



The  
Geological  
Society



**CODE FOR REPORTING OF MINERAL  
EXPLORATION RESULTS,  
MINERAL RESOURCES AND MINERAL  
RESERVES  
(THE REPORTING CODE)**

PREPARED BY THE INSTITUTION OF MINING AND METALLURGY WORKING  
GROUP ON RESOURCES AND RESERVES IN CONJUNCTION WITH THE  
EUROPEAN FEDERATION OF GEOLOGISTS, THE GEOLOGICAL SOCIETY OF  
LONDON AND THE INSTITUTE OF GEOLOGISTS OF IRELAND

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## INTRODUCTION

1. The Code for Reporting of Mineral Resources and Mineral Reserves (the 'Reporting Code' or 'the Code') sets out minimum standards, recommendations and guidelines for Public Reporting of Mineral Exploration Results, Mineral Resources and Mineral Reserves in the United Kingdom, Ireland and Europe. Initially it was drawn up by the Working Group on Resources and Reserves of the Institution of Mining and Metallurgy (IMM), which was established in 1999 to produce an up to date Code in response to similar moves overseas. In July 2000, it was agreed to broaden the exercise working in conjunction with the European Federation of Geologists (EFG), the Geological Society of London (GSL) and the Institute of Geologists of Ireland (IGI).

In December 1991, the Council of the IMM approved new definitions for resources and reserves. These also appeared in a slightly modified form in the London Stock Exchange Listing Rules (Chapter 19 – Mineral Companies).

Since 1994, the Council of Mining and Metallurgical Institutions (CMMI) has been working to create a set of standard international definitions for reporting Mineral Resources and Mineral Reserves, modelled on the existing JORC Code (the Australasian Code for Reporting of Mineral Resources and Ore Reserves). An ad-hoc CMMI Mineral Resources/Reserves International Reporting Standards Committee (CMMI – CRIRSCO) was formed, with representatives from mining and metallurgical institutions from the United States (SME), Australia (AusIMM - JORC), Canada (CIM), the United Kingdom (IMM) and South Africa (SAIMM). Concurrently, and since 1992, the

United Nations Economic Commission for Europe (UN-ECE) has been developing an International Framework Classification for Reserves/Resources - Solid Fuels and Mineral Commodities (the UNFC). In 1997, the CMMI - CRIRSCO reached a provisional agreement (the Denver Accord) on definitions of Mineral Resources and Mineral Reserves. At a joint meeting in Geneva in 1998 between the CMMI – CRIRSCO and the UN-ECE Task Force, agreement was reached to incorporate the CMMI – CRIRSCO standard reporting definitions for Mineral Resources and Mineral Reserves into the UNFC, thus giving truly international status to the CMMI – CRIRSCO definitions.

As a consequence of the CMMI initiative, significant developments have taken place towards producing consistent reporting standards for Mineral Resources and Mineral Reserves. These include the release of updated versions of the JORC Code in Australia in 1996 and 1999, followed by publication of similar Codes and Guidelines by the professional bodies in South Africa, the USA, Canada, UK, Ireland and Europe.

The similarity of reporting codes and guidelines in those countries represented by the CMMI is now at a point where the development of an International Code is being pursued.

This Reporting Code is consistent with these international developments and will be reviewed from time to time as necessary.

There are three additional categories in the UNFC that are not used in this Reporting Code. These are of particular interest for government planning purposes, which would include future land use or strategic mineral inventories. It is not intended that these categories be used for non-governmental investment and financing

decisions. These additional UNFC categories are included for information only in Appendix 1 of this Code.

2. This first edition of the Reporting Code replaces the 1991 Definitions of Reserves and Resources approved by the Council of the Institution of Mining and Metallurgy which have been in general use in UK and Ireland. The Reporting Code clauses are followed by Guidelines, which do not form part of the Code, but are intended to provide assistance and guidance to readers in interpreting the Code. Definitions in the Code are highlighted in bold text. Guidelines are indented and are in italics. The same indented italics typeface formatting has been applied to Table 1, which forms part of the Guidelines. Throughout the Code the use of the singular may be taken to represent the plural and reference to one gender includes both. Generic terms used in this code and their equivalents and intended meaning are given in Appendix 2.
3. The Code has been adopted by the Institution of Mining and Metallurgy (IMM), the European Federation of Geologists (EFG), the Geological Society of London (GSL) and the Institute of Geologists of Ireland (IGI), and is therefore binding on their individual members.

### SCOPE

4. The main principles governing the operation and application of the Reporting Code are transparency, materiality and competence. Transparency requires that the reader of a Public Report be provided with sufficient, clear and unambiguous information to understand the Public Report and is not misled. Materiality requires that a Public Report contains all the information which investors and their professional advisers would reasonably require, and reasonably expect to find

in the Public Report, for the purpose of making a reasoned and balanced judgement regarding the mineralisation being reported. Competence requires that the Public Report be based on the work of a suitably qualified, responsible and experienced person who is subject to an enforceable professional Code of Ethics or Rules of Conduct.

5. The Code is applicable to all solid minerals for which Public Reporting of Mineral Exploration Results, Mineral Resources and Mineral Reserves may be required, including metals, gemstones, bulk commodities such as coal and iron ore, industrial minerals, stone or aggregates.

Commodity specific guidelines may be developed from time to time and read in conjunction with the Code to assist in its interpretation. Such guidelines will not take precedence over the Code.

6. The Code sets a required **minimum** standard for Public Reporting. **Reference in the Code to a Public Report refers to any report on Mineral Exploration Results, Mineral Resources or Mineral Reserves prepared for the purpose of (a) informing investors or potential investors and their advisers or (b) satisfying regulatory requirements.** Companies are encouraged to provide information which is as comprehensive as possible in their Public Reports.

*Public Reports include, but are not limited to: company annual reports, quarterly reports and other reports to stock exchanges, or as required by law. The Code also applies to all publicly released information, including information memoranda, press releases, web site postings, expert reports and technical papers in respect of reporting on Mineral Exploration Results, Mineral Resources or Mineral Reserves.*

*While every effort has been made in the Code and Guidelines to cover most situations likely to be encountered in the Public Reporting of Mineral Exploration Results, Mineral Resources and Mineral Reserves, there will be occasions when doubt exists as to the appropriate procedure to follow. In such cases, users of the Code and those compiling reports under the Code should be guided by its intent. This is to provide a minimum standard for Public Reporting and to ensure that such reporting contains all information that investors and their professional advisers would require and expect to find in the report for the purpose of making a reasoned and balanced judgement regarding the mineralisation being reported.*

*Table 1, included at the end of the Code, supplies an outline of items that should be considered when evaluating a project. The importance of each item will vary with the specific project and it is recognised that, for some projects, other items may be relevant which are not on the list. Table 1 should be considered as a guide to facilitate a reasoned and balanced approach to reporting. However, many decisions, such as the classification of material as a Mineral Resource or a Mineral Reserve, remain a matter of professional judgment based on knowledge, experience and industry practices.*

*Public disclosure is required of those items in Table 1 most likely to affect the accuracy of estimates made in the report. The authors of reports should both identify and evaluate these important factors in their reports.*

*Estimation of Mineral Resources and Mineral Reserves is inherently subject to some level of uncertainty and inaccuracy. Considerable*

*skill and experience may be needed to interpret pieces of information, such as geological maps and analytical results, that commonly only represent a small part of the body of mineralisation. The uncertainty in the estimates should be discussed in reports and reflected in the appropriate choice of Mineral Reserve and Mineral Resource categories. Levels of confidence are covered in the Code in Clauses 21 and 28.*

## **COMPETENCE AND RESPONSIBILITY**

7. Documentation detailing Mineral Exploration Results, Mineral Resources and Mineral Reserves estimates from which a Public Report is produced, must be prepared by or under the direction of, and signed by, a Competent Person.
8. A Public Report concerning a company's Mineral Exploration Results, Mineral Resources and/or Mineral Reserves is the responsibility of the company acting through its Board of Directors. Any such report must be based on and fairly reflect a Mineral Resource and/or Mineral Reserve estimate and supporting documentation prepared by a Competent Person. A company making a Public Report shall disclose the name of the Competent Person, his qualifications, professional affiliations and relevant experience when required to do so. The Competent Person's written approval is required for the parts of his work included in the report.

