

# THE JORC CODE – ITS OPERATION AND APPLICATION

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## **ABSTRACT**

The 1999 edition of the *Australasian Code for Reporting of Mineral Resources and Ore Reserves* (the “JORC Code”) became effective in September 1999 and is the latest revision of a Code which was originally issued in 1989, but which has an ancestry dating back to the first JORC report released in 1972. The JORC Code has been operating successfully for over ten years and, together with complementary developments in stock exchange listing rules, has brought about substantially improved standards of public reporting by Australasian mining and exploration companies. The Code is now regarded as the world leader in this field, with other countries using it as a template for their own reporting standards, and Australia playing a leading role in the development of international reporting standards. The reasons for the success of the Code are varied, foremost amongst them being its adoption in full by the Australian and New Zealand Stock Exchanges, and the ability and willingness of mining industry organisations to bring Competent Persons to account when necessary.

## **INTRODUCTION**

Reporting of ore reserves (divided, in more recent times into Mineral Resources and Ore Reserves) and exploration information by mining companies is an activity which has grown haphazardly over the last 100 years, mostly on a country-by-country basis, with no serious attempt to reach a consensus or consistent, compatible reporting across international boundaries. In general, reporting by mining companies worldwide at the exploration, development and production stages has lagged well behind the advances in financial reporting. This has applied particularly to relevant and useful information about the most significant asset of most mining companies - their orebodies which are the source of future income.

The 1990s has, however, seen a world-wide upsurge of interest in improving standards of public reporting of exploration results, Mineral Resources and Reserves (Miskelly, 1994, Miskelly, 1997). The reasons for this development are varied, and include the success of the JORC Code in Australasia, concern over various instances of dubious or unacceptable reporting of exploration results or “Resource/Reserve” estimates in recent years, and increasing international competition for investment funds in the mining and exploration industry.

This paper describes the JORC Code in terms of its background, working environment and reasons for success. It also provides guidance on matters which companies are either obliged to observe in public reporting, by virtue of the mandatory provisions of the Code and Australian Stock Exchange (“ASX”) listing rules, or are encouraged to observe in the interests of good practice. The paper is based on others prepared by the author and co-authors in recent years, most of which have been presented at conferences organised by The Australasian Institute of Mining and Metallurgy (“The AusIMM”). The permission of The AusIMM to present extracts from these papers is gratefully acknowledged.

The author is currently Chairman of the Australasian Joint Ore Reserves Committee (“JORC”) of The AusIMM, Minerals Council of Australia (“MCA”) and Australian Institute of Geoscientists (“AIG”), but the views and opinions expressed herein are his own and should not be taken as necessarily those of the committee. The paper paraphrases a number of the provisions contained in the 1999 JORC Code and 1999 ASX listing rules. While care has been taken to ensure that the relevant portions of the Code and listing rules have been faithfully reflected, it is essential that readers refer to the original documents for authoritative information.

## **BRIEF HISTORY OF REPORTING STANDARDS AND THE JORC CODE**

The following description is a brief summary of the history of the JORC Code. For more details, readers are referred to Stephenson and Miskelly, 1997, and Stephenson and Glasson, 1992.

The first edition of the JORC Code was released in 1989, but the committee itself originated in 1971, following public, industry and regulatory concern with unacceptable reporting practices associated with the nickel boom and bust in Western Australia in the late 1960s. Essentially, JORC was formed because regulators hinted strongly that unless the mining industry developed appropriate reporting standards, they (the regulators) would do so instead. Recognising the warning signs, the Australian Mining Industry Council ("AMIC"), now the MCA, established a committee to examine the issue. It was promptly joined by The AusIMM, resulting in the formation of JORC. The AIG became JORC's third parent body in 1992.

Between 1972 and 1985, a number of reports were issued by JORC which made recommendations on public reporting and Ore Reserve classification and which gradually developed the principles now incorporated in the JORC Code. The recommendations had the status of guidelines only, but were, over time, gradually adopted by most Australasian mining and exploration companies. It is worth noting that the core concept on which the Code is built, the Competent Person, was introduced in JORC's first publication in 1972.

