

CRIRSCO modifying factors - a brief guide for exploration and resource geologists

Ruth Allington*

All of the codes and standards for reporting resources, reserves and exploration results in the CRIRSCO[1] family include identical definitions, which are represented in *Figure 1*.

Progression from inferred to measured resources is primarily the province of geoscientists and is all about reducing uncertainty regarding the quality, recoverable quantity and continuity of the minerals. The Competent Person (CP) responsible for public reporting of resources is likely to be an exploration or resource geologist. However, exploration and resource geologists may not have much experience or expertise pertaining to the ‘modifying factors’ and may consider that such things are really nothing to do with them.

Working with the Modifying Factors to establish technical feasibility, minimise environmental impact and ensure economic viability is often considered to be a distinct stage in the evaluation of a deposit and planning of a mine or quarry, completely separate from the exploration and modelling of the deposit itself. These activities typically involve many professionals including specialists in engineering, production, processing, environmental assessment, operations, legal and financial disciplines. There may be one Competent Person taking overall responsibility for co-ordinating the team and bringing together the reporting or there may be several, each taking responsibility for their own discipline area.

Modifying Factors are defined in the CRIRSCO family of codes and standards as “considerations used to convert Mineral Resources to Mineral Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors. Modifying factors also include any other factors which impact on the feasibility of the project.”[2]. This seems to say that consideration of

* PERC Honorary Treasurer, Joint Senior Partner, GWP Consultants LLP, Upton House, Market Street, Charlbury, Oxfordshire, OX7 3PJ. rutha@gwp.uk.com

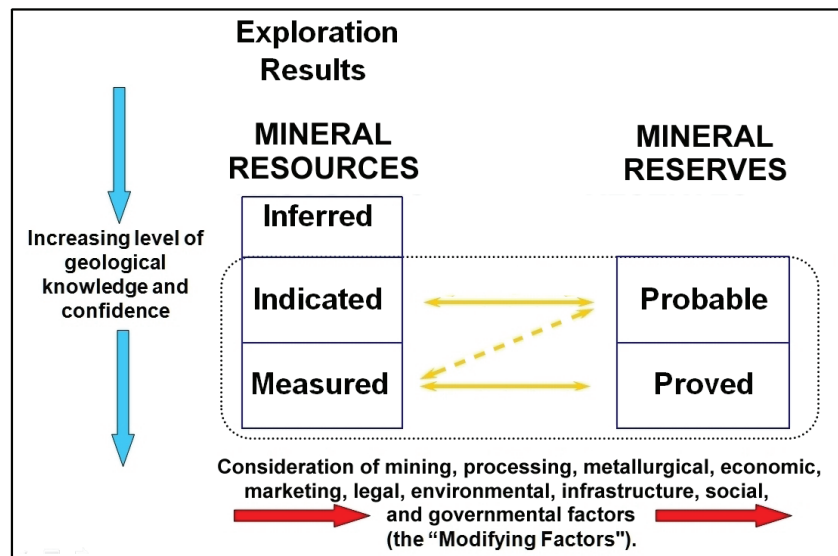


Figure 1: The CRIRSCO standard classification now used by all reporting standards that are aligned with CRIRSCO.

‘modifying factors’ plays no part in the evaluation of Mineral Resources but that they are used, once a Resource has been defined, to convert to Mineral Reserves. Whilst the author agrees that a thorough consideration of the impact of ‘modifying factors’ is essential to allow any deposit or part of a deposit to be classified as a ‘Reserve’, this is not the same as saying that there need be no consideration of ‘modifying factors’ until the resource evaluation is complete. This view is supported by the definition of Mineral Resources as “a concentration or occurrence of solid material of economic interest in or on the Earth’s crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction”[3]. In order to state that a mineral resource has ‘reasonable prospects for eventual economic extraction’, those responsible for classifying a deposit or part of a deposit in this way will need to have assessed whether this pre-requisite has been satisfied – in short, it would be expected that, whilst detailed feasibility assessments would not have been carried out at the resource evaluation stage, any ‘show stoppers’ would have been identified. Examples of such ‘show stoppers’ might be:

- Resource in a remote location with no access to market without significant investment in transport infrastructure, rendering the project uneconomical.
- A need for significant quantities of water for mineral processing and a deposit in a desert location with no groundwater available.
- Very high stripping ratio in an open pit setting making the extraction inherently uneconomic.