*Where all or part of another report is included in a Public Report, the written approval of that report's author should be obtained as to the form and content in which that report is to be included.*

- 9 **A 'Competent Person' is a person who is a corporate member of a recognised professional body relevant to the activity being undertaken, and with enforceable Rules of Conduct. A Competent Person must have a minimum of five years experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which that person is undertaking. If the Competent Person is estimating, or supervising the estimation of Mineral Resources, the relevant experience must be in the estimation, assessment and evaluation of Mineral Resources. If the Competent Person is estimating, or supervising the estimation of Mineral Reserves, the relevant experience must be in the estimation, assessment, evaluation and economic extraction of Mineral Reserves.**

*The key qualifier in the definition of a Competent Person is the word 'relevant'. Determination of what constitutes relevant experience can be difficult and common sense should be exercised. For example, in estimating vein gold mineralisation, experience in a high-nugget, vein-type mineralisation such as tin, uranium etc. will probably be relevant, whereas experience in massive deposits may not. As a second example, to be considered competent in evaluating and reporting on alluvial gold deposits, a person should have considerable experience in this type of mineralisation because of the characteristics of gold in alluvial systems, the particle sizing of the host sediment, and the low grades being quantified. Experience with placer deposits containing minerals other than gold may not necessarily provide relevant experience.*

*The key word 'relevant' also means that it is not always necessary for a person to have*

*five years experience in each and every type of deposit in order to act as a Competent Person if that person has relevant experience in other deposit types. For example, a person with twenty years experience in Mineral Resource estimation in a variety of metalliferous hard-rock deposit types may not require five years specific experience in porphyry copper deposits in order to act as a Competent Person. Relevant experience in the other deposit types would count towards the required experience in relation to porphyry copper deposits.*

*In addition to experience in the style of mineralisation, a Competent Person reporting Mineral Resources should have sufficient knowledge of sampling and assaying techniques relevant to the deposit under consideration to be aware of problems which could affect the reliability of the data. Some appreciation of extraction and processing techniques applicable to that deposit type is also important.*

*As a general guide, persons being called upon to sign as a Competent Person should be clearly satisfied in their own minds that they could face their peers and demonstrate competence in the commodity, type of deposit and situation under consideration. If doubt exists, the person should seek the advice of appropriately experienced colleagues or decline to act as a Competent Person.*

*Estimation of Mineral Resources may be a team effort (for example, involving one person or team collecting the data and another person or team preparing the Mineral Resource estimate). Estimation of Mineral Reserves is very commonly a team*

effort involving a number of technical disciplines. The Competent Person who signs the report is responsible and accountable for the whole of the report under the Code. However, it is recommended that, where there is a clear division of responsibilities within a team, each person and his or her contribution should be identified, and should accept responsibility for that particular contribution. For example, one person could accept responsibility for the collection of resource data, another for the resource estimation process, another for the mining study, and the project leader could accept responsibility for the overall report. It is important that the Competent Person accepting overall responsibility for a Mineral Resource or Mineral Reserve report which has been prepared in whole or in part by others is satisfied that the work of the other contributors is acceptable.

The Competent Person undertaking and signing off on Mineral Resource or Mineral Reserve reporting should accept full responsibility for the report and should not treat the procedure merely as a 'rubber-stamp' exercise. In particular, if the Competent Person is not himself fully responsible for the production of the resource and reserve estimates, he should take reasonable steps to ensure that he fully understands all of the estimation work, including visits to site and personal verification of the data. He should not rely implicitly on the word of others.

The Code is intended to be read in conjunction with a Professional Code of Ethics or Rules of Conduct and Guidelines issued by the institution of which the Competent Person is a corporate member.

Recognised professional institutions with enforceable Professional Codes of Ethics or Rules of Conduct subscribing to this Reporting Code are the IMM, EFG, GSL and IGI, and others will be added from time to time.

Rules of Conduct should meet the requirements and guidelines set out in Appendix 3.

Failure to adhere to the standards of professional conduct set out in the relevant Professional Codes of Ethics or Rules of Conduct and Guidelines can lead to disciplinary action and, in certain circumstances, to expulsion from the institution concerned. Complaints made in respect of the professional work of a Competent Person will be considered in terms of the Professional Code of Ethics or Rules of Conduct and Guidelines of the institution of which the Competent Person is a member, and will be dealt with by the relevant disciplinary procedures.



**REPORTING TERMINOLOGY**

10 Public Reports dealing with Mineral Resources and/or Mineral Reserves must only use the terms set out in Figure 1.

Figure 1 sets out the framework for classifying tonnage and grade estimates in order to reflect different levels of geological confidence and different degrees of technical and economic evaluation. Mineral Resources can be estimated on the basis of geological information with some input from other relevant disciplines. Mineral Reserves are a modified sub-set of the Indicated and Measured Mineral Resources (shown in the dashed outline in Figure 1). The conversion of Mineral Resources to Mineral Reserves requires consideration of factors affecting extraction ('modifying factors'), including mining, metallurgical, economic, marketing, legal, environmental, social and governmental, and should in all instances be estimated with input from a range of disciplines.

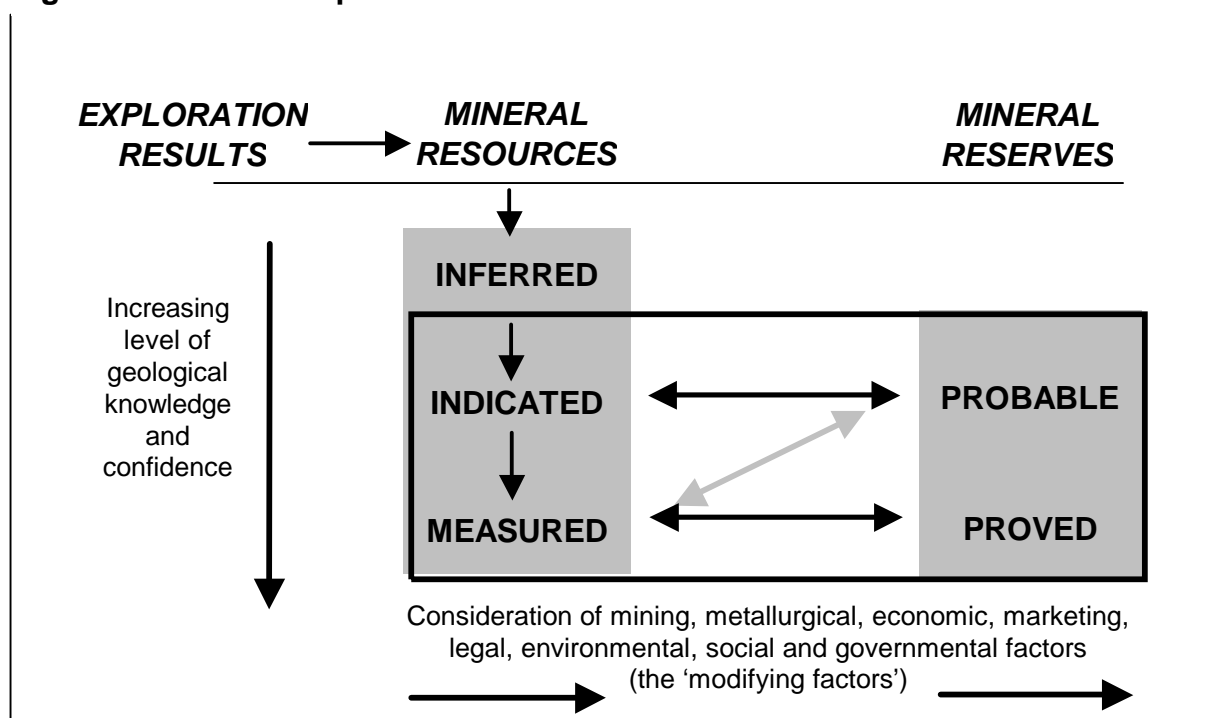
*In certain situations, Measured Mineral Resources could convert to Probable Mineral Reserves because of uncertainties associated with modifying factors that are taken into account in the conversion from Mineral Resources to Mineral Reserves. This relationship is shown by the broken arrow in Figure 1. Although the trend of the broken arrow includes a vertical component, it does not imply a reduction in the level of geological knowledge or confidence. In such a situation the modifying factors should be fully explained. Refer also to the guidelines to Clause 28.*

*It is possible that previously reported Mineral Reserves could convert back to Mineral Resources because of new information affecting the modifying factors. This two-way relationship is indicated by two-headed arrows in Figure 1. The changes in the modifying factors that cause such a conversion should be fully explained. Refer further to the guidelines to Clause 28.*

**REPORTING GENERAL**

11 Public Reports concerning a company's Mineral Exploration Results, Mineral Resources or

**Figure 1. Relationship between Mineral Resources and Mineral Reserves**



Mineral Reserves must include a description of the style and nature of mineralisation.