During this period, two key non-JORC documents were published which had a fundamental impact on the development of the JORC Code. In 1980, the US Geological Survey released a document entitled "*Principles of a Resource/Reserve Classification for Minerals*" (US Bureau of Mines and the US Geological Survey, 1980, commonly known as "Circular 831"), in which, for the first time, a clear division between Resources, representing in-situ material, and Reserves, representing economically extractable material, was presented. Two years later, Conzinc Riotinto Australia Ltd ("CRA") released a seminal document, entitled "*A Guide to the Understanding of Ore Reserve Estimation*" (King, McMahon, and Butjor, 1982), which set out many of the concepts which now underpin the Code.

In February 1989, JORC released the first version of the JORC Code (JORC, 1989). Apart from updating and improving previous documents and formally introducing into Australia the concept of Mineral Resources as the pre-cursor to Ore Reserves, this publication differed from those preceding in two critical ways; (1) it was immediately incorporated into ASX listing rules, thereby becoming binding on companies listed on the ASX; and (2) it was also immediately adopted by The AusIMM as an Institute Code, and therefore became binding on members of The AusIMM. Through these processes, it became mandatory for both individuals and companies to conform with the Code, and this has been the dominant factor underpinning its success. It was adopted as an AIG Code in 1992 and, in the same year, was incorporated into New Zealand Stock Exchange ("NZSE") listing rules.

Guidelines to the Code were published in 1990 and the two documents were revised and released in a combined form in 1992 (JORC, 1992). In 1993, an Appendix covering diamond reporting was issued and in 1996, the JORC Code was again slightly revised, incorporating the Diamond Appendix and changing the term "Pre-Resource Mineralisation" to "exploration results", with restrictions on its use. (JORC, 1996) A major revision was completed in early 1999, and the 1999 edition of the JORC Code became effective in September 1999 (JORC, 1999).

### **THE 1999 JORC CODE**

The 1999 revision of the JORC Code, which had over ten person-years of committee and industry input, was major, but none of the modifications materially altered the fundamentals of the Code. The main changes were:

- introduction of a clause (Clause 4) covering the underlying principles of the JORC Code, those being Transparency, Materiality and Competence;
- adjustments to the definitions of "Mineral Resource", "Measured Mineral Resource", "Indicated Mineral

Resource”, “Inferred Mineral Resource”, “Ore Reserve”, “Proved Ore Reserve” and “Probable Ore Reserve” to reflect agreements reached between organisations participating in the CMMI initiative to develop international standard Resource/Reserve definitions;

- recognition that Measured Mineral Resources may, in certain circumstances, be convertible to Probable Ore Reserves;
- improvements to the definition of a Competent Person to make it more clearly applicable to those estimating Ore Reserves as well as those estimating Mineral Resources;
- adjustment to the provision for public reports to fairly reflect documentation prepared by Competent Persons, in order to maintain compatibility with the 1999 ASX listing rules which were modified to remove a previous inconsistency;
- substantial expansion of Table 1 to include a check list for the reporting of exploration results and to provide a more comprehensive check list for the reporting of Mineral Resources and Ore Reserves;
- clarification of the types of reports covered by the JORC Code;
- simplification of the section on coal reporting by the insertion of several coal-specific clauses rather than the inclusion of a separate Coal Code which formed an appendix in previous editions of the Code;
- simplification of diamond reporting requirements by incorporation of diamond-specific clauses into the main body of the Code, rather than listing them as a separate section, thus removing duplicated and superfluous text;
- strengthening of the provision to explain whether Mineral Resources have been reported inclusive of, or additional to, Ore Reserves; now a mandatory requirement.

In addition to these changes to the JORC Code, the ASX introduced in its 1999 listing rules the concept of the “recognised mining professional”. This allows a company reporting to the ASX on Resources or Reserves for an overseas deposit, to base the report on documentation prepared by a person who does not qualify as a Competent Person because he or she is not a Member or Fellow of The AusIMM or AIG (but who would qualify in terms of relevant experience), as long as that person is a member of a recognised overseas professional body that has agreed to sanction the person if he or she does not comply with the JORC Code.