Giving appropriate weight to Modifying Factors throughout the progression from exploration through resource evaluation to feasibility studies and operational planning depends not only on ensuring that the right team is assembled but also that all members of the team have an awareness of the major constraints on reasonable prospects for eventual economic extraction in addition to their specialist geoscience or engineering skills. The following simple model illustrates the appropriate balance that must be achieved at every stage (*Fig.2*).

Establishing iteration and inter-disciplinary co-operation and information sharing helps to ensure that even early stage, con-

ceptual, broad brush mine designs, created for the purpose of estimating resources, are based on realistic, inherently economic assumptions and working limits. These provide a framework for planning a feasibility study and anticipating more extensive studies that will be needed to support the move from resources to reserves.

Anticipating at an early stage which of the Modifying Factors will be particularly important in eventually proving reserves (and which are critical to success or failure) can save time and money (e.g. by undertaking non geological data collection and establishment of long term monitoring when exploration and other geological field work is underway, or by developing cutoff values for ratios or other parameters that are critical to economic viability). The early consideration of Modifying Factors in a manner that aims to achieve the balance illustrated in *Figure 2* is also conducive to public participation and achieving a 'social licence to operate' because the consideration of matters of special concern to the public (particularly mitigation of social and environmental impacts) is integral to the process right from the start.

This short paper is based on part of a presentation made by the author at the Mineral Deposits Study Group Conference, January 7th 2014, Keble College, Oxford, United Kingdom.

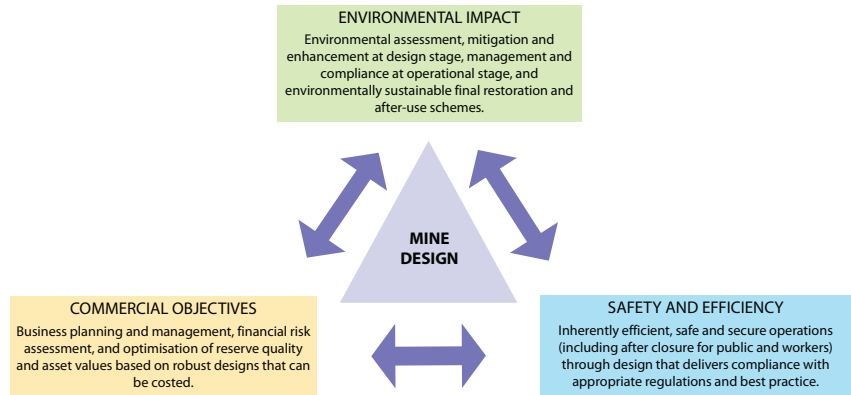


Figure 2: Design objectives – achieving an appropriate balance.

References

- [1] Committee for Mineral Reserves International Reporting Standards, www.criusco.com
- [2] PERC Standard 2013, Clause 11; www.percstandard.eu
- [3] PERC Standard 2013, Clause 20 (underlining added by the author for emphasis); www.percstandard.eu

**MOL GROUP,
RECOMMENDED
BY TOMORROW** ▶

WE THINK OF INNOVATIVE SOLUTIONS AND TECHNOLOGIES.
WE CREATE BETTER WAYS TO SERVE ENERGY NEEDS.
WE MOVE FORWARD TO CREATE VALUE FOR GENERATIONS TO COME.

MOL Group is a leading international oil and gas company from the heart of Europe with presence in more than 40 countries. We have over 75 years' experience, 29,000 employees on 3 continents, exploration assets in 13 countries and 1,700 service stations in Europe.