*terminology for the commodity or activity being reported.*

- 12 A company must disclose relevant information concerning the status and characteristics of a mineral deposit which could materially influence the economic value of that deposit, and promptly report any material changes in its Mineral Exploration Results, Mineral Resources or Mineral Reserves. Companies are encouraged to report at least annually and to provide details of the reasons for any significant year on year changes.

*Reports are prepared for different reasons and may contain more or less detail according to their intended purpose and readership. The contents of a report should be determined by the Competent Person to be appropriate for its use on the basis of relevance (materiality) and where appropriate, backup documentation, such as audit reports, should be referred to or made available.*

- 13 Throughout the Code, certain words are used in a general sense when a more specific meaning might be attached to them by particular commodity groups within the industry. In order to avoid unnecessary duplication, the generic terms are listed in Appendix 2 together with other terms that may be regarded as synonymous for the purposes of this document.

*The use of a particular term throughout this document does not signify that it is preferred or necessarily the ideal term in all circumstances. A typical example is where mining is referred to as quarrying when stone and aggregates are involved. Competent Persons would be expected to select and use the most appropriate*

## REPORTING OF MINERAL EXPLORATION RESULTS

- 14 **Mineral Exploration Results include data and information generated by exploration programmes that may be of use to investors but which may not be part of a formal declaration of Mineral Resources or Mineral Reserves.** This is common in the early stages of exploration when the quantity of data available is generally not sufficient to allow any reasonable estimates of tonnage and grade to be made. Examples include discovery outcrops, single drill hole intercepts or the results of geophysical surveys.

*It should be made clear in public reports that contain Mineral Exploration Results that it is inappropriate to use such information to derive estimates of tonnage and grade. It is recommended that such reports carry a continuing statement along the following lines:*

*"The information provided in this report/statement/release constitutes Mineral Exploration Results as defined in the Reporting Code, Clause 14. It is inappropriate to use such information for deriving estimates of tonnage and grade".*

- 15 If a Company reports Mineral Exploration Results in relation to mineralisation not classified as a Mineral Resource or Mineral Reserve, then estimates of tonnage and associated average grade must not be reported.

*Descriptions of exploration targets or exploration potential given in Public Reports,*



*should be expressed so as not to misrepresent them as an estimate of Mineral Resources or Mineral Reserves*

- 16 Public Reports of Mineral Exploration Results relating to mineralisation not classified as a Mineral Resource or Mineral Reserve must contain sufficient information to allow a considered and balanced judgement of the significance of the results. The reporting of Mineral Exploration Results must not be presented so as to unreasonably imply that potentially economic mineralisation has been discovered.

*Mineral Exploration Results should include an explanation of sampling techniques and data, land tenure status, geology and mineralisation and other relevant information. Table 1 provides a checklist and guide that those preparing reports on Mineral Exploration Results, Mineral Resources and Mineral Reserves should use as a reference. The checklist is not prescriptive and, as always, relevance and materiality are overriding principles that determine what information should be publicly reported. Reporting of isolated values without placing them in context is unacceptable.*

## REPORTING OF MINERAL RESOURCES

- 17 **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 prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from**

**specific geological evidence and knowledge. Mineral Resources are subdivided, in order of increasing geological confidence into Inferred, Indicated and Measured categories.**

Portions of a mineral deposit that do not have reasonable prospects for eventual economic extraction must not be included in a Mineral Resource.

*The term 'Mineral Resource' covers mineralised material, including dumps and tailings, that has been identified and estimated through exploration and sampling and from which Mineral Reserves may be derived by the application of the modifying factors.*

*The term 'reasonable prospects for eventual economic extraction' implies a judgement (albeit preliminary) by the Competent Person in respect of the technical and economic factors likely to influence the prospect of economic extraction, including the approximate mining parameters. In other words, a Mineral Resource is not an inventory of all mineralisation drilled or sampled, regardless of cut-off grades, likely mining dimensions, location or continuity. It is a realistic inventory of mineralisation, which, under assumed and justifiable technical and economic conditions, might become economically extractable.*

*The assumptions made in determining the 'reasonable prospects for eventual economic extraction' should be clearly stated in the Public Report.*

*Interpretation of the word 'eventual' in this context may vary depending on the commodity or mineral involved. For example, for many coal, iron ore, bauxite and other*

*bulk minerals or commodities, it may be reasonable to envisage 'eventual economic extraction' as covering time periods in excess of 50 years. However for the majority of gold deposits, application of the concept would normally be restricted to perhaps 20 to 30 years, and frequently to much shorter periods of time.*

*Certain reports (e.g. inventory reports, exploration reports to government and other similar reports not intended primarily for providing information for investment purposes) may require full disclosure of all mineralisation, including some material that does not have reasonable prospects for eventual economic extraction. Such estimates of mineralisation would not qualify as Mineral Resources or Mineral Reserves under the Code.*

*Any material adjustment made to the data for the purpose of making the estimate, for example by cutting high grades, should be clearly stated and described in the Public Report.*

*Where considered appropriate by the Competent Person, Mineral Resource estimates may include material below the selected cut-off grade to ensure that the Mineral Resources comprise bodies of mineralisation of adequate size and continuity to properly consider the most appropriate approach to mining. Such material could include dilution resulting from the requirement for a minimum mining width. Documentation of Mineral Resource estimates should clearly identify any such inclusions, and Public Reports should include commentary on the matter if considered material.*

**18 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 assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which is limited or of uncertain quality and reliability.**

An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource.

*The category is intended to cover situations where a mineral concentration or occurrence has been identified and limited measurements and sampling completed, but where the data are insufficient to allow the geological and/or grade continuity to be confidently interpreted. Due to the uncertainty which may be attached to some Inferred Mineral Resources, it cannot be assumed that all or part of an Inferred Mineral Resource will be upgraded to an Indicated or Measured Mineral Resource as a result of continued exploration. Confidence in the estimate is usually not sufficient to allow the appropriate application of technical and economic parameters or to enable a reliable evaluation of economic viability. For this reason, there is no direct link from an Inferred Resource to any category of Mineral Reserves (see Figure 1). At the discretion of the Competent Person, a Company may include all or part of its Inferred Mineral Resource for the purpose of internal planning. In such circumstances, the results are not considered to be sufficiently reliable to ensure beyond reasonable doubt that all of the Inferred*

*Mineral Resource will eventually become a Mineral Reserve. Any such reliance on Inferred Resources in a mine plan should be made clear in the report.*

- 19 **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 testing 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.**

An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource, but has a higher level of confidence than that applying to an Inferred Mineral Resource.

*An Indicated Mineral Resource requires that the nature, quality, amount and distribution of data are such as to allow the Competent Person to confidently interpret the geological framework and to assume geological continuity of mineralisation. Confidence in the estimate is sufficient to allow the appropriate application of technical and economic parameters and to enable an evaluation of economic viability.*

- 20 **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.**

*A Measured Mineral Resource requires that the nature, quality, amount and distribution of data are such as to leave no reasonable doubt in the opinion of the Competent Person, that the tonnage and grade of the mineralisation can be estimated to within close limits. Any variation within these limits would not significantly affect potential economic viability. This category requires a high level of confidence in, and understanding of, the geology and the controls of the mineral deposit. Confidence in the estimate is sufficient to allow the appropriate application of technical and economic parameters and to enable an evaluation of economic viability with a high level of confidence.*

- 21 The choice of the appropriate category of Mineral Resource depends upon the quantity, distribution and quality of data available and the level of confidence attached to the data. The appropriate Mineral Resource category must be determined by a Competent Person.