## **PURPOSE AND PRINCIPLES OF THE JORC CODE**

The purpose of the JORC Code is to provide a minimum standard for reporting of exploration results, Mineral Resources and Ore Reserves in Australasia, and to ensure that public reports on these matters contain all the information which investors and their advisers would reasonably require for the purpose of making a balanced judgement regarding the results and estimates being reported. It achieves this by:

- establishing and prescribing the minimum standards for public reporting of Mineral Resources and Ore Reserves in Australasia;
- setting out a system for the classification of tonnage (or volume) and grade (or quality) estimates as either Mineral Resources or Ore Reserves and for the subdivision of each into categories which reflect different levels of certainty or confidence;
- specifying the qualifications and experience required for a Competent Person;
- setting out the responsibilities of the Competent Person and companies’ Boards of Directors with regard to reporting of Mineral Resources and Ore Reserves;
- providing a summary list (Table 1 of the Code) of the main criteria which Competent Person(s) and others should consider in the course of preparing reports on exploration results, Mineral Resources and Ore Reserves.

The JORC Code does not regulate the procedures used by Competent Persons to estimate and classify Mineral Resources and Ore Reserves, nor does it regulate companies' internal classification and/or reporting systems.

The principles of the JORC Code can be summarised as Transparency, Materiality and Competence. "Transparency" requires that a public report contains sufficient information, the presentation of which is clear and unambiguous, so that a reader is able to understand the report and is not misled. "Materiality" requires that a public report contains all the relevant information which a reader could reasonably be expected to need in order to make a balanced judgement about the matters being reported. "Competence" requires that the public report is based on work which is the responsibility of a suitably qualified and experienced person who is subject to an enforceable professional code of ethics, i.e. that public reports are based on work undertaken or supervised by a Competent Person.

## **GUIDE TO MATTERS TO BE INCLUDED IN PUBLIC REPORTS**

### **MANDATORY REPORTING REQUIREMENTS**

The following is a list (not in order of priority) of the main mandatory provisions of the 1999 JORC Code and applicable 1999 ASX listing rules with respect to the reporting of exploration results, Mineral Resources and Ore Reserves. The list is not intended to be exhaustive, and must not be used as a replacement for the Code or listing rules. Readers must refer to the originals of the documents for definitive information and guidance.

Companies, when publicly reporting in Australia, must, in accordance with the JORC Code and ASX listing rules:

- adhere to the Code when presenting reports on exploration results, Mineral Resources or Ore Reserves which have been prepared for the purpose of informing investors or potential investors and their advisers;
- use only the terms set out in Figure 1 of the Code when reporting exploration results, Mineral Resources or Ore Reserves (terms like "Geological Ore Reserves", "Mineable Resources", "In-situ Reserves" etc are not permitted);
- only include in Mineral Resources mineralisation which has reasonable prospects of eventual economic extraction;
- only include in Ore Reserves those portions of Measured and/or Indicated Mineral Resources which have been shown to be economically mineable on the basis of appropriate assessments such as feasibility studies; these studies will have taken into account realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors;
- when reporting both Mineral Resources and Ore Reserves, include a clarifying statement which clearly indicates whether the Mineral Resources are inclusive of, or additional to the Ore Reserves;
- report the categories of Mineral Resources ("Measured", "Indicated" and "Inferred") and of Ore Reserves ("Proved" and "Probable") separately, not only as total Mineral Resources and total Ore reserves;
- not report Mineral Resources and Ore Reserves in terms of contained metal or mineral content unless the corresponding tonnages (volume) and grades (quality) are also presented.
- not aggregate Mineral Resources with Ore Reserves;
- name the Competent Person(s) who takes responsibility for the documentation on which the public reports are based, and the Competent Person's firm or employer;
- state that the public report is based on the documentation compiled by the Competent Person;

- obtain the written consent of the Competent Person(s) if a public report contains edited versions of documentation prepared by the Competent Person, and include a statement that this consent has been obtained;
- when reporting an overseas Mineral Resource or Ore Reserve estimate prepared by a person who does not qualify as a Competent Person, either abide by the “recognised mining professional” provision of the ASX listing rules, or nominate a Competent Person to take responsibility for the Mineral Resource or Ore Reserve estimate;
- discuss any matters from Table 1 of the Code which might materially affect the reader’s understanding or interpretation of the exploration results or Mineral Resource/Ore Reserve estimates being reported;
- include in reports of exploration results sufficient information to allow a considered and balanced judgement of the significance of the results, including information such as sampling intervals and methods, sample locations, assay data, laboratory analyses, data aggregation methods plus information on any of the other criteria listed in Table 1 of the Code that are material to an assessment (ASX listing rules 5.7 and 5.8 list specific requirements when reporting exploration results);
- not assign estimates of tonnage and average grade to mineralisation not classified as a Mineral Resource or an Ore Reserve (i.e. at the “exploration results” stage);
- clearly express any descriptions of exploration targets or exploration potential in reports so that they are not capable of being misinterpreted as an estimate of Mineral Resources or Ore Reserves;
- with respect to reporting exploration results for diamonds, specify the number and total carats of diamonds recovered, and the type and size of samples which produced the diamonds, including the lower cut-off sieve size;
- name the valuer if a report includes a valuation of a parcel of diamonds or gemstones.

