREC code. In reporting reserves, distinct cognisance has also been taken of Industry Guide 7 of the United States Securities Exchange Commission.

### Definitions as per the SAMREC code

#### Mineral resources

A **mineral resource** is a concentration (or occurrence) of material of economic interest in or on the earth's crust in such form, quality and quantity that there are reasonable and realistic prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics of a mineral resource are known, estimated from specific geological evidence and knowledge, or are interpreted from a well constrained and portrayed geological model.

Mineral resources are sub-divided in order of increasing confidence in respect of geoscientific evidence into inferred, indicated and measured categories.

An **inferred mineral resource** is that part of a mineral resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and sampling, and assumed but not verified geologically and/or through analysis of grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that may be limited or of uncertain quality and reliability.

An **indicated mineral resource** is that part of a mineral resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. It is based on exploration, sampling and the testing of information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed.

A **measured mineral resource** is that part of a mineral resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and grade continuity.

#### Mineral reserves

A **mineral reserve** is the economically mineable material derived from a measured and/or indicated mineral resource. It includes diluting and contaminating materials and allows for losses that are expected to occur when the material is mined. Appropriate assessments to a minimum of a pre-feasibility study for a project, or a life of mine plan for an operation, must have been carried out, including consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors (the modifying factors). Such modifying factors must be disclosed.

A **probable mineral reserve** is the economically mineable material derived from a measured and/or indicated mineral resource. It is estimated with a lower level of confidence than a proved mineral reserve. It includes diluting and contaminating materials and allows for losses that are expected to occur when the material is mined. Appropriate assessments to a minimum of a pre-feasibility study for a project, or a life of mine plan for an operation, must have been carried out, including

consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. Such modifying factors must be disclosed.

A **proved mineral reserve** is the economically mineable material derived from a measured mineral resource. It is estimated with a high level of confidence. It includes diluting and contaminating materials and allows for losses that are expected to occur when the material is mined. Appropriate assessments to a minimum of a pre-feasibility study for a project, or a life of mine plan for an operation, must have been carried out, including consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. Such modifying factors must be disclosed.

### Harmony reporting in compliance with SAMREC

In order to meet the requirements of the SAMREC code that the material reported as a mineral resource should have "reasonable and realistic prospects for eventual economic extraction", Harmony has determined an appropriate cut-off grade which has been applied to the quantified mineralised body according to a process incorporating a long-term view on future economic modifying factors. In applying this process, Harmony uses a gold price of R370 000/kg to derive a cut-off grade to determine the mineral resources at each of its South African underground operations. Mineral resources have been estimated on the basis of geoscientific knowledge with input from the company's mineral reserve managers, geologists and geostatistical staff. Each mine's mineral resources are categorised, blocked-out and ascribed an estimated value. At most mines computerised geostatistical estimation processes are used.

In order to define that portion of a measured and indicated mineral resource that can be converted to a proved and probable mineral reserve, Harmony applies the concept of a cut-off grade. At our underground South African mines, this is done by defining the optimal cut-off as the lowest grade at which an orebody can be mined such that the total profits, under a specified set of mining parameters, are maximised. The cut-off grade is determined using the company's Optimiser software which requires the following as input: the database of measured and indicated resource blocks (per shaft section); an assumed gold price which, for this mineral reserve statement, was taken as R250 000/kg; planned production rates; the mine recovery factor (MRF) which is equivalent to the mine call factor (MCF) multiplied by the plant recovery factor (PRF); and planned cash operating costs (rand per tonne). Rand per tonne cash operating costs are historically based but take cognisance of distinct changes in the cost environment such as restructuring, right-sizing, and other cost reduction initiatives, and for below-infrastructure ounces, an estimate of capital expenditure.

The block cave reserve at Golpu in PNG uses PCBC software to define the optimal mine plan and sequencing. The open-pit reserve at Hidden Valley in PNG is constrained by the capacity of the tailings storage facility with the Whittle optimisation programme guiding the most efficient mine design given this constraint.

The mineral reserves represent that portion of the measured and indicated resources above cutoff in the life-of-mine plan and have been estimated after consideration of the factors affecting extraction, including mining, metallurgical, economic, marketing, legal, environmental, social, and governmental factors.

A range of disciplines, including geology, survey, planning, mining engineering, rock engineering, metallurgy, financial management, human resources management and environmental management, has been involved at each mine in the life-of-mine planning process and the conversion of resources into reserves.

The modifying factors related to the ore flow that are used to convert the mineral resources to mineral reserves through the life-of-mine planning process are stated for each individual shaft. For these factors, historical information is used, except if there is a valid reason to do otherwise. As a result of the depth at which mining occurs and the resulting rock engineering requirements at our South African underground mines, some shafts include stope support pillars into the design of their mining layouts which accounts for discounts of 7% to 10%. A further 15% discount is applied as a life-of-mine factor to provide for unpay and off-reef mining. In general, life-of-mine plan extraction factors do not exceed 85% and are reflected in the mineral reserves.

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