*Mineral Resource classification is a matter for skilled judgement, and the Competent Person should take into account those items in Table 1 which relate to confidence, accuracy (i.e. lack of bias) and precision (i.e. repeatability) in Mineral Resource estimation.*

*In deciding between Measured Mineral Resources and Indicated Mineral Resources, the Competent Person may find it useful to consider, in addition to the phrases in the*

*two definitions relating to geological and grade continuity in Clauses 19 and 20, the phrase in the guideline to the definition for Measured Mineral Resources, ‘... any variation within these limits would not significantly affect potential economic viability’.*

*In deciding between Indicated Mineral Resources and Inferred Mineral Resources, the Competent Person may wish to take into account, in addition to the phrases in the two definitions in Clauses 18 and 19 relating to geological and grade continuity, the guideline to the definition for Indicated Mineral Resources: ‘Confidence in the estimate is sufficient to allow the appropriate application of technical, economic and financial parameters and to enable an evaluation of economic viability’. This contrasts with the guideline to the definition of Inferred Mineral Resources: ‘Confidence in the estimates is usually not sufficient to allow the appropriate application of technical, economic and financial parameters or to enable a reliable evaluation of economic viability. The Competent Person should also take into consideration issues of mineralisation style and scale when assessing geological and grade continuity.*

- 22 Mineral Resource estimates are not precise calculations, being dependent on the interpretation of limited information on the location, shape and continuity of the occurrence and on the available sampling results. Reporting of tonnage and grade figures should reflect the order of accuracy of the estimate by rounding off to the appropriate number of significant figures and, where appropriate by qualification with terms such as ‘approximately’.

*In most situations, rounding to the second significant figure should be sufficient. For example 10,863,000 tonnes at 8.23 per cent should be stated as 11 million tonnes at 8.2 per cent. There will be occasions, however, when rounding to the first significant figure may be necessary to convey properly the uncertainties in estimation. This would usually be the case with Inferred Mineral Resources.*

*In order to emphasise the imprecise nature of a Mineral Resource estimate, it is recommended that the final results always be referred to as an estimate, not a calculation.*

- 23 Public Reports of Mineral Resources must specify one or more of the categories of ‘Inferred’, ‘Indicated’ or ‘Measured’. Reports must not contain Mineral Resource figures combining two or more of the categories unless figures for the individual categories are also provided. A Mineral Resource must not be reported in terms of contained mineral content unless corresponding tonnage and grade figures are also presented. Mineral Resources must not be aggregated with Mineral Reserves.

*Table 1 provides, in summary form, a list of the main criteria that should be considered when preparing reports on Mineral Exploration Results, Mineral Resources and Mineral Reserves. These criteria need not be discussed in a Public Report unless they materially affect estimation or classification of the Mineral Resources and Mineral Reserves.*

*It is not necessary in a Public Report to comment on each item in Table 1, but it is essential to discuss any matters that might materially affect the reader’s understanding*

*or interpretation of the results or estimates being reported. This is particularly important where inadequate or uncertain data affect the reliability of, or confidence in, a statement of Mineral Exploration Results or an estimate of Mineral Resources and/or Mineral Reserves; for example poor sample recovery, poor repeatability of assay or laboratory results, limited information on tonnage factors etc.*

- 24 The words 'ore' and 'reserves' must not be used in stating Mineral Resource estimates as the terms imply technical feasibility and economic viability and are only appropriate when all relevant modifying factors have been considered. Reports and statements should continue to refer to the appropriate category or categories of Mineral Resources until technical feasibility and economic viability have been established. If re-evaluation indicates that any part of the Mineral Reserves is no longer viable, such Mineral Reserves must be re-classified as Mineral Resources or removed from the Mineral Resource/Mineral Reserve statements.

*It is not intended that re-classification from Mineral Reserves to Mineral Resources or vice-versa should be applied as a result of changes expected to be of a short term or temporary nature, or where company management has made a deliberate decision to temporarily operate on a sub-economic basis. Examples of such situations might be a commodity price drop expected to be of short duration, a mine emergency of a non-permanent nature, a transport strike, etc.*

## REPORTING OF MINERAL RESERVES

- 25 A 'Mineral Reserve' is the economically mineable part of a Measured and/or

**Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is justified. Mineral Reserves are sub-divided in order of increasing confidence into Probable Mineral Reserves and Proved Mineral Reserves.**

*Mineral Reserves are those portions of Mineral Resources which, after the application of the modifying factors, result in an estimated tonnage and grade, that in the opinion of the Competent Person making the estimates can be the basis of a viable project. Mineral Reserves are reported as inclusive of marginally economic material and diluting material delivered for treatment or dispatched from the mine without treatment. To avoid confusion in reporting Mineral Reserves the definition of treatment is taken to include any beneficiation of the raw product that might take place prior to, or during, the metallurgical process.*

*The evaluation techniques used (including, where relevant, the block sizes) and the key assumptions made in arriving at the estimate should be disclosed.*

*The term economic implies that extraction of the Mineral Reserve has been demonstrated to be viable and justifiable under reasonable financial assumptions. What constitutes realistic will vary with the type of deposit, the level of study that has been carried out and*



*the financial requirements of the individual company. For this reason, there can be no fixed definition for the term economic. However, it is expected that companies will attempt to achieve an acceptable return on capital invested, and that returns to investors in the project will be competitive with alternative investments of comparable risk.*

*In order to achieve the required level of confidence in the Mineral Resources and all of the modifying factors it is expected that studies to at least a prefeasibility level will have been carried out prior to determination of the Mineral Reserves. The study will have determined a mine plan that is technically achievable and economically viable and from which the Mineral Reserves can be derived.*

*The term 'Mineral Reserve' need not necessarily signify that extraction facilities are in place or operative, or that all governmental approvals have been received. It does signify that there are reasonable expectations of such approvals.*

*In reporting Mineral Reserves, information on estimated metallurgical recovery factors is very important, and should always be included in Public Reports.*

*If there is doubt about what should be reported, it is better to err on the side of providing too much information rather than too little.*

*Mineral Reserve estimates are sometimes reported after cutting or capping of high grades or the application of mine or mill 'call factors' that reflect historical experience of the reconciliation between Mineral Reserve estimates and actual production. If any of the data used in the Mineral Reserve*

*estimate are materially adjusted or modified for the purpose of making the estimate, this should be clearly stated in a Public Report and the nature of the adjustment or modification described.*

*It should be noted that the Code does not imply that an economic operation should have Proved Mineral Reserves. Situations may arise where Probable Mineral Reserves alone may be sufficient to justify extraction, as for example with some alluvial tin, diamond or gold deposits. This is a matter for judgement by the Competent Person.*

*Where companies prefer to use the term 'Ore Reserves' in their Public Reports, they should state clearly that this is being used with the same meaning as 'Mineral Reserves', defined in this Code.*

- 26 A 'Probable Mineral Reserve' is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is justified.**

A Probable Mineral Reserve has a lower level of confidence than a Proved Mineral Reserve but is of sufficient quality to serve as the basis for a decision on the development of the deposit.



**27 A 'Proved Mineral Reserve' is the economically mineable part of a Measured Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is justified.**

*A Proved Mineral Reserve represents the highest confidence category of material available to a company both technically and economically. As noted in the guidelines to Clause 25, the style of mineralisation or other factors could mean that Proved Mineral Reserves are not achievable in some deposits. Care should be taken to avoid declaring Proved Mineral Reserves too early in the life of a project when subsequent data might show that this decision has been over optimistic, and that the reserves have then to be downgraded or removed. It is generally better to maintain preliminary estimates as Probable Reserves or to defer reporting than to be forced to retract statements at a later date.*

**28** The choice of the appropriate category of Mineral Reserve is determined primarily by the relevant level of confidence in the Mineral Resource and after considering any uncertainties in the modifying factors. Allocation of the appropriate category must be made by the Competent Person.

*The Code provides for a direct relationship between Indicated Mineral Resources and Probable Mineral Reserves and between Measured Mineral Resources and Proved Mineral Reserves. In other words, the level of geological confidence for Probable Mineral Reserves is similar to that required for the determination of Indicated Mineral Resources. The level of geological confidence for Proved Mineral Reserves is similar to that required for the determination of Measured Mineral Resources. Inferred Mineral Resources are always additional to Mineral Reserves.*

*The Code also provides for a two-way relationship between Measured Mineral Resources and Probable Mineral Reserves. This is to cover a situation where uncertainties associated with any of the modifying factors considered when converting Resources to Reserves may result in there being a lower degree of confidence in the Mineral Reserves than in the corresponding Mineral Resources. Such a conversion would not imply a reduction in the level of geological knowledge or confidence.*

*A Measured Mineral Resource may be converted to a Proved Mineral Reserve if the uncertainties in the modifying factors are removed. No amount of confidence in the modifying factors for conversion of a Mineral Resource into a Mineral Reserve can override the upper level of confidence that exists in the Mineral Resource. Under no circumstances can an Indicated Mineral Resource be converted directly to a Proved Mineral Reserve (see Figure 1).*

*Application of the category of Proved Mineral Reserves implies the highest degree of*

*confidence in the estimate, with consequent expectations in the minds of the readers of the report. These expectations should be borne in mind when categorising a Mineral Resource as Measured.*

*Refer also to the guidelines in Clause 21 regarding classification of Mineral Resources.*

- 29 Mineral Reserve estimates are not precise calculations, and tonnage and grade figures in reports must be expressed so as to convey the order of accuracy of the estimates by rounding off to an appropriate number of significant figures.