## **NON-MANDATORY REPORTING GUIDANCE, REGARDED AS GOOD PRACTICE**

The following is a list of reporting practices which are not specifically required by the 1999 JORC Code or 1999 ASX listing rules, but which are either encouraged by the JORC Code or which are considered to be good practice by the author. Again, the list (which is not in order of priority) is not intended to be exhaustive, and readers are encouraged to read the 1999 JORC Code for full guidance.

Companies, when publicly reporting in Australasia, are encouraged as a matter of good practice to:

- provide information which is as comprehensive as possible in their reports, and err on the side of providing too much information rather than too little;
- describe the style and nature of mineralisation;
- discuss sampling, sample preparation and assaying techniques;
- discuss data density and distribution;
- describe the Resource and Reserve estimation method(s);
- discuss the basis upon which Resources and/or Reserves were classified;
- report the lower cut-off grades applied to define Mineral Resources/Ore Reserves;
- show the effect of varying lower cut-off grades on Resource/Reserve estimates;
- discuss any upper cuts applied to grades and show the effect of varying such cuts on Resource/Reserve estimates;
- describe the quality of the technical/economic studies undertaken to convert Resources to Reserves;
- provide information on assumed metallurgical recovery factors when reporting Ore Reserves;
- provide the commodity price(s) and exchange rates used for mine planning/Ore Reserve definition.

- report the dilution factors applied in converting Resources to Reserves;
- report overburden or strip ratio for Reserves;
- reconcile Ore Reserves with production figures;
- compare and reconcile Resources/Reserves with previously reported estimates;
- explain the reasons for any conversion of Measured Resources to Probable Reserves;
- explain any substantial differences between tonnages of total Mineral Resources and tonnages of Ore Reserves;
- describe any material adjustments made to Resource/Reserve figures after estimation, such as the application of modifying factors arising from reconciliation with mill data;
- round tonnages and grades figures so as to reflect the uncertainty surrounding their estimation;
- list, separately to other Mineral Resources or Ore Reserves, Resources or Reserves of low grade mineralisation intended for stockpiling and treatment towards the end of mine life;
- always refer to Mineral Resources and Ore Reserves as estimations, not calculations;
- not state that Resource and/or Reserve figures have been estimated in accordance with the Code (the Code is a minimum standard for public reporting, but does not regulate exploration techniques or Resource/Reserve estimation methods);
- lastly, but very importantly, be guided by the intent of the Code, which is to provide a minimum standard for public reporting and to ensure that such reporting contains all information which investors and their professional advisers would reasonably require, and reasonably expect to find in the report, for the purpose of making a reasoned and balanced judgement regarding the mineralisation being reported.

### **REASONS FOR THE SUCCESS OF THE JORC CODE**

The reasons for the success of the JORC Code are varied. The main three are:

- the regulatory backing;
- the intentional avoidance of overly prescriptive definitions and operational requirements;
- industry's ability and willingness to discipline Competent Persons.

Others include:

- the origins of the Code;
- the nature of the Joint Ore Reserves Committee;
- JORC's commitment to communication and to on-going revision of the Code.

### **THE REGULATORY BACKING OF THE JORC CODE**

The decision by the ASX to append the JORC Code in its entirety to its Listing Rules was probably the single most important development in making the Code an effective tool for setting and maintaining public reporting standards in Australia.

Its adoption by the ASX (and through the ASX by the Australian Securities and Investments Commission ("ASIC")) has given it regulatory backing on a national basis. Application of the Code is not, therefore, bedevilled by the varying statutory and reporting regimes which may apply at a State or Territory level. No other country (except New Zealand) in which a classification/reporting standard has been developed has so far managed to establish this degree of intimate linkage with the main national regulatory authority, although South Africa is likely to implement a similar regime in the year 2000.