*Refer to the guidelines to Clause 22 regarding rounding of Mineral Resource estimates.*

*In order to emphasise the imprecise nature of a Mineral Reserve estimate, it is recommended that the final results always be referred to as an estimate not a calculation.*

- 30 Public Reports of Mineral Reserves must specify one or other of the categories of 'Proved' and 'Probable'. Reports must not contain combined Proved and Probable Mineral Reserve figures unless the relevant figures for each of the individual categories are also provided. Reports must not present mineral content figures unless corresponding tonnage and grade figures are also given.

*Mineral Reserves may incorporate material (dilution) which is not part of the original Mineral Resource. It is essential that this fundamental difference between Mineral Resources and Mineral Reserves is borne in mind and caution exercised if attempting to*

*draw conclusions from a comparison of the two.*

*Public Reporting of tonnage and grade outside the categories covered by the Code is not permitted. These may be useful estimates for a company in its internal calculations and evaluation processes, but their inclusion in Public Reports would cause confusion.*

*When revised Mineral Reserve and Mineral Resource statements are publicly reported they should be accompanied by reconciliation with previous statements. A detailed account of differences between the figures is not essential, but sufficient comment should be made to enable significant variances to be understood by the reader.*

- 31 In situations where figures for both Mineral Resources and Mineral Reserves are reported, a clarifying statement must be included in the report which clearly indicates whether the Mineral Resources are inclusive of, or additional to the Mineral Reserves

*In some situations there are reasons for reporting Mineral Resources inclusive of Mineral Reserves and in other situations for reporting Mineral Resources additional to Mineral Reserves. It should be made clear which form of reporting has been adopted. Appropriate forms of clarifying statements may be:*

*'The Measured and Indicated Mineral Resources are inclusive of those Mineral Resources modified to produce the Mineral Reserves.'*

*Or*

## REPORTING OF COAL RESOURCES AND RESERVES

*'The Measured and Indicated Mineral Resources are additional to Mineral Reserves.'*

*In the former case, if any Mineral Resources have not been modified to produce Mineral Reserves for economic or other reasons, the relevant details of these unmodified Mineral Resources should be included in the report. This is to assist the reader of the report in making a judgement of the likelihood of the unmodified Measured and Indicated Mineral Resources eventually being converted to Mineral Reserves.*

*Inferred Mineral Resources are by definition always additional to Mineral Reserves.*

*For reasons stated in the first guideline of Clause 30 and in this paragraph, the reported Mineral Reserve figures cannot be added to the reported Mineral Resource figures. The resulting total is misleading and is capable of being misunderstood or, more seriously, of being misused to give a false impression of a company's prospects.*

32 Table 1 provides, in a summary form, a list of the main criteria which should be considered when preparing reports on Mineral Exploration Results, Mineral Resources and Mineral Reserves. These criteria need not be discussed in a Public Report unless they materially affect estimation or classification of the Mineral Resources and Mineral Reserves. However, changes in economic or political factors alone may be the basis for significant changes in Mineral Reserves and should be reported accordingly.

33 Clauses 34 to 37 of the Code address matters that relate specifically to the Public Reporting of Coal Resources and Reserves. Unless otherwise stated, Clauses 1 to 32 of this Code (including Figure 1) apply. Table 1, as part of the guidelines, should also be considered persuasive when reporting on Coal Resources and Reserves.

*For the purposes of Public Reporting, the requirements for coal are generally similar to those for other commodities with the replacement of terms such as 'mineral' by 'coal' and 'grade' by 'quality'. Other industry guidelines on the estimation and reporting of coal resources and reserves may be useful but will under no circumstances override the provisions and intention of the Code for public reporting.*

*Coal may be of particular interest to National Governments because of its impact on government planning and land use. Reports to governments may require estimates of coal resources that are not constrained by short to medium term economic considerations. Such reports and estimates of strategic resource are not covered by the Reporting Code.*

34 The terms 'Mineral Resource(s) and Mineral Reserve(s) and the subdivisions of these as defined above apply also to coal reporting, but if preferred by the reporting company, the terms 'Coal Resource(s) and Coal Reserve(s) and appropriate subdivisions may be substituted.

35 When reporting coal reserves, a clear distinction must be made between reserves where mining losses have been taken into account

(sometimes described as recoverable or run of mine) and saleable product where both mining and processing losses have been included (sometimes referred to as marketable reserves). All reserves, by definition, include mining losses and dilution and the use of superfluous description is discouraged. In situ coal is, also by definition, a resource. Reports must not contain combined Proved and Probable Coal Reserve figures unless the relevant figures for each of the individual categories are also provided

36 Saleable product (or marketable Coal Reserves), representing beneficiated or otherwise enhanced coal, may be publicly reported. Where this is the case, the equivalent recoverable Coal Reserves should be shown and the basis of the predicted yield to achieve saleable product should be stated.

37 Relevant coal quality information should be reported for all Coal Resource and Coal Reserve categories including the basis on which the quality parameters are derived. Where applicable, Marketable Coal Reserves should be subdivided into the relevant coal product types.

*The parameters used to measure coal quality, for example on an 'As Received' or 'Air Dried' moisture basis should be reported. The quality of coal should be expressed according to parameters relevant to specific applications e.g. steam coal, metallurgical coal etc. The selection of the relevant quality parameters is the responsibility of the Competent Person and might include ash, volatile matter, sulphur, coking properties, calorific value etc.*

*Resource classification should take into consideration both continuity and reliability of*

*thickness measurements and reliability and confidence in quality parameters, recognising that variability in seam thickness and quality are not necessarily interdependent.*

## **REPORTING OF RESOURCES AND RESERVES FOR DIAMONDS AND OTHER GEMSTONES**

38 Clauses 39 and 40 of this Code address matters that relate specifically to the Public Reporting of Diamond and other Gemstone Resources and Reserves. Unless otherwise stated, Clauses 1 to 32 of this Code (including Figure 1) apply. Table 1, as part of the guidelines, contains further general and specific advice on the criteria to consider when reporting Diamond and other Gemstone Resources and Reserves. The term diamond in this section may be taken to include all other gemstones

*For the purposes of public reporting, the requirements for diamonds and other gemstones are generally similar to those for other commodities with the replacement of terms such as 'mineral' by 'diamond' and 'grade' by 'grade and average diamond value'. The term 'quality' should not be substituted for 'grade,' as in diamond deposits these have distinctly separate meanings. Other industry guidelines on the estimation and reporting of diamond resources and reserves may be useful but will under no circumstances override the provisions and intention of the Code for Public Reporting.*

*A number of characteristics of diamond deposits are different from those of, for example, typical metalliferous and coal deposits and require special consideration. These include the generally low mineral*

*content and variability of primary and placer deposits, the particulate nature of diamonds, the specialised requirement for diamond valuation and the inherent difficulties and uncertainties in the estimation of diamond resources and reserves.*

- 39 For Public Reports dealing with diamonds it is a requirement of the Code that if a valuation of a parcel of diamonds is reported, then the person(s) or organisations valuing the parcel must be named in the report. Details should also be given of the valuer's professional experience, competency and independence.
- 40 Reports of diamonds recovered from sampling programmes must specify the weight (in carats) of diamonds recovered.

*The stone size distribution and price of diamonds and other gemstones are critical components of the resource and reserve estimates. At an early exploration stage, sampling and delineation drilling will not provide this information, which relies on large diameter drilling and, in particular, bulk sampling.*

*In order to demonstrate that a resource has reasonable prospects for economic extraction, some appreciation of the likely stone size distribution and price is necessary, however preliminary. To determine an Inferred Resource in simple, single facies or phase deposits, such information may be obtainable by representative large diameter drilling. More often, some form of bulk sampling, such as pitting and trenching, can be employed to provide larger sample parcels.*

*In order to progress to an Indicated Resource, and from there to a Probable*

*Reserve, it is likely that much more extensive bulk sampling will be needed to fully determine the stone size distribution and value relationships. Commonly such bulk samples would be obtained by underground development designed to obtain sufficient diamonds to enable a confident estimate of price.*

*In complex deposits, it may be extremely difficult to ensure that the bulk samples taken are truly representative of the whole deposit. The lack of direct bulk sampling, and the uncertainty in demonstrating spatial continuity of size and price should be persuasive in determining the appropriate resource category.*

## **REPORTING OF INDUSTRIAL MINERALS, STONE AND AGGREGATES**

- 41 Clauses 42 to 44 of this Code address matters which relate to the Public Reporting of Industrial Minerals, stone and aggregates of all forms and other bulk commodities such as borates, talc, kaolin etc. that are generally sold on the basis of their product specifications and market acceptance. Unless otherwise stated, clauses 1 to 32 of this Code (including Figure 1) apply. Table 1, as part of the guidelines, should also be considered persuasive when reporting on Industrial Minerals Resources and Reserves.
- 42 Other industry guidelines on the estimation and reporting of industrial mineral, stone and aggregate resources and reserves may be useful but will under no circumstances override the provisions and intention of this Code for public reporting.
- 43 With respect to modifying factors, the normal geological parameters may be less important in



the case of industrial minerals, stone and aggregate. Such factors as quality and marketability are important and should be carefully considered before declaring Mineral Reserves.

- 44 In certain cases commercial sensitivity may prevent the publication of quality parameters, but in such cases this should be clearly justified in the report.

### **REPORTING OF MINERALISED STOPE-FILL, PILLARS, LOW GRADE MINERALISATION, STOCKPILES, DUMPS AND TAILINGS**

- 45 The Code applies to the reporting of all potentially economic mineralised material. This can include mineralised stope-fill, remnants, pillars, low grade mineralisation, stockpiles, dumps and tailings (remnant materials) where there are reasonable and realistic prospects for eventual economic extraction in the case of Mineral Resources and where extraction is reasonably justifiable in the case of Mineral Reserves. Unless otherwise stated, Clauses 1 to 32 of the Code (including Figure 1) apply.

*Any remnant materials as described above can be considered to be similar to in situ mineralisation for the purposes of reporting Mineral Resources and Mineral Reserves. The opinion of a mining engineer or other relevant professional should be sought when making judgements about the mineability of stope-fill, remnants and pillars.*

*If there are no reasonable prospects for the economic extraction of all or part of the remnant materials then this material can not*

*be classified as either Mineral Resources or Mineral Reserves.*

*If some portion of the remnant materials is currently sub-economic, but there is a reasonable expectation that it will become economic, then this material may be classified as a Mineral Resource. If technical and economic studies have demonstrated that economic extraction could reasonably be justified under realistically assumed conditions, then the material may be classified as a Mineral Reserve.*

*The above guidelines apply equally to low grade mineralisation, often intended for stockpiling and treatment towards the end of mine life. For clarity of understanding, the tonnage and grade estimates of such material should be itemised separately in Public Reports, although they may be aggregated with total Mineral Resource and Mineral Reserve figures.*

*Stockpiles are defined to include both surface and underground stockpiles, including broken ore in stopes, and can include ore currently in the ore storage system. Mineralised material in the course of being processed (including leaching), if reported, should be reported separately.*



**CHECK LIST OF ASSESSMENT AND REPORTING CRITERIA**

Table 1 is a checklist and guideline that those preparing reports on Mineral Exploration Results Mineral Resources and Mineral Reserves should use as a reference. The checklist is not prescriptive and, as always, relevance and materiality are overriding principles that determine what information should be publicly reported. It is, however, important to report any matters that might materially affect a reader's understanding or interpretation of the results or estimates being reported. This is particularly important where inadequate or uncertain data affect the reliability of, or confidence in, a statement of Exploration Results or an estimate of Mineral Resources and/or Mineral Reserves.

The order and grouping of criteria in Table 1 reflect the normal systematic approach to exploration and evaluation. Criteria in the first group 'Sampling Techniques and Data' apply to all succeeding groups. In the remainder of the checklist, criteria listed in preceding groups would often apply to succeeding groups and should be considered when estimating and reporting.

CRITERIA	EXPLANATION
<b>SAMPLING TECHNIQUES AND DATA</b> <b>(criteria in this group apply to all succeeding groups)</b>	
<i>Type(s) of sampling</i>	<i>The type of sampling and its location, which will give rise to the results being reported should be stated. Types of sampling include stream sediment, soil and heavy mineral concentrate samples, trenching and pitting, rock chip and channel sampling, drilling, auger etc. Examples of locations include old workings, mine dumps etc. Wherever possible the spacing of such samples should be stated.</i>
<i>Drilling techniques</i>	<i>Drill type (e.g. core, reverse circulation, etc.) and details (e.g. core diameter). Measures taken to maximise sample recovery and ensure representative nature of the samples.</i>
<i>Logging</i>	<i>Whether samples have been logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies. Whether logging is qualitative or quantitative in nature. Core (or trench, channel etc.) photography.</i>
<i>Drill sample recovery</i>	<i>Whether sample recoveries have been properly recorded and results assessed. In particular whether a relationship exists between sample recovery and grade and sample bias (e.g. preferential loss/gain of fine/coarse material).</i>
<i>Other sampling techniques</i>	<i>Nature and quality of sampling (e.g. cut channels, random chips etc.) and measures taken to ensure sample representativity. Precise location and unique numbering of each sample.</i>

<i>Assay data and laboratory investigation</i>	<i>The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total. Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.</i>
<i>Sub-sampling techniques and sample preparation</i>	<i>If core, whether cut or sawn or whether quarter, half or all core taken. If non-core, whether riffled, tube sampled, rotary split etc. and whether split wet or dry. For all sample types, the nature, quality and appropriateness of the sample preparation technique. Quality control procedures adopted for all sub-sampling stages to maximise representativity of samples. Measures taken to ensure that the sampling is representative of the in situ material collected. Whether sample sizes are appropriate to the grain size of the material being sampled. A statement as to the security measures taken to ensure sample integrity is recommended.</i>
<i>Verification of results</i>	<i>The verification of selected intersections by either independent or alternative personnel. The use of twinned holes, deflections or duplicate samples.</i>
<i>Data location</i>	<i>Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation. Quality and adequacy of topographic control. Locality plans.</i>
<i>Data density and distribution</i>	<i>Data density for reporting of Exploration Results. Whether the data density and distribution are sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Mineral Reserve estimation procedure and classifications applied. Whether sample compositing has been applied.</i>
<i>Reporting Archives</i>	<i>Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) for preparing the report</i>
<i>Audits or reviews</i>	<i>The results of any audits or reviews of sampling techniques and data.</i>

<b>REPORTING OF MINERAL EXPLORATION RESULTS</b> <b>(criteria listed in the preceding group apply also to this group)</b>	
<i>Mineral rights and land ownership</i>	<i>Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, historical sites, wilderness or national park and environmental settings. In particular the security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area. Location plans of mineral rights and titles. It is not expected that the description of mineral title in a technical report should be a legal opinion, but should be a brief and clear description of such title as understood by the author.</i>
<i>Exploration work carried out by other parties</i>	<i>Acknowledgement and appraisal of exploration by other parties.</i>
<i>Geology</i>	<i>Description of the nature, detail, and reliability of geological information (rock types, structure, alteration, mineralisation, and relation to known mineralised zones, etc.). Description of geophysical and geochemical data. Reliable geological maps and cross sections should exist to support interpretations.</i>
<i>Data compositing (aggregation) methods.</i>	<i>In reporting Exploration Results, weighted averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually material and should be stated. Where composite intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such compositing should be stated and some typical examples of such composites should be shown in detail. The assumptions used for any reporting of metal equivalent values should be clearly stated.</i>
<i>Relationship between mineralisation widths and intercept lengths</i>	<i>These relationships are particularly important in the reporting of Exploration Results. If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported. If it is not known and only the down-hole lengths are reported, there should be a clear statement to this effect (e.g. 'down-hole length, true width not known').</i>
<i>Diagrams</i>	<i>Where possible, maps, plans and sections (with scales) and tabulations of intercepts should be included for any material discovery being reported if such diagrams significantly clarify the report.</i>