In addition, through a change to ASX Listing Rules introduced in 1995, the name(s) of the Competent Person(s) responsible for the preparation of Resource/Reserve estimates reported to the public must be published. Awareness that their name will appear in print has made individuals in Australia careful to ensure that they have the qualifications and experience necessary to act as Competent Persons in relation to the Resources or Reserves being reported.

## **THE AVOIDANCE OF OVERLY PRESCRIPTIVE REQUIREMENTS**

The JORC Code is deliberately structured to keep the definitions and operational requirements relatively non-prescriptive, and to allow Competent Persons considerable freedom to exercise their professional judgement while ensuring they can be held to account for their actions. This concept of responsibility with accountability gives the Code the flexibility to be applicable to a wide range of situations without the need to become unreasonably prescriptive.

## **INDUSTRY'S ABILITY AND WILLINGNESS TO DISCIPLINE COMPETENT PERSONS**

As stated above, one of the key elements of the JORC Code, and of similar codes/guides in other countries, is that the Code does not attempt to prescribe the requirements for the estimation and classification of Mineral Resources and Reserves, but instead defines the requirements for the estimators (the Competent Persons), and allows them freedom to use their experience to decide appropriate estimation and classification approaches. This system is likely to be effective only if the Competent Persons can be made to account for their actions.

In Australasia, obligatory membership of either The AusIMM or AIG provides the mechanism by which Competent Persons can be brought to account, since both organisations are national professional bodies which have effective and enforced codes of ethics. While the requirement for the Competent Person to be a Member or Fellow of The AusIMM or AIG has not always been a popular constraint, there is no doubt that it has been instrumental in achieving high standards of reporting in Australasia. There have been instances in which the Ethics Committees of The AusIMM or AIG have investigated complaints made in respect of reporting by "Competent Persons" and action has been taken when deemed justified. Such action would not have been possible if the person(s) concerned had not been members of The AusIMM or AIG.

Overseas, other national Ore Reserve committees have introduced, or are introducing, similar accountability provisions for qualified professionals. Although the means of enforcing this accountability may vary from country to country due to different regulatory and professional regimes, the principle is accepted as fundamental to effective reporting codes. International negotiations in the challenging area of reciprocal recognition of Competent Persons across international boundaries have been underway for some time, and encouraging progress is being made. The introduction of the "Recognised Mining Professional" by the ASX in its 1999 listing rules will assist some companies with overseas deposits to report more easily in Australia, while maintaining the strict qualification requirements which apply to Competent Persons.

## **OTHER REASONS FOR THE SUCCESS OF THE JORC CODE**

*The origins of the JORC Code:* The Code was developed by industry and then adopted by the ASX/NZSE rather than being forced on the industry by regulatory authorities. The JORC Code itself is therefore user-friendly to the mining industry and also, most importantly, meets the needs of readers of reports on Resources, Reserves and exploration results.

*The nature of the Joint Ore Reserves Committee:* JORC, which at end-1999 comprises 17 full-time members and two alternate members, is a permanent rather than an ad-hoc committee with members representing a diverse range of organisations and professions. Organisations represented on the committee are The AusIMM, AIG, MCA, Mineral Industry Consultants Association ("MICA"), ASX and Securities Institute of Australia ("SIA"). Ten committee members are practising geologists or have a geoscientific background, four are mining engineers, one is a metallurgist, one is an institutional

investment analyst and one is a stockbroker. There is also a mixture of company employees and specialist consultants, a blend of long-serving and newer members, and a wide geographic spread of members. All these encourage a balanced consideration of issues.

*JORC's commitment to communication and to ongoing revision of the Code:* JORC maintains constant communication with industry via various industry journals, and with the ASX. It also conducts regular reviews and updates of the Code and Guidelines. The Code was revised twice between 1989 and 1996, and a further major review was completed in 1999. Familiarity with application of the Code has taken time and education of compilers, publishers and readers of reports has been a constant objective of JORC.

## THE FUTURE

The JORC Code will continue to evolve to maintain its relevance to the exploration and mining industry in Australasia and to providers of finance to this industry. Domestically, the committee will concentrate for the next two to three years on the education of users and potential users of the JORC Code. This will be aided by a slight revision of the make-up of the committee to provide more strength in the areas of Ore Reserve estimation/reporting and added focus on the "customers" of public reports based on the JORC Code. Internationally, JORC will continue to play a leading role in negotiations designed to lead to the eventual development of truly global classification and reporting standards.

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