<i>Balanced reporting</i>	<i>Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practised to avoid misleading reporting of Exploration Results.</i>
<i>Other substantive exploration data</i>	<i>Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples - size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.</i>
<i>Further work</i>	<i>The nature and scale of planned further work (e.g. additional exploration). Environmental descriptions of anticipated liabilities.</i>
<b>ESTIMATION AND REPORTING OF MINERAL RESOURCES (criteria listed in the first group, and where relevant in the second group, apply also to this group)</b>	
<i>Database integrity</i>	<i>Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes. Data verification and/or validation procedures used.</i>
<i>Geological interpretation</i>	<i>Description of geological model and inferences made from this model. Discussion of sufficiency of data density to assure continuity of mineralisation and provide an adequate database for the estimation procedure used. Discussion of alternative interpretations and their potential impact on the estimation.</i>
<i>Estimation and modelling techniques</i>	<i>The nature and appropriateness of the estimation techniques applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters, maximum distance of projection from data points. The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data. The assumptions made regarding recovery of by-products. In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed. Any assumptions behind modelling of selective mining units (e.g. non-linear kriging). The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available. Detailed description of the method used and the assumptions made to estimate tonnages and grades (section, polygon, inverse distance, geostatistical, or other method). Description of how the geological interpretation was used to control the resource estimates. Discussion of basis for using or not using grade cutting or capping. If a computer method was chosen, description of programmes and parameters used. Geostatistical methods are extremely varied and should be described in detail. The method chosen should be justified. The geostatistical parameters, including the variogram, and their compatibility with the geological interpretation should be discussed. Experience gained in applying geostatistics to similar deposits should be taken into account.</i>

<i>Cut-off grades or parameters</i>	<i>The basis of the cut-off grades or quality parameters applied, including the basis, if appropriate, of equivalent metal formulae.</i>
<i>Mining factors or assumptions</i>	<i>The mining method proposed and its suitability for the style of mineralisation, including minimum mining dimensions and internal (or, if applicable, external) mining dilution. It may not always be possible to make detailed assumptions regarding mining factors when estimating Mineral Resources. In order to demonstrate realistic prospects for eventual economic extraction, basic assumptions are necessary. Examples include access issues (shafts, declines etc.), geotechnical parameters (pit slopes, stope dimensions etc.), infrastructure requirements and estimated mining costs. All assumptions should be clearly stated.</i>
<i>Metallurgical factors or assumptions</i>	<i>The metallurgical process proposed and the appropriateness of that process to the style of mineralisation. It may not always be possible to make detailed assumptions regarding metallurgical treatment processes when reporting Mineral Resources. In order to demonstrate realistic prospects for eventual economic extraction, basic assumptions are necessary. Examples include the extent of metallurgical test work, recovery factors, allowances for by-product credits or deleterious elements, infrastructure requirements and estimated processing costs. All assumptions should be clearly stated.</i>
<i>Tonnage factors (in situ bulk densities)</i>	<i>Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, the frequency of the measurements, the nature, size and representativeness of the samples.</i>
<i>Classification</i>	<i>The basis for the classification of the Mineral Resources into varying confidence categories. Whether appropriate account has been taken of all relevant factors i.e. relative confidence in tonnage/grade computations, confidence in continuity of geology and metal values, quality, quantity and distribution of the data. Whether the result appropriately reflects the Competent Person's view of the deposit.</i>
<i>Audits or reviews</i>	<i>The results of any audits or reviews of Mineral Resource estimates.</i>
<i>Others</i>	<i>Any potential impediments to mining such as land access, environmental or legal permitting. Location plans of mineral rights and titles.</i>

<b>ESTIMATION AND REPORTING OF MINERAL RESERVES</b> <b>(criteria listed in the first group, and where relevant in other preceding groups, apply also to this group)</b>	
<i>Mineral Resource estimate for conversion to Mineral Reserves</i>	<i>Description of the Mineral Resource estimate used as a basis for the conversion to a Mineral Reserve. Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Mineral Reserves.</i>
<i>Cut-off grades or parameters</i>	<i>The basis of the cut-off grade(s) or quality parameters applied, including the basis, if appropriate, of equivalent metal formulae. The cut-off parameter may be economic value per block rather than grade.</i>
<i>Mining factors or assumptions</i>	<i>The method and assumptions used to convert the Mineral Resource to a Mineral Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design). The choice of, the nature and the appropriateness of the selected mining methods and other mining parameters including associated design issues such as pre-strip, access, etc. The assumptions made regarding geotechnical parameters (e.g. pit slopes, stope sizes, etc.), grade control and pre-production drilling. The major assumptions made and Mineral Resource model used for pit optimisation (if appropriate). The mining dilution factors, mining recovery factors, and minimum mining widths used and the infrastructure requirements of the selected mining methods. Where available, the historic reliability of the performance parameters.</i>
<i>Metallurgical factors or assumptions</i>	<i>The metallurgical process proposed and the appropriateness of that process to the style of mineralisation. Whether the metallurgical process is well-tested technology or novel in nature. The nature, amount and representativeness of metallurgical test work undertaken and the metallurgical recovery factors used. Any assumptions or allowances made for deleterious elements. The existence of any bulk sample or pilot scale test work and the degree to which such samples are representative of the orebody as a whole. The tonnages and grades reported for Mineral Reserves should state clearly whether these are in respect of material to the plant or after recovery. Comment on existing plant and equipment, including an indication of replacement and salvage value.</i>
<i>Cost and revenue factors.</i>	<i>The derivation of or assumptions made, regarding projected capital and operating costs. The assumptions made regarding revenue including head grade, metal or commodity prices, exchange rates, transportation and treatment charges, penalties, etc. The allowances made for royalties payable, both Government and private. Basic cash flow inputs for a stated period.</i>



Market assessment.	<i>The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future. A customer and competitor analysis along with the identification of likely market windows for the product. Price and volume forecasts and the basis for these forecasts.</i>
Others.	<i>The effect, if any, of natural risk, infrastructure, environmental, legal, marketing, social or governmental factors on the likely viability of a project and/or on the estimation and classification of the Mineral Reserves. The status of titles and approvals critical to the viability of the project, such as mining leases, discharge permits, government and statutory approvals. Environmental descriptions of anticipated liabilities. Location plans of mineral rights and titles.</i>
Classification	<i>The basis for the classification of the Mineral Reserves into varying confidence categories. Whether the result appropriately reflects the Competent Person's view of the deposit. The proportion of Probable Mineral Reserves which have been derived from Measured Mineral Resources (if any).</i>
Audits or reviews.	<i>The results of any audits or reviews of Mineral Reserve estimates.</i>
<b>ESTIMATION AND REPORTING OF DIAMOND MINERALISATION (criteria listed in the first group and where relevant in other preceding groups, apply also to this group)</b>	
Sample collection	<i>Type of sample and purpose, e.g. large diameter drilling to establish stones per unit of volume or bulk samples to establish stone size distribution. Sample size, distribution and representativity.</i>
Sample treatment	<i>Type of facility, treatment rate, and accreditation. Sample size reduction. Bottom screen size, top screen size and re-crush. Processes (dense media separation, grease, X-ray, hand-sorting etc. Process efficiency, tailings auditing and granulometry. Laboratory used, type of process for micro diamonds and accreditation.</i>
Grade estimation	<i>Micro and macro diamonds per facies. Bulk sampling results, global grade per facies. Spatial structure analysis and grade distribution. Stone size and number distribution. Sample head feed and tailings particle granulometry. Sample density determination. Percent concentrate and undersize per sample. Grade with change in Bottom Cut-off Screen Size. Geostatistical techniques applied. Adjustments made to size distribution for sample plant performance and performance on a commercial scale.</i>
Value estimation	<i>Diamonds quantities per facies or depth. Details of parcel valued, number of stones, carats and size distribution. Estimation of value with size. Assessment of diamond breakage. Average \$/carat and \$/tonne value with change in bottom cut-off. Minimum parcel size for representative valuation.</i>

<i>Security and integrity</i>	<i>Accredited process audit. Whether samples were sealed after excavation. Valuer location, escort, delivery, cleaning losses, reconciliation with recorded sample carats and number of stones. Core samples washed prior to treatment for micro diamonds. Audit samples treated at alternative facility. Results of tailings checks. Recovery of tracer monitors used in sampling and treatment. Geophysical (logged) density and particle density. Cross validation of sample weights, wet and dry, with hole volume and density, moisture factor.</i>
<i>Classification</i>	<i>Consider the elements of uncertainty in estimates and develop classification accordingly. In addition to general requirements to assess volume and density there is a need to relate stone frequency (stones per cubic metre or tonne) to stone size (carats per stone) to derive grade (carats per tonne). The value per carat is of critical importance in demonstrating the mineral reserves and hence the project value.</i>

## **APPENDIX 1          ADDITIONAL UNFC CATEGORIES**

The additional three categories given below are included for information only and do not form part of the Code or Guidelines. They are of particular interest for government planning purposes, which would include future land use or strategic mineral inventories. These categories refer to material that is either poorly defined or which has been shown by appropriate technical and economic studies to be currently not economic, but possibly could become economically viable in future. It is not intended that these categories be used for non-governmental investment and financing decisions.

### **RECONNAISSANCE MINERAL RESOURCE**

**A 'Reconnaissance Mineral Resource' is based on regional geological studies and mapping, airborne and indirect methods, preliminary field inspection, as well as geological inference and extrapolation. The aim is to identify areas of enhanced mineral potential worthy of further investigation towards deposit identification. The level of confidence is lower than that applying to an Inferred Mineral Resource and is usually not sufficient to quote tonnage and grade figures. UNFC Code 334.**

Estimates of quantity based on limited information and analogies with known deposits of similar geological character may be possible but are inadequate for classification as Inferred Mineral Resources.

### **PREFEASIBILITY MINERAL RESOURCE**

**A 'Prefeasibility Mineral Resource' is that part of an Indicated, and in some circumstances Measured, Mineral Resource, that has been shown, after a Prefeasibility Study has been carried out, to be not economically mineable. The Prefeasibility Study will have included consideration of realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors, but will have demonstrated at the time of reporting that extraction is presently not justified. This material is identified as being possibly economically viable subject to changes in technological, economic, environmental and/or other relevant conditions. UNFC Code: 221 + 222.**

A Prefeasibility Mineral Resource has a lower level of confidence than a Feasibility Mineral Resource.

### **FEASIBILITY MINERAL RESOURCE**

**A 'Feasibility Mineral Resource' is that part of a Measured Mineral Resource, that has been shown, after a Feasibility Study has been carried out, to be not economically mineable. The Feasibility Study will have included consideration of realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors, but will have demonstrated at the time of reporting that extraction is presently not justified. This material is identified as being possibly economically viable subject to changes in technological, economic, environmental and/or other relevant conditions. UNFC Code: 211.**

The complete UNFC Codification, including the UNFC Codes used above is explained in United Nations International Framework Classification for Reserves/Resources – Solid Fuels and Mineral Commodities. United Nations Commission for Europe, Committee on Sustainable Energy. ENERGY/WP.1/R.70, 17 February 1997.

**APPENDIX 2      GENERIC TERMS AND EQUIVALENTS**

Throughout the Code, certain words are used in a general sense when a more specific meaning might be attached to them by particular commodity groups within the industry. In order to avoid unnecessary duplication, the generic terms are listed below together with other terms that may be regarded as synonymous for the purposes of this document.

<b>Generic Term</b>	<b>Synonyms and similar terms</b>	<b>Intended generalised meaning</b>
Mining	Quarrying	All activities related to extraction of <i>metals, minerals and gemstones</i> from the earth whether surface or underground, and by any method (e.g. quarries, open cast, open cut, solution mining, dredging etc.)
Tonnage	Quantity, Volume	An expression of the amount of material of interest irrespective of the units of measurement (which should be stated when figures are reported)
Grade	Quality, Assay, Analysis (Value)	Any physical or chemical measurement of the characteristics of the material of interest in samples or product. Note that the term quality has special meaning for diamonds and other gemstones.
Metallurgy	Processing, Beneficiation, Preparation Concentration	Physical and/or chemical separation of constituents of interest from a larger mass of material. Methods employed to prepare a final marketable product from material as mined. Examples include screening, flotation, magnetic separation, leaching, washing, roasting etc.
Recovery	Yield	The percentage of material of initial interest that is extracted during mining and/or processing. A measure of mining or processing efficiency.
Mineralisation	Type of deposit, orebody, style of mineralisation.	Any single mineral or combination of minerals occurring in a mass, or deposit, of economic interest. The term is intended to cover all forms in which mineralisation might occur, whether by class of deposit, mode of occurrence, genesis or composition.
Mineral Reserves	Ore Reserves	'Mineral' is preferred under the Reporting Code but 'ore' is in common use and is generally acceptable. Other descriptors can be used to clarify the meaning e.g. coal reserves, diamond reserves etc.

Cut off grade	Product specifications	The lowest grade, or quality, of mineralised material that qualifies as economically mineable and available in a given deposit. May be defined on the basis of economic evaluation, or on physical or chemical attributes that define an acceptable product specification.
Diamond	Gemstones	Diamonds and other gemstones with the same characteristics.



### APPENDIX 3 RULES OF CONDUCT and GUIDELINES

The following Rules of Conduct apply to Competent Persons engaged in the practice of preparing or contributing to public reports that include statements of Mineral Exploration Results, Mineral Resources or Mineral Reserves. These Rules are in addition to the Professional Codes of Ethics that may apply due to the Competent Person's membership of a recognised professional body. The Rules of Conduct are listed under various areas of responsibility, highlighted in bold text.

#### The Public and Society

**Competent Persons must discharge their duties with fidelity to the public, and at all times in their professional or employed capacities carry out their work with integrity and professional responsibility.** In particular:

*Recognise at all times, that the responsibility of Competent Persons towards the Public overrides all other specific responsibilities including responsibility to professional, sectional, or private interests or to other Competent Persons.*

*Ensure that public comments on geological, engineering and metallurgical and related matters are made with care and accuracy, without unsubstantiated, exaggerated, or premature statements; they should be made clearly and concisely.*

*Base Public Reports on Mineral Resources and Mineral Reserves on sound and relevant estimation techniques, adequately validated data and unbiased judgement.*

*Note that when required to do so, Competent Persons should give evidence, express opinions or make statements in an objective and truthful manner on the basis of adequate knowledge and understanding.*

*Recognise that where required to do so, Competent Persons should be prepared to disclose details of qualifications, professional affiliations and relevant experience in all public reports.*

#### The Profession, Employers and Clients

**Competent Persons must uphold the honour, integrity, reputation and dignity of their profession and maintain the highest level of conduct in all professional matters.** In particular they should:

*Act with due skill, care and diligence at all times in conducting their activities.*

*Perform work only in their area of competence.*

*Never knowingly mislead or deceive others, falsify or fabricate data.*

*Respect and safeguard confidential information.*

*Acknowledge and avoid wherever possible both real and perceived conflicts of interest.*

*Distinguish between fact and opinion so that it is clearly evident what is interpretation of fact and what is professional judgement. Competent/Qualified Persons may give a considered professional opinion based on facts, experience, interpretation, extrapolation or a combination of these.*

*Ensure the scientific and technological contributions are thorough, accurate and unbiased in design, implementation and presentation.*

*Ensure that sound and relevant estimation techniques, adequately validated data and unbiased judgement are applied to the documentation upon which public reports on Mineral Resources and Reserves are based.*

*Comply with all laws and regulations relating to the mineral industries and rules, regulations and practices as established and promulgated by the relevant regulatory authorities.*

*Use their best endeavours to ensure that their employer or client complies with the rules and regulations and practices of the relevant regulatory authorities.*

## **Professional Bodies, Colleagues and Associates**

**Competent Persons must at all times conform to the rules of the professional bodies to which they belong and respect and acknowledge the contributions of colleagues and other experts in enabling them to conduct their work.** They should:

*Accept responsibility for their own errors.*

*Demonstrate a willingness to be judged by their professional peers.*

*Agree to be bound by the disciplinary code of the professional body to which they are affiliated.*

*Encourage others to accept the same responsibilities, to join a recognised professional body and to be bound by these Rules of Conduct.*

## **The Environment, Health and Safety**

**In performing their work, Competent Persons should strive to protect the natural environment and ensure that the consequences of their work do not adversely affect the safety, health and welfare of themselves, colleagues and members of the Public.**

*Ensure that consideration of the modifying factors used to determine Mineral Reserves fully recognises the need to provide a safe working environment.*

*Ensure that Mineral Reserve estimates acknowledge the likely environmental impact of development and ensure that appropriate allowances are made for mitigation and remediation.*